Appendix 5 – All Pubmed Records in PBM Database

(Note: Each record consists of a Title, followed by ten spaces, followed by an Abstract (if available), followed by ten spaces, followed by Substances (if available), followed by ten spaces, followed by MeSH terms (if available))

Table 5A-1 – All Pubmed Records in PBM database

Phototherapy. In general, laser therapy and phototherapy are considered acceptable during breastfeeding.[1,2] Phototherapy for psoriasis is also generally acceptable; however, nursing should be withheld for 24 hours after ingestion of an oral psoralen, such as methoxsalen.[3]
Effect of post-space treatments on the push-out bond strength and failure modes of glass fibre posts. The aim of this study was to evaluate the effect of different post-space treatments on the push-out bond strength and failure modes of glass fibre posts. Forty mandibular premolar roots were cut and endodontically treated. Post spaces were prepared and roots were divided into four groups. In group 1 distilled water irrigation (control), in group 2 2.25% NaOCl irrigation, in group 3 2.25% NaOCl + 17% EDTA irrigation were done and in group 4 diode laser was applied to the prepared post spaces. Scanning electron microscope (SEM) analysis was made for each group. Fibre posts were then luted with resin cement. Each root was prepared for push-out test. Data were statistically analysed with anova ($P = 0.05$). After push-out test, the failure modes were observed but not statistically analysed. There were statistically significant differences between Group 3 and Group 2 in both regions ($P < 0.05$), also in the middle region of Group 4 and Group 2 ($P < 0.05$). Cervical root segments showed higher bond strengths than middle ones in all groups ($P < 0.05$). The highest bond strength values were obtained from NaOCl/EDTA and the lowest bond strength values were obtained from NaOCl for both regions. Composite Resins;Dental Materials;Resin Cements;Root Canal Irrigants;fiberglass;Edetic Acid;Sodium Hypochlorite Bicuspid;Composite Resins;Dental Bonding;Dental Materials;Dental Prosthesis Design;Dental Pulp Cavity;Dental Stress Analysis;Dentin;Edetic Acid;Glass;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Post and Core Technique;Resin Cements;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Stress, Mechanical;Surface Properties;Tooth, Nonvital
Evaluation of microleakage of root canal fillings irradiated with different output powers of erbium, chromium:yttrium-scandium-gallium-garnet laser. This study evaluated the root canal seal achieved by irradiation with an erbium, chromium:yttrium-scandium-gallium-garnet laser, and the optimal output power to remove debris and the smear layer were determined. One hundred mandibular premolar teeth were prepared and divided into four groups. Group 1 was not lased but was irrigated with 5 mL of 5.25% NaOCl and 5 mL of 17% ethylenediaminetetraacetic acid. Group 2 was irradiated at a panel setting of 1 W, group 3 at 2 W and group 4 at 2.5 W, with a 50% water level and 48% air-cooling level. Root canals were obturated by cold lateral compaction, and apical microleakage was measured using a fluid filtration model. The remaining debris and smear layer were evaluated via scanning electron microscopy. Statistically significant differences were detected between groups. Irradiation at 1 and 2 W using an erbium, chromium:yttrium-scandium-gallium-garnet laser produced a seal superior to that of the other treatments. Root Canal Filling Materials;Root Canal Irrigants;Gutta-Percha;Edetic Acid;Sodium Hypochlorite Dental Leakage;Dental Pulp Cavity;Dentin;Edetic Acid;Gutta-Percha;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Radiotherapy Dosage;Root Canal Filling Materials;Root Canal Irrigants;Root Canal Obturation;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Tooth Apex

[Using a laser based program in patients diagnosed with fibromyalgia]. In this study, the benefits of a program of treatment by laser were evaluated on the improvement of symptoms associated with fibromyalgia. A total of 31 participants took part in the study, all of them women, randomized into two groups: intervention with laser and placebo. The intervention with girlase E11010 consisted of the individual application of six frequencies on seven anatomical zones of the body. The results were statistically significant differences for "weariness" and "difficulty sleeping" variables. In the rest of the variables, we did not find any statistical significance. One of the conclusions from the present study is the need for development of new research to verify the influence of girlase E1.1010 in the improvement of symptoms associated with fibromyalgia.
Adult;Fatigue;Female;Fibromyalgia;Humans;Lasers;Low-Level Light Therapy;Middle Aged;Pain;Pain Measurement;Sleep Disorders, Intrinsic;Surveys and Questionnaires;Treatment Outcome

Low-level laser therapy for carpal tunnel syndrome and chronic neck pain. Carpal Tunnel Syndrome;Chronic Disease;Device Approval;Humans;Low-Level Light Therapy;Neck Pain;Randomized Controlled Trials as Topic;Technology Assessment, Biomedical;Treatment Outcome

[Alternative of laser treatment optimization in retinoschisis]. In this study a new original technique is proposed for treatment of II-III retinoschisis using diode laser Milon Lachta (Saint-Petersburg). Laser radiation parameters were wave length 0,83 microm, energy 350-850 m W, time 0,2-0,3 s, spot diameter 150-200 microm. Original technique of gradual progressive laser coagulation was performed in 72 patients with II-I1 retinoschisis using diode laser. This treatment allowed to preserve macular function to the maximum. Follow-Up Studies;Humans;Low-Level Light Therapy;Retina;Retinoschisis;Treatment Outcome

[The application of pulsed infrared laser radiation with autoresonant amplification for the treatment of patients with acute viral hepatitis B]. A group of 59 patients presenting with acute viral hepatitis B was available for examination. A single course of pulsed infrared laser irradiation with autoresonant amplification resulted in the improvement of clinical conditions of the patients and normalization of ALAT activity, total and direct bilirubin levels. Adolescent;Adult;Combined Modality Therapy;Female;Gallbladder;Hepatitis B;Humans;Infrared Rays;Lasers;Liver;Liver Function Tests;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

[Potentials of combined non-medication therapy of arterial hypertension associated with ischemic heart disease]. The objective of the present work was to develop methods and a scientifically sound rationale for the optimization of clinical results of the treatment of patients presenting with arterial hypertension (AH) associated with coronary heart disease (CHD) using red and infra-red (IR) low-intensity laser irradiation. The study included a total of 90 patients of working age (62.2% of men and 37.8% of women) having AH associated with coronary heart disease and abnormal blood lipid spectrum. They were allocated to three groups each comprising 30 patients matched for age, sex, severity of clinical conditions, and character of maintenance medicamental therapy. Patients of group 1 were treated by intravenous blood irradiation with laser light; those in group 2 were given similar treatment in combination with external low-intensity IR laser therapy; patients of group 3 received basal medicamental therapy. The study allowed the clinical value of different variants of low-intensity laser therapy to be assessed as regards efficiency of correction of hypersympaticotony, disturbances of lipid metabolism, and refractoriness to pharmaceutical products as well as improved tolerance of physical exercises, anti-hypertensive, anti-ischemic, and anti-anginal effects, diastolic function, and quality of life as targets of the comprehensive rehabilitative program designed for patients with AH associated with coronary heart disease. An optimized therapeutic modality is proposed for patients presenting with these pathologies based on the application of the low-intensity laser irradiation regime characterized by mutual amplification and complementary action of red and infrared lights.
Lipids Combined Modality Therapy;Endovascular

Procedures;Female;Humans;Hypertension;Lipids;Low-Level Light Therapy;Male;Myocardial Ischemia;Treatment Outcome
Successful treatment of chronic periapical osteomyelitis in a Parma wallaby (Macropus parma) using comprehensive endodontic therapy with apicoectomy. Although necrobacillosis remains a common condition of captive macropods, there have been limited reports of successful treatment modalities by which it can be treated. Comprehensive endodontic therapy with apicoectomy has been used reliably in human and domestic animal dentistry. This report describes a case of periapical osteomyelitis involving a mandibular incisor in a Parma wallaby (Macropus parma) that was successfully treated using these techniques in conjunction with low-level laser therapy at 810 nm, which was used for decontamination of the pulp cavity, anti-inflammatory, and biostimulatory effects. Animals;Apicoectomy;Chronic Disease;Female;Macropodidae;Osteomyelitis
Low power argon laser-induced thermal therapy for subcutaneous Ehrlich carcinoma in mice using spherical gold nanoparticles. The present study examines the feasibility of a low power argon laser-induced thermal therapy to Ehrlich carcinoma, employing a direct administration of spherical gold nanoparticles (GNPs). This modality utilizes the advantage of strong surface plasmon resonance exhibited by spherical GNPs in the visible range. Ehrlich tumors were grown in female balb mice by subcutaneous injection of Ehrlich ascites carcinoma cells. GNPs with an average diameter 13 +/- 1.2 nm and optical density (ODlambda:518 nm = 3) were directly injected within the tumor interstitium. Tumors were then illuminated with a continuous-wave (CW) argon ion laser with irradiance 55 mW cm-2 for 45 min. All laser-GNPs treated tumors exhibited a significant suppression in tumor growth throughout 15 days. On the contrary, sham-treated group (laser treatment without GNPs injection) and control group (neither laser nor GNPs treatment) showed a progressive increase in tumor growth during the same period. Histopathological examination demonstrated extensive necrotic percentage in laser-GNPs treated group (90%) in comparison with sham (35%) or control group (3-7%). A wide-angle X-ray scattering also revealed detectable changes in tumor protein structure exposed to both laser and GNPs. It can be concluded from this study that the intense surface plasmon resonance exhibited by spherical GNPs in the visible range could be very useful as a noninvasive technique for photothermal therapy of skin or near-surface type tumors that need much less laser energy and lower concentrations of GNPs. Gold Animals;Carcinoma, Ehrlich Tumor;Female;Gold;Lasers, Gas;Low-Level Light Therapy;Metal Nanoparticles;Mice;Mice, Inbred BALB C;Subcutaneous Tissue;X-Ray Diffraction
Does long-pulsed neodymium:yttrium-aluminum-garnet work on acne lesions?: management of acne in Asian patients with a combinational laser treatment. Acne Vulgaris;Adult;Asian People;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Republic of Korea;Young Adult
[Analysis of parameters of reproductive tract mucosal immunity in women with chlamydial infection before and after local magnetolaserotherapy]. The objective of the present study was to evaluate the influence of combined treatment with low-intensity laser radiation and magnetic field on neutrophil function in women presenting with Chlamydial infection. Dysfunction of neutrophil granulocytes in these patients was manifest in the first place as the decreased number of phagocytes and the low rate of phagocytosis. It was shown that the concentration of active oxygen species in neutrophils in the patients with Chlamydial infection was significantly smaller than in healthy women. The concurrent application of low-intensity laser radiation and a magnetic field not only stimulated phagocytosis but also increased intracellular production of active oxygen species especially under in vitro conditions. It is concluded that combined treatment with low-intensity laser radiation and magnetic field has beneficial effect on the parameters of mucosal immunity in the reproductive tract of women with Chlamydial infection. Reactive Oxygen Species Adult;Chlamydia

Infections;Female;Genitalia, Female;Humans;Immunity, Mucosal;Low-Level Light Therapy;Magnetic Field Therapy;Neutrophils;Phagocytosis;Reactive Oxygen Species
[Laser photodynamic therapy of septic wounds]. Two comparable groups, 60 patients in each, were included in the study. Localization and area of the wounds, as well as basic treatment were equal in these groups. Patients of the main group received the additional photodynamic therapy with chlorine photosensibilizing agent. It led to the shortening of the wound clearing time and stimulation of the epithelisation together with fast decrease of bacterial load. Morphologic analysis showed faster inflammation decrease and granulation as well as lesser microcirculatory disorders in wounds treated with photodynamic therapy. Moreover, cicatrixes were more elastic and gentle in these patients. Adolescent;Adult;Aged;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Sepsis;Treatment Outcome;Wound Healing;Wounds and Injuries;Young Adult
Biostimulation effects of low-power laser in the repair process. The wound healing process has always been an excellent subject for researchers. The use of low-power laser on wounds during the postoperative phase has increased the speed of the healing process. It has been implied that low power radiation affects cellular metabolic processes and promotes beneficial biological effects (analgesic, anti-inflammatory, and healing). Laser biostimulation appears to influence the behavior of the repair process. This paper aims at reviewing the most interesting aspects of the use of low-power laser in the tissue-repair process. Collagen Animals;Cell Proliferation;Collagen;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Tooth Extraction;Wound Healing
Role of low-level laser therapy in neurorehabilitation. This year marks the 50th anniversary of the discovery of the laser. The development of lasers for medical use, which became known as low-level laser therapy (LLLT) or photobiomodulation, followed in 1967. In recent years, LLLT has become an increasingly mainstream modality, especially in the areas of physical medicine and rehabilitation. At first used mainly for wound healing and pain relief, the medical applications of LLLT have broadened to include diseases such as stroke, myocardial infarction, and degenerative or traumatic brain disorders. This review will cover the mechanisms of LLLT that operate both on a cellular and a tissue level. Mitochondria are thought to be the principal photoreceptors, and increased adenosine triphosphate, reactive oxygen species, intracellular calcium, and release of nitric oxide are the initial events. Activation of transcription factors then leads to expression of many protective, anti-apoptotic, anti-oxidant, and pro-proliferation gene products. Animal studies and human clinical trials of LLLT for indications with relevance to neurology, such as stroke, traumatic brain injury, degenerative brain disease, spinal cord injury, and peripheral nerve regeneration, will be covered. Transcription Factors;Electron Transport Complex IV Brain Injuries;Electron Transport Complex IV;Humans;Low-Level Light Therapy;Nervous System Diseases;Stroke Rehabilitation;Transcription Factors
Fractional photothermolysis for the treatment of facial wrinkle in Asians. BACKGROUND: Fractional photothermolysis is a novel aesthetic-laser-surgical modality for the treatment of facial wrinkle in Caucasians apart from other conventional treatments. However there are limited reports regarding the effectiveness and side effects of this treatment in Asians' skin. OBJECTIVE: To evaluate the effectiveness and side effects of 1550 nm Erbium fiber Laser as a treatment for facial wrinkle in Asians'skin (Fitzpatrick's skin type III-V). MATERIAL AND METHOD: Twenty patients with mild to moderate facial wrinkle were included in the study. Half of the forehead in each patient was randomized to receive the treatment and the other half served as control. The treatment was done with FINE SCAN 1550 (TNC SPECTRONICS, Bangkok, Thailand), 1550 nm Erbium fiber laser once a week for 8 successive treatments. Photographs had been taken by VISIA at 0, 4 weeks and 12 weeks

after the treatment and were evaluated by three experienced dermatologists using a quartile grading scale. Patient satisfaction score and side effects during each treatment were also recorded. RESULTS: At 4 weeks after the treatment, mean wrinkle, dyspigmentation, irregularities and the overall improvement scores were 0.35, 0.10, 0.20 and 0.50 respectively. At 12 weeks post treatment, the score decreased to 0.20, 0.05, 0.10 and 0.20. All of the improvement scores were significantly higher ($p < 0.05$) in the treatment group than the control group except for the dyspigmentation improvement score. Patients' satisfaction score was graded as 2 (good) in 35% (7/20) of the patients. Side effects included transient erythema and edema which were mild and self-limited. Mean pain score using visual analog scale was 1.32. No serious side effect was observed. CONCLUSION: Fractional photothermolysis with 1550 nm Erbium fiber Laser is one of the effective treatments for facial wrinkle. However; the improvement score decreased with time. Side effects are few and tolerable, even in patients with Fitzpatrick's skin type III-V Erbium Adult;Asian People;Erbium;Erythema;Face;Female;Forehead;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin Aging;Thailand;Treatment Outcome

Effects of low-level laser therapy on human osteoblastic cells grown on titanium. The aim of this study was to investigate the effects of low-level laser therapy (LLLT) by using gallium aluminum arsenide (GaAlAs) diode laser on human osteoblastic cells grown on titanium (Ti). Osteoblastic cells were obtained by enzymatic digestion of human alveolar bone and cultured on Ti discs for up to 17 days. Cells were exposed to LLLT at 3 J/cm2 (wavelength of 780 nm) at days 3 and 7 and non-irradiated cultures were used as control. LLLT treatment did not influence culture growth, ALP activity, and mineralized matrix formation. Analysis of cultures by epifluorescence microscopy revealed an area without cells in LLLT treated cultures, which was repopulated latter with proliferative and less differentiated cells. Gene expression of ALP, OC, BSP, and BMP-7 was higher in LLLT treated cultures, while Runx2, OPN, and OPG were lower. These results indicate that LLLT modulates cell responses in a complex way stimulating osteoblastic differentiation, which suggests possible benefits on implant osseointegration despite a transient deleterious effect immediately after laser irradiation. Bone Morphogenetic Protein 7;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Integrin-Binding Sialoprotein;Osteoprotegerin;RANK Ligand;RUNX2 protein, human;Osteocalcin;Osteopontin;Intercellular Adhesion Molecule-1;Titanium;Alkaline Phosphatase Alkaline Phosphatase;Analysis of Variance;Bone Matrix;Bone Morphogenetic Protein 7;Cells, Cultured;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Gene Expression;Humans;Integrin-Binding Sialoprotein;Intercellular Adhesion Molecule-1;Lasers, Semiconductor;Low-Level Light Therapy;Osseointegration;Osteoblasts;Osteocalcin;Osteopontin;Osteoprotegerin;RANK Ligand;Statistics, Nonparametric;Titanium

En coup de sabre presenting as a port-wine stain initially treated with a pulsed dye laser. Diagnostic Errors;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Scleroderma, Localized;Young Adult

[The effect of low-intensity red and infrared laser radiation on the rat arterial and deoxygenated blood]. In vitro experiments the effect of low-intensity red or near-infrared laser irradiation on the blood samples (1.5 ml from abdominal aorta of Wistar rats) were studied. The diode laser light (lambda = 650 nm or 808 nm, power density 15.6 mW/cm2, duration 15 min) were used. In some experiments the deoxygenated blood as object for comparison with arterial blood was chosen. Under red laser irradiation we observed a significant increase of average volume of erythrocytes as well as mean amount of free (disaggregated) leukocytes especially in case of the deoxygenated blood. At the same time the concentration of Ca2+ and Na+ were decreased. The effects of infrared laser irradiation on indices mentioned above were not significant. We believe that red low-intensity laser irradiation on the blood is an important factor for theological properties in the field of

microcirculation. Animals;Cell Size;Dose-Response Relationship, Radiation;Erythrocytes;Infrared Rays;Lasers, Semiconductor;Leukocytes;Male;Rats;Rats, Wistar

The use of non-ablative fractional resurfacing in Asian acne scar patients. BACKGROUND AND OBJECTIVES: Non-ablative fractional resurfacing (NA FR) has been shown to be effective for photorejuvenation and acne scarring. Previous studies indicated that density, more than pulse energy, was associated with post-inflammatory hyperpigmentation (PIH) in Asians. The objective of this retrospective study was to assess the efficacy and complications of eight passes of NA FR ('full-NA FR') with the 1,550â€‰nm erbium-doped fibre fractional laser (Fraxel SR laser system, Solta Medical, Hayward, CA) versus four passes ('mini-NA FR') with comparable pulse energy and treatment level as 'full-NA FR', but double the number of treatment sessions in Asian acne scar patients. MATERIALS AND METHODS: Forty-seven Asian atrophic facial acne scar patients who received full-face full-NA FR or mini-NA FR treatments between December 2005 and February 2009 were included. All photographic images captured with the Canfield Visia CR system at baseline and follow-ups were assessed for clinical efficacy and complications by an independent, non-treating and blinded physician. RESULTS: The total treatment densities for full-NA FR and mini-NA FR were 442.5 and 210.5â€‰MTZ/cm(2), respectively. For full-NA FR, the PIH risk was 18.2% with cross-polarized images compared to 6.0% for mini-NA FR. This difference was statistically significant (Pâ€‰<â€‰0.001). Improvement in skin texture, acne scarring, enlarged pores and overall pigmentation irregularity all reached statistical significance at last follow-up compared to baseline. There was no statistically significant difference in clinical efficacy between three full-NA FR and six mini-NA FR treatments. CONCLUSIONS: NA FR was effective and safe in Asians. By reducing the number of passes and the total treatment density, the risk of PIH could be reduced. Meanwhile, clinical efficacy could be maintained by increasing the total number of treatment sessions. Acne Vulgaris;Adult;Asian People;Cicatrix;Cohort Studies;Dose Fractionation, Radiation;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Treatment Outcome;Young Adult

Pulsed dye laser treatment of pigmented lesions: a randomized clinical pilot study comparison of 607- and 595-nm wavelength lasers. BACKGROUND: The 595-nm pulsed dye laser has been used for the treatment of benign epidermal pigmented lesions (EPLs), but there is a risk of inducing undesirable purpura with treatment. OBJECTIVE: To compare a 607-nm laser with a commercially-available 595-nm laser for the treatment of EPLs. MATERIALS AND METHODS: Monte-Carlo simulations were performed to characterize laser interaction with skin. Ten patients with EPLs were treated with a 607-nm study prototype laser and the 595-nm pulsed dye laser twice at 2- to 4-week intervals on the left or right side on a randomized basis. Study endpoints included clearance rate of lesions, side effects immediately after treatment and at final follow-up, and patient discomfort/pain. RESULTS: Monte-Carlo simulations show that the 607-nm is absorbed more specifically by melanin than the 595-nm wavelength. Both lasers were effective in treatment of EPLs. The average degree of improvement overall was 41.2% with the 607-nm laser and 40% with the 595-nm laser. Patients reported less discomfort/pain during treatment with the 607-nm laser. CONCLUSIONS: Our findings suggest that the 607-nm laser is safe and at least as effective as the 595-nm laser in treatment of EPLs. There was less patient discomfort/pain during treatment using the 607-nm laser. Adult;Aged;Cohort Studies;Epidermis;Female;Humans;Hyperpigmentation;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Models, Biological;Pilot Projects;Treatment Outcome

Monitoring of the effect of low-intensity laser radiation with constant pulse generation on neutrophil granulocytes in vitro. We studied the effect of low-intensity laser radiation with constant pulse generation on bactericidal activity of neutrophilic granulocytes, in particular, on their capacity to form extracellular structures, so-called extracellular neutrophil traps. It was found that exposure to low-

intensity laser radiation with constant pulse generation enhanced bactericidal activity of neutrophilic granulocytes, which manifested in the increase of the percent of neutrophils forming extracellular neutrophil traps. Adult;Blood Bactericidal Activity;Humans;In Vitro Techniques;Low-Level Light Therapy;Neutrophils;Statistics, Nonparametric;Time Factors

Efficacy of low-level laser therapy and aluminum hydroxide in patients with chemotherapy and radiotherapy-induced oral mucositis. This study evaluated the efficacy of low-level laser therapy (LLLT) and aluminum hydroxide (AH) in the prevention of oral mucositis (OM). A prospective, comparative and non-randomized study was conducted with 25 patients with head and neck cancer subjected to radiotherapy (RT) or radiochemotherapy (RCT). Twelve patients received LLLT (830 nm, 15 mW, 12 J/cmÂ²) daily from the 1st day until the end of RT before each sessions during 5 consecutive days, and the other 13 patients received AH 310 mg/5 mL, 4 times/day, also throughout the duration of RT, including weekends. OM was measured using an oral toxicity scale (OTS) and pain was measured using the visual analogue scale (VAS). EORTC questionnaires were administered to the evaluate impact of OM on quality of life. The LLLT group showed lower mean OTS and VAS scores during the course of RT. A significant difference was observed in pain evaluation in the 13th RT session (p=0.036). In both groups, no interruption of RT was needed. The prophylactic use of both treatments proposed in this study seems to reduce the incidence of severe OM lesions. However, the LLLT was more effective in delaying the appearance of severe OM. Mouthwashes;Aluminum Hydroxide Aluminum Hydroxide;Combined Modality Therapy;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mouthwashes;Prospective Studies;Radiation Injuries;Radiotherapy;Stomatitis;Treatment Outcome

Immunohistochemical evaluation of the heat shock response to nonablative fractional resurfacing. Despite the emergence of nonablative fractional resurfacing (NFR) as a new therapeutic modality for skin photoaging, little is known about the molecular events that underlie the heat shock response to different treatment parameters. Human subjects are treated with a scanned 1550-nm fractional laser at pulse energies spanning 6 to 40 mJ and a 140-Î¼m spot size. The heat shock response is assessed immunohistochemically immediately through 7 days posttreatment. At the immediately posttreatment time point, we observe subepidermal clefting in most sections. The basal epidermis and dermal zones of sparing are both found to express HSP47, but not HSP72. By day 1, expression of HSP72 is detected throughout the epidermis, while that of HSP47 remains restricted to the basal layer. Both proteins are detected surrounding the dermal portion of the microscopic treatment zone (MTZ). This pattern of expression persists through day 7 post-NFR, although neither protein is found within the MTZ. Immediately posttreatment, the mean collagen denaturation zone width is 50 Î¼m at 6 mJ, increasing to 202 Î¼m at 40 mJ. The zone of cell death exceeds the denaturation zone by 19 to 55% over this pulse energy range. The two zones converge by day 7 posttreatment. Heat-Shock Proteins Cosmetic Techniques;Female;Heat-Shock Proteins;Heat-Shock Response;Humans;Laser Therapy;Low-Level Light Therapy;Male;Radiation Dosage;Skin

Low level laser can be a novel adjuvant method for orthodontic tooth movement on postmenopausal women. Osteoporosis, a pathological state commonly saw on postmenopausal women, has shown to affect jaw bone and the periodontium. While more and more adult patients seeking orthodontic treatment for a beautiful smile, the current strategy has not work well for extraction space closure in postmenopausal women with osteoporosis and concurrent bisphosphates taken. A new and non-invasive method is hoped to make a beginning. There are ample evidences showing low level laser has favorable effects on pain relief and wound healing procedure of hard and soft tissue. These effects are due to its ability to stimulate cell metabolism, angiogenesis, bone formation and osteoclastogenesis. The hypothesis we proposed herein is that low level laser may be a valuable adjuvant method for protecting and facilitating orthodontic tooth movement on this kind of patients.

Bone Remodeling;Female;Humans;Low-Level Light Therapy;Osteoporosis;Periodontium;Postmenopause;Radiotherapy, Adjuvant;Tooth Movement Techniques;Wound Healing

Can lung volumes and capacities be used as an outcome measure for phrenic nerve recovery after cardiac surgeries? Phrenic nerve is the main nerve drive to the diaphragm and its injury is a well-known complication following cardiac surgeries. It results in diaphragmatic dysfunction with reduction in lung volumes and capacities. This study aimed to evaluate the objectivity of lung volumes and capacities as an outcome measure for the prognosis of phrenic nerve recovery after cardiac surgeries. In this prospective experimental study, patients were recruited from Cardio-Thoracic Surgery Department, Educational-Hospital of College of Medicine, Cairo University. They were 11 patients with right phrenic nerve injury and 14 patients with left injury. On the basis of receiving low-level laser irradiation, they were divided into irradiated group and non-irradiated group. Measures of phrenic nerve latency, lung volumes and capacities were taken pre and post-operative and at 3-months follow up. After 3Â months of low-level laser therapy, the irradiated group showed marked improvement in the phrenic nerve recovery. On the other hand, vital capacity and forced expiratory volume in the first second were the only lung capacity and volume that showed improvement consequent with the recovery of right phrenic nerve (P value <0.001 for both). Furthermore, forced vital capacity was the single lung capacity that showed significant statistical improvement in patients with recovered left phrenic nerve injury (P value <0.001). Study concluded that lung volumes and capacities cannot be used as an objective outcome measure for recovery of phrenic nerve injury after cardiac surgeries.

Laser-induced modification of the patellar ligament tissue: comparative study of structural and optical changes. The effects of non-ablative infrared (IR) laser treatment of collagenous tissue have been commonly interpreted in terms of collagen denaturation spread over the laser-heated tissue area. In this work, the existing model is refined to account for the recently reported laser-treated tissue heterogeneity and complex collagen degradation pattern using comprehensive optical imaging and calorimetry toolkits. Patella ligament (PL) provided a simple model of type I collagen tissue containing its full structural content from triple-helix molecules to gross architecture. PL ex vivo was subjected to IR laser treatments (laser spot, 1.6Â mm) of equal dose, where the tissue temperature reached the collagen denaturation temperature of 60â€‰Â±â€‰2Â°C at the laser spot epicenterin the first regime, and was limited to 67â€‰Â±â€‰2Â°C in the second regime. The collagen network was analyzed versus distance from the epicenter. Experimental characterization of the collagenous tissue at all structural levels included cross-polarization optical coherence tomography, nonlinear optical microscopy, light microscopy/histology, and differential scanning calorimetry. Regressive rearrangement of the PL collagen network was found to spread well outside the laser spot epicenter (>2Â mm) and was accompanied by multilevel hierarchical reorganization of collagen. Four zones of distinct optical and morphological properties were identified, all elliptical in shape, and elongated in the direction perpendicular to the PL long axis. Although the collagen transformation into a random-coil molecular structure was occasionally observed, it was mechanical integrity of the supramolecular structures that was primarily compromised. We found that the structural rearrangement of the collagen network related primarily to the heat-induced thermo-mechanical effects rather than molecular unfolding. The current body of evidence supports the notion that the supramolecular collagen structure suffered degradation of various degrees, which gave rise to the observed zonal character of the laser-treated lesion. Collagen Animals;Calorimetry, Differential Scanning;Collagen;Female;Low-Level Light Therapy;Male;Optical Phenomena;Patellar Ligament;Protein Denaturation;Rabbits;Tomography, Optical Coherence

Resonance frequency analysis of orthodontic miniscrews subjected to light-emitting diode photobiomodulation therapy. The aim of this prospective experimental study was to evaluate the effect of light-emitting diode (LED) photobiomodulation therapy (LPT) on the stability of immediately loaded miniscrews under different force levels, as assessed by resonance frequency analysis (RFA). Sixty titanium orthodontic miniscrews with a length of 8 mm and a diameter of 1.4 mm were implanted into cortical bone by closed flap technique in each proximal tibia of 15 New Zealand white adult male rabbits (n = 30). The animals were randomly divided into irradiated and control groups under different force levels (0, 150, and 300 cN). OsseoPulseÂ® LED device (Biolux Research Ltd.) 618 nm wavelength and 20 mW/cm(2) output power irradiation (20 minutes/day) was applied to the miniscrews for 10 days. The RFA records were performed at miniscrew insertion session (T1) and 21 days after surgery (T2). Wilcoxon and Mann-Whitney U-tests were used for statistical evaluation at $P < 0.005$ level. It was found that initial primer stability of all miniscrews was similar in all groups at the start of the experimental procedure. Statistically significant differences were found for changes in implant stability quotient (ISQ) values between LED-photobiomodulated group and the control (0 cN, $P = 0.001$; 150 cN, $P < 0.001$; and 300 cN, $P < 0.001$). Significant increase was found in ISQ values of LPT applied miniscrews under 0 cN (+11.63 ISQ), 150 cN (+10.50 ISQ), and 300 cN (+7.00 ISQ) force during observation period. By the increase of force levels, it was determined that ISQ values decreased in non-irradiated control miniscrews. Within the limits of this in vivo study, the present RFA findings suggest that LPT might have a favourable effect on healing and attachment of titanium orthodontic miniscrews. Dental Materials;Titanium Animals;Bone Screws;Dental Materials;Male;Orthodontic Anchorage Procedures;Osseointegration;Phototherapy;Rabbits;Radiation Dosage;Random Allocation;Stress, Mechanical;Tibia;Time Factors;Titanium;Torque;Vibration

Low-level laser therapy (LLLT) acts as cAMP-elevating agent in acute respiratory distress syndrome. The aim of this work was to investigate if the low-level laser therapy (LLLT) on acute lung inflammation (ALI) induced by lipopolysaccharide (LPS) is linked to tumor necrosis factor (TNF) in alveolar macrophages (AM) from bronchoalveolar lavage fluid (BALF) of mice. LLLT has been reported to actuate positively for relieving the late and early symptoms of airway and lung inflammation. It is not known if the increased TNF mRNA expression and dysfunction of cAMP generation observed in ALI can be influenced by LLLT. For in vivo studies, Balb/c mice (nâ€‰=â€‰5 for group) received LPS inhalation or TNF intra nasal instillation and 3Â h after LPS or TNF-Î±, leukocytes in BALF were analyzed. LLLT administered perpendicularly to a point in the middle of the dissected bronchi with a wavelength of 660Â nm and a dose of 4.5Â J/cm(2). The mice were irradiated 15Â min after ALI induction. In vitro AM from mice were cultured for analyses of TNF mRNA expression and protein and adenosine3':5'-cyclic monophosphate (cAMP) levels. One hour after LPS, the TNF and cAMP levels in AM were measured by ELISA. RT-PCR was used to measure TNF mRNA in AM. The LLLT was inefficient in potentiating the rolipram effect in presence of a TNF synthesis inhibitor. LLLT attenuated the neutrophil influx and TNF in BALF. In AM, the laser increased the cAMP and reduced the TNF-Î± mRNA. LLLT increases indirectly the cAMP in AM by a TNF-dependent mechanism. DNA Primers;Lipopolysaccharides;Phosphodiesterase 4 Inhibitors;RNA, Messenger;Tumor Necrosis Factor-alpha;Cyclic AMP;Rolipram Animals;Base Sequence;Cyclic AMP;DNA Primers;Disease Models, Animal;Lipopolysaccharides;Low-Level Light Therapy;Macrophages, Alveolar;Male;Mice;Mice, Inbred BALB C;Phosphodiesterase 4 Inhibitors;RNA, Messenger;Respiratory Distress Syndrome;Rolipram;Tumor Necrosis Factor-alpha

Effect of photobiomodulation on vinblastine-poisoned murine HERS cells. OBJECTIVE: The aim of this study was to investigate the effect of near-infrared (NIR) photobiomodulation on the proliferation and glutathione levels in murine Hertwig's epithelial root sheath (HERS) cells after poisoning with vinblastine. BACKGROUND: Photobiomodulation has been shown to improve wound

healing in a number of animal models. There have been no studies on the effect of photobiomodulation on cancer-related chemotherapy injury to the cells that initiate tooth root growth. MATERIALS AND METHODS: Control groups consisted of murine HERS cells without vinblastine (VB-) and cells with vinblastine at 10, 20, and 30â€‰ng/mL (VB10, VB20, and VB30). Experimental groups consisted of these same groups with light therapy (VB-L, VB10L, VB20L, and VB30L). The cells were exposed to vinblastine for 1â€‰h. Photobiomodulation consisted of a 75-cm(2) gallium-aluminum-arsenide light-emitting diode (LED) array at an energy density of 12.8â€‰J/cm(2), delivered with 50â€‰mW/cm(2) power over 256â€‰s. RESULTS: Vinblastine alone significantly decreased HERS cell proliferation and glutathione levels at all concentrations (VB10 [-55%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-8)]; VB20 [-72%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-9)]; VB30 [-80%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-10)]; and VB10 [-36%, pâ€‰<â€‰0.0001]; VB20 [-49%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-6)]; VB30 [-53%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-7)] respectively). Photobiomodulation significantly increased cell proliferation at all levels of vinblastine exposure (VB10L [+50%, pâ€‰<â€‰0.0001]; VB20L [+45%, pâ€‰<â€‰0.05]; VB30 [+39%, pâ€‰<â€‰0.05]) but not of the control (+22%, pâ€‰=â€‰0.063). The photobiomodulation significantly increased glutathione production in all concentrations of vinblastine except 20â€‰ng/mL (VB10L [+39%, pâ€‰=â€‰0.007]; VB20L [+19%, pâ€‰=â€‰0.087]; VB30 [+14%, pâ€‰=â€‰0.025]) and the control (+12%, pâ€‰=â€‰0.13). CONCLUSIONS: Photobiomodulation demonstrated an improvement in proliferation and glutathione levels in vinblastine-poisoned murine HERS cells.
Vinblastine;Glutathione Animals;Cell Proliferation;Epithelial Cells;Glutathione;Mice;Phototherapy;Tooth Root;Vinblastine;Wound Healing

Improved cognitive function after transcranial, light-emitting diode treatments in chronic, traumatic brain injury: two case reports. OBJECTIVE: Two chronic, traumatic brain injury (TBI) cases, where cognition improved following treatment with red and near-infrared light-emitting diodes (LEDs), applied transcranially to forehead and scalp areas, are presented. BACKGROUND: Significant benefits have been reported following application of transcranial, low-level laser therapy (LLLT) to humans with acute stroke and mice with acute TBI. These are the first case reports documenting improved cognitive function in chronic, TBI patients treated with transcranial LED. METHODS: Treatments were applied bilaterally and to midline sagittal areas using LED cluster heads [2.1â€³ diameter, 61 diodes (9â€‰Ã—â€‰633â€‰nm, 52â€‰Ã—â€‰870â€‰nm); 12-15â€‰mW per diode; total power: 500â€‰mW; 22.2â€‰mW/cm(2); 13.3â€‰J/cm(2) at scalp (estimated 0.4â€‰J/cm(2) to cortex)]. RESULTS: Seven years after closed-head TBI from a motor vehicle accident, Patient 1 began transcranial LED treatments. Pre-LED, her ability for sustained attention (computer work) lasted 20 min. After eight weekly LED treatments, her sustained attention time increased to 3 h. The patient performs nightly home treatments (5 years); if she stops treating for more than 2 weeks, she regresses. Patient 2 had a history of closed-head trauma (sports/military, and recent fall), and magnetic resonance imaging showed frontoparietal atrophy. Pre-LED, she was on medical disability for 5 months. After 4 months of nightly LED treatments at home, medical disability discontinued; she returned to working full-time as an executive consultant with an international technology consulting firm. Neuropsychological testing after 9 months of transcranial LED indicated significant improvement (+1, +2SD) in executive function (inhibition, inhibition accuracy) and memory, as well as reduction in post-traumatic stress disorder. If she stops treating for more than 1 week, she regresses. At the time of this report, both patients are continuing treatment. CONCLUSIONS: Transcranial LED may improve cognition, reduce costs in TBI treatment, and be applied at home. Controlled studies are warranted.
Brain Injuries;Brain Injury, Chronic;Cognition Disorders;Female;Humans;Low-Level Light Therapy;Middle Aged

In vitro effect of low intensity laser on the cytotoxicity produced by substances released by bleaching gel. This in vitro study aimed to analyze the effect of different parameters of phototherapy with low intensity laser on the viability of human dental pulp fibroblasts under the effect of substances released by bleaching gel. Cells were seeded into 96 wells plates (1 x 10Â³ cells/well) and placed in contact with culture medium conditioned by a 35 % hydrogen peroxide bleaching gel for 40 minutes, simulating the clinical condition of the in-office bleaching treatment. Cells cultured in ideal growth conditions served as positive control group (PC), and the cells grown in conditioned medium and non-irradiated served as negative control group (NC). Cells grown in conditioned medium were submitted to a single irradiation with a diode laser (40 mW, 0.04 cmÂ²) emitting at visible red (660 nm; RL) or near infrared (780 nm; NIR) using punctual technique, in contact mode and energy densities of 4, 6 or 10 J/cmÂ². The cell viability was analyzed through the MTT reduction assay immediately and 24 hours after the irradiation. The data was compared by ANOVA followed by the Tukey's test (p â‰¤ 0.05). The cell viability increased significantly in 24 hours within each group. The PC presented cell viability significantly higher than NC in both experimental times. Only the NIR/10 J/cmÂ² group presented cell viability similar to that of PC in 24 hours. The phototherapy with low intensity laser in defined parameters is able to compensate the cytotoxic effects of substances released by 35 % hydrogen peroxide bleaching gel. Culture Media;Gels;Hydrogen Peroxide Analysis of Variance;Cell Survival;Cells, Cultured;Culture Media;Dental Pulp;Fibroblasts;Gels;Humans;Hydrogen Peroxide;Low-Level Light Therapy;Phototherapy;Time Factors;Tooth Bleaching

Comparative effects of low-intensity pulsed ultrasound and low-level laser therapy on injured skeletal muscle. OBJECTIVE: The main purpose of this study was to compare the effects of low-intensity pulsed ultrasound (US) and low-level laser therapy (LLLT) on injured skeletal muscle after cryolesion by means of histopathological analysis and immunohistochemistry for cyclo-oxygenase-2 (COX-2). BACKGROUND AND METHODS: Thirty-five male Wistar rats were randomly distributed into four groups: intact control group with uninjured and untreated animals; injured control group with muscle injury and no treatment; LLLT-treated group with muscle injury treated with 830-nm laser; and US-treated group with muscle injury treated with US. Treatments started 24â€‰h postsurgery and were performed during six sessions. RESULTS: LLLT-treated animals presented minor degenerative changes of muscle tissue. Exposure to US reduced tissue injuries induced by cryolesion, but less effectively than LLLT. A large number of COX-2 positive cells were found in untreated injured rats, whereas COX-2 immunoexpression was lower in both LLLT- and US-treated groups. CONCLUSION: This study revealed that both LLLT and US therapies have positive effects on muscle metabolism after an injury in rats, but LLLT seems to produce a better response. Cyclooxygenase 2 Animals;Cyclooxygenase 2;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Ultrasonic Therapy

Microtensile bond strength of resin cement to a feldspathic ceramic. OBJECTIVE: The purpose of this study was to evaluate the microtensile bond strength of resin cement to a feldspathic ceramic after treating the surface with (a) hydrofluoric (HF) acid, (b) air abrasion, (c) Er:YAG laser irradiation, (d) Nd:YAG laser irradiation, and (e) HF acid etching after either air abrasion or laser irradiation. BACKGROUND DATA: It is unknown whether the laser application or its combination with another treatment method can be used as a tool to roughen the surface of a feldspathic ceramic in order to increase the bond strength between the resin cement and ceramic surface. MATERIALS AND METHODS: Forty feldspathic ceramic blocks (Ceramco(TM)) were prepared and divided into eight equal groups (nâ€‰=â€‰5) according to the following surface treatments: no treatment; etching with 9.5% HF acid; air abrasion with 50â€‰Î¼m Al(2)O(3); Er:YAG laser irradiation; Nd:YAG laser irradiation; air abrasion plus acid etching; Er:YAG laser plus acid etching; and Nd:YAG laser plus acid etching. After surface treatment, a silane-coupling agent and resin cement (Panavia F(TM)) were

applied to each block. After storing for 24â€‰h at 37Â°C and thermocycling between 5Â°C and 55Â°C for 1000 cycles, the microtensile bond strength of each specimen was measured. RESULTS: The highest bond strength was obtained from HF acid etching. HF acid etching after each laser irradiation significantly increased the bond strength (pâ€‰<â€‰0.05). However, HF acid etching after air abrasion decreased bond strength when compared to air abrasion alone. CONCLUSIONS: HF acid etching is the most effective surface treatment method for a feldspathic ceramic. However, laser irradiation with either the Er:YAG or Nd:YAG laser is not an adequate method for improving the bond strength of Panavia F. The laser application should be combined with HF acid etching. Dental Materials;Panavia-Fluoro;Resin Cements;Dental Porcelain;Ceramco;Hydrofluoric Acid Acid Etching, Dental;Air Abrasion, Dental;Analysis of Variance;Dental Bonding;Dental Materials;Dental Porcelain;Dental Stress Analysis;Humans;Hydrofluoric Acid;In Vitro Techniques;Low-Level Light Therapy;Materials Testing;Resin Cements;Tensile Strength

Bisphosphonate-related osteonecrosis of the jaws: a case series of 25 patients affected by osteoporosis. Bisphosphonates (BPs) are used to treat metabolic bone diseases, such as osteoporosis. In this study the occurrence of bisphosphonates-related osteonecrosis of the jaws (BRONJ) is reported in 25 patients who received BP therapy for osteoporosis with different drug schedules. From June 2005 to May 2009, 25 patients affected by BRONJ were observed. A history of oral surgery was reported for 18 patients (72%). Of the 22 patients treated by the authors, 20 (91%) recorded healing improvement with a mean follow-up of 16.6 months, with particular regard for those treated with oral surgery and laser applications (10/22, 45%) who were all characterised by complete mucosal healing over time. The risk of developing BRONJ in patients treated with BP for osteoporosis is lower than in cancer patients, but is not negligible. It is advisable for the prescribing physician to recommend a dental check-up prior to treatment, at least for patients who have not been to the dentist in the last 12 months. An early surgical and possible laser-assisted approach for patients who develop BRONJ is recommended. Anti-Bacterial Agents;Bone Density Conservation Agents;Dental Implants;Diphosphonates;Drug Combinations;Glucocorticoids Aged;Aged, 80 and over;Anti-Bacterial Agents;Arthritis, Rheumatoid;Bone Density Conservation Agents;Combined Modality Therapy;Curettage;Debridement;Dental Care;Dental Implants;Dentures;Diabetes Mellitus, Type 2;Diphosphonates;Drug Combinations;Female;Follow-Up Studies;Glucocorticoids;Humans;Jaw Diseases;Laser Therapy;Low-Level Light Therapy;Middle Aged;Osteonecrosis;Osteoporosis, Postmenopausal;Patient Care Planning;Risk Factors;Tooth Extraction;Wound Healing

Oral mucositis prevention by low-level laser therapy in head-and-neck cancer patients undergoing concurrent chemoradiotherapy: a phase III randomized study. PURPOSE: Oral mucositis is a major complication of concurrent chemoradiotherapy (CRT) in head-and-neck cancer patients. Low-level laser (LLL) therapy is a promising preventive therapy. We aimed to evaluate the efficacy of LLL therapy to decrease severe oral mucositis and its effect on RT interruptions. METHODS AND MATERIALS: In the present randomized, double-blind, Phase III study, patients received either gallium-aluminum-arsenide LLL therapy 2.5 J/cm(2) or placebo laser, before each radiation fraction. Eligible patients had to have been diagnosed with squamous cell carcinoma or undifferentiated carcinoma of the oral cavity, pharynx, larynx, or metastases to the neck with an unknown primary site. They were treated with adjuvant or definitive CRT, consisting of conventional RT 60-70 Gy (range, 1.8-2.0 Gy/d, 5 times/wk) and concurrent cisplatin. The primary endpoints were the oral mucositis severity in Weeks 2, 4, and 6 and the number of RT interruptions because of mucositis. The secondary endpoints included patient-reported pain scores. To detect a decrease in the incidence of Grade 3 or 4 oral mucositis from 80% to 50%, we planned to enroll 74 patients. RESULTS: A total of 75 patients were included, and 37 patients received preventive LLL therapy. The mean delivered radiation dose was greater in the patients treated with LLL (69.4 vs. 67.9 Gy, p = .03). During CRT, the

number of patients diagnosed with Grade 3 or 4 oral mucositis treated with LLL vs. placebo was 4 vs. 5 (Week 2, p = 1.0), 4 vs. 12 (Week 4, p = .08), and 8 vs. 9 (Week 6, p = 1.0), respectively. More of the patients treated with placebo had RT interruptions because of mucositis (6 vs. 0, p = .02). No difference was detected between the treatment arms in the incidence of severe pain. CONCLUSIONS: LLL therapy was not effective in reducing severe oral mucositis, although a marginal benefit could not be excluded. It reduced RT interruptions in these head-and-neck cancer patients, which might translate into improved CRT efficacy. Cisplatin Adenocarcinoma, Clear Cell;Adult;Aged;Body Weight;Brazil;Carcinoma;Carcinoma, Squamous Cell;Chemoradiotherapy;Cisplatin;Deglutition Disorders;Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Radiotherapy Dosage;Stomatitis;Treatment Failure;Young Adult

Novel treatment immediately after myelomeningocele repair applying low-level laser therapy in newborns: a pilot study. BACKGROUND/AIMS: The use of low-level laser therapy (LLLT) in neurosurgery is still hardly disseminated and there are situations in which the effects of this therapeutic tool would be extremely relevant in this medical field. The aim of the present study is to analyze the effect of LLLT on tissue repair after the corrective surgical incision in neonates with myelomeningocele, in an attempt to diminish the incidence of postoperative dehiscences following surgical repair performed immediately after birth. MATERIALS AND METHODS: Prospective pilot study with 13 patients submitted to surgery at birth who received adjuvant treatment with LLLT (group A). A diode laser CW, Î» = 685 nm, p = 21 mW, was applied punctually along the surgical incision, with 0.19 J delivered per point, accounting for a total of 4-10 J delivered energy per patient, according to the surgical wound area and then compared with the results obtained in 23 patients who underwent surgery without laser therapy (group B). RESULTS: This pilot study disclosed a significant decline in dehiscences of the surgical wounds in neonates who were submitted to LLLT (7.69 vs. 17.39%). CONCLUSION: This new adjuvant therapeutic modality with LLLT aided the healing of surgical wounds, preventing morbidities, as well as shortening the period of hospital stay, which implies a reduction of costs for patients and for the institution. Female;Humans;Incidence;Infant, Newborn;Low-Level Light Therapy;Male;Meningomyelocele;Pilot Projects;Prospective Studies;Surgical Wound Dehiscence;Treatment Outcome

Increased mobility and stem-cell proliferation rate in Dugesia tigrina induced by 880nm light emitting diode. The therapeutic effects elicited by photobiostimulation in the near infrared range may be associated with increased proliferation rate of particular cell-types. The present study utilized commercial light emitting diodes to investigate the effects of low-level near-infrared radiation on the proliferation rate of stem cells in amputated planarian. Whole and amputated animals were exposed to either ambient diurnal lighting, darkness, white light, red light, or near-infrared (880 nm) light. Irradiation was consistent for the duration of the experiments and was provided using commercial 5mm light emitting diodes (âˆ¼1.0 mW/m(2) in power density and âˆ¼0.01 J/cm(2) in radiant exposure). Compared to other groups amputated planarian exposed to near-infrared displayed increased mobility by the 3rd day of exposure ($F((4,26))=4.31$, $p<0.04$, Î·(2)=41%). Higher densities of stem cells were measured in these worms 84 h post injury ($F((4,72))=4.78$, $p<0.01$, Î·(2)=21%). These findings suggest that non-coherent light sources with power-densities about 1000 times lower than contemporary low-power laser settings remain effective in generating photobiostimulation effects and warrants further investigation on stem-cell proliferation induced by near-infrared light emitting diodes. Animals;Cell Movement;Cell Proliferation;Low-Level Light Therapy;Planarians;Stem Cells;Time Factors

Evaluation of the vacuum-assisted handpiece compared with the sapphire-cooled handpiece of the 800-nm diode laser system for the use of hair removal and reduction. BACKGROUND: A

handpiece with a 35 Ã— 22-mm treatment window that uses vacuum technology has been designed for the diode laser system. Vacuum suction stretches the skin and brings the hair follicle closer to the surface with the intent to damage the hair follicle at a lower surface fluence. The objective of this study was to compare the degree of follicular thermal damage between the sapphire-cooled smaller handpiece at a higher fluence versus the larger vacuum-assisted handpiece at a lower fluence. METHODS: Five male patients with Fitzpatrick skin types I-IV were enrolled in the study. Three test spots on the right back were treated with the vacuum-assisted laser handpiece at a setting of 10-12 J/cmÂ², and 61-ms pulse duration. Three test spots on the left back were treated with the sapphire-cooled handpiece with a setting of 30-34 J/cmÂ² and a pulse duration of 14-16 ms. A punch biopsy was obtained from one treated area for each handpiece type. The biopsies were sectioned horizontally and examined for the degree of thermal damage to the hair follicle at the level of the isthmus and the bulb. Immediate treatment response, pain score, and total treatment time were recorded. RESULTS: Biopsies from the skin treated with the sapphire-cooled handpiece and the vacuum-assisted handpiece showed the mean hair follicle diameter was 258.3 Âµm (SE [standard error] 41.7) and 225.1 Âµm (SE 17.1), respectively. The mean thermal damage diameter to hair diameter ratio was 0.91 (SE 0.10) and 0.72 (SE 0.12), respectively. The mean immediate treatment response, the mean pain severity, and the mean total treatment time were all lower for the vacuum-assisted handpiece. CONCLUSION: Treatment with the vacuum-assisted handpiece is faster and has a tendency to be more comfortable. Thermal damage to the hair follicle was greater with the sapphire-cooled handpiece. Adult;Biopsy, Needle;Hair Follicle;Hair Removal;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Vacuum

A novel explanation for the healing effect of the Er:YAG laser during skin rejuvenation. The popularity of cutaneous laser resurfacing has soared in recent years. Ablative laser skin rejuvenation with carbon dioxide (COâ,,) and erbium:yttrium-aluminum-garnet (Er:YAG) lasers has been popularized and their side effects individually reported. It has been suggested that initial collagen contraction and thermal damage modulate wound healing. Progress in laser technology permits precise tissue removal and minimal thermal damage. However, mechanisms for cosmetic improvement have not yet been completely determined. In the present short communication, we would like to suggest a possible mechanism for the healing effects exerted by the Er:YAG laser. Reactive Oxygen Species;Collagen Cell Proliferation;Collagen;Extracellular Matrix;Humans;Lasers, Solid-State;Low-Level Light Therapy;Reactive Oxygen Species;Rejuvenation;Signal Transduction;Skin Aging;Wound Healing

Photomedicine and LLLT literature watch. Animals;Humans;Laser Therapy;Phototherapy

Low-level laser therapy in burning mouth syndrome patients: a pilot study. OBJECTIVE: The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on the treatment of burning mouth syndrome (BMS). In addition, the laser effect was compared on the different affected oral sites. MATERIALS AND METHODS: Eleven subjects with a total of 25 sites (tongue, lower lip, upper lip, and palate) affected by a burning sensation were selected. The affected areas were irradiated once a week for three consecutive weeks with an infrared laser (Î»â€‰=â€‰790â€‰nm). The probe was kept in contact with the tissue, and the mucosal surface was scanned during the irradiation. The exposure time was calculated based on the fluence of 6â€‰J/cm(2), the output power of 120â€‰mW, and the area to be treated. Burning intensity was recorded through a visual analog scale before and after the treatment and at the 6-week follow-up. The percentage of the improvement in symptoms was also obtained. RESULTS: Burning intensity at the end of the laser therapy was statistically lower than at the beginning (pâ€‰<â€‰0.01). Patients reported an 80.4% reduction in the intensity of symptoms after laser treatment. There was no statistical difference

between the end of the treatment and the 6-week follow-up, except for the tongue site. CONCLUSION: Under the investigated parameters, infrared LLLT proved to be a valuable alternative for BMS treatment, providing a significant and lasting reduction in symptoms. Adult;Aged;Burning Mouth Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pilot Projects

Laser-induced alveolar bone changes during orthodontic movement: a histological study on rodents. OBJECTIVE: The aim of this study was to assess by light microscopy changes in alveolar bone during orthodontic movement in rats. BACKGROUND: Orthodontic movement causes both removal and deposition of bone tissue. The use of laser phototherapy (LPT) is considered an enhancement factor for bone repair. METHODS: Thirty Wistar rats were divided into two groups (nâ€‰=â€‰15) and subdivided according to animal death (7,13, and 19 days). Half of the animals in each group were treated with LPT during orthodontic movement. After animal death, specimens were processed and underwent histological and semi-quantitative analyses (HE and Sirius red). RESULTS: LPT-irradiated specimens showed significantly higher numbers of osteoclasts when compared with controls at both 7 (pâ€‰=â€‰0.015) and 19 (pâ€‰=â€‰0.007) days, as well as significant increases in the number of osteoblasts (pâ€‰=â€‰0.015) between days 7 and 13. The amount of collagen matrix was significantly reduced between days 7 and 13 at both pressure and tension sites in controls (pâ€‰=â€‰0.015) but not in LPT-treated animals. LPT-treated subjects showed significantly greater deposition of collagen matrix at the pressure site at both the thirteenth (pâ€‰=â€‰0.007) and nineteenth days (pâ€‰=â€‰0.001). At the tension site, a significant increase in the amount of collagen matrix was observed in non-irradiated specimens (pâ€‰=â€‰0.048) between days 7 and 19. CONCLUSIONS: LPT caused significant histological changes in the alveolar bone during induced tooth movement, including alterations in the number of both osteoclasts and osteoblasts and in collagen deposition in both pressure and tension areas. Collagen Alveolar Process;Animals;Cell Count;Collagen;Low-Level Light Therapy;Microscopy;Osteoclasts;Rats;Rats, Wistar;Tooth Movement Techniques

Low-level laser therapy associated to N-acetylcysteine lowers macrophage inflammatory protein-2 (MIP-2) mRNA expression and generation of intracellular reactive oxygen species in alveolar macrophages. OBJECTIVE: The aim of this work was to investigate the low-level laser therapy (LLLT) effect on alveolar macrophages (AM) activated by oxidative stress and lipopolysaccharide (LPS). BACKGROUND DATA: LLLT has been reported to actuate positively relieving the late and early symptoms of airway and lung inflammation. It is not known if the increased MIP-2â€‰mRNA expression and intracellular reactive oxygen species (ROS) generation observed in acute lung inflammation (ALI) can be influenced by LLLT. MATERIALS AND METHODS: Rat AM cell line (AMJ2-C11) was cultured with LPS or H(2)O(2) and laser irradiated. MIP-2â€‰mRNA and ROS production in the AM were evaluated by Real Time-PCR and the 2',7'-dichlorofluorescin diacetate (DCFH-DA) respectively. The NF-ÎºB protein in the AM was measured by the enzyme linked immunoassay method. To investigate the antioxidant effect of laser, the AM were prebathed with N-acetylcysteine (NAC) and then irradiated with laser. LLLT was also studied in the presence of an inhibitor of NF-ÎºB (BMS 205820). In addition, the effect of LLLT on NF-ÎºB protein was investigated. RESULTS: LLLT attenuated the MIP-2â€‰mRNA expression and intracellular ROS generation after LPS or H(2)O(2). When the AM were pretreated with NAC, the laser effect was potentiated. BMS 205820 suppresses the effect of LLLT on MIP-2â€‰mRNA expression and ROS generation, stimulated by LPS or H(2)O(2). On NF-ÎºB transcription factor, both the LLLT and NAC reduced this protein in the AM exposed to LPS or H(2)O(2). The synergistic effect between LLLT and NAC on the reduction the NF-ÎºB was also evidenced. CONCLUSION: Results indicate that there is a synergistic action of LLLT with NAC on MIP-2â€‰mRNA expression from LPS- or H(2)O(2)-stimulated AM, and that both ROS intracellular

generation and NF-kB signaling seem to be involved. Chemokine CXCL2;Cxcl2 protein, rat;Free Radical Scavengers;RNA, Messenger;Reactive Oxygen Species;Acetylcysteine Acetylcysteine;Animals;Cells, Cultured;Chemokine CXCL2;Free Radical Scavengers;Low-Level Light Therapy;Macrophages, Alveolar;RNA, Messenger;Rats;Reactive Oxygen Species

Effects of two low-intensity laser therapy protocols on experimental tooth movement. OBJECTIVE: The purpose of this in vivo study was to determine the effect of two low-intensity laser therapy (LILT) protocols on macroscopic and microscopic parameters of experimental tooth movement. MATERIALS AND METHODS: To induce experimental tooth movement in rats, 40 cN of orthodontic force was applied to the left first molars. Next, a gallium-aluminum-arsenide (Ga-Al-As) diode laser with a wavelength of 830 nm and power output of 100â€‰mW was applied with fluence of 6000â€‰J/cm(2) on the area around the moved tooth. Two different application protocols were used in the experimental groups: one with daily irradiation and another with irradiation during early stages. Macroscopic and microscopic analyses were performed at days 2 and 7 of tooth movement. The amount of tooth movement was measured with a caliper, and tartrate-resistant acid phosphatase and picrosirius staining were used to enable identification of osteoclasts and immature collagen, respectively. RESULTS: The amount of tooth movement did not differ between the irradiated and nonirradiated groups on days 2 and 7 of the experiment. On day 2, no difference was observed in the number of osteoclasts or the percentage of immature collagen. On day 7, there was an increase in the number of osteoclasts after daily applications of LILT, while two applications produced no significant difference from control. The amount of immature collagen on the tension side significantly increased in the nonirradiated group and when LILT was applied for only 2 d, whereas it was shown to be inhibited by daily LILT applications (pâ€‰<â€‰0.05). CONCLUSION: The tested LILT protocols were unable to accelerate tooth movement. Even though the number of osteoclasts increased when LILT was applied daily, the repair at the tension zone was inhibited. Collagen Animals;Collagen;Low-Level Light Therapy;Male;Molar;Osteoclasts;Rats;Rats, Wistar;Tooth Movement Techniques

[Pulsed dye laser treatment for Jessner's lymphocytic infiltration of the skin]. BACKGROUND: Jessner's lymphocytic infiltration of the skin (LIS) is a chronic, benign T-cell infiltrative disorder, usually manifesting as erythematous papules or plaques on the face, neck and back. PATIENTS AND METHODS: five patients presented LIS with numerous skin lesions on the face and back characteristic of this disease. Histological examination showed a lymphocytic infiltrate in the dermis without any modification of the epidermis. Direct immunofluorescent study was negative in all cases. Response to dermocorticoids proved inconsistent or negative in all patients. An excellent outcome was achieved in all five patients with pulsed dye laser. In one case, further skin lesions appeared at 1 year and responded to the same treatment. Following a single treatment session with 6-8 J/cm(2), three of five patients showed normal skin. Regression occurred in the other two cases after two to three sessions. Pulsed dye laser appeared to be the best treatment for Jessner-Kanof disease for three patients at 4-8 years of follow-up. DISCUSSION: only one case of Jessner-Kanof disease treated by pulsed dye laser has been reported. Pulsed dye laser has been used in cutaneous lupus and annular granuloma. Selective photothermolysis allows photocoagulation of dilated vessels. CONCLUSION: pulsed dye laser at 595nm could offer a valuable therapeutic alternative, and even a first-line treatment with no side effects. Adult;Biopsy;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Lymphocytosis;Male;Microscopy, Fluorescence;Middle Aged;Recurrence;Retreatment;Skin;Skin Diseases, Papulosquamous;T-Lymphocytes

Low-intensity laser irradiation stimulates wound healing in diabetic wounded fibroblast cells (WS1). BACKGROUND: Patients with diabetes suffer from slow-to-heal wounds, which often necessitate amputation. Low-intensity laser irradiation (LILI) has been shown to reduce the healing time in such

patients. This study aimed to determine the effect of different wavelengths of LILI on cellular migration, viability, and proliferation in a wounded diabetic cell model. METHODS: Diabetic wounded and unwounded human skin fibroblast cells (WS1) were irradiated at 632.8, 830, or 1,064â€‰nm with 5â€‰J/cm(2). Cellular morphology and migration were determined microscopically, while cellular viability was determined by ATP luminescence, and proliferation was determined by basic fibroblast growth factor expression and alkaline phosphatase activity. RESULTS: Diabetic wounded cells irradiated at 1,064â€‰nm showed a lesser degree of migration, viability, and proliferation compared to cells irradiated at 632.8 or 830â€‰nm. Cells irradiated at 632.8â€‰nm showed a higher degree of haptotaxis and migration as well as ATP luminescence compared to cells irradiated at 830â€‰nm. CONCLUSIONS: This study showed that LILI of diabetic wounded cells in the visible range (632.8â€‰nm) was more beneficial to wound healing than irradiating the same cells to wavelengths in the infrared range. Cells irradiated at a longer wavelength of 1,064â€‰nm performed worse. Fibroblast Growth Factor 2 Cell Growth Processes;Cell Movement;Cell Survival;Diabetes Mellitus;Fibroblast Growth Factor 2;Fibroblasts;Humans;Low-Level Light Therapy;Wound Healing;Wounds and Injuries

New insight into the pathophysiology of tattoo reactions following laser tattoo removal. Coloring Agents Adult;Coloring Agents;Dermatitis, Photoallergic;Female;Foreign-Body Reaction;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin;Tattooing

High-power diode laser use on Fordyce granule excision: a case report. BACKGROUND: Fordyce granules are conventionally considered to be a developmental oral lesion with a higher incidence in men. OBJECTIVE: To report a clinical case of surgical lip Fordyce granule excision in a 19-year-old male. METHODS: Fordyce granules were excised using a high-power diode laser (gallium arsenide [GaAs], Diode VisionÂ®, MDL, 10 Dental Laser Unit, GmbH, Lower Saxony, Germany) with wavelength emission at 980 Â±â€ƒ10 nm, in a continuous wave mode, pulse width of 0.5 Î¼s, fiber optic delivery system of 400 Î¼m in diameter, at 2.5 W. Subsequently, low-intensity laser therapy was applied (gallium-aluminum-arsenide [GaAlAs], at 670 nm, 50 mW, at 4 J/cm(2); DentoflexÂ®, SÃ£o Paulo, Brazil] in order to stimulate a faster wound tissue-healing process and less postoperative pain and inflammation. CONCLUSION: The excellent esthetic result demonstrated the effectiveness of both high- and low-intensity laser therapy on the excision of Fordyce granules. Humans;Lasers, Semiconductor;Lip;Low-Level Light Therapy;Male;Sebaceous Gland Diseases;Young Adult

Nonablative fractional laser resurfacing in Asian skin--a review. Skin resurfacing has been a part of cosmetic dermatology for more than two decades now, and most of it has been ablative with traditional aggressive lasers including the CO(2) and erbium. The last few years have seen a revolutionary change with the invention of nonablative lasers for skin tightening. Fractional resurfacing is a new concept of cutaneous remodeling whereby laser-induced zones of microthermal injury are surrounded by normal untreated tissue that helps in quicker healing. The various wavelengths used are 1320, 1440, and 2940 nm with depth of penetration ranging from 25 Î¼ to 1.2 mm. This article reviews the history of nonablative fractional laser resurfacing, its indications, contraindications, and a review of use in Asian skin with Fitzpatrick type III-VI. Asian People;Contraindications;Cost-Benefit Analysis;History, 21st Century;Humans;Low-Level Light Therapy;Rejuvenation;Skin

Treatment of procedure-related postinflammatory hyperpigmentation using 1064-nm Q-switched Nd:YAG laser with low fluence in Asian patients: report of five cases. Postinflammatory hyperpigmentation (PIH) developing after cosmetic procedures, such as chemical peeling and laser therapies, are always a concern, especially in Asians. Some cases of PIH tend to be spontaneously regressed; however, certain forms of PIH need to be treated with several therapeutic attempts, including bleaching creams, several kinds of Q-switched lasers, and erbium-doped fractional

photothermolysis system, with various treatment outcomes. A 1064-nm Q-switched Nd:YAG laser with low-fluence therapy is easily applicable, and the therapeutic trial in our case was revealed to have minimal downtime without post-therapy bleeding or crust formation; the post-therapy erythema spontaneously resolved within a few hours. The 1064-nm Q-switched Nd:YAG laser with low-fluence treatment should be considered in the treatment of PIH caused by procedures like laser surgery and chemical peeling in Asian patients. Adult;Asian People;Face;Facial Dermatoses;Female;Humans;Hyperpigmentation;Inflammation;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome

Low-level laser in the treatment of carpal tunnel syndrome: clinical, electrophysiological, and ultrasonographical evaluation. The objective of this study is to investigate the efficacy of low-level laser therapy (LLLT) in patients with carpal tunnel syndrome (CTS). Sixty patients with CTS were included in this placebo-controlled and double-blind study and randomly assigned to three treatment groups: active laser with a dosage of 1.2Â J/per painful point, active laser with a dosage of 0.6Â J/per painful point, and placebo groups. A total of 5 points across the median nerve trace were irradiated with Gal-Al-As diode laser. All groups were treated 5 times per week for 3Â weeks. Clinical assessments included pain intensity, grip strength, symptom severity score (SSS), functional status score (FSS), nerve conduction studies, and cross-sectional area (CSA) of the median nerve as measured by ultrasonography. Compared to baseline, post-treatment VAS scores (group 1, PÂ <Â 0.001; group 2, PÂ <Â 0.001; group 3, PÂ <Â 0.01), grip strength (PÂ <Â 0.05), SSS scores (group 1, PÂ <Â 0.001; group 2, PÂ <Â 0.001; group 3, PÂ <Â 0.01), and FSS scores (PÂ <Â 0.05) improved significantly in all groups. Only sensorial nerve velocity measurements on the palmar region showed a significant improvement in both active laser groups (PÂ <Â 0.01). There was no significant difference in any of the outcome measures among the groups. With the chosen laser type and dose regimen, the results suggested that LLLT was no more effective than placebo in CTS.
Adult;Aged;Carpal Tunnel Syndrome;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Prospective Studies;Treatment Outcome;Ultrasonography

The effectiveness of low laser therapy in subacromial impingement syndrome: a randomized placebo controlled double-blind prospective study. OBJECTIVES: Conflicting results were reported about the effectiveness of Low level laser therapy on musculoskeletal disorders. The aim of this study was to investigate the effectiveness of 850-nm gallium arsenide aluminum (Ga-As-Al) laser therapy on pain, range of motion and disability in subacromial impingement syndrome. METHODS: A total of 52 patients (33 females and 19 males with a mean age of 53.59 Â± 11.34 years) with subacromial impingement syndrome were included. The patients were randomly assigned into two groups. Group I (n = 30, laser group) received laser therapy (5 joule/cmÂ² at each point over maximum 5-6 painful points for 1 minute). Group II (n = 22, placebo laser group) received placebo laser therapy. Initially cold pack (10 minutes) was applied to all of the patients. Also patients were given an exercise program including range of motion, stretching and progressive resistive exercises. The therapy program was applied 5 times a week for 14 sessions. Pain severity was assessed by using visual analogue scale. Range of motion was measured by goniometer. Disability was evaluated by using Shoulder Pain and Disability Index. RESULTS: In group I, statistically significant improvements in pain severity, range of motion except internal and external rotation and SPADI scores were observed compared to baseline scores after the therapy ($p < 0.05$). In Group II, all parameters except range of motion of external rotation were improved ($p < 0.05$). However, no significant differences were recorded between the groups ($p > 0.05$). CONCLUSIONS: The Low level laser therapy seems to have no superiority over placebo laser therapy in reducing pain severity, range of motion and functional disability. Epidemiologic Methods;Female;Humans;Lasers, Semiconductor;Male;Middle

Aged;Range of Motion, Articular;Severity of Illness Index;Shoulder Impingement Syndrome;Shoulder Pain

Management of myofascial pain: low-level laser therapy versus occlusal splints. The present study was designed to compare the effects of low-level laser with occlusal splints in patients with signs and symptoms of myofascial pain (MP) dysfunction syndrome. A total of 40 (34 women and 6 men, with a mean age of 32.84 [SD, 10.70] years) were selected after the diagnosis of MP according to the Research Diagnostic Criteria for Temporomandibular Disorder. The patients were randomly divided into 2 groups: study group (n = 20) and control group (n = 20). Low-level laser was applied to patients in the study group 2 times per week, for a total of 10 sessions. Patients in the control group were instructed to wear occlusal splints 24 h/d for 3 months. The functional examination was based on Research Diagnostic Criteria for Temporomandibular Disorder and pressure pain threshold values were obtained with the aid of an algometer in both groups. Patients' self-report of pain was evaluated with visual analog scale. Comparisons were made within and between the groups before and after treatment. Vertical movements showed statistically significant improvements after the treatments in both groups ($P < 0.01$), but when the groups were compared with each other, there were no significant difference between the groups. In both groups, tenderness to palpation of the muscles decreased significantly. Pressure pain threshold evaluations and visual analog scale scores revealed similar results, too. This particular type of low-level laser therapy (820 nm, 3 J/cm2, 300-mW output power) is as effective as occlusal splint in pain release and mandibular movement improvement in MP. Adolescent;Adult;Case-Control Studies;Earache;Facial Pain;Female;Follow-Up Studies;Headache;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Masseter Muscle;Middle Aged;Movement;Occlusal Splints;Pain Measurement;Pain Threshold;Range of Motion, Articular;Self Report;Temporal Muscle;Temporomandibular Joint Dysfunction Syndrome;Young Adult

The efficacy of low-energy selective laser trabeculoplasty. BACKGROUND AND OBJECTIVE: to analyze the efficacy of low-energy selective laser trabeculoplasty (SLT) in patients. PATIENTS AND METHODS: in 74 patients (74 eyes) with ocular hypertension, suspected glaucoma, or primary open-angle glaucoma, SLT was the first-choice treatment. Thirty-nine patients in the low-energy group received treatment using half of conventional laser energy over 360Â° of the trabecular meshwork (at 100 points). Thirty-five patients in the control group received conventional laser energy. Patients were observed for 1 year. Complications and intraocular pressure (IOP) were observed. RESULTS: postoperative transient IOP spike (â‰¥ 3 mm Hg) occurred in three eyes on the day of treatment and partial peripheral anterior synechiae occurred in one eye 1 month after treatment only in the control group. Effective rates of treatment (â‰¥ 20% IOP reduction) at week 2 and month 1, 3, 6, and 12 after treatment were 69.23%, 64.10%, 61.54%, 53.85%, and 48.72% in the low-energy group and 71.43%, 71.43%, 60%, 51.43%, and 48.57% in the control group, respectively. There was no statistically significant difference between the two groups at various time points ($P = .836, .501, .892, .835, .990$). CONCLUSION: compared with SLT using conventional laser energy, low-energy SLT lowers IOP with fewer complications, making it a safe and effective option.
Adult;Aged;Female;Glaucoma, Open-Angle;Humans;Intraocular Pressure;Intraoperative Complications;Low-Level Light Therapy;Male;Middle Aged;Ocular Hypertension;Postoperative Complications;Prospective Studies;Tonometry, Ocular;Trabeculectomy;Treatment Outcome

Randomized, double-blind study on role of low level nitrogen laser therapy in treatment failure tubercular lymphadenopathy, sinuses and cold abscess. BACKGROUND: Effectiveness of low level nitrogen laser therapy along with antitubercular treatment (ATT) in cases of treatment failure and drug resistant tubercular lymphadenopathy, sinuses and cold abscess. METHODS: In a double-blind randomized controlled trial of LLLT, 104 patients assigned to either the low level nitrogen laser

therapy along with ATT (LLLT group) (n = 54) or ATT only (Chemotherapy group) (n = 50). Both groups were treated two times per week for five weeks. Those in the treatment group received pulse nitrogen laser with a pulse duration of seven nanosecond, wave length 337 nanometer and average power output of 5 mW whereas those in the control group were treated with sham laser. The primary outcome measure was bacteriological conversion and the secondary outcome measures were decrease in size of lesion and the clinical improvement. RESULTS: Acid Fast Bacilli (AFB) smear, AFB culture and Polymerase Chain Reaction (PCR) conversion rate at five weeks (after 10 sittings of laser) were 49.15%(Fishers P exact test-p = 0.015), 60%, 44.44% (Fishers P exact test-p = 0.048) in LLLT group as compared to 11.86%, 20%,17.77% in chemotherapy group. Average percentage reduction in the size of gland at 5 weeks was 70.67% (p value 0.01) as compared to 54.81 in chemotherapy group. Average time taken for closure of sinuses was 11.03 weeks in LLLT group as compared to 26 weeks in chemotherapy group. The follow up was conducted for two years. CONCLUSION: Low level nitrogen laser therapy can be used as an adjunctive therapy along with antitubercular drugs in cases not responding and drug resistant tubercular lymphadenopathy, sinuses and cold abscess. Antitubercular Agents;Nitrogen Abscess;Adolescent;Adult;Aged;Antitubercular Agents;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nitrogen;Treatment Failure;Treatment Outcome;Tuberculosis, Lymph Node

Bisphosphonate-associated osteonecrosis of the jaws: surgical treatment with ErCrYSGG-laser. Case report. Bisphosphonates (BP) play an important role in concomitant therapy of certain types of cancer and multiple myeloma as well as in treatment of osteoporosis. The administration of BP has great therapeutic benefits, but correlates with a specific kind of osteonecrosis of the alveolar bone. The so-called bisphosphonate-related osteonecrosis of the jaws (BRONJ) is a rare, but often severe adverse side effect of high-dosage and long-term BP therapy. Thus far, no consensus for treatment of BRONJ has been achieved. All strategies have to take into account the insecure prognosis and danger of recurrence of clinically apparent necrosis and progression of disease. At the Department of Oral Surgery and Radiology, Medical University of Graz, an ErCrYSGG laser was successfully applied in surgical treatment of BRONJ. Stable mucosal coverage could be achieved in all of 5 cases. Laser surgery can be considered as a promising technique for the effective treatment of BRONJ. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid Aged;Aged, 80 and over;Bone Density Conservation Agents;Diphosphonates;Disease Progression;Female;Follow-Up Studies;Humans;Imidazoles;Jaw Diseases;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Mandibular Diseases;Middle Aged;Osteonecrosis;Photochemotherapy;Surgical Wound Dehiscence;Wound Healing;Zoledronic Acid

Diode laser treatment of rhinophyma. Aged;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rhinophyma

The effect of diode laser irradiation on dentin as a preventive measure against dental erosion: an in vitro study. Increasing rates of non-carious cervical lesions due to dental erosion, exposure of dentinal tubules, and hypersensitivity to environmental stimuli have led to the development of new prevention strategies. This study evaluated the effects of a low-intensity diode laser (Î» = 808 nm) on the dentinal chemical composition and prevention of demineralization. In addition, the study monitored temperature changes during the course of irradiation. Forty dentin specimens were randomly allocated into four groups (n = 10): G1 - No treatment (control), G2 - irradiated with 15 J/cm(2), G3 - irradiated with 30 J/cm(2), and G4 - irradiated with 60 J/cm(2). Each specimen was partially covered with nail varnish, treated according to the group irradiation levels, and exposed to an erosive challenge (1.0 M hydrochloric acid) for 5 min. Afterwards, dentin loss was profilometrically analyzed and examined by scanning electron microscopy (SEM) combined with energy dispersive X-ray (EDX). Intrapulpal temperatures were measured during the dentin irradiation. One-way ANOVA

and Tukey tests ($p < 0.05$) were performed to assess differences. For all irradiated groups, intrapulpal temperature changes were less than 3Â°C. The G2 group showed statistically significant differences when compared to the other groups, representing the lowest temperature increase. A quantitative element analysis via EDX did not significantly differ ($p < 0.05$) for Ca, P, F, O, or C between the four groups when measured after irradiation/erosion. The mean wear rates (Â± SD, Î¼m) were 35.66 Â± 7.28; 40.70 Â± 5.03; 38.17 Â± 10.81 and 25.25 Â± 6.87 for G1-G4, respectively. The G4 group statistically differed from all other groups representing the lowest wear rate. These results suggest that dentin irradiation, using a diode laser with levels set at 60 J/cm(2), may induce inhibitory effects on root dentin demineralization without causing any harmful thermal effects. However, the exact mechanism of the action of the laser remains unclear. Phosphorus;Calcium Calcium;Dentin;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Phosphorus;Spectrometry, X-Ray Emission;Temperature;Tooth Demineralization;Tooth Erosion

Effectiveness of Laser treatment at acupuncture sites compared to traditional acupuncture in the treatment of peripheral artery disease. Cardiovascular diseases are the main causes of mortality, not only in Brazil, but around the world. The use of acupuncture as a complementary and alternative treatment for cardiovascular diseases has been suggested for animals as well as human beings. Possible advantages in using acupuncture are the low cost of treatment and low risks of collateral damage from a combination of acupuncture with other medical treatments. The purpose of this study is to assess the effect of traditional acupuncture with needles and laser acupuncture on arterial pressure and peripheral circulation of inferior limbs in patients with circulatory deficiency. Ten acupuncture points were stimulated in 40 individuals, being that 20 were stimulated by Aluminum gallium arsenide (AlGaAs) laser with emission in the red spectral region (650 nm) using an energy density of 2,4 J/cm2, and 20 were stimulated by systemic acupuncture needles. The analysis of peripheral circulation was performed based on the measurement of arterial pressure of the ankle and arms, using sphygmomanometer and Doppler equipment. The variance of the revascularization index of the laser acupuncture group was 0,057, and 0.030 for the needles group with p= 0,006. These results show that only those treated with laser acupuncture exhibit a significant increase in systolic pressure of their lower limbs, with a consequent improvement of the Revascularization Index, suggesting that different stimuli on acupuncture points generate different variations of peripheral resistance of lower limbs. is column. Acupuncture Therapy;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Peripheral Arterial Disease;Treatment Outcome

Update dermatologic laser therapy. New trends in dermatological laser therapy during the last years are based on new wavelengths, concepts and treatment combinations resulting in a variety of new dermatologic indications. Fractional laser therapy of chronic actinic damage of the skin has been introduced and already represents a standard technique. The concept of fractional non-ablative and ablative laser treatment has been shown to be safe and effective. Also pigmented and vascular skin changes can be treated by this method. New, very promising concepts for laser epilation include linear scanned as well as low fluence laser systems. The first enable very short treatment times for large areas; the latter are the basis for the growing market of laser epilation devices for home use. Nevertheless, the potential of low fluence laser devices for long-term hair reduction has not been tested so far. Furthermore, no data exist on side effects resulting from repetitive application of laser light to melanocytic lesions. Laser lipolysis has been introduced as the latest, minimally invasive way of removing small localised fat deposits. The new procedure may have a great potential for liposculpture; its further development should be thoughtfully observed. The latest innovations for precise ablation are ultra-short pulsed laser systems. Femtosecond lasers avoid thermal damage at

the border areas of ablation zones. Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases
Inaccuracies in laser therapy meta-analysis for neck pain? Disability Evaluation;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Neck Pain;Reproducibility of Results;Treatment Outcome
Alternative applications of the femtosecond laser in ophthalmology. PURPOSE: To provide an update of novel applications for the femtosecond (FS) laser in ophthalmology. DESIGN: Perspective, literature review, case report, and commentary. METHODS: Literature review. RESULTS: The many advantages of etching flaps with the FS laser for laser in situ keratomileusis (LASIK) have been well established. Alternative applications of the FS have been approved and are now used in clinical practice. In refractive ophthalmology, the FS laser can be used for lenticule extraction to correct myopia and intrastromal biochemical manipulation to correct presbyopia. This laser can be used for preparing host and donor tissue for both full thickness and lamellar keratoplasty. Research is underway, exploring ways to employ the FS laser for different stages of cataract surgery. Cosmetic procedures with FS-assisted tattooing serve to correct leukoria. CONCLUSIONS: Advancements in technology have allowed measurable improvements in the surgical safety, efficiency, speed, and versatility of FS lasers in ophthalmology. Corneal Transplantation;Humans;Lasers, Solid-State;Low-Level Light Therapy;Ophthalmology
[The use of drinking sulfate mineral water in combination with laser and magnetic-laser irradiation for primary prophylaxis of post-radiation disorders(experimental study)]. Experiments on laboratory rats have demonstrated that prophylactic use of drinkable sulfate mineral water in combination with laser and magnetolaser irradiation of adrenal glands produces a radioprotecive effect that was especially well apparent in the liver and less so in the testes. Simultaneously, the functional activity of the thymus decreased. Protection of the liver by the combination of the above factors was more pronounced than the effect of each of them applied separately. Mineral Waters;Sulfates Adrenal Glands;Animals;Liver;Low-Level Light Therapy;Magnetic Field Therapy;Male;Mineral Waters;Radiation Injuries, Experimental;Rats;Spermatogenesis;Sulfates;Testis;Thymus Gland;Treatment Outcome
[The use of magnetic-laser therapy in the combined treatment of osteoarthrosis in workers exposed to inorganic fluoride compounds]. The present study included 67 patients who had been exposed to the impact of inorganic fluoride compounds. It demonstrated beneficial effect of magnetolaser therapy in combination with whole body iodine-bromide-sodium chlorine baths, physical exercises, and massage on clinical manifestations of the primary disease and concomitant pathologies. Simultaneously, metabolic processes in the articular cartilage and bone tissue were normalized, lipid peroxidation was improved and optimization of antioxidative protection achieved. These changes are indicative of high therapeutic efficiency of the combined treatment employed in this study and its favourable influence on the quality of life of the patients. Air Pollutants, Occupational;Fluorides Air Pollutants, Occupational;Fluorides;Humans;Lipid Peroxidation;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Occupational Diseases;Occupational Exposure;Osteoarthritis;Quality of Life;Treatment Outcome
Comparison between cold water immersion therapy (CWIT) and light emitting diode therapy (LEDT) in short-term skeletal muscle recovery after high-intensity exercise in athletes--preliminary results. In the last years, phototherapy has becoming a promising tool to improve skeletal muscle recovery after exercise, however, it was not compared with other modalities commonly used with this aim. In the present study we compared the short-term effects of cold water immersion therapy (CWIT) and light emitting diode therapy (LEDT) with placebo LEDT on biochemical markers related to skeletal muscle recovery after high-intensity exercise. A randomized double-blind placebo-controlled

crossover trial was performed with six male young futsal athletes. They were treated with CWIT (5Â°C of temperature [SD Â±1Â°]), active LEDT (69 LEDs with wavelengths 660/850Â nm, 10/30Â mW of output power, 30 s of irradiation time per point, and 41.7Â J of total energy irradiated per point, total of ten points irradiated) or an identical placebo LEDT 5Â min after each of three Wingate cycle tests. Pre-exercise, post-exercise, and post-treatment measurements were taken of blood lactate levels, creatine kinase (CK) activity, and C-reactive protein (CRP) levels. There were no significant differences in the work performed during the three Wingate tests (pâ€‰>â€‰0.05). All biochemical parameters increased from baseline values (pâ€‰<â€‰0.05) after the three exercise tests, but only active LEDT decreased blood lactate levels (pâ€‰=â€‰0.0065) and CK activity (pâ€‰=â€‰0.0044) significantly after treatment. There were no significant differences in CRP values after treatments. We concluded that treating the leg muscles with LEDT 5Â min after the Wingate cycle test seemed to inhibit the expected post-exercise increase in blood lactate levels and CK activity. This suggests that LEDT has better potential than 5Â min of CWIT for improving short-term post-exercise recovery. Lactic Acid;C-Reactive Protein;Creatine Kinase Adaptation, Physiological;Adolescent;Adult;Analysis of Variance;C-Reactive Protein;Creatine Kinase;Cross-Over Studies;Cryotherapy;Double-Blind Method;Exercise;Humans;Immersion;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Sports;Statistics as Topic;Time Factors;Young Adult

Effects of low level laser therapy (808Â nm) on physical strength training in humans. Recent studies have investigated whether low level laser therapy (LLLT) can optimize human muscle performance in physical exercise. This study tested the effect of LLLT on muscle performance in physical strength training in humans compared with strength training only. The study involved 36 men (20.8Â±2.2Â years old), clinically healthy, with a beginner and/or moderate physical activity training pattern. The subjects were randomly distributed into three groups: TLG (training with LLLT), TG (training only) and CG (control). The training for TG and TLG subjects involved the leg-press exercise with a load equal to 80% of one repetition maximum (1RM) in the leg-press test over 12 consecutive weeks. The LLLT was applied to the quadriceps muscle of both lower limbs of the TLG subjects immediately after the end of each training session. Using an infrared laser device (808Â nm) with six diodes of 60Â mW each a total energy of 50.4Â J of LLLT was administered over 140Â s. Muscle strength was assessed using the 1RM leg-press test and the isokinetic dynamometer test. The muscle volume of the thigh of the dominant limb was assessed by thigh perimetry. The TLG subjects showed an increase of 55% in the 1RM leg-press test, which was significantly higher than the increases in the TG subjects (26%, Pâ€‰=â€‰0.033) and in the CG subjects (0.27%, Pâ€‰<â€‰0.001). The TLG was the only group to show an increase in muscle performance in the isokinetic dynamometry test compared with baseline. The increases in thigh perimeter in the TLG subjects and TG subjects were not significantly different (4.52% and 2.75%, respectively; Pâ€‰=â€‰0.775). Strength training associated with LLLT can increase muscle performance compared with strength training only. Adolescent;Humans;Low-Level Light Therapy;Male;Models, Biological;Muscle Strength;Muscle Strength Dynamometer;Quadriceps Muscle;Resistance Training;Young Adult

[Low intensity laser therapy effects on cell proliferation and differentiation: review of the literature]. Low energy laser has been used as an adjuvant therapy or as a therapeutic tool in many different areas of Dentistry. It is recognized by its anti-inflammatory and analgesic properties, and also as a tissue repair inductor. Low intensity laser property in stimulate cell proliferation during wound healing and its biomodulation mechanisms are discussed in this paper. These properties have already been established for cultured benign cells, but there is a controversy when extended to the spectrum of the malignant neoplastic process, normally generating great discussions. The objective of this work was to perform a literature review about the low intensity laser capacity in induce cell proliferation.

The discussion is specially concerned about its effects on malignant cells. Cell Differentiation;Cell Proliferation;Humans;Laser Therapy;Neoplasms

Treatment of alopecia areata with 308-nm excimer lamp. Alopecia areata is considered to be a T-cell mediated autoimmune disorder. The 308-nm excimer lamp is thought to be capable of inducing T-cell apoptosis in vitro, suggesting that the lamp might be effective for the treatment of alopecia areata. We examined the effectiveness of the 308-nm excimer lamp for the treatment of alopecia areata. We recruited three patients with single alopecia areata lesions that were resistant to conventional treatment. The lesions were exposed to a 308-nm excimer lamp at 2-weekly intervals. Hair regrowth was observed in all three patients after approximately 10 treatment sessions. Our study showed that exposure to the 308-nm excimer lamp effectively induced hair regrowth in solitary alopecia areata lesions. Apart from erythema, there were no significant adverse effects. Therefore, we suggest that it may be considered as a treatment modality for recalcitrant alopecia areata. Adult;Aged;Alopecia Areata;Erythema;Female;Hair;Humans;Lasers, Excimer;Low-Level Light Therapy;Middle Aged;Scalp;Treatment Outcome

Stabilization of costal cartilage graft warping using infrared laser irradiation in a porcine model. OBJECTIVE: To develop a method to rapidly stabilize the shape change process in peripheral slices of costal cartilage by using infrared laser irradiation in a porcine model. METHODS: Forty peripheral porcine costal cartilage specimens (40 Ã— 10 Ã— 2 mm) were harvested. Thirty of these specimens were immediately irradiated with an Nd:YAG laser (Î» = 1.32 Î¼m; spot size, 2-mm diameter) using 1 of 3 exposure treatments: 6 W, 2 seconds, and 4 spots; 8 W, 3 seconds, and 4 spots; or 6 W, 2 seconds, and 8 spots. Ten control specimens were only immersed in 0.9% saline solution. Angle of curvature was measured from photographs taken at 0 minutes, immediately after irradiation, and at 30 minutes, 1 hour, 5 hours, and 24 hours. Infrared imaging was used to measure surface temperatures during irradiation. Cell viability after irradiation was determined using a live/dead assay in conjunction with fluorescent confocal microscopy. RESULTS: Compared with the untreated controls, the irradiated grafts underwent accelerated shape change within the first 30 minutes to reach a stable geometry. Thereafter, irradiated grafts underwent little or no shape change, whereas the control group exhibited significant change in curvature from 30 minutes to 24 hours ($P < .001$). The average peak irradiated spot temperatures ranged from 76Â°C to 82Â°C. Cell viability measurements at the laser spot sites demonstrated a hemispherically shaped region of dead cells with a depth of 0.8 to 1.2 mm and a surface diameter of 1.9 to 2.7 mm. CONCLUSIONS: Laser irradiation of peripheral costal cartilage slices provides an effective method for rapidly stabilizing acute shape change by accelerating the warping process. The temperature elevations necessary to achieve this are spatially limited and well within the limits of tolerable tissue injury. Animals;Cartilage;Infrared Rays;Lasers, Solid-State;Low-Level Light Therapy;Models, Animal;Ribs;Specimen Handling;Swine;Tissue and Organ Harvesting;Transplants

Possible role of low level laser therapy on bone turnover in ovariectomized rats. OBJECTIVE: The aim of this study was to assess the effect of low level laser therapy (LLLT) on bone turnover markers in ovariectomized rats. METHODS: Thirty adult female albino rats were divided into three groups; Group 1: 10 sham- operated control rats; Group 2: 10 bilaterally ovariectomized rats (OVX); Group 3: 10 OVX rats exposed to LLLT. LLLT was applied on the neck and shaft of femur, five times per week for 8 weeks. The dose applied on each point was 1000 Hertz, 5 Watts for 30 seconds with a total dose of 15 mJoule/cmÂ². At the end of experiment, blood samples were collected and sera were separated for determination of serum calcium (Ca), inorganic phosphorus (Pi), osteocalcin and alkaline phosphatase (ALP). In addition, a 24 hour urine sample was also collected from each rat for the determination of urinary calcium, phosphorous and deoxypyridinoline (U-DPD)/creatinine. RESULTS: Significant increase in serum Ca, Pi , ALP, osteocalcin and significant decrease in U-DPD/creatinine in

LLLT exposed group was found as compared to the other two groups. Bone morphological findings revealed the increase in calcium deposition and alkaline phosphatase of femoral bones in LLLT exposed group as compared to sham-operated and OVX rats. The software image analysis showed increased osteoblast numbers, decreased osteoclast numbers and increased compact bone thickness in LLLT exposed group. Significant positive correlations was obtained between osteoblast numbers and serum Ca , Pi, ALP and osteocalcin in LLLT exposed group ,while a significant negative correlation was noticed with U-DPD. CONCLUSION: The use of LLLT was found effective in enhancing bone formation and decreasing bone resorption in the osteoporotic OVX rats. Further studies are necessary to investigate the effect of different parameters of LLLT as wave length, duration and also numbers of sessions. The potential use of LLLT in postmenopausal women with osteoporosis is needed to be verified. Amino Acids;Osteocalcin;Phosphorus;deoxypyridinoline;Creatinine;Alkaline Phosphatase;Calcium Alkaline Phosphatase;Amino Acids;Animals;Bone Remodeling;Bone Resorption;Bone and Bones;Calcium;Cell Count;Creatinine;Female;Low-Level Light Therapy;Osteoblasts;Osteocalcin;Osteoclasts;Osteoporosis;Ovariectomy;Phosphorus;Rats

[Muscle regeneration and the state of the thymus in adult rats under laser irradiation and alloplasty of the gastrocnemius muscles and diaphragm of newborn rats]. The regeneration of gastrocnemius muscles of adult rats under implantation conditions in areas of muscle tissue damage in newborn rats has been studied. Alloplasty was performed using minced gastrocnemius and diaphragm muscles, which differs at birth in animals by degree of differentiation. The rat-recipient area of alloplasty was subjected to He-Ne laser radiation before operation, with the aim of reducing the immune response to allogenic muscle tissue. It has been shown that the number of regenerating myofibers produced in implanted gastrocnemius muscles is more than in alloplants from diaphragms. However, the formation of cartilage, bone, and adipose tissue foci were observed in the alloplastic region throughout the whole regeneration period. After implantation of minced diaphragm muscles, cartilage nodes were observed only in 7-day regenerates. At the end of observation, in the first instance, the area of muscle trauma in adult rat muscles was replaced by adipose tissue, even in the case of initial laser irradiation. During the implantation of diaphragm muscles, the area of trauma was filled with regenerating muscle tissue. Animals;Animals, Newborn;Diaphragm;Hindlimb;Low-Level Light Therapy;Muscle, Skeletal;Rats;Regeneration;Thymus Gland;Transplantation, Homologous;Wounds and Injuries

Granuloma Faciale treated with 595-nm pulsed dye laser. Aged;Cheek;Facial Dermatoses;Female;Forehead;Granuloma;Humans;Low-Level Light Therapy;Male;Middle Aged

The successful treatment of Schamberg's disease with the 595 nm vascular laser. Humans;Leg;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders

Lower-fluence, higher-density versus higher-fluence, lower-density treatment with a 10,600-nm carbon dioxide fractional laser system: a split-face, evaluator-blinded study. BACKGROUND: Adequate laser settings in the treatment of scars using a carbon dioxide fractional laser system (CO(2) FS) have not been established. OBJECTIVE: To compare the efficacy and safety of low-fluence, high-density with high-fluence, low-density treatment with CO(2) FS on acne scars and enlarged pores. METHODS: Ten patients with mild to severe atrophic acne scars and enlarged pores were enrolled. Half of each subject's face was treated with a single session of CO(2) FS with a fluence of 70 mJ and a density of 150 spots/cm(2) ; the other half was treated with a fluence of 30 mJ and a density of 250 spots/cm(2) . RESULTS: Follow-up results 3 months after a single low-fluence, high-density treatment with CO(2) FS showed that four of 10 participants had clinical improvement of 51% to 75% from baseline. After the high-fluence, low-density CO(2) FS treatment, five of 10 patients demonstrated marked clinical improvements of more than 76%. CONCLUSION: Higher-energy, lower-density laser settings seem to be more effective than lower-energy, higher-density settings for acne scars and

enlarged pores, although our results do not constitute a conclusive comparison of the two different modes of CO(2) FS. Carbon Dioxide Acne Vulgaris;Adult;Carbon Dioxide;Cicatrix;Face;Humans;Low-Level Light Therapy;Male;Prospective Studies;Statistics, Nonparametric;Treatment Outcome

Susceptibility of Candida albicans, Staphylococcus aureus, and Streptococcus mutans biofilms to photodynamic inactivation: an in vitro study. The purpose of this study was to evaluate specific effects of photodynamic inactivation (PDI) using methylene blue as photosensitizer and low-power laser irradiation on the viability of single-, dual-, and three-species biofilms formed by C. albicans, S. aureus, and S. mutans. Biofilms were grown in acrylic discs immersed in sterile brain heart infusion broth (BHI) containing 5% sucrose, inoculated with microbial suspension (10(6) cells/ml) and incubated for 5Â days. On the fifth day, the effects of the methylene blue (MB) photosensitizer at a concentration of 0.1Â mg/ml for 5Â min and InGaAlP laser (660Â nm) for 98Â s, alone and conjugated were evaluated. Next, the discs were placed in tubes with sterile physiological solution [0.9% sodium chloride (NaCl)] and sonicated for to disperse the biofilms. Ten-fold serial dilutions were carried and aliquots seeded in selective agar, which were then incubated for 48Â h. Then the numbers CFU/ml (log(10)) were counted and analyzed statistically (ANOVA, Tukey test, pâ€‰<â€‰0.05). Scanning electron microscopy (SEM) on discs treated with PDI and control biofilms groups was performed. Significant decreases in the viability of all microorganisms were observed for biofilms exposed to PDI mediated by MB dye. Reductions (log(10)) of single-species biofilms were greater (2.32-3.29) than the association of biofilms (1.00-2.44). Scanning electron microscopy micrographs suggested that lethal photosensitization occurred predominantly in the outermost layers of the biofilms. The results showed that PDI mediated by MB dye, might be a useful approach for the control of oral biofilms. Photosensitizing Agents;Methylene Blue Biofilms;Candida albicans;Humans;In Vitro Techniques;Lasers, Solid-State;Methylene Blue;Microscopy, Electron, Scanning;Mouth;Photochemotherapy;Photosensitizing Agents;Staphylococcus aureus;Streptococcus mutans

Shear bond strength to enamel after power bleaching activated by different sources. The purpose of the present study was to evaluate enamel bond strength of a composite resin material after hydrogen peroxide bleaching, activated by a diode laser (LaserSmile), an ozone device (HealOzone), a light-emitting diode (BT Cool whitening system), and a quartz-Plus. Fifty extracted caries-free permanent incisors were used in this study. Thirty-eight percent hydrogen peroxidegel was applied to sound, flattened labial enamel surfaces and activated by different sources. Enamel surfaces that had received no treatment were used as control samples. Bonding agent was applied according to the manufacturer's instructions and the adhesion test was performed according to ISO/TS 11405. Statistical analysis showed significant influence of the different activation technique of hydrogen peroxide on shear bond strength to enamel (ANOVA, LSD, $P < 0.05$). The data in this vitro explorative study suggest the activation of hydrogen peroxide by different sources may further affect the shear bond strength of subsequent composite resin restoration to enamel. Within the limitations of this in vitro study, further studies examining the structural changes of activated hydrogen peroxide-treated enamel are needed. Due to the different activation methods; duration of light irradiation effects, longer time periods may be needed before application of adhesive restorations to enamel, compared with non-activated bleaching. Clearfil SE Bond;Composite Resins;Dental Materials;Oxidants, Photochemical;Resin Cements;Saliva, Artificial;Tooth Bleaching Agents;clearfil majesty;Ozone;Hydrogen Peroxide Adhesiveness;Composite Resins;Dental Bonding;Dental Enamel;Dental Materials;Dental Stress Analysis;Equipment Design;Humans;Hydrogen Peroxide;Lasers, Semiconductor;Low-Level Light Therapy;Materials Testing;Oxidants,

Photochemical;Ozone;Phototherapy;Resin Cements;Saliva, Artificial;Shear Strength;Stress, Mechanical;Surface Properties;Time Factors;Tooth Bleaching;Tooth Bleaching Agents

Topical photodynamic therapy is very effective for oral verrucous hyperplasia and oral erythroleukoplakia. BACKGROUND: Oral verrucous hyperplasia (OVH) and oral erythroleukoplakia (OEL) are two oral precancerous lesions with relatively high malignant transformation potential. One of the best cancer prevention strategies is to use a conservative and effective treatment modality to eliminate oral precancers to stop their further malignant transformation. Our previous studies have shown that the topical 5-aminolevulinic acid-mediated photodynamic therapy (topical ALA-PDT) using the 635-nm light-emitting diode (LED) light is very effective for OVH and OEL lesions. METHODS: Because the laser machine is a more-popular light source than the LED device in PDT clinics, in this study 40 OVH and 40 OEL lesions were treated once a week with the same PDT protocol but using the 635-nm laser light to evaluate whether this laser light-mediated topical ALA-PDT was also effective for OVH and OEL lesions. RESULTS: We found that all the 40 OVH lesions exhibited complete response (CR) after an average of 3.6 PDT treatments. Of the 40 OEL lesions, 38 showed CR after an average of 3.4 PDT treatments and two showed partial response (PR). Better PDT outcomes were significantly associated with OVH and OEL lesions with the smaller size, pink to red color, epithelial dysplasia, or thinner surface keratin layer. CONCLUSION: This study indicates that the laser light-mediated topical ALA-PDT is also very effective for OVH and OEL lesions. Therefore, we suggest that topical ALA-PDT using either the LED or laser light may serve as the first-line treatment of choice for OVH and OEL lesions. Photosensitizing Agents;Keratins;Aminolevulinic Acid Adult;Aged;Aged, 80 and over;Aminolevulinic Acid;Biopsy;Carcinoma in Situ;Erythroplasia;Female;Humans;Hyperplasia;Keratins;Leukoplakia, Oral;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Mouth Neoplasms;Photochemotherapy;Photosensitizing Agents;Precancerous Conditions;Remission Induction;Treatment Outcome

An in vitro and in vivo study of combination therapy with PhotogemÂ®-mediated photodynamic therapy and cisplatin on mouse cancer cells (CT-26). OBJECTIVE: This study was designed to evaluate the anticancer effect of cisplatin and photodynamic therapy (PDT) combined in vitro and in vivo. BACKGROUND DATA: PDT, these days, is a promising modality for the treatment of cancer and infections. In order to optimize the treatment, cisplatin is often combined with other chemotherapeutic agents. METHODS: Colon cancer cells were incubated with cisplatin (0.1, 1, and 6â€‰Î¼g/ml), followed by photosensitization with PhotogemÂ® and irradiation with a 632â€‰nm diode laser at an energy density of 3.2â€‰J/cm(2). An MTT assay was then used to measure cell viability. For in vivo studies, established tumors were treated with cisplatin (3â€‰mg/kg) alone or with PDT (5â€‰mg/kg of PhotogemÂ®, 600â€‰J/cm(2)). The sizes of the tumors were continuously measured to note the effects. RESULTS: The cell viability of the combined therapy group was 19.88â€‰Â±â€‰0.41, corresponding to a 9% increase compared with that of the cisplatin- or PDT-only groups. In vivo, the tumors treated with PDT or combination therapy disappeared completely three days after each treatment, but on the 14th day, the recurrence rate was significantly lower in the combination therapy group than in the PDT group. CONCLUSIONS: Combination therapy results in an enhanced anticancer effect, presenting the possibility of minimizing the administration dosage of PhotogemÂ® and cisplatin. Antineoplastic Agents;Cisplatin Analysis of Variance;Animals;Antineoplastic Agents;Apoptosis;Cisplatin;Colonic Neoplasms;Combined Modality Therapy;Disease Models, Animal;Female;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Neoplasm Transplantation;Photochemotherapy;Random Allocation;Reference Values;Skin Absorption;Spectrum Analysis;Treatment Outcome;Tumor Cells, Cultured

The effect of low-level laser therapy on salivary glands in patients with xerostomia. OBJECTIVE: The aim of this study was to investigate the effect of low-level laser irradiation on the secretory function of salivary glands in 34 patients with xerostomia (dry mouth). BACKGROUND DATA: Xerostomia, a common complaint of oral dryness within the elderly population, is caused by a reduction in normal salivary secretion due to different causes. Treatment is aimed at increasing salivary flow, although in most cases it remains palliative. MATERIALS AND METHODS: In this study, laser light from a pulsed Ga-As laser operating at 904â€‰nm was applied bilaterally on each salivary gland area: extraorally on the parotid and submandibular gland areas and intraorally on the sublingual gland area. The operational probe distance from the irradiated area was 0.5â€‰cm resulting in an irradiance of 246â€‰mW/cm(2). The exposure time was 120â€‰sec per daily treatment during 10 consecutive days. The average energy density per exposure was 29.5â€‰J/cm(2). The control group consisted of 16 patients who were treated with 15â€‰mL of a 2% citric acid solution applied as a mouth rinse for 30â€‰sec. RESULTS: The average difference in the amount of salivation (dQ-sal, mL/min) before and after laser therapy increased linearly from dQ-salâ€‰=â€‰0.05â€‰mL/min on the first day, up to dQ-salâ€‰=â€‰0.13â€‰mL/min on the last (10th) day of therapy. In the control group, the average dQ-sal initially demonstrated a gradual increase, with a reversal of the trend toward the end of the therapy period and eventually yielding no correlation between the duration of therapy and dQ-sal. CONCLUSION: The results of our study indicate that the effects of low-level laser therapy on salivary glands are not only stimulating, but also regenerative to a degree since the glandular response to the same amount of applied laser energy increased linearly over time. Adult;Aged;Case-Control Studies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Radiation Dosage;Reference Values;Risk Assessment;Salivary Glands;Salivation;Severity of Illness Index;Treatment Outcome;Xerostomia

The effect of different preparation and etching procedures on the microleakage of direct composite veneer restorations. OBJECTIVES: The aim of this in vitro study was to compare the microleakage of direct composite veneer restorations prepared by a conventional dental bur or Er,Cr:YSGG (erbium, chromium doped yttrium scandium gallium garnet) laser and etched with different procedures. METHODS: Fifty maxillary incisor teeth prepared for direct veneers with gingival margins in dentin and incisal margins in enamel were randomly divided into five groups (nâ€‰=â€‰10): group 1 (control), prepared with diamond bur and etched with phosphoric acid; group 2, prepared with diamond bur and etched with Er,Cr:YSGG laser (Waterlase MD/Biolase); group 3, prepared with laser and not etched; group 4, prepared with laser and etched with phosphoric acid; and group 5, prepared and etched with laser. After the application of the etch and rinse adhesive system (Prime & Bond NT/Dentsply), teeth were restored with the nano ceramic restorative material (Ceram X Duo/Dentsply), subjected to thermocycling and immersed in 0.5% basic fuchsin dye for 24â€‰h. The teeth were sectioned longitudinally and dye penetration was evaluated by a binocular stereomicroscope equipped with a measuring device. Data were analyzed by Kruskal-Wallis and Wilcoxon signed ranks tests. The level of significance was set at pâ€‰=â€‰0.05. RESULTS: Significant differences were observed in enamel of the five groups (pâ€‰<â€‰0.05). Minimal microleakage was observed in groups 1 and 3. The highest microleakage was evaluated in group 5 (pâ€‰<â€‰0.05). No significant differences were found among the five groups in dentin (pâ€‰>â€‰0.05). No differences were recorded between the microleakage values in enamel and dentin within each group and this was valid for all groups (pâ€‰>â€‰0.05). CONCLUSIONS: The results confirmed that enamel and dentin surfaces prepared with Er,Cr:YSGG laser for direct composite veneer restorations may provide comparable sealing. Phosphoric Acids;phosphoric acid Acid Etching, Dental;Dental Cavity Preparation;Dental Enamel;Dental High-Speed

Equipment;Dental Leakage;Dental Restoration, Permanent;Humans;In Vitro Techniques;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Phosphoric Acids;Sensitivity and Specificity

[Stimulation of mucoperiostal slice epithelization by small power laser after the primary plastic of oroantral communication]. INTRODUCTION: The oroantral communication is a pathologic communication between the oral cavity and maxillary sinus. It originates with extraction of the upper lateral teeth. Primary plastics communication, which is more extensive than 5 mm has been unsuccessful in 16%. Small power lasers have positive reaction on wounds healing. The aim of this work was to determine the lasers effects on slice epithelization after the plastics more extensive than 5 mm. MATERIAL AND METHODS: The experimental research was done on dogs with extraction of the upper second premolars on both sides, and formed oroantral communication having diameter of 10 mm. After the plastics of sinus, the left side slices were exposed to radiation for 7 days, and the opposite slices healed spontaneously. Eight points (8x1J) were treated for 100s by GaAlAs laser, power 10 mW and wavelength 670 nm. Biopses of the slices connections were taken on the 14th day to be laboratory treated and examined microscopially. The study included 36 examinees with communication diameter of 10 mm and performed plastics of sinuses. In half of the examinees wounds were exposed to radiation for 7 days, and in other examinees they healed spontaneously. The results were analyzed on the fourteenth day according to the scale: (1) complete healing, without dehiscention; (2) incomplete healing, with minimal dehiscention; (3) communication did not heal, with partial dehiscention; (4) open communication, with significant dehiscention. RESULTS AND DISCUSSION: The microscopic analysis shows that no wounds exposed to radiation were overcast with mucous membrane which had smooth sub epithelia chronic inflammation and inflammable infiltrate, and strong fibroplasias and granulations. Wounds exposed to radiation had mucous membrane without any signals of inflammation. Laser radiation causes anti-inflammatory reaction, i.e., it provokes reduction of exudation, alteration and proliferation, it blocks cyclo- and lipo-oxygenation by delaying the synthesis of prostaglandin, stimulates neutrophyll, macrophage and lissome activity and it activates the function of immune complex T and B lymphocytes, so this difference could be primary referred to the action of laser. Our clinical study shows that complete healing of oroantral communication was recorded in 88.8% of the examinees who were exposed to radiation in relation to 50%, of those who did not receive radiation therapy which is statistically much higher percentage (chi2 test < 0.05). The surgery was repeated in 5.6% of those who had received radiation therapy and in 16.7% of those who had not been exposed to radiation. Laser radiation stimulates changing of ADP in ATP and it accelerates cells metabolism, it increases microcirculation and accelerates substance exchange of cells, it increases DNK and RNK synthesis and stimulates cells division, which cause quicker regeneration of epithelia, i.e., it accelerates the process of wound healing. CONCLUSION: It can be concluded that small power laser can be used successfully as additional method of treatment, after closing of oroantral communication surgically.
Animals;Dogs;Low-Level Light Therapy;Oroantral Fistula;Wound Healing

Effects of low-level laser therapy on expression of TNF-Î± and TGF-Î² in skeletal muscle during the repair process. The aim of the present study was to determine the effect of low-level laser therapy (LLLT) on the expression of TNF-Î± and TGF-Î² in the tibialis anterior muscle of rats following cryoinjury. Muscle regeneration involves cell proliferation, migration and differentiation and is regulated by growth factors and cytokines. A growing body of evidence suggests that LLLT promotes skeletal muscle regeneration by reducing the duration of acute inflammation and accelerating tissue repair. Adult male Wistar rats (nâ€‰=â€‰35) were randomly divided into three groups: control group (no lesion, untreated, nâ€‰=â€‰5), cryoinjury without LLLT group (nâ€‰=â€‰15), and cryoinjury with LLLT group (nâ€‰=â€‰15). The injured region was irradiated three times a week

using an AlGaInP laser (660Â nm; beam spot 0.04Â cm(2), output power 20Â mW, power density 500Â mW/cm(2), energy density 5Â J/cm(2), exposure time 10Â s). Muscle remodeling was evaluated at 1, 7 and 14Â days (long-term) following injury. The muscles were removed and total RNA was isolated using TRIzol reagent and cDNA synthesis. Real-time polymerase chain reactions were performed using TNF-Î± and TGF-Î² primers; GAPDH was used to normalize the data. LLLT caused a decrease in TNF-Î± mRNA expression at 1 and 7Â days following injury and in TGF-Î² mRNA expression at 7Â days following cryoinjury in comparison to the control group. LLLT modulated cytokine expression during short-term muscle remodeling, inducing a decrease in TNF-Î± and TGF-Î². RNA, Messenger;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha Animals;Base Sequence;Gene Expression;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Regeneration;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Wound Healing

Treatment of dermatosis papulosa nigra in 10 patients: a comparison trial of electrodesiccation, pulsed dye laser, and curettage. BACKGROUND: Dermatosis papulosa nigra (DPN) is a common variant of seborrheic keratoses in darkly pigmented individuals. Treatment options include cryosurgery, curettage, electrosurgery, and shave removal. OBJECTIVE: To compare the efficacy and complications of pulsed dye laser (PDL) therapy for the treatment of DPN with those of curettage and electrodesiccation. METHODS AND MATERIALS: Randomized, controlled, single-center, evaluator-blinded trial of 10 patients with at least four clinically diagnosed lesions. RESULTS: All 10 patients completed the study. Mean lesion clearance was 96% for curettage, 92.5% for electrodesiccation, and 88% for laser. There was no significant difference between the three treatment modalities. All three techniques had an overall cosmetic outcome of good for most patients. Five of the 10 patients preferred electrodesiccation. Patients rated the laser as the most painful treatment method. The most common adverse outcome was hyperpigmentation. There were no significant differences between the treatment groups for any of the measured outcomes. CONCLUSION: The efficacy of PDL in the treatment of DPN is not significantly different from the already established treatment modalities of electrodesiccation and curettage. The authors have indicated no significant interest with commercial supporters. Adult;Curettage;Electrocoagulation;Facial Dermatoses;Female;Humans;Hyperpigmentation;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Pilot Projects;Prospective Studies;Treatment Outcome

Punchgraft testing in vitiligo; effects of UVA, NB-UVB and 632.8 nm Helium-Neon laser on the outcome. Biopsy, Needle;Dose-Response Relationship, Radiation;Humans;Lasers, Gas;Low-Level Light Therapy;Phototherapy;Single-Blind Method;Skin;Time Factors;Treatment Outcome;Ultraviolet Rays;Vitiligo

Copper sulfide nanoparticles for photothermal ablation of tumor cells. AIMS: Copper sulfide (CuS) nanoparticles were developed as a new type of agent for photothermal ablation of cancer cells. MATERIALS & METHODS: CuS nanoparticles were synthesized by wet chemistry and their application in photothermal ablation of tumor cells was tested by irradiation using a near-infrared (NIR) laser beam at 808 nm to elevate the temperature of aqueous solutions of CuS nanoparticles as a function of exposure time and nanoparticle concentration. CuS nanoparticle-mediated photothermal destruction was evaluated using human cervical cancer HeLa cells with respect to laser dose and nanoparticle concentration. Their toxicity was evaluated by the 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay. RESULTS: CuS nanoparticles have an optical absorption band in the NIR range with a maximum absorbance at 900 nm. Irradiation by a NIR laser beam at 808 nm resulted in an increase in the temperature of the CuS nanoparticle aqueous solution as a function of exposure time and nanoparticle concentration. CuS nanoparticle-induced photothermal destruction of HeLa cells occured in a laser dose- and nanoparticle concentration-dependent manner,

and displayed minimal cytotoxic effects with a profile similar to that of gold nanoparticles. CONCLUSION: Owing to their unique optical property, small size, low cost of production and low cytotoxicity, CuS nanoparticles are promising new nanomaterials for cancer photothermal ablation therapy. Sulfides;Copper Ablation Techniques;Absorption;Cell Death;Cell Survival;Copper;HeLa Cells;Humans;Low-Level Light Therapy;Metal Nanoparticles;Neoplasms;Sulfides

Metrical and histological investigation of the effects of low-level laser therapy on orthodontic tooth movement. The aim of this study was to evaluate the effects of 820-nm diode laser on osteoclastic and osteoblastic cell proliferation-activity and RANKL/OPG release during orthodontic tooth movement. Thirty-eight albino Wistar rats were used for this experiment. Maxillary incisors of the subjects were moved orthodontically by a helical spring with force of 20 g. An 820-nm Ga-Al-As diode laser with an output power of 100 mW and a fiber probe with spot size of 2 mm in diameter were used for laser treatment and irradiations were performed on 5 points at the distal side of the tooth root on the first, second, and 3rd days of the experiment. Total laser energy of 54 J (100 mW, 3.18 W/cm(2), 1717.2 J/cm(2)) was applied to group II and a total of 15 J (100 mW, 3.18 W/cm(2), 477 J/cm(2)) to group III. The experiment lasted for 8 days. The number of osteoclasts, osteoblasts, inflammatory cells and capillaries, and new bone formation were evaluated histologically. Besides immunohistochemical staining of PCNA, RANKL and OPG were also performed. No statistical difference was found for the amount of tooth movement in between the control and study groups ($p > 0.05$). The number of osteoclasts, osteoblasts, inflammatory cells, capillary vascularization, and new bone formation were found to be increased significantly in group II ($p < 0.05$). Immunohistochemical staining findings showed that RANKL immunoreactivity was stronger in group II than in the other groups. As to OPG immunoreactivity, no difference was found between the groups. Immunohistochemical parameters were higher in group III than in group I, while both were lower than group II. On the basis of these findings, low-level laser irradiation accelerates the bone remodeling process by stimulating osteoblastic and osteoclastic cell proliferation and function during orthodontic tooth movement. Osteoprotegerin;Proliferating Cell Nuclear Antigen;RANK Ligand Animals;Bone Remodeling;Fibroblasts;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoblasts;Osteoclasts;Osteogenesis;Osteoprotegerin;Proliferating Cell Nuclear Antigen;RANK Ligand;Rats;Rats, Wistar;Tooth Movement Techniques;Tooth Root

[Photodynamic therapy for acne: use of the pulsed dye laser and methylaminolevulinate]. Recent decades have seen the inclusion of acne vulgaris as a potential new indication for photodynamic therapy. Photodynamic therapy and light sources can be considered to be additional tools for primary or adjunctive therapy in patients with recurrent acne or those in whom it is not possible to use other treatments. We investigated the use of pulsed dye laser plus methylaminolevulinate for photodynamic therapy and have performed a comparative study of the use of this laser alone and as an element in photodynamic therapy. Photosensitizing Agents;Sunscreening Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Acne Vulgaris;Adolescent;Aminolevulinic Acid;Combined Modality Therapy;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Pain;Patient Satisfaction;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Shoulder;Sunscreening Agents;Treatment Outcome

[Pseudofolliculitis barbae]. Pseudofolliculitis barbae is a chronic, irritating, and potentially disfiguring condition that develops as a result of attempts to eliminate hair from the beard area, usually by shaving. It is difficult to determine the incidence of the disorder, but some studies report that it affects up to 1 of every 5 caucasian individuals and that it is much more common in black persons. Clinically it is characterized by the appearance of inflammatory papules and pustules. Once pseudofolliculitis has become established, treatment consists of avoiding shaving and the use of

medical treatment similar to that used in acne. However, the long-term result is much more dependent on prevention through a correct shaving technique. In severe cases or when a definitive solution is sought, the treatment of choice is photodepilation. Dermatologic Agents;Benzoyl Peroxide;Eflornithine Benzoyl Peroxide;Black People;Cicatrix;Combined Modality Therapy;Dermatologic Agents;Disease Susceptibility;Eflornithine;Facial Dermatoses;Female;Folliculitis;Hair Diseases;Hair Removal;Hirsutism;Humans;Hyperpigmentation;Keloid;Lasers, Dye;Low-Level Light Therapy;Male;Skin Pigmentation;White People

Controversy: is there a role for adjuvants in the management of male pattern hair loss? Patients with hair loss are seeking treatment at a younger age and during earlier stages. Not all need hair transplants. Because of the lack of assured management and the fear of side-effects, patients are turning to ineffective alternative remedies from self-claimed experts. In this report, we discuss the available treatment options and how best they can be used in combination to produce satisfactory results. The traditional approach consists of administration of drugs such as minoxidil and finasteride. We propose a hypothesis that nutritional supplements, 2% ketoconazole shampoo and low-level laser therapy along with finasteride 1 mg used once in 3 days with 2% minoxidil used everyday, given in a cyclical medicine program may be useful to manage hair loss and achieve new hair growth. The scientific rationale for such an approach is explained. The need for further studies to establish the efficacy of the regime is stressed upon.

Six-month follow-up multicenter prospective study of 368 patients, phototypes III to V, on epilation efficacy using an 810-nm diode laser at low fluence. Laser hair removal is currently a popular cosmetic procedure. Traditional high-fluence laser treatment for hair elimination is associated with discomfort and adverse events and it is restricted to low phototype skins. A multicenter study of hair epilation with low fluences and high repetition pulse rate using an 810-nm diode laser was carried out on 368 patients (phototypes III to V) to test its efficacy in a 6-month follow-up after five treatments on the face and various body areas. Objective and subjective assessment as well as histologies show a high index of patient satisfaction due to high efficacy of hair elimination, also proved histologically by the damage observed at hair structure level. Results obtained a high degree of patient satisfaction and a low index of adverse events. Laser epilation was well accepted regarding discomfort and was also complication-free for dark and tanned skins. Treatment is easy to conduct and requires adapting the movement of the hand-piece to a constant speed in order to achieve high-energy deposit on tissue avoiding risks of burning. Adult;Female;Follow-Up Studies;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome;Young Adult

The reactive oxygen species-Src-Stat3 pathway provokes negative feedback inhibition of apoptosis induced by high-fluence low-power laser irradiation. High-fluence low-power laser irradiation (HF-LPLI) can induce apoptosis by triggering mitochondrial oxidative stress. Signal transducer and activator of transcription 3 (Stat3) is an important transcription factor in the modulation of cell proliferation and apoptosis. Here, using real-time single-cell analysis and western blotting analysis, we investigated the changes in activities of Stat3 in COS-7 cells upon HF-LPLI (633 nm, 80 and 120 JÂ·cm(-2)) and the underlying mechanisms involved. We found that Stat3 was significantly activated by HF-LPLI in a time-dependent and dose-dependent manner. Stat3 activation attenuated HF-LPLI-induced apoptosis, as shown by the fact that both dominant negative Stat3 (Y705F) and Stat3 small interfering RNA expression enhanced cellular apoptosis induced by HF-LPLI. Moreover, we also found that Src kinase was the major positive regulator of Stat3 activation induced by HF-LPLI. Reactive oxygen species (ROS) generation was essential for Stat3 and Src activation upon HF-LPLI, because scavenging of ROS by vitamin C or N-acetylcysteine totally abrogated the activation of Stat3 and Src.

Taken together, these findings show that the ROS-Src-Stat3 pathway mediates a negative feedback inhibition of apoptosis induced by HF-LPLI in COS-7 cells. Our research will provide new insights into the mechanism of apoptosis caused by HF-LPLI, and also extend the functional study of Stat3. RNA, Small Interfering;Reactive Oxygen Species;STAT3 Transcription Factor;src-Family Kinases Animals;Apoptosis;COS Cells;Chlorocebus aethiops;Dose-Response Relationship, Radiation;Feedback, Physiological;Fluorescence Resonance Energy Transfer;Genes, Reporter;Low-Level Light Therapy;Oxidation-Reduction;Oxidative Stress;RNA, Small Interfering;Reactive Oxygen Species;STAT3 Transcription Factor;Signal Transduction;src-Family Kinases

Effects of low-level laser treatment on mouth dryness. Mouth dryness (MD) is usually followed by inadequate mechanical cleaning of the mouth and decrease in the levels of salivary antimicrobial proteins (including secretory immunoglobulin A (sIgA)). It is accompanied by difficulties during speaking and food swallowing, with an unpleasant taste, burning sensations in the mouth and higher susceptibility to oral diseases. Low-level laser treatment (LLLT) can intensify cell metabolism and its application on salivary glands could improve salivation. The purpose of this study was to evaluate the effects of LLLT on salivation of patients suffering from MD. The study included 17 patients with MD. Their major salivary glands were treated with low intensity laser BTL2000 on 10 occasions. The whole unstimulated and stimulated saliva quantities were measured just before the 1st, after the 10th and thirty days following the last (10th) treatment. In the samples of unstimulated saliva concentrations of sIgA were estimated by using ELISA method and its quantity in the time unit was calculated. The visual analogue scale (VAS) score was used to assess burning and/or pain intensity at these three time points. Statistical tests revealed significant salivation improvement quantitatively and qualitatively, i.e. increase in the quantity of saliva and sIgA. VAS score was also significantly improved and no side effects were observed. CONCLUSIONS: According to the results of this study, application of LLLT to xerostomic patients' major salivary glands stimulates them to produce more saliva with better antimicrobial characteristics and improves the difficulties that are associated with MD. This simple non-invasive method could be used in everyday clinical practice for the treatment of MD. Immunoglobulin A, Secretory Adult;Aged;Female;Humans;Immunoglobulin A, Secretory;Lasers;Low-Level Light Therapy;Male;Middle Aged;Salivation;Xerostomia

Influence of the angle of irradiation of the Er,Cr:YSGG laser on the morphology, attachment of blood components, roughness, and root wear: in vitro study. BACKGROUND AND OBJECTIVES: To evaluate the influence of the working tip angulation of the Er,Cr:YSGG laser on the morphology, attachment of blood components, roughness, and wear on irradiated root surfaces compared to scaling and root planing (SRP). STUDY DESIGN/MATERIALS AND METHODS: The present study used 45 teeth, of which 25 were used for the analysis of the morphology and the attachment of blood components and 20 were used for the analysis of the roughness and of the root wear. The teeth were randomly divided into five groups according to the treatment applied: (G1) Laser Er,Cr:YSGG-30Â°; (G2) Laser Er,Cr:YSGG-45Â°; (G3) Laser Er,Cr:YSGG-60Â°; (G4) Laser Er,Cr:YSGG-90Â°; and (G5) SRP. RESULTS: The root surfaces irradiated with the Er,Cr:YSGG laser working angulation tip of 45Â° and 60Â°, and the samples scaled with manual instruments presented greater attachment of blood components than the group where the Er,Cr:YSGG laser irradiated at working tip angulation of 30Â° and 90Â° ($P<0.05$). The samples irradiated with the Er,Cr:YSGG laser were rougher than the samples scaled with manual instruments ($P<0.05$). The group that was irradiated with the Er,Cr:YSGG laser at an angle of 30Â° presented the least wear in comparison to all the other treatments ($P<0.01$). CONCLUSIONS: The irradiated root surfaces proved to be rougher than those scaled with manual instruments; however, irradiation at working tip angulations of 45Â° and 60Â° produced results of attachment of blood components and root wear comparable with those obtained with manual instrumentation. Fibrin Fibrin;Humans;Lasers, Solid-State;Low-Level Light

Therapy;Microscopy, Electron, Scanning;Protein Binding;Root Planing;Surface Properties;Tissue Culture Techniques;Tooth Root

Effects of 660 and 780 nm low-level laser therapy on neuromuscular recovery after crush injury in rat sciatic nerve. BACKGROUND AND OBJECTIVE: Post-traumatic nerve repair is still a challenge for rehabilitation. It is particularly important to develop clinical protocols to enhance nerve regeneration. The present study investigated the effects of 660 and 780 nm low-level laser therapy (LLLT) using different energy densities (10, 60, and 120 J/cmÂ²) on neuromuscular and functional recovery as well as on matrix metalloproteinase (MMP) activity after crush injury in rat sciatic nerve. MATERIALS AND METHODS: Rats received transcutaneous LLLT irradiation at the lesion site for 10 consecutive days post-injury and were sacrificed 28 days after injury. Both the sciatic nerve and tibialis anterior muscles were analyzed. Nerve analyses consisted of histology (light microscopy) and measurements of myelin, axon, and nerve fiber cross-sectional area (CSA). S-100 labeling was used to identify myelin sheath and Schwann cells. Muscle fiber CSA and zymography were carried out to assess the degree of muscle atrophy and MMP activity, respectively. Statistical significance was set at 5% (Pâ‰¤0.05). RESULTS: Six hundred sixty nanometer LLLT either using 10 or 60 J/cmÂ² restored muscle fiber, myelin and nerve fiber CSA compared to the normal group (N). Furthermore, it increased MMP-2 activity in nerve and decreased MMP-2 activity in muscle and MMP-9 activity in nerve. In contrast, 780 nm LLLT using 10 J/cmÂ² decreased MMP-9 activity in nerve compared to the crush group (CR) and N; it also restored normal levels of myelin and nerve fiber CSA. Both 60 and 120 J/cmÂ² decreased MMP-2 activity in muscle compared to CR and N. 780 nm did not prevent muscle fiber atrophy. Functional recovery in the irradiated groups did not differ from the non-irradiated CR. CONCLUSION: Data suggest that 660 nm LLLT with low (10 J/cmÂ²) or moderate (60 J/cmÂ²) energy densities is able to accelerate neuromuscular recovery after nerve crush injury in rats. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nerve Crush;Nerve Regeneration;Rats;Rats, Wistar;Recovery of Function;Sciatic Nerve;Sciatic Neuropathy

Low-level laser therapy for protection against skeletal muscle damage after ischemia-reperfusion injury in rat hindlimbs. BACKGROUND AND OBJECTIVE: Despite numerous hypotheses regarding the action of laser light, the use of low-level laser therapy (LLLT) in ischemic reperfusion (I/R) injury is still being verified. The present study investigates the effects of low-level laser irradiation (LLLI) on I/R injury of the musculus gracilis in rats. MATERIALS AND METHODS: I/R injury of the musculus gracilis flap was induced in male adult Sprague-Dawley rats (nâ€‰=â€‰84). Rats were subdivided depending on treatment into four subgroups: (1) healthy group, (2) I/R injury without irradiation, (3) R group irradiated only during reperfusion after injury, and (4) IR group irradiated during ischemia and reperfusion injury. LLLT (AlGaInP; Î»â€‰=â€‰670 nm; 4 J/cmÂ²; 40 mW/cmÂ²) was applied to the injured muscle four times daily until euthanasia. RESULTS: Lactate dehydrogenase (LD) levels were significantly lower ($P<0.05$) in the irradiated groups during the first 12-120 hours, while the lower creatine kinase (CK) level reached statistical significance only at 24 hours in the irradiated group when compared to the control group. The number of polymorphonuclear leukocytes in the gracilis muscle was significantly lower in the treated group only on the second day ($P<0.0001$). The lowered percentage of necrosis in the muscle tissue was statistically significant after 6 and 10 days of treatment ($P<0.0001$), while lower atrophy and higher neovascularization were observed at 6-14 days of irradiation ($P<0.05$). There was no statistically significant difference between the group irradiated only during reperfusion and that irradiated during ischemia and reperfusion. CONCLUSION: LLLT confers a protective effect against early inflammatory tissue response, further atrophy, and necrosis of the muscle and it stimulates neovascularization after I/R injury. Animals;Disease Models, Animal;Hindlimb;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;Neovascularization, Physiologic;Rats;Rats, Sprague-Dawley;Reperfusion Injury

Laser photobiostimulation of wound healing: defining a dose response for splinted wounds in diabetic mice. BACKGROUND AND OBJECTIVES: We have used a 660 nm, 80 mW laser diode in genetic diabetic mice to stimulate the healing of wounds covered with a Tegaderm HP dressing that causes a retardation of contraction (splinted wounds). The purpose of our study was to examine the effects of irradiating the wounds for different time intervals in order to determine a dose response relationship. MATERIALS AND METHODS: A circular excisional wound was made on the left flank of diabetic mice using a 5-mm skin punch, and covered with a Tegaderm HP dressing. Mice were allocated to four groups in which wounds were irradiated 660 nm, 80 mW for 0, 10, 20, or 40 seconds each day for 7 days. In total, 51 mice were used. Wounds were harvested on day 14 and the healing assessed from hematoxylin-eosin stained sections examined by light microscopy. RESULTS: The wounds were splinted in 40 of the mice, and splinting caused a retardation of healing. The findings for the four treatments showed that irradiation for 20 second/day for 7 days brought about the greatest extent of healing. The wounds healed mainly by re-epithelization and granulation tissue formation. This duration of irradiation represents an energy dose of 1.6 J per irradiation and, for an estimated area of irradiation of 32-43 mmÂ², corresponds to an energy density of 3.7-5.0 J/cmÂ². CONCLUSION: Irradiation with 660 nm, 80 mW at an energy density of 3.7-5.0 J/cmÂ² each day for 7 days caused the maximal stimulation of healing in splinted wounds of diabetic mice.
Animals;Bandages;Disease Models, Animal;Dose-Response Relationship, Radiation;Female;Granulation Tissue;Low-Level Light Therapy;Male;Mice;Mice, Inbred NOD;Splints;Wound Healing;Wounds, Penetrating

Treatment of leg veins with combined pulsed dye and Nd:YAG lasers: 60 patients assessed at 6 months. INTRODUCTION: Leg telangiectasias have been reported to have been treated with a variety of lasers. This study was designed to measure response to treatment of leg telangiectasias with a unique coupled 585 nm and 1064 nm pulse. METHODS: Sixty female patients (24-62 y.o., skin types II-IV) with leg vein varicosities were treated with pulses of a combined 585 nm long pulsed dye (LPDL) and 1064 nm Nd:YAG lasers, which were delivered sequentially using a novel dual laser device. Pulses were placed along the entire length of the targeted veins. A beam diameter of 7 mm with pulses of 10 ms and 9 J/cmÂ² of fluence for LPDL, and pulses of 30 ms and 80 J/cmÂ² for the 106 nm Nd:YAG were utilized and these remained uniform. Time delays between sequential LPDL and Nd:YAG pulses were 125 ms, 250 ms and 500 ms depending on vein diameter of 4, 3 and 2 mm respectively. One or two treatments were given at 2 month intervals, with post-treatment assessments at 6 months following the final treatment. Patients subjectively assessed the treatment and their results were used to draw up a satisfaction index (SI). Objective assessment was based on clinical photography and computer-generated data using a vein clearance detection computer program. RESULTS: The overall patient satisfaction rate was 47 of 60 patients and the objective assessments, based on blinded evaluation of clinical photography as well as computer assessment, demonstrated good to very good improvement in 47 by photograph evaluation and 49 of 60 patients by computer edge detection data. CONCLUSIONS: The combination of LPDL and Nd:YAG laser pulses offered efficient treatment of leg veins irrespective of skin type. Results were better on blue and vessels larger than 1 mm. Side effects were minimal and transient. Adult;Cohort Studies;Female;Humans;Lasers, Dye;Lasers, Solid-State;Leg;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Retrospective Studies;Telangiectasis;Treatment Outcome;Young Adult

Measurements of jaw movements and TMJ pain intensity in patients treated with GaAlAs laser. The aim of this study was to evaluate the effectiveness of low-level laser therapy (LLLT) on the improvement of the mandibular movements and painful symptoms in individuals with temporomandibular disorders (TMD). Forty patients were randomly divided into two groups (n=20): Group 1 received the effective dose (GaAlAs laser Î» 830 nm, 40 mW, 5J/cmÂ²) and Group 2 received

the placebo application (0 J/cmÂ²), in continuous mode on the affected condyle lateral pole: superior, anterior, posterior, and posterior-inferior, twice a week during 4 weeks. Four evaluations were performed: E1 (before laser application), E2 (right after the last application), E3 (one week after the last application) and E4 (30 days after the last application). The Kruskal-Wallis test showed significant more improvements ($p<0.01$) in painful symptoms in the treated group than in the placebo group. A significant improvement in the range of mandibular movements was observed when the results were compared between the groups at E4. Laser application can be a supportive therapy in the treatment of TMD, since it resulted in the immediate decrease of painful symptoms and increased range of mandibular movements in the treated group. The same results were not observed in the placebo group. Facial Pain;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Range of Motion, Articular;Temporomandibular Joint Disorders;Treatment Outcome

Does low-level laser therapy have an antianesthetic effect? A review. Because local anesthetics are vasodilators, they tend to be absorbed into the bloodstream from the operative field as a result of the vasodilation of peripheral arterioles. To counteract this vasodilation, vasoconstrictive agents are often included in local anesthetic solutions to provide a longer duration of anesthesia. Low-level laser therapy (LLLT) has the same benefits, such as microcirculation activation and more-efficient tissue metabolism, analgesic effects, and vasodilatation. If LLLT is used to prevent pain postoperatively, improvements in local circulation and increased vasodilatation may increase the absorption of a local anesthetic agent. This may reduce the duration of the anesthesia, thereby allowing postoperative pain management to begin sooner. The maximal intensity of pain occurs during the first hours after surgery, when the local anesthetic has worn off. Theoretically, postoperative pain control can be increased with the use of a local anesthetic with a more-prolonged action. If a treatment method has both analgesic and antianesthetic effects, then the method may block its own effects. We review whether LLLT applied postoperatively to operated-on areas has an antianesthetic effect, that is, whether pain in the first hours after surgery was greater for patients who received LLLT than for control patients. Not too much evidence supports the antianesthetic effects of LLLT. However, additional experimental and clinical studies must be performed to investigate the effects of LLLT on the duration of anesthesia. Anesthetics, Local Anesthetics, Local;Humans;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative

Laser phototherapy for Stevens-Johnson syndrome: a case report. BACKGROUND AND OBJECTIVE: Stevens-Johnson syndrome (SJS) is a life-threatening dermatosis characterized by epidermal sloughing and stomatitis. We report the case of a 7-year-old boy in whom laser phototherapy (LPT) was highly effective in reversing the effects of an initial episode of SJS that had apparently developed in association with treatment with phenobarbital for a seizure disorder. The patient was first seen in the intensive care unit (ICU) of our institution with fever, cutaneous lesions on his extremities, trunk, face, and neck; mucosal involvement of his genitalia and eyes (conjunctivitis); ulcerative intraoral lesions; and swollen, crusted, and bleeding lips. He reported severe pain at the sites of his intraoral and skin lesions and was unable to eat, speak, swallow, or open his mouth. MATERIALS AND METHODS: Trying to prevent and minimize secondary infections, gastric problems, pain, and other complications, the patient was given clindamycin, ranitidine, dipyrone, diphenhydramine (Benadryl) drops, and morphine. In addition, he was instructed to use bicarbonate solution and Ketoconazole (Xylogel) in the oral cavity. Because of the lack of progress of the patient, the LPT was selected. RESULTS: At 5 days after the initial session of LPT, the patient was able to eat gelatin, and on the following day, the number and severity of his intraoral lesions and his labial crusting and swelling had diminished. By 6 days after his initial session of LPT, most of the patient's intraoral lesions had disappeared, and the few that remained were painless; the patient was able to eat solid food by himself and was removed from the ICU. Ten sessions of LPT were conducted

in the hospital. The patient underwent three further and consecutive sessions at the School of Dentistry, when complete healing of his oral lesions was observed. CONCLUSION: The outcome in this case suggests that LPT may be a new adjuvant modality for SJS complications.
Child;Humans;Low-Level Light Therapy;Male;Stevens-Johnson Syndrome;Treatment Outcome

[Efficacy of magnetolaser therapy of patients with an inflammatory form of chronic abacterial prostatitis]. To assess efficacy of magnetolaser therapy (KAP-ELM-01 Andro-Gin unit) in the treatment of inflammatory chronic abacterial prostatitis (ICAP), 68 ICAP patients were divided into 2 groups. Group 1 patients (n = 33) received standard therapy. Group 2 patients received standard therapy plus magnetolaser (ML) therapy. The effect was assessed by the symptoms scale and indices of kallirrein-kinin system. After treatment pain relieved by 36,9%, on the average, in group 1 and by 63.1% in group 2. Lower urinary tract symptoms regressed insignificantly in both groups: by 4.8% and 7.1%, respectively. Quality of life improved by 27.6 and 65.5%, respectively. Kallikrein activity in prostatic secretion remained high in both groups. A 21.7% rise ($p < 0.05$) of prokallikrein level was seen after treatment only in group 2. Activity of KKS inhibitors (alpha2-MG and alphal-PI) in prostatic secretion normalized in group 2. Total activity of serin proteinases lowered in both groups ($p < 0.05$). High activity of alphal-PI (8.21 + 1.97 U/ml) persisted in group 1. Thus, standard treatment of ICAP does not result in biochemical normalization of prostatic secretion. ML therapy is more effective.
Adrenergic alpha-Antagonists;Ofloxacin Adrenergic alpha-Antagonists;Adult;Combined Modality Therapy;Drug Therapy, Combination;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Ofloxacin;Prostatitis;Radiography;Treatment Outcome;Young Adult

Low-level laser therapy on hands of patients with rheumatoid arthritis. Arthritis, Rheumatoid;Clinical Trials as Topic;Double-Blind Method;Hand;Humans;Low-Level Light Therapy;Treatment Outcome

Low-level laser therapy reduces delayed hypersensitivity reaction to ovalbumin in Balb/C mice.
The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) in an experimental model of delayed hypersensitivity reaction (DTH). LLLT has been used clinically to treat numerous diseases and has been tested in different experimental models, but some of its effects have yet to be explained. We assessed the effects of LLLT on DTH to ovalbumin (OVA), a protein that has commonly been used as an antigen to sensitize laboratory animals. This experimental model is broadly used to assess the effects of substances that can potentially modulate the immune system and inflammatory reactions. Balb/C mice were randomly divided into four groups: (I) immunized, untreated, and challenged (nâ€‰=â€‰6); (II) not immunized, untreated, and challenged (nâ€‰=â€‰6); (III) immunized, treated with azathioprine (AZA), and challenged (nâ€‰=â€‰6); and (IV) immunized, treated with LLLT, and challenged (nâ€‰=â€‰6). Forty-eight hours after the challenge, the animals were submitted to a paw edema test and euthanized for histopathology analysis of their plantar pads. The results obtained in DTH units were as follows: Group I, 19.6â€‰Â±â€‰8.9; Group II, 5.8â€‰Â±â€‰2.6; Group III, 5.6â€‰Â±â€‰2.5; and Group IV, 5.2â€‰Â±â€‰2.6. DTH was less intense for the groups treated with AZA and laser compared with Group I (pâ€‰<â€‰0.05). We observed no statistical difference between the AZA- and LLLT-treated groups. The slides obtained from the footpad specimens showed that AZA and laser acted similarly on the normal pattern of DTH triggering. Our results suggest that treatment with LLLT has an immunomodulatory effect on DTH to OVA. Immunosuppressive Agents;Ovalbumin;Azathioprine
Animals;Azathioprine;Hypersensitivity, Delayed;Immunomodulation;Immunosuppressive Agents;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Ovalbumin

The prevention of induced oral mucositis with low-level laser therapy in bone marrow transplantation patients: a randomized clinical trial. BACKGROUND DATA AND OBJECTIVE: Patients who have received high doses of chemotherapy, either alone or in combination with total body irradiation often

cite oral mucositis (OM) as the most debilitating side effect. The aim of this study was to investigate the clinical effects of low-level laser therapy (LLLT) on the prevention of conditioning-induced OM in hematopoietic stem cell transplantation (HSCT). METHODS: We randomized 42 patients who underwent autologous or allogeneic HSCT. A low-level InGaAlP diode laser was used, emitting light at 660â€‰nm, 40â€‰mW, and 4â€‰J/cm(2). An evaluation of OM was carried out using the World Health Organization scale. RESULTS AND CONCLUSION: In the LLLT group, 57.1% of patients had an OM grade 0, 9.6% had grade 1, and 33.3% had grade 2, whereas in the control group, only 4.8% of patients were free of OM (grade 0). Our results indicate that the preventive use of LLLT in patients who have undergone HSCT is a powerful instrument in reducing OM incidence. Adult;Bone Marrow Transplantation;Female;Humans;Low-Level Light Therapy;Male;Postoperative Complications;Stomatitis

Treatment of burning mouth syndrome with a low-level energy diode laser. OBJECTIVE: To test the therapeutic efficacy of low-level energy diode laser on burning mouth syndrome. BACKGROUND: Burning mouth syndrome is characterized by burning and painful sensations in the mouth, especially the tongue, in the absence of significant mucosal abnormalities. Although burning mouth syndrome is relatively common, little is known regarding its etiology and pathophysiology. As a result, no treatment is effective in all patients. Low-level energy diode laser therapy has been used in a variety of chronic and acute pain conditions, including neck, back and myofascial pain, degenerative osteoarthritis, and headache. METHODS: A total of 17 patients who had been diagnosed with burning mouth syndrome were treated with an 800-nm wavelength diode laser. A straight handpiece was used with an end of 1-cm diameter with the fiber end standing 4 cm away from the end of handpiece. When the laser was applied, the handpiece directly contacted or was immediately above the symptomatic lingual surface. The output used was 3 W, 50 msec intermittent pulsing, and a frequency of 10 Hz, which was equivalent to an average power of 1.5 W/cm(2) (3 W Ã— 0.05 msec Ã— 10 Hz = 1.5 W/cm(2)). Depending on the involved area, laser was applied to a 1-cm(2) area for 70 sec until all involved area was covered. Overall pain and discomfort were analyzed with a 10-cm visual analogue scale. RESULTS: All patients received diode laser therapy between one and seven times. The average pain score before the treatment was 6.7 (ranging from 2.9 to 9.8). The results showed an average reduction in pain of 47.6% (ranging from 9.3% to 91.8%). The burning sensation remained unchanged for up to 12 months. CONCLUSION: Low-level energy diode laser may be an effective treatment for burning mouth syndrome. Adult;Aged;Burning Mouth Syndrome;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Treatment Outcome

[Hemodynamic changes of pregnant rats with pre-eclampsia after treatment with low-energy laser irradiation of the chest]. OBJECTIVE: To observe the hemodynamic changes and liver and kidney function variations in pregnant rats with pre-eclampsia after treatment with low-energy laser irradiation. METHODS: Forty pregnant SD rats were randomly divided into the experimental group (group A), experimental control group (group B), blank control group (group C) and blank exposure group (group D) (n=10). The rats in groups A and B were injected with 1 Âμg/kg endotoxin via the tail vein at the 14th day of gestation, and those in groups C and D received normal saline injections. In groups A and B, low-energy laser irradiation of the chest was carried out since day 16 of gestation. Blood pressure, urine protein, liver and kidney function and the hemodynamic changes in the rats were observed. RESULTS: After the treatment, blood pressure, urine protein, ALT, BUN and Cr of group A were lower than those of group B ($P<0.05$), but similar with those in groups C and D ($P>0.05$). The blood and plasma viscosity and hematocrit of group A were also lower than those of group B ($P<0.01$), but comparable with those in groups C and D. CONCLUSION: Low-energy laser irradiation in the chest area may improve the hemodynamic indices, decrease blood pressure and urine protein, and ameliorate liver and kidney functions in pregnant rats with pre-eclampsia.

Animals;Blood Pressure;Female;Hemodynamics;Kidney;Lasers;Liver;Pre-Eclampsia;Pregnancy;Proteinuria;Rats;Rats, Sprague-Dawley;Thorax
[Oral venous malformation treated with pulsed-dye and neodymium:Yttrium-aluminum-garnet sequential laser]. Adolescent;Edema;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Mouth;Tongue Diseases;Vascular Malformations;Veins
Punctate leucoderma after 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet laser with low-fluence therapy: is it melanocytopenic or melanopenic? Adult;Female;Humans;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanocytes;Melanosis
Split-face comparison of long-pulse-duration neodymium-doped yttrium aluminum garnet (Nd:YAG) 1,064-nm laser alone and combination long-pulse and Q-switched Nd:YAG 1,064-nm laser with carbon photoenhancer lotion for the treatment of enlarged pores in Asian women. BACKGROUND: Long-pulse and Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) 1,064-nm laser used for facial rejuvenation can improve pore size. Topical carbon has been used to enhance efficacy. OBJECTIVE: To compare the efficacy and safety of a 1,064-nm long-pulse Nd:YAG laser alone with that of a combination Q-switched Nd:YAG laser with topical carbon lotion followed by long-pulse Nd:YAG to improve enlarged pores. METHODS: Twenty Thai women randomly received five treatments with a long-pulse Nd:YAG laser on one facial half (LP side) and long-pulse Nd:YAG after carbon-assisted Q-switched Nd:YAG laser on the contralateral side (carbon QS+LP side) at 2-week intervals. Participants were evaluated using digital photography, complexion analysis, and a chromometer. RESULTS: There was significant decrease in pore counts of 35.5% and 33% from baseline on the carbon QS+LP and LP sides, respectively. Physician-evaluated pore size improvement was 67% on the carbon QS+LP sides and 60% on the LP sides. Chromometer measurement showed an increase in skin lightness index. There was no significant difference between the two treatments, although there were more adverse effects on the carbon QS+LP side. CONCLUSION: Long-pulse Nd:YAG 1,064-nm laser improves the appearance of facial pores and skin color. Adding carbon-assisted Q-switched Nd:YAG did not enhance the results but produced more side effects. Photosensitizing Agents;Charcoal Administration, Topical;Adult;Asian People;Charcoal;Cosmetic Techniques;Female;Humans;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Photosensitizing Agents;Skin
Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Photochemotherapy
Long-term safety of single and multiple infrared transcranial laser treatments in Sprague-Dawley rats. BACKGROUND AND OBJECTIVE: Growing interest exists in the use of near-infrared laser therapies for the treatment of numerous neurologic conditions, including acute ischemic stroke, traumatic brain injury, Parkinson's disease, and Alzheimer's disease. In consideration of these trends, the objective of this study was to evaluate the long-term safety of transcranial laser therapy with continuous-wave (CW) near-infrared laser light (wavelength, 808â€‰Â±â€‰10â€‰nm, 2-mm diameter) with a nominal radiant power of 70â€‰mW; power density, 2,230â€‰mW/cm(2), and energy density, 268â€‰J/cm(2) at the scalp (10â€‰mW/cm(2) and 1.2â€‰J/cm(2) at the cerebral cortical surface) in healthy Sprague-Dawley rats. MATERIALS AND METHODS: In this study, 120 anesthetized rats received sequential transcranial laser treatments to the right and left parietal areas of the head on the same day (minimum of 5â€‰min between irradiation of each side), on either Day 1 or on each of Days 1, 3, and 5. Sixty anesthetized rats served as sham controls. Rats were evaluated 1 year after treatment for abnormalities in clinical hematology and brain and pituitary gland histopathology. RESULTS: No toxicologically important differences were found in the clinical hematology results between sham-control and laser-treated rats for any hematologic parameters examined. All values

fell within historic control reference ranges for aged Sprague-Dawley rats. Similarly, brain and pituitary gland histopathology showed no treatment-related abnormalities or induced neoplasia. CONCLUSIONS: Single and multiple applications of transcranial laser therapy with 808-nm CW laser light at a nominal power density of 10â€‰mW/cm(2) at the surface of the cerebral cortex appears to be safe in Sprague-Dawley rats 1 year after treatment. Analysis of Variance;Animals;Blood Chemical Analysis;Brain;Cerebral Cortex;Female;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Pituitary Gland;Radiation Dosage;Radiation Tolerance;Random Allocation;Rats;Rats, Sprague-Dawley;Reference Values

Effect of low-power gallium-aluminum-arsenium noncoherent light (640â€‰nm) on muscle activity: a clinical study. BACKGROUND DATA: Studies have shown the significant effects of electromagnetic irradiation in the visible region, with laser as an irradiation source. However, the effect of LEDs (light-emitting diodes) irradiation in similar wavelengths is not known. OBJECTIVE: The purpose of this clinical study was to verify the effects of the LED (640â€‰nm with 40â€‰nm full bandwidth at half maximum) on muscle activity. METHODS: The study was done with 30 test subjects, of both genders, aged 23â€‰Â±â€‰3 years, with a mean weight of 60â€‰kg, divided into three groups (nâ€‰=â€‰10). Fatigue was induced through the maximum power of a bite, for 60â€‰s in two overlaid occlusal platforms, coupled to a load cell and to a biologic signal-acquisition device. LED irradiation of the right masseter muscle was applied to all subjects. The left muscle received placebo treatment. Irradiation was applied in eight points on the right masseter muscle (transcutaneous), 1.044â€‰J per point, 2.088â€‰J per point, or 3.132â€‰J per point, 0.116â€‰W, 0.522â€‰cm(2) spot size, 0.816â€‰cm spot Ã˜, continuous wave, perpendicular to the skin. RESULTS: An increase in muscle activity was observed after irradiation with 1.044â€‰J per point (pâ€‰<â€‰0.05). A significant increase (pâ€‰<â€‰0.01) in the time before fatigue was observed in the irradiated muscle with 2.088â€‰J per point, without a change in the force of contraction (pâ€‰>â€‰0.05). This change was not observed with 1.044â€‰J per point and 3.132â€‰J per point. The results suggest a dose-dependent relation with this kind of noncoherent irradiation in the red region of the electromagnetic spectrum in the muscle-fatigue process. CONCLUSION: It was concluded that LED can be used as a clinical tool to increase muscle activity (1.044â€‰J per point) and to prevent fatigue (2.088â€‰J per point), without change in the muscle force.
Adult;Electromyography;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Masseter Muscle;Muscle Contraction;Muscle Fatigue;Radiation Dosage;Reference Values;Sampling Studies;Sensitivity and Specificity;Statistics, Nonparametric;Young Adult

A combination of 670â€‰nm and 810â€‰nm diode lasers for wound healing acceleration in diabetic rats. OBJECTIVES: To study the effects of the combination of 670â€‰nm and 810â€‰nm diode lasers on diabetic wound healing parameters in rats. BACKGROUND: An alternative to traditional treatment modalities for diabetic ulcers is low-level laser therapy (LLLT). A number of published studies demonstrate the beneficial effects of LLLT, although several other studies also exist which indicate results to the contrary. METHODS: Four groups were present in our study: Diabetic-laser (nâ€‰=â€‰5), Diabetic-control (nâ€‰=â€‰4), Nondiabetic-laser (nâ€‰=â€‰5) and Nondiabetic-control (nâ€‰=â€‰5) groups. Two intervention (laser) groups underwent low level laser therapy using 670â€‰nm diode laser (500â€‰mW, 10â€‰J, 48â€‰s) in the wound context, and 810â€‰nm diode laser (250â€‰mW, 12â€‰J, 50â€‰s) to the wound margins. The wound area was measured using computer software after digital microscopic photography on days 0, 3, 6, 9, 12, 15, 20, and 24. RESULTS: There were no statistically significant differences between the diabetic and non-diabetic groups in the wound area, percentage of open wound area, and wound healing rate throughout the repeated measurements of the study. After seven days of low level laser therapy in the non-diabetic group, urine excretion was significantly increased in comparison with the control

group. CONCLUSION: Overall, our study showed results of measured wound healing parameters that were not significantly different in the LLLT group compared with the control group. The urine volume increase in non-diabetic rats after LLLT was an incidental observation that warrants future study. Streptozocin Animals;Confidence Intervals;Diabetes Mellitus, Experimental;Disease Models, Animal;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Multivariate Analysis;Photomicrography;Radiation Dosage;Random Allocation;Rats;Rats, Wistar;Reference Values;Streptozocin;Wound Healing;Wounds and Injuries

Comparative study of the effects of gallium-aluminum-arsenide laser photobiomodulation and healing oil on skin wounds in wistar rats: a histomorphometric study. OBJECTIVE: The present study compared the effects of gallium-aluminum-arsenide diode laser and healing oil on fibroblasts, blood vessels, and collagen maturation of skin wounds in Wistar rats. MATERIALS AND METHODS: Twenty-four male rats weighing 325â€‰Â±â€‰27â€‰g were used. Five wounds, 12â€‰mm in diameter, were made on the animals' backs. The rats were randomly divided into four groups with six animals in each group. CONTROL GROUP: saline solution; L30 group: 30â€‰J/cm(2) laser; L60 group: 60â€‰J/cm(2) laser; Oil group: healing oil. Histomorphometric analysis was performed on the scar tissue removed from the different wounds every 4â€‰d for 20â€‰d. RESULTS: On day 4, there were significantly more fibroblasts in the wounds treated with the laser and the healing oil compared to the controls. On day 8, there were significantly more fibroblasts in the oil group compared to the L30 and L60 groups. On the same day, the quantity of vessels was significantly greater in the L60 group compared to the other groups. On day 16, there was a significant increase in the number of blood vessels in the wounds treated with the 60â€‰J/cm(2) laser compared to the other groups. Analysis of the collagen maturation index throughout the experiment showed significantly higher values in the L60 group compared to the other groups at all time points. CONCLUSION: The healing oil exerted a greater effect on fibroblast proliferation, whereas the 60â€‰J/cm(2) laser was more effective in stimulating angiogenesis and scar-tissue maturation. Plant Oils;Collagen Administration, Topical;Animals;Collagen;Disease Models, Animal;Fibroblasts;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Plant Oils;Random Allocation;Rats;Rats, Wistar;Reference Values;Skin;Wound Healing;Wounds and Injuries

Photodynamic therapy mediated by methylene blue dye in wound healing. OBJECTIVE: We sought to investigate the wound-healing process after photodynamic therapy (PDT) mediated by methylene blue dye (MB). BACKGROUND DATA: Few scientific studies show the PDT roles in wound healing. MATERIALS AND METHODS: One hundred rats were given a circular wound on the back, inflicted with a 6-mm-diameter punch. The animals were divided into four groups: control (no treatment); dye (topical application of MB); laser (InGaAlP, 117.85â€‰J/cm(2), 100â€‰mW, 660â€‰nm, single point); and PDT (topical application of MB followed by laser irradiation). After 1, 3, 5, 7, and 14 days, the cutaneous wounds were photographed and assessed with histopathologic examination by using light microscope. Changes seen in edema, necrosis, inflammation, granulation tissue, re-epithelialization, and number of young fibroblasts were semiquantitatively evaluated. The wound-area changes were measured with special software and submitted to statistical analysis. RESULTS: The laser group demonstrated the smallest wound area at 14 days after the surgical procedure (pâ€‰<â€‰0.01). Concerning complete re-epithelialization, the laser group showed it at 5-7 days after surgery, whereas the PDT and the other groups showed it at 14 days. CONCLUSIONS: Laser interaction with tissue is somehow changed when exposed to the MB. PDT mediated by MB was not prejudicial to wound healing, as no delay occurred compared with the control group. Coloring Agents;Methylene Blue Animals;Biopsy, Needle;Coloring Agents;Disease Models, Animal;Female;Immunohistochemistry;Low-Level Light Therapy;Methylene

Blue;Photochemotherapy;Random Allocation;Rats;Rats, Wistar;Statistics, Nonparametric;Wound Healing;Wounds and Injuries

Low-level laser therapy for neck pain. Headache;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Neck Pain;Review Literature as Topic

A prospective randomized study of 980 nm diode laser-assisted venous ulcer healing on 34 patients. Venous ulcers are chronic wounds affecting up to 1% of adults in developed countries. Considering that noncontact normothermic therapy has been shown to modify the wound healing process, we conducted a prospective comparative clinical trial aimed at evaluating 980 nm diode laser in laser-assisted venous ulcer healing. Thirty-four Caucasian patients with venous leg ulcers were included in the study and separated into two homogenous groups based on age, sex ratio, size, and etiologies of the ulcers. In the laser group, 980 nm InGasAs diode laser (power 15 W, spot size 8 mm, time 3 seconds, fluence 90 J/cm(2)) was applied weekly for 9 weeks to the ulcers in a homogenous standardized manner, resulting in a local temperature of 45-50 Â°C, which was controlled with a thermal infrared camera. Complete healing, reduction in size, and pain during and between each procedure were evaluated each time. Of the 18 patients in the laser group, three (16.7%) were completely healed during laser treatment. In the control group (16 patients), the healing was complete for four patients (25%). This difference was not significant (p=0.62). At the ninth follow-up visit, in the control group, the ulcers had decreased on an average to 94.3% of the original area of the ulcers. In the laser group, the decrease was to 74.2% of the original area of the ulcers. Again, this difference was not significant (p=0.60). The mean VAS score between each treatment was 2.7 (0.5-4.4) in the laser group compared with 3.8 (2.3-5.0) in the control group (0.13<p<0.86). During the treatment, the mean VAS score was 1.8 (0.2-3.8) in the laser group compared with 3.8 (2.1-6.0) in the control group (0.08<p<0.67). 980 nm diode laser-assisted venous ulcer healing was easy to perform and very well tolerated. However, there were no statistically significant differences in reduction of ulcer size between the two groups, suggesting that this particular laser regimen does not promote wound healing. Additional studies involving larger patient populations and an increased frequency of treatment should be performed to confirm our initial conclusions.
Aged;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Prospective Studies;Varicose Ulcer;Wound Healing

[Evaluation of low level laser and interferential current in the therapy of complex regional pain syndrome by infrared thermographic camera]. BACKGROUND/AIM; Complex regional pain syndrom type I (CRPS I) is characterised by continuous regional pain, disproportional according to duration and intensity and to the sort of trauma or other lesion it was caused by. The aim of the study was to evaluate and compare, by using thermovison, the effects of low level laser therapy and therapy with interferential current in treatment of CRPS I. METHODS: The prospective randomized controlled clinical study included 45 patients with unilateral CRPS 1, after a fracture of the distal end of the radius, of the tibia and/or the fibula, treated in the Clinical Centre in Nis from 2004 to 2007. The group A consisted of 20 patients treated by low level laser therapy and kinesy-therapy, while the patients in the group B (n = 25) were treated by interferential current and kinesy-therapy. The regions of interest were filmed by a thermovision camera on both sides, before and after the 20 therapeutic procedures had been applied. Afterwards, the quantitative analysis and the comparing of thermograms taken before and after the applied therapy were performed. RESULTS: There was statistically significant decrease of the mean maximum temperature difference between the injured and the contralateral extremity after the therapy in comparison to the status before the therapy, with the patients of the group A ($p < 0.001$) as well as those of the group B ($p < 0.001$). The decrease was statistically significantly higher in the group A than in the group B ($p < 0.05$). CONCLUSIONS: By the use of the infrared thermovision we showed that in the treatment of CRPS I both physical medicine

methods were effective, but the effectiveness of laser therapy was statistically significantly higher compared to that of the interferential current therapy. Complex Regional Pain Syndromes;Electric Stimulation Therapy;Exercise Therapy;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Thermography

Clinical evaluation of low-level laser treatment for recurring aphthous stomatitis. OBJECTIVE: The aim of the present study was to assess the effect of low-level laser on the control of pain and the repair of recurring aphthous stomatitis (RAS). BACKGROUND: One of the most frequent pathologic conditions in the oral cavity is RAS. This multifactor immunologic inflammatory lesion causes patient discomfort, and treatment is controversial because of its unknown etiology. A number of treatment modalities have been proposed, but none is definitive. Low-level laser treatment (LLLT) has been used for lesions of an inflammatory nature, not as an inhibitor of the process, but for its modulating action and reparative effect on tissues. MATERIALS AND METHODS: Twenty patients with RAS were divided into one group treated with a topical corticoid agent (n = 5) and another group treated with laser (n = 15). Group I received conventional treatment with triamcinolone acetonide 4 times per day. The patients in Group II received laser treatment with an InGaA1P diode laser with wavelength of 670 nm, 50 mW, 3 J/cm(2) per point in daily sessions (once per day) on consecutive days. Both treatments were applied until the disappearance of the lesions. All patients were evaluated on a daily basis, and the following clinical parameters were determined during each session: pain intensity before and after treatment and clinical measurement of lesion size. RESULTS: The results revealed that 75% of the patients reported a reduction in pain in the same session after laser treatment, and total regression of the lesion occurred after 4 days. Total regression in the corticoid group was from 5 to 7 days. CONCLUSION: The use of LLLT under the conditions administered in the present study demonstrated analgesic and healing effects with regard to RAS. Anti-Inflammatory Agents;Triamcinolone Acetonide Adult;Aged;Anti-Inflammatory Agents;Child, Preschool;Female;Humans;Infant;Low-Level Light Therapy;Male;Recurrence;Stomatitis, Aphthous;Treatment Outcome;Triamcinolone Acetonide;Young Adult

Calibration of low-level laser therapy equipment. BACKGROUND: Despite the increase in the use of low-level laser therapy (LLLT), there is still a lack of consensus in the literature regarding how often the equipment must be calibrated. OBJECTIVE: To evaluate the real average power of LLLT devices in the Greater SÃ£o Paulo area. METHODS: For the evaluation, a LaserCheck power meter designed to calibrate continuous equipment was used. The power meter was programmed with data related to the laser's wavelength to gauge the real average power being emitted. The LLLT devices were evaluated in two ways: first with the device cooled down and then with the device warmed up for 10 minutes. For each condition, three tests were performed. The laser probe was aligned with the power meter, which provided the real average power being emitted by the LLLT device. All of the data and information related to the laser application were collected with the use of a questionnaire filled in by the supervising therapists. RESULTS: The 60 devices evaluated showed deficit in real average power in the cooled-down and warmed-up condition. The statistical analysis (ANOVA) showed a significant decrease ($p<0.05$) in the real average power measured in relation to the manufacturer's average power. On average, the most common dose in the clinics was 4 J/cmÂ², and the most desired effects were healing and anti-inflammatory effects. According to the World Association for Laser Therapy (WALT), 1 to 4 J of final energy are necessary to achieve these effects, however only one device was able to reach the recommended therapeutic window. CONCLUSION: The LLLT devices showed a deficit in real average power that emphasized a lack of order in the application of this tool. The present study also showed the need for periodical calibration of LLLT equipment and a better technical knowledge of the therapists involved. Calibration;Laser Therapy

Comparison of the effects of electrical field stimulation and low-level laser therapy on bone loss in spinal cord-injured rats. OBJECTIVE: This study investigated the effects of low-level laser therapy (LLLT) and electrical stimulation (ES) on bone loss in spinal cord-injured rats. MATERIALS AND METHODS: Thirty-seven male Wistar rats were divided into four groups: standard control group (CG); spinal cord-injured control (SC); spinal cord-injured treated with laser (SCL; GaAlAs, 830â€‰nm, CW, 30â€‰mW/cm, 250â€‰J/cm(2)); and spinal cord-injured treated with electrical field stimulation (SCE; 1.5â€‰MHz, 1:4 duty cycles, 30 mW, 20â€‰min). Biomechanical, densitometric, and morphometric analyses were performed. RESULTS: SC rats showed a significant decrease in bone mass, biomechanical properties, and morphometric parameters (versus CG). SCE rats showed significantly higher values of inner diameter and internal and external areas of tibia diaphyses; and the SCL group showed a trend toward the same result (versus SC). No increase was found in either mechanical or densitometric parameters. CONCLUSION: We conclude that the mentioned treatments were able to initiate a positive bone-tissue response, maybe through stimulation of osteoblasts, which was able to determine the observed morphometric modifications. However, the evoked tissue response could not determine either biomechanical or densitometric modifications.
Analysis of Variance;Animals;Biomechanical Phenomena;Bone Density;Bone Remodeling;Bone and Bones;Densitometry;Disease Models, Animal;Electric Stimulation Therapy;Immunohistochemistry;Low-Level Light Therapy;Male;Osteoporosis;Random Allocation;Rats;Rats, Wistar;Reference Values;Spinal Cord Injuries

Low-level laser intensity application in masseter muscle for treatment purposes. OBJECTIVE: This study evaluated with histochemical analysis how the number of laser applications can affect the masseter muscle. BACKGROUND: In dentistry today, the laser is used in patients with temporomandibular disorders (TMDs), mainly for radiating pain in the masticatory muscles, whose origins may be associated with malocclusion, although the laser effects are not well understood on the cellular level. MATERIALS AND METHODS: Thirty mice (HRS/J lineage) were randomly distributed into groups according to the number of laser applications (three, six, and 10). For each group of laser applications (experimental, n = 5), it was considered the control group (n = 5), which was not irradiated. All animals inhaled halothane (2-bromo-2-chloro-1, 1, 1-trifluoroethane, minimum 99%, Sigma Aldrich, India) before each laser irradiation performed on the left masseter muscle region, on alternate days with 20 J/cm(2), 40 mW, for 20 sec. The muscle samples were collected for histochemical analysis with succinate dehydrogenase (SDH) enzyme 72 h after the last application. RESULTS: (a) A decrease in area of light fibers type (35.91% Â± 6.9%; 32.08% Â± 6.3%, and 27.88% Â± 6.3%), according to the increase of laser applications ($p < 0.05$); (b) significant increase ($p < 0.05$) in the area of intermediate fibers, with an increase of laser application (11.08% Â± 3.9%; 16.52% Â± 5.7%, and 15.96% Â± 3.9%), although the increase with 10 applications was small; (c) area increase of dark fibers in the group with three laser applications (0.16% Â± 0.3%) ($p < 0.05$), and in groups with six and 10 laser applications, respectively (9.68% Â± 6.0% and 9.60% Â± 4.0%). CONCLUSIONS: The SDH enzyme activity revealed that the number of laser applications increases the metabolic pattern of the muscle fibers. A minimal difference in metabolic activity between six and 10 applications of a laser suggests that further analyses should be done to confirm that six applications are enough to produce the same clinical effects, thereby contributing data to professionals from different fields in regard to the cost-benefit ratio of this therapy. Succinate Dehydrogenase Animals;Low-Level Light Therapy;Male;Masseter Muscle;Mice;Mice, Hairless;Muscle Fibers, Skeletal;Retreatment;Succinate Dehydrogenase

Effect of laser (670â€‰nm) on healing of wounds covered with occlusive dressing: a histologic and biomechanical analysis. OBJECTIVES: To analyze the effects of low-level laser therapy (LLLT), 670â€‰nm, with doses of 4 and 7â€‰J/cm(2), on the repair of surgical wounds covered by occlusive

dressings. BACKGROUND DATA: The effect of LLLT on the healing process of covered wounds is not well defined. MATERIALS AND METHODS: For the histologic analysis with HE staining, 50 male Wistar rats were submitted to surgical incisions and divided into 10 groups (nâ€‰=â€‰5): control; stimulated with 4 and 7â€‰J/cm(2) daily, for 7 and 14 days, with or without occlusion. Reepithelization and the number of leukocytes, fibroblasts, and fibrocytes were obtained with an image processor. For the biomechanical analysis, 25 rats were submitted to a surgical incision and divided into five groups (nâ€‰=â€‰5): treated for 14 days with and without occlusive dressing, and the sham group. Samples of the lesions were collected and submitted to the tensile test. One-way analysis of variance was performed, followed by post hoc analysis. A Tukey test was used on the biomechanical data, and the Tamhane test on the histologic data. A significance level of 5% was chosen (pâ€‰â‰¤â€‰0.05). RESULTS: The 4 and 7J/cm(2) laser with and without occlusive dressing did not alter significantly the reepithelization rate of the wounds. The 7â€‰J/cm(2) laser reduced the number of leukocytes significantly. The number of fibroblasts was higher in the groups treated with laser for 7 days, and was significant in the covered 4â€‰J/cm(2) laser group. CONCLUSIONS: Greater interference of the laser-treatment procedure was noted with 7 days of stimulation, and the occlusive dressing did not alter its biostimulatory effects. Analysis of Variance;Animals;Combined Modality Therapy;Disease Models, Animal;Immunohistochemistry;Low-Level Light Therapy;Male;Occlusive Dressings;Probability;Radiation Dosage;Random Allocation;Rats;Rats, Wistar;Tensile Strength;Wound Healing;Wounds and Injuries

Effectiveness of non-ablative three dimensional (3D) skin rejuvenation: a retrospective study involving 46 patients. BACKGROUND: Three dimensional (3D) skin rejuvenation is proposed to be effective for all skin layers. The aim of this concept is to treat sun spots with broad-band pulse light; large pores, fine lines and vascular lesions with a long-pulsed 1064â€‰nm neodymium-yttrium-aluminum-garnet (Nd:YAG) laser system and skin ptosis and laxity with a 1100-1800â€‰nm infrared light source. OBJECTIVE: In this study, 46 patients treated with the 3D skin rejuvenation procedure were retrospectively evaluated to assess the effectiveness of the 3D procedure according to both patient and doctor satisfaction. METHODS: The 3D procedure was carried out over the course of five sessions with 15 day intervals between sessions. Results were judged by an experienced laser dermatologist both by direct patient examination and by comparison of "before" and "after" photographs. Results were ranked into five categories ranging from 0 to 4. At the final control, the patients were also asked to rate their satisfaction with the procedure in five categories, ranging from 0 to 4. RESULTS: All of our patients showed improvement, with an overall patient satisfaction score of 2.65. Female patients were more satisfied than male patients. Patient and doctor satisfaction scores were generally correlated. CONCLUSIONS: Our clinical results indicate that the 3D procedure is an effective nonsurgical skin rejuvenation method. Adult;Age Factors;Aged;Cohort Studies;Esthetics;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Radiation Dosage;Rejuvenation;Retrospective Studies;Sex Factors;Skin Aging;Treatment Outcome

Influence of laser (Î»670â€‰nm) and dexamethasone on the chronology of cutaneous repair. OBJECTIVE: This study aimed to assess the effect of LLLT associated with and without dexamethasone on inflammation and wound healing in cutaneous surgical wounds. BACKGROUND: Limited studies are directed at the possible interference of laser photobiomodulation on the formation of myofibroblasts, associated with an antiinflammatory drug. METHODS AND MATERIALS: Standard skin wounds were performed on 80 Wistar rats, distributed into four groups: no treatment (sham group), laser only (Î»670â€‰nm, 9â€‰mW, 0.031â€‰W/cm(2), 4â€‰J/cm(2), single dose after surgery), dexamethasone only (2â€‰mg/kg 1â€‰h before surgery), and laser with dexamethasone. Tissue was examined histologically to evaluate edema, presence of polymorphonuclear, mononuclear cells,

and collagen. The analysis of myofibroblasts was assessed by immunohistochemistry and transmission electron microscopy. The intensity was rated semiquantitatively. RESULTS: The results showed that laser and dexamethasone acted in a similar pattern to reduce acute inflammation. Collagen synthesis and myofibroblasts were more intense in the laser group (pâ€‰=â€‰0.048), whereas animals treated with dexamethasone showed lower results for these variables. In a combination of therapies, the synthesis of collagen and actin and desmin-positive cells was less than laser group. CONCLUSIONS: Laser was effective in reducing swelling and polymorphonuclear cells and accelerated tissue repair, even in the presence of dexamethasone. Dexamethasone;Collagen Animals;Collagen;Combined Modality Therapy;Dexamethasone;Disease Models, Animal;Follow-Up Studies;Immunohistochemistry;Low-Level Light Therapy;Male;Microscopy, Electron, Transmission;Myofibroblasts;Random Allocation;Rats;Rats, Wistar;Skin;Time Factors;Wound Healing;Wounds and Injuries

Enhanced liver regeneration following acute hepatectomy by low-level laser therapy. OBJECTIVE: The aim of the present study was to investigate the effect of low-level laser therapy (LLLT) on liver regeneration following hepatectomy. BACKGROUND: LLLT has been found to modulate various biological processes. MATERIALS AND METHODS: Twelve mature male rats were used. The liver was exposed, and 70% of it was excised. The rats were assigned randomly to two groups: control, non-laser treated, and experimental, laser-treated (diode [Ga-Al-As] laser 804â€‰nm) group. For determination of newly formed blood vessels and proliferating cells, 5-Bromo-2'deoxyuridine (BrdU) was injected intraperitoneally. The rats were sacrificed 2â€‰d post hepatectomy, and histological sections from each liver were processed for analysis of new blood-vessel formation using BrdU immunostaining kit. Mesenchymal stem cells (MSCs) were assessed using c-kit immunostaining. BrdU-labeled cells were counted as for estimation of newly formed hepatic cells. RESULTS: It was found that the number of proliferating cells (BrdU positive cells) per area in the regenerating regions of the livers were significantly (pâ€‰<â€‰0.01) 2.6-fold higher in the laser-treated rats than in the control non-laser-treated rats. The density of the newly formed blood vessels and c-kit immunopositive cells in the regenerating area of the laser-treated livers was significantly (pâ€‰<â€‰0.01) 3.3- and 2.3-fold respectively higher than the control non-laser treated livers. CONCLUSION: It is concluded that LLLT following acute hepatectomy most probably stimulates a significant enhancement of liver regeneration conducive to both the formation of new hepatocytes and MSCs and angiogenesis in the regenerating liver. Acute Disease;Analysis of Variance;Animals;Disease Models, Animal;Hepatectomy;Immunohistochemistry;Lasers, Semiconductor;Liver Regeneration;Low-Level Light Therapy;Male;Photomicrography;Random Allocation;Rats;Rats, Inbred Strains;Reference Values

The use of the 308-nm excimer laser for the treatment of psoriasis. OBJECTIVE: The objective was to study the effectiveness of the 308-nm excimer laser for the treatment of various forms of localized stable psoriasis. BACKGROUND: Recent reports show that 308-nm excimer laser may be an effective and safe method for the treatment of localized stable psoriasis. METHODS: A retrospective chart review was performed of a population-based group of 98 patients with various forms of localized stable psoriasis treated with excimer laser. Of these, 41 were male, and 57 were female patients. Ages ranged from 10 to 84 years (mean, 51.4 years). Patients who completed at least 10 sessions were included unless they had achieved >70% improvement in PASI scores before 10 treatments. The initial dose was determined by the MED (minimal erythema dose), and the dose was raised gradually in a stepwise fashion. RESULTS: Significant improvement (â‰¥70%) was achieved by 59 (60.2%) patients; they needed an average cumulative dose of 6.46â€‰J/cm(2), and an average of 17 sessions. Twenty-four (24.5%) patients achieved good improvement (50% to 70%); the average cumulative dose needed was 5.36â€‰J/cm(2), and the average number of sessions required was 12. Side effects were limited to sunburn-like reaction. CONCLUSION: The 308-nm excimer laser is an

effective and safe modality for the treatment of psoriasis, with good results achieved in a relatively short time. Adolescent;Adult;Age Factors;Aged;Aged, 80 and over;Child;Cohort Studies;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Psoriasis;Radiation Dosage;Retrospective Studies;Severity of Illness Index;Sex Factors;Treatment Outcome;Young Adult

The effect of low-level laser therapy as an adjunct to non-surgical periodontal treatment. BACKGROUND: The aim of this study is to evaluate the effect of low-level laser therapy (LLLT) as an adjunct to non-surgical periodontal therapy of smoking and non-smoking patients with moderate to advanced chronic periodontitis. METHODS: All 36 systemically healthy patients who were included in the study initially received non-surgical periodontal therapy. The LLLT group (n = 18) received GaAlAs diode laser therapy as an adjunct to non-surgical periodontal therapy. A diode laser with a wavelength of 808 nm was used for the LLLT. Energy density of 4 J/cm(2) was applied to the gingival surface after periodontal treatment on the first, second, and seventh days. Each of the LLLT and control groups was divided into two groups as smoking and non-smoking patients to investigate the effect of smoking on treatment. Gingival crevicular fluid samples were collected from all patients and clinical parameters were recorded on baseline, the first, third, and sixth months after treatment. Matrix metalloproteinase-1, tissue inhibitor matrix metalloproteinase-1, transforming growth factor-Î²1, and basic-fibroblast growth factor levels in the collected gingival crevicular fluid were measured. RESULTS: The primary outcome variable in this study was change in gingival bleeding and inflammation. At all time points, the LLLT group showed significantly more improvement in sulcus bleeding index (SBI), clinical attachment level, and probing depth (PD) levels compared to the control group (P <0.001). There were clinically significant improvements in the laser-applied smokers' PD and SBI levels compared to smokers to whom a laser was not applied, between the baseline and all time points (P <0.001) (SBI score: control group 1.12, LLLT group 1.49; PD: control group 1.21 mm, LLLT group 1.46 mm, between baseline and 6 months). Transforming growth factor-Î²1 levels and the ratio of matrix metalloproteinase-1 to tissue inhibitor matrix metalloproteinase-1 decreased significantly in both groups at 1, 3, and 6 months after periodontal therapy (P <0.001). Basic-fibroblast growth factor levels significantly decreased in both groups in the first month after the treatment, then increased in the third and sixth months (P <0.005). No marker level change showed significant differences between the groups (P <0.05). CONCLUSION: LLLT as an adjunctive therapy to non-surgical periodontal treatment improves periodontal healing. Tissue Inhibitor of Metalloproteinase-1;Transforming Growth Factor beta1;Fibroblast Growth Factor 2;Matrix Metalloproteinase 1 Adult;Chronic Periodontitis;Dental Scaling;Female;Fibroblast Growth Factor 2;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 1;Middle Aged;Periodontal Index;Radiotherapy, Adjuvant;Smoking;Statistics, Nonparametric;Tissue Inhibitor of Metalloproteinase-1;Transforming Growth Factor beta1;Wound Healing

Tooth movement after infrared laser phototherapy: clinical study in rodents. OBJECTIVES: The aim of this research was to investigate the influence of low-power laser on tooth movement in rats. BACKGROUND: Tooth movement is closely related to the process of bone remodeling. The biologic result, with the application of a force to the tooth, is bone absorption on the pressure side and neoformation on the traction side of the alveolar bone. The laser photobiomodulation is capable of providing an increase in cellular metabolism, blood flow, and lymphatic drainage. METHODS: Thirty young-adult male Wistar rats weighing between 250 and 300 g were divided into two groups, control and experimental, containing 15 animals each. The animals received orthodontic devices calibrated to release a force of 40 g/F, with the purpose of moving the first upper molar mesially. Low-intensity laser, wavelength 790 nm, was used in the experimental group; the dose was 4.5 J/cm(2) per point, mesial and distal, on the palatal side, 11 J/cm(2) on the buccal side, and this procedure was repeated

every 48 h, totaling nine applications. The active movement was clinically evaluated after 7, 13, and 19 days. RESULTS AND CONCLUSION: The results showed no statistically significant difference, p = 0.079 (T0-T7), p = 0.597 (T7-T13), and p = 0.550 (T13-T19) between the laser and control groups on the amount of tooth movement in the different times evaluated. It may be concluded that laser phototherapy, with the parameters in the present study, did not significantly increase the amount of tooth displacement during induced orthodontic movement in rodents. Animals;Low-Level Light Therapy;Male;Orthodontic Appliances;Rabbits;Rats;Rats, Wistar;Tooth Movement Techniques

The effect of laser preexposure on seeding endothelial cells to a biomaterial surface. OBJECTIVE: In this study, the possible effect of low-level laser (LLL) on improving the adhesion of endothelial cells (ECs) to a biomaterial substrate was evaluated. BACKGROUND DATA: Despite the numerous studies regarding the effects of LLL on biologic systems, the influence of LLL on the binding between cells and materials was rarely investigated. MATERIALS AND METHODS: A low-power He-Ne laser apparatus with a continuous wavelength of 632.8 nm (a maximum power output of 50 mW) was used. The average irradiation energy on cells was 1.18 J/cm(2). Cell morphology and the concentrations of nitric oxide and calcium after laser exposure were measured. Biomedical grade poly(carbonate)urethane (PU) was synthesized and used to prepare microporous vascular grafts. ECs exposed to laser were harvested and seeded on the PU grafts. No further exposure was given. RESULTS: LLL could change the morphology and increase the matrix secretion of ECs, and such effects persisted when preexposed cells were harvested and seeded to another substrate. The number of ECs attached on the biomaterial substrate was not affected. Preexposed ECs on the PU graft, however, were, on average, more resistant to flushing (i.e., greater cell retention). CONCLUSION: ECs were pretreated with LLL before being seeded onto the PU biomaterial vascular grafts. The retention of LLL-preexposed ECs on the graft surface was enhanced, but not as significantly as that of ECs preexposed to low-intensity ultrasound. Biocompatible Materials;Polyurethanes;Nitric Oxide Animals;Biocompatible Materials;Blood Vessel Prosthesis;Cattle;Cell Adhesion;Endothelial Cells;Endothelium, Vascular;Low-Level Light Therapy;Materials Testing;Nitric Oxide;Polyurethanes;Tissue Engineering;Tissue Scaffolds

Histological and radiographic evaluation of the muscle tissue of rats after implantation of bone morphogenic protein (rhBMP-2) in a scaffold of inorganic bone and after stimulation with low-power laser light. OBJECTIVE: The present study histologically and radiologically evaluates the muscle tissue of rats after implantation of bone morphogenic protein (rhBMP-2) in a natural inorganic bone mineral scaffold from a bull calf femur and irradiation with low-power light laser. MATERIALS AND METHODS: The right and left hind limbs of 16 rats were shaved and an incision was made in the muscle on the face corresponding to the median portion of the tibia, into which rhBMP-2 in a scaffold of inorganic bone was implanted. Two groups of limbs were formed: control (G1) and laser irradiation (G2). G2 received diode laser light applied in the direction of the implant, at a dose of 8 J/cm2 for three minutes. On the 7th, 21st, 40th and 112th days after implantation, hind limbs of 4 animals were radiographed and their implants removed together with the surrounding tissue for study under the microscope. The histological results were graded as 0=absence, 1=slight presence, 2=representative and 3=very representative, with regard to the following events: formation of osteoid structure, acute inflammation, chronic inflammation, fibrin deposition, neovascularization, foreign-body granuloma and fibrosis. RESULTS: There were no statistically significant differences in these events at each evaluation times, between the two groups ($P > 0.05$; Mann-Whitney test). Nevertheless, it could be concluded that the natural inorganic bone matrix with rhBMP-2, from the femur of a bull calf, is a biocompatible combination. CONCLUSIONS: Under these conditions, the inductive capacity of rhBMP-2 for cell differentiation was inhibited. There was a slight acceleration in tissue healing in the group that received irradiation with low-power laser light. Biocompatible Materials;Bone

Morphogenetic Protein 2;Bone Morphogenetic Proteins;Recombinant Proteins;Transforming Growth Factor beta;recombinant human bone morphogenetic protein-2;Fibrin Absorbable Implants;Animals;Biocompatible Materials;Bone Matrix;Bone Morphogenetic Protein 2;Bone Morphogenetic Proteins;Cattle;Cell Differentiation;Fibrin;Fibrosis;Granuloma, Foreign-Body;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;Neovascularization, Physiologic;Osteogenesis;Radiation Dosage;Radiography;Rats;Rats, Wistar;Recombinant Proteins;Time Factors;Tissue Scaffolds;Transforming Growth Factor beta;Wound Healing

Raman spectroscopy validation of DIAGNOdent-assisted fluorescence readings on tibial fractures treated with laser phototherapy, BMPs, guided bone regeneration, and miniplates. OBJECTIVES: We aimed to assess through Raman spectroscopy and fluorescence the levels of calcium hydroxyapatite (CHA) and lipids and proteins in complete fractures treated with internal rigid fixation (IRF) treated or not with laser phototherapy (LPT) and associated or not with bone morphogenetic proteins (BMPs) and guided bone regeneration (GBR). BACKGROUND: Fractures have different etiologies and treatments and may be associated with bone losses. LPT has been shown to improve bone healing. METHODS: Tibial fractures were created on 15 animals and divided into five groups. LPT started immediately after surgery, repeated at 48-h intervals. Animal death occurred after 30 days. RESULTS: Raman spectroscopy and fluorescence were performed at the surface. Fluorescence data of group IRF + LPT + Biomaterial showed similar readings to those of the group IRF-no bone loss. Significant differences were seen between groups IRF + LPT + Biomaterial and IRF + LPT; IRF + LPT + Biomaterial; and IRF + Biomaterial; and between IRF + LPT + Biomaterial and IRF. CH groups of lipids and proteins readings showed decreased levels of organic components in subjects treated with the association of LPT, biomaterial, and GBR. Pearson correlation showed that fluorescence readings of both CHA and CH groups of lipids and proteins correlated negatively with the Raman data. CONCLUSIONS: The use of both methods indicates that the use of the biomaterials associated with infrared LPT resulted in a more-advanced and higher quality of bone repair in fractures treated with miniplates and that the DIAGNOdent may be used to perform optical biopsy on bone. Biocompatible Materials;Bone Morphogenetic Proteins Animals;Biocompatible Materials;Bone Morphogenetic Proteins;Bone Plates;Bone Regeneration;Combined Modality Therapy;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Rabbits;Spectrum Analysis, Raman;Tibial Fractures;Wound Healing

BiosilicateÂ® and low-level laser therapy improve bone repair in osteoporotic rats. The aim of this study was to investigate the effects of a novel bioactive material (BiosilicateÂ®) and low-level laser therapy (LLLT) on bone fracture consolidation in osteoporotic rats. Forty female Wistar rats were submitted to ovariectomy (OVX) to induce osteopenia. Eight weeks after surgery, the animals were randomly divided into four groups of 10 animals each: a bone defect control group (CG); a bone defect filled with Biosilicate group (BG); a bone defect filled with Biosilicate and irradiated with LLLT at 60 J/cm(2) group (BG60); and a bone defect filled with Biosilicate and irradiated with LLLT at 120 J/cm(2) group (BG120). Bone defects were surgically performed on both tibias. The size of particle used for Biosilicate was 180-212 Âµm. Histopathological analysis showed that bone defects were predominantly filled with the biomaterial in specimens treated with Biosilicate. LLLT with either 60 or 120 J/cm(2) was able to increase collagen, Cbfa-1, VGEF and COX-2 expression in the circumjacent cells of the biomaterial. A morphometric analysis revealed that the Biosilicate + laser groups showed a higher amount of newly formed bone. Our results indicate that laser therapy improves bone repair process in contact with Biosilicate as a result of increasing bone formation, as well as COX-2 and Cbfa-1 immunoexpression, angiogenesis and collagen deposition in osteoporotic rats. Azo Compounds;Core Binding Factor Alpha 1 Subunit;Silicates;sodium oxide-calcium oxide-silicon dioxide-

diphosphorus pentoxide;C.I. direct red 80;Collagen;Cyclooxygenase 2 Animals;Azo Compounds;Biomechanical Phenomena;Collagen;Core Binding Factor Alpha 1 Subunit;Cyclooxygenase 2;Female;Glass;Humans;Immunohistochemistry;Low-Level Light Therapy;Osteogenesis;Osteoporosis;Rats;Rats, Wistar;Silicates;Tibia;Wound Healing

Inflicting controlled nonthermal damage to subcellular structures by laser-activated gold nanoparticles. We show that low-intensity laser irradiation of cancer cells containing endosomal gold nanoparticles leads to endosome rupture and escape of the nanoparticles into the cytosol without affecting the cells' viability. The low light intensity of our experiments allows us to rule out photothermal effects as the underlying mechanism, and we present results that suggest photoinduced radicals as the photogenerated active species. This nonthermal mechanism may also be important in the context of cell death at higher laser intensities, which had been reported previously. Gold Gold;HeLa Cells;Hot Temperature;Humans;Lasers;Nanoparticles;Radiation Dosage;Subcellular Fractions

Usefulness of intravascular low-power laser illumination in preventing restenosis after percutaneous coronary intervention. Despite the several years of studies, no factor that could reduce the restenosis rate without significant limitations has been introduced. The aim of the present study was to evaluate the influence of low-power 808-nm laser illumination of coronary vessels after percutaneous angioplasty in preventing restenosis. The procedure of laser intravascular illumination was performed on 52 patients (laser group), and another 49 patients formed the control group. All patients were monitored for major adverse cardiac events (MACE) at the 6- and 12-month follow-up points. The MACE rate after 6 and 12 months was 7.7% in the laser group at both points. The MACE rate was 14.3% and 18.5% at 6 and 12 months of follow-up in the control group, respectively (p = NS). Follow-up coronary angiography was performed after 6 months. The difference in the restenosis rate was insignificant (15.0% vs 32.4%); however, significant differences were observed in the minimal lumen diameter (2.18 Â± 0.70 vs 1.76 Â± 0.74 mm; p < 0.05), late lumen loss (0.53 Â± 0.68 vs 0.76 Â± 0.76 mm; p < 0.01), and the late lumen loss index (0.28 Â± 0.39 vs 0.46 Â± 0.43; p < 0.005) in favor of the laser group. In conclusion, the new therapy seemed effective and safe. Marked differences between late loss, late loss index, and minimal lumen diameter were observed. The late lumen loss in the laser group was only slightly greater than that in studies of drug-eluting stents, and MACE rate remained within very comparable ranges. This suggests that intravascular laser illumination could bring advantages comparable to those of drug-eluting stents without the risk of late thrombosis. Angioplasty, Balloon, Coronary;Catheterization, Peripheral;Coronary Angiography;Coronary Restenosis;Electrocardiography;Female;Follow-Up Studies;Humans;Incidence;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia;Poland;Time Factors;Treatment Outcome

Laser therapy of pigmented lesions: pro and contra. Although frequently performed, laser removal of pigmented lesions still contains certain controversial issues. Epidermal pigmented lesions include solar lentigines, ephelides, cafÃ© au lait macules and seborrheic keratoses. Dermal lesions include melanocytic nevi, blue nevi, drug induced hyperpigmentation and nevus of Ota and Ito. Some lesions exhibit both an epidermal and dermal component like Becker's nevus, postinflammatory hyperpigmentations, melasma and nevus spilus. Due to the wide absorption spectrum of melanin (500-1100 nm), several laser systems are effective in removal of pigmented lesions. These lasers include the pigmented lesion pulsed dye laser (510 nm), the Q-switched ruby laser (694 nm), the Q-switched alexandrite laser (755 nm) and the Q-switched Nd:YAG laser (1064 nm), which can be frequency-doubled to produce visible green light with a wavelength of 532 nm. The results of laser therapy are usually successful. However, there are still many controversies regarding the use of lasers in treating certain pigmented lesions. Actually, the essential question in removing pigmented lesions

with lasers is whether the lesion has atypical features or has a malignant potential. Dermoscopy, used as a routine first-level diagnostic technique, is helpful in most cases. If there is any doubt whether the lesion is benign, then a biopsy for histologic evaluation is obligatory.
Humans;Hyperpigmentation;Laser Therapy;Lasers;Low-Level Light Therapy

Dermatologic lasers in the treatment of aging skin. Skin aging includes intrinsic aging, a universal and inevitable process attributable to the passage of the time alone; and photoaging, changes attributable to chronic sun exposure, which are neither universal nor inevitable. The major clinical features of aging skin include xerosis, laxity, wrinkles, slackness, and the occurrence of benign neoplasms such as seborrheic keratoses and cherry angiomas. Photoaging is characterized by dryness (roughness), actinic keratoses, irregular pigmentation (freckling, lentigines, guttate hypomelanosis, persistent hyperpigmentation), wrinkling, stellate pseudoscars, elastosis (fine nodularity and/or coarseness), inelasticity, telangiectasia, venous lakes, purpura (easy bruising), comedones (maladie de Favre et Racouchot) and sebaceous hyperplasia. Current antiaging therapy consists of lasers, intense pulsed light as well as fillers, neurotoxins, radiofrequency, microdermabrasion and chemical peeling. Over the last 50 years, lasers applications in dermatology have become more specific and often irreplaceable. In this manuscript laser resurfacing and laser therapy of vascular and pigmented lesions of aging skin will be overviewed. Current trends show an increase in the number of nonablative and fractional resurfacing procedures because they are followed by less intense side effects and faster recovery rates compared to ablative laser rejuvenation, although producing mild improvement. Cosmetic Techniques;Humans;Hyperpigmentation;Low-Level Light Therapy;Rejuvenation;Skin Aging;Skin Diseases, Vascular

Estimation of the optimal wavelengths for laser-induced wound healing. BACKGROUND AND OBJECTIVES: According to earlier in vitro low level laser therapy (LLLT) studies, wavelengths in the red and near infrared range, that are absorbed by cytochrome oxidase, stimulate cell growth and hence wound healing. Wavelengths in the blue region that are absorbed by flavins were found to exert a bactericidal effect that is very important for treating infected wounds. However, as far as therapeutic application of light is concerned, penetration into the tissue must be considered. For this purpose we estimated the penetration depth as a function of the relevant wavelengths, using the formulae of the photon migration model for skin tissue. METHODS: We use the photon diffusion model, which is an analytical model for describing light transfer in biological tissues. We refer to the most common chromophores in human tissue and evaluate their volume fraction and concentration in skin cells. These empirically estimated mean wavelength-dependent absorption coefficients are then substituted in the theoretical expressions for the optical penetration depth in the tissue. The wavelengths, for which the penetration depth is the highest, are the optimal wavelengths to be used in wound healing treatments. RESULTS: Our model suggests that the optimal wavelengths for therapeutic treatments are in the red region with a local maximum at 730â€‰nm. As to the blue region, a local maximum at 480â€‰nm was found. CONCLUSION: Light at 480â€‰nm should be used for treating infected wounds followed by 730â€‰nm light for enhancing wound closure.
Hemoglobins Diffusion;Fibroblasts;Hemoglobins;Humans;Lasers;Models, Biological;Photons;Radiation Dosage;Skin;Wound Healing

Split-face comparison of intense pulsed light with short- and long-pulsed dye lasers for the treatment of port-wine stains. BACKGROUND: So far, pulsed dye lasers have been regarded as the gold standard in the treatment of port-wine stains (PWS). Recently, intense pulsed light (IPL) has been reported to achieve more pronounced fading in some patients. OBJECTIVES: To evaluate the efficacy and the side effects of IPL treatment of PWS in a direct comparison to the short-pulsed dye laser (SPDL) and the long-pulsed dye laser (LPDL). METHODS: Test spots (nâ€‰=â€‰158) were applied with IPL (Î»(em)â€‰=â€‰555-950â€‰nm, pulse duration: 8-14â€‰milliseconds (single pulse),

fluence: 11-17.3â€‰J/cm(2)), the SPDL (Î»(em)â€‰= 585â€‰nm, pulse duration: 0.45â€‰milliseconds, fluence: 6â€‰J/cm(2)), and the LPDL (Î»(em)â€‰=â€‰585/590/595/600â€‰nm, pulse duration: 1.5â€‰milliseconds, fluence: 12/14/16/18â€‰J/cm(2)) in a side-by-side modus in untreated (nâ€‰=â€‰11) and previously treated (nâ€‰=â€‰14) patients with PWS. Lesion clearance was evaluated by three blinded investigators based on follow-up photographs 6 weeks after treatment. Incidence of side effects was assessed. RESULTS: In previously untreated PWS as well as in pretreated PWS, IPL treatments were rated significantly (P<0.05) better than treatments with the SPDL. In both groups, IPL and LPDL treatments did not differ significantly. Side effects were few in all settings. CONCLUSIONS: In PWS resistant to dye laser therapy, IPL showed additional lesion clearance. The use of IPL increases the therapeutic possibilities in PWS. Adolescent;Adult;Aged;Child;Child, Preschool;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Young Adult

Photodamage therapy using an electro-optic Q-switched Nd:YAG laser. BACKGROUND AND OBJECTIVE: Q-Switched Nd:YAG lasers produce photoacoustic effects in addition to photothermal effects which may allow for greater tissue collagen production. The objective of the study is to determine the effectiveness and tolerability of an Electro-Optic (EO) Q-switched Nd:YAG laser with Single Pulse and novel Double Pulse (DP) options in the treatment of photodamaged skin. MATERIALS AND METHODS: Sixteen subjects with photoaging were enrolled in this prospective, randomized, split-faced study. Subjects received 6 bi-weekly laser treatments. One half of the face was treated with a Single Pulse while the other half was treated with energies divided into a DP. Blinded investigators and subjects assessed improvement after the sixth treatment for wrinkles, coarseness, pigmentation, redness, laxity, comedones, pore size, and overall skin condition. Subjects also rated the tolerability of the treatments. RESULTS: For the Single Pulse side of the face, the investigators rated 33% of the patients as having a good to excellent (51% or greater) improvement in the overall condition of the skin while 47% of the subjects reported these levels. On the DP side, the overall improvement was good to excellent at a 27% rate by the investigators and 54% by the subjects. Distributions of improved ratings among investigators and subjects were similar for both sides of the treatment area. The majority of stinging/burning sensations during treatment were reported as mild on the DP side (62.8%) and moderate (63.8%) on the Single Pulse side. The chance of reporting none or only mild stinging/burning sensation during treatment was four times greater on the side of the face treated with the DP (Pâ€‰<â€‰0.0001). CONCLUSIONS: Results have shown that treatment with the EO QS Nd:YAG laser provides a safe and effective method of skin rejuvenation with the additional benefit of significantly lower patient discomfort during use of the DP mode. Adult;Aged;Double-Blind Method;Edema;Erythema;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Skin Aging;Sunlight

Low energy laser light (632.8 nm) suppresses amyloid-Î² peptide-induced oxidative and inflammatory responses in astrocytes. Oxidative stress and inflammation are important processes in the progression of Alzheimer's disease (AD). Recent studies have implicated the role of amyloid Î²-peptides (AÎ²) in mediating these processes. In astrocytes, oligomeric AÎ² induces the assembly of nicotinamide adenine dinucleotide phosphate (NADPH) oxidase complexes resulting in its activation to produce anionic superoxide. AÎ² also promotes production of pro-inflammatory factors in astrocytes. Since low energy laser has previously been reported to attenuate oxidative stress and inflammation in biological systems, the objective of this study was to examine whether this type of laser light was able to abrogate the oxidative and inflammatory responses induced by AÎ². Primary rat astrocytes were exposed to Helium-Neon laser (Î»=632.8 nm), followed by the treatment with oligomeric AÎ². Primary rat astrocytes were used to measure AÎ²-induced production of superoxide

anions using fluorescence microscopy of dihydroethidium (DHE), assembly of NADPH oxidase subunits by the colocalization between the cytosolic p47(phox) subunit and the membrane gp91(phox) subunit using fluorescent confocal microscopy, phosphorylation of cytosolic phospholipase A(2) cPLA(2) and expressions of pro-inflammatory factors including interleukin-1Î² (IL-1Î²) and inducible nitric-oxide synthase (iNOS) using Western blot Analysis. Our data showed that laser light at 632.8 nm suppressed AÎ²-induced superoxide production, colocalization between NADPH oxidase gp91(phox) and p47(phox) subunits, phosphorylation of cPLA(2,) and the expressions of IL-1Î² and iNOS in primary astrocytes. We demonstrated for the first time that 632.8 nm laser was capable of suppressing cellular pathways of oxidative stress and inflammatory responses critical in the pathogenesis in AD. This study should prove to provide the groundwork for further investigations for the potential use of laser therapy as a treatment for AD. Amyloid beta-Peptides;Inflammation Mediators;Peptide Fragments;Superoxides Alzheimer Disease;Amyloid beta-Peptides;Animals;Animals, Newborn;Astrocytes;Cells, Cultured;Cerebral Cortex;Dose-Response Relationship, Radiation;Inflammation Mediators;Low-Level Light Therapy;Oxidative Stress;Peptide Fragments;Rats;Superoxides

Infrared laser therapy after surgically assisted rapid palatal expansion to diminish pain and accelerate bone healing. The aim of this study was to illustrate how gallium arsenite aluminum diode laser (824 nm) irradiation can reduce postsurgical edema and discomfort and accelerate sutural osseous regeneration after surgically assisted rapid palatal expansion (SARPE). An adult patient with an 8-mm transverse maxillary discrepancy was treated with SARPE. Infrared laser therapy was started on the 7th postoperative day, with a total of eight sessions at intervals of 48 hours. The laser probe spot had a size of 0.2827 cm2 and was positioned in contact with the following (bilateral) points: infraorbital foramen, nasal alar, nasopalatine foramen, median palatal suture at the height of the molars, and transverse palatine suture distal to the second molars. The laser was run in continuous mode with a power of 100 mW and a fluency of 1.5 J/cm2 for 20 seconds at each point. Subsequently, an absence of edema and pain was observed. Further, fast bone regeneration in the median palatal suture could be demonstrated by occlusal radiographs. These findings suggest that laser therapy can accelerate bone regeneration of the median palatal suture in patients who have undergone SARPE.
Bone Regeneration;Edema;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Malocclusion, Angle Class II;Maxilla;Maxillary Osteotomy;Nasal Cartilages;Orbit;Orthodontic Appliance Design;Osteogenesis;Osteogenesis, Distraction;Pain, Postoperative;Palatal Expansion Technique;Palate;Postoperative Complications;Radiotherapy Dosage;Young Adult

Effects of laser photherapy on bone defects grafted with mineral trioxide aggregate, bone morphogenetic proteins, and guided bone regeneration: a Raman spectroscopic study. We have used Raman analysis to assess bone healing on different models. Benefits on the isolated or combined use of mineral trioxide aggregate, bone morphogenetic proteins, guided bone regeneration and laser on bone repair have been reported, but not their combination. We studied peaks of hydroxyapatite and CH groups on defects grafted with MTA, treated or not with laser, BMPs, and GBR. Ninety rats were divided in 10 groups each, subdivided into three subgroups. Laser (Î»850 nm) was applied at every other day for 2 weeks. Raman readings were taken at the surface of the defect. Statistical analysis (CHA) showed significant differences between all groups ($p = 0.001$) and between Group II and all other ($p < 0.001$), but not with Group X ($p = 0.09$). At day 21 differences were seen between all groups ($p = 0.031$) and between Groups VIII and X when compared with Groups VI ($p = 0.03$), V ($p < 0.001$), IV ($p < 0.001$), and IX ($p = 0.04$). At the end of the experimental period no significant differences were seen. On regards CH, significant differences were seen at the 15(th) day ($p = 0.002$) and between Group II and all other groups ($p < 0.0001$) but not with control. Advanced

maturation on irradiated bone is because of increased secretion of calcium hydroxyapatite (CHA) that is indicative of greater calcification and resistance of the bone. We conclude that the association of the MTA with laser phototherapy (LPT) and/or not with GBR resulted in a better bone repair. The use of the MTA associated to IR LPT resulted in a more advanced and quality bone repair. Aluminum Compounds;Bone Morphogenetic Proteins;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate;Durapatite Aluminum Compounds;Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Transplantation;Bone and Bones;Calcium Compounds;Drug Combinations;Durapatite;Fluorescence;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Oxides;Rats;Rats, Wistar;Silicates;Spectrum Analysis, Raman

[Laser acupuncture for chronic back pain. A double-blind clinical study]. BACKGROUND: The goal of this study was to evaluate the efficacy of laser acupuncture for the clinical picture of chronic back pain under everyday conditions using a randomized, double-blind, placebo-controlled study design. A further aim was to analyze to what extent placebo effects also influence the outcome of acupuncture under these conditions. PATIENTS AND METHODS: The study included male and female patients with chronic back pain (lasting longer than 6 months) aged between 30 and 77 years with a pain score of at least 5 on a visual analog scale. The main criterion was achieving alleviation of pain by at least 50% 3 months after the start of treatment. The assessment tools used were the Von Korff questionnaire supplemented by the FFbH, FABQ, and SF-12. In addition, the participants were questioned about whether they perceived anything during the treatment and how certain they were that they had received treatment with active or inactive lasers. RESULTS: A total of 111 patients were included in the study and were treated according to the randomization list in two groups each consisting of 51 subjects. The study was completed as scheduled by 102 participants. Analysis of the primary outcome measure, improvement of the pain score by more than 50% over baseline, revealed improvements in both treatment groups between the time points used for measurement. The placebo group exhibited better levels than the group that received laser treatment. No efficacy advantage of laser acupuncture over placebo treatment could be determined. CONCLUSION: It was possible to completely blind the acupuncture forms with the study design employed. Perhaps the consistent exclusion of nonspecific treatment effects contributed to this result. It cannot be ruled out that the effects of acupuncture are based on a strong placebo effect. Acupuncture Analgesia;Adult;Aged;Back Pain;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement

Pulsed dye laser-resistant capillary malformation treated using intradermal sclerotherapy with ethanolamine oleate after intense pulsed light treatment. Oleic Acids;Sclerosing Solutions;ethanolamine oleate Adult;Capillaries;Combined Modality Therapy;Humans;Injections, Intradermal;Lasers;Lasers, Dye;Low-Level Light Therapy;Male;Oleic Acids;Sclerosing Solutions;Sclerotherapy;Vascular Malformations

Effects of low-power laser irradiation (LPLI) at different wavelengths and doses on oxidative stress and fibrogenesis parameters in an animal model of wound healing. Gallium-arsenide (GaAs) and helium-neon (HeNe) lasers are the most commonly used low-energy lasers in physiotherapy for promoting wound healing and pain modulation. The aim of this study was investigate the effect of low-power laser irradiation (LPLI) at different wavelengths and doses on oxidative stress and fibrogenesis parameters in an animal model of wound healing. The animals were randomly divided into five groups (n=6): Controls (skin injured animals without local or systemic treatment), skin injury treated with HeNe 1 J/cm(2) (two seg); skin injury treated with HeNe 3 J/cm(2) (six seg); skin injury treated with GaAs 1 J/cm(2) (three seg); skin injury treated with GaAs 3 J/cm(2) (nine seg). A single circular wound measuring 8 mm in diameter was surgically created on the back of the animal. The

rats were irradiated at 2, 12, 24, 48, 72, 96, and 120 h after skin injury. The parameters, namely hydroxyproline content, activities of the antioxidant enzymes superoxide dismutase (SOD) and catalase (CAT), and lipid (TBARS) and protein oxidation (carbonyl groups) measurements were assessed. In addition, wound size regression was also analyzed. The results showed an improvement in the wound healing reflected by the reduction in wound size and increased collagen synthesis. Moreover, a significant reduction in TBARS levels, carbonyl content, and SOD and CAT activities were observed after laser irradiation, particularly with the treatments HeNe laser 1 and 3 J/cm(2) dose and GaAs 3 J/cm(2) dose. The data strongly indicate that LPLI therapy is efficient in accelerating the skin wound healing process after wounding, probably by reducing the inflammatory phase and inducing collagen synthesis. Thiobarbituric Acid Reactive Substances;Collagen;Catalase;Superoxide Dismutase;Hydroxyproline Animals;Catalase;Collagen;Dose-Response Relationship, Radiation;Hydroxyproline;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Oxidative Stress;Rats;Rats, Wistar;Skin;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances;Wound Healing

Changes in umbilical venous volume flow after fetoscopic laser occlusion of placental vascular anastomoses in twin-to-twin transfusion syndrome. OBJECTIVE: To examine effects of fetoscopic laser occlusion of placental vascular anastomoses on umbilical venous volume flow in twin-to-twin transfusion syndrome. STUDY DESIGN: Absolute umbilical venous volume flow, measured preoperatively and 48 hours after fetoscopic laser occlusion was related to Doppler studies, bladder filling in donors, and anastomoses. RESULTS: Among 45 patients, recipients had decreased ductus venosus pulsatility index (ductus venosus-pulsatility index for veins, 1.16 vs 1.01; $P < .001$) and unchanged umbilical venous volume flow after fetoscopic laser occlusion (74.7 vs 74.5 mL; $P = .407$). Donors had decreased umbilical artery pulsatility (1.34 vs 1.11; $P = .008$), increased ductus venous-pulsatility index for veins (0.75 vs 0.91; $P < .014$), and significantly increased umbilical venous volume flow per kilogram by 52.3% (136.6 vs 208.0 mL/Kg/min; $P < .001$). Donor bladder filling occurred at higher umbilical venous volume flow per kilogram (142.7 vs 221.4 mL/Kg/min; $P < .012$). Increase in umbilical venous volume flow per kilogram correlated with the net difference in arteriovenous anastomoses (Pearson $r = 0.403$, $P = .006$). CONCLUSION: Fetoscopic laser occlusion in twin-to-twin transfusion syndrome corrects intertwin differences in umbilical venous volume flow by predominant effects in the donor. Reappearance of donor bladder filling correlates with correction of volume flow. Arteriovenous Anastomosis;Female;Fetofetal Transfusion;Fetoscopy;Humans;Laser Coagulation;Low-Level Light Therapy;Placenta;Pregnancy;Prospective Studies;Pulsatile Flow;Regional Blood Flow;Ultrasonography, Prenatal;Umbilical Veins

Effects of the combined desensitizing dentifrice and diode laser therapy in the treatment of desensitization of teeth with gingival recession. OBJECTIVES: The purpose of this study was to evaluate and compare clinically the efficacy of desensitizer toothpaste alone and in combination with the diode laser in the management of dentin hypersensitivity (DH), as well as both the immediate and late therapeutic effects on teeth with gingival recessions. MATERIALS AND METHODS: In total, 52 teeth diagnosed with DH in 13 (seven women, six men, aged 16-48 years) healthy adult patients were included in this study, and teeth were randomly divided equally into two groups: the test group, which received treatment with desensitizer toothpaste and GaAlAs (diode) laser, and the control group, treated with desensitizer toothpaste. DH was assessed by means of an air stimulus, and a visual analogue scale (VAS) was used to measure DH. The selected teeth in the test group received laser therapy for three sessions. Teeth subjected to diode-laser treatment were irradiated at 100 mW for 25 sec at 808 nm, with continuous-emission, noncontact mode, perpendicular to the surface, with scanning movements on the region of exposed root surfaces. RESULTS: Significant reduction of DH occurred at all times measured during the three treatment sessions in the test group. When

compared with the means of the responses in the three treatment sessions of the two groups, the test group showed a higher degree of desensitization in teeth with gingival recession than did the control group ($p < 0.001$). The immediate and late therapeutic effects of the diode laser were more evident compared with those of desensitizer toothpaste. CONCLUSIONS: Within the limitations of the present study, a significant effect of combined desensitizer toothpaste and diode laser therapy occurs in the treatment of desensitization of teeth with gingival recession. Desensitizer toothpaste appears to have the therapeutic potential to alleviate DH. Conversely, diode laser can be used to reduce DH. Dentifrices;Dentin Desensitizing Agents;Toothpastes Adolescent;Adult;Combined Modality Therapy;Dentifrices;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Gingival Recession;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Toothpastes;Young Adult

Influence of carbon dioxide laser irradiation on the healing process of extraction sockets. OBJECTIVE: To clarify the healing-promoting effects of carbon dioxide laser irradiation in high and low reactive-level laser therapies (HLLT and LLLT, respectively) on extraction sockets after tooth extraction. MATERIAL AND METHODS: Forty-two 5-week-old male Wistar rats were divided into laser irradiation and non-irradiation (control) groups and compared. The laser-irradiation group underwent HLLT immediately after tooth extraction and then LLLT 1 day post-extraction. Tissue was excised 6 h and 3, 7, or 21 days after extraction and histopathologically investigated. The alveolar crest height was measured osteomorphometrically 21 days post-extraction, and granulation tissue in the extraction socket surface layer was immunohistologically investigated using anti-Î±-smooth muscle actin (anti-Î±-SMA) antibody 3 and 7 days post-extraction. RESULTS: Many osteoclasts appeared and active bone resorption was noted in the irradiation group 3 days after extraction compared to the controls. On Day 7, new bone formation started around the extraction socket in the control group, but from the superficial to over the middle layer of the socket in the irradiation group. On Day 21, a concavity existed in the alveolar crest region in the controls, whereas this region was flat, with no concavity, in the irradiation group. On osteomorphometry, the alveolar crest height was significantly higher in the irradiation (0.7791 Â± 0.0122) than the control (0.6516 Â± 0.0181) group ($P < 0.05$). On immunostaining, many Î±-SMA-positive cells were noted in the control group, but very few in the irradiation group. CONCLUSION: Laser-irradiated extraction wound healing showed characteristics different from those of the normal healing process, suggesting a favorable healing-promoting effect. Actins;Carbon Dioxide Actins;Animals;Bone Remodeling;Carbon Dioxide;Granulation Tissue;Lasers, Gas;Low-Level Light Therapy;Male;Myofibroblasts;Osteoclasts;Radiation Dosage;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket;Wound Healing

Combined photodynamic and low-level laser therapies as an adjunct to nonsurgical treatment of chronic periodontitis. BACKGROUND AND OBJECTIVE: In recent years, there has been a growing interest in the use of dental lasers for treatment of periodontal diseases. The purpose of this short-term clinical trial was to evaluate the effects of a combination of photodynamic therapy with low-level laser therapy as an adjunct to nonsurgical treatment of chronic periodontitis. MATERIAL AND METHODS: Twenty-four nonsmoking adults with untreated chronic periodontitis were randomly assigned in a split-mouth design to receive scaling and root debridement with or without one course of adjunctive photodynamic therapy and low-level laser therapy within 5 d. Plaque, bleeding on probing, probing depth and gingival recession were recorded at baseline, 1 and 3 mo after the treatment. Gingival crevicular fluid was collected for assay of interleukin-1Î² levels at baseline, 1 wk and 1 mo. RESULTS: The test teeth achieved greater reductions in the percentage of sites with bleeding on probing and in mean probing depth at 1 mo compared with the control teeth ($p < 0.05$). A significant decrease in gingival crevicular fluid volume was observed in both groups at 1 wk ($p < 0.001$), with a further decrease at 1 mo in the test sites ($p < 0.05$). The test sites showed a greater

reduction of interleukin-1Î² levels in gingival crevicular fluid at 1 wk than the control sites ($p < 0.05$). No significant differences in periodontal parameters were found between the test and control teeth at 3 mo. CONCLUSIONS: The present study suggests that a combined course of photodynamic therapy with low-level laser therapy could be a beneficial adjunct to nonsurgical treatment of chronic periodontitis on a short-term basis. Further studies are required to assess the long-term effectiveness of the combination of photodynamic therapy with low-level laser therapy as an adjunct in nonsurgical treatment of periodontitis. Interleukin-1beta Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Middle Aged;Periodontal Debridement;Photochemotherapy;Single-Blind Method;Treatment Outcome

Low-level laser therapy with a pulsed infrared laser accelerates second-degree burn healing in rat: a clinical and microbiologic study. OBJECTIVE: This study was carried out to investigate the influence of pulsed-wave low-level laser therapy (LLLT) on the healing of a deep second-degree burn model in rat. BACKGROUND DATA: Review of literature indicates that LLLT has a biostimulatory effect on wound healing; however, no clear recommendation can yet be made. METHODS: Two deep second-degree burns were made in the skin of 67 rats. Rats were divided into four groups. In the first group (control), the proximal burn were received LLLT with shot down laser; in the second and third groups, proximal burns were treated with a 3,000-Hz pulsed infrared diode laser with 2.3 and 11.7â€‰J/cm(2) energy densities, respectively. In the fourth group, the proximal burns were treated topically with 0.2% nitrofurazone. The distal burn of all groups was considered the control burn. The response to treatment was assessed both microbiologically and macroscopically. RESULTS: The incidence of Staphylococcus aureus decreased significantly in group 3 in comparison with group 1 on day 28 (Ï‡(2) test, pâ€‰=â€‰0.05). Analysis of variance showed that LLLT with 11.7â€‰J/cm (2) significantly increased the wound-closure rate at 2 weeks (0.915â€‰Â±â€‰0.310) and 3 weeks (0.677â€‰Â±â€‰0.397) after burning compared with placebo burns (1.413â€‰Â±â€‰0.319; 1.116â€‰Â±â€‰0.436, respectively) ANOVA-LSD test, pâ€‰=â€‰0.045 and pâ€‰=â€‰0.046 respectively. Independent sample t tests showed that LLLT with 11.7â€‰J/cm (2) significantly increased the wound-closure rate at 4 weeks after burning (0.211â€‰Â±â€‰0.146) compared with the control burns (0.707â€‰Â±â€‰0.480) pâ€‰=â€‰0.039. CONCLUSIONS: Pulsed LLLT with 11.7â€‰J/cm(2)/890â€‰nm of a deep second-degree burn model in rat significantly increased the rate of wound closure compared with control burns. Analysis of Variance;Animals;Burns;Disease Models, Animal;Follow-Up Studies;Immunohistochemistry;Injury Severity Score;Lasers, Solid-State;Low-Level Light Therapy;Male;Radiation Dosage;Random Allocation;Rats;Rats, Wistar;Reference Values;Time Factors;Wound Healing

Radiographic assessment of photodynamic therapy as an adjunctive treatment on induced periodontitis in immunosuppressed rats. OBJECTIVE: The aim of this study was to assess radiographically the effect of photodynamic therapy (PDT) as an adjunctive treatment to scaling and root planing (SRP) on induced periodontitis in dexamethasone-induced immunosuppressed rats. MATERIAL AND METHODS: The animals were divided into 2 groups: ND group (n=60): saline treatment; D group (n=60): dexamethasone treatment. In both ND and D groups, periodontal disease was induced by the placement of a ligature in the left first mandibular molar. After 7 days, ligature was removed and all animals received SRP, being divided according to the following treatments: SRP: saline and PDT: phenothiazinium dye (TBO) plus laser irradiation. Ten animals per treatment were killed at 7, 15 and 30 days. The distance between the cementoenamel junction and the height of the alveolar bone crest in the mesial surface of the mandibular left first molars was determined in millimeters in each radiograph. he radiographic values were analyzed statistically by ANOVA and Tukey's test at a p value <0.05. RESULTS: Intragroup radiographic assessment (ND and D groups)

showed that there was statistically significant less bone loss in the animals treated with PDT in all experimental periods compared to those submitted to SRP. Intergroup radiographic analysis (ND and D groups) demonstrated that there was greater bone loss in the ND group treated with SRP compared to the D group treated with PDT at 7 and 30 days. CONCLUSION: PDT was an effective adjunctive treatment to SRP on induced periodontitis in dexamethasone-induced immunosuppressed rats. Glucocorticoids;Immunosuppressive Agents;Photosensitizing Agents;Tolonium Chloride;Dexamethasone Alveolar Bone Loss;Alveolar Process;Animals;Combined Modality Therapy;Dental Scaling;Dexamethasone;Furcation Defects;Glucocorticoids;Immunocompromised Host;Immunosuppressive Agents;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Molar;Periodontitis;Photochemotherapy;Photosensitizing Agents;Radiography;Random Allocation;Rats;Rats, Wistar;Root Planing;Time Factors;Tolonium Chloride;Tooth Cervix

Ultra-low-level laser therapy. A growing number of laboratory and clinical studies over the past 10 years have shown that low-level laser stimulation (633 or 670 nm) at extremely low power densities (about 0.15 mW/cm(2)), when administered through a particular emission mode, is capable of eliciting significant biological effects. Studies on cell cultures and animal models as well as clinical trials give support to a novel therapeutic modality, which may be referred to as ultra low level laser therapy (ULLLT). In cultured neural cells, pulsed irradiation (670 nm, 0.45 mJ/cm(2)) has shown to stimulate NGF-induced neurite elongation and to protect cells against oxidative stress. In rats, anti-edema and anti-hyperalgesia effects following ULLL irradiation were found. Clinical studies have reported beneficial effects (also revealed through sonography) in the treatment of musculoskeletal disorders. The present paper reviews the existing experimental evidence available on ULLLT. Furthermore, the puzzling issue of the biophysical mechanisms that lie at the basis of the method is explored and some hypotheses are proposed. Besides presenting the state-of-the-art about this novel photobiostimulation therapy, the present paper aims to open up an interdisciplinary discussion and stimulate new research on this subject. Acupuncture Points;Animals;Biophysical Phenomena;Cell Adhesion;Humans;Low-Level Light Therapy;Mechanotransduction, Cellular;Models, Biological;Musculoskeletal Diseases;Neurites;Oxidation-Reduction;Pain;Rats;Signal Transduction;Treatment Outcome

Pulsed laser light forces cancer cells to absorb anticancer drugs--the role of water in nanomedicine. Anticancer drugs executing their function intracellularly enter cancer cells via diffusive processes. Complementary to these slow processes, cells can be forced to incorporate drugs by convection - a more efficient transport process. Transmembrane convection is induced by moderately intense pulsed laser light (or light emitting diodes) changing the structure of nanoscopic water layers in cells. This is a fundamental difference with the method of photodynamic therapy. In a model system we demonstrate that a total irradiation time of one minute is sufficient to completely inhibit proliferation of cancer cells. Transmembrane convection protects healthy cells from extended chemotherapy exposure, could be exploited to overcome multidrug resistance, and is a promising new tool in a variety of therapies as well as in skin rejuvenation. Antineoplastic Agents;Water Antineoplastic Agents;Biological Transport;Cell Growth Processes;Cell Membrane Permeability;Drug Delivery Systems;HeLa Cells;Humans;Low-Level Light Therapy;Nanomedicine;Neoplasms;Water

A case series of facial depigmentation associated with low fluence Q-switched 1,064â€‰nm Nd:YAG laser for skin rejuvenation and melasma. BACKGROUND AND OBJECTIVE: In recent years, "laser toning" using low fluence, large spot size, multiple passed Q-switched 1,064â€‰nm Nd:YAG laser has gained much popularity in Asian countries for non-ablative skin rejuvenation and the treatment of melasma. This case series highlights one of the complications associated with laser toning, which is facial depigmentation. MATERIALS AND METHODS: Fourteen patients with laser toning-associated

facial depigmentation were assessed with cross-polarized and ultraviolet (UV) photographic images. The laser toning regimens received by these patients, as well as the treatment given for depigmentation, were analyzed retrospectively. RESULTS: All 14 patients were Chinese females, 9 of whom received laser toning for non-ablative skin rejuvenation and the other 5 for melasma. The treatment regimens received by these patients were highly variable. The total number of treatments received ranged from 6 to 50 (mean 22.07). In all cases, UV photographic images demonstrated facial mottled depigmentation. Laser toning failed to significantly improve melasma in all five patients. Five patients received targeted narrowband UVB for depigmentation with good clinical results. CONCLUSIONS: Laser toning with low fluence Q-switched 1,064â€‰nm Nd:YAG laser for skin rejuvenation and melasma can be associated with mottled depigmentation. With laser toning being frequently performed, this complication may become more commonly encountered in clinical practice. The depigmentation can appear after only a few treatment sessions, and can cause much disfigurement, especially in cases with background melasma. Further studies on laser toning are needed with the view to optimizing efficacy and minimizing side-effects. Adult;Asian People;China;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Retrospective Studies;Skin Aging

Gene and noncoding RNA regulation underlying photoreceptor protection: microarray study of dietary antioxidant saffron and photobiomodulation in rat retina. PURPOSE: To identify the genes and noncoding RNAs (ncRNAs) involved in the neuroprotective actions of a dietary antioxidant (saffron) and of photobiomodulation (PBM). METHODS: We used a previously published assay of photoreceptor damage, in which albino Sprague Dawley rats raised in dim cyclic illumination (12 h 5Â lux, 12 h darkness) were challenged by 24 h exposure to bright (1,000Â lux) light. Experimental groups were protected against light damage by pretreatment with dietary saffron (1 mg/kg/day for 21 days) or PBM (9 J/cm(2) at the eye, daily for 5 days). RNA from one eye of four animals in each of the six experimental groups (control, light damage [LD], saffron, PBM, saffronLD, and PBMLD) was hybridized to Affymetrix rat genome ST arrays. Quantitative real-time PCR analysis of 14 selected genes was used to validate the microarray results. RESULTS: LD caused the regulation of 175 entities (genes and ncRNAs) beyond criterion levels ($p<0.05$ in comparison with controls, fold-change >2). PBM pretreatment reduced the expression of 126 of these 175 LD-regulated entities below criterion; saffron pretreatment reduced the expression of 53 entities (50 in common with PBM). In addition, PBM pretreatment regulated the expression of 67 entities not regulated by LD, while saffron pretreatment regulated 122 entities not regulated by LD (48 in common with PBM). PBM and saffron, given without LD, regulated genes and ncRNAs beyond criterion levels, but in lesser numbers than during their protective action. A high proportion of the entities regulated by LD (>90%) were known genes. By contrast, ncRNAs were prominent among the entities regulated by PBM and saffron in their neuroprotective roles (73% and 62%, respectively). CONCLUSIONS: Given alone, saffron and (more prominently) PBM both regulated significant numbers of genes and ncRNAs. Given before retinal exposure to damaging light, thus while exerting their neuroprotective action, they regulated much larger numbers of entities, among which ncRNAs were prominent. Further, the downregulation of known genes and of ncRNAs was prominent in the protective actions of both neuroprotectants. These comparisons provide an overview of gene expression induced by two neuroprotectants and provide a basis for the more focused study of their mechanisms. Antioxidants;Immunologic Factors;RNA, Untranslated Animals;Antioxidants;Cell Death;Cluster Analysis;Crocus;Cytoprotection;Diet;Gene Expression Profiling;Gene Expression Regulation;Immunologic Factors;Light;Oligonucleotide Array Sequence Analysis;Photoreceptor Cells, Vertebrate;RNA, Untranslated;Rats;Rats, Sprague-Dawley;Reproducibility of Results;Retina;Reverse Transcriptase Polymerase Chain Reaction

Pulse dye and other laser treatments for vocal scar. PURPOSE OF REVIEW: Vocal fold scar is a challenging clinical problem, resulting in a spectrum of voice-related complaints. While there are a variety of treatment options available, it is rare to obtain outcomes similar to the perfectly normal voice. The pulsed dye and other lasers are an emerging treatment option for cutaneous scar and have shown promise for the treatment of vocal fold scarring. The purpose of this review is to summarize the theory, and describe clinical outcomes from both cutaneous and vocal fold scarring treated with lasers. RECENT FINDINGS: There are a growing number of papers in the literature substantiating the use of pulsed dye and other lasers used to treat cutaneous scars. Some experimental models describe potential mechanisms of laser effect, which include the development of a sub-basement membrane cleavage plane, as well as up-regulation of proteins which may actively modulate continued fibrosis. One prospective pilot study of 11 patients with vocal fold scarring treated with the pulsed dye laser has also shown statistically significant improvement in subjective and objective voice measures, as well as laryngeal stroboscopy findings after treatment. SUMMARY: The pulsed dye and other lasers have shown effectiveness and potential in treating cutaneous and vocal scarring. Cicatrix;Female;Humans;Laryngoscopy;Lasers, Dye;Low-Level Light Therapy;Male;Pilot Projects;Prospective Studies;Risk Assessment;Severity of Illness Index;Treatment Outcome;Vocal Cords;Voice Disorders;Voice Quality

A meta-analysis of the efficacy of laser phototherapy on pain relief. OBJECTIVE: Laser phototherapy has been widely used to relieve pain for more than 30 years, but its efficacy remains controversial. To ascertain the overall effect of phototherapy on pain, we aggregated the literature and subjected the studies to statistical meta-analysis. METHODS: Relevant original studies were gathered from every available source and coded. Articles that met preestablished inclusion criteria were subjected to statistical meta-analysis, using Cohen's d statistic to determine treatment effect sizes. RESULTS: Fifty-two effect sizes were computed from the 22 articles that met the inclusion criteria. The resulting overall mean effect size was highly significant; d = +0.84 (95% confidence interval = 0.44-1.23). The effect size remained significant even when a high outlying d value was conservatively excluded from the analysis; d = +0.66 (95% confidence interval = 0.46-0.86). The fail-safe number associated with the overall treatment effect, that is, the number of additional studies in which phototherapy has negative or no effect on pain needed to negate the overall large effect size of +0.84, was 348. DISCUSSION: These findings warrant the conclusion that laser phototherapy effectively relieves pain of various etiologies; making it a valuable addition to contemporary pain management armamentarium. Clinical Trials as Topic;Confidence Intervals;Databases, Factual;Female;Humans;Low-Level Light Therapy;Male;Meta-Analysis as Topic;Pain Management;Reproducibility of Results;Treatment Outcome

Low-level laser irradiation enhances BMP-induced osteoblast differentiation by stimulating the BMP/Smad signaling pathway. Low-level laser irradiation (LLLI) has been shown to induce bone formation and osteoblast differentiation both in vivo and in vitro. However, the molecular mechanism by which LLLI stimulates osteoblast differentiation is still unclear. The aim of the present study was to examine whether Ga-Al-As laser irradiation could enhance BMP2-induced alkaline phosphatase (ALP) activity in C2C12 cells. Laser irradiation at 0.5 W for 20 min enhanced BMP2-induced ALP activity. Laser treatment alone did not affect ALP activity. To exclude the effect of pH or temperature changes during irradiation, we shortened the exposure time to 2 min, with various levels of laser power. At 2.5 W, irradiation stimulated BMP2-induced ALP activity but not cell proliferation, whereas 1 or 5 W laser power did not induce any significant effects. Irradiation stimulated BMP2-induced phosphorylation of Smad1/5/8 and BMP2 expression, but had no effect on the expression of inhibitory Smads 6 and 7, BMP4, or insulin-like growth factor 1. Laser irradiation enhanced Smad-induced Id1 reporter activity as well as expression of bone morphogenetic protein (BMP)-induced

transcription factors such as Id1, Osterix, and Runx2. Laser irradiation also stimulated BMP-induced expressions of type I collagen, osteonectin, and osteocalcin mRNA, markers of osteoblasts. This enhancement of BMP2-induced ALP activity and Smad phosphorylation by laser irradiation was also observed in primary osteoblasts. These results suggest that LLLI accelerates the differentiation of BMP-induced osteoblasts by stimulating the BMP/Smad signaling pathway. Bone Morphogenetic Protein 2;Bone Morphogenetic Proteins;Smad Proteins Animals;Blotting, Western;Bone Morphogenetic Protein 2;Bone Morphogenetic Proteins;Cell Differentiation;Cell Line;Cell Proliferation;Cells, Cultured;Lasers;Mice;Myoblasts;Reverse Transcriptase Polymerase Chain Reaction;Signal Transduction;Smad Proteins

An efficacy comparison of hair removal utilizing a diode laser and an Nd:YAG laser system in Chinese women. BACKGROUND: The 800 nm diode laser and the 1064 nm Nd:YAG laser have been used successfully for hair removal for many years. OBJECTIVE: To compare the efficacy of a diode laser with a Nd:YAG laser regarding axillary fossa hair removal in Chinese women. METHODS: Twenty-nine Chinese women underwent three treatment sessions at 4-week intervals with a diode laser (34-38 J/cm(2)) on one side and a Nd:YAG laser (34-40 J/cm(2)) on the other side. Assessments included the reduction of hair diameter following treatment, the regrowth rate in hair length, total hair reduction and the immediate pain associated with the treatments. RESULTS: At follow-up visit number 1 (4 weeks after the first session), the average reduction in hair diameter on the diode laser side and the Nd:YAG laser side was 2.44 Î¼m and -0.6 Î¼m, respectively. The regrowth rates of the hair were 61.93 Î¼m/day and 59.84 Î¼m/day, respectively, which were not statistically significant ($p > 0.05$). At follow-up visit number 1, hair reduction was 60.09% and 41.44%, respectively. At follow-up visit number 2 (4 weeks after the second session), hair reduction was noted to be 78.56% and 64.50%, respectively, which were both statistically significant ($p < 0.05$). Immediate pain scores at the first session were 6.97 and 6.17, respectively; at the second session were 5.48 and 6.69, respectively; and at the third session were 5.76 and 7.45, respectively; all statistically significant ($p < 0.05$). CONCLUSIONS: The diode laser showed more efficacy and was found to be more comfortable than the Nd:YAG laser for axillary fossa hair removal in Chinese women. Adult;China;Female;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Skin

Treatment of hypertrophic scars and keloids with a fractional CO2 laser: a personal experience. Keloids and hypertrophic scars are both abnormal wound responses in predisposed individuals but they differ in that keloids extend beyond the original wound and almost never regress, while hypertrophic scars remain within the original wound and tend to regress. How keloids grow is not totally clear because there is no animal model; in fact, keloids affect only humans. Different injuries can result in keloids, including burns, surgery, ear piercing, lacerations, abrasions, tattooing, vaccinations, injections, insect bites and any process causing skin inflammation (chicken pox, acne, folliculitis, zoster). Skin or wound tension is considered a critical factor in the formation of keloids and hypertrophic scars. This study is based on eight consecutive patients (four females and four males, F:M = 1:1) with a total of 12 keloids. All of whom were treated monthly with a MiXto SX CO(2) laser, using 13 W of power, 8 SX of index and 40% coverage (density) in combination with Same Plast Gel(Â®) twice a day. Each scar required 12 treatments, and all the patients, followed up for 1 year after the last treatment, had optimum results and no recurrence. Adult;Cicatrix, Hypertrophic;Female;Humans;Keloid;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged

Twenty-five years of active laser prevention of scars: what have we learned? BACKGROUND AND OBJECTIVES: Cosmetic results after skin surgery are essential for patient satisfaction. Since 1983, different lasers have been used to accelerate and improve the healing process in surgical scars. This article aims to review the different laser therapies available for preventive treatment of scars. METHODS: A Medline literature search was performed on laser scar prevention with cross-

referencing. RESULTS: Different lasers have been used for the preventive treatment of scars. Both the pulsed dye laser (PDL) (585 and 595 nm) and laser-assisted skin healing (LASH) (810 nm) provide excellent results. The mechanism of action, side effects and clinical applications are carefully reviewed in this article. Ease of the procedure, practical application of the laser and price of the therapy are then discussed for both types of laser. CONCLUSION: Two different lasers have mostly been used for the preventive treatment of scars. It appears that the use of laser energy in the early phase of the healing process is critical in the improvement of the resulting scar. More research is still warranted to understand the mechanisms of action potentially leading to scarless healing. Finally, the widespread, routine use of this technique will largely depend on the ease of use of the system. Cicatrix;Cicatrix, Hypertrophic;Humans;Keloid;Lasers, Dye;Low-Level Light Therapy;Surgical Procedures, Operative;Wound Healing

Clinical observations on laser acupuncture in simple obesity therapy. A previous study has shown that laser acupuncture is a useful healing method for the treatment of visceral postmenopausal obesity in combination with a low-calorie diet. We observe and evaluate the therapeutic effect of laser acupuncture in subjects of simple obesity with a non-restrictive diet protocol. Subjects included 73 women and 22 men with simple obesity and body mass indices > or = 27 kg/m2. Daily energy intake recommendations for obese females and males were 1620.0 and 1894.2 kcal in average, respectively. The gallium aluminum arsenide Handylaser Trion was used to apply 0.25 J of energy to each of the following acupuncture points three times per week for four consecutive weeks: Stomach, Hunger, ST25, ST28, ST40, SP15, and CV9. The subjects' body weights and body mass indices were recorded before treatment, and four weeks after treatment, and the percent reduction in each parameter was calculated. Statistically significant reductions in body weight and body mass index were detected after four weeks of treatment. The mean reduction and mean percent reduction in body weight were 3.17 kg and 3.80% ($p < 0.0001$), respectively. The corresponding values for the body mass index were 1.22 kg/m2 and 3.78% ($p < 0.0001$), respectively. We concluded that laser acupuncture was found to exert a therapeutic effect on simple obesity by reducing both body weight and body mass index. Moreover, subjects showed good compliance with this comfortable and non-restrictive diet protocol. Acupuncture Points;Acupuncture Therapy;Adolescent;Adult;Aged;Body Mass Index;Diet;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Obesity;Patient Compliance;Qualitative Research;Weight Loss;Young Adult

Safe and effective one-session fractional skin resurfacing using a carbon dioxide laser device in super-pulse mode: a clinical and histologic study. Carbon dioxide (CO(2)) laser ablative fractional resurfacing produces skin damage, with removal of the epidermis and variable portions of the dermis as well as associated residual heating, resulting in new collagen formation and skin tightening. The nonresurfaced epidermis helps tissue to heal rapidly, with short-term postoperative erythema. The results for 40 patients (8 men and 32 women) after a single session of a fractional CO(2) resurfacing mode were studied. The treatments included resurfacing of the full face, periocular upper lip, and residual acne scars. The patients had skin prototypes 2 to 4 and wrinkle degrees 1 to 3. The histologic effects, efficacy, and treatment safety in various clinical conditions and for different phototypes are discussed. The CO(2) laser for fractional treatment is used in super-pulse mode. The beam is split by a lens into several microbeams, and super-pulse repetition is limited by the pulse width. The laser needs a power adaptation to meet the set fluence per microbeam. Laser pulsing can operate repeatedly on the same spot or be moved randomly over the skin, using several passes to achieve a desired residual thermal effect. Low, medium, and high settings are preprogrammed in the device, and they indicate the strength of resurfacing. A single treatment was given with the patient under topical anesthesia. However, the anesthesia was injected on areas of scar tissue. Medium settings

(2Â Hz, 30Â W, 60Â mJ) were used, and two passes were made for dark skins and degree 1 wrinkles. High settings (2Â Hz, 60Â W, 120Â mJ) were used, and three passes were made for degree 3 wrinkles and scar tissue. Postoperatively, resurfaced areas were treated with an ointment of gentamycin, Retinol Palmitate, and DL-methionine (Novartis; Farmaceutics, S.A., Barcelona, Spain). Once epithelialization was achieved, antipigment and sun protection agents were recommended. Evaluations were performed 15Â days and 2Â months after treatment by both patients and clinicians. Treatment improved wrinkle aspect and scar condition, and no patient reported adverse effects or complications, irrespective of skin type, except for plaques of erythema in areas that received extra laser passes, which were not seen at the 2-month assessment. The results evaluated by clinicians were very much in correlation with those of patients. Immediately after treatment, vaporization was produced by stacked pulses, with clear ablation and collateral heat coagulation. An increased number of random pulses removed more epidermis, and with denser pulses per area, a thermal deposit was noted histologically. At 2Â months, a thicker, multicelluar epidermis and an evident increase in collagen were observed. Fractional CO(2) laser permits a variety of resurfacing settings that obtain safe, effective skin rejuvenation and correct scar tissue in a single treatment.
Adult;Dermis;Dose Fractionation, Radiation;Epidermis;Facial Dermatoses;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Plastic Surgery Procedures;Rejuvenation;Skin Aging;Treatment Outcome

Bactericidal effect of a Nd:YAG laser on Enterococcus faecalis at pulse durations of 15 and 25 ms in dentine depths of 500 and 1,000 Î¼m. The success of endodontic treatment depends on the effective elimination of microorganisms from the root canal, and lasers provide more effective disinfection than conventional treatment using rinsing solutions. The objective of this in vitro study was to determine the bactericidal effect of laser irradiation in dentine of various depths at a wavelength of 1,064 nm and pulse durations of 15 and 25 ms. A total of 90 dentine slices were cut from bovine incisors and divided into two groups (45 slices each) of thickness 500 and 1,000 Î¼m. All were inoculated with a suspension of Enterococcus faecalis (5.07 Ã— 10(9) bacteria/ml). Based on the clinically accepted dose (approximately 300 J/cm(2)), the following laser settings were chosen for this study: 1.75 W, 0.7 Hz for 4 s, three repetitions. The two groups were divided into two subgroups of 15 slices each to be irradiated with pulse durations of 15 and 25 ms. The remaining 15 slices per group were not irradiated to serve as a control. After irradiation, the colony-forming units (CFU) were counted and evaluated. To determine the bactericidal effect of irradiation with different pulse durations, the results in the different groups were compared statistically. For all irradiated subgroups a bactericidal effect was observed at pulse durations of 15 and 25 ms ($p=0.0085$ and $p<0.0001$). The corresponding average log kills were 0.29 (15 ms) and 0.52 (25 ms) for 500 Î¼m and 0.15 and 0.3 for 1,000 Î¼m, respectively. The results of this in vitro study showed that Nd:YAG laser irradiation with a pulse duration of 15 ms eliminated an average of 49% and 29% of E. faecalis at dentine depths of 500 Î¼m and 1,000 Î¼m, respectively, and irradiation with a pulse duration of 25 ms eliminated 70% (500 Î¼m) and 50% (1,000 Î¼m). However, these values are lower than those achieved with the established protocol using microsecond pulses. Animals;Bacterial Load;Cattle;Dental Pulp Cavity;Dentin;Disinfection;Enterococcus faecalis;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Models, Animal;Root Canal Therapy

Tooth desensitization with an Er:YAG laser: in vitro microscopical observation and a case report. Tooth hypersensitivity is a frequent condition that causes discomfort and sometimes severe pain. It is caused by exposure of spots of dentinal tubules to the oral environment. Conventional desensitizing agents (professional pastes, toothpastes, mouthwashes) aim to obliterate the exposed dentinal tubules. Laser desensitization was introduced as an alternative efficient tool for the immediate treatment of tooth hypersensitivity. We explored in vitro the microscopical occluding effects of the

Er:YAG laser on exposed dentinal tubules. The clinical application of this technique is also described. Dentin;Dentin Sensitivity;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Middle Aged;Pain Threshold

Non-ablative 1,550 nm fractional laser therapy versus triple topical therapy for the treatment of melasma: a randomized controlled split-face study. BACKGROUND: Melasma is a uichronic, often relapsing skin disorder, with poor long-term results from all current therapies. OBJECTIVE: To assess efficacy and safety of non-ablative 1,550 nm fractional laser therapy (FLT) as compared to the gold standard, triple topical therapy (TTT). STUDY DESIGN: Twenty-nine patients with melasma were included in a randomized controlled observer-blinded study with split-face design. Each side of the face was randomly allocated to either 4-5 non-ablative FLT sessions (15 mJ/microbeam, 14-20% coverage) or TTT (hydroquinone 5%, tretinoin 0.05%, triamcinolone acetonide 0.1% cream). TTT was applied once daily for 15 weeks until the last FLT session. After this last treatment, patients were asked to apply TTT twice weekly on both sides of the face during follow-up. Improvement of melasma was assessed by patient's global assessment (PGA), patient's satisfaction, physician's global assessment (PhGA), melanin index, and lightness (L-value) at 3 weeks, and at 3 and 6 months after the last treatment. RESULTS: Mean PGA and satisfaction were significantly lower at the FLT side ($P<0.001$). PhGA, melanin index, and L-value showed a significant worsening of hyperpigmentation at the FLT side. At the TTT side, no significant change was observed. At 6 months follow-up, most patients preferred TTT. Side effects of FLT were erythema, burning sensation, edema, and pain. Nine patients (31%) developed PIH after two or more laser sessions. Side effects of TTT were erythema, burning sensation, and scaling. CONCLUSIONS: Given the high rate of postinflammatory hyperpigmentation, non-ablative 1,550 nm fractional laser at 15 mJ/microbeam is not recommendable in the treatment of melasma. TTT remains the gold standard treatment. Tretinoin;Triamcinolone Acetonide Administration, Topical;Adult;Drug Therapy, Combination;Face;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Treatment Outcome;Tretinoin;Triamcinolone Acetonide

Importance of pulsing illumination parameters in low-level-light therapy. The influence of emission parameters in low-level-light therapy on cellular responses is not yet fully understood. This study assessed the impact of various light delivery modes on collagen production in human primary fibroblast cultured in monolayers after three treatments with red light-emitting diode illumination (630 nm, 8 J/cm(2)). Human type I collagen was measured in cell culture supernatants with procollagen type I C-peptide enzyme immunoassay. Results demonstrated that, 72 h post-baseline, specific microsecond pulsing patterns had a more favorable impact on the ability of fibroblasts to produce collagen de novo than comparative conditions of continuous wave, pulsed 50% duty cycle, and millisecond pulsing domains. The cascade of events leading to collagen production by red illumination may be explained by the photodissociation of nitric oxide from cytochrome c oxidase. Short and intermittent light delivery might enhance this cellular event. Collagen Type I Cell Line;Collagen Type I;Fibroblasts;Humans;Lighting;Low-Level Light Therapy

Bactericidal effect of Nd:YAG and Er:YAG lasers in experimentally infected curved root canals. OBJECTIVE: The purpose of this study was to evaluate the bactericidal efficacy of Nd:YAG and Er:YAG laser in the experimentally infected curved root canals. BACKGROUND DATA: Previous studies revealed that laser systems have a significant bactericidal effect in both human and bovine infected straight root canals. MATERIALS AND METHODS: Sixty extracted single-rooted teeth with single root canals were selected and then instrumented with endodontic files to a size 60 (K-type file). The degree of root curvature was determined according to modified Schneider's method. Each of the specimens was incubated in a sterile centrifuge tube with 1 mL of the Enterococcus faecalis suspension at 37Â°C for 2 weeks under aerobic conditions. After laser irradiation at each of the two

settings, 50 mJ, 10 pps (0.5 W) or 100 mJ, 10 pps (1.0 W), the number of E. faecalis in each root canal was examined. RESULTS: In the straight root canals, the Er:YAG laser showed higher bactericidal effects by 6.4-10.8% than did the Nd:YAG laser. Conversely, the bactericidal effect of Er:YAG laser in the curved root canals was higher by 1.5-3.1% than was that with the Nd:YAG laser. The bactericidal effect of the Er:YAG laser in the curved root canal is significantly lower than that in the straight root canal ($p < 0.05$). CONCLUSION: These results suggest that further development in the endodontic laser tip and technique is required to ensure its success in curved root canals sterilization. Root Canal Irrigants Bacterial Load;Dental Pulp Cavity;Endodontics;Enterococcus faecalis;Gram-Positive Bacterial Infections;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Irrigants

Effect of low-level laser irradiation on unresponsive oral lichen planus: early preliminary results in 13 patients. OBJECTIVE: To detail the efficacy of low-level laser therapy (LLLT) for the management of oral lichen planus (OLP) unresponsive to standard therapy. BACKGROUND: OLP is an inflammatory disease that can be painful, mainly in the atrophic and erosive forms. Numerous drugs have been used with dissimilar results, but most treatments are empiric. However, to date, the most commonly used and useful agents for the treatment of OLP are topical corticosteroids. MATERIALS AND METHODS: The investigators studied a prospective cohort of 13 patients affected by OLP, who received biostimulation with a pulsed diode laser (GaAs). Patients were exposed to a 904-nm pulsed infrared laser (4 J/cm(2) energy density per minute; spot size, 0.8 cm). Outcome variables, statistically evaluated, were as follows: the size of lesions, visual analogue score of pain, and stability of the obtained result in the follow-up period. RESULTS: We detailed significant reduction in lesion size and in reported pain. No reported complications or therapy side effects were observed in any of the patients treated. CONCLUSION: This study suggests that LLLT could be a possible treatment for patients with unresponsive OLP. These results, although not conclusive, are a step forward for enhanced management of this quite common condition; however, it would be interesting to the results would be the same with a greater number of patients or in a different clinical setting. Aged;Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Pain Measurement;Prospective Studies;Treatment Outcome

Low-level laser therapy (LLLT; 780 nm) acts differently on mRNA expression of anti- and pro-inflammatory mediators in an experimental model of collagenase-induced tendinitis in rat. Low-level laser therapy (LLLT) has been found to produce anti-inflammatory effects in a variety of disorders. Tendinopathies are directly related to unbalance in expression of pro- and anti-inflammatory cytokines which are responsible by degeneration process of tendinocytes. In the current study, we decided to investigate if LLLT could reduce mRNA expression for TNF-Î±, IL-1Î², IL-6, TGF-Î² cytokines, and COX-2 enzyme. Forty-two male Wistar rats were divided randomly in seven groups, and tendinitis was induced with a collagenase intratendinea injection. The mRNA expression was evaluated by real-time PCR in 7th and 14th days after tendinitis. LLLT irradiation with wavelength of 780 nm required for 75 s with a dose of 7.7 J/cm(2) was administered in distinct moments: 12 h and 7 days post tendinitis. At the 12 h after tendinitis, the animals were irradiated once in intercalate days until the 7th or 14th day in and them the animals were killed, respectively. In other series, 7 days after tendinitis, the animals were irradiated once in intercalated days until the 14th day and then the animals were killed. LLLT in both acute and chronic phases decreased IL-6, COX-2, and TGF-Î² expression after tendinitis, respectively, when compared to tendinitis groups: IL-6, COX-2, and TGF-Î². The LLLT not altered IL-1Î² expression in any time, but reduced the TNF-Î± expression; however, only at chronic phase. We conclude that LLLT administered with this protocol reduces one of features of tendinopathies that is mRNA expression for pro-inflammatory mediators. DNA Primers;Inflammation Mediators;Interleukin-1beta;Interleukin-6;RNA, Messenger;Transforming

Growth Factor beta;Tumor Necrosis Factor-alpha;Cyclooxygenase 2;Collagenases Animals;Base Sequence;Collagenases;Cyclooxygenase 2;DNA Primers;Disease Models, Animal;Gene Expression;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;RNA, Messenger;Rats;Rats, Wistar;Tendinopathy;Tendons;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha

Development and evaluation of fiber optic probe-based helium-neon low-level laser therapy system for tissue regeneration--an in vivo experimental study. We report the design and development of an optical fiber probe-based Helium-Neon (He-Ne) low-level laser therapy system for tissue regeneration. Full thickness excision wounds on Swiss albino mice of diameter 15â€ƒmm were exposed to various laser doses of 1, 2, 3, 4, 6, 8 and 10â€ƒJâ€ƒcm(-2) of the system with appropriate controls, and 2â€ƒJâ€ƒcm(-2) showing optimum healing was selected. The treatment schedule for applying the selected laser dose was also standardized by irradiating the wounds at different postwounding times (0, 24 and 48â€ƒh). The tissue regeneration potential was evaluated by monitoring the progression of wound contraction and mean wound healing time along with the hydroxyproline and glucosamine estimation on wound ground tissues. The wounds exposed to 2â€ƒJâ€ƒcm(-2) immediately after wounding showed considerable contraction on days 5, 9, 12, 14, 16 and 19 of postirradiation compared with the controls and other treatment schedules, showing significant (Pâ€ƒ<â€ƒ0.001) decrease in the healing time. A significant increase in hydroxyproline and glucosamine levels was observed for the 2â€ƒJâ€ƒcm(-2) irradiation group compared with the controls and other treatment groups. In conclusion, the wounds treated with 2â€ƒJâ€ƒcm(-2) immediately after the wounding show better healing compared with the controls. Hydroxyproline Animals;Dose-Response Relationship, Radiation;Female;Hydroxyproline;Lasers, Gas;Low-Level Light Therapy;Male;Mice;Optical Fibers;Regeneration;Skin;Wound Healing

Low intensity laser therapy (LILT) in vivo acts on the neutrophils recruitment and chemokines/cytokines levels in a model of acute pulmonary inflammation induced by aerosol of lipopolysaccharide from Escherichia coli in rat. It has been suggested that low intensity laser therapy (LILT) acts on pulmonary inflammation. Thus, we investigate in this work if LILT (650nm, 2.5mW, 31.2mW/cm(2), 1.3J/cm(2), laser spot size of 0.08cm(2) and irradiation time of 42s) can attenuate edema, neutrophil recruitment and inflammatory mediators in acute lung inflammation. Thirty-five male Wistar rats (n=7 per group) were distributed in the following experimental groups: control, laser, LPS, LPS+laser and dexamethasone+LPS. Airway inflammation was measured 4h post-LPS challenge. Pulmonary microvascular leakage was used for measuring pulmonary edema. Bronchoalveolar lavage fluid (BALF) cellularity and myeloperoxidase (MPO) were used for measuring neutrophil recruitment and activation. RT-PCR was performed in lung tissue to assess mRNA expression of tumor necrosis factor-Î± (TNF-Î±), interleukin-1Î² (IL-1Î²), interleukin (IL-10), cytokine-induced neutrophil chemoattractant-1 (CINC-1), macrophage inflammatory protein-2 (MIP-2) and intercellular adhesion molecule-1 (ICAM-1). Protein levels in both BALF and lung were determined by ELISA. LILT inhibited pulmonary edema and endothelial cytoskeleton damage, as well as neutrophil influx and activation. Similarly, the LILT reduced the TNF-Î± and IL-1Î², in lung and BALF. LILT prevented lung ICAM-1 up-regulation. The rise of CINC-1 and MIP-2 protein levels in both lung and BALF, and the lung mRNA expressions for IL-10, were unaffected. Data suggest that the LILT effect is due to the inhibition of ICAM-1 via the inhibition of TNF-Î± and IL-1Î². Aerosols;Anti-Inflammatory Agents;Chemokine CXCL1;Chemokine CXCL2;Chemokines;Cxcl1 protein, rat;Cytokines;Interleukin-1beta;Lipopolysaccharides;Tumor Necrosis Factor-alpha;Intercellular Adhesion Molecule-1;Interleukin-10;Dexamethasone;Peroxidase Acute Disease;Aerosols;Animals;Anti-Inflammatory Agents;Bronchoalveolar Lavage Fluid;Chemokine CXCL1;Chemokine CXCL2;Chemokines;Cytokines;Dexamethasone;Disease Models, Animal;Escherichia

coli;Intercellular Adhesion Molecule-1;Interleukin-10;Interleukin-1beta;Lipopolysaccharides;Low-Level Light Therapy;Lung;Male;Neutrophils;Peroxidase;Pneumonia;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha

Current treatments for radiation retinopathy. BACKGROUND: to review the currently available therapeutic modalities for radiation retinopathy (RR), including newer investigational interventions directed towards specific aspects of the pathophysiology of this refractory complication. METHODS: a review of the literature encompassing the pathogenesis of RR and the current therapeutic modalities available was performed. RESULTS: RR is a chronic and progressive condition that results from exposure to any source of radiation. It might be secondary to radiation treatment of intraocular tumors such as choroidal melanomas, retinoblastomas, and choroidal metastasis, or from unavoidable exposure to excessive radiation from the treatment of extraocular tumors like cephalic, nasopharyngeal, orbital, and paranasal malignancies. After the results of the Collaborative Ocular Melanoma Study, most of the choroidal melanomas are being treated with plaque brachytherapy increasing by that the incidence of this radiation complication. RR has been reported to occur in as many as 60% of eyes treated with plaque radiation, with higher rates associated with larger tumors. Initially, the condition manifests as a radiation vasculopathy clinically seen as microaneurysms and telangiectases, with posterior development of retinal hard exudates and hemorrhages, macular edema, neovascularization and tractional retinal detachment. Regrettably, the management of these eyes remains limited. Photodynamic therapy, laser photocoagulation, oral pentoxyphylline and hyperbaric oxygen have been attempted as treatment modalities with inconclusive results. Intravitreal injections of anti-vascular endothelial growth factor such as bevacizumab, ranibizumab and pegaptanib sodium have been recently used, also with variable results. DISCUSSION: RR is a common vision threatening complication following radiation therapy. The available therapeutic options are limited and show unsatisfactory results. Further large investigative studies are required for developing better therapeutic as well as preventive treatment strategies. Adrenal Cortex Hormones;Anti-Inflammatory Agents;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Aptamers, Nucleotide;Vascular Endothelial Growth Factor A;pegaptanib;Bevacizumab;Pentoxifylline;Ranibizumab Adrenal Cortex Hormones;Anti-Inflammatory Agents;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Aptamers, Nucleotide;Bevacizumab;Brachytherapy;Eye Neoplasms;Head and Neck Neoplasms;Humans;Laser Coagulation;Light Coagulation;Low-Level Light Therapy;Pentoxifylline;Photochemotherapy;Radiation Injuries;Ranibizumab;Retina;Retinal Diseases;Tomography, Optical Coherence;Vascular Endothelial Growth Factor A

Antimicrobial photodynamic therapy: photodynamic antimicrobial effects of malachite green on Staphylococcus, enterobacteriaceae, and Candida. OBJECTIVE: This study investigated in vitro the photodynamic antimicrobial effects of the photosensitizer malachite green on clinical strains of Staphylococcus, Enterobacteriaceae, and Candida. MATERIALS AND METHODS: Thirty-six microbial strains isolated from the oral cavity of patients undergoing prolonged antibiotic therapy, including 12 Staphylococcus, 12 Enterobacteriaceae, and 12 Candida strains, were studied. The number of cells of each microorganism was standardized to 10(6) cells/mL. Twenty-four assays were carried out for each strain according to the following experimental conditions: gallium-aluminum-arsenide laser and photosensitizer (n = 6, L+P+), laser and physiologic solution (n = 6, L+P-), photosensitizer (n = 6, L-P+), and physiologic solution (n = 6, L-P-). Next, cultures were prepared on brain-heart infusion agar for the growth of Staphylococcus and Enterobacteriaceae, and on Sabouraud dextrose agar for the growth of Candida, and incubated for 48 h at 37 degrees C. The results are reported as the number of colony-forming units (CFU/mL) and were analyzed with analysis of variance and the Tukey test. RESULTS: The Staphylococcus, enterobacterial, and Candida strains were sensitive to photodynamic

therapy with malachite green (L+P+). A reduction of approximately 7 log(10) for Staphylococcus, 6 log(10) for enterobacteria, and 0.5 log(10) for the genus Candida. Significant statistical differences were observed between the L+P+ groups and the control groups (L-P-). CONCLUSION: The Staphylococcus, Enterobacteriaceae, and Candida strains studied were sensitive to photodynamic therapy with malachite green. Anti-Infective Agents, Local;Photosensitizing Agents;Rosaniline Dyes;malachite green Anti-Infective Agents, Local;Bacterial Infections;Candida;Cells, Cultured;Colony Count, Microbial;Enterobacteriaceae;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Microbial Sensitivity Tests;Mouth;Mycoses;Photochemotherapy;Photosensitizing Agents;Rosaniline Dyes;Staphylococcus
Disorders of tissue transformations of lysophosphatidylcholines at experimental pancreatic diabetes in white rats and peculiarities of the corrective effect of low-energy laser radiation of an extremely low intensity. Lysophosphatidylcholines Animals;Brain;Diabetes Mellitus, Experimental;Dose-Response Relationship, Radiation;Kidney;Low-Level Light Therapy;Lysophosphatidylcholines;Male;Organ Specificity;Radiotherapy Dosage;Rats
Simultaneous laser depilation and perforator-based fasciocutaneous limberg flap for pilonidal sinus reconstruction. Adult;Fascia;Hair Removal;Hirsutism;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pilonidal Sinus;Secondary Prevention;Skin Transplantation;Surgical Flaps;Young Adult
Low-level laser therapy for acute neck pain with radiculopathy: a double-blind placebo-controlled randomized study. OBJECTIVE: The objective of the study was to investigate clinical effects of low-level laser therapy (LLLT) in patients with acute neck pain with radiculopathy. DESIGN: Double-blind, randomized, placebo-controlled study. SETTING: The study was carried out between January 2005 and September 2007 at the Clinic for Rehabilitation at the Medical School, University of Belgrade, Serbia. PATIENTS AND INTERVENTION: Sixty subjects received a course of 15 treatments over 3 weeks with active or an inactivated laser as a placebo procedure. LLLT was applied to the skin projection at the anatomical site of the spinal segment involved with the following parameters: wavelength 905 nm, frequency 5,000 Hz, power density of 12 mW/cm(2), and dose of 2 J/cm(2), treatment time 120 seconds, at whole doses 12 J/cm(2). OUTCOME MEASURES: The primary outcome measure was pain intensity as measured by a visual analog scale. Secondary outcome measures were neck movement, neck disability index, and quality of life. Measurements were taken before treatment and at the end of the 3-week treatment period. RESULTS: Statistically significant differences between groups were found for intensity of arm pain (P = 0.003, with high effect size d = 0.92) and for neck extension (P = 0.003 with high effect size d = 0.94). CONCLUSION: LLLT gave more effective short-term relief of arm pain and increased range of neck extension in patients with acute neck pain with radiculopathy in comparison to the placebo procedure. Acute Disease;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck Pain;Pain Measurement;Prospective Studies;Radiculopathy;Treatment Outcome
Photomedicine and LLLT Literature Watch. Animals;Humans;Low-Level Light Therapy;Phototherapy
Laser-induced ATP formation: mechanism and consequences. Uncoupling Agents;Adenosine Triphosphate Adenosine Triphosphate;Humans;Low-Level Light Therapy;Lymphocytes;Uncoupling Agents
Characterizing photothrombotic distal middle cerebral artery occlusion and YAG laser-induced reperfusion model in the Izumo strain of spontaneously hypertensive rats. No study has systematically studied the relevance of original Izumo strain of spontaneously hypertensive rats (SHR/Izm) as a stroke model. Furthermore, both SHR/Izm and stroke-prone SHR/Izm (SHRSP/Izm) are commercially available, and recent progress in genetic studies allowed us to use several congenic

strains of rats constructed with SHR/Izm and SHRSP/Izm as the genetic background strains. A total of 166 male SHR/Izm and 17 male SHRSP/Izm were subjected to photothrombotic middle cerebral artery (MCA) occlusion with or without YAG laser-induced reperfusion. The pattern of distal MCA was recorded. Infarct volumes were determined with 2,3,5-triphenyltetrazolium chloride. At 24 or 48 h after MCA occlusion, infarct volumes in the permanent occlusion and 2-h occlusion groups (88 Â± 22 [SD] and 87 Â± 25 mmÂ³, respectively) were significantly larger than that in the 1-h occlusion group (45 Â± 14 mmÂ³), indicating the presence of sizeable zone of penumbra. Infarct size in SHRSP/Izm determined at 24 h after MCA occlusion was fairly large (124.0 Â± 34.8 mmÂ³, n = 10). Infarct volume in SHR/Izm with simple distal MCA was 76 Â± 19 mmÂ³, which was significantly smaller than 95 Â± 22 mmÂ³ in the other SHR/Izm with more branching MCA. These data suggest that this stroke model in SHR/Izm is useful in the preclinical testing of stroke therapies and elucidating the pathophysiology of cerebral ischemia/reperfusion. Animals;Blood Pressure;Cerebrovascular Circulation;Disease Models, Animal;Infarction, Middle Cerebral Artery;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Cerebral Artery;Rats;Rats, Inbred SHR;Reperfusion

Influence of laser photobiomodulation on collagen IV during skeletal muscle tissue remodeling after injury in rats. OBJECTIVE: The aim of the present study was to determine the effect of GaAlAs low-level laser therapy (LLLT) on collagen IV remodeling of the tibialis anterior (TA) muscle in rats after cryolesion. BACKGROUND: Considerable interest exists in skeletal muscle regeneration in situations such as repair after exercise-induced muscle injury, after muscle transplantation, in muscular dystrophy, exercise-induced muscle injury, and the recovery of strength after atrophy due to disuse. A number of studies have demonstrated the potential of LLLT in facilitating the muscle-healing process; however, no consensus is found in the literature regarding the best laser-irradiation parameters. METHODS: Adult male Wistar rats (nâ€‰=â€‰45) were used and randomly divided into three groups: control (nâ€‰=â€‰5); nontreated cryolesioned group (nâ€‰=â€‰20), and LLLT-cryolesioned group (nâ€‰=â€‰20). The cryolesioned groups were analyzed at 1, 7, 14, and 21 days after the injury procedure. Laser irradiation was performed 3 times per week on the injured region by using the GaAlAs laser (660 nm; beam spot of 0.04â€‰cm(2), output power of 20 mW, power density of 500 mW/cm(2), and energy density of 5â€‰J/cm(2), for 10â€‰sec). The muscles were removed, frozen, cryosectioned, and then stained with hematoxylin-eosin for the visualization of general morphology or used for immunohistochemical analysis of collagen IV. RESULTS: It was demonstrated that LLLT promotes an increase in collagen IV immunolabeling in skeletal muscle in the first 7 days after acute trauma caused by cryoinjury, but does not modify the duration of the tissue-repair process. Even with LLLT, the injured muscle tissue needs âˆ¼21 days to achieve the same state of organization as that in the noninjured muscle. CONCLUSION: The collagen IV content is modulated in regenerating skeletal muscle under LLLT, which might be associated with better tissue outcome, although the histologic analysis did not detect tissue improvement in the LLLT group. Collagen Type IV Animals;Collagen Type IV;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Regeneration;Wound Healing

[The antimicrobial efficacy of an erbium laser on Streptococcus mutans. In vivo study]. This study was conducted in order to demonstrate the bactericidal effect of an erbium laser (Er,Cr:YSGG) on Streptococcus mutans, in vivo, at different laser power settings, obtaining sterile enamel surfaces with minimal tissue ablation. The practicians use the laser for the cutting effect on hard tissue to eliminate all the infected and affected enamel and dentine, without collateral damage on the pulp and for its bactericidal effect on cariogenic bacteria. MATERIAL AND METHOD: The study group included 132 superficial carious lesions, on 66 patients with ages between 6 and 20; a two-year study (January 2006 - November 2008) performed in a private practice. The carious lesions were ablated with an erbium laser with two types of tips. A sample of occlusal plaque was taken using a sterile

swab, soaked in normal saline solution (before and after the preparation). RESULTS: Before the laser treatment, the percentage with high counts of Streptococcus mutans was 70% and low counts 30% (chi2 = 26.16 ; p < 0.01). At the laser power of 4,5 watts, the zirconium tip (Z6) had a higher number of sterile culture (96,3%). The numbers of sterile cultures were higher at the laser power of 5 watts, with both tips: zirconium and sapphire, the percentage being equal: 91-92%.
Adolescent;Child;Colony Count, Microbial;Dental Caries;Dental Cavity Preparation;Dental Enamel;Humans;Lasers, Solid-State;Low-Level Light Therapy;Retrospective Studies;Streptococcus mutans;Young Adult

Clinic-epidemiological evaluation of ulcers in patients with leprosy sequelae and the effect of low level laser therapy on wound healing: a randomized clinical trial. BACKGROUND: Mycobacterium leprae is the only pathogenic bacteria able to infect peripheral nerves. Neural impairment results in a set of sensitive, motor and autonomic disturbances, with ulcers originating primarily on the hands and feet. The study objectives were to analyze the clinic-epidemiological characteristics of patients attended at one specialized dressing service from a leprosy-endemic region of the Brazilian Amazon and to evaluate the effect of low level laser therapy (LLLT) on wound healing of these patients. METHODS: Clinic-epidemiological evaluation of patients with leprosy sequelae was performed at the reference unit in sanitary dermatology of the state of ParÃ¡ in Brazil. We conducted anamnesis, identification of the regions affected by the lesions and measurement of ulcer depth and surface area. After that, we performed a randomized clinical trial. Fifty-one patients with ulcers related to leprosy were evaluated, twenty-five of them were randomly assigned to a low level laser therapy group or a control group. Patients were treated 3 times per week for 12 weeks. Outcome measures were ulcer surface area, ulcer depth and the pressure ulcer scale for healing score (PUSH). RESULTS: Ninety-seven ulcers were identified, with a mean (SD) duration of 97.6 (111.7) months, surface area of 7.3 (11.5) cm2, and depth of 6.0 (6.2) mm. Statistical analysis of the data determined that there were no significant differences in the variables analyzed before and after treatment with low level laser therapy. CONCLUSIONS: Ulcers in patients with leprosy remain a major source of economic and social losses, even many years after they have been cured of M. leprae infection. Our results indicate that it is necessary to develop new and more effective therapeutic tools, as low level laser therapy did not demonstrate any additional benefits to ulcer healing with the parameters used in this study. TRIAL REGISTRATION: The trial was registered at ClinicalTrials.gov as NCT00860717.
Adolescent;Adult;Aged;Aged, 80 and over;Brazil;Female;Humans;Leprosy;Low-Level Light Therapy;Male;Middle Aged;Skin Ulcer;Treatment Outcome;Wound Healing;Young Adult

The effect of the association of near infrared laser therapy, bone morphogenetic proteins, and guided bone regeneration on tibial fractures treated with internal rigid fixation: a Raman spectroscopic study. Fractures have different etiology and treatment and may be associated or not to bone losses. Laser light has been shown to improve bone healing. We aimed to assess, through Raman spectroscopy, the level of CHA (approximately 958 cm(-1)) on complete fractures animals treated with IRF treated or not with Low Level Laser Therapy-LLLT and associated or not to BMPs and GBR. Complete tibial fractures were created on 15 animals that were divided into five groups. LLLT (Laser Unit, Kondortech, SÃ£o Carlos, SP, Brazil, lambda790 nm, 4 J/cm(2)/point, 40 mW, phi approximately 0.5 cm(2), 16 J/cm(2) session) started immediately after surgery and repeated at 48 h interval (2 weeks). Animal death occurred after 30 days. Raman spectroscopy was performed at the surface of the fracture. Our results showed significant differences between the groups IRF + BL /IRF_NBL (p = 0.05); between all experimental groups and untreated bone; bone/IRF + BL; IRF + BL + Bio + GBR; IRF + BL + LLLT; IRF + BL + Bio + GBR + LLLT; IRF_NBL (p < 0.001, all); IRF_NBL/IRF + BL + LLLT (p = 0.03); IRF_NBL/IRF + BL + Bio + GBR + LLLT (p = 0.02); IRF + BL/IRF + BL + LLLT (p = 0.04); IRF + BL/IRF + BL + Bio + GBR + LLLT (p = 0.002); IRF + BL + Bio + GBR/IRF + BL + Bio + GBR + LLLT (p = 0.05). It is

concluded that the use of NIR LLLT associated to BMPs and GBR was effective in improving bone healing on fractured bones due to increased levels of CHA. Bone Morphogenetic Proteins Animals;Bone Morphogenetic Proteins;Bone Regeneration;Cattle;Fracture Fixation, Internal;Guided Tissue Regeneration;Infrared Rays;Laser Therapy;Male;Rabbits;Spectrum Analysis, Raman;Surface Properties;Tibial Fractures

Types of hair loss and treatment options, including the novel low-level light therapy and its proposed mechanism. Androgenetic alopecia (AGA) is the most common form of hair loss in men, and female pattern hair loss (FPHL) is the most common form of hair loss in women. Traditional methods of treating hair loss have included minoxidil, finasteride, and surgical transplantation. Currently there is a myriad of new and experimental treatments. In addition, low-level light therapy (LLLT) has recently been approved by the United States Food and Drug Administration (FDA) for the treatment of hair loss. There are several theories and minimal clinical evidence of the safety and efficacy of LLLT, although most experts agree that it is safe. More in vitro studies are necessary to elucidate the mechanism and effectiveness at the cellular level, and more controlled studies are necessary to assess the role of this new treatment in the general population. Androgens;Dermatologic Agents;Drugs, Investigational;Tretinoin;Finasteride;Minoxidil Alopecia;Androgens;Dermatologic Agents;Drugs, Investigational;Female;Finasteride;Humans;Male;Minoxidil;Off-Label Use;Phototherapy;Tretinoin

Interventions for treating oral mucositis for patients with cancer receiving treatment. BACKGROUND: Treatment of cancer is increasingly effective but associated with short and long term side effects. Oral side effects, including oral mucositis (mouth ulceration), remain a major source of illness despite the use of a variety of agents to treat them. OBJECTIVES: To assess the effectiveness of interventions for treating oral mucositis or its associated pain in patients with cancer receiving chemotherapy or radiotherapy or both. SEARCH STRATEGY: Electronic searches of Cochrane Oral Health Group and PaPaS Trials Registers (to 1 June 2010), CENTRAL via The Cochrane Library (to Issue 2, 2010), MEDLINE via OVID (1950 to 1 June 2010), EMBASE via OVID (1980 to 1 June 2010), CINAHL via EBSCO (1980 to 1 June 2010), CANCERLIT via PubMed (1950 to 1 June 2010), OpenSIGLE (1980 to 1 June 2010) and LILACS via the Virtual Health Library (1980 to 1 June 2010) were undertaken. Reference lists from relevant articles were searched and the authors of eligible trials were contacted to identify trials and obtain additional information. SELECTION CRITERIA: All randomised controlled trials comparing agents prescribed to treat oral mucositis in people receiving chemotherapy or radiotherapy or both. Outcomes were oral mucositis, time to heal mucositis, oral pain, duration of pain control, dysphagia, systemic infection, amount of analgesia, length of hospitalisation, cost and quality of life. DATA COLLECTION AND ANALYSIS: Data were independently extracted, in duplicate, by two review authors. Authors were contacted for details of randomisation, blindness and withdrawals. Risk of bias assessment was carried out on six domains. The Cochrane Collaboration statistical guidelines were followed and risk ratio (RR) values calculated using fixed-effect models (less than 3 trials in each meta-analysis). MAIN RESULTS: Thirty-two trials involving 1505 patients satisfied the inclusion criteria. Three comparisons for mucositis treatment including two or more trials were: benzydamine HCl versus placebo, sucralfate versus placebo and low level laser versus sham procedure. Only the low level laser showed a reduction in severe mucositis when compared with the sham procedure, RR 5.28 (95% confidence interval (CI) 2.30 to 12.13).Only 3 comparisons included more than one trial for pain control: patient controlled analgesia (PCA) compared to the continuous infusion method, therapist versus control, cognitive behaviour therapy versus control. There was no evidence of a difference in mean pain score between PCA and continuous infusion, however, less opiate was used per hour for PCA, mean difference 0.65 mg/hour (95% CI 0.09 to 1.20), and the duration of pain was less 1.9 days (95% CI 0.3 to 3.5). AUTHORS' CONCLUSIONS: There is weak and

unreliable evidence that low level laser treatment reduces the severity of the mucositis. Less opiate is used for PCA versus continuous infusion. Further, well designed, placebo or no treatment controlled trials assessing the effectiveness of interventions investigated in this review and new interventions for treating mucositis are needed. Analgesics;Anti-Ulcer Agents Analgesics;Anti-Ulcer Agents;Humans;Low-Level Light Therapy;Mouth Diseases;Neoplasms;Oral Ulcer;Pain;Pain Management;Randomized Controlled Trials as Topic;Stomatitis

Influence of naloxone and methysergide on the analgesic effects of low-level laser in an experimental pain model. BACKGROUND AND OBJECTIVES: Although the mechanism of action of laser phototherapy (LPT) is not known, it is a promising analgesic method. The aim of this study was to evaluate whether the action of LPT depends on the activation of peripheral opioid or serotonergic receptors. METHOD: Inflammatory pain was induced through the injection of carrageenin in the left posterior paw of male Wistar rats. The InGaAIP visible laser diode (660 nm) with fluency of 2.5 J*cm(-2) was used. Von Frey filaments were used to analyze mechanical hyperalgesia. Animals were separated into five groups: Carrageenin; Laser (LPT); Non-coherent light; LPT + Naloxone; and LPT + Methysergide. RESULTS: Low-Level Laser phototherapy proved to be an effective analgesic method, while non-coherent light did not show a similar effect. The use of naloxone blocked the analgesic effect of LPT, while methysergide did not affect LPT-induced analgesia. CONCLUSIONS: According to the parameter used in this study, LPT produced analgesia. Analgesia induced by laser phototherapy is mediated by peripheral opioid receptors. Laser phototherapy does not seem to interact with peripheral serotonergic receptors. Narcotic Antagonists;Serotonin Antagonists;Naloxone;Methysergide Analgesia;Animals;Low-Level Light Therapy;Male;Methysergide;Naloxone;Narcotic Antagonists;Pain;Rats;Rats, Wistar;Serotonin Antagonists

Clinical trials report. Low-level laser therapy in the management of neck pain.

Comparative analysis of analgesic efficacy of selected physiotherapy methods in low back pain patients. BACKGROUND: Low back pain syndromes are one of the most frequent causes of movement limitation in populations of highly industrialized countries. They are listed as the main cause of inability to work among people of working age. Chronic pain and the associated limitation of movement underlie the quest for effective therapies. The use of ultrasound, LLLT, vacuum therapy with Ultra Reiz current in physical therapy of these patients prompts research over their effectiveness in the therapy of patients with low-back pain. The aim of the work was to evaluate the analgesic efficacy of LLLT, ultrasound, and vacuum therapy with Ultra Reiz current in patients with low back pain. MATERIAL AND METHODS: The study involved 94 people divided into three groups (A,B,C). Group A (n=35) received a series of 10 low energy laser therapy sessions (wave length 808 nm, surface density of radiation 510 mW/cm(2), continuous wave form, scanning mode, a dose of 12 J/cm(2) on a surface of 100 cm(2) [10x10cm]). Patients in Group B (n=27) had ultrasound sessions with a wave intensity of 1 W/cm(2) for 3 minutes. Patients in Group C (n=32) underwent vacuum therapy (8 kPa) combined with Ultra Reiz current. Subjective pain assessment was carried out using a modified Latinen questionnaire and a visual analogue scale of pain intensity. Lumbosacral spine mobility was evaluated with the Schober test and the finger-to- floor test. RESULTS: In Group A, following low energy laser therapy, a statistically significant decrease in pain intensity was observed, together with decreased analgesic consumption compared to the other groups. In Group C, following vacuum therapy combined with Ultra Reiz currents, a significant decrease in the frequency of pain was observed together with increased physical activity compared to both Groups A and B, assessed according to a modified Laitinen pain indicator questionnaire. The biggest improvement in global spine mobility and lumbosacral flexion was observed in Group C (vacuum therapy plus Ultra Reiz current) compared to the other groups. However, the most significant improvement in lower spine

extension was noted in Group B (ultrasound). CONCLUSIONS: 1. The study showed slightly higher analgesic efficacy of laser biostimulation in comparison to vacuum therapy combined with Ultra Reiz current in patients with low back pain. 2. A more prominent increase in lumbosacral spine mobility was observed after vacuum therapy combined with Ultra Reiz current and ultrasound therapy. Adult;Aged;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Patient Satisfaction;Physical Therapy Modalities;Range of Motion, Articular;Transcutaneous Electric Nerve Stimulation;Treatment Outcome;Ultrasonic Therapy;Young Adult

Low-level laser therapy supported teeth extractions of two patients receiving IV zolendronate. BRONJ (bisphosphonate-related osteonecrosis of jaws) is a frequently encountered disease, particularly in the maxillofacial region, and a consequence of bisphosphonate use. Treatment of BRONJ remains controversial, as efficiency of medical and surgical approaches as well as a combination of these methods with supportive treatments have not been clearly demonstrated in the literature. In recent years, laser usage alone or in combination with the main therapy methods, has become popular for the treatment of bisphosphonate-related osteo-necrosis of jaws. In this article, we present the successful management of two dental patients who had high potentials for BRONJ development as a result of chemo and radiotherapy combined with IV zoledronic acid application. Multiple consecutive teeth extractions followed with primary wound closure and LLLT applications were performed under high doses of antibiotics prophylaxis. Satisfactory wound healing in both the surrounding soft and hard tissues was achieved. LLLT application combined with atraumatic surgical interventions under antibiotics prophylaxis is a preferable approach in patients with a risk of BRONJ development. Adjunctive effect of LLLT in addition to careful infection control on preventing BRONJ was reported and concluded. Bone Density Conservation Agents;Diphosphonates Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Breast Neoplasms;Diphosphonates;Female;Humans;Infusions, Intravenous;Low-Level Light Therapy;Male;Middle Aged;Multiple Myeloma;Risk Factors;Tooth Extraction

Clinical comparison of potassium-titanyl-phosphate (KTP) versus neodymium:YAG (Nd:YAG) laser treatment for lower extremity telangiectases. BACKGROUND: The Nd:YAG laser has been considered the gold standard of treatment for leg veins, but pain and side effects have fueled physicians to use treatment alternatives. OBJECTIVE: To compare the clinical efficacy of the long-pulsed 1064-nm Nd:YAG laser with KTP laser irradiation in the treatment of leg telangiectasia. METHODS: A series of 16 patients with size-matched superficial telangiectases of the lower extremities were randomly assigned to receive three consecutive monthly treatments with the long-pulsed 1064-nm Nd:YAG on one leg and 532-nm KTP laser irradiation on the other. RESULTS: For the 16 patients who completed the study, 64 leg vein sites were treated. Average clinical improvement scores were 1.94 and 1.25 for the KTP laser-treated leg and 3.38 and 3.50 for the Nd:YAG laser-treated leg with thin (â‰¤ 1 mm) and large (1-3 mm) vessels, respectively. After the third treatment session, average improvement scores of 2.44, 1.31 and 3.75, 3.23 were given for the KTP and Nd:YAG laser-treated sides, respectively. CONCLUSION: Both the 1064-nm Nd:YAG and KTP lasers are effective in the treatment of lower extremity telangiectases. However, the KTP laser has very low efficacy with vessels larger than 1 mm and should not be elected when treating such vessels. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Lower Extremity;Middle Aged;Telangiectasis

Testing photobiomodulatory effects of laser irradiation on wound healing: development of an improved model for dressing wounds in mice. OBJECTIVE: To develop a suitable method for dressing skin wounds in BKS.Cg-m(+)/(+)Lepr(db) mice for subsequent use in laser irradiation of wounds. The healing of nonirradiated wounds (controls) was examined histologically to provide

essential reference data. BACKGROUND DATA: Dressing excisional skin wounds in mice has many advantages. However, previous studies using dressings such as Tegaderm W or OpSite, with or without adhesives, have shown that this is not easily achieved. MATERIALS AND METHODS: In a pilot study, a full-thickness wound was made on the left flank in six diabetic and six nondiabetic mice, and five different methods were tried for dressing the wounds with Tegaderm HP to develop an optimized procedure. The optimized procedure was used in subsequent studies, with a total of 23 diabetic and 13 nondiabetic mice being controls for laser-irradiated mice. Measurements of healing outcomes from histologic sections of controls were statistically analyzed. RESULTS: The optimized procedure used Tegaderm HP with Cavilon and Fixomull Stretch strips for the first dressing, and with Mastisol for subsequent dressings. Wound closure by contraction was retarded in a large proportion of diabetic mice (approximately 80%) and a small proportion of nondiabetic mice. These wounds, described as "splinted," healed mainly by epithelial regeneration and granulation tissue formation. CONCLUSION: A simple, easy-to-perform procedure was developed for dressing wounds in diabetic and nondiabetic mice. It was found to cause splinting with wound healing mimicking that in human patients. This model is suitable for examining the effects of different therapies on wound healing, including lasers. Tissue Adhesives Analysis of Variance;Animals;Bandages;Diabetes Complications;Diabetes Mellitus, Experimental;Disease Models, Animal;Female;Immunohistochemistry;Low-Level Light Therapy;Male;Mice;Mice, Inbred NOD;Pilot Projects;Random Allocation;Reference Values;Risk Factors;Sensitivity and Specificity;Tissue Adhesives;Wound Healing;Wounds and Injuries

Laser photobiomodulation of proliferation of cells in culture: a review of human and animal studies. AIM: The aim of this article was to review experimental studies of laser irradiation of human and animal cells in culture to assess the photobiomodulatory effects of such irradiation. BACKGROUND: Previous studies have shown that various types of cells respond differently to laser irradiation, depending on irradiation parameters. Cellular outcomes measured or examined include cell numbers, cell viability, and ultrastructural features. A review of these studies may provide a further insight into the clinical effects brought about by laser light on cells and tissues, including laser effects in wound healing and repair of nerves and skeletal muscle after injury. METHODS: A systematic review was completed of original research articles investigating the effects of laser therapy on human and animal cells in culture (January 2002 to September 2009). Relevant articles were primarily sourced from PubMed and Medline by using EndNote X1, and from secondary searches. Search terms were "cell proliferation," "laser therapy," "laser irradiation," "laser phototherapy," and "phototherapy." RESULTS: In total, 46 relevant articles were included in the review, comprising work completed on a variety of cell types. Although results consistently demonstrated the potential of laser irradiation to affect cellular proliferation in a wavelength- and dosage-dependent manner, the relevance of other key irradiation parameters, such as irradiance, to such effects remained unclear. CONCLUSIONS: Findings from studies of cells in culture clearly demonstrate the ability of laser irradiation to modulate (typically stimulate) cellular proliferation. The relevance of some irradiation parameters remains occult and represents an important area for further research. Animals;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Endothelial Cells;Fibroblasts;Humans;Lasers;Low-Level Light Therapy;Wound Healing

The interaction of light with nanoscopic layers of water may be essential to the future of photobiomodulation. Water Low-Level Light Therapy;Nanostructures;Water

Assessment of the effect of the use of laser light or dantrolene on facial muscle under occlusal wear: a Raman spectroscopic study in a rodent model. OBJECTIVE: The aim of the present study was to use Raman spectroscopy to measure levels of CaPi in muscles under occlusal wear and treated with laser phototherapy (LPT) or muscle-relaxant therapy or both on rodents. BACKGROUND: The etiology of temporomandibular disorders is multifactorial. Malocclusion may influence the masticatory

muscles, causing fatigue. A major type of fatigue is the metabolic, caused by the increased accumulation of metabolites such as inorganic phosphate. Raman spectroscopy allows nondestructive analysis of the biochemical composition of tissues. METHODS: The 30 male Wistar rats were randomly divided into three groups: occlusal wear (G-1), occlusal wear + LPT (G-2), and occlusal wear + muscle relaxant (G-3). Ten untreated animals were used for baseline data. Under intraperitoneal general anesthesia, animals of groups 1, 2, and 3 had unilateral amputation of molar cusps to simulate an occlusal-wear situation. The masseter muscle of G-2 received LPT (lambda830 nm, 4 J/cm(2), 40 mW, phi approximately 2 mm) after the procedure and repeated every other day for 14-30 days. Animals of G-3 were treated with a daily injection of dantrolene (2.5 mg/kg in 0.5 ml of H(2)O) beginning 24 h after cusp removal. Animals were killed with an overdose of general anesthetics at days 14 and 30 after cusps removal, and the ipsilateral masseter muscle was excised and divided into two parts. One part was routinely processed and underwent histologic analysis; the other was kept in liquid nitrogen for Raman spectroscopy. The mean value of the intensity of the peak 958 per centimeter was determined. RESULTS: No morphologic changes were seen. Raman analysis showed significantly less Raman intensity in the laser group at 30 days ($p < 0.01$). CONCLUSION: Occlusal wear did not caused morphologic alterations in the masseter muscle but resulted in changes of the levels of CaP(i) that were less compromising when the laser light was used. Muscle Relaxants, Central;Dantrolene;Calcium Animals;Calcium;Dantrolene;Disease Models, Animal;Facial Muscles;Low-Level Light Therapy;Male;Masseter Muscle;Muscle Relaxants, Central;Rats;Rats, Wistar;Spectrum Analysis, Raman;Tooth Attrition

Effect of Er, Cr: YSGG laser irradiation on Enterococcus faecalis in infected root canals. OBJECTIVE: The purpose of this study was to investigate the eradication of Enterococcus faecalis by high-power settings of Er, Cr:YSGG laser irradiation in root canals of extracted teeth. BACKGROUND DATA: The bacteria entering the root canal system invade dentinal tubules, resulting in persistent infections in root canals due to limited penetration of irrigation solutions into the dentinal tubules. The antibacterial effects of different lasers have been investigated in previous studies. MATERIALS AND METHODS: Sixty newly extracted maxillary central incisors were enlarged chemomechanically and sterilized after removal of the smear layer. Root canals were inoculated with E. faecalis, and bacteria were incubated in root canals for 48 h. Samples were randomly divided into four groups, each containing 15 teeth. One group was considered as control with no intervention. Two groups were irradiated with 2- and 3-W output powers of Er, Cr:YSGG laser for 16 s. In the last group, the canals were irrigated with 1% sodium hypochlorite for 20 min. RESULTS: In the laser groups at 2- and 3-W powers, the number of bacteria was reduced 2.4% and 1.53%, respectively, compared with the controls. No significant differences were found between the two laser groups ($p > 0.05$). The canals irrigated with 1% NaOCl solution demonstrated no bacterial growth. CONCLUSIONS: According to the results of the present study, 2- and 3-W powers of Er, Cr:YSGG laser have antibacterial effects on E. faecalis in root canals of infected teeth; however, the effect is less remarkable than that of NaOCl solution. Dental Disinfectants;Root Canal Irrigants;Sodium Hypochlorite Dental Disinfectants;Dental Pulp Cavity;Dose-Response Relationship, Radiation;Enterococcus faecalis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Irrigants;Sodium Hypochlorite;Tooth Diseases

The anti-inflammatory effect of low-level laser therapy on experimentally induced inflammation of rabbit temporomandibular joint retrodiscal tissues. AIMS: To investigate the effect of low-level laser therapy (LLLT) on experimentally induced inflammation in retrodiscal tissues of the rabbit temporo?mandibular joint (TMJ) using scintigraphic imaging. METHODS: Eleven male New Zealand rabbits were included in this study. Six randomly selected rabbits were imaged to provide normal joint images (normal group) before the initiation of the experiment. A 5% formalin solution was

locally injected into both right and left TMJs of all rabbits. Subsequently, Ga-Al-As laser (wavelength: 815 nm; energy density: 12 J/cm2; output power: 250 mW) was applied for 48 seconds. The treatment was performed six times for 2 weeks to the left TMJ of all rabbits. The right TMJs of the rabbits were used as the control (nontreated) TMJ group, while left TMJs were used as the treated TMJ group. Static images of TMJ were taken at 24 hours, 7 days, and 14 days after the beginning of the treatment. The images of all TMJs were taken in the posteroanterior direction with the rabbit under sedation and its mouth open. The Mann-Whitney U test was used to compare group differences, and intragroup differences were determined by the Friedman test and Wilcoxon sign test. RESULTS: Significant differences were found between normal and both the control and treated TMJ groups. A reduction of inflammation in both treated and control TMJ groups was obtained, but there was no statistically significant difference between the groups. CONCLUSION: Under the conditions used in this study, quantitative scintigraphic measurements of TMJ inflammation of the treated TMJ group decreased but did not differ significantly from those of the control TMJ group. Formaldehyde Animals;Arthritis, Experimental;Formaldehyde;Injections, Intra-Articular;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rabbits;Radionuclide Imaging;Range of Motion, Articular;Temporomandibular Joint Disc;Temporomandibular Joint Disorders;Time Factors

Effects of superpulsed low-level laser therapy on temporomandibular joint pain. OBJECTIVES: A randomized double-blind study was conducted to compare the efficacy of superpulsed low-level laser therapy (SLLLT) with nonsteroidal anti-inflammatory drugs in the treatment of pain caused by temporomandibular joint disorders. METHODS: A total of 99 patients with temporomandibular joint disorders, secondary to disc displacement without reduction or osteoarthritis were randomly divided into 3 groups. Thirty-nine patients received SLLLT in 10 sessions over 2 weeks, 30 patients received ibuprofen 800 mg twice a day for 10 days, and 30 patients received sham laser as placebo in 10 sessions over 2 weeks. Pain intensity was measured by visual analog scale at baseline, 2, 5, 10, and 15 days of treatment. Mandibular function was evaluated by monitoring active and passive mouth openings and right and left lateral motions at baseline, 15 days, and 1 month of treatment. Magnetic resonance imaging was performed at baseline and the end of therapy. RESULTS: Mean visual analog scale pain scores in SLLLT group was significantly lower than in nonsteroidal anti-inflammatory drug group and control group (P=0.0001) from fifth day up to the end of the observation period. As for active and passive mouth openings and right and left lateral motions, superiority of SLLLT was evident 1 month after treatment (interaction time treatment, P=0.0001). DISCUSSION: Mandibular function improved in all SLLLT patients proving the effectiveness in the treatment of pain, as demonstrated by a significant improvement in clinical signs and symptoms of temporomandibular joint disc displacement without reduction and osteoarthritis at the end of treatment and stability over a period of 1 month. Anti-Inflammatory Agents, Non-Steroidal;Ibuprofen Adolescent;Adult;Anti-Inflammatory Agents, Non-Steroidal;Double-Blind Method;Female;Humans;Ibuprofen;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis;Pain;Pain Measurement;Patient Selection;Statistics, Nonparametric;Temporomandibular Joint;Temporomandibular Joint Disorders;Treatment Outcome

Prophylactic low-level light therapy for the treatment of hypertrophic scars and keloids: a case series. BACKGROUND AND OBJECTIVES: Hypertrophic and keloid scars result from alterations in the wound healing process. Treating abnormal scars remains an important challenge. The aim of this case series was to investigate the effectiveness of near infrared (NIR) light emitting diode (LED) treatment as a prophylactic method to alter the wound healing process in order to avoid or attenuate the formation of hypertrophic scars or keloids. STUDY DESIGN/PATIENTS AND METHODS: Three patients (age 27-57) of phototypes I-III with hypertrophic scars or keloids due to acne or surgery participated in this case series. Following scar revision by surgery or CO(2) laser ablation on bilateral areas, one scar was treated daily by the patient at home with non-thermal, non-ablative NIR LED (805 nm at 30

mW/cm(2)) for 30 days. Efficacy assessments, conducted up to a year post-treatment, included the Vancouver Scar scale (VSS), clinical global assessment of digital photographs, and quantitative profilometry analysis using PRIMOS. Safety was documented by adverse effects monitoring. RESULTS: Significant improvements on the NIR-treated versus the control scar were seen in all efficacy measures. No significant treatment-related adverse effects were reported. CONCLUSION: Possible mechanisms involved are inhibition of TGF-beta I expression. Further studies in larger group of patients are needed to evaluate this promising technique. Adult;Cicatrix;Cicatrix, Hypertrophic;Female;Humans;Keloid;Laser Therapy;Male;Middle Aged;Phototherapy;Rhytidoplasty;Self Care;Wound Healing

Low-level laser therapy in chronic autoimmune thyroiditis: a pilot study. BACKGROUND AND OBJECTIVES: Chronic autoimmune thyroiditis (CAT) remains the most common cause of acquired hypothyroidism. There is currently no therapy that is capable of regenerating CAT-damaged thyroid tissue. The objective of this study was to gauge the value of applying low-level laser therapy (LLLT) in CAT patients based on both ultrasound studies (USs) and evaluations of thyroid function and thyroid autoantibodies. STUDY DESIGN/MATERIALS AND METHODS: Fifteen patients who had hypothyroidism caused by CAT and were undergoing levothyroxine (LT4) treatment were selected to participate in the study. Patients received 10 applications of LLLT (830 nm, output power 50 mW) in continuous mode, twice a week, using either the punctual technique (8 patients) or the sweep technique (7 patients), with fluence in the range of 38-108 J/cm(2). USs were performed prior to and 30 days after LLLT. USs included a quantitative analysis of echogenicity through a gray-scale computerized histogram index (EI). Following the second ultrasound (30 days after LLLT), LT4 was discontinued in all patients and, if required, reintroduced. Triiodothyronine, thyroxine (T4), free T4, thyrotropin, thyroid peroxidase (TPOAb) and thyroglobulin (TgAb) antibodies levels were assessed before LLLT and then 1, 2, 3, 6, and 9 months after LT4 withdrawal. RESULTS: We noted all patients' reduced LT4 dosage needs, including 7 (47%) who did not require any LT4 through the 9-month follow-up. The LT4 dosage used pre-LLLT (96 +/- 22 microg/day) decreased in the 9th month of follow-up (38 +/- 23 microg/day; $P < 0.0001$). TPOAb levels also decreased (pre-LLLT = 982 +/- 530 U/ml, post-LLLT = 579 +/- 454 U/ml; $P = 0.016$). TgAb levels were not reduced, though we did observe a post-LLLT increase in the EI (pre-LLLT = 0.99 +/- 0.09, post-LLLT = 1.21 +/- 0.19; $P = 0.001$). CONCLUSION: The preliminary results indicate that LLLT promotes the improvement of thyroid function, as patients experienced a decreased need for LT4, a reduction in TPOAb levels, and an increase in parenchymal echogenicity. Autoantibodies;Triiodothyronine;Thyroglobulin;Iodide Peroxidase;Thyroxine Adult;Autoantibodies;Chronic Disease;Female;Humans;Hypothyroidism;Iodide Peroxidase;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Thyroglobulin;Thyroid Gland;Thyroiditis, Autoimmune;Thyroxine;Triiodothyronine;Ultrasonography

Evaluation of inflammatory biomarkers associated with oxidative stress and histological assessment of low-level laser therapy in experimental myopathy. The objective of the present work was to study the effect of helium-neon (He-Ne) and gallium-arsenide (Ga-As) laser upon inflammatory biomarkers associated with oxidative stress: fibrinogen, nitric oxide (NO), L-citrulline, and superoxide dismutase (SOD). These were evaluated through histological assessment, in rats with experimental myopathy. MATERIALS AND METHODS: The groups studied were: (A) control, (B) injured, (C) injured and treated with He-Ne laser, (D) injured and treated with Ga-As laser, (E) irradiated with He-Ne; and (F) irradiated with Ga-As laser. Myopathy was induced by injecting 0.05 mg/rat/day of adrenaline in the left posterior limb muscle at the same point on 5 consecutive days, in groups B, C, and D. Low-level laser therapy (LLLT) was applied with 9.5 J/cm(2) daily for 7 consecutive days with each laser. The determination of the biomarkers was made by spectrophotometry. The muscles (5/8, single blinded) were stained with Gomori Trichrome and examined by optic microscopy. The quantitative

variables were statistically analyzed by the Fisher's test and categorical data by the Axionvision 4.8 program. Pearson's chi-squared test was applied, setting significant difference at P < 0.05 for all cases. RESULTS: In group B, the biomarkers were significantly increased compared to the other groups (P < 0.001), except for NO which in group B decreased significantly (P < 0.001). In group B, there was a higher inflammatory infiltration level (80.67%) in relation to destroyed fibers. CONCLUSIONS: LLLT caused significant changes in inflammatory biomarkers and oxidative stress: decreased levels of fibrinogen, L-citrulline and SOD as opposed to the increase of NO in rats with experimental myopathies and significant muscle recovery. Biomarkers;Citrulline;Nitric Oxide;Fibrinogen;Superoxide Dismutase
Animals;Biomarkers;Citrulline;Female;Fibrinogen;Lasers, Gas;Low-Level Light Therapy;Muscle, Skeletal;Muscular Diseases;Nitric Oxide;Oxidative Stress;Rats;Spectrophotometry;Superoxide Dismutase

Collagen changes and realignment induced by low-level laser therapy and low-intensity ultrasound in the calcaneal tendon. BACKGROUND AND OBJECTIVE: The treatment of calcaneal tendon injuries requires long-term rehabilitation. Ultrasound (US) and low-level laser therapy (LLLT) are the most used and studied physical agents in the treatment of tendon injuries; however, only a few studies examined the effects of the combination of US and LLLT. Therefore, the purpose of this study was to investigate which treatment (the exclusive or combined use of US and LLLT) most effectively contribute to tendon healing. STUDY DESIGN/MATERIALS AND METHODS: This was a controlled laboratory study with 50 rats whose Achilles tendon was injured by direct trauma. The rats were randomly divided into five groups and treated for 5 consecutive days, as follows: group 1 (control) received no treatment; group 2 was treated with US alone; group 3 was treated with LLLT alone; group 4 was treated first with US followed by LLLT; and group 5 was treated first with LLLT followed by US. On the sixth post-injury day, the tendons were removed and examined by polarized light microscopy. The organization of collagen fibers was assessed by birefringence measurements. Picrosirius-stained sections were examined for the presence of types I and III collagen. RESULTS: There was a significantly higher organization of collagen fibers in group 2 (US) than in the control group (P = 0.03). The amount of type I collagen found in groups 2 (US), 3 (LLLT), and 5 (LLLT + US) was significantly higher than that in the control group (P <or= 0.01), but no significant differences were found between treatment groups. There were no differences in the amount of type III collagen between groups. CONCLUSION: Ultrasound, LLLT, and the combined use of LLLT and US resulted in greater synthesis of type I collagen; US was also effective in increasing collagen organization in the early stages of the healing process. Collagen Achilles Tendon;Animals;Collagen;Low-Level Light Therapy;Male;Microscopy;Random Allocation;Rats;Rats, Wistar;Rupture;Tendon Injuries;Ultrasonic Therapy;Wound Healing

Anti-inflammatory effects of low-level light emitting diode therapy on Achilles tendinitis in rats. BACKGROUND AND OBJECTIVES: The present study investigated the effects of low-level light emitting diode (LED) therapy (880 +/- 10 nm) on inflammatory process in a experimental model of Achilles tendinitis induced by collagenase. STUDY DESIGN/MATERIALS AND METHODS: Fifty-six male Wistar were separated into seven groups (n = 8), three groups in the experimental period of 7 days and four groups in the experimental period of 14 days, the control group (CONT), tendinitis group (TEND), LED therapy group (LEDT) for both experimental periods, and LED therapy group 7th to 14th day (LEDT delay) for 14 days experimental period. The LED parameters was 22 mW CW of optical output power, distributed in an irradiation area of 0.5 cm(2), with an irradiation time of 170 seconds, the applied energy density was 7.5 J/cm(2) in contact. The therapy was initiated 12 hours after the tendinitis induction, with a 48-hour interval between the irradiations. The histological analysis and inflammatory mediators were quantified. RESULTS: Our results showed that LED decreases the

inflammatory cells influx and mRNA expression to IL-1 beta, IL-6, tumor necrosis factor-alpha (TNF-alpha) in both phase, and cyclooxygenase-2 (COX-2) just in initial phase ($P < 0.05$). CONCLUSION: Our results suggest that the anti-inflammatory therapy with low-power LED (880 nm) enhanced the tissue response in all groups. We can conclude that the LED was able to reduce signs of inflammation in collagenase-induced tendinitis in rats by reducing the number of inflammatory cells and decrease mRNA expression of cytokines. Cytokines;RNA, Messenger;Cyclooxygenase 2;PTGS2 protein, human Achilles Tendon;Animals;Cyclooxygenase 2;Cytokines;Male;Phototherapy;RNA, Messenger;Rats;Rats, Wistar;Tendinopathy

Effects of low-level laser therapy on collagen expression and neutrophil infiltrate in 5-fluorouracil-induced oral mucositis in hamsters. BACKGROUND AND OBJECTIVES: Several studies have suggested that low-level laser therapy (LLLT) can ameliorate oral mucositis; however, the mechanisms involved are not well understood. The aim of this study was to investigate the mechanisms of action of LLLT on chemotherapy-induced oral mucositis, as related to effects on collagen expression and inflammation. MATERIALS AND METHODS: A hamster cheek pouch model of oral mucositis was used with all animals receiving intraperitoneal 5-fluorouracil, followed by surface irritation. Animals were randomly allocated into three groups, and treated with an InGaAlP diode laser at a wavelength of 660 nm and output power of 35 or 100 mW laser, or no laser. Clinical severity of mucositis was assessed at four time-points by a blinded examiner. Buccal pouch tissue was harvested from a subgroup of animals in each group at four time-points. Collagen was qualitatively and quantitatively evaluated after picrosirius staining. The density of the neutrophil infiltrate was also scored. RESULTS: Peak clinical severity of mucositis was reduced in the 35 mW laser group as compared to the 100 mW and control groups. The reduced peak clinical severity of mucositis in the 35 mW laser group was accompanied by a decrease in the number of neutrophils and an increase in the proportion of mature collagen as compared to the other two groups. The total quantity of collagen was significantly higher in the control (no laser) group at the day 11 time-point, as compared to the 35 mW laser group, consistent with a more prolonged inflammatory response in the control group. CONCLUSION: This study supports two mechanisms of action for LLLT in reducing mucositis severity. The increase in collagen organization in response to the 35 mW laser indicates that LLLT promotes wound healing. In addition, LLLT also appears to have an anti-inflammatory effect, as evidenced by the reduction in neutrophil infiltrate. Antimetabolites, Antineoplastic;Collagen;Fluorouracil Animals;Antimetabolites, Antineoplastic;Collagen;Cricetinae;Female;Fluorouracil;Low-Level Light Therapy;Mouth Mucosa;Neutrophil Infiltration;Neutrophils;Random Allocation;Severity of Illness Index;Stomatitis;Wound Healing

Low pulse energy Nd:YAG laser irradiation exerts a biostimulative effect on different cells of the oral microenvironment: "an in vitro study". BACKGROUND AND OBJECTIVES: Dental lasers represent a promising therapeutic tool in the treatment of periodontal and peri-implant diseases. However, their clinical application remains still limited. Here, we investigated the potential biostimulatory effect of low pulse energy neodymium:yttrium-aluminum-garnet (Nd:YAG) laser irradiation on different cells representative of the oral microenvironment and elucidated the underlying molecular mechanisms. MATERIALS AND METHODS: Saos-2 osteoblasts, H-end endothelial cells, and NIH/3T3 fibroblasts pre-treated or not with photosensitizing dye methylene blue (MB), were irradiated with low pulse energy (20 mJ) and high repetition rate (50-70 Hz) Nd:YAG laser, and evaluated for cell viability and proliferation as well as for the expression of specific differentiation markers by confocal immunofluorescence and real-time RT-PCR. Changes in intracellular Ca(2+) levels after laser exposure were also evaluated in living osteoblasts. RESULTS: Nd:YAG laser irradiation did not affect cell viability in all the tested cell types, even when combined with pre-treatment with MB, and efficiently stimulated cell growth in the non-sensitized osteoblasts. Moreover, a significant induction in the

expression of osteopontin, ALP, and Runx2 in osteoblasts, type I collagen in fibroblasts, and vinculin in endothelial cells could be observed in the irradiated cells. Pre-treatment with MB negatively affected cell differentiation in the unstimulated and laser-stimulated cells. Notably, laser irradiation also caused an increase in the intracellular Ca(2+) in osteoblasts through the activation of TRPC1 ion channels. Moreover, the pharmacologic or genetic inhibition of these channels strongly attenuated laser-induced osteopontin expression, suggesting a role for the laser-mediated Ca(2+) influx in regulating osteoblast differentiation. CONCLUSION: Low pulse energy and high repetition rate Nd:YAG laser irradiation may exert a biostimulative effect on different cells representative of the oral microenvironment, particularly osteoblasts. Pre-treatment with MB prior to irradiation hampers this effect and limits the potential clinical application of photosensitizing dyes in dental practice. Collagen Type I;Core Binding Factor Alpha 1 Subunit;Enzyme Inhibitors;TRPC Cation Channels;transient receptor potential cation channel, subfamily C, member 1;Osteopontin;Vinculin;Alkaline Phosphatase;Calcium;Methylene Blue Alkaline Phosphatase;Animals;Calcium;Cell Proliferation;Cell Survival;Cells, Cultured;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Endothelial Cells;Enzyme Inhibitors;Fibroblasts;Fluorescent Antibody Technique;Humans;Lasers, Solid-State;Low-Level Light Therapy;Methylene Blue;Mice;Mouth Mucosa;Osteoblasts;Osteopontin;Polymerase Chain Reaction;TRPC Cation Channels;Vinculin

Low-intensity laser irradiation stimulates mineralization via increased BMPs in MC3T3-E1 cells. BACKGROUND: Previously, we reported that low-intensity laser irradiation accelerated bone formation, and that this mechanism deeply involved insulin-like growth factor I expression. However, as bone formation is supported by many local factors, the mechanism involved in laser irradiation remains incompletely understood. Therefore, the purpose of this study was to determine the effects of laser irradiation on the osteogenic response in vitro. METHODS: Mouse osteoblast-like cells, MC3T3-E1, were cultured and were irradiated for 5-20 minutes (0.96-3.82 J/cm(2)) at the subconfluent stage using a low-intensity Ga-Al-As diode laser apparatus. After laser irradiation, expression of bone morphogenetic proteins (BMPs), transcription factors (Runx2, Osterix, Dlx5, Msx2), and phosphorylation of Smad1 were determined, and calcium content of cell cultures was also determined. RESULTS: Irradiation at 1.91 J/cm(2) significantly increased the expression of BMPs and Runx2, Osterix, Dlx5, Msx2, and the phosphorylation of Smad1. Noggin, a BMP receptor blocker, inhibited the laser-induced Runx2 expression and phosphorylation of Smad1. Moreover, laser irradiation significantly increased the calcium content of cell cultures, and noggin inhibited this increase. CONCLUSION: These results suggest that low-intensity laser irradiation stimulates in vitro mineralization via increased expression of BMPs and transcription factors associated with osteoblast differentiation. Carrier Proteins;Core Binding Factor Alpha 1 Subunit;Dlx5 protein, mouse;Homeodomain Proteins;MSX2 protein;Runx2 protein, mouse;Smad1 Protein;Smad1 protein, mouse;Sp7 Transcription Factor;Sp7 protein, mouse;Transcription Factors;noggin protein;Calcium Animals;Calcium;Carrier Proteins;Cells, Cultured;Core Binding Factor Alpha 1 Subunit;Homeodomain Proteins;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Osteoblasts;Osteogenesis;Phosphorylation;Smad1 Protein;Sp7 Transcription Factor;Transcription Factors

Mitochondrial signaling for histamine releases in laser-irradiated RBL-2H3 mast cells. BACKGROUND: The low power laser irradiation (LPLI) can promote the wound healing, but the mechanism is still not fully understood. We have found in our previous work that the LPLI induces mast cells to release the histamine and thus suggested that the increased histamine release is probably one of the causes for promoting the wound healing since mast cells have been found to play positive roles in the process of wound healing. This study aims to explore the mechanism of histamine release in RBL-2H3 mast cells under laser irradiations. MATERIALS AND METHODS: The

wavelength effect of laser irradiations, the permeability function of mitochondrial membrane, the Bcl-2 effect, the cytosolic alkalinization and the increment of intracellular Ca(2+) ([Ca(2+)](i)), on histamine release in RBL-2H3 cells were studied, respectively, with the corresponding fluorescence probes. RESULTS: The action bands of laser irradiations were consistent with the absorption bands of cytochrome c oxidase, suggesting that cytochrome c oxidase is the photoacceptor. After laser irradiation, (1) the cytochrome c releases from mitochondrial to cytosol reflecting an increased permeability of mitochondrial membrane, (2) the cytosolic alkalinization appears, (3) [Ca(2+)](i) increases, and (4) finally the enhancement of histamine release occurs. When Bcl-2 was used to inhibit the permeability of mitochondrial membrane these cellular signaling from (1) to (4) were all suppressed obviously. CONCLUSION: As a photoacceptor, cytochrome c oxidase absorbs incident photons and initiates the mitochondrial signaling. When the signals are transferred from the mitochondrial to the cytosol, the cytosolic alkalinization appears leading to the opening of a Ca(2+) channel on the membrane, the transient receptor potential vanilloid (TRPV), and an increment of [Ca(2+)](i). The increased [Ca(2+)](i) consequently mediates an enhanced histamine release. Such a responding chain is a suggested mechanism to understand the histamine release in RBL-2H3 cells under laser irradiations. Electron Transport Complex IV;Calcium Animals;Calcium;Calcium Signaling;Cell Line, Tumor;Cytosol;Electron Transport Complex IV;Histamine Release;Hydrogen-Ion Concentration;Low-Level Light Therapy;Mast Cells;Mitochondria;Permeability;Rats

Irradiation at 830 nm stimulates nitric oxide production and inhibits pro-inflammatory cytokines in diabetic wounded fibroblast cells. BACKGROUND AND OBJECTIVE: Wound healing in diabetic patients remains a chief problem in the clinical setting and there is a strong need for the development of new, safe, reliable therapies. This study aimed to establish the effect of irradiating diabetic wounded fibroblast cells (WS1) in vitro on pro-inflammatory cytokines and the production of nitric oxide (NO). MATERIALS AND METHODS: Normal, wounded and diabetic wounded WS1 cells were exposed to an 830 nm laser with 5 J/cm(2) and incubated for a pre-determined amount of time. Changes in cellular viability, proliferation and apoptosis were evaluated by the Trypan blue assay, VisionBlue fluorescence assay and caspase 3/7 activity respectively. Changes in cytokines (interleukin--IL-6, IL-1 beta and tumour necrosis factor-alpha, TNF-alpha) were determined by ELISA. NO was determined spectrophotometrically and reactive oxygen species (ROS) was evaluated by immunofluorescent staining. RESULTS: Diabetic wounded WS1 cells showed no significant change in viability, a significant increase in proliferation at 24 and 48 hours ($P<0.001$ and $P<0.01$ respectively) and a decrease in apoptosis 24 hours post-irradiation ($P<0.01$). TNF-alpha levels were significantly decreased at both 1 and 24 hours ($P<0.05$), while IL-1 beta was only decreased at 24 hours ($P<0.05$). There was no significant change in IL-6. There was an increase in ROS and NO ($P<0.01$) 15 minutes post-irradiation. CONCLUSION: Results show that irradiation of diabetic wounded fibroblast cells at 830 nm with 5 J/cm(2) has a positive effect on wound healing in vitro. There was a decrease in pro-inflammatory cytokines (IL-1 beta and TNF-alpha) and irradiation stimulated the release of ROS and NO due to what appears to be direct photochemical processes. Cytokines;Reactive Oxygen Species;Nitric Oxide Apoptosis;Cell Proliferation;Cells, Cultured;Cytokines;Diabetes Mellitus;Enzyme-Linked Immunosorbent Assay;Fibroblasts;Humans;Low-Level Light Therapy;Nitric Oxide;Reactive Oxygen Species;Wound Healing

Effect of laser therapy on DNA damage. BACKGROUND AND OBJECTIVE: Whereas the biostimulative effect on tissues using low intensity laser therapy for treating many diseases has been described, the photobiological basis and adverse effects are not well understood. The aim of this study, using experimental models, is to observe the combined effect of physical damage (laser) and a chemical agent (hydrogen peroxide) on Escherichia coli cultures and bacterial plasmids. MATERIALS AND METHODS: Survival of E. coli AB1157 (wild type) and BW9091 (xth(-)) cultures were used as an

experimental model to assess the effect of agents on DNA, also agarose gel electrophoretic profile of bacterial plasmids for studying single and double strand breaks in DNA exposed to laser irradiation and in DNA pre-exposed to laser and subsequently incubated with hydrogen peroxide. RESULTS: Data indicate low intensity laser: (i) did not alter the survival of E. coli cultures, (ii) pre-exposure had a protective effect against lethal action of hydrogen peroxide on E. coli cultures, and (iii) did not alter the electrophoretic profile and action of hydrogen peroxide on plasmids. This suggests that low intensity therapeutic red laser doses at different emission modes induces sub-lethal effects on E. coli wild type and exonuclease III mutant cultures inducing protective mechanisms against lethal action of hydrogen peroxide. Laser action on bacterial plasmids is related to lesions other than single or double DNA strands breaks. CONCLUSIONS: This study shows a protective effect or DNA repair mechanism induction by pre-exposure to low intensity red laser on the lethal action of oxidant agents and, therefore, laser therapy protocol should consider fluencies, wavelength and tissue conditions before beginning treatment. DNA, Bacterial;Oxidants;Hydrogen Peroxide DNA Damage;DNA Repair;DNA, Bacterial;Electrophoresis, Agar Gel;Escherichia coli;Hydrogen Peroxide;Laser Therapy;Oxidants;Plasmids

Effect of pulsing in low-level light therapy. BACKGROUND AND OBJECTIVE: Low level light (or laser) therapy (LLLT) is a rapidly growing modality used in physical therapy, chiropractic, sports medicine and increasingly in mainstream medicine. LLLT is used to increase wound healing and tissue regeneration, to relieve pain and inflammation, to prevent tissue death, to mitigate degeneration in many neurological indications. While some agreement has emerged on the best wavelengths of light and a range of acceptable dosages to be used (irradiance and fluence), there is no agreement on whether continuous wave or pulsed light is best and on what factors govern the pulse parameters to be chosen. STUDY DESIGN/MATERIALS AND METHODS: The published peer-reviewed literature was reviewed between 1970 and 2010. RESULTS: The basic molecular and cellular mechanisms of LLLT are discussed. The type of pulsed light sources available and the parameters that govern their pulse structure are outlined. Studies that have compared continuous wave and pulsed light in both animals and patients are reviewed. Frequencies used in other pulsed modalities used in physical therapy and biomedicine are compared to those used in LLLT. CONCLUSION: There is some evidence that pulsed light does have effects that are different from those of continuous wave light. However further work is needed to define these effects for different disease conditions and pulse structures. Adenosine Triphosphate Adenosine Triphosphate;Animals;Brain Ischemia;Cerebral Cortex;Humans;Lasers;Low-Level Light Therapy;Nerve Regeneration;Neural Conduction;Pain Management;Stroke;Wound Healing

Introduction to experimental and clinical studies using low-level laser (light) therapy (LLLT). Animals;Humans;Phototherapy

In vivo microscopic approaches for facial melanocytic lesions after quality-switched ruby laser therapy: time-sequential imaging of melanin and melanocytes of solar lentigo in Asian skin. BACKGROUND: The quality-switched ruby laser (QSRL) has been widely used for the treatment of pigmented lesions, but clinical evaluations in most studies have been conducted on macroscopic skin color observation comparing the laser-treated skin with its nontreated surrounding area. A few investigations examined skin changes after laser therapy at a cellular level, but almost none did so noninvasively. OBJECTIVE: To elucidate the dynamic changes after QSRL irradiation of facial solar lentigo using noninvasive optical techniques. MATERIALS AND METHODS: Time-sequential imaging of Japanese female patients with a clinical diagnosis of solar lentigo was performed using ultraviolet photography, high-magnification videomicroscopy, and reflectance-mode confocal microscopy to examine pigmentary change after QSRL irradiation. RESULTS: The present study showed that remaining melanocytes were visible in the solar lentigo of all subjects when crusts peeled off, despite

hardly observable skin pigmentation to the naked eye. Moreover, noninvasive confocal imaging revealed that pigmented melanocytes varied in each solar lentigo after QSRL treatment, as indicated by melanin reflection level. CONCLUSIONS: Optical techniques facilitate the evaluation of the in vivo dynamics of epidermal-melanocytic changes in solar lentigo after QSRL therapy and may be useful for monitoring outcomes after laser irradiation. Melanins Adult;Asian People;Cohort Studies;Dermoscopy;Face;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Melanins;Melanocytes;Microscopy, Confocal;Microscopy, Electron, Transmission;Time Factors;Treatment Outcome

New clinical outcomes utilizing a 1064-nm Nd:YAG laser for lipolysis of the torso oblique region. OBJECTIVES: The safety and efficacy of a 1064-nm Nd:YAG laser (Cynosure, Westford, USA) utilizing a 300-microm optical fiber and a 1-mm diameter micro-cannula were evaluated as a treatment for reduction in the appearance or elimination of unwanted fat in the lower back/flanks ('love handles'). In addition, the use of the laser for tightening the skin and collagen regeneration in the area of lipolysis was assessed through biopsies. METHODS: Ten subjects with unwanted flaccidity and fat deposits in the oblique region of the torso were enrolled in the study. Subjects underwent a single laser lipolysis treatment followed by aspiration of the treatment area. The total tumescence used, laser energy delivered, and tissue removed was recorded for each subject. All subjects had baseline photographs taken and their weight recorded prior to treatment. Pregnancy tests (if applicable) were performed prior to treatment as well. Three subjects had 4-mm biopsies taken at baseline and 6 months to evaluate collagen regeneration. Collagen and elastic tissue fibers were evaluated using special routine stains and histochemical stains designed to highlight these dermal components. Follow-up visits were conducted at 1 week, 1 month, 3 months and 6 months following treatment to evaluate side effects, weight loss and laxity. Additionally, patients kept an evaluation log for each of the first 7 days following treatment. At the 6-month conclusion, patient satisfaction was recorded. RESULTS: Laser lipolysis procedures with subsequent aspiration were performed bilaterally on the flanks of 10 subjects. At 1-week post-treatment, 80% of the subjects demonstrated reduction in laxity. Similarly, 100% of patients showed visible skin improvement at 1 month, with 70% recording a score of 2 (good improvement). Three-month evaluations yielded one patient (10%) with a score of 3 (excellent improvement) and seven patients (70%) with a score of 2. Histology reports confirmed the visual clinical outcomes, describing thicker collagen bundles at 6 months, as well as coagulation of blood vessels and adipocytes. Side effects were mild and transient in nature, and the majority of discomfort, redness, bruising, swelling, and tingling experienced was resolved within 1 week post-procedure. The treatment was well tolerated and efficacious, with 90% of patients rating their results as good or excellent and 100% of patients reporting that they would recommend the procedure. CONCLUSION: The use of the 1064-nm Nd:YAG laser with a 300-microm fiber demonstrated the ability to treat adipose tissue in the highly vascular flank area with favorable efficacy and safety. Patients exhibited a quick recovery time and excellent tolerance, as well as visually improved skin. Collagen Adult;Biopsy;Collagen;Elastic Tissue;Female;Humans;Lasers, Solid-State;Lipectomy;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Regeneration

Low-level laser therapy stimulates mineralization via increased Runx2 expression and ERK phosphorylation in osteoblasts. OBJECTIVE: This study examined the effects of low-level laser therapy (LLLT) on osteoblasts via insulin-like growth factor I (IGF-I) signal transduction. BACKGROUND: Because orthodontic treatment is usually accompanied by bone formation, if bone formation can be promoted, the treatment and retention periods will be shorter. Recently, we reported the stimulatory effects of LLLT on bone formation. It was dependent on increased IGF-I, which plays an essential role in the anabolic regulation of bone metabolism. However, the signal transduction of IGF-I stimulated by LLLT was not elucidated. MATERIALS AND METHODS: Mouse

osteoblastic MC3T3-E1 cells were cultured with or without LLLT (0.96-3.82 J/cm(2)), and the expression of IGF-I and Runt-related transcription factor 2 (Runx2) and the phosphorylation of extracellular-signal-regulated kinase (ERK) were determined by using real-time PCR and Western blot analysis. RESULTS: LLLT at 1.91 J/cm(2) significantly increased the expression of IGF-I and Runx2 and of ERK phosphorylation. Cyclolignan picropodophyllin (PPP; an IGF-I receptor inhibitor) partly inhibited the LLLT-induced expression of these factors. Moreover, when conditioned medium from the LLLT (1.91 J/cm(2)) cells was added to the MC3T3-E1 culture, the calcium content in the mineralized nodules increased significantly. PPP or noggin [a bone morphogenetic protein (BMP) antagonist] partly inhibited the LLLT-induced change in calcium content, and the addition of both PPP and noggin inhibited most of the LLLT-induced change in calcium content. CONCLUSION: These results suggest that LLLT stimulates in vitro mineralization through increased IGF-I and BMP production, through Runx2 expression and ERK phosphorylation in osteoblasts. Bone Morphogenetic Proteins;Core Binding Factor Alpha 1 Subunit;Culture Media, Conditioned;Insulin-Like Growth Factor I;Protein Kinases 3T3 Cells;Animals;Blotting, Western;Bone Morphogenetic Proteins;Calcification, Physiologic;Core Binding Factor Alpha 1 Subunit;Culture Media, Conditioned;Insulin-Like Growth Factor I;Low-Level Light Therapy;Mice;Osteoblasts;Phosphorylation;Protein Kinases;Signal Transduction

Theoretic, experimental, clinical bases of the water oscillator hypothesis in near-infrared photobiomodulation. The objective of this review is to propose and document a role for the water oscillator in near-infrared (NIR) photobiomodulation. Greater understanding of the role of the water oscillator may add to a more-coherent description of central effects of NIR light on redox centers and key transmembrane enzymes such as cytochrome c oxidase (CcO). In addition, water provides a complementary pathway for absorption and transportation of NIR energy in photobiomodulation. Because of its unexpected potential, we propose terming it the "water oscillator paradox." Photobiologic mechanisms involved in the treatment of complex diseases are discussed in light of the present state of the art. Macromolecular Substances;Photosynthetic Reaction Center Complex Proteins;Water Absorption;Energy Transfer;Humans;Infrared Rays;Low-Level Light Therapy;Macromolecular Substances;Neoplasms;Oxidation-Reduction;Photosynthetic Reaction Center Complex Proteins;Radiation;Water

A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. Low back pain (LBP) is a common and disabling disorder in western society. The management of LBP comprises a range of different intervention strategies including surgery, drug therapy, and non-medical interventions. The objective of the present study is to determine the effectiveness of physical and rehabilitation interventions (i.e. exercise therapy, back school, transcutaneous electrical nerve stimulation (TENS), low level laser therapy, education, massage, behavioural treatment, traction, multidisciplinary treatment, lumbar supports, and heat/cold therapy) for chronic LBP. The primary search was conducted in MEDLINE, EMBASE, CINAHL, CENTRAL, and PEDro up to 22 December 2008. Existing Cochrane reviews for the individual interventions were screened for studies fulfilling the inclusion criteria. The search strategy outlined by the Cochrane Back Review Groups (CBRG) was followed. The following were included for selection criteria: (1) randomized controlled trials, (2) adult (â‰¥ 18 years) population with chronic (â‰¥ 12 weeks) non-specific LBP, and (3) evaluation of at least one of the main clinically relevant outcome measures (pain, functional status, perceived recovery, or return to work). Two reviewers independently selected studies and extracted data on study characteristics, risk of bias, and outcomes at short, intermediate, and long-term follow-up. The GRADE approach was used to determine the quality of evidence. In total 83 randomized controlled trials met the inclusion criteria: exercise therapy (n = 37), back school (n = 5), TENS (n = 6), low level laser therapy (n = 3), behavioural

treatment (n = 21), patient education (n = 1), traction (n = 1), and multidisciplinary treatment (n = 6). Compared to usual care, exercise therapy improved post-treatment pain intensity and disability, and long-term function. Behavioural treatment was found to be effective in reducing pain intensity at short-term follow-up compared to no treatment/waiting list controls. Finally, multidisciplinary treatment was found to reduce pain intensity and disability at short-term follow-up compared to no treatment/waiting list controls. Overall, the level of evidence was low. Evidence from randomized controlled trials demonstrates that there is low quality evidence for the effectiveness of exercise therapy compared to usual care, there is low evidence for the effectiveness of behavioural therapy compared to no treatment and there is moderate evidence for the effectiveness of a multidisciplinary treatment compared to no treatment and other active treatments at reducing pain at short-term in the treatment of chronic low back pain. Based on the heterogeneity of the populations, interventions, and comparison groups, we conclude that there are insufficient data to draw firm conclusion on the clinical effect of back schools, low-level laser therapy, patient education, massage, traction, superficial heat/cold, and lumbar supports for chronic LBP. Humans;Low Back Pain;Physical Therapy Modalities;Treatment Outcome
Laser phototherapy in the treatment of periodontal disease. A review. Many studies in the literature address the effect of low-power lasers in the management of pathologies related to periodontal tissues. Due to the lack of standardized information and the absence of a consensus, this review presents the current status of laser phototherapy (LPT) in periodontics and discusses its benefits and limits in the treatment of periodontal disease. The literature was searched for reviews and original research articles relating to LPT and periodontal disease. The articles were selected using either electronic search engines or manual tracing of the references cited in key papers. The literature search retrieved references on wound and bone healing, analgesia, hypersensitivity, inflammatory process and antimicrobial photodynamic therapy. Each topic is individually addressed in this review. The current literature suggests that LPT is effective in modulating different periodontal disease aspects in vitro, in animals, and in simple clinical models. Further development of this therapy is now dependent on new clinical trials with more complex study designs. Matrix Metalloproteinase 8;Dinoprostone Analgesia;Animals;Bacterial Infections;Bone and Bones;Dentin Sensitivity;Dinoprostone;Humans;Low-Level Light Therapy;Matrix Metalloproteinase 8;Pain;Periodontal Diseases;Photochemotherapy;Regeneration;Wound Healing
Lasers in dental traumatology. AIM: Dental traumas are frequent in children. They can be complex events and sometimes real emergencies. Since very little attention is devoted to this topic in the international literature and there are no well-coded laser guidelines for these specific clinical events, our aim is to consider and present those situations in which laser-assisted therapy can offer new treatment possibilities. The authors' aim is to stimulate more extensive scientific research in this area, which might not only increase the use of these technologies, but also improve outcomes and reduce complications connected to dental trauma, particularly in children. Furthermore, laser-assisted therapies drastically reduce the need for analgesics and anti- inflammatory medications compared with conventional procedures. CONCLUSION: Using laser equipment to obtain anaesthesia is another challenge, while the use of low power setting for desensitising tissue and to obtain anaesthesia is also an open field. Adolescent;Child;Humans;Lasers, Solid-State;Low-Level Light Therapy;Pain, Postoperative;Periodontium;Pulpotomy;Tooth Bleaching;Tooth Fractures
Low-level laser therapy for the treatment of epidermolysis bullosa: a case report. Epidermolysis bullosa (EB) is a rare group of diseases characterized by skin fragility. There is no specific treatment, short of protection from trauma, currently available for these patients. Low-level laser therapy (LLLT) was effective as an analgesic and in accelerating cutaneous wound healing after six sessions of

therapy in a child with dystrophic EB with cutaneous scarring and blisters on the limbs and trunk.
Child, Preschool;Epidermolysis Bullosa;Female;Humans;Low-Level Light Therapy

Pseudodysplastic epithelial artefacts associated with oral mucosa CO2 laser excision: an assessment of margin status. Using a CO(2) laser beam for biopsy is compromised by thermal cytological artefacts that could be critical when assessing dysplastic changes, as they may simulate cytological atypia. This study examined wounds caused by CO(2) laser, evaluating their size and features, utilizing 25 Sprage rats randomly allocated to five groups: four glossectomized using a CO(2) laser at 3, 6, 9 and 12 W and a control group treated with a conventional scalpel. Samples were prepared in 4 microm sections, stained, and studied double-blind by two pathologists. The artefacts identified included cellular and nuclear polymorphism, nuclear hyperchromatism and loss of intercellular adherence; they were mainly located in the basal and suprabasal layers of the oral epithelium. Number of artefacts per specimen did not differ between experimental groups. The width of epithelial damage adjacent to the laser incisions revealed 298.7+/-150.7 microm of damaged tissue (range 100-750 microm), with no differences between low (3 W) and high wattages (6, 9 and 12 W) (X(i)-X(j)=41.6; 95% CI=-125.1 to 208.4). No changes were observed in the control group. CO(2) laser (3-12 W) generates epithelial damage that can simulate light dysplasia with atypias mainly affecting basal and suprabasal layers that may lead to erroneous therapy.
Animals;Artifacts;Biopsy;Glossectomy;Lasers, Gas;Low-Level Light Therapy;Mouth Mucosa;Mouth Neoplasms;Random Allocation;Rats;Rats, Sprague-Dawley

Phenotype characterization of pericytes during tissue repair following low-level laser therapy. BACKGROUND/PURPOSE: The action of low-level laser therapy (LLLT) on pericytes during wound healing is not well established. The objective of this study was to identify the effect of laser treatment on pericytes during tissue repair. METHODS: Punch biopsies were performed on 40 Wistar rats. Twenty animals had their wounds treated with a dose of 4 J/cm(2) using a 670 nm diode laser (9 mW output, 0.031 W/cm(2)) every other day, while the controls received sham irradiation. Animals were sacrificed 3, 7, 10 and 14 days after punch biopsy. Immunohistochemistry staining with anti-desmin, anti-smooth muscle alpha-actin and anti-NG2 antibodies was used to characterize and count pericytes around blood vessels and myofibroblasts dispersed in the extracellular matrix (ECM). The morphology of pericytes was confirmed by transmission electronic microscopy. RESULTS: The laser group exhibited significantly more smooth muscle alpha-actin-positive staining cells at day 7 and more desmin-positive staining cells at day 10 around blood vessels. Laser treatment was also associated with higher numbers of NG2-positive staining cells, especially on days 3 and 7 post-biopsy ($P<0.05$). Ultrastructural findings confirmed the presence of pericytes sharing the basal membrane with endothelial cells. CONCLUSION: LLLT stimulated the proliferation and migration of pericytes to the ECM and their phenotypic modulation to myofibroblasts.
Animals;Immunohistochemistry;Laser Therapy;Microscopy, Electron, Transmission;Pericytes;Phenotype;Rats;Rats, Wistar;Wound Healing

Effect of light-emitting diodes therapy (LEDT) on knee extensor muscle fatigue. OBJECTIVE: The purpose of this study was to evaluate the effects of light-emitting diodes therapy (LEDT) on quadriceps muscle fatigue by using torque values from the isokinetic dynamometer as an outcome measure. BACKGROUND DATA: Light therapy is considered an innovative way to prevent muscle fatigue. Although positive results have been obtained in animal models and in clinical experiments, no results are available on the effects of this therapeutic modality on human performance studies with isokinetic dynamometry. MATERIALS AND METHODS: Seventeen healthy and physically active male volunteers were included in a crossover randomized double-blinded placebo-controlled trial. They performed two sessions of an isokinetic fatigue test (30 maximal concentric knee flexion-extension contractions; range of motion, 90 degrees; angular velocity, 180 degrees per second) after LEDT or

placebo treatment. Maximal knee extensor muscle isokinetic voluntary contractions were performed before (PRE-MVC) and after (POST-MVC) the fatigue test. LEDT treatment was performed with a multidiode cluster probe (34 red diodes of 660â€‰nm, 10â€‰mW; 35 infrared diodes of 850â€‰nm, 30â€‰mW) at three points of the quadriceps muscle, with a total irradiating dose of 125.1â€‰J. RESULTS: No differences were observed in the PRE-MVC between LEDT (284.81â€‰Â±â€‰4.52â€‰Nm) and placebo (282.65â€‰Â±â€‰52.64â€‰Nm) treatments. However, for the POST-MVC, higher torques (pâ€‰=â€‰0.034) were observed for LEDT (237.68â€‰Â±â€‰48.82â€‰Nm) compared with placebo (225.68â€‰Â±â€‰44.14â€‰Nm) treatment. CONCLUSION: LEDT treatment produced a smaller maximal isometric torque decrease after high-intensity concentric isokinetic exercise, which is consistent with an increase in performance. Adolescent;Adult;Cross-Over Studies;Double-Blind Method;Exercise Test;Humans;Knee Joint;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Range of Motion, Articular;Recovery of Function;Reference Values;Young Adult

Electrotherapy: yesterday, today and tomorrow. The use of electrotherapy has been part of physical therapy treatment for the past few decades. There have been numerous modalities used such as TENS, interferential, diathermy, magnetic therapy, ultrasound, laser and surface electromyography to name a few. There has been an upsurge in the past decade of new and innovative modalities. There needs to be extensive research on each of these electrotherapy devices to determine the proper use of each device. Electric Stimulation Therapy;Electromyography;History, 19th Century;History, 20th Century;History, 21st Century;Humans;Low-Level Light Therapy;Magnetic Field Therapy

[Application of low-intensive laser irradiation in the treatment of perforative gastroduodenal ulcers]. Comparative analysis of results of surgical treatment, performed for perforative gastroduodenal ulcers in the patients, lacking H. pylori (control group) and owing this etiologic factor (main group), was conducted. Together with other conventional schemes of medicinal treatment in the early postoperative period a low-intensive irradiation of He-Ne laser was applied. Complete eradication of H. pylori was noted in 95.8% patients of the main group. In a late follow-up period (in 1-5 yrs observation terms) the frequency of recurrence, hemorrhage, pyloroduodenal stenosis and other surgical complications, occurring in the main group, was lesser than in a control one. Adolescent;Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Female;Follow-Up Studies;Helicobacter Infections;Helicobacter pylori;Humans;Low-Level Light Therapy;Male;Middle Aged;Peptic Ulcer Perforation;Recurrence;Treatment Outcome;Young Adult

A systematic review of conservative interventions for osteoarthritis of the hand. STUDY DESIGN: Systematic Review. INTRODUCTION: Hand therapy interventions for patients with hand osteoarthritis (OA) can include splinting, joint protection technique instruction, paraffin, exercises, and provision of a home exercise program. PURPOSE: Examine the quality of the evidence regarding the hand therapy interventions for hand OA. METHODS: Twenty-one studies dated between 1986 and 2009 were included in the systematic review for analysis. RESULTS: The current evidence provides varied support for the interventions of orthotics, hand exercises, joint protection techniques, the utilization of adaptive devices, and paraffin. Findings for the use of joint protection techniques are supported for improvements in function and pain reduction. Minimal evidence exists for paraffin used for the treatment of hand OA. CONCLUSIONS: The current literature supports the use of orthotics, hand exercises, application of heat, and joint protection education combined with provision of adaptive equipment to improve grip strength and function. LEVEL OF EVIDENCE: 2A. Paraffin Cryotherapy;Exercise Therapy;Hand;Hand Strength;Hot Temperature;Humans;Low-Level Light Therapy;Orthotic Devices;Osteoarthritis;Pain Measurement;Paraffin;Research Design;Splints

Incorporating modalities into the rehab mix. Exploring pain solutions for athletes and weekend warriors. Athletic Injuries;Athletic Tape;Electric Stimulation Therapy;Humans;Iontophoresis;Low-Level Light Therapy;Physical Therapy Modalities;Ultrasonic Therapy

Biological effects of a semiconductor diode laser on human periodontal ligament fibroblasts. PURPOSE: It has been reported that low-level semiconductor diode lasers could enhance the wound healing process. The periodontal ligament is crucial for maintaining the tooth and surrounding tissues in periodontal wound healing. While low-level semiconductor diode lasers have been used in low-level laser therapy, there have been few reports on their effects on periodontal ligament fibroblasts (PDLFs). We performed this study to investigate the biological effects of semiconductor diode lasers on human PDLFs. METHODS: Human PDLFs were cultured and irradiated with a gallium-aluminum-arsenate (GaAlAs) semiconductor diode laser of which the wavelength was 810 nm. The power output was fixed at 500 mW in the continuous wave mode with various energy fluencies, which were 1.97, 3.94, and 5.91 J/cm(2). A culture of PDLFs without laser irradiation was regarded as a control. Then, cells were additionally incubated in 72 hours for MTS assay and an alkaline phosphatase (ALPase) activity test. At 48 hours post-laser irradiation, western blot analysis was performed to determine extracellular signal-regulated kinase (ERK) activity. ANOVA was used to assess the significance level of the differences among groups ($P<0.05$). RESULTS: At all energy fluencies of laser irradiation, PDLFs proliferation gradually increased for 72 hours without any significant differences compared with the control over the entire period taken together. However, an increment of cell proliferation significantly greater than in the control occurred between 24 and 48 hours at laser irradiation settings of 1.97 and 3.94 J/cm(2) ($P<0.05$). The highest ALPase activity was found at 48 and 72 hours post-laser irradiation with 3.94 J/cm(2) energy fluency ($P<0.05$). The phosphorylated ERK level was more prominent at 3.94 J/cm(2) energy fluency than in the control. CONCLUSIONS: The present study demonstrated that the GaAlAs semiconductor diode laser promoted proliferation and differentiation of human PDLFs.

Review conclusion for low-level laser therapy in shoulder impingement syndrome appears to be sensitive to alternative interpretations of trial results. Humans;Low-Level Light Therapy;Shoulder Impingement Syndrome;Treatment Outcome

Low level laser therapy before eccentric exercise reduces muscle damage markers in humans. The purpose of the present study was to determine the effect of low level laser therapy (LLLT) treatment before knee extensor eccentric exercise on indirect markers of muscle damage. Thirty-six healthy men were randomized in LLLT group (n = 18) and placebo group (n = 18). After LLLT or placebo treatment, subjects performed 75 maximal knee extensors eccentric contractions (five sets of 15 repetitions; velocity = 60Â° seg(-1); range of motion = 60Â°). Muscle soreness (visual analogue scale--VAS), lactate dehydrogenase (LDH) and creatine kinase (CK) levels were measured prior to exercise, and 24 and 48 h after exercise. Muscle function (maximal voluntary contraction--MVC) was measured before exercise, immediately after, and 24 and 48 h post-exercise. Groups had no difference on kineanthropometric characteristics and on eccentric exercise performance. They also presented similar baseline values of VAS (0.00 mm for LLLT and placebo groups), LDH (LLLT = 186 IU/l; placebo = 183 IU/l), CK (LLLT = 145 IU/l; placebo = 155 IU/l) and MVC (LLLT = 293 Nm; placebo = 284 Nm). VAS data did not show group by time interaction ($P = 0.066$). In the other outcomes, LLLT group presented (1) smaller increase on LDH values 48 h post-exercise (LLLT = 366 IU/l; placebo = 484 IU/l; $P = 0.017$); (2) smaller increase on CK values 24 h (LLLT = 272 IU/l; placebo = 498 IU/l; $P = 0.020$) and 48 h (LLLT = 436 IU/l; placebo = 1328 IU/l; $P < 0.001$) post-exercise; (3) smaller decrease on MVC immediately after exercise (LLLT = 189 Nm; placebo = 154 Nm; $P = 0.011$), and 24 h (LLLT = 249 Nm; placebo = 205 Nm; $P = 0.004$) and 48 h (LLLT = 267 Nm; placebo = 216 Nm; $P = 0.001$) post-exercise

compared with the placebo group. In conclusion, LLLT treatment before eccentric exercise was effective in terms of attenuating the increase of muscle proteins in the blood serum and the decrease in muscle force. Biomarkers;L-Lactate Dehydrogenase;Creatine Kinase Adult;Biomarkers;Creatine Kinase;Exercise;Humans;Knee Joint;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Muscle Contraction;Muscle, Skeletal;Pain;Young Adult

Laser hair removal following reconstructive surgery. Adult;Female;Hair Removal;Humans;Hypertrichosis;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome

[Effects of low-level laser irradiation on rat mesenteric microcirculatory disturbance during early stage of endotoxemia]. OBJECTIVE: To observe the effects of low-level laser irradiation on mesenteric microcirculation of rats in vivo in the early stage of endotoxemia (ETM). METHODS: The experimental model of ETM was reproduced by injection of lipopolysaccharide (LPS). Sixty healthy male Sprague-Dawley (SD) rats were divided into three groups used random number table: control group, LPS group and low-level laser irradiation group, each group included 20 rats which were subdivided into four temporal subgroups (1, 2, 4, 6 hours, respectively). In low-level laser irradiation group, the rats were irradiated by type SLT semiconductor laser (650 nm, 5 mW) on unilateral femoral artery and vein, and blood vessel of the ear concurrently for 30 minutes. The interference course was vertical irradiation taken at 30 minutes after the injection of LPS. At 1, 2, 4, 6 hours after the injection of LPS, changes in mesenteric microcirculation and microcirculatory blood flow were recorded with the laser Doppler flowmeter, the velocity of red blood cells in venules was observed, and the number of open capillaries and adherent leukocytes were recorded. RESULTS: The blood flow velocity (mm/s) of the mesenteric microcirculation in LPS group was accelerated at 1 hour and 2 hours after LPS injection (1 hour: 0.190+/-0.007 vs. 0.174+/-0.009, 2 hours: 0.200+/-0.010 vs. 0.172+/-0.015, both $P<0.05$, respectively), but decelerated at 6 hours (0.116+/-0.015 vs. 0.164+/-0.011, $P<0.05$). The blood flow volume in the mesenteric vessels and the number of open capillaries did not show any significant change at that time. Significant increase in number of adherent leukocytes was observed at 2, 4, 6 hours after injury (2 hours: 2.60+/-1.14 vs. 0.40+/-0.55, 4 hours: 5.40+/-0.89 vs. 0.40+/-0.55, 6 hours : 5.40+/-1.52 vs. 0.60+/-0.90, all $P<0.05$, respectively). The state of blood flow in the microcirculation became abnormal. After irradiated with laser in low dose, the blood flow velocity was smooth and stable (mm/s, 1 hour: 0.174+/-0.011, 2 hours: 0.180+/-0.023, 4 hours: 0.168+/-0.013, 6 hours: 0.162+/-0.023), and the number of adherent leukocytes was reduced significantly at 4 hours and 6 hours than that in LPS group (4 hours: 2.00+/-0.71 vs. 5.40+/-0.89, 6 hours: 2.60+/-1.52 vs. 5.40+/-1.52, both $P<0.05$) and the microcirculatory flow state was improved obviously. CONCLUSION: Low-level laser irradiation may ameliorate the local mesenteric microcirculation, alleviate the microcirculatory disorder in early stage of ETM. Animals;Disease Models, Animal;Endotoxemia;Low-Level Light Therapy;Male;Mesentery;Microcirculation;Rats;Rats, Sprague-Dawley

BIOMECHANICAL AND HISTOLOGICAL ANALYSIS OF THE GASTROCNEMIUS IN RATS SUBJECTED TO MUSCLE INJURY AND TREATMENT WITH LOW-LEVEL LASER THERAPY. OBJECTIVE: To mechanically and histologically evaluate the application of low-level laser therapy to the reparative process on lesions caused by impact on the gastrocnemius muscles of rats. METHODS: 45 female Wistar rats were divided into three groups (n=15/ group): C (control, no lesion), ML (muscle lesion) and ML-L (muscle lesion and laser therapy). The experimental muscle lesion was produced by letting a 250 g load drop from a height of 30 cm, directly onto the muscle. The animals in the ML-L group were subjected to application of 960 nm laser, 2 J/cm(2), on the lesion site, for three days, twice a day. Mechanical tests were performed on an Emic(Â®) universal testing machine. RESULTS: The mean values for the maximum force were: 35.70 (Â± 2.69) N in group C, 31.77 (Â± 2.59) N in group ML and

34.36 (Â± 3.63) N in group ML-L, with a statistically significant difference between groups C and ML ($p < 0.05$). The mean values for relative stiffness were: 3.75 (Â± 0.98) N/mm in group C, 3.84 (Â± 0.32) N/mm in group ML and 4.43 (Â± 0.68) N/mm in group ML-L, with no statistically significant differences ($p>0.05$). Histological analysis showed the presence of blood vessels in group ML-L and hematomas during the repair process. CONCLUSION: Laser therapy had a positive effect on the regeneration process of the muscle injury.

Low-level laser therapy of dentin hypersensitivity: a short-term clinical trial. The aim of this study was to evaluate low-level laser therapy in cervical dentin hypersensitivity. A randomized controlled clinical trial was conducted with a total of 64 teeth. Dentin desensitizer and diode laser were applied on the cervical dentin surfaces. Distilled water and placebo laser was used as the placebo groups. The irradiance used was 4 J/cm(2) per treatment site. The baseline measurement of hypersensitivity was made by using visual analog scale (VAS). Twenty-four hours and 7 days after the application of desensitizer, diode laser and placebo groups, a new VAS analysis was conducted for the patients' sensitivity level. The mean pain scores of placebo groups were significantly higher than the desensitizer's and diode laser's mean scores (ANOVA, $p < 0.05$). The VAS analysis revealed a significant decrease in dentin hypersensitivity in 7 days with the use of the desensitizer and low-level laser therapy and no statistically significant difference was observed between these two treatments ($p > 0.05$). Although low-level laser and glutaraldehyde containing desensitizer present distinct modes of action, experimental agents caused a significant reduction of dentin hypersensitivity without showing secondary effects, not irritating the pulp or causing pain, not discoloring or staining the teeth, and not irritating the soft tissues at least for a period of 1 week with no drawbacks regarding handling and/or ease of application. Low-level laser therapy and desensitizer application had displayed similar effectiveness in reducing moderate dentin hypersensitivity. Dentin Desensitizing Agents;Glutaral Adult;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Glutaral;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Time Factors;Young Adult

[Role of endogenous porphyrins in laser therapy of experimental skin wounds]. The role of endogenous porphyrins in the effect of laser irradiation on the superoxide dismutase (SOD) activity of wound exudate and rat leukocyte activity has been studied on models of aceptic incised skin wounds. Wounds were irradiated by a He-Ne laser (632.8 nm, 1.5 J/cm2) on the 2nd, 3rd, and 4th days after the beginning of the experiment. Irradiation effects were evaluated by the SOD activity (NBT test) and the activity of leukocytes of wound exudate (as a chemiluminescent response to opsonized zymosan). It was found that in animals subjected to laser irradiation, the SOD activity sharply increased. This effect depended on endogenous porphyrin concentration and was retained throughout the experiment. The SOD activity in unirradiated animals decreased from the 2nd to the 5th day of experiment. The evaluation of the activity of wound exudate leukocytes did not reveal any distrinct dependence of the effect on the concentration of endogenous porphyrins. Porphyrins;Superoxide Dismutase Animals;Exudates and Transudates;Lasers, Gas;Leukocytes;Low-Level Light Therapy;Male;Porphyrins;Rats;Skin;Spectrometry, Fluorescence;Superoxide Dismutase

Red-light light-emitting diode irradiation increases the proliferation and osteogenic differentiation of rat bone marrow mesenchymal stem cells. OBJECTIVE: The objective of this study was to investigate the effects on the proliferation and osteogenic differentiation of rat mesenchymal stem cells (MSCs) by using red-light light-emitting diode (LED) irradiation. BACKGROUND DATA: Low-level light irradiation (LLLI) has been shown to enhance proliferation and cytokine secretion of a number of cells. MSCs are capable of regenerating various mesenchymal tissues and are essential in supporting the growth and differentiation of hematopoietic stem cells within the bone marrow. MATERIALS AND

METHODS: Rat bone marrow MSCs were treated with single or multiple doses of LLLI from an LED array (630 nm) at the irradiances of 5 and 15 mW/cm(2), and radiant exposures of 2 and 4 J/cm(2). The proliferation, clonogenic potential, and osteogenic differentiation of MSCs were evaluated after illumination. RESULTS: The growth of MSCs was enhanced by red-light LLLI, and the effect became more obvious at low cell density. A single dose of LLLI led only to a short-term increase in MSCs proliferation. A maximal increase in cell proliferation was observed with multiple exposures of LLLI at 15 mW/cm(2) and 4 J/cm(2). The number of colony-forming unit fibroblasts increased when cells were illuminated under the optimal parameter. During osteogenesis, significant increases ($p < 0.01$) in both alkaline phosphatase and osteocalcin expressions were found in the MSCs that received light irradiation. CONCLUSION: Our data demonstrated that MSCs proliferation was enhanced by multiple exposures to LLLI from 630-nm LEDs, and cell growth depended on the plating density. Furthermore, multiple dose of LLLI could enhance the osteogenic potential of rat MSCs. Animals;Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Female;Lasers, Semiconductor;Mesenchymal Stem Cells;Osteogenesis;Rats;Rats, Wistar

Long-term effects of a single application of a water-cooled pulsed Nd:YAG laser in supplement to scaling and root planing in patients with periodontal inflammation. The aim of this work was to investigate the long-term effects of a single application of a water-cooled pulsed neodymium yttrium aluminium garnet (Nd:YAG) laser, in combination with scaling and root planing (SRP) for the treatment of periodontal inflammation. Twenty-two patients were included in this split-mouth single blind randomized controlled clinical trial. The parameters of the air and water-cooled Nd:YAG laser were: 4 W, 80 mJ/pulse, 50 Hz and a pulse width of 350 Î¼s. The "test side" was treated with a single application of Nd:YAG laser and SRP; while the "control side " was treated with SRP alone. At baseline, and after a median follow-up time of 20 months (range 12-39), periodontal inflammatory parameters (plaque index [PI], gingival index [GI], probing pocket depth [PPD]), and marginal bone loss (on digital bite-wing radiographs) were measured. Gingival crevicular fluid (GCF) was collected from the teeth 35, 36, 45, and 46 at baseline and at follow-up. PI ($p < 0.01$), GI ($p < 0.01$), and PPD ($p < 0.001$) were significantly lower on the test side compared to the control side at follow-up. Radiological results showed significantly less bone loss on the test side compared to the control side ($p < 0.05$). GCF volume was lower on the test side compared to the control side ($p < 0.01$). In conclusion, a single application of Nd:YAG laser in combination with SRP had a positive long-term effect on periodontal health compared to treatment by SRP alone. Adult;Aged;Combined Modality Therapy;Dental Scaling;Female;Follow-Up Studies;Gingival Crevicular Fluid;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Periodontitis;Root Planing;Single-Blind Method

Survivin mediates self-protection through ROS/cdc25c/CDK1 signaling pathway during tumor cell apoptosis induced by high fluence low-power laser irradiation. Survivin, an important member of inhibitor-of-apoptosis (IAP) family, can be up-regulated by various pro-apoptotic stimuli, such as UV, photodynamic therapy (PDT) and cisplatin. High fluence low-power laser irradiation (HF-LPLI) is a newly discovered pro-apoptotic stimulator. The anti-apoptotic mechanism of survivin during HF-LPLI-induced apoptosis is still not investigated. Here, we report that HF-LPLI up-regulates survivin activity through reactive oxygen species (ROS)/cdc25c protein phosphatase (cdc25c)/cyclin-dependent kinase (CDK1) signaling pathway in human lung adenocarcinoma cells (ASTC-a-1). The up-regulation of survivin activity can reduce HF-LPLI-induced apoptosis, while down-regulation of the activity can promote the apoptosis. In addition, activated survivin delays mitochondrial depolarization, cytochrome c release, caspase-9 and Bax activation, all of which are typical pro-apoptotic events of cell apoptosis induced by HF-LPLI. On the basis of the present studies, we conclude that survivin can mediate self-protection during tumor cell apoptosis caused by HF-LPLI. BAX protein,

human;BIRC5 protein, human;Caspase Inhibitors;Cytochrome c Group;Inhibitor of Apoptosis Proteins;Microtubule-Associated Proteins;Reactive Oxygen Species;Survivin;bcl-2-Associated X Protein;CDC2 Protein Kinase;CDC25C protein, human;cdc25 Phosphatases;Caspases Apoptosis;CDC2 Protein Kinase;Caspase Inhibitors;Caspases;Cell Line, Tumor;Cell Survival;Cytochrome c Group;Humans;Inhibitor of Apoptosis Proteins;Low-Level Light Therapy;Lung Neoplasms;Microtubule-Associated Proteins;Phosphorylation;Reactive Oxygen Species;Signal Transduction;Survivin;Transfection;Up-Regulation;bcl-2-Associated X Protein;cdc25 Phosphatases

Low-level laser therapy effects in traumatized permanent teeth with extrusive luxation in an orthodontic patient. The aim of this case report was to present and evaluate the effect of low-level laser therapy on traumatized permanent teeth with extrusive luxation in an orthodontic patient. The treatment and follow-up evaluation of two orally luxated maxillary permanent central incisors in a 19-year-old man is described. Detailed anamnesis was taken, and extraoral, intraoral, radiographic examinations and electrical and thermal pulpal tests were performed to determine the type of the luxation and the further treatment protocol. Teeth were splinted with composite resin, and antibiotic therapy was prescribed. Low-level laser therapy was applied for 25 sessions. No root canal treatment was applied to the teeth. Continuation of the orthodontic treatment was restarted after 6 months. No sign of clinical or radiographic pathology was detected after 2 years from the end of the treatment. Teeth were identified healthy and sound without any root canal intervention. Treatments with low-level laser applications may be evaluated as noninvasive alternative treatment options in comparison with endodontic treatment for teeth with extrusive luxation more than 2 mm, especially for those who have orthodontic treatment needs. Anti-Bacterial Agents;Composite Resins;Dental Materials Accidental Falls;Anti-Bacterial Agents;Composite Resins;Dental Materials;Dental Pulp;Follow-Up Studies;Humans;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Male;Open Bite;Orthodontics, Corrective;Soccer;Splints;Tooth Avulsion;Tooth Mobility;Wound Healing;Young Adult

Interventions for pain during fixed orthodontic appliance therapy. A systematic review. OBJECTIVE: To compare the different methods of pain control intervention during fixed orthodontic appliance therapy. MATERIALS AND METHODS: A computerized literature search was performed in MEDLINE (1966-2009), The Cochrane Library (Issue 4, 2009), EMBASE (1984-2009), and CNKI (1994-2009) to collect randomized controlled trials (RCTs) for pain reduction during orthodontic treatment. Data were independently extracted by two reviewers and a quality assessment was carried out. The Cochrane Collaboration's RevMan5 software was used for data analysis. The Cochrane Oral Health Group's statistical guidelines were followed. RESULTS: Twenty-six RCTs were identified and six trials including 388 subjects were included. Meta-analysis showed that ibuprofen had a pain control effect at 6 hours and at 24 hours after archwire placement compared with the placebo group. The standard mean difference was -0.47 and -0.48, respectively. There was no difference in pain control between ibuprofen, acetaminophen, and aspirin. Other analgesics such as tenoxicam and valdecoxib had relatively lower visual analog scale (VAS) scores in pain perception. Low-level laser therapy (LLLT) was also an effective approach for pain relief with VAS scores of 3.30 in the LLLT group and 7.25 in the control group. CONCLUSIONS: Analgesics are still the main treatment modality to reduce orthodontic pain despite their side effects. Some long-acting nonsteroidal anti-inflammatory drugs (NSAIDs) and cyclo-oxygenase enzyme (COX-2) inhibitors are recommended for their comparatively lesser side effects. Their preemptive use is promising. Other approaches such as LLLT have aroused researchers' attention. Analgesics;Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Cyclooxygenase 2 Inhibitors Analgesics;Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Cyclooxygenase 2 Inhibitors;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Orthodontic Appliances;Pain;Randomized Controlled Trials as Topic

Comparison of short-pulsed and long-pulsed 532 nm lasers in the removal of freckles. The purpose of this study was to compare the efficacy and safety of the 532 nm long-pulsed laser (10 ms) with that of the 532 nm short-pulsed laser (10 ns) for freckle removal. Currently, the gold standard for treatment is the short-pulsed laser. Recently, several long-pulsed lasers have been introduced for both hair removal and the treatment of freckles. To our investigative team's knowledge, no controlled experiments have been performed to compare the safety and efficacy of long-pulsed versus short-pulsed lasers for the treatment of freckles. This was a 4-week trial, and all patients had three freckles that were randomly allocated to be treated with short-pulse laser, long-pulse laser, or to receive no treatment (control). All patients had three freckles that were randomly selected to be treated with short-pulse 532 nm Medlite IV laser (10 n, 1 J/cm(2)), or long-pulse 532 nm Aura laser (10 ms, 1 J/cm(2)) or to remain as a control (no treatment). The laser treatment was only performed once, followed by a 1-day and a 1-month follow-up visit. Freckle size was determined by a novel surface area measurement technique that was created by our research staff. The study included 17 sets of freckles (three in each set). All of the lesions which received the short-pulsed laser treatment had immediate whitening of the lesions, which turned into dry scabs the next day. None of the freckles treated in the long-pulsed group or control group developed immediate whitening or scabs. No blisters or ulcers developed. The average pain score in the short-pulsed laser group was 2-3 out of 10, while it was 0 out of 10 in the long-pulsed laser group. All scabs that developed in the short-pulsed laser group fell off between days 6 and 12 (average 8 days). The outcome of this study verified the appropriate treatment of freckles. The study confirmed that when the same energy settings, short-pulsed laser is the more effective laser treatment regimen (when compared with the long-pulsed laser), with high tolerability and minimal side effects for patients with skin types I to IV. Melanins Adolescent;Adult;Aged;Aged, 80 and over;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Melanins;Melanosis;Middle Aged;Pain;Pain Measurement;Patient Satisfaction;Treatment Outcome;Young Adult

[Changes in plasma hemostatic parameters under intravascular laser irradiation of blood in patients with community-acquired pneumonia]. AIM: To study the time course of changes in the activity of the protein C system and other hemostatic parameters under intravascular laser irradiation of blood (ILIB) in patients with community-acquired pneumonia (CAP). SUBJECTS AND METHODS: One hundred and forty patients aged 17 to 62 years (mean 39.5 +/- 8.4 years) with CAP were examined. A control group (n = 40) received conventional drug therapy; the study group (n = 100) had a course of ILIB in addition to conventional therapy. RESULTS: Before treatment, the patients with CAP were observed to have a lower protein C system activity and the signs of hypercoagulation that were eliminated by ILIB. CONCLUSION: ILIB is an effective method in correcting hemocoagulative disorders in patients with CAP. Protein C;Antithrombin III Adolescent;Adult;Antithrombin III;Blood Coagulation;Community-Acquired Infections;Humans;Low-Level Light Therapy;Male;Middle Aged;Pneumonia, Bacterial;Protein C;Treatment Outcome;Young Adult

[Preventive measures with low-intensity laser for workers exposed to physical exertion]. Studies covered 168 personal computer users, 98 jewelry female polishers, 64 assemblers of metallic ship frameworks. Various doses of laser rays in accordance with work conditions appeared effective for improving upper limbs microcirculation. The suggested method is based on effects of low-intensity laser irradiation. Adult;Arm;Data Collection;Female;Humans;Industrial Oils;Jewelry;Low-Level Light Therapy;Male;Microcirculation;Microcomputers;Middle Aged;Occupational Diseases;Occupations;Plethysmography, Impedance;Ships;Time Factors

Fast and robust extraction of optical and morphological properties of human skin using a hybrid stochastic-deterministic algorithm: Monte-Carlo simulation study. A hybrid deterministic-stochastic algorithm combining the simplex method (SM) and a genetic algorithm (GA) was applied to

the problem of extracting the optical and morphological properties of human skin (HSOMPs) from visual reflectance spectroscopy data. The results using the GA-SM hybrid algorithm adopting tournament selection and selecting new sets of HSOMPs were compared with those using other conventional optimization algorithms that have generally been used for the extraction of HSOMPs. Monte-Carlo simulation showed that the suggested GA-SM hybrid algorithm enhanced the stability of the inverse solutions and computational efficiency. Computer Simulation;Humans;Low-Level Light Therapy;Models, Biological;Monte Carlo Method;Optical Phenomena;Port-Wine Stain;Skin;Skin Physiological Phenomena;Stochastic Processes

Quantification of fibrosis and mast cells in the tissue response of endodontic sealer irradiated by low-level laser therapy. Low-level laser therapy (LLLT) accelerates tissue repair. Mast cells induce the proliferation of fibroblasts and the development of local fibrosis. The objective of this study was to quantify fibrosis rate and mast cells in connective tissue after endodontic sealer zinc oxide and eugenol (ZOE) was implanted and submitted to LLLT, immediately after implant and again 24 h later. Sixty mice were distributed into three groups: GI, GII, and GIII (n = 20). In GI, the tubes filled with Endofill were implanted in the animals and were not irradiated with LLLT. In GII, the tubes containing Endofill were implanted in the animals and then irradiated with red LLLT (InGaAlP) 685-nm wavelength, D = 72 J/Cm(2), E = 2 J, T = 58 s, P = 35 mW, and in GIII, the tubes with Endofill were implanted and irradiated with infrared LLLT (AsGaAl) 830-nm wavelength, D = 70 J/Cm(2), E = 2 J, T = 40 s, P = 50 mW. After 7 days and 30 days, the animals were killed. A series of 6-Âµm-thick sections were obtained and stained with Toluidine Blue and Picrosirius and analyzed under a standard light microscope using a polarized light filter for the quantification of fibrosis. The statistics were qualitative and quantitative with a significance of 5%. The irradiation with LLLT did not offer improvement in the fibrosis rate, however, it provided a significant decrease in the concentration of independent mast cells for the period studied. Root Canal Filling Materials;Endo-Fill;Eugenol;Zinc Oxide Animals;Eugenol;Fibrosis;Low-Level Light Therapy;Male;Mast Cells;Mice;Root Canal Filling Materials;Root Canal Therapy;Wound Healing;Zinc Oxide

Photomedicine and LLLT literature watch. Humans;Laser Therapy;Low-Level Light Therapy

Treatment of post-mastectomy lymphedema with laser therapy: double blind placebo control randomized study. BACKGROUND: In post-mastectomy patients, lymphedema has the potential to become a permanent progressive condition and become extremely resistant to treatment. Thus, it can results in function impairment and decrease quality of life. The aim of this study was to evaluate the effect of low level laser therapy (LLLT) on limb volume, shoulder mobility, and hand grip strength. MATERIAL AND METHODS: Fifty women with breast cancer-related lymphedema were enrolled in a double-blind, placebo controlled trial. Patients were randomly assigned to active laser (n = 25) and placebo (n = 25) groups and received irradiation with Ga-As laser device that had wavelength of 904 nm, power of 5 mW, and spot size of 0.2 cm(2) over the axillary and arm areas, three times a week for 12 wk. The total energy applied at each point was 300 mjoules over seven points, giving a dosage of 1.5 joules/cm(2) in the active group. The placebo group received placebo therapy in which the laser had been disabled without affecting its apparent function. Limb circumference, shoulder mobility, and grip strength were measured before treatment and at 4, 8, and 12 wk. RESULTS: The two groups had similar parameters at baseline. The reduction of limb volume tended to decline in both groups. The trend being more significantly pronounced in active LLLT group than placebo at 8 and 12 wk, respectively ($P < 0.05$). Goniometric data for shoulder mobility and hand grip strength were statistically significance for LLLT group than for placebo. CONCLUSION: Laser treatment was found to be effective in reducing the limb volume, increase shoulder mobility, and hand grip strength in approximately 93% of patients with postmastectomy lymphedema. Double-Blind

Method;Extremities;Female;Hand Strength;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Range of Motion, Articular;Shoulder

Low-level laser therapy for hand arthritis-fact or fiction? Arthritis;Hand;Humans;Low-Level Light Therapy;Treatment Outcome

Comparative study of the effects of low-intensity pulsed ultrasound and low-level laser therapy on bone defects in tibias of rats. The aim of this study was to investigate and to compare the effects of low intensity ultra-sound (LIPUS) and low-level laser therapy (LLLT) during the process of bone healing by means of histopathological and morphometric analysis. The animals were randomly distributed into three groups of 30 animals each: the control group (bone defect without treatment); the laser-treated group: (bone defect treated with laser), and the LIPUS-treated (bone defect treated with ultrasound). Each group was further divided into three different subgroups (n = 10) and on days 7, 13, and 25 post-injury, rats were killed with an intra-peritoneal injection of general anesthetic. The rats were treated with a 30-mW/cm(2) low-intensity pulsed ultrasound and a 830-nm laser at 50 J/cm(2). The results showed intense new bone formation surrounded by highly vascularized connective tissue presenting a slight osteogenic activity, with primary bone deposition being observed in the group exposed to laser in the intermediary (13 days) and late stages of repair (25 days). This was confirmed by morphometric analysis in which significant statistical differences ($p < 0.05$) were noticed when compared to the control. No remarkable differences were noticed in the specimens treated with ultrasound with regard to the amount of newly formed bone in comparison to the control group. Taken together, our results indicate that laser therapy improves bone repair in rats as depicted by histopathological and morphometric analysis, mainly at the late stages of recovery. Moreover, it seems that this therapy was more effective than US to accelerate bone healing. Animals;Bone Regeneration;Fracture Healing;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibial Fractures;Time Factors;Ultrasonic Therapy

Combination of Q-switched and quasi long-pulsed 1064-nm Nd:YAG laser, non-ablative 1450-nm diode laser, and ablative 10 600-nm carbon dioxide fractional laser for enlarged pores. Currently, there is no gold standard for the treatment of enlarged facial pores. In this report, we describe a patient with enlarged nasal pores which were treated with a combination of a non-ablative 1450-nm diode laser, a Q-switched and quasi long-pulsed 1064-nm Nd:YAG laser, and an ablative 10 600-nm carbon dioxide fractional laser system. Four months after the final treatment, the condition of the patient's pores had markedly improved, and the patient was satisfied with the results. Adult;Combined Modality Therapy;Esthetics;Facial Dermatoses;Follow-Up Studies;Humans;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Nose;Risk Assessment;Treatment Outcome

The 308-nm excimer laser in the darkening of the white lines of striae alba. OBJECTIVE: To evaluate the true efficacy of the 308-nm excimer laser for darkening striae alba using a modified approach. METHODS: Ten subjects were treated using the excimer laser on the white lines of striae, while the normal skin near to and between the lines was covered with zinc oxide cream. Assessment of efficacy was performed by colorimetric scores based on mexameter measurement and also digital photographs showing before-after laser therapy, which were compared by two independent dermatologists. RESULTS: The mexameter-based data analysis showed that the excimer laser was weakly effective in the repigmentation of the lines of striae. The analysis using before-after photographs showed that 80% of patients had a poor or moderate result. CONCLUSIONS: The results of this study showed the weakly positive effect of the 308-nm excimer laser in the repigmentation of striae alba; the splaying of pigment was a major side effect. Abdomen;Adolescent;Adult;Elastic Tissue;Female;Follow-Up

Studies;Groin;Humans;Hypopigmentation;Lasers, Excimer;Low-Level Light Therapy;Middle Aged;Sampling Studies;Treatment Outcome;Young Adult

Low-dose 1064-nm Q-switched Nd:YAG laser for the treatment of melasma. BACKGROUND: Melasma is a common acquired pigmentary disorder which is sometimes hard to treat with conventional methods. Various kinds of modalities have been applied for the treatment of melasma but none shows constantly good results. OBJECTIVES: In this study, we would like to know the effect of low-dose 1064-nm Q-switched Nd:YAG laser (QSNYL) on melasma and want to evaluate the changes of skin after laser treatment. METHODS: Twenty melasma patients were enrolled. Two regions were evaluated from each patient; a total of 40 sites. The 1064-nm QSNYL at fluences of 2.0-3.5 J/cm(2) was used to treat the whole face, including the melasma lesions. The fluence was adjusted individually and increased until erythema was developed on the laser-treated area. The treatment was performed five times with a 1-week interval. Non-invasive measuring methods, including a chromatometer, mexameter, cutometer, visioscan and a corneometer, were used before and after treatment. RESULTS: The L-value from the chromatometer, which reflects the lightness of skin, was increased (0.86 +/- 1.67, $p < 0.05$). The melanin index from the mexameter was significantly decreased (-28.23 +/- 28.21, $p < 0.001$). The SEw value from the visioscan, which reflects the degree of wrinkling, decreased (-5.80 +/- 0.59, $p = 0.040$). None of the other measurement parameters showed significant changes. CONCLUSIONS: Low-dose 1064-nm QSNYL appears to be an effective treatment modality for melasma. Adult;Cohort Studies;Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Probability;Treatment Outcome;Young Adult

Lack of adjunctive benefit of Er:YAG laser in non-surgical periodontal treatment: a randomized split-mouth clinical trial. AIM: This split-mouth, randomized, clinical trial aimed to evaluate the efficacy of erbium-doped:yttrium-aluminium-garnet (Er:YAG) laser application in non-surgical periodontal treatment. MATERIALS AND METHODS: A total of 27 patients underwent four modalities of non-surgical therapy: supragingival debridement; scaling and root planing (SRP)+Er:YAG laser; Er:YAG laser; and SRP. Each strategy was randomly assigned and performed in one of the four quadrants. Clinical outcomes were evaluated at 3 and 6 months. Subjective benefits of patients have been evaluated by means of questionnaires. RESULTS: Six months after therapy, Er:YAG laser showed no statistical difference in clinical attachment gain with respect to supragingival scaling [0.15 mm (95% CI -0.16; 0.46)], while SRP showed a greater attachment gain than the supragingival scaling [0.37 mm (95% CI 0.05; 0.68)]. No difference resulted between Er:YAG laser+SRP and SRP alone [0.05 mm (95% CI -0.25; 0.36)]. CONCLUSIONS: The adjunctive use of Er:YAG laser to conventional SRP did not reveal a more effective result than SRP alone. Furthermore, the sites treated with Er:YAG laser showed similar results of the sites treated with supragingival scaling. Chronic Periodontitis;Dental Plaque Index;Dental Prophylaxis;Dental Scaling;Dentin Sensitivity;Female;Follow-Up Studies;Gingival Hemorrhage;Gingival Recession;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Mastication;Middle Aged;Pain Measurement;Patient Satisfaction;Periodontal Abscess;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Root Planing;Surveys and Questionnaires;Treatment Outcome;Ultrasonic Therapy

[Therapy of acne scars]. Acne scarring is common but difficult to treat. A descriptive, universally acceptable classification system of atrophic acne scars includes three scar types: icepick, boxcar, and rolling. Erythema and, less often, pigmentary changes may be associated. Once the scar type has been defined, appropriate treatment regimens can be offered. It is important to emphasize to the patient that acne scars can be improved by a variety of medical or surgical methods but never entirely reversed. Acne Vulgaris;Atrophy;Chemexfoliation;Cicatrix;Cicatrix,

Hypertrophic;Dermabrasion;Evidence-Based Medicine;Humans;Keloid;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Skin;Skin Transplantation
[The laser chromoendoscopy eradication of Helicobacter pylori]. 35 patients with absence of positive dynamics after course of treatment of diseases associated with Helicobacter pylori infection and without achievement of eradication are surveyed. The original technique of Helicobacter pylori endoscopy eradication with use of the therapeutic laser in length of a wave of 660 nanometers is offered. Carrying out of rate laser chromoendoscopy eradication considerably reduces terms of healing of inflammatory-destructive changes of stomach and duodenum mucous membrane allows achieving of Helicobacter pylori eradication. Duodenum;Female;Gastric Mucosa;Helicobacter Infections;Helicobacter pylori;Humans;Inflammation;Intestinal Mucosa;Low-Level Light Therapy;Male;Middle Aged
Effects of equal daily doses delivered by different power densities of low-level laser therapy at 670 nm on open skin wound healing in normal and corticosteroid-treated rats: a brief report. The optimal parameters for low-level laser therapy (LLLT) for wound healing are still open to discussion. Hence, our study was aimed at comparing the effects of different power densities of LLLT at 670 nm in rats. Four round full-thickness skin wounds were placed on the backs of 16 rats which were divided into two groups (non-steroid and steroid-treated). Three wounds were stimulated daily with a diode laser (daily dose 5 J/cm(2)) at different power densities (5, 15 and 40 mW/cm(2), respectively), and the fourth wound served as a control. Six days after surgery all animals were killed and samples removed for histological evaluation. Significant acceleration of fibroblast proliferation and new vessel formation was observed in wounds treated at the selected power densities. No significant differences were found in corticosteroid-treated rats. In conclusion, LLLT with the methodology used improved wound healing in non-steroid rats, but was not effective after corticosteroid-treatment. Adrenal Cortex Hormones Adrenal Cortex Hormones;Animals;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Skin;Wound Healing
Low level laser effects on pain to palpation and electromyographic activity in TMD patients: a double-blind, randomized, placebo-controlled study. The purpose of this study was to evaluate the effect of diode laser (GaAlAs - 780 nm) on pain to palpation and electromyographic (EMG) activity of the masseter and anterior temporalis muscles. The laser was applied on the temporalis and masseter muscles twice a week (four weeks). Forty-eight (48) patients with myofascial pain were randomly assigned between actual and placebo treatments and between the energetic doses of 25 J/cm2 and 60 J/cm2, and were evaluated using VAS before, immediately after the final application, and 30 days after the laser treatment. Surface electromyography was performed with maximum dental clenching before and after laser therapy. The results show there were no significant statistical differences in the EMG activity between the groups before and after laser treatment. With regard to the pain at palpation, although both groups presented a significant difference in the symptoms before and after the treatment, only the active doses showed statistically significant reductions in pain level in all the regions of the palpated muscles. However, there was no significant statistical difference between groups (experimental and placebo). In conclusion, low level laser did not promote any changes in EMG activity. The treatment did, however, lessen the pain symptoms in the experimental groups. Placebos Adolescent;Adult;Double-Blind Method;Electromyography;Facial Pain;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Masseter Muscle;Middle Aged;Muscle Contraction;Pain Measurement;Palpation;Placebos;Radiotherapy Dosage;Signal Processing, Computer-Assisted;Temporal Muscle;Temporomandibular Joint Disorders;Young Adult
Effects of the 532-nm and 1,064-nm Q-switched Nd:YAG lasers on collagen turnover of cultured human skin fibroblasts: a comparative study. Cultured human skin fibroblasts were irradiated twice successively with the 1.5 J/cm(2) of 532-nm and 1,064-nm lasers, respectively. The mRNA of

procollagen, matrix metalloproteinases (MMPs), tissue inhibitors of metalloproteinases (TIMPs), heat-shock protein 70 (Hsp70), interleukin-6 (IL-6) and transforming growth factor beta (TGF-beta) were analyzed at 24 and 48 h post-irradiation by using RT-PCR. Both lasers significantly increased the expression of type I and III procollagen, TIMP1, and TIMP2, but decreased MMP1 and MMP2 expression. The 1,064-nm laser initiated TGF-beta expression while the 532-nm laser elicited the increase of Hsp70 and IL-6. The increase/decrease rates of procollagen, TIMPs and MMPs for the 1,064-nm laser were higher than that of the 532-nm laser. Thus, both lasers effectively accelerated collagen synthesis and inhibited collagen degradation. Collagen synthesis induced by the 1,064-nm laser might be partly due to the upregulation of TGF-beta expression, while the increase of Hsp70 and IL-6 might be partly responsible for collagen synthesis stimulated by the 532-nm laser. With the parameters used in this study, the 1,064-nm infrared laser is more effective in promoting the beneficial molecular activities than the 532-nm visible laser. DNA Primers;HSP70 Heat-Shock Proteins;IL6 protein, human;Interleukin-6;RNA, Messenger;Tissue Inhibitor of Metalloproteinases;Transforming Growth Factor beta;Collagen;Matrix Metalloproteinases Base Sequence;Cells, Cultured;Collagen;DNA Primers;Fibroblasts;Gene Expression;HSP70 Heat-Shock Proteins;Humans;Interleukin-6;Lasers, Solid-State;Low-Level Light Therapy;Matrix Metalloproteinases;RNA, Messenger;Skin;Skin Aging;Tissue Inhibitor of Metalloproteinases;Transforming Growth Factor beta

Clinicopathologic efficacy of copper bromide plus/yellow laser (578 nm with 511 nm) for treatment of melasma in Asian patients. BACKGROUND: Melasma is a common pigmentary disorder in Asians. Although the pathogenesis of melasma is not yet fully understood, there are several hypotheses supporting angiogenetic factors related to some types of melasma. OBJECTIVE: To test the efficacy of copper bromide laser in the treatment of Korean women with melasma. MATERIALS AND METHODS: Clinical parameters included physician and patient assessment and Melasma Area and Severity Index score. The intensity of pigmentation and erythema was measured using a chromometer. To evaluate histopathologic changes, punch biopsies from melasma were obtained from four patients. Immunohistochemical staining for Melan-A, endothelin 1, CD34, and vascular endothelial growth factor (VEGF) antigen of the melasma lesions was observed. RESULTS: Mean MASI score decreased dramatically after treatment. Patients exhibited telangiectatic erythema within the melasma lesion. The values of L(*) reflecting intensity of pigmentation increased, and the values of a(*) as the measurement of redness decreased after the treatments. Expression of Melan-A, CD34, endothelin-1, and VEGF decreased after treatment. CONCLUSION: The potential application of an antiangiogenetic laser for the treatment of melasma specially accompanied by pronounced telangiectasia in Asian skin is a possible treatment option. Antigens, CD34;Vascular Endothelial Growth Factor A Adult;Antigens, CD34;Asian People;Cohort Studies;Female;Humans;Korea;Lasers, Gas;Low-Level Light Therapy;Melanosis;Middle Aged;Severity of Illness Index;Treatment Outcome;Vascular Endothelial Growth Factor A

Treatment of infantile hemangioma with optimal pulse technology. BACKGROUND AND OBJECTIVE: The treatment of infantile hemangioma must address both the effectiveness of the treatment and have as few adverse events as possible for the patient as a result of the therapy. The intense pulsed light (IPL) source can be useful in this regard in treating infantile hemangioma. IPL with optimal pulse technology (OPT) represents a new generation of IPLs and in this clinical investigation, the efficacy and adverse event profiles of treating infantile hemangiomas with an IPL with OPT will be reviewed. METHODS: A total of 62 patients with infantile hemangiomas were included in this clinical trial. The mean age of the patients was 6 months old. The Fitzpatrick skin types for those enrolled was either Type III or Type IV. Each patient was subjected to a treatment protocol which included four to five IPL treatments at 4-week intervals. The patients were then assessed at 3 months following their

last IPL treatment and clinical improvement was determined by comparisons of pre- and post-therapy photographs. The parents of the patients were asked to score their overall satisfaction with the treatments. RESULTS: From the clinical trial presented, 76% of the infantile hemangiomas were noted to improve with great satisfaction in this clinical trial. A clearance rate of more than 80% was observed. Adverse events, as a result of the IPL treatment, was minimal with less than 5% of the treatments resulting in an adverse event, all of which were noted to be transient in nature. No scarring or pigmentary disturbances were seen in any of the patients evaluated. CONCLUSIONS: This new generation IPL with OPT can be considered a safe and effective modality for the treatment of infantile hemangioma. Marked improvement was noted in the majority of study patients and adverse events were noted to be minimal. Consumer Behavior;Female;Hemangioma;Humans;Infant;Lasers;Low-Level Light Therapy;Male

Treatment of refractory melasma with the MedLite C6 Q-switched Nd:YAG laser and alpha arbutin: a prospective study. OBJECTIVE: To evaluate the effectiveness of a Q-switched Nd:YAG laser (MedLite C6; HOYA ConBio, Fremont, CA, USA) and 7% alpha arbutin solution (Skin Advance Laboratory, Japan) in the treatment of melasma. METHODS: This was a prospective study of 35 refractory melasma cases treated with 10 weekly laser sessions, two monthly follow-up treatments and topical 7% alpha arbutin solution. Clinical photographs and severity grading on a 5-point scale were carried out by an independent observer at each visit. RESULTS: At 6 months, 30% of study subjects received results in the excellent clearance category (> 81% reduction of melasma) and 36.7% received good (51-80% reduction) clearance. Mild and transient side effects included discomfort during treatment, erythema, whitening of fine hair and urticaria. Three cases of mottling hypo-pigmentation (8.57%) and two cases of recurrence of melasma (5.71%) were recorded. CONCLUSION: Combination therapy with the MedLite C6 and 7% alpha arbutin solution is an effective and well-tolerated treatment for refractory melasma. Arbutin Adult;Arbutin;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Prospective Studies

Treatment of mild, moderate, and severe onychomycosis using 870- and 930-nm light exposure. BACKGROUND: The Noveon is a unique dual-wavelength near-infrared diode laser used to treat onychomycosis. The device operates at physiologic temperatures that are thermally safe for human tissue. It uses only 870- and 930-nm near-infrared light, wavelengths that have unique photolethal effects on fungal pathogens. These wavelengths lack the teratogenic danger presented by ultraviolet light and the photoablation toxic plume associated with pulsed Nd:YAG lasers. METHODS: In this randomized controlled study, treatments followed a predefined protocol and laser parameters and occurred on days 1, 14, 42, and 120. Toes were cultured and evaluated, and measurements were taken from standardized photographs obtained periodically during the 180 day follow-up period. RESULTS: We treated mycologically confirmed onychomycosis in 26 eligible toes (ten mild, seven moderate, and nine severe). All of the patients were followed-up for 180 days. An independent expert panel, blinded regarding treatment versus control, found that at 180 days, 85% of the eligible treated toenails were improved by clear nail linear extent (P = .0015); 65% showed at least 3 mm and 26% showed at least 4 mm of clear nail growth. Of the 16 toes with moderate to severe involvement, ten (63%) improved, as shown by clear nail growth of at least 3 mm (P = .0112). Simultaneous negative culture and periodic acid-Schiff was noted in 30% at 180 days. CONCLUSIONS: These results indicate a role for this laser in the treatment of onychomycosis, regardless of degree of severity. Ease of delivery and the lack of a need to monitor blood chemistry are attractive attributes. Adolescent;Adult;Aged;Female;Follow-Up Studies;Foot Dermatoses;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Severity of Illness Index;Treatment Outcome;Young Adult

Conservative treatments for rheumatoid arthritis in the foot and ankle. Rheumatoid arthritis (RA) is a systemic inflammatory disease that attacks peripheral joints, causing their destruction. Several pharmacologic therapies and physical modalities are available for its treatment. Because of the progressive nature of RA, complementary and alternative medicine therapy in conjunction with conventional medicine is administered to patients with RA. This article discusses the presence of undiagnosed RA in the foot and ankle and reviews the concurrent nonoperative measures in treatment, including pharmacologic and physical modalities. Adrenal Cortex Hormones;Analgesics;Anti-Inflammatory Agents, Non-Steroidal;Antirheumatic Agents Adrenal Cortex Hormones;Analgesics;Anti-Inflammatory Agents, Non-Steroidal;Antirheumatic Agents;Arthritis, Rheumatoid;Balneology;Complementary Therapies;Cryotherapy;Electric Stimulation Therapy;Exercise;Foot Joints;Hot Temperature;Humans;Low-Level Light Therapy;Orthotic Devices;Ultrasonic Therapy
[Management of childhood psoriasis]. Anti-Bacterial Agents;Anti-Inflammatory Agents;Dermatologic Agents;Immunologic Factors Age of Onset;Anti-Bacterial Agents;Anti-Inflammatory Agents;Child;Dermatologic Agents;Disease Management;Disease Susceptibility;Facial Dermatoses;Humans;Immunologic Factors;Lasers, Excimer;Low-Level Light Therapy;Organ Specificity;Psoriasis;Risk Factors;Streptococcal Infections;Ultraviolet Therapy;Virus Diseases
Pulsed dye laser for port wine stains. Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain
The use of pulsed dye laser in the treatment of melanoma metastatic to the skin: a Mayo Clinic case series. Aged;Aged, 80 and over;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Melanoma;Middle Aged;Skin Neoplasms
Clinical study of repigmentation patterns with either narrow-band ultraviolet B (NBUVB) or 308 nm excimer laser treatment in Korean vitiligo patients. BACKGROUND: Various repigmentation patterns such as perifollicular, marginal, diffuse, and mixed configuration can occur in vitiligo. The aim of this study was to clinically assess the types of repigmentation patterns obtained with narrow-band ultraviolet B (NBUVB) phototherapy or targeted phototherapy using a 308 nm excimer laser and to reveal whether the repigmentation patterns have any relationship to the location of lesions, patient's age, duration of lesions, or speed of improvement. METHODS: This study enrolled 51 patients who had effective responses as compared with baseline when treated with NBUVB alone and 52 patients who had effective responses as compared with baseline when treated with excimer laser alone. We evaluated the repigmentation patterns when the responses to treatments appeared. RESULTS: The most frequent repigmentation pattern was the perifollicular type in both groups treated with NBUVB (42.2%) or excimer laser (51.3%), followed by marginal, diffuse, and combined, in that order. There was no significant difference in the repigmentation pattern according to the location of lesions, patient's age, or duration of lesions. The marginal pattern was predominant in both NBUVB and excimer laser-treated groups when excellent responses (more than 75% repigmentation achieved at 12 weeks) appeared. CONCLUSIONS: The repigmentation patterns according to location, age, duration of lesions, and speed of response showed similarities in both the NBUVB and excimer laser-treated groups. Adolescent;Aged;Asian People;Child;Child, Preschool;Dose-Response Relationship, Radiation;Female;Humans;Korea;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo;Young Adult
Subcellular selective photothermolysis of melanosomes in adult zebrafish skin following 1064-nm Q-switched Nd:YAG laser irradiation. Age Factors;Animals;Lasers, Solid-State;Low-Level Light Therapy;Melanosomes;Models, Animal;Skin;Skin Pigmentation;Zebrafish

Acquired bilateral nevus of Ota-like macules mimicking dark circles under the eyes. Adult;Eyelid Neoplasms;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus, Pigmented

Formation of arcuate crusted lesions after non-ablative 1450-nm diode laser treatment equipped with a dynamic cooling device. Acne Keloid;Acne Vulgaris;Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy

Comparison of regional efficacy and complications in the treatment of aberrant Mongolian spots with the Q-switched ruby laser. BACKGROUND AND OBJECTIVE: Aberrant Mongolian spots (AMS) distal from the lumbosacral region are said to be more apt to persist than the typical sacral AMS, so the Q-switched ruby laser (QSRL) has been the treatment of choice for AMS. However, so far as we could determine, there is no statistical analysis of the treatment of AMS. This paper shows statistical comparisons of the efficacy and complications in the treatment of AMS with QSRL. METHODS: Fifty-three patients (16 males and 37 females) with 57 AMS regions were treated with the QSRL from March 1999 to April 2007, and we divided the diseased areas into exposed regions that could not be concealed by clothing and non-exposed regions that could be concealed by clothing, and performed a statistical analysis. RESULTS: The results indicated that QSRL treatment of AMS in the exposed regions showed significantly improved coloration and caused less pigmentation when compared with the non-exposed regions. CONCLUSION: We concluded that QSRL treatment of AMS in the exposed regions is more effective than that of AMS in the non-exposed regions. Adolescent;Adult;Age Factors;Child;Child, Preschool;Female;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Mongolian Spot;Skin Neoplasms;Young Adult

Photoacoustic monitoring of granulation tissue grown in a grafted artificial dermis on rat skin. In this study, we investigated the validity of photoacoustic (PA) measurement for monitoring granulation tissue and hence adhesion of grafted artificial dermis (AD). A 2.5 cm x 2.5 cm, 3-mm-thick AD composed of an atelocollagen sponge sheet and a silicone film was grafted on a full-thickness open wound in rat dorsal skin. The grafted AD was irradiated with low-energy, 532-nm nanosecond laser pulses to photoacoustically excite blood in neovascularities, and the PA signals induced were measured using a piezoelectric transducer as a function of postgrafting time. The PA signals were compared with results of laser Doppler imaging and histological analysis. We found a significant correlation between the depths of the first or shallowest PA signal peaks and the depths of granulation tissues estimated from histology with hematoxylin & eosin staining ($R=0.951$, $p<0.05$). There was also a significant correlation between the amplitudes of the first PA signal peaks and densities of CD31-positive cells evaluated from histology with immunohistochemical staining ($R=0.859$, $p<0.05$). With laser Doppler imaging, no clear perfusion signals were observed, which is attributable to a high light scattering loss in ADs. These findings suggest the validity of PA measurement for monitoring the adhesion of grafted ADs. Acoustics;Animals;Granulation Tissue;Image Enhancement;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin Transplantation;Skin, Artificial;Wound Healing

[Estimation of efficacy of the ozone-quant therapy in prophylaxis and treatment of the purulent-necrotic complications of pancreatic pseudocysts]. There were analyzed the tactics and the results of 132 patients complex surgical treatment , suffering pancreatic gland pseudocysts (PGP). The original method of the ozone-quant therapy (OQTH), using biophysical factors, such as the ozonized solution of sodium chloride and low-intensity laser irradiation, was applied for prophylaxis and treatment of PGP purulent-necrotic complications (PNC). The data obtained, witness about efficacy of the proposed OQTH method in prophylaxis and treatment of PGP PNC. Isotonic Solutions;Sodium Chloride;Ozone Adult;Aged;Combined Modality Therapy;Drainage;Female;Humans;Isotonic Solutions;Low-Level Light Therapy;Male;Middle

Aged;Necrosis;Ozone;Pancreatic Pseudocyst;Sodium Chloride;Suppuration;Treatment Outcome;Young Adult

Low-level laser therapy in the treatment of mucous membrane pemphigoid: a promising procedure. BACKGROUND: Mucous membrane pemphigoid is a heterogeneous group of autoimmune, subepithelial, blistering diseases. A combination of topical and systemic steroid treatment is often used when managing patients with mucous membrane pemphigoid. The use of systemic steroids presents an increased risk of adverse side effects. Consequently, effective alternative modalities of therapy should be considered, such as the application of low-level laser therapy (LLLT). METHODS: A patient presented with mucous membrane pemphigoid and was successfully treated with the application of local corticosteroids and LLLT using an 810-nm diode laser. The lesions were treated by LLLT over a period of 7 days using a continuous waveform for 40 seconds and an energy density of 5 J/cm(2). RESULTS: After treatment, a significant improvement in tissue color and consistency was observed. The patient was followed every month for a period of 12 months, and the lesions healed uneventfully. CONCLUSION: The results reported in this case show that the healing of mucous membrane pemphigoid was achieved when LLLT was used as an adjunct to the application of a local corticosteroid. Anti-Inflammatory Agents;Glucocorticoids;Ointments;Betamethasone Valerate;Triamcinolone Acetonide Anti-Inflammatory Agents;Betamethasone Valerate;Female;Follow-Up Studies;Gingival Diseases;Glucocorticoids;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Ointments;Pemphigoid, Benign Mucous Membrane;Treatment Outcome;Triamcinolone Acetonide

Subjective intensity of pain during supportive periodontal treatment using a sonic scaler or an Er:YAG laser. OBJECTIVE: To assess the subjective intensities of pain during supportive periodontal treatment using a sonic scaler or an Er:YAG laser. MATERIAL AND METHODS: Forty patients with two residual periodontal pockets following conventional periodontal therapy were treated using a sonic scaler and an Er:YAG laser in a split-mouth design. A visual analogue scale was used for pain assessment directly after each treatment procedure. Additionally, pain was recorded during the treatment of 11 patients at intervals of 0.5 s using an inter-modal intensity comparison. RESULTS: Pain assessment during treatment showed that laser treatment (median pain score: 0.71 U, maximum: 9.94 U, minimum: 0 U) caused less pain than the sonic device (median pain score: 2.17 U, maximum: 11.26 U, minimum: 0 U) ($p<0.05$) with no difference in the treatment time ($p>0.05$). These results could be confirmed by the visual analogue scale: pain scores assessed after laser treatment (median: 1 U, maximum: 7 U, minimum: 0 U) were lower than those after sonic instrumentation (median: 3.5 U, maximum: 7.5 U, minimum: 0 U) ($p<0.05$). CONCLUSIONS: Using an Er:YAG laser during supportive periodontal treatment, painful sensations can be reduced compared with sonic scaler instrumentation. Adult;Chronic Periodontitis;Dental Scaling;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Periodontal Pocket;Time Factors;Treatment Outcome;Ultrasonic Therapy

The short-term effects of low-level laser therapy in the management of breast-cancer-related lymphedema. BACKGROUND: Breast-cancer-related lymphedema (BCRL) is a chronic disease, and currently there is no definitive treatment for it. There are some therapeutic interventions targeted to decrease the limb swelling and the associated problems. Low-level laser therapy (LLLT) has been used in the treatment of post-mastectomy lymphedema since 2007 in the US. The aim of this study is to review our short-term experience with LLLT in the treatment of BCRL. METHOD: Seventeen BCRL patients referred to our lymphedema program between 2007 and 2009 were enrolled in this study. All patients had experienced at least one conventional treatment modality such as complex physical therapy, manual lymphatic drainage, and/or pneumatic pump therapy. LLLT was added to patients' ongoing therapeutic regimen. All patients completed the full course of LLLT

consisting of two cycles. The difference between sums of the circumferences of both affected and unaffected arms (Î”C), pain score, scar mobility, and range of motion were measured before and after first and second cycles of LLLT sequentially. RESULTS: All patients were female with a median age of 51.8 (44-64) years. Î”C decreased 54% (15-85%) and 73% (33-100%), after the first and second cycles of LLLT, respectively. Fourteen out of seventeen experienced decreased pain with motion by an average of 40% (0-85%) and 62.7% (0-100%) after the first and second cycle of LLLT, respectively. Three patients had no improvement in pain after LLLT. Scar mobility increased in 13 (76.4%) and shoulder range of motion improved in 14 (82.3%) patients after LLLT. One patient developed cellulitis during LLLT. CONCLUSION: Patients with BCRL received additional benefits from LLLT when used in conjunction with standard lymphedema treatment. These benefits include reduction in limb circumference, pain, increase in range of motion and scar mobility. Additionally, two cycles of LLLT were found to be superior to one in this study. Adult;Arm;Breast Neoplasms;Cellulitis;Cicatrix;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Pain;Range of Motion, Articular;Shoulder Pain;Treatment Outcome

Effect of gallium-arsenide laser, gallium-aluminum-arsenide laser and healing ointment on cutaneous wound healing in Wistar rats. This study determined the effects of gallium-aluminum-arsenide laser (GaAlAs), gallium-arsenide laser (GaAs) and Dersani healing ointment on skin wounds in Wistar rats. The parameters analyzed were: type I and III collagen fiber concentrations as well as the rate of wound closure. Five wounds, 12 mm in diameter, were made on the animals' backs. The depth of the surgical incision was controlled by removing the epithelial tissue until the dorsal muscular fascia was exposed. The animals were anesthetized with ketamine and xylazine via intraperitoneal injection. The rats were randomly divided into five groups of 6 animals each, according to the treatment received. Group 1 (L4): GaAs laser (4 J/cm(2)); group 2 (L30): GaAlAs laser (30 J/cm(2)); group 3 (L60): GaAlAs laser (60 J/cm(2)); group 4 (D): Dersani ointment; group 5 (control): 0.9% saline. The applications were made daily over a period of 20 days. Tissue fragments were stained with picrosirius to distinguish type I collagen from type III collagen. The collagen fibers were photo-documented and analyzed using the Quantum software based on the primary color spectrum (red, yellow and blue). Significant results for wound closing rate were obtained for group 1 (L4), 7.37 mm/day. The highest concentration of type III collagen fibers was observed in group 2 (L30; 37.80 + or - 7.10%), which differed from control (29.86 + or - 5.15%) on the 20th day of treatment. The type I collagen fibers of group 1 (L4; 2.67 + or - 2.23%) and group 2 (L30; 2.87 + or - 2.40%) differed significantly from control (1.77 + or - 2.97%) on the 20th day of the experiment. Collagen Type I;Collagen Type III Animals;Collagen Type I;Collagen Type III;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Wound Healing

[Cytological evaluation of laser therapy influence upon skin reparation]. Evidence on the studying of the effectiveness the low intensive laser radiation influence as complex treatment of patient with maxillofacial phlegmons with using of the cytological method were presented. Results of the laser therapeutist were in acceleration of the inflammation stage. The neutrophil granulocytes and macrophages settled down in wound earlier then in the control. This led to acceleration of the wound healing. Anti-Bacterial Agents Animals;Anti-Bacterial Agents;Cellulitis;Face;Humans;Low-Level Light Therapy;Macrophages;Maxillary Diseases;Mice;Neutrophils;Phototrophic Processes;Radiotherapy Dosage;Regeneration;Skin Physiological Phenomena;Time Factors;Wound Healing

Effects of low-level laser therapy (LLLT) in the development of exercise-induced skeletal muscle fatigue and changes in biochemical markers related to postexercise recovery. STUDY DESIGN: Randomized crossover double-blinded placebo-controlled trial. OBJECTIVE: To investigate if low-level

laser therapy (LLLT) can affect biceps muscle performance, fatigue development, and biochemical markers of postexercise recovery. BACKGROUND: Cell and animal studies have suggested that LLLT can reduce oxidative stress and inflammatory responses in muscle tissue. But it remains uncertain whether these findings can translate into humans in sport and exercise situations. METHODS: Nine healthy male volleyball players participated in the study. They received either active LLLT (cluster probe with 5 laser diodes; lambda = 810 nm; 200 mW power output; 30 seconds of irradiation, applied in 2 locations over the biceps of the nondominant arm; 60 J of total energy) or placebo LLLT using an identical cluster probe. The intervention or placebo were applied 3 minutes before the performance of exercise. All subjects performed voluntary elbow flexion repetitions with a workload of 75% of their maximal voluntary contraction force until exhaustion. RESULTS: Active LLLT increased the number of repetitions by 14.5% (mean +/- SD, 39.6 +/- 4.3 versus 34.6 +/- 5.6; P = .037) and the elapsed time before exhaustion by 8.0% (P = .034), when compared to the placebo treatment. The biochemical markers also indicated that recovery may be positively affected by LLLT, as indicated by postexercise blood lactate levels (P<.01), creatine kinase activity (P = .017), and C-reactive protein levels (P = .047), showing a faster recovery with LLLT application prior to the exercise. CONCLUSION: We conclude that pre-exercise irradiation of the biceps with an LLLT dose of 6 J per application location, applied in 2 locations, increased endurance for repeated elbow flexion against resistance and decreased postexercise levels of blood lactate, creatine kinase, and C-reactiveprotein. LEVEL OF EVIDENCE: Performance enhancement, level 1b. Biomarkers;Lactic Acid;C-Reactive Protein;Creatine Kinase Adolescent;Arm;Biomarkers;C-Reactive Protein;Creatine Kinase;Cross-Over Studies;Double-Blind Method;Exercise Test;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Physical Exertion;Recovery of Function;Young Adult

Laser disruption and killing of methicillin-resistant Staphylococcus aureus biofilms. OBJECTIVE: The aim of the study was to study the efficacy of 2 different lasers in vitro, in disrupting biofilm and killing planktonic pathogenic bacteria. MATERIALS AND METHODS: Biofilms of a stable bioluminescent of Staphylococcus aureus Xen 31 were grown in a 96-well microtiter plate for 3 days. The study included 7 arms: (a) control; (b) ciprofloxacin (3 mg/L, the established minimum inhibitory concentration [MIC]) alone; (c) shock wave (SW) laser alone; (d) near-infrared (NIR) laser alone; (e) SW laser and ciprofloxacin; (f) SW and NIR lasers; (g) SW, NIR lasers, and ciprofloxacin. The results were evaluated with an in vivo imaging system (IVIS) biophotonic system (for live bacteria) and optical density (OD) for total bacteria. RESULTS: Without antibiotics, there was a 43% reduction in OD (P < .05) caused by the combination of SW and NIR suggesting that biofilm had been disrupted. There was an 88% reduction (P < .05) in live biofilm. Ciprofloxacin alone resulted in a decrease of 28% of total live cells (biofilm remaining attached) and 58% of biofilm cells (both P > .05). Ciprofloxacin in combination with SW and SW + NIR lasers caused a decrease of more than 60% in total live biomass and more than 80% of biofilm cells, which was significantly greater than ciprofloxacin alone (P < .05). CONCLUSIONS: We have demonstrated an effective nonpharmacologic treatment method for methicillin-resistant Staphylococcus aureus (MRSA) biofilm disruption and killing using 2 different lasers. The preferred treatment sequence is a SW laser disruption of biofilm followed by NIR laser illumination. Treatment optimization of biofilm is possible with the addition of ciprofloxacin in concentrations consistent with planktonic MIC. Culture Media;Ciprofloxacin Biofilms;Ciprofloxacin;Culture Media;High-Energy Shock Waves;Humans;In Vitro Techniques;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Microbial Sensitivity Tests;Reference Values;Sensitivity and Specificity;Spectroscopy, Near-Infrared;Staphylococcal Infections

Protective effect of autophagy in laser-induced glioma cell death in vitro. BACKGROUND AND OBJECTIVE: Laser phototherapy could be potentially used for cancer treatment, but the mechanisms of laser-induced cell death are not completely understood. Autophagy is the process in which the

damaged cellular proteins and organelles are engulfed by and destroyed in acidified multiple-membrane vesicles. The aim of the present study was to investigate the role of autophagy in laser-induced tumor cell death in vitro. STUDY DESIGN/MATERIALS AND METHODS: The monolayers of U251 human glioma tumor cells were exposed to 532 nm laser light from a single mode frequency-doubled Nd-YVO4 laser. A flattened Gaussian radial profile of laser beam (0.5-4 W) was used to uniformly illuminate entire colony of cells for various amounts of time (15-120 seconds) in the absence of cell culture medium. The cells were grown for 24 hours and the cell viability was determined by crystal violet or MTT assay. The presence of autophagy was assessed after 16 hours by fluorescence microscopy/flow cytometric analysis of acridine orange-stained autophagolysosomes and Western blot analysis of the autophagosome-associated LC3-II protein. The concentration of the principal pro-autophagic protein beclin-1 was determined after 6 hours by cell-based ELISA. RESULTS: The intracytoplasmic accumulation of autophagic vesicles, increase in LC3-II and up-regulation of beclin-1 expression were clearly observed under irradiation conditions that caused approximately 50% cytotoxicity. Post-irradiation addition of three different autophagy inhibitors (bafilomycin A1, chloroquine, or wortmannin) further increased the laser-induced cytotoxicity, without affecting non-irradiated cells. CONCLUSIONS: These data indicate that beclin-1-dependent induction of autophagy can protect glioma cells from laser-mediated cytotoxicity. Apoptosis Regulatory Proteins;Beclin-1;Becn1 protein, rat Animals;Apoptosis Regulatory Proteins;Autophagy;Beclin-1;Blotting, Western;Cell Proliferation;Cell Survival;Enzyme-Linked Immunosorbent Assay;Flow Cytometry;Glioma;Humans;Hyperthermia, Induced;In Vitro Techniques;Laser Therapy;Lasers, Solid-State;Microscopy, Fluorescence;Necrosis;Tumor Cells, Cultured;Up-Regulation

Clinical study to determine the safety and efficacy of a low-energy, pulsed light device for home use hair removal. BACKGROUND AND OBJECTIVES: The principle of selective photo-thermolysis has been studied extensively for hair removal applications in a medical setting. A new, portable, hand-held device featuring two filtered Xenon lamps that utilizes pulsed light in low optical fluencies for hair removal has been developed for consumer use. The purpose of this clinical study was to determine the efficacy and safety of this low-energy, pulsed-intense light device intended for home use hair removal. STUDY DESIGN/ MATERIALS AND METHODS: The treatment group consisted of 10 adults with skin types I-IV who possessed unwanted dark hair in the non-facial region. The subjects received between 4 and 6 treatments on a bi-weekly basis with the device by a trained member of the clinical staff. The clinical responses were evaluated by performing manual hair counts using magnified vision and photographs which were obtained prior to treatment and at each subsequent visit. RESULTS: Mean hair reduction was 36% 4 weeks after the final treatment and 10% 12 weeks after the final treatment. This resulted in a mean hair count reduction of 23% over the two follow-up appointments. There was no definitive correlation between customer satisfaction and hair count reduction. Adverse reactions were limited to transient, localized, post-treatment erythema. No complications were encountered. CONCLUSIONS: This low-energy, pulsed-light device is a quick, safe, and relatively effective at-home hair reduction treatment option in patients with various skin phototypes. Adult;Female;Hair Removal;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Self Care;Skin Pigmentation;Statistics, Nonparametric

Ablative erbium:YAG laser treatment of idiopathic chronic inflammatory non-cicatricial balanoposthitis (Zoon's disease)--a series of 20 patients with long-term outcome. BACKGROUND: Chronic inflammatory non-cicatricial balanitis/balanoposthitis (Zoon 1952) is not uncommon among aged uncircumcised males. The course is chronic and will lead to severe epidermal atrophy. This disease is poorly responsive to topical treatment. The golden standard for treatment is circumcision. OBJECTIVE: This study was performed to evaluate the efficacy and safety of ablative erbium:YAG laser treatment. METHODS: An uncontrolled trial was performed with 20 Caucasian male patients (mean

age 64.8 years) who presented with chronic inflammatory non-cicatricial balanitis or balanoposthitis. The patients received multiple topical treatments. The disease duration ranged from 1 to more than 7 years. Diagnosis was confirmed by histology. Topical anaesthesia was performed before erbium:YAG laser ablation (focus 1.6-5 mm; frequency 8 Hz; impulse energy mostly 800 mJ; fluence between 11.3 and 20 J cm(-2)). The pulses were partly overlapping. The pain sensation was recorded by visual analogue scale (VAS). Complete clearance was defined as complete absence of erythematous, smooth-faced, 'wet'-looking patches or erosions. Patients were requested to attend a regular follow-up once a year. The outcome was further assessed by patient's global assessment (PGA). RESULTS: In all patients a complete re-epithelialization could be achieved within 2-3 weeks. During follow-up between 3 months and 30 months (mean 12.1 +/- 7.2 months), a complete and stable clearing was achieved in 20 patients (100%). There were no severe adverse effects. With topical anaesthetic cream the VAS was very low (mean 1.5 +/- 4.1 mm for 18 patients and 22 treatments). All but three patients were 'completely satisfied' with the procedure and the outcome; three were 'satisfied'. CONCLUSIONS: Ablative erbium:YAG laser therapy is a safe, effective and minimally invasive treatment option in chronic inflammatory non-cicatricial balanitis/balanoposthitis. Aged;Balanitis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain

Treatment of striae alba using the 10,600-nm carbon dioxide fractional laser. Adult;Antibiotic Prophylaxis;Cicatrix;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Thigh

Clinical and microbiologic follow-up evaluations after non-surgical periodontal treatment with erbium:YAG laser and scaling and root planing. BACKGROUND: This study compared erbium-doped: yttrium, aluminum, and garnet (Er:YAG) laser irradiation (100 mJ/pulse; 10 Hz; 12.9 J/cm(2)) with or without conventional scaling and root planing (SRP) to SRP only for treatment of periodontal pockets. METHODS: Nineteen patients with pockets from 5 to 9 mm were included. In a split-mouth design, each site was allocated to a treatment group: 1) SRPL, SRP and laser; 2) L, laser; 3) SRP, SRP only; and 4) C, no treatment. Clinical parameters of probing depth (PD), gingival recession, and clinical attachment level (CAL) were evaluated at baseline and 1, 3, 6, and 12 months after treatment. Visible plaque index, gingival bleeding index (GI), bleeding on probing (BOP), and subgingival plaque samples were also measured 12 days postoperatively, in addition to the above mentioned months. Intergroup and intragroup statistical analyses were performed ($P < 0.05$). RESULTS: GI decreased for SRPL and increased for L, SRP, and C ($P < 0.05$) 12 days postoperatively and decreased for SRPL and SRP ($P < 0.05$) 3, 6, and 12 months after baseline; BOP and PD decreased for all treated groups ($P < 0.01$) 3, 6, and 12 months after treatment. CAL gain was significant for SRPL, L, and SRP ($P < 0.05$) 3, 6, and 12 months postoperatively. SRPL and L presented a significant reduction in the percentage of sites with bacteria 6 and 12 months after treatment ($P < 0.05$). CONCLUSION: Non-surgical periodontal treatment with Er:YAG laser may be an alternative treatment for reduction and control of the proliferation of microorganisms in persistent periodontitis. Adult;Aggregatibacter actinomycetemcomitans;Bacteroides;Colony Count, Microbial;Dental Plaque;Dental Plaque Index;Dental Scaling;Female;Follow-Up Studies;Gingival Hemorrhage;Gingival Recession;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Porphyromonas gingivalis;Prevotella intermedia;Prevotella nigrescens;Root Planing

[Effect of the photosensitizers pheophorbid a and protoporphyrin IX on skin wound healing by the action of low-intensity laser irradiation]. The effect of photosensitizer with subsequent He-Ne (632.8 nm; 3 mW/cm2) laser irradiation on experimental skin wound healing has been studied. Pheophorbid a and protoporphyrin IX were used as photosensitizers. It was found that the application of the photosensitizer and subsequent laser irradiation, first, decreased the amount and the functional activity of leukocyte in wound excudate and, second, inhibited the SOD-activity, compared

to that of the control group. Moreover, pheophorbide a and protoporphyrin practically did not affect the total healing period but decreased the length of the inflammation stage. It was supposed that these effects are related to the generation of reactive oxygen species during irradiation. Photosensitizing Agents;Protoporphyrins;Chlorophyll;protoporphyrin IX;pheophorbide a Animals;Chlorophyll;Low-Level Light Therapy;Male;Photosensitizing Agents;Protoporphyrins;Rats;Skin;Wound Healing;Wounds and Injuries

Melanoma after laser therapy of pigmented lesions--circumstances and outcome. The use of laser therapy in the treatment of pigmented lesions is a controversial issue as it can delay melanoma diagnosis and may negatively impact mortality. Few cases of melanoma after laser therapy have been reported. It is still unknown whether melanoma can be induced by lasers. We discuss the outcomes of twelve patients presenting with melanoma subsequent to previous treatment with laser. In four patients, a skin biopsy was performed before laser treatment. Histology was re-evaluated by a panel of experienced dermatopathologists and analyzed in the context of clinical and photo-optical data. There was evidence for pathological misdiagnosis in two cases. The other two cases initially presented with non-suspicious features before laser treatment and were clearly diagnosed as melanoma thereafter, opening the possibility of melanoma induction by laser treatment. Most patients were female and presented with facial lesions. Three patients have already died of melanoma and two are in stage IV, showing progressive disease with distant metastases. Laser therapy is a common treatment for pigmented lesions, increasing the risk of delayed melanoma diagnosis. This prevents appropriate and timely therapy, and may therefore lead to a fatal outcome. A careful examination of all pigmented lesions using surface microscopy and representative biopsies in combination with a close follow-up is recommended. Adult;Aged;Biopsy;Disease Progression;Dose-Response Relationship, Radiation;Fatal Outcome;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Melanoma;Middle Aged;Neoplasms, Radiation-Induced;Pigmentation Disorders;Retrospective Studies;Risk Factors;Skin;Skin Neoplasms;Young Adult

Comparison of dentin root canal permeability and morphology after irradiation with Nd:YAG, Er:YAG, and diode lasers. The aim of this study was to compare the effects of Nd:YAG, Er:YAG, and diode lasers on the morphology and permeability of root canal walls. The three laser wavelengths mentioned interact differently with dentin and therefore it is possible that the permeability changes caused will determine different indications during endodontic treatment. Twenty-eight human single-rooted teeth were instrumented up to ISO 40 and divided into four groups: group C, control (GC), non-laser irradiated; group N (GN), irradiated with Nd:YAG laser; group E (GE), with Er:YAG laser and group D (GD) with diode laser. After that, the roots were filled with a 2% methylene blue dye, divided into two halves and then photographed. The images were analyzed using Image J software and the percentage of dye penetration in the cervical, middle, and apical root thirds were calculated. Additional scanning electron microscopy (SEM) analyses were also performed. The analysis of variance (ANOVA) showed significant permeability differences between all groups in the middle and cervical thirds ($p < 0.05$). The Tukey test showed that in the cervical third, GN presented means of dye penetration statistically significantly lower than all of the other groups. In the middle third, GE and GD showed statistically higher dye penetration means than GC and GN. SEM analysis showed melted surfaces for GN, clean wall surfaces with open dentinal tubules for GE, and mostly obliterated dentinal tubules for GD. Er:YAG (2,094 nm) laser and diode laser (808 nm) root canal irradiation increase dentinal permeability and Nd:YAG (1,064 nm) laser decreases dentin permeability, within the studied parameters. Dental Pulp Cavity;Dentin;Dentin Permeability;Humans;In Vitro Techniques;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Preparation;Root Canal Therapy

Comparison of effects of diode laser and CO2 laser on human teeth and their usefulness in topical fluoridation. Various authors have reported more effective fluoridation from the use of lasers combined with topical fluoride than from conventional topical fluoridation. Besides the beneficial effect of lasers in reducing the acid solubility of an enamel surface, they can also increase the uptake of fluoride. The study objectives were to compare the action of CO(2) and GaAlAs diode lasers on dental enamel and their effects on pulp temperature and enamel fluoride uptake. Different groups of selected enamel surfaces were treated with amine fluoride and irradiated with CO(2) laser at an energy power of 1 or 2Â W or with diode laser at 5 or 7Â W for 15Â s each and compared to enamel surfaces without treatment or topical fluoridated. Samples were examined by means of environmental scanning electron microscopy (ESEM). Surfaces of all enamel samples were then acid-etched, measuring the amount of fluoride deposited on the enamel by using a selective ion electrode. Other enamel surfaces selected under the same conditions were irradiated as described above, measuringÂ the increase in pulp temperature with a thermocouple wire. Fluorination with CO(2) laser at 1Â W and diode laser at 7Â W produced a significantly greater fluoride uptake on enamel (89â€‰Â±â€‰18Â mg/l) and (77â€‰Â±â€‰17Â mg/l) versus topical fluoridation alone (58â€‰Â±â€‰7Â mg/l) and no treatment (20â€‰Â±â€‰1Â mg/l). Diode laser at 5Â W produced a lesser alteration of the enamel surface compared to CO(2) laser at 1Â W, but greater pulp safety was provided by CO(2) laser (Î”TÂ° 1.60Â°â€‰Â±â€‰0.5) than by diode laser (Î”TÂ° 3.16Â°â€‰Â±â€‰0.6). Diode laser at 7Â WÂ and CO(2) laser at 2Â W both caused alterations on enamel surfaces, but great pulp safety was again obtained with CO(2) (Î”TÂ° 4.44Â°â€‰Â±â€‰0.60) than with diode (Î”TÂ° 5.25Â°â€‰Â±â€‰0.55). Our study demonstrates that CO(2) and diode laser irradiation of the enamel surface can both increase fluoride uptake; however, laser energy parameters must be carefully controlled in order to limit increases in pulpal temperature and alterations to the enamel surface. Fluorides, Topical Dental Caries;Dental Enamel;Dental Pulp;Fluorides, Topical;Humans;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Surface Properties;Temperature;Tooth

Light distribution in intravascular low level laser therapy applying mathematical simulation: a comparative study. Intravascular low level laser therapy (ILLLT) has been applied in the treatment of many diseases for about twenty years. However, much fundamental work has not been done on its dosimetry. The study was designed to compare the difference of light distribution during ILLLT between using flat end fiber and optical fiber coupled with cylindrical light diffuser. Light distribution of He-Ne laser was processed by Monte Carlo model. The laser output was 5 mW. The diameter of both optical fibers was 400 microm. Four tissue optical parameters were chosen for simulation. The results showed that optical parameters of blood are important to determine the distribution of laser energy. The highest power density could increase to over 5000 mW/cm2 using flat end fiber. And the laser energy was absorbed by the blood cells in very small area before the tip of flat end fiber. But when using optical fiber coupled with cylindrical light diffuser, the highest power density was about 100 mW/cm2. More volume of blood cells could be irradiated by laser light. In summary, optical fiber coupled with cylindrical light diffuser is superior to flat end fiber at the aspect of increasing the volume of irradiated blood and decreasing unwanted damage to blood cells during intravascular low level laser therapy. Oxygen Blood Vessels;Computer Simulation;Humans;Low-Level Light Therapy;Models, Theoretical;Monte Carlo Method;Optical Fibers;Optical Phenomena;Oxygen

Is low-level laser therapy effective in acute or chronic low back pain? The purpose of this study was to compare the effectiveness of low-level laser therapy (LLLT) on pain and functional capacity in patients with acute and chronic low back pain caused by lumbar disk herniation (LDH). LLLT has been used to treat acute and chronic pain of musculoskeletal system disorders. This study is a randomized,

double-blind, placebo-controlled study. Forty patients with acute (26 females/14 males) and 40 patients with chronic (20 females/20 males) low back pain caused by LDH were included in the study. Patients were randomly allocated into four groups. Group 1 (acute LDH, n = 20) received hot-pack + laser therapy; group 2 (chronic LDH, n = 20) received hot-pack + laser therapy; group 3 (acute LDH, n = 20) received hot-pack + placebo laser therapy, and group 4 (chronic LDH, n = 20) received hot-pack + placebo laser therapy, for 15 sessions during 3 weeks. Assessment parameters included pain, patients' global assessment, physician's global assessment, and functional capacity. Pain was evaluated by visual analog scale (VAS). [corrected] Patients' and physician's global assessment were also measured with VAS. Modified Schober test and flexion and lateral flexion measures were used in the evaluation of range of motion (ROM) of lumbar spine. Roland Disability Questionnaire (RDQ) and Modified Oswestry Disability Questionnaire (MODQ) were used in the functional evaluation. Measurements were done before and after 3 weeks of treatment. After the treatment, there were statistically significant improvements in pain severity, patients' and physician's global assessment, ROM, RDQ scores, and MODQ scores in all groups ($p < 0.05$). However, no significant differences were detected between four treatment groups with respect to all outcome parameters ($p > 0.05$). There were no differences between laser and placebo laser treatments on pain severity and functional capacity in patients with acute and chronic low back pain caused by LDH. Acute Disease;Adult;Aged;Chronic Disease;Disability Evaluation;Double-Blind Method;Female;Humans;Intervertebral Disc Displacement;Lasers, Semiconductor;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Severity of Illness Index;Treatment Outcome

[Effects of low-level helium-neon laser on induced wound healing in rats]. OBJECTIVE: To evaluate the effects of low-level helium-neon (HeNe) laser on cutaneous wound healing in rats. METHODS: Sixty Wistar rats were divided into control group and experimental group. A sutured longitudinal, dorsal-medial incision was made, with simple separate stitches. The experimental group was irradiated daily in three areas of the wound with HeNe laser (5mW maximum continuous power, 632.8 nm wavelength, 4 J/cm(2) energy density and 0.015 cm(2) laser beam area) for 36 seconds. The areas were evaluated on the third, seventh and fourteenth days postoperative. Histological sections were stained with hematoxylin-eosin to determine the type of inflammatory reaction according to the protocol by Vizzotto et al. (2003)* and with Picrosirius to identify types I and III collagen and the collagen maturation index (CMI). Immunohistochemical detection was employed with anti-CD45-LCA to recognize the inflammatory cells. RESULTS: Both groups had the same inflammatory pattern. The experimental group had fewer inflammatory cells at the three evaluation times ($p<0.001$) with faster reduction in the number of leukocytes. The experimental group had greater total collagen density on the third day ($p=0.001$), with more type III collagen ($p=0.001$) and more type I collagen ($p=0.001$). There was no significant difference in the CMI. CONCLUSION: Low-level laser irradiation does not change the quality of the inflammatory response, but it does reduce its intensity; it increases collagen deposition in the early stages of the healing process and does not interfere with collagen maturation. Animals;Lasers, Gas;Male;Rats;Rats, Wistar;Skin;Wound Healing

In vivo low-level light therapy increases cytochrome oxidase in skeletal muscle. Low-level light therapy (LLLT) increases survival of cultured cells, improves behavioral recovery from neurodegeneration and speeds wound healing. These beneficial effects are thought to be mediated by upregulation of mitochondrial proteins, especially the respiratory enzyme cytochrome oxidase. However, the effects of in vivo LLLT on cytochrome oxidase in intact skeletal muscle have not been previously investigated. We used a sensitive method for enzyme histochemistry of cytochrome oxidase to examine the rat temporalis muscle 24 h after in vivo LLLT. The findings showed for the first time that in vivo LLLT induced a dose- and fiber type-dependent increase in cytochrome oxidase in

muscle fibers. LLLT was particularly effective at enhancing the aerobic capacity of intermediate and red fibers. The findings suggest that LLLT may enhance the oxidative energy metabolic capacity of different types of muscle fibers, and that LLLT may be used to enhance the aerobic potential of skeletal muscle. Electron Transport Complex IV Anaerobic Threshold;Animals;Electron Transport Complex IV;Energy Metabolism;Light;Low-Level Light Therapy;Muscle Fibers, Skeletal;Muscle, Skeletal;Rats

Multiple basal cell carcinomas arising in radiotherapy-treated nevus flammeus: early detection facilitated by 595-nm pulsed dye laser. Carcinoma, Basal Cell;Diagnosis, Differential;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Port-Wine Stain;Skin Neoplasms;Thorax

Surgical treatment is indicated in long-duration segmental vitiligo. Adolescent;Adult;Aged;Child;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Phototherapy;Retrospective Studies;Skin Transplantation;Treatment Outcome;Vitiligo;Young Adult

Low-level laser therapy (LLLT) attenuates RhoA mRNA expression in the rat bronchi smooth muscle exposed to tumor necrosis factor-alpha. Low-level laser therapy (LLLT) has been found to produce anti-inflammatory effects in a variety of disorders. Bronchial smooth muscle (BSM) hyperreactivity is associated with increased Ca+2 sensitivity and increased RhoA mRNA expression. In the current study, we investigated if LLLT could reduce BSM contraction force and RhoA mRNA expression in tumor necrosis factor-alpha (TNF-alpha)-induced BSM hyperreactivity. In the study, 112 male Wistar rats were divided randomly into 16 groups, and BSM was harvested and suspended in TNF-alpha baths for 6 and 24 h, respectively. Irradiation with LLLT was performed with a wavelength of 660 nm for 42 s with a dose of 1.3 J/cm2. This LLLT dose was administered once in the 6-h group and twice in the 24-h group. LLLT significantly decreased contraction force in BSM at 6 h (TNF-alpha + LLLT: 11.65+/-1.10 g/100 mg of tissue) (F=3115) and at 24 h (TNF-alpha+â€‰LLLT: 14.15+/-1.1 g/100 mg of tissue) (F=3245, p<0.05) after TNF-alpha, respectively, when compared to vehicle-bathed groups (control). LLLT also significantly decreased the expression of RhoA mRNA in BSM segments at 6 h (1.22+/-0.20) (F=2820, p<0.05) and 24 h (2.13+/-0.20) (F=3324, p<0.05) when compared to BSM segments incubated with TNF-alpha without LLLT irradiation. We conclude that LLLT administered with this protocol, reduces RhoA mRNA expression and BSM contraction force in TNF-alpha-induced BSM hyperreactivity. Amides;Pyridines;RNA, Messenger;Tumor Necrosis Factor-alpha;Y 27632;rhoA GTP-Binding Protein Amides;Animals;Bronchi;Bronchial Hyperreactivity;Calcium Signaling;Gene Expression;In Vitro Techniques;Low-Level Light Therapy;Male;Muscle, Smooth;Pyridines;RNA, Messenger;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha;rhoA GTP-Binding Protein

Mechanical evaluation of the influence of low-level laser therapy in secondary stability of implants in mice shinbones. The present work evaluates mechanically the bone-implant attachment submitted or not to low-level laser therapy, with wavelength of 795 nm, in a continuous way, with power of 120 mW. The implant was placed in one of the shinbones of 24 mice, randomly distributed into two groups. The experimental group was submitted to six laser applications, divided into four points previously established, two lateral and two longitudinal, six times 8 J/cm2 with an interval of 2 days, totaling the dose of 48 J/cm2. The control group did not receive laser therapy. The interval between applications was 48 h and the irradiations began immediately after the end of the implant surgeries. The two groups were killed on the 14th day and a bone block of the area was removed where the implant was inserted. A torque machine was used to measure the torque needed for loosening the implants. A statistically significant difference was observed between the two groups. The experimental group presented larger difficulty for breaking up the implant interface with the

bone block than the control group. It can be concluded that with the animal model and the protocol of irradiation present in this study, the laser therapy demonstrated capacity to increase the attachment bone implant. Dental Implants;Titanium Animals;Biomechanical Phenomena;Bone and Bones;Dental Implants;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Osseointegration;Prostheses and Implants;Rats;Rats, Wistar;Titanium;Torque

Development of compression-controlled low-level laser probe system: towards clinical application. Various physico-chemical tissue optical clearing (TOC) methods have been suggested to maximize photon density in tissue. In order to enhance photon density, a compression-controlled low-level laser probe (CCLLP) system was developed by utilizing the principle of mechanical tissue compression. Negative compression (NC) was applied to the laser probes built in various diameters and simultaneously the laser was irradiated into ex-vivo porcine skin samples. Laser photon density (LPD) was evaluated as a function of NC and probe diameter by analyzing 2D diffusion images of the laser exposures. The CCLLP system resulted in a concentrated laser beam profile, which means enhancement of the LPD. As indicators of LPD, the laser peak intensity increased and the full width at half maximum (FWHM) decreased as a function of NC. The peak intensity at â€“30 kPa increased 2.74, 3.22, and 3.64 fold at laser probe diameters of 20, 30, and 40 mm, respectively. In addition, sample temperature was measured with a thermal camera and increased 0.4 K at â€“30 kPa after 60 s of laser irradiation as a result of enhanced LPD. The CCLLP system effectively demonstrated enhancement of the LPD in tissue and potentially its clinical feasibility.
Animals;Biomechanical Phenomena;Compressive Strength;Equipment Design;Hot Temperature;Humans;In Vitro Techniques;Low-Level Light Therapy;Models, Theoretical;Skin;Skin Physiological Phenomena;Sus scrofa

Effectiveness and safety of tisuacryl in treating dentin hypersensitivity (DH). INTRODUCTION: Dentin hypersensitivity (DH) is a painful tooth condition affecting a large proportion of the world population. While DH is not a direct cause of tooth loss, it does cause discomfort and stress. DH treatment methods include desensitizers, such as fluoride compounds; polycyanoacrylate coating; low intensity laser therapy; and surgery as a last resort. In Cuba, a fluoride varnish, Profilac, is widely used with acceptable results. Tisuacryl, an N-butyl-2-cyanoacrylate-based tissue adhesive is licensed in Cuba as a medical device used for closing wounds and as a protective covering or dressing for oral tissues. Experimental use of Tisuacryl in DH treatment has begun recently with good results. OBJECTIVE: Evaluate the effectiveness and safety of Tisuacryl in treating dentin hypersensitivity. METHODS: An experimental, prospective, longitudinal, multicenter, non-controlled clinical investigation was conducted using the licensed medical device Tisuacryl. The study universe consisted of patients with DH symptoms who sought treatment at three dental clinics in Havana Province between May 2007 and February 2009. The sample consisted of 152 patients who met inclusion and diagnostic criteria for the study. DH was classified as severe, moderate, or mild. Remission of dentinal pain was the principal variable for evaluating effectiveness. Safety variables were mucosal irritation and burning sensation at the treatment site. Treatment was considered successful if DH was cured, defined as remission of pain and relief of discomfort (irritation or burning sensation) with no other adverse events by the final evaluation on day 6 after treatment initiation. RESULTS: Tisuacryl treatment was successful in 96.7% of patients (81.5% with severe DH and 100% with mild to moderate DH). Mucosal irritation was observed in only 1 patient at first evaluation on day 2 but disappeared by the second evaluation. No other adverse events were reported. CONCLUSIONS: Tisuacryl was shown to be an effective, safe treatment of dentin hypersensitivity, especially moderate and mild cases. Enbucrilate Adolescent;Adult;Aged;Dentin Sensitivity;Enbucrilate;Female;Humans;Male;Middle Aged;Periodontal Dressings;Treatment Outcome;Young Adult

Treatment of superficial infantile hemangiomas of the eyelid using the 595-nm pulsed dye laser. BACKGROUND: Despite the proven effectiveness of the 595-nm pulsed dye laser (PDL) in treating superficial infantile hemangiomas, many physicians are reluctant to treat such lesions involving the eyelid. OBJECTIVE To examine the safety and efficacy of the 595-nm PDL for the treatment of superficial infantile hemangiomas of the eyelid. MATERIALS & METHODS: Records were reviewed for patients with superficial infantile hemangiomas of the eyelid treated with 595-nm PDL. Pre- and post-treatment photographs were compared. Reviewers rated the degree of improvement of the hemangioma as excellent (76-100%), good (51-75%), moderate (26-50%), or poor (0-25%) and indicated whether the hemangioma was 100% clear. Side effects of scarring, atrophy, hyperpigmentation, and hypopigmentation were assessed. RESULTS: Twenty-two patients met the study criteria. Eight (36.4%) demonstrated complete clearance of their hemangioma, 17 (77.3%) received an improvement rating of excellent, and five (22.7%) received a rating of good. No scarring, atrophy, or hypopigmentation was noted. Two patients (9.1%) were noted to have hyperpigmentation in the treated area. CONCLUSION: Early treatment with the 595-nm PDL can safely and effectively diminish proliferative growth and hasten resolution of superficial infantile hemangiomas of the eyelid. Child, Preschool;Eyelid Neoplasms;Female;Follow-Up Studies;Hemangioma;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Retrospective Studies;Severity of Illness Index;Time Factors;Treatment Outcome

Commentary: Early laser treatment of periorbital infantile hemangiomas may work, but is it really the best treatment option? Eyelid Neoplasms;Humans;Lasers, Dye;Low-Level Light Therapy;Time Factors;Treatment Outcome

Safety and efficacy of erbium-doped yttrium aluminum garnet fractionated laser for treatment of acne scars in type IV to VI skin. BACKGROUND: Ablative resurfacing lasers are effective for treatment of acne scars, but they have a high risk of complications. Fractional lasers have less severe side effects but more moderate efficacy than ablative devices. Studies were performed in individuals with Fitzpatrick skin type I to VI. OBJECTIVE: To determine the efficacy and safety of an erbium 1,550-nm fractional laser in the treatment of facial acne scars in Fitzpatrick skin types IV to VI. METHODS: We conducted a prospective, single-blind, randomized trial in patients with acne scars (n=15), skin type IV to VI, with a 1,550-nm erbium fractionated laser. Patients were divided into two groups; one was treated with 10 mJ and the other with 40 mJ. Five monthly laser sessions were performed. A patient questionnaire was distributed. RESULTS: There was a significant improvement in the acne scarring and overall appearance ($p<.001$). No significant difference was found between 10 and 40 mJ. Patients were highly satisfied with their results. Significant postinflammatory hyperpigmentation was seen; pain was significantly higher in darker skin. CONCLUSIONS: Fractional photothermolysis is effective for the treatment of acne scars, but practition-ers should be aware of the higher incidence of pain and postinflammatory hyperpigmentation in individuals with skin types IV to VI. Acne Vulgaris;Cicatrix;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Single-Blind Method;Skin Pigmentation;Surveys and Questionnaires;Treatment Outcome

Treatment of xanthelasma palpebrarum using a pulsed dye laser: a prospective clinical trial in 38 cases. BACKGROUND: Several studies have reported positive results of nonablative laser treatment of xanthelasma palpebrarum, but the published evidence is weak and inconclusive. OBJECTIVE: To systematically evaluate the effect of pulsed dye laser (PDL) treatment of xanthelasmas. MATERIALS AND METHODS: Twenty female Caucasian patients with 38 lesions (< or =1 mm above skin level) were enrolled. They received up to five treatment sessions with a PDL (wavelength, 585 nm; energy fluence, 7 J/cm(2); pulse duration, 0.5 ms; spot size, 10 mm; number of passes, 2) at 2- to 3-week intervals. Photographs were taken before each treatment session and 4 weeks after the last

treatment. Two independent examiners categorized clearance into four groups (no clearance [<25% xanthelasma area(s) cleared], moderate [25-50%], good [51-75%], and excellent [>75%]). Patient satisfaction was assessed on a verbal rating scale. RESULTS: Approximately two-thirds of the lesions showed clearance greater than 50%, and one-quarter had clearance greater than 75%. Interrater reliability was excellent (contingency coefficient >0.7 at all visits). Treatments were well tolerated and had no major side effects. Patient satisfaction was generally high. CONCLUSION: PDL is a promising approach for treating xanthelasmas, especially when multiple sessions are performed. Adult;Aged;Eyelid Diseases;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Surveys and Questionnaires;Treatment Outcome;Xanthomatosis
A comparative study of pulsed 532-nm potassium titanyl phosphate laser and electrocoagulation in the treatment of spider nevi. OBJECTIVE: To assess the clinical efficacy and safety of potassium titanyl phosphate (KTP) laser treatment and electrocoagulation (EC) for the treatment of spider nevi (SN). METHOD: A randomized single-blind intrapatient comparison study was performed. A blinded observer and patients reported the clinical treatment outcome and pain on a visual analogue scale (0-10). Side effects were noted if present. RESULTS: Mean physician-rated clinical efficacy scores+/-standard error of the mean were 7.7+/-0.7 for KTP laser and 6.2+/-0.9 for EC treatment (p=.05). Patient-rated mean clinical efficacy of KTP laser was 8.3+/-0.6 and of EC was 7.3+/-0.7 (p=.09). Stratification for potential confounding bias, such as location of SN, central bulging vein, and diameter (p=.25) of the treated SN did not reveal any statistically significant differences between the treatments. Treatment with KTP or EC did not result in scarring or pigmentary changes. Pain was reported for KTP treatment (3.1+/-0.4) and EC (6.4+/-0.7) (p<.05). CONCLUSION: Clinical efficacy of KTP laser and EC for SN is comparable, although there is a tendency toward an advantage in favor of the KTP laser. KTP laser treatment was less painful. Adult;Aged;Electrocoagulation;Facial Neoplasms;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus, Intradermal;Patient Satisfaction;Single-Blind Method;Skin Neoplasms;Thoracic Wall;Treatment Outcome
Commentary: See the light or feel the heat: efficacy, economics, and balance. Electrocoagulation;Facial Neoplasms;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus, Intradermal;Skin Neoplasms;Thoracic Wall;Treatment Outcome
Nevus comedonicus: a novel approach to treatment. Antineoplastic Agents;Tretinoin Administration, Topical;Antineoplastic Agents;Biopsy;Diagnosis, Differential;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Nevus, Pigmented;Sweat Gland Neoplasms;Tretinoin
Excimer laser therapy (308 nm) for mycosis fungoides palmaris et plantaris: a skin-directed and anatomically feasible treatment. Adult;Female;Foot Diseases;Hand Dermatoses;Humans;Low-Level Light Therapy;Mycosis Fungoides;Skin Neoplasms;Treatment Outcome
[Physical treatment modalities for chronic leg ulcers]. An increasing numbers of physical treatment options are available for chronic leg ulcer. In this review article, compression therapy, therapeutic ultrasound, negative pressure therapy, extracorporeal shock wave therapy, electrostimulation therapy, electromagnetic therapy, photodynamic therapy, water-filtered infrared-A-radiation and hydrotherapy are discussed in terms of their practical applications and the underlying evidence. With the exception of compression therapy for most of these treatments, good scientific data are not available. However this is a widespread problem in the treatment of chronic wounds. Nevertheless, several of the described methods such as negative pressure therapy represent one of the gold standards in practical treatment of patients with chronic leg ulcers. Although the use of

physical treatment modalities may improve healing in patients with chronic leg ulcers, the diagnosis and treatment of the underlying causes are essential for long-lasting success. Electric Stimulation Therapy;Evidence-Based Medicine;High-Energy Shock Waves;Humans;Hydrotherapy;Infrared Rays;Low-Level Light Therapy;Negative-Pressure Wound Therapy;Photochemotherapy;Physical Therapy Modalities;Radiation;Stockings, Compression;Ultrasonic Therapy;Varicose Ulcer
Photomedicine and LLLT literature watch. Laser Therapy;Low-Level Light Therapy;Phototherapy
Mitochondrial mechanisms of photobiomodulation in context of new data about multiple roles of ATP. Adenosine Triphosphate Adenosine Triphosphate;Humans;Laser Therapy;Mitochondria
Photodynamic therapy for acne vulgaris: a randomized, controlled, split-face clinical trial of topical aminolevulinic acid and pulsed dye laser therapy. BACKGROUND: There remains the need for more effective therapeutic options to treat acne vulgaris. Interest in light-based acne treatments has increased, but few randomized, controlled clinical trials assessing the value of photodynamic therapy (PDT) for acne have been reported. AIMS: We sought to examine the efficacy of PDT using 5-aminolevulinic acid (ALA) and pulsed dye laser therapy in the treatment of acne. PATIENTS/METHODS: We conducted a randomized, controlled, split-face, single-blind clinical trial of 44 patients with facial acne. Patients were randomized to receive three pulsed dye laser treatments to one side of the face after a 60-90 min ALA application time, while the contralateral side remained untreated and served as a control. Serial blinded lesion counts and global acne severity ratings were performed. RESULTS: Global acne severity ratings improved bilaterally with the improvement noted to be statistically significantly greater in treated skin than in untreated skin. Erythematous macules (remnants of previously active inflammatory lesions) decreased in number in treated skin when compared with control skin and there was a transient but significant decrease in inflammatory papules in treated skin when compared with untreated skin. There were no other statistically significant differences between treated and untreated sides of the face in terms of counts of any subtype of acne lesion. Thirty percent of patients were deemed responders to this treatment with respect to improvement in their inflammatory lesion counts, while only 7% of patients responded in terms of noninflammatory lesion counts. CONCLUSIONS: PDT with the treatment regimen employed here may be beneficial for a subgroup of patients with inflammatory acne. Dermatologic Agents;Photosensitizing Agents;Aminolevulinic Acid Acne Vulgaris;Administration, Cutaneous;Adolescent;Aminolevulinic Acid;Dermatologic Agents;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Severity of Illness Index;Single-Blind Method;Treatment Outcome
595-nm long pulsed dye laser and 1450-nm diode laser in combination with intralesional triamcinolone/5-fluorouracil for hypertrophic scarring following a phenol peel. Hypertrophic scars and keloids are a therapeutic challenge because of the low response to treatment and recurrences after treatment. A variety of treatment regimens have been used with different degrees of success, with no universally accepted treatment protocol resulting in their complete and permanent resolution. We offer this case to demonstrate a combination approach for the treatment of hypertrophic scarring. A 75-year-old woman (with Fitzpatrick skin type II) presented with a 4-month history of scarring, which had developed following a phenol peel for perioral rhytides. The patient underwent 10 treatment sessions with the 595-nm long-pulsed dye laser followed immediately by the 1450-nm diode laser in combination with intralesional triamcinolone and 5-fluorouracil. After the fifth treatment session, about 90% improvement was noted; at the last treatment session, greater than 95% overall improvement was noted. Two and a half years after the

last treatment session, the patient and treating physician noted no regression. A limitation of this therapy is that the combination approach makes it difficult to determine what individual contributions each treatment modality had on the final result. We have illustrated a successful multifaceted treatment regimen for hypertrophic scars and keloids using a combination approach. Glucocorticoids;Triamcinolone;Phenol;Fluorouracil Aged;Chemexfoliation;Cicatrix, Hypertrophic;Combined Modality Therapy;Female;Fluorouracil;Glucocorticoids;Humans;Injections, Intralesional;Lasers, Dye;Lasers, Semiconductor;Low-Level Light Therapy;Phenol;Triamcinolone

Transpupillary thermotherapy: new observations on neuroprotection of retinal ganglion cells. Animals;Cell Survival;Hyperthermia, Induced;Lasers, Semiconductor;Low-Level Light Therapy;Optic Nerve;Optic Nerve Injuries;Pupil;Rats;Retinal Ganglion Cells

Bisphosphonate-Related Osteonecrosis of the Jaw (BRONJ) therapy. A critical review. Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is an area of uncovered bone in the maxillo-facial region that did not heal within 8 weeks after identification by health care provider, in a patient who was receiving or had been exposed to Bisphosphonate Therapy (BPT) without previous radiation therapy to the craniofacial region. Low-grade risk of ONJ is connected with oral BPT used in the treatment of osteopenia, osteoporosis and Paget's disease (from 0.01% to 0.04%) while higher-grade risk is associated with intravenous (IV) administration in the treatment of multiple myeloma and bone metastases (from 0.8% to 12%). The management of BRONJ currently is a dilemma. No effective treatment has yet been developed and interrupting BPT does not seem to be beneficial. Temporary suspension of BPs offers no short-term benefit, whilst long term discontinuation (if systemic conditions permit it) may be beneficial in stabilizing sites of ONJ and reducing clinical symptoms. The use of oral antimicrobial rinses in combination with oral systemic antibiotic therapy - penicillin, metronidazole, quinolones, clindamycin, doxycycline, erythromycin- is indicated for Stages I and II of Ruggiero's Staging. The role of hyperbaric oxygen therapy is still unclear but some benefits of this treatment have recently been described in association with discontinuation of BPT and conventional therapy (medical or/and surgical). Surgical treatment, in accordance to the AAOMS Position Paper, is reserved to patients affected by Stage III of BRONJ even if in the last version (2009) a superficial debridement is indicated to relieve soft tissue irritation also in the stage II (lesions being unresponsive to antibiotic treatment). Aggressive surgical treatment may occasionally results in even larger areas of exposed and painful infected bone. Surgical debridement or resection in combination with antibiotic therapy may offer long-term palliation with resolution of acute infection and pain. Mobile segments of bony sequestrum should be removed without exposing unaffected bone. If pathological fractures or complete mandibular involvement are observed, if the medical condition of the patients allows it the affected bone portion may be resected and primary bone reconstruction or revascularization graft may be carried out. Ozone therapy in the management of bone necrosis or in extractive sites during and after oral surgery in patients treated with BPs may stimulate cell proliferation and soft tissue healing. Laser applications at low intensity (Low Level Laser Therapy - LLLT) have been reported in the literature for the treatment of BRONJ. Biostimulant effects of laser improve reparative process, increase inorganic matrix of bone and osteoblast mitotic index and stimulate lymphatic and blood capillaries growth. Laser can be used for conservative surgery, whereby necrotic bone is vaporized, until healthy bone is reached. The Er:YAG laser wavelength has a high degree of affinity for water and hydroxyapatite, hence both soft and bone tissues can be easily treated. An additional advantage of the Er:YAG laser is its bactericidal and possible biostimulatory action, accelerating the healing of both soft and bone tissues, in comparison to conventional treatments. Long-term, prospective studies are required to establish the efficacy of drug holidays in reducing the risk of BRONJ for patients receiving oral BPs even if it has been suggested that BPT may be discontinued for three months before the surgical procedures and bone turnover markers (CTx,

NTx, PTH, 1,25-dihydroxy vitamin D) may be checked. However it must be recognized that interindividual variability, gender, age, physical activity, and seasonal and circadian variation exist that can result in difficulty in interpreting these assays and more research is needed. Laser application (LLLT and laser surgery) nowadays appears to be a promising modality of BRONJ treatment, being safe and well tolerated, and it permits the minimally invasive treatment of early stages of the disease. Diphosphonates Diphosphonates;Humans;Jaw;Laser Therapy;Osteonecrosis

Use of laser technology in orthodontics: hard and soft tissue laser treatments. AIM: Modern technology has perfected a new instrument that has become almost indispensable in modern dentistry, in accordance with the philosophy of minimally invasive therapy: the laser. The aim of this work is to evaluate the effectiveness and efficacy of laser technology to solve mucogingival problems associated with orthodontic treatment. Some laser wavelengths work both on hard and soft tissues (2780 nm, 2940 nm), other lasers, such as the 810 nm diode, have a very good surgical and haemostatic action on soft tissues and an important analgesic and biostimulating effect that can help the healing of both TMJ painful symptoms as well as the pain following active orthodontic treatment. Several cases connected to orthodontic therapy are presented. MATERIALS AND METHODS: Different laser systems (diode laser at 810 nm; Er,Cr:YSGG laser at 2780 nm; Erbium:YAG laser at 2940 nm) were used, both for soft tissue surgery and enamel etching, and for biostimulating effect. These wavelengths were used with different parameters for each case, according to international current studies in view of minimally invasive therapy. RESULTS: The cases reported showed very quick and good healing of the laser treated tissues. These treatments, necessary for the orthodontic therapy or for its completion, become extremely simple, safe and rapid and the orthodontic specialist can perform them himself. CONCLUSION: The laser technique is very effective in many operative and surgical procedures during orthodontic therapy. Further studies are however necessary to set the treatment protocols in orthodontic biostimulation.
Adolescent;Child;Cuspid;Female;Follow-Up Studies;Humans;Labial Frenum;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Lingual Frenum;Low-Level Light Therapy;Male;Mandible;Minimally Invasive Surgical Procedures;Orthodontics, Corrective;Tooth Movement Techniques;Tooth, Impacted

Oral mucositis. Review of literature. The standard treatment for malignant neoplasia of the cervicofacial area is surgery in association with radio- and/or chemotherapy. These therapies can cause local and systemic complications. Mucositis is the most common dose-correlated complication to the oral cavity. It is particularly difficult to treat in patients who are already physically and psychologically exhausted by the tumoral pathology. This study illustrates, through a review of the literature, the attack rate, the pathogenesis and the clinical course of the mucositis, as well as the correct dental approach and clinical-therapeutic management of these patients, with the aim of improving the quality of their lives. Anti-Infective Agents, Local;Antineoplastic Agents;Mouthwashes;Granulocyte-Macrophage Colony-Stimulating Factor Anti-Infective Agents, Local;Antineoplastic Agents;Cranial Irradiation;Cryotherapy;Granulocyte-Macrophage Colony-Stimulating Factor;Humans;Low-Level Light Therapy;Mouthwashes;Mucositis;Stomatitis

Effect of near-infrared light-emitting diodes on nerve regeneration. BACKGROUND: Photobiomodulation by red to near-infrared light-emitting diodes (LEDs) has been reported to accelerate wound healing, attenuate degeneration of an injured optic nerve, and promote tissue growth. The purpose of this study was to investigate the effect of LEDs on nerve regeneration. A histological study as well as a measurement of antioxidation levels in the nerve regeneration chamber fluid was performed. METHODS: For the histological study, the bilateral sciatic nerves were transected, and the left proximal stump and the right distal stump were inserted into the opposite ends of a silicone chamber, leaving a 10-mm gap. Light from an LED device (660 nm, 7.5 mW/cm(2)) was irradiated for 1 h per day. At 3 weeks after surgery, regenerated tissue was fixed and examined

by light microscopy. For the antioxidation assay of chamber fluid, the left sciatic nerve and a 2-mm piece of nerve from the proximal stump were transected and inserted into opposite sides of a silicone chamber leaving a 10-mm gap. LEDs were irradiated using the same parameters as those described in the histological study. At 1, 3, and 7 days after surgery, antioxidation of the chamber fluid was measured using an OXY absorbent test. RESULTS: Nerve regeneration was promoted in the LED group. Antioxidation of the chamber fluid significantly decreased from 3 days to 7 days in the control group. In the LED group, antioxidation levels did not decrease until 7 days. CONCLUSIONS: Chamber fluid is produced from nerve stumps after nerve injury. This fluid contains neurotrophic factors that may accelerate axonal growth. Red to near-infrared LEDs have been shown to promote mitochondrial oxidative metabolism. In this study, LED irradiation improved nerve regeneration and increased antioxidation levels in the chamber fluid. Therefore, we propose that antioxidation induced by LEDs may be conducive to nerve regeneration. Free Radical Scavengers Animals;Female;Free Radical Scavengers;Infrared Rays;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Neuropathy

Effects of low-level light therapy on streptozotocin-induced diabetic kidney. Hyperglycemia causes oxidative damage in tissues prone to complications in diabetes. Low-level light therapy (LLLT) in the red to near infrared range (630-1000nm) has been shown to accelerate diabetic wound healing. To test the hypothesis that LLLT would attenuate oxidative renal damage in Type I diabetic rats, male Wistar rats were made diabetic with streptozotocin (50mg/kg, ip), and then exposed to 670nm light at a dose of 9J/cm(2) once per day for 14weeks. The activity and expression of catalase and the activity of Na K-ATPase increased in kidneys of light-treated diabetic rats, whereas the activity and expression of glutathione peroxidase and the expression of Na K-ATPase were unchanged. LLLT lowered the values of serum BUN, serum creatinine, and BUN/creatinine ratio. In addition, LLLT augmented the activity and expression of cytochrome c oxidase, a primary photoacceptor molecule in the mitochondrial respiratory chain, and reduced the formation of the DNA adduct 8-hydroxy-2'-deoxyguanosine in kidney. LLLT improved renal function and antioxidant defense capabilities in the kidney of Type I diabetic rats. Thus, 670nm LLLT may be broadly applicable to the amelioration of renal complications induced by diabetes that disrupt antioxidant defense mechanisms. Catalase;Glutathione Peroxidase;Sodium-Potassium-Exchanging ATPase;Creatine Animals;Blood Urea Nitrogen;Catalase;Creatine;Diabetes Mellitus, Experimental;Glutathione Peroxidase;Infrared Rays;Kidney;Male;Phototherapy;Rats;Rats, Wistar;Sodium-Potassium-Exchanging ATPase

The influence of baseline characteristics on response to a laser acupuncture intervention: an exploratory analysis. OBJECTIVES: In clinical practice it is known that subjects vary in their response to acupuncture, but there is little data on what predicts the outcome. The aim of this study was to identify such predictors. METHOD: A secondary analysis was performed on data from 100 participants in a trial of laser and sham laser acupuncture for chronic non-specific low back pain. Multiple regression analysis was used to identify which baseline characteristics predicted pain change in the immediate, short and intermediate term. An analysis of covariance was performed based on these results to re-examine the primary result of the trial. RESULTS: Strong predictors of poor response were receipt of disability support pension, headache, the regular use of analgesics or previous failed back surgery. Higher pain scores or exacerbation of pain at baseline predicted a greater proportionate pain relief after the intervention. Adjusted analysis suggested a clinically important effect of laser compared to sham ($p<0.05$), at short term follow-up only. CONCLUSION: The findings of this study suggest which characteristics of patients with chronic low back pain are more likely to respond to laser acupuncture treatment, but require replication in other studies. The findings may not apply in other acupuncture interventions and treatment of different conditions. They may also be used to set selection criteria for future studies, and to aid interpreting the effect of baseline imbalances on trial results. Acupuncture Analgesia;Adult;Chronic Disease;Double-Blind

Method;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Patient Satisfaction;Predictive Value of Tests;Prognosis;Research Design;Self Efficacy;Surveys and Questionnaires

Influence of the irradiation distance and the use of cooling to increase enamel-acid resistance with Er:YAG laser. OBJECTIVES: The aim of this study was to assess the influence of irradiation distance and the use of cooling in the Er:YAG laser efficacy in preventing enamel demineralization. METHODS: 84 enamel blocks were randomly assigned to seven groups (n=12): G1: control group - no treatment, G2-G7: experimental groups treated with Er:YAG laser (80mJ/2Hz) at different irradiation distances with or without cooling: G2: 4mm/2mL; G3: 4mm/no cooling; G4: 8mm/2mL; G5: 8mm/no cooling; G6: 16mm/2mL; G7: 16mm/no cooling. The samples were submitted to an in vitro pH cycles for 14 days. Next, the specimens were sectioned in sections of 80-100microm in thickness and the demineralization patterns of prepared slices were assessed using a polarized light microscope. Three samples from each group were analyzed with scanning electronic microscopy. Analysis of variance and the Fisher test were performed for the statistical analysis of the data obtained from the caries-lesion-depth measurements (CLDM) (alpha=5%). RESULTS: The control group (CLDM=0.67mm) was statistically different from group 2 (CLDM=0.42mm), which presented a smaller lesion depth, and group 6 (0.91mm), which presented a greater lesion depth. The results of groups 3 (CLDM=0.74mm), 4 (CLDM=0.70mm), 5 (CLDM=0.67mm) and 7 (CLDM=0.89mm) presented statistical similarity. The scanning electronic microscopy analysis showed ablation areas in the samples from groups 4, 5, 6 and 7, and a slightly demineralized area in group 2. CONCLUSIONS: It was possible to conclude that Er:YAG laser was efficient in preventing enamel demineralization at a 4-mm irradiation distance using cooling. Acids;Saliva, Artificial Acids;Cold Temperature;Dental Enamel;Dental Enamel Solubility;Humans;Hydrogen-Ion Concentration;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Microscopy, Polarization;Radiation Dosage;Saliva, Artificial;Temperature;Time Factors;Tooth Demineralization;Tooth Remineralization

308-nm excimer lamp vs. 308-nm excimer laser for treating vitiligo: a randomized study. BACKGROUND: The 308-nm excimer laser and 308-nm excimer lamp have both been shown to be effective in treating vitiligo but a direct comparison has never been performed. OBJECTIVES: To test the equivalence of these two devices for treating nonsegmental vitiligo. PATIENTS AND METHODS: A randomized monocentric study was undertaken. One lesion was treated with the 308-nm excimer laser and its counterpart with the 308-nm excimer lamp. Lesions were treated twice weekly with the same dose on both sides for a total of 24 sessions. The evaluation was done by two independent physicians blinded to the treatment on direct light and ultraviolet light photos. RESULTS: Twenty patients were included: 17 completed the study and 104 lesions were treated. The two treatments showed similar results in terms of efficacy for a repigmentation of at least 50% (P = 0.006). The lamp induced more erythema than the laser. CONCLUSIONS: The 308-nm excimer lamp and laser showed a similar efficacy in treating vitiligo. For the same fluence, the lamp induced more erythema suggesting photobiological differences between the two devices. Adult;Algorithms;Dose-Response Relationship, Radiation;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Single-Blind Method;Treatment Outcome;Ultraviolet Therapy;Vitiligo;Young Adult

The effects of low-level diode laser treatment and dental pulp-capping materials on the proliferation of L-929 fibroblasts. Low-level laser therapy (LLLT) has been reported to improve tissue healing and might therefore be useful in dental pulp capping after trauma. We evaluated the effects of a low-level diode laser (lambda = 680 nm) and dental pulp-capping substances on cell proliferation. Calcium hydroxide and adhesive resin were applied as conditioned media to cultures. Half of the samples received irradiation with the diode laser at a fluence of 4 J/cm(2) for 60 s. Using a hemocytometer,

cells were counted at 1, 3, 5, and 7 days, and the data were analyzed by ANOVA. All cultures exhibited continuous growth, except those treated with adhesive resin. As compared to the other two groups, cell proliferation was significantly lower in cultures treated with adhesive resin; it was also significantly lower in cultures treated with calcium hydroxide, as compared to the control group. When combined with dental pulp-capping materials, LLLT had no effect on L-929 cell proliferation. Culture Media, Conditioned;Resin Cements;single bond;Bisphenol A-Glycidyl Methacrylate;Calcium Hydroxide Animals;Bisphenol A-Glycidyl Methacrylate;Calcium Hydroxide;Cell Proliferation;Cell Survival;Culture Media, Conditioned;Dental Pulp Capping;L Cells;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Resin Cements

Overhead is superior to underneath light-emitting diode phototherapy in the treatment of neonatal jaundice: a comparative study. AIM: To compare the efficacy of overhead and underneath light-emitting diode (LED) devices in the treatment of neonatal jaundice. METHODS: We compared two LED phototherapy devices: the neoBLUE device, which provides overhead illumination, and the neoBLUE cozy device, which provides illumination from underneath the infant. The models we used had similar LED sources and provided similar light intensities (30 microW/cm(2)/nm). Infants with hyperbilirubinemia were assigned to one of two groups according to the phototherapy device used (group 1, overhead illumination, 181 infants; group 2, underneath illumination, 61 infants). Recorded variables included birthweight, gender, family history, aetiology of jaundice, total duration of phototherapy and total serum bilirubin (TSB) concentration at the initiation of phototherapy, at 12-hour intervals and just before the cessation of phototherapy. The rates of decrease in TSB concentration were calculated. RESULTS: There were significant differences in the mean duration of phototherapy and in the rate of decrease in TSB concentration between the two groups. The mean duration of phototherapy in group 2 was higher than in group 1 (P= 0.037). The rate of decrease in TSB in group 1 was higher than in group 2 (P= 0.01). CONCLUSION: These results suggest that when phototherapy is used in the treatment of neonatal jaundice, the direction from which the light is applied should be considered in addition to light source intensity. Bilirubin Bilirubin;Equipment Design;Female;Humans;Infant, Newborn;Jaundice, Neonatal;Male;Phototherapy;Treatment Outcome

Cellular and molecular effects of pulsed dye laser and local narrow-band UVB therapy in psoriasis. BACKGROUND AND OBJECTIVES: Pulsed dye laser (PDL) therapy is effective in clearing psoriasis plaques, but the mechanism of action is only partially understood. Local narrow-band ultraviolet B (NB-UVB), which has a better-defined mode of action, is an effective standard treatment for psoriasis. Our aim was to evaluate the cellular and molecular effects of PDL and to compare them with those of local NB-UVB in order to gain further insight into their mechanisms of action in psoriasis. STUDY DESIGN/PATIENTS AND METHODS: Nineteen patients with stable plaque-type psoriasis were treated either with PDL or NB-UVB. Lesional punch biopsies were obtained from all patients before treatment. Additional biopsies were obtained at 3 and 24 hours after PDL treatment in five of these patients. In 14 patients additional biopsies were taken after 7 and 13 weeks of treatment. Samples were histopathologically examined for the level of dermal T cell infiltrate, and the expression of epidermal beta-defensin 2, immune cell-derived tumor necrosis factor (TNF)-alpha, endothelial E-selectin, vascular endothelial growth factor receptor (VEGFR) 2 and 3, and the expression of interleukin (IL)-23 before and after treatment. RESULTS: The expression of VEGFR2, VEGFR3, and E-selectin was decreased in clinically high responders within 24 hours after PDL treatment. The expression of IL-23, TNF-alpha mRNA, and E-selectin protein were significantly reduced after two PDL treatments, whereas the expression of all epidermal markers and dermal T cell infiltrates had normalized after four treatments. The expression of epidermal activation markers and E-selectin were significantly reduced after 13 weeks of NB-UVB treatment. CONCLUSIONS: The expression of

epidermal activation markers and the dermal T cell infiltrates were decreased after both treatments. The decreased expression of VEGFR2 and VEGFR3 followed by the down-regulation of TNF-alpha and IL-23p19 may be contributory factors in the efficacy of PDL in stable plaque-type psoriasis. Biomarkers;E-Selectin;Interleukin-23 Subunit p19;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2 Adult;Aged;Biomarkers;Biopsy, Needle;Cell Biology;Down-Regulation;E-Selectin;Female;Follow-Up Studies;Humans;Immunohistochemistry;Interleukin-23 Subunit p19;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Molecular Biology;Probability;Prospective Studies;Psoriasis;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome;Tumor Necrosis Factor-alpha;Ultraviolet Therapy;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2;Young Adult

LPLI inhibits apoptosis upstream of Bax translocation via a GSK-3beta-inactivation mechanism. Low-power laser irradiation (LPLI), a non-damage physical therapy, which has been used clinically for decades of years, is shown to promote cell proliferation and prevent apoptosis. However, the underlying mechanisms that LPLI prevents cell apoptosis remain undefined. In this study, based on real-time single-cell analysis, we demonstrated for the first time that LPLI inhibits staurosporine (STS)-induced cell apoptosis by inactivating the GSK-3beta/Bax pathway. LPLI could inhibit the activation of GSK-3beta, Bax, and caspase-3 induced by STS. In the searching for the mechanism, we found that, LPLI can activate Akt, which was consistence with our former research, even in the presence of STS. In this anti-apoptotic process, the interaction between Akt and GSK-3beta increased gradually, indicating Akt interacts with and inactivates GSK-3beta directly. Conversely, LPLI decreased the interaction between GSK-3beta and Bax, with the suppression of Bax translocation to mitochondria, suggesting LPLI inhibits Bax translocation through inactivating GSK-3beta. These results were further confirmed by the experiments of co-immunoprecipitation. Wortmannin, an inhibitor of phosphatidylinositol 3'-OH kinase (PI3K), potently suppressed the activation of Akt and subsequent anti-apoptotic processes induced by LPLI. Taken together, we conclude that LPLI protects against STS-induced apoptosis upstream of Bax translocation via the PI3K/Akt/GSK-3beta pathway. These findings raise the possibility of LPLI as a promising therapy for neuron-degeneration disease induced by GSK-3beta. Androstadienes;BAX protein, human;Phosphoinositide-3 Kinase Inhibitors;Protein Kinase Inhibitors;bcl-2-Associated X Protein;GSK3B protein, human;Glycogen Synthase Kinase 3 beta;Proto-Oncogene Proteins c-akt;Glycogen Synthase Kinase 3;CASP3 protein, human;Caspase 3;Staurosporine;Wortmannin Adenocarcinoma;Androstadienes;Apoptosis;Caspase 3;Cell Line, Tumor;Dose-Response Relationship, Radiation;Enzyme Activation;Glycogen Synthase Kinase 3;Glycogen Synthase Kinase 3 beta;Humans;Lasers, Gas;Low-Level Light Therapy;Lung Neoplasms;Phosphatidylinositol 3-Kinases;Phosphoinositide-3 Kinase Inhibitors;Protein Binding;Protein Kinase Inhibitors;Protein Transport;Proto-Oncogene Proteins c-akt;RNA Interference;Signal Transduction;Staurosporine;Time Factors;Transfection;Wortmannin;bcl-2-Associated X Protein

Reply to: The use of low-level light for hair growth: Part I. Alopecia;Female;Hair;Humans;Low-Level Light Therapy;Male;Skin Physiological Phenomena;Treatment Outcome

Use of the Q-switched Nd:YAG laser for the treatment of pigmentary disorders in Egyptians. BACKGROUND AND OBJECTIVE: Laser treatment of cutaneous pigmentation is one of the most interesting areas in cutaneous surgery. Our purpose was to study the efficacy of Q-switched Nd:YAG at 1064 nm and 532 nm for the treatment of some pigmented lesions in our locality in Egypt. METHODS: A total of 60 subjects were treated with the Q-switched Nd:YAG laser with fluences ranging from 8 to 10 J/cm(2) for dermal lesions and 2.5-5 J/cm(2) for epidermal lesions. The number

of sessions ranged from one to six sittings for epidermal lesions, four to six sessions for dermal lesions, while the mixed group required two to three sessions. RESULTS: A total of 34 patients (56.7%) showed excellent response, seven patients (11.7%) showed good response, nine patients (15%) showed fair response, and 10 (16.6%) showed poor response. Transient postinflammatory hyperpigmentation occurred in five patients (8.33%) and erythema in seven patients (11.66%). Complications were common in darker skin types V and VI. CONCLUSION: The Q-switched Nd:YAG laser is an effective and safe technique for the treatment of pigmented skin lesions. Adverse hyperpigmentation can occur but is transient. Adolescent;Adult;Child;Dose-Response Relationship, Radiation;Egypt;Erythema;Face;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Severity of Illness Index;Skin Pigmentation;Treatment Outcome;Young Adult
Split-face comparison study of cryogen spray cooling versus pneumatic skin flattening in skin tightening treatments using a long-pulsed Nd:YAG laser. BACKGROUND: Nd:YAG pulsed lasers are used for non-ablative skin tightening treatment. A common drawback of this procedure is pain, which is often intolerable. Pneumatic skin flattening (PSF) is a new technology which alleviates pain in laser treatments. The purpose of this study is to assess the clinical efficacy and pain reduction in Nd:YAG laser skin tightening treatments with PSF compared to Nd:YAG laser skin tightening treatments with cryogen spray cooling (CSC). METHODS: Eleven patients were treated on the face with an Nd:YAG laser operated at an energy setting of 30 J/cm(2) and a pulse duration of 50 ms. Half of the face was treated with the Nd:YAG using CSC and the other side was treated with the Nd:YAG using PSF. A comparison of pain elicited from each treatment was done by comparing each patient's VAS pain scoring of the two sides. RESULTS: Treatment efficacy with CSC and with PSF was identical. The study confirmed significant pain reduction with PSF ($p < 0.01$). The average pain scores for PSF and CSC were 2.4 and 6.9, respectively. Mild ecchymosis was observed in two patients on the PSF side. CONCLUSION: Nd:YAG laser skin tightening treatments with PSF are less painful than Nd:YAG laser skin tightening treatments with CSC; the PSF treatments can be done with minimum side effects. Aerosol Propellants Aerosol Propellants;Aged;Aged, 80 and over;Cryotherapy;Edema;Face;Female;Humans;Low-Level Light Therapy;Middle Aged;Pain;Patient Satisfaction;Pressure;Stress, Mechanical;Treatment Outcome
Use of 532-nm Q-switched Nd:YAG laser for smoker's gingival hyperpigmentation. Laser treatments using 532-/1064-nm Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) lasers are popular non-ablative and selective photothermolysis therapies for pigmentary disorders. We treated three male Korean patients (aged 23, 27 and 24 years) for smoker's gingival hyperpigmentation using a 532-nm Q-switched Nd:YAG laser. At each treatment session, the laser was delivered at 1.2 J/cm(2) with a 5-mm spot size and appropriate overlap. Clinical improvement as well as complete healing of the treated gingiva was noted within 2 weeks after each treatment. We also observed that the therapeutic effects lasted more than 6 months. Adult;Esthetics, Dental;Gingival Diseases;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Oral Surgical Procedures;Smoking;Treatment Outcome;Young Adult
Journal of Cosmetic and Laser Therapy. Editorial. Humans;Laser Therapy;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain
Vitiligo therapy in children: a case for considering excimer laser treatment. Immunosuppressive Agents;Steroids;Tacrolimus Adolescent;Child;Child, Preschool;Combined Modality Therapy;Humans;Immunosuppressive Agents;Lasers, Excimer;Low-Level Light Therapy;Phototherapy;Steroids;Tacrolimus;Treatment Outcome;Vitiligo
Morphological assessment of dentine and cementum following apicectomy with Zekrya burs and Er:YAG laser associated with direct and indirect Nd:YAG laser irradiation. OBJECTIVES: This study

aimed to assess the apical surface morphology of maxillary central incisors resected 3.0 mm from the tooth apex using Zekrya burs or Er:YAG laser, with or without subsequent direct Nd:YAG laser irradiation (apical and buccal surfaces) and indirect irradiation (palatal surface). STUDY DESIGN: Forty maxillary central incisors were instrumented and obturated. The roots were divided into 4 groups according to the root resection method (Zekrya bur or Er:YAG laser - 1.8 W, 450 mJ, 4 Hz, 113 J/cm(2)) and further surface treatment (none or Nd:YAG laser - 2.0 W, 100 mJ, 20 Hz, 124 J/cm(2)). The teeth were prepared for SEM analysis. Scores ranging from 1 to 4 were attributed to cut quality and morphological changes. The data were analyzed by the Kruskal-Wallis test and by Dunn's test. RESULTS: SEM images showed irregular surfaces on the apical portions resected with Zekrya burs, with smear layer and grooves in the resected dentine and slight gutta-percha displacement and plasticization. On the other hand, apicectomies carried out with Er:YAG laser showed morphological changes compatible with ablated dentine, with rough surfaces and craters. In spite of the presence of plasticized gutta-percha, with the presence of bubbles, an irregular adaptation of the filling material to the root walls was also observed. Direct Nd:YAG laser irradiation of the apical and buccal surfaces of the resected roots resulted in areas of resolidification and fusion in the dentine and cementum, with a vitrified aspect; indirect Nd:YAG laser irradiation of the palatal surfaces yielded a lower number of changes in the cementum, with irregular resolidification areas. CONCLUSIONS: There were no differences in terms of cut quality between the use of burs and Er:YAG laser or between the 2 surfaces (apical and buccal) treated with Nd:YAG laser with direct irradiation. However, morphological changes were significantly less frequent on surfaces submitted to indirect irradiation (palatal) when compared with those directly irradiated. Root Canal Filling Materials;Root Canal Irrigants;Gutta-Percha Apicoectomy;Dental Cementum;Dental Marginal Adaptation;Dentin;Gutta-Percha;Humans;Incisor;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Filling Materials;Root Canal Irrigants;Root Canal Obturation;Root Canal Preparation;Single-Blind Method;Smear Layer;Surface Properties;Tooth Apex

Low-fluence Q-switched neodymium-doped yttrium aluminum garnet (1,064 nm) laser for the treatment of facial melasma in Asians. BACKGROUND: Pigment lasers have been used in melasma with unsatisfactory results. OBJECTIVE: To determine the effectiveness and safety of 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet (QS-Nd:YAG) laser treatment of melasma in Asians. MATERIALS AND METHODS: Split-face randomized study comparing combination QS-Nd:YAG laser and 2% hydroquinone with topical treatment in dermal or mixed-type melasma. Twenty-two patients were treated with 1,064-nm QS-Nd:YAG laser, 6-mm spot size, 3.0- to 3.8-J/cm(2) fluence for five sessions at 1-week intervals. Pigmentation was objectively recorded using a colorimeter (lightness index score), and subjective assessments were evaluated using the modified Melasma Area and Severity Index (mMASI) score. RESULTS: After five laser treatments, statistically significant improvement of melasma from baseline was observed in colorimeter ($p<.001$) and mMASI score ($p<.001$) on the laser side. The laser side achieved an average 92.5% improvement in relative lightness index and 75.9% improvement in mMASI, compared with 19.7% and 24%, respectively, on the control side ($p<.001$). Mottled hypopigmentation developed in three patients. During follow-up, four of 22 patients developed rebound hyperpigmentation, and all patients had recurrence of melasma. CONCLUSION: QS-Nd:YAG laser treatment for melasma in Asians produced only temporary improvement and had side effects. Common complications were hypopigmentation, melasma recurrence, and rebound hyperpigmentation. Dermatologic Agents;Hydroquinones;hydroquinone Administration, Topical;Adult;Asian People;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Skin;Skin Pigmentation;Treatment Outcome

Laser acupuncture for myofascial pain of the masticatory muscles. A controlled pilot study. PURPOSE: The purpose of this investigation was to evaluate the effectiveness of laser acupuncture within the scope of a pilot study. METHODS: 108 adult patients were examined and of those eleven patients were included in the prospective pilot study. These patients took part voluntarily and were diagnosed with tendomyopathy of the masticatory musculature with maximum face and jaw pain on a visual analogous scale VAS > or = 30 in the last 14 days. Four patients wanted to be sure not to be assigned to the placebo group and were treated with the laser (group1, verum open, N = 4). The remaining seven were split by means of block randomisation into groups 2 (verum blind, N = 3) and 3 (placebo blind, N = 4). Two local points (ST 6, SI 18) and two distant points (SI 3, LI 4) on both sides of the body were stimulated (groups 1 and 2) or placebo-stimulated (group 3) with the LASERneedle machine for 15 minutes twice a week for three weeks (6 sessions). After three months a clinical follow-up was carried out, which included a standardised questionnaire as to the maximum pain intensity (VAS and verbal scale) and on the need for further treatment. A pain reduction (VAS) of about 50% was evaluated as a success. RESULTS: Pain decreased on average 40 VAS points for ten of eleven patients. The pain reduction on the VAS in group 1 (verum open) was more than 50% for all four patients, in group 3 (placebo blind) for three of four patients, and in group 2 (verum blind) all remained under 50%. The evaluation on the verbal scale showed a pain reduction from moderate to very strong pains initially, to moderate, light and no pain after three months for all three groups. DISCUSSION: The range of application of the laser was limited by the narrow inclusion criteria of the pilot study. The laser acupuncture (open and blinded) did not show a negative effect in any group. The pain reduction was strongest with the blinded patients of the placebo group. The worst performance was in the blinded group with laser acupuncture. CONCLUSION: Due to the low number of participants, no clear conclusion can be drawn. Laser needle acupuncture may be a treatment option for patients with an interest in a noninvasive, complementary therapy. But clarification and treatment planning on an individual basis must take place first. Acupuncture Analgesia;Adult;Double-Blind Method;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Masticatory Muscles;Middle Aged;Pain Measurement;Pilot Projects;Prospective Studies;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome;Young Adult

Photodynamic therapy in periodontal therapy: microbiological observations from a private practice. In recent years, the combination of laser light and photosensitizer known as photodynamic therapy (PDT) has been used in periodontal therapy. However, there are not enough clinical studies to fully evaluate the effects of PDT on the periodontal tissues. This microbiological study examined the effects of PDT on the periodontal bacteria in combination with scaling and root planing (SRP) in the same group of patients by randomly selecting PDT or SRP for use in different quadrants of the mouth. For the present study, PDT was compared with a diode laser (980 nm) and an Nd:YA G laser (1,064 nm). Microbiological samples were examined and evaluated over a period of three months. Significant bacterial reduction has been observed in all cases. The diode laser with SRP presented long-term positive results, while PDT showed a significant bacteria reduction during the entire observation period. Photosensitizing Agents Aggregatibacter actinomycetemcomitans;Bacterial Load;Bacteroides;Dental Scaling;Fusobacterium nucleatum;Gram-Negative Bacteria;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Peptostreptococcus;Periodontal Diseases;Photochemotherapy;Photosensitizing Agents;Porphyromonas gingivalis;Prevotella intermedia;Root Planing;Treponema denticola

Onycotrychia?: subungual hair follicle as another cause of longitudinal melanonychia or pigmentationâ€Š--â€Šhair follicle as cause of melanonychia. Keratin-19 Adult;Biopsy;Hair Follicle;Humans;Keratin-19;Lasers, Gas;Low-Level Light Therapy;Nail Diseases;Nails;Pigmentation Disorders

Laser biomodulation on L 929 cell culture. OBJECTIVE: The aim of the present study was to analyze the effects of photobiomodulation using a 904-nm diode laser at two energy densities (6 J/cm(2) and 50 mJ/cm(2)) on L929 fibroblast cells. BACKGROUND: Low-power laser irradiation (LPLI) is a non-pharmacological resource that induces important in vitro photobiomodulation on cell cultures and tissues. METHODS: Irradiation was performed for three days at 24-h intervals. After each interval, the cells were stained with MitoTracker Orange and DioC6 dyes to assess the photobiomodulatory effects of irradiation on mitochondrial activity and changes in the endoplasmic reticulum. The MTT assay [3-(4.5-dimethylthiazol-2-yl)-2.5 diphenyltetrazolium bromide] was used to evaluate cell proliferation. RESULTS AND CONCLUSIONS: The fluorescence microscopy assessment of mitochondria and endoplasmic reticulum in cells irradiated with 6 J/cm(2) and 50 mJ/cm(2) demonstrated intense mitochondrial activity, which was confirmed by DioC6 staining. Reticular activity was observed stemming from increased protein synthesis. Photobiomodulation with 50 mJ/cm(2) was slightly higher than with 6 J/cm(2), as demonstrated by fluorescence microscopy results. Photobiomodulation was also time-dependent, with better results 72-h after irradiation. Tetrazolium Salts Animals;Cell Division;Cells, Cultured;Endoplasmic Reticulum;Fibroblasts;Lasers;Mice;Microscopy, Fluorescence;Mitochondria;Tetrazolium Salts;Time Factors

Low power laser in the management of ureteral stones. OBJECTIVE: To evaluate the outcome of the low power Holmium-Yag laser in management of ureteral stones, and to report the incidence rate of different types of stones. METHODS: One hundred and seventy patients underwent ureteroscopy and fragmentation of ureteral stones at the International Medical Center, Jeddah, Kingdom of Saudi Arabia between March 2007 and August 2009. Stones were measured by their largest diameter on CT and classified according to their location from the ureter to the proximal middle and distal ureteral stones. We utilized 8-11 F Semi rigid or 7.5 F flexible ureteroscopes to identify the stones, and all stones were fragmented and evaporated using a 10 watt lower power Holmium-yag laser lithotripter. RESULTS: All stones were completely evaporated and fragmented using the Holmium-yag laser through ureteroscopy. The age of the patients varied between 21-76 years with a mean age of 38.6 years (males 113, and females 57). The largest diameter of the largest stone was 6-12mm (mean 8 mm) and classified according to its location in the ureter into proximal (93 [54.7%]), middle (26 [15.3%]), or distal ureteral stones (51 [30%]). We performed stone analysis in 122 patients (oxalate [n=87], uric acid [n=16], cystine [n=11], and calcium phosphate [n=8]). CONCLUSION: Laser lithotripsy using low power 10 watt laser lithotripter is safe and effective method for stone evaporation and disintegration, and can be carried out as a day care procedure. The types of stones in Saudi Arabia are same as it has been reported before in the literature. Adult;Aged;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Ureteral Calculi

Optical heating and rapid transformation of functionalized fullerenes. Irradiating single-walled carbon nanotubes can lead to heat generation or ignition. These processes could be used in medical and industrial applications, but the poor solvent compatibility and high aspect ratios of nanotubes have led to concerns about safety. Here, we show that certain functionalized fullerenes, including polyhydroxy fullerenes (which are known to be environmentally safe and to have therapeutic properties) are heated or ignited by exposure to low-intensity (<10(2) W cm(-2)) continuous-wave laser irradiation. We also show that polyhydroxy fullerenes and other functionalized fullerenes can be transformed into single-walled nanotubes, multiwalled nanotubes and carbon onions without the presence of a catalyst by exposure to low-intensity laser irradiation in an oxygen-free environment. To demonstrate the potential usefulness of these processes in applications, we disrupted animal cells dosed with polyhydroxy fullerenes by exposing them to a near-infrared laser for a few seconds, and also ignited an explosive charge in contact with a particle of carboxy fullerenes. Fullerenes;Nanotubes, Carbon;Argon;Silicon Dioxide Ablation Techniques;Animals;Argon;Cell

Line, Tumor;Fullerenes;Hot Temperature;Humans;Lasers;Nanoparticles;Nanotubes, Carbon;Silicon Dioxide;Temperature

Effects of CO2 laser irradiation of the gingiva during tooth movement. Patients often feel pain or discomfort in response to orthodontic force. It was hypothesized that CO(2) laser irradiation may reduce the early responses to nociceptive stimuli during tooth movement. The distribution of Fos-immunoreactive (Fos-IR) neurons in the medullary dorsal horn of rats was evaluated. Two hrs after tooth movement, Fos-IR neurons in the ipsilateral part of the medullary dorsal horn increased significantly. CO(2) laser irradiation to the gingiva just after tooth movement caused a significant decrease of Fos-IR neurons. PGP 9.5- and CGRP-positive nerve fibers were observed in the PDL of all study groups. The maximum temperature below the mucosa during CO(2) laser irradiation was less than 40 degrees C. It was suggested that CO(2) laser irradiation reduced the early responses to nociceptive stimuli during tooth movement and might not have adverse effects on periodontal tissue. Proto-Oncogene Proteins c-fos;UCHL1 protein, rat;Ubiquitin Thiolesterase;Calcitonin Gene-Related Peptide Animals;Body Temperature;Calcitonin Gene-Related Peptide;Cell Count;Gingiva;Lasers, Gas;Low-Level Light Therapy;Male;Nerve Fibers;Neural Pathways;Neurons;Nociceptors;Periodontal Ligament;Proto-Oncogene Proteins c-fos;Rats;Rats, Wistar;Time Factors;Tooth Movement Techniques;Trigeminal Nuclei;Ubiquitin Thiolesterase

Effect of low-level laser therapy (GaAlAs) on bone regeneration in midpalatal anterior suture after surgically assisted rapid maxillary expansion. OBJECTIVE: The aim of this study was to evaluate the effects of laser therapy on bone regeneration in the midpalatal anterior suture (MPAS) after surgically assisted rapid maxillary expansion (SARME). METHODS: Thirteen patients aged between 18 and 33 years old with maxillary transverse deficiency (> or =7.0 mm) were evaluated. All patients underwent subtotal Le Fort I osteotomy with separation of the pterygomaxillary suture with the use of Hyrax expander, and were divided into 2 groups: control group (n = 6) and laser group (n = 7). A GaAlAs laser (P = 100 mW, lambda = 830 nm, Ã˜ = 0.06 cm(2)) was used. The laser was applied in 8 treatment sessions with intervals of 48 hours. Each treatment session consisted of laser applications, per point (E = 8.4J, ED = 140J/cm(2)), at 3 points on the MPAS, and total dose of E = 25.2 J, ED = 420 J/cm(2). Digital radiographs were taken before the surgical procedure and at 1-, 2-, 3-, 4-, and 7-month follow-up visits. Optical density analysis of the regenerated bone was performed using Adobe Photoshop 8.0 software. RESULTS: Bone regeneration associated with the use of laser after SARME showed a statistically significant difference. A higher mineralization rate was found in the laser group (26.3%, P < .001) than the control group. CONCLUSION: Low-level laser irradiation (GaAlAs) accelerates bone regeneration in MPAS after SARME. However, the optical density measurements after 7 months of follow-up were lower in comparison with the preoperative measurements. Adolescent;Adult;Bone Density;Bone Regeneration;Case-Control Studies;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxilla;Osteotomy, Le Fort;Palatal Expansion Technique;Palate, Hard;Radiography;Reproducibility of Results;Statistics, Nonparametric;Treatment Outcome;Young Adult

Laser 904 nm action on bone repair in rats with osteoporosis. SUMMARY: The aim of the present study was to determine the action of AsGA laser irradiation on bone repair in the tibia of osteopenic rats. The animals were randomly divided into eight experimental groups according to the presence of ovarian hormone (sham group) or the absence of the hormone (OVX group), as well as being irradiated or non-irradiated. Low-level 904-nm laser (50 mJ/cm(2)) accelerated the repair process of osteopenic fractures, especially in the initial phase of bone regeneration. INTRODUCTION: The development of new techniques to speed the process of bone repair has provided significant advances in the treatment of fractures. Some attention recently focused on the effects of biostimulation on bone. METHODS: Forty-eight adult rats were randomly divided into eight

experimental groups (six animals in each group) according to the presence of ovarian hormone (sham group) or absence of the hormone (ovariectomized (OVX) group) as well as being irradiated or non-irradiated. For the application of low-level laser therapy, the animals were anesthetized with one third of the dose sufficient to immobilize the animal and irradiated with AsGa laser (904 nm, 50 mJ/cm(2) for 2 s, point form and in contact). The control animals received the same type of manipulation as the irradiated animals, but with the laser turned off. Half of the animals were killed 7 days following the confection of the bone defect, and the other half were killed 21 days after the surgery. After complete demineralization, the tibias were cut cross-sectionally in the central region of the bone defect and embedded in paraffin blocks. The blocks were then cut in semi-seriated slices and stained with hematoxylin and eosin. RESULTS: There was new bone formation in the animals in the OVX group with laser treatment killed after 7 days (pâ€‰<â€‰0.001). The lowest percentage of bone formation was observed in the OVX without laser killed after 7 days (pâ€‰>â€‰0.05). All animals killed after 21 days exhibited linear closure of the lesion. CONCLUSION: Low-level 904-nm laser (50 mJ/cm(2)) accelerated the repair process of osteopenic fractures, especially in the initial phase of bone regeneration. Animals;Bone Regeneration;Disease Models, Animal;Female;Fracture Healing;Low-Level Light Therapy;Osteoporotic Fractures;Ovariectomy;Rats;Rats, Wistar;Tibial Fractures

The role of laser biostimulation in early post-surgery rehabilitation and its effect on wound healing. BACKGROUND: The aim of this paper is to investigate whether laser biostimulation starting on the first day after surgery of the brachial plexus or peripheral nerves has a positive therapeutic effect on wound healing. MATERIAL AND METHODS: Surgical procedures were carried out on 44 male Wistar rats. The animals were divided into a control group (Group 1), where the surgical wounds were allowed to heal spontaneously, and an experimental Group 2, where the wounds were exposed to laser irradiation with the following parameters: wavelength 810 nm, power 100 mW, energy 15 J, laser exposure surface 3 cm(2), single application time 2 min. 30 sec., continuous mode. The results were assessed with pathomorphological tests (gross appearance of the wound, light and electron microscopy studies) and breaking strength examination. Statistical analysis used arithmetic means, standard deviations and Student's t test for independent samples. RESULTS: Low energy infrared laser radiation had a beneficial effect on the covering of the scar with stratified squamous cornifying epithelium and intensified wound healing. CONCLUSIONS: The gross and microscopic findings indicated a beneficial effect of laser stimulation on wound healing. These results underscore the utility of biostimulation lasers in the early post-operative period. Physicomechanical investigations did not reveal an effect of infrared laser biostimulation on the breaking strength of the cutaneous scar. Collagen Animals;Cell Proliferation;Collagen;Disease Models, Animal;Fibroblasts;Infrared Rays;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Skin;Wound Healing

Argon laser phototherapy could eliminate the damage effects induced by the ionizing radiation "gamma radiation" in irradiated rabbits. The ionizing radiations could be taken in considerate as an integral part in our life, since, living organisms are actually exposed to a constant shower of ionizing radiations whether from the natural or artificial resources. The radio-protective efficiency of several chemicals has been confirmed in animal trails, whereas, due to their accumulative toxicity, their clinical utility is limited. Therefore, we aimed in the present work to investigate the possibility of using argon laser to recuperate the damaged tissues due to exposing to the ionizing radiation. The rabbits were used in this study, and they were designed as control, gamma irradiated, laser, and gamma plus laser groups. Lipid peroxidation, reduced glutathione (GSH), glutathione peroxidase (GSH-Px) and glucose-6-phosphate dehydrogenase (G-6-PD) in blood and liver were evaluated. As well as, the level of protein thiol was evaluated in the plasma among each group. Results of this study

revealed the potential therapeutic performance of the treatment by laser argon to decline the damaging effect of the ionized radiation whether at systematic or local levels. In conclusion, argon laser therapy appears propitious protective effect against the hazard effects of gamma radiation. Sulfhydryl Compounds;Glucosephosphate Dehydrogenase;Glutathione Peroxidase;Glutathione Animals;Gamma Rays;Glucosephosphate Dehydrogenase;Glutathione;Glutathione Peroxidase;Lasers, Gas;Lipid Peroxidation;Liver;Phototherapy;Rabbits;Sulfhydryl Compounds;Whole-Body Irradiation
Effect of GaAlAs laser irradiation on the epiphyseal cartilage of rats. OBJECTIVE: To study the effect of an 830-nm gallium-aluminum-arsenic (GaAlAs) diode laser at two different energy densities (5 and 15 J/cm(2)) on the epiphyseal cartilage of rats by evaluating bone length and the number of chondrocytes and thickness of each zone of the epiphyseal cartilage. BACKGROUND DATA: Few studies have been conducted on the effects of low-level laser therapy on the epiphyseal cartilage at different irradiation doses. MATERIALS AND METHODS: A total of 30 male Wistar rats with 23 days of age and weighing 90 g on average were randomly divided into 3 groups: control group (CG, no stimulation), G5 group (energy density, 5 J/cm(2)), and G15 group (energy density, 15 J/cm(2)). Laser treatment sessions were administered every other day for a total of 10 sessions. The animals were killed 24 h after the last treatment session. Histological slides of the epiphyseal cartilage were stained with hematoxylin-eosin (HE), photographed with a Zeiss photomicroscope, and subjected to histometric and histological analyses. Statistical analysis was performed using one-way analysis of variance followed by Tukey's post hoc test. All statistical tests were performed at a significance level of 0.05. RESULTS: Histological analysis and x-ray radiographs revealed an increase in thickness of the epiphyseal cartilage and in the number of chondrocytes in the G5 and G15 groups. CONCLUSION: The 830-nm GaAlAs diode laser, within the parameters used in this study, induced changes in the thickness of the epiphyseal cartilage and increased the number of chondrocytes, but this was not sufficient to induce changes in bone length. Animals;Chondrocytes;Growth Plate;Lasers, Semiconductor;Male;Rats;Rats, Wistar
More experiments. Biomedical Research;Carpal Tunnel Syndrome;Evidence-Based Medicine;Hand;Humans;Low-Level Light Therapy;Periodicals as Topic;Review Literature as Topic
Low-level laser treatment. Carpal Tunnel Syndrome;Diagnosis, Differential;Humans;Low-Level Light Therapy;Male;Middle Aged
[Low level laser therapy: treatment option in neck pain]. Complementary Therapies;Humans;Low-Level Light Therapy;Neck Pain
Low-level laser therapy for neck pain. Data Interpretation, Statistical;Humans;Low-Level Light Therapy;Neck Pain;Pain Measurement;Randomized Controlled Trials as Topic;Research Design;Treatment Outcome
Low-level laser therapy for neck pain. Data Interpretation, Statistical;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Neck Pain;Pain Measurement;Sample Size
Diagnosis and treatment of osteoarthritis. Osteoarthritis (OA) is a common disease in aging dogs and cats but frequently goes undiagnosed and untreated. Although OA cannot be cured, long-term management of the disease can be very rewarding for the veterinary medical team as well as pet owners. Managing pain with pain medications is an essential first step. There are a wealth of pain medications available, including nonsteroidal antiinflammatory drugs, gabapentin, amantadine, and tramadol. There are also physical modalities available for pain reduction. Weight management and nutritional joint support are also important in aspects of managing OA in dogs and cats. Finally, physical rehabilitation is a great way to improve mobility and keep pets active as they age. Analgesics Analgesics;Animals;Cat Diseases;Cats;Dietary Supplements;Dog Diseases;Dogs;Exercise Therapy;Low-Level Light Therapy;Osteoarthritis;Pain;Pain Management;Pain Measurement;Weight Loss

Fractional photothermolysis for the treatment of surgical scars. Cicatrix;Cosmetic Techniques;Humans;Lasers, Solid-State;Low-Level Light Therapy;Mohs Surgery;Postoperative Complications;Plastic Surgery Procedures;Treatment Outcome

Pilot study in neonates using low-level laser therapy in the immediate postoperative period of myelomeningocele. OBJECTIVE: To analyze the tissue repair behavior after corrective surgical incision in neonates submitted to low-level laser therapy, in an attempt to diminish the incidence of postoperative dehiscence following the surgery for myelomeningocele performed immediately after birth. METHODS: It is a prospective pilot study with 13 myelomeningocele patients submitted to surgery at birth who received adjuvant treatment with low-level laser therapy (Group A). Diode laser C.W., Î» = 685t nm, p = 21 mW, E = 0.19 J was punctually applied along the surgical incision, summing up 4 to 10 J energy delivered per patient, according to the surgical wound area and, then, compared with the previous results, which were obtained from 23 patients undergoing surgery without laser therapy (Group B). RESULTS: This pilot study showed a significant decline in dehiscence of surgical wounds in neonates submitted to low-level laser therapy as compared to controls (7.69 versus 17.39%, respectively), demonstrating this is an effective, safe and noninvasive treatment method. CONCLUSION: This new adjuvant therapeutic proposal with low-level laser therapy aided healing of surgical wounds, preventing morbidities, as well as decreasing hospital stay, which implies cost of reduction for patients and for the institution.

Low-level Er:YAG laser irradiation enhances osteoblast proliferation through activation of MAPK/ERK. Although the use of high-level Er:YAG laser irradiation has been increasing in periodontal and peri-implant therapy, the effects of low-level Er:YAG laser on surrounding tissues and cells remain unclear. In the present study, the effects of low-level Er:YAG laser irradiation on osteoblast proliferation were investigated. Cells of the osteoblastic cell line MC3T3-E1 were treated with low-level Er:YAG laser irradiation with various combinations of laser settings (fluence 0.7-17.2 J/cm(2)) and in the absence or presence of culture medium during irradiation. On day 1 and/or day 3, cell proliferation and death were determined by cell counting and by measurement of lactate dehydrogenase (LDH) levels. Further, the role of mitogen-activated protein kinase (MAPK) pathways in laser-enhanced cell proliferation was investigated by inhibiting the MAPK pathways and then measuring MAPK phosphorylation by Western blotting. Higher proliferation rates were found with various combinations of irradiation parameters on days 1 and 3. Significantly higher proliferation was also observed in laser-irradiated MC3T3-E1 cells at a fluence of approximately 1.0-15.1 J/cm(2), whereas no increase in LDH activity was observed. Further, low-level Er:YAG irradiation induced the phosphorylation of extracellular signal-regulated protein kinase (MAPK/ERK) 5 to 30 min after irradiation. Although MAPK/ERK 1/2 inhibitor U0126 significantly inhibited laser-enhanced cell proliferation, activation of stress-activated protein kinases/Jun N-terminal kinase (SAPK/JNK) and p38 MAPK was not clearly detected. These results suggest that low-level Er:YAG laser irradiation increases osteoblast proliferation mainly by activation of MAPK/ERK, suggesting that the Er:YAG laser may be able to promote bone healing following periodontal and peri-implant therapy. L-Lactate Dehydrogenase;Extracellular Signal-Regulated MAP Kinases;JNK Mitogen-Activated Protein Kinases;Mitogen-Activated Protein Kinases;p38 Mitogen-Activated Protein Kinases Animals;Blotting, Western;Cell Death;Cell Line;Cell Proliferation;Extracellular Signal-Regulated MAP Kinases;JNK Mitogen-Activated Protein Kinases;L-Lactate Dehydrogenase;Lasers, Solid-State;Low-Level Light Therapy;Mice;Mitogen-Activated Protein Kinases;Osteoblasts;Phosphorylation;p38 Mitogen-Activated Protein Kinases

Lymphatic malformations: a proposed management algorithm. OBJECTIVE: The aim of this study was to develop a management algorithm for cervicofacial lymphatic malformations, based on the authors' experience in managing these lesions as well as current literature on the subject. STUDY

DESIGN AND METHODS: A retrospective medical record review of all the patients treated for lymphatic malformations at our institution during a 10-year period (1998-2008) was performed. DATA COLLECTED: age at diagnosis, location and type of lesion, radiologic investigation performed, presenting symptoms, treatment modality used, complications and results achieved. RESULTS: 14 patients were identified. Eight (57%) male and six (43%) female. There was an equal distribution between the left and right sides. The majority (71%) of cases were diagnosed within the first year of life. The majority of lesions were located in the suprahyoid region. The predominant reason for referral was an asymptomatic mass in 7 cases (50%) followed by airway compromise (36%) and dysphagia (14%). Management options employed included: observation, OK-432 injection, surgical excision and laser therapy. In 5 cases (36%) a combination of these were used. CONCLUSION: Historically surgical excision has been the management option of choice for lymphatic malformations. However due to the morbidity and high complication rate associated this is increasingly being questioned. Recent advances in sclerotherapy e.g. OK-432 injection have also shown significant promise. Based on experience in managing these lesions as well as current literature the authors of this paper have developed an algorithm for the management of cervicofacial lymphatic malformations. Antineoplastic Agents;Picibanil Airway Obstruction;Algorithms;Antineoplastic Agents;Child;Child, Preschool;Deglutition Disorders;Diagnostic Imaging;Female;Head and Neck Neoplasms;Humans;Infant;Infant, Newborn;Lasers, Solid-State;Low-Level Light Therapy;Lymphangioma;Male;Neoplasm Recurrence, Local;Picibanil;Retrospective Studies;Sclerotherapy

Photodynamic photorejuvenation of the face with a combination of microneedling, red light, and broadband pulsed light. BACKGROUND: High efficacy and safety, coupled with in-office, short contact protocols have made photodynamic therapy (PDT) with aminolevulenic acid (ALA) for the treatment of actinic keratoses a mainstay option over the last decade. Clinical improvement in photoaged skin has also been reported to accompany PDT treatments. The study objective was to maximize epidermal penetration and subsequent activation of ALA for the treatment of photodamaged facial skin, utilizing a microneedle roller prior to incubation and combined irradiation with red light and broadband pulsed light in a single treatment. MATERIALS AND METHODS: A full-face treatment of 21 patients was performed with 630 nm light and broadband pulsed light after multiple passes with a microneedle roller and 1-hour ALA incubation. The primary endpoint was clinical improvement, scored during two separate live assessments by three physicians blinded to previous scores, using a 5-point standardized photoaging scale. The secondary endpoint was evaluation of patient satisfaction based on a quartile scale comparing baseline to 6-month post-treatment photography. RESULTS: Statistically significant improvement was seen in the global photoaging scores, as well as sub-components of the scale (fine lines, mottled pigmentation, sallowness, tactile roughness, and telangiectasias) at 3 months as compared with baseline live assessment, and at 6-month live assessment compared with the 3 months. In addition, 90% of patients judged clinical improvement to be greater than 50% at 6 months compared to baseline photography. CONCLUSION: Use of a microneedle roller to "pre-treat" prior to application of ALA appears to be well tolerated and allows for even absorption and perhaps deeper penetration of ALA following a defined incubation period. Use of red light and broadband pulsed light allowed for deeper activation of ALA, potentially accounting for marked clinical improvement in photoaging. Aminolevulinic Acid Aged;Aminolevulinic Acid;Cohort Studies;Combined Modality Therapy;Facial Dermatoses;Female;Humans;Immunohistochemistry;Lasers;Low-Level Light Therapy;Male;Middle Aged;Needles;Patient Satisfaction;Photochemotherapy;Rejuvenation;Skin Aging;Treatment Outcome

Enhancement of skin optical clearing efficacy using photo-irradiation. BACKGROUND AND OBJECTIVES: Tissue optical clearing technique based on immersion of tissues into optical clearing

agents (OCAs) can reduce the scattering and enhance the penetration of light in tissue. However, the barrier function of epidermis limits the penetration of OCAs, and hence is responsible for the poor optical clearing efficacy of skin by topical action. In this study, a variety of light irradiation was applied to increase permeability of agents in skin and improve the optical clearing efficacy. STUDY DESIGN/MATERIALS AND METHODS: Different light sources with different dose, i.e, CO(2) laser, Nd:YAG laser (532 and 1,064 nm) with different pulse modes and Intense Pulsed Light (IPL) (400-700 and 560-950 nm) were used to irradiate rat skin in vivo, and then glycerol was applied onto the irradiated zone. VIS-NIR spectrometer was utilized to monitor the changes of reflectance. In vitro skin samples were also irradiated by Q-switched Nd:YAG laser (1,064 nm) and then treated by glycerol for 10-60 minutes. Based on the measurement of the reflectance and transmittance of the samples, the optical properties of skin and penetration depth of light were calculated. RESULTS: Results show that photo-irradiation with appropriate dose combining with the following glycerol treatment is able to reduce in vivo skin reflectance. Compared with the control group, the maximal changes in reflectance are ninefold at 575 nm and eightfold at 615 nm, respectively, which were caused by Q-switched 1,064-nm Nd:YAG laser irradiation and following glycerol treatment. The results for in vitro skin demonstrate that the joint action can significantly increase the optical penetration depth in samples. CONCLUSIONS: The combination of Q-switched Nd:YAG (1,064 nm) laser and glycerol could enhance optical skin clearing efficacy significantly. This study provides a non-invasive way to improve the optical clearing of skin, which will benefit the skin optical therapy. Glycerol Administration, Cutaneous;Animals;Glycerol;Lasers;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Models, Animal;Permeability;Photochemotherapy;Probability;Random Allocation;Rats;Rats, Sprague-Dawley;Scattering, Radiation;Skin;Skin Absorption;Spectrophotometry;Tomography, Optical Coherence;Treatment Outcome

A split-face study of intense pulsed light on photoaging skin in Chinese population. BACKGROUND AND OBJECTIVES: Intense pulsed light (IPL) is regarded as the gold standard of nonablative photo-rejuvenation. Yet there is still a need to observe its efficacy and safety on dark skin using a split-face module. STUDY DESIGN/MATERIALS AND METHODS: Twenty-four Chinese women with photoaging were enrolled in this study. Patients were randomized to receive four IPL treatments at 3- to 4-week intervals on one side of face, with the other side spared as control. Changes of photoaging were evaluated using a global evaluation, an overall self-assessment, a Mexameter and a Corneometer. Skin biopsies were taken after four sessions of treatment on one side of face. The melanocyte density and the contents of melanin, collagen fibers, and elastic fibers were stained and used to evaluate the improvement on dyschromia and other signs of photoaging. RESULTS: The global scores of photoaging on treated side decreased significantly from 3.02 to 1.22, while it remained unchanged on the untreated side. Twenty-one of 24 patients (87.5%) rated their improvement as excellent or good. The difference on the values of melanin index and erythema index on treated side were significantly larger than those on untreated side after the 1st session, the 4th session and at 3-month follow-up ($P<0.05$). The melanin contents were significantly decreased and the collagen fibers were obviously increased only on treated side ($P<0.05$). Adverse effects of treated side were limited to mild pain and transient erythema. CONCLUSION: Using this split-face module, IPL treatment is proved both clinically and histologically to be effective in treating photoaging skin in Chinese population. Adverse effects were minimal and acceptable. Adult;Asian People;China;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Probability;Rejuvenation;Risk Assessment;Skin Aging;Statistics, Nonparametric;Treatment Outcome

Phototoxicity is not associated with photochemical tissue bonding of skin. BACKGROUND AND OBJECTIVE: We have developed a light-activated method called photochemical tissue bonding (PTB)

for closing wounds using green light and a photosensitizing dye (Rose Bengal-RB) to initiate photochemical crosslinking of wound surface proteins. These studies were designed to determine whether RB causes phototoxicity during closure of skin incisions with PTB. STUDY DESIGN/MATERIALS AND METHODS: RB phototoxicity was evaluated after sealing incisions in porcine skin ex vivo and rabbit skin in vivo using PTB (1 mM RB, 100 J/cm(2), 532 nm, 0.3 or 0.5 W/cm(2).) Dead cells were identified by pyknotic nuclei and eosinophilic cytoplasm on H&E-stained sections. The influence on RB phototoxicity of penetration of RB into the wound wall (by confocal microscopy), RB concentration in the tissue (by extraction), and fluence of 532 nm reaching depths in skin (calculated from skin optical properties) were investigated. RESULTS: No significant differences were found in the percent dead cells in PTB-treated and control incisions in porcine skin at 24 hours or in rabbit skin at 2 hours and 3 and 7 days after surgery. RB was retained in a approximately 100 microm wide band next to the wound wall. The mean RB concentration within this band was 0.42+/-0.03 mM. Monte Carlo modeling of light distribution indicated that the fluence rate decreased from the subsurface peak to 0.5 W/cm(2) in the mid-dermis (approximately 350 microm.) In vitro RB phototoxicity to dermal fibroblasts yielded an LD(50) of 0.50+/-0.09 J/cm(2) when the cells contained 0.46 mM RB. CONCLUSIONS: PTB does not cause phototoxicity when used to repair skin wounds even though the RB concentration and 532 nm fluence in the mid-dermis during PTB are much greater than the LD(50) for RB phototoxicity in vitro. These results indicate that phototoxicity is not a concern when using PTB for tissue repair. Photosensitizing Agents;Tissue Adhesives;Rose Bengal Animals;Cell Survival;Cells, Cultured;Dermatitis, Phototoxic;Dermatologic Surgical Procedures;Disease Models, Animal;Female;Fibroblasts;Immunohistochemistry;Low-Level Light Therapy;Male;Monte Carlo Method;Photosensitizing Agents;Rabbits;Random Allocation;Reference Values;Risk Factors;Rose Bengal;Skin;Skin Absorption;Swine;Tissue Adhesives;Wound Healing

Paring and intense pulsed light versus paring alone for recalcitrant hand and foot warts: a randomized clinical trial with blinded outcome evaluation. BACKGROUND AND OBJECTIVES: Treatment of recalcitrant viral warts remains a therapeutic challenge. Intense pulsed light (IPL) has been suggested effective to clear wart tissue. The objective was in a randomized controlled trial to assess the efficacy of paring followed by IPL versus paring alone for recalcitrant hand and foot warts. MATERIALS AND METHODS: Eighty-nine patients with recalcitrant hand and foot warts were included and randomized (1:1) to three treatments at 3-week intervals with either paring of warts followed by IPL or paring of warts alone. IPL was given with the Ellipse Flex IPL system (Danish Dermatologic Development A/S, HÃ¸rsholm, Denmark, 400-950 nm, 5.5 millisecond pulse duration in double pulses with a 2 millisecond interval, 26.0-32.5 J/cm(2) repetitive passes). The primary outcome was complete and partial clearance of warts evaluated by blinded photo assessment at 6 weeks after final treatment. Secondary outcomes were treatment related pain and adverse reactions. RESULTS: We found no significant difference in clearance of warts between the two intervention groups (OR 1.64, 95% confidence interval 0.62-4.38). Paring followed by IPL resulted in complete or partial clearance of wart tissue in nine (22%) and five patients (12.2%) versus five (13.5%) and four patients (10.8%) from paring alone. Mostly plantar warts were treated (92.1%). The pain intensity after paring and IPL was moderate and significantly higher than the pain intensity after paring alone (P<0.0005). No adverse reactions were observed from the two interventions. CONCLUSION: Paring followed by IPL did not differ significantly from paring alone in clearance of recalcitrant hand and foot warts but caused significantly more pain. Adult;Female;Follow-Up Studies;Foot Dermatoses;Hand Dermatoses;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Probability;Risk Assessment;Single-Blind Method;Treatment Outcome;Warts

Intense pulsed light (IPL): a review. BACKGROUND: Intense pulsed light (IPL) devices use flashlamps and bandpass filters to emit polychromatic incoherent high-intensity pulsed light of

determined wavelength spectrum, fluence, and pulse duration. Similar to lasers, the basic principle of IPL devices is a more or less selective thermal damage of the target. The combination of prescribed wavelengths, fluences, pulse durations, and pulse intervals facilitates the treatment of a wide spectrum of skin conditions. OBJECTIVE: To summarize the physics of IPL, to provide guidance for the practical use of IPL devices, and to discuss the current literature on IPL in the treatment of unwanted hair growth, vascular lesions, pigmented lesions, acne vulgaris, and photodamaged skin and as a light source for PDT and skin rejuvenation. METHODS: A systematic search of several electronic databases, including Medline and PubMed and the authors experience on intense pulsed light. RESULTS: Numerous trials show the effectiveness and compatibility of IPL devices. CONCLUSION: Most comparative trials attest IPLs similar effectiveness to lasers (level of evidence: 2b to 4, depending on the indication). However, large controlled and blinded comparative trials with an extended follow-up period are necessary. Acne Vulgaris;Equipment Design;Equipment Safety;Female;Hair Removal;Humans;Lasers;Low-Level Light Therapy;Male;Phototherapy;Pigmentation Disorders;Rejuvenation;Skin Aging;Skin Diseases;Treatment Outcome

Fractional CO(2) laser-assisted drug delivery. BACKGROUND AND OBJECTIVES: Ablative fractional resurfacing (AFR) creates vertical channels that might assist the delivery of topically applied drugs into skin. The purpose of this study was to evaluate drug delivery by CO(2) laser AFR using methyl 5-aminolevulinate (MAL), a porphyrin precursor, as a test drug. MATERIALS AND METHODS: Two Yorkshire swine were treated with single-hole CO(2) laser AFR and subsequent topical application of MAL (Metvix(R), Photocure ASA, Oslo, Norway), placebo cream and no drug. MAL-induced porphyrin fluorescence was measured by fluorescence microscopy at skin depths down to 1,800 microm. AFR was performed with a 10.6 microm wavelength prototype CO(2) laser, using stacked single pulses of 3 millisecond and 91.6 mJ per pulse. RESULTS: AFR created cone-shaped channels of approximately 300 microm diameter and 1,850 microm depth that were surrounded by a 70 microm thin layer of thermally coagulated dermis. There was no porphyrin fluorescence in placebo cream or untreated skin sites. AFR followed by MAL application enhanced drug delivery with significantly higher porphyrin fluorescence of hair follicles ($P<0.0011$) and dermis ($P<0.0433$) versus MAL alone at skin depths of 120, 500, 1,000, 1,500, and 1,800 microm. AFR before MAL application also enhanced skin surface (epidermal) porphyrin fluorescence. Radial diffusion of MAL from the laser-created channels into surrounding dermis was evidenced by uniform porphyrin fluorescence up to 1,500 microm from the holes (1,000, 1,800 microm depths). Skin massage after MAL application did not affect MAL-induced porphyrin fluorescence after AFR. CONCLUSIONS: Ablative fractional laser treatment facilitates delivery of topical MAL deeply into the skin. For the conditions of this study, laser channels approximately 3 mm apart followed by MAL application could produce porphyrins throughout essentially the entire skin. AFR appears to be a clinically practical means for enhancing uptake of MAL, a photodynamic therapy drug, and presumably many other topical skin medications. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Administration, Cutaneous;Aminolevulinic Acid;Animals;Drug Delivery Systems;Lasers, Gas;Low-Level Light Therapy;Male;Models, Animal;Photochemotherapy;Photosensitizing Agents;Sensitivity and Specificity;Skin Absorption;Swine

Chondrogenic mRNA expression in prechondrogenic cells after blue laser irradiation. Low-level laser therapy (LLLT) has been used as a method for biostimulation. Cartilage develops through the differentiation of mesenchymal cells into chondrocytes, and differentiated chondrocytes in articular cartilage maintain cartilage homeostasis by synthesizing cartilage-specific extracellular matrix. The aim of this study is to evaluate the enhancement of chondrocyte differentiation and the expression levels of chondrogenic mRNA in prechondrogenic ATDC5 cells after laser irradiation. For chondrogenic induction, ATDC5 cells were irradiated with a blue laser (405 nm, continuous wave) at 100 mW/cm(2)

for 180 s following incubation in chondrogenic differentiation medium. Differentiation after laser irradiation was quantitatively evaluated by the measurement of total collagen contents and chondrogenesis-related mRNAs. The total amount of collagen and mRNA levels of aggrecan, collagen type II, SOX-9, and DEC-1 were increased relative to those of a non-laser irradiated group after 14 days of laser irradiation. On the other hand, Ap-2alpha mRNA, a negative transcription factor of chondrogenesis, was dramatically decreased after laser irradiation. In addition, intracellular reactive oxygen species (ROS) were generated after laser irradiation. These results, for the first time, provide functional evidence that mRNA expression relating to chondrogenesis is increased, and Ap-2alpha is decreased immediately after laser irradiation. As this technique could readily be applied in situ to control the differentiation of cells at an implanted site within the body, this approach may have therapeutic potential for the restoration of damaged or diseased tissue. RNA, Messenger;Reactive Oxygen Species Animals;Cell Line;Chondrocytes;Chondrogenesis;Color;Dose-Response Relationship, Radiation;Gene Expression Regulation;Lasers;Mice;RNA, Messenger;Radiation Dosage;Reactive Oxygen Species

Low-energy laser irradiation facilitates the velocity of tooth movement and the expressions of matrix metalloproteinase-9, cathepsin K, and alpha(v) beta(3) integrin in rats. It has previously been reported that low-energy laser irradiation stimulated the velocity of tooth movement via the receptor activator of nuclear factor kappa B (RANK)/RANK ligand and the macrophage colony-stimulating factor/its receptor (c-Fms) systems. Matrix metalloproteinase (MMP)-9, cathepsin K, and alpha(v) beta(3) [alpha(v)beta3] integrin are essential for osteoclastogenesis; therefore, the present study was designed to examine the effects of low-energy laser irradiation on the expression of MMP-9, cathepsin K, and alpha(v)beta3 integrin during experimental tooth movement. Fifty male, 6-week-old Wistar strain rats were used in the experiment. A total force of 10g was applied to the rat molars to induce tooth movement. A Ga-Al-As diode laser was used to irradiate the area around the moving tooth and, after 7 days, the amount of tooth movement was measured. To determine the amount of tooth movement, plaster models of the maxillae were made using a silicone impression material before (day 0) and after tooth movement (days 1, 2, 3, 4, and 7). The models were scanned using a contact-type three-dimensional (3-D) measurement apparatus. Immunohistochemical staining for MMP-9, cathepsin K, and integrin subunits of alpha(v)beta3 was performed. Intergroup comparisons of the average values were conducted with a Mann-Whitney U-test for tooth movement and the number of tartrate-resistant acid phosphatase (TRAP), MMP-9, cathepsin K, and integrin subunits of alpha(v)beta3-positive cells. In the laser-irradiated group, the amount of tooth movement was significantly greater than that in the non-irradiated group at the end of the experiment ($P < 0.05$). Cells positively stained with TRAP, MMP-9, cathepsin K, and integrin subunits of alpha(v)beta3 were found to be significantly increased in the irradiated group on days 2-7 compared with those in the non-irradiated group ($P < 0.05$). These findings suggest that low-energy laser irradiation facilitates the velocity of tooth movement and MMP-9, cathepsin K, and integrin subunits of alpha(v)beta3 expression in rats. Integrin alphaVbeta3;Cathepsin K;Matrix Metalloproteinase 9 Alveolar Process;Animals;Bone Remodeling;Cathepsin K;Dental Stress Analysis;Integrin alphaVbeta3;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 9;Osteoclasts;Rats;Rats, Wistar;Tooth Movement Techniques

Treatment of cellulite: Part II. Advances and controversies. Treatments for localized adiposities range from topical creams to liposuction. Most treatments lack a substantial proof of efficacy. The unpredictable treatment outcome can be related to the fact that cellulite adipose tissue is physiologically and biochemically different from subcutaneous tissue found elsewhere in the body. Part II of this two-part series on cellulite reviews the various treatment options that are currently available for human adipose tissue including, but not limited to, cellulite. It also focuses on newer

techniques that can be potentially useful in the future for the treatment of cellulite. Peroxisome Proliferator-Activated Receptors;Phosphatidylcholines Ablation Techniques;Adipose Tissue;Combined Modality Therapy;Female;Humans;Lipectomy;Lipolysis;Low-Level Light Therapy;Male;Massage;Obesity;Peroxisome Proliferator-Activated Receptors;Phosphatidylcholines;Radiofrequency Therapy;Ultrasonic Therapy;Weight Loss

Lasers, stem cells, and COPD. The medical use of low level laser (LLL) irradiation has been occurring for decades, primarily in the area of tissue healing and inflammatory conditions. Despite little mechanistic knowledge, the concept of a non-invasive, non-thermal intervention that has the potential to modulate regenerative processes is worthy of attention when searching for novel methods of augmenting stem cell-based therapies. Here we discuss the use of LLL irradiation as a "photoceutical" for enhancing production of stem cell growth/chemoattractant factors, stimulation of angiogenesis, and directly augmenting proliferation of stem cells. The combination of LLL together with allogeneic and autologous stem cells, as well as post-mobilization directing of stem cells will be discussed. Intercellular Signaling Peptides and Proteins Animals;Cell Differentiation;Cell Proliferation;Clinical Trials as Topic;Humans;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Neovascularization, Physiologic;Pulmonary Disease, Chronic Obstructive;Stem Cell Transplantation;Stem Cells

Removal of orange eyebrow tattoo in a single session with the Q-switched Nd:YAG 532-nm laser. Aged;Color;Eyebrows;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Tattooing

In vitro analysis of human tooth pulp chamber temperature after low-intensity laser therapy at different power outputs. In vitro studies have provided conflicting evidence of temperature changes in the tooth pulp chamber after low-level laser irradiation of the tooth surface. The present study was an in vitro evaluation of temperature increases in the human tooth pulp chamber after diode laser irradiation (GaAlAs, Î»â€‰=â€‰808Â nm) using different power densities. Twelve human teeth (three incisors, three canines, three premolars and three molars) were sectioned in the cervical third of the root and enlarged for the introduction of a thermocouple into the pulp chamber. The teeth were irradiated with 417Â mW, 207Â mW and 78Â mW power outputs for 30Â s on the vestibular surface approximately 2Â mm from the cervical line of the crown. The highest average increase in temperature (5.6Â°C) was observed in incisors irradiated with 417Â mW. None of the teeth (incisors, canines, premolars or molars) irradiated with 207Â mW showed temperature increases higher than 5.5Â°C that could potentially be harmful to pulp tissue. Teeth irradiated with 78Â mW showed lower temperature increases. The study showed that diode laser irradiation with a wavelength of 808Â nm at 417Â mW power output increased the pulp chamber temperature of certain groups of teeth, especially incisors and premolars, to critical threshold values for the dental pulp (5.5Â°C). Thus, this study serves as a warning to clinicians that "more" is not necessarily "better". Body Temperature;Dental Pulp;Dental Pulp Cavity;Humans;In Vitro Techniques;Low-Level Light Therapy

Eczematous dermatitis after vascular laser therapy: a report of two cases. Eczematous dermatitis was found in two port wine stain (PWS) lesions in two different individuals following variable pulsed 532-nm laser therapy. Both of the individuals described in this report had received low-dose superficial X-ray several years prior to the development of the eczematous dermatitis. The eczematous dermatitis in the PWS lesions was characterized by oozing, crusting, and pruritus, which showed a tendency to expand to other sites when exacerbated. Treatment with topical corticosteroid ointments produced some temporary improvement, but the dermatitis in both cases recurred when the topical medications were stopped. The mechanism of action for the development of an eczematous dermatitis in a PWS remains unclear, but may be related to multiple factors including abnormal hemodynamic forces resulting from the malformed vessels, an abnormal production of

cytokines, local pathophysiological and immunological changes resulting from either the X-ray therapy or the laser therapy, and atopic constitution inherent in these individuals. These hypotheses and ideas need further study for additional insight into this rare, but reported adverse event. Adrenal Cortex Hormones;Ointments Adolescent;Adrenal Cortex Hormones;Eczema;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Ointments;Port-Wine Stain;Treatment Outcome;X-Ray Therapy

Adaptive real-time bioheat transfer models for computer-driven MR-guided laser induced thermal therapy. The treatment times of laser induced thermal therapies (LITT) guided by computational prediction are determined by the convergence behavior of partial differential equation (PDE)-constrained optimization problems. In this paper, we investigate the convergence behavior of a bioheat transfer constrained calibration problem to assess the feasibility of applying to real-time patient specific data. The calibration techniques utilize multiplanar thermal images obtained from the nondestructive in vivo heating of canine prostate. The calibration techniques attempt to adaptively recover the biothermal heterogeneities within the tissue on a patient-specific level and results in a formidable PDE constrained optimization problem to be solved in real time. A comprehensive calibration study is performed with both homogeneous and spatially heterogeneous biothermal model parameters with and without constitutive nonlinearities. Initial results presented here indicate that the calibration problems involving the inverse solution of thousands of model parameters can converge to a solution within three minutes and decrease the [see text for symbol](L) (2) (2) ((0, T; L) (2) ((Omega))) norm of the difference between computational prediction and the measured temperature values to a patient-specific regime. Animals;Body Temperature;Computer Simulation;Computer Systems;Energy Transfer;Humans;Hyperthermia, Induced;Image Interpretation, Computer-Assisted;Low-Level Light Therapy;Magnetic Resonance Imaging;Models, Biological;Therapy, Computer-Assisted

Tattooing in the Gulf region: a review of tattoo practices and response to treatment with the Q-switched ruby laser. BACKGROUND: Data regarding tattoo practices in the Gulf region and response to treatment are almost non-existent in the medical literature. OBJECTIVE: To study the profile of patients with permanent tattoos in the Arab world, and to evaluate their response to Q-switched ruby laser treatment. METHODS: A total of 468 consecutive patients with permanent tattoos consulting us for tattoo removal were recruited in the present study. Before starting the treatment each patient was given a set of questionnaires to answer. The patients were then treated with the Q-switched ruby laser, with a time interval of 8 weeks between each laser session, until complete clearance or up to a maximum of 10 sessions. RESULTS: A total of 292 patients out of 348 patients achieved excellent lightening to complete clearance of tattoo pigment after an average of six sittings (range 2-10 sittings). Female patients with fair complexions and amateur tattoos on the face responded best. Seventy-eight (22.4%) patients developed pigmentary changes. CONCLUSION: More females than males had tattoos, and at a very young age and mostly on the advice of their parents. The majority of patients wanted to remove the tattoos because of religious reasons. The Q-switched ruby laser seems to be highly effective in removing amateur blue-black tattoos in patients with colored skin. Anti-Bacterial Agents;Silver Sulfadiazine Adult;Age Factors;Aged;Anti-Bacterial Agents;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Middle East;Sex Factors;Silver Sulfadiazine;Tattooing

Topical delivery of active principles: the field of dermatological research. To be effective an active drug or principle must cross the stratum corneum barrier; this process can be influenced to obtain better functional and therapeutical effects. In spite of the wide variety of the methods studied in order to improve the transdermal transfer to obtain systemic effects, the applicability is limited in this field. Attention to the epidermal barrier and penetration of active principles has been reported

mostly in studies concerning dermocosmetics. Studies regarding methods of penetration are gaining experimental and clinical interest. Cutaneous bioavailability of most commercially available dermatological formulations is low. Increase of intradermal delivery can relate to chemical, biochemical, or physical manipulations. Chemical enhancers have been adopted to: (a) increase the diffusibility of the substance across the barrier; (b) increase product solubility in the vehicle; (c) improve the partition coefficient. Moreover methods of interference with the biosynthesis of some lipids allow the modification of the structure of the barrier to increase the penetration. The main physical techniques that increase cutaneous penetration of substances are: iontophoresis (that increases the penetration of ionized substances), electroporation (that electrically induces penetration through the barrier), and sonophoresis, based on 20 to 25 KHz ultrasound that induces alterations of the horny barrier, allowing penetration of active principles. Recent development of these methods are here reported and underline the importance and role of vehicles and other factors that determine effects of partition and diffusion, crucial to absorption. Dermatologic Agents;Excipients;Liposomes;Pharmaceutical Vehicles Administration, Cutaneous;Administration, Topical;Biological Availability;Dermatologic Agents;Electroporation;Excipients;Humans;Injections, Intradermal;Iontophoresis;Liposomes;Low-Level Light Therapy;Pharmaceutical Vehicles;Phonophoresis;Skin;Skin Absorption

Comparative effects of wavelengths of low-power laser in regeneration of sciatic nerve in rats following crushing lesion. Peripheral nerves are structures that, when damaged, can result in significant motor and sensory disabilities. Several studies have used therapeutic resources with the aim of promoting early nerve regeneration, such as the use of low-power laser. However, this laser therapy does not represent a consensus regarding the methodology, thus yielding controversial conclusions. The objective of our study was to investigate, by functional evaluation, the comparative effects of low-power laser (660 nm and 830 nm) on sciatic nerve regeneration following crushing injuries. Twenty-seven Wistar rats subjected to sciatic nerve injury were divided into three groups: group sham, consisting of rats undergoing simulated irradiation; a group consisting of rats subjected to gallium-aluminum-arsenide (GaAlAs) laser at 660 nm (10 J/cm(2), 30 mW and 0.06 cm(2) beam), and another one consisting of rats subjected to GaAlAs laser at 830 nm (10 J/cm(2), 30 mW and 0.116 cm(2)). Laser was applied to the lesion for 21 days. A sciatic functional index (SFI) was used for functional evaluation prior to surgery and on days 7, 14, and 21 after surgery. Differences in SFI were found between group 660 nm and the other ones at the 14th day. One can observe that laser application at 660 nm with the parameters and methods utilised was effective in promoting early functional recovery, as indicated by the SFI, over the period evaluated. Animals;Gait;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve

Evaluation of carbon dioxide laser irradiation associated with calcium hydroxide in the treatment of dentinal hypersensitivity. A preliminary study. Attempts have been made to treat dentinal hypersensitivity by sealing exposed dentinal tubules, and the carbon dioxide (CO(2)) laser has been shown to have a sealing effect on dentinal surfaces. The purpose of this study was to analyze the morphological ultra-structure and temperature change after CO(2) laser irradiation of dentin. Fourteen human third molars were selected and cleaned. An area was delimited, and the samples were randomly divided into seven groups: Group 1 (G1): control; G2, calcium hydroxide paste (CA)â€‰+ CO(2) laser (L) (0.5 W/63,69 W/cm(2)); G3, CA + L (1 W/125,38 W/cm(2)); G4, CA + L (1.5 W/191,08 W/cm(2)); G5, L (0.5 W); G6, L (1 W); G7, L (1.5 W). All irradiation was performed in unfocused mode. The electron micrographs were analyzed by three observers. For temperature analysis, a thermocouple was used. Data were subjected to statistical analysis. The Kruskal-Wallis non-parametric test showed statistical differences between the groups ($P < 0.05$). For the two by two comparisons, all groups treated with calcium hydroxide paste presented significantly higher mean

scores. In the groups treated by CO(2) laser only, fusion, re-crystallization, cracks and carbonization were observed. A change of 1 Â± 5Â°C was noted in the temperature. Under the limitation of an in vitro study, and with the protocols used, we concluded that CO(2) laser is safe to use for the establishment of partial fusion and re-solidification of the dentinal surface. Ointments;Calcium Hydroxide Calcium Hydroxide;Dentin Sensitivity;Humans;Lasers, Gas;Low-Level Light Therapy;Microscopy, Electron, Scanning;Ointments;Temperature

Influence of ingaalp laser (660nm) on the healing of skin wounds in diabetic rats. PURPOSE: To determine the influence of low-power laser (660 nm) on the collagen percentage and macrophages in skin wounds in diabetic rats. METHODS: 30 male Wistar rats were used, distributed in two groups: laser treated diabetic (n= 15); untreated diabetic (n = 15). The diabetes was induced by intravenous injection of alloxan into the dorsal vein of the penis, at a rate of 0.1 ml of solution per 100 g of body weight. A wound was made on the back of all the animals. Groups 2 were treated with Aluminium Gallium Indium Phosphide - InGaAlP type diode laser (Photon Laser III DMC) with a continuous output power of 100 mW and wavelength (lambda) of 660 nm (4 J/cm(2)) for 24 s. five animal from each group was sacrificed on the 3rd, 7th and 14th days after wounding. Samples were taken, embedded in paraffin, stained with hematoxylin-eosin, Masson's trichrome, and immunohistochemical macrophage. morphometrically analyzed using the Image Pro Plus 4.5 software. The percentages of collagen fibers and macrophages were determined from the samples from the euthanasia animals. RESULTS: The data were treated statistically using analysis of variance (ANOVA) and the Post-hocTukey test. The significance level was set at 0.05 or 5%. CONCLUSION: The low-power laser (660 nm) was shown to be capable of influencing the collagen percentage in skin wounds by increasing the mean quantity of collagen fibers and macrophages. Collagen Analysis of Variance;Animals;Collagen;Diabetes Mellitus, Experimental;Disease Models, Animal;Low-Level Light Therapy;Macrophages;Male;Random Allocation;Rats;Rats, Wistar;Skin;Wound Healing

The effect of Er,Cr:YSGG laser and air abrasion on shear bond strength of a fissure sealant to enamel. PURPOSE: The authors conducted an in vitro study to evaluate the shear bond strength of a fissure sealant to enamel pretreated with erbium,chromium:yttrium, scandium,gallium,garnet (Er,Cr:YSGG) laser or air abrasion followed by acid etching. METHODS: The authors sectioned extracted sound premolars mesiodistally and used the buccal and lingual surfaces for experimental analysis. They divided specimens randomly into three groups of 15 each according to the enamel surface pretreatment methods: group A, 37 percent phosphoric acid; group B, air abrasion followed by acid etching with 37 percent phosphoric acid; group C, irradiation with Er,Cr:YSGG laser followed by acid etching with 37 percent phosphoric acid. After applying a bonding system, the authors bonded cylinders of sealant to the enamel surfaces by using transparent gelatin tubes (0.7 millimeter in diameter and 1 mm in height) and then polymerized them. They stored all specimens in distilled water at 37 degrees C for 24 hours. They tested shear bond strength by using a universal testing machine with a crosshead speed of 0.5 mm per second. The authors analyzed the data by means of one-way analysis of variance and Tukey-Kramer post hoc tests (alpha = .05). RESULTS: The bond strength of group B specimens was statistically higher than those of group A and group C specimens ($P < .05$). The authors found no statistically significant differences in shear bond strength between surfaces treated with Er,Cr:YSGG laser and those treated with acid etching alone ($P > .05$). CONCLUSION: Pretreatment of enamel surfaces with air abrasion increased the bond strength of fissure sealant, but pretreatment with Er,Cr:YSGG laser did not increase the effectiveness of conventional acid etching of enamel in sealant bonds. Dentin-Bonding Agents;Phosphoric Acids;Pit and Fissure Sealants;single bond;Water;Bisphenol A-Glycidyl Methacrylate;phosphoric acid Acid Etching, Dental;Air Abrasion, Dental;Bisphenol A-Glycidyl Methacrylate;Dental Bonding;Dental Enamel;Dental Stress Analysis;Dentin-Bonding Agents;Humans;Lasers, Solid-State;Low-Level Light

Therapy;Materials Testing;Phosphoric Acids;Pit and Fissure Sealants;Shear Strength;Stress, Mechanical;Temperature;Time Factors;Water

Fractional photothermolysis improves a depressed alar scar following Mohs micrographic surgery. Fractional photothermolysis (FPT; Fraxel SR laser) is a 1550 nm non-ablative erbium laser device with a variety of clinical applications. FPT has been used to treat photodamage, photoaging, melasma, actinic keratoses and acne scarring. We present the case of a 49-year-old woman with a depressed 0.7 x 0.5 cm alar scar resulting from Mohs micrographic surgery for basal cell carcinoma with secondary intention healing. She was treated with FPT initially eight weeks post-operatively. FPT was performed a total of five times at four-week intervals. At the completion of FPT, the scar was nearly imperceptible and has remained so eighteen months later. To the authors' knowledge, treatment of facial scars resulting from Mohs micrographic surgery for cutaneous malignancy has not previously been reported. Carcinoma, Basal Cell;Cicatrix;Face;Female;Humans;Low-Level Light Therapy;Middle Aged;Mohs Surgery;Postoperative Complications;Skin Neoplasms

A prospective study of the improvement in periorbital wrinkles and eyebrow elevation with a novel fractional CO2 laser--the fractional eyelift. BACKGROUND AND OBJECTIVE: The purpose of this study was to assess the efficacy and safety of a new fractional CO2 laser system for improving periorbital rhytids, tightening skin and elevating the eyebrow. MATERIALS AND METHODS: One hundred subjects with periocular wrinkles, tissue laxity, photoaged skin and moderate dermatochalasis of the face were prospectively treated one to four times in the periorbital area with a fractional CO2 laser device equipped with a scanning handpiece. Improvements in eyelid wrinkles, crow's feet and skin laxity were evaluated photographically by two blinded, independent observers. Eyebrow elevation was measured by the investigators. Subjects also scored satisfaction and tolerability. RESULTS: Approximately half of subjects achieved or maintained 26-50% improvement at 12 months. Nearly 40% of subjects maintained 1-2 mm elevation of the brow at six and 12 months after treatment. Subject satisfaction was high and the procedure was well tolerated. Mild-to-moderate erythema and edema persisted for up to three to four days. CONCLUSION: Treatment with a fractional CO2 laser device improves periorbital rhytids, tightens skin and elevates the eyebrow with minimal adverse effects. Cosmetic Techniques;Dermatologic Surgical Procedures;Double-Blind Method;Eyebrows;Female;Humans;Intraoperative Complications;Low-Level Light Therapy;Male;Middle Aged;Orbit;Pain;Prospective Studies;Rhytidoplasty

Influence of 670 nm low-level laser therapy on mast cells and vascular response of cutaneous injuries. Laser biomodulation has been getting considerable attention when it comes to its effects on the inflammatory process. Its action upon mast cells have been already studied, but none of the previous papers related the resulting effect to the inflammatory and vascular status of the wounds. Therefore, the acute inflammatory process as well as the mast cells behavior and the vascular response were analyzed under the influence of laser treatment on cutaneous wounds. Surgical procedures were performed on 60 rats divided into sham and laser groups. Low-level laser therapy was performed following surgical procedures (670 nm, 9 mW, 4 J/cm(2), 124 s). Histological specimens were analyzed for cell morphology and immunohistochemistry using anti-von Willebrand Factor and anti-Vascular Endothelial Growth Factor antibody. Laser treatment resulted in an increased acute inflammatory response in irradiated tissues; surgical wounds treated with laser therapy had increased polymorphonuclear cells, mast cells and vasodilation and lower numbers of vessels than those in control rats. Laser treatment resulted in higher expression of VEGF in irradiated tissues 6-24h post-treatment (p=0.002). It is possible to observe an amplification of acute inflammatory process during the first hours after surgical procedure in rats submitted to laser therapy.
Animals;Female;Low-Level Light Therapy;Male;Mast Cells;Rats;Rats, Wistar;Skin;Vasculitis;Wounds, Penetrating

Use of therapeutic laser after surgical removal of impacted lower third molars. PURPOSE: To evaluate the effectiveness of a therapeutic laser in the control of postoperative pain, swelling, and trismus associated with the surgical removal of impacted third molars. PATIENTS AND METHODS: A double-blind, randomized, controlled clinical trial was conducted in 2 groups of 15 patients each undergoing surgical removal of impacted lower third molars under local anesthesia. The experimental group received 4 J/cm(2) of energy density intraorally and extraorally, with a laser with a diode wavelength of 810 nm and output power of 100 mW in a continuous wave. The control group received only standard management. The degree of postoperative pain, swelling, and trismus was registered for both groups. RESULTS: The experimental group exhibited a lower intensity of postoperative pain, swelling, and trismus than the control group, without significant statistical differences. Patients of both groups required rescue medication; however, the time lapse between the end of the surgery and the administration of the medication was shorter for the control group. CONCLUSION: The use of therapeutic laser in the postoperative management of patients having surgical removal of impacted third molars, using the protocol of this study, decreases postoperative pain, swelling, and trismus, without statistically significant differences.
Adolescent;Adult;Double-Blind Method;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain, Postoperative;Tooth, Impacted;Trismus;Young Adult

Scar prevention using Laser-Assisted Skin Healing (LASH) in plastic surgery. BACKGROUND: The use of lasers has been proposed for scar revision. A recent pilot clinical study demonstrated that lasers could also be used immediately after surgery to reduce the appearance of scars. The LASH (Laser-Assisted Skin Healing) technique induces a temperature elevation in the skin which modifies the wound-healing process. We report a prospective comparative clinical trial aimed at evaluating an 810-nm diode-laser system to accelerate and improve the healing process in surgical scars immediately after skin closure. METHODS: Twenty-nine women and 1 man (mean age = 41.4 years; Fitzpatrick skin types I-IV) were included to evaluate the safety and performance of the laser system. The laser dose (or fluence in J/cm(2)) was selected as a function of phototype and skin thickness. Each surgical incision (e.g., abdominoplasty) was divided into two parts. An 8-cm segment was treated with the laser immediately after skin closure. A separate 8-cm segment was left untreated as a control. Clinical evaluations (overall appearance ratings, comparative scar scale) of all scars were conducted at 10 days, 3 months, and 12 months by both surgeon and patients. Profilometry analysis from silicone replicas of the skin was done at 12 months. Wilcoxon signed-rank test analyses were performed. RESULTS: Twenty-two patients were treated using a high dose (80-130 J/cm(2)) and 8 patients with a low dose (<80 J/cm(2)). At 12 months in the high-dose group, both surgeon and patients reported an improvement rate of the laser-treated segment over the control area of 72.73 and 59.10%, respectively. For these patients, profilometry results showed a decrease in scar height of 38.1% ($p = 0.027$) at 12 months for the laser-treated segment versus control. Three patients treated with higher doses (>115 J/cm(2)) experienced superficial burns on the laser-treated segment, which resolved in about 5-7 days. For the eight patients treated at low dosage (<80 J/cm(2)), there was no significant difference in the treated segment versus the control segment. No side effects were observed. CONCLUSION: This prospective comparative trial demonstrates that an 810-nm diode laser treatment, performed immediately after surgery, can improve the appearance of a surgical scar. The dose plays a great role in scar improvement and must be well controlled. There is interest in LASH for hypertrophic scar revision. LASH can be used to prevent and reduce scars in plastic surgery.
Adult;Cicatrix;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Wound Healing

[Physical treatment methods for acne. Light, laser, photodynamic therapy and peeling]. The medical treatment of acne is generally sufficient to meet the expectations of acne patients. However,

in a number of situations additional therapeutic approaches may be advisable. There are a wide variety of useful physical methods. They range from electromagnetic waves, usually light, to peeling and manual therapy. Phototherapy of acne includes not just visible light but also laser and flash lamp therapy. The present review provides an overview on the evidence. Visible light, in particular blue light, provides an effective option for treatment of inflammatory acne. Photodynamic therapy also is efficacious; however, it should not be used because of an unfavorable risk-benefit ratio. UV treatment of acne is obsolete. Newer studies on the use of a variety of laser systems and flash lamps have demonstrated in part rewarding results. Acne Vulgaris;Chemexfoliation;Cosmetic Techniques;Humans;Low-Level Light Therapy;Photochemotherapy;Treatment Outcome

Fractionated laser skin resurfacing treatment complications: a review. BACKGROUND: Fractional photothermolysis represents a new modality of laser skin resurfacing that was developed to provide a successful clinical response while minimizing postoperative recovery and limiting treatment complications. OBJECTIVES: To review all of the reported complications that develop as a result of fractional ablative and nonablative laser skin resurfacing. METHODS: A literature review was based on a MEDLINE search (1998-2009) for English-language articles related to laser treatment complications and fractional skin resurfacing. Articles presenting the highest level of evidence and the most recent reports were preferentially selected. RESULTS: Complications with fractional laser skin resurfacing represent a full spectrum of severity and can be longlasting. In general, a greater likelihood of developing post-treatment complications is seen in sensitive cutaneous areas and in patients with intrinsically darker skin phototypes or predisposing medical risk factors. CONCLUSIONS: Although the overall rate of complications associated with fractional laser skin resurfacing is much lower than with traditional ablative techniques, recent reports suggest that serious complications can develop. An appreciation of all of the complications associated with fractional laser skin resurfacing is important, especially given that many of them can be potentially prevented. The authors have indicated no significant interest with commercial supporters. Acne Vulgaris;Dermatitis, Contact;Dermatologic Surgical Procedures;Erythema;Herpes Simplex;Humans;Keratoacanthoma;Laser Therapy;Low-Level Light Therapy;Rejuvenation;Skin Aging

WITHDRAWN. Interventions for treating plantar heel pain. BACKGROUND: Ten percent of people may experience pain under the heel (plantar heel pain) at some time. Injections, insoles, heel pads, strapping and surgery have been common forms of treatment offered. The absolute and relative effectiveness of these interventions are poorly understood. OBJECTIVES: The objective of this review was to identify and evaluate the evidence for effectiveness of treatments for plantar heel pain. SEARCH STRATEGY: We searched the Cochrane Bone, Joint and Muscle Trauma Group specialised register (September 2002), the Cochrane Central Register of Controlled Trials Register (The Cochrane Library issue 3, 2002), MEDLINE (1966 to September 2002), EMBASE (1988 to September 2002) and reference lists of articles and dissertations. Four podiatry journals were handsearched to 1998. We contacted all UK schools of podiatry to identify dissertations on the management of heel pain, and investigators in the field to identify unpublished data or research in progress. No language restrictions were applied. SELECTION CRITERIA: Randomised and quasi-randomised trials of interventions for plantar heel pain in adults. DATA COLLECTION AND ANALYSIS: Two reviewers independently evaluated randomised controlled trials for inclusion, extracted data and assessed trial quality. Additional information was obtained by direct contact with investigators. No poolable data were identified. Where measures of variance were available we have calculated the weighted mean differences based on visual analogue scale (VAS) scores. MAIN RESULTS: Nineteen randomised trials involving 1626 participants were included. Trial quality was generally poor, and pooling of data was not conducted. All trials measured heel pain as the primary outcome. Seven trials evaluated interventions against placebo/dummy or no treatment. There was limited evidence for the

effectiveness of topical corticosteroid administered by iontophoresis, i.e. using an electric current, in reducing pain. There was some evidence for the effectiveness of injected corticosteroid providing temporary relief of pain. There was conflicting evidence for the effectiveness of low energy extracorporeal shock wave therapy in reducing night pain, resting pain and pressure pain in the short term (6 and 12 weeks) and therefore its effectiveness remains equivocal. In individuals with chronic pain (longer than six months), there was limited evidence for the effectiveness of dorsiflexion night splints in reducing pain. There was no evidence to support the effectiveness of therapeutic ultrasound, low-intensity laser therapy, exposure to an electron generating device or insoles with magnetic foil. No randomised trials evaluating surgery, or radiotherapy against a randomly allocated control population were identified. There was limited evidence for the superiority of corticosteroid injections over orthotic devices. AUTHORS' CONCLUSIONS: Although there is limited evidence for the effectiveness of local corticosteroid therapy, the effectiveness of other frequently employed treatments in altering the clinical course of plantar heel pain has not been established in randomised controlled trials.At the moment there is limited evidence upon which to base clinical practice. Treatments that are used to reduce heel pain seem to bring only marginal gains over no treatment and control therapies such as stretching exercises. Steroid injections are a popular method of treating the condition but only seem to be useful in the short term and only to a small degree. Orthoses should be cautiously prescribed for those patients who stand for long periods; there is limited evidence that stretching exercises and heel pads are associated with better outcomes than custom made orthoses in people who stand for more than eight hours per day.Well designed and conducted randomised trials are required. Adrenal Cortex Hormones Adrenal Cortex Hormones;Adult;Electromagnetic Phenomena;Foot Diseases;Humans;Laser Therapy;Orthotic Devices;Pain Management;Pain Measurement;Randomized Controlled Trials as Topic;Ultrasonic Therapy

Spectrophotometers for the clinical assessment of port-wine stain skin lesions: a review. Reflectance spectrophotometry is the most established and widely used objective technique for the assessment of port-wine stain (PWS) skin, and has been applied extensively in other dermatological applications. To date, no review has been published regarding the different spectrophotometric devices used on PWS skin. This paper comprises such a review, introducing the reader to the relevant background material and then discussing scanning, narrow-band and tristimulus spectrophotometers in turn. Scanning spectrophotometry is the most versatile of the three methods but it is noted that considerable expertise is required to interpret the acquired data. Narrow-band and tristimulus devices are available at a much lower price and can be considerably simpler to use. They do, however, provide limited information that does not account for the complex effects of melanin and other chromophores within the skin. Although scanning spectrophotometers would be the preferred choice for most investigations, cheaper, simpler and equally reliable options are available and may better suit the needs of some research projects. Colorimetry;Humans;Lasers, Dye;Low-Level Light Therapy;Models, Biological;Monte Carlo Method;Port-Wine Stain;Skin Pigmentation;Spectrophotometry

Treatment of hypertrophic scars and keloids with an LBO laser (532 nm) and silicone gel sheeting. BACKGROUND: Keloid scars continue to be a complex and poorly understood subject. The main problem faced by researchers is the lack of an animal model because keloids affect only humans. Traditional techniques for keloids and hypertrophic scars are still available. More recently, lasers have gained an increasing role in the treatment of hypertrophic scars and keloids. METHODS: A total of 37 consecutive patients (31 females and six males; F:M=5:1 ratio) with 48 scars (34 hypertrophic and 14 keloids) were included in this study. Patients ranged in age from 8 to 67 years (mean age 34 years) with Fitzpatrick skin types II-IV. The age of scars ranged from 3 to 35 months (average 9 months). The

scars were classified according to the Vancouver Scars Scale (VSS). Clinical digital photography was performed under standard and cross-polarized illumination. Laser treatment was performed in association with silicone gel sheeting. RESULTS: Overall, excellent resolution of the scars was achieved, with an initial average VSS score of 12.6 and a mean VSS final score of 3.3. CONCLUSION: The combined use of silicone gel sheeting and a 532-nm millisecond laser is an effective and safe treatment for hypertrophic scars and keloids. Silicone Gels Adolescent;Adult;Aged;Child;Cicatrix, Hypertrophic;Erythema;Female;Humans;Keloid;Low-Level Light Therapy;Male;Middle Aged;Silicone Gels;Young Adult

A simple solution to the common problem of ecchymosis. Adult;Arm;Ecchymosis;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Treatment Outcome

In vitro and in vivo laser treatments of tattoos: high efficiency and low fluences. OBJECTIVE: To analyze the absorption of tattoo inks related to their in vivo and in vitro behavior under laser irradiation to improve laser-assisted tattoo removal. DESIGN: The absorption of 21 tattoo inks in a wavelength range from 300 to 800 nm was characterized by reflection spectroscopy from samples consisting of inks mixed in gelatin. Tattoo inks were removed in vitro using pulsed laser radiation with different variables, and morphologic analysis of the irradiated areas was performed. SETTING: An interdisciplinary laser laboratory with a common industrial project with the Spanish company Milesman S.A. PARTICIPANT: One person was voluntarily tattooed with 2 of the studied inks. MAIN OUTCOME MEASURES: (1) First approach to the optimum dose for pigment removal in in vitro models. (2) Correlation between the in vitro and in vivo situations at the optimum dose. RESULTS: Reflection spectroscopy facilitated selection of the most adequate laser wavelengths for tattoo removal. Red, orange, and rose inks were successfully lightened at 532 nm with 0.6 J/cm2; brown at 1064 nm with 0.3 J/cm2; yellow and green at 448 nm with 2.6 J/cm2; and blue at 600 nm with 0.9 J/cm2. Similar colors in in vitro and in vivo tattoos responded with the same efficiency to the laser variables. CONCLUSIONS: High efficiency is reached in the removal of in vivo tattoos by using an irradiation wavelength at which the percentage of reflection from the pigment is minimal. Under this condition, laser pulses can be used with a low fluence, minimizing adverse effects and clinical time. Pigments, Biological Humans;Low-Level Light Therapy;Models, Biological;Pigments, Biological;Tattooing

Basal cell nevus syndrome: a brave new world. Basal Cell Nevus Syndrome;Diagnosis, Differential;Genetic Predisposition to Disease;Humans;Low-Level Light Therapy;Male;Middle Aged;Mohs Surgery;Skin Neoplasms

Assessment of the effectiveness of low-level laser therapy on the hands of patients with rheumatoid arthritis: a randomized double-blind controlled trial. Assess the effectiveness of low-level laser therapy on pain reduction and improvement in function in the hands of patients with rheumatoid arthritis. A randomized double-blind controlled trial was carried out on 82 patients with rheumatoid arthritis. The experimental group was submitted to the application of laser therapy, whereas the control group received a placebo laser. Aluminum gallium arsenide laser was used, at a wavelength of 785 nm, dose of 3 J/cm(2) and mean power of 70 mW. The groups were homogenous at the beginning of the study with regard to the main variables ($p > 0.05$). There were no statistically significant differences between groups in most of the measurements taken at the end of the intervention including the primary variables; the following variables were the exceptions: favoring the experimental group-inflammation of the interphalangeal joint of the right thumb ($p = 0.012$) and perimetry of the interphalangeal joint of the left thumb ($p = 0.013$); and favoring the control group-flexion of the proximal interphalangeal joint of the right fifth finger ($p = 0.021$), perimetry of the third proximal interphalangeal joint of the right hand ($p = 0.044$), grip strength in the left hand ($p = 0.010$),

and the work domain of the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire (p = 0.010). We conclude that low-level aluminum gallium arsenide laser therapy is not effective at the wavelength, dosage, and power studied for the treatment of hands among patients with rheumatoid arthritis. Arsenicals;Placebos;gallium arsenide;Gallium;Aluminum Adult;Aluminum;Arsenicals;Arthritis, Rheumatoid;Double-Blind Method;Female;Gallium;Hand;Humans;Inflammation;Laser Therapy;Lasers;Male;Middle Aged;Physical Therapy Modalities;Placebos;Surveys and Questionnaires;Treatment Outcome

PHOTOFRIN-mediated photodynamic therapy for treatment of early stage (Tis-T2N0M0) SqCCa of oral cavity and oropharynx. OBJECTIVES: To evaluate the efficacy of dihematoporphyrin ether (PHOTOFRIN)-mediated photodynamic therapy (PDT) for the treatment of diffuse field cancerization and Tis-T2N0M0 squamous cell carcinoma (SqCCA) of the oral cavity and oropharynx in patients not amenable to or that have failed conventional head and neck cancer treatment. METHODS: This is a retrospective study of 30 patients with Tis-T2N0M0 SqCCA of the oral cavity/oropharynx treated with PDT. Intravenous PHOTOFRIN (porfimer sodium) (dose 2.0 mg/kg) was administered outpatient, followed 48-60 hours later by intraoperative photoactivation at 630 nm via fiberoptic microlens surface delivery (light dose 50-100 J/cm(2)) or interstitial implantation via cylindrical diffuser fiberoptic delivery (light dose 50-100 J/cm). RESULTS: Twenty-four of 30 patients (80%) have demonstrated complete remission (follow-up 3-144 months). There were six patients who had partial remission with recurrence observed at 3, 3, 5, 9, 23, and 26 months subsequently retreated with conventional therapy. Eleven of 24 patients were cancer disease free at 2 years following PDT. CONCLUSION: PDT provides a surgical oncologic modality for potentially curative treatment of early stage oral cavity and oropharyngeal malignancies either as a primary modality or for treatment in patients that have previously failed surgery and/or radiation therapy. Photosensitizing Agents;Dihematoporphyrin Ether Adult;Aged;Aged, 80 and over;Carcinoma, Squamous Cell;Cohort Studies;Dihematoporphyrin Ether;Disease-Free Survival;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Neoplasms;Oropharyngeal Neoplasms;Photochemotherapy;Photosensitizing Agents;Retrospective Studies;Treatment Outcome

[Light-emitting diodes (LED)]. LED home-use is now widely spread. In dermatology, numerous reports have stated their results for many indications: wound healing process, rejuvenation, acne and, of course, photodynamic therapy. Nevertheless, fluence, pulse duration and color of the LED are so variable as it is difficult to bring well codified results. But how should you not be interested in this field? It is already any more a near future but well and truly a therapeutic reality... Humans;Lasers, Semiconductor;Low-Level Light Therapy;Skin Aging;Skin Diseases

Neuroprotective effect on retinal ganglion cells by transpupillary laser irradiation of the optic nerve head. This study demonstrates that subthreshold transpupillary thermotherapy (TTT) laser irradiation on optic nerve head protects retinal ganglion cells (RGCs) in an optic nerve crush (ONC) model. TTT was performed in right eyes with an 810-nm diode laser aimed at the center of the optic nerve head, using the following protocol: power 60mW, duration 60s, spot size 500mum. Fluoro-Gold was injected into bilateral superior colliculi 5 days before sacrifice and fluorescent gold labeled RGCs were counted under fluorescence microscopy. In the ONC group, a progressive loss of RGCs was observed; however, in comparison with the ONC group, RGCs density was significantly higher (P=0.001, independent samples t-test) at day 7 postoperative and only borderline significances were obtained at days 14 and 28 postoperative (P=0.044 and P=0.045, respectively, independent samples t-test) in ONC+TTT group, which implies the potential neuroprotective role of TTT. This protective effect seems to be heat shock proteins (HSPs) related, because intraperitoneal Quercetin (an inhibitor of HSPs, 4mg/kg/day for 7 days) could completely abolish this protective effect at days 7, 14 and 28 postoperative (P=0.012, P=0.002, and P=0.000, respectively, independent samples t-test). Minimal

collateral damage of TTT on optic nerve head tissue, peripapillary RGCs and the myelin sheath of the optic nerve were observed under transmission electron microscopy. These findings suggested that subthreshold TTT might be a safe and practical approach to protect RGCs. The underlying mechanisms may involve TTT-induced HSPs in RGCs. Animals;Cell Survival;Female;Hyperthermia, Induced;Lasers, Semiconductor;Low-Level Light Therapy;Nerve Crush;Optic Nerve;Optic Nerve Injuries;Pupil;Rats;Retinal Ganglion Cells

[Many-level polysensory stimulation of brain functions by physical therapeutic agents]. A combination of physiotherapeutic methods for neurorehabilitative treatment has been developed and applied to the treatment of 576 patients with neurosurgical problems including the loss of brain functions as a sequel to nervous system lesions of traumatic, vascular, and other origin. Methodologically, this complex is adapted to the level and extent of the lesion and the character of regeneration of the nervous tissues. It implies many-level stimulation of neuroregeneration by syndromically and pathogenetically substantiated application of physical factors in the early post-injury and postoperative periods. The proposed approach allows the brain function to be completely restored by virtue of persistent compensatory changes in the nervous system. A combination of many-level magnetic, electrical, and laser stimulation is recommended to manage lesions in the speech, motor, and visual analyzers. Combined laser and differential electrostimulation may be prescribed to patients with nerve lesions, extremely high frequency therapy to those with epileptic syndrome, combined microwave therapy to cases with impairment of consciousness, and a variant of systemic UV irradiation with underwater shower-massaging for the treatment of vegetative and asthenic disturbances. Selected physiological aspects of the action of the above physical factors are specified. This physiotherapeutic system is protected by 20 RF patents of invention. Adolescent;Adult;Aged;Brain;Brain Diseases;Child;Electrocardiography;Female;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Physical Therapy Modalities;Radiotherapy, High-Energy

Effects of low power laser irradiation on bone healing in animals: a meta-analysis. PURPOSE: The meta-analysis was performed to identify animal research defining the effects of low power laser irradiation on biomechanical indicators of bone regeneration and the impact of dosage. METHODS: We searched five electronic databases (MEDLINE, EMBASE, PubMed, CINAHL, and Cochrane Database of Randomised Clinical Trials) for studies in the area of laser and bone healing published from 1966 to October 2008. Included studies had to investigate fracture healing in any animal model, using any type of low power laser irradiation, and use at least one quantitative biomechanical measures of bone strength. There were 880 abstracts related to the laser irradiation and bone issues (healing, surgery and assessment). Five studies met our inclusion criteria and were critically appraised by two raters independently using a structured tool designed for rating the quality of animal research studies. After full text review, two articles were deemed ineligible for meta-analysis because of the type of injury method and biomechanical variables used, leaving three studies for meta-analysis. Maximum bone tolerance force before the point of fracture during the biomechanical test, 4 weeks after bone deficiency was our main biomechanical bone properties for the Meta analysis. RESULTS: Studies indicate that low power laser irradiation can enhance biomechanical properties of bone during fracture healing in animal models. Maximum bone tolerance was statistically improved following low level laser irradiation (average random effect size 0.726, 95% CI 0.08-1.37, p 0.028). While conclusions are limited by the low number of studies, there is concordance across limited evidence that laser improves the strength of bone tissue during the healing process in animal models.

[LOW-INTENSITY LASER THERAPY IN THE PROPHYLACTIC TREATMENT OF TUBERCULIN HYPERERGIC CHILDREN]. The results of sanatorium treatment were analyzed in 156 children and adolescents aged 11-17 years at high risk for tuberculosis. All the patients had been long infected with

Mycobacterium tuberculosis with hyperergic tuberculin sensitivity; they had comorbidity and were susceptible to frequent respiratory diseases. A course of percutaneous low-intensity laser irradiation was incorporated as a new method into a complex of prophylactic treatment. The time course of changes in tuberculin sensitivity, serological values, and clinical data were estimated. The proposed treatment regimen was shown to have some advantage over the conventional treatment one.
Antitubercular Agents;Tuberculin Adolescent;Antitubercular Agents;Balneology;Chemoprevention;Child;Female;Humans;Hypersensitivity, Delayed;Low-Level Light Therapy;Male;Mycobacterium tuberculosis;Treatment Outcome;Tuberculin;Tuberculin Test;Tuberculosis

The low level laser therapy in the management of neurological burning mouth syndrome. A pilot study. BACKGROUND AND OBJECTIVE: Burning Mouth Syndrome (BMS) is a common disease but still a diagnostic and therapeutic challenge for clinicians. Despite many studies its nature remains obscure and controversial; nowadays there is no consensus about definition, diagnosis and classification. BMS is characterized clinically by burning sensations in the tongue or other oral sites, often without clinical and laboratory findings. According to the etiology, BMS cases should be subdivided into three subtypes: BMS by local factors (lfBMS), BMS by systemic factors (sfBMS) and neurological BMS (nBMS), the most frequent, in which the symptom is caused by central or peripheral neurological malfunctions affecting in particular the taste pathway. To establish the type of BMS, both anamnesis and clinical examination, including laboratory tests, are necessary; nBMS cases will be recognized by exclusion of any other type. In case of lfBMS or sfBMS, the treatment of the main pathology will be resolutive; in nBMS cases many Authors proposed different pharmacological trials without satisfactory results and the current opinion is that a multidisciplinary approach is required to keep the condition under control. This pilot study aimed to investigate whether the biostimulative effect of Low Level Laser Therapy (LLLT) could enhance the symptoms of nBMS cases, improving patients' quality of life. STUDY DESIGN/MATERIALS AND METHODS: Among 160 patients affected by oral burning sensation attending to the Oral Pathology Complex Operative Unit of the Department of Stomatological Sciences of Sapienza University of Rome, 77 resulted affected by nBMS. Twenty-five of these patients, 16 females and 9 males, were randomly selected for low level laser applications. All the patients were irradiated with a double diode laser (Lumix 2 Prodent, Italy) emitting contemporarily at 650 nm and 910 nm, with a fluence of 0.53 J/cm(2) for 15 minutes twice a week for 4 weeks. The areas of irradiation were the sides of the tongue on the path of taste fibers. A NRS (numerical rating scale) evaluation of maximum and minimum pain was registered before and after the treatment. In each case to the total value of NRS rates registered before the treatment was deducted the total NRS rate registered after the treatment. The difference was estimated effective if over two points. The Kruskall-Wallis test revealed the significance of the study ($p<0.0001$) and the Dunn's Multiple Comparison test, applied to compare NRS rates before and after the treatment, showed that there is not a statistically relevant difference between min NRS ratings before and after treatment, while there are statistically significant differences between max NRS ratings ($p<0.05$). RESULTS: All the patients agreed the treatment confirming the general good compliance related to laser treatments. No side effects were registered and all the patients completed the therapy without interruption. Seventeen patients (68%) had relevant benefits from the treatment with valid reduction of NRS ratings. In 8 cases the differences of NRS rates were not relevant being under the limit of reliability established in study design. In no case there was a worsening of the symptoms. CONCLUSIONS: According to the results of this pilot study it is reasonable to suppose that LLLT may play an important role in the management of nBMS cases, more investigations are needed to clarify, by a greater number of cases and a placebo control group, the real effectiveness of this innovative LLLT application.

Ordinal regression models for continuous scales. Ordinal regression analysis is a convenient tool for analyzing ordinal response variables in the presence of covariates. In this paper we extend this methodology to the case of continuous self-rating scales such as the Visual Analog Scale (VAS) used in pain assessment, or the Linear Analog Self-Assessment (LASA) scales in quality of life studies. These scales measure subjects' perception of an intangible quantity, and cannot be handled as ratio variables because of their inherent nonlinearity. We express the likelihood in terms of a function connecting the scale with an underlying continuous latent variable and approximate this function either parametrically or non-parametrically. Then a general semi-parametric regression framework for continuous scales is developed. Two data sets have been analyzed to compare our method to the standard discrete ordinal regression model, and the parametric to the non-parametric versions of the model. The first data set uses VAS data from a study on the efficacy of low-level laser therapy in the treatment of chronic neck pain; the second comes from a study on chemotherapy treatments in advanced breast cancer and looks at the impact of different drugs on patients' quality of life. The continuous formulation of the ordinal regression model has the advantage of no loss of precision due to categorization of the scores and no arbitrary choice of the number and boundaries of categories. The semi-parametric form of the model makes it a flexible method for analysis of continuous ordinal scales. Antineoplastic Combined Chemotherapy Protocols;Breast Neoplasms;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Models, Statistical;Neck Pain;Pain Measurement;Regression Analysis;Sensitivity and Specificity;Statistical Distributions

[Modern tactics of the dystrophic retina disease treatment of patients of the elder age group]. One of the problems of elderly and senile patients is the reduction of visual acuity. Primarily this is due to AREDS as the most frequent cause of loss of visual acuity in people over 60 years. Therefore, the search for ways to protect and maintain visual function of elderly and senile patients is an important task both for ophthalmology and geriatrics. Aged;Disease Progression;Drug Therapy, Combination;Humans;Low-Level Light Therapy;Macular Degeneration;Middle Aged;Monitoring, Physiologic;Ophthalmologic Surgical Procedures;Retina;Retinal Dystrophies;Vision, Ocular;Visual Acuity;Visual Field Tests

[Induced thymus aging: radiation model and application perspective for low intensive laser radiation]. The influence of gamma-radiation on morphofunctional state of thymus is rather like as natural thymus aging. However gamma-radiation model of thymus aging widely used to investigate geroprotectors has many shortcomings and limitations. Gamma-radiation can induce irreversible changes in thymus very often. These changes are more intensive in comparison with changes, which can be observed at natural thymus aging. Low intensive laser radiation can not destroy structure of thymus and its effects are rather like as natural thymus aging in comparison with gamma-radiation effects. There are many parameters of low intensive laser radiation, which can be changed to improve morphofunctional thymus characteristics in aging model. Using low intensive laser radiation in thymus aging model can be very perspective for investigations of aging immune system. Aging;Animals;Gamma Rays;Humans;Lasers;Low-Level Light Therapy;Models, Animal;Rats;Thymus Gland

[CO(2)-laser in treatment of patients with basal cell face cancer]. Adult;Aged;Aged, 80 and over;Carcinoma, Basal Cell;Facial Neoplasms;Female;Follow-Up Studies;Humans;Lasers, Gas;Light Coagulation;Low-Level Light Therapy;Male;Middle Aged;Skin Neoplasms;Time Factors;Treatment Outcome

Histological evaluation of the effect of low-level laser on distraction osteogenesis in rabbit mandibles. OBJECTIVES: This study evaluated the action of low level laser therapy (LLLT) on the percentage of newly formed bone in rabbit mandibles that underwent distraction osteogenesis (DO). STUDY DESIGN: Ten rabbits underwent bone lengthening according to the following protocol: Latency - 3

days; Activation - 7 days 0.7 mm/d; and Consolidation - 10 days. The control group was composed of 4 rabbits. The experimental group, composed of 6 rabbits, received infrared GaAlAs LLLT (wavelength=830 nm, P=40 mW) according to the following protocol: point dose of 10 J/cm(2) applied directly on the bone site that underwent DO during bone consolidation at 48-hour intervals. RESULTS: The percentage of newly formed bone was greater in the LLLT group (57.89%) than in the control group (46.75%) (p=0.006). CONCLUSION: The results suggest that LLLT had a positive effect on the percentage of newly formed bone. Better-quality bone sites may allow early removal of the osteogenic distractors, thus shortening total treatment time. Animals;Low-Level Light Therapy;Mandible;Osteogenesis, Distraction;Rabbits

Conservative management of posterior interosseous neuropathy in an elite baseball pitcher's return to play: a case report and review of the literature. This report documents retrospectively a case of Posterior Interosseous Neuropathy (PIN) occurring in an elite baseball pitcher experiencing a deep ache in the radial aspect of the forearm and altered sensation in the dorsum of the hand on the throwing arm during his pitching motion. The initial clinical goal was to control for inflammation to the nerve and muscle with active rest, microcurrent therapy, low-level laser therapy, and cessation of throwing. Minimizing mechanosensitivity at the common extensor region of the right elbow and PIN, was achieved by employing the use of myofascial release and augmented soft tissue mobilization techniques. Neurodynamic mobilization technique was also administered to improve neural function. Implementation of a sport specific protocol for the purposes of maintaining throwing mechanics and overall conditioning was utilized. Successful resolution of symptomatology and return to pre-injury status was achieved in 5 weeks. A review of literature and an evidence-based discussion for the differential diagnoses, clinical examination, diagnosis, management and rehabilitation of PIN is presented.

Photomedicine and LLLT literature watch. Humans;Laser Therapy;Phototherapy

Most important aspect of the treatment of severe burns is to close the wound as quickly as possible. Animals;Burns;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Time Factors;Wound Healing

The effects of helium-neon light therapy on healing of partial osteotomy of the tibia in streptozotocin induced diabetic rats. OBJECTIVE: The effect of light therapy (LT) on surgically created partial osteotomy in streptozotocin (STZ)-induced diabetic rats was examined. BACKGROUND DATA: LT has been shown to enhance bone repair in healthy human and animal models. MATERIALS AND METHODS: Forty male rats were divided into groups 1 to 5. Diabetes was induced in rats of groups 1, 2, and 3 using an intraperitoneal injection of STZ. All diabetic rats were maintained for 30 days after STZ injection. Under general anesthesia and sterile conditions, a partial transversal standardized osteotomy was made in the mid-portion of the right tibia. The defects in groups 2, 3, and 5 were treated using a helium-neon (He-Ne) laser (632.8 nm, 10 mW, circular beam shape). Groups 1 and 4 were diabetic placebo and normal placebo groups, respectively. A dose of 369.4 J/cm2 for groups 2 and 5 and a dose of 66.8 J/cm2 for group 3 were applied three times a week. Six weeks after surgery, the right tibia was collected. The specimen was subjected to a three-point bending test. RESULTS: LT with 369.4 J/cm2 energy density resulted in significantly greater bending stiffness in group 5 (41.8+/-5.2) than in groups 1 (18.5+/-4.1), 2 (17.7+/-1.6), and 3 (11.5+/-4) (least significant difference (LSD) test, $p<0.01$, $p<0.001$, and $p<0.001$, respectively). LT with 369.4 J/cm2 energy density resulted in a significantly higher stress load in group 5 (10+/-0.4) than in groups 1 (4.9+/-1.5), 2 (5.7+/-0.52), and 3 (3.9+/-1.1) (LSD test, $p<0.01$, $p<0.01$, $p<0.001$, respectively). CONCLUSION: LT with a He-Ne laser in STZ-induced diabetic rats did not enhance bone repair of a partial transversal standardized osteotomy. Helium;Neon;Streptozocin Analysis of Variance;Animals;Diabetes Mellitus, Experimental;Disease Models, Animal;Fracture Healing;Helium;Low-Level Light

Therapy;Male;Neon;Osteotomy;Rats;Rats, Wistar;Statistics, Nonparametric;Streptozocin;Stress, Mechanical;Tibia;Tibial Fractures

Non-ablative 1550-nm erbium-glass and ablative 10 600-nm carbon dioxide fractional lasers for acne scars: a randomized split-face study with blinded response evaluation. BACKGROUND: Non-ablative 1550-nm erbium-doped fractional photothermolysis systems (FPS) and 10 600-nm carbon dioxide fractional laser systems (CO(2) FS) have been effectively used to treat scars. OBJECTIVE: We compared the efficacy and safety of single-session treatments of FPS and CO(2) FS for acne scars through a randomized, split-face, evaluator-blinded study. METHODS: Eight patients with acne scars were enrolled in this study. Half of each subject's face was treated with FPS and the other half was treated with CO(2) FS. We used a quartile grading scale for evaluations. RESULTS: At 3 months after the treatment, the mean grade of improvement based on clinical assessment was 2.0 +/- 0.5 for FPS and 2.5 +/- 0.8 for CO(2) FS. On each side treated by FPS and CO(2) FS, the mean duration of post-therapy crusting and scaling was 2.3 and 7.4 days respectively and that of post-therapy erythema was 7.5 and 11.5 days respectively. The mean VAS pain score was 3.9 +/- 2.0 with the FPS and 7.0 +/- 2.0 with the CO(2) FS. CONCLUSION: We demonstrated the efficacy and safety of single-session acne scar treatment using FPS and CO(2) FS in East Asian patients. We believe that our study could be used as an essential reference when choosing laser modalities for scar treatment. Erbium Acne Keloid;Erbium;Asia, Eastern;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Prospective Studies;Single-Blind Method;Treatment Outcome;Young Adult

Effect of low-level laser therapy (GaAs 904 nm) in skeletal muscle fatigue and biochemical markers of muscle damage in rats. We wanted to test if pre-exercise muscle irradiation with 904 nm laser affects the development of fatigue, blood lactate levels and creatine kinase (CK) activity in a rat model with tetanic contractions. Thirty male Wistar rats were divided into five groups receiving either one of four different laser doses (0.1, 0.3, 1.0 and 3.0 J) or a no-treatment control group. Laser irradiation was performed immediately before the first contraction for treated groups. Electrical stimulation was used to induce six tetanic tibial anterior muscle contractions with 10 min intervals between them. Contractions were stopped when the muscle force fell to 50% of the peak value for each contraction; blood samples were taken before the first and immediately after the sixth contraction. The relative peak forces for the sixth contraction were significantly better ($P < 0.05$) in the two laser groups irradiated with highest doses [151.27% (SD +/- 18.82) for 1.0 J, 144.84% (SD +/- 34.47) for 3.0 J and 82.25% (SD +/- 11.69) for the control group]. Similar significant ($P < 0.05$) increases in mean performed work during the sixth contraction for the 1.0 and 3.0 J groups were also observed. Blood lactate levels were significantly lower ($P < 0.05$) than the control group in all irradiated groups. All irradiated groups except the 3.0 J group had significantly lower post-exercise CK activity than the control group. We conclude that pre-exercise irradiation with a laser dose of 1.0 J and 904 nm wavelength significantly delays muscle fatigue and decreases post-exercise blood lactate and CK in this rat model. Lactic Acid Animals;Dose-Response Relationship, Radiation;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Radiation Dosage;Rats;Rats, Wistar

Pulsed dye laser in burn scars: current concepts and future directions. Hypertrophic scarring after partial-thickness burns is common, resulting in raised, erythematous, pruritic, and contracted scars. Treatment of hypertrophic scars, especially on the face, is challenging and has high failure rates. Excisional treatment has morbidity and can create iatrogenic deformities. After an extensive experience over 10 years with laser therapy for the treatment of difficult scars, the pulsed dye laser (PDL) has emerged as a successful alternative to excision in patients with hypertrophic burn scars. Multiple studies have shown its ability to decrease scar erythema and thickness while significantly decreasing pruritus and improving the cosmetic appearance of the scar. The history of laser therapy

and the mechanism of action and results of the PDL in burn scars will be reviewed. The PDL should become an integral part of the management of burn scarring and will significantly decrease the need for excisional surgery. Collagen Adolescent;Adult;Burns;Child, Preschool;Cicatrix, Hypertrophic;Collagen;Facial Injuries;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male
Unwanted facial hair removal with laser treatment improves quality of life of patients. BACKGROUND: Unwanted facial hair can have adverse psychological effects on women and reduce their quality of life. OBJECTIVE: To assess the effects of unwanted facial hair removal with laser on improving quality of life. METHODS: In this study, 70 patients treated for unwanted facial hair by laser were assessed by Dermatology Life Quality Index (DLQI) questionnaire on admission and 3 months later after three sessions of laser treatment. RESULTS: The DLQI score before treatment was 9.42 +/- 5.99, which was reduced to 3.12 +/- 3.40 after laser treatment ($p < 0.05$). CONCLUSION: Unwanted facial hair removal with laser can improve the quality of life of patients. Adolescent;Adult;Face;Female;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Quality of Life;Time Factors;Young Adult
Wound healing after laser skin resurfacing: the effect of a silver sulfadiazine-hyaluronic acid-containing cream under an occlusive dressing. INTRODUCTION: Occlusive dressings promote wound healing after laser skin resurfacing. Our goal was to evaluate whether a cream containing hyaluronic acid-silver sulfadiazine could improve this process. METHODS: Ten guinea pigs received laser resurfacing on the skin of their backs. Polyurethane foam film adhesive dressing was applied. A cream containing hyaluronic acid-silver sulfadiazine was applied under the dressing over half of the wound. Skin biopsies were taken at days 2, 4, 7 and 9 and examined by a pathologist blinded to the study. RESULTS: Re-epithelialization appeared to occur faster in the cream-treated areas, together with a lower level of acute inflammation in the early phase of the healing process. CONCLUSIONS: The cream containing silver sulfadiazine/hyaluronic acid seems to improve wound healing after laser skin resurfacing in guinea pigs. The clinical application of this finding on humans should be assessed. Anti-Bacterial Agents;Drug Combinations;Hyaluronic Acid;Silver Sulfadiazine Animals;Anti-Bacterial Agents;Drug Combinations;Erythema;Guinea Pigs;Hyaluronic Acid;Low-Level Light Therapy;Occlusive Dressings;Silver Sulfadiazine;Wound Healing
[Application of low-power visible and near infrared radiation in clinical oncology]. Although low-power visible (VIS) and near infrared (nIR) radiation emitted from lasers, photodiodes, and other sources does not cause neoplastic transformation of the tissue, these phototherapeutic techniques are looked at with a great deal of caution for fear of their stimulatory effect on tumour growth. This apprehension arises in the first place from the reports on the possibility that the proliferative activity of tumour cells may increase after their in vitro exposure to light. Much less is known that these phototherapeutic modalities have been successfully used for the prevention and management of complications developing after surgery, chemo- and radiotherapy. The objective of the present review is to summarize the results of applications of low-power visible and near infrared radiation for the treatment of patients with oncological diseases during the last 20-25 years. It should be emphasized that 2-4 year-long follow-up observations have not revealed any increase in the frequency of tumour recurrence and metastasis. Animals;Humans;Infrared Rays;Low-Level Light Therapy;Neoplasms
[Comparative hemodynamic characteristics of patients with the organ of vision subjected to low-intensity laser radiation of the green and red wavelengths]. This comparative study was designed to evaluate effect of low-intensity speckle laser radiation in the green and red wavelengths on intraocular hemodynamics in 202 patients (202 eyes) with retinal vascular problems and without them. Irradiation was performed using "Izumrud" and "Rubin" adapters for an AMO-ATOS unit. Peak systolic velocity and peripheral resistance index in posterior short ciliary arteries and central retinal

artery were measured. It was shown for the first time that green speckle laser radiation (wavelength 535 nm) has more pronounced (compared with the red light) effect on intraocular hemodynamics; thereby, it makes a greater contribution to the improvement of the visual function (e.g. in the case of glaucoma) and to the widening of the fields of vision. Aged;Blood Flow Velocity;Female;Glaucoma;Humans;Low-Level Light Therapy;Male;Middle Aged;Retinal Artery;Retinal Diseases
Effect of helium-neon laser irradiation on hair follicle growth cycle of Swiss albino mice. We report the results of a study carried out to investigate the effect of helium-neon (He-Ne) laser (632.8 nm) irradiation on the hair follicle growth cycle of testosterone-treated and untreated mice. Both histology and optical coherence tomography (OCT) were used for the measurement of hair follicle length and the relative percentage of hair follicles in different growth phases. A positive correlation (R = 0.96) was observed for the lengths of hair follicles measured by both methods. Further, the ratios of the lengths of hair follicles in the anagen and catagen phases obtained by both methods were nearly the same. However, the length of the hair follicles measured by both methods differed by a factor of 1.6, with histology showing smaller lengths. He-Ne laser irradiation (at approximately 1 J/cm(2)) of the skin of both the control and the testosterone-treated mice was observed to lead to a significant increase ($p < 0.05$) in % anagen, indicating stimulation of hair growth. The study also demonstrates that OCT can be used to monitor the hair follicle growth cycle, and thus hair follicle disorders or treatment efficacy during alopecia. Testosterone Alopecia;Animals;Hair;Hair Follicle;Lasers, Gas;Low-Level Light Therapy;Male;Mice;Testosterone;Tomography, Optical Coherence
Low-level laser therapy as a non-invasive approach for body contouring: a randomized, controlled study. BACKGROUND AND OBJECTIVE: Transmission electron microscopic images have demonstrated the formation of transitory pores in adipocyte cell membranes followed by the collapse of adipose cells subsequent to laser irradiation of 635 nm. The objective is to evaluate the application of a 635 nm and 17.5 mW exit power per multiple diode laser for the application of non-invasive body contouring of the waist, hips, and thighs. STUDY DESIGN/PATIENTS AND METHODS: Double-blind, randomized, placebo-controlled trial of a 2-week non-invasive laser treatment conducted from May 2007 to June 2008 across multiple-private practice sites in the United States of America. Sixty-seven volunteers between the ages of 18-65 with a body mass index (BMI) between 25 and 30 kg/m(2) and who satisfied the set inclusion criteria participated. Eight of the 67 subjects did not have circumference measurements recorded at the 2-week post-procedure measurement point. Participants were randomly assigned to receive low-level laser treatments or a matching sham treatment three times per week for 2 weeks. Reduction in the total combined inches of circumference measurements of the waist, hip and bilateral thighs from baseline to the completion of the 2-week procedure administration phase was assessed. RESULTS: Participants in the treatment group demonstrated an overall reduction in total circumference across all three sites of -3.51 in. ($P < 0.001$) compared with control subjects who revealed a -0.684 reduction ($P < 0.071745$). Test group participants demonstrated a reduction of -0.98 in. ($P < 0.0001$) across the waist, -1.05 in. ($P < 0.01$) across the hip, and -0.85 in. ($P < 0.01$) and -0.65 in. ($P < 0.01$) across the right and left thighs from baseline to 2 weeks (end of treatment). At 2 weeks post-procedure, test group subjects demonstrated a gain of 0.31 total inches collectively across all three sites. CONCLUSION: These data suggest that low-level laser therapy can reduce overall circumference measurements of specifically treated regions. Abdomen;Adipose Tissue;Adolescent;Adult;Aged;Body Size;Cosmetic Techniques;Double-Blind Method;Hip;Humans;Low-Level Light Therapy;Middle Aged;Thigh;Waist Circumference;Young Adult
Biphasic dose response in low level light therapy. The use of low levels of visible or near infrared light for reducing pain, inflammation and edema, promoting healing of wounds, deeper tissues and

nerves, and preventing cell death and tissue damage has been known for over forty years since the invention of lasers. Despite many reports of positive findings from experiments conducted in vitro, in animal models and in randomized controlled clinical trials, LLLT remains controversial in mainstream medicine. The biochemical mechanisms underlying the positive effects are incompletely understood, and the complexity of rationally choosing amongst a large number of illumination parameters such as wavelength, fluence, power density, pulse structure and treatment timing has led to the publication of a number of negative studies as well as many positive ones. A biphasic dose response has been frequently observed where low levels of light have a much better effect on stimulating and repairing tissues than higher levels of light. The so-called Arndt-Schulz curve is frequently used to describe this biphasic dose response. This review will cover the molecular and cellular mechanisms in LLLT, and describe some of our recent results in vitro and in vivo that provide scientific explanations for this biphasic dose response.

Effect of low-level laser irradiation on in vitro function of pancreatic islets. INTRODUCTION: Although islet isolation and transplantation techniques have improved extensively in recent years, the loss of healthy functional islets is one of the major obstacles in this enterprise. A biostimulatory effect of low-level laser irradiation has been proven on proliferation of some kinds of cells. The aim of this study was to evaluate the effect of low-level laser irradiation on the function of isolated rat pancreatic islets after 24 hours of preculture. METHODS: Pancreatic islets isolated from male rats (250 to 300 g) were cultured for 24 hours in RPMI 1640 media. Groups of islets then received different energy densities (1, 3, 5 joules/cm(2) or silent) at 2 wavelengths (810 nm and 630 nm) using laser devices. Insulin concentrations in buffer media were measured as indices of islet function. RESULTS: Irradiation of incubated islets with 830 nm low-level laser significantly increased insulin secretion after a glucose challenge test ($P < .05$). There was a significant increase in insulin secretion after irradiation with joules/cm(2) 630 nm energy density ($P < .001$). CONCLUSION: These findings suggest that low-level laser irradiations improved islet cell function before transplantation. Insulin;Glucose;Calcium Animals;Calcium;Glucose;Insulin;Insulin Secretion;Islets of Langerhans;Low-Level Light Therapy;Male;Rats

Evaluation of 60 patients with pilonidal sinus treated with laser epilation after surgery. BACKGROUND: The surgical treatments for pilonidal sinus disease often result in recurrences, and the patients risk requiring multiple surgical interventions. OBJECTIVE: To evaluate the role of alexandrite laser hair removal after surgery in pilonidal sinus disease. METHODS: Sixty patients who underwent surgical treatment of pilonidal sinus disease and were treated with a 755-nm alexandrite laser after surgery between 1999 and 2007 were examined retrospectively. The charts were reviewed, and the patients were interviewed on the telephone about their post-laser period and recurrence. The laser parameters, patient history, and surgical details were recorded. RESULTS: The overall recurrence rate was 13.3%, after a mean follow-up period +/- standard error of the mean of 4.8 +/- 0.3 years. The mean number of laser treatment was 2.7 +/- 0.1. Seventy-five percent of the recurrences were detected after a follow-up period of 5 to 9 years. Fifty percent of the recurrent cases had drainage and secondary intention before the laser epilation. CONCLUSION: Our results strongly suggest that laser hair removal after surgical interventions in pilonidal sinus disease decreases the risk of recurrence over the long term. Adolescent;Adult;Child;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pilonidal Sinus;Retrospective Studies;Secondary Prevention;Young Adult

Effect of LED phototherapy of three distinct wavelengths on fibroblasts on wound healing: a histological study in a rodent model. AIM: The aim of the present investigation was to evaluate histologically fibroblastic proliferation on dorsal cutaneous wounds in a rodent model treated or not with light-emitting diodes (LEDs) of three wavelengths. BACKGROUND: Fibroblasts secrete substances

essential for wound healing. There are few reports of LED phototherapy on fibroblast proliferation, mainly in vivo. ANIMALS AND METHODS: Following approval by the Animal Experimentation Committee of the School of Dentistry of the Federal University of Bahia, we obtained 16 young adult male Wistar rats weighing between 200 and 250 g. Under general anesthesia, one excisional wound was created on the dorsum of each animal; they were then randomly distributed into four groups of four animals each: G0, untreated control; G1, red LED (700 +/- 20 nm, 15 mW, 10 J/cm(2)); G2, green LED (530 +/- 20 nm, 8 mW, 10 J/cm(2)); and G3, blue LED (460 +/- 20 nm, 22 mW, 10 J/cm(2)). The irradiation started immediately after surgery and was repeated every other day for 7 days. Animals were killed 8 days after surgery. The specimens were removed, routinely processed to wax, cut, and stained with hematoxylin/eosin (HE). Fibroblasts were scored by measuring the percentage of these cells occupying the area corresponding to wound healing on stained sections. RESULTS: The quantitative results showed that red LED (700 +/- 20 nm) and green LED (530 +/- 20 nm) showed a significant increase in fibroblast numbers ($p < 0.01$ and $p = 0.02$) when compared with the control group. CONCLUSION: The use of green and red LED light is effective in increasing fibroblastic proliferation on rodents. Animals;Dermatologic Surgical Procedures;Fibroblasts;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Skin;Wound Healing

Acute low back pain with radiculopathy: a double-blind, randomized, placebo-controlled study. OBJECTIVE: The aim of this study was to investigate the clinical effects of low-level laser therapy (LLLT) in patients with acute low back pain (LBP) with radiculopathy. BACKGROUND DATA: Acute LBP with radiculopathy is associated with pain and disability and the important pathogenic role of inflammation. LLLT has shown significant anti-inflammatory effects in many studies. MATERIALS AND METHODS: A randomized, double-blind, placebo-controlled trial was performed on 546 patients. Group A (182 patients) was treated with nimesulide 200 mg/day and additionally with active LLLT; group B (182 patients) was treated only with nimesulide; and group C (182 patients) was treated with nimesulide and placebo LLLT. LLLT was applied behind the involved spine segment using a stationary skin-contact method. Patients were treated 5 times weekly, for a total of 15 treatments, with the following parameters: wavelength 904 nm; frequency 5000 Hz; 100-mW average diode power; power density of 20 mW/cm(2) and dose of 3 J/cm(2); treatment time 150 sec at whole doses of 12 J/cm(2). The outcomes were pain intensity measured with a visual analog scale (VAS); lumbar movement, with a modified Schober test; pain disability, with Oswestry disability score; and quality of life, with a 12-item short-form health survey questionnaire (SF-12). Subjects were evaluated before and after treatment. Statistical analyses were done with SPSS 11.5. RESULTS: Statistically significant differences were found in all outcomes measured ($p < 0.001$), but were larger in group A than in B ($p < 0.0005$) and C ($p < 0.0005$). The results in group C were better than in group B ($p < 0.0005$). CONCLUSIONS: The results of this study show better improvement in acute LBP treated with LLLT used as additional therapy. Anti-Inflammatory Agents, Non-Steroidal;Sulfonamides;nimesulide Adult;Anti-Inflammatory Agents, Non-Steroidal;Double-Blind Method;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Prospective Studies;Radiculopathy;Radiotherapy Dosage;Sulfonamides

A multimodal approach to management of suspected neuropathic pain in a prairie falcon (Falco mexicanus). An adult male prairie falcon (Falco mexicanus) was presented for evaluation and treatment of self-inflicted wounds along the right proximal patagium. The bird had started self-traumatizing approximately 1 month after fracturing the right metacarpus, although the fracture had stabilized, surface wounds had healed completely, and treatment with a nonsteroidal antiinflammatory drug had been administered. The bird was treated with gabapentin (11 mg/kg p.o. q12h), ketamine (0.5 mg/kg i.m. q24h), and low level laser therapy (LLLT) (<5 mW, 630-680 nm, 5-second application per site) for 3 weeks, but, despite initial improvement, new self-inflicted wounds appeared at the same site. Approximately 1.5 months later, a radial and medianoulnar nerve block

was performed by using bupivacaine (2 mg/kg) and medetomidine (0.5 microg/kg). In addition, the dosing interval of ketamine was increased to q12h, and the dose of gabapentin was increased 7.5-fold. A higher energy and wavelength of LLLT (1040 mW, 830 nm, 2 J/cm2) was applied once to the injured region and fracture site, then the original LLLT protocol was applied once daily. After 2.5 months, the wounds healed completely and no further mutilation took place. Once deemed ready for release, the falcon was returned to the wild after 181 days in captivity. This is the first reported application of successful multimodal analgesia in a raptor with uncontrolled neuropathic pain. Analgesics Analgesics;Animals;Bird Diseases;Falconiformes;Laser Therapy;Male;Neuralgia;Wings, Animal;Wounds and Injuries

Psychological benefits 2 and 4 weeks after a single treatment with near infrared light to the forehead: a pilot study of 10 patients with major depression and anxiety. BACKGROUND: Many studies have reported beneficial effects from the application of near-infrared (NIR) light photobiomodulation (PBM) to the body, and one group has reported beneficial effects applying it to the brain in stroke patients. We have reported that the measurement of a patient's left and right hemispheric emotional valence (HEV) may clarify data and guide lateralized treatments. We sought to test whether a NIR treatment could 1. improve the psychological status of patients, 2. show a relationship between immediate psychological improvements when HEV was taken into account, and 3. show an increase in frontal pole regional cerebral blood flow (rCBF), and 4. be applied without side effects. METHODS: We gave 10 patients, (5 M/5 F) with major depression, including 9 with anxiety, 7 with a past history of substance abuse (6 with an opiate abuse and 1 with an alcohol abuse history), and 3 with post traumatic stress disorder, a baseline standard diagnostic interview, a Hamilton Depression Rating Scale (HAM-D), a Hamilton Anxiety Rating Scale (HAM-A), and a Positive and Negative Affect Scale (PANAS). We then gave four 4-minute treatments in a random order: NIR to left forehead at F3, to right forehead at F4, and placebo treatments (light off) at the same sites. Immediately following each treatment we repeated the PANAS, and at 2-weeks and at 4-weeks post treatment we repeated all 3 rating scales. During all treatments we recorded total hemoglobin (cHb), as a measure of rCBF with a commercial NIR spectroscopy device over the left and the right frontal poles of the brain. RESULTS: At 2-weeks post treatment 6 of 10 patients had a remission (a score </= 10) on the HAM-D and 7 of 10 achieved this on the HAM-A. Patients experienced highly significant reductions in both HAM-D and HAM-A scores following treatment, with the greatest reductions occurring at 2 weeks. Mean rCBF across hemispheres increased from 0.011 units in the off condition to 0.043 units in the on condition, for a difference of 0.032 (95% CI: -0.016, 0.080) units, though this result did not reach statistical significance. Immediately after treatment the PANAS improved to a significantly greater extent with NIR "on" relative to NIR "off" when a hemisphere with more positive HEV was treated than when one with more negative HEV was treated. We observed no side effects. CONCLUSION: This small feasibility study suggests that NIR-PBM may have utility for the treatment of depression and other psychiatric disorders and that double blind randomized placebo-controlled trials are indicated. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT00961454.

Laser photobiomodulation of wound healing: a review of experimental studies in mouse and rat animal models. OBJECTIVES: This investigation reviewed experimental studies of laser irradiation of wound healing in mice and rats published from 2003 to August 2008, respectively, to assess putative stimulatory effects of this treatment. BACKGROUND: Animal models, including rodents, attempt to reflect human wound healing and associated problems such as dehiscence, ischemia, ulceration, infection, and scarring. They have played a key role in furthering understanding of underlying mechanisms involved in impaired wound healing, and in testing new therapeutic strategies including laser irradiation. METHOD: Original research papers investigating effects of laser or monochromatic light therapy on wound healing in mice and rats and published from January 2003

to August 2008 were retrieved from library sources, PubMed and Medline databases, reference lists from retrieved papers, and hand searches of relevant journals. Papers were selected for this review with regard to specific inclusion and exclusion criteria. Studies were critically reviewed in terms of study design, methodology, and appropriateness of laser irradiation parameters. RESULTS: The literature search identified eight studies in mice and 39 in rats. A variety of wound models were investigated, including acute-wound, impaired-healing, and chronic-wound models. Considerable variation was observed in research design, methodology, and irradiation parameters employed, limiting comparison of research findings between studies. Inadequate reporting of key experimental details, or errors in specification and/or calculation of key irradiation parameters was also found. Evidence from the studies reviewed suggested that use of red or infrared wavelength at a range of dosage parameters (median 4.2 J cm(-2)) results in significant benefits in measured parameters of wound healing. Interestingly, coherence does not seem essential to the photobiomodulatory effects of 'laser' phototherapy. CONCLUSION: Studies reviewed consistently demonstrated the ability of laser or monochromatic light to photobiomodulate wound healing processes in experimental wounds in rats and mice, and strongly support the case for further controlled research in humans. Immunologic Factors Animals;Dose-Response Relationship, Radiation;Female;Guinea Pigs;Immunologic Factors;Low-Level Light Therapy;Male;Models, Animal;Rats;Tomography, Optical Coherence;Wound Healing

Treatment of striae distensae with a TriPollar radiofrequency device: a pilot study. BACKGROUND: Striae distensae are a frequent skin condition for which treatment remains a challenge. OBJECTIVES: To determine the efficacy and safety of a TriPollar radiofrequency (RF) device for the treatment of striae in skin phototypes IV-V. METHODS: Seventeen females with striae received six weekly treatments with a TriPollar RF device. The participants were evaluated using standardized photographs and a UVA-light video camera at baseline, and at 1 and 6 weeks after the final treatment. Side effects of treatment were recorded at every session. RESULTS: At 1 week after the final treatment, 38.2% and 11.8% of the subjects were assessed to have 25-50% and 51-75% improvement of their striae, respectively. Compared with the 1-week follow-up, at the 6-week follow-up a higher percentage of the subjects were rated to have improvement of their striae. There were no significant differences in the striae surface smoothness at the 1- ($p = 0.907$) and 6-week ($p = 0.057$) follow-ups, compared with that of baseline. Twelve percent (2/17), 23% (4/17), and 65% (11/17) of the study subjects rated their satisfaction of the overall improvement as slightly satisfied, satisfied, and very satisfied, respectively. No adverse effect was reported. CONCLUSION: TriPollar RF appears to be a promising alternative for the treatment of striae distensae. Abdomen;Adult;Analysis of Variance;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Multivariate Analysis;Patient Satisfaction;Pilot Projects;Prospective Studies;Radio Waves;Skin Diseases;Thigh;Treatment Outcome

Comparison of a single treatment with Q-switched ruby laser and Q-switched Nd:YAG laser in removing black-blue Chinese tattoos. BACKGROUND: Black and blue are two popular colors in Chinese tattooing. Two Q-switched lasers, ruby and Nd:YAG, are effective for tattoo removal. No reference with regard to a comparison of the effects and adverse reactions in Chinese individuals has been made in the literature. OBJECTIVE: To compare a single treatment of black-blue tattoos with the Q-switched ruby laser and Q-switched Nd:YAG (1064 nm) laser. METHODS: A total of 35 Chinese patients with black-blue tattoos at the laser center of the Institute of Dermatology, Chinese Academy of Medical Sciences were enrolled into a self-control study. Tattoos were split into two parts or two nearby tattoos on the same body part were used; one side was treated with the Q-switched ruby laser and the other with the Q-switched Nd:YAG laser. Immediate response, treatment outcome and adverse effects were compared. The statistical significance level was set at $p< 0.05$. RESULTS: Edema

and exudation were more common immediately after ruby laser treatment (p< 0.05). The Q-switched Nd:YAG laser had a significant difference in tattoo lightening versus the Q-switched ruby laser after a single treatment (p<0.05). There was no significant difference in adverse effects between the two lasers. CONCLUSION: The Q-switched Nd:YAG laser is more effective at tattoo lightening for Chinese individuals. Its immediate response after treatment is slighter than the Q-switched ruby laser. Adolescent;Adult;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Tattooing;Young Adult

Laser-assisted skin healing (LASH) in hypertrophic scar revision. Laser-Assisted Skin Healing (LASH) is based on the therapeutic effects of controlled thermal post-conditioning. The authors have previously demonstrated on humans that an 810-nm diode-laser system could assist wound closure leading to an improvement of wound healing with a resulting indiscernible scar. A 47-year-old woman (skin type II), who developed systematically hypertrophic scars after surgery, was enrolled for a hypertrophic scar revision. Excess scar tissue was removed. Immediately after the conventional closure of the incision, laser irradiation (120 J/cm(2)) using a 0.8 cm(2) spot size (rectangular spot, length = 20 mm, width = 4 mm) was applied. Topical silicone gel sheeting (Cerederm((R))) was applied for 2 months afterwards to prevent a thick scar from reforming. No complications occurred during the course of this study. No recurrence of hypertrophic scarring was noticed 6 months after scar revision. This study reports, for the first time, the possibility of improving the appearance of hypertrophic scarring in scar revision by altering through thermal stress the wound-healing process. Since the appropriate initial management of wounds is of importance, the LASH technique could be offered as a new approach to prevent hypertrophic scarring. Cicatrix, Hypertrophic;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Middle Aged;Recurrence;Reoperation;Wound Healing

Syringoma of the face treated with fractional photothermolysis. We experienced that two Japanese women diagnosed with syringoma, confirmed by a punch biopsy, were successfully treated with fractional resurfacing. Both clinical cases have had positive results after only a few treatments, with high patient satisfaction, not only for the improvement of syringoma, but also for the improvement of aging skin, and with no side effects. From that aspect, laser treatment with fractional photothermolysis may be considered to be one of the effective treatment methods for syringoma. Although fractional photothermolysis was originally developed for an aesthetic purpose, it also can be utilized for intractable skin disease, as demonstrated by taking the concept of fractional photothermolysis and the results from this study with skin biopsy. Aged;Cosmetic Techniques;Face;Female;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Skin;Sweat Gland Neoplasms;Syringoma

Atrophic acne scar treatment using triple combination therapy: dot peeling, subcision and fractional laser. Atrophic scars are a common complication of acne. Many modalities are proposed but each does not yield satisfactory clinical outcomes. Thus, a new combination therapy is suggested that incorporates (i) dot peeling, the focal application and tattooing of higher trichloroacetic acid concentrations; (ii) subcision, the process by which there is separation of the acne scar from the underlying skin; and (iii) fractional laser irradiation. In this pilot study, the efficacy and safety of this method was investigated for the treatment of acne scars. Ten patients received this therapy for a year. Dot peeling and subcision were performed twice 2-3 months apart and fractional laser irradiation was performed every 3-4 weeks. Outcomes were assessed using scar severity scores and patients' subjective ratings. Acne scarring improved in all of the patients completing this study. Acne scar severity scores decreased by a mean of 55.3%. Eighty percent of the patients felt significant or marked improvement. There were no significant complications at the treatment sites. It would appear that triple combination therapy is a safe and very effective combination treatment modality

for a variety of atrophic acne scars. Trichloroacetic Acid Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Pilot Projects;Skin;Trichloroacetic Acid

SPF-RR sequential photothermal fractional resurfacing and remodeling with the variable pulse Er:YAG laser and scanner-assisted Nd:YAG laser. BACKGROUND AND OBJECTIVE: Many different lasers, polychromatic high-intensity light sources (PCLs), and RF devices have claimed clinical efficacy in rejuvenating the skin. In this study, the sequential combination of two different laser wavelengths was evaluated to produce reliably significant clinical improvements optimizing treatment parameters. METHODS: The left volar aspects of the forearms of four volunteers were treated with nine different parameter settings using a variable pulsewidth fractional Er:YAG 2940-nm laser with and without air cooling. The pain perception level was recorded on a 0-10 point scale (0=No pain; 10=Most severe pain). Three evaluations were made: during treatment, immediately after treatment, and 5 minutes after treatment. The same investigation was made on the right volar aspects of the same four volunteers using a short-pulse, random pattern, 3-mm spot, scanner-assisted Nd-YAG 1064-nm laser at 0.3 ms pulsewidth at seven different parameter settings. Clinical evaluations were made concerning erythema and edema 3 days after treatment, as well as pre-operative and 60 days postoperative skin texture plus color uniformity. Considering that the majority of cosmetic patients are willing to accept a relatively short and uneventful downtime (2-4 days according to a study we are presently conducting) and do prefer to limit their intra- and postoperative pain to a minimum, the best combination of clinical improvement matching these two important parameters were selected for our study. A treatment strategy combining two sequential passes of long-pulse Nd:YAG laser (Nd:YAG-LP) at 0.3 and 35 ms followed by two passes of long-pulse fractional Er:YAG laser (Er:YAG-FT) at 600 micros was designed to treat the facial regions of 10 volunteers affected by a combination of intrinsic (chrono-) and extrinsic (mostly photo-) aging. The pain perception level was recorded on a 0-10 scale (0=No pain; 10=Most severe pain). Three evaluations were made: during, immediately after, and 5 minutes after treatment. Erythema and edema were evaluated on a 0-3 point scale (0=No clinical signs; 3=Severe Clinical signs) at 7, 15 and 30 days. Improvements were determined by blind evaluation of photographs before, at 4 weeks, and at 8 weeks following treatments. Patient satisfaction was also evaluated on a 0-4 point scale (0=No satisfaction; 4=Excellent perceived improvement, 76-100%). RESULTS: At the 30-day follow-up, participants had clinically detectable improvements of facial telangiectasias (1-25%), lentigines (25-50%), diffuse dyspigmentation (25-75%), fine lines (25-75%), and skin texture (25-75%). Clinical improvements were maintained at the 60-day follow-up, demonstrating the prolonged photothermally induced biological effect on skin function and texture. All volunteers confirmed their willingness to undergo the same procedure again to maintain and possibly improve their clinical results. Further clinical evaluations at 4 and 6 months will therefore be needed to identify a suitably convenient interval between two consecutive procedures. CONCLUSION: The present study demonstrates objective and subjective improvements in fine lines, skin texture and dyspigmentation of facial skin after one sequential non-ablative and ablative laser treatment combining two different laser sources (Nd:YAG laser + Er:YAG laser). Adult;Aged;Cosmetic Techniques;Edema;Erythema;Face;Female;Forearm;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Patient Satisfaction;Skin;Skin Aging

Fractional CO2 laser resurfacing of photoaged facial and non-facial skin: histologic and clinical results and side effects. BACKGROUND: CO(2) fractional ablation offers the potential for facial and non-facial skin resurfacing with minimal downtime and rapid recovery. OBJECTIVES: The purpose of this study was (i) to document the average depths and density of adnexal structures in non-lasered facial and non-facial body skin; (ii) to determine injury in ex vivo human thigh skin with varying fractional laser modes; and (iii) to evaluate the clinical safety and efficacy of treatments. METHODS: Histologies

were obtained from non-lasered facial and non-facial skin from 121 patients and from 14 samples of excised lasered thigh skin. Seventy-one patients were evaluated after varying energy (mJ) and density settings by superficial ablation, deeper penetration, and combined treatment. RESULTS: Skin thickness and adnexal density in non-lasered skin exhibited variable ranges: epidermis (47-105 mum); papillary dermis (61-105 mum); reticular dermis (983-1986 mum); hair follicles (2-14/ HPF); sebaceous glands (2-23/HPF); sweat glands (2-7/HPF). Histological studies of samples from human thigh skin demonstrated that increased fluencies in the superficial, deep and combined mode resulted in predictable deeper levels of ablations and thermal injury. An increase in density settings results in total ablation of the epidermis. Clinical improvement of rhytids and pigmentations in facial and non-facial skin was proportional to increasing energy and density settings. Patient assessments and clinical gradings by the Wilcoxon's test of outcomes correlated with more aggressive settings. CONCLUSIONS: Prior knowledge of normal skin depths and adnexal densities, as well as ex vivo skin laser-injury profiles at varying fluencies and densities, improve the safety and efficiency of fractional CO(2) for photorejuvenation of facial and non-facial skin. Carbon Dioxide Adult;Aged;Aged, 80 and over;Carbon Dioxide;Cosmetic Techniques;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Neck;Rejuvenation;Skin;Skin Aging;Thigh

Editorial. Cosmetic Techniques;Humans;Low-Level Light Therapy

[Influence of infrared cold laser radiation emission on free radical processes in various tissues of rats with circulatory cerebral hypoxia]. Influence of infrared cold laser emission (IRCL) on the dynamic equilibrium between lipid peroxidation and tension of the antioxidant defense system in rat's tissues (blood, brain, retina, cornea) was evaluated in animals with circulatory cerebral hypoxia induced by occlusion of the left carotid artery. Tissues of white rats were examined for IRCL effects on hemiluminescence, malonic dialdehyde, SOD and catalase activities on the background of circulatory cerebral hypoxia. Data of the experiment evidenced an antioxidant effect of posthypoxic IRCL therapy as it reduces intensity of the free radical processes in plasma, cerebral tissues and retina. The experiment demonstrated the IRCL ability to modulate LPO, to stiffen the antioxidant defense system in the event of eye diseases originated from circulatory hypoxia of the ocular analyzer. Free Radical Scavengers Animals;Brain;Cerebrovascular Circulation;Cornea;Disease Models, Animal;Disease Progression;Free Radical Scavengers;Hypoxia, Brain;Low-Level Light Therapy;Male;Rats;Retina

Low level laser therapy does not modulate the outcomes of a highly bioactive glass-ceramic (Biosilicate) on bone consolidation in rats. The main purpose of the present work was to evaluate if low level laser therapy (LLLT) can improve the effects of novel fully-crystallized glass-ceramic (Biosilicate) on bone consolidation in tibial defects of rats. Forty male Wistar rats with tibial bone defects were used. Animals were divided into four groups: group bone defect control (CG); group bone defect filled with Biosilicate (BG); group bone defect filled with Biosilicate, irradiated with LLLT, at 60 J cm(-2) (BG 60) and group bone defect filled with Biosilicate, irradiated with LLLT, at 120 J cm(-2) (BG 120). A low-energy GaAlAs 830 nm, CW, 0.6 mm beam diameter, 100 W cm(-2), 60 and 120 J cm(-2) was used in this study. Laser irradiation was initiated immediately after the surgery procedure and it was performed every 48 h for 14 days. Fourteen days post-surgery, the three-point bending test revealed that the structural stiffness of the groups CG and BG was higher than the values of the groups BG60 and BG120. Morphometric analysis revealed no differences between the control group and the Biosilcate group. Interestingly, the groups treated with Biosilicate and laser (BG 60 and BG120) showed statistically significant lower values of newly formed bone in the area of the defect when compared to negative control (CG) and bone defect group filled with Biosilicate (CB). Our findings suggest that although Biosilicate exerts some osteogenic activity during bone repair, laser therapy is not able to modulate this process. Biocompatible Materials;Bone Substitutes;Glass

ceramics Animals;Biocompatible Materials;Biomechanical Phenomena;Bone Regeneration;Bone Substitutes;Ceramics;Fracture Healing;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;Tibia;Treatment Outcome
The diagnosis and treatment of peripheral lymphedema. Humans;Low-Level Light Therapy;Lymphedema;Practice Guidelines as Topic;Societies, Scientific
Laser as a therapy for dry mouth symptoms in a patient with SjÃ¶gren's syndrome: a case report. This clinical case study reports on dry mouth symptoms in a patient with SjÃ¶gren's syndrome (SS) who was treated with laser phototherapy (LPT). A 60-year-old woman diagnosed with SS was referred to the laboratory for lasers in dentistry to treat her severe xerostomia. A diode laser (780 nm, 3.8 J/cm2, 15 mW) was used to irradiate the parotid, submandibular, and sublingual glands, three times per week, for a period of 8 months. The salivary flow rate and xerostomia symptoms were measured before, during, and after LPT. Dry mouth symptoms improved during LPT. After LPT, the parotid salivary gland pain and swelling were no longer present. Treatment with LPT was an effective method to improve the quality of life of this patient with SS. Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Pain Measurement;Parotid Diseases;Saliva;Secretory Rate;Sjogren's Syndrome;Sublingual Gland;Submandibular Gland;Surveys and Questionnaires;Xerostomia
Eradication of Enterococcus faecalis by phage therapy in chronic bacterial prostatitis--case report. The treatment of three patients suffering from chronic bacterial prostatitis who were qualified for an experimental phage therapy protocol managed at the Phage Therapy Unit in WrocÅ‚aw is described. They had previously been treated unsuccessfully with long-term targeted antibiotics, autovaccines, and laser biostimulation. Rectal application of phage lysates targeted against Enterococcus faecalis cultured from the prostatic fluid gave encouraging results regarding bacterial eradication, abatement of clinical symptoms of prostatitis, and lack of early disease recurrence. Adult;Bacteriophages;Biological Therapy;Enterococcus faecalis;Gram-Positive Bacterial Infections;Humans;Male;Prostatitis
Non-surgical periodontal therapy assisted by potassium-titanyl-phosphate laser: a pilot study. As the American Academy of Periodontology indicates, the treatment of chronic periodontitis should be achieved in the least invasive manner through non-surgical periodontal therapy. However, complete removal of subgingival plaque and calculus is hindered with increasing probing depth (PD) and furcation involvement using hand, sonic or ultrasonic instruments. Many authors have suggested that the use of laser as an adjunct to scaling and root planing (SRP) might improve the effectiveness of conventional periodontal treatment. The aim of this study was to evaluate potassium-titanyl-phosphate (KTP) laser in non-surgical periodontal therapy. Seven hundred and thirty sites with probing depths of 4-6 mm were involved in the study. The sites were divided into four groups: control (SRP, chlorhexidine gel 0.5%), group A (SRP, chlorhexidine gel 0.5%, three sessions of KTP laser irradiation); group B (SRP, three sessions of KTP laser irradiation) and group C (SRP, irrigation with povidone-iodine 10%, three sessions of KTP laser irradiation). KTP laser was used with the following parameters: output power 0.6 W, time on 10 ms, time off 50 ms, 30 s per irradiation, fluence 19 J/cm(2). All the sites showed improvement in all clinical parameters. Clinical attachment loss (CAL), pocket probing depths (PPDs) and bleeding on probing (BOP), especially in the lased groups, showed significant results ($P < 0.001$). Our experience showed KTP laser to be a significant help in SRP; nevertheless, more studies are necessary to confirm our results. Adult;Aged;Dental Scaling;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Diseases;Periodontal Pocket;Pilot Projects;Root Planing
Acne and systemic disease. Acne is the most common disease of the skin. It affects 85% of teenagers, 42.5% of men, and 50.9% of women between the ages of 20 and 30 years.96,97 The role

of hormones, particularly as a trigger of sebum production and sebaceous growth and differentiation, is well known. Excess production of hormones, specifically androgens, GH, IGF-1, insulin, CRH, and glucocorticoids, is associated with increased rates of acne development. Acne may be a feature in many endocrine disorders, including polycystic ovary disease, Cushing syndrome, CAH, androgen-secreting tumors, and acromegaly. Other nonendocrine diseases associated with acne include Apert syndrome, SAPHO syndrome, BehÃ§et syndrome and PAPA syndrome. Acne medicamentosa is the development of acne vulgaris or an acneiform eruption with the use of certain medications. These medications include testosterone, progesterone,steroids, lithium, phenytoin, isoniazid, vitamins B2, B6, and B12, halogens, and epidermal growth factor inhibitors. Management of acne medicamentosa includes standard acne therapy. Discontinuation of the offending drug may be necessary in recalcitrant cases. Basic therapeutic interventions for acne include topical therapy, systemic antibiotics,hormonal agents, isotretinoin, and physical treatments. Generally, the severity of acne lesions determines the type of acne regimen necessary. The emergence of drug-resistant P acnes and adverse side effects are current limitations to effective acne management. Anti-Bacterial Agents;Dermatologic Agents;Hormones;Isotretinoin Acne Vulgaris;Acquired Hyperostosis Syndrome;Acrocephalosyndactylia;Anti-Bacterial Agents;Behcet Syndrome;Dermatologic Agents;Drug-Related Side Effects and Adverse Reactions;Endocrine System Diseases;Hormones;Humans;Isotretinoin;Low-Level Light Therapy;Phototherapy

The effect of low-level laser irradiation (In-Ga-Al-AsP - 660 nm) on melanoma in vitro and in vivo. BACKGROUND: It has been speculated that the biostimulatory effect of Low Level Laser Therapy could cause undesirable enhancement of tumor growth in neoplastic diseases. The aim of the present study is to analyze the behavior of melanoma cells (B16F10) in vitro and the in vivo development of melanoma in mice after laser irradiation. METHODS: We performed a controlled in vitro study on B16F10 melanoma cells to investigate cell viability and cell cycle changes by the Tripan Blue, MTT and cell quest histogram tests at 24, 48 and 72 h post irradiation. The in vivo mouse model (male Balb C, n = 21) of melanoma was used to analyze tumor volume and histological characteristics. Laser irradiation was performed three times (once a day for three consecutive days) with a 660 nm 50 mW CW laser, beam spot size 2 mm(2), irradiance 2.5 W/cm(2) and irradiation times of 60s (dose 150 J/cm(2)) and 420s (dose 1050 J/cm(2)) respectively. RESULTS: There were no statistically significant differences between the in vitro groups, except for an increase in the hypodiploid melanoma cells (8.48 +/- 1.40% and 4.26 +/- 0.60%) at 72 h post-irradiation. This cancer-protective effect was not reproduced in the in vivo experiment where outcome measures for the 150 J/cm(2) dose group were not significantly different from controls. For the 1050 J/cm(2) dose group, there were significant increases in tumor volume, blood vessels and cell abnormalities compared to the other groups. CONCLUSION: LLLT Irradiation should be avoided over melanomas as the combination of high irradiance (2.5 W/cm(2)) and high dose (1050 J/cm(2)) significantly increases melanoma tumor growth in vivo. Animals;Apoptosis;Cell Proliferation;Lasers;Low-Level Light Therapy;Male;Melanoma, Experimental;Mice;Mice, Inbred BALB C

Treatment of angiokeratoma of the vulva with pulsed dye laser therapy. Angiokeratoma of the vulva is relatively rare with few cases reported in the literature. The lesions are usually asymptomatic, but clinical presentations can include bleeding and vulval pruritus. Treatments for symptomatic cases include surgical excision, cryotherapy and argon or carbon dioxide laser therapy. We present a case series of patients who have been successfully treated with pulsed dye laser therapy. This was performed in the outpatient setting without the need for local anaesthesia. All patients had resolution of their symptoms. This treatment modality to our knowledge has not been reported in the literature. Adult;Angiokeratoma;Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Skin Neoplasms;Vulva

Spotted leucoderma after treatment of facial hyperpigmentation on hemodialysis patients employing 1064-nm Q-switched Nd:YAG laser. The development of skin hyperpigmentation in patients with end-stage renal disease (ESRD) on hemodialysis (HD) have been well documented. However, the cosmetic concern was neither valued seriously nor treated effectively in the past. We report a female case who suffered from facial hyperpigmentation (FH). She was treated by large-spot sized, 1064-nm Q-switched Nd:YAG laser (QSNYL). A significant improvement was found after three treatment sessions at a fluence of 3.9 J/cm(2) with 8-day intervals, but spotted leucoderma developed at the fourth visit. Neither residual FH nor spotted leucoderma subsequently improved following two additional sessions of 1064-nm QSNYL at a lower fluence with topical hydroquinone and HeNe laser, and it persisted at the 1-year follow-up. This clinically specific round-shaped leucoderma suggested laser-induced damage to melanocytes due to unsuitable application. The 1064-nm QSNYL with a large spot size and an appropriate parameter may become an effective therapeutic modality if properly utilized. Aged;Face;Female;Humans;Hyperpigmentation;Hypopigmentation;Kidney Failure, Chronic;Lasers, Solid-State;Low-Level Light Therapy;Renal Dialysis

The effects of low level laser irradiation on gingival inflammation. OBJECTIVE: The goal of this study was to analyze the effects of low level laser irradiation treatment and conservative treatment on gingival inflammation. BACKGROUND: It is widely accepted today that the primary etiological factor for the onset of periodontitis is dental plaque, although the exact mechanism of damage remains unknown. Inflammation is a basic response of periodontal tissue to damage and serves as a fast first line of defense against damage and infections. The treatment of gingivitis and periodontitis has gone through various stages: from the simplest, classical treatment methods, through improved radical interventions, to a new era marked by laser technology. Low level laser irradiation has an anti-inflammatory effect, both general and local. MATERIALS AND METHODS: The research was done on patients who had chronic periodontal disease (mild periodontitis) with expressed clinical symptoms of gingival inflammation. All patients in the study underwent conservative treatment. After conservative therapy, the patients from the experimental group were subjected to 10 low level laser treatment sessions. Both groups underwent regular follow-up visits 1, 3, and 6 months after treatment, which involved only clinical examination using plaque index (PI), gingival index (GI), and bleeding on probing index (BOP index). RESULTS: A considerable decrease in all three indexes after the application of both therapies was noticed. The follow-up visits revealed the difference in index values. With laser therapy, the values of indexes decreased steadily, whereas with conservative therapy they increased up to a certain point, but did not reach the pre-therapy values. CONCLUSIONS: A general conclusion can be drawn that low level laser irradiation (semiconductor, 670 nm) can be used as a successful physical adjuvant method of treatment, which, together with traditional periodontal therapy, leads to better and longer-lasting therapeutic results. Adult;Case-Control Studies;Dental Plaque Index;Female;Gingival Hemorrhage;Gingivitis;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Statistics, Nonparametric;Treatment Outcome

[Phototherapy for chronic pain treatment]. Three types of machines are used in the field of phototherapy for chronic pain. One type is an instrument for low reactive level laser therapy (LLLT), one is an instrument for linear polarized infrared light irradiation (SUPER LIZER), and the last one is an instrument for Xenon light irradiation (beta EXCEL Xe10). The available machines for LLLT all project laser by semiconductor. The newest machine (MEDILASER SOFT PULSE10) has peak power of 10 W and mean power of 1 W. This machine is as safe as 1 W machine and is effective twice as deep as the 1 W machine. The irradiation by low reactive level laser induces hyperpolarization, decreased resistance of neuronal membrane, and increased intra-cellular ATP concentrations. The effects of low reactive level laser might be induced by the activation of ATP-dependent K channel. The significant

analgesic effects of 1 W and 10 W LLLT were reported with double blind test. The significant analgesic effects of linear polarized near infrared light irradiation with double blind test were also reported. The effects of low reactive level laser upon the sympathetic nerve system were thought to result from its normalization of the overloaded sympathetic nerve system. Chronic Disease;Humans;Low-Level Light Therapy;Pain Management;Phototherapy

Modeling of plasmonic heating from individual gold nanoshells for near-infrared laser-induced thermal therapy. Gold nanoparticles can be engineered to target cancerous cells and at the same time designed to absorb specific wavelengths of light. Consequently, with the presence of optically tunable gold nanoparticles such as gold nanoshells, light can be effectively converted to heat via photothermal effect well enough to raise the temperature of medium surrounding gold nanoshells for thermal ablation or hyperthermia treatments of cancers. In this study, the authors proposed a new computational method to estimate thermal response of gold nanoshells embedded in a tissue-like medium when illuminated by a near-infrared (NIR) laser. Specifically, the light transport theory with diffusion approximation was initially applied to model the temperature rise within a medium without gold nanoshells as a result of the dissipation of the NIR laser power throughout the medium. After then, the heat generated by individual gold nanoshells due to photothermal effect was calculated and combined with the results for the medium without gold nanoshells to estimate the global elevation of temperature within the gold nanoshell-laden medium. The current computational model was tested for its validity using two different phantom examples, one of which was similar to a previously reported phantom experiment. The test demonstrated the capability of the current model in terms of producing qualitatively reasonable results, while it also revealed a number of potential differences in the assumptions for the current model and previous experiment. After an adjustment in the model parameters to properly take into account such differences, the computational results and the experimental data matched reasonably well within the average percentage difference of 10%. Gold Animals;Body Temperature;Computer Simulation;Dose-Response Relationship, Radiation;Gold;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Models, Biological;Nanoparticles;Radiation Dosage;Surface Plasmon Resonance;Therapy, Computer-Assisted

Fractional CO2 laser: a novel therapeutic device upon photobiomodulation of tissue remodeling and cytokine pathway of tissue repair. Minimally ablative fractional laser devices have gained acceptance as a preferred method for skin resurfacing. Notable improvements in facial rhytides, photodamage, acne scarring, and skin laxity have been reported. The aim of the present work was to compare how different CO(2) laser fluences, by modulating the secretory pathway of cytokines, are able to influence the wound-healing process, and how these fluences are associated with different clinical results. Eighteen patients, all with photodamaged skin, were treated using a fractional CO(2) laser (SmartXide DOT, Deka M.E.L.A., Florence, Italy) with varying laser fluences (2.07, 2.77, and 4.15 J/cm(2)). An immunocytochemical study was performed at defined end points in order to obtain information about specific cytokines of the microenvironment before and after treatment. The secretory pathway of cytokines changed depending on the re-epithelization and the different laser fluences. Different but significant improvements in wrinkles, skin texture, and hyperpigmentation were definitely obtained when using 2.07, 2.77, and 4.15 J/cm(2), indicating fractional CO(2) laser as a valuable tool in photorejuvenation with good clinical results, rapid downtime, and an excellent safety profile. Platelet-Derived Growth Factor;Transforming Growth Factor beta;VEGFA protein, human;Vascular Endothelial Growth Factor A;Vimentin;Fibroblast Growth Factor 2;Carbon Dioxide;Epidermal Growth Factor Carbon Dioxide;Cosmetic Techniques;Epidermal Growth Factor;Female;Fibroblast Growth Factor 2;Humans;Immunohistochemistry;Laser Therapy;Lasers,

Gas;Middle Aged;Platelet-Derived Growth Factor;Rejuvenation;Skin;Skin Aging;Transforming Growth Factor beta;Vascular Endothelial Growth Factor A;Vimentin;Wound Healing

Physiologic changes in vascular birthmarks during early infancy: mechanisms and clinical implications. Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain

Survey of the cosmetic use of lasers and other strong optical radiation sources. A survey was undertaken regarding the extent to which optical radiation is used in cosmetic treatments and the compliance with national regulations. Questionnaires were sent to 65 clinics, and 23 of these were later inspected. Only one of 41 class 4 lasers had been reported to the authorities according to the regulations prior to the survey. Among sources other than lasers, intense pulsed light (IPL) sources were the most frequent. Although qualified health personnel should be in charge of the treatment, it was observed that 30% of the clinics did not fulfil this requirement. Deviations with respect to personnel training, availability of written procedures, protective equipment and warning signs were frequently observed. The results give rise to concern about the safety of patients and employees. Cosmetic Techniques;Data Collection;Guideline Adherence;Low-Level Light Therapy;Norway;Practice Guidelines as Topic;Practice Patterns, Physicians';Radiation Protection

Laser photobiomodulation of wound healing in diabetic and non-diabetic mice: effects in splinted and unsplinted wounds. OBJECTIVE: The aim of this investigation was to compare the healing of laser-irradiated and non-irradiated wounds covered by an occlusive dressing in mice. BACKGROUND DATA: Many previous studies of the effects of laser irradiation of experimental wounds in mice and rats did not cover the wounds so that healing occurred mainly by contraction. Healing of covered wounds is slower and mimics more closely wound healing in humans. MATERIALS AND METHODS: Forty-seven diabetic and twenty non-diabetic mice were used. A single wound (5 mm diameter) was created on the left flank of each animal and covered by Tegaderm HP dressing (Day 1). Wounds were irradiated (660 nm) for 20 s using a lower power (18 mW) or higher power (80 mW) laser starting immediately post-wounding for seven consecutive days (0.36 or 1.6 J/day); untreated wounds served as controls. Animals were euthanized on Day 8, 10, or 14. Wound specimens were cut and stained using haematoxylin and eosin, and picrosirius red, and examined by microscopy. RESULTS: Results confirmed that wound healing was impaired in diabetic mice. Analysis of the data demonstrated that Tegaderm HP dressing had retarded contraction (splinted the wounds) in a large proportion of diabetic mice and, to a lesser extent, in non-diabetic mice. Healing of splinted wounds was delayed compared to unsplinted wounds, but laser irradiation (1.6 J/day, 7 days) stimulated healing by re-epithelization and granulation tissue formation. CONCLUSION: These are the first findings of laser-mediated stimulation of healing in splinted wounds. Further studies are needed to assess the effects of different constellation sets of laser parameters in this wound model. Animals;Diabetes Complications;Diabetes Mellitus, Experimental;Laser Therapy;Low-Level Light Therapy;Mice;Occlusive Dressings;Wound Healing

[Use of plasmapheresis-based extracorporeal hemocorrection in the treatment of endogenic uveitis and autoimmune eye diseases]. The paper gives the methods of plasmapheresis-based extracorporeal exposure to blood and its components to correct hemostatic disorders. Afferent methods, as well as quantum hemotherapy methods are outlined. The immunomodulating mechanism of their action, which favors a prompter elimination of inflammation, increases ocular functions, and reduces recurrences, is revealed. The mechanisms of action of plasmapheresis as a technique used alone and in combination with laser and ultraviolet blood irradiation and indications for and contraindications to the use of various hemocorrection methods are described. Humans;Low-Level Light Therapy;Ophthalmia, Sympathetic;Plasmapheresis;Treatment Outcome;Ultraviolet Therapy;Uveitis, Intermediate

Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. BACKGROUND: Neck pain is a common and costly condition for which pharmacological management has limited evidence of efficacy and side-effects. Low-level laser therapy (LLLT) is a relatively uncommon, non-invasive treatment for neck pain, in which non-thermal laser irradiation is applied to sites of pain. We did a systematic review and meta-analysis of randomised controlled trials to assess the efficacy of LLLT in neck pain. METHODS: We searched computerised databases comparing efficacy of LLLT using any wavelength with placebo or with active control in acute or chronic neck pain. Effect size for the primary outcome, pain intensity, was defined as a pooled estimate of mean difference in change in mm on 100 mm visual analogue scale. FINDINGS: We identified 16 randomised controlled trials including a total of 820 patients. In acute neck pain, results of two trials showed a relative risk (RR) of 1.69 (95% CI 1.22-2.33) for pain improvement of LLLT versus placebo. Five trials of chronic neck pain reporting categorical data showed an RR for pain improvement of 4.05 (2.74-5.98) of LLLT. Patients in 11 trials reporting changes in visual analogue scale had pain intensity reduced by 19.86 mm (10.04-29.68). Seven trials provided follow-up data for 1-22 weeks after completion of treatment, with short-term pain relief persisting in the medium term with a reduction of 22.07 mm (17.42-26.72). Side-effects from LLLT were mild and not different from those of placebo. INTERPRETATION: We show that LLLT reduces pain immediately after treatment in acute neck pain and up to 22 weeks after completion of treatment in patients with chronic neck pain. FUNDING: None. Humans;Low-Level Light Therapy;Neck Pain;Pain Measurement;Randomized Controlled Trials as Topic

Neck pain and low-level laser: does it work and how? Humans;Low-Level Light Therapy;Neck Pain

Current concepts review: noninsertional Achilles tendinopathy. Aprotinin;Nitroglycerin Achilles Tendon;Aprotinin;Exercise Therapy;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Nitroglycerin;Orthopedic Procedures;Tendinopathy;Treatment Outcome

Effect of smooth pulsed light at 400 to 700 and 870 to 1,200 nm for acne vulgaris in Asian skin. BACKGROUND: Intense pulsed light (IPL) treatment is effective for acne in Caucasians, but no significant improvements have been observed in studies on Asian skin. OBJECTIVE: To evaluate the efficacy and safety of IPL on acne vulgaris in Asian skin. METHODS: Twenty-five Japanese patients, mainly of skin phototypes III or IV and moderate to severe acne, were treated five times with IPL at wavelengths of 400 to 700 nm and 870 to 1,200 nm. Results were evaluated in terms of changes in numbers of noninflammatory comedones and inflammatory papules, pustules, and cysts and acne grade before and after treatment. RESULTS: After the first exposure, numbers of noninflammatory and inflammatory acne lesions decreased to 36.6% and 43.0%, respectively, of their pretreatment values. After five treatments, they decreased to 12.9% and 11.7%, respectively, of their pretreatment values. Acne grade improved significantly over the course of the study. Transient erythema, with or without burning or stinging, was noted in 20 (80%) patients, but no major adverse reactions were observed. CONCLUSION: IPL with dominant wavelengths of 400 to 700 nm had a satisfactory effect on acne vulgaris in Asians. Acne Vulgaris;Adolescent;Adult;Asian People;Female;Humans;Low-Level Light Therapy;Male;Skin;Treatment Outcome;Young Adult

Effectiveness of pulsed dye laser in the treatment of recalcitrant warts in children. BACKGROUND: To determine the efficacy and safety of the 585-nm pulsed dye laser (PDL) in the treatment of recalcitrant warts in children. METHODS AND MATERIAL: Retrospective survey of the medical records of children with recalcitrant warts who were treated with PDL between March 1995 through January 1999 at the Children's Memorial Hospital outpatient subspecialty center, Chicago, Illinois. RESULTS: Sixty-one children with recalcitrant warts were treated with PDL; 75% of them had total clearance of warts after an average of 3.1 treatment sessions. Overall success rates were 100%

for both perineal and perianal and face-only warts, 93% for hands, 69% for plantar warts, 67% when both face and extremities were involved, and 60% when multiple extremities were involved. Pain and other side effects were minimal. Mild scarring occurred in 2% of patients; 75% of patients remained free of warts after a follow-up period of 24 months or longer. CONCLUSION: PDL therapy is an effective, safe alternative therapy for treatment of recalcitrant warts in children, with few side effects and a low long-term recurrence rate. Adolescent;Child;Child, Preschool;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome;Warts

Expression of heat shock proteins, Hsp70 and Hsp25, in the rat gingiva after irradiation with a CO2 laser in coagulation mode. BACKGROUND AND OBJECTIVE: The therapeutic rationale of low-energy pulsed CO(2) laser coagulation mode has not been clarified yet. We conducted this study to characterize the effect of low-energy pulsed CO(2) laser coagulation mode irradiation of the rat gingiva in terms of the expression of heat shock proteins. MATERIAL AND METHODS: Laser irradiation was achieved with the parameters of 5 W, 600 mus pulse duration, and fluence of 326 J/cm(2). The gingiva dissected at different times after irradiation was processed for immunohistochemical examination of the expression of the heat shock proteins, Hsp70 and Hsp25. RESULTS: One hour after irradiation, the epithelial keratinocytes facing the laser wound exhibited an overexpression of Hsp70 in their nucleus. The connective tissue cells facing the laser wound, which included fibroblasts and capillary endothelial cells, showed de novo expression of Hsp70 at 3 h post-irradiation, the level of which peaked at 1 d and thereafter decreased. An enhanced and/or de novo expression of Hsp25 in the connective tissue cells facing the laser wound became evident at 3 h after irradiation, and after 1 d the Hsp25-expressing cells increased in number and spread over the wound as wound repair progressed. There was a temporospatial difference in the expression pattern between Hsp70 and Hsp25, with only a few cells appearing to co-express both heat shock proteins. CONCLUSION: The CO(2) laser treatment in coagulation mode produced the expression of heat shock proteins, and the findings suggest that while Hsp70 mainly conferred cell protection, Hsp25 was involved in the progress of wound repair as well as cell protection. HSP27 Heat-Shock Proteins;HSP70 Heat-Shock Proteins;Hspb1 protein, rat Animals;Capillaries;Cell Count;Cell Nucleus;Connective Tissue Cells;Cytoplasm;Dental Cementum;Endothelial Cells;Endothelium, Vascular;Epithelial Cells;Fibroblasts;Gingiva;Gingivectomy;HSP27 Heat-Shock Proteins;HSP70 Heat-Shock Proteins;Keratinocytes;Laser Coagulation;Lasers, Gas;Low-Level Light Therapy;Male;Osteoblasts;Periodontal Ligament;Rats;Rats, Wistar;Regeneration;Time Factors;Wound Healing

Personal experience with a combined laser treatment in angiolymphoid hyperplasia. Adult;Angiolymphoid Hyperplasia with Eosinophilia;Cheek;Chin;Combined Modality Therapy;Ear Diseases;Ear, External;Facial Dermatoses;Female;Humans;Laser Therapy;Lasers, Dye;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Postoperative Hemorrhage

Rosacea: a review of current topical, systemic and light-based therapies. Rosacea is a common chronic inflammatory disorder of the facial skin characterized by periods of exacerbation, remission and possible progression. The principle subtypes include erythematotelangiectatic rosacea, papulopustular rosacea, phymatous rosacea and ocular rosacea. Although the pathogenesis is unknown, rosacea is largely recognized as an inflammatory disorder. Individual subtypes are likely a result of different pathogenic factors and respond best to different therapeutic regimens. The non-pharmacologic approach to therapy is adequate skin care, trigger avoidance and photoprotection; in addition, there are several topical, herbal, systemic and light based therapies available. Standard Food and Drug Administration (FDA) approved treatments include topical sodium sulfacetamide, metronidazole, and azelaic acid. Anti-inflammatory dose doxycycline, a controlled-release 40 mg

formulation offers a non-antibiotic, anti-inflammatory treatment option. Combination of azelaic acid or topical metronidazole with anti-inflammatory doxycycline appears to have a synergistic effect. Oral isotretinoin may be effective for phymatous rosacea and treatment resistant rosacea. Light based therapies with pulsed dye laser and intense pulsed light are effective in treatment of erythema and telangiectasias. As our knowledge of rosacea and its therapeutic options expand, a multifaceted approach to treatment is warranted. Anti-Bacterial Agents;Anti-Inflammatory Agents;Cosmetics;Dermatologic Agents Administration, Cutaneous;Anti-Bacterial Agents;Anti-Inflammatory Agents;Combined Modality Therapy;Cosmetics;Dermatologic Agents;Diet;Drug Therapy, Combination;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Mite Infestations;Phototherapy;Phytotherapy;Pregnancy;Pregnancy Complications;Randomized Controlled Trials as Topic;Rosacea;Skin

New insights into adolescent acne. Interest in sebaceous gland functioning and its diseases is increasing. This article provides a summarized update of the current knowledge of the pathophysiology of acne vulgaris and the new treatment concepts that have emerged in recent years. Recent literature is reviewed regarding teenage acne, focusing on pathogenesis, associations, controversies and considerations in therapy to further help practitioners stay current on the issues regarding this topic. Current research is expected to provide new and improved treatments in the near future. Anti-Bacterial Agents;Bacterial Vaccines;Dermatologic Agents;Botulinum Toxins, Type A Acne Vulgaris;Adolescent;Animals;Anti-Bacterial Agents;Bacterial Vaccines;Botulinum Toxins, Type A;Combined Modality Therapy;Dermatologic Agents;Diet;Exercise;Forecasting;Humans;Hygiene;Low-Level Light Therapy;Mice;Puberty;Sebaceous Glands;Severity of Illness Index

Clinical applicability of a 1 450 nm diode laser as adjunctive treatment for refractory acne. Acne is a multifactorial disease of the pilosebaceous units of the face and trunk, most commonly affecting young adolescents. Acne still represents the most common concern in dermatologic consultations and despite aggressive multi-treatment regimens, many patients demonstrate a poor response. A number of recent studies have evaluated the role of laser and light therapy in the treatment of acne vulgaris, with variable clinical outcomes. Among them, a 1450 nm diode laser has been shown to improve refractory acne in a clinical setting. The content of this manuscript draws upon current literature and will critically review the role of mid-infrared lasers as adjunctive therapy for acne. Acne Vulgaris;Adolescent;Adult;Animals;Clinical Trials as Topic;Combined Modality Therapy;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rabbits;Radiotherapy, Adjuvant;Randomized Controlled Trials as Topic;Sebaceous Glands;Skin Pigmentation;Treatment Outcome;Young Adult

Laser-aided circumferential supracrestal fiberotomy and low-level laser therapy effects on relapse of rotated teeth in beagles. OBJECTIVE: To investigate the effectiveness and periodontal side effects of laser circumferential supracrestal fiberotomy (CSF) and low-level laser therapy (LLLT) on orthodontically rotated teeth in beagles. MATERIALS AND METHODS: Eighteen mandibular incisors from nine dogs were divided into three groups by treatment (n = 6/group): A, orthodontic couple force application only (control); B, laser CSF following orthodontic couple force application; and C, LLLT following orthodontic couple force application. Both mandibular lateral incisors were rotated for 4 weeks, and the relapse tendency was observed for 4 weeks more without any retainers. The amount of relapse, sulcus depth, and gingival recession were measured at weeks 4 and 8. One-way analysis of variance (ANOVA) and ScheffÃ©'s post hoc test were used for data analysis. Tissue specimens were examined at week 8 under light microscopy after hematoxylin-eosin (H&E) and Masson's trichrome staining. RESULTS: The mean percentage of relapse was 41.29% in group A, 14.52% in group B, and 56.80% in group C ($P < .001$). Four weeks after laser CSF, the sulcus depth

increased by 0.67 mm, but no gingival recession was observed. There was no significant difference between groups A and C in terms of sulcus depth and gingival recession. CONCLUSIONS: Laser CSF is an effective procedure to decrease relapse after tooth rotation, causing no apparent damage to the supporting periodontal structures, whereas LLLT on orthodontically rotated teeth without retainers appears to increase the relapse tendency. Analysis of Variance;Animals;Dental Stress Analysis;Dogs;Gingival Recession;Gingivectomy;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rotation;Secondary Prevention;Statistics, Nonparametric;Tooth Movement Techniques

Periodontal treatment with a low-level diode laser: clinical findings. This study assessed the effects of low-level laser treatment in combination with scaling and root planing (SRP) in patients with periodontitis. Sixty subjects with chronic advanced periodontitis were assigned randomly to three treatment groups (n = 20) after collecting gingival clinical parameters. Group A received SRP on a single quadrant per day for four consecutive days; on the fifth day, all quadrants were rescaled. Group B received the same treatment as Group A, followed by laser application for five days. Group C received the same treatment as Group B but the laser treatment was administered for a total of 10 days. For Groups B and C, a low-level diode laser (630 to 670 nm) was used. The plaque index, gingival index, and sulcular bleeding index were recorded for all groups. For all clinical parameters, all three groups reported statistically significant differences ($p < 0.005$) compared to baseline data. Compared to Group A, Groups B and C showed statistically significant improvement for all clinical parameters. These findings suggest that a low-level diode laser can have a beneficial effect for treating inflammatory chronic advanced periodontitis. Chronic Periodontitis;Combined Modality Therapy;Dental Plaque Index;Dental Scaling;Gingival Hemorrhage;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Oral Hygiene;Periodontal Index;Prospective Studies;Root Planing;Single-Blind Method

Photodynamic therapy for the treatment of recurrent herpes labialis: preliminary results. This study sought to evaluate the clinical outcome of patients who had been diagnosed with recurrent herpes labialis (RHL) after treatment with photodynamic therapy (PDT) associated with low-level laser therapy (LLLT). PDT has shown great effectiveness for treating already-established RHL vesicles, compared to ordinary treatments involving antiviral compounds. Two patients with vesicles on their lips were treated with PDT, followed by irradiation with LLLT. Both patients reported pain relief immediately after the procedure; at a six-month follow-up, neither patient showed signs or symptoms that related to RHL. Photosensitizing Agents;Methylene Blue Adult;Female;Herpes Labialis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Secondary Prevention;Young Adult

Clinical evaluation of desensitizing treatments for cervical dentin hypersensitivity. The aim of this study was to compare different treatments for dentin hypersensitivity in a 6-month follow-up. One hundred and one teeth exhibiting non carious cervical lesions were selected. The assessment method used to quantify sensitivity was the cold air syringe, recorded by the visual analogue scale (VAS), prior to treatment (baseline), immediately after topical treatment, after 1 week, 1, 3 and 6 months. Teeth were randomly assigned to five groups (n = 20): G1: Gluma Desensitizer (GD); G2: Seal& (SP); G3: Oxa-gel (OG); G4: Fluoride (F); G5: Low intensity laser-LILT (660 nm/3.8 J/cm(2)/15 mW). Analysis was based on the non-parametric Kruskal-Wallis test that demonstrated statistical differences immediately after the treatment ($p = 0.0165$). To observe the individual effects of each treatment, data was submitted to Friedman test. It was observed that GD and SP showed immediate effect after application. Reduction in the pain level throughout the six-month follow-up was also observed. In contrast, LILT presented a gradual reduction of hypersensitivity. OG and F showed effects as of the first and third month respectively. It can be concluded that, after the 6-month clinical evaluation, all therapies showed lower VAS sensitivity values compared with baseline, independently of their

different modes of action. Dentin Desensitizing Agents Administration, Topical;Dentin Desensitizing Agents;Dentin Sensitivity;Humans;Low-Level Light Therapy;Random Allocation;Treatment Outcome

Low-level laser therapy for pain caused by placement of the first orthodontic archwire: a randomized clinical trial. INTRODUCTION: The purpose of this study was to clinically evaluate the effect of low-level laser therapy (LLLT) as a method of reducing pain reported by patients after placement of their first orthodontic archwires. METHODS: The sample comprised 60 orthodontic patients (ages, 12-18 years; mean, 15.9 years). All patients had fixed orthodontic appliances placed in 1 dental arch (maxillary or mandibular), received the first archwire, and were then randomly assigned to the experimental (laser), placebo, or control group. This was a double-blind study. LLLT was started in the experimental group immediately after placement of the first archwire. Each tooth received a dose of 2.5 J per square centimeter on each side (buccal and lingual). The placebo group had the laser probe positioned into the mouth at the same areas overlying the dental root and could hear a sound every 10 seconds. The control group had no laser intervention. All patients received a survey to be filled out at home describing their pain during the next 7 days. RESULTS: The patients in the LLLT group had lower mean scores for oral pain and intensity of pain on the most painful day. Also, their pain ended sooner. LLLT did not affect the start of pain perception or alter the most painful day. There was no significant difference in pain symptomatology in the maxillary or mandibular arches in an evaluated parameter. CONCLUSIONS: Based on these findings, we concluded that LLLT efficiently controls pain caused by the first archwire. Adolescent;Analysis of Variance;Child;Double-Blind Method;Facial Pain;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Maxilla;Orthodontic Wires;Orthodontics;Treatment Outcome

Evaluation of low intensity laser therapy in myofascial pain syndrome. Limited studies have demonstrated that low intensity laser therapy (LILT) may have a therapeutic effect on the treatment of myofascial pain syndrome (MPS). Sixty (60) patients with MPS and having one active trigger point in the anterior masseter and anterior temporal muscles were selected and assigned randomly to six groups (n=10): Groups I to Ill were treated with GaAIAS (780 nm) laser, applied in continuous mode and in a meticulous way, twice a week, for four weeks. Energy was set to 25 J/cm2, 60 J/cm2 and 105 J/cm2, respectively. Groups IV to VI were treated with placebo applications, simulating the same parameters as the treated groups. Pain scores were assessed just before, then immediately after the fourth application, immediately after the eighth application, at 15 days and one month following treatment. A significant pain reduction was observed over time ($p<0.001$). The analgesic effect of the LILT was similar to the placebo groups. Using the parameters described in this experiment, LILT was effective in reducing pain experienced by patients with myofascial pain syndrome. Thus, it was not possible to establish a treatment protocol. Analyzing the analgesic effect of LILT suggests it as a possible treatment of MPS and may help to establish a clinical protocol for this therapeutic modality. Analysis of Variance;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Myofascial Pain Syndromes;Pain Measurement;Treatment Outcome

Clinical experience in the treatment of different vascular lesions using a neodymium-doped yttrium aluminum garnet laser. BACKGROUND: A neodymium-doped yttrium aluminum garnet (Nd:YAG) laser has been used with good results for the treatment of various vascular lesions. OBJECTIVE: To report our experience with a variable long-pulsed Nd:YAG laser for the treatment of different vascular lesions. MATERIALS AND METHODS: One hundred ten patients with different vascular skin lesions were included. Patients were examined before the treatment; 1 week after each treatment session; and 1, 2, and 3 months after the last treatment session. Improvement was judged according to clinical examination of the patients and by comparing pre- and post-treatment photographs. Results were graded in four groups using percentage resolution (0-25%, 26-50%, 51-75%, and 76-100%. RESULTS:

One hundred five patients (19 port wine stains, 48 telangiectasias, 25 hemangiomas, and 13 other vascular lesions) completed the study; 71.5% of patients showed greater than 50% improvement. Good to excellent (more than 50%) results were achieved in 63.2% of patients with port wine stain, 80.0% of patients with hemangioma, 66.7% of patients with telangiectasia, and 84.6% of patients with other vascular lesions; 71.5% of all patients were very satisfied or satisfied with the results. CONCLUSION: A variable long-pulsed Nd:YAG laser was found to be effective in the treatment of different vascular lesions ranging from easy to difficult to treat. The authors have indicated no significant interest with commercial supporters.
Adolescent;Adult;Aged;Child;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases;Vascular Diseases;Young Adult

Outcomes of childhood hemangiomas treated with the pulsed-dye laser with dynamic cooling: a retrospective chart analysis. BACKGROUND: Laser treatment of childhood hemangiomas remains controversial. Previous studies have used outdated technology, resulting in a potential overrepresentation of adverse outcomes. OBJECTIVE: To evaluate outcomes of hemangiomas treated with the most current laser technology. METHODS: A retrospective chart analysis of 90 patients with a median age of 3.0 months and a total of 105 hemangiomas were enrolled over a 2.5-year period. All were treated with the 595-nm long-pulse pulsed-dye laser (LP-PDL) with dynamic epidermal cooling at 2- to 8-week intervals depending on the stage of growth. Exclusion criteria were previous laser, surgical, or corticosteroid treatment. Three reviewers assessed outcomes. RESULTS: Near-complete or complete clearance in color were achieved for 85 (81%) and in thickness for 67 (64%) hemangiomas. There was no scarring or atrophy. Ulceration occurred in one case and resolved during treatment. Hyperpigmentation and hypopigmentation occurred in 4% and 14% of hemangiomas, respectively. CONCLUSION: Early treatment of childhood hemangiomas with the 595-nm LP-PDL with dynamic cooling may reduce the proliferative phase and result in excellent rates of clearing and few adverse events. Child, Preschool;Female;Hemangioma;Humans;Hypothermia, Induced;Infant;Infant, Newborn;Lasers, Dye;Low-Level Light Therapy;Male;Retrospective Studies;Skin Neoplasms;Treatment Outcome

Multiwavelength laser treatment of venous lakes. BACKGROUND: Venous lakes (VLs) are common benign ectasias in the upper dermis, usually observed in older people. Different treatment strategies have been described as useful, such as cryosurgery, excision, and various types of laser. OBJECTIVE: We report our experiences using a multiwavelength laser, which has not been previously described. PATIENTS AND METHODS: Thirty-nine VLs in 30 patients were treated. Treatment with 595-nm pulsed-dye laser was conducted at 20 ms and 10 J/cm(2), followed by 1,064-nm neodymium-doped yttrium aluminum garnet laser at 20 ms and 70 J/cm(2). RESULTS: Complete resolution was observed in 38 lesions (95%). No complications after treatment were noted. One case developed a small scar. CONCLUSIONS: Multiwavelentgh laser (595 nm; 1,064 nm) provides a safe, fast, and effective option in the treatment of VLs. Adult;Aged;Aged, 80 and over;Dilatation, Pathologic;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Vascular Diseases;Veins;Young Adult

[Effect of infrared low-intensity laser therapy on orbital blood circulation in children with progressive short sightedness]. This work was designed to study effect of low-intensity infrared laser radiation (LIIRR) on orbital circulation in children with progressive progressive short-handedness. Parameters of the blood flow in the orbital artery, central retinal artery, and posterior ciliary artery were evaluated in a total of 88 patients at the age from 6 to 14 years. The study group (group 1) comprised 66 children with moderately severe progressive myopia (112 eyes), the control one (group 2) included 22 patients without visual disturbances (44 eyes). Patients of group 1 received physiotherapy for the treatment of significantly deteriorated hemodynamics in the orbital region.

Indirect action of LIIRR on the orbital region promoted stabilization of short-handedness in 78.8% of the treated patients. It is concluded that the method described in this paper is clinically efficient and may be recommended for the prevention of progressive myopia in children. Adolescent;Child;Diagnostic Techniques, Ophthalmological;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Myopia;Orbit;Regional Blood Flow;Treatment Outcome

Morphological analysis of second-intention wound healing in rats submitted to 16 J/cm 2 lambda 660-nm laser irradiation. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) has been extensively applied to improve wound healing due to some biostimulatory properties presented by laser arrays apparently able to accelerate the cicatricial repair of soft tissue injuries. However, many controversial results have been reported in the literature, probably as a result of the wide sort of different protocols of photobiomodulation employed in those experiments. The goal of this study was to investigate the effect of a low-dose protocol of LLT on the intensity of the inflammatory response and the pattern of collagen fibers' deposition during second-intention wound healing in rodents. MATERIALS AND METHODS: Standard-sized wounds were carried out in the back of 24 male rats. Half of them underwent LLLT treatment (16 J/cm 2) at 660 nm delivered for 7 days. Eight and 14 days after the wounds were performed, the repairing area was removed and stained in HE and Masson's trichrome, and the inflammatory response, epithelization, and collagen fiber depositions were evaluated. RESULTS: We found that LLLT was able to slightly reduce the intensity of the inflammatory reaction as well as to enhance substantially the epithelization process at both 8 th and 14 th days. In addition, it also appeared to stimulate the deposition of collagen fibers at the final stages of wound healing. CONCLUSIONS: The LLLT protocol tested in this study resulted in some improvements in second-intention wound healing in rodents. Fibrillar Collagens Animals;Cicatrix;Disease Models, Animal;Fibrillar Collagens;Longitudinal Studies;Low-Level Light Therapy;Male;Rats;Treatment Outcome;Wound Healing

Low-level laser therapy with pulsed infrared laser accelerates third-degree burn healing process in rats. This study investigated the influence of pulsed low-level laser therapy (LLLT) on the healing of a third-degree burn in a rat model. Two third-degree burns (distal and proximal) were made in the skin of 74 rats. Rats were divided into four groups. In group 1, the distal burn received LLLT with laser switched off; in groups 2 and 3, distal burns were treated with a 3,000 Hz-pulsed infrared diode laser with 2.3 and 11.7 J/cm(2) energy densities, respectively. In group 4, the distal burns were treated topically with 0.2% nitrofurazone. The proximal burn of all groups was considered a control burn. We assessed the response to treatment both microbiologically and macroscopically. The chi-square test showed that the incidence of Staphylococcus epidermidis, Lactobacillus, and diphtheria decreased significantly in laser-treated groups compared with other groups. Independent sample t-test showed that LLLT with 11.7 J/cm(2) energy density significantly increased wound-closure rate at 3 and 4 weeks after burning compared with their relevant control burns ($p = 0.018$ and $p = 0.01$, respectively). Pulsed LLLT with 11.7 J/cm(2)/890 nm of a third-degree burn in a rat model significantly increased wound-closure rate compared with control burns. Animals;Burns;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Time Factors;Wound Healing

Micropulse diode laser photocoagulation for central serous chorio-retinopathy. PURPOSE: Central serous chorioretinopathy (CSC) is usually characterized by a localized detachment of the neurosensory retina that is self-limiting. However, some cases may persist or recur leading to degenerative changes of the retinal pigment epithelium and the neurosensory retina resulting in severe visual loss and requiring intervention. METHODS: This retrospective case series reports the long-term visual outcome of the use of micropulse laser photocoagulation for this condition with a review of literature. RESULTS: The mean follow up was 17.1 months. Four of the five patients had

complete resolution of symptoms whereas one patient had recurrent CSC from a new leak that failed to resolve after repeat micropulse treatment despite improvement in symptoms. DISCUSSION: The outcomes in this case series confirm the long-term efficacy of micropulse laser in the management of CSC. It produces therapeutic effects that appear comparable to those of conventional photocoagulation with no detectable signs of laser-induced iatrogenic damage.
Adult;Central Serous Chorioretinopathy;Follow-Up Studies;Humans;Lasers, Semiconductor;Light Coagulation;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Treatment Outcome;Visual Acuity

Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy

Laser light may improve the symptoms of oral lesions of cicatricial pemphigoid: a case report. OBJECTIVE: The aim of this work is to report the handling of a patient suffering from cicatricial pemphigoid (CP) treated with laser phototherapy (LPT) and systemic steroids. BACKGROUND DATA: CP is a group of rare chronic autoimmune blistering diseases that predominately affect the mucous membranes and occasionally the skin. The gingiva is most commonly involved, followed by the palate and the buccal mucosa. High-dosage systemic steroids are widely used for its treatment. LPT has been shown to improve wound healing and relieve pain. Its efficacy depends on the amount of energy delivered to the tissue, exposure time, and delivery method. MATERIALS AND METHODS: A white 47-y-old man with CP who used systemic steroids for the previous 5 y was examined at our clinic. Extra- and intraoral examination revealed classic signs of the condition. LPT (GaAlAs diode laser, 660 nm wavelength, 30 mW, continuous wave, diameter approximately 3 mm, 60 J/cm(2) per session) was used in association with the steroids. LPT was performed in a punctual contact manner every other day on the oral mucosa. Maintenance of the treatment was carried out weekly because interruption of the LPT resulted in the recurrence of the lesions. At the time that this report was written, the patient had been undergoing twice weekly treatments for 6 months without signs of lesion recurrence. CONCLUSION: Concomitant use of systemic steroids and LPT showed a positive effect on controlling oral CP lesions and on improving both oral health and the quality of life of the patient.
Glucocorticoids Combined Modality Therapy;Glucocorticoids;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pemphigoid, Benign Mucous Membrane

Dental enamel irradiated with infrared diode laser and photo-absorbing cream: part 2--EDX study. OBJECTIVE: The effects of laser-induced compositional changes on the enamel were investigated by energy-dispersive X-ray fluorescence spectrometry (micro-EDX). After cariogenic challenge, we administered treatment of low-level infrared diode laser and a photo-absorbing cream (used to intensify the superficial light absorption). BACKGROUND DATA: Dental caries is considered the most prevalent oral disease. A simple and noninvasive caries preventive regimen is treating tooth enamel with a laser, either alone or in combination with fluoride, which reduces enamel solubility and dissolution rates. High power lasers are still not widely used in private practice. Low-power near-infrared lasers may be an alternative approach. Energy-dispersive micro-EDX is a versatile and nondestructive spectroscopic technique that allows for a qualitative and quantitative elemental analysis of inorganic enamel components, such as calcium and phosphorus. MATERIALS AND METHODS: Twenty-four extracted or exfoliated caries-free deciduous molars were divided into six groups: 1) control group (CTR-no treatment); 2) infrared laser treatment (L) (lambda = 810 nm, 100 mW/cm(2), 90 sec, 4.47 J/cm(2), 9 J); 3) infrared laser irradiation and photo-absorbing agent (CL); 4) photo-absorbing agent alone (C); 5) infrared laser irradiation and fluoridated photo-absorbing agent (FCL); and 6) fluoridated photo-absorbing agent alone (FC). Samples were analyzed using micro-EDX after two sets of treatments and pH cycling cariogenic challenges. RESULTS: The CL group showed statistically significant increases in calcium and phosphorus (wt%) compared with the CTR group. The

Ca/P ratio was similar in the FCL and CTR groups. There was a significant laser-induced reduction compared with the CTR group, and there was a possible modification of the organic balance content in enamel treated with laser and cream. CONCLUSION: micro-EDX may be able to detect compositional changes in mineral phases of lased enamel under cariogenic challenge. Our results suggest that with a combined laser and photo-absorbing agent (CL) treatment, there was a possible disorganization of organic content in the tooth enamel with hydroxyapatite crystal reordering and reorganization. Phosphorus;Calcium Calcium;Dental Caries;Dental Enamel;Humans;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Phosphorus;Spectrometry, X-Ray Emission

Managing postmastectomy lymphedema with low-level laser therapy. OBJECTIVE: We aimed to investigate the effects of low-level laser therapy (LLLT) in managing postmastectomy lymphedema. BACKGROUND DATA: Postmastectomy lymphedema (PML) is a common complication of breast cancer treatment that causes various symptoms, functional impairment, or even psychosocial morbidity. A prospective, single-blinded, controlled clinical trial was conducted to examine the effectiveness of LLLT on managing PML. METHODS: Twenty-one women suffering from unilateral PML were randomly allocated to receive either 12 sessions of LLLT in 4 wk (the laser group) or no laser irradiation (the control group). Volumetry and tonometry were used to monitor arm volume and tissue resistance; the Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire was used for measuring subjective symptoms. Outcome measures were assessed before and after the treatment period and at the 4 wk follow-up. RESULTS: Reduction in arm volume and increase in tissue softening was found in the laser group only. At the follow-up session, significant between-group differences (all $p < 0.05$) were found in arm volume and tissue resistance at the anterior torso and forearm region. The laser group had a 16% reduction in the arm volume at the end of the treatment period, that dropped to 28% in the follow-up. Moreover, the laser group demonstrated a cumulative increase from 15% to 33% in the tonometry readings over the forearm and anterior torso. The DASH score of the laser group showed progressive improvement over time. CONCLUSION: LLLT was effective in the management of PML, and the effects were maintained to the 4 wk follow-up. Adult;Breast Neoplasms;Disability Evaluation;Female;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Prospective Studies;Single-Blind Method;Treatment Outcome

Investigation of the effect of GaAs laser therapy on lateral epicondylitis. BACKGROUND AND OBJECTIVE: There are conflicting reports regarding the efficacy of low energy laser therapy in treatment of lateral epicondylitis (LE). Contradictory results are considered to be due to different joint treatment protocols regarding variables such as dose, duration, and frequency. The aim of this study was to investigate the efficacy of gallium-arsenide (GaAs) laser therapy, which was performed with the dose regimen recommended by the World Association for Laser Therapy, in relieving pain and improving functional activities in patients with LE. PATIENTS AND METHODS: Forty-nine patients (50 elbows) evaluated in our outpatient clinic were included in the study. Elbows were randomized into two groups: laser ($n = 25$) and placebo laser ($n = 25$). Either laser or placebo laser therapy was applied to patients for 15 sessions (5 d per week for 3 weeks). Main outcome measures were visual analog scale, tenderness, Disability of the Arm Shoulder and Hand (DASH) questionnaire, the Patient-Related Lateral Epicondylitis Evaluation (PRTEE) test, pain-free grip strength, and the Nottingham Health Profile (NHP) questionnaire. Evaluations were performed before treatment, at the end of 3 weeks of treatment, and after the 12th week of treatment ended. RESULTS: Upon post-treatment evaluation, a significant improvement in all parameters was observed for both groups ($p < 0.05$). No significant difference was found when the laser and placebo groups were compared. At the 12 week evaluation, a significant sustained improvement in all parameters was observed. On intergroup evaluation, a significant improvement was observed in favor of the active treatment group regarding

pain with resisted extension of the wrist, tenderness with pressure, and for both the total and subgroup scores of the DASH questionnaire and PRTEE test, as well as for the pain subgroup of the NHP questionnaire ($p < 0.05$). CONCLUSION: Although low energy laser therapy had no advantage compared to placebo in patients with LE for the short term, a significant improvement, particularly in functional parameters, was achieved in the long term. Laser, which has relatively no side effects, might be included among long-term treatment options for LE. Adult;Female;Hand Strength;Health Status Indicators;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Surveys and Questionnaires;Tennis Elbow

Effect of low-level laser therapy on malondialdehyde concentration in random cutaneous flap viability. OBJECTIVE: The aim of this study was to assess the effects of 830 and 670 nm laser on malondialdehyde (MDA) concentration in random skin-flap survival. BACKGROUND DATA: Low-level laser therapy (LLLT) has been reported to be successful in stimulating the formation of new blood vessels and activating superoxide-dismutase delivery, thus helping the inhibition of free-radical action and consequently reducing necrosis. MATERIALS AND METHODS: Thirty Wistar rats were used and divided into three groups, with 10 rats in each one. A random skin flap was raised on the dorsum of each animal. Group 1 was the control group; group 2 received 830 nm laser radiation; and group 3 was submitted to 670 nm laser radiation. The animals underwent laser therapy with 36 J/cm(2) energy density immediately after surgery and on the 4 days subsequent to surgery. The application site of the laser radiation was 1 point, 2.5 cm from the flap's cranial base. The percentage of the skin-flap necrosis area was calculated 7 days postoperative using the paper-template method, and a skin sample was collected immediately after as a way of determining the MDA concentration. RESULTS: Statistically significant differences were found between the necrosis percentages, with higher values seen in group 1 compared with groups 2 and 3. Groups 2 and 3 did not present statistically significant differences ($p > 0.05$). Group 3 had a lower concentration of MDA values compared to the control group ($p < 0.05$). CONCLUSION: LLLT was effective in increasing the random skin-flap viability in rats, and the 670 nm laser was efficient in reducing the MDA concentration. Malondialdehyde Animals;Low-Level Light Therapy;Male;Malondialdehyde;Microcirculation;Necrosis;Rats;Regional Blood Flow;Surgical Flaps

Therapeutic effects of low-level laser on lateral epicondylitis from differential interventions of Chinese-Western medicine: systematic review. BACKGROUND: Low-level laser therapy (LLLT) is a conservative treatment for lateral epicondylitis (LE), but it is also an alternative intervention between the very different approaches of Chinese and Western medicine. OBJECTIVE: The purpose of this study was to systematically review and meta-analyze the therapeutic effects of LLLT on LE. METHODS: We searched several electronic databases, including Medline, PubMed, and CINAHL, and explored studies that were randomized controlled trials on the therapeutic effects of LLLT on LE from 1990 to February 2009. These studies were systematically reviewed for the difference in therapeutic effects among various LLLTs on acupuncture points and on tender and myofascial trigger points (MTrPs). The reviewed therapeutic effects included pain, grip strength, range of motion (ROM), and weight tests, and were compared by meta-analysis. RESULTS: We selected ten articles, and in seven of them the irradiation was conducted on tender points or MTrPs in the experimental groups. In two other articles, the irradiation was conducted on acupuncture points, and the last one was conducted on both kinds of points. Only three articles provided sufficient data for meta-analysis. The results revealed that applying LLLT on tender points or MTrPs is an effective means to improve the effect size (ES) of pain release after treatment (pooled ES: 0.71, 95% CI: 0.82- approximately 0.60) and follow-up (pooled ES: 1.05, 95% CI: 1.16- approximately 0.94). LLLT application was also able to increase the grip force, ROM, and weight test ($p < 0.05$). CONCLUSIONS: We suggest that using LLLT on tender points or MTrPs of LE could effectively improve therapeutic effects. Acupuncture Points;Hand

Strength;Humans;Low-Level Light Therapy;Medicine, Chinese Traditional;Pain Measurement;Randomized Controlled Trials as Topic;Range of Motion, Articular;Tennis Elbow

Studies show combination laser therapy effective at clearing acne, reducing oil production. Acne Vulgaris;Humans;Low-Level Light Therapy;Photochemotherapy

Low-level laser therapy for implants without initial stability. OBJECTIVE: This study evaluated the effect of low-level infrared laser on removal torque values of implants with poor initial stability inserted in rabbit tibias. BACKGROUND DATA: It is important to analyze the effects of laser radiation on bone repair when low-quality bone and implants with poor initial stability are used. MATERIALS AND METHODS: Thirty male white New Zealand rabbits (Oryctolagus Cuniculus) about 2 mo old and weighing 1.5-2.0 kg were used. Machined implants with poor initial stability were inserted in the tibia of each animal. Animals were randomly divided into two groups: laser irradiated and laser nonirradiated. Each group was further divided into three subgroups, according to the day the animals were killed: 15, 30, or 45 d. Torque values were measured with an axial digital torquemeter that applied counter-torque. The Student's t-test was used to calculate means and standard deviations for the comparisons between laser and control groups. RESULTS: A significant increase ($p = 0.050$) in removal torque values was found in the group of laser-irradiated implants at 15 and 30 d when compared with the control groups. At 45 d, no significant differences were found. CONCLUSION: In this study, low-level laser therapy promoted the osseointegration of implants with poor initial stability, particularly in the initial stages of bone healing. Titanium Animals;Bone and Bones;Dental Etching;Dental Implantation, Endosseous;Device Removal;Low-Level Light Therapy;Male;Materials Testing;Osseointegration;Rabbits;Surface Properties;Tibia;Time Factors;Titanium;Torque

Effect of biostimulation on healing of bone defects in diabetic rats. BACKGROUND AND OBJECTIVE: The aim of this study was to investigate the effects of biostimulation on healing of bone defects in diabetic rats. STUDY DESIGN/MATERIAL AND METHODS: Twenty-eight Wistar rats weighting 250 to 300 g were used for this study. Diabetes was chemically induced with streptozotocin, and 14 nondiabetic and 14 diabetic rats were included in the study. The distal epiphysis of the right and left femurs of the diabetic rats were perforated with a surgical bone drill. This surgical procedure was performed on the left femurs of normal rats too. The wound on the right side of each diabetic rat received laser stimulation. The left femur of each nondiabetic (normal) rat served as a control. The rats were assigned to three experimental groups: (1) normal bur (control group); (2) diabetic bur; (3) diabetic bur + biostimulation. RESULTS: There was a significant difference among all groups in substantia spongiosa formation on day 10. According to the Mann-Whitney U test, there was a difference between Groups 1 and 2. A significant difference was noted between Groups 2 and 3 as well as between Groups 1 and 3 and between Groups 2 and 3 in union at 20 d of healing. CONCLUSIONS: Substantia spongiosa formation was slightly more evident in Groups 1 and 3 than in Group 2. Also, there was more union in Group 3 than in the other groups on day 20. As a result, it can be concluded that low-level laser therapy (808 nm laser at 10 J/cm(2)) can have a beneficial effect on spongiosa in diabetic bone repair when five treatments are administered with 2 d intervals between treatments. Animals;Bone Remodeling;Diabetes Mellitus, Experimental;Femoral Fractures;Lasers, Solid-State;Low-Level Light Therapy;Rats;Rats, Wistar;Wound Healing

The association of low and high laser treatments on self-inflicted lip injury: a case report. OBJECTIVE: Report a clinical case of surgical lip lesion removal owing to self-injury in a 9-year-old male quadriplegic, spastic cerebral palsy (CP) patient using low and high lasers in association. BACKGROUND: Various management methods for oral trauma have been suggested, depending on the severity, frequency, and cause of injury, including medication, behavioral techniques, and oral

appliances or dental extractions. METHODS: Initially, low-level laser therapy (LLLT) was used on the injured labial tissue measuring 2.2 cm externally and 3.4 cm in the internal mucosal, followed by surgical removal using a CO(2) laser. After 30 days, a significant reduction in injury to the oral tissues was observed, and the region presented normal color and good healing conditions. CONCLUSION: The association of different laser therapies to remove and heal a lip lesion owing to self-injurious behavior was effective and promoted improvement in the patient's quality of life by establishing painless mastication. Child;Humans;Lasers, Gas;Lip;Low-Level Light Therapy;Male;Wound Healing

Healing of surgical wounds made with lambda970-nm diode laser associated or not with laser phototherapy (lambda655 nm) or polarized light (lambda400-2000 nm). OBJECTIVE: The aim of this study was to analyze the effect of two phototherapies, laser and polarized light, on diode laser (970lambda nm) wounds. BACKGROUND DATA: Lasers have been used in surgery, and some wavelengths may cause thermal damage to the tissue and affect healing. Several studies have shown that some wavelengths are effective in improving healing. Coherent and noncoherent light have been successfully used on the modulation of biological phenomena of several origins. ANIMALS AND METHODS: Thirty-one Wistar rats were divided into 3 groups (GI to GIII). A 20-mm x 2-mm wound was created on the dorsum of each animal with a diode laser (Sirolaser, Sirona, Bensheim, Germany). Group GI acted as control. On GII, laser light (lambda655 nm, 30 mW, phi approximately 3 mm, 12 J/cm(2)) was used and on GIII illumination with polarized light (lambda400-2000 nm, 40 mW, phi approximately 5.5 cm, 12 J/cm(2)) was used, every other day (GII) or daily (GIII) for 7 days. The animals were killed at 0, 7, and 14 days after surgery. Specimens were taken, routinely processed, stained and imunnomarked [HE (hematoxylin-eosin), sirius red, alpha-smooth muscle actin (SMA)], and underwent histological analysis. RESULTS: GII showed better response at day 14 when re-epithelialization was in a more advanced stage. The number of myofibroblasts was significantly different over the healing time (7 to 14 days); this number was smaller than that observed on G1. On GIII at day 7, the number of myofibroblasts was significantly higher than for GII. At day 14, a more pronounced deposition of collagen matrix was also seen, and inflammation was discrete and more advanced for GIII. CONCLUSION: The results of the present study showed that the effect of the use of laser light was more evident at early stages of healing and that the use of polarized light improved the resolution of the inflammatory reaction, increased the deposition of collagen, increased the number of myofibroblasts, and quickened re-epithelialization during the experimental time. Animals;Dermatologic Surgical Procedures;Lasers, Semiconductor;Low-Level Light Therapy;Myofibroblasts;Rats;Rats, Wistar;Skin;Wound Healing

Treatment of faun-tail naevus with intense pulsed light. BACKGROUND: Faun tail is a rare cutaneous marker of spinal dysraphism. This neurological abnormality may lead to difficulties such as severe pain and burning sensations in treatment of hypertrichosis of faun tail with laser or laser-like devices. OBJECTIVE: We evaluated outcomes of an intense pulsed light source in two patients with faun tail. METHODS: The Lumina intense pulsed light system [650-nm handpiece (550-1100 nm)] was used for the treatment. Magnetic resonance imaging and neurological examination were done. RESULTS: Tethered cord syndrome was detected as a neurological abnormality. The patients were treated with an energy fluence of 18- 26 J/cm(2), pulse sequencing of 3 to 4, and a delay time of 20-35 ms. Local anesthesia was applied in one patient during treatment for severe pain sensation. A mean of 85% hair reduction was achieved. CONCLUSION: A good cosmetic result with intense pulsed light treatment was achieved in the patients with faun tail. Local anesthesia may be required before treatment of faun tail with laser or laser-like systems due to associated neurological abnormalities. Adolescent;Female;Hair Removal;Humans;Hypertrichosis;Low-Level Light Therapy;Neural Tube Defects;Nevus;Young Adult

Effects of low-level laser therapy and orthodontic tooth movement on dental pulps in rats. OBJECTIVES: To describe the microscopic pulpal reactions resulting from orthodontically induced tooth movement associated with low-level laser therapy (LLLT) in rats. MATERIALS AND METHODS: Forty-five young male Wistar rats were randomly assigned to three groups. In group I (n = 20), the maxillary right first molars were submitted to orthodontic movement with placement of a coil spring. In group II (n = 20), the teeth were submitted to orthodontic movement plus LLLT at 4 seconds per point (buccal, palatal, and mesial) with a GaAlAs diode laser source (830 nm, 100 mW, 18 J/cm(2)). Group III (n = 5) served as a control (no orthodontic movement or LLLT). Groups I and II were divided into four subgroups according to the time elapsed between the start of tooth movement and sacrifice (12 hours, 24 hours, 3 days, and 7 days). RESULTS: Up until the 3-day period, the specimens in group I presented a thicker odontoblastic layer, no cell-free zone of Weil, pulp core with differentiated mesenchymal and defense cells, and a high concentration of blood vessels. In group II, at the 12- and 24-hour time points, the odontoblastic layer was disorganized and the cell-free zone of Weil was absent, presenting undifferentiated cells, intensive vascularization with congested capillaries, and scarce defense cells in the cell-rich zone. In groups I and II, pulpal responses to the stimuli were more intense in the area underneath the region of application of the force or force/laser. CONCLUSIONS: The orthodontic-induced tooth movement and LLLT association showed reversible hyperemia as a tissue response to the stimulus. LLLT leads to a faster repair of the pulpal tissue due to orthodontic movement. Chromatin Animals;Capillaries;Cell Nucleus;Chromatin;Cytoplasm;Dental Pulp;Erythrocytes;Fibroblasts;Hyperemia;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mesoderm;Molar;Odontoblasts;Orthodontic Wires;Random Allocation;Rats;Rats, Wistar;Time Factors;Tooth Movement Techniques

Effects of 660-nm gallium-aluminum-arsenide low-energy laser on nerve regeneration after acellular nerve allograft in rats. PURPOSE: The purpose of this study was to explore and discuss the effects of 660-nm gallium-aluminum-arsenide low-energy laser (GaAlAs LEL) irradiation on neural regeneration after acellular nerve allograft repair of the sciatic nerve gap in rats. METHODS: Eight male and female Sprague-Dawley rats were used as nerve donors, and 32 healthy Wistar rats were randomly divided into four groups: normal control group, acellular rat sciatic nerve (ARSN) group, laser group, and autograft group. Twelve weeks after surgery, nerve conduction velocity, restoration rate of tibialis anterior wet muscle weight, myelinated nerve number, and calcitonin gene-related peptide (CGRP) protein and mRNA expression of the spinal cord and muscle at the injury site were quantified and statistically analyzed. RESULTS: Compared with the ARSN group, laser therapy significantly increased nerve conduction velocity, restoration rate of tibialis anterior wet muscle weight, myelinated nerve number, and CGRP protein and mRNA expression of the L(4) spinal cord at the injury site. CONCLUSIONS: These findings demonstrate that 660-nm GaAlAs LEL therapy upregulates CGRP protein and mRNA expression of the L(4) spinal cord at the injury site and increases the rate of regeneration and target reinnervation after acellular nerve allograft repair of the sciatic nerve gap in rats. Low-energy laser irradiation may be a useful, noninvasive adjunct for promoting nerve regeneration in surgically induced defects repaired with ARSN. RNA, Messenger;Calcitonin Gene-Related Peptide Animals;Calcitonin Gene-Related Peptide;Female;Lasers, Semiconductor;Lumbar Vertebrae;Male;Muscle, Skeletal;Myelin Sheath;Nerve Regeneration;Neural Conduction;Organ Size;RNA, Messenger;Random Allocation;Rats;Rats, Sprague-Dawley;Rats, Wistar;Sciatic Nerve;Sciatic Neuropathy;Spinal Cord;Transplantation, Homologous

Microlaryngoscopic and office-based injection of bevacizumab (Avastin) to enhance 532-nm pulsed KTP laser treatment of glottal papillomatosis. OBJECTIVES: Photoangiolytic lasers effectively treat glottal papillomatosis, but do not reliably prevent recurrence. Therefore, sublesional injections of the antiangiogenic agent bevacizumab (Avastin) were given to assess the effect on disease

recurrence and phonatory function. METHODS: A retrospective investigation was done in a pilot group of 10 adult patients with bilateral glottal papillomatosis who had prior angiolytic laser treatment with established patterns of recurrence. The patients underwent 5 bevacizumab injections (5 to 10 mg) into the diseased vocal folds along with 532-nm pulsed KTP laser photoangiolysis treatments 4 to 6 weeks apart. Their disease resolution was compared to findings from prior laser treatment alone, and objective measures of vocal function (acoustic, aerodynamic, Voice-Related Quality of Life survey) were obtained. RESULTS: All 10 patients had a greater than 90% reduction in recurrence. Four of the 10 had resolution. Four of the 10 have limited recurrent or persistent disease, receive injections of bevacizumab at 8- to 12-week intervals, and have not required laser treatment. Two of the 10 have ongoing periodic office-based KTP laser treatment along with bevacizumab injections. No patient has required microlaryngeal surgery with general anesthesia, and all 10 have had substantial improvement in vocal function. CONCLUSIONS: This pilot investigation provides preliminary evidence that bevacizumab injections enhance photoangiolytic laser treatment of glottal papillomatosis while enhancing phonatory function. Coupling an antiangiogenesis agent with pulsed KTP laser photoangiolysis is conceptually promising, since the mechanisms of action are complementary. Angiogenesis Inhibitors;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Vascular Endothelial Growth Factor A;Bevacizumab Adult;Ambulatory Care;Angiogenesis Inhibitors;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Bevacizumab;Equipment Design;Female;Follow-Up Studies;Glottis;Humans;Laryngeal Neoplasms;Laryngoscopes;Laryngoscopy;Lasers, Solid-State;Low-Level Light Therapy;Male;Miniaturization;Papilloma;Pilot Projects;Retrospective Studies;Treatment Outcome;Vascular Endothelial Growth Factor A;Voice Quality

Ultrasonographic evaluation of plantar fasciitis after low-level laser therapy: results of a double-blind, randomized, placebo-controlled trial. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on plantar fasciitis documented by the ultrasonographic appearance of the aponeurosis and by patients' pain scores. Thirty individuals with diagnosis of unilateral plantar fasciitis were enrolled in a randomized, double-blind, placebo-controlled trial, but 25 participants completed the therapeutic protocol. The contralateral asymptomatic fascia was used as control. After enrolment, symptomatic individuals were randomly assigned to receive LLLT, or identical placebo, for 6 weeks. Ultrasonography was performed at baseline and after completion of therapy. The subjective subcalcaneal pain was recorded at baseline and after treatment on a visual analogue scale (VAS). After LLLT, plantar fascia thickness in both groups showed significant change over the experimental period and there was a difference (before treatment and after treatment) in plantar fascia thickness between the two groups. However, plantar fascia thickness was insignificant (mean 3.627 +/- 0.977 mm) when compared with that in the placebo group (mean 4.380 +/- 1.0042 mm). Pain estimation on the visual analogue scale had improved significantly in all test situations (after night rest, daily activities) after LLLT when compared with that of the placebo group. (P=0.006 and P=0.01, respectively). Additionally, when the difference in pain scores was compared between the two groups, the change was statistically significant (after night rest P=0.000; daily activities P=0.001). In summary, while ultrasound imaging is able to depict the morphologic changes related to plantar fasciitis, 904 nm gallium-arsenide (GaAs) infrared laser may contribute to healing and pain reduction in plantar fasciitis. Adult;Aged;Double-Blind Method;Fasciitis, Plantar;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Ultrasonography;Young Adult

Molecular analysis of aggressive microdermabrasion in photoaged skin. OBJECTIVE: To investigate dermal remodeling effects of crystal-free microdermabrasion on photodamaged skin. DESIGN: Biochemical analyses of human skin biopsy specimens following microdermabrasion

treatment in vivo. SETTING: Academic referral center. PARTICIPANTS: Volunteer sample of 40 adults, aged 50 to 83 years, with clinically photodamaged forearms. Intervention Focal microdermabrasion treatment with diamond-studded handpieces of varying abrasiveness on photodamaged forearms and serial biopsies at baseline and various times after treatment. MAIN OUTCOME MEASURES: Quantitative polymerase chain reaction, immunohistochemistry, and enzyme-linked immunosorbent assay were used to quantify changes in inflammatory, proliferative, and remodeling effectors of normal wound healing. Type I and type III procollagen served as the main outcome marker of dermal remodeling. RESULTS: Coarse-grit microdermabrasion induces a wound healing response characterized by rapid increase in induction of cytokeratin 16 and activation of the AP-1 transcription factor in the epidermis. Early inflammation was demonstrated by induction of inflammatory cytokines, antimicrobial peptides, and neutrophil infiltration in the dermis. AP-1 activation was followed by matrix metalloproteinase-mediated degradation of extracellular matrix. Consistent with this wound-healing response, we observed significant remodeling of the dermal component of the skin, highlighted by induction of type I and type III procollagen and by induction of collagen production enhancers heat shock protein 47 and prolyl 4-hydroxylase. Dermal remodeling was not achieved when microdermabrasion was performed using a medium-grit handpiece. CONCLUSIONS: Microdermabrasion using a coarse diamond-studded handpiece induces a dermal remodeling cascade similar to that seen in incisional wound healing. Optimization of these molecular effects is likely the result of more aggressive treatment with a more abrasive handpiece. Collagen Type III;Cytokines;Keratin-16;RNA, Messenger;Matrix Metalloproteinases Academic Medical Centers;Aged;Aged, 80 and over;Biopsy, Needle;Cohort Studies;Collagen Type III;Cytokines;Female;Humans;Immunohistochemistry;Keratin-16;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Middle Aged;Molecular Biology;Probability;RNA, Messenger;Regeneration;Reverse Transcriptase Polymerase Chain Reaction;Skin;Skin Aging;Treatment Outcome

Fractional photothermolysis: a new therapeutic modality for xanthelasma. Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Risk Assessment;Severity of Illness Index;Treatment Outcome;Xanthomatosis

308-nm excimer laser for the treatment of alopecia areata in children. Alopecia areata (AA) is a common skin disease which is characterized by nonscarring localized or diffused hair loss. In this study we assessed the efficacy of 308-nm Excimer laser in the treatment of alopecia areata in children. A total of 9 children with 30 recalcitrant patches alopecia areata and two children with alopecia areata totalis were enrolled in this study which included seven male and four female patients, aged between 4 and 14 years and the durations of their disease were between 7 and 25 months. All of these patients had more than one lesion of alopecia areata and at least one of them was left as a control for comparison. The lesions were treated with the 308-nm Excimer laser twice a week for a period of 12 weeks. Regrowth of hair was observed in 18 (60%) alopecia patches in the scalp, while there was no response in the control patches and over the extremities. Only four patients with scalp lesions showed a recurrence of alopecia after 6 months post laser therapy. So, 308-nm Excimer laser is considered an effective safe therapeutic option for patchy alopecia areata in children. Adolescent;Alopecia Areata;Arm;Child;Child, Preschool;Female;Hair;Humans;Lasers, Excimer;Leg;Low-Level Light Therapy;Male;Scalp;Secondary Prevention;Treatment Outcome

Low-energy laser irradiation accelerates the velocity of tooth movement via stimulation of the alveolar bone remodeling. INTRODUCTION: Previously, the authors have reported the acceleration of tooth movement and osteoclastogenesis on the pressure site in an experimental tooth movement model by low-energy laser irradiation (LELI), which stimulated the RANK/RANKL system and c-fms/macrophage colony-stimulating factor system. However, the effect of LELI on

osteogenesis on the tension site is not known clearly. Moreover, the temporal changes in alveolar bone during tooth movement have not been investigated as yet. Therefore, the present study was designed to examine the effects of LELI on alveolar bone remodeling during experimental tooth movement, and observe the temporal bone mineral density (BMD) using micro-computed tomography (muCT). MATERIALS AND METHODS: To induce experimental tooth movement in rats, 10 g force was applied to the upper right first molar with Nickel titanium closed-coil. Next, a gallium-aluminum-arsenide (Ga-Al-As) diode laser was used to irradiate the area around the moved tooth, and BMD and the amount of tooth movement were measured by muCT scanning for 21 days. Histopathological examination was also performed. RESULTS: The amount of tooth movement in the LELI group was significantly greater than in the non-irradiation group by the end of the experimental period. Further, compared with the non-irradiation group, the fall of BMD was less in the LELI group. CONCLUSION: These findings suggest that LELI accelerates the velocity of tooth movement via stimulation of the alveolar bone remodeling. Alveolar Process;Animals;Bone Density;Bone Remodeling;Dental Stress Analysis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;Tooth Movement Techniques;X-Ray Microtomography

Histologic evaluation of the effects of Er:YAG laser on bone ablation. AIM: The aim of the present study was to compare the healing of bone defects created using an Er:YAG laser with those defects created using a surgical bone drill. METHODS AND MATERIALS: Fourteen Wistar rats were used for this study. Femurs were perforated with a surgical bone drill, coupled to a micromotor (bur group) to create a bone defect. Another defect was created using a 2940 nm wavelength Er:YAG laser on the same femur (Er:YAG Group). The Er:YAG laser was used with a energy density of 1.5 W in noncontact mode under a water coolant. Incisions were then sutured with polyglycolic acid sutures. Seven rats were sacrificed at day ten and the other seven at day 20 to compare the status of bone repair of each group at those post-surgical intervals. The femurs were fixed with 10% neutral buffered formalin and decalcified in 10% EDTA. The specimens were embedded in paraffin and sectioned at a 5 micron thickness and stained with hematoxylin and eosin (H&E) stain. The specimens were examined at a magnification of X100 and scored using a standardized histologic scoring system. RESULTS: Stages of bone healing including union, spongioza, cortex, and bone marrow development were evaluated and no significant difference between groups were found at days ten and 20 of healing. There was also no significant difference among the two groups in sum of histologic scores on day ten. CONCLUSION: Bone can be ablated effectively and precisely using a Er:YAG laser without the vibration associated with steel surgical burs, but it is a slower process than when burs are used. There was no significant difference between the two groups in terms of bone repair at ten and 20 day intervals of healing. CLINICAL SIGNIFICANCE: Within the limits of this study a 2940 nm Er:YAG laser at 1.5 W can be used with confidence in cases requiring effective bone ablation. Animals;Bone Regeneration;Femur;Low-Level Light Therapy;Orthopedic Procedures;Osteotomy;Rats;Wound Healing

Treatment for anogenital molluscum contagiosum. Antiviral Agents Anal Canal;Antiviral Agents;Debridement;Genitalia;Humans;Low-Level Light Therapy;Molluscum Contagiosum;Practice Guidelines as Topic

Influence of the use of laser phototherapy (lambda660 or 790 nm) on the survival of cutaneous flaps on diabetic rats. OBJECTIVE: The aim of this study was to assess and compare the effects of laser phototherapy (LPT) on cutaneous flaps on diabetic rats. BACKGROUND: Diabetes mellitus is characterized by high blood glucose levels. Its main complications are delayed wound healing, an impaired blood supply, and a decrease in collagen production. Cutaneous flaps are routinely used in several surgical procedures, and most failures are related to poor blood supply. LPT has been studied using several healing models. ANIMALS AND METHODS: Twelve Wistar rats were randomized into

three groups: group 1 (G1; diabetic animals without treatment), group 2 (G2; diabetic animals irradiated with lambda680 nm), and group 3 (G3; diabetic animals irradiated with lambda790 nm). Diabetes was induced with streptozotocin. A 2- x 8-cm cutaneous flap was raised on the dorsum of each animal, and a plastic sheet was introduced between the flap and the bed to cause poor blood supply. Nonirradiated animals acted as controls. The dose per session was 40 J/cm(2). Laser light was applied transcutaneously and fractioned on 16 contact points at the wound margins (16 x 2.5 J/cm(2)). Animal death occurred on day 8 after surgery. Specimens were taken, processed, cut, stained with eosin (HE) and sirius red, and underwent histological analysis. RESULTS: It is shown that accute inflammation was mostly discrete for G3. Chronic inflammation was more evident for G2. Fibroblast number was higher for G3. Angiogenesis was more evident for G3. Necrosis was more evident for G2. Statistical analysis among all groups showed significant differences (p = 0.04) on the level of acute inflammation between G1 and G3, tissue necrosis between G1 and G2 (p = 0.03), chronic inflammation between (p = 0.04), fibroblastic proliferation between G2 and G3 (p = 0.05), and neovascularization between G2 and G3 (p = 0.04). CONCLUSION: LPT was effective in increasing angiogenesis as seen on irradiated subjects and was more pronounced when IR laser light was used. Animals;Diabetes Mellitus, Experimental;Graft Survival;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Surgical Flaps

[Types of microcirculation and laser therapy in chronic pancreatitis]. The aim of the study was to evaluate effect of low-intensity laser therapy (LILT) on systemic circulation in patients with chronic pancreatitis (CP) in the phase of exacerbation. 65 patients aged 36-77 years were divided into study (n = 20) and control (n = 45) groups. In addition, 30 healthy subjects were examined. Patients of the study group received drug therapy combined with intravenous blood or skin laser irradiation. Controls were treated with medicinal preparations alone. CP was diagnosed based on characteristic pain syndrome, compromised secretory function of the pancreas, results of laboratory and instrumental analysis. Microcirculation was studied by laser Doppler flowmetry with a LAKK-02 apparatus (Lazma, Russia). CP patients had heterogeneous microcirculation with a significantly increased frequency of its pathologic types (spastic, hyperemic, spastic-congestive). Major characteristics of microcirculation were significantly different from those in healthy subjects. Combination of drug therapy and LILT substantially improved microcirculation regardless of its hemodynamic type. Adult;Aged;Female;Follow-Up Studies;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Pancreas;Pancreatitis, Chronic;Treatment Outcome

Biomodulative effects of visible and IR laser light on the healing of cutaneous wounds of nourished and undernourished Wistar rats. AIM: We evaluated histologically the differences in the healing of cutaneous wounds on nourished or undernourished rats following laser phototherapy (LPT) (20 or 40 J/cm2). BACKGROUND: Wound healing occurs due to a competitive mechanism between the synthesis and lysis of collagen. Any factor that increases the lysis or reduces the synthesis of collagen may change the healing process. Nutritional deficiencies have a great effect on wound healing. METHODS: Fifty nourished or undernourished Wistar rats had one standardized wound created on the dorsum and were divided into 10 subgroups: Control (standard diet); Control [Northeastern Brazilian basic diet (DBR)]; Standard diet+LPT (lambda635 nm; spatial average energy fluence (SAEF) 20 J/cm2); Standard diet+LPT (lambda635 nm; SAEF 40 J/cm2); Standard diet+LPT (lambda780 nm; SAEF 20 J/cm2); Standard diet+LPT (lambda780 nm; SAEF 40 J/cm2); DBR+LPT (lambda635 nm; SAEF 20 J/cm2); DBR+LPT (lambda635 nm; SAEF 40 J/cm2); DBR+LPT (lambda780 nm; SAEF 20 J/cm2); DBR+LPT (lambda780 nm; SAEF 40 J/cm2). The first application of the treatment was carried out immediately and repeated daily for seven days. The specimens were routinely processed to wax, cut, stained with H&E and Sirius Red stains, and analyzed using light microscopy. The analyses included re-

epithelization, inflammatory infiltrate, and fibroblastic proliferation. Sirius Red stained slides were used to perform descriptive analyses of the collagen fibers. RESULTS: The results showed that LPT with lambda635 wavelength was more effective for the treatment of undernourished subjects, treated with either LPT with lambda730 nm with SAEF of 20 J/cm2 or lambda780 nm with SAEF of 40 J/cm2. CONCLUSION: Nutritional status influenced the progression of the healing process as well as the quality of the healed tissue. In addition, the use of both wavelengths resulted in a positive biomodulatory effect on both nourished and undernourished subjects. Animals;Laser Therapy;Malnutrition;Nutritional Status;Photomicrography;Phototherapy;Rats;Rats, Wistar;Skin;Staining and Labeling;Wound Healing

Evaluation of low-level laser therapy with a He-Ne laser on the healing of an osteochondral defect using a biomechanical test. OBJECTIVE: The aim of the present study was to examine the influence of low-level laser therapy (LLLT) on the healing of an osteochondral defect in rabbits. BACKGROUND DATA: Full-thickness defects of articular cartilage in the knee have a negligible capacity to heal spontaneously. Biostimulatory effects of LLLT on chondrocytes and articular cartilage were reported. MATERIALS AND METHODS: An osteochondral defect with a 5-mm diameter was surgically induced in the right femoral patellar groove of forty-two adult male rabbits. They were divided into control and experimental groups. The experimental group received He-Ne laser treatment (632.8 nm, 10 mW, circular laser beam, with a surface area of 0.0314 cm(2)) of 148.4 J/cm(2) three times a week. The control group received placebo LLLT with the equipment switched off. Each group was divided into four subgroups: A, B, C, and D. The subgroups were sacrificed at 2, 4, 8, and 16 wk after surgery, respectively. The femur was removed and the defect was examined biomechanically by the in-situ indentation method. The instantaneous stiffness, maximum force, equilibrium load, and energy absorption were calculated. RESULTS: The results of the experimental group were higher than those of the control group. Only one significant difference was observed between the control and experimental groups: the second part of the energy absorption of the experimental group (56.11 +/- 11.5) was significantly higher than that of the control group (18.9 +/- 4) ($p = 0.015$) 4 wk after surgery. CONCLUSION: LLLT with a He-Ne laser of an osteochondral defect in rabbits could not significantly accelerate the healing of the osteochondral defect from a biomechanical standpoint when compared with a control group. Animals;Biomechanical Phenomena;Cartilage, Articular;Femur;Lasers, Gas;Low-Level Light Therapy;Male;Rabbits;Wound Healing

High-intensity laser and photodynamic therapy as a treatment for recurrent herpes labialis. OBJECTIVE: The aim of this study was to report the treatment of recurrent herpes labialis (RHL) using a high-intensity laser or methylene blue (MB)-mediated photodynamic therapy (PDT) in combination with low-level laser therapy (LLLT). MATERIALS AND METHODS: Four clinical cases of patients diagnosed with RHL are described in this report. Two patients were subjected to high-intensity laser therapy (HILT) followed by LLLT, and two patients received MB-mediated PDT, again followed by LLLT. LLLT was conducted at 24, 48, 72 h, and 7 d after HILT or PDT. Patients were followed up after 6 mo. RESULTS: Throughout the follow-up period, all patients reported pain relief and did not show any signs or symptoms of RHL. A favorable healing process was observed in all cases. None of the patients reported pain as a consequence of the treatment. CONCLUSION: These results suggest that HILT and MB-mediated PDT, in combination with LLLT, may constitute a benefit when treating vesicles in RHL. Adolescent;Combined Modality Therapy;Female;Herpes Labialis;Humans;Laser Therapy;Low-Level Light Therapy;Male;Photochemotherapy;Recurrence;Wound Healing;Young Adult

Effects of low-level laser therapy on pain and scar formation after inguinal herniation surgery: a randomized controlled single-blind study. OBJECTIVE: The aim of this study was to investigate the efficacy of an infrared GaAlAs laser operating with a wavelength of 830 nm in the postsurgical scarring process after inguinal-hernia surgery. BACKGROUND: Low-level laser therapy (LLLT) has been

shown to be beneficial in the tissue-repair process, as previously demonstrated in tissue culture and animal experiments. However, there is lack of studies on the effects of LLLT on postsurgical scarring of incisions in humans using an infrared 830-nm GaAlAs laser. METHOD: Twenty-eight patients who underwent surgery for inguinal hernias were randomly divided into an experimental group (G1) and a control group (G2). G1 received LLLT, with the first application performed 24 h after surgery and then on days 3, 5, and 7. The incisions were irradiated with an 830-nm diode laser operating with a continuous power output of 40 mW, a spot-size aperture of 0.08 cm(2) for 26 s, energy per point of 1.04 J, and an energy density of 13 J/cm(2). Ten points per scar were irradiated. Six months after surgery, both groups were reevaluated using the Vancouver Scar Scale (VSS), the Visual Analog Scale, and measurement of the scar thickness. RESULTS: G1 showed significantly better results in the VSS totals (2.14 +/- 1.51) compared with G2 (4.85 +/- 1.87); in the thickness measurements (0.11 cm) compared with G2 (0.19 cm); and in the malleability (0.14) compared with G2 (1.07). The pain score was also around 50% higher in G2. CONCLUSION: Infra-red LLLT (830 nm) applied after inguinal-hernia surgery was effective in preventing the formation of keloids. In addition, LLLT resulted in better scar appearance and quality 6 mo postsurgery. Adult;Cicatrix;Hernia, Inguinal;Humans;Keloid;Low-Level Light Therapy;Middle Aged;Pain Measurement;Pain, Postoperative;Postoperative Complications;Single-Blind Method;Wound Healing

Melasma treatment in Korean women using a 1064-nm Q-switched Nd:YAG laser with low pulse energy. The efficacy of a 1064-nm Q-switched neodymium:yttrium-aluminium-garnet (QS Nd:YAG) laser with low pulse energy in the treatment of melasma in 25 women was assessed by retrospective analysis of clinical photographs and patient satisfaction rates. Follow-up results 2 months after the last treatment revealed that, as defined by our grading scale, 11 of the 25 patients (44%) had marked clinical improvement: 7 of these (28%) had near-total clinical improvement, 5 had moderate clinical improvement and 2 had minimal to no improvement. Our data suggest that the use of a QS Nd:YAG laser with low pulse energy is an effective, easily performed treatment for melasma in selected East Asian patients. Adult;Female;Humans;Korea;Lasers;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction

Analysis of low-level laser radiation transmission in occlusive dressings. OBJECTIVE: The purpose of this study is to analyze the power transmitted by low-level laser therapy (LLLT) into occlusive dressings using different wavelengths for the treatment of cutaneous lesions. BACKGROUND DATA: LLLT has been largely used to treat several cutaneous lesions commonly associated with occlusive dressings to accelerate the healing process. MATERIALS AND METHODS: Radiation transmission was measured by a digital power analyzer connected to a laser emitter with wavelengths of 660, 830, and 904 nm and mean levels of 30, 30, 6.5 mW, respectively, previously calculated. Thirteen different occlusive dressings were analyzed and interposed between the laser emitter and the power analyzer sensor, with 15 measurements made for each dressing. Statistics were provided by the analysis of variance (ANOVA), followed by Student's t-test ($p < 0.05$). RESULTS: The power transmitted ranged between 98.6% and 0%, depending on the material and wavelength. The dressings tested were BioFill, Hydrofilm, Confeel Plus 3533, Confeel 3218, DuoDERM Extra Thin, Hydrocoll, Micropore Nexcare, CIEX tape, Emplasto SÃ¡bia, CombiDERM, Band-aid, Actisorb Plus, in addition to polyvinylchloride (PVC) film, and transmitted power higher than 40% of the incident power, independently from the wavelength indicated for the association with LLLT. CONCLUSION: The results showed that LLLT transmission depends on the occlusive dressing material and the wavelength irradiated. Humans;Low-Level Light Therapy;Occlusive Dressings;Radiation Dosage;Wound Healing

Comparison of clinical outcomes of oral erythroleukoplakia treated with photodynamic therapy using either light-emitting diode or laser light. BACKGROUND AND OBJECTIVES: Topical 5-

aminolevulinic acid-mediated photodynamic therapy (topical ALA-PDT) using a 635-nm light-emitting diode (LED) light is an effective treatment modality for oral verrucous hyperplasia. This study tested whether topical ALA-PDT using either the LED or laser light was also an effective treatment modality for oral erythroleukoplakia (OEL) lesions. STUDY DESIGN/MATERIALS AND METHODS: In this prospective but non-randomized study, 20 OEL lesions were treated with topical ALA-PDT using the 635-nm LED light and 26 OEL lesions were treated with topical ALA-PDT using the 635-nm laser light. The difference in clinical outcomes was compared between the two groups by Fisher exact test. RESULTS: We found that the 20 LED light-treated OEL lesions showed complete response (CR) in 17 and partial response (PR) in 3. The 17 CR OEL lesions required an average of 3.7 (range, 2-7) treatments of ALA-PDT to achieve CR of the lesions. The 26 laser light-treated OEL lesions showed CR in 25 and PR in 1. The 25 CR OEL lesions needed an average of 3.3 (range, 2-6) treatments of ALA-PDT to achieve CR of the lesions. There was no significant difference in PDT outcomes between the 20 LED light-treated and 26 laser light-treated OEL lesions (P = 0.303). When the 42 CR OEL lesions were pooled together, we found that smaller lesions (greatest diameter <1.5 cm) and lesions with thinner surface keratin (keratin layer < or =30 microm) needed significantly fewer mean treatment number of PDT to achieve a CR than the larger lesions (P = 0.000) and lesions with thicker surface keratin (P = 0.000), respectively. CONCLUSIONS: Topical ALA-PDT using either the LED or laser light is an effective treatment modality for OEL lesions. There is no significant difference in clinical outcomes of OEL lesions treated with PDT using either the LED or laser light. Photosensitizing Agents;Aminolevulinic Acid Adult;Aged;Aged, 80 and over;Aminolevulinic Acid;Erythroplasia;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Leukoplakia, Oral;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Treatment Outcome

Effect of 830 nm laser phototherapy on osteoblasts grown in vitro on Biosilicate scaffolds. OBJECTIVE: The purpose of this study was (i) to develop a method for successfully seeding osteoblasts onto a glass-ceramic scaffold designed for use in clinical settings, and (ii) to determine whether the application of laser phototherapy at 830 nm would result in osteoblast proliferation on the glass-ceramic scaffold. BACKGROUND: The use of bioscaffolds is considered a promising strategy for a number of clinical applications where tissue healing is sub-optimal. As in vitro osteoblast growth is a slow process, laser phototherapy could be used to stimulate osteoblast proliferation on bioscaffolds. METHODS: A methodology was developed to seed an osteoblastic (MC3T3) cell line onto a novel glass-ceramic scaffold. Seeded scaffolds were irradiated with a single exposure of 830 nm laser at 10 J/cm(2) (at diode). Non-irradiated seeded scaffolds acted as negative controls. Cell proliferation was assessed seven days after irradiation. RESULTS: Osteoblastic MC3T3 cells were successfully grown on discs composed of a glass-ceramic composite. Laser irradiation produced a 13% decrease in MC3T3 cell proliferation on glass-ceramic discs (mean +/- SD = 0.192 +/- 0.002) compared with control (non-irradiated) discs (mean +/-SD = 0.22 +/- 0.002). CONCLUSIONS: Despite successful seeding of bioscaffolds with osteoblasts, laser phototherapy resulted in a reduction in cell growth compared to non-irradiated controls. Future research combining laser phototherapy and glass-ceramic scaffolds should take into account possible interactions of the laser with matrix compounds. Biocompatible Materials;Bioglass Animals;Biocompatible Materials;Cell Differentiation;Cell Line;Cell Proliferation;Ceramics;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Microscopy, Electron, Scanning;Osteoblasts;Osteogenesis;Tissue Scaffolds

Laser phototherapy as topical prophylaxis against radiation-induced xerostomia. The common consequences of radiotherapy (RT) to the head and neck are oral mucositis, xerostomia, and severe pain. The aim of this study was to verify how laser phototherapy (LPT) used for oral mucositis could influence xerostomia symptoms and hyposalivation of patients undergoing RT. Patients were divided

into two groups: 12 individuals receiving three laser irradiations per week (G1) and 10 patients receiving one laser irradiation per week (G2). A diode laser (660 nm, 6 J/cm(2), 0.24 J, 40 mW) was used until completely healing of the lesions or the end of the RT. At the first and last laser sessions, whole resting and stimulated saliva were collected, and questionnaires were administered. According to Wilcoxon and Student statistical test, xerostomia for G1 was lower than for G2 ($p < 0.05$), and salivary flow rate was no different before and after RT, except for stimulated collection of G2, which was lower ($p < 0.05$). Our results suggest that LPT can be beneficial as an auxiliary therapy for hypofunction of salivary glands. Adolescent;Adult;Aged;Carcinoma, Squamous Cell;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pharyngeal Neoplasms;Prospective Studies;Radiotherapy;Radiotherapy Dosage;Salivation;Tongue Neoplasms;Xerostomia;Young Adult

The effect of laser irradiation on proliferation of human breast carcinoma, melanoma, and immortalized mammary epithelial cells. OBJECTIVE: This study compared the effects of different doses (J/cm(2)) of laser phototherapy at wavelengths of either 780, 830, or 904 nm on human breast carcinoma, melanoma, and immortalized human mammary epithelial cell lines in vitro. In addition, we examined whether laser irradiation would malignantly transform the murine fibroblast NIH3T3 cell line. BACKGROUND: Laser phototherapy is used in the clinical treatment of breast cancer-related lymphoedema, despite limited safety information. This study contributes to systematically developing guidelines for the safe use of laser in breast cancer-related lymphoedema. METHODS: Human breast adenocarcinoma (MCF-7), human breast ductal carcinoma with melanomic genotypic traits (MDA-MB-435S), and immortalized human mammary epithelial (SVCT and Bre80hTERT) cell lines were irradiated with a single exposure of laser. MCF-7 cells were further irradiated with two and three exposures of each laser wavelength. Cell proliferation was assessed 24 h after irradiation. RESULTS: Although certain doses of laser increased MCF-7 cell proliferation, multiple exposures had either no effect or showed negative dose response relationships. No sign of malignant transformation of cells by laser phototherapy was detected under the conditions applied here. CONCLUSION: Before a definitive conclusion can be made regarding the safety of laser for breast cancer-related lymphoedema, further in vivo research is required. Adenocarcinoma;Analysis of Variance;Breast Neoplasms;Carcinoma, Ductal, Breast;Cell Line;Cell Line, Tumor;Cell Proliferation;Cell Transformation, Neoplastic;Dose-Response Relationship, Radiation;Epithelial Cells;Humans;Lasers, Semiconductor;Linear Models;Low-Level Light Therapy;Melanoma;Transfection

KTP/532 YAG laser treatment for allergic rhinitis. BACKGROUND: The purpose of this study was to investigate the efficacy of the KTP/532 YAG laser to reduce nasal congestion and discharge in patients with allergic rhinitis. METHODS: Forty-eight patients with symptoms of allergic rhinitis were treated with the KTP/532 laser. All had positive skin tests for common allergens. Treatments were provided on an ambulatory basis in one to three sessions under local anesthesia with lidocaine nose spray. Outcome was determined by daily symptom reports and regular endoscopy examination and interviews for 12 months. RESULTS: Treatment was very well tolerated. There were no major side effects. At examination after 1 year, nasal obstruction was improved in 69% and nasal discharge in 40% of cases. CONCLUSION: The KTP/532 YAG laser is effective for the treatment of nasal obstruction and discharge. Comparison with other techniques showed it to be the most effective in reducing nasal discharge. It can be done as an office procedure and does not damage the nasal mucous membrane. The KTP/532 YAG laser is effective as an additional treatment for patients refractory to medication. Adolescent;Adult;Aged;Blood Circulation;Blood Vessels;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nasal Mucosa;Nasal Obstruction;Rhinitis, Allergic, Perennial;Treatment Outcome

The effects of 660 nm and 780 nm laser irradiation on viability of random skin flap in rats. BACKGROUND AND OBJECTIVE: Some studies have shown that laser phototherapy is able to increase skin flap viability by decreasing the necrotic area and increasing neoangiogenesis. However, the mechanism by which laser acts on cells is not fully understood. The present study investigated the effects of two different laser wavelengths at 30 and 40 J/cm(2) on the viability of skin flap in rats. MATERIAL AND METHODS: Sixty male animals were used in this study. They were distributed into the following groups (n = 12 each group): control group, group irradiated with 660 nm at 30 J/cm(2); group irradiated with 780 nm, at 30 J/cm(2), group irradiated with 660 nm at 40 J/cm(2); and group irradiated with 780 nm at 40 J/cm(2). The skin flap was performed on the back of all animals studied, with a plastic sheet interposed between the flap and the donor site. Laser irradiation was done immediately after the surgery and on days 1, 2, 3, and 4 post-surgery. The percentage of the necrotic area of the flap was calculated at day 7 post-surgery. RESULTS: Control group showed a necrotic area of 62.83%. Interestingly, no statistically significant differences were found among the treated groups and the control group. CONCLUSION: This present study showed that 660 nm and 780 nm lasers at doses of 30 and 40 J/cm(2) were not effective for decreasing the necrotic area of the skin flaps in rats. Animals;Disease Models, Animal;Graft Survival;Low-Level Light Therapy;Male;Necrosis;Rats;Rats, Wistar;Skin;Surgical Flaps;Tissue Survival;Wound Healing

Novel wavelengths for laser nerve stimulation. BACKGROUND: Laser light is known to stimulate nerves. This study investigated alternative wavelengths for nerve stimulation. MATERIALS AND METHODS: The sciatic nerves of rats were irradiated with four different lasers-a Ho:YAG (2100 nm), a Yb:glass fiber laser (1495 nm) and diode lasers (1450 nm and 1540 nm). RESULTS: All lasers evoked a visible leg twitch response, and electromyography confirmed muscle activation. The Yb:glass laser at 1495 nm delivered through a single mode fiber was found to be the most effective stimulus. The stimulation threshold for a 2 millisecond pulse from the Yb:glass laser was determined to be 3.7+/-2.8 mJ/cm(2). CONCLUSIONS: The Yb:glass laser has the potential for use in neurostimulation, as an alternative to electrical stimulation. Animals;Electric Stimulation Therapy;Electromyography;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Neural Conduction;Rats;Rats, Sprague-Dawley;Sciatic Nerve

The influence of erbium:yttrium-aluminum-garnet laser ablation with variable pulse width on morphology and microleakage of composite restorations. The objective of this study was to evaluate the influence of various pulse widths with different energy parameters of erbium:yttrium-aluminum-garnet (Er:YAG) laser (2.94 mum) on the morphology and microleakage of cavities restored with composite resin. Identically sized class V cavities were prepared on the buccal surfaces of 54 bovine teeth by high-speed drill (n = 6, control, group 1) and prepared by Er:YAG laser (Fidelis 320A, Fotona, Slovenia) with irradiation parameters of 350 mJ/ 4 Hz or 400 mJ/2 Hz and pulse width: group 2, very short pulse (VSP); group 3, short pulse (SP); group 4, long pulse (LP); group 5, very long pulse (VLP). All cavities were filled with composite resin (Z-250-3 M), stored at 37 degrees C in distilled water, polished after 24 h, and thermally stressed (700 cycles/5-55 degrees C). The teeth were impermeabilized, immersed in 50% silver nitrate solution for 8 h, sectioned longitudinally, and exposed to Photoflood light for 10 min to reveal the stain. The leakage was evaluated under stereomicroscope by three different examiners, in a double-blind fashion, and scored (0-3). The results were analyzed by Kruskal-Wallis test ($P > 0.05$) and showed that there was no significant differences between the groups tested. Under scanning electron microscopy (SEM) the morphology of the cavities prepared by laser showed irregular enamel margins and dentin internal walls, and a more conservative pattern than that of conventional cavities. The different power settings and pulse widths of Er:YAG laser in cavity preparation had no influence on microleakage of composite resin restorations. Composite Resins Animals;Cattle;Composite Resins;Dental Cavity

Preparation;Dental Enamel;Dental Leakage;Dental Restoration, Permanent;Dentin;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning
Effect of phototherapy with low intensity laser on local and systemic immunomodulation following focal brain damage in rat. Brain injury is responsible for significant morbidity and mortality in trauma patients, but controversy still exists over therapeutic management for these patients. The objective of this study was to analyze the effect of phototherapy with low intensity lasers on local and systemic immunomodulation following cryogenic brain injury. Laser phototherapy was applied (or not-controls) immediately after cryogenic brain injury performed in 51 adult male Wistar rats. The animals were irradiated twice (3 h interval), with continuous diode laser (gallium-aluminum-arsenide (GaAlAs), 780 nm, or indium-gallium-aluminum-phosphide (InGaAlP), 660 nm) in two points and contact mode, 40 mW, spot size 0.042 cm(2), 3 J/cm(2) and 5 J/cm(2) (3 s and 5 s, respectively). The experimental groups were: Control (non-irradiated), RL3 (visible red laser/ 3 J/cm(2)), RL5 (visible red laser/5 J/cm(2)), IRL3 (infrared laser/3 J/cm(2)), IRL5 (infrared laser/5 J/cm(2)). The production of interleukin-1IL-1beta (IL-1beta), interleukin6 (IL-6), interleukin-10 (IL-10), and tumor necrosis factor-alpha (TNF-alpha) was analyzed by enzyme immunoassay technique (ELISA) test in brain and blood samples. The IL-1beta concentration in brain of the control group was significantly reduced in 24 h ($p<0.01$). This reduction was also observed in the RL5 and IRL3 groups. The TNF-alpha and IL-6 concentrations increased significantly ($p<0.01$ and $p<0.05$, respectively) in the blood of all groups, except by the IRL3 group. The IL-6 levels in RL3 group were significantly smaller than in control group in both experimental times. IL-10 concentration was maintained stable in all groups in brain and blood. Under the conditions of this study, it is possible to conclude that the laser phototherapy can affect TNF-alpha, IL-1beta and IL-6 levels in the brain and in circulation in the first 24 h following cryogenic brain injury. Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Interleukin-10 Animals;Brain Injuries;Interleukin-10;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Phototherapy;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha
Dermatosis papulosa nigra treatment with fractional photothermolysis. Facial Dermatoses;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Middle Aged;Radiotherapy Dosage
Effects of 780-nm low-level laser therapy with a pulsed gallium aluminum arsenide laser on the healing of a surgically induced open skin wound of rat. OBJECTIVE: The aim of the present investigation is to evaluate the effects of a 780-nm low-level laser on open skin wound healing. BACKGROUND DATA: Optimal parameters of low-level laser therapy (LLLT) for wound healing are discussed. METHODS: One full-thickness skin wound was surgically induced in the dorsum skin of 30 rats. The rats were divided into two groups. Rats in the experimental group were daily treated with a gallium aluminum arsenide (GaAlAs) laser (2 J/cm(2), lambda = 780 nm, pulse frequency of 2336 Hz). Rats in the sham-exposed group received LLLT with switched off equipment. After 4, 7, and 15 days, wounds were checked by histological and biomechanical methods. Data were analyzed by the Mann-Whitney U-test. RESULTS: Fibroblasts, endothelium of blood vessels, blood vessel sections, and maximum stress were significantly increased, whereas macrophages were significantly decreased, compared with those of the sham-exposed group. CONCLUSION: Pulsed LLLT with a 780-nm GaAlAs laser significantly accelerates the process of healing of surgically induced, full-thickness skin wounds in rat. Animals;Dermatologic Surgical Procedures;Fibroblasts;Lasers, Semiconductor;Low-Level Light Therapy;Macrophages;Rats;Skin;Wound Healing
Salivary levels of TNF-alpha and IL-6 in patients with denture stomatitis before and after laser phototherapy. OBJECTIVE: The aim of this study was to monitor therapeutic response by determining the level of proinflammatory cytokines TNF-alpha and IL-6 in whole unstimulated saliva in patients with denture stomatitis (DS), before and after laser phototherapy (LPT). BACKGROUND: DS

is an inflammatory condition that occurs in subjects who wear dentures, and it is a common oral mucosal lesion. A potential noninvasive treatment for DS patients is LPT. MATERIALS AND METHODS: A sample consisting of 40 consecutive subjects was selected on a voluntary basis from patients who presented for the diagnosis and treatment of DS at the Oral Medicine Unit of the Medical Faculty at the University of Rijeka. A clinical examination was performed according to the standard clinical criteria. Lesions described as palatal inflammation were diagnosed as Newton type II denture stomatitis. The patients were randomly assigned to either an experimental group (20 patients receiving real LPT) or a control group (20 patients receiving inactive/placebo laser treatment). In order to determine the salivary levels of TNF-alpha and IL-6, ELISA (Sigma Immunochemicals, St Louis, MO) was performed. RESULTS: Following treatment with LPT for 4 wk, the levels of TNF-alpha and IL-6 decreased significantly ($p < 0.001$) and were significantly different from controls ($p < 0.001$). CONCLUSION: The results of this study suggest that LPT may be an efficacious choice of therapy. Interleukin-6;Tumor Necrosis Factor-alpha Female;Humans;Interleukin-6;Low-Level Light Therapy;Male;Middle Aged;Saliva;Stomatitis, Denture;Tumor Necrosis Factor-alpha

Effect of low-level laser irradiation on bisphosphonate-induced osteonecrosis of the jaws: preliminary results of a prospective study. OBJECTIVE: The aim of this study was to detail the clinical efficacy of low-level laser therapy (LLLT) for the management of bisphosphonate-induced osteonecrosis of the jaws (ONJ-BP). BACKGROUND: ONJ-BP is the correct term, recently emerged, to describe a significant complication in a subset of patients receiving drugs such as zoledronic acid, pamidronate, and alendronate. No definitive standard of care has been set for ONJ-BP and no definitively agreed guidelines have been provided. There is currently no consensus on the correct approach to the issue. MATERIALS AND METHODS: The investigators studied a prospective cohort of 20 patients affected by ONJ-BP, who received biostimulation with a pulsed diode laser (GaAs). Patients were exposed to a 904-nm infrared laser (50 kHz, 28.4 J/cm(2) energy density, 40% duty cycle, spot size 0.8 cm). Outcome variables were the size of lesions, edema, visual analogue score of pain, presence of pus, fistulas, and halitosis. Preoperative results were compared with the postoperative outcome and statistically evaluated. RESULTS: Four weeks after LLLT, a statistically significant difference was observed for reported pain ($p = 0.0001$), clinical size ($p = 0.0034$), edema ($p = 0.0005$), and presence of pus and fistulas ($p = 0.0078$ and $p = 0.03$, respectively). CONCLUSION: This study suggests that LLLT would appear to be a promising modality of treatment for patients with ONJ-BP, providing that clinical efficacy is safe and well tolerated, especially by those patients who require conservative treatment. Of course, this needs to be addressed further in larger and randomly controlled studies in different clinical settings. Diphosphonates Aged;Diphosphonates;Female;Humans;Jaw Diseases;Low-Level Light Therapy;Male;Middle Aged;Osteonecrosis;Prospective Studies;Treatment Outcome

Visible light induces nitric oxide (NO) formation in sperm and endothelial cells. BACKGROUND: Visible light-based stimulation using low-intensity lasers, LEDs, and broadband visible light devices has been recently introduced for therapy of human tissues in the absence of exogenous photosensitizers. Nitric oxide (NO) formation might be a potential mechanism for photobiomodulation because it is synthesized in cells by nitric oxide synthase (NOS), which contains both flavin and heme groups that absorb visible light. NO synthesis may also result from increased reactive oxygen species (ROS), which are found in various cell cultures following visible light illumination. NO is mainly known for inducing blood vessel dilation by endothelial cells, and in sperm cells NO is considered as an important agent in acrosome reaction and capacitation process, which are essential for successful fertilization. PURPOSE: To study NO formation in endothelial and sperm cells following visible light irradiation. MATERIALS AND METHODS: Sperm and endothelial cells were illuminated with broadband visible light, 400-800 nm, 130 mW/cm(2), for 5 minutes. During

illumination, the endothelial cells were incubated in PBS free of Ca(+2) and Mg(+2), and the sperm cells were incubated in NKM buffer, to induce "stress conditions." NO production was quantified by using the Griess reagent which reacts with nitrite in the medium to yield an Azo compound which has an absorption band at 540 nm. RESULTS: Visible light illumination increased NO concentration both in sperm and endothelial cells. Blue light was more effective than red. Light-induced NO occurred only when endothelial cells were incubated in PBS free of Ca(+2) and Mg(+2), and in sperm cells, only when incubated in NKM. CONCLUSION: Light induces NO formation in endothelial and sperm cells. In endothelial cells, NO formation may explain previous results demonstrating enhanced wound healing and pain relief following illumination. In illuminated sperm cells, NO formation may account for the enhanced fertilization rate. Nitric Oxide Animals;Cattle;Endothelial Cells;Endothelium, Vascular;Light;Male;Nitric Oxide;Spermatozoa

Fractional photothermolysis--an update. The novel concept of non-ablative fractional photothermolysis was introduced to the market in 2003 as an answer to the need for effective, yet low risk, resurfacing techniques. Unlike conventional ablative and non-ablative lasers, fractional ablative and non-ablative photothermolysis treats only a fraction of the skin, leaving up to a maximum of 95% of the skin uninvolved. The undamaged surrounding tissue allows for a reservoir of viable tissue, permitting rapid epidermal repair. Non-ablative fractional photothermolysis is currently approved by the US Food and Drug Administration (FDA) for the treatment of pigmented lesions, periorbital rhytides, skin resurfacing, melasma and soft tissue coagulation, acne and surgical scars, and actinic keratoses. However, its off-label use is clearly more extended. In 2007 the concept was further developed, and ablative fractional photothermolysis was introduced, using an erbium yttrium aluminium garnet (Er: YAG) or carbon dioxide laser. These devices are FDA cleared to treat wrinkles, rhytides, furrows, fine lines, textural irregularities, pigmented lesions and vascular dyschromia. In this review we discuss the two concepts, their technical details and clinical indications, and we describe the current literature available. Humans;Low-Level Light Therapy;Phototherapy;Skin Diseases

Use of therapeutic laser for prevention and treatment of oral mucositis. Oral mucositis (OM) affects patients who are submitted to hematopoietic stem cell transplantation (HSCT) due to high doses of chemotherapy and/or radiotherapy. The purpose of this investigation was to perform a comparative study of the frequency and evolution of OM among patients subjected to therapeutic laser and to the conventional therapy (use of mouthwash called 'Mucositis Formula'). The patients were subjected to a myeloablative conditioning regimen before the allogeneic HSCT. Twenty-two patients were selected and divided into 2 groups: group I was irradiated with InGaAlP laser (660 nm) and GaAlAs laser (780 nm), 25 mW potency, 6.3J/cm(2) dose, in 10-s irradiation time, followed to conventional treatment; group II was subjected only to the conventional treatment. Both World Health Organization (WHO) scale and the Oral Mucositis Assessment Scale (OMAS) were used to evaluate the results. Data were analyzed by the non-parametric Wilcoxon test, with $p<0.05$ considered as statistically significant. Group I presented a lower frequency of OM ($p=0.02$) and lower mean scores, according to WHO and OMAS scales ($p<0.01$ and $p=0.01$, respectively). In conclusion, laser reduced the frequency and severity of OM, suggesting that therapeutic laser can be used both as a new form of prevention and treatment of OM. Mouthwashes Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Leukemia;Low-Level Light Therapy;Male;Middle Aged;Mouthwashes;Severity of Illness Index;Statistics, Nonparametric;Stomatitis;Transplantation Conditioning;Treatment Outcome

Anti-inflammatory effect of low-level laser and light-emitting diode in zymosan-induced arthritis. OBJECTIVE: The aim of this work was to investigate the effect of low-level laser therapy (LLLT) and light-emitting diode (LED) on formation of edema, increase in vascular permeability, and articular

joint hyperalgesia in zymosan-induced arthritis. BACKGROUND DATA: It has been suggested that low-level laser and LED irradiation can modulate inflammatory processes. MATERIAL AND METHODS: Arthritis was induced in male Wistar rats (250-280 g) by intra-articular injection of zymosan (1 mg in 50 microL of a sterile saline solution) into one rear knee joint. Animals were irradiated immediately, 1 h, and 2 h after zymosan administration with a semiconductor laser (685 nm and 830 nm) and an LED at 628 nm, with the same dose (2.5 J/cm(2)) for laser and LED. In the positive control group, animals were injected with the anti-inflammatory drug dexamethasone 1 h prior to the zymosan administration. Edema was measured by the wet/dry weight difference of the articular tissue, the increase in vascular permeability was assessed by the extravasation of Evans blue dye, and joint hyperalgesia was measured using the rat knee-joint articular incapacitation test. RESULTS: Irradiation with 685 nm and 830 nm laser wavelengths significantly inhibited edema formation, vascular permeability, and hyperalgesia. Laser irradiation, averaged over the two wavelengths, reduced the vascular permeability by 24%, edema formation by 23%, and articular incapacitation by 59%. Treatment with LED (628 nm), with the same fluence as the laser, had no effect in zymosan-induced arthritis. CONCLUSION: LLLT reduces inflammatory signs more effectively than LED irradiation with similar irradiation times (100 sec), average outputs (20 mW), and energy doses (2 J) in an animal model of zymosan-induced arthritis. The anti-inflammatory effects of LLLT appear to be a class effect, which is not wavelength specific in the red and infrared parts of the optical spectrum. Zymosan
Animals;Arthritis, Experimental;Light;Low-Level Light Therapy;Male;Phototherapy;Rats;Zymosan

[Laser therapy in oncological diseases and its hardware implementation].
Humans;Low-Level Light Therapy;Neoplasms

In vivo effects on the expression of vascular endothelial growth factor-A165 messenger ribonucleic acid of an infrared diode laser associated or not with a visible red diode laser. OBJECTIVE: This study investigated and correlated the kinetic expression of vascular endothelial growth factor (VEGF)-A(165) messenger ribonucleic acid (mRNA) with the associated use or not of an infrared laser and a visible red laser during the wound healing in rats. BACKGROUND DATA: There is a lack of scientific evidence demonstrating the influence of low-level laser therapy (LLLT) on the expression of VEGF mRNA in vivo. MATERIALS AND METHODS: Forty-five Wistar rats were randomly allocated to one of three groups: I (n = 5, nonoperated animals), II (n = 25, operated animals), and III (n = 25, animals operated and subjected to laser irradiation). A surgical wound was performed using a scalpel in the right side of the tongue of operated animals. In group III, two sessions of laser irradiation were performed, one right after the surgical procedure (infrared laser, 780 nm, 70 mW, 35 J/cm(2)) and the other 48 h later (visible red laser, 660 nm, 40 mW, 5 J/cm(2)). Five animals each were sacrificed 1, 3, 5, and 7 days postoperatively in groups II and III, and samples of tongue tissue were obtained. The animals of group I were sacrificed on day 7. Total RNA was extracted using guanidine-isothiocyanate-phenol-chloroform method. The results of horizontal electrophoresis after reverse transcription polymerase chain reaction permitted the ratio of VEGF-A(165) mRNA and glyceraldehyde 3-phosphate dehydrogenase mRNA expression for groups I, II, and III to be assessed (two-way analysis of variance and Tukey test, $p < 0.05$). RESULTS: The expression of VEGF-A(165) mRNA in group II (0.770 +/- 0.098) was statistically greater than that observed in groups I (0.523 +/- 0.164) and III (0.504 +/- 0.069) in the first day after surgery ($p < 0.05$). Significant differences between the groups were not observed in other time periods. CONCLUSION: LLLT influenced the expression of VEGF-A(165) mRNA during wound healing after a surgical procedure on the tongue of Wistar rats.
RNA, Messenger;VEGFA protein, human;Vascular Endothelial Growth Factor A;Glyceraldehyde 3-Phosphate Analysis of Variance;Animals;Glyceraldehyde 3-Phosphate;Infrared Rays;Lasers, Semiconductor;RNA, Messenger;Random Allocation;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Tongue;Vascular Endothelial Growth Factor A;Wound Healing

[Surgical treatment of rectovaginal fistulae]. Results of treatment of 31 patients, aged 22-62 years, with rectovaginal fistula (RVG) were analyzed. RVG of the 1st degree of complexity was found in 7 patients; 19 women had RVG of the 2nd degree of complexity and the rest 5 patients had an RVG of the 3rd degree. During the surgery bringing down mucosa, the so called "tissue flap plasty" with the anterior sphincterolevatoroplasty was performed. Low-intensity laser irradiation was used for wound treatment postoperatively. Fistula recurrence was registered only in two patients.
Adult;Female;Follow-Up Studies;Humans;Middle Aged;Plastic Surgery Procedures;Rectovaginal Fistula;Rectum;Retrospective Studies;Surgical Flaps;Treatment Outcome;Vagina;Young Adult

Use of 660-nm diode laser in the prevention and treatment of human oral mucositis induced by radiotherapy and chemotherapy. OBJECTIVE: The aim of this multidisciplinary study was to evaluate quantitatively and qualitatively the effect of a 660-nm diode laser in the prevention and treatment of human oral mucositis (OM) in patients suffering from head and neck cancer who had undergone radiotherapy and chemotherapy. BACKGROUND DATA: OM is a severe oral lesion resulting from the toxic effects of treatment for cancer in the head and neck region. Low-level laser therapy is indicated to prevent and treat this oral complication and may be used alone or in association with conventional drug treatment, producing pain relief and wound repair. METHODS: This study included 72 patients with head and neck cancer treated at the Cancer Hospital of Mato-Grosso, Brazil, and divided into a control group (C; n = 36) and a laser group (L; n = 36). Laser therapy was performed in combination with radiotherapy and chemotherapy twice a week using a diode laser (lambda = 660 nm, power = 30 mW, spot size = 2 mm, energy = 2 J per point). RESULTS: Statistically significant differences were observed between the two groups. Patients in group L usually did not present with OM or pain, but all patients in group C presented with OM ranging from Level I to III associated with pain. This difference was significant from week 1 on, increased until week 4 and remained stable up to week 7. CONCLUSION: Laser therapy was effective in preventing and treating oral effects induced by radiotherapy and chemotherapy, thus improving the patient's quality of life.
Adult;Aged;Aged, 80 and over;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Radiation Injuries;Stomatitis

Laser therapy in the tissue repair process: a literature review. OBJECTIVE: Carry out a literature review on the use of laser therapy in the tissue repair process and address the different lasers and parameters used by the authors. METHODS: A review was carried out of the literature from 1960 to 2008 in the Lilacs, Medline, and PubMed databases using the following key words: Laser Therapy, Wound Healing, and Tissue repair. RESULTS: The most frequently used types of laser are helium neon (HeNe) lasers and diode lasers, including gallium-aluminum-arsenium (GaAlAs), arsenium-gallium (AsGa), and indium-gallium-aluminum-phosphide (InGaAlP) lasers. However, implementation of different protocols was found, with different materials and different activating wavelengths, thus making it difficult to compare results and choose the parameters of treatment. CONCLUSIONS: The majority of authors report that laser therapy speeds up the process of tissue repair, but further studies are suggested to determine the best parameters to be used. Animals;Humans;Low-Level Light Therapy;Wound Healing

Analysis of permeability and morphology of root canal dentin after Er,Cr:YSGG laser irradiation. OBJECTIVE: The aim of this study was to evaluate the morphology and permeability of root canal walls irradiated with Er,Cr:YSGG laser after conventional endodontic treatment. BACKGROUND: Laser irradiation can be used for dentinal tubule exposure, smear layer removal, and disinfection. Another potential, interesting application is as an adjunct to endodontic treatment, especially in the intracanal medication phase. METHODS: Fifty-two single-rooted teeth had their crowns sectioned at the cementoenamel junction and were randomly divided into four groups (n = 13): G1: conventional preparation (CP) + irrigation with EDTA-T + rhodamine B dye solution associated with NDP

(dexamethasone phosphate, paramonochlorophenol, polyethylenoglycol) (Rhod-NDP); G2: CP + EDTA-T + Er,Cr:YSGG laser irradiation 0.75 W + Rhod-NDP; G3: CP + EDTA-T + Er,Cr:YSGG 1.5 W + Rhod-NDP; G4: CP + EDTA-T + Er,Cr:YSGG 2.5 W + Rhod-NDP. For the permeability analysis (n = 9), teeth were transversely cut and two slices of each third were selected. The images were analyzed by ImageLab software (Softium InformÃ¡tica Ltda., SÃ£o Paulo, SP, Brazil). Additional samples (n = 4) were examined by scanning electron microscopy. RESULTS: Data were analyzed statistically using the Kruskal-Wallis and Student-Newman-Keuls tests for the following areas: apical third (H = 23.4651): G1 (14.25)(a), G2 (17.66)(ab), G3 (26.50)(b), G4 (39.58)(c); medium (H = 23.1611): G1 (14.16)(a), G2 (16.66)(ab), G3 (28.83)(b), G4 (38.33)(b); and cervical (H = 32.4810): G1 (9.66)(a), G2 (20. 00)(ab), G3 (27.00)(b), G4 (41.33)(c), ($p < 0.01$). Despite the irregular aspect of laser irradiation along the canal walls, the parameters of 1.5 W and 2.5 W allowed morphologic modifications that increased dentinal permeability. CONCLUSIONS: Irradiation with Er,Cr:YSGG laser could be effective in endodontic treatment for increasing dentinal permeability. Rhodamines;rhodamine B Dentin;Endodontics;Humans;Image Processing, Computer-Assisted;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Permeability;Rhodamines;Surface Properties

Effect of low-level laser therapy with output power of 30 mW and 60 mW in the viability of a random skin flap. OBJECTIVE: To assess the effects of low-level laser therapy (LLLT) with output power of 30 and 60 mW in the viability of a random skin flap in rats. BACKGROUND DATA: Output power values in LLLT are not well defined. MATERIALS AND METHODS: Controlled, single-blind experimental study. Thirty-six animals were randomly distributed into three groups: sham group (SG), 30-mW output power (30G), and 60-mW output power (60G). In both treated groups, a fluency of 3 J/cm(2) was used. Two minutes after elevation of a random-pattern cranially based dorsal flap (4 x 10 cm), laser irradiation was applied and repeated on the first, second, third, and fourth postoperative days. Percentages of flap necrosis were calculated on the seventh postoperative day. Also, four fragments of each flap were collected to allow determination of the percentages of vascular density according to the bidimensional method of the morphometric analysis of blood vessels. Statistical analysis included the Wilcoxon test and Kruskal-Wallis variance analysis. A significance level of 5% was elected ($p < 0.05$). RESULTS: Laser-treated animals presented significantly less necrosis than the sham group (SG, 53%; 30G, 24%; $p < 0.05$) (60G, 25%; $p < 0.05$). Also, laser-treated animals presented significantly more vascular density than the sham group (SG, 37%; 30G, 57%; $p < 0.05$) (60G, 59%; $p < 0.05$). CONCLUSION: LLLT (660 nm) with 30-mW and 60-mW output power was efficient in the increase of skin flap viability, but there was no difference between them. Analysis of Variance;Animals;Low-Level Light Therapy;Male;Necrosis;Random Allocation;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Surgical Flaps

Low-level laser irradiation (InGaAlP-660 nm) increases fibroblast cell proliferation and reduces cell death in a dose-dependent manner. BACKGROUND AND OBJECTIVE: Impaired cell metabolism and increased cell death in fibroblast cells are physiological features of chronic tendinopathy. Although several studies have shown that low-level laser therapy (LLLT) at certain parameters has a biostimulatory effect on fibroblast cells, it remains uncertain if LLLT effects depend on the physiological state. STUDY DESIGN/MATERIAL AND METHODS: High-metabolic immortal cell culture and primary human keloid fibroblast cell culture were used in this study. Trypan blue exclusion and the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) test were used to determine cell viability and proliferation. Propidium iodide stain was used for cell-cycle analysis by flow cytometry. Laser irradiation was performed daily on three consecutive days with a GaAlAs 660-nm laser (mean output: 50 mW, spot size 2 mm(2), power density =2.5 W/cm(2)) and a typical LLLT dose and a high LLLT dose (irradiation times: 60 or 420 s; fluences:150 or 1050 J/cm(2); energy delivered: 3 or 21 J). RESULTS: Primary fibroblast cell culture from human keloids irradiated with 3 J showed

significant proliferation by the trypan blue exclusion test ($p < 0.05$), whereas the 3T3 cell culture showed no difference using this method. Propidium iodide staining flow cytometry data showed a significant decrease in the percentage of cells being in proliferative phases of the cell cycle (S/g(2)/M) when irradiated with 21 J in both cell types (hypodiploid cells increased). CONCLUSIONS: Our data support the hypothesis that the physiological state of the cells affects the LLLT results, and that high-metabolic rate and short- cell-cycle 3T3 cells are not responsive to LLLT. In conclusion, LLLT with a dose of 3 J reduced cell death significantly, but did not stimulate cell cycle. A LLLT dose of 21 J had negative effects on the cells, as it increased cell death and inhibited cell proliferation. 3T3 Cells;Animals;Cell Death;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Fibroblasts;Flow Cytometry;Humans;Keloid;Low-Level Light Therapy;Mice

Combination 830-nm and 633-nm light-emitting diode phototherapy shows promise in the treatment of recalcitrant psoriasis: preliminary findings. BACKGROUND AND OBJECTIVES: Psoriasis is one of the major problems facing dermatologists worldwide. Planar arrays of light-emitting diodes (LEDs) have recently attracted attention in the treatment of difficult dermatological entities, 830 nm in near infrared (near-IR) and 633 nm in visible red. This study was designed to assess the efficacy of combination 830-nm and 633-nm LED phototherapy in the treatment of recalcitrant psoriasis. SUBJECTS AND METHODS: Nine informed and consenting patients with psoriasis were enrolled in this preliminary study, (3 men, 6 women, mean age 34.3, skin types I to IV). All had chronic psoriasis, which in most cases had proved resistant to conventional treatments. They were treated sequentially with LED arrays delivering continuous-wave 830 nm (near-IR) and 633 nm (red) in two 20-min sessions over 4 or 5 weeks, with 48 h between sessions (830 nm, 60 J/cm(2); 633 nm, 126 J/cm(2)). RESULTS: All patients completed their LED regimens (4 requiring 1 regimen, 5 requiring a second). Follow-up periods were from 3 to 8 months, except in two patients who were lost to follow-up. Clearance rates at the end of the follow-up period ranged from 60% to 100%. Satisfaction was universally very high. CONCLUSIONS: The antiinflammatory effects of LED energy at 830 nm and 633 nm have been well documented, as has their use in wound healing. LED phototherapy is easy to apply, pain free and side-effect free, and is well tolerated by patients of all skin types. The promising results of this preliminary study warrant a proper controlled double-blind study with a larger patient population. Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Psoriasis;Treatment Outcome

Evaluation of the furcation area permeability of deciduous molars treated by neodymium:yttrium-aluminum-garnet laser or adhesive. The purpose of this in vitro study was to compare the effects of a self-etch adhesive system and neodymium:yttrium-aluminum-garnet (Nd:YAG) laser application on the dentinal permeability of the furcation area of primary molars. After endodontic access, 39 extracted human deciduous molars were divided into three groups: control group (CG), no treatment; adhesive group (AG), self-etching adhesive was applied to the furcation area; laser group (LG), specimens were irradiated with Nd:YAG laser. To evaluate dentin permeability of the furcation area, we immersed the specimens in 0.5 % methylene blue dye for 4 h. Then, they were longitudinally sectioned into two halves and photographed. The images were analyzed by two qualified evaluators using TpsDig software to calculate the percentage of the dye penetration area in comparison with the total furcation area. Additional analyses by scanning electron microscopy (SEM) were performed. The analysis of variance (ANOVA), complemented by Student's t-test, showed that mean dye penetration in the LG was statistically significant lower than that in all the other groups ($P < 0.05$). The SEM analysis showed mostly dentinal tubules obliterated by smear layer in the CG; in the AG the smear layer was modified by the adhesive, and, in the LG, melted surfaces were observed. It can be concluded that the Nd:YAG laser was capable of reducing the dentinal permeability of the furcation area of deciduous molars. Coloring Agents;Dental Cements;Methylene Blue Coloring

Agents;Dental Cements;Dental Etching;Dentin;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Methylene Blue;Microscopy, Electron, Scanning;Molar;Permeability;Tooth, Deciduous

Biophoton detection and low-intensity light therapy: a potential clinical partnership. Low-intensity light therapy (LILT) is showing promise in the treatment of a wide variety of medical conditions. Concurrently, our knowledge of LILT mechanisms continues to expand. We are now aware of LILT's potential to induce cellular effects through, for example, accelerated ATP production and the mitigation of oxidative stress. In clinical use, however, it is often difficult to predict patient response to LILT. It appears that cellular reduction/oxidation (redox) state may play a central role in determining sensitivity to LILT and may help explain variability in patient responsiveness. In LILT, conditions associated with elevated reactive oxygen species (ROS) production, e.g. diabetic hyperglycemia, demonstrate increased sensitivity to LILT. Consequently, assessment of tissue redox conditions in vivo may prove helpful in identifying responsive tissues. A noninvasive redox measure may be useful in advancing investigation in LILT and may one day be helpful in better identifying responsive patients. The detection of biophotons, the production of which is associated with cellular redox state and the generation of ROS, represents just such an opportunity. In this review, we will present the case for pursuing further investigation into the potential clinical partnership between biophoton detection and LILT. Reactive Oxygen Species;Adenosine Triphosphate Adenosine Triphosphate;Animals;Humans;Lipid Peroxidation;Low-Level Light Therapy;Microsomes;Mitochondria;Oxidation-Reduction;Oxidative Stress;Photons;Reactive Oxygen Species;Ultraviolet Rays

The effect of low-level laser therapy on healing of skin incisions made using a diode laser in diabetic rats. BACKGROUND AND OBJECTIVE: To investigate the effect of low-level laser therapy (LLLT) on healing of skin incisions made using a diode laser in diabetic rats. MATERIAL AND METHODS: Eighteen diabetic Wistar rats were used for this study. One incision was performed on the left side of the dorsum using a diode laser, and the other two incisions were made with a scalpel and diode laser on the right side of each rat. The wound on the left side of each rat received laser stimulation (10 J/cm(2)). The rats were assigned to three experimental groups. Group 1, scalpel (n = 18); Group 2, diode (n = 18); Group 3, diode + biostimulation (n = 18). RESULTS: Reepithelialization was fastest in Group 2 than Group 1 at day 10. The difference between Groups 1 and 3 was also statistically significant in reepithelialization at day 10. There was a significant difference between Groups 1 and 2 and between Groups 2 and 3 in inflammation at day 10. There was no difference between any of the groups in inflammation and reepithelialization at day 20. CONCLUSIONS: Scalpel incisions heal more slowly than diode and diode + biostimulation incisions in diabetic rats. We can suggest that diode + biostimulation may produce the least amount of tissue injury, with the fastest resolution of inflammatory response in diabetic rats. Diode laser incision (4 W) with 10-J/cm(2) LLLT seems to have a beneficial effect on skin incisions in diabetic rats. Animals;Diabetes Mellitus, Experimental;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Wound Healing

A dual-wavelength approach with 585-nm pulsed-dye laser and 800-nm diode laser for treatment-resistant port-wine stains. Adolescent;Adult;Child;Child, Preschool;Facial Dermatoses;Female;Humans;Lasers, Dye;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Treatment Outcome;Young Adult

Effects of laser photobiomodulation on cutaneous wounds treated with mitomycin C: a histomorphometric and histological study in a rodent model. AIM: The aim of the present study was to assess histologically the effect of Laser Photobiomodulation (LPBM) on skin wounds treated with Mitomycin C (MMC). BACKGROUND DATA: Wound healing occurs because of a competitive

mechanism between the synthesis and lyses of collagen. Therefore, any factor that increases the lyses or reduces the synthesis of collagen may result in changes in the healing process. MMC is an antineoplastic drug that inhibits fibroblast proliferation, collagen synthesis, and neoangiogenesis. LPBM has been shown to stimulate wound healing, increasing the production of collagen, fibroblastic proliferation, and angiogenesis. MATERIALS AND METHODS: Forty-eight Wistar rats were randomly distributed into 4 main groups (n = 12): G1--control (G1a--7 d and G1b--14 d); G2--MMC (G2a--7 d and G2b--14 d); G3--MMC + lambda660 nm laser (G3a--7 d and G3b--14 d); and G4--MMC + lambda790 nm laser (G4a--7 d and G4b--14 d). Under general anesthesia, one excisional wound was created on the dorsum of each animal. Two ml of MMC solution was applied to the wound 4 h after surgery for 5 min. LPBM was performed on groups G3 (lambda690 nm; 20 J/cm(2); 30 mW; Phi = 2 mm) and G4 (lambda790 nm; 20 J/cm(2); 40 mW; Phi = 2 mm), starting immediately after the application of the MMC and repeated every other day during the experimental period. Laser light was applied transcutaneously at 4 equidistant points on the wound margin (4 x 5 J/cm(2), 20 J/cm(2)/session). The specimens were routinely cut and processed to wax. The slides were stained with HE and Sirius red. Computerized hystomorphometry was performed. RESULTS: LPBM resulted in reduced inflammation and an increase in both fibroblast proliferation and collagen deposition. CONCLUSION: The use of LPBM improves wound healing in subjects treated with MMC. Mitomycin Administration, Topical;Analysis of Variance;Animals;Low-Level Light Therapy;Male;Mitomycin;Photomicrography;Random Allocation;Rats;Rats, Wistar;Skin;Wound Healing

Pulsed dye laser-induced inflammatory response and extracellular matrix turnover in rat vocal folds and vocal fold fibroblasts. BACKGROUND AND OBJECTIVES: Disruption of the vocal fold extracellular matrix (ECM) can induce a profound and refractory dysphonia. Pulsed dye laser (PDL) irradiation has shown early promise as a treatment modality for disordered ECM in patients with chronic vocal fold scar; however, there are limited data addressing the mechanism by which this laser energy might induce cellular and extracellular changes in vocal fold tissues. In this study, we examined the inflammatory and ECM modulating effects of PDL irradiation on normal vocal fold tissues and cultured vocal fold fibroblasts (VFFs). STUDY DESIGN/MATERIALS AND METHODS: We evaluated the effects of 585 nm PDL irradiation on inflammatory cytokine and collagen/collagenase gene transcription in normal rat vocal folds in vivo (3-168 hours following delivery of approximately 39.46 J/cm(2) fluence) and VFFs in vitro (3-72 hours following delivery of 4.82 or 9.64 J/cm(2) fluence). We also examined morphological vocal fold tissue changes 3 hours, 1 week, and 1 month post-irradiation. RESULTS: PDL irradiation altered inflammatory cytokine and procollagen/collagenase expression at the transcript level, both in vitro and in vivo. Additionally, PDL irradiation induced an inflammatory repair process in vivo that was completed by 1 month with preservation of normal tissue morphology. CONCLUSIONS: PDL irradiation can modulate ECM turnover in phenotypically normal vocal folds. Additional work is required to determine if these findings extend to disordered ECM, such as is seen in vocal fold scar. Lasers Surg. Med. 41:585-594, 2009. (c) 2009 Wiley-Liss, Inc. Cytokines;Extracellular Matrix Proteins;RNA, Messenger;Cyclooxygenase 2 Animals;Cell Culture Techniques;Cyclooxygenase 2;Cytokines;Extracellular Matrix;Extracellular Matrix Proteins;Fibroblasts;Inflammation;Lasers, Dye;Low-Level Light Therapy;Male;RNA, Messenger;Rats;Rats, Sprague-Dawley;Reverse Transcriptase Polymerase Chain Reaction;Vocal Cords

Randomized controlled trial: Comparative efficacy for the treatment of facial telangiectasias with 532 nm versus 940 nm diode laser. BACKGROUND: While the 532 nm wavelength has been demonstrated to be effective for facial telangiectasias, 940 nm is a novel wavelength which has only been reported in case reports. While both the 532 and 940 nm wavelengths are effective for facial telangiectasias, we lack evidence to support whether one wavelength is superior. STUDY DESIGN:

Randomized, blinded split-faced trial for the 532 and 940 nm diode laser wavelengths. Side effects of erythema, crusting, swelling, and blistering (0-5 scale, 0 = not present, 1 = trace, 5 = severe) were assessed. Prior to treatment and at 2 months after a series of two treatments, telangiectasias were assessed (1-10 scale, 1 = focal telangiectasias, 10 = diffuse telangiectasias). Assessment of the degree of improvement in facial telangiectasias was performed by two blinded non-treating physician evaluators from patient photographs. RESULTS: A total of 24 facial anatomic sites were treated with the 532 and 940 nm wavelengths. Presence and severity of side effects of erythema, crusting, swelling, blistering (0-5 scale, 0 = not present, 1 = trace, 5 = severe) were assessed. Pain associated with the laser treatment was rated as significantly less for the 940 nm wavelength relative to the 532 nm wavelength. Erythema post-treatment was significantly less with 940 nm relative to 532 nm. Significant crusting and swelling were only reported with the 532 nm wavelength. The mean percentage improvement with the 940 nm wavelength (63.0%) was greater than that achieved with the 532 nm wavelength (47.8%) ($P<0.05$). On photographic evaluation, 940 nm was significantly more efficacious for larger caliber vessels than 532 nm. Both wavelengths were equally efficacious for smaller caliber vessels. CONCLUSIONS: While both 532 and 940 nm diode laser produced significant improvement in facial telangiectasias, greater efficacy was found with 940 nm as well as a significantly more tolerable side effect profile. Lasers Surg. Med. 41:555-562, 2009. (c) 2009 Wiley-Liss, Inc. Adult;Aged;Aged, 80 and over;Cohort Studies;Double-Blind Method;Erythema;Facial Dermatoses;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain, Postoperative;Telangiectasis;Treatment Outcome

The effect of equal daily dose achieved by different power densities of low-level laser therapy at 635 and 670 nm on wound tensile strength in rats: a short report. OBJECTIVE: The aim of our study was to compare the effects of different power densities of LLLT at 635 and 670 nm achieving a daily dose of 5 J/cm(2) on wound tensile strength (TS) in rats. BACKGROUND DATA: Optimal parameters of low-level laser therapy (LLLT) are still unknown. MATERIALS AND METHODS: Under general anesthesia, one full-thickness skin incision was performed on the back of each rat (n = 40) and immediately closed using an intradermal running suture. Rats were separated into five groups depending on treatment parameters: (1) sham irradiated control group (SIC); (2) 635 nm laser-treated group at 4 mW/cm(2) (L-635/4); (3) 635 nm laser-treated group at 15 mW/cm(2) (L-635/15); (4) 670 nm laser-treated group at 4 mW/cm(2) (L-670/4); and (5) 670 nm laser-treated group at 15 mW/cm(2) (L-670/15). The total daily dose was 5 J/cm(2). Seven days after surgery each wound was removed for wound TS measurement. RESULTS: The lowest wound TS results were measured in the SIC rats (10.5 +/- 2.8 g/mm(2)). Higher wound TS results were measured in group L-670/15 (11.5 +/- 2.5 g/mm(2)) and group L-635/4 (11.7 +/- 4.3 g/mm(2)) rats, while significantly higher results were found in group L-670/4 (15.8 +/- 4.4 g/mm(2)) and group L-635/15 (15.9 +/- 4.8 g/mm(2)). The differences were significant between certain groups ($p < 0.01$: SIC vs. L-635/15, SIC vs. L-670/4; $p < 0.05$: L-635/4 vs. L-635/15, L-635/4 vs. L-670/4, L-635/15 vs. L-670/15, L-670/4 vs. L-670/15). CONCLUSION: Both red lasers significantly increased wound TS at selected parameters. Whereas the 635 nm laser significantly improved wound healing by using the higher power density, the 670 nm laser improved healing using a lower power density. Animals;Low-Level Light Therapy;Male;Radiation Dosage;Rats;Rats, Sprague-Dawley;Skin;Tensile Strength;Wound Healing;Wounds and Injuries

In vivo comparison of simple and double-fractionated low-level laser irradiation schemes on the healing of rat skin lesions. OBJECTIVE: To compare the efficacy of a simple irradiation scheme with that of a double-fractionated irradiation scheme on the healing of rat skin lesions using in vivo monitoring of tissue diffuse reflectance. BACKGROUND DATA: Low-level laser therapy (LLLT) is used in medicine for treating a wide range of pathological conditions. The practical benefits of laser

treatment of acute and chronic conditions were obtained, using a single session of irradiation per day. MATERIALS AND METHODS: Thirty Wistar rats were divided into three experimental groups (controls, simple laser irradiation scheme, and double-fractionated laser irradiation scheme). A skin lesion was created on the calf of the right hind leg of all rats. The laser irradiation parameters were lambda = 635 nm and power = 15 mW. The exposure time was 600 s for the simple laser irradiation scheme and 300 s x 2 for the double-fractionated laser irradiation scheme on 3 consecutive days. The optical properties of tissue were studied by processing and analyzing the diffuse reflectance spectra of injured skin, acquired before and after each laser irradiation. RESULTS: The results demonstrate that, using a simple laser irradiation scheme (single daily irradiation session: t exp 1 =600 s, power = 15 mW, lambda = 635 nm), healing of the skin lesion began after 3 consecutive treatment days. The application of the double-fractionated laser irradiation scheme (2 daily irradiation sessions: t exp 2 = t exp 1/2 = 300 s, power = 15 mW and lambda = 635 nm) led to a reduction in treatment time to 2 days. CONCLUSION: In conclusion, a double-fractionated irradiation scheme is more efficient than simple irradiation scheme for LLLT in rat skin lesions. Animals;Low-Level Light Therapy;Radiotherapy Dosage;Rats;Rats, Wistar;Skin;Time Factors;Wound Healing

Helium-neon laser reduces the inflammatory process of arthritis. OBJECTIVE: A histological study of the anti-inflammatory effect of helium-neon laser in models of arthropathies induced by hydroxyapatite and calcium pyrophosphate in rats. BACKGROUND: Crystal deposition diseases are inflammatory pathologies induced by cellular reaction to the deposit of crystals in the joints. METHODS: Fifty-six Suquia strain rats were distributed in seven groups. Two mg of each crystal diluted in 0.05 ml physiologic solution were injected six times in each back limb joint, during two weeks on alternate days. Eight J/cm(2) were applied daily to the crystal-injected joints on five consecutive days. The joints were cut and put in 10% formaldehyde, stained with hematoxylin-eosin and observed by light microscopy. The percentage of area with inflammatory infiltrates was determined in five optical microscopy photographs (100X) for each group and analyzed using the Axionvision 4.6 program. A Pearson's Chi Squared test was applied, with significance level set at $p < 0.05$. RESULTS: Both crystals produced an inflammatory process in the osteoarticular structures, consisting of predominantly mononuclear infiltration, fibrosis, and granulomas of foreign body-type giant cells containing phagocytosed remains of crystals. In the arthritic joints treated with laser, a marked decrease ($p < 0.0001$) was found in the percentage of area with inflammatory infiltrates, although the granulomas remained in a less ostensible form, with adipose tissue cells, fibrosis bands with light residual inflammation, and an absence of or very few crystals. Laser alone or physiologic solution injection did not produce histological changes. CONCLUSIONS: Helium-neon laser reduced the intensity of the inflammatory process in the arthritis model induced by hydroxyapatite and calcium pyrophosphate crystals. Durapatite;Calcium Pyrophosphate Animals;Arthritis, Experimental;Calcium Pyrophosphate;Chi-Square Distribution;Disease Models, Animal;Durapatite;Lasers, Gas;Low-Level Light Therapy;Rats

Laser acupuncture for chronic non-specific low back pain: a controlled clinical trial. OBJECTIVE: the primary aim was to determine if laser acupuncture (LA) is more effective than sham laser in reducing pain and disability in adults with chronic non-specific low back pain. METHODS: the design was a double blind, two-group parallel randomised controlled trial. The active intervention was an 830 nm (infrared), 10 mW, Ga-Al-As laser diode laser for acupuncture and a sham control. The primary outcome measures were changes in pain (visual analogue scale) and disability (Oswestry Disability Index) at the end of 5-10 treatment sessions. Secondary outcomes were patient global assessment, psychological distress (Depression Anxiety Stress Scale) and subjective wellbeing (Personal Wellbeing Index). Follow up was performed at 6 weeks and 6 months after completion of treatment. RESULTS: 100 participants were enrolled and treated in a general practice setting. Per

protocol analysis of the primary outcome measures using ANOVA suggested that although there was a significant overall improvement in pain and disability after the course of treatments ($p<0.01$), there was no significant difference between the intervention and control group in both the primary and most secondary outcome measures. CONCLUSION: this study did not show a specific effect for LA using infrared laser at 0.2 Joules per point for chronic low back pain. The overall intervention appeared effective because of placebo and other factors. As there was some concern about baseline inequality between the groups further research using tighter inclusion criteria should attempt to replicate the result and examine if a dose response may exist. Acupuncture Points;Adult;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement;Predictive Value of Tests;Quality of Life;Research Design

Laser acupuncture: effectiveness depends upon dosage. Acupuncture;Acupuncture Analgesia;Acupuncture Therapy;Dose-Response Relationship, Radiation;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement;Treatment Outcome

Blood flow dynamics after laser therapy of port wine stain birthmarks. BACKGROUND AND OBJECTIVE: During laser therapy of port wine stain (PWS) birthmarks, regions of perfusion may persist. We hypothesize that such regions are not readily observable even when laser surgery is performed by highly experienced clinicians. The objective of this study was to use objective feedback to assess the acute vascular response to laser therapy. STUDY DESIGN/MATERIALS AND METHODS: A clinic-friendly laser speckle imaging (LSI) instrument was developed to provide the clinician with real-time images of blood flow during laser therapy. Images were acquired from patients undergoing laser therapy of PWS birthmarks at Scripps Clinic and the Beckman Laser Institute and Medical Clinic. Blood flow maps were extracted from the acquired imaging data. Histogram-based analysis was applied in grading the degree of heterogeneity present in the blood flow maps after laser therapy. RESULTS: Collectively, two types of patient responses were observed in response to laser exposure: (1) an immediate increase in perfusion within minutes after laser therapy; and (2) an overall decrease in blood perfusion approximately 1 hour after laser therapy, with distinct regions of persistent perfusion apparent in the majority of post-treatment blood-flow images. A comparison of blood flow in PWS and adjacent normal skin demonstrated that PWS blood flow can be greater than, or sometimes equivalent to, that of normal skin. CONCLUSION: In general, a decrease in skin perfusion is observed during pulsed laser therapy of PWS birthmarks. However, a heterogeneous perfusion map was frequently observed. These regions of persistent perfusion may be due to incomplete photocoagulation of the targeted vessels. We hypothesize that immediate retreatment of these regions identified with LSI, will result in enhanced removal of the PWS vasculature. Lasers Surg. Med. 41:563-571, 2009. (c) 2009 Wiley-Liss, Inc. Adolescent;Adult;Child;Cohort Studies;Female;Humans;Image Processing, Computer-Assisted;Laser-Doppler Flowmetry;Lasers, Dye;Low-Level Light Therapy;Male;Microfluidics;Middle Aged;Photoplethysmography;Port-Wine Stain;Regional Blood Flow;Treatment Outcome;Young Adult

Effects of ablative 10,600-nm carbon dioxide fractional laser therapy on suppurative diseases of the skin: a case series of 12 patients. BACKGROUND AND OBJECTIVES: We have used an ablative 10,600-nm carbon dioxide fractional laser system (CO(2) FS) for suppurative diseases in order to attempt improvement. The purpose of our study was to demonstrate the effect of CO(2) FS on the course of inflammatory reactions in suppurative diseases. MATERIALS AND METHODS: We reviewed a total of 12 Korean patients with suppurative diseases of the skin who had a history of treatment failure with several therapeutic modalities as well as active and multiple inflammatory lesions at the time of CO(2) FS treatment. RESULTS: Improvement scores considering the number of suppurative lesions revealed that 3 of the 12 patients demonstrated clinical improvement of grade 4. Seven had clinical improvement of grade 3 and two showed improvement of grade 2. Improvement scores in

severity were also evaluated; 2 of the 12 patients showed clinical improvement of grade 4. Six demonstrated clinical improvement of grade 3 and four had clinical improvement of grade 2. No patient showed a worsening of suppurative lesions. CONCLUSION: Our observations demonstrated that the use of CO(2) FS did not make active suppurative lesions worse, and might have a therapeutic effect on suppurative diseases and their related scars. Lasers Surg. Med. 41:550-554, 2009. (c) 2009 Wiley-Liss, Inc. Adult;Cohort Studies;Dose Fractionation, Radiation;Humans;Korea;Lasers, Gas;Low-Level Light Therapy;Male;Retrospective Studies;Skin Diseases;Suppuration;Treatment Outcome;Young Adult

Effect of cluster multi-diode light emitting diode therapy (LEDT) on exercise-induced skeletal muscle fatigue and skeletal muscle recovery in humans. BACKGROUND AND OBJECTIVES: There are some indications that low-level laser therapy (LLLT) may delay the development of skeletal muscle fatigue during high-intensity exercise. There have also been claims that LED cluster probes may be effective for this application however there are differences between LED and laser sources like spot size, spectral width, power output, etc. In this study we wanted to test if light emitting diode therapy (LEDT) can alter muscle performance, fatigue development and biochemical markers for skeletal muscle recovery in an experimental model of biceps humeri muscle contractions. STUDY DESIGN/MATERIALS AND METHODS: Ten male professional volleyball players (23.6 [SD +/-5.6] years old) entered a randomized double-blinded placebo-controlled crossover trial. Active cluster LEDT (69 LEDs with wavelengths 660/850 nm, 10/30 mW, 30 seconds total irradiation time, 41.7 J of total energy irradiated) or an identical placebo LEDT was delivered under double-blinded conditions to the middle of biceps humeri muscle immediately before exercise. All subjects performed voluntary biceps humeri contractions with a workload of 75% of their maximal voluntary contraction force (MVC) until exhaustion. RESULTS: Active LEDT increased the number of biceps humeri contractions by 12.9% (38.60 [SD +/-9.03] vs. 34.20 [SD +/-8.68], P = 0.021) and extended the elapsed time to perform contractions by 11.6% (P = 0.036) versus placebo. In addition, post-exercise levels of biochemical markers decreased significantly with active LEDT: Blood Lactate (P = 0.042), Creatine Kinase (P = 0.035), and C-Reative Protein levels (P = 0.030), when compared to placebo LEDT. CONCLUSION: We conclude that this particular procedure and dose of LEDT immediately before exhaustive biceps humeri contractions, causes a slight delay in the development of skeletal muscle fatigue, decreases post-exercise blood lactate levels and inhibits the release of Creatine Kinase and C-Reative Protein. Lasers Surg. Med. 41:572-577, 2009. (c) 2009 Wiley-Liss, Inc. Adolescent;Adult;Cross-Over Studies;Double-Blind Method;Exercise;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle Strength;Muscle, Skeletal;Recovery of Function;Volleyball;Young Adult

In vitro investigation of intra-canal dentine-laser beam interaction aspects: II. Evaluation of ablation zone extent and morphology. Laser endodontic tips appear to provide a promising alternative to available treatment modalities in the field of endodontology. With the shortcomings in published results regarding the intra-canal behavioural aspects of those tips, it was the aim of this study to investigate the extent of the intra-canal ablation zone and the pattern associated with those tips. Ninety intact extracted bovine teeth were used to prepare mid-root testing cylinders. The samples were divided into three groups (A, B, C), corresponding to the tip diameters. Each group was further subdivided to be irradiated at three different power settings (1500 mW, 1750 mW, 2000 mW) with an erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser with a 65% water to 35% air ratio. Collected data were subjected to analysis of variance (ANOVA) and the Tukey test. At a chosen significance level of alpha = 1%, no statistical difference was found among the groups (P > 0.01). The results suggest that shortening of the estimated working length is mandatory for the use of those tips within the canal, and that, provided that certain measurements are used for intra-canal laser

ablation, this is a secure mode of treatment. Further investigation and system improvement will be required for more satisfactory results. Animals;Cattle;Dental Pulp Cavity;Dentin;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Preparation;Surface Properties

Low level laser irradiation precondition to create friendly milieu of infarcted myocardium and enhance early survival of transplanted bone marrow cells. We suggested that low-level laser irradiation (LLLI) precondition prior to cell transplantation might remodel the hostile milieu of infarcted myocardium and subsequently enhance early survival and therapeutic potential of implanted bone marrow mesenchymal stem cells (BMSCs). Therefore, in this study we wanted to address: (1) whether LLLI pre-treatment change the local cardiac micro-environment after myocardial infarction (MI) and (2) whether the LLLI preconditions enhance early cell survival and thus improve therapeutic angiogenesis and heart function. MI was induced by left anterior descending artery ligation in female rats. A 635 nm, 5 mW diode laser was performed with energy density of 0.96 J/cm(2) for 150 sec. for the purpose of myocardial precondition. Three weeks later, qualified rats were randomly received with LLLI precondition (n= 26) or without LLLI precondition (n= 27) for LLLI precondition study. Rats that received thoracotomy without coronary ligation were served as sham group (n= 24). In the cell survival study, rats were randomly divided into 4 groups: serum-free culture media injection (n= 8), LLLI precondition and culture media injection (n= 8), 2 million male BMSCs transplantation without LLLI pre-treatment (n= 26) and 2 million male BMSCs transplantation with LLLI precondition (n= 25) group, respectively. Vascular endothelial growth factor (VEGF), glucose-regulated protein 78 (GRP78), superoxide dismutase (SOD) and malondialdehyde (MDA) in the infarcted myocardium were evaluated by Western blotting, real-time PCR and colorimetry, respectively, at 1 hr, 1 day and 1 week after laser irradiation. Cell survival was assayed with quantitative real-time PCR to identify Y chromosome gene and apoptosis was assayed with transferase-mediated dUTP end labelling staining. Capillary density, myogenic differentiation and left ventricular function were tested by immunohistochemistry and echocardiography, respectively, at 1 week. After LLLI precondition, increased VEGF and GRP78 expression, as well as the enhanced SOD activity and inhibited MDA production, was observed. Compared with BMSC transplantation and culture media injection group, although there was no difference in the improved heart function and myogenic differentiation, LLLI precondition significantly enhanced early cell survival rate by 2-fold, decreased the apoptotic percentage of implanted BMSCs in infarcted myocardium and thus increased the number of newly formed capillaries. Taken together, LLLI precondition could be a novel non-invasive approach for intraoperative cell transplantation to enhance cell early survival and therapeutic potential. Animals;Bone Marrow Transplantation;Dose-Response Relationship, Drug;Female;Myocardial Infarction;Rats

Fractionated CO2 laser resurfacing: our experience with more than 2000 treatments.
Fractionated carbon dioxide (CO(2)) laser resurfacing combines the concept of fractional photothermolysis with an ablative 10,600-nm wavelength. This technology allows for the effective treatment of rhytides, photodamage, and scars, with shorter recovery periods and a significantly reduced side effect profile as compared to traditional CO(2) laser resurfacing. In this article, the authors review the concept of fractional photothermolysis, the expanding array of indications for use of fractionated CO(2) lasers, and their preferred treatment technique.
Adult;Aged;Cicatrix;Cosmetic Techniques;Equipment Design;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Selection;Rejuvenation;Skin Aging;Skin Diseases;Treatment Outcome

Clinical evaluation of a 3% potassium oxalate gel and a GaAlAs laser for the treatment of dentinal hypersensitivity. OBJECTIVES: This study evaluated the immediate and 3 month clinical effects of a low-level gallium-aluminum-arsenide (GaAlAs) laser and a 3% potassium oxalate gel for the

treatment of dentinal hypersensitivity. MATERIALS AND METHODS: A total of 164 teeth from 30 patients with clinical diagnoses of dentinal hypersensitivity were selected for this randomized, placebo-controlled, double-blind clinical study. The teeth were randomized to three groups: GaAlAs laser, oxalate gel, and placebo gel. The treatment sessions were performed at 7 d intervals for four consecutive weeks. The degree of sensitivity in response to an air blast and tactile stimuli was assessed according to a visual analogue scale at baseline, immediately after the fourth application, and then 3 months after the fourth application. The reductions in dentinal hypersensitivity from baseline at the two follow-up assessments were evaluated as the main outcome. RESULTS: In both the active and control groups, there were statistically significant reductions in dentinal hypersensitivity immediately after and 3 months after the treatments, when compared with the hypersensitivity at baseline. No significant differences among the three groups could be detected in their efficacy at either the immediate or 3 month evaluations irrespective of the stimulus. CONCLUSIONS: The treatments under study were effective for reducing dentinal hypersensitivity, and longer observational periods could enhance the ability of studies to detect differences between active and placebo groups. Biomedical and Dental Materials;Gels;Oxalates Adult;Aged;Biomedical and Dental Materials;Combined Modality Therapy;Dentin Sensitivity;Female;Gels;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Oxalates;Young Adult

Low- and high-intensity lasers in the treatment of herpes simplex virus 1 infection. Herpes simplex virus (HSV) is one of the most common viral infections of the human being. Although most of the seropositive persons do not manifest symptoms, infected individuals may present recurrent infections, characterized by cold sores. HSV-1 infection can result in potentially harmful complications in some patients, especially in those with compromised immunity. We report a clinical case of a patient with severe oral HSV-1 infection in the lower lip. The treatment of the lesions with the association of high-intensity (erbium-doped yttrium aluminum garnet, 2.94 mum, 80 mJ/pulse, 2-4 Hz) and low-intensity (indium gallium aluminum phosphide, 660 nm, 3.8 J/cm(2), 10 mW) lasers has not been reported in the literature. During treatment, no systemic or topical medication was used. Pain sensitivity was completely gone after the first irradiation with the low-intensity laser. During the healing process, lesions were traumatized twice, on the days 4 and 7. Even though the lesions were completely healed within 10 days. Aluminum Compounds;Phosphines;Indium;Gallium;aluminum phosphide Aluminum Compounds;Female;Gallium;Herpes Labialis;Humans;Indium;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Phosphines;Wound Healing;Young Adult

Evaluation of neodymium-doped yttrium aluminium garnet laser, scalpel incision wounds, and low-level laser therapy for wound healing in rabbit oral mucosa: a pilot study. OBJECTIVE: The aim of the present randomized controlled clinical trial was to assess the clinical and histopathological effects of laser and low-level laser therapy (LLLT) on healing of the oral mucosa after vestibuloplasty surgery. METHODS: The alterations at the end of healing in scalpel- and laser-incised and LLLT-applied oral mucosa were studied in eight healthy adult New Zealand white rabbits by taking specimens for light microscopic inspection. For the evaluation of wound healing, the surgical areas were stained using a solution (Mira-2-tones), and the stained surfaces were measured horizontally immediately after the surgery and on postoperative days 4, 7, and 10. RESULTS: Although the stained surface areas of the groups were similar immediately after the surgical procedures, the LLLT-applied sites had significantly fewer stained surface areas than the other groups on postoperative days 4, 7, and 10. Areas of hyperkeratosis and parakeratinization were observed in the epithelia of the laser surgery groups. A significant increase in epithelial thickness was found, suggesting increased scar tissue after wound repair; long and irregular connective tissue protrusions projecting into the undersurface of the epithelium were noted in these groups. CONCLUSION: LLLT used for soft tissue operations provides

better and faster wound healing, and LLLT enhances epithelization.
Animals;Epithelium;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Mouth Mucosa;Pilot Projects;Rabbits;Random Allocation;Staining and Labeling;Wound Healing

Effect of low-level laser therapy and calcitonin on bone repair in castrated rats: a densitometric study. OBJECTIVE: To investigate the healing of bone defects in male rats treated with salmon calcitonin, low-level laser therapy (LLLT), or both. BACKGROUND: Healing of bone defects still represents a challenge to health professionals in several areas. In this article, the effect of calcitonin in combination with LLLT on bone repair was studied. Densitometry was used as a valuable tool for the measurement of bone regeneration. METHODS: Sixty male Wistar rats underwent bilateral castration surgery before the creation of a surgical bone defect. The animals were randomly divided into four groups: control, treated with calcitonin (Ca), treated with LLLT (La), and treated with calcitonin and LLLT (CaLa). Groups Ca and CaLa received 2 IU/kg of synthetic salmon calcitonin intramuscularly three times a week. Groups La and CaLa received laser therapy using a gallium-aluminum-arsenide laser (10 mW, 20 J/cm(2), wavelength 830 nm). Control animals were submitted to sham irradiation. The animals were sacrificed 7, 14, and 21 days after surgery, and bone defects were analyzed using densitometry. RESULTS: The CaLa group had a higher degree of bone regeneration 14 and 21 days after surgery. CONCLUSIONS: The La and CaLa had significantly higher bone mineral density than the control and Ca groups. salmon calcitonin;Calcitonin Absorptiometry, Photon;Analysis of Variance;Animals;Bone Regeneration;Calcitonin;Castration;Femur;Low-Level Light Therapy;Male;Models, Animal;Random Allocation;Rats;Rats, Wistar

[Infrared cold laser radiation as an antimutagen]. Effects of infrared cold laser radiation (IRCLR) on mutagenesis and proliferation of the corneal epithelium were studied with laboratory white mice subjected to instigated circulatory hypoxia of the brain. The experiment was to reveal whether IRCLR influences the frequency of chromosomal rearrangements and to allow calculation of the corneal cells mitotic index for circulatory brain hypoxia. Laser radiation was shown to reconstitute the normal frequency of chromosomal aberrations as well as the mitotic cycle in epithelial cells of the mice cornea. Data of the experiment are promising from the standpoint of antihypoxic use of IRCLR in ophthalmology. Animals;Brain Ischemia;Chromosome Aberrations;Epithelium, Corneal;Low-Level Light Therapy;Male;Mutagenesis;Rats

[Hemoaggregation dynamics in human-operator during percutaneous laser blood irradiation]. The experiment with essentially healthy male subjects no older than 50 involved functional load testing and irradiation by a low-energy helium-neon laser according to the standard therapeutic regimen (0.2 ml/V/ 30 min/10 sessions). Biomedical evaluation of hemoaggregation was made by 30 parameters of a multifunctional diagnostic system characterizing three blood aggregation levels: rheological (biophysical), coagulolytic (biochemical) and system (mathematical). The investigation resulted in delineation of a single-vector hypodynamic transformation of biophysical and biochemical modules, i.e. decrease in the rheological and coagulative potential mediated by a moderate platelets disaggregation (24.6%) and hyperactivation of plasmin proferments in euglobulin fraction (126.76 %). Added sessions of percutaneous laser irradiation of blood were shown to induce a medium imbalance of biophysical and biochemical hemoaggregation. At the same time, low-energy laser did not modulate significantly the general functional state of human operator as the rheological and coagulative protective potential of organism remained reasonably high (88.89 and 87.5 %, respectively). Blood;Blood Coagulation;Blood Coagulation Disorders;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Platelet Aggregation;Reference Values

[Laserotherapy of diabetic angiopathy of the lower extremities]. Low-intensity laser radiation was included in combined therapy of lower limb angiopathy in patients with diabetes mellitus. The

course and results of the treatment were monitored by means of perfusion scintiography. Adult;Aged;Aged, 80 and over;Diabetic Foot;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Regional Blood Flow;Treatment Outcome

[Targeted UVB-308 nm (NUVB) therapy with excimer laser in the treatment of atopic dermatitis and other inflammatory dermatoses]. UVB 311 nm phototherapy (NUVB) is used successfully in the treatment of psoriasis or atopic dermatitis and is often chosen as "first-line" therapy. In a prospective study we investigated the efficacy of the targeted UVB 308 phototherapy by excimer laser in the treatment of 57 patients with localized, mild therapy-resistant atopic dermatitis. We achieved a complete remission (CR) in nearly 85% and a partial remission (PR) in 15% after 10 treatments during 6-8 weeks in all patients. A mean reduction in patient-reported pruritus was one hallmark after 3-4 treatments. 48 other patients with lichen simplex chronicus Vidal, nodular prurigo, granuloma anulare, alopezia areata (AA) and lichen ruber planus were also treated by targeted NUVB. We found higher rates of CR and PR only in patients with AA and in patients with oral Lichen ruber mucosae. These results and the systematically reviewing of the current medical literature shows that targeted NUVB by excimer laser cannot be successfully transferred for all inflammatory skin diseases. In particular, Excimer UVB treatment expands the therapeutic options in patients with localized and therapy-resistant atopic dermatitis enormously. Dermatitis, Atopic;Humans;Lasers, Excimer;Low-Level Light Therapy;Ultraviolet Therapy

Practice of phototherapy in the treatment of moderate-to-severe psoriasis. This chapter will discuss the entire spectrum of phototherapy, including narrowband UVB photo-therapy, broadband UVB phototherapy, PUVA, targeted excimer laser phototherapy, and combination treatments. Phototherapy can range from simple treatments in a UVB phototherapy box, with or without concurrent use of various tar preparations, to more elaborate modalities in which the intensity of UVB radiation applied varies according to different anatomical regions. Combining PUVA or UVB phototherapy with topical and systemic agents can also enhance phototherapy. Certain forms of phototherapy, such as the traditional Goeckerman regimen of using black tar daily with UVB light, induce a prolonged remission. Outpatient phototherapy is usually reserved for patients whose disease is not adequately controlled with topical medications, including steroids, vitamin D analogues, tazarotene, tar, or anthralin. It is also indicated for patients with such extensive psoriasis that topical therapy is nearly impossible. Additionally, phototherapy may be an excellent option for patients with specific medical problems for whom systemic medications such as methotrexate, cyclosporine, or biological agents may not be suitable. For patients with generalized psoriasis, phototherapy is a reasonable first choice among the available options because of its superior systemic safety profile in comparison to systemic or biological agents. As with all other forms of psoriasis therapy, it is essential to consider the impact of the treatment on the patient's lifestyle when selecting the treatment plan. Important points to consider when initially discussing phototherapy are the patient's employment schedule, commitment, flexibility, location of the phototherapy unit, and transportation. Dermatologic Agents Combined Modality Therapy;Cost-Benefit Analysis;Dermatologic Agents;Humans;Phototherapy;Psoriasis;Treatment Outcome

Is Q-switched neodymium-doped yttrium aluminium garnet laser an effective approach to treat xanthelasma palpebrarum? Results from a clinical study of 76 cases. BACKGROUND: Treating xanthelasma palpebrarum may prove difficult because of its delicate location on the eyelid. Various forms of nonablative laser techniques have been examined, and Q-switched neodymium-doped yttrium aluminium garnet (Nd:YAG) laser therapy has shown promising preliminary results. OBJECTIVES: To determine the efficacy of Q-switched Nd:YAG laser treatment for xanthelasma removal. MATERIALS AND METHODS: Thirty-seven consecutive patients with 76 lesions received two

treatment sessions with a Q-switched Nd:YAG laser without local anesthesia (6 J/cm(2) [1,064 nm] or 2 J/cm(2) [532 nm], 4-mm spot size, 2-3 passes). Photographs were taken before each treatment session and 4 weeks after the second treatment. Two independent examiners rated clearance in four groups (none [<25% cleared], moderate [25-50%], good [51-75%], and excellent [>75%]). RESULTS: Only two-thirds of the patients completed the entire course of the study; disappointing early results were the main reason for dropping out. The majority of treated lesions (70% or 75%, depending on the examiner) showed no clearance. Plasma low-density lipoprotein cholesterol levels displayed some influence on treatment results but not enough to facilitate stratification of patients. CONCLUSION: Q-switched Nd:YAG (532 nm and 1,064 nm) laser treatment of xanthelasma cannot be recommended. Adult;Aged;Eyelids;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Xanthomatosis

Low level laser treatment of tendinopathy: a systematic review with meta-analysis. OBJECTIVES: To assess the clinical effectiveness of Low Level Laser Therapy (LLLT) in the treatment of tendinopathy. Secondary objectives were to determine the relevance of irradiation parameters to outcomes, and the validity of current dosage recommendations for the treatment of tendinopathy. BACKGROUND: LLLT is proposed as a possible treatment for tendon injuries. However, the clinical effectiveness of this modality remains controversial, with limited agreement on the most efficacious dosage and parameter choices. METHOD: The following databases were searched from inception to 1(st) August 2008: MEDLINE, PubMed, CINAHL, AMED, EMBASE, All EBM reviews, PEDro (Physiotherapy Evidence Database), SCOPUS. Controlled clinical trials evaluating LLLT as a primary intervention for any tendinopathy were included in the review. Methodological quality was classified as: high (> or =6 out of 10 on the PEDro scale) or low (<6) to grade the strength of evidence. Accuracy and clinical appropriateness of treatment parameters were assessed using established recommendations and guidelines. RESULTS: Twenty-five controlled clinical trials met the inclusion criteria. There were conflicting findings from multiple trials: 12 showed positive effects and 13 were inconclusive or showed no effect. Dosages used in the 12 positive studies would support the existence of an effective dosage window that closely resembled current recommended guidelines. In two instances where pooling of data was possible, LLLT showed a positive effect size; in studies of lateral epicondylitis that scored > or =6 on the PEDro scale, participants' grip strength was 9.59 kg higher than that of the control group; for participants with Achilles tendinopathy, the effect was 13.6 mm less pain on a 100 mm visual analogue scale. CONCLUSION: LLLT can potentially be effective in treating tendinopathy when recommended dosages are used. The 12 positive studies provide strong evidence that positive outcomes are associated with the use of current dosage recommendations for the treatment of tendinopathy. Controlled Clinical Trials as Topic;Humans;Low-Level Light Therapy;Tendinopathy

Analysis of the systemic effect of red and infrared laser therapy on wound repair. OBJECTIVE: To evaluate, using histological analysis, the systemic action and repair process of wounds produced on the back of rats and treated with red, infrared, or both lasers applied directly or indirectly to the wounds. BACKGROUND DATA: Skin tissue repair and wound healing are complex processes that involve a series of dynamic events. Many benefits are associated with biomodulation using laser therapy. METHODS: Thirty-six male Wistar rats were divided into four groups: control (without laser), red laser (aluminium gallium indium phosphide (AlGaInP); lambda=685 nm; phi=0.0314 cm2; CW; P=30 mW; D=20 J, time of irradiation=667 sec), infrared laser (gallium-aluminum-arsenide (GaAlAs): lambda=830 nm; phi=0.0314 cm2; CW; P=50 mW; D=20 J, time of irradiation=401 sec), and both lasers (infrared laser: GaAlAs; lambda=830 nm; phi=0.0314 cm2; CW; P=50 mW; D=10 J, time of irradiation=201 sec+red laser: AlGaInP; lambda=685 nm; phi=0.0314 cm2; CW; P=30 mW; D=10 J, time of irradiation=334 sec; total dose=20 J). Three subgroups were formed according to observation

time points. Three wounds were produced on the back of each animal. Only the wound closest to the head was irradiated in the experimental groups. For the evaluation of skin reaction and wound healing, three animals of each group were killed at 3, 5, and 7 days postoperatively. The irradiation protocol established 48-hour intervals between applications, with the first application immediately after the surgical procedure. RESULTS: In the red and infrared laser group, healing was more advanced in the wound located furthest from the point of laser application. The most effective healing of a proximal wound was verified in the control group on the 7th postoperative day. CONCLUSION: The combined application of red and infrared lasers resulted in the most evident systemic effect on the repair of skin wounds produced in rats. Aluminum Compounds;Phosphines;Indium;gallium phosphide;Gallium;aluminum phosphide;indium phosphide Aluminum Compounds;Animals;Back;Gallium;Indium;Infrared Rays;Low-Level Light Therapy;Male;Phosphines;Photomicrography;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Time Factors;Wound Healing

A predictive model of minimally invasive bipolar fractional radiofrequency skin treatment. BACKGROUND: A novel bipolar fractional radiofrequency (FRF) system with temperature feedback was recently developed for facial laxity and rhytid treatment. The study objective was to develop a model based on published in vivo human skin data that could be extrapolated to aid physicians in making future dosimetry choices under clinically relevant conditions. METHODS: A standard electrode pair designed for use with the FRF system was modeled using finite element analysis (FEA). The model incorporated temperature feedback from sensors within the electrodes, selectable target dermal temperatures, and an epidermal cooling plate. The model was validated using data obtained during clinical treatments. Thermal injury as a function of target temperatures and electrical conductivity was simulated and then validated using in vivo histology results. RESULTS: Lesion size predicted by the model matched histology samples. Lesion width and height were 1.65 and 1.24 mm compared to 1.75 and 1.21 mm for the model versus in vivo, respectively. The thermal profile remained confined between the proximal and distal ends of the electrodes. Ninety-six percent of power was deposited in the dermis. Dose-response curves showed a nonlinear volume increase to 1.7 and 4.7 mm(3) at target temperatures of 65 and 75 degrees C, respectively, and a low sensitivity to electrical conductivity variation. CONCLUSION: FEA of the Bipolar FRF system revealed that isotherms were mainly within the dermis. Lesion volume was found to be less sensitive to changes in electrical conductivity than to target temperature and duration. Simulation results matched well the in vivo lesion dimensions. To our knowledge, this is the first model of bipolar FRF treatment capable of accurately predicting the thermal response of human skin in vivo. The findings of this study allow for the development of accurate dose-response curves to aid physicians in parameter selection and achieving efficacy and safety profiles. Dose Fractionation, Radiation;Finite Element Analysis;Humans;Immunohistochemistry;Low-Level Light Therapy;Models, Anatomic;Predictive Value of Tests;Radiotherapy Dosage;Sensitivity and Specificity;Skin;Thermal Conductivity

Combination of 308-nm excimer laser with topical pimecrolimus for the treatment of childhood vitiligo. Forty-nine patients enrolled in a single-blinded, randomized, comparing 308-nm excimer laser therapy together with topical 1% pimecrolimus cream twice daily (group A) with excimer laser therapy twice per week (group B). Of 48 patients evaluated after 30 weeks of treatment, 71% of patients from group A achieved Grade 3 or 4 repigmentation compared with 50% in group B. Significant difference was found between group A and B at the end of 30 weeks of treatment ($p = 0.001$). Dermatologic Agents;pimecrolimus;Tacrolimus Administration, Cutaneous;Adolescent;Child;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Single-Blind Method;Skin Pigmentation;Tacrolimus;Vitiligo

The effects of low-level laser therapy on bone in diabetic and nondiabetic rats. OBJECTIVE: The aim of the present study was to examine the effects of low-level laser therapy (LLLT) on the tibia of streptozotocin-induced diabetic (STZ-D) rats. BACKGROUND DATA: LLLT has been found to accelerate fracture healing in animals. Diabetes mellitus decreases bone volume and its biomechanical parameters. MATERIALS AND METHODS: Twenty rats were divided randomly into four groups. Rats in the first two groups were administrated a single injection of STZ to induce diabetes, while animals in groups 3 and 4 were given a sham injection of distilled water. The right tibia in groups 1 and 2 was treated with a He-Ne laser (632.8 nm, 10 mW) of 28.6 and 382.2 J/cm(2), respectively. LLLT was performed daily for 14 consecutive days. The right tibia of rats in group 3 was treated with LLLT the same as group 2. The right tibia of rats in group 4 was used for based line studies. After 14 d, right tibiae and left tibiae (control bone) were extracted and subjected to the three-point bending test and histological study. RESULTS: Maximum force (N) was significantly greater in laser-treated bones of groups 2 and 3 compared with their relevant control groups (paired Student t test, $p = 0.05$ and $p = 0.007$, respectively). Density of the bone lamella meshwork of compact bone in group 2 was significantly greater in comparison with its control group (paired Student t test, $p = 0.005$). CONCLUSION: LLLT on tibia of STZ-D rats increased the bone lamella meshwork density of compact bone and also increased its strength. Animals;Bone Density;Diabetes Mellitus, Experimental;Disease Models, Animal;Fracture Healing;Lasers, Gas;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibia;Tibial Fractures

Low-level laser therapy using 80-Hz pulsed infrared diode laser accelerates third-degree burn healing in rat. OBJECTIVE: To evaluate 80-Hz pulsed infrared diode low-level laser therapy (LLLT) for third-degree burn healing in rats. BACKGROUND DATA: Review of the literature indicates that LLLT has a biostimulatory effect on wound healing, although no clear recommendation can be made yet. METHODS: Forty-eight male rats were divided into groups 1 and 2. On day 0, three third-degree burns were made on the dorsum of each rat using steam. In group 1, the first burn was exposed to an 80-Hz pulsed 890-nm infrared diode laser at 0.396 J/cm2 three times a week. In group 2, the first burn was exposed to the inactivated laser. In both groups, the second burns were treated with topical application of nitrofurazone 0.2%, and third burns did not receive any treatment and were considered as control burns. Burns were clinically examined. The rats were treated for 8, 12, and 20 days in both groups. On days 8, 2, and 20, microbiological samples of burns were collected and analyzed. Data were analyzed using the chi-square method. RESULTS: The paired Student t-test showed that the wound closure rate of laser-treated burns (17.6+/-1.86 days) was significantly longer than that of the control burns (19.6+/-0.81 days) ($p=0.007$).The number of laser-treated burns that closed was significantly higher than controls. Chi-square tests showed that there was not significant difference between each microorganism (Staphylococcus epidermis, S. aureus and Pseudomonas aeruginosa). CONCLUSION: LLLT using an 80-Hz pulsed infrared diode laser accelerated third-degree burn healing in rat. Animals;Burns;Chi-Square Distribution;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Effect of low-energy gallium-aluminum-arsenide and aluminium gallium indium phosphide laser irradiation on the viability of C2C12 myoblasts in a muscle injury model. OBJECTIVE: To evaluate the effect of phototherapy on the viability of cultured C2C12 myoblasts under different nutritional conditions (muscle injury model) using low-energy gallium-aluminum-arsenide (GaAlAs) and aluminium-gallium-indium-phosphide (InGaAlP) lasers with different wavelengths and powers. BACKGROUND DATA: The beneficial effects of phototherapy using low-energy lasers depend on irradiation parameters and type of laser used, but there are no data in the literature on C2C12 myoblasts proliferation after phototherapy with GaAlAs and InGaAlP lasers. METHODS: A C2C12 cell line cultured in regular (10% fetal bovine serum, FBS) and nutrient-deficient (5% FBS) media were

irradiated with low-energy GaAlAs (660 nm) and InGaAlP (780 nm) lasers with energy densities of 3.8, 6.3, and 10 J/cm2, and 3.8, 10, and 17.5 J/cm2, respectively. Cell proliferation was assessed indirectly 24 h after irradiation by measuring the mitochondrial activity and using the crystal violet assay. RESULTS: There were no significant differences in cell viability between laser-treated myoblasts and control cultures for all tested parameters after 24 h of cell culture, although cell cultures grown in regular nutrient medium supplemented with 10% FBS exhibited higher growth rates than cultures, irradiated or not, grown in nutrient-deficient medium. CONCLUSION: Laser phototherapy did not improve C2C12 viability under regular or nutrient-deficient (muscle injury model) conditions using the above parameters. Aluminum Compounds;Arsenicals;Phosphines;Indium;gallium arsenide;gallium phosphide;Gallium;aluminum phosphide;indium phosphide Aluminum Compounds;Animals;Arsenicals;Cell Line;Cell Proliferation;Cell Survival;Cells, Cultured;Gallium;Indium;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Muscle, Skeletal;Myoblasts;Phosphines

The effect of gallium-aluminum-arsenide 808-nm low-level laser therapy on healing of skin incisions made using a diode laser. BACKGROUND AND OBJECTIVE: To investigate the effect of low-level laser therapy (LLLT) on healing of skin incisions made using a diode laser in rats. MATERIAL AND METHODS: Eighteen Wistar rats were used for this study. Two parallel incisions (approximately 15 mm in length) were performed on the left and right side of the dorsum of each rat using a diode laser (4-W output powers with a tip 300 microm in diameter, 6 mm long, and 635-nm aiming beam). The wound on the left side of each rat received laser stimulation (10 J/cm2) from an 808-nm-wavelength gallium-aluminum-arsenide laser (Laser Source Power 20W, Laser Class IV, Medical Class IIB, Input Power Supply 230+/-10% VAC). They were assigned to two experimental groups: Group 1, diode laser (control); Group 2, diode laser+LLLT. RESULTS: It was determined that there was a significant difference between the diode laser and diode laser+LLLT groups in inflammation at day 10 and a difference in reepithelization at day 20 but no significant difference in inflammation at day 20. CONCLUSIONS: Diode laser incision (4 W) with 10 J/cm2 LLLT seems to have a beneficial effect on skin incisions in rats. As a result, it can be concluded that wound closure was significantly enhanced with lllt on diode laser incisions in rats. Arsenicals;gallium arsenide;Gallium;Aluminum Aluminum;Animals;Arsenicals;Gallium;Lasers, Semiconductor;Low-Level Light Therapy;Photomicrography;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Wound Healing

Effects of low-level laser irradiation on rat skeletal muscle injury after eccentric exercise. BACKGROUND AND OBJECTIVE: The effect of photobiomodulation on delayed onset muscle soreness remains unknown. This study represents the first investigation of this treatment using an animal model. METHODS: Seventy-two Sprague-Dawley rats were randomly divided into five groups: sedentary control group, exercise control group and three exercise-plus-laser groups. Downhill running was used to induce muscle injury in the gastrocnemius muscle. He-Ne laser irradiations were administered to the injured muscles immediately and at 18 and 42 h after exercise in the three exercise-plus-laser groups at 12, 28, and 43 J/cm2, respectively. Histological examination and serum creatine kinase (CK), muscle superoxide dismutase (SOD) and malondialdehyde (MDA) analyses were done at 24 and 48 h after exercise. RESULTS: The exercise control group exhibited a marked inflammation in the gastrocnemius muscle and significant elevations in serum CK activity and muscle MDA level after downhill running. He-Ne laser irradiation at 43 J/cm2 inhibited muscle inflammation, significantly enhanced muscle SOD activity and significantly reduced serum CK activity and muscle MDA level at both 24 and 48 h after exercise, whereas the irradiation at 12 or 28 J/cm2 slightly inhibited muscle inflammation and significantly reduced serum CK activity at 48 h after exercise only ($P<0.05$). CONCLUSIONS: Low-level He-Ne laser therapy could exert therapeutic effects on eccentric exercise-induced rat muscle injury through enhancing muscle anti-oxidative capacity and reducing the

inflammatory reaction. The photobiomodulation was dose-dependent, and the 43 J/cm2 dose was the most efficient among the doses used. Malondialdehyde;Superoxide Dismutase;Creatine Kinase Analysis of Variance;Animals;Creatine Kinase;Dose-Response Relationship, Radiation;Female;Inflammation;Low-Level Light Therapy;Malondialdehyde;Muscle, Skeletal;Physical Conditioning, Animal;Random Allocation;Rats;Rats, Sprague-Dawley;Superoxide Dismutase
Photomedicine and LLLT literature watch. Humans;Phototherapy
The effects of infrared low-level laser therapy on healing of partial osteotomy of tibia in streptozotocin-induced diabetic rats. OBJECTIVE: The effects of low-level laser therapy (LLLT) on a bone defect model in streptozotocin-induced diabetic (STZ-D) rats was examined. BACKGROUND DATA: LLLT accelerates bone fracture repair in healthy animals, but its effect in diabetic animals is unclear. METHODS: Twenty-eight rats were divided into five groups: 1 (diabetes, no LLLT), 2 (diabetes, LLLT high dose), 3 (diabetes, LLLT low dose), 4 (no diabetes, no LLLT), and 5 (no diabetes, LLLT low dose) Diabetes was induced by a single injection of STZ in rats of groups 1, 2, and 3. A bone defect was made in the right tibia of rats in all groups. The defect in groups 2, 3, and 5 was treated with LLLT (890 nm, 70 W, 3000 Hz, circular beam shape, and 1 cm(2) spot size). Doses of 23.3 J/cm(2) (530 s) for group 2 and 11.6 J/cm(2) (265 s) for groups 3 and 5 were applied three times a week. The right tibias were collected 42 days after surgery and subjected to three-point bending test on a material testing machine (MTM) until fracture occurred. Data was automatically recorded on the MTM formed the load-deformation curve. RESULTS: Mann-Whitney test showed that LLLT with 11.6 J/cm(2) significantly increased bending stiffness and maximum force in diabetic rats compared with group 1 (both p = 0.041). CONCLUSION: LLLT in an experimental diabetic model enhanced bone repair with a higher bending stiffness and maximum force compared to the control group. Toxins, Biological;Streptozocin Animals;Diabetes Mellitus;Disease Models, Animal;Fracture Healing;Fractures, Bone;Infrared Rays;Low-Level Light Therapy;Male;Osteotomy;Rats;Rats, Wistar;Streptozocin;Tibia;Toxins, Biological
Effect of biostimulation on wound healing in diabetic rats. BACKGROUND AND OBJECTIVE: Impaired wound healing is a complication of diabetes and is a serious problem in clinical practice. The purpose of this study was to evaluate the effect of biostimulation on wound healing in diabetic rats. MATERIAL AND METHODS: Thirty-six female Wistar rats weighting 250 to 300 g were used for this study. Diabetes was chemically induced with streptozotocin. Eighteen nondiabetic and 18 diabetic rats were included in the analysis. One incision was performed on the dorsum of each nondiabetic rat and the wound served as a control. Two parallel incisions were performed on the dorsum of each diabetic rat. The laser treatments were started immediately after surgery and were repeated on the second, fourth, sixth, and eighth days. A GaAlAs laser was used with an 808 nm wavelength. One wound of each diabetic rat received 10 J/cm(2) laser stimulation. RESULTS: Inflammation and re-epithelialization were evaluated in all groups, and there was a significant difference between the nondiabetic scalpel, diabetic scalpel, and diabetic scalpel + biostimulation groups. CONCLUSIONS: Treatment with laser biostimulation showed a beneficial effect on wound healing in diabetic rats. It can be concluded that low-level laser therapy (808 nm laser at 10 J/cm(2)) can have a beneficial effect on diabetic wound healing, when used at 2 d intervals over 5 d. Animals;Diabetes Mellitus;Disease Models, Animal;Female;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Wound Healing
Laser phototherapy in dentistry. Dentistry;Humans;Laser Therapy;Phototherapy
Influence of different conditioning methods on the shear bond strength of novel light-curing nano-ionomer restorative to enamel and dentin. The purpose of this study was to investigate shear bond strength (SBS) between a light-curing nano-ionomer restorative and enamel or dentin after acid etching, after erbium:yttrium-aluminum-garnet (Er:YAG) laser etching, or after combined treatment.

Forty third molars were selected, the crowns were sectioned, and 80 tooth slabs were obtained. The specimens were assigned to two groups, which were divided into four subgroups(n = 10). Group 1 [enamel (e)], treated with 37% phosphoric acid (A) + Ketac nano-primer (K); group 2 [dentin (d)], (A) + (K); group 3(e), Er:YAG laser etching (L) + (A) + (K); group 4(d), (L) + (A) + (K); group 5(e), (L) + (K); group 6(d), (L) + (K); group 7(e), (K); group 8(d), (K). The SBS of the specimens was measured with a universal test machine (1 mm/min). Data were analyzed by independent samples t-test, one-way analysis of variance (ANOVA) and a post-hoc Duncan test ($p < 0.05$). No difference was determined between groups 3 and 5 ($p > 0.05$). Group 7 exhibited higher SBS values than those of groups 3 and 5 ($p < 0.05$). Group 1 showed higher SBSs than those of groups 3, 5 and 7 ($p < 0.05$). There was no significant difference between groups 4 and 6 ($p > 0.05$). No difference was observed between groups 2 and 4 ($p > 0.05$). However, group 2 presented higher SBSs than did group 6 ($p < 0.05$). Group 8 exhibited the highest SBS values when compared with groups 2, 4 and 6 ($p < 0.05$). Er:YAG laser adversely affected the adhesion of the light-curing nano-ionomer restorative to both enamel and dentin. Glass Ionomer Cements Acid Etching, Dental;Dental Bonding;Dental Enamel;Dental Etching;Dental Restoration, Permanent;Dental Stress Analysis;Dentin;Glass Ionomer Cements;Humans;In Vitro Techniques;Lasers, Solid-State;Light-Curing of Dental Adhesives;Low-Level Light Therapy;Shear Strength

Photodynamic therapy for head and neck dysplasia and cancer. OBJECTIVE: To determine the response of dysplasia, carcinoma in situ (CIS), and T1 carcinoma of the oral cavity and larynx to photodynamic therapy with porfimer sodium. DESIGN: Prospective trial. SETTING: A National Cancer Institute-designated cancer institute. PATIENTS: Patients with primary or recurrent moderate to severe oral or laryngeal dysplasia, CIS, or T1N0 carcinoma. INTERVENTION: Porfimer sodium, 2 mg/kg of body weight, was injected intravenously 48 hours before treatment. Light at 630 nm for photosensitizer activation was delivered from an argon laser or diode laser using lens or cylindrical diffuser fibers. The light dose was 50 J/cm(2) for dysplasia and CIS and 75 J/cm(2) for carcinoma. MAIN OUTCOME MEASURES: Response was evaluated at 1 week and at 1 month and then at 3-month intervals thereafter. Response options were complete (CR), partial (PR), and no (NR) response. Posttreatment biopsies were performed in all patients with persistent and recurrent visible lesions. RESULTS: Thirty patients were enrolled, and 26 were evaluable. Mean follow-up was 15 months (range, 7-52 months). Twenty-four patients had a CR, 1 had a PR, and 1 had NR. Three patients with oral dysplasia with an initial CR experienced recurrence in the treatment field. All the patients with NR, a PR, or recurrence after an initial CR underwent salvage treatment. Temporary morbidities included edema, pain, hoarseness, and skin phototoxicity. CONCLUSION: Photodynamic therapy with porfimer sodium is an effective treatment alternative, with no permanent sequelae, for oral and laryngeal dysplasia and early carcinoma. TRIAL REGISTRATION: clinicaltrials.gov Identifier: NCT00530088. Photosensitizing Agents;Dihematoporphyrin Ether Adult;Aged;Aged, 80 and over;Carcinoma in Situ;Dihematoporphyrin Ether;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Staging;Photochemotherapy;Photosensitizing Agents;Precancerous Conditions;Prospective Studies;Treatment Outcome

Effect of acid etching duration on tensile bond strength of composite resin bonded to erbium:yttrium-aluminium-garnet laser-prepared dentine. Preliminary study. The purpose of this study was to compare the tensile bond strength of composite resin bonded to erbium:yttrium-aluminium-garnet (Er:YAG) laser-prepared dentine after different durations of acid etching. The occlusal third of 68 human third molars was removed in order to expose the dentine surface. The teeth were randomly divided into five groups: group B (control group), prepared with bur and total etch system with 15 s acid etching [37% orthophosphoric acid (H(3)PO(4))]; group L15, laser photo-ablated dentine (200 mJ) (laser irradiation conditions: pulse duration 100 micros, air-water spray, fluence 31.45 J/ cm(2), 10 Hz,

non-contact hand pieces, beam spot size 0.9 mm, irradiation speed 3 mm/s, and total irradiation time 2 x 40 s); group L30, laser prepared, laser conditioned and 30 s acid etching; group L60, laser prepared, laser conditioned and 60 s acid etching; group L90, laser prepared, laser conditioned and 90 s acid etching. A plot of composite resin was bonded onto each exposed dentine and then tested for tensile bond strength. The values obtained were statistically analysed by analysis of variance (ANOVA) coupled with the Tukey-Kramer test at the 95% level. A 90 s acid etching before bonding showed the best bonding value ($P < 0.05$) when compared with all the other groups including the control group. There is no significance difference between other groups, nor within each group and the control group. There was a significant increase in tensile bond strength of the samples acid etched for 90 s. Composite Resins Acid Etching, Dental;Composite Resins;Dental Bonding;Dental Etching;Dental Stress Analysis;Dentin;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Tensile Strength;Time Factors

Chapter 25: Phototherapy in peripheral nerve injury: effects on muscle preservation and nerve regeneration. Posttraumatic nerve repair and prevention of muscle atrophy represent a major challenge of restorative medicine. Considerable interest exists in the potential therapeutic value of laser phototherapy for restoring or temporarily preventing denervated muscle atrophy as well as enhancing regeneration of severely injured peripheral nerves. Low-power laser irradiation (laser phototherapy) was applied for treatment of rat denervated muscle in order to estimate biochemical transformation on cellular and tissue levels, as well as on rat sciatic nerve model after crush injury, direct or side-to-end anastomosis, and neurotube reconstruction. Nerve cells' growth and axonal sprouting were investigated in embryonic rat brain cultures. The animal outcome allowed clinical double-blind, placebo-controlled randomized study that measured the effectiveness of 780-nm laser phototherapy on patients suffering from incomplete peripheral nerve injuries for 6 months up to several years. In denervated muscles, animal study suggests that the function of denervated muscles can be partially preserved by temporary prevention of denervation-induced biochemical changes. The function of denervated muscles can be restored, not completely but to a very substantial degree, by laser treatment initiated at the earliest possible stage post injury. In peripheral nerve injury, laser phototherapy has an immediate protective effect. It maintains functional activity of the injured nerve for a long period, decreases scar tissue formation at the injury site, decreases degeneration in corresponding motor neurons of the spinal cord, and significantly increases axonal growth and myelinization. In cell cultures, laser irradiation accelerates migration, nerve cell growth, and fiber sprouting. In a pilot, clinical, double-blind, placebo-controlled randomized study in patients with incomplete long-term peripheral nerve injury, 780-nm laser irradiation can progressively improve peripheral nerve function, which leads to significant functional recovery. A 780-nm laser phototherapy temporarily preserves the function of a denervated muscle, and accelerates and enhances axonal growth and regeneration after peripheral nerve injury or reconstructive procedures. Laser activation of nerve cells, their growth, and axonal sprouting can be considered as potential treatment for neural injury. Animal and clinical studies show the promoting action of phototherapy on peripheral nerve regeneration, which makes it possible to suggest that the time for broader clinical trials has come. Receptors, Cholinergic;Creatine Kinase Animals;Creatine Kinase;Humans;Median Nerve;Muscle, Skeletal;Nerve Regeneration;Neurons;Peripheral Nerve Injuries;Peripheral Nerves;Phototherapy;Receptors, Cholinergic;Sciatic Nerve

Low-power laser to prevent oral mucositis in autologous hematopoietic stem cell transplantation. Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Male;Stomatitis;Time Factors;Transplantation, Autologous

Fractional photothermolysis for the treatment of postinflammatory hyperpigmentation. Female;Humans;Hyperpigmentation;Inflammation;Low-Level Light Therapy;Middle Aged;Neck;Radiotherapy Dosage
Treatment of angiofibromas of tuberous sclerosis with 5-aminolevulinic acid blue light photodynamic therapy followed by immediate pulsed dye laser. Photosensitizing Agents;Aminolevulinic Acid Adolescent;Adult;Aminolevulinic Acid;Angiofibroma;Child;Combined Modality Therapy;Facial Neoplasms;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Skin Neoplasms;Tuberous Sclerosis;Young Adult
Successful treatment of severe keratosis pilaris rubra with a 595-nm pulsed dye laser. Adolescent;Face;Humans;Keratosis;Low-Level Light Therapy;Male
A study of low power laser on the regenerative process of Girardia tigrina (Girard,1850) (Turbellaria; Tricladida; Dugesiidae). The mechanism of regeneration does not start to restore the wound until its corresponding epimorphic phase. A bioestimulation of tissues and cells by laser radiation depends on the wavelength, on the dose, and on the intensity of the light. The goal of this work was to verify the effect of the low power laser at 660 nm on the regenerative process of Girardia tigrina. The specimens were maintained in the laboratory under a temperature ranging from 19 degrees up to 24 degrees C for 21 days. The planarians were anesthetized by placing them on ice and then cut them with a scalpel. The three treatments were as following: animals individually irradiated with 14 sessions with 1 minute duration (treatment 1), 14 sessions with 3 minutes duration (treatment 2), and without irradiation (control). The planarians were amputated and divided in three study treatments: a control group (without radiation), and two other treatments: irradiated for 1 minute, and irradiated for 3 minutes. The animals were irradiated with diode laser (660 nm) with 3.3 +/- 0.3 mW of power, using 0.94 mW.mm-2 power density for each irradiation procedure. During the experiment, 14 irradiation sessions were undertaken. The specimens were fixed in Bouin, and stained with hematoxyline and eosin. From observation and histological analysis, it was possible to assess the effects of interaction between laser and tissue. The head fragment after 1 minute of irradiation presented a better organized tissue scheme, when compared with the other treatments. Aspects of the body fragments submitted to 3 minutes of light treatment were very similar to fragments that had not been injured. It can be concluded that there are changes in the quality of regeneration when treated with low power laser under the conditions mentioned above. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Regeneration;Turbellaria
Contemporary hair transplantation. BACKGROUND: The field of hair transplantation has evolved considerably over the last quarter century. Performed correctly, the cosmetic results of contemporary hair transplantation are virtually undetectable in women and men. Large, pluggy "punch grafts" have been replaced with natural-appearing follicular unit grafts, which maintain their existing anatomy and with proper technique can match the orientation of surrounding hair follicles. OBJECTIVE: To review all of the steps involved in hair transplantation surgery and to provide an overview of medications used in conjunction with transplantation to help prevent hair loss. MATERIALS, METHODS, AND RESULTS: The authors review key aspects of the consultation, physical examination, selection of appropriate candidates, excision of donor area, hairline design, graft creation and placement, and postoperative instructions. The role of medications such as minoxidil and finasteride in preventing ongoing hair loss is an essential part of the treatment plan. For nonsurgical candidates, other treatments such as wigs, hairpieces, and camouflages are reviewed. Future trends may involve the use of low-level laser light therapy, dutasteride, and cloning of follicles. CONCLUSION: Patients and physicians alike are pleased with the results of contemporary hair transplantation, and physicians can

now recommend the procedure without reservation. The authors have indicated no significant interest with commercial supporters. Alopecia;Hair;Humans;Transplantation, Autologous

[Effect of intravenous laser blood irradiation on endothelial dysfunction in patients with hypertensive disease]. The aim of this work was to study effect of intravenous laser blood irradiation (ILBI) on endothelial dysfunction in 120 patients (mean age 53.4 +/- 1.3 yr) with grade I-II hypertensive disease (HD) allocated to 2 groups. Traditional drug therapy given to patients of control group was supplemented by ILBI using a Mulat laser therapy device in the study group. Endothelial function was evaluated from the total plasma concentration of stable NOx metabolites, nitrates (NO3-), nitrites (NO2-), and Willebrand's factor. HD patients were found to have elevated activity of the Willebrand factor and show 3 types of response of the NO generating system: (1) decreased NO synthesis, (2) lack of its changes, and (3) increased NO synthesis. NO production in HD patients negatively correlated with systolic (r = -0.59) and diastolic (r = - 0.64) arterial pressure (AP) which suggests the relationship between decreased NO production and elevated AP. Inclusion of ILBl in the therapy of HD resulted in a significant decrease of Willebrand's factor activity and normalization of the NO level regardless of its initial value. von Willebrand Factor;Nitric Oxide Adult;Aged;Blood;Blood Pressure;Endothelium, Vascular;Female;Follow-Up Studies;Humans;Hypertension;Low-Level Light Therapy;Male;Middle Aged;Nitric Oxide;Treatment Outcome;Vasodilation;von Willebrand Factor

Effect of laser phototherapy on recurring herpes labialis prevention: an in vivo study. Alternative treatment for recurrent labial infection by herpes simplex virus (HSV) have been considered. The aim of this study was to evaluate the effectiveness of laser phototherapy in prevention and reduction of severity of labial manifestations of herpes labialis virus. Seventy-one patients, divided into experimental (n = 41) and control (n = 30) groups were followed up for 16 months. Patients in the control group were treated topically with aciclovir and patients in the experimental group were subjected to laser phototherapy (one session per week, 10 weeks): 780 nm, 60 mW, 3.0 J/cm(2) or 4.5 J/cm(2) on healthy (no HSV-1 infection) and affected (with HSV-1 infection) tissues. Patients in the experimental group presented a significant decrease in dimension of herpes labialis lesions (P = 0.013) and inflammatory edema (P = 0.031). The reduction in pain level (P = 0.051) and monthly recurrences (P = 0.076) did not reach statistical significance. This study represents an in vivo indication that this treatment should be further considered as an effective alternative to therapeutic regimens for herpes labialis lesions. Antiviral Agents;Acyclovir Acyclovir;Adult;Antiviral Agents;Female;Herpes Labialis;Humans;Low-Level Light Therapy;Male;Pain;Secondary Prevention

Influence of etching time on bond strength in dentin irradiated with erbium lasers. The purpose of this in vitro study was to evaluate the effect of etching time on the tensile bond strength (TBS) of a conventional adhesive bonded to dentin previously irradiated with erbium:yttrium-aluminum-garnet (Er:YAG) and erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) lasers. Buccal and lingual surfaces of 45 third molars were flattened until the dentin was exposed and randomly assigned to three groups (n = 30) according to the dentin treatment: control (not irradiated), irradiated with Er:YAG (1 W; 250 mJ; 4 Hz; 80.6 J/cm(2)) laser or Er,Cr:YSGG (4 W; 200 mJ; 20 Hz; 71.4 J/cm(2)) laser, and into three subgroups (n = 10) according to acid etching time (15 s, 30 s or 60 s) for each experimental group. After acid etching, the adhesive was applied, followed by the construction of an inverted cone of composite resin. The samples were immersed in distilled water (37 degrees C for 24 h) and subjected to TBS test [50 kilogram-force (kgf), 0.5 mm/min]. Data were analyzed by analysis of variance (ANOVA) and Tukey statistical tests (P < or = 0.05). Control group samples presented significant higher TBS values than those of all lased groups. Both irradiated groups exhibited similar TBS values. Samples subjected to the different etching times in each experimental group presented similar TBS. Based on the conditions of this in vitro study we concluded that Er:YAG and Er,Cr:YSGG laser irradiation of the dentin weakens the bond strength of the adhesive. Moreover,

increased etching time is not able to modify the bonding strength of the adhesive to irradiated dentin. Acid Etching, Dental;Dental Bonding;Dental Etching;Dental Stress Analysis;Dentin;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Tensile Strength;Time Factors

The effect of erbium, chromium:yttrium-scandium-gallium-garnet laser etching on marginal integrity of a resin-based fissure sealant in primary teeth. The aim of this in vitro study was to evaluate the effect of erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser pretreatment alone, or associated with acid etching, on the quality of marginal integrity (microleakage and marginal gap) of a resin-based fissure sealant in primary teeth. Fifty sound primary molar teeth were randomly assigned to one of five study groups, pretreated as follows: (1) 35% orthophosphoric acid etching; (2) 2.5 W laser etching; (3) 3.5 W laser etching; (4) 2.5 W laser + 35% orthophosphoric acid etching; (5) 3.5 W laser + 35% orthophosphoric acid etching. After surface pretreatment, a resin-based sealant (ClinPro) was applied to the fissures. Sample teeth were then subjected to thermocycling and stored thereafter in distilled water at 37 degrees C for 1 month. Following immersion in 0.5% basic fuchsin solution for 24 h, three bucco-lingual slices of each sample tooth were scored under a stereo-microscope. Statistical analysis was performed with Kruskal-Wallis one-way analysis of variance (ANOVA) and Pearson chi-square tests. The level of significance was set at $P < 0.05$. Microleakage scores of group 1 were significantly less than those of groups 2 and 3 ($P < 0.05$), whereas no statistically significant difference was observed between groups 1, 4 and 5 ($P > 0.05$). In terms of marginal gap formation, no significant difference was observed between groups ($P > 0.05$). It was concluded that Er,Cr:YSGG laser etching did not eliminate the need for acid etching. When combined with acid etching, Er,Cr:YSGG laser seems to be as effective as conventional acid etching. Clinpro Sealant;Composite Resins;Pit and Fissure Sealants Acid Etching, Dental;Composite Resins;Dental Caries;Dental Etching;Dental Fissures;Dental Leakage;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Pit and Fissure Sealants

Effect of laser acupoint treatment on blood pressure and body weight-a pilot study. OBJECTIVE: This study reports on the effects of laser acupuncture on blood pressure, body weight, and heart rate variability by stimulating acupuncture points and meridians on college students and faculty members. METHODS: Forty-five students and faculty members from a chiropractic college were recruited in the study. All subjects signed a written informed consent before their participation in the study. This study was a randomized controlled pilot study with subjects divided into control and experimental groups. The control group received a sham low-level laser therapy treatment with no power output to the laser during their "treatment." The experimental group was treated with an activated laser. The acupuncture points used in this study were LI 4 and LI 11 for body weight and blood pressure. The treatment groups received 16 J of laser energy output for a total treatment time of 8 minutes (4 minutes for each of the 2 points). RESULTS: After using the laser treatment for 90 days (at least 12 treatments per subject), both the systolic and diastolic blood pressures decreased significantly ($P < .01$). The mean systolic blood pressure was 129.6 +/- 14.7 mm Hg before the treatment and was reduced to 122.5 +/- 17.2 mm Hg ($P < .001$). The mean diastolic blood pressure was 85.6 +/- 8.0 mm Hg before treatment and was reduced to 77.2 +/- 8.7 mm Hg ($P < .001$). Subject's body weight was reduced in the active acupoint group, but the weight reduction did not reach a significant level. There were no significant changes in the heart rate variability. CONCLUSION: It was concluded that low-level laser treatment of acupoint resulted in lower blood pressure by stimulating the LI 11 and LI 4. No significant difference was observed in both the body weight and heart rate variability after the laser acupoint treatment.

Effects of low-level laser therapy after Corticision on tooth movement and paradental remodeling. BACKGROUND AND OBJECTIVE: Both Corticision and low-level laser therapy (LLLT) are known to

affect the rate of tooth movement. Our objective was to investigate the combined effects of Corticision and LLLT on the tooth movement rate and paradental remodeling in beagles. STUDY DESIGN/MATERIALS AND METHODS: The maxillary second premolars (n = 24) of 12 beagles were randomly divided into four groups (n = 6 per group) based on the treatment modality: group A, only orthodontic force (control); group B, orthodontic force plus Corticision; group C, orthodontic force plus LLLT; group D, orthodontic force plus Corticision and LLLT. RESULTS: Ratios of second premolar-to-canine movement were greater by 2.23-fold in group B and 2.08-fold in group C, but 0.52-fold lesser in group D than in group A. The peak velocity was observed at an earlier stage of tooth movement in group B but at a later stage in group C during the 8-week treatment period. At week 8, both tartrate-resistant acid phosphatase (TRAP)-positive osteoclasts on the compression side and proliferating cell nuclear antigen (PCNA)-positive osteoblasts on the tension side increased significantly (P<.05) in group C but decreased in group D. Histomorphometric analysis revealed that the mean apposition length of newly formed mineralized bone during the 8 weeks of treatment significantly increased in both group B (2.8-fold) and group C (2.2-fold). In group D, the labeling lines on lamina dura were thin and discontinuous, but intratrabecular remodeling and lamellation were found to be active. CONCLUSION: Periodic LLLT after Corticision around a moving tooth decreased the tooth movement rate and alveolar remodeling activity. Analysis of Variance;Animals;Bicuspid;Bone Remodeling;Dental Stress Analysis;Disease Models, Animal;Dogs;Immunohistochemistry;Low-Level Light Therapy;Male;Orthodontic Appliances;Orthodontics;Osteogenesis;Probability;Random Allocation;Reference Values;Tooth Extraction;Tooth Movement Techniques

Assessment of the optical radiation hazard from a home-use intense pulsed light (IPL) source. BACKGROUND AND OBJECTIVES: Intense pulsed light (IPL) systems have evolved and crossed over from the clinic to the home. Studies have shown home-use IPLs to be clinically effective but there has been no published data on ocular safety. It was our aim to measure the spectral and temporal optical radiation output from a home-use IPL and assess the ocular hazard. MATERIALS AND METHODS: The iPulse Personal is a new home-use IPL hair reduction system. We measured its optical radiation spectral output using a calibrated diode array spectrometer that was traceable to national standards. Pulse duration was determined by measurement with a fast photodiode. The results from these measurements were used to assess the optical radiation hazard to the human eye. Retinal thermal hazard (RTH), blue light hazard (BLH), and infrared radiation hazard to the cornea and lens were assessed in accordance with IEC TR 60825-9 and the International Committee on Non-Ionizing Radiation Protection (ICNIRP) Guidelines on Limits of Exposure to Broad-band Incoherent Optical Radiation, as there are no specific international IPL standards. RESULTS: Neither the BLH radiance dose nor the infrared radiation hazard to the cornea and lens irradiance exceeded the exposure limit values (ELVs) set by the ICNIRP. The RTH radiance, however, was exceeded at a fluence of 11 J cm(-2) and pulse duration of 16 milliseconds. Following these results the settings on the IPL were adjusted and the RTH was no longer exceeded at a new fluence of 10 J cm(-2) and pulse duration of 26 milliseconds. CONCLUSIONS: The home-use device that we assessed does not present an optical hazard according to currently available international standards. Cosmetic Techniques;Equipment Design;Equipment Safety;Eye Injuries;Hair Removal;Humans;Incidence;Infrared Rays;Low-Level Light Therapy;Prognosis;Radiation Injuries;Risk Assessment;Spectrum Analysis

Laser induced explosive vapor and cavitation resulting in effective irrigation of the root canal. Part 1: a visualization study. BACKGROUND AND OBJECTIVES: Limited information exists regarding the induction of explosive vapor and cavitation bubbles in an endodontic rinsing solution. It is also not clear whether a fiber has to be moved in the irrigation solution or can be kept stationary. No

information is available on safe power settings for the use of cavitation in the root canal. This study investigates the fluid movements and the mechanism of action caused by an Er,Cr:YSGG laser in a transparent root model. MATERIAL AND METHODS: Glass models with an artificial root canal (15 mm long, with a 0.06 taper and apical diameter of 400 microm) were used for visualization and registration with a high-speed imaging technique (resolution in the microsecond range) of the creation of explosive vapor bubbles with an Er,Cr:YSGG laser at pulse energies of 75, 125, and 250 mJ at 20 Hz using a 200 microm fiber (Z2 Endolase). Fluid movement was investigated by means of dyes and visualization of the explosive vapor bubbles, and as a function of pulse energy and distance of the fiber tip to the apex. RESULTS: The recordings in the glass model show the creation of expanding and imploding vapor bubbles with secondary cavitation effects. Dye is flushed out of the canal and replaced by surrounding fluid. It seems not necessary to move the fiber close to the apex. CONCLUSION: Imaging suggests that the working mechanism of an Er,Cr:YSGG laser in root canal treatment in an irrigation solution can be attributed to cavitation effects inducing high-speed fluid motion into and out the canal. Root Canal Irrigants Dental Pulp Cavity;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Anatomic;Root Canal Irrigants;Root Canal Preparation;Root Canal Therapy;Sensitivity and Specificity;Therapeutic Irrigation;Volatilization

Laser induced explosive vapor and cavitation resulting in effective irrigation of the root canal. Part 2: evaluation of the efficacy. BACKGROUND AND OBJECTIVES: Limited information exists regarding the efficacy of laser activated irrigation (LAI) on removal of root canal debris. This study compares the efficacy of LAI for removal of debris in root canals as compared to conventional irrigation (CI) and passive ultrasonic irrigation (PUI). MATERIALS AND METHODS: A splitted tooth model was constructed with straight roots prepared to a 0.06 taper and an apical diameter of ISO 40. A vertical groove was cut in the canal wall at 2-6 mm to the end of the canal in one halve of the root canal wall and filled with dentinal debris. In group 1 root canals were irrigated with 2.5% NaOCl by hand (20 seconds) with the needle 1 mm short from the apical stop, in group 2 NaOCl was ultrasonically activated (20 seconds) with an Irrisafe tip 1 mm short from the apical stop, and in group 3 NaOCl was activated with an Er,Cr:YSGG laser (Z2 Endolase tip -200 microm fiber, four times for 5 seconds, 75 mJ, 20 Hz, stationary at 5 mm from the apical stop). The remaining quantity of dentin debris in the groove was evaluated using a scoring system. RESULTS: LAI resulted in significantly less debris than PUI ($P<0.005$) and CI ($P<0.0005$). PUI also showed significantly less debris than CI ($P<0.005$). CONCLUSION: Under the conditions of this study LAI is statistically significantly more effective in removing artificially placed dentin debris in a root canal as PUI and CI. Root Canal Irrigants Dental Pulp Cavity;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Anatomic;Root Canal Irrigants;Root Canal Preparation;Root Canal Therapy;Treatment Outcome;Volatilization

Comparison of a 1,550 nm Erbium: glass fractional laser and a chemical reconstruction of skin scars (CROSS) method in the treatment of acne scars: a simultaneous split-face trial. BACKGROUND AND OBJECTIVE: Acne scarring is a common complication of acne but no effective single treatment modality has been developed. To compare the efficacy of 1,550 nm Er:Glass fractional laser and chemical reconstruction of skin scar (CROSS) method in the treatment of acne scars. STUDY DESIGN/MATERIALS AND METHODS: A split-face trial was conducted in 20 patients (10 rolling, 10 icepick types) with acne scars. One side was treated with the 1,550 nm Er:Glass fractional laser three times with a 6-week interval. And the other side was treated with CROSS method two times every 12 weeks. RESULTS: Significant improvement was observed in both sides of the face. In rolling type, the objective and subjective improvement rates were significantly higher in the sides treated with laser than CROSS method. However, in icepick type, there were no statistically significant differences between the two treatment sides. In the laser sides, grades of pain were significantly higher than that of treated with CROSS method. However, downtimes and lasting days of erythema were significantly

longer in the sides treated with CROSS method. CONCLUSION: A 1,550 nm Er:Glass fractional laser and CROSS method are both well-tolerated and effective treatment options in the acne scars. However, there was a relatively small difference between the two treatment modalities. Therefore, dermatologists should consider the acne scar type to select the treatment options. Lasers Surg. Med. 41:545-549, 2009. (c) 2009 Wiley-Liss, Inc. Caustics;Trichloroacetic Acid;Erbium Acne Vulgaris;Administration, Cutaneous;Adult;Caustics;Chemexfoliation;Cicatrix;Dose Fractionation, Radiation;Erbium;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome;Trichloroacetic Acid;Young Adult

The effects of laser irradiation of cartilage on chondrocyte gene expression and the collagen matrix. OBJECTIVES: Laser reshaping of cartilage is an emerging technology aimed at replacing conventional techniques for aesthetic and reconstructive surgery. Little is known about the mechanisms of wound healing following the photothermal heating during laser reshaping and, ultimately, how collagen remodels in the irradiated tissue. Healthy hyaline and elastic cartilage as found in the ear, nose, larynx, and trachea does not express collagen type I which is characteristic of fibro-cartilage and scar tissue. The aim of the study was to determine if collagen I and II gene expression occurs within laser irradiated rabbit septal cartilage. METHODS: Nasal septum harvested from freshly euthanized New Zealand White rabbits were irradiated with an Nd:YAG laser. After 2 weeks in culture, the laser spot and surrounding non-irradiated regions were imaged using immunofluorescence staining and evaluated using reverse transcription polymerase chain reaction (RT-PCR) to determine the presence of collagen I and II, and ascertain collagen I and II gene expression, respectively. RESULTS: All laser irradiated specimens showed a cessation in collagen II gene expression within the center of the laser spot. Collagen II was expressed in the surrounding region encircling the laser spot and within the non-irradiated periphery in all specimens. Immunohistochemistry identified only type II collagen. Neither collagen I gene expression nor immunoreactivity were identified in any specimens regardless or irradiation parameters. CONCLUSIONS: Laser irradiation of rabbit septal cartilage using dosimetry parameters similar to those used in laser reshaping does not result in the detection of either collagen I gene expression or immunoreactivity. Only collagen type II was noted after laser exposure in vitro following cell culture, which suggests that the cellular response to laser irradiation is distinct from that observed in conventional wound healing. Laser irradiation of cartilage can leave an intact collagen matrix which likely allows chondrocyte recovery on an intact scaffold. Collagen Animals;Chondrocytes;Collagen;Disease Models, Animal;Dose-Response Relationship, Radiation;Extracellular Matrix;Gene Expression Regulation;Immunohistochemistry;Low-Level Light Therapy;Nasal Cartilages;Nasal Septum;Rabbits;Radiation Dosage;Regeneration;Reverse Transcriptase Polymerase Chain Reaction;Sensitivity and Specificity

In vitro investigation of intra-canal dentine-laser beam interaction aspects: I. Evaluation of ablation capability (ablation rate and efficiency). The aim of this study was to determine the amount of intra-canal dentine removed with an erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser using different endodontic tips and different power settings. Ninety intact extracted bovine teeth were selected as samples. After sectioning the roots and preparing the testing cylinders, we divided the samples into three main groups (A, B, C), with further subdivision of each group to be irradiated with three different powers (1500 mW, 1750 mW and 2000 mW). An Er,Cr:YSGG laser system (2.78 microm, 140 micros, 20 Hz and 65% water to 35% air ratio) was used for irradiation, and the loss of intra-canal dentine mass was calculated by the difference between the initial and final sample masses. Data were analysed with Kolmogorov-Smirnov, analysis of variance (ANOVA) and Tukey tests. At a significance level of alpha = 1%, the results showed statistically significant differences ($P < 0.0001$) between different tip groups, regarding both the ablation rate and the ablation efficiency criteria. With regard to the three irradiation power settings, statistically

significant difference were recorded only between groups C and A, for the ablation rate criteria. The intra-canal ablation ability of the Er,Cr:YSGG laser improved with increasing power and/or tip diameter. The latter exhibited a stronger influence on ablation rate and efficiency. Laser intra-canal ablation is an important addition to the field of endodontics; nevertheless, further investigations and system improvements are required. Animals;Cattle;Dentin;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Obturation;Root Canal Preparation
Lasers as aids for cleaning, shaping, and obturation of the root canal system. Dental Pulp Cavity;Dentin;Disinfection;Humans;Low-Level Light Therapy;Retreatment;Root Canal Obturation;Root Canal Preparation
Application of a biodegradable macromolecular contrast agent in dynamic contrast-enhanced MRI for assessing the efficacy of indocyanine green-enhanced photothermal cancer therapy. PURPOSE: To investigate the effectiveness of a polydisulfide-based biodegradable macromolecular contrast agent, (Gd-DTPA)-cystamine copolymers (GDCC), in assessing the efficacy of indocyanine green-enhanced photothermal cancer therapy using dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI). MATERIALS AND METHODS: Breast cancer xenografts in mice were injected with indocyanine green and irradiated with a laser. The efficacy was assessed using DCE-MRI with GDCC of 40 kDa (GDCC-40) at 4 hours and 7 days after the treatment. The uptake of GDCC-40 by the tumors was fit to a two-compartment model to obtain tumor vascular parameters, including fractional plasma volume (f(PV)), endothelium transfer coefficient (K(PS)), and permeability surface area product (PS). RESULTS: GDCC-40 resulted in similar tumor vascular parameters at three doses, with larger standard deviations at lower doses. The values of f(PV), K(PS), and PS of the treated tumors were smaller ($P < 0.05$) than those of untreated tumors at 4 hours after the treatment and recovered to pretreatment values ($P > 0.05$) at 7 days after the treatment. CONCLUSION: DCE-MRI with GDCC-40 is effective for assessing tumor early response to dye-enhanced photothermal therapy and detecting tumor relapse after the treatment. GDCC-40 has a potential to noninvasively monitor anticancer therapies with DCE-MRI. Coloring Agents;Contrast Media;Macromolecular Substances;Polymers;Indocyanine Green;Gadolinium DTPA;Cystamine Animals;Coloring Agents;Confidence Intervals;Contrast Media;Cystamine;Female;Gadolinium DTPA;Image Enhancement;Image Processing, Computer-Assisted;Indocyanine Green;Low-Level Light Therapy;Macromolecular Substances;Magnetic Resonance Imaging;Mammary Neoplasms, Experimental;Mice;Mice, Nude;Polymers
CO2 laser resurfacing of intraoral lymphatic malformations: a 10-year experience. OBJECTIVE: To evaluate the safety and efficacy of CO(2) laser resurfacing in the symptomatic treatment of intraoral lymphatic malformations (LM). DESIGN: Retrospective review. METHODS: Charts were reviewed on 26 patients (16 male, 10 female) from January 1997 to July 2007 who underwent CO(2) laser resurfacing for symptomatic treatment of intraoral LM. A questionnaire was given in order to elucidate effectiveness in controlling symptoms and speed of postoperative recovery. RESULTS: Mean age at time of first treatment was 9.2 years (median 6.8). Mean number of treatments was 3.0 (median 2.5). Average time between treatments was 9.7 months (median 5.6). Questionnaires were returned for 17 patients (65%). Common preoperative symptoms included swelling, bleeding, vesicle formation, and pain. All 17 patients reported symptomatic improvement after laser treatment. Five patients (29%) tolerated oral intake immediately, 10 (59%) the following day, and 1 (6%) was gastric tube dependent. Four patients (24%) returned to normal activity immediately after treatments, six (35%) by the following day, six (35%) within a few days, and one (6%) within a week. No postoperative complications were seen. CONCLUSION: CO(2) laser resurfacing appears to be both safe and efficacious in treatment of symptoms related to intraoral LM. Intermittent treatments for recurrent symptoms is expected. Adolescent;Adult;Age Factors;Child;Cohort

Studies;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Lymphatic Abnormalities;Male;Retreatment;Retrospective Studies;Risk Assessment;Sex Factors;Surveys and Questionnaires;Tongue;Treatment Outcome;Young Adult

Treatment of alopecia areata with fractional photothermolysis laser. Adult;Alopecia Areata;Hair;Humans;Low-Level Light Therapy;Male;Scalp

Low power laser treatment of the retina ameliorates neovascularisation in a transgenic mouse model of retinal neovascularisation. This study was designed to determine if low power laser therapy can achieve amelioration of vasoproliferation yet preserve useful vision in the treated area in a transgenic mouse model of retinal neovascularisation. The mice were anaesthetised and the pupils dilated for ERG and fundus fluorescein angiography on postnatal day 32. The left eyes were treated with approximately 85 laser spots (532 nm, 50 ms, 300 microm diameter) at a power level of 20 mW at the cornea. The eyes were examined using ERG and fluorescein angiography, one, four and six weeks later. Flat mounts of FITC-dextran infused retinas, retinal histology and PEDF immunohistochemistry was studied one or six weeks after laser treatment. In untreated eyes the expected course of retinal neovascularisation in this model was observed. However, retinal neovascularisation in the laser treated eye was significantly reduced. The laser parameters chosen produced only mild lesions which took 10-20 s to become visible. ERG responses were comparable between the treated and untreated eyes, and histology showed only partial loss of photoreceptors in the treated eyes. PEDF intensity corresponded inversely with the extent of neovascularisation. Low power panretinal photocoagulation can inhibit retinal neovascularisation and yet preserve partial visual function in this transgenic mouse model of retinal neovascularisation. Eye Proteins;Nerve Growth Factors;Serpins;Vascular Endothelial Growth Factor A;pigment epithelium-derived factor;Rhodopsin Animals;Disease Models, Animal;Electroretinography;Eye Proteins;Fluorescein Angiography;Immunohistochemistry;Laser Coagulation;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Mice, Transgenic;Nerve Growth Factors;Photoreceptor Cells, Vertebrate;Promoter Regions, Genetic;Retinal Neovascularization;Retinal Vessels;Rhodopsin;Serpins;Time Factors;Vascular Endothelial Growth Factor A;Vision Disorders;Vision, Ocular

Topical imiquimod in conjunction with Nd:YAG laser for tattoo removal. The purpose of this study is to evaluate the efficacy of tattoo removal using topical imiquimod 5% cream in conjunction with the 1,064-nm Nd:YAG laser. This procedure for tattoo removal will be compared to laser treatment alone, which is the standard for cosmetic removal of tattoos. Previous studies have linked partial tattoo removal to imiquimod application in a guinea pig model. METHODS: This was a small-sized, double-blinded, placebo-controlled trial with patients with Fitzpatrick skin types I-IV (light skin) who were 18-65 years of age. The patients were required to have had two tattoos of similar age and dark blue or black in color in areas that can be covered by clothing. There were four visits in total, with laser treatment and photography being performed on the first visit. Laser settings were with 1,064-nm Nd:YAG with a 10-ns pulse, 3-mm spot size, and 4 J of energy, a standard laser used for tattoo removal. During the second visit, tattoos were randomized and chosen to receive either the laser-imiquimod treatment course or laser-vehicle cream treatment. The patients returned 1 month after the completion of cream application (week #10) and 2 months after the completion of treatment with cream (week #14) for final evaluation and photographing. RESULTS: Three patients were enrolled in this study. All of them are Fitzpatrick skin type IV. All of the patients were compliant with the drug application and have good tolerability with only mild pruritus without changing of vascularity or pigmentation. None of the patients had ulceration or scar development during the cream application. CONCLUSIONS: imiquimod plus laser therapy demonstrated a more favorable outcome when evaluated by the investigators or subjects. The mean scores for tattoo clearance from baseline to 2 months after completion of treatment with 5% imiquimod cream versus placebo cream

were 4.3 versus 2.7 as rated by investigators and 4.7 versus 2.3 as rated by subjects. No textural changes were observed after therapy and were not shown to be different between the two groups. Further large-scale studies are important in developing a role for the use of imiqumod in laser-assisted tattoo removal. Adjuvants, Immunologic;Aminoquinolines;Imiquimod Adjuvants, Immunologic;Administration, Topical;Adolescent;Adult;Aged;Aminoquinolines;Double-Blind Method;Female;Humans;Imiquimod;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Tattooing;Treatment Outcome;Young Adult

Effects of diode laser therapy on the acellular dermal matrix. Acellular dermal matrix (ADM) was subcutaneously implanted into calvarian skin of male Wistar rats (n = 40). Low-level laser (lambda 685 nm, 4 J/cm(2)) was locally applied in experimental group (n = 20) above the skin flap. Grafts were harvested at 1, 3, 7 and 14 days after surgery and underwent histological analyses. In treated animals, the extent of edema and the number of inflammatory cells were reduced ($P < 0.05$). The amount of collagen in graft treated with low-level laser were significantly higher than those of controls ($P < 0.05$) and were statistically more prominent on the 14th day after surgery. The mean count of fibroblasts was significantly higher in the low-laser therapy group within the 3rd day, showing a marked influx of fibroblasts into area. In conclusion, wound healing of the ADM appear to be positively affected by laser therapy. Alloderm;Collagen Animals;Collagen;Fibroblasts;Graft Survival;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin Transplantation;Skin, Artificial;Transplantation, Heterologous;Wound Healing

A three-dimensional evaluation of microleakage of class V cavities prepared by the very short pulse mode of the erbium:yttrium-aluminium-garnet laser. The aim of this study was to evaluate microleakage along resin restoration in cavities prepared with an erbium:yttrium-aluminium-garnet (Er:YAG) laser, with and without acid etching, and to compare it with that in diamond-drilled cavities. Thirty intact molars were divided into three equal groups. In the teeth in group I, class V cavities were prepared with a diamond drill. Cavities in groups II and III were prepared with an Er:YAG laser (400 mJ/15 Hz for enamel and 250 mJ/10 Hz for dentine). The cavities in groups I and II were acid-etched and adhesive and flowable composite were applied to all cavities. The specimens were first immersed in dye for 24 h and then in 5% nitric acid for 72 h for softening. The fillings were extracted and photographed through a dissecting microscope. The leakage area was measured with specially designed software. The Kruskal-Wallis test showed that the best ranking was group II [mean range (m.r.) = 27.46], followed by group I (m.r. = 33.48) and, lastly, group III (m.r. = 45.15). The differences between groups I and III ($P = 0.023$) and between groups II and III were statistically significant ($P = 0.080$). The least microleakage was found in those cavities prepared by Er:YAG laser and subsequently acid-etched, whereas the most leakage was in the lased cavities that had not been etched; the traditional diamond-drilled acid-etched cavities produced medium leakage. Acid Etching, Dental;Dental Caries;Dental Cavity Preparation;Dental Leakage;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy

Phototherapy promotes healing of chronic diabetic leg ulcers that failed to respond to other therapies. OBJECTIVE: We tested the hypothesis that combined 660 and 890 nm LED phototherapy will promote healing of diabetic ulcers that failed to respond to other forms of treatment. RESEARCH DESIGN AND METHODS: A double-blind randomized placebo controlled design was used to study 23 diabetic leg ulcers in two groups of 14 patients. Group one ulcers were cleaned, dressed with 1% silver sulfadiazine cream and treated with "placebo" phototherapy (<1.0 J cm(-2)) twice per week, using a Dynatron Solaris 705(R) device. Group two ulcers were treated similarly but received 3 J cm(-2) dose. RESULTS: At each of 15, 30, 45, 60, 75, and 90 days of healing, mean ulcer granulation and healing rates were significantly higher for group two than the "placebo" group ($P < 0.02$). While "placebo" treated ulcers worsened during the initial 30 days, group two ulcers healed

rapidly; achieving 56% more granulation and 79.2% faster healing by day 30, and maintaining similarly higher rates of granulation and healing over the "placebo" group all through. By day 90, 58.3% of group two ulcers had healed fully and 75% had achieved 90-100% healing. In contrast, only one "placebo" treated ulcer healed fully by day 90; no other ulcer attained > or =90% healing. CONCLUSION: Combined 660 and 890 nm light promotes rapid granulation and healing of diabetic ulcers that failed to respond to other forms of treatment. Aged;Aged, 80 and over;Cohort Studies;Diabetes Mellitus, Type 2;Double-Blind Method;Female;Granulation Tissue;Humans;Lasers, Semiconductor;Leg Ulcer;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Wound Healing

Port wine stain progression: a potential consequence of delayed and inadequate treatment? BACKGROUND AND OBJECTIVES: Port wine stains are congenital low-flow vascular malformations of the skin. Unlike hemangiomas, PWS do not involute with time, but rather if left untreated can hypertrophy and develop nodularity. Laser therapy of PWS particularly with pulsed-dye lasers, is a safe, well-established treatment that is successful in the majority of patients, especially for younger patients. Patients that fail to receive treatment early in life may subsequent develop lesions more likely to progress. STUDY DESIGN/PATIENTS AND METHODS: A case report and review of the literature are presented. We report a 43 year-old man born with a port-wine stain on the right side of his face that extended in the V2 distribution on his face. He had undergone several sessions with a pulsed-dye laser, the sequential dual-wavelength (595 nm and 1064 nm) laser and a CO2 resurfacing laser from the age of 26 but failed to follow through with a sufficient number of treatments to prevent hypertrophy. RESULTS: Due to an insufficient number and interval of treatments (with only 7 treatments over 16 years starting at age 26) with the various lasers, the patient's port wine stain continued to progress in color and development of nodularity. CONCLUSIONS: Patients born with port wine stains should have early laser treatment to achieve optimal results. Delay in treatment, as in this patient until age 26, may result in hard to treat PWS that can continue to progress in nodularity. This case illustrates the hypertrophy and nodularity that can occur due to progression of a PWS with failure to follow through with sufficient number of laser treatments. Adult;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Male;Patient Compliance;Port-Wine Stain;Treatment Failure

The effect of 595 nm pulsed dye laser on superficial and nodular basal cell carcinomas. BACKGROUND AND OBJECTIVE: Basal cell carcinomas (BCCs) have supporting vasculature that could serve as a target for 595 nm pulsed dye laser (PDL). The objective of this study was to determine the effect of repeated PDL treatments on BCCs of superficial and nodular subtypes and of varying diameters. STUDY DESIGN/MATERIALS AND METHODS: Twenty biopsy-proven BCCs received four 595 nm PDL treatments at 2-week intervals. The tumor and 4 mm of peripheral skin were treated using a set of previously optimized laser parameters: one pass, 15 J/cm2 energy, 3 ms pulse length, no cooling, and 7 mm spot size with 10% overlap. The treated area was excised and evaluated histologically for residual tumor. Histologic response rates of the PDL treated BCCs were compared with that of non-PDL treated, matched control tumors. RESULTS: Nearly all BCCs <1.5 cm in diameter (n = 12) showed complete response to four PDL treatments (91.7%; n = 11/12) versus 16.7% of controls (n = 2/12, P-value = 0.0003). BCCs > or =1.5 cm in diameter (n = 8) showed a complete response rate of 25% (n = 2/8) versus 0% of controls (n = 0/8, P-value = 0.2). Mean clinical tumor diameter of the complete responders was 1.1 cm (n = 13) versus 2.2 cm (n = 7) for incomplete responders (P-value = 0.005). Tumor histologic types among the complete responders included superficial, nodular, micronodular, and keratinizing. Incompletely responding BCCs showed a significant reduction in tumor burden after PDL treatment, with residual histologic tumor burden ranging from <1% to 29% of the original clinical tumor diameter, compared to 13-68% residual tumor burden for the corresponding controls (P-value = 0.05). CONCLUSIONS: PDL is an effective means of

reducing tumor burden in patients with large BCCs and may be an alternative therapy in BCCs <1.5 cm in diameter. Carcinoma, Basal Cell;Cohort Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Neoadjuvant Therapy;Neoplasm, Residual;Skin Neoplasms;Treatment Outcome;Tumor Burden

Treatment of hypertrophic and resistant port wine stains with a 755 nm laser: a case series of 20 patients. BACKGROUND AND OBJECTIVE: Port wine stains (PWS) are heterogeneous vascular malformations that can be treated with vascular-selective pulsed dye lasers (PDL). Hypertrophic PWS, especially in adults, are consistently less responsive to PDL. Furthermore, many PWS that respond well initially to PDL treatment may reach a response plateau, becoming unresponsive to further PDL treatments, a phenomenon termed "treatment resistance." Based on the theory of selective photothermolysis, vessels in such lesions may also be specifically targeted with a 755 nm laser that has selectivity for deoxyhemoglobin as well as oxyhemoglobin and increased depth of skin penetration. STUDY DESIGN/PATIENTS AND METHODS: Retrospective case review of 20 patients with either hypertrophic or PDL-resistant PWS treated with a 755 nm laser alone or in combination with other lasers, including PDL. RESULTS: Hypertrophic PWS showed significant lightening after treatment with a 755 nm laser in combination with PDL. Most PDL-resistant PWS showed moderate improvement after treatment with either a 755 nm laser alone or in combination with another laser, including PDL. Some lesions showed only mild improvement or did not respond. Serious side effects were infrequent. Most commonly encountered complications included pain, edema, bullae, crusting, and rare scarring. CONCLUSIONS: Alexandrite 755 nm laser can be useful for the treatment of hypertrophic and treatment-resistant PWS in adult and pediatric patients. Complications are infrequent and predictable. Careful attention to using a fluence at or near the threshold for clinical response with this deeply penetrating laser is essential to prevent serious sequelae. Adolescent;Adult;Age Factors;Child;Child, Preschool;Cohort Studies;Female;Humans;Hypertrophy;Infant;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Retrospective Studies;Treatment Outcome;Young Adult

In vitro effect of carboplatin, cytarabine, paclitaxel, vincristine, and low-power laser irradiation on murine mesenchymal stem cells. BACKGROUND AND OBJECTIVES: Mesenchymal stem cells (MSCs) are promising for use in regenerative medicine. Cytostatics can decrease, but low-power laser irradiation (LPLI) can increase the growth of MSCs. The interaction of LPLI, MSCs and cytostatics is not known. This study investigated the effect of four cytostatics (carboplatin, cytarabine, paclitaxel, vincristine), LPLI, and combination of a cytostatic drug and LPLI on murine MSCs (mMSCs). STUDY DESIGN/MATERIALS AND METHODS: MMSCs were exposed to LPLI (660 nm diode laser; 60 mW output power; range of power density: 76-156 mW/cm(2); range of energy density: 1.9-11.7 J/cm(2)) and/or a cytostatic drug (carboplatin: 2, 10, 50; cytarabine: 0.4, 10, 50; paclitaxel: 0.4, 2, 10; vincristine: 0.02, 0.1, 0.5 microg/ml, respectively). Cell proliferation was measured after 24, 48, or 72 hours incubation. RESULTS: LPLI at 1.9 J/cm(2) dose increased the proliferation rate with 41% after 48 hours. However, 11.7 J/cm(2) LPLI caused 42% inhibition and cytostasis was still detectable after 72 hours. LPLI caused equivalent stimulation in single or in divided doses (3.8 vs. double 1.9 J/cm(2) in a 24-hour period). The cytotoxicity of 50 microg/ml carboplatin was eliminated, the inhibitory power of 0.1 microg/ml vincristine was attenuated by 1.9 J/cm(2) LPLI even 3 days post-treatment (attenuation >10%). The 11.7 J/cm(2) LPLI enhanced the cytotoxicity of 50 microg/ml cytarabine (from 48% to 73%) and 10 microg/ml paclitaxel (from 37% to 78%). Combination of the ineffective 0.4 microg/ml cytarabine or paclitaxel with the inhibitory 11.7 J/cm(2) LPLI exhibited stronger inhibition than the 11.7 J/cm(2) LPLI alone (69% and 69% vs. 42%). CONCLUSIONS: Low energy density of LPLI increases and high energy density of LPLI decreases the proliferation of mMSCs. Furthermore, LPLI can prevent or attenuate some drug's cytotoxicity and amplify others'. The result depends on the applied energy

density, on the type and concentration of the cytostatics. Antineoplastic Agents;Cytarabine;Vincristine;Carboplatin;Paclitaxel Animals;Antineoplastic Agents;Carboplatin;Cell Culture Techniques;Cytarabine;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice;Mice, Inbred C57BL;Paclitaxel;Vincristine

Different light-activated in-office bleaching systems: a clinical evaluation. The aim of this clinical study was to evaluate the efficiency of in-office bleaching systems with different light sources for color change and possible side effects such as tooth sensitivity and gingival irritations. Forty healthy volunteers aged 18 years and older (average age 27.3 years), having all their natural healthy teeth in shade A3 or darker on the Vita shade guide, with no restorations on the buccal surfaces and no tooth sensitivity, participated in this study. Participants were randomly assigned to four groups of ten volunteers. Group 1 received bleaching without light activation (Opalescence Xtra Boost, Ultradent); group 2 received bleaching (Laser White 10, Biolase) with a diode laser (810 nm, 10 W/ Laser Smile, Biolase) activation; group 3 received bleaching treatment (Remewhite, Remedent) with a plasma arc lamp (400-490 nm, 2800 mV/cm(2), Remecure CL15), and group 4 received bleaching with a light emitting diode (LED) lamp (By White accelerator, Ensodent) according to the manufacturers' recommendations. The shade was assessed with a classical Vita shade guide (Vita Zahnfabrik) and a digital spectrophotometer (Vita Easy Shade, Vident). The color of teeth was scored at baseline and 1 week after bleaching. Any side effects on teeth or gingiva was recorded by visual analog scale. Results were analyzed statistically, by one-way analysis of variance (ANOVA), Kruskal-Wallis, and Mann-Whitney U tests with Bonferroni correction. All the bleaching techniques resulted in shade change. No significant differences were found in the color change among the four groups with shade guide assessment ($P > 0.05$), but spectrophotometer readings exhibited significant differences among the groups ($P < 0.05$). The overall shade change values expressed as DeltaL, Deltaa, Deltab, DeltaE for group 2 was significantly higher than those for the other groups ($P < 0.05$). Group 2 also showed lower tooth and gingival sensitivity scores than those of the other groups ($P < 0.05$). All techniques resulted in shade change. Although the shade guide evaluation did not exhibit any differences among the bleaching treatment groups, spectrophotometer readings showed different findings. The results obtained by the two methods of evaluation of shade change used in this study were different from each other. Bleaching with diode laser resulted in less tooth and gingival sensitivity than the other bleaching systems. CLINICAL RELEVANCE: in-office bleaching systems used with or without light, lead to a shade change. As bleaching with diode laser resulted in less tooth and gingival sensitivity, it might be preferred among in-office bleaching systems. Adolescent;Adult;Color;Dentin Sensitivity;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Tooth Bleaching;Young Adult

Regulation of skin collagen metabolism in vitro using a pulsed 660 nm LED light source: clinical correlation with a single-blinded study. It has been reported that skin aging is associated with a downregulation in collagen synthesis and an elevation in matrix metalloproteinase (MMP) expression. This study investigated the potential of light-emitting diode (LED) treatments with a 660 nm sequentially pulsed illumination formula in the photobiomodulation of these molecules. Histological and biochemical changes were first evaluated in a tissue-engineered Human Reconstructed Skin (HRS) model after 11 sham or LED light treatments. LED effects were then assessed in aged/photoaged individuals in a split-face single-blinded study. Results yielded a mean percent difference between LED-treated and non-LED-treated HRS of 31% in levels of type-1 procollagen and of -18% in MMP-1. No histological changes were observed. Furthermore, profilometry quantification revealed that more than 90% of individuals showed a reduction in rhytid depth and surface roughness, and, via a blinded clinical assessment, that 87% experienced a reduction in the Fitzpatrick wrinkling severity score after

12 LED treatments. No adverse events or downtime were reported. Our study showed that LED therapy reversed collagen downregulation and MMP-1 upregulation. This could explain the improvements in skin appearance observed in LED-treated individuals. These findings suggest that LED at 660 nm is a safe and effective collagen-enhancement strategy. Collagen Type I;Matrix Metalloproteinase 1 Adult;Cells, Cultured;Collagen Type I;Down-Regulation;Female;Humans;Keratinocytes;Light;Male;Matrix Metalloproteinase 1;Middle Aged;Phototherapy;Rejuvenation;Single-Blind Method;Skin Aging;Skin Temperature;Tissue Engineering;Up-Regulation

Permanent makeup removal using Q-switched Nd:YAG laser. Red-brown tattoos are usually treated with a frequency-doubled Q-switched (QS) neodymium:yttrium-aluminum-garnet Nd:YAG laser (532 nm), because red and pink pigments show maximum absorption between 500 and 570 nm. Using a QS laser for red-brown tattoo removal has sometimes led to paradoxical darkening of the tattoo pigments, and this darkened grey-black colour may be difficult to remove. A woman with red-brown cosmetic tattoos on her eyebrows was treated using a QS Nd:YAG laser (1064 nm) initially with low fluence and subsequently with increasing fluences at 6-weekly intervals. After the first treatment, a slight darkening of the tattoo pigments was seen, but this faded and complete clearance was achieved after five treatments. There was no downtime during every treatment and there were no scars, pigmentary alterations or textural changes. Coloring Agents;yttrium-aluminum-garnet;Yttrium;Aluminum Adult;Aluminum;Coloring Agents;Eyebrows;Female;Humans;Lasers;Low-Level Light Therapy;Tattooing;Treatment Outcome;Yttrium

Comparison of the photodynamic fungicidal efficacy of methylene blue, toluidine blue, malachite green and low-power laser irradiation alone against Candida albicans. This study was to evaluate specific effects of photodynamic therapy (energy density 15.8 J/cm(2), 26.3 J/cm(2) and 39.5 J/cm(2)) using methylene blue, toluidine blue and malachite green as photosensitizers and low-power laser irradiation on the viability of Candida albicans. Suspensions of C. albicans containing 10(6) cells/ml were standardized in a spectrophotometer. For each dye, 120 assays, divided into four groups according to the following experimental conditions, were carried out: laser irradiation in the presence of the photosensitizer; laser irradiation only; treatment with the photosensitizer only; no exposure to laser light or photosensitizer. Next, serial dilutions were prepared and seeded onto Sabouraud dextrose agar for the determination of the number of colony-forming units per milliliter (CFU/ml). The results were subjected to analysis of variance and the Tukey test ($P < 0.05$). Photodynamic therapy using the photosensitizers tested was effective in reducing the number of C. albicans.. The number of CFU/ml was reduced by between 0.54 log(10) and 3.07 log(10) and depended on the laser energy density used. Toluidine blue, methylene blue and malachite green were effective photosensitizers in antimicrobial photodynamic therapy against C. albicans, as was low-power laser irradiation alone. Antifungal Agents;Photosensitizing Agents;Rosaniline Dyes;malachite green;Tolonium Chloride;Methylene Blue Antifungal Agents;Candida albicans;Candidiasis;Humans;In Vitro Techniques;Low-Level Light Therapy;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Rosaniline Dyes;Tolonium Chloride

Photomedicine and LLLT Literature Watch. Humans;Low-Level Light Therapy;Phototherapy

Assessment of cytoskeleton and endoplasmic reticulum of fibroblast cells subjected to low-level laser therapy and low-intensity pulsed ultrasound. OBJECTIVE: The aim of the present study was to compare the effect of low-level laser therapy (LLLT) and low-intensity pulsed ultrasound (LIPUS) on the cytoskeleton and endoplasmic reticulum of L929 cells. Thermal and non-thermal physical mechanisms such as LLLT and LIPUS induce clinically significant responses in cells, tissues, and organs.

MATERIALS AND METHODS: L929 fibroblast cell cultures were irradiated with LLLT and subjected to LIPUS. Cultures irradiated with the laser (904 nm) were divided into three groups: group I, control (no irradiation); group II, irradiated at 6 J/cm(2); and group III, irradiated at 50 mJ/cm(2). Cultures subjected to ultrasound were divided into five groups: group I, control (no LIPUS); group II, LIPUS at 0.2 W/cm(2) in pulsed mode at 10% (1:9 duty cycle); group III, LIPUS at 0.6 W/cm(2) in pulsed mode at 10% (1:9 duty cycle); group IV, LIPUS at 0.2 W/cm(2) in pulsed mode at 20% (2:8 duty cycle); and group V, LIPUS at 0.6 W/cm(2) in pulsed mode at 20% (2:8 duty cycle). Each group was irradiated at 24-h intervals, with the following post-treatment incubation times: 24, 48, and 72 h. The effects of LLLT and LIPUS on the cytoskeleton and endoplasmic reticulum was evaluated by the use of fluorescent probes and with fluorescence microscopy analysis. RESULTS: The results following LLLT and LIPUS demonstrate that ultrasound was more effective than laser on fibroblast cell cultures when the endoplasmic reticulum was assessed, whereas there was a better distribution of the filaments of the cytoskeleton in the cells subjected to laser irradiation. CONCLUSION: The study demonstrated that both LLLT and LIPUS promote changes on the cellular level. However, LIPUS was more effective than LLLT at the doses used here, as assessed by fluorescence microscopy, which revealed increased reticulum activity and increased protein synthesis. However, when the organization of actin filaments was assessed, LLLT achieved a better result. Animals;Cells, Cultured;Cytoskeleton;Endoplasmic Reticulum;Fibroblasts;Low-Level Light Therapy;Mice;Microscopy, Fluorescence;Ultrasonic Therapy

Effect of low-level laser treatment of tissue-engineered skin substitutes: contraction of collagen lattices. Fibroblast-populated collagen lattices (FPCL) are widely used in tissue-engineered artificial skin substitutes, but their main drawback is that interaction of fibroblasts and matrix causes contraction of the lattice, reducing it to about 20% of its original area. The effect of low-level laser treatment (LLLT) on the behavior of 3T3 fibroblasts seeded in collagen lattices containing 20% chondroitin-6-sulphate was investigated to determine whether LLLT could control the contraction of FPCL. A He-Ne laser was used at 632.8 nm to deliver a 5-mW continuous wave with fluences from 1 to 4 J/cm(2). Laser treatment at 3 J/cm(2) increased contraction of collagen lattices in the absence of cells but decreased contraction of cell seeded lattices over a 7-day period. The effect was energy dependent and was not observed at 1, 2, or 4 J/cm(2). There was no alteration in fibroblast viability, morphology, or mitochondrial membrane potential after any laser treatments, but the distribution of actin fibers within the cells and collagen fibers in the matrices was disturbed at 3 J/cm(2). These effects contribute to the decrease in contraction observed. LLLT may offer a means to control contraction of FPCL used as artificial skin substitutes. Actins;Glycosaminoglycans;Collagen Actins;Animals;Cell Survival;Cells, Cultured;Collagen;Fibroblasts;Glycosaminoglycans;Lasers;Lasers, Gas;Membrane Potential, Mitochondrial;Microscopy, Confocal;Rats;Skin, Artificial;Tissue Engineering;Wound Healing

[Pathomorphological and histochemical manifestations of interaction of laser irradiation with tissues of a chorioretinal complex]. Animals;Choroid;Choroid Diseases;Humans;Low-Level Light Therapy;Retina;Retinal Diseases

Wavelength effect in temporomandibular joint pain: a clinical experience. Temporomandibular disorders (TMDs) are common painful multifactorial conditions affecting the temporomandibular joint (TMJ) and whose treatment depends on the type and symptoms. Initially, it requires pain control, and, for this, drugs, biting plates, occlusal adjustment, physiotherapy or their association are used. Lately, laser phototherapy (LPT) has been used in the treatment of pain of several origins, including TMDs. This study reports the treatment of a selected group of 74 patients treated at the Laser Center of the Federal University of Bahia between 2003 and 2008. Following standard anamneses, clinical and imaging examination and with the diagnosis of any type of TMD, the patients

were prepared for LPT. No other intervention was carried out during the treatment. Treatment consisted of three sessions a week for 6 weeks. Prior to irradiation, the patients were asked to score their pain using a visual analog scale (VAS). Lasers of wavelength (lambda)780 nm, lambda790 nm or lambda830 nm and/or lambda660 nm were used at each session (30/40 mW; spot (varphi) approximately 3 mm; mean dose per session 14.2 +/- 6.8 J/cm(2); mean treatment dose of 170 +/- 79.8 J/cm(2)). Of the patients, 80% were female (approximately 46 years old). At the end of the 12 sessions the patients were again examined, and they scored their pain using the VAS. The results were statistically analyzed and showed that 64% of the patients were asymptomatic or had improved after treatment and that the association of both wavelengths was statistically significant (P = 0.02) in the asymptomatic group. It was concluded that the association of red and infrared (IR) laser light was effective in pain reduction on TMJ disorders of several origins.
Adult;Brazil;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Phototherapy;Retrospective Studies;Temporomandibular Joint Disorders

The role of mast cells in non-ablative laser resurfacing with 1,320 nm neodymium:yttrium-aluminium-garnet laser. The aim of this study was to investigate the role of mast cells in mechanisms of collagen remodelling induced by non-ablative laser treatment. The dorsal skin of Kunming (KM) mice was exposed to 1,320 nm neodymium-yttrium-aluminium garnet (Nd:YAG) laser weekly for four consecutive weeks. Biopsies were taken 1 h after irradiation and 1 day, 7 days, 14 days, 30 days and 60 days after the first treatment. Skin samples were studied for mast cells, fibroblasts, and type I and III collagen, by toluidine blue, haematoxylin-eosin (HE) and immunohistochemical staining, respectively. The total number of mast cells in the skin of experimental group was significantly greater than that in the control at 1 h, 1 day, 21 days and 60 days after the first treatment ($P < 0.05$, respectively). At any of the time points studied, the number of degranulated mast cells in the experimental group was significantly higher than in the control ($P < 0.01$, $P < 0.01$, $P < 0.05$, $P < 0.01$, $P < 0.05$, $P < 0.05$, respectively).The number of fibroblasts in the experimental group exhibited a significant increase in comparison with those in control skin at days 7, 21, 30 and 60 after irradiation ($P < 0.05$, $P < 0.01$, $P < 0.01$, $P < 0.05$, respectively). The amount of type I collagen was significantly higher than in the control from day 21 to day 60 ($P < 0.05$, $P < 0.01$, $P < 0.01$, respectively), and type III collagen showed a marked increase between day 7 and day 60, compared with the control ($P < 0.01$, $P < 0.05$, $P < 0.01$, $P < 0.01$, respectively). There was a significant positive correlation between the number of fibroblasts and granulated mast cells ($r = 0.549$, $P < 0.01$). The amount of type I and III collagen also showed significant positive correlations with the number of degranulated mast cells ($r = 0.555$, $P < 0.01$ and $r = 0.579$, $P < 0.01$, respectively). The results suggested that dermal mast cells might be involved in the inflammatory response, fibroblast proliferation and collagen remodelling induced by non-ablative laser treatment. Collagen Type I;Collagen Type III Animals;Cell Proliferation;Collagen Type I;Collagen Type III;Female;Fibroblasts;Lasers, Solid-State;Low-Level Light Therapy;Mast Cells;Mice;Skin Aging;Wound Healing

Radiant power determination of low-level laser therapy equipment and characterization of its clinical use procedures. OBJECTIVE: The main objectives of this study were to characterize low-level laser therapy (LLLT) and the physical therapy clinical procedures for its use. BACKGROUND DATA: There are few scientific studies that characterize the calibration of LLLT equipment. MATERIALS AND METHODS: Forty lasers at 36 physical therapy clinics were selected. The equipment was characterized through data collected from the owner manuals, direct consultation with the manufacturers, and a questionnaire answered by the users. A digital potency analyzer was used to calibrate released mean potency. Qualitative data were presented throughout the descriptive statistics and quantitative data were analyzed by the Wilcoxon/Kruskal-Wallis and Fisher tests (significance, $p < 0.05$). RESULTS: The

laser equipment was either AsGa (70.5%) or HeNe (23.5%), and 60% was analog and acquired over 5 years ago. The majority of the equipment was used 10-15 times per week and the most frequent density level used was 2 to 4 J/cm(2). Protective goggles were available in only 19.4% of the clinics evaluated. The association between the analyzed categories demonstrated that a lower mean potency was correlated both with equipment acquired over 5 years ago and analog technology. The determined mean potency was lower than the one claimed by the manufacturer ($p < 0.05$). In 30 cases, the analyzed equipment presented a potency between 3 microW and 5.6 mW; in three cases, the potency was >25 mW; and in seven cases, potency was nonexistent. CONCLUSION: The analyzed equipment was out-dated and periodical maintenance was not conducted, which was reflected in the low irradiated potency. Calibration;Equipment Design;Equipment Failure Analysis;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Physical Therapy Modalities

Different applications of monochromatic excimer light in skin diseases. BACKGROUND: Ultraviolet radiation has been used for curative purposes in dermatologic conditions, especially in the last 30 years. OBJECTIVES: We analyzed the efficacy of monochromatic excimer light in psoriasis, palmoplantar pustulosis, vitiligo, mycosis fungoides and alopecia areata, and to examine potential new indications. METHODS: Two hundred seventy-nine patients with common and persistent skin diseases were enrolled in an open prospective study: 152 patients with stable and localized plaque psoriasis, 47 with palmoplantar psoriasis, 7 with palmoplantar pustulosis, 32 with vitiligo, 11 with prurigo nodularis, 9 with mycosis fungoides stage Ia, 8 with alopecia, 5 with localized scleroderma, 5 with genital lichen sclerosus, and 3 with granuloma annulare. The 308 nm excimer light was used at a power density of 48 mW/cm(2). An average of 12 sessions (range, 6-18), one session per week, was performed and yielded a total dose range of 4-12.5 J/cm(2). Clinical response was assessed using photos, biopsies, and specific clinical scores. Patients were monitorized for 6 and 12 months for psoriasis, 12 months for mycosis fungoides, and 4 months for the remaining conditions. RESULTS: We observed complete remission in more than 50% of patients with plaque psoriasis and palmoplantar dermatoses, respectively, complete remission in all patients affected by mycosis fungoides, excellent repigmentation in one third of vitiligo patients, hair regrowth in three patients with alopecia areata, an overall improvement in prurigo nodularis, a partial remission in patients affected by localized scleroderma, and a complete remission in most of the patients with genital lichen sclerosus and granuloma annulare. CONCLUSIONS: Our study confirms the use of monochromatic excimer light as a valid choice for the treatment of psoriasis, vitiligo, and mycosis fungoides; we also observed and report for the first time that monochromatic excimer light produces a therapeutic response in prurigo nodularis, localized scleroderma, genital lichen sclerosus, and granuloma annulare. Adult;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases;Ultraviolet Therapy

Physical and compositional changes on demineralized primary enamel induced by CO2 Laser. OBJECTIVE: This in vitro study aimed to evaluate the physical and chemical changes promoted by a CO(2) laser at 10.6-microm wavelength on primary dental enamel with artificial caries-like lesions. BACKGROUND DATA: Several previous investigations have shown that enamel can be modified by CO(2) laser to obtain a caries-preventive effect, but the specific mechanism remains uncertain. MATERIALS AND METHODS: Twenty-seven primary molars were randomly assigned to three groups as follows: control, carious, and laser ($n = 9$). The specimens from the carious and laser groups were demineralized and treated with or without CO(2) laser, according to the group. Enamel surface changes after treatments were monitored using Fourier transform Raman spectroscopy and scanning electron microscopy (SEM). RESULTS: The Raman spectra showed a statistically significant reduction of mineral content in carious and laser groups when compared to control group. Additionally, carbonate content was reduced in irradiated specimens when compared to the other groups. No

physical change was observed in specimens evaluated by SEM. CONCLUSION: The results suggest that CO(2) laser irradiation may reduce the carbonate content of enamel, which is likely to make this substrate more acid-resistant. Carbonates Carbonates;Child;Dental Caries;Dental Enamel;Fourier Analysis;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Microscopy, Electron, Scanning;Spectrum Analysis, Raman;Tooth Demineralization

Longitudinal study on the influence of Nd:YAG laser irradiation on microleakage associated with two filling techniques. OBJECTIVE: This study investigates the effects of Nd:YAG laser irradiation on apical and coronal seals, when used prior to two root canal filling techniques. BACKGROUND DATA: Limited information exists regarding the effects of morphologic changes to dentin walls following Nd:YAG laser irradiation on the sealing ability of root fillings. METHODS: Two hundred forty teeth were analyzed by observing coronal and apical leakage of Indian ink (DL), and 60 were analyzed for through-and-through leakage using the fluid transport model (FTM). The Nd:YAG laser parameters were 1.5 W, 100 mJ, and 15 Hz (four times for 5 s at 20 s intervals). Each group consisted of a lased and a nonlased subgroup: each subgroup had root fills done by either cold lateral condensation (CLC) or hybrid condensation (HC). Leakage was assessed after 48 h, and then at 1, 6, and 12 months. The DL group was divided into four groups of 15 teeth for each evaluation point. Through-and-through leakage (L in microliters/day) was measured for 48 h under a pressure of 1.2 atm using FTM, and recorded as L = 0 (L1), 0 < L <or= 10 (L2), or L > 10 (L3). RESULTS: Apical and coronal dye leakage was observed in all groups. Significant differences ($p < 0.05$) in apical leakage were found between HC and HC + Nd after 1, 6, and 12 months, and between CLC and CLC + Nd at 6 and 12 months. No significant differences were found between laser-irradiated and non-laser-irradiated groups with FTM. CONCLUSION: Pulsed Nd:YAG laser irradiation following root canal preparation may reduce apical leakage in association with hybrid gutta-percha condensation. Root Canal Filling Materials;Gutta-Percha Dental Leakage;Dentin;Gutta-Percha;Humans;Lasers, Solid-State;Longitudinal Studies;Low-Level Light Therapy;Root Canal Filling Materials;Root Canal Preparation;Root Canal Therapy

[Relationship between laser acupuncture analgesia and the function of mast cells]. OBJECTIVE: To observe the analgesic effects of single-and combined-laser irradiation with low-intensity applied at "Zusanli" (ST 36) in rats, and their relation to degranulation of mast cells. METHODS: Sixty-six SD rats were randomly divided into 6 groups: normal control group (Group NC), model control group (Group MC), sham irradiation group (Group SI), 10.6 microm laser irradiation group (Group 10.6 microm LI), 650 nm laser irradiation group (Group 650 nm LI) and combined (10.6 microm + 650 nm) laser irradiation group (Group CLI). Complete Freund's Adjuvant (0.05 mL) was injected into the left ankle joints of all the rats except those in Group NC to cause acute adjuvant-induced arthritis. In treatment, laser irradiation was applied at "Zusanli" (ST 36) for 30 minutes in all the rats except those in Group NC and Group MC. The paw withdrawal latency (PWL) to radian heat was used to compare analgesic effects among the groups. By means of toluidine blue, dyed slices of local tissues of "Zusanli" (ST 36) were used to observe changes of mast cell degranulation before and after laser irradiation. RESULTS: The pain thresholds to irradiation of the rats in Group 650 nm LI and Group CLI were significantly higher than those in Group MC and Group SI ($P < 0.01$), and the mast cell degranulation rate in Group 650 nm LI and Group CLI were also significantly higher than that in Group MC and Group SI ($P < 0.001$). The pain threshold and mast cell degranulation rate in Group 10. 6 microm LI were not significantly different from those in Group MC and Group SI. There was a linear correlation between mast cell degranulation rate and PWL with 0. 737 in coefficient ($P < 0.001$). CONCLUSION: Single 650 nm laser and combined 650 nm + 10.6 microm laser with low intensity irradiated at "Zusanli" (ST 36) in acute adjuvant rats can provide remarkable analgesic effects, and there was a positive correlation between mast cell degranulation rate and analgesic effects, which plays an important part in laser

irradiation-induced analgesia. Freund's Adjuvant Acupuncture Analgesia;Acute Disease;Animals;Arthritis, Experimental;Cell Degranulation;Combined Modality Therapy;Freund's Adjuvant;Low-Level Light Therapy;Male;Mast Cells;Pain Measurement;Pain Threshold;Random Allocation;Rats;Rats, Sprague-Dawley

Laser acupuncture for acute inflammatory, visceral and neuropathic pain relief: An experimental study in the laboratory rat. Laser acupuncture is defined as the stimulation of traditional acupuncture points with low-intensity, non-thermal laser irradiation. We explored the clinical efficacy of a very low level diode laser wavelength 670 nm (Biolite LP020, RGM, Genoa, Italy), used to stimulate acupoints ST36 Zu San Li and TH5 Waiguan, on well-established experimental models of acute and persistent pain in the rat, e.g. acute inflammatory pain, muscle pain, visceral pain and neuropathic pain. We report the anti-edema and anti-hyperalgesia effects of laser acupuncture in models of acute inflammatory pain, e.g. CFA-induced inflammation and myofascial pain. We also indicate that spontaneous pain and thermal hyperalgesia are reduced in a neuropathic pain model, e.g. axotomy. On the contrary, no effects due to laser-acupuncture were observed on discomfort indices in a model of visceral pain, e.g. cystitis due to cyclophosphamide. We thus provide evidences that acupoints stimulation using a very low intensity laser irradiation can control pain and edema in specific experimental conditions. Acupuncture Analgesia;Acupuncture Points;Animals;Cystitis;Disease Models, Animal;Galvanic Skin Response;Inflammation;Low-Level Light Therapy;Male;Neuralgia;Pain;Pain Management;Pain Measurement;Rats;Rats, Sprague-Dawley

Treatment of resistant port-wine stains with a pulsed dual wavelength 595 and 1064 nm laser: a histochemical evaluation of the vessel wall destruction and selectivity. BACKGROUND AND OBJECTIVES: Pulsed dye laser (PDL) is the current treatment of choice for port-wine stains (PWS), but 25-50% of treated lesions do not demonstrate a significant improvement. Hybrid lasers may improve treatment efficacy, especially those using the synergies between PDL and Nd:YAG 1064 nm laser. The objectives of this study were to assess vessel wall damage and epidermal sparing after a dual wavelength treatment with the two lasers, using different laser parameters. MATERIAL AND METHODS: Post-treatment biopsies, after using a laser platform that allows sequential pulses of PDL and Nd:YAG 1064 nm lasers, were performed in five patients with PWS resistant to PDL. The biopsies were stained with nitroblue-tetrazolium chloride (NBTC), using enzymatic activity that stops immediately after cell death and allows a better identification of viable cells. RESULTS: Five patients with PWS and a median age of 33 years were enrolled in this study. Selectivity and efficacy was observed with this dual wavelength approach, with the best results observed with PDL pulses shorter than 10 ms, use of the 10 mm spot, and a second pass with PDL only. CONCLUSIONS: Histochemical studies with NBTC stain can help the laser surgeon establish the best treatment parameters and understand some of the unwanted side effects. The dual wavelength used in this study showed efficacy, but better assessment of treatment parameters, such as the delay between the two lasers, is needed to avoid side effects. Indicators and Reagents;Nitroblue Tetrazolium Adolescent;Adult;Blood Vessels;Dose-Response Relationship, Radiation;Epidermis;Female;Histocytochemistry;Humans;Indicators and Reagents;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nitroblue Tetrazolium;Port-Wine Stain

Low-level laser therapy attenuates creatine kinase levels and apoptosis during forced swimming in rats. Studies suggest that high-intensity physical exercise can cause damage to skeletal muscles, resulting in muscle soreness, fatigue, inflammatory processes and cell apoptosis. The aim of this study was to investigate the effects of low-level laser therapy (LLLT) on a decrease in creatine kinase (CK) levels and cell apoptosis. Twenty male Wistar rats were randomly divided into two equal groups: group 1 (control), resistance swimming; group 2 (LLLT), resistance swimming with LLLT. They were subjected to a single application of indium gallium aluminum phosphide (InGaAlP) laser immediately

following the exercise for 40 s at an output power of 100 mW, wavelength 660 nm and 133.3 J/cm(2). The groups were subdivided according to sample collection time: 24 h and 48 h. CK was measured before and both 24 h and 48 h after the test. Samples of the gastrocnemius muscle were processed to determine the presence of apoptosis using terminal deoxynucleotidyl transferase (TdT)-mediated deoxyuridine triphosphate (dUTP) nick end labeling. (There was a significant difference in CK levels between groups (P < 0.0001) as well as between the 24 h and 48 h levels in the control group, whereas there was no significant intra-group difference in the LLLT group at the same evaluation times. In the LLLT group there were 66.3 +/- 13.2 apoptotic cells after 24 h and 39.0 +/- 6.8 apoptotic cells after 48 h. The results suggest that LLLT influences the metabolic profile of animals subjected to fatigue by lowering serum levels of CK. This demonstrates that LLLT can act as a preventive tool against cell apoptosis experienced during high-intensity physical exercise. Creatine Kinase Animals;Apoptosis;Creatine Kinase;In Situ Nick-End Labeling;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Rats;Rats, Wistar;Swimming

Treatment of punched-out atrophic and rolling acne scars in skin phototypes III, IV, and V with variable square pulse erbium:yttrium-aluminum-garnet laser resurfacing. BACKGROUND: Treatment of acne scars remains a challenge, especially in dark-skinned individuals. Treatment parameters may be optimized by selecting appropriate pulse width and laser energy that enhance tissue thermal response with limited morbidity. OBJECTIVE: To determine the efficacy and side effects of variable square pulse (VSP) erbium:yttrium-aluminum-garnet (Er:YAG) laser resurfacing for treatment of punched-out atrophic and rolling acne scars. METHODS Twenty-four subjects with acne scars were treated monthly for 2 months with four passes of VSP Er:YAG laser resurfacing using a 7-mm spot size and a fluence of 0.4 J/cm(2). Subjects were divided into two groups and treated with two different pulse widths: 300 micros (short pulse, SP) and 1,500 micros (extra-long pulse, XLP). Objective and subjective assessments were obtained at baseline and 1, 2, and 4 months after treatment. RESULTS: In the SP group, skin smoothness improved significantly (p<.01); in the XLP group, skin smoothness (p<.05) and scar volume (p<.05) improved significantly from baseline. Adverse effects consisted of transient postinflammatory hyperpigmentation (18%) and acneiform eruption (9%). CONCLUSIONS: Low-fluence VSP Er:YAG laser resurfacing is a promising treatment option for acne scars, with minimal risk of side effects. Laser pulse width and energy determine the efficacy and the risk of side effects. The authors have indicated no significant interests with commercial supporters. Acne Vulgaris;Adolescent;Adult;Cicatrix;Follow-Up Studies;Humans;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Skin Pigmentation;Treatment Outcome;Young Adult

Nonablative fractional photothermolysis for the treatment of striae rubra. Adolescent;Breast;Child;Cicatrix;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Patient Satisfaction;Skin;Thigh

Use of the erbium, chromium:yttrium-scandium-gallium-garnet laser on human enamel tissues. Influence of the air-water spray on the laser-tissue interaction: scanning electron microscope evaluations. The study investigated the influence of varying amounts of air/water spray and the energy used by an erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) 2,780 nm laser when treating dental tissues. The morphological effects produced by the laser interaction on healthy human enamel were evaluated by scanning electron microscopy (SEM). The vestibular and lingual surfaces of ten molars were treated with laser at different power settings; each surface was subdivided into cervical, median, and occlusal parts and treated with different proportions of water spray; the series contained 60 tooth portions. Treatment differed in terms of power setting and air/water percentage. All specimens were then subjected to dehydration and metallisation. At SEM evaluation, the classic aspect of laser-treated enamel was visible: grooves, flakes, shelves and sharp

edges, indicative of micro-explosion rather than melting. Vaporisation of the tissue created a clear delimitation from surrounding healthy tissue, with partial respect to the prismatic structure of the treated enamel. The aspect of the enamel was rarely type 1 Silverstone but more frequently type 2 or 3, with prismatic structure not respected and/or completely disordered. These morphological differences appeared to be correlated with the inclination of the laser beam aimed at the enamel prisms and with the percentage of air/water used. The laser system analysed showed itself to be effective at removing human dental enamel. The results appeared to be closely correlated with the variation of the percentage of the laser's water-air spray. Water Air;Dental Cavity Preparation;Dental Enamel;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Water

Effects of low-level laser therapy on bone formed after distraction osteogenesis. This study evaluated the effect of low-level laser therapy (LLLT) on the chemical composition, crystallinity and crystalline structure of bone at the site of distraction osteogenesis. Five rabbits were subjected to distraction osteogenesis (latency = 3 days; rate and frequency = 0.7 mm/day for 7 days; consolidation = 10 days), and three were given LLLT with arsenide-gallium-aluminum (AsGaAl; 830 nm, 40 mW): 10 J/cm(2) dose per spot, applied directly to the distraction osteogenesis site during the consolidation stage at 48 h intervals. Samples were harvested at the end of the consolidation stage. X-ray fluorescence and X-ray diffraction were used to analyze chemical composition, crystallinity and crystalline structure of bone at the distraction osteogenesis site. The analysis of chemical composition and calcium (Ca) and phosphorus (P) ratios revealed greater mineralization in the LLLT group. Diffractograms showed that the crystalline structure of the samples was similar to that of hydroxyapatites. Crystallinity percentages were greater in rabbits that were given LLLT. Crystallinity (41.14% to 54.57%) and the chemical composition of the bone at the distraction osteogenesis site were similar to the that of the control group (42.37% to 49.29%). The results showed that LLLT had a positive effect on the biomodulation of newly formed bone. Phosphorus;Calcium Animals;Bone Regeneration;Bone and Bones;Calcium;Low-Level Light Therapy;Male;Osteogenesis;Osteogenesis, Distraction;Phosphorus;Rabbits;Spectrometry, X-Ray Emission;X-Ray Diffraction

Bactericidal activity of erbium, chromium:yttrium-scandium-gallium-garnet laser in root canals. The aim of this study was to investigate the effectiveness of the erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser by measuring its bactericidal effect inside root canals experimentally colonized with Enterococcus faecalis. We also determined the optimal conditions for the Er,Cr:YSGG laser to achieve the maximal bactericidal effect. An Er,Cr:YSGG Waterlase laser was used, and its antimicrobial effect was compared with that of sodium hypochlorite (NaOCl) at various concentrations as widely used in clinics. This laser emits photons at a wavelength of 2.78 microm. It is a pulsed laser operating at 20 Hz (20 pulses/s). Significant differences between measurements in the different groups ($P < 0.05$) were observed, depending on time and power used. The use of NaOCl 5% was the most effective procedure, with NaOCl 0.5% being the least effective; however, laser treatment was as effective as NaOCl 5% when applied at 2 W for 60 s. Dental Disinfectants;Sodium Hypochlorite Bacterial Load;Dental Disinfectants;Dental Pulp Cavity;Disinfection;Enterococcus faecalis;Gram-Positive Bacterial Infections;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Therapy;Sodium Hypochlorite

Prediction of clinical response to excimer laser treatment in vitiligo by using neural network models. BACKGROUND: A predictive model may help to select likely responders and to anticipate treatment duration in vitiligo. METHODS: We aimed to develop a predictive rule based on data from a randomized trial of excimer laser in vitiligo. Information on 325 treated patches was available. The degree of repigmentation was assessed by digital image analysis of UVB-reflected photographs. Since

no strong relationship between any single predictive parameter and outcome was initially documented, we relied on artificial neural networks. RESULTS: Using a time-response optimal threshold model, data were divided into 2 groups of responders and nonresponders. A discriminant network was trained in order to detect responders versus nonresponders. A regression network was subsequently used to compute repigmentation time in responders. The neural network discriminator achieved 66.46 +/- 5.37% (95% CI) overall accuracy. The mean absolute error of the neural network regressor was 19.5843 +/- 2.0930 with a root mean square error of 23.7156 +/- 2.2225. CONCLUSION: Our study offers insight into the difficulty of clinical prediction in vitiligo and presents a way to develop an instrument with which to predict the clinical time response in patients treated by excimer laser. Adult;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Neural Networks, Computer;Patient Satisfaction;Predictive Value of Tests;Risk Assessment;Severity of Illness Index;Treatment Outcome;Vitiligo

Role of artificial neural networks in dermatology. Dermatology;Female;Forecasting;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Neural Networks, Computer;Therapy, Computer-Assisted;Vitiligo

Inhibition of mitochondria-dependent apoptosis by 635-nm irradiation in sodium nitroprusside-treated SH-SY5Y cells. Nitric oxide (NO) is a major factor contributing to the loss of neurons in ischemic stroke, demyelinating diseases, and other neurodegenerative disorders. NO not only functions as a direct neurotoxin, but also combines with superoxide (O(2)(-)) by a diffusion-controlled reaction to form peroxynitrite (ONOO(-)), a species that contributes to oxidative signaling and cellular apoptosis. However, the mechanism by which ONOO(-) induces apoptosis remains unclear, although subsequent formation of reactive oxygen species (ROS) has been suggested. The aim of this study was to further investigate the triggers of the apoptotic pathway using O(2)(-) scavenging with light irradiation to block ONOO(-) production. Antiapoptotic effects of light irradiation in sodium nitroprusside (SNP)-treated SH-SY5Y cells were assayed by reduction of 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide, DNA fragmentation, flow cytometry, Western blot, and caspase activity assays. In addition, NO, total ROS, O(2)(-), and ONOO(-) levels were measured to observe changes in NO and its possible involvement in radical induction. Cell survival was reduced to approximately 40% of control levels by SNP treatment, and this reduction was increased to 60% by low-level light irradiation. Apoptotic cells were observed in the SNP-treated group, but the frequency of these was reduced in the irradiation group. NO, O(2)(-), total ROS, and ONOO(-) levels were increased after SNP treatment, but O(2)(-), total ROS, and ONOO(-) levels were decreased after irradiation, despite the high NO concentration induced by SNP treatment. Cytochrome c was released from mitochondria of SNP-treated SH-SY5Y cells, but not of irradiated cells, resulting in a decrease in caspase-3 and -9 activity in SNP-treated cells. Finally, these results show that 635-nm irradiation, by promoting the scavenging of O(2)(-), protected against neuronal death through blocking the mitochondrial apoptotic pathway induced by ONOO(-) synthesis. Tetrazolium Salts;Thiazoles;Superoxides;Peroxynitrous Acid;Nitroprusside;Nitric Oxide;Cytochromes c;Caspase 3;Caspase 9;thiazolyl blue Apoptosis;Caspase 3;Caspase 9;Cell Line, Tumor;Cytochromes c;DNA Fragmentation;Humans;Light;Mitochondria;Neurons;Nitric Oxide;Nitroprusside;Peroxynitrous Acid;Superoxides;Tetrazolium Salts;Thiazoles

Comparison of splinting and splinting plus low-level laser therapy in idiopathic carpal tunnel syndrome. This study aimed to compare the short-term efficacy of splinting (S) and splinting plus low-level laser therapy (SLLLT) in mild or moderate idiopathic carpal tunnel syndrome (CTS) with a prospective, randomized controlled study. The patients with unilateral, mild, or moderate idiopathic CTS who experienced symptoms over 3 months were included in the study. The SLLLT group received ten sessions of laser therapy and splinting while S group was given only splints. The patients were

evaluated at the baseline and after 3 months of the treatment. Follow-up parameters were nerve conduction study (NCS), Boston Questionnaire (BQ), grip strength, and clinical response criteria. Forty-five patients with CTS completed the study. Twenty-four patients were in S and 21 patients were in SLLLT group. In the third-month control, SLLLT group had significant improvements on both clinical and NCS parameters (median motor nerve distal latency, median sensory nerve conduction velocities, BQ symptom severity scale, and BQ functional capacity scale) while S group had only symptomatic healing (BQ symptom severity scale). The grip strength of splinting group was decreased significantly. According to clinical response criteria, in SLLLT group, five (23.8%) patients had full and 12 (57.1%) had partial recovery; four (19%) patients had no change or worsened. In S group, one patient (4.2%) had full and 17 (70.8%) partial recovery; six (25%) patients had no change or worsened. Additionally, applied laser therapy provided better outcomes on NCS but not in clinical parameters in patients with CTS. Adult;Aged;Carpal Tunnel Syndrome;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Neural Conduction;Prospective Studies;Severity of Illness Index;Splints;Treatment Outcome

Surgical approach with Er:YAG laser on osteonecrosis of the jaws (ONJ) in patients under bisphosphonate therapy (BPT). Osteonecrosis of the jaw (ONJ) in patients on long-term bisphosphonate Therapy (BPT) has been reported with increasing frequency in literature over the past 4 years. Therapy for this condition is still a dilemma. Temporary suspension of BPT offers no short-term benefits; hyperbaric oxygen has no proven efficacy and therefore is not recommended. Intermittent or continuous antibiotic therapy with surgical debridement can be beneficial to palliate the symptoms. Er:YAG laser can be used to eliminate necrotic bone portions by partial or total resection as an alternative to conventional rotary devices. In our study, 91 patients affected by ONJ-BP lesion, for a total of 115 ONJ sites were observed between January 2004 and May 2008 (Department of Odontostomatology, University of Parma). Fifty-five ONJ sites were considered for this study in four different groups, retrospectively identified on the basis of treatment performed (G1-G4). G1: 13 ONJ-BP sites were treated with medical therapy (amoxicillin 1gr x 3/die per os with metronidazole 250 mg x 2/die per os) for at least 2 weeks; G2: 17 ONJ-BP sites received medical treatment in association with cycles of low-level laser therapy (LLLT) applications performed using an Nd:YAG laser (1,064 nm) once a week for 2 months; G3: 13 ONJ-BP sites were surgically treated (sequestrectomy of necrotic bone, debridement, corticotomy/surgical removal of alveolar and/or cortical bone); G4: 12 ONJ-BP sites were treated with surgical therapy performed using an Er:YAG laser (2,940 nm) in association with LLLT. Clinical success has been defined for each treatment performed as: (a) complete mucosal healing free from signs and symptoms (classified as stage "0") or (b) transition from a higher to a lower stage (Ruggiero staging) for at least 3 months. All the ONJ-BP sites treated with Er:YAG laser (G4 group) had a clinical improvement (100%) and 87.5% of sites had a complete mucosal healing with a mean follow-up of 13 months. The result obtained in the G4 is extremely significant in comparison with those obtained by medical treatment alone or in a traditional surgical approach. Thanks to the high degree of affinity of this wavelength for water and hydroxyapatite, both soft and bone tissues can be easily treated. This technique can also be used for conservative operations whereby necrotic bone is vaporized until healthy bone is reached. In addition, an additional advantage of the Er:YAG laser is its bactericidal and possible biostimulatory action, accelerating the healing of both soft tissues and bone tissues, in comparison to conventional treatments. In conclusion, from our experience, it is possible to observe that an early conservative surgical approach with Er:YAG laser associated with LLLT, for BP-induced ONJ could be considered as more efficient in comparison with medical therapy or other conventional techniques. Bone Density Conservation Agents;Diphosphonates Adult;Aged;Aged, 80 and over;Bone Density

Conservation Agents;Diphosphonates;Female;Humans;Jaw Diseases;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Oral Surgical Procedures;Osteonecrosis;Treatment Outcome

Reduced axonal transport in Parkinson's disease cybrid neurites is restored by light therapy. BACKGROUND: It has been hypothesized that reduced axonal transport contributes to the degeneration of neuronal processes in Parkinson's disease (PD). Mitochondria supply the adenosine triphosphate (ATP) needed to support axonal transport and contribute to many other cellular functions essential for the survival of neuronal cells. Furthermore, mitochondria in PD tissues are metabolically and functionally compromised. To address this hypothesis, we measured the velocity of mitochondrial movement in human transmitochondrial cybrid "cytoplasmic hybrid" neuronal cells bearing mitochondrial DNA from patients with sporadic PD and disease-free age-matched volunteer controls (CNT). The absorption of low level, near-infrared laser light by components of the mitochondrial electron transport chain (mtETC) enhances mitochondrial metabolism, stimulates oxidative phosphorylation and improves redox capacity. PD and CNT cybrid neuronal cells were exposed to near-infrared laser light to determine if the velocity of mitochondrial movement can be restored by low level light therapy (LLLT). Axonal transport of labeled mitochondria was documented by time lapse microscopy in dopaminergic PD and CNT cybrid neuronal cells before and after illumination with an 810 nm diode laser (50 mW/cm2) for 40 seconds. Oxygen utilization and assembly of mtETC complexes were also determined. RESULTS: The velocity of mitochondrial movement in PD cybrid neuronal cells (0.175 +/- 0.005 SEM) was significantly reduced ($p < 0.02$) compared to mitochondrial movement in disease free CNT cybrid neuronal cells (0.232 +/- 0.017 SEM). For two hours after LLLT, the average velocity of mitochondrial movement in PD cybrid neurites was significantly ($p < 0.003$) increased (to 0.224 +/- 0.02 SEM) and restored to levels comparable to CNT. Mitochondrial movement in CNT cybrid neurites was unaltered by LLLT (0.232 +/- 0.017 SEM). Assembly of complexes in the mtETC was reduced and oxygen utilization was altered in PD cybrid neuronal cells. PD cybrid neuronal cell lines with the most dysfunctional mtETC assembly and oxygen utilization profiles were least responsive to LLLT. CONCLUSION: The results from this study support our proposal that axonal transport is reduced in sporadic PD and that a single, brief treatment with near-infrared light can restore axonal transport to control levels. These results are the first demonstration that LLLT can increase axonal transport in model human dopaminergic neuronal cells and they suggest that LLLT could be developed as a novel treatment to improve neuronal function in patients with PD.

Effects of low intensity laser irradiation during healing of skin lesions in the rat. OBJECTIVE: To determine whether laser light can improve healing of skin wounds by killing wound bacteria while simultaneously accelerating host tissue activity. MATERIALS AND METHODS: Wounds on the rat dorsum were irradiated or sham-irradiated three times weekly from days 1 to 19 using 635 or 808 nm diode lasers at 1 or 20 J/cm(2). Wound area and bacterial growth were evaluated three times weekly. Histological analysis was performed on days 8 and 19. Immunohistochemical analysis was performed on day 19. RESULTS: Wounds that were irradiated using 635 nm light at 1 J/cm(2) healed similarly to controls. Wounds that were irradiated using 808 nm (1 and 20 J/cm(2), P<or=0.05) and 635 nm light (20 J/cm(2), P<or=0.05) were worse in wound maximum area at day 3 compared with controls. Further, 635 nm light at 20 J/cm(2) delayed wound closure at day 19 (ASL = 0.0127). Bacterial colonization of wounds was altered using 635 nm (20 J/cm(2), P<0.0001) and 808 nm light (1 J/cm(2), P<0.0001; 20 J/cm(2), P = 0.02). In particular, the presence of normal skin flora decreased (P<0.0001-0.0002) and, when using 808 nm light, the presence of S. aureus increased (P = 0.0001). There was histological evidence of advanced repair using 635 nm at 1 J/cm(2) at day 8 (ASL<0.04). In contrast, markers of acute repair were increased and of late repair were decreased at day 19 using 635 nm at 20 J/cm(2) (ASL<0.04). CONCLUSIONS: This study demonstrates that while clearing wounds of certain

bacteria is feasible it does not necessarily translate into a healing advantage. When normal flora are disturbed, environmental organisms more readily colonize the wound surface. It is not clear when using 808 nm light whether the loss of normal flora in the wound alone is responsible for the proliferation of S. aureus or whether the light adds to the effect by stimulating S. aureus growth. Animals;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Skin;Wound Healing

Effect of photodynamic therapy on the healing of cutaneous third-degree-burn: histological study in rats. The aim of this study was to conduct a histological assessment of the effect of photodynamic therapy (PDT) on the repairing of third-degree-burn wounds made on the backs of rats with a heated scalpel. Ninety-six rats were divided into groups: G1, control (n = 24), cold scalpel; G2, burned, heated scalpel (n = 24); G3, low-level laser therapy (LLLT) (n = 24), on burns; and G4, photodynamic therapy (PDT) (n = 24), toluidine-O blue (100 microg/ml) and LLLT treatment on burns. The laser (685 nm) was applied in continuous mode, 50 mW, 4.5 J/cm(2), contact mode at nine points (9 s/point). Eight animals in each group were killed at 3 days, 7 days or 14 days after surgery, and tissue specimens containing the whole wounded area were removed and processed for histological analysis; the results were statistically analyzed with Kruskal-Wallis and Dunn's tests ($P < 0.05$). The results demonstrated significant differences between G2 and G3, and between G2 and G4, at both 3 days and 7 days, with regard to acute inflammation scores; G1 and G2 showed significant differences when compared with G4 at 3 days, with regard to neo-angiogenesis scores; G1 and G2 were statistically different from G3 and G4 at both 3 days and 7 days, with regard to re-epithelization scores; G2 showed statistically significant differences when compared with G3 and G4 with regard to collagen fiber scores at 7 days. LLLT and PDT acted as a biostimulating coadjuvant agent, balancing the undesirable effect of the burn on the wound healing process, acting mainly in the early healing stages, hastening inflammation and increasing collagen deposition. Photosensitizing Agents;Tolonium Chloride Animals;Burns;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Rats;Rats, Wistar;Tolonium Chloride;Wound Healing

The effect of low-level laser in knee osteoarthritis: a double-blind, randomized, placebo-controlled trial. INTRODUCTION: Low-level laser therapy (LLLT) is thought to have an analgesic effect as well as a biomodulatory effect on microcirculation. This study was designed to examine the pain-relieving effect of LLLT and possible microcirculatory changes measured by thermography in patients with knee osteoarthritis (KOA). MATERIALS AND METHODS: Patients with mild or moderate KOA were randomized to receive either LLLT or placebo LLLT. Treatments were delivered twice a week over a period of 4 wk with a diode laser (wavelength 830 nm, continuous wave, power 50 mW) in skin contact at a dose of 6 J/point. The placebo control group was treated with an ineffective probe (power 0.5 mW) of the same appearance. Before examinations and immediately, 2 wk, and 2 mo after completing the therapy, thermography was performed (bilateral comparative thermograph by AGA infrared camera); joint flexion, circumference, and pressure sensitivity were measured; and the visual analogue scale was recorded. RESULTS: In the group treated with active LLLT, a significant improvement was found in pain (before treatment [BT]: 5.75; 2 mo after treatment : 1.18); circumference (BT: 40.45; AT: 39.86); pressure sensitivity (BT: 2.33; AT: 0.77); and flexion (BT: 105.83; AT: 122.94). In the placebo group, changes in joint flexion and pain were not significant. Thermographic measurements showed at least a 0.5 degrees C increase in temperature--and thus an improvement in circulation compared to the initial values. In the placebo group, these changes did not occur. CONCLUSION: Our results show that LLLT reduces pain in KOA and improves microcirculation in the irradiated area. Adult;Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Thermography

Effect of low-level laser therapy in the myonecrosis induced by Bothrops jararacussu snake venom. OBJECTIVE: The aim of this work was to investigate the capacity of low-level laser therapy (LLLT) alone or in combination with antivenom (AV) to reduce myonecrosis induced by Bothrops jararacussu snake venom. BACKGROUND DATA: Myonecrosis is the most pronounced local effect caused by B. jararacussu venom. AV therapy and other first-aid treatments do not reverse these local effects. MATERIAL AND METHODS: Male Swiss mice were used. Myonecrosis was induced by injection of 0.6 mg/kg of B. jararacussu venom in the right gastrocnemius muscle and was evaluated at 3 or 24 h after venom injection. The site of venom administration was irradiated for 29 s with a low power semiconductor laser (685 nm) at a dose of 4.2 J/cm(2). Intravenous AV therapy (0.5 mL dose) was administered at different times: 30 min before venom injection or 0, 1, or 3 h afterward. Both AV therapy and LLLT treatments were duplicated in mice groups killed at 3 or 24 h. RESULTS: B. jararacussu venom caused a significant myonecrotic effect 3 and 24 h after venom injection. LLLT significantly reduced myonecrosis by 83.5% at 24 h ($p < 0.05$) but not at 3 h, and AV therapy alone was ineffective for reducing myonecrosis at 3 and 24 h. CONCLUSION: Only LLLT significantly reduced myonecrosis of the envenomed muscle, suggesting that LLLT is a potentially therapeutic approach for treating the local effects of B. jararacussu venom. Antivenins;Crotalid Venoms Animals;Antivenins;Bothrops;Crotalid Venoms;Disease Models, Animal;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Muscular Diseases;Necrosis

Pulp temperature increase during photo-activated disinfection (PAD) of periodontal pockets: an in vitro study. The capacity of photo-sensitizers, used in combination with laser light to kill micro-organisms has been demonstrated in different studies. Photo-activated disinfection (PAD) has been introduced in periodontology as an aid for disinfection of periodontal pockets. The aim of this study is to verify the harm for dental vitality of the use of PAD in periodontal pockets. Root canals of 24 freshly extracted human teeth where prepared using profiles up to a size of ISO #50 and filled with thermo-conductor paste. A silicon-based false gum was made in which a periodontal pocket was created and filled with photo-sensitizer phenothiazine chloride (phenothiazine-5-ium, 3.7-bis (dimethylamino)-, chloride). The external root surface was irradiated during 60 s with a 660-nm diode laser (output power: 20 mW; power density: 0.090 W/cm(2); Energy density: 5.46 J/cm(2)) using a periodontal tip with a diameter of 1 mm and a length of 7 mm. Temperatures were recorded inside the root canal using a thermocouple. Measurements were recorded every second, starting at 10 s before lasering, during the irradiation and were continued for 150 s after the end of irradiation, and six measurements were done per tooth. An average temperature increase of 0.48 +/- 0.11 degrees C was recorded. Our results demonstrated that pulp temperature increase was lower than 3 degrees C, which is considered to be harmless for pulp injury. Regarding pulp temperature increase, the use of PAD for disinfection of periodontal pockets can be considered as a safe procedure for dental vitality. Photosensitizing Agents Dental Pulp;Disinfection;Hot Temperature;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Pocket;Photosensitizing Agents;Safety;Temperature

Current role of resurfacing lasers. Resurfacing lasers have been the treatment of choice for diminishing rhytids and tightening skin. The carbon dioxide and erbium lasers have been the gold and silver standards. Despite their effectiveness, these resurfacing lasers have a very high risk profile including scarring, hyperpigmentation and hypopigmentation. Because of these side effects, various practitioners have tried alternative settings for these lasers as well as alternative wavelengths, particularly in the infrared spectrum. These devices have had less downtime, but their effectiveness has been limited to fine wrinkles. As with selective photothemolysis, a major advance in the field has been fractionated resurfacing which incorporates grids of microthermal zones that spares islands of skin. This concept permits less tissue damage and quicker tissue regeneration. Initially, fractionated

resurfacing was limited to the nonablative mid-infrared spectrum. These resurfacing lasers is appropriate for those patients with acne scars, uneven skin tone, mild to moderate photodamage, and is somewhat effective for melasma. Importantly, because there is less overall tissue damage and stimulation of melanocytes, these lasers can be used in darker skin types. Downtime is 2-4 days of erythema and scaling. Yet, these nonablative fractionated devices required 5-6 treatments to achieve a moderate effect. Logically, the fractionated resurfacing has now been applied to the CO2 and the Erbium:Yag lasers. These devices can treat deeper wrinkles and tighten skin. Downtime appears to be 5-7 days. The long term effectiveness and the question of whether these fractionated devices will approach the efficacy of the standard resurfacing lasers is still in question. Ultimately either integrated devices which may use fractionated resurfacing, radiofrequency and a sensitizer, or combining different lasers in a single treatment may prove to be the most effective in reducing rhtyides, smoothing the skin topography and tightening the skin envelope. Carbon Dioxide;Erbium Carbon Dioxide;Clinical Trials as Topic;Dose Fractionation, Radiation;Erbium;Forecasting;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Radiation Injuries;Rejuvenation;Skin;Skin Diseases;Surgery, Plastic

Micro-island damage with a nonablative 1540-nm Er:Glass fractional laser device in human skin. BACKGROUND AND OBJECTIVES: Fractional photothermolysis produces micro-islands of thermal injury to the skin while preserving areas among treated tissue sites in order to promote wound healing. Histological changes associated with single and multiple passes of the 1540-nm Er:Glass fractional laser were examined using in vivo human skin. METHODS AND MATERIALS: Panni of five abdominoplasty patients were treated intraoperatively with a Fractional Lux1540 erbium glass laser system at various laser parameters, with single and multiple passes. Biopsies were removed and examined using standard histological stains. RESULTS: Deep coagulated columns of collagen separated by regions of unaffected tissue were observed at variable fluence parameters. A direct correlation between the depth of penetration of the coagulated microcolumns and increasing energies was observed. Micro-islands of coagulation were approximately 250 microm in diameter and separated by approximately 800 microm of unaffected tissue. With multiple passes, significantly more disruption of the dermal-epidermal junction (DEJ) occurred at higher fluences. In contrast to the controlled fractional columns observed with single-pass treatments, nonuniform coagulated columns were distributed randomly throughout the tissue when instituting multiple passes over the same treatment region. CONCLUSION: Micro-islands of thermal damage were observed at variable energy parameters. Pathological changes within the skin were clearly dependent on amount of energy and number of passes of the laser treatment. Significantly more superficial damage, accompanied by disruption of the DEJ was observed with multiple passes when compared with single pass at similar fluences. However, with multiple passes, depth of thermal injury did not increase with increasing energies but did disrupt the micro-island array observed with single-pass fractional treatments. Erbium Abdominal Wall;Biopsy;Dose Fractionation, Radiation;Erbium;Humans;Intraoperative Care;Low-Level Light Therapy;Plastic Surgery Procedures;Skin;Wound Healing;Wounds and Injuries

Beneficial effects of spraying low mineral content thermal spring water after fractional photothermolysis in patients with dermal melasma. INTRODUCTION: Melasma is a common dermatological skin disease that can now be treated by fractional photothermolysis (fractional resurfacing). Past studies have shown that thermal spring water (TSW) spray can reduce local inflammatory symptoms after dermatological surgery, laser surgery or chemical peelings. The aim of this study was to evaluate the clinical efficacy and safety of spraying TSW post-fractional resurfacing treatment in patients with dermal melasma. METHODS: Twenty patients with bilateral dermal melasma were included in this split-face comparative study. Patients were treated by fractional resurfacing laser and then TSW was sprayed generously unilaterally. For the next 48 h, patients were

instructed to spray thermal water at least six times a day on one side. Patient's self-assessment conducted 10 min and 2 days after TSW spraying (stinging, pain, skin dryness, swelling, and redness) and investigator's 48-h post-treatment evaluation (purpura, skin dryness, erythema, swelling, scars, hyper- or hypopigmentation) were recorded for the treated and control sides using visual analogue scales. RESULTS: Pain, dryness, and redness were significantly lower 10 min after spraying on the TSW-treated side in comparison with the untreated side, as assessed by the patients ($P < 0.05$). Two days after fractional resurfacing, dryness and redness were still improved on the TSW-treated side. The investigator's evaluation revealed that erythema, the only perceivable sign following irradiation, was significantly reduced by TSW spraying ($P < 0.01$). CONCLUSION: This split-face comparative study conducted in patients with dermal melasma showed that spraying TSW after fractional laser resurfacing significantly reduced short-term adverse effects associated with the procedure. Mineral Waters Adult;Erythema;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Melanosis;Mineral Waters;Pain Measurement;Phototherapy;Self-Assessment;Treatment Outcome

Single photon fluorescent microlithography for live-cell imaging. Using fluorescent dyes to trigger the polymerization of a commercial polyurethane resin allows a rapid fabrication of micrometer and submicrometer sized fluorescent structures by one-photon absorption. Here, we show that standard He-Ne lasers emitting at 632.8 nm can be used to start the photopolymerization and that very low laser power is required. This procedure allows the fabrication of fiduciary fluorescent references on standard glass coverslips, mica sheets, or gold-coated coverslips for laser scanning or standard fluorescent microscopy. The biocompatibility of the polymerized resin with cells in culture was tested by growing Xenopus melanophores and a standard laser scanning microscope was used to demonstrate that it is possible to use equipment readily available in several laboratories. We show that fluorescent structure with less than 10 nm in height may be used as references in fluorescence microscopy allowing a smooth environment for cell growth. Different dyes were tested and the conditions for one-photon polymerization were outlined. Polyurethanes;Urethane Animals;Cells, Cultured;Low-Level Light Therapy;Melanophores;Microscopy, Confocal;Microscopy, Fluorescence;Polyurethanes;Urethane;Xenopus

Low-level laser irradiation promotes the recovery of atrophied gastrocnemius skeletal muscle in rats. Low-level laser (LLL) irradiation promotes proliferation of muscle satellite cells, angiogenesis and expression of growth factors. Satellite cells, angiogenesis and growth factors play important roles in the regeneration of muscle. The objective of this study was to examine the effect of LLL irradiation on rat gastrocnemius muscle recovering from disuse muscle atrophy. Eight-week-old rats were subjected to hindlimb suspension for 2 weeks, after which they were released and recovered. During the recovery period, rats underwent daily LLL irradiation (Ga-Al-As laser; 830 nm; 60 mW; total, 180 s) to the right gastrocnemius muscle through the skin. The untreated left gastrocnemius muscle served as the control. In conjunction with LLL irradiation, 5-bromo-2-deoxyuridine (BrdU) was injected subcutaneously to label the nuclei of proliferating cells. After 2 weeks, myofibre diameters of irradiated muscle increased in comparison with those of untreated muscle, but did not recover back to normal levels. Additionally, in the superficial region of the irradiated muscle, the number of capillaries and fibroblast growth factor levels exhibited significant elevation relative to those of untreated muscle. In the deep region of irradiated muscle, BrdU-positive nuclei of satellite cells and/or myofibres increased significantly relative to those of the untreated muscle. The results of this study suggest that LLL irradiation can promote recovery from disuse muscle atrophy in association with proliferation of satellite cells and angiogenesis. Fibroblast Growth Factor 2;Insulin-Like Growth Factor I;Bromodeoxyuridine Animals;Bromodeoxyuridine;Capillaries;Cell Proliferation;Fibroblast Growth Factor 2;Hindlimb Suspension;Insulin-Like Growth Factor I;Low-Level

Light Therapy;Male;Muscle, Skeletal;Muscular Atrophy;Myoblasts, Skeletal;Myofibrils;Neovascularization, Physiologic;Rats;Rats, Wistar;Satellite Cells, Skeletal Muscle

Immediate efficacy of diode laser application in the treatment of dentine hypersensitivity in periodontal maintenance patients: a randomized clinical trial. BACKGROUND: To evaluate the immediate efficacy in the reduction of dentine hypersensitivity (DH) when applying an 810 nm diode laser (DL), and a 10% potassium nitrate bioadhesive gel (NK10%). MATERIAL AND METHODS: Forty-five consecutive periodontal maintenance patients of both sexes, with a DH >or= 2 on the verbal rating scale (VRS) in one or more teeth, were randomly allocated into three equal groups: 15 patients received DL and placebo gel; 15 patients were tested with a placebo laser and NK10%; and the remaining 15 received a placebo laser and placebo gel. The DH was evaluated at the start of the study, 15 and 30 min. after the laser application, and on days 2, 4, 7, 14, 30 and 60 by a blind examiner. RESULTS: After 15 min., observations showed a reduction in DH after an evaporative stimulus (ES) of 36.9% (0.86), three times greater than that of the control group (0.23) (p=0.008). After 14 days, this effect was even greater [DL 71.7% (1.67)/NK10% 36.3% (1.73)/control 28.1% (0.73); p=0.004], and lasted until day 60 [65.7% (1.53)/30.4% (0.73)/25.8% (0.67); p=0.01]. CONCLUSIONS: The DL and NK10% gel were proven effective in the treatment of DH. A significantly greater immediate response was observed with DL. Gels;Nitrates;Placebos;Potassium Compounds;potassium nitrate Adult;Aged;Chronic Periodontitis;Dentin Sensitivity;Female;Follow-Up Studies;Gels;Gingival Recession;Gingivitis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Nitrates;Periodontal Diseases;Periodontitis;Physical Stimulation;Placebos;Potassium Compounds;Time Factors;Touch;Young Adult

Immunohistochemical expression of matrix metalloproteinases in photodamaged skin by photodynamic therapy. BACKGROUND: Photodynamic therapy (PDT) has been described for photoageing treatment, but its mechanism of action is not clarified. Although PDT-induced matrix metalloproteinase (MMP) expression and collagen production have been studied in normal skin and in inflammatory disease, there is no report about the effect of PDT on the extracellular matrix in photodamaged skin. OBJECTIVES: To evaluate skin remodelling induced by methyl aminolaevulinate (MAL)-PDT in photodamaged skin by histological and immunohistochemical studies. METHODS: Fourteen patients were treated with two sessions of MAL-PDT. The light source was a light-emitting diode (635 nm, 37 J cm(-2)). Skin biopsies were performed in all patients before and at 3 and 6 months after treatment. Immunohistochemical studies evaluated collagen types I and III, MMP-1, MMP-3, MMP-7, MMP-9, MMP-12 and tissue inhibitor of metalloproteinases-1. RESULTS: Global improvement in photodamaged skin was observed. A significant increase in expression of MMP-9 in the dermis was detected at 3 months after treatment (P = 0.002). Significant increases in the expression of collagen type I at 3 months (P = 0.002) and at 6 months after treatment (P = 0.001) were also observed. CONCLUSIONS: Skin remodelling induced by MAL-PDT was demonstrated in photodamaged skin. Two sessions of MAL-PDT increases immunohistochemical expression of MMP-9 in the dermis at 3 months after treatment, and also of collagen type I. Collagen Type I;Collagen Type III;Photosensitizing Agents;Tissue Inhibitor of Metalloproteinase-1;methyl 5-aminolevulinate;Aminolevulinic Acid;Matrix Metalloproteinases Aminolevulinic Acid;Collagen Type I;Collagen Type III;Female;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Middle Aged;Photochemotherapy;Photosensitizing Agents;Skin;Skin Aging;Tissue Inhibitor of Metalloproteinase-1

[Effect of infrared low-intensity laser radiation on a mutation process and proliferative corneal activity in experimental cerebral hypoxia]. The paper deals with the impact of infrared low-intensity laser radiation (IRLILR) on a mutation process and the proliferative activity of the animal

cornea during stimulation of circulatory brain hypoxia. During an experiment on laboratory albino rats, IRLILR was studied for its impact on the level of chromosomal rearrangements and the mitotic index in the corneal cells was calculated in circulatory brain hypoxia. Laser exposure during stimulation of circulatory brain hypoxia favors normalization of the level of chromosomal aberrations and a mitotic cycle in the rat corneal epithelial cells. The experimental findings suggest that IRLILR may be used in ophthalmological care for antihypoxic purposes. Animals;Cell Proliferation;Chromosome Aberrations;Cornea;Corneal Diseases;Disease Models, Animal;Hypoxia, Brain;Low-Level Light Therapy;Male;Mutation;Oxidative Stress;Rats;Treatment Outcome

[Platelet aggregatory properties in patients with chronic pancreatitis and possibilities of correcting their impairments]. The purpose of the investigation was to study the impact of low-intensity laser therapy (LILT) on platelet aggregatory properties in patients with chronic pancreatitis (CP) on an exacerbation. A total of 105 patients aged 36 to 77 years who were divided into a study group (n = 60) and a control one (n = 45) were examined. Thirty persons who formed a healthy group were additionally examined. In the study group patients, drug therapy was supplemented by LILT via various methods. The control group received only drug therapy. The investigation revealed that patients with CP on an exacerbation showed diverse changes in platelet aggregatory properties towards hyperaggregation. LILT was ascertained to have a normalizing effect on platelet aggregatory properties in the study group patients. Adult;Aged;Combined Modality Therapy;Drug Therapy, Combination;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pancreatitis, Chronic;Platelet Aggregation

Utilization of low-intensity laser during healing of free gingival grafts. OBJECTIVES: This study evaluates the action of a low-intensity diode laser with gallium-aluminum-arsenide (GaAlAs) active medium on the healing process and analgesia in individuals undergoing free gingival grafts. MATERIAL AND METHOD: Ten individuals needing bilateral gingival graft in the mandibular arch were enrolled in a double-blind study. Each individual had a 30-d interval between the two surgeries. The side receiving application of laser was defined as test side and was established upon surgery; laser application was simulated on the control side. The laser was applied in the immediate postoperative period and after 48 h, and patients rated pain on a scale of 0 to 10, representing minimal and maximal pain, respectively. Photographs were obtained at 7, 15, 30, and 60 d postoperatively and evaluated by five periodontists. RESULTS: No statistically significant difference was found at any postoperative period between control and test sides, even though greater clinical improvement associated with treatment was observed at 15 d postoperative. At 30 and 60 d, some examiners observed the same or greater clinical improvement for the control. Only one individual reported mild to moderate pain on the first postoperative day. CONCLUSIONS: Low-intensity laser therapy did not improve the healing of gingival grafts and did not influence analgesia.
Adolescent;Adult;Double-Blind Method;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Transplants;Wound Healing;Young Adult

Early diagnosis of ocular hypertension using a low-intensity laser irradiation test. OBJECTIVE: We investigated the potential use of low-intensity laser irradiation (LILI) as a diagnostic tool for identifying hypertensive eyes at risk of glaucoma. BACKGROUND DATA: The diagnosis of early-stage ocular hypertension is particularly difficult to establish. METHODS: This study of a case series included 123 healthy subjects with normal vision. The intraocular pressure (IOP) was determined before (baseline) and 30 min after a 30-sec irradiation of the limbus area with laser light (780 nm; 7.5 mW; 292 Hz modulation). RESULTS: Baseline IOP was >21 mm Hg in 44 of 211 eyes (20.9%), consistent with ocular hypertension. LILI decreased the mean IOP by 6.2 mm Hg (-25.7%; $p < 0.001$; paired t test) in these eyes. The remaining 167 eyes (79.1%) exhibited a normotensive IOP <or=21 mm Hg. LILI reduced the mean IOP by 2.9 mm Hg (-17.1%; $p < 0.001$) in these eyes, but there were different

response patterns: 1) the IOP did not change (27.0%); 2) the IOP was reduced by the same extent in both eyes (32.3%); 3) initial IOP differences between left and right eyes became level and the absolute IOP was reduced to a lower level that was identical in both eyes (18.0%); and 4) the initial difference in IOP between the left and right eye persisted despite LILI (22.7%). CONCLUSION: LILI lowers IOP, even in normotensive eyes. This effect may be useful to determine the individual physiological IOP and to diagnose latent ocular hypertension in eyes with presumably normotensive IOP. Aged;Early Diagnosis;Female;Humans;Intraocular Pressure;Lasers, Semiconductor;Limbus Corneae;Low-Level Light Therapy;Male;Middle Aged;Ocular Hypertension

[Low-intensity laser radiation in the combined treatment of patients with chronic obstructive bronchitis]. This study included 89 patients with chronic obstructive bronchitis (COB) that were exposed to harmful occupational factors. The control group consisted of 30 healthy subjects. Chronic obstructive bronchitis is characterized by serious disturbances in the cardiorespiratory system that manifest themselves in the form of bronchogenic pneumosclerosis with moderate lung emphysema and pulmonary hypertension associated with impaired general resistance. Simultaneously, activity of lipid peroxidation reactions decreases. Application of low-intensity laser radiation in combination with other therapeutic modalities for the treatment of patients with chronic obstructive bronchitis accelerates elimination of clinical symptoms, increases its efficiency, promotes drainage function of the bronchi, facilitates normalization of the patient's immune status, and contributes to the optimization of lipid peroxidation processes. Asthma;Bronchitis, Chronic;Combined Modality Therapy;Humans;Lipid Peroxidation;Low-Level Light Therapy;Male;Middle Aged;Occupational Exposure

[Prevention of occupational diseases of lower limbs joints]. Study covered 84 personal computer users, 48 jewelry female polishers, 92 metallic ships body assemblers. Objective investigations revealed lower limbs joints stiffness. After prevention measures based on low-intensity laser rays, the joints functions recovered. Adult;Ankle Joint;Female;Hip Joint;Humans;Incidence;Joint Diseases;Knee Joint;Low-Level Light Therapy;Male;Middle Aged;Occupational Diseases;Occupational Exposure;Russia;Young Adult

[Prevention of upper limbs diseases in workers subjected to occupational hazards]. Study covered 120 personal computer users, 98 jewelry female polishers, 64 metallic ships body assemblers. Objective investigations revealed joints pain on palpation, joints function disorders, hypoesthesia of finger tips. After prevention measures based on low-intensity laser rays, the joints functions recovered, hands edema disappeared, hypoesthesia cleared. Adult;Female;Follow-Up Studies;Hand-Arm Vibration Syndrome;Humans;Low-Level Light Therapy;Male;Middle Aged;Occupational Exposure;Prevalence;Russia;Vibration;Young Adult

Low level laser therapy in acute dehiscence saphenectomy: therapeutic proposal. Dehiscence is a feared complication after major surgeries. Patient who had undergone coronary artery bypass grafting developed saphenectomy's dehiscence on lower limb with edema and pain on the 15th postoperative day. Conventional treatment had been initially performed without clinical improvement. On the 30th postoperative day only Low Level Laser Therapy (LLLT) was applied punctually around surgical wounds edge. The results revealed granulated tissue, reduction of inflammatory process and analgesic effect since the first application. In this pilot study, LLLT has shown a considerable role as a wound healing agent, through a new proposal for efficient, safe and noninvasive therapy. Acute Disease;Coronary Artery Bypass;Female;Humans;Leg Injuries;Low-Level Light Therapy;Middle Aged;Postoperative Care;Saphenous Vein;Surgical Wound Dehiscence

Evaluation of dental pulp temperature rise during photo-activated decontamination (PAD) of caries: an in vitro study. Photo-activated decontamination (PAD) has been reported in caries treatment

as an aid in dentine decontamination. The aim of this study is to verify the harmlessness for pulp vitality of photo-activated decontamination (PAD) in caries treatment. Twenty freshly extracted single-rooted teeth were used. Deep class I cavities with a <or= 0.5 mm dentine thickness between the floor of the cavity and the roof of cameral pulp were prepared. Following the manufacturer's instructions, cavities were filled with a photo-sensitizer (Phenothiazinechloride: 10 mg /ml), irradiated during 30 s with a 660-nm diode laser (output power: 40 mW in continuous wave; total delivered energy density: 4.87 J/cm(2)). Pulp temperature raises were recorded using a thermocouple (ALCr). Measurements were recorded every second during the irradiation and 150 s afterwards. Six records were repeated for each tooth. After 30 s of irradiation, the mean of temperature rise was 0.83 degrees C +/- 0.22 degrees C. All records showed temperature increases lower than the 3 degrees C (safety level for pulp injury). Based on our in vitro study, we can conclude that the dental pulp temperature rise following the use of PAD technique for the decontamination of dentine can be considered as save procedure for pulp vitality. Photosensitizing Agents Dental Caries;Dental Pulp;Dentin;Disinfection;Hot Temperature;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Photosensitizing Agents;Safety;Temperature

Placebo-controlled randomized clinical trial of the effect two different low-level laser therapies (LLLT)--intraoral and extraoral--on trismus and facial swelling following surgical extraction of the lower third molar. The purpose of this study is to compare the effects of extraoral and intraoral low-level laser therapies (LLLT) on postoperative trismus and oedema following the removal of mandibular third molars. Forty-eight patients who were to undergo surgical removal of their lower third molars were studied. Patients were randomly allocated to one of three groups: extraoral LLLT, intraoral LLLT, or placebo. In the study, a Ga-Al-As diode laser device with a continuous wavelength of 808 nm was used, and the laser therapy was applied by using a 1 x 3-cm handpiece. The flat-top laser beam profile was used in this therapy. For both of the LLLT groups, laser energy was applied at 100 mW (0.1 W) for a total of 120 s (0.1 W x 120 s = 12 J). Patients in the extraoral-LLLT group (n = 16) received 12-J (4 J/cm(2)) low-level laser irradiation, and the laser was applied at the insertion point of the masseter muscle immediately after the operation. Patients in the intraoral-LLLT group (n = 16) received 12-J (4 J/cm(2)) low-level laser irradiation intraorally at the operation site 1 cm from the target tissue. In the placebo group (n = 16), the handpiece was inserted intraorally at the operation site and then was touched extraorally to the masseter muscle for 1 min at each site (120 s total), but the laser was not activated. The size of the interincisal opening and facial swelling were evaluated on the second and seventh postoperative days. At the second postoperative day, trismus (29.0 +/- 7.6 mm [p = 0.010]) and swelling (105.3 +/- 5.0 mm [p = 0.047]) in the extraoral-LLLT group were significantly less than in the placebo group (trismus: 21.1 +/- 7.6 mm, swelling: 109.1 +/- 4.4 mm). Trismus (39.6 +/- 9.0 mm [p = 0.002]) in the extraoral-LLLT group at the seventh postoperative day was also significantly less than in the placebo group (29.0 +/- 6.2 mm). However, at the seventh postoperative day in the intraoral-LLLT group, only trismus (35.6 +/- 8.5 [p = 0.002]) was significantly less than in the placebo group (29.0 +/- 6.2 mm). This study demonstrates that extraoral LLLT is more effective than intraoral LLLT for the reduction of postoperative trismus and swelling after extraction of the lower third molar. Adolescent;Adult;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Molar, Third;Postoperative Complications;Tooth Extraction;Tooth, Impacted;Trismus;Young Adult

Dentinal hypersensitivity following scaling and root planing: comparison of low-level laser and topical fluoride treatment. The aim of this study is to compare the effectiveness of low-level laser irradiation to traditional topical fluoride treatment for treatment choices of dentinal hypersensitivity following scaling and root planing. The experimental group (15 patients) was treated with low-energy-level diode laser at each site of dentinal hypersensitivity following scaling and root planning.

The control group (15 patients) received topical fluoride treatment (protective varnish for desensitization). All the patients were treated at baseline visit, and then at day 2 and 4 after the initial treatment; the pain was subjectively assessed by the patients as strong, medium, medium low, low, or no pain. Total absence of the dental hypersensitivity was reported in 26.66% of the examined group even after the second visit, compared to the control group where complete resolution of the hypersensitivity was not present after the second visit in any of the treated cases. Complete absence of pain was achieved in 86.6% of patients treated with laser and only in 26.6% in the fluoride treated group, after the third visit. Based on our findings, we conclude that low-energy biostimulative laser treatment can be successfully used for treatment of dental hypersensitivity following scaling and root planing. Fluorides, Topical Adult;Dental Scaling;Dentin Sensitivity;Fluorides, Topical;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain;Root Planing

The Effect of CO(2) and KTP laser on the cat saccule and utricle. OBJECTIVES/HYPOTHESIS: To assess the potential carbon dioxide (CO(2)) and potassium-titanyl-phosphate (KTP) laser-related trauma to the saccule and utricle in a cat model. STUDY DESIGN: Basic science experiment utilizing cat model. METHODS: Twelve adult male cats were divided into two groups-CO(2) and KTP-to assess the potential saccule and/or utricle trauma with direct discharge of laser energy into the vestibule after the stapes was removed. Both groups were subdivided to assess the effects with acute sacrifice and three-month survival. Bone conduction auditory brain-stem response thresholds were used to monitor auditory function. Clinical observation was used to monitor vestibular function. The temporal bones were harvested, processed, and stained with hematoxylin and eosin (H&E) in all animals with the uninvolved side serving as the control. RESULTS: None of the animals demonstrated changes in bone conduction auditory brain-stem responses. None of the animals in the survival group demonstrated clinical vestibular dysfunction. Saccular and utricular wall rupture was observed in all animals sacrificed acutely. None of the saccular and utricular wall ruptures were of a size and location that could be attributed to laser trauma, and none of the saccular and utricular wall ruptures were associated with neuroepithelial trauma. CONCLUSIONS: There is no evidence of a difference between the CO(2) and KTP laser in potential laser-related trauma. Using bone-conducting auditory brain-stem response threshold and clinical monitoring of vestibular function, there was no evidence of clinical auditory or vestibular dysfunction. The histologic evidence of saccular and utricular wall rupture is more consistent with stapes extraction trauma than laser-related trauma.
Animals;Auditory Threshold;Biopsy, Needle;Bone Conduction;Cats;Disease Models, Animal;Evoked Potentials, Auditory, Brain Stem;Immunohistochemistry;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Random Allocation;Reference Values;Risk Assessment;Saccule and Utricle;Sensitivity and Specificity;Stapes Surgery;Vestibule, Labyrinth

Intricacies of dose in laser phototherapy for tissue repair and pain relief. Inaccurate measurement and incorrect reporting of dosages are major shortcomings of phototherapy articles. As many as 30% of published reports in the field either lack relevant information needed to determine a dosage or report dosages that are altogether inaccurate. The high prevalence of dosage-related mistakes in published reports suggests that dosage determination errors are common among clinicians and other end-users. This special article is designed to advance understanding of the relevant parameters used in phototherapy for tissue repair and pain relief, particularly among clinicians and others who may not be completely familiar with the technology. I define and discuss five key parameters that influence dosage, including 1) radiant power, 2) radiant energy, 3) power density, 4) energy density, and 5) wavelength, and use hypothetical cases to demonstrate how factors such as beam spot size, size of lesion, mode of treatment (contact, noncontact, or scanning), frequency of treatment, dose per treatment, and cumulative dose affect dosages and treatment outcomes. The potential effects of patient-related factors, such as etiology, pathology, tissue optical

density, depth of target tissue, and skin pigmentation are discussed concurrently and strategies are suggested to improve dosage determination. Humans;Laser Therapy;Pain Measurement;Pain, Intractable;Radiotherapy Dosage;Wounds and Injuries

Comparing the effects of exercise program and low-level laser therapy with exercise program and polarized polychromatic non-coherent light (bioptron light) on the treatment of lateral elbow tendinopathy. BACKGROUND DATA: The use of low-level laser therapy (LLLT) and polarized polychromatic non-coherent light as supplements to an exercise program has been recommended for the management of lateral elbow tendinopathy (LET). OBJECTIVE: To investigate whether an exercise program supplemented with LLLT is more successful than an exercise program supplemented with polarized polychromatic non-coherent light in treating LET. MATERIALS AND METHODS: Patients with unilateral LET for at least 4 wk were sequentially allocated to receive either an exercise program with LLLT or an exercise program with polarized polychromatic non-coherent light. The exercise program consisted of eccentric and static stretching exercises of wrist extensors. In the LLLT group a 904-nm Ga-As laser was used in continuous mode, and the power density was 130 mW/cm(2), and the dose was 0.585 J/point. In the group receiving polarized polychromatic non-coherent light the Bioptron 2 was used to administer the dose perpendicularly to the lateral epicondyle at three points at an operating distance of 5-10 cm for 6 min at each position. The outcome measures were pain and function and were evaluated at baseline, at the end of the treatment (week 4), and 3 mo after the end of treatment (week 16). RESULTS: Fifty patients met the inclusion criteria. At the end of treatment there was a decline in pain and a rise in function in both groups compared with baseline ($p < 0.0005$ on the paired t-test). There were no significant differences in the reduction of pain and the improvement of function between the groups at the end of treatment and at the 3-mo follow-up ($p > 0.0005$ on the independent t-test). CONCLUSIONS: The results suggest that the combination of an exercise program with LLLT or polarized polychromatic non-coherent light is an adequate treatment for patients with LET. Further research to establish the relative and absolute effectiveness of such a treatment approach is needed. Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Phototherapy;Recovery of Function;Tennis Elbow;Treatment Outcome

Circumference reduction and cellulite treatment with a TriPollar radiofrequency device: a pilot study. BACKGROUND: A wide variety of treatments for circumference reduction and cellulite are available, but most procedures offer suboptimal clinical effect and/or delayed therapeutic outcome. Objective To determine the safety and efficacy of the TriPollar radiofrequency device for cellulite treatment and circumference reduction. METHODS: Thirty-nine females with cellulite received eight weekly TriPollar treatments. Treatment areas included the abdomen, thighs, buttocks and arms. Subjects were evaluated using standardized photographs and measurements of body weight, circumference, subcutaneous thickness, and skin elasticity of the treatment sites at baseline, immediately after and 4 weeks after the final treatment. Physicians' evaluation of clinical improvement scores using a quartile grading scale was recorded. RESULTS: Thirty-seven patients (95%) completed the treatment protocol. There was significant circumference reduction of 3.5 and 1.7 cm at the abdomen ($P = 0.002$) and thigh ($P = 0.002$) regions, respectively. At 4 weeks after the last treatment, the average circumferential reductions of the abdomen and thighs were sustained. No significant circumferential reductions of the buttocks and arms at the last treatment visit compared to baseline were demonstrated ($P = 0.138$ and 0.152, respectively). Quartile grading scores correlating to approximately 50% improvement in cellulite appearance were noted. CONCLUSIONS: Tripollar radiofrequency provided beneficial effects on the reduction of abdomen and thigh circumference and cellulite appearance. Abdomen;Cosmetic Techniques;Dermatologic Surgical Procedures;Humans;Low-Level Light Therapy;Pilot Projects;Radio Waves;Thigh;Treatment Outcome;Ultrasonography

Comparison of electrodesiccation and potassium-titanyl-phosphate laser for treatment of dermatosis papulosa nigra. BACKGROUND: There is a lack of randomized split-face studies investigating treatments for dermatosis papulosa nigra (DPN) in dark skin. OBJECTIVE: To compare the efficacy, safety, and tolerability of potassium-titanyl-phosphate (KTP) laser with efficacy, safety, and tolerability of electrodesiccation in the treatment of DPN in subjects with Fitzpatrick skin phototypes IV to VI. METHODS: Fourteen subjects with Fitzpatrick skin phototypes IV to VI were randomized to receive two KTP laser treatments 4 weeks apart to half of the face. The contralateral half received two electrodesiccation treatments 4 weeks apart. Response was evaluated by photography reviewed by blinded dermatologists at 4 weeks after the second treatment. A treatment quality questionnaire about side effects and cosmetic outcome was also administered. RESULTS: Difference in improvement of DPN between the KTP side and the electrodesiccation side per each rater (p=.99, p=.54) and per raters combined (p=.50) did not reach statistical significance. There was no treatment difference for subjective effectiveness (p=.06) or subjective confidence improvement (p=.99), although there was a significant treatment difference for subjective discomfort (p=.002) in favor of KTP. Both treatments were well tolerated without significant adverse effects. CONCLUSIONS: Although treatment of DPN with KTP laser and electrodesiccation are comparable in efficacy, KTP laser is preferable for patient comfort. Adult;Electrocoagulation;Facial Dermatoses;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Photography;Prospective Studies;Single-Blind Method;Skin Pigmentation;Surveys and Questionnaires;Treatment Outcome

The use of low-level light for hair growth: part I. BACKGROUND AND OBJECTIVE: Low-level laser therapy (LLLT) is a new therapy for the treatment of hair loss. It has received enormous media attention and tremendous marketing budgets from companies that sell the devices, but no independent, peer-reviewed studies have demonstrated its efficacy in this application. Here we investigate the efficacy of LLLT in enhancing hair growth. METHODS: A total of seven patients were exposed to LLLT twice weekly for 20 minutes each time over a period of 3-6 months. Five patients were treated for a total of 3 months and two were treated for 6 months. Videomicroscopic images were taken at baseline, 3 months, and 6 months, and analyzed for changes in vellus hair counts, terminal hair counts, and shaft diameter. Both videomicroscopic and global images underwent blinded review for evidence of subjective improvement. Patients also answered questionnaires assessing hair growth throughout the study. Neither patients nor physicians conducting the study received any financial compensation. RESULTS: The results indicate that on average patients had a decrease in the number of vellus hairs, an increase in the number of terminal hairs, and an increase in shaft diameter. However, paired i-testing indicated that none of these changes was statistically significant. Also, blinded evaluation of global images did not support an improvement in hair density or caliber. CONCLUSIONS: LLLT may be a promising treatment option for patients who do not respond to either finasteride or minoxidil, and who do not want to undergo hair transplantation. This technology appears to work better for some people than for others. Factors predicting who will most benefit are yet to be determined. Larger, longer-term placebo-controlled studies are needed to confirm these findings, and demonstrate statistical significance, or refute them altogether. Adult;Alopecia;Female;Hair;Humans;Low-Level Light Therapy;Male;Middle Aged

Effects of low-power laser irradiation on the threshold of electrically induced paroxysmal discharge in rabbit hippocampus CA1. In acute experiments using adult rabbits, we measured the paroxysmal discharge threshold (PADT) elicited by stimulation to the apical dendritic layer of the hippocampal CA1 region before and after low-power laser irradiation. Nd:YVO(4) laser irradiation (wavelength: 532 nm) was introduced into the same region as the stimulation site. The average PADT was 247 +/- 13 microA (n = 18) before laser irradiation, while after 5-min laser irradiation with 50, 75, and 100 mW,

PADT was 333 +/- 40 (n = 4), 353 +/- 33 (n = 4) and 367 +/- 27 microA (n = 6), respectively. The latter two increments were statistically significant compared to the control ($p < 0.05$ and $p < 0.01$). After 10-min laser irradiation with 75 and 100 mW, PADT was 340 +/- 47 (n = 9) and 480 +/- 60 microA (n = 11; $p < 0.01$), respectively. Laser irradiation with a specific wavelength and average power offers the potential to suppress the generation of paroxysmal discharges in rabbit hippocampus CA1. Correlation analyses suggest that PADT increments are based on photochemical as well as photothermal effects of laser irradiation. Action Potentials;Animals;Body Temperature;CA1 Region, Hippocampal;Electric Stimulation;Electrophysiological Phenomena;Epilepsy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Membrane Potentials;Models, Animal;Neural Conduction;Rabbits

Tuberculosis (HIV-negative people). INTRODUCTION: About a third of the world's population has latent tuberculosis. In 2004, over 14 million people had active tuberculosis. Approximately 1.7 million people died from the infection. Over 80% of new cases diagnosed in 2004 were in people in Africa, South-East Asia, and Western Pacific regions. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of interventions to prevent tuberculosis in people without HIV infection at high risk of developing tuberculosis? What are the effects of interventions to prevent tuberculosis in people without HIV infection at high risk of developing multidrug-resistant tuberculosis? What are the effects of different drug regimens in people with newly diagnosed pulmonary tuberculosis without HIV infection? What are the effects of different drug regimens in people with multidrug-resistant tuberculosis without HIV infection? What are the effects of low-level laser therapy in people with tuberculosis without HIV infection? Which interventions improve adherence to treatment in people with tuberculosis without HIV infection? We searched: Medline, Embase, The Cochrane Library, and other important databases up to July 2008 (Clinical Evidence reviews are updated periodically, please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 31 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review we present information relating to the effectiveness and safety of the following interventions: adding pyrazinamide in chemotherapy regimens lasting up to 6 months; adding rifampicin to isoniazid regimens; benefits of different regimens; chemotherapy for less than 6 months; daily chemotherapy; direct observation treatment; intermittent chemotherapy for 6 months or longer; isoniazid; low-level laser therapy for pulmonary tuberculosis; regimens containing quinolones; rifampicin plus isoniazid; substituting rifampicin with ethambutol in the continuous phase; and support mechanisms for directly observed treatment. Antitubercular Agents;Isoniazid;Rifampin Antitubercular Agents;HIV Infections;Humans;Isoniazid;Latent Tuberculosis;Low-Level Light Therapy;Rifampin;Tuberculosis;Tuberculosis, Multidrug-Resistant;Tuberculosis, Pulmonary

Low-level laser irradiation inhibits abdominal aortic aneurysm progression in apolipoprotein E-deficient mice. AIMS: Increased early detection of abdominal aortic aneurysm (AAA) and the severe complications of its current treatment have emphasized the need for alternative therapeutic strategies that target pathogenetic mechanisms of progression and rupture. Recent in vitro studies from our laboratory have shown that low-level laser irradiation (LLLI) (780 nm) modifies cellular processes fundamental to aneurysm progression. The present study was designed to determine whether LLLI retards the progression of suprarenal AAA in vivo. METHODS AND RESULTS: High-frequency ultrasonography (0.01 mm resolution) was used to quantify the effect of LLLI on aneurysmatic aortic dilatation from baseline to 4 weeks after subcutaneous infusion of angiotensin II

by osmotic minipumps in the apolipoprotein E-deficient mouse. At 4 weeks, seven of 15 non-irradiated, but none of the 13 LLLI, mice had aneurysmal dilatation in the suprarenal aneurysm-prone segments that had progressed to >or=50% increase in maximal cross-sectional diameter (CSD) over baseline (P = 0.005 by Fisher's exact test). The mean CSD of the suprarenal segments (normalized individually to inter-renal control segments) was also significantly lower in irradiated animals (LLLI vs. non-irradiated: 1.32 +/- 0.14 vs. 1.82 +/- 0.39, P = 0.0002 by unpaired, two-tailed t-test) with a 94% reduction in CSD at 4 weeks compared with baseline. M-mode ultrasound data showed that reduced radial wall velocity seen in non-treated was significantly attenuated in the LLLI mice, suggesting a substantial effect on arterial wall elasticity. CONCLUSION: These in vivo studies, together with previous in vitro studies from this laboratory, appear to provide strong evidence in support of a role for LLLI in the attenuation of aneurysm progression. Further studies in large animals would appear to be the next step towards testing the applicability of this technology to the human interventional setting. Apolipoproteins E;Angiotensin II Angiotensin II;Animals;Aortic Aneurysm, Abdominal;Apolipoproteins E;Dilatation, Pathologic;Humans;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Mice, Knockout;Ultrasonography

Comparison between laser therapy and non-surgical therapy for periodontitis in rats treated with dexamethasone. The aim of this study was to compare low-level laser therapy (LLLT) as adjuvant treatment for induced periodontitis with scaling and root planing (SRP) in dexamethasone-treated rats. One-hundred twenty rats were divided into groups: D group (n = 60), treated with dexamethasone; ND group (n = 60) treated with saline solution. In both groups, periodontal disease was induced by ligature at the left first mandibular molar. After 7 days, the ligature was removed and all animals were subjected to SRP and were divided according to the following treatments: SRP, irrigation with saline solution (SS); SRP + LLLT, SS and laser irradiation (660 nm; 24 J; 0.428 W/cm(2)). Ten animals in each treatment were killed after 7 days, 15 days and 30 days. The radiographic and histometric values were statistically analyzed. In all groups radiographic and histometric analysis showed less bone loss (P < 0.05) in animals treated with SRP + LLLT in all experimental periods. SRP + LLLT was an effective adjuvant conventional treatment for periodontitis in rats treated with dexamethasone. Dexamethasone Alveolar Bone Loss;Animals;Combined Modality Therapy;Dental Scaling;Dexamethasone;Low-Level Light Therapy;Male;Periodontitis;Rats;Rats, Wistar;Root Planing

Q-switched alexandrite laser treatment of oral labial lentigines in Chinese subjects with Peutz-Jeghers syndrome. BACKGROUND: Peutz-Jeghers syndrome (PJS) is characterized by gastrointestinal hamartomatous polyps and visible mucocutaneous lentigines distributed in the oral and anal mucosa, hands, face, and nails. Although there are many reports regarding successful treatment of intestinal polyps of PJS, there is little information regarding treatment of lentigines. Q-switched lasers are the preferred method of treatment for benign melanocytic lesions. OBJECTIVE: To evaluate the efficacy of the Q-switched alexandrite laser (QSAL) in treating oral labial lentigines of PJS. METHODS AND MATERIALS: Fourteen cases of laser treatment of oral labial lentigines in patients diagnosed with PJS were studied between 2005 and 2008. All were treated using a single treatment with a QSAL with a 3-mm handpiece and a fluence of 4.0 to 9.0 J/cm(2). Retrospective analysis of the effect of QSAL was conducted. RESULTS: All 14 cases exhibited successful elimination of treated lentigines after one laser treatment. There were significant acute side effects. After a median 2-year follow-up, there were no recurrences or scars in treated sites. CONCLUSIONS: The QSAL provides effective treatment for removal of labial lentigines associated with PJS. Adolescent;Adult;Asian People;Face;Female;Humans;Lasers;Lasers, Solid-State;Lentigo;Lip;Low-Level Light Therapy;Male;Middle Aged;Peutz-Jeghers Syndrome;Young Adult

Clinical trial of dual treatment with an ablative fractional laser and a nonablative laser for the treatment of acne scars in Asian patients. BACKGROUND: Many methods have been proposed for the treatment of acne scars, with variable cosmetic results. Nonablative skin resurfacing is one method that has been proposed. Because of a need for more noticeable clinical improvements, the ablative fractional laser was recently introduced. OBJECTIVE: To reduce complications and improve the results of ablative fractional laser resurfacing by combining this treatment of acne scars with nonablative lasers. METHODS: A series of 20 patients (skin phototypes IV-V) with atrophic facial acne scars were randomly divided into two groups that received three successive monthly treatments with an ablative fractional laser using high (group A) and low (group B) energy on one facial half and an ablative fractional laser with low energy plus a nonablative resurfacing laser on the other facial half. Patients were evaluated using digital photography at each treatment visit and at 3 months postoperatively. Clinical assessment scores were determined at each treatment session and follow-up visit. RESULTS: Although the use of the ablative fractional laser with high energy resulted in an improvement in patients' acne scars, the combination of ablative fractional laser resurfacing and nonablative laser resurfacing yielded the best results, as assessed in photographs as well as by the overall appearance of the acne scars. With the combination method, fewer complications were observed. Acne Vulgaris;Adult;Asian People;Cicatrix;Combined Modality Therapy;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Young Adult

Treatment of Becker's nevi with a long-pulse alexandrite laser. BACKGROUND: Becker's nevus (BN) can be a distressing cosmetic handicap for patients and a treatment challenge for physicians. Various treatment modalities have been used, but repigmentation commonly occurs after treatment. OBJECTIVE: To evaluate the efficacy of long-pulse alexandrite laser in the treatment of BN. MATERIALS AND METHODS: Eleven Korean patients with Fitzpatrick skin type III to V were included in this study. A long-pulsed alexandrite laser with a wavelength of 755 nm and a pulse duration of 3 ms was used. Patients were treated with a fluence of 20 to 25 J/cm(2) and a spot size of 15 to 18 mm. Cryogen spray cooling was not used. RESULTS: Two patients had excellent responses, five had good responses, and four had fair responses. Hair density simultaneously decreased with treatment in all patients. Although mild hypopigmentation was observed in some patients, and partial hypertrophic scarring was observed in one patient, the outcomes were cosmetically acceptable. No repigmentation was noted during the follow-up period. CONCLUSION: A long-pulsed alexandrite laser without cryogen spray cooling is an effective and safe alternative in the treatment of BN. Adolescent;Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Nevus, Pigmented;Young Adult

Successful treatment of cutaneous sarcoidosis lesions with the flashlamp pumped pulsed dye laser: a case report. Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Sarcoidosis;Skin Diseases

Treatment of striae distensae with fractional photothermolysis. BACKGROUND: Striae distensae are dermal scars characterized by flattening and atrophy of the epidermis. Although many treatment modalities have been tried with variable results, most have been disappointing. OBJECTIVE: To determine whether striae distensae might respond to fractional photothermolysis. METHODS: Twenty-two women with striae distensae were treated with two sessions each of fractional photothermolysis at a pulse energy of 30 mJ, a density level of 6, and eight passes at intervals of 4 weeks. Response to treatment was assessed by comparing pre- and post-treatment clinical photography and skin biopsy samples. RESULTS: Six of the 22 patients (27%) showed good to excellent clinical improvement from baseline, whereas the other 16 (63%) showed various degrees of improvement. Most of the lesions with excellent results were white in color and of long duration. Skin biopsy revealed that average epidermal thickness and dermal thickness were greater than at

baseline. The immunoreactivity of procollagen type 1 increased after treatment. There were no significant side effects except erythema and mild pigmentation. CONCLUSION: Fractional photothermolysis may be effective in treating striae distensae, without significant side effects. Treatment outcomes were better in patients with white rather than red striae. Adult;Cicatrix;Female;Humans;Low-Level Light Therapy;Middle Aged;Skin;Treatment Outcome

Low-energy helium-neon laser induces melanocyte proliferation via interaction with type IV collagen: visible light as a therapeutic option for vitiligo. BACKGROUND: The treatment of vitiligo remains a challenge for clinical dermatologists. We have previously shown that the helium-neon laser (He-Ne laser, 632.8 nm) is a therapeutic option for treatment of this depigmentary disorder. OBJECTIVES: Addressing the intricate interactions between melanocytes, the most important cellular component in the repigmentation scheme of vitiligo, and their innate extracellular matrix collagen type IV, the current study aimed to elucidate the effects of the He-Ne laser on melanocytes. METHODS: Cultured melanocytes were irradiated with the He-Ne laser. Relevant biological parameters including cell attachment, locomotion and growth were evaluated. In addition, the potentially involved molecular pathways were also determined. RESULTS: Our results show that in addition to suppressing mobility but increasing attachment to type IV collagen, the He-Ne laser stimulates melanocyte proliferation through enhanced alpha2beta1 integrin expression. The expression of phosphorylated cyclic-AMP response element binding protein (CREB), an important regulator of melanocyte growth, was also upregulated by He-Ne laser treatment. Using a specific mitochondrial uncoupling agent [carbonyl cyanide m-chlorophenyl-hydrazone (CCCP)], the proliferative effect of the He-Ne laser on melanocytes was abolished and suppression of melanocyte growth was noted. CONCLUSIONS: In summary, we have demonstrated that the He-Ne laser imparts a growth stimulatory effect on functional melanocytes via mitochondria-related pathways and proposed that other minor pathways including DNA damage may also be inflicted by laser treatment on irradiated cells. More importantly, we have completed the repigmentation scheme of vitiligo brought about by He-Ne laser light in vitro and provided a solid theoretical basis regarding how the He-Ne laser induces recovery of vitiligo in vivo. Collagen Type IV;Neon Adult;Blotting, Western;Cell Adhesion;Cell Proliferation;Collagen Type IV;Gene Expression;Humans;Lasers, Gas;Low-Level Light Therapy;Melanocytes;Neon;Vitiligo

Treatment of refractory arcuate hyperpigmentation using a fractional photothermolysis system. This is a case report of a 27-year-old Korean woman with Fitzpatrick skin type IV presenting with refractory arcuate hyperpigmentation, which developed after non-ablative 1450-nm diode laser therapy. The refractory arcuate hyperpigmentation was unresponsive to the use of Q-switched lasers, vitamin C iontophoresis, and a bleaching agent, but was responsive to fractional photothermolysis system treatment. Acne Vulgaris;Adult;Face;Female;Humans;Hyperpigmentation;Low-Level Light Therapy

Capacity of photodynamic therapy for microbial reduction in periodontal pockets. Practitioners are not successful in implemented treatments due to the great difficulty in completely removing bacterial deposits and their endotoxins. This study aimed to evaluate the capacity of photodynamic therapy to reduce the numbers of viable bacteria in periodontal pockets. Microbiological samples were collected before and after scaling and after photodynamic therapy. Photodynamic therapy was performed through the insertion of the photosensitizer toluidine blue and Endo PTC into the pocket for 3 min, followed by photosensitization with low-intensity diode of 4 J/cm(2). The results (log(10)) were submitted to a descriptive analysis and a t-test. A reduction of 81.24% in the numbers of bacteria after scaling was observed, as well as 95.90% after photodynamic therapy ($P < 0.01$). Photodynamic therapy is indicated as an adjuvant treatment to reduce the numbers of viable bacteria in periodontal diseases. Photosensitizing Agents;Tolonium Chloride Adult;Colony Count,

Microbial;Dental Scaling;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Periodontal Pocket;Photochemotherapy;Photosensitizing Agents;Tolonium Chloride

Dental enamel irradiated with infrared diode laser and photoabsorbing cream: Part 1 -- FT-Raman Study. OBJECTIVE: The aim of this FT-Raman study was to investigate laser-induced compositional changes in enamel after therapy with a low-level infrared diode laser and a photoabsorbing cream, in order to intensify the superficial light absorption before and after cariogenic challenge. BACKGROUND DATA: Dental caries remains the most prevalent disease during childhood and adolescence. Preventive modalities include the use of fluoride, reduction of dietary cariogenic refined carbohydrates, plaque removal and oral hygiene techniques, and antimicrobial prescriptions. A relatively simple and noninvasive caries preventive regimen is treating tooth enamel with laser irradiation, either alone or in combination with topical fluoride treatment, resulting in reduced enamel solubility and dissolution rates. Due to their high cost, high-powered lasers are still not widely employed in private practice in developing countries. Thus, low-power red and near-infrared lasers appear to be an appealing alternative. MATERIALS AND METHODS: Twenty-four extracted or exfoliated caries-free deciduous molars were divided into six groups: control group (no treatment; n = 8); infrared laser treatment (L; n = 8) (810 nm at 100 mW/cm(2) for 90 sec); infrared diode laser irradiation (810 nm at 100 mW/cm(2) for 90 sec) and photoabsorbing cream (IVL; n = 8); photoabsorbing cream alone (IV; n = 8); infrared diode laser irradiation (810 nm at 100 mW/cm(2) for 90 sec) and fluorinated photoabsorbing agent (IVLF; n = 8); and fluorinated photoabsorbing agent alone (IVF; n = 8). Samples were analyzed using FT-Raman spectroscopy before and after pH cycling cariogenic challenge. RESULTS: There was a significant laser-induced reduction and possible modification of the organic matrix content in enamel treated with the low-level diode laser (the L, IVL, and IVFL groups). CONCLUSION: The FT-Raman technique may be suitable for detecting compositional and structural changes occurring in mineral phases and organic phases of lased enamel under cariogenic challenge. Cariostatic Agents;Coloring Agents;Fluorides, Topical;Gels;Ointments;Sodium Fluoride;Indocyanine Green Absorption;Cariostatic Agents;Coloring Agents;Confidence Intervals;Dental Caries;Dental Enamel;Fluorides, Topical;Gels;Humans;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Molar;Ointments;Sodium Fluoride;Spectrum Analysis, Raman;Tooth, Deciduous

Photodynamic therapy for the treatment of buccal candidiasis in rats. The study objective was to evaluate the effects of photodynamic therapy on buccal candidiasis in rats. After experimental candidiasis had been induced on the tongue dorsum, 72 rats were distributed into four groups according to treatment: treated with laser and methylene blue photosensitizer (L+P+); treated only with laser (L+P-); treated only with photosensitizer (L--P+); not treated with laser or photosensitizer (L-P-). The rats were killed immediately, 1 day, or 5 days after treatment, for microscopic analysis of the tongue dorsum. Observation verified that the photodynamic therapy group (L+P+) exhibited fewer epithelial alterations and a lower chronic inflammatory response than the L-P- group. The group L+P- presented more intense epithelial alterations and chronic inflammatory response than the remaining groups. The L-P+ group showed tissue lesions similar to those of the L-P- group. In conclusion, rats treated with photodynamic therapy developed more discrete candidiasis lesions than did the remaining groups. Photosensitizing Agents;Methylene Blue Animals;Candida albicans;Candidiasis, Oral;Cheek;Low-Level Light Therapy;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Rats;Rats, Wistar;Tongue

Efficacy of interferential low-level laser therapy using two independent sources in the treatment of knee pain. OBJECTIVE: The aim of this study was to evaluate the effectiveness of an interferential pattern generated by two identical and independent lasers in the relief of knee pain. BACKGROUND DATA: Low-level laser therapy (LLLT) is generally applied by a single probe. MATERIALS

AND METHODS: A double-blind controlled clinical trial was performed on 152 patients with knee pain who were randomly assigned into two different groups. Group I patients (n = 76) received interferential laser therapy generated by two identical laser probes located opposite each other on the knee joint. Group II patients (n = 76) received one live probe in conventional laser therapy and one dummy probe. The device used in both groups was an AlGaAs laser (wavelength 810 nm, power 100 mW, in continuous mode). Fifteen laser sessions were applied transcutaneously on 5 knee points (6 J/point) per session. In addition, patients in both groups received a quadriceps strength program based on isometric exercises. A visual analogue scale (VAS) was used for pain evaluation in different situations, such as in standing, in knee flexion/extension, and when going up and down stairs. VAS pain scores were evaluated before, in the middle of, and after treatment. RESULTS: ANOVA results showed no significant differences between groups for all VAS scores or in the interaction with the sessions ($p > 0.05$). The VAS score results showed a statistically significant pain reduction throughout all sessions ($p = 0.000$). CONCLUSIONS: Interferential laser therapy is safe and effective in reducing knee pain. However, the results of the study indicate that it is not superior to the use of a single conventional laser. Analysis of Variance;Double-Blind Method;Exercise Therapy;Female;Humans;Knee;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Treatment Outcome

The application of low-level laser therapy after cesarean section does not compromise blood prolactin levels and lactation status. OBJECTIVE: This study evaluates the systemic effect of low-level laser therapy (LLLT) on blood prolactin levels and lactation status when it is used to hasten surgical wound healing in women having undergone a cesarean section. BACKGROUND DATA: LLLT has been used in parturient patients for postpartum mastitis and nipple soreness. However, previous studies have revealed hormonal and physiological effects of LLLT on the lactation status. MATERIALS AND METHODS: Twenty healthy women scheduled for cesarean section were randomly divided into two groups: an LLLT group and a control group. LLLT was delivered as follows: (1) irradiation with 980 nm (100 mW, 3.3 J/cm(2), total energy 60 J), and 650 nm (30 mW, 1.5 J/cm(2), total energy 27 J) to the incision line, and (2) intravenous laser irradiation at 2.5 mW and 650 nm for 15 min on three consecutive postoperative days. Except for LLLT, all the therapeutic conditions in both groups were identical. Blood prolactin levels were measured in the groups on the third postoperative day, and tissue samples were taken from the wound margins for histological evaluation on the 10th postoperative day. RESULTS: Although there was a difference between blood prolactin levels in the two groups, the difference was not statistically significant ($p = 0.205$). However, there was a statistically significant difference in the mean lymphocyte counts and number of vessel lumina, with higher numbers seen in the LLLT group. CONCLUSION: LLLT after cesarean section has no serious deleterious effects on lactation, and it helps to modulate metabolic processes and thus promotes wound healing post-surgery. Prolactin Adult;Cesarean Section;Female;Humans;Lactation;Lasers, Semiconductor;Low-Level Light Therapy;Lymphocyte Count;Pregnancy;Prolactin;Wound Healing

Effect of low-level laser therapy on the fracture healing process. Low-level laser therapy (LLLT) is a biophysical form of intervention in the fracture-repair process, which, through several mechanisms, accelerates the healing of fractures and enhances callus formation. The effect of laser on fracture healing is controversial. Some authors affirm that LLLT can accelerate bone formation by increasing osteoblastic activity. The objective of our study was to evaluate the effect of laser therapy on fracture healing. Thirty rabbits were subjected to tibial bone open osteotomies that were stabilized with external fixators. The animals were divided into two study groups: laser group and control group. Callus development and bone mineral density were quantitatively evaluated by CT; the animals were then killed and the fractures were assessed for biomechanical properties. The results demonstrated

that the increasing rate of bone mineral density was higher in the laser (L) group than in the control (C) group. CT at 5 weeks revealed a mean callus density of 297 Hounsfield units (HU) for the control group and 691 HU for the L group, which was statistically significant (P = 0.001). In the L group, the mean recorded fracture tension was 190.5 N and 359.3 N for healed and intact bones, respectively, which was statistically significant (P < 0.001). The result of the study showed that the use of laser could enhance callus development in the early stage of the healing process, with doubtful improvement in biomechanical properties of the healing bone; therefore, laser therapy may be recommended as an additional treatment in non-union fractures in humans. Animals;Biomechanical Phenomena;Bone Density;Bony Callus;Disease Models, Animal;Female;Fracture Fixation;Fracture Healing;Lasers, Semiconductor;Low-Level Light Therapy;Rabbits

Improvement of postfractional laser erythema with light-emitting diode photomodulation. BACKGROUND: The most common side effects of fractional laser skin treatment are erythema and edema. Low-level light therapy and light-emitting diode (LED) devices have been used to stimulate fibroblast activity and hasten wound healing. OBJECTIVE: To determine whether LED treatment immediately after fractional laser skin resurfacing affects the severity and duration of postoperative eythema. MATERIALS AND METHODS: Twenty patients received treatment with a 590-nm wavelength LED array to randomly selected facial halves immediately after undergoing full-face fractional laser skin resurfacing with a 1,550-nm erbium-doped fiber laser. Differences in erythema between LED-treated and untreated facial halves were recorded at 24, 48, and 96 hours post-treatment. RESULTS: The LED-treated facial halves were less erythematous in all 20 patients 24 hours postoperatively. The six patients who received the highest mean energy densities during fractional laser treatment continued to exhibit decreased erythema in the LED-treated areas at 48 hours. At 96 hours post-treatment, no discernible differences between facial halves were observed in any patient. CONCLUSIONS: Photomodulation with a 590-nm-wavelength LED array can decrease the intensity and duration of postfractional laser treatment erythema. Adult;Aged;Cosmetic Techniques;Erythema;Face;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Middle Aged;Phototherapy;Treatment Outcome

Comparative efficacy of nonpurpuragenic pulsed dye laser and intense pulsed light for erythematotelangiectatic rosacea. BACKGROUND: Erythematotelangiectatic (ET) rosacea is commonly treated with a variety of laser and light-based systems. Although many have been used successfully, there are a limited number of comparative efficacy studies. OBJECTIVE: To compare nonpurpuragenic pulsed dye laser (PDL) with intense pulsed light (IPL) treatment in the ability to reduce erythema, telangiectasia, and symptoms in patients with moderate facial ET rosacea. METHODS: Twenty-nine patients were enrolled in a randomized, controlled, single-blind, split-face trial with nonpurpuragenic treatment with PDL and IPL and untreated control. Three monthly treatment sessions were performed with initial PDL settings of 10-mm spot size, 7 J/cm(2), 6-ms pulse duration and cryogen cooling, and initial IPL settings of 560-nm filter, a pulse train of 2.4 and 6.0 ms in duration separated by a 15-ms delay, and a starting fluence of 25 J/cm(2). Evaluation measures included spectrophotometric erythema scores, blinded investigator grading, and patient assessment of severity and associated symptoms. RESULTS: PDL and IPL resulted in significant reduction in cutaneous erythema, telangiectasia, and patient-reported associated symptoms. No significant difference was noted between PDL and IPL treatment. CONCLUSION: A series of nonpurpuragenic PDL and IPL treatments in ET rosacea was performed with similar efficacy and safety, and both modalities seem to be reasonable choices for the treatment of ET rosacea. Erythema;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Rosacea;Single-Blind Method;Spectrophotometry;Treatment Outcome

Combined 595-nm and 1,064-nm laser irradiation of recalcitrant and hypertrophic port-wine stains in children and adults. PURPOSE: Although pulsed dye laser (PDL) treatment of port-wine stain (PWS) has long been proven safe and effective, incomplete clearance of these vascular malformations can be problematic. In addition, advanced PWS with deeper coloration and tissue hypertrophy can be particularly difficult to treat because of the superficial dermal penetration of 585- to 595-nm light. The purpose of this study was to evaluate the safety and efficacy of a novel device that delivers sequential pulses of 595- and 1,064-nm wavelengths in the treatment of recalcitrant and hypertrophic PWS. METHODS: Twenty-five children and adults (skin phototypes I-III) with recalcitrant or hypertrophic PWS showing incomplete clearance after 10 prior PDL treatments were included in the study. Successive treatments using a 595-nm PDL and a 1,064-nm neodymium-doped yttrium-aluminum-garnet (Nd:YAG) laser were delivered at 6- to 8-week intervals. Two masked assessors determined clinical improvement of treatment areas using independent evaluation of comparative photographs at baseline and 3 months after treatment using a standard quartile grading scale. RESULTS: The use of dual 595-/1,064-nm wavelengths provided continued improvement of PWS that were previously recalcitrant to ongoing PDL therapy. Side effects were limited to transient erythema, edema, and mild purpura. Rare vesicle formation was observed, with no subsequent scarring or undesirable pigmentary changes. CONCLUSION: The novel dual 595-nm PDL and 1,064-nm Nd:YAG laser is an effective treatment for PWS that are recalcitrant to PDL therapy alone. Adolescent;Adult;Aged;Child;Child, Preschool;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Humans;Hypertrophy;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Severity of Illness Index;Skin;Treatment Outcome;Young Adult

Multiple eccrine hidrocystomas--response to treatment with carbon dioxide and pulsed dye lasers. Female;Follow-Up Studies;Hidrocystoma;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Sweat Gland Neoplasms

[Morphometry and electrophoretic mobility of red blood cells from patients with asthma in the intravenous blood laser irradiation]. The morphometry and electrophoretic mobility of red blood cells from patients with infection-dependent asthma were comparatively studied prior to and following treatment. The patients who had underwent intravenous laser irradiation of blood (ILIB) in addition to conventional therapy had better morphofunctional parameters of red blood cells, by restoring their normal forms, decreasing their transitional ones, and increasing their electrophoretic mobility to normal values. Those who received traditional drug therapy showed no considerable morphofunctional changes of erythrocytes. Thus, in asthmatic patients, the changes in the morphology and function of red blood cells may suggest their membranous structural changes for whose correction ILIB should used. Adult;Aged;Aged, 80 and over;Asthma;Blood;Electrophoresis;Erythrocytes;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Young Adult

Role of the 585-nm pulsed dye laser in the treatment of acne in comparison with other topical therapeutic modalities. BACKGROUND: Acne vulgaris is a disease of the pilosebaceous unit characterized by the development of inflammatory and/or non-inflammatory lesions that may progress to scars. The increase of bacterial resistance and adverse effects, the teratogenicity of retinoids and lack of response to usual therapies has led to the investigation of new therapeutic alternatives. OBJECTIVE: To evaluate the role of the pulsed dye laser in the treatment of acne in comparison with other topical therapeutic modalities. METHODS: We studied 45 patients with mild to moderate acne. Patients were randomly divided into three groups: group A received treatment with pulsed dye laser therapy every 2 weeks, group B received topical preparations and group C was subjected to chemical peeling using trichloroacetic acid 25%. RESULTS: At 12 weeks of treatment, there was a significant improvement of the lesions within each group with the best results seen in

group A; however, no significant difference was detected between the three treatment protocols after the treatment period. Remission in the follow-up period was significantly higher in the first group. CONCLUSIONS: Pulse dye laser therapy mainly improves the inflammatory lesions of acne with few adverse effects. Keratolytic Agents;Trichloroacetic Acid Acne Vulgaris;Adolescent;Adult;Chemexfoliation;Erythema;Female;Humans;Keratolytic Agents;Lasers, Dye;Low-Level Light Therapy;Male;Prospective Studies;Trichloroacetic Acid;Young Adult

Fractional photothermolysis for the treatment of hypertrophic scars: clinical experience of eight cases. BACKGROUND: Hypertrophic scars are common problems and represent a challenging condition to treat. Fractional photothermolysis has been effective at resurfacing photodamaged skin, acne scars, and atrophic scars, but there are few reports on its use for hypertrophic scars. OBJECTIVE: To evaluate the safety and efficacy of 1,550-nm erbium-doped fiber laser treatment of hypertrophic scars in eight patients. METHODS: Eight patients (skin phototypes II-IV) with hypertrophic scars received monthly treatments with a 1,550-nm erbium-doped fiber laser. Energy settings ranged from 35 to 50 mJ, and eight to 10 passes were applied with treatment levels 6 to 8. An independent physician evaluator assessed the treatment response by comparing pre- and posttreatment clinical photographs using a quartile grading scale (grade 1, < or =25%=minimal to no improvement; grade 2, 26-50%=moderate improvement; grade 3, 51-75%=marked improvement; grade 4, >75%=near total improvement. RESULTS: At four weeks after the last treatment session, a mean grade of 2.4 was achieved based on an independent physician's clinical assessment. Improvement in pigmentation occurred in all hyperpigmented scars. CONCLUSION: Hypertrophic scars can be effectively and safely improved with 1,550-nm erbium-doped fiber laser treatment. Photosensitizing Agents Adult;Aged;Cicatrix, Hypertrophic;Dose Fractionation, Radiation;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Photosensitizing Agents;Phototherapy;Time Factors;Treatment Outcome;Young Adult

Fluoroscopy-guided endovenous foam sclerotherapy using a microcatheter in varicose tributaries followed by endovenous laser treatment of incompetent saphenous veins: technical feasibility and early results. OBJECTIVES: To evaluate the technical feasibility and preliminary results of endovenous foam sclerotherapy using a microcatheter in varicose tributaries followed by endovenous laser treatment (EVLT) of incompetent saphenous veins. MATERIALS AND METHODS: From July 2005 to August 2006, 312 patients (M:F=139:173, mean age 45.8) who presented with varicose veins with reflux in the saphenofemoral, saphenopopliteal junction or tributaries were enrolled. Under ultrasound or fluoroscopy guidance, selective microcatheterization and endovenous foam slcerotherapy were first performed in varicose tributaries, followed by EVLT (980 nm) of incompetent saphenous veins. Follow-up at 1-week and 1-, 3-, and 6-month intervals was done. RESULTS: Technical success was seen in 410 of 411 limbs (99%). Continued closure of the saphenous veins and the complete sclerosis of varicose tributaries were noted in 332 of 373 limbs (89%) at the 1-month follow-up, all 307 limbs (100%) at the 3-month follow-up, and all 274 limbs (100%) at the 6-month follow-up. No serious complication was noted. CONCLUSION: Endovenous foam sclerotherapy using a microcatheter in varicose tributaries followed by EVLT in incompetent saphenous veins is a safe, effective, and technically feasible treatment for varicose veins. It not only reduces additional sclerotherapy and technical failure, but also makes multiple therapeutic sessions unnecessary. Sclerosing Solutions;Tissue Adhesives;Polidocanol;Polyethylene Glycols Adult;Aged;Angioscopy;Catheterization, Peripheral;Equipment Design;Feasibility Studies;Female;Fluoroscopy;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Miniaturization;Phlebography;Polidocanol;Polyethylene Glycols;Retrospective Studies;Saphenous Vein;Sclerosing Solutions;Sclerotherapy;Tissue Adhesives;Treatment Outcome;Varicose Veins;Young Adult

Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy
Photodynamic therapy can be effective as a treatment for herpes simplex labialis. BACKGROUND DATA AND OBJECTIVE: Herpes is a common infectious disease that is caused by human herpesviruses. Several treatments have been proposed, but none of them prevent reactivation of the virus. This article describes the use of photodynamic therapy (PDT) as a treatment for herpes lesions, and reports on four cases. MATERIALS AND METHODS: PDT was used as an adjuvant therapy for the treatment of herpes labialis in four patients. A special type of 0.01% (m/V) of methylene blue solution was applied to the vesicular stage of herpesviral disease and the lesions were irradiated with laser energy (wavelength 660 nm, energy density 120 J/cm(2), output power of 40 mW, 2 min per point, 4.8 J of energy/point, at four points). After 24 h the patients returned and phototherapy was repeated with the same equipment, this time with 3.8 J/cm(2) and 15 mW, for a total dose of 0.6 J. The same procedure was repeated 72 h and 1 wk later. RESULTS: Treatment with low-level laser therapy can be considered as an option in the treatment of herpes labialis, and decreases the frequency of vesicle recurrence and provides comfort for patients. No significant acute side effects were noted and the lesions healed rapidly. CONCLUSION: Treatment of herpes labialis with PDT was effective, had no side effects, and when associated with laser phototherapy, accelerated the healing process. Enzyme Inhibitors;Photosensitizing Agents;Methylene Blue Adult;Enzyme Inhibitors;Female;Herpes Labialis;Humans;Low-Level Light Therapy;Male;Methylene Blue;Middle Aged;Photochemotherapy;Photosensitizing Agents;Young Adult
Low-level laser therapy increases transforming growth factor-beta2 expression and induces apoptosis of epithelial cells during the tissue repair process. BACKGROUND DATA: Low-level laser therapy (LLLT) has been reported to modulate the healing of wounds by inducing an increase in mitotic activity, fibroblast number, synthesis of collagen, and neovascularization. OBJECTIVE: In the present study we evaluated the effect of LLLT on expression of TGF-beta(2), an immunosuppressive cytokine, at the site of tissue repair, using an experimental rat model to study cutaneous wound healing. In addition, we also investigated the presence of apoptotic cells in epithelial and connective tissue. MATERIALS AND METHODS: Thirty male Wistar rats were divided into two groups: group 1, which was subjected to surgical skin wounds only (n = 15), and group 2, which was subjected to surgical skin wounds followed by LLLT (n = 15). In group 2, the LLLT was given with these parameters: 15 mW of power, a dose of 3.8 J/cm(2), for 15 sec for three applications. At 10 d post-surgery and laser application the animals were sacrificed with an overdose of anesthetic and tissue samples from the wounds were submitted to immunohistochemistry and in-situ detection of apoptosis. RESULTS: Most of the inflammatory cells and fibroblasts were TGF-beta(2)-positive, and many apoptotic epithelial cells and fibroblasts were seen in the tissue samples from the LLLT-treated animals. However, a few apoptotic epithelial cells and fibroblasts were also seen in the samples obtained from control animals. CONCLUSION: Our results indicate that LLLT may be an important inducer of apoptosis during the process of tissue repair. In addition, we demonstrated that LLTT has an immunomodulatory effect on TGF-beta(2) expression at sites of wound healing. Transforming Growth Factor beta2 Animals;Apoptosis;Disease Models, Animal;Epithelial Cells;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Transforming Growth Factor beta2;Wound Healing
Effect of Er:YAG laser parameters on ablation capacity and morphology of primary enamel. OBJECTIVE: The purpose of this study was to evaluate the ablation capacity of different energies and pulse repetition rates of Er:YAG laser energy on primary molar enamel, by assessing mass loss and by analyzing the surface morphology with scanning electron microscopy. BACKGROUND DATA: Previous studies have demonstrated the capacity of the Er:YAG laser to ablate enamel substrate. METHODS: Forty-two sound primary molars were bisected in a mesiodistal direction. The enamel surfaces were

flattened and their initial mass (in milligrams) was obtained. An area of 4 mm(2) was delimited. The specimens were randomly assigned to 12 groups according to the combination of energy (160, 200, 250, and 300 mJ) and pulse repetition rate (2, 3, and 4 Hz). Er:YAG laser irradiation was performed on each specimen for 20 sec. After irradiation, the final mass was obtained and specimens were prepared for examination with scanning electron microscopy. The data obtained by subtracting the final mass from the initial mass were statistically analyzed using ANOVA and the Tukey test ($p < 0.05$). RESULTS: The pulse repetition rate of 4 Hz provided greater mass loss, different from that seen with 2 Hz, and similar to that seen with 3 Hz. The energy level of 300 mJ resulted in greater mass loss, similar to that seen with 200 and 250 mJ. Scanning electron photomicrographs showed that there was non-selective enamel removal, with fused and cracked areas in all specimens. CONCLUSION: The parameters of 200 mJ and 2 Hz produced a good ablation rate with fewer surface alterations in primary molar enamel. Dental Caries;Dental Cavity Preparation;Dental Enamel;Humans;Lasers, Solid-State;Low-Level Light Therapy

Autofluorescence of breast tissues: evaluation of discriminating algorithms for diagnosis of normal, benign, and malignant conditions. OBJECTIVE: We evaluated different discriminating algorithms for classifying laser-induced fluorescence spectra of normal, benign, and malignant breast tissues that were obtained with 325-nm excitation. BACKGROUND DATA: Mammography and histopathology are the conventional gold standard methods of screening and diagnosis of breast cancers, respectively. The former is prone to a high rate of false-positive results and poses the risk of repeated exposure to ionizing radiation, whereas the latter suffers from subjective interpretations of morphological features. Thus the development of a more reliable detection and screening methodology is of great interest to those practicing breast cancer management. Several studies have demonstrated the efficacy of optical spectroscopy in diagnosing cancer and other biomedical applications. MATERIALS AND METHODS: Autofluorescence spectra of normal, benign, and malignant breast tissues, with 325-nm excitation, were recorded. The data were subjected to diverse discriminating algorithms ranging from intensities and ratios of curve-resolved bands to principal components analysis (PCA)-derived parameters. RESULTS: Intensity plots of collagen and NADPH, two known fluorescent biomarkers, yielded accurate classification of the different tissue types. PCA was carried out on both unsupervised and supervised methods, and both approaches yielded accurate classification. In the case of the supervised classification, the developed standard sets were verified and evaluated. The limit test approach provided unambiguous and objective classification, and this method also has the advantage of being user-friendly, so untrained personnel can directly compare unknown spectra against standard sets to make diagnoses instantly, objectively, and unambiguously. CONCLUSION: The results obtained in this study further support the efficacy of 325-nm-induced autofluorescence, and demonstrate the suitability of limit test analysis as a means of objectively and unambiguously classifying breast tissues. Algorithms;Biopsy;Breast;Breast Neoplasms;Carcinoma, Ductal, Breast;Female;Fibroadenoma;Fluorescence;Humans;Low-Level Light Therapy

Thermal and morphological effects of the pulsed Nd:YAG laser on root canal surfaces. OBJECTIVE: To investigate the sequential thermal and morphological effects of the pulsed Nd:YAG laser on root canal surfaces. BACKGROUND DATA: Effectiveness and safety are two critical aspects of laser application for root canal instrumentation. To date, few studies have synchronously focused on the efficacy of root canal cleanliness and thermal changes in root surfaces irradiated by the Nd:YAG laser. MATERIALS AND METHODS: Single-root human premolars (n = 144) were sectioned at the cementoenamel junction. The root canals were instrumented and divided into three groups: group 1 (15 Hz), group 2 (20 Hz), and group 3 (15 Hz with black ink). Each group was divided into eight subgroups according to the laser power settings used. The temperature elevations of the apical and coronal root surfaces were measured with a thermocouple measurement system during laser

irradiation. Then the roots were bisected longitudinally and examined with the scanning electron microscope. RESULTS: There was a positive correlation between laser energy level and temperature elevation of the root surfaces of all three groups. The temperature elevation in group 3 was the highest, while that in group 1 was the lowest at all power settings. More strikingly, with increasing laser power and frequency, there were corresponding morphological changes seen in the root canal wall, such as removal of the smear layer and melting and recrystallization of the dentin. At 2.0 W, the temperature elevations seen in all three groups were within the biologically tolerable thermal limit, but efficient removal of the smear layer was achieved only in groups 2 and 3. Additionally, the thermal and morphological changes seen at the apical third of the root were greater than those seen at the coronal third. CONCLUSION: This study provides useful information on the choice of appropriate energy parameters to use during application of pulsed Nd:YAG energy for root canal therapy. Dental Pulp Cavity;Hot Temperature;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Therapy

Implantation of low-level laser irradiated mesenchymal stem cells into the infarcted rat heart is associated with reduction in infarct size and enhanced angiogenesis. OBJECTIVE: The aim of the present study was to evaluate the possible beneficial effects of implantation of laser-irradiated mesenchymal stem cells (MSCs) into the infarcted rat heart. BACKGROUND DATA: It was demonstrated that low-level laser therapy (LLLT) upregulates cytoprotective factors in ischemic tissues. MATERIALS AND METHODS: MSCs were isolated from rat bone marrow and grown in culture. The cells were laser irradiated with a Ga-Al-As laser (810 nm wavelength), labeled with 5-bromo-2'deoxyuridine (BrdU), and then implanted into infarcted rat hearts. Non-irradiated cells were similarly labeled and acted as controls. Hearts were excised 3 wk later and cells were stained for BrdU and c-kit immunoreactivity. RESULTS: Infarcted hearts that were implanted with laser-treated cells showed a significant reduction of 53% in infarct size compared to hearts that were implanted with non-laser-treated cells. The hearts implanted with laser-treated cells prior to implantation demonstrated a 5- and 6.3-fold significant increase in cell density that positively immunoreacted to BrdU and c-kit, respectively, as compared to hearts implanted with non-laser-treated cells. A significantly 1.4- and 2-fold higher level of angiogenesis and vascular endothelial growth factor, respectively, were observed in infarcted hearts that were implanted with laser-treated cells compared to non-laser-treated implanted cells. CONCLUSION: The findings of the present study provide the first evidence that LLLT can significantly increase survival and/or proliferation of MSCs post-implantation into the ischemic/infarcted heart, followed by a marked reduction of scarring and enhanced angiogenesis. The mechanisms associated with this phenomenon remain to be elucidated in further studies. Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Myocardial Infarction;Neovascularization, Physiologic;Rats

Phototherapy in peripheral nerve injury for muscle preservation and nerve regeneration. Animals;Disease Models, Animal;Humans;Low-Level Light Therapy;Muscle, Skeletal;Muscular Atrophy;Nerve Regeneration;Peripheral Nerve Injuries;Phototherapy;Rats;Trauma, Nervous System

[Segmental Darier disease : treatment with pulsed dye laser]. Darier disease is often associated with pruritus and an unpleasant odor, causing medical and emotional problems. Ablative laser therapy has proven effective in ameliorating these symptoms. Side effects of this approach include permanent hypopigmentation and a risk of scarring. We present two cases where non-ablative therapy with pulsed dye lasers proved a safe and effective way to manage the intertriginous lesions. Although the mechanism of action is unclear, our success indicates that pulsed dye laser therapy is an option in Darier disease. Larger numbers of patients, ideally in multicenter studies, must be treated in

this way to confirm our results. Adult;Darier Disease;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Retreatment

HairMax LaserComb laser phototherapy device in the treatment of male androgenetic alopecia: A randomized, double-blind, sham device-controlled, multicentre trial. BACKGROUND AND OBJECTIVE: The use of low levels of visible or near infrared light for reducing pain, inflammation and oedema, promoting healing of wounds, deeper tissue and nerves, and preventing tissue damage has been known for almost 40 years since the invention of lasers. The HairMax LaserComb is a hand-held Class 3R lower level laser therapy device that contains a single laser module that emulates 9 beams at a wavelength of 655 nm (+/-5%). The device uses a technique of parting the user's hair by combs that are attached to the device. This improves delivery of distributed laser light to the scalp. The combs are designed so that each of the teeth on the combs aligns with a laser beam. By aligning the teeth with the laser beams, the hair can be parted and the laser energy delivered to the scalp of the user without obstruction by the individual hairs on the scalp. The primary aim of the study was to assess the safety and effectiveness of the HairMax LaserComb laser phototherapy device in the promotion of hair growth and in the cessation of hair loss in males diagnosed with androgenetic alopecia (AGA). METHODS: This double-blind, sham device-controlled, multicentre, 26-week trial randomized male patients with Norwood-Hamilton classes IIa-V AGA to treatment with the HairMax LaserComb or the sham device (2 : 1). The sham device used in the study was identical to the active device except that the laser light was replaced by a non-active incandescent light source. RESULTS: Of the 110 patients who completed the study, subjects in the HairMax LaserComb treatment group exhibited a significantly greater increase in mean terminal hair density than subjects in the sham device group ($p < 0.0001$). Consistent with this evidence for primary effectiveness, significant improvements in overall hair regrowth were demonstrated in terms of patients' subjective assessment ($p < 0.015$) at 26 weeks over baseline. The HairMax LaserComb was well tolerated with no serious adverse events reported and no statistical difference in adverse effects between the study groups. CONCLUSIONS: The results of this study suggest that the HairMax LaserComb is an effective, well tolerated and safe laser phototherapy device for the treatment of AGA in males. Adult;Alopecia;Double-Blind Method;Equipment Design;Hair;Humans;Laser Therapy;Male;Middle Aged;Phototherapy

Evidence-based dentistry on laser paediatric dentistry: review and outlook. The goal of paediatric dentistry is to provide preventive education to parents and patients as well as interception and therapy of dental diseases in a minimally invasive way using a stress-free approach. Different laser wavelengths are used for different applications following these minimally invasive concepts: argon, KTP, diode, Nd:YAG, and CO2 lasers are used for soft tissue applications and the erbium family is used for both soft and hard tissue procedures. This paper offers a revision and a discussion of the international literature, showing also some clinical procedures. related to these scientific studies. Soft tissues laser applications in Pediatric Dentistry include application in oral surgery as well as in periodontics and orthodontics. Laser applications on hard tissues include caries prevention and detection and application for sealing of pits and fissures. Also application for cavity preparation, carious removal and pulp therapy are discussed. Child;Evidence-Based Dentistry;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Mouth Diseases;Pediatric Dentistry;Tooth Diseases

[Effectiveness of extracorporal haemocorrection methods in the treatment of infectious endocarditis]. Adult;Endocarditis;Extracorporeal Circulation;Female;Humans;Low-Level Light Therapy;Male;Photopheresis;Plasmapheresis;Treatment Outcome

Using a 308-nm excimer laser to treat vitiligo in Asians. BACKGROUND: Current vitiligo therapies require many months of treatment and often result in disappointing outcomes. Treatment with a 308-nm excimer laser has shown promising results in patients with vitiligo. OBJECTIVE: This controlled

prospective trial studied the effectiveness of the 308-nm excimer laser for treating vitiligo in Asians. METHODS: Thirty-four patients (14 males and 20 females) with localized vitiligo were enrolled in the study. Vitiligo patches were treated using a 308-nm excimer laser. Lesions were treated twice weekly for 13 weeks. The treatment was started with 50 to 100 mJ/cm2 (according to site) and increased by 50 mJ/cm2 in every session until erythema appeared. Patients were treated for 25 sessions, or until 100% repigmentation, whichever was achieved first. The overall response rate was assessed clinically and by comparison of photographs before and after treatment by two independent investigators. RESULTS: Twenty-nine patients (12 males and 17 females) completed the study. Lesions on the face responded better than elsewhere on the body. The least responsive areas were the hands and feet. The average number of treatment sessions prior to repigmentation was 11. Untreated control patches remained unchanged. In higher skin phototypes the response was more favorable. There was no significant correlation between the age of the patients and their response to treatment. CONCLUSION: The use of the 308-nm excimer laser for the treatment of vitiligo is effective, relatively safe, and more convenient compared to other available modalities of treatment for stable vitiligo with small patches. However, similar to other modalities of treatment, the therapeutic effect is mainly dependent on the location of vitiligo lesions. Adolescent;Adult;Aged;Aged, 80 and over;Asian People;Child;Child, Preschool;Female;Follow-Up Studies;Humans;Kuwait;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome;Vitiligo;Young Adult

Dermal scatter reduction in human skin: a method using controlled application of glycerol. BACKGROUND AND OBJECTIVE: Previous studies in a hairless Guinea pig model showed that transdermal application of glycerol effected a temporary reduction in dermal scatter of light. This study focuses on the application of this protocol on human patients. STUDY DESIGN/MATERIALS AND METHODS: After stratum corneal removal, glycerol was applied to human subjects using a low pressure transdermal application device. Optical coherence tomography imaging showed increased intensity of radiation reaching deeper regions in the skin and photographs showed enhanced visualization of dermal structures. RESULTS/CONCLUSION: Topically applied glycerol increased light penetration of in vivo corneal-stripped skin. This minimally invasive approach to temporary dermal scatter reduction has the potential to improve the efficacy of light-based diagnostic or therapeutic devices. Glycerol Administration, Cutaneous;Glycerol;Humans;Low-Level Light Therapy;Skin;Tattooing;Tomography, Optical Coherence

Low level light effects on inflammatory cytokine production by rheumatoid arthritis synoviocytes. BACKGROUND AND OBJECTIVE: Low level light therapy (LLLT) is being evaluated for treating chronic and acute pain associated with rheumatoid arthritis (RA) and other inflammatory diseases. The mechanisms underlying the effectiveness of LLLT for pain relief in RA are not clear. The objectives of this study were to determine whether LLLT decreased production of pro-inflammatory cytokines by cells from RA joints, and, if so, to identify cellular mechanisms. STUDY DESIGN/MATERIALS AND METHODS: Synoviocytes from RA patients were treated with 810 nm radiation before or after addition of tumor necrosis factor-alpha (TNF-alpha). mRNA for TNF-alpha, interleukin (IL)-1beta, IL-6, and IL-8 was measured after 30, 60, and 180 minutes using RT-PCR. Intracellular and extracellular protein levels for 12 cytokines/chemokines were measured at 4, 8, and 24 hours using multiplexed ELISA. NF-kappaB activation was detected using Western blotting to follow degradation of IkappaBalpha and nuclear localization of the p65 subunit of NF-kappaB. RESULTS: Radiation at 810 nm (5 J/cm(2)) given before or after TNF-alpha decreases the mRNA level of TNF-alpha and IL-1beta in RA synoviocytes. This treatment using 25 J/cm(2) also decreases the intracellular levels of TNF-alpha, IL-1beta, and IL-8 protein but did not affect the levels of seven other cytokines/chemokines. TNF-alpha-induced activation of NF-kappaB is not altered by 810 nm radiation using 25 J/cm(2). CONCLUSIONS:

The mechanism for relieving joint pain in RA by LLLT may involve reducing the level of pro-inflammatory cytokines/chemokines produced by synoviocytes. This mechanism may be more general and underlie the beneficial effects of LLLT on other inflammatory conditions. Interleukin-1beta;Tumor Necrosis Factor-alpha Arthritis, Rheumatoid;Cells, Cultured;Humans;Interleukin-1beta;Low-Level Light Therapy;Synovial Membrane;Tumor Necrosis Factor-alpha

Superpulsed laser irradiation increases osteoblast activity via modulation of bone morphogenetic factors. BACKGROUND AND OBJECTIVE: Laser therapy is a new approach applicable in different medical fields when bone loss occurs, including orthopedics and dentistry. It has also been used to induce soft-tissue healing, for pain relief, bone, and nerve regeneration. With regard to bone synthesis, laser exposure has been shown to increase osteoblast activity and decrease osteoclast number, by inducing alkaline phosphatase (ALP), osteopontin, and bone sialoprotein expression. Studies have investigated the effects of continuous or pulsed laser irradiation, but no data are yet available on the properties of superpulsed laser irradiation. This study thus aimed to investigate the effect of superpulsed laser irradiation on osteogenic activity of human osteoblast-like cells, paying particular attention to investigating the molecular mechanisms underlying the effects of this type of laser radiation. STUDY DESIGN/MATERIALS AND METHODS: Human osteoblast-like MG-63 cells were exposed to 3, 7, or 10 superpulsed laser irradiation (pulse width 200 nanoseconds, minimum peak power 45 W, frequency 30 kHz, total energy 60 J, exposure time 5 minutes). The following parameters were evaluated: cell growth and viability (light microscopy, lactate dehydrogenase release), calcium deposits (Alizarin Red S staining), expression of bone morphogenetic factors (real-time PCR). RESULTS: Superpulsed laser irradiation decreases cell growth, induces expression of TGF-beta2, BMP-4, and BMP-7, type I collagen, ALP, and osteocalcin, and increases the size and the number of calcium deposits. The stimulatory effect is maximum on day 10, that is, after seven applications. CONCLUSIONS: Reported results show that superpulsed laser irradiation, like the continuous and pulsed counterparts, possesses osteogenic properties, inducing the expression of molecules known to be important mediators of bone formation and, as a consequence, increasing calcium deposits in human MG-63 cells. Moreover, the data suggest a new potential role for PPARgamma as a regulator of osteoblast proliferation. Bone Morphogenetic Proteins;Osteocalcin;Alkaline Phosphatase;Calcium Alkaline Phosphatase;Bone Morphogenetic Proteins;Calcium;Cell Proliferation;Cell Survival;Cells, Cultured;Humans;Low-Level Light Therapy;Osteoblasts;Osteocalcin;Osteogenesis

Effects of low-level laser therapy on proliferation and differentiation of murine bone marrow cells into osteoblasts and osteoclasts. BACKGROUND AND OBJECTIVE: Low-Level Laser Therapy (LLLT) has been suggested to improve bone tissue healing. The cellular and molecular mechanisms involved in this effect are still unclear but bone cell proliferation and differentiation alteration have been proposed. The aim of the present study was to investigate, in vitro, the effect of LLLT on bone cell proliferation, osteoblastic and osteoclastic differentiation, both involved in bone remodeling and regeneration. STUDY DESIGN/MATERIALS AND METHODS: Murine bone marrow cells, which contain both osteoblast and osteoclast progenitors, were cultured and induced to differentiate in the absence or in the presence of LLLT. Laser exposition parameters were determined using a powermeter and consisted in an 808 nm infrared wavelength laser light in continuous mode, with an energy density of 4 J/cm(2) administered three times a week. Cell proliferation and differentiation were assessed after specific staining and microscopic analysis of the cultures after various times, as well as by quantitative RT-PCR analysis of a panel of osteoblast and osteoclast markers after nucleic acid extraction. RESULTS: The use of a powermeter revealed that the power emitted by the optical fiber of the laser device was markedly reduced compared to the displayed power. This allowed to adjust the LLLT parameters to a final energy density exposure of 4 J/cm(2). In these conditions, proliferation of bone

marrow mesenchymal stem cells as well as osteoclast or osteoblast differentiation of the corresponding progenitors were found similar in control and LLLT conditions. CONCLUSION: Using the present experimental protocol, we concluded that an 808 nm wavelength infrared LLLT does not alter murine bone progenitor cell proliferation and differentiation. Moreover our results confirm the necessary use of a powermeter to fix LLLT protocol parameters. Bone Morphogenetic Proteins;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Osteocalcin;Acid Phosphatase Acid Phosphatase;Animals;Bone Marrow Cells;Bone Morphogenetic Proteins;Cell Differentiation;Cell Proliferation;Cells, Cultured;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Gene Expression;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Osteoblasts;Osteocalcin;Osteoclasts

Laser phototherapy as topical prophylaxis against head and neck cancer radiotherapy-induced oral mucositis: comparison between low and high/low power lasers. BACKGROUND AND OBJECTIVE: Oral mucositis is a dose-limiting and painful side effect of radiotherapy (RT) and/or chemotherapy in cancer patients. The purpose of the present study was to analyze the effect of different protocols of laser phototherapy (LPT) on the grade of mucositis and degree of pain in patients under RT. PATIENTS AND METHODS: Thirty-nine patients were divided into three groups: G1, where the irradiations were done three times a week using low power laser; G2, where combined high and low power lasers were used three time a week; and G3, where patients received low power laser irradiation once a week. The low power LPT was done using an InGaAlP laser (660 nm/40 mW/6 J cm(-2)/0.24 J per point). In the combined protocol, the high power LPT was done using a GaAlAs laser (808 nm, 1 W/cm(2)). Oral mucositis was assessed at each LPT session in accordance to the oral-mucositis scale of the National Institute of the Cancer-Common Toxicity criteria (NIC-CTC). The patient self-assessed pain was measured by means of the visual analogue scale. RESULTS: All protocols of LPT led to the maintenance of oral mucositis scores in the same levels until the last RT session. Moreover, LPT three times a week also maintained the pain levels. However, the patients submitted to the once a week LPT had significant pain increase; and the association of low/high LPT led to increased healing time. CONCLUSIONS: These findings are desired when dealing with oncologic patients under RT avoiding unplanned radiation treatment breaks and additional hospital costs. Administration, Topical;Adolescent;Adult;Aged;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Phototherapy;Prospective Studies;Radiation Injuries;Radiotherapy;Stomatitis;Young Adult

Increase of neuronal sprouting and migration using 780 nm laser phototherapy as procedure for cell therapy. BACKGROUND AND OBJECTIVES: The present study focuses on the effect of 780 nm laser irradiation on the growth of embryonic rat brain cultures embedded in NVR-Gel (cross-linked hyaluronic acid with adhesive molecule laminin and several growth factors). Dissociated neuronal cells were first grown in suspension attached to cylindrical microcarriers (MCs). The formed floating cell-MC aggregates were subsequently transferred into stationary cultures in gel and then laser treated. The response of neuronal growth following laser irradiation was investigated. MATERIALS AND METHODS: Whole brains were dissected from 16 days Sprague-Dawley rat embryos. Cells were mechanically dissociated, using narrow pipettes, and seeded on positively charged cylindrical MCs. After 4-14 days in suspension, the formed floating cell-MC aggregates were seeded as stationary cultures in NVR-Gel. Single cell-MC aggregates were either irradiated with near-infrared 780 nm laser beam for 1, 4, or 7 minutes, or cultured without irradiation. Laser powers were 10, 30, 50, 110, 160, 200, and 250 mW. RESULTS: 780 nm laser irradiation accelerated fiber sprouting and neuronal cell migration from the aggregates. Furthermore, unlike control cultures, the irradiated cultures (mainly after 1 minute irradiation of 50 mW) were already established after a short time of cultivation. They contained a much higher number of large size neurons ($P<0.01$), which formed dense branched interconnected networks of thick neuronal fibers. CONCLUSIONS: 780 nm laser phototherapy of

embryonic rat brain cultures embedded in hyaluronic acid-laminin gel and attached to positively charged cylindrical MCs, stimulated migration and fiber sprouting of neuronal cells aggregates, developed large size neurons with dense branched interconnected network of neuronal fibers and, therefore, can be considered as potential procedure for cell therapy of neuronal injury or disease. Animals;Brain;Cell Movement;Cell- and Tissue-Based Therapy;Cells, Cultured;Low-Level Light Therapy;Neurons;Phototherapy;Rats;Rats, Sprague-Dawley

Effect of low level laser therapy (830 nm) with different therapy regimes on the process of tissue repair in partial lesion calcaneous tendon. BACKGROUND AND OBJECTIVE: Calcaneous tendon is one of the most damaged tendons, and its healing may last from weeks to months to be completed. In the search after speeding tendon repair, low intensity laser therapy has shown favorable effect. To assess the effect of low intensity laser therapy on the process of tissue repair in calcaneous tendon after undergoing a partial lesion. STUDY DESIGN/MATERIALS AND METHODS: Experimentally controlled randomized single blind study. Sixty male rats were used randomly and were assigned to five groups containing 12 animals each one; 42 out of 60 underwent lesion caused by dropping a 186 g weight over their Achilles tendon from a 20 cm height. In Group 1 (standard control), animals did not suffer the lesion nor underwent laser therapy; in Group 2 (control), animals suffered the lesion but did not undergo laser therapy; in Groups 3, 4, and 5, animals suffered lesion and underwent laser therapy for 3, 5, and 7 days, respectively. Animals which suffered lesion were sacrificed on the 8th day after the lesion and assessed by polarization microscopy to analyze the degree of collagen fibers organization. RESULTS: Both experimental and standard control Groups presented significant values when compared with the control Groups, and there was no significant difference when Groups 1 and 4 were compared; the same occurred between Groups 3 and 5. CONCLUSION: Low intensity laser therapy was effective in the improvement of collagen fibers organization of the calcaneous tendon after undergoing a partial lesion. Collagen Achilles Tendon;Animals;Collagen;Low-Level Light Therapy;Male;Physical Therapy Modalities;Random Allocation;Rats;Rats, Wistar;Wound Healing;Wounds, Nonpenetrating

The effect of low-intensity laser therapy on bone healing around titanium implants: a histometric study in rabbits. PURPOSE: This study aimed to histometrically evaluate the influence of low-intensity laser treatment on bone healing around titanium implants placed in rabbit tibiae. MATERIALS AND METHODS: Each tibia of 12 adult rabbits received a 3.3 x 6-mm titanium implant. The implants placed in the right tibiae were irradiated with a gallium-aluminum-arsenide diode low-intensity laser every 48 hours for 14 days postoperatively, and the left tibiae were not irradiated. After 3 or 6 weeks, the animals were sacrificed (six animals per period), and nondecalcified sections were obtained and analyzed for bone-to-implant contact (BIC) and bone area within the implant threads. Data were subjected to statistical analysis using analysis of variance (ANOVA) and the Tukey test. RESULTS: BIC was significantly increased in the laser-treated group at both 3 weeks and 6 weeks. BIC did not increase significantly with time (3 weeks versus 6 weeks). Conversely, bone area within the threads was significantly increased with time (3 weeks versus 6 weeks), regardless of whether the laser was used. Considering bone area within the threads, no significant difference was found for treatment, eg, with or without laser. CONCLUSION: Low-intensity laser therapy did not affect the area of bone formed within the threads, but it may improve BIC in rabbit tibiae. Dental Implants;Dental Materials;Titanium Animals;Dental Implants;Dental Materials;Lasers, Semiconductor;Low-Level Light Therapy;Osseointegration;Rabbits;Radiation Dosage;Random Allocation;Surface Properties;Tibia;Time Factors;Titanium;Wound Healing

Melasma: treatment evaluation. INTRODUCTION: Melasma is a common disorder of facial hyperpigmentation that can be resistant to treatment. Our purpose is to evaluate the clinical efficacy of the different available modalities of treatment of melasma among Egyptian patients who have

mostly skin types IV-V under a sunny climate. METHODS: A total of 45 patients with moderate-to-severe melasma were subjected to topical application of hydroquinone 4% cream, chemical peeling with 30% trichloroacetic acid (TCA) and/or frequency-doubled Q-switched Nd:YAG laser therapy for an average of 6 months. Clinical evaluation and melasma severity were recorded using the melasma area and severity index (MASI) score. RESULTS: The improvement score was significantly higher among the topically treated group compared with other lines of therapy ($p<0.0001$). No significant difference in improvement score was detected in the laser group compared with the peeling group. The epidermal type of melasma was also significantly improved compared with the dermal type ($p<0.01$). CONCLUSION: Topical hydroquinone remains the most effective agent for the treatment of melasma in dark-skinned people with rare side effects. Caustics;Dermatologic Agents;Hydroquinones;Trichloroacetic Acid;hydroquinone Administration, Cutaneous;Caustics;Dermatologic Agents;Egypt;Female;Humans;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Severity of Illness Index;Trichloroacetic Acid

Erosive pustular dermatosis of the scalp. A chronic recalcitrant dermatosis developed upon CO2 laser treatment. Erosive pustular dermatosis of the scalp (EPDS) is a rare, chronic inflammatory dermatosis that mostly affects elderly patients, who develop erosions, pustulation, crusting and scarring on the scalp. Its aetiology remains elusive, although the role of local trauma is being emphasized. Treatment is difficult, with several topical and systemic agents being reported to induce improvement. A 63-year-old Caucasian male had been suffering from persistent painful pustules, erosions and crusts on his scalp for 2 years. The onset of the lesions followed a CO2 laser vaporization procedure to treat multiple actinic keratoses. Different topical and systemic treatments had unsuccessfully been tried. A 4-month course of bid 0.1% tacrolimus ointment, along with strict external photoprotection, resulted in dramatic improvement, sustained after careful tapering of tacrolimus. This case is interesting in that the scalp eruption followed CO2 laser treatment. Other cases have been associated with cryosurgery, radiotherapy, surgery, and 5-FU. In fact, to our knowledge, ours is the fourth reported case of EPDS following CO2 laser treatment. Our case also strengthens previous observations as to the efficacy and safety of topical calcineurin inhibitors in this dermatosis. This is noteworthy bearing in mind the atrophic character of the skin in EPDS, which limits the usefulness of chronically administered topical steroids. Chronic Disease;Humans;Keratosis, Actinic;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Scalp Dermatoses;Skin Diseases, Vesiculobullous

Treatment of inflammatory acne vulgaris with combination 595-nm pulsed-dye laser and fractional photothermolysis system. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Lasers, Dye;Low-Level Light Therapy

[Effects of laser reflex therapy on a motor function of the gall bladder and physical properties of bile in patients with chronic acalculous cholecystitis]. AIM: To study effects of laser puncture in combined treatment of chronic non-calculous cholecystitis on motor function of the gallbladder, bile physical characteristics and clinical symptoms. MATERIAL AND METHODS: 73 patients with chronic non-calculous cholecystitis were divided into two groups: 35 patients received standard therapy alone (control group) and 38 patients were exposed to laser puncture as a component of combined treatment. RESULTS: Laser radiation on acupuncture points has a positive therapeutic result, i.e. shorter clinical symptoms, correction of motor function of the gallbladder and bile physical characteristics. CONCLUSION: Laser puncture is an effective method of acalculous cholecystitis treatment and can be included in relevant combined schemes. Acalculous Cholecystitis;Acupuncture Points;Acupuncture Therapy;Adult;Aged;Bile;Chemical Phenomena;Chronic Disease;Female;Gallbladder;Gallbladder Emptying;Humans;Low-Level Light Therapy;Male;Middle Aged;Reflexotherapy;Treatment Outcome;Young Adult

Self-diagnosis of Mild-to-Moderate Acne for Self Treatment with Blue Light Therapy. This study was an evaluation of self-applied, blue light, light-emitting diode therapy in the treatment of mild-to-moderate inflammatory acne on the face and associated labeling to determine if subjects are capable of self diagnosing their condition and whether they are capable of self-administrating treatment. Subjects included had no prior experience with the device. They were given the device and a copy of the labeling. Based on their own assessment, they were evaluated for their comprehension of the device and for its intended use. The study, which comprised 18 females and three males with an average age of 31, demonstrated that all participants (100%) were capable of correctly identifying their acne condition. The labeling, which was key to educating users in recognizing their acne type, included clear descriptions of different categories of acne. The study also demonstrated that the user was capable of self administering the treatment based solely on the device's labeling and without the supervision of a medical doctor.

Photodynamic therapy following carbon dioxide laser enhances efficacy in the treatment of extramammary Paget's disease. Surgical resection is the first-choice therapy for extramammary Paget's disease, but extensive resection is highly invasive and non-surgical treatments are sometimes preferred. Although photodynamic therapy (PDT) has been used for extramammary Paget's disease for some time, recurrence and residual tumour cells are common. In the present study, five patients with extramammary Paget's disease with a total of eight lesions first underwent carbon dioxide (CO2) laser abrasion, followed by 3 h of occlusive application of aminolaevulinic acid (ALA) and then 100 J/cm2 irradiation with a 630-nm excimer dye laser. This combination treatment regime was repeated every 2 weeks for a total of 3 times. Group 1 comprised two patients (five lesions) who received CO2 laser and ALA-PDT only. Group 2 comprised three patients (three lesions) who received CO2 laser and ALA-PDT for residual tumour cells following surgery. Follow-up examinations showed that seven lesions in five patients had not recurred after 12 months, suggesting the efficacy of the present method. Photosensitizing Agents;Aminolevulinic Acid Aged;Aged, 80 and over;Aminolevulinic Acid;Combined Modality Therapy;Female;Humans;Lasers, Excimer;Lasers, Gas;Low-Level Light Therapy;Male;Paget Disease, Extramammary;Penile Neoplasms;Photochemotherapy;Photosensitizing Agents;Skin Neoplasms;Vulvar Neoplasms

Tissue-punch technique in nonattached tissue using the YSGG laser. Tissue Adhesives Dental Implantation, Endosseous;Dental Implants, Single-Tooth;Female;Gingiva;Gingivectomy;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Osteotomy;Patient Care Planning;Tissue Adhesives;Tomography, X-Ray Computed;Wound Healing

Laser applications in endodontics: an update review. The search for new devices and technologies for endodontic procedures always has been challenging. Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of potential applications for lasers in endodontics have been proposed. With the development of thinner, more flexible and durable laser fibres, laser applications in endodontics have increased. Since laser devices are still relatively costly, access to them is limited. The purpose of this paper is to summarise laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilisation of root canals, root canal shaping and obturation and apicectomy. The effects of lasers on root canal walls and periodontal tissues are also reviewed. Apicoectomy;Dental Pulp Capping;Dental Pulp Diseases;Dentin Sensitivity;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Pulpotomy;Root Canal Obturation;Root Canal Preparation;Root Canal Therapy

Laser accelerated radiotherapy: is it on its way to the clinic? Protons Animals;Electrons;Humans;Laser Therapy;Low-Level Light Therapy;Proton Therapy;Radiotherapy

[Efficacy and safety of low-energy QS Nd:YAG and QS alexandrite laser for melasma]. OBJECTIVE: To assess the efficacy and safety of low-energy QS Nd : YAG and QS alexandrite laser for melsasma. METHODS: We treated 32 patients with melasma using the low-energy QS Nd : YAG and QS alexandrite laser. Pigment subsided by > or = 90% was regarded as "cured", by 60% -89% as "remarkably improved", by 30% -59% as "effective", and by < 30% as "ineffective" . RESULTS: Among the 32 patients, 21 patients (65.6%) were cured after (10.2 +/- 3.5) times (range: 4-15 times) of treatments, 11 patients (34.4%) were remarkably improved after (11.4 +/- 2.5) times (range: 10-14 times) of treatment. The rates of "cured" and "remarkably improved" were 81.3% and 18.7% among patients with light brown melasma and 50.0% and 50.0% among patients with dark brown melasma ($P < 0.05$). In patients with a disease history of less than 2 years, the rates of " cured" and "remarkably improved" were 87.5% and 12.5%, which was significantly better than the treatment results of patients with a disease history of more than 2 years (the rates of "cured" and "remarkably improved" were 58.3% and 41.7%) ($P < 0.05$). No hyperpigment and scarring was observed and only one patient experienced a transient pigment loss. CONCLUSIONS: Lower-energy QS Nd : YAG and QS Alexandrite Laser can be used to treat patients with melasma safely and effectively. The color and disease course of melasma were factors that may affect the treatment results.
Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Risk Assessment;Treatment Outcome

[Efficacy and safety of 308 nm excimer laser for vitiligo]. OBJECTIVE: To assess the efficacy and safety of the 308 nm excimer laser for the treatment of vitiligo. METHODS: We treated 170 patients with stable vitiligo by using the 308 nm excimer laser. The lesions of vitiligo were treated one to two times per week for 10-30 times. Efficacies were evaluated every 7 days and 3 days after the treatments were completed. Patients were followed up for two months. RESULTS: The rates of "remarkably improved" and "cured" were 67.97% and 32.03% in faces, 54.55% and 27.27% in necks, 63.26% and 26.53% in trunks, 38.84% and 15.70% in limbs, and 0 and 0 in hands and feet. The areas of faces had a better response than those of necks, trunks, or limbs ($P < 0.01$), and the areas of trunks or limbs had better response than that of hands and feet ($P < 0.01$). CONCLUSION: The 308 nm excimer laser is safe and effective in treating stable vitiligo and the efficacy varies in different lesion sites. Adolescent;Adult;Child;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Risk Assessment;Treatment Outcome;Vitiligo;Young Adult

Treatment of segmental cafÃ©-au-lait macules using 1064-nm Q-switched Nd:YAG laser with low pulse energy. Cafe-au-Lait Spots;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Comparison between single-diode low-level laser therapy (LLLT) and LED multi-diode (cluster) therapy (LEDT) applications before high-intensity exercise. BACKGROUND DATA AND OBJECTIVE: There is anecdotal evidence that low-level laser therapy (LLLT) may affect the development of muscular fatigue, minor muscle damage, and recovery after heavy exercises. Although manufacturers claim that cluster probes (LEDT) maybe more effective than single-diode lasers in clinical settings, there is a lack of head-to-head comparisons in controlled trials. This study was designed to compare the effect of single-diode LLLT and cluster LEDT before heavy exercise. MATERIALS AND METHODS: This was a randomized, placebo-controlled, double-blind cross-over study. Young male volleyball players (n = 8) were enrolled and asked to perform three Wingate cycle tests after 4 x 30 sec LLLT or LEDT pretreatment of the rectus femoris muscle with either (1) an active LEDT cluster-probe (660/850 nm, 10/30 mW), (2) a placebo cluster-probe with no output, and (3) a single-diode 810-nm 200-mW laser. RESULTS: The active LEDT group had significantly decreased post-exercise creatine kinase (CK) levels (-18.88 +/- 41.48 U/L), compared to the placebo cluster group (26.88 +/- 15.18 U/L) ($p < 0.05$) and the active single-diode laser group (43.38 +/- 32.90 U/L) ($p < 0.01$). None of the pre-exercise LLLT or LEDT

protocols enhanced performance on the Wingate tests or reduced post-exercise blood lactate levels. However, a non-significant tendency toward lower post-exercise blood lactate levels in the treated groups should be explored further. CONCLUSION: In this experimental set-up, only the active LEDT probe decreased post-exercise CK levels after the Wingate cycle test. Neither performance nor blood lactate levels were significantly affected by this protocol of pre-exercise LEDT or LLLT. Lactic Acid;Creatine Kinase Adolescent;Creatine Kinase;Cross-Over Studies;Double-Blind Method;Exercise;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle, Skeletal;Young Adult

Photothermally-induced disordered patterns of corneal collagen revealed by SHG imaging. The loss of organization of the corneal collagen lattice induced by photothermal effects was analyzed by using second-harmonic generation (SHG) imaging. Porcine cornea samples were treated with low-power laser irradiation in order to get localized areas of tissue disorganization. The disorder induced within the irradiated area of corneal stroma was quantified by means of Discrete Fourier Transform, auto-correlation and entropy analyses of the SHG images. Polarization modulated SHG measurements allowed to probe the changes in the structural anisotropy of sub-micron hierarchical levels of the stromal collagen. Our results emphasize the great potential of the SHG imaging to detect subtle modifications in the collagen assembly. The proposed analytical methods may be used to track several genetic, pathologic, accidental or surgical-induced disorder states of biological tissues. Collagen Animals;Collagen;Cornea;Fourier Analysis;Lasers;Light;Sus scrofa;Temperature

Targeted phototherapy. Phototherapy is one of the most important therapeutic modalities in dermatology. This field has seen several major advances in the recent years, the most recent being targeted phototherapy. Targeted phototherapy, which includes laser and nonlaser technologies, delivers light/laser in the ultraviolet spectrum, of specific wavelength, specifically targeted at the affected skin and thereby avoids many of the side effects of conventional phototherapy. The treatment has been claimed to be effective, quick, and needing fewer treatment sessions. The article reviews this new mode of phototherapy. Animals;Dermatology;Humans;Low-Level Light Therapy;Phototherapy;Skin Diseases

Effect of a novel low-energy pulsed-light device for home-use hair removal. BACKGROUND: Removal of unwanted hair is the most popular skin treatment worldwide. Over the past decade, various lasers and light sources for epilation have been advocated for use in an office setting, although most people continue to treat unwanted hair with a variety of temporary physical methods (e.g., waxing, shaving) in a home setting, presumably due to cost and convenience factors. OBJECTIVES: To evaluate the safety and efficacy of a low-energy pulsed-light device intended for home-use hair removal. MATERIALS AND METHODS: Twenty women (skin phototypes I-IV) with dark terminal hair in nonfacial sites (axilla, forearms, inguinal region, legs) self-administered three treatments at 2-week intervals using a handheld intense-pulsed-light device. Matched untreated skin sites were also studied. Hair counts and clinical photographs were obtained pretreatment and at 1, 3, and 6 months after the third treatment. Side effects and patient satisfaction scores were recorded. RESULTS: All patients showed a positive clinical response to treatment, with reduction of unwanted hair. No reduction of hair was noted in untreated matched areas. Hair counts were reduced 37.8% to 53.6% 6 months after the three treatments. Skin region influenced clinical response, with lower legs exhibiting greater hair reduction than arms and inguinal and axillary areas. Mild erythema was experienced in 25% of patients, but no other side effects or complications were encountered. Patient satisfaction scores were high, with all patients stating that they would purchase the device for future home use. CONCLUSIONS Low-energy pulsed light can be applied safely and effectively for at-home hair removal in a variety of nonfacial locations and skin phototypes I-IV. Adult;Female;Hair Removal;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Skin Pigmentation;Treatment Outcome

Effects of near-infrared laser exposure in a cellular model of wound healing. BACKGROUND: Clinical studies have demonstrated beneficial outcomes for low-level laser therapy (LLLT) using near-infrared (NIR) wavelengths. It has been hypothesized that the benefits of NIR LLLT are due in part to the thermal effects of NIR exposure. However, it is not clear whether photochemical interactions between NIR light and superficial tissues contribute to beneficial outcomes. To investigate the photochemical effects of NIR exposure, the efficacy of 980 nm NIR LLLT on human fibroblast growth rates is investigated using an in vitro model of wound healing. METHODS: A small pipette is used to induce a wound in fibroblast cell cultures, which are imaged at specific time intervals over 48 h and exposed to a range of laser doses (1.5-66 J/cm(2)) selected to encompass the range of doses used during other in vivo and in vitro studies. For each image acquired, wound sizes were quantified using a novel application of existing image processing algorithms. RESULTS: Cell growth rates were compared across different laser exposure intensities with the same exposure duration, and across different laser exposure durations with the same exposure intensity. Exposure to low- and medium-intensity laser light accelerates cell growth, whereas high-intensity light negated the beneficial effects of laser exposure. Cell growth was accelerated over a wide range of exposure durations using medium-intensity laser light, with no significant inhibition of cell growth at the longest exposure durations used in this study. CONCLUSION: Low-level exposure to 980 nm laser light can accelerate wound healing in vitro without measurable temperature increases. However, these results also demonstrate the need for appropriate supervision of laser therapy sessions to prevent overexposure to NIR laser light that may inhibit cell growth rates observed in response to lower intensity laser exposure. Cell Proliferation;Cells, Cultured;Humans;Lasers;Models, Biological;Wound Healing

Low-energy laser irradiation promotes synovial fibroblast proliferation by modulating p15 subcellular localization. BACKGROUND AND OBJECTIVE: Low-energy laser irradiation (low-level laser therapy) (LELI/LLLT/photobiomodulation) has been found to modulate various biological effects, especially those involved in promoting cell proliferation. Synovial fibroblasts are important in maintaining the homeostasis of articular joints and have strong chondrogenetic capacity. Here, we investigated the effect and molecular basis of LELI on synovial fibroblast proliferation. STUDY DESIGN/MATERIALS AND METHODS: HIG-82 rabbit synovial fibroblasts were cultured, and laser irradiation (660 nm) was applied at the power density of 40 mW/cm(2) for 2 minutes, corresponding to laser fluence of 4.8 J/cm(2). The effect of LELI on cell proliferation, cell cycle progression, and expression of cyclin-dependent kinase inhibitors (CKIs) were investigated. We also examined whether the effects of LELI on HIG-82 cell proliferation were affected by cAMP content, which is known to influence the cell cycle via inducing CKIs. RESULTS: LELI promoted HIG-82 synovial fibroblast proliferation and induced cytoplasmic localization of cyclin-dependent kinase inhibitor p15 (INK4B/CDKN2B). Moreover, the proliferation of HIG-82 synovial fibroblasts was reduced by cAMP, while cAMP inhibitor, SQ22536, induced p15 cytoplasmic localization and as a result, elevated synovial fibroblast proliferation was observed. In addition, the promotive effect of LELI-induced HIG-82 synovial fibroblast proliferation was abolished by cAMP treatment. Our findings suggest that cAMP may be involved in the effect of LELI on synovial fibroblast proliferation. CONCLUSION: We revealed the effect and molecular link involved in synovial fibroblast proliferation induced by 660-nm LELI. Our study provides new insights into the mechanisms by which LELI has biological effects on synovial fibroblast proliferation. These insights may contribute to further investigation on biological effects and application of LELI in regenerative medicine. Cyclin-Dependent Kinase Inhibitor Proteins;Cyclic AMP;Bromodeoxyuridine Animals;Bromodeoxyuridine;Cell Cycle;Cell Proliferation;Cells, Cultured;Cyclic AMP;Cyclin-Dependent Kinase Inhibitor

Proteins;Fibroblasts;Fluorescent Antibody Technique;Low-Level Light Therapy;Rabbits;Synovial Membrane
In vivo effects of low level laser therapy on inducible nitric oxide synthase. BACKGROUND AND OBJECTIVE: Low level laser therapy (LLLT) has been demonstrated to modulate inflammatory processes with evidence suggesting that treatment protocol, such as wavelength, total energy, and number of treatments determine the clinical efficacy. In this study, the effects of LLLT mediated by different wavelengths and continuous versus pulsed delivery mode were quantified in a transgenic murine model with the luciferase gene under control of the inducible nitric oxide synthase (iNOS) expression. STUDY DESIGN/MATERIALS AND METHODS: LLLT modulated iNOS gene expressed in the acute Zymosan-induced inflammation model is quantified using transgenic mice (FVB/N-Tg(iNOS-luc)). Here an energy density of 5 J cm(-2) at either 635, 660, 690, and 905 nm in continuous wave mode and at 905 nm for short pulse delivery were evaluated. Age of the animals was determined as additional modulating the inflammatory response and the LLLT efficacy for some treatment protocols. RESULTS: Animals younger than 15 weeks showed mostly reduction of iNOS expression, while older animals showed increased iNOS expression for some LLLT protocols. Intensity and time course of inducible nitric oxide expression was found to not only depend on wavelength, but also on the mode of delivery, continuous, or pulsed irradiation. CONCLUSION: LLLT exhibit different effects in induced inflammatory process according to different wavelengths and wave mode. Upregulation of iNOS gene following 905 nm pulsed wave suggests a different mechanism in activating the inflammatory pathway response when compared to the continuous wave. Zymosan;Nitric Oxide Synthase Type II Aging;Animals;Inflammation;Knee Joint;Low-Level Light Therapy;Luminescent Measurements;Mice;Mice, Transgenic;Nitric Oxide Synthase Type II;Random Allocation;Up-Regulation;Zymosan
Noninvasive laser vasectomy: preliminary ex vivo tissue studies. BACKGROUND AND OBJECTIVES: Male sterilization (vasectomy) is more successful, safer, less expensive, and easier to perform than female sterilization (tubal ligation). However, female sterilization is more popular, primarily due to male fear of vasectomy complications (incision, bleeding, infection, and scrotal pain). The development of a completely noninvasive vasectomy technique may eliminate these concerns. MATERIALS AND METHODS: Ytterbium fiber laser radiation with a wavelength of 1,075 nm, average power of 11.7 W, 1-second pulse duration, 0.5 Hz pulse rate, and 3-mm-diameter spot was synchronized with cryogen cooling of the scrotal skin surface in canine tissue for a treatment time of 60 seconds. RESULTS: Vas thermal lesion dimensions measured 2.0+/-0.3 mm diameter by 3.0+/-0.9 mm length, without evidence of skin damage. The coagulated vas bursting pressure measured 295+/-72 mm Hg, significantly higher than typical vas ejaculation pressures of 136+/- 29 mm Hg. CONCLUSIONS: Noninvasive thermal coagulation and occlusion of the vas was produced in an ex vivo canine tissue model. However, chronic in vivo animal studies will be necessary to optimize the laser/cooling treatment parameters and confirm long-term vas occlusion with absence of sperm in the ejaculate, before clinical application. Animals;Dogs;Hypothermia, Induced;Laser Coagulation;Low-Level Light Therapy;Male;Scrotum;Skin;Vas Deferens;Vasectomy
Pulsed-dye laser for treating ecchymoses after facial cosmetic procedures. OBJECTIVE: To assess the safety and efficacy of a 595-nm pulsed-dye laser in the treatment of ecchymoses after facial cosmetic procedures. METHODS: Twenty consecutive patients with ecchymoses after facial cosmetic procedures underwent treatment with the pulsed-dye laser. A 10-mm spot size was used, with pulse duration of 6 milliseconds, fluence of 6 J/cm(2), and cryogen spray for 30 milliseconds with a 20-millisecond delay. The ecchymotic area was outlined; the lateral half was treated on postoperative day 5 or 6 and the medial half on postoperative day 7 to 10. Clinical photographs were obtained before and after each treatment. Three blinded independent observers evaluated the photographs

and graded the ecchymoses on a scale of 0 to 3, with 3 indicating severe ecchymosis. RESULTS: The most common procedures associated with ecchymoses are cervicofacial rhytidectomy, facial lipocontouring, thread lift, and minimally invasive subperiosteal midface-lift. Pulsed-dye laser treatment resulted in a 63% mean improvement in ecchymosis scores within 48 to 72 hours. The only adverse effects were mild edema and discomfort. Maximal efficacy of the laser treatment was observed when it was performed between 5 and 10 days postoperatively. Patient satisfaction was universally high. CONCLUSIONS: Treatment with the pulsed-dye laser is safe and effective for expeditious resolution of postoperative ecchymoses after facial cosmetic procedures. It has the potential for wider application in treating postoperative ecchymoses on other areas of the body and after trauma. Adult;Aged;Aged, 80 and over;Ecchymosis;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Rhytidoplasty;Treatment Outcome

The use of laser technology (Er;Cr:YSGG) and stereolithography to aid in the placement of a subperiosteal implant: case study. The use of laser technology has helped this clinician to provide treatment with less postoperative pain and increased healing. The subperiosteal implant is a modality that has been used for several decades, although its popularity has declined in favor of endosseous dental implants. In some instances, however, it remains the treatment of choice, specifically in the atrophic mandible (where placement of endosseous implants is not possible) or when placement would increase the chances of jaw fracture. This article reports the case of a patient rehabilitated using a simplified surgical protocol involving laser surgery and stereolithography. Dental Implants Aged;Computer-Aided Design;Dental Implantation, Subperiosteal;Dental Implants;Dental Prosthesis, Implant-Supported;Denture, Complete, Lower;Denture, Overlay;Female;Humans;Jaw, Edentulous;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Mandible;Patient Care Planning

[Laserotherapy and mesodiencephalic modulation after hemihepatoectomy in the early postoperative period]. Combined Modality Therapy;Diencephalon;Electric Stimulation Therapy;Humans;Liver;Liver Neoplasms;Low-Level Light Therapy;Mesencephalon;Postoperative Period

[The use of laseropuncture in patients with bronchial asthma and concomitant chronic rhinosinusitis]. Acupuncture Therapy;Adult;Asthma;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Rhinitis;Sinusitis;Young Adult

[Impact of low-intensity laser on the suppression of infections caused by Herpes simplex viruses 1 and 2: in vitro study]. The use of low-level laser to suppress infections caused by Herpes simplex viruses 1 and 2 was evaluated after one to five applications. A gradual reduction in replication of Herpes simplex viruses 1 and 2 was observed, with 68.4% and 57.3% inhibition, respectively, after five applications, thus favoring its clinical use. Animals;Chlorocebus aethiops;Herpes Simplex;Herpesvirus 1, Human;Herpesvirus 2, Human;Humans;Low-Level Light Therapy;Vero Cells;Virus Replication

Laser therapy of painful shoulder and shoulder-hand syndrome in treatment of patients after the stroke. The common complication after stroke is pain and dysfunction of shoulder of paralyzed arm, as well as the swelling of the hand. The aim of this study was to determine the effects of LASER therapy and to correlate with electrotherapy (TENS, stabile galvanization) in subjects after stroke. We analyzed 70 subjects after stroke with pain in shoulder and oedema of paralyzed hand. The examinees were divided in two groups of 35, and they were treated in the Clinic for Physical Medicine and Rehabilitation in Tuzla during 2006 and 2007. Experimental group (EG) had a treatment with LASER, while the control group (CG) was treated with electrotherapy. Both groups had kinesis therapy and ice massage. All patients were examined on the admission and discharge by using the VAS, DASH, Barthel index and FIM. The pain intensity in shoulder was significantly reduced in EG ($p<0,0001$),

swelling is lowered in EG (p=0,01). Barthel index in both groups was significant higher (p<0,01). DASH was significantly improved after LASER therapy in EG (p<0,01). EG had higher level of independency (p<0,01). LASER therapy used on EG shows significantly better results in reducing pain, swelling, disability and improvement of independency. Activities of Daily Living;Aged;Cryotherapy;Electric Stimulation Therapy;Hand Joints;Humans;Kinesis;Low-Level Light Therapy;Middle Aged;Range of Motion, Articular;Reflex Sympathetic Dystrophy;Shoulder Joint;Shoulder Pain;Stroke

[Application of low-intensity laser radiation and endotoxin-binding preparations to the treatment of female infertility]. A total of 38 women of reproductive age (from 20 to 45 years) with chronic inflammatory gynecological diseases including 7 with primary and 9 with secondary infertility were examined by standard clinical, instrumental, and laboratory methods. In addition, variations of such important characteristics as serum endotoxin level and activity of antiendotoxin immunity were measured. The study has demonstrated participation of chronic aggression of endotoxins (of intestinal origin) in pathogenesis of the disorders of interest. Inclusion of the "antiendotoxic component" in the combined therapy allowed the efficacy of the treatment of chronic inflammation and female infertility to be greatly enhanced. It suggests the important (if not decisive) role of bacterial lipopolysacchardides in the pathogenetic mechanism underlying the problems considered in this study. Endotoxins Adult;Endotoxins;Female;Humans;Infertility, Female;Low-Level Light Therapy;Middle Aged;Sorption Detoxification;Young Adult

[Parameters of lipid peroxidation and antioxidative protection in patients with chronic pancreatitis treated by low-intensity laser therapy]. The objective of this study was to evaluate the influence of low-intensity laser therapy (LILT) on the processes of lipid peroxidation (LPO) and antioxidative protection (AOP) in patients with chronic pancreatitis. A total of 78 patients aged from 36 to 77 years were treated with LILT in addition to conventional therapy; the patients of the control group (n = 40) received only medicamentous therapy. Examination of the patients in the exacerbation phase of chronic pancreatitis revealed activation of LPO processes and differently-directed shifts of AOP components. These changes are supposed to reflect variations in the activity of the inflammatory processes in the pancreas and oxidative stress on this organ. Antioxidants;Enzyme Inhibitors Adult;Aged;Antioxidants;Enzyme Inhibitors;Female;Humans;Lipid Peroxidation;Low-Level Light Therapy;Male;Middle Aged;Pancreatitis, Chronic

Molecular mechanisms of cell proliferation induced by low power laser irradiation. Low power laser irradiation (LPLI) promotes proliferation of multiple cells, which (especially red and near infrared light) is mainly through the activation of mitochondrial respiratory chain and the initiation of cellular signaling. Recently, the signaling proteins involved in LPLI-induced proliferation merit special attention, some of which are regulated by mitochondrial signaling. Hepatocyte growth factor receptor (c-Met), a member of tyrosine protein kinase receptors (TPKR), is phosphorylated during LPLI-induced proliferation, but tumor necrosis factor alpha (TNF-alpha) receptor has not been affected. Activated TPKR could activate its downstream signaling elements, like Ras/Raf/MEK/ERK, PI3K/Akt/eIF4E, PI3K/Akt/eNOS and PLC-gamma/PKC pathways. Other two pathways, DeltaPsim/ATP/cAMP/JNK/AP-1 and ROS/Src, are also involved in LPLI-induced proliferation. LPLI-induced cell cycle progression can be regulated by the activation or elevated expressions of cell cycle-specific proteins. Furthermore, LPLI induces the synthesis or release of many molecules, like growth factors, interleukins, inflammatory cytokines and others, which are related to promotive effects of LPLI. Cell Cycle Proteins Animals;Cell Cycle;Cell Cycle Proteins;Cell Proliferation;Humans;Inflammation;Low-Level Light Therapy;Mitochondria;Signal Transduction

Ablative fractional laser resurfacing for the treatment of a third-degree burn. Burn scars are the result of wound healing following a partial-thickness or full-thickness thermal injury. Thermal injury

can frequently result in extensive scarring, which may have profound psychologic impact on the victim, serving as a visible and palpable reminder of a traumatic event. Standard treatments for scars include the use of skin grafts, intralesional steroid injections, and pulsed-dye laser treatments. The authors have previously described successful treatment of a burn scar with nonablative fractional resurfacing. Ablative fractional lasers may offer burn patients advantages over nonablative techniques, including improved function and cosmetic outcomes. In addition, ablative fractional laser may require fewer treatments, and therefore, be a more cost-effective treatment option for patients. The authors report the use of fractional ablative laser for the treatment of a disfiguring scar that was more than 50-years-old. To our knowledge, this is the first report of this technology for the treatment of a scar resulting from a third-degree burn in the literature. The demonstrated successful outcome in this case patient may indicate a progessive treatment option for many patients who have been disfigured by these types of thermal injuries. Burns;Cicatrix;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged

Vascular-specific laser wavelength for the treatment of facial telangiectasias. BACKGROUND: Facial telangiectasias have been successfully treated with a variety of laser wavelengths. Shorter wavelengths (532 nm) are generally effective in the treatment of smaller vessels; longer wavelengths (1064 nm), although potentially more effective in the treatment of larger vessels, may be associated with a higher complication rate. The 980-nm wavelength has the potential benefits of a longer wavelength with the safety of shorter wavelengths. OBJECTIVE: The efficacy and safety of a new 980-nm diode laser in the treatment of facial telangiectasias was evaluated. MATERIALS AND METHODS: Twelve subjects, aged 44 to 67 years with Fitzpatrick skin types 1 to 3 and bilateral facial telangiectasias, underwent 1 to 3 monthly treatments with a 980-nm diode laser using fluences ranging from 22.2 to 146.9 J/cm2, pulse durations of 50-160 ms, spot sizes of 0.7 to 1 mm, and pulse frequencies of 3 to 10 Hz. Clinical evaluation included digital photography, as well as subject and investigator assessment of reduction in the size and appearance of telangiectasias on a 1 to 5 point scale. Adverse effects were also assessed. RESULTS: Significant improvement in the appearance of telangiectasias was seen after treatment. No complications were observed. CONCLUSION: A new 980-nm diode laser effectively treats facial telangiectasias without any observed complications. Adult;Aged;Face;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Telangiectasis

Treatment of neck pain: noninvasive interventions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. STUDY DESIGN: Best evidence synthesis. OBJECTIVE: To identify, critically appraise, and synthesize literature from 1980 through 2006 on noninvasive interventions for neck pain and its associated disorders. SUMMARY OF BACKGROUND DATA: No comprehensive systematic literature reviews have been published on interventions for neck pain and its associated disorders in the past decade. METHODS: We systematically searched Medline and screened for relevance literature published from 1980 through 2006 on the use, effectiveness, and safety of noninvasive interventions for neck pain and associated disorders. Consensus decisions were made about the scientific merit of each article; those judged to have adequate internal validity were included in our best evidence synthesis. RESULTS: Of the 359 invasive and noninvasive intervention articles deemed relevant, 170 (47%) were accepted as scientifically admissible, and 139 of these related to noninvasive interventions (including health care utilization, costs, and safety). For whiplash-associated disorders, there is evidence that educational videos, mobilization, and exercises appear more beneficial than usual care or physical modalities. For other neck pain, the evidence suggests that manual and supervised exercise interventions, low-level laser therapy, and perhaps acupuncture are more effective than no treatment, sham, or alternative interventions; however, none of the active treatments was clearly superior to any other in either the short- or long-term. For both whiplash-associated disorders and other neck pain without radicular

symptoms, interventions that focused on regaining function as soon as possible are relatively more effective than interventions that do not have such a focus. CONCLUSION: Our best evidence synthesis suggests that therapies involving manual therapy and exercise are more effective than alternative strategies for patients with neck pain; this was also true of therapies which include educational interventions addressing self-efficacy. Future efforts should focus on the study of noninvasive interventions for patients with radicular symptoms and on the design and evaluation of neck pain prevention strategies.

Ultrastructural analysis of the low level laser therapy effects on the lesioned anterior tibial muscle in the gerbil. Low level laser therapy (LLLT) is known for its positive results but studies on the biological and biomodulator characteristics of the effects produced in the skeletal muscle are still lacking. In this study the effects of two laser dosages, 5 or 10 J/cm(2), on the lesioned tibial muscle were compared. Gerbils previously lesioned by 100 g load impact were divided into three groups: GI (n=5) controls, lesion non-irradiated; GII (n=5), lesion irradiated with 5 J/cm(2) and GIII (n=5), lesion irradiated with 10 J/cm(2), and treated for 7 consecutive days with a laser He-Ne (lambda=633 nm). After intracardiac perfusion, the muscles were dissected and reduced to small fragments, post-fixed in 1% osmium tetroxide, dehydrated in increasing alcohol concentrations, treated with propylene oxide and embedded in Spurr resin at 60 degrees C. Ultrafine cuts examined on a transmission electron microscope (Jeol 1010) revealed in the control GI group a large number of altered muscle fibers with degenerating mitochondria, intercellular substance containing degenerating cell fragments and budding blood capillaries with underdeveloped endothelial cells. However, groups GII and GIII showed muscle fibers with few altered myofibrils, regularly contoured mitochondria, ample intermembrane spaces and dilated mitochondrial crests. The clean intercellular substance showed numerous collagen fibers and capillaries with multiple abluminal processes, intraluminal protrusions and several pinocytic vesicles in endothelial cells. It was concluded that laser dosages of 5 or 10 J/cm(2) delivered by laser He-Ne (lambda=633 nm) during 7 consecutive days increase mitochondrial activity in muscular fibers, activate fibroblasts and macrophages and stimulate angiogenesis, thus suggesting effectivity of laser therapy under these experimental conditions.
Animals;Fibroblasts;Gerbillinae;Low-Level Light Therapy;Macrophages;Microscopy, Electron, Transmission;Mitochondria;Muscle Fibers, Skeletal;Muscle, Skeletal;Neovascularization, Physiologic;Specimen Handling

[Effect of low-intensity laser radiation on the function of vascular endothelium in patients with chronic viral hepatitis]. The aim of the study was to measure plasma levels of stable metabolites of nitric oxide, nitrates, and nitrites (NOx) in patients with chronic viral hepatitis and evaluate the possibility of their correction by low-power laser irradiation. NO metabolites (total nitrites and nitrates) were measured colorimetrically from the development of colour in the reaction of nitrite with sulfanilamide diazotization in Griess reagent. Colour intensity was determined with Victor2 enzyme immunoanalyzer, Perkin Elmaer (Finland). The patients were divided into three groups. In group 1 (control, n = 30) they received combined medicamentous therapy, in group 2 (n = 45) medicamentous therapy and a course of intravenous laser therapy, in goup 3 (n = 45) medicamentous therapy and skin laserotherapy. The results indicate that medicamentous treatment of patients with chronic hepatitis does not bring any beneficial changes in plasma NOx whose levels are significantly improved in case of simultaneous laser therapy. It is concluded that different laserotherapeutic modalities have beneficial effect on NO-producing function of endothelium and thereby improve its functional state. Compensation of NO deficit by laser therapy ensures overall protection of the organism against free radicals and decreases severity of oxidative stress. Nitric Oxide
Adult;Endothelium, Vascular;Female;Follow-Up Studies;Hepatitis B, Chronic;Hepatitis C,

Chronic;Humans;Low-Level Light Therapy;Male;Nitric Oxide;Oxidative Stress;Treatment Outcome;Vasodilation

Comparison of a long-pulse Nd:YAG laser and a combined 585/1,064-nm laser for the treatment of acne scars: a randomized split-face clinical study. BACKGROUND: Nonablative laser is gaining popularity because of the low risk of complications, especially in patients with darker skin. OBJECTIVE: To compare the efficacy and safety of a long-pulse neodymium-doped yttrium aluminium garnet (Nd:YAG) laser and a combined 585/1,064-nm laser for the treatment of acne scars. MATERIALS AND METHODS: Nineteen patients with mild to moderate atrophic acne scars received four long-pulse Nd:YAG laser or combined 585/1,064-nm laser treatment sessions at fortnightly intervals. Treatments were administered randomly in a split-face manner. RESULTS: Acne scars showed mild to moderate improvement, with significant Echelle d'Ã©valuation clinique des cicatrices d'acnÃ© (ECCA) score reductions, after both treatments. Although intermodality differences were not significant, combined 585/1,064-nm laser was more effective for deep boxcar scars. In patients with combined 585/1,064-nm laser-treated sides that improved more than long-pulse Nd:YAG laser-treated sides, ECCA scores were significantly lower for combined 585/1,064-nm laser treatment. Histologic evaluations revealed significantly greater collagen deposition, although there was no significant difference between the two modalities. Patient satisfaction scores concurred with physicians' evaluations. CONCLUSION: Both lasers ameliorated acne scarring with minimal downtime. In light of this finding, optimal outcomes might be achieved when laser treatment types are chosen after considering individual scar type and response. Acne Vulgaris;Adult;Atrophy;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Young Adult

Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy

Immunohistochemical assessment of myofibroblasts and lymphoid cells during wound healing in rats subjected to laser photobiomodulation at 660 nm. OBJECTIVE: The goal of this study was to assess the biomodulatory effect of low-level laser therapy (LLLT) on myofibroblasts and T and B cells during wound healing. BACKGROUND DATA: Phtotobiomodulation using LLLT has been extensively applied to improve wound healing. MATERIALS AND METHODS: Standardized artificial surgical wounds were made on the backs of 24 male rats. Half of them underwent LLLT (20 J/cm(2)) at 660 nm delivered for 7 d. At 8 and 14 d post-surgery the healing wounds were removed and immunohistochemical analysis of myofibroblasts, T cells, and B cells was carried out. The mean of each cell subset was calculated and compared to one another using two-way analysis of variance (ANOVA) and Tukey's test. RESULTS: The average number of myofibroblasts was statistically significantly higher in the irradiated group than in the non-irradiated group on the eighth ($p = 0.001$) but not the 14th ($p = 0.555$) day. B and T cells were significantly more conspicuous in the irradiated group on both the eighth ($p = 0.004$ and 0.02, respectively) and 14th days ($p = 0.04$ and 0.03, respectively). CONCLUSIONS: Our results suggest that LLLT facilitates myofibroblastic differentiation during the early stages of the cicatricial repair process. Furthermore, LLLT also appears to modulate the inflammatory response by downregulating lymphocytic proliferation during the wound healing process. Animals;Cell Differentiation;Cell Proliferation;Fibroblasts;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Lymphocytes;Male;Muscle, Smooth;Rats;Rats, Wistar;Wound Healing

Low-level laser therapy in subacromial impingement syndrome. BACKGROUND DATA AND OBJECTIVE: Although previous studies have evaluated the effect of different kinds of physical therapy in subacromial impingement syndrome (SIS), there have been few investigations assessing the effectiveness of low-level laser therapy (LLLT) in shoulder disorders. The goal of this prospective

randomized study was to assess whether gallium-arsenide (Ga-As) laser therapy improves the outcome of a comprehensive home exercise program in patients with SIS. MATERIALS AND METHODS: Forty-four newly-diagnosed SIS patients were enrolled in this study. Group 1 patients (n = 22) received Ga-As laser therapy combined with a 12-wk comprehensive home exercise program, and group 2 patients (n = 22) received the same 12-wk comprehensive home exercise program alone. Night pain, shoulder pain and disability index (SPADI), and University of California-Los Angeles end-result (UCLA) scores were used as outcome measures. RESULTS: Both groups showed a significant reduction in night pain and SPADI scores at the second and 12th weeks with respect to baseline values, with the exception of the SPADI total score at the second week in group 1. UCLA results improved significantly in both groups at the 12th in comparison to the second week. There were no significant differences between groups in mean actual changes in night pain and SPADI scores at the second week from baseline. When values at the 12th week were compared to baseline, mean actual changes in night pain differed significantly between the groups, with a larger change in group 1, but there was no difference between groups in mean actual change in SPADI scores. Second- and 12th-week UCLA scores did not differ between the two groups. CONCLUSION: Our study was unable to demonstrate any distinct advantage of low-level laser therapy over exercise alone. Comprehensive home exercise programs should be the primary therapeutic option in the rehabilitation process in SIS. Adolescent;Adult;Aged;Exercise Therapy;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Shoulder Impingement Syndrome;Young Adult

Neodymium-doped yttrium-aluminium-garnet laser irradiation abolishes the increase in interleukin-6 levels caused by peptidoglycan through the p38 mitogen-activated protein kinase pathway in human pulp cells. The anti-inflammatory effects of low-power laser irradiation have previously been reported. However, how the laser irradiation regulates the expression of inflammatory cytokines remains unknown. In the present study, to elucidate the mechanism behind the anti-inflammatory effect, we examined the effects of low-power neodymium-doped yttrium-aluminium-garnet (Nd:YAG) laser irradiation on interleukin (IL)-6 expression in human pulp (HP) cells stimulated by peptidoglycan (PGN) and focused on intracellular signaling pathways. Low-power Nd:YAG laser irradiation obviated the PGN-induced increase in IL-6 levels in HP cells. A p38 mitogen-activated protein kinase inhibitor, SB203580, also inhibited the increase in IL-6 messenger RNA levels. PGN stimulated the activity of phosphorylated p38 in HP cells. Low-power laser irradiation inhibited the activity. Thus, suppression of the phosphorylated p38 activity by low-power laser irradiation in HP cells culminates in inhibition of the increase in IL-6 induced by PGN, suggesting that low-power laser irradiation regulates intracellular signaling molecule activities to exert its anti-inflammatory effect. Anti-Inflammatory Agents, Non-Steroidal;Imidazoles;Interleukin-6;Peptidoglycan;Protease Inhibitors;Pyridines;p38 Mitogen-Activated Protein Kinases;SB 203580 Anti-Inflammatory Agents, Non-Steroidal;Cells, Cultured;Dental Pulp;Enzyme Activation;Humans;Imidazoles;Interleukin-6;Lasers, Solid-State;Low-Level Light Therapy;MAP Kinase Signaling System;Peptidoglycan;Phosphorylation;Protease Inhibitors;Pyridines;p38 Mitogen-Activated Protein Kinases

Low Power Laser Irradiation Stimulates the Proliferation of Adult Human Retinal Pigment Epithelial Cells in Culture. We investigated the effects of low power laser irradiation on the proliferation of retinal pigment epithelial (RPE) cells. Adult human RPE cells were artificially pigmented by preincubation with sepia melanin, and exposed to a single sublethal laser pulse (590 nm, 1 Âµs, <200 mJ/cm(2)). DNA synthesis, cell number, and growth factor activity in irradiated RPE cells were subsequently monitored. The effect of sublethal laser irradiation on the "wound" healing response of an RPE monolayer in an in vitro scratch assay was also investigated. Single pulsed laser irradiation increased DNA synthesis in pigmented RPE cells measured 6 h post-treatment. In the scratch assay, laser irradiation increased the rates of cell proliferation and wound closure. Conditioned medium,

collected 48 h following laser treatment, increased cell proliferation of unirradiated cells. Irradiation increased RPE cell secretion of platelet-derived growth factor (PDGF)-B chain, and increased mRNA levels of several growth factors and their receptors, including PDGF, transforming growth factor-Î²1, basic fibroblast growth factor, epidermal growth factor, insulin-like growth factor, as well as heat shock proteins. This demonstrates, for the first time, that low power single pulsed laser irradiation stimulates the proliferation of RPE cells, and upregulates growth factors that are mitogenic for RPE cells.

Clinical Efficacy of Self-applied Blue Light Therapy for Mild-to-Moderate Facial Acne. This study was an evaluation of the performance of self-applied, blue light, light-emitting diode therapy in the treatment of mild-to-moderate inflammatory acne on the face, concerning: 1) time to improvement and/or resolution of the number of blemishes and lesions on the face; 2) quality of skin condition; 3) occurrence and count of the number of new blemishes and lesions; and 4) ease of product use; patient comfort, wellbeing, and satisfaction during the treatment period; and safety of treatment. Subjects (N=21) were included according to the inclusion/exclusion criteria and after they had given informed consent. The blue light treatment was conducted over an eight-week period. For study data management and analysis, SPSS 16.0 statistical software was used. Data management and analysis was performed independently using, where appropriate, ANOVA, student t-test, and Mann-Whitney test for N=20. Tests were carried out at the five-percent significance level. The confidence interval was 95 percent. Twenty-one subjects concluded the study (18/21 were female and 3/21 were male). Upon the first outbreak of acne, subjects had a mean age of 15 years (range 8-28 years), and 19 subjects had mild-to-moderate acne for a mean duration of 13.1 years. During the study period with self-applied blue light treatment, the total number of comedones on the face had significantly reduced for the assessment at Day 7 ($p<0.019$) and at Day 28 ($p<0.001$). The total number of open comedones (blackheads) on the face during the treatment period was reduced significantly ($p<0.02$) for assessment at treatment Day 7 ($p<0.005$) and for the assessment at Day 28. The total number of closed comedones (whiteheads) on the face during the treatment period, was reduced significantly ($p<0.007$) for the assessment at Day 28. The total number of papules during treatment had reduced significantly for assessment at Day 7 ($p<0.048$) and Day 28 ($p<0.005$). The total number of pustules during treatment had reduced, but this difference was not statistically significant. This was similar for nodules present. Subjects expressed confidence in using the self-applied blue light without the supervision of a doctor. Regarding previous treatments, subjects expressed dissatisfaction and considered self-applied blue light treatment to be better for their condition. Self-applied blue light treatment was reported to be easy and safe to use.

[Use of laser irradiation in the treatment of facial cutaneous melanoma]. N.N.Petrov Research Institute of Oncology, St.Petersburg Radiation from a high-energy neodymium laser is an effective means of treating superficial or bulging (1-2 mm), up to 4 mm thick, stage I melanoma (grade of invasion IV--Clark). Adult;Aged;Facial Neoplasms;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Melanoma;Middle Aged;Skin Neoplasms;Treatment Outcome

The effect of 904 nm low level laser on condylar growth in rats. A growth center of the mandible that contributes to its length and height is the mandibular condyle. Proliferation of prechondroblasts, followed by synthesis of the extracellular matrix and hypertrophy of the cartilage cells, governs the major part of condylar growth. The sample consisted of 54 male rats, weighing between 60 g and 80 g, divided randomly into three groups. Group I was the control group, group II was irradiated bilaterally, and group III was irradiated on the right side. Laser irradiation (lambda = 904 nm, 2000 Hz, pulse length 200 ns and output power 4 mW) was performed, and the procedure was repeated after a 50-day interval. Two months later, the rats were killed. In a single blind manner the lengths of denuded mandibles and the lengths of mandibles on soft tissue were measured. The growth of the

mandibles in the unilaterally irradiated group ($P < 0.001$) and the bilaterally irradiated group ($P < 0.05$) was significantly more than that in the control group. There was no significant difference between right and left condylar growth in the bilaterally irradiated group ($P = 0.3$). Soft tissue analysis also verified these results ($P < 0.001$). Histomorphometric results also revealed a significant difference between laser-irradiated groups and the control group ($P < 0.01$). We concluded that particular laser irradiation with the chosen parameters can stimulate condylar growth and subsequently cause mandibular advancement. These findings might be clinically relevant, indicating that low level laser irradiation can be used for further improvement of mandibular retrognathism.
Animals;Chondrocytes;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Condyle;Models, Animal;Osteoblasts;Rats;Rats, Wistar;Retrognathia;Time Factors

Treatment of experimental periodontal disease by photodynamic therapy in immunosuppressed rats. BACKGROUND AND OBJECTIVE: The aim of this study was to compare photodynamic therapy (PDT) as an adjunctive treatment of induced periodontitis with scaling and root planing (SRP) in dexamethasone-inhibited rats. MATERIAL AND METHODS: The animals were divided into two groups: ND (n=90), saline solution treatment; D (n=90), dexamethasone treatment. In the ND and D Groups, periodontal disease was ligature-induced at the first mandibular molar. After 7 days, the ligature was removed and all animals received SRP and were divided according to the following treatments: SRP, saline solution; Toluidine Blue-O (TBO), phenothiazinium dye; and PDT, TBO and laser irradiation. Ten animals in each treatment were killed at 7, 15 and 30 days. The radiographic and histometric values were statistically analysed. RESULTS: In the ND and D Groups, radiographic analysis showed less bone loss in animals treated by PDT in all the experimental periods than SRP and TBO at 15 days ($p<0.05$). After a histometric analysis was carried out in the ND and D groups, the animals treated by PDT showed less bone loss in all periods than SRP and TBO after 15 days ($p<0.05$). CONCLUSIONS: The PDT was an effective adjunctive treatment of induced periodontitis compared with SRP in dexamethasone-inhibited rats. Immunosuppressive Agents;Photosensitizing Agents;Tolonium Chloride;Dexamethasone Alveolar Bone Loss;Analysis of Variance;Animals;Dental Scaling;Dexamethasone;Disease Models, Animal;Immunosuppressive Agents;Low-Level Light Therapy;Male;Mandible;Periodontitis;Photochemotherapy;Photosensitizing Agents;Random Allocation;Rats;Rats, Wistar;Tolonium Chloride;Treatment Outcome

Cyclooxygenase-2 and vascular endothelial growth factor expression in 5-fluorouracil-induced oral mucositis in hamsters: evaluation of two low-intensity laser protocols. GOAL OF WORK: The aim of this study was to investigate the mechanisms whereby low-intensity laser therapy may affect the severity of oral mucositis. MATERIALS AND METHODS: A hamster cheek pouch model of oral mucositis was used with all animals receiving intraperitoneal 5-fluorouracil followed by surface irritation. Animals were randomly allocated into three groups and treated with a 35 mW laser, 100 mW laser, or no laser. Clinical severity of mucositis was assessed at four time-points by a blinded examiner. Buccal pouch tissue was harvested from a subgroup of animals in each group at four time-points. This tissue was used for immunohistochemistry for cyclooxygenase-2 (COX-2), vascular endothelial growth factor (VEGF), and factor VIII (marker of microvessel density) and the resulting staining was quantified. MAIN RESULTS: Peak severity of mucositis was reduced in the 35 mW laser group as compared to the 100 mW laser and control groups. This reduced peak clinical severity of mucositis in the 35 mW laser group was accompanied by a significantly lower level of COX-2 staining. The 100 mW laser did not have an effect on the severity of clinical mucositis, but was associated with a decrease in VEGF levels at the later time-points, as compared to the other groups. There was no clear relationship of VEGF levels or microvessel density to clinical mucositis severity. CONCLUSION: The tissue response to laser therapy appears to vary by dose. Low-intensity laser therapy appears to reduce the severity of mucositis, at least in part, by reducing COX-2 levels and associated inhibition of

the inflammatory response. Antimetabolites, Antineoplastic;Vascular Endothelial Growth Factor A;Factor VIII;Cyclooxygenase 2;Fluorouracil Animals;Antimetabolites, Antineoplastic;Antineoplastic Combined Chemotherapy Protocols;Cheek;Cricetinae;Cyclooxygenase 2;Dose-Response Relationship, Radiation;Factor VIII;Fluorouracil;Immunohistochemistry;Low-Level Light Therapy;Mouth Mucosa;Severity of Illness Index;Stomatitis;Vascular Endothelial Growth Factor A

Effectiveness and safety of transcranial laser therapy for acute ischemic stroke. BACKGROUND AND PURPOSE: We hypothesized that transcranial laser therapy (TLT) can use near-infrared laser technology to treat acute ischemic stroke. The NeuroThera Effectiveness and Safety Trial-2 (NEST-2) tested the safety and efficacy of TLT in acute ischemic stroke. METHODS: This double-blind, randomized study compared TLT treatment to sham control. Patients receiving tissue plasminogen activator and patients with evidence of hemorrhagic infarct were excluded. The primary efficacy end point was a favorable 90-day score of 0 to 2 assessed by the modified Rankin Scale. Other 90-day end points included the overall shift in modified Rankin Scale and assessments of change in the National Institutes of Health Stroke Scale score. RESULTS: We randomized 660 patients: 331 received TLT and 327 received sham; 120 (36.3%) in the TLT group achieved favorable outcome versus 101 (30.9%), in the sham group (P=0.094), odds ratio 1.38 (95% CI, 0.95 to 2.00). Comparable results were seen for the other outcome measures. Although no prespecified test achieved significance, a post hoc analysis of patients with a baseline National Institutes of Health Stroke Scale score of <16 showed a favorable outcome at 90 days on the primary end point (P<0.044). Mortality rates and serious adverse events did not differ between groups with 17.5% and 17.4% mortality, 37.8% and 41.8% serious adverse events for TLT and sham, respectively. CONCLUSIONS: TLT within 24 hours from stroke onset demonstrated safety but did not meet formal statistical significance for efficacy. However, all predefined analyses showed a favorable trend, consistent with the previous clinical trial (NEST-1). Both studies indicate that mortality and adverse event rates were not adversely affected by TLT. A definitive trial with refined baseline National Institutes of Health Stroke Scale exclusion criteria is planned. Acute Disease;Adult;Aged;Aged, 80 and over;Brain Ischemia;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Severity of Illness Index;Stroke;Treatment Outcome

Evaluation of mitochondrial respiratory chain activity in muscle healing by low-level laser therapy. BACKGROUND: Recent studies demonstrate that low-level laser therapy (LLLT) modulates many biochemical processes, especially the decrease of muscle injures, the increase in mitochondrial respiration and ATP synthesis for accelerating the healing process. OBJECTIVE: In this work, we evaluated mitochondrial respiratory chain complexes I, II, III and IV and succinate dehydrogenase activities after traumatic muscular injury. METHODS: Male Wistar rats were randomly divided into three groups (n=6): sham (uninjured muscle), muscle injury without treatment, muscle injury with LLLT (AsGa) 5J/cm(2). Gastrocnemius injury was induced by a single blunt-impact trauma. LLLT was used 2, 12, 24, 48, 72, 96, and 120 hours after muscle-trauma. RESULTS: Our results showed that the activities of complex II and succinate dehydrogenase after 5days of muscular lesion were significantly increased when compared to the control group. Moreover, our results showed that LLLT significantly increased the activities of complexes I, II, III, IV and succinate dehydrogenase, when compared to the group of injured muscle without treatment. CONCLUSION: These results suggest that the treatment with low-level laser may induce an increase in ATP synthesis, and that this may accelerate the muscle healing process. Electron Transport Chain Complex Proteins;Electron Transport Complex II;Succinate Dehydrogenase;Electron Transport Complex IV Animals;Electron Transport;Electron Transport Chain Complex Proteins;Electron Transport Complex II;Electron Transport Complex IV;Low-

Level Light Therapy;Male;Mitochondria, Muscle;Muscle, Skeletal;Rats;Rats, Wistar;Succinate Dehydrogenase;Wound Healing
Mitochondrial responses of normal and injured human skin fibroblasts following low level laser irradiation--an in vitro study. Laser irradiation has proved to be very efficient in speeding and improving the quality of healing in pathological conditions of diverse etiologies. However, the mechanisms by which the beneficial effects are attained are not clear. Mitochondria are the primary phototargets during irradiation. The study aimed to establish if laser irradiation had an effect on hypoxic and acidotic cells. The study also aimed to use existing information regarding the possible mechanism of action (established in wounded cells) and apply these principles to acidic and hypoxic irradiated cells to determine whether laser has a stimulatory or inhibitory effect. Cell cultures were modified to simulate conditions of hypoxia (hypoxic gas mixture 95% N2 and 5% O2) and acidosis (pH 6.7) whereas the central scratch model was used to simulate a wound. Cells were irradiated with a helium-neon (632.8 nm, 3 mW cm(-2)) laser using 5 or 16 J cm(-2) on days 1 and 4. Mitochondrial responses were measured 1 or 24 h after laser irradiation by assessing changes in mitochondrial membrane potential (MMP), cyclic AMP, intracellular Ca2+ and adenosine triphosphate (ATP) cell viability. Hypoxia and acidosis significantly reduced MMP when compared with normal nonirradiated control cells. Wounded, hypoxic and acidotic cells irradiated with 5 J cm(-2) showed an increase in mitochondrial responses when compared with nonirradiated cells while 16 J cm(-2) showed a significant decrease. The study confirmed that laser irradiation with 5 J cm(-2) stimulated an increase in intracellular Ca2+ which resulted in an increase in MMP, ATP and cAMP, which ultimately results in photobiomodulation to restore homeostasis of injured cells. Cell Line;Fibroblasts;Humans;In Vitro Techniques;Mitochondria;Skin
Comparison of a 585-nm pulsed dye laser and a 1064-nm Nd:YAG laser for the treatment of acne scars: A randomized split-face clinical study. BACKGROUND: No studies have reported a comparison of the pulsed dye laser (PDL) and the 1064-nm long-pulsed neodymium:yttrium-aluminum-garnet (Nd:YAG) laser treatment of acne scars in the same patient. OBJECTIVE: To compare the efficacies of these two lasers in the treatment of acne scars. METHODS: Eighteen patients received 4 sessions of PDL or Nd:YAG laser at 2-week intervals in a randomized split-face manner. RESULTS: Both lasers induced notable and comparable improvement in the appearance of acne scars, particularly superficial scars, with significant reductions in the scores associated with the clinical evaluation scale for acne scarring (ECCA). Histologic evaluations revealed significant increases in collagen production and deposition following both lasers. Patient satisfaction scores concurred with these improvements. Ice-pick scars and boxcar scars tended to respond better to PDL and Nd:YAG lasers, respectively. LIMITATIONS: The number of subjects was small. CONCLUSIONS: Both lasers are effective modalities for the treatment of acne scars. Optimal outcomes might be achieved considering scar types and responses to a specific laser. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Treatment Outcome
In-office treatment of dentinal hypersensitivity. Dentinal hypersensitivity is a common dental complaint, especially in periodontal patients. It is believed to be mediated by a hydrodynamic mechanism in which various stimuli result in increased fluid flow in dentinal tubules, thereby generating action potentials in associated nerve fibers. Although it is often perceived as mild discomfort by the patient, it can be severe. A variety of interventions has been used, although few have been subjected to rigorous study. This article surveys those in-office treatments that are available, and suggests directions for research so that clinicians may treat patients based on best evidence. Until such evidence is available, it seems prudent to employ therapies that are least likely to cause harm and are reversible. Dental Materials Action Potentials;Dental

Materials;Dental Offices;Dentin;Dentin Sensitivity;Dentinal Fluid;Evidence-Based Dentistry;Gingivoplasty;Humans;Low-Level Light Therapy;MEDLINE;Nerve Fibers

Ablative skin resurfacing with a novel microablative CO2 laser. Carbon dioxide (CO2) laser skin resurfacing has been a mainstay of facial rejuvenation since its introduction in the mid 1990s. Recently, a new generation of fractional or microablative CO2 lasers has been introduced to the marketplace. According to the concept of fractional photothermolysis, these lasers ablate only a fraction of the epidermal and dermal architecture in the treatment area. An array of microscopic thermal wounds is created that ablates the epidermis and dermis within very tiny zones; adjacent to these areas, the epidermis and dermis are spared. This microablative process of laser skin resurfacing has proven safe and effective not only for facial rejuvenation, but elsewhere on the body as well. It is capable of improving wrinkles, acne scars, and other types of atrophic scars and benign pigmented lesions associated with elastotic, sun-damaged skin. Because of the areas of spared epidermis and dermis inherent in a procedure that employs fractional photothermolysis, healing is more rapid compared to fully ablative CO2 laser skin resurfacing and downtime is proportionately reduced. A series of 32 consecutive patients underwent a single laser resurfacing procedure with the a new microablative CO2 laser. All patients were followed for a minimum of 6 months and were asked to complete patient satisfaction questionnaires; a 6 month postoperative photographic evaluation by an independent physician, not involved in the treatment, was also performed. Both sets of data were graded and reported on a quartile scale. Results demonstrated greater than 50% improvement in almost all patients with those undergoing treatment for wrinkles, epidermal pigment or solar elastosis deriving the greatest change for the better (>75%).
Dermabrasion;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Postoperative Period;Preoperative Care;Rejuvenation;Skin Aging;Skin Diseases

Endoscopic brachytherapy for obstructive colorectal cancer. PURPOSE: Palliation of obstructive colon cancer is often challenging. Treatment options include Yttrium aluminum garnet (YAG) laser, stent placement, and surgical intervention. High-dose-rate intraluminal brachytherapy (HDRILBT) has been used to relieve obstructive symptoms due to rectal, bronchial, and esophageal cancers. In this case report, we document the combined use of YAG laser and HDRILBT for the palliation of obstructive colon cancer at the hepatic flexure, not previously reported in the literature. METHODS AND MATERIALS: The patient in this case report had a large colonic tumor at the hepatic flexure causing near complete obstruction. Stent insertion and surgery were not feasible. YAG laser was used once and 11 days later, two fractions of HDRILBT were given 1 week apart. Under endoscopic vision and fluoroscopic guidance, a 150-cm Teflon catheter was passed through the lumen of the partially obstructed bowel for purposes of HDRILBT. A total dose of 10Gy was delivered at 1cm from the center of the source axis using a high-dose-rate afterloader. RESULTS: After treatment with the first fraction of HDRILBT, the tumor size decreased and the colonic lumen was significantly more patent. The patient's symptoms were significantly relieved after two fractions. Her weight increased and she was medically fit enough to undergo further chemotherapy. Further HDRILBT was not indicated. The calculated biological effective dose for the total HDRILBT treatments was well below the dose tolerances for acute effects for normal colonic tissue. CONCLUSION: HDRILBT should be considered as a possible treatment option for obstructive colon cancers when stent placement or surgery is not possible. Adult;Brachytherapy;Colorectal Neoplasms;Female;Humans;Intestinal Obstruction;Liver Neoplasms;Low-Level Light Therapy;Radiotherapy Dosage

Punctate leucoderma after melasma treatment using 1064-nm Q-switched Nd:YAG laser with low pulse energy. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Pigmentation Disorders;Skin

Dental whitening using 532/ 1064-nm Q-switched Nd:YAG lasers. Humans;Lasers, Solid-State;Low-Level Light Therapy;Tooth Discoloration;Treatment Outcome

Effectiveness of combined counseling and low-level laser stimulation in the treatment of disturbing chronic tinnitus. We recruited 46 adult patients affected by disturbing tinnitus lasting for at least 3 years. All were treated with a combined counseling protocol constituting hypnotherapeutic and muscle relaxation techniques. We randomly assigned 26 patients to the group receiving low-level laser stimulation treatment and 20 to the placebo group. The laser power was 5 mV and the wavelength 650 nm. The irradiation lasted 20 minutes daily for 3 months. The Tinnitus Handicap Inventory (THI) questionnaire was submitted at the beginning and at the end of treatment. The THI scores improved in the entire sample after treatment but more significantly in the group receiving low-level laser stimulation. From the point of view of clinical classification, approximately 61% of irradiated patients had tinnitus severity decreased by one class, in comparison to 35% of the placebo group. Adult;Aged;Aged, 80 and over;Chronic Disease;Combined Modality Therapy;Counseling;Disability Evaluation;Female;Humans;Hypnosis;Low-Level Light Therapy;Male;Middle Aged;Muscle Relaxation;Tinnitus

Is low-power pulsed laser ineffective in neural growth? Animals;Lasers, Semiconductor;Low-Level Light Therapy;Nerve Regeneration;Rats

Effects of low-level light therapy on hepatic antioxidant defense in acute and chronic diabetic rats. Diabetes causes oxidative stress in the liver and other tissues prone to complications. Photobiomodulation by near infrared light (670 nm) has been shown to accelerate diabetic wound healing, improve recovery from oxidative injury in the kidney, and attenuate degeneration in retina and optic nerve. The present study tested the hypothesis that 670 nm photobiomodulation, a low-level light therapy, would attenuate oxidative stress and enhance the antioxidant protection system in the liver of a model of type I diabetes. Male Wistar rats were made diabetic with streptozotocin (50 mg/kg, ip) then exposed to 670 nm light (9 J/cm(2)) once per day for 18 days (acute) or 14 weeks (chronic). Livers were harvested, flash frozen, and then assayed for markers of oxidative stress. Light treatment was ineffective as an antioxidant therapy in chronic diabetes, but light treatment for 18 days in acutely diabetic rats resulted in the normalization of hepatic glutathione reductase and superoxide dismutase activities and a significant increase in glutathione peroxidase and glutathione-S transferase activities. The results of this study suggest that 670 nm photobiomodulation may reduce, at least in part, acute hepatic oxidative stress by enhancing the antioxidant defense system in the diabetic rat model. Antioxidants;Blood Glucose;Malondialdehyde;Glutathione Peroxidase;Superoxide Dismutase;Glutathione Reductase;Glutathione Transferase;Glutathione Acute Disease;Animals;Antioxidants;Blood Glucose;Body Weight;Chronic Disease;Diabetes Mellitus, Experimental;Glutathione;Glutathione Peroxidase;Glutathione Reductase;Glutathione Transferase;Lipid Peroxidation;Liver;Male;Malondialdehyde;Phototherapy;Rats;Rats, Wistar;Superoxide Dismutase

Phototherapy in peripheral nerve regeneration: From basic science to clinical study. OBJECT: This review summarizes the continuous study of low-power laser radiation treatment of a severely injured peripheral nerve. Laser phototherapy was applied as a supportive factor for accelerating and enhancing axonal growth and regeneration after injury or a reconstructive peripheral nerve procedure. In nerve cell cultures, laser phototherapy was used to stimulate activation of nerve cells. METHODS: Low-power laser radiation was used for treatment of peripheral nerve injury using a rat sciatic nerve model after crush injury, neurorrhaphy, or neurotube reconstruction. Nerve cell growth and axonal sprouting were investigated using laser phototherapy on embryonic rat brain cultures. The outcome in animal studies facilitated a clinical double-blind, placebo-controlled, randomized study that measured the effectiveness of 780-nm laser phototherapy on patients suffering from

incomplete peripheral nerve injuries for 6 months to several years. RESULTS: Animal studies showed that laser phototherapy has an immediate protective effect, maintains functional activity of the injured nerve, decreases scar tissue formation at the injury site, decreases degeneration in corresponding motor neurons of the spinal cord, and significantly increases axonal growth and myelinization. In cell cultures, laser irradiation accelerates migration, nerve cell growth, and fiber sprouting. A pilot clinical double-blind, placebocontrolled, randomized study showed that in patients with incomplete long-term peripheral nerve injury, 780-nm laser radiation can progressively improve peripheral nerve function, which leads to significant functional recovery. CONCLUSIONS: Using 780-nm laser phototherapy accelerates and enhances axonal growth and regeneration after injury or a reconstructive peripheral nerve procedure. Laser activation of nerve cells, their growth, and axonal sprouting can be considered as potential treatment of neuronal injury. Animal and clinical studies show the promoting action of phototherapy on peripheral nerve regeneration, making it possible to suggest that the time for broader clinical trials has arrived. Animals;Humans;Low-Level Light Therapy;Nerve Regeneration;Neurons;Peripheral Nerve Injuries;Peripheral Nerves;Phototherapy;Randomized Controlled Trials as Topic;Rats;Trauma, Nervous System

Influence of laser (660 nm) on functional recovery of the sciatic nerve in rats following crushing lesion. With the aim of accelerating the regenerative processes, the objective was to study the influence of gallium-aluminum-arsenide (GaAlAs) laser (660 nm) on functional and histomorphological recovery of the sciatic nerve in rats. The sciatic nerves of 12 Wistar rats were crushed divided into two groups: control and laser therapy. For the latter, GaAlAs laser was utilized (660 nm, 4 J/cm(2), 26.3 mW and 0.63 cm(2) beam), at three equidistant points on the lesion, for 20 days. Comparison of the sciatic functional index (SFI) showed that there was a significant difference only between the pre-lesion value of the laser therapy group and that after the 21st day in the control group. It was concluded that the parameters and methods utilized demonstrated positive results regarding the SFI over the time period evaluated. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve

The effect of low-level laser therapy on trismus and facial swelling following surgical extraction of a lower third molar. OBJECTIVE: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) on postoperative trismus and edema after the removal of mandibular third molars. MATERIALS AND METHODS: Thirty-two patients who were to undergo surgical removal of lower third molars were studied. Patients were randomly allocated to two groups, LLLT and placebo. Patients in the LLLT group received 12 J (4 J/cm(2)) low-level laser irradiation to the operative side intraorally 1 cm from the target tissue, and to the masseter muscle extraorally immediately after surgery. In the placebo group the handpiece was inserted into the operative side intraorally and was applied to the masseter muscle extraorally each for 1 min, but laser power was not activated. Inter-incisal opening and facial swelling were evaluated on postoperative days 2 and 7. Student's t-test used to analyze the data. RESULTS: It was determined that the trismus and the swelling in LLLT group were significantly less than in the placebo group on postoperative days 2 and 7. CONCLUSION: Within the limitations of this study it can be concluded that LLLT can be beneficial for the reduction of postoperative trismus and swelling after third molar surgery.
Adult;Edema;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Postoperative Hemorrhage;Tooth Extraction;Trismus;Young Adult

The effect of diode laser (980 nm) treatment on aggressive periodontitis: evaluation of microbial and clinical parameters. OBJECTIVE: The aim was to compare the effect of scaling and root planing (SRP) alone, diode laser treatment (LAS) alone, and SRP combined with LAS (SRP + LAS) on clinical and microbial parameters in patients with aggressive periodontitis. MATERIALS AND METHODS: Thirty patients with aggressive periodontitis were assessed for plaque, bleeding on probing (BOP), probing

pocket depth (PPD), and clinical attachment level (CAL). Four plaque samples were randomly obtained, one from each quadrant that was randomly assigned to SRP alone, SRP + LAS, LAS alone, and control (CRL). A 980-nm diode laser was used in continuous mode at 2 W power. Plaque samples were collected 2 wk, 12 wk, and 6 mo post-treatment. The levels of Porphyromonas gingivalis, Tannerella forsythia, Aggregatibacter actinomycetemcomitans, Treponema denticola, and total bacterial load (TBL) were evaluated using ssrRNA probes. RESULTS: Bacterial counts were decreased with all three treatment modalities and they did not reach baseline levels at 6 mo post-treatment. The SRP + LAS group showed statistically significantly lower TBL and bacterial levels of P. gingivalis and T. denticola at 6 mo post-treatment compared to SRP or LAS treatments alone. At the end of the observation period significant differences were observed for PPD and CAL between the SRP + LAS group and both the SRP alone and LAS alone groups. No differences were detected for percentage of plaque and percentage of BOP between any of the treatment groups at 6 mo post-treatment. CONCLUSIONS: Within the limits of this study, diode laser-assisted treatment with SRP showed a superior effect over SRP or LAS alone for certain microbial and clinical parameters in patients with aggressive periodontitis over the 6-mo monitoring period. Adult;Aggressive Periodontitis;Dental Scaling;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Root Planing;Single-Blind Method

Inflammatory and oxidative stress markers in experimental crystalopathy: their modification by photostimulation. Crystalopathies are inflammatory pathologies caused by cellular reactions to the deposition of crystals in the joints. The anti-inflammatory effect of the helium-neon (He-Ne) laser and that of the nonsteroidal anti-inflammatory drugs (NSAIDs) diclofenac, meloxicam, celecoxib, and rofecoxib was studied in acute and chronic arthritis produced by hydroxyapatite and calcium pyrophosphate in rats. The presence of the markers fibrinogen, L-citrulline, nitric oxide, and nitrotyrosine was determined. Crystals were injected into the posterior limb joints of the rats. A dose of 8 J/cm(2) of energy from an He-Ne laser was applied for 3 d in some groups and for 5 d in other groups. The levels of some of the biomarkers were determined by spectrophotometry, and that of nitrotyrosine was determined by ELISA. For statistical analysis, Fisher's exact test was used, and p +/- 0.05 was considered significant. In arthritic rats, the fibrinogen, L-citrulline, nitric oxide, and nitrotyrosine levels increased in comparison to controls and to the laser-treated arthritic groups (p +/- 0.001), (p +/- 0.001), (p +/- 0.02), and (p +/- 0.01), respectively. When comparing fibrinogen from arthritic rats with disease induced by hydroxyapatite with undiseased and arthritic rats treated with NSAIDs, the He-Ne laser decreased levels to values similar to those seen in controls (p +/- 0.01). Inflammatory and oxidative stress markers in experimental crystalopathy are positively modified by photobiostimulation. Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Citrulline;Nitric Oxide;Fibrinogen;Durapatite;Calcium Pyrophosphate Animals;Anti-Inflammatory Agents, Non-Steroidal;Arthritis;Biomarkers;Calcium Pyrophosphate;Citrulline;Crystallization;Durapatite;Female;Fibrinogen;Hindlimb;Inflammation;Injections, Intra-Articular;Lasers, Gas;Low-Level Light Therapy;Nitric Oxide;Oxidative Stress;Rats

Phenothiazine chloride and soft laser light have a biostimulatory effect on human osteoblastic cells. OBJECTIVE: Low-level laser therapy (LLLT) is a well accepted tool to accelerate wound healing and to reduce inflammation after oral implant insertion. Since there are no in vitro data on a combination of LLLT with prior photosensitization, it was the aim of this study to investigate if photosensitization with phenothiazine chloride results in an alteration of the biostimulatory effect of low-level laser irradiation. BACKGROUND DATA: LLLT and antimicrobial photodynamic therapy are well established for the treatment of peri-implantitis. In vitro studies have shown a biostimulatory effect of LLLT on various cell types, including osteogenic cells. MATERIALS AND METHODS: SaOS-2 cells were treated with the photosensitizer phenothiazine chloride before irradiation with matched laser light. At 24-h

intervals the viability and differentiation were analyzed in treated and untreated cells. RESULTS: While the biostimulatory effect of the LLLT could be observed for the lower irradiation dose, the pretreatment with phenothiazine chloride did not significantly affect the growth and differentiation of the SaOS-2 cells. CONCLUSION: It can thus be concluded that combined treatment with phenothiazine chloride and LLLT does not result in a synergistic enhancement of the biostimulatory effect of LLLT, but there was also no evidence for antagonizing effects on growth and differentiation of human osteoblasts. Collagen Type I;Dental Implants;Phenothiazines;Photosensitizing Agents;Alkaline Phosphatase Alkaline Phosphatase;Cell Line, Tumor;Cell Proliferation;Cell Survival;Collagen Type I;Dental Implants;Humans;Low-Level Light Therapy;Osteoblasts;Phenothiazines;Photosensitizing Agents;Reverse Transcriptase Polymerase Chain Reaction;Tumor Cells, Cultured

Effect of low-level infrared laser therapy on large surgical osteochondral defect in rabbit: a histological study. OBJECTIVE: The present study investigates whether low-level laser therapy (LLLT) can accelerate healing of large osteochondral defects in rabbits. BACKGROUND DATA: LLLT has been used in the treatment of musculoskeletal disorders and fractures. MATERIALS AND METHODS: Seventy rabbits were divided into control and experimental groups. Under sterile conditions and after general anesthesia, the rabbits received one full-thickness defect 5 mm wide by 10 mm deep in the distal portion of the patellar groove of the right femur. The rabbits in the experimental group were exposed to a pulsed 890-nm infrared laser (1500 Hz, 4.8 J/cm(2) energy density, spot size 1 cm) twice weekly. The rabbits were killed at 2 wk, 1 mo, 2 mo, and 4 mo post-surgery. The defects were evaluated macroscopically and histologically for the filling of the defect, integration of repair tissue, matrix staining, and cellular morphology. The Student's t-test was performed to determine the differences between the control and experimental groups. Statistical significance was set at p +/- 0.05. RESULTS: Results in the experimental group were better than those in the control group; however, there were no significant differences between the two study groups. CONCLUSION: LLLT did not accelerate healing of large osteochondral defects in rabbits. Animals;Cartilage, Articular;Infrared Rays;Low-Level Light Therapy;Male;Patella;Rabbits;Wound Healing

The effectiveness of conservative treatments of carpal tunnel syndrome: splinting, ultrasound, and low-level laser therapies. OBJECTIVE: The objective of this study was to investigate the effectiveness of splinting, ultrasound (US), and low-level laser (LLL) in the management of carpal tunnel syndrome (CTS). BACKGROUND DATA: CTS is the entrapment mononeuropathy most frequently seen in clinical practice, caused by compression of the median nerve at the wrist. Although several treatment modalities are routinely in use, there is no consensus about the best way to manage CTS. MATERIALS AND METHODS: In our study, patients were randomly allocated to three groups that received the following treatment protocols: splinting only, splinting plus US, and splinting plus LLL therapy. Patients were assessed with the Boston Questionnaire, patient satisfaction inquiry, visual analogue scale for pain, and electroneuromyography. RESULTS AND CONCLUSION: The study was completed with a total of 100 hands of 50 women patients with bilateral CTS at 3 mo after treatment. At the end of the follow-up period, each of the groups had improvements to varying degrees. It appeared that the combinations of US or LLL therapy with splinting were more effective than splinting alone in treating CTS. However, LLL therapy plus splinting was more advantageous than US therapy plus splinting, especially for the outcomes of lessening of symptom severity, pain alleviation, and increased patient satisfaction. Carpal Tunnel Syndrome;Female;Humans;Low-Level Light Therapy;Middle Aged;Neural Conduction;Pain Measurement;Severity of Illness Index;Splints;Ultrasonic Therapy

Evaluation of the effects of Er:YAG and Nd:YAG lasers and ultrasonic instrumentation on root surfaces. OBJECTIVE: Evaluate the effects of Er:YAG and Nd:YAG lasers on the morphology and

chemical composition of root surfaces and compare them with those produced by using ultrasonic instrumentation (US). BACKGROUND DATA: The benefits of the use of Er:YAG and Nd:YAG lasers as an adjunct to conventional periodontal therapy have not yet been determined. MATERIALS AND METHODS: The radicular surfaces of 18 extracted human multi-radicular teeth were treated for 1 min on the right side of the root either with laser (Er:YAG, 2940 nm, 10 Hz, output 80 mJ/pulse, 100 mJ/pulse, and 120 mJ/pulse, 250 mus pulse length, spot size 0.8 mm, or Nd:YAG; 1064 nm; 10 Hz; output 0.5, 1.0, and 1.5 W; 150 micros pulse length; spot size 0.6 mm) or on the left side of the root with US (28,500 Hz, medium power, and standard tip). Subsequently, the teeth were subjected to scanning electron microscopic (SEM) examination and energy dispersive x-ray (EDX) spectrometric analysis. RESULTS: SEM examination of the areas treated with US showed a smooth appearance. In all specimens from the experimental groups treated with Er:YAG laser, entire cementum layers were removed and dentinal tubules were exposed. EDX analysis of root surfaces treated by Er:YAG laser at 120 mJ/pulse showed an increase in the peak intensities of calcium and phosphorus more than that seen with US treatment. When Nd:YAG laser irradiation was utilized, SEM examination showed effects such as melting, and fissuring of the root surface. EDX analysis of root surfaces treated by the Nd:YAG laser at 1.5 W revealed some changes in the elemental composition, with the peak intensities of calcium and phosphorus decreased in relation to the levels obtained by US treatment. CONCLUSIONS: US treatment better preserves the original morphology of cementum compared with Er:YAG and Nd:YAG laser treatment. Dental Instruments;Dental Scaling;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Tooth Root;Ultrasonics

Evaluation of actual vs expected photodynamic therapy spot size. PURPOSE: To determine the accuracy of the photodynamic therapy (PDT) laser spot size on the retina as generated by 2 Food and Drug Administration (FDA)-approved lasers. DESIGN: Prospective observational case series. METHODS: Fundus photographs were taken of 1 eye of each of 10 subjects with the WinStation 4000 fundus photography system (OIS; Ophthalmic Imaging Systems, Sacramento, California, USA); disc size was calculated using OIS software. Slit-lamp photographs were taken of the PDT laser spot focused on the retina adjacent to the optic disc, using various spot sizes in combination with 3 different contact lenses and 2 different lasers. Spot size at the retina was determined by measuring the ratio of disc diameter to spot diameter in Adobe Photoshop (San Jose, California, USA) and applying this ratio to the OIS disc measurements. RESULTS: Spot size at the retina averaged 87% of expected spot size for the Coherent Opal laser (Coherent Inc, Santa Clara, California, USA) and 104% of expected spot size for the Zeiss Visulas laser (Carl Zeiss Meditec Inc, Dublin, California, USA)(P = .002). Multivariate analysis demonstrated that percentage of expected spot size decreased with larger spot diameter (P = .01 for Coherent laser; P = .02 for Zeiss laser). CONCLUSIONS: PDT spot size at the retina appears to be consistently smaller than expected for the Coherent laser while the spot size was consistently within 10% of expected size for the Zeiss laser. The deviation from expected size increased with larger spot size using the Coherent laser. Photosensitizing Agents;Porphyrins;Verteporfin Adult;Aged;Aged, 80 and over;Choroidal Neovascularization;Female;Fluorescein Angiography;Humans;Lasers, Semiconductor;Lens, Crystalline;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Photochemotherapy;Photography;Photosensitizing Agents;Porphyrins;Prospective Studies;Refractive Errors;Reproducibility of Results;Retina;Verteporfin

Laser therapy converts diabetic wound healing to normal healing. OBJECTIVE: We have determined optimal laser dosimetric parameters in comparison with polychromatic light-emitting diodes (LEDs) that can speed up healing in four animal models: non-diabetic oval full-thickness wounds, diabetic oval full-thickness wounds, non-diabetic burns, and diabetic burns in Sprague-

Dawley rats. MATERIALS AND METHODS: This series of studies used 532-, 633-, 810-, 980-, and 10,600-nm lasers (visible to far infrared) and polychromatic LED clusters (510-872 nm, visible to infrared) as photon sources. Sprague-Dawley rats (n = 893) were used; however, animals that died before and during the experiments from anesthesia accidents and for any other reason were excluded from statistical analysis. RESULTS: The improvements seen (>10% improvement of impairment) show that phototherapy with the 633-nm laser is quite promising for alleviating diabetic wound and burn healing, and exhibited the best results with 38.5% and 53.4% improvements, respectively. CONCLUSION: In this induced-diabetes model, wound and burn healing were improved by 40.3% and 45%, respectively, in 633-nm laser dosimetry experiments, and diabetic wound and burn healing was accelerated by phototherapy. This indicates that the healing rate was normalized in the phototherapy-treated diabetic rats. In view of these interesting findings, 633-nm laser therapy given three times per week at 4.71 J/cm(2) per dose for diabetic burns, and three times per week at 2.35 J/cm(2) per dose for diabetic wound healing are recommended as actual doses for human clinical trials, especially after major surgery in those with impaired healing, such as diabetics and the elderly. Animals;Burns;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley;Wound Healing

Effects of laser on the synovial fluid in the inflammatory process of the knee joint of the rabbit. OBJECTIVE: The purpose of this study was to evaluate the effects of low-level laser (LLL) energy on the clinical signs of inflammation and the cellular composition of synovial fluid (SF) in the inflamed knee of the rabbit. BACKGROUND DATA: There are few findings related to the effects of LLL on SF in inflammatory processes and there is little knowledge about the optimal parameters for reducing joint inflammation. MATERIALS AND METHODS: Inflammation in the right knee of 36 rabbits was induced by intracapsular injection (0.2 mL) of Terebinthina commun (Tc). The animals were randomly assigned to three groups: acute experimental group (AEG), chronic experimental group (CEG), and control group (CG), which only received Tc. Each group was divided in two subgroups of six animals each. The AEG and CEG groups began to receive laser treatment 2 and 5 d after the induction of inflammation, respectively. Laser irradiation at a wavelength of 830 nm, power output of 77 mW, and power density of 27.5 W/cm(2) was applied daily for 7 d for either 0.12 sec or 0.32 sec, resulting in doses of 3.4 J/cm(2) and 8 J/cm(2), respectively. Body mass, joint perimeter, joint temperature, and the morphology of the SF were analyzed. RESULTS: There was no statistically significant differences between groups in the body mass, joint perimeter, and SF morphology. CONCLUSION: Laser irradiation with the selected parameters produced only a few subtle differences in the inflammatory signs and the SF. The lack of effects may have been due to the short irradiation time. Animals;Arthritis;Knee Joint;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rabbits;Synovial Fluid

Effect of laser phototherapy on the release of TNF-alpha and MMP-1 by endodontic sealer-stimulated macrophages. OBJECTIVE: Our aim was to analyze the effect of laser phototherapy on the secretory activity of macrophages activated by interferon-gamma (IFN-gamma) and lipopolysaccharide (LPS), and stimulated by substances leached from an epoxy resin-based sealer (AH-Plus) and a calcium hydroxide-based sealer (Sealapex). BACKGROUND DATA: Laser phototherapy can modulate the inflammatory process, improving wound healing. This type of therapy could be useful for modulating postoperative symptoms seen after endodontic treatment. MATERIALS AND METHODS: Cytotoxicity was indirectly assessed by measuring mitochondrial activity. Macrophages were stimulated by the leached substances or not (controls), and the groups were then irradiated or not. The secretion of pro-inflammatory cytokines (TNF-alpha and MMP-1) was analyzed using ELISA. Two irradiations at 6-h intervals were done with an As-Ga-Al diode laser (780 nm, 70 mW, spot size 4.0 mm(2), 3 J/cm(2), for 1.5 sec) in contact mode. RESULTS: The sealers were non-cytotoxic to

macrophages. The production of TNF-alpha was significantly decreased by laser phototherapy, regardless of experimental group. The level of secretion of MMP-1 was similar in all groups. CONCLUSION: Based on the conditions of this study we concluded that in activated macrophages, laser phototherapy impairs the secretion of the pro-inflammatory cytokine TNF-alpha, but has no influence on MMP-1 secretion. Lipopolysaccharides;Recombinant Proteins;Root Canal Filling Materials;Salicylates;Tumor Necrosis Factor-alpha;Sealapex;Interferon-gamma;Matrix Metalloproteinase 1;Calcium Hydroxide Animals;Calcium Hydroxide;Cell Survival;Cells, Cultured;Interferon-gamma;Lasers, Semiconductor;Lipopolysaccharides;Low-Level Light Therapy;Macrophage Activation;Macrophages;Male;Matrix Metalloproteinase 1;Mice;Mice, Inbred BALB C;Recombinant Proteins;Root Canal Filling Materials;Salicylates;Tumor Necrosis Factor-alpha

Clinical evaluation of lasers and sodium fluoride gel in the treatment of dentine hypersensitivity. OBJECTIVE: The aim of the present study was to evaluate and compare the efficacy of CO(2) and Er:YAG lasers alone and in combination with topical sodium fluoride (NaF) in the management of dentine hypersensitivity. MATERIALS AND METHODS: A group of 50 patients presenting with a total of 420 hypersensitive teeth were randomly allocated into five groups. Group 1 was treated with 2% NaF, groups 2 and 3 were lased by a CO(2) (1 W, continuous wave mode, for 10 sec) or Er:YAG (30 Hz, 60 mJ for 10 sec, without water/air spray) laser, and groups 4 and 5 received NaF plus the CO(2) and the Er:YAG laser, respectively. The scanning speed of the laser was 0.8 mm/sec. The degree of thermal sensitivity was determined with an evaporative stimulus consisting of a 1-sec air blast at a distance of 2 mm from each site tested. Quantification of the degree of discomfort was determined according to a four-point pain scale before treatment and 1 wk, 1 mo, and 6 mo after treatment. RESULTS: All treatment forms resulted in significant improvement of discomfort. At 1 wk, 1 mo, and 6 mo, cold air blast scores were significantly reduced compared to baseline scores, except for the NaF group. In the NaF group, there was a statistically significant increase in mean degree of discomfort at 6 mo compared with 1 wk (p +/- 0.01) and 1 mo (p +/- 0.001). Comparison of the other treatment regimens revealed that cold air blast scores were significantly lower for the other four treatments than for NaF gel alone (p +/- 0.001). No superiority was found for desensitization among the CO(2), Er:YAG, CO(2) + NaF, and Er:YAG + NaF groups. CONCLUSIONS: We concluded that both the CO(2) and Er:YAG lasers have promising potential for the treatment of dentine hypersensitivity. Lasers in combination with NaF gel appear to show better efficacy compared to either treatment modality alone. Fluorides, Topical;Gels;Sodium Fluoride Adult;Aged;Combined Modality Therapy;Dentin Sensitivity;Female;Fluorides, Topical;Gels;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Sodium Fluoride

Permanent hyperpigmentation following laser hair removal using the dynamic cooling device. Female;Hair Removal;Humans;Hyperpigmentation;Hypothermia, Induced;Low-Level Light Therapy;Male

[Effectiveness of photo- and mesophotophoresis in the combined treatment of patients with chronic generalized parodontitis]. Antioxidants;Gels;Actihaemyl;Heme;Actovegin Actihaemyl;Adult;Antioxidants;Chronic Disease;Combined Modality Therapy;Gels;Heme;Humans;Low-Level Light Therapy;Middle Aged;Periodontitis;Phototherapy;Young Adult

Hair removal with the long-pulse alexandrite and long-pulse Nd:YAG lasers is safe and well tolerated in children. BACKGROUND: Children with excessive hair may have severe psychological consequences. Laser hair removal in adults is known to be safe and well tolerated, but this is less well established in children. OBJECTIVE: To describe our experience with laser hair removal in children, and to investigate the safety and tolerability of this procedure in children. METHODS: The case records of 24 children aged < 16 years, who had received a minimum of three treatments for hair

removal were analysed retrospectively. For patients with Fitzpatrick skin phototype II-IV, the lasers used were a long-pulse alexandrite (755 nm) with either continuous chilled-air cooling at fluences of 16-27 J/cm(2) or a long-pulse alexandrite with cryogen cooling at fluences of 16-32 J/cm(2). For patients with Fitzpatrick skin phototype IV-VI, lasers used were a long-pulse Nd:YAG (1064 nm) with a chilled contact sapphire tip at fluences of 20-35 J/cm(2) or a long-pulse Nd:YAG with cryogen cooling at fluences of 16-26 J/cm(2). RESULTS: Mean age at first treatment was 12.3 years. Diagnoses were constitutional hirsutism (14 patients), polycystic ovarian syndrome (five), congenital melanocytic naevus (two), generalized hypertrichosis (two) and naevoid hypertrichosis (one). One patient required a general anaesthetic, eight required topical anaesthetic cream, and 15 did not require any form of anaesthesia. Intolerable discomfort requiring adjustment in fluence was the only recorded side-effect, affecting two cases. There were no incidences of blistering, infection, dyspigmentation or scarring. CONCLUSION: When administered appropriately, laser hair removal is safe and well tolerated in children aged < 16 years. Adolescent;Anesthesia;Child;Child, Preschool;Female;Hair Removal;Hirsutism;Humans;Hypertrichosis;Low-Level Light Therapy;Male;Patient Satisfaction;Referral and Consultation;Retrospective Studies;Treatment Outcome

[Chemotactic potential of phagocytes as a criterion for the efficacy of therapy in inflammatory diseases of the uterine appendages]. Adnexa Uteri;Chemotaxis;Female;Humans;Low-Level Light Therapy;Macrophages;Magnetic Field Therapy;Monocytes;Neutrophils;Pelvic Inflammatory Disease;Treatment Outcome

[Effectiveness of laser puncture in elderly patients with bronchial asthma]. Aged;Asthma;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Reflexotherapy

Effect of low-level laser irradiation and epidermal growth factor on adult human adipose-derived stem cells. The study investigated the effects of low-level laser radiation and epidermal growth factor (EGF) on adult adipose-derived stem cells (ADSCs) isolated from human adipose tissue. Isolated cells were cultured to semi-confluence, and the monolayers of ADSCs were exposed to low-level laser at 5 J/cm(2) using 636 nm diode laser. Cell viability and proliferation were monitored using adenosine triphosphate (ATP) luminescence and optical density at 0 h, 24 h and 48 h after irradiation. Application of low-level laser irradiation at 5 J/cm(2) on human ADSCs cultured with EGF increased the viability and proliferation of these cells. The results indicate that low-level laser irradiation in combination with EGF enhances the proliferation and maintenance of ADSCs in vitro. Biomarkers;Thy-1 Antigens;Epidermal Growth Factor;Adenosine Triphosphate Adenosine Triphosphate;Adipose Tissue;Adult Stem Cells;Biomarkers;Cell Proliferation;Cell Survival;Cells, Cultured;Epidermal Growth Factor;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Luminescence;Thy-1 Antigens

Evaluation of low intensity laser's action on silicone mammary implant pseudocapsules in rats. PURPOSE: To evaluate the effect of low intensity laser on the pseudocapsule contraction that occurs around silicone implants. METHODS: 60 male rats divided in two experimental groups received a silicone implant in the subcutaneous of the dorsal region. Group I: animals received implants in the subcutaneous dorsal region and did not receive any treatment; Group II: animals received seven irradiation sessions with low intensity laser after they had received subcutaneous implants. Thirty, 60 and 180 days after the surgery, tonometric evaluation of the implants was conducted. After that, the animals were sacrificed, study material was removed and prepared for histological examination. The thickness of the pseudocapsule and the inflammatory reaction were morphometrically quantified. Data obtained were statistically analyzed using the Variance method, and Tukey's Test(P<0.0 5). RESULTS: Group II animals had significant lower pressure. The histological study did not show a significant difference between the groups, but only a higher number of swollen vessels in Group II.

The thickness of pseudocapsule around Group II's implants lower than in Group I. CONCLUSION: The low intensity laser modify tissue's reparation process around the implants suggesting it may be useful to model contractures that are formed around silicone implants. Silicones Analysis of Variance;Animals;Breast Implants;Contracture;Disease Models, Animal;Implants, Experimental;Low-Level Light Therapy;Male;Models, Animal;Random Allocation;Rats;Rats, Wistar;Silicones

Efficacy of pneumatic compression and low-level laser therapy in the treatment of postmastectomy lymphoedema: a randomized controlled trial. OBJECTIVE: To compare the long-term efficacy of pneumatic compression and low-level laser therapies in the management of postmastectomy lymphoedema. DESIGN: Randomized controlled trial. SETTING: Department of Physical Medicine and Rehabilitation of Cukurova University, Turkey. SUBJECTS: Forty-seven patients with postmastectomy lymphoedema were enrolled in the study. INTERVENTIONS: Patients were randomly allocated to pneumatic compression (group I, n=24) and low-level laser (group II, n=23) groups. Group I received 2 hours of compression therapy and group II received 20 minutes of laser therapy for four weeks. All patients were advised to perform daily limb exercises. MAIN MEASURES: Demographic features, difference between sum of the circumferences of affected and unaffected limbs (delta C), pain with visual analogue scale and grip strength were recorded. RESULTS: Mean age of the patients was 48.3 (10.4) years. Delta C decreased significantly at one, three and six months within both groups, and the decrease was still significant at month 12 only in group II (P = 0.004). Improvement of group II was greater than that of group I post treatment (P = 0.04) and at month 12 after 12 months (P = 0.02). Pain was significantly reduced in group I only at posttreatment evaluation, whereas in group II it was significant post treatment and at follow-up visits. No significant difference was detected in pain scores between the two groups. Grip strength was improved in both groups, but the differences between groups were not significant. CONCLUSIONS: Patients in both groups improved after the interventions. Group II had better long-term results than group I. Low-level laser might be a useful modality in the treatment of postmastectomy lymphoedema. Adult;Female;Hand Strength;Humans;Intermittent Pneumatic Compression Devices;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Pain Measurement;Physical Therapy Modalities;Prospective Studies;Treatment Outcome;Upper Extremity

Clinical effect of low-energy double-pass 1450 nm laser treatment for acne in Asians. BACKGROUND: While the 1450 nm diode laser is highly effective for the treatment of acne, its use is associated with considerable pain. Low-energy, double-pass irradiation was attempted as an alternative to prevent the occurrence of pain as an adverse effect. PURPOSE: This study aimed to evaluate the clinical efficacy of low-energy, double-pass, 1450 nm diode laser treatment in the treatment of acne in Asian patients. METHODS: Thirty Japanese patients with inflammatory acne were treated with the low-energy, double-pass, 1450 nm diode laser at 2-4-week intervals. An open study was performed in patients that underwent at least five and up to 10 treatment sessions. The clinical effect was assessed using an acne grading scale. RESULTS: Of the 30 patients, 27 completed the study. The mean acne grades decreased from 3.9 to 1.4 (P<0.01) in the 27 patients. The pain was tolerated by 25 patients, and two patients required local anesthesia. No remarkable side effects occurred in any of the patients; all but a few patients had transient faint erythema. CONCLUSION: Low-energy, double-pass therapy is an alternative method that is beneficial for patients who complain of considerable pain. Furthermore, the method may have a lower risk of transient hyperpigmentation induced by cryogen spray, even in Asian patients who tend to develop inflammatory pigmentation. Acne Vulgaris;Asian People;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy

Future considerations in cutaneous photomedicine. Laser and light technology and their use in dermatology are rapidly advancing. Radiofrequency devices have recently integrated lasers to

augment the beneficial effects of both while minimizing potential complications of each. Laser-assisted liposuction is becoming more commonplace, and new investigations into the noninvasive selective destruction of fat with lasers have been undertaken. A better understanding of photobiology has generated renewed interest in the effects of low-level laser therapy on skin and wound healing. Lasers also are being used in novel ways for the purposes of in vivo diagnosis, producing some incredible imaging that may prove useful in the early diagnosis and evaluation of cutaneous disease. Finally, more recent work in the field of photochemical tissue bonding may be bringing us closer to sutureless and scarless surgery. Although not an exhaustive review, this article explores some recent advances in laser and light technologies for dermatologic applications and diagnosis. Cosmetic Techniques;Forecasting;Humans;Low-Level Light Therapy;Phototherapy;Skin Diseases;Skin Diseases, Vascular;Wound Healing

Current and future trends in home laser devices. Laser and intense pulse light procedures, once limited to physician offices and operating rooms, have become increasingly available at a variety of nonmedical sites such as spas. State regulations as to whom can perform these treatments varies greatly across the United States and, thus, in some states, the operators of these devices do not have any significant additional medical or laser knowledge more so than the patients who receive treatment. Although serious complications of laser treatments occur, they are rare when the procedure is performed correctly. Currently, there are 2 light devices approved by the Food and Drug Administration for home hair removal on the U.S. market, and several other companies are expected to release products in the near future. There are two home laser devices marketed for hair loss. As these light-based devices become smaller, safer, easier to use, as well as cheaper to manufacture, direct use by patients will increase. Results from home use devices are impressive but still inferior to office-based lasers and light devices. It is likely that home lasers and intense pulsed light devices will eventually receive other indications because many of these devices use wavelengths similar to currently available office based equipment. Cosmetic Techniques;Device Approval;Hair Removal;Humans;Low-Level Light Therapy;Self Administration;United States

Laser treatment of acne, psoriasis, leukoderma, and scars. Lasers frequently are used by dermatologists for their multiple aesthetic applications, but they also can be used to treat a variety of medical dermatology conditions. Conditions such as acne vulgaris, psoriasis, and vitiligo can all be successfully treated with laser, thereby providing the patient with additional therapeutic options. Lasers have also been used for years to improve the appearance of scars. The newer fractionated lasers have been especially effective in enhancing the clinical outcomes of scar revision. Cicatrix;Cosmetic Techniques;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Skin Diseases

Update on lasers and light devices for the treatment of vascular lesions. Patients frequently present to dermatologists for the treatment of vascular lesions, including facial telangiectases, diffuse redness, port wine stains (PWS), hemangiomas, and leg veins. There are many laser and light devices that can be used with excellent results. This article summarizes the available platforms that are commonly used for the treatment of superficial vascular lesions. Newer devices and techniques are highlighted with respect to the unique characteristics of individual lesions. Humans;Lasers, Dye;Low-Level Light Therapy;Phototherapy;Skin Diseases, Vascular

Fractionated mid-infrared resurfacing. Fractional resurfacing devices thermally alter microscopic treatment columns in the skin, leaving intervening areas between the columns untouched. Because only a fraction of the skin is being modified, untreated areas are able to rapidly repopulate the treatment columns to greatly reduce recovery time and adverse events. Mid-infrared fractional systems have shown improvement in treating photoaging, scars, rhytides, dyschromia, and textural disorders. An additional advantage is that they are safe and effective for the treatment of nonfacial

areas such as the neck, chest, and extremities. Cosmetic Techniques;Humans;Infrared Rays;Low-Level Light Therapy;Skin Aging;Skin Diseases

Light-emitting diodes (LEDs) in dermatology. Light-emitting diode photobiomodulation is the newest category of nonthermal light therapies to find its way to the dermatologic armamentarium. In this article, we briefly review the literature on the development of this technology, its evolution within esthetic and medical dermatology, and provide practical and technical considerations for use in various conditions. This article also focuses on the specific cell-signaling pathways involved and how the mechanisms at play can be put to use to treat a variety of cutaneous problems as a stand-alone application and/or complementary treatment modality or as one of the best photodynamic therapy light source. Humans;Phototherapy;Radiation;Skin Diseases

Introduction. Update on lasers. Acne Vulgaris;Cosmetic Techniques;Humans;Lasers, Solid-State;Lipolysis;Low-Level Light Therapy;Telangiectasis

Lymphedema: a primer on the identification and management of a chronic condition in oncologic treatment. The primary goals of oncologic therapy are the compassionate care of cancer patients, eradication of disease, and palliation of symptoms. Advances in various targeted therapies such as highly conformal and image-guided radiotherapy techniques, sentinel lymph node dissection, and molecularly targeted agents hold the promise of allowing those goals to be reached with fewer treatment-related complications. Unfortunately, certain side effects remain problematic due to the inability to completely avoid injuring normal tissues. Lymphedema, a chronic condition that occurs as a result of the body's inability to drain lymph fluid from the tissues, is a common treatment-related side effect experienced by cancer patients. In this review, many of the important aspects of lymphedema with which clinicians who treat cancer patients should be familiar are outlined, including the anatomy, pathophysiology, diagnosis, and management of this condition. The authors also identify some of the resources available both to cancer patients with lymphedema and to the clinicians who treat them. It is hoped that this review will convey the importance of the early identification and management of this incurable disorder because this is essential to minimizing its complications. Chronic Disease;Humans;Low-Level Light Therapy;Lymph Node Excision;Lymphedema;Physical Therapy Modalities;Practice Guidelines as Topic;Quality of Life;Radiotherapy, Adjuvant;Randomized Controlled Trials as Topic;Risk Factors;Sentinel Lymph Node Biopsy;Skin Care;Treatment Outcome

Effect of low-intensity laser irradiation and wideband red light on experimentally ischemized myocardium. The effect of helium-neon laser irradiation and wideband red light on electrical activity of open rat heart was examined after experimentally produced ischemia. The red light applied with the help of optical fibers modified parameters of cardiac electrical activity and intensity of lipid peroxidation in the myocardium. The effects of laser and red light irradiation differed significantly. Superoxide Dismutase Animals;Electrophysiological Phenomena;Light;Lipid Peroxidation;Low-Level Light Therapy;Male;Myocardial Ischemia;Phototherapy;Rats;Superoxide Dismutase

Bipolar fractional radiofrequency treatment induces neoelastogenesis and neocollagenesis. BACKGROUND: We recently introduced Renesis, a novel minimally invasive radiofrequency (RF) device, for the treatment of human skin. The wound healing response post-fractional RF (FRF) treatment was examined in human subjects. STUDY DESIGN: The FRF system delivered RF energy directly within the dermis via 5 micro-needle electrode pairs. Tissue temperature was held at 72 degrees C for 4 seconds using an intelligent feedback system. The wound healing response was evaluated histologically and by RT-PCR up to 10 weeks post-RF treatment. Neoelastogenesis and the role of heat shock proteins (HSPs) were assessed by immunohistochemistry. RESULTS: FRF treatment generated a RF thermal zone (RFTZ) pattern in the reticular dermis that consisted of zones of denatured collagen separated by zones of spared dermis. RFTZs were observed through day 28 post-

treatment but were replaced by new dermal tissue by 10 weeks. HSP72 expression rapidly diminished after day 2 while HSP47 expression increased progressively through 10 weeks. Reticular dermal volume, cellularity, hyaluronic acid, and elastin content increased. RT-PCR studies revealed an immediate increase in IL-1beta, TNF-alpha, and MMP-13 while MMP-1, HSP72, HSP47, and TGF-beta levels increased by 2 days. We also observed a marked induction of tropoelastin, fibrillin, as well as procollagens 1 and 3 by 28 days post-treatment. CONCLUSION: Our study revealed a vigorous wound healing response is initiated post-treatment, with progressive increase in inflammatory cell infiltration from day 2 through 10 weeks. An active dermal remodeling process driven by the collagen chaperone HSP47 led to complete replacement of RFTZs with new collagen by 10 weeks post-treatment. Furthermore, using both immunohistochemical and PCR studies, we successfully demonstrated for the first time evidence of profound neoelastogenesis following RF treatment of human skin. The combination of neoelastogenesis and neocollagenesis induced by treatment with the FRF system may provide a reliable treatment option for skin laxity and/or rhytids. Heat-Shock Proteins;Inflammation Mediators;Collagen;Elastin Adult;Collagen;Dose Fractionation, Radiation;Elastic Tissue;Elastin;Heat-Shock Proteins;Humans;Inflammation Mediators;Low-Level Light Therapy;Prospective Studies;Wound Healing

810 nm Wavelength light: an effective therapy for transected or contused rat spinal cord. BACKGROUND AND OBJECTIVES: Light therapy has biomodulatory effects on central and peripheral nervous tissue. Spinal cord injury (SCI) is a severe central nervous system trauma with no effective restorative therapies. The effectiveness of light therapy on SCI caused by different types of trauma was determined. STUDY DESIGN/MATERIALS AND METHODS: Two SCI models were used: a contusion model and a dorsal hemisection model. Light (810 nm) was applied transcutaneously at the lesion site immediately after injury and daily for 14 consecutive days. A laser diode with an output power of 150 mW was used for the treatment. The daily dosage at the surface of the skin overlying the lesion site was 1,589 J/cm(2) (0.3 cm(2) spot area, 2,997 seconds). Mini-ruby was used to label corticospinal tract axons, which were counted and measured from the lesion site distally. Functional recovery was assessed by footprint test for the hemisection model and open-field test for the contusion model. Rats were euthanized 3 weeks after injury. RESULTS: The average length of axonal re-growth in the rats in the light treatment (LT) groups with the hemisection (6.89+/-0.96 mm) and contusion (7.04+/-0.76 mm) injuries was significantly longer than the comparable untreated control groups (3.66+/-0.26 mm, hemisection; 2.89+/-0.84 mm, contusion). The total axon number in the LT groups was significantly higher compared to the untreated groups for both injury models ($P<0.05$). For the hemisection model, the LT group had a statistically significant lower angle of rotation ($P<0.05$) compared to the controls. For contusion model, there was a statistically significant functional recovery ($P<0.05$) in the LT group compared to untreated control. CONCLUSIONS: Light therapy applied non-invasively promotes axonal regeneration and functional recovery in acute SCI caused by different types of trauma. These results suggest that light is a promising therapy for human SCI. Animals;Axons;Contusions;Disease Models, Animal;Female;Lasers, Semiconductor;Low-Level Light Therapy;Nerve Regeneration;Rats;Rats, Sprague-Dawley;Recovery of Function;Spinal Cord Injuries;Wounds, Penetrating

Nd:YAG laser in caries prevention: a clinical trial. BACKGROUND AND OBJECTIVE: It is widely known that Nd:YAG can increase enamel resistance to demineralization; however, there are no studies that report the application of Nd:YAG associated with topical application of fluoride in vivo. The aim of this study was to evaluate the effects of the Nd:YAG laser, when associated with the topical application of acidulated phosphate fluoride (APF), for preventing enamel demineralization in vivo. MATERIALS AND METHODS: A double-blind crossover experimental design was used, in which 121 teeth of 33 volunteers were selected. In all volunteers, the right side teeth were selected for

Nd:YAG laser+APF application (lased group) and the left side teeth were kept as control group (only APF application). Nd:YAG laser was applied at 60 mJ/pulse, at a repetition rate of 10 Hz and fluence of 84.9 J/cm(2); after that, topical APF was applied for 4 minutes. Recalls were made after 1 year in order to evaluate the formation of white-spot lesions or caries cavities. RESULTS: After 1 year, this in vivo experiment showed a reduction of 39.2% in caries incidence in lased group when compared with the control. The number of white-spots or caries cavities decreased significantly (P = 0.0043) in the Nd:YAG laser group; the formation of white-spots was significantly less (P = 0.0031) when compared with the number of lesions in the control group. CONCLUSION: Combined Nd:YAG laser and topical fluoride treatment was effective for reducing the incidence of caries in vivo. Acidulated Phosphate Fluoride Acidulated Phosphate Fluoride;Administration, Topical;Adolescent;Child;Combined Modality Therapy;Cross-Over Studies;Dental Caries;Double-Blind Method;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy

Low level laser therapy (LLLT): attenuation of cholinergic hyperreactivity, beta(2)-adrenergic hyporesponsiveness and TNF-alpha mRNA expression in rat bronchi segments in E. coli lipopolysaccharide-induced airway inflammation by a NF-kappaB dependent mechanism. BACKGROUND AND OBJECTIVES: It is unknown if the decreased ability to relax airways smooth muscles in asthma and other inflammatory disorders, such as acute respiratory distress syndrome (ARDS), can be influenced by low level laser therapy (LLLT) irradiation. In this context, the present work was developed in order to investigate if LLLT could reduce dysfunction in inflamed bronchi smooth muscles (BSM) in rats. STUDY DESIGN/MATERIALS AND METHODS: A controlled ex vivo study was developed where bronchi from Wistar rat were dissected and mounted in an organ bath apparatus with or without a TNF-alpha. RESULTS: LLLT administered perpendicularly to a point in the middle of the dissected bronchi with a wavelength of 655 nm and a dose of 2.6 J/cm(2), partially decreased BSM hyperreactivity to cholinergic agonist, restored BSM relaxation to isoproterenol and reduced the TNF-alpha mRNA expression. An NF-kappaB antagonist (BMS205820) blocked the LLLT effect on dysfunction in inflamed BSM. CONCLUSION: The results obtained in this work indicate that the LLLT effect on alterations in responsiveness of airway smooth muscles observed in TNF-alpha-induced experimental acute lung inflammation seems to be dependent of NF-kappaB activation. Adrenergic beta-Agonists;Cholinergic Agents;NF-kappa B;RNA, Messenger;Tumor Necrosis Factor-alpha;Isoproterenol;Acetylcholine Acetylcholine;Adrenergic beta-Agonists;Animals;Bronchi;Cholinergic Agents;Isoproterenol;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Contraction;Muscle, Smooth;NF-kappa B;RNA, Messenger;Rats;Rats, Wistar;Tissue Culture Techniques;Tumor Necrosis Factor-alpha

Light therapy and supplementary Riboflavin in the SOD1 transgenic mouse model of familial amyotrophic lateral sclerosis (FALS). BACKGROUND AND OBJECTIVE: Familial amyotrophic lateral sclerosis (FALS) is a neurodegenerative disease characterized by progressive loss of motor neurons and death. Mitochondrial dysfunction and oxidative stress play an important role in motor neuron loss in ALS. Light therapy (LT) has biomodulatory effects on mitochondria. Riboflavin improves energy efficiency in mitochondria and reduces oxidative injury. The purpose of this study was to examine the synergistic effect of LT and riboflavin on the survival of motor neurons in a mouse model of FALS. STUDY DESIGN/MATERIALS AND METHODS: G93A SOD1 transgenic mice were divided into four groups: Control, Riboflavin, Light, and Riboflavin+Light (combination). Mice were treated from 51 days of age until death. A single set of LT parameters was used: 810 nm diode laser, 140-mW output power, 1.4 cm(2) spot area, 120 seconds treatment duration, and 12 J/cm(2) energy density. Behavioral tests and weight monitoring were done weekly. At end stage of the disease, mice were euthanized, survival data was collected and immunohistochemistry and motor neuron counts were performed. RESULTS: There was no difference in survival between groups. Motor function was not

significantly improved with the exception of the rotarod test which showed significant improvement in the Light group in the early stage of the disease. Immunohistochemical expression of the astrocyte marker, glial fibrilary acidic protein, was significantly reduced in the cervical and lumbar enlargements of the spinal cord as a result of LT. There was no difference in the number of motor neurons in the anterior horn of the lumbar enlargement between groups. CONCLUSIONS: The lack of significant improvement in survival and motor performance indicates study interventions were ineffective in altering disease progression in the G93A SOD1 mice. Our findings have potential implications for the conceptual use of light to treat other neurodegenerative diseases that have been linked to mitochondrial dysfunction. Vitamin B Complex;Sod1 protein, mouse;Superoxide Dismutase;Superoxide Dismutase-1;Riboflavin Amyotrophic Lateral Sclerosis;Animals;Combined Modality Therapy;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Transgenic;Riboflavin;Superoxide Dismutase;Superoxide Dismutase-1;Vitamin B Complex

Low-power laser irradiation promotes cell proliferation by activating PI3K/Akt pathway. Low-power laser irradiation (LPLI) can stimulate cell proliferation through a wide network of signals. Akt is an important protein kinase in modulating cell proliferation. In this study, using real-time single-cell analysis, we investigated the activity of Akt and its effects on cell proliferation induced by LPLI in African green monkey SV40-transformed kidney fibroblast cells (COS-7). We utilized a recombinant fluorescence resonance energy transfer (FRET) Akt probe (BKAR) to dynamically detect the activation of Akt after LPLI treatment. Our results show that LPLI induced a gradual and continuous activation of Akt. Moreover, the activation of Akt can be completely abolished by wortmannin, a specific inhibitor of PI3K, suggesting that the activation of Akt caused by LPLI is a PI3K-dependent event. Src family is involved in Akt activation as demonstrated by the part inhibition of Akt activity in samples treated with PP1 (an inhibitor of Src family). In contrast, loading GÃ¶ 6983, a PKC inhibitor, did not affect this response. Further experiments performed using GFP-Akt fluorescence imaging and Western blot analysis demonstrate that, the activation of Akt is a multi-step process in response to LPLI, involving membrane recruitment, phosphorylation, and membrane detachment. LPLI promotes cell proliferation through PI3K/Akt activation since the cell viability was significantly inhibited by PI3K inhibitor. All these studies create a concernful conclusion that PI3K/Akt signaling pathway is well involved in LPLI triggered cell proliferation that acts as a time- and dose-dependent manner. J. Cell. Physiol. 219: 553-562, 2009. (c) 2009 Wiley-Liss, Inc.
Carbazoles;Indoles;Maleimides;Phosphoinositide-3 Kinase Inhibitors;Protein Kinase Inhibitors;Pyrazoles;Pyrimidines;Recombinant Fusion Proteins;src-Family Kinases;Proto-Oncogene Proteins c-akt Animals;COS Cells;Carbazoles;Cell Proliferation;Cell Survival;Chlorocebus aethiops;Enzyme Activation;Fluorescence Resonance Energy Transfer;Indoles;Lasers;Maleimides;Models, Biological;Phosphatidylinositol 3-Kinases;Phosphoinositide-3 Kinase Inhibitors;Protein Kinase Inhibitors;Proto-Oncogene Proteins c-akt;Pyrazoles;Pyrimidines;Recombinant Fusion Proteins;Signal Transduction;Transfection;src-Family Kinases

H-Ras and PI3K are required for the formation of circular dorsal ruffles induced by low-power laser irradiation. The formation of circular dorsal ruffles upon growth factor stimulation facilitates the static cells for subsequent motility. Low-power laser irradiation (LPLI) has been shown to exert some promotive effects on migration and proliferation in various cell types. It is unclear whether LPLI could induce the formation of circular ruffles. In this study, using confocal fluorescence microscope, we for the first time demonstrated that LPLI could induce the production of circular ruffle structures in COS-7 cells. These structures were proved to be actin-based and originated from membrane microdomains enriched in cholesterol. Ras was shown to be activated by LPLI and expression of YFP-H-Ras (N17), a dominant negative H-Ras, blocked the generation of circular ruffles induced by LPLI.

Wortmannin, PI3K inhibitor, potently suppressed the formation of LPLI-induced circular ruffles in a dose-dependent manner. However, blocking the activation of PKC, which was activated during LPLI-induced cell proliferation in our previous study, had no effect on the formation of circular ruffles. Thus, both H-Ras and PI3K were required for the formation of circular ruffles induced by LPLI and the generation of circular ruffles provides new information for the mechanisms of biological effects of LPLI. J. Cell. Physiol. 219: 535-543, 2009. (c) 2009 Wiley-Liss, Inc. Culture Media;Recombinant Fusion Proteins;Green Fluorescent Proteins;Epidermal Growth Factor;ras Proteins Animals;COS Cells;Cell Membrane Structures;Chlorocebus aethiops;Culture Media;Epidermal Growth Factor;Genes, ras;Green Fluorescent Proteins;Lasers;Microscopy, Confocal;Phosphatidylinositol 3-Kinases;Recombinant Fusion Proteins;Transfection;ras Proteins

Effect of low power laser treatment on a traumatized disc in a rat model. This study investigated the effects of low power laser on the healing process of a traumatized disc in an animal model. The experimental design consisted of 14 rats divided into the following three groups: Animals in group I (n = 5) served as controls with no surgery. Animals in group II (n = 5), the sham group, received a surgically created defect in the disc at L4/L5 level and received no other treatment. Animals in the third group (n = 4) received a similar defect to L4/L5 in similar fashion as described for animals in the sham group (group II) with the exception that they received laser of 830 nm wavelength treatment or irradiation for a period of 4 weeks. The animals were euthanized at 30 days post-implantation using overdose of isoflurane. The discs were then harvested in addition to the vital organs, the reproductive organs, and sample of the adjacent skeletal muscles. The hard and soft tissues were evaluated histopathologically by following laboratory standard techniques. The results of this study indicated that the discs of the laser treated animals healed in a greater magnitude than the sham group. Image analysis revealed that there was more disc formation in the laser irradiated animals than the sham. In conclusion, data obtained from this study demonstrated that laser irradiation delivered on traumatized discs resulted in a remarkable increase in discs regeneration and healing following trauma.

Lasers and soft tissue treatments for the pediatric dental patient. Historically, oral soft tissue surgery on infants and young children was completed in the operating room under a general anesthetic agent. Many children were referred to an oral surgeon and required a physician's physical examination and medical clearance for a hospital admission. potentially placed a child at risk during the use of a general anesthetic for an elective procedure, which may not have insurance benefits. Traditional methods of oral surgery using scalpels or electrosurgery may produce significant postoperative discomfort and require sutures and prolonged healing. Lasers provide a simple and safe in-office alternative for children while at the same time reducing the chances of infection, swelling, discomfort, and scaring. Analgesia;Biopsy;Child;Dental Pulp;Gagging;Gingivectomy;Hematoma;Herpes Labialis;Humans;Infant;Laser Therapy;Lasers;Lasers, Solid-State;Lingual Frenum;Low-Level Light Therapy;Oral Surgical Procedures;Postoperative Complications;Pulpotomy;Risk Factors;Stomatitis, Aphthous;Stomatitis, Herpetic;Tooth Injuries

Multiple microvenular hemangiomas in a healthy child. Adolescent;Biopsy, Needle;Follow-Up Studies;Health Status;Hemangioma;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Risk Assessment;Skin Neoplasms;Treatment Outcome

Effects of various parameters of the 1064 nm Nd:YAG laser for the treatment of enlarged facial pores. BACKGROUND: A variety of treatment modalities have been used to reduce the size of enlarged facial pores without obvious success. OBJECTIVES: To assess and compare the effects of various parameters of a 1064 nm Nd:YAG laser in the treatment of enlarged facial pores. METHODS: This was a prospective intra-individual left-right comparative study. A total of 40 individuals with enlarged facial pores were recruited for this study. Ten individuals were respectively treated on one half of the face

with a quasi long-pulsed 1064 nm Nd:YAG laser (method 1), a Q-switched 1064 nm Nd:YAG laser (method 2), both quasi long-pulsed and Q-switched 1064 nm Nd:YAG lasers without carbon-suspended lotion (method 3), and both quasi long-pulsed and Q-switched 1064 nm Nd:YAG lasers with carbon-suspended lotion (method 4). The other half of the face was left untreated as a control. Five laser sessions were performed with a 3-week interval. The pore sizes were measured using an image analysis program and the sebum level was measured with a Sebumeter before and after the treatments. RESULTS: The pore size and sebum level decreased in all four methods on the treated side compared to the control ($p < 0.05$). CONCLUSIONS: Treatment with a 1064 nm Nd:YAG laser is an effective method for reducing pore size and sebum level. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Rejuvenation;Skin;Skin Aging;Young Adult

Low-level infrared laser therapy in chemotherapy-induced oral mucositis: a randomized placebo-controlled trial in children. BACKGROUND: Oral mucositis (OM) is one of the most frequent complications of chemotherapy for which there is no standard therapy; treatment is mostly conservative. This study was conducted to determine whether low-intensity laser therapy (LLLT) can reduce the duration of chemotherapy-induced OM. PROCEDURE: A placebo-controlled randomized trial was carried out using LLLT or placebo (sham treatment). Children and adolescents with cancer receiving chemotherapy or hematopoietic stem-cell transplantation between October 2005 and May 2006 were eligible as soon as they developed OM. Patients received intervention for 5 days. The LLLT group was treated with laser GaAlAs, wavelength (lambda): 830 nm (infrared), power: 100 mW, dose: 4 J/cm, and placebo group underwent sham treatment. The grade of OM was clinically assessed by the National Cancer Institute, Common Toxicity Criteria scale. RESULTS: Twenty-one patients developed OM and were evaluable for analysis; 18 (86%) patients had a diagnosis of leukemia or lymphoma and 3(14%) had solid tumors. The mean age was 8.2 (+/-3.1) years. Nine patients were randomized in the laser group and 12 in the placebo-control group. Once OM was diagnosed, the patients had daily OM grading assessments before laser or sham application and thereafter until complete healing of the lesions. On day 7 after OM diagnosis, 1/9 of patients remained with lesions in laser group and 9/12 of patients in the placebo-control group (P=0.029). In the laser group, the mean of OM duration was 5.8+/-2 days and in the placebo group was 8.9+/-2.4 days (P=0.004). CONCLUSIONS: Our study has shown evidence that laser therapy in addition to oral care can decrease the duration of chemotherapy-induced OM. Our results confirm the promising results observed in adult cancer patients and should encourage pediatric oncologists to use laser therapy as first-line option in children with chemotherapy-induced OM. Adolescent;Antineoplastic Combined Chemotherapy Protocols;Child;Female;Hematopoietic Stem Cell Transplantation;Humans;Infrared Rays;Low-Level Light Therapy;Male;Neoplasms;Stomatitis;Treatment Outcome

[Effect of various low-intensity laser methods of treatment on an aggregation properties of erythrocytes in chronic pancreatitis]. The aim of the present investigation is to study the influence of low-intensity laser therapy at the aggregate function of erythrocytes in patients with chronic pancreatitis. 118 patients aged 36-77 years old were examined and divided into 2 groups: the experimental (73 patients) and the control group (45 patients). The experimental group has had a complex drug and laser therapy of various therapeutic techniques. Control group has had only drug therapy. In this study were found out various changes of aggregate properties of erythrocytes in patients with exacerbation of chronic pancreatitis. Was established normalizing effects of low-intensity laser therapy on erythrocytes aggregation in experimental group. Adult;Aged;Erythrocyte Aggregation;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pancreatitis, Chronic

Effect of He-Ne laser radiation on healing of osteochondral defect in rabbit: a histological study. This study examined the influence of low-level laser therapy (LLLT) on the healing of a large

osteochondral defect in rabbits.An osteochondral defect with 5 mm diameter was surgically induced in the right femoral patellar groove of 48 adult male rabbits. They were divided into a control and an experimental group. The rabbits were treated at 2, 4, 8, and 16 weeks after surgery, with six rabbits in each study period being tested at each biweekly period. The experimental group received LLLT with a helium-neon (He-Ne) laser (632.8 nm, 10 mW) of 148.4 J/cm(2) three times a week, and the control group received placebo LLLT with equipment switched off. The defects were examined macroscopically and microscopically. The results of the histological examination 2 weeks after surgery showed that the osteochondral healing of the control group was significantly accelerated compared with that of the experimental group. However, the osteochondral healing of the experimental group 4 weeks and 16 weeks after surgery showed that healing accelerated significantly compared with that of the control group. The conclusion was that LLLT with an He-Ne laser could not significantly accelerate healing of a large osteochondral defect in rabbits of the experimental group compared with that of the control group throughout the duration of the present study.
Animals;Cartilage, Articular;Femur;Knee Injuries;Lasers, Gas;Low-Level Light Therapy;Male;Rabbits;Wound Healing

Effect of laser therapy (660 nm) on recovery of the sciatic nerve in rats after injury through neurotmesis followed by epineural anastomosis. The aim of this study was to analyze the influence of aluminum gallium arsenide (AlGaAs) laser (660 nm) on the myelin sheath and functional recovery of the sciatic nerve in rats. The sciatic nerves of 12 Wistar rats were subjected to injury through neurotmesis and epineural anastomosis, and the animals were divided into two groups: group 1 was the control and group 2, underwent low-level laser therapy (LLLT). After the injury, AlGaAs laser at 660 nm, 4 J/cm(2), 26.3 mW and beam area of 0.63 cm(2) was administered to three equidistant points on the injury for 20 consecutive days. In the control group the mean area of the myelin impairment was 0.51 (+/- 0.11) on day 21 after the operation, whereas this value was 1.31 (+/- 0.22) in the LLLT group. Student's t-test revealed a P value = 0.0229 for the mean area values of the myelin sheath between the LLLT and control groups. Comparison of the sciatic functional index (SFI) showed that there was no significant difference between the pre-lesion value in the laser therapy group and the control group. The use of AlGaAs laser (660 nm) provided significant changes to the morphometrically assessed area of the myelin sheath, but it did not culminate in positive results for functional recovery in the sciatic nerve of the rats after injury through neurotmesis.
Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Myelin Sheath;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve

Photomedicine and LLLT literature watch. Humans;Laser Therapy;Phototherapy

Absorption measurements of cell monolayers relevant to mechanisms of laser phototherapy: reduction or oxidation of cytochrome c oxidase under laser radiation at 632.8 nm. OBJECTIVE: The objective of this work was a further investigation of redox mechanisms of laser phototherapy on the cellular level. BACKGROUND DATA: Cytochrome c oxidase, the terminal enzyme of the mitochondrial respiratory chain, is believed to work as the photoacceptor to modulate cellular metabolism in laser phototherapy. MATERIALS AND METHODS: The changes in the absorption spectra of HeLa-cell monolayers before and after irradiation at 632.8 nm using fast multi-channel recording were evaluated by the intensity ratio between the peaks at 770 and 670 nm (intensity ratio criterion). RESULTS: By the intensity ratio criterion, the irradiation effects (reduction or oxidation of the photoacceptor) depended on the initial redox status of cytochrome c oxidase. The irradiation (three times at 632.8 nm, dose = 6.3 x 103 J/m(2), tau(irrad.) = 10 sec, tau(record.) = 600 msec) of cells initially characterized by relatively oxidized cytochrome c oxidase caused first a reduction of the photoacceptor, and then its oxidation (a bell-shaped curve). The irradiation by the same scheme of the cells with initially relatively reduced cytochrome c oxidase caused first oxidation and then a slight

reduction of the enzyme (a curve opposite to the bell-shaped curve). CONCLUSION: The experimental results of our work demonstrate that irradiation at 632.8 nm causes either a (transient) relative reduction of the photoacceptor, putatively cytochrome c oxidase, or its (transient) relative oxidation, depending on the initial redox status of the photoacceptor. The maximum in the bell-shaped dose-dependence curve or the minimum of the reverse curve is the turning point between the prevailing of oxidation or reduction processes. Our results are evidence that the bell-shaped dose dependences recorded for various cellular responses are characteristic also for redox changes in the photoacceptor, cytochrome c oxidase. Electron Transport Complex IV Absorption;Electron Transport Complex IV;HeLa Cells;Humans;Lasers;Oxidation-Reduction

Reduction of subcutaneous fat and improvement in cellulite appearance by dual-wavelength, low-level laser energy combined with vacuum and massage. BACKGROUND: This study compares the efficacy and safety of low-level, dual-wavelength laser energy and massage with massage alone for the reduction of subcutaneous fat in the thighs of normal women. The device was an early prototype of the FDA-cleared SmoothShapes system (ElemÃ© Medical, Merrimack, NH, USA). METHODS: The thighs of each individual (n=102) were randomized to either laser light (dual wavelength of 650+/-20 nm and 915+/-10 nm) and massage or to massage alone (control). Individuals who completed the study (n=74) received a mean of 14.3 treatments over 4-6 weeks. Magnetic resonance imaging (MRI) scans quantified fat pad dimensions before and after the final treatment. RESULTS: Fat thickness decreased for the leg treated with laser-massage by 1.19 cm(2) (mean) and increased by 3.82 cm(2) (mean) for the control leg over time. The difference was statistically significant ($p<0.001$). Among those who completed the study, 82.26% responded to treatment. Individuals reported looser-fitting clothing and satisfaction with the procedure and results. Adverse effects were limited to occasional increases in urinary frequency. CONCLUSION: Low-level, dual-beam laser energy with massage appears to be safe and more efficacious than massage alone for reducing subcutaneous fat in the thighs of normal women. Adipose Tissue;Adolescent;Adult;Female;Humans;Lipectomy;Low-Level Light Therapy;Magnetic Resonance Imaging;Massage;Middle Aged;Obesity;Patient Satisfaction;Thigh;Young Adult

Low-level laser therapy improves bone repair in rats treated with anti-inflammatory drugs. Nowadays, selective cyclooxygenase-2 non-steroidal anti-inflammatory drugs have been largely used in surgical practice for reducing oedema and pain. However, the association between these drugs and laser therapy is not known up to now. Herein, the aim of this study was to evaluate the action of anti-COX-2 selective drug (celecoxib) on bone repair associated with laser therapy. A total of 64 rats underwent surgical bone defects in their tibias, being randomly distributed into four groups: Group 1) negative control; Group 2) animals treated with celecoxib; Group 3) animals treated with low-level power laser and Group 4) animals treated with celecoxib and low-level power laser. The animals were killed after 48 h, 7, 14 and 21 days. The tibias were removed for morphological, morphometric and immunohistochemistry analysis for COX-2. Statistical significant differences ($P < 0.05$) were observed in the quality of bone repair and quantity of formed bone between groups at 14 days after surgery for Groups 3 and 4. COX-2 immunoreactivity was more intense in bone cells for intermediate periods evaluated in the laser-exposed groups. Taken together, such results suggest that low-level laser therapy is able to improve bone repair in the tibia of rats as a result of an up-regulation for cyclooxygenase-2 expression in bone cells. Anti-Inflammatory Agents, Non-Steroidal;Pyrazoles;Sulfonamides;Celecoxib Animals;Anti-Inflammatory Agents, Non-Steroidal;Bone Regeneration;Celecoxib;Combined Modality Therapy;Fracture Healing;Low-Level Light Therapy;Male;Pyrazoles;Rats;Rats, Wistar;Sulfonamides;Tibial Fractures

[Experimental and clinical rationale for photophoresis therapy of chronic generalized parodontitis]. Drug Combinations;metrogil denta;Metronidazole;Chlorhexidine Adult;Chlorhexidine;Chronic

Periodontitis;Drug Combinations;Humans;Low-Level Light Therapy;Metronidazole;Middle Aged;Photopheresis

Pulsed-dye laser treatment of angioma serpiginosum. Angioma serpiginosum (AS) is a rare, benign, vascular disorder comprising nonblanchable punctate red to purple lesions in a gyrate or serpiginous configuration. Tunable pulsed-dye laser (PDL) therapy has been successfully used in the treatment of AS. We report our results of treatment of 12 AS sites in eight patients who were treated with PDL. After an average of 3.75 treatments, complete resolution of AS was seen in five lesions, an excellent response in four and a good response in three. Self-limiting hyperpigmentation at the test sites was noted in two patients. This study provides further evidence of the efficacy of PDL for treatment of AS. Adolescent;Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Telangiectasis;Treatment Outcome;Young Adult

A comparative study on the efficacy of treatment with 585 nm pulsed dye laser and ultraviolet B-TL01 in plaque type psoriasis. BACKGROUND: Narrow-band ultraviolet-B and pulsed dye laser (PDL) affect psoriasis but via different pathways. OBJECTIVE: To compare the results of PDL with ultraviolet-B light therapy (UVB) and to look for synergism of both therapies in patients with plaque type psoriasis. METHODS: In each eligible individual, four similar target plaques were selected, and halves of these plaques were treated using PDL, UVB, or a combination of PDL and UVB or were not treated. Results were recorded single-blind using the Physician's Global Assessment score at study enrolment and Week 13. Nonparametric, paired statistical tests were used to test for differences within and between therapies.The results were also analyzed after dichotomization of the changes in the Physician's Global Assessment score into responsive and nonresponsive to treatment. RESULTS: A significant improvement of the psoriasis lesions was noted at Week 13 (P<.001) with each therapy. No significant differences were noted between the therapies. Synergism of PDL and UVB was not observed. CONCLUSIONS: PDL is safe for treating plaque type psoriasis, but its efficacy is limited to a subgroup of patients. Combining PDL with UVB has no additional benefit. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Psoriasis;Ultraviolet Therapy

Low-fluence 1,064-nm laser hair reduction for pseudofolliculitis barbae in skin types IV, V, and VI. PURPOSE: To evaluate the efficacy of a 1,064-nm neodymium-doped yttrium aluminium garnet (Nd:YAG) laser using lower than traditional fluences (22-40 J/cm(2)) for treatment of pseudofolliculitis barbae (PFB). METHODS: Twenty-two patients with PFB refractory to conservative therapy received five weekly treatments over the anterior neck using a 1,064-nm Nd:YAG laser at 12 J/cm(2). Pulse duration was 20 ms with 10 mm spot size. Topical anesthesia was not used. Treatments were completed 15 minutes after patient arrival. Patients presented for 2- and 4-week follow-up. Ten evaluators used a Global Assessment Scale (GAS) to assess dyspigmentation, papule counts, and cobblestoning by comparing baseline to 4-week follow-up visit photographs. Hair and papule counts were performed on five patients and compared with the GAS. Investigators recorded adverse effects using a visual analog and side effects scale. RESULTS: Eleven patients demonstrated 83% improvement on the GAS (p<.01). There was a mean reduction of 59.5% in dyspigmentation (p<.03), 91.2% in papule count (p<.01), and 75.6% in cobblestoning (p<.02). Patients reported 1 out of 10 on both adverse effects scales. CONCLUSION: Low-fluence 1,064-nm laser treatment achieved significant temporary reduction in PFB. Subjects noted minimal pain without topical anesthesia. Adult;Female;Folliculitis;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain;Pilot Projects;Prospective Studies;Skin Pigmentation

En coup de sabre presenting as a port-wine stain previously treated with pulsed dye laser. Child;Diagnostic Errors;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Scleroderma, Localized

[Cellular mechanisms of magneto-laser treatment of reparative osteogenesis (an experimental study)]. Animals;Bone Regeneration;Low-Level Light Therapy;Magnetic Field Therapy;Male;Osteogenesis;Rats;Rats, Wistar

[Magneto-laser therapy of chronic gastritis in children and adolescents]. The efficiency of transcutaneous magneto-laser treatment as a component of combined therapy of chronic gastritis in children and adolescents (aged 5-17 years) was compared with that of pharmacotherapy and low-intensity laser therapy. The patients were allocated to three groups of 25 persons each. Patients of group 1 were given only drug therapy, those in group 2 were treated with pharmaceuticals and low-intensity laser therapy. The patients comprising group 3 were subjected to the action of magneto-laser radiation. Magneto-laser therapy was shown to result in a significantly more expressed improvement of clinical and morphological characteristics of the patients compared with pharmacotherapy alone. There was no significant difference between effects of magneto-laser and low-intensity laser radiation. Adolescent;Child;Child, Preschool;Chronic Disease;Female;Gastritis;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male

[Laser therapy and "dry" carbonic acid gas baths in the combined treatment of patients with hypertensive disease and coronary heart disease]. Carbon Dioxide Adult;Aged;Carbon Dioxide;Combined Modality Therapy;Coronary Disease;Humans;Hypertension;Low-Level Light Therapy;Middle Aged

[Biological effects of Lamipharen photodynamic therapy]. Biological effects of Lamipharen treatment of sarcoma M-1 was studied in newborn rats and photodynamic therapy in combination with radiation was evaluated. Photosensitizing Agents Animals;Animals, Newborn;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Radiotherapy, Adjuvant;Rats;Rats, Wistar;Sarcoma, Experimental

In vitro effects of low-level laser irradiation for bone marrow mesenchymal stem cells: proliferation, growth factors secretion and myogenic differentiation. BACKGROUND AND OBJECTIVES: Bone marrow derived mesenchymal stem cells (BMSCs) have shown to be an appealing source for cell therapy and tissue engineering. Previous studies have confirmed that the application of low-level laser irradiation (LLLI) could affect the cellular process. However, little is known about the effects of LLLI on BMSCs. The aim of this study was designed to investigate the influence of LLLI at different energy densities on BMSCs proliferation, secretion and myogenic differentiation. STUDY DESIGN/MATERIALS AND METHODS: BMSCs were harvested from rat fresh bone marrow and exposed to a 635 nm diode laser (60 mW; 0, 0.5, 1.0, 2.0, or 5.0 J/cm(2)). The lactate dehydrogenase (LDH) release was used to assess the cytotoxicity of LLLI at different energy densities. Cell proliferation was evaluated by using 3-(4, 5-dimethylithiazol-2-yl)-2, 5-diphenyl tetrazolium bromide (MTT) and 5-bromo-2'-deoxyuridine (BrdU) assay. Production of vascular endothelial growth factor (VEGF) and nerve growth factor (NGF) were measured by enzyme-linked immunosorbent assay (ELISA). Myogenic differentiation, induced by 5-azacytidine (5-aza), was assessed by using immunocytochemical staining for the expression of sarcomeric alpha-actin and desmin. RESULTS: Cytotoxicity assay showed no significant difference between the non-irradiated group and irradiated groups. LLLI significantly stimulated BMSCs proliferation and 0.5 J/cm(2) was found to be an optimal energy density. VEGF and NGF were identified and LLLI at 5.0 J/cm(2) significantly stimulated the secretion. After 5-aza induction, myogenic differentiation was observed in all groups and LLLI at 5.0 J/cm(2) dramatically facilitated the differentiation. CONCLUSIONS: LLLI stimulates proliferation, increases growth factors secretion and facilitates myogenic differentiation of BMSCs. Therefore, LLLI may provide a novel approach for the preconditioning of BMSCs in vitro prior to transplantation. Enzyme Inhibitors;Vascular Endothelial Growth Factor A;Nerve Growth Factor;L-Lactate Dehydrogenase;Azacitidine Animals;Azacitidine;Bone Marrow Cells;Cell Differentiation;Cell

Proliferation;Enzyme Inhibitors;In Vitro Techniques;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Nerve Growth Factor;Rats;Rats, Sprague-Dawley;Vascular Endothelial Growth Factor A

Acanthosis nigricans: a practical approach to evaluation and management. Acanthosis nigricans is a dermatosis characterized by thickened, hyperpigmented plaques, typically of the intertriginous surfaces and neck. Common in some populations, its prevalence depends on race. Clinicians should recognize acanthosis nigricans; it heralds disorders ranging from endocrinologic disturbances to malignancy. In this review, we discuss the pathogenesis of acanthosis nigricans and its clinical implications and management. Fish Oils;Hypoglycemic Agents;Retinoids;calcipotriene;Insulin-Like Growth Factor I;Receptor Protein-Tyrosine Kinases;Calcitriol Acanthosis Nigricans;Adolescent;Calcitriol;Child;Disease Susceptibility;Ethnicity;Female;Fish Oils;Humans;Hypoglycemic Agents;Insulin Resistance;Insulin-Like Growth Factor I;Low-Level Light Therapy;Male;Neoplasms;Prevalence;Receptor Protein-Tyrosine Kinases;Retinoids

Patient perceptions of 595 nm pulsed dye laser through glass compression in the treatment of thick port wine stains and superficial venous malformations. In treating thickened port wine stains and superficial venous malformations with the 595 nm pulse dye laser, we have sometimes compressed the lesion with a glass slide to enable the laser beam to penetrate more deeply. In order to evaluate the patients' perception of this modality, 54 subjects were treated with glass compression using ice applications to cool the skin surface and without glass compression using a cryospray to cool the surface. The subjects were asked to rate the difference in 2 questionnaires after the first and second treatments as to effectiveness, pain of procedure, and overall preference. Of those subjects who perceived a difference between modalities, a significant number perceived treatments with glass compression to be more effective than without ($p=0.0002$ and $p=0.0006$), but more painful ($p<0.0001$). There was no significant difference in overall preference. Blistering occurred in 5 subjects when the glass slide was left on the skin more than 1 minute between ice applications. Ice Blister;Glass;Humans;Ice;Lasers, Dye;Low-Level Light Therapy;Pain;Patient Acceptance of Health Care;Port-Wine Stain;Pressure;Surveys and Questionnaires;Vascular Malformations

Effect of 830 nm low-level laser therapy applied before high-intensity exercises on skeletal muscle recovery in athletes. Our aim was to investigate the immediate effects of bilateral, 830 nm, low-level laser therapy (LLLT) on high-intensity exercise and biochemical markers of skeletal muscle recovery, in a randomised, double-blind, placebo-controlled, crossover trial set in a sports physiotherapy clinic. Twenty male athletes (nine professional volleyball players and eleven adolescent soccer players) participated. Active LLLT (830 nm wavelength, 100 mW, spot size 0.0028 cm(2), 3-4 J per point) or an identical placebo LLLT was delivered to five points in the rectus femoris muscle (bilaterally). The main outcome measures were the work performed in the Wingate test: 30 s of maximum cycling with a load of 7.5% of body weight, and the measurement of blood lactate (BL) and creatine kinase (CK) levels before and after exercise. There was no significant difference in the work performed during the Wingate test ($P > 0.05$) between subjects given active LLLT and those given placebo LLLT. For volleyball athletes, the change in CK levels from before to after the exercise test was significantly lower ($P = 0.0133$) for those given active LLLT (2.52 U l(-1) +/- 7.04 U l(-1)) than for those given placebo LLLT (28.49 U l(-1) +/- 22.62 U l(-1)). For the soccer athletes, the change in blood lactate levels from before exercise to 15 min after exercise was significantly lower ($P < 0.01$) in the group subjected to active LLLT (8.55 mmol l(-1) +/- 2.14 mmol l(-1)) than in the group subjected to placebo LLLT (10.52 mmol l(-1) +/- 1.82 mmol l(-1)). LLLT irradiation before the Wingate test seemed to inhibit an expected post-exercise increase in CK level and to accelerate post-exercise lactate removal without affecting test performance. These findings suggest that LLLT may be of benefit in accelerating post-exercise recovery. Lactic Acid;Creatine Kinase

Adolescent;Adult;Athletes;Athletic Injuries;Athletic Performance;Creatine Kinase;Cross-Over Studies;Double-Blind Method;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle, Skeletal;Soccer;Volleyball;Young Adult
[Parenteral litholytic therapy of urate urolithiasis]. We studied clinical efficacy of parenteral dissolving of urate concrements with trometamol N monotherapy. Parenteral litholytic therapy of urate uroliths was conducted in 8 (16.4%) patients with, renal and 41 (83.6%) patients with ureteral concrements. The solution was performed with trometamol N (Berlin Chemie, Germany). Stimulation of the drug elimination by the affected kidney was provided by renal parenchyma exposure to low-intensive laser irradiation. For assessment of the dynamics of renal function recovery and urine passage along the upper urinary tract in the presence of ureteral concrement we used deep radiothermometry and dopplerography. The concrements solved completely in 36 (73.5%) patients, small fragments less than 0.4 cm in size evacuated spontaneously after partial dissolution. Mean duration of litholysis was 6.3 +/- 2.2 days. Excipients;Tromethamine;Uric Acid Adult;Aged;Excipients;Female;Humans;Lithotripsy, Laser;Male;Middle Aged;Retrospective Studies;Time Factors;Tromethamine;Uric Acid;Urolithiasis
The histological and clinical effects of 630 nanometer and 860 nanometer low-level laser on rabbits' ear punch holes. Low-level laser therapy (LLLT) studies on the musculoskeletal and cartilage tissues of rabbits have reported conflicting results. We aimed to investigate the effects of 630 nm and 860 nm low-level laser on injured rabbit cartilage. After punching 5 mm holes in both ears of ten rabbits, we grouped the rabbits randomly. The punched holes of the laser-treated group were irradiated with 630 nm and 860 nm diode laser on days 3-5 and then every other day until day 20. In both laser and control groups, the hole diameters were measured weekly. Histological evaluation was carried out on day 30. The inter-group difference in hole diameters was not significant. Mann-Whitney U tests showed significant inter-group differences in histological variables related to chondrocyte production and organization, growth rate, granulation tissue and pseudocarcinomatosis. LLLT improved cartilage formation and reduced inflammation and formation of granulation tissue. More accurate results on its healing effects warrant studies with larger sample sizes. Animals;Chondrocytes;Ear Cartilage;Granulation Tissue;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Rabbits;Regeneration;Wound Healing
Reduction of pain in the treatment of vascular lesions with a pulsed dye laser and pneumatic skin flattening. The treatment of vascular lesions, including port wine stains (PWSs), with a pulsed dye laser is very painful and often requires general anaesthesia. This is particularly problematic with children. Pneumatic skin flattening (PSF) is a new technology that naturally reduces pain in laser-based aesthetic treatments. The objective of this study was to test pain reduction, as well as lesional clearance, by combining pneumatic skin flattening (PSF) technology with a pulsed dye laser in the treatment of vascular lesions. Twenty-one patients (three of them children) were treated for vascular lesions, mostly PWSs (13 patients). The patients were treated with a 595 nm pulsed dye laser operated at energies of 5.75-13.25 (median 9.25) J/cm(2). Acute pain was evaluated in all 21 patients. Topical anaesthetic (EMLA cream) was applied before treatment in six cases. Identical energies were applied to both sites. The pain during PSF treatment was compared to pain during regular treatment without PSF. Blanching response to treatment was evaluated in 18 patients after 6-12 weeks. Significant pain reduction was observed in 21/21 patients (100%). The average reduction in pain score was from 10 without PSF (painful) to 2.6 with PSF (comfortable). Follow-up examination of 18 patients after 6-12 weeks showed identical blanching of tissue in both the PSF-treated areas and those not treated with PSF in all patients. It was concluded that the PSF technology significantly reduced pain in the treatment of vascular lesions with a pulsed dye laser without affecting efficacy.

Adult;Child;Humans;Intermittent Pneumatic Compression Devices;Keloid;Keratosis;Lasers, Dye;Low-Level Light Therapy;Pain;Port-Wine Stain;Rosacea;Skin;Skin Abnormalities;Time Factors
[Hair removal in patients with pigmented hair follicles]. Pigments, Biological Female;Forecasting;Hair Follicle;Hair Removal;Humans;Low-Level Light Therapy;Pigments, Biological;Polycystic Ovary Syndrome
Understanding and management of female pattern alopecia. Female pattern hair loss is devastating to many of the 21 million U.S. women who suffer from it. It is essential to differentiate female pattern hair loss from other types of hair loss to ensure appropriate treatment. Through use of follicular units, follicular families, and follicular pairing between existing hair follicles, natural-looking results can be achieved in women. Hair transplants create the benefit of increasing density and providing options for hair styling and can be combined with medications, devices, and styling aids such as minoxidil, low-level laser therapy, and topical powder makeup, respectively. Alopecia;Female;Hair Follicle;Humans;Scalp;Skin Transplantation;Tissue and Organ Harvesting;Transplantation, Autologous
Venous malformation of the eyelid treated with pulsed-dye-1064-nm neodymium yttrium aluminum garnet sequential laser: an effective and safe treatment. Venous malformations of the skin and subcutaneous tissue are compressible, blue-purple tumors that are present at birth. According to the location and symptoms caused, venous malformations can be treated with surgery, sclerotherapy, or a combination of both. Laser therapy can also be used, especially when surgery is contraindicated. We report the case of a 24-year-old man who presented with a venous malformation on the upper and lower left eyelids, which provoked a mechanical ptosis. Treatment with sequential pulsed-dye neodymium yttrium aluminum garnet (PDL-Nd:YAG) laser was performed. After 2 treatments, a marked reduction of volume and blanching of the venous malformation was observed, with satisfactory cosmetic results. The sequential PDL-Nd:YAG laser seems to be an effective and safe therapy for the treatment of cutaneous venous malformations. It penetrates deeper than pulsed-dye laser alone, and because it allows the use of lower fluencies than Nd:YAG laser alone, it reduces the risk of adverse effects. Blood Flow Velocity;Eyelids;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Ultrasonography, Doppler;Vascular Malformations;Veins;Young Adult
The effectiveness of low-level laser therapy on shoulder function in subacromial impingement syndrome. PURPOSE: To investigate the effectiveness of low-level laser therapy (LLLT) in addition to exercise programme on shoulder function in subacromial impingement syndrome (SAIS). METHOD: Sixty-seven patients with SAIS were randomly assigned to either a group that received laser (n = 34) or a group that received placebo Laser (n = 26). Pain, functional assessment, disability and muscle strength of shoulder were assessed before and after a 3-week rehabilitation programme. Besides Laser or placebo Laser, superficial cold and progressive exercise programme were administered to both groups, 5 days a week, for 3 weeks. A progressive exercise programme that was done daily twice under supervision in clinic and at home was given to the patients. RESULTS: After the treatment, all outcome measurements had shown significant improvement except muscle strength in both the groups. When the parameters of the improvement were compared, there were no significant differences between the two groups after treatment. CONCLUSION: We concluded that there is no fundamental difference between LLLT and placebo LLLT when they are supplementing an exercise programme for rehabilitation of patients with shoulder impingement syndrome. Adult;Disability Evaluation;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Pain Measurement;Range of Motion, Articular;Shoulder Impingement Syndrome;Statistics, Nonparametric;Treatment Outcome

Enhancement of light propagation depth in skin: cross-validation of mathematical modeling methods. Various techniques to enhance light propagation in skin have been studied in low-level laser therapy. In this study, three mathematical modeling methods for five selected techniques were implemented so that we could understand the mechanisms that enhance light propagation in skin. The five techniques included the increasing of the power and diameter of a laser beam, the application of a hyperosmotic chemical agent (HCA), and the whole and partial compression of the skin surface. The photon density profile of the five techniques was solved with three mathematical modeling methods: the finite element method (FEM), the Monte Carlo method (MCM), and the analytic solution method (ASM). We cross-validated the three mathematical modeling results by comparing photon density profiles and analyzing modeling error. The mathematical modeling results verified that the penetration depth of light can be enhanced if incident beam power and diameter, amount of HCA, or whole and partial skin compression is increased. In this study, light with wavelengths of 377 nm, 577 nm, and 633 nm was used. Finite Element Analysis;Humans;Low-Level Light Therapy;Mathematical Concepts;Models, Biological;Monte Carlo Method;Photobiology;Photochemotherapy;Photons;Skin;Stochastic Processes

Strategies for managing radiation-induced mucositis in head and neck cancer. Radiation-induced mucositis (RIM) is a common toxicity for head and neck cancer (HNC) patients. The frequency has increased because of the use of more intensive altered radiation fractionation and concurrent chemotherapy regimens. The extent of the injury is directly related to the mucosal volume irradiated, anatomic subsite exposed, treatment intensity, and individual patient predisposition. The consequences of mucositis include pain, dysphagia including feeding tube dependency, dehydration, micronutrient deficiencies, weight loss, and potentially life-threatening aspiration. Currently, there is no Food and Drug Administration-approved cytoprotective agent that reliably prevents RIM for HNC, but several are under investigation. Strategies to limit the extent of mucositis and to manage its symptoms include basic oral care and supportive medications. Limiting the use of aggressive treatments to truly high-risk cancers and special attention to radiation therapy planning techniques can also help restrict the scope of the problem. This review focuses on mucositis recognition, patient treatment selection, and RIM symptom-management strategies. Intercellular Signaling Peptides and Proteins;Mouthwashes;Glutamine;Amifostine;Acetylcysteine Acetylcysteine;Amifostine;Carcinoma, Squamous Cell;Glutamine;Head and Neck Neoplasms;Humans;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mouthwashes;Oral Hygiene;Pain Management;Risk Factors;Stomatitis

Effect of application site of low-level laser therapy in random cutaneous flap viability in rats. OBJECTIVE: This study aimed to investigate the effect of diode laser (830 nm) irradiation on the viability of ischemic random skin flaps in rats, as well as to determine the most effective site for applying laser radiation to speed healing. BACKGROUND DATA: Low-level laser therapy (LLLT) has recently been used to improve the viability of ischemic random skin flaps in rats. MATERIALS AND METHODS: Seventy Wistar rats were used and divided into seven groups of 10 rats each: group 1, sham laser treatment; group 2, which received irradiation at 1 point 5 cm from the flap's cranial base; group 3, which received irradiation at 2 points (5 and 7.5 cm from the flap's base); group 4, which received irradiation at 3 points (2.5, 5 and 7.5 cm from the flap's base); group 5, which received irradiation at 1 point 2.5 cm from the flap's base; group 6, which received irradiation at 2 points (2.5 and 5 cm from the flap's base); and group 7, which received irradiation at 1 point 7.5 cm from the flap's base. The animals were subjected to laser therapy at an energy density of 36 J/cm(2) for 72 sec immediately after surgery, and one time on each of the four subsequent days. The percentage of necrotic skin flap area was calculated on the seventh postoperative day using a paper template. RESULTS: The results showed that the rats in group 5 had the highest increase in skin flap viability,

with a statistically significant difference compared to the other groups. Statistically significant differences were not seen between any of the other groups. CONCLUSION: The diode laser was effective in increasing skin flap viability in rats, and laser irradiation of a point 2.5 cm from the cranial base flap was found to be the most effective. Analysis of Variance;Animals;Cell Survival;Graft Survival;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Necrosis;Rats;Rats, Wistar;Skin;Surgical Flaps;Wound Healing

Carpal tunnel syndrome treated with a diode laser: a controlled treatment of the transverse carpal ligament. OBJECTIVE: The purpose of this placebo-controlled study was to investigate the therapeutic effects of the 830-nm diode laser on carpal tunnel syndrome (CTS). BACKGROUND DATA: Many articles in the literature have demonstrated that low-level laser therapy (LLLT) may help to alleviate various types of nerve pain, especially for CTS treatment. We placed an 830-nm laser directly above the transverse carpal ligament, which is between the pisiform and navicular bones of the tested patients, to determine the therapeutic effect of LLLT. MATERIALS AND METHODS: Thirty-six patients with mild to moderate degree of CTS were randomly divided into two groups. The laser group received laser treatment (10 Hz, 50% duty cycle, 60 mW, 9.7 J/cm(2), at 830 nm), and the placebo group received sham laser treatment. Both groups received treatment for 2 wk consisting of a 10-min laser irradiation session each day, 5 d a week. The therapeutic effects were assessed on symptoms and functional changes, and with nerve conduction studies (NCS), grip strength assessment, and with a visual analogue scale (VAS), soon after treatment and at 2-wk follow-up. RESULTS: Before treatment, there were no significant differences between the two groups for all assessments ($p > 0.05$). The VAS scores were significantly lower in the laser group than the placebo group after treatment and at follow-up ($p < 0.05$). After 2 wk of treatment, no significant differences were found in grip strengths or for symptoms and functional assessments ($p > 0.05$). However, there were statistically significant differences in these variables at 2-wk follow-up ($p < 0.05$). Regarding the findings of NCS, there was no statistically significant difference between groups after treatment and at 2-wk follow-up. CONCLUSIONS: LLLT was effective in alleviating pain and symptoms, and in improving functional ability and finger and hand strength for mild and moderate CTS patients with no side effects. Carpal Tunnel Syndrome;Double-Blind Method;Hand Strength;Humans;Lasers, Semiconductor;Ligaments, Articular;Low-Level Light Therapy;Median Nerve;Middle Aged;Neural Conduction;Pain Measurement

[Low-level laser efficiency in the therapy of chronic gingivitis in children]. BACKGROUND/AIM: Gingivitis is a frequent phenomenon in children considered to be a risk factor for the occurrence and progression of paradontal tissue disease. So, it is necessary not only to identify inflammation, but also to react in due time and adequately in order to avoid further disease spread and the beginning of periodontitis. The aim of this study was to determine the efficiency of a low-level laser application in the therapy of chronic gingivitis in children. METHODS: The study a included hundred of children with permanent dentition suffering from chronic gingivitis. All the examinees were divided into two groups: group I--50 examinees with chronic gingivitis, who underwent the basic therapy; group II--50 examinees with chronic gingivitis, who underwent the basic therapy and also a therapy with a low-level laser. Evaluation of the condition of oral hygiene, the health of gingiva and periodontium were done using appropriate index before and after the therapy. RESULTS: For the plaque index (PI) following results were obtained: in the group I PI = 1.94, and in the group II PI = 1.82. After the therapy in both groups PI was 0. In the group I sulcus plaque index (SPI) was 2.02 before the therapy and 0.32 after the therapy. In the group II SPI was 1.90 before the therapy, and 0.08 after the therapy. In the group I Community Periodontal Index of Treatment Needs (CPITN) was 1.66 before the therapy, and 0.32 after the therapy, and in the group II CPITN was 1.60 before the therapy, and 0.08 after the therapy. CONCLUSION: Chronic gingivitis in children can be successfully cured by the

basic treatment. The use of a low-level laser can significantly improve this effect. Child;Gingivitis;Humans;Low-Level Light Therapy

Magnetic resonance imaging guidance for laser photothermal therapy. Temperature distribution is a crucial factor in determining the outcome of laser photothermal therapy in cancer treatment. Magnetic resonance imaging (MRI) is an ideal method for 3-D noninvasive temperature measurement. A 7.1-T MRI was used to determine laser-induced high thermal gradient temperature distribution of target tissue with high spatial resolution. Using a proton density phase shift method, thermal mapping is validated for in vivo thermal measurement with light-absorbing enhancement dye. Tissue-simulating phantom gels, biological tissues, and tumor-bearing animals were used in the experiments. An 805-nm laser was used to irradiate the samples, with laser power in the range of 1 to 3 W. A clear temperature distribution matrix within the target and surrounding tissue was obtained with a specially developed processing algorithm. The temperature mapping showed that the selective laser photothermal effect could result in temperature elevation in a range of 10 to 45 degrees C. The temperature resolution of the measurement was about 0.37 degrees C with 0.4-mm spatial resolution. The results of this study provide in vivo thermal information and future reference for optimizing laser dosage and dye concentration in cancer treatment. Animals;Breast Neoplasms;Female;Hyperthermia, Induced;Laser Therapy;Magnetic Resonance Imaging;Rats;Rats, Wistar;Surgery, Computer-Assisted;Treatment Outcome

Lasers and optical technologies in facial plastic surgery. Lasers and optical technologies play a significant role in aesthetic and reconstructive surgery. The unique ability of optical technologies to target specific structures and layers in tissues to effect chemical, mechanical, or thermal changes makes them a powerful tool in cutaneous rejuvenation, hair removal, fat removal, and treatment of vascular lesions such as port-wine stains, among many other procedures. With the development of adjunct techniques such as epidermal cooling, lasers and optical technologies have become more versatile and safe. The constant improvement of existing applications and the emergence of novel applications such as photodynamic therapy, nanoparticles, spectroscopy, and noninvasive imaging continue to revolutionize aesthetic medicine by offering a minimally invasive alternative to traditional surgery. In the future, therapies will be based on individualized, maximum, safe radiant exposure to deliver optimal dosimetry. Lasers and optical technologies are headed toward safer, easier, more quantifiable, and more individualized therapy. Face;Facial Asymmetry;Female;Forecasting;Humans;Laser Therapy;Low-Level Light Therapy;Male;Minimally Invasive Surgical Procedures;Nanoparticles;Optical Devices;Photochemotherapy;Plastic Surgery Procedures;Sensitivity and Specificity;Skin Diseases;Spectrum Analysis;Surgery, Plastic;Treatment Outcome

Ultrastructural evaluation of radicular dentin after Nd:YAG laser irradiation combined with different chemical substances. This aticle sought to evaluate the dentin morphology after irradiation by a Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) laser, using different chemical substances to irrigate radicular canals: distilled water, 17% ethylenediaminetetraacetic acid plus Cetavlon (EDTAC), 1% sodium hypochlorite, and 2% chlorhexidine. Groups were subdivided according to the protocol of laser application (n=9). The specimens were analyzed by scanning electron microscopy (SEM). No differences were found in dentin morphology when different root thirds were examined. Regardless of the chemical substance used, alterations were more evident in groups in which the surfaces were dried before laser irradiation. Fusion areas, craters, carbonization, and partially exposed tubules were verified. When the irradiation was performed in water, the smear layer was incorporated into the laser-modified surface. Among the specimens irrigated with EDTAC and laser-treated, partial obliteration of dentin tubules due to the laser action was verified; in addition, there was no remaining smear layer on the surfaces. Samples irrigated with sodium hypochlorite followed by laser irradiation

demonstrated similar morphology to the samples in the chlorhexidine group, with some fusion areas present and no exposed dentin tubules or fissures. The irradiation from an Nd:YAG laser in the presence of EDTAC solution provided a more favorable surface pattern compared to the other experimental conditions, due to the removal of the contaminated layer and the posterior sealing of dentin tubules. Anti-Infective Agents, Local;Chelating Agents;Root Canal Irrigants;Water;EDTAC;Carbon;Edetic Acid;Sodium Hypochlorite;Chlorhexidine Anti-Infective Agents, Local;Carbon;Chelating Agents;Chlorhexidine;Dental Pulp Cavity;Dentin;Desiccation;Edetic Acid;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Water

Low level lasers in dentistry. Low level laser therapy (LLLT) uses light energy, in the form of adenosine triphosphate (ATP), to elicit biological responses in the body. The increased cellular energy and changes in the cell membrane permeability result in pain relief, wound healing, muscle relaxation, immune system modulation, and nerve regeneration. This article investigates the clinical effects of LLLT and explains how it can be applied in the dental field. Dental Implants;Adenosine Triphosphate Adenosine Triphosphate;Arthritis;Cell Membrane Permeability;Dental Care;Dental Implants;Dental Restoration, Permanent;Dentin Sensitivity;Facial Pain;Humans;Immunity;Low-Level Light Therapy;Muscle Relaxation;Muscle, Skeletal;Nerve Regeneration;Orthodontics, Corrective;Osteoarthritis;Pain;Pain, Postoperative;Periodontal Diseases;Safety;Temporomandibular Joint Disorders;Tooth Diseases;Tooth Extraction;Wound Healing

Lasers and pediatric dental care. There are several types of lasers that will allow pediatric dentists to remove soft tissue (such as diode or Neodynium:Yttrium-Aluminum-Garnet (Nd:YAG) lasers) or remove both hard and soft tissue (such as the Erbium:YAG laser), in addition to photobiostimulation or therapeutic lasers that produce their healing benefits without producing heat. Lasers allow pediatric dentists to provide optimal care without many of the fear factors that result from conventional dental techniques. Lasers are extremely safe and effective when the user has a proper understanding of laser physics. Using lasers for caries removal, bone removal, and soft tissue treatment can reduce postoperative discomfort and infection and make it possible for dentists to provide safe, simple treatments. Anesthesia, Dental;Anesthesia, Local;Child;Child, Preschool;Crown Lengthening;Dental Care for Children;Dental Cavity Preparation;Dental Restoration, Permanent;Facial Injuries;Female;Gagging;Gingivectomy;Herpes Labialis;Humans;Infant;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Lingual Frenum;Lip Diseases;Low-Level Light Therapy;Male;Pulpotomy;Stomatitis, Herpetic;Tooth Avulsion;Tooth, Deciduous;Tooth, Impacted;Trismus;Vascular Malformations

[Treatment of haemangiomas and vascular malformations with the neodymium-YAG laser--strategy and results in over 2000 cases]. BACKGROUND: Haemangiomas represent the most common type of benign vascular tumours in childhood. A proliferative phase of unknown duration and extent is followed by an involutional period, which passes into regression in approximately 70 % of all cases. A multitude of different treatment options, such as corticosteroids, cryotherapy, laser, sclerotherapy, radiotherapy and surgical methods have been published. Due to the high rate of spontaneous regression, many authors advise not to undertake any treatment. The dilemma of this "wait and see" approach constitutes those cases in which sudden and pronounced growth is not followed by complete regression with possible severe aesthetic and functional impairment. To avoid this dilemma, a specific algorithm for the treatment of haemangiomas was instituted at our department, based essentially on early laser treatment when relevant growth is present. PATIENTS AND METHODS: More than 2000 patients with haemangiomas as well as vascular malformations have been treated at our department in the last 16 years. An algorithm for treatment of these disorders is presented. RESULTS: All therapeutic procedures, especially direct neodymium-YAG laser treatment

with either contact cooling or intralesional, is described and postinterventional results are presented. CONCLUSION: Early laser treatment of fast growing haemangiomas prevents uncontrolled proliferation of these childhood tumours and, in our experience, represents a definite improvement of long-term results when compared to the "wait and see" method. Adolescent;Adult;Algorithms;Arteriovenous Malformations;Brachytherapy;Child;Child, Preschool;Facial Neoplasms;Female;Follow-Up Studies;Hemangioma;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin;Skin Neoplasms;Soft Tissue Neoplasms;Ultrasonography;Young Adult

Effect of low-level laser therapy after implantation of poly-L-lactic/polyglycolic acid in the femurs of rats. This study evaluated the use of red and infrared lasers on tissue surrounding the femurs of 60 rats randomly divided into three groups after implantation of bioabsorbable plates. The control group were not subjected to laser irradiation; group A was treated with red laser [indium-gallium-aluminum-phosphide (InGaAlP) laser, wavelength 685 nm, 35 mW, continuous wave (CW), Ã˜ = 0.06 cm, 2.23 min], and group B was subjected to infrared laser [gallium-aluminum-arsenium (GaAlAs) laser, wavelength 830 nm, 50 mw, CW, Ã˜ = 0.06 cm, 1.41 min], both at 10 J/cm(2). Samples were stained with hematoxylin and eosin (H&E) and examined microscopically. Results showed that the laser irradiation had had a positive photobiomodulation effect on inflammation, confirmed by a better histologic pattern than that of the control group at 3 days and 7 days. Semiquantitative analysis revealed that groups A and B had a histologic score significantly greater than that of the control group at 3 days. At 21 days, histomorphometric analysis revealed a more intense inflammation in the red laser group than in the other groups. We concluded that low-level laser therapy (LLLT) has positive effects on the photobiomodulation of inflammation in the tissues surrounding the poly-L-lactic/polyglycolic acid (PLLA/PGA) bioabsorbable plate. It stimulated vascularization, fibroblast proliferation, and collagen deposition. Biocompatible Materials;Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid Animals;Biocompatible Materials;Bone Plates;Bone Regeneration;Femur;Inflammation;Lactic Acid;Low-Level Light Therapy;Male;Materials Testing;Osseointegration;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer;Rats;Rats, Wistar

Effects of low-level laser therapy on mast cell number and degranulation in third-degree burns of rats. Mast cells have been shown to participate in the wound healing process. We investigated the effects of low-level laser therapy (LLLT) on mast cell number in the inflammation, proliferation, and remodeling phases of the wound healing process of experimental burns. Sixty rats subjected to third-degree burns were divided into four groups: two laser-treated, one control, and one nitrofurazone-treated group. In the two laser-treated groups, burned areas received LLLT with a helium-neon laser at energy densities of 38.2 J/cm(2) and 76.4 J/cm(2), respectively. The effects on mast cell number and degranulation were assessed 7, 16, and 30 days postburn (inflammation, proliferation, and remodeling phases of wound healing, respectively). Intact and degranulated mast cells were counted. Five rats with no burns were used for baseline studies. On day 7 in the first laser group, the total number of mast cells was significantly higher than in the other groups. On day 16 in the nitrofurazone-treated group, the total number of mast cells was significantly higher than in the control, first laser, and normal groups. LLLT on the experimental third-degree burns significantly increased the total number of mast cells during the inflammation phase of wound healing; also, topical application of 0.2% nitrofurazone ointment on the same burns significantly increased the total number of mast cells during the proliferation phase of burn healing. Analysis of Variance;Animals;Burns;Cell Degranulation;Low-Level Light Therapy;Male;Mast Cells;Random Allocation;Rats;Rats, Wistar;Wound Healing

High fluence low-power laser irradiation induces mitochondrial permeability transition mediated by reactive oxygen species. High fluence low-power laser irradiation (HF-LPLI) can induce cell apoptosis via the mitochondria/caspase-3 pathway. Here, we further investigated the mechanism involved in the apoptotic process in human lung adenocarcinoma cells (ASTC-a-1) at a laser irradiation fluence of 120 J/cm(2) (633 nm). Cytochrome c release was ascribed to mitochondrial permeability transition (MPT) because the release was prevented by cyclosporine (CsA), a specific inhibitor of MPT. Furthermore, mitochondrial permeability for calcein (approximately 620 Da) was another evidence for the MPT induction under HF-LPLI treatment. A high-level intracellular reactive oxygen species (ROS) generation was observed after irradiation. The photodynamically produced ROS caused onset of MPT, as the ROS scavenger docosahexaenoic acid (DHA) prevented the MPT. However, CsA failed to prevented cell death induced by HF-LPLI, indicating the existence of other signaling pathways. Following laser irradiation, Bax activation occurred after mitochondrial depolarization and cytochrome c release, indicating Bax activation was a downstream event. In the presence of CsA, Bax was still activated at the end-stage of apoptotic process caused by HF-LPLI, suggesting that Bax was involved in an alternative-signaling pathway, which was independent of MPT. Under HF-LPLI treatment, cell viabilities due to pre-treatment with DHA, CsA, or Bax small interfering RNA (siRNA) demonstrated that the MPT signaling pathway was dominant, while Bax signaling pathway was secondary, and more importantly ROS mediated both pathways. Taken together, these results showed that HF-LPLI induced cell apoptosis via the CsA-sensitive MPT, which was ROS-dependent. Furthermore, there existed a secondary signaling pathway through Bax activation. The observed link between MPT and triggering ROS could be a fundamental phenomenon in HF-LPLI-induced cell apoptosis. Mitochondrial Membrane Transport Proteins;Mitochondrial Permeability Transition Pore;RNA, Small Interfering;Reactive Oxygen Species;bcl-2-Associated X Protein;Docosahexaenoic Acids;Cyclosporine;Cytochromes c Cell Death;Cell Line, Tumor;Cell Survival;Cyclosporine;Cytochromes c;Docosahexaenoic Acids;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mitochondria;Mitochondrial Membrane Transport Proteins;Mitochondrial Permeability Transition Pore;Permeability;RNA, Small Interfering;Reactive Oxygen Species;bcl-2-Associated X Protein

Effect of low level laser therapy on bronchial hyper-responsiveness. The objective of this study was to investigate whether low level laser therapy (LLLT) could reduce bronchial hyper-responsiveness (BHR) induced by tumour necrosis factor-alpha (TNF-alpha) modulating the metabolism of inositol phosphate (IP) in bronchial smooth muscle cells (BSMCs). The study was on 28 Wistar rats, randomly divided into four groups. Irradiation (1.3 J/cm(2)) was administered 5 min and 4 h after bronchial smooth muscle (BSM) had been suspended in TNF-alpha baths, and the contractile response-induced calcium ion (Ca(2+)) sensitization was measured. The BSMCs were isolated, and the IP accumulation was measured before and after TNF-alpha immersion in the groups that had been irradiated or not irradiated. BSM segments significantly increased contraction 24 h after TNF-alpha immersion when exposed to carbachol (CCh) as Ca(2+), but it was significantly reduced by 64% and 30%, respectively, after laser treatment. The increase in IP accumulation induced by CCh after TNF-alpha immersion was reduced in the BSMCs by LLLT. The dose of 2.6 J/cm(2) reduced BHR and IP accumulation in the rats' inflammatory BSMCs. DNA Primers;Inositol 1,4,5-Trisphosphate Receptors;Inositol Phosphates;Macrocyclic Compounds;Oxazoles;RNA, Messenger;Tumor Necrosis Factor-alpha;xestospongin C;Carbachol;Calcium Animals;Base Sequence;Bronchial Hyperreactivity;Calcium;Carbachol;DNA Primers;Gene Expression;In Vitro Techniques;Inositol 1,4,5-Trisphosphate Receptors;Inositol Phosphates;Low-Level Light Therapy;Macrocyclic Compounds;Male;Muscle Contraction;Myocytes, Smooth Muscle;Oxazoles;RNA, Messenger;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha

Low intensity laser therapy in temporomandibular disorder: a phase II double-blind study. The purpose of this study was to evaluate the analgesic effect of Low Intensity Laser Therapy (LILT) and its influence on masticatory efficiency in patients with temporomandibular dysfunction (TMD). This study was performed using a random, placebo-controlled, and double-blind research design. Fourteen patients were selected and divided into two groups (active and placebo). Infrared laser (780 nm, 70 mw, 60s, 105J/cm2) was applied precisely and continuously into five points of the temporomandibular joint (TMJ) area: lateral point (LP), superior point (SP), anterior point (AP), posterior point (PP), and posterior-inferior point (PIP) of the condylar position. This was performed twice per week, for a total of eight sessions. To ensure a double-blind study, two identical probes supplied by the manufacturer were used: one for the active laser and one for the inactive placebo laser. They were marked with different letters (A and B) by a clinician who did not perform the applications. A Visual Analogue Scale (VAS) and a colorimetric capsule method were employed. Data were obtained three times: before treatment (Ev1), shortly after the eighth session (Ev2), and 30 days after the first application (Ev3). Statistical tests revealed significant differences at one percent (1%) likelihood, which implies that superiority of the active group offered considerable TMJ pain improvement. Both groups presented similar masticatory behavior, and no statistical differences were found. With regard to the evaluation session, Ev2 presented the lowest symptoms and highest masticatory efficiency throughout therapy. Therefore, low intensity laser application is effective in reducing TMD symptoms, and has influence over masticatory efficiency [Ev2 (0.2423) and Ev3 (0.2043), observed in the interaction Evaluations x Probes for effective dosage]. Coloring Agents;Placebos;Rosaniline Dyes Analgesia;Colorimetry;Coloring Agents;Double-Blind Method;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mandibular Condyle;Mastication;Pain Measurement;Placebos;Rosaniline Dyes;Spectrophotometry, Ultraviolet;Temporomandibular Joint;Temporomandibular Joint Disorders

Clinical trial of pin-point photodynamic therapy using an optic fiber for the improvement of enlarged facial pores: a case study. BACKGROUND: There are few publications on the treatment options for facial pore size reduction. A focused therapy is needed. OBJECTIVE: To evaluate the efficacy of selective photodynamic therapy (PDT) using an optic fiber for the size reduction of large facial pores. METHODS: A series of five patients (skin phototypes IV-V) with large facial pores received two successive weekly treatments with an 810-nm diode laser using a fine optic fiber after indocyanine green (ICG) was applied selectively to enlarged pores. Patients were evaluated using digital photography at each treatment session, and at 3 months post-operation. Clinical assessment scores were determined at each treatment session and follow-up visit. Patient satisfaction surveys were obtained at the end of the study. RESULTS: All five participants who completed the 3-month follow-up gave a subjective assessment of reduction of facial pore size. Modest to excellent improvement was achieved. CONCLUSION: This study demonstrates that treatment with pin-point PDT using an optic fiber is a well-tolerated and effective regimen for the reduction of facial pore size. Adult;Equipment Design;Equipment Safety;Facial Dermatoses;Female;Follow-Up Studies;Humans;Korea;Lasers, Semiconductor;Low-Level Light Therapy;Male;Optical Fibers;Patient Satisfaction;Photochemotherapy;Reference Values;Risk Assessment;Severity of Illness Index;Treatment Outcome;Young Adult

Low-level laser therapy and myofacial pain dysfunction syndrome: a randomized controlled clinical trial. Myofacial pain dysfunction syndrome (MPDS) is the most common reason for pain and limited function of the masticatory system. The effects of low-level lasers (LLLs) for controlling the discomfort of patients are investigated frequently. However, the aim of this study was to evaluate the efficacy of a particular source producing 660 nm and 890 nm wavelengths that was recommended to reduce of the pain in the masticatory muscles. This was a double-blind and placebo-controlled trial.

Sixteen MPDS patients were randomly divided into two groups. For the laser group, two diode laser probes (660 nm (nanometers), 6.2 J/cm(2), 6 min, continuous wave, and 890 nm, 1 J/cm(2) (joules per square centimetre), 10 min, 1,500 Hz (Hertz)) were used on the painful muscles. For the control group, the treatment was similar, but the patients were not irradiated. Treatment was given twice a week for 3 weeks. The amount of patient pain was recorded at four time periods (before and immediately after treatment, 1 week after, and on the day of complete pain relief). A visual analog scale (VAS) was selected as the method of pain measurement. Repeated-measures analysis of variance (ANOVA), the t-test and the paired t-test were used to analyze the data. In each group the reduction of pain before and after the treatment was meaningful, but, between the two groups, low-level laser therapy (LLLT) was more effective (P = 0.031) According to this study, this type of LLLT was the effective treatment for pain reduction in MPDS patients. Adolescent;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Masticatory Muscles;Optical Phenomena;Pain;Temporomandibular Joint Dysfunction Syndrome;Time Factors;Young Adult

Eating disorders part II: clinical strategies for dental treatment. AIM: To present the strategies of treatment for dental implications of eating disorders. METHODS AND MATERIALS: A comprehensive review of the literature was conducted with special emphasis on the treatment of the oral implications of anorexia nervosa and bulimia nervosa, dividing the treatment into different parts. RESULTS: Oral manifestations of eating disorders represent a challenge to the dental practitioner. Dental erosion, caries, xerostomia, enlargement of parotide glands, traumatized oral mucosa, and other oral manifestations may present in anorexic and bulimic patients. CONCLUSION: Often the dentist is the first healthcare provider to observe the clinical symptoms of an eating disorder. Dental treatment should be carried out simultaneously with the medical treatment. However, dentists are not aware of the fundamental importance of the dentist's participation in the multidisciplinary treatment and no training is provided with regard to the strategies involved in the dental treatment. CLINICAL SIGNIFICANCE: Oral complications of eating disorders are a major concern. The difficulties of recognizing the oral manifestations, and the failure to do so, may lead to serious systemic problems in addition to progressive and irreversible damage to the oral hard tissues. Considering the increasing incidence and prevalence rates of eating disorders, the dentist's participation and dental treatment should be discussed. Dental Care for Chronically Ill;Dental Caries;Dental Restoration, Permanent;Dentin Sensitivity;Feeding and Eating Disorders;Humans;Lasers, Solid-State;Low-Level Light Therapy;Parotid Diseases;Patient Care Team;Psychotherapy;Tooth Erosion;Tooth Remineralization;Xerostomia

Low-level laser irradiation promotes cell proliferation and mRNA expression of type I collagen and decorin in porcine Achilles tendon fibroblasts in vitro. Achilles tendon problems are commonly encountered in sports medicine and low-level laser therapy (LLLT) is widely used in rehabilitative applications to decrease pain, reduce inflammatory processes, and promote tissue healing. This study examined the effects on the proliferation of porcine Achilles tendon fibroblasts and gene expression, using different doses of low-level laser irradiation (LLLI). Four groups of identically cultured fibroblasts were exposed to LLLI and harvested after 24 h. The control group (Group 1) was subjected to no LLLI. Other groups received 1 J/cm2 (Group 2), 2 J/cm2 (Group 3), and 3 J/cm2 (Group 4), respectively. Cell proliferation and mRNA expressions of type I collagen and decorin were then measured. When compared to the control group, the cell proliferation of irradiated Achilles tendon fibroblasts in the other three groups increased significantly by 13% +/- 0.8% (Group 2), 30% +/- 0.4% (Group 3), and 12% +/- 0.6% (Group 4) respectively. But progressively higher laser intensity did not achieve a correspondingly higher cell proliferation effect in Achilles tendon fibroblasts. The mRNA expressions of decorin and type I collagen in fibroblasts with LLLI were significantly higher ($p < 0.05$). Therefore, suitable dosages of LLLI may result in more effective tissue healing by promoting type I collagen and

decorin synthesis. However, these positive effects of LLLI on the repair of the Achilles tendon in humans should be further investigated in clinic. Collagen Type I;DCN protein, human;Decorin;Extracellular Matrix Proteins;Proteoglycans;RNA, Messenger Achilles Tendon;Animals;Cell Proliferation;Cells, Cultured;Collagen Type I;Decorin;Extracellular Matrix Proteins;Fibroblasts;Gene Expression;Low-Level Light Therapy;Proteoglycans;RNA, Messenger;Swine;Wound Healing

Atomic force microscopy and transmission electron microscopy analyses of low-temperature laser welding of the cornea. Low-temperature laser welding of the cornea is a technique used to facilitate the closure of corneal cuts. The procedure consists of staining the wound with a chromophore (indocyanine green), followed by continuous wave irradiation with an 810 nm diode laser operated at low power densities (12-16 W/cm(2)), which induces local heating in the 55-65 degrees C range. In this study, we aimed to investigate the ultrastructural modifications in the extracellular matrix following laser welding of corneal wounds by means of atomic force microscopy and transmission electron microscopy. The results evidenced marked disorganization of the normal fibrillar assembly, although collagen appeared not to be denatured under the operating conditions we employed. The mechanism of low-temperature laser welding may be related to some structural modifications of the nonfibrillar extracellular components of the corneal stroma. Coloring Agents;Fibrillar Collagens;Indocyanine Green Animals;Coloring Agents;Cornea;Fibrillar Collagens;In Vitro Techniques;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Atomic Force;Microscopy, Electron, Transmission;Swine;Temperature

Effect of diode laser on enzymatic activity of parotid glands of diabetic rats. The aim of this study was to evaluate the effect of laser irradiation (LI) on enzymatic activities of amylase, catalase and peroxidase in the parotid glands (PG) of diabetic and non-diabetic rats. Ninety-six female rats were divided into eight groups: D0; D5; D10; D20 and C0; C5; C10; C20, respectively. Diabetes was induced by administration of streptozotocin and confirmed later by the glycemia results. Twenty-nine (29) days after the induction, the PGs of groups D5 and C5; D10 and C10; D20 and C20, were irradiated with 5 J/cm(2), 10 J/cm(2) and 20 J/cm(2) of laser diode (660 nm/100 mW) respectively. On the following day, the rats were euthanized and the enzymatic activity in the PGs was measured. Diabetic rats that had not been irradiated (group D0) showed higher catalase activity ($P < 0.05$) than those in group C0 (0.14 +/- 0.02 U/mg protein and 0.10 +/- 0.03 U/mg protein, respectively). However, laser irradiation of 5 J/cm(2) and 20 J/cm(2) decreased the catalase activity of the diabetic groups (D5 and D20) to non-diabetic values ($P > 0.05$). Based on the results of this study, LI decreased catalase activity in the PGs of diabetic rats. Catalase;Peroxidase;Amylases Amylases;Animals;Catalase;Diabetes Complications;Diabetes Mellitus, Experimental;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Parotid Gland;Peroxidase;Rats;Rats, Wistar;Xerostomia

Treatment of experimental periodontal disease by photodynamic therapy in rats with diabetes. BACKGROUND: The aim of this study was to evaluate histologically and histometrically the influence of photodynamic therapy (PDT) as an adjuvant treatment on induced periodontitis in rats with diabetes. METHODS: Two hundred forty rats were divided evenly into two groups: non-diabetic (ND; n = 120) and alloxan diabetic (D; n = 120). Periodontal disease was induced in both groups at the first mandibular molar. After 7 days, the ligature was removed, and all animals underwent scaling and root planing (SRP) and were divided according to the following treatments: irrigation with saline solution (SRP); irrigation with a phenothiazinium dye (100 microg/ml) (TBO); laser irradiation (660 nm, 24 J) (LLLT); and PDT (TBO and laser irradiation). Ten animals in each experimental group and treatment subgroup were euthanized at 7, 15, and 30 days. The histometric values were analyzed statistically ($P <0.05$). RESULTS: In the ND group, the animals treated by PDT showed less bone loss

(0.33 +/- 0.05 mm(2), 0.35 +/- 0.06 mm(2), and 0.27 +/- 0.07 mm(2) at 7, 15, and 30 days, respectively; P <0.05) at all experimental periods than the SRP group (1.11 +/- 0.11 mm(2), 0.84 +/- 0.12 mm(2), and 0.97 +/- 0.13 mm(2) at 7, 15, and 30 days, respectively), the TBO group (0.51 +/- 0.12 mm(2), 0.70 +/- 0.13 mm(2), and 0.64 +/- 0.08 mm(2) at 7, 15, and 30 days, respectively), and the LLLT group (0.59 +/- 0.03 mm(2), 0.61 +/- 0.04 mm(2), and 0.60 +/- 0.03 mm(2) at 7, 15, and 30 days, respectively). In the D group, the animals treated by PDT showed less bone loss (0.29 +/- 0.03 mm(2), 0.24 +/- 0.02 mm(2), and 0.27 +/- 0.06 mm(2) at 7, 15, and 30 days, respectively; P <0.05) at all experimental periods than the SRP group (2.27 +/- 0.47 mm(2), 3.23 +/- 0.34 mm(2), and 2.82 +/- 0.75 mm(2) at 7, 15, and 30 days, respectively), the TBO group (0.51 +/- 0.15 mm(2), 0.44 +/- 0.07 mm(2), and 0.57 +/- 0.13 mm(2) at 7, 15, and 30 days, respectively), and the LLLT group (0.37 +/- 0.05 mm(2), 0.35 +/- 0.09 mm(2), and 0.39 +/- 0.12 mm(2) at 7, 15, and 30 days, respectively). CONCLUSION: PDT was a beneficial adjuvant treatment for periodontal diseases induced by bacterial plaque and systemically modified by diabetes mellitus. Phenothiazines;Photosensitizing Agents Alveolar Bone Loss;Analysis of Variance;Animals;Diabetes Mellitus, Experimental;Furcation Defects;Low-Level Light Therapy;Male;Periodontal Attachment Loss;Periodontitis;Phenothiazines;Photochemotherapy;Photosensitizing Agents;Rats;Rats, Wistar;Statistics, Nonparametric

Pain and swelling in periapical surgery. A literature update. In recent years, periapical surgery (PS) has evolved thanks to the incorporation of technical and diagnostic advances. In PS, secondary effects such as pain and swelling occur as with all surgical procedures. The objective of the present study is to review the literature of articles published on pain and swelling during the postoperative period in periapical surgery. For this review, a search was made in Medline and of literature published in Spanish odontological journals. In the reviewed literature the maximum pain was produced during the first 24 postoperative hours and maximum swelling between the first and second day. Recent studies propose the use of corticoids and nonsteroidal anti-inflammatory drugs (NSAIDs) during the pre-and post-operative period, in order to reduce pain perception during the first postoperative week after surgery. Likewise, low-level laser therapy has been used; although with no statistically significant results being observed for the control of pain. In the majority of published studies there was no statistically significant relationship between age and sex and the postoperative symptoms. However, greater pain and swelling is observed in patients with poor oral hygiene before surgery, and higher pain in patients who smoke, and in those with pain before surgery. Surgery of anterior teeth and molars is associated with greater pain. Edema;Humans;Pain, Postoperative;Periapical Diseases;Postoperative Complications

Low-intensity red laser on the prevention and treatment of induced-oral mucositis in hamsters. OBJECTIVE: The purpose of this study was to investigate the effects of laser phototherapy as preventive and therapeutic regime on induced-oral mucositis in hamsters. DESIGN: The animals were divided into four groups: preventive cryotherapy, preventive laser, therapeutic laser and therapeutic control group. Mucositis was induced in hamsters by intraperitoneal injection of 5-fluorouracil (5-FU) and superficial scratching. All preventive treatment was performed on the right cheek pouch mucosa. The left pouch mucosa was used for a spontaneous development of mucositis and did not receive any preventive therapy. Laser parameters were: lambda=660nm, P= 30mW, D=1.2J/cm(2), Deltat=40s, spot size 3mm(2), I=1W/cm(2). Cryotherapy was done positioning ice packs in the hamster mucosa 5min before 5-FU infusion and 10min afterward. To study the healing of mucositis, the left pouch mucosa of each of the hamsters in the TLG received laser irradiation on the injured area. Irradiation parameters were kept the same as abovementioned. The control hamsters in the TCG did not receive any treatment. The mucositis degree and the animal's body mass were evaluated. An assessment of blood vessels was made based on immunohistochemical staining. RESULTS: The CG animals lost

15.16% of theirs initial body mass while the LG animals lost 8.97% during the first 5 days. The laser treated animals had a better clinical outcome with a faster healing, and more granulation tissue. The quantity of blood vessels at both LG and CG were higher than in healthy mucosa. Regarding the therapeutic analysis, the severity of the mucositis in the TLG was always lower than TCG. TLG presented higher organization of the granulation tissue, parallel collagen fibrils, and increased angiogenesis. CONCLUSION: The results suggest that laser phototherapy had a positive effect in reducing mucositis severity, and a more pronounced effect in treating established mucositis. Animals;Body Weight;Color;Cricetinae;Female;Low-Level Light Therapy;Mesocricetus;Stomatitis

Blinding techniques in randomized controlled trials of laser therapy: an overview and possible solution. Low-level laser therapy has evidence accumulating about its effectiveness in a variety of medical conditions. We reviewed 51 double blind randomized controlled trials (RCTs) of laser treatment. Analysis revealed 58% of trials showed benefit of laser over placebo. However, less than 5% of the trials had addressed beam disguise or allocation concealment in the laser machines used. Many of the trials used blinding methods that rely on staff cooperation and are therefore open to interference or bias. This indicates significant deficiencies in laser trial methodology. We report the development and preliminary testing of a novel laser machine that can blind both patient and operator to treatment allocation without staff participation. The new laser machine combines sealed preset and non-bypassable randomization codes, decoy lights and sound, and a conical perspex tip to overcome laser diode glow detection.

Nd: YAG laser (1,064 nm) fails to improve localized plaque type psoriasis: a clinical and immunohistochemical pilot study. Chronic and localized plaque-type-psoriasis is often therapy resistant as a result of which dermatologists often have trouble finding a suitable treatment option. Traditional therapies for psoriasis merely focus on the inhibition of epidermal proliferation, inflammation, or both. The earliest changes, however, in a novel psoriatic lesion concern abnormal microvasculature. The position of lasers in the treatment of psoriatic lesions is debatable, as different views exist with respect to efficacy and tolerability. The current investigation evaluates the clinical and immunohistochemical effect of the Nd:YAG (1,064 nm) laser in chronic localized psoriasis, as this laser can penetrate up to the deeper abnormal psoriatic vasculature. The effects are compared to treatment with the well-established calcipotriol/betamethasone dipropionate ointment. The use of the Nd:YAG laser with treatment-intervals of four weeks was found not to be of additional value in the array of treatment modalities for chronic localized plaque-psoriasis. Targeting the more superficially located microvasculature in psoriasis seems of stronger significance for achieving a clinical effect than the deeper vasculature targeted by the Nd:YAG laser. Therefore, the present data are of importance in preserving dermatologists from treating psoriatic lesions with a Nd:YAG laser. However, further studies incorporating changes in methodology, in particular shortened time-intervals between treatments, are needed in order to refute or confirm this position. CD3 Complex;Dermatologic Agents;Drug Combinations;Platelet Endothelial Cell Adhesion Molecule-1;calcipotriene;betamethasone-17,21-dipropionate;Betamethasone;Calcitriol Betamethasone;CD3 Complex;Calcitriol;Dermatologic Agents;Drug Combinations;Female;Humans;Immunohistochemistry;Keratinocytes;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Platelet Endothelial Cell Adhesion Molecule-1;Psoriasis

Light-emitting diode therapy in chemotherapy-induced mucositis. BACKGROUND AND OBJECTIVE: Mucositis is the most common oral complication of cancer chemotherapy, which causes pain on mastication and swallowing, impairs patients' ability to eat and take oral drugs and may determine interruption of the treatment. The aim of this study was to evaluate the effect of light-emitting diode (LED) therapy on chemotherapy-induced mucositis in hamsters. STUDY DESIGN/MATERIALS AND METHODS: Animals of both experimental (Group I; n = 32) and positive

control (Group II; n = 32) groups received intraperitoneal injections of 5-fluorouracil on days 0 and 2. All animals had their right and left cheek pouch irritated by superficial scratching on days 3 and 4. In Group I, LED irradiation (630 nm+/-10 nm, 160 mW, 12 J/cm2) was applied during 37.5 seconds at days 3, 4, 6, 8, 10, 12, and 14. In Group II, mucositis was induced, but LED therapy was not performed. The oral mucosa was photographed from day 4 to 14 at 2-day intervals. Photographs were randomly scored according to the severity of induced mucositis (0 to 5). In the negative control group (Group III; n = 6), no mucositis was induced. Biopsies of the cheek pouches of 8 animals (Group I and Group II) were surgically obtained on days 5, 9, 13 and 15 and processed for histological examination. RESULTS: The statistical analysis showed significant differences between irradiated and non-irradiated groups ($P<0.05$). However, muscular degeneration was observed in 18% of the samples of Group I. CONCLUSION: It may be concluded that the LED therapy protocol established for this in vivo study was effective in reducing the severity of oral mucositis, although the oral lesions were not completely prevented. Antineoplastic Agents;Fluorouracil Animals;Antineoplastic Agents;Cheek;Cricetinae;Disease Models, Animal;Fluorouracil;Male;Mesocricetus;Phototherapy;Stomatitis

Vascular effects of photodynamic and pulsed dye laser therapy protocols. BACKGROUND AND OBJECTIVE: Pulsed dye laser (PDL) treatment of cutaneous vascular lesions is associated with variable and unpredictable efficacy. Thus, alternative treatment modalities are needed. Previous in vitro and in vivo studies have demonstrated enhanced selective vascular destruction with benzoporphyrin derivative (BPD) monoacid ring A photodynamic therapy (PDT) followed immediately by PDL irradiation (PDT+PDL). Here, we evaluate PDT alone, PDL alone, and PDT+PDL protocols using an optimized in vivo rodent dorsal window chamber model. STUDY DESIGN/MATERIALS AND METHODS: A dorsal window chamber was surgically installed on male Golden Syrian hamsters. BPD solution was administered intravenously via a jugular venous catheter. Evaluated interventions included: (1) Control (no BPD, no light); (2) Control (BPD, no light); (3) PDT alone (lambda = 576 nm; 25, 50, 75, or 96 J/cm2 radiant exposure; 15 minutes post-BPD injection); (4) PDL alone at 7 J/cm2 (585 nm, 1.5 milliseconds pulse duration, 7 mm spot); and (5) PDT (25 or 75 J/cm2)+PDL (7 J/cm2). Laser speckle imaging was used to monitor blood flow dynamics before, immediately after, and 1, 3, and 5 days post-intervention. RESULTS: Perfusion reduction on day 1 post-intervention was achieved with PDT>50 J/cm2, PDL alone, and PDT+PDL. However, by day 5 post-intervention, recovery of flow was observed with PDT alone at 50 J/cm2 (-15.1%) and PDL alone (+215%). PDT (75 J/cm2)+PDL resulted in the greatest prolonged reduction in vascular perfusion (-99.8%). CONCLUSIONS: Our in vivo data suggest that the PDT+PDL therapeutic protocol can result in enhanced and persistent vascular shutdown compared to PDT or PDL alone. The PDT+PDL approach has potential for considerable superficial vascular destruction and should be considered as a treatment modality for cutaneous vascular lesions. Monitoring of blood flow changes for as long as possible is crucial for accurate assessment of light-based vascular interventions. Photosensitizing Agents;Porphyrins;Verteporfin Animals;Cricetinae;Disease Models, Animal;Lasers, Dye;Low-Level Light Therapy;Male;Mesocricetus;Photochemotherapy;Photosensitizing Agents;Porphyrins;Skin Diseases, Vascular;Verteporfin

Treatment of folliculitis with monochromatic excimer light (308 nm). BACKGROUND/AIMS: 308-nm excimer light has been reported to be safe and effective in the treatment of chronic skin diseases. The aim of the study was to prove the efficacy of 308-nm monochromatic excimer light in the treatment of recalcitrant and antibiotic-resistant folliculitis. METHODS: Eight patients affected with folliculitis were enrolled and treated twice weekly with the 308-nm excimer light. The follow-up was 12 weeks from the end of the treatment. RESULTS: A mean number of 13 sessions (range 10-20) was performed with increasing dosage according to the patient's photo-type and response. Remission, in

terms of number and infiltration of papulopustular elements, was achieved in all patients after 4-16 therapeutic sessions. At the end of the follow-up period, recurrence of folliculitis was observed in 2 patients. CONCLUSIONS: These results suggest that the 308-nm excimer light is a valid therapeutic option for the treatment of resistant forms of folliculitis especially in difficult-to-treat areas. Adult;Female;Folliculitis;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Pilot Projects;Prospective Studies;Treatment Outcome

[Main results of research reported by the Center's Department of Innovation in Radiotherapy]. The efficacy of multimodality conservative treatment for prostate and bladder cancer and cervical carcinoma was improved due to integration of such modem modalities as intra-arterial chemotherapy, local hyperthermia and hyperglycemia and combination of local and systemic radiomodifiers. Our methods use criteria of actual survival and are intended to raise it. Radiation-Sensitizing Agents Academies and Institutes;Animals;Biomedical Research;Female;Government Agencies;Humans;Low-Level Light Therapy;Male;Prostatic Neoplasms;Radiation-Sensitizing Agents;Radiotherapy;Thyroid Neoplasms;Urinary Bladder Neoplasms;Uterine Cervical Neoplasms

Effect of drug-light interval on the mode of action of Photofrin photodynamic therapy in a mouse tumor model. Our objective was to examine the effect of time intervals between Photofrin injection and laser irradiation [i.e., drug-light interval (DLI)] on the mode of action of Photofrin photodynamic therapy (PDT). Kunming mice transplanted with sarcoma-180 cells were used as an animal model. The tumor-bearing mice in the control group were given neither photosensitizer nor laser irradiation. PDT groups were given intravenous (i.v.) injection of Photofrin (7.5 mg/kg) prior to being irradiated with a 630 nm laser at 120 J/cm(2) at different DLIs (1 min-48 h). Tumors and overlying skin were visually examined daily. Histopathological and electron microscopic examinations were carried out 48 h after PDT. Survival rates were recorded. The mice in the groups that had experienced short DLIs (<60 min) showed stronger skin reactions than the groups subjected to long DLIs (>6 h). Histological examination showed that antitumor effects were achieved mainly by the destruction of tumor blood vessels and the formation of thrombosis at short DLIs, whereas, at long DLIs, the tumor cells were killed directly by PDT-mediated cytotoxicity. Electron microscopy revealed various degrees of mitochondrial swelling. The survival rate of the mice subjected to long DLIs was slightly higher than that of the mice subjected to short DLIs. Both vascular (e.g., tumor vessel destruction) and cellular (e.g., cytotoxicity) effects contributed to Photofrin PDT-induced tumor ablation. Photosensitizing Agents;Dihematoporphyrin Ether Animals;Dihematoporphyrin Ether;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Microscopy, Electron, Transmission;Neoplasm Transplantation;Photochemotherapy;Photosensitizing Agents;Sarcoma 180;Skin;Time Factors

Heat-induced "recall" of treatment zone erythema following fractional resurfacing with a combination laser (1320 nm/1440 nm). Adult;Erythema;Follow-Up Studies;Hot Temperature;Humans;Lasers;Low-Level Light Therapy;Male;Recurrence;Remission, Spontaneous;Risk Assessment;Time Factors

Comparison of long-pulsed alexandrite and Nd:YAG lasers, individually and in combination, for leg hair reduction: an assessor-blinded, randomized trial with 18 months of follow-up. OBJECTIVE: To compare the long-term effectiveness and safety of long-pulsed Nd:YAG and alexandrite lasers, individually and in combination, in long-term leg hair reduction. DESIGN: Randomized, single-center, within-participant, investigator-blinded, active-controlled clinical trial. SETTING: Private skin laser center. PARTICIPANTS: Twenty individuals aged 16 to 50 years with skin phototypes III and IV. INTERVENTIONS: The medial and lateral sides of each participant's legs were randomly assigned to receive 1 of the following laser treatments: (1) long-pulsed 1064-nm Nd:YAG laser (12-mm spot size);

(2) long-pulsed 755-nm alexandrite laser (12-mm spot size); (3) long-pulsed 755-nm alexandrite laser (18-mm spot size); and (4) a combination of long-pulsed 1064-nm Nd:YAG laser and long-pulsed 755-nm alexandrite laser (treatments 1 and 2). Identified areas were treated for a total of 4 sessions at 8-week intervals. MAIN OUTCOME MEASURES: Hair reduction from baseline based on hair counting with digital photography by 2 blinded assessors, 8 and 18 months after the last treatment session. RESULTS: Fifteen participants completed the trial. The mean (SD) hair reduction 18 months after the last treatment, as measured by the assessors from digital photographs, were 75.9% (19.0%) for the 12-mm spot size alexandrite laser, 84.3% (12.4%) for the 18-mm spot size alexandrite laser, 73.6% (11.4%) for the Nd:YAG laser, and 77.8% (15.9%) for the combination therapy (analysis of variance, $P > .05$). The incidence of adverse effects (hyperpigmentation) and pain severity were significantly greater in areas that received combination therapy ($P = .001$). CONCLUSIONS: After 18 months of follow-up, alexandrite and Nd:YAG lasers were efficacious for leg hair removal. Combination therapy did not have any additional benefit and caused more adverse effects.
Adolescent;Adult;Combined Modality Therapy;Female;Follow-Up Studies;Hair Follicle;Hair Removal;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Lower Extremity;Male;Middle Aged;Probability;Risk Assessment;Single-Blind Method;Time Factors;Treatment Outcome

Molecular effects of photodynamic therapy for photoaging. OBJECTIVE: To quantitatively examine the epidermal and dermal cellular and molecular changes that occur after photodynamic therapy of photodamaged human skin. DESIGN: Serial in vivo biochemical and immunohistochemical analyses after photodynamic therapy using topical 5-aminolevulinic acid (5-ALA) and pulsed-dye laser treatment. SETTING: Academic referral center, Department of Dermatology, University of Michigan, Ann Arbor. PATIENTS: A volunteer sample of 25 adults, 54 to 83 years old, with clinically apparent photodamage of the forearm skin. INTERVENTIONS: Three-hour application of 5-ALA followed by pulsed-dye laser therapy using non-purpura-inducing settings to focal areas of photodamaged forearms and serial biopsy specimens taken at baseline and various times after treatment. MAIN OUTCOME MEASURES: Immunohistochemical analysis was used to assess levels of markers of epidermal proliferation (Ki67), epidermal injury (cytokeratin 16), and photodamage (p53), as well as various markers of dermal collagen production (including prolyl 4-hydroxylase and heat shock protein 47, and type I procollagen). Real-time reverse transcriptase-polymerase chain reaction technology was used to quantify type I and type III collagen. Type I procollagen protein was quantified with enzyme-linked immunosorbent assay. RESULTS: Epidermal proliferation was stimulated as demonstrated by increases in Ki67 (more than a 5-fold increase; $P < .05$) and epidermal thickness (more than a 1.4-fold increase; $P < .05$). Epidermal injury was produced with increased cytokeratin 16 levels demonstrated (to nearly 70-fold of baseline levels; $P < .05$). Upregulation of collagen production was demonstrated with increases in procollagen I messenger RNA (2.65-fold; $P < .05$), procollagen III messenger RNA (3.32-fold; $P < .05$), and procollagen I protein (2.42-fold; $P < .05$) levels detected. The baseline epidermal p53 level correlated with cytokeratin 16 levels at acute time points, and the latter were found to correlate with peak collagen production. CONCLUSIONS: Photodynamic therapy with the specific treatment regimen employed produces statistically significant quantitative cutaneous molecular changes (eg, production of types I and III collagen) that are associated with improved appearance of the skin. Baseline epidermal p53 immunostaining levels may be predictive of dermal responses to this therapy. Comparison with historical data using pulsed-dye laser therapy alone suggests that use of the photosensitizer may enhance dermal remodeling. The quantitative in vivo molecular data presented herein are in keeping with an evolving model to potentially predict the efficacy of new techniques for the treatment of photoaging. Biomarkers;Collagen Type I;Keratin-16;Ki-67 Antigen;RNA, Messenger;Aminolevulinic Acid Aged;Aged, 80 and over;Aminolevulinic

Acid;Biomarkers;Collagen Type I;Combined Modality Therapy;Epidermis;Female;Follow-Up Studies;Humans;Keratin-16;Ki-67 Antigen;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Probability;RNA, Messenger;Reverse Transcriptase Polymerase Chain Reaction;Risk Assessment;Sampling Studies;Skin Aging;Treatment Outcome;Up-Regulation

Excimer laser as adjuvant therapy for adult cutaneous Langerhans cell histiocytosis.
Aged, 80 and over;Biopsy, Needle;Follow-Up Studies;Histiocytosis, Langerhans-Cell;Humans;Immunohistochemistry;Lasers, Excimer;Low-Level Light Therapy;Male;Radiotherapy, Adjuvant;Skin Diseases;Treatment Outcome

Near infrared light protects cardiomyocytes from hypoxia and reoxygenation injury by a nitric oxide dependent mechanism. Photobiomodulation with near infrared light (NIR) provides cellular protection in various disease models. Previously, infrared light emitted by a low-energy laser has been shown to significantly improve recovery from ischemic injury of the canine heart. The goal of this investigation was to test the hypothesis that NIR (670 nm) from light emitting diodes produces cellular protection against hypoxia and reoxygenation-induced cardiomyocyte injury. Additionally, nitric oxide (NO) was investigated as a potential cellular mediator of NIR. Our results demonstrate that exposure to NIR at the time of reoxygenation protects neonatal rat cardiomyocytes and HL-1 cells from injury, as assessed by lactate dehydrogenase release and MTT assay. Similarly, indices of apoptosis, including caspase 3 activity, annexin binding and the release of cytochrome c from mitochondria into the cytosol, were decreased after NIR treatment. NIR increased NO in cardiomyocytes, and the protective effect of NIR was completely reversed by the NO scavengers carboxy-PTIO and oxyhemoglobin, but only partially blocked by the NO synthase (NOS) inhibitor L-NMMA. Mitochondrial metabolism, measured by ATP synthase activity, was increased by NIR, and NO-induced inhibition of oxygen consumption with substrates for complex I or complex IV was reversed by exposure to NIR. Taken together these data provide evidence for protection against hypoxia and reoxygenation injury in cardiomyocytes by NIR in a manner that is dependent upon NO derived from NOS and non-NOS sources. Free Radicals;Oxyhemoglobins;omega-N-Methylarginine;Nitric Oxide;Caspase 3;Oxygen Animals;Apoptosis;Caspase 3;Cytosol;Free Radicals;Hypoxia;Infrared Rays;Light;Mitochondria;Myocytes, Cardiac;Nitric Oxide;Oxygen;Oxyhemoglobins;Rats;Rats, Sprague-Dawley;omega-N-Methylarginine

Attenuation of morphine withdrawal signs by low level laser therapy in rats. In the present study, the effects of low-intensity laser therapy (LILT) on naloxone-induced withdrawal signs of morphine-dependent rats were examined. Low-intensity lasers with a power density of 12.5J/cm(2) have been used by a Ga-Al-As laser. One-way ANOVA showed that the LILT which applied immediately or 15min prior to naloxone injection significantly decreased total withdrawal score (TWS). These results suggest that LILT prior to naloxone injection attenuates the expression of withdrawal signs in morphine-dependent rats. Further studies may elucidate the likely role of LILT in clinical management of opioid withdrawal syndrome. Analgesics, Opioid;Narcotic Antagonists;Naloxone;Morphine Analgesics, Opioid;Animals;Behavior, Animal;Data Interpretation, Statistical;Low-Level Light Therapy;Male;Morphine;Naloxone;Narcotic Antagonists;Rats;Rats, Wistar;Substance Withdrawal Syndrome

Photomedicine and LLLT Literature Watch. Humans;Laser Therapy;Phototherapy

GaAs laser treatment of bilateral eyelid ptosis due to complication of botulinum toxin type A injection. The widespread use of botulinum toxin type A (BTX-A) for aesthetic procedures in recent years has brought about some unwanted side effects that, though they are self-limited, cause inconvenience for patients. Injection of this paralytic toxin inactivates target muscle(s) for many months and unwanted facial movements will thus be prevented. Spreading of the toxin beyond the target muscles sometimes involves muscles necessary for other facial movements, such as the levator

palpebrae, inactivation of which causes upper eyelid ptosis. Mild cases resolve after 2-3 wk, but in severe cases the complication may last as long as the cosmetic results persist (3-4 mo), and until now there has been no medical intervention to accelerate healing. In an effort to achieve more rapid recovery from eyelid ptosis due to overdose of BTX-A in the glabella, laser therapy was used in a 46-year-old woman with bilateral eyelid ptosis (partial on the right side and complete on the left) 12 d after injection. A GaAs laser was used and the protocol consisted of irradiation of three points on the upper lid just above the levator, and one point on the corrugator muscle on each side in contact mode, with three sessions per week (wavelength 890 nm, peak power 94 W, output power 28 mW, pulse duration 200 ns, spot size 3 mm, pulse repetition rate 3000 Hz, duration of irradiation 40 sec per point, energy per point 1.1 J, total energy per session 8.8 J, dose 16 J/cm2). The result was complete recovery from ptosis after 10 sessions, but the cosmetic results persisted for several months. It appears that if this procedure has similar results in other case series, it will be an effective therapeutic option to treat this complication. Neuromuscular Agents;Botulinum Toxins, Type A Blepharoptosis;Botulinum Toxins, Type A;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Neuromuscular Agents

The effect of low-level laser therapy on electrically induced muscle fatigue: a pilot study. OBJECTIVE: The purpose of this pilot study is to determine if low-level laser therapy (LLLT) could attenuate skeletal muscle fatigue induced by surface neuromuscular electrical stimulation (NMES) in healthy volunteers. MATERIALS AND METHODS: Five college-age participants underwent three cross-over randomized trials: two (LLLT + NMES) test trials and a control trial (NMES only), in which NMES was applied to their dominant knee extensor muscle group. The LLLT doses, 500 mW at 808 nm, were either adjusted to deliver a total energy of 7 J for 10 min or 3 J for 5 min in a blinded fashion. Following LLLT irradiation, the NMES protocol was immediately delivered for 3 min to induce fatigue in the knee extensor muscle group. RESULTS: The five participants completed the three trials. After the control trial, torque significantly decreased (62%; $p < 0.0001$) at the end of 3 min. There was no significant difference between the 7 J and 3 J trials on muscle fatigue. Following both LLLT trials, torque significantly decreased (51%; $p < 0.0001$) at the end of 3 min. Although there was a difference (11%) in fatigue between the two LLLT trials and the control trial, this difference did not attain statistical significance ($p = 0.63$). CONCLUSION: LLLT did not attenuate muscle fatigue evoked by NMES, but this needs to be further addressed in human studies and clinical settings. The lack of significant findings could be explained by the small sample size and the selection of LLLT parameters. Adolescent;Electric Stimulation;Humans;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Pilot Projects;Young Adult

Intracellular ATP level increases in lymphocytes irradiated with infrared laser light of wavelength 904 nm. OBJECTIVE: Red and near-infrared laser irradiation is reported to have a range of biological effects on cultured cells and different tissues, leading to the hypothesis that laser light can affect energy metabolism. Increased adenosine triphosphate (ATP) synthesis has been reported in cultured cells and rat brain tissue after irradiation at 632.8 nm and 830 nm, respectively. This study investigated whether diode pulsed laser irradiation enhances ATP production in lymphocytes. MATERIALS AND METHODS: Aliquots (500 microL) of an extract of cultured lymphocytes of the Molt-4 cell line were irradiated with diode laser light (lambda = 904 nm, pulsed mode, 6 kHz frequency) with an average emission power of 10 mW for 60 min. A Spectra Physics M404 power meter was used to measure light intensity. Controls were treated similarly but not irradiated. The amount of ATP was measured by the luciferin-luciferase bioluminescent assay. RESULTS: The amount of ATP in irradiated cell cultures was 10.79 +/- 0.15 microg/L (SD; n = 10), and in non-irradiated cell cultures it was 8.81 +/- 0.13 microg/L (SD; n = 10). The average percentage increase of irradiated versus control cell cultures was about 22.4% +/- 0.56% SD ($p < 0.001$). CONCLUSION: This significant increase is probably

due to laser irradiation; it cannot be attributed to any thermal effect, as the temperature during irradiation was maintained at 37.0 degrees +/- 0.5 degrees C. Thus the therapeutic effects of the biostimulating power of this type of laser are identified and its indications may be expanded. Adenosine Triphosphate Adenosine Triphosphate;Cell Culture Techniques;Cells, Cultured;Humans;Infrared Rays;Low-Level Light Therapy;Lymphocytes

Role of nitric oxide in the visible light-induced rapid increase of human skin microcirculation at the local and systemic levels: II. healthy volunteers. OBJECTIVE: The aim of this study is to evaluate the skin microcirculation increase seen in healthy volunteers after a single exposure to polychromatic visible (pVIS) light, and to prove the role of nitric oxide (NO) in the development of this effect. BACKGROUND DATA: Improvement of microcirculation is one of the most important effects of laser and pVIS light therapy; however, its mechanism of action remains unknown. A main role in the regulation of vascular tone is known to be played by NO. It is produced by NO-synthase (NOS) located in membranes of many cells, including endothelial and blood cells. NOS, a biopteroflavohemoprotein, absorbs pVIS light, resulting in its activation. MATERIALS AND METHODS: The central area of the dorsal side of the right hand (24 cm2) of 42 volunteers was irradiated for 5 min with pVIS light from a Q-light (385-750 nm, 95% polarization, 40 mW/cm2, 12 J/cm2). Then for 90 min, the blood flow rate (Qas) was measured eight times, both in the area of the irradiation (local effect) and in the non-irradiated left hand (systemic effect) by using a high-frequency ultrasound Doppler device, recording Qas in human skin to a depth up to 5 mm. In the central area of the right hand of 14 volunteers an NOS inhibitor, N-monomethyl-L-arginine (L-NMMA, 0.1% solution), was iontophoretically administered prior to exposure, whereas in 10 other subjects it was administered to the left hand with subsequent exposure of the right hand. RESULTS: As soon as 2 min after exposure, Qas in the irradiated area rose on average by 32%, and in 20 min by 45%; it then decreased and in 90 min returned to the initial level. A statistically significant Qas increase in the non-irradiated hand was recorded in 5 min (+9%), and in 20 min it reached a maximum level (+39%), and 90 min later it decreased to the initial values. The presence of L-NMMA in the light-exposed area completely blocked the photoinduced rise of microcirculation, both in the irradiated and in non-irradiated hand; however, its administration to the non-irradiated hand did not prevent these effects. CONCLUSION: The increase in skin microcirculation produced by pVIS light at the local and systemic levels is due to activation of NO synthesis in the irradiated area. Nitric Oxide Adult;Aged;Aged, 80 and over;Female;Hand;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Nitric Oxide;Reference Values;Regional Blood Flow;Skin;Vasodilation

Combining therapeutic laser and herbal remedy for treating ligament injury: an ultrastructural morphological study. OBJECTIVE: We examined the ultrastructural morphology (number of collagen fibrils, mean and mass-averaged diameter) of isolated and combined treatments of a therapeutic laser and herbs for medial collateral ligament (MCL) injury in rats. MATERIALS AND METHODS: Twenty-eight rats, divided into seven groups: laser (L), herb (H), laser + herb (LH), laser control (LC), herb control (HC), laser sham (LS) and herb sham (HS), were studied. Right MCL of groups L, H, LH, LC and HC were transected, while that of LS and HS remained intact. Group L received 9 treatment sessions of GaAlAs laser with a dosage of 3.5 Jcm(-2); group H received herbal plaster treatment; groups LH had combined treatments of laser and herb; group LC had placebo laser; group LS had no treatment; groups HC and HS received only bandage without herb. All MCLs were analyzed using transmission electron microscopy at 3 weeks. RESULTS: Differences ($p < 0.05$) existed in mean fibril diameters among groups. Core mass-averaged diameters of groups L and H were larger than the control groups (LC and HC). Fibril diameter of group LH (combined treatment) was even larger and approaching that of the intact MCL. CONCLUSION: Combined therapeutic laser and herbal treatment hastened collagen fibril maturation in MCL repair. Plant Preparations Animals;Combined

Modality Therapy;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Phytotherapy;Plant Preparations;Rats;Rats, Sprague-Dawley

Temperature variation on the external root surface during intracanal Er:YAG laser irradiation. OBJECTIVE: To evaluate the temperature changes on the root's external surface during Er:YAG laser irradiation with different tips and pulse repetition rates. BACKGROUND DATA: There have been limited reports that correlate temperature variations with Er:YAG laser irradiation using different tips and pulse repetition rates. MATERIALS AND METHODS: Sixty roots of central incisors were sectioned 10 mm from the apex, biomechanically prepared, embedded in acrylic resin, and randomly distributed into six groups: the teeth in group I, group II, and group III were irradiated with an Opus 20 laser with a sapphire tip at 8, 10, and 15 Hz, respectively; the teeth in group IV, group V, and group VI were irradiated with the fiberoptic tip of a Kavo Key laser at 6, 10, and 15 Hz, respectively. Laser irradiation was applied for 20 sec to all teeth and temperature changes were recorded with thermocouples in the root surfaces. RESULTS: There were significant differences ($p < 0.05$) among pulse repetition rates: 6 and 8 Hz (2.36 degrees +/- 0.91 degrees C), 10 Hz (4.92 degrees +/- 1.60 degrees C), and 15 Hz (8.23 degrees +/- 2.78 degrees C); and radicular thirds: apical (8.33 degrees +/- 2.69 degrees C), middle (4.70 degrees +/- 1.60 degrees C), and cervical (2.48 degrees +/- 0.83 degrees C). No significant differences were seen between the two types of laser tips used ($p > 0.05$). CONCLUSION: The temperature changes on root external surfaces remained above the critical threshold (13 degrees C) during Er:YAG laser irradiation, except for irradiation with 15 Hz in the apical third. However, the type of Er:YAG laser tip used (sapphire or fiberoptic) did not affect the temperature variation. Body Temperature;Humans;Lasers, Solid-State;Low-Level Light Therapy;Organ Culture Techniques;Tooth Root

Standard parameters in laser phototherapy. Humans;Laser Therapy;Phototherapy

Vascular based non conventional dye laser treatment for basal cell carcinoma. Basal cell carcinoma is the most common skin tumor in humans which can be removed in a variety of ways (depending on the type of the lesion, the affected area, and depth of the lesion). Laser therapy offers another option to the traditional methods of treatment; thus, the purpose of this work is to valuate the efficacy of dye laser in a selected group of patients affected by superficial basal cell carcinoma. We suggest that the success of pulse dye laser treatment lies in the fact that as all tumors, basal cell carcinomas contain an increased number of dilated blood vessels. Twenty patients (eight males and 12 females) with superficial basal cell carcinoma were given five treatments with a flashlamp-pumped pulse dye laser every 20 days. The clinical follow up was 12-24 months after the fifth treatment. A complete response was obtained in 16 patients out of 20. Three recurrences and one no response was observed during the study. Pulse dye laser is effective and safe in the treatment of superficial basal cell carcinoma. Aged;Carcinoma, Basal Cell;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Skin Neoplasms;Treatment Outcome;Wound Healing

Transmeatal low-level laser therapy for chronic tinnitus with cochlear dysfunction. OBJECTIVES: To establish the efficacy of low-level laser therapy for tinnitus. METHODS: We performed a prospective, randomized double-blind study on 60 outpatients with tinnitus presenting sensorineural hearing loss in the affected ear. They were randomly divided into two groups, the first performing active laser therapy 20 min a day for 3 months with a 650-nm, 5-mW soft laser (group L), the second using a dummy device which duplicated all aspects of active laser therapy except for the activation of the laser beam (group C). One subject in both groups dropped out due to an increase in tinnitus loudness. Two more patients in each group ceased to comply with the protocol due to familiar problems. RESULTS: The Tinnitus Handicap Inventory (THI) was considered the main outcome measure; no statistical difference was detected between the 2 groups in the THI total score ($p = 0.97$),

and its functional (p = 0.89), emotional (p = 0.89) and catastrophic (p = 0.89) subscales. Moreover, a visual analog scale for self-perceived loudness of the tinnitus showed no difference between the groups (p = 0.69). Regarding psychoacoustic parameters, the minimum masking level showed no difference (p = 0.42), while loudness expressed in sensation level exhibited lower values in group L (p = 0.0127). Group L subjects also presented a decreased rate of hyperacusis (p = 0.02). No changes were detected in the audiometric threshold in both groups. CONCLUSIONS: Soft laser therapy demonstrated no efficacy as a therapeutic measure for tinnitus. Adult;Audiometry, Pure-Tone;Cochlear Diseases;Female;Follow-Up Studies;Humans;Loudness Perception;Low-Level Light Therapy;Male;Middle Aged;Perceptual Masking;Prospective Studies;Psychoacoustics;Severity of Illness Index;Surveys and Questionnaires;Tinnitus;Treatment Outcome

[Therapeutic and diagnostic criteria of choice of treatment methods in adenoid vegetations as a focus of chronic infection in childhood]. Clinical, laboratory and device methods were used in examinations of 175 children. Basing on the results of the above examinations, therapeutic and diagnostic criteria of choice of a method of treating adenoid vegetations in children were proposed. Benzalkonium Compounds;miramistin Adenoidectomy;Adenoids;Adolescent;Benzalkonium Compounds;Child;Child, Preschool;Chronic Disease;Diagnosis, Differential;Endoscopy;Female;Follow-Up Studies;Humans;Hypertrophy;Infections;Low-Level Light Therapy;Male;Nasopharyngeal Diseases;Retrospective Studies;Therapeutic Irrigation;Treatment Outcome

Hair removal on dark-skinned patients with pneumatic skin flattening (PSF) and a high-energy Nd:YAG laser. BACKGROUND: Permanent laser hair removal is normally performed with high-energy densities and associated with acute pain. Pneumatic skin flattening (PSF) is a new technology, which helps to control the pain during laser aesthetic treatments. Based on the gate theory of pain transmission, it activates tactile and pressure skin receptors just before the laser shot to naturally block the transmission of pain to the brain while the laser is activated. OBJECTIVE: To test the safety, pain reduction, as well as the efficacy of PSF in hair removal on patients with dark skin (mainly skin types IV, V and VI) with a high-energy Nd:YAG laser and without skin chilling. METHODS: Patients were treated for hair removal with a 1064-nm laser (GentleYAG, Candela) at energy densities of 40-44 J/cm(2). Each patient was treated on both axillae: PSF on one side and without PSF (but with a chiller) on control sites. Pain was evaluated on a 1-10 scale. Hair re-growth was counted after 12 weeks. A second treatment was delivered at that time for additional evaluation of pain and further efficacy evaluation. Post-treatment erythema and adverse effects were also noted. RESULTS: Pain reduction was demonstrated in all 28 patients: the average was 2.6 with PSF and 4.5 without PSF. Hair removal efficacy with and without PSF was identical: 78-79% hair reduction after 12 weeks (standard deviation 14% and 10% respectively, t-test: 0.78). There were no cases of adverse effects and post-treatment erythema was consistently lower with PSF. All patients preferred PSF over non-PSF treatment. CONCLUSION: The PSF technology considerably reduces pain in hair removal with high-energy Nd:YAG lasers on dark skins without side effects, while preserving efficacy. Analgesic creams and skin chilling are not required. Axilla;Hair Removal;Humans;Low-Level Light Therapy;Pain;Patient Satisfaction;Skin

Intravenous vitamin C in the treatment of post-laser hyperpigmentation for melasma: a short report. Melasma is difficult to treat. Vitamin C, topical and by iontophoresis, has been shown to be useful. When lasers are used, there is a significant incidence of post-laser hyperpigmentation. There is no single established treatment for the latter. The case history of a 51-year-old Chinese woman is presented. Intravenous vitamin C appears to be useful in treating this complication. Ascorbic Acid Ascorbic Acid;Female;Humans;Hyperpigmentation;Injections, Intravenous;Iontophoresis;Low-Level Light Therapy;Melanosis;Middle Aged

Analgesic action of laser therapy (LLLT) in an animal model. OBJECTIVES: To evaluate the analgesic effect of laser therapy on healthy tissue of mice. STUDY DESIGN: Forty-five animals were divided in three groups of 15: A--infrared laser irradiation (830 nm, Kondortech, SÃ£o Carlos, SP, Brazil); B--red laser irradiation (660 nm, Kondortech, SÃ£o Carlos, SP, Brazil); C-- ham irradiation with laser unit off. After laser application, the mice remained immobilized for the injection of 30 microl of 2% formalin in the plantar pad of the irradiated hind paw. The time that the mouse kept the hind paw lifted was measured at 5 min intervals for 30 minutes. RESULTS: Results showed statistically significant differences comparing the control group with the infrared laser group at 5, 20, 25 and 30 accumulated minutes, and with the red laser group at all time points. The analysis of partial times, at each 5 minutes, showed statistically significant differences between the control and the laser groups up to 20 minutes. CONCLUSIONS: Laser therapy had an analgesic effect and red laser had the best results. Analgesia;Animals;Low-Level Light Therapy;Male;Mice;Models, Animal

Expression of receptor activator of nuclear factor -kappaB ligand, receptor activator of nuclear factor -kappaB, and osteoprotegerin, following low-level laser treatment on deproteinized bovine bone graft in rats. The aim of this study was to investigate by immunohistochemistry the effects of low-level laser (LLL) irradiation on the expression of the receptor activator of nuclear factor -kappaB ligand (RANKL), osteoprotegerin (OPG), and the receptor activator of nuclear factor -kappaB (RANK) in deproteinized bovine bone grafts in rats. Twenty-four male Sprague-Dawley rats aged 15 weeks were allocated to either an experimental group that underwent LLL irradiation during bone healing at the bone graft sites of the rats' calvarial bone defects or a control group. In the experimental group, gallium-aluminum-arsenide (Ga-Al-As) diode LLL (wavelength 808 nm; output 96 mW) was used to irradiate three areas on and around bone defects. The radiation was administered by the contact method for 10 s at 8.3 J/cm(2), once a day for 7 days. The total dose over the complete schedule was 40.32 J. The animals were killed on days 7, 14 or 21. The results of immunohistochemical analysis showed that the expression of RANKL ($P = 0.199$), OPG ($P = 0.035$), and RANK ($P = 0.020$) in the experimental group significantly increased from day 7, with a more even distribution than in the control group, and that this difference prevailed until the end of the experiment. Bone density of the experimental group after trichrome staining was also higher than in the control group. These results suggest that LLL irradiation facilitates bone metabolism during bone healing at the sites of deproteinized bovine bone grafts in rats. Osteoprotegerin;RANK Ligand;Receptor Activator of Nuclear Factor-kappa B;Tnfrsf11b protein, rat Animals;Bone Regeneration;Bone Transplantation;Bone and Bones;Cattle;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoprotegerin;RANK Ligand;Rats;Rats, Sprague-Dawley;Receptor Activator of Nuclear Factor-kappa B;Time Factors

[Observation on therapeutic effect of low energy He-Ne laser acupoint radiation on infantile cold]. OBJECTIVE: To search for an effective therapy for infantile cold. METHODS: Two hundred and fifty-five cases were randomly divided into a laser group (n = 130) and a medication group (n = 125). The laser group were treated with lower energy He-Ne laser radiation at Tiantu (CV 22), Renying (ST 9), Dazhui (CV 14), Fengmen (BL 12), etc. and the medication group were treated mainly with oral administration of Amantadine tablets. The therapeutic effect was assessed after treatment of 5 days. RESULTS: The laser group in alleviation of cough, nasal obstruction, rhinorrhea, sputum sound were significantly better than the medication group ($P < 0.001$, $P < 0.01$); the cured rate was 68.5% in the laser group and 42.4% in the medication group, the former being better than the latter ($P < 0.001$). CONCLUSION: The low energy He-Ne laser acupoint radiation has a significant therapeutic effect on infantile cold. Acupuncture Points;Child, Preschool;Common Cold;Female;Humans;Infant;Low-Level Light Therapy;Male

[Effect of low-intensity laser radiation on neutrophils from cervical discharge of women with mycoplasma infection]. Effect of low-intensity laser radiation on the main effector functions of neutrophils from the cervical discharge was studied in women with mycoplasma infection and dysfunction of neutrophil granulocytes manifest in the first place as a reduced number of phagocytic cells and decreased intensity of phagocytosis. The fraction of intracellular active forms of oxygen in cervical neutrophils from infected women was smaller than in healthy ones. Irradiation by low-intensity laser light increased both activity of pagocytosis and intracellular generation of active oxygen forms. It is concluded that low-intensity laser radiation normalizes disturbed neutrophil function. Adult;Cervix Uteri;Female;Humans;Low-Level Light Therapy;Mycoplasma Infections;Neutrophils

[Low-intensity laser irradiation in the combined treatment of depressive disoreders in patients with chronic salpingo-oophoritis]. This study was designed to evaluate the possibility to use low-intensity laser radiation in combined therapy of somatogenic depressions in patients having gynecological problems, such as inflammatory disease of uterine appendages. It was shown that the combined treatment including administration ofantidepressants significantly accelerated the development of beneficial changes and stabilized depressive manifestations. Inclusion of low-intensity laser irradiation in the combined therapy further improved its positive effect. Nevertheless, the complete recovery could not be achieved in the absence of specific antidepressant treatment despite the alleviation of depressive symptoms. Antidepressive Agents Antidepressive Agents;Chronic Disease;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Oophoritis;Salpingitis

[Low-intensity laser irradiation of blood for the correction of disturbed lipid metabolism in airmen]. Adult;Blood;Humans;Laser Therapy;Lipid Metabolism;Lipid Peroxidation

Effect of 655-nm low-level laser therapy on exercise-induced skeletal muscle fatigue in humans. OBJECTIVE: To investigate if development of skeletal muscle fatigue during repeated voluntary biceps contractions could be attenuated by low-level laser therapy (LLLT). BACKGROUND DATA: Previous animal studies have indicated that LLLT can reduce oxidative stress and delay the onset of skeletal muscle fatigue. MATERIALS AND METHODS: Twelve male professional volleyball players were entered into a randomized double-blind placebo-controlled trial, for two sessions (on day 1 and day 8) at a 1-wk interval, with both groups performing as many voluntary biceps contractions as possible, with a load of 75% of the maximal voluntary contraction force (MVC). At the second session on day 8, the groups were either given LLLT (655 nm) of 5 J at an energy density of 500 J/cm2 administered at each of four points along the middle of the biceps muscle belly, or placebo LLLT in the same manner immediately before the exercise session. The number of muscle contractions with 75% of MVC was counted by a blinded observer and blood lactate concentration was measured. RESULTS: Compared to the first session (on day 1), the mean number of repetitions increased significantly by 8.5 repetitions (+/- 1.9) in the active LLLT group at the second session (on day 8), while in the placebo LLLT group the increase was only 2.7 repetitions (+/- 2.9) ($p = 0.0001$). At the second session, blood lactate levels increased from a pre-exercise mean of 2.4 mmol/L (+/- 0.5 mmol/L), to 3.6 mmol/L (+/- 0.5 mmol/L) in the placebo group, and to 3.8 mmol/L (+/- 0.4 mmol/L) in the active LLLT group after exercise, but this difference between groups was not statistically significant. CONCLUSION: We conclude that LLLT appears to delay the onset of muscle fatigue and exhaustion by a local mechanism in spite of increased blood lactate levels. Adult;Double-Blind Method;Exercise;Humans;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal

The effects of a 785-nm AlGaInP laser on the regeneration of rat anterior tibialis muscle after surgically-induced injury. OBJECTIVE: This study aims to investigate the effects of low-level laser

therapy (LLLT) on muscle regeneration. For this purpose, the anterior tibialis muscle of 48 male Wistar rats received AlGaInP laser treatment (785 nm) after surgically-induced injury. BACKGROUND DATA: Few studies have been conducted on the effects of LLLT on muscle regeneration at different irradiation doses. MATERIALS AND METHODS: The animals were randomized into four groups: uninjured rats (UN); uninjured and laser-irradiated rats (ULI); injured rats (IN); and injured and laser-irradiated rats (ILI). The direct contact laser treatment was started 24 h after surgery. An AlGaInP diode laser emitting 75 mW of continuous power at 785 nm was used for irradiation. The laser probe was placed at three treatment points to deliver 0.9 J per point, for a total dose of 2.7 J per treatment session. The animals were euthanized after treatment sessions 1, 2, and 4. Mounted sections were stained with hematoxylin and eosin and used for quantitative morphological analysis, in which the number of leukocytes and fibroblasts were counted over an area of 4480 mum(2). The data were statistically analyzed by analysis of variance (ANOVA) and the Bonferroni t-test. RESULTS: Quantitative data showed that the number of both polymorphonuclear and mononuclear leukocytes in the inflammatory infiltrate at the injury site was smaller in the ILI(1), ILI(2), and ILI(4) subgroups compared with their respective control subgroups (IN(1), IN(2), and IN(4)) for sessions 1, 2, and 4, respectively ($p < 0.05$). On the other hand, the number of fibroblasts increased after the fourth treatment session ($p < 0.05$). With regard to the regeneration of muscle fibers following injury, only after the fourth treatment session was it possible to find muscle precursor cells such as myoblasts and some myotubes in the ILI(4) subgroup. CONCLUSION: During the acute inflammatory phase, the AlGaInP laser treatment was found to have anti-inflammatory effects, reducing the number of leukocytes at the injury site and accelerating the regeneration of connective tissue.
Animals;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Radiation Dosage;Rats, Wistar;Regeneration;Tibia;Wound Healing

Effect of three different intensities of infrared laser energy on the levels of amino acid neurotransmitters in the cortex and hippocampus of rat brain. OBJECTIVE: The aim of this study is to investigate the effects of three different intensities of infrared diode laser radiation on amino acid neurotransmitters in the cortex and hippocampus of rat brain. BACKGROUND DATA: Lasers are known to induce different neurological effects such as pain relief, anesthesia, and neurosuppressive effects; however, the precise mechanisms of these effects are not clearly elucidated. Amino acid neurotransmitters (glutamate, aspartate, glutamine, gamma-aminobutyric acid [GABA], glycine, and taurine) play vital roles in the central nervous system (CNS). MATERIALS AND METHODS: The shaved scalp of each rat was exposed to different intensities of infrared laser energy (500, 190, and 90 mW) and then the rats were sacrificed after 1 h, 7 d, and 14 d of daily laser irradiation. The control groups were exposed to the same conditions but without exposure to laser. The concentrations of amino acid neurotransmitters were measured by high-performance liquid chromatography (HPLC). RESULTS: The rats subjected to 500 mW of laser irradiation had a significant decrease in glutamate, aspartate, and taurine in the cortex, and a significant decrease in hippocampal GABA. In the cortices of rats exposed to 190 mW of laser irradiation, an increase in aspartate accompanied by a decrease in glutamine were observed. In the hippocampus, other changes were seen. The rats irradiated with 90 mW showed a decrease in cortical glutamate, aspartate, and glutamine, and an increase in glycine, while in the hippocampus an increase in glutamate, aspartate, and GABA were recorded. CONCLUSION: We conclude that daily laser irradiation at 90 mW produced the most pronounced inhibitory effect in the cortex after 7 d. This finding may explain the reported neurosuppressive effect of infrared laser energy on axonal conduction of hippocampal and cortical tissues of rat brain.
Amino Acids;Neurotransmitter Agents Amino Acids;Animals;Cerebral Cortex;Hippocampus;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Neurotransmitter Agents;Rats

Improvement in quality of life of an oncological patient by laser phototherapy. OBJECTIVE AND BACKGROUND DATA: Common side effects of radiotherapy (RT) to the head and neck include oral mucositis, xerostomia, and severe pain. The aim of this study is to report improvement in the quality of life of an oncological patient by laser phototherapy (LPT). CLINICAL CASE AND LASER PHOTOTHERAPY PROTOCOL: The patient, a 15-year-old girl diagnosed with mucoepidermoid carcinoma, underwent surgical excision of a tumor of the left palatomaxilla. After that, she was subjected to 35 sessions of RT (2 Gy/d). Clinical examination revealed the spread of severe ulcerations to the jugal mucosa, gums, lips, hard palate, and tongue (WHO mucositis score 3). She had difficulty in moving her tongue and she was unable to eat any solid food. Oral hygiene orientation and LPT were performed throughout all RT sessions. A continuous diode laser, 660 nm, 40 mW, 6 J/cm(2), 0.24 J per point in contact mode, with spot size of 0.04 cm(2) was used in the entire oral cavity. A high-power diode laser at 1 W, 10 sec per cm of mucositis, approximately 10 J/cm(2), was used in defocused mode only on ulcerative lesions. After the first laser irradiation session, decreases in pain and xerostomia were reported; however, a more significant improvement was seen after five sessions. At that point although the mucositis score was still 2, the patient reported that she was free of pain, and consequently a palatine plate could be made to rehabilitate the entire surgical area. Seventeen laser irradiation sessions were necessary to eliminate all oral mucositis lesions. CONCLUSION: Normal oral function and consequent improvements in the quality of life of this oncologic patient were observed with LPT. Adolescent;Carcinoma, Mucoepidermoid;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Maxillary Neoplasms;Oral Ulcer;Palatal Neoplasms;Quality of Life;Radiotherapy;Stomatitis;Xerostomia

Autofluorescence of normal, benign, and malignant ovarian tissues: a pilot study. OBJECTIVE: The objective of this study is to evaluate the efficacy of laser-induced fluorescence (LIF) data obtained at 325-nm pulsed laser excitation for the discrimination of normal, benign, and malignant ovarian tissues. BACKGROUND DATA: Several studies have reported that the autofluorescence technique has a high specificity and sensitivity for discrimination between diseased and non-diseased tissues of various cancers, and also has the advantages of being non-invasive and producing a real-time diagnosis. When using this technique on ovarian tissues in most of the previously reported studies, multivariate statistical tools were used and classification analyses were carried out. MATERIALS AND METHODS: Autofluorescence spectra of normal, benign, and malignant ovarian tissues were recorded with 325-nm pulsed laser excitation in the spectral region from 350-600 nm in vitro. The spectral analysis for discrimination between the different types of tissues was carried out using principal component analysis (PCA)-based non-parametric k-nearest neighbor (k-NN) analysis. RESULTS: A total of 97 (34 normal, 33 benign, and 30 malignant) spectra were obtained from 22 subjects with normal, benign, and malignant tissues. The discrimination analysis of data using a PCA-based k-NN algorithm showed very good discrimination. The performance of the analysis was evaluated by calculating statistical parameters, specificity, sensitivity, and accuracy and were found to be 100%, 90.90%, and 94.2%, respectively. CONCLUSION: The results show that the discrimination of normal, benign, and malignant ovarian conditions can be achieved quite successfully using LIF. Algorithms;Endometriosis;Female;Fluorescence;Humans;Lasers;Low-Level Light Therapy;Ovarian Neoplasms;Ovary;Pilot Projects;Principal Component Analysis;Spectrometry, Fluorescence

Transmission electron microscopic examination of the interface between a resin-modified glass-ionomer and Er:YAG laser-irradiated dentin. OBJECTIVE: The aim of this study was to analyze the ultrastructural characteristics of the interface between a resin-modified glass ionomer (RMGI) and Er:YAG laser-irradiated dentin. BACKGROUND DATA: The Er:YAG laser has been considered as a possible alternative for cavity preparation, but the interaction between glass ionomers and Er:YAG-lased dentin still needs further investigation. MATERIALS AND METHODS: Five dentin surfaces were

prepared by diamond bur (120,000 rpm) as controls or for Er:YAG laser irradiation (31.45 J/cm(2), 200 mJ, 10 Hz, 100 micros). The RMGI Fuji II LC (GC) was then applied to their surfaces, which were previously conditioned with a 20% polyalkenoic acid conditioner. The samples were sealed with an unfilled resin, stored in distilled water for 1 wk at 37 degrees C, and then processed for transmission electron microscopic (TEM) examination. RESULTS: When applied to bur-cut dentin (controls), Fuji II LC was able to partially demineralize the dentin surface, resulting in the formation of a hybrid layer, on top of which a sub-micron gel-phase was observed. In the laser-irradiated samples, the RMGI was in close contact with the irregular dentin substrate, but no hybrid layer or gel-phase formation could be detected, nor were there signs of dentin demineralization or collagen melting. Horizontal cracks were clearly seen in the sub-surface layer of dentin. CONCLUSION: Although presenting horizontal micro-cracks in its sub-surface, the irregular laser-irradiated dentin showed close contact with the RMGI. However, no hybrid layer or gel-phase could be detected, and there were no signs of dentin demineralization and collagen melting. Dental Materials;Fuji II LC cement;Glass Ionomer Cements;Resins, Synthetic Dental Materials;Dentin;Glass Ionomer Cements;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Transmission;Resins, Synthetic

Low-intensity pulsed laser irradiation affects RANKL and OPG mRNA expression in rat calvarial cells. OBJECTIVE: This study aimed to investigate the effect of low-intensity pulsed laser (LIPL; 650 nm, 2 mW) irradiation on mRNA expression of receptor activator of NF-kappaB ligand (RANKL) and osteoprotegerin (OPG) in rat calvarial cells. MATERIALS AND METHODS: Cultured cells were treated with LIPL irradiation of 1.14 J/cm(2) (group A) or 2.28 J/cm(2) (group B), and non-irradiated cells (group C) were used as controls. The changes in cell numbers, alkaline phosphatase (ALP) activity, RANKL, and OPG mRNA expression in the three study groups was determined using MTT, UV/VIS spectrophotometry, and RT-PCR analyses. RESULTS: The cell numbers in groups A and B increased significantly (7.52% and 8.80%, respectively), as did ALP activity (71.95% and 88.20%, respectively), compared with group C ($p < 0.001$). Meanwhile, RANKL and OPG mRNA expression in group A were 51.06% lower and 3.35 times higher, respectively, than those seen in the controls ($p < 0.05$), and the RANKL:OPG mRNA ratio in group A was 81.82% lower than that in group C ($p < 0.005$). CONCLUSION: LIPL irradiation may directly promote osteoblast proliferation and differentiation, and indirectly inhibit osteoclast differentiation, by downregulating the RANKL:OPG mRNA ratio in osteoblasts. Thus LIPL irradiation may play an important role in bone remodeling, and should be valuable for the treatment of bone diseases such as osteoporosis. Osteoprotegerin;RANK Ligand;RNA, Messenger Animals;Cell Differentiation;Cell Proliferation;Cells, Cultured;Lasers;Low-Level Light Therapy;Models, Animal;Osteoprotegerin;RANK Ligand;RNA, Messenger;Rats;Rats, Sprague-Dawley;Skull

Effects of 808 nm low-power laser irradiation on the muscle contraction of frog gastrocnemius. BACKGROUND AND OBJECTIVES: The efficacy of low-power laser irradiation (LLI) on muscle fibers remains unclear; therefore, we examined the effect of LLI (808 nm: 60 or 100 mW) on muscle contraction and conducted waveform analyses of the twitch curve, including alterations in the peak amplitudes of tension (AMP), latency (LAT), contraction period (CP), and relaxation period (RP). STUDY DESIGN/MATERIALS AND METHODS: The sciatic nerve-gastrocnemius muscles of 35 frogs (Xenopus laevis) were prepared. In Experiment 1, continuous stimulation for gastrocnemius contraction was delivered to the sciatic nerve (10 minutes); the experimental group simultaneously received LLI. In Experiment 2, two sets of stimulation and cessation (2 minutes each) were repeated after the initial stimulation period (2 minutes); the experimental group received LLI during the resting period. RESULTS AND CONCLUSIONS: In Experiment 1, 60 mW LLI significantly facilitated an attenuation of AMP and maintained a smaller prolongation of CP ($P<0.05$), whereas 100 mW LLI significantly influenced a retardation of AMP attenuation and LAT prolongation ($P<0.05$). In Experiment 2, 100 mW LLI significantly influenced AMP attenuation and LAT prolongation by

retardation (P<0.05); almost no effects were obtained in the case of 60 mW LLI. These results suggest that 808 nm LLI influences both synaptic signal transmission at the neuromuscular junction and excitation-contraction coupling in the muscle fibers, but not the relaxation process. We conclude that LLI at relatively high doses can influence muscle by retarding AMP attenuation and LAT prolongation. Animals;Lasers;Muscle Contraction;Muscle, Skeletal;Xenopus laevis

The effects of low-level light emitting diode on the repair process of Achilles tendon therapy in rats. Thirty Wistar rats (350 +/- 20 g) were subjected to total Achilles tendon tenotomy of the right fore limb. They were submitted to a daily dose of 20 J/cm(2) light emitting diode (LED) (640 +/- 20 nm) therapy. The LED was applied punctually and transcutaneously to the lesioned region. The animals were separated into six groups, C1 and L1, C2 and L2, C3 and L3. The C groups were used for control and the L groups, treated for 7, 14 and 21 consecutive days, respectively. The animals were killed on the 7th, 14th and 21st days after surgery. After the animals had been killed, their tendons were extracted and dissected, fixed in formaldehyde at 10%, and sent for histological analysis by light microscopy in which the repair process was analysed. This study demonstrated that LED interfered in the repair process of the tendon tissue, reducing the number of fibroblasts in the initial periods and improving the quality of the repair in all periods studied. Achilles Tendon;Animals;Low-Level Light Therapy;Male;Phototherapy;Rats;Rats, Wistar;Time Factors;Wound Healing

Facial scars after a road accident--combined treatment with pulsed dye laser and Q-switched Nd:YAG laser. We report the case of a woman who presented with several facial scars following a road accident. Treatment was carried out using combined laser treatment with pulsed dye laser (PDL) and Q-switched neodymium:yttrium-aluminum-garnet laser (QS Nd:YAG laser). No side effects or complications from treatment were noted or reported. The patient had very good cosmetic results with this combined technique. A variety of facial scars - erythematous, pigmented, atrophic, and hypertrophic - may occur as a result of trauma, surgery, burns, and skin disease. Surgery with other adjunctive methods including radiotherapy, intralesional steroids, and pressure therapy have shown variable results. Laser treatment has been attempted for scar revision since the 1980s. The PDL is the optimal treatment for reducing scar bulk and symptoms. It also decreases erythema and telangiectasia associated with scars, normalizes the skin surface texture, and improves the scar pliability. The QS Nd:YAG laser (1064 nm) is highly effective for traumatic tattoo removal, resulting in complete clearance in the majority of cases. Accidents, Traffic;Cicatrix;Cosmetic Techniques;Facial Injuries;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Advances in plasma skin regeneration. Plasma skin regeneration (PSR) is a novel method of resurfacing that uses plasma energy to create a thermal effect on the skin. PSR is different from lasers, light sources, and ablative lasers in that it is not chromophore dependent and does not vaporize tissue, but leaves a layer of intact, desiccated epidermis that acts as a natural biologic dressing and promotes wound healing and rapid recovery. Histological studies performed on plasma resurfacing patients have confirmed continued collagen production, reduction of elastosis, and progressive skin rejuvenation beyond 1 year after treatment. PSR has received US Food and Drug Administration 510 (k) clearance for treatment of rhytides of the body, superficial skin lesions, actinic keratoses, viral papillomata, and seborrheic keratoses. PSR also has beneficial effects in the treatment of other conditions including dyschromias, photoaging, skin laxity, and acne scars. The safety profile of PSR is excellent, and there have been no reports of demarcation lines in perioral, periorbital, or jawline areas, as can sometimes be observed following CO2 resurfacing. PSR is effective in improving facial and periorbital rhytides and can be used on nonfacial sites, including the hands, neck, and chest. Numerous treatment protocols with variable energy settings allow for individualized treatments and provide the operator with fine control over the degree of injury and length of

subsequent recovery time. Endothelium-Dependent Relaxing Factors;Nitric Oxide Cosmetic Techniques;Endothelium-Dependent Relaxing Factors;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Nitric Oxide;Regeneration;Rejuvenation;Skin Aging;Treatment Outcome;United States;United States Food and Drug Administration;Wound Healing

Treatment of refractory dermal melasma with the MedLite C6 Q-switched Nd:YAG laser: two case reports. OBJECTIVE: Dermal melasma in Fitzpatrick skin types III-V usually does not respond to topical treatments. Laser resurfacing often either fails to treat these lesions or results in severe postinflammatory hyperpigmentation (PIH) or permanent hypopigmentation. Two cases of refractory dermal melasma are reported, which responded to treatment with the MedLite C6 Q-switched Nd:YAG laser. METHODS: Case 1: A 50-year-old Asian female with refractory dermal melasma and severe PIH received 10 weekly laser treatments combined with 7% alpha arbutin and a broad-spectrum sunscreen. Case 2: A 45-year-old Asian female with refractory dermal melasma received 10 weekly laser treatments combined with 7% alpha arbutin and a broad-spectrum sunscreen. RESULTS: In both cases, there was a greater than 80% reduction in epidermal and dermal hyperpigmentation. The melanin index at the site of the lesions decreased from 50 to 35 and 45 to 33, respectively. There was no recurrence of melasma at 1 year (case 1) or 6 months (case 2). CONCLUSION: Even in cases of long-standing refractory dermal melasma in a darker skin type, combination therapy has been shown to be an effective treatment for this difficult condition. Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Melanosis;Middle Aged;Skin Pigmentation

Laser photorejuvenation of Asian and ethnic skin. Laser therapy of Asian and ethnic skin has been relatively poorly studied in the literature. Owing to particular physiologic aspects of darker skin, the physical properties of currently available lasers, and the nature of laser-tissue interactions, the use of lasers to treat chronological and photodamage in such patients may be challenging and fraught with complications. Nevertheless, both ablative and non-ablative technologies have been used successfully to address various cosmetic concerns. This article is a review of skin physiology and laser-tissue interactions in Asian and ethnic skin, particular aesthetic concerns and medical pre- and postoperative considerations in such patients, and a summary of the past 20 years of experience with ablative and non-ablative technologies for effective and safe photorejuvenation. Asian People;Cosmetic Techniques;Ethnicity;Humans;Low-Level Light Therapy;Skin Aging;Skin Pigmentation

Morphometric and histological analysis of low-power laser influence on bone morphogenetic protein in bone defects repair. Bone morphogenetic proteins (BMPs) are secreted signaling molecules belonging to the transforming growth factor-beta (TGF-beta) superfamily. The objective of this study was to determine how gallium-aluminum-arsenium (GaAlAs) 650 nm laser influenced the action of BMPs on bone defects created in rat femurs. The sample consisted of 24 male albino Wistar rats. Group 1 was composed of rats with bone defects filled with bone-inducing substance, with the application of low-power laser. Group 2 contained rats with bone defects filled with a bone-inducing substance, without the application of low-power laser. Group 3 rats had bone defects not filled with a bone-inducing substance, with the application of low-power laser. Group 4 rats had bone defects and no treatment (control group). A bone defect was produced with drills. In groups 1 and 2 the defects were filled with a bone-inducing substance. The animals were treated with GaAlAs (50 mW) laser, energy density 4 J/cm(2), for 80 ss on a 1 cm(2) area. Groups 2 and 4 were used as control. Bone samples were removed for histological procedures and morphometric analysis on the 7th, 14th and 21st days after surgery. Results obtained were subjected to statistical analysis. Rejection level for the null hypothesis was 0.05. Statistical differences were found in the comparison between group 1 (G1), G2, G3 and G4 [analysis of variance (ANOVA); $P < 0.0134$]. There was a statistically significant correlation between groups 1 and 4 ($P < 0.01$). The results of other correlations by Tukey's post-hoc test were: group 1 vs group 3 ($P = 0.341$), group 1 vs group 2 ($P = 0.862$), group 2 vs group 4 ($P =$

0.061), group 2 vs group 3 (P = 0.744), and group 3 vs group 4 (P = 0.249). We concluded that the association of low-power laser with a bone-inducing substance produced better results than when low-power laser or BMPs were used alone. Bone Morphogenetic Proteins;Bone Substitutes Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Substitutes;Bone and Bones;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar

The effect of low-level laser irradiation on dog spermatozoa motility is dependent on laser output power. Biological tissues respond to low-level laser irradiation and so do dog spermatozoa. Among the main parameters to be considered when a biological tissue is irradiated is the output power. We have studied the effects on sperm motility of 655 nm continuous wave diode laser irradiation at different output powers with 3.34 J (5.97 J/cm(2)). The second fraction of fresh dog sperm was divided into five groups: control, and four to be irradiated with an average output power of 6.8 mW, 15.4 mW, 33.1 mW and 49.7 mW, respectively. At 0 min and 45 min after irradiation, pictures were taken and a computer aided sperm analysis (CASA) performed to analyse different motility parameters. The results showed that different output powers affected dog semen motility parameters differently. The highest output power showed the most intense effects. Significant changes in the structure of the motile sperm subpopulation were linked to the different output powers used. Animals;Dogs;In Vitro Techniques;Low-Level Light Therapy;Male;Optical Phenomena;Sperm Count;Sperm Motility;Spermatozoa

Clinical and radiographic investigation of the adjunctive effects of a low-power He-Ne laser in the treatment of moderate to advanced periodontal disease: a pilot study. OBJECTIVE: To evaluate the adjunctive effect of a low-power He-Ne laser in the non-surgical periodontal treatment of patients with moderate to advanced chronic periodontitis. BACKGROUND DATA: Laser applications in dental treatment are now more common in the literature. However, limited data are available on the potential effects of the low-power laser as an adjunct to non-surgical periodontal therapy for managing patients with moderate to advanced periodontal disease. MATERIALS AND METHODS: Sixteen patients with probing pocket depth (PPD) > or =5 mm and comparable bone defects on both sides of the mouth were recruited. Supragingival plaque (PL), bleeding on probing (BOP), PPD, and probing attachment level (PAL) were recorded at baseline and at 3, 6, 9, and 12 mo, while gingival crevicular fluid (GCF) samples and standardized intra-oral radiographs for digital subtraction radiography were taken at baseline and at 1, 3, 6, 9, and 12 mo. After non-surgical mechanical periodontal treatment, the test sites were selected randomly and irradiated with a low-power He-Ne laser (output power 0.2 mW) for 10 min for a total of eight times in the first 3-mo period, while the control sites received no additional treatment. RESULTS: PL percentage (83-16%) and BOP percentage (95-34%) decreased significantly after 12 mo. Statistically significant changes in reductions of PPD and GCF volume, gain in PAL, and increase in recession were seen in both test and control sites when compared to baseline ($p < 0.05$). No statistically significant differences in any clinical parameters or radiographic findings were found between the test and control sites. Changes in GCF volume were significant only at 3 mo in the test sites. CONCLUSION: Within the limits of this pilot study, the use of the low-power He-Ne laser as an adjunct to non-surgical periodontal therapy in patients with moderate to advanced chronic periodontitis did not seem to provide additional clinical benefit. Adult;Chronic Periodontitis;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Periodontal Pocket;Pilot Projects;Radiography

Effect of low-level laser therapy on mast cells in viability of the transverse rectus abdominis musculocutaneous flap. OBJECTIVE: To assess the effect of low-level laser therapy (LLLT) on viability of mast cells of the transverse rectus abdominis musculocutaneous (TRAM) flap. BACKGROUND DATA: LLLT has been recently used on the TRAM flap to stimulate mast cells. MATERIALS AND METHODS: Eighty-four Wistar rats were randomly divided into seven groups of 12

rats in each: group 1 (sham laser therapy); group 2 received 3 J/cm(2) at one point; group 3 received 3 J/cm(2) at 24 points; group 4 received 72 J/cm(2) at 1 point; group 5 received 6 J/cm(2) at 1 point; group 6 received 6 J/cm(2) at 24 points; and group 7 received 144 J/cm(2) at 1 point. All experimental groups underwent LLLT immediately after TRAM surgery and on the next two following days, for three sessions in total. The percentage of the area of skin flap necrosis was calculated on the fourth postoperative day and two samples of skin were collected from each rat with a 1-cm(2) punch to perform mast cell evaluations with toluidine blue dye. RESULTS: Statistically significant differences were found in the percentage of necrosis, and higher values were seen in group 1 than in all other groups. Among groups 3-7 no statistically significant differences were found ($p < 0.292$). For mast cells, when group 1 was compared to groups 5 (6 J/cm(2) at 1 point) and 7 (144 J/cm(2) at 1 point), it had fewer mast cells. CONCLUSION: LLLT at a wavelength of 670 nm was effective at reducing the necrotic area, and we found that it can stimulate mast cells growth to increase vascular perfusion. Animals;Cell Survival;Graft Survival;Low-Level Light Therapy;Male;Mast Cells;Models, Animal;Rats;Rats, Wistar;Rectus Abdominis;Skin;Surgical Flaps

Study of autonomic nervous activity of night shift workers treated with laser acupuncture. OBJECTIVE: The aim of this study was to evaluate the impact of laser acupuncture on the autonomic nervous system (ANS) of the night shift worker. BACKGROUND DATA: Many articles have demonstrated that levels of affective disorders and stress are high in night shift workers. We applied laser energy to the Neiguan point (PC6) to examine the impact of laser acupuncture on the ANS of 45 healthy young males who were night shift workers and evaluated their heart-rate variability (HRV). MATERIALS AND METHODS: The laser group (n = 15) received laser acupuncture (9.7 J/cm(2), 830 nm) for 10 min, and the placebo group (n = 15) received sham laser treatment. The effects before and after this intervention on the HRV of the subjects were assessed, along with those seen after 30 min of lying down. RESULTS: After treatment and after the 30-min rest period, the independent-sample t-test showed that both groups exhibited statistically significant differences in high-frequency (HF) HRV, low-frequency (LF) HRV, and the LF:HF ratio of HRV ($p < 0.05$). Compared with the placebo group, the paired-samples t-test showed that after laser treatment the treatment group had a statistically significant improvement in HF HRV ($p = 0.001$), LF HRV ($p = 0.001$), and the LF:HF HRV ratio ($p = 0.02$). CONCLUSIONS: Laser acupuncture stimulation applied to the Neiguan point increased vagal activity and suppression of cardiac sympathetic nerves. This effect was positive and could be used to help patients who have circadian rhythm disorders. Acupuncture Therapy;Autonomic Nervous System;Circadian Rhythm;Double-Blind Method;Heart Rate;Hemodynamics;Humans;Low-Level Light Therapy;Male;Young Adult

Histologic study of the effect of laser therapy on bone repair. AIM: This study used histologic analysis and HE staining to evaluate laser biomodulation of bone repair in cavities made in the femurs of rats that underwent non-ablative laser irradiation. METHODS AND MATERIALS: Eighteen male Wistar rats weighing 300 to 400 grams were randomly assigned to three groups of six animals each. A surgical defect site was produced with a trephine about 2 mm in diameter under abundant irrigation. In Group I the complete surgical protocol to produce a bone defect was followed but without laser radiation (control). In Group II a continuous wave 830 nm infrared laser was used at 10 J/cm2 and 50 mW at each point of the surgical site. In Group III a continuous wave 685 nm infrared laser at 10J/cm2 and 35 mW was used at each point of surgical site. The animals were irradiated at intervals of 48 hours beginning immediately after the preparation of the defect and were sacrificed on the 15th, 21st, and 30th days. Slides were studied by means of descriptive analysis. RESULTS: Greater degrees of new bone formation and vertical regeneration were found in the irradiated groups than in the control group. CONCLUSION: Laser therapy in this study protocol was efficient in promoting bone repair. CLINICAL SIGNIFICANCE: The use of laser technology has been used to improve the clinical

results of bone surgeries and to promote a more comfortable postoperative period and quicker healing. Animals;Bone Regeneration;Femur;Infrared Rays;Lasers;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Wound Healing
Efficacy of low-level laser therapy in the treatment of temporomandibular disorder. AIMS: To evaluate the effectiveness of low-level laser therapy (LLLT) in patients presenting with temporomandibular disorder (TMD) in a random and placebo-controlled research design. METHODS: The sample consisted of 40 patients, divided into an experimental group (G1) and a placebo group (G2). The treatment was done with an infrared laser (830nm, 500mW, 20s, 4J/point) at the painful points, once a week for four consecutive weeks. The patients were evaluated before and after the treatment through a Visual Analogue Scale (VAS) and the Craniomandibular Index (CMI). RESULTS: The baseline and posttherapy values of VAS and CMI were compared by the paired T-test, separately for the placebo and laser groups. A significant difference was observed between initial and final values ($p < 0.05$) in both groups. Baseline and post-therapy values of pain and CMI were compared in the therapy groups by the two-sample T-test, yet no significant differences were observed regarding VAS and CMI ($p > 0.05$). CONCLUSION: After either placebo or laser therapy, pain and temporomandibular symptoms were significantly lower, although there was no significant difference between groups. The low-level laser therapy was not effective in the treatment of TMD, when compared to the placebo. Adult;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Temporomandibular Joint Disorders;Treatment Failure
Generation of effective vaccines against liver cancer by using photodynamic therapy. Preclinical studies have shown that photodynamic therapy (PDT) enhances immune responses. To examine the role of the direct effects of PDT in liver cancer with regard to enhancement of the antitumor response, we injected PDT-generated H22 liver cancer cell lysate (as a tumor vaccine) intradermally into Kunming mice. In the control group, the cell lysate was substituted with normal saline solution. A liver tumor model was established by the injection of H22 cell suspension. We found that the PDT-generated vaccine significantly increased the percentages of CD4(+), CD8(+), and CD19(+) cells, inhibited tumor growth, and prolonged the survival time. Our findings suggest that PDT-generated vaccines can significantly enhance the antitumor immune response and may have the potential to be used as an adjuvant therapy clinically. Cancer Vaccines;Photosensitizing Agents Animals;Cancer Vaccines;Cell Line, Tumor;Combined Modality Therapy;Female;Immunity, Cellular;Liver Neoplasms, Experimental;Low-Level Light Therapy;Lymphocyte Subsets;Male;Mice;Photochemotherapy;Photosensitizing Agents
Innovative approach to laser acupuncture therapy of acute obstruction in asthmatic children. A prospective randomized study encompassed 100 patients with asthma in the stage of acute bronchial obstruction, 7 to 17 years of age, of both sexes and with the similar rate of attack severity. The patients were spirometrically monitored (FVC, FEV1, PEF and FEF 25-75%) by a pediatrician-pulmonologist for 12 days. Fifty patients were subjected to conservative drug therapy, whereas other 50 patients additionally underwent the Su Jok therapy according to the 6-Ki principles, applying laser ray at the acupuncture points in the hand. After 12 days of treatment the group, in which both therapy methods were applied, reached the range of referent values for all investigated parameters. In the same period of time the group undergoing only conservative drug therapy retained values below the reference ones for the given age for 3 (FEV1, PEFR and FEF 25-75%) out of 5 investigated parameters. The obtained results differed from the group subjected to the combined therapy with the high rate of statistical significance. On the basis of the obtained results the efficacy of the 6-Ki technique of Su Jok therapy was confirmed as the therapeutic method supplementary to the conservative drug therapy in the treatment of acute bronchial obstruction in asthmatic children,

provided that therapy is carried out in stationary conditions and under constant spirometric surveillance of the patient. Acupuncture Therapy;Adolescent;Asthma;Child;Female;Forced Expiratory Volume;Humans;Low-Level Light Therapy;Male;Maximal Midexpiratory Flow Rate;Peak Expiratory Flow Rate

Low-power laser irradiation inhibiting Abeta25-35-induced PC12 cell apoptosis via PKC activation. Apoptosis is a contributing pathophysiological mechanism of Alzheimer's disease (AD). Recently, low-power laser irradiation (LPLI) has been applied to moderate AD, but the underlying mechanism remains unknown. In this study, the techniques of fluorescence resonance energy transfer (FRET) and real-time quantitative RT-PCR were used to investigate the anti-apoptotic mechanism of LPLI. Rat pheochromocytoma (PC12) cells were treated with amyloid beta 25-35 (Abeta(25-35)) for induction of apoptosis before LPLI treatment. The cell viability assays and morphological examinations show that low fluence of LPLI (0.156 J/cm(2)-0.624 J/cm(2)) could inhibit the cells apoptosis. An increase of PKC activation was dynamically monitored in the cells treated with PMA (specific activator of PKC), LPLI only or Abeta(25-35) followed by 5 min LPLI treatment, respectively. However, the effect of LPLI activating PKC could be inhibited by Go 6983 (specific inhibitor of PKC). Similar results were obtained by using Western blot analysis. Furthermore, LPLI involved an increase in mRNA of the cell survival member bcl-xl and a decrease in the up-regulation of cell death member bax mRNA caused by Abeta(25-35). Further data show that low fluence of LPLI could reverse the increased level of bax/bcl-xl mRNA ratio caused by Abeta(25-35) treatment. In addition, Go 6983 could inhibit the decreased level of bax/bcl-xl mRNA ratio. Taken together, these data clearly indicate that LPLI inhibited Abeta(25-35)-induced PC12 cell apoptosis via PKC-mediated regulation of bax/bcl-xl mRNA ratio. Amyloid beta-Peptides;Peptide Fragments;Protein Kinase Inhibitors;RNA, Messenger;bcl-2-Associated X Protein;bcl-X Protein;Protein Kinase C;Bisbenzimidazole Amyloid beta-Peptides;Animals;Apoptosis;Bisbenzimidazole;Cell Proliferation;Cell Survival;Enzyme Activation;Gene Expression Regulation;Low-Level Light Therapy;Models, Biological;Nucleic Acid Denaturation;PC12 Cells;Peptide Fragments;Protein Kinase C;Protein Kinase Inhibitors;RNA, Messenger;Rats;bcl-2-Associated X Protein;bcl-X Protein

Effect of low intensity helium-neon (HeNe) laser irradiation on experimental paracoccidioidomycotic wound healing dynamics. The effect of HeNe laser on the extracellular matrix deposition, chemokine expression and angiogenesis in experimental paracoccidioidomycotic lesions was investigated. At days 7, 8 and 9 postinfection the wound of each animal was treated with a 632.8 nm HeNe laser at a dose of 3 J cm(-2). At day 10 postinfection, the wounds were examined by using histologic and immunohistochemical methods. Results revealed that laser-treated lesions were lesser extensive than untreated ones, and composed mainly by macrophages and lymphocytes. High IL-1beta expression was shown in the untreated group whereas in laser-treated animals the expression was scarce. On the other hand, the expression of CXCL-10 was found to be reduced in untreated animals and quite intensive and well distributed in the laser-treated ones. Also, untreated lesions presented vascular endothelial growth factor (VEGF) in a small area near the center of the lesion and high immunoreactivity for hypoxia-inducible factor-1 (HIF-1), whereas laser-treated lesions expressed VEGF surrounding blood vessels and little immunoreactivity for HIF-1. Laser-treated lesions presented much more reticular fibers and collagen deposition when compared with the untreated lesion. Our results show that laser was efficient in minimizing the local effects observed in paracoccidioidomycosis and can be an efficient tool in the treatment of this infection, accelerating the healing process. Chemokine CXCL10;Cxcl10 protein, mouse;Interleukin-1beta;Interleukin-10 Animals;Chemokine CXCL10;Interleukin-10;Interleukin-1beta;Lasers, Gas;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Paracoccidioidomycosis;Wound Healing

Fractional laser skin therapy. Modern treatment of chronically photodamaged skin provides new, minimally invasive methods for laser intervention, using fractional, non-ablative thermal energy for an induction of dermal remodeling. The clinical efficacy coupled with a minimum "down time" for the patient has directed the development of fractional ablative laser systems. Recently introduced systems are based on CO(2) and heated Er:YAG laser systems. The clinical efficacy has been tested on one prototype each and verified their effects at a microscopic level. Initial reports suggest the results are comparable to those achieved with fractional ablative systems. We review the current possibilities incorporating our personal experience. Systematic investigations of clinical outcomes with various system settings are still needed. The possible combination of ablative and non-ablative fractional technology may also lead to increased efficacy and safety of the procedure.
Dermatology;Humans;Low-Level Light Therapy;Skin Aging

Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy

Evaluation of low-level laser therapy of osteoblastic cells. OBJECTIVE: The purpose of the present study was to evaluate the effect of biomodulation on osteoblastic cells using a gallium-aluminium-arsenide diode laser. BACKGROUND DATA: Low-level laser therapy (LLLT) is a non-pharmacological therapeutic resource to which biological tissues respond well, producing such effects as the acceleration of bone formation and bone repair. MATERIALS AND METHODS: Osteoblastic cell cultures (OFCOL II) were irradiated with a gallium-aluminium-arsenide diode laser (GaAlAs lambda = 830 nm; 50 mW; 3 J/cm(2); 600-microm-diameter optical fiber) and divided into two groups: group 1--irradiated cells, and group 2--non-irradiated cells. Irradiation occurred at 24-h intervals for a total of 3 d. After each interval, the cells were marked with Mito Tracker Orange dye to assess the biostimulatory effect on mitochondrial activity and cell proliferation using an MTT assay. RESULTS: Intense grouping of mitochondria in the perinuclear region was observed at 24 h and 48 h following irradiation. Changes from a filamentous to a granular appearance in mitochondrial morphology and mitochondria distributed throughout the cytoplasm were observed 72 h following proliferation. Such changes led to an in vitro proliferation process, as confirmed by the MTT assay. CONCLUSION: LLLT has shown itself capable of altering mitochondrial activity and the population of OFCOL II cells.
Animals;Cell Culture Techniques;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mitochondria;Osteoblasts

Low-level laser therapy in the prevention and treatment of chemotherapy-induced oral mucositis in young patients. OBJECTIVE: A pilot clinical study was conducted to evaluate the efficacy and feasibility of low-level laser therapy (LLLT) in the prevention and treatment of chemotherapy (CT)-induced oral mucositis (OM) in young patients. BACKGROUND DATA: Besides compromising the patient's nutrition and well-being, oral mucositis represents a portal of entry into the body for microorganisms present in the mouth, which may lead to sepsis if there is hematological involvement. Oncologic treatment tolerance decreases and systemic complications may arise that interfere with the success of cancer treatment. LLLT appears to be an interesting alternative to other approaches to treating OM, due to its trophic, anti-inflammatory, and analgesic properties. MATERIALS AND METHODS: Patients undergoing chemotherapy (22 cycles) without mucositis were randomized into a group receiving prophylactic laser-irradiation (group 1), and a group receiving placebo light treatment (group 2). Patients who had already presented with mucositis were placed in a group receiving irradiation for therapeutic purposes (group 3, with 10 cycles of CT). Serum granulocyte levels were taken and compared to the progression of mucositis. RESULTS: In group 1, most patients (73%) presented with mucositis of grade 0 ($p = 0.03$ when compared with the placebo group), and 18% presented with grade 1. In group 2, 27% had no OM and did not require therapy. In group 3, the patients had marked pain relief (as assessed by a visual analogue scale), and a decrease

in the severity of OM, even when they had severe granulocytopenia. CONCLUSION: The ease of use of LLLT, high patient acceptance, and the positive results achieved, make this therapy feasible for the prevention and treatment of OM in young patients. Adolescent;Antineoplastic Combined Chemotherapy Protocols;Child;Feasibility Studies;Female;Granulocytes;Humans;Leukocyte Count;Low-Level Light Therapy;Male;Mouth Mucosa;Pilot Projects;Prospective Studies;Stomatitis;Treatment Outcome;Young Adult

The effects of low level laser in clinical outcome and neurophysiological results of carpal tunnel syndrome. OBJECTIVES: Carpal tunnel syndrome (CTS) is the most common neuropathy that can be diagnosed with confidence by the nerve conduction study (NCS). One of the recent treatments of CTS is the application of low power laser (LPL) therapy. The present study evaluates the effects of LPL irradiation through NCS and clinical signs and symptoms. METHODS: A total of 80 patients were included in this study. Diagnosis of CTS was based on both clinical examination and electromyographic (EMG) findings. Patients were randomly assigned into two groups. Test group (group A) underwent laser therapy (9-11 joules/cm2) over the carpal tunnel area. Control group (group B) received sham laser therapy. Pain, hand grip strength, median proximal sensory and motor latencies, transcarpal median sensory nerve conduction (SNCV) were recorded. After fifteen sessions of irradiation (five times per week), parameters were recorded again and clinical symptoms were measured in both groups. Pain was evaluated by Visual Analog Scale (VAS; day-night). Hand grip was measured by Jamar dynometer. Paired t-test and independent sample t-test were used for statistical analysis. RESULTS: There was a significant improvement in clinical symptoms and hand grip in group A ($p < 0.001$). Proximal median sensory latency, distal median motor latency and median sensory latencies were significantly decreased ($p < 0.001$). Transcarpal median SNCV increased significantly after laser irradiation ($p < 0.001$). There were no significant changes in group B except changes in clinical symptoms ($p < 0.001$). CONCLUSIONS: Laser therapy as a new conservative treatment is effective in treating CTS paresthesia and numbness and improves the subjects' power of hand grip and electrophysiological parameters. Adult;Carpal Tunnel Syndrome;Cohort Studies;Electromyography;Female;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Neural Conduction;Reaction Time;Recovery of Function;Treatment Outcome

[Low-energy semiconductor laser intranasal irradiation of the blood improves blood coagulation status in normal pregnancy at term]. OBJECTIVE: To explore the effect of low-energy semiconductor laser intranasal irradiation of the blood on blood coagulation status in healthy pregnant women at term. METHODS: Low-energy semiconductor laser was introduced into the nasal cavity in 126 healthy pregnant women at term and 123 healthy young unmarried women as the control group. The plasma prothrombin time (PT), activated partial thromboplastin time (APTT), thrombin time (TT), and fibrinogen levels were examined using transmissive turbidimetry after the therapy. RESULTS: PT, APTT and TT levels were significantly lowered, whereas fibrinogen level significantly increased in the healthy pregnant women before the laser therapy as compared with those in the control group ($P<0.01$). After intranasal laser therapy, these parameters were significantly improved in the healthy pregnant women ($P<0.05$) although there were differences from those of the control group. CONCLUSION: Low-energy semiconductor laser intranasal irradiation of the blood can effectively improve high blood coagulation status in healthy pregnant women at term. Adult;Blood Coagulation;Blood Coagulation Tests;Female;Humans;Labor Onset;Low-Level Light Therapy;Nasal Cavity;Partial Thromboplastin Time;Pregnancy;Prothrombin Time;Semiconductors;Thrombin Time;Young Adult

Attenuation of TCDD-induced oxidative stress by 670 nm photobiomodulation in developmental chicken kidney. 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), a potent developmental teratogen inducing oxidative stress and sublethal changes in multiple organs, provokes developmental renal

injuries. In this study, we investigated TCDD-induced biochemical changes and the therapeutic efficacy of photobiomodulation (670 nm; 4 J/cm(2)) on oxidative stress in chicken kidneys during development. Eggs were injected once prior to incubation with TCDD (2 pg/g or 200 pg/g) or sunflower oil vehicle control. Half of the eggs in each dose group were then treated with red light once per day through embryonic day 20 (E20). Upon hatching at E21, the kidneys were collected and assayed for glutathione peroxidase, glutathione reductase, catalase, superoxide dimutase, and glutathione-S-transferase activities, as well as reduced glutathione and ATP levels, and lipid peroxidation. TCDD exposure alone suppressed the activity of the antioxidant enzymes, increased lipid peroxidation, and depleted available ATP. The biochemical indicators of oxidative and energy stress in the kidney were reversed by daily phototherapy, restoring ATP and glutathione contents and increasing antioxidant enzyme activities to control levels. Photobiomodulation also normalized the level of lipid peroxidation increased by TCDD exposure. The results of this study suggest that 670 nm photobiomodulation may be useful as a noninvasive treatment for renal injury resulting from chemically induced cellular oxidative and energy stress. Antioxidants;Polychlorinated Dibenzodioxins;Reactive Oxygen Species;Teratogens;Adenosine Triphosphate;Glutathione Peroxidase;Superoxide Dismutase;Glutathione Reductase;Glutathione Transferase;Glutathione Adenosine Triphosphate;Animals;Antioxidants;Chick Embryo;Glutathione;Glutathione Peroxidase;Glutathione Reductase;Glutathione Transferase;Kidney;Lipid Peroxidation;Organ Size;Oxidative Stress;Phototherapy;Polychlorinated Dibenzodioxins;Reactive Oxygen Species;Superoxide Dismutase;Teratogens

[Low-intensity laser irradiation-induced rat breast morphological changes]. [The paper presents the characteristics of breast parenchyma and stromal morphological changes in non-inbred albino rats exposed to various low-intensity laser irradiation modes] Animals;Lasers;Male;Mammary Glands, Animal;Rats

A possible mechanism for visible light-induced wound healing. BACKGROUND AND OBJECTIVES: Chronic wounds resistant to conventional therapy have been treated successfully with low energy lasers and light emitting diodes (LEDs) in the visible and near IR region. It has been proposed that production of low level reactive oxygen species (ROS) following illumination is the first step of photobiomodulation. It was also shown that white light (400-800 nm) has similar stimulatory effects as lasers and LEDs. ROS at higher levels are toxic to cells and bacteria. STUDY DESIGN/MATERIALS AND METHODS: In the present study, we examined the phototoxicity of broadband (400-800 nm, 120 J/cm(2)) visible light on the survival of several pathogenic bacteria: Staphylococcus aureus 195, Pseudomonas aeruginosa 1316, Escherichia coli 1313, and Serratia marcescens. These bacteria were chosen due to their high prevalence in infected wounds. The survival of bacterial cells following illumination was monitored by counting the number of colony forming units before and after exposure to light. RESULTS: Illumination with white light, 120 J/cm(2), caused a reduction of 62%, 83%, and 56% in the colony count of E. coli 1313, S. aureus 195 and S. marcescens, respectively, though no reduction in the viability of P. aeruginosa 1316 was demonstrated. The phototoxic effect was found to involve induction of ROS production by the bacteria. It was also found that illumination of S. aureus 195 and E. coli 1313 in the presence of pyocyanin, known to be secreted by P. aeruginosa, had a stronger bactericidal effect compared to illumination alone. CONCLUSION: Visible light at high intensity can kill bacteria in infected wounds. Thus, illumination of infected wounds with intense visible light, prior to low intensity illumination for stimulating wound closure, may reduce infection and promote healing. Bacteria;Light;Wound Healing

Topical delivery of methotrexate via skin pretreated with physical enhancement techniques: low-fluence erbium:YAG laser and electroporation. BACKGROUND AND OBJECTIVE: The high hydrophilicity and molecular weight of methotrexate (MTX) make it difficult to deliver via the skin

route for treating psoriasis or rheumatoid arthritis. The objective of this study was to enhance and optimize the skin permeation of MTX using two physical techniques: an erbium:yttrium-aluminum-garnet (Er:YAG) laser and electroporation. METHODS: In vitro skin permeation was performed using horizontal side-by-side diffusion cells. The animal model utilized nude mice. The skin where epidermal hyperproliferation was reproduced by repeated barrier abrogation was also used as a permeation barrier for MTX delivery. RESULTS: Application of the laser and electroporation significantly enhanced the permeation of MTX. The enhancing effect was more pronounced after applying the laser. Er:YAG laser pretreatment on the skin produced a 3- to 80-fold enhancement dependent upon the magnitude of the laser fluence. Using electroporation, treatment with 10 pulses resulted in a twofold increase in MTX flux. A combination of laser pretreatment and subsequent electroporation for 10 minutes resulted in a higher drug permeation than either technique alone. However, this synergistic effect was only observed when the lower laser fluence (1.4 J/cm(2)) was applied. Hyperproliferative skin generally showed a greater variability of MTX flux and lower permeation. CONCLUSION: The results shown in the present study encourage further investigation of laser- and electroporation-assisted topical drug delivery. Dermatologic Agents;Methotrexate Administration, Topical;Animals;Dermatologic Agents;Electroporation;Female;Lasers, Solid-State;Low-Level Light Therapy;Methotrexate;Mice;Mice, Nude;Skin

Low density, non-ablative fractional CO2 laser rejuvenation. BACKGROUND AND OBJECTIVES: Fractional skin rejuvenation has gained increased interest since its introduction in 2003. Both non-ablative and ablative lasers as well as different treatment techniques have been devised. Recent clinical studies indicate that a paradigm of low spot density combined with high fluences tend to produce better clinical results and less risk of post-inflammatory hyperpigmentation in darker skin types. The present study is focused on investigations of the clinical outcome by non-ablative fractional CO(2) treatments with a single pass with low spot density. METHODS AND MATERIALS: A CO(2) laser was equipped with a scanner enabling it to perform fractional treatments with 36, 64 or 100 microthermal zones (MTZ)/cm(2). Twelve patients participated in the study. The perioral area was treated three times with 1-month intervals using a spot density of 64 MTZ/cm(2), a spot diameter of 0.5 mm, a micro-beam energy of 36-60 mJ, and a pulse duration of 3-5 milliseconds. Follow-up was performed 3 months after the last treatment. RESULTS: At the 3-month follow-up 72.7% of the volunteers had obtained improvement in ultrasonographically determined dermal density, and the average improvement was 40.2% (SD: 48.0%). This improvement was statistically significant ($P<0.006$). Eighty percent of the volunteers rated the reduction in visible perioral wrinkles to be fair, good or excellent. For reduction of irregular pigmentation, fair, good or excellent clearance was reported by 62.5% of the volunteers. CONCLUSIONS: The present study demonstrates subjective improvements in wrinkles, skin texture and mottled pigmentation as well as statistically significant objectively measured improvements in ultrasonographical dermal density after three non-ablative fractional CO(2) laser treatments. Adult;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Rejuvenation;Rhytidoplasty

Anti-Inflammatory effects of low-level laser therapy (660 nm) in the early phase in carrageenan-induced pleurisy in rat. BACKGROUND AND OBJECTIVE: In the classic model of pleurisy there is little evidence about the anti-inflammatory effects of low-level laser therapy (LLLT) as well the dosage characteristics, such as wavelength, total energy, number and pattern of treatment. In this study we investigated the potential effects of LLLT on modulating the pro-inflammatory and anti-inflammatory mediators of acute inflammation in a rat pleurisy model. STUDY DESIGN/MATERIALS AND METHODS: A sample of 48 female Wistar rats were divided into control and experiential groups. An inflammation was induced by carrageenan (0.2 ml) injected into the pleural cavity. At 1, 2, and 3 hours after induction a continuous wave (20 mW) diode laser of the InGaAlP (660 nm) type was used in the four

laser groups with different doses and treatment patterns. One group received a single dose of 2.1 J and the other three groups received a total energy of 0.9, 2.1, and 4.2 J. Four hours later the exudate volume, total and differential leukocytes, protein concentration, NO, IL-6, IL-10, TNF-alpha, and MCP-1 were measured from the aspirated liquid. RESULTS: All the treatment patterns and quantity of energy studied show significant reduction of the exudate volume ($P<0.05$). Using energy of 0.9 J only NO, IL-6, MCP-1 and IL-10 are significantly reduced ($P<0.05$). On the other hand, higher energies (2.1 and 4.2 J) significantly reduce all variables independently of the treatment pattern. The neutrophil migration has a straight correlation with the TNF-alpha ($r = 0.551$) and NO ($r = 0.549$) concentration. CONCLUSIONS: LLLT-660 nm induced an anti-inflammatory effect characterized by inhibition of either total or differential leukocyte influx, exudation, total protein, NO, IL-6, MCP-1, IL-10, and TNF-alpha, in a dose-dependent manner. Under these conditions, laser treatment with 2.1 J was more effective than 0.9 and 4.2 J. Carrageenan Animals;Carrageenan;Female;Inflammation;Low-Level Light Therapy;Pleurisy;Rats;Rats, Wistar

[Laser Doppler fluometry in assessment of endothelium state in patients with coronary heart disease and its correction by intravenous laser irradiation of blood]. Influence of laser therapy on vascular endothelium function in patients with stable angina pectoris, detected by the method of laser Doppler fluorimetry, was studied. 77patients with stable angina pectoris were divided into 2 groups. In control group only medicamentous therapy was used, in main group a course of intravenous blood laser irradiation was carried out additionally. The increase of initially decreased mean index of microcirculation and index of microcirculation after acetylcholine iontophoresis was noticed. Tendency to increase of endothelial oscillations and capillary blood flow under influence of intravenous blood laser irradiation was noticed too. Laser therapy can be considered an effective method of increase of endothelial functional activity in patients with stable angina pectoris. Adult;Aged;Blood;Blood Flow Velocity;Electrocardiography;Endothelium, Vascular;Female;Follow-Up Studies;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Myocardial Ischemia;Skin;Treatment Outcome

Low risk of postinflammatory hyperpigmentation in skin types 4 and 5 after treatment with fractional CO2 laser device. BACKGROUND/OBJECTIVE: Hyperpigmentation occurs in more than 37% of dark-skinned subjects treated with a fully ablative CO2 laser device. This study assessed the risk of postinflammatory hyperpigmentation (PIH) in subjects with skin types 4 and 5 treated once with a specific protocol of treatment using a fractional CO2 laser. METHODS: Seven subjects with photodamaged skin received a single facial treatment using a fractional CO2 laser. Anesthesia was limited to a lidocaine and prilocaine cream for 1 hour before the single-pass treatment. Subjects were evaluated for improvement and PIH on alternate days for 14 days, and at 1 month, 3 months, and 6 months posttreatment. RESULTS: All subjects achieved improvement in their specific skin conditions and in skin texture. Postinflammatory hyperpigmentation was not observed in any subject. Four subjects experienced no pain during treatment, while 3 reported mild pain. Recovery was associated with minimal pain and itching. CONCLUSION: In dark-skinned subjects, fractional CO2 laser treatment and topical anesthesia subjectively improves common skin conditions without PIH. Anesthetics, Local;Prilocaine;Lidocaine Adult;Anesthesia, Local;Anesthetics, Local;Dermatitis, Phototoxic;Female;Humans;Hyperpigmentation;Inflammation;Lasers, Gas;Lidocaine;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Prilocaine;Risk;Skin

Randomized controlled trial comparing the effectiveness of 308-nm excimer laser alone or in combination with topical hydrocortisone 17-butyrate cream in the treatment of vitiligo of the face and neck. BACKGROUND: Vitiligo is a pigmentary disorder which may have disfiguring consequences. Its treatment remains a challenge. OBJECTIVES: We designed a parallel-group randomized controlled trial to compare the effectiveness of 308-nm excimer laser alone or in

combination with topical hydrocortisone 17-butyrate cream in patients with vitiligo unresponsive to previous treatment with topical steroids or narrow-band ultraviolet (UV) B phototherapy. METHODS: Consecutive patients aged 18-75 years with nonsegmental vitiligo localized on the face and/or neck lacking response to previous conventional treatment were eligible. In total, 84 patients (44 women and 40 men, mean age 44 years) were randomized to 308-nm excimer laser phototherapy twice weekly alone or in combination with topical hydrocortisone 17-butyrate cream twice daily for three periods of 3 weeks followed by a 1-week steroid-free interval. The primary outcome was a reduction of at least 75% of the overall lesional areas as judged by automatic image analysis on reflected UV photographs, conducted blind to treatment assignment, at 12 weeks compared with baseline. Secondary outcomes were clearance, and improvements on Physician's Global Assessment (PGA) and Skindex-29 scores. RESULTS: A total of 76 (90%) patients completed the study. In an intention-to-treat analysis, seven [16.6%; 95% confidence interval (CI) 5.3-27.8%] patients in the excimer monotherapy arm and 18 (42.8%; 95% CI 27.8-57.8%) in the combination arm showed > or = 75% reduction of vitiligo lesions at 12 weeks (chi(2) test 6.89, P = 0.0087). Clearance was observed in two (4.7%; 95% CI 1.6-11.2%) and nine (21.4%; 95% CI 9.0-33.8%) patients, respectively (Fisher's exact test P = 0.04). A significant difference also emerged for PGA scores, while no difference was documented for Skindex-29. CONCLUSIONS: Recalcitrant vitiligo of the face and neck may benefit from the combination of excimer laser phototherapy with topical hydrocortisone 17-butyrate cream. Dermatologic Agents;hydrocortisone-17-butyrate;Hydrocortisone Administration, Topical;Adolescent;Adult;Aged;Combined Modality Therapy;Dermatologic Agents;Facial Dermatoses;Female;Humans;Hydrocortisone;Lasers, Excimer;Male;Middle Aged;Neck;Quality of Life;Treatment Outcome;Vitiligo;Young Adult

A clinical comparison of topical piroxicam and EMLA cream for pain relief and inflammation in laser hair removal. The aim of this study was to compare the efficacy of topical piroxicam and EMLA cream on pain control and subsequent inflammation in neodymium:yttrium-aluminum-garnet (Nd:YAG) 1,064 nm laser hair removal in female volunteers. Fifty female volunteers were enrolled in this prospective, randomized, double-blind, clinical study over a 6-month period. Patients were randomly assigned to receive topical piroxicam as group Piroxicam or EMLA cream as group EMLA. Topical analgesics were applied to the treatment sites for 60 min. The pain scores [on a visual analog scale (VAS)] and side effects were recorded before the hair removal, during the hair removal, at the end of the hair removal, and 1 h, 2 h and 24 h after the hair removal. Patients' characteristics and the treatment settings of the Nd:YAG 1,064 nm laser were similar in the two groups. The pain scores (VAS) were similar, and satisfaction was high in both groups after the hair removal. The number of blanching and erythema episodes were significantly higher in group E than in group P ($P < 0.001$). Inflammatory side effects were less frequent in group P than in group E after the procedure ($P < 0.001$). This study showed that topical piroxicam and EMLA provided adequate and similar pain relief after Nd:YAG 1,064 nm laser hair removal in female volunteers. Topical piroxicam was associated with fewer inflammatory side effects than was EMLA cream, because of its anti-inflammatory effect after the procedure. Anesthetics, Local;Anti-Inflammatory Agents, Non-Steroidal;Lidocaine, Prilocaine Drug Combination;Prilocaine;Piroxicam;Lidocaine Administration, Topical;Adolescent;Adult;Anesthetics, Local;Anti-Inflammatory Agents, Non-Steroidal;Dermatitis;Double-Blind Method;Erythema;Female;Hair Removal;Humans;Lasers, Solid-State;Lidocaine;Lidocaine, Prilocaine Drug Combination;Low-Level Light Therapy;Pain;Piroxicam;Prilocaine;Prospective Studies;Young Adult

Effect of equal daily doses achieved by different power densities of low-level laser therapy at 635 nm on open skin wound healing in normal and corticosteroid-treated rats. Optimal parameters of low-level laser therapy (LLLT) for wound healing are still discussed. Hence, our study was aimed to

compare effects of different power densities of LLLT at 635 nm in rats. Four, round, full-thickness, skin wounds were made on the backs of 48 rats that were divided into two groups (non-steroid laser-treated and steroid laser-treated). Three wounds were stimulated daily with a diode laser (daily dose 5 J/cm(2)) each with different power density (1 mW/cm(2), 5 mW/cm(2), and 15 mW/cm(2)), whereas the fourth wound served as a control. Two days, 6 days, and 14 days after surgery, eight animals from each group were killed and samples were removed for histological evaluation. In the non-steroid laser-treated rats, significant acceleration of epithelization and collagen synthesis 2 days and 6 days after surgery was observed in stimulated wounds. In steroid laser-treated rats, 2 days and 14 days after surgery, a decreased leucocyte/macrophage ratio and a reduction in the area of granulation tissue were recorded, respectively. In conclusion, LLLT, by the method we used, improved wound healing in the non-steroid laser-treated rats, but it was useless after corticosteroid treatment. Glucocorticoids;Methylprednisolone Animals;Glucocorticoids;Granulation Tissue;Lasers, Semiconductor;Leukocytes;Low-Level Light Therapy;Macrophages;Male;Methylprednisolone;Rats;Rats, Sprague-Dawley;Skin;Time Factors;Wound Healing

Pre-Irradiation of blood by gallium aluminum arsenide (830 nm) low-level laser enhances peripheral endogenous opioid analgesia in rats. BACKGROUND: Low-level laser therapy (LLLT) has been reported to relieve pain, free of side effects. However, the mechanisms underlying LLLT are not well understood. Recent studies have also demonstrated that opioid-containing immune cells migrate to inflamed sites and release beta-endorphins to inhibit pain as a mode of peripheral endogenous opioid analgesia. We investigated whether pre-irradiation of blood by LLLT enhances peripheral endogenous opioid analgesia. METHODS: The effect of LLLT pretreatment of blood on peripheral endogenous opioid analgesia was evaluated in a rat model of inflammation. Additionally, the effect of LLLT on opioid production was also investigated in vitro in rat blood cells. The expression of the beta-endorphin precursors, proopiomelanocortin and corticotrophin releasing factor, were investigated by reverse transcription polymerase chain reaction. RESULTS: LLLT pretreatment produced an analgesic effect in inflamed peripheral tissue, which was transiently antagonized by naloxone. Correspondingly, beta-endorphin precursor mRNA expression increased with LLLT, both in vivo and in vitro. CONCLUSION: These findings suggest that that LLLT pretreatment of blood induces analgesia in rats by enhancing peripheral endogenous opioid production, in addition to previously reported mechanisms. Adjuvants, Immunologic;Analgesics, Opioid;Arsenicals;gallium arsenide;beta-Endorphin;Gallium;Aluminum Adjuvants, Immunologic;Aluminum;Analgesics, Opioid;Animals;Arsenicals;Blood;Gallium;Immunohistochemistry;Inflammation;Lasers;Male;Models, Biological;Pain;Rats;Rats, Sprague-Dawley;beta-Endorphin

Short-term clinical effects of adjunctive antimicrobial photodynamic therapy in periodontal treatment: a randomized clinical trial. OBJECTIVE: The aim of this study was to assess the effect of adjunctive antimicrobial photodynamic therapy (aPDT) in chronic periodontitis. MATERIAL AND METHODS: Twenty patients with untreated chronic periodontitis were included. All teeth received periodontal treatment comprising scaling and root planing. Using a split-mouth design, two quadrants (test group) were additionally treated with aPDT. Sulcus fluid flow rate (SFFR) and bleeding on probing (BOP) were assessed at baseline, 1 week and 3 months after treatment. Relative attachment level (RAL), probing depths (PDs) and gingival recession (GR) were evaluated at baseline and 3 months after treatment. RESULTS: Baseline median values for PD, GR and RAL were not different in the test group and control group. Values for RAL, PD, SFFR and BOP decreased significantly 3 months after treatment in the control group (median delta RAL: -0.35 mm, inter-quartile range: 0.21 mm), with a higher impact on the sites treated with adjunctive aPDT (median delta RAL: -0.67 mm, inter-quartile range: 0.36 mm, $p<0.05$). GR increased 3 months after treatment with and without adjunctive aPDT

(p<0.05), with no difference between the groups (p>0.05). CONCLUSIONS: In patients with chronic periodontitis, clinical outcomes of conventional subgingival debridement can be improved by adjunctive aPDT. Phenothiazines;Photosensitizing Agents;phenothiazine Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Deposits;Dental Scaling;Female;Gingiva;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Index;Phenothiazines;Photochemotherapy;Photosensitizing Agents;Single-Blind Method;Statistics, Nonparametric;Treatment Outcome

Low-energy laser stimulates tooth movement velocity via expression of RANK and RANKL. OBJECTIVE: Recent studies have demonstrated that low-energy laser irradiation stimulates bone formation in vitro and in vivo. However, very little is known about the effects of laser irradiation on osteoclastogenesis. The receptor activator of the nuclear factor-kB (RANK) / RANK ligand (RANKL) / osteoprotegerin (OPG) system is essential and sufficient for osteoclastogenesis. The present study was designed to examine the effects of low-energy laser irradiation on expressions of RANK, RANKL, and OPG during experimental tooth movement. DESIGN: To induce experimental tooth movement in rats, 10 g of orthodontic force was applied to the molars. Next, a Ga-Al-As diode laser was used to irradiate the area around the moved tooth and the amount of tooth movement was measured for 7 days. Immunohistochemical staining with RANK, RANKL, and OPG was performed. Real time PCR was also performed to elucidate the expression of RANK in irradiated rat osteoclast precursor cells in vitro. RESULTS: In the irradiation group, the amount of tooth movement was significantly greater than in the non-irradiation group by the end of the experimental period. Cells that showed positive immunoreactions to the primary antibodies of RANKL and RANK were significantly increased in the irradiation group on day 2 and 3, compared with the non-irradiation group. In contrast, the expression of OPG was not changed. Further, RANK expression in osteoclast precursor cells was detected at an early stage (day 2 and 3) in the irradiation group. CONCLUSION: These findings suggest that low-energy laser irradiation stimulates the velocity of tooth movement via induction of RANK and RANKL. Osteoprotegerin;RANK Ligand;RNA, Messenger;Receptor Activator of Nuclear Factor-kappa B Animals;Bone Remodeling;Dental Stress Analysis;Immunohistochemistry;Lasers, Semiconductor;Male;Osteoclasts;Osteoprotegerin;RANK Ligand;RNA, Messenger;Rats;Rats, Wistar;Receptor Activator of Nuclear Factor-kappa B;Reverse Transcriptase Polymerase Chain Reaction;Tooth Movement Techniques

Standard guidelines of care: laser and IPL hair reduction. Laser-assisted hair removal, Laser hair removal, Laser and light-assisted hair removal, Laser and light-assisted, long-term hair reduction, IPL photodepilation, LHE photodepilation; all these are acceptable synonyms. Laser (Ruby, Nd Yag, Alexandrite, Diode), intense pulse light, light and heat energy system are the different light-/Laser-based systems used for hair removal; each have its advantages and disadvantages. The word "LONG-TERM HAIR REDUCTION" should be used rather than permanent hair removal. Patient counseling is essential about the need for multiple sessions. PHYSICIANS' QUALIFICATIONS: Laser hair removal may be practiced by any dermatologist, who has received adequate background training during postgraduation or later at a centre that provides education and training in Lasers or in focused workshops providing such training. The dermatologist should have adequate knowledge of the machines, the parameters and aftercare. The physician may allow the actual procedure to be performed under his/her direct supervision by a trained nurse assistant/junior doctor. However, the final responsibility for the procedure would lie with the physician. FACILITY: The procedure may be performed in the physician's minor procedure room. Investigations to rule out any underlying cause for hair growth are important; concurrent drug therapy may be needed. Laser parameters vary with area, type of hair, and the machine used. Full knowledge about the machine and cooling system is

important. Future maintenance treatments may be needed. Hair Follicle;Hair Removal;Hot Temperature;Humans;Lasers;Light;Low-Level Light Therapy;Phototherapy

Visible lasers were better than invisible lasers in accelerating burn healing on diabetic rats. OBJECTIVE: This study was designed to assess and compare the efficacy of accelerating burn healing in diabetic rats using low-power visible and invisible lasers. BACKGROUND DATA: Low-level laser therapy (LLLT) has been used in a number of diabetic animal and human studies, with both positive and no effects. MATERIALS AND METHODS: Male Sprague-Dawley rats were used in the study. Streptozotocin (70 mg/kg) was given for diabetes induction. A burn wound was created on the shaved back of the animals using a metal rod heated to 600 degrees C. The study was performed using 532-, 633-, 670-, 810-, and 980-nm diode lasers. Incident doses of 5, 10, 20, and 30 J/cm(2) and a treatment schedule of three times per week were used in the experiments. The burned areas on all rats were measured and plotted on a chart, and the slope values (mm(2)/d) and the percentages of burn healing were compared. RESULTS: The percentage of burn healing on diabetic rats after LLLT was 78.37% for the visible lasers and 50.68% for the invisible lasers. There was a significant difference ($p < 0.005$) between visible lasers and invisible lasers in the percentage of burn healing on diabetic rats after laser therapy. CONCLUSION: LLLT at the appropriate treatment parameters can accelerate burn healing on diabetic rats using both visible and invisible lasers. The effects of visible lasers were better than those of invisible lasers in accelerating burn healing on diabetic rats in this study. Animals;Burns;Diabetes Mellitus, Experimental;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Wound Healing

Severity of oral mucositis in patients undergoing hematopoietic cell transplantation and an oral laser phototherapy protocol: a survey of 30 patients. BACKGROUND DATA AND OBJECTIVE: Oral mucositis (OM) is one of the worst cytotoxic effects of chemotherapy and radiotherapy in patients undergoing hematopoietic cell transplantation (HCT), and it causes severe morbidity. Laser phototherapy has been considered as an alternative therapy for prevention and treatment of OM. The aim of this study was to describe the incidence and severity of OM in HCT patients subjected to laser phototherapy, and to discuss its effect on the oral mucosa. PATIENTS AND METHODS: Information concerning patient age and gender, type of basic disease, conditioning regimen, type of transplant, absence or presence of pain related to the oral cavity, OM grade, and adverse reactions or unusual events were collected from 30 patients undergoing HCT (allogeneic or autologous). These patients were given oral laser phototherapy with a InGaAlP laser (660 nm and 40 mW) daily. The data were tabulated and their frequency expressed as percentages. RESULTS: In the analysis of those with OM, it was observed that 33.4% exhibited grade I, 40% grade II, 23.3% grade III, and 3.3% grade IV disease. On the most critical post-HCT days (D+5 and D+8), it was observed that 63.3% of patients had grade I and 33.3% had grade II disease; no patients had grade III or IV disease in this period. This severity of OM was similar to that seen in other studies of laser phototherapy and OM. CONCLUSION: The low grades of OM observed in this survey show the beneficial effects of laser phototherapy, but randomized clinical trials are necessary to confirm these findings. Antineoplastic Agents Adolescent;Adult;Aged;Antineoplastic Agents;Child;Female;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Lymphoma;Male;Middle Aged;Stomatitis;Transplantation Conditioning;Young Adult

Progressive disseminated essential telangiectasia and erythrosis interfollicularis colli as examples for successful treatment with a high-intensity flashlamp. BACKGROUND: Treatment of progressive disseminated essential telangiectasia and erythrosis interfollicularis colli by flashlamp pulsed dye laser frequently results in a mottled appearance and often leads to hypo- or hyperpigmentation after treatment. Furthermore, treatment is time-consuming due to the small spot size. OBJECTIVE: To report the successful removal of thin vessels in patients with the above-mentioned indications by an

intense pulsed light (IPL) source. METHODS: Four patients with progressive disseminated telangiectasia on the extremities and 5 patients with erythrosis interfollicularis colli were treated with IPL. RESULTS: A clearance of up to 90% of the telangiectasias was achieved. CONCLUSION: The superficial, thin vessels of progressive disseminated essential telangiectasia and erythrosis interfollicularis colli can be successfully treated by IPL. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases, Vascular;Telangiectasis;Treatment Outcome

An evaluation of different treatments for recurrent aphthous stomatitis and patient perceptions: Nd:YAG laser versus medication. OBJECTIVE: The aim of this randomized controlled clinical trial was to determine the anxiety levels of patients with recurrent aphthous stomatitis (RAS) prior to therapy with the Nd:YAG laser or medication, and to compare the effects of these different treatment methods on the degree of post-treatment pain, discomfort, and functional complications (eating and speech) experienced. MATERIALS AND METHODS: Twenty patients with RAS-related oral problems were included in the study. Levels of pre- and post-treatment pain and functional complications were assessed at patient visits on days 1, 4, and 7. RESULTS: The results indicated that patients treated with the Nd:YAG laser had less post-treatment pain and fewer functional complications, and reported immediate relief of pain and faster healing (p +/- 0.05). However, only after 5 d was there a significant reduction in the pain levels of the patients treated with medication. CONCLUSION: Our results suggest that the Nd:YAG laser has better patient acceptance, shorter treatment time, and lower rates of pain and post-treatment adverse events among patients with RAS. Adult;Anxiety;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain Measurement;Patient Satisfaction;Recurrence;Stomatitis, Aphthous

Re: Effect of low-level laser therapy on mast cells in second-degree burns in rats. Animals;Burns;Low-Level Light Therapy;Mast Cells;Rats

[Diagnosis and treatment of acute epididymoorchitis]. From 1963 we treated 330 patients aged from 15 to 85 years admitted to the urological clinic with acute epididymoorchitis of mild (n = 106), moderate (n = 82) and grave severity (n = 152). The diagnosis of purulent forms of epididymitis and epididymoorchitis was made basing on clinical and ultrasonic studies. Aspiration thin-needle puncture of epididymic membrane under ultrasonic control with calculation of leucocyte count was made for detection of purulent-process in 17 patients with epididymitis at the stage of diffuse inflammation. 198 patients with mild and moderate forms of acute epididymoorchitis received complex conservative treatment including laser therapy. 132 patients with severe epididymoorchitis were operated. In epididymoorchitis with total inflammatory-purulent process we made epididymectomy, in local - resection. The testis was removed in total necrosis or purulent lesion of its tissues. For comparison we analysed case histories of 150 patients with epididymoorchitis treated before 1983. Comparison of the treatment results in patients with acute inflammatory diseases of scrotal organs favours early surgical treatment. Anti-Bacterial Agents Adolescent;Adult;Aged;Aged, 80 and over;Anti-Bacterial Agents;Combined Modality Therapy;Epididymitis;Humans;Low-Level Light Therapy;Male;Middle Aged;Orchitis;Treatment Outcome

Effect of 670-nm laser therapy and dexamethasone on tissue repair: a histological and ultrastructural study. OBJECTIVE: In this study we investigated the role of extracellular matrix elements and cells during the wound healing phases following the use of low-level laser therapy (LLLT) and anti-inflammatory drugs. BACKGROUND DATA: There are few scientific studies that characterize the possible interactions of LLLT and anti-inflammatory medications. MATERIALS AND METHODS: Thirty-two rats submitted to a wound inflicted with a 6-mm-diameter punch. The animals were divided into four groups: sham treated, those treated with the GaAlAs laser (4 J/cm(2), 9 mW, lambda = 670 nm, spot size 28.27 x 10(2) cm(2)), those treated with dexamethasone (2 mg/kg), and those treated with

both LLLT and dexamethasone. After 3 and 5 d, the cutaneous wounds were assessed by histopathology using polarized light and ultrastructural assessment using transmission electron microscopy. Changes seen in polymorphonuclear inflammatory cells, edema, mononuclear cells, and collagen fiber deposition were semi-quantitatively evaluated. RESULTS: The laser-treated group demonstrated increased collagen content and better arrangement of the extracellular matrix ($p < 0.05$). Fibroblasts in these tissues were increased in number and were more synthetically active. In the dexamethasone group, the collagen was shown to be non-homogenous and disorganized, with a scarcity of fibroblasts. In the group treated with both types of therapy, fibroblasts were more common and they exhibited vigorous rough endoplasmic reticulum, but they had less collagen production compared to those seen in the laser group. CONCLUSION: LLLT alone accelerates post-surgical tissue repair and reduces edema and the polymorphonuclear infiltrate even in the presence of dexamethasone. Anti-Inflammatory Agents;Dexamethasone Animals;Anti-Inflammatory Agents;Dexamethasone;Disease Models, Animal;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Ultrasonography;Wound Healing

Low-intensity light therapy: exploring the role of redox mechanisms. Low-intensity light therapy (LILT) appears to be working through newly recognized photoacceptor systems. The mitochondrial electron transport chain has been shown to be photosensitive to red and near-infrared (NIR) light. Although the underlying mechanisms have not yet been clearly elucidated, mitochondrial photostimulation has been shown to increase ATP production and cause transient increases in reactive oxygen species (ROS). In some cells, this process appears to participate in reduction/oxidation (redox) signaling. Redox mechanisms are known to be involved in cellular homeostasis and proliferative control. In plants, photostimulation of the analogous photosynthetic electron transport chain leads to redox signaling known to be integral to cellular function. In gene therapy research, ultraviolet lasers are being used to photostimulate cells through a process that also appears to involve redox signaling. It seems that visible and near visible low-intensity light can be used to modulate cellular physiology in some nonphotosynthetic cells, acting through existing redox mechanisms of cellular physiology. In this manner, LILT may act to promote proliferation and/or cellular homeostasis. Understanding the role of redox state and signaling in LILT may be useful in guiding future therapies, particularly in conditions associated with pro-oxidant conditions. Reactive Oxygen Species Electron Transport;Humans;Low-Level Light Therapy;Mitochondria;Oxidation-Reduction;Oxidative Stress;Photosynthesis;Reactive Oxygen Species;Ultraviolet Rays

Efficacy of low-level laser therapy in MÃ©niÃ¨re's disease: a pilot study of 10 patients. OBJECTIVE: To assess the efficacy of low-level laser therapy (LLLT) for MÃ©niÃ¨re's disease (MD). MATERIALS AND METHODS: Twenty patients with unilateral MD were included in the study; all presented with uncontrolled vertigo. The patients were randomly divided into two groups: group 1 patients received LLLT 20 min a day with a 5-mW soft laser for 6 mo, while group 2 received betahistine 16 mg twice a day for 6 mo. According to American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) guidelines, the main outcome for vertigo control was considered to be the number of spells per month in the 6 mo before treatment compared with the same parameter in the 6 mo of therapy. The duration of spells expressed in minutes was also considered. Moreover, a hearing test was performed before and after therapy and results were reported as the pure tone average of 500-, 1000-, 2000-, and 3000-Hz frequencies. All results were valued at baseline, and after 3 and 6 mo of therapy. RESULTS: Compared to baseline, the number and duration of spells were significantly reduced in both groups; statistical significance was detected for the 3-mo control in both groups (p 0.05 with the multiple pair comparison test). Betahistine seems to have a faster action in spell reduction (p 0.05 comparing the 3-mo results between the two groups). Audiometric

examination did not show a statistically significant difference between the two groups. CONCLUSIONS: In our experience, LLLT seems to prevent vertigo spells in MD, although results indicate that it has a slower action than betahistine. Dose-dependent therapeutic effects could explain the last result. In our opinion, increased blood flow in the inner ear is the main mechanism leading to the therapeutic results. Adult;Female;Humans;Low-Level Light Therapy;Male;Meniere Disease;Middle Aged;Pilot Projects;Treatment Outcome

Burning, paradoxical hypertrichosis, leukotrichia and folliculitis are four major complications of intense pulsed light hair removal therapy. BACKGROUND: Lasers and intense pulsed light (IPL) are now used worldwide for prolonged photo-epilation. OBJECTIVE: To study the side effects of IPL hair removal therapy among 2541 female hirsute patients as the largest series reported so far in the literature. METHODS: The first series of 1000 patients were treated by the Lumina IPL system. (Lynton Lasers, UK). The second series of 1541 patients were treated by Vasculight-SR, a multi-functional laser and IPL system (Lumenis, Inc., USA). The fluences used for Lumina varied between 16 and 30 J/cm2. The parameters used for Vasculight-SR were as follows: fluences ranged from 33 to 42 J/cm2; pulse duration was 3-5 ms, and pulse delay was 20-80 ms. The pulse mode was either double or triple. The parameters were chosen according to the patients' Fitzpatrick skin types and tolerance. The cut-off filters frequently used were 695, 755, 645 and 615 nm in descending order of their frequencies. Patients were treated every 4-6 weeks and for eight sessions or more. All patients were followed for up to 20 months. RESULTS: Series 1 - burning and its sequelae presented as post-inflammatory hyperpigmentation (PIH), post-inflammatory hypopigmentation (PIHPO), bulla and erosion, and finally scar formation in 75, 10, 64 and one case, respectively. Leukotrichia, folliculitis, and paradoxical hypertrichosis were recorded in 40, 35, and 12 more cases, respectively. Series 2 - PIH and PIHPO were recorded in 28 and four patients. Erosion and crust formation were recorded in 28 patients. Paradoxical effect, leukotrichia and acne formation were seen in 79, 27 and 19 cases, respectively. CONCLUSION: Burning and its sequellae, leukotrichia, paradoxical hypertrichosis and folliculitis are four major side effects of IPL hair removal therapy in our study. Adolescent;Adult;Female;Folliculitis;Follow-Up Studies;Hair Color;Hair Removal;Hirsutism;Humans;Hyperpigmentation;Hypertrichosis;Hypopigmentation;Low-Level Light Therapy;Melanocytes;Middle Aged;Paresthesia;Retrospective Studies;Treatment Outcome

Visualising the procedures in the influence of water on the ablation of dental hard tissue with erbium:yttrium-aluminium-garnet and erbium, chromium:yttrium-scandium-gallium-garnet laser pulses. The exact mechanism of the ablation of tooth hard tissue with most common wavelengths, which are 2,940 nm and 2,780 nm, is not yet clear. There are several different theories, but none of them has yet been established. Concepts and methods of looking at these mechanisms have been based on heat formation and transformation, and mathematical calculations evaluating the outcome of ablation, such as looking at the shape of cuts. This study provides a new concept, which is the monitoring of the direct interactions between laser light, water and enamel, with a high-speed camera. For this purpose, both the above-mentioned wavelengths were examined. Bovine anterior teeth were prepared as thin slices. Each imaged slice had a thickness close to that of the beam diameter so that the ablation effect could be shown in two dimensional pictures. The single images were extracted from the video-clips and then were animated. The following steps, explaining the ablation procedures during each pulse, were seen and reported: (1) low-output energy intensity in the first pulses that did not lead to an ablative effect; (2) bubble formation with higher output energy density; (3) the tooth surface during the pulse was covered with the plume of vapour (comparable with a cloud), and the margins of ablation on the tooth were not clear; (4) when the vapour bubble (cloud) was collapsing, an additional ablative process at the surface could be seen.

Water Animals;Cattle;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Photography, Dental;Tooth Preparation;Video Recording;Water
Photothermal response of superparamagnetic iron oxide nanoparticles. BACKGROUND AND OBJECTIVE: Superparamagnetic iron oxide nanoparticles have been used as MRI contrast agents in medical imaging. The purpose of this study was to explore the photothermal response of superparamagnetic iron oxide nanoparticles for biomedical applications. STUDY DESIGN/MATERIALS AND METHODS: Absorbance, temperature increase, and optical path length change of solutions of superparamagnetic iron oxide nanoparticles, SPIO and MION, in response to a 532 nm pulsed laser irradiation were measured. RESULTS: Both SPIO and MION showed absorption at 532 nm, temperature increase, and optical path length change. SPIO and MION underwent selective heating due to absorption of laser energy (532 nm). CONCLUSION: Temperature increase and optical path length change of SPIO and MION in response to 532 nm pulsed laser irradiation demonstrate a potential application of these particles in biomedical imaging. For further study, additional experiments applying the photothermal response of SPIO and MION in tissues are required. monocrystalline iron oxide nanoparticle;Ferrosoferric Oxide Cells, Cultured;Ferrosoferric Oxide;Humans;Image Enhancement;Image Processing, Computer-Assisted;Low-Level Light Therapy;Nanoparticles;Sensitivity and Specificity;Tomography, Optical Coherence
Experimental study on thermic effects, morphology and function of guinea pig cochlea: a comparison between the erbium:yttrium-aluminum-garnet laser and carbon dioxide laser. BACKGROUND AND OBJECTIVE: Surgery of the inner ear requires atraumatic techniques to preserve the morphology of the inner ear. Recent experiment and clinical studies have demonstrated that several laser systems are suitable for cochleostomy. The goal of this study was to quantify the thermic effects, morphology and function of guinea pig cochlea in vivo by comparing the erbium:yttrium-aluminum-garnet (Er:YAG) laser and carbon dioxide (CO(2)) laser and to determine the optimum laser parameters for safe clinical treatment. STUDY DESIGN/MATERIALS AND METHODS: A fenestration in the basal cochlear turn of guinea pigs was created. A type K thermocouple was placed on the membrane of round window to detect the local temperature change during laser irradiation. The auditory evoked brainstem response (ABR) was measured before and after laser application. Confocal laser microscopy and scanning electron microscopy (SEM) was used for cochlear morphology. RESULTS: An increased hearing loss immediately and 4 weeks later after irradiation was observed in animals with the higher power CO(2) laser in accordance with a higher temperature increase during laser application. In contrast, a wider safety scope of Er:YAG application in cochleostomy was presented with little temperature increase. These findings were correlated with the ultrastructural changes in guinea pig cochlea. CONCLUSION: The Er:YAG and CO(2) lasers are shown to be safe if the total amount of energy is kept within the limits applied in this study. In addition, on this preliminary basis by guinea pig laser cochleostomy, Er:YAG laser maybe less damaging to inner ear structures than CO(2) laser with a larger safety scope and less thermic effects. Carbon Dioxide;Erbium Animals;Auditory Threshold;Carbon Dioxide;Cochlea;Disease Models, Animal;Erbium;Evoked Potentials, Auditory;Guinea Pigs;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Confocal;Probability;Random Allocation;Risk Factors;Sensitivity and Specificity
Effect of fluence on efficacy using the 1440 nm laser with CAP technology for the treatment of rhytids. BACKGROUND AND OBJECTIVE: The objective of this study was to evaluate the effect of fluence on the treatment of rhytids using a 1440 nm laser with CAP(SM) technology and the T350 tip. STUDY DESIGN/MATERIALS AND METHODS: Twelve subjects with rhytids were enrolled in an IRB approved study. The Affirm laser with CAP technology (Cynosure, Inc., Westford, MA) 1440 nm, 10 mm T350, 2 milliseconds, 1.5 Hz was used at fluences ranging from 3.0 to 5.5 J/cm(2) in a split face study. At each treatment visit, fluences on the right side of the face were held constant at 3.0

J/cm(2), while the left side of the face started at 3.0 J/cm(2) and increased 0.5 J/cm(2) with each treatment to a maximum of 5.5 J/cm(2). Five treatments were given at 2-week intervals using the SmartCool (Cynosure, Inc.). Photographic comparisons at baseline and 3 months were used to compare fluence results as well as to evaluate for efficacy in the treatment of rhytids. The following standard scale was employed: Poor (0-25%), Fair (26-50%), Good (51-75%), and Excellent (76-100%). In addition, following the study, a few subjects received a series of laser pulses at increasing fluences on their buttocks to further evaluate the effect of fluence on tissue reaction. RESULTS: Comparing the right and left photographic results, no clinically observable differences were noted. Both sides received the same grade in all cases. Five subjects (42%) were noted to have Good results, three (25%) were given a rating of Fair, and four (33%) were given a Poor result with little or no improvement observed. The follow-up buttock fluence study demonstrated an effect threshold at 3.0 J/cm(2). CONCLUSION: The 1440 nm laser with CAP technology can provide overall improvement in patients with rhytids at moderate fluences. Increasing the fluence does not appear to increase efficacy. Aged;Dose-Response Relationship, Radiation;Esthetics;Female;Follow-Up Studies;Humans;Lasers;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Risk Assessment;Sensitivity and Specificity;Skin Aging;Treatment Outcome

Effects of laser irradiation on collagen organization in chemically induced degenerative annulus fibrosus of lumbar intervertebral disc. BACKGROUND AND OBJECTIVE: The number of in vitro experimental studies was carried out with the use of intact tissues to establish a mechanism of laser-tissue interaction. However, in the process of degeneration, both biochemical composition and behavior of the disc were altered drastically. The objective of this study was to evaluate the role of the main matrix components in laser modification of annulus fibrosus (AF) under IR laser irradiation. STUDY DESIGNS/MATERIALS AND METHODS: The samples of AF in a motion segment after hyaluronidase treatment, trypsin digestion and glycation by glyceraldehyde were heated in hydrothermal bath (95 degrees C, 2 min) or irradiated by laser at 1.56 microm. Specimens were imaged by cross-polarization optical coherence tomography (CP-OCT), and then analyzed by differential scanning calorimery (DSC). RESULTS AND DISCUSSION: According to CP-OCT and DSC data non-significant alteration was revealed in AF after hyaluronidase treatment, glycation led to stabilization of annulus collagen and trypsin digestion resulted in a noticeable impairment of collagen fibrils. Laser treatment induced subsequent damages of AF matrix but these damages cannot be explained by laser heating only. The specificity of chemical modification of AF matrix has an influence on a character of collagen network alteration due to IR laser effect. Minimal and maximal alterations are observed for hyaluronidase and trypsin treated samples respectively. Glyceraldehyde fixed samples showed failure of the collagen structure after moderate laser treatment; at the same time thermal denaturation of collagen macromolecules was negligible. We assume that a mechanical effect of laser irradiation plays an important role in laser-induced annulus collagen modification and propose the scheme of physico-chemical process occurring under non-uniform IR laser treatment in AF tissue. CONCLUSION: CP-OCT and DSC techniques allow us to record the alteration of collagen network organization as a result of chemical modification. There were detected significant and specific effects of the biochemical composition and material properties on the response of AF collagen network on laser irradiation. The results go in accordance with our hypothesis that the primary effect of laser influence on collagen network under tension is the mechanical damage of collagen fiber. Fibrillar Collagens;Hyaluronoglucosaminidase;Trypsin Animals;Disease Models, Animal;Female;Fibrillar Collagens;Hyaluronoglucosaminidase;Intervertebral Disc;Intervertebral Disc Chemolysis;Low-Level Light Therapy;Lumbar Vertebrae;Male;Probability;Rabbits;Random Allocation;Sensitivity and Specificity;Spinal Diseases;Tomography, Optical Coherence;Trypsin

Stem cell proliferation under low intensity laser irradiation: a preliminary study. BACKGROUND AND OBJECTIVES: Phototherapy with low intensity laser irradiation has shown to be effective in promoting the proliferation of different cells. The aim of this in vitro study was to evaluate the potential effect of laser phototherapy (660 nm) on human dental pulp stem cell (hDPSC) proliferation. STUDY DESIGN/MATERIALS AND METHODS: The hDPSC cell strain was used. Cells cultured under nutritional deficit (10% FBS) were either irradiated or not (control) using two different power settings (20 mW/6 seconds to 40 mW/3 seconds), with an InGaAlP diode laser. The cell growth was indirectly assessed by measuring the cell mitochondrial activity through the MTT reduction-based cytotoxicity assay. RESULTS: The group irradiated with the 20 mW setting presented significantly higher MTT activity at 72 hours than the other two groups (negative control--10% FBS--and lased 40 mW with 3 seconds exposure time). After 24 hours of the first irradiation, cultures grown under nutritional deficit (10% FBS) and irradiated presented significantly higher viable cells than the non-irradiated cultures grown under the same nutritional conditions. CONCLUSIONS: Under the conditions of this study it was possible to conclude that the cell strain hDPSC responds positively to laser phototherapy by improving the cell growth when cultured under nutritional deficit conditions. Thus, the association of laser phototherapy and hDPSC cells could be of importance for future tissue engineering and regenerative medicine. Moreover, it opens the possibility of using laser phototherapy for improving the cell growth of other types of stem cells. Analysis of Variance;Cell Proliferation;Cells, Cultured;Dental Pulp;Dose-Response Relationship, Radiation;Humans;In Vitro Techniques;Low-Level Light Therapy;Probability;Radiation Dosage;Reference Values;Sensitivity and Specificity;Stem Cells

Effect of 830 nm low-level laser therapy in exercise-induced skeletal muscle fatigue in humans. This study aimed to investigate the effect of 830 nm low-level laser therapy (LLLT) on skeletal muscle fatigue. Ten healthy male professional volleyball players entered a crossover randomized double-blinded placebo-controlled trial. Active LLLT (830 nm wavelength, 100 mW output, spot size 0.0028 cm(2), 200 s total irradiation time) or an identical placebo LLLT was delivered to four points on the biceps humeri muscle immediately before exercises. All subjects performed voluntary biceps humeri contractions with a load of 75% of the maximum voluntary contraction (MVC) force until exhaustion. After active LLLT the mean number of repetitions was significantly higher than after placebo irradiation [mean difference 4.5, standard deviation (SD) +/- 6.0, P = 0.042], the blood lactate levels increased after exercises, but there was no significant difference between the treatments. We concluded that 830 nm LLLT can delay the onset of skeletal muscle fatigue in high-intensity exercises, in spite of increased blood lactate levels. Lactic Acid Adolescent;Adult;Cross-Over Studies;Double-Blind Method;Exercise Test;Humans;Infrared Rays;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Volleyball;Young Adult

Effect of low-power gallium-aluminum-arsenium laser therapy (830 nm) in combination with bisphosphonate treatment on osteopenic bone structure: an experimental animal study. Laser therapy is able to modulate cell metabolism and accelerate the repair of fracture. Little attention has been given to the effect of laser on bone with osteopenia or osteoporosis. The purpose of our study was to verify the effect of laser therapy in combination with bisphosphonate on osteopenic bone structure. The 35 Wistar female rats used were divided into five groups: (1) sham-operation rats (control), (2) ovariectomized (OVX'd) rats with osteopenia, (3) OVX'd rats with osteopenia treated with laser, (4) OVX'd rats with osteopenia treated with bisphosphonate and (5) OVX'd rats with osteopenia treated with bisphosphonate and laser. Groups 3 and 5 were given daily 6 mg doses of bisphosphonate orally. Groups 4 and 5 underwent low level laser therapy [gallium-aluminum-arsenium (GaAlAs) laser, 830 nm, 50 mW and 4 J/cm(2)] on the femoral neck and vertebral segments (T13-L2). Both treatments were performed over an 8-week period. Rats from the osteopenic control and osteopenic + laser groups presented marked osteopenia. In the osteopenic + bisphosphonate

group, the trabecular bone volume in vertebra L2 was significantly greater than in the osteopenic control group. Notably, in the association between laser and bisphosphonate, the trabecular bone volume was significantly greater in vertebrae L2 and T13 and was similar to that in the sham-operation control group. It was concluded that the laser therapy associated with bisphosphonate treatment was the best method for reversing vertebral osteopenia caused by the ovariectomy.
Bone Density Conservation Agents;Alendronate Alendronate;Animals;Bone Density Conservation Agents;Bone Diseases, Metabolic;Combined Modality Therapy;Disease Models, Animal;Female;Lasers, Semiconductor;Low-Level Light Therapy;Ovariectomy;Rats;Rats, Wistar;Spine

Evaluation of the effect of the GaAlAs laser on subgingival scaling and root planing. OBJECTIVE: To evaluate the auxiliary effect of the low-intensity laser in subgingival scaling and root planing by analysis of its clinical aspects, as well as its analgesic potential during the procedure. BACKGROUND DATA: Despite the large number of studies conducted on low-intensity laser energy, few clinical studies are available on periodontics. MATERIALS AND METHODS: Ten patients were selected and submitted to measurement of six sites per tooth, four teeth per hemiarch (960 sites in all). All patients then received subgingival scaling and root planing. Besides periodontal treatment, the test side was also submitted to laser application. The analysis comprised measurement of probing depth, clinical attachment level, and gingival index. Laser energy was applied at a wavelength of 780 nm (35 J/cm(2), 70 mW, 20 sec per site) for preoperative analgesia, and scaling and root planing were performed with application of laser energy at a wavelength of 780 nm (35 J/cm(2), 70 mW, 20 sec) for analgesia, and at a wavelength of 630 nm (8.8 J/cm(2), 35 mW, 10 sec) for healing. The patients filled out a visual analogue scale to assess the pain they felt during the procedure. After 24 and 48 h, the laser was again applied at the wavelength of 630 nm, and the patients were re-evaluated after 3 d. RESULTS: There was a reduction in gingival inflammation, yet without a statistically significant difference between the study and control sides, both in clinical aspects and evaluation of pain during the procedure. CONCLUSION: Utilization of the diode laser as an auxiliary in subgingival scaling and root planing did not provide any apparent clinical benefit for teeth with shallow to moderate pockets.
Adolescent;Adult;Dental Scaling;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Periodontal Pocket;Root Planing;Young Adult

Does the use of laser photobiomodulation, bone morphogenetic proteins, and guided bone regeneration improve the outcome of autologous bone grafts? An in vivo study in a rodent model. OBJECTIVE: The aim of the present investigation was to histologically assess the effect of laser photobiomodulation (LBPM) on the repair of autologous bone grafts in a rodent model. BACKGROUND DATA: A major problem in modern dentistry is the recovery of bone defects caused by trauma, surgical procedures, or pathologies. Several types of biomaterials have been used to improve the repair of these defects. These materials are often associated with procedures of guided bone regeneration (GBR). MATERIALS AND METHODS: Twenty four animals were divided into four groups: group I (control); group II (LPBM of the bone graft); group III (bone morphogenetic proteins [BMPs] + bone graft); and group IV (LPBM of the bed and the bone graft + BMPs). When appropriate the bed was filled with lyophilized bovine bone and BMPs used with or without GBR. The animals in the irradiated groups received 10 J/cm(2) per session divided over four points around the defect (4 J/cm(2)), with the first irradiation immediately after surgery, and then repeated seven times every other day. The animals were humanely killed after 40 d. RESULTS: The results showed that in all treatment groups, new bone formation was greater and qualitatively better than the untreated subjects. Control specimens showed a less advanced repair after 40 d, and this was characterized by the presence of medullary tissue, a small amount of bone trabeculi, and some cortical repair. CONCLUSION: We conclude that LPBM has a positive biomodulatory effect on the healing of bone

defects, and that this effect was more evident when LPBM was performed on the surgical bed intraoperatively, prior to the placement of the autologous bone graft. Bone Morphogenetic Proteins Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Transplantation;Guided Tissue Regeneration;Low-Level Light Therapy;Models, Animal;Rats;Rats, Wistar

Laser-needle therapy for spontaneous osteonecrosis of the knee. OBJECTIVE: This case report describes the treatment of a 63-year-old patient with spontaneous osteonecrosis of the knee (SONK). BACKGROUND DATA: SONK usually appears in the elderly patient without the typical risk factors for osteonecrosis. It is characterized by acute and sudden pain, mostly occurring at the medial side of the knee joint. Symptoms usually worsen with physical activity and improve with rest. Besides physical therapy, limited weight-bearing and the use of analgesics and nonsteroidal anti-inflammatory drugs, we propose low-level laser therapy (LLLT) as a conservative treatment option. METHODS: LLLT was carried out using laser needles emitting radiation with wavelengths of 685 and 885 nm, and a power density of 17.8 W/cm(2). Therapy sessions lasted 60 min and were performed daily over a period of 3 mo. The total irradiation dose emitted by 8 laser needles in 60 min of treatment was 1008 J. RESULTS: Magnetic resonance imaging revealed distinct restitution of the spongiosa edema 5 wk after treatment onset, and the final check-up at 35 wk demonstrated complete restoration of integrity. CONCLUSION: The present case report provides the first indication that laser-needle therapy may be a promising tool for complementary and alternative therapeutic intervention for those with SONK. Humans;Knee Joint;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Needles;Osteonecrosis

The use of light photobiomodulation on the treatment of second-degree burns: a histological study of a rodent model. OBJECTIVE: The aim of this investigation was to compare, by light microscopy, the effects of the use of laser photobiomodulation (LPBM) and polarized light (PL) on second-degree burns on rodents. BACKGROUND DATA: Burns are severe injuries that result in the loss of tissue fluids, destruction of tissues, infection, and shock. With severe and widespread third-degree burns death may occur. Several light sources have been suggested as being effective for improving wound healing. MATERIALS AND METHODS: Forty five rats were used in this study. A second-degree burn was created on the dorsum of each animal, and the animals were divided into four groups: PL (400-2000 nm, 40 mW, 2.4 J/cm(2)/min); LPBM-1 (780 nm, 35/40 mW, theta approximately 2 mm, 4 x 5 J/cm(2)); LPBM-2 (660 nm, 35/40 mW, theta approximately 2 mm, 4 x 5 J/cm(2)); and untreated animals acted as controls. The treatment was started immediately post-burn at four points around the burned area (laser: 5 J/cm(2) per site). The illumination with PL was performed according to the manufacturer's instructions. Treatments were repeated at 24-h intervals for 7 d. The animals were sacrifice at 3, 5, and 7 d post-burn. The specimens were routinely cut and stained and analyzed by light microscopy using hematoxylin and eosin and Sirius red. RESULTS: The analysis of the results demonstrated that the damaged tissue was able to efficiently absorb and process the light at all tested wavelengths. LPBM at 660 nm showed better results at early stages of wound healing. However, the use of 780-nm laser light had beneficial effects throughout the experimental period, with the animals growing newly-formed tissue similar to normal dermis. CONCLUSION: Despite our findings that the use of both types of light energy improved the healing of second-degree burns at the early stages, long-term assessment is needed to verify if this improvement will influence the final results of treatment. Animals;Burns;Disease Models, Animal;Light;Low-Level Light Therapy;Male;Phototherapy;Rats;Rats, Wistar;Skin;Wound Healing

The ability of low level laser therapy to prevent muscle tissue damage induced by snake venom. Antivenom therapy has been ineffective in neutralizing the severe local fast developing tissue damage following snakebite envenoming. Herein, some effects of in situ helium neon (HeNe) laser irradiation

on rat nerve-muscle preparation injected with Bothrops jararacussu venom are described. The tibialis anterior muscle was injected with venom diluted in 0.9% saline solution (60 microg/0.02 mL) or saline solution alone. Sixty minutes after venom injection, laser (HeNe) treatment was administered at three incident energy densities: dose 1, a single exposure of 3.5 J cm(-2); dose 2, three exposures of 3.5 J cm(-2); dose 3, a single exposure of 10.5 J cm(-2). Muscle function was assessed through twitch tension recordings whereas muscle damage was evaluated through histopathologic analysis, morphometry of area of tissue affected and creatine kinase (CK) serum levels, and compared to unirradiated muscles. Laser application at the dose of 3.5 J cm(-2) reduced the area of injury by 64% (15.9 +/- 1.5%vs 44.2 +/- 5.7%), decreased the neuromuscular blockade (NMB) by 62% (11.5 +/- 2.5%vs 30.4 +/- 5.2%) and reduced CK levels by 58% (from 455 +/- 4.5% to 190.3 +/- 23.4%) when compared with unirradiated controls. Dose 2 showed a poorer benefit than dose 1, and dose 3 was ineffective in preventing the venom effects. Measurements of the absorbance of unirradiated and irradiated venom solution showed no difference in absorption spectra. In addition, no difference in the intensity of partial NMB in nerve-muscle preparation was shown by unirradiated and irradiated venom. The results indicate that the laser light did not alter venom toxicity. We conclude that HeNe laser irradiation at a dosage of 3.5 J cm(-2) effectively reduces myonecrosis and the neuromuscular transmission blocking effect caused by B. jararacussu snake venom. Thus, low level laser therapy may be a promising tool to minimize the severity of some of the local effects of snake envenoming. Snake Venoms Animals;Bothrops;Low-Level Light Therapy;Male;Muscular Diseases;Rats;Rats, Wistar;Snake Venoms

The use of the pulse dye laser in the treatment of vocal fold scar: a preliminary study. OBJECTIVES/HYPOTHESIS: Dysphonia due to vocal fold scarring is a challenging problem to the laryngologist. Vocal fold scarring after radiation, phonosurgery, and laser cordectomy causes moderate to severe dysphonia. Surgical attempts at scar removal and voice restoration have limited success. Pulsed dye laser (PDL) treatment has been shown to be effective in softening scarred skin by serial office treatments. The objective of this preliminary study was to evaluate the use of the PDL in the management of patients with established vocal fold scar. STUDY DESIGN: This is an Institutional Review Board-approved prospective study involving 11 patients. The causes of scarring were phonosurgery (n = 7), radiation (n = 2), and partial laryngectomy (n = 2). The subjects were evaluated pre- and postprocedure using the voice handicap index (VHI), laryngeal stroboscopy rating, voice recordings with acoustic and aerodynamic analysis, and self-evaluation. METHODS: The PDL was applied with the fiberoptic delivery system by three treatments at 1-month intervals in the office setting. Each treatment endpoint was blanching of the treatment site. RESULTS: : There were three women and eight men in our study group. Ten of 11 patients subjectively improved by self-rating. No patients were worse. VHI improved from 48.44 pretreatment to 35.55 at 6 months posttreatment ($P < .05$). The jitter at 6 months improved from 2.230% to 1.654% (P = NS) and shimmer improved from 3.679% to 3.196% (P = NS). The noise to harmonic ration improved from 0.1428 to 0.1316 (P = NS). The mean phonotory flow went from 0.177 to 0.254 L/S ($P < .05$). Three raters blinded to treatment sequence rated the posttreatment stroboscopy findings as better than pretreatment in a forced choice comparison, kappa score 0.903. CONCLUSION: PDL is a safe and potentially promising treatment for established vocal fold scar. Subjectively, no patients were worse and 10 of 11 patients reported improved voice. There was improvement in the VHI, acoustic measures of shimmer and jitter, and stroboscopy findings. Further study using this approach in a larger cohort seems to be warranted. Adult;Aged;Aged, 80 and over;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Speech Acoustics;Vocal Cords;Voice Disorders;Voice Quality

Intratissue refractive index shaping (IRIS) of the cornea and lens using a low-pulse-energy femtosecond laser oscillator. PURPOSE: To assess the optical effect of high-repetition-rate, low-energy femtosecond laser pulses on lightly fixed corneas and lenses. METHODS: Eight corneas and eight lenses were extracted postmortem from normal, adult cats. They were lightly fixed and stored in a solution that minimized swelling and opacification. An 800-nm Ti:Sapphire femtosecond laser oscillator with a 27-fs pulse duration and 93-MHz repetition rate was used to inscribe gratings consisting of 20 to 40 lines, each 1-microm wide, 100-microm long, and 5-microm apart, 100 mum below the tissue surface. Refractive index changes in the micromachined regions were calculated immediately and after 1 month of storage by measuring the intensity distribution of diffracted light when the gratings were irradiated with a 632.8-nm He-Ne laser. RESULTS: Periodic gratings were created in the stromal layer of the corneas and the cortex of the lenses by adjusting the laser pulse energy until visible plasma luminescence and bubbles were no longer generated. The gratings had low scattering loss and could only be visualized using phase microscopy. Refractive index changes measured 0.005 +/- 0.001 to 0.01 +/- 0.001 in corneal tissue and 0.015 +/- 0.001 to 0.021 +/- 0.001 in the lenses. The gratings and refractive index changes were preserved after storing the micromachined corneas and lenses for 1 month. CONCLUSIONS: These pilot experiments demonstrate a novel application of low-pulse-energy, MHz femtosecond lasers in modifying the refractive index of transparent ocular tissues without apparent tissue destruction. Although it remains to be verified in living tissues, the stability of this effect suggests that the observed modifications are due to long-term molecular and/or structural changes.
Animals;Cats;Cornea;Lens, Crystalline;Low-Level Light Therapy;Refraction, Ocular

Investigation of mast cells in human gingiva following low-intensity laser irradiation. OBJECTIVE: The aims of the present study were to investigate the effect of low-intensity laser irradiation on the total number of mast cells as well as the percentage of degranulation in human gingiva. Blood vessel dilation was also evaluated. BACKGROUND DATA: It has been proposed that low-intensity laser irradiation can ameliorate pain, swelling, and inflammation. In periodontal tissue, mast cells may influence either the destructive events or the defense mechanism against periodontal disease via secretion of cytokines and through cellular migration to improve the healing process. Mast cells play an important role in the inflammatory process. METHODS: Twenty patients with gingival enlargement indicated for gingivectomy were selected. Gingival fragments were obtained from each patient and divided into three different groups before surgery. One fragment was removed without any irradiation. The two others were submitted to punctual irradiation with an energy density of 8 J/cm(2) at an output power of 50 mW at 36 Hz for 36 sec before gingivectomy. Nondegranulated and degranulated mast cells were counted in five areas of the gingival fragment connective tissue. Major and minor diameters of the blood vessels were also measured. RESULTS: Both red and infrared radiation promoted a significant increase in mast cell degranulation compared to controls; however, no statistically significant differences ($p > 0.05$) were observed between the irradiated groups. No significant differences among the groups were observed regarding blood vessel size. CONCLUSION: The results suggests that red and infrared wavelengths promote mast cell degranulation in human gingival tissue, although no dilation of blood vessels was observed. The effects of premature degranulation of mast cells in human tissue and the laser radiation protocol applied in this study encourage further investigations to extend these results into clinical practice. Adult;Cell Degranulation;Female;Gingiva;Gingival Overgrowth;Gingivectomy;Humans;Low-Level Light Therapy;Male;Mast Cells;Middle Aged;Vasodilation

Paradoxical hypertrichosis and terminal hair change after intense pulsed light hair removal therapy. BACKGROUND: Although complications such as blister formation, erosion, and post-inflammatory hypo- and hyperpigmentation are well-known side effects of intense pulsed light (IPL) photoepilation,

little is known about the paradoxical hypertrichosis after therapy. OBJECTIVE: To report the paradoxically increased hair density and coarseness after IPL photoepilation. METHODS: Within a period of 23 months, a total of 991 hirsute female patients were treated with IPL for photoepilation. The IPL system used was the Vasculight-SR, a multifunctional laser and IPL system (Lumenis Inc., Santa Clara, CA, USA). The cut-off filters frequently used were 695, 755 and 645 nm. RESULTS: Paradoxical hypertrichosis and terminal hair change were detected after a few sessions of IPL therapy among 51 out of 991 patients. Our serial digital photographs, schematic diagrams, and hair counts before and after treatment confirmed the patients' claims. The other more commonly seen complications were epidermal burning with blisters, erosion, and crust formation followed by post-inflammatory hypo- and/or hyperpigmentation. CONCLUSION: Paradoxical hypertrichosis and terminal hair change is a common complication of IPL photoepilation. Adult;Cohort Studies;Face;Female;Follow-Up Studies;Hair Removal;Hirsutism;Humans;Hypertrichosis;Low-Level Light Therapy;Middle Aged;Retrospective Studies;Risk Assessment;Severity of Illness Index

Intense pulsed light photoepilation in hirsute women: the role of obesity. Intense pulsed light (IPL) has shown diverse results in hair clearance related to treatment protocols or skin phototype. Hirsutism may be due to endocrine disease, as in polycystic ovary syndrome (PCOS) and congenital adrenal hyperplasia (CAH), both of which conditions may be associated with obesity. Obesity complicates the metabolic pattern, particularly in terms of insulin resistance, which may worsen the clinical condition of hirsutism. This study evaluated the role of obesity in photoepilation, comparing the clinical efficacy, long-term hair reduction and patient satisfaction in 40 hirsute women with PCOS or CAH, either obese (n = 20) or of normal weight (n = 20). The IPL settings were the same for both groups, but the number of sessions varied according to the clinical results. Obese patients showed a statistically significant severity of initial hirsutism if compared to the non-obese population and, for this reason, required more sessions to achieve hair reduction. The results were maintained at the 2-year follow-up examination, with a high satisfaction rate in both groups. Adolescent;Adrenal Hyperplasia, Congenital;Adult;Female;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Middle Aged;Obesity;Patient Satisfaction;Polycystic Ovary Syndrome;Young Adult

Effect of soft laser and bioactive glass on bone regeneration in the treatment of bone defects (an experimental study). This study aimed to investigate the influence of low-power gallium-aluminium-arsenide (GaAlAs) laser [830 nm, continuous wave (CW), 40 mW and fluence 4 J/cm(2)] on the healing of surgically created bone defects in rats treated with bioactive glass graft material. Surgical bone defects were created in the mandibles of 36 Wistar rats divided into two groups, each consisting of 18 rats. Group I was treated with bioactive glass plus laser irradiation. Group II was treated with graft material only. The animals were killed at 4 weeks, 8 weeks and 12 weeks postoperatively for histological examination. Laser irradiation had significantly accelerated bone healing at 4 weeks and 8 weeks in comparison with that at the sites not irradiated. However at 12 weeks, complete healing of the defects had occurred with no difference detected. Our results have confirmed the positive effect of soft laser in accelerating bone regeneration. Bioglass;Bone Substitutes Animals;Bone Regeneration;Bone Substitutes;Bone and Bones;Ceramics;Guided Tissue Regeneration;Lasers, Semiconductor;Low-Level Light Therapy;Osseointegration;Rats;Rats, Wistar;Time Factors;Wound Healing

Treatment of halo nevus with 308-nm excimer laser: a pilot study. Facial Neoplasms;Humans;Lasers, Excimer;Low-Level Light Therapy;Nevus, Halo;Pilot Projects

Electrophysiologic effects of a therapeutic laser on myofascial trigger spots of rabbit skeletal muscles. OBJECTIVE: To better understand the mechanisms of therapeutic lasers for treating human myofascial trigger points, we designed a blinded controlled study of the effects of a therapeutic laser on the prevalence of endplate noise (EPN) recorded from the myofascial trigger spot (MTrS) of rabbit

skeletal muscle. DESIGN: In eight rabbits, one MTrS in each biceps femoris muscle was irradiated with a 660-nm, continuous-wave, gallium-aluminum-arsenate (GaAlAs) laser, at 9 J/cm2. The contralateral side of muscle was treated with a sham laser. Each rabbit received six treatments. The immediate and cumulative effects were assessed by the prevalence of EPN with electromyographic (EMG) recordings after the first and last treatments. RESULTS: Compared with pretreatment values, the percentages of EPN prevalence in the experimental side after the first and last treatments were significantly reduced ($P < 0.01$ for both). The change in EPN prevalence in the experimental side was significantly greater than in the control side immediately after the first and last treatments ($P < 0.05$). However, no significant differences were noted between the first and last treatments ($P > 0.05$). CONCLUSIONS: In our study, immediate and cumulative effects of a GaAlAs laser applied on MTrS were demonstrated on the basis of the assessment of EPN prevalence. It seems that laser irradiation may inhibit the irritability of an MTrS in rabbit skeletal muscle. This effect may be a possible mechanism for myofascial pain relief with laser therapy. Animals;Electromyography;Electrophysiological Phenomena;Low-Level Light Therapy;Motor Endplate;Muscle, Skeletal;Myofascial Pain Syndromes;Rabbits;Random Allocation;Single-Blind Method

Multimodal therapy for chronic tinnitus. From 2001 to 2006, we performed a retrospective study of patients suffering from chronic unilateral or bilateral tinnitus that was previously ineffectively treated by oral drugs [betahistine (Betaserc), extract of Ginkgo biloba (EGb 761), tanakan (Tebokan), and cinnarizine-dimenhydrinate (Arlevert), singly or in combination]. We divided 150 tinnitus patients (80 men, 70 women) into seven treatment groups. Treatments consisted of application of intravenous pentoxifylline, lidocaine, or vinpocetine (Cavinton) and combination of these agents with physiotherapy and soft laser. Mean duration (+/- standard deviation) of tinnitus in these patients was 7.4 +/- 6.0 years; their mean age was 55.6 +/- 12.5 years. The aim of our study was to compare treatment modalities and define their effectiveness for tinnitus relief. The most effective treatment was defined as a combination of Cavinton and physiotherapy. We evaluated pure lidocaine infusion therapy as ineffective. None of the treatment modalities had an objective correlate of improvement, though improvement was reported by a visual analog scale. Drug Combinations;Plant Extracts;Vinca Alkaloids;cinnarizine, dimenhydrinate drug combination;Ginkgo biloba extract;Cinnarizine;vinpocetine;Lidocaine;Dimenhydrinate;Pentoxifylline;Betahistine Adult;Aged;Betahistine;Chronic Disease;Cinnarizine;Combined Modality Therapy;Dimenhydrinate;Drug Combinations;Drug Therapy, Combination;Female;Ginkgo biloba;Humans;Lidocaine;Low-Level Light Therapy;Male;Middle Aged;Pentoxifylline;Physical Therapy Modalities;Plant Extracts;Retrospective Studies;Tinnitus;Vinca Alkaloids

Low-power laser irradiation activates Src tyrosine kinase through reactive oxygen species-mediated signaling pathway. Low-power laser therapy in medicine is widespread but the mechanisms are not fully understood. It has been suggested that low-power laser irradiation (LPLI) could induce photochemical reaction and activate several intracellular signaling pathways. Reactive oxygen species (ROS) are considered to be the key secondary messengers produced by LPLI. Here, we studied the signaling pathway mediated by ROS upon the stimulation of LPLI. Src tyrosine kinases are well-known targets of ROS and can be activated by oxidative events. Using a Src reporter based on fluorescence resonance energy transfer (FRET) and confocal laser scanning microscope, we visualized the dynamic Src activation in Hela cells immediately after LPLI. Moreover, Src activation by LPLI was in a dose-dependent manner. The increase of Src phosphorylation at Tyr416 was detected by Western blotting. In the presence of vitamin C, catalase alone, or the combination of catalase and superoxide dismutase (SOD), the activation of Src by LPLI is significantly abolished. In contrast, GÃ¶6983 loading, a PKC inhibitor, did not affect this response. Treatment of Hela cells with exogenous H(2)O(2) also resulted in a concentration-dependent activation of Src. These results demonstrated that it was ROS that

mediated Src activation by LPLI. Cellular viability assay revealed that laser irradiation of low doses (</=25 J/cm(2)) promoted Hela cells viability while high doses impaired. Therefore, LPLI induces ROS-mediated Src activation which may play an important role in biostimulatory effect of LPLI. Antioxidants;Carbazoles;Cyan Fluorescent Protein;Indoles;Luminescent Proteins;Maleimides;Protein Kinase Inhibitors;Reactive Oxygen Species;Recombinant Fusion Proteins;Green Fluorescent Proteins;Hydrogen Peroxide;Catalase;Superoxide Dismutase;src-Family Kinases;Protein Kinase C;Ascorbic Acid Antioxidants;Ascorbic Acid;Carbazoles;Catalase;Cell Survival;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Enzyme Activation;Fluorescence Resonance Energy Transfer;Green Fluorescent Proteins;HeLa Cells;Humans;Hydrogen Peroxide;Indoles;Low-Level Light Therapy;Luminescent Proteins;Maleimides;Microscopy, Confocal;Phosphorylation;Protein Kinase C;Protein Kinase Inhibitors;Reactive Oxygen Species;Recombinant Fusion Proteins;Signal Transduction;Superoxide Dismutase;Time Factors;Transfection;src Homology Domains;src-Family Kinases

Measuring physiotherapy performance in patients with osteoarthritis of the knee: a prospective study. BACKGROUND: Patients with knee osteoarthritis [OA] are commonly treated by physiotherapists in primary care. Measuring physiotherapy performance is important before developing strategies to improve quality. The purpose of this study was to measure physiotherapy performance in patients with knee OA by comparing clinical practice to evidence from systematic reviews. METHODS: We developed a data-collection form and invited all private practitioners in Norway [n = 2798] to prospectively collect data on the management of one patient with knee OA through 12 treatment session. Actual practice was compared to findings from an overview of systematic reviews summarising the effect of physiotherapy interventions for knee OA. RESULTS: A total of 297 physiotherapists reported their management for patients with knee OA. Exercise was the most common treatment used, provided by 98% of the physiotherapists. There is evidence of high quality that exercise reduces pain and improves function in patients with knee OA. Thirty-five percent of physiotherapists used acupuncture, low-level laser therapy or transcutaneous electrical nerve stimulation. There is evidence of moderate quality that these treatments reduce pain in knee OA. Patient education, supported by moderate quality evidence for improving psychological outcomes, was provided by 68%. Physiotherapists used a median of four different treatment modalities for each patient. They offered many treatment modalities based on evidence of low quality or without evidence from systematic reviews, e.g. traction and mobilisation, massage and stretching. CONCLUSION: Exercise was used in almost all treatment sessions in the management of knee OA. This practice is desirable since it is supported by high quality evidence. Physiotherapists also provide several other treatment modalities based on evidence of moderate or low quality, or no evidence from systematic reviews. Ways to promote high quality evidence into physiotherapy practice should be identified and evaluated. Data Collection;Exercise Therapy;Humans;Norway;Osteoarthritis, Knee;Pain;Physical Therapy Modalities;Physical Therapy Specialty;Private Practice;Prospective Studies;Quality of Health Care

Facial scars after a road accident: combined treatment with PDL and Q-switched ND:YAG laser. We report the case of a woman who presented with several facial scars following a road accident. Treatment was carried out using combined laser treatment with pulsed dye laser (PDL) and the Q-switched neodymium:yttrium-aluminum-garnet laser (QS Nd:YAG laser). No side effects or complications from treatment were noted or reported. The patient had very good cosmetic results with this combined technique. A variety of facial scars--erythematous, pigmented, atrophic and hypertrophic--may occur as a result of trauma, surgery, burns and skin disease. Surgery with other adjunctive methods including radiotherapy, intralesional steroids and pressure therapy has shown variable results. Laser treatment has been attempted for scar revision since the 1980s. The PDL is the

optimal treatment for reducing scar bulk and symptoms. It also decreases the erythema and telangiectasia associated with scars, normalizes the skin surface texture and improves scar pliability. The QS Nd:YAG laser (1064 nm) is highly effective for traumatic tattoo removal, resulting in complete clearance in the majority of cases. Accidents, Traffic;Cicatrix;Cosmetic Techniques;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged

Safe and effective treatment of problem scars with the purely thermal non-ablative Er:YAG laser scar mode. INTRODUCTION: Traumatic events as well as surgery can cause a large variety of scars, which are often a major psychological concern to patients. Moreover, patients often report itching or burning sensations as well as pain. We investigated the efficacy of purely non-ablative laser therapy in order to improve the appearance and quality of these scars. METHODS: A total of 62 patients with problem scars were enrolled in the study. The purely thermal, non-ablative scar mode of an Er:YAG laser (BURANE XL; Wavelight AG, Erlangen, Germany) was used. One to six treatment sessions were performed. The improvement of scar redness, scar flatness, scar quality, itching and burning sensations as well as pain and patient satisfaction were evaluated. RESULTS: The overall scar quality improved in 93% of patients. Similarly, the flatness improved in 89% of scars, itching sensation in 79% and burning sensation in 86% of patients. In 91% of scars a decrease of scar redness was seen and all painful scars showed a pain reduction. Average patient satisfaction was 7.4 on a 10-point scale. Sixty-one patients would recommend the therapy to another person. Side effects were limited to transient erythema and oedema. CONCLUSION: The high success rate combined with the low side-effects resulted in high patient satisfaction. Post-traumatic or post-surgical scars can safely and effectively be treated by the thermal scar mode of the Er:YAG laser used.
Adolescent;Adult;Aged;Child;Cicatrix;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction

Hair transplantation for men. Men throughout history have suffered from various degrees of hair loss. Modern techniques for hair transplantation give rise to natural and long-lasting results. In this paper we provide an overview of the procedure, including the harvesting of donor hair in the occipital scalp, and its redistribution along the frontal- and mid-scalp areas. Special consideration must be made to choosing the candidates carefully and to performing their surgery in a manner that looks appropriate for all ages. We describe the role of medications for male pattern hair loss and with hair transplantation. Finasteride;Minoxidil Alopecia;Cicatrix;Cosmetic Techniques;Finasteride;Hair;Hair Follicle;Humans;Low-Level Light Therapy;Male;Minoxidil;Scalp

Retention of intratumor injections of cisplatinum in murine tumors and the impact on laser thermal therapy for cancer treatment. Recent studies using murine models of human squamous cell carcinoma (SCCA) have revealed a significant improvement in survival and cure rate of animals transplanted with human SCCA when treated with a combination of intratumor injections of chemotherapy and laser induced thermal therapy (LITT). These preliminary results suggest that this novel combination therapy may lead to improved clinical response compared to either treatment modality alone. Using a murine model of human SCCA we investigated two different modes of intratumor injection of cisplatin: a sustained-release cisplatin gel implant (CDDP/gel) versus cisplatin in solution (CDDP) at varying doses (range 1-3 mg/ml). In addition, we tested CDDP/gel combined with LITT. Results showed optimal drug concentration (30-300 nM) at tumor margins up to 4 h after injection of CDDP/gel implant compared to 3 nM at 5 min after injection with CDDP solution. Combined CDDP/gel and laser therapy significantly decreased tumor volume ($P<0.05$), with recurrence in only 25% of animals tested, compared to 78% tumor regrowth after LITT alone. These results suggest that laser chemotherapy may be an effective treatment for head and neck SCCA.
Delayed-Action Preparations;Cisplatin Animals;Carcinoma, Squamous Cell;Cisplatin;Combined Modality Therapy;Delayed-Action Preparations;Disease Models, Animal;Head and Neck

Neoplasms;Injections, Intralesional;Low-Level Light Therapy;Mice;Mice, Nude;Neoplasm Recurrence, Local;Neoplasms, Experimental;Random Allocation;Sensitivity and Specificity

Influence of laser photobiomodulation upon connective tissue remodeling during wound healing. The modulation of collagen fibers during experimental skin wound healing was studied in 112 Wistar rats submitted to laser photobiomodulation treatment. A standardized 8mm-diameter wound was made on the dorsal skin of all animals. In half of them, 0.2ml of a silica suspension was injected along the border of the wound in order to enhance collagen deposition and facilitate observation. The others received saline as vehicle. The treatment was carried out by means of laser rays from an aluminum-gallium arsenide diode semiconductor with 9mW applied every other day (total dose=4J/cm2) on the borders of the wound. Tissue sections obtained from four experimental groups representing sham-irradiated animals, laser, silica and the association of both, were studied after 3, 7, 10, 15, 20, 30 and 60 days from the laser application. The wounded skin area was surgically removed and submitted to histological, immunohistochemical, ultrastructural, and immunofluorescent studies. Besides the degree and arrangement of collagen fibers and of their isotypes, the degree of edema, the presence of several cell types especially pericytes and myofibroblasts, were described and measured. The observation of Sirius-red stained slides under polarized microscopy revealed to be of great help during the morphological analysis of the collagen tissue dynamic changes. It was demonstrated that laser application was responsible for edema regression and a diminution in the number of inflammatory cells ($p<0.05$). An evident increase in the number of actin-positive cells was observed in the laser-treated wounds. Collagen deposition was less than expected in silica-treated wounds, and laser treatment contributed to its better differentiation and modulation in all irradiated groups. Thus, laser photobiomodulation was able to induce several modifications during the cutaneous healing process, especially in favoring newly-formed collagen fibers to be better organized and compactedly disposed. Actins;Desmin;Fibrin;Collagen Actins;Animals;Collagen;Connective Tissue;Desmin;Female;Fibrin;Low-Level Light Therapy;Male;Microscopy, Electron;Rats;Rats, Wistar;Wound Healing;Wounds and Injuries

Effect of laser phototherapy on the release of fibroblast growth factors by human gingival fibroblasts. The effects of laser phototherapy on the release of growth factors by human gingival fibroblasts were studied in vitro. Cells from a primary culture were irradiated twice (6 h interval), with continuous diode laser [gallium-aluminum-arsenium (GaAlAs), 780 nm, or indium-gallium-aluminum-phosphide (InGaAlP),_660 nm] in punctual and contact mode, 40 mW, spot size 0.042 cm(2), 3 J/cm(2) and 5 J/cm(2) (3 s and 5 s, respectively). Positive [10% fetal bovine serum (FBS)] and negative (1%FBS) controls were not irradiated. Production of keratinocyte growth factor (KGF) and basic fibroblast growth factor (bFGF) was quantified by enzyme-linked immunosorbent assay (ELISA). The data were statistically compared by analysis of variance (ANOVA) followed by Tukey's test ($P </= 0.05$). The characterization of the cell line indicated a mesenchymal nature. KGF release was similar in all groups, while that of bFGF was significantly greater (1.49-times) in groups treated with infra-red laser. It was concluded that increased production of bFGF could be one of the mechanisms by which infra-red laser stimulates wound healing. Culture Media;FGF7 protein, human;Fibroblast Growth Factor 2;Fibroblast Growth Factor 7;Fibroblast Growth Factors Animals;Cattle;Cells, Cultured;Culture Media;Fibroblast Growth Factor 2;Fibroblast Growth Factor 7;Fibroblast Growth Factors;Fibroblasts;Gingiva;Gingivoplasty;Humans;Low-Level Light Therapy;Phototherapy;Wound Healing

Low-level laser irradiation facilitates fibronectin and collagen type I turnover during tooth movement in rats. The aim of this study was to investigate the effects of low-level laser (LLL) irradiation on the turnover of fibronectin and collagen type I in periodontal tissue during tooth movement in rats by immunohistochemistry. Thirty male Sprague-Dawley rats aged 15 weeks were assigned to either an

experimental group (n = 15) that underwent LLL irradiation during tooth movement, or a control group (n = 15). In the experimental group, the gallium-aluminum-arsenide (Ga-Al-As) diode LLL (wavelength 808 nm; output 96 mW) was used to irradiate three areas on both the palatal side and the labial side of the maxillary incisor. The radiation was administered by the contact method for 10 s at 0.83 J/cm(2) energy dose, once a day for 7 days. Total energy dose over the complete schedule was 34.86 J/cm(2). The animals were killed on days 1, 3, 7, 14 and 21. There was no difference between the two groups in the amount of tooth movement. The immunohistochemistry results showed that the expression of fibronectin and collagen type I in the experimental group had significantly increased from day 1, with a more even distribution than in the control group, and that this difference was maintained until the end of the experiment. These results suggest that LLL irradiation facilitates the reorganization of the connective tissues during tooth movement in rats. Collagen Type I;Fibronectins Animals;Collagen Type I;Fibronectins;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Periodontium;Rats;Rats, Sprague-Dawley;Time Factors;Tooth Movement Techniques

Low-level laser therapy improves vision in patients with age-related macular degeneration. OBJECTIVE: The objective of this study of a case series was to examine the effects of low-level laser therapy (LLLT) in patients with age-related macular degeneration (AMD). BACKGROUND DATA: AMD affects a large proportion of the elderly population; current therapeutic options for AMD are limited, however. PATIENTS AND METHODS: In total, 203 patients (90 men and 113 women; mean age 63.4 +/- 5.3 y) with beginning ("dry") or advanced ("wet") forms of AMD (n = 348 eyes) were included in the study. One hundred ninety-three patients (mean age 64.6 +/- 4.3 y; n = 328 eyes) with cataracts (n = 182 eyes) or without cataracts (n = 146 eyes) were treated using LLLT four times (twice per week). A semiconductor laser diode (780 nm, 7.5 mW, 292 Hz, continuous emission) was used for transconjunctival irradiation of the macula for 40 sec (0.3 J/cm2) resulting in a total dose of 1.2 J/cm2. Ten patients (n = 20 eyes) with AMD received mock treatment and served as controls. Visual acuity was measured at each visit. Data were analyzed retrospectively using a t-test. RESULTS: LLLT significantly improved visual acuity ($p < 0.00001$ versus baseline) in 162/182 (95%) of eyes with cataracts and 142/146 (97%) of eyes without cataracts. The prevalence of metamorphopsia, scotoma, and dyschromatopsia was reduced. In patients with wet AMD, edema and bleeding improved. The improved vision was maintained for 3-36 mo after treatment. Visual acuity in the control group remained unchanged. No adverse effects were observed in those undergoing therapy. CONCLUSION: In patients with AMD, LLLT significantly improved visual acuity without adverse side effects and may thus help to prevent loss of vision. Female;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Visual Acuity

Effect of soft laser and bioactive glass on bone regeneration in the treatment of infra-bony defects (a clinical study). This study aimed to investigate the influence of low-power 830 nm gallium-aluminium-arsenide (GaAlAs) laser [continuous wave (CW) 40 mW and fluence 4 J/cm(2), with total energy density of 16 J/cm(2)] on the healing of human infra-bony defects treated with bioactive glass graft material. Twenty patients with chronic periodontitis and bilateral infra-bony defects were included. Using a split mouth design, we treated 20 defects with bioactive glass plus laser irradiation during surgical procedures and on days 3, 5, 7 postoperatively; 20 contra-lateral defects were treated with bioactive glass only. Clinical probing pocket depths, clinical attachment levels and standardized periapical radiographs were recorded at baseline and at 3 months and 6 months postoperatively. At 3 months there was a statistically significant difference between the laser and non-laser sites in the parameters investigated. However, at 6 months, no difference was observed. Our results have confirmed the positive effect of soft laser in accelerating periodontal wound healing. Bioglass;Bone Substitutes Adult;Alveolar Bone Loss;Bone Regeneration;Bone

Substitutes;Ceramics;Chronic Periodontitis;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Radiography
[Comparative evaluation of influence of low-intensity laser radiation of different spectrum components and regimen of laser work upon microcirculation in comprehensive treatment of chronic parodontitis]. Comparative study of the influence details of low-intensity pulse and continuous oscillation of laser radiation of red and infrared parts of spectrum upon microcirculation indices in comprehensive treatment of chronic parodontitis of light and middle severity was performed. For the first time the predominantly activating influence upon microcirculation in gingival tissues of the pulsed laser radiation in the red part of spectrum was established. Adult;Chronic Disease;Combined Modality Therapy;Equipment Design;Female;Gingiva;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Periodontal Diseases
Influence of low-level laser therapy on biomaterial osseointegration: a mini-review. The aim of this paper is to provide an overview of the available literature on low-level laser therapy (LLLT) and its influence on bone repair and the osseointegration of biomaterials. Extensive studies of alveolar bone repair, a common problem in periodontal therapy, have been conduced worldwide. The utility of LLLT in biomaterial osseointegration is still unanswered, due to lack of literature and poorly understood mechanisms. It is still difficult for one to compare studies about the action of LLLT on the osseointegration of biomaterials because the experimental models and duration of treatments are very distinct. However, it could be concluded that LLLT may offer advantages in terms of periodontal and bone functional recovery and biomaterial osseointegration. Biocompatible Materials;Bone Substitutes Alveolar Process;Animals;Biocompatible Materials;Bone Regeneration;Bone Substitutes;Humans;Low-Level Light Therapy;Osseointegration
Irradiation with 780 nm diode laser attenuates inflammatory cytokines but upregulates nitric oxide in lipopolysaccharide-stimulated macrophages: implications for the prevention of aneurysm progression. BACKGROUND AND OBJECTIVES: Low level laser irradiation (LLLI) has been shown to reduce inflammation in a variety of clinical situations. We have shown that LLLI (780 nm) increases aortic smooth muscle cell proliferation and matrix protein secretion and modulates activity and expression of matrix metalloproteinases. Inflammation is a major component of arteriosclerotic diseases including aneurysm. Macrophage recruitment and secretion of pro-inflammatory cytokines and the vasodilator, nitric oxide (NO), are central to most immune responses in the arterial wall. The present study was designed to determine the effect of LLLI on cytokine gene expression and secretion as well as gene expression of inducible nitric oxide synthase (iNOS) and NO production in lipopolysaccharide (LPS)-stimulated macrophages. STUDY DESIGN/MATERIALS AND METHODS: Murine monocyte/macrophages (RAW 264.7) were irradiated with a 780 nm diode laser (2 mW/cm(2), 2.2 J/cm(2)) during stimulation with LPS (0, 0.1, and 1 microg/ml). Gene expression of chemokines, cytokines, and iNOS were assessed by RT-PCR. Secretion of interleukin (IL)-1beta and monocyte chemotactic protein (MCP)-1 and NO were assessed by ELISA and the Griess reaction, respectively. RESULTS: LLLI reduced gene expression of MCP-1, IL-1alpha, IL-10 (P<0.01), IL-1beta, and IL-6 (P<0.05) when cells were stimulated by 1 microg/ml LPS. LLLI reduced LPS-induced secretion of MCP-1 over non-irradiated cells by 17+/-5% and 13+/-5% at 12 hours (0.1 and 1 microg/ml LPS; P<0.01 and P=0.05, respectively), and reduced IL-1beta by 22+/-5% and 25+/-9% at 24 hours (0.1 and 1 microg/ml LPS, P=0.01 and P=0.06, respectively). However, LLLI increased NO secretion after 12 hours (LLLI vs. CONTROL: without LPS, 1.72+/-0.37 vs. 0.95+/-0.4 microM, P<0.05; 0.1 microg/ml LPS, 7.46+/-1.62 vs. 4.44+/-1.73 microM, P=0.06; 1 microg/ml LPS, 10.91+/-3.53 vs. 6.88+/-1.52 microM, P<0.05). CONCLUSIONS: These properties of LLLI, with its effects on smooth muscle cells reported previously, may be of profound therapeutic relevance for arterial diseases such as aneurysm where inflammatory processes and weakening of the matrix structure of the arterial wall are major

pathologic components. Cytokines;Lipopolysaccharides;RNA, Messenger;Nitric Oxide Aneurysm;Animals;Cell Culture Techniques;Cell Line;Cytokines;Lasers, Semiconductor;Lipopolysaccharides;Low-Level Light Therapy;Macrophages;Mice;Nitric Oxide;RNA, Messenger

A study of actinic cheilitis treatment by two low-morbidity CO2 laser vaporization one-pass protocols. Therapeutic approaches to chronic actinic cheilitis focus on the removal or destruction of diseased epithelium. The CO(2) laser has become an important therapeutic alternative, achieving clinical resolution in around 90% of patients. Although many laser physical parameters have been reported, some are known for their low potential for scar induction without compromising the success of the results. The aim of this clinicohistological study was to compare the therapeutic responses to two low-morbidity protocols involving a single laser pass. A total of 40 patients with chronic multicentric and microscopically proven disease were randomly submitted to two conservative CO(2) laser protocols using a bilateral comparative model. The degree of histological atypia of the epithelium was determined in 26 patients both pre- and postoperatively for both protocols. Other histological phenomena were assessed in addition to this central analysis parameter. Clinical recurrence occurred in 12.5% of patients for each protocol, together with a significant reduction in the degree of epithelial atypia ($p < 0.001$), which was occasionally complete. However, no difference was found between the protocols ($p > 0.05$). Using these morphological parameters it was not possible to determine whether postoperative epithelial atypias in part of the sample were reactive or residual in nature. A few patients may show minor postoperative lesions. Due to their potential to achieve clinical and importantly microscopic resolution, the studied protocols may be used for mild through moderate dysplastic epithelium and clinically diffuse disease. Adult;Aged;Cheilitis;Clinical Protocols;Epithelium;Female;Humans;Lasers, Gas;Lip Neoplasms;Low-Level Light Therapy;Male;Middle Aged;Precancerous Conditions

Low-voltage electrical injuries treated with Er:Yag laser. Adult;Debridement;Electric Injuries;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged

Selective retina therapy (SRT) of chronic subfoveal fluid after surgery of rhegmatogenous retinal detachment: three case reports. BACKGROUND: Shallow subfoveal fluid accumulation after successful surgery for retinal detachment can be the reason for compromised visual acuity. To date, therapeutical options to tackle this problem have not been established. Selective retina therapy (SRT) is a new laser technology that uses a train of mus-laser pulses to selectively damage retinal pigment epithelial (RPE) cells while sparing retinal structures. METHODS: We treated three patients with chronic subfoveal fluid accumulation after retinal detachment surgery. The median period between retinal surgery and SRT treatment was 7 months. For SRT, we used a prototype frequency-doubled, Q-switched Nd:YLF laser (lambda = 527 nm). Each laser exposition contained 30 pulses (t = 1,7 micros, 100 Hz, E = 100-400 microJ). Two of the three patients were treated subfoveally. OCT III (optical coherence tomography) examinations were performed to evaluate changes in subretinal fluid accumulation. RESULTS: In all three patients, we observed complete resolution of subfoveal fluid within 1-5 months. Follow-up has been 16 months to 2 years. Visual acuity improved in all patients. In one patient, cystoid macular edema developed 3 months after treatment. Additional SRT treatments were not necessary. CONCLUSION: SRT is a safe treatment. Visual acuity improved after SRT, even in subfoveal irradiations. SRT is an option to support subretinal fluid reabsorption. In this situation where no other therapeutical options are established, SRT may be a beneficial treatment for chronic subfoveal fluid accumulation after retinal detachment surgery. Adult;Aged;Body Fluids;Female;Fluorescein Angiography;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Postoperative Complications;Retinal Detachment;Retinal Pigment Epithelium;Retrospective Studies;Scleral Buckling;Tomography, Optical Coherence;Visual Acuity

Central nervous system abnormalities in fibromyalgia and chronic fatigue syndrome: new concepts in treatment. Fibromyalgia (FM) and chronic fatigue syndrome (CFS) are poorly understood disorders that share similar demographic and clinical characteristics. The etiology and pathophysiology of these diseases remain unclear. Because of the similarities between both disorders it was suggested that they share a common pathophysiological mechanisms, namely, central nervous system (CNS) dysfunction. Current hypotheses center on atypical sensory processing in the CNS and dysfunction of skeletal muscle nociception and the hypothalamic-pituitary-adrenal (HPA) axis. Researches suggest that the (CNS) is primarily involved in both disorders in regard to the pain, fatigue and sleep disturbances. Many patients experience difficulty with concentration and memory and many others have mood disturbance, including depression and anxiety. Although fibromyalgia is common and associated with substantial morbidity and disability, there are no US Food and Drug Administration (FDA)-approved treatments except pregabalin. Recent pharmacological treatment studies about fibromyalgia have focused on selective serotonin and norepinephrine (NE) reuptake inhibitors, which enhance serotonin and NE neurotransmission in the descending pain pathways and lack many of the adverse side effects associated with tricyclic medications. CFS is a descriptive term used to define a recognisable pattern of symptoms that cannot be attributed to any alternative condition. The symptoms are currently believed to be the result of disturbed brain function. To date, no pharmacological agent has been reliably shown to be effective treatment for CFS. Management strategies are therefore primarily directed at relief of symptoms and minimising impediments to recovery. This chapter presents data demonstrating CFS, abnormal pain processing and autonomic nervous system (ANS) dysfunction in FM and CFS and concludes by reviewing the new concepts in treatments in CFS and FM. Adrenergic beta-Antagonists;Analgesics;Antidepressive Agents;Antipsychotic Agents;Central Nervous System Stimulants Acupuncture Therapy;Adrenergic beta-Antagonists;Analgesics;Antidepressive Agents;Antipsychotic Agents;Autonomic Nervous System Diseases;Central Nervous System;Central Nervous System Stimulants;Electroconvulsive Therapy;Fatigue Syndrome, Chronic;Fibromyalgia;Humans;Low-Level Light Therapy;Pain Management;Physical Therapy Modalities;Psychotherapy;Sleep Wake Disorders

Influence of different types of electromagnetic fields on skin reparatory processes in experimental animals. Wound healing is a very complex process, some phases of which have only recently been explained. Magnetic and electromagnetic fields can modulate this process in a non-thermal way. The aim of this research was to compare the influence of constant and pulsed electromagnetic fields and low-level laser therapy (LLLT) on wound healing in experimental animals. The experiment was conducted on 120 laboratory rats divided into four groups of 30 animals each (constant electromagnetic field, pulsed electromagnetic field, LLLT and control group). It lasted for 21 days. Under the influence of the constant electromagnetic field the healing of the skin defect was accelerated in comparison with the control group. The difference was statistically significant in all the weeks of the experiment at the $P < 0.01$ level. Accelerated healing was also observed under the influence of the pulsed electromagnetic field ($P < 0.05$). In the group of animals exposed to LLLT, the healing of the skin defect was faster than in the control group. The statistical significance was at the $P < 0.05$ level. Different types of electromagnetic fields have a promoting effect on the wound healing process. Animals;Electromagnetic Fields;Low-Level Light Therapy;Magnetic Field Therapy;Male;Rats;Skin;Skin Physiological Phenomena;Wound Healing

In vivo effect of photodynamic therapy on periodontal bone loss in dental furcations. BACKGROUND: The purpose of this study was to histometrically evaluate the influence of photodynamic therapy on bone loss in furcation areas in rats with experimentally induced periodontal disease. METHODS: Ligatures were placed on the first mandibular molar in rats. Then the animals were divided into four groups: control group = no treatment; methylene blue group (MB) =

treated topically with methylene blue (100 microg/ml); laser group (LLLT) = treated with low-level laser therapy; and photodynamic therapy group (PDT) = treated topically with MB followed by LLLT (4.5 J/cm(2)). Rats from all groups were sacrificed at 7, 15, or 30 days postoperatively. The area of bone loss in the furcation region of the first molar was histometrically analyzed. Data were analyzed statistically (analysis of variance and Bonferroni tests; P <0.05). RESULTS: The PDT group demonstrated less bone loss compared to the other groups at 7 days (1.986 +/- 0.417 mm(2)); at 15 days, the PDT (1.641 +/- 0.115 mm(2)) and MB groups (1.991 +/- 0.294 mm(2)) demonstrated less bone loss compared to the control (4.062 +/- 0.416 mm(2)) and LLLT (2.641 +/- 0.849 mm(2)) groups. CONCLUSION: Within the parameters used in this study, PDT may be an effective alternative for control of bone loss in furcation areas in periodontitis. Enzyme Inhibitors;Photosensitizing Agents;Methylene Blue Alveolar Bone Loss;Animals;Enzyme Inhibitors;Furcation Defects;Lasers, Semiconductor;Ligation;Low-Level Light Therapy;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Random Allocation;Rats;Rats, Wistar

A systematic review with procedural assessments and meta-analysis of low level laser therapy in lateral elbow tendinopathy (tennis elbow). BACKGROUND: Recent reviews have indicated that low level level laser therapy (LLLT) is ineffective in lateral elbow tendinopathy (LET) without assessing validity of treatment procedures and doses or the influence of prior steroid injections. METHODS: Systematic review with meta-analysis, with primary outcome measures of pain relief and/or global improvement and subgroup analyses of methodological quality, wavelengths and treatment procedures. RESULTS: 18 randomised placebo-controlled trials (RCTs) were identified with 13 RCTs (730 patients) meeting the criteria for meta-analysis. 12 RCTs satisfied half or more of the methodological criteria. Publication bias was detected by Egger's graphical test, which showed a negative direction of bias. Ten of the trials included patients with poor prognosis caused by failed steroid injections or other treatment failures, or long symptom duration or severe baseline pain. The weighted mean difference (WMD) for pain relief was 10.2 mm [95% CI: 3.0 to 17.5] and the RR for global improvement was 1.36 [1.16 to 1.60]. Trials which targeted acupuncture points reported negative results, as did trials with wavelengths 820, 830 and 1064 nm. In a subgroup of five trials with 904 nm lasers and one trial with 632 nm wavelength where the lateral elbow tendon insertions were directly irradiated, WMD for pain relief was 17.2 mm [95% CI: 8.5 to 25.9] and 14.0 mm [95% CI: 7.4 to 20.6] respectively, while RR for global pain improvement was only reported for 904 nm at 1.53 [95% CI: 1.28 to 1.83]. LLLT doses in this subgroup ranged between 0.5 and 7.2 Joules. Secondary outcome measures of painfree grip strength, pain pressure threshold, sick leave and follow-up data from 3 to 8 weeks after the end of treatment, showed consistently significant results in favour of the same LLLT subgroup ($p < 0.02$). No serious side-effects were reported. CONCLUSION: LLLT administered with optimal doses of 904 nm and possibly 632 nm wavelengths directly to the lateral elbow tendon insertions, seem to offer short-term pain relief and less disability in LET, both alone and in conjunction with an exercise regimen. This finding contradicts the conclusions of previous reviews which failed to assess treatment procedures, wavelengths and optimal doses. Elbow Joint;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Tendinopathy;Tennis Elbow;Therapeutics

[Laser therapy in the complex treatment of prostatic tuberculosis at the sanatorium stage of rehabilitation]. Seventy nine patients with prostatic tuberculosis were examined and treated at the specialized "Glukhovskaya" sanatorium. All the patients were divided into 2 groups: a study group and a control one. In the study group patients, low-intensity laser radiotherapy was additionally performed in combination with etiological and pathogenetical treatments. The performed studies demonstrated that in the patients exposed to low-intensity laser radiation, there was a rapid relief of dysuric symptoms, cessation or diminishment of the signs of copulative dysfunction; positive changes

in life quality indices and laboratory parameters were statistically significantly more frequently and more rapidly recorded. Laser therapy simultaneously was found to affect a few links of the pathogenesis of genitourinary tuberculosis, to have limited number of contraindications, to be well tolerated, and to be an effective method of the complex treatment of patients with prostatic tuberculosis during sanatorium rehabilitation. Humans;Low-Level Light Therapy;Male;Prostatic Diseases;Treatment Outcome;Tuberculosis, Male Genital

Frequency doubled neodymium:yttrium-aluminum-garnet and diode laser-activated power bleaching--pH, environmental scanning electron microscopy, and colorimetric in vitro evaluations. Corrosiveness of enamel surfaces of Smartbleach, Opus White, Opalescense Xtra Boost and a gel containing titanium dioxide (TiO(2)) particles, activated either by a frequency doubled neodymium: yttrium-aluminum-garnet (Nd:YAG) laser (532 nm) or a diode laser (810 nm) was evaluated by environmental scanning electron microscopy (ESEM). Changes in teeth color shades and the pH were also evaluated. Each bleaching agent was laser activated for 30 s and removed after 1 min or 10 min. This procedure was repeated up to four times, the bleaching agent receiving a maximum application time of 40 min, with total irradiation times of 0.5 min to 2 min of laser activation. The results of the pH measurements showed that only Smartbleach was in the alkaline pH range, whereas the other three were acidic. The surface effects were unrelated to the pH of the bleaching agents. With the exception of Opus White, no severe alterations on the enamel surface were detected. Although short application times were chosen, improved changes in brightness of up to ten steps on the Vitapan classical shade guide were detected. Colorimetry;Dental Enamel;Humans;Hydrogen-Ion Concentration;In Vitro Techniques;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Photobiology;Tooth Bleaching

Low level laser therapy for healing acute and chronic wounds - the extendicare experience. The purpose of the study is to assess the effectiveness of low level laser therapy for wound healing when combined with the Extendicare Wound Prevention and Management Program. Sixteen residents at a Canadian Extendicare nursing home had a total of 27 sites treated consisting of 23 open wounds and 4 'at risk' areas. Of the 23 open wounds, two wounds in between toes were not able to be 'traced' and deemed 'immeasurable' wounds, resulting in 21 open, measured wounds. The four 'at risk' (closed) areas were treated preventatively. Pressure, venous insufficiency and diabetic wounds were included. The majority (12/21) or 57.1%, of the wounds were chronic (>or=3 months duration) and 42.9% were acute (<3 months duration). The primary outcome measures included the PUSH Tool score, EZ Graph tracings and photographs. Secondary outcome measures were employed to better understand potential barriers to successful integration into clinical practice. Feedback on the effectiveness of low level laser therapy, the education program and determinations of hands-on relevance was sought from staff. At the end of the 9-week trial, the majority (61.9%) of the 21 wounds achieved significant improvement (>or=50% wound closure). Nine (42.8%) had 100% closure. Some improvement was seen in 14.3% and 23.8% of wounds demonstrated no change. Chronic and acute wounds had similar improvement. None of the wounds in this debilitated, frail population deteriorated during the study and no negative consequences of treatment were encountered. Without staff support, even if new technology has positive clinical outcomes, success would be limited. Staff rated low level laser, easy to learn and use, effective for the majority of their residents worth the additional time. Staff requested a continuation of low level laser even after study completion. Aged;Aged, 80 and over;Canada;Cohort Studies;Feasibility Studies;Female;Frail Elderly;Humans;Low-Level Light Therapy;Male;Nursing Homes;Skin Ulcer;Treatment Outcome;Wound Healing

Overviews and systematic reviews on low back pain. Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Neuromuscular Agents;Acetaminophen

Acetaminophen;Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Humans;Low Back Pain;Low-Level Light Therapy;Neuromuscular Agents;Research Design;Review Literature as Topic

Characteristics of choroidal neovascularization in the complications of age-related macular degeneration prevention trial. OBJECTIVE: To describe the characteristics of incident choroidal neovascularization (CNV) in observed and treated eyes in the Complications of Age-related Macular Degeneration Prevention Trial (CAPT). DESIGN: Cross-sectional descriptive study within a multicenter, randomized clinical trial. PARTICIPANTS: Patients who developed CNV during CAPT follow-up. METHODS: Inclusion criteria for CAPT specified bilateral large drusen (>or=10 drusen at least 125 micro), visual acuity >or=20/40 in each eye, and age >or=50. Exclusion criteria included CNV and geographic atrophy >1 Macular Photocoagulation Study (MPS) disc area or within 500 micro of the foveal center. One eye of each person was selected randomly for low-intensity laser treatment and the contralateral eye was observed. Fluorescein angiography was performed at baseline, annually for >or=5 years, and whenever there were symptoms of CNV. Trained readers at the CAPT Photograph Reading Center assessed color stereo photographs and angiogram negatives to identify CNV. MAIN OUTCOME MEASURES: Choroidal neovascularization was classified by type (predominantly classic CNV, minimally classic CNV, occult only CNV, or scar), location, and area. Visual acuity was measured by certified examiners. Symmetry of characteristics between eyes of bilaterally affected patients was examined. RESULTS: Choroidal neovascularization developed in 282 eyes of 225 patients. At the time of detection, 192 (68%) of the lesions were occult only, 153 (54%) were subfoveal, and 157 (56%) were <or=2 MPS disc areas. Visual acuity was >or=20/40 in 123 (69%) of 179 eyes with visual acuity measured at the time of detection. Choroidal neovascularization developed in both eyes in 57 patients (25%) during CAPT follow-up. Lesions in eyes of bilaterally affected patients were no more similar to each other than affected eyes in 2 different patients. CONCLUSIONS: When patients are monitored closely, many CNV lesions can be detected outside of the fovea and when they are relatively small. Early detection may lead to improved long-term visual acuity. Choroidal Neovascularization;Cross-Sectional Studies;Fluorescein Angiography;Follow-Up Studies;Humans;Laser Coagulation;Macular Degeneration;Photography;Reproducibility of Results;Visual Acuity

Low-intensity laser irradiation improves the mitochondrial dysfunction of C2C12 induced by electrical stimulation. OBJECTIVE: We investigated the effects of electrical stimulation and low-intensity laser (LIL) energy on the mitochondrial function of cultured C2C12 myotubes in order to find a dosage that could be used to improve the function of mitochondria, and then rehabilitate exercise-induced damage and fatigue. BACKGROUND DATA: Many other studies in the past demonstrated that LIL had a cytoprotective effect, and a recent study also found that LIL could reduce muscular fatigue during tetanic contractions in rats. METHODS: Cultured C2C12 myotubes were subjected to electrical stimulation or/and LIL irradiation at various intensities. Reactive oxygen species (ROS) were detected with a fluorescent probe (DCFH-DA) and mitochondrial function was assessed with an MTT assay. RESULTS: The results showed that electrical stimulation at 20 ms, 5 Hz, and 45 V for 75 min can induce mitochondrial dysfunction in cultured C2C12 myotubes. Electrical stimulation-induced mitochondrial dysfunction was improved, but degeneration occurred with LIL at doses of 0.33-8.22 and 11.22-14.16 J/cm2, respectively, and these changes were markedly increased with LIL at 0.33 and 1.34 J/cm2, respectively. CONCLUSIONS: We conclude that treatment of myotubes with the proper dosage of LIL irradiation significantly diminished production of ROS and restored mitochondrial function, and this may provide a foundation for the use of photobiomodulation to treat exercise-induced mitochondrial dysfunction or skeletal muscular fatigue. Animals;Cell Line;Electric Stimulation;Lasers;Mice;Mitochondria, Muscle;Muscle Contraction;Muscle Fatigue;Muscle Fibers, Skeletal

Blood flow changes of a superficial temporal artery before and after low-level laser irradiation applied to the temporomandibular joint area. PURPOSE: The aim of this study was to evaluate the blood flow changes of a superficial temporal artery before and after low-level laser irradiation was applied to the TMJ area of healthy subjects. METHODS: Right TMJ areas of six healthy subjects were irradiated with a CO2 laser. Variation of diameter, blood flow rate, and blood flow volume of the vessel, on both the irradiated side and opposite side, before and after irradiation on the TMJ were evaluated by using a Doppler flowmeter. RESULTS: The diameter and blood flow volume of the vessel after irradiation increased significantly compared to that before irradiation. CONCLUSION: Low-level laser irradiation applied to the right TMJ area caused an expansion of blood vessels and an increase in blood flow volume. The same result on the contralateral side may be caused by the vasodilator reflex via the hypothalamic thermostat. Carbon Dioxide Carbon Dioxide;Humans;Low-Level Light Therapy;Radiation Dosage;Regional Blood Flow;Temporal Arteries;Temporomandibular Joint

Clinical evaluation of a 1,450-nm diode laser as adjunctive treatment for refractory facial acne vulgaris. BACKGROUND: Despite aggressive multitreatment medical acne regimens, many patients demonstrate modest benefit. The 1,450-nm diode laser has been shown to improve acne in a study setting. OBJECTIVE: Herein we evaluate the use of this laser as an adjunctive tool in the management of refractory facial acne vulgaris. MATERIALS AND METHODS: Thirteen patients were treated. Lesion counts, clinical evaluation, and digital photography were performed at baseline and at all follow-up visits. Patients received an average of three treatments. Acne severity index and patient satisfaction were assessed. Patients continued their medical acne regimen where applicable. RESULTS Mean total lesion and inflammatory lesion counts decreased from 66 +/- 14 and 23 +/- 5 at baseline to 34 +/- 12.9 and 14 +/- 7 after three treatments ($p<.05$). Side effects were mild, including erythema lasting up to 24 hours. CONCLUSION: The 1,450-nm diode laser provides moderate improvement of refractory acne vulgaris. Our findings support the use of this device as an adjunctive treatment for acne management. Acne Vulgaris;Adolescent;Adult;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction

Nonablative fractional resurfacing for total body rejuvenation. Combined Modality Therapy;Esthetics;Humans;Low-Level Light Therapy;Patient Selection;Rejuvenation;Skin Aging

The use of low-energy laser (LEL) for the prevention of chemotherapy- and/or radiotherapy-induced oral mucositis in cancer patients: results from two prospective studies. BACKGROUND: Low-energy laser (LEL) treatment has been suggested as an effective and safe method to prevent and/or treat oral mucositis induced by chemotherapy and/or radiotherapy; however, it has not gained wide acceptance so far. MATERIALS AND METHODS: We conducted two clinical trials testing the LEL technique: firstly, as a secondary prevention in patients with various solid tumors treated with chemotherapy who all developed severe mucositis after a previous identical chemotherapy and, secondly, as therapeutic intervention (compared to sham illumination in a randomized way) in patients with hematological tumors receiving intensive chemotherapy and having developed low-grade oral mucositis. RESULTS: We entered 26 eligible patients in the first study and 36 were randomized in the second study. The success rate was 81% (95%CI = 61-93%) when LEL was given as a preventive treatment. In the second study, in patients with existing lesions, the therapeutic success rate was 83% (95%CI = 59-96%), which was significantly different from the success rate reached in the sham-treated patients (11%; 95%CI = 1-35%); the time to development of grade 3 mucositis was also significantly shorter in the sham-treated patients ($p < 0.001$). CONCLUSION: Our results strongly support the already available literature, suggesting that LEL is an effective and safe approach to prevent or treat oral mucositis resulting from cancer chemotherapy. Antineoplastic Agents Adult;Aged;Antineoplastic Agents;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Radiotherapy;Secondary Prevention;Stomatitis;Young Adult

Clinical experience with the Fraxel SR laser: 202 treatments in 59 consecutive patients. BACKGROUND: The authors investigated postprocedure patient satisfaction after fractional photothermolysis with the Fraxel SR laser. METHODS: All patients were surveyed with respect to their satisfaction with the results using a Likert scale ranging from 1 to 5, with 5 = extremely satisfied and 1 = extremely dissatisfied. Fraxel SR laser treatment was performed for categories of skin abnormalities that included dyschromia, scarring, and texture abnormalities. Most patients had more than one concern. Univariate and multivariate analyses were performed. Logistic regression was used to explore predictors of a satisfaction score of 4 or 5. RESULTS: Fifty-nine patients (median age, 52 years; range, 30 to 71 years) underwent Fraxel SR laser resurfacing and completed the survey. A total of 202 treatments (median, four; range, one to six) were performed. Seventy-five percent of all patients were very satisfied (4 or 5 rating) with treatment. Seventy-five percent with dyschromia, 74 percent with texture abnormalities, and 100 percent with scarring had a satisfaction score of 4 or 5. Multivariate analysis found scarring, four or more treatments, and age older than 56 years to be associated with a score of 4 or 5. The odds of giving a satisfaction score of 4 or 5 increased approximately two-fold for each additional treatment a patient received. CONCLUSIONS: This study reports the largest experience to date with the clinical use of the Fraxel SR laser and is the first report of patient satisfaction after fractional photothermolysis. Patients reported high satisfaction rates for improvements in texture, dyschromia, and scarring.
Adult;Aged;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pigmentation Disorders;Regression Analysis;Skin Aging

Treatment of tendinopathy: what works, what does not, and what is on the horizon. Tendinopathy is a broad term encompassing painful conditions occurring in and around tendons in response to overuse. Recent basic science research suggests little or no inflammation is present in these conditions. Thus, traditional treatment modalities aimed at controlling inflammation such as corticosteroid injections and nonsteroidal antiinflammatory medications (NSAIDS) may not be the most effective options. We performed a systematic review of the literature to determine the best treatment options for tendinopathy. We evaluated the effectiveness of NSAIDS, corticosteroid injections, exercise-based physical therapy, physical therapy modalities, shock wave therapy, sclerotherapy, nitric oxide patches, surgery, growth factors, and stem cell treatment. NSAIDS and corticosteroids appear to provide pain relief in the short term, but their effectiveness in the long term has not been demonstrated. We identified inconsistent results with shock wave therapy and physical therapy modalities such as ultrasound, iontophoresis and low-level laser therapy. Current data support the use of eccentric strengthening protocols, sclerotherapy, and nitric oxide patches, but larger, multicenter trials are needed to confirm the early results with these treatments. Preliminary work with growth factors and stem cells is promising, but further study is required in these fields. Surgery remains the last option due to the morbidity and inconsistent outcomes. The ideal treatment for tendinopathy remains unclear. LEVEL OF EVIDENCE: Level II, systematic review. Anti-Inflammatory Agents, Non-Steroidal;Glucocorticoids;Intercellular Signaling Peptides and Proteins;Nitroglycerin Anti-Inflammatory Agents, Non-Steroidal;Combined Modality Therapy;Glucocorticoids;Humans;Intercellular Signaling Peptides and Proteins;Nitroglycerin;Orthopedic Procedures;Physical Therapy Modalities;Sclerotherapy;Stem Cell Transplantation;Tendinopathy;Ultrasonic Therapy

Photomedicine and LLLT Literature Watch. Animals;Humans;Low-Level Light Therapy;Phototherapy

Near-infrared light via light-emitting diode treatment is therapeutic against rotenone- and 1-methyl-4-phenylpyridinium ion-induced neurotoxicity. Parkinson's disease is a common progressive neurodegenerative disorder characterized by the degeneration of dopaminergic neurons in the

substantia nigra pars compacta. Mitochondrial dysfunction has been strongly implicated in the pathogenesis of Parkinson's disease. Thus, therapeutic approaches that improve mitochondrial function may prove to be beneficial. Previously, we have documented that near-infrared light via light-emitting diode (LED) treatment was therapeutic to neurons functionally inactivated by tetrodotoxin, potassium cyanide (KCN), or methanol intoxication, and LED pretreatment rescued neurons from KCN-induced apoptotic cell death. The current study tested our hypothesis that LED treatment can protect neurons from both rotenone- and MPP(+)-induced neurotoxicity. Primary cultures of postnatal rat striatal and cortical neurons served as models, and the optimal frequency of LED treatment per day was also determined. Results indicated that LED treatments twice a day significantly increased cellular adenosine triphosphate content, decreased the number of neurons undergoing cell death, and significantly reduced the expressions of reactive oxygen species and reactive nitrogen species in rotenone- or MPP(+)-exposed neurons as compared with untreated ones. These results strongly suggest that LED treatment may be therapeutic to neurons damaged by neurotoxins linked to Parkinson's disease by energizing the cells and increasing their viability. Cyanates;Neurotoxins;Reactive Oxygen Species;Rotenone;rotenolone;Nitric Oxide;3-nitrotyrosine;Tyrosine;Adenosine Triphosphate;Electron Transport Complex IV;potassium cyanate;1-Methyl-4-phenylpyridinium 1-Methyl-4-phenylpyridinium;Adenosine Triphosphate;Analysis of Variance;Animals;Animals, Newborn;Cell Death;Cells, Cultured;Cerebral Cortex;Cyanates;Dose-Response Relationship, Radiation;Electron Transport Complex IV;Infrared Rays;Lasers, Semiconductor;Male;Neurons;Neurotoxins;Nitric Oxide;Rats;Rats, Sprague-Dawley;Reactive Oxygen Species;Rotenone;Tyrosine

Effect of low-level laser therapy in the inflammatory response induced by Bothrops jararacussu snake venom. This article reports the effect of low-level laser therapy (LLLT) on the edema formation and leukocyte influx caused by Bothrops jararacussu snake venom as an alternative treatment for Bothrops snakebites. The inflammatory reaction was induced by injection of 0.6 mg/kg of B. jararacussu venom, in gastrocnemius muscle. Cell influx and edema were evaluated at 3 or 24h after venom injection. Mice were irradiated at the site of injury by a low-level laser (685 nm) with a dose of 4.2J/cm(2). A therapy that combines LLLT and antivenom was also studied. B. jararacussu venom caused a significant edema formation 3 and 24h after its injection, and a prominent leukocyte infiltrate composed predominantly of neutrophils at 24h after venom inoculation. LLLT significantly reduced edema formation by 53% and 64% at 3 and 24h, respectively, and resulted in a reduction of neutrophils accumulation ($P<0.05$). The combined therapy showed to be more efficient than each therapy acting separately. In conclusion, LLLT significantly reduced the edema and leukocyte influx into the envenomed muscle, suggesting that LLLT should be considered as a potentially therapeutic approach for the treatment of the local effects of Bothrops species. Antivenins;Crotalid Venoms Animals;Antivenins;Bothrops;Combined Modality Therapy;Crotalid Venoms;Disease Models, Animal;Edema;Injections, Intramuscular;Leukocytes;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Myositis

Pulsed dye laser therapy and z-plasty for facial burn scars: the alternative to excision. Hypertrophic scarring after partial thickness facial burns is common when epithelialization takes longer than 3 weeks. Well-healed areas continue to mature unfavorably, resulting in raised, erythematous, and contracted scars. Excisional treatment of such scars has morbidity and can create iatrogenic deformities. The flashlamp-pumped, pulsed dye laser (PDL) in combination with z-plasty can be used as a successful alternative to excision in patients with facial hypertrophic burn scars. Fifty-seven patients with hypertrophic facial burn scars (mean age 12 years; range, 2-21 years) were treated with the PDL over the past 8 years. Thirty-four patients (60%) were also treated with z-plasties to relieve scar tension. There was one complication of postoperative blistering. Patients were

divided into 3 groups based on time from burn to initial laser treatment. Group I (<1 year) had 11 patients and the laser diminished scar proliferation in these patients. Group II (1-4 years) included 24 patients and treatment resulted in reversal of hypertrophic scarring and elimination of erythema. Group III (>5 years) consisted of 22 patients. The PDL was effective in treating their stable and persistent erythema as long as 17 years after burn injury. No scars required excision in this cohort of 57 patients. The PDL should become an integral part of the management of facial burn scarring and will significantly decrease the need for excisional surgery.
Adolescent;Adult;Burns;Child;Child, Preschool;Cicatrix, Hypertrophic;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male

Efficacy of low-level laser therapy for chronic cutaneous ulceration in humans: a review and discussion. Chronic wounds, particularly venous ulcerations, are notoriously difficult to heal. Because current therapies are variable in their ability to induce complete healing, there remains a need to develop adjunctive treatments that can improve or accelerate the healing process. The use of low-energy lasers to stimulate wound healing has been pursued over many decades in studies of varying quality. This form of treatment has had high appeal due to its novelty, relative ease, and low morbidity profile. The authors reviewed the available published literature on low-level laser technology in an attempt to provide cumulative insight on the effect of this treatment for wound healing. Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Skin Ulcer

Photodynamic therapy in endodontic treatment of deciduous teeth. The purpose of this study was to evaluate photodynamic therapy in deciduous teeth with necrotic pulp by means of fully quantifying viable bacteria, before and after instrumentation and after the use of photodynamic therapy. Radicular canal cultures were conducted (n = 10): the first one was performed right after access and location of the radicular canal; the second was performed after the conclusion of chemical-mechanical instrumentation, and the last one after photodynamic therapy. The photodynamic therapy was performed with 4 J/cm energy low-intensity diode together with toluidine blue. The results (log(10)) were submitted to a descriptive analysis and Wilcoxon test. The percentage of reduction was submitted to the Mann-Whitney test. The instrumentation resulted in a reduction of 82.59% of viable bacteria, and, after photodynamic therapy, the microbial reduction observed was 98.37% (P = 0.0126). Photodynamic therapy is recommended as adjunct therapy for microbial reduction in deciduous teeth with necrotic pulp. Photosensitizing Agents;Tolonium Chloride Child;Child, Preschool;Dental Pulp Necrosis;Female;Humans;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Tolonium Chloride;Tooth, Deciduous;Tooth, Nonvital

Low level laser therapy for nonspecific low-back pain. BACKGROUND: Low-back pain (LBP) is a major health problem and a major cause of medical expenses and disablement. Low level laser therapy (LLLT) can be used to treat musculoskeletal disorders such as back pain. OBJECTIVES: To assess the effects of LLLT in patients with non-specific LBP. SEARCH STRATEGY: We searched CENTRAL (The Cochrane Library 2005, Issue 2), MEDLINE, CINAHL, EMBASE, AMED and PEDro from their start to November 2007 with no language restrictions. We screened references in the included studies and in reviews and conducted citation tracking of identified RCTs and reviews using Science Citation Index. We also contacted content experts. SELECTION CRITERIA: Randomised controlled clinical trials (RCTs) investigating LLLT to treat non-specific low-back pain were included. DATA COLLECTION AND ANALYSIS: Two authors independently assessed methodological quality using the criteria recommended by the Cochrane Back Review Group and extracted data. Studies were qualitatively and quantitatively analysed according to Cochrane Back Review Group guideline. MAIN RESULTS: Seven heterogeneous English language RCTs with reasonable quality were included. Three small studies (168 people) separately showed statistically significant but clinically unimportant pain relief

for LLLT versus sham therapy for sub-acute and chronic low-back pain at short-term and intermediate-term follow-up (up to six months). One study (56 people) showed that LLLT was more effective than sham at reducing disability in the short term. Three studies (102 people) reported that LLLT plus exercise were not better than exercise, with or without sham in the short-term in reducing pain or disability. Two studies (90 people) reported that LLLT was not more effective than exercise, with or without sham in reducing pain or disability in the short term. Two small trials (151 people) independently found that the relapse rate in the LLLT group was significantly lower than in the control group at the six-month follow-up. No side effects were reported. AUTHORS' CONCLUSIONS: Based on the heterogeneity of the populations, interventions and comparison groups, we conclude that there are insufficient data to draw firm conclusions on the clinical effect of LLLT for low-back pain. There is a need for further methodologically rigorous RCTs to evaluate the effects of LLLT compared to other treatments, different lengths of treatment, wavelengths and dosages.
Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Randomized Controlled Trials as Topic

Low-energy helium-neon laser therapy induces repigmentation and improves the abnormalities of cutaneous microcirculation in segmental-type vitiligo lesions. Segmental vitiligo (SV) is a special form of vitiligo occurring in a dermatomal distribution, and an abnormality involving the sympathetic nerves supplying the affected dermatome is known to underlie this disorder. Previously, we have shown that SV is associated with an abnormal increase in cutaneous blood flow and adrenoceptor responses in the affected areas. Since SV is resistant to conventional forms of therapy, its management represents a challenge for dermatologists. Low energy helium-neon lasers (He-Ne laser, wavelength 632.8 nm) have been employed as a therapeutic instrument in many clinical situations, including vitiligo management and repair of nerve injury. The purpose of this study was to evaluate the effectiveness and safety of He-Ne lasers in treating SV, and determine their effects on the repair of sympathetic nerve dysfunction. Forty patients with stable-stage SV on the head and/or neck were enrolled in this study. He-Ne laser irradiation was administered locally at 3.0 J/cm2 with point stimulation once or twice weekly. Cutaneous microcirculatory assessments in six SV patients were performed using a laser Doppler flowmeter. The sympathetic adrenoceptor response of cutaneous microcirculation was determined by measuring cutaneous blood flow before, during and after iontophoresis with sympathomimetic drugs (phenylephrine, clonidine and propranolol). All measurements of microcirculation obtained at SV lesions were simultaneously compared with contralateral normal skin, both before and after He-Ne laser treatment. After an average of 17 treatment sessions, initial repigmentation was noticed in the majority of patients. Marked repigmentation (> 50%) was observed in 60% of patients with successive treatments. Cutaneous blood flow was significantly higher at SV lesions compared with contralateral skin, but this was normalized after He-Ne laser treatment. In addition, the abnormal decrease in cutaneous blood flow in response to clonidine was improved by He-Ne laser therapy. Our study showed that He-Ne laser therapy is an effective treatment for SV by normalizing dysfunctions of cutaneous blood flow and adrenoceptor responses in SV patients. Thus, the beneficial effects of He-Ne laser therapy may be mediated in part by a reparative effect on sympathetic nerve dysfunction.
Adolescent;Adult;Child;Child, Preschool;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Microcirculation;Regional Blood Flow;Skin;Skin Pigmentation;Vitiligo

The spectrum of laser skin resurfacing: nonablative, fractional, and ablative laser resurfacing.
The drive to attain cosmetic facial enhancement with minimal risk and rapid recovery has inspired the field of nonsurgical skin rejuvenation. Laser resurfacing was introduced in the 1980s with continuous wave carbon dioxide (CO(2)) lasers; however, because of a high rate of side effects, including scarring, short-pulse, high-peak power, and rapidly scanned, focused-beam CO(2) lasers and normal-mode erbium-doped yttrium aluminium garnet lasers were developed, which remove skin in a precisely

controlled manner. The prolonged 2-week recovery time and small but significant complication risk prompted the development of non-ablative and, more recently, fractional resurfacing in order to minimize risk and shorten recovery times. Nonablative resurfacing produces dermal thermal injury to improve rhytides and photodamage while preserving the epidermis. Fractional resurfacing thermally ablates microscopic columns of epidermal and dermal tissue in regularly spaced arrays over a fraction of the skin surface. This intermediate approach increases efficacy as compared to nonablative resurfacing, but with faster recovery as compared to ablative resurfacing. Neither nonablative nor fractional resurfacing produces results comparable to ablative laser skin resurfacing, but both have become much more popular than the latter because the risks of treatment are limited in the face of acceptable improvement. LEARNING OBJECTIVES: At the completion of this learning activity, participants should be familiar with the spectrum of lasers and light technologies available for skin resurfacing, published studies of safety and efficacy, indications, methodologies, side effects, complications, and management. Anesthesia, Local;Cicatrix;Contraindications;Dermatologic Surgical Procedures;Face;Female;Humans;Laser Therapy;Low-Level Light Therapy;Photochemotherapy;Postoperative Care;Rejuvenation;Skin Aging

Low level laser therapy (LLLT) decreases pulmonary microvascular leakage, neutrophil influx and IL-1beta levels in airway and lung from rat subjected to LPS-induced inflammation. BACKGROUND AND OBJECTIVE: Low level laser therapy (LLLT) is a known anti-inflammatory therapy. Herein we studied the effect of LLLT on lung permeability and the IL-1beta level in LPS-induced pulmonary inflammation. STUDY DESIGN/METHODOLOGY: Rats were divided into 12 groups (n = 7 for each group). Lung permeability was measured by quantifying extravasated albumin concentration in lung homogenate, inflammatory cells influx was determined by myeloperoxidase activity, IL-1beta in BAL was determined by ELISA and IL-1beta mRNA expression in trachea was evaluated by RT-PCR. The rats were irradiated on the skin over the upper bronchus at the site of tracheotomy after LPS. RESULTS: LLLT attenuated lung permeability. In addition, there was reduced neutrophil influx, myeloperoxidase activity and both IL-1beta in BAL and IL-1beta mRNA expression in trachea obtained from animals subjected to LPS-induced inflammation. CONCLUSION: LLLT reduced the lung permeability by a mechanism in which the IL-1beta seems to have an important role. AF 12198;Interleukin-1beta;Lipopolysaccharides;Proteins;RNA, Messenger;Receptors, Interleukin;Peroxidase Animals;Bronchoalveolar Lavage Fluid;Capillary Permeability;Disease Models, Animal;Enzyme-Linked Immunosorbent Assay;Interleukin-1beta;Lipopolysaccharides;Low-Level Light Therapy;Lung;Male;Neutrophil Infiltration;Neutrophils;Peroxidase;Pneumonia;Polymerase Chain Reaction;Proteins;RNA, Messenger;Rats;Rats, Wistar;Receptors, Interleukin;Time Factors;Trachea;Tracheotomy

[Use of the electrophoresis with acetic acid in a complex treatment of heel spurs at a sanatorium]. The author studied the influence of physical factors of electrophoresis with acetic acid, massage and laseropuncture in sanatorium conditions where 28 patients with heeling spurs have been treated. The patients in a control group (n=25) received a traditional treatment - an injection of hydrocortisone in area of heeling spurs, skin rubbing with herbs (tincture with different flowers, elder-berry buds. Efficiency of a proposed medical complex was shown using clinical and radiographic data. Acetic Acid Acetic Acid;Adult;Combined Modality Therapy;Electrophoresis;Female;Health Resorts;Heel Spur;Humans;Low-Level Light Therapy;Male;Massage;Middle Aged;Radiography;Treatment Outcome

Bone repair following bone grafting hydroxyapatite guided bone regeneration and infra-red laser photobiomodulation: a histological study in a rodent model. The aim of the investigation was to assess histologically the effect of laser photobiomodulation (LPBM) on a repair of defects surgically created in the femurs of rats. Forty-five Wistar rats were divided into four groups: group I (control); group II (LPBM); group III (hydroxyapatite guided bone regeneration; HA GBR); group IV (HA GBR

LPBM). The animals in the irradiated groups were subjected to the first irradiation immediately after surgery, and it was repeated every day for 2 weeks. The animals were killed 15 days, 21 days and 30 days after surgery. When the groups irradiated with implant and membrane were compared, it was observed that the repair of the defects submitted to LPBM was also processed faster, starting from the 15th day. At the 30th day, the level of repair of the defects was similar in the irradiated groups and those not irradiated. New bone formation was seen inside the cavity, probably by the osteoconduction of the implant, and, in the irradiated groups, this new bone formation was incremental. The present preliminary data seem to suggest that LPMB therapy might have a positive effect upon early wound healing of bone defects treated with a combination of HA and GBR. Biocompatible Materials;Durapatite Animals;Biocompatible Materials;Bone Regeneration;Combined Modality Therapy;Durapatite;Female;Femur;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Adverse effects reported in pulsed dye laser treatment for port wine stains. A retrospective study was conducted over a 762-day period to investigate the incidence of adverse effects following pulsed dye laser treatment for port wine stains using the Chromos 585 nm pulsed dye laser (PDL). Treatment energy densities typically ranged from 4.0 J/cm(2) to 7.5 J/cm(2). Treatment was predominantly delivered as a 7 mm-diameter pulse of laser light, although a 5 mm pulse was occasionally used. Nine patients experienced one adverse event each, with scabbing, blistering (prolonged in one case that persisted for more than 2 months), hypopigmentation or hyperpigmentation; one of the nine patients developed both blistering and hypopigmentation. The incidence of adverse effects per treatment was 1.4% (1.7% for adults and 0.6% for children). The lower leg was the most common site for an adverse effect; four out of 22 patients (18%) receiving PDL treatment for lower leg port wine stains (PWSs) suffered an adverse effect (three cases of hyperpigmentation and one of hypopigmentation and blistering). Four patients suffered an adverse effect following an increase in the energy density of the laser treatment. There was no statistically significant correlation between laser performance and the occurrence of adverse effects. Adolescent;Adult;Blister;Cohort Studies;Equipment Failure;Female;Humans;Incidence;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Port-Wine Stain;Retrospective Studies;Risk Factors;Treatment Outcome;Young Adult

Rosacea treatment using the new-generation, high-energy, 595 nm, long pulse-duration pulsed-dye laser. BACKGROUND AND OBJECTIVES: Rosacea results from sun-induced hyper-vascularity of exposed facial skin, often accompanied by acneiform papules and pustules. The pulsed-dye laser has an unparalleled safety record and emits an ideal wavelength for treating the abnormal vessels that occur in rosacea patients. In this study we investigate the ability of the long pulse-duration pulsed-dye laser to improve rosacea. STUDY DESIGN/MATERIALS AND METHODS: Twenty subjects with rosacea were treated with the high-energy, long pulse-duration pulsed-dye laser. An elliptical spot and long pulse-duration was used to spot-treat linear telangiectasias, while a circular spot and short pulse-duration was used to treat the entire face. Improvement was determined by blinded evaluation of photographs and by the treating physician's subjective evaluation, before and 8 weeks following the final treatment. RESULTS: The average rosacea score as estimated by the treating physician decreased from 2.7+/-1.1 to 1.4+ 0.7 (mean+SD) on a 0-6 scale with 0 representing no rosacea and 6 representing the most severe rosacea ($P<0.001$ level). The average rosacea score as rated by blinded physician observers scoring digital photos was 2.3+/-1.3 before treatment and 1.4+/-0.9 8 weeks following treatment, using a 0 (mild) to 6 (severe) scale. CONCLUSIONS: The high-energy, long pulse-duration pulsed-dye laser improves rosacea with a very favorable safety profile, and less purpura than resulted from earlier generation pulsed-dye lasers. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Rosacea;Treatment Outcome

[Correction of microcirculation in patients with atherosclerotic lesions of different vessels by efferent methods]. The state of microcirculation was studied in 35 patients with obliterating atherosclerosis of the lower extremity vessels (1st group) and 36 patients with extensive atherosclerosis having a combined impairment of the peripheral basin: arteries of lower extremities and coronary arteries (2nd group) treated using the method of plasmapheresis (PPh) and PPh combined with intravascular laser irradiation of blood (IVLIB). The isolated use of PPh in patients of the 1st group was established to be effective, while combination of PPh and IVLIB was necessary for the patients of the 2nd group. Adult;Aged;Atherosclerosis;Blood;Blood Flow Velocity;Coronary Artery Disease;Female;Humans;Leg;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Plasmapheresis;Treatment Outcome;Ultrasonography, Doppler

Relieving pain in minor aphthous stomatitis by a single session of non-thermal carbon dioxide laser irradiation. This randomized controlled clinical trial was designed to evaluate the efficacy of single-session, non-thermal, carbon dioxide (CO(2)) laser irradiation in relieving the pain of minor recurrent aphthous stomatitis (miRAS) as a prototype of painful oral ulcers. Fifteen patients, each with two discrete aphthous ulcers, were included. One of the ulcers was randomly allocated to be treated with CO(2) laser (1 W of power in de-focused continuous mode) and the other one served as a placebo. Before laser irradiation, a layer of transparent, non-anesthetic gel was placed on both the laser lesions and the placebo lesions. The patients were requested to grade their pain on a visual analog scale up to 96 h post-operatively. The reduction in pain scores was significantly greater in the laser group than in the placebo group. The procedure itself was not painful, so anesthesia was not required. Powermetry revealed the CO(2) laser power to be 2-5 mW after passing through the gel, which caused no significant temperature rise or any visual effect of damage to the oral mucosa. Our results showed that a low-intensity, non-thermal, single-session of CO(2) laser irradiation reduced pain in miRAS immediately and dramatically, with no visible side effects.
Adult;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Pain;Recurrence;Stomatitis, Aphthous;Young Adult

[Private insurance coverage of laser acupuncture]. Acupuncture Therapy;Germany;Humans;Insurance Coverage;Low-Level Light Therapy;National Health Programs;Treatment Outcome

Effect of laser radiation on production of reactive oxygen species in the blood of patients with chronic obstructive pulmonary disease. The effect of laser radiation on generation of reactive oxygen species in the whole blood from patients with chronic obstructive pulmonary disease was studied by in vitro recording of luminol-dependent chemiluminescence. Laser irradiation of the blood from patients with increased production of reactive oxygen species decreased the microbicidal potential of cells. In patients with low generation of reactive oxygen species and normal potential of cells, laser exposure increased production of O2 metabolites. Laser radiation had little effect on chemiluminescence of the blood in patients with low generation of reactive oxygen species and decreased functional activity of cells. Reactive Oxygen Species Blood Bactericidal Activity;Humans;In Vitro Techniques;Low-Level Light Therapy;Luminescence;Pulmonary Disease, Chronic Obstructive;Reactive Oxygen Species

Large-spot subthreshold infrared laser to treat diabetic macular edema. PURPOSE: To evaluate the efficacy of a large-spot subthreshold infrared laser protocol to treat diabetic maculopathy. METHODS: In a prospective, fellow eye, controlled case series, all patients had clinically significant diabetic macular edema (DME) treated with a single application of subthreshold infrared (810 nm) laser. If bilateral disease was present, the fellow eye was treated with conventional macular laser. The study was to include 20 patients. Visual acuity and central macular thickness (CMT) measured by

optical coherence tomography (OCT) were assessed in the study and fellow eyes at baseline and 6 months, and any changes were compared. RESULTS: The 11th patient developed a choroidal infarct with subsequent profound loss of vision immediately after treatment. The study was terminated prematurely at this point. For the remaining 10 patients, there was a trend toward improvement in visual acuity in the study eye compared with the fellow eye at the 6-month follow-up (median change: +1.5 letters for study eye vs -6.5 letters for fellow eye; P = 0.08). There was also significant improvement in OCT-measured CMT in the study eye (mean decrease, 117 microm) compared with deterioration in OCT-measured CMT in the fellow eye (mean increase, 24 microm; P = 0.02). CONCLUSION: This subthreshold infrared laser protocol led to improvement in OCT-measured CMT and stabilization of vision in most subjects. The current protocol is however unpredictable and should not be used in the treatment of DME without further modification. Aged;Diabetic Retinopathy;Female;Fluorescein Angiography;Humans;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Macular Edema;Male;Middle Aged;Pilot Projects;Prognosis;Prospective Studies;Retina;Tomography, Optical Coherence;Visual Acuity

Comparison of 3 physical therapy modalities for acute pain in lumbar disc herniation measured by clinical evaluation and magnetic resonance imaging. OBJECTIVE: This study measures and compares the outcome of traction, ultrasound, and low-power laser (LPL) therapies by using magnetic resonance imaging and clinical parameters in patients presenting with acute leg pain and low back pain caused by lumbar disc herniation (LDH). METHODS: A total of 60 patients were enrolled in this study and randomly assigned into 1 of 3 groups equally according to the therapies applied, either with traction, ultrasound, or LPL. Treatment consisted of 15 sessions over a period of 3 weeks. Magnetic resonance imaging examinations were done before and immediately after the treatment. Physical examination of the lumbar spine, severity of pain, functional disability by Roland Disability Questionnaire, and Modified Oswestry Disability Questionnaire were assessed at baseline, immediately after, and at 1 and 3 months after treatment. RESULTS: There were significant reductions in pain and disability scores between baseline and follow-up periods, but there was not a significant difference between the 3 treatment groups at any of the 4 interview times. There were significant reductions of size of the herniated mass on magnetic resonance imaging after treatment, but no differences between groups. CONCLUSIONS: This study showed that traction, ultrasound, and LPL therapies were all effective in the treatment of this group of patients with acute LDH. These results suggest that conservative measures such as traction, laser, and ultrasound treatments might have an important role in the treatment of acute LDH. Acute Disease;Adult;Female;Follow-Up Studies;Humans;Intervertebral Disc Displacement;Low Back Pain;Low-Level Light Therapy;Lumbar Vertebrae;Magnetic Resonance Imaging;Male;Middle Aged;Pain Measurement;Physical Examination;Quality of Life;Severity of Illness Index;Traction;Treatment Outcome;Ultrasonic Therapy

Blue foot: an unusual complication of tattoo and successful treatment with a QS-Nd:YAG laser. Coloring Agents Adult;Coloring Agents;Female;Foreign-Body Migration;Humans;Lasers, Solid-State;Low-Level Light Therapy;Pigmentation Disorders;Tattooing

Topical 5-aminolevulinic acid photodynamic therapy for the treatment of unilesional mycosis fungoides: a report of two cases and review of the literature. BACKGROUND: Unilesional mycosis fungoides (MF) is a rare variant of cutaneous T-cell lymphoma (CTCL), characterized clinically by a solitary lesion and by histopathological features indistinguishable from multilesional MF. The photodynamic therapy (PDT) is a new and effective treatment of precancerous lesions and non-melanoma skin cancers. In recent years it has been used successfully for the treatment of MF. METHODS: We present two cases of unilesional MF treated with 5-Aminolevulinic acid-PDT (ALA-PDT). We used twenty per cent ALA, applied topically to the lesion, and a well defined laser irradiation at 585 nm wavelength from C-Beam laser. Treatment was repeated three times at monthly

intervals. Skin biopsies were taken before and after therapy. RESULTS: Both patients showed clinical remission. The biopsies confirmed a regression of the infiltrate after treatment. CONCLUSIONS: PDT is effective and can be used successfully for MF treatment, particularly for patch and plaque stage MF, including unilesional MF. Photosensitizing Agents;Aminolevulinic Acid Administration, Topical;Adult;Aminolevulinic Acid;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Mycosis Fungoides;Photochemotherapy;Photosensitizing Agents;Skin;Skin Neoplasms

An update on new and emerging options for the treatment of vitiligo. Vitiligo is an acquired leukoderma that results from the loss of epidermal melanocytes, and is characterized by macules and patches of depigmented skin. With a relatively high rate of prevalence, vitiligo occurs in localized, generalized, or segmental patterns; it can run a rapidly progressive course or remain stationary. The pathogenesis of vitiligo is not yet fully understood, but the autoimmune hypothesis is the most commonly accepted one, based on which, many treatment modalities have been described. Although many therapeutic options exist and new modalities are still emerging, treatment challenges persist, as not all patients respond to available therapies. Variables that affect the choice of treatment include the extent, distribution, and progression rate of the lesions. Another challenge is the lack of a standardized scoring system, which hampers the production of level 1a evidence studies for the treatment of this condition. Adrenal Cortex Hormones;Dermatologic Agents;Immunosuppressive Agents;calcipotriene;Calcitriol;Tacrolimus Administration, Cutaneous;Adrenal Cortex Hormones;Calcitriol;Combined Modality Therapy;Dermatologic Agents;Humans;Immunosuppressive Agents;Low-Level Light Therapy;Phototherapy;Tacrolimus;Vitiligo

[Efficacy of different laser treatments in combined therapy of patients with gastroduodenal ulcer]. AIM: To investigate efficacy of different methods of low-intensity laser treatment (LILT) in therapy of exacerbated gastroduodenal ulcer. MATERIAL AND METHODS: A total of 111 gastroduodenal ulcer (GDU) patients were divided into two groups: the study group (81 patients) and control group (30 patients). Patients from the study group received combined treatment with anti-ulcer drugs and LILT performed by three methods: intravenous laser radiation of blood (ILRB), epicutaneous radiation (ER) and combination ILRB+ER. Control patients received medication alone. The efficacy of the treatment was assessed by the time of ulcer defect heeling, duration of hospital stay, clinical symptoms of the disease exacerbation manifesting with three syndromes: pain, dyspepsia, asthenovegetative syndrome. RESULTS: The shortest heeling of ulcer defect was achieved in the patients treated with ILRB+ER combination: 17.8 +/- 0.8 and 19.3 +/- 3.4 days for gastric and duodenal ulcer, respectively ($p < 0.05$ and $p < 0.01$ vs control). CONCLUSION: Combined treatment of gastric and duodenal ulcer with inclusion of laser radiation (ILRB, ER, ILRB+ER) is effective in therapy of ulcer. Gastrointestinal Agents Blood;Duodenal Ulcer;Endoscopy, Gastrointestinal;Female;Follow-Up Studies;Gastrointestinal Agents;Humans;Length of Stay;Low-Level Light Therapy;Male;Middle Aged;Stomach Ulcer;Treatment Outcome

[Influence of laser radiation of the whole blood in vitro on adhesion and aggregation of blood platelets]. The authors revealed dependence of reaction blood plates to photoeffect on the dose and rate of blood movement at laser radiation of donor blood in vitro. The red light decreases adhesion and aggregation of blood plates both at high and low rate of shift. Infrared laser radiation is effective only at high rate of shift leading to increase of adhesion and decrease of aggregation of blood plates. Blue laser is effective in small doses only and at low rate of sift it leads to decrease of adhesion and at high rate it provokes increase of adhesion. Blue laser do not have a significant influence on aggregation of blood plates. These results make possible to suppose ambiguity of biological response of venous and arterial blood to radiation. Adult;Blood Platelets;Cell Adhesion;Female;Humans;In Vitro Techniques;Lasers;Low-Level Light Therapy;Male;Platelet Aggregation

The influence of low-power helium-neon laser irradiation on function of selected peripheral blood cells. The effects of low-level laser light irradiation are debatable and the mechanisms of its action are still unclear. This study was conducted to test the effects of low-level laser irradiation on human blood cells: erythrocytes, granulocytes, and lymphocytes. Whole blood obtained by phlebotomy was irradiated at 632.8 nm by using energy fluences 0.6 J/cm2. An analysis of blood gases revealed an increase in PO2 and SaO2 (P<0.001) in irradiated blood. No shifts in PCO2 and pH were recorded. Spontaneous synthesis of DNA in T and B blood lymphocytes decreased significantly after laser irradiation (P<0.02 and P<0.04, respectively). Phytohemagglutinin (PHA)-induced proliferation of T cells and SAC proliferation of B cells, expressed as a stimulation index, were statistically higher in the samples of irradiated than in non-irradiated blood (P<0.01). Chemiluminescence of fMLP-stimulated granulocytes from irradiated blood increased in comparison with non-irradiated samples (P<0.001). No changes of spontaneous and stimulated chemiluminescence kinetics in irradiated samples were observed. These results reveal the influence of photodynamic reactions on the ability of blood to transport oxygen and on immunomodulatory effects on leukocytes. N-Formylmethionine Leucyl-Phenylalanine;Oxygen Acid-Base Equilibrium;B-Lymphocytes;Blood Cells;Blood Gas Analysis;Erythrocytes;Granulocytes;Humans;Hydrogen-Ion Concentration;In Vitro Techniques;Lasers, Gas;Luminescence;N-Formylmethionine Leucyl-Phenylalanine;Oxygen;T-Lymphocytes

[Low-power laser therapy in the treatment of parodontopathy]. Gingiva;Humans;Low-Level Light Therapy;Periodontal Diseases

Low-level laser therapy (670 nm) on viability of random skin flap in rats. This study investigated the effects of 670 nm laser, at different fluences, on the viability of skin flap in rats. One hundred male animals were used. The animals were divided into control group; group treated with 3 J/cm(2); group treated with 6 J/cm(2); group treated with 12 J/cm(2) and group treated with 24 J/cm(2). The skin flap was made on the backs of all animals studied, with a plastic sheet interposed between the flap and the donor site. Laser irradiation was done immediately after the surgery and on days 1, 2, 3 and 4 after surgery. The percentage of necrosis of the flap was calculated at the 7th postoperative day. Additionally, a sample of each flap was collected to enable us to count the blood vessels. Treated animals showed a statistically significant smaller area of necrosis than did the control group. The necrosis in the treated groups was 41.82% (group 2), 36.51% (group 3), 29.45% (group 4) and 20.37% (group 5). We also demonstrated that laser irradiation at 670 nm, at all doses used, had a stimulatory effect on angiogenesis. Our study showed that the 670 nm laser was efficient to increase the viability of the skin flap, at all fluences used, with a tendency of reaching better results at higher doses. Animals;Dermatologic Surgical Procedures;Dose-Response Relationship, Radiation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Radiotherapy Dosage;Rats;Skin;Surgical Flaps;Suture Techniques;Tissue Survival

Infrared laser light further improves bone healing when associated with bone morphogenetic proteins and guided bone regeneration: an in vivo study in a rodent model. OBJECTIVE: This study assessed histologically the effect of laser photobiomodulation on the repair of surgical defects created in the femurs of Wistar rats treated or not treated with bone morphogenetic proteins (BMPs) and organic bovine bone graft. BACKGROUND DATA: This paper is part of an ongoing series of works in which biomaterials and/or guided bone regeneration (GBR) are used in association with laser photobiomodulation. Several previous reports from our group have shown that the use of laser photobiomodulation improves the treatment of bone defects. MATERIALS AND METHODS: Forty-eight adult male Wistar rats were divided into four randomized groups: group 1 (controls, n = 12); group 2 (laser photobiomodulation, n = 12); group 3 (BMPs + organic bovine bone graft + GBR, n = 12); and group 4 (BMPs + organic bovine bone graft + GBR + laser photobiomodulation, n = 12). The

irradiated groups received seven irradiations every 48 h, the first immediately after the surgical procedure. Laser photobiomodulation (830 nm, 40 mW, CW, phi approximately 0.6 mm) consisted of a total of 16 J/cm2 per session at four points (4 J/cm2 each) equally spaced around the periphery of the defect. The animals were sacrificed after 15, 21, and 30 d, and the specimens were routinely embedded in wax and stained with hematoxylin and eosin and Sirius red stains and analyzed under light microscopy. RESULTS: The results showed histological evidence of increased deposition of collagen fibers (at 15 and 21 d), as well as an increased amount of well-organized bone trabeculi at the end of the experimental period (30 d) in irradiated animals compared to non-irradiated controls. CONCLUSION: We concluded that the use of laser photobiomodulation in association with BMPs, organic bovine bone grafts, and GBR increases the positive biomodulating effects of laser energy. Biocompatible Materials;Bone Morphogenetic Proteins Animals;Biocompatible Materials;Bone Morphogenetic Proteins;Bone Regeneration;Female;Femur;Guided Tissue Regeneration;Laser Therapy;Male;Rats;Rats, Wistar

Low-power laser treatment in patients with frozen shoulder: preliminary results. OBJECTIVE: In this study I sought to test the efficacy of low-power laser therapy (LLLT) in patients with frozen shoulder. BACKGROUND DATA: The use of low-level laser energy has been recommended for the management of a variety of musculoskeletal disorders. MATERIALS AND METHODS: Sixty-three patients with frozen shoulder were randomly assigned into one of two groups. In the active laser group (n = 31), patients were treated with a 810-nm Ga-Al-As laser with a continuous output of 60 mW applied to eight points on the shoulder for 30 sec each, for a total dose of 1.8 J per point and 14.4 J per session. In the placebo group (n = 32), patients received placebo laser treatment. During 8 wk of treatment, the patients in each group received 12 sessions of laser or placebo, two sessions per week (for weeks 1-4), and one session per week (for weeks 5-8). RESULTS: Relative to the placebo group, the active laser group had: (1) a significant decrease in overall, night, and activity pain scores at the end of 4 wk and 8 wk of treatment, and at the end of 8 wk additional follow-up (16 wk post-randomization); (2) a significant decrease in shoulder pain and disability index (SPADI) scores and Croft shoulder disability questionnaire scores at those same intervals; (3) a significant decrease in disability of arm, shoulder, and hand questionnaire (DASH) scores at the end of 8 wk of treatment, and at 16 wk posttreatment; and (4) a significant decrease in health-assessment questionnaire (HAQ) scores at the end of 4 wk and 8 wk of treatment. There was some improvement in range of motion, but this did not reach statistical significance. CONCLUSIONS: The results suggested that laser treatment was more effective in reducing pain and disability scores than placebo at the end of the treatment period, as well as at follow-up. Cohort Studies;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Recovery of Function;Shoulder Impingement Syndrome;Treatment Outcome

A comparative study of the effects of laser photobiomodulation on the healing of third-degree burns: a histological study in rats. OBJECTIVE: The aim of this investigation was to compare by light microscopy the effects of laser photobiomodulation at wavelengths of 660 and 780 nm on third-degree burns in Wistar rats. BACKGROUND DATA: Burns are severe injuries that result in the loss of fluid and destruction of tissue, infection, and shock that may result in death. Laser energy has been suggested as an effective method to improve wound healing. MATERIALS AND METHODS: Fifty-five animals were used in this study. A third-degree burn measuring 1.5 x 1.5 cm was created on the dorsum of each animal. The animals were divided into three subgroups according the type of laser photobiomodulation they received (wavelength of 660 or 780 nm, 35 mW, theta = 2 mm, and 20 J/cm2). In the animals receiving treatment, it was begun immediately post-burn at four points around the burn (5 J/cm2) and repeated at 24-h intervals for 21 d. The animals were humanely killed after 3, 5, 7, 14, and 21 d by an intraperitoneal overdose of general anesthetic. The specimens were routinely

cut and stained, and then were analyzed by light microscopy. RESULTS: The results showed more deposition of collagen fibers, larger amounts of granulation tissue, less edema, a more vigorous inflammatory reaction, and increased revascularization on all laser-treated animals. These features were more evident at early stages when the 660-nm laser was used, and were more evident throughout the experimental period for the animals receiving 780-nm laser therapy. CONCLUSION: We concluded that laser photobiomodulation using both wavelengths improved healing of third-degree burns on Wistar rats. Animals;Burns;Laser Therapy;Male;Phototherapy;Rats;Rats, Wistar;Wound Healing

Stretch marks: treatment using the 1,064-nm Nd:YAG laser. BACKGROUND: Striae are frequent skin lesions that cause considerable aesthetic concern. The 1,064-nm long-pulsed Nd:YAG laser has been used to promote an increase in dermal collagen and is known to be a laser that has a high affinity for vascular chromophores. OBJECTIVE: This study aims to verify the efficacy of the long-pulsed Nd:YAG laser in the treatment of immature striae. MATERIALS AND METHODS: Twenty patients who had immature striae, i.e., red striae, were treated using the 1,064-nm long-pulsed Nd:YAG laser. The analysis of treatment efficacy was performed by the comparison between the images taken before and after each treatment session as well as through a subjective assessment carried out by the patients themselves. RESULTS: Results were considered satisfactory to both patients and doctors. A higher number of patients (55%) considered the results excellent when compared to the same assessment made by the doctor (40%). CONCLUSION: The clinical improvement of immature striae can be obtained with the use of the 1,064-nm long-pulsed Nd:YAG laser. The low incidence of side effects makes this laser a good alternative in the treatment of these common skin lesions. Adolescent;Adult;Elastic Tissue;Female;Humans;Low-Level Light Therapy;Patient Satisfaction;Skin;Treatment Outcome

Fractional photothermolysis. Humans;Low-Level Light Therapy;Phototherapy;Rejuvenation;Skin Aging;Skin Diseases;Treatment Outcome

Early improvement in rhytides and skin laxity following treatment with a combination fractional laser emitting two wavelengths sequentially. BACKGROUND: Carbon dioxide laser resurfacing remains the gold standard for the treatment of photoaged skin. Today, however, fewer patients will tolerate the postoperative downtime associated with the use of this device. Fractional photothermolysis was designed to overcome the disadvantages associated with ablative resurfacing. Prototype fractional lasers (Fraxel, Reliant Technologies Inc.) have required the use of blue tracking dye to give evenly spaced microtreatment zones, and treatments are associated with moderate levels of discomfort because of microtreatment zone depths reaching nearly 1000 microm. Newer technologies have evolved that do not require tracking dye, and are less painful than older prototypes because microtreatment zones are more superficial (100 to 300 microm) than that of the Fraxel laser. Newer devices offer advances in treating facial rhytides and skin laxity through the use of 2 laser wavelengths (1320 nm/1440 nm) emitted sequentially through a specialized diffractive lens array that produces high-intensity microtreatment zones surrounded by deeper low level heating. OBSERVATIONS: One to 3 treatments with this combination fractional laser device were performed on 16 Caucasian females with static periocular rhytides or skin laxity affecting the nasolabial crease. There was a 3-week period between treatments. Improvement was noted in both areas after a small number of treatments. CONCLUSION: The technology behind fractional lasers is rapidly evolving, and new devices offer significant advances over older prototypes.
Aged;Eyelids;Female;Humans;Low-Level Light Therapy;Middle Aged;Nose;Rejuvenation;Skin;Skin Aging;Time Factors;Treatment Outcome

Biophysics behavior of acupuncture points irradiated with low energy lasers. This work describes the Low Energy Laser (LEL) coherent light interaction with the skin cover on acupuncture loci for the

purpose of detecting and measuring the spatial and temporal alteration of the thermal, electric and optical properties of the LI4 (HEGU) acupoint, irradiated with a 685 nm, 30 mW, III.B Laser. Novel electrostatic imaging technique, an original Acupuncture 3-D Thermal and Electric Mapping Technique and an original Method for Laser-Skin Reflectance, were used in the study. The results indicate that the visible laser light, with low frequency and low power, specifically modify the 3-D pattern of the temperature, electric potential and electric impedance outline of an acupuncture point, meanwhile with a significant decrease of the laser reflectance index, all measured on a 27 apparently healthy subject lot (48 years mean age, 54% male), when comparing with a non-active, non-acupunctural skin area, placed on the volar side of the same hand. The biophysical method presented, combines in a complex way and reproducible the electro stasis exploration (bioelectric homeostasis), with cutaneous thermodynamic exploration and photo-optical exploration of the derma and provides information that can be appreciated in dynamics and compared depending on the exploration target. Acupuncture Points;Biophysical Phenomena;Biophysics;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin

Low-level laser therapy for treatment of temporomandibular joint pain: a double-blind and placebo-controlled trial. OBJECTIVE: The objective of this study was to assess the effectiveness of low-level laser therapy (LLLT) in the management of temporomandibular joint (TMJ) pain in a random and double-blind research design. STUDY DESIGN: TMJ pain patients, randomly assigned, received 2 to 3 treatments per week for 8 weeks of active LLLT (Helium Neon, 632.8 nm, 30 mW) (n = 26) or sham LLLT (n = 26). Measures of TMJ pain during function were evaluated at baseline and weeks 2, 4, and 8 after the first laser therapy. RESULTS: At the 8-week point, within-group improvements were present for TMJ pain during function, for both the active and sham LLLT groups (P = .000). Between-group differences were not highly evident (P > .05). CONCLUSION: The study suggests that LLLT is not better than placebo at reducing TMJ pain during function. Adolescent;Adult;Epidemiologic Methods;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Temporomandibular Joint Disorders

Low-level laser therapy decreases levels of lung neutrophils anti-apoptotic factors by a NF-kappaB dependent mechanism. BACKGROUND AND OBJECTIVE: Low-level laser therapy (LLLT) is a known modulator of inflammatory process. Herein we studied the effect of 660 nm diode laser on mRNA levels of neutrophils anti-apoptotic factors in lipopolysaccharide (LPS)-induced lung inflammation. STUDY DESIGN/METHODOLOGY: Mice were divided into 8 groups (n=7 for each group) and irradiated with energy dosage of 7.5 J/cm(2). The Bcl-xL and A1 mRNA levels in neutrophils were evaluated by Real Time-PCR (RT-PCR). The animals were irradiated after exposure time of LPS. RESULTS: LLLT and an inhibitor of NF-kappaB nuclear translocation (BMS 205820) attenuated the mRNA levels of Bcl-xL and A1 mRNA in lung neutrophils obtained from mice subjected to LPS-induced inflammation. CONCLUSION: LLLT reduced the levels of anti-apoptotic factors in LPS inflamed mice lung neutrophils by an action mechanism in which the NF-kappaB seems to be involved. BCL2-related protein A1;BMS 205820;Bcl2l1 protein, mouse;Lipopolysaccharides;Minor Histocompatibility Antigens;NF-kappa B;Peptides;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;bcl-X Protein Animals;Inflammation;Lipopolysaccharides;Low-Level Light Therapy;Lung;Male;Mice;Minor Histocompatibility Antigens;NF-kappa B;Neutrophils;Peptides;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;bcl-X Protein

Keloids: pathophysiology and management. Keloid formation occurs as a result of abnormal wound healing. Despite the high prevalence of keloids in the general population, they remain one of the more challenging dermatologic conditions to manage. More than a cosmetic nuisance, they are often symptomatic and can have a significant psychosocial burden for the patient. Although multiple treatment modalities exist, no single treatment has proven widely effective. In fact, recurrence

following treatment is generally the norm. Combination therapy is likely the optimal strategy. In this review, we highlight the clinical features, pathophysiology and management of keloids. Adjuvants, Immunologic;Glucocorticoids;Intercellular Signaling Peptides and Proteins;Silicone Gels;Collagen Adjuvants, Immunologic;Administration, Topical;Animals;Apoptosis;Bandages;Collagen;Cryotherapy;Fibroblasts;Glucocorticoids;Humans;Injections, Intralesional;Intercellular Signaling Peptides and Proteins;Keloid;Low-Level Light Therapy;Radiotherapy, Adjuvant;Risk Factors;Silicone Gels;Surgical Procedures, Operative;Treatment Outcome;Wounds and Injuries

Initial effects of low-level laser therapy on growth and differentiation of human osteoblast-like cells. Low-level laser therapy is a clinically well established tool for enhancement of wound healing. In vitro studies have also shown that low level laser therapy has a biostimulatory effect on cells of different origin. The aim of this in vitro study was to investigate the initial effect of low-level laser therapy on growth and differentiation of human osteoblast-like cells. SaOS-2 cells were irradiated with laser doses of 1 J/cm2 and 2 J/cm2 using a diode laser with 670 nm wave length and an output power of 400 mW. Untreated cells were used as controls. At 24 h, 48 h and 72 h post irradiation, cells were collected and assayed for viability of attached cells and alkaline phosphatase specific activity. In addition, mRNA expression levels of osteopontin and collagen type I were assessed using semi-quantitative RT-PCR. Over the observation period, cell viability, alkaline phosphatase activity and the expression of osteopontin and collagen type I mRNA were slightly enhanced in cells irradiated with 1 J/cm2 compared with untreated control cells. Increasing the laser dose to 2 J/cm2 reduced cell viability during the first 48 h and resulted in persistently lower alkaline phosphatase activity compared with the other two groups. The expression of osteopontin and collagen type I mRNA slightly decreased with time in untreated controls and cells irradiated with 1 J/cm2, but their expression was increased by treatment with 2 J/cm2 after 72 h. These results indicate that low-level laser therapy has a biostimulatory effect on human osteoblast-like cells during the first 72 h after irradiation. Further studies are needed to determine the potential of low-level laser therapy as new treatment concept in bone regeneration. Collagen Type I;RNA, Messenger;Osteopontin;Alkaline Phosphatase;Receptor-Like Protein Tyrosine Phosphatases, Class 3 Alkaline Phosphatase;Cell Differentiation;Cell Division;Cell Line;Cell Survival;Collagen Type I;Gene Expression;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteopontin;RNA, Messenger;Radiotherapy Dosage;Receptor-Like Protein Tyrosine Phosphatases, Class 3;Reverse Transcriptase Polymerase Chain Reaction

Split-face treatment of facial dyschromia: pulsed dye laser with a compression handpiece versus intense pulsed light. BACKGROUND: Many visible light lasers and intense pulsed light (IPL) devices are available to treat photodamaged skin. OBJECTIVES: The objective was to perform a multiple-treatment split-face comparison evaluating a pulsed dye laser (PDL) with a compression handpiece versus IPL for photorejuvenation. METHODS: Ten subjects were treated three times at 3- to 4-week intervals. One side of the face was treated with the PDL with compression handpiece, and the other with IPL. One month after final treatment, blinded evaluation assessed for improvements in dyschromias and texture. Patients provided self-assessment of improvement in dyschromias and texture. Time to complete final treatments and pain during all treatments were recorded for each device. RESULTS: Improvement of the PDL was (mean) 86.5, 65, 85, 38, and 40% for dark lentigines, light lentigines, vessels <0.6 mm, vessels >0.6 mm, and texture, respectively, versus 82, 62.5, 78.5, 32.5, and 32%, respectively, for the IPL side. Patient-evaluated difference in improvement for vascular lesions significantly favored the PDL (p=.011). Mean third treatment times were 7.7 minutes for PDL versus 4.6 minutes for the IPL (p=.005). Mean pain ratings were 5.8 for the PDL and 3.1 for the IPL (p=.007). Purpura-free procedures depended on proper technical use of the compression handpiece

when treating lentigines with the PDL. CONCLUSIONS: The PDL with compression handpiece and IPL are highly effective for photorejuvenation. Adult;Aged;Aged, 80 and over;Edema;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Prospective Studies;Rejuvenation;Skin;Sunlight;Treatment Outcome

Minimally ablative erbium:YAG laser resurfacing of facial atrophic acne scars in Asian skin: a pilot study. BACKGROUND: Atrophic scars are dermal depressions caused by collagen damage most commonly occurring after inflammatory acne vulgaris. There are little published data regarding the effectiveness and safety of minimally invasive lasers in the treatment of atrophic acne scars in darker skin types. OBJECTIVE: The purpose was to evaluate the efficacy and safety of a low-fluence 2,940-nm erbium:YAG laser in the treatment of atrophic acne scars in Asian patients. MATERIALS AND METHODS: Nine patients aged 19 to 45 years with mild to moderate atrophic facial scars and Skin Types IV and V were treated with topical anesthesia and one to two passes with an erbium:YAG laser two times at 1-month intervals. Treatment parameters were 6-mm spot size, fluence of 400 mJ, pulse duration of 300 micros, and repetition rate of 2 Hz. RESULTS: At 2 months after the last treatment, mild to moderate clinical improvement was noted in all patients compared to baseline. Treatment was well tolerated. Side effects consisted of posttreatment erythema, peeling, and crusting, which resolved within 1 to 2 weeks. There was no postinflammatory hyper- or hypopigmentation, blistering, or hypertrophic scarring. CONCLUSION: Low-fluence erbium:YAG facial resurfacing was effective and safe in patients with mild to moderately severe atrophic acne scarring. Acne Vulgaris;Adult;Asian People;Atrophy;Cicatrix;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pilot Projects;Skin;Treatment Outcome

Hemangiomas in infancy and childhood. S 2k Guideline of the German Society of Dermatology with the working group Pediatric Dermatology together with the German Society for Pediatric Surgery and the German Society for Pediatric Medicine. Prednisolone Child;Child, Preschool;Combined Modality Therapy;Cross-Sectional Studies;Cryosurgery;Diagnosis, Differential;Dose-Response Relationship, Drug;Esthetics;Female;Hemangioma;Humans;Infant;Infant, Newborn;Infant, Premature, Diseases;Low-Level Light Therapy;Male;Prednisolone;Skin Neoplasms;Syndrome

Low-level laser therapy modulates cyclo-oxygenase-2 expression during bone repair in rats. The goal of this study was to analyze the role of cyclo-oxygenase-2 following bone repair in rats submitted to low-level laser therapy. A total of 48 rats underwent surgery to inflict bone defects in their tibias having been randomly distributed into two groups: negative control and laser exposed group, i.e., the animals were treated with low-level laser therapy by means of gallium arsenide laser at 16 J/cm(2). The animals were killed after 48 h, 7 days, 14 days, or 21 days. The tibias were removed for morphological, morphometric, and immunohistochemistry analysis for cyclo-oxygenase-2. Statistical significant differences ($P < 0.05$) were observed in the quality of bone repair and quantity of formed bone between groups 14 days after surgery in the laser exposed group. In the same way, cyclo-oxygenase-2 immunoreactivity was more intense in bone cells for intermediate periods evaluated in this group. Taken together, such results suggest that low-level laser therapy is able to improve bone repair in the tibia of rats after 14 days of surgery as a result of an up-regulation for cyclo-oxygenase-2 expression in bone cells. Cyclooxygenase 2 Animals;Cyclooxygenase 2;Disease Models, Animal;Fracture Healing;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibial Fractures;Time Factors

Laser phototherapy effect on protein metabolism parameters of rat salivary glands. The aim of this study was to evaluate the effects of infrared diode laser phototherapy (LP) on tissues of the submandibular gland (SMG) and parotid gland (PG). Wistar rats were randomly divided into experimental (A and B) and control (C) groups. A diode laser, 808 nm wavelength, in continuous wave

mode, was applied to the PG, SMG and sublingual gland in the experimental groups on two consecutive days. The doses were 4 J/cm(2) and 8 J/cm(2), and total energy was 7 J and 14 J, respectively. The power output (500 mW) and power density (277 mW/cm(2)) were the same for both experimental groups. In order to visualize the area irradiated by the infrared laser, we used a red pilot beam (650 nm) with 3 mW maximum power for the experimental groups. For the control group, the red pilot beam was the only device used. The SMG and PG were removed after 1 week of the first irradiation. Total protein concentration, amylase, peroxidase, catalase and lactate dehydrogenase assays were performed, as well as histological analysis. Statistical tests revealed significant increase in the total protein concentration for groups A and B in the parotid glands ($P < 0.05$). Based on the results of this study, LP altered the total protein concentration in rats' parotid glands. Salivary Proteins and Peptides;L-Lactate Dehydrogenase;Peroxidases Animals;L-Lactate Dehydrogenase;Lasers, Semiconductor;Male;Peroxidases;Phototherapy;Radiotherapy Dosage;Rats;Rats, Wistar;Salivary Glands;Salivary Proteins and Peptides

Elementary processes in cells after light absorption do not depend on the degree of polarization: implications for the mechanisms of laser phototherapy. OBJECTIVE: The objective of this work was to evaluate the importance of the degree of light polarization in stimulation of cellular metabolism. BACKGROUND DATA: Although the possible role of polarization's effects on the mechanisms of laser phototherapy is sometimes discussed in the literature, there are still no clear answers. MATERIAL AND METHODS: A model system (HeLa cell suspension) was used in which the lengths of light scattering (l sc) and absorption (l a) were much larger than the thickness of the irradiated layer (L = 3 mm). The cell suspension (1 x 10(6) cells/cm3) was irradiated with a diode laser (lambda = 637 nm, D = 65.7 J/m2, tau = 10 sec, I = 6.57 W/m2). The polarization degree (99.4%, 60.9%, and 34.2%) of the beam was changed by means of optical fibers of different lengths. The irradiated suspension was incubated at 37 degrees C for 30 min, and the attached cells were counted afterwards. RESULTS: The cell fraction stimulated to adhere by red light at 637 nm was nearly the same in all three experimental groups (58.1% +/- 2.5%, 57.6% +/- 3.5%, and 62.5% +/- 3.2% for degree of beam polarization of 99.4%, 66.9%, and 34.2%, respectively). There was no statistically significant difference in these results ($p <0.8$, <0.6, and <0.7, respectively). At the same time, all three groups had statistically significant differences ($p < 0.01$) in adherence from the sham-irradiated control group (39.1% +/- 2.2%). CONCLUSION: The biological effect (stimulation of cell attachment) of light with lambda = 637 nm on cells in our model system was pronounced, but did not depend on the degree of light polarization. Elementary processes in cells (light absorption and photochemistry) do not appear to depend on the degree of light polarization. Cell Adhesion;Cell Culture Techniques;Glass;HeLa Cells;Humans;Lasers, Semiconductor;Light;Models, Biological;Phototherapy;Scattering, Radiation;Surface Properties

LED photoprevention: reduced MED response following multiple LED exposures. BACKGROUND AND OBJECTIVES: As photoprotection with traditional sunscreen presents some limitations, the use of non-traditional treatments to increase skin resistance to ultraviolet (UV) induced damage would prove particularly appealing. The purpose of this pilot study was to test the potential of non-thermal pulsed light-emitting diode (LED) treatments (660 nm) prior to UV exposure in the induction of a state of cellular resistance against UV-induced erythema. STUDY DESIGN/MATERIALS AND METHODS: Thirteen healthy subjects and two patients with polymorphous light eruption (PLE) were exposed to 5, 6, or 10 LED treatments (660 nm) on an EXPERIMENTAL anterior thigh region. Individual baseline minimal erythema doses (MED) were then determined. UV radiation was thereafter performed on the LED EXPERIMENTAL and CONTROL anterior thigh areas. Finally, 24 hours post-UV irradiation, LED pre-treated MED responses were compared to the non-treated sites. RESULTS: Reduction of erythema was considered significant when erythema was reduced by >50% on the LED-treated side as

opposed to CONTROL side. A significant LED treatment reduction in UV-B induced erythema reaction was observed in at least one occasion in 85% of subjects, including patients suffering from PLE. Moreover, there was evidence of a dose-related pattern in results. Finally, a sun protection factor SPF-15-like effect and a reduction in post-inflammatory hyperpigmentation were observed on the LED pre-treated side. CONCLUSIONS: Results suggest that LED based therapy prior to UV exposure provided significant protection against UV-B induced erythema. The induction of cellular resistance to UV insults may possibly be explained by the induction of a state a natural resistance to the skin via specific cell signaling pathways and without the drawbacks and limitations of traditional sunscreens. These results represent an encouraging step towards expanding the potential applications of LED therapy and could be useful in the treatment of patients with anomalous reactions to sunlight. Adult;Dose-Response Relationship, Radiation;Erythema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Photosensitivity Disorders;Pilot Projects;Thigh;Ultraviolet Rays

Treatment of resistant tattoos using a new generation Q-switched Nd:YAG laser: influence of beam profile and spot size on clearance success. BACKGROUND AND OBJECTIVES: Multiple treatments of resistant tattoos often result in fibrosis and visible textural changes that lessen response to subsequent treatments. The aim of this study is to evaluate the influence of beam profile and spot size on clearance rates and side effects in the setting of resistant tattoos. STUDY DESIGN/MATERIAL AND METHODS: Thirty-six professional, black tattoos (32 patients) were treated unsuccessfully with a Q-switched Nd:YAG laser (MedLite C3, HoyaConBio Inc., Fremont, CA). Because of therapy resistance all tattoos were re-treated using a new generation Nd:YAG laser (MedLite C6, HoyaConBio Inc.). Maximum energy fluence (E (max)), mean energy fluence, mean spot size, level of clearance, side effects and beam profile (irradiance distribution) of both laser systems were assessed and evaluated in a retrospective study. RESULTS: All tattoos were previously treated with the C3 laser at 1,064 nm using a mean E(max) of 5.8+/-0.8 J/cm(2) (range 3.8-7.5 J/cm(2)) as compared with a mean E(max) of 6.4+/-1.6 J/cm(2) (range 3.2-9.0 J/cm(2)) during the C6 treatment course. Corresponding spot sizes were larger during C6 treatments as compared with C3 (5.0+/-0.9 and 3.6+/-0.2 mm, respectively). The C6 laser had a "flat top" and homogenous profile regardless of the spot size. For the C3 laser the beam shape was "Gaussian," and the homogeneity was reduced by numerous micro-spikes and micro-nadirs. After the C6 treatment course 33.3% of the tattoos showed clearance of grade 1 (0-25%), 16.7% of grade 2 (26-50%), 16.7% of grade 3 (51-75%), 30.5% of grade 4 (76-95%), 2.8% of grade 5 (96-100%). The total rate of side effects due to C6 treatment was 8.3% in all tattoos (hyperpigmentation 5.6%, hypopigmentation 2.7%, textural changes/scars 0%). CONCLUSION: This clinical study documents for the first time the impact of a 1,064-nm Nd:YAG laser with a more homogenous beam profile and a larger spot size on the management of resistant tattoos. Only a few treatment sessions were necessary to achieve an additional clearance with a low rate of side effects. Adult;Aged;Cohort Studies;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retreatment;Retrospective Studies;Tattooing;Treatment Outcome

The Impact of low power laser in the treatment of conditioning-induced oral mucositis: a report of 11 clinical cases and their review. We have investigated the clinical effects of low power laser therapy (LPLT) on the treatment of conditioning-induced oral mucositis (OM) in patients submitted to hematopoietic stem cell transplantation (HSCT). The evaluation of OM was done using the Oral Mucositis Assessment Scale (OMAS) and World Health Organization (WHO) scale. In the context of a randomized placebo-controlled trial with 38 patients for the evaluation of preventive LPLT, eleven individuals were submitted to allogeneic (AL) HSCT and developed oral mucositis grade 4 (WHO) or a total area of OM of 12 cm (OMAS) and due to that were treated with LPLT with the purpose of symptom relief. The irradiation used was a diode InGaAlP, emitting light at 660 nm, 50 mW and 8 J/cm(2) measured at the end of fiber optic with 0.196 cm(2) of section area during the treatment. The

tip of the laser device touched the oral mucosa and patients recovered on average 6 days (3-12 days) from the beginning of the laser application. Our results have indicated that the use of LPLT in HSCT patients is a powerful instrument in the treatment of overt OM and is now a standard procedure in this group of patients in our hospital. Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Male;Middle Aged;Stomatitis;Transplantation Conditioning

Retinoids, 585-nm laser, and carbon dioxide laser: a numeric comparison of neocollagen formation in photoaged hairless mouse skin. BACKGROUND: A variety of new methods for treating photoaging have been recently introduced. There has been increasing interest in comparing the relative efficacy of multiple methods for photoaging. However, the efficacy of a single method is difficult to assess from the data reported in the literature. METHODS: Photoaged hairless mice were randomly divided into seven treatment groups: control, retinoids (tretinoin and adapalene), lasers (585 nm and CO(2)), and combination groups (585 nm + adapalene and CO(2)+ adapalene). Biopsies were taken from the treated regions, and the results were analyzed based on the repair zone. The repair zones of the various methods for photoaging were compared. RESULTS: Retinoids produced a wider repair zone than the control condition. The 585-nm and CO(2) laser resurfacing produced a result equivalent to that of the control condition. A combination of these lasers with adapalene produced a wider repair zone than the lasers alone, but the combination produced a result equivalent to that of adapalene alone. CONCLUSION: Retinoids are potent stimuli for neocollagen formation. The 585-nm or CO(2) laser alone did not induce more neocollagen than the control condition. In addition, no synergistic effect was observed with the combination treatments. The repair zone of the combination treatment is mainly attributable to adapalene.
Naphthalenes;Retinoids;Adapalene;Collagen Adapalene;Animals;Biopsy, Needle;Collagen;Combined Modality Therapy;Disease Models, Animal;Immunohistochemistry;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Mice;Mice, Hairless;Naphthalenes;Probability;Random Allocation;Reference Values;Retinoids;Risk Assessment;Sensitivity and Specificity;Skin Aging;Statistics, Nonparametric

[Using some new technologies in medical rehabilitation in chronic prostatitis]. Plant Preparations;Suppositories;Radon Chronic Disease;Humans;Iontophoresis;Leuzea;Low-Level Light Therapy;Male;Mud Therapy;Physical Therapy Modalities;Plant Preparations;Prostatitis;Radon;Suppositories;Treatment Outcome;Ultrasound, High-Intensity Focused, Transrectal

Photobiomodulation of the development of early mouse embryos by luminescent irradiation with lambda(max) = 626 nm. Animals;Embryo Culture Techniques;Embryo, Mammalian;Embryonic Development;Female;Light;Male;Mice;Sunlight

Effects of low-level laser therapy and eccentric exercises in the treatment of recreational athletes with chronic achilles tendinopathy. BACKGROUND: Eccentric exercises (EEs) are recommended for the treatment of Achilles tendinopathy, but the clinical effect from EE has a slow onset. HYPOTHESIS: The addition of low-level laser therapy (LLLT) to EE may cause more rapid clinical improvement. STUDY DESIGN: Randomized controlled trial; Level of evidence, 1. METHODS: A total of 52 recreational athletes with chronic Achilles tendinopathy symptoms were randomized to groups receiving either EE + LLLT or EE + placebo LLLT over 8 weeks in a blinded manner. Low-level laser therapy (lambda = 820 nm) was administered in 12 sessions by irradiating 6 points along the Achilles tendon with a power density of 60 mW/cm(2) and a total dose of 5.4 J per session. RESULTS: The results of the intention-to-treat analysis for the primary outcome, pain intensity during physical activity on the 100-mm visual analog scale, were significantly lower in the LLLT group than in the placebo LLLT group, with 53.6 mm versus 71.5 mm (P = .0003) at 4 weeks, 37.3 mm versus 62.8 mm

(P = .0002) at 8 weeks, and 33.0 mm versus 53.0 mm (P = .007) at 12 weeks after randomization. Secondary outcomes of morning stiffness, active dorsiflexion, palpation tenderness, and crepitation showed the same pattern in favor of the LLLT group. CONCLUSION: Low-level laser therapy, with the parameters used in this study, accelerates clinical recovery from chronic Achilles tendinopathy when added to an EE regimen. For the LLLT group, the results at 4 weeks were similar to the placebo LLLT group results after 12 weeks. Achilles Tendon;Adult;Athletic Injuries;Chronic Disease;Female;Humans;Laser Therapy;Male;Physical Therapy Modalities;Recreation;Single-Blind Method;Tendon Injuries;Treatment Outcome

[Patients with tuberculosis associated with chronic non-specific lung diseases]. 159 patients have been observed to assess the efficiency of laseropuncture use in a complex treatment of patients with lung tuberculosis and chronic bronchitis. Disbalance in renal meridian (R), urinary bladder (V) and insufficiency of the energy in colon meridian (60.3%) were observed in patients with tuberculosis associated with chronic bronchitis. Medium deviations of electro-skin conductivity from the physiological gape in meridians of GI, IG, F, V, R in patients with tuberculosis associated with chronic bronchitis considerably differ from those data obtained from patients with only tuberculosis. Obtained data testify more severe disorders of energy balance in meridians of patients having except tuberculosis other associated diseases. Medium parameters of deviations from the physiological gape considerably decrease after the course of laseropuncture compared with those patients treated traditionally. Improve of the course of the chronic bronchitis was noted in patients who underwent laseropuncture. Bronchitis, Chronic;Humans;Low-Level Light Therapy;Meridians;Pulmonary Disease, Chronic Obstructive;Respiratory Function Tests;Treatment Outcome;Tuberculosis, Pulmonary

Improved wound healing by low-level laser irradiation after gingivectomy operations: a controlled clinical pilot study. AIM: Low-level laser therapy (LLLT) may induce morphological, molecular and cellular processes, which are involved in wound healing. The aim of this split-mouth controlled clinical trial was to assess the effects of LLLT on healing of gingiva after gingivectomy and gingivoplasty. MATERIAL AND METHODS: Twenty patients with inflammatory gingival hyperplasias on their symmetrical teeth were included in this study. After gingivectomy and gingivoplasty, a diode laser (588 nm) was randomly applied to one side of the operation area for 7 days. The surgical areas were disclosed by a solution (Mira-2-tones) to visualize the areas in which the epithelium is absent. Comparison of the surface areas on the LLLT-applied sites and controls were made with an image-analysing software. RESULTS: Despite the prolonged time needed for application, patients have tolerated LLLT well. While there were no statistically significant differences between the stained surface areas of the LLLT applied and the control sites immediately after the surgery, LLLT-applied sites had significantly lower stained areas compared with the controls on the post-operative third, seventh and 15th day ($p<0.001$ for each). CONCLUSIONS: Within the limitations of this study, the results indicated that LLLT may enhance epithelization and improve wound healing after gingivectomy and gingivoplasty operations. Adult;Female;Gingiva;Gingival Overgrowth;Gingivectomy;Gingivoplasty;Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Male;Pilot Projects;Statistics, Nonparametric;Wound Healing

Comparison of sandblasting, laser irradiation, and conventional acid etching for orthodontic bonding of molar tubes. The purpose of the study was to determine if sandblasted and laser-irradiated enamel may be viable alternatives to acid etching for molar tube bonding. Seventy-seven molar teeth extracted for periodontal reasons were used. Seventy teeth underwent shear bond strength (SBS) testing and the remaining seven were examined under scanning electron microscopy (SEM). Adhesive remnant index (ARI) scores were also considered. An erbium, chromium-doped:yttrium-scandium-gallium-garnet (Er, Cr: YSGG) laser was used for enamel etching. Sandblasted and laser-irradiated

enamel surfaces with different power outputs (0.5, 0.75, 1, 1.5, and 2 W) were compared with conventional phosphoric acid etching. Descriptive statistics, including mean, standard deviation, and minimum and maximum values, were calculated for each group. Multiple comparisons of the SBS of different etching types were performed by analysis of variance testing. The chi-square test was used to evaluate differences in ARI scores between groups. Acid-etched, 1-, 1.5-, and 2-W laser irradiation groups demonstrated a clinically acceptable mean SBS (7.65 +/- 1.38, 6.69 +/- 1.27, 7.13 +/- 1.67, 7.17 +/- 1.69 MPa, respectively). Irradiation with an output of 0.5 and 0.75 W and sandblasting of the enamel showed a lower SBS than the other groups (2.94 +/- 1.98, 4.16 +/- 2.87, 2.01 +/- 0.64 MPa, respectively). SEM evaluation of 1, 1.5, and 2 W laser irradiation revealed similar etching patterns to acid etching. Sandblasting and 0.5, and 0.75 W laser etching were not able to etch enamel in preferential patterns. Laser irradiation at 1.5 and 2 W was able to etch enamel. More adhesive was left on the enamel surface with low-power laser irradiation. Sandblasting and low-power laser irradiation (0.5, 0.75, and 1 W) are not capable of etching enamel suitable for orthodontic molar tube bonding, but 1.5- and 2-W laser irradiation may be an alternative to conventional acid etching. Resin Cements;Transbond XT Acid Etching, Dental;Air Abrasion, Dental;Analysis of Variance;Chi-Square Distribution;Dental Bonding;Dental Enamel;Dental Stress Analysis;Humans;Lasers, Solid-State;Molar;Orthodontic Appliances;Resin Cements;Shear Strength

Comparative evaluation of long-pulse alexandrite and long-pulse Nd:YAG laser systems used individually and in combination for axillary hair removal. BACKGROUND: The 755-nm alexandrite and the 1,064-nm Nd:YAG lasers are both utilized for hair removal. Advances in laser technology have led to the development of dual-wavelength treatment for increased efficacy. OBJECTIVE: The objective was to evaluate the safety and efficacy of combining 755- and 1,064-nm wavelengths for axillary hair removal. METHODS: Twenty patients received three treatments at 4- to 6-week intervals in four axillary quadrants. The left upper axilla was treated with the alexandrite laser, the left lower axilla with the Nd:YAG laser, the right upper axilla with combination alexandrite and Nd:YAG laser, and the right lower quadrant with the diode laser. At 1- and 2-month follow-up visits, subjects completed questionnaires and were assessed for percentage of hair reduction. RESULTS: Eighteen subjects completed the study. The greatest reduction was seen with the alexandrite laser at 70.3% and combination of alexandrite and Nd:YAG laser at 67.1%. The diode laser was less efficacious at 59.7% and the Nd:YAG laser had the least improvement with 47.4% reduction. Subjects found the alexandrite and diode lasers to be the most tolerable and the Nd:YAG and combination treatment to be the most painful. CONCLUSION: Combination treatment of alexandrite and Nd:YAG lasers provides no added benefit over the alexandrite laser alone. Adult;Axilla;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy

Clinical effect of CO(2) laser in reducing pain in orthodontics. OBJECTIVE: To test the hypothesis that there is no difference in the pain associated with orthodontic force application after the application of local CO(2) laser irradiation to the teeth involved. MATERIALS AND METHODS: Separation modules were placed at the distal contacts of the maxillary first molars in 90 patients in this single-blinded study. In 60 of these patients (42 females and 18 males; mean age = 19.22 years) this was immediately followed by laser therapy. The other 30 patients (18 females and 12 males; mean age = 18.8 years) did not receive active laser irradiation. Patients were then instructed to rate their levels of pain on a visual analog scale over time, and the amount of tooth movement was analyzed. RESULTS: Significant pain reductions were observed with laser treatment from immediately after insertion of separators through day 4, but no differences from the nonirradiated control side were noted thereafter. No significant difference was noted in the amount of tooth movement between the irradiated and nonirradiated group. CONCLUSIONS: The hypothesis was rejected. The results suggest that local CO(2) laser irradiation will reduce pain associated with orthodontic force

application without interfering with the tooth movement. Adolescent;Adult;Facial Pain;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Orthodontics, Corrective;Pain Measurement;Single-Blind Method;Tooth Movement Techniques
Treatment of neck pain: noninvasive interventions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. STUDY DESIGN: Best evidence synthesis. OBJECTIVE: To identify, critically appraise, and synthesize literature from 1980 through 2006 on noninvasive interventions for neck pain and its associated disorders. SUMMARY OF BACKGROUND DATA: No comprehensive systematic literature reviews have been published on interventions for neck pain and its associated disorders in the past decade. METHODS: We systematically searched Medline and screened for relevance literature published from 1980 through 2006 on the use, effectiveness, and safety of noninvasive interventions for neck pain and associated disorders. Consensus decisions were made about the scientific merit of each article; those judged to have adequate internal validity were included in our best evidence synthesis. RESULTS: Of the 359 invasive and noninvasive intervention articles deemed relevant, 170 (47%) were accepted as scientifically admissible, and 139 of these related to noninvasive interventions (including health care utilization, costs, and safety). For whiplash-associated disorders, there is evidence that educational videos, mobilization, and exercises appear more beneficial than usual care or physical modalities. For other neck pain, the evidence suggests that manual and supervised exercise interventions, low-level laser therapy, and perhaps acupuncture are more effective than no treatment, sham, or alternative interventions; however, none of the active treatments was clearly superior to any other in either the short- or long-term. For both whiplash-associated disorders and other neck pain without radicular symptoms, interventions that focused on regaining function as soon as possible are relatively more effective than interventions that do not have such a focus. CONCLUSION: Our best evidence synthesis suggests that therapies involving manual therapy and exercise are more effective than alternative strategies for patients with neck pain; this was also true of therapies which include educational interventions addressing self-efficacy. Future efforts should focus on the study of noninvasive interventions for patients with radicular symptoms and on the design and evaluation of neck pain prevention strategies. Anti-Inflammatory Agents, Non-Steroidal Anti-Inflammatory Agents, Non-Steroidal;Braces;Cost-Benefit Analysis;Exercise Therapy;Humans;Manipulation, Spinal;Neck Pain;Patient Care Team;Patient Education as Topic;Whiplash Injuries
Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy
Infrared laser light further improves bone healing when associated with bone morphogenic proteins: an in vivo study in a rodent model. OBJECTIVE: This study assessed histologically the effect of laser photobiomodulation (LPBM) on the repair of surgical defects created in the femurs of Wistar rats treated or not treated with bone morphogenic proteins (BMPs) and organic bovine bone graft. BACKGROUND DATA: This paper is part of an ongoing series of works in which biomaterials are used in association with LPBM. Several previous reports by our group have shown that the use of laser photobiomodulation improves the treatment of bone defects. MATERIALS AND METHODS: Forty-eight adult male Wistar rats were divided into four randomized groups: group I (control, n = 12); group II (LPBM, n = 12); group III (BMPs + organic bovine bone graft, n = 12); and group IV (BMPs + organic bovine bone graft + LPBM, n = 12). The irradiated groups received seven irradiations every 48 h, beginning immediately after the surgical procedure. The laser therapy (lambda = 830 nm, 40 mW CW, varphi = 0.6 mm) consisted of 16 J/cm(2) per session divided equally over four points (4 J/cm(2) each) around the defect. The subjects were sacrificed after 15, 21, and 30 d, and the specimens were routinely embedded in wax, stained with hematoxylin and eosin and sirius red, and analyzed under light microscopy. RESULTS: The results showed histological evidence of increased deposition of

collagen fibers (at 15 and 21 d), as well as an increased amount of well-organized bone trabeculae at the end of the experimental period (30 d) in the irradiated animals versus the non-irradiated controls. CONCLUSION: The use of LPBM with BMPs and organic bovine bone grafts increases the positive biomodulating effects of laser light. Biocompatible Materials;Bone Morphogenetic Proteins Animals;Biocompatible Materials;Bone Morphogenetic Proteins;Bone Regeneration;Femur;Infrared Rays;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Effectiveness of laser photobiomodulation at 660 or 780 nanometers on the repair of third-degree burns in diabetic rats. OBJECTIVE: The aim of this investigation was to compare by light microscopy the effects of laser photobiomodulation (LPBM) at lambda = 660 nm and lambda = 780 nm on third-degree burns in diabetic Wistar rats. BACKGROUND DATA: Burns are severe injuries that result in fluid loss, tissue destruction, infection, and shock, that may result in death. Diabetes is a disease that reduces the body's ability to heal properly. LPBM has been suggested as an effective method of improving wound healing. MATERIALS AND METHODS: A third-degree burn measuring 1.5 x 1.5 cm was created in the dorsum of each of 55 animals, and they were divided into three groups that were or were not treated with LPBM (lambda = 660 nm or lambda = 780 nm, 35 mW, varphi = 2 mm, 20 J/cm(2)). The treatments were started immediately post-burn at four points within the burned area (5 J/cm(2)) and were repeated at 24-hour intervals over 21 d. The animals were humanely killed after 3, 5, 7, 14, and 21 d by an overdose of intraperitoneal general anesthetic. The specimens were routinely cut and stained and analyzed by light microscopy. RESULTS: We found that healing in the animals receiving 660-nm laser energy was more apparent at early stages, with positive effects on inflammation, the amount and quality of granulation tissue, fibroblast proliferation, and on collagen deposition and organization. Epithelialization and local microcirculation were also positively affected by the treatment. CONCLUSION: The use of 780-nm laser energy was not as effective as 660-nm energy, but it had positive effects at early stages on the onset and development of inflammation. At the end of the experimental period the primary effect seen was on the amount and quality of the granulation tissue. The 660-nm laser at 20 J/cm(2), when used on a daily basis, was more effective than the 780-nm laser for improving the healing of third-degree burns in the diabetic rats beginning at the early stages post-burn. Animals;Burns;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Nd:YAG laser biostimulation in the treatment of bisphosphonate-associated osteonecrosis of the jaw: clinical experience in 28 cases. OBJECTIVE: To research an efficient treatment for the management of bisphosphonate-associated osteonecrosis. BACKGROUND DATA: Necrosis of the jawbone has recently been described in association with systemic bisphosphonate therapy with drugs including zoledronic acid, pamidronate, and alendronate. The extent and clinical characteristics of bisphosphonate-associated osteonecrosis (BON) of the jaw are extremely variable, and range from the presence of fistulae in the oral mucosa or orofacial tissues, to large exposed areas of necrotic bone within the oral cavity. Clinical signs and symptoms commonly reported include pain, swelling, the presence of pus, loose teeth, ill-fitting dentures, and paresthesias of the inferior alveolar nerve when the necrosis affects the mandible. Fractures have also been reported. The treatment of BON of the jaw is still controversial since no therapy has proven to be efficacious as shown by the literature on the subject. MATERIALS AND METHODS: In this study we report results achieved with 28 patients affected by BON of the jaw, who received treatment with the Nd:YAG laser alone or in combination with conventional medical or surgical treatment. Clinical variables such as severity of symptoms, presence of pus, and closure of mucosal flaps before and after therapy were evaluated to establish the effectiveness of laser irradiation. The 28 patients with BON were subdivided into four groups: eight patients were treated with medical therapy only (antibiotics with or without antimycotics and/or antiseptic rinses), six patients were treated with medical and surgical therapy (necrotic bone

removal and bone curettage), six patients were treated with medical therapy associated with laser biostimulation, and eight patients were treated with medical therapy associated with both surgical therapy and laser biostimulation. RESULTS: Of the 14 patients who underwent laser biostimulation, nine reported complete clinical success (no pain, symptoms of infection, or exposed bone or draining fistulas), and three improved their symptomatology only, with a follow-up of between 4 and 7 mo. CONCLUSIONS: While the results reported in this study are not conclusive, they indicate that laser therapy has potential to improve management of BON. Bone Density Conservation Agents;Diphosphonates Aged;Aged, 80 and over;Bone Density Conservation Agents;Cohort Studies;Diphosphonates;Female;Humans;Jaw;Low-Level Light Therapy;Male;Middle Aged;Osteonecrosis;Treatment Outcome

Laser therapy in the treatment of achilles tendinopathy: a pilot study. OBJECTIVE: To test the feasibility of a randomized controlled trial to assess the clinical effectiveness of low-level laser therapy (LLLT) when used in addition to eccentric exercise in the management of Achilles tendinopathy. BACKGROUND DATA: LLLT has emerged as a possible treatment modality for tendon injuries. Over the past 20 years only three human studies have investigated LLLT for Achilles tendinopathy. MATERIALS AND METHODS: Twenty patients were randomized into an active laser or placebo group; all patients, therapists, and investigators were blinded to allocation. All patients were given a 12-week eccentric exercise program and irradiated three times per week for 4 wk with either an active or placebo laser at standardized points over the affected tendons. Irradiation parameters in the active treatment group were: 810 nm, 100 mW, applied to six points on the tendon for 30 s, for a total dose of 3 J per point and 18 J per session. Outcome measures were the VISA-A questionnaire, pain, and isokinetic strength. Patients were measured before treatment and at 4 and 12 wk. Analysis of covariance was used to analyze data, using the effects of baseline measurements as a covariate. RESULTS: Within groups, there were significant improvements ($p < 0.05$) at 4 and 12 wk for all outcome measures, except eccentric strength for the placebo group at 4 wk ($p = 0.11$). Based on the results of the current study, recruitment of 20 subjects per group would be required to perform an adequately powered study based on minimally important clinical differences in VISA-A scale. CONCLUSION: This study has demonstrated the feasibility of undertaking a randomized controlled trial of LLLT for Achilles tendinopathy. Conclusions regarding effectiveness cannot be made due to the low statistical power of this pilot study. Achilles Tendon;Adult;Cohort Studies;Double-Blind Method;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Tendinopathy;Treatment Outcome

Cytokine mRNA expression is decreased in the subplantar muscle of rat paw subjected to carrageenan-induced inflammation after low-level laser therapy. OBJECTIVE: The objective of this work was to investigate the anti-inflammatory effects of low-level laser therapy, applied at different wavelengths (660 and 684 nm), on cytokine mRNA expression after carrageenan-induced acute inflammation in rat paw. BACKGROUND DATA: Low-level laser therapy (LLLT) has been observed to reduce pain in inflammatory disorders. However, little is known about the mechanisms behind this effect or whether it is wavelength-specific. MATERIALS AND METHODS: The test sample consisted of 32 rats divided into four groups: A(1) (control-saline), A(2) (carrageenan-only), A(3) (carrageenan + 660 nm laser therapy), and A(4) (carrageenan + 684 nm laser therapy). The animals from groups A(3) and A(4) were irradiated 1 h after induction of inflammation by carrageenan injection. Continuous-wave red lasers with wavelengths of 660 and 684 nm and dose of 7.5 J/cm(2) were used. RESULTS: Both the 660 nm and 684 nm laser groups had 30%-40% lower mRNA expression for cytokines TNF-alpha, IL-1beta, and IL-6 in the paw muscle tissue than the carrageenan-only control group. Cytokine measurements were made 3 h after laser irradiation of the paw muscle, and all cytokine differences between the carrageenan-only control group and the LLLT groups were

statistically significant ($p < 0.001$). CONCLUSIONS: LLLT at the 660-nm and 684-nm wavelengths administered to inflamed rat paw tissue at a dose of 7.5 J/cm(2) reduce cytokine mRNA expression levels within 3 h in the laser-irradiated tissue. Cytokines;Inflammation Mediators;RNA, Messenger;Carrageenan Animals;Carrageenan;Cytokines;Edema;Hindlimb;Inflammation Mediators;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar

Efficacy of monochromatic excimer light (308 nm) in the treatment of atopic dermatitis in adults and children. OBJECTIVE: To demonstrate the efficacy of light produced by a 308 nm xenon-chloride monochromatic excimer light (MEL) in the treatment of localized lesions of atopic dermatitis (AD) in adults and in children. BACKGROUND DATA: The 308-nm excimer light has been reported to be safe and effective in the treatment of chronic skin diseases, although the range of potential applications has not been fully explored. METHODS: Twelve adults and six children affected by localized lesions of AD were enrolled in this pilot study and treated with a weekly session of MEL. A range of 6-12 sessions was performed with an increasing dosage according to the patient's phototype and response. Follow-up was for 16 wk. RESULTS: All patients completed the protocol. At the end of treatment complete remission was observed in 12/18 patients (66.7%), a partial remission in 3/18 (16.7%) and no remission in 3/18 (16.7%). A mean total dose of 21.89 minimal erythemal dose (MED) was performed. Forty-four percent of patients maintained the results achieved at a 16-week follow-up. Treatment was well tolerated overall. CONCLUSIONS: MEL can be considered as a valid and safe therapeutic option for the treatment of localized AD in adults and children. Adolescent;Adult;Aged;Child;Dermatitis, Atopic;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Comparison between the effect of low-level laser therapy and low-intensity pulsed ultrasonic irradiation in vitro. OBJECTIVE: The objective of this study was to compare the effect of low-level laser therapy (LLLT) and low-intensity pulsed ultrasound (LIPUS) on fibroblast cell culture. Several methods, including ultrasound treatment and LLLT, are being used to facilitate tissue repair and healing processes. MATERIALS AND METHODS: L929 fibroblast cell cultures were irradiated with low-level laser energy and LIPUS. Cultures irradiated with ultrasound were divided into five groups: group 1: control (did not receive irradiation); group 2: 0.2 W/cm(2) in pulsed mode at 10% (1:9 duty cycle); group 3: 0.6 W/cm(2) in pulsed mode at 10% (1:9 duty cycle); group 4: 0.2 W/cm(2) in pulsed mode at 20% (2:8 duty cycle); and group 5: 0.6 W/cm(2) in pulsed mode at 20% (2:8 duty cycle). Cultures irradiated with laser energy were divided into three groups: group 1: control (did not receive irradiation); group 2: 6 J/cm(2); and group 3: 50 mJ/cm(2). Each group was irradiated at 24-h intervals, with the following incubation periods post-irradiation: 24, 48, and 72 h; after each irradiation cycle the cultures were analyzed using MTT [3-(4.5-dimethylthiazol-2-yl)-2.5 diphenyltetrazolium bromide]. RESULTS: Analysis of results after LLLT and LIPUS demonstrated that the effect of laser therapy on fibroblast cell culture was greater than that of LIPUS ($p < 0.05$). CONCLUSION: Results demonstrated that LLLT significantly increased fibroblastic activity more than LIPUS. Therefore, in the first and second phases of tissue repair, laser treatment may be more effective than ultrasound treatment. Animals;Cell Culture Techniques;Fibroblasts;Low-Level Light Therapy;Mice;Ultrasonic Therapy

Effect of low-level laser therapy on mast cells in second-degree burns in rats. OBJECTIVE: This study sought to investigate whether low-level laser therapy (LLLT) with a helium-neon (He-Ne) laser would affect mast cell number and degranulation in second-degree burns in rats. BACKGROUND DATA: LLLT has been recently applied to stimulate the wound healing process. MATERIALS AND METHODS: Sixty-five rats were randomly allocated to one of five groups. A deep second-degree burn was inflicted on all rats except those in the control group. In the sham-exposed group burns remained untreated. In the two laser-treated groups, the burns were irradiated every day by LLLT, with energy

densities of 1.2 and 2.4 J/cm(2). In the fifth group the burns were treated topically with 0.2% nitrofurazone cream every day. The unburned skin of the rats in the control group were used for baseline study. The effects on mast cell number and degranulation were assessed by counting the number of intact and degranulated mast cells in sections fixed in formalin and stained with toluidine blue. RESULTS: On the seventh and 16th days post-burn, the type 1 mast cell count in the 2.4-J/cm(2) laser-treated group was significantly higher than that of the control group. On the 30th day, the total numbers of mast cells in the laser-treated groups were lower than those in the control and sham-exposed groups. CONCLUSION: LLLT of deep second-degree cutaneous burns in rats significantly increased the number of intact mast cells during the inflammatory and proliferative phases of healing, and decreased the total number of mast cells during the remodeling phase.
Animals;Burns;Low-Level Light Therapy;Male;Mast Cells;Rats;Rats, Wistar

Histological evaluation of the safety of toluidine blue-mediated photosensitization to periodontal tissues in mice. Our previous in vitro study has shown that toluidine blue (TB)-mediated lethal photosensitization of periodontal pathogens (PPs) from periodontal patients is possible. The purpose of this study was to investigate whether TB-mediated photosensitization exerted damaging effects on periodontal tissues in mice. Twenty-four mice were randomly divided into four groups; the experimental photodynamic therapy (PDT) group was treated with 1 mg/ml TB and light irradiation (60 J/cm(2), 635 nm, 337 s). Those in control groups were subjected to 140 J/cm(2) laser irradiation alone or to 2.5 mg/ml TB alone or received neither TB nor light exposure. All the mice were killed 72 h after they had been subjected to PDT, and periodontal tissue samples were taken for histological examination. During the 72 h observation period, no mice showed any distress. No necrotic or inflammatory changes were found in the gingiva, dentin, dental pulp or alveolar bone of the mice in any of the groups in this study. The results suggest that TB-mediated PDT is a safe antimicrobial approach for the treatment of periodontopathy without damaging effects to adjacent normal tissues.
Hemostatics;Tolonium Chloride Animals;Feasibility Studies;Hemostatics;Low-Level Light Therapy;Male;Mice;Periodontium;Photochemotherapy;Radiotherapy Dosage;Tolonium Chloride

Treatment of halo nevus with a 308-nm excimer laser: a pilot study. BACKGROUND: The treatment of halo nevus is controversial and ranges from observation requiring no therapy to excision biopsy. OBJECTIVE: To assess the efficacy of excimer laser for the treatment of halo nevus. METHODS: Four patients with halo nevus on the face were treated by excimer laser three times a week until they achieved 75% pigmentation or a maximum of 36 treatment sessions. They were assessed visually by comparing photographs taken before and at the end of treatment. RESULTS: Two patients re-pigmented completely and two showed 80% pigmentation. The number of sessions ranged from seven to 35. The study is limited by the small number of patients. CONCLUSION: Treatment with the 308-nm excimer laser may be an effective treatment of halo nevi located on the face.
Adolescent;Adult;Facial Neoplasms;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Nevus, Pigmented;Patient Satisfaction;Pilot Projects;Treatment Outcome

Efficacy of He-Ne Laser in the prevention and treatment of radiotherapy-induced oral mucositis in oral cancer patients. OBJECTIVE: The objective of this study was to evaluate the efficacy of low-level lasers for the prevention and treatment of radiotherapy-induced oral mucositis in oral cancer patients. MATERIAL AND METHODS: Twenty-four hospitalized patients with oral cancer, scheduled to undergo radiotherapy at KMC, Manipal, were enrolled in the present study and assigned to laser (Group I)/control group (Group II). They were treated using He-Ne laser (lambda = 632.8nm, output = 10 mW and energy density = 1.8 J/cm(2)). Patients were subjected to treatment using laser scanner for 8 days and subsequently were treated using laser probe at 6 anatomic sites in the oral cavity for 5 minutes each. The patients were evaluated on each day of treatment for pain severity (NRS), functional impairment (FIS), and oral mucositis (RTOG) and were followed until the end of cancer

treatment. Statistical analysis was done using SPSS version 10. RESULTS: Laser therapy applied prophylactically during radiotherapy can reduce the severity of oral mucositis, severity of pain, and functional impairment. Cranial Irradiation;Eating;Female;Humans;Jaw Neoplasms;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Mouth Neoplasms;Mucositis;Pain;Prospective Studies;Stomatitis

Experimental study on low pulse energy processing with femtosecond lasers for glaucoma treatment. The feasibility of low energy processing in ocular tissues with femtosecond laser sources was investigated in this research. One laser source was a femtosecond amplifier, and the other was a femtosecond oscillator. The amplifier used in this experiment was a CPA-2001 (Clark-MXR, Inc), with 150 fs pulse duration and 1 kHz repetition rate. The femtosecond oscillator (model 900-B Mira) produced a 200 fs pulse duration and a 76 MHz repetition rate. Both these two laser systems operated at 800 nm wavelengths. Firstly, the pulse intensity thresholds in water produced by the two laser sources were compared. The optical breakdown probability analysis shows that the pulse energy threshold achieved by the oscillator was less than 10% of that achieved by the amplifier. Then, the non-linear propagation of the femtosecond pulses in the ocular tissues was studied with the femtosecond oscillator. The results showed a potential for pulse energy processing at the nanojoule level with a femtosecond oscillator in glaucoma treatment. Amplifiers, Electronic;Cornea;Glaucoma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Scattering, Radiation;Signal Processing, Computer-Assisted

Low-level (gallium-aluminum-arsenide) laser irradiation of Par-C10 cells and acinar cells of rat parotid gland. We investigated cell response, including cell proliferation and expression of heat stress protein and bcl-2, to clarify the influence of low-level [gallium-aluminum-arsenide (Ga-Al-As) diode] laser irradiation on Par-C10 cells derived from the acinar cells of rat parotid glands. Furthermore, we also investigated amylase release and cell death from irradiation in acinar cells from rat parotid glands. The number of Par-C10 cells in the laser-irradiated groups was higher than that in the non-irradiated group at days 5 and 7, and the difference was statistically significant ($P < 0.01$). Greater expression of heat shock protein (HSP)25 and bcl-2 was seen on days 1 and 3 in the irradiated group. Assay of the released amylase showed no significant difference statistically between the irradiated group and the non-irradiated group. Trypan blue exclusion assay revealed that there was no difference in the ratio of dead to live cells between the irradiated and the non-irradiated groups. These results suggest that low-level laser irradiation promotes cell proliferation and expression of anti-apoptosis proteins in Par-C10 cells, but it does not significantly affect amylase secretion and does not induce rapid cell death in isolated acinar cells from rat parotid glands. Apoptosis Regulatory Proteins;Heat-Shock Proteins;Amylases Amylases;Animals;Apoptosis Regulatory Proteins;Cell Death;Cell Proliferation;Heat-Shock Proteins;Lasers, Semiconductor;Low-Level Light Therapy;Male;Parotid Gland;Rats;Rats, Sprague-Dawley

[Fractional photothermolysis: a new option for treating melasma?]. Melasma or chloasma is a common acquired hypermelanosis of the face and neck that is notoriously difficult to treat. Laser treatment has been employed in patients who do not respond to conventional topical agents but has failed to achieve an acceptable compromise between efficacy and side effects. Fractional photothermolysis (FP) combines the efficacy of ablative and the tolerability of non-ablative laser treatment in some skin conditions. There are few studies on using FP in melasma and its value cannot be estimated presently. Review of the literature and the authors' own experience show a definite potential which should be further investigated in systematic studies, but we cannot at this point subscribe to the euphoria expressed in some publications. Dose Fractionation, Radiation;Facial Dermatoses;Humans;Low-Level Light Therapy;Melanosis

[Photoepilation: state-of-the-art]. The field of dermatological laser medicine consists of four main areas: therapy for blood vessels, therapy for pigmented lesions, ablation of tissue, and photoepilation. The first tests were carried out in 1993, and since 1996 there has been a growing demand for "permanent hair removal." This strong demand and the rapid development of devices call for extensive knowledge in terms of current technical innovation or affirmation of proven procedures. This article gives a general survey of the different systems that can be used for "permanent hair removal" [ruby laser, alexandrite laser, diode, Nd:YAG laser, so-called intense pulsed light (IPL) systems, and combined radio frequency/IPL systems], including their inherent advantages and disadvantages. Physical and biological aspects necessary for photoepilation are pointed out. Furthermore, we emphasize new methods concerning removal of depigmented and therapy-resistant hair, as well as the treatment of female patients with polycystic ovary syndrome. Female;Forecasting;Hair Removal;Humans;Low-Level Light Therapy;Polycystic Ovary Syndrome

Primary myogenic cells see the light: improved survival of transplanted myogenic cells following low energy laser irradiation. BACKGROUND AND OBJECTIVES: There is a substantial need for finding new avenues to promote muscle recovery when acute skeletal muscle loss extends beyond the natural capacity of the muscle to recover. Maintenance and regeneration of skeletal muscles depend mainly on resident stem cells known as satellite cells. Nevertheless, there are situations in which a significant loss of muscle tissue exhausts the satellite cell pool. For such cases, cell therapy and tissue engineering are becoming promising alternatives. Thus far, attempts to supplement damaged host muscles with donor satellite cells by means of myoblast transplantation therapy were mostly unsuccessful due to massive and rapid loss of donor cells within few hours after transplantation. This study aims at following the effects of low-energy-laser irradiation on the fate of implanted myoblasts. STUDY DESIGN: Primary myogenic cells, harvested from male rat skeletal muscles, were irradiated with low energy laser, seeded on a biodegradable scaffold and expanded in vitro. The scaffold containing cells was transplanted into partially excised muscles of host female rats. Donor cells were identified in the host muscle tissue, using Y-chromosome in situ hybridization. RESULTS: In this study, we show that laser irradiated donor primary myogenic cells not only survive, but also fuse with host myoblasts to form a host-donor syncytium. CONCLUSIONS: Our data show that the use of low energy laser irradiation (LELI), a non-surgical tool, is a promising means to enhance both the survival and functionality of transplanted primary myogenic cells. Culture Media, Serum-Free Animals;Cell Cycle;Cell Differentiation;Cell Division;Cell Fusion;Cell Survival;Cell Transplantation;Cells, Cultured;Culture Media, Serum-Free;In Situ Hybridization;Low-Level Light Therapy;Microscopy, Electron, Scanning;Muscle, Skeletal;Rats;Regeneration

Low-energy laser irradiation increases endothelial cell proliferation, migration, and eNOS gene expression possibly via PI3K signal pathway. BACKGROUND AND OBJECTIVES: The purpose of this study, therefore, was to determine the mechanisms by which low-energy laser irradiation (LELI) may exert some of its angiogenic effects via the PI3 kinase/eNOS signaling pathway and induce endothelial cell migration and neovascularization, an important and necessary part of wound healing. STUDY DESIGN/MATERIALS AND METHODS: The possible molecular mechanism of helium-neon (He-Ne) laser irradiation on endothelial cells was proposed. He-Ne laser at 632.5 nm was used to stimulate human umbilical vein endothelial cell (HUVEC), and its effect on cell proliferation, nitric oxide secretion, and cell migration was determined. RESULTS: Irradiation enhanced endothelial nitric oxidase synthase (eNOS) protein expression, and irradiation of less than 0.26 J/cm(2) enhanced eNOS gene expression in HUVEC. The cell migration ability was promoted for HUVEC irradiated with 0.26 J/cm(2). This agreed with the vinculin protein expression induced by irradiation. In addition, the angiogenesis was promoted. The induced eNOS expression was inhibited by LY294002, indicating that the effect of laser on EC could be attributed to the up-regulation of eNOS expression through PI3K pathway at the

cellular and molecular levels as a result of the He-Ne laser. CONCLUSIONS: The study has shown that LELI increased endothelial cell proliferation, migration, NO secretion, and identified that activation of PI3K/Akt pathway was a critical step for the elevated for eNOS expression upon LELI. NOS3 protein, human;Nitric Oxide Synthase Type III;Phosphatidylinositol 3-Kinases Analysis of Variance;Blotting, Western;Cell Movement;Cell Proliferation;Cells, Cultured;Humans;Low-Level Light Therapy;Microscopy, Fluorescence;Nitric Oxide Synthase Type III;Phosphatidylinositol 3-Kinases;Reverse Transcriptase Polymerase Chain Reaction;Signal Transduction;Umbilical Veins;Wound Healing

[Treating papillomatous intradermal nevi: lasers - yes or no? A prospective study]. BACKGROUND: Papillomatous intradermal nevi are common acquired melanocytic nevi. Although harmless, they can be - especially on the face - cosmetically disturbing. At selected sites on the trunk, they may be traumatized by clothing, so that patients often wish to have them removed with a low likelihood of recurrence. MATERIAL AND METHODS: In a prospective study with 90 (female symbol=77, male symbol=13) patients aged between 13 and 67 years, 130 intradermal nevi (female symbol=114, male symbol=16) were removed using a combined therapy with CO(2), erbium: YAG and ruby lasers. RESULTS: After therapy, 2.3% of intradermal nevi recurred as a pigmented macule, while 6.9% reappeared as a papule or nodule (volume recurrence). 88% of the patients were very satisfied with the result; 11%, satisfied; and 1%, not satisfied. 99% would undergo the therapy again. CONCLUSION: The combined laser method (CO(2), erbium: YAG and ruby lasers) for the treatment of intradermal nevi produces excellent cosmetic results, is easily performed, leads to high patient satisfaction and is safe if correctly applied. Adolescent;Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Nevus, Pigmented;Papilloma;Skin Neoplasms;Treatment Outcome

[Laser and flashlamp systems]. Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases

The short-term efficacy of laser, brace, and ultrasound treatment in lateral epicondylitis: a prospective, randomized, controlled trial. The aims of this study were to evaluate the effects of low-level laser therapy (LLLT) and to compare these with the effects of brace or ultrasound (US) treatment in tennis elbow. The study design used was a prospective and randomized, controlled, single-blind trial. Fifty-eight outpatients with lateral epicondylitis (9 men, 49 women) were included in the trial. The patients were divided into three groups: 1) brace group-brace plus exercise, 2) ultrasound group-US plus exercise, and 3) laser group-LLLT plus exercise. Patients in the brace group used a lateral counterforce brace for three weeks, US plus hot pack in the ultrasound group, and laser plus hot pack in the LLLT group. In addition, all patients were given progressive stretching and strengthening exercise programs. Grip strength and pain severity were evaluated with visual analog scale (VAS) at baseline, at the second week of treatment, and at the sixth week of treatment. VAS improved significantly in all groups after the treatment and in the ultrasound and laser groups at the sixth week ($p<0.05$). Grip strength of the affected hand increased only in the laser group after treatment, but was not changed at the sixth week. There were no significant differences between the groups on VAS and grip strength at baseline and at follow-up assessments. The results show that, in patients with lateral epicondylitis, a brace has a shorter beneficial effect than US and laser therapy in reducing pain, and that laser therapy is more effective than the brace and US treatment in improving grip strength. Adult;Aged;Braces;Female;Follow-Up Studies;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Single-Blind Method;Tennis Elbow;Time Factors;Treatment Outcome;Ultrasonic Therapy

[Laser treatment of warts]. Human papilloma viruses (HPV) lead to common warts in 5% of the population and genital warts in 1% of sexually-active individuals. Although about 50% of HPV

infections regress spontaneously, the course is uncertain. Expectant waiting often leads to progression and dissemination. Plantar warts may cause pain on walking, while palmar and genital warts may impair social contacts. There are many treatments for warts, including a variety of laser systems. The CO(2) laser is the best ablative approach, producing cure rates of up to 75% for therapy-resistant common warts in cohort and case-control studies. Side effects such as bleeding, pain and reduced function over weeks must be weighed against the likelihood of success. Considering non-ablative approaches, pulsed dye lasers can be used for a selective, non-bloody destruction of extragenital and genital warts and may become the treatment of choice. In prospective randomized studies, they produced cure rates of up to 82% for therapy-resistant warts with few side effects. Hemorrhage;Humans;Low-Level Light Therapy;Pain;Risk Assessment;Warts

[Side effects of therapy with flashlamps and lasers]. Dermatologic flashlamp and laser therapy involves photochemical, thermal, photoablative, photoacoustic and phtoodisruptive effects, depending on the wave length, energy density and pulse duration. All of these effects when properly employed can lead to optimal dermatologic and cosmetic results. They also carry a high risk for side effects and damage when not properly used. The risk of side effects depends greatly on the training and experience of the treating physician. Both a solid dermatologic training in order to correctly diagnosis skin changes and knowledge of laser principles are required. Burns;Humans;Low-Level Light Therapy;Radiodermatitis

A pilot study showing pulsed-dye laser treatment improves localized areas of chronic atopic dermatitis. BACKGROUND: Eczematous skin changes overlying port-wine stains have been reported to improve with pulsed-dye laser (PDL) treatment. However, PDL has not as yet been evaluated for the treatment of atopic dermatitis (AD; eczema). AIM: To evaluate in a controlled trial the effects and safety of PDL treatment in children with AD who had chronic localized lesions. METHODS: Twelve children with localized, chronic eczema were treated with PDL (595 nm), with untreated areas used as an intrapatient control. Treatment was given at baseline and patients were followed up at 2 and 6 weeks. Clinical outcome measures were localized Eczema Severity Score (ESS), a visual analogue scale (VAS) indicating eczema severity assessed by photographs, and adverse events. RESULTS: After 2 and 6 weeks, a significant decrease in ESS was seen for the PDL-treated areas compared with the control areas (mean +/- SEM reduction in ESS 7.0 +/- 1.0 vs. 3.3 +/- 0.8 at 2 weeks, P = 0.003, and 7.8 +/- 1.4 vs. 4.9 +/- 1.3 at 6 weeks, P = 0.002). A significant difference in eczema severity assessed by VAS at 6 weeks was seen in favour of PDL (mean +/- SEM improvement 78% +/- 20% vs. 52% +/- 10%, P = 0.003). Treatment was well-tolerated. CONCLUSIONS: In this pilot study, PDL treatment was effective in treating small areas of chronic localized eczema. This may suggest that in AD dermal vasculature plays an important role or that PDL may have an effect on cutaneous immunological activation. Emollients Adolescent;Child;Child, Preschool;Dermatitis, Atopic;Dose-Response Relationship, Radiation;Emollients;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Pilot Projects;Port-Wine Stain;Severity of Illness Index;Treatment Outcome

Light therapy and advanced wound care for a neuropathic plantar ulcer on a Charcot foot. Light therapy is a relatively novel modality in wound care. I used a light-emitting diode (LED) and superluminous diode (SLD) to deliver low-intensity laser light as an adjunctive treatment to a patient with a chronic diabetic foot ulcer. Standard treatment of conservative sharp debridement, off-loading, bioburden management, and advanced dressings was delivered in a WOC clinic setting. This combination of therapies resulted in closure of the neuropathic plantar ulcer within 8 weeks. Carboxymethylcellulose Sodium Aged;Arthropathy, Neurogenic;Bandages;Carboxymethylcellulose Sodium;Chronic Disease;Combined Modality Therapy;Debridement;Diabetes Mellitus, Type 2;Diabetic Foot;Female;Humans;Lasers,

Semiconductor;Low-Level Light Therapy;Nursing Assessment;Orthotic Devices;Patient Care Planning;Shoes;Skin Care;Treatment Outcome;Wound Healing

Rehabilitation in the first 48 hours after surgery. Physical therapy is commonly used postoperatively in humans to decrease pain, inflammation and recovery time. The same goals can be achieved in our veterinary patients using similar modalities such as; cryotherapy, passive range of motion, massage, transcutaneous electrical stimulation and low-level light laser therapy. When used in the first 48 hours following surgery, the reduction in pain, increased mobility, and decreased inflammation will aid in early return to normal function. Applied appropriately these treatments have both immediate and long term benefits.
Animals;Cryotherapy;Dogs;Inflammation;Massage;Pain, Postoperative;Postoperative Care;Postoperative Period;Range of Motion, Articular

Select modalities. Physical rehabilitation modalities such as therapeutic ultrasound (TU), transcutaneous electrical neuromuscular stimulation (TENS), neuromuscular electrical stimulation (NMES), cold or low-level laser therapy (LLLT), and pulsed magnetic field therapy (PMF) can all, when used properly, assist in treating orthopedic injuries, neurological conditions, and chronic conditions brought about by normal aging in our small animal companions. TU uses sound waves to produce both thermal and nonthermal effects that aid in tissue healing, repair, and function. TENS uses different frequencies of electrical current to decrease pain and inflammation. NMES also uses an electrical current to stimulate muscle contraction to assist in normal neuromuscular function in postorthopedic and neurological injuries. LLLT uses light energy to reduce pain, decrease inflammation, and stimulate healing at a cellular level. PMF uses magnetic field to stimulate normal cellular ion exchange and oxygen utilization and promote generalized healing of tissues. These modalities are discussed in detail covering mechanism of action, parameters, settings, and indications/contraindications of use in our small animals. Although these modalities are important in the physical rehabilitation of small animals, they need to be incorporated with a proper diagnosis, manual therapy, and home exercise program into a specific and individualized patient treatment protocol. Animals;Dog Diseases;Dogs;Electric Stimulation Therapy;Electromagnetic Fields;Laser Therapy;Physical Therapy Modalities;Transcutaneous Electric Nerve Stimulation;Treatment Outcome;Ultrasonography;Veterinary Medicine

Scar sarcoidosis in a child: case report of successful treatment with the pulsed dye laser.
Cheek;Child;Cicatrix;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Sarcoidosis

Low level laser therapy modulates kinin receptors mRNA expression in the subplantar muscle of rat paw subjected to carrageenan-induced inflammation. Low level laser therapy (LLLT) has been used clinically in order to treat inflammatory processes. In this work, we evaluated if LLLT alters kinin receptors mRNA expression in the carrageenan-induced rat paw edema. Experimental groups were designed as followed: A1 (Control-saline), A2 (Carrageenan-only), A3 (Carrageenan+laser 660 nm) and A4 (Carrageenan+laser 684 nm). Edema was measured by a plethysmometer. Subplantar tissue was collected for kinin receptors mRNA quantification by Real time-PCR. LLLT of both 660 and 684 nm wavelengths administrated 1 h after carrageenan injection was able to promote the reduction of edema produced by carrageenan. In the A2 group, B1 receptor expression presented a significantly increase when compared to control group. Kinin B1 receptor mRNA expression significantly decreased after LLLT's 660 or 684 nm wavelength. Kinin B2 receptor mRNA expression also diminished after both laser irradiations. Our results suggest that expression of both kinin receptors is modulated by LLLT, possibly contributing to its anti-inflammatory effect. RNA, Messenger;Receptor, Bradykinin B1;Receptor, Bradykinin B2;Carrageenan
Animals;Carrageenan;Edema;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Receptor, Bradykinin B1;Receptor, Bradykinin B2

Lymphangioma circumscriptum: pitfalls and problems in definitive management. Abdominal Wall;Adolescent;Diagnosis, Differential;Follow-Up Studies;Humans;Low-Level Light Therapy;Lymphangioma;Male;Neoplasm Recurrence, Local;Plastic Surgery Procedures;Skin Neoplasms

A pulsed dye laser with a 10-mm beam diameter and a pigmented lesion window for purpura-free photorejuvenation. BACKGROUND AND OBJECTIVES: In traditional pulsed dye lasers (PDLs), power limitations and pulse characteristics have compromised purpura-free procedures. This study evaluated a new PDL with a modified pulse structure and a 10-mm beam diameter for purpura-free photorejuvenation. A compression handpiece was used for targeting lentigines. MATERIALS AND METHODS: Twenty patients with skin types I to III were treated three times at 3- to 4-week intervals. The first pass was delivered through a 10-mm compression handpiece to target pigment dyschromias using fluences between 6.5 and 8.0 J/cm(2) with a 1.5-ms pulse duration. A second pass was then performed with a 10-mm spot with fluences between 9.5 and 10 J/cm(2), a 20-ms pulse duration, and cryogen spray enabled. Improvement was evaluated by comparing pre- and posttreatment photographs and live subjects 1 month after the third treatment. RESULTS: In the majority of patients, >90% reduction of fine telangiectasias (<0.6 mm) and dark lentigines was achieved. Pigmented dyschromias improved proportional to the degree of pigment at presentation. Avoidance of purpura with the compression handpiece was dependent on obtaining proper compression before laser emission. Mean textural improvement was 34%. CONCLUSIONS: The new 595-nm PDL is highly effective for two-pass purpura-free improvement of telangiectases, pigment dyschromias, and texture. Female;Humans;Lasers, Dye;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Rejuvenation;Skin Aging;Telangiectasis

Effects of continuous-wave (670-nm) red light on wound healing. BACKGROUND: Recent work suggests that injuries can heal faster if treated by lasers emitting 670-nm red light. LED lights emitting 670-nm light are now available. This suggests that inexpensive and easy-to-use 670-nm LED lights might help accelerate cutaneous wound healing. OBJECTIVE: The objective was to evaluate the effect of 670-nm LED light on wound healing in SKH-1 hairless mice. METHODS: To study 670-nm light effects on incisional injury, animals were left unexposed or exposed to equal doses of high-, medium-, or low-flux light. Burn injuries were treated with high-flux light or left unexposed. Healing was assessed by measurement of the burn area and the gap remaining to closure of incisional injury. RESULTS: Mice exposed to 670-nm red light showed significantly faster healing than control mice. High, medium, and low fluxes of light were all effective after incisional injury. In burn injury, there was improvement in wound healing initially, but the time to repair was unchanged. CONCLUSIONS: A 670-nm LED red light source accelerates healing in skin of SKH-1 hairless mice after incisional injuries, but is not as effective for burn injuries. These data that suggest red light exposure may be helpful in postoperative wound repair. Animals;Burns;Disease Models, Animal;Light;Low-Level Light Therapy;Mice;Mice, Hairless;Skin;Wound Healing;Wounds, Penetrating

Pressure ulcers. INTRODUCTION: Unrelieved pressure or friction of the skin, particularly over bony prominences, can lead to pressure ulcers in up to a third of people in hospitals or community care, and a fifth of nursing home residents. Pressure ulcers are more likely in people with reduced mobility and poor skin condition, such as older people or those with vascular disease. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of preventive interventions in people at risk of developing pressure ulcers? What are the effects of treatments in people with pressure ulcers? We searched: Medline, Embase, The Cochrane Library and other important databases up to February 2007 (Clinical Evidence reviews are updated periodically, please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA)

and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 60 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review we present information relating to the effectiveness and safety of the following interventions: air-filled vinyl boots, air-fluidised supports, alternating pressure surfaces (including mattresses), alternative foam mattresses, constant low-pressure supports, debridement, electric profiling beds, electrotherapy, hydrocellular heel supports, low-air-loss beds (including hydrotherapy beds), low-level laser therapy, low-tech constant low-pressure supports, medical sheepskin overlays, nutritional supplements, orthopaedic wool padding, pressure-relieving overlays on operating tables, pressure-relieving surfaces, repositioning (regular "turning"), seat cushions, standard beds, standard care, standard foam mattresses, standard tables, surgery, therapeutic ultrasound, topical lotions and dressings, topical negative pressure, and topical phenytoin. Phenytoin Animals;Bandages;Beds;Humans;Low-Level Light Therapy;Negative-Pressure Wound Therapy;Phenytoin;Pressure Ulcer

[Effectiveness of laser puncture in elderly patients with bronchial asthma accompanied by chronic rhinosinusitis]. We apply laser puncture to influence biological active points with infra red laser ionizing at scheme with effect of treatment of asthma bronchial with chronic accompanied by rhino sinusitis. The clinical effectiveness of treatment was seen in positive dynamics of clinical, instrumental and spirographycal indices regarding bronchial asthma and concomitant rhinitis as well, which was confirmed by X-ray examination. Application of laser punctureto treat the elderly patients with asthma bronchial accompanied by rhino sinusitis is an effective method having no side effects that can be used in an ambulatory and in a hospital. Aged;Asthma;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Rhinitis;Sinusitis;Treatment Outcome

Mechanistic study of apoptosis induced by high-fluence low-power laser irradiation using fluorescence imaging techniques. Low-power laser irradiation (LPLI) can cause cell proliferation, differentiation, or death; however, the cellular mechanisms of these effects of LPLI, at high or low fluences, are not well known. To investigate the mechanism of high-fluence LPLI-induced apoptosis, both human lung adenocarcinoma cells (ASTC-a-1) and African green monkey SV40-transformed kidney fibroblast cells (COS-7) were irradiated with a He-Ne laser for 10 min under a fluence of 120 J/cm(2) and 80 J/cm(2), respectively. The dynamics of reactive oxygen species (ROS) generation was determined by measuring changes in fluorescence resulting from oxidation of intracellular dichlorodihydrofluorescein diacetate (H(2)DCFDA) to (DCF). The changes of mitochondrial membrane potential, DeltaPsim, were studied by measuring the reduction of cellular fluorescence of Rhodamine 123 dyes using confocal laser scanning microscopy. The activation of caspase-3 in cells transfected by [SCAT3] reporters was observed using fluorescence resonance energy transfer (FRET) imaging. The activity of caspase-8 during high-fluence LPLI-induced apoptosis was studied by monitoring the cellular distribution of [Bid-CFP] reporters using fluorescence imaging. The following temporal sequence of cellular events was observed during apoptosis induced by high-fluence LPLI (120 J/cm(2), ASTC-a-1 cells): (1) immediate generation of mitochondrial ROS following laser irradiation, reaching a maximum level 60 min after irradiation; (2) onset of DeltaPsim decrease 15 min after laser irradiation, reaching a minimum level 50 min after irradiation; and (3) activation of caspase-3 between 30 min and 180 min after laser irradiation. Our results also show that the high-fluence LPLI does not activate caspase-8, indicating that the induced apoptosis was initiated directly from mitochondrial ROS generation and DeltaPsim decrease, independent of the caspase-8 activation. Fluorescent Dyes;Reactive Oxygen Species;Caspase 3;Caspase 8 Animals;Apoptosis;COS Cells;Caspase 3;Caspase 8;Cell Line, Tumor;Chlorocebus aethiops;Fluorescence Resonance Energy

Transfer;Fluorescent Dyes;Humans;Lasers;Membrane Potential, Mitochondrial;Reactive Oxygen Species

[Comprehensive treatment in Achilles tendon rupture]. Due to incapacity caused by calcaneal tendon injuries for the reintegration of patients back to their daily activities and/or sparts it is necessary to decrease the time of reinstatement of patients. At present these times have improved by a good surgical technique and an early rehabilitation, and the patient is returned quickly as he sees less disability. It is proposed in this paper a type of surgical treatment and an early rehabilitation program, which have shortened the time of disability and incorporation to their daily activities and sports to eight weeks in 10 patients with Achilles tendon plasty. Achilles Tendon;Adult;Athletic Injuries;Combined Modality Therapy;Electric Stimulation Therapy;Humans;Isometric Contraction;Isotonic Contraction;Low-Level Light Therapy;Male;Middle Aged;Physical Therapy Modalities;Prospective Studies;Plastic Surgery Procedures;Recovery of Function;Rupture;Soccer;Suture Techniques;Time Factors

Letter to the editor: inadequate statistical analysis hides significant effect of low level laser therapy in carpel tunnel syndrome. Carpal Tunnel Syndrome;Humans;Low-Level Light Therapy;Statistics as Topic;Treatment Outcome;Ultrasonography

Effect of low-level laser therapy on skin fibroblasts of streptozotocin-diabetic rats. OBJECTIVE: This study explored the effects of low-level laser therapy (LLLT) on cellular changes in cell culture and organ culture of skin from streptozotocin-diabetic (STZ-D) rats. BACKGROUND DATA: Growth of skin and its fibroblasts are impaired in diabetes. Therefore the healing of skin wounds is impaired in diabetic patients. The positive effects of LLLT on complications of diabetes in patients and animal models have been shown. METHODS: Diabetes was induced in rats by streptozotocin 30 days after its injection. Two sets of skin samples were extracted from skin under sterile conditions. Fibroblasts that were extruded from the samples were proliferated in vitro, and another set of samples were cultured as organ culture. A 24-well culture medium containing Dulbecco's modified minimum essential medium was supplemented by 12% fetal bovine serum. There were five laser-treated and five sham-exposed groups. A helium-neon laser was used, and 0.9-4 J/cm(2) energy densities were applied four times to each organ culture and cell culture. The organ cultures were analyzed by light microscopy and transmission electron microscopy examinations. Cell proliferation was evaluated by dimethylthiazol-diphenyltetrazolium bromide (MTT) assay. RESULTS: Statistical analysis revealed that 4-J/cm(2) irradiation significantly increases the fibroblast numbers compared to the sham-exposed cultures (p = 0.046). CONCLUSION: It is concluded that LLLT resulted in a significant increase of fibroblast proliferation of STZ-D rats in vitro. Tramadol Animals;Cell Proliferation;Diabetes Complications;Diabetes Mellitus, Experimental;Fibroblasts;Low-Level Light Therapy;Male;Organ Culture Techniques;Rats;Tramadol;Wound Healing

Surface morphology of sound deciduous tooth enamel after application of a photo-absorbing cream and infrared low-level laser irradiation: an in vitro scanning electron microscopy study. OBJECTIVES: The purpose of this descriptive scanning electron microscopic study was to characterize surface alterations in deciduous tooth enamel after in vitro infrared diode laser irradiation, using a photo-absorbing agent alone and also combined with fluoride, before and after laser irradiation. BACKGROUND DATA: Previous investigations have demonstrated increased enamel caries resistance after laser irradiation. METHODS: Seven extracted or exfoliated primary molar teeth underwent soft tissue dÃ©bridement and fluoride-free prophylaxis. Buccal surfaces were determined to be caries free by macroscopic examination. Sample groups were divided into: (1) control (no treatment); (2) infrared diode laser irradiation (lambda = 810 nm, 68 nm, 60 mW/mm(2), 30 W) using the photo-absorbing agent alone (IRDL + PA; 500 J/cm(2)); and (3) infrared diode laser irradiation using a photo-absorbing agent combined with 2% fluoride (IRDL + PFA; 500 J/cm(2)). Buccal surfaces were evaluated

following standard scanning electron microscopy preparation techniques. Control samples of enamel surfaces were relatively smooth but presented occasional enamel prism ends. There were no areas with cavitations or surface defects. RESULTS: After the IRDL + PA treatment, irradiated surfaces became rough and mildly to moderately irregular with scarce enamel cavitations and without exposure of enamel prism ends. The surfaces had adherent granules and only occasional fine cracks and porosities in surface coatings were noted. After the IRDL + PFA treatment, there was a homogenous confluent surface that masked typical enamel surface markings. The surfaces had well-defined globules resulting from the IRDL + PFA treatment, that were not seen after IRDL + PA treatment. CONCLUSIONS: Treatment of deciduous tooth enamel with infrared diode laser irradiation using a photo-absorbing agent and a photo-absorbing agent combined with 2% fluoride created surface coatings that may act as reservoirs for mineral phases during cariogenic activity on enamel, and also provide a certain degree of protection against cariogenic challenge. Cariostatic Agents;Coloring Agents;Fluorides, Topical;Indocyanine Green Absorption;Cariostatic Agents;Coloring Agents;Dental Enamel;Fluorides, Topical;Humans;Indocyanine Green;Low-Level Light Therapy;Microscopy, Electron, Scanning;Tooth, Deciduous

Effect of lower-level laser therapy on rabbit tibial fracture. OBJECTIVE: The purpose of the study was to demonstrate the biological effects of low-level laser therapy (LLLT) on tibial fractures using radiographic, histological, and bone density examinations. METHODS: Fourteen New Zealand white rabbits with surgically induced mid-tibial osteotomies were included in the study. Seven were assigned to a group receiving LLLT (LLLT-A) and the remaining seven served as a sham-treated control group (LLLT-C). A low-energy laser apparatus with a wavelength of 830 nm, and a sham laser (a similar design without laser diodes) were used for the study. Continuous outflow irradiation with a total energy density of 40 J/cm(2) and a power level of 200 mW/cm(2) was directly delivered to the skin for 50 seconds at four points along the tibial fracture site. Treatment commenced immediately postsurgery and continued once daily for 4 weeks. RESULTS: Radiographic findings revealed no statistically significant fracture callus thickness difference between the LLLT-A and LLLT-C groups ($p > 0.05$). However, the fractures in the LLLT-A group showed less callus thickness than those in LLLT-C group 3 weeks after treatment. The average tibial volume was 14.5 mL in the LLLT-A group, and 11.25 mL in the LLLT-C group. The average contralateral normal tibial volume was 7.1 mL. Microscopic changes at 4 weeks revealed an average grade of 5.5 and 5.0 for the LLLT-A group and the LLLT-C group, respectively. The bone mineral density (BMD) as ascertained using a grey scale (graded from 0 to 256) showed darker coloration in the LLLT-A group (138) than in the LLLT-C group (125). CONCLUSION: The study suggests that LLLT may accelerate the process of fracture repair or cause increases in callus volume and BMD, especially in the early stages of absorbing the hematoma and bone remodeling. Further study is necessary to quantify these findings. Animals;Bone Density;Fracture Healing;Low-Level Light Therapy;Rabbits;Tibial Fractures

Effectiveness of helium-neon laser irradiation on viability and cytotoxicity of diabetic-wounded fibroblast cells. OBJECTIVE: This study investigated the effectiveness of helium-neon (He-Ne) laser irradiation at increasing intervals on diabetic-induced wounded human skin fibroblast cells (WS1) at a morphological, cellular, and molecular level. BACKGROUND DATA: The controversies over light therapy can be explained by the differing exposure regimens and models used. No therapeutic window for dosimetry and mechanism of action has been determined at the level of individual cell types, particularly in diabetic cells in vitro. METHODS: WS1 cells were used to simulate an in vitro wounded diabetic model. The effect of the frequency of He-Ne irradiation (632.8 nm) at a fluence of 5 J/cm(2) was determined by analysis of cell morphology, viability, cytotoxicity, and DNA damage. Cells were irradiated using three different protocols: they were irradiated at 30 min only; irradiated twice, at 30 min and at 24 h; or irradiated twice, at 30 min and at 72 h post-wound induction.

RESULTS: A single exposure to 5 J/cm(2) 30 min post-wound induction increased cellular damage. Irradiation of cells at 30 min and at 24 h post-wound induction decreased cellular viability, cytotoxicity, and DNA damage. However, complete wound closure as well as an increase in viability and a decrease in cytotoxicity and DNA damage occurs when cells were irradiated at 30 min and at 72 h post-wound induction. CONCLUSIONS: Wounded diabetic WS1 cells irradiated to 5 J/cm(2) showed increased cellular repair when irradiated with adequate time between irradiations, allowing time for cellular response mechanisms to take effect. Therefore, the irradiation interval was shown to play an important role in wound healing in vitro and should be taken into account. Helium;Neon Cell Proliferation;Cell Survival;Cells, Cultured;Chemotaxis;Comet Assay;DNA Damage;Diabetes Mellitus;Fibroblasts;Helium;Humans;Low-Level Light Therapy;Neon;Time Factors;Treatment Outcome;Wound Healing

Effect of low-level laser therapy on inflammatory reactions during wound healing: comparison with meloxicam. OBJECTIVE: This study evaluated the action of low-level laser therapy (LLLT) on the modulation of inflammatory reactions during wound healing in comparison with meloxicam. BACKGROUND DATA: LLLT has been recommended for the postoperative period because of its ability to speed healing of wounds. However, data in the literature are in disagreement about its anti-inflammatory action. METHODS: Standardized circular wounds were made on the backs of 64 Wistar rats. The animals were divided into four groups according to the selected postoperative therapy: group A-control; group B-administration of meloxicam; and groups C and D-irradiation with red (lambda = 685 nm) and infrared (lambda = 830 nm) laser energy, respectively. The animals were killed at 12, 36, and 72 h and 7 days after the procedure. RESULTS: Microscopic analysis revealed significant vascular activation of irradiated sites in the first 36 h. Only group B showed decreases in the intensity of polymorphonuclear infiltrates and edema. Group D showed a higher degree of organization and maturation of collagen fibers than the other groups at 72 h. The animals in group C showed the best healing pattern at 7 days. The anti-inflammatory action of meloxicam was confirmed by the results obtained in this research. The quantification of interleukin-1beta (IL-1beta) mRNA by real-time polymerase chain reaction (PCR) did not show any reduction in the inflammatory process in the irradiated groups when compared to the other groups. CONCLUSIONS: LLLT improves the quality of histologic repair and is useful during wound healing. However, with the methods used in this study the laser energy did not minimize tissue inflammatory reactions. Anti-Inflammatory Agents, Non-Steroidal;Interleukin-1beta;RNA, Messenger;Thiazines;Thiazoles;Collagen;Meloxicam Animals;Anti-Inflammatory Agents, Non-Steroidal;Collagen;Immunohistochemistry;Inflammation;Interleukin-1beta;Low-Level Light Therapy;Male;Meloxicam;Photomicrography;Polymerase Chain Reaction;RNA, Messenger;Rats;Rats, Wistar;Thiazines;Thiazoles;Wound Healing

[Plasma technologies in treatment of purulent wounds]. The article is devoted to using plasma flow for treatment of purulent wounds. The authors have shown an anti-inflammatory, antibacterial, stimulating effect of plasma radiation on the basis of clinical methods of control of the wound process in 143 patients (hypothermia, pain syndrome in rest, the presence of purulent discharge, edema, granulation tissue). Follow-Up Studies;Granulation Tissue;Humans;Low-Level Light Therapy;Suppuration;Treatment Outcome;Wound Healing;Wound Infection

[Complex treatment of venous trophic ulcers of the lower extremities]. Under observation there were 189 patients with trophic ulcers of the lower extremities of venous genesis (CEAP VI class). In 78 patients conservative treatment was used with the low intensity laser radiation. Complex treatment consisted of preliminary preparing the ulcers and the following correction of the venous blood flow was used in 111 patients. 82 patients were treated by traditional methods disregarding the data of ultrasonic diagnosis. Laser therapy of ulcers by our original techniques and correction of the venous

blood flow using new technologies and considering the data of duplex scanning was used in 29 patients, the best nearest and long-term results of the treatment being obtained in patients of this clinical group. Hydroxyethylrutoside;Ointments;troxevasin Adolescent;Adult;Aged;Aged, 80 and over;Bandages;Blood Flow Velocity;Female;Follow-Up Studies;Humans;Hydroxyethylrutoside;Low-Level Light Therapy;Male;Middle Aged;Ointments;Prospective Studies;Retrospective Studies;Treatment Outcome;Ultrasonography, Doppler, Duplex;Varicose Ulcer;Vascular Surgical Procedures

Cutaneous compression for the laser treatment of epidermal pigmented lesions with the 595-nm pulsed dye laser. BACKGROUND: The 595-nm pulsed dye laser has been the standard of care for many vascular lesions and has rarely been used in the treatment of epidermal pigmented lesions. OBJECTIVE: The objective was to investigate the effectiveness and safety of a compression technique for the treatment of epidermal pigmented lesion using a modified 595-nm pulsed dye laser with no epidermal cooling. METHODS: Twelve subjects (mean age 58 years) underwent treatments using a modified 595-nm dye laser with a compression handpiece and no epidermal cooling. Treatments were performed with radiant exposures of 7 to 12 J/cm(2), 7-mm spot size, and 1.5-ms pulse duration. Each subject received one to four treatments, 4 to 6 weeks apart. Follow-up evaluations were held before each treatment and 4 months after last treatment. RESULTS: Clearance of 75% to 100% was obtained in 43, 59, 76, and 79% of the lesions treated after one, two, three, and four treatments respectively. The fourth treatment was evaluated 4 months posttreatment. Side effects included immediate erythema and edema and rare cases of transient hyperpigmentation and atrophy. No purpura and long-lasting side effects were observed. CONCLUSION: The compression technique with a modified 595-nm pulsed dye laser system is effective and safe for the treatment of epidermal pigmented lesions. Adult;Aged;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Treatment Outcome

Nonablative fractional resurfacing in the male patient. Skin resurfacing can be divided into nonablative, nonablative fractional, ablative fractional, and traditional ablative categories. Nonablative technologies have yielded inconsistent and unimpressive results, whereas ablative technologies, although generally clinically effective, are losing momentum as a result of prolonged recovery times, risks for hypopigmentation, limitation in lighter skin types, and the production of unnatural sheen and texture to the skin. Fractional resurfacing can produce the safety of nonablative technologies and the efficacy of traditional ablative resurfacing. Nonablative fractional resurfacing is the most widely studied of fractional technologies allowing for nonablative tissue coagulation, creation of microthermal zones, and resurfacing with extrusion and replacement of damaged tissue with rapid re-epithelialization. This article will review nonablative fractional resurfacing with 1550-nm laser in the male patient. Esthetics;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Rejuvenation;Risk Assessment;Skin Aging;Treatment Outcome

Nonablative laser rejuvenation in men. As our culture increasingly emphasizes youth and virility in the workplace, men have become interested in enhancing their appearance. Once confined to a small number of "progressive" urban patients, the ever-enlarging buffet of minimally invasive procedures has broadened the appeal for laser rejuvenation. Although most procedures are gender neutral, there are sex-specific characteristics that should be considered in designing logical laser strategies for men. In this review, the major categories of rejuvenation are examined in a modality- and application-specific manner. When possible, settings are discussed for particular devices. The reader should be aware, however, that "go-by" recipes, although enticing for the novice, should only be applied within the context of identifiable tissue endpoints and with properly functioning equipment. The best settings are those that achieve desired results for a specific device, and ultimately, experience is the best guide for optimal parameter selection. Cosmetic

Techniques;Esthetics;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Rejuvenation;Risk Factors;Skin Aging;Treatment Outcome

The physical therapy prescription. Numerous guidelines recommend physical therapy for the management of musculoskeletal conditions. However, specific recommendations are lacking concerning which exercises and adjunct modalities to use. Physical therapists use various techniques to reduce pain and improve mobility and flexibility. There is some evidence that specific exercises performed with the instruction of physical therapists improve outcomes in patients with low back pain. For most modalities, evidence of effectiveness is variable and controlled trials are lacking. Multiple modalities may be used to treat one clinical condition; decisions for the treatment of an individual patient depend on the expertise of the therapist, the equipment available, and the desire of the attending physician. A physical therapy prescription should include the diagnosis; type, frequency, and duration of the prescribed therapy; goals of therapy; and safety precautions. Electric Stimulation Therapy;Exercise Therapy;Humans;Iontophoresis;Low-Level Light Therapy;Medical Records;Phonophoresis;Physical Therapy Modalities;Ultrasonic Therapy

Low-level laser therapy in oral and maxillofacial surgery.

Low intensity laser therapy is comparable to bromocriptine-evening primrose oil for the treatment of cyclical mastalgia in Egyptian females. One of the successful treatments for cyclical mastalgia is bromocriptine evening primrose combination. A double blind study was applied on 80 patients with cyclical mastalgia. They were randomly divided into two groups (A and B). In group A, patients were treated by bromocriptine/evening primrose. To group B, LILT with specified dosimetry was applied, using a device that delivers He-Ne laser combined with 4 infra-red diode laser. Evaluation of treatment was both subjective (using VAS) and objective (studying the degree of drop in plasma cortisol level). The drop of plasma cortisol with treatment was studied using the student -t distribution. A good response was observed in the laser group in 82.5%, compared to 63.9% in the bromocriptine/evening primrose group. There was a significant deference before and after treatment in both groups ($P<0.05$). This difference was more for the drug treated group than for the laser treated group, but in the latter, it acted on a wider sector of patients. In conclusion, LILT is recommended as a new treatment modality for cyclical mastalgia. Anti-Inflammatory Agents, Non-Steroidal;Linoleic Acids;Plant Oils;Bromocriptine;evening primrose oil;gamma-Linolenic Acid;Hydrocortisone Adult;Anti-Inflammatory Agents, Non-Steroidal;Breast Diseases;Bromocriptine;Double-Blind Method;Drug Therapy, Combination;Egypt;Female;Humans;Hydrocortisone;Linoleic Acids;Low-Level Light Therapy;Oenothera biennis;Pain Measurement;Plant Oils;gamma-Linolenic Acid

The effectiveness of PUVA treatment in severe psoriasis is significantly increased by additional UV 308-nm excimer laser sessions. In most cases, patients with moderate to severe psoriasis are treated with narrow-band UVB phototherapy or with psoralen UVA (PUVA-) photochemotherapy. This UV-radiation is given to the whole skin, including unaffected skin. Normally, these two PUVA- and UVB-radiation procedures cannot be combined on account of the phototherapeutic side-effects on unaffected skin. The 308-nm excimer laser has been shown to be safe and effective in the treatment of localized mild-to-moderate plaque-type psoriasis whilst sparing healthy skin. Our aim was to compare the therapeutic response to PUVA plus up to 4 UVB308-nm radiations and PUVA monotherapy in patients with moderate-severe plaque-type psoriasis. 272 hospitalized adult patients were enrolled on this prospective random study. 256 patients completed the full course of treatment. PUVA treatment was given 4 times weekly to all patients. 123 patients received PUVA as a monotherapy. During the first two weeks, 149 patients were additionally treated up to four times with 308-nm excimer-derived UVB on the affected skin and treatment was evaluated for its efficacy, duration, number of times necessary for complete (CR) or partial remission (PASI reduction > 90 or >

50%, respectively), cumulative light dose, side effects of therapy and duration of remission after therapy. Statistically, there is no significant difference when comparing the efficacy of PUVA (CR 67.3%) and PUVA plus excimer (CR 63.6%). On average, patients treated by the combination method went into remission in half the treatment time (15 +/- 6 versus 27 +/- 7 days) and with half the cumulative UVA dose (22.9 +/- 5.8 versus 53.2 +/- 26.3), $p < 0.05$. In conclusion, skin heals considerably quicker when treated with a combination of photochemotherapy and a short course of UVB 308 nm laser treatment applied directly to the affected skin, resulting in a shorter hospital stay and quicker rehabilitation of patients with moderate-severe psoriasis. Combined Modality Therapy;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;PUVA Therapy;Psoriasis;Ultraviolet Therapy

Effect of low-intensity laser therapy on mast cell degranulation in human oral mucosa. Little is known about the physiological mechanisms related to low-intensity laser therapy (LILT), particularly in acute inflammation and subsequent wound healing. The objective of this study was to verify the effect of LILT on mast cell degranulation. Epulis fissuratum tissues from eight patients were used. One part of the lesion was irradiated with an AsGaAl laser (lambda = 670 nm, 8.0 J/cm(2), 5 mW, 4 min). The other part was not irradiated. Then, the specimens were immediately removed, fixed and examined by light microscopy. The number of mast cells was similar in laser-treated samples when compared with non-irradiated specimens. The degranulation indexes of the mast cells observed in the irradiated samples were significantly higher than those of controls ($P < 0.05$). LILT with the parameters used increased the number of degranulated mast cells in oral mucosa. Adult;Cell Degranulation;Humans;Low-Level Light Therapy;Mast Cells;Middle Aged;Mouth Mucosa

Enamel matrix derivative and low-level laser therapy in the treatment of intra-bony defects: a randomized placebo-controlled clinical trial. AIM: The aim of this study was to evaluate the immediate post-operative pain, wound healing and clinical results after the application of an enamel matrix protein derivative (EMD) alone or combined with a low-level laser therapy (LLLT) for the treatment of deep intra-bony defects. MATERIAL AND METHODS: This study was an intra-individual longitudinal test of 12 months' duration conducted using a blinded, split-mouth, placebo-controlled and randomized design. In 22 periodontitis patients, one intra-bony defect was randomly treated with EMD+LLLT, while EMD alone was applied to the contra-lateral defect site. LLLT was used both intra- and post-operatively. Clinical measurements were performed by a blinded periodontist at the time of surgery, in the first week and in the first, second, sixth and 12th month. Visual analogue scale (VAS) scores were recorded for pain assessment. RESULTS: The results have shown that the treatment of intra-bony defects with EMD alone or EMD+LLLT leads to probing depth reduction and attachment-level gain. In addition, EMD+LLLT had resulted in less gingival recession ($p<0.05$), less swelling ($p<0.001$) and less VAS scores ($p<0.02$) compared with EMD alone. CONCLUSION: This study shows that EMD is an effective, safe and predictable biomaterial for periodontal regeneration and LLLT may improve the effects of EMD by reducing post-operative complications. Bone Substitutes;Dental Enamel Proteins;enamel matrix proteins Adult;Alveolar Bone Loss;Bone Substitutes;Combined Modality Therapy;Dental Enamel Proteins;Epidemiologic Methods;Female;Humans;Low-Level Light Therapy;Male;Mandibular Diseases;Maxillary Diseases;Middle Aged;Pain, Postoperative;Treatment Outcome;Wound Healing

Diode laser hair removal around ileo-colo ostomys is safe, effective and beneficial: a pilot study. BACKGROUND AND OBJECTIVE: Hair removal around an ileo-colo ostomy can cause a number of problems. We compared laser hair removal with mechanical shaving around the ostomy. METHOD: Eleven patients were selected with hairy skin around the ostomy for therapy with an AlGaAs diode laser at 800 nm. Three to four treatments were given with an interval of 6 weeks. RESULTS: Ten patients completed laser therapy. The average hair reduction was 60% based on visual inspection.

Shaving frequency reduced from once a week to once every 6 weeks. CONCLUSIONS: Laser hair removal likely becomes the preferred method in ostomy patients. Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Ostomy;Pilot Projects;Treatment Outcome

GaAlAs (830 nm) low-level laser enhances peripheral endogenous opioid analgesia in rats. BACKGROUND: Low-level laser therapy (LLLT) has been reported to relieve pain with minimal side effects. Recent studies have demonstrated that opioid-containing immune cells migrate to inflamed sites and release beta-endorphins to inhibit pain as a mode of peripheral endogenous opioid analgesia. The present study investigates whether LLLT may enhance peripheral endogenous opioid analgesia. METHODS: The effect of LLLT on opioid analgesia and production was evaluated in vivo in a rat model of inflammation as well as in vitro in Jurkat cells, a human T-cell leukemia cell line. mRNA expression of the beta-endorphin precursors proopiomelanocortin and corticotrophin releasing factor was assessed by reverse transcription polymerase chain reaction. RESULTS: LLLT produced an analgesic effect in inflamed peripheral tissue which was transiently antagonized by naloxone. Beta-endorphin precursor mRNA expression increased with LLLT, both in vivo and in vitro. CONCLUSION: This study demonstrates that LLLT produces analgesic effects in a rat model of peripheral inflammation. We further revealed an additional mechanism of LLLT-mediated analgesia via enhancement of peripheral endogenous opioids. These findings suggest that LLLT induces analgesia in rats by enhancing peripheral endogenous opioid production in addition to previously reported mechanisms. Adjuvants, Immunologic;Hormones;Narcotic Antagonists;RNA, Messenger;Naloxone;Pro-Opiomelanocortin;Adrenocorticotropic Hormone;Freund's Adjuvant Adjuvants, Immunologic;Adrenocorticotropic Hormone;Animals;Freund's Adjuvant;Hindlimb;Hormones;Humans;Immunohistochemistry;Jurkat Cells;Low-Level Light Therapy;Male;Naloxone;Narcotic Antagonists;Pro-Opiomelanocortin;RNA, Messenger;Rats;Rats, Sprague-Dawley;Reverse Transcriptase Polymerase Chain Reaction;Staining and Labeling

Effect of low-level laser therapy on bone repair: histological study in rats. BACKGROUND AND OBJECTIVES: Bone remodeling is characterized as a cyclic and lengthy process. It is currently accepted that not only this dynamics is triggered by a biological process, but also biochemical, electrical, and mechanical stimuli are key factors for the maintenance of bone tissue. The hypothesis that low-level laser therapy (LLLT) may favor bone repair has been suggested. The purpose of this study was to evaluate the bone repair in defects created in rat lower jaws after stimulation with infrared LLLT directly on the injured tissue. STUDY DESIGN/MATERIALS AND METHODS: Bone defects were prepared on the mandibles of 30 Holtzman rats allocated in two groups (n = 15), which were divided in three evaluation period (15, 45, and 60 days), with five animals each. control group-no treatment of the defect; laser group-single laser irradiation with a GaAlAs semiconductor diode laser device (lambda = 780 nm; P = 35 mW; t = 40 s; Theta = 1.0 mm; D = 178 J/cm(2); E = 1.4 J) directly on the defect area. The rats were sacrificed at the pre-established periods and the mandibles were removed and processed for staining with hematoxylin and eosin, Masson's Trichrome and picrosirius techniques. RESULTS: The histological results showed bone formation in both groups. However, the laser group exhibited an advanced tissue response compared to the control group, abbreviating the initial inflammatory reaction and promoting rapid new bone matrix formation at 15 and 45 days ($P<0.05$). On the other hand, there were no significant differences between the groups at 60 days. CONCLUSION: The use of infrared LLLT directly to the injured tissue showed a biostimulating effect on bone remodeling by stimulating the modulation of the initial inflammatory response and anticipating the resolution to normal conditions at the earlier periods. However, there were no differences between the groups at 60 days. Animals;Bone Remodeling;Low-Level Light Therapy;Male;Mandible;Mandibular Injuries;Rats;Rats, Sprague-Dawley

Depth of penetration of an 850nm wavelength low level laser in human skin. Low Level Laser Therapy is used for a wide variety of conditions including superficial skin sores, musculoskeletal and joint problems, and dentistry. Knowledge of the penetration depth of laser radiation in human skin is an essential prerequisite to identifying its method of action. Mathematical simulations and estimates from the literature suggest that the depth of penetration of laser radiation using wavelengths from 630nm up to 1100nm may be up to 50mm. The aim of this study is to directly measure the penetration depth of a Low Level Laser in human tissue. Human abdominal skin samples up to 0.784mm thickness were harvested by dermatome following abdominoplasty procedures. These samples were irradiated by a Gallium Aluminium Arsenide Laser (Wavelength 850nm near infra-red invisible light, 100mW, 24kHz, 0.28mm diameter probe) and the transmitted radiation measured with an Ophir Optronics 'Nova' external energy meter. The intensity of laser radiation reduced by 66% after being transmitted through a 0.784mm sample of human abdominal tissue. In this study most laser radiation was absorbed within the first 1mm of skin. Epidermis;Humans;In Vitro Techniques;Infrared Rays;Lasers;Low-Level Light Therapy;Skin;Skin Physiological Phenomena

Laser treatment of pigmented lesions in clinical practice: a retrospective case series and patient satisfaction survey. Lasers are frequently used to treat pigmented skin lesions; however, there is little published data from routine clinical practice. We performed a retrospective review of patients treated between January 2003 and January 2004 to describe the patients, methods used and the clinical outcome. The long-term result was determined by a patient questionnaire. In total, 67 patients with 76 pigmented lesions were treated (22 males and 45 females, mean age 22 years); 27% had Fitzpatrick skin types IV-VI. The Q-switched Nd:YAG, and erbium:YAG lasers were used in 75% and 24% of cases, respectively, with an average of 5.4 treatments/patient. The physician-rated outcome at the end of treatment was 'very positive' in 45% and 'mostly positive' in 30% of cases. The patient-rated outcome at an average of 21 months post-treatment was 'excellent' in 29.5%, 'good' in 25%, and 'fair' in 22.7% of the 44 cases. About 50% of patients with the three most common lesions (congenital naevi, other/unspecified naevi and naevus of Ota) achieved good or excellent long-term results. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nevus;Patient Satisfaction;Pigmentation Disorders;Retrospective Studies;Skin Neoplasms;Surveys and Questionnaires;Treatment Outcome

Lack of effect of the pulsed-dye laser in the treatment of multiple eccrine hidrocystomas: a report of two cases. Aged;Face;Female;Hidrocystoma;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Treatment Failure

308-nm excimer laser for the treatment of alopecia areata. BACKGROUND: Alopecia areata is loss of hair from localized or diffuse areas of hair-bearing area of the skin. Recently there are reports of efficacy of the 308-nm excimer radiation for this condition. OBJECTIVE: To study the effect of the 308-nm excimer laser in the treatment of alopecia areata. MATERIALS AND METHODS: Eighteen patients with 42 recalcitrant patches (including 1 adult with alopecia totalis) were enrolled in this study. The lesions were treated with the 308-nm excimer laser twice a week for a period of 12 weeks; one lesion on each patient was left as a control for comparison. RESULTS: There were 7 males and 11 females in this study. Regrowth of hair was observed in 17 (41.5%) patches. Thirteen of the 18 lesions in scalp showed a complete regrowth of hair. The extremity regions failed to show a response. Atopic diatheses had an unfavorable effect on the outcome in our patients. CONCLUSION: The 308-nm excimer laser is an effective therapeutic option for patchy alopecia areata of the scalp and for some cases with patchy alopecia areata of the beard area. It does not work for patchy alopecia areata of the extremities. Adolescent;Adult;Alopecia Areata;Child;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male

Pulsed dye laser treatment is effective in the treatment of recalcitrant viral warts. BACKGROUND: Verrucae vulgaris can be removed in a variety of ways but a specific therapy of choice has not yet been developed. Doctors are faced with a challenge, especially in the treatment of recalcitrant warts. It has been suggested that the success of pulsed dye laser treatment lies in the fact that warts contain an increased number of dilated blood vessels. METHODS: Seventy-three patients (42 female, 31 male) with verrucae vulgaris on their hands or feet (1:1.5) were given a maximum of 12 treatments with a flashlamp-pumped pulsed dye laser every 2 weeks over a period of 24 weeks until complete clearance had been achieved. A laser energy density of 8 to 12 J/cm2 with a spot size of 5 mm and a pulse duration of 450 microsec were used. The minimum follow-up period was 6 months. RESULTS: A total of 15.1% patients achieved complete clearance after 1 session and 47.9% after 2 to 5 sessions, resulting in a remission of 63.0% patients after a maximum of 5 treatment sessions. A remission of 23.3% patients was seen after 6 to 9 treatments and a total of 89.0% of patients showed remission after a maximum of 10 sessions. Only three patients (4.1%) failed and five patients (6.9%) stopped the treatment on account of pain/noncompliance. Only one patient, from a group of patients treated between January 2003 and April 2004, has relapsed. CONCLUSION: Pulsed dye laser treatment is effective and safe in the treatment of recalcitrant viral warts. Adolescent;Adult;Aged;Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Papillomavirus Infections;Prospective Studies;Treatment Outcome;Warts

Fractional photothermolysis for photoaging of hands. BACKGROUND: Laser treatment for photoaging of the hands should ideally address pigmentary alteration as well as associated skin roughness and wrinkling. Fractional resurfacing has been previously shown to effectively treat facial rhytids and dyschromia. OBJECTIVE: We examined the effect of fractional resurfacing for photoaging of the hands. METHODS AND MATERIALS: Ten patients (skin phototypes II to IV) with hand photodamage were randomized to receive five treatments with a 1,550-nm diode-pumped erbium fiber laser (Fraxel SR, Reliant Technologies) laser on either the right or left hand. Treatments were performed at settings of 8 to 9 mJ/microscopic treatment zone and density of 2,500 microscopic treatment zones/cm2. Subjective assessments by the patients and investigator were performed for skin roughness, wrinkling, and pigmentation using a 5-point scale. Skin biopsies were taken at baseline and at 1 and 3 months. RESULTS: Patient subjective assessment and physician clinical assessment at 1 and 3 months revealed a mean 51% to 75% improvement in skin pigmentation and 25% to 50% improvement in skin roughness and wrinkling. Biopsies of the skin showed increased density of dermal collagen. Patients experienced transient erythema and edema and none had scarring or other adverse effects. LIMITATIONS: This was a small study. CONCLUSION: Fractional resurfacing appears to be an effective and safe treatment modality for correcting both the pigmentary and the textural aspects of photoaging of the hand. Adult;Aged;Cosmetic Techniques;Female;Hand;Humans;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Pigmentation Disorders;Prospective Studies;Skin Aging

Adverse effects of Q-switched laser treatment of tattoos. Adult;Blister;Female;Humans;Lasers;Low-Level Light Therapy;Tattooing

Acne vulgaris: lasers, light sources and photodynamic therapy--an update 2007. Inflammatory acne vulgaris remains one of the most common dermatologic disorders seen in clinical practice. Medical therapy remains the gold standard for therapy but recent advances have shown that a variety of lasers and light sources may be useful in the treatment of inflammatory acne vulgaris. In addition, the use of 20% 5-aminolevulinic acid has found a useful niche in the treatment of moderate-to-severe inflammatory acne vulgaris. Photosensitizing Agents;Aminolevulinic Acid Acne Vulgaris;Aminolevulinic Acid;Humans;Laser Therapy;Light;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

[The effect of intravenous laser irradiation of blood on the system hemodynamics of patients with chronic obstructive bronchitis exacerbation]. The aim of the study was to evaluate the effects of intravenous laser irradiation of blood (ILIB) on system hemodynamics in patients with chronic obstructive bronchitis (COB) exacerbation. Ninety-seven patients with COB exacerbation were divided into two comparable groups. The 47 patients of the control group received conventional medication, while the 50 patients of the main group received the same therapy plus ILIB, which consisted of 10 everyday 20-min procedures. Central hemodynamic variables were measured prior to and after the treatment. The results demonstrated higher effectiveness of COB treatment when ILIB was applied and that ILIB itself had a positive effect on system circulation in COB exacerbation by changing hyperkinetic hemodynamics into normokinetic one. The study shows that it is appropriate to include ILIB into treatment of COB. Blood;Follow-Up Studies;Hemodynamics;Humans;Low-Level Light Therapy;Pulmonary Disease, Chronic Obstructive;Remission Induction;Treatment Outcome

Activation of latent TGF-beta1 by low-power laser in vitro correlates with increased TGF-beta1 levels in laser-enhanced oral wound healing. The term Laser "Photobiomodulation" was coined to encompass the pleiotropic effects of low-power lasers on biological processes. The purpose of this study was to investigate whether transforming growth factor (TGF)-beta had a role in mediating the biological effects of low-power far-infrared laser irradiation. We assayed for in vitro activation using various biological forms of cell-secreted, recombinant, and serum latent TGF-beta using the p3TP reporter and enzyme-linked immunosorbent assays. We demonstrate here that low-power lasers are capable of activating latent TGF-beta1 and -beta3 in vitro and, further, that it is capable of "priming" these complexes, making them more amenable to physiological activation present in the healing milieu. Using an in vivo oral tooth extraction-healing model, we observed an increased TGF-beta1, but not beta3, expression by immunohistochemistry immediately following laser irradiation while TGF-beta3 expression was increased after 14 days, concomitant with an increased inflammatory infiltrate. All comparisons were performed between laser-irradiated wounds and nonirradiated wounds in each subject essentially using them as their own control (paired T-test $p<0.05$). Low-power laser irradiation is capable of activating the latent TGF-beta1 complex in vitro and its expression pattern in vivo suggests that TGF-beta play a central role in mediating the accelerated healing response. Transforming Growth Factor beta Enzyme-Linked Immunosorbent Assay;Humans;Immunohistochemistry;Linear Models;Low-Level Light Therapy;Tooth Socket;Transforming Growth Factor beta;Wound Healing

Perioral rejuvenation: complementary techniques and procedures. The intertwined nature of the aging process necessitates the use of complementary techniques to address each different aspect. Aging affects the perioral region in very specific ways that involve the upper lip, oral commissures, vermilion and philtral columns, lower lip, nasolabial folds, marionette lines, and perioral rhytids. Chin;Cosmetic Techniques;Humans;Low-Level Light Therapy;Mouth;Rejuvenation;Skin Aging

Treatment of perioral rhytids. Many techniques exist for treating rhytids in the perioral region. Injectable fillers, Botox, implants, lip lifts, and lip advancements all produce lasting results. Resurfacing procedures can also be used to rejuvenate this area. This article discusses the use of chemical peels, dermabrasion, and laser resurfacing, alone or in combination, as methods to reduce fine and vertical rhytids of the upper and lower lips and superficial scarring in the perioral region. The authors emphasize that the best outcomes are often achieved using a combination of these modalities tailored to each patient's needs, which also allows surgeons greater flexibility in achieving maximal results. This article also discusses patient selection, counseling, planning, and techniques that have yielded consistent results with high patient satisfaction. Chin;Cosmetic Techniques;Humans;Low-Level Light Therapy;Mouth;Patient Selection;Postoperative Care;Skin Aging

Successful treatment of nevus comedonicus with the use of the Erbium Yag laser. Adolescent;Hamartoma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin;Skin Neoplasms
Effects of low level red-light irradiation on the proliferation of mesenchymal stem cells derived from rat bone marrow. Mesenchymal stem cells (MSCs) are capable of regenerating various mesenchymal tissues and are essential in supporting the growth and differentiation of hematopoietic stem cells within the bone marrow microenvironment in vivo. To achieve clinically meaningful numbers of cells, many approaches have been used to maintain the differentiation potentialities and expand enough cells for clinical treatments. Previously, we have reported that low level light irradiation (LLLI) using 630 nm light emitting diodes (LEDs) could enhance replicative and colony formation potentials of MSCs derived from human bone marrow. The purpose was to study the effect on the proliferation of MSCs derived from the rat bone marrow by red light LLLI (630 nm) under different parameters of irradiation. The irradiance used was 5, 10 or 15 mW/cm2, and the radiant exposure was 2 or 4 J/cm2. Rat MSCs were irradiated at room temperature with single and multiple exposures. The results showed that the proliferation of MSCs plated at the low density (100 cells/well) and high density (1000 cells/well) was enhanced by multiple exposures of red-light LED treatment. The rate of proliferation of MSCs plated at the high density was not as high as those plated at the low density. The optimal parameter for LLLI was at irradiance of 15 mW/cm2, and radiant exposure of 4 J/cm2. The effect on the proliferation of cells by single dose irradiation was temporary. Multiple stimuli may be necessary for the enhancement of cell growth. Animals;Bone Marrow Cells;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Female;Light;Mesenchymal Stem Cells;Radiation Dosage;Rats;Rats, Wistar
Physical therapy interventions for patients with osteoarthritis of the knee: an overview of systematic reviews. Patients with osteoarthritis of the knee are commonly treated by physical therapists. Practice should be informed by updated evidence from systematic reviews. The purpose of this article is to summarize the evidence from systematic reviews on the effectiveness of physical therapy for patients with knee osteoarthritis. Systematic reviews published between 2000 and 2007 were identified by a comprehensive literature search. We graded the quality of evidence across reviews for each comparison and outcome. Twenty-three systematic reviews on physical therapy interventions for patients with knee osteoarthritis were included. There is high-quality evidence that exercise and weight reduction reduce pain and improve physical function in patients with osteoarthritis of the knee. There is moderate-quality evidence that acupuncture, transcutaneous electrical nerve stimulation, and low-level laser therapy reduce pain and that psychoeducational interventions improve psychological outcomes. For other interventions and outcomes, the quality of evidence is low or there is no evidence from systematic reviews. Evidence-Based Medicine;Humans;Osteoarthritis, Knee;Physical Therapy Modalities;Review Literature as Topic;Treatment Outcome
Photomedicine and LLT Literature Watch. Humans;Low-Level Light Therapy
Laser phototherapy (780 nm), a new modality in treatment of long-term incomplete peripheral nerve injury: a randomized double-blind placebo-controlled study. OBJECTIVE: The authors conducted this pilot study to prospectively investigate the effectiveness of low-power laser irradiation (780 nm) in the treatment of patients suffering from incomplete peripheral nerve and brachial plexus injuries for 6 months up to several years. BACKGROUND DATA: Injury of a major nerve trunk frequently results in considerable disability associated with loss of sensory and motor functions. Spontaneous recovery of long-term severe incomplete peripheral nerve injury is often unsatisfactory. METHODS: A randomized, double-blind, placebo-controlled trial was performed on 18 patients who were randomly assigned placebo (non-active light: diffused LED lamp) or low-power laser irradiation (wavelength,

780 nm; power, 250 mW). Twenty-one consecutive daily sessions of laser or placebo irradiation were applied transcutaneously for 3 h to the injured peripheral nerve (energy density, 450 J/mm(2)) and for 2 h to the corresponding segments of the spinal cord (energy density, 300 J/mm(2)). Clinical and electrophysiological assessments were done at baseline, at the end of the 21 days of treatment, and 3 and 6 months thereafter. RESULTS: The laser-irradiated and placebo groups were in clinically similar conditions at baseline. The analysis of motor function during the 6-month follow-up period compared to baseline showed statistically significant improvement ($p = 0.0001$) in the laser-treated group compared to the placebo group. No statistically significant difference was found in sensory function. Electrophysiological analysis also showed statistically significant improvement in recruitment of voluntary muscle activity in the laser-irradiated group ($p = 0.006$), compared to the placebo group. CONCLUSION: This pilot study suggests that in patients with long-term peripheral nerve injury noninvasive 780-nm laser phototherapy can progressively improve nerve function, which leads to significant functional recovery. Adult;Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Peripheral Nerve Injuries;Pilot Projects;Recovery of Function;Time Factors;Trauma, Nervous System;Treatment Outcome

Optimal frequency of treatment with the 308-nm excimer laser for vitiligo on the face and neck. OBJECTIVES: This study was designed to determine the optimal treatment frequency with the 308-nm excimer laser for vitiligo and identify key clinical variable(s) associated with treatment efficacy at the optimal frequency. BACKGROUND DATA: Optimal clinical parameters for excimer laser treatment of vitiligo have not been fully determined. Data about the influence on treatment frequency of different clinical variables of vitiligo are needed to facilitate effective treatment regimens. METHODS: A total of 187 patients were treated with the 308-nm excimer laser for 20 sessions at different frequencies (0.5, 1.0, 2.0, and 3.0 per week). The repigmentation rate was graded on a six-point scale and was blindly evaluated by independent physicians. RESULTS: The final percentage of repigmentation for group 0.5 was statistically lower than those for group 1.0, 2.0, and 3.0, and percentages of final levels of repigmentation among these three groups were not statistically different. The clinical variables showed no statistical differences in the final repigmentation effect. Repigmentation occurred fastest with treatment frequencies of 2.0 and 3.0 and there was no statistically significant difference between them. The onset of repigmentation correlated with the area of vitiliginous patches treated, not with the other clinical variables. CONCLUSIONS: The 308-nm excimer laser is effective for therapy to treat vitiligo on the face and neck. The ultimate laser-induced repigmentation effect does not correlate with treatment frequency and repigmentation occurs faster with treatment frequencies of 2.0 and 3.0 than that of 1.0. It appears that the onset of repigmentation correlates with the total area of vitiliginous patches and the optimal treatment frequency. Monitored studies on a larger population with long-term follow-up would be needed to confirm and extend our findings. Adolescent;Adult;Aged;Child;Child, Preschool;Facial Dermatoses;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Vitiligo

Bond strength of self-etching primer to bur cut, Er,Cr:YSGG, and Er:YAG lased dental surfaces. OBJECTIVE: The purpose of this study was to evaluate the tensile bond strength of a self-etching primer system to enamel and dentin surfaces treated with Er:YAG and Er,Cr:YSGG lasers. BACKGROUND DATA: The recently introduced self-etching primer systems have been shown to adhere better to dental surfaces with thin or no smear layers. Moreover, there have been no previous reports on the bond strength of these adhesives to Er,Cr:YSGG laser-irradiated enamel and dentin, which have been shown to be free of a smear layer. METHODS: Thirty samples of enamel and thirty of dentin were divided into three groups. The first group of each substrate served as a control with a standardized bur cut, and the other two groups were conditioned with Er:YAG (350 mJ, 10 Hz, 20 J/cm(2) for enamel; 300 mJ, 6 Hz, 17 J/cm(2) for dentin) and Er,Cr:YSGG laser (125 mJ, 20 Hz, 16

J/cm(2) for both substrates). After the bonding procedure, samples were restored with composite resin, and the tensile bond strength test was performed. RESULTS: The ANOVA two-way analysis and the Tukey test at 5% significance level showed that for enamel and dentin, the bond strength values were statistically higher in Er:YAG-laser treated than in Er,Cr:YSGG-laser treated surfaces ($p = 0.0001$). However, bond strength means for both laser-irradiated groups were statistically lower than for the bur cut group (Er:YAG: $p = 0.0281$ and Er,Cr:YSGG: $p < 0.0001$). SEM observation of laser-irradiated surfaces revealed a roughened aspect and absence of smear layer. CONCLUSIONS: The self-etching system adhesion was influenced by the type of erbium laser used, and the bond strength was higher in the Er:YAG-laser irradiated than in the Er,Cr:YSGG-laser irradiated surfaces. Dentin-Bonding Agents Adhesiveness;Dental Bonding;Dental Enamel;Dental Etching;Dentin-Bonding Agents;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Tensile Strength

Relevance of laser irradiance threshold in the induction of alkaline phosphatase in human osteoblast cultures. Induction of matrix synthesis by low-level laser has been demonstrated extensively. However, the question of dose- or power intensity-dependency is under-investigated. To address this issue we chose human osteoblast cell cultures and measured their alkaline phosphatase (ALP) activity after laser irradiation. The cell cultures were irradiated periodically by 690 nm radiation via optical transmission fiber-based laser needles, reaching into the culture dishes. The osteoblasts showed no induction of ALP activity when we used a single laser needle stimulation with a laser irradiance of 51 mW/cm(2), an increase of approximately 43% at 102 mW/cm(2) irradiance (two needles per well) and a ninefold increase at 204 mW/cm(2) irradiance (four needles per well), leaving the temperature of the culture medium unaffected. We concluded that the osteoblastic response in ALP activity to a laser stimulus shows a logarithmic relationship, with a distinct threshold, rather than a linear dose-dependency. Secondly, the laser irradiance, rather than the dose, is relevant for the impact of the laser. Alkaline Phosphatase Alkaline Phosphatase;Bone and Bones;Cell Culture Techniques;Humans;Low-Level Light Therapy;Osteoblasts;Osteosarcoma

Effects of Er,Cr:YSGG laser irradiation on the root surface: morphologic analysis and efficiency of calculus removal. BACKGROUND: This in vitro study was performed to determine the appropriate power output setting for an erbium, chromium-doped:yttrium, scandium, gallium, and garnet (Er,Cr:YSGG) laser used in periodontal pocket irradiation by examining the morphologic alterations of the root surfaces and the efficiency of calculus removal. METHODS: Sixty-five non-carious extracted human teeth were used in this study. For morphologic analysis of the root surface, the clean, single roots of 22 teeth were separated into 91 pieces, and these pieces were immersed in acrylic resin. The specimens with root-surface exposure were prepared and divided randomly into three groups: a control group (N=8), an irradiation without water group (no water [NW] group; N=39), and an irradiation in water to simulate the conditions in a periodontal pocket group (in water [IW] group; N=44). The power output settings for laser irradiation were 0.5, 1.0, 1.5, and 2.0 W for each group. The roughness (Ra), depth (Z), and width (X) of the disk specimens were determined after laser irradiation. Eight other single-rooted teeth were examined by scanning electron microscopy (SEM) after laser irradiation under the same conditions. Thirty-five single- or multirooted teeth with heavy subgingival calculus were used to test the efficiency of laser scaling. The efficiency of calculus removal was quantified by measuring the time needed to remove the calculus completely using the laser. RESULTS: The mean Ra and Z values in the IW group were significantly higher than in the NW group with the same power output. In addition, these values with 0.5- and 1.0-W power output settings were significantly lower than with 1.5- and 2.0-W settings in the NW and IW groups. No obvious morphologic differences could be found between the 0.5- and 1.0-W power output specimens under SEM. Additionally, thermal alterations, i.e., carbonization or melting, were completely absent in the IW group. Regarding the efficiency of calculus removal, the 0.5-W setting

(0.11+/-0.036 mm2/second) was significantly inferior to the 1.0-W setting (0.27+/-0.043 mm2/second). However, there was no significant difference between 1.0- and 1.5-W (0.36+/-0.11 mm2/second). The 2.0-W setting (0.63+/-0.272 mm2/second) was much more efficient but resulted in significant morphologic alterations. CONCLUSIONS: Based on these findings, it is appropriate to use a 1.0-W power output setting with an Er,Cr:YSGG laser for root scaling. This may be done without any conspicuous morphologic alterations to the root surface and with acceptably efficient removal of calculus. Water Dental Calculus;Humans;Lasers, Solid-State;Low-Level Light Therapy;Statistics, Nonparametric;Surface Properties;Tooth Root;Water

Views of a type I posterior glottic stenosis before and after lysis. Adult;Female;Humans;Intubation, Intratracheal;Laryngostenosis;Low-Level Light Therapy;Time Factors;Tracheotomy;Treatment Outcome

Low-level light stimulates excisional wound healing in mice. BACKGROUND: Low levels of laser or non-coherent light, termed low-level light therapy (LLLT) have been reported to accelerate some phases of wound healing, but its clinical use remains controversial. METHODS: A full thickness dorsal excisional wound in mice was treated with a single exposure to light of various wavelengths and fluences 30 minutes after wounding. Wound areas were measured until complete healing and immunofluorescence staining of tissue samples was carried out. RESULTS: Wound healing was significantly stimulated in BALB/c and SKH1 hairless mice but not in C57BL/6 mice. Illuminated wounds started to contract while control wounds initially expanded for the first 24 hours. We found a biphasic dose-response curve for fluence of 635-nm light with a maximum positive effect at 2 J/cm(2). Eight hundred twenty nanometer was found to be the best wavelength tested compared to 635, 670, and 720 nm. We found no difference between non-coherent 635+/-15-nm light from a lamp and coherent 633-nm light from a He/Ne laser. LLLT increased the number of alpha-smooth muscle actin (SMA)-positive cells at the wound edge. CONCLUSION: LLLT stimulates wound contraction in susceptible mouse strains but the mechanism remains uncertain. Analysis of Variance;Animals;Dose-Response Relationship, Radiation;Immunohistochemistry;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Wound Healing

Treatment of an intrameatal wart with short pulse dye laser: a case report. Adult;Condylomata Acuminata;Humans;Low-Level Light Therapy;Male;Penis

Plasma skin resurfacing for regeneration of neck, chest, and hands: investigation of a novel device. BACKGROUND: Many noninvasive treatments to rejuvenate photodamaged skin are characterized by an unattainable balance between effectiveness and morbidity. The demand for safe, effective procedures has fueled the emergence of plasma skin regeneration (PSR). Preliminary studies have elaborated on the safety and efficacy of PSR for facial skin; however, no evaluation in nonfacial areas has been made. OBJECTIVE: This study was conducted to evaluate the efficacy and safety of PSR in the treatment of moderately photodamaged skin on the neck, chest, and dorsal hands. MATERIALS AND METHODS: Thirty skin areas in 10 patients were selected. Each area received one of three discrete energy settings using a commercially available PSR system. Clinical evaluations of skin texture, pigmentation, wrinkle severity, and side effects were conducted immediately and at 4, 7, 14, 30, and 90 days after treatment. RESULTS: Mean clinical improvements of 57, 48, and 41% were observed in chest, hands, and neck sites, respectively. Significant reduction in wrinkle severity, hyperpigmentation, and increased skin smoothness were achieved. Higher-energy settings yielded greater benefit but also prolonged tissue healing. CONCLUSIONS: PSR offers improvement of moderately photodamaged skin of the neck, chest, and dorsal hands with limited side effects. Further studies are needed to determine the effect of multiple treatment sessions, optimal treatment parameters, and intervals for each site and longevity of clinical results. Aged;Cosmetic Techniques;Equipment Safety;Female;Hand;Humans;Low-Level Light Therapy;Middle

Aged;Neck;Photosensitivity Disorders;Prospective Studies;Rejuvenation;Skin;Thorax;Treatment Outcome;Ultraviolet Rays

The 1st meeting of the European division of the World Federation for Laser Dentistry: Nice University, France, 26-27 April 2007. Congresses as Topic;Europe;Humans;Low-Level Light Therapy;Tooth Diseases

Influence of water-layer thickness on Er:YAG laser ablation of enamel of bovine anterior teeth. Different ideas have been presented to describe the mechanism of augmented laser ablation of dental enamel with different shapes by adding water to the working environment. In this study, the influence of water-laser interaction on the surface of enamel during ablation was investigated at a wavelength of 2.94 microm with different distances between the laser tip and the enamel surface. A motion-control system was used to produce linear incisions uniformly on flat enamel surfaces of bovine anterior teeth, with free-running Er:YAG laser very short pulses (pulse length = 90-120 micros, repetition rate = 10 pulses per second). Four different output energies (100, 200, 300 and 400 mJ) were radiated on samples under distilled water from different distances (0.5, 0.75, 1, 1.25, 1.75 and 2.00 mm). The tooth slices were prepared with a cutting machine, and the surfaces of the ablated areas were measured with software under a light microscope. The average and standard deviation of all cut areas in different groups were reported. There was no significant difference when using a different pulse ablation speed (cm(3)/J) and a water-layer thickness between the tip and enamel surface of 0.5-1.25 mm with energy densities of 30-60 J/cm(2) (200-400 mJ). However, using an output energy of 15 J/cm(2) (100 mJ) and a thicker water layer than 1 mm, a linear ablation did not take place. This information led to a clearer view of the efficiency of Er:YAG laser in the conditions of this study. There are several hypotheses which describe a hydrokinetic effect of Er,Cr:YSGG. These basic studies could guide us to have a correct attitude regarding hydro-mechanical effects of water, although the wavelength of 2.78 microm has a better absorption in hydroxyl branch of water molecules. Therefore, our results do not directly interrupt with the series of investigations done with Er,Cr:YSGG. Water propagation and channel formation under water are investigated during the ablation of tooth enamel with the Er:YAG laser from different distances. Comparing the results of this study with the same research done with water/air spray concludes that the bubble formation and channel propagation in water with this wavelength leads to a more symmetric (linear) ablation process with cavity-preparation-recommended parameters. Water Animals;Cattle;Dental Bonding;Dental Enamel;Dentin;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Models, Animal;Water

Design of the laser acupuncture therapeutic instrument. Laser acupuncture is defined as the stimulation of traditional acupuncture points with low-intensity, non-thermal laser irradiation. It has been well applied in clinic since the 1970s; however, some traditional acupuncture manipulating methods still cannot be implemented in the design of this kind of instruments, such as lifting and thrusting manipulating method, and twisting and twirling manipulating method, which are the essential acupuncture method in traditional acupuncture. The objective of this work was to design and build a low cost portable laser acupuncture therapeutic instrument, which can implement the two essential acupuncture manipulating methods. Digital PID control theory is used to control the power of laser diode (LD), and to implement the lifting and thrusting manipulating method. Special optical system is designed to implement twisting and twirling manipulating method. M5P430 microcontroller system is used as the control centre of the instrument. The realization of lifting and thrusting manipulating method and twisting and twirling manipulating method are technological innovations in traditional acupuncture coming true in engineering.
Acupuncture;Acupuncture Therapy;Equipment Design;Lasers;Low-Level Light Therapy;Medicine, Chinese Traditional;Needles;Radiation Dosage

Low-energy laser therapy for prevention of oral mucositis in hematopoietic stem cell transplantation. AIM: To evaluate the clinical effects of laser therapy on the prevention and reduction of oral mucositis in patients who underwent hematopoietic stem cell transplantation (HSCT). PATIENTS AND METHODS: From January 2003 to September 2004, 24 patients received prophylactic laser therapy (L+ group). The applications started from the beginning of the conditioning regimen up to day +2. The oral assessment was performed daily until day +30. This group was compared with historical controls, namely 25 patients, who did not receive laser therapy (L- group). RESULTS: All patients developed some grade of mucositis. However, the L- group presented initial mucositis by 4.36 days, whereas the L+ group presented it in 6.12 days (P = 0.01). The maximum mucositis occurred between day +2 and day +6 with healing by day +25 in the L- group and between day +2 and day +7 with healing by day +14 for the L+ group (P = 0.84). Laser therapy also reduced the time of oral pain from 5.64 to 2.45 days (P = 0.04), and decreased the consumption of morphine (P = 0.07). CONCLUSION: This study suggests that laser therapy can be useful in oral mucositis to HSCT patients and improve the patient's quality of life. However, controlled randomized trials should be performed to confirm the real efficacy of laser therapy. Adolescent;Adult;Epidemiologic Methods;Female;Hematopoietic Stem Cell Transplantation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Stomatitis;Time Factors

WITHDRAWN: Low level laser therapy for nonspecific low-back pain. BACKGROUND: Low-back pain (LBP) and related disabilities are major public health problems and a major cause of medical expenses, absenteeism and disablement. Low level laser therapy (LLLT) can be used as a therapeutic intervention for musculoskeletal disorders such as back pain. OBJECTIVES: To assess the effects of LLLT in patients with non-specific low-back pain and to explore the most effective method of administering LLLT for this disorder. SEARCH STRATEGY: We searched CENTRAL (The Cochrane Library 2005, Issue 2), MEDLINE and CINAHL from their start to January 2007 and EMBASE, AMED and PEDro from their start to 2005 with no language restrictions. We screened references in the included studies and in reviews of the literature and conducted citation tracking of identified RCTs and reviews using Science Citation Index. We also contacted content experts. SELECTION CRITERIA: Only randomised controlled clinical trials (RCTs) investigating low level laser therapy as a light source treatment for non-specific low-back pain were included. DATA COLLECTION AND ANALYSIS: Two authors independently assessed methodological quality using the criteria recommended by the Cochrane Back Review Group and extracted data. Consensus was used to resolve disagreements. Clinically and statistically homogeneous studies were pooled using the fixed-effect model; clinically homogeneous and statistically heterogeneous studies were pooled using the random-effects model. MAIN RESULTS: Six RCTs with reasonable quality were included in the review. All of them were published in English. Because of clinical heterogeneity in study populations, interventions used and reported outcomes, meta-analysis was not possible to determine an overall effect for pain, disability and range of motion. Three studies (n=168) separately showed a significant pain relief effect of LLLT compared to sham therapy for sub-acute and chronic low-back pain. These effects were only observed at short-term and intermediate-term follow-ups. Long-term follow-ups were not reported. There was insufficient evidence to investigate the difference between LLLT and comparison groups for pain-related disability. There is insufficient evidence to determine the effectiveness of LLLT on anterior-posterior lumbar range of motion compared to control group in short-term follow-up. The relapse rate in the LLLT group was significantly lower than in the control group at six months follow-up period according to the findings of two trials. One study (n=50) reported a significant improvement in pain in LLLT group versus exercise therapy. AUTHORS' CONCLUSIONS: No side effects were reported. However, we conclude that there are insufficient data to draw firm conclusions. There is a need for further methodologically rigorous RCTs to evaluate the effects of LLLT compared to other treatments,

different lengths of treatment, different wavelengths and different dosages. Comparison of different LLLT treatments will be more reasonable if dose calculation methods are harmonized. Humans;Low Back Pain;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Anti-inflammatory effects of low-level laser therapy (LLLT) with two different red wavelengths (660 nm and 684 nm) in carrageenan-induced rat paw edema. It has been suggested that low-level laser therapy (LLLT) can modulate inflammatory processes. The aim of this experiment was to investigate what effects red laser irradiation with two different wavelengths (660 nm and 684 nm) on carrageenan-induced rat paw edema and histology. Thirty two male Wistar rats were randomly divided into four groups. One group received a sterile saline injection, while inflammation was induced by a sub-plantar injection of carrageenan (1 mg/paw) in the three other groups. After 1 h, LLLT was administered to the paw in two of the carrageenan-injected groups. Continuous wave 660 nm and 684 nm red lasers respectively with mean optical outputs of 30 mW and doses of 7.5 J/cm(2) were used. The 660 nm and 684 nm laser groups developed significantly ($p<0.01$) less edema (0.58 ml [SE+/-0.17] ml and 0.76 ml [SE+/-0.10] respectively) than the control group (1.67 ml [SE+/-0.19]) at 4h after injections. Similarly, both laser groups showed a significantly lower number of inflammatory cells in the muscular and conjunctive sub-plantar tissues than the control group. We conclude that both 660 nm and 684 nm red wavelengths of LLLT are effective in reducing edema formation and inflammatory cell migration when a dose of 7.5 J/cm(2) is used. Anti-Inflammatory Agents, Non-Steroidal;Carrageenan Animals;Anti-Inflammatory Agents, Non-Steroidal;Carrageenan;Cell Count;Color;Edema;Foot Diseases;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscles;Rats;Rats, Wistar

[Efficiency of a combination of haloaerosols and helium-neon laser in the multimodality treatment of patients with bronchial asthma]. A hundred and thirty-eight patients with infection-dependent bronchial asthma, including 73 with moderate persistent asthma and 65 with severe persistent one, were examined. Four modes of a combination of traditional (drug) therapy (DT) and untraditional (halotherapy (HT) and endobronchial helium-neon laser irradiation (ELI) one were used. The efficiency of the treatment performed was evaluated, by determining the time course of clinical symptoms of the disease on the basis of scores of their magnitude and the patients' condition. The findings indicated that in moderate persistent asthma, both HT and ELI in combination with DT exerted an equal therapeutic effect, which provided a good and excellent condition in 83.3% of cases. In severe persistent asthma, such a condition was achieved in 93.75% of cases only when multimodality treatment involving DT, HT, and ELI had been performed. Adrenergic beta-Antagonists;Anti-Bacterial Agents;Expectorants;Glucocorticoids Adrenergic beta-Antagonists;Adult;Anti-Bacterial Agents;Asthma;Bronchi;Drug Administration Routes;Drug Therapy, Combination;Expectorants;Follow-Up Studies;Glucocorticoids;Humans;Low-Level Light Therapy;Remission Induction;Severity of Illness Index;Treatment Outcome

Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. BACKGROUND: Many nonpharmacologic therapies are available for treatment of low back pain. PURPOSE: To assess benefits and harms of acupuncture, back schools, psychological therapies, exercise therapy, functional restoration, interdisciplinary therapy, massage, physical therapies (interferential therapy, low-level laser therapy, lumbar supports, shortwave diathermy, superficial heat, traction, transcutaneous electrical nerve stimulation, and ultrasonography), spinal manipulation, and yoga for acute or chronic low back pain (with or without leg pain). DATA SOURCES: English-language studies were identified through searches of MEDLINE (through November 2006) and the Cochrane Database of Systematic Reviews (2006, Issue 4). These electronic searches were supplemented by hand searching of reference lists and additional citations suggested by experts. STUDY SELECTION:

Systematic reviews and randomized trials of 1 or more of the preceding therapies for acute or chronic low back pain (with or without leg pain) that reported pain outcomes, back-specific function, general health status, work disability, or patient satisfaction. DATA EXTRACTION: We abstracted information about study design, population characteristics, interventions, outcomes, and adverse events. To grade methodological quality, we used the Oxman criteria for systematic reviews and the Cochrane Back Review Group criteria for individual trials. DATA SYNTHESIS: We found good evidence that cognitive-behavioral therapy, exercise, spinal manipulation, and interdisciplinary rehabilitation are all moderately effective for chronic or subacute (>4 weeks' duration) low back pain. Benefits over placebo, sham therapy, or no treatment averaged 10 to 20 points on a 100-point visual analogue pain scale, 2 to 4 points on the Roland-Morris Disability Questionnaire, or a standardized mean difference of 0.5 to 0.8. We found fair evidence that acupuncture, massage, yoga (Viniyoga), and functional restoration are also effective for chronic low back pain. For acute low back pain (<4 weeks' duration), the only nonpharmacologic therapies with evidence of efficacy are superficial heat (good evidence for moderate benefits) and spinal manipulation (fair evidence for small to moderate benefits). Although serious harms seemed to be rare, data on harms were poorly reported. No trials addressed optimal sequencing of therapies, and methods for tailoring therapy to individual patients are still in early stages of development. Evidence is insufficient to evaluate the efficacy of therapies for sciatica. LIMITATIONS: Our primary source of data was systematic reviews. We included non-English-language trials only if they were included in English-language systematic reviews. CONCLUSIONS: Therapies with good evidence of moderate efficacy for chronic or subacute low back pain are cognitive-behavioral therapy, exercise, spinal manipulation, and interdisciplinary rehabilitation. For acute low back pain, the only therapy with good evidence of efficacy is superficial heat. Acute Disease;Behavior Therapy;Chronic Disease;Combined Modality Therapy;Humans;Low Back Pain;Mind-Body Therapies;Physical Therapy Modalities

Effectiveness of nonpharmacological and nonsurgical interventions for patients with rheumatoid arthritis: an overview of systematic reviews. Conclusions based on systematic reviews of randomized controlled trials are considered to provide the highest level of evidence about the effectiveness of an intervention. This overview summarizes the available evidence from systematic reviews on the effects of nonpharmacological and nonsurgical interventions for rheumatoid arthritis (RA). Systematic reviews of studies of patients with RA (aged >18 years) published between 2000 and 2007 were identified by comprehensive literature searches. Methodological quality was independently assessed by 2 authors, and the quality of evidence was summarized by explicit methods. Pain, function, and patient global assessment were considered primary outcomes of interest. Twenty-eight systematic reviews were included in this overview. High-quality evidence was found for beneficial effects of joint protection and patient education, moderate-quality evidence was found for beneficial effects of herbal therapy (gamma-linolenic acid) and low-level laser therapy, and low-quality evidence was found for the effectiveness of the other interventions. The quality of evidence for the effectiveness of most nonpharmacological and nonsurgical interventions in RA is moderate to low. gamma-Linolenic Acid Adult;Arthritis, Rheumatoid;Disability Evaluation;Humans;Low-Level Light Therapy;Orthotic Devices;Pain Measurement;Patient Education as Topic;Randomized Controlled Trials as Topic;Recovery of Function;gamma-Linolenic Acid

Fluoride uptake and acid resistance of enamel irradiated with Er:YAG laser. This study evaluated the resistance to demineralization and fluoride incorporation of enamel irradiated with Er:YAG. A total of 110 bovine teeth were selected and divided into eight groups: unlased, 37% phosphoric acid, and samples irradiated with the Er:YAG laser at several fluences (31.84 J/cm(2), 25.47 J/cm(2), 19.10 J/cm(2), 2.08 J/cm(2), 1.8 J/cm(2), and 0.9 J/cm(2)). The application of acidulated phosphate fluoride was performed after treatments. All samples were immersed in 2 ml of 2.0 M acetic-acetate acid

solution at pH 4.5 for 8 h, and fluoride, calcium, and phosphorus ions dissolved were analyzed by atomic absorption spectrometry and spectrophotometry. The phosphoric acid and 31.84 J/cm(2) groups presented the lowest dissolution of calcium and phosphorus ions. Higher fluoride incorporation was observed on 1.8 J/cm(2) and 0.9 J/cm(2) groups. Based on these results, Er:YAG laser was able to decrease acid dissolution and increase fluoride uptake and can be a promissory alternative for preventive dentistry. Fluorides Animals;Cattle;Dental Caries;Dental Caries Activity Tests;Dental Caries Susceptibility;Dental Enamel;Dental Enamel Solubility;Fluorides;Lasers;Low-Level Light Therapy;Microscopy, Electron, Scanning;Pilot Projects;Spectrophotometry;Tooth Demineralization

Nd:YAG laser clinical assisted in class II furcation treatment. The Nd:YAG laser efficacy associated with conventional treatment for bacterial reduction has been investigated throughout literature. The purpose of this study was to evaluate the bacterial reduction after Nd:YAG laser irradiation associated with scaling and root planning in class II furcation defects in patients with chronic periodontitis. Thirty-four furcation lesions were selected from 17 subjects. The control group received conventional treatment, and the experimental group received the same treatment followed by Nd:YAG laser irradiation (100 mJ/pulse; 15 Hz; 1.5 W, 60 s, 141.5 J/cm(2)). Both treatments resulted in improvements of most clinical parameters. A significant reduction of colony forming unit (CFU) of total bacteria number was observed in both groups. The highest reduction was noted in the experimental group immediately after the treatment. The number of dark pigmented bacteria and the percentage of patients with Porphyromonas gingivalis, Prevotella intermedia, and Actinobacillus actinomycetemcomitans reduced immediately after the treatment and returned to values close to the initial ones 6 weeks after the baseline for both groups. The Nd:YAG laser associated with conventional treatment promoted significant bacterial reduction in class II furcation immediately after irradiation, although this reduction was not observed 6 weeks after the baseline. Neodymium Chronic Periodontitis;Colony Count, Microbial;Dental Scaling;Double-Blind Method;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neodymium;Periodontal Pocket;Root Planing

Congenital combined dermal and epidermal melanocytosis: a new entity? Adult;Dermis;Epidermis;Female;Humans;Low-Level Light Therapy;Melanocytes;Pigmentation Disorders

Cracks on the tip: an unusual complication using the fractional photothermolysis system. Acne Vulgaris;Adult;Cicatrix;Equipment Failure;Face;Female;Humans;Low-Level Light Therapy;Photolysis;Skin

Does dye laser treatment with higher fluences in combination with cold air cooling improve the results of port-wine stains? BACKGROUND AND OBJECTIVE: The use of cold air cooling (CAC) and cryogen spray cooling during dye laser treatment of port-wine stains (PWS) has become a standard in recent years. Still unsolved is the question of which fluences are necessary in combination with CAC in order to achieve an optimum clearance and the lowest possible rate of side-effects. STUDY DESIGN: In a prospective study, we treated 11 patients with PWS with pulsed dye laser (Photogenica V, Cynosure, lambda = 585 nm, iota(p) = 0.5 ms, spot size = 7 mm). Each PWS was partitioned into three areas: (area 1) 6 J/cm(2) without CAC, (area 2) 6 J/cm(2) with CAC (level 4), (area 3) 9 J/cm(2) with CAC (level 4). RESULTS: Area 3 (mean, 59%) showed a slightly better clearance than area 1 (mean, 57%); in area 2, we observed a reduced clearance (mean, 45%). Compared with area 1, we achieved a reduction of pain through CAC in areas 2 and 3. The healing periods as well as the rate of side-effects were comparable in all areas. CONCLUSION: We observed a slight but not statistically relevant increase in clearance with the use of higher fluences and CAC compared with lower fluences without CAC. Because pain is lowered significantly when using CAC, and because this makes the treatment

more comfortable for the patients, we tend to recommend the use of higher fluences (9 J/cm(2)) with simultaneous CAC for treating PWS. Adolescent;Adult;Air;Child;Child, Preschool;Cryotherapy;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Prospective Studies;Radiotherapy Dosage;Skin Temperature;Statistics, Nonparametric;Treatment Outcome

Increased expression of mitochondrial benzodiazepine receptors following low-level light treatment facilitates enhanced protoporphyrin IX production in glioma-derived cells in vitro. BACKGROUND AND OBJECTIVES: This study investigates whether low-level light treatment (LLLT) can enhance the expression of peripheral-type mitochondrial benzodiazepine receptors (PBRs) on glioma-derived tumor cells, and by doing so promote the synthesis of protoporphyrin IX (PpIX) and increase the photodynamic therapy (PDT)-induced cell kill using 5-aminolevulinic acid (ALA). The endogenous photosensitizer, PpIX and related metabolites including coproporphyrin III are known to traffic into or out of the mitochondria via the PBRs situated on the outer mitochondrial membrane. Cells of astrocytic derivation within the brain express PBRs, while neurons express the central-type of benzodiazepine receptor. STUDY DESIGN: Astrocytoma-derived CNS-1 cells were exposed to a range of differing low-level light protocols immediately prior to PDT. LLLT involved using broad-spectrum red light of 600-800 nm or monochromatic laser light specific to 635 or 905 nm wavelength. Cells (5 x 10(5)) were exposed to a range of LLLT doses (0, 1, or 5 J/cm(2)) using a fixed intensity of 10 mW/cm(2) and subsequently harvested for cell viability, immunofluorescence, or Western blot analysis of PBR expression. The amount of PpIX within the cells was determined using chemical extraction techniques. RESULTS: Results confirm the induction of PBR following LLLT is dependent on the dose and wavelength of light used. Broad-spectrum red light provided the greatest cell kill following PDT, although LLLT with 635 nm or 905 nm also increased cell kill as compared to PDT alone. All LLLT regimens increased PBR expression compared to controls with corresponding increases in PpIX production. CONCLUSIONS: These data suggest that by selectively increasing PBR expression in tumor cells, LLLT facilitates enhanced tumor cell kill using ALA-PDT. This may further improve the selectivity and efficacy of PDT treatment of brain tumors. Protoporphyrins;Receptors, GABA;TSPO protein, human;protoporphyrin IX Astrocytoma;Cell Cycle;Cell Survival;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Confocal;Mitochondria;Protoporphyrins;Receptors, GABA;Spectrometry, Fluorescence

Prevention of third molar development in dog with long pulse diode laser: a preliminary report. INTRODUCTION: Wisdom teeth continue to plague man with a high rate of frequency. It may be possible to prevent their development in children at an early age with a non- or minimally invasive technique, even before the tooth begins to form, by treating the soft tissue overlying the site of their development. A previous study that treated the intra-oral soft tissues of newborn rats with a 20 watt diode laser stopped third molar development up to 80% of the time with minimum observable side effects. This brief report describes a similar use of the diode laser in a limited number of young beagle pups. It is the first reported attempt at preventing third molar development in an animal model close in size to man. MATERIALS AND METHODS: Four 6-7 week old beagle pups were treated on one side of their mandibles with either a 20 or a 100 watt, 800 nm diode laser at a time third molar tooth buds are just beginning to form under the oral mucosa. Six months following treatment, the pups were examined intra-orally and radiographically for evidence of third molar formation. RESULTS: The two intra-oral sites that received the 20 watt diode laser treatment showed normal third molar development. The two intra-oral sites that received the 100 watt diode laser treatment did not develop third molars. CONCLUSIONS: The diode laser may be capable of selectively stopping third molar development and further studies are warranted. Animals;Dogs;Low-Level Light Therapy;Molar, Third;Tooth Eruption

[Therapeutic effects of laser therapy in patients with silent myocardial ischemia]. The technique of registration of pain and vibration sensitivity providing early diagnosis of painless ischemic heart disease is described. Basing on evident pathogenetic direction of a therapeutic action of laser therapy to different links of pathogenesis of arterial hypertension and ischemic heart disease, therapeutic effects of laser therapy in patients with painless myocardial ischemia in combination with essential hypertension were studied. Chest Pain;Exercise Test;Humans;Hypertension;Low-Level Light Therapy;Myocardial Ischemia

[The dynamics of microcirculation parameters in patients with pneumonia receiving intravenous irradiation of blood as a part of complex treatment]. The aim of the study was to evaluate the condition of the microcirculatation under the influence of low-intensity laser irradiation as a part of complex treatment of patients with pneumonia. The subjects were 62 patients with pneumonia divided into two groups. The 30 patients of the control group received only conventional medication therapy, while the 32 patients of the main group received a course of laser irradiation of blood (LIB) in addition to conventional medication. Positive dynamics in microcirculation was more prominent in the main group. In conclusion, LIB may be considered to be an effective method to correct microcirculatory disturbances in patients with pneumonia. Adult;Aged;Blood Flow Velocity;Combined Modality Therapy;Disease Progression;Drug Therapy;Female;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Lung;Male;Microcirculation;Middle Aged;Pneumonia;Ultrasonography

Effect of IR laser photobiomodulation on the repair of bone defects grafted with organic bovine bone. A major problem on modern dentistry is the recovery of bone defects of different etiologies. Biomaterials are used to improve the repair of these defects. Previous studies have shown positive effects of Laser Photobiomodulation (LPBM) on the repair of both soft and bone tissues. This study assessed histologically the effect of LPBM on the repair of surgical defects on the femur of rats filled with lyophilized bovine bone. The animals were divided into three groups: group I (control); group II (graft); group III (graft + LPBM). The animals on the irradiated groups received 16 J/cm(2) per session divided into four points around the defect being the first irradiation immediately after surgery and repeated at every 48 h during 2 weeks. Animal death occurred 15, 21, and 30 days after surgery. The specimens were routinely processed and stained with H/E and Sirius red and analyzed by light microscopy. There was histological evidence of improved collagen fiber deposition at early stages of the healing; increased amount of well-organized bone trabeculae at the end of the experimental period on irradiated animals. It is concluded that LPBM has positive biomodulative effect on the healing process bone defects. Animals;Bone Regeneration;Bone Transplantation;Cattle;Low-Level Light Therapy;Models, Animal;Photomicrography;Rats;Rats, Wistar

[The influence of laser irradiation with different power densities on incisional wound healing in healthy and diabetic rats]. INTRODUCTION: The optimal parameters of low level laser therapy (LLLT) are still under debate. It has been documented that a dose or 5 J/cm2 would be capable to accelerate the wound healing process in patients. However, the optimal delivering form, i.e. power intensity, is unknown. Therefore, the aim of our study was to compare different power densities of LLLT. MATERIALS AND METHODS: Sixteen male Sprague-Dawley rats were included in this experiment and randomized into two groups, normal healthy group and streptozotocine induced diabetic group. In general anesthesia four full thickness skin incisions were performed under standard aseptic conditions on the back of each rat and immediately closed using intradermal running suture. Three wounds were stimulated with diode laser (wavelength: 635 nm; daily dose 5 J/cm2; power densities: 1 mW/cm2, 5 mW/cm2 and 15 mW/cm2) each with different power density while the fourth wound served as control. Six days after surgery animals were sacrificed and samples removed for histological evaluation. RESULTS: Our study demonstrated that LLLT positively influences wound healing. The

most significant changes were observed in wounds stimulated at the highest power density 15 mW/cm2. Since using the highest power density the shortest time is needed to achieve the optimal daily dose of 5 J/cm2, it can be suggested that 15 mW/cm2 might be optimal parameter for such a therapy in patients. Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley;Skin;Wound Healing

Effect of cold air cooling on the incidence of postinflammatory hyperpigmentation after Q-switched Nd:YAG laser treatment of acquired bilateral nevus of Ota like macules. OBJECTIVE: To investigate the effect of cold air cooling on the incidence of postinflammatory hyperpigmentation (PIH) after laser treatment in Asian patients. DESIGN: Randomized, controlled, split-face study. SETTING: Skin laser center of a university hospital. PATIENTS: Twenty-three Thai women with acquired bilateral nevus of Ota-like macules. INTERVENTIONS: Patients were treated using a 1064-nm Q-switched Nd:YAG laser at an average fluence of 7.0 J/cm(2) using a 3-mm spot size. The same laser fluence was used on both sides of the face in individual patients. One randomly selected face side of each patient was cooled using a cold air cooling device during and 30 seconds before and after laser irradiation, and the other side was irradiated without cooling. MAIN OUTCOME MEASURES: Occurrence of PIH was objectively evaluated by measuring the melanin index using a spectrometer, and it was subjectively assessed by 2 nontreating physicians before treatment and once weekly for 4 weeks. RESULTS: Of the 21 patients who completed the study, 13 (62%) and 5 (24%) developed PIH on the cooled and uncooled sides, respectively. One patient (5%) had PIH on both the cooled and uncooled sides, and 2 (10%) did not experience PIH. The cooled sides were significantly more likely to become hyperpigmented after laser irradiation than the uncooled sides (relative risk, 2.6; 95% confidence interval, 1.13-6.00; P = .03). The clinical evaluation corresponded to the spectrometer reading. CONCLUSION: Epidermal cooling with cold air is associated with an increased risk of PIH after Q-switched Nd:YAG laser treatment. TRIAL REGISTRATION: clinicaltrials.gov Identifier: NCT00287001. Adult;Aged;Cold Temperature;Facial Neoplasms;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Middle Aged;Nevus of Ota;Skin Neoplasms

A self-reported clinical trial investigates the efficacy of 1072 nm light as an anti-ageing agent. BACKGROUND: Previous laboratory research has shown that human lymphocytes pre-irradiated with 1072 nm light are afforded some protection against subsequent ultraviolet light toxicity. OBJECTIVE: To investigate the possibility that 1072 nm light can prevent or reverse skin ageing which itself is known to be accelerated by ultraviolet light. METHODS: A randomized, prospective, double-blind, placebo-controlled, self-reporting study was performed to assess the effect of one daily treatment episode for a period of between 6 and 8 weeks on wrinkles and fine lines around the eyes as well as the appearance of bags under the eyes. RESULTS: Between 52% and 57% of volunteers were able to accurately identify an improvement in the fine lines and wrinkles of the treated areas of skin. Fewer volunteers, between 37% and 46%, observed an improvement in the bags under the treated eye or eyes, albeit with an emphatic statistical significance. CONCLUSION: Regular application of a non-thermal quantity of 1072nm light around the eyes demonstrated efficacy as an anti-ageing agent. Administration, Cutaneous;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Phototherapy;Prospective Studies;Self Administration;Skin;Skin Aging;Treatment Outcome

CO2 laser desiccation of urethral hair post-penoscrotal hypospadias repair. BACKGROUND: Proximal urethral defects account for approximately 20% of hypospadiac urethras. Previous surgical interventions involved hair-bearing genital skin which consequently resulted in a hairy urethra, which is seen mainly in older patients. OBJECTIVE: To evaluate the safety and effectiveness of the CO2 laser for urethra hair elimination. METHODS: Four men aged 18-20 years with hairy urethras, who failed electrolysis treatment, were treated with CO2 laser desiccation at low fluences (2-5 watts). The

treatments were performed at 1-month intervals. Treatment was continued until no hair was seen. Visual assessment of the hair reduction was recorded. RESULTS: Patients received two to four treatment sessions (average 3.2). On clinical assessment 3 months after the last treatment, outcome was rated excellent (no hair) in all patients. CONCLUSIONS: CO2 laser desiccation should be considered as a therapeutic modality for a hairy urethra, especially after the failure of electrolysis. Carbon Dioxide Adult;Carbon Dioxide;Hair Removal;Humans;Hypertrichosis;Hypospadias;Low-Level Light Therapy;Male;Plastic Surgery Procedures;Scrotum;Skin Transplantation;Treatment Outcome;Urethra

Comparison study of a Q-switched alexandrite laser delivered with versus without compression in the treatment of dermal pigmented lesions. BACKGROUND: The Q-switched laser is the treatment of choice when attempting to improve dermal pigmented lesions. However, purpura and dyspigmentation are frequently observed after treatment. OBJECTIVE: To compare the efficacy and complications of the Q-switched alexandrite laser when delivered with versus without compression in the treatment of dermal pigmented lesions. METHODS: Ten patients with dermal lesions were enrolled in the study. Each patient had a lesion treated with the Q-switched alexandrite laser delivered with compression. Each patient also had a lesion treated with the Q-switched alexandrite laser delivered without compression with the same fluence and spot size. The patients were evaluated for efficacy and treatment-related side effects. RESULTS: There was no significant difference in efficacy, but purpura and dyspigmentation were more likely when pigmented lesions were treated without compression. CONCLUSION: Purpura from Q-switched laser treatment in darkly pigmented skin is due to mechanical injury of blood vessels. It is well known that pressure 'diascopy' eliminates blood from cutaneous vessels by coapting the vessel lumen. In this study, we used pressure applied by a glass window on the Q-switched laser handpiece to remove cutaneous blood during laser exposure, making it possible to reduce purpura and dyspigmentation. alexandrite;Beryllium Adult;Asian People;Beryllium;Facial Dermatoses;Female;Follow-Up Studies;Humans;Hyperpigmentation;Japan;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Effect of low fluence diode laser irradiation on the hydraulic conductivity of perfused trabecular meshwork endothelial cell monolayers. OBJECTIVE: To determine the effect of low-fluence diode laser irradiation upon the fluid perfusion characteristics of cultured human trabecular meshwork cell monolayers when placed in a specially designed testing apparatus and subjected to fluid flow driven by a hydrostatic pressure gradient. METHODS: Two experimental series were conducted. In the first series, six low-fluence diode laser irradiation experiments were conducted using cultured human trabecular meshwork cell monolayers grown on filter supports. Upon reaching a steady state perfusion condition at approximately 5.0 mmHg, monolayers were irradiated at fluencies ranging from 0.2619 to 0.8571 J/cm2 using a diode laser (lambda=810 nm). Perfusion and data collection continued for 45 minutes post-irradiation, after which the monolayers were tested to determine post-experimental viability. Hydraulic conductivity values were analyzed for post-irradiation response in 2.5-minute intervals, grouped by viability. In the second series, a total of six irradiated experiments and six simultaneous nonirradiated control experiments were conducted. Fluence values of 0.3571 J/cm2 (n=3) and 0.4286 J/cm2 (n=3) were used. Hydraulic conductivity values were analyzed for post-irradiation response in 2.5-minute intervals, grouped by irradiated vs. nonirradiated control groups. RESULTS: In the first series, analysis showed that the viable monolayers exhibited a statistically significant increase in hydraulic conductivity ($p<0.001$) from 10 minutes post-irradiation onward. The non-viable monolayers exhibited a statistically significant decrease in hydraulic conductivity. In the second series, irradiated groups showed a significant difference ($p<0.001$) from nonirradiated controls from 10 minutes post-irradiation onward. CONCLUSION: Low-fluence diode laser irradiation

increases hydraulic conductivity in viable perfused TM cell monolayers when compared to baseline values or simultaneous nonirradiated controls while decreasing hydraulic conductivity in nonviable monolayers. Cytoskeletal Proteins;Eye Proteins;Glucocorticoids;Glycoproteins;Membrane Proteins;Phosphoproteins;TJP1 protein, human;Zonula Occludens-1 Protein;trabecular meshwork-induced glucocorticoid response protein;Dexamethasone Aqueous Humor;Biological Transport;Caco-2 Cells;Cells, Cultured;Cytoskeletal Proteins;Dexamethasone;Endothelial Cells;Eye Proteins;Glucocorticoids;Glycoproteins;Humans;Hydrostatic Pressure;Low-Level Light Therapy;Membrane Proteins;Phosphoproteins;Trabecular Meshwork;Zonula Occludens-1 Protein

Port-wine-stain-associated dermatitis: implications for cutaneous vascular laser therapy. Port-wine stains are congenital vascular malformations affecting 0.3% to 0.5% of infants. Dermatitis occurring exclusively or most severely within port-wine stains has been described in the literature. Traditionally, topical corticosteroid therapy has been used for the treatment of dermatitis, while pulseddye laser treatment is considered a safe and effective means of lightening the appearance of congenital port-wine stains. To describe the development of port-wine stain-associated dermatitis as well as a rational treatment approach to these patients, we studied three children with facial, limb, or truncal port-wine stains who developed dermatitis within the congenital vascular malformation either prior to or during treatment with pulseddye laser. Laser therapy of dermatitis-affected areas was subsequently deferred pending resolution of the dermatitis with topical corticosteroid or topical calcineurin inhibitor treatment. While pulseddye laser therapy is an effective means of lightening port-wine stains and achieving lasting resolution of any associated dermatitis, this therapy to dermatitis-affected areas should be postponed until the inflammation resolves to minimize the risk of laser-associated adverse effects. Anti-Inflammatory Agents Anti-Inflammatory Agents;Dermatitis;Female;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Port-Wine Stain

The effect of low reactive-level laser therapy (LLLT) with helium-neon laser on operative wound healing in a rat model. The effect of low reactive-level laser therapy (LLLT) with a He-Ne laser on operative wound healing was investigated in a rat model. 10-millimeter surgical wounds were created on the backs of Sprague Dawley rats, and animals were assigned to one of eleven groups (n=5). Ten groups received either 8.5 mW or 17.0 mW irradiation of 15 seconds LLLT a day with one of five different irradiation frequencies, i.e. daily (from the 1st to 6th day following surgery), every other day (the 1st, 3rd, and 5th day), on only the 1st day, on only the 3rd day, and on only the 5th day; the 1st day was the day following the surgery. The control group received no irradiation. A skin specimen was harvested from the dorsal thoracic region on the 7th day to measure the rupture strength. The control group had the lowest rupture strength (5.01 N), and the 17.0 mW every other day irradiation group had the highest rupture strength (13.01 N). Statistical differences were demonstrated in the 8.5 mW irradiation setting between the every other day irradiation group and the control group ($p<0.05$); and in 17.0 mW irradiation setting between the every day irradiation, the every other day, and the 1st day only groups vs. the control group ($p<0.01$). Histological examination demonstrated that wound healing in the 17.0 mW every other day irradiation group was promoted most significantly such as the prevention of excessive inflammation, increased formation of collagen fibers, and recovery in continuity of tissues. The control group showed poor wound healing and the other experimental groups showed intermediate healing. Thus LLLT with a He-Ne laser was found to promote the healing of operative wounds in the present rat model, in which the most favorable application of LLLT was the 17.0 mW setting of 15 seconds a day with a frequency of every other day. Animals;Disease Models, Animal;Laser Therapy;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Tensile Strength;Wound Healing;Wounds and Injuries

Biostimulation of Na,K-ATPase by low-energy laser irradiation (685 nm, 35 mW): comparative effects in membrane, solubilized and DPPC:DPPE-liposome reconstituted enzyme. OBJECTIVE: The aim

of the present work was to investigate the effect of low-energy laser irradiation (685 nm, 35 mW) on the ATPase activity of the different forms of the Na,K-ATPase. METHODS: Membrane-bound and solubilized (alphabeta)(2) form of Na,K-ATPase was obtained from the dark red outer medulla of the kidney and proteoliposomes of DPPC:DPPE and Na,K-ATPase was prepared by the co-solubilization method. Irradiations were carried out at 685 nm using an InGaAlP diode laser. RESULTS: The ATPase activity of the membrane fraction was not altered with exposition to irradiation doses between 4 and 24 J/cm(2). However, with irradiation doses ranging from 32 to 40 J/cm(2), a 28% increase on the ATPase activity was observed while when using up to 50 J/cm(2) no additional enhancement was observed. When biostimulation was done using the solubilized and purified enzyme or the DPPC:DPPE-liposome reconstituted enzyme, an increase of about 36-40% on the ATPase activity was observed using only 4-8 J/cm(2). With irradiation above these values (24 J/cm(2)) no additional increase in the activity was observed. These studies revealed that the biostimulation of ATPase activity from different forms of the Na,K-ATPase is dose dependent in different ranges of irradiation exposure. The stimulation promoted by visible laser doses was modulated and the process was reverted after 2 h for the enzyme present in the membrane and after about 5 h for the solubilized or the reconstituted in DPPC:DPPE-liposomes. Liposomes;Membrane Proteins;Phosphatidylethanolamines;1,2-Dipalmitoylphosphatidylcholine;1,2-dipalmitoyl-3-phosphatidylethanolamine;Adenosine Triphosphate;Sodium-Potassium-Exchanging ATPase 1,2-Dipalmitoylphosphatidylcholine;Adenosine Triphosphate;Animals;Enzyme Activation;Kidney Medulla;Kinetics;Lasers, Semiconductor;Liposomes;Membrane Proteins;Phosphatidylethanolamines;Rabbits;Sodium-Potassium-Exchanging ATPase;Solubility

Effectiveness of low-level laser therapy in temporomandibular joint disorders: a placebo-controlled study. OBJECTIVE: Low-level laser therapy (LLLT) treatment for pain caused by temporomandibular joint disorders (TMD) was investigated in a controlled study comparing applied energy density, subgroups of TMD, and duration of disorders. BACKGROUND DATA: Although LLLT is a physical therapy used in the treatment of musculoskeletal disorders, there is little evidence for its effectiveness in the treatment of TMD. METHODS: The study group of 61 patients was treated with 10 J/cm(2) or 15 J/cm(2), and the control group of 19 patients was treated with 0.1 J/cm(2). LLLT was performed by a GaAlAs diode laser with output of 400 mW emitting radiation wavelength of 830 nm in 10 sessions. The probe with aperture 0.2 cm(2) was placed over the painful muscle spots in the patients with myofascial pain. In patients with TMD arthralgia the probe was placed behind, in front of, and above the mandibular condyle, and into the meatus acusticus externus. Changes in pain were evaluated by self-administered questionnaire. RESULTS: Application of 10 J/cm(2) or 15 J/cm(2) was significantly more effective in reducing pain compared to placebo, but there were no significant differences between the energy densities used in the study group and between patients with myofascial pain and temporomandibular joint arthralgia. Results were marked in those with chronic pain. CONCLUSION: The results suggest that LLLT (application of 10 J/cm(2) and 15 J/cm(2)) can be considered as a useful method for the treatment of TMD-related pain, especially long lasting pain. Placebos Adolescent;Adult;Aged;Chi-Square Distribution;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Placebos;Surveys and Questionnaires;Temporomandibular Joint Disorders;Treatment Outcome

Effect of feldspathic ceramic surface treatments on bond strength to resin cement. OBJECTIVE: The objective of this study was to evaluate the shear bond strength of resin cement to feldspathic ceramic with various surface treatments. BACKGROUND DATA: Application of adhesive techniques is well established in restorative dentistry, yet the influence of surface treatments on the bond strength of resin cement to ceramic materials prior to luting or repair procedures remains unclear. METHODS: One hundred samples made of a feldspathic ceramic were divided into 10 groups (n = 10): (1) control

(no treatment); (2) 10% hydrofluoric acid (HF); (3) 37% phosphoric acid (H(3)PO(4)); (4) 1.23% acidulated phosphate fluoride acid (APF); (5) diamond bur; (6) air abrasion with Al(2)O(3); (7) Al(2)O(3) + HF; (8) CoJet-Sand; (9) Er:YAG laser, and (10) Al(2)O(3) + Er:YAG laser. Afterwards, silane was applied and a resin cement cylinder was built. After 24 hours at 37 degrees C, the prepared specimens were submitted to a shear bond strength test and stereoscopic evaluation to determine the type of failure after rupture. RESULTS: Bond strength means were statistically different for the different surface treatments. The highest bond strengths were obtained with HF, CoJet-Sand, and Al(2)O(3). The groups treated with Al(2)O(3) + Er:YAG laser, diamond bur, and Al(2)O(3) + HF had moderate bond strengths. The lowest bond strengths were obtained with H(3)PO(4), APF, Er:YAG laser, and the control group. CONCLUSIONS: The HF, CoJet-Sand, and Al(2)O(3) techniques were the most effective surface treatments. The null surface treatment proposed with the Er:YAG laser showed low bond strength, and seems to be inadequate for clinical use with the parameters tested. Aluminum Silicates;Potassium Compounds;Resin Cements;feldspar Acid Etching, Dental;Air Abrasion, Dental;Aluminum Silicates;Ceramics;Dental Bonding;Dental Restoration, Permanent;Humans;Low-Level Light Therapy;Materials Testing;Potassium Compounds;Resin Cements;Surface Properties;Tensile Strength

The effects of laser irradiation on osteoblast and osteosarcoma cell proliferation and differentiation in vitro. OBJECTIVE: The aim of this study was to investigate the effects of 670-nm, 780-nm, and 830-nm laser irradiation on cell proliferation of normal primary osteoblast (MC3T3) and malignant osteosarcoma (MG63) cell lines in vitro. BACKGROUND: Some studies have shown that laser phototherapy is able to stimulate the osteogenesis of bone tissue, increasing osteoblast proliferation and accelerating fracture consolidation. It has been suggested that laser light may have a biostimulatory effect on tumor cells. However, the mechanism by which the laser acts on cells is not fully understood. MATERIALS AND METHODS: Neonatal, murine, calvarial, osteoblastic, and human osteosarcoma cell lines were studied. A single laser irradiation was performed at three different wavelengths, at the energies of 0.5, 1, 5, and 10 J/cm(2). Twenty-four hours after laser irradiation, cell proliferation and alkaline phosphatase assays were assessed. RESULTS: Osteoblast proliferation increased significantly after 830-nm laser irradiation (at 10 J/cm(2)) but decreased after 780-nm laser irradiation (at 1, 5, and 10 J/cm(2)). Osteosarcoma cell proliferation increased significantly after 670-nm (at 5 J/cm(2)) and 780-nm laser irradiation (at 1, 5, and 10 J/cm(2)), but not after 830-nm laser irradiation. Alkaline phosphatase (ALP) activity in the osteoblast line was increased after 830-nm laser irradiation at 10 J/cm(2), whereas ALP activity in the osteosarcoma line was not altered, regardless of laser wavelength or intensity. CONCLUSION: Based on the conditions of this study, we conclude that each cell line responds differently to specific wavelength and dose combinations. Further investigations are required to investigate the physiological mechanisms responsible for the contrasting outcomes obtained when using laser irradiation on cultured normal and malignant bone cells. Biomarkers;Alkaline Phosphatase Alkaline Phosphatase;Analysis of Variance;Animals;Biomarkers;Cell Differentiation;Cell Line;Cell Proliferation;Cell Transformation, Neoplastic;Humans;In Vitro Techniques;Low-Level Light Therapy;Mice;Osteoblasts;Osteogenesis;Osteosarcoma;Skull;Tumor Cells, Cultured

Effect of the diode laser on bacteremia associated with dental ultrasonic scaling: a clinical and microbiological study. OBJECTIVE: The purpose of this study is to evaluate the potential use of diode lasers (DLs) to reduce bacteremia associated with ultrasonic scaling (US). Furthermore, the clinical efficacy of DLs as an adjunct to US in the treatment of gingivitis was investigated. BACKGROUND DATA: Recently, lasers have found new applications in dental practice. The benefits of the use of DLs as an adjunct to US have not yet been determined. METHODS: Twenty-two gingivitis patients were treated using a split-mouth study design in which each side was randomly treated by

US alone or DL followed by US (DL + US). Blood samples were drawn just before and during US in each treatment step to detect induced bacteremia. Clinical parameters including plaque index, sulcus bleeding index, probing depth, and relative attachment level were recorded at baseline and 4 weeks postoperatively. RESULTS: Bacteremia was detected in 15 patients (68%) after US alone, and in 8 patients following DL + US (36%). The reduction of the incidence of odontogenic bacteremia during US after the application of DL was statistically significant ($p < 0.05$). Clinical signs improved eventually, with no significant differences between the two treatment regimens ($p > 0.05$). CONCLUSIONS: Application of DL energy can reduce bacteria in gingival crevices which may reduce bacteremia following US. The use of DL did not show additional clinical influence on gingival healing after treatment of gingivitis with US. Adult;Bacteremia;Chi-Square Distribution;Dental Scaling;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Pocket;Pilot Projects;Root Planing;Treatment Outcome;Ultrasonic Therapy

Low-level laser therapy (GaAs lambda = 904 nm) reduces inflammatory cell migration in mice with lipopolysaccharide-induced peritonitis. OBJECTIVE: This study was designed to study the effect of an infrared low-level laser (GaAs lambda = 904 nm, 4 mW) on inflammatory cell migration in lipopolysaccharide (LPS)-induced peritonitis in mice. BACKGROUND DATA: It has been suggested that red wavelengths of low-level laser therapy (LLLT) can exert anti-inflammatory effects, but little is known about the anti-inflammatory effects of infrared lasers. Peritonitis is a potentially life-threatening inflammatory condition that may be suitable for studying anti-inflammatory effects of infrared lasers. METHODS: Sixty male mice were randomly divided into five groups, and one group was given an intraperitoneal sterile saline injection. In the remaining four groups, peritonitis was induced by an intraperitoneal LPS injection. Animals in three of the LPS groups were irradiated at a single point over the peritoneum with doses of 3 J/cm(2), 7.5 J/cm(2), and 15 J/cm(2), respectively. The fourth group injected with LPS was an LPS-control group. RESULTS: At 6 hours after injection the groups irradiated with doses of 3 J/cm(2) and 7.5 J/cm(2) had a reduced number of neutrophil cells in the peritoneal cavity compared with the LPS-control group, and there were significant differences between the number of neutrophils in the peritoneal cavity between the LPS-control group and groups irradiated with doses of 3 J/cm(2) (-42%) and 7.5 J/cm(2) (-70%). In the group irradiated with 15 J/cm(2), neutrophil cell counts were lower than, but not significantly different from, LPS controls (-38%; $p = 0.07$). At 24 hours after injection, both neutrophil and total leukocyte cell counts were lower in all the irradiated groups than in the LPS controls. The 3-J/cm(2) exposure group showed the best results at 24 hours, with reductions of 77% in neutrophil and 49% in leukocyte counts. CONCLUSION: Low-level laser therapy (904 nm) can reduce inflammatory cell migration in mice with LPS-induced peritonitis in a dose-dependent manner. Lipopolysaccharides Animals;Cell Movement;Inflammation;Leukocyte Count;Lipopolysaccharides;Low-Level Light Therapy;Male;Mice;Peritonitis;Random Allocation

Effects of low-level He-Ne laser irradiation on the gene expression of IL-1beta, TNF-alpha, IFN-gamma, TGF-beta, bFGF, and PDGF in rat's gingiva. Biostimulatory effects of laser irradiation on cell proliferation and wound healing has been reported. However, little is known about the molecular basis of the mechanism. Interleukin 1beta (IL-1beta), tumor necrotic factor-alpha (TNF-alpha), and interferon-gamma (IFN-gamma) play an important role in inflammation, while platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-beta) and blood-derived fibroblast growth factor (bFGF) are the most important growth factors of periodontal tissues. The aim of this study was to investigate the effect of low-level He-Ne laser on the gene expression of these mediators in rats' gingiva and mucosal tissues. Twenty male Wistar rats were randomly assigned into four groups (A(24), A(48), B(24), B(48)) in which A(24) and A(48) were cases and B(24), B(48) were controls. An incision was made on gingiva and mucosa of the labial surface of the rats' mandibular

incisors. Group A(24) was irradiated twice with 24 hours interval, while the inflamed tissues of group A(48) was irradiated three times with continuous He-Ne laser (632.8 nm) at a dose of 7.5 J/cm2 for 300 s. An energy of 5.1 J was given to the 68 mm(2) irradiation zone. Rats were killed 30 min after the last irradiation of case and control groups, then excisional biopsy was performed. Gene expression of the cytokines was measured using reverse transcriptase-polymerase chain reaction (RT-PCR) technique. Results were analyzed with Kruskal-Wallis and Mann-Whitney U tests. The gene expression of IL-1beta and IFN-gamma was significantly inhibited in the test groups ($P < 0.05$), while the gene expression of PDGF and TGF-beta were significantly increased ($P < 0.05$). The case and control groups did not have a significant difference in the gene expression of TNF-alpha and bFGF ($P > 0.05$). These findings suggest that low-level He-Ne laser irradiation decreases the amount of inflammation and accelerates the wound healing process by changing the expression of genes responsible for the production of inflammatory cytokines. Interleukin-1beta;Platelet-Derived Growth Factor;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Fibroblast Growth Factor 2;Helium;Neon;Interferon-gamma Animals;Fibroblast Growth Factor 2;Gene Expression;Gingiva;Helium;Interferon-gamma;Interleukin-1beta;Low-Level Light Therapy;Male;Neon;Platelet-Derived Growth Factor;Random Allocation;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Statistics, Nonparametric;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha

Recalcitrant rosacea successfully treated with multiplexed pulsed dye laser. There are few treatments that address both papulopustular and telangiectatic components of rosacea. We present a case of rosacea that was unresponsive to treatment with antibiotics. We report the novel use of a new laser technology, the multiplexed laser, for treatment of both papular and telangiectatic rosacea. Anti-Bacterial Agents;Minocycline Administration, Cutaneous;Anti-Bacterial Agents;Chronic Disease;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Middle Aged;Minocycline;Rosacea;Time Factors

The use of light-emitting diode therapy in the treatment of photoaged skin. BACKGROUND: Light-emitting diode (LED) therapy is an increasingly popular methodology for the treatment of sun damage. Combination use of light wavelengths reported to stimulate collagen synthesis and accelerate fibroblast-myofibroblast transformation may display a composite rejuvenative effect. OBJECTIVE: To clinically assess reduction in sun damage signs following a 5-week course of LED therapy and to assess subject's perception of the treatment. METHODS: Thirteen subjects with wrinkles or fine lines in the periorbital and nasolabial region and those presenting Glogau scale photodamage grade II-III received nine 20-min duration light treatments using the Omnilux LED system. The treatments combined wavelengths of 633 and 830 nm at fluences of 126 and 66 J/cm(2), respectively. Sun-damage reduction was assessed at 6, 9, and 12 weeks by clinical photography and patient satisfaction scores. RESULTS: The majority of subjects displayed "moderate" (50%) or "slight" (25%) response to treatment at investigator assessment. Treatment of the periorbital region was reported more effective than the nasolabial region. At 12-week follow-up, 91% of subjects reported improved skin tone, and 82% reported enhanced smoothness of skin in the treatment area. CONCLUSION: Good response to LED therapy has been shown in this modest sample. Larger trials are needed to assess optimum frequency of light treatments and overall treatment time. Adult;Cosmetic Techniques;Face;Female;Follow-Up Studies;Humans;Infrared Rays;Male;Middle Aged;Phototherapy;Rejuvenation;Skin Aging;Treatment Outcome

In chronic low back pain, low level laser therapy combined with exercise is more beneficial than exercise alone in the long term: a randomised trial. QUESTION: Is low level laser therapy an effective adjuvant intervention for chronic low back pain? DESIGN: Randomised trial with concealed allocation, blinded assessors and intention-to-treat analysis. PARTICIPANTS: Sixty-one patients who

had low back pain for at least 12 weeks. INTERVENTION: One group received laser therapy alone, one received laser therapy and exercise, and the third group received placebo laser therapy and exercise. Laser therapy was performed twice a week for 6 weeks. OUTCOME MEASURES: Outcomes were pain severity measured using a 10-cm visual analogue scale, lumbar range of motion measured by the Schober Test and maximum active flexion, extension and lateral flexion, and disability measured with the Oswestry Disability Index on admission to the study, after 6 weeks of intervention, and after another 6 weeks of no intervention. RESULTS: There was no greater effect of laser therapy compared with exercise for any outcome, at either 6 or 12 weeks. There was also no greater effect of laser therapy plus exercise compared with exercise for any outcome at 6 weeks. However, in the laser therapy plus exercise group pain had reduced by 1.8 cm (95% CI 0.1 to 3.3, $p = 0.03$), lumbar range of movement increased by 0.9 cm (95% CI 0.2 to 1.8, $p < 0.01$) on the Schober Test and by 15 deg (95% CI 5 to 25, $p < 0.01$) of active flexion, and disability reduced by 9.4 points (95% CI 2.7 to 16.0, $p = 0.03$) more than in the exercise group at 12 weeks. CONCLUSION: In chronic low back pain low level laser therapy combined with exercise is more beneficial than exercise alone in the long term.
Adult;Chronic Disease;Combined Modality Therapy;Disability Evaluation;Exercise;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Range of Motion, Articular;Treatment Outcome

[Efficacy of low-intensity laser radiation and antibacterial therapy in the treatment of chronic prostatitis in the presence of sexually transmitted infections]. We studied 94 patients with chronic prostatitis (CP) in combination with urogenital chlamydiasis. The patients were divided into three groups. Group 1 consisted of 32 patients with bacterial prostatitis and sexually transmitted infection (STI). They were treated with fromilid in a dose 500 mg twice a day. Group 2 (n = 27) received also low-intensity laser radiation (LILR) on the prostatic gland. Group 3 patients (n = 35) with abacterial prostatitis were given fromilid (500 mg twice a day). We studied prostatic hemodynamics with color doppler mapping. A specific feature of prostatic vascularisation in CP and STI versus healthy subjects is heterogeneous decline of vessels density in ischemic zones with parallel decrease in these vessels diameter. A peripheral prostatic zone in CP patients with STI was characterized by lower vascularisation than central one. This deteriorates the course of the disease. The results of the study show that adjuvant LILR in CP patients with STI raises efficacy of therapy by 11%. Investigation of prostate vascularisation and hemodynamics of its vessels in CP patients with STI using transrectal ultrasonography and dopplerography provide detailed information about prostatic structure allowing for lesion zones. This facilitates choice of an optimal complex treatment with application of LELR in peripheral inflammation of the prostate. Anti-Bacterial Agents;Vasodilator Agents;Clarithromycin;Pentoxifylline Adolescent;Adult;Anti-Bacterial Agents;Blood Flow Velocity;Chlamydia Infections;Chronic Disease;Clarithromycin;Combined Modality Therapy;Drug Therapy, Combination;Humans;Low-Level Light Therapy;Male;Middle Aged;Pentoxifylline;Prostate;Prostatitis;Sexually Transmitted Diseases, Bacterial;Treatment Outcome;Ultrasonography, Doppler, Color;Vasodilator Agents

The effect of mastectomy and radiotherapy for breast carcinoma on soft tissues of the shoulder and its joint mobility among Egyptian patients. Patients with post mastectomy soft tissue shoulder disorders usually benefit from various lines of physiotherapy treatment. However, the controversy about their efficacy persists. The aim of this work was to study and assess the efficacy of each, and to identify the best intervention. One hundred female patients with ipsilateral post mastectomy shoulder problems were enrolled in the study, from September 2003 until December 2004. They were followed up for 32 weeks. Mastectomy, both radical and conservative and axillary lymph node clearance, was the standard surgery applied for operable breast carcinoma in this series. Clinical examination was followed by testing for the shoulder complaint by measuring maximal protrusion at

the inferior scapular angle, scapular stabilization and the lift-off tests. Approved physiotherapy modalities were then applied, viz: no treatment (randomly chosen 12 patients), passive and active motion therapy (14 patients), oral diclofenac sodium (19 patients), local triamcinilone injection (40 patients) and manually applied low intensity laser therapy (15 patients). Assessment was by determining overall success rate for each intervention modality. Intervention outcome was assessed at 8, 16, and 32 weeks as shown by physical examination using the healthy shoulder as a reference, and by measuring restricted mobility during passive lateral rotation and glenohumeral abduction. "Success rate" was determined separately for each group at the end of the intervention period. The applied surgery was followed by radiotherapy in 96%, chemotherapy in 24% and both in 11%. The presenting post mastectomy symptoms at the shoulder were pain (100%), shoulder weakness (88%), winging of the scapula (11%) and inability to perform everyday shoulder movements (23%). Evaluation was by overall improvement score. The results were: 14.3% for untreated patients, 43.3% for those treated by motion therapy, 42% for diclofenac therapy, 80.7% for local triamcinolone, and lastly 68% for low intensity laser therapy. All treatment regimens for shoulder disabilities in those patients gave little long-term advantage, local steroid injections were the most effective. Low level laser therapy may augment its effect. It is concluded that all treatment regimens provide little long-term advantage; however, trimcinilone local injections may be the most useful in terms of pain relief and improvement in shoulder movement. Breast Neoplasms;Connective Tissue;Egypt;Female;Humans;Mastectomy;Middle Aged;Neuromuscular Diseases;Radiotherapy;Shoulder Joint;Treatment Outcome

The effect of low level laser irradiation on adult human adipose derived stem cells. This study investigated the effect of low level laser irradiation on primary cultures of adult human adipose derived stem cells (ADSC) using a 635-nm diode laser, at 5 J/cm(2) with a power output of 50.2 mW and a power density of 5.5 mW/cm(2). Cellular morphology did not appear to change after irradiation. Using the trypan blue exclusion test, the cellular viability of irradiated cells increased by 1% at 24 h and 1.6% at 48 h but was not statistically significant. However, the increase of cellular viability as measured by ATP luminescence was statistically significant at 48 h ($p < 0.05$). Proliferation of irradiated cells, measured by optical density, resulted in statistically significant increases in values compared to nonirradiated cells ($p < 0.05$) at both time points. Western blot analysis and immunocytochemical labeling indicated an increase in the expression of stem cell marker beta1-integrin after irradiation. These results indicate that 5 J/cm(2) of laser irradiation can positively affect human adipose stem cells by increasing cellular viability, proliferation, and expression of beta1-integrin. Integrin beta Chains;Adenosine Triphosphate;Trypan Blue Adenosine Triphosphate;Adipocytes;Blotting, Western;Cell Differentiation;Cells, Cultured;Humans;Integrin beta Chains;Low-Level Light Therapy;Stem Cells;Trypan Blue

Low intensity laser application in temporomandibular disorders: a phase I double-blind study.
The purpose of this study was to evaluate the effectiveness of low intensity laser therapy (LILT) for the control of pain from temporomandibular disorder (TMD) in a random and double-blind research design. Forty-eight (48) patients presenting temporomandibular joint (TMJ) pain were divided into an experimental group (GI) and a placebo group (GII). The sample was submitted to the treatment with infrared laser (780 nm, 70 mW, 10 s, 89.7 J/cm2) applied in continuous mode on the affected temporomandibular region, at one point: inside the external auditive duct toward the retrodiskal region, twice a week, for four weeks. For the control group, two identical probes (one active and one that does not emit radiation) were used unknown by the clinician and the subjects. A tip planned for laser acupuncture was used and connected to the active point of the probe. The parameter evaluated was the intensity of pain after palpation of the condylar lateral pole, pre-auricular region and external auditive duct, according to the Visual Analogue Scale (VAS). Four evaluations were performed: Ev1

(before laser application), Ev2 (after 4th application), Ev3 (after 8th application) and Ev4 (30 days after the last application). Data were submitted to statistical analysis. The results showed a decrease in the pain level mainly for the active probe. Among the evaluations, the Ev3 exhibited lower sensitivity to palpation. In conclusion, the results show that low intensity laser is an effective therapy for the pain control of subjects with TMD. Analysis of Variance;Double-Blind Method;Facial Pain;Humans;Low-Level Light Therapy;Pain Measurement;Temporomandibular Joint Disorders

Management of postoperative morbidity after third molar surgery: a review of the literature. BACKGROUND: Patients' complaints of pain, swelling and limitation in mouth opening following lower third molar surgery is an important factor affecting their daily life. The aim of this study was to review the different methods of minimizing postoperative morbidity following lower third molarsurgery. METHODS: Relevant literatures from Scirus, Pubmed and Medline computerized search on management of postoperative morbidity following third molar surgery were evaluated and highlighted. Information was also obtained from texts and journals in the medical libraries of Federal School of Dental Technology and the University of Nigeria both in Enugu. RESULTS: studies reviewed have not pointed to the effectiveness of the routine use of any systemic or local agent for minimizing postoperative morbidity after third molar surgery without other undesirable effects. Oral surgeons across the world have devised several methods, which include the use of drugs, different surgical techniques, laser therapy and the use of drains. CONCLUSION: Postoperative morbidity after the surgical removal of impacted lower third molar still remains an important factor in patients' recovery and comfort. The awareness of different methods of reducing morbidity after lower third molar surgery would help both the surgeon and the patients in the management of impacted lower third molar. Adrenal Cortex Hormones;Analgesics Adrenal Cortex Hormones;Analgesics;Cold Temperature;Hot Temperature;Humans;Low-Level Light Therapy;Molar, Third;Postoperative Complications;Tooth Extraction

Transcranial near-infrared light therapy improves motor function following embolic strokes in rabbits: an extended therapeutic window study using continuous and pulse frequency delivery modes. Photon or near-infrared light therapy (NILT) may be an effective neuroprotective method to reduce behavioral dysfunction following an acute ischemic stroke. We evaluated the effects of continuous wave (CW) or pulse wave (P) NILT administered transcranially either 6 or 12 h following embolization, on behavioral outcome. For the studies, we used the rabbit small clot embolic stroke model (RSCEM) using three different treatment regimens: 1) CW power density of 7.5 mW/cm(2); 2) P1 using a frequency of 300 mus pulse at 1 kHz or 3) P2 using a frequency of 2 ms pulse at 100 Hz. Behavioral analysis was conducted 48 h after embolization, allowing for the determination of the effective stroke dose (P(50)) or clot amount (mg) that produces neurological deficits in 50% of the rabbits. Using the RSCEM, a treatment is considered beneficial if it significantly increases the P(50) compared with the control group. Quantal dose-response analysis showed that the control group P(50) value was 1.01+/-0.25 mg (n=31). NILT initiated 6 h following embolization resulted in the following P(50) values: (CW) 2.06+/-0.59 mg (n=29, P=0.099); (P1) 1.89+/-0.29 mg (n=25, P=0.0248) and (P2) 1.92+/-0.15 mg (n=33, P=0.0024). NILT started 12 h following embolization resulted in the following P(50) values: (CW) 2.89+/-1.76 mg (n=29, P=0.279); (P1) 2.40+/-0.99 mg (n=24, P=0.134). At the 6-h post-embolization treatment time, there was a statistically significant increase in P(50) values compared with control for both pulse P1 and P2 modes, but not the CW mode. At the 12-h post-embolization treatment time, neither the CW nor the P1 regimens resulted in statistically significant effect, although there was a trend for an improvement. The results show that P mode NILT can result in significant clinical improvement when administered 6 h following embolic strokes in rabbits and should be considered for clinical development. Animals;Behavior, Animal;Disease Models, Animal;Dose-Response Relationship, Radiation;Intracranial Embolism;Low-Level Light

Therapy;Male;Motor Activity;Rabbits;Severity of Illness Index;Spectrum Analysis;Stroke;Time Factors;Treatment Outcome
The use of the pulsed dye laser in a case of an occupationally acquired arteriovenous malformation. Arteriovenous Malformations;Female;Humans;Low-Level Light Therapy;Masks;Middle Aged;Nose;Recurrence;Risk Factors;Treatment Outcome
Laser treatment for stroke. Low-level laser therapy is an irradiation technique that has the ability to induce biological processes using photon energy. There are studies showing proliferation and angiogenesis after irradiation in skeletal muscle post-myocardial infarction tissue cells. Most evidence of efficacy is based on the increase in energy state and the activation of mitochondrial pathways. In the brain, there is similar evidence of cellular activity with laser irradiation. In vivo studies reinforced the efficacy of this technique for a better neurological and functional outcome post-stroke. The evidence is based on in vivo animal studies of various models and one human clinical study. Although the data is very promising, some fundamental questions remain to be answered, such as the exact mechanism along the cascade of post-stroke interconnective molecular disturbance, the optimal technique and time of treatment, and the long-term safety aspects. The answers to these questions are expected to evolve within the next few years. Animals;Brain;Humans;Low-Level Light Therapy;Stroke
The analgesic effectiveness of laser therapy in patients with gonarthrosis: an evaluation. Background. Osteoarthrosis is a very common disease of the musculo-skeletal system. Laser therapy can be used to alleviate the pain associated with this syndrome, which markedly impinge the patients physical comfort and limit physical activity. Material and methods. The research involved 32 patients (26 women and 6 men, average age 57.3 A+/-12.1 years) with pain complaints in one knee joint and radiologically confirmed degenerative changes. The control group consisted of 32 matched patients awaiting treatment. Laser biostimulation was applied with a semiconductor laser (400 mW, wave length 810 nm). Contact (point) irradiation was applied, with a surface energy density of 12.7 J/cm2. One series of 10 procedures was performed on one knee joint, 5 days a week. Pain intensity was evaluated with the Visual Analogue Scale (VAS) and a modified version of the Laitinen questionnaire. Results. In 29 patients (91%) there was a statistically significant reduction in pain complaints in the affected knee measured by VAS. In 19 patients (59%) there was a statistically significant reduction in the frequency and intensity of pain complaints on the Laitinen questionnaire. The improvement in daily motor activity and the reduced use of antalgesic drugs were not statistically significant. Conclusions. Laser biostimulation in patients with knee pain reduces symptoms on the VAS, and significantly reduces the intensity and frequency of pain as assessed by the Laitinen questionnaire. One series of laser treatments has no significant effect on motor activity and use of painkillers in patients with chronic knee pain due to osteoarthrosis.
Plasmonic photothermal therapy (PPTT) using gold nanoparticles. The use of lasers, over the past few decades, has emerged to be highly promising for cancer therapy modalities, most commonly the photothermal therapy method, which employs light absorbing dyes for achieving the photothermal damage of tumors, and the photodynamic therapy, which employs chemical photosensitizers that generate singlet oxygen that is capable of tumor destruction. However, recent advances in the field of nanoscience have seen the emergence of noble metal nanostructures with unique photophysical properties, well suited for applications in cancer phototherapy. Noble metal nanoparticles, on account of the phenomenon of surface plasmon resonance, possess strongly enhanced visible and near-infrared light absorption, several orders of magnitude more intense compared to conventional laser phototherapy agents. The use of plasmonic nanoparticles as highly enhanced photoabsorbing agents has thus introduced a much more selective and efficient cancer therapy strategy, viz. plasmonic photothermal therapy (PPTT). The synthetic tunability of the

optothermal properties and the bio-targeting abilities of the plasmonic gold nanostructures make the PPTT method furthermore promising. In this review, we discuss the development of the PPTT method with special emphasis on the recent in vitro and in vivo success using gold nanospheres coupled with visible lasers and gold nanorods and silica-gold nanoshells coupled with near-infrared lasers. Gold Absorption;Animals;Gold;Humans;Hyperthermia, Induced;Metal Nanoparticles;Neoplasms;Scattering, Radiation;Surface Plasmon Resonance

Novel use of 308-nm excimer laser to treat a primary cutaneous CD30+ lymphoproliferative nodule. CD30+ cutaneous lymphoproliferative disorders, the second most common cutaneous T cell lymphoma after mycosis fungoides, represent a spectrum of conditions ranging from lymphomatoid papulosis to borderline CD30+ lesions to anaplastic large-cell lymphoma. We report the case of a solitary cutaneous CD30+ lymphoproliferative nodule that was successfully treated with a 308-nm excimer laser. Our findings suggest that the 308-nm excimer laser may be a safe, effective, and well-tolerated therapy for primary localized CD30+ cutaneous lymphoproliferative lesions. Ki-1 Antigen Diagnosis, Differential;Humans;Insect Bites and Stings;Ki-1 Antigen;Low-Level Light Therapy;Lymphoma, Large-Cell, Anaplastic;Lymphomatoid Papulosis;Male;Middle Aged;Time Factors;Treatment Outcome

Case reports: clearance of lentigines in Japanese men with the long-pulsed alexandrite laser. Benign pigmented lesions can be effectively treated with multiple modalities including lasers. The treatment of pigmented lesions in phototype IV skin is more complicated and challenging given the risk of pigmentation changes and scarring. We present the novel use of the long-pulsed Alexandrite 755 nm laser for the treatment of solar lentigines in sun-reactive phototype IV skin of patients of Japanese decent. Our Japanese patients cleared with one treatment with no pigmentary changes or scarring. No recurrences were noted to date. The long-pulsed Alexandrite 755-nm laser is a novel, safe, and effective treatment of solar lentigines in Japanese patients. alexandrite;Beryllium Asian;Beryllium;Humans;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Sunlight;Treatment Outcome

[Pulsed dye laser treatment of acne. Study of clinical efficacy and mechanism of action]. INTRODUCTION: Acne vulgaris is a multifactorial disease of the pilosebaceous unit characterized by the development of inflammatory (papules, pustules, cysts) and/or non inflammatory lesions (open and closed comedones) that may progress to scars. The increase of bacterial resistances, adverse effects and teratogenicity of retinoids and lack of response to usual therapies have led to investigate new therapeutic alternatives for acne. MATERIAL AND METHOD: We studied 36 patients with mild to moderate acne vulgaris. We performed treatment every 4 weeks using pulsed dye laser therapy with a wavelength of 585 nm and pulse duration of 350 microseconds. RESULTS: At twelve weeks of treatment a decrease of 27 % of non inflammatory lesions and of 57 % of active lesions was observed. Treatment was well tolerated and considered positive, in terms of healing, in 25 patients. CONCLUSIONS: Pulse dye laser therapy mainly improves inflammatory lesions of acne with few adverse effects. Porphyrins Acne Vulgaris;Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Patient Acceptance of Health Care;Porphyrins;Propionibacterium acnes;Radiation Tolerance;Treatment Outcome

Reciprocity of exposure time and irradiance on energy density during photoradiation on wound healing in a murine pressure ulcer model. BACKGROUND: Energy density and exposure time reciprocity is assumed and routinely used in low-level light therapy (LLLT) regimens. This study examined dose reciprocity effects on wound healing. METHODS: Pressure ulcers were created on seven groups of C57/BL mice (n = 18). Photoradiation was administered (18 days; 5 J/cm(2)/day @ 670 nm) using a custom LED apparatus and treatment matrix varying both intensity and exposure. Control animals were treated similarly, without photoradiation. Ulcer staging was performed using a

standardized scale. Changes in stage, wound area and wound closure rates were measured. Histology was performed. RESULTS: Photostimulatory effects at day 7 occurred with parameters of 125 seconds @ 40 mW x 1/day; 625 seconds @ 8 mWx1/day; 62.5 seconds @ 40 mWx2/day; and 312.5 seconds @ 8 mWx2/day; and at day 18 using 625 seconds @ 8 mW and 312.5 seconds @ 8 mWx2/day. Statistically significant increases in wound closure rates occurred using 625 seconds @ 8 mW; 62.5 seconds @ 40 mWx2/day; and 312.5 seconds @ 8 mWx2/day treatments. Mean ulcer grade scores were similar to controls. CONCLUSIONS: Varying irradiance and exposure time to achieve a specified energy density affects phototherapy outcomes in this model. Variation of exposure time and irradiance may account for conflicting results in the literature. Further studies of these effects are warranted. Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Light;Mice;Pressure Ulcer;Time Factors;Wound Healing

Optically mediated nerve stimulation: Identification of injury thresholds. BACKGROUND AND OBJECTIVE: Transient optical nerve stimulation is a promising new non-contact, spatially precise, artifact-free neural excitation technique useful in research and clinical settings. This study evaluates safety of this pulsed infrared laser technique by histopathologic examination of stimulated peripheral nerves. STUDY DESIGN/MATERIALS AND METHODS: Exposed rat sciatic nerves were functionally stimulated with the pulsed Holmium:YAG laser, previously validated as an effective tool for optical stimulation. Nerves were removed immediately and up to 2 weeks after stimulation and assessed histologically for thermal damage. Laser parameters studied include upper limits for radiant exposure, repetition rate, and duration of stimulation. RESULTS: Radiant exposures with <1% probability of thermal tissue damage (0.66-0.70 J/cm(2)) are significantly greater than radiant exposures required for reliable stimulation (0.34-0.48 J/cm(2)). The upper limit for safe laser stimulation repetition rate occurs near 5 Hz. Maximum duration for constant low repetition rate stimulation (2 Hz) is approximately 4 minutes with adequate tissue hydration. CONCLUSION: Results confirm that optical stimulation has the potential to become a powerful non-contact clinical and research tool for brief nerve stimulation with low risk of nerve thermal damage. Action Potentials;Animals;Female;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Sprague-Dawley;Sciatic Nerve

Low-intensity laser irradiation stimulates bone nodule formation via insulin-like growth factor-I expression in rat calvarial cells. BACKGROUND AND OBJECTIVE: We previously reported that low-intensity laser irradiation stimulated bone nodule formation through enhanced cellular proliferation and differentiation. However, the mechanisms of irradiation are unclear. Thus, we attempted to determine the responsibility of insulin-like growth factor (IGF)-I for the action observed. STUDY DESIGN/MATERIALS AND METHODS: Osteoblast-like cells were isolated from fetal rat calvariae and cultured with rat recombinant (r) IGF-I, IGF-I-antibody (Ab), and/or the cells were irradiated once (3.75 J/cm(2)) with a low-intensity Ga-Al-As laser (830 nm). The number and area of bone nodules formed in the culture were analyzed, and IGF-I expression was also examined. RESULTS: Treatment with rIGF-I significantly stimulated the number and area of bone nodules. This stimulatory effect was quite similar to those by laser irradiation, and this stimulation was abrogated dose-dependently by treatment with IGF-I-Ab. Moreover, laser irradiation significantly increased IGF-I protein and gene expression. CONCLUSION: The stimulatory effect of bone nodule formation by low-intensity laser irradiation will be at least partly mediated by IGF-I expression. Antibodies;Insulin-Like Growth Factor I;Dinoprostone Animals;Antibodies;Cells, Cultured;Dinoprostone;Female;Fetus;Gene Expression;Insulin-Like Growth Factor I;Low-Level Light Therapy;Models, Animal;Osteoblasts;Osteogenesis;Pregnancy;Rats;Rats, Wistar;Skull

Low-level laser therapy for zymosan-induced arthritis in rats: Importance of illumination time. BACKGROUND: It has been proposed for many years that low-level laser (or light) therapy (LLLT) can

ameliorate the pain, swelling, and inflammation associated with various forms of arthritis. Light is thought to be absorbed by mitochondrial chromophores leading to an increase in adenosine triphosphate (ATP), reactive oxygen species and/or cyclic AMP production and consequent gene transcription via activation of transcription factors. However, despite many reports about the positive effects of LLLT in arthritis and in medicine in general, its use remains controversial. For all indications (including arthritis) the optimum optical parameters have been difficult to establish and so far are unknown. METHODS: We tested LLLT on rats that had zymosan injected into their knee joints to induce inflammatory arthritis. We compared illumination regimens consisting of a high and low fluence (3 and 30 J/cm(2)), delivered at high and low irradiance (5 and 50 mW/cm(2)) using 810-nm laser light daily for 5 days, with the positive control of conventional corticosteroid (dexamethasone) therapy. RESULTS: Illumination with 810-nm laser was highly effective (almost as good as dexamethasone) at reducing swelling and a longer illumination time (10 or 100 minutes compared to 1 minute) was more important in determining effectiveness than either the total fluence delivered or the irradiance. LLLT induced reduction of joint swelling correlated with reduction in the inflammatory marker serum prostaglandin E2 (PGE2). CONCLUSION: LLLT with 810-nm laser is highly effective in treating inflammatory arthritis in this model. Longer illumination times were more effective than short times regardless of total fluence or irradiance. These data will be of value in designing clinical trials of LLLT for various arthritides. Anti-Inflammatory Agents;Polysaccharides;Dexamethasone;Zymosan;Dinoprostone Animals;Anti-Inflammatory Agents;Arthritis;Dexamethasone;Dinoprostone;Disease Models, Animal;Dose-Response Relationship, Radiation;Female;Low-Level Light Therapy;Polysaccharides;Rats;Rats, Inbred Lew;Time Factors;Zymosan

Simulated consumer use of a battery-powered, hand-held, portable diode laser (810 nm) for hair removal: A safety, efficacy and ease-of-use study. BACKGROUND AND OBJECTIVES: Safety, efficacy and ease-of-use of a hair removal diode laser for consumer use were evaluated. STUDY DESIGN/MATERIALS AND METHODS: The treatment group consisting of 77 appropriate users measured safety and efficacy from three self-administered treatments. The non-treatment group consisting of 44 inappropriate users measured safety from delivery of a single laser pulse. RESULTS: The mean hair reduction was 61% 3 weeks after the first treatment, 70% 3 weeks after the second treatment, 60% 1 month after the third treatment, 24% 2 months after the third treatment, 6% 3 months after the third treatment, 41% 6 months after the third treatment, 31% 9 months after the third treatment, and 33% 12 months after the third treatment. The only observed side effect for appropriate users was transient erythema. CONCLUSIONS: In simulated consumer use, the laser was highly effective at removing hair with minimal side effects for appropriate users. Adolescent;Adult;Female;Hair;Hair Removal;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin;Treatment Outcome

Pulsed dye laser: what's new in non-vascular lesions? BACKGROUND AND OBJECTIVE: In dermatology, the pulsed dye laser (PDL) is the therapeutic instrument of choice for treating most superficial cutaneous vascular lesions. In addition, clinical experience over the last decade allowed us to treat patients with an ever increasing number of non-vascular indications. The purpose of this report is to summarize and critically appraise the scientific evidence that support the role of PDL in treating non-vascular skin lesions. METHODS: A literature-based study has been conducted, including the review of publications over the period January 1995 to December 2006, using the Medline Database. We also included our own experience in managing non-vascular lesions with the PDL. Four sets of preoperative and postoperative photos are presented. RESULTS: For viral skin lesions, PDL proved to be an alternative to other therapy options. This applies particularly to periungual warts and mollusca contagiosa. The mechanism of PDL with inflammatory dermatoses has not yet been

elucidated. The effect seems to be better if there is a vascular component to the disease. With most of these indications (such as psoriasis and acne), PDL currently plays a rather minor or complementary role. Regarding collagen remodelling (hypertrophic scars, keloids, stretch marks, and skin rejuvenation), the question of whether a therapy makes sense or not has to be decided from case to case. CONCLUSION: With PDL, it is possible to achieve good results with numerous, partly less well-known indications (i.e. lupus erythematosus). With other diseases, PDL has so far been considered to be a complementary therapy method or to be in an experimental state. Dermatology;Humans;Low-Level Light Therapy;Skin Diseases

[Current methods of treatment and prevention of pathologic scars]. The aetiology of pathologic scarring is unknown today regarding the keloids. The authors have analyzed the literature and own experience retrospectively according to the evidence based treatments and prevention of the hypertrophic and keloid scars. The corticosteroids have been used intralesionally since the beginning of the 1960-ies. It was followed by the pressure garment therapy in order to treat the widespread burns scars in the early 1970-ies. The silicone gel sheeting is being used since the 1980-ies. The basic treatment of keloids changed, radiotherapy was combined with the above mentioned methods because of its high recurrence rate. Newer methods, cryosurgery as well as lasers were used to treat keloids. The number of effective topical agents was increased. The researchers have been looking for other, intralesionally usable medicine and genetic causes for more than ten years. The clinicians have had the standard protocols of the adjunct and alternative methods too. After having the standard and internationally accepted scar assessment system (Vancouver-scar scale and score), the controlled, randomized trials were practicable. The prospective evaluation of the efficacy of different protocols with adequate follow-up became performable. The comparison of different methods is difficult because of the lack of its standard outcome. Adrenal Cortex Hormones;Gels;Silicones;Siloxanes Adrenal Cortex Hormones;Animals;Bandages;Burns;Cicatrix, Hypertrophic;Cryosurgery;Gels;Humans;Injections, Intralesional;Keloid;Low-Level Light Therapy;Pressure;Risk Factors;Severity of Illness Index;Silicones;Siloxanes

[Intra-auricular laser therapy of children suffering from bronchial asthma]. Asthma;Child;Combined Modality Therapy;Ear, Middle;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Treatment Outcome

Effects of low power laser irradiation on intracellular calcium and histamine release in RBL-2H3 mast cells. Although laser irradiation has been reported to promote skin wound healing, the mechanism is still unclear. As mast cells are found to accumulate at the site of skin wounds we hypothesized that mast cells might be involved in the biological effects of laser irradiation. In this work the mast cells, RBL-2H3, were used in vitro to investigate the effects of laser irradiation on cellular responses. After laser irradiation, the amount of intracellular calcium ([Ca2+]i) was increased, followed by histamine release, as measured by confocal fluorescence microscopy with Fluo-3/AM staining and a fluorescence spectrometer with o-phthalaldehyde staining, respectively. The histamine release was mediated by the increment of [Ca2+]i from the influx of the extracellular buffer solution through the cation channel protein, transient receptor potential vanilloid 4 (TRPV4). The TRPV4 inhibitor, Ruthenium Red (RR) can effectively block such histamine release, indicating that TRPV4 was the key factor responding to laser irradiation. These induced responses of mast cells may provide an explanation for the biological effects of laser irradiation on promoting wound healing, as histamine is known to have multi-functions on accelerating wound healing. TRPV Cation Channels;Trpv4 protein, rat;Calcium Animals;Calcium;Cell Line, Tumor;Histamine Release;Mast Cells;Rats;Spectrometry, Fluorescence;TRPV Cation Channels

WITHDRAWN: Low level laser therapy (Classes III) for treating osteoarthritis. BACKGROUND: Osteoarthritis (OA) affects a large portion of the population. Low Level Laser Therapy (LLLT) is a light

source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment for OA about 30 years ago, but its effectiveness has to be examined more closely, especially in the treatment of OA. OBJECTIVES: To assess the effectiveness of class III LLLT for osteoarthritis when irradiation is directed at the osteoarthritic joint capsule. SEARCH STRATEGY: Searches were conducted in the following databases: MEDLINE, EMBASE, the Cochrane Musculoskeletal registry, the Rehabilitation and Related Therapies field registry and the Cochrane Controlled Trials Register up to May, 2005. SELECTION CRITERIA: Following an a prior protocol, only controlled clinical trials of LLLT for the treatment of patients with a clinical diagnosis of OA were eligible. Abstracts lacking data were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials and extracted data using predetermined forms. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed; in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), whereas the difference between the treatment and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treatment and control by the baseline variance, and were used in the analysis of pain because different scales were used to measure it. Dichotomous outcomes were analyzed with relative risk (RR). MAIN RESULTS: Eight trials were included with 233 patients randomized to laser and 172 patients to placebo laser. Treatment duration ranged from two to six weeks. Pain was assessed in seven trials. When the results were pooled from different pain scales used in these seven trials, a statistically significant difference in favor of laser treatment was found with a SMD of -0.28 (95% CI: -0.48 to -0.09). One of these studies also measured pain during movement and found a statistically significant difference in favor of laser treatment with a WMD of -1.16 (95% CI: -2.02 to -0.30). Two studies found significant results for increased knee range of motion. Two others studies found a statistically significant difference in favor of laser treatment for patient-assessed global disease activity with laser compared to placebo (RR 1.70, 95%CI: 1.1. to 2.63). One trial evaluated the effectiveness of laser treatment in temporomandibular joint OA and found a statistically significant difference (WMD 38.69, 95% CI: 29.25 to 48.13) using the change in VAS score to measure pain. One study found a statistically significant difference in favor of laser treatment at the end of treatment and at 4 and 8 weeks post-treatment for morning stiffness. Other outcome measures of joint tenderness and strength did not yield significant differences. AUTHORS' CONCLUSIONS: Five trials included in this review showed a statistically significant difference favoring laser treatment when compared to placebo for at least one outcome measure. Three trials did not report beneficial effects. The varying results of these trials may be due to the method of laser application and/or other features of LLLT application. Clinicians and researchers should consistently report the characteristics of LLLT devices and application techniques used. New trials on LLLT should make use of standardized, validated outcomes. There is clearly a need to investigate the effects of different dosages on LLLT effectiveness for OA in future randomized, controlled clinical trials. Also, more studies should be done to investigate the anti-inflammatory action of laser as well as the appropriate parameters needed to achieve an anti-inflammatory effect. Hand;Humans;Low-Level Light Therapy;Osteoarthritis;Osteoarthritis, Hip;Osteoarthritis, Knee;Randomized Controlled Trials as Topic

[Influence of low-intensity laser therapy on spatial perception threshold and electroneurographic finding in patients with diabetic polyneuropathy]. INTRODUCTION: Low-intensity laser therapy (LILT) can be applied in cases when patients with diabetic polyneuropathy (DPN) suffer from chronic severe neuropathic pain. OBJECTIVE: We wanted to analyse influence of LILT on spatial perception threshold (SPT) and electroneurographic (ENG) parameters in patients with painful DPN. METHOD:

We analysed 45 patients (25 males), average age 54.3 years (54.3 +/- 10.9), with clinical and ENG signs of painful DPN. The patients were divided into two groups: A and B. Group A consisted of 30 patients with DPN who had 30 LILT treatments over the period of 12 weeks and group B consisted of 15 patients with DPN who received only vitamin therapy per os within the same period. Prior to and after 12 weeks of treatment, the following ENG parameters were determined using surface electrodes: motor (MCV) and sensory conduction velocities (SCV) values (in m/s) of nervus (n.) peroneus (NP), n. tibialis (NT) and n. medianus (NM) and their motor distal latency (MDL) values (in ms). SPT value (score as number from 1 to 8) was determined with Tactile Circumferential Discriminator on dorsal part of foot's big toe skin. For statistical analysis, we used Student's t-test and Pearson correlation (sig. 2 tailed) study. RESULTS; We registered statistically significant difference between SPT ($p < 0.01$) values prior to (5.25 +/- 1.11) and after (4.87 +/- 0.90) LILT, as well as NMMCV ($p < 0.05$) values prior to (47.18 +/- 5.08) and after (49.12 +/- 3.72) LILT. Besides, we registered, only after LILT, statistically significant correlation beetwen SPT and NMDML ($p < 0.01$) values and also beetwen SPT and NMSCV ($p < 0.05$) values. The differences and correlations beetwen other analysed parameters before and after treatments were not significant ($p > 0.05$). CONCLUSION: In this study we registered significant decrease of SPT and increase of NMMCV after LILT and that indicated a favourable effect of this treatment in analysed patients with painful DPN. In our opinion these results need further investigation. Diabetic Neuropathies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neural Conduction;Pain;Sensory Thresholds;Space Perception

[Risks of lucrative light bundles. "Blunders in laser medicine"]. Clinical Competence;Family Practice;Germany;Humans;Laser Therapy;Low-Level Light Therapy;Quality Assurance, Health Care;Specialization

Multilaser photoplethysmography technique. New technique for parallel recording of reflection photoplethysmography signals in broad spectral band (violet to NIR) has been developed based on fiber-coupled laser irradiation and time-resolved spectrometric detection. Differences in photoplethysmography waveforms that were recorded simultaneously at different wavelengths confirmed the depth variety of the skin blood pulsation dynamics, thus the proposed methodology has a potential for application in skin microcirculation studies. Blood Flow Velocity;Humans;Lasers;Low-Level Light Therapy;Microcirculation;Photoplethysmography;Signal Processing, Computer-Assisted;Skin;Skin Physiological Phenomena;Vascular Resistance

Effectiveness of muscle stretching exercises with and without laser therapy at tender points for patients with fibromyalgia. OBJECTIVE: To assess the efficiency of a treatment composed of muscle stretching exercises, associated or not to laser therapy at tender points, for patients with fibromyalgia (FM), in view of bettering their quality of life. METHODS: Twenty FM patients were randomly assigned to two groups: one submitted to laser therapy and stretching (LSG, n=10), and the other only to stretching exercises (SG, n=10). The visual analog scale of pain (VAS) and dolorimetry at tender points were used to assess pain; life quality was evaluated by means of the Fibromyalgia Impact Questionnaire (FIQ) and the 36-item Short-Form Health Survey (SF-36). RESULTS: After the treatment program, both in LSG and SG were detected pain reduction, higher pain threshold at tender points (all $p<0.01$), lower mean FIQ scores, and higher SF-36 mean scores (all $p<0.05$). No significant differences were found between both groups. CONCLUSION: The stretching exercises program proposed is efficient to reduce pain and painful sensibility at tender points, thus enhancing patients' quality of life. Laser therapy has not shown advantages when added to muscle stretching exercises. Adult;Female;Fibromyalgia;Health Surveys;Humans;Low-Level Light Therapy;Middle Aged;Muscle Stretching Exercises;Muscle, Skeletal;Pain;Pain Measurement;Quality of Life

Effect of low level laser therapy in rheumatoid arthritis patients with carpal tunnel syndrome. OBJECTIVE: the aim of the present study was to evaluate the efficacy of low level laser therapy (LLLT) in patients with rheumatoid arthritis (RA) with carpal tunnel syndrome (CTS). MATERIAL AND METHODS: a total of 19 patients with the diagnosis of CTS in 19 hands were included and randomly assigned to two treatment groups; LLLT (Group 1) (10 hands) with dosage 1.5 J/ per point and placebo laser therapy group (Group 2) (9 hands). A Galium-Aluminum-Arsenide diode laser device was used as a source of low power laser with a power output of 50 mW and wavelength of 780 nm. All treatments were applied once a day on week days for a total period of 10 days. Clinical assessments were performed at baseline, at the end of the treatment and at month 3. Tinel and Phalen signs were tested in all patients. Patients were evaluated for such clinical parameters as functional status scale (FSS), visual analogue scale (VAS), symptom severity scale (SSS) and grip-strength. However, electrophysiological examination was performed on all hands. Results were given with descriptive statistics and confidence intervals between group means at 3 months adjusted for outcome at baseline and for the difference between unadjusted group proportions. RESULTS: clinical and electrophysiological parameters were similar at baseline in both groups. Improvements were significantly more pronounced in the LLLT group than placebo group. A comparison between groups showed significant improvements in pain score and functional status scale score. Group mean differences at 3 months adjusted at baseline were found to be statistically significant for pain score and functional status scale score. The 95% significant confidence intervals were [-15 - (-5)] and [-5 - (-2)] respectively. There were no statistically significant differences in other clinical and electrophysiological parameters between groups at 3 months. CONCLUSIONS: our study results indicate that LLLT and placebo laser therapy seems to be effective for pain and hand function in CTS. We, therefore, suggest that LLLT may be used as a good alternative treatment method in CTS patients with RA. Adult;Aged;Arthritis, Rheumatoid;Carpal Tunnel Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Effectiveness of transmeatal low power laser irradiation for chronic tinnitus. OBJECTIVE: To evaluate effectiveness of 5 mW laser irradiation in the treatment of chronic tinnitus. STUDY DESIGN: Prospective, randomised, double-blind study. METHODS: This investigation included 66 ears in 45 patients with chronic unilateral or bilateral tinnitus. A 5 mW laser with a wavelength of 650 nm, or placebo laser, was applied transmeatally for 15 minutes, once daily for a week. A questionnaire was administered which asked patients to score their symptoms on a five-point scale, before and two weeks after laser irradiation. A decrease of one scale point, regarding the loudness, duration and degree of annoyance of tinnitus, was accepted to represent an improvement. RESULTS: The loudness, duration and degree of annoyance of tinnitus were improved, respectively, in up to 48.8, 57.7 and 55.5 per cent of the patients in the active laser group. No significant improvement was observed in the placebo laser group. CONCLUSION: Transmeatal, low power (5 mW) laser irradiation was found to be useful for the treatment of chronic tinnitus. Adult;Aged;Chronic Disease;Double-Blind Method;Female;Humans;Loudness Perception;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Severity of Illness Index;Statistics as Topic;Surveys and Questionnaires;Tinnitus

Effect of defocused infrared diode laser on salivary flow rate and some salivary parameters of rats. This study aims to investigate whether infrared diode low-level laser therapy (LLLT) increased salivary flow rate and altered pH value, protein concentration, and peroxidase and amylase activities in saliva of rats. Wistar rats were used and divided into three groups. Experimental groups (A and B) had their parotid, submandibular and sublingual glands submitted to diode laser, 808-nm wavelength, on two consecutive days. The dose results were 4 and 8 J/cm(2), respectively. A red guide light was used to visualize the irradiated area. Group C was irradiated only with red pilot beam and served as control.

The saliva samples were collected after each irradiation step (first and second collection days) and 1 week after the first irradiation (seventh day). Statistical analysis was performed, and differences were observed according to different days of salivary collection. The results showed that salivary flow rate for groups A and B was higher on the seventh day if it is compared to data obtained for the first day ($p < 0.05$). LLLT applications on salivary glands are a therapy procedure that requires further studies. Salivary Proteins and Peptides;Peroxidase;Amylases Amylases;Animals;Hydrogen-Ion Concentration;Lasers, Semiconductor;Low-Level Light Therapy;Male;Parotid Gland;Peroxidase;Radiation Dosage;Rats;Rats, Wistar;Saliva;Salivary Glands;Salivary Proteins and Peptides;Secretory Rate;Spectrophotometry;Sublingual Gland;Submandibular Gland
Effects of laser irradiation on the release of basic fibroblast growth factor (bFGF), insulin like growth factor-1 (IGF-1), and receptor of IGF-1 (IGFBP3) from gingival fibroblasts. Various studies have shown biostimulation effects of laser irradiation by producing metabolic changes within the cells. Little is known about the biological effect of laser irradiation on the oral tissues. Among the many physiological effects, it is important to recognize that low-level laser therapy (LLLT) may affect release of growth factors from fibroblasts. Therefore, the aim of the present study was to determine whether the laser irradiation can enhance the release of basic fibroblast growth factor (bFGF), insulin-like growth factor-1 (IGF-1), and receptor of IGF-1 (IGFBP3) from human gingival fibroblasts (HGF). The number of all samples in the study were 30, and the samples were randomly divided into three equal groups; In the first group (single dose group), HGF were irradiated with laser energy of 685 nm, for 140 s, 2 J/cm(2) for one time, and in the second group, energy at the same dose was applied for two consecutive days (double dose group). The third group served as nonirradiated control group. Proliferation, viability, and bFGF, IGF-1, IGFBP3 analysis of control and irradiated cultures were compared with each other. Both of the irradiated groups revealed higher proliferation and viability in comparison to the control group. Comparison of the single-dose group with the control group revealed statistically significant increases in bFGF ($p < 0.01$) and IGF-1 ($p < 0.01$), but IGFBP3 increased insignificantly ($p > 0.05$). When the double dose group was compared with the control group, significant increases were determined in all of the parameters ($p < 0.01$). In the comparison of the differences between the two irradiated groups (one dose and two doses), none of the parameters displayed any statistically significant difference ($p > 0.05$). In both of the laser groups, LLLT increased the cell proliferation and cell viability. The results of this study showed that LLLT increased the proliferation of HGF cells and release of bFGF, IGF-1, and IGFBP3 from these cells. LLLT may play an important role in periodontal wound healing and regeneration by enhancing the production of the growth factors. Insulin-Like Growth Factor Binding Protein 3;Fibroblast Growth Factor 2;Insulin-Like Growth Factor I Cell Culture Techniques;Cell Proliferation;Fibroblast Growth Factor 2;Fibroblasts;Gingiva;Humans;Insulin-Like Growth Factor Binding Protein 3;Insulin-Like Growth Factor I;Lasers, Semiconductor;Low-Level Light Therapy
[Laser boom in Germany. Who guarantees quality? (interview by Dr. med. Horst Gross)]. Certification;Clinical Competence;Germany;Humans;Laser Therapy;Low-Level Light Therapy;Quality Assurance, Health Care;Specialization;Surgery, Plastic
[Visit in laser surgery. Flashes for health and esthetics]. Ambulatory Care;Esthetics;Germany;Humans;Low-Level Light Therapy;Retreatment;Skin Aging;Skin Diseases;Skin Neoplasms
COX-2 mRNA expression decreases in the subplantar muscle of rat paw subjected to carrageenan-induced inflammation after low level laser therapy. OBJECTIVE AND DESIGN: Low level laser therapy (LLLT) has been presented as a novel therapy to treat inflammation. Herein we studied the effect of LLLT on the COX-2 mRNA expression in subplantar tissue taken from rats treated with carrageenan. MATERIAL: The groups consisted of 32 rats: A(1) (Saline), A(2) (Carrageenan), A(3)

(Carrageenan + laser 660 nm) and A(4) (Carrageenan + laser 684 nm). TREATMENT: A(3) and A(4) were irradiated in the first hour after carrageenan. METHODS: The edema was measured by a plethysmometer and COX-2 mRNA was by RT-PCR. Statistical were evaluated by ANOVA and Tukey-Kramer Test. RESULTS: Carrageenan increased both edema (A 1)= 0.6 +/- 0.04 vs. A(2)= 2.24 +/- 0.08) and COX-2 mRNA (A(1)= 1.1 +/- 0.26 vs. A(2)= 3.52 +/- 0.69). Irradiation reduced the edema (A(3)= 0.84 +/- 0.09; A(4)= 1.31 +/- 0.05) and the COX-2 mRNA (A(3)= 2.16 +/- 0.28; A(4)= 1.86 +/- 0.20). CONCLUSION: LLLT reduce the expression of COX-2 mRNA. RNA, Messenger;Carrageenan;Cyclooxygenase 2 Animals;Carrageenan;Cyclooxygenase 2;Edema;Extremities;Gene Expression Regulation;Inflammation;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar

Photomedicine and LLLT LiteratureWatch. Animals;Humans;Laser Therapy;Low-Level Light Therapy;Phototherapy

Photodynamic therapy with a new photosensitizing agent. OBJECTIVE: The aim of this study was to investigate the cytotoxicity of octal-bromide zinc phthalocyanine (ZnPcBr(8)) before and after irradiation with a low-power laser (AsGaAl) and analyze the effects of photodynamic therapy (PDT) on the nucleus of L929 cells. BACKGROUND DATA: One of the most recent and promising applications of phthalocyanine in medicine is in the detection and cure of tumors. We studied the ZnPcBr(8) in agreement with the development of new photosensitizing agents for curing tumors. METHODS: L929 cells were cultivated at standard conditions, incubated with ZnPcBr(8) for 1 h at different concentrations, irradiated with a semiconductor laser, and incubated in MEM medium for 1, 12, or 24 h. Cells were analyzed using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (MTT) technique and fluorescence microscopy. RESULTS: The results demonstrated that ZnPcBr(8) at 1 microM was the most effective concentration for PDT, with a decrease of 63% after 1 h, 99% after 12 h, and 100% after 24 h in relation to the control group. The fluorescence microscopy results showed that ZnPcBr(8) was localized in the perinuclear region when analyzed 1 h after incubation. Nucleus staining with DAPI made it possible to observe that nuclear fragmentation occurred 24 h after PDT, cytoplasm retraction at 1, 12, and 24 h after PDT, and vacuoles along the cytoplasm at 12 and 24 h after PDT. CONCLUSION: According to the results obtained in this study, L929 cell death caused by PDT with ZnPcBr(8) possesses characteristics of apoptosis mediated by the mitochondria, due to the decrease in cells viability, the subcellular localization, and the photodamage found. Coloring Agents;Indoles;Isoindoles;Organometallic Compounds;Photosensitizing Agents;Tetrazolium Salts;Thiazoles;Zinc Compounds;octal-bromide zinc phthalocyanine;thiazolyl blue Cell Nucleus;Coloring Agents;Humans;Indoles;Isoindoles;Low-Level Light Therapy;Organometallic Compounds;Photochemotherapy;Photosensitizing Agents;Tetrazolium Salts;Thiazoles;Zinc Compounds

Effects of low-level laser and plyometric exercises in the treatment of lateral epicondylitis. OBJECTIVE: This study was undertaken to compare the effectiveness of a protocol of combination of laser with plyometric exercises and a protocol of placebo laser with the same program, in the treatment of tennis elbow. BACKGROUND DATA: The use of low-level laser has been recommended for the management of tennis elbow with contradictory results. Also, plyometric exercises was recommended for the treatment of the tendinopathy. METHODS: Fifty patients who had tennis elbow participated in the study and were randomised into two groups. Group A (n = 25) was treated with a 904 Ga-As laser CW, frequency 50 Hz, intensity 40 mW and energy density 2.4 J/cm(2), plus plyometric exercises and group B (n = 25) that received placebo laser plus the same plyometric exercises. During eight weeks of treatment, the patients of the two groups received 12 sessions of laser or placebo, two sessions per week (weeks 1-4) and one session per week (weeks 5-8). Pain at rest, at palpation on the lateral epicondyle, during resisted wrist extension, middle finger test, and

strength testing was evaluated using Visual Analogue Scales. Also it was evaluated the grip strength, the range of motion and weight test. Parameters were determined before the treatment, at the end of the eighth week course of treatment (week 8), and eighth (week 8) after the end of treatment. RESULTS: Relative to the group B, the group A had (1) a significant decrease of pain at rest at the end of 8 weeks of the treatment ($p < 0.005$) and at the end of following up period ($p < 0.05$), (2) a significant decrease in pain at palpation and pain on isometric testing at 8 weeks of treatment ($p < 0.05$), and at 8 weeks follow-up ($p < 0.001$), (3) a significant decrease in pain during middle finger test at the end of 8 weeks of treatment ($p < 0.01$), and at the end of the follow-up period ($p < 0.05$), (4) a significant decrease of pain during grip strength testing at 8 weeks of treatment ($p < 0.05$), and at 8 weeks follow-up ($p < 0.001$), (5) a significant increase in the wrist range of motion at 8 weeks follow-up ($p < 0.01$), (6) an increase in grip strength at 8 weeks of treatment ($p < 0.05$) and at 8 weeks follow-up ($p < 0.01$), and (7) a significant increase in weight-test at 8 weeks of treatment ($p < 0.05$) and at 8 weeks follow-up ($p < 0.005$). CONCLUSION: The results suggested that the combination of laser with plyometric exercises was more effective treatment than placebo laser with the same plyometric exercises at the end of the treatment as well as at the follow-up. Future studies are needed to establish the relative and absolute effectiveness of the above protocol.
Adult;Combined Modality Therapy;Exercise Therapy;Female;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Range of Motion, Articular;Single-Blind Method;Tennis Elbow;Treatment Outcome;Wrist Joint

Effect of laser therapy on bone tissue submitted to radiotherapy: experimental study in rats. OBJECTIVE: The aim of this study was to investigate the effect of laser therapy (lambda = 780 nm) on bone tissue submitted to ionizing radiation. BACKGROUND DATA: The biostimulation effect of laser in normal bone tissue has already been demonstrated successfully; however its effect on bone tissue submitted to radiotherapy has not yet been studied. METHODS: Twenty-two Wistar rats were randomly divided into four groups: group I, control (n = 4), submitted only to radiotherapy; group II, laser starting 1 day prior to radiotherapy (n = 6); group III, laser started immediately after radiotherapy (n = 6); group IV, laser 4 weeks after radiotherapy (n = 6). The source of ionizing radiation used was Cobalt 60, which was applied in a single dose of 3000 cGy on the femur. The laser groups received seven applications with a 48-h interval in four points per session of DE = 4 J/cm(2), P = 40 mW, t = 100 sec, and beam diameter of 0.04 cm(2). All animals were killed 6 weeks after radiotherapy. RESULTS: Clinical examination revealed cutaneous erosions on experimental groups (II, III, and IV) starting at the 6th week after radiotherapy. The radiographic findings showed higher bone density in groups II and IV ($p < 0.05$) compared to the control group. The results further showed an increase of bone marrow cells, and number of osteocytes and Haversian canals in experimental groups II and IV ($p < 0.05$). It was also found an increase of osteoblastic activity, in groups II, III, and IV ($p < 0.05$). CONCLUSION: Laser therapy on bone tissue in rats presented a positive biostimulative effect, especially when applied before or 4 weeks after radiotherapy. However, the use of laser in the parameters above should be used with caution due to epithelial erosions. Animals;Body Weight;Bone Marrow Cells;Bone and Bones;Cell Count;Haversian System;Low-Level Light Therapy;Male;Osteocytes;Rats;Rats, Wistar

Effect of low-level laser therapy on healing of medial collateral ligament injuries in rats: an ultrastructural study. OBJECTIVE: This study sought to investigate whether low-level laser therapy (LLLT) with a helium-neon (He-Ne) laser would increase fibril diameter of transected medial collateral ligament (MCL) in rats. BACKGROUND DATA: It has been shown that LLLT can increase ultimate tensile strength MCL healing. METHODS: Thirty rats received surgical transect to their right MCL, and five were assigned as the control group. After surgery, the rats were divided into three groups: group 1 (n = 10) received LLLT with He-Ne laser and 0.01 J/cm(2) energy fluency per day,

group 2 (n = 10) received LLLT with 1.2 J/cm(2) energy fluency (density) per day and group 3 (sham-exposed group; n = 10) received daily placebo laser with shut-down laser equipment, while control group received neither surgery nor LLLT. Transmission electron microscope (TEM) examination was performed on days 12 and 21 after surgery and dimension and density of ligament fibrils were measured. The data were analyzed by Student t-test and Mann-Whitney tests, respectively. RESULTS: On day 12, the fibril dimension of group 2 and their density were higher than of groups 1 and 3. CONCLUSION: LLLT with He-Ne laser on incised MCL in rats could not significantly increase fibril diameter and their density in comparison with sham-exposed group. Animals;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Rats;Rats, Wistar;Tensile Strength;Wound Healing

In vitro observations on the influence of copper peptide aids for the LED photoirradiation of fibroblast collagen synthesis. OBJECTIVE: The purpose of this study was to evaluate the influence of Cu-GHK aids for the LED-PI on fibroblast proliferation and collagen production in vitro. BACKGROUND DATA: Light-emitting diode photoirradiation (LED-PI) and copper-glycyl-L-histidyl-L-lysine complex (Cu-GHK) treatment may be useful in accelerating the rate of wound healing. Red LED (625-635 nm) was used as a light source for LED-PI. In the process of wound healing, Cu-GHK was shown to be an activator of remodeling. LED-PI would maintain fibroblast activity and viability, and there would be a positive effect on type I collagen (COL1) and basic fibroblast growth factor (bFGF) production from the combination of LED-PI and Cu-GHK incorporation. METHODS: Cell activity/viability, procollagen type I C-peptide (P1CP), and bFGF were evaluated in vitro with human fibroblasts (HS68). The effects of single factors (LED-PI using 0, 1, and 2 J energy doses) or a combination of factors (LED-PI and Cu-GHK) on fibroblast viability (i.e., alamarBlue reduction), collagen production (i.e., P1CP production and COL1 mRNA expression), and bFGF secretion were also evaluated. RESULTS: Reduction in cell viability was significantly suppressed with LED-PI (1 J) and Cu-GHK-supplied incubation. Cell viability was increased 12.5-fold compared with the non-irradiated group (0 J). Collagen production was also increased significantly with LED-PI and Cu-GHK incorporation (197.6 ng/mL). A dose-response effect was observed for LED-PI combined with Cu-GHK. The combinative effects of LED-PI and Cu-GHK led to an increase not only in bFGF secretion (approximately 230%) but also in P1CP production (approximately 30%) and COL1 mRNA expression (approximately 70%) compared with LED-PI alone. CONCLUSION: LED-PI maintained human fibroblast (HS68) viability and increased collagen synthesis when applied by itself. In the combinative stimulation for in vitro collagen production (when LED-PI was followed by Cu-GHK-supplied incubation), stimulated cells showed increased bFGF secretion, P1CP production, and COL1 expression, compared to the LED-PI treatment alone. Collagen Type I;Oligopeptides;Organometallic Compounds;copper-lysine complex;Fibroblast Growth Factor 2;copper-glycyl-glycyl-histidine;Lysine Collagen Type I;Dose-Response Relationship, Immunologic;Fibroblast Growth Factor 2;Fibroblasts;Humans;Low-Level Light Therapy;Lysine;Oligopeptides;Organometallic Compounds;Wound Healing

Ga-As (808 nm) laser irradiation enhances ATP production in human neuronal cells in culture. OBJECTIVE: The aim of the present study was to investigate whether Ga-As laser irradiation can enhance adenosine triphosphate (ATP) production in normal human neural progenitor (NHNP) cells in culture. METHODS: NHNP were grown in tissue culture and were treated by Ga-As laser (808 nm, 50 mW/cm(2), 0.05 J/cm(2)), and ATP was determined at 10 min after laser application. RESULTS: The quantity of ATP in laser-treated cells was 7513 +/- 970 units, which was significantly higher ($p < 0.05$) than the non-treated cells, which comprised 3808 +/- 539 ATP units. CONCLUSION: Laser application to NHNP cells significantly increases ATP production in these cells. These findings may explain the beneficial effects of low-level laser therapy (LLLT) in stroked rats. Tissue culture of NHNP cells might offer a good model to study the mechanisms associated with promotion of ATP production in the

nervous system by LLLT. Adenosine Triphosphate Adenosine Triphosphate;Cells, Cultured;Humans;Low-Level Light Therapy;Neurons;Stem Cells

Influence of broad-spectrum and infrared light in combination with laser irradiation on the proliferation of wounded skin fibroblasts. OBJECTIVE: This study aimed to establish if broad-spectrum or infrared (IR) light in combination with laser therapy can assist phototherapy and accelerate cell proliferation to improve the rate of wound healing. BACKGROUND DATA: The effect of laser light may be partly or completely reduced by broad-spectrum light. There are few studies that investigate the benefit or detriment of combining laser irradiation with broad-spectrum or IR light. METHODS: Wounded human skin fibroblasts were irradiated with a dose of 5 J/cm(2) using a heliumneon laser, a diode laser, or a Nd:YAG laser in the dark, in the light, or in IR. Changes in cell proliferation were evaluated using optical density at 540 nm, alkaline phosphatase (ALP) enzyme activity, cytokine expression, and basic fibroblast growth factor (bFGF) expression. RESULTS: The optical density and ALP enzyme activity indicate that 5 J/cm(2) using 1064 nm in the light is more effective in increasing cell proliferation or cell growth than 830 nm in the light, but not as effective as 632.8 nm in the light. bFGF expression shows that the response of wounded cells exposed to 5 J/cm(2) in IR light is far less than the biological response of wounded cells exposed to 5 J/cm(2) in the dark or light. The results indicate that wounded cells exposed to 5 J/cm(2) using 632.8 nm in the dark results in a greater increase in IL-6 when compared to cells exposed to 5 J/cm(2) in the light or in IR. CONCLUSION: Results indicate that 5 J/cm(2) (using 632.8 nm in the dark or 830 nm in the light) is the most effective dose to stimulate cell proliferation, which may ultimately accelerate or improve the rate of wound healing. Alkaline Phosphatase Alkaline Phosphatase;Cell Count;Cell Proliferation;Dose-Response Relationship, Radiation;Enzyme-Linked Immunosorbent Assay;Fibroblasts;Humans;Infrared Rays;Low-Level Light Therapy;Skin;Wound Healing

Antiinfectives and low-level light: a new chapter in photomedicine. OBJECTIVE: The purpose of this study was to identify synergistic effects in the interaction of light with biosystems in the presence of chemical agents. Their systematic analysis promises therapeutic strategies. BACKGROUND DATA: Light intensities around 1000 Wm(2) potentially induce density variations in nanoscopic water layers adhering to surfaces in air or subaquatically. In permeable nanoscopic compartments in the interior of biosystems, this could result in powerful flow processes and bidirectional flows for repetitive applications of light. Consequently, external stimulation with light will force microorganisms and cells to incorporate a suitable antiinfective. Nanoscale biosystems, which respond to both light stimulation and antibiotics, are nanobacteria. Responses include growth, inhibition, and slime secretion. Slime secretion was provoked in vitro by gentamycin, an agent proposed for in vivo eradication, and blocked by light. Depending on the field of action, co-operative effects between light and an antiinfective can be exploited by considering two properties of the drug: transmission of light and resorption by the tissue. Antiinfectives can be administered in an active form or via drug delivery systems. In the latter case, a double action of the light could be exploited: stimulated release from the carrier and subsequent uptake by the targeted biosystem. METHODS: The attenuation of laser light (670 nm) by antiinfectives was measured in films of different thickness of a vaginal suppository. The effect of 670-nm laser light - not absorbed by water - on nanoscopic water layers was examined by comparing the evaporation time of irradiated drops of water-based nanosuspensions with non-irradiated controls. RESULTS: The 6-microm-thick suppository films were virtually transparent to the laser light, and the 1-mm-thick films totally attenuated it. Nanosuspension drops irradiated with 670-nm light needed more time to evaporate than controls. CONCLUSION: Low-level light (LLL) therapy is compatible with antiinfectives, and even capable of boosting effects of superficially applied and/or absorbed antiinfectives. Temporal coordination between light treatment and drug administration maximizes drug effects and minimizes possible adverse effects. Irradiation should start when the drug

concentration has reached its maximum in the desired field of action. Light-induced flow in nanoscale cavities could represent one mechanism of LLL therapy. Anti-Infective Agents Anti-Infective Agents;Biophysical Phenomena;Biophysics;Combined Modality Therapy;Diabetic Neuropathies;Female;Humans;Low-Level Light Therapy;Lymphocytes;Nanomedicine;Vaginosis, Bacterial;Wound Healing

Melanin density affects photobiomodulation outcomes in cell culture. OBJECTIVE: This study investigated the influence of melanin on the outcome of photoradiation at 670 nm in a cell culture model. BACKGROUND DATA: Melanins are naturally occurring cutaneous pigments. Human skin is classified into six skin types based on melanin content. METHODS: Gelatin photo filters were fabricated with varying melanin contents. Human HEP-2 and murine L929 cell lines were cultured in complete Dulbecco's Modified Eagle's Medium (DMEM) media. Photoradiation at 670 nm delivering 5.0 J/cm(2) per treatment/24 h (50 J/cm(2) total fluence) was carried out with melanin filters placed between the light source and the wells using a light-emitting diode (LED) device. Five groups based on percent melanin were treated: group 1, no filter; group 2, gelatin alone; group 3, 0.0125%; group 4, 0.025%; and group 5, 0.050%. Cell proliferation was measured using CyQuant and 3-(4,5-dimethylthiazol-2-yl)-2,5-disphenyl tetrasodiumbromide (MTT) assays for 240 h post-photoradiation. RESULTS: The Proliferation Index (PI) as measured by CyQuant assay was not statistically different amongst the groups in either cell line. MTT assay results demonstrated a significant dose response effect ($p < or = 0.05$) in both cell lines with activity inversely proportional to melanin concentration. The relative PI values by MTT assay at 144 h for groups 1, 2, 3, and 4, respectively, were 1.44 +/- 0.06, 1.28 +/- 0.05, 1.20 +/- 0.07, and 1.06 +/- 0.04 for the L-929 cells, and 1.61 +/- 0.03, 1.47 +/- 0.06, 1.35 +/- 0.03, and 1.19 +/- 0.06 for the HEP-2 cells ($n = 4$; $p < 0.05$). CONCLUSION: These results demonstrate that cutaneous melanin content should be taken into consideration in photobiomodulation paradigms. Further studies to quantify these effects are warranted. Melanins Cell Line;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Drug;Humans;Low-Level Light Therapy;Melanins;Skin

Efficacy of 780-nm laser phototherapy on peripheral nerve regeneration after neurotube reconstruction procedure (double-blind randomized study). OBJECTIVE: This pilot double-blind randomized study evaluated the efficacy of 780-nm laser phototherapy on the acceleration of axonal growth and regeneration after peripheral nerve reconstruction by polyglycolic acid (PGA) neurotube. BACKGROUND DATA: The use of a guiding tube for the reconstruction of segmental loss of injured peripheral nerve has some advantages over the regular nerve grafting procedure. Experimental studies have shown that laser phototherapy is effective in influencing nerve regeneration. METHODS: The right sciatic nerve was transected, and a 0.5-cm nerve segment was removed in 20 rats. A neurotube was placed between the proximal and the distal parts of the nerve for reconnection of nerve defect. Ten of 20 rats received post-operative, transcutaneous, 200-mW, 780-nm laser irradiation for 14 consecutive days to the corresponding segments of the spinal cord (15 min) and to the reconstructed nerve (15 min). RESULTS: At 3 months after surgery, positive somato-sensory evoked responses were found in 70% of the irradiated rats ($p = 0.015$), compared to 30% of the non-irradiated rats. The Sciatic Functional Index in the irradiated group was higher than in the non-irradiated group ($p < 0.05$). Morphologically, the nerves were completely reconnected in both groups, but the laser-treated group showed an increased total number of myelinated axons. CONCLUSION: The results of this study suggest that postoperative 780-nm laser phototherapy enhances the regenerative process of the peripheral nerve after reconnection of the nerve defect using a PGA neurotube. Polyglycolic Acid Animals;Double-Blind Method;Evoked Potentials, Somatosensory;Low-Level Light Therapy;Male;Nerve Regeneration;Peripheral Nerves;Pilot Projects;Polyglycolic Acid;Random Allocation;Rats;Rats, Wistar;Sciatic Nerve

Effects of Low-level Laser in the Treatment of Myofascial Pain Dysfunction Syndrome. BACKGROUND AND AIMS: Muscular pain in the facial region is the most common cause of facial pains. Myofascial pain dysfunction syndrome (MPDS) is one of the most important facial muscle disorders comprising of signs and symptoms including pain during function, tenderness in the muscles of mastication and restricted jaw movement. Due to the lack of an accepted therapeutic approach, the purpose of this paper was to find an effective treatment to decrease the pain of such patients. Considering the analgesic and anti-inflammatory action of laser therapy, the effects of low level laser (Ga-Al-As) in the treatment of MPDS patients referred to Tehran University of Medical Sciences Faculty of Dentistry, were investigated in the present study. MATERIALS AND METHODS: This study was a quasi-experimental research. Twenty-two MPDS patients were selected from those referred to Department of Oral Medicine, Tehran University of Medical Sciences Faculty of Dentistry. Clinical examination was performed at six stages in the following order: prior to the treatment, at 2 and 4 weeks after treatment, and monthly thereafter for a 3-months follow-up. All patients underwent low-level laser therapy for 4 weeks (12 sessions). Variables such as pain severity, pain of cheek region, pain frequency, tenderness of masticatory muscles, click, and mouth opening were evaluated at each stage. Numerical variables were investigated using Analysis of Variance test for repeated measures whereas ranking variables were studied by non-parametric Kruskal-Wallis test. RESULTS: At the end of treatment period, pain severity, pain of cheek region, pain frequency, tenderness of masseter, temporalis, medial pterygoid, and lateral pterygoid muscles showed significant improvement as compared with the commencement of any treatment which continued during the 3-months post-treatment ($p<0.05$). CONCLUSION: It was shown that low-level laser (Ga-Al-As) therapy had the efficacy to alleviate pain and decrease the tenderness of masticatory muscles among MPDS patients through a continuous and regular therapeutic program.

Low-level-laser therapy as an alternative treatment for primary herpes simplex infection: a case report. Gingivostomatitis is the most common primary and symptomatic clinical manifestation of HSV-1 infection. Painful oral lesions appear as ulcerative erosions on the gingiva, palate, buccal mucosa, and tongue, leading to eating and drinking difficulties with an evolution between 10-14 days. This paper describes a case of a 19-month-old boy with severe painful Gingivostomatitis lesions. Low level laser therapy (LLLT) was used with an immediate outcome. Follow-Up Studies;Humans;Infant;Lasers, Semiconductor;Lip Diseases;Low-Level Light Therapy;Male;Oral Ulcer;Stomatitis, Herpetic;Tongue Diseases;Treatment Outcome

Management of mild to moderate rhinophyma with a 1,450-nm diode laser: report of five patients. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Rhinophyma;Treatment Outcome

Randomized controlled trial of light-emitting diode phototherapy. OBJECTIVE: We wished to compare the efficacy of light-emitting diode (LED) phototherapy with special blue fluorescent (BB) tube phototherapy in the treatment of neonatal hyperbilirubinemia. STUDY DESIGN: We randomly assigned 66 infants >or=35 weeks of gestation to receive phototherapy using an LED device or BB. In addition to phototherapy from above, all infants also received phototherapy from below using four BB tubes or a fiberoptic pad. RESULT: After 15+/-5 h of phototherapy, the rate of decline in the total serum bilirubin (TSB) was 0.35+/-0.25 mg/dl/h in the LED group vs 0.27+/-0.25 mg/dl/h in the BB group (P=0.20). CONCLUSION: LED phototherapy is as effective as BB phototherapy in lowering serum bilirubin levels in term and near-term newborns. Bilirubin Bilirubin;Female;Fiber Optic Technology;Gestational Age;Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Male;Phototherapy;Treatment Outcome

Redarkening of port-wine stains 10 years after laser treatment. Age Factors;Child, Preschool;Humans;Infant;Low-Level Light Therapy;Port-Wine Stain;Recurrence;Skin Pigmentation

Short-term efficacy of physical interventions in osteoarthritic knee pain. A systematic review and meta-analysis of randomised placebo-controlled trials. BACKGROUND: Treatment efficacy of physical agents in osteoarthritis of the knee (OAK) pain has been largely unknown, and this systematic review was aimed at assessing their short-term efficacies for pain relief. METHODS: Systematic review with meta-analysis of efficacy within 1-4 weeks and at follow up at 1-12 weeks after the end of treatment. RESULTS: 36 randomised placebo-controlled trials (RCTs) were identified with 2434 patients where 1391 patients received active treatment. 33 trials satisfied three or more out of five methodological criteria (Jadad scale). The patient sample had a mean age of 65.1 years and mean baseline pain of 62.9 mm on a 100 mm visual analogue scale (VAS). Within 4 weeks of the commencement of treatment manual acupuncture, static magnets and ultrasound therapies did not offer statistically significant short-term pain relief over placebo. Pulsed electromagnetic fields offered a small reduction in pain of 6.9 mm [95% CI: 2.2 to 11.6] (n = 487). Transcutaneous electrical nerve stimulation (TENS, including interferential currents), electro-acupuncture (EA) and low level laser therapy (LLLT) offered clinically relevant pain relieving effects of 18.8 mm [95% CI: 9.6 to 28.1] (n = 414), 21.9 mm [95% CI: 17.3 to 26.5] (n = 73) and 17.7 mm [95% CI: 8.1 to 27.3] (n = 343) on VAS respectively versus placebo control. In a subgroup analysis of trials with assumed optimal doses, short-term efficacy increased to 22.2 mm [95% CI: 18.1 to 26.3] for TENS, and 24.2 mm [95% CI: 17.3 to 31.3] for LLLT on VAS. Follow-up data up to 12 weeks were sparse, but positive effects seemed to persist for at least 4 weeks after the course of LLLT, EA and TENS treatment was stopped. CONCLUSION: TENS, EA and LLLT administered with optimal doses in an intensive 2-4 week treatment regimen, seem to offer clinically relevant short-term pain relief for OAK. Acupuncture Analgesia;Humans;Magnetics;Osteoarthritis, Knee;Randomized Controlled Trials as Topic;Transcutaneous Electric Nerve Stimulation;Treatment Outcome;Ultrasonography, Interventional

Influence of He-Ne laser therapy on the dynamics of wound healing in mice treated with anti-inflammatory drugs. We determined the effects of helium-neon (He-Ne) laser irradiation on wound healing dynamics in mice treated with steroidal and non-steroidal anti-inflammatory agents. Male albino mice, 28-32 g, were randomized into 6 groups of 6 animals each: control (C), He-Ne laser (L), dexamethasone (D), D + L, celecoxib (X), and X + L. D and X were injected im at doses of 5 and 22 mg/kg, respectively, 24 h before the experiment. A 1-cm long surgical wound was made with a scalpel on the abdomens of the mice. Animals from groups L, D + L and X + L were exposed to 4 J (cm(2))-1 day-1 of He-Ne laser for 12 s and were sacrificed on days 1, 2, or 3 after the procedure, when skin samples were taken for histological examination. A significant increase of collagen synthesis was observed in group L compared with C (168 +/- 20 vs 63 +/- 8 mm(2)). The basal cellularity values on day 1 were: C = 763 +/- 47, L = 1116 +/- 85, D = 376 +/- 24, D + L = 698 +/- 31, X = 453 +/- 29, X + L = 639 +/- 32 U/mm(2). These data show that application of L increases while D and X decrease the inflammatory cellularity compared with C. They also show that L restores the diminished cellularity induced by the anti-inflammatory drugs. We suggest that He-Ne laser promotes collagen formation and restores the baseline cellularity after pharmacological inhibition, indicating new perspectives for laser therapy aiming to increase the healing process when anti-inflammatory drugs are used. Anti-Inflammatory Agents;Pyrazoles;Sulfonamides;Helium;Neon;Dexamethasone;Celecoxib Animals;Anti-Inflammatory Agents;Celecoxib;Dexamethasone;Helium;Low-Level Light Therapy;Male;Mice;Neon;Pyrazoles;Sulfonamides;Wound Healing

Pulsed-dye laser treatment of nonhealing chronic ulcer with hypergranulation tissue. Aged, 80 and over;Carcinoma, Squamous Cell;Diagnosis, Differential;Forehead;Granulation Tissue;Humans;Low-Level Light Therapy;Male;Middle Aged;Mohs Surgery;Scalp;Skin Neoplasms;Skin Ulcer;Surgical Flaps

Lipoplasty: a personal, conceptual, and historical perspective. Clinical Competence;Female;Humans;Lipectomy;Low-Level Light Therapy;Male;Patient Satisfaction;Practice Patterns, Physicians';Ultrasonic Therapy;United States
[Therapy of congenital melanocytic nevi. Excision, dermabrasion, laser]. Congenital melanocytic nevi are rare lesions which depending on their size and location may cause major cosmetic and psychological problems. Large congenital melanocytic nevi may undergo malignant change and can also be associated with neurocutaneous melanosis. The different treatment approaches reach different levels of the skin. Complete excision is the treatment of choice, but is not always possible with giant nevi. Superficial treatment can reduce the pigmentation, but repigmentation is not uncommon. Incomplete removal of melanocytic nevi does not reduce the melanoma risk. Surgical intervention must be carefully planned; the advantages and disadvantages of the different modalities must be discussed with the parents. The risk of malignant transformation must be weighed up against the expected aesthetic and functional outcomes. Adolescent;Adult;Cell Transformation, Neoplastic;Child;Child, Preschool;Dermabrasion;Dermatologic Surgical Procedures;Esthetics;Facial Neoplasms;Female;Follow-Up Studies;Humans;Infant;Infant, Newborn;Laser Coagulation;Low-Level Light Therapy;Male;Melanoma;Nevus, Pigmented;Reoperation;Skin;Skin Neoplasms;Surgery, Plastic;Surgical Flaps;Treatment Outcome
Photo-induced damages of cytoplasmic and mitochondrial membranes by a [C60]fullerene malonic acid derivative. The biological activities of fullerene derivatives have attracted much attention in the last decade. In this paper, effects of dimalonic acid C(60) (DMA C(60)) on cytoplasmic membrane, intracellular calcium concentration ([Ca(2+)](i)), and mitochondrial membrane in HeLa cells were studied by using laser scanning confocal microscopy together with fluorescent probes propidium iodide (PI), fluo-3 acetoxymethyl ester (fluo-3 AM), and tetramethyl rhodamine methyl ester (TMRM). The data showed that under laser irradiation produced by a Kr/Ar laser source with a low power less than 1 mW, DMA C(60) might induce damages against both cytoplasmic and mitochondrial membranes in a time- and dose-dependent manner. Prior to leakage of cytoplasmic membrane, a transient increase in [Ca(2 +)](i) occurred due to influx of calcium from the culture medium. These data provided some novel clues to explain the mechanisms involved in the photo-induced cytotoxicity of fullerene derivatives. Fluorescent Dyes;Fullerenes;Malonates;fullerene C60;Calcium Calcium;Cell Membrane;Cell Membrane Permeability;Cell Survival;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Fluorescent Dyes;Fullerenes;HeLa Cells;Humans;Low-Level Light Therapy;Malonates;Microscopy, Confocal;Mitochondrial Membranes;Time Factors
Effects of diode 808 nm GaAlAs low-power laser irradiation on inhibition of the proliferation of human hepatoma cells in vitro and their possible mechanism. Low-power laser irradiation (LPLI) has come into a wide range of use in medical field. Considering basic research, LPLI can enhance DNA synthesis and increases proliferation rate of human cells. But only a few data about the effects of LPLI on human liver or hepatoma cells are available. The cytoskeleton plays important roles in cell function and therefore is implicated in the pathogenesis of many human liver diseases, including malignant tumors. In our previous study, we found the stability of cytokeratin molecules in human hepatocytes was related to the intact microtubule network that was influenced by colchicine. In this study, we are going to search the effect of LPLI on proliferation of human hepatoma cell line HepG2 and J-5 cells. In addition, the stability of cytokeratin and synemin (one of the intermediate filament-associated proteins) were analyzed under the action of LPLI to evaluate the possible mechanism of LPLI effects on proliferation of human hepatoma cells. In experiment, HepG2 and J-5 cells were cultured in 24-well plate for 24 hours. After irradiation by 130 mW diode 808 nm GaAlAs continue wave laser in different time intervals, the cell numbers were counted. Western blot and immunofluorescent staining examined the expression and distribution of PCNA, cytokeratin and

synemin. The cell number counting and PCNA expression were evaluated to determine the proliferation. The organization and expression of cytokeratin and synemin were studied to identify the stability of cytoskeleton affected by LPLI. The results revealed that proliferation of HepG2 and J-5 cells was inhibited by LPLI since the cell number and PCNA expression was reduced. Maximal effect was achieved with 90 and 120 seconds of exposure time (of energy density 5.85 J/cm2 and 7.8 J/cm2, respectively) for HepG2 and J-5, respectively. The decreased ratio of cell number by this dose of irradiation was 72% and 66% in HepG2 and J-5 cells, respectively. Besides that, the architecture of intermediate filaments in these cells was disorganized by laser irradiation. The expression of intermediate filament-associated protein, synemin, was also reduced. Two significant findings are raised in this study: (1) Diode 808 nm GaAlAs continuous wave laser has an inhibitory effect on the proliferation of human hepatoma cells line HepG2 and J-5. (2) The mechanism of inhibition might be due to down-regulation of synemin expression and alteration of cytokeratin organization that was caused by laser irradiation. Fluorescent Dyes;Intermediate Filament Proteins;Proliferating Cell Nuclear Antigen;desmuslin;Phalloidine;Keratins;Fluorescein-5-isothiocyanate Analysis of Variance;Blotting, Western;Carcinoma, Hepatocellular;Cell Count;Cell Line, Tumor;Cell Proliferation;Fluorescein-5-isothiocyanate;Fluorescent Antibody Technique, Indirect;Fluorescent Dyes;Humans;In Vitro Techniques;Intermediate Filament Proteins;Keratins;Liver Neoplasms;Low-Level Light Therapy;Phalloidine;Proliferating Cell Nuclear Antigen;Radiation Dosage;Time Factors

[Magnetolaser therapy of patients with bronchial asthma in combination with essential hypertension]. Adolescent;Adult;Aged;Asthma;Combined Modality Therapy;Female;Humans;Hypertension;Infrared Rays;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Physical Therapy Modalities;Treatment Outcome

Histologic comparison of light emitting diode phototherapy-treated hydroxyapatite-grafted extraction sockets: a same-mouth case study. BACKGROUND: The stimulating effect of red and near-infrared (NIR) laser phototherapy on bone regeneration and growth has been shown in a number of in vitro and animal studies. However, the effect of NIR phototherapy on the bone regeneration of hydroxyapatite (HA) -treated extraction sockets has not been previously demonstrated. MATERIALS AND METHODS: An investigational Biolux extraoral light emitting diode phototherapy device was used daily for 21 days postextraction and socket grafting with HA (Osteograf LD300) unilaterally. Bone regeneration of the phototherapy-treated and nontreated side was compared in same-mouth extraction sockets. RESULTS: Histologic evaluations showed enhanced bone formation and faster particle resorption associated with the phototherapy-treated socket graft compared with the non-phototherapy-treated socket. CONCLUSIONS: The accelerated bone healing in the phototherapy-treated HA socket graft may provide faster implant placement compared to non-phototherapy-treated socket grafts. Bone Substitutes;Durapatite Absorbable Implants;Bone Regeneration;Bone Substitutes;Durapatite;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Mandible;Middle Aged;Molar;Osteogenesis;Radiotherapy Dosage;Tooth Extraction;Tooth Socket;Wound Healing

Vascular lasers and IPLS: guidelines for care from the European Society for Laser Dermatology (ESLD). Dermatology and dermatologic surgery have rapidly evolved during the last two decades thanks to the numerous technological and scientific acquisitions focused on improved precision in the diagnosis and treatment of skin alterations. Given the proliferation of new devices for the treatment of vascular lesions, we have considerably changed our treatment approach. Lasers and non-coherent intense pulse light sources (IPLS) are based on the principle of selective photothermolysis and can be used for the treatment of many vascular skin lesions. A variety of lasers has recently been developed for the treatment of congenital and acquired vascular lesions which incorporate these concepts into their design. The list is a long one and includes pulsed dye (FPDL, APDL) lasers (577 nm, 585 nm and 595

nm), KTP lasers (532 nm), long pulsed alexandrite lasers (755 nm), pulsed diode lasers (in the range of 800 to 900 nm), long pulsed 1064 Nd:YAG lasers and intense pulsed light sources (IPLS, also called flash-lights or pulsed light sources). Several vascular lasers (such as argon, tunable dye, copper vapour, krypton lasers) which were used in the past are no longer useful as they pose a higher risk of complications such as dyschromia (hypopigmentation or hyperpigmentation) and scarring. By properly selecting the wavelength which is maximally absorbed by the target--also called the chromophore (haemoglobin in the red blood cells within the vessels)--and a corresponding pulse duration which is shorter than the thermal relaxation time of that target, the target can be preferentially injured without transferring significant amounts of energy to surrounding tissues (epidermis and surrounding dermal tissue). Larger structures require more time for sufficient heat absorption. Therefore, a longer laser-pulse duration has to be used. In addition, more deeply situated vessels require the use of longer laser wavelengths (in the infrared range) which can penetrate deeper into the skin. Although laser and light sources are very popular due to their non-invading nature, caution should be considered by practitioners and patients to avoid permanent side effects. These guidelines focus on patient selection and treatment protocol in order to provide safe and effective treatment. Physicians should always make the indication for the treatment and are responsible for setting the machine for each individual patient and each individual treatment. The type of laser or IPLS and their specific parameters must be adapted to the indication (such as the vessel's characteristics, e.g. diameter, colour and depth, the Fitzpatrick skin type). Treatments should start on a test patch and a treatment grid can improve accuracy. Cooling as well as a reduction of the fluence will prevent adverse effects such as pigment alteration and scar formation. A different number of repeated treatments should be done to achieve complete results of different vascular conditions. Sunscreen use before and after treatment will produce and maintain untanned skin. Individuals with dark skin, and especially tanned patients, are at higher risk for pigmentary changes and scars after the laser or IPLS treatment. Humans;Informed Consent;Low-Level Light Therapy;Patient Selection;Phototherapy;Practice Guidelines as Topic;Vascular Diseases

The therapeutic effect of low-level laser on repair of osteochondral defects in rabbit knee. INTRODUCTION: Low level laser therapy (LLLT) has been shown to enhance collagen production and wound healing but its effect on cartilage repair from biomechanical point of view is not known yet. The aim of present study was to evaluate the biomechanical behaviour of repairing osteochondral defect in rabbits which received a pulsed low-level gallium-arsenide (Ga-As) laser irradiation. MATERIALS AND METHODS: Osteochondral defects with 5mm diameter and 4mm in depth induced by drilling in right femoral patellar grooves of 41 adolescent male rabbits. They were divided into experimental and control groups. Experimental group received pulsed Ga-As (890nm) laser irradiation with energy density of 4.8J/cm(2). The rabbits in control group received placebo LLLT with shut-down equipment. The control defects were allowed to heal spontaneously. Each group were divided into three subgroups: A, B and C. Subgroups A, B and C were sacrificed on 4, 8, and 16 weeks after surgery. The knee joint were removed, and the defects were examined biomechanically by in situ-indentation method. The thickness, instantaneous and equilibrium indentation stiffness was measured during the test. Data were analysed using ANOVA and independent sample t-test. RESULT: While no difference was observed in the repaired cartilage biomechanical properties among 4th, 8th, 16th weeks in study groups. The equilibrium indentation stiffness of experimental group was significantly higher in 8th week in comparison with control group. CONCLUSION: LLLT significantly enhances the stiffness of repairing tissue in the 8th week post injury in osteochondral defects in rabbits. Animals;Cartilage, Articular;Chondrocytes;Extremities;Femur;Joints;Low-Level Light Therapy;Male;Rabbits;Time Factors;Wound Healing

A case of milium-like syringoma with focal calcification in Down syndrome. Adolescent;Down Syndrome;Epidermal Cyst;Female;Humans;Low-Level Light Therapy;Sweat Gland Neoplasms;Syringoma;Treatment Outcome

Treatment of facial acne papules and pustules in Korean patients using an intense pulsed light device equipped with a 530- to 750-nm filter. BACKGROUND: A rising number of laser- or light-based therapies are addressing the need for effective acne treatments with minimal downtime. OBJECTIVE: The purpose of this study is to evaluate an intense pulsed light (IPL) equipped with a 530- to 750-nm filter for inflammatory acne treatment. PATIENTS AND METHODS: Thirty female patients (mean age, 25.7 years) with mild-to-moderate acne were enrolled. While using benzoyl peroxide (BP) gel, one side of the face was treated with the PR filter (acne filter) of the IPL. RESULTS: All patients experienced the reduction of inflammatory lesion counts in both sides of face. There was no significant difference between IPL-treated and untreated sides of the face for mean papule plus pustule counts, 3 weeks after three sessions. As to red macules, 63% were good or excellent on the laser-treated side compared to 33% on the untreated side. Improvement of irregular pigmentation and skin tone was detected on the laser-treated side than the untreated side. CONCLUSION: This new wavelength band of IPL system was safe and effective in improving acne red macules, irregular pigmentation, and skin tone but did not affect inflammatory acne lesion counts on the skin of Asian persons. Acne Vulgaris;Adult;Asian People;Female;Filtration;Humans;Korea;Low-Level Light Therapy;Severity of Illness Index;Treatment Outcome

Conservative therapy for plantar fasciitis: a narrative review of randomized controlled trials. A narrative literature review of RCTs only, was conducted to ascertain which conservative treatments provide the best results for plantar fasciitis patients. Stretching, prefabricated and custom-made orthotics and night splints have all been scrutinized in numerous studies with mixed results. Chiropractic manipulative therapy has been examined in one study, with favorable results. Therapeutic ultrasound and low intensity laser therapy have been examined in one study apiece with unsatisfactory results. Based on the trials reviewed a trial of therapy beginning with low-cost, patient-centered treatments is recommended, particularly stretching, over-the-counter orthotics, and patient education. Several (but not all) of the reviewed articles indicated that custom-made orthoses are more beneficial for plantar fasciitis than over-the-counter orthotics. In the event these treatments do not provide satisfactory results, use of night splints should be considered. Based on this review, there is no support for the use of magnetic insoles for plantar fasciitis. Most of the studies were found to have at least one methodological flaw, including inadequate sample sizes, high drop-out rates, comparing multiple interventions to multiple interventions (thus making it difficult to determine the effect of each individual intervention) and lack of long-term follow-up. Outcome measure use between studies was inconsistent.

Antimicrobial photodynamic therapy in the non-surgical treatment of aggressive periodontitis: a preliminary randomized controlled clinical study. BACKGROUND: The treatment of aggressive periodontitis has always presented a challenge for clinicians, but there are no established protocols and guidelines for the efficient control of the disease. METHODS: Ten patients with a clinical diagnosis of aggressive periodontitis were treated in a split-mouth design study to either photodynamic therapy (PDT) using a laser source with a wavelength of 690 nm associated with a phenothiazine photosensitizer or scaling and root planing (SRP) with hand instruments. Clinical assessment of plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing depth (PD), gingival recession (GR), and relative clinical attachment level (RCAL) were made at baseline and 3 months after treatment with an automated periodontal probe. RESULTS: Initially, the PI was 1.0 +/- 0.5 in both groups. At the 3-month evaluation, the plaque scores were reduced and remained low throughout the study. A significant reduction of GI and BOP occurred in both groups after 3 months (P

<0.05). The mean PD decreased in the PDT group from 4.92 +/- 1.61 mm at baseline to 3.49 +/- 0.98 mm after 3 months (P <0.05) and in SRP group from 4.92 +/- 1.14 mm at baseline to 3.98 +/- 1.76 mm after 3 months (P <0.05). The mean RCAL decreased in the PDT group from 9.93 +/- 2.10 mm at baseline to 8.74 +/- 2.12 mm after 3 months (P <0.05), and in the SRP group, from 10.53 +/- 2.30 mm at baseline to 9.01 +/- 3.05 mm after 3 months. CONCLUSION: PDT and SRP showed similar clinical results in the non-surgical treatment of aggressive periodontitis. Adolescent;Adult;Dental Plaque;Dental Scaling;Female;Humans;Low-Level Light Therapy;Male;Periodontal Attachment Loss;Periodontitis;Root Planing;Statistics, Nonparametric;Treatment Outcome

[Photoaging: laser and light-based therapy]. Photoaging is clinical character by dyspigmentations, telangiectacia, and wrinkles. Therefore, the assessment of therapeutic effects of photoaging depends on the management results of these three lesions. This article introduces the effect of laser and light-based therapies on photoaging. Humans;Low-Level Light Therapy;Pigmentation Disorders;Skin Aging;Telangiectasis;Ultraviolet Rays

Mongolian spots with involvement of mandibular area. A 1-year-old boy had grayish pigmentation on the left side of his face over the area supplied by the mandibular branch of the trigeminal nerve. Upon further examination, the lesion was also found on the left side of the neck, shoulder, upper arm, right lower back and buttock. The pigmentation was uniform in intensity. This case report demonstrates that Mongolian spots can occur on the face in the area supplied by the mandibular branch of the trigeminal nerve. These spots should not be misdiagnosed as nevus of Ota. Arm;Back;Buttocks;Diagnosis, Differential;Face;Humans;Infant;Low-Level Light Therapy;Male;Mongolian Spot;Neck;Nevus of Ota;Shoulder;Skin Neoplasms

[Intravascular laser irradiation of blood in the treatment of patients with bronchial asthma]. AIM: To investigate action of intravascular laser blood irradiation (ILBI) on production of active oxygen forms (AOF) in patients with bronchial asthma (BA). MATERIAL AND METHODS: The trial included 59 BA patients aged 20 to 60 years (mean age 40.2 +/- 3.1 years). AOF generation in whole blood was registered with luminol-dependent chemiluminescence (CL). Basic therapy was given to 42 patients. ILBI was added to basic therapy in 17 patients. RESULT: . CL of whole blood in BA patients depended on severity of inflammation. BA patients with intensive CL exposed to ILBI retained free radical oxidation defects and the disease symptoms. In low intensity of blood CL, ILBI activated A OF generation and raised treatment effectiveness. CONCLUSION: ILBI raises AOF production in the whole blood of BA patients. CL registration can be used for validation of ILBI administration in BA patients and control of effectiveness of laser therapy. Reactive Oxygen Species Asthma;Blood;Female;Humans;Low-Level Light Therapy;Luminescent Measurements;Male;Reactive Oxygen Species;Treatment Outcome

Nd:YAG laser biostimulation of bisphosphonate-associated necrosis of the jawbone with and without surgical treatment. Bisphosphonate-associated osteonecrosis was first reported in 2003 and is getting common. Size of lesions, symptoms, and duration of time between starting bisphosphonates and the development of bone necrosis vary. There is currently no effective treatment. We describe our preliminary results with 19 patients affected by bisphosphonate-associated osteonecrosis of the jaws who were treated conventionally with surgical or medical treatment alone or in combination with neodimium: yttrium-aluminium-garnet (Nd:YAG) laser. Clinical variables such as symptoms, presence of pus, and closure of mucosal flaps before and after treatment were evaluated to establish the effect of the laser irradiation. We treated nine patients with laser biostimulation with or without surgical treatment, and in this group there were eight clinical successes and one symptomatic improvement, with a clinical finding better than ones without laser biostimulation (ten patients, five clinical successes, and one symptomatic improvement). Anti-Bacterial Agents;Anti-Infective Agents, Local;Antifungal Agents;Bone Density Conservation Agents;Diphosphonates Aged;Anti-

Bacterial Agents;Anti-Infective Agents, Local;Antifungal Agents;Bone Density Conservation Agents;Combined Modality Therapy;Curettage;Diphosphonates;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Mandibular Diseases;Maxillary Diseases;Osteonecrosis;Treatment Outcome;Wound Healing
Effect of low-level laser treatment after installation of dental titanium implant-immunohistochemical study of RANKL, RANK, OPG: an experimental study in rats. BACKGROUND AND OBJECTIVES: This experiment using an animal experimental model was conducted in order to investigate the effect of low-level laser therapy (LLLT) on the healing of the dental titanium implant. STUDY DESIGN/MATERIALS AND METHODS: The experimental group received LLLT for a week and the control group did not. Each group consisted of 10 rats. Two rats from the groups were euthenized on the days 1, 3, 7, 14, and 21 of the experiment. The expression of receptor activator of nuclear factor kB ligand (RANKL), osteoprotegerin (OPG), and receptor activator of nuclear factor kB (RANK) were investigated. RESULTS: The expression of RANKL was observed from the initial stage of the installation of the implant for both the experimental and control groups. However, the degree of expression was higher in the experimental group. The degree of expression of OPG increased remarkably in the experimental group, while in the control group the degree of expression increased only slightly. In the experimental group, the expression of RANK was observed from the first day, but in the control group, it was weakly observed after day 3. The overall expression within the bone was slight on day 7 in the control group, while an active expression was observed in the experimental group. Bone density after installation of dental titanium implant during osseointegration in the experimental group was higher than the control group. The surface and structure of the titanium implant was not damaged by low-level laser (LLL). CONCLUSIONS: From the above results, the expression of OPG, RANKL, and RANK during the osseointegration of the dental titanium implant was observed within bone tissue. The application of the LLL influenced the expression of OPG, RANKL, and RANK, and resulted in the expansion of metabolic bone activity and increased the activity of bone tissue cells. Dental Implants;Osteoprotegerin;RANK Ligand;Titanium Animals;Bone Density;Dental Implantation;Dental Implants;Immunohistochemistry;Low-Level Light Therapy;Microscopy, Electron, Scanning;Models, Animal;Osseointegration;Osteoprotegerin;RANK Ligand;Rats;Rats, Sprague-Dawley;Tibia;Titanium
Fractional photothermolysis for the treatment of adult colloid milium. Dose Fractionation, Radiation;Facial Dermatoses;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases, Papulosquamous
Effect of low-intensity laser irradiation on the chemical composition and structure of lipids in wheat tissue culture. Lipids Lasers;Lipid Metabolism;Lipids;Molecular Structure;Spectrophotometry, Infrared;Triticum
Single-cell analysis of protein kinase C activation during anti-apoptosis and apoptosis induced by laser irradiation. Protein Kinase C Apoptosis;Enzyme Activation;Humans;Low-Level Light Therapy;Protein Kinase C
Effect of low-level laser therapy on hemorrhagic lesions induced by immune complex in rat lungs. OBJECTIVE: The aim of this study was to investigate if low-level laser therapy (LLLT) can modulate formation of hemorrhagic lesions induced by immune complex. BACKGROUND DATA: There is a lack of information on LLLT effects in hemorrhagic injuries of high perfusion organs, and the relative efficacy of LLLT compared to anti-inflammatory drugs. METHODS: A controlled animal study was undertaken with 49 male Wistar rats randomly divided into seven groups. Bovine serum albumin (BSA) i.v. was injected through the trachea to induce an immune complex lung injury. The study compared the effect of irradiation by a 650-nm Ga-Al-As laser with LLLT doses of 2.6 Joules/cm(2) to celecoxib, dexamethasone, and control groups for hemorrhagic index (HI) and myeloperoxide activity

(MPO) at 24 h after injury. RESULTS: The HI for the control group was 4.0 (95% CI, 3.7-4.3). Celecoxib, LLLT, and dexamethasone all induced significantly ($p < 0.01$) lower HI than control animals at 2.5 (95% CI, 1.9-3.1), 1.8 (95% CI, 1.2-2.4), and 1.5 (95% CI, 0.9-2.1), respectively, for all comparisons to control. Dexamethasone, but not celecoxib, induced a slightly, but significantly lower HI than LLLT ($p = 0.04$). MPO activity was significantly decreased in groups receiving celecoxib at 0.87 (95% CI, 0.63-1.11), dexamethasone at 0.50 (95% CI, 0.24-0.76), and LLLT at 0.7 (95% CI, 0.44-0.96) when compared to the control group, at 1.6 (95% CI, 1.34-1.96; $p < 0.01$), but there were no significant differences between any of the active treatments. CONCLUSION: LLLT at a dose of 2.6 Joules/cm(2) induces a reduction of HI levels and MPO activity in hemorrhagic injury that is not significantly different from celecoxib. Dexamethasone is slightly more effective than LLLT in reducing HI, but not MPO activity. Anti-Inflammatory Agents;Pyrazoles;Sulfonamides;Dexamethasone;Celecoxib Animals;Anti-Inflammatory Agents;Celecoxib;Dexamethasone;Hemorrhage;Immune Complex Diseases;Low-Level Light Therapy;Lung Diseases;Male;Pyrazoles;Rats;Rats, Wistar;Sulfonamides

Promotion of regenerative processes in injured peripheral nerve induced by low-level laser therapy. OBJECTIVE: This study aimed to assess in vitro the influence of low-level laser therapy (LLLT) on the regenerative processes of a peripheral nerve after trauma. BACKGROUND DATA: In peripheral nerve injury initiated after severing due to accident or by a surgeon during operation, photomodulation by light in the red to near-infrared range (530-1000 nm) using low-energy lasers has been shown to accelerate nerve regeneration. METHOD: Twenty-four New Zealand adult male rabbits were randomly assigned to two equal groups (control and laser-treated). General anesthesia was administered intramuscularly, and exploration of the peroneal nerve was done in the lateral aspect of the left leg. Complete section of the nerve was performed, which was followed by suturing of the neural sheath (epineurium). Irradiation was carried out directly after the operation and for 10 consecutive days. The laser used was diode with wavelength of 901 nm (impulsive) and power of 10 mW; it was a square-shaped window type (16 cm(2)), and its energy was applied by direct contact of the instrument's window to the site of the operation. Three rabbits from each group were sacrificed at the end of weeks 2, 4, 6, and 8, and specimens were collected from the site of nerve suturing and sent for histopathological examination. RESULTS: Two important factors were examined via histopathology: diameter of the nerve fibers and individual internodal length. Compared to the control group, significant variations in regeneration were observed, including thicker nerve fibers, more regular myelin layers, clearer nodes of Ranvier with absence of short nodes in the treated group. Variations between the two groups for diameter were significant for the 2(nd) week ($p < 0.05$), highly significant for the 4(th) and 6(th) weeks, respectively ($p < 0.01$), and very highly significant for the 8(th) week ($p < 0.001$). Variations between the two groups for internodal length were highly significant for the 2(nd) and 4(th) weeks ($p < 0.01$), and very highly significant for the 6(th) and 8(th) weeks ($p < 0.001$). CONCLUSION: This experiment affirms the beneficial effect of LLLT on nerve regeneration, since LLLT produced a significant amount of structural and cellular change. The results of the present study suggest that laser therapy may be a viable approach for nerve regeneration, which may be of clinical relevance in scheduled surgery or microsurgery. Animals;Low-Level Light Therapy;Male;Nerve Fibers;Nerve Regeneration;Peripheral Nerve Injuries;Peripheral Nerves;Rabbits

Photobiomodulation on the angiogenesis of skin wounds in rats using different light sources. OBJECTIVE: The aim of this study was to compare the angiogenic effects of laser and light-emitting diode (LED) illumination on wounds induced in rats, with varied fluence. BACKGROUND DATA: The LED is an alternative light source that accelerates wound healing, and its efficiency concerning the angiogenic effect was compared to low-level laser therapy (LLLT). METHODS: The experimental model consisted of a circular wound inflicted on the quadriceps of 120 rats, using a 15-mm-diameter

"punch." Animals were divided randomly into five groups: two groups of laser, with dosages of 5 and 20 J/cm(2), respectively, two groups of LED, also with dosages of 5 and 20 J/cm(2), and a control group. Six hours after wound infliction, the treated groups received the diverse applications accordingly and were irradiated every 24 h. Angiogenesis was studied through histomorphometry on days 3, 7, 14, and 21 after the wounds were inflicted. RESULTS: On days 3, 7, and 14, the proliferation of blood vessels in all irradiated groups was superior in comparison to those of the control group ($p < 0.05$). Treatment with fluence of 5 J/cm(2) was better than the laser group with 20 J/cm(2) on day 21. CONCLUSION: Red LLLT and LED demonstrated expressive results in angiogenesis. Light coherence was shown not to be essential to angiogenesis. However, further studies are needed in order to investigate the photobiomodulatory effects of LED in relation to LLLT in various biological tissues. Animals;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Phototherapy;Rats;Rats, Wistar;Skin;Wound Healing

Infrared laser photobiomodulation (lambda 830 nm) on bone tissue around dental implants: a Raman spectroscopy and scanning electronic microscopy study in rabbits. OBJECTIVE: The aim of this study was to assess, through Raman spectroscopy, the incorporation of calcium hydroxyapatite (CHA; approximately 960 cm(1)), and scanning electron microscopy (SEM), the bone quality on the healing bone around dental implants after laser photobiomodulation (lambda830 nm). BACKGROUND DATA: Laser photobiomodulation has been successfully used to improve bone quality around dental implants, allowing early wearing of prostheses. METHODS: Fourteen rabbits received a titanium implant on the tibia; eight of them were irradiated with lambda830 nm laser (seven sessions at 48-h intervals, 21.5 J/cm(2) per point, 10 mW, phi approximately 0.0028 cm(2), 86 J per session), and six acted as control. The animals were sacrificed 15, 30, and 45 days after surgery. Specimens were routinely prepared for Raman spectroscopy and SEM. Eight readings were taken on the bone around the implant. RESULTS: The results showed significant differences on the concentration of CHA on irradiated and control specimens at both 30 and 45 days after surgery ($p < 0.001$). CONCLUSION: It is concluded that infrared laser photobiomodulation does improve bone healing, and this may be safely assessed by Raman spectroscopy or SEM. Biocompatible Materials;Dental Implants;Durapatite Animals;Biocompatible Materials;Dental Implants;Durapatite;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Osseointegration;Rabbits;Spectrum Analysis, Raman

In vitro exposure of wounded diabetic fibroblast cells to a helium-neon laser at 5 and 16 J/cm2. OBJECTIVE: The aim of the present investigation was to assess morphological, cellular, and molecular effects of exposing wounded diabetic fibroblast cells to He-Ne (632.8 nm) laser irradiation at two different doses. BACKGROUND DATA: An alternative treatment modality for diabetic wound healing includes low-level laser therapy (LLLT). Although it's used in many countries and for many medical conditions, too many health care workers are unaware of this therapy, and there is still controversy surrounding its effectiveness. METHODS: Normal human skin fibroblast cells (WS1) were used to simulate a wounded diabetic model. The effect of LLLT (632.8 nm, 5 and 16 J/cm(2) once a day on two non-consecutive days) was determined by analysis of cell morphology, cytotoxicity, apoptosis, and DNA damage. RESULTS: Cells exposed to 5 J/cm(2) showed a higher rate of migration than cells exposed to 16 J/cm(2), and there was complete wound closure by day 4. Exposure of WS1 cells to 5 J/cm(2) on two non-consecutive days did not induce additional cytotoxicity or genetic damage, whereas exposure to 16 J/cm(2) did. There was a significant increase in apoptosis in exposed cells as compared to unexposed cells. CONCLUSION: Based on cellular morphology, exposure to 5 J/cm(2) was stimulatory to cellular migration, whereas exposure to 16 J/cm(2) was inhibitory. Exposure to 16 J/cm(2) induced genetic damage on WS1 cells when exposed to a He-Ne laser in vitro, whereas exposure to 5 J/cm(2) did not induce any additional damage. Cell Movement;Cells, Cultured;Diabetes Mellitus;Fibroblasts;Humans;Lasers;Radiation Dosage;Wound Healing

Low-level laser therapy enhances wound healing in diabetic rats: a comparison of different lasers. OBJECTIVE: The effects of wound healing acceleration on diabetic rats were determined and compared using different laser wavelengths and incident doses. BACKGROUND DATA: Many studies have demonstrated that low-level laser therapy (LLLT) can promote the wound healing on non-diabetic animals. METHODS: Male Sprague-Dawley rats were used. Streptozotocin (70 mg/kg) was applied for diabetes induction. An oval full-thickness skin wound was created aseptically with a scalpel in 51 diabetic rats and six non-diabetic rats on the shaved back of the animals. The study was performed using 532, 633, 810, and 980 nm diode lasers. Incident doses of 5, 10, 20, and 30 J/cm(2) and treatment schedule of 3 times/week were used in the experiments. The area of wound on all rats was measured and plotted on a slope chart. The slope values (mm(2)/day), the percentage of relative wound healing, and the percentage of wound healing acceleration were computed in the study. RESULTS: Mean slope values were 6.0871 in non-diabetic control and 3.636 in diabetic control rats ($p > 0.005$). The percentages of wound healing acceleration were 15.23, 18.06, 19.54, and 20.39 with 532-nm laser, 33.53, 38.44, 32.05, and 16.45 with 633-nm laser, 15.72, 14.94, 9.62, and 7.76 with 810-nm laser, and 12.80, 16.32, 13.79, and 7.74 with 980-nm laser, using incident doses of 5, 10, 20, and 30 J/cm(2), respectively. There were significant differences ($p > 0.001$) in the mean slope value of wound healing on diabetic rats between control groups and treatment groups in 532, 633, 810, and 980 nm lasers. CONCLUSION: The wound healing on control rats with diabetes was slower than on control rats without diabetes. LLLT at appropriate treatment parameters can enhance the wound healing on diabetic rats. The optimum wavelength was 633 nm, and the optimum incident dose was 10 J/cm(2) in our study. Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley;Wound Healing

Effects of 904-nm low-level laser therapy in the management of lateral epicondylitis: a randomized controlled trial. OBJECTIVE: The aim of this study was to evaluate the effectiveness of 904-nm low-level laser therapy (LLLT) in the management of lateral epicondylitis. BACKGROUND DATA: Lateral epicondylitis is characterized by pain and tenderness over the lateral elbow, which may also result in reduction in grip strength and impairment in physical function. LLLT has been shown effective in its therapeutic effects in tissue healing and pain control. METHODS: Thirty-nine patients with lateral epicondylitis were randomly assigned to receive either active laser with an energy dose of 0.275 J per tender point (laser group) or sham irradiation (placebo group) for a total of nine sessions. The outcome measures were mechanical pain threshold, maximum grip strength, level of pain at maximum grip strength as measured by the Visual Analogue Scale (VAS) and the subjective rating of physical function with Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. RESULTS: Significantly greater improvements were shown in all outcome measures with the laser group than with the placebo group ($p < 0.0125$), except in the two subsections of DASH. CONCLUSION: This study revealed that LLLT in addition to exercise is effective in relieving pain, and in improving the grip strength and subjective rating of physical function of patients with lateral epicondylitis. Disability Evaluation;Female;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Tennis Elbow

[Technologies of laser prophylaxis of depressive disorder relapses]. Adaptation, Psychological;Adult;Depression;Humans;Low-Level Light Therapy;Middle Aged;Secondary Prevention

Treatment of cutaneous and mucosal telangiectases in hereditary hemorrhagic telangiectasia: Report of three cases. INTRODUCTION: Hereditary hemorrhagic telangiectasia (HHT) or Rendu-Osler-Weber disease is an autosomal dominant disorder characterized by epistaxis, mucocutaneous telangiectases and visceral arteriovenous malformations. Cutaneous telangiectases are the most obvious sign of this disorder and are not a merely cosmetic problem owing to their risk for bleeding, which may constitute an authentic matter of concern to these patients. METHODS: Three patients

with type-II HHT disease who presented cutaneous and labial lesions were treated with an intense pulsed light (IPL) system associated with a long-pulsed Nd:YAG laser (Photoderm-Vasculight, Lumenis). Labial lesions were treated with the IPL system and cutaneous lesions were treated with the IPL system and the long-pulsed Nd:YAG laser. All treatments were accomplished on an outpatient basis, without anesthesia. RESULTS: All three patients experienced a reduction in the frequency and severity of bleeding episodes and a great cosmetic improvement, with total lesion clearance. Side effects, such as purpura, hypopigmentation, hyperpigmentation or textural changes, were not observed. Recurrences were not detected after a maximum period of 24 months of follow-up. CONCLUSION: The combination of an IPL system and a long-pulsed Nd:YAG laser is efficient and safe for the treatment of cutaneous and labial telangiectases in patients with HHT disease and constitutes an important tool in improving their quality of life. Adult;Female;Humans;Low-Level Light Therapy;Middle Aged;Phototherapy;Telangiectasia, Hereditary Hemorrhagic

A study evaluating the safety and efficacy of the VelaSmooth system in the treatment of cellulite. BACKGROUND: Most cellulite treatments are limited in their effectiveness. A combination of radiofrequency energy, infrared light and mechanical manipulation of the skin and fat merits further examination. OBJECTIVE: Subjects were treated with a device combining these energies to evaluate its safety and efficacy. METHODS: Sixteen subjects with cellulite were treated twice weekly for 6 weeks with the VelaSmooth system. One thigh was treated while the other served as a control. Treatment efficacy was measured through circumferential measurements of both thighs and by having the investigator and an independent evaluator grade visual improvement during follow-up visits. Five patients provided blood specimens for assessment of lipid and hormone levels and liver function. Two subjects provided three biopsies each in order to monitor the level of estrogen and progesterone receptors. RESULTS: The overall thigh circumference decreased in 71.87% of the treated legs. The mean decrease was 0.44 cm of the lower thigh and 0.53 cm of the upper thigh. There was significant visual improvement in cellulite and skin texture. At the final follow-up visit, 50% of subjects had greater than 25% improvement (good be very good). CONCLUSION: This study showed positive results. Future studies employing higher energy levels and additional treatments will likely augment the results of the present study. Adult;Buttocks;Cosmetic Techniques;Female;Humans;Infrared Rays;Low-Level Light Therapy;Massage;Middle Aged;Radiofrequency Therapy;Subcutaneous Fat;Suction

Pimecrolimus 1 percent cream and pulsed dye laser in treatment of a patient with reticular erythematous mucinosis syndrome. We report on the efficacy of twice daily application of pimecrolimus 1 percent cream in a 48-year-old woman with reticular erythematous mucinosis (REM) syndrome and compare its results with pulsed dye laser (PDL) on the other side of her chest and back. The patient was previously treated by hydroxychloroquine but only a fair response was observed. After application of 5 months of pimecrolimus, the lesions completely resolved and the result was comparable with the other side of her body treated by pulsed dye laser PDL. Topical pimecrolimus and pulsed dye laser appear to be effective and safe treatments for REM. pimecrolimus;Tacrolimus Administration, Topical;Biopsy, Needle;Combined Modality Therapy;Erythema;Female;Follow-Up Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Middle Aged;Mucinoses;Syndrome;Tacrolimus;Treatment Outcome

"Multi Light and Drugs": a new technique to treat face photoaging. Comparative study with photorejuvenation. Nonablative skin rejuvenation using laser, intense pulsed lights (IPLs), or radiofrequency techniques are becoming increasingly popular. In this paper, a novel protocol that integrates IPL sessions, low intense light and vitamin C, low-weight hyaluronic acid, betaglucan dermal injection versus IPL photorejuvenation as monotherapy is compared. A group of 100 patients, all women, with ages ranging from 35 to 65 years old (median age 56.3) with different degrees of

photodamage was considered. A blinded control study was done. The patients were divided not randomly into two groups. These groups are similar for ages, skin types, and degrees of photoaging distribution. A first group of 40 patients had monotherapy consisting of seven sessions of IPL only. A second group of 60 patients had triple therapy consisting of seven sessions of IPL as well as nine sessions of low intense diode light and also biostimulation by drugs. Considering only the improvement in hyperpigmentations and teleangectasias, the monotherapy and the triple therapy show good results with no significant statistical difference between the two groups. Considering the improvement in skin texture and firmness in the group treated only with monotherapy, 30% (12 patients) had positive results, and 70% (28 patients) had poor results. In the group treated with triple therapy, 70% (42 patients) had positive results, and 30% (18 patients) had poor results, with the main differences in skin silicone negative imprints. On the basis of the data presented, the new technique of IPL, low intensity diode light, and multidrugs biostimulation seems to be a safe and effective method for skin rejuvenation and upgrades the effects of IPL in the fibroblasts' stimulation. Hyaluronic Acid;Ascorbic Acid Adult;Aged;Ascorbic Acid;Cosmetic Techniques;Female;Humans;Hyaluronic Acid;Lasers, Semiconductor;Light;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Skin Aging;Surveys and Questionnaires;Treatment Outcome

Abstracts of the 27th Annual Conference of the American Society for Laser Medicine and Surgery , Grapevine, Texas, USA, April 11-15, 2007. Animals;Humans;Laser Therapy;Lasers;Low-Level Light Therapy

Effects of low-power red laser on dentine-pulp interface after cavity preparation. An ultrastructural study. OBJECTIVE: Studies on the influence of low-power red laser on the repair of dental structures are very scarce. This study investigated the effects of the laser therapy on the ultrastructure of the dentine-pulp interface after conservative class I cavity preparation. DESIGN: Two female volunteers with 8 premolars indicated for extraction for orthodontic reasons were recruited. Class I cavities were prepared and the teeth were randomly divided into two groups. The first group received treatment with a GaA1As laser, lambda=660nm, power of 30mW and energy dose of 2J/cm(2), directly and perpendicularly into the cavity in a single visit. After the irradiation, the cavities were filled with composite resin. The second group received the same treatment, except by the laser therapy. RESULTS: Twenty-eight days post-preparation, the teeth were extracted and processed for transmission electron microscopy analysis. Two sound teeth, without cavity preparation, were also studied. The irradiated group presented odontoblast process in higher contact with the extracellular matrix and the collagen fibrils appeared more aggregated and organised than those of control group. These results were also observed in the healthy teeth. CONCLUSION: These findings suggest that laser irradiation accelerates the recovery of the dental structures involved in the cavity preparation at the predentine region. Composite Resins;Collagen Adult;Collagen;Composite Resins;Dental Cavity Preparation;Dental Pulp;Dental Restoration, Permanent;Dentin;Extracellular Matrix;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Transmission;Odontoblasts;Radiation Dosage

Micro-shear bond strength of Er:YAG-laser-treated dentin. This study tested if dentin adhesion is affected by Er:YAG laser. Ninety dentin disks were divided in groups (n = 10): G1, control; G2, Er:YAG laser 150 mJ, 90 degrees contact, 38.8 J/cm(2); G3, Er:YAG laser 70 mJ, 90 degrees contact, 18.1 J/cm(2); G4, Er:YAG laser 150 mJ, 90 degrees non-contact, 1.44 J/cm(2); G5, Er:YAG laser 70 mJ, 90 degrees non-contact, 0.67 J/cm(2); G6, Er:YAG laser 150 mJ, 45 degrees contact, 37.5 J/cm(2); G7, Er:YAG laser 70 mJ, 45 degrees contact, 17.5 J/cm(2); G8, Er:YAG laser 150 mJ, 45 degrees non-contact, 1.55 J/cm(2); and G9, Er:YAG laser 70 mJ, 45 degrees non-contact, 0.72 J/cm(2). Bonding procedures were carried out and the micro-shear-bond strength (MSBS) test was performed. The

adhesive surfaces were analyzed under SEM. Two-way ANOVA and multiple comparison tests revealed that MSBS was significantly influenced by the laser irradiation ($p < 0.05$). Mean values (MPa) of the MSBS test were: G1 (44.97 +/- 6.36), G2 (23.83 +/- 2.46), G3 (30.26 +/- 2.57), G4 (35.29 +/- 3.74), G5 (41.90 +/- 4.95), G6 (27.48 +/- 2.11), G7 (34.61 +/- 2.91), G8 (37.16 +/- 1.96), and G9 (41.74 +/- 1.60). It was concluded that the Er:YAG laser can constitute an alternative tool for dentin treatment before bonding procedures. Composite Resins;Methacrylates;yttrium-aluminum-garnet;Yttrium;Erbium;Collagen;Aluminum Adhesiveness;Aluminum;Collagen;Composite Resins;Dental Bonding;Dentin;Dose-Response Relationship, Radiation;Erbium;Humans;Lasers;Low-Level Light Therapy;Methacrylates;Shear Strength;Yttrium

Effects of a single near-infrared laser treatment on cutaneous wound healing: biometrical and histological study in rats. BACKGROUND: Low intensity laser therapy has been recommended to support the cutaneous repair; however, so far studies do not have evaluated the tissue response following a single laser treatment. This study investigated the effect of a single laser irradiation on the healing of full-thickness skin lesions in rats. METHODS: Forty-eight male rats were randomly divided into three groups. One surgical lesion was created on the back of rats using a punch of 8mm in diameter. One group was not submitted to any treatment after surgery and it was used as control. Two energy doses from an 830-nm near-infrared diode laser were used immediately post-wounding: 1.3 J cm(-2) and 3 J cm(-2). The laser intensity 53 m W cm(-2) was kept for both groups. Biometrical and histological analyses were accomplished at days 3, 7 and 14 post-wounding. RESULTS: Irradiated lesions presented a more advanced healing process than control group. The dose of 1.3 J cm(-2) leaded to better results. Lesions of the group irradiated with 1.3 J cm(-2) presented faster lesion contraction showing quicker re-epithelization and reformed connective tissue with more organized collagen fibers. CONCLUSIONS: Low-intensity laser therapy may accelerate cutaneous wound healing in a rat model even if a single laser treatment is performed. This finding might broaden current treatment regimens. Animals;Biometry;Dose-Response Relationship, Radiation;Laser Therapy;Light;Male;Rats;Skin;Time Factors;Treatment Outcome;Wound Healing

Infrared laser therapy for ischemic stroke: a new treatment strategy: results of the NeuroThera Effectiveness and Safety Trial-1 (NEST-1). BACKGROUND AND PURPOSE: The NeuroThera Effectiveness and Safety Trial-1 (NEST-1) study evaluated the safety and preliminary effectiveness of the NeuroThera Laser System in the ability to improve 90-day outcomes in ischemic stroke patients treated within 24 hours from stroke onset. The NeuroThera Laser System therapeutic approach involves use of infrared laser technology and has shown significant and sustained beneficial effects in animal models of ischemic stroke. METHODS: This was a prospective, intention-to-treat, multicenter, international, double-blind, trial involving 120 ischemic stroke patients treated, randomized 2:1 ratio, with 79 patients in the active treatment group and 41 in the sham (placebo) control group. Only patients with baseline stroke severity measured by National Institutes of Health Stroke Scale (NIHSS) scores of 7 to 22 were included. Patients who received tissue plasminogen activator were excluded. Outcome measures were the patients' scores on the NIHSS, modified Rankin Scale (mRS), Barthel Index, and Glasgow Outcome Scale at 90 days after treatment. The primary outcome measure, prospectively identified, was successful treatment, documented by NIHSS. This was defined as a complete recovery at day 90 (NIHSS 0 to 1), or a decrease in NIHSS score of at least 9 points (day 90 versus baseline), and was tested as a binary measure (bNIH). Secondary outcome measures included mRS, Barthel Index, and Glasgow Outcome Scale. Primary statistical analyses were performed with the Cochran-Mantel-Haenszel rank test, stratified by baseline NIHSS score or by time to treatment for the bNIH and mRS. Logistic regression analyses were conducted to confirm the results. RESULTS: Mean time to treatment was >16 hours (median time to treatment 18 hours for active and 17 hours for control). Time to treatment ranged from 2 to 24 hours. More patients (70%) in the active

treatment group had successful outcomes than did controls (51%), as measured prospectively on the bNIH (P=0.035 stratified by severity and time to treatment; P=0.048 stratified only by severity). Similarly, more patients (59%) had successful outcomes than did controls (44%) as measured at 90 days as a binary mRS score of 0 to 2 (P=0.034 stratified by severity and time to treatment; P=0.043 stratified only by severity). Also, more patients in the active treatment group had successful outcomes than controls as measured by the change in mean NIHSS score from baseline to 90 days (P=0.021 stratified by time to treatment) and the full mRS ("shift in Rankin") score (P=0.020 stratified by severity and time to treatment; P=0.026 stratified only by severity). The prevalence odds ratio for bNIH was 1.40 (95% CI, 1.01 to 1.93) and for binary mRS was 1.38 (95% CI, 1.03 to 1.83), controlling for baseline severity. Similar results held for the Barthel Index and Glasgow Outcome Scale. Mortality rates and serious adverse events (SAEs) did not differ significantly (8.9% and 25.3% for active 9.8% and 36.6% for control, respectively, for mortality and SAEs). CONCLUSIONS: The NEST-1 study indicates that infrared laser therapy has shown initial safety and effectiveness for the treatment of ischemic stroke in humans when initiated within 24 hours of stroke onset. A larger confirmatory trial to demonstrate safety and effectiveness is warranted. Adult;Aged;Aged, 80 and over;Brain Ischemia;Double-Blind Method;Female;Humans;Infrared Rays;Internationality;Low-Level Light Therapy;Male;Middle Aged;Stroke;Time Factors

Pulsed dye laser therapy for pediatric warts. Viral wart infections constitute one of the most common pediatric skin diseases, and various modalities have been used to manage them. Although pulsed dye laser therapy is known to be a safe and efficacious modality, the reported cure rates for this method have varied, and no studies have reported treatment of pediatric patients alone. This prospective, nonblinded, nonrandomized study was performed to evaluate the efficacy and safety of pulsed dye laser therapy for pediatric warts. We found that this method is safe, relatively effective, and worth considering as an additional therapeutic option for viral warts in children, although not as a first-line therapy. Child;Child, Preschool;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Prospective Studies;Treatment Outcome;Warts

The therapeutic effects of angiotensin-converting enzyme inhibitors in severe non-proliferative diabetic retinopathy. PURPOSE: To evaluate the effects of angiotensin-converting enzyme inhibitors (ACE-I) in retarding progression of severe non-proliferative diabetic retinopathy (NPDR) in normotensive type 2 diabetic patients. METHODS: This was a retrospective case control study of 128 patients with normotensive type 2 diabetes with lower than +1 dipstick proteinuria and severe NPDR who were classified into either an ACE-I treated group (Enalapril maleate 10 mg, n=12 , Ramipril 5 mg, n=17) or an ACE-I untreated group (n=99). Medical records were reviewed for endpoints of (a) occurrence of proliferative diabetic retinopathy (PDR) or macular edema (ME) for which laser phototherapy was necessary or (b) development of proteinuria of higher than +1 level requiring medication of ACE-I. RESULTS: From the total of 128 patients, there were 29 ACE-I treated patients and 99 ACE-I untreated patients. There were no differences in the average age, duration of diabetes, body mass indices, blood pressure and levels of hyperglycemia or HbA1C between the two groups. Blood pressure and HbA1C levels in both groups remained unchanged during the study. The mean follow-up period was 41.6 months. In the ACE-I group, 6 patients progressed to PDR, 5 to ME and 6 developed proteinuria of greater than +1 over the follow-up period. In the control group, 30 patients progressed to PDR, 6 to ME and 9 developed proteinuria of greater than +1 over the follow-up period. CONCLUSIONS: Small doses of ACE-I did not yield any beneficial effects in retarding the progression of severe NPDR. Angiotensin-Converting Enzyme Inhibitors;Enalapril;Ramipril Aged;Angiotensin-Converting Enzyme Inhibitors;Case-Control Studies;Diabetes Mellitus, Type 2;Diabetic Retinopathy;Disease Progression;Dose-Response Relationship,

Drug;Enalapril;Female;Fundus Oculi;Humans;Male;Middle Aged;Ramipril;Retrospective Studies;Severity of Illness Index;Treatment Failure

Treatment of mycosis fungoides using a 308-nm excimer laser: two case studies. Early-stage mycosis fungoides (MF) is most commonly treated with skin-directed therapies such as topical steroids, phototherapy (broadband or narrowband UVB), photochemotherapy (psoralen plus UVA), topical nitrogen mustard, and total skin electron-beam irradiation. Recently, several small studies have demonstrated the efficacy of the 308-nm excimer laser in the treatment of early-stage MF. This xenon-chloride laser, which emits monochromatic excimer light at the 308-nm wavelength, has been approved by the Food and Drug Administration to treat psoriasis since 1997 and to treat vitiligo since 2001. We report two patients in which patch-stage MF was treated with a 308-nm excimer laser. Our findings confirm previous observations that the 308-nm excimer laser is a safe, effective, and well-tolerated therapy for early stage MF. Aged;Biopsy;Female;Humans;Low-Level Light Therapy;Middle Aged;Mycosis Fungoides;Skin

Low-level laser irradiation (LLLI) promotes proliferation of mesenchymal and cardiac stem cells in culture. BACKGROUND AND OBJECTIVES: Low-level laser irradiation (LLLI) was found to promote the proliferation of various types of cells in vitro. Stem cells in general are of significance for implantation in regenerative medicine. The aim of the present study was to investigate the effect of LLLI on the proliferation of mesenchymal stem cells (MSCs) and cardiac stem cells (CSCs). STUDY DESIGN/MATERIALS AND METHODS: Isolation of MSCs and CSCs was performed. The cells were cultured and laser irradiation was applied at energy densities of 1 and 3 J/cm2. RESULTS: The number of MSCs and CSCs up to 2 and 4 weeks respectively, post-LLLI demonstrated a significant increase in the laser-treated cultures as compared to the control. CONCLUSION: The present study clearly demonstrates the ability of LLLI to promote proliferation of MSCs and CSCs in vitro. These results may have an important impact on regenerative medicine. Animals;Bone Marrow Cells;Cell Proliferation;Cells, Cultured;Immunohistochemistry;Male;Mesenchymal Stem Cells;Myocytes, Cardiac;Rats

Flashlamp pulsed-dye laser suppressed TGF-beta1 expression and proliferation in cultured keloid fibroblasts is mediated by MAPK pathway. BACKGROUND AND OBJECTIVES: Our previous clinical study indicated that transforming growth factor-beta1 (TGF-beta1) and mitogen-activated protein kinases (MAPK) are both involved in keloid regression following flashlamp pulsed-dye laser (PDL). To further characterize of this involvement, this work examined whether PDL suppression of TGF-beta1 expression was mediated through MAPK pathway in cultured keloid fibroblasts (KF). STUDY DESIGN/MATERIALS AND METHODS: Primary culture of KF harvested from keloid patients received various dosages of PDL treatment in 585-nm wavelength. TGF-beta1 expressions in KF following various dosages of PDL were assessed. Additionally, MAPK pathway activities were studied using the PD98059 (an ERK inhibitor), SB203580 (a p38 kinase inhibitor), and SP600125 (a JNK inhibitor), to determine the role in keloid following PDL treatment. Activator protein-1 (AP-1), a transcription factor of TGF-beta, was analyzed by electrophoretic mobility shift assay (EMSA). Phosphorylated c-Jun, one of the components of AP-1, was also detected. RESULTS: The observation results demonstrated that optimal dosages of PDL significantly suppressed KF proliferation and TGF-beta1 expression. EMSA study identified PDL downregulation of super-shift of AP-1. Three subtypes of MAPK cascades were augmented between 30 minutes and 4 hours following PDL treatment, particularly phosphorylation of ERK1/2 and p38. Pre-treatment with PD98059, SB203580, but not SP600125, markedly inhibited the downregulating effects of TGF-beta1 and phosphorylated c-Jun expression following PDL treatment. CONCLUSION: PDL induced keloid regression is mediated by triggering MAPK cascades and blockade of AP-1 transcription and TGF-beta expression. Modulation of TGF-beta and MAPK interaction in keloids may provide specific targets for therapeutic intervention.

Anthracenes;Enzyme Inhibitors;Flavonoids;Imidazoles;Pyridines;Transcription Factor AP-1;Transforming Growth Factor beta1;pyrazolanthrone;JNK Mitogen-Activated Protein Kinases;Mitogen-Activated Protein Kinases;SB 203580 Anthracenes;Cell Proliferation;Cells, Cultured;Down-Regulation;Enzyme Inhibitors;Fibroblasts;Flavonoids;Humans;Imidazoles;JNK Mitogen-Activated Protein Kinases;Keloid;Low-Level Light Therapy;Mitogen-Activated Protein Kinases;Phosphorylation;Pyridines;Transcription Factor AP-1;Transforming Growth Factor beta1

The current role of laser/light sources in the treatment of male and female pattern hair loss. Over the past several years there has been great interest in the potential role of laser/light-based treatments for male and female pattern hair loss. Despite aggressive marketing and centers claiming great success in the treatment of hair loss there is little scientific data supporting laser/light sources in hair loss. This paper is a consensus of hair loss experts on the current scientific data, mechanisms of action, safety, protocols and recommendations regarding laser/light treatment for hair loss. The authors believe that, while seemingly safe, there are no controlled, peer-reviewed studies validating current devices for hair loss and that all patients should be medically evaluated for any hair loss by a physician specialist to rule out other underlying medical conditions or the etiology of hair loss. Alopecia;Female;Humans;Low-Level Light Therapy;Male;Phototherapy;Safety;Treatment Outcome

Efficacy of pulsed dye laser in facial port-wine stains in Indian patients. BACKGROUND: Facial port-wine stain (PWS) produces severe cosmetic disfigurement and pulsed dye laser (PDL) has revolutionized the treatment of PWS. OBJECTIVE: To assess the efficacy of PDL for facial PWS in Indian patients. MATERIALS AND METHODS: Twenty-seven patients of Fitzpatrick skin types IV and V in the age group of 8 to 34 years (mean 21.6 years), with lesional size 3 x 1.5 to 25 x 19 cm and color from light pink to deep red and violaceous, were recruited. Laser parameters were spot size, 7 mm; fluence, 5 to 7.5 J/cm(2); wavelength, 585 nm, pulse duration, 0.45 ms; along with continuous air cooling. Response at every session was graded from 0 to 5+(0, no improvement; 1+, up to 25%; 2+, 26% to 50%; 3+, 51% to 75%; 4 +, 76% to 99%; 5+, 100% lightening). RESULTS: In a total of 170 sessions, maximum response of 1+ was observed in 6 patients after mean of 3.5 sessions, 2+ in 8 patients after mean of 5.25 sessions, 3+ in 8 patients after mean of 7 sessions, and 4+ improvement in 5 patients after mean of 4.8 sessions. No patient showed complete clearance. Seven patients developed hyperpigmentation while 1 patient showed hypopigmentation, but none had textural change or scarring. CONCLUSION: PDL offers significant cosmetic improvement in facial PWS in Indian patients. Adolescent;Adult;Child;Facial Dermatoses;Female;Humans;India;Low-Level Light Therapy;Male;Port-Wine Stain;Severity of Illness Index;Treatment Outcome;White People

Comparison of stacked pulses versus double-pass treatments of facial acne with a 1,450-nm laser. BACKGROUND: Although effective as a monotherapy for the treatment of inflammatory acne, the 1,450-nm diode laser is associated with considerable pain at higher fluences. MATERIALS AND METHODS: Eleven subjects were treated with a 1,450-nm diode laser in a split-face bilateral paired acne study. One-half of the face received a single-pass consisting of stacked double pulses. The other side received a double-pass treatment of single pulses. Settings were 11 J/cm(2) or lower as tolerated with appropriate dynamic cooling device (range 25-35). RESULTS: The mean pain rating was 5.33 on a 0 to 10 scale on the stacked-pulse treatment side and 5.12 on the double-pass side. Blinded reduction in mean acne lesion counts were 57.6% and 49.8% reduction, respectively. An overall acne scar improvement was seen in 83% of subjects with acne scarring. Transient hyperpigmentation occurred in two patients on the stacked pulse side and completely resolved without sequelae. CONCLUSIONS: The pulsed 1,450-nm diode laser can be used at lower fluences that elicit less discomfort yet effectively improve inflammatory acne. Stacking pulses appears to render a slightly higher efficacy than the multipass technique. Single-pulse, multiple-pass treatments may have a lower risk of cryogen-induced transient hyperpigmentation compared to standard high fluence techniques.

Acne Vulgaris;Adult;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Severity of Illness Index;Treatment Outcome

A randomized trial to determine the influence of laser therapy, monopolar radiofrequency treatment, and intense pulsed light therapy administered immediately after hyaluronic acid gel implantation. BACKGROUND: Hyaluronic acid-based dermal fillers, such as hyaluronic acid gel (Restylane, Q-Medical AB, Uppsala, Sweden), are widely used for tissue augmentation of the nasolabial folds. Additional dermatologic treatments using infrared light, radiofrequency (RF), and intense pulsed light (IPL) are also important tools for facial rejuvenation. This study was designed to evaluate whether these therapies could be safely administered immediately after hyaluronic acid gel treatment without compromising the effect of the dermal filler. OBJECTIVE: The objective of this study was to confirm or refute any possible subtractive effects of augmentation of the nasolabial folds when followed by 1,320-nm Nd:YAG laser, 1,450-nm diode laser, monopolar RF, and/or IPL treatments. METHODS: Thirty-six patients with prominent nasolabial folds were treated with hyaluronic acid gel implantation on one side of the face and hyaluronic acid gel followed by one of the nonablative laser/RF/IPL therapies on the contralateral side of the face. RESULTS: There were no statistically significant differences between wrinkle severity or global aesthetic scores for hyaluronic acid gel implantation alone and hyaluronic acid gel with laser/RF/IPL treatment at any time point. In a small sample, histologic changes were not apparent after laser/RF/IPL treatment. CONCLUSIONS: Based on this small pilot study, laser, RF, and IPL treatments can safely be administered immediately after hyaluronic acid gel implantation without reduction in overall clinical effect. Gels;Hyaluronic Acid Adult;Aged;Cosmetic Techniques;Double-Blind Method;Facial Dermatoses;Female;Gels;Humans;Hyaluronic Acid;Injections, Subcutaneous;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Pilot Projects;Prostheses and Implants;Radiofrequency Therapy;Severity of Illness Index;Skin Aging;Treatment Outcome

Fractional photothermolysis: a novel aesthetic laser surgery modality. The ubiquity of increased sun exposure, oral contraceptives, and phototoxic drugs has led to an increased prevalence of conditions such as dyschromia, melasma, rhytides, and other signs of photoaging over the past few decades. Through the application of selective photothermolysis, laser surgery has attempted to create therapeutic options for these medically recalcitrant conditions. To date, however, this technology has been met with limited success, due to a high incidence of posttreatment side effects, inability to treat off the face, and a safety profile tailored to Fitzpatrick skin types I to III. More recently, a novel approach coined "fractional photothermolysis" was developed in an attempt to overcome these limitations. This new laser treatment modality has allowed for effective treatment of a diverse array of dermatologic conditions on and off the face with a wider therapeutic index and improved safety profile independent of Fitzpatrick skin type. This review sheds light on the technical aspects, biologic mechanisms, and clinical effects of fractional photothermolysis that help set it apart from previous modes of laser surgery. Dose Fractionation, Radiation;Facial Dermatoses;Humans;Low-Level Light Therapy;Skin;Skin Aging

Influence of low-level laser treatment on bone regeneration and osseointegration of dental implants following sinus augmentation. An experimental study on sheep. OBJECTIVES: The aim of this experimental study was to evaluate if low-level laser treatment (LLLT) enhances bone regeneration and osseointegration of dental implants in a sinus graft model. MATERIAL AND METHODS: Twelve sheep underwent a bilateral sinus floor elevation procedure with cancellous bone from the iliac crest. Implant insertion followed 4 weeks (six sheep) and 12 weeks (six sheep) later. Sixteen weeks after second-stage surgery, animals were sacrificed. Unilaterally, the grafted sinus and during the second-stage surgery the implant sites were irradiated intraoperatively and three times during the first postoperative week with a diode laser (75 mW, 680 nm). The overall energy density per irradiation

was 3-4 J/cm(2). Biopsies of the augmented area were obtained during implant insertion and after scarification. RESULTS: Bone regeneration within the grafted sinus histomorphometric analysis hardly differed between control and test side both 4 and 12 weeks after sinus grafting. Osseointegration measurements resulted in a significantly higher bone/implant contact (BIC) on the test side (P=0.045). Further evaluation of peri-implant bone tends to amount in significant higher percentage on the laser side (P=0.053). CONCLUSION: The presented experimental study on sheep did not confirm a positive LLLT effect on bone regeneration within a cancellous sinus graft. Nevertheless, LLLT possibly has a positive effect on osseointegration of dental implants inserted after sinus augmentation. Dental Implants Analysis of Variance;Animals;Bone Regeneration;Bone Transplantation;Dental Implantation, Endosseous;Dental Implants;Female;Linear Models;Low-Level Light Therapy;Maxillary Sinus;Oral Surgical Procedures, Preprosthetic;Osseointegration;Sheep

Low level laser therapy for nonspecific low-back pain. BACKGROUND: Low-back pain (LBP) and related disabilities are major public health problems and a major cause of medical expenses, absenteeism and disablement. Low level laser therapy (LLLT) can be used as a therapeutic intervention for musculoskeletal disorders such as back pain. OBJECTIVES: To assess the effects of LLLT in patients with non-specific low-back pain and to explore the most effective method of administering LLLT for this disorder. SEARCH STRATEGY: We searched CENTRAL (The Cochrane Library 2005, Issue 2), MEDLINE and CINAHL from their start to January 2007 and EMBASE, AMED and PEDro from their start to 2005 with no language restrictions. We screened references in the included studies and in reviews of the literature and conducted citation tracking of identified RCTs and reviews using Science Citation Index. We also contacted content experts. SELECTION CRITERIA: Only randomised controlled clinical trials (RCTs) investigating low level laser therapy as a light source treatment for non-specific low-back pain were included. DATA COLLECTION AND ANALYSIS: Two authors independently assessed methodological quality using the criteria recommended by the Cochrane Back Review Group and extracted data. Consensus was used to resolve disagreements. Clinically and statistically homogeneous studies were pooled using the fixed-effect model; clinically homogeneous and statistically heterogeneous studies were pooled using the random-effects model. MAIN RESULTS: Six RCTs with reasonable quality were included in the review. All of them were published in English. There is some evidence of pain relief with LLLT, compared to sham therapy for subacute and chronic low-back pain. These effects were only observed at short-term and intermediate-term follow-ups. Long-term follow-ups were not reported. There was no difference between LLLT and comparison groups for pain-related disability. There is insufficient evidence to determine the effectiveness of LLLT on antero-posterior lumbar range of motion compared to control group in short-term follow-up. The relapse rate in the LLLT group was significantly lower than in the control group at six months follow-up period according to the findings of two trials. AUTHORS' CONCLUSIONS: No side effects were reported. However, we conclude that there are insufficient data to draw firm conclusions. There is a need for further methodologically rigorous RCTs to evaluate the effects of LLLT compared to other treatments, different lengths of treatment, different wavelengths and different dosages. Comparison of different LLLT treatments will be more reasonable if dose calculation methods are harmonized. Humans;Low Back Pain;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Alexandrite laser treatment of intraoral venous vascular malformations. alexandrite;Beryllium Adult;Arteriovenous Malformations;Beryllium;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Risk Assessment;Severity of Illness Index;Tongue Diseases;Treatment Outcome;Veins

low-level laser therapy applied transcranially to mice following traumatic brain injury significantly reduces long-term neurological deficits. Low-level laser therapy (LLLT) has been evaluated in this study as a potential therapy for traumatic brain injury (TBI). LLLT has been found to modulate various

biological processes. Following TBI in mice, we assessed the hypothesis that LLLT might have a beneficial effect on their neurobehavioral and histological outcome. TBI was induced by a weight-drop device, and motor function was assessed 1 h post-trauma using a neurological severity score (NSS). Mice were then divided into three groups of eight mice each: one control group that received a sham LLLT procedure and was not irradiated; and two groups that received LLLT at two different doses (10 and 20 mW/cm(2)) transcranially. An 808-nm Ga-As diode laser was employed transcranially 4 h post-trauma to illuminate the entire cortex of the brain. Motor function was assessed up to 4 weeks, and lesion volume was measured. There were no significant changes in NSS at 24 and 48 h between the laser-treated and non-treated mice. Yet, from 5 days and up to 28 days, the NSS of the laser-treated mice were significantly lower ($p < 0.05$) than the traumatized control mice that were not treated with the laser. The lesion volume of the laser treated mice was significantly lower (1.4%) than the non-treated group (12.1%). Our data suggest that a non-invasive transcranial application of LLLT given 4 h following TBI provides a significant long-term functional neurological benefit. Further confirmatory trials are warranted. Animals;Brain;Brain Injuries;Cerebral Cortex;Head Injuries, Closed;Low-Level Light Therapy;Male;Mice;Movement;Nervous System Diseases;Postural Balance;Reflex;Walking

Analysis of 602 Chinese cases of nevus of Ota and the treatment results treated by Q-switched alexandrite laser. BACKGROUND: Nevus of Ota is a congenital or acquired pigmentary disorder of the skin and mucous membranes, which are areas innervated by the first and second branches of the trigeminal nerve. Nevus of Ota is very common in Asia. Nevus of Ota was effectively treated with Q-switched alexandrite (755 nm) laser, but no detailed report existed on many Chinese cases treated with Q-switched alexandrite laser. OBJECTIVE: The objective was to gauge clinical and treatment data and material statistics for 602 cases of nevus of Ota and analyze its pathogenic mechanism and therapeutic results. METHODS: A total of 602 cases of clinical data on nevus of Ota were collected by means of clinical registration, photo verification, and telephone inquiry or correspondence. CONCLUSIONS: There are some differences in sex, age, and local regions in nevus of Ota. Nevus of Ota can combine with other diseases. The treatment of Nevus of Ota by a Q-switched alexandrite laser is safe and effective. Additional treatment will achieve good results. The results correlate to the eyelids and Tanino's classification. Adolescent;Adult;Aged;Child;Child, Preschool;Facial Neoplasms;Female;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Skin Neoplasms

A split-face comparison study of pulsed 532-nm KTP laser and 595-nm pulsed dye laser in the treatment of facial telangiectasias and diffuse telangiectatic facial erythema. BACKGROUND AND OBJECTIVES: Pulsed 595 nm and 532 nm lasers can effectively diminish or eliminate facial telangiectasia. We performed a split-face, single-blind, controlled, comparison study in an effort to determine their individual and comparative efficacy. STUDY DESIGN/MATERIALS AND METHODS: Fifteen patients were treated using a 595-nm PDL on one side of the face and a pulsed 532-nm potassium-titanyl-phosphate (KTP) laser on the other. Each subject was evaluated at 3 weeks after three treatments. RESULTS: Both devices improved telangiectasia. The 532-nm device, however, was at least as effective or more effective than the 595-nm laser in all subjects. On average, the KTP laser achieved 62% clearing after the first treatment and 85% clearing 3 weeks after the third treatment, compared to 49% and 75% for the PDL, respectively. Seventy-nine percent of KTP laser-treated patients continued to have swelling for greater than 1 day versus 71% of PDL-treated patients. Of those patients who noted persistent erythema for at least 1 day after treatment, 58% noted more erythema on the KTP laser-treated side compared to 8% on the PDL-treated side. CONCLUSIONS: Both the 595-nm and the 532-nm pulsed lasers are highly effective in the treatment of facial telangiectasia and redness. The 532-nm KTP laser appears to be more effective but causes more

swelling and erythema. Adult;Aged;Erythema;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Telangiectasis

Urethral pain syndrome and its management. Urethral pain syndrome is occurrence of persistent or recurrent episodic urethral pain usually on voiding with daytime frequency and nocturia, in the absence of proven infection or other obvious pathology. This is a condition of uncertain etiology. The objective of this article is to review etiology, diagnosis, and management of urethral pain syndrome. Since there is paucity of information on randomized trials, search of published literature has been made using keywords such as "urethral pain syndrome", "painful bladder syndrome", "urethral stenosis", and "lower urinary tract symptoms". Urethral pain syndrome is a disease of ambiguous etiology. Diagnosis is mainly based upon symptoms, and investigations are aimed to exclude other conditions affecting lower urinary tract. Various modalities of treatment including antibiotics, alpha-blockers, acupuncture, and laser therapy have been proved successful. Psychological support is very important in this group of women. Management requires multidisciplinary approach, and treatment at its best is by trial and error. TARGET AUDIENCE: Obstetricians & Gynecologists, Family Physicians. LEARNING OBJECTIVES: After completion of this article, the reader should be able to explain that the urethral pain syndrome (UPS) has specific signs and symptoms without specific responses to a variety of treatment options and recall that treatment may require a multidisciplinary approach and a lot of sensitivity by the physician. Anti-Bacterial Agents Acupuncture Therapy;Anti-Bacterial Agents;Diagnosis, Differential;Female;Humans;Low-Level Light Therapy;Urethra;Urethral Diseases

[Nonpharmalogical correction of respiratory disorders in poor health children]. Antigens, CD Antigens, CD;Child;Child, Preschool;Electromagnetic Phenomena;Equipment Design;Female;Humans;Low-Level Light Therapy;Male;Respiration Disorders

Effect of low-level helium-neon laser therapy on histological and ultrastructural features of immobilized rabbit articular cartilage. The present study investigates whether low-level helium-neon laser therapy can increase histological parameters of immobilized articular cartilage in rabbits or not. Twenty five rabbits were divided into three groups: the experiment group, which received low-level helium-neon laser therapy with 13J/cm(2) three times a week after immobilization of their right knees; the control group which did not receive laser therapy after immobilization of their knees; and the normal group which received neither immobilization nor laser therapy. Histological and electron microscopic examinations were performed at 4 and 7 weeks after immobilization. Depth of the chondrocyte filopodia in four-week immobilized experiment group, and depth of articular cartilage in seven-week immobilized experiment group were significantly higher than those of relevant control groups (exact Fisher test, p=0.001; student's t-test, p=0.031, respectively). The surfaces of articular cartilages of the experiment group were relatively smooth, while those of the control group were unsmooth. It is therefore concluded that low-level helium-neon laser therapy had significantly increased the depth of the chondrocyte filopodia in four-week immobilized femoral articular cartilage and the depth of articular cartilage in seven-week immobilized knee in comparison with control immobilized articular cartilage. Animals;Cartilage, Articular;Immobilization;Knee Joint;Low-Level Light Therapy;Rabbits;Surface Properties

Ablation of atrial fibrillation with concomitant cardiac surgery. Atrial fibrillation is present in approximately 35% of patients presenting for mitral valve surgery and in 1 to 6% of adult patients undergoing other forms of cardiac surgery. If left untreated, atrial fibrillation is associated with increased morbidity, and, in some subgroups, increased mortality. Therefore, concomitant management of the arrhythmia is indicated in most cardiac surgery patients with preexisting atrial fibrillation. Although the cut-and-sew Cox-maze III procedure is extremely effective, it has been supplanted by newer operations that rely on alternate energy sources to create lines of conduction block. Early and mid-term results are good with a variety of technologies. Choice of lesion set remains

a matter of debate, but results of ablation appear to be enhanced by a biatrial lesion set. Targeted areas for improvement in concomitant ablation include acceptance of uniform standards for reporting results, development of improved technology for ablation and intraoperative assessment, and creation of instrumentation that facilitates minimally invasive approaches. Atrial Fibrillation;Catheter Ablation;Cryosurgery;Energy-Generating Resources;Humans;Low-Level Light Therapy;Mitral Valve;Thoracic Surgery;Time Factors

Utilization of an Er,Cr:YSGG laser for the removal of all-ceramic restorations. Adult;Ceramics;Dental Debonding;Device Removal;Female;Humans;Low-Level Light Therapy

A phase III randomized double-blind placebo-controlled clinical trial to determine the efficacy of low level laser therapy for the prevention of oral mucositis in patients undergoing hematopoietic cell transplantation. INTRODUCTION: Oral mucositis (OM) is a significant early complication of hematopoietic cell transplantation (HCT). This phase III randomized double-blind placebo-controlled study was designed to compare the ability of 2 different low level GaAlAs diode lasers (650 nm and 780 nm) to prevent oral mucositis in HCT patients conditioned with chemotherapy or chemoradiotherapy. MATERIALS AND METHODS: Seventy patients were enrolled and randomized into 1 of 3 treatment groups: 650 nm laser, 780 nm laser or placebo. All active laser treatment patients received daily direct laser treatment to the lower labial mucosa, right and left buccal mucosa, lateral and ventral surfaces of the tongue, and floor of mouth with energy densities of 2 J/cm2. Study treatment began on the first day of conditioning and continued through day +2 post HCT. Mucositis and oral pain was measured on days 0, 4, 7, 11, 14, 18, and 21 post HCT. RESULTS: The 650 nm wavelength reduced the severity of oral mucositis and pain scores. Low level laser therapy was well-tolerated and no adverse events were noted. DISCUSSION: While these results are encouraging, further study is needed to truly establish the efficacy of this mucositis prevention strategy. Future research needs to determine the effects of modification of laser parameters (e.g., wavelength, fluence, repetition rate of energy delivery, etc.) on the effectiveness of LLE laser to prevent OM. Adult;Aged;Female;Hematopoietic Stem Cell Transplantation;Humans;Laser Therapy;Male;Middle Aged;Preventive Medicine;Stomatitis;Treatment Outcome;Washington

Increases in central retinal artery blood flow in humans following carotid artery and stellate ganglion irradiation with 0.6 to 1.6 microm irradiation. The authors applied near-infrared low-level laser irradiation (LLLI) directed to the stellate ganglion (SG) and to the common carotid artery (CCA), and compared the effects on central retinal artery blood flow using color pulse Doppler sonography. In 10 healthy volunteers, LLLI (0.92 W, 1 : 1 duty cycle, 10 min) to both the SG and CCA significantly increased peak systolic blood velocity in the ophthalmic artery ($p<0.001$, each) and central retinal artery ($p<0.001$, each) without changes in vessel resistance. Irradiation to the CCA produced a stronger effect than that to the SG in the ophthalmic artery ($p=0.007$) and central retinal artery ($p=0.031$). These data suggest that LLLI to the SG or to the CCA is a useful therapy for increasing the retrobulbar blood flow, with irradiation directed to the CCA being more effective than that directed to the SG in clinical settings. Adult;Blood Flow Velocity;Carotid Artery, Common;Female;Humans;Infrared Rays;Lasers;Male;Middle Aged;Radiation Dosage;Regional Blood Flow;Retinal Artery;Stellate Ganglion;Ultrasonography, Doppler, Color

Redarkening of port-wine stains 10 years after pulsed-dye-laser treatment. BACKGROUND: Although pulsed-dye-laser therapy is currently the gold standard for the treatment of port-wine stains, few objective data are available on its long-term efficacy. Using objective color measurements, we performed a 10-year follow-up of a previously conducted prospective clinical study of the treatment of port-wine stains with a pulsed-dye laser. METHODS: We invited the patients to undergo repeated color measurements performed by the same procedures as in the previous study. The results at long-term follow-up were compared with color measurements obtained before treatment

and after completion of an average of five laser treatments of the complete port-wine stain. A questionnaire was used to investigate patients' satisfaction with the treatment and their perception of long-term changes in the stain. RESULTS: Of the 89 patients from whom color measurements were obtained in the previous study, 51 were included in this study. The patients had received a median of seven additional treatment sessions since the last color measurement, which had been made after an average of five treatments. The median length of follow-up was 9.5 years. On average, the stain when measured at follow-up was significantly darker than it was when measured after the last of the initial five laser treatments (P=0.001), but it was still significantly lighter than it was when measured before treatment (P<0.001). Fifty-nine percent of patients were satisfied with the overall treatment result. Six percent of patients reported that the stain had become lighter since their last treatment, 59% that it was unchanged, and 35% that it had become darker. CONCLUSIONS: Using objective color measurements, we observed significant redarkening of port-wine stains at long-term follow-up after pulsed-dye-laser therapy. Patients should be informed about the possibility of redarkening before beginning treatment. Adolescent;Adult;Child;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Port-Wine Stain;Recurrence;Skin Pigmentation;Surveys and Questionnaires

Combination of 308-nm xenon chloride excimer laser and topical calcipotriol in vitiligo. BACKGROUND: A large variety of therapeutic agents are being used for the treatment of vitiligo, but treatment remains a challenge. Recently, monochromatic phototherapies such as 311-nm narrowband ultraviolet B therapy and 308-nm xenon chloride excimer laser have been reported to be an effective and safe therapeutic option in children and adult patients with vitiligo. Single reports stipulate that the addition of topically applied calcipotriol to phototherapy increases its effectiveness. OBJECTIVE: The purpose of the present pilot study was to determine if the addition of topical calcipotriol increases the efficacy of the 308-nm xenon chloride excimer in the treatment of vitiligo. METHODS: Ten patients with vitiligo with essentially bilateral symmetrical lesions were enrolled in this prospective right/left comparative, single-blinded trial conducted over a 15-month period. All patients received 308-nm XeCl excimer laser therapy three times weekly. Calcipotriol ointment (Daivonex) was applied to lesions on one side of the body twice daily. RESULTS: After 24 treatments (8 weeks), nine patients were evaluated. Eight patients showed evidence of repigmentation on both body sides, with no significant difference between the body side treated with calcipotriol and excimer laser and the side treated with excimer laser alone. The mean repigmentation rate was 22.4% (1-37%). CONCLUSION: The addition of calcipotriol ointment to 308-nm xenon chloride excimer laser phototherapy does not significantly enhance its efficacy. Small additive effects must be investigated in a larger trial. Chlorides;Dermatologic Agents;calcipotriene;Xenon;xenon chloride;Calcitriol Administration, Topical;Adult;Calcitriol;Chlorides;Dermatologic Agents;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Middle Aged;Pilot Projects;Prospective Studies;Single-Blind Method;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo;Xenon

Hair removal with the 3-msec alexandrite laser in patients with skin types IV-VI: efficacy, safety, and the role of topical corticosteroids in preventing side effects. BACKGROUND: Laser hair removal targets melanin in the hair shaft. The abundance of melanin in the epidermis of patients with dark skin color has always been regarded as hazardous due to the increased incidence of side effects in this patient population. OBJECTIVE: To establish the efficacy and safety of using the 3-msec alexandrite laser in patients with skin types IV to VI, and evaluate the role of topical corticosteroids in preventing side effects. METHODS: Thirty-seven patients with skin types IV to VI and brown or black hair were recruited and divided into 2 groups. Twenty-six patients were treated with the 18-mm spot size and 11 patients were treated with the 15-mm spot size. Hair shafts in the treatment and control areas were counted and clipped for measurement of the thickness at the base. The laser was used

with fluences between 8 and 32 J/cm2. Two 16-cm2 areas were treated; one area was pretreated with a class I topical corticosteroid (TCS) cream (betamethasone dipropionate) 10 minutes prelaser and twice a day for 5 days postlaser. The dynamic cooling device (DCD) spray duration was set at 90 msec, and the delay was set at 20 msec. Pain was graded on a scale from I to 10. Patients were followed up on day 1 and day 7 and at 1, 3, and 6 months. Histological samples from the 2 treatment areas and control were obtained from 5 patients. At follow-up visits, side effects were graded on a scale from 1 to 3. Hair reduction was evaluated by performing hair counts. The thickness of hair was measured microscopically at the base. Average hair count reduction and hair thickness were recorded at the 3- and 6-month visits. RESULTS: Thirty-one patients completed the study. The average hair count reduction at 6 months was 35.4%. The average hair thickness reduction was 31.2%. At one week hyperpigmentation was seen in 48.4% of the laser only treated area and in 45.2% of laser/TCS treated area. The effect of TCS was minimal and more prominent at 1 and 3 months. The incidence of hyperpigmentation was higher in the 15-mm group than the 18-mm group as a result of using higher fluence. Hypopigmentation was generally preceded by crust formation and lasted up to 3 months. Reducing spot size resulted in decreased peripheral crust formation. TCS appears to have a role in reducing the erythema and crusting. Histopathology of both groups at day one showed necrosis of the follicular infundibulum and the inner layer of the perifollicular epithelium. No vascular damage was seen. CONCLUSION: The 3-msec alexandrite laser utilized in this study provides a safe and effective treatment achieving long-term reduction of unwanted, pigmented hair in skin types IV and V, but is less safe in skin type VI. Using a TCS helps in minimizing post-treatment erythema and edema; it also decreases the duration of hyperpigmentation. Adrenal Cortex Hormones;alexandrite;Beryllium Administration, Cutaneous;Adrenal Cortex Hormones;Adult;Beryllium;Edema;Epidermis;Erythema;Female;Follow-Up Studies;Hair Follicle;Hair Removal;Humans;Hyperpigmentation;Hypopigmentation;Low-Level Light Therapy;Male;Postoperative Care;Postoperative Complications;Preoperative Care;Radiography;Skin Pigmentation;Skin Temperature;Time Factors;Treatment Outcome;Wound Healing

Skin rejuvenation with microthermal fractional photothermolysis. Fractional resurfacing is gaining acceptance as a preferred method for skin resurfacing. Experience in treating photoaging, acne scars, and melasma is reviewed. Cicatrix;Humans;Low-Level Light Therapy;Melanosis;Rejuvenation;Skin Aging

Macroscopic and microscopic effects of GaAlAs diode laser and dexamethasone therapies on oral mucositis induced by fluorouracil in rats. PURPOSE: To present an animal model for mucositis induced by fluorouracil in rats, and test two therapeutic options, the GaAlAs laser and topical dexamethasone, analysing them with regard to the quality and quantity of tissue alterations and comparing them with the phases of mucositis. MATERIALS AND METHODS: Forty-five Wistar rats (250 g) were treated with fluorouracil (60 mg/kg) and, in order to mimic the clinical effect of chronic irritation, the palatal mucosa was irritated by superficial scratching with an 18-gauge needle. When all of the rats presented oral ulcers of mucositis, they were randomly allocated to one of three groups: group I was treated with laser (GaAlAs), group II was treated with topical dexamethasone, and group III was not treated. Excisional biopsies of the palatal mucosa were then performed, and the rats were killed. Tissue sections were stained with haematoxylin and eosin for morphological analyses, and with toluidine blue for mast-cell counts. RESULTS: Group I specimens showed higher prevalence of ulcers, bacterial biofilm, necrosis and vascularisation, while group II specimens showed higher prevalance of granulation tissue formation. There were no significant statistical differences in the numbers of mast cells and epithelial thickness between groups. CONCLUSION: For the present model of mucositis, rats with palatal mucositis treated with laser (GaAlAs) showed characteristics compatible with the ulcerative phase of oral mucositis, and rats treated with topical dexamethasone

showed characteristics compatible with the healing phase of mucositis. Topical dexamethasone was more efficient in the treatment of rats' oral mucositis than the laser. Anti-Inflammatory Agents;Antimetabolites;Arsenicals;Glucocorticoids;Dexamethasone;Gallium;Aluminum;Fluorouracil Aluminum;Animals;Anti-Inflammatory Agents;Antimetabolites;Arsenicals;Biofilms;Dexamethasone;Disease Models, Animal;Fluorouracil;Gallium;Glucocorticoids;Granulation Tissue;Low-Level Light Therapy;Male;Mouth Mucosa;Necrosis;Oral Ulcer;Random Allocation;Rats;Rats, Wistar;Stomatitis;Wound Healing

Pulsed dye laser versus treatment with calcipotriol/betamethasone dipropionate for localized refractory plaque psoriasis: effects on T-cell infiltration, epidermal proliferation and keratinization. BACKGROUND: Selective photothermolysis of diseased capillaries by pulsed dye laser (PDL) treatment has been described as a mechanism for long-lasting clearance of psoriatic plaques. AIM: To evaluate PDL and a two-compound formulation of calcipotriol/betamethasone dipropionate ointment for the treatment of localized, recalcitrant plaque psoriasis. METHODS: Eight psoriatic patients were treated for 4 weeks with both PDL and topical calcipotriol/betamethasone dipropionate in an open, intra-patient, left-right comparison. Biopsies were analyzed for T-cell subsets, cells expressing NK-receptors, epidermal proliferation, differentiation and epidermal thickness. RESULTS: After active treatment, both treatments showed statistically significant but comparable improvements of T-cell subsets, epidermal proliferation, differentiation and epidermal thickness. In line with the clinical results, after an 8-week follow-up period statistically significant further reductions were observed for dermal CD3(+), CD4(+), CD45RO(+), CD2(+) T cells, epidermal CD3(+), CD8(+), CD45RO(+), CD2(+), CD25(+) T cells and the epidermal parameters for the PDL-treated plaques, in contrast to the topically treated plaques. CONCLUSION: After 8 weeks of follow-up, PDL treatment for localized and recalcitrant plaque psoriasis resulted in persistent reductions of activated and memory effector T-helper cells in the dermis, cytotoxic T cells in the epidermis, and normalization of epidermal proliferation and keratinization, in contrast to treatment with calcipotriol/betamethasone dipropionate ointment. Anti-Inflammatory Agents;Antigens, CD;Dermatologic Agents;Ointments;calcipotriene;betamethasone-17,21-dipropionate;Betamethasone;Calcitriol Administration, Cutaneous;Adult;Anti-Inflammatory Agents;Antigens, CD;Betamethasone;Biopsy;Calcitriol;Cell Proliferation;Dermatologic Agents;Drug Therapy, Combination;Epidermis;Female;Humans;Keratinocytes;Low-Level Light Therapy;Male;Ointments;Psoriasis;Skin;T-Lymphocytes;T-Lymphocytes, Cytotoxic;T-Lymphocytes, Helper-Inducer;Treatment Outcome

[Quality of life in patients with subacute low back pain treated with physiotherapy rehabilitation]. INTRODUCTION: Low back pain is one of the most frequent health problems. The aim of the study was to investigate clinical effects of complex rehabilitation programs on quality of life of patients with subacute lumbar pain, and also to investigate the relationship between quality of life and the intensity of pain and local functional status of the lumbar spine. MATERIAL AND METHODS: The prospective study included 60 patients suffering from subacute low back pain with radiculopathy caused by lumbar disc syndrome, without any previous treatment, and who did not need surgery. In a single blind trial patients were divided into two groups. The first group (A group, n=30) was treated by low level laser therapy (wavelength 904 nm, frequency 4000 Hz, at dose 2J per point); the whole dose of 12J, then with TENS (frequency 80 Hz, 30 minutes, pulse duration 200 micros), with exercise, and simultaneously with conventional therapy with NSAIDs which inhibit COX-2 (meloxicam, 15 mg per day). Patients were treated 5 times a week, a total of 15 treatments. The second group (B group, n =30), was treated only by meloxicam (15 mg per day). The subjects were evaluated before the first treatment and three days after the last treatment (21st to 24th day). Data were analyzed using Student's t test and with analytic statistical methods. RESULTS: The mean Oswestry scores before and

after therapy for group A have reduced from 25+/-2 to 16+/-3, with statistical significance (t= 8.84 p<0.001) and in group B from 24+/-2.5 to 22+/-2.5 (t=2.56 p<0.05). Statistical analysis has shown an increase of mean values for the 12-item health survey (SF-12) from 22.33+/-4.66 to 36.33+/-3.66 (t=9.12 p<0.001), in group A and from 23.66+/-3.66 to 30.33+/-4.66 (t=3.15 p <0.001) in group B. Mean values of intensity of pain in group A have been reduced from 82+/-6.50 to 46+/-5.50, (t=7.85, p<0.001) and from 80+/-5.50 to 62+/-6.50 in group B (t=5.65; p<0.001). No significant changes have been recorded in Schober measurement. The intensity of pain was in positive correlation with Oswestry score (Ft=7.84; p<0.001) in group A and also in group B (Ft=5.25: p<0.05), as for the 12-item health survey (SF-12) (Ft=8.34: p<0.001) in group A and in group B (Ft=5.98; p<0.05). Two measurements of quality of life have shown close relationship (Ft=5.45; p<0.05) in group A and group B (Ft=6.45: p<0.05). CONCLUSION: Results of this study showed that better results were achieved in group treated with complex rehabilitation methods in comparison with patients treated only with anti-inflammatory drugs. Also, the 12-item health survey (SF-12) has shown positive correlation with intensity of pain reduction and with Oswestry disability score and so it is valid for measuring the effectiveness of therapeutic modalities in subacute lumbar pain. Adult;Disability Evaluation;Female;Humans;Low Back Pain;Male;Middle Aged;Physical Therapy Modalities;Quality of Life;Single-Blind Method

The effect of low-level laser therapy during orthodontic movement: a preliminary study. It has been emphasized that one of the most valuable treatment objectives in dental practice is to afford the patient a pain-free treatment. By the evolution of the laser applications, the dental committee aimed to achieve this goal without analgesic drugs and painful methods. Orthodontic treatment is one of these concerns, that one of the major components of patient to reject this treatment is the pain accompanied during the different treatment phases. Another great concern of the patient is not to get through prolonged periods of treatment. The aim of this study is to evaluate the effect of the low-level (GaAlAs) diode laser (809 nm, 100 mW) on the canine retraction during an orthodontic movement and to assess pain level during this treatment. A group of 15 adult patients with age ranging from 14 to 23 years attended the orthodontic department at Dental School, Damascus University. The treatment plan for these patients included extraction of the upper and lower first premolars because there was not enough space for a complete alignment or presence of biprotrusion. For each patient, this diagnosis was based on a standard orthodontic documentation with photographs, model casts, cephalometric, panorama, and superior premolar periapical radiographies. The orthodontic treatment was initiated 14 days after the premolar extraction with a standard 18 slot edgewise brackets [Rocky Mountain Company (RMO)]. The canine retraction was accomplished by using prefabricated Ricketts springs (RMO), in both upper and lower jaws. The right side of the upper and lower jaw was chosen to be irradiated with the laser, whereas the left side was considered the control without laser irradiation. The laser was applied with 0-, 3-, 7-, and 14-day intervals. The retraction spring was reactivated on day 21 for all sides. The amount of canine retraction was measured at this stage with a digital electronic caliper (Myoto, Japan) and compared each side of the relative jaw (i.e., upper left canine with upper right canine and lower left canine with lower right canine). The pain level was prompted by a patient questionnaire. The velocity of canine movement was significantly greater in the lased group than in the control group. The pain intensity was also at lower level in the lased group than in the control group throughout the retraction period. Our findings suggest that low-level laser therapy can highly accelerate tooth movement during orthodontic treatment and can also effectively reduce pain level.
Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Brackets;Orthodontic Space Closure;Pain Measurement;Statistics, Nonparametric;Tooth Movement Techniques

Laser- and light-based hair removal: an update. A variety of laser technologies are now able to successfully remove unwanted hair. Successful removal is based on an understanding of laser physics and appropriate wavelengths, pulse durations and cooling of the skin. Although ruby lasers were among the first to be used, alexandrite, diode and neodymium-doped yttrium aluminium garnet (Nd:YAG) lasers, as well as a variety of broad-spectrum intense pulsed light sources, are currently more commonly used for the treatment of unwanted hair. Darker skin types are more difficult to treat but can also be treated. Complications can occur after laser hair removal but can be reduced through an understanding of the fundamentals of laser removal. These complications include the obvious, such as scarring and pigmentary changes, and the not so obvious, such as reticulate erythema and uveitis. Laser hair removal is now widely accepted as a successful approach to remove unwanted hair in both men and women. The future will involve office-based laser and light source hair removal, as well as a variety of laser and light-based home devices. Equipment Design;Forecasting;Hair Removal;Low-Level Light Therapy;Technology Assessment, Biomedical

Treatment of pigmented lesions of neurofibromatosis 1 with intense pulsed-radio frequency in combination with topical application of vitamin D3 ointment. Cafe-au-lait spots and pigmented freckling are found in most of patients with neurofibromatosis 1 (NF1). Although many modalities have been used for treating the pigmented lesions, the response to treatment has been variable. Therefore, we performed the treatment of pigmented lesions with NF1 by intense pulsed-radio frequency (IPL-RF) in combination with topical application of vitamin D(3) ointment. Eight patients were treated in this study and the improvement was moderate to good in six cases (75%) although the response was relatively mild. Thus, results from our study indicate that IPL-RF irradiation in combination with topical application of vitamin D(3) ointment would be useful as new modalities, especially for treatment of numerous small pigmented lesions in patients with NF1. Although further studies with large groups of patients should be performed for a better conclusion, it could improve quality of life with NF1 patients who are concerned with serious cosmetic and social problems. Ointments;Vitamins;Cholecalciferol Administration, Cutaneous;Adolescent;Adult;Cafe-au-Lait Spots;Child;Child, Preschool;Cholecalciferol;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Neurofibromatosis 1;Ointments;Radiofrequency Therapy;Vitamins

Percutaneous laser disc decompression for lumbar disc hernia: indications based on Lasegue's Sign. OBJECTIVE: The present study was conducted to establish reasonable indications of patient neurological manifestations for use of percutaneous laser disc decompression (PLDD). BACKGROUND DATA: PLDD is a less invasive surgical procedure for lumbar disc hernia, whose indications have been described on the basis of radiographical findings. METHODS: Sixty-five consecutive patients (45 men and 20 women) with lumbar disc hernia were treated with PLDD by applying a diode laser (wavelength 805 nm). A total of 450-1,205 joules (average, 805.5 joules) were delivered per disc. All patients suffered from radicular pain. They were divided based on the presence of Lasegue's sign. The post-procedure results at 1 week and 1 year were compared between the groups. RESULTS: PLDD was effective for patients with Lasegue's sign (80.0%), but ineffective for those without the sign. CONCLUSION: The present study suggests that Lasegue's sign in patients is an indication of PLDD for lumbar disc hernia. Adolescent;Adult;Aged;Female;Humans;Intervertebral Disc Displacement;Low-Level Light Therapy;Lumbar Vertebrae;Male;Middle Aged;Radiography;Retrospective Studies

Laser therapy in the treatment of carpal tunnel syndrome: a randomized controlled trial. OBJECTIVE: This prospective, randomized, placebo-controlled trial aimed to investigate the efficacy of laser therapy in the treatment of carpal tunnel syndrome (CTS). BACKGROUND DATA: Low-level laser therapy (LLLT) has been found to have positive effects in the treatment of CTS and various musculoskeletal conditions. METHODS: A total of 81 patients were included in this study. Diagnosis of

CTS was based on both clinical examination and electromyographic (EMG) study. Patients were randomly assigned into two groups. Group 1 (n = 41) underwent laser therapy (7 joules/2 min) over the carpal tunnel area. Group 2 (n = 40) received placebo laser therapy. All patients received therapy five times per week, for a total of 10 sessions. Patients also used a wrist splint each night. Patients were assessed according to pain, hand-pinch grip strength, and functional capacity. Pain was evaluated by Visual Analog Scale (VAS; day-night). Hand grip was measured by Jamar dynometer, and pinch grip was measured by pinchmeter. Functional capacity was assessed by a self-administered questionnaire for severity of symptoms. RESULTS: The mean age of the patients (70 women, 11 Men) was 49.3 +/- 11.0 (range, 26-78). After therapy there were statistically significant improvements in VAS, pinch grip, and functional capacity measurement in both groups ($p < 0.001$). Hand grip was found to have been improved in the laser group. In EMG, there were statistically improvements in sensory nerve velocity, and sensory and motor distal latancies in the laser group ($p < 0.001$). Only sensory nerve velocity was meaningful in the placebo group. CONCLUSION: In using LLLT, (1) there was no difference relative to pain relief and functional capacity during the follow-up in CTS patients; (2) there were positive effects on hand and pinch grip strengths. Adult;Aged;Carpal Tunnel Syndrome;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies

Laser needle acupuncture at Neiguan (PC6) does not mediate heart rate variability in young, healthy men. OBJECTIVE: The aim of this randomized, double-blinded, placebo-controlled trial was to evaluate specific effects of laser needle acupuncture at the Neiguan point (PC6) on sympathetic and parasympathetic nerve activity in healthy subjects using heart rate variability (HRV) analysis. BACKGROUND DATA: Acupuncture at the Neiguan point (PC6) has been shown to modulate the autonomic nervous system. METHODS: Forty-five healthy non-smoking males were randomly divided into a placebo group (n = 20) with no laser irradiation and into an intervention group (n = 25) for which laser needle irradiation (36.8 kJ/cm(2)) was performed on the right forearm. Monitoring of HRV was performed before, during, and after intervention. RESULTS: Repeated-measures MANOVA did not show statistically significant main effects of time ($F = 1.29$, $p = 0.27$) or of group ($F = 1.67$, $p = 0.16$). The time by group interaction was also not statistically significant ($F = 0.95$, $p = 0.54$). CONCLUSION: Our results suggest that heart rate variability was not influenced by laser needle acupuncture at the Neiguan point (PC6). Acupuncture Therapy;Double-Blind Method;Heart Rate;Humans;Low-Level Light Therapy;Male;Pericardium;Reference Values

Laser acupuncture in knee osteoarthritis: a double-blind, randomized controlled study. OBJECTIVE: The purpose of this study was to investigate the effects and minimum effective dose of laser acupuncture in knee osteoarthritis (KOA), and to determine if it is superior to placebo treatment (sham) in the evaluation of clinical-functional outcome and quality of life. METHODS: In this randomized, placebo-controlled study, patients with grade 2 and 3 primary KOA were selected. Group I (n = 27) received 904-nm low-level laser irradiation with 10 mW/cm(2) power density, 4 mW output power, 0.4 cm(2) spot size, 0.48 J dose per session, and 120-sec treatment time on the medial side of the knee to the acupuncture point Sp9. Group II (n = 25) received placebo-laser therapy at the same place on the same point. Patients in both of the groups had treatment 5 days per week (total duration of therapy was 10 days) and 20 min per day. The study was comprised of a 2-week (10-session) intervention. Participants were evaluated before treatment (baseline), after treatment (2nd week), and at the 12th week. In this double-blind study, a blind examiner carried out all outcome assessments. The main outcome measures were as follows: pain on movement (pVAS), 50-foot walking time (50 foot w), knee circumference (KC), medial tenderness score (MTS), Western Ontario and McMaster Universities osteoarthritis index (WOMAC), and Nottingham Health Profile (NHP). RESULTS: Statistically significant improvement was observed in PVAS, 50 foot w, and KC in group 1. In

Group II, statistically significant improvement was observed in PVAS, 50 foot w, and WOMAC. When groups were compared with each other, the improvement observed in KC was superior in Group I at the 2(nd) week (p = 0.005). CONCLUSION: Laser acupuncture was found to be effective only in reducing periarticular swelling when compared with placebo laser. Acupuncture Therapy;Adult;Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee

Lasers and soft tissue: 'fixed' soft tissue surgery. Within a general practice setting, there are few benign pathological conditions of the attached or keratinised gingival complex that are not amenable to simple surgical intervention. The majority of surgical procedures are adjunctive to the delivery of restorative dentistry. There is an understandable dogma worldwide towards the management of soft tissues as they interface with restorative procedures. Contemporary teaching, both at undergraduate and postgraduate level, would recognise the need for a period of wound healing and stability, based on scalpel-induced incisional therapy. The use of laser wavelengths, based on predictable evidence-based protocols, has re-defined the surgical management of keratinised mucosa that is bound to the underlying periosteum and bone. This can be seen as being of benefit to the clinician in determining the outcome, and the patient in achieving quality results. Gingival Diseases;Gingival Hyperplasia;Gingivectomy;Granuloma, Giant Cell;Humans;Low-Level Light Therapy;Tooth, Unerupted

Strategies for prevention and management of musculoskeletal conditions. Neck pain. The aim of this article was to summarise the existing evidence concerning interventions for non-specific neck pain. Neck-and-shoulder pain is commonly experienced by both adolescents and adults. Although the prevalence appears to vary among different nations, the situation is essentially the same, at least in the industrialised nations. Explanations for the wide variation in incidence and prevalence include various methodological issues. Back and neck disorders represent one of the most common causes for both short- and long-term sick leave and disability pension. Evidenced risk factors for the onset and maintenance of non-specific neck and back pain include both individual and work-related psychosocial factors. Based on the existing evidence different forms of exercise can be strongly recommended for at-risk populations, as well as for the acute and chronic non-specific neck pain patient. Furthermore, for symptom relief this condition can be treated with transcutaneous electric nerve stimulation, low level laser therapy, pulse electromagnetic treatment or radiofrequency denervation. Evidence-Based Medicine;Humans;Life Style;Neck Pain;Occupational Diseases;Physical Fitness;Shoulder Pain;Whiplash Injuries;Workplace

Achieving good cosmetic results following pulsed dye laser therapy for port wine stains, a short report. Esthetics;Evaluation Studies as Topic;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Port-Wine Stain;Risk Assessment;Severity of Illness Index;Treatment Outcome

Elderly skin and its rejuvenation: products and procedures for the aging skin. In the last few decades, there has been a substantial increase in the population of people over 60 years of age. Most of them maintain a good general health and physical activity and fitness. For these individuals there is a good number of dermatologic procedures, medications, and cosmetics that can be prescribed to improve the aspect of skin aging, providing an improvement in their self-esteem and quality of life as a result of their better look. We will discuss the mechanisms of skin aging, and the procedures and substances used to minimize its deleterious effects, such as sunscreens, estrogens, chemical peels, toxin botulinum, fillers and surgical procedures, among others. The use of makeup and the adverse reactions to cosmetics will also be mentioned. Dermatologic Agents Aged;Aged, 80 and over;Chemexfoliation;Cosmetic Techniques;Dermabrasion;Dermatologic Agents;Esthetics;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient

Satisfaction;Rejuvenation;Rhytidoplasty;Risk Assessment;Skin Aging;Surgery, Plastic;Treatment Outcome

Treatment of facial reticular veins with dynamically cooled, variable spot-sized 1064 nm Nd:YAG laser. BACKGROUND: Facial reticular veins are often seen on the temple and periorbital areas in patients with genetic predisposition or after facial cosmetic surgery. AIM: The purpose of this study was to evaluate the efficacy and safety of dynamically cooled, variable spot sized 1064 nm Nd:YAG laser in the treatment of facial reticular veins. PATIENTS/METHODS: This is a retrospective study. Twenty patients with facial reticular veins who underwent treatment with dynamically cooled, variable spot sized 1064 nm Nd:YAG laser were evaluated. Patients were followed up 1 month to 2 years after the procedure. RESULTS: Objective and subjective improvement scores after one or two treatments of dynamically cooled, variable spot sized 1064 nm Nd:YAG laser were nearly 100% when appropriate parameters were used. CONCLUSION: Dynamically cooled, variable spot sized 1064 nm Nd:YAG laser is a safe and effective treatment for facial reticular veins. Most patients responded to one treatment and experienced no significant side effects other than tolerable pain associated with the procedure. Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Retrospective Studies;Risk Assessment;Sampling Studies;Severity of Illness Index;Telangiectasis;Treatment Outcome

[Protective effect of low-power laser radiation in acute toxic stress]. The effect of preliminary short-term irradiation with He-Ne laser light (632.8 nm, 0.2 mW/cm2) of the thymus zone projection of male NMRI mice subjected to acute toxic stress on the responses of immune cells was studied. Stress was modeled by lipopolysaccharide injection, 250 mg/100 g of body weight, which induced a significant increase in the production of several macrophage cytokines, IL-1alpha, IL-1beta, IL-6, IL-10 and TNF-alpha. A single irradiation with laser light did not provoke considerable variations in NO production in cells but induced an enhancement in the production of heat shock proteins Hsp25, Hsp70, and Hsp90. Nevertheless, when irradiation with red laser light was applied prior to toxic stress, considerable normalization of production of nearly all cytokines studied and nitric oxide was observed. Moreover, the normalization of production of heat shock proteins has been shown in these conditions. Thus, preliminary exposure of a small area of animal skin surface provoked a significant lowering in the toxic effect of lipopolysaccharide. Heat-Shock Proteins;Lipopolysaccharides;Monokines;Nitric Oxide Acute Disease;Animals;Heat-Shock Proteins;Lipopolysaccharides;Low-Level Light Therapy;Male;Mice;Monokines;Nitric Oxide;Shock, Septic;Thymus Gland

A pilot study on the use of a plasma skin regeneration device (Portrait PSR3) in full facial rejuvenation procedures. A new modality, the Portrait plasma skin regeneration (PSR(3)) system, allows precise and rapid treatment of photo-damaged skin, with controlled thermal injury and modification. Radio frequency (RF) energy converts nitrogen gas into plasma within the handpiece. Rapid heating of the skin occurs as the plasma rapidly gives up energy to the skin. This energy transfer is not chromophore dependent. The gold standard, carbon dioxide (CO(2)) laser resurfacing, has decreased in popularity due to high morbidity and downtime. There is demand for a technology that can provide the degree of improvement obtained with resurfacing without the complications associated with its use. This study evaluated the PSR(3) technology in full facial procedures. A two-site prospective study evaluated safety and efficacy for a single pass treatment of the full face using the Portrait PSR(3) system. Improvement in skin texture, tone, fine lines, dyschromia, and rhytides were assessed. Two-millimeter punch biopsy specimens were taken pre- and 90 days post-treatment. Follow-up was performed at days 2, 5, 7, 30, and 90 post-treatment to monitor recovery, improvement, and any subsequent sequelae. Patients developed erythema and edema shortly after treatment, with no immediate epidermal loss or charring. Epidermal loss occurred in the subsequent 24-48 h followed by

epidermal recovery in approximately 7 days. Histological investigation showed regenerative epidermal and dermal architecture. The Rhytec Portrait PSR(3) system provides an attractive alternative to standard lasers that is well tolerated by patients, stimulates collagen remodeling, and provides excellent clinical outcomes. Collagen;Nitrogen Collagen;Cosmetic Techniques;Humans;Hyperpigmentation;Low-Level Light Therapy;Nitrogen;Pilot Projects;Prospective Studies;Rejuvenation;Skin Aging;Technology Assessment, Biomedical;Treatment Outcome

[Comparison of analgetic effect of magnetic and laser stimulation before oral surgery procedures]. Oral surgery procedures are often the cause of painful sensations because of their tissue invasiveness. To avoid these sensations a wide use of nonsteroid antiinflammatory drugs is usually accepted. Because of plenty side effects of these drugs alternative antipain agents are desired. The goal of this study was to assess antipain effect of laser stimulation and alternating magnetic field in oral surgery procedures. Pain sensations in patients during: local anesthetics application, surgical procedure and after it were assessed according to VAS scale. Level of stomatological fear was assessed with the use of Corah's scale. Achieved results were analyzed statistically. Conclusion of this analysis is that laser stimulation and alternating magnetic field applied directly before oral surgery procedure are effective antipain agents that decrease intra and postoperative sensations. It was observed that patients with high level of stomatological fear had more pain sensations but even in this group laser and magnetic stimulation significantly lowered these complaints. Adolescent;Adult;Analgesia;Anesthesia, Dental;Dental Anxiety;Dentistry, Operative;Facial Pain;Female;Humans;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Oral Surgical Procedures;Pain Measurement;Pain, Postoperative;Physical Stimulation;Preoperative Care;Stomatognathic Diseases;Surgery, Oral

High-tech dermatology. Dermatology;Humans;Low-Level Light Therapy;Photochemotherapy;Skin Diseases;Ultraviolet Therapy

Influence of photodynamic therapy on the development of ligature-induced periodontitis in rats. BACKGROUND: The purpose of this study was to evaluate, histologically and radiographically, the effect of photodynamic therapy on the progression of experimentally induced periodontal disease in rats. METHODS: Ligatures were placed at the first mandibular molar in rats. The animals were divided into four groups: group 1 (C) received no treatment; group 2 was treated topically with methylene blue (MB; 100 microg/ml); group 3 was treated with low-level laser therapy (LLLT); and group 4 was treated topically with methylene blue followed by LLLT (4.5 J/cm(2)) (photodynamic therapy; PDT). Rats were sacrificed 5, 15, or 30 days postoperatively. Standardized radiographs were taken to measure bone loss around the mesial root surface of the first molar. Data were analyzed statistically (analysis of variance and Tukey test; $P < 0.05$). A scoring system was used to evaluate the connective tissue, periodontal ligament, and alveolar bone histologically. Data were analyzed statistically (Kruskal-Wallis test; $P < 0.05$). RESULTS: Radiographic examination showed that there was significantly less bone loss in Group PDT compared to Group C at 5 and 15 days postoperatively. There was no significant difference in bone loss at 30 days. At 15 days, the histologic results showed significant differences in the extent of inflammatory reaction in the gingival tissue, with a greater extent of chronic inflammatory reaction in Group LLLT. CONCLUSION: PDT transiently reduced the periodontal tissue destruction. Photosensitizing Agents;Methylene Blue Alveolar Bone Loss;Analysis of Variance;Animals;Ligation;Low-Level Light Therapy;Methylene Blue;Periodontitis;Photochemotherapy;Photosensitizing Agents;Radiography;Rats;Rats, Wistar;Statistics, Nonparametric

The importance of coherence length in laser phototherapy of gingival inflammation: a pilot study. The aim of this study was to investigate if coherence length is of importance in laser phototherapy. Twenty patients with moderate periodontitis were selected. After oral hygiene instructions, scaling

and root planing (SRP), one side of the upper jaw was randomly selected for HeNe (632.8 nm, 3 mW) or InGaAlP (650 nm, 3 mW) laser irradiation. One week after SRP, the following parameters were measured: pocket depth, gingival index, plaque index, gingival crevicular fluid volume, matrix metalloproteinase (MMP-8), interleukin (IL-8) and subgingival microflora. The irradiation (180 s per point, energy 0.54 J) was then performed once a week for 6 weeks. At the follow up examination, all clinical parameters had improved significantly in both groups. A more pronounced decrease of clinical inflammation was observed after HeNe treatment. MMP-8 levels were considerably reduced on the HeNe side, while there was no difference for IL-8 or microflora. Coherence length appears to be an important factor in laser phototherapy. Interleukin-8;Matrix Metalloproteinase 8 Adult;Female;Gingiva;Gingivitis;Health Status Indicators;Humans;Inflammation;Interleukin-8;Lasers, Gas;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Periodontitis;Phototherapy;Pilot Projects;Prospective Studies

Effects of two types of low-level laser wave lengths (850 and 630 nm) on the orthodontic tooth movements in rabbits. The effects of low-level lasers on bone cellular activity, bone structures, bone healing, fibroblasts activity and inflammation process have already been investigated. Considering orthodontic tooth movement, which is a complicated inflammatory process involving simultaneous bone apposition and resorption, the aim of this controlled study is to investigate the quantitative effects of a pulsed 850 nm laser (Optodan) and a continuous 630 nm laser (KLO3) on the orthodontic tooth movement in rabbits. This experimental study was conducted on 18 male albino rabbits divided into three equal groups of control, Optodan and KLO3. In all the groups, NiTi-closed coil springs were used on the first mandibular molars with 4-oz tension. The control group was not irradiated by laser, but the teeth in the laser groups were irradiated 9 days according to the periodontal therapeutic protocols. After 16 days, samples were sacrificed. The distance between the distal surface of the first molar and the mesial surface of the second molar was measured with 0.05-mm accuracy. The data were subjected to the statistical tests of Kolmogrov Smirnov and variance analysis. The mean orthodontic tooth movements of the first mandibular molars were 1.7 +/- 0.16 mm in control group, 0.69 +/- 0.16 mm in Optodan group and 0.86 +/- 0.13 mm in KLO3 group. There were statistically significant difference between the control and the two other laser-irradiated groups ($P < 0.001$). The findings of the present study imply that the amounts of orthodontic tooth movement, after low-level laser therapy, are diminished. It could not be concluded that any low-level laser will reduce the speed of teeth movement in orthodontic treatments, and further studies with less or more energies may show different results. Animals;Bone Remodeling;Lasers;Low-Level Light Therapy;Male;Osteogenesis;Periodontium;Rabbits;Time Factors;Tooth Movement Techniques

Treatment of carpal tunnel syndrome by low-level laser versus open carpal tunnel release.
Carpal tunnel syndrome (CTS) is an entrapment neuropathy of the median nerve at the wrist. It is one of the most common peripheral nerve disorders. The cause of idiopathic CTS remains unclear. The diagnosis of CTS is still mainly clinical. Open carpal tunnel release is the standard treatment. The present study was conducted to evaluate the effectiveness of low level laser treatment (LLLT) for CTS in comparison to the standard open carpal tunnel release surgery. Out of 54 patients, 60 symptomatic hands complaining of CTS were divided into two equal groups. Group A, was subjected to LLLT by Helium Neon (He-Ne) laser (632.8 nm), whereas group B was treated by the open approach for carpal tunnel release. The patients were evaluated clinically and by nerve conduction studies (NCSs) about 6 months after the treatment. LLLT showed overall significant results but at a lower level in relation to surgery. LLLT showed significant outcomes in all parameters of subjective complaints ($p < or = 0.01$) except for muscle weakness. Moreover, LLLT showed significant results in all parameters of objective findings ($p < or = 0.01$) except for thenar atrophy. However, NCSs expressed the same statistical

significance (p < or = 0.01) after the treatment by both modalities. LLLT has proven to be an effective and noninvasive treatment modality for CTS especially for early and mild-to-moderate cases when pain is the main presenting symptom. However, surgery could be preserved for advanced and chronic cases. Refinement of laser tools and introduction of other wavelengths could make LLLT for CTS treatment a field for further investigations. Adult;Aged;Carpal Tunnel Syndrome;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Pain;Pain Management;Prospective Studies

Nd:YAG lasers (1,064 nm) in the treatment of venous malformations of the face and neck: challenges and benefits. Neodymium:yttrium aluminum garnet (Nd:YAG) laser therapy for venous malformations (VMs) of the head and neck is a rather new therapeutical option in addition to sclerotherapy and surgery. One hundred forty-six patients (age 2 months to 77.5 years) with VMs in the head/neck (localized, diffuse, and multifocal) were retrospectively analyzed with regard to number and quality of treatments and laser parameters used. Of these patients, 72 had no prior treatment of any kind, and 74 were pretreated. Laser treatment of mucosa and tongue was done with a mean fluence of 103.1 J/cm(2), of skin with 90.7 J/cm(2), and of glomuvenous malformations with 81.2 J/cm(2). Complex VM can mostly be controlled but rarely cured. Initial Nd:YAG laser therapy is important in the treatment of VMs regarding shrinkage of the tissue, discoloration, and induction of the desired dermal fibrosis that facilitates the surgical handling of the skin and reduces the risk of skin loss in surgery and sclerotherapy. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum Adolescent;Adult;Aged;Aluminum;Arteriovenous Malformations;Child;Child, Preschool;Face;Female;Humans;Infant;Lasers;Low-Level Light Therapy;Male;Middle Aged;Neck;Neodymium;Retrospective Studies;Sclerotherapy;Yttrium

[Fractional photothermolysis]. Fractional photothermolysis (FP) has been recently introduced as a new concept in dermatologic laser medicine. FP employs an array of small laser beams to create many microscopic areas of thermal necrosis within the skin called microscopic treatment zones (MTZ). Even though FP completely destroys the epidermis and dermis within these MTZ, the 3-dimensional pattern of damage heals quickly and with few side effects. FP is currently used to treat fine wrinkles, photodamaged skin, acne scars, and melasma. Due to its clinical efficacy and limited side effects FP has established itself in the past two years as an alternative treatment modality to the conventional ablative and non ablative laser therapy. Cicatrix;Humans;Low-Level Light Therapy;Melanosis;Phototherapy;Rejuvenation;Skin Aging

Laser surgery of port wine stains using local vacuum [corrected] pressure: changes in calculated energy deposition (Part II). BACKGROUND AND OBJECTIVES: Application of local vacuum pressure to human skin during laser irradiation results in less absorption in the epidermis and more light delivered to targeted vessels with an increased blood volume. The objective of the present numerical study is to assess the effect of applying local vacuum pressure on the temperatures of the epidermis and small vessels during port wine stain (PWS) laser treatment. STUDY DESIGN/ MATERIALS AND METHODS: Mathematical models of light deposition and heat diffusion are used to compute absorbed energy and temperature distributions of skin and blood vessels with different diameters (10-60 microm) at various depths (200-800 microm) exposed to laser irradiation under atmospheric and vacuum pressures. RESULTS: Under 50 kPa (15 in Hg) vacuum pressure, peak temperatures at the inner walls of small diameter vessels (10-30 microm) located 200-300 microm below the skin surface are approximately 10 degrees C higher than those under atmospheric pressure, and peak temperatures in the epidermis of patients with skin phototype II are approximately 5 degrees C lower. In patients with darker skin phototype (IV), the peak temperature at the inner wall of a 10 microm diameter vessel located 200 microm below the skin surface is approximately 5 degrees C higher than that under atmospheric pressure, and the peak temperature

in the epidermis is approximately 10 degrees C lower. CONCLUSIONS: Additional energy deposition in a larger blood volume permits higher temperatures to be achieved at vessel walls in response to laser irradiation. While more energy is deposited in every vessel, temperature gains in small diameter vessels (10-30 microm) are greater, increasing the likelihood of irreversible thermal damage to such vessels. In addition, temperatures in the epidermis decrease because less energy is absorbed therein due to reduced epidermal thickness and concentration of melanin per unit area.
Humans;Low-Level Light Therapy;Models, Theoretical;Port-Wine Stain;Skin;Skin Temperature;Vacuum

The new-generation, high-energy, 595-nm, long pulse-duration pulsed-dye laser improves the appearance of photodamaged skin. BACKGROUND AND OBJECTIVES: Chronic sun-exposure results in five main changes to exposed skin: telangiectasia, hyperpigmentation, rhytides, enlarged pores, and sagging skin. Various laser and non-laser modalities have been used to improve sun-damaged skin. The pulsed-dye laser (PDL) has an unparalleled safety record and an ideal wavelength for treating the signs of photodamage. In this study, we investigate the ability of the long pulse-duration PDL to improve the appearance of photodamaged skin. STUDY DESIGN/MATERIALS AND METHODS: Ten subjects with cutaneous photodamage were treated with the high-energy, long pulse-duration PDL using fluences ranging from 8.0 to 10.0 J/cm(2), a 10-mm spot, and a 10-millisecond pulse-duration. Five subjects judged to have discrete solar lentigos or ephiledes were also treated to these lesions using a compression handpiece. Improvement was determined by blinded evaluation of photographs taken before and after the final treatment, and by subjects' self-evaluation 8 weeks following the final treatment. RESULTS: Subjects rated overall improvement as 65%, facial veins as 72% improved, hyperpigmentation 65% improved, enlarged pores 65% improved, and wrinkles 62% improved. Improvement was also determined by 3 physicians rating digital photographs and blinded as to which photos were pre- or post-treatment. They rated wrinkles as improved in 50% of photographs, veins as improved in 82%, diffuse redness as improved in 80%, pigmentary alterations as improved in 61.4%, and pore size as improved in 25%. CONCLUSIONS: The high-energy, long pulse-duration PDL improves photodamaged skin using non-purpuric settings. Coloring Agents
Adult;Coloring Agents;Cosmetic Techniques;Face;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Purpura;Skin;Skin Aging

Laser surgery of port wine stains using local vacuum pressure: changes in skin morphology and optical properties (Part I). BACKGROUND AND OBJECTIVES: In a recent case study, the use of a suction device to aid in port wine stain (PWS) laser treatments showed favorable results. It is our objective to further understand the mechanisms of vacuum-assisted laser therapy by analyzing the mechanical and optical changes of the skin and musculoskeletal tissues during the application of mild vacuum pressure from a suction cup. STUDY DESIGN/MATERIALS AND METHODS: A mathematical model of tissue deformation was used to determine the changes in tissue morphology that affect the underlying laser-tissue interactions, such as epidermal stretching and thinning, blood vessel dilation, and change in blood vessel depth. Video imaging experiments were used to verify the bulk tissue deformation and skin surface stretching computed by the mathematical model. Additionally, visible reflectance spectroscopy was used to determine the changes in the optical characteristics of tissue, including blood vessel dilation and epidermal absorption coefficient. RESULTS: At a vacuum pressure of 50 kP(a), the epidermis at the center of the suction cup was measured to stretch 4% and was calculated to be thinned approximately 6%. Blood vessels embedded in the dermis were measured to dilate up to two times their original size. However, these vessels were calculated to be displaced toward the skin surface by a very small amount, approximately 1-3 microm. The absorption coefficient of the epidermis was also measured to be reduced significantly by approximately 25% at a wavelength of 585 nm. CONCLUSIONS: Mild vacuum pressure applied to the skin surface causes

considerable changes in the morphology and optical properties of the tissue. These changes may be used for more efficient photothermolysis of small PWS blood vessels. Blood Vessels;Elasticity;Humans;Low-Level Light Therapy;Models, Theoretical;Port-Wine Stain;Skin;Spectrum Analysis;Vacuum

Seeking relief. A variety of modalities is available for management of acute and chronic pain. Acute Disease;Athletic Injuries;Chronic Disease;Electric Stimulation Therapy;Exercise Therapy;Humans;Iontophoresis;Low-Level Light Therapy;Pain Management;Sprains and Strains;Ultrasonic Therapy

Evaluation of plasma skin regeneration technology in low-energy full-facial rejuvenation. OBJECTIVE: To evaluate the use of multiple, low-energy, full-face plasma skin regeneration treatments. DESIGN: Plasma skin regeneration delivers energy to the skin through plasma pulses induced by passing radiofrequency into nitrogen gas. Single-treatment, high-energy, 1-pass treatments have been demonstrated to achieve good results with an excellent safety profile. Eight volunteers underwent full-face treatments every 3 weeks, for a total of 3 treatments, using energy settings of 1.2 to 1.8 J. Before each subsequent treatment, the quality of regenerated epidermis, the degree of downtime, and erythema were recorded. Full-thickness skin biopsy specimens were obtained from 6 patients before treatment and 90 days following the last treatment. Patients were seen for follow-up 4 days after each treatment and 30 and 90 days after the third treatment. RESULTS: Three months after treatment, investigators found a 37% reduction in facial rhytids and study participants noted a 68% improvement in overall facial appearance. Reepithelialization was complete in 4 days. Patients assessed erythema to persist an average of 6 days after treatment. Epidermal regeneration from the first treatment was longer than from the following treatments (9 vs 4 and 5 days, respectively). One patient developed localized hyperpigmentation after the first treatment, which resolved by follow-up at day 30. No scarring or hypopigmentation occurred. A histologic evaluation 3 months after treatment revealed a band of new collagen at the dermoepidermal junction with less dense elastin in the upper dermis. The mean depth of new collagen was 72.3 mum. CONCLUSIONS: Plasma skin regeneration using the multiple low-energy treatment technique allows significant successful treatment of photodamaged facial skin with minimal downtime. Results are comparable to a single high-energy treatment, but with less healing time. Equipment Design;Face;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Regeneration;Rejuvenation;Skin Aging;Time Factors

Effect of pulse width of a 595-nm flashlamp-pumped pulsed dye laser on the treatment response of keloidal and hypertrophic sternotomy scars. BACKGROUND: Flashlamp-pumped pulsed dye lasers (PDLs) have successfully treated keloidal and hypertrophic scars. OBJECTIVE: The objective was to investigate the effect of pulse width of a PDL in treating keloidal and hypertrophic scars. METHODS: On each of 19 patients, keloidal or hypertrophic median sternotomy scars were divided into two segments. Both segments on all patients were randomly treated with a 595-nm PDL at a fluence of 7 J/cm(2) and pulse widths of 0.45 and 40 ms to both segments, every 4 weeks for a total of three treatments. Scar volume, height, erythema, and pliability were measured at Weeks 0, 4, 8, and 24. RESULTS: The volume of segments treated with 0.45- and 40-ms pulses decreased significantly after two treatments. Segments treated with a 0.45-ms pulse width showed significantly greater improvement than those treated with 40-ms pulses after three treatments. Elasticity of 0.45-ms segments was significantly higher than those of 40-ms segments, following two treatments. Pulse width had no significant effect in improvement of scar erythema. CONCLUSIONS: A pulse width of 0.45 ms of PDL was more effective in decreasing scar size and improving scar pliability than that of 40 ms. A 595-nm PDL was safe and effective in treatment of hypertrophic scars and keloids in dark-skinned individuals. This study was supported in part by an educational grant from the

Dermatological Society of Thailand. Adolescent;Adult;Aged;Child;Cicatrix, Hypertrophic;Female;Humans;Keloid;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Statistics, Nonparametric;Sternum;Thoracotomy;Treatment Outcome;Wound Healing
Minimally invasive therapy for lower urinary tract symptoms secondary to benign prostatic hyperplasia. Diathermy;Electrocoagulation;Humans;Low-Level Light Therapy;Male;Minimally Invasive Surgical Procedures;Prostatic Hyperplasia;Urination Disorders
Conservative management of mechanical neck disorders: a systematic review. OBJECTIVE: To determine if conservative treatments (manual therapies, physical medicine methods, medication, and patient education) relieved pain or improved function/disability, patient satisfaction, and global perceived effect in adults with acute, subacute, and chronic mechanical neck disorders (MND) by updating 11 systematic reviews of randomized controlled trials (RCT). METHODS: Two independent authors selected studies, abstracted data, and assessed methodological quality from computerized databases. We calculated relative risks and standardized mean differences (SMD) when possible. In the absence of heterogeneity, we calculated pooled effect sizes. RESULTS: We studied 88 unique RCT. The mean methodological quality scores were acceptable in 59% of the trials. We noted strong evidence of benefit for maintained pain reduction [pooled SMD -0.85 (95% CI -1.20, -0.50)], improvement in function, and positive global perceived effect favoring exercise plus mobilization/manipulation versus control for subacute/chronic MND. We found moderate evidence of longterm benefit for improved function favoring direct neck strengthening and stretching for chronic MND, and for high global perceived effect favoring vertigo exercises. We noted moderate evidence of no benefit for botulinium-A injection [pooled SMD -0.39 (95% CI -01.25, 0.47)]. We found many treatments demonstrating short-term effects. CONCLUSION: Exercise combined with mobilization/manipulation, exercise alone, and intramuscular lidocaine for chronic MND; intravenous glucocorticoid for acute whiplash associated disorders; and low-level laser therapy demonstrated either intermediate or longterm benefits. Optimal dosage of effective techniques and prognostic indicators for responders to care should be explored in future research. Acute Disease;Chronic Disease;Databases, Bibliographic;Humans;Meta-Analysis as Topic;Neck Pain;Pain Measurement;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Recovery of Function;Treatment Outcome;Whiplash Injuries
Laser biostimulation in end-stage multivessel coronary artery disease--a preliminary observational study. BACKGROUND: Low-energy laser radiation through its direct influence on tissue repair processes without heating effect may have vital importance in the therapy of patients with advanced coronary artery disease (CAD). AIM: The introductory assessment of the effects of laser biostimulation applied to patients with advanced multivessel CAD. METHODS: 39 patients with advanced CAD were assigned (mean age 64.8+/-9.6, male gender 64%, CCS class 2.5+/-0.5, EF=46+/-11%, 69% with a history of acute myocardial infarction), to undergo two sessions of irradiation of low-energy laser light on skin in the chest area from helium-neon B1 lasers. The time of irradiation was 15 minutes while operations were performed 6 days a week for one month. Before including the patients in the experimental group a full clinical evaluation, basic biochemical tests, ECG, 24h Holter recordings, 6-minute walk test, treadmill test using Bruce protocol and full echocardiographic examination were performed. After the first and second period of laser therapy with a one-month break between them analogical parameters with the initial examination were measured. RESULTS: No side effects associated with the laser biostimulation or performed clinical tests were noted. Lower CCS class (2.5+/-0.5 --> 2.2+/-0.4 --> 2.0+/-0.4, p<0.001), higher exercise capacity (5.1+/-2.2 --> 5.8+/-2.2 --> 6.6+/-2.5 [METS], p=0.023), longer exercise time (257+/-126 --> 286+/-127 --> 325+/-156 [s], p=0.06), less frequent angina symptoms during the treadmill test (65% --> 44% --> 38%, p=0.02), longer distance of 6-minute walk test (341+/-93 --> 405+/-113 --> 450+/-109 [m], p <0.001), lower

systolic blood pressure values (SP 130+/-14 --> 125+/-12 --> 124+/-14 [mmHg], p=0.05) and trend towards less frequent 1 mm ST depression lasting 1 min during Holter recordings were noted. CONCLUSIONS: An improvement of functional capacity and less frequent angina symptoms during exercise tests without a significant change in the left ventricular function were observed. Laser biostimulation in short-term observation was a very safe method. These encouraging results should be confirmed in a larger, placebo-controlled study. Aged;Coronary Artery Disease;Electrocardiography;Exercise Test;Feasibility Studies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Treatment Outcome;Ultrasonography

Effect of 650 nm low-power laser on bone morphogenetic protein in bone defects induced in rat femors. PURPOSE: To investigate the influence of 650 nm GaAlAs laser on the action of bone morphogenetic protein (BMP) in bone defects produced in rat femurs. METHODS: The sample consisted of 12 male albino Wistar rats (Rattus norvegicus). The animals were randomly divided into four experimental groups. After undergoing anesthesia, the fur was removed from the lateral face of the right thigh and surgical dissection was performed to view the femur region. A bone defect was created using a spherical diamond-tipped drill bit. In groups 1 and 2, the defect was filled with a paste of Gen-Tech bone-inducing substance. The animals were treated with GaAlAs laser, at a predetermined dose of joules/cm(2) for 80 seconds, over an area of 1 cm(2). Groups 2 and 4 were used as controls. Bone samples were removed to perform histological procedures and morphometric analyses on the 7th, 14th and 21st days after the operation. The results obtained were subjected to statistical analysis using ANOVA variance according to two criteria, with four repetitions, followed by the post hoc t test. The rejection level for the nullity hypothesis was 0.05 or 5% (alpha < or = 0.05). RESULTS: In comparisons between G1, G2, G3 and G4, p = 0.024 was observed. In statistical comparisons using the t test for paired samples, only G1 vs. G4 presented a statistically significant result (p = 0.021). CONCLUSION: The association of low-power laser application and Gen-Tech bone-inducing substance achieved a better result than laser application alone or BMP use alone. Bone Morphogenetic Proteins Animals;Bone Morphogenetic Proteins;Bone Remodeling;Disease Models, Animal;Femur;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoblasts;Rats;Rats, Wistar

Photodynamic inactivation of in vitro bacterial cultures from pressure ulcers. PURPOSE: To evaluate in vitro the antibacterial effect of diode laser light of wavelength 650 nm, in association with the photosensitive substance toluidine blue, on the bacteria in infected skin ulcers. METHODS: Samples were collected by means of swabs containing a medium for transporting infected material from skin ulcers. The material was inoculated into culturing medium containing azide blood agar for the growth of Gram-positive bacteria, and MacConkey agar for Gram-negative bacteria, and incubated for 48 hours. The results obtained from counting the colony-forming units were correlated and subjected to statistical analysis, adopting the significance level of p > or = 0.05. RESULTS: From analysis of variance (ANOVA), the result for the general mean was p = 0.0215. Using the t test with post-hoc test, the result for TBO vs. Control was p = 0.0186, and for TBO + Laser vs. Control it was p = 0.0039. CONCLUSION: There was a significant reduction in colony-forming units when the cultures were subjected to photodynamic therapy. Photosensitizing Agents;Tolonium Chloride Analysis of Variance;Colony Count, Microbial;Gram-Negative Bacteria;Gram-Positive Bacteria;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Pressure Ulcer;Tolonium Chloride

Low-level laser use in dentistry. The use of laser light at power levels below that capable of direct tissue change (protein denaturation, water vaporisation and tissue ablation), has been advocated in diverse branches of medicine and veterinary practice, yet its acceptance in general dental practice remains low. However, the scope for using low-level laser light (LLLT) has emerged

through many applications, either directly or indirectly tissue-related, in delivering primary dental care. The purpose of this article is to explain the mechanisms of action and to explore the uses of this group of lasers in general dental practice. Acrylic Resins;Composite Dental Resin;Composite Resins;Polyurethanes Acrylic Resins;Animals;Composite Resins;Cricetinae;Dental Care;Dental Caries;History, 20th Century;History, 21st Century;Humans;Low-Level Light Therapy;Mouth Diseases;Polyurethanes

Effects of low power red laser on induced-dental caries in rats. OBJECTIVE: The purpose of this study was to investigate the effects of low power red laser associated with acidulated phosphate fluoride on the development of induced-dental caries in rats. DESIGN: Dental caries were induced in molars of 40 rats divided into five groups: control group (CG), the teeth were not submitted to any treatment; laser group (LG), teeth were irradiated with a low power red laser (LPRL), power of 30 mW and dose of 5 J/cm(2); fluoride group (FG), teeth were treated with topical acidulated phosphate fluoride (APF) 1.23% applied for 4 min; laser+fluoride group (LFG), teeth were irradiated with LPRL followed by APF; fluoride+laser group (FLG), teeth were treated with APF followed by LPRL. The animals were killed after 48 days, and the first and second molars were extracted to analyze the caries lesion area, microhardness, and calcium and phosphorus ratio. RESULTS: There were no statistical differences among FG, LFG, and FLG regarding to caries area and microhardness, although the caries area were smaller in LFG. Ca/P ratio did not show significant differences among all groups. CONCLUSIONS: Although LPRL before APF application appeared to diminish the caries progression, LPRL did not present any additional benefit compared with acidulated phosphate fluoride on the prevention of induced-dental caries in rats. Cariostatic Agents;Phosphorus;Acidulated Phosphate Fluoride;Fluorides;Calcium Acidulated Phosphate Fluoride;Animals;Calcium;Cariostatic Agents;Dental Caries;Disease Progression;Electron Probe Microanalysis;Female;Fluorides;Hardness;Lasers, Semiconductor;Low-Level Light Therapy;Molar;Phosphorus;Random Allocation;Rats;Rats, Wistar;Spectrophotometry

Liposuction: review of the techniques, innovations and applications. Liposuction is currently the most frequently performed aesthetic operation in the world. Despite its wide-spread popularity, it should nevertheless be stated that it is not trivial surgery, not always benign and not as safe as intimated in the glossy office brochures. Since the initial description of liposuction, numerous changes have taken place. Today, surgical indications are well defined and the liposuction procedure is well codified. However, several surgeons and manufacturers have developed new equipment and techniques. We propose to survey all the techniques showing the real place of each of them. Their advantages and disadvantages will be discussed. The various techniques dealt with are: the wetting solution techniques, standard liposuction or Suction-Assisted Lipoplasty (SAL), internal Ultrasound-Assisted Liposuction (iUAL), VASSER assisted liposuction, external Ultrasound-Assisted Liposuction (eUAL), Laser-Assisted Liposuction (LAL), Power-Assisted Liposuction (PAL) and Vibroliposuction (VL). On the basis of this review of the literature and of our clinical experience, we conclude that VL is the safest, most effective and precise surgery that can be used in any of the modern indications for liposuction. We concluded that VL seems to have all the advantages and none of the disadvantages associated with iUAL. Equipment Design;Humans;Laser Therapy;Lipectomy;Low-Level Light Therapy;Patient Selection;Ultrasonics

Effect of superpulsed laser irradiation on bone formation in a human osteoblast-like cell line. AIM: The effect superpulsed of low-level laser therapy (SLLLT) on bone regeneration has been the focus of recent research. This preliminary study investigated the effect of superpulsed laser irradiation on proliferation and bone formation in human osteoblast-like cells MG-63. METHODS: Human osteoblast-like cells MG-63 were exposed every 24 h to superpulsed low-level laser produced by the device Lumix 2 HFPL Dental (Fisioline s.n.c., Verduno, Cuneo, Italy); the experimental protocol

comprised 4 days of treatment. At each experimental time, cell proliferation and some markers of osteoblast activity were evaluated. RESULTS: Numbers of laser-treated cells increased starting from day 2 of treatment. The ability of SLLLT irradiation to stimulate bone production was evaluated by determining the expression of osteocalcin and alkaline phosphatase, proteins involved in calcium nodule formation. These proteins increased markedly after 3 days of laser treatment. CONCLUSIONS: These preliminary results show that repeated SLLLT irradiation stimulates cell proliferation in human osteoblast-like cells and, importantly, increases the expression of proteins essential for bone formation. Osteocalcin;Alkaline Phosphatase Alkaline Phosphatase;Cell Division;Cell Line;Humans;Lasers;Osteoblasts;Osteocalcin;Osteogenesis;Polymerase Chain Reaction

KTP-nd:YAG laser therapy for the treatment of vestibulodynia: a follow-up study. OBJECTIVE: To evaluate the results of KTP-Nd:YAG laser therapy for the treatment of vestibulodynia. STUDY DESIGN: Retrospective review and follow-up mail survey of women with vestibulodynia who underwent laser treatment. Demographics, number of laser treatments and symptom severity prior to laser treatment (100-mm visual analog scale) were obtained from the medical record. The survey included questions regarding current sexual pain, sexual quality of life and satisfaction with treatment. RESULTS: Of41 treated women, 37 women were located and agreed to participate. The mean number of laser sessions was 2.81 (range, 1-8). The mean age was 32.9 years and mean follow-up, 2.8. Following laser treatment, most (24 of 37, 68%) subjects reported less pain with sexual intercourse. One subject reported more pain, while 29% (11 of 37) reported no change. Sixty percent (21 of 37) reported their sex lives to be more satisfying/pleasurable following laser treatment. Thirteen women (13 of 37, 35%) underwent vestibulectomy following laser therapy, and 2 subjects were treated with a laser after failed vestibulectomy. CONCLUSION: Most women with vestibulodynia treated with a KTP-Nd:YAG laser achieve a reduction in sexual pain and improved sexual satisfaction without excisional therapy. Adult;Dyspareunia;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Pain;Pain Management;Retrospective Studies;Vulvar Diseases

[Current potentialities of laser radiation in otorhinolaryngological practice]. Humans;Laser Therapy;Low-Level Light Therapy;Otorhinolaryngologic Diseases;Treatment Outcome

Re: "low-level laser therapy and lateral epicondylitis" Maher S. Phys Ther. 2006;86:1161-1167. Evidence-Based Medicine;Humans;Low-Level Light Therapy;Tennis Elbow

A randomized bilateral vehicle-controlled study of eflornithine cream combined with laser treatment versus laser treatment alone for facial hirsutism in women. BACKGROUND AND OBJECTIVE: Although there are a multitude of therapeutic modalities for removing unwanted facial hair in women, there is very little information on using the newer medical treatment approaches in combination. This study was designed to determine whether topical eflornithine can enhance the efficacy of laser hair removal. DESIGN: This was a randomized, double-blind, placebo-controlled, right-left comparison study of eflornithine cream combined with laser treatment versus laser alone for treating unwanted hair on the upper lip in women. All subjects underwent treatment to the entire upper lip with a long pulse alexandrite laser (10-40 ms pulse duration) at fluences of 7 to 40 J/cm(2). Laser treatments were performed every 4 weeks for up to 6 sessions. Each patient also applied either eflornithine or placebo cream twice daily to each side of the upper lip in a double-blinded manner. Subjects were evaluated for safety by recording adverse events and for efficacy via (1) investigator global scoring, (2) patient self assessment, and (3) hair count analysis. RESULTS: Both treatment modalities were well tolerated by the 31 evaluable patients. All 3 outcome measures showed significantly better results in favor of eflornithine plus laser versus laser treatment alone. At the end of the study, complete or almost complete hair removal was achieved in 29 of 31 (93.5%) of the eflornithine-laser-treated sites versus 21 of 31 (67.9%) for the placebo cream-laser-treated sites (P = .021, McNemar test). Statistically significant differences in favor of eflornithine were likewise

demonstrated at the final assessment through blinded patient grading (13/31 patients [41.9%] thought that the eflornithine was superior to placebo, P = .029, Poisson regression) and hair count analysis (P < .01, paired t test). LIMITATIONS: This is a single-center study that did not determine whether the differences noted above last beyond 6 months. CONCLUSIONS: On the basis of both investigator and patient assessments and hair count analysis, we have demonstrated that the addition of eflornithine to laser hair removal results in a more rapid and complete reduction of unwanted facial hair in women when the combination is used for up to 6 months. Eflornithine Adult;Aged;Combined Modality Therapy;Double-Blind Method;Eflornithine;Female;Hair Removal;Hirsutism;Humans;Lip;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Mathematical modeling of selective photothermolysis to aid the treatment of vascular malformations and hemangioma with pulsed dye laser. Pulsed dye lasers (PDL) are the standard of care in the treatment of cutaneous vascular disorders such as the port-wine strains or hemangiomas of infancy. Nonetheless, there is still uncertainty regarding the specific laser parameters that are likely to yield optimal clinical outcomes. Using mathematical modeling, we explain and associate clinical outcomes with laser wavelength, radiant exposure, and pulse time and shape. The model's prediction that a continuous PDL pulse of 0.45 ms with a radiant exposure of 6 J/cm(2) is equivalent to delivering a 1.5-ms pulse consisting of three pulses with a radiant exposure of 12 J/cm(2) is in agreement with clinical studies. The model also suggests that for vascular malformations involving vessel diameters in the range of 150-500 microm, one should use a PDL at a wavelength of 595 nm with a radiant exposure of at least 12 J/cm(2) and pulse time of 1.5 ms, delivered in three pulses. Whereas it is calculated that malformations with vessels smaller than 50 microm will not respond to PDL in any clinical setting, an excellent response to PDL treatment at either a 585- or 595-nm wavelength can be expected for malformations with vessel diameters of 50-150 microm. Epidermal cooling is highly recommended for all settings to minimize pain and the risk of side effects. Finally, the model is used to generate a reference table that suggests specific PDL parameters for the treatment of various malformations and hemangiomas. The table cannot replace a clinician's experience with respect to which and how parameters should be changed, but provides a defined window of parameters that should be tried to improve clinical response. Hemangioma;Humans;Low-Level Light Therapy;Models, Theoretical;Port-Wine Stain;Reference Standards;Skin Diseases, Vascular

Laser applications in oral surgery and implant dentistry. Lasers have been used for many years in oral surgery and implant dentistry. In some indications, laser treatment has become state of the art as compared to conventional techniques. This article is a comprehensive review of new laser applications in oral surgery and implant dentistry. One of the most interesting developments over the last years was the introduction of the 9.6-microm CO(2) laser. It has been shown in the recent literature that the use of this new device can preserve tissue with almost no adverse effects at the light microscopic level. In contrast, modifications of approved CO(2) laser therapies of premalignant lesions resulted in higher recurrence rates than the conventional defocused laser technique. However, several studies indicate that other wavelengths such as Nd-YAG (lambda = 1,064 nm) or diode lasers (lambda = 810 nm) may be also of value in this field. In many other indications, the use of lasers is still experimental. Intraoperatively used photodynamic therapy or peri-implant care of ailing implants with the CO(2) laser seems to be more of value than conventional methods. However, further studies are required to assess standard protocols. Over the past years, research identified some new indications for laser treatment in oral surgery and implant dentistry. Moreover, well-known laser applications were defined as state of the art. Nevertheless, further studies are required for laser treatment in oral surgery and implant dentistry. Dental Implants Dental Implants;Hemostasis;Humans;Lasers;Lasers, Gas;Low-Level Light Therapy;Mouth Mucosa;Spectrometry, Fluorescence;Surgery, Oral

Effects of skin temperature on lesion size in fractional photothermolysis. BACKGROUND AND OBJECTIVES: Fractional photothermolysis is a new concept in cutaneous re-modeling whereby laser-induced microscopic zones of thermal injury (MTZ-Microscopic Treatment Zones) are surrounded by normal, viable tissue. This unique thermal damage pattern allows re-epithelialization in less than 24 hours. To increase patient comfort level during the procedure of fractional photothermolysis, simultaneous skin cooling has been proposed and is now extensively used. The purpose of this in vitro study was to examine the influence of skin temperature on the diameter of the epidermal microthermal zone and the extent of thermal injury per unit area. The determination of the changes in these parameters that are due to skin temperature will allow the better control and understanding of fractional photothermolysis at different skin temperatures. MATERIALS AND METHODS: Fractional photothermolysis was performed with a 1,550 nm fiber laser (Fraxel SR Laser) with 10 mJ per pulse on full-thickness cadaver skin. The skin samples were brought prior to exposure to temperatures that ranged from 0 to 45 degrees C. The epidermis of the skin samples was separated by dispase treatment, stained for thermal damage by NBTC stain, and lesion diameter was assessed by a blinded investigator. RESULTS: The average MTZ diameter exhibits a positive, linear relationship with skin temperature ($R(2) = 0.904$, $P < 0.0001$). As the skin temperature increases from 0 to 45 degrees C. The MTZ diameter increases from 93 to 147 microm (58%), and the MTZ area from 6,870 to 17,050 microm(2) (148%). CONCLUSION: The skin temperature affects the size of epidermal MTZs during fractional photothermolysis and is an important variable factor. The use of simultaneous skin cooling increases patient comfort; however, as it also decreases MTZ size, it may interfere with treatment efficacy. The control of skin temperature is necessary to provide a consistent outcome and to be able to compare treatments. Cadaver;Dose Fractionation, Radiation;Humans;Low-Level Light Therapy;Photolysis;Skin;Skin Temperature

What is safe?: an introduction. Animals;Humans;Lasers;Low-Level Light Therapy;Mice;Risk;Safety;Skin;Skin Neoplasms;Time

A comparative study of intense pulsed light alone and its combination with photodynamic therapy for the treatment of facial acne in Asian skin. BACKGROUND AND OBJECTIVES: The reaction to intense pulsed light (IPL) on Asian skin often differs from that on Caucasian skin. The study reported herein evaluated the effect on acne vulgaris of IPL alone and when IPL was combined with photodynamic therapy (PDT) using topical methyl aminolevulinate (MAL) in Asians. STUDY DESIGN/MATERIALS AND METHODS: Thirty Chinese subjects with phototypes IV or V and moderate acne were enrolled for a randomized, half-facial treatment study with IPL alone, IPL with PDT, or as controls. Sixteen percent MAL cream was applied to half of the face 30 minutes before treatment in the PDT group. The IPL was provided by the Ellipse Flex system (Danish Dermatologic Development, Denmark), which emitted wavelengths of 530 to 750 nm. The subjects were treated four times at 3-week intervals. Single passes of double pulses with a 10 milliseconds delay and a pulse duration of 2.5 milliseconds were used. The assessment of inflammatory and non-inflammatory acne lesions by two blinded investigators was based on standardized photographs that were taken before each treatment, and at 4 and 12 weeks after the final treatment. RESULTS: Twenty-three patients completed the study. The mean reduction of the inflammatory lesion count was 53% in the PDT group, 22% in the IPL group, and 72% in the control group at 4 weeks, and 65% in the PDT group, 23% in the IPL group, and 88% in control group at 12 weeks. The mean clearance of non-inflammatory lesions was 52% in the PDT group, 15% in the IPL group, and 14% in the control group at 4 weeks, and 38% in the PDT group and 44% in the IPL group at 12 weeks, when and an increase of 15% was noted in the control group. Most patients experienced a reduction of inflammatory lesions that was not statistically significant on the PDT-treated side ($P = 0.06$) or the IPL-treated side ($P = 0.82$) at 12 weeks after treatment. Pretreatment with MAL resulted in a better clearance of inflammatory acne than IPL

alone. There were no statistically significant differences between the intervention groups and the control group in the mean reduction of inflammatory lesions. Significant reductions of non-inflammatory lesions were observed in the MAL-PDT group (38%, P = 0.05) and IPL groups (43%, P = 0.00) 12 weeks after treatment. Twenty-five percent of the subjects in the PDT group withdrew because of intolerance to procedure-related discomfort. CONCLUSIONS: MAL-PDT using IPL and MAL in Asians did not lead to significant improvement of moderate inflammatory acne compared with the control group. However, there was a delayed effect on non-inflammatory lesions, with significant reductions in both the PDT and IPL groups. A proportion of patients could not tolerate the discomfort that was related to PDT despite the short MAL incubation. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Acne Vulgaris;Adolescent;Adult;Aminolevulinic Acid;Asian People;Face;Female;Humans;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Single-Blind Method

Evaluation of the treatment of venous lakes with the 595-nm pulsed-dye laser: a case series. Venous lakes (VLs) are common benign venous ectasias in the upper dermis. They are treated to improve cosmesis and occasionally to prevent bleeding. Numerous methods have been used, such as cryotherapy, infrared coagulation and various types of lasers. They are variable in their success and all can be complicated by scarring. We report our experiences of using the 595 nm pulsed-dye laser (PDL), which has not been previously described. Eight patients were treated but sufficient resolution was achieved in only three patients. The limited success with this laser could be attributed to insufficient thermal energy being generated to close all the blood vessels permanently. A large prospective study would provide further data regarding the efficacy of the PDL. The use of compression and longer pulse durations may improve the efficacy of the 595 nm PDL to treat VLs. Aged;Child;Female;Humans;Lip;Low-Level Light Therapy;Middle Aged;Skin Diseases, Vascular;Treatment Outcome;Venules

Demodicidosis as spinulosis of the face: a therapeutic challenge. Anti-Infective Agents;Metronidazole;Hydroxyurea Aged;Anti-Infective Agents;Combined Modality Therapy;Facial Dermatoses;Humans;Hydroxyurea;Low-Level Light Therapy;Male;Metronidazole;Mite Infestations;Skin Diseases, Parasitic

Low-level laser effect on mandibular distraction osteogenesis. PURPOSE: The purpose of this study was to determine whether low-level laser (LLL) application during distraction osteogenesis could accelerate bone regeneration and decrease the length of the consolidation phase and thereby reduce potential patient morbidity. MATERIALS AND METHODS: Nine adult female New Zealand white rabbits underwent bilateral mandibular corticotomies and placement of unidirectional distraction devices (KLS-Martin LP, Jacksonville, FL). Each rabbit served as its own internal control. After a latency of 1 day, distraction progressed bilaterally at 1 mm per day for 10 days. Immediately after each device activation, the experimental side, chosen randomly, was treated with real LLL (Laser Medical Systems, Hedehusene, Denmark) of 6.0 J x 6 transmucosal sites in the area of the distraction gap. Radiographs were taken presurgically, immediately postsurgically, and weekly until sacrifice, and the bone was analyzed using a semiquantitative 4-point scale (Bone Healing Score [BHS]). Three animals each were sacrificed at 2, 4, and 6 weeks postdistraction, and each hemimandible was prepared for histologic examination in a blinded fashion. RESULTS: Ten millimeters of distraction was achieved in each rabbit bilaterally. Radiographically, the BHS was higher for the LLL-treated group at all time periods. Histologically, the area of new bone trabeculation and ossification was more advanced for the LLL-treated group, with less intervening fibrovascular intermediate zone in the bony regenerate, at all time periods. The formation of a complete inferior border occurred sooner in the treatment group than in the controls. CONCLUSIONS: LLL accelerates the process of bone regeneration during the consolidation phase after distraction osteogenesis. The adjunctive use of LLL

may allow a shortened period of consolidation and therefore permit earlier device removal, with the avoidance of morbidity associated with prolonged device retention. Animals;Bone Regeneration;Female;Low-Level Light Therapy;Mandible;Mandibular Advancement;Osteogenesis, Distraction;Rabbits;Random Allocation;Statistics, Nonparametric;Time Factors;Wound Healing

[Individual prognosis and identification of patient reactions on laser therapy course according to the Luscher's test]. Adolescent;Adult;Aged;Child;Color Perception Tests;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prognosis;Psychological Techniques

Treatment modalities for allergic reactions in pigmented tattoos. Decorative tattoos have become very popular. As a result, a higher number of hypersensitivity reactions are seen, caused by the mostly undeclared tattoo dyes. If local and intralesional therapy with corticosteroids is not effective, total excision was formerly considered the best approach. Selective laser therapy offers an alternative approach for removing the offending pigment. Case reports are used to illustrate the individual treatment options for removal of tattoos. Adrenal Cortex Hormones;Coloring Agents;Dermatologic Agents Adrenal Cortex Hormones;Adult;Coloring Agents;Dermatologic Agents;Female;Humans;Hypersensitivity;Low-Level Light Therapy;Male;Practice Guidelines as Topic;Practice Patterns, Physicians';Tattooing

Acne and PDT: new techniques with lasers and light sources. Acne vulgaris is one of the most common dermatologic disorders encountered in everyday practice. Treatment options for this often psychologically scarring disease are numerous and, for many individuals, provide relief from the disorder. However, factors such as antibiotic resistance and slow onset of action from many topical therapies have led researchers to seek out alternative therapies, especially for those suffering from moderate to severe inflammatory acne vulgaris. Lasers and light sources are finding increased usage in the treatment of inflammatory acne vulgaris. Light sources including blue lights and intense pulsed lights are becoming regular additions to routine medical management to enhance the therapeutic response. Finally, photodynamic therapy may change many of the acne vulgaris paradigms, as its place is being defined in the treatment of moderate to severe inflammatory acne vulgaris. More and more clinical trials are showing the effectiveness of 5-aminolevulinic acid and photodynamic therapy in the treatment of moderate to severe inflammatory acne vulgaris. Photosensitizing Agents;Aminolevulinic Acid;Indocyanine Green Acne Vulgaris;Aminolevulinic Acid;Humans;Indocyanine Green;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Phototherapy

Effect of low intensity laser interaction with human skin fibroblast cells using fiber-optic nano-probes. Over the past forty years, many efforts have been devoted to study low power laser light interactions with biological systems. Some of the investigations were performed in-vitro, on bulk cell populations. Our present work was undertaken to apply specially engineered fiber-optic based nano-probes for the precise delivery of laser light on to a single cell and to observe production of low power laser light induced reactive oxygen species (ROS). A normal human skin fibroblast (NHF) cell line was utilized in this investigation and the cells were irradiated under two different schemes of exposure: (1) an entire NHF cell population within a Petri dish using a fan beam methodology, and (2) through the precise delivery of laser energy on to a single NHF cell using fiber-optic nano-probe. Photobiostimulative studies were conducted through variation of laser intensity, exposure time, and the energy dose of exposure. Laser irradiation induced enhancement in the rate of cell proliferation was observed to be dependent on laser exposure parameters and the method of laser delivery. The total energy dose (fluence) had a greater influence on the enhancement in the rate of cellular proliferation than compared to laser intensity. The enhancement in the growth rate was observed to have a finite life-time of several days after the initial laser exposure. Fluorescent life-time imaging of ROS was

performed during the nano-based single cell exposure method. The kinetics of ROS generation was found to depend strongly on the laser fluence and not on the laser intensity. Reactive Oxygen Species Cell Line;Cell Proliferation;Fiber Optic Technology;Fibroblasts;Humans;Low-Level Light Therapy;Nanoparticles;Nanotechnology;Optical Fibers;Reactive Oxygen Species;Skin
New developments and technologies in dermatology. Dermatology;Humans;Low-Level Light Therapy;Skin Diseases
Pyogenic granuloma: satellitosis after carbon dioxide laser vaporization resolved with an intense pulsed light system. Adolescent;Female;Granuloma, Pyogenic;Humans;Laser Therapy;Low-Level Light Therapy;Recurrence;Skin Diseases
Clearance of multiple venous lakes with an 800-nm diode laser: a novel approach. Aged;Cheek;Dilatation, Pathologic;Female;Humans;Lip;Low-Level Light Therapy;Male;Middle Aged;Venules
Radiofrequency and 585-nm pulsed dye laser treatment of striae distensae: a report of 37 Asian patients. BACKGROUND: Various lasers have recently been reported as effective treatment modalities for striae distensae, but pigmentary alterations are a major concern to the darker skin type. The Thermage (Therma Cool TC; Thermage Inc, Hayward, CA) is a radiofrequency device for the lifting of face and neck, and there is no report of using it for striae distensae. OBJECTIVE: The purpose was to evaluate the effectiveness of the Thermage in combination with pulsed dye laser. MATERIALS AND METHODS: Thirty-seven patients with abdominal striae distensae were treated with the Thermage and 585-nm pulsed dye laser in the first session at baseline. An additional two sessions of pulsed dye laser were performed at Weeks 4 and 8. Thermage was used at fluences of 53 to 97 J/cm2 and pulsed dye laser at fluences of 3.0 J/cm2 with 10-mm spot. Skin biopsies were taken of nine patients. RESULTS: In the subjective assessment, 89.2% of the patients showed "good and very good" to overall improvement, and 59.4% were graded as "good and very good" in elasticity. All of the nine specimens showed an increase in the amount of collagen fibers, and increased elastic fibers were found in six specimens. CONCLUSION: The Thermage and pulsed dye laser appear to be an effective treatment for striae distansae. Adult;Asian People;Diathermy;Elasticity;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases;Treatment Outcome
Stimulatory effects of hydroxyl radical generation by Ga-Al-As laser irradiation on mineralization ability of human dental pulp cells. The present study was conducted to investigate the effects of Ga-Al-As laser irradiation on the mineralization ability of human dental pulp (HDP) cells. HDP cells in vitro were irradiated once with a Ga-AL-As laser at 0.5 W for 500 s and at 1.0 W for 500 s in order to investigate free radicals as one mechanism for transmission of laser photochemical energy to cells. Production of the hydroxyl radical (*OH) was measured using the ESR spin-trapping method and was found to be increased by laser irradiation. The DMPO-OH was not detected in the presence of dimethyl sulfoxide (DMSO), a *OH scavenger. The formation of calcification nodule was also investigated by von Kossa staining. The number of calcified nodules was increased by 1.0 W-laser irradiation. Alkaline phosphatase (ALP) activity was higher in the 1.0 W-laser irradiation group. Expression of mRNAs for heat shock protein 27, bone morphogenetic proteins (BMPs) and ALP were greater in the 1.0 W-laser irradiation group. Expression of BMPs in the conditioned medium was also higher in the 1.0 W-laser irradiation group. In particular, DMSO decreased the number of calcified nodule produced by 1.0 W-laser irradiation. These results supposed that the mineralization of HDP cells is stimulated by laser irradiation, and that *OH generated by laser irradiation is a trigger for promotion of HDP cell mineralization. Arsenates;BMP2 protein, human;BMP4 protein, human;Bone Morphogenetic Protein 2;Bone Morphogenetic Protein 4;Bone Morphogenetic Proteins;HSP27 Heat-Shock Proteins;HSPB1 protein, human;Heat-Shock Proteins;Molecular Chaperones;Neoplasm Proteins;RNA, Messenger;Transforming Growth Factor beta;Hydroxyl

Radical;Gallium;Aluminum;Alkaline Phosphatase;arsenic acid Alkaline Phosphatase;Aluminum;Arsenates;Bone Morphogenetic Protein 2;Bone Morphogenetic Protein 4;Bone Morphogenetic Proteins;Cells, Cultured;Dental Pulp;Dental Pulp Calcification;Dose-Response Relationship, Radiation;Electron Spin Resonance Spectroscopy;Gallium;HSP27 Heat-Shock Proteins;Heat-Shock Proteins;Humans;Hydroxyl Radical;Lasers;Low-Level Light Therapy;Molecular Chaperones;Neoplasm Proteins;RNA, Messenger;Reverse Transcriptase Polymerase Chain Reaction;Spin Trapping;Time Factors;Tooth Calcification;Transforming Growth Factor beta
[Effects of physical factors on morphofunctional condition of cell cultures]. Animals;Balneology;Cell Culture Techniques;Cells, Cultured;Humans;Low-Level Light Therapy;Magnetics
Consensus agreement on the design and conduct of clinical studies with low-level laser therapy and light therapy for musculoskeletal pain and disorders. Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Research Design;Review Literature as Topic
Standards for the design and conduct of systematic reviews with low-level laser therapy for musculoskeletal pain and disorders. Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Research Design;Review Literature as Topic
Comparative study using 685-nm and 830-nm lasers in the tissue repair of tenotomized tendons in the mouse. OBJECTIVE: The objective of this study was to evaluate the effects of 685- and 830-nm laser irradiations, at different fluences on the healing process of Achilles tendon (Tendon calcaneo) of mice after tenotomy. BACKGROUND DATA: Some authors have shown that low-level laser therapy (LLLT) is able to accelerate the healing process of tendinuos tissue after an injury, increasing fibroblast cell proliferation and collagen synthesis. However, the mechanism by which LLLT acts on healing process is not fully understood. METHODS: Forty-eight male mice were divided into six experimental groups: group A, tenomized animals, treated with 685 nm laser, at the dosage of 3 J/cm(2); group B, tenomized animals, treated with 685-nm laser, at the dosage of 10 J/cm(2); group C, tenomized animals, treated with 830-nm laser, at dosage of 3 J/cm(2); group D, tenomized animals, treated with 830-nm laser, at the dosage of 10 J/cm(2); group E, injured control (placebo treatment); and group F, non-injured standard control. Animals were killed on day 13 post-tenotomy, and their tendons were surgically removed for a quantitative analysis using polarization microscopy, with the purpose of measuring collagen fibers organization through the birefringence (optical retardation [OR]). RESULTS: All treated groups showed higher values of OR when compared to injured control group. The best organization and aggregation of the collagen bundles were shown by the animals of group A (685 nm, 3 J/cm(2)), followed by the animals of group C and B, and finally, the animals of group D. CONCLUSION: All wavelengths and fluences used in this study were efficient at accelerating the healing process of Achilles tendon post-tenotomy, particularly after the 685-nm laser irradiation, at 3 J/cm(2). It suggests the existence of wavelength tissue specificity and dose dependency. Further studies are required to investigate the physiological mechanisms responsible for the effects of laser on tendinuos repair. Achilles Tendon;Animals;Low-Level Light Therapy;Male;Mice;Wound Healing
Comparative study of how low-level laser therapy and low-intensity pulsed ultrasound affect bone repair in rats. OBJECTIVE: This study aimed to compare the consequences of low-level laser therapy (LLLT) and low-intensity pulsed ultrasound (LIPUS) on bone repair. BACKGROUND DATA: Many studies have assessed the effects of LLLT and LIPUS on bone repair, but a comparison of them is rare. METHODS: Male Wistar rats (n = 48) with tibial bone osteotomy were used. One group had the osteotomized limb treated with LLLT (GaAlAs laser, 780 nm, 30 mW, 112.5 J/cm(2)) and the second group with LIPUS (1.5 MHz, 30 mW/cm(2)), both for 12 sessions (five times per week); a third group was the control. After 20 days, rats were sacrificed and had their tibias submitted to a bending test or

histomorphometric analysis. RESULTS: In the bending test, maximum load at failure of LLLT group was significantly higher ($p < 0.05$). Bone histomorphometry revealed a significant increase in osteoblast number and surface, and osteoid volume in the LLLT group, and a significant increase in eroded and osteoclast surfaces in the LIPUS group. CONCLUSION: LIPUS enhanced bone repair by promoting bone resorption in the osteotomy area, while LLLT accelerated this process through bone formation. Animals;Fracture Healing;Fractures, Bone;Low-Level Light Therapy;Male;Osteotomy;Rats;Rats, Wistar;Tibia;Ultrasonic Therapy

Effect of multiple exposures of low-level laser therapy on the cellular responses of wounded human skin fibroblasts. OBJECTIVE: This study aimed to establish the behavior of wounded human skin fibroblasts (HSF) after heliumneon (HeNe) (632.8 nm) laser irradiation using one, two, or three exposures of different doses, namely, 2.5, 5.0, or 16.0 J/cm(2) on each day for 2 consecutive days. BACKGROUND DATA: Low-level laser therapy (LLLT) is a form of phototherapy used to promote wound healing in different clinical conditions. LLLT at than adequate wavelength, intensity, and dose can accelerate tissue repair. However, there is still conflicting information about the effect of multiple irradiations on the cellular responses of wounded cells. METHODS: Cellular responses to HeNe laser irradiation were evaluated by measuring changes in cell morphology, cell viability, cell proliferation, and damage caused by multiple irradiations. RESULTS: A single dose of 5.0 J/cm(2), and two or three doses of 2.5 J/cm(2) had a stimulatory or positive effect on wounded fibroblasts with an increase in cell migration and cell proliferation while maintaining cell viability, but without causing additional stress or damage to the cells. Multiple exposures at higher doses (16 J/cm(2)) caused additional stress, which reduces cell migration, cell viability, and ATP activity, and inhibits cell proliferation. CONCLUSION: The results show that the correct energy density or fluence (J/cm(2)) and number of exposures can stimulate cellular responses of wounded fibroblasts and promote cell migration and cell proliferation by stimulating mitochondrial activity and maintaining viability without causing additional stress or damage to the wounded cells. Results indicate that the cumulative effect of lower doses (2.5 or 5 J/cm(2)) determines the stimulatory effect, while multiple exposures at higher doses (16 J/cm(2)) result in an inhibitory effect with more damage. Helium;Neon Cells, Cultured;Dose-Response Relationship, Radiation;Fibroblasts;Helium;Humans;Low-Level Light Therapy;Neon;Skin;Wound Healing

Harnessing energy. Acute Disease;Chronic Disease;Humans;Low-Level Light Therapy;Pain;Pain Measurement

An investigation into the depth of penetration of low level laser therapy through the equine tendon in vivo. Low level laser therapy (LLLT) is frequently used in the treatment of wounds, soft tissue injury and in pain management. The exact penetration depth of LLLT in human tissue remains unspecified. Similar uncertainty regarding penetration depth arises in treating animals. This study was designed to test the hypothesis that transmission of LLLT in horses is increased by clipping the hair and/or by cleaning the area to be treated with alcohol, but is unaffected by coat colour. A LLLT probe (810 nm, 500 mW) was applied to the medial aspect of the superficial flexor tendon of seventeen equine forelimbs in vivo. A light sensor was applied to the lateral aspect, directly opposite the laser probe to measure the amount of light transmitted. Light transmission was not affected by individual horse, coat colour or leg. However, it was associated with leg condition ($F = 4.42$, $p = 0.0032$). Tendons clipped dry and clipped and cleaned with alcohol, were both associated with greater transmission of light than the unprepared state. Use of alcohol without clipping was not associated with an increase in light transmission. These results suggest that, when applying laser to a subcutaneous structure in the horse, the area should be clipped and cleaned beforehand.

[Laser therapy for tattoos]. Tattoos are produced by bringing colorants of various compositions into the skin. The ingredients of these colorants are not declared and are not subjected to

pharmacological and toxicological tests. Ultrashort and high intensity laser pulses are used to remove tattoos. The laser beam breaks up the pigments embedded in the skin so that they can be transported away from the site. Clinically, the pigment becomes less intense or completely disappears. The success of the laser treatment essentially depends on the pigments used in the tattoo and on how deeply the pigments are embedded in the skin. The laser treatment is slightly painful and has a low rate of permanent side effects. Coloring Agents Coloring Agents;Humans;Laser Therapy;Low-Level Light Therapy;Lymph Nodes;Retreatment;Tattooing;Treatment Outcome

Combination therapies in oculofacial rejuvenation. The oculo-facial surgeon's quest for non-invasive procedures is a response to increasing patient demands for enhanced results without any downtime. Technology has obliged us with multiple injectable and light therapeutic modalities that tighten skin, relax and fill in wrinkles, and improve skin dyspigmentation and texture. When these techniques are combined, the results are superior to the use of individual therapies alone. The foundation for combination therapies are: botulinum toxin, filling agents, chemical peels, intense pulsed light, non-ablative and ablative lasers. Neuromuscular Agents;Hyaluronic Acid;Botulinum Toxins, Type A;Restylane Blepharoplasty;Botulinum Toxins, Type A;Chemexfoliation;Combined Modality Therapy;Cosmetic Techniques;Humans;Hyaluronic Acid;Low-Level Light Therapy;Neuromuscular Agents;Patient Selection;Rejuvenation;Rhytidoplasty;Skin Aging

Bone necrosis of the jaws associated with bisphosphonate treatment: a report of twenty-nine cases. Bone necrosis of the jaws is often related to head and neck radiotherapy, to surgical procedures at maxillary or mandibular level but also to various local and systemic factors such as haematological diseases, haemoglobinopathies and systemic lupus eritematosus; its pathogenesis maybe associated with defects of vascularization. Bisphosphonate are synthetic analogues of pyrophosphate used for the treatment of hypercalcemia in patients with malignancies and bone metastasis and for the treatment of many other disorders such as metabolic bone diseases, Paget's disease, and osteoporosis; their pharmacological activity is related to the inhibition of the osteoclastic function which leads to resorption and reduction of bone vascularization. Since the end of 2003 Bisphosphonate-associated Osteonecrosis (BON) has become an increasing problem and the test of that is the increase of the relative published case report and case series. Here we report 29 cases of bone necrosis of the jaws in patients treated with pamidronate (Aredia), zoledronate (Zometa) and alendronate: 15 underwent surgical procedures and 14 occurred spontaneously. Among these patients (21 females, 8 males; mean age between 45 and 83 years); 14 were treated for bone metastasis, 12 for multiple myeloma and 3 for osteoporosis. Bone necrosis involved only maxilla in 7 patients, only mandible in 20 patients and both in 2 patients. Six patients had multiple osteonecrotic lesions, 3 contemporary lesions and 3 non contemporary. In these patients we performed 3 kinds of therapy, associated or not: medical therapy (with antibiotic drugs, antimycotics and antiseptic mouthwashes), surgical therapy with curettage or sequestrectomy and Nd:YAG laser biostimulation. Anti-Bacterial Agents;Antifungal Agents;Bone Density Conservation Agents;Diphosphonates;Imidazoles;Mouthwashes;Zoledronic Acid;Hydrogen Peroxide;Pamidronate;Chlorhexidine;Alendronate Aged;Aged, 80 and over;Alendronate;Anti-Bacterial Agents;Antifungal Agents;Bone Density Conservation Agents;Bone Neoplasms;Chlorhexidine;Curettage;Diphosphonates;Female;Humans;Hydrogen Peroxide;Imidazoles;Jaw Diseases;Male;Mandibular Diseases;Maxillary Diseases;Middle Aged;Mouthwashes;Multiple Myeloma;Osteonecrosis;Osteoporosis;Pamidronate;Radiography;Time Factors;Zoledronic Acid

[Structure peculiarities of muscle regenerates and state of thymus under He-Ne laser therapy in different periods after muscle trauma]. We studied the gastrocnemius muscle regeneration and the reactive changes in thymus of rats under different regimens of He-Ne laser therapy of both

operated legs (632.8 nm; 2.5-3.0 mW/cm(2)). Laser radiation (10 exposures by 3 min within 1-15 days after muscle trauma, 4.5-5.4 J/cm(2) total dose per each leg) stimulated inflammatory reaction, muscle healing and favored preservation of muscle tissue in regenerates. The changes in thymus mass, its histological structure, size of cortex and thymocite mitotic index pointed to the increase of the functional load on thymus and delay of its recovery. The same dose of laser therapy of muscles within 16-30 days after trauma led to the increase of muscle tissue sclerotization in regenerates. The reactive changes in thymus were less pronounced. Threefold decrease of laser dose (10 exposures by 1 min for 1-15 days, 1.5-1.8 J/cm(2)) suppressed inflammatory reaction, impaired the muscle regeneration. The increase of functional activity in thymus was not observed.
Animals;Dose-Response Relationship, Radiation;Female;Low-Level Light Therapy;Mitosis;Muscle, Skeletal;Organ Size;Rats;Thymus Gland;Time Factors;Wound Healing;Wounds and Injuries

Lasers, lights and related technologies: a review of recent journal highlights.
Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

An in-vivo experimental evaluation of He-Ne laser photostimulation in healing Achilles tendons.
There is no method of treatment that has been proven to accelerate the rate of tendon healing or to improve the quality of the regenerating tendon. Low level laser photostimulation has gained a considerable attention for enhancing tissue repair in a wide spectrum of applications. However, there is controversy regarding the effectiveness of laser photostimulation for improvement of the healing process of surgically repaired tendons. Accordingly, the present study was conducted to evaluate the role of helium-neon (He-Ne) laser photostimulation on the process of healing of surgically repaired Achilles tendons. Thirty unilateral Achilles tendons of 30 Raex rabbits were transected and immediately repaired. Operated Achilles tendons were randomly divided into two equal groups. Tendons at group A were subjected to He-Ne laser (632.8 nm) photostimulation, while tendons at group B served as a control group. Two weeks later, the repaired Achilles tendons were histopathologically and biomechanically evaluated. The histopathological findings suggest the favorable qualitative pattern of the newly synthesized collagen of the regenerating tendons after He-Ne laser photostimulation. The biomechanical results support the same favorable findings from the functional point of view as denoted by the better biomechanical properties of the regenerating tendons after He-Ne laser photostimulation with statistical significance ($p \leq 0.01$) at most of the biomechanical parameters. He-Ne laser photostimulation reported a great value after surgical repair of ruptured and injured tendons for a better functional outcome. It could be applied safely and effectively in humans, especially with respect to the proposed long-term clinical outcome.
Helium;Neon Achilles Tendon;Animals;Area Under Curve;Biomechanical Phenomena;Helium;Low-Level Light Therapy;Microscopy, Electron, Scanning;Neon;Rabbits;Wound Healing

Optimal low-energy laser irradiation causes temporal G2/M arrest on rat calvarial osteoblasts.
Low-energy laser irradiation (LELI) accelerates wound healing and is thought to accelerate bone formation. However, the mechanism of laser healing is not clear. To clarify the biological mechanism of LELI healing, we investigated the effects of LELI on rat osteoblasts in vitro. Osteoblastic cells from 3-day-old Wistar rat calvaria were irradiated using a low-energy gallium-aluminum-arsenide (Ga-Al-As) diode laser. Bone formation, osteoblast differentiation, and cell proliferation were evaluated by von Kossa staining, reverse-transcription polymerase chain reaction, alkaline phosphatase (ALP) staining, 5-bromo-2'-deoxyuridine (BrdU) uptake, and fluorescence-activated cell sorter (FACS) analysis. At 21 days after LELI, the greatest bone formation was observed with irradiation energy of 3.75 J/cm2 and the first week after seeding. LELI (3.75 J/cm2) induced an increased number of cells at day 3. LELI-stimulated differentiation in osteoblastic cells was demonstrated by the increases of Runx2 expression and ALP-positive colonies. By contrast, at 1 day after laser irradiation, the number

of cells in the irradiation group was significantly lower than that in the control group. BrdU uptake indicated lower proliferation 12 and 24 hours after irradiation compared with the control. Furthermore, FACS data demonstrated a higher proportion of cells in the G2/M phase of the cell cycle 12 hours after irradiation compared with the control. G2/M arrest was confirmed by the appearance of G2/M arrest marker 14-3-3-sigma or phospho-p53. These results demonstrate that LELI induces not only acceleration of bone formation but also initial G2/M arrest, which may cause wound healing like tissue repair. Core Binding Factor Alpha 1 Subunit;Runx2 protein, rat;Alkaline Phosphatase;Bromodeoxyuridine Alkaline Phosphatase;Animals;Animals, Newborn;Bromodeoxyuridine;Cell Proliferation;Cells, Cultured;Core Binding Factor Alpha 1 Subunit;Flow Cytometry;G2 Phase;Lasers;Mitosis;Osteoblasts;Osteogenesis;Rats;Skull

Effect of low level helium-neon (He-Ne) laser therapy in the prevention & treatment of radiation induced mucositis in head & neck cancer patients. BACKGROUND & OBJECTIVES: Oral mucositis is a common debilitating complication of radiotherapy occurring in about 60 per cent of cancer patients. Considerable buccal toxicity of radiotherapy or chemotherapy in cancer patients to become discouraged and can affect their quality of life. In addition, such toxicity can alter the treatment plan. At present, there is no clinically appropriate prophylaxis efficacious antidote for mucositis. The low level laser (LEL) appears to be a simple, non-traumatic technique for the prevention and treatment of radiation induced mucositis. Therefore the present study was carried out to find out the effect of low-level helium-neon (He-Ne) laser in the prevention and treatment of radiation induced mucositis in head and neck cancer patients. METHODS: The patients with carcinoma of oral cavity with stages II-IV a being uniformly treated with curative total tumour dose of 66 Gy in 33 fractions over 6 wk were selected for the study. The patients were divided based on computer generated randamosization into laser (study group) and control groups with 25 patients in each group. Both study and control groups were comparable in terms of site of the lesion, stage of the cancer and histology. The study group patients were treated with He-Ne laser (wavelength 632.8 nm and output of 10mW) and control group patients were given oral analgesics, local application of anaesthetics, 0.9 per cent saline and povidine wash during the course of radiotherapy. RESULTS: All patients tolerated the laser treatment without any adverse effect or reactions. The result showed a significant difference in pain and mucositis ($P<0.001$) between the two groups. At the end of radiotherapy (after 6 wk) mean pain sure and mucositis grade were significantly lower ($P<0.001$) in the study group compared to control. INTERPRETATION & CONCLUSION: The low-level He-Ne laser therapy during the radiotherapy treatment was found to be effective in preventing and treating the mucositis in head and neck cancer patients. Further studies need to be done on a larger sample to find the mechanism. Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Prospective Studies;Radiation Injuries;Stomatitis

Low level laser therapy (LLLT): a new paradigm in the management of cancer therapy-induced mucositis ? Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiation Injuries;Stomatitis

Effectiveness of dexamethasone and low-power laser in minimizing oedema after third molar surgery: a clinical trial. Postoperative oedema is common following removal of impacted lower third molars. Several types of drug therapy (corticosteroids, non-steroidal anti-inflammatory drugs, enzymes) have been tried. The aim of this study was to compare the effectiveness of low-power laser (LPL) and dexamethasone after surgical removal of impacted lower third molars under local anaesthesia (2% lidocaine/epinephrine). MATERIAL AND METHODS: There were 120 healthy patients divided into four groups of 30 each. Group 1 received LPL irradiation immediately after operation (energy output 4 J/cm2 with constant power density of 50 mW, wavelength 637 nm); group 2 also received i.m. injection of 4 mg dexamethasone (Dexason) into the internal pterygoid muscle; group 3

received LPL irradiation supplemented by systemic dexamethasone (Dexason), 4 mg i.m. in the deltoid region, followed by 4 mg of dexamethasone intraorally 6h postoperatively; and the fourth (control) group received only the usual postoperative recommendations (cold packs, soft diet, etc.). RESULTS: LPL irradiation with local use of dexamethasone (group 2) resulted in a statistically significant reduction of postoperative oedema in comparison to the other groups. No adverse effects of the procedure or medication were observed. CONCLUSION: LPL irradiation after lower third molar surgery can be recommended to minimize swelling. The effect is enhanced by simultaneous local intramuscular use of dexamethasone. Anti-Inflammatory Agents;Dexamethasone Administration, Oral;Anti-Inflammatory Agents;Combined Modality Therapy;Dexamethasone;Edema;Humans;Injections, Intramuscular;Low-Level Light Therapy;Mandible;Molar, Third;Tooth Extraction;Tooth, Impacted

[Personalized laser therapy of cardiological patients as a pilot design of the concept of personalized physiotherapy]. Humans;Hypertension;Low-Level Light Therapy;Myocardial Ischemia;Personal Health Services;Pilot Projects

[Low-intensity laser effects on local immunity of female reproductive system affected with chlamidia infection]. Low-intensity laser impact on the main effector functions of the cervical secretion neutrophils in females suffering from Chlamidia infection has been studied. Dysfunction of neutrophil granulocytes of the cervical secretion was revealed. This manifested in the decreased number of phagocytes and lower rates of phagocytosis. The study of cervical secretion neutrophils has found that the content of active intracellular forms of oxygen was decreased in patients compared to healthy subjects. Low-intensity laser stimulated not only phagocytosis but also intracellular generation of active oxygen forms. Thus, low-intensity laser eliminates dysfunction of cervical secretion neutrophils. Reactive Oxygen Species Cervix Mucus;Chlamydia Infections;Chlamydia trachomatis;Combined Modality Therapy;Female;Humans;Immunity;Low-Level Light Therapy;Neutrophils;Phagocytosis;Reactive Oxygen Species;Uterine Cervicitis

[PDT photodynamic therapy in orthopedic inflammatory conditions?]. The infections in orthopedic surgery and traumatology represents important medical problem. The results of treatment of motor-organs infections in high degree were improved by the introduction of antisepsis and asepsis in XIX century and the antibiotics' discovery in the beginning of XX century. However, widespread usage of antibiotics leaded to the rise of refractory tribes of bacteria on their activity, which caused higher percentage of fails in the therapy. Also the rapid civilization development, which flown on arising of a new invasive methods of operative trauma protection and stabilizations of fractures in motor-organs area increased the number of infectious complications during treatment. These facts gave a reason to look for a more effective therapeutic methods. It seems that photodynamic therapy gives us the new possibilities of infectious treatment, which avails oneself activity of therapeutic light laser with proper wave length on the human tissue with photosensitizer included. Indeed there are known until now splendid results of PDT in neoplasma treatment, however it seems, based on experimental investigations and publications in medical literature, that this method can be a chance of effectual and non-invasive treatment of the soft tissues and bones inflammations. Photosensitizing Agents;Porphyrins Animals;Arthritis;Bacterial Infections;Humans;Low-Level Light Therapy;Orthopedics;Photochemotherapy;Photosensitizing Agents;Porphyrins

Aminolevulinic acid photodynamic therapy for actinic keratoses/actinic cheilitis/acne: vascular lasers. The combination of newer laser and light sources, the long-pulsed pulsed dye laser (LP PDL) and intense pulsed light, with topical aminolevulinic acid photodynamic therapy (PDT) has achieved enhanced efficacy and rapid treatment and recovery, while diminishing unwanted side effects. In particular, LP PDL PDT has been shown to be safe and effective in the treatment of actinic keratoses,

actinic cheilitis, photodamage, and acne vulgaris with minimal discomfort, rapid treatment and recovery, and excellent posttreatment cosmesis. Photosensitizing Agents;Aminolevulinic Acid Acne Vulgaris;Aminolevulinic Acid;Cheilitis;Humans;Keratosis;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Ultraviolet Rays
Physiotherapy applied to the horse: a review. Animals;Electric Stimulation Therapy;Exercise Therapy;Horse Diseases;Horses;Hydrotherapy;Low-Level Light Therapy;Massage;Physical Therapy Modalities;Treatment Outcome;Ultrasonography
Facial rejuvenation and light: our personal experience. The treatment of ageing skin remains a very hot topic, and many systems have been reported as having varying degrees of success. Nonablative lasers were developed to avoid the problematic and uncomfortable sequelae following laser ablative resurfacing, and while there was no downtime, there was also poor patient satisfaction. The same was true of the intense pulsed light systems. The use of different modalities in various combinations was found to offer much better results, however, such as a 595-nm pulsed dye laser followed by a 1,450-nm diode laser, and so on, all used at subablative thresholds. The recent entry of blue and infrared tunable plasma light and light-emitting diodes into the skin rejuvenation arena has attracted a great deal of attention. The authors suggest that no single modality can accomplish all the complex events required for effective skin rejuvenation, suggest that combination phototherapy is the best approach combined with an adjunctive epidermal care regimen, and demonstrate their development of this methodology. Aging;Cosmetic Techniques;Face;Humans;Low-Level Light Therapy;Phototherapy;Rejuvenation;Skin Aging;Wound Healing
[Long-term results of conservative treatment of patients with obliterating atherosclerosis of the lower extremity arteries]. An analysis of long-term results of treatment of 56 patients has shown that a complex program including the intravascular photohemotherapy and a course of a modified method of plasmapheresis is the most effective method in such cases. Adult;Aged;Arteriosclerosis Obliterans;Follow-Up Studies;Humans;Leg;Low-Level Light Therapy;Middle Aged;Photochemotherapy;Plasmapheresis;Time Factors;Treatment Outcome
[Intravascular laser irradiation of blood in complex treatment of obliterating atherosclerosis of the lower extremity vessels in elderly and senile patients]. The authors describe comparative results of treatment of 60 elderly and senile patients with obliterating atherosclerosis of the lower extremity vessels. In 50 patients treatment with traditional medicines was combined with intravascular laser irradiation of blood, 10 patients were treated with traditional medicines only. The data obtained by questionnaires concerning the patients' state, expert judgment of doctors in charge of the profile department, indices of instrumental examinations of regional hemodynamics (rheovasography of the lower extremity vessels), data of laboratory investigations of morphofunctional state of erythrocytes and hemorheology showed that laser irradiation of blood gave better results of treatment. Its therapeutic effect persisted during 3 months in most patients. Aged;Aged, 80 and over;Angioscopy;Arteriosclerosis Obliterans;Erythrocytes;Female;Follow-Up Studies;Humans;Leg;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Photomicrography;Plethysmography, Impedance;Treatment Outcome
Irradiation at 634 nm releases nitric oxide from human monocytes. Previous studies have shown that irradiation at 634 nm decreases the release of extracellular reactive oxygen species (ROS) without affecting viability in human monocytes. Here, we examined the effect of irradiation at 634 nm on the release of nitric oxide (NO), activation of inducible nitric oxide synthase (iNOS) and endothelial NOS (eNOS), and release of intracellular ROS. Chemiluminescence assays were used to measure NO release, intracellular ROS, and adenosine triphosphate levels (to assess cell viability). Levels of iNOS and eNOS mRNA were analyzed using PCR. Irradiation resulted in elevated levels of NO but had no effect on iNOS or eNOS. Irradiation also caused a decrease in levels of intracellular ROS

and had no effect on cell viability. Our studies indicate that irradiation at 634 nm releases NO, possibly from a preformed store, and reduces the production of intracellular ROS without affecting cell viability. Irradiation at 634 nm may have a wide range of clinical applications, including a reduction in oxidative stress-mediated injury in the vasculature. Reactive Oxygen Species;Nitric Oxide;Adenosine Triphosphate Adenosine Triphosphate;Humans;Low-Level Light Therapy;Monocytes;Nitric Oxide;Reactive Oxygen Species

An animal study of the effects on p16 and PCNA expression of repeated treatment with high-energy laser and intense pulsed light exposure. BACKGROUND AND OBJECTIVE: Non-ablative skin rejuvenation treatments that involve the use of laser/light sources together with cooling devices have gained much popularity in recent years due to the lack of down time that is associated with them. One important but neglected issue is long-term safety. Does the repeated use of non-ablative skin rejuvenation lead to photoaging? Are we creating another sun-bed phenomenon? Recently, we performed an in vitro study to examine the effect of sub-lethal QS 755 nm lasers on the expression of p16INK4a on melanoma cell lines, and found that sub-lethal laser damage could increase DNA damage, which led to an increase in p16 expression. Our objective was to assess the cutaneous effect of repeated exposure to high-energy lasers and intense pulsed light sources on male Institute of Cancer Research (ICR) mice. STUDY DESIGN/MATERIALS AND METHODS: Twenty-eight male ICR mice were divided into four groups. Other than the control group, all groups received either laser (585 nm pulsed dye laser or 1,320 nm Nd:YAG laser) or intense pulsed light (IPL) treatment. All four groups were anesthetized with a mixture of Hypnorm/Dormicum before treatment. The animals were irradiated twice a week for 6 months. Signs of toxicity such as mortality and weight loss were checked once a week. Skin tumor formation was evidenced by lesions of greater than 1 mm in diameter that persisted for 2 weeks. At the end of the 6 months, the expression of proliferating cell nuclear antigen (PCNA) and p16 in the mouse skin was determined by immunohistochemical staining and immunoblotting using specific monoclonal antibodies for mouse PCNA and p16. The results were expressed as mean +/- standard error of the mean (SEM). Statistical difference was assessed by multiple ANOVA. A P-value of <0.05 was considered to be significant. RESULTS: At the end of the 6 months, none of the animals had developed any signs of toxicity such as mortality or weight lost. There was no evidence of tumor formation. There were significant elevations of p16 and PCNA in all treated groups as compared to the control group (ANOVA $P < 0.05$). This particularly applied to the group that was treated with the 1,320 nm Nd:YAG laser. CONCLUSION: The repeated use of high-energy laser and intense pulsed light source did not cause any toxicity in mice. The changes in p16 and PCNA imply that further studies are necessary to consider the implications of repeated exposure to longer wavelength radiation in human skin. Biomarkers;Proliferating Cell Nuclear Antigen Animals;Biomarkers;Genes, p16;Lasers;Low-Level Light Therapy;Male;Mice;Mice, Inbred ICR;Proliferating Cell Nuclear Antigen;Skin;Time

Effect of laser soldering irradiation on covalent bonds of pure collagen. Laser tissue welding and soldering is being increasingly used in the clinical setting for defined surgical procedures. The exact induced changes responsible for tensile strength are not yet fully investigated. To further improve the strength of the bonding, a better understanding of the laser impact at the subcellular level is necessary. The goal of this study was to analyze whether the effect of laser irradiation on covalent bonding in pure collagen using irradiances typically applied for tissue soldering. Pure rabbit and equine type I collagen were subjected to laser irradiation. In the first part of the study, rabbit and equine collagen were compared using identical laser and irradiation settings. In the second part of the study, equine collagen was irradiated at increasing laser powers. Changes in covalent bonding were studied indirectly using the sodium dodecylsulfate polyacrylamide gel electrophoresis (SDS-PAGE) technique. Tensile strengths of soldered membranes were measured with a calibrated tensile

force gauge. In the first experiment, no differences between the species-specific collagen bands were noted, and no changes in banding were found on SDS-PAGE after laser irradiation. In the second experiment, increasing laser irradiation power showed no effect on collagen banding in SDS-PAGE. Finally, the laser tissue soldering of pure collagen membranes showed virtually no determinable tensile strength. Laser irradiation of pure collagen at typical power settings and exposure times generally used in laser tissue soldering does not induce covalent bonding between collagen molecules. This is true for both rabbit and equine collagen proveniences. Furthermore, soldering of pure collagen membranes without additional cellular components does not achieve the typical tensile strength reported in native, cell-rich tissues. This study is a first step in a better understanding of laser impact at the molecular level and might prove useful in engineering of combined collagen-soldering matrix membranes for special laser soldering applications. Collagen Animals;Collagen;Electrophoresis, Polyacrylamide Gel;Horses;Image Processing, Computer-Assisted;Low-Level Light Therapy;Rabbits;Temperature;Tensile Strength

A comparative SEM study between hand instrument and Er:YAG laser scaling and root planing. Scaling and root planing are one of the most commonly used procedures for the treatment of periodontal diseases. Removal of calculus using conventional hand instruments is incomplete and rather time-consuming. In search for more efficient and less difficult instrumentation, investigators have proposed lasers as alternatives or adjuncts for scaling and root planing. The aim of the present study was to compare the effectiveness of subgingival scaling and root planing with erbium: yttrium, aluminium, garnet (Er:YAG) laser and hand instrumentation in vitro. The mesial and distal surfaces of 15 periodontal loosed extracted teeth were treated randomly either by hand instrumentation or by Er:YAG laser irradiation. After choosing the "very long pulse mode" (pulse duration of about 700 micros), the output energy of 160 mJ with 920-microm beam diameter (RO7 Perio tip, Fidelis, Fotona, Slovenia) and frequency of 12 Hz were selected, both according to the best results of past studies. In addition, air water spray was used during the procedures. The morphology of the root surface was evaluated by three observers with a scanning electron microscopy in magnifications of 50x and 400x. The result of this setting showed that the rate of remained roughness on treated root surfaces in two groups of hand instruments and Er:YAG laser had a meaningful difference: The surface roughness in Er:YAG laser group was more than in hand instruments group. The present study could demonstrate the in vitro capability of the Er:YAG laser for scaling and root planing in periodontitis, although the effectiveness of this setting did not reach that achieved by hand instrumentation. It could be concluded that lower frequency and long pulse duration maybe more suitable for the micro-morphology of root surface after treatment. This theory is going to be tested with the same laser instrument in the next study. Erbium Dental Calculus;Dental Instruments;Dental Scaling;Erbium;Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Planing;Statistics, Nonparametric;Surface Properties

Evaluation of mitochondrial respiratory chain activity in wound healing by low-level laser therapy. Laser therapy is used in many biomedical sciences to promote tissue regeneration. Many studies involving low-level laser therapy have shown that the healing process is enhanced by such therapy. In this work, we evaluated mitochondrial respiratory chain complexes II and IV and succinate dehydrogenase activities in wounds after irradiation with low-level laser. The animals were divided into two groups: group 1, the animals had no local nor systemic treatment and were considered as control wounds; group 2, the wounds were treated immediately after they were made and every day after with a low-level laser (AsGa, wavelength of 904 nm) for 10 days. The results showed that low-level laser therapy improved wound healing. Besides, our results showed that low-level laser therapy significantly increased the activities of complexes II and IV but did not affect succinate dehydrogenase activity. These findings are in accordance to other works, where cytochrome c oxidase (complex IV)

seems to be activated by low-level laser therapy. Besides, we showed, for the first time, that complex II activity was also activated. More studies are being carried out in order to evaluate other mitochondrial enzymes activities after different doses and irradiation time of low-level laser. Electron Transport Complex II;Succinate Dehydrogenase;Electron Transport Complex IV Animals;Electron Transport;Electron Transport Complex II;Electron Transport Complex IV;Low-Level Light Therapy;Male;Mitochondria;Rats;Rats, Wistar;Skin;Succinate Dehydrogenase;Wound Healing

Laser therapy of vascular lesions. Since the first construction of a laser by Maiman in 1960 and the first clinical application of a laser in the therapy of skin lesions by Leon Goldman, laser therapy has become an important therapeutic modality in dermatology. Various lasers can be used for the treatment of different vascular and non-vascular lesions. According to our results, vascular lesions constitute the most important indication for laser therapy in dermatology. Adult;Facial Dermatoses;Female;Hemangioma;Humans;Low-Level Light Therapy;Lymphangioma;Neoplasms, Vascular Tissue;Port-Wine Stain;Severity of Illness Index;Telangiectasis

Topical tacalcitol and 308-nm monochromatic excimer light: a synergistic combination for the treatment of vitiligo. BACKGROUND/PURPOSE: To study and compare the efficacy of combined 308-nm monochromatic excimer light (MEL) therapy with tacalcitol vs. that of MEL 308-nm therapy alone in treatment of vitiligo. METHODS: Thirty-eight patients with vitiligo were enrolled in a single-blind, within patient controlled clinical trial. Symmetrical or nearby lesions were randomly applied with either topical tacalcitol cream or vehicle. Each lesion was treated weekly with the 308-nm MEL, for a total of 12 sessions. Patients were examined at monthly intervals. The mean number of sessions and the cumulative dosage for initial repigmentation were calculated. RESULT: Thirty-five patients were evaluated. Treatment with tacalcitol and MEL resulted in higher percentages for excellent repigmentation (25.7%) compared with vehicle and MEL (5.7%) ($P<0.05$). Percentages for total response were 71.4% and 60%, respectively ($P>0.05$). The mean+/-SEM cumulative dose and number of excimer light exposures for initial repigmentation were, respectively, 3.93+/-0.59 J/cm2 and 4.52+/-0.49 at the tacalcitol side, and, respectively, 4.99+/-0.68 J/cm2 and 5.3+/-0.52 at the vehicle side ($P<0.05$). CONCLUSION: Our results have shown that concurrent topical tacalcitol potentiates the efficacy of the 308-nm MEL in the treatment of vitiligo, and that this combination achieves earlier pigmentation with a lower total dosage. Dermatologic Agents;Dihydroxycholecalciferols;1 alpha,24-dihydroxyvitamin D3 Adolescent;Adult;Aged;Child;Dermatologic Agents;Dihydroxycholecalciferols;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Radiation Dosage;Severity of Illness Index;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo

[Clinical and experimental aspects of the treatment effect of laser irradiation]. The article summarizes literature data and results of the authors' studies on clinical experimental aspects of the treatment effect of laser emission. The literature shows that among different therapeutic effects of laser emission, the most studied are neurotropic, methabolic, immunomodulating, antioxidant, anti-inflammatory as well as its ability to stimulate the regeneration of wounds and bones. The authors stressed on biostimulative effect of laser therapy. Animals;Disease;Humans;Low-Level Light Therapy;Wound Healing

[Effect of magnet-laser therapy on the central nervous system functional state in patients with ischemic stroke]. Twenty three patients aged from 41 to 75, which have had ischemic stroke in the carotid basin (up to 2 years after an acute period of the stroke), have been examined. The course of magneto-laser therapy lasted 15 days. The author carried out neurological examinations, determined the state of psychoemotional activity, cerebral hemodynamics and frequency-amplitude indices of the brain to assess the mechanisms of MLT effect on the CNS functional state in patients being in a rehabilitative period after ischemic stroke. The course of MLT administration improves

cerebral hemodynamics, increases the level of the bioelectrical activity of the brain. We can recommend based on obtained results MLT in the system of rehabilitation of patients which had had ischemic stroke. Adult;Aged;Blood Flow Velocity;Brain Ischemia;Cerebrovascular Circulation;Electroencephalography;Humans;Low-Level Light Therapy;Magnetics;Middle Aged;Stroke;Treatment Outcome;Ultrasonography, Doppler

Modeling severely discordant hematocrits and normal amniotic fluids after incomplete laser therapy in twin-to-twin transfusion syndrome. Our objective was to explain the clinical presentations of sustained arteriovenous anastomotic transfusion of blood after incomplete laser therapy in twin-to-twin transfusion syndrome (TTTS). We extended our mathematical model of TTTS by adding the dynamics of hematocrit, and simulated incomplete laser therapy, first, by leaving one patent opposite arteriovenous anastomosis from the recipient to the donor and, second, by leaving one patent arteriovenous anastomosis from the donor to the recipient. In both simulations we reproduced the clinical observation of severe hematocrit discordance preceding delayed amniotic fluid imbalance. In conclusion, incomplete laser therapy may cause a severe circulatory imbalance between the twins which presents predominantly as discordant hematocrits rather than discordant amniotic fluid volumes as in primary TTTS. These results imply that the anemia-polycythemia sequence is a sensitive mechanism to identify transfusion reversal after complicated laser therapy, confirming the suggested role of middle cerebral artery peak systolic velocity Doppler measurements as a useful method of follow-up. Amniotic Fluid;Arteriovenous Anastomosis;Computer Simulation;Female;Fetofetal Transfusion;Hematocrit;Humans;Low-Level Light Therapy;Models, Biological;Pregnancy

Neodymium:yttrium aluminum garnet laser irradiation with low pulse energy: a potential tool for the treatment of peri-implant disease. Bacterial contamination may seriously compromise successful implant osteointegration in the clinical practice of dental implantology. Several methods for eliminating bacteria from the infected implants have been proposed, but none of them have been shown to be an effective tool in the treatment of peri-implantitis. In the present study, we investigated the efficacy of pulsed neodymium:yttrium aluminum garnet laser irradiation (Nd:YAG) in achieving bacterial ablation while preserving the surface properties of titanium implants. For this purpose, suspensions of Escherichia coli or Actinobacillus (Haemophilus) actinomycetemcomitans were irradiated with different laser parameters, both streaked on titanium implants, and in broth medium. It was found, by light and atomic force microscopy, that Nd:YAG laser, when used with proper working parameters, was able to bring about a consistent microbial ablation of both aerobic and anaerobic species, without damaging the titanium surface. Dental Implants;Neodymium;Yttrium Aggregatibacter actinomycetemcomitans;Dental Implantation, Endosseous;Dental Implants;Escherichia coli;Low-Level Light Therapy;Neodymium;Periodontitis;Surface Properties;Yttrium

[Effect of infrared laser on pituitrin-induced bradycardia in rabbits]. OBJECTIVE: To observe the effect of infrared laser stimulation on Neiguan (PC 6) for bradycardia of rabbits induced by injection of pituitrin. METHODS: 10.6 microm CO(2) infrared laser, 650 nm semiconductor red laser and the compound laser of their aggregation were sent out by a compound laser sanatory instrument to stimulate Neiguan (PC 6) respectively for the purpose of analyzing the differences of the effects exerted by infrared laser and red laser as well as the changes of the effects after their aggregation. RESULTS: After 30 min and 40 min of the injection of pituitrin, the heart rate showed no significant difference between 10.6 microm CO(2) infrared laser group and the normal control group ($P>0.05$). However, the heart rate showed significant difference between the 650 nm semiconductor red laser group and the normal control group ($P<0.05$). After 30 min of the injection of pituitrin, the heart rate of the compound laser group were significantly different to that of the untreated group ($P<0.05$), and

it was not significantly different to that of the normal control group (P>0.05). However, the heart rate of non-acupoint stimulated by the compound laser group showed no significant difference to that of the untreated group (P>0.05), and it was significantly different to that of the normal control group (P<0.05). CONCLUSION: Stimulation on Neiguan with 10.6 microm CO(2) infrared laser can evidently improve the bradycardia induced by injection of pituitrin, while the 650 nm semiconductor red laser has no such function, but they have coordinating effect. The thermal effect produced by CO(2) infrared laser stimulating acupoint is probably beneficial for semiconductor laser penetrating skin as well as the biochemical reactions it carries. The improvement of heart rate produced by the laser stimulation on Neiguan (PC 6) has relative specificity. Pituitary Hormones, Posterior Acupuncture Points;Animals;Bradycardia;Heart Rate;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pituitary Hormones, Posterior;Rabbits;Random Allocation

[Non-ablative laser refractive interventions into the fibrous tunic of the eye]. Humans;Low-Level Light Therapy;Refraction, Ocular;Refractive Errors;Sclera;Treatment Outcome

Long-pulsed dye laser for the treatment of erythromelanosis follicularis faciei: report of two clinical cases. Adult;Cheek;Diagnosis, Differential;Facial Dermatoses;Humans;Low-Level Light Therapy;Male;Melanosis

Photorejuvenation by intense pulsed light with objective measurement of skin color in Japanese patients. BACKGROUND AND OBJECTIVES: This study had two objectives: subjective evaluation of overall skin rejuvenation effects of relatively short-wavelength intense pulsed light (IPL) and objective changes in basic skin tone as measured by a spectrophotometer. STUDY DESIGN/MATERIALS AND METHODS: Twenty-five women selected at random received a series of three IPL treatments. Efficacy was evaluated over a 3-month follow-up period. Concurrently, a spectrophotometer was used to measure "lightness" (L(*)) to quantify the lightening effect changes to pretreatment and posttreatment basic skin tone. RESULTS: Subjective improvement of 50% or more was seen in 18 of 25 patients for pigmentation. One patient showed exacerbation of latent epidermal melasma as a complication. In the spectrophotometric analysis, the mean value of L(*) increased from a baseline value of 60.86 to 63.22, at 3-month follow-up period, with statistical significance. CONCLUSION: IPL skin rejuvenation using relatively shorter wavelengths and pulse widths brought about significant macroscopic and quantitative improvements, especially in the treatment of epidermal pigmentation and improvement of basic skin tone. Adult;Aged;Facial Dermatoses;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Middle Aged;Severity of Illness Index;Skin Pigmentation;Treatment Outcome

Fractional Laser treatment for pigmentation and texture improvement. Fractional laser treatment with the 1,550 nm erbium fiber laser (Fraxel Laser, Reliant Technologies) has bridged the gap between the ablative and nonablative laser modalities used to treat the epidermal and dermal signs of skin aging. By targeting water as its chromophore, the laser induces a dense array of microscopic, columnar thermal zones of tissue injury that do not perforate or impair the function of the epidermis. The significant skin remodeling that ensues can be used to treat, with limited downtime, epidermal pigmentation, melasma, and rhytides, as well as textural abnormalities that include acne-related and surgical scars. Cicatrix;Humans;Low-Level Light Therapy;Melanosis;Pain;Pigmentation Disorders;Skin Aging

Laser treatment in patients with bilateral large drusen: the complications of age-related macular degeneration prevention trial. OBJECTIVE: To evaluate the efficacy and safety of low-intensity laser treatment in the prevention of visual acuity (VA) loss among participants with bilateral large drusen. DESIGN: Multicenter randomized clinical trial. One eye of each participant was assigned to treatment, and the contralateral eye was assigned to observation. PARTICIPANTS: A total of 1052 participants who had > or =10 large (>125 microm) drusen and VA> or =20/40 in each eye enrolled

through 22 clinical centers. INTERVENTION: The initial laser treatment protocol specified 60 barely visible burns applied in a grid pattern within an annulus between 1500 and 2500 mum from the foveal center. At 12 months, eyes assigned to treatment that had sufficient drusen remaining were retreated with 30 burns by targeting drusen within an annulus between 1000 and 2000 mum from the foveal center. MAIN OUTCOME MEASURE: Proportion of eyes at 5 years with loss of > or =3 lines of VA from baseline. Secondary outcome measures included the development of choroidal neovascularization or geographic atrophy (GA), change in contrast threshold, change in critical print size, and incidence of ocular adverse events. RESULTS: At 5 years, 188 (20.5%) treated eyes and 188 (20.5%) observed eyes had VA scores > or = 3 lines worse than at the initial visit (P = 1.00). Cumulative 5-year incidence rates for treated and observed eyes were 13.3% and 13.3% (P = 0.95) for choroidal neovascularization and 7.4% and 7.8% (P = 0.64) for GA, respectively. The contrast threshold doubled in 23.9% of treated eyes and in 20.5% of observed eyes (P = 0.40). The critical print size doubled in 29.6% of treated eyes and in 28.4% of observed eyes (P = 0.70). Seven treated eyes and 14 observed eyes had an adverse event of a > or =6-line loss in VA in the absence of late age-related macular degeneration or cataract. CONCLUSION: As applied in the Complications of Age-Related Macular Degeneration Prevention Trial, low-intensity laser treatment did not demonstrate a clinically significant benefit for vision in eyes of people with bilateral large drusen. Aged;Choroidal Neovascularization;Contrast Sensitivity;Disease Progression;Female;Follow-Up Studies;Humans;Incidence;Laser Therapy;Lasers;Macular Degeneration;Male;Reading;Retinal Drusen;Time Factors;Treatment Failure;Vision Disorders;Visual Acuity

A pilot study to optimize laser-assisted hair removal using real-time high-speed infrared imaging. OBJECTIVE: The aim of this study was to investigate thermal effects on the skin surface during laser-assisted hair removal using real-time high-speed infrared imaging. BACKGROUND DATA: Although hair laser removal (HLR) can be considered an inherently safe treatment, there may be approaches to optimise the benefit/risk ratio of this common therapeutic and cosmetic procedure. METHODS: In this pilot study on three subjects, a ruby laser equipped with a cryogen spray cooling (CSC) system was used to investigate the effect of different CSC durations and delay times between CSC and the laser impulse. Skin surface temperature (SST) was assessed in real-time using a high-speed infrared camera (ThermaCam Phoenix) and a special image analysis software (analySIS Doku). RESULTS: There was no substantial difference of SST between the use of CSC spurts of 10 and 20 msec (6.1 degrees C versus 5.7 degrees C). The use of single laser and cooling parameters revealed baseline SST of 31.7 degrees C, immediately after CSC (10 ms) SST of 6.5 degrees C, and after laser pulse SST of 47 degrees C. Using fluences of 10-20 J/cm(2), a marked difference in temperature was observed between the skin surface and hair (e.g., 26.7 degrees C versus 57.5 degrees C). SST of 62-64 degrees C was observed using fluences of 18-20 J/cm(2), resulting in adverse effects. A maximum SST of 59 degrees C was observed using a CSC spurt of 40 msec, whereas a maximum SST of 60 degrees C was recorded for 30, 20, and 10 msec. The use of CSC delay time of 600 msec revealed baseline SST of 34.6 degrees C, immediately after CSC (10 msec) SST of 5.2 degrees C, after 600 msec delay SST of 21.5 degrees C, and SST of 60 degrees C following the laser pulse. By contrast, 100 msec delay time revealed baseline SST of 34.8 degrees C, immediately after CSC (10 ms) SST of 7 degrees C, after 100 msec delay SST of 7.5 degrees C, and SST of 55.2 degrees C following the laser pulse. CONCLUSION: Our preliminary data indicate that side effects of HLR can be avoided using CSC duration of 10 msec with a delay of about 200 msec. Short delay times between the CSC and laser pulse seem to result in lower post-irradiation SST and may therefore lead to less adverse effects. With regard to the fluence used in HLR, it is of importance that the maximum SST remains below 60 degrees C. Based on these preliminary results, real-time high-speed infrared imaging seems to be an interesting method to study the thermodynamics on skin surface during laser treatment. Adult;Cryotherapy;Female;Hair

Removal;Humans;Infrared Rays;Low-Level Light Therapy;Pilot Projects;Prospective Studies;Skin Temperature

Effects of 830-nm laser light on preventing bone loss after ovariectomy. OBJECTIVE: The aim of this study was to investigate the effects of low-level laser therapy (LLLT; infrared, 830 nm) on the bone properties and bone strength of rat femora after ovariectomy (OVX). BACKGROUND DATA: Osteoporosis affects 30% of postmenopausal women, and it has been recognized as a major public health problem. Based on the stimulatory effects of LLLT on proliferation of bone cells, we hypothesized that LLLT would be efficient in preventing bone mass loss in OVX rats. METHODS: Forty female rats were divided into four groups: sham-operated control (SC), OVX control (OC), sham-operated irradiated at a dose of 120 J/cm(2) (I120), and OVX irradiated at a dose of 120 J/cm(2) (O120). Animals were operated at the age of 90 days. Laser irradiation was initiated 1 day after the operation and was performed three times a week, for 2 months. Femora were submitted to a biomechanical test and a physical properties evaluation. RESULTS: Maximal load of O120 was higher than in control groups. Wet weight, dry weight, and bone volume of O120 did not show any difference when compared with SC. CONCLUSION: The results of the present study indicate that LLLT was able to prevent bone loss after OVX in rats. However, further studies are needed to investigate the effects of different parameters, wavelengths, and sessions of applications on OVX rats. Animals;Bone Density;Female;Femur;Lasers;Organ Size;Osteoporosis;Ovariectomy;Rats;Rats, Wistar

Evaluation of low-level laser therapy in the treatment of temporomandibular disorders. OBJECTIVE: The purpose of this study was to assess the effectiveness of low-level laser therapy (LLLT) in the treatment of myogenic originated temporomandibular disorders (TMD). BACKGROUND DATA: Limited studies have demonstrated that LLLT may have a therapeutic effect on the treatment of TMD. METHODS: Thirty-nine patients with myogenic TMD-associated orofacial pain, limited mandibular movements, chewing difficulties, and tender points were included in this study. Twenty-four of them were treated with LLLT for 10 sessions per day excluding weekends as test group, and 15 patients with the same protocol received placebo laser treatment as a control group. These parameters were assessed just before, just after, and 1 month after the treatment. RESULTS: Maximal mouth-opening improvement, and reductions in pain and chewing difficulty were statistically significant in the test group when compared with the control group. Statistically significant improvements were also detected between two groups regarding reduction in the number of tender points. CONCLUSION: Based on the results of this placebo-controlled report, LLLT is an appropriate treatment for TMD and should be considered as an alternative to other methods. Adolescent;Adult;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Mastication;Middle Aged;Pain Measurement;Temporomandibular Joint Disorders

Low-level laser therapy at different energy densities (0.1-2.0 J/cm2) and its effects on the capacity of human long-term cryopreserved peripheral blood progenitor cells for the growth of colony-forming units. OBJECTIVE: The aim of this research was to investigate the effects of low-level laser therapy (LLLT) at different energy densities (0.1-2.0 J/cm(2)) on the capacity of long-term cryopreserved peripheral blood progenitor cell (PBPC) for growth of colony-forming units (CFU) in vitro. BACKGROUND DATA: There are no data concerning the effects of LLLT on human cryopreserved PBPC. METHODS: Cryopreserved PBPC samples were thawed after 3 years in order to demonstrate the positive effect of LLLT and after 5 years in order to confirm the LLLT's proliferative effect. Cultures were plated in quadruplicate 35-mm-diameter Petri dishes in methylcellulose medium (2 x 10(5)/mL final concentration) and incubated for 14 days at 37 degrees C with 5% CO(2). A 685-nm diode laser with 25-mW optical power was used as the source of irradiation. Cultures were exposed to energy densities of 0.1, 0.5, 1.0, 1.5, and 2.0 J/cm(2) before incubation (10 irradiated and 10 controls at each energy density group). RESULTS: A higher number of CFU was observed at the dose of 1.0 J/cm(2)

(control 21.3 +/- 8.5 x 10(5) cells, irradiated 40.1 +/- 10.5 x 10(5) cells, p < 0.001). No differences were observed in cultures exposed to doses of 0.1, 0.5, and 1.5 J/cm(2). A decreased number of CFU was demonstrated in samples exposed to the dose of 2.0 J/cm(2) (control 21.4 +/- 11.9 x 10(5) cells, p = 0.013). PBPC samples cryopreserved for 5 years were thawed for CFU assays and exposed to a single dose of 1.0 J/cm(2); once again the exposed group showed a higher number of CFU (control 8.8 +/- 7.8 x 10(5) cells, irradiated 18.1 +/- 13.1 x 10(5) cells, p = 0.026). CONCLUSION: Dependent upon the energy density, LLLT elevates (1.0 J/cm(2)) or decreases (2.0 J/cm(2)) the potential of long-term cryopreserved PBPC for growth of CFU in vitro. Colony-Forming Units Assay;Cryopreservation;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Stem Cells

Clinical study of the gingiva healing after gingivectomy and low-level laser therapy. OBJECTIVE: The purpose of this study was to investigate gingival healing after gingivectomy and adjunctive use of low-level laser therapy (LLLT). BACKGROUND DATA: LLLT has been used in animal experiments to examine the influence of laser radiation on the wound healing process since the 1960s. However, clinical trials in dentistry are scarce, and most of them refer to treatment after extraction of the third molars, with only a few reports in the area of periodontics. METHODS: Twenty patients with periodontal disease were selected, and treatment was planned for gingivectomy to bilateral maxillary and mandibular premolar teeth. After surgery, one side was submitted to LLLT using a 685-nm wavelength, output power of 50 mW, and energy density of 4 J/cm(2). The other side was used as the control and did not receive laser irradiation. Healing was evaluated, clinically and biometrically, immediately post-surgery and at days 3, 7, 14, 21, 28, and 35. Results were submitted to statistical analysis. RESULTS: Biometrical evaluation indicated a significant improvement in healing for the laser group at 21 and 28 days. Clinical evaluation showed better repair for the laser group, mainly after the third day. CONCLUSION: LLLT was an effective adjunctive treatment that appeared to promote healing following gingivectomy. Gingiva;Gingivectomy;Humans;Low-Level Light Therapy;Wound Healing

The effects of intense pulsed light (IPL) on blood vessels investigated by mathematical modeling. BACKGROUND AND OBJECTIVES: Intense pulsed light (IPL) sources have been successfully used for coagulation of blood vessels in clinical practice. However, the broadband emission of IPL hampers the clinical evaluation of optimal light parameters. We describe a mathematical model in order to visualize the thermal effects of IPL on skin vessels, which was not available, so far. STUDY DESIGN/MATERIALS AND METHODS: One IPL spectrum was shifted towards the near infrared range (near IR shifted spectrum: NIRSS) and the other was heavily shifted toward the visible range (visible shifted spectrum: VSS). The broadband emission was separated in distinct wavelengths with the respective relative light intensity. For each wavelength, the light and heat diffusion equations were simultaneously solved with the finite element method. The thermal effects of all wavelengths at the given radiant exposure (15 or 30 J/cm2) were added and the temperature in the vessels of varying diameters (60, 150, 300, 500 microm) was calculated for the entire pulse duration of 30 milliseconds. RESULTS: VSS and NIRSS both provided homogeneous heating in the entire vessel. With the exception of the small vessels (60 microm), which showed only a moderate temperature increase, all vessels exhibited a temperature raise within the vessel sufficient for coagulation with each IPL parameter. The time interval for effective temperature raise in larger vessels (diameter >60 microm) was clearly shorter than the pulse duration. In most instances, the vessel temperature was higher for VSS when compared to NIRSS. CONCLUSIONS: We presented a mathematical model capable of calculating the photon distribution and the thermal effects of the broadband IPL emission within cutaneous blood vessels. Blood Vessels;Hot Temperature;Humans;Lasers;Low-Level Light Therapy;Models, Theoretical;Skin;Skin Temperature

In vitro and in vivo tissue repair with laser-activated chitosan adhesive. BACKGROUND AND OBJECTIVES: Sutures are currently the gold standard for wound closure but they are still unable to seal tissue and may induce scarring or inflammation. Biocompatible glues, based on polysaccharides such as chitosan, are a possible alternative to conventional wound closure. In this study, the adhesion of laser-activated chitosan films is investigated in vitro and in vivo. In particular we examine the effect of varying the laser power, as well as adding a natural cross-linker (genipin) to the adhesive composition. STUDY DESIGN/MATERIALS AND METHODS: Flexible and insoluble strips of chitosan films (surface area approximately 34 mm(2), thickness approximately 20 microm) were bonded to sheep intestine using several laser powers (0, 80, 120, and 160 mW) at 808-nm wavelength. The strength of repaired tissue was tested by a calibrated tensiometer to select the best power. A natural cross-linker (genipin) was also added to the film and the tissue repair strength compared with the strength of plain films. The adhesive was also bonded in vivo to the sciatic nerve of rats and the thermal damage induced by the laser assessed 4 days post-operatively. RESULTS: Chitosan adhesives successfully repaired intestine tissue, attaining a maximum repair strength of 14.7+/-4.3 kPa (n = 30) at the laser power of 120 mW. The chitosan-genipin films achieved lower repair strength (9.1+/-2.9 kPa). The laser caused partial demyelination of axons at the site of operation, but the myelinated axons retained a normal morphology proximally and distally. CONCLUSIONS: The chitosan adhesive effectively bonded to tissue causing only localized thermal damage in vivo, when the appropriate laser parameters were selected. Biocompatible Materials;Hemostatics;Iridoid Glycosides;Iridoids;Tissue Adhesives;Chitosan;genipin Animals;Biocompatible Materials;Calorimetry, Differential Scanning;Chitosan;Hemostatics;Intestines;Iridoid Glycosides;Iridoids;Low-Level Light Therapy;Microscopy, Atomic Force;Microscopy, Electron, Scanning;Rats;Sciatic Nerve;Sheep;Spectrophotometry, Ultraviolet;Tensile Strength;Tissue Adhesives;Tissue Engineering

Regeneration of skeletal muscles and state of thymus in gamma-irradiated rats under laser therapy of the area of muscle trauma. The gamma-irradiation of adult rats with a semi-lethal dose (6 Gy) suppressed the posttraumatic regeneration of skeletal muscles and brought about considerable destructive changes in the thymus. The effect of He-Ne laser radiation at a total dose 4.5-5.4 J/cm2 at each operated leg in irradiated rats stimulated the regenerative capacity of skeletal muscle tissue, the healing of skin-muscle wound, and the processes of postradiation recovery in thymus cells (a decrease of chromosome aberrations). The histological structure of regenerates had more muscle pattern. At the same time, the positive dynamics of regenerative processes in muscles was achieved by an increased functional load on the thymus. To stimulate the regeneration of irradiated muscles on the background of a more moderate load on the thymus, the prolonged period of laser therapy and fragmentary distribution of laser exposures during muscle regeneration were preferable. Wound healing improved visibly. Nor formation of chronic radiation ulcers on operated shins was observed. Animals;Gamma Rays;Low-Level Light Therapy;Muscle, Skeletal;Radiation, Ionizing;Rats;Thymus Gland;Wound Healing;Wounds and Injuries

Treatment of poikiloderma of Civatte with the pulsed dye laser: a series of patients with severe depigmentation. BACKGROUND: Pulsed dye laser (PDL) treatment is widely used for poikiloderma of Civatte. Some adverse events in small numbers of patients have been reported. Guidelines for treatment of poikiloderma of Civatte do not exist. OBJECTIVE: To report the occurrence of persistent depigmentation as a late adverse event in a series of patients with poikiloderma of Civatte after treatment with PDL. METHODS: Eight patients (seven women and one man, mean age 48 years) with poikiloderma of Civatte were treated with PDL using a 585-nm wavelength and a fixed pulse duration of 450 micros. In all patients one or two test PDL patches were performed and reviewed after 3 months. All of the patients tolerated the testing without complications. Subsequent

treatments were undertaken at intervals of 3 months. RESULTS: All patients were treated with fluences between 3.5 and 7 J/cm2, using a 7- or 10-mm spot size. All patients had a good result with respect to clearing of the vascular component. Nevertheless, six of them, treated with 5-7 J/cm2, reported severe depigmentation 4-11 months after treatment. Two patients treated with lower fluences (3.5-5.5 J/cm2) did not report this depigmentation. CONCLUSIONS: Great care is needed when PDL treatment is used for poikiloderma of Civatte. Pigment changes have been incidentally mentioned as late complications but have not been well documented as the late depigmentation has been in this series. It is advisable to use fluences as low as possible, and not exceeding an upper limit of 5 J/cm2, on a 10-mm spot size. More research is needed to define an optimal pulse duration. Coloring Agents Adult;Coloring Agents;Female;Humans;Hyperpigmentation;Hypopigmentation;Low-Level Light Therapy;Male;Middle Aged;Photosensitivity Disorders;Severity of Illness Index;Skin Pigmentation

[Using AELTIS-synchro-02 device in the therapy of chronic bacterial prostatitis]. The treatment of chronic bacterial prostatitis combined antibacterial drugs and physiotherapy (low-energy laser radiation, electrostimulation of the prostate). Treatment of chronic bacterial prostatitis with medication and complex two-channel bio-synchronized electrolaser therapy with application of the unit AELTIS-synchro-02 raises efficacy of treatment with chronic bacterial prostatitis due to combined effect of antibacterial drugs and bacteriostatic and immunomodulating actions of the physical factors applied. These normalize microcirculation in the region of the prostatic gland, improve a draining function of the prostatic ducts, allows achievement of good results in 88.2% patients. Bacterial Infections;Chronic Disease;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Magnetics;Male;Physical Therapy Modalities;Prostate;Prostatitis;Regional Blood Flow;Treatment Outcome;Ultrasonography

[Use of Intramag devices with Intraterm and LAST-02 attachments in complex therapy of chronic prostatitis]. The examination of the patients exposed to physical factors (magnetotherapy, laser therapy and thermotherapy) has demonstrated that Intramag unit with attachments Intraterm and LAST-02 for local physiotherapy is effective in patients with chronic prostatitis and can be used in urological hospitals and outpatient clinics. Adult;Chronic Disease;Combined Modality Therapy;Electric Stimulation Therapy;Erectile Dysfunction;Humans;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Physical Therapy Modalities;Prostate;Prostatitis;Quality of Life;Treatment Outcome;Ultrasonography

[Application of magnet laser radiation to stimulate healing of perineum injuries in the maternity patients]. The study is aimed at developing the new complex effective method of treatment with an application of magnet laser radiation as a stimulating aid in healing of perineum injuries in the maternity patients. 86 maternity patients with perineotomy and/or episiotomy were studied in treatment. The injury on the perineum was conventionally treated by antiseptics in 40 maternity patients (control group); the magnet laser therapy (MLT) by means of device "MILTA" was applied to 46 maternity patients in concomitantly with the conventional methods. The therapeutic effect was based on the combined influence of the constant magnetic field and impulsive laser radiation of the red and infra-red range on the body. The patients reported less discomfort during MLT, which promotes the decrease of pain intensity and hyperaemia instantly after 2-3 procedures. We have not observed any sutures divergence in the maternity patients who received MLT, in comparison to the control group where full divergence of sutures was registered in 2.5%, and partial--in 7.5%. The proposed complex method of treatment with the application of MLT improves the process of the healing considerably, promotes the rapid disappearance of inflammatory signs and renders analgesic effect. Analgesics Analgesics;Cicatrix, Hypertrophic;Episiotomy;Female;Humans;Low-Level Light Therapy;Magnetics;Pain;Perineum;Postoperative Complications;Pregnancy;Wound Healing

Lasers, light sources, and radiofrequency devices for skin rejuvenation. Dermabrasion;Humans;Lasers;Low-Level Light Therapy;Phototherapy;Radio Waves;Rejuvenation;Skin Aging

Low-power laser in the prevention of induced oral mucositis in bone marrow transplantation patients: a randomized trial. We investigated the clinical effects of low-power laser therapy (LPLT) on prevention and reduction of severity of conditioning-induced oral mucositis (OM) for hematopoietic stem cell transplantation (HSCT). We randomized 38 patients who underwent autologous (AT) or allogeneic (AL) HSCT. A diode InGaAlP was used, emitting light at 660 nm, 50 mW, and 4 J/cm2, measured at the fiberoptic end with 0.196 cm2 of section area. The evaluation of OM was done using the Oral Mucositis Assessment Scale (OMAS) and the World Health Organization (WHO) scale. In the LPLT group, 94.7% of patients had an OM grade (WHO) lower than or equal to grade 2, including 63.2% with grade 0 and 1, whereas in the controls group, 31.5% of patients had an OM grade lower than or equal to grade 2 ($P < .001$). Remarkably, the hazard ratio (HR) for grades 2, 3, and 4 OM was 0.41 (range, 0.22-0.75; $P = .002$) and for grades 3 and 4 it was 0.07 (range, 0.11-0.53; $P < .001$). Using OMAS by the calculation of ulcerous area, 5.3% of the laser group presented with ulcers of 9.1 cm2 to 18 cm2, whereas 73.6% of the control group presented with ulcers from 9.1 cm2 to 18 cm2 ($P = .003$). Our results indicate that the use of upfront LPLT in patients who have undergone HSCT is a powerful instrument in reducing the incidence of OM and is now standard in our center. Adult;Bone Marrow Transplantation;Female;Humans;Lasers;Male;Pain;Stomatitis;Treatment Outcome;World Health Organization

Postoperative analgesia after lower third molar surgery: contribution of the use of long-acting local anesthetics, low-power laser, and diclofenac. OBJECTIVES: Postoperative pain is a common phenomenon after surgical extraction of lower third molars (LTM), and its successful control is an essential part of routine oral surgery. The aims of the study were twofold: (1) to evaluate the postoperative analgesic efficacy, comparing long-acting and intermediate-acting local anesthetics; and (2) to compare the use of low-power laser irradiation and the nonsteroid anti-inflammatory drug diclofenac, which are claimed to be among the most successful aids in postoperative pain control. STUDY DESIGN: A twofold study of 102 patients of both sexes undergoing surgical extraction of LTM was conducted. In the first part of the study, 12 patients with bilaterally impacted LTMs were treated in a double-blind crossover fashion; local anesthesia was achieved with 0.5% bupivacaine plain or 2% lidocaine with 1:80.000 epinephrine. In the second part of the study, 90 patients undergoing LTM surgical extraction with local anesthesia received postoperative low-power laser irradiation (30 patients) and a preoperative single dose of 100 mg diclofenac (30 patients), or only regular postoperative recommendations (30 patients). RESULTS: The results of the first part of the study showed a strikingly better postoperative analgesic effect of bupivacaine than lidocaine/epinephrine (11 out of 12; 4 out of 12, respectively, patients without postoperative pain). In the second part of the study, low-power laser irradiation significantly reduced postoperative pain intensity in patients premedicated with diclofenac, compared with the controls. CONCLUSION: Provided that basic principles of surgical practice have been achieved, the use of long-acting local anesthetics and low-power laser irradiation enables the best postoperative analgesic effect and the most comfortable postoperative course after surgical extraction of LTMs. Anesthetics, Local;Anti-Inflammatory Agents, Non-Steroidal;Diclofenac;Lidocaine;Bupivacaine Anesthetics, Local;Anti-Inflammatory Agents, Non-Steroidal;Bupivacaine;Chi-Square Distribution;Cross-Over Studies;Diclofenac;Double-Blind Method;Female;Humans;Lidocaine;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain, Postoperative;Tooth Extraction;Tooth, Impacted

Eflornithine cream combined with laser therapy in the management of unwanted facial hair growth in women: a randomized trial. BACKGROUND: Eflornithine cream is approved for the reduction of unwanted facial hair in women. The mechanism of action for eflornithine is reduction in follicular cell growth rate, while laser photoepilation heats hair and adjacent tissues to suspend growth. OBJECTIVE: The objective was to assess the efficacy and safety of eflornithine or vehicle with laser therapy in the treatment of unwanted facial hair in women. METHODS: Subjects were randomized to treatment with eflornithine on one side of the face and vehicle on the contralateral side for 34 weeks. Subjects received Nd:YAG or alexandrite laser therapy to both sides of the face at Weeks 2 and 10. Blinded evaluations included left to right comparisons and appearance relative to baseline. RESULTS: Fifty-four women completed the trial. From Weeks 6 through 22, eflornithine-treated sides showed significant reduction in hair growth. By Week 34, no significant differences were seen. Subject grading showed significant and persistent hair reduction through Week 34 for eflornithine-treated sides. The safety profile for combination therapy is similar to eflornithine alone. CONCLUSION: Eflornithine is safely used in conjunction with laser hair removal treatments and promotes more rapid hair removal when combined with laser treatment. Patients demonstrate a clear preference for treatment with laser and eflornithine. Ointments;Eflornithine Administration, Topical;Adult;Aged;Aged, 80 and over;Double-Blind Method;Eflornithine;Face;Female;Follow-Up Studies;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Middle Aged;Ointments;Treatment Outcome

CO2 laser-induced zonation in dental enamel: a Raman and IR microspectroscopic study. The gradient of structural alteration and molecular exchange across CO(2) laser-irradiated areas in dental enamel was analyzed by Raman and attenuated total reflectance infrared microspectroscopy. The type and the degree of structural changes in morphologically distinguishable zones within the laser spot vary depending on the laser-irradiation parameters--power (1 and 3 W), treatment time (5 and 10 s), and operational mode (super pulse and continuous wave). Using higher power, irrespective of the operation mode, the enamel tissue ablates and a crater is formed. The prevalent phase at the bottom of the crater is dehydrated O(2) (2-)-bearing apatite, that is, the fundamental framework topology is preserved. Additional nonapatite calcium phosphate phases are located mainly at the slope of the laser crater. No structural transformation of mineral component was detected aside the crater rim, only a CO(3)-CO(2) exchange, which decays with the radial distance. A lower-power laser irradiation slightly roughens the enamel surface and the structural modification of enamel apatite is considerably weaker for continuous wave than for super pulse mode. Prolonged low-power laser treatment results in recrystallization, and thus structural recovering of apatite might be of clinical relevance for enamel surface treatments. Apatites;Calcium Phosphates;Carbon Dioxide Apatites;Calcium Phosphates;Carbon Dioxide;Dental Enamel;Hot Temperature;Humans;In Vitro Techniques;Laser Therapy;Materials Testing;Spectrophotometry, Infrared;Spectrum Analysis, Raman;X-Ray Diffraction

Low-level laser therapy can reduce lipopolysaccharide-induced contractile force dysfunction and TNF-alpha levels in rat diaphragm muscle. Our objective was to investigate if low-level laser therapy (LLLT) could improve respiratory function and inhibit tumor necrosis factor (TNF-alpha) release into the diaphragm muscle of rats after an intravenous injection of lipopolysaccharide (LPS) (5 mg/kg). We randomly divided Wistar rats in a control group without LPS injection, and LPS groups receiving either (a) no therapy, (b) four sessions in 24 h with diode Ga-AsI-Al laser of 650 nm and a total dose of 5.2 J/cm2, or (c) an intravenous injection (1.25 mg/kg) of the TNF-alpha inhibitor chlorpromazine (CPZ). LPS injection reduced maximal force by electrical stimulation of diaphragm muscle from 24.15+/-0.87 N in controls, but the addition of LLLT partly inhibited this reduction (LPS only: 15.01+/-1.1 N vs LPS+LLLT: 18.84+/-0.73 N, $P<0.05$). In addition, this dose of LLLT and CPZ significantly ($P<0.05$ and $P<0.01$, respectively) reduced TNF-alpha concentrations in diaphragm muscle when compared to the

untreated control group. Lipopolysaccharides;Tumor Necrosis Factor-alpha;Chlorpromazine Animals;Chlorpromazine;Diaphragm;Lipopolysaccharides;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Respiratory Insufficiency;Tumor Necrosis Factor-alpha

Ultrastructural and autoradiographical analysis show a faster skin repair in He-Ne laser-treated wounds. There are evidences that low-intensity red laser radiation is capable to accelerate wound healing. Nowadays, this therapy has been gradually introduced in clinical practice although mechanisms underlying laser effects are poorly understood. To better understand the photobiological effects of laser radiation, this study investigated by electron microscopy, immunohistochemistry and autoradiography the morphological and functional features of irradiated and none irradiated injured mice skin. Full-thickness skin lesions were created on the back of mice and irradiated on days 1, 5, 8, 12, and 15 post-wounding with a He-Ne laser (lambda=632.8nm), dose 1J/cm(2), exposure time 3min. Non-irradiated lesions were used as a control. The mice were inoculated with (3)H-proline and sacrificed one hour after on the 8th, 15th and 22nd days to histological and radioautographical analysis. The irradiated-lesions showed a faster reepithelization compared with control lesions. The irradiated dermis contained a higher number of activated fibroblasts compared to control group and, most of them showed several cytoplasmic collagen-containing phagosomes. In irradiated-lesions, smooth muscle alpha-actin positive cells predominated, which correspond to a higher number of myofibroblasts observed in the electron microscope. Moreover, laser radiation reduced the local inflammation and appears to influence the organization of collagen fibrils in the repairing areas. Quantitative autoradiography showed that the incorporation of (3)H-proline was significantly higher in irradiated-dermis on the 15th day post-wounding ($p<0.05$). These results suggest that laser radiation may accelerate cutaneous wound healing in a murine model.
Animals;Autoradiography;Disease Models, Animal;Laser Therapy;Low-Level Light Therapy;Male;Mice;Radiography;Skin;Skin Diseases;Wound Healing

Pigmentary disorders in Asian skin: treatment with laser and intense pulsed light sources. The development of selective photothermolysis has enabled removal of targets such as melanin. Both lasers and intense pulsed light (IPL) sources have been used in the treatment of pigmented lesions, however careful selection is important to ensure success. This is especially true in darker skinned individuals where the risk of postinflammatory hyperpigmentation (PIH) is high. The advent of the Q-switched laser, IPL, and now fractional photothermolysis (Fraxel, Reliant Technologies) offers a variety of ways to treat epidermal and dermal pigmentary disorders. Asian People;Humans;Low-Level Light Therapy;Phototherapy;Pigmentation Disorders;Treatment Outcome

The effect of gallium arsenide aluminum laser therapy in the management of cervical myofascial pain syndrome: a double blind, placebo-controlled study. The efficacy of low-level laser therapy (LLLT) in myofascial pain syndrome (MPS) seems controversial. A prospective, double-blind, randomized controlled trial was conducted in patients with chronic MPS in the neck to evaluate the effects of low-level 830-nm gallium arsenide aluminum (Ga-As-Al) laser therapy. The study group consisted of 64 MPS patients. The patients were randomly assigned into two groups. In group 1 ($n = 32$), Ga-As-Al laser treatment was applied over three trigger points bilaterally for 2 min over each point once a day for 15 days during a period of 3 weeks. In group 2 ($n = 32$), the same treatment protocol was given, but the laser instrument was switched off during applications. All patients in both groups performed daily isometric exercise and stretching exercises for cervical region. Parameters were measured at baseline and after 4 weeks. All patients were evaluated with respect to pain (at rest, movement, and night) and assessed by visual analog scale, measurement of active range of motion using an inclinometer and a goniometer, and the neck disability index. In both groups, statistically significant improvements were detected in all outcome measures compared with baseline ($p < 0.05$). However, no significant differences were obtained between the two groups ($p > 0.05$). In

conclusion, although the laser therapy has no superiority over placebo groups in this study, we cannot exclude the possibility of effectivity with another treatment regimen including different laser wavelengths and dosages (different intensity and density and/or treatment interval). Arsenicals;gallium arsenide;Gallium;Aluminum Adult;Aluminum;Arsenicals;Double-Blind Method;Female;Gallium;Humans;Low-Level Light Therapy;Male;Myofascial Pain Syndromes;Neck Pain;Pain Measurement;Treatment Outcome

[Outpatient use of laser therapy in bronchial asthma]. AIM: To analyse effects of outpatient laser therapy on the course of different forms of bronchial asthma (BA). MATERIAL AND METHODS: The examination has covered 466 patients with BA divided into three groups: group 1 patients received monotherapy with low-intensive laser radiation (LILR); group 2 - LILR plus conventional drug therapy (CDT); group 3 - CDT only. RESULTS: Group 1 and 2 patients achieved improvement after 2-3 sessions. Asphyxia attacks were less frequent and severe. These attacks disappeared to session 7-10, 10-12 in patients with exogenic, endogenic and mild, moderate mixed BA, respectively. The patients recovered sensitivity to sympathomimetics and methylxantines. Glucocorticosteroids (GCS) doses, hospital stay and temporary disability duration decreased. These two groups achieved remission within 0.5-1 year in 50% patients. Remission for 1-2 years was observed in 40% patients while in group. 3 - in 14%. CONCLUSION: The addition of laser therapy improves a BA course, results of outpatient treatment and rehabilitation, recovers bronchial sensitivity to sympathomimetics and xantine derivatives, reduces GCS dose and duration of hospital stay and disability in BA patients. Adolescent;Adult;Aged;Ambulatory Care;Asthma;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Outpatients;Treatment Outcome

[Clinical efficacy of target low-intensity laser radiation on the adrenal projection region in patients with bronchial asthma]. AIM: To study efficacy of infrared laser radiation on the adrenal projection region in patients with bronchial asthma (BA). MATERIAL AND METHODS: The adrenal region of BA patients was exposed to infrared laser radiation. The effect was stated after blood count, examination of the urine and sputum, blood biochemical tests, blood hydrocortisone assay. RESULTS: Positive clinical response to laser therapy manifested with improvement of clinical, device and spirometric indices in BA patients. Blood levels of hydrocortisone normalized. CONCLUSION: Infrared laser radiation of adrenal projection region reduced the number of asphyxia attacks, improved bronchial drainage, shortened the disease duration. The method is well tolerated, safe, easy to make and suggested for use in combined treatment of BA. Adolescent;Adrenal Glands;Adult;Asthma;Combined Modality Therapy;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

A systematic review of common conservative therapies for arm lymphoedema secondary to breast cancer treatment. Secondary arm lymphoedema is a chronic and distressing condition which affects a significant number of women who undergo breast cancer treatment. A number of health professional and patient instigated conservative therapies have been developed to help with this condition, but their comparative benefits are not clearly known. This systematic review undertook a broad investigation of commonly instigated conservative therapies for secondary arm lymphoedema including; complex physical therapy, manual lymphatic drainage, pneumatic pumps, oral pharmaceuticals, low level laser therapy, compression bandaging and garments, limb exercises and limb elevation. It was found that the more intensive and health professional based therapies, such as complex physical therapy, manual lymphatic drainage, pneumatic pump and laser therapy generally yielded the greater volume reductions, whilst self instigated therapies such as compression garment wear, exercises and limb elevation yielded smaller reductions. All conservative therapies produced improvements in subjective arm symptoms and quality of life issues, where these were measured. Despite the identified benefits, there is still the need for large scale, high level clinical trials in this

area. Arm;Breast Neoplasms;Drainage;Exercise Therapy;Female;Humans;Laser Therapy;Lymphedema;Physical Therapy Modalities

The effect of laser on remanescent liver tissue after 90% hepatectomy in rats. PURPOSE: To evaluate the effect of laser beam on reminiscent liver after partial hepatectomy 90%. METHODS: Wistar rats, (N=42), were divided into six groups with seven specimens each. The partial hepatectomy (HP) was performed in all animals through exeresis of approximately 90% of the liver parenchyma. The animals from groups HP and Laser application, HPL24, HPL48 and HPL72 undertook laser irradiation carried out through application (dose of 22.5 J/cm2) in five different sites in the reminiscent liver. The rats were then sacrificed 24, 48 and 72 hours after HP procedure, for the liver regeneration analysis,using the Proliferating Cell Nuclear Antigen (PCNA),and for dosage of serum aminotransferases. RESULTS: Were demonstrated an increase of the serum levels of alanine aminotransferase for the group of 24 hours and a decrease for the group of 72 hours exposed to laser. The index of marked cells had a considerable more improvement for the group of 72 hours exposed in laser compared to other groups. CONCLUSION: Laser did not cause hepatic injuries additional to the partial hepatectomy and perhaps led to a benefit by stimulating the proliferative activity. Biomarkers;Proliferating Cell Nuclear Antigen;Transaminases Animals;Biomarkers;Disease Models, Animal;Hepatectomy;Laser Therapy;Liver;Liver Failure, Acute;Liver Regeneration;Low-Level Light Therapy;Male;Proliferating Cell Nuclear Antigen;Rats;Rats, Wistar;Transaminases

New photonic technologies for the treatment and diagnosis of hepatic diseases: an overview of the experimental work performed in collaboration, between Physics Institute of SÃ£o Carlos and RibeirÃ£o Preto Faculty of Medicine of the University of SÃ£o Paulo. Recent advances in optical techniques have created a great range of possibilities for diagnosis and therapeutics in liver related diseases. With the uses of efficient light sources like lasers and LEDs (Light Emitting Diodes) it is possible to employ the light-tissue interaction to promote hepatic tissue regeneration after partial hepatectomy, to detect hepatocarcinoma and steatosis by utilizing optical fluorescence, to evaluate the metabolism of the liver during hepatic transplantation as well as to treat liver tumors. We present here an overview of the technique presently in development at the RibeirÃ¢o Preto Faculty of Medicine-USP in cooperation with the Physics Institute of SÃ£o Carlos-USP. The results obtained so far have been the subject of a list of publications and are here presented as an overview. A new perspective for modern application of optical techniques in different medical practices related to the liver is presented. Photosensitizing Agents Biopsy;Carcinoma;Humans;Liver;Liver Diseases;Liver Neoplasms;Liver Regeneration;Liver Transplantation;Low-Level Light Therapy;Necrosis;Photochemotherapy;Photosensitizing Agents;Time Factors

[The venous ulcer therapy in use of the selected physical methods (Part 2)--The comparison analysis]. The aim of the study was to evaluate the influence of a high voltage stimulation, sonotherapy and laser biostimulation on the process of healing of venous leg ulcers. MATERIAL AND METHODS: Four comparative groups--A, B, C and D--were made at a random from 92 patients with venous leg ulcers. The group A consisted of 26 patients, the group B--21 patients, the group C--21 patients, and the group D--24 patients. The patients in all comparative groups were treated pharmacologically. Ulcerations at the patients in the group A were additionally treated with the high voltage stimulation. However, ulcerations at the patients in the group B were treated with the sonotherapy. Ulcerations at the patients in the group C were treated with the laser biostimulation. Changes of the area, length, width and volume of the tissue defekt after above physical therapies were assessed. Changes of the pus decontamination and granulation processes were observed too. CONCLUSIONS: After treatment concluded, high voltage stimulation and ultrasound therapy had been more efficient at enhancing healing of venous leg ulcers than topical pharmacology. No significant effect of laser biostimulation

on healing process was observed. Adult;Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Ultrasonic Therapy;Varicose Ulcer

A newly modified 595-nm pulsed dye laser with compression handpiece for the treatment of photodamaged skin. BACKGROUND AND OBJECTIVES: The pulsed dye laser set the standard of care for the treatment of vascular lesions, and recent modifications have enabled improved efficacy with fewer side effects. An investigational high energy, variable pulse duration pulsed dye laser has been modified to treat both vascular and pigmented lesions associated with photoaging. Each laser pulse is comprised of a sequence of eight uniform micropulses, which evenly distribute the pulse energy, effectively increasing the purpura threshold at any given fluence. Pigmented lesions are treated with a compression handpiece (CHP) that removes competing vascular target from the field, and helps to prevent purpura. This pilot study was undertaken to determine the optimum laser settings, and to investigate the ability of this device to improve vascular and pigmented lesions associated with photoaging. STUDY DESIGN/MATERIALS AND METHODS: Twenty-four patients with photoaged skin and phototype I-III were enrolled in the study. Thirteen received treatment for vascular and pigmented lesions, and 11 subjects were treated for pigmented lesions alone. Subjects received one to three treatments at 3-4 weeks intervals, and underwent 3- and 12-week follow-up evaluation. The degree of improvement was assessed by subject evaluation as well as comparison of standardized digital photographs by three independent dermatologists. Background erythema was treated with a 12-mm spot size, at a fluence of 7 J/cm(2), and a pulse width of 10 ms. The cryogen cooling was set at 30 mseconds with a 30 ms delay. Individual telangiectasias were treated with a 5- or 7-mm spot size at fluences of 9-14 J/cm(2) and pulse widths of 6-20 mseconds. Pigmented lesions were treated using a 5- or 7-mm spot size, with energy of 9-15 J/cm(2) and a pulse width of 1.5-10 ms without cooling. The CHP had a 7-mm spot size, and fluences of 9-16 J/cm(2), and pulse widths of 1.5 or 3 ms were used in the treatment of pigmented lesions. RESULTS: The treatment was well tolerated without the use of topical anesthetic. All subjects noted improvement in the both vascular and pigmented lesions, and were satisfied with their outcomes. Objectively, there was moderate improvement in background erythema, telangiectasia, and pigmented lesions. Three subjects who were treated with sun tans developed transient hypopigmentation and two subjects developed a transient textural change following pulse stacking for the treatment of pigmented lesions with the conventional handpiece. Purpura was noted in all patients treated for pigment with the conventional handpiece at pulsewidths less than 6 mseconds, as compared to only one that was treated with the CHP. Three patients treated in rapid succession for vascular, and then pigmented lesions with the CHP exhibited purpura, which was prevented in future treatments with 1-2 minutes of topical ice cooling between passes. CONCLUSIONS: This novel 595-nm pulsed dye laser, with a modified pulse sequence and CHP, now has the versatility to safely treat both pigment and vascular changes associated with photoaging. Adult;Aged;Cold Temperature;Equipment Design;Erythema;Female;Follow-Up Studies;Humans;Hypopigmentation;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Photography;Pigmentation Disorders;Pilot Projects;Purpura;Skin Aging;Skin Diseases, Vascular;Surveys and Questionnaires;Time Factors;Treatment Outcome

Ineffective dose and lack of laser output testing in laser shoulder and neck studies. Humans;Low-Level Light Therapy;Neck Pain;Radiotherapy Dosage;Shoulder Pain;Treatment Failure

Treatment of cellulite with optical devices: an overview with practical considerations. Cellulite is a common condition in women for which treatment is frequently requested. Its etiology is unknown, but a myriad of factors including genetics, hormones, and inflammation appear to contribute to its formation. Despite the popularity of therapies touting their effectiveness for this pervasive condition, few have proven long-lasting benefits. Lasers and light sources are the latest devices to have entered the cellulite therapeutic market. This paper describes these optical devices and provides an overview

of their published effectiveness. Adipose Tissue;Adult;Buttocks;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Middle Aged;Phototherapy;Thigh

A pilot investigation comparing low-energy, double pass 1,450 nm laser treatment of acne to conventional single-pass, high-energy treatment. BACKGROUND AND OBJECTIVES: Laser treatment using a 1,450 nm diode laser has been shown to improve acne and acne scarring. Its widespread adoption in younger populations has been significantly limited by discomfort. STUDY DESIGN/MATERIALS AND METHODS: Six subjects with active papular acne were treated in a pilot study to determine parameters for a split-face, double-pass, low-energy protocol of 1,450 nm laser treatment. Sides of the face were randomized to receive single-pass, high-energy treatment (13-14 J/cm(2)), or double-pass, low energy treatment (8-11 J/cm(2)), for a total of four treatments delivered at monthly intervals. Acne counts and standardized, digital photograph were performed 2 months following the final treatment, and compared to pre-treatment counts and photographs. RESULTS: Improvement was evaluated comparing pre- and post-treatment photos and averaged 2.5 for the high-energy, single-pass side and 2.3 for the low-energy, double-pass side, using a 0 (worse) to 4 (max improvement) scale. Acne counts were reduced 78% on the high-energy, single-pass side and 67% on the low-energy, double-pass side. Pain ratings on a 1 (min) to 10 (max) scale averaged 5.6 (range 1-9) for the high-energy, single-pass side and 1.3 (range 1-2) for the low-energy, double-pass side. CONCLUSIONS: Low-energy, double-pass 1,450 nm laser treatment effectively reduces acne counts 2 months post-treatment, and dramatically reduces the pain associated with treatment. The treatment parameters used in this study have eliminated the need for anesthetic cream in daily practice. Acne Vulgaris;Adult;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Pilot Projects;Treatment Outcome

Pain relief by single low-level laser irradiation in orthodontic patients undergoing fixed appliance therapy. INTRODUCTION: The objective of this study was to analyze the effect of single low-level laser therapy (LLLT) irradiation on pain perception in patients having fixed appliance treatment. METHODS: Seventy-six patients (46 women, 30 men; mean age, 23.1 years) enrolled in this single-blind study were assigned to 2 groups. The patients in group 1 (G1; 38 patients, 13 men, 25 women; mean age, 25.1 years) received a single course of LLLT (Mini Laser 2075, Helbo Photodynamic Systems GmbH & Co KG, Linz, Austria; wavelength 670 nm, power output 75 mW) for 30 seconds per banded tooth. The patients in group 2 (G2; 38 patients, 17 men, 21 women; mean age, 21.0 years) received placebo laser therapy without active laser irradiation. Pain perception was evaluated at 6, 30, and 54 hours after LLLT by self-rating with a standardized questionnaire. RESULTS: Major differences in pain perception were found between the 2 groups. The number of patients reporting pain at 6 hours was significantly lower in G1 (n = 14) than in G2 (n = 29) (P <.05), and the differences persisted at 30 hours (G1, n = 22; G2, n = 33) (P <.05). At 54 hours, no significant differences were seen between the number of patients reporting pain (G1, n = 20; G2, n = 25), although the women had a different prevalence between G1 (n = 11) and G2 (n = 15) (P = .079). At 6, 30, and 54 hours, more than 90% of the subjects in both groups described the pain as "tearing." CONCLUSIONS: LLLT immediately after multibanding reduced the prevalence of pain perception at 6 and 30 hours. LLLT might have positive effects in orthodontic patients not only immediately after multibanding, but also for preventing pain during treatment. Adolescent;Adult;Chi-Square Distribution;Child;Facial Pain;Female;Humans;Linear Models;Low-Level Light Therapy;Male;Orthodontic Appliances;Pain Measurement;Perception;Sex Factors;Single-Blind Method;Surveys and Questionnaires;Time Factors;Tooth Movement Techniques

Long-pulsed Nd:YAG laser treatment of venous lakes: report of a series of 34 cases. BACKGROUND: Some venous lakes do not respond well to traditional vascular lasers. The Nd:YAG laser output at 1,064 nm is less well absorbed by hemoglobin but penetrates more deeply into tissue.

OBJECTIVE: This study was undertaken to assess the effectiveness of the long-pulsed Nd:YAG on venous lakes. METHODS: Thirty-five consecutive adult patients presenting with a venous lake were studied. Four patients had failed to respond to polidocanol 1% sclerotherapy, and 1 patient to pulsed dye laser. Long-pulsed Nd:YAG was administered via a water-cooled tip. Either a 3-mm spot at 250 J/cm(2) and 55 ms or a 5-mm spot at 140 to 180 J/cm(2) was used depending on the size of the lesion. Clinical end points were characterized by hardening of the lesion, central blackening, minimal whitening of the periphery, and in most cases, an audible popping sound. Responses were assessed visually in 50% of cases or by phone contact in the remaining 50% if the lesion had completely disappeared. One patient was lost to follow-up. RESULTS: After a single treatment, 94% cleared completely; incomplete clearance occurred in 6%. There were no reported complications. CONCLUSIONS: The long-pulsed Nd:YAG laser is highly effective treatment for venous lakes of the lip and cheeks. Female;Follow-Up Studies;Humans;Lip;Low-Level Light Therapy;Middle Aged;Skin Diseases, Vascular;Treatment Outcome;Varicose Veins

Treatment of angiokeratoma of Fordyce with pulsed dye laser. BACKGROUND: Angiokeratomas of Fordyce are typically asymptomatic vascular lesions characterized by blue-to-red papules with a scale surface, most often located on the scrotum. Although considered benign, the lesions may bleed, either spontaneously or secondary to rupture, leading to patient anxiety and social embarrassment. OBJECTIVE: The objective was to determine the safety and effectiveness of 585-nm pulsed dye laser for the treatment of angiokeratomas of Fordyce. METHODS: Twelve patients with Fitzpatrick skin type II to IV were treated for angiokeratomas of Fordyce with pulsed dye laser (5.5-8.0 J/cm(2)) in two to six sessions. Lesion clearance was evaluated by two specialists on the basis of digital photographs taken before the first treatment and 2 months after the last treatment. RESULTS: Seven patients had an excellent response (clearance rating 75%-100%) and five patients had a good response (clearance rating 50%-75%). Transient purpura and pain were present in all patients. Bleeding during treatment occurred in five patients. There were no permanent side effects. CONCLUSION: Pulsed dye laser is effective and safe for the treatment of angiokeratoma of Fordyce, with minimum side effects, providing an additional nonablative therapeutic option. Adult;Aged;Angiokeratoma;Follow-Up Studies;Genital Neoplasms, Male;Humans;Low-Level Light Therapy;Male;Middle Aged;Penile Neoplasms;Scrotum;Skin Neoplasms;Treatment Outcome

Investigation of the mechanism of action of nonablative pulsed-dye laser therapy in photorejuvenation and inflammatory acne vulgaris. BACKGROUND: Nonablative lasers are widely used for treatment of wrinkles, atrophic scars and acne. These lasers stimulate dermal remodelling and collagen production, but the early molecular stimulus for this is unknown. The mechanism of nonablative lasers in inflammatory acne is variously suggested to be damage either to sebaceous glands or to Propionibacterium acnes. Their effects on cytokine production are unknown. OBJECTIVES: To assess the in vivo effects of a short pulse duration nonablative pulsed-dye laser (NA-PDL) previously used for photorejuvenation and treatment of acne, on cytokine production, P. acnes colonization density and sebum excretion rate (SER). METHODS: We examined the effect of NA-PDL (NliteV; Chromogenex Light Technologies, Llanelli, U.K.) on P. acnes colonization before and after laser therapy using a scrub-wash technique and culture at 0 and 24 h (n = 15), on SER using absorptive tape at 0, 2, 4, 8 and 12 weeks (n = 19) and on cytokine mRNA using reverse transcription-polymerase chain reaction from skin biopsies at 0, 3 and 24 h (n = 8). Results NA-PDL had no effect on P. acnes or SER. Transforming growth factor (TGF)-beta1 mRNA increased fivefold after 24 h and 15-fold in two subjects (P = 0.012). CONCLUSIONS: TGF-beta is known to be a potent stimulus for neocollagenesis and a pivotal immunosuppressive cytokine which promotes inflammation resolution. Its upregulation by NA-PDL provides a possible unifying molecular mechanism linking stimulation of dermal remodelling in photorejuvenation with inhibition of inflammation in acne. Damage to P. acnes

or sebaceous glands cannot explain the effect of this device in acne. Cytokines;RNA, Messenger Acne Vulgaris;Adolescent;Adult;Cytokines;Gene Expression;Humans;Low-Level Light Therapy;Middle Aged;Propionibacterium acnes;RNA, Messenger;Sebaceous Glands;Sebum;Skin;Skin Aging

Laser-induced transepidermal elimination of dermal content by fractional photothermolysis. The wound healing process in skin is studied in human subjects treated with fractional photothermolysis. In-vivo histological evaluation of vacuoles formed over microthermal zones (MTZs) and their content is undertaken. A 30-W, 1550-nm single-mode fiber laser system delivers an array of 60 microm or 140 microm 1e2 incidence microbeam spot size at variable pulse energy and density. Treatments span from 6 to 20 mJ with skin excisions performed 1-day post-treatment. Staining with hematoxylin and eosin demonstrates an intact stratum corneum with vacuolar formation within the epidermis. The re-epithelialization process with repopulation of melanocytes and keratinocytes at the basal layer is apparent by 1-day post-treatment. The dermal-epidermal (DE) junction is weakened and separated just above zones of dermal coagulation. Complete loss of dermal cell viability is noted within the confines of the MTZs 1-day post-treatment, as assessed by lactate dehydrogenase. All cells falling outside the irradiation field remain viable. Content within the epidermal vacuoles stain positively with Gomori trichrome, suggesting a dermal origin. However, the positive staining could be due to loss of specificity after thermal alteration. Nevertheless, this dermal extrusion hypothesis is supported by very specific positive staining with an antihuman elastin antibody. Fractional photothermolysis creates microthermal lesions that allow transport and extrusion of dermal content through a compromised DE junction. Some dermal material is incorporated into the microepidermal necrotic debris and shuttled up the epidermis to eventually be exfoliated through the stratum corneum. This is the first report of a nonablative laser-induced transport mechanism by which dermal content can be predictably extruded biologically through the epidermis. Thus, treatment with the 1550-nm fiber laser may provide the first therapeutic option for clinical indications, including pigmentary disorders such as medically recalcitrant melasma, solar elastosis, as well as depositional diseases such as mucinosis and amyloidosis. Dose Fractionation, Radiation;Epidermal Cells;Epidermis;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Photolysis;Skin;Treatment Outcome;Wound Healing

Cell disintegration by laser-induced transient microbubbles and its simultaneous monitoring by interferometry. Selective retina treatment (SRT) is a novel short pulsed laser therapy of several retinal diseases associated with a decreased metabolism at the retinal pigment epithelium (RPE). The range of laser pulse energies is small, in which the desired selective RPE disintegration is achieved without adverse effects to the neural retina. Thus, a real-time dosimetry control is required. We investigated a noninvasive interferometric technique able to monitor microbubble formation around the intracellular melanin granula, which is the origin of the desired RPE damage. A porcine ex vivo RPE model was irradiated by single pulses (350 ns1.7 mus) of a neodymium: yttrium lithium fluoride laser (527 nm). The specimen was simultaneously probed by a Michelson interferometer (helium neon-laser: 633 nm) and by a hydrophone. Cell viability assays (Calcein-AM) were performed after irradiation. At threshold radiant exposure for cell death (ED(50)=129+/-5 mJ cm2 for 350 ns; ED50=180+/-5 mJ cm2 for 1.7 mus), the interferometric transients changed due to microbubble formation. No major differences in the bubble dynamics were observed between both pulse durations. An algorithm to determine cell death from the interferometric transients showed less than 10% false positive or false negative results for the applied laser expositions compared to the viability assay. Interferometry is a reliable noncontact technique to monitor RPE disintegration and may serve as real-time dosimetry control during SRT. Animals;Apoptosis;Cell Fractionation;Cells, Cultured;Equipment Design;Equipment Failure Analysis;In Vitro Techniques;Interferometry;Low-Level Light Therapy;Microbubbles;Pigment Epithelium of Eye;Radiation Dosage;Radiometry;Swine

[The influence of laser irradiation of low-power density on an experimental cartilage damage in rabbit knee-joints: an in vivo investigation considering macroscopic, histological and immunohistochemical changes]. In a total of 45 rabbits, knee-joint arthrosis was induced according to the Hulth & Telhag model. Depending on the post-operative survival time, the cartilage was investigated macroscopically, histologically and immunohistochemically (within a period of 10 days to 8 months). Thereafter, the influence of laser irradiation at a wavelength of 692.6 nm and energy densities of 1 and 4 J/cm2 on the cartilage morphology seven days following the exposure was examined. After joint instability surgery it was found out that the cartilage changes in the main stress area (MSA) and in regions outside the main stress area (ROMSA) progressed differently. Various qualitative and semi-quantitative changes were found for collagens I, II, IV and V, and for the glycoproteins fibronectin and tenascin. Immunohistochemically, there was a growing expression of collagen I in the apical layers, collagen II showed a stronger pericellular expression, and collagen IV showed, after an initial growth of the pericellular expression, a reduced territorial expression and a stronger apical-interterritorial expression in the osteoarthrotic cartilage. For fibronectin, the cellular expression turned out to grow in the ROMSA. In the MSA it decreased, but at the same time the interterritorial expression grew. For Tanascin, there was a decrease of the interterritorial expression in the radial zone while the pericellular and interterritorial expression of the apical layers of the osteoarthrotic cartilage grew. Lasing proved to significantly influence the osteoarthrotically changed cartilage when applied at an energy density of 1 J/cm2, i.e., the morphological changes had not yet progressed to the extent the control group had. Both the chondrocyte density and the glucosaminoglycan content turned out to be higher. When lasing was applied at higher energy densities, no significant difference among the control groups was found. Thus, it could be demonstrated in vivo that an arthrotic process decelerates through the influence of laser light of low-energy densities. Animals;Cartilage, Articular;Dose-Response Relationship, Radiation;Female;Joint Instability;Low-Level Light Therapy;Osteoarthritis, Knee;Rabbits;Radiotherapy Dosage;Treatment Outcome

Clinical inquiries. What nonpharmacological treatments are effective against common nongenital warts? Cryotherapy has similar cure rates to topical salicylate (a pharmacologic therapy) for nongenital common warts (strength of recommendation [SOR]: B, based on systemic review of variable quality randomized trials). Duct tape may be equivalent to cryotherapy (SOR: B, based on a single randomized trial). CO2 laser, photodynamic therapy, pulsed dye laser (PDL), and Er:Yag laser therapies may also be effective for recalcitrant warts (SOR: C, based on observational cohort studies). Cryotherapy;Elective Surgical Procedures;Humans;Low-Level Light Therapy;Pain;Photochemotherapy;Randomized Controlled Trials as Topic;Warts

Treatment of multiple warts in a renal transplant recipient with decreased laser doses after application of a light absorbing dye. BACKGROUND/PURPOSE: Multiple warts are a tremendous problem in immunosuppressed patients. Standard treatment has low efficacy and is often painful. We examined a new treatment combination of gentian violet and dye-laser. METHODS: A 55-year-old male renal transplant recipient was treated with dye-laser at 585 nm after application of gentian violet 0.5%. RESULTS: One laser pulse made the stain explode and evaporate and resulted in a considerable reduction in warts size with minimal pain and tissue damage. CONCLUSION: Application of gentian violet before dye-laser treatment may be effective in the battle against warts in immunocompromised patients. Anti-Infective Agents, Local;Gentian Violet Administration, Cutaneous;Anti-Infective Agents, Local;Gentian Violet;Humans;Immunocompromised Host;Kidney Transplantation;Low-Level Light Therapy;Male;Middle Aged;Severity of Illness Index;Skin Neoplasms;Warts

Low-level laser therapy applied transcranially to rats after induction of stroke significantly reduces long-term neurological deficits. BACKGROUND AND PURPOSE: Low-level laser therapy (LLLT)

modulates various biological processes. In the present study, we assessed the hypothesis that LLLT after induction of stroke may have a beneficial effect on ischemic brain tissue. METHODS: Two sets of experiments were performed. Stroke was induced in rats by (1) permanent occlusion of the middle cerebral artery through a craniotomy or (2) insertion of a filament. After induction of stroke, a battery of neurological and functional tests (neurological score, adhesive removal) was performed. Four and 24 hours poststroke, a Ga-As diode laser was used transcranially to illuminate the hemisphere contralateral to the stroke at a power density of 7.5 mW/cm2. RESULTS: In both models of stroke, LLLT significantly reduced neurological deficits when applied 24 hours poststroke. Application of the laser at 4 hours poststroke did not affect the neurological outcome of the stroke-induced rats as compared with controls. There was no statistically significant difference in the stroke lesion area between control and laser-irradiated rats. The number of newly formed neuronal cells, assessed by double immunoreactivity to bromodeoxyuridine and tubulin isotype III as well as migrating cells (doublecortin immunoactivity), was significantly elevated in the subventricular zone of the hemisphere ipsilateral to the induction of stroke when treated by LLLT. CONCLUSIONS: Our data suggest that a noninvasive intervention of LLLT issued 24 hours after acute stroke may provide a significant functional benefit with an underlying mechanism possibly being induction of neurogenesis. Animals;Behavior, Animal;Brain;Brain Ischemia;Doublecortin Protein;Infarction, Middle Cerebral Artery;Low-Level Light Therapy;Male;Movement Disorders;Random Allocation;Rats;Rats, Sprague-Dawley;Stroke;Time Factors
Short term beneficial effects of low level laser therapy for patients with rheumatoid arthritis.
Low level laser therapy is not low. Humans;Low-Level Light Therapy;Terminology as Topic
Arthralgia of the temporomandibular joint and low-level laser therapy. OBJECTIVE: This case report describes the treatment of a patient with arthralgia of the temporomandibular joint (TMJ) caused by disc displacement. BACKGROUND DATA: The goal of the treatment of TMJ arthralgia is to decrease pain by promotion of the musculoskeletal system's natural healing ability. METHODS: This report describes the complex treatment of TMJ arthralgia. Low-level laser therapy (LLLT) was chosen for its antiinflammatory and analgesic effects. Laser therapy was carried out using the GaAlAs diode laser with an output power of 400 mW, emitting radiation with a wavelength of 830 nm, and having energy density of 15 J/cm2; the laser radiation was applied by contact mode on four targeted spots in 10 sessions. Physiotherapy was recommended to this patient to prevent the injury of intraarticular tissue caused by incorrect movement during opening of the mouth. Splint stabilization and prosthetic treatment were used to reduce overloading of the TMJ, resulting from unstable occlusion and to help repositioning of the dislocated disc. RESULTS: Five applications of LLLT led to decrease of pain in the area of the TMJ on the Visual Analog Scale, from 20 to 5 mm. The anti-inflammatory effect of the laser was confirmed by thermographic examination. Before treatment, the temperature differences between the areas of the normal TMJ and TMJ with arthralgia was higher than 0.5 degrees C. However, at the conclusion of LLLT, temperatures in the areas surrounding the TMJ were equalized. CONCLUSION: This study showed the effectiveness of complex non-invasive treatment in patients with arthralgia of the TMJ. The analgesic and anti-inflammatory effects of LLLT were confirmed by infrared thermography. Arthralgia;Humans;Low-Level Light Therapy;Male;Middle Aged;Temporomandibular Joint
Histological assessment of the effect of laser irradiation on skin wound healing in rats. OBJECTIVE: The purpose of this study was to evaluate, from the histological point of view, the effect of diode laser irradiation on skin wound healing in Sprague-Dawley rats. BACKGROUND DATA: Various biological effects have been described in different studies after low-level laser therapy (LLLT). METHODS: Two parallel full-thickness skin incisions were performed on the back of each rat (n = 49)

and immediately sutured. After surgery, one wound of each rat was exposed to laser irradiation (continuous mode, 670 nm, daily dose 30 J/cm2), whereas the parallel wound was not irradiated and served as control. Both wounds were removed 24, 48, 72, 96, 120, 144, and 168 h after surgery and routinely fixed and embedded in paraffin sections, stained with hematoxylin and eosin, van Gieson, periodic acid Schiff + periodic acid Schiff diastase, Mallory's phosphotungstic hematoxylin, and azur and eosin, and histopathologically evaluated. RESULTS: As compared to nonirradiated control wounds, laser stimulation shortened the inflammatory phase as well as accelerated the proliferative and maturation phase, and positively stimulated the regeneration of injured epidermis and the reparation of injured striated muscle. CONCLUSION: LLLT at 670 nm positively influences all phases of rat skin wound healing. Animals;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Skin;Wound Healing;Wounds, Penetrating

Comparison between wound healing in induced diabetic and nondiabetic rats after low-level laser therapy. OBJECTIVE: The aim of this work was to compare the effect of low-level laser therapy (LLLT) on the wound healing process in nondiabetic and diabetic rats. BACKGROUND DATA: Among the clinical symptoms caused by diabetes mellitus, a delay in wound healing is a potential risk for patients. It is suggested that LLLT can improve wound healing. METHODS: The tissue used for this study was extracted from animals suffering from diabetes, which was induced by Streptozotocin, and from nondiabetic rats. Animals were assembled into two groups of 25 rats each (treated and control) and further subdivided into two groups: diabetic (n = 15) and nondiabetic (n = 10). A full-thickness skin wound was made on the dorsum area, with a round 8-mm holepunch. The treated group was irradiated by a HeNe laser at 632.8 nm, with the following parameters: 15 mW, exposition time of 17 sec, 0.025 cm2 irradiated area, and energy density of 10 J/cm2. Square full-thickness skin samples (18 mm each side, including both injured and noninjured tissues) were obtained at 4, 7, and 15 days after surgery and analyzed by qualitative and quantitative histological methods. RESULTS: Quantitative histopathological analysis confirmed the results of the qualitative analysis through histological microscope slides. When comparing tissue components (inflammatory cells, vessels and fibroblast/area), we found that treated animals had a less intense inflammatory process than controls. CONCLUSION: Results obtained by both qualitative and quantitative analyses suggested that irradiation of rats with HeNe (632.8 nm), at the tested dose, promoted efficient wound healing in both nondiabetic and diabetic rats as, compared to the control group. Streptozocin Animals;Diabetes Complications;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Streptozocin;Wound Healing;Wounds, Penetrating

Effects of power densities, continuous and pulse frequencies, and number of sessions of low-level laser therapy on intact rat brain. OBJECTIVE: The aim of the present study was to investigate the possible short- and long-term adverse neurological effects of low-level laser therapy (LLLT) given at different power densities, frequencies, and modalities on the intact rat brain. BACKGROUND DATA: LLLT has been shown to modulate biological processes depending on power density, wavelength, and frequency. To date, few well-controlled safety studies on LLLT are available. METHODS: One hundred and eighteen rats were used in the study. Diode laser (808 nm, wavelength) was used to deliver power densities of 7.5, 75, and 750 mW/cm2 transcranially to the brain cortex of mature rats, in either continuous wave (CW) or pulse (Pu) modes. Multiple doses of 7.5 mW/cm2 were also applied. Standard neurological examination of the rats was performed during the follow-up periods after laser irradiation. Histology was performed at light and electron microscopy levels. RESULTS: Both the scores from standard neurological tests and the histopathological examination indicated that there was no long-term difference between laser-treated and control groups up to 70 days post-treatment. The only rats showing an adverse neurological effect were those in the 750 mW/cm2 (about 100-fold optimal dose), CW mode group. In Pu mode, there was much less heating, and no tissue damage was

noted. CONCLUSION: Long-term safety tests lasting 30 and 70 days at optimal 10x and 100x doses, as well as at multiple doses at the same power densities, indicate that the tested laser energy doses are safe under this treatment regime. Neurological deficits and histopathological damage to 750 mW/cm2 CW laser irradiation are attributed to thermal damage and not due to tissue-photon interactions. Animals;Brain;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley

[Immunological and microbiological aspects of low intensity laser effect on the factors of local immunity of the reproductive tract in women with chlamydia infection]. Assessment of immunological and microbiological efficacy of Chlamydia cervicitis management was made by a complex method with a low intensity laser. The total number of leukocytes, percentage of viable cells and the number of neutrophils were detected in cervical secrets. Functional status of neutrophils was studied by a content of lysosomes on the ground of spontaneous and induced by latex HCT-reducing capacity, phagocytic activity. A system of cytokines was studied by interleukine level (IL-1 alpha, IL-1 beta, TNF-alpha, IL-8) and IFN-gamma content in cervical mucus. Positive clinical effect of the local use of the low intensity laser for Chlamydia cervicitis treatment was accompanied by positive changes in immunological indices of cervical secret, normal concentration of cytokines in cervical secret, restoration of the number and functions of neutrophils. Local use of the low intensity laser contributed to decreased number of opportunistic pathogenic microorganisms and their associations, and restored local flora. Acridines;Anti-Bacterial Agents;Interferon Inducers;Interleukins;Interferon-gamma;Azithromycin;10-carboxymethyl-9-acridanone Acridines;Adult;Anti-Bacterial Agents;Azithromycin;Cell Count;Cervix Mucus;Cervix Uteri;Chlamydia Infections;Chlamydia trachomatis;Female;Humans;Interferon Inducers;Interferon-gamma;Interleukins;Leukocyte Count;Leukocytes;Low-Level Light Therapy;Lysosomes;Neutrophils;Phagocytosis;Treatment Outcome;Uterine Cervicitis

Different photoresponses of Staphylococcus aureus and Pseudomonas aeruginosa to 514, 532, and 633 nm low level lasers in vitro. Low Level Light irradiation (LLLI) may proliferate cell growth at certain conditions during a set of photochemical reactions called biostimulation. However, phototoxic inhibitory reactions after irradiating natural or artificially inoculated cells are possible. The purpose of this study was to determine these effects on Pseudomonas aeruginosa and Staphylococcus aureus. Ar ion laser at 514 nm was used to determine the effect of various energy densities of green light on these bacteria. The most effective energy densities of Ar ion laser were chosen to irradiate both bacteria with He-Ne (633 nm) and SHG Nd:YAG (532 nm) lasers to compare the effect of red and green lights on the growth. Irradiation of Pseudomonas aeruginosa for both He-Ne and SHG Nd:YAG lasers in the presence of toluidine blue O or safranine O as photosensitizers was also studied. All energy densities of Ar ion laser showed a proliferative effect on Pseudomonas aeruginosa and inhibitory effect on Staphylococcus aureus. Similarly, SHG Nd:YAG and He-Ne lasers with chosen energy densities were again proliferating for Pseudomonas aeruginosa and inhibitory for Staphylococcus aureus and SHG Nd:YAG was more effective than He-Ne in both cases. Irradiation of Pseudomonas aeruginosa in the presence of both photosensitizers led to the decrease of the cell population compared to the control. Phenazines;Photosensitizing Agents;Tolonium Chloride;Argon;safranine T Argon;Lasers;Phenazines;Photosensitizing Agents;Pseudomonas aeruginosa;Staphylococcus aureus;Tolonium Chloride

Prevention of demineralization by CO2 and Er,Cr:YSGG laser irradiation of overdenture abutments. PURPOSE: To assess the effects of Er,Cr:YSGG and CO2 laser irradiation on the prevention of demineralization of overdenture abutments. METHODS: 32 human canines, premolars, and molars were acquired, cleaned, and scaled. They were randomly divided into two groups. Each tooth had two windows on the occlusal cut dentin. One window on each tooth was irradiated by either Er,Cr:YSGG

or CO2 laser, while the other window served as a control. After pH cycling at pH 5.5 for 18 days and pH 4.7 for 16 days, the teeth were sectioned and analyzed using polarized light microscopy with water as the imbibing medium. RESULTS: The Er,Cr:YSGG irradiated dentin had a mean lesion depth of 207 +/- 27 microm while its control had a mean lesion depth of 209 +/- 34 microm. The CO2 laser irradiated dentin had a mean lesion depth of 185 +/- 24 microm while its control had a mean lesion depth of 205 +/- 22 microm. Based on paired t-tests Er,Cr:YSGG laser irradiation of dentin did not reduce demineralization when compared to the controls (P= 0.81), while CO2 laser irradiation of dentin showed that it helped reduce demineralization when compared to the controls (P= 0.025). Adult;Dental Abutments;Dentin;Denture, Overlay;Humans;Laser Therapy;Low-Level Light Therapy;Pilot Projects;Tooth Demineralization

The effects of infrared-830 nm laser on exercised osteopenic rats. The aim of this study was to investigate the effects of low-level laser therapy (LLLT), 830 nm, on femora of exercised osteopenic rats. Sixty female rats were used, which were divided into six groups: sham-operated control, osteopenic control, sham-operated trained, osteopenic trained, sham-operated trained and irradiated, and osteopenic trained and irradiated. The exercise program and the laser irradiation were performed 48 h over an 8-week period. The exercise program was made in a container, filled with warm water, and consisted of jumps (four series, with ten jumps). The laser irradiation was performed with a Ga-Al-As laser, 830 nm, 100 W/cm2, 120 J/cm2. Femora were submitted to a physical and geometrical properties evaluation, a biomechanical test, and calcium and phosphorus evaluation. Exercised animals showed higher bone strength and physical properties values. However, the LLLT did not improve the stimulatory effects of the exercise on the osteopenic rats. The exercise program was able to increase femora strength and physical properties of osteopenic rats. However, concurrent treatments did not produce a more pronounced effect on femora. Animals;Biomechanical Phenomena;Bone Diseases, Metabolic;Exercise Therapy;Female;Femur;Low-Level Light Therapy;Rats;Rats, Wistar

Effects of Nd:Yag laser irradiation on osteoblast cell cultures. The application of Nd:YAG lasers in endodontics has been explored by many investigators for different purposes. The aim of this in vitro study is to evaluate the effects of Nd:YAG laser on osteoblast cell cultures. A 1,064 nm Nd:YAG laser was used to irradiate human osteoblast-like cells (Saos-2) in noncontact mode for 10 s with different energy settings. The settings varied were pulse energy (20-120 mJ), pulse repetition rate (10-30 Hz), and power output (0.2-3.6 W). He-Ne, the aiming beam of Nd:YAG laser, was used in noncontact mode for 10 s. After 7-, 14-, and 21-day incubation period, cell viability and proliferation were evaluated with methylthiazoletetrazolium (MTT) colorometric method. The comparison of average MTT values gave no statistically significant difference between 20 mJ, 10 Hz, He-Ne, and control ($p < 0.05$). The differences between all other groups were significant ($p < 0.05$). Increase in the pulse energy, pulse repetition rate, and power output has a negative effect on the cell viability and proliferation. Alveolar Process;Cell Culture Techniques;Cell Proliferation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Endodontics;Humans;Laser Therapy;Low-Level Light Therapy;Osteoblasts

[Laser therapy in complex treatment of chronic acalculous cholecystitis]. The effectiveness of various laser techniques in patients with exacerbation of chronic acalculous cholecystitis was studied. The subjects were 62 patients, in whom the diagnosis was made using clinical and instrumental tests. The patients were divided into three groups. Group I received conventional pharmacotherapy; group II received a course of intravenous laser therapy in addition to it; group III received a course of laseropuncture and low-intensive laser irradiation of the hepatic area in addition to pharmacotherapy. The best results according to clinical and instrumental data were achieved in group III. Thus, the study demonstrates advantages provided by laser therapy in complex treatment

of exacerbation of chronic acalculous cholecystitis Adult;Cholecystitis;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Remission Induction;Treatment Outcome

Systemic toxicity from topically applied lidocaine in conjunction with fractional photothermolysis. BACKGROUND: Topical anesthetics, unlike injectable anesthetics, can be applied painlessly and can provide sufficient pain control to maintain patient comfort throughout a variety of laser procedures. Although the use of topical lidocaine is considered relatively safe, instances of cardiotoxic and neurotoxic adverse events have been reported to occur. OBSERVATIONS: A 52-year-old woman underwent fractional photothermolysis for management of severe hypopigmentation and scarring of several years' duration. Shortly after termination of treatment to her face and neck, which required prolonged exposure to a 30% lidocaine gel compound both before and during surgery, she developed clinical signs and symptoms consistent with systemic lidocaine toxicity. The results of laboratory studies confirmed serum lidocaine levels within the toxic range. We postulate that the combination of the high concentration of topical lidocaine required to achieve sufficient anesthesia, together with the laser-induced disruption in epidermal barrier function, may have been responsible for this phenomenon. CONCLUSIONS: Application of a 30% topical lidocaine gel to a limited area in conjunction with fractional photothermolysis may generate serum lidocaine levels high enough to elicit systemic toxicity. Laser surgeons should be alert to this phenomenon, particularly in patients with underlying hepatic, endocrine, cardiac, or central nervous system/psychiatric dysfunction; in patients with a low body mass index; and in patients who are taking medications that may interfere with hepatic lidocaine metabolism. Anesthetics, Local;Lidocaine Administration, Cutaneous;Anesthetics, Local;Diagnosis, Differential;Drug-Related Side Effects and Adverse Reactions;Facial Dermatoses;Female;Humans;Hypopigmentation;Lidocaine;Low-Level Light Therapy;Middle Aged

Facial resurfacing for nonmelanoma skin cancer prophylaxis. OBJECTIVE: To determine the effect of facial skin resurfacing for treatment of actinic keratoses (AKs) and prophylaxis against new primary basal and squamous cell carcinomas in individuals with previous nonmelanoma skin cancer (NMSC) or severe photodamage. DESIGN: Randomized, prospective 5-year trial. SETTING: Dermatology and otolaryngology clinics of a Veterans Affairs hospital. PATIENTS: Thirty-four patients with a history of facial or scalp AKs or basal or squamous cell carcinoma were enrolled. Five of 7 eligible patients who declined study-related treatment were used as controls. Twenty-seven patients were randomized to 3 treatment arms; 3 patients were discontinued from the study. INTERVENTIONS: Carbon dioxide laser resurfacing, 30% trichloroacetic acid peel, or 5% fluorouracil cream applied twice daily for 3 weeks. MAIN OUTCOME MEASURES: Reduction in the number of AKs was measured 3 months after treatment. The incidence of new NMSC in treated areas was assessed between January 1, 2001, and June 30, 2005. Times from baseline to diagnosis of first skin cancer were compared between the treatment and control groups. RESULTS: Treatment with fluorouracil, trichloroacetic acid, or carbon dioxide laser resulted in an 83% to 92% reduction in AKs (P< or =.03), a lower incidence of NMSC compared with the control group (P<.001), and a trend toward longer time to development of new skin cancer compared with the control group (P=.07). However, no significant differences were noted among the treatment groups. CONCLUSION: All 3 modalities demonstrated benefit for AK reduction and skin cancer prophylaxis compared with controls and warrant further study in a larger trial. Keratolytic Agents;Carbon Dioxide;Trichloroacetic Acid;Fluorouracil Aged;Aged, 80 and over;Carbon Dioxide;Carcinoma, Basal Cell;Carcinoma, Squamous Cell;Disease-Free Survival;Drug Administration Schedule;Face;Female;Fluorouracil;Humans;Keratolytic Agents;Keratosis;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Scalp;Severity of Illness Index;Skin Neoplasms;Treatment Outcome;Trichloroacetic Acid

Verruca vulgaris: pulsed dye laser therapy compared with salicylic acid + pulsed dye laser therapy. BACKGROUND: In recent years, lasers have been used in verruca therapy and some successful results have been obtained in some types of verruca. In some of these laser studies, peeling processes have been used to increase penetration. OBJECTIVE: This study aimed to compare the effects of pulsed dye laser (PDL) therapy with the effects of PDL therapy following salicylic acid (SA) application. The purpose of the SA application is to increase the laser penetration by decreasing the hyperkeratosis of verruca vulgaris. METHODS: This controlled study included 66 lesions from 19 patients enrolled in the study. PDL was applied to 33 lesions following 30% SA application twice a day for 5 days, and the remaining 33 lesions underwent PDL therapy. PDL was administered in both groups at 4-week intervals varying from one to five sessions. In the comparison of these two groups, the changes in verruca dimensions were recorded in width x length x height (mm3), and the results of the therapy were evaluated statistically. RESULTS: In both PDL and SA + PDL groups, the regressions observed in the size of the lesions were statistically significant at the end of the fifth session compared with those observed at the onset of the therapy ($P < 0.05$). At the end of the fifth session, the difference between the two groups was not statistically significant ($P = 0.451$); however, the clearance rate in the SA + PDL group was more statistically significant than that in the PDL group after the second session ($P = 0.049$). The complete clearance rate in the SA + PDL group was 54.6% after the second session, but 66.4% in the PDL group only after the fifth session. Complete clearance in the SA + PDL group was observed after 2.2 sessions, and in the PDL group after 3.1 sessions ($P < 0.05$). CONCLUSIONS: Although there was no difference between the clearance rate of the SA + PDL group and that of the PDL group after the fifth session, adding SA to PDL decreased the number of sessions to a large extent. Keratolytic Agents;Salicylic Acid Adolescent;Adult;Child;Female;Humans;Keratolytic Agents;Low-Level Light Therapy;Male;Middle Aged;Salicylic Acid;Treatment Outcome;Warts

Cutaneous effects of cryogen spray cooling on in vivo human skin. BACKGROUND: Despite widespread clinical use of cryogen spray cooling (CSC) in conjunction with laser dermatologic surgery, in vivo cutaneous effects have not been systematically evaluated. OBJECTIVE: The authors characterize the in vivo cutaneous effects for Fitzpatrick skin types I through VI after CSC exposures of varying spurt durations and spurt delivery patterns (single vs. multiple spurts). MATERIALS AND METHODS: Twenty-seven normal human subjects were exposed to single cryogen spurts from 10 to 80 milliseconds, and multiple spurt patterns consisting of two 20-millisecond spurts, four 10-millisecond spurts, and eight 5-millisecond spurts. Subjects were evaluated by clinical observation and photography at 1 hour, 1 day, and 1, 4, 8, and 12 weeks after CSC exposure. RESULTS: Acute erythema and urticaria (1-24 hours) were noted in 14 of 27 and 3 of 27 subjects, respectively. Transient hyperpigmentation occurred in 4 of 27 subjects (skin types III-VI) but resolved spontaneously without medical intervention in all subjects by 8 weeks. No permanent skin changes were noted in any subjects. Skin reactions were more common with longer single-spurt durations (50 milliseconds or greater) and multiple spurt patterns. CONCLUSION: Acute erythema, urticaria, and, less commonly, transient hyperpigmentation were observed after CSC exposure. Permanent skin injury was not observed and is unlikely. Aerosols;Fluorocarbons;tetrafluoroethylene Administration, Topical;Aerosols;Cryotherapy;Fluorocarbons;Humans;Low-Level Light Therapy;Skin;Skin Pigmentation

Bisphosphonate-associated osteonecrosis (BON) of the jaws: a possible treatment? Anti-Bacterial Agents;Bone Density Conservation Agents;Diphosphonates Anti-Bacterial Agents;Bone Density Conservation Agents;Bone Regeneration;Calcification, Physiologic;Combined Modality Therapy;Debridement;Diphosphonates;Follow-Up Studies;Humans;Jaw Diseases;Low-Level Light Therapy;Osteonecrosis;Treatment Outcome;Wound Healing

A clinical comparison and long-term follow-up of topical 5-fluorouracil versus laser resurfacing in the treatment of widespread actinic keratoses. BACKGROUND AND OBJECTIVES: Many treatment modalities exist for actinic keratoses (AK). Topical 5-fluorouracil (5-FU) has been one of the standard treatments. Laser resurfacing is a more recent treatment option. In the literature prospective randomized studies comparing these treatments are lacking. STUDY DESIGN/PATIENTS AND METHODS: Prospective randomized study to compare topical 5-FU with Er:YAG laser resurfacing. Fifty-five patients with multiple AK on the scalp and or the face were included. Clinical and histopathological evaluation took place at 3, 6, and 12 months after treatment. RESULTS: At 3, 6, and 12 months after treatment, there were significantly less recurrences in the laser group compared to the group of patients treated with 5-FU. Side effects did occur more frequently in the laser group, especially erythema and hypopigmentation. CONCLUSIONS: Compared to treatment with topical 5-FU, Er:YAG laser resurfacing is more effective regarding recurrence rates. Although significantly more side effects occur, laser resurfacing is a useful therapeutic option especially in patients with widespread AK. Fluorouracil Administration, Topical;Aged;Aged, 80 and over;Chi-Square Distribution;Face;Female;Fluorouracil;Follow-Up Studies;Humans;Keratosis;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Scalp;Treatment Outcome

Unilateral nevoid telangiectasia--response to pulsed dye laser. BACKGROUND: Unilateral nevoid telangiectasia (UNT) is a unique vascular dermatosis of ambiguous etiology. The therapeutic role of pulsed dye laser in this condition, especially in individuals with skin types III and IV, has not been elucidated completely. The aim of this study was to assess the response to flash-lamp pulsed dye laser of UNT in Indian patients. METHODS: A detailed analysis of nine confirmed cases of UNT patients was undertaken to determine the possible etiologic association of this disease. Six cases were treated with pulsed dye laser in combination with cryogen cooling using the following parameters: spot size, 7 mm; fluence, 5-7.5 J/cm2; wavelength, 585 nm; pulse duration, 450 micros. The procedure was repeated every 4-6 weeks and the response was assessed both clinically and photographically before each session. RESULTS: The cases had a mean age of presentation of 20.6 years with an age of onset varying from 2.5 to 23 years. The lesions were located on the head and neck region in four patients, upper limb in four, and lower limb in one. No significant etiologic association could be established. Of the six cases treated with pulsed dye laser, a moderate response (26-50% lightening) was achieved in all cases after a mean of 2.33 sessions, a good response (51-75% lightening) was observed in four patients after 3.25 sessions, and an excellent response (>75% lightening) was found in three patients after 3.66 sessions. Mild and reversible pigmentary alterations occurred in five cases, with mild textural change in one case. There was no scarring. No recurrence was observed. CONCLUSION: Pulsed dye laser is a useful modality for treating UNT in Indian patients. Reversible pigmentary changes are the major side-effects.
Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Nevus;Skin Neoplasms;Telangiectasis

Therapeutic photobiomodulation of myocardium structure in the hypertensive SHR strain.
Animals;Heart;Hypertension;Light;Male;Myocardium;Photons;Phototherapy;Rats;Rats, Inbred SHR;Rats, Inbred WKY

Excimer laser versus narrow-band UVB (311 nm) in the treatment of psoriasis vulgaris.
BACKGROUND: The excimer laser is a new therapeutic option in the treatment of psoriasis vulgaris. OBJECTIVE: The purpose of this study was to determine the response of psoriasis lesions to the 308-nm excimer laser compared to 311-nm UVB phototherapy. METHODS: In this prospective right/left comparative, open, single-blinded trial, selected psoriasis plaques of 16 patients were treated with the excimer laser whereas the rest of the body was treated with UVB narrow-band phototherapy. A modified PASI score was used to evaluate the results. RESULTS: After 12 treatments, 15 patients were

evaluated. In 2 patients no difference between the two body sides was observed. In 9 patients the laser-treated lesions showed better results, whereas in 4 patients the side treated with 311-nm UVB showed more clearing. The mean reduction in PASI score was 5.6 and 4.9, respectively (difference not significant). CONCLUSION: The use of the 308-nm xenon chloride excimer laser is an additional effective therapeutic option for the treatment of psoriasis vulgaris.
Adult;Aged;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Psoriasis;Single-Blind Method;Treatment Outcome

Monitoring of bactericidal action of laser by in vivo imaging of bioluminescent E. coli in a cutaneous wound infection. The worldwide rise in antibiotic resistance necessitates the development of novel antimicrobial strategies. This study aimed to evaluate the bactericidal action of an 810-nm diode laser in a cutaneous wound infection. An Escherichia coli strain was transformed with a shuttle vector (pRB474) containing firefly luciferase gene from Photinus pyralis resulting in a bioluminescent phenotype. Because firefly luciferase is an enzyme and as such is prone to inactivation at elevated temperature, the first phase has consisted in evaluating in vitro the effect of temperature elevation (30, 40, 50, and 60 degrees C for 2 min) on bacteria bioluminescence. The second phase was performed in vivo. Two full-thickness circular, 14-mm diameter wounds (control and laser-irradiated) were induced on rats. Wound infection was carried out using a suspension (50 microl PBS) containing 5 x 10(7) cells of bioluminescent E. coli (10(9) cells/ml). Thirty minutes later, light irradiation was performed with an 810-nm diode laser (P = 10 W, psi = 1.4 cm, fluence: 130, 195, and 260 J/cm2). Temperature was measured within each wound with a noncontact infrared thermometer. Light emission of the bioluminescent bacteria was monitored in vivo by a bioluminescence imaging system before and at 4, 8, 24, and 48 h after laser irradiation. In vitro, bacteria bioluminescence is not affected when temperature is maintained at 50 degrees C for 2 min. In vivo, bioluminescence imaging showed that at 4 h, the viability of E. coli was reduced when compared to the control (CTRL) group ($p < 0.01$). This observation was confirmed at 8 h ($p < 0.001$), at 24 h ($p < 0.001$), and finally at 48 h ($p < 0.001$). Loss of viability of E. coli depends on laser fluence. At 48 h, bioluminescent bacteria were not detected (100% loss of viability) in the wound irradiated at 260 J/cm2. For this fluence, the temperature reached 45 degrees C at the end of the irradiation. This study confirms previous observations on the bactericidal effect of diode lasers. Because a progressive desiccation of the superficial dermis is usually observed when using laser irradiation, the hypothesis that laser irradiation dries out the wound making the wound an inhospitable place for bacteria is much more relevant than a direct effect of infrared light on chromophores inside bacteria. This is confirmed by the fact that in this latter case, one would expect an immediate drop in luminescence followed by an increase as the surviving bacteria started to divide and repopulate the wound. However, the exact mechanism deserves further studies. This study points out the advantage of using bioluminescence imaging to evaluate laser for the treatment of acute infections in vivo, nondestructively, and noninvasively. Luminescent Agents;Firefly Luciferin;Luciferases, Firefly Animals;Escherichia coli;Escherichia coli Infections;Firefly Luciferin;Low-Level Light Therapy;Luciferases, Firefly;Luminescent Agents;Male;Models, Animal;Rats;Rats, Sprague-Dawley;Skin;Wound Infection

Holmium:YAG laser treatment of ureteral calculi: A 5-year experience. The purpose of this study was to provide an account of the 5-year experience we have gained using holmium:yttrium-aluminium-garnet (Ho:YAG) lasertripsy in the treatment of ureteral stones. One-hundred thirty-seven transurethral ureterolithotripsies were performed in 131 patients. A Ho:YAG laser device, fibres with diameters of 360 and 550 mum, a video camera as well as semi-rigid and flexible ureterorenoscopes were used. Results showed that the direct success rates-which meant stone-free ureters on the first post-operative day-in the upper, middle and lower ureters were 84.6, 88.7 and 94.8%, respectively. The final success rates--which meant stone-free ureters 4 weeks after the operation without a second

intervention--were 84.6, 96.7 and 96.7%, respectively. The pulsatile Ho:YAG laser beam fragmented all kinds of stones easily. No ureteral stricture or reflux was identified during the follow-up period. The advantages of Ho lasertripsy outweighed its disadvantages. Based on our experience, the Ho:YAG laser is one of the most effective and safest energy sources in the treatment of ureteral calculi. Adolescent;Adult;Aged;Aged, 80 and over;Female;Humans;Laser Therapy;Lithotripsy, Laser;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Time Factors;Ureteral Calculi;Ureteroscopy

Effect of Er,Cr:YSGG laser irradiation on eruption of rat mandibular incisor after disturbance of the enamel organ in the pulp. To investigate the efficacy of Er,Cr:YSGG (erbium,chromium:yttrium scandium gallium garnet) laser irradiation in root canal preparation and to evaluate its effect on eruption of rat incisors after disturbance of the enamel organ in the pulp, 20 canals of lower left incisor teeth were prepared by K-files followed by Er,Cr:YSGG laser irradiation, and 20 canals of right incisors were subjected to K-files only (control). At 1 week after irradiation, both sides of incisors erupted at the same level from the gingival margin. Histological findings showed that laser irradiation produced a slightly larger damage in the pulp than that of control. Scanning electron microscope observation revealed that laser-treated surface revealed a rough, irregular, and very clean surface; there was almost no evidence of debris or smear layer, and dentinal tubules were opened. Adequate power of Er,Cr:YSGG laser irradiation is effective in root canal preparation without disturbance of the eruption. Animals;Case-Control Studies;Dental Enamel;Dental Pulp;Dental Pulp Cavity;Dentition;Hot Temperature;Lasers;Low-Level Light Therapy;Microscopy, Electron, Scanning;Rats;Rats, Wistar;Tooth Eruption

Low-level laser irradiation modulates matrix metalloproteinase activity and gene expression in porcine aortic smooth muscle cells. BACKGROUND AND OBJECTIVES: The vascular extracellular matrix is maintained by a dynamic balance between matrix synthesis and degradation. This equilibrium is disrupted in arterial pathologies such as abdominal aortic aneurysm. Low-level laser irradiation (LLLI) promotes wound healing. However, its effect on smooth muscle cells (SMCs), a central player in these responses, has not been established. The current study was designed to determine the effects of LLLI on arterial SMC proliferation, inflammatory markers, and matrix proteins. STUDY DESIGN/MATERIALS AND METHODS: Porcine primary aortic SMCs were irradiated with a 780 nm laser diode (1 and 2 J/cm(2)). Trypan blue exclusion assay, immunofluorescent staining for collagen I and III, Sircol assay, gelatin zymography, and RT-PCR were used to monitor proliferation; collagen trihelix formation; collagen synthesis; matrix metalloproteinase-2 (MMP-2) activity, and gene expression of MMP-1, MMP-2, tissue inhibitor of MMP-1 (TIMP-1), TIMP-2, and IL-1-beta, respectively. RESULTS: LLLI-increased SMC proliferation by 16 and 22% (1 and 2 J/cm(2), respectively) compared to non-irradiated cells ($P<0.01$ and $P<0.0005$). Immediately after LLLI, trihelices of collagen I and III appeared as perinuclear fluorescent rings. Collagen synthesis was increased twofold (2 days after LLLI: 14.3+/-3.5 microg, non-irradiated control: 6.6+/-0.7 microg, and TGF-beta stimulated control: 7.1+/-1.2 microg, $P<0.05$), MMP-2 activity after LLLI was augmented (over non-irradiated control) by 66+/-18% (2 J/cm(2); $P<0.05$), and MMP-1 gene expression upregulated. However, TIMP-2 was upregulated, and MMP-2 gene expression downregulated. IL-1-beta gene expression was reduced. CONCLUSIONS: LLLI stimulates SMC proliferation, stimulates collagen synthesis, modulates the equilibrium between regulatory matrix remodeling enzymes, and inhibits pro-inflammatory IL-1-beta gene expression. These findings may be of therapeutic relevance for arterial diseases such as aneurysm where SMC depletion, weakened extracellular matrix, and an increase in pro-inflammatory markers are major pathologic components. Collagen;Matrix Metalloproteinases Analysis of Variance;Animals;Aorta, Abdominal;Collagen;Gene Expression;Low-Level Light Therapy;Matrix Metalloproteinases;Muscle, Smooth, Vascular;Myocytes, Smooth Muscle;Swine

[Influence of low intensive laser irradiation on ultrastructural changes in kidney tissue in experimental colic]. This investigation aimed at estimation of the influence of low-intensive laser irradiation on ultrastructural changes in renal tissue according to electronic microscopy data in case of experimental renal colic. The experiment was made on twenty rabbits with a single or recurrent colic. Ten animals after a single colic were exposed to low intensive laser therapy. Electronic microscopy showed that single renal colic is associated with marked ultrastructural changes in the proximal tubules. In recurrent colic the edema and destruction were more expressed in all nephron parts. Low intensive laser irradiation suppresses pathological processes in nephrocytes both after a single renal colic and after a recurrent renal colic; has a systemic effect on the body; stimulates compensatory processes in the contralateral kidney. Animals;Colic;Disease Models, Animal;Kidney;Kidney Diseases;Low-Level Light Therapy;Rabbits

[A basic study and clinical trial of 585 nm pulsed dye laser in the treatment of congestive scars]. OBJECTIVE: To study the biological effects of 585 nm pulsed dye laser (FLPDL) in the treatment of congestive scar. METHODS: By histological study, collagen VG staining and microvascular staining, we investigated the changes of collagen fibers and the density of microvessels in the congestive scars after FLPDL treatment. RESULTS: Histological and immunohistochemistry examinations showed that FLPDL achieved normal vascularity in the scar after over 3 times of treatment. CONCLUSIONS: PDL treatment can change fundamentally the physiology of wound healing if applied in the early phases. Adolescent;Adult;Cicatrix;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Plastic Surgery Procedures;Treatment Outcome;Wound Healing;Young Adult

Low-level laser therapy and lateral epicondylitis. Female;Humans;Low-Level Light Therapy;Middle Aged;Pain Measurement;Tennis Elbow

Improvement of familial benign pemphigus after treatment with pulsed-dye laser: a case report. Adult;Axilla;Diagnosis, Differential;Female;Humans;Low-Level Light Therapy;Pemphigus, Benign Familial

New combination of triamcinolone, 5-Fluorouracil, and pulsed-dye laser for treatment of keloid and hypertrophic scars. BACKGROUND: Keloids and hypertrophic scars are benign growths of dermal collagen that usually cause major physical, psychological, and cosmetic problems. METHODS: In this 12-week single-blinded clinical trial, 69 patients were randomly assigned into three study groups. In Group 1, intralesional triamcinolone acetonide (TAC, 10 mg/mL) was injected at weekly intervals for a total of 8 weeks. In Group 2 [TAC+5-fluorouracil (5-FU)], 0.1 mL of 40 mg/mL TAC was added to 0.9 mL of 5-FU (50 mg/mL). This combination was injected weekly for 8 weeks. In Group 3, in addition to weekly TAC+5-FU injection for 8 weeks, lesions were irradiated by 585-nm flashlamp-pumped pulsed-dye laser (PDL, 5-7.5 J/cm2) at the 1st, 4th, and 8th weeks. Lesions were assessed for erythema, pruritus, pliability, height, length, and width. RESULTS: Sixty patients completed the study. At the 8- and 12-week follow-up visits, all groups showed an acceptable improvement in nearly all measures, but in comparison between groups, these were statistically more significant in the TAC+5-FU and TAC+5-FU+PDL groups ($p<.05$ for all). At the end of the study, the erythema score was significantly lower, and itch reduction was statistically higher in the TAC+5-FU+PDL group ($p<.05$ for both). Good to excellent improvements (>50% improvement) were reported by the patients as follows: 20% in Group 1, 55% in Group 2, and 75% in Group 3, all of which were significantly different ($p<.05$). Good to excellent responses were reported by the blinded observer as follows: 15% in Group 1, 40% in Group 2, and 70% in Group 3. Their differences were statistically significant ($p<.05$). Atrophy and telangiectasia were seen in 37% of patients in TAC group. CONCLUSION: Overall efficacy of TAC+5-FU was comparable with TAC+5-FU+PDL, but the TAC+5-FU+PDL combination was more acceptable by the patients and produced better results. Its effect on lightening of the lesion was promising. The TAC+5-FU+PDL combination seems to be the best approach for treatment of keloid and hypertrophic

scars. Keratolytic Agents;Triamcinolone;Fluorouracil Adult;Cicatrix, Hypertrophic;Combined Modality Therapy;Drug Therapy, Combination;Female;Fluorouracil;Humans;Injections, Subcutaneous;Keloid;Keratolytic Agents;Low-Level Light Therapy;Male;Single-Blind Method;Treatment Outcome;Triamcinolone

Brief report: embryonic growth and hatching implications of developmental 670-nm phototherapy and dioxin co-exposure. OBJECTIVE: We assessed the effect of 670-nm light therapy on growth and hatching kinetics in chickens (Gallus gallus) exposed to dioxin. BACKGROUND DATA: Photobiomodulation has been shown to stimulate signaling pathways resulting in improved energy metabolism, antioxidant production, and cell survival. In ovo treatment with 670-nm light-emitting diode (LED) arrays improves hatching success and increases hatchling size in control chickens. Under conditions where developmental dioxin exposure is above the lethality threshold (100 ppt), phototherapy attenuates dioxin-induced early embryonic death. We hypothesized that 670-nm LED therapy would attenuate dioxin-induced developmental anomalies and increase hatching success. METHODS: Fertile chicken eggs were injected with control oil, 2, 20, or 200 ppt dioxin, or 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) prior to the start of incubation. Half of the eggs in each dose group were treated once per day from embryonic days 0-20 with 670-nm LED light at a fluence of 4 J/cm2. Hatchling size, organ weights, and energy parameters were compared between dose groups and LED treatment. RESULTS: LED therapy resulted in earlier pip times (small hole created 12-24 h prior to hatch), and increased hatchling size and weight in the 200 ppt dose groups. However, there appears to be an LED-oil interaction within the oil-treated controls that results in longer hatch times and decreased liver weight within the LED control dose groups in comparison to the non-LED control dose groups. CONCLUSION: Size and hatching times suggest that the hatching success and preparedness of chicks developmentally exposed to dioxin concentrations above the lethality threshold is improved by 670-nm LED treatment administered throughout the gestation period, but the relationship may be complicated by an LED-oil interaction. Dioxins Animals;Chick Embryo;Chickens;Dioxins;Liver;Organ Size;Phototherapy

Effects of laser therapy in CO2 laser wounds in rats. OBJECTIVE: The aim of this study was to assess the effects of laser therapy and its possible dose dependency on the healing of CO2 laser surgical wounds. BACKGROUND DATA: Several reports from our group and others have indicated that light therapies may improve healing, depending on wavelength, dose, intensity of the light, and both local and systemic conditions. METHODS: Circular surgical wounds were created on the dorsum of Wistar rats, which were separated into three groups (A, B, and C). Group A acted as control and had no additional treatment. Groups B and C were irradiated with GaAlAs lambda685-nm laser light, either with 20 J/cm2 (Group B) or 40 J/cm2 (Group C). The animals were humanely killed at the end of the experimental period; specimens were taken and routinely processed to wax and stained with Hematoxylin and Eosin, Sirius Red, and alpha-Smooth Muscle Actin (alphaSMA). RESULTS: Laser-irradiated groups showed a healing process characterized by a more prominent fibroblastic proliferation, with young fibroblasts actively producing collagen; no myofibroblasts were found. No statistically significant differences were observed when the different doses were compared. CONCLUSION: It may be concluded that, using this methodology, laser therapy has a positive effect in wound healing produced by CO2 laser, and the dose has no influence on the treatment. Carbon Dioxide;Collagen Animals;Carbon Dioxide;Cell Proliferation;Collagen;Fibroblasts;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing;Wounds and Injuries

Effect of GaAlAs laser on reactional dentinogenesis induction in human teeth. OBJECTIVE: This study investigated the biomodulatory effect of the gallium- aluminum-arsenate laser (GaAlAs) in pulp cells on reactional dentinogenesis, and on the expression of collagen type III (Col III), tenascin (TN), and fibronectin (FN) in irradiated dental tissues and controls (not irradiated). BACKGROUND DATA:

Several studies suggest a biomodulatory influence of low-intensity laser radiation in the inflammatory and reparative processes of biological tissues. METHODS: Sixteen human premolar teeth were selected (after extraction due to orthodontal reasons) and divided into irradiated and control groups. Black class V cavity preparations were accomplished in both groups. For the irradiated group, GaAlAs laser (670 nm, 50 mW) with an energy density of 4 J/cm2 was used. Soon after, the cavities were restored with a glass ionomer and the extractions made after 14 and 42 days. RESULTS: Histological changes were observed by light microscopy; less intense inflammatory reaction in the irradiated group was found when compared to the controls. Only the irradiated group of 42 days exhibited an area associated with reactional dentinogenesis. After immunohistochemical analysis by the streptoavidin-biotin complex (SABC) method, the expression of Col III, TN, and FN was greater in the irradiated groups. CONCLUSION: Our results suggest that a GaAlAs laser with energy density of 4 J/cm2 and wavelength of 670 nm caused biomodulation in pulp cells and expression of collagen, but not collagen of the extracellular matrix, after preparation of a cavity. Arsenates;Collagen Type III;Fibronectins;Tenascin;Gallium;Aluminum Aluminum;Arsenates;Bicuspid;Collagen Type III;Dental Pulp;Dentinogenesis;Fibronectins;Gallium;Humans;Immunohistochemistry;Low-Level Light Therapy;Tenascin

Treatment of vitiligo using the 308-nm excimer laser. OBJECTIVE: The aim of this study was to study the effectiveness of the 308-nm xenon chloride excimer laser in the treatment of vitiligo and to determine factors that favor a good response to treatment. BACKGROUND DATA: Targeted phototherapy using the 308-nm xenon chloride excimer laser represents an effective therapy for the management of vitiligo. However, studies on a large number of patients are few despite the increasing use of the excimer laser to treat patients with vitiligo. METHODS: A retrospective chart review of 97 patients with chronic stable vitiligo was done with a total of 221 vitiligo patches treated. RESULTS: Out of 221 vitiligo patches treated, 50.6% showed 75% pigmentation or more, 25.5% achieved 100% pigmentation of their patches, and 64.3% showed 50% pigmentation or more. Lesions on the face responded better than lesions elsewhere. CONCLUSION: The 308-nm xenon chloride excimer laser is an effective and safe modality for the treatment of vitiligo, with good results achieved in a relatively short duration of time. Chlorides;Xenon;xenon chloride Adolescent;Adult;Aged;Child;Child, Preschool;Chlorides;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Vitiligo;Xenon

[The venous ulcer therapy in use of the selected physical methods--circumstances for clinical application]. Venous ulcers are significant both surgical and dermatological problem. The chronic and recurrent natures of the disease require a search for new methods to improve treatment efficiency. Therefore, the attempts at using some physical methods are needed. The authors review the current literature on characteristics and biological effects of high voltage stimulation (HVS), ultrasound (sonotherapy) and laser biostimulation. Modern hypotheses (skin battery theory, cavitation, acoustic streaming, fotobiostimulation effect) explaining the mechanisms of applied physical factors arising in soft tissue healing process are presented too. Electric Stimulation Therapy;Humans;Laser Therapy;Ultrasonic Therapy;Varicose Ulcer

New dimensions in Hirsutism. The following is a review of a satellite symposium held at the British Medical Laser Association Meeting, in November 2005. Prof. V.A. Randall gave a comprehensive overview of hormones and hair growth, followed by an in-depth discussion of hirsutism, the therapeutic options, treatment and trends, by Dr. S. Lanigan. Dr. I. Hamzavi concluded the symposium with a presentation of the latest work on eflornithine in combination with laser hair removal. Data were reproduced with the speakers' permission. Androgens;Enzyme Inhibitors;Testosterone;Cholestenone 5 alpha-Reductase;Eflornithine Androgens;Cholestenone 5

alpha-Reductase;Eflornithine;Enzyme Inhibitors;Female;Hirsutism;Humans;Low-Level Light Therapy;Male;Sex Characteristics;Sex Factors;Testosterone

Low level laser therapy partially restores trachea muscle relaxation response in rats with tumor necrosis factor alpha-mediated smooth airway muscle dysfunction. BACKGROUND AND OBJECTIVE: It is unknown if the decreased ability to relax airway smooth muscles in asthma and other inflammatory airways disorders can be influenced by low level laser therapy (LLLT) irradiation. To investigate if LLLT could reduce impairment in inflamed trachea smooth muscles (TSM) in rats. STUDY DESIGN/MATERIALS AND METHODS: Controlled rat study where trachea was dissected and mounted in an organ bath apparatus with or without a TNF-alpha solution. RESULTS: Low level laser therapy administered perpendicularly to a point in the middle of the dissected trachea with a wavelength of 655 nm and a dose of 2.6 J/cm(2), partially restored TSM relaxation response to isoproterenol. Tension reduction was 47.0 % (+/-2.85) in the laser-irradiated group compared to 22.0% (+/-2.21) in the control group ($P < 0.01$). Accumulation of cAMP was almost normalized after LLLT at 22.3 pmol/mg (+/-2.1) compared to 17.6 pmol/mg (+/-2.1) in the non-irradiated control group ($P < 0.01$). CONCLUSION: Low level laser therapy partially restores the normal relaxation response in inflamed TSM and normalizes accumulation of cAMP in the presence of isoproterenol. Tumor Necrosis Factor-alpha Animals;In Vitro Techniques;Low-Level Light Therapy;Male;Muscle Relaxation;Muscle, Smooth;Rats;Rats, Wistar;Trachea;Tumor Necrosis Factor-alpha

Segmental haemangioma of infancy of the lower limb with skeletal overgrowth. A female infant presented at 3 months of age with vascular lesions involving the left lower limb and left side of the vulva. At birth, the left leg was thinner than the right, but equal in length. She had macular, reticulate, bluish discolouration covering most of the skin of the involved leg with superimposed cherry-red papules, most dense over the proximal portion. The macular component showed evidence of improvement within the first few months of life. Papular and nodular components over the leg and the vulva progressively increased in size and thickness until the age of 10 months. These elements had the appearance and behaviour typical of haemangioma of infancy. Regression of these lesions started at the age of 15 months. By the age of 6.5 months, the involved leg was no longer thinner than the right, but the left leg and foot had grown longer. Leg length discrepancy peaked at 2.4 cm at the age of 2 years. The most rapid phase of relative growth discrepancy of left and right leg bones was contemporaneous with the growth phase of the haemangioma. Radiological investigations and histopathology have been consistent with haemangioma of infancy. GLUT-1 immunostaining of the lesion was positive. Female;Femur;Follow-Up Studies;Hemangioma;Humans;Infant;Leg Length Inequality;Low-Level Light Therapy;Tibia;Treatment Outcome

[Effects of combined use of therapeutic physical factors on early postoperative adhesion process in experiment]. Experimental adhesion process in the abdominal cavity was provoked in 36 guinea-pigs by autoimmune injury of the abdomen. The adhesions were exposed to impulse magnetic field and low-intensive infra-red laser radiation. The effects of the latter modalities on adhesion in early postoperative period, further use of lidase electrophoresis and ultrasound were studied. A combined action of various physical factors changes adhesion process: limits adhesion and visceral deformity, makes adhesions elastic. Abdomen;Animals;Combined Modality Therapy;Guinea Pigs;Infrared Rays;Low-Level Light Therapy;Magnetics;Postoperative Period;Tissue Adhesions

Influence of low-energy laser in the prevention of oral mucositis in children with cancer receiving chemotherapy. BACKGROUND: This study assessed the use of low-energy laser in the prevention or reduction of the severity of oral mucositis. PROCEDURE: A randomized clinical trial was carried out. Patients from 3 to 18 years of age treated with chemotherapy or hematopoietic stem-cell transplantation between May, 2003 and February, 2005 were eligible. The intervention group received laser application for 5 days following the start of chemotherapy. The grade of oral mucositis

was assessed by the WHO per NCI-CTC common toxicity criteria and the assessments were made on days 1, 8 and 15 by a trained examiner blind to the intervention. RESULTS: Sixty patients were evaluable for analysis; thirty-nine (65%) were males, 35 (58%) patients had a diagnosis of leukemia or lymphoma, and 25 (42%) had solid tumors. The mean age was 8.7 +/- 4.3 years. Twenty-nine patients were randomized in the laser group and 31 in the control group. On day 1, no patients presented with mucositis. On day 8, of 20 patients (36%) who developed mucositis, 13 of them were from the laser group and 7 from the control group. On day 15, of 24 patients (41%) who developed mucositis, 13 of them were from the laser group and 11 from the control group. There was no significant difference between groups concerning the grades of mucositis on day 8 (P = 0.234) or on day 15 (P = 0.208). CONCLUSIONS: This study showed no evidence of benefit from the prophylactic use of low-energy laser in children and adolescents with cancer treated with chemotherapy when optimal dental and oral care was provided. Antineoplastic Agents, Phytogenic;Etoposide;Irinotecan;Carboplatin;Ifosfamide;Camptothecin;Methotrexate Adolescent;Antineoplastic Agents, Phytogenic;Antineoplastic Combined Chemotherapy Protocols;Camptothecin;Carboplatin;Child;Child, Preschool;Cohort Studies;Etoposide;Female;Humans;Ifosfamide;Irinotecan;Low-Level Light Therapy;Male;Methotrexate;Mouth Mucosa;Neoplasms;Nutritional Status;Oral Hygiene;Severity of Illness Index;Stomatitis;Treatment Outcome

Experimental model for low level laser therapy on ischemic random skin flap in rats. PURPOSE: To develop an experimental model to be used in the study of low level Laser therapy on viability of random skin flap in rats. METHODS: The sample was 24 Wistar-EPM rats. The random skin flap measured 10 x 4 cm and a plastic sheet was interposed between the flap and donor site. Group 1 (control) underwent sham irradiation with diode laser (830 nm). Group 2 was submitted to laser irradiation with diode laser (830 nm). The animals were submitted to Laser therapy with 36 J/cm(2) energy density (72 seconds) immediately after the surgery and on the four subsequent days. The probe was usually held in contact with the skin flap surface on a point at 2.5 cm cranial from the flap base. On the seventh postoperative day, the percentage of necrotic area was measured and calculated. RESULTS: Group 1 reached an average necrotic area of 48.86%, Group 2 - 23.14%. After the statistic analysis, compared with the control group, Group 2 showed a statistically significant increase in survival area ($p<0.001$). CONCLUSION: The experimental model proved to be reliable to be used in the study of effects of low level laser therapy in random skin flap in rats. Analysis of Variance;Animals;Disease Models, Animal;Ischemia;Low-Level Light Therapy;Male;Necrosis;Random Allocation;Rats;Rats, Wistar;Skin;Surgical Flaps;Time Factors;Tissue Survival

Laser therapy for solar lentigines: review of the literature and case report. Solar lentigines are benign, brownish lesions that occur on light exposed skin surfaces from age 30 onwards, as a sign of photoaging. As they are of cosmetic importance to many patients, different therapeutic modalities have been tried to remove these unwanted spots. The recent development of short-pulsed, pigment-specific lasers has enabled physicians to selectively destroy the pigment within the solar lentigo lesions with significant clinical improvement, low risk of adverse effects, and high patient acceptance. Therefore this therapeutic option is superior to traditional treatment modalities and represents the treatment of choice in the management of solar lentigines. A case is reported of the successful use of Q-switched ruby laser in the treatment of solar lentigo on the face. Female;Humans;Lentigo;Low-Level Light Therapy;Middle Aged;Sunlight

[Endovascular Helium-Neon laser irradiation of the blood in the treatment of chronic pyelonephritis]. The authors analyze the condition of free-radical oxidation and activity of antioxidant system, clinical effectiveness of He-Ne laser therapy of patients with chronic pyelonephritis. It is shown that clinical manifestation of the disease is accompanied with activation of free radical oxidation and hypoactivity

of antioxidant system. Endovascular laser hemotherapy stimulates antioxidant system, activity of superoxide dismutase, in particular. A good response and immunomodulation are achieved.
Antioxidants Adolescent;Adult;Antioxidants;Blood;Chronic Disease;Erythrocytes;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pyelonephritis;Treatment Outcome

[Prevention and treatment of face herpes with magnetic-laser radiation from Optodan unit].
Equipment Design;Herpes Labialis;Humans;Low-Level Light Therapy;Treatment Outcome

Combined effect of low-power laser irradiation and anthraquinone anticancer drug aclarubicin on survival of immortalized cells: Comparison with mitoxantrone. The photodynamic response of the anthraquinone anticancer drug aclarubicin (ACL) was investigated in vitro and compared with that of mitoxantrone (MTX). Cultured immortalized rodent B14 and NIH 3T3 cells were used in the experiments as a model for cells with neoplastic phenotype. Long-term cytotoxicity and inhibition of cell proliferation assayed by the clonal growth and MTT-tetrazolium methods were estimated to compare the efficacy of aclarubicin and mitoxantrone in photosensitizing cells and their death after non-thermal exposure to monochromatic laser light. Green He-Ne (543.5 nm) or red semiconductor (670 nm) low-power laser (LPL) irradiations were applied. Different dose-responses of both cell lines to aclarubicin and mitoxantrone were found so that the cytotoxicity of MTX was considerably greater than the cytotoxicity of ACL. Phototherapy response ($P < 0.0001$) was observed only for B14 cells after sensitisation with aclarubicin. Under the same conditions no significant effect of red light irradiation (semiconductor 670 nm laser) on survival of both cell lines treated with mitoxantrone was found.
Antibiotics, Antineoplastic;Photosensitizing Agents;Aclarubicin;Mitoxantrone Aclarubicin;Animals;Antibiotics, Antineoplastic;Cell Line;Cell Survival;Lasers;Mice;Mitoxantrone;Molecular Structure;Neoplasms;Photochemotherapy;Photosensitizing Agents

Effect of low intensity laser irradiation on surgically created bony defects in rats. Low intensity lasers have been used by clinicians to improve healing and reduce pain in humans. Lasing also results in new bone formation around hydroxyapatite implants and a significant increase in the total bone area. However, the exact mechanism of cell biostimulation by laser is still unclear. This study biochemically assessed the effects of low intensity laser (Gallium-Arsenide) using 4 and 22.4 mW cm(-2) power density on the bone healing process after surgically creating bony cavities in rat mandibles. Rats (n = 24) were divided into two groups each treated with specific energy, 4 or 22.4 mW cm(-2), for 3 min each day post-surgery. Surgical cavities were created on both sides of the mandible: the left served as an untreated control, the right was treated with laser. All rats were sacrificed after 1, 2 and 4 weeks of treatment. In the newly formed callus, accumulation of radiocalcium and alkaline phosphatase activity was measured to indicate osteogenic activity. One-way anova with repeated measures showed that the low intensity laser using 4 mW cm(-2) power density significantly increased radiocalcium accumulation from 2 weeks post-surgery, whereas 22.4 mW cm(-2) had no effect. No changes were noted in the activity of alkaline phosphatase with the laser treatment. These results suggest that laser therapy of low power density is effective on the bone healing process in artificially created osseous cavities by affecting calcium transport during new bone formation.
Calcium Radioisotopes;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone Regeneration;Calcification, Physiologic;Calcium Radioisotopes;Low-Level Light Therapy;Male;Mandible;Osteogenesis;Rats;Rats, Wistar;Wound Healing

[Low-intensity laser radiation in preoperative preparation of patients with benign prostatic hyperplasia]. Low-intensity laser therapy administered in the form of intravenous blood irradiation, transrectal and transurethral prostatic irradiation and their combination as preoperative preparation and correction of immunity disturbances in patients with benign prostatic hyperplasia

(BPH) were studied. The response to the treatment was evaluated by positive changes in the immune status and bacterial contamination of the urine and prostatic tissue. Conventional preoperative preparation (uroantiseptics, antibiotics and phytotherapy) fails to correct signs of T-cell immunodeficiency, depression of phagocytic activity of neutrophils, significantly reduce bacteriurea. Laser therapy as intravenous laser blood radiation acts immunomodulatorily on cellular immunity and normalized the proportion of T-helpers of the first and second order (T-suppressors) and neutrophil phagocytosis. The antibacterial effect of this technique on urinary microflora and prostatic tissue is not very high. Local laser therapy is a potent immunostimulator of T- and B-lymphocytes, increased the index of immunoregulatory cells' proportion, activated phagocytosis of neutrophils. It has pronounced antibacterial effect against gram-negative urinary microflora and tissue of the prostate. Combined laser therapy produced the highest immunomodulating action on T-lymphocytes and immunostimulating one on B-lymphocytes, potentiated phagocytic ability of neutrophils, elevated index of the immunoregulatory cells, but was unable to correct their imbalance completely. Antibacterial effects of combined laser therapy were the highest, including the bacterial group Proteus-Providencia. Preoperative low-intensity laser therapy of BPH reduced the number of postoperative pyoinflammatory complications, hospital stay, severity of postoperative period.
Aged;Aged, 80 and over;B-Lymphocytes;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Preoperative Care;Prostatic Hyperplasia;T-Lymphocytes

Endovascular excimer laser atherectomy techniques to treat complex peripheral vascular disease: an orderly process. Peripheral vascular disease represents the largest obstructive subsegment within the vascular system. Advances in equipment, techniques, biochemical treatments, and the influx of multiple specialties into this arena indicate a coming tidal wave of change to the standard treatment plan for patients with claudication and especially critical limb ischemia. Initial attempts in the 1980s to utilize the "laser" to treat peripheral vascular disease led to a clinical debacle: wavelengths and methods were not optimized; tissue heating was excessive, resulting in restenosis. Since then the "laser" has fallen from grace for endovascular treatment, although it has an infinite set of potential wavelengths, energy levels, and delivery methods. The xenon chloride, excimer laser, a pulsed 308-nm system, has overcome many of these early catastrophes. The long, ongoing success of this method of photoablating thrombus and plaque represents a true step forward in the endovascular treatment of occlusive disease. Although only a tool, the excimer laser provides a means to utilize electromagnetic energy instead of shearing mechanical force to resolve occlusions. With its active element at the tip, the excimer laser requires much less mechanical translation force to cross total occlusions, find the distal lumen, and thereby cause less plaque destabilization. In addition, removing the firm surface layer of plaque, decapping, and some of the plaque volume, debulking, exposes the softer subsegments of the plaque to balloon angioplasty. Utilizing this method, more complex lesions can be approached safely, with a high likelihood of successful revascularization and a low risk of potentially limb-threatening complication.
Angiography;Angioplasty, Laser;Atherectomy;Humans;Low-Level Light Therapy;Peripheral Vascular Diseases;Stents

Evaluation of fluence and pulse-duration on purpuric threshold using an extended pulse pulsed-dye laser in the treatment of port wine stains. Laser therapy of port-wine stains (PWS) using the extended pulse pulsed-dye laser (EPPDL) is accepted as the optimal approach because the thermal relaxation time for the vessels in PWS is actually 1-10 msec. The purpose of this study is to elucidate the purpuric threshold using the EPPDL for treatment of PWS. One hundred and seventy-seven Japanese patients with PWS were recruited for this study. All the patients were dark-skinned with skin phototype III (n = 103) and IV (n = 74). PWS were treated with the EPPDL with a pulse duration ranging 1.5-10 msec, fluence ranging 9-15 J/cm(2), and a spot size of 7 mm. Cryogen spray cooling

(CSC) was fixed to 30 msec of delay and 30 msec of spray duration. Patients returned to our clinic within 1 week after their initial laser therapy and the treatment sites were examined for the evidence of purpura formation. Of the 177 patients, 108 developed purpura. The lowest fluences that caused purpura and were seen in more than 50% of patients were 10 J/cm(2) with a pulse duration of 1.5 msec, 12 J/cm(2) with a pulse duration of 3 msec, 13 J/cm(2) with a pulse duration of 6 msec, and 13 J/cm(2) with a pulse duration of 10 msec. The fluence and pulse duration thresholds were 12.5 J/cm(2) and 1.65 msec, respectively. Because purpura is one of the treatment endpoints when using a pulsed-dye laser for PWS, higher fluences are necessary when using a long pulse duration. Adolescent;Adult;Female;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Purpura

Beneficial effect of combined aspiration and interstitial laser therapy in patients with benign cystic thyroid nodules: a pilot study. The aim of this study was to evaluate the effect of combined cyst aspiration and ultrasound-guided interstitial laser photocoagulation (ILP) on recurrence rate and the volume of benign cystic thyroid nodules. 10 euthyroid outpatients with a solitary and cytologically benign partially cystic thyroid nodule causing local discomfort were assigned to cyst aspiration followed by ultrasound-guided ILP and followed for 12 months. The ILP was performed under continuous ultrasound-guidance and with an output power of 2.5-3.5 W. The volume of the nodules was assessed by means of ultrasound and determination of the amount of aspirated cyst fluid, thereby calculating the volume of the solid part. Follow-up included ultrasound and determination of thyroid function. Pressure and cosmetic complaints were evaluated on a visual analogue scale. The median initial volume of the cystic nodule decreased from 9.6 ml [6.8;15.5 (quartiles)] to 3.5 ml [2.7;9.0 (quartiles)] ($p = 0.0001$), and the median cyst volume from 3.0 ml [2.0;6.0 (quartiles)] to 0 ml [0;0.5 (quartiles)] ($p = 0.0001$) during follow-up. Recurrence of the cystic part was defined as a cyst volume > 1 ml. In eight of 10 patients there was no recurrence of the cystic part. Both pressure symptoms and cosmetic complaints were significantly reduced. The only side effect was mild pain or tenderness for a few days. Our study suggests that complete cyst aspiration and subsequent ultrasound-guided ILP of benign cystic thyroid nodules is a feasible and safe technique, resulting in a significant reduction in the volume of both the solid and the cystic component. A large-scale prospective randomized study is warranted. Adult;Aged;Biopsy, Fine-Needle;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Prospective Studies;Statistics, Nonparametric;Thyroid Gland;Thyroid Nodule;Treatment Outcome;Ultrasonography, Interventional

The use of lasers for decorative tattoo removal. As the incidence of tattoo placement continues to increase, so does the demand for tattoo removal, with more than 10 million people in the US alone with a tattoo. Used in an appropriate clinical setting, Q-switched lasers provide relatively efficacious clearance of decorative tattoo pigment with minimal side-effects. We present our clinical experience along with literature findings on decorative tattoo removal and the important issues practitioners should consider in the management of tattoos. Dermatology;Humans;Laser Therapy;Low-Level Light Therapy;Skin;Tattooing

A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. BACKGROUND AND PURPOSE: This systematic review analyzed studies examining the effectiveness of various physical therapy interventions for temporomandibular disorder. METHODS: Studies met 4 criteria: (1) subjects were from 1 of 3 groups identified in the first axis of the Research Diagnostic Criteria for Temporomandibular Disorders, (2) the intervention was within the realm of physical therapist practice, (3) an experimental design was used, and (4) outcome measures assessed one or more primary presenting symptoms. Thirty studies were evaluated using Sackett's rules of evidence and 10

scientific rigor criteria. Four randomly selected articles were classified independently by 2 raters (interrater agreement of 100% for levels of evidence and 73.5% for methodological rigor). RESULTS: The following recommendations arose from the 30 studies: (1) active exercises and manual mobilizations may be effective; (2) postural training may be used in combination with other interventions, as independent effects of postural training are unknown; (3) mid-laser therapy may be more effective than other electrotherapy modalities; (4) programs involving relaxation techniques and biofeedback, electromyography training, and proprioceptive re-education may be more effective than placebo treatment or occlusal splints; and (5) combinations of active exercises, manual therapy, postural correction, and relaxation techniques may be effective. DISCUSSION AND CONCLUSION: These recommendations should be viewed cautiously. Consensus on defining temporomandibular joint disorder, inclusion and exclusion criteria, and use of reliable and valid outcome measures would yield more rigorous research. Adult;Biofeedback, Psychology;Electric Stimulation Therapy;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Randomized Controlled Trials as Topic;Relaxation Therapy;Temporomandibular Joint Disorders;Treatment Outcome

Stimulation of alkalothermophilic Aspergillus terreus xylanase by low-intensity laser radiation. In this study, Aspergillus terreus was irradiated by a 7.3 mW He-Ne laser in the presence of crystal violet, toluidine blue O and hematoporphyrin as photosensitizers. Xylanases recovered from non-irradiated and irradiated fungi were purified and characterized. The maximum production of xylanase (42.2 U/ml) was obtained after 5 min of laser irradiation in the absence of the photosensitizer. The irradiation of the sensitized fungus diminished the production of xylanase. On purification using G-100, the specific activity of xylanase recovered from the irradiated fungus was 292 U/mg protein representing a 37-fold purification over the crude extract compared with 95.6 U/mg protein representing the 12.8-fold for the enzyme recovered from the non-irradiated fungus. The enzyme recovered from the irradiated fungus had lower molecular weight as compared with that recovered from the non-irradiated one. Characterization of the purified enzymes revealed that the enzyme recovered from the irradiated fungus was more thermostable and had a wider range of optimum reaction temperature (60-70 degrees C) and pH (4.0-12.0), compared to the non-irradiated one. Xylans;Xylosidases Aspergillus;Low-Level Light Therapy;Molecular Weight;Xylans;Xylosidases

The effect of 300 mW, 830 nm laser on chronic neck pain: a double-blind, randomized, placebo-controlled study. A randomized, double-blind, placebo-controlled study of low-level laser therapy (LLLT) in 90 subjects with chronic neck pain was conducted with the aim of determining the efficacy of 300 mW, 830 nm laser in the management of chronic neck pain. Subjects were randomized to receive a course of 14 treatments over 7 weeks with either active or sham laser to tender areas in the neck. The primary outcome measure was change in a 10 cm Visual Analogue Scale (VAS) for pain. Secondary outcome measures included Short-Form 36 Quality-of-Life questionnaire (SF-36), Northwick Park Neck Pain Questionnaire (NPNQ), Neck Pain and Disability Scale (NPAD), the McGill Pain Questionnaire (MPQ) and Self-Assessed Improvement (SAI) in pain measured by VAS. Measurements were taken at baseline, at the end of 7 weeks' treatment and 12 weeks from baseline. The mean VAS pain scores improved by 2.7 in the treated group and worsened by 0.3 in the control group (difference 3.0, 95% CI 3.8-2.1). Significant improvements were seen in the active group compared to placebo for SF-36-Physical Score (SF36 PCS), NPNQ, NPAD, MPQVAS and SAI. The results of the SF-36 - Mental Score (SF36 MCS) and other MPQ component scores (afferent and sensory) did not differ significantly between the two groups. Low-level laser therapy (LLLT), at the parameters used in this study, was efficacious in providing pain relief for patients with chronic neck pain over a period of 3 months. Adult;Aged;Chronic Disease;Disability Evaluation;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck

Pain;Pain Measurement;Retrospective Studies;Surveys and Questionnaires;Time Factors;Treatment Outcome
Laser-assisted penetration of allergens for patch testing. BACKGROUND: Patch-test patients often complain of itching and inconvenience. OBJECTIVE: To demonstrate (1) the usefulness of laser-assisted alteration of the stratum corneum to enhance allergen delivery and (2) patient satisfaction with this procedure. METHODS: The LAD-01 (erbium:yttrium-aluminum-garnet) laser unit was used to alter stratum corneum from patients with known sensitivity to nickel or Kathon CG. These allergens were then applied to the laser-pretreated sites for 60 minutes. Results were observed at 24, 48, and 96 hours and at 1 week. One patient who refused conventional patch testing was tested with an entire modified North American standard series tray with the laser patch-test technique. An additional patient with previously demonstrated positive atopy patch-test reactions to environmental organisms was retested with laser pretreatment to the same antigens. RESULTS: Three of three patients known to be sensitive to Kathon CG and eight of eleven known nickel-sensitive patients had positive reactions at the laser-pretreated sites. The patient who was tested with the entire standard series demonstrated relevant positive reactions to formaldehyde and to a textile resin. One subject with known reactions to three environmental organisms reproduced patch-test responses with laser pretreatment. No irritant reactions were noted. Patients reported no pain. CONCLUSION: With further modification, laser pretreatment may improve patient convenience and decrease irritant test reactions owing to occlusion. Allergens Adult;Allergens;Biopsy, Needle;Cohort Studies;Dermatitis, Allergic Contact;Epidermis;Female;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Patch Tests;Reference Values;Sensitivity and Specificity;Skin;Skin Absorption
Modulations of VEGF and iNOS in the rat heart by low level laser therapy are associated with cardioprotection and enhanced angiogenesis. BACKGROUND AND OBJECTIVES: It has been shown previously that low-level laser therapy (LLLT) significantly reduces infarct size following induction of myocardial infarction in rats and dogs. The aim of the present study was to investigate the effect of LLLT on the expression of vascular endothelial growth factor (VEGF) and inducible nitric oxide synthase (iNOS). STUDY DESIGN AND MATERIAL AND METHODS: Myocardial infarction was induced by occlusion of the left descending artery in 87 rats. LLLT was applied to intact and post-infarction. VEGF, iNOS, and angiogenesis were determined. RESULTS: Both the laser-irradiated rat hearts post-infarction and intact hearts demonstrated a significant increase in VEGF and iNOS expression compared to non-laser-irradiated hearts. LLLT also caused a significant elevation in angiogenesis. CONCLUSIONS: It is concluded that VEGF and iNOS expression in the infarcted rat heart is markedly upregulated by LLLT and is associated with enhanced angiogenesis and cardioprotection. Vascular Endothelial Growth Factor A;Nitric Oxide Synthase Type II Animals;Coronary Vessels;Heart;Low-Level Light Therapy;Male;Myocardial Infarction;Myocardium;Neovascularization, Physiologic;Nitric Oxide Synthase Type II;Radiation Dosage;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley;Up-Regulation;Vascular Endothelial Growth Factor A
Effects of low-level laser therapy (LLLT) on the nuclear factor (NF)-kappaB signaling pathway in traumatized muscle. BACKGROUND AND OBJECTIVE: To investigate the effects of low-level laser therapy (LLLT) on nuclear factor kappa B (NF-kappaB) activation and inducible nitric oxide synthase (iNOS) expression in an experimental model of muscle trauma. STUDY DESIGN/MATERIALS AND METHODS: Injury to the gastrocnemius muscle in the rat was produced by a single impact blunt trauma. A low-level galium arsenide (Ga-As) laser (904 nm, 45 mW, and 5 J/cm2) was applied for 35 seconds duration, continuously. RESULTS: Histological abnormalities with increase in collagen concentration, and oxidative stress were observed after trauma. This was accompanied by activation of NF-kappaB and upregulation of iNOS expression, whereas protein concentration of I kappa B alpha decreased. These effects were blocked by LLLT. CONCLUSION: LLLT reduced the inflammatory

response induced by trauma and was able to block the effects of reactive oxygen species (ROS) release and the activation of NF-kappaB. The associated reduction of iNOS overexpression and collagen production suggest that the NF-kappaB pathway may be a signaling route involved in the pathogenesis of muscle trauma. NF-kappa B;Reactive Oxygen Species;Collagen;Gallium;Nitric Oxide Synthase Type II;Arsenic Animals;Arsenic;Collagen;Disease Models, Animal;Gallium;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;NF-kappa B;Nitric Oxide Synthase Type II;Oxidative Stress;Random Allocation;Rats;Rats, Wistar;Reactive Oxygen Species;Signal Transduction;Time Factors;Up-Regulation;Wounds, Nonpenetrating

Condition known as "dark rings under the eyes" in the Japanese population is a kind of dermal melanocytosis which can be successfully treated by Q-switched ruby laser. BACKGROUND: In general, dark rings under the eyes are believed to be a phenomenon caused mainly by physiological change because of their daily fluctuation. Medically speaking, the precise cause or pathogenesis of dark rings is unknown, and this condition has not been clearly defined. In our experience, the dark rings associated with conventional nevus of Ota can be successfully treated with Q-switched ruby laser (QSRL). OBJECTIVE: This study was conducted to clarify the nature of dark rings under the eyes and to determine the efficacy of QSRL. PATIENTS AND METHODS: Fifty-four patients who received a biopsy for pigment macules of the face were retrieved, and of that number 12 patients with bilateral homogeneous pigment macule on suborbital regions were selected for study of the dark rings. Of those patients, the histology and the efficacy of QSRL were evaluated retrospectively. RESULTS: Histologically, all 12 patients indicated dermal melanocytosis, which was confirmed by the Masson-Fontana silver stain and staining against S100. In five patients who received QSRL therapy two times or more, the clinical improvement of two patients was scored as good (40-69%), and two other patients as excellent (>70% clearance). CONCLUSIONS: We speculate that so-called dark rings under the eyes in the Japanese population is a kind of dermal melanocytosis which can be successfully treated by QSRL. Biopsy;Diagnosis, Differential;Facial Dermatoses;Follow-Up Studies;Humans;Low-Level Light Therapy;Melanosis;Orbit;Retrospective Studies;Treatment Outcome

Laser therapy in treatment of generalized parodontitis. Laser therapy has a significant place among the treatment methods in stomatology. An experiment was carried out on 48 male white rats with the masses of 150,0-200,0 gr. Parodontitis was simulated by application of ligature around the dental cervix. Morphometric indicators such as diameter of arterioles and capillars Dk (mkm), density of blood vessels distribution VvK, diameter of the zone of peri-capillar diffusion Di (mkm) and intensity of the local blood circulation were taken as the criteria for the effectiveness of treatment. We also conducted microbiological studies of the mucous tunic of the oral cavity. The results gained on the seventh day of treatment equaled to the reference ones. As a result of a combined treatment with medications (3% indometacin ointment, heparin ointment, vitamins, ferments, antibiotics) and laser-beam therapy, the diameter of arterioles and capillaries was increased, or it is to say, the diameter indicator equaled to the reference one, the capillary distribution density V(v)(K) was increased and the diameter of peri-capillar diffusion was also increased. The indicator of the local blood circulation was increased and reached the norm. The analysis of the data gained through research indicates the effeciency of inclusion of laser therapy into the thorough treatment of parodontitis. Animals;Capillaries;Gingiva;Low-Level Light Therapy;Male;Periodontitis;Rats;Treatment Outcome

The use of 308-nm excimer laser for dermatoses: experience with 34 patients. Targeted phototherapy has been utilized in the past few years for the treatment of various dermatoses. In this article, we summarize the experience of using 308-nm excimer laser at Henry Ford Hospital, Detroit, MI, for the treatment of psoriasis, vitiligo, palmoplantar psoriasis, and hand dermatitis. A total of 34 patients were treated between January 2003 and February 2005. Of the 28 patients with psoriasis,

over 80% had greater than 75% improvement after an average of 12 treatments. While the number of patients was small, excimer laser showed promising results for palmoplantar psoriasis. Possibly due to patient selection bias, we have not had the same success as other studies for the treatment of vitiligo with this modality. Adult;Aged;Aged, 80 and over;Dermatitis;Female;Humans;Low-Level Light Therapy;Male;Medical Records;Middle Aged;Psoriasis;Retrospective Studies;Treatment Outcome;Vitiligo

Excess salt and pepper hair treated with a combination of laser hair removal and topical eflornithine HCl. A common problem among aging women, salt and pepper facial hair poses a significant psychosocial impact as well as a challenge for treatment. Various laser therapies or topical eflornithine HCl 13.9% cream are commonly used to reduce the rate of hair growth. We report a case of a woman with salt and pepper hair in the beard distribution. A combination of laser hair removal with concurrent use of topical eflornithine was used in the treatment. Enzyme Inhibitors;Eflornithine Administration, Topical;Eflornithine;Enzyme Inhibitors;Female;Hirsutism;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction

Treatment of hirsutism and acne in hyperandrogenism. Hirsutism and acne are common and highly distressing complaints in women with polycystic ovary syndrome (PCOS). Drugs are only partially effective on terminalized hairs, and removal of these hairs is usually required. Therefore, management of hirsutism is generally based upon a dual approach: a pharmacological therapy to reduce androgen secretion and/or androgen action, and removal of terminal hair already present. Ovarian suppression of androgen secretion with oral contraceptives is widely used in these women, but its efficacy appears limited. The most effective medical therapy for hirsutism is by anti-androgen drugs. Electrolysis and laser photothermolysis are considered the most effective cosmetic procedures, although the effects of these methods should not be considered permanent. Acne may be treated with different tools, according to the severity of the condition and other characteristics of the patient. These tools include topical and systemic retinoids and antibiotics, topical antibacterial agents, androgen suppression by oral contraceptives, and anti-androgen drugs. 5-alpha Reductase Inhibitors;Androgen Antagonists;Anti-Bacterial Agents;Contraceptives, Oral;Retinoids;Finasteride;Eflornithine 5-alpha Reductase Inhibitors;Acne Vulgaris;Androgen Antagonists;Anti-Bacterial Agents;Combined Modality Therapy;Contraceptives, Oral;Eflornithine;Female;Finasteride;Hirsutism;Humans;Low-Level Light Therapy;Retinoids

Treatment of genital warts in males by pulsed dye laser. OBJECTIVE: To determine the safety and efficacy of the flashlamp-pumped pulsed dye laser for the treatment of uncomplicated genital warts in adult males. METHODS: This was a prospective observational study set in the outpatient clinics of the Department of Andrology and Sexually Transmitted Diseases, National Institute of Laser Enhanced Sciences, the Dermatology Clinic, Cairo University, and the Department of Dermatology and Venereology, Suez Canal University. A total of 174 adult male patients with 550 uncomplicated anogenital warts were included. Selective photothermolysis and photocoagulation of the lesions with the flashlamp-pumped pulsed dye laser was carried out. A pulsed dye laser (wavelength 585 nm, 450 s pulse duration; Cynosure, USA) was used with the following settings: spot size 5-7 mm; fluence 9-10 J/cm2. RESULTS: Complete resolution of treated warts was achieved in 96% of lesions. Side effects were limited, transient and infrequent. Lesion recurrence rate was 5%. CONCLUSION: The pulsed dye laser has been found to be safe, effective and satisfactory for the treatment of anogenital warts in males. It could be used to selectively destroy warts without damaging the surrounding skin. Adult;Anus Diseases;Condylomata Acuminata;Follow-Up Studies;Genital Diseases, Male;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies

Combination blue (415 nm) and red (633 nm) LED phototherapy in the treatment of mild to severe acne vulgaris. BACKGROUND AND OBJECTIVE: Acne vulgaris represents both a challenge to the

treating dermatologist and a major concern for the patient. Conventional treatments have proved inconsistent with often unacceptable side effects and high rates of recurrence. Non-thermal, non-laser, phototherapy for acne with a combination of blue and red light has recently attracted attention. The present study was designed to assess the efficacy of this combination phototherapy. METHODS: Twenty-four subjects, Fitzpatrick skin types II-V, with mild to severe symmetric facial acne vulgaris were recruited for the study. Subjects were well matched at baseline in terms of both age and duration of acne. Subjects were treated over eight sessions, two per week 3 days apart, alternating between 415 nm blue light (20 minutes/session, 48 J/cm2) and 633 nm red light (20 minutes/session, 96 J/cm2) from a light-emitting diode (LED)-based therapy system. Patients received a mild microdermabrasion before each session. Acne was assessed at baseline and at weeks 2, 4, 8 and 12. RESULTS: Twenty-two patients completed the trial. A mean reduction in lesion count was observed at all follow-up points. At the 4-week follow-up, the mean lesion count reduction was significant at 46% (p=0.001). At the 12-week follow-up, the mean lesion count reduction was also significant at 81% (p=0.001). Patient and dermatologist assessments were similar. Severe acne showed a marginally better response than mild acne. Side effects were minimal and transitory. Comedones did not respond as well as inflammatory lesions. CONCLUSIONS: Combination blue and red LED therapy appears to have excellent potential in the treatment of mild to severe acne. Treatment appears to be both pain- and side effect-free. Acne Vulgaris;Humans;Phototherapy;Rejuvenation;Severity of Illness Index;Skin Physiological Phenomena;Treatment Outcome

What's new in hypochromy. Hypochromy is a common dermatological disorder. However, its treatment still gives unsatisfactory results. Interesting clues into the understanding of the pathophysiology of hypochromy have been recently brought about thanks to the pigmentary side effects reported with the new tyrosine kinase inhibition treatments. New therapeutic approaches to hypochromy are further discussed. Antioxidants;Calcineurin Inhibitors;Keratolytic Agents;calcipotriene;Protein-Tyrosine Kinases;Calcitriol;Tacrolimus Administration, Cutaneous;Antioxidants;Calcineurin Inhibitors;Calcitriol;Combined Modality Therapy;Humans;Keratolytic Agents;Low-Level Light Therapy;Phototherapy;Protein-Tyrosine Kinases;Randomized Controlled Trials as Topic;Tacrolimus;Ultraviolet Therapy;Vitiligo

The first 1000 cases of Italian Endovenous-laser Working Group (IEWG). Rationale, and long-term outcomes for the 1999-2003 period. AIM: The innovations for disease management need to be thoroughly evaluated so that their benefits and potential downsides can be compared with the already existing approaches. Endovascular laser (EVL) treatment for varicose veins offers today several advantages over surgical standard stripping. The Italian Endovenous-laser Working Group (IEWG) is a homogeneous group of surgeons and phlebologists who have been using EVL since 1999 and has undertaken to examine EVL in a multicenter study starting from a well defined rationale, with the benefit of a single protocol to use. METHODS: In a cooperative, multicenter, clinical study, 1076 limbs in 1050 patients, mean age of 54.5 years, 241 males and 809 females affected by chronic venous insufficiency (CVI) were considered eligible for surgery and stratified by CEAP classification in a four-year period (January 1999 December 2003). Inclusion criteria were insufficiency of the great and/or small saphenous vein at various levels, beyond those accessory saphenous trunks with incompetence in the saphenofemoral junction. In all cases truncular reflux apparead up on duplex scan examination, with or without associated varicosities. All the patients underwent a surgery on the basis of the clinical assessment. All the centres involved performed treatment in conformity with the Food and Drug Administration (FDA) validated procedure, using an endo-laser venous system kit with a 810-980 nm diode. Duplex scan was performed in all patients after 36 months with very few lost to follow-up cases. RESULTS: In the immediate postoperative period the results have been impressive,

with a very effective closure of incompetent great saphenous vein and the other treated varicose veins (the early occlusion rate has been 99%). Major complications have not been detected: in particular, no deep venous thrombosis (DVT) evaluated duplex ultrasound. The patients' acceptability and satisfaction regarding the procedure, have been measured by means of a questionnaire on the quality of life, and the result was 96.7%. After 36 months, the total occusion rate of saphenous trunks has been 97%. CONCLUSIONS: The first important Italian experience with EVL based on preoperative, perioperative and postoperative duplex control and which is also based on the patients' satisfaction at mid/long-term has indicated some advantages over the standard treatment with the stripping method. In terms of reduced postoperative pain, shorter sick leave, a faster resumption of the normal activities, and, in particular, the total absence of DVT, we can conclude that EVL is a good solution for all patients with anatomic and hemodinamic patterns for saphenous vein surgery.
Adult;Aged;Aged, 80 and over;Chronic Disease;Female;Follow-Up Studies;Humans;Italy;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Saphenous Vein;Time Factors;Treatment Outcome;Ultrasonography, Doppler, Color;Venous Insufficiency

[Laser therapy in rehabilitation of patients with primary chronic gastroduodenitis].
Histamine H2 Antagonists;Famotidine Adolescent;Adult;Chronic Disease;Duodenitis;Famotidine;Female;Gastritis;Histamine H2 Antagonists;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

[Low-intensity laser radiation in therapy of bronchial asthma]. Efficacy of low-intensity laser radiation (LR) was studied by changes in a histamine level in peripheral blood and external respiration function (ERF). A total of 228 patients with exogenic bronchial asthma (EBA) were divided into two groups: 167 patients with nonhormone dependent asthma (group 1) and 61 patients with hormone-dependent bronchial asthma (group 2). Low-intensity LR lowered a histamine level and improved ERF in both group 1 and 2. A definite negative correlation was found between histamine content and ERF parameters. Laser therapy alone is effective in mild EBA. For moderate and severe EBA and hormone-dependent bronchial asthma a combination of conventional drug therapy with low-intensity LR is recommended. Anti-Asthmatic Agents;Histamine Adolescent;Adult;Anti-Asthmatic Agents;Asthma;Blood Cell Count;Female;Histamine;Humans;Low-Level Light Therapy;Male;Middle Aged;Respiration;Treatment Outcome

[Effect of low-intensity laser radiation on lipid metabolism and hemostasis in patients with myocardial infarction]. Progression of coronary atherosclerosis often causes complications resulting in myocardial infarction, early disability and death of patients with coronary heart disease. Low efficacy of medicines against coronary atherosclerosis progression after myocardial infarction gave rise to investigations of nonpharmacological methods, laser radiation, in particular. Our study shows a noticeable positive effect of low-intensity laser radiation on blood lipid spectrum and hemostasis. This makes laser therapy promising in combined rehabilitation of postmyocardial infarction patients.
Adult;Hemostasis;Humans;Lipid Metabolism;Low-Level Light Therapy;Middle Aged;Myocardial Infarction;Treatment Outcome

[Laser therapy for vascular lesions]. The use of lasers to treat vascular lesions began in the late 1960s with the introduction of argon laser. More recently pulsed laser and intense pulsed light techniques have further improved results and reduced side effects. Their function is based on the principle of selective photothermolysis. Simultaneous application of cooling methods (contact cooling, cold air, cryogen spray) has become standard procedure for these types of therapy, whose most important indications are port-wine stain, hemangioma, and telangiectasia. A persistent difficulty is their limited penetration, resulting in limited or no effect on deeper dermal layers. New approaches therefore include combinations with bipolar radio frequency or the use of two different laser systems, e.g., dye and Nd:YAG lasers. The different lasers are described along with their

effectivity, limitations and indications. Combined Modality Therapy;Hemangioma;Humans;Low-Level Light Therapy;Port-Wine Stain;Skin Neoplasms;Telangiectasis

Analysis of the influence of low-power HeNe laser on the healing of skin wounds in diabetic and non-diabetic rats. PURPOSE: To study the influence of HeNe laser irradiation on the collagen percentage in surgically-induced skin wounds in rats with and without alloxan-induced diabetes, by morphometric analysis of collagen fibers. METHODS: 48 male Wistar rats were used, divided into groups: laser-treated diabetic (group 1); untreated diabetic (group 2); treated non-diabetic (group 3); and untreated non-diabetic (group 4). For groups 1 and 2, diabetes was induced by intravenous injection of alloxan (2,4,5,6-tetraoxypyrimidine; 5,6-dioxyuracil; Sigma), into the dorsal vein of the penis, at a rate of 0.1 ml of solution per 100 g of body weight. A wound was made on the back of all the animals. Groups 1 and 3 were treated with HeNe laser (4 J/cm2) for 60 s. One animal from each group was sacrificed on the 3rd, 7th and 14th days after wounding. Samples were taken, embedded in paraffin, stained with hematoxylin-eosin and Masson's trichrome, and morphometrically analyzed using the Imagelab software. The percentages of collagen fibers were determined from the samples from the euthanasia animals. The data were treated statistically using analysis of variance (ANOVA) and the Student t and Kruskal-Wallis tests. The significance level was set at 0.05 or 5%. RESULTS: The results obtained from the samples taken on the third, seventh and fourteenth days after wounding demonstrated that the laser-treated group presented a statistically significant ($p<0.05$) greater mean quantity of collagen fibers than in the non-treated group, both for diabetic rats ($p = 0.0104$) and for non-diabetic rats ($p = 0.039$). CONCLUSION: The low-power laser (632.8 nm) was shown to be capable of influencing the collagen percentage in skin wounds by increasing the mean quantity of collagen fibers, both for the diabetic and for the non-diabetic group. Alloxan;Collagen Alloxan;Animals;Collagen;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Wound Healing

[Effectiveness and safety of long-pulsed Alexandrite laser for hair removal in 1702 patients]. OBJECTIVE: To evaluate the effectiveness and safety of long-pulsed Alexandrite laser for hair removal. METHODS: Hair removal was performed in 1702 hirsute patients with long-pulsed Alexandrite laser. Among them 1603 patients received two or more operations. RESULTS: In patients who received 2, 3, 4, 5, and > or =6 operations, the effectiveness rates were 9.79%, 18.33%, 29.10%, 37.64%, and 82.68%, respectively. The number of operation correlated with the effectiveness, and > or =6 operations resulted in superior outcomes. Pigmentation occurred in 0.94% of the patients (16/1702). CONCLUSION: The long-pulsed Alexandrite laser system is effective and safe in removing hair. Adolescent;Adult;Aged;Child;Child, Preschool;Female;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Treatment Outcome

[Flashlamp-pumped pulsed dye laser (585 nm) in the treatment of port-wine stains--a retrospective study of 2317 Chinese patients]. OBJECTIVE: To evaluate the efficacy and safety of 585 nm flashlamp-pumped pulsed dye lasers (PDL) in the treatment of port-wine stains (PWS). METHODS: A retrospective review was performed in 2 317 patients with PWS who visited the Dermatology Laser Centre of PUMC Hospital and accepted treatment with 585 nm PDL. The correlation between the treatment efficacy and the treatment sessions, lesion types, and usage of other therapies were analyzed. The adverse effects were also observed. RESULTS: All the 2 317 patients with PWS received 1-13 consecutive treatments with PDL at 2-3-month intervals. The median number of treatment was 4.93 and the median energy density was 8.29 J/cm2. The response rate after 8 treatments sessions were 84%. The response rate in patients whose lesions are characterized as purple plaques with proliferation and treated with isotope, CO2, cryotherapy, and other treatments was significantly lower than the total response rate ($P < 0.05$). Superficial scar, hyperpigmentation, and

hypopigmentation were found in 5.2%, 2.5%, and 4.0% of these patients, respectively. CONCLUSION: 585 nm PDL is effective and safe in treating PWS. Adolescent;Adult;Aged;Child;Child, Preschool;Female;Follow-Up Studies;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Retrospective Studies;Treatment Outcome

[Clinical efficacy of Q-switched Alexandrite laser for pigmentary skin diseases in 4656 patients]. OBJECTIVE: To evaluate the clinical efficacy and safety of Q-switched Alexandrite laser in the treatment of pigmentary skin, diseases (PSDs). METHODS: Totally 4 656 patients with PSDs were treated with Q-switched Alexandrite laser. These PDSs included nevus of Ota, seborrheic keratosis, tattoo, naevus fusco-caeruleus zygomaticus, cafe-au-lait-spots, lentigo, naevus of Ito, and spilus naevus. The outcomes and adverse events after treatment were oberserved. RESULTS: The response rate was 92.31% and the cure rate was 55.39% for nevus of Ota after six times of treatment, and the cure rate was 100% after nine times of treatment. The response rate was 100% for freckles, seborrheic keratosis, and naevus fuscocaeruleus zygomaticus after four times of treatment. The response rate was more than 77.18% and the cure rate was more than 50% for tattoos after three times of treatment, including amateur tattoo, artificial eyebrow, eyelid lines, and traumatic tattoo. However, after four times of treatment, the response rate and the cure rate were only 50. 00% and 21.43% for cafe-au-lait spots, and 50.00% and 25.00% for spilus naevus, respectively. The response rate was 35.29% for lentigo and 25.00% for naevus of Ito/ spilus naevus after four times of treatment. CONCLUSION: Q-switched Alexandrite laser is effective in the treatment of nevus of Ota, seborrheic keratosis, tattoo, and naevus fusco-caeruleus zygomaticus, but has limited efficacy for cafe-au-lait-spots, lentigo, naevus of Ito, and spilus naevus. Adolescent;Adult;Aged;Child;Child, Preschool;Female;Follow-Up Studies;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Retrospective Studies;Treatment Outcome

In vivo photoacoustic imaging of blood vessels with a pulsed laser diode. Photoacoustic imaging is a hybrid imaging modality that is based on the detection of acoustic waves generated by absorption of pulsed light by tissue chromophores such as hemoglobin in blood. For this technique, usually large and costly Q-switched Nd:YAG lasers are used. These lasers provide a pulse energy of at least several milliJoules. In search of alternative light sources, we investigated the use of a small and compact pulsed laser diode to image blood vessels. We proved that a pulsed laser diode can be applied for imaging blood vessels in vivo. Acoustics;Blood Vessels;Diagnostic Imaging;Humans;Lasers;Low-Level Light Therapy;Radionuclide Angiography;Spectrum Analysis;Ultrasonography

[Possibilities and prospects of the dental apparatus Optodan use for the magnetic-laser treatment of stomatologic diseases]. Equipment Design;Humans;Low-Level Light Therapy;Stomatognathic Diseases;Treatment Outcome

Long-term results following percutaneous myocardial laser therapy. OBJECTIVES: The usefulness and safety of percutaneous myocardial laser therapy in selected patients have been identified in previous 1-year randomized trial reports, including that from a double-blind, sham-controlled trial we independently conducted. We aimed to determine whether the 1-year effects are maintained through a long-term, longitudinal follow-up. METHODS: Patients (n=77) with chronic, stable, medically refractory angina (class III or IV) not amenable to conventional revascularization and with evidence of reversible ischemia, ejection fraction > or =25%, and myocardial wall thickness > or =8 mm were treated with percutaneous myocardial laser. After the 1-year follow-up and disclosure of all randomized assignments as prespecified in the respective study protocol, patients were followed up longitudinally for a mean of 3 years for angina class, left ventricular ejection fraction, medication usage, and adverse events. RESULTS: No procedural mortality, myocardial infarction, or cerebral embolism occurred. Pericardiocentesis was required in two patients (2.6%). Cardiac event-free

survival was 88% at 1 year and 66% at late follow-up. Mean Canadian Cardiovascular Society angina class was significantly improved from baseline (3.2+/-0.4) at 1 year (2.2+/-1.1, P<0.001) and at a mean of 3 years (1.9+/-1.2, P<0.001). Nitrate usage was significantly reduced at late follow-up; however, ejection fraction did not change over time. In a multivariate analysis, angina improvement at 1 year was found to be a significant independent predictor of both survival and angina improvement at late follow-up. CONCLUSION: We conclude that percutaneous myocardial laser therapy in selected patients with severe, medically refractory angina not treatable with conventional revascularization induces significant and sustained symptomatic benefit. Aged;Angina Pectoris;Angioplasty, Balloon, Coronary;Angioplasty, Balloon, Laser-Assisted;Angioplasty, Laser;Electrocardiography;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Myocardial Revascularization;Randomized Controlled Trials as Topic;Ventricular Function, Left

Low-level laser therapy in acute pain: a systematic review of possible mechanisms of action and clinical effects in randomized placebo-controlled trials. OBJECTIVE: The aim of this study was to review the biological and clinical short-term effects of photoradiation in acute pain from soft-tissue injury. BACKGROUND DATA: It is unclear if and how photoradiation can reduce acute pain. METHODS: Literature search of (i) controlled laboratory trials investigating potential biological mechanisms for pain relief and (ii) randomized placebo-controlled clinical trials which measure outcomes within the first 7 days after acute soft-tissue injury. RESULTS: There is strong evidence from 19 out of 22 controlled laboratory studies that photoradiation can modulate inflammatory pain by reducing levels of biochemical markers (PGE(2), mRNA Cox 2, IL-1beta, TNFalpha), neutrophil cell influx, oxidative stress, and formation of edema and hemorrhage in a dose-dependent manner (median dose 7.5 J/cm(2), range 0.3-19 J/cm(2)). Four comparisons with non-steroidal anti-inflammatory drugs (NSAIDs) in animal studies found optimal doses of photoradiation and NSAIDs to be equally effective. Seven randomized placebo-controlled trials found no significant results after irradiating only a single point on the skin overlying the site of injury, or after using a total energy dose below 5 Joules. Nine randomized placebo-controlled trials (n = 609) were of acceptable methodological quality, and irradiated three or more points and/or more than 2.5 cm(2) at site of injury or surgical incision, with a total energy of 5.0-19.5 Joules. Results in these nine trials were significantly in favor of photoradiation groups over placebo groups in 15 out of 18 outcome comparisons. Poor and heterogeneous data presentation hampered statistical pooling of continuous data. Categorical data of subjective improvement were homogeneous (Q-value = 7.1) and could be calculated from four trials (n = 379) giving a significant relative risk for improvement of 2.7 (95% confidence interval [CI], 1.8-3.9) in a fixed effects model. CONCLUSION: photoradiation can modulate inflammatory processes in a dose-dependent manner and can be titrated to significantly reduce acute inflammatory pain in clinical settings. Further clinical trials with adequate photoradiation doses are needed to precisely estimate the effect size for photoradiation in acute pain. Animals;Humans;Pain Management;Phototherapy;Randomized Controlled Trials as Topic;Soft Tissue Injuries

Photobiomodulation of pain and inflammation in microcrystalline arthropathies: experimental and clinical results. OBJECTIVE: This article presents the results of laser therapy in crystal (hydroxyapatite, calcium pyrophosphate, and urates) deposition-induced arthritis in rats and the clinical applications in humans. BACKGROUND DATA: Microcrystalline arthropathies are prevalent among geriatric patients, who are more vulnerable to the side effects of drugs. The effectiveness of laser therapy for pain relief, free of side effects, has been reported in painful conditions. METHODS: Two milligrams of each of the above-mentioned crystals was injected in both joints of the back limbs in three groups of rats; these groups were then treated with laser irradiation. Three other groups received no treatment after the injections. We determined the plasmatic levels of inflammatory markers (fibrinogen, prostaglandin E2, and TNF(alpha)), tissues (prostaglandin E(2)) and conducted

anatomopathological studies. Twenty-five patients with acute gout arthritis were randomized into two groups and treated over 5 days: group A, diclofenac 75 mg orally, twice a day; and group B, laser irradiation once a day. Forty-nine patients with knee chronic pyrophosphate arthropathy were randomized into two groups and treated over 21 days; group A, diclofenac 50 mg orally, twice a day; and group B, laser irradiation once a day. Thirty patients with shoulder chronic hydroxyapatite arthropathy were randomized into two groups and treated over 21 days; group A, diclofenac 50 mg orally, twice a day; and group B, laser irradiation once a day. RESULTS: Fibrinogen, prostaglandin E(2), and TNF(alpha) concentrations in the rats injected with crystals and treated with laser decreased significantly as compared with the groups injected with crystals without treatment. Both laser therapy and diclofenac achieved rapid pain relief in patients with acute gouty arthritis without significant differences in efficacy. Laser therapy was more effective than diclofenac in patients with chronic pyrophosphate arthropathy and in patients with chronic apatite deposition disease. CONCLUSION: Laser therapy represents an effective treatment in the therapeutic arsenal of microcrystalline arthropathies. Biomarkers;Tumor Necrosis Factor-alpha;Diclofenac;Uric Acid;Fibrinogen;Durapatite;Dinoprostone;Calcium Pyrophosphate Animals;Arthralgia;Arthritis, Experimental;Biomarkers;Calcium Pyrophosphate;Diclofenac;Dinoprostone;Durapatite;Female;Fibrinogen;Gout;Humans;Laser Therapy;Middle Aged;Rats;Tumor Necrosis Factor-alpha;Uric Acid

Clinical and experimental applications of NIR-LED photobiomodulation. This review presents current research on the use of far-red to near-infrared (NIR) light treatment in various in vitro and in vivo models. Low-intensity light therapy, commonly referred to as "photobiomodulation," uses light in the far-red to near-infrared region of the spectrum (630-1000 nm) and modulates numerous cellular functions. Positive effects of NIR-light-emitting diode (LED) light treatment include acceleration of wound healing, improved recovery from ischemic injury of the heart, and attenuated degeneration of injured optic nerves by improving mitochondrial energy metabolism and production. Various in vitro and in vivo models of mitochondrial dysfunction were treated with a variety of wavelengths of NIR-LED light. These studies were performed to determine the effect of NIR-LED light treatment on physiologic and pathologic processes. NIRLED light treatment stimulates the photoacceptor cytochrome c oxidase, resulting in increased energy metabolism and production. NIR-LED light treatment accelerates wound healing in ischemic rat and murine diabetic wound healing models, attenuates the retinotoxic effects of methanol-derived formic acid in rat models, and attenuates the developmental toxicity of dioxin in chicken embryos. Furthermore, NIR-LED light treatment prevents the development of oral mucositis in pediatric bone marrow transplant patients. The experimental results demonstrate that NIR-LED light treatment stimulates mitochondrial oxidative metabolism in vitro, and accelerates cell and tissue repair in vivo. NIR-LED light represents a novel, noninvasive, therapeutic intervention for the treatment of numerous diseases linked to mitochondrial dysfunction. Animals;Chick Embryo;Humans;In Vitro Techniques;Infrared Rays;Mice;Mitochondria;Myocardial Ischemia;Oxidation-Reduction;Rats;Wound Healing

Photobiomodulation of pain in carpal tunnel syndrome: review of seven laser therapy studies. In this review, seven studies using photoradiation to treat carpal tunnel syndrome (CTS) are discussed: two controlled studies that observed real laser to have a better effect than sham laser, to treat CTS; three openprotocol studies that observed real laser to have a beneficial effect to treat CTS; and two studies that did not observe real laser to have a better effect than a control condition, to treat CTS. In the five studies that observed beneficial effect from real laser, higher laser dosages (9 Joules, 12-30 Joules, 32 J/cm(2), 225 J/cm(2)) were used at the primary treatment sites (median nerve at the wrist, or cervical neck area), than dosages in the two studies where real laser was not observed to have a better effect than a control condition (1.8 Joules or 6 J/cm(2)). The average success rate across the

first five studies was 84% (SD, 8.9; total hands = 171). The average pain duration prior to successful photoradiation was 2 years. Photoradiation is a promising new, conservative treatment for mild/moderate CTS cases (motor latency < 7 msec; needle EMG, normal). It is cost-effective compared to current treatments. Carpal Tunnel Syndrome;Humans;Low-Level Light Therapy;Treatment Outcome

[Changes of blood paramagnetic centres of animals irradiated with low-intensity laser]. Therapeutic effects of lasers are based on activation of oxidative process on cellular and subcellular levels. The first photoacceptor of laser beam being mitochondria., which simultaneously represents the source of oxidation products as well as their target and thus, laser exposure can cause numerical effects: inactivation of electron chain components of mitochondria, energy metabolism inhibition, oxidation of lipids and DNA molecule. The aim of the given work is to investigate the influence of submaximal dozes of infrared (0,85 mkm) low-intensity laser on the activity of oxidative processes in laboratory mice blood, which are reflected on the state of paramagnetic centers. For this purpose the condition of blood paramagnetic centers (caeruloplazmin, Fe(3+)-transferin, Fe(2+), Mn(2+), MetHb and NO) has been studied. Results imply that irradiation of mice blood with submaximal dozes of low-intensity laser causes the activation of oxidative process, but those changes do not lead to impairment of blood antioxidant features. Antioxidants;Nitric Oxide Animals;Antioxidants;Blood;Low-Level Light Therapy;Magnetics;Mice;Nitric Oxide

Adjuvant laser acupuncture in the treatment of whiplash injuries: a prospective, randomized placebo-controlled trial. Following introduction of the compulsory use of seat belts in cars, whiplash injuries of the cervical spine have become common in everyday practice. Current treatment approaches lead to resolution of the symptoms within a short time in most cases but cannot prevent a small proportion of patients developing persistent health problems. The effects of adjuvant treatment with laser acupuncture on the acute symptoms and the results one year after the injury were studied in this prospective, randomized, placebo-controlled single-blind study. One group of patients (n = 23) were treated with laser acupuncture (5 mW HeNe laser on 22 acupuncture points for 15 s each) plus cervical collar and a combination of paracetamol and chlormezanone; a second group (n = 22) received the same treatments but with the use of a placebo laser. The treatment was given three times per week until the patient was asymptomatic. No statistically significant advantage of the laser acupuncture treatment was found in the acute phase (mobility in all three planes, duration of pain and duration of use of a cervical collar) or the chronic phase (drug use and the incidences of chronic recurrent problems such as myofascial pain, headaches, vertigo and tinnitus). CONCLUSION: Adjuvant laser acupuncture with a 5 mW HeNe laser and an irradiation time of 15 s appears to be ineffective in the management of whiplash injuries. Analgesics, Non-Narcotic;Muscle Relaxants, Central;Placebos;Acetaminophen;Chlormezanone Acetaminophen;Acupuncture Points;Acupuncture Therapy;Adolescent;Adult;Analgesics, Non-Narcotic;Chlormezanone;Data Interpretation, Statistical;Drug Therapy, Combination;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Muscle Relaxants, Central;Placebos;Prospective Studies;Radiotherapy, Adjuvant;Surveys and Questionnaires;Time Factors;Treatment Outcome;Whiplash Injuries

Treatment of small hepatocellular carcinoma: a comparison of techniques and long-term results. OBJECTIVE: The aim of this study was to compare the results over time of transcatheter arterial chemoembolization (TACE), percutaneous ethanol injection (PEI), laser thermal ablation (LTA) and combined therapy in the treatment of small hepatocellular carcinoma. METHODS: Between 1998 and 2004, 131 cirrhosis patients (99 Child-Pugh class A, 32 Child-Pugh class B) with a small hepatocellular carcinoma were included in the study; 34 were treated with PEI, 46 with LTA, 18 with TACE and 33 with combined therapy. RESULTS: No major complication occurred during any procedure. Computed

tomography scan showed that complete necrosis was achieved in 81% of treated nodules (120 out of 148); as a whole, the disease relapsed in 42 (32.0%) patients (with a disease-free interval of 17.0+/- 13.7 months). The cumulative survival rates were 81.9, 35.7 and 20.8% at 12, 36 and 60 months respectively. A univariate analysis of survival showed statistically significant differences in the comparison between Child-Pugh class A with respect to Child-Pugh class B (P<0.0001) and between nodules with a diameter of 20 mm or less as opposed to larger than 20 mm (P=0.001). Patients subjected to LTA showed a statistically significant longer survival than those treated with TACE and PEI. CONCLUSIONS: LTA proves to be the most effective treatment, affording reduced invasiveness, a limited number of sessions, complete necrosis in almost all cases and better total survival in the treated patients. Antineoplastic Agents;Ethanol Adult;Aged;Aged, 80 and over;Antineoplastic Agents;Carcinoma, Hepatocellular;Chemoembolization, Therapeutic;Combined Modality Therapy;Ethanol;Female;Follow-Up Studies;Humans;Injections, Intradermal;Liver Cirrhosis;Liver Neoplasms;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Recurrence, Local;Prospective Studies;Survival Rate;Tomography, X-Ray Computed

Influence of different power densities of LILT on cultured human fibroblast growth : a pilot study. The aim of this in vitro study was to analyze the influence of different power densities of low-intensity laser therapy (LILT) on the biomodulation of human gingival fibroblasts. The cells were cultured in nutritional deficit. Laser irradiation was carried out with a GaAlAs diode laser (lambda-660 nm, 2 J/cm2). The irradiation was done twice with 12-h interval using the punctual technique, at continuous mode and in contact. The experimental groups were: I, control, nonirradiated; II, power of 10 mW and intensity approximately or equal to 142.85 mW/cm2; III, 29 mW and 428.57 mW/cm2. Growth curves were obtained by using the trypan blue dye exclusion assay. The cell growth of the irradiated groups was significantly higher than control group (P<or=0.05). The cultures of Group II presented cell growth superior to that of Group III. Based on the conditions of this study, we concluded that the power density influences cell growth in an inversely proportional manner. Cell Count;Cell Culture Techniques;Cell Proliferation;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Pilot Projects;Time Factors

The efficacy of low level laser therapy for chronic neck pain. Chronic Disease;Humans;Low-Level Light Therapy;Neck Pain;Pain Measurement

[Use of electropuncture diagnostics and laseropuncture in patient with pulmonary tuberculosis]. Patients with pulmonary tuberculosis have underwent laseropuncture to potentiate the treatment. Electropuncture diagnostics had been carried out to each patient to determine laseropuncture individual recipe. The common treatment of the patient together with laseropuncture resulted in faster lung infiltration resorption and resolution of disease sypmtoms than in patient, who did not undergo laseropuncture. Laseropuncture showed to be effective in decreasing bacterioexcretion period, enhancing tuberculosis cavern healing. Patients with tuberculosis and without concomitant diseases recovered more quickly than tuberculosis patients with concomitant diseases. Antitubercular Agents Antitubercular Agents;Combined Modality Therapy;Electroacupuncture;Humans;Low-Level Light Therapy;Treatment Outcome;Tuberculosis, Pulmonary

The efficacy of excimer laser (308 nm) for vitiligo at different body sites. BACKGROUND: The treatment with XeCl-excimer laser generated 308-nm UVB radiation has shown promising results in patients with vitiligo. OBJECTIVE: In this controlled, prospective trial we studied the primary efficacy (start and grade of repigmentation) and patient's satisfaction of XeCl-excimer laser for treatment of vitiligo patches at different body sites and re-evaluated the achieved repigmentation 12 months after the end of therapy. METHODS: Twenty-five patients with generalized or localized vitiligo with a total of 85 lesions at different body sites were enrolled in this study. Vitiligo patches were treated with

308-nm XeCl-excimer laser 3 times a week for 6 to 10 weeks. The overall repigmentation grade of each treated lesion was evaluated once a week on a 5 point scale rating from 0 (no repigmentation), 1 (1-5%), 2 (6-25%), 3 (26-50%), 4 (51-75%), to 5 (76-100%). RESULTS: Twenty-four patients completed the study. Within 6 to 10 weeks of treatment 67% of the patients (16/24) developed follicular repigmentation of at least one of their vitiligo lesions. Lesion repigmentation started after a mean of 13 treatments in lesions located on the face, trunk, arm, and/or leg (high-responder location), and after a mean of 22 treatments in lesions located on the elbow, wrist, dorsum of the hand, knee, and/or dorsum of the foot (low-responder location). Untreated control lesions and lesions located on the fingers did not achieve any repigmentation. After 10 weeks of treatment repigmentation of more than 75% was found in 25% (7/28) of lesions of the high-responder location group versus 2% (1/43) of lesions of the low-responder location group. In most cases, laser-induced repigmentation was persistent, as determined 12 months after the end of treatment. CONCLUSIONS: 308-nm excimer laser is an effective modality for the treatment of vitiligo. However, similar to other non-surgical treatment modalities, the therapeutic effect is mainly dependent on the location of vitiligo lesions. Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Statistics, Nonparametric;Treatment Outcome;Vitiligo

Effect of different LLLT on pituitrin-induced bradycardia in the rabbit. The objective of this paper was to observe the effect of low-level combined- or single-laser irradiation on bradycardia produced by pituitrin in rabbits. A combined-laser apparatus was made. A 10.6-microm CO2 laser and a 650-nm semiconductor laser, transmitted by different optical fibers, converged to output and irradiate on the Neiguan (PC6) acupuncture point in rabbits with bradycardia produced by pituitrin. Thirty minutes after the model was set, the heart rates of the combined-laser Neiguan group made quicker recoveries than those of the model control group, the laser-control group, or the single-laser Neiguan group ($P<0.05$), and the heart rates of the single-CO2-laser Neiguan group were similar to those of the normal group ($P>0.05$). However, there were significant differences between the 650-nm-laser Neiguan group and the normal control group ($P<0.05$). The combined-laser irradiation certainly has a curative effect on bradycardia produced by pituitrin. A single CO2 laser could accelerate the recovery from bradycardia, while single 650-nm-laser irradiation on the Neiguan acupoint does not produce such an effect. Pituitary Hormones, Posterior Acupuncture Points;Animals;Bradycardia;Disease Models, Animal;Equipment Design;Lasers;Low-Level Light Therapy;Male;Pituitary Hormones, Posterior;Rabbits;Skin Temperature

Argon versus selective laser trabeculoplasty. PURPOSE: To compare conventional argon laser trabeculoplasty (ALT) with selective laser trabeculoplasty (SLT) in terms of their efficiency in lowering the intra-ocular pressure. METHODS: In this retrospective study, 56 eyes from 44 patients with primary open angle glaucoma, ocular hypertension, pseudo-exfoliative (PXF) or pigment dispersion glaucoma (PDG) were included. Patients underwent either ALT (n=18) or SLT (n=38). The intraocular pressure (IOP) was measured immediately prior to and 3 to 5 weeks after the theraPY. RESULTS: At 3 to 5 weeks the lOP-reduction was 22.4% after ALT and 15.5% after SLT ($p = 0.141$). Of note, of the four patients with PDG 2 underwent ALT and 2 SLT. Remarkably, both patients who had had SLT showed a paradoxical rise in lOP after the procedure (+15.5%). When these patients were excluded from the analysis, a similar hypotensive efficacy was found between ALT (-19%) and SLT (-17.9%) ($p = 0.836$). A small additional study with lower energy levels (< 0.9 mJ) confirmed the paradoxical IOP rise in 6 patients with heavily pigmented angles (2 with PDG and 2 with PXF) (+19.2%). It occurred in the absence of steroid treatment and persisted until 12 weeks after treatment. CONCLUSIONS: The short term efficacy of ALT and SLT was similar. In this study, the patients with PDG who underwent SLT showed a paradoxical rise in IOR This finding may indicate that even lower energies (0.4 to 0.6 mJ) are required when performing SLT in patients with heavily pigmented trabeculae.

Aged;Female;Glaucoma;Humans;Intraocular Pressure;Low-Level Light Therapy;Male;Ocular Hypertension;Retrospective Studies;Trabeculectomy;Treatment Outcome

Angioma serpiginosum: dermoscopy for diagnosis, pulsed dye laser for treatment. Angioma serpiginosum is a rare benign vascular disorder, characterized clinically by multiple minute, red to purple, grouped macules in serpiginous and gyrate patterns and histopathologically by ectatic dilatation of capillaries. Patients can undergo unnecessary hematological tests, because the condition can be confused with chronic purpuric dermatoses. An 18-year-old man with angioma serpiginosum of his left arm was evaluated by dermoscopy and treated with pulsed dye laser. Numerous small, relatively well-demarcated, round to oval red lagoons were determined with dermoscopy, and approximately 75% of the area of his lesion disappeared after four sessions of pulsed dye laser. Our case supports the hypothesis that dermoscopy is beneficial in the diagnosis of angioma serpiginosum and that pulsed dye laser is effective in the treatment of this disorder.
Adolescent;Dermoscopy;Hemangioma;Humans;Low-Level Light Therapy;Male;Skin Neoplasms

Collagen birefringence in skin repair in response to red polarized-laser therapy. We use the optical path difference (OPD) technique to quantify the organization of collagen fibers during skin repair of full-thickness burns following low-intensity polarized laser therapy with two different polarization incidence vectors. Three burns are cryogenerated on the back of rats. Lesion L(parallel) is irradiated using the electric field vector of the polarized laser radiation aligned in parallel with the rat's occipital-caudal direction. Lesion L(perpendicular) is irradiated using the electric field vector of the polarized laser radiation aligned perpendicularly to the aforementioned orientation. Lesion C is untreated. A healthy area labeled H is also evaluated. The tissue samples are collected and processed for polarized light microscopy. The overall finding is that the OPD for collagen fibers depends on the electric field vector of the incident polarized laser radiation. No significant differences in OPDs are observed between L(parallel) and H in the center, sides, and edges of the lesion. Lesions irradiated using the electric field vector of the polarized laser radiation aligned in parallel with the rat's occipital-caudal direction show higher birefringence, indicating that collagen bundles in these lesions are more organized. Collagen Birefringence;Burns;Cicatrix;Collagen;Color;Low-Level Light Therapy;Microscopy, Polarization;Skin;Treatment Outcome;Wound Healing

Low-level laser therapy in management of postmastectomy lymphedema. The aim of this paper was to study the effects of low-level laser therapy (LLLT) in the treatment of postmastectomy lymphedema. Eleven women with unilateral postmastectomy lymphedema were enrolled in a double-blind controlled trial. Patients were randomly assigned to laser and sham groups and received laser or placebo irradiation (Ga-As laser device with a wavelength of 890 nm and fluence of 1.5 J/cm2) over the arm and axillary areas. Changes in patients' limb circumference, pain score, range of motion, heaviness of the affected limb, and desire to continue the treatment were measured before the treatment and at follow-up sessions (weeks 3, 9, 12, 18, and 22) and were compared to pretreatment values. Results showed that of the 11 enrolled patients, eight completed the treatment sessions. Reduction in limb circumference was detected in both groups, although it was more pronounced in the laser group up to the end of 22nd week. Desire to continue treatment at each session and baseline score in the laser group was greater than in the sham group in all sessions. Pain reduction in the laser group was more than in the sham group except for the weeks 3 and 9. No substantial differences were seen in other two parameters between the two treatment groups. In conclusion, despite our encouraging results, further studies of the effects of LLLT in management of postmastectomy lymphedema should be undertaken to determine the optimal physiological and physical parameters to obtain the most effective clinical response.
Adult;Arm;Axilla;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Patient Satisfaction;Treatment Outcome

A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders. BACKGROUND AND PURPOSE: The purpose of this qualitative systematic review was to assess the evidence concerning the effectiveness of physical therapy interventions in the management of temporomandibular disorders. METHODS: A literature search of published and unpublished articles resulted in the retrieval of 36 potential articles. RESULTS: Twelve studies met all selection criteria for inclusion in the review: 4 studies addressed the use of therapeutic exercise interventions, 2 studies examined the use of acupuncture, and 6 studies examined electrophysical modalities. Two studies provided evidence in support of postural exercises to reduce pain and to improve function and oral opening. One study provided evidence for the use of manual therapy in combination with active exercises to reduce pain and to improve oral opening. One study provided evidence in support of acupuncture to reduce pain when compared with no treatment; however, in another study no significant differences in pain outcomes were found between acupuncture and sham acupuncture. Significant improvements in oral opening were found with muscular awareness relaxation therapy, biofeedback training, and low-level laser therapy treatment. DISCUSSION AND CONCLUSION: Most of the studies included in this review were of very poor methodological quality; therefore, the findings should be interpreted with caution. Acupuncture Therapy;Adolescent;Adult;Aged;Biofeedback, Psychology;Exercise Therapy;Female;Humans;Laser Therapy;Male;Manipulation, Chiropractic;Middle Aged;Pain;Pain Measurement;Physical Therapy Modalities;Posture;Range of Motion, Articular;Relaxation Therapy;Temporomandibular Joint;Temporomandibular Joint Disorders;Time Factors;Transcutaneous Electric Nerve Stimulation

Light-emitting diode phototherapy at 630 +/- 3 nm increases local levels of skin-homing T-cells in human subjects. BACKGROUND AND AIMS: Red light phototherapy with laser sources has been used successfully for a number of indications. A new generation of quasimonochromatic 630 +/- 3 nm light-emitting diode (LED) systems has recently been yielding good results for the same indications, but no study has examined changes in visible red light irradiated skin at an immunological level. This study was thus designed to examine changes in skin-homing T-cell levels induced in normal human skin by visible red LED energy. SUBJECTS AND METHODS: Six adult male volunteers (35 approximately 48 years old) who satisfied all study criteria had the skin over the lateral aspect of the leg irradiated once per week for 8 weeks with a visible red (630 +/- 3 nm) LED-based system, with irradiance of 105 m/cm2, 15 minutes/session, and a radiant flux of 94 J/cm2. Skin biopsies were performed after the eighth treatment session, and cultures were prepared to assay the type and quantity of skin-homing T-cells using qualitative and quantitative polymerase chain reaction (PCR) techniques. Ultrastructural changes were also assessed with transmission electron microscopy. RESULTS: Transmission electron microscopy revealed mild fibroplastic changes in fibroblasts, with no acute inflammatory changes throughout the treatment session. Qualitative PCR showed the presence of both Th-1 and Th-2 T-cells, and quantitative PCR showed an increase in the numbers of both types of skin-homing T-cells, much more so for Th-2 than for Th-1. CONCLUSIONS: Visible red LED irradiation appears to activate the skin-homing immune system. Adult;Humans;Male;Middle Aged;Phototherapy;Skin;T-Lymphocytes

Lasers may induce terminal hair growth. Hair Follicle;Humans;Low-Level Light Therapy

Repeated treatment protocols for melasma and acquired dermal melanocytosis. BACKGROUND AND OBJECTIVE: Melasma and acquired dermal melanocytosis (ADM; acquired bilateral nevus of Ota-like macules) are both seen most commonly symmetrically on the face of women with darker skin and are also known as difficult conditions to treat. METHODS: Our topical bleaching protocol with 0.1 to 0.4% tretinoin gel and 5% hydroquinone was performed repeatedly (1-3 times) for melasma (n=163), and a combination treatment with topical bleaching and Q-switched ruby (QSR) laser was performed

repeatedly (1-3 times) for ADM (n=62). RESULTS: There is a significant correlation between clinical results (clearance of pigmentation) and the number of sessions in both melasma (p=.019) and ADM (p<.0001). CONCLUSION: The repeated treatment protocol for melasma and ADM showed successful clinical results compared with conventional ones, and they may be applied to other pigment conditions. It may be better that epidermal and dermal pigmentations are treated separately, especially in dark-skinned people who are more likely to suffer postinflammatory hyperpigmentation after inflammation-inducing therapies. Antioxidants;Hydroquinones;Keratolytic Agents;Tretinoin;hydroquinone Adult;Antioxidants;Asian People;Combined Modality Therapy;Drug Therapy, Combination;Facial Neoplasms;Female;Follow-Up Studies;Humans;Hydroquinones;Keratolytic Agents;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Nevus, Pigmented;Retreatment;Skin Neoplasms;Treatment Outcome;Tretinoin

Hypothesis that embolization is an important mechanism in the laser destruction of cutaneous vascular lesions. It is hypothesized that laser-induced red blood cell aggregations form emboli that assist in the therapeutic effect of lasers on vascular lesions. Embolization, Therapeutic;Humans;Low-Level Light Therapy;Skin Diseases;Telangiectasis

Long-pulsed neodymium:yttrium-aluminum-garnet laser treatment for port wine stains. Neodymium;Yttrium;Aluminum Aluminum;Humans;Low-Level Light Therapy;Neodymium;Port-Wine Stain;Reproducibility of Results;Treatment Outcome;Yttrium

A comparison of Q-switched alexandrite laser and intense pulsed light for the treatment of freckles and lentigines in Asian persons: a randomized, physician-blinded, split-face comparative trial. BACKGROUND: Q-switched (QS) pigmented lasers and intense pulsed light (IPL) successfully treat pigment disorders. OBJECTIVE: We sought to compare efficacy and side effects of QS alexandrite laser (QSAL) and IPL for freckle and lentigo treatment in Asians. METHODS: In all, 15 patients with freckles and 17 patients with lentigines were treated randomly with one session QSAL in one cheek and two sessions IPL in the other cheek at 4-week intervals. Efficacy was determined using a new pigmentation area and severity index score. RESULTS: All patients experienced improvement ($P < .0001$). Postinflammatory hyperpigmentation developed in one patient with freckles and 8 patients with lentigines after QSAL. No postinflammatory hyperpigmentation occurred after IPL. Freckles achieved greater improvement after QSAL than IPL ($P = .04$). In lentigines, the results after IPL were better than QSAL among those with postinflammatory hyperpigmentation after QSAL. LIMITATIONS: Limitations include a small case number and short follow-up period. CONCLUSION: QSAL was superior to IPL for freckle treatment. IPL should be used for lentigines in Asian persons. alexandrite;Beryllium Adult;Beryllium;Face;Female;Humans;Lentigo;Low-Level Light Therapy;Melanosis;Middle Aged;Phototherapy;Severity of Illness Index;Single-Blind Method;Skin Pigmentation;Treatment Outcome

Effects of argon laser irradiation on polar excitations in frog sciatic nerve. BACKGROUND AND OBJECTIVES: Since the mechanisms underlying the effects of low-power laser irradiation on the nervous system remain unclear, we examined whether such irradiation can influence ionic channels of the nerve membrane using the law of polar excitation in isolated frog sciatic nerve. STUDY DESIGN/MATERIALS AND METHODS: Using 43 frogs (Xenopus laevis), nerve preparations were stimulated at 0.5/second using a 10-millisecond pulse at supramaximal intensity. Ar+ laser irradiation (457, 488, 514 nm; 50, 75, 100 mW) was applied for 30 minutes to the portion between the anode and cathode stimulating electrodes. RESULTS AND CONCLUSIONS: Ar+ laser irradiations (457, 488 nm; 50 mW) blocked the generation of anode-break-excitation, rather than cathode-make-excitation. Such a selective effect occurred when applying a blocker of hyperpolarization-activated cation current (Ih) channel, ZD7288. Ar+ laser irradiation may influence Na+ channels in addition to Ih

channels. Argon Action Potentials;Animals;Argon;Electric Stimulation;Electrophysiology;Lasers;Sciatic Nerve;Xenopus laevis

Repair of bone defects treated with autogenous bone graft and low-power laser. Because bone healing at the graft site is similar to a fracture repair, the purpose of the present study was to evaluate the effects of low-power laser irradiation on the repair of rat skull defects treated with autogenous bone graft. A defect measuring 3 mm in diameter was produced in the left parietal bone and filled with an autogenous bone graft obtained from the right parietal bone. The animals were divided into 3 groups of 20 rats each: nonirradiated control, irradiated with 5.1 J/cm, and irradiated with 10.2 J/cm. The laser (2.4 mW, 735 nm, 3.4 x 10 W/cm, 3-mm spot size) was applied three times per week for 4 weeks. Greater volume of newly formed bone was observed in the irradiated group with 10.2 J/cm. In both irradiated groups, a greater volume of newly formed bone occurred only in the first 2 weeks. The results demonstrated that laser irradiation at the grafted site stimulated osteogenesis during the initial stages of the healing process in a skull defect of the rat and that this effect was dose dependent. Analysis of Variance;Animals;Bone Density;Bone Regeneration;Bone Transplantation;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Parietal Bone;Rats;Rats, Wistar

Effect of low-level laser (Ga-Al-As 655 nm) on skeletal muscle fatigue induced by electrical stimulation in rats. We investigated whether low-level laser therapy (LLLT) can reduce muscular fatigue during tetanic contractions in rats. Thirty-two male Wistar rats were divided into four groups receiving either one of three different LLLT doses (0.5, 1.0, and 2.5 J/cm2) or a no-treatment control group. Electrical stimulation was used to induce six tetanic muscle contractions in the tibial anterior muscle. Contractions were stopped when the muscle force fell to 50% of the initial value for each contraction (T50%). There was no significant difference between the 2.5 J/cm2 laser-irradiated group and the control group in mean T50% values. Laser-irradiated groups (0.5 and 1.0 J/cm2) had significantly longer T50% values than the control group. The relative peak force for the sixth contraction in the laser-irradiated groups were significantly higher at 92.2% (SD 12.6) for 0.5 J/cm2, 83.2% (SD 20.5) for 1.0 J/cm2, and 82.9% (SD 18.3) for 2.5 J/cm2 than for the control group [50% (SD 15)]. Laser groups receiving 0.5 and 1.0 J/cm2 showed significant increases in mean performed work compared with both the control group and their first contraction values. Muscle damage was indirectly measured by creatine kinase levels in plasma. A distinct dose-response pattern was found in which 1.0 and 2.5 J/cm2 LLLT groups had significantly lower creatine kinase levels than the 0.5 J/cm2 LLLT group and the control group. We conclude that LLLT doses of 0.5 and 1.0 J/cm2 can prevent development of muscular fatigue in rats during repeated tetanic contractions. Creatine Kinase Animals;Creatine Kinase;Dose-Response Relationship, Radiation;Electric Stimulation;Hypoxia;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Rats;Rats, Wistar

Comparison of biophysical properties of skin measured by using non-invasive techniques in the KM mice following 595 nm pulsed dye, 1064 nm Q-Switched Nd:YAG and 1320 nm Nd:YAG laser non-ablative rejuvenation. BACKGROUNDS/AIMS: The aim of the study was to compare the changes of the biophysical properties and to objectify the effects of 595 nm pulsed dye, 1064 nm Q-switched Nd:YAG and 1320 nm Nd:YAG lasers non-ablative rejuvenation by non-invasive techniques. METHODS: KM mice were used for the study. The 595 nm pulsed dye, 1064 nm Q-switched Nd:YAG and 1320 nm Nd:YAG laser treatments were evaluated with biophysical parameter measurements including skin elasticity, skin color, skin trans-epidermal water loss (TEWL) and skin hydration. RESULTS: All three lasers improved the biophysical properties in the skin of KM mice. In skin elasticity measurements, the 1064 nm laser treatment showed the lowest ratio (0.61+/-0.09) while the 1320 nm laser showed the highest one (0.76+/-0.07) on day 60. For erythema values, a significant increase

was observed immediately after the 1064 nm laser treatment (196.67+/-19.17), but the lowest values occurred with the 1320 nm laser treatment (189.83+/-16.54). None of the three lasers resulted in obvious changes of skin melanin. TEWL increased immediately after laser irradiation, then began to recover and decreased 60 days after the 595 and 1064 nm laser treatments. With the 1320 nm laser treatment the TEWL began to decrease from day 7 and obtained the lowest mean values (5.23+/-1.13). The water-holding capacity increased initially for the 595 and 1320 nm laser irradiation, while decreased for the 1064 nm laser. At day 60 of the experiment, skin hydration values in all animals were superior to those of the controls. The 1320 nm laser treatment caused the highest ratio (1.29+/-0.26). Both the values of TEWL and skin hydration for the 1320 nm laser treated areas differed significantly from the other two lasers. CONCLUSIONS: Our data showed the 1064 nm Q-switched Nd:YAG laser treatment was most effective in improving the skins' mechanical properties, while the 1320 nm Nd:YAG laser can enhance greatly the skin barrier function and the water-holding capacity. Moreover, we demonstrated the biophysical properties differed considerably between different areas. Water Animals;Elasticity;Female;Light;Low-Level Light Therapy;Mice;Rejuvenation;Skin Absorption;Skin Aging;Skin Physiological Phenomena;Skin Pigmentation;Stress, Mechanical;Water;Water Loss, Insensible

Abstracts of the American Society for Laser Medicine and Surgery 26th Annual Meeting, Boston, Massachusetts, USA, April 5-9, 2006. Animals;Humans;Laser Therapy;Low-Level Light Therapy

Low level laser therapy for treating tuberculosis. BACKGROUND: The main treatment for tuberculosis is antituberculous drugs. Low level laser therapy is used as an adjunct to antituberculous drugs, predominantly in the former Soviet Union and India. OBJECTIVES: To compare low level laser therapy plus antituberculous drugs with antituberculous drugs alone for treating tuberculosis. SEARCH STRATEGY: We searched the Cochrane Infectious Diseases Group Specialized Register (December 2005), CENTRAL (The Cochrane Library 2005, Issue 4), MEDLINE (1966 to December 2005), EMBASE (1974 to December 2005), CINAHL (1982 to December 2005), Science Citation Index (1945 to December 2005), PEDro (1929 to December 2005), the Central Medical Library of Moscow catalogue (1988 to June 2005), the internet, and reference lists of articles. We contacted relevant organizations and researchers for the original version. SELECTION CRITERIA: Randomized trials comparing low level laser therapy plus antituberculous drugs with antituberculous drugs alone in people with tuberculosis. DATA COLLECTION AND ANALYSIS: Two authors independently assessed trial quality and extracted data, including adverse events. MAIN RESULTS: One randomized controlled trial (130 participants) conducted in India met the inclusion criteria. This trial was poorly reported, with no information on the generation of allocation sequence or allocation concealment. The trial report did not provide details on the group that each of the participants were randomized into or which group those participants that left the trial were from. This precluded the use of its data on time to sputum conversion and other outcome measures for analysis. AUTHORS' CONCLUSIONS: The use of low level laser therapy for treating tuberculosis is still not supported by reliable evidence. Researchers need to focus on conducting well-designed randomized controlled trials to justify the continued participation of volunteers for studies of this experimental intervention. Humans;Laser Therapy;Lasers;Randomized Controlled Trials as Topic;Tuberculosis, Pulmonary

Shoulder pain. Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal;Arthroscopy;High-Energy Shock Waves;Humans;Injections, Intra-Articular;Low-Level Light Therapy;Musculoskeletal Manipulations;Shoulder Pain;Ultrasonic Therapy

Lasers: no longer science fiction. Humans;Low-Level Light Therapy;Nerve Regeneration;Pain;Wounds and Injuries

Laser therapy's evolution. Humans;Low-Level Light Therapy;Pain
Microvascular blood flow dynamics associated with photodynamic therapy, pulsed dye laser irradiation and combined regimens. BACKGROUND AND OBJECTIVES: Previous in vitro studies demonstrated the potential utility of benzoporphyrin derivative monoacid ring A (BPD) photodynamic therapy (PDT) for vascular destruction. Moreover, the effects of PDT were enhanced when this intervention was followed immediately by pulsed dye laser (PDL) irradiation (PDT/PDL). We further evaluate vascular effects of PDT alone, PDL alone and PDT/PDL in an in vivo rodent dorsal skinfold model. STUDY DESIGN/MATERIALS AND METHODS: A dorsal skinfold window chamber was installed surgically on female Sprague-Dawley rats. One milligram per kilogram of BPD solution was administered intravenously via a jugular venous catheter. Evaluated interventions were: control (no BPD, no light), PDT alone (576 nm, 16 minutes exposure time, 15 minutes post-BPD injection, 10 mm spot), PDL alone at 7 J/cm2 (585 nm, 1.5 ms pulse duration, 7 mm spot), PDL alone at 10 J/cm2, PDT/PDL (PDL at 7 J/cm2), and PDT/PDL (PDL at 10 J/cm2). To assess changes in microvascular blood flow, laser speckle imaging was performed before, immediately after, and 18 hours post-intervention. RESULTS: Epidermal irradiation was accomplished without blistering, scabbing or ulceration. A reduction in perfusion was achieved in all intervention groups. PDT/PDL at 7 J/cm2 resulted in the greatest reduction in vascular perfusion (56%). CONCLUSIONS: BPD PDT can achieve safe and selective vascular flow reduction. PDT/PDL can enhance diminution of microvascular blood flow. Our results suggest that PDT and PDT/PDL should be evaluated as alternative therapeutic options for treatment of hypervascular skin lesions including port wine stain birthmarks. Photosensitizing Agents;Porphyrins;Verteporfin Animals;Female;Low-Level Light Therapy;Microcirculation;Models, Animal;Photochemotherapy;Photosensitizing Agents;Porphyrins;Rats;Rats, Sprague-Dawley;Regional Blood Flow;Skin;Verteporfin
Treatment of primary intraocular melanoma. The treatment of intraocular melanoma has evolved recently. Enucleation has been superseded largely by brachytherapy, proton beam radiotherapy, stereotactic irradiation, trans-scleral local resection, transretinal resection and diode laser phototherapy. Many patients develop metastatic disease, which usually involves the liver and occurs hematogenously. Disseminated disease rarely responds to therapy, and is usually fatal within 1 year of the onset of symptoms. Uveal melanomas develop characteristic chromosomal abnormalities, such as loss of chromosome 3. This is associated with a reduction in the 5-year survival from approximately 95% to less than 50%. Antineoplastic Agents Antineoplastic Agents;Eye Neoplasms;Humans;Melanoma;Survival Rate
[The influence of low-intensive laser therapy on the aggregation properties of thrombocytes in patients with peptic ulcer]. The purpose of the study was to evaluate the influence of low-intensive laser therapy (LILT) on the aggregation properties of thrombocytes in patients with exacerbation of peptic ulcer (PU). The subjects, 111 patients aged 18 to 63, were divided into two groups: the main group (n = 81), and the control group (n = 30). In addition there were 15 healthy people who also underwent examination. Patients in the main group received complex treatment with untiulcer drugs and different methods of laser therapy: intravenous laser irradiation of blood, cutaneous irradiation, and a combination of both. The control group was treated with drugs only. The study found various changes in the aggregation properties of thrombocytes in patients with PU exacerbation, which consisted mostly in hyperaggregation. LILT had a normalizing effect on the aggregation properties of thrombocytes in patients of the main group. Anti-Ulcer Agents Adolescent;Adult;Anti-Ulcer Agents;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Peptic Ulcer;Platelet Aggregation;Radiotherapy Dosage;Time Factors
Laser-assisted anesthesia reduces the pain of venous cannulation in children and adults: a randomized controlled trial. OBJECTIVES: Application of topical anesthetics before intravenous

(IV) cannulation is effective yet limited by delayed transdermal absorption. The authors evaluated a handheld laser device to enhance topical anesthetic absorption by ablating the stratum corneum, the major barrier to drug absorption through the skin. The hypothesis was that laser-assisted anesthesia would reduce the pain of IV cannulation in emergency department (ED) patients. METHODS: This was a blinded, randomized, controlled trial. ED patients aged 1 year and older requiring nonemergent IV cannulation were included. Patients were randomized to pretreatment of the skin with laser or sham laser, and standardized venous cannulation was performed on the dorsum of the patients' hands or antecubital fossa. In the experimental group, the area over the target vein was pretreated with a lightweight, portable Er:YAG unit, with a fluence of 3.5 J/cm2, a pulse width of 600 microseconds, and a spot diameter of 6 mm. Lidocaine 4% cream was applied to the area immediately after laser application. Five minutes later, the cream was wiped off and a trained nurse inserted an IV catheter. In the control group, a sham laser and lidocaine were used. Pain of laser application and IV cannulation was recorded on age-appropriate pain scales; presence of infection or abnormal pigmentation was determined at one week. Pain of cannulation was compared using parametric and nonparametric tests. RESULTS: Sixty-one patients were randomized to laser (30) and sham (31) pretreatment. Mean (+/- SD) age was 27 (+/- 21) years, 49% were female, and one half were children younger than 18 years. The mean pain of IV cannulation was significantly less (mean difference, 28.3 mm; 95% confidence interval = 17.9 to 38.7) in patients pretreated with the laser (10.0 mm; 95% confidence interval = 4.4 to 15.6) than with sham laser (38.3 mm; 95% confidence interval = 29.3 to 42.2). The difference in children was also significant. Application of the laser was painless in most patients. No patient developed infection or abnormal pigmentation. CONCLUSIONS: Pretreatment of the skin with a laser device followed by a five-minute topical lidocaine 4% application reduces the pain of IV cannulation in ED adult and pediatric patients. Anesthetics, Local Adolescent;Adult;Anesthesia, Local;Anesthetics, Local;Catheterization, Peripheral;Child;Child, Preschool;Combined Modality Therapy;Double-Blind Method;Female;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Pain;Pain Measurement;Prospective Studies;Treatment Outcome

Laser versus intense pulsed light: Competing technologies in dermatology. Lasers have been competing with non-laser intense pulsed light (IPL) sources in the cosmetic arena over the past 10 years. Initially IPLs were somewhat cumbersome and accepted by a minority of "serious" practitioners. Recently, however, the popularity of full-face visible light skin rejuvenation, enhanced engineering of IPLs, and favorable cost versus many lasers, have lead to a proliferation of IPL devices. No longer a stepchild in the rejuvenation market, IPLs may overtake lasers as the devices of choice among most physicians. We review the pros and cons of lasers and IPLs within the context of design, cost, and other practical concerns for a typical office-based practice. Biomedical Technology;Dermatology;Equipment Design;Humans;Low-Level Light Therapy;Phototherapy;Risk Assessment

[Photodynamic therapy in dermatology]. Photodynamic therapy (PDT) is a therapeutic modality based on the photooxidation of biological materials induced by a photosensitizer, which selectively locates itself in certain tumorous cells or tissues, so that when illuminated by a light of the right length and at a sufficient dose, these cells are destroyed. In dermatology, PDT with topical 5-aminolevulinic acid or 5-methyl aminolevulinate is very effective in the treatment of actinic keratoses, basal cell carcinomas and Bowen's disease. In addition, very promising results have been obtained in inflammatory pathologies like morphea or sarcoidosis, infections like warts, and cosmetic processes such as photoaging, among others. This article reviews the most significant aspects of PDT in dermatology. First of all, we will review the basic fundamentals of photodynamic treatment. Next, we will outline its clinical applications in dermatology, both in oncological applications and all those

dermatological processes in which PDT may play a role in their management. We will also discuss its promising cosmetic application in the treatment of photoaging. We will complete the review with photodiagnosis and the different non-invasive ways to monitor the effectiveness of PDT. Photosensitizing Agents;Aminolevulinic Acid Aminolevulinic Acid;Esthetics;Forecasting;Humans;Infrared Rays;Low-Level Light Therapy;Photochemistry;Photochemotherapy;Photosensitivity Disorders;Photosensitizing Agents;Precancerous Conditions;Rejuvenation;Skin Diseases;Skin Diseases, Infectious;Skin Neoplasms;Ultraviolet Rays

A comparison study of the efficacy and side effects of different light sources in hair removal. Unwanted hairs are a common problem in which different light sources were developed as the treatment of choice. Alexandrite laser, diode laser, and intense pulsed light (IPL) were clinically used for this purpose with long-term scarce comparative results. The objective of the study was to compare the clinical efficacy, complications, and long-term hair reduction of alexandrite laser, diode laser, and IPL. Clinical trials on 232 persons using diode, alexandrite, laser and IPL were conducted. The number of sessions to reach optimal result varied between 3 and 7. Then the side effects were evaluated. Six months after the last session, optimal hair reduction was observed with no significant differences between the light sources, but a hair reduction was found to be higher using the diode laser. Side effects were observed with all light sources but more frequently with diode. Our findings indicate that all three light sources tested have similar effects on hair removal and in Iranian patients, using lower wavelengths minimizes the side effects. Face;Female;Hair Removal;Humans;Low-Level Light Therapy;Neck;Treatment Outcome

TENS and low-level laser therapy in the management of temporomandibular disorders. Pain relief and reestablishment of normal jaw function are the main goals of conservative management of Temporomandibular Disorders (TMD). Transcutaneous electrical nerve stimulation (TENS) and laser therapy are part of these modalities, although little is known about their real efficacy in controlled studies. This research compared these two treatments in a sample of 18 patients with chronic TMD of muscular origin, divided into two groups (LASER and TENS). Treatment consisted of ten sessions, in a period of 30 days. Active range of motion (AROM), visual analogue scale (VAS) of pain and muscle (masseter and anterior temporalis) palpation were used for follow-up analysis. Data were analyzed by Friedman test and ANOVA for repeated measurements. Results showed decrease in pain and increase in AROM for both groups ($p<0.05$), and improvement in muscle tenderness for the LASER group. Authors concluded that both therapies are effective as part of TMD management and a cumulative effect may be responsible for the improvement. Caution is suggested when analyzing these results because of the self-limiting feature of musculoskeletal conditions like TMD.

Laser skin tightening: non-surgical alternative to the face lift. Humans;Low-Level Light Therapy;Rhytidoplasty;Skin Aging

Photoradiation could influence the cytoskeleton organization and inhibit the survival of human hepatoma cells in vitro. Low-power laser therapy has become popular in clinical applications including promoting wound healing and pain relief. However, effects of this photoradiation on human hepatoma cells are rarely studied. Previously, we found 808 nm gallium aluminum arsenide (GaAlAs) continuous wave laser had an inhibitory effect on the proliferation of human hepatoma cell lines HepG2 and J-5 at the energy density of 5.85 and 11.7 J/cm(2), respectively. The aim of the present study was to evaluate the possible mechanism of action of this photoradiation on HepG2 and J-5 cells. HepG2 and J-5 cells were cultured in 24-well plates for 24 h. After photoradiation by 130 mW 808 nm GaAlAs continuous wave laser for different time intervals (0, 30, 60, 90, 120, 150, and 180 s), Western blot and immunofluorescent staining were used to examine the expression and distribution of histone and cytoskeletal proteins. The cell counts as well as histone and synemin expression of

HepG2 and J-5 cells were reduced by photoradiation at the energy density of 5.85 and 11.7 J/cm(2), respectively. Furthermore, the architecture of cytoskeletons and the distribution of intermediate filament-associated proteins (plectin and synemin) were disorganized by photoradiation. Photoradiation by 808 nm GaAlAs continuous wave laser at the energy density of 5.85 and 7.8 J/cm(2) inhibited the survival of human hepatoma cell lines. The mechanism might reduce synthesis of histone and synemin. Reduced histone synthesis might further reduce the proliferation rate of these cells. Reduced synemin synthesis might result in the destruction of the cytoskeleton. Therefore, the net effects by this photoradiation were reduced cell survival. Cytoskeletal Proteins;Histones;Intermediate Filament Proteins;Plectin;Tubulin;desmuslin;Keratins Cell Line, Tumor;Cell Survival;Cytoskeletal Proteins;Cytoskeleton;Histones;Humans;Intermediate Filament Proteins;Keratins;Low-Level Light Therapy;Plectin;Tubulin

Wrong parameters can give just any results. Hand;Humans;Low-Level Light Therapy;Osteoarthritis;Radiotherapy Dosage;Treatment Failure

Laser-induced autofluorescence study of caries model in vitro. Laser-induced autofluorescence spectra of teeth irradiated by a 337 nm nitrogen laser were measured during in vitro caries formation through initial enamel demineralization and introducing of carious bacterial flora in the lesions developed. Spectra obtained from sound teeth consist of an intensive maximum at 480-500 nm and secondary maximum at 430-450 nm. In the process of caries formation, we observed an increase in the intensity at 430-450 nm and the appearance of two maxima in the red spectral region-at 590-650 nm. The intensity increase at 430-450 nm was related to the tooth demineralization. Bacteria presence and their metabolism products induced an increase in the absorption in the UV-blue spectral region at 350-420 nm and the appearance of a fluorescence signal in the long-wave spectral region at 590-650 nm. From the point of view of tissue optics, these results allow caries to be considered as consisting of two different phenomena-tissue destruction and bacterial flora and its metabolism products increase. The results could be used to obtain a more complete picture of caries formation on the base of its fluorescent properties. Dental Caries;Fluorescence;Humans;In Vitro Techniques;Lactobacillus;Low-Level Light Therapy;Models, Biological;Staphylococcus aureus;Viridans Streptococci

Low-energy irradiation stimulates formation of osteoclast-like cells via RANK expression in vitro. Low-energy laser irradiation (Ga-Al-As semiconductor laser, output 50 mW) was applied to rat osteoclast precursor cells for 1, 3, 6, or 10 min at 24-h intervals during the culture period. The number of tartrate-resistant acid phosphatase positive multinucleate cells was increased by approximately 1.3-fold in the 3- and 6-min irradiation groups. Further, osteoclasts appeared on day 2 in the laser irradiation groups but not until day 3 in the control groups. In immunohistochemical staining for receptor activator of NF-kappaB (RANK), the laser irradiation groups showed significantly greater amounts of staining in comparison with the control group on days 2 and 3. Reverse transcription-polymerase chain reaction results also showed that the expressions of RANK were upregulated. In the pit formation assay, resorption pits were significantly more abundant in the laser irradiation groups than in the controls. The present results suggest that low-energy laser irradiation facilitates differentiation and activation of osteoclasts via RANK expression. Glycoproteins;Osteoprotegerin;Receptors, Cytoplasmic and Nuclear;Receptors, Tumor Necrosis Factor;Tnfrsf11b protein, rat Animals;Cells, Cultured;Glycoproteins;Low-Level Light Therapy;Osteoclasts;Osteoprotegerin;Rats;Receptors, Cytoplasmic and Nuclear;Receptors, Tumor Necrosis Factor;Stem Cells

Is quality control of Cochrane reviews in controversial areas sufficient? OBJECTIVES: Some conclusions from the Cochrane Database of Systematic Reviews (CDSR) seem volatile in areas of controversy and have recently changed conclusions. With this perspective in mind we decided to test

the validity and sensitivity of negative conclusions in a systematic review of low-level laser therapy (LLLT) for osteoarthritis (OA) from the Cochrane Library was valid and robust. SETTINGS/LOCATION: None as this was a systematic review of literature. DESIGN: Validity was tested against a 9-item checklist for systematic reviews. Review selections were analyzed for possible discrepancies between trial and review reports and omissions of relevant trials and data. Data from discrepancies and omissions were then entered into sensitivity and subgroup analyses. OUTCOME MEASURES: Continuous and dichotomous data for pain SUBJECTS: Patients with osteoarthritis. INTERVENTIONS: LLLT. RESULTS: Only clinicians who had performed LLLT trials, and had negative results were invited into the review group. The review was oblivious to findings published after 1993 about physiologic mechanisms and dose response patterns for LLLT. We found 18 questionable selections that favored a negative review conclusion in 17 of 18 cases. These were largely omissions of relevant positive data and selective inclusion of negative data from trials with small, ineffective doses. When existing and omitted data from relevant trials were combined, results changed from negative to significantly positive for continuous and categorical data. Subgrouping trials by location and recommended doses taken from current guidelines, revealed a highly significant effect of LLLT for treating knee OA. CONCLUSIONS: The results of this CDSR was not robust and seems to be colored by questionable selections or omissions. For alternative pain therapies, it should be considered if lack of expertise on therapy mechanisms, or conflicts of interests with competing pain drug manufacturers, may bias conclusions. Review groups should recruit a balanced mix of current views and expertise and expand the use of sensitivity analyses to improve quality of CDSRs in areas of controversy. Advisory Committees;Databases, Bibliographic;Evidence-Based Medicine;Humans;Information Storage and Retrieval;Low-Level Light Therapy;Osteoarthritis;Peer Review, Research;Quality Control;Randomized Controlled Trials as Topic

Action of low-level laser therapy on living fatty tissue of rats. Little is known about the action of laser rays on normal adipose cells. The present study attempts to observe the behavior of fatty cells submitted to laser therapy. Dorsal fat pads of normal adult rats were submitted to low-level laser irradiation applied locally through intact skin, with four different dose schedules (4, 8, 12, and 16 J/cm(2)), with a further group being sham-irradiated. Histology, morphometry, immunofluorescence, and electron microscopy were all used to analyze irradiated tissues. Changes were restricted to the brown fatty tissue, in which a tendency was shown for multivacuolar cells to be transformed into the unilocular type. The number of cells which exhibited enlargement and fusion of small vacuoles was greater in the 4- and 16-J/cm(2) groups ($p<0.05$). Increased vascular proliferation and congestion was another more evident finding in laser-treated animals compared to nontreated animals. Low-level laser rays cause brown adipose fat droplets to coalesce and fuse. Additionally, they stimulated proliferation and congestion of capillaries in the extracellular matrix. Adipose Tissue;Animals;Dose-Response Relationship, Radiation;Female;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Wistar

Long-term effect on tinnitus by treatment of temporomandibular disorders: a two-year follow-up by questionnaire. OBJECTIVE: The aim of the study was to investigate the presence of symptoms and signs of temporomandibular disorders (TMD) in patients with tinnitus and to evaluate the effect of TMD treatment on tinnitus in a long-term perspective in comparison with a control group of patients on a waiting list. MATERIAL AND METHODS: One-hundred-and-twenty patients with tinnitus were subjected to a clinical examination of the masticatory system and whether they had co-existing TMD to TMD treatment. Ninety-six patients had TMD, most frequently localized myalgia. Seventy-three of these completed the treatment and responded to a questionnaire 2 years later. Fifty patients with tinnitus who were on the waiting list served as a control group. RESULTS: Eighty percent of the patients had signs of TMD, most commonly myofascial pain. Forty-three percent of the patients

reported that their tinnitus was improved at the 2-year follow-up, 39% that it was unchanged, and 17% that it was impaired compared to before the treatment. Twelve percent of the subjects in the control group reported that their tinnitus was improved compared to 2 years previously, 32% that it was unchanged, and 56% that it was impaired. The difference between groups was significant (chi(2): p<0.001). CONCLUSION: The results of this study showed that TMD symptoms and signs are frequent in patients with tinnitus and that TMD treatment has a good effect on tinnitus in a long-term perspective, especially in patients with fluctuating tinnitus. Adolescent;Adult;Chi-Square Distribution;Exercise Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Myofunctional Therapy;Occlusal Splints;Statistics, Nonparametric;Surveys and Questionnaires;Temporomandibular Joint Dysfunction Syndrome;Tinnitus;Treatment Outcome

[Evidences of physical agents action on bone metabolism and their potential clinical use]. The action of physical agents such as low level laser therapy, low-intensity pulsed ultrasound and electrical and electromagnetic fields on bone have been often studied, showing that they are able to promote osteogenesis, accelerate fracture consolidation and augment bone mass. The use of these therapeutic modalities was first based on the finding that bone is a piezoelectric material, that means it can generate polarization when deformed, transforming mechanical energy into electric energy, and this has widen therapeutic possibilities to bony tissue. The present work aims to present evidences of physiologic effects and mechanisms of action of these physical agents on bone metabolism, based on articles published in international scientific literature. Bone Diseases;Bone and Bones;Electric Stimulation Therapy;Electromagnetic Fields;Humans;Low-Level Light Therapy;Osteogenesis;Ultrasonic Therapy

Irradiation at 780 nm increases proliferation rate of osteoblasts independently of dexamethasone presence. BACKGROUND AND OBJECTIVES: We have previously shown that phototherapy increases cell growth and impairs protein secretion of fibroblasts. Our objective was to study the effect of phototherapy on osteoblast-like cells in culture treated with dexamethasone. STUDY DESIGN/MATERIALS AND METHODS: Rat calvaria osteoblast-like cells were previously treated or not with dexamethasone and then, they were irradiated or not with a GaAlAs diode laser (wavelength of 780 nm, 10 mW, 3 J/cm2). Adhesion, proliferation, and osteonectin synthesis were analyzed. RESULTS: Phototherapy increased the proliferation rate of cells independently of dexamethasone presence. Adhesion and osteonectin synthesis were not significantly influenced by laser and/or dexamethasone. CONCLUSIONS: Based on the conditions of this study we concluded that phototherapy acts as a proliferative stimulus on osteoblast-like cells, even under the influence of dexamethasone. Thus, we suggest that phototherapy can be of importance as co-adjuvant in bone clinical manipulation in order to accelerate bone regeneration. Anti-Inflammatory Agents;Osteonectin;Dexamethasone Animals;Anti-Inflammatory Agents;Cell Adhesion;Cell Culture Techniques;Cell Proliferation;Dexamethasone;Low-Level Light Therapy;Osteoblasts;Osteonectin;Rats

[Effects of exposure of different skin areas to low-power laser light]. The effect of helium-neon laser light of extremely low power of 0.2 mW/cm2 and wavelength 632.8 nm on the immune status of mice bearing solid tumors was studied. The evaluation of the status of tumor-bearing animals was provided by taking into account the number of immune cells, cytokine concentration (tumor necrosis factor, interleukin 2, production of nitric oxide, expression of heat shock proteins (Hsp70 and Hsp90), and activity of natural killers. The model of a solid tumor was formed by subcutaneous injection of Ehrlich carcinoma cells, and average life span of tumor-bearing mice achieved about 55 days. Different areas of the skin of tumor-bearing mice were subjected either to a single (1 min, dose 0.012 J/cm3) or repeated exposure to laser light (1 min, 48-h intervals, 30 days). Two different areas were irradiated: the thymus projection area or a hind limb with solid tumors. The results showed that

chronic exposure of tumor-bearing mice in the thymus projection area, and especially, hind limb, reduced the resistance, which manifested itself in the acceleration of tumor growth and a tendency of mouse life span to decrease. On the contrary, a single exposure stimulated the antitumor immunity for several days after the exposure. The results show the expediency of further investigation of the immunomodulative effects of low-power laser light and the necessity of monitoring the immune system during laser therapy. Heat-Shock Proteins;Interleukin-2;Tumor Necrosis Factor-alpha;Helium;Nitric Oxide;Neon Animals;Carcinoma, Ehrlich Tumor;Heat-Shock Proteins;Helium;Immunity;Interleukin-2;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Neon;Nitric Oxide;Skin;T-Lymphocytes;Thymus Gland;Tumor Necrosis Factor-alpha

[Radiation-induced mucositis of the aerodigestive tract: prevention and treatment. MASCC/ISOO mucositis group's recommendations]. Acute mucositis is the main intensity-limiting toxicity in the management of head and neck (H&N) and digestive track carcinomas with radiotherapy. New radiation modalities (hyperfractionation and/or acceleration) as well as combined modality regimens in this situation induce higher rates of acute toxicity. Hyperfractionation for example allows higher control rates, with few late toxicities, but it slightly increases acute mucositis. The addition of chemotherapy introduces systemic toxicity and can exacerbate local tissue reactions when used concurrently with radiation. Mucositis is recognized as the principal limiting factor to further treatment intensification. As local-regional control and overall survival are related to dose-intensity in this case, further research into the assessment, analysis, prevention and treatment of mucosal toxicity is not only crucial to the improvement in quality of life, but certainly to improved rates of disease control as well. Several topical and systemic treatments are directed to the decrease and the acceptance of this acute toxicity, but few have shown significant preventive effect. Improvement of technical aspects of H&N radiotherapy (3D conformal radiation, intensity-modulated radiotherapy) should have a major impact in the prevention of mucositis. The efficacy of low level laser therapy in the management of such a toxicity could hence yield important development of this method in the field of oncology. MASCC/ISOO mucositis group's recommendations for the management of acute radiation-induced mucositis are here summarized. Digestive System Diseases;Humans;Mucositis;Radiation Injuries;Respiratory Tract Diseases

[Experience on treatment of children with otorhinolaryngological diseases by low intensity laser irradiation]. Among diseases of children of young age dominate pathologies of otorhinolaryngological profile. Due to good blood circulation characteristics of these organs and also predominantly inflammatory or allergic nature of these diseases, laser therapy is considered to be an effective therapeutic procedure in the otorhinolaryngology. It is well known, that one of the characteristics of laser irradiation is the improvement of microcirculation in the cases of diseases involving inflammatory and allergic mechanisms. Treatment of 445 children and teenagers aged 2-15 with the following diseases: pollinosis (68), adenoiditis and rhino-sinusitis (198), tonsillitis (64) and otitis (115) was carried out simultaneously with infrared and red laser irradiations. The positive results were achieved in 85% of patients. The results achieved by us with simultaneous irradiations using infrared and red lasers prove the effectiveness of these methods for treatment of otorhinolaryngological diseases. Adolescent;Child;Child, Preschool;Humans;Low-Level Light Therapy;Otorhinolaryngologic Diseases;Treatment Outcome

Mitogen-activated protein kinase/extracellular signal-regulated protein kinase activation of cultured human dental pulp cells by low-power gallium-aluminium-arsenic laser irradiation. AIM: To examine whether low-power laser irradiation (LPLI) promotes cellular proliferation of human dental pulp-derived fibroblast-like cells (dental pulp cells). METHODOLOGY: Dental pulp cells were obtained by primary culture of human dental pulp tissues from extracted third molar teeth. The phosphorylation of the mitogen-activated protein kinase (MAPK) family after LPLI of these cells was

investigated by Western blotting. By using a specific MAPK/ERK kinase (MEK) inhibitor (PD098059), the specific effect of LPLI on the MAPK pathway was also investigated by Western blotting as described above. The incorporation of [3H]thymidine into the cells after LPLI was determined, and statistical analysis was performed by Wilcoxon signed-ranks test. RESULTS: Extracellular signal-regulated protein kinase (ERK) 1/2 was phosphorylated between 5 and 30 min after LPLI. Moreover, PD098059 inhibited LPLI-mediated ERK1/2 activation. LPLI did not affect p38 MAPK or c-Jun N-terminal kinase (JNK) phosphorylation. But LPLI did not stimulate [3H]thymidine incorporation into these cells. CONCLUSIONS: These results indicated that LPLI activated MAPK/ERK, a signal for proliferation, differentiation and survival, but did not activate the stress signals p38 MAPK and JNK in human dental pulp cells. Extracellular Signal-Regulated MAP Kinases;Mitogen-Activated Protein Kinases Dental Pulp;Enzyme Activation;Extracellular Signal-Regulated MAP Kinases;Fibroblasts;Humans;Laser Therapy;Mitogen-Activated Protein Kinases;Statistics, Nonparametric
[Dye laser treatment of periungual pyogenic granuloma]. Treatment of pyogenic granuloma may be difficult in locations such as the face and fingertips. We successfully treated a 1 cm periungual fingertip pyogenic granuloma with a dye laser. Adult;Fingers;Follow-Up Studies;Granuloma, Pyogenic;Humans;Low-Level Light Therapy;Male;Nail Diseases
[Excimer laser treatment of vitiligo -- critical retrospective assessment of own results and literature overview]. BACKGROUND: In numerous studies the 308-nm excimer laser has been described as an effective therapy method for localized vitiligo. Our experience and critical evaluation of the relevant literature lead to a less enthusiastic endorsement. PATIENTS AND METHODS: A total of 9 patients with localized vitiligo were evaluated in our retrospective study. The sessions took place 2-3 times per week; the energy dose was increased depending on the occurring side effects. The rate of repigmentation was evaluated in 5 grades: grade 0 = 0 %, grade 1 = 1-25 %, grade 2 = 26-50 %, grade 3 = 51-75 %,grade 4 = 76-100 %. Subjective patient satisfaction was rated "satisfied"/"not satisfied". RESULTS: In face and neck areas we used a cumulative energy dose of 16.6 J/cm(2) and achieved repigmentation grade 4 in 33.3 %, grade 2 in 33.3 %, grade 1 in 11.1 % and no improvement in 22.2 % of the cases. On hands and knees we used a medium cumulative energy dose of 20.8 J/cm(2) and did not observe any tendency towards repigmentation. Four of the patients were satisfied, while 5 were not. Side effects (erythema, blisters, crusting and perilesional hyperpig-mentation) were transient in all cases. Within a medium observation period of 19.1 months, one patient had a relapse. CONCLUSIONS: The excimer laser should be regarded as a treatment alternative in cases of localized vitiligo of the face. The treatment at other sites is clearly limited because of only partial repigmentation, considerable expense of time and money as well as the potentially higher risk of tumorigenesis. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Outcome and Process Assessment, Health Care;Patient Satisfaction;Radiotherapy Dosage;Retrospective Studies;Skin Pigmentation;Vitiligo
Pseudomelanoma following laser therapy. Adolescent;Arm;Diagnosis, Differential;Female;Humans;Low-Level Light Therapy;Melanoma;Neoplasm Recurrence, Local;Nevus, Pigmented;Skin Neoplasms
Laser acupuncture studies should not be included in systematic reviews of phototherapy. Acupuncture Therapy;Humans;Low-Level Light Therapy;Phototherapy;Review Literature as Topic
Management of mouth opening in patients with temporomandibular disorders through low-level laser therapy and transcutaneous electrical neural stimulation. OBJECTIVE: The aim of this study was to evaluate the effectiveness of low-level laser therapy (LLLT) and transcutaneous electrical neural stimulation (TENS) on the improvement of mouth opening in patients with temporomandibular disorder (TMD). BACKGROUND DATA: TMDs are conditions that affect the form

and/or function of the temporomandibular joint (TMJ), masticatory muscles, and dental apparatus. Often TMD is associated with pain localized in the TMJ and/or in the muscles of the face and neck. METHODS: This clinical trial was performed in 10 patients, 18-56 years old, diagnosed with TMD of multiple causes. All patients received both methods of treatment in two consecutive weeks. LLLT was delivered via a 670-nm diode laser, output power 50 mW, fluence 3 J per site/4 sites (masseter muscle, temporal muscle, mandibular condyle, and intrauricular). TENS therapy was applied with a two-electrode machine at 20 W, maximum frequency of 60 Hz, adjusted by the patient according to their sensitivity. The amplitude of mouth opening was recorded before treatment and immediately after using a millimeter rule; the measurements were performed from the incisal of the upper incisors to the incisal of the lower incisors. A paired t-test was applied to verify the significance of the results. RESULTS: A significant improvement in the range of motion for both therapies was observed immediately after treatment. Comparing the two methods, the values obtained after LLLT were significantly higher than those obtained after TENS ($p < 0.01$). CONCLUSIONS: Both methods are effective to improve mouth opening. Comparing the two methods, LLLT was more effective than TENS applications. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Range of Motion, Articular;Temporomandibular Joint Disorders;Transcutaneous Electric Nerve Stimulation

Laser therapy improves healing of bone defects submitted to autologous bone graft. OBJECTIVE: The aim of the present study was to assess histologically the effect of low-level laser thrapy (LLLT) (lambda 830 nm) on the healing of bone defects associated with autologous bone graft. BACKGROUND DATA: LLLT has been used on the modulation of bone healing because of the photo-physical and photochemical properties of some wavelengths. The use of correct and appropriate parameters has been shown to be effective in the promotion of a positive biomodulative effect on the healing bone. METHODS: Sixty male Wistar rats were divided into four groups: G1 (control), G2 (LLLT on the surgical bed), G3 (LLLT on the graft), and G4 (LLLT on both the graft and the surgical bed). The dose per session was 10 J/cm(2), and it was applied to the surgical bed (G2/G4) and on the bone graft (G3/G4). LLLT was carried out every other day for 15 days (lambda 830 nm, phi = 0.5 cm(2), 50 Mw, 10 J/cm(2)). The dose was fractioned in four points. The animals were sacrificed 15, 21, and 30 days after surgery; specimens were taken and routinely processed (wax, cut, and stain with H&E and Sirius red stains). Light microscopic analysis was performed by a pathologist. RESULTS: In the groups in which the LLLT was used trans-operatively on the surgical bed (G2/G4), bone remodeling was both quantitatively and qualitatively more evident when compared to subjects of groups G1 and G3. CONCLUSION: The present study indicates that the use of LLLT trans-operatively resulted in a positive biomodulative effect on the healing of bone defects associated with autologous bone grafts. Animals;Bone Remodeling;Bone Transplantation;Femur;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Transplantation, Autologous

Low-level laser therapy induces dose-dependent reduction of TNFalpha levels in acute inflammation. OBJECTIVE: The aim of this study was to investigate if low-level laser therapy (LLLT) can modulate acute inflammation and tumor necrosis factor (TNFalpha) levels. BACKGROUND DATA: Drug therapy with TNFalpha-inhibitors has become standard treatment for rheumatoid arthritis, but it is unknown if LLLT can reduce or modulate TNFalpha levels in inflammatory disorders. METHODS: Two controlled animal studies were undertaken, with 35 male Wistar rats randomly divided into five groups each. Rabbit antiserum to ovalbumin was instilled intrabronchially in one of the lobes, followed by the intravenous injection of 10 mg of ovalbumin in 0.5 mL to induce acute lung injury. The first study served to define the time profile of TNFalpha activity for the first 4 h, while the second study compared three different LLLT doses to a control group and a chlorpromazine group at a timepoint where TNFalpha activity was increased. The rats in LLLT groups were irradiated within 5 min at the

site of injury by a 650-nm Ga-Al-As laser. RESULTS: There was a time-lag before TNFalpha activity increased after BSA injection. TNFalpha levels increased from < or =6.9 (95% confidence interval [CI], 5.6-8.2) units/mL in the first 3 h to 62.1 (95% CI, 60.8-63.4) units/mL ($p < 0.001$) at 4 h. An LLLT dose of 0.11 Joules administered with a power density of 31.3 mW/cm(2) in 42 sec significantly reduced TNFalpha level to 50.2 (95% CI, 49.4-51.0), $p < 0.01$ units/mL versus control. Chlorpromazine reduced TNFalpha level to 45.3 (95% CI, 44.0-46.6) units/mL, $p < 0.001$ versus control. CONCLUSION: LLLT can reduce TNFalpha expression after acute immunocomplex lung injury in rats, but LLLT dose appears to be critical for reducing TNFalpha release. Tumor Necrosis Factor-alpha Animals;Bronchoalveolar Lavage Fluid;Inflammation;Low-Level Light Therapy;Lung;Male;Models, Animal;Radiotherapy Dosage;Rats;Rats, Wistar;Reperfusion Injury;Tumor Necrosis Factor-alpha

Survivorship and mortality implications of developmental 670-nm phototherapy: dioxin co-exposure. OBJECTIVE: We assessed the effect of 670-nm light therapy on dioxin-induced embryonic mortality in chickens (Gallus gallus). BACKGROUND DATA: Developmental photobiomodulation using 670-nm light-emitting diode (LED) arrays improves hatching success and increases body size in hatchling chickens. Photobiomodulation also stimulates signaling pathways resulting in improved energy metabolism, antioxidant production and cell survival. Dioxin causes embryonic mortality, including increases in the frequency of chicken embryos that pip but can't go to hatch. We hypothesized that 670-nm LED therapy would attenuate dioxin-induced embryo mortality. METHODS: Fertile chicken eggs were injected with control or 2, 20, or 200 ppt 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD; dioxin) prior to the start of incubation. Half of the eggs in each dose group were treated once per day from embryonic days 0-20 with 670-nm LED light at a fluence of 4 J/cm(2). In ovo survival and hatching success were compared between dose groups and LED treatment. RESULTS: LED therapy decreased the embryonic mortality rate by 41%, resulting in increased embryonic survival and improved hatching success in eggs exposed to 200 ppt dioxin. However, at sub-lethal dioxin concentrations and in oil-treated controls, LED therapy slightly increased mortality. CONCLUSION: Overall survivorship and hatching success of chicks developmentally exposed to dioxin concentrations above the lethality threshold (>100 ppt TCDD) is improved by 670-nm LED treatment administered throughout the gestation period, but the relationship may be complicated by an LED-oil interaction. Polychlorinated Dibenzodioxins;Teratogens Animals;Chick Embryo;Phototherapy;Polychlorinated Dibenzodioxins;Teratogens

Complications following pulsed dye laser treatment of superficial hemangiomas. BACKGROUND AND OBJECTIVE: Pulsed dye laser (PDL) has been reported to be safe and effective in the management of superficial hemangiomas of infancy. We report 12 patients with hemangiomas with complications following PDL. STUDY DESIGN/MATERIALS AND METHODS: Records of patients with hemangiomas and a known adverse outcome following PDL were reviewed. RESULTS: All were treated early (age range: 5 days to 4 months), and all hemangiomas were facial with a superficial component. Eleven were treated with a 585 nm wavelength, fluence range of 4.7-7 J/cm(2), without dynamic cooling. One patient received 7-12 J/cm(2) utilizing a 595 nm wavelength with dynamic cooling. In eight cases, treatment led to severe ulceration with subsequent pain, scarring, and in one instance, life-threatening hemorrhage. In four, permanent atrophic scarring was noted without ulceration. CONCLUSIONS: PDL treatment of superficial hemangiomas may rarely lead to significant complications including atrophic scarring and severe ulceration. Atrophy;Cicatrix;Female;Hemangioma;Hemorrhage;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Pain;Skin Ulcer

Infant hemangiomas: a controversy worth solving. Hemangioma;Humans;Infant;Low-Level Light Therapy

Enhanced susceptibility of mouse squamous cell carcinoma to photodynamic therapy combined with low-dose administration of cisplatin. PURPOSE: We have investigated the antitumor effect of photodynamic therapy (PDT), using Photofrin as the photosensitizer, combined with low-dose cisplatin (CDDP) on NR-S1 mouse squamous cell carcinoma. MATERIALS AND METHODS: CDDP (5 mg/kg body weight) was injected intraperitoneally either 1 hour or 3 hours prior to PDT or immediately afterward. Twenty-four hours after each protocol, the antitumor effects were evaluated by percentage area of the tumor necrosis in hematoxylin-eosin stained specimens as well as terminal deoxynucleotidyl transferase-mediated d-UTP nick-end labeling indices. Furthermore, the tumor sizes were evaluated at 3, 7, and 10 days after each protocol. RESULTS: The antitumor effect of PDT was enhanced by administration of CDDP 3 hours before PDT, whereas the administration of CDDP 1 hour before PDT or immediately after PDT did not potentiate a PDT antitumor effect. CONCLUSION: Administration of low-dose CDDP 3 hours before PDT appears to be a useful treatment modality. Antineoplastic Agents;Radiation-Sensitizing Agents;Dihematoporphyrin Ether;Cisplatin Animals;Antineoplastic Agents;Antineoplastic Combined Chemotherapy Protocols;Carcinoma, Squamous Cell;Cisplatin;Dihematoporphyrin Ether;In Situ Nick-End Labeling;Low-Level Light Therapy;Male;Mice;Mice, Inbred C3H;Necrosis;Neoplasms, Connective Tissue;Photochemotherapy;Radiation-Sensitizing Agents;Radiotherapy, Adjuvant;Statistics, Nonparametric;Subcutaneous Tissue;Treatment Outcome;Tumor Burden

[Free radical processes in the etiology, pathogenesis, and treatment of malignant tumors of the brain]. Free Radicals Apoptosis;Brain Neoplasms;Free Radicals;Humans;Lipid Peroxidation;Low-Level Light Therapy

Management of injected hyaluronic acid induced Tyndall effects. BACKGROUND AND OBJECTIVES: Soft tissue augmentation represents a cosmetic procedure performed with increasing frequency. STUDY DESIGN/MATERIALS AND METHODS: Correct utilization permits precise correction of facial rhytids and scars. Novice injectors occasionally inject too superficially in tissue with the resultant appearance of discoloration secondary to the Tyndall effect. RESULTS AND CONCLUSION: In this article, we will review the Tyndall effect in the skin and management options for this growing problem in aesthetic dermatology. Biocompatible Materials;Enzymes;Hyaluronic Acid;Hyaluronoglucosaminidase Adult;Biocompatible Materials;Cosmetic Techniques;Enzymes;Female;Humans;Hyaluronic Acid;Hyaluronoglucosaminidase;Injections, Subcutaneous;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Skin;Skin Aging;Treatment Outcome

Effect of low power laser irradiation on disconnecting the membrane-attached hemoglobin from erythrocyte membrane. In our previous study we found that low power laser irradiation improved the erythrocyte deformability, but the mechanism is unclear. The membrane-attached hemoglobin (Hbm) may be one of the determining factors for the erythrocyte deformability. We report here for the first time, that laser irradiation can reduce the Hbm contents in pig's erythrocytes, providing the explanation for the improvement of erythrocyte deformability. The decrease of the Hbm was proportional to the irradiation dose, but the relative change of Hbm was saturated around 35%. The 532 nm laser was more efficient at lowering Hbm than the 632.8 nm laser, consistent with the absorption spectrum of Hbm. Hemoglobins Animals;Erythrocyte Deformability;Erythrocyte Membrane;Hemoglobins;In Vitro Techniques;Low-Level Light Therapy;Photobiology;Sus scrofa

Efficacy of low level laser therapy on neurosensory recovery after injury to the inferior alveolar nerve. BACKGROUND: The most severe complication after the removal of mandibular third molars is injury to the inferior alveolar nerve or the lingual nerve. These complications are rather uncommon (0.4% to 8.4%) and most of them are transient. However, some of them persist for longer than 6 months,

which can leave various degrees of long-term permanent disability. While several methods such as pharmacologic therapy, microneurosurgery, autogenous and alloplastic grafting can be used for the treatment of long-standing sensory aberrations in the inferior alveolar nerve, there are few reports regarding low level laser treatment. This paper reports the effects of low level laser therapy in 4 patients with longstanding sensory nerve impairment following mandibular third molar surgery. METHODS: Four female patients had complaints of paresthesia and dysesthesia of the lip, chin and gingiva, and buccal regions. Each patient had undergone mandibular third molar surgery at least 1 year before. All patients were treated with low level laser therapy. Clinical neurosensory tests (the brush stroke directional discrimination test, 2-point discrimination test, and a subjective assessment of neurosensory function using a visual analog scale) were used before and after treatment, and the responses were plotted over time. RESULTS: When the neurosensory assessment scores after treatment with LLL therapy were compared with the baseline values prior to treatment, there was a significant acceleration in the time course, as well as in the magnitude, of neurosensory return. The VAS analysis revealed progressive improvement over time. CONCLUSION: Low level laser therapy seemed to be conducive to the reduction of long-standing sensory nerve impairment following third molar surgery. Further studies are worthwhile regarding the clinical application of this treatment modality.

Tubule-occluding effect of desensitizing laser treatment on prepared dentin surfaces: an environmental SEM study. PURPOSE: The purpose of this in vitro study was to demonstrate the dentinal tubule-occluding effect of desensitizing laser treatment on dentin surfaces using environmental scanning electron microscopy (E-SEM). MATERIALS AND METHODS: Ground dentin surfaces were divided into 5 areas. Each area received a different mode of laser irradiation (low potency [LP] versus high potency [HP] and short time [ST] versus long time [LT]). Lased dentin surfaces were viewed and graded under E-SEM at x5000 magnification. RESULTS: The tubule closure rates of 4 different irradiation modes were as follows: LP/LT (74%) > HP/ST (70%) > LP/ST (51%) > HP/LT (46%) > control (6%). CONCLUSION: It was demonstrated that desensitizing laser application was an efficient treatment option for the occlusion of dentinal tubule apertures. Dentin;Dentin Sensitivity;Humans;Laser Therapy;Low-Level Light Therapy;Microscopy, Electron, Scanning;Radiation Dosage;Time Factors

Treatment effects of combined radio-frequency current and a 900 nm diode laser on leg blood vessels. BACKGROUND AND OBJECTIVES: Effective laser treatment of leg veins remains a major challenge. The present study examined the safety and efficacy of a new technology for leg vein treatment combining 900 nm diode laser with radiofrequency (RF) current. STUDY DESIGN/MATERIALS AND METHODS: Forty patients, skin types II-IV, received a maximum of three treatments on 1-4 mm leg veins at 2-week intervals with a 900 nm diode laser (250 millisecond exposure time, average fluence 60 J/cm2) and RF (energy 100 J/cm3). Results were assessed after each treatment and at 2 and 6 months after the final session. Patients rated their satisfaction with the clinical outcome on a five-item scale. Clinician and computer analysis of the clinical photography was also performed, in addition to histological assessment. RESULTS: One or two sessions were required in the majority of patients. Shortly after treatment, histology revealed contracted vessels with perivascular edema. Side effects were extremely rare. The clinician 2- and 6-month assessments showed that 70% and 82.5% of subjects, respectively, achieved over 50% clearance, with patient and computer assessments lower and slightly higher, respectively. Treatments showed greater efficacy on thicker vessels and in the darker skin types. CONCLUSIONS: The success of the treatment, minimal side effects, and patient comfort suggest that this combination is an effective, safe technique for leg vein treatment. When compared to previous studies using diode laser alone, the very low fluence needed to achieve vessel clearance emphasizes the role of RF energy. Adult;Cosmetic

Techniques;Female;Humans;Image Processing, Computer-Assisted;Leg;Low-Level Light Therapy;Middle Aged;Radiofrequency Therapy;Skin;Treatment Outcome;Vascular Diseases;Veins

Pulsed dye laser treatment of genital warts. BACKGROUND AND OBJECTIVES: Genital warts represent benign epithelial proliferations induced by human papillomavirus. The goal of treatment is the clearance of visible warts. Different regimens are available. Flashlamp-pumped pulsed dye laser (FPDL) represents one of many treatment options for the management of viral warts (verrucae vulgares), its effectiveness being comparable with that of conventional therapies. We evaluated the effectivity of FPDL light for the treatment of genital warts. STUDY DESIGN/MATERIALS AND METHODS: A prospective study was performed to examine the efficacy of FPDL in untreated genital warts in which 22 patients were included. RESULTS: All patients showed complete remission after 1.59 (1-5) laser sessions and no scarring was observed. CONCLUSIONS: This study demonstrate that FPDL is a simple and safe, cost and time saving alternative treatment option for genital warts and should be listed in genital warts treatment guidelines. Adolescent;Adult;Condylomata Acuminata;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Penile Diseases;Prospective Studies;Recurrence;Treatment Outcome;Vulvar Diseases

Potassium titanyl phosphate (KTP) laser treatment for molluscum contagiosum. We report a case of an immunocompromised 38-year-old Asian patient who developed several hundred atypical lesions of molluscum on her face and neck, resistant to conventional treatment. These lesions were treated successfully by potassium titanyl phosphate (KTP) laser without pigmentary disturbance. KTP laser is a novel treatment for molluscum contagiosum. Phosphates;potassium titanylphosphate;Titanium Adult;Female;Humans;Low-Level Light Therapy;Molluscum Contagiosum;Phosphates;Titanium

Photobiomodulation partially rescues visual cortical neurons from cyanide-induced apoptosis. Near-infrared light via light-emitting diode treatment has documented therapeutic effects on neurons functionally inactivated by tetrodotoxin or methanol intoxication. Light-emitting diode pretreatment also reduced potassium cyanide-induced cell death, but the mode of death via the apoptotic or necrotic pathway was unclear. The current study tested our hypothesis that light-emitting diode rescues neurons from apoptotic cell death. Primary neuronal cultures from postnatal rat visual cortex were pretreated with light-emitting diode for 10 min at a total energy density of 30 J/cm2 before exposing to potassium cyanide for 28 h. With 100 or 300 microM potassium cyanide, neurons died mainly via the apoptotic pathway, as confirmed by electron microscopy, Hoechst 33258, single-stranded DNA, Bax, and active caspase-3. In the presence of caspase inhibitor I, the percentage of apoptotic cells in 300microM potassium cyanide was significantly decreased. Light-emitting diode pretreatment reduced apoptosis from 36% to 17.9% (100 microM potassium cyanide) and from 58.9% to 39.6% (300 microM potassium cyanide), representing a 50.3% and 32.8% reduction, respectively. Light-emitting diode pretreatment significantly decreased the expression of caspase-3 elicited by potassium cyanide. It also reversed the potassium cyanide-induced increased expression of Bax and decreased expression of Bcl-2 to control levels. Moreover, light-emitting diode decreased the intensity of 5-(and -6) chloromethy-2', 7-dichlorodihydrofluorescein diacetate acetyl ester, a marker of reactive oxygen species, in neurons exposed to 300 microM potassium cyanide. These results indicate that light-emitting diode pretreatment partially protects neurons against cyanide-induced caspase-mediated apoptosis, most likely by decreasing reactive oxygen species production, down-regulating pro-apoptotic proteins and activating anti-apoptotic proteins, as well as increasing energy metabolism in neurons as reported previously. Cyanides;DNA, Single-Stranded;Enzyme Inhibitors;Proto-Oncogene Proteins c-bcl-2;Reactive Oxygen Species;bcl-2-Associated X Protein;Casp3 protein, rat;Caspase 3;Caspases Animals;Apoptosis;Blotting, Western;Caspase 3;Caspases;Cell Count;Cell Nucleus;Cells, Cultured;Cyanides;DNA, Single-Stranded;Densitometry;Dose-Response

Relationship, Drug;Enzyme Inhibitors;Immunohistochemistry;Light;Microscopy, Electron, Transmission;Neurons;Phototherapy;Proto-Oncogene Proteins c-bcl-2;Rats;Rats, Sprague-Dawley;Reactive Oxygen Species;Visual Cortex;bcl-2-Associated X Protein

A comparison between the occluding effects of the Nd:YAG laser and the desensitising agent sensodyne on permeation through exposed dentinal tubules of endodontically treated teeth: an in vitro study. OBJECTIVE: Dentine hypersensitivity may occur due to loss of covering enamel and/or loss of cementum after gingival recession, resulting in exposure of cervical dentine and patency of dentinal tubules. The effect of thermally cooled pulsed neodymium:yttrium-aluminium-garnet (Nd:YAG) laser on the permeability and structural appearance of the root canal wall was investigated in vitro. The aim of this study was to compare the occluding effect of Nd:YAG laser with that of sensodyne on exposed dentine. MATERIAL AND METHODS: Forty freshly extracted human maxillary anterior teeth were collected at random. Root canal obturations were performed using master apical file no. 60 k-type for obturated teeth. All teeth were stored in 100% humidity at 37 degrees C for 48h to allow time for the sealer to set. Dentine of 35 teeth was exposed by removing the cementum, and the remaining five teeth represented a negative control group. Specimens were examined using stereomicroscopy to show the surface topography of the dentine substrate before and after treatment with Nd:YAG laser or sensodyne. RESULTS: A double-blind technique was used when taking measurements of ink penetration (in mm) for each group. Teeth treated by Nd:YAG laser showed the least ink penetration, followed by teeth treated by sensodyne. The positive control group demonstrated complete ink penetration and the negative control group showed no ink penetration. Stereomicroscopic examination of specimens treated with Nd:YAG laser showed deposition on the dentinal surface, and specimens treated with sensodyne showed partial deposition. Untreated specimens were free of deposition and the tubules remained patent. CONCLUSION: There is no significant difference in the occluding effect of Nd:YAG laser and sensodyne toothpaste. Both treatments have a promising effect on the reduction of permeation through exposed dentinal tubules. However, the occluding effect of Nd:YAG laser occurs within seconds whereas that of sensodyne takes at least 3 weeks. Drug Combinations;Nitrates;Phosphates;Sensodyne;Toothpastes;Fluorides Analysis of Variance;Dentin;Drug Combinations;Fluorides;Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Nitrates;Permeability;Phosphates;Tooth, Nonvital;Toothpastes

Effect of low-level helium-neon laser therapy on the healing of third-degree burns in rats. This paper presents the results of a study on the effects of low-level helium-neon laser therapy (LL He-Ne LT) on the healing of burns. Seventy-eight adult male rats, having been subjected to third-degree burns, were randomly divided into four groups: two laser treated groups (n=20, each), one control group (n=19) and one nitrofurazone treated group (n=19). In the two laser treated groups, the burns were treated on a daily basis with LL He-Ne LT with an energy density of 1.2 and 2.4 J/cm(2), respectively. The response to treatment was assessed histologically at 7, 16 and 30 days after burning, and microbiologically at day 15. Analysis of variance showed that the mean of blood vessel sections in the 1.2J/cm(2) laser group was significantly higher than those in the other groups and the mean of the depth of new epidermis in the 2.4 J/cm(2) laser group on day 16 was significantly lower than in the nitrofurazone treated group (P=0.025, P=0.047, respectively). When Staphylococcus aureus and Pseudomonas aeruginosa grew in more than 50% of samples obtained from control group, there were no S. aureus and P. aeruginosa in the samples of 2.4 J/cm(2) laser group. It is concluded that LL He-Ne LT induced the destruction of S. aureus and P. aeruginosa in third-degree burns of rats, yet at the same time our histological findings showed that LL He-Ne LT caused a significant increase in the mean of blood vessel sections on day 7 after third degree burns and a decrease in the mean of the depth of new epidermis on day 16 after the same burns in rats.

Anti-Infective Agents, Local;Nitrofurazone Animals;Anti-Infective Agents, Local;Burns;Low-Level Light Therapy;Male;Nitrofurazone;Pseudomonas aeruginosa;Rats;Rats, Wistar;Staphylococcus aureus;Wound Healing
Physical therapy modalities in management of fibromyalgia. The etiology of fibromyalgia syndrome (FM) is uncertain and the prognosis for symptomatic recovery is generally poor. A wide variety of interventions are used in the management of FM. There is, however, no clear consensus on the treatment of choice and FM remains relatively refractory to treatment. Therefore, prevention, causal therapy and rehabilitation are not possible. FM patients frequently use alternative therapies, indicating dissatisfaction or ineffectiveness of traditional medical therapy. Alternative therapies are generally perceived to be more "natural" and as a result, to have fewer adverse effects. Despite the positive results found, the number of publications related to the application of physical therapy modalities such as acupuncture, transcutaneous electrical stimulation, laser, biofeedback, electrotherapy and magnetic field is still scant, especially concerning FM treatment. The demonstration of a long-term effective intervention for managing the symptoms associated with FM is needed. Multidisciplinary approaches to management include physical and medical therapeutic strategies. Treatment modalities should be individualised for patients based on target symptoms and impairment in functioning. Patience and positive attitude on part of the physician and active involvement of patients and their families in treatment are likely to enhance improvement. It can be concluded that there is a need for larger, more systematic and methodologically sound randomised controlled clinical trials to evaluate the effectiveness of physical therapy modalities of managing FM. We will review some of the existing studies of physical therapy relevant in the treatment of FM and give some practical advice for their use. Acupuncture;Biofeedback, Psychology;Electric Stimulation Therapy;Electromagnetic Fields;Fibromyalgia;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Transcutaneous Electric Nerve Stimulation;Ultrasonics
Nevoid basal cell carcinoma syndrome in an adolescent boy. Adolescent;Basal Cell Nevus Syndrome;Biopsy, Needle;Facial Dermatoses;Follow-Up Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Risk Assessment;Skin Neoplasms;Treatment Outcome
Transcranial application of low-energy laser irradiation improves neurological deficits in rats following acute stroke. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) has been shown to have beneficial effects on ischemic skeletal and heart muscles tissues. The aim of the present study was to approve the effectiveness of LLLT treatment at different locations on the brain in acute stroked rats. STUDY DESIGN/MATERIALS AND METHODS: Stroke was induced in 169 rats that were divided into four groups: control non-laser and three laser-treated groups where laser was employed ipsilateral, contralateral, and both to the side of the induced stroke. Rats were tested for neurological function. RESULTS: In all three laser-treated groups, a marked and significant improvement in neurological deficits was evident at 14, 21, and 28 days post stroke relative to the non-treated group. CONCLUSIONS: These observations suggest that LLLT applied at different locations in the skull and in a rather delayed-phase post stroke effectively improves neurological function after acute stroke in rats. Analysis of Variance;Animals;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Statistics, Nonparametric;Stroke
Bactericidal effects of diode laser on Streptococcus mutans after irradiation through different thickness of dentin. BACKGROUND AND OBJECTIVES: A reliable method to eradicate the bacteria of residual carious dentin has not yet been developed. The aim of this study was to evaluate the antibacterial effect of a diode laser on Streptococcus mutans through different thickness (500, 1,000, and 2,000 microm) of human dentin. The thermal effect of laser irradiation was also investigated. STUDY DESIGN/MATERIALS AND METHODS: Dentin specimens were inoculated with 2 microl of S.

mutans on one side and irradiated by a diode laser on the other side with a power output ranging from 0.5 to 7 W. The laser tip was swept with the whole irradiation area of 7 mm x 3 mm at a speed of about 10 mm/second with a total irradiation time of 30 seconds. Cooling with distilled water (30 ml/minute) was applied simultaneously during laser irradiation. After laser irradiation, the bacteria was removed from the dentin surfaces and cultured for 48 hours at 37 degrees C anaerobically to assess the colony forming units (CFU) per ml. The morphology of the lased bacteria and the temperature rise during laser irradiation were observed by scanning electron microscope (SEM) and measured by thermocouple, respectively. RESULTS: The results revealed that 7 W of laser power could kill 97.7% of CFU through 500 microm thickness of dentin. However, the bactericidal efficiency was significantly reduced as the dentin thickness was increased. The morphological changes of lased bacteria ranged from less affected such as loss of their wall bands and existence of minicells to more severely degenerated, such as disintegration and fusion of cells with pores on the cell wall. Only the dentin specimens with a thickness of 500 microm exhibited a temperature rise greater than 5.5 degrees C after receiving 5 or 7 W of laser irradiation. CONCLUSIONS: A diode laser can eliminate the Streptococcus mutans of the residual carious dentin without inducing high pulpal temperature rise when the remaining dentin thickness is greater than 1 mm. Dental Caries;Dentin;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Statistics, Nonparametric;Streptococcus mutans

The role of laser fluence in cell viability, proliferation, and membrane integrity of wounded human skin fibroblasts following helium-neon laser irradiation. BACKGROUND: In medicine, lasers have been used predominantly for applications, which are broadly termed low level laser therapy (LLLT), phototherapy or photobiomodulation. This study aimed to establish cellular responses to Helium-Neon (632.8 nm) laser irradiation using different laser fluences (0.5, 2.5, 5, 10, and 16 J/cm(2)) with a single exposure on 2 consecutive days on normal and wounded human skin fibroblasts. MATERIALS AND METHODS: Changes in normal and wounded fibroblast cell morphology were evaluated by light microscopy. Changes following laser irradiation were evaluated by assessing the mitochondrial activity using adenosine triphosphate (ATP) luminescence, cell proliferation using neutral red and an alkaline phosphatase (ALP) activity assay, membrane integrity using lactate dehydrogenase (LDH), and percentage cytotoxicity and DNA damage using the Comet assay. RESULTS: Morphologically, wounded cells exposed to 5 J/cm(2) migrate rapidly across the wound margin indicating a stimulatory or positive influence of phototherapy. A dose of 5 J/cm(2) has a stimulatory influence on wounded fibroblasts with an increase in cell proliferation and cell viability without adversely increasing the amount of cellular and molecular damage. Higher doses (10 and 16 J/cm(2)) were characterized by a decrease in cell viability and cell proliferation with a significant amount of damage to the cell membrane and DNA. CONCLUSIONS: Results show that 5 J/cm(2) stimulates mitochondrial activity, which leads to normalization of cell function and ultimately stimulates cell proliferation and migration of wounded fibroblasts to accelerate wound closure. Laser irradiation can modify cellular processes in a dose or fluence (J/cm(2)) dependent manner. Helium;Neon Cell Proliferation;Cells, Cultured;Comet Assay;DNA Damage;Fibroblasts;Helium;Humans;Low-Level Light Therapy;Neon;Skin;Wound Healing

[Peculiarities of NO-syntase expression in experimental hypertension caused by inhibition during low frequency laser irradiation of cardiovascular system and kidneys]. The aim of our study was the investigation of expression of NO-syntase endothelial (eNOS) and inducted (iNOS) forms in cardiovascular system and kidneys at experimental hypertension caused by laser irradiation. For investigation of experimental model of hypertension the rats of Vister species together with the drinking water were administered by L-NAME, NO inhibitor. Rats were divided into the following groups: in group I, irradiation with laser was started immediately after L-NAME administration, in

group II - on the third day, in group III - on the 12th day, but in group IV - on the 28th day, respectively. The animals have been killed on the 10th day after irradiation. The morphological and immunohistochemical studies of heart and blood vessels (coronary arteries, aorta and kidney artery) and kidneys have been performed, with determination of eNOS and iNOS expression. The obtained results show that at irradiation by laser irradiation of low-frequency immediately after administration of L-NAME, eNOS expression is kept as in heart and blood vessels as in kidneys then iNOS expression is started firstly in myocardium and kidney (II group) and then in all studied blood vessels (III group). The mentioned facts prove that the irradiation by a laser of low - frequency inhibits eNOS inhibition after L-NAME action that must represent the background of antihypertensic effect after laser irradiation. Due to the results of study, an irradiation by a laser of low - frequency might be used for prevention of hypertension in preclinical stage to avoid the further complications, but its using with the aim to relieve the clinical evidences is not recommended. Nitric Oxide Synthase;NG-Nitroarginine Methyl Ester Animals;Cardiovascular System;Hypertension;Kidney;Low-Level Light Therapy;Male;NG-Nitroarginine Methyl Ester;Nitric Oxide Synthase;Rats

Fractional photothermolysis for treatment of poikiloderma of civatte. Poikiloderma of Civatte refers to a change in the skin where there is atrophy, hyper- and hypopigmentation, and dilation of fine blood vessels (telangiectasia). These alterations often cause cosmetic disfigurement, most commonly in middle-aged or elderly women with a fair complexion. Several treatment modalities, based on the theory of selective photothermolysis, including argon lasers, KTP lasers, pulsed dye lasers, and intense pulsed light devices, have been used to treat this condition in the past. Clinical experience has shown that complete clearing is difficult to achieve. Moreover, depending on the modality used, adverse effects, such as scarring with irregular hypopigmentation, post-inflammatory hyperpigmentation, post-treatment purpura, mottled appearance, crusting, and erythema, have been reported. Multiple sessions with these treatments are usually necessary to obtain optimal clearing. Atrophy;Female;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Middle Aged;Neck;Phototherapy;Pigmentation;Skin Diseases;Telangiectasis

Multiple eccrine hidrocystomas: successful treatment with the 595 nm long-pulsed dye laser. Dermatologic Agents;Atropine Administration, Topical;Aged;Atropine;Dermatologic Agents;Eccrine Glands;Female;Hidrocystoma;Humans;Low-Level Light Therapy;Sweat Gland Neoplasms;Treatment Outcome

Laser lipolysis using a novel 1,064 nm Nd:YAG Laser. BACKGROUND: We studied the safety and efficacy of a 1,064 nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser with a 300-micron fiber for the reduction of small unwanted fat areas. METHODS: Thirty subjects with focal areas of fat less than 100 cc were enrolled. Ten subjects were treated with laser lipolysis and had magnetic resonance imaging (MRI) at baseline and 3 months post-treatment. Ten subjects had laser lipolysis followed by biweekly treatments with the Tri-active system. The last group of 10 subjects served as control. Patients were seen at baseline and 1-week, 1-month, and 3-month follow-up visits. RESULTS: Twenty-nine patients completed the study. Self-assessment evaluations reported an improvement of 37% at the 3-month follow-up visit. MRI demonstrated an average 17% reduction in fat volume. Smaller baseline volume areas, such as the submentum, had better results, suggesting a dose-response relationship. The most common side effects were mild bruising and swelling resolving within 2 weeks. CONCLUSION: Laser lipolysis using the 1,064 nm Nd:YAG laser with a 300-micron fiber appears to be a very promising procedure that delivers good, reproducible results safely and effectively. The advantages include excellent patient tolerance, quick recovery time, and the benefit of dermal tightening. Adipose Tissue;Female;Humans;Lipectomy;Low-Level Light Therapy;Magnetic Resonance Imaging;Pilot Projects;Treatment Outcome

Effects of low-power laser radiation on mice immunity. BACKGROUND/PURPOSE: Because of large interest in biological effects of laser radiation used in laser therapy, the effect of extremely low-level red laser light intensity on the immune cell activity has been studied in the animal model with well-characterized macrophage and T cell populations as responder cells producing cytokines, protective proteins, active oxygen, and nitric compounds. To study of the possible side effects of laser immunotherapy we monitored the productions of cytokines, nitric oxide (NO), and heat shock protein 70 (Hsp70) in mice subjected to a periodic laser exposure for 1 month. METHODS: Helium-neon laser radiation with the power of 0.2 mW/cm2 and wavelength of 632.8 nm was applied on two different mouse skin surfaces, i.e. a thymus projection area or a hind limb. Healthy NMRI male mice were irradiated repeatedly with laser light for 1 min with 48-h intervals for 30 days. The animals were divided into three groups of 25 mice. The first and the second groups were exposed to laser light, on the thymus and hind limb area, respectively. The third, sham-irradiated group served as a control. Early and prolonged effects of laser radiation on the levels of NO (by Griess assay), Hsp70 (by Western blot assay), tumor necrosis factors (TNF-alpha and TNF-beta) (by cytotoxic assay using L929 cells as targets), and interleukin-2 (IL-2) (by ELISA assay) were determined. RESULTS: The dynamics of immune responses to low-power laser light intensity was shown to be dependent on two factors, i.e. the cumulative dose and the localization of the irradiated surface. Besides, various populations of cells demonstrated different sensitivity to laser radiation, with T cells being more responsive among examined populations of the cells. Low intensity laser light induced an immune cell activity when the exposure duration did not exceed 10 days, while a more prolonged period of treatment generated more severe changes in the immune system, up to immunosuppression. The treatment of the thymus zone resulted in more pronounced changes in the cytokine production as well as in NO and Hsp70 synthesis. CONCLUSION: Low-power laser irradiation showed more effective immunomodulatory effects when applied on the thymus projection area. The rise in IL-2 and Hsp70 production related to a short-term effect of laser application may be reversed after repeating laser treatment. We suggest that for the support of immune system stability, the prolonged laser therapy should be accompanied by supplementary methods. HSP70 Heat-Shock Proteins;Interleukin-2;Interleukin-6;Tumor Necrosis Factor-alpha;Helium;Nitric Oxide;Neon;Interferon-gamma Animals;Blotting, Western;HSP70 Heat-Shock Proteins;Helium;Immunity;Interferon-gamma;Interleukin-2;Interleukin-6;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Neon;Nitric Oxide;Skin;Thymus Gland;Tumor Necrosis Factor-alpha

A side-by-side prospective study of intense pulsed light and Nd:YAG laser treatment for vascular lesions. Recently, lasers and light systems are used more for the treatment of vascular lesions due to their noninvasiveness, ease of use, and short recovery time. This side-by-side prospective study compares results, satisfaction, and complications after intense pulsed light (IPL) and Nd:Yag laser treatment of small vascular lesions. Twenty-five patients with telangiectases, leg veins, or cherry angiomas underwent treatment of the same category of lesion in the same area. One year after completing treatment, patients were asked to report their satisfaction level after comparing digital photos before and after treatment; 72% felt they had good to excellent results after Nd:Yag treatment, while only 48% felt the same after IPL. The most common side effect after Nd:Yag was hyperpigmentation. Satisfaction level was significantly higher after Nd:Yag than after IPL. Patients with telangiectases, cherry angiomas, or leg veins <1 mm were more satisfied after IPL, while those with leg veins >1 mm were more satisfied after Nd:Yag. Overall, satisfaction with treatment of vascular lesions was greater with Nd:Yag although this method was more painful. Adult;Female;Hemangioma;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Phototherapy;Skin Diseases, Vascular;Telangiectasis;Varicose Veins

[Own clinical experience in treatment of port-wine stain with KTP 532 nm laser]. Lesions of port-wine stain (PWS) type are the most commonly occurring vascular malformations of the skin which concerns about 0.3% of the population. These important from aesthetic and psychological points of view capillaries malformations have always been difficult for treatment. Previously applied methods consisting in cryosurgery, dermabrasion, radiation therapy or surgery and skin grafting produced unsatisfactory results. It was only when highly selective lasers were introduced that PWS could be treated effectively and safely. A lot of available lasers and lack of experience of the health care providers result in not always proper qualification of the lesions to the given laser type. The aim of the study was to present a prospective analysis of the efficacy of treatment of PWS vascular malformations by means of KTP 532 nm laser. From January 2003 to May 2005, 155 patients (115 women, 40 men) aged from 2 to 62 years (mean age 18.23) were treated by means of laser at the Plastic Surgery Hospital in Polanica ZdrÃ³j, Poland. In the investigated population, the vascular malformation was a component of Sturge-Weber syndrome in 7 patients, Klippel-Trenaunay syndrome--in 2 patients, while in one case it accompanied Recklinghausen disease. The vascular lesions had not been treated before in majority of cases, while in 37 patients the laser therapy was the continuation of other previously attempted treatment, which included excision and skin grafting, argon laser therapy, radiation therapy and pulsed dye laser treatment. The procedures were performed with at least 4-week intervals without, or under local and in children general anaesthesia. Therapeutic efficacy was evaluated independently by 3 surgeons and a photographer on the basis of Subjective Scoring System (SSS) comparing simultaneously shown pictures of the patients taken prior to and after the last procedure. The outcomes of treatment were classified according to a 4-degree scale: excellent outcome--75-100% improvement, with 100% perceived as eradication of the lesion; good--50-74% improvement; fair--25-49% improvement and poor--less than 25% improvement, including no observable improvement. In 81% of the lesions (126 patients) treatment with KTP 532 nm laser produced significant improvement which was found satisfactory by the patient. excellent outcome of treatment was obtained in 49 patients (31%), good in 42 (27%), fair in 35 (23%). However, despite many laser treatments using various energy and pulse duration, there was almost not observable improvement in 19% of the study population (29 patients). The PWS which failed to treatment were most commonly located on the limbs. The results of treatment was poor in 74% of malformations which were located beyond the face and neck (all of them were on the limbs). There was no episodes of scarring or persistent pigmentary changes in any of the patients. CONCLUSIONS: 1. KTP (532 nm) laser is an effective and safe tool in the management of capillary malformations of PWS type. 2. The treatment is especially effective in adults and in lesions localized to the face and neck area. 3. Port-wine stain localized on the trunk and extremities often appears to be KTP laser resistant. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Poland;Port-Wine Stain;Retrospective Studies;Treatment Outcome

Effect of auricular acupuncture with low power laser on four chronic allergic dermatoses and serum IgE level. Immunoglobulin E Acupuncture, Ear;Adolescent;Adult;Aged;Aged, 80 and over;Dermatitis, Atopic;Eczema;Female;Humans;Immunoglobulin E;Low-Level Light Therapy;Male;Middle Aged;Urticaria

Effects of low-level laser therapy on the rate of orthodontic tooth movement. OBJECTIVES: To test the hypothesis that mechanical forces combined with low-level laser therapy stimulate the rate of orthodontic tooth movement. STUDY DESIGN: This study was a double blind, randomized placebo/control matched pairs clinical trial to test the efficacy of GaAlAs low-level laser therapy (LLLT) on 12 young adult patients who required retraction of maxillary canines into first premolar extraction spaces using tension coil springs with fixed edgewise appliance. LLLT was applied on the mucosa

buccally, distally and palatally to the canine on the test side and using a pseudo-application on the placebo side. Dental impressions and casts were made at the commencement of the trial and at the end of the first, second and third months after starting the trial. Measurement of tooth movements was made on each stage model using a stereo microscope. RESULTS: There was no significant difference of means of the canine distal movement between the LLLT side and the placebo side for any time periods (p-value = 0.77). CONCLUSION: The energy density of LLLT (GaAlAs) at the surface level in this study (25 J/cm(2)) was probably too low to express either stimulatory effect or inhibitory effect on the rate of orthodontic tooth movement. Placebos;Gallium;Aluminum;Arsenic Adult;Aluminum;Arsenic;Case-Control Studies;Cuspid;Double-Blind Method;Female;Follow-Up Studies;Gallium;Humans;Low-Level Light Therapy;Male;Models, Dental;Orthodontic Brackets;Orthodontic Space Closure;Orthodontic Wires;Placebos;Reproducibility of Results;Stress, Mechanical;Tooth Movement Techniques
[Changes in prostatic circulation in response to laser therapy and magnetic therapy in patients with benign prostatic hyperplasia]. The results of preoperative preparation were analysed in 59 patients with prostatic benign hyperplasia (PBH) subjected to TUR. Treatment outcomes were assessed by transrectal ultrasound (color Doppler mapping) in two groups of patients. Group 1 received combined therapy including transrectal laser radiation of the prostate, group 2--transrectal magnetotherapy. The analysis showed that laser radiation reduced insignificantly the size of the prostate and adenomatous node, improved microcirculation and circulation in the prostate. This resulted in relief of inflammation and reduction of the number of postoperative inflammatory complications. Transrectal magnetotherapy has a positive effect on vascularization and hemodynamics of the prostate, local immunity, contamination of the tissues with pathogenic flora. Aged;Aged, 80 and over;Blood Circulation;Combined Modality Therapy;Humans;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Postoperative Complications;Preoperative Care;Prostate;Prostatic Hyperplasia;Transurethral Resection of Prostate;Treatment Outcome
To the editor: effect of single pulsed dye laser treatment on acne vulgaris. Acne Vulgaris;Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome
[Potentialities of alternative non-drug therapy of gastric ulcer]. The aim of the study was to evaluate the influence of non-invasive laser therapy on the efficacy of gastric ulcer therapy. The study revealed shortening of the time to ulcer cicatrization in patients who were treated with laser emission of the organospecific iridic zones and immunocompetent body parts in addition to standard drug therapy. Anti-Ulcer Agents Anti-Ulcer Agents;Biopsy;Endoscopy, Gastrointestinal;Follow-Up Studies;Gastric Mucosa;Humans;Low-Level Light Therapy;Middle Aged;Stomach Ulcer;Treatment Outcome
[Infrared laser therapy in combined therapy of patients with chronic salpingo-oophoritis]. Adjuvants, Immunologic;Anti-Bacterial Agents;Anti-Inflammatory Agents, Non-Steroidal;Antioxidants;Vitamins Adjuvants, Immunologic;Adolescent;Adult;Anti-Bacterial Agents;Anti-Inflammatory Agents, Non-Steroidal;Antioxidants;Chronic Disease;Combined Modality Therapy;Female;Humans;Infrared Rays;Low-Level Light Therapy;Oophoritis;Salpingitis;Vitamins
Effective laser treatment in a case of lupus pernio. Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Middle Aged;Sarcoidosis
Striae distensae. Keratolytic Agents;Vitamins;Ascorbic Acid Ascorbic Acid;Humans;Keratolytic Agents;Low-Level Light Therapy;Skin Diseases;Vitamins
Efficacy of diode laser for treating acne keloidalis nuchae. Acne keloidalis nuchae is usually treated with oral antibiotics, local antiseptics or intralesional steroids but with limited success. I assessed the efficacy of diode laser for treating the inflammatory and keloidal papules of acne

keloidalis nuchae in two cases. The lesions in both the cases showed about 90 to 95% clearance after 4 treatment sessions at one to one and half month intervals. No new lesions were observed during the follow up period of six months after the last laser treatment. Thus, after clearing bacterial infection, laser hair epilation can be used as the first line of therapy for treating papules of acne keloidalis nuchae. This is the first attempt at treating acne keloidalis nuchae with a diode laser. Acne Keloid;Adult;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck;Risk Assessment;Severity of Illness Index;Treatment Outcome

Comparison of the effects of pulsed dye laser, pulsed dye laser + salicylic acid, and clobetasole propionate + salicylic acid on psoriatic plaques. BACKGROUND: Studies show that pulsed dye laser (PDL) has some clinical benefits on psoriasis with a low clearance rate. In addition, it has been suggested that applying keratolytics before treatment might be helpful in PDL therapy. Topical corticosteroids remain the most commonly prescribed agents for psoriasis. OBJECTIVE: This study was designed to compare the efficacy of the PDL treatment with that of PDL treatment after salicylic acid on psoriatic plaques. The other goal of this study was to compare the efficacy of the PDL treatment with that of clobetasol propionate treatment. METHODS: Twenty-two patients with chronic, stable psoriatic plaques that involved less than 20% of their body were included in the study. Three similar-appearing psoriasis plaques in these patients were selected. Whereas the first plaque received only PDL, the second plaque received PDL after salicylic acid, and the third plaque received clobetasol propionate ointment and salicylic acid. Evaluation of the study plaques was carried out by the modified Psoriasis Area and Severity Index (mPASI) score and by measuring the area of the plaques. RESULTS: Of the 21 patients, 19 completed the study. Although the decrease in mPASI scores was determined to be maximum for clobetasol propionate + salicylic acid-treated plaques and minimum for only PDL-treated plaques, the decrease was statistically significant in all groups when compared with baseline ($p < .003$). At the 3- and 6-week evaluations, there was a statistically significant difference between clobetasol propionate + salicylic acid-treated plaques and the two PDL-treated plaques ($p < .003$); however, the difference observed at the 9-, 12-, and 15-week evaluations was statistically significant only between clobetasol propionate + salicylic acid-treated plaques and PDL-treated plaques ($p < .003$). When the baseline and 15-week evaluations were compared, there was no statistically significant increase in the mean lesion areas of clobetasol propionate + salicylic acid-treated psoriatic plaques ($p > .003$), but there was a statistically significant increase in the mean lesion areas of two PDL-treated psoriatic plaques ($p < .003$). CONCLUSION: The results of this study showed that the effect of PDL could be increased when salicylic acid was added to treatment, although there was no statistically significant difference between both treatment protocols. However, clobetasol propionate + salicylic acid treatment is more effective than both PDL and PDL + salicylic acid treatment. Glucocorticoids;Keratolytic Agents;Clobetasol;Salicylic Acid Adult;Aged;Clobetasol;Combined Modality Therapy;Drug Therapy, Combination;Female;Follow-Up Studies;Glucocorticoids;Humans;Keratolytic Agents;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Psoriasis;Salicylic Acid;Treatment Outcome

Treatment of vascular skin lesions with the variable-pulse 595 nm pulsed dye laser. BACKGROUND: In the dermatology field, variable-pulse 595 nm pulsed dye lasers (PDLs) are now being widely used to treat vascular skin lesions. However, there is little information available on variable-pulse 595 nm PDL treatment of dark-skinned patients. OBJECTIVE: The objective of this study was to evaluate the outcome of variable-pulse 595 nm PDL treatment on Korean patients. METHOD: Two hundred thirty-nine patients (Fitzpatrick skin phototypes III to V) with vascular skin lesions, such as nevus flammeus, telangiectasia, or hemangioma, were included in this study. All patients were treated with a variable-pulse 595 nm PDL, and the outcomes were assessed by comparing preoperative and postoperative photographs. RESULTS: The average number of treatments per

patient was 4.29, and 51.9% of patients showed a good (51-75% clearance) to excellent (76-100% clearance) response. For nevus flammeus, 48.0% of the patients achieved good to excellent results. The gender and age of the patients did not influence the clinical response; however, lesions of the head and neck were found to respond more favorably to treatment. For telangiectasia, 78.0% of patients showed good to excellent results, and, again, the gender and age of the patients did not alter the treatment outcome. For hemangioma, the male to female ratio of patients was 1.0:3.1 and 54.1% of the patients achieved a good to excellent response. Superficial hemangioma showed a better clinical response than deep hemangioma, and the lesions of younger patients responded more favorably than those of older patients. CONCLUSION: The variable-pulse 595 nm PDL was found to be effective for treating several vascular skin lesions in dark-skinned patients. However, there were differences in treatment outcome owing to disease, age, and the location of the lesions. Adolescent;Adult;Aged;Aged, 80 and over;Asian People;Child;Child, Preschool;Female;Hemangioma;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Retrospective Studies;Skin Neoplasms;Skin Pigmentation;Telangiectasis;Treatment Outcome

Treatment of acquired bilateral nevus of ota-like macules (Hori's nevus) with a combination of the 532 nm Q-Switched Nd:YAG laser followed by the 1,064 nm Q-switched Nd:YAG is more effective: prospective study. BACKGROUND: Acquired bilateral nevus of Ota-like macules (Hori's nevus) is a common dyschromatosis among Asian women. Q-switched lasers have been used successfully as a treatment modality. OBJECTIVE: The purpose of this study was to compare the efficacy of using the Q-switched 532 nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser followed by the 1,064 nm laser versus the Q-switched 1,064 nm Nd:YAG laser alone in the treatment of Hori's nevus. METHODS: This is a prospective left-right comparative study. Ten women with bilateral Hori's nevus were recruited and treated with a combination of the Q-switched 532 and 1,064 nm Nd:YAG lasers on the right cheek and the Q-switched 1,064 nm Nd:YAG laser alone on the left cheek. Only one laser treatment session was performed. The degree of pigmentation was objectively recorded with a mexameter. Subjective assessment was made by both patients and two blinded, nontreating dermatologists. RESULTS: At 6 months, there was a statistically significant difference ($p = .009$) of 35.10 points using objective mexameter measurements between the two sides, favoring the side treated with a combination of 532 and 1,064 nm laser treatment. Subjective grading by the patients and blinded dermatologists also confirmed that combination therapy was more successful after one treatment. Although combination treatment had a higher incidence of mild postinflammatory changes, this disappeared within 2 months. CONCLUSIONS: Concurrent use of the Q-switched 532 nm Nd:YAG laser in combination with the 1,064 nm laser is more effective in pigment clearance than the Q-switched 1,064 nm Nd:YAG laser alone for Hori's nevi. Adult;Facial Neoplasms;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Nevus of Ota;Patient Satisfaction;Prospective Studies;Skin Neoplasms;Treatment Outcome

High-energy 595 nm pulsed dye laser improves refractory port-wine stains. BACKGROUND: Port-wine stains respond quite well to 585 nm pulsed dye laser treatment, but often clearance is not complete. We investigated a prototype, a high-energy 595 nm pulsed dye laser capable of delivering up to 9.5 J/cm2 using a 10 mm circular spot, with a 1.5 ms pulse duration. OBJECTIVE: This study was undertaken to determine if the high-energy, 595 nm, variable-pulse duration pulsed dye laser could improve port-wine stains that had become refractory to conventional treatment. METHODS: Twenty patients were entered into the study and treated with the high-energy, 595 nm, variable-pulse duration pulsed dye laser using fluences ranging from 7.5 to 9.5 J/cm2, a 1.5 ms pulse duration, and a 10 mm spot size. RESULTS: Average improvement was rated as 40% prior to the initiation of the study after an average of 8.8 treatments at an average energy of 7.9 J/cm2 with the 585 nm pulsed dye

laser and 76% following an average of 3.1 treatments with the high-energy 595 nm pulsed dye laser using an average fluence of 7.9 J/cm2. Dermal spectrometer erythema measurements improved from 2.2-fold that of normal skin to 1.5-fold that of unaffected skin. CONCLUSIONS: The high-energy 595 nm pulsed dye laser improves port-wine stains that have become refractory to the conventional 585 nm pulsed dye laser. Adolescent;Adult;Aged;Child;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Port-Wine Stain;Retreatment;Single-Blind Method;Treatment Outcome

Clinical effect of a single pulsed dye laser treatment of fresh surgical scars: randomized controlled trial. BACKGROUND: Pulsed dye laser has been used to decrease erythema and telangiectasia associated with scars, including surgical scars. There is limited evidence indicating improved surgical scar appearance if pulsed dye laser treatments are commenced immediately at the time of suture removal. OBJECTIVE: To determine whether a single one-pass pulsed dye laser treatment at the time of suture removal can improve the appearance of surgical scars. METHODS: Randomized controlled trial enrolling 20 patients (complete data for 17 patients) at two geographic sites, with blinded ratings of pre- and post-treatment photographs obtained at various time points. Included patients underwent elliptical excision for atypical nevi of the trunk and/or extremities, with at least one resulting scar of at least 5 cm in length or two scars of at least 2.5 cm in length. For each patient, each scar or half-scar (if a larger scar was used) was randomized to treatment or control groups. Treatment scars received a single one-pass treatment with a 595 nm pulsed dye laser (Vbeam, Candela Corporation, Wayland, MA, USA) at the time of suture removal (ie, 2 weeks after excision) at the following parameters: 7 J/cm2 fluence, 7 mm spot size, 1.5-millisecond pulse duration, and 30-millisecond spray, 20-millisecond delay of dynamic cooling. The treatment area included 1 cm on either side of the scar, and the round laser spots were overlapped 10%. Control scars were not treated with laser. RESULTS: Immediate purpura was induced from the laser treatment Six weeks after laser treatment, no significant difference was found in the clinical appearance of surgical scars treated with a single pulsed dye laser treatment on suture removal day versus those surgical scars not treated with laser. Parameters on which no significant difference was found included visibility of incision, erythema, hyperpigmentation, hypopigmentation, induration, and atrophy. Both sets of scars improved over time. CONCLUSIONS: A single pulsed dye laser treatment at the time of suture removal does not appear to have a beneficial effect on clinical scar appearance. The point of minimal benefit for such laser treatments may lie somewhere between one and three treatments. Adult;Cicatrix;Device Removal;Follow-Up Studies;Humans;Low-Level Light Therapy;Nevus;Postoperative Complications;Prospective Studies;Single-Blind Method;Skin Neoplasms;Suture Techniques;Treatment Outcome

Treatment of surgical scars with the cryogen-cooled 595 nm pulsed dye laser starting on the day of suture removal. BACKGROUND: Cosmetic results after skin surgery are a key component of patient satisfaction and self-image. Various lasers have been used to attempt scar improvement, without consistent results. The optimal time to initiate laser treatment has not been determined. A recent study using a noncooled 585 nm pulsed dye laser starting on the day of suture removal demonstrated substantial improvement in scar appearance. OBJECTIVE: To determine the efficacy of the 595 nm cryogen-cooled pulsed dye laser in the treatment of surgical scars starting on the day of suture removal. METHODS: Sixteen patients with postoperative linear scars of greater than 2 cm were treated three times at 4- to 8-week intervals with a 595 nm cryogen-cooled pulsed dye laser. All patients had Fitzpatrick skin types I to IV. Each scar was divided at the midline into two fields, with half receiving treatment using a 7 mm spot size at 1.5 ms with 8 J/cm2 and a 30 ms spray duration with a 10 ms delay. The other half was not treated. Scars were evaluated for pigmentation, vascularity, pliability, and height by a blinded examiner using the Vancouver Scar Scale (VSS). In addition, the same blinded examiner evaluated the cosmetic appearance using a scale from 0 (worst)

to 10 (best) prior to the second treatment and 1 month after the final treatment. RESULT: SThe average sum of all parameters in the VSS showed significant improvement from 1-month post-treatment to the final evaluation of 60% compared with the control of -3%. Also, scars in the treated portions scored an average of 2 points higher in the overall cosmetic appearance by the same blinded examiner based on a scale of 0 (worst) to 10 (best). Among the individual parameters in the VSS, the most significant improvements were found in vascularity and pliability. CONCLUSION: The cryogen-cooled 595 nm pulsed dye laser is a safe and effective option to improve the cosmetic appearance of surgical scars in skin types I to IV starting on the day of suture removal.
Adult;Aged;Cicatrix;Dermatologic Surgical Procedures;Device Removal;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Prospective Studies;Single-Blind Method;Suture Techniques;Treatment Outcome

Comparative treatment of small diameter (< or =400 microm) vascular lesions using extended pulse dye lasers. BACKGROUND AND OBJECTIVES: Extended-pulse dye lasers (EPDL) are commonly used to treat a variety of vascular lesions. This study evaluated whether differences in pulse formats and cooling methods might affect outcome in the treatment of small facial telangictasia. STUDY DESIGN/MATERIALS AND METHODS: Ten subjects presenting with symmetric, bilateral facial telangiectasia were studied. Each side of the face was treated with either the V-Startrade mark smart-cool air cooling (Cynosure, Inc.) (VS) or V-beam DCD cooling (Candela, Inc.) (VB) EPDL treatments with both systems were undertaken with a 10-milliseconds pulse duration, 1 J/cm(2) below the purpuric threshold, with up to three passes. RESULTS: Treatment clearance with the VS EPDL occurred with a lower fluence, using fewer passes than with the VB EPDL ($P < 0.05$). CONCLUSIONS: Although both the currently popular EPDL systems are highly effective in the treatment of small facial telangiectasia, clinical differences can be seen between these two systems.
Cryotherapy;Erythema;Face;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Purpura;Telangiectasis;Treatment Outcome

The biological effects of 632.8-nm low energy He-Ne laser on peripheral blood mononuclear cells in vitro. The aim of this study was to examine the proliferation of peripheral blood mononuclear cells due to the low energy 632.8-nm He-Ne laser application. The results of previous studies supported the hypothesis that low level laser therapy (LLLT) might have an increasing effect on the proliferation of lymphocytes and production of cytokines. The effect of laser irradiation was investigated by comparing the proliferation of peripheral blood mononuclear cells (PBMC) with a mitogenic stimulator, PHA (phytohemaglutinin) and laser irradiation. PBMCs of control samples, only laser irradiated samples, PHA included samples and both PHA included and laser irradiated samples were quantified and compared. Results of [3H] Thymidine test, 20 s laser irradiated and 40 s laser irradiated samples' proliferation were found statistically higher than control samples. There was no significant difference between control and 60 s laser irradiated samples. PHA also showed its ability to proliferate cells. PHA included samples and both PHA included and laser irradiated samples' proliferation was higher than both control and only laser irradiated samples. Our results showed that He-Ne laser application enhanced the proliferation significantly. Moreover, laser dose was noted as a significant parameter. On the other hand, LLLT by itself was found less effective than PHA.
Helium;Neon Adult;Cell Proliferation;Helium;Humans;In Vitro Techniques;Lasers;Male;Monocytes;Neon

Age-related macular degeneration: options for earlier detection and improved treatment.
Aptamers, Nucleotide;Vitamins;pegaptanib Aged;Aged, 80 and over;Aptamers, Nucleotide;Humans;Hypertension;Low-Level Light Therapy;Macular Degeneration;Risk Factors;Smoking;Visual Acuity;Vitamins

Low level laser therapy (LLLT) as an effective therapeutic modality for delayed wound healing. Low level laser therapy (LLLT) is a form of phototherapy that involves the application of low power monochromatic and coherent light to injuries and lesions. It has been used successfully to induce wound healing in nonhealing defects. Other wounds treated with lasers include burns, amputation injuries, skin grafts, infected wounds, and trapping injuries. The unique properties of lasers create an enormous potential for specific therapy of skin diseases. As with any new device, the most efficacious and appropriate use requires an understanding of the mechanisms of light interaction with tissue as well as the properties of the laser itself. Diabetes Complications;Humans;Low-Level Light Therapy;Wound Healing;Wounds and Injuries

Endovenous ablation of truncal veins. The use of endovenous procedures to eliminate saphenous and primary branch reflux has been growing exponentially over the last few years. Although initially developed by dermatologic surgeons, the technique has been embraced by many other specialties including radiology, vascular surgery and anesthesiology. Radiofrequency energy was the first used in 1999 for endovenous ablation. More recently, laser technology targeting hemoglobin (810 nm, 940 nm & 980 nm) and water (1320 nm) have been developed to quickly and effectively treat saphenous reflux, with minimal side effects. The placement of peri-vascular anesthesia, using the tumescent technique, has further streamlined these procedures. The purpose of this article is to review our experience and outline advantages and disadvantages of the various techniques available. Catheter Ablation;Humans;Low-Level Light Therapy;Saphenous Vein;Varicose Veins

Laser treatment of leg veins. The development of lasers using deeper-penetrating, near-infrared wavelengths with millisecond pulse durations and skin-cooling methods has produced safer and more predictable results for the treatment of leg veins less than 1 mm in diameter and depth. Recent prospective studies of the near-infrared lasers show comparable efficacy and side effect profiles to those observed with sclerotherapy. Treatment of reticular and varicose veins is effective with these wavelengths but is limited by patient discomfort when compared with sclerotherapy. Visible light lasers (such as the pulsed dye and KTP) and intense pulsed-light sources are reproducibly effective only for superficial, nonarborizing pink-to-red telangiectasia, in the absence of points of proximal reflux. Because most lower-extremity vascular ectasias comprise a heterogeneous group of vessel sizes and depths, many patients achieve the best results using a combination of techniques. This article reviews the fundamentals of laser tissue interactions for the treatment of leg veins and details the recent clinical experience with the newer near-infrared devices. Humans;Low-Level Light Therapy;Varicose Veins

Low Level Laser Therapy in Treatment of Stress Fractures Tibia: A Prospective Randomized Trial. BACKGROUND: Standard treatment of Stress fracture includes rest, compression, elevation and passive stretching. Low level laser therapy (LLLT) has been described in treatment of joint conditions, tendophaties, musculofascial pains and dermatological conditions. A prospective randomized control study was carried out to assess efficacy of LLLT in treatment of stress fractures in tibia. METHOD: 68 cases were enrolled. 34 each in control and test group. Control cases were treated with placebo and test group with laser-therapy. Complete resolution of pain and tenderness, and return to painless ambulation was taken as end point of therapy in both groups. RESULT: The test group showed earlier resolution of symptoms and painless ambulation with fewer recurrence. CONCLUSION: LLLT appears beneficial in treatment of stress fracture in this preliminary study. A larger multicentric study is indicated to prove the benefit conclusively.

[Rehabilitation, physical therapy or Back School?]. Braces;Ergonomics;Evidence-Based Medicine;Exercise Therapy;Humans;Interdisciplinary Communication;Low Back Pain;Low-Level Light

Therapy;Massage;Patient Education as Topic;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Traction;Transcutaneous Electric Nerve Stimulation
[Current surgical treatment of lumbar instability]. Ozone Diskectomy;Humans;Joint Instability;Low-Level Light Therapy;Lumbar Vertebrae;Ozone;Prostheses and Implants;Spinal Fusion;Spondylolisthesis;Spondylolysis;Total Disc Replacement
Epilation today: physiology of the hair follicle and clinical photo-epilation. Despite the variations of length and type of hair (vellus or terminal), the growth of human hair in all body sites is cyclic. Phases of active hair growth, or anagen, are separated by periods of quiescence, or telogen. The duration of both phases varies greatly depending on the body site. Whether hairs are in anagen/telogen at the time of hair removal is important because only anagen hairs are particularly sensible to physical insults. Photo-epilation is a technique for long-term removal of unwanted hair by thermal destruction of the hair follicle and its reproductive system (stems cells). As melanin is the main chromophor existing in hair follicles the corresponding wavelength spectrum would range from ultraviolet up to infrared light. Furthermore longer wavelengths are preferred as the cromophor lies deep in the skin and the penetration of light is increasing with the wavelength. Thus, in the range of 600-1100 nm melanin absorption may be used for selective photothermolysis of hair follicles. Yet to be resolved questions for permanent destruction are the location of the key follicular target and the possible influence of the hair growth cycle on photothermolysis-induced hair removal. An overview on the individual physiology of the hair follicle is given to discuss the latest strategies for photo-epilation. Hair;Hair Follicle;Hair Removal;Humans;Low-Level Light Therapy;Melanocytes
Comparison study of a traditional pulsed dye laser versus a long-pulsed dye laser in the treatment of early childhood hemangiomas. BACKGROUND AND OBJECTIVE: The role of pulsed dye laser (PDL) in the treatment of childhood hemangiomas is still controversial because of the inherent characteristics of hemangiomas as well as the side effects of the PDL. Recently, the long pulsed dye laser (LPDL) with cryogen spray cooling (CSC) has been found relatively more effective and safer than the PDL in the treatment of port-wine stains and telangiectasia. This study was designed to compare the efficacy and complication rate of PDL versus LPDL for treating childhood hemangiomas. STUDY DESIGN/MATERIALS AND METHODS: We did a prospective, randomized, controlled trial in which we enrolled 52 Asian infants, aged 1-3 months, with early hemangiomas. These infants were assigned to PDL treatment (n = 26) or LPDL treatment (n = 26) and followed to age 1 year. A PDL with a wavelength of 585 nm and spot size of 7 mm and a LPDL with a wavelength of 595 nm and spot size of 7 mm were used. Each patient in the PDL group was treated with energy fluence between 6 and 7 J/cm(2) and a pulse duration of 0.45 milliseconds without epidermal cooling. Each patient in the LPDL group was treated with energy fluence between 9 and 15 J/cm(2) and a pulse duration of 10-20 milliseconds, utilizing CSC to protect the epidermis. Each group was treated at 4-week intervals until the lesion cleared. When each patient reached an age of 1 year, outcome measures such as clearance rate, time period of maximum proliferation, and complications were assessed. RESULTS: The number of children whose lesions showed complete clearance or minimal residual signs at 1 year of age was 14 (54%) in the PDL group and 17 (65%) in the LPDL group (P = 0.397). Compared with the LPDL, PDL treated children had more hypopigmentation (3, 12% vs. 8, 31%; P = 0.001), more hyperpigmentation (2, 8% vs. 4, 15%; P = 0.005), and more textural changes (1, 4% vs. 6, 23%; P = 0.001). The average time period of maximum proliferation in the LPDL group was significantly shorter than that of the PDL group (106 days vs. 177 days; P = 0.01). CONCLUSION: Early treatment of childhood hemangiomas with the LPDL is safer and more effective than the PDL. Asian People;Female;Hemangioma;Humans;Hyperpigmentation;Hypopigmentation;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Prospective Studies;Time Factors;Treatment Outcome

A randomised, placebo controlled trial of low level laser therapy for activated Achilles tendinitis with microdialysis measurement of peritendinous prostaglandin E2 concentrations. BACKGROUND: Low level laser therapy (LLLT) has gained increasing popularity in the management of tendinopathy and arthritis. Results from in vitro and in vivo studies have suggested that inflammatory modulation is one of several possible biological mechanisms of LLLT action. OBJECTIVE: To investigate in situ if LLLT has an anti-inflammatory effect on activated tendinitis of the human Achilles tendon. SUBJECTS: Seven patients with bilateral Achilles tendinitis (14 tendons) who had aggravated symptoms produced by pain inducing activity immediately before the study. METHOD: Infrared (904 nm wavelength) LLLT (5.4 J per point, power density 20 mW/cm2) and placebo LLLT (0 J) were administered to both Achilles tendons in random blinded order. RESULTS: Ultrasonography Doppler measurements at baseline showed minor inflammation through increased intratendinous blood flow in all 14 tendons and measurable resistive index in eight tendons of 0.91 (95% confidence interval 0.87 to 0.95). Prostaglandin E2 concentrations were significantly reduced 75, 90, and 105 minutes after active LLLT compared with concentrations before treatment ($p = 0.026$) and after placebo LLLT ($p = 0.009$). Pressure pain threshold had increased significantly ($p = 0.012$) after active LLLT compared with placebo LLLT: the mean difference in the change between the groups was 0.40 kg/cm2 (95% confidence interval 0.10 to 0.70). CONCLUSION: LLLT at a dose of 5.4 J per point can reduce inflammation and pain in activated Achilles tendinitis. LLLT may therefore have potential in the management of diseases with an inflammatory component. Dinoprostone Achilles Tendon;Adult;Dinoprostone;Double-Blind Method;Humans;Low-Level Light Therapy;Microdialysis;Middle Aged;Pain Measurement;Tendinopathy;Treatment Outcome;Ultrasonography

[Morphological changes of cardiovascular system at experimental hypertension, caused by no inhibition in condition of the laser irradiation of low-frequency]. The aim of our study was the investigation of the morphological changes of cardiovascular system, caused by NO inhibition during the laser irradiation of low-frequency. On reception of L NAME and a low-frequency laser irradiation arterial pressure during all experiment remains within the norm. At slight increase of phonic arterial pressure the laser irradiation proved to be less effective, while on a background of high arterial pressure the irradiation does not interfere the further development of hypertension and persistency. Immediately after reception of L NAME and at a low-frequency laser irradiation, the fibrosis and inflammatory changes of myocardium have not been observed; on the background of the slight enhancement of arterial pressure, laser irradiation causes insignificantly expressed fibrosis, inflammatory changes in myocardium; while on the background of increased arterial pressure a laser irradiation doesn't interfere development of fibrosis, myocardium and inflammatory changes in it. Immediately after reception L NAME and at a laser irradiation of low-frequency from the third day, a damage of cardiovascular walls, inflammatory changes, perivascular fibrosis have not been developed, while on the background of increased arterial pressure the irritation doesn't interfere the development of the above mentioned changes. Thus, the irradiation of a low-frequency laser might be recommended to prevent the development of hypertension and to avoid the complications of pre-clinical phase of hypertension. Though, the analogous recommendations are not foreseen for involvement in algorithm of the treatment of hypertension and correction of clinical evidence of the disease. Nitric Oxide;Arginine Animals;Arginine;Endomyocardial Fibrosis;Hypertension;Low-Level Light Therapy;Myocardium;Neutrophils;Nitric Oxide;Rats;Time Factors

Clinical efficacy of semiconductor laser application as an adjunct to conventional scaling and root planing. BACKGROUND AND OBJECTIVES: The aim of the in vitro study was to examine the clinical efficacy of semiconductor laser periodontal pocket irradiation as an adjunct to conventional scaling and root planing. MATERIALS AND METHODS: Twenty-two healthy patients with a need of

periodontal treatment (15 women, 7 men, mean age 45.0 +/- 10.8 years) with at least four teeth in all quadrants, were included. All of them underwent a conventional periodontal treatment including scaling and root planing. Using a split mouth design, two randomly chosen quadrants (one upper and the corresponding lower one) were subsequently treated with an 809 nm GaAlAs laser operated at a power output of 1.0 Watt using a 0.6 mm optical fiber. The teeth in the control quadrants were rinsed with saline. The clinical outcome was evaluated by means of plaque index (PI), gingival index (GI), bleeding on probing (BOP), sulcus fluid flow rate (SFFR), Periotest (PT), probing pocket depth (PPD), and clinical attachment loss (CAL) at baseline and at 3 months after treatment. A total of 492 teeth in both groups were evaluated and differences between the laser and the control teeth were analyzed using the Wilcoxon test ($P < 0.05$). RESULTS: Teeth treated with the laser revealed a significantly higher reduction in tooth mobility, pocket depth, and clinical attachment loss. Twelve percent of the teeth in the laser group showed an attachment gain of 3 mm or more, compared to 7% in the control group. An attachment gain of 2-3 mm was found in 24% of the teeth in the laser group and 18% in the control group. No significant group differences, however, could be detected for the plaque index, gingival index, bleeding on probing, and the sulcus fluid flow rate. CONCLUSIONS: The higher reduction in tooth mobility and probing depths is probably not predominantly related to bacterial reduction in the periodontal pockets but to the de-epithelization of the periodontal pockets leading to an enhanced connective tissue attachment. The application of the diode laser in the treatment of inflammatory periodontitis at the irradiation parameters described above is a safe clinical procedure and can be recommended as an adjunct to conventional scaling and root planing.
Adult;Case-Control Studies;Combined Modality Therapy;Dental Scaling;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Pocket;Probability;Prospective Studies;Root Planing;Sensitivity and Specificity;Statistics, Nonparametric;Treatment Outcome

Use of lasers and light-based therapies for treatment of acne vulgaris. Over the last two decades, lasers and light-based therapies have been developed to treat a wide variety of cutaneous maladies. Given the prevalence and number of patients who suffer from refractory acne, alternatives to existing care are constantly sought after. In this review, we discuss the evidence currently available to justify the use of laser and light-based modalities and conclude that in combination therapy, such approaches provide a safe and effective treatment for acne vulgaris. Acne Vulgaris;Adolescent;Adult;Esthetics;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Photochemotherapy;Phototherapy;Risk Assessment;Severity of Illness Index;Treatment Outcome;Ultraviolet Therapy

Effects of helium-neon laser on the mucopolysaccharide induction in experimental osteoarthritic cartilage. OBJECTIVE: To investigate the effects of mucopolysaccharide induction after treatment by low power laser for experimental osteoarthritis (OA). METHODS: Seventy-two rats with three different degrees of papain induced OA over right knee joints were collected for helium-neon (He-Ne) laser treatment. The severity of induced arthritis was measured by 99mTc bone scan and classified into three groups (I-III) by their radioactivity ratios (right to left knee joints). The rats in each group were further divided into study subgroups (Is, IIs, and IIIs) and control subgroups (Ic, IIc, and IIIc) randomly. The arthritic knees in study subgroups received He-Ne laser treatment, and those in controls received sham laser treatment. The changes of arthritic severity after treatment and follow-up 2 months later were measured. The histopathological changes were evaluated through light microscope after disarticulation of sections (H.E. stain), and the changes of mucopolysaccharide density in cartilage matrix were measured by Optimas scanner analyzer after Alcian blue (AB) stain. The densities of mucopolysaccharide induced after treatment in arthritic cartilage were compared and correlated with their histopathological changes. RESULTS: The density of mucopolysaccharide

rose at the initial stage of induced arthritis, and decreased progressively in later stages. The densities of mucopolysaccharide in treated rats increased upon complete laser treatment more than those of the controls, which is closely related with the improvement in histopathological findings, but conversely with the changes in arthritic severity. CONCLUSION: He-Ne laser treatment will enhance the biosynthesis of arthritic cartilage, and results in the improvement of arthritic histopathological changes. Glycosaminoglycans;Noble Gases;Helium;Neon Animals;Cartilage, Articular;Glycosaminoglycans;Helium;Low-Level Light Therapy;Neon;Noble Gases;Osteoarthritis, Knee;Rats

[A comparative study of the effects of laser and light-emitting diode irradiation on the wound healing and functional activity of wound exudate leukocytes]. The effects of coherent He-Ne laser and non-coherent light-emitting diode radiation on rat skin wound healing and functional activity of wound excudate leukocytes were compared. A comparative pathomorphological analysis showed that the He-Ne laser and light-emitting diode irradiation stimulated the transition of the inflammatory phase of the wound healing into the reparative (proliferative) and scarring phases sequentially. It was also detected that the functional activity of leucocytes changed in a dose-dependent manner. The leukocyte activity was found to be similar in the groups with laser and light-emitting diode irradiation. Thus, we can conclude that coherent laser and non-coherent light-emitting diode radiation have very close effects on wound healing and activity of wound exudate leukocytes, and coherence is not required for this activity. Animals;Cicatrix;Dose-Response Relationship, Radiation;Laser Therapy;Leukocytes;Light;Low-Level Light Therapy;Male;Rats;Skin;Wound Healing

Effect of ambient humidity on light transmittance through skin phantoms during cryogen spray cooling. Cryogen spray cooling (CSC) is a technique employed to reduce the risk of epidermal damage during dermatologic laser surgery. However, while CSC protects the epidermis from non-specific thermal damage, it might reduce the effective fluence reaching the target chromophore due to scattering of light by the spray droplets and subsequent water condensation/freezing on the skin surface. The objective of this work was to study the effect of ambient humidity (omega) on light transmittance during CSC. An integrating sphere was employed to measure the dynamics of light transmittance through a deformable agar phantom during CSC. The study included two representative CSC spurt patterns studied using four omega: 57, 40, 20 and 12%. Results show that during CSC, as omega increased, light transmittance decreased. For the highest humidity level (57%) studied, light transmittance reached a minimum of 55% approximately 30 ms after spurt termination. In a controlled environment with omega = 12%, light transmittance reached a minimum of 87% approximately 30 ms after spurt termination. The reduced light transmittance immediately after spurt termination was most likely because of scattering of light caused by condensation of water vapour due to aggressive cooling of ambient air in the wake of the cryogen spurt. Aerosol Propellants Aerosol Propellants;Cold Temperature;Humans;Humidity;Lasers;Light;Low-Level Light Therapy;Phantoms, Imaging;Phototherapy;Reproducibility of Results;Skin;Skin Physiological Phenomena;Time Factors

Helium-neon and nitrogen laser irradiation accelerates the phagocytic activity of human monocytes. OBJECTIVE: Intracellular survival of mycobacteria within monocytes is a crucial stage in the pathogenesis of tuberculosis. The aim was to check intracellular survival of Mycobacterium fortuitum within the human monocytes exposed to He-Ne and nitrogen laser irradiation. BACKGROUND DATA: Tuberculosis remains one of the most important infectious diseases for developing countries. Low-level laser therapy (LLLT) has been tried to treat tubercular cavitory lung disease with encouraging results. The in vitro photobiological effect of low level laser radiation on the intracellular mycobacteria needs to be evaluated before we could go for large clinical trials. METHODS: The aliquots of human monocytes from peripheral blood of healthy volunteers and tuberculosis cases

were exposed to He-Ne or nitrogen laser beam. The non-irradiated monocytes from the same source served as controls. The monocytes were then challenged with M. fortuitum, and surviving mycobacteria within monocytes were subjected to viable counts. RESULTS: Enhanced killing of mycobacterial cells was seen among monocytes exposed to He-Ne and nitrogen laser irradiation. CONCLUSIONS: He-Ne and nitrogen laser irradiation activates the monocytes to increase intracellular killing of mycobacteria. Helium;Neon;Nitrogen
Helium;Humans;Lasers;Monocytes;Mycobacterium fortuitum;Neon;Nitrogen;Phagocytosis

Evaluation of low intensity laser effects on the thyroid gland of male mice. OBJECTIVE: The purpose of this study was to assess whether there were alterations in the thyroid hormone plasma levels under infrared laser irradiation, in the thyroid gland region. BACKGROUND DATA: Studies have demonstrated that infrared laser can cause alterations in thyroid glands. METHODS: Sixty-five albino male mice were used and assigned to five groups (n = 13), with differences in the times that they were sacrificed. Irradiation procedures consisted of an infrared diode laser emitting at 780 nm, at 4 J/cm(2) energy density, in contact mode, point manner. Blood was collected before irradiation (group 1), and then at 24 h (group 2), 48 h (group 3) and 72 h (group 4), and 1 week (group 5) after the third irradiation. The collected material was used for clinical analysis to evaluate the T(3) (triiodothyronine) and T(4) (thyroxin) hormones. Five animals were used for light microscopy analysis. RESULTS: A statistically significant hormonal level alteration between the first day and 7 days after the last irradiation was found. CONCLUSIONS: It was concluded that low-level laser therapy (LLLT) of the thyroid gland may affect the level of thyroidal hormones. Triiodothyronine;Thyroxine
Animals;Laser Therapy;Male;Mice;Thyroid Gland;Thyroxine;Triiodothyronine

Low-level laser therapy improves early healing of medial collateral ligament injuries in rats. OBJECTIVE: This study sought to investigate whether or not low-level laser therapy (LLLT) with a helium-neon laser increased biomechanical parameters of transected medial collateral ligament (MCL) in rats. BACKGROUND DATA: It has been reported that LLLT can enhance tendon healing. METHODS: Thirty rats received surgical transection to their right MCL, and five were assigned as the control group. After surgery, the rats were divided into three groups: group 1 (n = 10) received LLLT with 0.01 J/cm(2) energy density per day, group 2 (n = 10) received LLLT with 1.2 J/cm(2) energy density per day, and group 3 (sham = exposed group; n = 10) received daily placebo laser with shut-down laser equipment, while the control group received neither surgery nor LLLT. Biomechanical tests were performed at 12 and 21 days after surgery. The data were analyzed by one-way analysis of variance. RESULTS: The ultimate tensile strength (UTS) of group 2 on day 12 was significantly higher than that of groups 1 and 3. Furthermore, the UTS and energy absorption of the control (uninjured) group were significantly higher than those of the other groups. CONCLUSIONS: LLLT with a helium-neon laser is effective for the early improvement of the ultimate tensile strength of medial collateral ligament injuries. Animals;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Rats;Rats, Wistar;Tensile Strength;Wound Healing

Endoluminal phototherapy for prevention of restenosis: preliminary results at 6-month follow-up. OBJECTIVE: The objective of this observational study was to investigate safety and efficacy of laser phototherapy (LPh) in prevention of restenosis after percutaneous coronary intervention (PCI). BACKGROUND DATA: Laser irradiation is known to cause a limitation of the local inflammatory cascade and a stimulation of proliferation of specific cells. Based on the results of previous experiments proving the beneficial effects of laser light on the activity of vascular and inflammatory cells, we attempted to use these properties to prevent restenosis. METHODS: Laser phototherapy was performed in 41 patients after stent implantation or balloon angioplasty. Illumination power of 100 mW and energy dose equal to 9 J/cm(2) was used. Patients were monitored for major adverse cardiac events (MACE) after 30 days and 6 months. At 6 months, angiography as a control was

performed to assess the influence of LPh on restenosis rate. RESULTS: Angiographic follow-up (n = 30) revealed restenosis in 9% and 25% of patients after stent implantation and balloon angioplasty, respectively. The MACE rate was 4.5% and 12.5% in stent and balloon-treated patients, respectively. CONCLUSIONS: Laser phototherapy gives very promising results in restenosis prevention, especially after stent implantation. The treatment method is safe, with a low rate of MACE in follow-up. Angioplasty, Balloon;Coronary Restenosis;Female;Follow-Up Studies;Humans;Male;Middle Aged;Phototherapy;Stents
Low level laser therapy is not low. Humans;Low-Level Light Therapy;Phototherapy;Terminology as Topic
Acne, lasers, and light. Acne Vulgaris;Humans;Low-Level Light Therapy;Photochemotherapy
Early recurrence of eruptive vellus hair cysts after Er:YAG laser therapy: case report and review of the literature. BACKGROUND: Therapy of eruptive vellus hair cysts (EVHCs) often leads to unsatisfying results or recurrences. Recently, erbium:yttrium-aluminum-garnet (Er:YAG) laser therapy has been recommended in this condition. OBJECTIVE: To report the results of Er:YAG laser treatment and discuss the treatment options in EVHC, presenting a review of the literature. METHODS: Full-face Er:YAG laser therapy was performed in a 30-year-old female patient with a 15-year history of cosmetically bothersome facial EVHCs. RESULTS: Immediately after the laser treatment, the ablated skin showed an even surface, presenting no residual signs of EVHCs. After reepithelialization, however, early recurrence of EVHCs occurred. Recurrence was also observed in the previously treated test spot, where slight atrophy indicated deeper ablation. CONCLUSION: Er:YAG laser therapy might be a treatment option for distinct lesions of EVHCs but proved to be ineffective in a case of EVHCs in the face, where the depth of ablation is limited owing to the risk of atrophy or scarring and where deep enucleation of distinct single cysts was not possible owing to the dense dissemination of the lesions. Despite numerous treatment options reported in the literature, therapy for EVHCs is still challenging owing to recurrences or side effects. Adult;Cysts;Face;Female;Hair Diseases;Hair Follicle;Humans;Low-Level Light Therapy;Recurrence
Nonablative wrinkle treatment of the face and neck using a combined diode laser and radiofrequency technology. BACKGROUND: Nonablative laser systems that integrate optical and conducted radiofrequency (RF) energies are a novel technology for the treatment of wrinkles. OBJECTIVE: This two-center study investigated the safety and effectiveness of combination diode laser (900 nm) and RF for the treatment of wrinkles and skin texture. METHODS: Patients with grade II to IV wrinkling on the face, according to the Glogau classification system, were treated with a combination diode laser and RF using a fluence of 30 to 50 J/cm2 and RF energy of 80 to 100 J/cm3. Patients received up to three treatment sessions at 2- to 3-week time intervals. Wrinkle assessments using the Glogau scale were conducted at baseline and at 3 months following the last treatment. In addition, patients and physicians graded the level of improvement using pre- and post-treatment photographs. RESULTS: Twenty-three subjects completed all three treatment sessions. Of these participants, more than 50% had a greater than 50% improvement in the appearance of wrinkles. All subjects reported a noticeable improvement in skin smoothness and texture. CONCLUSION: This preliminary study demonstrates that the combination of diode laser and RF energies decreases the appearance of wrinkles and improves skin texture. Adult;Aged;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck;Prospective Studies;Radiofrequency Therapy;Skin;Skin Aging;Treatment Outcome
Prospective, comparative evaluation of three laser systems used individually and in combination for axillary hair removal. BACKGROUND: Using the concept of selective photothermolysis, a variety of laser systems have been developed to remove unwanted hair. OBJECTIVE: To evaluate the relative

efficacy, tolerability, and subject satisfaction of three different laser systems used individually and in rotation for axillary hair removal. METHODS: Twenty female patients (17 with dark-colored hair, 3 with red or light-colored hair) with Fitzpatrick phototype II skin received three treatments performed at 6- to 8-week intervals. Each axilla was divided in half to yield four distinct areas that were treated by the following lasers: (1) three sessions with a long-pulse 755 nm alexandrite laser, (2) three sessions with a long-pulse 810 nm diode laser, (3) three sessions with a long-pulse 1,064 nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser, and (4) rotational treatment consisting of a single session by each of the three laser systems. Percent hair reduction and acute and long-term side effects were evaluated after treatment. Subjects completed questionnaires assessing tolerability and satisfaction. RESULTS: All subjects tolerated the treatments well, with only local, transient side effects seen. At the 3-month follow-up, the greatest average hair reduction was comparably similarly seen after the alexandrite laser at 59.3 +/- 9.7% and the 810 nm diode laser at 58.7 +/- 7.7%. The Nd:YAG laser and rotational regimens were less efficacious, with 31.9 +/- 11.1% and 39.8 +/- 10.1% hair reduction, respectively. Subjects with red or light-colored hair experienced 5 to 15% reduced efficacy with any laser system used. Subjects found the alexandrite and diode lasers to be equally tolerable, with only slight discomfort, and the Nd:YAG laser to be the least comfortable of the three systems. Overall, subject satisfaction of each treated site, in decreasing order, was (1) the 810 nm diode laser, (2) the alexandrite laser, (3) rotational therapy, and (4) the Nd:YAG laser. CONCLUSION: At the 3-month follow-up, the long-pulse alexandrite and 810 nm diode lasers demonstrated no statistically significant differences in efficacy, comparable efficacy and tolerability, and highest subject satisfaction. Rotational therapy with the three laser systems is not as effective as treatment with the alexandrite laser or diode laser alone but is statistically more effective than use of the long-pulse Nd:YAG system alone. Individuals with red or light-colored hair and Fitzpatrick phototype II skin have decreased efficacy of laser treatment than those with dark-colored hair and the same phototype. Adult;Axilla;Female;Hair;Hair Removal;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Prospective Studies;Skin;Treatment Outcome

595 nm pulsed dye laser for the treatment of superficial basal cell carcinoma. Aged;Carcinoma, Basal Cell;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin Neoplasms;Treatment Outcome

Inflammation in periodontal tissues in response to mechanical forces. Orthodontic forces are known to produce mechanical damage and inflammatory reactions in the periodontium and dental pulp, as well as inflammatory mediators, e.g. prostaglandins, interleukin (IL)-1, IL-6, tumor necrosis factor alpha, and receptor activator of nuclear factor kappaB ligand, in the periodontal ligament (PDL) and dental pulp. We have studied the effects of aging on the production of inflammatory mediators in the PDL using in vitro and in vitro methods and found that aging of PDL tissues may be an important factor in the severity of periodontal disease through a higher production of inflammatory mediators in response to mechanical forces. Further, the levels of inflammatory mediators in gingival crevicular fluid, an osmotically mediated inflammatory exudates found in the gingival sulcus, have been shown to be significantly elevated during orthodontic treatment. In order to reduce inflammation, low-level laser therapy has been recently studied in vitro and in vitro by many investigators as a substitute for anti-inflammatory drugs. Clinical and experimental studies have shown that low-level laser irradiation reduces orthodontic post-adjustment inflammation. We believe that orthodontic forces (mechanical forces) may play an important role in periodontal inflammation and that low-level laser therapy may be useful for its inhibition. Cytokines;Prostaglandins Aging;Cytokines;Dental Pulp;Humans;Low-Level Light Therapy;Orthodontics, Corrective;Periodontal Ligament;Periodontitis;Prostaglandins;Stress, Mechanical;Tooth Movement Techniques

Standards for laser therapy studies. Chronic Disease;Humans;Low-Level Light Therapy;Varicose Ulcer;Wound Healing

Q-switched alexandrite laser-assisted treatment of melasma: 2-year follow-up monitoring. Melasma is a common disorder of hyperpigmentation involving sun exposed face and neck areas. Three clinical patterns of melasma are recognized: the centrofacial, the malar, and the mandibular ones. Several factors have been implicated in the pathogenesis of this disorder including pregnancy, oral contraceptive therapy, sun exposure, genetic factors, cosmetics, and race. This condition is most frequently observed in women and affects all racial groups; however, it is commonly found in darker-complexioned individuals (skin types IV through VI) and in Asian women who live and work under strong sunlight exposure for long periods. Melasma is very difficult to treat and often resistant to therapy. Treatment of melasma includes various hypopigmenting agents, chemical peeling, and laser surgery with unsatisfactory results. We report 3 cases of facial melasma successfully treated with a Q-switched Alexandrite laser. Hydroquinones;Melanins;Radiation-Protective Agents;hydroquinone Adult;Female;Follow-Up Studies;Humans;Hydroquinones;Low-Level Light Therapy;Melanins;Melanosis;Pregnancy;Prognosis;Radiation-Protective Agents;Recurrence;Skin Pigmentation;Time Factors

[Excimer laser (308 nm) - a new option in dermatologic UVB therapy]. Dose-Response Relationship, Radiation;Follow-Up Studies;Lasers, Excimer;Low-Level Light Therapy;Psoriasis;Retreatment;Ultraviolet Therapy

[Effects of He-Ne laser on gastric mucosa in rat with chronic atrophic gastritis]. This study sought to explore the effects of He-Ne laser irradiation on the gastric mucosa of experimental chronic atrophic gastritis (CAG) in rat. Fifty-two male adult Wistar rats were randomly divided into five groups including normal control group, model group and three different doses He-Ne laser groups. The CAG model in rats was made by administering (per gastrogavage) a compositus liquor, including 2% sodium salicylate and 30% alcohol, for 8 weeks to stimulate the rat's gastric mucosa, combined with irregular fasting and compulsive sporting as pathogenic factors. He-Ne laser therapy was used at different doses of He-Ne laser, once a day for twenty days, then the morphological changes and the expression of cyclinD1 were observed. Compared with untreated group, the gastric mucosa of 3.36J x cm(-2) He-Ne laser group was significantly thicker ($P < 0.01$), the inflammatory cells of gastric mucosa were decreased ($P < 0.05$), the morphology, structure and volume of the cells were restored or nearly normal and the expressions of cyclinD1 were higher ($P < 0.05$). In a word, small dose He-Ne laser (3.36 J x cm(-2)) has a good adjuvant therapeutic effect on rat's CAG. Animals;Chronic Disease;Gastric Mucosa;Gastritis, Atrophic;Low-Level Light Therapy;Male;Precancerous Conditions;Random Allocation;Rats;Rats, Wistar

Histologic effects of laser-assisted topical anesthesia in a porcine model. OBJECTIVES: A handheld laser device that removes the stratum corneum, the major barrier to transdermal absorption, has recently been approved to assist with topical anesthesia before painful procedures such as intravenous cannulation. The authors assessed the cutaneous histomorphologic effects of the laser device and the ability of the laser-treated skin to resist infection in a porcine model. METHODS: This was a blinded, randomized animal experiment using isoflurane-anesthetized young domestic pigs. The ventral surface of the animals was irradiated multiple times with a lightweight, portable erbium yttrium-aluminum-garnet unit or a sham laser. One third of the wounds were inoculated with a Staphylococcus aureus suspension. The treated areas were then covered with a dry dressing, and full-thickness biopsy specimens of the treated areas were obtained immediately after treatment and at three, seven, ten, and 14 days for blinded histopathologic evaluation using hematoxylin and eosin staining and electron microscopy. Quantitative bacterial counts were obtained at three days in wounds exposed to bacteria. Main outcomes were quantitative bacterial counts, presence of cellular

necrosis, epidermal integrity, and dermal scarring. Data analysis was conducted with descriptive statistics. RESULTS: Laser irradiation resulted in immediate disruption of the cornified layer of the skin and necrosis of the stratum spinosum in all treated areas. There were also focal areas of vacuolar alteration of the basal one third of the epidermis. There was no evidence of any damage to the basement membrane or the underlying dermis. At three days, the epidermis had healed and there was evidence of epidermal hyperplasia and hyperkeratosis that was completely resolved by 14 days. There were no infections and no scarring. Sham laser had no histomorphologic effects on the skin. There was no bacterial growth from all sham laser-treated wounds challenged with bacteria. Three of 20 (15%; 95% confidence interval = 0% to 31%) laser-irradiated wounds that were challenged with bacteria grew between 280,000 and 1,600,000 colony-forming units/g. CONCLUSIONS: Laser irradiation results in ablation of the stratum corneum and a superficial burn to the epidermis that heals by three to 14 days without any scarring or infection in pigs. Challenging laser-irradiated cutaneous wounds with a large bacterial inoculum resulted in bacterial growth in a minority of wounds. Administration, Topical;Anesthesia, Local;Animals;Bacterial Infections;Disease Models, Animal;Female;Low-Level Light Therapy;Random Allocation;Reference Values;Skin;Sus scrofa;Wound Healing

Low level laser irradiation stimulates osteogenic phenotype of mesenchymal stem cells seeded on a three-dimensional biomatrix. Mesenchymal stem cells (MSCs) seeded on three-dimensional (3D) coralline (Porites lutea) biomatrices were irradiated with low-level laser irradiation (LLLI). The consequent phenotype modulation and development of MSCs towards ossified tissue was studied in this combined 3D biomatrix/LLLI system and in a control group, which was similarly grown, but was not treated by LLLI. The irradiated and non irradiated MSC were tested at 1-7, 10, 14, 21, 28 days of culturing via analysis of cellular distribution on matrices (trypan blue), calcium incorporation to newly formed tissue (alizarin red), bone nodule formation (von Kossa), fat aggregates formation (oil red O), alkaline phosphatase (ALP) activity, scanning electron microscopy (SEM) and electron dispersive spectrometry (EDS). The results obtained from the irradiated samples showed enhanced tissue formation, appearance of phosphorous peaks and calcium and phosphate incorporation to newly formed tissue. Moreover, in irradiated samples ALP activity was significantly enhanced in early stages and notably reduced in late stages of culturing. These findings of cell and tissue parameters up to 28 days of culture revealed higher ossification levels in irradiated samples compared with the control group. We suggest that both the surface properties of the 3D crystalline biomatrices and the LLLI have biostimulatory effects on the conversion of MSCs into bone-forming cells and on the induction of ex-vivo ossification. Alkaline Phosphatase Alkaline Phosphatase;Animals;Anthozoa;Cell Culture Techniques;Cell Differentiation;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice;Osteogenesis;Phenotype

Anti-infective therapy with an Er:YAG laser: influence on peri-implant healing. In addition to conventional treatment modalities (mechanical and chemical), the use of lasers has been increasingly proposed for the treatment of periodontal and peri-implant infections (i.e., cleaning and detoxification of implant surfaces). Preliminary results from basic studies have pointed to the high potential of the Erbium-doped: Yttrium, Aluminum and Garnet (Er:YAG) laser. Furthermore, preliminary clinical data indicate that treatment with this kind of laser may positively influence peri-implant healing. The aim of this research update is to evaluate, based on the currently available evidence, the use of an Er:YAG laser for the treatment of peri-implant infections and to indicate its potential as a new treatment modality. Dental Implants Dental Implants;Equipment Design;Equipment Failure Analysis;Humans;Laser Therapy;Low-Level Light Therapy;Periodontitis;Prosthesis-Related Infections;Technology Assessment, Biomedical;Treatment Outcome;Wound Healing

[Pseudomelanoma following laser treatment or laser-treated melanoma?]. BACKGROUND: The increasing use of lasers for the removal of pigmented skin lesions has led to a growing risk of erroneously treated malignant melanocytic tumours. PATIENTS AND METHODS: In two patients, both of whom developed a melanoma, the lesions were initially misdiagnosed clinically as a benign naevus and treated with laser vaporisation. RESULTS: On recurrence of the tumours, the diagnosis of melanoma was finally established by histological examination of the excised tumours in which differentiation from pseudomelanoma remained difficult. CONCLUSIONS: In such cases of initially misdiagnosed melanomas, laser removal not only complicates and delays the correct diagnosis but might also worsen the prognosis after recurrence of an incompletely removed tumour. Adult;Diagnosis, Differential;Female;Humans;Low-Level Light Therapy;Medical Errors;Melanoma;Middle Aged;Neoplasm Recurrence, Local;Nevus;Skin Neoplasms

Efficacy of neodymium:YAG laser therapy for gastric antral vascular ectasia (GAVE) following hematopoietic cell transplant. We determined the incidence of severe bleeding from gastric antral vascular ectasia (GAVE) after myeloablative hematopoietic cell transplant and the outcomes after treatment with endoscopic neodymium:YAG laser photocoagulation. From 1992 to 2005, the incidence of severe bleeding from GAVE was 6/4491 (0.13%). All patients had received oral busulfan and four had sinusoidal obstruction syndrome. Gastrointestinal bleeding began a median of 53 days after transplant (range 15-2952). After GAVE was diagnosed by endoscopic and histologic findings, a median of three (range 2-7) sessions of laser therapy were required to control the bleeding with a median of 2737 J (range 1117-6160 J) per session. A median of 16 units (range 4-44) had been transfused prior to laser therapy and a median of four additional units (range 0-113) were transfused until bleeding was controlled. All patients were followed for at least 70 days after the last laser therapy session, with no further episodes of bleeding. Complications were mild and included abdominal pain and asymptomatic ulceration; however, one patient required gastrectomy due to gastric necrosis following transarterial embolizations. In summary, severe bleeding from GAVE is rare following hematopoietic cell transplant. Treatment with endoscopic therapy using the Nd:YAG laser is safe and effective. Neodymium Adolescent;Adult;Endoscopy, Gastrointestinal;Female;Gastric Antral Vascular Ectasia;Hematopoietic Stem Cell Transplantation;Hemorrhage;Humans;Low-Level Light Therapy;Male;Middle Aged;Neodymium;Neoplasms

The Complications of Age-Related Macular Degeneration Prevention Trial (CAPT): rationale, design and methodology. BACKGROUND: The Complications of Age-Related Macular Degeneration Prevention Trial (CAPT) is a randomized clinical trial to evaluate whether prophylactic laser treatment to the retina can prevent the complications of the advanced stage of Age-Related Macular Degeneration (AMD), the leading cause of irreversible blindness. METHODS: CAPT is conducted in 23 clinical centers and in three central resource centers. The primary outcome measure is change in visual acuity; secondary outcomes include the incidence of complications of AMD, changes in other measures of visual functioning and vision-related quality of life. In total, 1052 patients with two high-risk eyes were enrolled. One eye was randomized to receive laser treatment and the other eye to observation. All patients were treated immediately after randomization and again at 12 months, dependent on clinical status. All patients are followed via study visits and telephone calls for a minimum of five years. Study visit procedures include established tests of visual function conducted by examiners masked to the treatment assignment of each eye, a biomicroscopic examination by CAPTophthalmologists, and photographs of each eye taken according to protocol and assessed by masked graders in a centralized Photograph Reading Center. RESULTS: This paper describes the CAPT study, including study rationale, operational structure, and measures implemented to ensure standardization of assessments, adherence to protocol, quality assurance, and maintaining follow-up.

Several features related to study design and procedures that are specific to CAPT are highlighted, including clinic selection and judgements regarding patient eligibility. CONCLUSIONS: An intervention that can reduce the risk of advanced AMD by 30% in the eyes of people with two high-risk eyes may halve the rate of bilateral blindness from AMD. It would also yield substantial savings in expenditures devoted to treating advanced AMD and the disability it causes, and enhance the quality of life for people at risk. Blindness;Follow-Up Studies;Humans;Low-Level Light Therapy;Macular Degeneration;Middle Aged;Multicenter Studies as Topic;Randomized Controlled Trials as Topic;Research Design;Treatment Outcome

Cutaneous immunological activation elicited by a low-fluence pulsed dye laser. BACKGROUND: Three years ago, the nonablative wrinkle reduction laser (a 585-nm laser, Chromogenex V3; Chromogenex Light Technologies, Llanelli, U.K.) was developed, and there have already been several reports about its clinical effectiveness. The Chromogenex V3 laser has also been reported to be effective in treating acne and atopic dermatitis. These results suggest that the Chromogenex V3 laser has some immunological role. In this study, we investigated immunological changes elicited by laser irradiation at the ultrastructural level and by analysis of interleukin (IL)-2 and IL-4 mRNA in skin homing T lymphocytes. MATERIALS AND METHODS: Eight healthy adult volunteers (mean age 56.3 years, range 25-66 years) were recruited for this study. Ultrastructural analysis was done 3 h after the laser irradiation, as well as 1 day, 3 days, 1 week, 2 weeks, 4 weeks and 5 weeks later. IL-2 and IL-4 mRNAs in skin homing T cells cultured for 6 weeks were semiquantitatively measured using reverse transcriptase-polymerase chain reaction. RESULTS: Ultrastructural observations revealed that at 3 h after laser therapy, neutrophils, monocytes and mast cells could already be seen in the extravascular dermis. These dermal acute inflammatory changes were observed also at 1 week after laser treatment. Two weeks after laser treatment, the capillaries showed an almost normal structure. Four weeks after laser treatment, many lymphocytes and fibroblasts were observed. The numbers of these lymphocytes increased further at 5 weeks after the laser treatment. One week after the laser irradiation, all subjects were positive for IL-2 mRNA and for IL-4 mRNA. The level of IL-4 mRNA was larger compared with that of IL-2 mRNA in all subjects. CONCLUSION: The Chromogenex V3 is a 585-nm visible light laser, and it may affect the skin not only by selective photothermolysis but also by direct cutaneous immunological activation. Cytokines;Interleukin-2;RNA, Messenger;Interleukin-4 Adult;Aged;Capillaries;Cell Count;Cytokines;Edema;Endothelial Cells;Fibroblasts;Humans;Interleukin-2;Interleukin-4;Low-Level Light Therapy;Lymphocyte Count;Microscopy, Electron;Middle Aged;RNA, Messenger;Reverse Transcriptase Polymerase Chain Reaction;Skin;T-Lymphocytes;Time Factors

[Controversy in dermatology--laser therapy and melanocytic nevi]. Dermatology;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Nevus, Pigmented;Practice Guidelines as Topic;Practice Patterns, Physicians';Prognosis;Skin Neoplasms;Treatment Outcome

Clinical strategy in hereditary hemorrhagic telangiectasia. BACKGROUND: Hereditary hemorrhagic telangiectasia (HHT) is a recurrent bleeding tendency caused by vascular malformations and preferentially involving the mucous membrane of the nose. The rhinological management of epistaxis is a challenge in which the frequency of bleeding has to be reduced without damage to the nasal mucosa, despite the fact that therapy necessarily has to be repeated. METHODS: The clinical course in 30 patients with HHT was monitored prospectively. Nasal mucosal efflorescences underwent Nd:YAG laser therapy at individually defined intervals, and the effect on the frequency and duration of bleeding was documented, as were adverse effects. RESULTS: No serious adverse effects (e.g., septal defects or synechiae) were observed as a consequence of therapy. During the course of laser therapy and ongoing compliance with nasal mucosal care instructions, the frequency of bleeding fell from "several times daily" to "every 2 weeks." CONCLUSION: In conjunction with

Nd:YAG laser therapy, ongoing and consistent care of the nasal mucosa is a proven and effective treatment regimen in HHT. As an integral element in an interdisciplinary strategy for diagnosis and therapy, this regimen yields satisfactory quality of life while avoiding local complications. Adolescent;Adult;Aged;Aged, 80 and over;Epistaxis;Female;Humans;Laser Coagulation;Low-Level Light Therapy;Male;Middle Aged;Nasal Mucosa;Telangiectasia, Hereditary Hemorrhagic

Q-switched ruby versus long-pulsed dye laser delivered with compression for treatment of facial lentigines in Asians. BACKGROUND AND OBJECTIVES: Q-switched lasers have been used for the treatment of lentigines but post-inflammatory hyperpigmentation (PIH) can be an issue especially in Asians. The 595 nm long-pulsed dye laser (LPDL) has been used for the treatment of vascular lesions and although it is well absorbed by oxyhemoglobin, it is also absorbed by melanin. To use this device for the treatment of facial lentigines, we attached a flat glass lens to the tip of the laser's handpiece, allowing compression of the skin during treatment. In doing so, eliminated the absorption by oxyhemoglobin. This prospective study aims to compare the efficacy and complications of such an approach to the use of Q-switched ruby laser (QSRL) in the treatment of facial lentigines in Asians. STUDY DESIGN/MATERIALS AND METHODS: Eighteen Asian patients (1 male, 17 female) with facial lentigines Fitzpatrick skin types III-IV were enrolled. One of the lentigines present was treated with LPDL by compression method and the other one was treated with QSRL. A LPDL emitting wavelength of 595 nm, spot size of 7 mm was used, with fluence between 10 and 13 J/cm(2) and pulse duration of 1.5 milliseconds. Cryogen spray cooling was not used. A 694 nm QSRL was used with a spot size of 4 mm, fluence of 6-7 J/cm(2), and pulse duration of 30 nanoseconds. Lightening of the lesions was assessed by reflectance spectrometer Erythema, hypo- or hyperpigmentation and scarring were also assessed by clinical examinators. RESULTS: The degree of clearing achieved with the two lasers was 70.3% and 83.3% for QSRL and LPDL, respectively. All QSRL treated areas developed erythema whereas only 4 of 18 LPDL treated areas developed erythema. Hyperpigmentation was seen in four patients after QSRL, but not after LPDL. There was no scarring or hypopigmentation. CONCLUSIONS: LPDL delivered with a compression method is more effective than QSRL for facial lentigines. Complications after LPDL treatment were substantially less frequent than after QSRL. The addition of compression technique may allow "vascular" pulsed dye laser to be used for treating a variety of pigmented lesions. Adult;Aged;Asian People;Erythema;Facial Dermatoses;Female;Humans;Japan;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Pressure;Prospective Studies

A numerical coupling model to analyze the blood flow, temperature, and oxygen transport in human breast tumor under laser irradiation. The aim of this study is to investigate the variation of the blood perfusion rate and distribution of oxygen partial pressure (PO2) in human tumors by a coupling numerical model when laser irradiation is used as an adjuvant method in the treatment of cancer. A two-dimensional finite element (FE) thermal model of a human breast with a tumor was developed. The blood circulation inside the breast was modeled using one-dimensional non-linear equations of pulsatile fluid flow. The distribution of PO2 inside the capillaries, tumor vessels, and surrounding tissue was obtained by the Krogh analysis model. Finally, the variations of the average tumor temperature, blood perfusion, and PO2 during laser heating were computed by coupling the blood circulation, FE thermal, and oxygen transport models. Oxygen Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Models, Biological;Oxygen;Partial Pressure;Regional Blood Flow;Temperature

Polarized light (400-2000 nm) and non-ablative laser (685 nm): a description of the wound healing process using immunohistochemical analysis. OBJECTIVE: This study aimed to describe, through morphologic and cytochemical analysis, the healing process of wounds submitted (or not) to laser therapy (lambda685 nm) or polarized light (lambda400-2000 nm). BACKGROUND DATA: There are

many reports on different effects of several types of phototherapies on the treatment of distinct conditions, amongst them, on wound healing. Laser therapy and the use of polarized light are still controversial despite successive reports on their positive effects on several biological processes. METHODS: Thirty male Wistar rats, approximately 4 months old, were used, and standardized excisional wounds were created on their dorsum. The wounds were irradiated in four equidistant points with laser light or illuminated with polarized light, both with doses of 20 or 40 J/cm2. Group 1 acted as untreated controls. Animals were irradiated every 48 h during 7 days, starting immediately after surgery, and were humanely killed on the 8th post-operative day. Specimens were taken and routinely processed and stained with H&E, and for descriptive analysis of myofibroblasts and collagen fibers, the specimens were imunnomarked by smooth muscle alpha-actin and picrosirius stain. RESULTS: Control specimens showed the presence of ulceration, hyperemia, discrete edema, intense, and diffuse inflammation, collagen deposition was irregular, and myofibroblasts were seen parallel to the wound margins. Wounds treated by laser therapy with a dose of 20 J/cm2 showed mild hyperemia, inflammation varied from moderate to intense, the number of fibroblasts was large, and the distribution of collagen fibers was more regular. Increasing the dose to 40 J/cm2 evidenced exuberant neovascularization, severe hyperemia, moderate to severe inflammation, large collagen deposition, and fewer myofibroblasts. On subjects illuminated with polarized light with a dose of 20 J/cm2, mild to moderate hyperemia was detectable, and collagen matrix was expressive and unevenly distributed; a larger number of myofibroblasts was present and no re-epithelialization was seen. Increasing the dose resulted in mild to moderate hyperemia, no re-epithelialization was seen, edema was discrete, and inflammation was moderate. CONCLUSION: The use of 685-nm laser light or polarized light with a dose of 20 J/cm2 resulted in increased collagen deposition and better organization on healing wounds, and the number of myofibroblast was increased when polarized light is used. Animals;Biopsy, Needle;Disease Models, Animal;Immunohistochemistry;Lasers;Low-Level Light Therapy;Male;Photomicrography;Probability;Random Allocation;Rats;Rats, Wistar;Reference Values;Sensitivity and Specificity;Wound Healing;Wounds and Injuries

Effect of In-Ga-Al-P diode laser irradiation on angiogenesis in partial ruptures of Achilles tendon in rats. OBJECTIVE: This study was conducted to analyze the effect of different irradiances of low-level laser therapy (LLLT) on angiogenesis after partial rupture of Achilles tendon of rats. METHODS: Ninety-six animals were divided into three groups subject to treatment during 3, 5, and 7 days post-lesion. Thirty-two animals were used in each group. The groups were further divided into four subgroups with eight animals in each, receiving In-Ga-Al-P laser (660 nm) treatment at (1) mean output of 10 mW, (2) 40 mW during 10 sec, (3) a sham subgroup, and (4) a non-treatment subgroup. Each animal was subjected to a lesion of the Achilles tendon by dropping a 186-g weight from a 20-cm height over the tendon. Treatment was initiated 6 h post-injury for all the groups. Blood vessels were colored with India ink injection and were examined in a video microscope. RESULTS: Laser exposure promoted an increase in blood vessel count when compared to controls. The 40-mW group showed early neovascularization, with the greatest number of microvessels after three laser applications. The 10-mW subgroup showed angiogenesis activity around the same time as the sham laser group did, but the net number of vessels was significantly higher in the former than in the controls. After seven irradiations, the subgroup receiving 40 mW experienced a drop in microvessel number, but it was still higher than in the control groups. CONCLUSIONS: LLLT of different intensities seems to promote neovascularization in damaged Achilles tendons of rats after partial rupture compared to controls. Achilles Tendon;Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Photomicrography;Random Allocation;Rats;Rats, Wistar;Reference Values;Regional Blood Flow;Rupture;Sensitivity and Specificity;Tendon Injuries

Low-power laser treatment for shoulder pain. OBJECTIVE: The objective of this study is to investigate the effect of low-power gallium-arsenide laser treatment on the patients with shoulder pain. BACKGROUND DATA: Low-energy laser therapy has recently been popularized in the treatment of various rheumatologic, neurologic, and musculoskeletal disorders such as osteoarthritis, rheumatoid arthritis, fibromyalgia, carpal tunnel syndrome, rotator cuff tendinitis, and chronic back pain syndromes. METHODS: A total of 40 patients who applied to our clinic with shoulder pain and complied with the selection criteria were included in the study. The patients were randomly assigned into Group I (n = 20, laser treatment) and Group II (n = 20, control). In Group I, patients were given laser treatment and an exercise protocol for 10 sessions during a period of 2 weeks. Laser was applied over tuberculum majus and minus, bicipital groove, and anterior and posterior faces of the capsule, regardless of the existence of sensitivity, for 1 min at each location at each session with a frequency of 2000 Hz using a GaAs diode laser instrument (Roland Serie Elettronica Pagani, wavelength 904 nm, frequency range of 5-7000 Hz, and maximum peak power of 27 W, 50 W, or 27 x 4 W). In Group II, placebo laser and the same exercise protocol was given for the same period. Patients were evaluated according to the parameters of pain, palpation sensitivity, algometric sensitivity, and shoulder joint range of motion before and after treatment. RESULTS: Analysis of measurement results within each group showed a significant posttreatment improvement for some active and passive movements in both groups, and also for algometric sensitivity in Group I ($p < 0.05$-0.01). Posttreatment palpation sensitivity values showed improvement in 17 patients (85%) for Group I and six patients (30%) for Group II. Comparison between two groups showed superior results ($p < 0.01$ and $p < 0.001$) in Group I for the parameters of passive extension and palpation sensitivity but no significant difference for other parameters. CONCLUSIONS: The results of our study have shown better results in palpation sensitivity and passive extension, but no significant improvement in pain, active range, and algometric sensitivity in laser treatment group compared to the control group in the patients with shoulder pain. Adult;Aged;Aged, 80 and over;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Probability;Range of Motion, Articular;Reference Values;Risk Assessment;Severity of Illness Index;Shoulder Pain;Statistics, Nonparametric;Treatment Outcome

Can Cochrane Reviews in controversial areas be biased? A sensitivity analysis based on the protocol of a Systematic Cochrane Review on low-level laser therapy in osteoarthritis. OBJECTIVE: The aim of this study was to test if a conclusion in a systematic review of low-level laser therapy (LLLT) for osteoarthritis from the Cochrane Library was valid and robust. BACKGROUND DATA: Health policy decisions often rely on conclusions from the Cochrane Database of Systematic Reviews for approval of new therapies, although their validity for controversial non-pharmacological treatment has been questioned. METHODS: Validity was tested against a nine-item checklist for systematic reviews. Review selections were analyzed for possible discrepancies between trial and review reports, and omissions of relevant trials and data. Alternative data from discrepancies and omissions were then imputed in a sensitivity analysis, to test if review conclusions were robust. RESULTS: Only clinicians who had performed LLLT trials with negative results were invited into the review group. Review quality was sound in areas of literature search and methodological assessments, and some of the limitations were mentioned. The statistical analysis held 18 questionable selections such as omissions of trials, data, and subgroup analyses. These selections systematically favored the negative review conclusion. Without altering the review protocol, the sensitivity analysis of combined results changed to significantly positive for continuous and categorical data when data from all included trials were combined. Further sensitivity analyses with inclusion of valid non-included trials, performance of missing follow-up, and subgroup analyses revealed consistent and highly significant results in favor of active LLLT. CONCLUSIONS: In this example, the Cochrane review conclusion was neither robust nor

valid. Representation of experts and different views on efficacy in the review group and extensive use of sensitivity analyses could probably improve quality control of reviews in areas of controversy. Bias;Bibliometrics;Data Interpretation, Statistical;Evidence-Based Medicine;Female;Humans;Information Storage and Retrieval;Low-Level Light Therapy;Male;Osteoarthritis;Randomized Controlled Trials as Topic;Sensitivity and Specificity;Systematic Reviews as Topic

Pure or tarnished: are systematic reviews blind or biased? Bias;Bibliometrics;Humans;Low-Level Light Therapy;Osteoarthritis;Randomized Controlled Trials as Topic;Review Literature as Topic;Sensitivity and Specificity

Emerging modalities in veterinary rehabilitation. Many new modalities have been introduced in human and veterinary physical rehabilitation. In many instances, there is sound theory of how they may impact the physiology of various cells, tissues, or organs. This article reviews some of the modalities that have been introduced recently in human and veterinary rehabilitation. Topics include low-level laser, phototherapy, and extracorporeal shock wave treatment. Animals;Animals, Domestic;Lithotripsy;Low-Level Light Therapy;Phototherapy;Physical Therapy Modalities;Veterinary Medicine

Periorbital ablative and nonablative resurfacing. Ablative resurfacing using laser systems for facial rejuvenation, especially in the periorbital areas, has effectively replaced chemical peels. Refined methods yield outstanding efficacy with significantly fewer side effects as compared with the prototypical lasers of decades past. Despite these technologic refinements, the trend toward minimally invasive rejuvenation techniques has placed a substantial emphasis on the many nonablative modalities available to the practitioner. Although the clinical efficacy to date has been less with the nonablative devices, the lack of substantial morbidity has made the devices marketable to a large population of patients despite their modest results at best and highly unpredictable results at worst. Numerous options, ablative and nonablative, are now available for the patient desiring improvement in periorbital rhytids. Chemexfoliation;Cosmetic Techniques;Eye;Humans;Laser Therapy;Low-Level Light Therapy;Phototherapy;Rejuvenation;Skin Aging;Wound Healing

[Potential risks of non-physicians' use of lasers and intense pulsed light in dermatology]. Lasers and light sources are increasingly used by non-physicians, which raises major concern due to the potentially increased risk of errors and complications. Safe treatments depend on optimal preoperative information, examination, and patient selection; optimal performance of the treatments; and optimal postoperative care of wounds and possible complications. Non-physicians do not normally possess these required skills. There is a need for quality assurance in cutaneous laser surgery. This report was initiated by the Danish National Board of Health. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Patient Education as Topic;Patient Selection;Postoperative Care;Postoperative Complications;Preoperative Care;Professional Competence;Quality Assurance, Health Care;Risk Factors;Skin Diseases

[Free versus non-free treatments with laser and intense pulsed light in dermatology: distinguishing medical laser treatments to be provided free of charge from cosmetic self-payment treatments]. Lasers and light sources are increasingly used in dermatology. Due to the limited financial resources of the public health care system, the Danish Dermatological Society has developed recommendations for distinguishing medical laser treatments to be provided free of charge from cosmetic self-payment treatments. Several considerations underlie the recommendations: present legislation; the diagnosis, etiology, severity, and anatomical location of the disease; and the availability of evidence-based treatments. It is suggested that the recommendations constitute the basis for referring patients to dermatological treatment involving laser and intense pulsed light in Denmark. Cosmetic

Techniques;Denmark;Facial Dermatoses;Female;Hirsutism;Humans;Insurance, Health;Laser Therapy;Low-Level Light Therapy;Male;Surgery, Plastic;Tattooing;Telangiectasis

[Quality and documentation prior to dermatological laser treatment]. Documentation;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Publishing;Skin Diseases

[Intracavitary laser therapy and its effect on the kallikrein-kinin system of blood in children with pneumothorax]. The article presents the results of low-intensity laser application in complex treatment of 137 children with acute purulent destructive pneumonia complicated by pneumothorax with bronchial fistulas. A method of intracavitary laser therapy, developed in the clinic, allowed obliteration of bronchopleural fistulas without application of bronchial occlusion and other invasive techniques. Evaluation of the kallikrein-kinin system of blood revealed prominent reduction of kininogenesis in most (87%) patients upon admission (3 weeks after the onset of the disease), which is an important link of the pathogenesis of late stages of complicated acute purulent lung destruction in children. The study also demonstrated that low-intensity laser emission modulates pyoinflammatory process due to its effect on cell-mediated immunity, neutrophilic phagocytosis and the kallikrein-kinin system of blood. Intracavitary laser therapy is the treatment of choice in children with acute purulent destructive pneumonia complicated by pneumothorax with bronchial fistulas. Application of intracavitary laser therapy in complex therapy of complicated acute purulent lung destruction in children allowed discharge from the hospital 5 to 7 day earlier, and prevented lung inflammatory process chronization. None of the patients have died within last 10 years. Kallikreins Acute Disease;Age Factors;Bronchial Fistula;Cells, Cultured;Child, Preschool;Combined Modality Therapy;Follow-Up Studies;Humans;Immunity, Cellular;Infant;Kallikrein-Kinin System;Kallikreins;Length of Stay;Low-Level Light Therapy;Lung;Models, Theoretical;Phagocytosis;Pneumonia;Pneumothorax;Radiography, Thoracic;Suppuration;Time Factors

[The role of lipid peroxidation products in the effect of He-Ne laser on human blood leukocytes]. The role of lipid peroxidation products formed in membranes of human blood leukocytes after irradiation with He-Ne laser was studied. It was found that low-intensity laser irradiation (0.3-1.6 J/cm2) leads to both cell activation and an increase in the content of lipid peroxidation products. The intensity of lipid peroxidation was analyzed by estimating the amount of TBA reactive products and lipid diene conjugates. Irradiation in the presence of an exogenous photosensitizer (protoporphyrin IX) enhanced the phenomena observed. The use of antioxidants (tocopherol and ionol) completely eliminated the laser-induced effects (changes in leukocyte activity and accumulation of lipid peroxidation products). These results can be explained by the fact that laser irradiation leads to the activation of lipid peroxidation in leukocyte membranes, which in turn enhances the response of cells to the stimulus (priming). Antioxidants;Lipid Peroxides;Photosensitizing Agents;Protoporphyrins;Thiobarbituric Acid Reactive Substances;Butylated Hydroxytoluene;protoporphyrin IX;Tocopherols Antioxidants;Butylated Hydroxytoluene;Cells, Cultured;Humans;Lasers;Leukocytes;Light;Lipid Peroxidation;Lipid Peroxides;Photosensitizing Agents;Protoporphyrins;Thiobarbituric Acid Reactive Substances;Tocopherols

Effects of monopolar radiofrequency treatment over soft-tissue fillers in an animal model. BACKGROUND AND OBJECTIVES: Monopolar radiofrequency (RF) treatment is used by physicians to tighten and contour the skin of their patients. In many cases, patients have received prior treatment with other aesthetic modalities such as soft-tissue augmentation or they may wish to receive these treatment modalities simultaneously. Together, soft-tissue augmentation and monopolar RF treatment have the potential to restore tissue volume and improve facial laxity. To date, no published studies have documented the effects of RF treatment directly over soft-tissue fillers. STUDY DESIGN/MATERIALS AND METHODS: We examined the tissue interactions of monopolar RF heating with five commonly injected fillers in a juvenile pig model. This is the first part of a two-part study. In

this study, the interaction of monopolar RF and filler substances was examined over a period of 4 months. The five soft-tissue fillers examined were cross-linked human collagen (Cosmoplast), hyaluronic acid (Restylane), calcium hydroxylapatite (Radiesse), polylactic acid (Sculptra), and liquid injectable silicone (Silikon 1000). RESULTS: There was no apparent increase in the risk of local burns and no observable effect of RF treatment on filler persistence in the tissue. With monopolar RF treatment, an increase in fibroplasia and collagen deposition surrounding Restylane, Radiesse, and Sculptra was observed. When scored in a blinded fashion, the increase in collagen deposition was statistically significant for Radiesse. CONCLUSIONS: In this animal study, RF treatment had no observed adverse effect on filler collagen responses or persistence. Filler presence did not increase the risk of undesirable thermal effects with monopolar RF treatment. Further clinical studies are required to evaluate the effect of monopolar RF treatment over dermal fillers with respect to aesthetic outcome. Hyaluronic Acid;Collagen;Restylane Animals;Biopsy, Needle;Collagen;Disease Models, Animal;Female;Hyaluronic Acid;Immunohistochemistry;Injections, Subcutaneous;Low-Level Light Therapy;Reference Values;Risk Factors;Sensitivity and Specificity;Swine

Effect of Er:YAG laser on enamel acid resistance: morphological and atomic spectrometry analysis. BACKGROUND AND OBJECTIVES: This study evaluated the effect of Er:YAG laser on enamel acid resistance. STUDY DESIGN/MATERIALS AND METHODS: Seventy human enamel slabs were randomly divided into seven groups (n = 10): G1, Er:YAG laser (Key Laser 2, KaVo, Germany) 60 mJ, 2 Hz, 33.3 J/cm2 (handpiece no. 2051, non-contact); G2, Er:YAG laser 80 mJ, 2 Hz, 44.4 J/cm2 (handpiece no. 2051, non-contact); G3, Er:YAG laser 120 mJ, 2 Hz, 66.6 J/cm2 (handpiece no. 2051, non-contact); G4, Er:YAG laser 64 mJ, 2 Hz, 20 J/cm2 (handpiece no. 2055, contact); G5, Er:YAG laser 86.4 mJ, 2 Hz, 26.9 J/cm2 (handpiece no. 2055, contact); G6, Er:YAG laser 135 mJ, 2 Hz, 42.2 J/cm2 (handpiece no. 2055, contact); G7, control. After laser irradiation, samples were submitted to an acid challenge. For both the nos. 2051 and 2055 handpieces, irradiation was performed with a water cooled spray (5.0 ml/minutes). The calcium and phosphorous ions delivered from the tooth surface were quantified by atomic emission spectrometry, and morphological analysis of the enamel surface was performed under scanning electron microscopy. Kruskal-Wallis and multiple comparisons tests were applied to distinguish significant differences among the treatments (alpha = 5%). RESULTS: Groups G1, G2, and G4 presented decreased demineralization. The SEM evaluation revealed different surface alterations as a result of the different energies used. CONCLUSION: Lower energies can decrease enamel solubility without severe alterations of the enamel. Acids;Erbium Acids;Dental Caries;Dental Cavity Preparation;Dental Enamel;Erbium;Humans;Low-Level Light Therapy;Materials Testing;Microscopy, Electron, Scanning;Molar;Sampling Studies;Tensile Strength

Photothermal nanotherapeutics and nanodiagnostics for selective killing of bacteria targeted with gold nanoparticles. We describe a new method for selective laser killing of bacteria targeted with light-absorbing gold nanoparticles conjugated with specific antibodies. The multifunctional photothermal (PT) microscope/spectrometer provides a real-time assessment of this new therapeutic intervention. In this integrated system, strong laser-induced overheating effects accompanied by the bubble-formation phenomena around clustered gold nanoparticles are the main cause of bacterial damage. PT imaging and time-resolved monitoring of the integrated PT responses assessed these effects. Specifically, we used this technology for selective killing of the Gram-positive bacterium Staphylococcus aureus by targeting the bacterial surface using 10-, 20-, and 40-nm gold particles conjugated with anti-protein A antibodies. Labeled bacteria were irradiated with focused laser pulses (420-570 nm, 12 ns, 0.1-5 J/cm(2), 100 pulses), and laser-induced bacterial damage observed at different laser fluences and nanoparticle sizes was verified by optical transmission, electron microscopy, and conventional viability testing. Gold Gold;Hot Temperature;Lasers;Low-Level Light Therapy;Microscopy;Microscopy, Electron;Microscopy, Electron,

Transmission;Microscopy, Phase-Contrast;Nanostructures;Nanotechnology;Phototherapy;Protein Transport;Spectrophotometry;Spectrum Analysis, Raman;Staphylococcus aureus;Surface Plasmon Resonance;Temperature;Time Factors

Low level laser therapy (Classes I, II and III) for treating rheumatoid arthritis. BACKGROUND: Rheumatoid arthritis (RA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) was introduced as an alternative non-invasive treatment for RA about ten years ago. LLLT is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. The effectiveness of LLLT for rheumatoid arthritis is still controversial. This review is an update of the original review published in October 1998. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of RA. SEARCH STRATEGY: We initially searched MEDLINE, EMBASE (from 1998), the registries of the Cochrane Musculoskeletal Group and the field of Rehabilitation and Related Therapies as well as the Cochrane Central Register of Controlled Trials (CENTRAL) up to June 2001. This search has now been updated to include articles published up to June 2005. SELECTION CRITERIA: Following an a priori protocol, only randomized controlled trials of LLLT for the treatment of patients with a clinical diagnosis of RA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials for inclusion, then extracted data and assessed quality using predetermined forms. Heterogeneity was tested using chi-squared. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Dichotomous outcomes were analyzed with relative risks. MAIN RESULTS: A total of 222 patients were included in the five placebo-controlled trials, with 130 randomized to laser therapy. Relative to a separate control group, LLLT reduced pain by 1.10 points (95% CI: 1.82, 0.39) on visual analogue scale relative to placebo, reduced morning stiffness duration by 27.5 minutes (95%CI: 2.9 to 52 minutes) and increased tip to palm flexibility by 1.3 cm (95% CI: 0.8 to 1.7). Other outcomes such as functional assessment, range of motion and local swelling did not differ between groups. There were no significant differences between subgroups based on LLLT dosage, wavelength, site of application or treatment length. For RA, relative to a control group using the opposite hand, there was no difference observed between the control and treatment hand for morning stiffness duration, and also no significant improvement in pain relief RR 13.00 (95% CI: 0.79 to 214.06). However, only one study was included as using the contralateral limb as control. . AUTHORS' CONCLUSIONS: LLLT could be considered for short-term treatment for relief of pain and morning stiffness for RA patients, particularly since it has few side-effects. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. There is clearly a need to investigate the effects of these factors on LLLT effectiveness for RA in randomized controlled clinical trials. Arthritis, Rheumatoid;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Synergism of epidermal growth factor receptor-targeted immunotherapy with photodynamic treatment of ovarian cancer in vivo. BACKGROUND: Epithelial ovarian cancer often develops resistance to standard treatments, which is a major reason for the high mortality associated with the disease. We examined the efficacy of a treatment regimen that combines immunotherapy to block the activity of epidermal growth factor receptor (EGFR), overexpression of which is associated with the development of resistant ovarian cancer, and photodynamic therapy (PDT), a mechanistically

distinct photochemistry-based modality that is effective against chemo- and radioresistant ovarian tumors. METHODS: We tested a combination regimen consisting of C225, a monoclonal antibody that inhibits the receptor tyrosine kinase activity of EGFR, and benzoporphyrin derivative monoacid A (BPD)-based PDT in a mouse model of human ovarian cancer. Therapeutic efficacy was evaluated in acute treatment response and survival studies that used 9-19 mice per group. Analysis of variance and Wilcoxon statistics were used to analyze the data. All statistical tests were two-sided. RESULTS: Mice treated with PDT + C225 had the lowest mean tumor burden compared with that in the no-treatment control mice (mean percent tumor burden = 9.8%, 95% confidence interval [CI] = 2.3% to 17.3%, P < .001). Mean percent tumor burden for mice treated with C225 only or PDT only was 66.6% (95% CI = 58.7% to 74.4%, P < .001) and 38.2% (95% CI = 29.3% to 47.0%, P < .001), respectively. When compared with PDT only or C225 only, PDT + C225 produced synergistic reductions in mean tumor burden (P < .001, analysis of variance) and improvements in survival (P = .0269, Wilcoxon test). Median survival was approximately threefold greater for mice in the PDT + C225 group than for mice in the no-treatment control group (80 days versus 28 days), and more mice in the PDT + C225 group were alive at 180 days (3/9; 33% [95% CI = 7% to 70%]) than mice in the C225-only (0/12; 0% [95% CI = 0% to 22%]) or PDT-only (1/10; 10% [95% CI = 0.2% to 44%]) groups. CONCLUSION: A mechanistically nonoverlapping combination modality consisting of receptor tyrosine kinase inhibition with C225 and BPD-PDT is well tolerated, effective, and synergistic in mice. Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Antineoplastic Agents;Photosensitizing Agents;Porphyrins;benzoporphyrin D;ErbB Receptors;Receptor Protein-Tyrosine Kinases;Cetuximab Analysis of Variance;Animals;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Antineoplastic Agents;Carcinoma;Cetuximab;Combined Modality Therapy;Confidence Intervals;Drug Synergism;ErbB Receptors;Female;Gene Expression Regulation, Neoplastic;Hematoporphyrin Photoradiation;Humans;Immunotherapy;Injections, Intraperitoneal;Low-Level Light Therapy;Mice;Ovarian Neoplasms;Peritoneal Neoplasms;Photosensitizing Agents;Porphyrins;Receptor Protein-Tyrosine Kinases;Transplantation, Heterologous;Tumor Burden;Tumor Cells, Cultured

C225 and PDT combination therapy for ovarian cancer: the play's the thing. Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Antineoplastic Agents;Photosensitizing Agents;Porphyrins;benzoporphyrin D;ErbB Receptors;Cetuximab Animals;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Antineoplastic Agents;Carcinoma;Cetuximab;Drug Synergism;ErbB Receptors;Female;Hematoporphyrin Photoradiation;Immunotherapy;Injections, Intraperitoneal;Low-Level Light Therapy;Mice;Ovarian Neoplasms;Peritoneal Neoplasms;Photosensitizing Agents;Porphyrins;Transplantation, Heterologous;Tumor Cells, Cultured

Treating vascular lesions. The treatment of acquired vascular lesions is one of the most commonly requested and performed cutaneous laser procedures. Furthermore, every year, 40,000 children are born in the United States each with congenital vascular lesions and malformations. Laser treatment of vascular lesion is based on the principle of selective photothermolysis, conceived in the 1980s. A variety of different lasers and light sources have since been used in the treatment of vascular lesions: lasers with wavelengths between green and yellow, near infrared lasers, and broadband light sources. Despite limitations, this remains the treatment of choice today. This publication addresses acquired and congenital vascular lesions as different entities and proposes a separation of vascular lesions into those that can easily be treated from those where clearance is difficult. Different treatment modalities and the various endpoints of individual vascular lesions will be discussed. Adolescent;Adult;Arteriovenous Malformations;Child;Child, Preschool;Esthetics;Female;Follow-Up Studies;Hemangioma;Humans;Infant;Laser Therapy;Low-Level

Light Therapy;Male;Port-Wine Stain;Risk Assessment;Skin Diseases, Vascular;Skin Neoplasms;Telangiectasis;Treatment Outcome
Optical treatments for acne. Light-based treatments for acne are becoming increasingly commonplace in dermatology. This article reviews various light approaches in acne therapy. Methods are discussed from an anatomical and a functional perspective. The emphasis is on the practicality of treatment as well as the pros and cons of various devices. Also, a review of the recent literature is presented. The article is intended to give the reader a panoramic view of this still-young and developing area. Most likely, light-based acne treatment will receive more popularity as dermatologists learn how to integrate this type of therapy within the context of more established drug agents. Acne Vulgaris;Adolescent;Adult;Biopsy, Needle;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Photochemotherapy;Phototherapy;Risk Assessment;Rosacea;Severity of Illness Index;Skin Absorption;Treatment Outcome
Treatment of melanocytic nevi. Pigmented nevi are a heterogeneous group of lesions that range from uniquely curable with laser treatment, to partially responsive, to unresponsive or dangerous. This article presents laser and IPL treatment strategies from a clinical perspective for nevi organized by their typical responsiveness. A rationale for surgical excision, laser, and/or medical therapy in individual patients is also presented. Despite significant recent progress, it is clear that much understanding are still lacking about optimal laser treatment for pigmented lesions. Adult;Age Factors;Child;Child, Preschool;Esthetics;Female;Follow-Up Studies;Humans;Infant;Laser Therapy;Low-Level Light Therapy;Male;Melanoma;Nevus, Pigmented;Phototherapy;Risk Assessment;Skin Neoplasms;Treatment Outcome
Laser hair removal. Since 1996, there have been numerous advances in hair laser removal that utilize melanin as a chromophore. All of the devices on the market may be used in patients with light skin (phototypes I-III) and yield hair reduction near 75%. The ruby (694 nm) laser, alexandrite (755 nm) laser, and diode (810 nm) laser, as well as intense pulsed light are commonly used devices for hair laser removal. The long-pulsed Nd:YAG (1064 nm) laser represents the safest device for hair removal in dark-skinned patients because of its long wavelength, although the diode laser, alexandrite laser, and intense pulse light may be used. For treatment of light hair, combination radiofrequency and optical devices as well as photodynamic therapy are under investigation. Equipment Design;Equipment Safety;Esthetics;Female;Follow-Up Studies;Hair Removal;Humans;Lasers;Low-Level Light Therapy;Male;Optical Devices;Patient Satisfaction;Risk Assessment;Treatment Outcome
Visible light treatment of photoaging. Recently, a number of new devices have been developed specifically to improve the visible signs of aging in a noninvasive way. These include visible or near-infrared lasers, intense pulsed light sources (IPL), light-emitting diode (LED), and radiofrequency devices. This paper reviews the use of visible light sources and examines the attributes of specific systems for noninvasive skin rejuvenation. Aged;Equipment Design;Equipment Safety;Esthetics;Female;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Phototherapy;Practice Guidelines as Topic;Rejuvenation;Safety;Skin Aging;Treatment Outcome
[Effect of laser irradiation of diode laser on healing of surgical wounds in rats]. The aim of this work was to continue in previous study, which concerns biostimulation of skin wound healing evaluated after 24, 48, 120, 168 hours and so complete the chronological continuance of the process during the first seven days. Male, Sprague-Dawley rats (n=21) were used for the experiment. The rats were divided into 3 groups of 7 animals. In general anaesthesia (combination of xylazine, ketamine and tramadol) under aseptic condition two 3,5 cm long parallel skin incisions were performed on the

left and right side of the rats spine and immediately sutured. The left wounds were daily stimulated with the diode laser (670 nm). The right wounds were not stimulated and served as control. The specimens of skin wounds were removed for histological evaluation 72, 96 and 144 hours after surgery. The biological specimens were stained with hematoxylin and eosin and histopathologically evaluated. In summary, in our histomorphological study of the influence of laser irradiation on primary wound healing evaluated after 72, 96 and 144 hours was concluded, that the healing of stimulated wounds was accelerated in comparison with controls. The histological evaluation showed earlier regress of inflammatory phase, faster finishing of reepithelization and acceleration in maturation phase. Presented experimental study completes the previous study and achieves the positive effect of biostimulation on all phases of skin wound healing in vivo.
Animals;Dermatologic Surgical Procedures;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Wound Healing

Physical and rehabilitative approaches in osteoarthritis. Arthroplasty, Replacement, Knee;Balneology;Cryotherapy;Drug Therapy, Combination;Exercise;Hot Temperature;Humans;Joint Instability;Low-Level Light Therapy;Osteoarthritis;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Self-Help Devices;Transcutaneous Electric Nerve Stimulation;Treatment Outcome

Method of laser activated nano-thermolysis for elimination of tumor cells. We describe novel ex vivo method for elimination of tumor cells from cell suspension, Laser Activated Nanothermolysis and propose this method for purging of bone marrow and blood transplants. K562 and human lympholeukemia cells were eliminated in experiments by laser-induced micro-bubbles that emerge inside individual target cells around selectively formed clusters of light-absorbing gold nanoparticles. Pretreatment of tumor cells with specific monoclonal antibodies and Ig-conjugated 30-nm gold particles allowed the formation of clusters of 10-20 on the surface of cell membrane. Electron microscopy found the nanoparticulate clusters inside the cells. Total (100%) elimination of K562 cells targeted with specific antibodies was achieved with single laser pulses with optical fluence of 5J/cm(2) at the wavelength of 532 nm without damage to the same cells targeted without specific antibodies. Total elimination of human lymphoblasts from suspension of normal stem cells was achieved by a single laser pulse with the optical fluence of 1.7J/cm(2), while the damage level of normal cells was 16%. Antibodies, Neoplasm;Gold Antibodies, Neoplasm;Gold;Humans;Hyperthermia, Induced;K562 Cells;Lasers;Low-Level Light Therapy;Nanostructures;Neoplasms;Phototherapy

Low intensity laser therapy in the treatment of temporomandibular disorders: a double-blind study. This study aimed to evaluate the effectiveness of low intensity laser therapy (LILT) in 30 patients presenting temporomandibular joint (TMJ) pain and mandibular dysfunction in a random and double-blind research design. The sample, divided into experimental group (1) and placebo group (2), was submitted to the treatment with infrared laser (780 nm, 30 mW, 10 s, 6.3 J/cm(2)) at three TMJ points. The treatment was evaluated throughout six sessions and 15, 30 and 60 days after the end of the therapy, through visual analogue scale (VAS), range of mandibular movements and TMJ pressure pain threshold. The results showed a reduction in VAS ($p < 0.001$) and through the ANOVA with repeated measures it was observed that the groups did not present statistically significant differences ($P = 0.2060$), as the averages of the evaluation times ($P = 0.3955$) and the interaction groups evaluation times ($P = 0.3024$), considering the MVO. The same occurred for RLE ($P = 0.2988$, $P = 0.1762$ and $P = 0.7970$), LLE ($P = 0.3265$, $P = 0.4143$ and $P = 0.0696$), PPTD ($P = 0.1558$, $P = 0.4695$ and $P = 0.0737$) and PPTE ($P = 0.2376$, $P = 0.3203$ and $P = 0.0624$). For PE, there were not statistically significant differences for groups ($P = 0.7017$) and the interaction groups evaluation times ($P = 0.6678$), even so in both groups the PE varied with time ($P = 0.0069$).

Adolescent;Adult;Analysis of Variance;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain Management;Temporomandibular Joint Disorders;Time Factors;Treatment Failure
[Laser interstitial thermo therapy (LITT) for brain tumors]. Brain Neoplasms;Fiber Optic Technology;Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Magnetic Resonance Imaging;Magnetic Resonance Spectroscopy;Temperature;Thermography
[Light, laser and PDT therapy for acne]. In recent years, a number of studies have evaluated the treatment of acne using electromagnetic waves, such as lasers, photodynamic therapy, visible light or radio waves. While the efficacy of laser treatment is still uncertain, photodynamic therapy shows promising results, but with marked side-effects, as destruction of sebaceous glands. Treatment with blue light (405-420 nm wavelength) also appears effective and can be regarded as an treatment option for inflammatory acne. Photosensitizing Agents Acne Vulgaris;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Practice Guidelines as Topic;Practice Patterns, Physicians';Treatment Outcome
Selective laser photo-thermal therapy of epithelial carcinoma using anti-EGFR antibody conjugated gold nanoparticles. Efficient conversion of strongly absorbed light by plasmonic gold nanoparticles to heat energy and their easy bioconjugation suggest their use as selective photothermal agents in molecular cancer cell targeting. Two oral squamous carcinoma cell lines (HSC 313 and HOC 3 Clone 8) and one benign epithelial cell line (HaCaT) were incubated with anti-epithelial growth factor receptor (EGFR) antibody conjugated gold nanoparticles and then exposed to continuous visible argon ion laser at 514nm. It is found that the malignant cells require less than half the laser energy to be killed than the benign cells after incubation with anti-EGFR antibody conjugated Au nanoparticles. No photothermal destruction is observed for all types of cells in the absence of nanoparticles at four times energy required to kill the malignant cells with anti-EGFR/Au conjugates bonded. Au nanoparticles thus offer a novel class of selective photothermal agents using a CW laser at low powers. The potential of using this selective technique in molecularly targeted photothermal therapy in vivo is discussed. Antibodies, Monoclonal;Immunoconjugates;Gold;ErbB Receptors Antibodies, Monoclonal;Carcinoma, Squamous Cell;Epithelial Cells;ErbB Receptors;Gold;Humans;Hyperthermia, Induced;Immunoconjugates;Low-Level Light Therapy;Mouth Neoplasms;Nanostructures;Tumor Cells, Cultured
Evaluation of photochemical tissue bonding for closure of skin incisions and excisions. BACKGROUND AND OBJECTIVES: Photochemical tissue bonding (PTB) is a new non-thermal technique for tissue repair involving application of a photochemically active dye and irradiation with visible light. The objective was to compare PTB with standard sutures and the tissue adhesive, octyl cyanoacrylate, for closure of skin incisions and excisions. STUDY DESIGN/MATERIALS AND METHODS: Incisions and excisions made on the flanks of a Hanford mini-pig were secured with subcutaneous sutures. Superficial closure methods were 3-0 monofilament sutures, PTB (Rose Bengal and green light), tissue adhesive and the combination of tissue adhesive then PTB. Wounds were evaluated 2, 4, and 6 weeks postoperatively for cosmetic outcomes and histology. RESULTS: Cosmetic outcomes and histological scar width of incisions and excisions did not differ among the treatment groups at 2, 4, and 6 weeks. CONCLUSION: PTB is as effective as standard sutures for wound closure in porcine skin in terms of cosmetic outcomes and safety. Fluorescent Dyes;Tissue Adhesives;Rose Bengal Animals;Dermatologic Surgical Procedures;Esthetics;Fluorescent Dyes;Low-Level Light Therapy;Male;Photochemistry;Rose Bengal;Skin;Sutures;Swine;Swine, Miniature;Tissue Adhesives;Wound Healing
Low-level laser therapy (LLLT) prevents oxidative stress and reduces fibrosis in rat traumatized Achilles tendon. BACKGROUND AND OBJECTIVES: The present study investigated the effects of

low-level laser therapy (LLLT) on oxidative stress and fibrosis in an experimental model of Achilles tendon injury induced by a single impact trauma. STUDY DESIGN/MATERIALS AND METHODS: Male Wistar rats were randomly divided into four groups (n = 8): control, trauma, trauma+LLLT for 14 days, and trauma+LLLT for 21 days. Achilles tendon traumatism was produced by dropping down a load with an impact kinetic energy of 0.544 J. A low level Ga-As laser was applied with a 904 nm wavelength, 45 mW average power, 5 J/cm(2) dosage, for 35 seconds duration, continuously. Studies were carried out at day 21. RESULTS: Histology showed a loss of normal architecture, with inflammatory reaction, angiogenesis, vasodilatation, and extracellular matrix formation after trauma. This was accompanied by a significant increase in collagen concentration when compared the control group. Oxidative stress, measured by the concentration of thiobarbituric acid reactive substances and hydroperoxyde-initiated chemiluminiscence, was also significantly increased in the trauma group. Administration of LLLT for 14 or 21 days markedly alleviated histological abnormalities reduced collagen concentration and prevented oxidative stress. Superoxide dismutase activity was significantly increased by LLLT treatment over control values. CONCLUSION: LLLT by Ga-As laser reduces histological abnormalities, collagen concentration, and oxidative stress in an experimental model of Achilles tendon injury. Reduction of fibrosis could be mediated by the beneficial effects on the oxidant/antioxidant balance. Collagen Achilles Tendon;Animals;Collagen;Fibrosis;Low-Level Light Therapy;Male;Oxidative Stress;Rats;Rats, Wistar

Treatment of granuloma annulare with the 585 nm pulsed dye laser. BACKGROUND: Granuloma annulare is a chronic asymptomatic dermatosis that is typically manifested by annular papules arising on the dorsa of the hands, feet, elbows, and knees. Multiple treatment modalities have been used with variable efficacy, but no known cure exists. Obtaining long-term resolution of involved areas is often a therapeutic challenge. OBJECTIVE: We report the results of treatment of a patient with localized erythematous granuloma annulare with a 585 nm flashlamp-pumped pulsed dye laser. METHODS: A single granuloma annulare plaque present on the left wrist for 3 years was treated on three occasions with a 585 nm flashlamp-pumped pulsed dye laser initially and repeated at months 5 and 13. RESULTS: After initial pulsed dye laser treatment, significant flattening and reduction of erythema were evident within the treated area. After a second treatment at month 5 and a third treatment at month 13, further improvement was evident, and long-term remission was achieved. CONCLUSION: Localized granuloma annulare may be difficult to manage, presenting a therapeutic challenge. Thorough understanding of available treatment options, their relative efficacies, and risks of complication can facilitate successful management of this chronic disease. Pulsed dye laser therapy may be an effective and relatively safe treatment option for erythematous granuloma annulare, although prospective studies in additional patients would be desirable. Improvement of the condition in a single patient does not imply that others might improve, and variability in response is more likely. Female;Granuloma Annulare;Humans;Low-Level Light Therapy;Middle Aged;Treatment Outcome;Wrist

Nonablative phototherapy for acne vulgaris using the KTP 532 nm laser. BACKGROUND: Acne vulgaris is an acute inflammatory disease of the pilosebaceous units. The bastion of treatment for acne vulgaris has been the use of topical and systemic therapies. Despite many modalities available for treatment, there exists an imperative need for effective noninvasive treatments that reduce the risks of medication side effects. OBJECTIVE: To study the safety and efficacy of the potassium titanyl phosphate (KTP) 532 nm pulsed laser for the treatment of acne vulgaris. METHODS: Twenty-six subjects, clinically evaluated with moderate facial acne, were enrolled in this single-center prospective trial. The entire facial area for each subject was divided in half and randomly designated as either a treatment or a control side. Each subject was treated with four laser exposures using a KTP 532 nm laser with continuous contact cooling. The results were assessed at 1 and 4 weeks post-final

treatment. Primary outcome measures were MichaÃ«lsson acne severity score and adverse treatment effects. Secondary outcome measures included subjective evaluations from the investigator and patients assessing their overall percent satisfaction. RESULTS: Primary outcome analysis in the MichaÃ«lsson acne severity score demonstrated a mean 34.9% (p = .011) and 20.7% (p = .25) reduction at the 1-week and 4-week post-final treatments, respectively. Subjective investigator evaluations of overall percent satisfaction indicated that all patients demonstrated a minimum 50% overall satisfaction in treatment outcomes at the 4-week follow-up period. No side effects were encountered. CONCLUSION: Use of the KTP 532 nm laser for the treatment and management of acne vulgaris is both safe and effective, with positive results enduring up to 4 weeks post-treatment. Phosphates;potassium titanylphosphate;Titanium Acne Vulgaris;Adult;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Phosphates;Phototherapy;Prospective Studies;Severity of Illness Index;Titanium;Treatment Outcome

Nonablative laser surgery for pigmented skin. BACKGROUND: Nonablative laser surgery has been proven to improve early photodamaged skin and acne scars. These techniques include treatments with lasers, light sources, and/or radiofrequency devices. OBJECTIVES: To review the history of nonablative technology and its applicability to darker skin types and to provide an objective look at the various published studies documenting the efficacy of nonablative technology. CONCLUSION: Nonablative laser surgery can improve skin quality and acne scars in all skin types. Complications are rare but can occur. Future studies are required to compare the efficacy of the various nonablative technologies. Humans;Hyperpigmentation;Low-Level Light Therapy;Pigmentation Disorders;Treatment Outcome

Treatment for poikilodermatous erythema of dermatomyositis with the pulsed dye laser. Adult;Dermatomyositis;Erythema;Humans;Low-Level Light Therapy;Male;Middle Aged

Treatment of inflammatory facial acne vulgaris with combination 595-nm pulsed-dye laser with dynamic-cooling-device and 1,450-nm diode laser. BACKGROUND AND OBJECTIVES: The 585-nm pulsed-dye laser and the 1,450-nm diode laser have been found effective for the treatment of mild-to-moderate inflammatory facial acne. This study was designed to evaluate the efficacy and safety of the combined treatment with the 595-nm pulsed-dye laser and the 1,450-nm diode laser for inflammatory facial acne. STUDY DESIGN/MATERIALS AND METHODS: Fifteen patients with inflammatory facial acne were treated with a combination of the 595-nm pulsed-dye laser and the 1,450-nm diode laser. Patients' subjective response to treatment was evaluated regarding improvement in acne, acne scarring, oiliness, and redness of the skin. RESULTS: All patients had reductions in acne lesion counts. Mean lesion counts decreased 52% ($P < 0.01$), 63% ($P < 0.01$), and 84% ($P < 0.01$) after one, two, and three treatments, respectively. Patients described moderate-to-marked improvement in acne, acne scarring, and post-inflammatory erythema. Adverse effects were limited to mild, transient erythema. CONCLUSIONS: The combination of the 595-nm pulsed-dye laser and the 1,450-nm diode laser is safe and effective for the treatment of inflammatory facial acne, acne scarring, and post-inflammatory erythema. Dermatologic Agents Acne Vulgaris;Adolescent;Adult;Cicatrix;Cryotherapy;Dermatologic Agents;Face;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Patient Satisfaction;Treatment Outcome

Does the use of low-level laser influence wound healing in chronic venous leg ulcers? OBJECTIVE: Venous leg ulcer treatment often requires months or years of regular wound care by trained staff. It has been suggested that low-level laser irradiation has a biostimulative and wound healing effect, but this has not been clinically verified by controlled studies. This study aimed to compare the effectiveness of low-level laser irradiation with that of a placebo 'light source'. METHOD: Forty-four patients were assigned to two treatment groups (laser and placebo) or a third group (standardised treatment only) to quantify the effect of the laser therapy. Patients in all three groups received

standardised wound care (disinfection, a hydrofibre dressing and compression bandaging). Ulcer size was measured at baseline (day 1), at the end of therapy (day 28) and then two months later (day 90). The relative difference in wound size was evaluated. RESULTS: The difference in the reduction in wound size was not statistically significant in all three groups. A positive effect of using the non-laser device (placebo effect) was demonstrated in some patients. CONCLUSION: These study results suggest that low-level laser does not stimulate wound healing in venous leg ulcers. Further controlled studies are needed to clarify the efficacy of low-level laser treatment as a wound-healing stimulant. Adult;Aged;Aged, 80 and over;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Matched-Pair Analysis;Middle Aged;Statistics, Nonparametric;Varicose Ulcer;Wound Healing

Comparison of diffusion approximation and Monte Carlo based finite element models for simulating thermal responses to laser irradiation in discrete vessels. Both diffusion approximation (DA) and Monte Carlo (MC) models have been used to simulate light distribution in multilayered human skin with or without discrete blood vessels. However, no detailed comparison of the light distribution, heat generation and induced thermal damage between these two models has been done for discrete vessels. Three models were constructed: (1) MC-based finite element method (FEM) model, referred to as MC-FEM; (2) DA-based FEM with simple scaling factors according to chromophore concentrations (SFCC) in the epidermis and vessels, referred to as DA-FEM-SFCC; and (3) DA-FEM with improved scaling factors (ISF) obtained by equalizing the total light energy depositions that are solved from the DA and MC models in the epidermis and vessels, respectively, referred to as DA-FEM-ISF. The results show that DA-FEM-SFCC underestimates the light energy deposition in the epidermis and vessels when compared to MC-FEM. The difference is nonlinearly dependent on wavelength, dermal blood volume fraction, vessel size and depth, etc. Thus, the temperature and damage profiles are also dramatically different. DA-FEM-ISF achieves much better results in calculating heat generation and induced thermal damage when compared to MC-FEM, and has the advantages of both calculation speed and accuracy. The disadvantage is that a multidimensional ISF table is needed for DA-FEM-ISF to be a practical modelling tool. Blood Vessels;Computer Simulation;Dose-Response Relationship, Radiation;Finite Element Analysis;Humans;Lasers;Low-Level Light Therapy;Models, Biological;Monte Carlo Method;Radiation Dosage;Skin;Skin Physiological Phenomena;Skin Temperature

Synergistic enhancement of selective nanophotothermolysis with gold nanoclusters: potential for cancer therapy. BACKGROUND AND OBJECTIVE: We developed a new approach that enhances selective photothermolysis of tumor through laser activation of synergistic phenomena around nanoclusters, which are self-assembled into cancer cells. STUDY DESIGN/MATERIALS AND METHODS: In vitro verification of this approach was performed by laser pulse irradiation (420-570 nm and 1064 nm; 8-12 nanosecond; 0.1-10 J/cm2) of MDA-MB-231 breast cancer cells targeted with primary antibodies to which 40-nm gold nanoparticles were selectively attached by means of secondary antibodies. Photothermal (PT) radiometry, thermolens techniques, electron microscopy, atomic force microscopy, silver and gold enhancing kits, and viability test (Annexin V-propidium iodide) were employed to study nanoparticle spatial organization, the dynamics of microbubble formation, and cell damage. RESULTS: The assembly of gold nanoclusters on the cell membrane was accompanied by increased local absorption and red-shifting as compared to cells that did not have nanoclusters. These effects were amplified by a silver-enhancing kit and pre-irradiation of cells with low laser-pulse energy. Finally, a significant increase in laser-induced bubble formation and cancer cell killing was observed using near-IR lasers (1064 nm). A cancer cell antigens was used to provide target specificity for nanoclusters formation making the cancer cells sensitive to laser activation. CONCLUSION: The described approach uses relatively small and simple gold nanoparticles offering more effective

delivery to target. In addition, the further self-assembling of these nanoparticles into nanoclusters on live cells provides significant enhancement of laser-induced cell damage. These nanoclusters (gold "nanobombs") can be activated in cancer cells only by confining near-IR laser pulse energy within the critical mass of the nanoparticles in the nanoclusters. Antibodies, Neoplasm;Metals;Gold Adenocarcinoma;Antibodies, Neoplasm;Breast Neoplasms;Cell Line, Tumor;Female;Gold;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Metals;Nanostructures;Phototherapy

Use of erythema index imaging for systematic analysis of port wine stain skin response to laser therapy. BACKGROUND AND OBJECTIVES: Quantitative methods to assess port wine stain (PWS) skin response to laser therapy are needed to improve therapeutic outcome. In this study, PWS skin erythema was analyzed using erythema index difference (DeltaEI: erythema index difference between PWS and normal skin) images before and after treatment to investigate systematically subject-dependent response to laser therapy. STUDY DESIGN/MATERIALS AND METHODS: Cross-polarized digital skin color images were acquired from 17 subjects with facial PWS and the associated DeltaEI images were computed. Qualitative and quantitative analyses of PWS skin erythema were performed with DeltaEI images, in which ranges of 40-6 and 5-0 represented PWS and normal skin, respectively. RESULTS: After laser therapy, we qualitatively observed a reduction in the DeltaEI values for all subjects. Regression fitting of DeltaEI values before and after PWS laser therapy was associated with strong positive linear correlation. CONCLUSIONS: The imaging modality and analysis method allowed systematic analysis of PWS skin erythema in response to laser therapy. PWS skin response was dependent on pretreatment DeltaEI values, suggesting that erythema can be utilized as an effective parameter to monitor PWS response to laser therapy. Erythema;Face;Humans;Low-Level Light Therapy;Photography;Port-Wine Stain;Severity of Illness Index

Physico-chemical changes of human enamel irradiated with ArF excimer laser. BACKGROUND AND OBJECTIVES: Irradiation of tooth enamel by lasers can alter its structure and chemical composition. The purpose of this work was to determine the compositional changes and to elucidate the mechanisms of laser-enamel interaction using ArF excimer laser. STUDY DESIGN/MATERIALS AND METHODS: Human enamel irradiated with ArF excimer laser (wavelength, 193 nm) at different fluences, was examined using X-ray diffraction, infrared (IR) spectroscopy and microprobe analysis. RESULTS: Ablation without significant compositional changes in irradiated enamel was evident when low fluences (approximately 200-380 mJ/cm2) were used. However, fluences between 640 and 2,300 mJ/cm2 resulted in an increased Ca/P ratio, decreased amount of carbonate and protein, and the formation of tricalcium phosphate and tetracalcium phosphate, suggesting the involvement of a photothermal mechanism. CONCLUSIONS: The results show that ArF excimer laser can alter the chemical composition and morphology of the highly mineralized (96%) dental enamel, depending on the fluence used. Calcium Phosphates;Carbonates;Phosphates;Proteins;tetracalcium phosphate;tricalcium phosphate;Calcium Calcium;Calcium Phosphates;Carbonates;Dental Enamel;Humans;Laser Therapy;Low-Level Light Therapy;Phosphates;Phototherapy;Proteins

Laser-induced thermal injury to dermal blood vessels: analysis of wavelength (585 nm vs. 595 nm), cryogen spray cooling, and wound healing effects. BACKGROUND AND OBJECTIVES: Successful laser treatment of cutaneous hyper-vascular lesions requires appropriate laser irradiation parameters for selective photothermolysis of ectatic dermal blood vessels as well as appropriate cooling parameters for epidermal protection based on an individual patient basis. Using the rabbit ear as an in vivo model for dermal vasculature, we investigated the influences of laser wavelength (585 nm vs. 595 nm) and cryogen spray cooling with various spurt durations on the laser-induced thermal injury to dermal blood vessels. Wound healing response was also evaluated in 2 hours and 4 days. STUDY DESIGN/MATERIALS AND METHODS: Flashlamp-pumped pulsed dye laser ScleroPlus (operated at the

wavelength of 585 or 595 nm) was used for the comparison between the influences of two wavelengths (585 nm vs. 595 nm). R134-a cryogen spurts with the durations from 50 to 300 milliseconds were sprayed onto the sites to be irradiated and terminated 20 milliseconds before the onset of the laser pulses. In vivo rabbit ear was used as the model for cutaneous hyper-vascular lesions. Totally 10 New Zealand Albino white rabbits were experimented and in each rabbit ear six to seven sites were irradiated. Five animals were sacrificed 2 hours after the irradiation, and the remaining five sacrificed 4 days after the irradiation. Thermal injury to the blood vessel was assessed by hematoxylin and eosin stained histological sections and confirmed by an apoptosis assay. RESULTS: When the radiant exposures were above 10 J/cm2, 595 nm wavelength induced equivalent or more severe thermal injury to dermal blood vessels than 585 nm. Cryogen spray cooling with the spurt durations above 100 milliseconds resulted in increased depth of the most superficial thermal injury to dermal blood vessels than without cooling, indicating that superficial blood vessels were non-specifically cooled by the cryogen spurts applied at these parameters. Laser-induced thermal injury was significantly healed in the rabbit ear vasculature at 4 days post irradiation. CONCLUSIONS: Given sufficient radiant exposure, 595 nm wavelength can induce equivalent or more severe vascular injury compared with 585 nm. Cryogen spray cooling with the spurt durations above 100 ms may impair the photocoagulation of superficial blood vessels. Irreversible thermal injury to blood vessel can be achieved only when the basement membrane of blood vessel wall is irreversibly damaged.
Aerosols Aerosols;Animals;Blood Vessels;Cryotherapy;Hot Temperature;Low-Level Light Therapy;Models, Animal;Rabbits;Skin;Wound Healing

Effective and safe use of lasers, light sources, and radiofrequency devices in the clinical management of Asian patients with selected dermatoses. BACKGROUND AND OBJECTIVES: The use of lasers, light sources, and radiofrequency devices in Asian patients differs from their use in Caucasians in several respects. STUDY DESIGN/MATERIALS AND METHODS: The disease spectrum is very different with pigmentary disorders being more commonly encountered in Asian populations. Asian skin, with its higher epidermal melanin content, is more likely to develop adverse reactions, especially post-inflammatory hyperpigmentation (PIH), following treatment. RESULTS AND CONCLUSIONS: The purpose of this article is to discuss the effective and safe use of lasers, light sources, and radiofrequency devices in the clinical management of Asian patients with selected dermatoses.
Acne Vulgaris;Asian People;Catheter Ablation;Cicatrix;Humans;Hyperpigmentation;Low-Level Light Therapy;Photochemotherapy;Phototherapy;Skin Aging

Hemangiomas of infancy: treatment of ulceration in the head and neck. Ulceration is a common complication of hemangiomas of infancy and presents a therapeutic dilemma for the head and neck-facial plastic surgeon. Multiple therapies are available, further complicating treatment of patients. We review the common characteristics of ulcerated hemangiomas and discuss the treatment modalities available. We present case reports to illustrate management options and a stepwise algorithm for treatment of ulcerated hemangiomas. Adrenal Cortex Hormones;Interferon alpha-2;Interferon-alpha;Recombinant Proteins Adrenal Cortex Hormones;Combined Modality Therapy;Facial Neoplasms;Follow-Up Studies;Head and Neck Neoplasms;Hemangioma;Humans;Infant;Infant, Newborn;Interferon alpha-2;Interferon-alpha;Low-Level Light Therapy;Recombinant Proteins;Risk Assessment;Sampling Studies;Skin Ulcer;Treatment Outcome;Wound Healing

Description and analysis of treatments for port-wine stain birthmarks. Port-wine stain (PWS) birthmarks are congenital, low-flow vascular malformations of the skin. Lasers are the modality of choice for the treatment of PWS birthmarks, and for most patients the pulsed-dye laser in conjunction with epidermal cooling offers the greatest efficacy and safety. Other light devices, including the 532-nm frequency-doubled Nd:YAG laser, intense pulsed light, 1064-nm Nd:YAG laser,

and combined 1064/532-nm system, may be useful during a treatment course for resistant PWS. Laser treatment results in blanching of most lesions, although complete resolution may not occur and some resistant PWS birthmarks respond minimally, if at all. Factors limiting laser treatment include variable vascular geometry, inadequate damage of some vessels, and lesional posttreatment recurrence as a result of neovascularization. Alternative or adjunct treatment options that address these limitations should be explored, including noninvasive real-time imaging to optimize the selection of treatment settings, photodynamic therapy, and perioperative use of antiangiogenic compounds. Adolescent;Adult;Biopsy, Needle;Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Risk Assessment;Severity of Illness Index;Treatment Outcome

Carbon dioxide laser treatment of erythroplasia of Queyrat: a revisited treatment to this condition. Carbon Dioxide Adult;Aged;Carbon Dioxide;Cohort Studies;Erythroplasia;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Staging;Penile Neoplasms;Risk Assessment;Treatment Outcome

Single cell analysis of PKC activation during proliferation and apoptosis induced by laser irradiation. Laser irradiation has been shown to trigger cellular proliferation and apoptosis in various cell types. Studying the signaling pathways involved in the laser irradiation is important for understanding these processes. In present study, to monitor the protein kinase Cs (PKCs) activity in living cells in real time, we transfected and screened human lung adenocarcinoma cells (ASTC-a-1) stably expressing C kinase activity reporter (CKAR) constructed based on fluorescence resonance energy transfer (FRET) technique. The CKAR is a specific, reversible reporter of phosphorylation by PKCs and it can monitor the ongoing balance between PKCs and phosphatases. The increasing dynamics of PKCs activity is monitored during cell proliferation induced by low-power laser irradiation (LPLI) (0.8 J/cm2) in serum-starved ASTC-a-1 cells stably expressing CKAR reporter using FRET imaging on laser scanning confocal microscope and using spectrofluorometric analysis on a luminescence spectrometer, respectively. However, the decreasing dynamics of PKCs activity has been monitored in real time using FRET imaging for the cells treated with high fluence LPLI (60 J/cm2), which was previously found to induce cell apoptosis. Taken together, LPLI induces the ASTC-a-1 cell proliferation by specifically activating PKCs. However, PKCs activity decreases during cell apoptosis induced by high fluence LPLI. Our results indicate that PKCs play an important role in the laser irradiation-induced biological effects. Protein Kinase C;Tetradecanoylphorbol Acetate Apoptosis;Cell Line, Tumor;Cell Proliferation;Enzyme Activation;Humans;Low-Level Light Therapy;Models, Biological;Protein Kinase C;Spectrometry, Fluorescence;Tetradecanoylphorbol Acetate;Time Factors;Transfection

A randomised, blinded, controlled study of the clinical relevance of matching pulse duration to thermal relaxation time when treating facial telangiectasia. The theory of selective photo-thermolysis (SP) suggests the occurrence of optimal damage when the laser pulse duration (PD) equals the target thermal relaxation time (Tr). This study examines the clinical relevance of this theory. The study design and methods consisted of prospective, randomised, blinded, controlled study of KTP 532-nm laser treatment of 28 telangiectatic facial vessels. The PD varied from 0.13 to 1.71 times Tr (factor of 13). All vessels achieved marked improvement or clearance. The analysis of proportions reaching clearance over marked improvement for small and large calibre vessels shows a better outcome when the PD is nearer to the Tr (86% vs 57%; P = 0.09, 95% CI for difference -3% to 60%). Logistic regression analysis shows that, as the ratio of PD to Tr increases (PD near to or higher than Tr), the chance of clearing improves (P = 0.169; 95% CI 0.34 to 341). This study has shown that, for the range of vessels investigated: (1) marked improvement or clearance may be achieved using PDs that range between 0.13 and 1.71 times the Tr; and (2) it also reveals an overall trend towards a higher proportion of clearance when the PD is near to or higher than the Tr. Adult;Double-

Blind Method;Facial Dermatoses;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Telangiectasis;Time Factors;Treatment Outcome;Vasodilation
Comparison of the effectiveness of the conservative treatment of the periodontal pockets with or without the use of laser biostimulation. The use of laser therapy as the agent reinforcing conventional treatment of the periodontal diseases becomes more and more common. In the physiotherapy of the periodontal diseases the biostimulating, laser is eagerly used because of its action which accelerates the healing of wounds and also because of its antioedematous, anti-inflammatory and analgesic action. The aim of work was the evaluation of the influence of laser biostimulation on the change of the periodontological pockets depth after the routine conservative periodontological treatment with additional use of laser biostimulation and without it for two groups of pockets: above and below 5 mm. In six patients having periodontitis 613 sites were submitted to the statistic analysis (290 treated conservatively only, including 251 with the depth 2-5 mm and 39 above 5 mm as well as 323 with the use of laser therapy including 297 shallow pockets and 26 deep ones). The initial values of API, SBI, PPD and their changes in the course of the treatment were registered. During each control appointment the patients subjectively estimated periodontal pain occurrence. In both studied groups statistically essential decrease of the evaluated parameters was obtained. Reinforcing the conventional treatment with laser biostimulation shortens its duration and leads to the elimination of pain faster than with the use of conservative treatment only. The changes of the PPD index among the successive examinations were statistically essentially higher in the therapy with the use of laser, especially in relation to deep pockets. Combined Modality Therapy;Dental Scaling;Follow-Up Studies;Humans;Low-Level Light Therapy;Oral Hygiene;Outcome and Process Assessment, Health Care;Periodontal Pocket;Wound Healing
Laser literature watch. Dentistry;Dermatology;Gastroenterology;General Surgery;Humans;Laser Therapy;Low-Level Light Therapy;Ophthalmology;Phototherapy;Research;Surgery, Plastic;Wound Healing
The penetration of white light through human tissue. Cells;Energy Transfer;Humans;Light;Low-Level Light Therapy;Signal Transduction
The importance of the coherency. Animals;Biophysical Phenomena;Biophysics;Humans;Laser Therapy;Light;Low-Level Light Therapy
Effectiveness of low-level laser therapy for lateral elbow tendinopathy. OBJECTIVE: Our aim was to determine the effectiveness of low-lever laser therapy (LLLT) in the management of lateral elbow tendinopathy (LET) and to provide recommendations based on this evidence. BACKGROUND DATA: LET is a common clinical condition, and a wide array of physiotherapy treatments is used for treating LET. METHODS: Randomized controlled trials (RCTs) identified by a search strategy in six databases were used in combination with reference checking. RCTs that included LLLT, patients with LET, and at least one of the clinically relevant outcome measure were selected. Aqualitative analysis of the selected studies was conducted using the Chalmers' technique. RESULTS: Nine RCTs fulfilled the criteria and were included in the review. Although these studies had satisfactory methodology, shortcomings were not absent; poor results were revealed as to the effectiveness of LLLT for LET management. CONCLUSIONS: LLLT need not be ruled out for LET as it is a dose-response modality, and the optimal treatment dose has obviously not yet have been discovered. Further research with well-designed RCTs is needed to establish the absolute and relative effectiveness of this intervention for LET. Health Planning Guidelines;Humans;Low-Level Light Therapy;Tennis Elbow;Treatment Outcome
Photo-infrared pulsed bio-modulation (PIPBM): a novel mechanism for the enhancement of physiologically reparative responses. OBJECTIVE: The present manuscript describes the non-

invasive, long-range, energy transport of a singular infrared pulsed laser device (IPLD) and the upstream components of the original action mechanism, designated photo-infrared pulsed bio-modulation (PIPBM). BACKGROUND DATA: Major strides have been taken in recent years towards scientifically acceptable clinical applications of low-energy lasers. Nevertheless, challenges still abound. For instance, the range of potential target tissues for laser therapy in medicine has been, until now, limited by the optical penetration of the beam or to sites accessible by fiberoptics. In addition, much needs to be learned about the action mechanisms of pulsed lasers, which can induce unique biological effects. METHODS: We present a review of the IPLD laser technology and the PIPBM mechanism. RESULTS: The studies reviewed suggest that the PIPBM enhances physiologically reparative processes in a non-toxic and selective manner through the activation and modulation of chaotic dynamics in water. These, in turn, lead not only to local, but also long-distance (systemic) effects. CONCLUSIONS: Though additional studies are necessary to fully explore the biological effects of the PIPBM induced by the IPLD, this mechanism may have multiple potential applications in medicine that are the subject of active current and future investigations. Adenosine Triphosphate Adenosine Triphosphate;Biophysical Phenomena;Biophysics;Cells;Energy Transfer;Humans;Infrared Rays;Low-Level Light Therapy;Wound Healing

Assessment of bone repair associated with the use of organic bovine bone and membrane irradiated at 830 nm. OBJECTIVE: The aim of the present investigation was to assess histologically the effect of LLLT (GaAlAs, 830 nm, 40 mW, CW, (Phi) approximately 0.6 mm, 16 J/cm(2) per session) on the repair of surgical defects created in the femur of the Wistar Albinus rat. The defects were filled to lyophilized bovine bone (Gen-ox), organic matrix) associated or not to GTR (Gen-derm). BACKGROUND DATA: A major problem on modern Dentistry is the recovery of bone defects caused by trauma, surgical procedures or pathologies. Several types of biomaterials have been used in order to improve the repair of these defects. These materials are often associated to procedures of GTR. Previous studies have shown positive effects of LLLT on the repair of soft tissue wounds, but there are a few on its effects on bone healing. METHODS: Surgical bone defects were created in 42 animals divided into five groups: Group I (control, 6 animals); Group II (Gen-ox, 9 animals); Group III (Gen-ox + Laser, 9 animals); Group IV (Gen-ox + Gen-derm, 9 animals); Group V (Gen-ox + Gen-derm + Laser, 9 animals). The animals on the irradiated group received 16 J/cm(2) per session divided into four points around the defect (4 J/cm(2)) being the first irradiation immediately after surgery and repeated seven times at every 48 h. The animals were humanly killed after 15, 21, and 30 days. RESULTS: The results of the present investigation showed histological evidence of improved amount of collagen fibers at early stages of the bone healing (15 days) and increased amount of well organized bone trabeculae at the end of the experimental period (30 days) on irradiated animals compared to non irradiated ones. CONCLUSIONS: It is concluded that a positive biomodulative effect on the healing process of one defect associated or not to the use of organic lyophilized bone and biological bovine lyophilized membrane on the femur of the rat. Collagen Animals;Bone Regeneration;Bone Transplantation;Collagen;Female;Femur;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Wistar

Spontaneous effects of low-level laser therapy (650 nm) in acute inflammatory mouse pleurisy induced by carrageenan. OBJECTIVE: Our aim was to investigate the effect of low-level laser therapy (LLLT), 650-nm wavelength, on acute inflammatory pleurisy. BACKGROUND DATA: There is only scattered evidence of anti-inflammatory effects from LLLT and dosage characteristics, and the effect on pleurisy inflammation has yet to be investigated. METHODS: A classical experimental model of pleurisy was used in a sample of 40 Balb male mice, randomly divided into five groups. Inflammation was induced by carrageenan (0.5 mg/cavity) administered by intrathoracic injections. Four groups received the inflammatory agent, and one received injections of sterile saline solution. At

1, 2, and 3 h after injections, LLLT irradiation was performed, with the same power (2.5 mW), but different irradiation times. The energy densities at each of the three treatment sessions were 0 J/cm(2) (placebo), 3 J/cm(2), 7.5 J/cm(2), and 15 J/cm(2), respectively. RESULTS: Total and differential cell analysis at 4 h after induction of pleurisy showed a significant reduction of inflammatory cell migration for all groups treated with active laser. However, at 4 h after injection, the most significant ($p < 0.001$) reduction of leukocyte cell migration was seen in the 7.5 J/cm(2) group, at 2.7 (95% CI: 2.5-2.9) x 10(6), versus 7.9 (95% CI: 6.7-9.1) x 10(6) in the placebo control group. The greatest reduction of inflammatory cells was registered for neutrophils. CONCLUSIONS: LLLT administered at 1-3 h after the induction of inflammatory pleurisy significantly reduces the inflammatory cell migration measured. Under these conditions and at 2.5 mW, 7.5 J/cm(2) was more effective than 3 J/cm(2) and 15 J/cm(2). Irritants;Carrageenan Animals;Carrageenan;Chemotaxis, Leukocyte;Irritants;Low-Level Light Therapy;Male;Mice;Pleurisy

Laser application effects on the bite strength of the masseter muscle, as an orofacial pain treatment. OBJECTIVE: The present research studies the effects of AsGaAl (low-intensity laser) on the bite strength of the masseter muscle in order to evaluate the contribution of laser therapy in patients with orofacial pain. BACKGROUND DATA: Studies on laser therapy suggest its usefulness in the treatment of temporomandibular disorders. This paper presents the effects of low-intensity laser in the contraction of the masseter muscle in patients with neuromuscular discomfort. METHODS: Fifteen patients of both genders, ages 19-29, suffering from pain in the masseter muscle, were exposed to laser application (AsGaAl) applied from a 2-mm distance. RESULTS: All patients showed improvement in muscle contraction strength of about 2.51-3.01 kgf on the right and left masseter muscle. CONCLUSIONS: These results suggest that low-level laser application is an effective tool for the treatment of patients with orofacial pain. Adult;Bites and Stings;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Masseter Muscle

Exact action spectra for cellular responses relevant to phototherapy. OBJECTIVE: The aim of the present work is to analyze available action spectra for various biological responses of HeLa cells irradiated with monochromatic light of 580-860 nm. BACKGROUND DATA: Phototherapy (low-level laser therapy or photobiomodulation) is characterized by its ability to induce photobiological processes in cells. Exact action spectra are needed for determination of photoacceptors as well as for further investigations into cellular mechanisms of phototherapy. METHODS: Seven action spectra for the stimulation of DNA and RNA synthesis rate and cell adhesion to glass matrix are analyzed by curve fitting, followed by deconvolusion with Lorentzian fitting. Exact parameters of peak positions and bandwidths are presented. RESULTS: The peak positions are between 613.5 and 623.5 nm (in one spectrum, at 606 nm), in the red maximum. The far-red maximum has exact peak positions between 667.5 and 683.7 nm in different spectra. Two near infrared maxima have peak positions in the range 750.7-772.3 nm and 812.5-846.0 nm, respectively. CONCLUSIONS: In the wavelength range important for phototherapy (600-860 nm), there are four "active" regions, but peak positions are not exactly the same for all spectra. RNA;DNA Cell Adhesion;DNA;HeLa Cells;Humans;Low-Level Light Therapy;RNA

Split treatment of photodamaged skin with KTP 532 nm laser with 10 mm handpiece versus IPL: a cheek-to-cheek comparison. BACKGROUND AND OBJECTIVES: The treatment of photodamaged skin with potassium-titanyl-phosphate (KTP) laser and intense pulsed light (IPL) has been reported in several studies. Each device has strengths and weaknesses; however, patient and device variability have made it difficult to ascertain the optimal device for photorejuvenation. The objective of this study was to obtain a head-to-head comparison of IPL and KTP laser for photorejuvenation. Each patient received one KTP laser treatment on one side of the face and one IPL treatment on the other side. STUDY DESIGN/MATERIALS AND METHODS: Seventeen patients with skin types I-IV were

accepted into the study based on existence of dyschromias (pigmented and vascular) and/or discrete telangiectases. After performance of test spots on each patient to determine optimal settings for both devices, patients were treated with both devices in a split face manner. Evaluations and photographs were performed 1 week and 1 month after treatment. Patient and observer evaluations of results were recorded, as well as time to perform each treatment, and patient feedback with regard to pain and edema. No anesthesia was used in these treatments. Photographs were reviewed by a panel of blinded observers to assess changes in red and brown dyschromias. RESULTS: One month average improvement (evaluator) for IPL side was (mean) 38.16%/35.08% for vascular/pigment lesions versus 41.99%/30.21% for KTP side. Patient self-evaluated global improvement at 1 month was (mean) 65.59% for IPL side versus 60.88% for KTP side. A majority of patients found the KTP to be slightly more painful with a mean pain rating of 5.27 of 10 versus 4.4 of 10 for IPL. A majority of patients experienced subjectively greater post-procedure swelling on the KTP side. Time to conduct treatment was an average of 10.0 minutes for IPL, 8.7 minutes for KTP. CONCLUSIONS: Both large spot KTP and IPL achieved marked improvement in vascular and pigmented lesions in one session. The KTP laser caused slightly more discomfort and edema than the IPL. On the other hand, the KTP laser was faster, and more ergonomically flexible.
Phosphates;Titanium;Potassium Edema;Erythema;Humans;Low-Level Light Therapy;Pain Measurement;Phosphates;Phototherapy;Pigmentation Disorders;Potassium;Skin;Sunlight;Titanium;Treatment Outcome;Ultraviolet Rays

Laser-assisted anesthesia prior to intravenous cannulation in volunteers: a randomized, controlled trial. BACKGROUND: Intravenous cannulation is common and painful. Absorption of topical anesthetics is limited by the stratum corneum, the outermost layer of the epidermis. A single pulse of an erbium:yttrium-aluminum-garnet (Er:YAG) laser irradiation can remove an area of the stratum corneum, leading to enhanced uptake of topical agents, such as lidocaine, while leaving the rest of the epidermis intact. OBJECTIVE: The authors hypothesized that pretreatment of the skin with laser-assisted anesthesia would reduce the pain of venous cannulation. METHODS: This was a blinded, randomized, controlled clinical trial. Subjects were 30 healthy adult volunteers. Standardized venous cannulation was performed on the dorsum of both of each subject's hands. In the study hand, the area over the target vein was pretreated with a lightweight, portable Er:YAG unit, with a fluence of 3.5 J/cm(2), a pulse width of 600 microseconds, and a spot diameter of 6 mm. Lidocaine 4% cream was applied to the area. After 5 minutes, the cream was wiped off and a nurse inserted an intravenous (IV) catheter and verified placement. In the control hand, a sham laser was used. Pain of laser application and pain of IV cannulation were recorded on a validated 100-mm visual analog scale (VAS) marked "most pain" at the high end. The presence of burns, infection, and scarring at one week and at three months after the study was also noted. The levels of pain of cannulation were compared using a paired t-test. RESULTS: Mean subject age was 32 years; 43% were female. The mean pain of cannulation after laser-assisted lidocaine application (13 mm, 95% CI = 8 to 19) was significantly less than after application of sham laser (29 mm, 95% CI = 22 to 36; mean difference, 15 mm, 95% CI = 6 to 24). No subject had persistent erythema or scarring. CONCLUSIONS: Pretreatment of the skin with a laser device followed by a 5-minute topical lidocaine application reduces the pain of IV cannulation in volunteers. Lidocaine Adult;Anesthesia, Local;Catheterization, Peripheral;Combined Modality Therapy;Double-Blind Method;Emergency Medicine;Female;Hand;Humans;Lidocaine;Low-Level Light Therapy;Male;Pain;Pain Measurement;Patient Satisfaction;Prospective Studies;Treatment Outcome

Evaluation of the efficacy of low-level laser therapy (LLLT) and the microelectric neurostimulation (MENS) in the treatment of myogenic temporomandibular disorders: a randomized clinical trial. OBJECTIVE: The aim of the present study was to evaluate the efficacy of low-level laser therapy (LLLT)

and the microelectric neurostimulation (MENS) in the treatment of patients with temporomandibular disorders (TMD). MATERIAL AND METHODS: A sample of 19 individuals presenting with signs and symptoms of myogenic TMD was randomly divided into two groups (I - LLLT and II - MENS). Therapy was done in 10 sessions, three times a week, for one month. Patients were evaluated by the Visual Analogue Scale (VAS), measurement of active range of motion (AROM) and muscle palpation, performed immediately before and 5 minutes after each therapeutic session by a blinded TMD specialist. The ANOVA for repeated measurements and Mann-Whitney tests were used for the statistical analysis. RESULTS: The results showed an increase in maximum mouth opening and a decrease in tenderness to palpation for both groups. The VAS reduced for both groups, although more evident for the laser group ($p<0.05$). CONCLUSION: Authors concluded that both therapies were effective as part of the TMD treatment, and the cumulative effect may have been responsible for this fact. However, caution is recommended when judging the results due to the self-limiting aspect of musculoskeletal conditions such as TMD.

Laser physician legal responsibility for physician extender treatments. BACKGROUND AND OBJECTIVE: Increased demand for non-invasive cosmetic laser procedures has led to an increase in the use of physician extenders (PE). This demand has now led to a variety of medical legal concerns surrounding the use of lasers by non-physician PE. STUDY DESIGN: This review looks at the evolution of the relationship between physicians and the various types of PE. The focus of the manuscript is on the variety of legal issues that may arise because of this relationship. Physicians are increasingly utilizing PE in their laser facilities leading to potential legal issues. CONCLUSIONS: An understanding of these legal issues will lead to better defensive practices by both the physician and PE. Humans;Laser Therapy;Liability, Legal;Low-Level Light Therapy;Physician Assistants

Determination of an optimized conversion matrix for device independent skin color image analysis. BACKGROUND AND OBJECTIVE: A cross-polarized diffuse reflectance (CDR) color imaging system was developed for quantitative evaluation of port wine stain (PWS) response to laser therapy. To obtain calibrated Commission International de l'Eclairage (CIE) color space images from RGB (red, green, and blue) images, it was necessary to derive an optimized conversion matrix specific to our imaging system. STUDY DESIGN/MATERIALS AND METHODS: A chromameter (CR-200, Minolta) and CDR imaging system were used to acquire CIELAB (CIE L*, a*, and b*) tristimulus values and RGB image values, respectively. A cost function was defined using these sample data sets and then a minimization algorithm was applied to obtain an optimized conversion matrix for our imaging system and illumination conditions. CIELAB color space values (L*, a*, and b*) obtained with the chromameter and CDR color images were compared to assess the accuracy of the derived matrix. RESULTS: In measurements using in vitro standard color patch or in vivo human skin samples, use of the optimized conversion matrix resulted in a good correlation with standard chromameter values for PWS human skin sites. CONCLUSIONS: The cost function minimization algorithm resulted in an optimized conversion matrix for our CDR imaging system. Use of the optimized matrix improved the utility of CDR color image analysis as a simple non-contact measurement technique to monitor quantitatively PWS response to laser therapy. Color;Costs and Cost Analysis;Diagnosis, Computer-Assisted;Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Port-Wine Stain;Skin

Effects of helium-neon laser irradiation and local anesthetics on potassium channels in pond snail neurons. Intracellular dialysis and membrane voltage clamping were used to show that He-Ne laser irradiation of a pond snail neuron at a dose of 0.7 x 10(-4) J (power density 1.5 x 10(2) W/m2) increases the amplitude of the potential-dependent slow potassium current, while a dose of 0.7 x 10(-3) J decreases this current. Bupivacaine suppresses the potassium current. Combined application of laser irradiation at a dose of 0.7 x 10(-3) J increased the blocking effect of 10 microM bupivacaine on

the slow potassium current, while an irradiation dose of 0.7 x 10(-4) J weakened the effect of bupivacaine. Anesthetics, Local;Potassium Channels;Helium;Neon;Bupivacaine Anesthetics, Local;Animals;Bupivacaine;Ganglia, Invertebrate;Helium;Lasers;Low-Level Light Therapy;Lymnaea;Membrane Potentials;Neon;Neurons;Patch-Clamp Techniques;Potassium Channels

The clinical effect of LLLT in endodontic surgery: a prospective study on 72 cases. OBJECTIVES: The purpose of this prospective study was to evaluate a possible clinical benefit of LLLT in endodontic surgery. STUDY DESIGN: Seventy-two endosurgery cases on incisors and premolars were included to the study and were split randomly into an LLLT test group, a placebo group, and a control group. In the LLLT group, irradiation was performed intraoperatively and postoperatively 1, 3, and 7 days after surgery. In the placebo group, irradiation was performed without laser activation. In the control group, neither LLLT nor placebo therapy was used. Swelling, wound healing, and pain were evaluated by a blinded investigator 1, 3, and 7 days postoperatively. RESULTS: No statistically relevant differences between the LLLT and the placebo groups were found. Patients in the control group reported on statistically relevant stronger pain. CONCLUSION: In routine endodontic surgery cases, LLLT does not achieve a significant clinical benefit. Further, the results indicate a prominent placebo effect of the soft laser therapy. Adult;Aged;Apicoectomy;Female;Humans;Intraoperative Care;Low-Level Light Therapy;Male;Middle Aged;Outcome Assessment, Health Care;Pain Measurement;Pain, Postoperative;Periapical Granuloma;Postoperative Care;Postoperative Complications;Prospective Studies;Retrograde Obturation;Single-Blind Method

Mitochondrial signal transduction in accelerated wound and retinal healing by near-infrared light therapy. Photobiomodulation by light in the red to near infrared range (630-1000 nm) using low energy lasers or light-emitting diode (LED) arrays has been shown to accelerate wound healing, improve recovery from ischemic injury in the heart and attenuate degeneration in the injured optic nerve. Recent evidence indicates that the therapeutic effects of red to near infrared light result, in part, from intracellular signaling mechanisms triggered by the interaction of NIR light with the mitochondrial photoacceptor molecule cytochrome c oxidase. We have demonstrated that NIR-LED photo-irradiation increases the production of cytochrome oxidase in cultured primary neurons and reverses the reduction of cytochrome oxidase activity produced by metabolic inhibitors. We have also shown that NIR-LED treatment prevents the development of oral mucositis in pediatric bone marrow transplant patients. Photobiomodulation improves wound healing in genetically diabetic mice by upregulating genes important in the promotion of wound healing. More recent studies have provided evidence for the therapeutic benefit of NIR-LED treatment in the survival and functional recovery of the retina and optic nerve in vivo after acute injury by the mitochondrial toxin, formic acid generated in the course of methanol intoxication. Gene discovery studies conducted using microarray technology documented a significant upregulation of gene expression in pathways involved in mitochondrial energy production and antioxidant cellular protection. These findings provide a link between the actions of red to near infrared light on mitochondrial oxidative metabolism in vitro and cell injury in vivo. Based on these findings and the strong evidence that mitochondrial dysfunction is involved in the pathogenesis of numerous diseases processes, we propose that NIR-LED photobiomodulation represents an innovative and non-invasive therapeutic approach for the treatment of tissue injury and disease processes in which mitochondrial dysfunction is postulated to play a role including diabetic retinopathy, age-related macular degeneration, Leber's hereditary optic neuropathy and Parkinson's disease.

A comparative study of a 595-nm with a 585-nm pulsed dye laser in refractory port wine stains. BACKGROUND: The pulsed dye laser (PDL) is the treatment of choice for port wine stains (PWS); however, some patients' PWS become refractory to further treatments. Technological advances have enabled new machines with the advent of surface cooling devices to deliver longer wavelengths and

higher fluence more safely. These advances have the potential to achieve improved response rates in refractory PWS. There are few studies comparing the efficacy of standard PDL treatments for refractory PWS with the wider choice of treatment variables available from newer PDL machines. OBJECTIVES: To determine if there is any advantage of using a longer wavelength (595 nm) and pulse widths (1.5 ms, 6 ms and 20 ms) over conventional PDL settings (wavelength 585 nm, pulse width 1.5 ms) in refractory PWS. METHODS: Eighteen consecutive consenting patients with Fitzpatrick skin types 1-4 with a mean age 35 years (range 17-59 years) with refractory PWS were treated routinely with three separate test areas using 595-nm PDL (using three different pulse width settings of 1.5 ms, 6 ms and 20 ms), compared with test areas treated with 585-nm PDL (pulse width 1.5 ms). All test areas were treated with an identical fluence (15 J cm(-2)), spot size (7 mm) and cooling setting (dynamic cooling 60 ms, delay 60 ms). RESULTS: We found a statistically significant advantage of 595-nm PDL (pulse width 1.5 ms) over 595-nm PDL (pulse width 6 ms) ($P < 0.05$) in the treatment of refractory PWS; however, we found no significant advantage using longer pulse widths of 20 ms compared with 1.5 ms with the 595-nm PDL. There was no statistically significant advantage in using a 595-nm PDL over a 585-nm PDL using identical pulse widths of 1.5 ms, spot size, fluence and cryogen cooling settings; however, the number of directly comparable test areas was smaller. Some individual patients in our study obtained a better response with certain 595-nm PDL settings (pulse width 1.5 ms and 6 ms) compared with 585-nm PDL (pulse width 1.5 ms). CONCLUSIONS: Our experience of high fluence PDL in the treatment of refractory PWS suggests patients treated with 585 nm (pulse width 1.5 ms) improve to a similar degree as patients treated with 595-nm PDL (pulse width 1.5 ms). However, the use of the 595-nm PDL with longer pulse widths yields no extra advantage. For those patients who have failed to improve with high-fluence 585-nm PDL (pulse width 1.5 ms), test areas using 595-nm PDL (pulse width 1.5 ms and 6 ms) should be undertaken to ascertain if individual patients may benefit from the longer pulse width 595-nm PDL.
Adolescent;Adult;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Prospective Studies;Radiotherapy Dosage;Treatment Outcome

Laser treatment of vascular lesions. Lasers and other light sources have been developed that remove or improve many vascular lesions that were previously untreatable. Port-wine stains are the most notable example. Vascular lasers and light sources represent a major advance in dermatology for cosmetic and non-cosmetic applications. This article reviews the common vascular conditions amenable to laser therapy and the approaches and devices used. Humans;Low-Level Light Therapy;Skin Diseases, Vascular

Grade 3 vulvar and anal intraepithelial neoplasia in a HIV seropositive child--therapeutic result: case report. A case report of a HIV seropositive 8-year-old child with vulvar and anal border neoplasia, both grade 3, and the adopted therapeutic management are presented. The mother reported the history of a progressively growing verrucous lesion in the vulva since the age of three and a half years. On physical examination a pigmented and elevated lesion was observed in the whole vulvar region extending to the anal region and intergluteal sulcus. After biopsies and anatomic pathological examination, antiretroviral therapy, adequate for age, and topical application of podophyllotoxin associated with Thuya officinalis extract was started. Three months afterwards vaporization and CO2 laser excision were performed in five sequential sessions, thereafter associated with topical imiquimod application. After the first two sessions of laser therapy early relapses occurred. After four weeks of imiquimod use, already a significant improvement of the lesions was observed, making the following laser therapy sessions easier. We conclude that antiretroviral therapy associated with podophyllotoxin and Thuya was not effective regarding regression of the lesions. Laser therapy alone led to early relapses. The local use of imiquimod associated with laser was effective in decreasing and controling the lesions. Aminoquinolines;Anti-HIV Agents;Imiquimod

Administration, Topical;Aminoquinolines;Anti-HIV Agents;Anus Neoplasms;Carcinoma;Child;Combined Modality Therapy;Female;Follow-Up Studies;HIV Infections;HIV Seropositivity;Humans;Imiquimod;Immunocompromised Host;Low-Level Light Therapy;Papillomavirus Infections;Risk Assessment;Treatment Outcome;Vulvar Neoplasms
Effects of an infrared pulsed laser device (IPLD) over apoptosis in cancer cells. Apoptosis;Electrochemistry;Electromagnetic Fields;Energy Transfer;Humans;Infrared Rays;Low-Level Light Therapy;Necrosis;Neoplasms;Tumor Cells, Cultured
Modification of the intrinsic fluorescence and the biochemical behavior of ATP after irradiation with visible and near-infrared laser light. In this work, the effects of visible (655 nm) and near-infrared (830 nm) light on ATP in solution were examined. The addition of irradiated ATP to the hexokinase reaction caused significant differences in the reaction rates and in the Michaelis-Menten kinetic parameters, k(m) and v(max). Irradiated ATP cleavage by hexokinase occurred in less time. Changes were wavelength and dose dependent. Excitation of ATP with a 260 nm wavelength ultraviolet light induced a fluorescence emission that was decreased when Mg2+ was added due to ion binding of the phosphates, which are the structures that modify the fluorescence produced by the adenine dipoles. The irradiation of this ATP.Mg2+ solution using 655 and 830 nm light increased the fluorescence by a possible displacement of Mg2+ from the phosphates. In conclusion, visible and near-infrared light modifies the biochemical behavior of ATP in the hexokinase reaction and the fluorescence intensity of the molecule thus altering the Mg2+ binding strength to the oxygen atoms in the phosphate group. Adenosine Monophosphate;Adenosine Diphosphate;Adenosine Triphosphate;Hexokinase;Magnesium Adenosine Diphosphate;Adenosine Monophosphate;Adenosine Triphosphate;Fluorescence;Hexokinase;Infrared Rays;Kinetics;Low-Level Light Therapy;Magnesium
Lasers and light therapy for acne vulgaris. Acne vulgaris remains an emotionally and debilitating dermatologic disease, and is conventionally treated with a variety of oral and topical therapies with a number of significant side effects. An evolving understanding of laser-tissue interactions involving Propionibacterium acnes-produced porphyrins, and the development of infrared nonablative lasers to target sebaceous glands, has lead to the development of an escalating number of laser, light and radiofrequency devices for acne. Used as monotherapy or in combination, these devices are showing promise as a method to clear acne in a convenient, non-invasive manner, though there remains a clear need for long-term data and randomized, blinded studies. Acne Vulgaris;Gram-Positive Bacterial Infections;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Photochemotherapy;Phototherapy;Propionibacterium acnes;Sebaceous Glands
[LASER applications in endodontics]. Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of lasers with a wide range of characteristics are now being used in endodontic therapy. In the past two decades much experience and knowledge has been gained The first purpose of the present paper is to provide an understanding of the essential physical science behind laser technology and information on the effects of laser beams on tissue (tissue interaction). A second purpose is to summarize laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, modification of the root canal walls, sterilization of the root canal system, cleaning--shaping--obturation of the root canal, and endodontic surgery. It will be clear that a number of endodontic procedures with conventional treatments cannot provide comparable results or are less effective. Neodymium Dental Instruments;Dental Pulp Capping;Dental Pulp Test;Dentin;Dentin Sensitivity;Endodontics;Humans;Laser Therapy;Laser-Doppler Flowmetry;Lasers;Low-Level Light Therapy;Neodymium;Pulpotomy;Root Canal Preparation;Sterilization

In vivo study of the inflammatory modulating effects of low-level laser therapy on iNOS expression using bioluminescence imaging. This study was designed to demonstrate that bioluminescence imaging (BLI) can be used as a new tool to evaluate the effects of low-level laser therapy (LLLT) during in vivo inflammatory process. Here, the efficacy of LLLT in modulating inducible nitric oxide synthase (iNOS) expression using different therapeutic wavelengths was determined using transgenic animals with the luciferase gene under control of the iNOS gene expression. Thirty transgenic mice, FVB/N-Tg(iNOS-luc)Xen, were allocated randomly to one of four experimental groups treated with different wavelengths (lambda = 635, 785, 808 and 905 nm) or a control group (nontreated). Inflammation was induced by intra-articular injection of zymosan A in both knee joints. Laser treatment (25 mW cm(-2), 200 s, 5 J cm(-2)) was applied to the knees 15 min after inflammation induction. Measurements of iNOS expression were performed at various times (0, 3, 5, 7, 9 and 24 h) by measuring the bioluminescence signal using a highly sensitive charge-coupled device (CCD) camera. The results showed a significant increase in BLI signal after irradiation with 635 nm laser when compared to the nonirradiated animals and the other LLLT-treated groups, indicating wavelength dependence of LLLT effects on iNOS expression during the inflammatory process, and thus demonstrating an action spectrum of iNOS gene expression following LLLT in vivo that can be detected by BLI. Histological analysis was also performed and demonstrated the presence of fewer inflammatory cells in the synovial joints of mice irradiated with 635 nm compared with nonirradiated knee joints. Zymosan;Luciferases;Nitric Oxide Synthase Age Factors;Animals;Arthritis;Disease Models, Animal;Gene Expression Regulation;Hindlimb;Low-Level Light Therapy;Luciferases;Luminescent Measurements;Mice;Mice, Transgenic;Nitric Oxide Synthase;Zymosan

[Combined use of low-intensive laser therapy and biologically active food additive Fitopan M in sanatorium treatment of patients with chronic prostatitis]. Food Additives Adult;Chronic Disease;Combined Modality Therapy;Food Additives;Health Resorts;Humans;Low-Level Light Therapy;Male;Prostatitis;Treatment Outcome

Study of patient-reported morbidity following V-beam pulsed-dye laser treatment of port wine stains. The V-beam pulsed-dye laser (PDL) (595 nm) has gained popularity in the treatment of port wine stains (PWS). It uses longer pulse durations than the standard flashlamp-pumped pulsed-dye laser (FPDL) (585 nm) and has an in-built cooling system to protect the epidermis. This should, theoretically, reduce the treatment-associated side effects, including discomfort. The aim of this questionnaire-based study was to confirm the clinical impression that V-beam PDL is well tolerated. The results were compared with a historical group of 62 PWS patients treated with FPDL. Fifty-one patients took part in the current study. Only 35.7% (vs. 81% in the historical comparison group) required topical anaesthetic prior to laser treatment. A shortening in the duration of bruising (8 vs. 10 days) and of symptoms such as burning and tightness (3 vs. 10 days) was recorded. Lifestyle change after treatment was recorded by fewer patients (39 vs. 57%). We conclude that V-beam PDL is better tolerated than FPDL when used at therapeutic levels in patients with PWS. Anesthetics, Local Adolescent;Adult;Aged;Anesthetics, Local;Child;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Port-Wine Stain;Quality of Life;Skin Diseases;Social Behavior;Surveys and Questionnaires;Time Factors

Comparison of a 1,064 nm laser and a 1,320 nm laser for the nonablative treatment of acne scars. BACKGROUND: There have been many reports of the use of nonablative lasers for the treatment of acne scars. OBJECTIVE: To evaluate the ability of the 1,064 nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser to treat acne scars and compare it with that of the 1,320 nm Nd:YAG laser. METHODS: Twelve patients with Fitzpatrick skin types I to III were randomly selected to have half of the face or back treated with the Lyra 1,064 nm Nd:YAG laser (Laserscope Corporation, San Jose, CA, USA) and the other half with the CoolTouch II 1,320 nm Nd:YAG laser (ICN Pharmaceuticals, Inc., Costa Mesa,

CA, USA). Three treatments at 4-week intervals were performed. Patients were evaluated by photographic and profilometric methods before and 6 months after the last treatment. RESULTS: Immediate changes included mild erythema with the 1,064 nm Nd:YAG laser and mild edema and erythema with the 1,320 nm Nd:YAG laser. No long-term adverse changes were seen with either laser system. Using the 1,320 nm system, 42% of the patients had 30 to 40% clinical improvement, 42% had 11 to 29%, and 16% had 10% or less. With the 1,064 nm system, 58% had 30 to 40% clinical improvement and 42% had 11 to 29%. Average improvement in acne scars evaluated by three independent observers was 22% with the 1,320 nm laser compared with 28% with the 1,064 nm laser. The subjects' own grading was 39% with the 1,320 nm laser compared with 37% for the 1,064 nm laser. Prolifometric studies demonstrated comparable improvement, with no statistical difference using either laser. CONCLUSION: These data indicate that both the 1,064 nm laser and the 1,320 nm Nd:YAG laser are safe and effective systems for the nonablative treatment of acne scars, achieving similar improvement. There appears to be a greater response with the 1,064 nm laser system as assessed by the clinical investigators. Acne Vulgaris;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Severity of Illness Index;Treatment Outcome

Long-pulsed dye laser treatment for facial telangiectasias and erythema: evaluation of a single purpuric pass versus multiple subpurpuric passes. BACKGROUND AND OBJECTIVE: Subpurpuric treatments with the pulsed dye laser can be effective for treatment of vascular lesions, although less so than when purpuric fluences are used. Increased efficacy may be achieved by performing multiple passes at the time of treatment. We performed a split-face bilateral paired comparison of multiple low-fluence subpurpuric passes compared with a single high-fluence purpuric pass in the treatment of facial telangiectasias. MATERIALS AND METHODS: Nine patients were included in the study. One cheek was chosen to be treated with four passes of a nonpurpuric fluence, and the contralateral cheek was treated with a single purpuric pass. Reductions in vessel density, diameter, arborization, and background erythema were evaluated 3 weeks after treatment. RESULTS: We found a 43.4% reduction in surface area covered by telangiectasias on the cheek treated with a single purpuric pass compared with 35.9% on the cheek treated with four subpurpuric passes. The purpuric fluences produced greater reduction in vessel diameter and arborization, whereas the subpurpuric protocol was more effective in reducing background erythema. Purpuric fluences were also noted to produce more significant edema and transient hyperpigmentation in one patient. CONCLUSION: The multipass subpurpuric approach to treatment with the pulsed dye laser is both cosmetically acceptable and effective, although purpuric treatments may be required to effectively eliminate larger-caliber, more highly networked vessels. Erythema;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Purpura;Severity of Illness Index;Telangiectasis;Treatment Outcome

Ablative facial resurfacing. Ablative resurfacing is a powerful tool for rejuvenation of the aging face and for the treatment of a wide array of skin lesions. In the proper hands, it is a safe and effective way to treat many of the problems of photodamaged skin that surgery or nonablative methods cannot address. This article discusses the three most common modalities used in ablative facial resurfacing: chemical peels, dermabrasion, and laser resurfacing. Indications, mechanism of action, techniques, results, and complications all are reviewed. Chemexfoliation;Dermabrasion;Facial Dermatoses;Humans;Low-Level Light Therapy;Skin Aging

Rejuvenation of the aging hand. This article reviews aging of the hand and the treatment options for cosmetic rejuvenation. Options available for cutaneous rejuvenation include microdermabrasion, chemical peeling, intense light sources, and laser therapy, including pigment lasers, ablative resurfacing, and noninvasive rejuvenation. Protuberant veins of the aging hand can be treated effectively with sclerotherapy. The soft tissue atrophy of the aging hand is best treated with fat augmentation. The article concludes with a mention of new fillers that are just beginning to be used

for soft tissue atrophy of the hand. Chemexfoliation;Dermabrasion;Hand Dermatoses;Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

Low power laser irradiation alters gene expression of olfactory ensheathing cells in vitro. BACKGROUND AND OBJECTIVES: Both photobiomodulation (PBM) and olfactory ensheathing cells (OECs) transplantation improve recovery following spinal cord injury. However, neither the combination of these two therapies nor the effect of light on OECs has been reported. The purpose of this study was to determine the effect of light on OEC activity in vitro. MATERIALS AND METHODS: OECs were purified from adult rat olfactory bulbs and exposed to 810 nm light (150 mW; 0, 0.2, or 68 J/cm(2)). After 7-21 days in vitro, cells underwent immunocytochemistry or RNA extraction and RT-PCR. RESULTS: Analysis of immunolabeling revealed a significant decrease in fibronectin expression in the cultures receiving 68 J/cm(2). Analysis of gene expression revealed a significant ($P < 0.05$) increase in brain derived neurotrophic factor (BDNF), glial derived neurotrophic factor (GDNF), and collagen expression in the 0.2 J/cm(2) group in comparison to the non-irradiated and 68 J/cm(2) groups. OEC proliferation was also found to significantly increase in both light treated groups in comparison to the control group ($P < 0.001$). CONCLUSIONS: These results demonstrate that low and high dosages of PBM alter OEC activity, including upregulation of a number of neurotrophic growth factors and extracellular matrix proteins known to support neurite outgrowth. Therefore, the application of PBM in conjunction with OEC transplantation warrants consideration as a potential combination therapy for spinal cord injury. Fibronectins;Nerve Growth Factors;Collagen Animals;Cell Proliferation;Collagen;Fibronectins;Gene Expression;Low-Level Light Therapy;Models, Animal;Nerve Growth Factors;Olfactory Bulb;Rats;Rats, Sprague-Dawley

Genetic determinants of efficiency of magnetic laser therapy of essential hypertension. The efficiency of magnetic laser therapy was evaluated in patients with essential hypertension (stages I and II). The role of angiotensinogen, angiotensin-converting enzyme, type II bradykinin receptor, and endothelial nitrogen oxide synthetase gene polymorphism in the realization of hypotensive effect of magnetic laser therapy was evaluated. The hypotensive effect of magnetic laser therapy depends on the polymorphism of the studied genes and is maximum in patients with MM polymorphism of angiotensinogen gene and DD polymorphism of angiotensin-converting enzyme gene. Additive interaction between angiotensin-converting enzyme and angiotensinogen genes in the formation of hemodynamic effects of magnetic laser therapy was detected. Receptor, Bradykinin B2;Angiotensinogen;Peptidyl-Dipeptidase A Angiotensinogen;Humans;Hypertension;Low-Level Light Therapy;Magnetics;Peptidyl-Dipeptidase A;Polymorphism, Genetic;Receptor, Bradykinin B2

The influence of cryotherapy on reduction of swelling, pain and trismus after third-molar extraction: a preliminary study. BACKGROUND: Swelling, pain and trismus are undesirable consequences of impacted mandibular third-molar extraction. The authors conducted a study to evaluate the effectiveness of cryotherapy, the therapeutic use of cold, in reducing undesirable consequences after surgery. METHODS: Fourteen patients aged 20 to 28 years comprised the sample. The authors extracted two impacted mandibular third molars at different times from each patient. Immediately after surgery, the patient underwent cryotherapy on one side for 30 minutes every one and one-half hours for 48 hours when he or she was awake. The patient did not receive cryotherapy on the other side. The authors performed clinical examinations to measure trismus and swelling before surgery, immediately after surgery and 24 and 48 hours after surgery. RESULTS: The authors compared both sides for differences in swelling, pain and trismus in each patient. The results showed significant statistical differences in two of the five points that were used to measure the swelling (Wilcoxon nonparametric signed rank test of linear distances between the angle of the mandible to the pogonion and to the tragus). They found statistical differences between the two sides in relation to the pain; however, they found no significant differences in relation to trismus. CONCLUSIONS:

Cryotherapy was effective in reducing swelling and pain in this sample. Despite playing no role in the reduction of trismus, cryotherapy was effective in reducing swelling and pain in this sample, and the authors still recommend it be used. CLINICAL IMPLICATIONS: Cryotherapy is helpful after third-molar extraction. Further studies need to be conducted that use larger samples of patients and other types of therapy, such as low-level laser therapy. Ice Adult;Cross-Over Studies;Cryotherapy;Double-Blind Method;Edema;Facial Pain;Female;Humans;Ice;Male;Molar, Third;Pain, Postoperative;Prospective Studies;Range of Motion, Articular;Statistics, Nonparametric;Tooth Extraction;Trismus

An assessment of traditional and novel therapies for cellulite. There are numerous treatments for cellulite including topical, surgical, laser and other therapies. Many of these treatments are expensive. Part of the difficulty in treating cellulite arises from our incomplete understanding of this phenomenon. As noted previously in this journal, there is no consensus as to the etiology of cellulite. This article will focus on both traditional and novel treatments for cellulite and assess their efficacy based on the scientific literature. Phosphodiesterase Inhibitors;Retinoids Adipose Tissue;Cosmetic Techniques;Humans;Low-Level Light Therapy;Obesity;Phosphodiesterase Inhibitors;Retinoids

Biostimulation of dermal fibroblast by sublethal Q-switched Nd:YAG 532 nm laser: collagen remodeling and pigmentation. The application of medical lasers in treating pigmented lesions has rapidly developed over the past decade. In both clinical and cosmetic application, melanin is targeted in pigmented areas and destroyed by the mechanism of selective photothermolysis. When laser radiation passes through superficial pigmented tissue, energy will be further reduced by dermal collagen scattering and absorption. Non-pigmented dermal fibroblasts will be exposed to co-incidental laser irradiation at lower energy levels. Biostimulation of dermal fibroblasts by low energy laser is reported in this paper. The Q-switched frequency doubled Nd:YAG 532nm laser used in clinical laser therapy was used in this study. Sublethal laser fluence was determined at 0.8J/cm(2) and used to stimulate normal human fibroblasts in monolayer culture. The results showed that there was no significant difference in collagen synthesis between the stimulated fibroblasts and controls. However, significant delay in collagen remodeling activity was demonstrated in the irradiated group by measuring fibroblast populated collagen lattice (FPCL) contraction. The stimulation of SCF, HGF and b-FGF gene expression was determined by RT-PCR analysis and demonstrated to vary between cases. Two out of six cell lineages that showed stronger responses to laser stimulation on SCF, HGF and b-FGF gene expressions were used to prepare conditioned media. The conditioned media from irradiated groups showed significant increase in SCF and b-FGF content and stimulated SK-mel-3 melanoma cells to synthesize more melanin in vitro. These results suggest that sublethal laser stimulation of fibroblasts may cause post-laser hyperpigmentation through production of melanogenic stimulatory cytokines. The degree of stimulation of SCF, HGF and b-FGF production varied between individual cell lineages, which may reflect the true variation of post-laser hyperpigmentation in clinical practice. Melanins;Stem Cell Factor;Fibroblast Growth Factor 2;Hepatocyte Growth Factor;Collagen Adult;Cell Proliferation;Cell Survival;Cells, Cultured;Child;Collagen;Dose-Response Relationship, Radiation;Female;Fibroblast Growth Factor 2;Fibroblasts;Gene Expression;Hepatocyte Growth Factor;Humans;Low-Level Light Therapy;Male;Melanins;Melanoma;Skin;Stem Cell Factor;Tumor Cells, Cultured

[Clinical-microbiological evaluation of the efficacy of combined use of chitosan, low intensity laser radiation and photosensitizer in treatment of patients with acute suppurative maxillofacial periostitis]. Results are presented on treatment of 68 patients with acute suppurative periostitis of maxillofacial region. After surgical interventions in patients of the study group (48 patients) the wounds were cleansed by 1% chitosan on 0.2% HC1 in combination with methylene blue and

irradiated by IR laser beam. The wounds healed in 2-3 days. In the control group (20 patients) for wound dressing chlorhexidine as a standard procedure was used, length of the healing process was 5-6 days. After combined treatment the number of microflora in the wound was reduced and microflora did not show the signs of pathogenicity. Photosensitizing Agents;Chitosan Adolescent;Adult;Aged;Chitosan;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Maxillary Diseases;Middle Aged;Periostitis;Photosensitizing Agents;Suppuration;Treatment Outcome

Laser and light technology and phototherapy. Humans;Light;Low-Level Light Therapy;Phototherapy

Topical anesthetics for cosmetic and laser dermatology. Many effective and simple topical anesthetic products are available today and commonly used in medical and non-medical settings. The increased use of topical anesthetics, especially by non-physicians in the medical and non-medical settings, has resulted in increased rates of complications including ineffective anesthesia, allergy, and even potential fatalities. This review focuses on various techniques and formulations for topical anesthesia and their appropriate applications in cosmetic and laser dermatology. In addition, the history, pharmacology, and clinical complications of topical anesthetics are discussed. Anesthetics, Local Administration, Topical;Anesthetics, Local;Cosmetic Techniques;Dermatology;Humans;Low-Level Light Therapy

Comparison of intense pulsed light to 595-nm long-pulsed pulsed dye laser for treatment of hypertrophic surgical scars: a pilot study. BACKGROUND: The short-pulsed pulsed dye laser (PDL) has been previously reported to improve the appearance of hypertrophic scars. Prolonged purpura following treatment led to the development of the newer long-pulsed pulsed dye laser (LPDL). Intense pulsed light (IPL) has been extensively used to improve the various components of photo damage and to reduce the incidence of purpura, but its effect on scars has not been analyzed. The objective of this pilot study was to prospectively determine and compare the safety and efficacy of LPDL and IPL on surgically induced scars. METHODS: Breast reduction scars (N = 10 scars) and abdominoplasty scars (N=5 scars) were treated using both LPDL and IPL. For breast reduction scars, one side was treated with each technique. For abdominoplasty scars, one half of the scar was treated with each device. Two treatments were performed 2 months apart. Physician global assessment scores of improvement were determined by side-by-side comparison of preoperative and randomly presented postoperative photographs. Patient pain scores during treatment were also obtained and the presence of post, treatment purpura was assessed. RESULTS: Mean improvement on a 0 to 3 point scale was 2.2 (55%) after the first LPDL treatment and 3.2 (80%) after the second. Mean improvement was 1.8 (45%) after the first IPL treatment and 2.6 (65%) after the second. Differences in improvement between the LPDL and IPL sides were not statistically significant. Patients rated IPL as more painful than LPDL. The incidence of post-treatment purpura was lower with IPL. CONCLUSIONS: This pilot study suggests that LPDL and IPL are equally effective in improving the appearance of hypertrophic surgical scars. IPL offers a novel method of treating scars that minimizes the risk of purpura. Cicatrix, Hypertrophic;Female;Humans;Light;Low-Level Light Therapy;Pilot Projects;Postoperative Complications

It is time to test low level laser therapy in Great Britain. Low level laser therapy (LLLT) has been used in Eastern Europe and Asia for the treatment of a wide range of conditions for many years. Its continued acceptance in these populations reflects the efficacy with which it is regarded both by clinicians and their patients. Although there have been a substantial number of reports on its clinical benefit and some practitioners have used the technique in North America and Australasia it has yet to be subjected to detailed assessment through randomised clinical trials. The purpose of this review is to stimulate interest in the technique and to encourage rigorous research into its potential value.

Cardiovascular Diseases;Female;Humans;Low-Level Light Therapy;Male;Technology Assessment, Biomedical;United Kingdom

Biophysical, histological and biochemical changes after non-ablative treatments with the 595 and 1320 nm lasers: a comparative study. BACKGROUND/PURPOSE: The objective was to compare the efficiencies of the 595 nm pulsed dye and the 1320 nm Nd : YAG laser non-ablative rejuvenation. METHODS: KM mice were irradiated with the 595 nm pulsed dye and the 1320 nm Nd : YAG lasers. Histological changes were evaluated immediately, 1, 7, 21, 30 and 60 days after the two laser treatments. Skin hydration and hydroxyproline content were measured to quantify the degree of improvement of the skin's water-holding capacity and the rate of hydroxyproline synthesis. RESULTS: Although not statistically significant, the 1320 nm Nd : YAG laser treatment induced 9.7% greater improvement of skin hydration than the 595 nm laser while the 595 nm pulsed dye laser treatment led to a thicker dermis and 8.7% greater increase of hydroxyproline than the 1320 nm laser. More than 50% increase of collagen type I was observed in 75% of 595 nm laser-treated sites and 42% of 1320 nm laser-treated sites, and more than 25% increase of collagen type III was observed in 75% of 595 nm laser-treated sites and 50% of 1320 nm laser-treated sites. The 595 nm laser treatment was better in increasing the amount of collagen fibers, especially collagen type I ($P < 0.05$). CONCLUSION: Our results demonstrated that the 595 nm laser appeared to be more effective in increasing new collagen formation, while the 1320 nm laser was superior to the 595 nm laser in improving the skin's water-holding capacity. Collagen;Hydroxyproline Analysis of Variance;Animals;Body Water;Collagen;Dermis;Hydroxyproline;Laser Therapy;Low-Level Light Therapy;Mice;Rejuvenation;Skin Aging;Water Loss, Insensible

Effects of He-Ne laser irradiation on chronic atrophic gastritis in rats. AIM: To study the effects of He-Ne laser irradiation on experimental chronic atrophic gastritis (CAG) in rats. METHODS: Sixty-three male adult Wistar rats were randomly divided into five groups including normal control group, model control group and three different dosages He-Ne laser groups. The chronic atrophic gastritis (CAG) model in rats was made by pouring medicine which was a kind of mixed liquor including 2% sodium salicylate and 30% alcohol down the throat for 8 wk to stimulate rat gastric mucosa, combining with irregular fasting and compulsive sporting as pathogenic factors; 3.36, 4.80, and 6.24 J/cm(2) doses of He-Ne laser were used, respectively for three different treatment groups, once a day for 20 d. The pH value of diluted gastric acid was determined by acidimeter, the histopathological changes such as the inflammatory degrees in gastric mucosa, the morphology and structure of parietal cells were observed, and the thickness of mucosa was measured by micrometer under optical microscope. RESULTS: In model control group, the secretion of gastric acid was little, pathologic morphological changes in gastric mucosa such as thinner mucous, atrophic glands, notable inflammatory infiltration were found. After 3.36 J/cm(2) dose of He-Ne laser treatment for 20 d, the secretion of gastric acid was increased ($P<0.05$), the thickness of gastric mucosa was significantly thicker than that in model control group ($P<0.01$), the gastric mucosal inflammation cells were decreased ($P<0.05$). Morphology, structure and volume of the parietal cells all recuperated or were closed to normal. CONCLUSION: 3.36 J/cm(2) dose of He-Ne laser has a significant effect on CAG in rats. Animals;Chronic Disease;Gastric Acid;Gastritis, Atrophic;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Stomach

[Validity of using physical therapy in combined treatment of chronic prostatitis]. To evaluate efficacy of combined physiotherapy in patients with chronic prostatitis (chronic bacterial, chronic abacterial prostatitis), an open comparative trial was made by specialists of the Research Institute of Urology in 2003-2004 of the unit Andro-Gin. Before the treatment, a standard examination was made including analysis of case history and complaints, rectal palpation, questionnaire filling-in, prostatic secretion tests, PCR diagnosis, transrectal ultrasonic scanning and uroflowmetry. In group 1 (chronic bacterial prostatitis) given monotherapy with an etiotropic drug (ED) or combination of ED with

Andro-Gin treatment, a significant improvement was achieved by the scale NIH-CPSI, Sorensen scale ($p < 0.05$). In group 2 (chronic abacterial prostatitis with inflammation) subgroups C,D,E patients showed significant improvement by the scales NIH-CPSI and Sorensen ($p < 0.05$). The highest symptomatic effect was recorded in the subgroup D in combined treatment with ED and Andro-Gin physiotherapy. In group 3 low NIH-CPSI scale score occurred due to alleviation of pain in subgroup F ($p < 0.05$), In subgroup G symptoms by the above scales did not change. Uroflowmetry featured moderate dynamics of the increment in maximal voiding speed. Voiding improved significantly in subgroup F in patients with chronic abacterial prostatitis in the absence of inflammation. Anti-Bacterial Agents;Anti-Inflammatory Agents Adult;Anti-Bacterial Agents;Anti-Inflammatory Agents;Chronic Disease;Combined Modality Therapy;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Physical Therapy Modalities;Prostatitis

Chemotherapy- and radiotherapy-induced oral mucositis: review of preventive strategies and treatment. Oral mucositis is a frequently encountered and potentially severe complication associated with administration of chemotherapy and radiotherapy. Although many pharmacologic interventions have been used for the prevention and treatment of oral mucositis, there is not one universally accepted strategy for its management. Most preventive and treatment strategies are based on limited, often anecdotal, clinical data. Basic oral hygiene and comprehensive patient education are important components of care for any patient with cancer at risk for development of oral mucositis. Nonpharmacologic approaches for the prevention of oral mucositis include oral cryotherapy for patients receiving chemotherapy with bolus 5-fluorouracil, and low-level laser therapy for patients undergoing hematopoietic stem cell transplantation. Chlorhexidine, amifostine, hematologic growth factors, pentoxifylline, glutamine, and several other agents have all been investigated for prevention of oral mucositis. Results have been conflicting, inconclusive, or of limited benefit. Treatment of established mucositis remains a challenge and focuses on a palliative management approach. Topical anesthetics, mixtures (also called cocktails), and mucosal coating agents have been used despite the lack of experimental evidence supporting their efficacy. Investigational agents are targeting the specific mechanisms of mucosal injury; among the most promising of these is recombinant human keratinocyte growth factor. Antineoplastic Agents Antineoplastic Agents;Clinical Trials as Topic;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Mouth Mucosa;Neoplasms;Oral Hygiene;Palliative Care;Patient Education as Topic;Radiation Injuries;Radiotherapy;Severity of Illness Index;Stomatitis

Effect of low-level Er:YAG laser irradiation on cultured human gingival fibroblasts.
BACKGROUND: Low-level laser irradiation has been reported to enhance wound healing. Activation of gingival fibroblasts (GF) has a potential for early wound healing in periodontal treatment. The present study aimed to investigate the direct effect of low-level Er:YAG laser irradiation on gingival fibroblasts proliferation in order to clarify the laser effect on healing. METHODS: Cultured human gingival fibroblasts (hGF) were exposed to low-power, pulsed Er:YAG laser irradiation with different energy densities ranging from 1.68 to 5.0 J/cm(2). The cultures were analyzed by means of trypan blue staining and counted under a light microscope. The effect of Er:YAG laser on hGF was also evaluated using a transmission electron microscope (TEM). RESULTS: Cultures irradiated with Er:YAG laser presented faster cell growth when compared with untreated controls. This difference was statistically significant. Transmission electron microscopy revealed rough endoplasmic reticulum, prominent Golgi complexes, and mitochondria after laser irradiation. CONCLUSIONS: Our results showed that the low-level Er:YAG laser irradiation stimulates the proliferation of cultured gingival fibroblasts. The optimal stimulative energy density was found to be 3.37 J/cm(2). This result suggests that Er:YAG laser irradiation may be of therapeutic benefit for wound healing. Erbium Analysis of Variance;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Endoplasmic

Reticulum, Rough;Erbium;Fibroblasts;Gingiva;Golgi Apparatus;Humans;Lasers;Low-Level Light Therapy;Microscopy, Electron, Transmission;Mitochondria;Wound Healing

Epidermal and vascular damage analysis of in vivo human skin in response to 595 nm pulsed laser irradiation. BACKGROUND AND OBJECTIVES: Laser irradiation is the current modality for treatment of cutaneous hypervascular malformations such as port wine stains and telangiectasia. Although cryogen spray cooling (CSC) is used to protect the epidermis from non-specific laser-induced thermal damage in moderately-pigmented skin types, individuals with high melanin content are still at risk for epidermal damage using the current laser irradiation and CSC parameters. The objective of this study was to investigate the influence of the spray Weber number (1,100 or 5,100) on epidermal protection and examine vascular coagulation in response to pulsed dye laser irradiation. STUDY DESIGN/MATERIALS AND METHODS: Normal, in vivo human skin from eight subjects of Fitzpatrick skin types I-V were precooled with either low or high Weber number cryogen sprays and subsequently irradiated with a pulsed dye laser at 595 nm. Analysis of gross purpura, morphological vascular damage, and apoptosis of the vascular walls were performed. RESULTS: Results demonstrated a high Weber number spray of 5,100 decreased the level of epidermal damage in darker and moderate pigmented individuals compared to a Weber number spray of 1,100. This study also established a positive correlation between gross purpura and the level of vessel wall apoptosis. CONCLUSIONS: This study has demonstrated that CSC with a high Weber number spray can decrease nonspecific thermal damage to the epidermis in response to laser irradiation in vivo. We have also established a positive correlation between gross purpura and the level of vessel wall apoptosis. Lasers Surg. Med. (c) 2005 Wiley-Liss, Inc. Aerosol Propellants Aerosol Propellants;Apoptosis;Blood Coagulation;Blood Vessels;Cryotherapy;Epidermis;Female;Humans;Hypothermia, Induced;Low-Level Light Therapy

Successful treatment of recalcitrant pemphigus vulgaris and pemphigus vegetans with etanercept and carbon dioxide laser. Immunoglobulin G;Receptors, Tumor Necrosis Factor;Carbon Dioxide;Etanercept Adult;Carbon Dioxide;Combined Modality Therapy;Etanercept;Facial Dermatoses;Female;Follow-Up Studies;Humans;Immunoglobulin G;Low-Level Light Therapy;Patient Satisfaction;Pemphigus;Receptors, Tumor Necrosis Factor;Risk Assessment;Severity of Illness Index;Treatment Outcome

[Excimer laser therapy of alopecia areata--side-by-side evaluation of a representative area]. We report for the first time on hair regrowth in alopecia areata of the scalp achieved with the 308-nm xenon-chloride excimer laser in a prospective side-by-side trial. The alopecia areata had shown progression over a period of three years, and various treatments had not been effective. Out of a number of affected areas, one representative lesion was chosen; one half of it was treated, the other half remained untreated. After 27 sessions (200 - 4000 mJ/cm2, cumulative dose 52.6 J/cm2) over 3 months, only the treated area showed hair growth; which suggests that this was most probably not a spontaneous remission. Adult;Alopecia Areata;Follow-Up Studies;Hair;Humans;Low-Level Light Therapy;Male;Prospective Studies;Scalp;Treatment Outcome

The short-term effects of low-level lasers as adjunct therapy in the treatment of periodontal inflammation. OBJECTIVES: The aim of this split-mouth, double-blind controlled clinical trial was to study the effects of irradiation with low-level lasers as an adjunctive treatment of inflamed gingival tissue. MATERIALS AND METHODS: Seventeen patients with moderate periodontitis were included. After clinical examination, all teeth were scaled and root planed (SRP). One week after SRP, we took samples of gingival crevicular fluid (GCF) and subgingival plaque. The laser therapy was started 1 week later and continued once a week for 6 weeks. One side of the upper jaw was treated with active laser and the other with a placebo. The test side was treated with two low-level lasers having wavelengths of 635 and 830 nm. The patients then underwent another clinical examination with

sampling of GCF and plaque. The GCF samples were analysed for elastase activity, interleukin-1beta (IL-1beta) and metalloproteinase-8 (MMP-8). We examined the subgingival plaque for 12 bacteria using DNA probes. RESULTS: The clinical variables i.e. probing pocket depth, plaque and gingival indices were reduced more on the laser side than on the placebo one ($p<0.01$). The decrease in GCF volume was also greater on the laser side, 0, 12 microl, than on the placebo side, 0.05 microl ($p=0.01$). The total amount of MMP-8 increased on the placebo side but was slightly lower on the laser side ($p=0.052$). Elastase activity, IL-1beta concentration and the microbiological analyses showed no significant differences between the laser and placebo sides. CONCLUSION: Additional treatment with low-level lasers reduced periodontal gingival inflammation. Interleukin-1;Leukocyte Elastase;Matrix Metalloproteinase 8 Adult;Aged;Chronic Disease;Dental Plaque;Dental Scaling;Double-Blind Method;Female;Gingival Crevicular Fluid;Humans;Interleukin-1;Leukocyte Elastase;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Nucleic Acid Hybridization;Periodontitis;Radiotherapy, Adjuvant;Statistics, Nonparametric

Effect of LLLT Ga-Al-As (685 nm) on LPS-induced inflammation of the airway and lung in the rat. The purpose of this study was to investigate the effect of low level laser therapy (LLLT) on male Wistar rat trachea hyperreactivity (RTHR), bronchoalveolar lavage (BAL) and lung neutrophils influx after Gram-negative bacterial lipopolyssacharide (LPS) intravenous injection. The RTHR, BAL and lung neutrophils influx were measured over different intervals of time (90 min, 6 h, 24 h and 48 h). The energy density (ED) that produced an anti-inflammatory effect was 2.5 J/cm(2), reducing the maximal contractile response and the sensibility of trachea rings to methacholine after LPS. The same ED produced an anti-inflammatory effect on BAL and lung neutrophils influx. The Celecoxib COX-2 inhibitor reduced RTHR and the number of cells in BAL and lung neutrophils influx of rats treated with LPS. Celecoxib and LLLT reduced the PGE(2) and TXA(2) levels in the BAL of LPS-treated rats. Our results demonstrate that LLLT produced anti-inflammatory effects on RTHR, BAL and lung neutrophils influx in association with inhibition of COX-2-derived metabolites. Inflammation Mediators;Lipopolysaccharides;Pyrazoles;Sulfonamides;Celecoxib;Dinoprostone Animals;Bronchial Hyperreactivity;Bronchoalveolar Lavage Fluid;Celecoxib;Chemotaxis, Leukocyte;Dinoprostone;Disease Models, Animal;Inflammation Mediators;Lipopolysaccharides;Low-Level Light Therapy;Male;Neutrophils;Pneumonia;Probability;Pyrazoles;Random Allocation;Rats;Reference Values;Sensitivity and Specificity;Sulfonamides;Trachea

Hair growth induced by diode laser treatment. BACKGROUND: Although hair reduction by long-pulsed red and infrared lasers and light sources is generally quite effective, paradoxical hair growth has rarely been observed following treatment. OBJECTIVE: To report a case of thick hair growth following 810 nm diode laser treatment and its subsequent treatment. METHODS. A 24-year-old man who had previously had laser hair reduction on his posterior neck was treated to a test area on his upper back. RESULTS: Thick terminal hair developed in the treated area subsequent to laser treatment. Further treatment of this area removed the terminal hair but resulted in terminal hair growth in an annular distribution surrounding the treatment site. CONCLUSIONS: Diode laser treatment rarely stimulates terminal hair growth. This phenomenon should be studied to better understand hair growth cycles and to help develop more effective treatments for hair loss and hair growth. Adult;Hair Follicle;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Male;Neck

Effects of intense pulsed light and the 1,064 nm Nd:YAG laser on sun-damaged human skin: histologic and immunohistochemical analysis. BACKGROUND: Nonablative methods may produce collagen synthesis in sun-damaged skin. OBJECTIVE: To study the effects of intense pulsed light (IPL) and 1,064 nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser: a histologic and immunohistochemical analysis of sun-damaged skin. MATERIALS AND METHODS: Nine subjects participated. Five subjects

received five-monthly treatments with IPL (560 nm cutoff filter, 8 x 35 mm spot size, pulse duration 2.4/4.2 milliseconds, pulse delay 15 milliseconds, fluence 28-35 J/cm2). Four subjects received treatment with a 1,064 nm Nd:YAG laser (130 J/cm2, triple pulse, 7.0/7.0/7.0-millisecond pulse duration, 75-millisecond delay). Routine histology and immunohistochemistry on 2 mm punch biopsies were taken before treatment and then at 3 and 6 months. We quantified collagen in the upper dermis and expression of heat shock protein 70 and procollagen 1. RESULTS: Pretreatment specimens contained solar damage. After treatment with the 1,064 nm Nd:YAG laser, the amount of collagen in the papillary dermis was slightly thicker than in those subjects treated with the IPL device (nonsignificant differences). Scattered dendritic cells in the papillary and upper reticular dermis expressed heat shock protein 70 and procollagen 1 after treatment with either light device. CONCLUSION: Both the IPL and 1,064 nm Nd:YAG laser-induced heat activation of superficial dermal dendritic cells resulted in deposition of collagen in the papillary dermis without evident morphologic damage to the epidermis or dermis. Heat-Shock Proteins;Procollagen Female;Heat-Shock Proteins;Humans;Immunohistochemistry;Low-Level Light Therapy;Middle Aged;Phototherapy;Procollagen;Skin Aging

Outcomes of 532 nm frequency-doubled Nd:YAG laser use in the treatment of port-wine stains. BACKGROUND: Port-wine stains (PWSs) are congenital dermal malformations involving venules, capillaries, and, probably, perivascular nerves. The primary morbidities of PWS are psychological disturbances that adversely affect the development of personality. Lasers have been the treatment of choice for PWS. However, only one type of laser is not a panacea for all PWS malformations. For the treatment of PWSs, carbon dioxide, argon, krypton, copper bromide, frequency-doubled neodymium:yttrium-aluminum-garnet (Nd:YAG), flashlamp pumped pulsed dye laser, and also intense pulsed light sources can be used. OBJECTIVE: To determine the efficacy and the frequency of side effects of the frequency-doubled Nd:YAG laser for the treatment of PWSs. PATIENTS AND METHODS: In this study, 532 nm frequency-doubled Nd:YAG laser with a 2 to 6 mm spot size, 15- to 50-millisecond pulse width, and a 9.5 to 20 J/cm2 fluence was applied for 89 patients (62 female, 27 male; age range 3-49 years) with PWSs on the face and/or neck for 1 to 12 sessions, with 2-month treatment-free intervals. Improvement rates were considered a failure (< 25%), mild (25-49%), moderate (50-74%), good (75-94%), and excellent (> 95%). RESULTS: Excellent (n = 12; 13%), good (n = 34; 38%), moderate (n = 39; 44%), and mild (n = 4; 5%) improvement of lesions was obtained after an average of 5.6, 5.5, 4.4, and 3.8 therapy sessions, respectively. No treatment failure was observed for any patient. As adverse effects, transient hyperpigmentation (n = 2; 2.25%), hypopigmentation (n = 1; 1.12%), and hypotrophic scarring (n = 1; 1.12%) were noted. CONCLUSIONS: The results obtained asserted that the frequency-doubled Nd:YAG laser is a quick, safe, and effective treatment modality for PWS malformations and can be appreciated as a useful alternative therapy that can raise the rates of success in cases with PWSs refractory to other laser therapies.
Adolescent;Adult;Child;Child, Preschool;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Severity of Illness Index;Treatment Outcome

[Reflexotherapy used in excretory-and-inflammatory form of male infertility].
Humans;Infertility, Male;Low-Level Light Therapy;Male;Prostatitis;Reflexotherapy;Treatment Outcome

[Increasing the effectiveness of skin cancer T(2-3) N0M0 radiotherapy by use of radiosencibilizers]. The paper presents an attempt to increase the effectiveness of radiotherapy of locally advanced skin cancer by use of radiomodifiers. With this aim the researchers used metronidozol (MZ) and low-intensive laser emission (LILE), whoes radiosensibilizing activity is based on overcoming radioresistance of tumor hypoxic cell fraction. In order to increase MZ concentration in the tumor and eleminate its toxic effect the authors developed a new radiosensibilization technique, implying local

use of a drug applicator. The technique is based on use of textile materials with specifed medical qualities (the method of their production was developed by the Scientific and Practical Association "Textileprogress"). The second direction of the research consisted in use of low-intensive laser emission as a radiosensibilizer, which was considered to be possible due to theoretical and experimental data suggesting the LILE capability of activating microcirculation in tumor and surrounding tissues. According to the authors of the article, the improvement of tumor microsirculation must increase tumor cell oxygenation, thus increasing their radiosensitivity. Applying radiosensibilization of hypoxic cells with MZ and LILE in radiotherapy of T2 basal cell and squamous cell carcinomas with the tumor size 4-5 cm and T3 tumors using original dose fractioning regimens (TFD 72 to 73 Gy) allows significant improvement of immediate treatment results without increase in local radioreactions and without substantial influence of the recurrence rate. Radiation-Sensitizing Agents Humans;Low-Level Light Therapy;Neoplasm Staging;Radiation-Sensitizing Agents;Skin Neoplasms;Treatment Outcome

[Biospectroscopy-based endoscopy with low-intensive laser radiation for differential diagnostics and treatment of peptic ulcer]. The article covers results of application of biospectrometry-based endoscopy with low-intensive He-Ne laser radiation in complex therapy of torpid esophageal, gastric, and duodenal ulcers. The authors are the first to offer a method based upon individual biophotometric control (autofluorescence, oxigination), which allows verification of the ulcerous process character, individual optimization of treatment and objective control of ulcer regression. Diagnosis, Differential;Endoscopy, Gastrointestinal;Humans;Low-Level Light Therapy;Peptic Ulcer;Spectrophotometry;Treatment Outcome

Low-level laser therapy. Humans;Low-Level Light Therapy

Effect of low-level laser therapy on Candida albicans growth in patients with denture stomatitis. OBJECTIVE: The purpose of our report is to present the effect of low-level laser therapy on Candida albicans growth and palatal inflammation in two patients with denture stomatitis. BACKGROUND DATA: The most common oral mucosal disorder in denture wearers is denture stomatitis, a condition that is usually associated with the presence of the yeast Candida albicans. Different treatment methods have been suggested to treat this symptom, none of which is proven to be absolutely effective. METHODS: Two denture-wearing patients, both with palatal inflammation diagnosed as Newton type II denture stomatitis were treated with low-power semiconductor diode laser (BTL-2000, Prague, Czech Republic) at different wavelengths (685 and 830 nm) for 5 d consecutively. In both patients, palatal mucosa and acrylic denture base were irradiated in noncontact mode (probe distance of 0.5 cm from irradiated area) with different exposure times-5 min (830 nm, 3.0 J/cm2, 60 mW) and 10 min (685 nm, 3.0 J/cm2, 30 mW). The effect of laser light on fungal growth in vivo was evaluated after the final treatment using the swab method and semiquantitative estimation of Candida albicans colonies growth on agar plates. The severity of inflammation was evaluated using clinical criteria. RESULTS: After lowlevel laser treatment, the reduction of yeast colonies on the agar plates was observed and palatal inflammation was diminished. CONCLUSION: LLLT is effective in the treatment of denture stomatitis. Further placebo controlled studies are in progress. Aged;Candida albicans;Candidiasis, Oral;Colony Count, Microbial;Female;Humans;Low-Level Light Therapy;Middle Aged;Mouth Mucosa;Stomatitis, Denture

Low-level laser therapy accelerates collateral circulation and enhances microcirculation. OBJECTIVE: To evaluate the efficacy of low-level laser therapy (LLLT) on collateral circulation and microcirculation if a blood vessel is occluded. BACKGROUND DATA: Investigators have attempted prostaglandin and ultrasound therapy to promote improvements in the vascular bed of deprived tissue after an injury, which may lead to occlusion of the blood vessels. MATERIALS AND METHODS: Thirty-four adult rabbits were used in this study, two of them considered 0-h reading group, while the

rest were divided into two equal groups, with 16 rabbits each: control and those treated with LLLT. Each rabbit underwent two surgical operations; the medial aspect of each thigh was slit, the skin incised and the femoral artery exposed and ligated. The site of the operation in the treated group was irradiated directly following the operation and for 3 d after, one session daily for 10 min/session. The laser system used was a gallium-aluminum-arsenide (Ga-Al-As) diode laser with a wavelength of 904 nm and power of 10 mW. Blood samples collected from the femoral artery above the site of the ligation were sent for examination with high-performance liquid chromatography (HPLC) to determine the levels of adenosine, growth hormone (GH) and fibroblast growth factor (FGF). Tissue specimens collected from the site of the operation, consisting of the artery and its surrounding muscle fibers, were sent for histopathological examination to determine the fiber/capillary (F/C) ratio and capillary diameter. Blood samples and tissue specimens were collected at 4, 8, 12, 16, 20, 24, 48 and 72 h postoperatively from the animals of both groups, control and treated. RESULTS: Rapid increases in the level of adenosine, GH, and FGF occurred. The F/C ratio and capillary diameter peaked at 12-16 h; their levels declined gradually, reaching normal values 72 h after irradiation in the treated group. Numerous collateral blood vessels proliferated the area, with marked increases in the diameters of the original blood vessels. CONCLUSIONS: The results indicated that LLLT accelerated collateral circulation and enhanced microcirculation and seemed to be unique in the normalization of the functional features of the injured area, which could lead to occlusion of the regional blood vessels. Fibroblast Growth Factors;Growth Hormone;Adenosine Adenosine;Animals;Chromatography, High Pressure Liquid;Collateral Circulation;Fibroblast Growth Factors;Growth Hormone;Microcirculation;Rabbits

Protection of skeletal muscles from ischemic injury: low-level laser therapy increases antioxidant activity. OBJECTIVE: The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on ischemic-reperfusion (I-R) injury in the gastrocnemius muscle of the rat. BACKGROUND DATA: Ischemic injury in skeletal muscle is initiated during hypoxia and is aggravated by reoxygenation during blood reperfusion and accumulation of cytotoxic reactive oxygen superoxides. LLLT has been found to biostimulate various biological processes, such as attenuation of ischemic injury in the heart. MATERIALS AND METHODS: The injury was induced in the gastrocnemius muscles of 106 rats by complete occlusion of the blood supply for 3 h, followed by reperfusion. Another group of intact rats served to investigate the effect of LLLT on intact nonischemic muscles. Creatine phosphokinase, acid phosphatase, and heat shock protein were determined 7 days after I-R injury and antioxidant levels 2 h after reperfusion. RESULTS: Laser irradiation (Ga-As, 810 nm) was applied to the muscles immediately and 1 h following blood supply occlusion. It was found that laser irradiation markedly protects skeletal muscles from degeneration following acute I-R injury. This was evident by significantly ($p < 0.05$) higher content of creatine phosphokinase activity and lower ($p < 0.05$) activity of acid phosphatase in the LLLT-treated muscles relative to the injured non-irradiated ones. The content of antioxidants and heat shock proteins was also higher ($p < 0.05$) in the LLLT-treated muscles relative to that of injured non-irradiated muscles. CONCLUSION: The present study describes for the first time the ability of LLLT to significantly prevent degeneration following ischemia/reperfusion injury in skeletal muscles, probably by induction of synthesis of antioxidants and other cytoprotective proteins, such as hsp-70i. The elevation of antioxidants was also evident in intact muscle following LLLT. The above phenomenon may also be of clinical relevance in scheduled surgery or microsurgery requiring extended tourniquet applications to skeletal muscle followed by reperfusion. Antioxidants;Creatine Kinase Animals;Antioxidants;Creatine Kinase;Low-Level Light Therapy;Muscle, Skeletal;Rats;Rats, Sprague-Dawley;Reperfusion Injury

Effects of 670-nm phototherapy on development. OBJECTIVE: The objective of the present study was to assess the survival and hatching success of chickens (Gallus gallus) exposed in ovo to far-red

(670-nm) LED therapy. BACKGROUND DATA: Photobiomodulation by light in the red to near-infrared range (630-1000 nm) using low-energy lasers or light-emitting diode (LED) arrays has been shown to accelerate wound healing and improve recovery from ischemic injury. The mechanism of photobiomodulation at the cellular level has been ascribed to the activation of mitochondrial respiratory chain components resulting in initiation of a signaling cascade that promotes cellular proliferation and cytoprotecton. MATERIALS AND METHODS: Fertile chicken eggs were treated once per day from embryonic days 0-20 with 670-nm LED light at a fluence of 4 J/cm2. In ovo survival and death were monitored by daily candling (after Day 4). RESULTS: We observed a substantial decrease in overall and third-week mortality rates in the light-treated chickens. Overall, there was approximately a 41.5% decrease in mortality rate in the light-treated chickens (NL: 20%; L: 11.8%). During the third week of development, there was a 68.8% decrease in the mortality rate in light-treated chickens (NL: 20%; L: 6.25%). In addition, body weight, crown-rump length, and liver weight increased as a result of the 670-nm phototherapy. Light-treated chickens pipped (broke shell) earlier and had a shorter duration between pip and hatch. CONCLUSION: These results indicate that 670-nm phototherapy by itself does not adversely affect developing embryos and may improve the hatching survival rate. Animals;Body Weight;Chick Embryo;Crown-Rump Length;Light;Organogenesis;Phototherapy

Biological effects of helium-neon laser irradiation on normal and wounded human skin fibroblasts. OBJECTIVE: This study aimed to investigate a number of structural, cellular, and molecular responses to heliumneon (632.8 nm) laser irradiation following a single dose of 0.5, 2.5, 5, or 10 J/cm2 on normal and wounded human skin fibroblasts. BACKGROUND DATA: Low-level laser therapy (LLLT) is a form of phototherapy, involving the application of low-power monochromatic and coherent light to injuries and lesions to stimulate healing. 1 This therapy has been successfully used for pain attenuation and to induce wound healing in nonhealing defects. 2 METHODS: Changes in normal and wounded fibroblast cell morphology were evaluated by light microscopy. Cellular parameters evaluated cell proliferation, cell viability, and cytotoxicity while molecular parameters assessed the extent of DNA damage. RESULTS: The results clearly demonstrate that LLLT has an effect on normal and wounded(3) human skin fibroblasts. The parameters showed that doses of 0.5, 2.5, 5, and 10 J/cm2 were sufficient to produce measurable changes in fibroblast cells. CONCLUSION: A dose of 10 J/cm2 appeared to produce a significant amount of cellular and molecular damage, which could be an important consideration for other therapies, such as photodynamic therapy. Helium;Neon Cell Proliferation;Cells, Cultured;Comet Assay;Fibroblasts;Helium;Humans;Lasers;Low-Level Light Therapy;Neon;Skin

Burn healing with a diode laser: 670 nm at different doses as compared to a placebo group. OBJECTIVE: A study on burn healing in rats was initiated using a diode laser at varied doses for determination of optimum dosimetry and treatment schedule. MATERIALS AND METHODS: A number of male Sprague-Dawley rats were randomly assigned to several groups. Anesthesia (a mixture of ketamine HCl and Xylocaine) was administered intraperitoneally. Burn on both flanks was created using a preheated metal probe and measured daily using a caliper. The right side of the treated rats was irradiated five times and three times per week. Slopes from the actual burn areas were obtained and compared against the control with the healing rate calculated and expressed in percent. RESULTS: In reference to the control group, no significant difference in healing was observed. In comparing both treatment schedules, there was likewise no significant difference at any day in both age-groups. Notably in younger rats, accelerated healing was observed with the highest rate in the lower range of doses (1 and 5 J/cm2), 12.4% and 11.6%, respectively. CONCLUSION: This experiment affirms that the beneficial effect on burn healing in rats is indeed affected by an interplay of several

factors. Animals;Burns;Low-Level Light Therapy;Male;Prospective Studies;Rats;Rats, Sprague-Dawley;Wound Healing
ED50 study of femtosecond terawatt laser pulses on porcine skin. BACKGROUND AND OBJECTIVES: Terawatt (TW) lasers have become commonplace since the development of the chirped-pulse amplification method using Ti:sapphire and Nd:glass laser rods. We have measured the minimum visible lesion (MVL) thresholds for porcine1The animals involved in this study were procured, maintained, and used in accordance with the Federal Animal Welfare Act and the "Guide for the Care and Use of Laboratory Animals" prepared by the Institute of Laboratory Animal Resources-National Research Council. Brooks City-Base, TX has been fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care, International (AAALAC) since 1967. (Yucatan mini-pig) skin using TW laser pulses. STUDY DESIGN/MATERIALS AND METHODS: Our system produced laser pulses at 810 nm and sub-50 femtoseconds. These 1-2 TW laser pulses created multiple self-focusing (SF) filaments during propagation and were directed on the flanks of mini-pigs under anesthesia. We measured the pulse energies necessary to determine the ED(50) skin damage thresholds. RESULTS: The MVL ED(50) threshold at 1 hour was 8 mJ and increased to 21 mJ after 24 hours. Histological sections were obtained after 1-hour and 24-hour readings. CONCLUSIONS: The damage patterns on the skin indicated the number of filaments in the laser pulse. Many of the pulses produced only superficial damage that disappeared in 24 hours and that nearly three times the pulse energy was required to cause subdural or cellular damage. With further research, non-thermal tissue ablation using TW laser pulses could provide a viable alternative to current techniques of laser use in dermatology. Animals;Dose-Response Relationship, Radiation;Female;Low-Level Light Therapy;Models, Animal;Skin;Swine;Swine, Miniature
Systematic review of the literature of low-level laser therapy (LLLT) in the management of neck pain. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) is widely used in the treatment of musculoskeletal pain. However, there is controversy over its true efficacy. We aimed to determine the efficacy of LLLT in the treatment of neck pain through systematically reviewing the literature. STUDY DESIGN/MATERIALS AND METHODS: A search of computerized bibliographic databases covering medicine, physiotherapy, allied health, complementary medicine, and biological sciences was undertaken undertaken from date of inception until February 2004 for randomized controlled trials of LLLT for neck pain. A comprehensive list of search terms was applied and explicit inclusion criteria were developed a priori. Twenty studies were identified, five of which met the inclusion criteria. RESULTS: Significant positive effects were reported in four of five trials in which infrared wavelengths (lambda = 780, 810-830, 904, 1,064 nm) were used. Heterogeneity in outcome measures, results reporting, doses, and laser parameters precluded formal meta-analysis. Effect sizes could be calculated for only two of the studies. CONCLUSIONS: This review provides limited evidence from one RCT for the use of infrared laser for the treatment of acute neck pain (n = 71) and chronic neck pain from four RCTs (n = 202). Larger studies are required to confirm the positive findings and determine the most effective laser parameters, sites and modes of application. Humans;Low-Level Light Therapy;Neck Pain;Treatment Outcome
Effect of the 1,450 nm diode non-ablative laser on collagen expression in an artificial skin model. BACKGROUND AND OBJECTIVE: The 1,450-nm Smoothbeam Laser is a diode laser equipped with a cryogen cooling spray. Primary objectives were to evaluate the effects of this non-ablative laser on Apligraf (bioengineered skin-substitute) and to document its use as a model for non-ablative procedures. We also measured the effects of laser fluence levels on collagen and elastin expression. STUDY DESIGN/MATERIALS AND METHODS: Three sheets of Apligraf were used for this study. Each received six separate laser applications at 4J, 6J, 8J, 10 J, 12J, and 14J. The sheets were then incubated with 10% CO(2) at 37 degrees C and samples were collected and analyzed 3 days later,

using RT-PCR and immunofluorescent staining. RESULTS: Collagen III expressions significantly increased in both mRNA and protein levels at approximately 12 J. CONCLUSIONS: There appears to be a threshold effect where there is very little increased collagen III mRNA and protein expression until the laser fluence reaches around 12J. Apligraf;Collagen Collagen;Humans;Infant, Newborn;Low-Level Light Therapy;Models, Biological;Skin, Artificial
Helium-neon laser in viability of random skin flap in rats. BACKGROUND AND OBJECTIVES: The purpose of this study was to determine the role of helium-neon (He-Ne) laser random skin flap viability in rats. STUDY DESIGN/MATERIALS AND METHODS: Experimentally controlled randomized study. Forty-eight Wistar-EPM rats were used, weighed, and divided into 4 groups with 12 rats each. The random skin flap was performed measuring 10 x 4 cm, with a plastic sheet interposed between the flap and the donor site. The Group 1 (control) underwent sham irradiation with He-Ne laser. The Group 2 was submitted to laser irradiation, using the punctual contact technique on the skin flap surface. The Group 3 was submitted to laser irradiation surrounding the skin flap, and the Group 4 was submitted to laser irradiation both on the skin flap surface and around it. The experimental groups were submitted to He-Ne laser irradiation with 3 J/cm(2) energy density immediately after the surgery and for the four subsequent days. The percentage of necrotic area of the four groups was calculated at the 7th post-operative day, through a paper-template method. RESULTS: Group 1 reached an average necrotic area of 48.86%; Group 2, 38.67%; Group 3, 35.34%; and Group 4, 22.61%. After the statistic analysis, results showed that all experimental groups reached statistically significant values when compared to the control group, and Group 4 was the best one, when compared to all groups of this study (P<0.001). CONCLUSION: The He-Ne laser irradiation was efficient to increase random skin flap viability in rats. Noble Gases;Helium;Neon Animals;Helium;Humans;Low-Level Light Therapy;Male;Necrosis;Neon;Noble Gases;Rats;Skin;Surgical Flaps;Tissue Survival
Granuloma faciale treated with the pulsed-dye laser: a case series. Granuloma faciale (GF) is a rare cutaneous condition of unknown origin with characteristic clinicopathological features. It predominantly affects the face and in some causes an unacceptable cosmetic appearance. Numerous medical and surgical treatments have been used with varying degrees of success. Several single-patient case reports have demonstrated the successful use of the pulsed dye laser (PDL) in treating GF. This study assesses the results of four patients with facial GF from one dermatological laser centre that were treated with the Candela Vbeam PDL at 595 nm. Resolution of the GF was achieved in only two of the four patients (50%). Nevertheless this study provides further evidence that the PDL can help some patients with GF. Subsequently it is still a valuable treatment option for GF, especially as it is safe, well tolerated and quick. Facial Dermatoses;Granuloma;Humans;Low-Level Light Therapy;Male;Middle Aged
Low level laser: does it influence wound healing in venous leg ulcers? A randomized, placebo-controlled, double-blind study. Adult;Aged;Aged, 80 and over;Double-Blind Method;Female;Humans;Leg Ulcer;Low-Level Light Therapy;Male;Middle Aged;Statistics, Nonparametric;Treatment Failure;Wound Healing
[Low intensive infrared laser radiation in early rehabilitation of patients after acute disorders of cerebral circulation (guidelines for physicians)]. Cerebrovascular Disorders;Humans;Infrared Rays;Low-Level Light Therapy
Effect of low-intensity laser irradiation on the process of bone repair. The effect of low-intensity laser (GaAsAl) irradiation on bone repair in the femurs of mice was investigated. An experimental model of hole injury with surgery drills was used in 20 mouse femurs followed by a study of the effect of low-energy laser irradiation on bone repair. The experimental model was divided into two groups. The first (10 left femurs) received laser irradiation immediately after injury and was followed for

different time intervals (24, 48, and 72 h). The right femurs (control group) underwent hole injury but no laser irradiation. The rats were sacrificed after 14 days and the results were analyzed using a quantitative histometrical method. The Mann-Whitney test was used to perform the statistical analysis. Histometrical analysis revealed a more rapid accumulation of reparative new bone in the hole injury of the laser-irradiated legs. We conclude that GaAsAl laser irradiation after injury was effective on bone repair when compared to results in the control group. Animals;Bone Regeneration;Femur;Low-Level Light Therapy;Male;Mice

Comparative study of aminolevulic acid photodynamic therapy plus pulsed dye laser versus pulsed dye laser alone in treatment of viral warts. OBJECTIVE AND BACKGROUND: A number of scientific publications describe the removal of viral warts using photoselective laser destruction with pulsed dye laser (PDL) or photodynamic therapy (PDT). Although both methods represent an enormous improvement in therapy, the results are not sufficiently consistent to consider these methods as the "gold standard" for therapy. METHODS: With a view to further improvement we combined a photoselective dye laser (595 nm, 20 J.cm(-2)) with photodynamic therapy using aminolevulic acid. The results of this method were compared against traditional laser photodestruction (of identical physical parameters) and against traditional photodynamic therapy (of similar parameters). RESULTS: After combined therapy (PDT + PDL) of 86 warts in 24 patients, 100% were cured, with an average of 1.96 therapeutic sessions. Therapy with PDT alone failed in 3 of 76 warts even after 5 sessions (96%), with an average of 2.54 therapeutic sessions. Therapy with PDL alone failed in 21 of 112 warts even after 5 sessions, with an average of 3.34 therapeutic sessions. CONCLUSIONS: All three therapeutic methods are able to cure infectious warts with high probability (>80%). However, a combination of PDT and PDL is the most effective and the most favored therapy. If other investigators also confirm results near or equal to 100% success, this therapy could become a treatment of choice for this indication. Photosensitizing Agents;Aminolevulinic Acid Aminolevulinic Acid;Humans;Low-Level Light Therapy;Patient Satisfaction;Photochemotherapy;Photosensitizing Agents;Treatment Outcome;Warts

Evaluation of facial thermographic changes before and after low-level laser irradiation. OBJECTIVE: The aim of the present study was to evaluate the facial thermographic changes before and after low-level laser irradiation applied to the temporomandibular joint in normal subjects. BACKGROUND DATA: Although this therapy has been reported to be effective in the pain management of patients with rheumatoid arthritis and degenerative joint disease, several researchers have stated that this therapy has no effect on pain of myogeneous origin. MATERIALS AND METHODS: Nine healthy subjects underwent irradiation using the continuous wave setting of a CO2 laser with a power output of 1.0 W. The laser tip was positioned 10 cm above the skin over the right TMJ area for 10 min. The actual fluence on the facial surface was 7.64 J/cm2. Variation of the facial temperature was evaluated by using thermography. RESULTS: The facial temperature 10 min after stopping irradiation was higher than that after 10 min of irradiation applied to the opposite side. The warmer area was found not only over the TMJ area but also over the temporal area, forehead area, and eyelid area on both sides. CONCLUSION: These results suggested that low-level laser irradiation had a long-lasting effect on facial cutaneous tissues. Face;Humans;Low-Level Light Therapy;Skin Temperature;Temporomandibular Joint;Thermography

Effect of low intensity helium-neon (He-Ne) laser irradiation on diabetic wound healing dynamics. OBJECTIVE: The aim of this study was to determine the effect of low-energy He-Ne laser treatment on wound healing dynamics (histological and biochemical) in diabetic rats. BACKGROUND DATA: Low-energy laser photostimulation at certain wavelengths can enhance tissue repair by releasing growth factors from fibroblasts and can facilitate the healing process of diabetic wounds. MATERIALS AND METHODS: A circular 4 cm2 excisional wound was created on the dorsum of the experimentally

(Alloxan)-induced diabetic rats. In the study group (N = 24) the wound was treated with He-Ne laser (632.8 nm wavelength) at a dose of 4.8 J/cm2 for 5 days a week until the wound healed completely. The control group (N = 24) was sham-irradiated. The results were statistically analyzed by an independent t test for biochemical analysis and the nonparametric Mann-Whitney U test for histopathological parameters. RESULTS: The analysis of the biochemical parameters and histopathological parameters of the wounds showed that the laser-treated group healed faster and better as compared to the control group ($p < 0.0001$). The laser-treated group healed on average by the 18th day whereas, the control group healed on average by the 59th day. CONCLUSION: Laser photostimulation promotes the tissue repair process of diabetic wounds.
Collagen;Hydroxyproline Animals;Capillaries;Cell Proliferation;Collagen;Diabetes Mellitus, Experimental;Epithelium;Fibroblasts;Granulation Tissue;Hydroxyproline;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Analgesic effect of He-Ne (632.8 nm) low-level laser therapy on acute inflammatory pain.
OBJECTIVE: The aim of this study was to evaluate the analgesic effect of the low level laser therapy (LLLT) with a He-Ne laser on acute inflammatory pain, verifying the contribution of the peripheral opioid receptors and the action of LLLT on the hyperalgesia produced by the release of hyperalgesic mediators of inflammation. BACKGROUND DATA: All analgesic drugs have undesired effects. Because of that, other therapies are being investigated for treatment of the inflammatory pain. Among those, LLLT seems to be very promising. MATERIAL AND METHODS: Male Wistar rats were used. Three complementary experiments were done. (1) The inflammatory reaction was induced by the injection of carrageenin into one of the hind paws. Pain threshold and volume increase of the edema were measured by a pressure gauge and plethysmography, respectively. (2) The involvement of peripheral opioid receptors on the analgesic effect of the laser was evaluated by simultaneous injection of carrageenin and naloxone into one hind paw. (3) Hyperalgesia was induced by injecting PGE2 for the study of the effect of the laser on the sensitization increase of nociceptors. A He-Ne laser (632.8 nm) of 2.5 J/cm2 was used for irradiation. RESULTS: We found that He-Ne stimulation increased the pain threshold by a factor between 68% and 95% depending on the injected drug. We also observed a 54% reduction on the volume increase of the edema when it was irradiated. CONCLUSION: He-Ne LLLT inhibits the sensitization increase of nociceptors on the inflammatory process. The analgesic effect seems to involve hyperalgesic mediators instead of peripheral opioid receptors. Narcotic Antagonists;Naloxone;Carrageenan;Dinoprostone
Animals;Carrageenan;Dinoprostone;Edema;Hyperalgesia;Inflammation;Injections;Low-Level Light Therapy;Male;Naloxone;Narcotic Antagonists;Nociceptors;Pain;Pain Threshold;Rats;Rats, Wistar

Green light emitting diode irradiation enhances fibroblast growth impaired by high glucose level.
BACKGROUND AND OBJECTIVE: The chronic metabolic disorder diabetes mellitus is an important cause of morbidity and mortality due to a series of common secondary metabolic complications, such as the development of severe, often slow healing skin lesions. In view of promoting the wound-healing process in diabetic patients, this preliminary in vitro study investigated the efficacy of green light emitting diode (LED) irradiation on fibroblast proliferation and viability under hyperglycemic circumstances. MATERIALS AND METHODS: To achieve hyperglycemic circumstances, embryonic chicken fibroblasts were cultured in Hanks' culture medium supplemented with 30 g/L glucose. LED irradiation was performed on 3 consecutive days with a probe emitting green light (570 nm) and a power output of 10 mW. Each treatment lasted 3 min, resulting in a radiation exposure of 0.1 J/cm2. RESULTS: A Mann-Whitney U test revealed a higher proliferation rate ($p = 0.001$) in all irradiated cultures in comparison with the controls. CONCLUSION: According to these results, the effectiveness of green LED irradiation on fibroblasts in hyperglycemic circumstances is established. Future in vivo investigation would be worthwhile to investigate whether there are equivalent positive results in

diabetic patients. Sweetening Agents;Glucose Animals;Cell Proliferation;Cells, Cultured;Chick Embryo;Fibroblasts;Glucose;Low-Level Light Therapy;Sweetening Agents

Low-level laser irradiation promotes proliferation and differentiation of human osteoblasts in vitro. OBJECTIVES: The aim of the present study was to investigate the effect of low-level laser irradiation on proliferation and differentiation of a human osteoblast cell line. BACKGROUND DATA: It was previously found that low-level laser therapy (LLLT) enhances bone repair in experimental models. MATERIALS AND METHODS: Cultured osteoblast cells were irradiated using He-Ne laser irradiation (632 nm; 10 mW power output). On the second and third day after seeding the osteoblasts were exposed to laser irradiation. The effect of irradiation on osteoblast proliferation was quantified by cell count and colorimetric MTT (dimethylthiazol tetrazolium bromide) assay 24 and 48 h after second irradiation. RESULTS: A significant 31-58% increase in cell survival (MTT assay) and higher cell count in the once-irradiated as compared to nonirradiated cells was monitored. Differentiation and maturation of the cells was followed by osteogenic markers: alkaline phosphatase (ALP), osteopontin (OP), and bone sialoprotein (BSP). A two-fold enhancement of ALP activity and expression of OP and BSP was much higher in the irradiated cells as compared to non-irradiated osteoblasts. CONCLUSION: We conclude that LLLT promotes proliferation and maturation of human osteoblasts in vitro. These results may have clinical implications. Biomarkers;Coloring Agents;IBSP protein, human;Integrin-Binding Sialoprotein;SPP1 protein, human;Sialoglycoproteins;Tetrazolium Salts;Thiazoles;Osteopontin;Alkaline Phosphatase;thiazolyl blue Alkaline Phosphatase;Biomarkers;Cell Count;Cell Differentiation;Cell Line;Cell Proliferation;Colorimetry;Coloring Agents;Humans;Immunohistochemistry;Integrin-Binding Sialoprotein;Low-Level Light Therapy;Osteoblasts;Osteogenesis;Osteopontin;Sialoglycoproteins;Tetrazolium Salts;Thiazoles

The response of Na+/K+ -ATPase of human erythrocytes to green laser light treatment. The objective of this study was to investigate the response of Na(+)/K(+)-ATPase of human erythrocytes to green laser irradiation. Effects of green laser light of fluences 9.5-63.3 J.cm(-2) and merocyanine 540-mediated laser light treatment were studied. Isolated erythrocyte membranes (protein concentration of 1 mg/ml) were irradiated by Nd:YAG laser (532 nm, 30 mW) and then incubated in a medium with 2 mM ATP for 30 min. Activity of ATPase was determined colorimetrically by measuring the colored reaction product of liberated inorganic phosphate and malachite green at 640 nm. Contribution of Na(+)/K(+)-ATPase to overall phosphate production was determined using ouabain. A positive effect of green laser light on Na(+)/K(+)-ATPase activity was observed. The dependence of enzymatically liberated inorganic phosphate on light fluence showed a linear correlation (R(2)=0.96, P=0.0005) for all fluences applied (9.5-63.3 J.cm(-2)). On the other hand, MC 540-mediated phototreatment caused a suppression of enzyme activity. Fluorescent Dyes;Pyrimidinones;merocyanine dye;Sodium-Potassium-Exchanging ATPase Color;Erythrocytes;Fluorescent Dyes;Humans;Lasers;Low-Level Light Therapy;Pyrimidinones;Sodium-Potassium-Exchanging ATPase

The effect of low level laser irradiation on implant-tissue interaction. In vivo and in vitro studies. Low-level laser therapy (LLLT) is increasingly used in medicine and dentistry. It has been suggested that LLLT may be beneficial in the management of many different medical conditions, including pain, wound healing and nerve injury. The present thesis is based on a series of in vivo and in vitro experimental studies investigating whether LLLT has the potential to enhance titanium-implant interaction. Information about LLLT effect on bone healing is fundamental to understand whether LLLT may improve implant-tissue interaction. Thus in the initial study (I), the effect of LLLT on bone healing and growth in rat calvarial bone defects was investigated. It was found that LLLT may accelerate metabolism and/or mineralization during early bone healing. Based on these findings, study II explored the hypothesis that LLLT can enhance implant integration in the rabbit tibial bone. It

was shown that LLLT stimulated the mechanical strength of the interface between the implant and bone after a healing period of 8 weeks. Histomorphometrical and mineral analyses showed that the irradiated implants had greater bone-to-implant contact than the controls. In the in vitro experiments, cellular responses to LLLT were studied in two cell types: primary cultures of human gingival fibroblasts and human osteoblast-like cells, with special reference to attachment, proliferation, differentiation and production of transforming growth factor beta1 (TGF-beta1). The objectives of studies III & IV were to develop a standardized, reproducible in vitro model for testing a GaAlAs diode laser device and to document the influence of single or multiple doses of LLLT, as a guide to defining the optimal laser dose for enhancing cell activity. A further objective was to investigate the effect of LLLT on initial attachment and subsequent behaviour of human gingival fibroblasts cultured on titanium. While both multiple doses (1.5 and 3 J/cm2) and a single dose (3 J/cm2) enhanced cellular attachment, proliferation increased only after multiple doses (1.5 and 3 J/cm2). Study V concerned the response to LLLT of osteoblast-like cells, derived from human alveolar bone cultured on titanium implant material. In this study LLLT significantly enhanced cellular attachment. Greater cell proliferation in the irradiated groups was observed first after 96 h indicating that the cellular response is dose dependent. Osteocalcin synthesis and TGF-beta1 production were significantly stimulated on the samples exposed to 3 J/cm2. The following conclusions are drawn from the results of these five studies: LLLT can promote bone healing and bone mineralization and thus may be clinically beneficial in promoting bone formation in skeletal defects. It may be also used as additional treatment for accelerating implant healing in bone. LLLT can modulate the primary steps in cellular attachment and growth on titanium surfaces. Multiple doses of LLLT can improve LLLT efficacy, accelerate the initial attachment and alter the behaviour of human gingival fibroblasts cultured on titanium surfaces. The use of LLLT at the range of doses between 1.5 and 3 J/cm2 may modulate the activity of cells interacting with an implant, thereby enhancing tissue healing and ultimate implant success. Dental Implants;Titanium Animals;Cell Division;Cell Proliferation;Dental Implants;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Male;Osseointegration;Osteoblasts;Rabbits;Rats;Titanium;Wound Healing

Enhancement of liver regeneration by the association of Hyptis pectinata with laser therapy.
Since new molecules that normally would accelerate regeneration can also be potentialized by light, the use of new substances combined with laser therapy seems to be a natural type of experiment. Therefore, the purpose of this study was to assess the effects of Hyptis pectinata leaves on liver regeneration after partial hepatectomy (PH) associated with laser therapy. Twenty-four rats were divided into four groups--PH(control), PHL (laser therapy), PH200 (200 mg/kg of Hyptispectinata), and PHL200 (200 mg/kg of the plant and laser)--which were submitted to 67% hepatectomy. Laser treatment consisted of focusing the light on the remaining liver after hepatectomy. The data analyzed were serum levels of aminotransferases, liver regeneration, and mitochondrial function. Group PH200 showed a statistically significant decrease in AST levels, and PHL200 disclosed an augmentation in ALT levels. The liver regeneration index was significantly increased in group PHL200. Concerning liver mitochondrial respiratory assay, groups PH200 and PHL200 showed lower state 3 levels than groups PH and PHL. Group PHL showed an increase in state 4 levels and a reduction in membrane potential and RCR. The present study shows that the association of the aqueous extract of Hyptis pectinata leaves at 200 mg/kg with intraoperative laser therapy can stimulate liver regeneration and cause a reduction in liver mitochondrial respiratory function without altering its phosphorylative activity. Plant Extracts;Transaminases Animals;Hepatectomy;Hyptis;Liver Regeneration;Low-Level Light Therapy;Male;Mitochondria, Liver;Phytotherapy;Plant Extracts;Plant Leaves;Rats;Rats, Wistar;Transaminases

Er:YAG laser in defocused mode for scaling of periodontally involved root surfaces: an in vitro pilot study. BACKGROUND: The Er:YAG laser may be used on periodontally involved teeth in combination with conventional periodontal therapy in order to improve the efficacy of root instrumentation. The aim of this study was to compare the effect of hand instrumentation on root surfaces of periodontally involved teeth with Er:YAG laser application. METHODS: Thirty freshly extracted, non-carious, single-rooted, periodontally diseased human teeth from adult humans with advanced periodontal disease were used in this study. The teeth were divided into three groups of 10 specimens each. Group A was treated with scaling and root planing (SRP) with curets only (control). In group B, the root surfaces were scaled with curets and then lased with an Er:YAG laser (wavelength 2.94 microm). A handpiece with a water spray was used in non-contact mode (defocused) at a distance of 1 cm from root surface. Laser parameters were set at energy of 100 to 200 mJ/pulse, with 10 Hz of frequency. In group C, the root surfaces were lased only with power settings 250 to 300 mJ/pulse and 10 Hz frequency. An epon-araldite plastic embedding technique was used for light microscopic investigation. RESULTS: Histologic findings showed significant differences between the test and control sites. In control sites, after hand instrumentation, the surface was smooth, without a cementum layer, and the dentin layer presented opened tubules. Defects on the dentin layer were also present along root surfaces. In the test sites (B, C) root surfaces revealed no thermal damage; no cracking or tissue carbonization were observed. The superficial layers of lased surfaces appeared smooth and melted without alterations. CONCLUSION: Based on these findings, it appears that it may be feasible to use the Er:YAG laser for root instrumentation without prior root planing if the proper parameters are followed. Adult;Dental Calculus;Dental Scaling;Humans;Low-Level Light Therapy;Periodontal Diseases;Pilot Projects;Root Planing;Tooth Root

Evidence of changes in sural nerve conduction mediated by light emitting diode irradiation. The introduction of light emitting diode (LED) devices as a novel treatment for pain relief in place of low-level laser warrants fundamental research on the effect of LED devices on one of the potential explanatory mechanisms: peripheral neurophysiology in vivo. A randomised controlled study was conducted by measuring antidromic nerve conduction on the peripheral sural nerve of healthy subjects (n=64). One baseline measurement and five post-irradiation recordings (2-min interval each) were performed of the nerve conduction velocity (NCV) and negative peak latency (NPL). Interventional set-up was identical for all subjects, but the experimental group (=32) received an irradiation (2 min at a continuous power output of 160 mW, resulting in a radiant exposure of 1.07 J/cm(2)) with an infrared LED device (BIO-DIO preprototype; MDB-Laser, Belgium), while the placebo group was treated by sham irradiation. Statistical analysis (general regression nodel for repeated measures) of NCV and NPL difference scores, revealed a significant interactive effect for both NCV (P=0.003) and NPL (P=0.006). Further post hoc LSD analysis showed a time-related statistical significant decreased NCV and an increased NPL in the experimental group and a statistical significant difference between placebo and experimental group at various points of time. Based on these results, it can be concluded that LED irradiation, applied to intact skin at the described irradiation parameters, produces an immediate and localized effect upon conduction characteristics in underlying nerves. Therefore, the outcome of this in vivo experiment yields a potential explanation for pain relief induced by LED. Adolescent;Adult;Dose-Response Relationship, Radiation;Electromyography;Female;Humans;Low-Level Light Therapy;Male;Neural Conduction;Probability;Reaction Time;Reference Values;Regression Analysis;Sensitivity and Specificity;Sural Nerve

A study of Q-switched Nd:YAG laser irradiation and paracrine function in human skin cells. BACKGROUND AND OBJECTIVES: This preliminary laboratory-based study looks at the paracrine release from human skin cells subject to sublethal Q-switched Nd:YAG 532 nm laser irradiation.

STUDY DESIGN/MATERIALS AND METHODS: Human dermal fibroblast and keratinocyte cultures were exposed to sublethal energy using the Nd:YAG 532 nm laser. Altered gene expression was then screened using RT-PCR for a range of paracrine factors known to affect melanogenesis, basic fibroblast growth factor (b-FGF), hepatocyte growth factor (HGF), stem cell factor (SCF), melanocyte stimulating hormone (MSH), endothelin-1 (ET-1), interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-alpha) and protease-activated receptor-2 (PAR-2). Enzyme-linked immunosorbent assay (ELISA) was used to confirm protein production. Conditioned medium was used to assess altered melanogenesis in a melanoma cell line. RESULTS: Fibroblasts exposed to sublethal radiation showed upregulation of b-FGF, HGF and SCF. This contrasts with keratinocytes which showed upregulation of IL-6. Elevated protein levels of b-FGF and SCF were confirmed by ELISA assay. Conditioned fibroblast medium was shown to stimulate melanogenesis in a melanoma cell line. CONCLUSIONS: This preliminary laboratory study reports, for the first time, specific gene upregulation using the Q-switched Nd:YAG 532 nm laser. DNA Primers;Growth Substances;Stem Cell Factor;Fibroblast Growth Factors;Hepatocyte Growth Factor Cells, Cultured;DNA Primers;Enzyme-Linked Immunosorbent Assay;Fibroblast Growth Factors;Fibroblasts;Growth Substances;Hepatocyte Growth Factor;Humans;Keratinocytes;Low-Level Light Therapy;Reverse Transcriptase Polymerase Chain Reaction;Skin;Stem Cell Factor;Up-Regulation

Novel endourologic applications for holmium laser. The holmium laser is used routinely during endoscopic procedures to treat stones, strictures, and tumors of the urinary tract. We report two successful novel endourologic applications of a holmium laser: division and removal of a synthetic urethral sling mesh in one patient and fragmentation of a tempered stainless steel surgical needle in another. Adult;Foreign Bodies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Needles;Urinary Bladder

[Progressing myopia in children: does it need treatment or not?]. The purpose of the case study was to evaluate the remote consequences of a complex of laser and repeated surgical sclerorestorative procedures made in progressing myopia and its complications. Three hundred and forty-six children, aged 8-10, with rapidly progressing uncomplicated myopia of 4.25 to 9.5 D were shared between 2 groups. Two hundred and forty patients of the experimental group were made sclerorestorative procedures and transscleral low-energy laser stimulation of the ciliary muscle by means of infrared laser MACDEL-09. No such treatment was applied to patients of the control group. When indicated, preventive laser coagulation of the retina was made in both groups. The dynamic 10-year follow-up over the status of refraction and eye bottom showed that the complex scheme of repeated sclerorestorative procedures and low-energy laser treatment combined with preventive peripheral laser coagulation of the retina cut the rate of progressing myopia and prevented peripheral vitreoretinal dystrophy and retinal detachment in children and teenagers with progressing myopia. Age Factors;Child;Ciliary Body;Decision Making;Disease Progression;Female;Humans;Laser Coagulation;Low-Level Light Therapy;Male;Myopia;Photic Stimulation;Refraction, Ocular;Retina;Retinal Detachment;Sclera;Scleroplasty;Visual Acuity;Vitreoretinopathy, Proliferative

A study of the effects of phototherapy dose interval on photobiomodulation of cell cultures. BACKGROUND AND OBJECTIVES: Dosimetry and treatment frequency are controversial phototherapy issues. Efficacy of dose fractionation on photobiomodulation was evaluated in vitro. STUDY DESIGN/MATERIALS AND METHODS: Human HEP-2 and murine L-929 cell lines were cultured in complete DMEM media. Photoradiation (670 nm, 5 J/cm2/treatment, 50 J/cm2 total energy delivery), was performed varying treatments per 24 hour period: Group I (Controls)-0, Group II-1/d, Group III-2/d, Group IV-4/d. Cell proliferation was measured using Cyquant (fluorescent DNA content) and MTT (3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyl tetrasolium bromide) assays for 240 hours post therapy. A

proliferation index: PI = (#Cells Experimental(t) / #Cells Control(t)) was computed. RESULTS: MTT assay results demonstrated maximal response in Group III ($P < 0.05$, $n = 3$). Cyquant maxima occurred in HEP-2 Groups II and III ($P < 0.045$) and L-929 Group III ($P < 0.091$). CONCLUSIONS: Cellular response to dose frequency varies. More frequent treatments (2/24 hours) increased metabolism and proliferation in both cell lines. Further investigation of dose fractionation in phototherapy is warranted. Coloring Agents;Tetrazolium Salts;Thiazoles;thiazolyl blue Animals;Cell Line;Cell Proliferation;Coloring Agents;Connective Tissue Cells;Dose Fractionation, Radiation;Epithelial Cells;Humans;Mice;Phototherapy;Tetrazolium Salts;Thiazoles;Time Factors

[Changes in erythrocyte count during blood laser radiation]. Aged;Blood;Erythrocyte Count;Female;Humans;Low-Level Light Therapy;Male;Myocardial Ischemia;Treatment Outcome

Bilateral Coats' disease with unusual presentation--a case report. Coats' disease is a well-known ocular disorder, characterized by idiopathic retinal telangiectasia, retinal exudation and retinal detachment. We report on a boy who first presented at the age of 2 years with Coats' disease and secondary neovascular glaucoma. The differential diagnosis with retinoblastoma could not be made clinically or with the help of imaging studies, such as ultrasonography or computed tomography scanning (CT-scan). The right eye was consequently enucleated for diagnostic and therapeutical purposes. Histopathologic examination confirmed the diagnosis of Coats' disease. Five years later the same boy consulted again with profound visual loss in his only functional left eye. Fundoscopy revealed lesions typical for Coats' disease. Coats' disease can present in very different ways and bilateral disease is possible, even after several years. Child, Preschool;Diagnosis, Differential;Glaucoma, Neovascular;Humans;Low-Level Light Therapy;Male;Retinal Detachment;Retinal Diseases;Retinal Neoplasms;Retinoblastoma

The effect of laser irradiation for nucleus pulposus: an experimental study. BACKGROUND: The radicular pain caused by disc herniation can be explained by two mechanisms: the compression of the nerve root by the herniated disc or the irritation of the nerve root due to chemical factors. Percutaneous laser disc decompression (PLDD) was introduced for the treatment of lumbar disc hernias in the 1980s. Decompression of the nerve root is assumed to be an effective therapeutic mechanism for PLDD. However, laser irradiation might reduce the chemical factors that cause nerve root irritation by altering intra-disc proteins. We used nerve conduction velocities (NCV) and levels of two chemical factors to evaluate the differences between the two groups in this in vivo study. METHODS: All rabbits had the nerve root in contact with the leakage from the nucleus pulposus. One group underwent laser irradiation for the leaking nucleus pulposus including the incision site of the disc and nucleus pulposus itself. The levels of two chemical factors, prostaglandin E2 and phospholipase E2, in the intervertebral disc were measured before and after laser irradiation. RESULTS: NCV in the laser-irradiated group was significantly faster than in the non-laser-irradiated group. The levels of chemical factors were significantly reduced after laser irradiation. CONCLUSIONS: One of the mechanisms thought to be responsible for PLDD's effectiveness is a decrease in the chemical factors through protein alteration in the intervertebral disc by laser irradiation. Phospholipases A;Dinoprostone Animals;Dinoprostone;Disease Models, Animal;Intervertebral Disc Displacement;Laminectomy;Low-Level Light Therapy;Lumbar Vertebrae;Neural Conduction;Phospholipases A;Rabbits;Spinal Nerve Roots

The use of laser acupuncture for the treatment of neurogenic pruritus in a child--a case history. This report describes the successful treatment using laser acupuncture of a six year old girl with neurogenic pruritus of the abdomen. It is the first case report of neurogenic pruritus treated by laser acupuncture. The main advantage of using low energy laser, as opposed to acupuncture needles, to stimulate points, is that low energy laser causes little or no sensation, which is particularly useful

when treating children. Acupuncture Therapy;Child;Female;Humans;Laser Therapy;Low-Level Light Therapy;Muscle, Skeletal;Pruritus;Treatment Outcome

The effects of laser acupuncture on chronic tension headache--a randomised controlled trial. OBJECTIVE: Headache affects the quality of life for many people throughout the world. Tension headache is among the commonest forms. Acupuncture is the most widely practised non-medicinal treatment for headaches. The purpose of this study was to explore the effects of laser acupuncture in this type of headache. METHODS: Fifty patients with chronic tension-type headache were randomly allocated to treatment or placebo groups. Patients in the treatment group received low energy laser acupuncture to LU7, LI4, GB14, and GB20 bilaterally. Points were irradiated for 43 seconds, and the intensity was 1.3J (approximately 13J/cm2). Ten sessions were given, three per week. The placebo group was treated in a similar way except that the output power of the equipment was set to zero. The outcome variables were headache intensity (VAS), duration of attacks, and number of days with a headache per month, by daily diary, assessed monthly to three months after treatment. RESULTS: There were significant differences between groups ($P<0.001$) in changes from baseline in months one, two and three, in median score for headache intensity (treatment group -5, -3 and -2, placebo group -1, 0 and 0), median duration of attacks (treatment group -6, -4 and -4, placebo group -1, 0 and 0 hours), and median number of days with headache per month (treatment group -15, -10 and -8, placebo group -2, 0 and 0). CONCLUSION: This study suggests that laser acupuncture may be an effective treatment for chronic tension-type headache, but the results should be confirmed in larger and more rigorous trials. Acupuncture Therapy;Adult;Chronic Disease;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Severity of Illness Index;Single-Blind Method;Tension-Type Headache;Treatment Outcome

Depth-resolved phase retardation measurements for laser-assisted non-ablative cartilage reshaping. Since polarization-sensitive optical coherence tomography (PS-OCT) is emerging as a new technique for determining phase retardation in biological materials, we measured phase retardation changes in cartilage during local laser heating for application to laser-assisted cartilage reshaping. Thermally-induced changes in phase retardation of nasal septal cartilage following Nd:YAG laser irradiation were investigated using a PS-OCT system. A PS-OCT system and infrared imaging radiometer were used to record, respectively, depth-resolved images of the Stokes parameters of light backscattered from ex vivo porcine nasal septal cartilage and radiometric temperature changes following laser irradiation. PS-OCT images of cartilage were recorded before (control), during and after laser irradiation. From the measured Stokes parameters (I, Q, U and V), an estimate of the relative phase retardation between two orthogonal polarizations was computed to determine birefringence in cartilage. Phase retardation images of light backscattered from cartilage show significant changes in retardation following laser irradiation. To investigate the origin of retardation changes in response to local heat generation, we differentiated two possible mechanisms: dehydration and thermal denaturation. PS-OCT images of cartilage were recorded after dehydration in glycerol and thermal denaturation in heated physiological saline. In our experiments, observed retardation changes in cartilage are primarily due to dehydration. Since dehydration is a principal source for retardation changes in cartilage over the range of heating profiles investigated, our studies suggest that the use of PS-OCT as a feedback control methodology for non-ablative cartilage reshaping requires further investigation. Animals;Birefringence;Cartilage;Cartilage Diseases;Hyperthermia, Induced;Image Interpretation, Computer-Assisted;In Vitro Techniques;Laser Therapy;Low-Level Light Therapy;Refractometry;Swine;Therapy, Computer-Assisted;Tomography, Optical Coherence

Low-level laser therapy for wound healing: mechanism and efficacy. BACKGROUND: Given the recent interest in light-emitting diode (LED) photomodulation and minimally invasive nonablative

laser therapies, it is timely to investigate reports that low-level laser therapy (LLLT) may have utility in wound healing. OBJECTIVES: To critically evaluate reported in vitro models and in vivo animal and human studies and to assess the qualitative and quantitative sufficiency of evidence for the efficacy of LLLT in promoting wound healing. METHOD: Literature review, 1965 to 2003. RESULTS: In examining the effects of LLLT on cell cultures in vitro, some articles report an increase in cell proliferation and collagen production using specific and somewhat arbitrary laser settings with the helium neon (HeNe) and gallium arsenide lasers, but none of the available studies address the mechanism, whether photothermal, photochemical, or photomechanical, whereby LLLT may be exerting its effect. Some studies, especially those using HeNe lasers, report improvements in surgical wound healing in a rodent model; however, these results have not been duplicated in animals such as pigs, which have skin that more closely resembles that of humans. In humans, beneficial effects on superficial wound healing found in small case series have not been replicated in larger studies. CONCLUSION: To better understand the utility of LLLT in cutaneous wound healing, good clinical studies that correlate cellular effects and biologic processes are needed. Future studies should be well-controlled investigations with rational selection of lasers and treatment parameters. In the absence of such studies, the literature does not appear to support widespread use of LLLT in wound healing at this time. Although applications of high-energy (10-100 W) lasers are well established with significant supportive literature and widespread use, conflicting studies in the literature have limited low-level laser therapy (LLLT) use in the United States to investigational use only. Yet LLLT is used clinically in many other areas, including Canada, Europe, and Asia, for the treatment of various neurologic, chiropractic, dental, and dermatologic disorders. To understand this discrepancy, it is useful to review the studies on LLLT that have, to date, precluded Food and Drug Administration approval of many such technologies in the United States. The fundamental question is whether there is sufficient evidence to support the use of LLLT. Animals;Cell Culture Techniques;Humans;Low-Level Light Therapy;Skin;Wound Healing

Effect of 655-nm diode laser on dog sperm motility. Sperm motility depends on energy consumption. Low-level laser irradiation increases adenosin triphosphate (ATP) production and energy supply to the cell. The aim of this study is to analyse whether the irradiation affects the parameters that characterise dog sperm motility. Fresh dog sperm samples were divided into four groups and irradiated with a 655-nm continuous-wave diode laser with varying doses: 0 (control), 4, 6 and 10 J/cm(2). At 0, 15 and 45 min following irradiation, pictures were taken of all the groups in order to study motility with computer-aided sperm analysis (CASA). Functional tests were also performed. Average path velocity (VAP), linear coefficient (Lin) and beat cross frequency (BCF) were statistically and significantly different when compared to the control. The functional tests also showed a significant difference. At these parameters, the 655-nm continuous-wave diode laser improves the speed and linear coefficient of the sperm. Analysis of Variance;Animals;Disease Models, Animal;Dogs;Equipment Design;Low-Level Light Therapy;Male;Probability;Semen Preservation;Sensitivity and Specificity;Sperm Motility

Treatment of congenital melanocytic nevi using the combined (normal-mode plus Q-switched) ruby laser in Asians: clinical response in relation to histological type. Clinical response of congenital melanocytic nevus (CMN) to the combined normal-mode ruby laser (NMRL) and Q-switched ruby laser (QSRL) treatment method (ie, NM plus QS) was correlated with the histologic depth of nevomelanocytic nests to predict the efficacy rate and therapeutic outcome of the laser treatment. Thirty-four patients with CMN were treated using the combined (NM plus QS) ruby laser method. The clinical results of the laser treatment demonstrated that 20 had excellent response, 11 had good response, 3 had fair response, and there was no poor response. When correlated with the histologic type, the efficacy rate of the combined ruby laser was significantly higher in the superficial

intradermal type than in the others. We conclude that combining the NMRL and QSRL with appropriate parameters to target both superficial and deep nevomelanocytic components provides a greater degree of penetration of laser light. Adolescent;Adult;Asian People;Child;Child, Preschool;Female;Humans;Infant;Low-Level Light Therapy;Male;Melanocytes;Middle Aged;Nevus, Pigmented

Treatment of hypertrophic scars using a long-pulsed dye laser with cryogen-spray cooling. Hypertrophic scars are common and cause functional and psychologic morbidity. The conventional pulsed dye laser (585 nm) has been shown previously to be effective in the treatment of a variety of traumatic and surgical scars, with improvement in scar texture, color, and pliability, with minimal side effects. This prospective study was performed to determine the effectiveness of the long-pulsed dye laser (595 nm) with cryogen-spray cooling device in the treatment of hypertrophic scars. Fifteen Asian patients with 22 hypertrophic scars were treated by the long-pulsed dye laser (595 nm) with cryogen-spray cooling device. In 5 patients, the scar area was divided into halves, one half of which was treated with the laser, whereas the other half was not treated and was used as a negative control. All patients received 2 treatments at 4-week intervals, and evaluations were done by photographic and clinical assessment and histologic evaluation before the treatment and 1 month after the last laser treatment. Treatment outcome was graded by a blind observer using the Vancouver General Hospital (VGH) Burn Scar Assessment Scale. Symptoms such as pain, pruritus, and burning of the scar improved significantly. VGH scores improved in all treated sites, and there was a significant difference between the baseline and posttreatment scores, corresponding to an improvement of 51.4 +/- 14.7% ($P < 0.01$). Compared with the baseline, the mean percentage of scar flattening and erythema elimination was 40.7 +/- 20.7 and 65.3 +/- 25.5%, respectively ($P < 0.01$). The long-pulsed dye laser (595-nm) equipped with cryogen spray cooling device is an effective treatment of hypertrophic scars and can improve scar pliability and texture and decrease scar erythema and associated symptoms. Adolescent;Adult;Asian People;Child;Child, Preschool;Cicatrix, Hypertrophic;Combined Modality Therapy;Cryotherapy;Erythema;Female;Humans;Infant;Low-Level Light Therapy;Male

Temporary dermal scatter reduction: quantitative assessment and implications for improved laser tattoo removal. BACKGROUND AND OBJECTIVES: Temporary dermal clearing, i.e., reduction in the attenuation coefficient of the dermis and epidermis, may lead to improved laser tattoo removal by providing increased efficiency of laser delivery to embedded ink particles and enabling the use of shorter wavelength visible lasers more effective on certain inks. STUDY DESIGNS/MATERIALS AND METHODS: In a hairless guinea pig model of human tattoo, we tested both intradermal and transdermal application of glycerol, using visual inspection, spectral analysis, and optical coherence tomography techniques to assess effectiveness. In controlled experiments, we compared the outcomes of single laser treatment sessions for both cleared and uncleared tattoo sites using Q-switched 755 and 532 nm lasers on three different inks. RESULTS: Intradermal injection of clearing agents induced dermal clearing but resulted in necrosis and scar. Transdermal application of clearing agents resulted in moderate reversible clearing, which was localized to the superficial layers of the skin and did not result in complications. Statistically significant differences in laser treatment outcome were observed relative to a number of treatment parameters including the treatment of certain tattoos by short wavelength lasers. CONCLUSIONS: Temporary clearing of superficial skin layers may be performed in an apparently safe and reliable manner. Clearing should lead to increased penetration of laser light to tattoos and should, therefore, increase treatment efficiency. Further study is needed to determine the degree to which this change is of clinical value. Dermatologic Agents;Glycerol Animals;Dermatologic Agents;Dermis;Feasibility Studies;Glycerol;Guinea Pigs;Ink;Lasers;Low-Level Light Therapy;Models, Animal;Photolysis;Scattering, Radiation;Tattooing;Treatment Outcome

[The efficiency of magneto-laser therapy used in excretory-and-inflammatory form of male infertility]. Acupuncture Therapy;Adult;Female;Humans;Infertility, Male;Low-Level Light Therapy;Magnetics;Male;Pregnancy;Sperm Count;Sperm Motility;Spermatogenesis;Spermatozoa;Time Factors;Treatment Outcome

Low-level laser for prevention and therapy of oral mucositis induced by chemotherapy or radiotherapy. PURPOSE OF REVIEW: Oral mucositis is a common morbid condition associated with chemotherapy or radiotherapy for which there is no standard prophylaxis or treatment. There is increasing evidence that the use of low-level laser can reduced the severity of mucositis associated with chemotherapy or radiation therapy. The purpose of this review is to examine the available evidence for it. RECENT FINDINGS: For most approaches commonly used to prevent or treat chemotherapy-associated or radiotherapy-associated oral mucositis, a recent panel of experts could not find sufficient levels of evidence to recommend or suggest their use. As for low-level laser therapy, the results are difficult to assess and compare because of interoperator variability and because clinical trials are difficult to conduct in that field. Nevertheless, there is accumulating evidence in support of low-level laser therapy. SUMMARY: On the basis of literature data, it is reasonable to conclude that the evidence that low-level laser therapy may be useful in decreasing the severity of chemotherapy-associated or radiotherapy-associated mucositis is substantial, even though there have been few controlled studies in the field of prevention. Antineoplastic Combined Chemotherapy Protocols;Bone Marrow Transplantation;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Medical Oncology;Mouth Mucosa;Radiotherapy;Stomatitis;Transplantation Conditioning

Lasers and light sources for rosacea. Pharmacologic agents remain the mainstay for initial and maintenance treatment of rosacea. However, monochromatic (i.e., laser) and polychromatic light-based therapies are increasingly being used for the treatment of certain signs of rosacea. Despite the increased use of lasers and other light-based therapies, few well-controlled studies have been conducted on their use for the treatment of rosacea. The studies that do exist suggest that these modalities have value in treating erythematotelangiectatic rosacea, including persistent erythema and phymatous rosacea. Light-based therapies should be strongly considered in cases of serious erythema, flushing, and telangiectasia because these signs are not optimally addressed by pharmacologic interventions. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Phototherapy;Rosacea

[Laser correction of microcirculation disorders in patients having CHD with hypercholesterinemia]. The study demonstrates that hypercholesterinemia in patients with coronary heart disease (CHD) is associated with functional depression of microcirculation, increase in total peripheral vascular resistance, reduction in the functional efficiency of heart and decrease in activity tolerance. After receiving a course of low-intensity infrared laser radiation treatment the patients displayed positive changes in blood lipid spectrum, which was associated with improvement in microcirculation, decrease in afterload, increase in economization of heart functioning and activity tolerance. The obtained results demonstrate that the hypolipidemic effect of laser radiation is a substantial factor in the regression of CHD manifestations. Lipids Adult;Coronary Artery Disease;Humans;Hypercholesterolemia;Lipids;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Treatment Outcome

[Laser therapy in the combined treatment of pulmonary tuberculosis in adolescents (a guide for the physician)]. Adolescent;Humans;Low-Level Light Therapy;Tuberculosis, Pulmonary

Influence of laser wavelength and pulse duration on gas bubble formation in blood filled glass capillaries. BACKGROUND AND OBJECTIVES: Hypervascular skin lesions (HVSL) are treated with medical lasers characterized by a variety of parameters such as wavelength lambda, pulse duration

t(p), and radiant exposure E that can be adjusted for different pathology and blood vessel size. Treatment parameters have been optimized assuming constant optical properties of blood during laser photocoagulation. However, recent studies suggest that this assumption may not always be true. Our objective was to quantify thermally induced changes in blood that occur during irradiation using standard laser parameters. STUDY DESIGN/MATERIALS AND METHODS: Glass capillary tubes (diameter D = 100, 200, and 337 microm) filled with fresh or hemolyzed rabbit blood were irradiated once at lambda = 585, 595, or 600 nm, t(p) = 1.5 milliseconds; and also at lambda = 585 nm, t(p) = 0.45 milliseconds. E was increased until blood ablation caused formation of permanent gas bubbles. In a corroborative study, human blood was heated at 50 degrees C and absorbance spectra were measured as a function of time. RESULTS: Threshold radiant exposure, E(thresh), for gas bubble formation was found not to depend on lambda, which might be surprising in view of the 10-fold lower absorption coefficient at 600 nm as compared to 585 nm. The spectroscopic study revealed heat-induced changes in blood constituent composition of hemoglobins (Hb) from initially 100% oxyhemoglobin (HbO2) to deoxyhemoglobin (HHb) and, ultimately, methemoglobin (metHb) as the major constituent. Model calculations of E(thresh)(lambda,D) based on changing constituent blood composition during heating with milliseconds lasers were found to correlate with experimental results. CONCLUSIONS: For laser treatment of HVSL it appears that lambda is of secondary importance and that the choice of t(p) is a more important factor.
Gases;Hemoglobins;Oxyhemoglobins;deoxyhemoglobin;Methemoglobin Animals;Blood;Blood Chemical Analysis;Dose-Response Relationship, Radiation;Equipment and Supplies;Gases;Glass;Hemoglobins;Hot Temperature;Humans;In Vitro Techniques;Laser Coagulation;Lasers;Low-Level Light Therapy;Male;Methemoglobin;Oxyhemoglobins;Rabbits

Comparison of laser beam intensity profiles produced by photodynamic therapy (PDT) and transpupillary thermotherapy (TTT) lasers. BACKGROUND AND OBJECTIVES: For photodynamic therapy (PDT) or transpupillary thermotherapy (TTT) lasers, long irradiation time (typically 1 minute or longer) is used and a large area of retina is treated. Consequently, the power stability but also the light distribution within the laser beam plays a major role. This study aimed to evaluate beam intensity profiles produced by several PDT and TTT lasers. STUDY DESIGN/MATERIALS AND METHODS: A beam profile analyzer (Cohu 4812 camera connected to a LPA-300PC, Spiricon, Logan, UT) was used to compare the beam profiles of PDT lasers: OPAL (Lumenis, USA); ACTIVIS (Quantel Medical, France), VISULAS (Zeiss, Germany). Spots of 2, 3, 4, and 5 mm were tested with each laser. Similarly, TTT lasers: OCULIGHT SLx (Iridex, CA) and IRIDIS trade mark (Quantel Medical, France) were evaluated with 2 and 3 mm spot diameter and power ranging from 200 to 1,000 mW. RESULTS: PDT lasers: OPAL had a "top hat" and homogeneous profile whatever the spot size. Numerous micro-spikes and micro-nadirs of power were observed with the ACTIVIS and the VISULAS. TTT lasers: for the IRIDIS the beam shape was rather gaussian, but the homogeneity was reduced by micro-spikes of power. With the OCULIGHT Slx the beam shape was rather top hat and only few micro-spikes or micro-nadirs of power could be disclosed. DISCUSSION: The literature tends to prove that the shape and homogeneity of the beam profile could play a role on the efficacy of the treatment. CONCLUSION: Since PDT and TTT lasers display different beam profiles, this parameter should be carefully evaluated when performing clinical evaluations of PDT or TTT treatments. Photosensitizing Agents;Porphyrins;Verteporfin Laser Coagulation;Light;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Porphyrins;Retinal Diseases;Verteporfin

Reactivation of ophthalmic herpes zoster following pulsed-dye laser treatment for inflammatory acne vulgaris. Acne Vulgaris;Adult;Female;Herpes Zoster Ophthalmicus;Herpesvirus 3, Human;Humans;Low-Level Light Therapy;Virus Activation

In vivo quantification of the structural abnormalities in psoriatic microvessels before and after pulsed dye laser treatment. BACKGROUND: Microvascular abnormalities (capillary elongation, widening and tortuosity) are a characteristic feature of psoriasis and form one of the pathological diagnostic criteria. These changes occur early in the progression of a psoriatic plaque, before there is clinical or histological evidence of epidermal hyperplasia. Treatment of psoriatic microvessels with a pulsed dye laser (PDL) has been associated with both clinical improvement and clearance of lesions. OBJECTIVES: To quantify the structural vascular abnormalities in plaque skin using noninvasive techniques in vivo. Investigations were carried out before and after PDL treatment to determine the nature of laser-induced microvascular changes and the relationship between these changes and clinical improvement. METHODS: Plaque microvessels were visualized using native capillaroscopy. Plaques were then treated three times with the PDL at 14-day intervals. Native capillaroscopy was repeated at 2 and 6 weeks after the final laser treatment. Images were analysed using a combination of nonstereological and stereological measurements. RESULTS: Whole body disease was stable. Treated plaques showed a 48% reduction in plaque severity score ($P < 0.01$). Native studies showed that the PDL significantly reduced plaque microvessel density ($P < 0.05$), image area fraction ($P < 0.01$), microvessel length density ($P < 0.01$) and vessel image width ($P < 0.01$). The reduction in plaque severity score (which denoted clinical improvement) was related quantitatively to the reduction in microvessel area per unit area of plaque skin, i.e. the image area fraction (correlation coefficient = 0.772, $P < 0.01$). The greatest response of plaque microvessels was within 2 weeks after the final laser treatment, while the greatest reduction in plaque severity score occurred between 2 and 6 weeks after the final laser treatment, i.e. clinical improvement was preceded by microvascular improvement. CONCLUSIONS: These findings indicate that there is a close correlation between the state of the superficial vasculature and the clinical status of psoriasis. The expanded superficial microvascular bed in plaque skin is a necessary component for maintaining clinical lesions and these blood vessels are thus a legitimate target for treatment.
Adult;Aged;Capillaries;Female;Humans;Low-Level Light Therapy;Male;Microscopic Angioscopy;Middle Aged;Psoriasis;Severity of Illness Index;Skin;Treatment Outcome

Characterization of measurement artefacts in fluoroptic temperature sensors: implications for laser thermal therapy at 810 nm. BACKGROUND AND OBJECTIVES: Fluoroptic sensors are used to measure interstitial temperatures but their utility for monitoring laser interstitial thermal therapy (LITT) is unclear because these sensors exhibit a measurement artefact when exposed to the near-infrared (NIR) treatment light. This study investigates the cause of the artefact to determine whether fluoroptic sensors can provide reliable temperature measurements during LITT. STUDY DESIGN/MATERIALS AND METHODS: The temperature rise measured by a fluoroptic sensor irradiated in non-absorbing media (air and water) was considered an artefact. Temperature rise was measured as a function of distance from a laser source. Two different sensor designs and several laser powers were investigated. A relationship between fluence rate and measurement artefact in water was determined and coupled with a numerical simulation of LITT in liver to estimate the error in temperature measurements made by fluoroptic sensors in tissue in proximity to the laser source. The effect of ambient light on the performance of sensors capped with a transparent material ("clear-capped sensors") was also investigated. RESULTS: The temperature rise recorded in air by both clear- and black-capped fluoroptic sensors decreased with distance from a laser source in a manner similar to fluence rate. Sensor cap material, laser power, and the thermal properties of the surrounding medium affected the magnitude of the artefact. Numerical simulations indicated that the accuracy of a clear-capped fluoroptic sensor used to monitor a typical LITT treatment in liver is > 1 degrees C provided the sensor is further than approximately 3 mm from the source. It was also shown that clear-capped fluoroptic sensors are affected by ambient light. CONCLUSIONS: The measurement

artefact experienced by both black-capped and clear-capped fluoroptic sensors irradiated by NIR light scales with fluence rate and is due to direct absorption of the laser light, which results in sensor self-heating. Clear-capped fluoroptic sensors can be used to accurately monitor LITT in tissue but should be shielded from ambient light. Water Air;Artifacts;Body Temperature;Hot Temperature;Humans;Liver;Low-Level Light Therapy;Models, Biological;Thermography;Thermometers;Water

Low-level laser therapy (LLLT) efficacy in post-operative wounds. OBJECTIVE: The aim of this paper was to investigate the efficacy of low-level laser radiation (LLLR) with wavelength of 904 nm on the stimulation of the healing process of postoperative aseptic wounds (early scar). BACKGROUND DATA: Low-level laser therapy (LLLT) has been increasingly used to treat many disorders, including wounds. However, despite such increased clinical usage, there is still controversy regarding the efficacy of this wound treatment in curent clinical practice. METHODS: LLLT has been used to treat cutting plague in the right instep and on the left foot. Both resulted from sutured wounds. The clinical evaluation by semiquantitative methods is presented. RESULTS: Clinical evaluation showed that the healing process of these postoperatively treated wounds has occurred and that the functional recovery of the patients (i.e., return to their ordinary life) was faster than without treatment. CONCLUSION: LLLR with wavelength of 904 nm to stimulate postoperative aseptic wounds (early scar) is efficient in both cases of cutting plague. Foot Injuries;Humans;Low-Level Light Therapy;Postoperative Care;Wound Healing

Retrospective study of adjunctive diode laser therapy for pain attenuation in 662 patients: detailed analysis by questionnaire. OBJECTIVE: The aim of this study was to assess the long-term effects of low-level laser therapy (LLLT) through a retrospective survey using questionnaires. BACKGROUND DATA: The use of LLLT for chronic pain attenuation has been reported in the international literature for over 20 years. METHODS: We used a series of diode laser systems in which the most effective wavelength was consistently found to be 830 nm with an output power in continuous-wave of 60 mW. Subjects were 1,087 patients treated by LLLT at the Shiroto Clinic from April 1992 to August 1995. Questionnaires were sent to subjects in September and October 1996. RESULTS: The reply rate was 60.9%, comprising 662 questionnaires (265 males, 397 females, mean age of 53.4 years). The total efficacy rating (excellent plus good) immediately after LLLT was 46.8% in men and 47% in women. At the time of the survey, this rose to 73.3% in men and 76.8% in women, with positive effects also recorded on psychosomatic factors such as well-being, physical energy, general fatigue, mental vigor, and emotional stability. LLLT effects continued for 1-3 days. No statistically significant difference in efficacy was seen between males and females. LLLT as used in the study is therefore considered safe, effective, and side-effect-free, making it an ideal adjunctive therapeutic modality for intractable chronic and other pain. CONCLUSION: Infrared diode LLLT is therefore considered safe, effective, and side-effect-free, making it an ideal adjunctive therapeutic modality for intractable chronic pain. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain, Intractable;Retrospective Studies;Surveys and Questionnaires

Nociceptive scores and endorphin-containing cells reduced by low-level laser therapy (LLLT) in inflamed paws of Wistar rat. OBJECTIVE: This study aimed to investigate how local pain relief is mediated by laser therapy and how dose affects the relationship. METHODS: Inflammation was induced in the hind-paws of Wistar rats. Two groups of rats received 780-nm laser therapy (Spectra-Medics Pty Ltd.) at one of two doses (2.5 and 1 J/cm(2)). One group acted as a control. Scores of nociceptive threshold were recorded using paw pressure and paw thermal threshold measures. RESULTS: A dose of 1 J/cm(2) had no statistically significant effect on antinociceptive responses. A dose of 2.5 J/cm(2) demonstrated a statistically significant effect on paw pressure threshold ($p < 0.029$) compared to controls. There was no difference in paw thermal threshold responses and paw

volumes at either dose. Immunohistochemistry in control animals demonstrated normal beta-endorphin containing lymphocytes in control inflamed paws but no beta-endorphin containing lymphocytes in rats that received laser at 2.5 J/cm(2). CONCLUSION: The results confirm previous findings that the effect of laser therapy is dose-related. The mechanism of effect may occur via a differentiated pressure-sensitive neural pathway rather than a thermal-sensitive neural pathway. The significance of the immunohistochemistry findings remains unknown. beta-Endorphin Animals;Hindlimb;Inflammation;Low-Level Light Therapy;Lymphocytes;Male;Pain;Pain Threshold;Radiotherapy Dosage;Rats;Rats, Wistar;beta-Endorphin

Infrared laser light reduces loading time of dental implants: a Raman spectroscopic study. OBJECTIVE: The aim of this study was to assess, through near-infrared Raman spectroscopy (NIRS), the incorporation of hydroxyapatite of calcium (CHA; approximately 960 cm(1))--on the healing bone around dental implants submitted or not to low-level laser therapy (LLLT) (lambda830 nm). BACKGROUND DATA: The process of maturation of the bone is important for the success of dental implants, as it improves the fixation of the implant to the bone, allowing the wearing of a prosthesis. LLLT has been suggested as a mean of improving bone healing because of its biomodulatory capabilities. METHODS: Fourteen rabbits received a titanium implant on the tibia; eight of them were irradiated with lambda830-nm laser (seven sessions at 48-h intervals, 21.5 J/cm(2) per session, 10 mW, phi approximately 0.0028 cm(2), 85 J/cm(2) treatment dose), and six acted as control. The animals were sacrificed at 15, 30, and 45 days after surgery. Specimens were routinely prepared for Raman spectroscopy. Twelve readings were taken on the bone around the implant. RESULTS: The results showed significant differences in the concentration of CHA on irradiated and control specimens at both 30 and 45 days after surgery ($p < 0.001$). CONCLUSION: It is concluded that LLLT does improve bone healing, and this can be safely assessed by Raman spectroscopy. Coated Materials, Biocompatible;Dental Implants;Hydroxyapatites;Titanium Animals;Coated Materials, Biocompatible;Dental Implants;Hydroxyapatites;Lasers;Male;Osseointegration;Rabbits;Spectrum Analysis, Raman;Tibia;Titanium

Low-energy laser irradiation promotes cellular redox activity. Low-energy visible light (LEVL) has been shown to stimulate cell functions. This is called "photobiostimulation" and has been used successfully over the last three decades for treating a range of conditions, including soft tissue injuries, severe wounds, chronic pain, and more. Nevertheless, the mechanism of photobiostimulative processes is still being debated. It is obvious that, in order to interact with the living cell, light has to be absorbed by intracellular chromophores. In a search for chromophores responsible for photobiostimulation, endogenous porphyrins, mitochondrial and membranal cytochromes, and flavoproteins were found to be suitable candidates. The above-mentioned chromophores are photosensitizers that generate reactive oxygen species (ROS) following irradiation. As the cellular redox state has a key role in maintaining the viability of the cell, changes in ROS may play a significant role in cell activation. In the present review, we summarize evidence demonstrating that various ROS and antioxidants are produced following LEVL illumination. We found that very little evidence for NO formation in illuminated non-vascular smooth muscle cells exists in the literature. We suggest that the change in the cellular redox state which plays a pivotal role in maintaining cellular activities leads to photobiostimulative processes. Antioxidants;Reactive Oxygen Species Antioxidants;Humans;Lasers;Reactive Oxygen Species

Protein kinase C expression in the rabbit retina after laser photocoagulation. BACKGROUND: Laser photocoagulation is a well-established treatment for diabetic retinopathy but the mechanism behind its effectiveness has not been elucidated. The protein kinase C (PKC) family is a group of enzymes which has been the subject of extensive interest in clinically related research since the advent of its role in the pathogenesis of diabetic retinopathy. With this study we wanted to explore

whether PKC expression is altered in the retina after laser photocoagulation. METHODS: Normal rabbit eyes were treated with laser photocoagulation of varying intensity and examined after 30 min to 7 weeks. Treated and untreated regions of the retina were investigated histologically with the MC5 monoclonal antibody against PKC. Labeling for glial fibrillary acidic protein (GFAP), as well as hematoxylin and eosin (H&E) staining was also performed to assess the laser-induced trauma. RESULTS: In the normal retina, the MC5 antibody labeled rod bipolar cells and photoreceptor outer segments corresponding to PKC alpha. A translocated PKC expression with labeling concentrated in the rod bipolar terminals was seen in specimens examined 30 min after laser treatment, and after 1 week, no expression was seen in any part of the retina. After 2 weeks, PKC expression again indicated a translocated labeling pattern. After 5 weeks, labeling was found only in rod bipolar terminals in the peripheral retina. When comparing high- and low-intensity laser treatment 7 weeks postoperatively, no labeling was found in the high intensity-treated retinas, whereas low intensity-treated eyes displayed a near-normal labeling pattern. H&E staining revealed focal neuroretinal edema immediately after laser treatment, also in untreated areas. At later stages, destruction of the outer nuclear layer and migration of pigment epithelial cells in laser-lesioned areas was seen. GFAP-labeled MÃ¼ller cells were seen 1 week postoperatively in the entire retina. Labeling after this time decreased, but was still present in laser spots after 5 and 7 weeks. CONCLUSIONS: Laser photocoagulation alters the expression of PKC in the entire normal rabbit retina. The response follows a temporal pattern and is also related to laser intensity. These findings may help to explain the high efficacy of laser treatment in diabetic retinopathy. Antibodies, Monoclonal;Protein Kinase C Animals;Antibodies, Monoclonal;Fluorescent Antibody Technique, Indirect;Laser Coagulation;Protein Kinase C;Rabbits;Retina;Time Factors

Laser therapy accelerates initial attachment and subsequent behaviour of human oral fibroblasts cultured on titanium implant material. A scanning electron microscope and histomorphometric analysis. The aim of the study was to investigate the effect of low-level laser therapy (LLLT) on attachment and proliferation of human gingival fibroblasts (HGF) cultured on titanium implant material. HGF were exposed to gallium-aluminum-arsenide diode laser at dosages of 1.5 or 3 J/cm(2) and then cultured on commercially pure titanium discs. Cell profile areas were measured after 1, 3 and 24 h, using scanning electron microscopy and an automatic image analyzer. The results were expressed as percentage of attachment. In order to investigate the effect of LLLT on cellular growth after 8 and 10 days, HGF were cultured on titanium discs for 24 h and then exposed to laser irradiation on 3 consecutive days. Colony-forming efficiency (CFE) and clonal growth rates (CGR) were measured. Cell viability was determined by Hoechst and prodidium iodide staining. Non-lased cultures served as controls. Morphologically, the cells spread well on all titanium surfaces, indicating good attachment by both irradiated and non-irradiated cells. Fibroblasts exposed to laser irradiation had significantly higher percentages of cell attachment than the non-exposed cells ($P<0.05$). CFE and CGR were also enhanced for the irradiated cells ($P<0.05$). Cell viability was high (>90%) in the irradiated and control groups, without significant differences. It is concluded that in vitro LLLT enhances the attachment and proliferation of HGF on titanium implant material. Dental Implants;Titanium Cell Adhesion;Cell Proliferation;Cells, Cultured;Dental Implants;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Surface Properties;Titanium

Laser therapy in the treatment of dentine hypersensitivity. Cervical dentine hypersensitivity is the most frequent complaint among reported odontalgias. Thus, this study evaluated the effectiveness of two types of lasers (660 nm wavelength red, and 830 nm wavelength infrared) as dentine desensitizers, as well as both the immediate and late therapeutic effects in individuals 25 to 45 years of age. A total of 40 teeth with cervical exposure were treated in 4 sessions. They were

divided into 2 groups according to treatment. A 660 nm wavelength red diode laser and an 830 nm wavelength infrared diode laser were used. Dentine sensitivity to cold nociceptive stimulus was evaluated by means of a pain numeric scale from zero to 10 before each treatment session, at 15 and 30 min after irradiation, and in a follow-up period of 15, 30 and 60 days after the end of treatment. Significant levels of dentinal desensitization were only found in patients ranging in age from 25 to 35 years. The 660 nm red diode laser was more effective than the 830 nm infrared laser and a higher level of desensitization was observed at the 15 and 30 minute post-irradiation examinations. The immediate and late therapeutic effects of the 660 nm red diode laser were more evident in 25-35-year-old patients compared with those of the 830 nm infrared diode laser, in terms of the different age groups. Adult;Age Factors;Analysis of Variance;Dentin Sensitivity;Female;Humans;Infrared Rays;Laser Therapy;Light;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement

[Preventing locomotory diseases caused by static, dynamic load on hands and by local vibration]. Adult;Female;Hand;Humans;Low-Level Light Therapy;Male;Middle Aged;Occupational Diseases;Occupational Exposure;Osteochondritis;Regional Blood Flow;Vibration

Photodynamic effect of argon and diode laser on cholesteatoma cell cultures after intravital staining with absorption enhancers. Chronic epitympanic otitis media, or chronic suppurative osteitis, is a destructive form of chronic middle-ear inflammation. The therapy of choice is complete surgical removal of the squamous epithelium from the middle ear. It is often impossible to inspect all areas of the middle ear with the posterior canal wall intact. Not all recesses can be reliably monitored with the microscope, particularly in the area of the antrum and hypotympanum. Residual squamous epithelium here causes frequent recurrences following cholesteatoma surgery. This study examines the effect of argon and diode lasers on cholesteatoma tissue. The aim is to develop a laser treatment selectively directed against cholesteatoma cells that can be performed after cholesteatoma surgery to eliminate any residual squamous epithelium. Intraoperatively harvested monolayer-cultured cholesteatoma cells stained in vivo with various absorption enhancers served as the in vitro examination model. Argon (499 nm) and diode lasers (810 nm) were applied since their irradiation has an appropriate tissue penetration depth and is absorbed by various chromophores such as neutral red (475-500 nm), fluorescein (488 nm), and indocyanine green (790-810). Intracellular staining of cultured cells increased the optical density at the wavelength corresponding to the dye. Neutral red damaged 50-60% of cultured cells merely by intracellular accumulation at high concentrations. An additive cell destruction of about 30% was achieved by also applying argon laser irradiation. Fluorescein diacetate caused no appreciable stain-induced damage to cultured cholesteatoma cells. Argon laser irradiation destroyed up to 60% of the cultures. Indocyanine green resulted in only minor damage to cultured cells. The diode laser destroyed up to 60% of the irradiated cells. Selective staining of cholesteatoma cells was not achieved with any of the dyes examined. Thus, other stained tissue could be damaged. Staining and subsequent laser irradiation destroys up to 60% of cultured cholesteatoma cells. Unstained irradiated cells are not affected. Indocyanine green and fluorescein are nontoxic and may thus be used as absorption enhancers. The diode and argon lasers appear to be basically suitable. Cell staining is not selective, i.e., other tissues would also be stained and damaged. To avoid such unwanted damage, it would be desirable to couple the chromophore to a specific antibody that binds only to cholesteatoma cells. Coloring Agents;Fluoresceins;Neutral Red;Argon;Indocyanine Green;diacetylfluorescein Argon;Cell Line;Cholesteatoma, Middle Ear;Coloring Agents;Fluoresceins;Humans;Indocyanine Green;Keratinocytes;Low-Level Light Therapy;Neutral Red;Photometry;Staining and Labeling

[Complex treatment of elderly patients with pain reflectory manifestations of lumbosacral osteochondrosis and peripheral circulation disorder]. Involutional age makes difficult the

treatment of pain syndromes of vertebra origin. Concomitant diseases, age stress syndrome, hormone disbalance constrain the management of the disease. Combination of laser stimulation, reflexotherapy, psychodiagnostics and psychocorrection enhances the efficiency of the treatment of pain syndromes in patients with lumbo-sacral radiculitis and peripheral circulation disorder. Aged;Humans;Low Back Pain;Low-Level Light Therapy;Lumbosacral Region;Microcirculation;Osteochondritis;Peripheral Vascular Diseases;Psychotherapy;Reflexotherapy;Treatment Outcome

[Electrophysiological changes in a complex treatment of lumbosacral pain syndrome in patients of different age group]. The influence of two methods of treatment (pharmacological and combination with infra-red laser puncture and manual therapy) on clinical picture, electromyographic indices in 165 patients of different age group with lumbosacral radiculitis has been studied by the author. The use of these methods in treatment of such patients is substantiated by the obtained data. Vitamin B Complex Adult;Aged;Aging;Electrophysiology;Female;Humans;Low Back Pain;Low-Level Light Therapy;Lumbosacral Region;Male;Massage;Middle Aged;Muscle, Skeletal;Pain Measurement;Vitamin B Complex

[Study on time-resolved spectra shape of aluminum plasma's characteristic radiation]. Aluminum plasma was obtained with a Nd:YAG pulsed laser beam ablating target aluminum. The radiation information of the plasma was recorded on a time and space resolution basis. So the time-resolved spectra of Al plasma were obtained with a time delay of 10 to 10,000 ns. From those spectra, we acquired the time-resolved spectra of Al I 396.15 and Al I 394.40 nm, the characteristic lines of Al plasma radiation. The shape of the two characteristic lines was studied from 800 to 10,000 ns delay. Further more, the two characteristic lines were respectively fitted in Lorentz profile and Gauss profile with Lorentz and Gauss function. As a result, all the characteristic lines after 1000 ns delay well fitted Lorentz profile, and before that time, they also fitted each other, but slightly. In the whole range of time delay, the experimental lines departed by far from the fitted Gauss profile. So we could conclude that the shape of Al I 396.15 and that of Al I 394.40 nm were all Lorentz lines, not Gauss ones. The half-high-full widths of the two characteristic lines were determined, aided with the Lorentz lines fitting. Compared with the natural widths of the two lines, the experimental results were much wider than the theoretical values. Aluminum Acoustics;Aluminum;Elasticity;Kinetics;Lasers, Dye;Light;Low-Level Light Therapy;Radiation;Spectrometry, Fluorescence;Thermodynamics;Ultraviolet Rays

Infrared thermotherapy: from laboratory to clinic. Thermotherapy by the transpupillary route is an effective outpatient eye-salvaging therapy for intraocular tumors. It does not require surgery, it can be repeated, and it does not affect the healthy structures of the eye. Thermotherapy by the transscleral route is under investigation and may have potential in the treatment of choroidal melanomas. The indications for chemoreduction, thermochemotherapy, and thermotherapy for retinoblastoma remain under investigation. Animals;Choroid;Choroid Neoplasms;Humans;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Melanoma;Prognosis;Treatment Outcome

[Protective effect of low-level laser irradiation on acupuncture points combined with iontophoresis against focal cerebral ischemia-reperfusion injury in rats]. OBJECTIVE: To investigate the effects of low-level laser irradiation on acupuncture points combined with iontophoresis against brain damage after middle cerebral artery occlusion (MCAO) in rats. METHODS: Sixty-nine SD rats were randomly divided into five groups, including normal group, sham operation group, model group, electro-acupuncture group and low-level laser irradiation on acupuncture points combined with iontophoresis group (LLLI group). The cerebral ischemia-reperfusion (I/R) model was established by thread embolism of middle cerebral artery. The rats in the LLLI group, as well as the electro-

acupuncture group were given treatment as soon as the occlusion finished (0 hour) and 12, 24 hours after the occlusion. We observed the changes of neurological deficit scores and the body weight of the rats at different time. The activity of superoxide dismutase (SOD) and the content of malondialdehyde (MDA) in the ratos brain tissue were tested. RESULTS: The neurological deficit score of the LLLI group was significantly lower than that of the model group. The body weight and the activity of SOD of the rats decreased slightly, and the content of MDA decreased significantly after the treatment. CONCLUSION: The low-level laser irradiation on acupuncture points combined with iontophoresis can prevent focal cerebral ischemia-reperfusion injury. One of its mechanisms may be increasing the activity of SOD and decreasing the damage of the oxidation products to the body. Drugs, Chinese Herbal;Superoxide Dismutase Acupuncture Points;Animals;Brain;Drugs, Chinese Herbal;Infarction, Middle Cerebral Artery;Iontophoresis;Laser Therapy;Male;Random Allocation;Rats;Rats, Sprague-Dawley;Reperfusion Injury;Superoxide Dismutase

American Society for Laser Medicine and Surgery 25th Annual Meeting, Lake Buena Vista, Florida, March 30 - April 3, 2005, Abstracts. Animals;Humans;Laser Coagulation;Laser Therapy;Lasers;Low-Level Light Therapy

[New treatment methods in pathologies of the choroid and retina including the use of subthreshold power of diode infrared laser radiation]. Aged;Animals;Diabetic Retinopathy;History, 19th Century;History, 20th Century;Humans;Low-Level Light Therapy;Macula Lutea;Macular Degeneration;Middle Aged;Pigment Epithelium of Eye;Retinal Neovascularization;Russia;Treatment Outcome;United States

The challenge of preventing vision loss from diabetic retinopathy. Diabetes is present in 7% of Missourians. Another 52% are at risk. Periodic eye examinations are key to averting vision loss from diabetic retinopathy. Signs of diabetic retinopathy are evident long before vision loss and include microaneurysms, retinal hemorrhage, microvascular and venous caliber abnormalities and neovascularization. Loss of vascular integrity can lead to retinal edema and neovascular growth. Laser ablation of the peripheral retina can curb neovascular growth. It can also help stabilize macular edema. Blindness;Diabetic Retinopathy;Education, Medical, Continuing;Humans;Low-Level Light Therapy;Missouri

Principles of cosmetic dentistry in orthodontics: Part 3. Laser treatments for tooth eruption and soft tissue problems. Esthetics, Dental;Gingival Hypertrophy;Gingivoplasty;Humans;Laser Therapy;Low-Level Light Therapy;Orthodontic Brackets;Orthodontic Space Closure;Stomatitis, Aphthous;Tooth, Impacted;Tooth, Unerupted

Cellular effects of low power laser therapy can be mediated by nitric oxide. BACKGROUND AND OBJECTIVES: The objective of this study was to investigate the possibility of involvement of nitric oxide (NO) into the irradiation-induced increase of cell attachment. These experiments were performed with a view to exploring the cellular mechanisms of low-power laser therapy. STUDY DESIGN/MATERIALS AND METHODS: A suspension of HeLa cells was irradiated with a monochromatic visible-to-near infrared radiation (600-860 nm, 52 J/m2) or with a diode laser (820 nm, 8-120 J/m2) and the number of cells attached to a glass matrix was counted after 30 minute incubation at 37 degrees C. The NO donors sodium nitroprusside (SNP), glyceryl trinitrate (GTN), or sodium nitrite (NaNO2) in the concentration range 5 x 10(-9)-5 x 10(-4)M were added to the cellular suspension before or after irradiation. The action spectra and the concentration and fluence dependencies obtained were compared and analyzed. RESULTS: The well-structured action spectrum for the increase of the adhesion of the cells, with maxima at 619, 657, 675, 740, 760, and 820 nm, points to the existence of a photoacceptor responsible for the enhancement of this property (supposedly cytochrome c oxidase, the terminal respiratory chain enzyme), as well as signaling pathways between the cell mitochondria, plasma membrane, and nucleus. Treating the cellular suspension with SNP (5 x

10(-5)M) before irradiation significantly modifies the action spectrum for the enhancement of the cell attachment property (band maxima at 642, 685, 700, 742, 842, and 856 nm). The action of SNP, GTN, and NaNO2 added before or after irradiation depends on their concentration and radiation fluence. CONCLUSIONS: The NO donors added to the cellular suspension before irradiation eliminate the radiation-induced increase in the number of cells attached to the glass matrix, supposedly by way of binding NO to cytochrome c oxidase. NO added to the suspension after irradiation can also inhibit the light-induced signal downstream. Both effects of NO depend on the concentration of the NO donors added. These results indicate that NO can control the irradiation-activated reactions that increase the attachment of cells. Nitric Oxide Donors;Nitroprusside;Nitric Oxide;Nitroglycerin;Sodium Nitrite Cell Adhesion;Female;HeLa Cells;Humans;Light;Low-Level Light Therapy;Nitric Oxide;Nitric Oxide Donors;Nitroglycerin;Nitroprusside;Sodium Nitrite

[Laser treatment supposedly modifies dentin. 1 visit to the dentist--an no caries from then on? (interview by Dr. Thomas Meissner)]. Carbonates;Fluorides Acid-Base Equilibrium;Awards and Prizes;Carbonates;Child;Clinical Trials as Topic;Dental Caries;Dental Enamel;Fluorides;Humans;Low-Level Light Therapy;Treatment Outcome

Patients with moderate chemotherapy-induced mucositis: pain therapy using low intensity lasers. BACKGROUND: Intensive cancer therapy normally affects malignant and normal cells with high replication rates. Cells in the gastrointestinal tract are therefore commonly affected by cytotoxins. This often results in the development of chemotherapy-induced oral mucositis (COM). COM is the inflammatory response of the oral mucous membrane to the chemotherapy drugs. Low level laser therapy (LLLT) has proved to be effective in treating and repairing biologically damaged tissue and to reduce pain. LLLT has also proven to be an efficient method for the prevention of oral mucositis. OBJECTIVE: To investigate the effect of LLLT on pain relief among patients who have developed COM. METHOD: The study was performed as a clinical test with a sample consisting of 13 adult patients receiving oncology treatment. The patients were treated during a 5-day period, and the pain was measured before and after each laser application. The laser used was an AsGaAl, with a wavelength of 830 nm and a potency of 250 mW. The energy given was 35 J cm(-2). ANALYSIS: The results were analysed using the Wilcoxon test. RESULTS: There was a significant (P = 0.007) 67% decrease in the daily average experience of pain felt before and after each treatment, confirming that LLLT can relieve pain among patients who have developed COM. STUDY LIMITATIONS: The low number of COM patients at the hospital did not allow a control group to be included in the study, and therefore the results contain a potential placebo effect. IMPLICATIONS FOR NURSING CARE: The most important benefit the authors consider to be the value for the patients of better and quicker treatment with a drastic reduction in painful mucositis. Antineoplastic Agents Adult;Antineoplastic Agents;Humans;Low-Level Light Therapy;Mouth Mucosa;Pain Management;Pain Measurement;Stomatitis;Treatment Outcome

[Laser puncture in the treatment of reflectory manifestations of lumbosacral osteochondrosis in elderly patients in geriatric hospital]. Peculiarities of involution age are of great importance choosing treatment methods. Laser puncture was shown to be an effective method in treatment of pain syndromes in elder patients with lumbosackul radiculitis. Combination of pharmacotherapy, laser stimulation, acupuncture, vaccum massage, bishophit use enhances considerably efficiency of the treatment. Acupuncture Therapy;Adaptation, Physiological;Aged;Aged, 80 and over;Health Services for the Aged;Humans;Low-Level Light Therapy;Lumbosacral Region;Microcirculation;Osteochondritis;Pain Measurement;Treatment Outcome

Lupus miliaris disseminatus faciei: treatment with the 1450-nm diode laser. Adult;Biopsy, Needle;Drug Therapy, Combination;Facial Dermatoses;Female;Follow-Up

Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Risk Assessment;Severity of Illness Index;Treatment Outcome
Multicenter study of the safety and efficacy of a 585 nm pulsed-dye laser for the nonablative treatment of facial rhytides. OBJECTIVE: The objective of this study was to assess the safety and efficacy of a 585 nm flashlamp pulsed-dye laser for the nonablative treatment of facial rhytides. METHODS: A multicenter prospective randomized controlled study on 58 volunteers was performed. A split-face approach was adopted, with one periorbital region acting as a control and the other receiving either one or two treatments. Patients were photographed and imaged three-dimensionally before and after treatment. Histologic sections were analyzed. RESULTS: Three-dimensional topographic evaluation showed improvements of 9.8% (p = .0022) and 15% (p = .0029) in surface roughness for single and double treatments, respectively. Histology revealed an increase in type I collagen messenger ribonucleic acid expression, type III procollagen, chondroitin sulfate, and grenz zone thickness. Two treatments resulted in greater improvement than one treatment. CONCLUSION: Clinical improvement was achieved following a single treatment. Further improvement was observed following a second treatment. The subjective evaluation of clinical improvement was consistent with both histologic and topographic quantitative measurements. Adult;Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Rhytidoplasty;Skin Aging;Statistics, Nonparametric;Treatment Outcome
[Male infertility treatment using KAP-ELM-01 apparatus complex "Andro-Gin"]. Adult;Ejaculation;Electric Stimulation Therapy;Electromagnetic Fields;Humans;Infertility, Male;Low-Level Light Therapy;Male;Middle Aged;Sperm Count;Sperm Motility;Spermatogenesis;Treatment Outcome
Lightwave of the future. Carpal Tunnel Syndrome;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Patient Satisfaction;Prognosis;Recovery of Function;Risk Assessment;Severity of Illness Index;Treatment Outcome
In vitro and in vivo efficacy of new blue light emitting diode phototherapy compared to conventional halogen quartz phototherapy for neonatal jaundice. High intensity light emitting diodes (LEDs) are being studied as possible light sources for the phototherapy of neonatal jaundice, as they can emit high intensity light of narrow wavelength band in the blue region of the visible light spectrum corresponding to the spectrum of maximal bilirubin absorption. We developed a prototype blue gallium nitride LED phototherapy unit with high intensity, and compared its efficacy to commercially used halogen quartz phototherapy device by measuring both in vitro and in vivo bilirubin photodegradation. The prototype device with two focused arrays, each with 500 blue LEDs, generated greater irradiance than the conventional device tested. The LED device showed a significantly higher efficacy of bilirubin photodegradation than the conventional phototherapy in both in vitro experiment using microhematocrit tubes (44+/-7% vs. 35+/-2%) and in vivo experiment using Gunn rats (30+/-9% vs. 16+/-8%). We conclude that high intensity blue LED device was much more effective than conventional phototherapy of both in vitro and in vivo bilirubin photodegradation. Further studies will be necessary to prove its clinical efficacy. gallium nitride;Gallium;Bilirubin Animals;Bilirubin;Biochemistry;Gallium;Hematocrit;In Vitro Techniques;Light;Phototherapy;Rats;Rats, Gunn
[Experimental use of low-energy infrared laser radiation to stimulate antitumor effect of cyclophosphane]. The potential of increased antitumor effect of cyclophosphane used in conjunction with low-energy infra-red laser radiation was studied in sarcoma-45--bearing rats. Exposure to certain modes stimulated non-specific antitumor resistance and enhanced antitumor influence of the drug by reducing its damaging effect. Also, it inhibited refractory leukopenia and marked intoxication induced by antistressor reactions. Antineoplastic Agents,

Alkylating;Cyclophosphamide Animals;Antineoplastic Agents, Alkylating;Cyclophosphamide;Dose-Response Relationship, Radiation;Infrared Rays;Low-Level Light Therapy;Male;Neoplasms, Experimental;Rats
[Angioroentgenologic response of rat M-1 sarcoma to low-energy infrared laser irradiation at varying frequency]. After rats with sarcoma M-1 inoculated in the femur area were exposed to low-energy (0.54 mT1) infra-red laser irradiation, 100Hz, for 10 min, the number of contrast-enhanced vessels of tumor fell sharply as compared with controls. That effect lasted for almost 24 hrs. At 1kHz, the total-sum of diameters of such vessels still increased 24 hrs after the exposure. When at 10kHz, that index decreased, and by day 3 vascular pattern and diameter came back to normal in all experiments. Animals;Dose-Response Relationship, Radiation;Infrared Rays;Low-Level Light Therapy;Radiography;Rats;Sarcoma, Experimental
Lasers in dermatology: two-year experience at University Department of Dermatology and Venerology, Zagreb University Hospital Center, Zagreb, Croatia. Croatia;Hospitals, University;Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases;Treatment Outcome
The efficiency of laser for the treatment of Ehlers-Danlos syndrome. BACKGROUND AND OBJECTIVES: A 61-year-old woman presented herself with extensive elastosis of the facial skin caused by Ehlers-Danlos syndrome (EDS). STUDY DESIGN/MATERIALS AND METHODS: Two laser skin resurfacings reduced the wrinkles significantly better than the two preceding conventional facelifts. For the first time, we have been able to compare two treatments with different laser systems on the same patient. The first treatment was performed with a high energy pulsed CO(2) laser, which has been in use for 8 years. The second treatment was performed by us using the latest technology CO(2)/erbium:YAG combination laser. RESULTS/CONCLUSION: Resulting in a similar degree of wrinkle reduction, the treatment with the combination laser markedly reduced the duration of the healing process and erythema phase. Ehlers-Danlos Syndrome;Esthetics;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Rhytidoplasty;Severity of Illness Index;Time Factors;Treatment Outcome
Laser treatment of leg veins: Physical mechanisms and theoretical considerations. BACKGROUND AND OBJECTIVES: A discussion of laser treatment of leg veins is based on a review of the literature, theoretical analysis, and the clinical experiences of the authors. Theoretical computations are discussed within the context of clinical observations. STUDY DESIGN/MATERIALS AND METHODS: A Monte Carlo model is used to examine volumetric heat production, fluence rate, and temperature profiles in blood vessels at 1,064 and 532 nm wavelengths with various beam diameters, vessel diameters, and pulse durations. RESULTS: Clinical observations, Monte Carlo results, and a review of the literature suggest that longer wavelengths and longer pulses durations favor vessel contraction over intraluminal thrombosis. Monte Carlo simulations show that longer wavelengths are more likely to uniformly heat the vessel compared to highly absorbing wavelengths. Methemoglobin production causes deeply penetrating wavelengths to generate more volumetric heat for the same input radiant exposure. CONCLUSIONS: Clinical observations and models support the role of long wavelengths and long pulses in optimal clearance of most leg telangiectasias. Humans;Leg;Low-Level Light Therapy;Monte Carlo Method;Patient Simulation;Sensitivity and Specificity;Telangiectasis;Varicose Veins
Non-ablative skin tightening with radiofrequency in Asian skin. BACKGROUND AND OBJECTIVES: The recent successful application of radiofrequency (RF) in non-ablative skin tightening for skin laxity has attracted attention worldwide. The efficacy and clinical effect of RF were assessed in Asian skin, with additional study on the duration of the effect and any complications. STUDY DESIGN/MATERIALS AND METHODS: Eighty-five Japanese females were enrolled in the study for treatment of nasolabial folds, marionette lines, and sagging jowls with 6-month follow-up. RESULTS: RF treatment was

effective for nasolabial folds, marionette lines, and jowls. Objective physician evaluation found relatively good improvement at 3 months post-treatment, and even better improvement at the 6-month evaluation. CONCLUSIONS: RF treatment was very satisfactory for skin tightening in Asian facial skin. When compared with published literature from the United States, the results suggested that there might be race-related differences in the treatment parameters.
Adult;Aged;Asian People;Cohort Studies;Cosmetic Techniques;Esthetics;Female;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Rhytidoplasty;Risk Factors;Skin Aging;Treatment Outcome

Effects of hypobaric pressure on human skin: implications for cryogen spray cooling (part II). BACKGROUND AND OBJECTIVES: Clinical results have demonstrated that dark purple port wine stain (PWS) birthmarks respond favorably to laser induced photothermolysis after the first three to five treatments. Nevertheless, complete blanching is rarely achieved and the lesions stabilize at a red-pink color. In a feasibility study (Part I), we showed that local hypobaric pressure on PWS human skin prior to laser irradiation induced significant lesion blanching. The objective of the present study (Part II) is to investigate the effects of hypobaric pressures on the efficiency of cryogen spray cooling (CSC), a technique that assists laser therapy of PWS and other dermatoses. STUDY DESIGN/MATERIALS AND METHODS: Experiments were carried out within a suction cup and vacuum chamber to study the effect of hypobaric pressure on the: (1) interaction of cryogen sprays with human skin; (2) spray atomization; and (3) thermal response of a model skin phantom. A high-speed camera was used to acquire digital images of spray impingement on in vivo human skin and spray cones generated at different hypobaric pressures. Subsequently, liquid cryogen was sprayed onto a skin phantom at atmospheric and 17, 34, 51, and 68 kPa (5, 10, 15, and 20 in Hg) hypobaric pressures. A fast-response temperature sensor measured sub-surface phantom temperature as a function of time. Measurements were used to solve an inverse heat conduction problem to calculate surface temperatures, heat flux, and overall heat extraction at the skin phantom surface. RESULTS: Under hypobaric pressures, cryogen spurts did not produce skin indentation and only minimal frost formation. Sprays also showed shorter jet lengths and better atomization. Lower minimum surface temperatures and higher overall heat extraction from skin phantoms were reached. CONCLUSIONS: The combined effects of hypobaric pressure result in more efficient cryogen evaporation that enhances heat extraction and, therefore, improves the epidermal protection provided by CSC.
Aerosols;Hydrocarbons, Fluorinated Aerosols;Cold Temperature;Humans;Hydrocarbons, Fluorinated;Laser Therapy;Low-Level Light Therapy;Port-Wine Stain;Pressure;Sensitivity and Specificity;Skin Temperature;Thermal Conductivity;Thermography;Video Recording

Comparison of 585 and 595 nm laser-induced vascular response of normal in vivo human skin. BACKGROUND AND OBJECTIVES: Two wavelengths, 585 and 595 nm, are currently common options for treating vascular malformations such as port-wine stains (PWS). Controversy exists as to which wavelength induces greater photothermal damage to the blood vessels and subsequent resolution of the malformations. STUDY DESIGN/MATERIALS AND METHODS: We irradiated normal, human skin in vivo at 585 and 595 nm wavelengths using fluences of 10-30 J/cm(2) with a 1.5 millisecond laser pulse. The level of purpura, total vascular damage, maximum coagulation depth (MCD), and perivascular damage were quantified by gross observation and histological analysis. RESULTS: Results demonstrated that 585 nm light caused greater purpura, vascular damage, maximum coagulation depth, and perivascular damage than 595 nm. Purpura showed a positive correlation with total vascular damage to a certain extent beyond which the total vascular damage did not change. For equivalent purpura, 585 and 595 nm produced no statistically significant difference in vascular damage. The difference in the laser-induced vascular damage between 585 and 595 nm, although statistically significant, was no more than 50%. CONCLUSIONS: The bathochromic (red) shift and

formation of met-hemoglobin, which reduces the 585 nm light absorption and increases that of 595 nm compared to native oxy-hemoglobin, play a considerable role in creating more parity in vascular damage between the two wavelengths than would be expected based on their respective "native" absorption coefficients alone. Biopsy, Needle;Blood Vessels;Humans;Immunohistochemistry;Laser Therapy;Lasers;Low-Level Light Therapy;Port-Wine Stain;Radiation Injuries;Reference Values;Risk Factors;Sampling Studies;Sensitivity and Specificity;Skin

Effects of hypobaric pressure on human skin: feasibility study for port wine stain laser therapy (part I). BACKGROUND AND OBJECTIVES: Since the development of laser-induced photothermolysis for the therapy of port wine stain (PWS) birthmarks, clinical results have shown that dark purple lesions usually respond well to the first three to five treatments. However, for most PWS, complete blanching is never achieved, and the lesion stabilizes at a red-pink color. The aim of this feasibility study is to demonstrate that with the aid of a local vacuum applied to the lesion site prior to laser exposure, photocoagulation of the smaller PWS blood vessels may be successfully achieved. STUDY DESIGN/MATERIALS AND METHODS: Suction cups were designed to fit onto the hand pieces of commercial laser devices used for PWS laser therapy. One subject with normal skin and another with PWS skin were recruited for this study. Laser pulses of various fluences were applied at atmospheric pressure or shortly after (5-15 seconds) hypobaric pressures (17-51 kPa) were placed as test sites on the forearm of both subjects. The laser-induced purpura at the test sites was documented over the course of 1 week on both subjects and the resulting PWS blanching was optically quantified by visible reflectance spectrometry 7 months after therapy. RESULTS: For the subject with normal skin, the laser fluence needed with hypobaric pressure (51 kPa) to induce similar purpura intensity to that observed with atmospheric pressure was approximately 35% lower. For PWS skin, all suction application times (5-15 seconds) and hypobaric pressures (17-51 kPa) resulted in more intense purpura and the PWS blanching 7 months after treatment was clinically significant for test sites treated with hypobaric pressures ranging from 17 to 34 kPa. CONCLUSIONS: The temporary and controlled dilation of the targeted blood vessels achieved with a local vacuum can significantly reduce the "small-vessel-limitation" in the treatment of PWS without increasing the risk of epidermal damage. Feasibility Studies;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Port-Wine Stain;Pressure;Purpura;Regional Blood Flow;Skin;Spectrum Analysis;Vasodilation

Determining optimal dose of laser therapy for attachment and proliferation of human oral fibroblasts cultured on titanium implant material. The purpose of this study was to investigate the influence of single or multiple doses of low-level laser therapy (LLLT) on attachment and proliferation of human gingival fibroblasts in a standardized, reproducible in vitro model. Titanium discs were randomly allotted to one of three groups: group I served as a control, group II was exposed to a single laser dose of 3 J/cm2, and the three subgroups in group III were exposed to laser doses of 0.75, 1.5, and 3 J/cm2. To examine the possible thermal effects of laser exposure on the cell culture, the temperature in the Petri dish was measured for every dose used, before and during irradiation. For attachment assays, groups II and III were exposed to laser irradiation and then seeded onto titanium discs. In group III, the exposures were repeated after 3 and 6 h. Cells were cultured for 6 and 24 h and stained with Hoechst and Propidium. Attached cells were counted under a light microscope. To investigate the effect of LLLT on cell proliferation after 48 h, 72 h, and 7 days, cells were cultured on titanium discs for 24 h and then exposed to laser irradiation for 1 day and 3 consecutive days, respectively. Cell proliferation was determined by counting cells under the microscope and by a cell proliferation enzyme-linked immunosorbent assay system. No increase of temperature of the cell cultures occurred before or during laser exposure at any of the doses tested. Both single and multiple doses of LLLT significantly enhanced cellular attachment ($p<0.05$). The proliferation assays showed higher cell proliferation ($p<0.05$) in group III at doses of 1.5 and 3 J/cm2 after 72 h and 7 days, with agreement

between staining and enzyme-linked immunosorbent assay. It is concluded that, in this cellular model, the attachment and proliferation of human gingival fibroblasts are enhanced by LLLT in a dose-dependent manner. Titanium Cell Adhesion;Cell Proliferation;Cell Survival;Cells, Cultured;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Prostheses and Implants;Temperature;Titanium

Increase of enamel fluoride retention by low fluence argon laser beam: a 6-month follow-up study in vivo. BACKGROUND AND OBJECTIVES: The aim of this 6-month in vivo study was to investigate if argon laser irradiation of enamel can increase the retention of fluoride. STUDY DESIGN/MATERIALS AND METHODS: Ninety-eight teeth in 12 patients were randomly divided into three groups: (1) EF group: 40 teeth were only treated with fluoride gel (applied for 5 minutes followed by a 1 minute rinsing with distilled water). (2) EFL group: 40 teeth were treated the same way as in the EF group but they were lased after fluoridation. (3) E group: 18 teeth were kept without any treatment as a control group. In order to quantify the fluoride content in the enamel samples, the teeth were analyzed by proton beam delivered by a tandem accelerator (PIgE, particle induced gamma-ray emission). A low energy density of argon laser beam was used: 10.74 J/cm2 (11 mm of beam diameter, irradiation time of 30 seconds, and an output power of 340 mW in continuous mode). RESULTS: The results after 6 months showed that the lased enamel still retained 52.55+/-8.47 ppm or 14.12% of fluoride after the fluoridation process, whereas the unlased enamel retained only 12.18+/-6.82 ppm or 3.27% of fluoride. The untreated and control enamel (E group: unlased and without fluoride treatment) had 1.16+/-4.27 ppm value of fluoride. The statistical test (ANOVA tests at 95% level) showed that the difference is significant between the fluoride retention in the group EFL and the group EF 6 months after fluoridation. CONCLUSIONS: The use of argon laser at low energy density (10.74 J/cm2) significantly increased the fluoride retention in lased enamel that had approximately 400 times more fluoride than the unlased enamel. We consider this procedure as an alternative clinical procedure to increase the fluoride content of enamel surface. Acidulated Phosphate Fluoride Acidulated Phosphate Fluoride;Dental Caries;Dental Enamel;Follow-Up Studies;Humans;Low-Level Light Therapy

Light promotes regeneration and functional recovery and alters the immune response after spinal cord injury. BACKGROUND AND OBJECTIVES: Photobiomodulation (PBM) has been proposed as a potential therapy for spinal cord injury (SCI). We aimed to demonstrate that 810 nm light can penetrate deep into the body and promote neuronal regeneration and functional recovery. STUDY DESIGN/MATERIALS AND METHODS: Adult rats underwent a T9 dorsal hemisection, followed by treatment with an 810 nm, 150 mW diode laser (dosage = 1,589 J/cm2). Axonal regeneration and functional recovery were assessed using single and double label tract tracing and various locomotor tasks. The immune response within the spinal cord was also assessed. RESULTS: PBM, with 6% power penetration to the spinal cord depth, significantly increased axonal number and distance of regrowth ($P < 0.001$). PBM also returned aspects of function to baseline levels and significantly suppressed immune cell activation and cytokine/chemokine expression. CONCLUSION: Our results demonstrate that light, delivered transcutaneously, improves recovery after injury and suggests that light will be a useful treatment for human SCI. Cytokines;EDA protein, human;Ectodysplasins;Glial Fibrillary Acidic Protein;Membrane Proteins;Nitric Oxide Synthase;Leukocyte Common Antigens Animals;Axons;Cytokines;Ectodysplasins;Female;Glial Fibrillary Acidic Protein;Immunohistochemistry;Leukocyte Common Antigens;Locomotion;Low-Level Light Therapy;Macrophages;Membrane Proteins;Nerve Regeneration;Neuroglia;Nitric Oxide Synthase;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley;Recovery of Function;Spectrophotometry;Spinal Cord Injuries;T-Lymphocytes

Randomized controlled trial on low level laser therapy (LLLT) in the treatment of osteoarthritis (OA) of the hand. BACKGROUND AND OBJECTIVES: Low level laser therapy (LLLT) offers promising

symptomatic relief of osteoarthritic (OA) pain. We examined efficacy of active LLLT versus sham LLLT on finger joints and three superficial nerves. STUDY DESIGN/MATERIALS AND METHODS: OA-patients randomly assigned, received three treatments per week for 6 weeks of LLLT (n = 42) or sham LLLT (n = 46). RESULTS: Pain relief, morning stiffness, and functional status did not significantly improve for LLLT versus placebo. No significant differences were found in finger range of motion, except carpometacarpal opposition (P = 0.011), grip strength, and patient global assessment which improved for active LLLT participants (P = 0.041). CONCLUSIONS: LLLT is no better than placebo at reducing pain, morning stiffness, or improving functional status for OA-hand patients. Arsenicals;Gallium;Aluminum Aged;Aluminum;Arsenicals;Female;Finger Joint;Gallium;Hand;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis;Pain Measurement;Range of Motion, Articular;Treatment Outcome

In the clear from acne. Isotretinoin Acne Vulgaris;Administration, Topical;Humans;Isotretinoin;Low-Level Light Therapy;United States

Efficiency of laser therapy applied in labial traumatism of patients with spastic cerebral palsy. The aim of this study was to report the effectiveness of laser therapy applied to traumatic labial injury of patients with spastic cerebral palsy. We report two cases of patients with internal mucosa and lower lip traumatism caused by oral reflex automatism with spastic tonic bite and lower lip interposition. One patient presented extensive lower lip ulceration, loss of tissue, crusty and hemorrhagic areas, with increasing pain and spasticity. The other patient presented local congestion signs, extremely enlarged tissue growth and increased labial volume. Laser therapy was applied to all injured areas, with a low-potency diode InGaAlP laser [685 nm Quasar (Dentoflex), 190 J/ cm2, with a 24-h interval between the first and second administration, and a 7-day interval between the two subsequent ones. At first re-evaluation, 24 h later, there was a striking reduction in inflammation, a decrease in vascular congestion, and a reduction of the ulcerated area with spasticity and pain reduction. At the 14-day re-evaluation, significant clinical differences in the advanced healing process were seen. Low-intensity laser showed to be effective in traumatic soft tissue treatment in cerebral palsy patients by accelerating the healing process, reducing secondary contamination, promoting analgesia; thus, it can be an important tool in the treatment of these patients. Cerebral Palsy;Child, Preschool;Female;Humans;Infant;Laser Therapy;Lip;Low-Level Light Therapy;Male;Wound Healing

A clinical study on serum prostaglandin E2 with low-level laser therapy. METHODS: The subjects of this investigation consisted of 83 female patients that were treated in this department during the 2-year period from January 1999 to December 2002. Laser irradiation was applied for 3 min either every day or every other day for a total of 10 times. A diode semi-conductor laser with a wavelength of 830 nm and a photointensity of 1 W was used. Evaluations were performed before and after the series of 10 exposures to laser irradiation. The evaluation included the measurement of pain using the visual analog scale (VAS) and serum prostaglandin E(2) (pg/mL) measured by RIA-PEG. RESULTS: The analgesic effects were observed in 67 of 83 cases, or 80.7%. The VAS scores for the effective cases decreased after the irradiation series from 8.5 +/- 0.2, to 2.8 +/- 0.2 ($p < 0.001$). The post-irradiation PGE(2) levels were lower than the pre-irradiation PGE(2) levels in the effective cases, which were 5.8 +/- 0.3 and 7.1 +/- 0.4 pg/mL, respectively ($p < 0.05$). The postirradiation PGE(2) levels for the effective cases were lower than those for the ineffective cases, which were 5.8 +/- 0.3 and 7.3 +/- 0.9 pg/mL, respectively ($p < 0.05$). CONCLUSIONS: Based on the above findings, the analgesic effects of LLLT were found to be valid. The serum PGE(2) levels are therefore considered to directly reflect nociceptive pain. Dinoprostone Adult;Aged;Dinoprostone;Female;Humans;Low-Level Light Therapy;Middle Aged;Pain;Pain Measurement

Cell growth modulation of human cells irradiated in vitro with low-level laser therapy. OBJECTIVE: The aim of this study was to investigate the effects of different wavelengths and doses of laser radiation on in vitro cell proliferation. We evaluated the biological effects of low-level laser therapy (LLLT) on two human cancer cell lines: HeLa (epithelial adenocarcinoma) and TK6 (lymphoblast). Our attention was focused on the combination of the two laser emissions as it could have a synergic effect greater than the single emission applied separately. BACKGROUND DATA: The effects of LLLT on human cells are still poorly understood and unexplained. Several cell types were found non responsive to laser bio stimulation; in other cases, only a partial activation was observed. METHODS: A laser device was used for cell irradiation with a continuous wave diode (lambda = 808 nm), a pulsed wave diode (lambda = 905 nm), and a combined wave diodes (lambda = 808 nm + 905 nm), in the dose range of 1-60 J/cm(2). RESULTS: The effect of the combined low-level 808-905-nm diode laser irradiation were slightly superior to those achieved with either laser alone in HeLa cells. TK6 cellular proliferation was not found to be significantly affected by any of the energy levels and varying exposure doses investigated. CONCLUSIONS: Our results are a confirmation of previous observations carried out on human cells, where only the proliferation of slowly growing cell populations appeared to be stimulated by laser light. Cell Cycle;Cell Proliferation;Cells, Cultured;HeLa Cells;Humans;Low-Level Light Therapy

Temperature variation at soft periodontal and rat bone tissues during a medium-power diode laser exposure. OBJECTIVE: The aim of this study was to evaluate temperature variation induced by a diode laser in periodontal repair. BACKGROUND DATA: A diode laser operating with medium power can constitute an alternative device for bacterial reduction at periodontal pockets. This procedure will probably avoid any kind of undesirable thermal damage to the irradiated tissues. METHODS: The temperature variation induced by a 810-nm diode laser was investigated in an in vitro study, varying the soft tissue thickness, and in an in vivo study for soft periodontal and bone tissues. The laser powers used were 600 mW, 800 mW, 1.0 W, and 1.2 W, and the light was delivered by a 300-microm fiber. RESULTS: The laser parameters and irradiation time used did not induce a temperature variation high enough to cause thermal irreversible damage to the periodontal tissues investigated. CONCLUSIONS: This study contributes to the establishment of thermally safe working parameters of a diode medium power laser. Animals;Bone and Bones;Low-Level Light Therapy;Male;Periodontal Pocket;Rats;Rats, Wistar;Temperature

A preliminary report on the effect of laser therapy on the healing of cutaneous surgical wounds as a consequence of an inversely proportional relationship between wavelength and intensity: histological study in rats. OBJECTIVE: The objective of the present investigation was to assess the histological effects of different wavelengths and intensities on the healing process of cutaneous wounds. BACKGROUND DATA: Tissue repair is a dynamic interactive process which involves mediators, cells and extra-cellular matrix. Several reports on the use of laser therapy have shown that the healing process is positively affected when the correct parameters are used. METHODS: Eighteen standardized wounds were surgically created on the dorsum of male and female Wistar rats, which were subsequently divided into two experimental groups according to wavelength used lambda.670 or lambda685 nm) for lasertherapy (LLLT). Each group was divided into three subgroups of three animals according to the intensity of the applied irradiation (2, 15, or 25 mW). Twelve animals were used as untreated controls and were not irradiated. The irradiation was carried out during seven consecutive days. The animals were sacrificed eight days after surgery. The specimens were removed, kept in 4% formaldehyde for 24 h, routinely prepared to wax, stained with H&E, and analyzed under light microscopy. RESULTS: For both groups, light microscopy showed a substitution repair process; however, when LLLT was used, a positive biomodulatory effect was detectable, chiefly associated with shorter wavelength and low intensity. CONCLUSIONS: The results of the present study indicate

that LLLT improved cutaneous wound repair and that the effect is a result of an inversely proportional relationship between wavelength and intensity, with treatment more effective when combining higher intensity with short wavelength or lower intensity with higher wavelength. Animals;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Wound Healing

Laser therapy on arthritis induced by urate crystals. OBJECTIVE: We aimed to evaluate low-power laser therapy efficacy on fibrinogen (PF) in the plasma of rats with arthritis induced by urate crystals. In addition, anatomopathological (AP) studies were carried out. BACKGROUND DATA: Raised blood uric acid may form microscopic crystals in the joint. These crystals set up the inflammation called "acute gouty arthritis." METHODS: Two mg of uric acid were injected in both joints of the lower limbs of rats over 2 days. A group was treated with He-Ne laser (6 mW) on the injected joints during 3 consecutive days. After 96 h of the first injection, animals were sacrificed to determine fibrinogen by spectrophotometry. Sections from the lower limbs were used for AP studies. RESULTS: A statistically significant increase ($p < 0.001$) in plasma fibrinogen levels was observed in the group injected with urates, when compared to both control group and the laser-treated group. The AP observed in the untreated group showed an intense fibroblastic proliferation and chronic inflammation. In the group treated with laser no inflammatory reaction was observed. CONCLUSIONS: Laser therapy has an anti-inflammatory effect in arthropathy induced in rats injected with urates, determined by fibrinogen levels and by histological involution. Uric Acid;Fibrinogen Adipose Tissue;Animals;Arthritis;Female;Fibrinogen;Laser Therapy;Rats;Uric Acid

Temperature-controlled 830-nm low-level laser therapy of experimental pressure ulcers. OBJECTIVE: This study was performed to evaluate the effectiveness of near-infrared low-level laser therapy (LLLT) treatment of pressure ulcers under temperature-controlled conditions. BACKGROUND DATA: Little information is available regarding the potential thermal effects of near-infrared photo-radiation during LLLT. METHODS: Pressure ulcers were created in C57BL mice by placing the dorsal skin between two round ceramic magnetic plates (12.0 x 5.0 mm, 2.4 g, 1 K Gauss) for three 12-h cycles. Animals were divided into three groups (n = 9) for daily light therapy (830 nm, CW, 5.0 J/cm(2)) on days 3-13 post ulceration in both groups A and B. A special heat-exchange device was applied in Group B to maintain a constant temperature at the skin surface (30 degrees C). Group C served as controls, with irradiation at 5.0 J/cm(2) using an incandescent light source. Temperature of the skin surface, and temperature alterations during treatment were monitored. The wound area was measured and the rate and time to complete healing were noted. RESULTS: The maximum temperature change during therapy was 2.0 +/- 0.64 degrees C in Group A, 0.2 +/- 0.2 degrees C in Group B and 3.54 degrees C +/- 0.72 in Group C. Complete wound closure occurred at 18 +/- 4 days in Groups A and B and 25 +/- 6 days in Group C ($p </= 0.05$). The percentage of the wound closure at 14 days was 75. 4 +/- 7.2% and 77.7 +/- 5.6% for Groups A and B, respectively (NS differences). However, animals in Group C demonstrated a wound closure of 36.3 +/- 4.8% ($p < 0.05$). CONCLUSIONS: These results demonstrate that the salutary effects of LLLT on wound healing are temperature independent in this model. Animals;Disease Models, Animal;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Pressure Ulcer;Temperature

Antinociceptive effect of Er:YAG laser irradiation in the orofacial formalin test. Low-power, soft, or low-level laser irradiation has been successfully used to provide analgesia in injured or diseased tissues. In this study, we tested the possible antinociceptive effect of laser irradiation when applied to a normal tissue before the onset of a painful stimulus. Male Wistar rats (350-380 g) were used. A 1.5% formalin solution (50 microL s.c., diluted in saline) was injected into the right upper lip of the test animals (n = 9) immediately after 10 min of low-power Er:YAG laser irradiation (wavelength: 2.94 microm; energy: 0.1 J/cm(2)/pulse at 10 Hz). Control animals (n = 9) were restrained for 10 min without laser application. The nociceptive response, i.e., the amount of time the rats spent rubbing

the formalin injected area, was measured by an investigator blind to whether the animals had been laser irradiated or not. On laser irradiated rats, significantly less nociceptive behavior was observed only during the late phase (12-39 min) of the test. This result is similar to that reported for nonsteroid antiinflammatory drugs (NSAIDs) and other peripherally acting antiinflammatory agents. We conclude that low-power laser irradiation have a tonic antinociceptive effect on inflammatory pain even when applied before tissue injury. Formaldehyde Animals;Facial Pain;Formaldehyde;Low-Level Light Therapy;Male;Pain Measurement;Rats;Rats, Wistar;Time Factors

[Dependence of the efficiency of low-intensity laser therapy in involution chorioretinal dystrophy on a used wavelength]. Seventy-five patients (75 eyes) with central involution chorioretinal dystrophy (non-exudative type at the progression stage) were followed up. All of them received low-intensity laser therapy. Irradiation of 890 nm, 644 nm and 500 nm was used in groups 1, 2 and 3, respectively. The study purpose was to compare the efficiency of wavelengths. Visual acuity and retinal sensitivity were determined. The results were evaluated immediately after treatment and in 3 months. The maximal improvement in visual acuity and retinal sensitivity was in those who received 890 nm laser therapy; 500 nm irradiation--a less pronounced effect and 640 nm--the lowest one. We attribute such distribution of efficiency to a proliferation type of each irradiation range in the macular zone. Aged;Choroid;Choroid Diseases;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Macula Lutea;Male;Middle Aged;Retinal Degeneration;Visual Acuity;Visual Field Tests;Visual Fields

[Laser technologies used in the complex treatment of psychopharmacotherapy resistant endogenic depression]. Adult;Combined Modality Therapy;Depressive Disorder;Drug Resistance;Female;Humans;Low-Level Light Therapy;Middle Aged

Use of low-energy laser as adjunct treatment of alcohol addiction. Auricular acupuncture is a medical method that has been used in the treatment of alcohol addiction. In our study we decided to intensify this method by additional biostimulation of the whole organism. The aim of this study was the therapy of patients with alcohol dependence syndrome. Fifty-three alcoholics were treated with two types of laser stimulation in four sessions. Each session consisted of 20 consecutive daily helium-neon laser neck biostimulations and 10 auricular acupuncture treatments with argon laser (every 2nd day). The Beck Depression Inventory-Fast Screen (BDI-FS) was used to assess their frame of mind before the session and after 2 months of treatment. Moreover, beta-endorphin plasma concentration was estimated five times using the radioimmunoassay (RIA) method. Improvement in BDI-FS and increase in, beta-endorphin level were observed. These results suggest that laser therapy can be useful as an adjunct treatment for alcoholism. beta-Endorphin Acupuncture;Adult;Alcoholism;Analysis of Variance;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Statistics, Nonparametric;Treatment Outcome;beta-Endorphin

Multiple basal cell carcinomas arising in a port-wine stain with a remote history of therapeutic irradiation. The coexistence of a basal cell carcinoma and a port-wine stain is a very rare condition that may be associated with previous treatments. We present a case of multiple basal cell carcinomas developing within the boundaries of a port-wine stain, which had been treated with a tholium X and argon laser. Our case suggests that port-wine stains which were previously treated with irradiation or argon laser should be examined carefully and regularly by both physician and patient, because they may hide basal cell carcinomas. Biopsy, Needle;Carcinoma, Basal Cell;Cell Transformation, Neoplastic;Follow-Up Studies;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Precancerous Conditions;Risk Assessment;Skin Neoplasms;Treatment Outcome

Effect of low-level laser therapy on the healing of second-degree burns in rats: a histological and microbiological study. This paper presents the results of a study on the effects of two different doses of low-level laser therapy on healing of deep second-degree burns. Sixty rats were randomly

allocated to one of four groups. A deep second-degree burn was inflicted in each rat. In the control group burns remained untreated; in two laser treated groups the burns were irradiated daily with low-level helium-neon laser with energy densities of 1.2 and 2.4 J/cm2, respectively. In the fourth group the burns were treated topically with 0.2% nitrofurazone cream every day. The response to treatments was assessed histologically at 7, 16 and 30 days after burning, and microbiologically at Day 15. The number of macrophages at day 16, and the depth of new epidermis at day 30, was significantly less in the laser treated groups in comparison with control and nitrofurazone treated groups (P=0.000). Staphylococcus epidermidis was found in the 70% of rat wounds in the laser treated groups in comparison with 100% of rats in the control group. S. aureus was found in the 40% rat wounds in the nitrofurazone treated group, but there was not found in the wounds of laser treated, and control groups. It is concluded that low-level laser therapy of deep second-degree burn caused significant decrease in the number of macrophage and depth of new epidermis. In addition, it decreased incidence of S. epidermidis and S. aureus. Animals;Burns;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Staphylococcus;Wound Healing

Wound-healing technologies: low-level laser and vacuum-assisted closure. Humans;Low-Level Light Therapy;Outcome and Process Assessment, Health Care;Vacuum;Wound Healing;Wounds and Injuries

Measuring dynamics of caspase-3 activity in living cells using FRET technique during apoptosis induced by high fluence low-power laser irradiation. BACKGROUND AND OBJECTIVES: Low-power laser irradiation (LPLI) has been used for therapies such as curing spinal cord injury, healing wound etc. Yet, the mechanism of LPLI remains unclear. In order to determine the effects of high fluence LPLI on cell growth and caspase-3 activity, we have measured the dynamics of caspase-3 activity during cell apoptosis induced by high fluence LPLI treatment. STUDY DESIGN/MATERIALS AND METHODS: He-Ne laser was used to irradiate human lung adenocarcinoma cells (ASTC-a-1). Cell Counting Kit-8 was used for cytotoxicity assay. A fluorescent microscope was used to perform fluorescence resonance energy transfer (FRET) imaging. A luminescence spectrometer was used to acquire the fluorescent emission spectrum. Statistical analysis was performed with Student's paired t-test. RESULTS: Cytotoxicity assay showed that when light irradiation fluence exceeded 60 J/cm2, LPLI treatment induced ASTC-a-1 cell apoptosis in a fluence-dependent manner. FRET imaging and spectrofluorometric analysis demonstrated that caspase-3 was activated during high fluence LPLI-induced cell apoptosis. CONCLUSIONS: Using FRET technique, we have reported that high fluence LPLI can induce human lung adenocarcinoma cells (ASTC-a-1) apoptosis. The activation of caspase-3 plays an important role in the apoptotic process. CASP3 protein, human;Caspase 3;Caspases Adenocarcinoma;Apoptosis;Caspase 3;Caspases;Cell Line, Tumor;Cell Survival;Fluorescence Resonance Energy Transfer;Humans;Low-Level Light Therapy;Lung Neoplasms

Effect of wavelength on low-intensity laser irradiation-stimulated cell proliferation in vitro. BACKGROUND AND OBJECTIVES: There exist contradictory reports about low-intensity laser light-stimulated cell proliferation. The purpose of this study was to determine the effect of wavelength on proliferation of cultured murine cells. STUDY DESIGN/MATERIALS AND METHODS: Proliferation of primary cell cultures was measured after irradiation with varying laser wavelengths. RESULTS: Fibroblasts proliferated faster than endothelial cells in response to laser irradiation. Maximum cell proliferation occurred with 665 and 675 nm light, whereas 810 nm light was inhibitory to fibroblasts. CONCLUSIONS: These observations suggest that both wavelength and cell type influence the cell proliferation response to low-intensity laser irradiation. Animals;Cell Culture Techniques;Cell Proliferation;Dose-Response Relationship, Radiation;Endothelial Cells;Fibroblasts;Low-Level Light Therapy;Male;Mice;Mice, Inbred C3H

Femtosecond laser for glaucoma treatment: a study on ablation energy in pig iris. Safe and effective laser ophthalmic surgery requires a fine balance between the efficiency of laser delivered and the degree of collateral side damage. The laser-ocular tissue interaction process is reliant on three main variables, namely, wavelength, pulse duration, and deposited energy. A certain amount of energy is needed to achieve ablation, while too much energy can result in unwanted collateral thermal damage. In our work the relationship between energy deposition and ablation effect is studied by an in-vitro experiment using an 800 nm wavelength 150 fs-pulse-duration laser system. This experiment aims to validate the probability of decreasing the supplied energy during glaucoma surgery by femtosecond laser. Our results show that less energy is needed using femtosecond laser than that using a longer pulse laser. Animals;Glaucoma;In Vitro Techniques;Iris;Low-Level Light Therapy;Radiation Dosage;Swine

Evaluation of different temperatures in cold air cooling with pulsed-dye laser treatment of facial telangiectasia. BACKGROUND AND OBJECTIVES: Cold air cooling is widely used in dermatological laser therapy. We investigated the influence of cold air cooling at different skin temperatures on therapeutic outcome and side effects of pulsed dye laser treatment of facial telangiectasia. STUDY DESIGN/MATERIALS AND METHODS: From September 2002 to February 2003, 17 patients with previously untreated facial telangiectasia underwent a single treatment session with flash-lamp pulsed dye laser (3.5 J/cm(2), 585 nm, 0.45 milliseconds pulse length, 10 mm beam diameter, Cynosure V). The treatment area was divided into three sub-areas: no cooling, cold air cooling to 20 degrees C and to 17 degrees C skin temperature. The skin temperature was monitored by a prototype infrared sensor system which controlled the temperature of the cold air stream (Cryo5). In a prospective study, we collected data on purpura, pain, clearance, and patient satisfaction on numerical analog scales (NAS) from 0 (meaning "no") to 3 (meaning "high"). RESULTS: Without cooling, purpura (2.53), pain (2.41), and clearance (2.35) were rated medium to high. Cooling to 20 degrees C reduced purpura (1.12) and pain (1.06), whereas the clearance (2.12) was only slightly affected. Cooling to 17 degrees C reduced purpura (0.88) and pain (0.76) even more, the clearance (2.06) was lowered marginally. Most patients preferred cooling to 20 degrees C skin temperature. CONCLUSION: In dermatological laser therapy of facial telangiectasia, the use of cold air cooling can significantly reduce side effects and increase patient satisfaction while only slightly affecting clearance. Cooling to 20 degrees C skin temperature proved to be a well-balanced middle course. For the practical use of cold air cooling, we thus recommend cooling to a level which the patient can tolerate without problems and to try to increase the energy densities.
Adult;Aged;Analgesia;Cold Temperature;Cryotherapy;Facial Dermatoses;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Severity of Illness Index;Telangiectasis;Treatment Outcome

Rosacea in a new light. Humans;Laser Therapy;Low-Level Light Therapy;Rosacea

Design and testing of low intensity laser biostimulator. BACKGROUND: The non-invasive nature of laser biostimulation has made lasers an attractive alternative in Medical Acupuncture at the last 25 years. However, there is still an uncertainty as to whether they work or their effect is just placebo. Although a plethora of scientific papers published about the topic showing positive clinical results, there is still a lack of objective scientific proofs about the biostimulation effect of lasers in Medical Acupuncture. The objective of this work was to design and build a low cost portable laser device for stimulation of acupuncture points, considered here as small localized biosources (SLB), without stimulating any sensory nerves via shock or heat and to find out a suitable method for objectively evaluating its stimulating effect. The design is aimed for studying SLB potentials provoked by laser stimulus, in search for objective proofs of the biostimulation effect of lasers used in Medical Acupuncture. METHODS: The proposed biostimulator features two operational modes: program

mode and stimulation mode and two output polarization modes: linearly and circularly polarized laser emission. In program mode, different user-defined stimulation protocols can be created and memorized. The laser output can be either continuous or pulse modulated. Each stimulation session consists of a pre-defined number of successive continuous or square pulse modulated sequences of laser emission. The variable parameters of the laser output are: average output power, pulse width, pulse period, and continuous or pulsed sequence duration and repetition period. In stimulation mode the stimulus is automatically applied according to the pre-programmed protocol. The laser source is 30 mW AlGaInP laser diode with an emission wavelength of 685 nm, driven by a highly integrated driver. The optical system designed for beam collimation and polarization change uses single collimating lens with large numerical aperture, linear polarizer and a quarter-wave retardation plate. The proposed method for testing the device efficiency employs a biofeedback from the subject by recording the biopotentials evoked by the laser stimulus at related distant SLB sites. Therefore measuring of SLB biopotentials caused by the stimulus would indicate that a biopotential has been evoked at the irradiated site and has propagated to the measurement sites, rather than being caused by local changes of the electrical skin conductivity. RESULTS: A prototype device was built according to the proposed design using relatively inexpensive and commercially available components. The laser output can be pulse modulated from 0.1 to 1000 Hz with a duty factor from 10 to 90%. The average output power density can be adjusted in the range 24-480 mW/cm2, where the total irradiation is limited to 2 Joule per stimulation session. The device is controlled by an 8-bit RISC Flash microcontroller with internal RAM and EEPROM memory, which allows for a wide range of different stimulation protocols to be implemented and memorized. The integrated laser diode driver with its onboard light power control loop provides safe and consistent laser modulation. The prototype was tested on the right Tri-Heater (TH) acupuncture meridian according to the proposed method. Laser evoked potentials were recorded from most of the easily accessible SLB along the meridian under study. They appear like periodical spikes with a repetition rate from 0.05 to 10 Hz and amplitude range 0.1-1 mV. CONCLUSION: The prototype's specifications were found to be better or comparable to those of other existing devices. It features low component count, small size and low power consumption. Because of the low power levels used the possibility of sensory nerve stimulation via the phenomenon of shock or heat is excluded. Thus senseless optical stimulation is achieved. The optical system presented offers simple and cost effective way for beam collimation and polarization change. The novel method proposed for testing the device efficiency allows for objectively recording of SLB potentials evoked by laser stimulus. Based on the biopotential records obtained with this method, a scientifically based conclusion can be drawn about the effectiveness of the commercially available devices for low-level laser therapy used in Medical Acupuncture. The prototype tests showed that with the biostimulator presented, SLB could be effectively stimulated at low power levels. However more studies are needed to derive a general conclusion about the SLB biostimulation mechanism of lasers and their most effective power and optical settings. Acupuncture Points;Acupuncture Therapy;Equipment Design;Equipment Failure Analysis;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Photic Stimulation;Radiation Dosage;Signal Processing, Computer-Assisted

He-Ne laser effects on blood microcirculation during wound healing: a method of in vivo study through laser Doppler flowmetry. BACKGROUND AND OBJECTIVES: Low-intensity laser therapy (LILT) is widely used for wound healing promotion and its mechanism of action may be due to an enhancement of blood supply. The aim of this study was to evaluate blood flow alterations in a wound healing model, using laser Doppler flowmetry (LDF) associated with a normalized perfusion parameter. STUDY DESIGN/MATERIALS AND METHODS: An injury was provoked in 15 rats and blood flow was measured periodically over a period of 21 days. Control groups were established to evaluate

LDF and He-Ne laser effects on microcirculation. A 1 J/cm(2) dose was utilized, with 6 mW/cm(2) irradiance. RESULTS: The results demonstrated flow alterations provoked by lesion, and inflammatory response (P < 0.05). There were no statistical differences between groups. CONCLUSIONS: The results did not show a significant sustained effect on microcirculation with this He-Ne dose. Animals;Laser-Doppler Flowmetry;Low-Level Light Therapy;Microcirculation;Models, Animal;Neovascularization, Physiologic;Rats;Rats, Wistar;Ultrasonography;Wound Healing

Effects of low-power laser irradiation on cell locomotion in protozoa. Low-power lasers are commonly used in human medicine for treatment of various pathological conditions, but mechanisms of their healing effects are still poorly understood. The results of this study provide information related to these effects at the cellular level. Two different protozoan species, Euglena gracilis and Tetrahymena thermophila, were used to study changes in locomotion behavior in response to low-power lasers. The cells were irradiated at 830 and 650 nm generated by a semiconductor laser (99 J/cm2, 360 mW) and a laser pointer (0.75 J/cm2, 5 mW), respectively, and their locomotion was recorded by a TV camera and analyzed using computer software. Exposure to laser light, regardless of the wavelength, resulted in increased cell velocity in both species (P <0.001). Exposure to 650 nm produced an equal increase in median cell velocity in both E. gracilis (19.0%) and T. thermophila (18.2%), and some increase persisted in the postirradiation 30 s period. Irradiation by the 830 nm laser resulted in a markedly higher response in Tetrahymena (29.4%) than in Euglena (15.2%), and the two median values remained increased after irradiation was discontinued. Different reactions found in the species studied and some mechanisms underlying the response of cells to radiation are discussed. Animals;Cell Movement;Euglena gracilis;Low-Level Light Therapy;Tetrahymena thermophila

Effect of laser therapy on attachment, proliferation and differentiation of human osteoblast-like cells cultured on titanium implant material. The aim of this in vitro study was to investigate the effect of low-level laser therapy (LLLT) on the attachment, proliferation, differentiation and production of transforming growth factor-ss(1) (TGF-beta(1)) by human osteoblast-like cells (HOB). Cells derived from human mandibular bone were exposed to GaAlAs diode laser at dosages of 1.5 or 3 J/cm(2) and then seeded onto titanium discs. Non-irradiated cultures served as controls. After 1, 3 and 24h, cells were stained and the attached cells were counted under a light microscope. In order to investigate the effect of LLLT on cell proliferation after 48, 72 and 96 h, cells were cultured on titanium specimens for 24h and then exposed to laser irradiation for three consecutive days. Specific alkaline phosphatase activity and the ability of the cells to synthesize osteocalcin after 10 days were investigated using p-nitrophenylphosphate as a substrate and the ELSA-OST-NAT immunoradiometric kit, respectively. Cellular production of TGF-beta(1) was measured by an enzyme-linked immunosorbent assay (ELISA), using commercially available kits. LLLT significantly enhanced cellular attachment (P<0.05). Greater cell proliferation in the irradiated groups was observed first after 96 h. Osteocalcin synthesis and TGF-beta(1) production were significantly greater (P<0.05) on the samples exposed to 3 J/cm(2). However, alkaline phosphatase activity did not differ significantly among the three groups. These results showed that in response to LLLT, HOB cultured on titanium implant material had a tendency towards increased cellular attachment, proliferation, differentiation and production of TGF-beta(1), indicating that in vitro LLLT can modulate the activity of cells and tissues surrounding implant material. Biocompatible Materials;TGFB1 protein, human;Transforming Growth Factor beta;Transforming Growth Factor beta1;Titanium Biocompatible Materials;Cell Adhesion;Cell Culture Techniques;Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Humans;Laser Therapy;Light;Osteoblasts;Osteogenesis;Prostheses and Implants;Radiation Dosage;Titanium;Transforming Growth Factor beta;Transforming Growth Factor beta1

Use of laser for rectal lesions in poor-risk patients. BACKGROUND: This study evaluates laser ablation of large polyps and cancer of the rectum in poor-risk surgical patients. METHODS: We performed a retrospective review of treatment of rectal lesions with the neodymium yttrium aluminium garnet (Nd:YAG) laser. Biopsy was performed before the first and subsequent therapies. Large lesions were initially debulked by diathermy snare. Biopsies were performed on suspicious areas at follow-up after completion of therapy. RESULTS: Three patients with unresectable rectal cancer had symptom control over a mean period of 15.7 months and 12 patients with large polyps over 60.6 months since the start of therapy. Indications in polyps were carpeting of the rectum (n = 3), proximity to sphincter (n = 1), or comorbidity (n = 8). No complication occurred; however, there was 1 treatment failure. None of the patients with polyps developed cancer during a mean follow-up interval of 14 months after final treatment. CONCLUSIONS: Outpatient laser therapy is safe, repeatable, and effective in the local control of rectal lesions. Neodymium Adenocarcinoma;Aged;Aged, 80 and over;Colonic Polyps;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neodymium;Neoplasm Staging;Palliative Care;Proctoscopy;Quality of Life;Rectal Neoplasms;Retrospective Studies;Risk Assessment;Survival Analysis;Treatment Outcome

Lasers in periodontology. Since the development of the ruby laser by Maiman in 1960, lasers have been widely employed in medicine for a number of years. The purpose of this paper is to summarize potential applications for lasers in dentistry, with special regard to periodontology. This article briefly describes clinical applications of lasers and laser safety. Particularly, the use of a diode laser seems to be promising, especially in already compromised transplant patients, who need to be treated with a technique where the operative and post-operative blood loss, post-operative discomfort and the recurrence of drug-induced gingival overgrowth need to be kept to a minimum or eliminated. Therefore, the use of lasers in periodontology may lead to an alteration in present clinical practice and help to establish the best management strategy because, by maintaining periodontal health, the life quality of patients can be improved. Dental Calculus;Dental Cavity Preparation;Dental Equipment;Dentin Sensitivity;Humans;Laser Therapy;Low-Level Light Therapy;Oral Surgical Procedures;Periodontics;Root Planing;Subgingival Curettage

Histomorphometric study of the healing of human oral mucosa after gingivoplasty and low-level laser therapy. BACKGROUND AND OBJECTIVES: The aim of the present study was to analyze the effects of diode laser irradiation on the healing of human oral mucosa. MATERIALS AND METHODS: After gingivoplasty, the right hemi-arch (test group) of 16 patients was irradiated with a diode laser. The left side (control group) was not irradiated. Incisional biopsies were performed on both sides at 7, 14, 21, and 60 days after surgery and morphometrically analyzed by light microscopy. RESULTS: Epithelium width ranged from 260.6 to 393.5 microm. Volume densities of basal (20.2%), prickle cell (55.6%), and cornified (24.2%) layers remained stable. The peak number of neutrophils were 6 cells/mm(2) and the mononuclear cells were 44 cells/mm(2). Collagen fibers (80%) and fibroblasts (14%) occupied the main volume of connective tissue. The one-way ANOVA and the paired Student's t-test were used for statistical analysis ($P < 0.05$). CONCLUSION: Low-level laser therapy did not accelerate the healing of oral mucosa after gingivoplasty. Gingival Hyperplasia;Gingivoplasty;Humans;Low-Level Light Therapy;Mouth Mucosa;Treatment Outcome;Wound Healing

Low level laser irradiation stimulates mitochondrial membrane potential and disperses subnuclear promyelocytic leukemia protein. BACKGROUND AND OBJECTIVES: Low level laser irradiation (LLLI) is used to promote wound healing. Molecularly it is known to stimulate mitochondrial membrane potential (MMP), cytokine secretion, and cell proliferation. This study was designed to determine the influence of LLLI on the kinetics of MMP stimulation and decay, specific cytokine gene

expression, and subcellular localization of promyelocytic leukemia (PML) protein on HaCaT human keratinocytes. STUDY DESIGN/MATERIAL AND METHODS: The cells were irradiated by a 780 nm titanium-sapphire (Ti-Sa) laser with 2 J/cm(2) energy density. MMP was monitored with Mitotracker, a mitochondrial voltage-sensitive fluorescent dye. Cytokine gene expression was carried out using semi-quantitative-reverse transcription polymerase chain reaction. Subcellular localization of PML protein, a cell-cycle checkpoint protein, was determined using immunofluorescent staining. RESULTS: The fluorescence intensity of MMP was increased immediately after the end of LLLI by 148 +/- 6% over control (P<0.001). Subsequently it decayed, reaching 51 +/- 14% of the control level (P < 0.01) within 200 minutes. This decay was characterized by an exponential curve (R = 0.96) with a lifetime of 79 +/- 36 minutes (P < 0.05). Following irradiation, the expression of interleukin-1alpha, interleukin-6, and keratinocyte growth factor (KGF) genes were transiently upregulated; but the expression of the proinflammatory gene interleukin-1beta, was suppressed. The subnuclear distribution of PML was altered from discrete domains to its dispersed form within less than 1 hour after LLLI. CONCLUSIONS: These changes reflect a biostimulative boost that causes a shift of the cell from a quiescent to an activated stage in the cell cycle heralding proliferation and suppression of inflammation. Further characterization of MMP kinetics may provide a quantitative basis for assessment of the effect of LLLI in the clinical setting. Cytokines;Neoplasm Proteins;Nuclear Proteins;Promyelocytic Leukemia Protein;Transcription Factors;Tumor Suppressor Proteins;PML protein, human Cells, Cultured;Cytokines;Gene Expression;Humans;Keratinocytes;Low-Level Light Therapy;Membrane Potentials;Mitochondria;Neoplasm Proteins;Nuclear Proteins;Promyelocytic Leukemia Protein;Transcription Factors;Tumor Suppressor Proteins

Prevention of third molar tooth development in neonate rat with a long pulse diode laser. BACKGROUND AND OBJECTIVES: Third molars (wisdom teeth) in humans have limited functional value and cause a high frequency of morbidity. A window of opportunity exists to stop their development. The purpose of this study is to evaluate whether a long pulse diode laser can selectively prevent third molar development in a rat animal model. STUDY DESIGN/MATERIALS AND METHODS: The study calculated theoretical diode laser parameters and irradiated 2- to 4-day-old rat pups in the posterior aspects of the oral cavity near the time of tooth bud initiation. Rats were sacrificed at 35-50 days and examined intraorally and radiographically for third molar development. Control and treated sides were compared histologically. RESULTS: Nearly half of the maxillary third molars and 80% of the mandibular third molars were selectively prevented from developing using a 20 W diode laser with infrequent, minor adverse effects on maxillary jaw growth. CONCLUSIONS: This study confirms the hypothesis that controlled, non-invasive laser treatment delivered on the surface of the oral mucosa near the site of tooth bud formation can selectively achieve third molar agenesis. It also offers hope that further innovative studies may bring about a safe, non-invasive laser treatment to selectively prevent third molar development in humans. Animals;Animals, Newborn;Low-Level Light Therapy;Models, Animal;Molar, Third;Odontogenesis;Rats;Tooth Eruption

[Potentialities of reflexotherapy in complex treatment of hypotonic states]. Methods of reflexotherapy in complex treatment of hypotonic state have significant advantage before traditional medicamentous therapy. Patients with hypotonic conditions which received traditional treatment are exposed to the greater risk in development of various forms cerebrovascular pathologies. Neuroprotective Agents;Nootropic Agents;Vasodilator Agents Acupuncture Points;Acupuncture Therapy;Adult;Aging;Cerebrovascular Circulation;Electroencephalography;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Hypotonia;Neuroprotective Agents;Nootropic Agents;Plethysmography, Impedance;Reflexotherapy;Treatment Outcome;Vasodilator Agents

[Venous leg ulcers: no improvement of wound healing with 685-nm low level laser therapy. Randomised, placebo-controlled, double-blind study]. INTRODUCTION: Venous leg ulcers (ulcera

crurum venosa) are frequently seen in elderly patients. It has been suggested that low level laser irradiation has a biostimulative and wound healing effect; however, this has not yet been clinically verified by controlled studies. STUDY DESIGN: The difference in size reduction of leg ulcers with and without low level laser or placebo laser treatment was measured in 44 patients randomised into two treatment groups (685-nm low level laser and placebo laser) or a control group which served to quantify the effect of laser application. All patients received standardized wound care. OBJECTIVE: The aim of the study was to compare the effectiveness of low level laser irradiation with that of a placebo "light source". The size of the ulcers was planimetrically measured at baseline (day 1), at the end of therapy (day 28) and 2 months later (day 90). The difference in wound size was evaluated. RESULTS: There were no statistically significant differences in reduction of wound size between the three groups, thus suggesting that low level laser light does not have any stimulatory effect on wound healing in ulcera crurum venosa. Adult;Aged;Aged, 80 and over;Double-Blind Method;Female;Humans;Male;Middle Aged;Prognosis;Radiation Dosage;Treatment Outcome;Varicose Ulcer;Wound Healing

Very low level laser therapy attenuates edema and pain in experimental models. In this study, we tested a new square wave microprocessor-controlled red laser with an extremely low peak power output (<3 mW; very low level laser therapy [vLLLT]) in experimental pain in the rat. Acute inflammation was induced by intraplantar injection of carrageenan, chronic inflammation was induced by complete Freund's adjuvant (CFA) and neuropathic pain was produced by sciatic nerve chronic constriction injury (CCI). In our study vLLLT was effective in reducing edema and hyperalgesia in acute and chronic inflammation if administered at the points usually selected for acupuncture. Moreover, spontaneous pain and thermal hyperalgesia were reduced in CCI rats treated with vLLLT In conclusion, vLLLT reduced edema and induced analgesia in experimental plantar pain in rats. We interpret this to mean that enkephalin mRNA level was strongly upregulated in the external layers of the dorsal horn of the spinal cord in CFA and CCI animals, and that vLLLT further increased the mRNA level in single neurons. Enkephalins Animals;Edema;Enkephalins;In Situ Hybridization;Lasers;Male;Neurons;Pain Management;Pain Measurement;Rats;Rats, Sprague-Dawley;Spinal Cord

Low level laser therapy in primary Raynaud's phenomenon--results of a placebo controlled, double blind intervention study. OBJECTIVE: To assess the efficacy of low level laser therapy in patients with primary Raynaud's phenomenon and predict the success of laser therapy by clinical characteristics. METHODS: Forty-eight patients were included in a randomized placebo controlled, double blind crossover study. Laser and sham therapy each were applied 5 days a week for 3 weeks. Clinical symptoms, exposure to triggers, and frequency and intensity of attacks were recorded in diaries. Results of infrared thermography before onset and at the end of both irradiation sequences were evaluated. Primary endpoint was the average intensity of attacks; secondary endpoints were average number of attacks and thermography results. Age, sex, duration of symptoms, age at onset of symptoms, evoking conditions other than cold, maximum temperature drop after cold provocation, and rewarming time after cold provocation were tested as potential predictors. RESULTS: Number of attacks and their intensity were significantly reduced during laser therapy compared to sham treatment. Thermographic parameters did not reach statistical significance. In a stepwise multiple regression analysis, evoking conditions other than cold (stress, wetness as additional triggers), rewarming time, and temperature decrease after cold provocation were significant predictors of therapeutic efficacy. CONCLUSION: Low level laser therapy reduces frequency and severity of Raynaud attacks. The effect is most pronounced in patients with signs of decreased threshold for vasospasm and less effective in patients with delayed hyperemia. Analysis of Variance;Cross-Over Studies;Double-Blind Method;Female;Follow-Up Studies;Humans;Linear

Models;Low-Level Light Therapy;Male;Pain Measurement;Probability;Raynaud Disease;Reference Values;Risk Assessment;Severity of Illness Index;Treatment Outcome

[Clinical and immunological aspects of low-intensity laser irradiation in patients with gastroduodenal ulcers]. Laser iridotherapy was carried out simultaneously with irradiation of immuno-competent zones on the integument of the human body in patients with stomach and duodenal ulcers. As a result of such treatment, it was discovered that laser therapy has immunomodulating action leading to the reduction of the ulcer cicatrisation period. Adult;Antibody Formation;Duodenal Ulcer;Duodenum;Endoscopy, Digestive System;Helicobacter Infections;Helicobacter pylori;Humans;Immunity, Cellular;Low-Level Light Therapy;Lymphocyte Count;Stomach;Stomach Ulcer;Stromal Cells;T-Lymphocytes;Treatment Outcome

[State of humoral immunity and phagocytic activity of neutrophils in patients with ulcer and effect of low-intensity laser therapy]. The aim of our investigation was to study the influence of low-intensity laser therapy at the immunologic parameters and Helicobacter pylori (HP) microbial contamination in patients with exacerbation of peptic and duodenal ulcer. 100 patients aged 18-65 were examined and divided into 2 groups. The experimental group (75 patients) underwent a complex drug and laser therapy of various therapeutic techniques. The control group (25 patients) underwent only drug therapy. The results of this study show the immunocorrective effect of different methods of low-intensity laser therapy in the exacerbation period and more essential decrease of HP microbial contamination in the experimental group. Anti-Bacterial Agents;Anti-Ulcer Agents;Immunoglobulins Adult;Anti-Bacterial Agents;Anti-Ulcer Agents;Antibody Formation;Helicobacter Infections;Helicobacter pylori;Humans;Immunoglobulins;Low-Level Light Therapy;Neutrophils;Peptic Ulcer;Phagocytosis;Treatment Outcome

[Effect of magnetolaser therapy on dynamics of bioamines, heparin in injured peritoneum and healing of this injury]. An experimental study on 62 guinea pigs was made to examine a magnetic-laser effect on the levels of histamin, serotonin, catecholamine, heparin and pathomorphology of wound healing after operations in the abdominal cavity. Magnetolaser therapy promotes fast normalization of the above levels, suppression of inflammatory-necrotic processes and stimulation of reparative and regenerative processes. Biogenic Amines;Heparin Abdominal Injuries;Animals;Biogenic Amines;Disease Models, Animal;Guinea Pigs;Heparin;Infrared Rays;Intestine, Large;Low-Level Light Therapy;Wound Healing

[The age aspect of treatment of patient with ulcer of gastroduodenal zone]. The existent methods of treatment patient with ulcer of gastroduodenal zone provide treatment of ills in correspondence with "Standards..." and don't take into account age features of patient. For increase efficiency of treatment patient with gastric ulcer taking into account infection Helicobacter pylori, age features a patient, we conduct the treatment 612 ills using eradication therapy, laser therapy, needlereflexotherapy. We made deduction that eradicates Helicobacter pylori increases time of remission of disease. The needlereflexotherapy conducting with using our methods measures spud of cicatrisation gastric ulcer, especially in cases with the elderly ills. The laser therapy conducting with using our methods especially increases speed of cicatrisation gastric ulcer in cases with the elderly ills, too. Acupuncture Therapy;Adult;Age Factors;Aged;Aged, 80 and over;Combined Modality Therapy;Female;Helicobacter Infections;Helicobacter pylori;Humans;Low-Level Light Therapy;Male;Middle Aged;Stomach Ulcer;Treatment Outcome

Photobiomodulation directly benefits primary neurons functionally inactivated by toxins: role of cytochrome c oxidase. Far red and near infrared (NIR) light promotes wound healing, but the mechanism is poorly understood. Our previous studies using 670 nm light-emitting diode (LED) arrays suggest that cytochrome c oxidase, a photoacceptor in the NIR range, plays an important role in therapeutic photobiomodulation. If this is true, then an irreversible inhibitor of cytochrome c oxidase,

potassium cyanide (KCN), should compete with LED and reduce its beneficial effects. This hypothesis was tested on primary cultured neurons. LED treatment partially restored enzyme activity blocked by 10-100 microm KCN. It significantly reduced neuronal cell death induced by 300 microm KCN from 83.6 to 43.5%. However, at 1-100 mm KCN, the protective effects of LED decreased, and neuronal deaths increased. LED significantly restored neuronal ATP content only at 10 microm KCN but not at higher concentrations of KCN tested. Pretreatment with LED enhanced efficacy of LED during exposure to 10 or 100 microm KCN but did not restore enzyme activity to control levels. In contrast, LED was able to completely reverse the detrimental effect of tetrodotoxin, which only indirectly down-regulated enzyme levels. Among the wavelengths tested (670, 728, 770, 830, and 880 nm), the most effective ones (830 nm, 670 nm) paralleled the NIR absorption spectrum of oxidized cytochrome c oxidase, whereas the least effective wavelength, 728 nm, did not. The results are consistent with our hypothesis that the mechanism of photobiomodulation involves the up-regulation of cytochrome c oxidase, leading to increased energy metabolism in neurons functionally inactivated by toxins. Macromolecular Substances;Propidium;Tetrodotoxin;Adenosine Triphosphate;DNA;Electron Transport Complex IV;Potassium Cyanide Adenosine Triphosphate;Animals;Cell Death;Cerebral Cortex;DNA;Densitometry;Dose-Response Relationship, Drug;Down-Regulation;Electron Transport;Electron Transport Complex IV;Infrared Rays;Intracellular Membranes;Light;Macromolecular Substances;Neurons;Potassium Cyanide;Propidium;Rats;Spectrophotometry;Tetrodotoxin;Time Factors

420 nm intense continuous light therapy for acne. BACKGROUND: Topical antibiotics, isotretinoin or systemic antibiotics are usually used for acne therapy. However, isotretinoin cannot be used during pregnancy because it can cause significant birth defects while systemic antibiotics can have adverse side effects such as gastrointestinal irritation, photosensitivity and tetracycline sensitivity. Describe here is a high-intensity, narrow-band, blue light (ClearLight) system, and its therapeutic clinical effect is investigated on acne using cutaneous measurements, bacterial observations and ultrastructural changes. MATERIALS AND METHODS: A total of 28 adult healthy volunteers with facial acne (mean age 28.1 years, range 16-56 years) were recruited for this study. They were treated with a total of eight serial biweekly 15-minute treatment sessions. Clinical counts of acne, as well as moisture, sebum and pH measurements were taken between each session. Nine of the 28 patients were followed for 2-3 months after the last treatment. Detection of bacteria in acne pustules was analyzed by culture and by polymerase chain reaction (PCR). Ultrastructural changes were examined in eight patients after four sessions of the light therapy. RESULTS: All patients completed the study. Overall, there was a 64.7% improvement in acne lesions. There were no bacterial changes before or after the therapy, although damaged Propionibacterium acnes were observed at the ultrastructural level. CONCLUSIONS: ClearLight performed eight times over 4 weeks can be useful in the treatment of acne. Further investigation will be needed to elucidate the mechanism of action of ClearLight. Acne Vulgaris;Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Middle Aged

Resolution of retracted scar after 585-nm pulse dye laser surgery. BACKGROUND: Laser scar revision has been an effective method for improving several aspects of scarring through ablative and non-ablative sources. The 585-nm pulsed dye laser (PDL) is an important non-ablative instrument for reducing scar bulk and symptoms. OBJECTIVE: To describe the use of a 585-nm PDL for the treatment of a retracted and atrophic facial scar. METHODS: We report the case of a 26-year-old patient who presented with a retracted facial scar following surgical excision of an aggressive benign tumor. Treatment was carried out using the 585-nm PDL. RESULTS: Treatment of the scar using two low-level PDL therapies significantly altered the appearance of the scar and augmentation of the retracted defect was avoided. CONCLUSION: Treatment of this retracted and atrophic facial scar with the 585-

nm PDL was very effective and safe. Adult;Chin;Cicatrix;Facial Dermatoses;Fasciitis;Female;Humans;Low-Level Light Therapy

Long pulsed dye laser treatment of facial wrinkles. BACKGROUND: The flashlamp pulsed dye laser has been used in the treatment of rhytids. OBJECTIVE: To evaluate the efficacy of the long pulsed dye laser in the treatment of mild to moderate wrinkles in Asian patients. METHODS: Wrinkles on one half of the face in 10 subjects were treated with the long pulsed dye laser (595 nm, 10 mm spot size, 10 ms, 7 J/cm2, 40 ms spray, 40 ms delay, single-pass, 30% overlap) with the other side serving as a control. A total of three treatments were given at 2 monthly intervals. The following sites were treated: periorbital area, six patients; forehead, two patients; cheek, two patients. No preoperative anesthesia or postoperative treatment were used. Clinical photographs were taken before and after each treatment, and analysis was undertaken through photographic evaluation by non-treating physicians. RESULTS: At 2 months after the last treatment, the clinical improvement of rhytids was noted in all patients compared with baseline. Four subjects had mild improvement (< or = 25%), five had moderate improvement (26-50%) and one had marked improvement (51-75%). The periorbital area was more responsive to treatment compared with the other sites. No clinical changes were noted in the control areas. No adverse effects were reported except for transient mild erythema in two patients which lasted for up to an hour. Nine patients were somewhat satisfied with the treatment and one was highly satisfied. All wanted the other half of the face to be treated. CONCLUSION: Treatment with a non-ablative 595 nm flashlamp pulsed dye laser can lead to mild to moderate clinical improvement in class I-II rhytids with minimal to no side effects in patients with darker skin types. Adult;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Rhytidoplasty;Skin Aging

[Low-intensity helium-neon laser in the treatment of patients after endonasal dacryocystorhinostomy]. Described in the paper is an efficiency study of using, postoperatively, the low-intensity helium-neon laser (LIHNL) in patients with obstruction of the lacrimal tracts. Eighty patients were examined after endonasal dacryocystorhinostomy. They were shared between 2 groups with respect to a postoperative course: group 1--experimental, 40 patients, and group 2--control, 40 patients. The experimental patients received, apart from the traditional postoperative therapy, a course of LIHNL therapy. The controls received only the traditional postoperative treatment. The efficiency of postoperative treatment was evaluated by clinical, instrumental and laboratory examination methods. The study denoted that the use of LIHNL in the early postoperative period after endonasal dacryocystorhinostomy had a pronounced anti-inflammatory effect, speeded up the wound healing, prevented the growth of granulation tissues and the merging of the shaped lacrimal-sac fistula with the nasal cavity. LIHNL contributed to a complete recovery of the functional activity of the nasal mucous tunic. Thus, the LIHNL therapy essentially facilitates the postoperative management of patients, cuts the rehabilitation period and enhances the treatment results. Helium;Neon Adult;Aged;Aged, 80 and over;Dacryocystorhinostomy;Female;Helium;Humans;Lacrimal Duct Obstruction;Low-Level Light Therapy;Male;Middle Aged;Neon;Postoperative Care;Treatment Outcome

In vitro laser ablation of natural marine biofilms. We studied the efficiency of pulsed low-power laser irradiation of 532 nm from an Nd:YAG (neodymium-doped yttrium-aluminum-garnet) laser to remove marine biofilm developed on titanium and glass coupons. Natural biofilms with thicknesses of 79.4 +/- 27.8 microm (titanium) and 107.4 +/- 28.5 microm (glass) were completely disrupted by 30 s of laser irradiation (fluence, 0.1 J/cm2). Laser irradiation significantly reduced the number of diatoms and bacteria in the biofilm (paired t test; $P < 0.05$). The removal was better on titanium than on glass coupons. Neodymium;Yttrium;Aluminum;Titanium Aluminum;Biofilms;Diatoms;Dose-

Response Relationship, Radiation;Glass;Lasers;Neodymium;Pseudoalteromonas;Radiation Dosage;Seawater;Titanium;Yttrium

[Registration of surface fluorescence of endogenous porphyrins during low-level laser therapy of gastric and duodenal ulcers]. With the use of the developed opto-fiber spectroscope and gastroscope, the intensity of fluorescence from the ulcer surface into the gastrointestinal tract was measured in the range of 670-690 nm under the He-Ne laser (= 632.8 nm) illumination. Surface fluorescence data were collected with the use of a special diagnostic fiber with a total diameter of about 2 mm, which combines some illuminating and receiving fibers. To do the measurements, the diagnostic fiber was brought into a slight contact with the mucosa surface. The quantitative results were calculated with the use of the special fluorescent contrast coefficient (Kf), which takes into account the backscattered light as well. After the fluorescent diagnostic procedure, the low-level laser therapy was applied to all patients. It was found that: first of all, during the laser medical cure the registered fluorescence for the patients with a good dynamics of treatment had an evident tendency to a decrease, and the coefficient Kf for observed ulcers tended to approach the value obtained from normal mucosa (Kf), which indicates the normalization of the porphyrin content in the tissue. Second, the retrospective analysis of the efficacy of laser therapy versus initial values of Kf showed that, for the patients with the initial values Kf = 0.2, the efficiency of the laser treatment was the highest: the relation between the patients with good treatment results and bad ones was 4:1 (more than 80%). For the initial Kf = 0.2-0.3, this relation was 3:1 but for Kf = 0.4-0.5 it was 2:3. The differences in the efficiency of the low-level laser therapy, except the cases of the cancer in the ulcers, may be due to different content of porphyrin in the tissue: at high concentrations of the photosensitizer in the ulcer, the effect of the overdosing could be realized. In this case, another technology of laser illumination is needed. The results are discussed in terms of the free-radical conception of the stimulating effect of laser radiation. Porphyrins Adolescent;Adult;Aged;Aged, 80 and over;Duodenal Ulcer;Female;Fluorescence;Humans;Low-Level Light Therapy;Male;Middle Aged;Porphyrins;Retrospective Studies;Spectrometry, Fluorescence;Stomach Ulcer;Treatment Outcome

Effect of low-level laser therapy on osteoarthropathy in rabbit. The aim of this study was to determine whether low-level laser therapy (LLLT) aided the recovery of damaged articular cartilage in joints with artificially induced osteoarthropathy (OA). OA was induced by injecting hydrogen peroxide (H_2O_2) into the articular spaces of both knees in rabbits, twice a week for 4 weeks. The induction of OA and the effect of LLLT were evaluated by biochemical, radiological and histopathological analysis. Superoxide dismutase (SOD) activity increased about 40% in the OA group, as compared to the controls. Although SOD activity in the OA group was not significantly different from the 2-week groups, it was significantly different from the 4-week control and treatment groups. There was also a significant difference between the 4-week control and treatment groups. Simple radiographs and three-dimensional computed tomographs (3D CT) did not show detectable arthropathy in the OA group, nor any particular changes in the 2-week groups. In contrast, distinct erosions were seen in the distal articular cartilage of the femur, with irregularity of the articular surface, in the 4-week control group, while the erosions were reduced and arthropathy improved slightly in the 4-week treatment group. Grossly, erosions formed on the articular surface in the OA group. In comparison, severe erosions damaged the articular cartilage in the 4-week control group, but not in the 2-week control and treatment groups. Regeneration of articular cartilage was seen in gross observations in the 4-week treatment group. Histopathologically, there was slight irregularity of the articular surface and necrosis in the OA group, and serious cartilage damage, despite slight chondrocyte regeneration, in the 4-week control group. Conversely, the 4-week treatment group showed chondrocyte replacement, with sometimes close to normal articular cartilage on the articular surface. These

results suggest that LLLT was effective in the treatment of chemically-induced OA. Superoxide Dismutase Animals;Arthrography;Cartilage, Articular;Disease Models, Animal;Hindlimb;Low-Level Light Therapy;Osteoarthritis;Rabbits;Regeneration;Stifle;Superoxide Dismutase;Tomography, X-Ray Computed;Treatment Outcome
Reticulate erythema following diode laser-assisted hair removal: a new side effect of a common procedure. The popularity of laser-assisted hair removal has grown rapidly since April 3, 1995 when the Food and Drug Administration approved the introduction of the first hair removal laser system. Lasers with wavelengths in the red and infrared portion of the electromagnetic spectrum are most often used for hair removal because they effectively target melanin in the hair follicle and can potentially penetrate to the appropriate depth of the dermis. Despite all efforts to protect the skin from damage, photoepilation may result in clinically significant adverse reactions. The most common and known side effects of laser hair removal include transient erythema, perifollicular edema, pain, folliculitis, hyper-pigmentation, hypopigmentation, crusting, purpura, erosions and scarring. The present report describes the appearance of a reticulate erythema after diode laser treatment for hair removal, encountered in 10 patients in our clinics in London and Israel. To the best of our knowledge, this is the first report of this side effect. The aim of this work is to detail the clinical manifestations, histological findings, and follow-up of these patients in order to expand the clinical spectrum of laser-assisted hair removal side effects and to alert dermatologists to the possibility of this type of net-like erythema. Adult;Diagnosis, Differential;Erythema;Female;Follow-Up Studies;Hair Removal;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome
Ottawa Panel Evidence-Based Clinical Practice Guidelines for Electrotherapy and Thermotherapy Interventions in the Management of Rheumatoid Arthritis in Adults. BACKGROUND AND PURPOSE: The purpose of this project was to create guidelines for electrotherapy and thermotherapy interventions in the management of adult patients (>18 years of age) with a diagnosis of rheumatoid arthritis according to the criteria of the American Rheumatism Association (1987). METHODS: Using Cochrane Collaboration methods, the Ottawa Methods Group identified and synthesized evidence from comparative controlled trials. The group then formed an expert panel, which developed a set of criteria for grading the strength of the evidence and the recommendation. Patient-important outcomes were determined through consensus, provided that these outcomes were assessed with a validated and reliable scale. RESULTS: The Ottawa Panel developed 8 positive recommendations of clinical benefit. Lack of evidence meant that the panel could not gauge the efficacy of electrical stimulation. DISCUSSION AND CONCLUSION: The Ottawa Panel recommends the use of low-level laser therapy, therapeutic ultrasound, thermotherapy, electrical stimulation, and transcutaneous electrical nerve stimulation for the management of rheumatoid arthritis. Adult;Arthritis, Rheumatoid;Electric Stimulation Therapy;Humans;Hyperthermia, Induced;Laser Therapy;Transcutaneous Electric Nerve Stimulation;Treatment Outcome;Ultrasonic Therapy
Low-Level Laser Therapy Facilitates Superficial Wound Healing in Humans: A Triple-Blind, Sham-Controlled Study. OBJECTIVE: Low-level laser therapy (LLLT) has been promoted for its beneficial effects on tissue healing and pain relief. However, according to the results of in vivo studies, the effectiveness of this modality varies. Our purpose was to assess the putative effects of LLLT on healing using an experimental wound model. DESIGN AND SETTING: We used a randomized, triple-blind, placebo-controlled design with 2 within-subjects factors (wound and time) and 1 between-subjects factor (group). Data were collected in the laboratory setting. SUBJECTS: Twenty-two healthy subjects (age = 21 +/- 1 years, height = 175.6 +/- 9.8 cm, mass = 76.2 +/- 14.2 kg). MEASUREMENTS: Two standardized 1.27-cm(2) abrasions were induced on the anterior forearm. After wound cleaning, standardized digital photos were recorded. Each subject then received LLLT (8 J/cm(2); treatment time = 2 minutes, 5 seconds; pulse rate = 700 Hz) to 1 of the 2 randomly chosen wounds from either a

laser or a sham 46-diode cluster head. Subjects reported back to the laboratory on days 2 to 10 to be photographed and receive LLLT and on day 20 to be photographed. Data were analyzed for wound contraction (area), color changes (chromatic red), and luminance. RESULTS: A group x wound x time interaction was detected for area measurements. At days 6, 8, and 10, follow-up testing revealed that the laser group had smaller wounds than the sham group for both the treated and the untreated wounds ($P < .05$). No group x wound x time differences were detected for chromatic red or luminance. CONCLUSIONS: The LLLT resulted in enhanced healing as measured by wound contraction. The untreated wounds in subjects treated with LLLT contracted more than the wounds in the sham group, so LLLT may produce an indirect healing effect on surrounding tissues. These data indicate that LLLT is an effective modality to facilitate wound contraction of partial-thickness wounds.

Fungicidal effect of diode laser irradiation in patients with denture stomatitis. BACKGROUND AND OBJECTIVE: Denture stomatitis (DS) is a common inflammatory condition that affects denture wearers. The aim of this study was to examine, in vivo, the effect of diode laser irradiation on fungal growth in both the palatal mucosa and in denture base materials, in denture wearing patients. STUDY DESIGN/MATERIALS AND METHODS: In total, 70 patients with clinical study design evidence of DS participated in this parallel, single blind, and placebo controlled study. The subjects were randomly assigned to one of four different treatment regimens: (1) irradiation with a 685 nm wavelength laser for 10 minutes (30 mW); (2) irradiation with a 830 nm wavelength laser for 5 minutes (60 mW). A semiconductor diode laser, BTL-2000 (BTL-2 Dravotnicka Technika, Prague, Czech Republic), was used in both treatment cases using an energy density of 3.0 J/cm(2) and a continuous working mode for five consecutive days; (3) placebo-sham irradiation of patients; (4) antimicotic-self treatment of patient's palatal mucosa with an antifungal oral gel and the use of an antiseptic solution for their dentures. The effect of laser light on fungal growth in vivo was evaluated after final treatment using the swab method and a semi-quantitative estimation of Candida albicans colonies cultivated on agar plates. RESULTS: A fungicidal effect was achieved in the laser treated and antimicotic treated groups, whereas most subjects in the placebo group were found to have unchanged conditions on both their palate ($P = 0,004$) and dentures ($P < 0,001$). CONCLUSIONS: Light from a low-power laser (LLLT) may be valuable in the treatment of DS. This is of great importance since the rate of recurrence of disease is high, whereas an optimal treatment modality has not yet been found.
Aged;Candida;Candidiasis, Oral;Female;Humans;Laser Therapy;Male;Single-Blind Method;Stomatitis, Denture

Efficacy of the 308-nm excimer laser in the treatment of mycosis fungoides.
Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Mycosis Fungoides;Prospective Studies;Treatment Outcome

Ultrasound and laser therapy in the treatment of carpal tunnel syndrome. This study was designed to compare the efficacy of ultrasound and laser treatment for mild to moderate idiopathic carpal tunnel syndrome. Ninety hands in 50 consecutive patients with carpal tunnel syndrome confirmed by electromyography were allocated randomly in two experimental groups. One group received ultrasound therapy and the other group received low level laser therapy. Ultrasound treatment (1 MHz, 1.0 W/cm(2), pulse 1:4, 15 min/session) and low level laser therapy (9 joules, 830 nm infrared laser at five points) were applied to the carpal tunnel for 15 daily treatment sessions (5 sessions/week). Measurements were performed before and after treatment and at follow up four weeks later, and included pain assessment by visual analogue scale; electroneurographic measurement (motor and sensory latency, motor and sensory action potential amplitude); and pinch and grip strength. Improvement was significantly more pronounced in the ultrasound group than in low level laser therapy group for motor latency (mean difference 0.8 m/s, 95% CI 0.6 to 1.0), motor action potential amplitude (2.0 mV, 95% CI 0.9 to 3.1), finger pinch strength (6.7 N, 95% CI 5.0 to 8.2),

and pain relief (3.1 points on a 10-point scale, 95% CI 2.5 to 3.7). Effects were sustained in the follow-up period. Ultrasound treatment was more effective than laser therapy for treatment of carpal tunnel syndrome. Further study is needed to investigate the combination therapy effects of these treatments in carpal tunnel syndrome patients. Action Potentials;Carpal Tunnel Syndrome;Electrodiagnosis;Hand Strength;Humans;Low-Level Light Therapy;Middle Aged;Pain Measurement;Treatment Outcome;Ultrasonic Therapy

Effect of low-power pulsed laser on peripheral nerve regeneration in rats. The purpose of this study was to determine whether low-power pulsed laser irradiation could affect the regeneration of a 10-mm gap of rat sciatic nerve created between the proximal and distal nerve stumps, which were sutured into silicone rubber tubes. After 8 weeks of recovery, pulsed laser-irradiated groups at frequencies of 5 kHz and 20 kHz both had significantly lower success percentages of regeneration (50% and 44%, respectively) compared to sham-irradiated controls (100%). In addition, qualitative and quantitative histology of the regenerated nerves revealed a less mature ultrastructural organization with a smaller cross-sectional area and a lower number of myelinated axons in both pulsed laser-irradiated groups than in controls. These results suggest that pulsed laser irradiation could elicit suppressing effects on regenerating nerves. Animals;Axons;Low-Level Light Therapy;Motor Neurons;Muscle, Skeletal;Nerve Regeneration;Peripheral Nerves;Rats;Rats, Sprague-Dawley;Sciatic Nerve

Histological effect and protein expression in subthreshold transpupillary thermotherapy in rabbit eyes. OBJECTIVE: To investigate the histological effect of subthreshold transpupillary thermotherapy (TTT) on the retina. METHODS: We performed TTT in normal pigmented rabbit eyes using an 810-nm diode laser with spot size of 1.2 mm, power of 50 mW, and varying durations of 15, 30, or 60 seconds. Four weeks later, fluorescein angiography was performed, and the enucleated eyes were examined by means of electron microscopy and immunohistochemical staining. RESULTS: Funduscopy immediately and at 4 weeks showed no discernable changes at TTT sites, and fluorescein angiography at 4 weeks showed no abnormalities. However, electron microscopy showed photoreceptor and retinal pigment epithelium cell disruption, changes more prominent with longer durations of treatment. Immunohistochemical staining was positive for heat shock protein 60, heat shock protein 70, tumor necrosis factor alpha, and vascular cell adhesion molecule 1 in the photoreceptors and retinal pigment epithelium at TTT sites. Untreated control eyes showed no staining. CONCLUSIONS: Despite the absence of changes evident by funduscopy and fluorescein angiography, TTT resulted in dose-dependent histological changes in photoreceptors and retinal pigment epithelium. The induction of heat shock proteins, cytokines, and cell adhesion molecules may play a role in the tissue response to subthreshold TTT. Clinical Relevance Unrecognized damage to the retina and retinal pigment epithelium may contribute to visual loss in eyes that undergo subthreshold TTT. Chaperonin 60;HSP70 Heat-Shock Proteins;Tumor Necrosis Factor-alpha;Vascular Cell Adhesion Molecule-1 Animals;Chaperonin 60;Fluorescein Angiography;HSP70 Heat-Shock Proteins;Hyperthermia, Induced;Immunohistochemistry;Low-Level Light Therapy;Microscopy, Electron;Ophthalmoscopes;Photoreceptor Cells, Vertebrate;Pigment Epithelium of Eye;Rabbits;Retina;Retinal Vessels;Tumor Necrosis Factor-alpha;Vascular Cell Adhesion Molecule-1

[Efficacy of low-intensive laser irradiation in coronary heart disease]. Coronary Disease;Humans;Low-Level Light Therapy

Low-level laser therapy in dentistry. Low-level laser therapy (LLLT) is a newly developing technique in dentistry, although it has been used among medical, dental, physiotherapy, and veterinary professions in some parts of the world for decades. LLLT can offer tremendous therapeutic benefits to patients, such as accelerated wound healing and pain relief. There is much to be learned about the mechanisms, recognition of the therapeutic window, and how to properly use these

cellular phenomena to reach the treatment goals. Humans;Low-Level Light Therapy;Mouth Diseases;Pain;Radiotherapy Dosage;Tooth Diseases;Wound Healing
Lasers in pediatric dentistry. Pediatric dentistry's mission in delivering care to our young patients is simple: provide optimal preventive, interceptive, and restorative dental care in a stress-free environment. Lasers such as argon, diode, Nd:YAG, CO2, and now the erbium family enable minimally invasive dentistry for hard- and soft-tissue procedures. This article offers an understanding of treatment planning in the pediatric practice and demonstrates the procedures that dental lasers can perform on younger patients. Child;Child, Preschool;Dental Care for Children;Humans;Infant;Laser Therapy;Lasers;Low-Level Light Therapy;Minimally Invasive Surgical Procedures;Mouth Diseases;Tooth Diseases
Combined nonablative skin rejuvenation with the 595- and 1450-nm lasers. BACKGROUND: Histologic findings are not echoed in the visible effect in the epidermis after skin rejuvenation. SUBJECTS AND METHODS: Ten women (Group A) received five treatment sessions with a 595-nm pulsed dye laser immediately followed by a 1450-nm diode laser. Two other demographically similar groups of 10 patients each, Groups B and C, were treated with the 595-nm pulsed dye laser or the 1450-nm diode laser alone, respectively. RESULTS: Good dermal collagen remodeling was observed in Group A. Overall better and faster results were seen in Group A. The 6-month clinical outcome was best in Group A followed by Group C and Group B. CONCLUSIONS: Wavelengths of 595 plus 1450 nm for skin rejuvenation produced good results with much higher patient satisfaction than those obtained with the 595- or 1450-nm wavelengths alone. Adult;Face;Female;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Rejuvenation;Skin Aging;Treatment Outcome
[Male genital tuberculosis in West Siberia]. Clinical picture and structure of male genital tuberculosis were analyzed basing on case histories of Novosibirsk regional tuberculous hospital (outpatient department): 42 patients with tuberculous epidydymitis and 58 patients with prostatic tuberculosis. Efficiency of combined etiopathogenetic treatment was estimated in 91 patients admitted to the Urogenital clinic of Novosibirsk Research Institute of Tuberculosis. These patients received polychemotherapy alone (control group) or in combination with laser therapy (study group). Combination of polychemotherapy with laser radiation proved more effective than polychemotherapy alone. Antitubercular Agents Adolescent;Adult;Antitubercular Agents;Combined Modality Therapy;Epididymitis;Humans;Low-Level Light Therapy;Male;Mycobacterium tuberculosis;Prostatitis;Siberia;Tuberculosis, Male Genital
Effect of low-energy laser irradiation on the area of experimental myocardial infarction, lipid peroxidation, and hemoglobin affinity for oxygen. The mechanism of antiischemic effect of low-energy laser radiation was studied in rats with experimental myocardial infarction taking into consideration the effect of laser on hemoglobin affinity for oxygen and intensity of lipid peroxidation. Low-energy laser irradiation for 15 min in vitro decreased the area of myocardial infarction, slightly reduced hemoglobin affinity for oxygen, and inhibited lipid peroxidation. Short-term low-energy laser irradiation did not reduce the area of necrosis, initiated lipid peroxidation, and increased superoxide dismutase activity. Hemoglobins;Malondialdehyde;Superoxide Dismutase;Oxygen Animals;Female;Hemoglobins;Humans;Lasers;Lipid Peroxidation;Male;Malondialdehyde;Myocardial Infarction;Myocardium;Oxygen;Rabbits;Rats;Superoxide Dismutase
[Quality of life as a research field in physiotherapy]. Mineral Waters Dyspepsia;Humans;Hypertension;Low-Level Light Therapy;Mineral Waters;Myocardial Ischemia;Physical Therapy Modalities;Quality of Life
[Ultraphonophoresis and photophoresis of chondroxide ointment in combined treatment of mandibular fractures]. Efficacy of mandibular fractures treatment with laser irradiation, ultrasound therapy, photophoresis and ultraphonophoresis of 5% chondroxide oitment in 108

patients with mandibular fractures was studied. Physicopharmacological and clinical investigations showed perspectiveness of using photophoresis and ultraphonophoresis of chondroxide in maxillofacial traumatology for treatment of mandibular fractures. Ointments;Chondroitin Sulfates Adolescent;Adult;Chondroitin Sulfates;Combined Modality Therapy;Humans;Low-Level Light Therapy;Mandibular Fractures;Middle Aged;Ointments;Phonophoresis;Physical Therapy Modalities;Treatment Outcome;Ultrasonic Therapy

[Semiconductor low level laser irradiation for exposure of hydroxyapatite orbital implants]. OBJECTIVE: To evaluate the efficacy of semiconductor low level laser irradiation for the treatment of postoperative exposure of hydroxyapatite orbital implants. METHODS: 22 cases with postoperative exposure of hydroxyapatite orbital implants were divided into three groups according to the size of implants exposure. The exposure wound in the 3 groups was irradated with semiconductor low level laser 5 min per day for 5-15 days. The follow-up period ranged from 2 to 24 months. RESULTS: In the group with less then 3 mm of exposure, the wound healed in 1 week after 5-10 days irradiation; in the group with implant exposure of 4-7 mm, the would healed in 1-2 weeks after 10-15 days irradiation; in the group with implant exposure of 8-10 mm, the would healed in 2-3 weeks after 10-15 days irradiation. Compared with the treatments of drugs and/or surgical repair, which was used for another 20 cases of exposure of hydroxyapatite orbital implants, semiconductor low level laser increased healing rate obviously in the groups with implant exposure of 4-7 mm and 8-10 mm (P = 0.019, 0.018). CONCLUSION: Semiconductor low level laser has better effects than drugs and/or surgical repair for exposure of hydroxyapatite orbital implants. Durapatite Adolescent;Adult;Aged;Child;Durapatite;Eye;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Orbital Implants;Postoperative Complications;Semiconductors;Treatment Outcome

Efficacy of 904 nm gallium arsenide low level laser therapy in the management of chronic myofascial pain in the neck: a double-blind and randomize-controlled trial. BACKGROUND AND OBJECTIVES: A prospective, double-blind, randomized, and controlled trial was conducted in patients with chronic myofascial pain syndrome (MPS) in the neck to evaluate the effects of infrared low level 904 nm Gallium-Arsenide (Ga-As) laser therapy (LLLT) on clinical and quality of life (QoL). STUDY DESIGN/PATIENTS AND METHODS: The study group consisted of 60 MPS patients. Patients were randomly assigned to two treatment groups: Group I (actual laser; 30 patients) and Group II (placebo laser; 30 patients). LLLT continued daily for 2 weeks except weekends. Follow-up measures were evaluated at baseline, 2, 3, and 12 weeks. All patients were evaluated with respect to pain at rest, pain at movement, number of trigger points (TP), the Neck Pain and Disability Visual Analog Scale (NPAD), Beck depression Inventory (BDI), and the Nottingham Health Profile (NHP). RESULTS: In active laser group, statistically significant improvements were detected in all outcome measures compared with baseline ($P < 0.01$) while in the placebo laser group, significant improvements were detected in only pain score at rest at the 1 week later of the end of treatment. The score for self-assessed improvement of pain was significantly different between the active and placebo laser groups (63 vs. 19%) ($P < 0.01$). CONCLUSION: This study revealed that short-period application of LLLT is effective in pain relief and in the improvement of functional ability and QoL in patients with MPS. Adult;Chronic Disease;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Myofascial Pain Syndromes;Neck;Prospective Studies;Quality of Life;Recovery of Function;Treatment Outcome

Neurotransmitter release changes induced by low power 830 nm diode laser irradiation on the neuromuscular junctions of the mouse. BACKGROUND AND OBJECTIVE: Treating patients with a Gallium-Aluminum-Arsenide (GaAlAs) infrared (IR) diode laser reduces muscle spasm and increases mobility in the muscles. The effect of low intensity laser irradiation on nerve function, growth, and

repair mechanisms is a contentious area of research. We have addressed one aspect of this controversy by systematically examining the influence of 830 nm laser radiation on neurotransmitter release in neuromuscular junctions (NMJ) of the mouse diaphragm. STUDY DESIGN/MATERIALS AND METHODS: Thirty adult mice were studied. Diode laser GaAlAs 830 nm (4 and 12 J/cm2) was used. Neurotransmitter release was studied by conventional intracellular recording techniques on curarized muscles or high magnesium media. The quantal content, amplitude, and latency of the end-plate potentials (EPPs) were analyzed. Frequency and amplitude were evaluated for the miniature end-plate potentials (MEPPs). Facilitation of the neurotransmitter release was also evaluated by paired pulse stimulation. RESULTS AND CONCLUSIONS: The irradiated (12 J/cm2) muscles showed a significant reduction in quantal content (P = 0.01) and EPP amplitude (P = 0.04), but the latency, spontaneous transmitter release (MEPPs) and paired pulse facilitation did not change. No alterations were observed in NMJ irradiated with 4 J/cm2. We conclude that 830 nm diode laser irradiation (at a dose of 12 J/cm2) can affect the evoked neurotransmitter release in the mouse motor endplates. Neurotransmitter Agents Animals;Evoked Potentials, Motor;Low-Level Light Therapy;Male;Mice;Neuromuscular Junction;Neurotransmitter Agents

Laser irradiation of the guinea pig basilar membrane. BACKGROUND AND OBJECTIVES: The cochlea is the part of the inner ear that transduces sound waves into neural signals. The basilar membrane, a connective tissue sheet within the cochlea, is tonotopically tuned based on the spatial variation of its mass, stiffness, and damping. These biophysical properties are mainly defined by its constituent collagen fibers. We sought to assess the effect of laser irradiation on collagen within the basilar membrane using histological analysis. STUDY DESIGN/MATERIALS AND METHODS: Four excised guinea pig cochleae were stained with trypan blue. From these, two were irradiated with a 600 nm pulsed dye laser and two were used as controls. Collagen organization was visualized using polarization microscopy. RESULTS: Laser irradiation reduced the birefringence within the basilar membrane as well as within other stained collagen-containing structures. Larger reductions in birefringence were measured when more laser pulses were given. The effects were similar across all turns of each cochlea. CONCLUSIONS: Laser irradiation causes immediate alterations in collagen organization within the cochlea that can be visualized with polarization microscopy. These alterations may affect cochlear tuning. Ongoing research is aimed at analyzing the effect of laser irradiation on cochlear function. It is conceivable that this technique may have therapeutic benefits for patients with high-frequency sensorineural hearing loss. Collagen Animals;Basilar Membrane;Collagen;Female;Guinea Pigs;Low-Level Light Therapy;Male

Effects of helium-neon laser on levels of stress protein and arthritic histopathology in experimental osteoarthritis. OBJECTIVE: To investigate the effect of low-power laser therapy on levels of stress proteins (SPs) in experimental arthritis and their relation to the bioeffects on arthritic cartilage repair. DESIGN: A total of 42 rats with similar degrees of induced arthritis evaluated by means of bone scan were divided randomly into two groups. In the treated group, 21 rats received helium-neon laser treatment; in the control group, 21 rats received sham laser treatment. The changes in chondrocytes of SPs were measured by electrophoresis of proteins extracted from chondrocytes of arthritic cartilage at various time periods. The histopathologic changes and the presence of SP of arthritic cartilage were identified by hematoxylin and eosin stain and by immunostains of SP72 antibody individually from frozen sections of arthritic cartilage. RESULTS: SP density increased markedly in rats after laser treatment and was closely related to the repair of arthritic cartilage. Furthermore, the pathohistology of arthritic cartilage improved significantly with the decline of SP levels in the follow-up period. CONCLUSION: Helium-neon (632 nm) low-power laser can enhance SP production in arthritic chondrocytes. The extragenic production of SP is well correlated with the therapeutic effect of low-power laser in preserving chondrocytes and the repair of arthritic cartilage in rats. Heat-

Shock Proteins;Helium;Neon Animals;Cartilage, Articular;Chondrocytes;Disease Models, Animal;Female;Heat-Shock Proteins;Helium;Low-Level Light Therapy;Neon;Osteoarthritis;Rats;Rats, Wistar
Pulsed dye laser treatment of acne vulgaris. Acne Vulgaris;Humans;Laser Therapy;Low-Level Light Therapy
Effect of carbon dioxide laser resurfacing on epidermal p53 immunostaining in photodamaged skin. OBJECTIVE: To quantitatively examine changes in p53 tumor suppressor gene immunostaining after carbon dioxide (CO(2)) laser resurfacing of photodamaged skin to assess the potential value of this treatment in reducing the risk of progression to cutaneous carcinoma. DESIGN: Serial in vivo immunohistochemical analyses after laser therapy. SETTING: Academic referral center, Department of Dermatology, University of Michigan, Ann Arbor. OTHER PARTICIPANTS: Volunteer sample of 11 adults, 51 to 76 years old, with clinically evident photodamage of the forearms. INTERVENTION: Focal CO(2) laser resurfacing of photodamaged forearms and serial biopsies at baseline, 3 weeks, and 6 months after treatment. MAIN OUTCOME MEASURES: Because keratinocytes with mutations in p53 or altered p53 expression stain via immunohistochemical techniques, image analysis of immunohistochemically stained sections was used to quantify p53 expression. RESULTS: Positive immunostaining for p53 in the interfollicular epidermis was noted in 8 of 11 subjects at baseline, with an average staining density of 250 cells/mm(2). Average staining decreased to 3 cells/mm(2) 3 weeks after treatment. This decrease was sustained at 5 cells/mm(2) 6 months after resurfacing. CONCLUSIONS: There was a consistent decrease in p53 immunostaining in the interfollicular epidermis lasting for at least 6 moths after CO(2) laser resurfacing of photodamaged skin. Since p53 mutation or overexpression is observed in a majority of cases of cutaneous carcinoma, the posttreatment repopulation of the epidermis with p53-negative keratinocytes should theoretically decrease the risk of malignant progression. Further study of laser resurfacing as a prophylactic procedure in patients at high risk for skin cancer development appears warranted. Carbon Dioxide;Tretinoin Administration, Topical;Aged;Biopsy, Needle;Carbon Dioxide;Epidermis;Female;Follow-Up Studies;Genes, p53;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Middle Aged;Mutation;Prospective Studies;Rhytidoplasty;Risk Assessment;Single-Blind Method;Skin Aging;Treatment Outcome;Tretinoin
Topical tacrolimus and the 308-nm excimer laser: a synergistic combination for the treatment of vitiligo. OBJECTIVE: To compare the efficacy of combined tacrolimus and 308-nm excimer laser therapy vs 308-nm excimer laser monotherapy in treating vitiligo. DESIGN: Comparative, prospective, randomized, intraindividual study. PATIENTS: Fourteen patients, aged 12 to 63 years, with Fitzpatrick skin types II to IV. INTERVENTION: For each patient, 4 to 10 target lesions were chosen. The treatment applied to each target lesion was randomized by drawing lots. Each lesion was treated twice a week by the 308-nm excimer laser, for a total of 24 sessions. Initial fluences were 12 mcal/cm(2) (50 mJ/cm(2)) less than the minimal erythemal dose in vitiliginous skin. Then, fluences were increased by 12 mcal/cm(2) every second session. Moreover, topical 0.1% tacrolimus ointment was applied twice daily on target lesions receiving the combined tacrolimus and excimer laser treatment (group A). Group B target lesions received only excimer laser monotherapy. For each treated lesion, the untreated lesion on the opposite side served as the control. Tolerance was evaluated by a visual analog scale, and secondary events were recorded at each session. MAIN OUTCOME MEASURE: Treatment efficacy, which was blindly evaluated by 2 independent physicians by direct and polarized light photographs taken before and after treatment. RESULTS: Forty-three lesions were treated (23 in group A and 20 in group B). All patients completed the study. Repigmentation was observed in all group A lesions (100%) and in 17 (85%) of the 20 group B lesions. Repigmentation was not observed in the untreated lesions (control group). A repigmentation rate of

75% or more was obtained in 16 (70%) of the 23 group A lesions and in 4 (20%) of the 20 group B lesions. In UV-sensitive areas (the face, neck, trunk, and limbs, with the exception of bony prominences and extremities), 10 (77%) of 13 group A lesions had a repigmentation rate of 75% or more vs 4 (57%) of 7 group B lesions. In classically UV-resistant areas, 6 (60%) of 10 group A lesions had a repigmentation rate of 75% or more vs 0 of the 13 group B lesions. The mean number of sessions necessary for an improvement of repigmentation was 10 in group A and 12 in group B. Adverse effects have been limited, and tolerance was excellent. CONCLUSIONS: The combination treatment of 0.1% tacrolimus ointment plus the 308-nm excimer laser is superior to 308-nm excimer laser monotherapy for the treatment of UV-resistant vitiliginous lesions (P<.002). The efficacy and the good tolerance of the 308-nm excimer laser in monotherapy for treating localized vitiligo were also confirmed, but this treatment regimen should be proposed only for UV-sensitive areas. Tacrolimus Administration, Topical;Adolescent;Adult;Child;Combined Modality Therapy;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Drug Administration Schedule;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Probability;Prospective Studies;Radiation Dosage;Reference Values;Risk Assessment;Severity of Illness Index;Tacrolimus;Treatment Outcome;Vitiligo

[Transpupillary thermotherapy of choroidal neovascularisation (CNV) among other methods of treatment]. Choroidal neovascularization (CNV) secondary to age-related macular degeneration is a leading cause of vision loss in adults. Although most patients present with occult CNV, treatment has focused on the small percentage of eyes with well-delineated, classic CNV. Transpupillary thermotherapy is a recent advancement in the management of occult CNV. We demonstrated the effectiveness of transpupillary thermotherapy (TTT) for the treatment of occult choroidal neovascularization (CNV). In a retrospective, case selected trial 50 eyes with CNV secondary to age related macular degeneration (AMD) were studied. The eyes with CNV were treated with diode laser (810 nm) TTT. Laser beam sizes ranged between 0.8 and 3.0 mm and power settings between 700-800 mW. Treatment was given in one area for 1 minute. Transpupillary thermotherapy is a potential treatment for CNV. It is able to close choroidal neovascularization while maintaining visual function in patients with classic and especially occult disease. Aged;Aged, 80 and over;Choroidal Neovascularization;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

Effect of Ga-as laser on the regeneration of injured sciatic nerves in the rat. Laser irradiation is one of the therapeutic methods for the recovery of degenerated peripheral nerves. The aim of the present study was to determine if low-power laser treatment stimulates the regeneration process of damaged nerves. A standardized crush to the sciatic nerve was applied to cause extensive axonal degeneration. After this procedure, low-power infrared laser irradiation was administered transcutaneously to the injured sciatic nerve, 3 minutes daily to each of four treatment groups for 1, 3, 5 and 7 weeks, respectively. A nerve conduction study was done, and a morphological assessment was performed using both light and electron microscopy. With trauma of the nerve, both amplitude of compound motor action potential and nerve conduction velocity decreased significantly compared to the pre-trauma state. Morphologically, the numbers of myelinated axons and degenerated axons were decreased and increased, respectively, compared with the control. Typical aspects were of onion skin-type lamellation, fragmentation, edematous swelling and rarefaction in the myelin sheath. All these parameters recovered almost to the level of the pre-trauma state with laser irradiation, in direct proportion to the time spent for treatment. These results suggest that low-power infrared laser irradiation can relieve the mechanical damage of sciatic nerves and stimulate the regeneration of peripheral nerves. Arsenicals;gallium arsenide;Gallium Animals;Arsenicals;Disease Models, Animal;Gallium;Low-Level Light Therapy;Male;Microscopy, Electron, Transmission;Nerve Regeneration;Neural Conduction;Rats;Rats, Sprague-Dawley;Sciatic Nerve;Time Factors

[Regenerative capacity of muscle tissue and thymus state in irradiated rats exposed to long-term He-Ne laser radiation]. We studied the effect of He-Ne laser on regeneration of damaged gastrocnemius muscle in rats irradiated at 6 Gy in conditions of fractional laser energy spread (10 exposures, 3 min for each limb, within 30 days after the operation; 2-3 exposures weekly; 2.5-3.0 mW/cm2 power density; and 9.0-10.8 J/cm2 total dose per animal). Laser radiation stimulated regenerative activity of the skeletal muscle and favored a more even distribution of load on the thymus (a smooth decrease in its weight and slow aplasia). The level of chromosomal aberrations in the thymocytes demonstrated certain instability although remained lower as compared to the control during the whole observation period (60 days). Animals;Chromosome Aberrations;Low-Level Light Therapy;Male;Muscle, Skeletal;Radiation Injuries, Experimental;Rats;Regeneration;Thymus Gland

Laser acupuncture: past, present, and future. Laser acupuncture is defined as the stimulation of traditional acupuncture points with low-intensity, nonthermal laser irradiation. Although the therapeutic use of laser acupuncture is rapidly gaining in popularity, objective evaluation of its efficacy in published studies is difficult because treatment parameters such as wavelength, irradiance, and beam profile are seldom fully described. The depth of laser energy transmission, likely an important determinant of efficacy, is governed not only by these parameters, but also by skin properties such as thickness, age, and pigmentation-factors which have also received little consideration in laser acupuncture. Despite the frequently equivocal nature of the published laser studies, recent evidence of visual cortex activation by laser acupuncture of foot points, together with the known ability of laser irradiation to induce cellular effects at subthermal thresholds, provides impetus for further research. Acupuncture;Animals;Humans;Low-Level Light Therapy;Pain;Placebo Effect;Radiotherapy Dosage

[A clinical observation of pericoronitis treatment with pulse semiconductor laser]. In order to valuate the effect of pericoronitis treated with pulse semiconductor laser. As a treatment group, 24 ones drawn ramdomly from 48 cases of pericoronitis were given periodontal radiation, point-radiation therapy and pharmacotherapy as well. While another 24 cases as a contrast group were given pharmacotherapy only. On the 3rd day and the 5th day the degree of pain and restriction of mouth opening of the two groups were graded, contrasted and processed by Ridit statistics. Result, The therapy group gained more notable effect in pain-relieving and mouth-opening-improving than the contrast group. Because of no damage, handy and can be done easily, be definite in curative effect, Pulse semiconductor laser treatment pericoronitis deserves popularizing. Acupuncture Points;Adult;Female;Humans;Low-Level Light Therapy;Male;Pericoronitis;Semiconductors

[The 308 nm excimer laser--an advance in the treatment of psoriasis]. Humans;Low-Level Light Therapy;Psoriasis;Radiation Dosage;Retreatment;Secondary Prevention

Photomedicine and laser literature watch. Humans;Laser Therapy;Low-Level Light Therapy

ArF-193 excimer laser and Emdogain in the treatment of experimental periodontitis: an experimental study in rabbits. OBJECTIVE: We aimed to investigate how the progress made on laser technology during the last ten years could overcome this obstacle and allow the use of lasers in periodontology, together with the application of a number of products permitting the regeneration of periodontal tissues. BACKGROUND DATA: The use of lasers in dentistry remains controversial, in spite of their increasing application in medical practice. The main reason for this discrepancy is the frequent report of damage to surrounding tissues and the dental pulp, due to the energy transfer, from the site of laser impact. METHODS: Experimental periodontitis was initiated in fifteen rabbits. Animals were divided into five equal groups. In the control group, no therapy was applied. The

remaining four groups were treated with curettage or ArF 193 excimer laser, under conditions of strict control of frequency, fluency, and application, without or with the application of a periodontal healing product (Emdogain). Laser was applied by the use of a new, articulated arm for beam delivery. Pocket depth and microscopic analysis were performed three weeks after treatment. RESULTS: Our results show that all treatment groups decreased pocket depth significantly. ArF193 excimer laser does not produce any histological damage to the dental pulp, and facilitates periodontal regeneration. This result is highly facilitated by the application of Emdogain). CONCLUSIONS: The use of UV lasers, under a tight control of its energy, may be a valuable tool for the treatment of periodontal diseases, especially combined with the use of healing products. Further study is need to confirm these results. Dental Enamel Proteins;enamel matrix proteins;Erbium Animals;Dental Enamel Proteins;Disease Models, Animal;Erbium;Female;Low-Level Light Therapy;Male;Microscopy, Electron;Periodontitis;Periodontium;Pilot Projects;Probability;Rabbits;Reference Values;Sensitivity and Specificity;Subgingival Curettage;Treatment Outcome

Tensile bond strength of a one-bottle adhesive system to indirect composites treated with Er:YAG laser, air abrasion, or fluoridric acid. OBJECTIVE: This in vitro study evaluated the tensile bond strength of Single Bond adhesive system to indirect composite surfaces treated with Er:YAG laser, fluoridric acid, or air abrasion. BACKGROUND DATA: Application of adhesive techniques is well established in restorative dentistry, yet the influence of surface treatments on the bond strength of adhesive systems to indirect composite restorations prior to luting or repair procedures remains unclear. METHODS: Two hundred and ten samples made of three indirect composites (BelleGlass, Sculpture, and Targis) were divided into 21 groups (n = 10) and treated with (1) control (no treatment); (2) silane (RelyX 3M ceramic primer); (3) 10% fluoridric acid; (4) Er:YAG laser; (5) Er:YAG laser + 10% fluoridric acid; (6) air abrasion; and (7) air abrasion + 10% fluoridric acid. Afterwards, silane and Single Bond adhesive system were applied on each treated surface, and a direct composite resin (Z250) cone was built. The prepared specimens were submitted to tensile bond strength test and stereoscopy evaluation to determine the type of failure after rupture. RESULTS: Bond strength mean values were statistically different in function of indirect composite and surface treatment. BelleGlass treated with Er:YAG laser had the highest mean value (22.92 MPa), and Sculpture conditioned with fluoridric acid had the lowest mean (11.88 MPa). Stereoscopy showed a predominant cohesive failure in Targis resin and mixed type for Sculpture and BelleGlass. CONCLUSIONS: These results suggest that Single Bond tensile bond strength improves with Er:YAG laser as a surface treatment compared to fluoridric acid or air abrasion. Composite Resins;Tissue Adhesives;Neodymium;Fluorides Acid Etching, Dental;Air Abrasion, Dental;Composite Resins;Dental Bonding;Fluorides;Humans;In Vitro Techniques;Low-Level Light Therapy;Neodymium;Probability;Reference Values;Sensitivity and Specificity;Spectrophotometry, Infrared;Tensile Strength;Tissue Adhesives

Histological and TEM examination of early stages of bone healing after Er:YAG laser irradiation. OBJECTIVE: The aim of this study was to analyze the early healing process of bone tissue irradiated by Er:YAG laser and compare it with that treated by mechanical drilling and CO(2) laser. BACKGROUND DATA: Er:YAG laser has a great potential for cutting hard tissues as it is capable of ablation with less thermal damage. METHODS: Twenty-four male Wistar rats were used for this study. The calvarial bone of rats was exposed and straight grooves were prepared by Er:YAG laser, mechanical bur and continuous wave CO(2) laser. Four rats each were sacrificed at six time points: 10 min, 6 and 24 h and 3, 7, and 14 days post-surgery. Sections were prepared for light and transmission electron microscopic (TEM) observations. RESULTS: Compared to mechanical bur and CO(2) groups, the inflammatory cell infiltration adjacent to the irradiated bone surface, fibroblastic reaction, and

revascularization were more pronounced in the Er:YAG laser-irradiated tissues. A cell-rich granulation tissue with fibroblasts and osteoblasts was predominant in 7-day specimens of Er:YAG laser group. Histopathological analysis of 14-day specimens in the Er:YAG group also revealed significantly greater new bone formation, compared with the mechanical bur and CO(2) laser groups. CONCLUSIONS: Initial bone healing following Er:YAG laser irradiation occurred faster than that after mechanical bur and CO(2) laser. Er:YAG laser treatment may be advantageous for wound healing of bone tissue, presumably by providing a favorable surface for cell attachment. Carbon Dioxide;Neodymium Analysis of Variance;Animals;Carbon Dioxide;Craniotomy;Culture Techniques;Disease Models, Animal;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning Transmission;Neodymium;Osteogenesis;Parietal Bone;Probability;Random Allocation;Rats;Rats, Wistar;Sensitivity and Specificity;Wound Healing

Effects on periradicular periodontal tissues of root canal irradiation with Er:YAG laser in rats. OBJECTIVE: The effects of Er:YAG laser irradiation on the periodontal region during root canal preparation were evaluated using rats histopathologically. BACKGROUND DATA: The effects on periodontal tissues along the root surface and apical area during root canal preparation using Er:YAG laser irradiation in vivo are not clear. METHODS: One hundred mesial root canals of mandibular first molars in rats were divided into four groups. In three of these groups, root canals were irradiated using an Er:YAG laser at 2 Hz and 34, 68, and 102 mJ/pulse for 30 sec. Non-irradiated canals served as controls. The effects of laser irradiation on the periodontal tissues along the root surface and apical area were evaluated at 0, 2 days, 1, 2, and 4 weeks after irradiation under light microscopy. RESULTS: At 4 weeks after treatment, no inflammation or resorption was observed in any cases in the control or 34 mJ/pulse-irradiated groups. However, moderate to severe inflammation with resorption of root surface was observed in four of five cases (80%) in the 102 mJ/pulse-irradiated group, which was significantly different from the control ($p < 0.01$). CONCLUSIONS: These results suggest that the effects on periodontal tissues during root canal preparation by Er:YAG laser irradiation after pulpectomy are minimal, if appropriate parameters are selected, and this is a potential therapy for human root canals of teeth. Neodymium Animals;Biopsy, Needle;Dental Pulp Cavity;Disease Models, Animal;Immunohistochemistry;Lasers;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Neodymium;Periodontium;Photomicrography;Rats;Rats, Wistar;Reference Values;Root Canal Preparation;Sensitivity and Specificity;Spectroscopy, Fourier Transform Infrared

Structural changes of Er:YAG laser-irradiated human dentin. OBJECTIVE: The aim of this study was to investigate the phase, compositional, and morphological changes of Er:YAG laser-irradiated dentin. BACKGROUND DATA: To date, nothing comprehensive has been reported about the phase and compositional changes of human dentin after Er:YAG laser irradiation. METHODS: The human dentin was irradiated by Er:YAG laser with irradiation energies from 300 mJ/pulse-10 pps-10 sec to 700 mJ/pulse-10 pps-10 sec with and without water spray. After irradiation, the specimens were analyzed by means of x-ray diffractometer (XRD), Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). RESULTS: After exposure to Er:YAG laser, dentin showed no phase changes on the x-ray diffractometer. In Fourier transform infrared analysis, two absorption bands at 2200 and 2015 cm(-1) could be traced on dentin treated by Er:YAG laser with irradiation energies beyond 300 mJ/pulse-10 pps-10 sec and without water spray. The OH(-) band disappeared at 1630 cm(-1). Scanning electron micrographs revealed that laser energy of 500 mJ/pulse-10 pps-10 sec was sufficient to prompt melting and recrystallization of dentin crystals. CONCLUSIONS: Our study demonstrated that Er:YAG laser irradiation on dentin with water spray would not significantly change the structure and composition. Therefore, water cooling is important for reducing the thermal effect of Er:YAG laser. Erbium Dentin;Electron Probe Microanalysis;Erbium;Humans;In Vitro

Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Molar;Sensitivity and Specificity;Spectroscopy, Fourier Transform Infrared;Structure-Activity Relationship

The efficacy of low-power lasers in tissue repair and pain control: a meta-analysis study. OBJECTIVE: We used statistical meta-analysis to determine the overall treatment effects of laser phototherapy on tissue repair and pain relief. BACKGROUND DATA: Low-power laser devices were first used as a form of therapy more than 30 years ago. However, their efficacy in reducing pain or promoting tissue repair remains questionable. METHODS: Following a literature search, studies meeting our inclusion criteria were identified and coded. Then, the effect size of laser treatment, that is, Cohen's d, was calculated from each study using standard meta-analysis procedures. RESULTS: Thirty-four peer-reviewed papers on tissue repair met our inclusion criteria and were used to calculate 46 treatment effect sizes. Nine peer-reviewed papers on pain control met the inclusion criteria and were used to calculate nine effect sizes. Meta-analysis revealed a positive effect of laser phototherapy on tissue repair (d = +1.81; n = 46) and pain control (d = +1.11; n = 9). The positive effect of treatment on specific indices of tissue repair was evident in the treatment effect sizes determined as follows: collagen formation (d = +2.78), rate of healing (d = +1.57), tensile strength (d = +2.13), time needed for wound closure (d = +0.76), tensile stress (d = +2.65), number and rate of degranulation of mast cells (d = +1.87), and flap survival (d = +1.95). Further, analysis revealed the positive effects of various wavelengths of laser light on tissue repair, with 632.8 nm having the highest treatment effect (d = +2.44) and 780 nm the least (d = 0.60). The overall treatment effect for pain control was positive as well (d = +1.11). The fail-safe number-that is, the number of studies in which laser phototherapy has negative or no effect-needed to nullify the overall outcome of this analysis was 370 for tissue repair and 41 for pain control. CONCLUSIONS: These findings mandate the conclusion that laser phototherapy is a highly effective therapeutic armamentarium for tissue repair and pain relief. Female;Humans;Injury Severity Score;Low-Level Light Therapy;Male;Pain Measurement;Pain, Intractable;Randomized Controlled Trials as Topic;Risk Assessment;Severity of Illness Index;Treatment Outcome;Wound Healing;Wounds and Injuries

The caries-preventive potential of subablative Er:YAG and Er:YSGG laser radiation in an intraoral model: a pilot study. OBJECTIVE: The aim of the present study was to investigate the effect of sub-ablative Er:YAG and Er:YSGG laser radiation on the demineralization of human dental enamel in situ. METHODS: Eighteen enamel specimens were prepared to this end, nine of which were irradiated at 8 J/cm(2) with the Er:YSGG laser and nine at 6 J/cm(2) with the Er:YAG laser (125 pulses per surface). Each test surface was assigned a control surface on the same specimen. Three healthy volunteers from each group subsequently wore three enamel specimens in situ for a period of 1 week. The demineralization was assessed by determining the surface microhardness according to Knoop (KH) before and after wearing. RESULTS: Before wearing, the mean surface hardness measured on the control surfaces was 233 (SD 99) KH (CYSGG) and 162 (SD 59) KH (CYAG). After sub-ablative laser irradiation, the surface hardness values measured were already found to be lower compared to the untreated control surfaces (YSGG: 195 [SD 110] KH/YAG: 112 [SD 72] KH). Marked demineralization was observed on the control surfaces after 1 week of wearing in situ (CYSGG*: 60 [SD 57] KH; CYAG*: 53 [SD 9] KH). After wearing, the hardness on the irradiated test surfaces was ErYSGG*: 133 [SD 58] KH and ErYAG*: 89 [SD 28] KH, and was thus higher than on the control surfaces. CONCLUSIONS: The results indicate a tendency towards increased caries resistance following sub-ablative erbium laser irradiation. However, in an analysis of variance model with repeated measures, the tendency in this study failed to reach statistical significance (alpha = 0.05). Neodymium Dental Caries;Dental Enamel;Dental Enamel Solubility;Humans;Low-Level Light Therapy;Models, Theoretical;Neodymium;Pilot Projects;Sampling Studies;Sensitivity and Specificity;Tooth Demineralization

Comparison of laser, dry needling, and placebo laser treatments in myofascial pain syndrome. OBJECTIVE: We aimed to evaluate the effectiveness of laser therapy in myofascial pain syndrome treatment. BACKGROUND DATA: Myofascial pain syndrome is a disease that is characterized by hypersensitive points called trigger points found in one or more muscles and/or connective tissues. It can cause pain, muscle spasm, sensitivity, stiffness, weakness, limitation of range of motion and rarely autonomic dysfunction. Physical therapy modalities and exercise are used in the treatment of this frequently encountered disease. METHODS: The placebo controlled, prospective, long-term follow up study was planned with 60 patients who had trigger points in their upper trapezius muscles. The patients were divided into three groups randomly. Stretching exercises were taught to each group and they were asked to exercise at home. Treatment duration was 4 weeks. Placebo laser was applied to group 1, dry needling to group 2 and laser to group 3. He-Ne laser was applied to three trigger points in the upper trapezius muscles on both sides with 632.8 nm. The patients were assessed at before, post-treatment, and 6 months after-treatment for pain, cervical range of motion and functional status. RESULTS: We observed a significant decrease in pain at rest, at activity, and increase in pain threshold in the laser group compared to other groups. Improvement according to Nottingham Health Profile gave the superiority of the laser treatment. However, those differences among the groups were not observed at 6-month follow up. CONCLUSIONS: Laser therapy could be useful as a treatment modality in myofascial pain syndrome because of its noninvasiveness, ease, and short-term application. Acupuncture Therapy;Adolescent;Adult;Analysis of Variance;Chi-Square Distribution;Facial Neuralgia;Female;Humans;Low-Level Light Therapy;Middle Aged;Pain Measurement;Placebo Effect;Prospective Studies;Reference Values;Risk Assessment;Severity of Illness Index;Treatment Outcome

Nd:YAG laser influence on microleakage of class V composite restoration. OBJECTIVE: The purpose of this research was to evaluate Nd:YAG laser influence on microleakage of class V composite restorations. BACKGROUND DATA: There are few studies concerning laser with restorative materials, considering microleakage. One more sent. METHODS: Thirty six cavities were prepared and divided into three groups (n = 12): group 1, control; group 2, Nd:YAG laser irradiation before adhesive technique; group 3, Nd:YAG laser irradiation after adhesive technique was used as the single bottle. Adhesive system Nd:YAG laser parameters were 320 microm of fiberoptic; energy/pulse of 40 mJ of energy/pulse; repetition rate of 15 Hz; power of 0.6 W; pulsed and non-contact, 1 mm from the surface; 30 seconds in scanning mode; energy density was 49.76 J/cm(2). Cavities were restored with microhybrid composite. After having used a polishing technique, thermocycling and impermeabilization procedures were performed and specimens were submitted to a microleakage test consisting of immersion in aqueous solution of 50% silver nitrate for 8 h, in the total absence of light. After washing and drying procedures, teeth were embedded to facilitate buccal-lingual vertical sectioning. Microleakage was revealed by light. RESULTS: We accomplished Kruskal-Wallis test at 5% level of confidence and observed no statistically significant difference between the tested groups. CONCLUSIONS: Based on the obtained results, it was possible to conclude that Nd:YAG laser in the parameters used, has no influence on marginal microleakage in composite restorations, independent of the moment the laser was used. Composite Resins;Neodymium;Silver Nitrate Animals;Cattle;Composite Resins;Dental Cavity Preparation;Dental Leakage;Dental Marginal Adaptation;Dental Restoration, Permanent;Low-Level Light Therapy;Models, Animal;Neodymium;Reference Values;Sensitivity and Specificity;Silver Nitrate

Thermographical and morphological studies of Er,Cr:YSGG laser irradiation on root canal walls. OBJECTIVE: This study was performed to investigate the temperature rises on root surfaces and morphological changes on root canal walls of extracted human teeth after irradiation by erbium, chromium: yttrium, scandium, gallium, garnet (Er, Cr:YSGG) laser and to evaluate the efficiency in

removing smear layer and debris from the prepared root canal walls in vitro. BACKGROUND DATA: No report on Er, Cr:YSGG laser effects under various conditions and specific tips for endodontic treatments has been reported. METHODS: Sixty extracted human teeth with single and straight root were used in this study. The teeth were prepared at 1 mm short of the apical foramen by a conventional technique using K-files. Fifty-four specimens were irradiated by Er, Cr:YSGG laser at the output powers of 2 W, 3 W, and 5 W for 7 sec with three fiber tips (200, 320, and 400 microm diameters). Temperature changes were recorded thermographically. All teeth were examined by light microscopy or scanning electron microscopy (SEM). RESULTS: Thermographic study showed that the average temperature rises on root surfaces were less than 8 degrees C. Observation by light microscopy revealed the ablation at the apical stop, and that by SEM indicated that laser irradiation at 5 W using a fiber tip with 400 microm diameter was efficient for removing smear layer and debris without carbonization or melting. CONCLUSIONS: The results of this study suggested that the temperature rises during Er, Cr:YSGG laser irradiation at the parameters used in this study are minimal to cause the damage on periodontal and bone tissues. Moreover, it was suggested that it is efficient to remove smear layer and debris without causing any carbonization and melting. Chromium;Yttrium;Erbium Chromium;Dental Cavity Preparation;Dental Pulp Cavity;Electron Probe Microanalysis;Erbium;Humans;Lasers;Low-Level Light Therapy;Microscopy, Electron, Scanning;Photogrammetry;Sampling Studies;Sensitivity and Specificity;Temperature;Tooth Root;Yttrium

Photobiomodulation improves cutaneous wound healing in an animal model of type II diabetes. OBJECTIVE: We investigated the effects of photobiomodulation (PBM) on cutaneous wound healing in an animal model of type II diabetes, Psammomys obesus (Sand Rats). BACKGROUND DATA: 632-nm light has been established as the most effective wavelength for treatment of cutaneous wounds; however, the inconsistent efficacy of PBM may be due to inadequate treatment parameter selection. METHODS: Using 632-nm light, an initial series of experiments were done to establish optimal treatment parameters for this model. Following creation of bilateral full-thickness skin wounds, non-diabetic Sand Rats were treated with PBM of differing dosages. Wound healing was assessed according to wound closure and histological characteristics of healing. Optimal treatment parameters were then used to treat type II diabetic Sand Rats while a diabetic control group received no irradiation. In order to elucidate the mechanism behind an improvement in wound healing, expression of basic fibroblast growth factor (bFGF) was assessed. RESULTS: Significant improvement in wound healing histology and wound closure were found following treatment with 4 J/cm(2) (16 mW, 250-sec treatments for 4 consecutive days; $p < 0.05$). The 4 J/cm(2) dosage significantly improved histology and closure of wounds in the diabetic group in comparison to the non-irradiated diabetic group. Quantitative analysis of bFGF expression at 36 h post-injury revealed a threefold increase in the diabetic and non-diabetic Sand Rats after PBM. CONCLUSIONS: The results demonstrate that PBM at an energy density of 4 J/cm(2) is effective in improving the healing of cutaneous wounds in an animal model of type II diabetes, suggesting that PBM (632 nm, 4 J/cm(2)) would be effective in treating chronic cutaneous wounds in diabetic patients. Fibroblast Growth Factor 2 Animals;Biopsy, Needle;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Disease Models, Animal;Female;Fibroblast Growth Factor 2;Gerbillinae;Immunohistochemistry;Low-Level Light Therapy;Male;Random Allocation;Rats;Reference Values;Sensitivity and Specificity;Skin;Wound Healing;Wounds and Injuries

Intranasal irradiation with the xenon chloride ultraviolet B laser improves allergic rhinitis. We earlier reported that the 308 nm xenon chloride (XeCl) ultraviolet B (UVB) laser is highly effective for the treatment of inflammatory skin diseases. Since UVB irradiation has been shown to exert both local and systemic immunosuppression, we investigated the clinical efficacy of UVB irradiation in

allergic rhinitis. In an open study, groups of patients with severe allergic rhinitis received intranasal irradiation with a 308 nm XeCl UVB excimer laser for two weeks. In the low-dose group (n=10), treatment was given twice weekly, starting with 0.25x the individual minimal erythema dose (MED), whereas patients in the medium-dose group (n=8) were treated four times weekly, starting with 0.4x MED. In each group, the dosage was gradually increased. Evaluation was based on the symptom scores. The effect of the XeCl laser on the skin prick test reaction was also studied. In the low-dose group, seven patients completed the study, and there was no improvement in the nasal symptoms. In the medium-dose group, the XeCl UVB irradiation significantly inhibited the rhinorrhoea, the sneezing, the nasal obstruction and the total nasal score ($p<0.05$). The XeCl UVB excimer laser also inhibited the allergen-induced skin prick test in a dose-dependent manner. These results suggest that the XeCl UVB excimer laser might serve as a new therapeutic tool in the treatment of allergic rhinitis. Chlorides;Xenon;xenon chloride Adolescent;Adult;Aged;Chlorides;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Middle Aged;Nasal Cavity;Rhinitis, Allergic, Perennial;Statistics, Nonparametric;Ultraviolet Rays;Xenon

Effects of low-intensity laser therapy on the orthodontic movement velocity of human teeth: a preliminary study. BACKGROUND AND OBJECTIVES: Low-intensity laser therapy (LILT) has been studied in many fields of dentistry, but to our knowledge, this is the first time that its effects on orthodontic movement velocity in humans are investigated. STUDY DESIGN/PATIENTS AND METHODS: Eleven patients were recruited for this 2-month study. One half of the upper arcade was considered control group (CG) and received mechanical activation of the canine teeth every 30 days. The opposite half received the same mechanical activation and was also irradiated with a diode laser emitting light at 780 nm, during 10 seconds at 20 mW, 5 J/cm2, on 4 days of each month. Data of the biometrical progress of both groups were statistically compared. RESULTS: All patients showed significant higher acceleration of the retraction of canines on the side treated with LILT when compared to the control. CONCLUSIONS: Our findings suggest that LILT does accelerate human teeth movement and could therefore considerably shorten the whole treatment duration. Adolescent;Child;Cuspid;Female;Humans;Laser Therapy;Male;Time Factors;Tooth Movement Techniques

[The role of physical rehabilitation in the treatment of exudative pleurisy]. INTRODUCTION: Exudates are due to a variety of diseases, the major and most common ones being tuberculosis, nonspecific inflammation and malignancy. They are usually treated conservatively, sometimes combined with surgery and physical treatment. Physical therapy includes positional exercises, breathing exercises and biostimulation. AIM OF THE STUDY: The study was aimed to find out the following: 1) Is lung function improved by physical therapy; 2) Can adhesions be diminished and mobility of the affected hemidiaphragm improved by physical treatment; 3) Is there a direct positive correlation between physical treatment and obtained improvement, or the same can be achieved in patients receiving medicamentous treatment only; 4) What are the effects of some factors we cannot influence (sex, age, effusion level, position of adhesions) on lung function and diaphragm mobility improvement, that is on the efficiency of physical treatment; 5) How do the factors we can influence (the time interval before initiating the treatment and its duration) affect improvement of the same lung function parameters, that is treatment efficacy? MATERIAL AND METHODS: Physical treatment of patients with exudative pleurisy was accomplished at the Department of Rehabilitation in our Institute and it consisted of directed breathing exercises and laser biostimulation. Its effects were examined in a group of 175 patients, who received both conservative and physical treatment, and results were compared with the control group patients, treated only conservatively (with antibiotics, antituberculotics, corticosteroids). RESULTS: Comparative analysis confirmed a significant improvement of lung function parameters (VC, FEV1, PEF) as well as of hemidiaphragm mobility on

the affected side of the thorax in favour of the examined group. The severity of the lung function and diaphragm mobility impairments have been found to be in correlation with the localization of adhesions, whereas the degree of improvement correlated with the time interval before the treatment initiation, as well as with its duration. DISCUSSION AND CONCLUSION: The applied physical therapy resulted in: 1) significant improvement of all examined lung function parameters in the examined group, which was not registered in the control group; 2) significant improvement of the diaphragm mobility in general; 3) factors such as sex, age and effusion level have no effects on the physical treatment results; 4) treatment results are affected by the time interval passed before the treatment initiation and its duration, as well as the localization of adhesions; anterior adhesions affected lung function and diaphragm mobility least, posterior ones more, while the influence of lateral adhesions was most significant. It is finally concluded that physical treatment should necessarily be included in the treatment of exudative pleurisy. Adult;Female;Humans;Low-Level Light Therapy;Male;Pleural Effusion;Pleurisy;Respiratory Therapy;Treatment Outcome

Ruby laser treatment of congenital melanocytic nevi: a review of the literature and report of our own experience. The authors describe the possibilities and advantages of ruby laser treatment of large congenital nevi as an alternative to surgical excision. The literature (from 1980 to 2002) is reviewed and a case report is presented. Literature and the authors' experience show good cosmetic results after ruby laser treatment. Skin texture is improved and there is a considerable reduction in pigmentation and unsightly hair growth. Ruby laser treatment does not result in scarring, mutilation, or functional impairments, in contrast to surgical treatment. Only short outpatient sessions are required, recovery periods are extremely short, and no rehabilitation period is needed. No malignant changes have been reported after treatment with the ruby laser, even after 8 years of follow-up. The results imply that ruby laser treatment could be a valuable new treatment modality for large congenital nevi. It should be considered when patients refuse to undergo surgery, or when surgery would cause severe morbidity. More research should be initiated to assess possible risks and long-term results. Child;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Nevus, Pigmented;Skin Neoplasms;Treatment Outcome

Low-power laser biostimulation enhances nerve repair after end-to-side neurorrhaphy: a double-blind randomized study in the rat median nerve model. Previous studies have shown that low-power laser biostimulation (lasertherapy) promotes posttraumatic nerve regeneration. The objective of the present study was to investigate the effects of postoperative lasertherapy on nerve regeneration after end-to-side neurorrhaphy, an innovative technique for peripheral nerve repair. After complete transection, the left median nerve was repaired by end-to-side neurorrhaphy on the ulnar "donor" nerve. The animals were then divided into four groups: one placebo group, and three laser-treated groups that received lasertherapy three times a week for 3 weeks starting from postoperative day 1. Three different types of laser emission were used: continuous (808 nm), pulsed (905 nm), and a combination of the two. Functional testing was carried out every 2 weeks after surgery by means of the grasping test. At the time of withdrawal 16 weeks postoperatively, muscle mass recovery was assessed by weighing the muscles innervated by the median nerve. Finally, the repaired nerves were withdrawn, embedded in resin and analyzed by light and electron microscopy. Results showed that laser biostimulation induces: (1) a statistically significant faster recovery of the lesioned function; (2) a statistically significant faster recovery of muscle mass; (3) a statistically significant faster myelination of the regenerated nerve fibers. From comparison of the three different types of laser emissions, it turned out that the best functional outcome was obtained by means of pulsed-continuous-combined laser biostimulation. Taken together, the results of the present study confirm previous experimental data on the effectiveness of lasertherapy for the promotion of peripheral nerve regeneration and suggest that early postoperative lasertherapy should be

considered as a very promising physiotherapeutic tool for rehabilitation after end-to-side neurorrhaphy. Animals;Double-Blind Method;Laser Therapy;Male;Median Nerve;Nerve Regeneration;Postoperative Care;Rats;Rats, Wistar

Treatment of superficial cutaneous vascular lesions: experience with the KTP 532 nm laser. Whilst most facial telangiectasias respond well to short-pulse-duration pulsed dye laser therapy, studies have shown that for the treatment of larger vessels these short-duration pulses are sub-optimal. Long-pulse frequency-doubled neodymium:YAG lasers have been introduced with pulse durations ranging from 1-50 ms and treatment beam diameters of up to 4 mm. We report the results of KTP/532 nm laser treatment for superficial vascular skin lesions. The aim was to determine the efficacy of the KTP/532 nm laser in the treatment of superficial cutaneous vascular lesions at a regional dermatology centre in a 2 year retrospective analysis. Patients were referred from general dermatology clinics to a purpose-built laser facility. A test dose was performed at the initial consultation and thereafter patients were reviewed and treated at 6 week intervals. Outcome was graded into five classifications by the patient and operator independently based on photographic records: clear, marked improvement, partial response, poor response, and no change or worsening. Over the 2 year period, 204 patients with 246 diagnoses were treated [156 female; median age 41 (range 1-74) years; Fitzpatrick skin types I-III]. Equal numbers of spider angioma (102) and facial telangiectasia (102) were treated. Of those patients who completed treatment and follow up, 57/58 (98%) of spider angiomas and 44/49 (90%) of facial telangiectasia markedly improved or cleared. Satisfactory treatment outcomes, with one clearance and two partial responses, occurred in three of five patients with port-wine stain. Few patients experienced adverse effects: two declined further treatment due to pain, and a small area of minimal superficial scarring developed in one case. Two patients developed mild persistent post-inflammatory hyperpigmentation, and one subject experienced an episode of acute facial erythema, swelling and blistering after one treatment. The KTP/532 nm frequency-doubled neodymium:YAG laser is a safe and effective treatment for common superficial cutaneous vascular lesions in patients with Fitzpatrick skin types I-III. Adolescent;Adult;Aged;Child;Child, Preschool;Facial Dermatoses;Facial Neoplasms;Female;Hemangioma;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Telangiectasis;Treatment Outcome

Laser literature watch. Laser Therapy;Low-Level Light Therapy

Molecular structure of the bony tissue after experimental trauma to the mandibular region followed by laser therapy. OBJECTIVE: We investigated the therapeutic efficiency of laser irradiation and Bio-Oss, both and separately, on the post-traumatic regeneration of bone tissue in rats using infrared spectroscopy as an informative and accurate measuring method. BACKGROUND DATA: The therapeutic effect of low-power laser irradiation on bone tissue regeneration processes in animal models has been studied using morphogenic, biochemical, roentgenographic and electron microscopic measurements. Natural bone minerals, such as Bio-Oss collagen, were recommended for the reconstruction of bone defects in the alveolar process. MATERIALS AND METHODS: 29 male Wistar rats, divided into four random groups in a blinded manner were operated on the right alveolar process. A bone defect was made by penetrating the right alveolar process of the mandible bone using a 3-mm drill. The rats were divided into four groups as follows: Group I, left side served as intact bone and right injured side as the control; Group II, right injured side was treated by organic bovine bone (Bio-Oss); Group III, right side bone defect was treated by HeNe laser (632.8 nm, 35 mW) applied transcutaneously for 20 min to the injured area daily for the following 14 consecutive days; and Group IV, Bio-Oss was placed loosely in the right side defect followed by laser treatment. After 2 weeks, the intact bone and bone replicas of the trauma area were removed and analyzed by infra-red spectroscopy technique. The composition and the structure of the bone tissue mineral substances

were determined and compared among the four groups. For quantitative analysis of the regenerative bone process, the Mineralization index was used. An increase in this index indicates regenerative bone processes. RESULTS: The normal state analysis of the IR spectra of the normal alveolar bone tissue within the intervals of 400 to 4000 cm(-1) revealed characteristic absorption bands for the inorganic bone component in spectrum regions 450-1480 cm(-1), and the organic component at 1540-3340 cm(-1). In the case of trauma, the intensity of absorption of the inorganic component was decreased by 54%, and the absorption band became narrow, which can be interpreted as quantitative changes of the bone tissue mineral content. The wavelength characteristics of the inorganic component remained unchanged; that is, the induced trauma under these experimental conditions did not provoke alterations in the structure of the phosphate framework. The organic component showed decreased absorption by 10-15%, compared to the normal bone, and slight displacement of the wavelength, which can be interpreted as changes occurring in the quality of the organic content of the bone tissue. In the Bio-Oss-treated group, the intensity of absorption of the inorganic component increased by 43%, compared to the control injured area; however, there was a decrease of 22.6% in the normal bone. The wavelength characteristics of the inorganic component remained unchanged. The organic component showed similar absorption results in the injured non-treated group and absorption was 10-15% less than in the normal bone. Mineralization Index in the Bio-Oss-treated group was 0.93, compared to 0.63 in the control group and 2.04 in the normal bone. In the laser-treated group, the intensity of absorption of the inorganic component increased by 62, compared to the control injured area, and decreased only 11.4% in the normal bone. The wavelength characteristics of the organic component remained unchanged; that is, the organic component was similar to that of normal bone. Mineralization Index in the laser-treated group increased significantly to 1.86, compared to 0.63 in the control group and 2.04 in the normal bone. In the combined laser and Bio-Oss-treated groups, the intensity of absorption of the inorganic component and organic component was similar to that of normal bone. Mineralization Index in this group increased significantly to 1.98, compared to 0.63 in the control group and 2.04 in the normal bone. CONCLUSION: The results suggest that low-power laser irradiatults suggest that low-power laser irradiation alone and in combination with Bio-Oss enhances bone healing and increases bone repair. Bio-Oss;Bone Substitutes;Minerals Animals;Bone Regeneration;Bone Substitutes;Bone and Bones;Low-Level Light Therapy;Male;Mandibular Injuries;Minerals;Models, Animal;Rats;Rats, Wistar;Single-Blind Method;Spectrophotometry, Infrared;Treatment Outcome

The efficacy of laser therapy in wound repair: a meta-analysis of the literature. OBJECTIVE: We determined the overall effects of laser therapy on tissue healing by aggregating the literature and subjecting studies meeting the inclusion and exclusion criteria to statistical meta-analysis. BACKGROUND DATA: Low-level laser therapy (LLLT) devices have been in use since the mid sixties, but their therapeutic value remains doubtful, as the literature seems replete with conflicting findings. MATERIALS AND METHODS: Pertinent original research papers were gathered from library sources, online databases and secondary sources. The papers were screened and coded; those meeting every inclusion and exclusion criterion were subjected to meta-analysis, using Cohen's d. statistic to determine the treatment effect size of each study. RESULTS: Twenty-four studies with 31 effect sizes met the stringent inclusion and exclusion criteria. The overall mean effect of laser therapy on wound healing was highly significant (d = +2.22). Sub-analyses of the data revealed significant positive effects on wound healing in animal experiments (d = +1.97) as well as human clinical studies (d = +0.54). The analysis further revealed significant positive effects on specific indices of healing, for example, acceleration of inflammation (d = +4.45); augmentation of collagen synthesis (d = +1.80); increased tensile strength (d = +2.37), reduced healing time (d = +3.24); and diminution of wound size (d = +0.55). The Fail-Safe number associated with the overall effect of laser therapy was 509; a high

number representing the number of additional studies-in which laser therapy has negative or no effect on wound healing-required to negate the overall large effect size of +2.22. The corresponding Fail-Safe number for clinical studies was 22. CONCLUSION: We conclude that laser therapy is an effective tool for promoting wound repair. Animals;Humans;Low-Level Light Therapy;Treatment Outcome;Wound Healing

An inexpensive, automated instrument for laser irradiation of cultured cells. OBJECTIVE: Laser irradiation of cultured cells is a valuable technique for elucidating the mechanisms of low-level laser therapy, but is often tedious because of the need to manually change the position of the laser beam. Consequently, we developed a computer-based system that automatically moves a cell culture plate over a laser beam and times the exposure. BACKGROUND DATA: There are presently no commercial devices available for automated laser irradiation of cultured cells. Many investigators thus manually aim and time laser exposure, a time-consuming task that is prone to errors. MATERIALS AND METHODS: We used outdated, surplus computer components to construct a system for automated laser exposure of cultured cells. This design strategy makes the system quite inexpensive. RESULTS: Construction and operation of the system is described and an example of its use is presented. Alternate means of accomplishing automated laser irradiation are also presented. CONCLUSION: Inexpensive and relatively simple devices can be constructed for automated laser irradiation of cultured cells. These devices can eliminate the tedium and errors of manual laser exposure. Automation;Cells, Cultured;Computers;Equipment Design;Fibroblasts;Humans;Low-Level Light Therapy;Software

Alteration of skin temperature during low-level laser irradiation at 830 nm in a mouse model. OBJECTIVE: This study investigated the change in local skin temperature in black and white mice during irradiation at 830 nm. BACKGROUND DATA: The photostimulation effect low-level laser therapy (LLLT) (700-900 nm) is widely accepted and used. However, the exact biological mechanisms of biostimulation are not yet established. MATERIALS AND METHODS: Groups of C57BL/6J and BALB/cJ mice (n = 12 in each group) were lightly anesthetized with 50% carbon dioxide and 50% oxygen. The dorsum was shaved and a 1.0 x 0.5 cm spot was marked in the same location on each subject. Animals were photo-irradiated with a diode laser (CW, 830 nm, 36 mW output at 5 cm distance). Fluences of 0.0-5.0 J/cm(2) were delivered. Skin surface temperature was monitored by a thermal camera. Two thermocouples were placed 1 mm below the skin surface at the site of light exposure. RESULTS: Temperature increased with increasing fluences of exposure. The surface temperature change at 5.0 J/cm(2) was 6.25 x 10(-2) +/- 2.0 x 10(-3) vs. 1.2 x 10(-2) +/- 3.0 x 10(-3) degrees C/mW for black and white mice, respectively. The temperature change at 1.0 mm depth was 4.51 x 10(-2) +/- 3.0 x 10(-3) vs. 0.83 x 10(-2) +/- 1.0 x 10(-3), respectively. CONCLUSION: CW irradiation at 830 nm and 5.0 J/cm(2) fluence induces a small temperature increase at the surface and at 1 mm in depth. The smaller effects seen in white mice might be due in part to reflection. This suggests that the thermal effects of irradiation at 830 nm are unlikely to explain the LLLT effect. However skin color should be considered, particularly at higher fluences. Further investigations are warranted to correlate the melanin content of the skin with observed LLLT effects. Animals;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Mice, Inbred C57BL;Models, Animal;Skin;Skin Temperature

A histologic assessment of the influence of low-intensity laser therapy on wound healing in steroid-treated animals. OBJECTIVE: The aim of the present study was to evaluate the effect of low-intensity laser therapy on the wound healing process treated with steroid. BACKGROUND DATA: Various biological effects have been associated with low-level laser therapy (LLLT). MATERIALS AND METHODS: Forty-eight rats were used, and after execution of a wound on the dorsal region of each animal, they were divided into 4 groups (n = 12), receiving the following treatments: G1 (control),

wounds and animals received no treatment; G2, wounds were treated with LLLT; G3, animals received an intraperitoneal injection of steroid dosage (2 mg/kg of body weight); G4, animals received steroid and wounds were treated with LLLT. The laser emission device used was a GaAIAs (904 nm), in a contact mode, with 2.75 mW gated with 2.900 Hz during 120 sec (33 J/cm(2)). After the period of 3, 7, and 14 days, the animals were sacrificed and the parts sent to histological processing and dyed using hematoxylin and eosin (HE) and Masson trichromium (MT) techniques. RESULTS: The results have shown that the wounds treated with steroid had a delay in healing, while LLLT accelerated the wound healing process. Also, wounds treated with laser in the animals treated with steroid presented a differentiated healing process with a larger collagen deposition and also a decrease in both the inflammatory infiltrated and the delay on the wound healing process. CONCLUSION: LLLT accelerated healing, caused by the steroid, acting as a biostimulative coadjutant agent, balancing the undesirable effects of cortisone on the tissue healing process. Adrenal Cortex Hormones;Immunosuppressive Agents Adrenal Cortex Hormones;Animals;Immunosuppressive Agents;Low-Level Light Therapy;Models, Animal;Rats;Rats, Wistar;Skin;Wound Healing

The safety and efficacy of the 308-nm excimer laser for pigment correction of hypopigmented scars and striae alba. OBJECTIVE: To assess the safety and efficacy of the 308-nm excimer laser in pigment correction of hypopigmented scars and striae alba. DESIGN: Institutional review board-approved randomized controlled trial. SETTING: Private research center. PATIENTS: Volunteer sample of 31 adult subjects with hypopigmented scars or striae alba distributed on the face, torso, or extremities. INTERVENTIONS: Lesions were randomized to receive treatment or not, with site-matched normal control areas. Treatments were initiated with a minimal erythema dose minus 50 mJ/cm(2) to affected areas. Subsequent treatments were performed biweekly until 50% to 75% pigment correction, then every 2 weeks thereafter until a maximum of 10 treatments, 75% increase in colorimetric measurements, or 100% visual pigment correction. MAIN OUTCOME MEASURES: Pigment correction by visual and colorimetric assessments compared with untreated control lesions and site-matched normal skin before each treatment and at 1-, 2-, 4-, and 6-month follow-up intervals. Occurrence of erythema, blistering, dyspigmentation, or other adverse effects was monitored. RESULTS: The percentage pigment correction by both assessments increased in direct proportion to the number of treatments. The mean percentage pigment correction by visual assessment relative to control of 61% (95% confidence interval [CI], 55%-67%) for scars and 68% (95% CI, 62%-74%) for striae was achieved after 9 treatments. The mean percentage pigmentation by colorimetric measurements relative to control of 101% (95% CI, 99%-103%) for scars and 102% (95% CI, 99%-104%) for striae was achieved after 9 treatments. Both sets of values gradually declined toward baseline levels during the 6-month follow-up. No blistering or dyspigmentation occurred. CONCLUSIONS: Therapy with the 308-nm excimer laser is safe and effective in pigment correction of hypopigmented scars and striae alba. Mean final pigment correction rates relative to control sites of approximately 60% to 70% by visual assessment and 100% by colorimetric analysis were observed after 9 treatments administered biweekly. Maintenance treatment every 1 to 4 months is required to sustain the cosmetic benefit.
Abdomen;Adult;Cicatrix;Extremities;Face;Female;Humans;Hypopigmentation;Low-Level Light Therapy;Male;Thorax;Treatment Outcome

Comparison of characteristics of acquired bilateral nevus of Ota-like macules and nevus of Ota according to therapeutic outcome. Both acquired bilateral nevus of Ota-like macules (ABNOM) and nevus of Ota are characterized by the presence of dermal melanocytes. There are no differences in the method of treatment, however, postinflammatory hyperpigmentation (PIH) develops more often in ABNOM than in nevus of Ota following treatment. We investigated the differences in the

development of PIH after treatment between ABNOM and nevus of Ota, and the histopathologic differences in the PIH. A total of 82 patients with ABNOM (n=47) and nevus of Ota (n=35) were treated with Q-switched alexandrite laser and followed up 2 weeks and 3 months later. Biopsies were performed on lesional skin before treatment. The distribution and the amount of melanin pigments were visualized with Fontana-Masson stain, and the distribution and the depth of melanocytes were measured by GP-100 (NK1-beteb) stain. Clinically, there was more erythema and PIH in ABNOM than in nevus of Ota. Histopathologically, intradermal melanocytes were clustered in groups and dispersed perivascularly in ABNOM, while melanocytes were scattered evenly throughout the dermis in nevus of Ota. Both groups show that when there is a statistically significant number of melanocytes in the perivascular area, erythema and PIH occur after laser therapy. In conclusion, indirect vessel injury in addition to perivascular clustering melanocytes might be considered the cause of increased PIH after treatment in ABNOM. Fontana-Masson stain;Silver Nitrate Adolescent;Adult;Child;Child, Preschool;Humans;Hyperpigmentation;Low-Level Light Therapy;Melanocytes;Middle Aged;Nevus of Ota;Nevus, Pigmented;Silver Nitrate;Skin Neoplasms;Treatment Outcome

Comparison of the effects of laser, ultrasound, and combined laser + ultrasound treatments in experimental tendon healing. BACKGROUND AND OBJECTIVE: Therapeutic ultrasound (US) and laser (L) treatments accelerate and facilitate wound healing, and also have beneficial effects on tendon healing. This randomized control study was designed to evaluate the effects of low-intensity US and low-level laser therapy (LLLT) on tendon healing in rats. STUDY DESIGN/MATERIALS AND METHODS: Eighty-four healthy male Swiss-Albino rats were divided into three groups consisting of 28 rats, the left Achilles tendons were used as treatment and the right Achilles tendons as controls. The right and left Achilles tendons of rats were traumatized longitudinally. The treatment was started on postinjury day one. We applied the treatment protocols including low-intensity US treatment in Group I (US Group), Sham US in Group II (SUS Group), LLLT in Group III (L Group), Sham L in Group IV (SL Group), US and LLLT in Group V (US + L Group), and Sham US and Sham L in Group VI (SUS + SL Group). The US treatment was applied with a power of 0.5 W/cm2, a frequency of 1 MHz, continuously, 5 minutes daily. A low-level Ga-As laser was applied with a 904 nm wavelength, 6 mW average power, 1 J/ cm2 dosage, 16 Hz frequency, for 1 minute duration, continuously. In the control groups, the similar procedures as in the corresponding treatment groups were applied with no current (Sham method). The treatment duration was planned for 9 days (sessions) in all groups, except the rats used for biochemical evaluation on the 4th day of treatment, which were treated for 4 days. We measured the levels of the tissue hydroxyproline for biochemical evaluation on the 4th, 10th, and 21st days following the beginning of treatment and the tendon breaking strength on the 21st day following the beginning of treatment for biomechanical evaluation. Seven rats in each group were killed on the 4th, 10th, and 21st days for biochemical evaluation and on the 21st day for biomechanical evaluation. RESULTS: The hydroxyproline levels were found to be significantly increased in the treatment groups on the 10th and 21st days compared to their control groups ($P < 0.05$). In comparison of the treatment groups on the 4th, 10th, and 21st days of the treatment, the levels of tissue hydroxyproline were found to be more increased in combined US+L Group compared with US Group and L Group, but the difference was not significant ($P > 0.05$). In comparison of the tendon breaking strengths, it was found as significantly increased in the treatment groups compared with their control groups ($P < 0.05$), although there was no significant difference between the treatment groups. CONCLUSIONS: Although US, L, and combined US + L treatments increased tendon healing biochemically and biomechanically more than the control groups, no statistically significant difference was found between them. Also we did not find significantly more cumulative positive effects of combined treatment. As a result, both of these physical modalities can be used successfully in the treatment of tendon healing. Achilles Tendon;Animals;Combined Modality

Therapy;Laser Therapy;Male;Random Allocation;Rats;Tendon Injuries;Ultrasonic Therapy;Wound Healing

An 810 nm diode laser in the treatment of small (< or = 1.0 mm) leg veins: a preliminary assessment. A consistently effective treatment for small leg veins (< or = 1.0 mm) is still being sought. The efficacy of an 810 nm diode laser in vein removal was assessed in a preliminary study. Fifteen females, skin types I to III, vein diameters 0.5-1 mm, aged from 25 to 42 years, participated in the study. An 810 nm diode laser (90 W, 20 ms/pulse, 10 Hz rep rate, 4.0 mm hand piece) was applied along the target veins. Biopsies were taken from two patients before and after the first treatment session. No compression was applied post-treatment. Four weeks later, a second treatment was given. Results were assessed subjectively from the patients' satisfaction index (SI) and objectively from clinical photography done by an independent clinician, who also judged the venous morphology before and 4 weeks after the second session. All patients completed the trial. Pain was moderate to severe at the time of treatment and erythema which was mild, which was seen in all 15 patients; oedema occurred in 12 patients and blistering in only one. No scarring was noticed. The overall satisfaction indices at the 4- and 8-week assessments were 20.7% and 55.1%, respectively. No patient got worse. The objective evaluations at the 4- and 8-week assessments showed increasing improvement in all aspects examined. Pain at the time of treatment was a problem for all patients, so epidermal cooling should be added. Despite this, the 810 laser diode was an interesting and promising device for treatment of small leg veins, warranting further study in larger patient cohorts with a longer-term follow up. Adult;Female;Humans;Leg;Low-Level Light Therapy;Telangiectasis;Treatment Outcome

Treatment of Acanthosis nigricans of the axillae using a long-pulsed (5-msec) alexandrite laser. BACKGROUND: Acanthosis nigricans of the axillae is a common cutaneous disorder that is difficult to treat. OBJECTIVE: The objective was to assess the efficacy and safety of a long-pulsed alexandrite laser (5 msec) in the treatment of acanthosis nigricans of the axillae. METHODS: A single axilla was treated using the long-pulsed alexandrite laser. Ten sessions were required, at fluences of 16 to 23 J/cm2 using either 10- or 12.5-mm spot sizes. The untreated axilla served as a control. RESULTS: Greater than 95% clearance was achieved after seven sessions. There was no recurrence after 2 years. The untreated axilla was unchanged. CONCLUSIONS: The long-pulsed alexandrite laser can effectively and safely treat acanthosis nigricans of the axillae. alexandrite;Beryllium Acanthosis Nigricans;Adult;Axilla;Beryllium;Diagnosis, Differential;Female;Humans;Low-Level Light Therapy

Utilization of the 1320-nm Nd:YAG laser for the reduction of photoaging of the hands. BACKGROUND: Nonablative laser resurfacing has been shown to improve the appearance photoaged skin. Clinical improvement has been associated with dermal collagen remodeling. OBJECTIVE: The objective was to determine the efficacy of a 1320-nm Nd:YAG laser for the treatment of photoaging hands. METHODS: Seven patients with photoaged hands received six monthly treatments with a 1320-nm Nd:YAG laser. Improvement in skin smoothness was evaluated by objective and patient assessment using a 6-point improvement scale: 1=no improvement and 6=80% to 100% improvement. RESULTS: Mild to moderate improvement was achieved as determined by both objective and patient assessment. Mean improvement by objective assessment was 2.4 points. Objective improvement was noted in four of seven patients, and these patients demonstrated a mean improvement score of 3.5 points. The mean improvement by patient assessment was 3.1 points. CONCLUSION: This case series demonstrates that the 1320-nm Nd:YAG laser with cryogen cooling can be effective for rejuvenation of photoaged hands. Neodymium Aged;Female;Hand Dermatoses;Humans;Low-Level Light Therapy;Middle Aged;Neodymium;Skin Aging;Treatment Outcome

The safety and effectiveness of single-pass erbium:YAG laser in the treatment of mild to moderate photodamage. BACKGROUND: There are several treatment modalities for mild to moderate photodamage. The demand for effective treatments with minimal side effects has increased. OBJECTIVE: The objective of this study was to determine the effectiveness of short-pulsed erbium:YAG laser in treating mild to moderate photodamage. METHODS: Twenty patients were treated with the short-pulse erbium:YAG laser on the face and neck. One pass was given over the entire face with two to three passes over the perioral and periorbital regions. Patients were evaluated for improvement of pigmentary irregularities, skin texture, and fine wrinkles. All side effects were recorded at follow-up visits. Two lasers were used, Sciton and Cynosure CO3, under local anesthesia. RESULTS: There was a 58% reduction in pigment irregularities and a 54% improvement in skin texture. There was minimal improvement in fine wrinkles with one pass. Two and three passes resulted in a 50% reduction in wrinkles. The procedure was minimally painful. Side effects included 3 to 5 days of erythema and edema. Patients returned to work within 3 days on average. There were no infections. Patient satisfaction with the procedure was rated as very good. There was no difference in efficacy or adverse effects with either laser. CONCLUSIONS: One-pass short-pulse erbium:YAG laser in treating photodamage of the face and neck is safe and effective. There are minimal side effects and patients heal within 3 to 5 days. Erbium Erbium;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Middle Aged;Neck;Severity of Illness Index;Skin Aging;Treatment Outcome

Double-blind randomized controlled trial of low-level laser therapy in carpal tunnel syndrome. Several studies have suggested that low-level laser therapy (LLLT) is effective in patients with carpal tunnel syndrome (CTS). In a double-blind randomized controlled trial of LLLT, 15 CTS patients, 34 to 67 years of age, were randomly assigned to either the control group (n = 8) or treatment group (n =7). Both groups were treated three times per week for 5 weeks. Those in the treatment group received 860 nm galium/aluminum/arsenide laser at a dosage of 6 J/cm2 over the carpal tunnel, whereas those in the control group were treated with sham laser. The primary outcome measure was the Levine Carpal Tunnel Syndrome Questionnaire, and the secondary outcome measures were electrophysiological data and the Purdue pegboard test. All patients completed the study without adverse effects. There was a significant symptomatic improvement in both the control (P = 0.034) and treatment (P =0.043) groups. However, there was no significant difference in any of the outcome measures between the two groups. Thus, LLLT is no more effective in the reduction of symptoms of CTS than is sham treatment. Adult;Aged;Carpal Tunnel Syndrome;Disability Evaluation;Double-Blind Method;Electrophysiology;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Motor Neurons;Severity of Illness Index;Surveys and Questionnaires;Treatment Failure

Low level laser therapy (Classes I, II and III) for treating osteoarthritis. BACKGROUND: Osteoarthritis (OA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment for OA about 20 years ago, but its effectiveness is still controversial. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of OA. SEARCH STRATEGY: We searched MEDLINE, EMBASE, the Cochrane Musculoskeletal registry, the registry of the Rehabilitation and Related Therapies field and the Cochrane Controlled Trials Register up to January 30, 2004. SELECTION CRITERIA: Following an a priori protocol, only controlled clinical trials of LLLT for the treatment of patients with a clinical diagnosis of OA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials and abstracted data using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables,

except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. MAIN RESULTS: Seven trials were included, with 184 patients randomized to laser, 161 patients to placebo laser. Treatment duration ranged from 4 to 12 weeks. Pain was assessed by four trials. The pooled estimate (random effects) of three trials showed no effect on pain measured using a scale (SMD: -0.2, 95% CI: -1.0, +0.6), but there was statistically significant heterogeneity (p>0,05). Three of the trials showed no effect and two demonstrated very beneficial effects with laser. In another trial, with no scale-based pain outcome, significantly more patients reported pain relief (yes/no) with laser with an odds ratio of 0.05, (95% CI: 0.0 to 1.56). Only one study found significant results for increased knee range of motion (WMD: -10.62 degrees, 95% CI: -14.07,-7.17). Other outcomes of joint tenderness and strength were not significant. Lower dosage of LLLT was found as effective than higher dosage for reducing pain and improving knee range of motion. REVIEWERS' CONCLUSIONS: For OA, the results are conflicting in different studies and may depend on the method of application and other features of the LLLT application. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. There is clearly a need to investigate the effects of these factors on LLLT effectiveness for OA in randomized controlled clinical trials.
Hand;Humans;Low-Level Light Therapy;Osteoarthritis;Osteoarthritis, Hip;Osteoarthritis, Knee;Randomized Controlled Trials as Topic

Acne vulgaris. Acne vulgaris is a common inflammatory skin condition that presents management difficulties to cosmetic surgeons. Acute management and treatment focuses on early diagnosis as well as treatment with topical agents, oral antibiotics, hormonal therapy,and nonablative chemical peel and laser applications. The treatment of postinflammatory scarring must be individualized to address potential macular dyschromia, cystic lesions,epithelial bridges, or deep pitted scars. A review of interventional options is presented to apply to the spectrum of acne scarring as well as a review of the literature to address objectively published reports on efficacy.
Acne Vulgaris;Adolescent;Adult;Cicatrix;Combined Modality Therapy;Esthetics;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Risk Factors;Severity of Illness Index;Skin Transplantation;Surgery, Plastic;Treatment Outcome

Use of combined modality for maximal resurfacing. Resurfacing of the skin plays a substantial role in facial rejuvenation. To better prepare the cosmetic surgeon for this endeavor, we have set out to define aging skin changes,review resurfacing indications, outline and compare various resurfacing practices, and discuss anticipated outcomes in our experience and in the current literature. We have found that appropriate patient selection, counseling, and technique have yielded a consistent result with a high degree of patient satisfaction. Furthermore, outcomes are maximized when one takes advantage of multiple modalities, combining resurfacing techniques, or when one combines resurfacing with surgical rejuvenation. Aged;Chemexfoliation;Combined Modality Therapy;Cosmetic Techniques;Dermabrasion;Esthetics;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Patient Selection;Rejuvenation;Risk Assessment;Skin Aging;Treatment Outcome

Superficial skin resurfacing. Options for both the cosmetic surgeon offering and patients seeking treatment for cutaneous aging have expanded greatly in recent years and continue to grow. Increasingly sophisticated aesthetic patients are seeking procedures to rejuvenate in record numbers,but many are unwilling to tolerate a large amount of downtime. In expert hands, ablative laser resurfacing has a long history of dramatic results for the treatment of cutaneous aging. During the last decade, there have been a growing number of reports of modalities targeting the more superficial skin structure. Such modalities offer more modest results without the downtime associated with more aggressively ablative procedures. These resurfacing techniques include the use of mechanical, chemical, and thermal forces.
Adult;Aged;Chemexfoliation;Dermabrasion;Esthetics;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Rejuvenation;Risk Assessment;Skin Aging;Treatment Outcome

Review of nonablative laser resurfacing modalities. Because of considerable morbidities and recovery time associated with CO2 laser resurfacing,many efforts are being made to discover a less ablative resurfacing modality. A thorough review of the literature demonstrates promising but less than ideal results for all of the currently used lasers. The clinical efficacy does not appear to be as significant as the histologic results that have been documented. Our review of the literature also demonstrates that not all of the modalities are equal. Aged;Esthetics;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Rejuvenation;Risk Factors;Skin Aging;Treatment Outcome

Low-intensity indocyanine-green laser phototherapy of acne vulgaris: pilot study. Near infrared (NIR) diode laser low-intensity (soft) phototherapy with the topical application of indocyanine green (ICG) has been suggested for treatment of acne vulgaris. Twelve volunteers with acne lesions on their faces and/or backs were enrolled in the experiment. Skin areas of the subjects that were 4 x 5 cm2 were stained with ICG solution for 5 min before laser irradiation (803 nm) at a power density up to 50 mW/cm2 for 5 to 10 min. For 75% of the subjects, a single treatment was provided and for the other 25%, eight sequential treatments over a period of a month were carried out. Observations a month after the completion of the treatment showed that only the multiple treatments with a combination of ICG and NIR irradiation reduced inflammation and improved the state of the skin for a month without any side effects. A month after treatment, the improvement was about 80% for the group receiving multiple treatments. Single treatments did not have a prolonged effect.
Photosensitizing Agents;Indocyanine Green Acne Vulgaris;Administration, Topical;Adolescent;Adult;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Female;Humans;Indocyanine Green;Infrared Rays;Male;Photochemotherapy;Photosensitizing Agents;Pilot Projects;Treatment Outcome

Low-power laser in osteoarthritis of the cervical spine. Patients with symptomatic osteoarthritis of the cervical spine were treated with very low-power modulated laser (LPL). Two applications were performed at an interval of 20 days. Changes in pain and ultrasound thickness of the soft connective tissue layer above the right and the left superior trapezium were studied. No worsening of pain was observed. Pain improved after the first application of LPL in 9 out of 14 patients, but the difference was not significant. Pain improvement remained stable between the first assessment and the second assessment, which was performed after 20 days. In comparison with the first application, at the second application the number of patients with improved pain after LPL increased to 12 out of 14 ($p < 0.01$). An appreciable difference in the thickness of the subcutaneous soft tissue layer overlying the two superior trapezia was demonstrated in all patients at the first examination. Comparison of the measurements before and after the application of LPL showed significant differences.

Aged;Cervical Vertebrae;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck;Osteoarthritis;Pain;Pain Measurement;Spondylarthritis;Ultrasonography

Low power laser treatment in patients with knee osteoarthritis. The aim of this study was to investigate the analgesic efficacy of low power laser therapy in patients with knee osteoarthritis (OA). The study design was randomised, placebo-controlled and single blinded. Sixty patients with knee OA according to the American College of Rheumatology criteria were included and randomly assigned to three treatment groups: active laser with dosage of 3 J/per painful point, active laser with a dosage of 1.5/J per painful point and placebo laser treatment groups. A Gal-Al-As diode laser device was used as a source of low power laser with a power output of 50 mW and a wavelength of 830 nm. The patients were treated 5 times weekly with 10 treatments in all. The clinical assessments included Western Ontario and McMaster Universities osteoarthritis index (WOMAC) pain, stiffness and physical function subscales. In addition, the intensity of pain at rest and on activation was evaluated on a visual analogue scale. Compared to baseline, at week 3 and at month 6, no significant improvement was observed within the groups. Similarly, no significant differences were found among the treatment groups at any time. With the chosen laser type and dose regimen the results that we obtained in this study, suggest that low-level laser therapy has no effect on pain in patients with knee OA. Aged;Analysis of Variance;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Prospective Studies;Single-Blind Method

[Intravenous blood laser irradiation in patients with chronic nonspecific lung diseases and bronchial epithelial dysplasia]. The study included patients with chronic nonspecific lung diseases (CNLD) and a morphologically verified diagnosis of first-second degree bronchial epithelial dysplasia (BED). Forty-six patients underwent intravenous blood laser irradiation (IBLI) (a study group); 45 patients received routine anti-inflammatory therapy (a control group). After therapy in the study group, the clinical and endoscopic signs of an inflammatory process were eliminated in 80.4 and 78.2% of cases, respectively. With morphological monitoring, a full and partial regression of BED occurred in 63.1 and 17.4%, respectively. In the control group, clinical and endoscopic improvements were achieved in 53.3 and 52.0% of cases. Dysplastic changes could be arrested only in 8.9% of cases. The differences were statistically significant ($p < 0.05$). Thus, IBLI is a highly effective treatment of dysplastic bronchial epithelial changes in patients with CNLD as compared with the controls.
Adult;Blood;Bronchial Neoplasms;Chronic Disease;Epithelium;Female;Humans;Low-Level Light Therapy;Lung Diseases;Male;Middle Aged;Precancerous Conditions;Respiratory Mucosa;Veins

[Effect of laser therapy on the patient respiration system in the acute phase of inhalation burn].
Acute Disease;Adolescent;Adult;Aged;Aged, 80 and over;Burns, Inhalation;Female;Humans;Low-Level Light Therapy;Lung;Male;Middle Aged

Evaluation of the use of low level laser and photosensitizer drugs in healing. BACKGROUND AND OBJECTIVES: In the last decade, many different kinds of therapies have emerged as a consequence of advances in the field of applied technology. It is known that low level laser therapy contributes to tissue healing; however, the use of photodynamic therapy (PDT) in healing and the scar formation processes has not been fully explored. The present study analyses the effect of low level laser InGaAlP (685 nm), radiation, either alone or combined with a phthalocyanine-derived photosensitizer (PS) in a gel base delivery (GB) system, on the healing process of cutaneous wounds in rats. STUDY DESIGN/MATERIALS AND METHODS: The rats were divided into six groups: control (untreated) (CG), gel base (GB), photosensitizer (PS), laser (LG), laser+photosensitizer (LPS), and laser+photosensitizer in a GB (LPSG). Standardized circular wounds were made on the dorsum of each rat with a skin punch biopsy instrument. After wounding, treatment was performed once daily and the animals were killed at day 8. Tissue specimens containing the whole wound area were removed and processed for histological analysis using conventional techniques. Serial cross-sections were analyzed to evaluate

the organization of the dermis and epidermis as well as collagen deposition. RESULTS: The animals of groups LG, PS, LPS, and LPSG presented higher collagen content and enhanced re-epithelialization as compared to CG (control) and GB rats. Connective tissue remodeling was more evident in groups LPS and LPSG. CONCLUSIONS: The results clearly indicated a synergetic effect of light+photosensitizer+delivery drug on tissue healing. PDT did not cause any healing inhibition or tissue damage during the healing process. Gels;Indoles;Isoindoles;Photosensitizing Agents;Poloxamer;phthalocyanine Administration, Topical;Animals;Gels;Indoles;Isoindoles;Low-Level Light Therapy;Male;Photosensitizing Agents;Poloxamer;Rats;Rats, Wistar;Skin;Wound Healing

Clinical evaluation of enhanced nonablative skin rejuvenation using a combination of a 532 and a 1,064 nm laser. BACKGROUND AND OBJECTIVES: Improvements in the physical signs of photoaging can be achieved by non-invasive laser resurfacing procedures. To evaluate the effectiveness and safety of the Nd:YAG 1,064 nm and KTP 532 nm lasers for non-invasive skin rejuvenation. STUDY DESIGN/PATIENTS AND METHODS: Subjects requesting non-invasive skin rejuvenation underwent two treatments with the 532 nm laser to one side of the face and with both lasers to the other side, followed by three treatments with the 1,064 nm laser to both sides. Skin characteristics were evaluated before, during, and up to 4 months after treatment. RESULTS: A >25% improvement in overall skin condition was observed for >30% of subjects at the 1 month follow-up and >40% of subjects at the 4 month follow-up. The greatest improvements were observed for visual dryness, roughness, and uneven pigmentation. No adverse events were reported. There was a trend for greater improvement in patients who received more 1,064 nm treatments but this was not statistically significant. CONCLUSIONS: The 532 nm KTP and 1,064 nm Nd: YAG lasers can be effectively and safely used for non-invasive skin rejuvenation. Combined Modality Therapy;Humans;Laser Therapy;Low-Level Light Therapy;Skin Aging

Methemoglobin formation during laser induced photothermolysis of vascular skin lesions. BACKGROUND AND OBJECTIVE: Monitoring dynamic changes during laser induced photothermolysis of vascular skin lesions is essential for obtaining an optimal therapeutic result. Rapid photoinduced thermal damage occurs at a threshold temperature of about 70 degrees C. It is therefore, relevant to identify markers to indicate if this threshold temperature has been reached. Methemoglobin, which is formed by a photo-induced oxidation of hemoglobin, indicates that the temperature has reached this threshold value. This study presents a proof of concept of a method for monitoring the in vivo presence of methemoglobin immediately after laser exposure. STUDY DESIGN/MATERIALS AND METHODS: The present study was designed to investigate the in vivo temperature dependence of hemoglobin absorption in the 450-800 nm spectrum range. In vivo diffuse reflectance measurements of port-wine stain (PWS) and telangiectasia were performed prior to, and immediately after, laser treatment with a pulsed dye laser (PDL) at 585 nm wavelength. RESULTS: In vivo measurements following laser treatment of vascular skin lesions showed an immediate increase in the optical absorption of blood. This effect, caused by thermal stress, is a result of an increased dermal blood volume fraction and methemoglobin formation. The effect is light dose dependent, and reflectance spectra revealed methemoglobin formation in patients treated with fluences above 5 J/cm2 at 585 nm wavelength. CONCLUSIONS: It was proved that methemoglobin can be measured in vivo by reflectance spectroscopy. Measurements of the average methemoglobin concentrations immediately after laser exposure may be a valuable diagnostic tool to verify that the blood temperature has been sufficiently high to induce thermal damage to the vessel wall. Melanins;Methemoglobin Adolescent;Adult;Aged;Blood Volume;Child;Humans;Low-Level Light Therapy;Melanins;Methemoglobin;Middle Aged;Port-Wine Stain;Skin;Spectrum Analysis;Telangiectasis

Combined photodynamic and photothermal induced injury enhances damage to in vivo model blood vessels. BACKGROUND AND OBJECTIVES: The degree of port wine stain (PWS) blanching following pulsed dye laser (PDL) therapy remains variable and unpredictable. Because of the limitations of current PDL therapy, alternative treatment approaches should be explored. The objective was to evaluate a novel methodology for selective vascular damage, combined photodynamic (PDT) and photothermal (PDL) treatment, using the in vivo chick chorioallantoic membrane (CAM) model. STUDY DESIGN/MATERIALS AND METHODS: Thirty microliters of benzoporphyrin derivative monoacid ring A (BPD) solution was administered intraperitoneally into chick embryos at day 12 of development. Study groups were: (1) control (no BPD, no light); (2) BPD alone; (3) continuous wave irradiation (CW) alone (576 nm, 60 mW/cm2, 125 seconds); (4) CW + PDL; (5) BPD+PDL; (6) PDT (BPD+CW); (7) PDL alone (585 nm, 4 J/cm(2)); and (8) PDT+PDL (BPD + CW followed immediately by PDL). Vessels were videotaped prior to, and at 1 hour post-intervention and then assessed for damage based on the following scale: 0, no damage; 1, coagulation; 1.5, vasoconstriction; 2.0, coagulation+vasoconstriction; 2.5, angiostasis; 3.0, hemorrhage. Damage scores were weighted by vessel "order." RESULTS: PDT + PDL resulted in significantly ($P < 0.01$) more severe vascular damage than was observed in any other study group: 127% more than PDT, 47% more than PDL alone. CONCLUSIONS: PDT + PDL is a novel and promising approach for selective vascular damage and may offer a more effective method for treatment of PWS and other vascular skin lesions. Photosensitizing Agents;Porphyrins;Verteporfin;Allantoin Allantoin;Animals;Chick Embryo;Chorion;Combined Modality Therapy;Low-Level Light Therapy;Microcirculation;Microscopy, Video;Photochemotherapy;Photosensitizing Agents;Porphyrins;Verteporfin

Herpes simplex infection and colonization with Pseudomonas aeruginosa complicating pulsed-dye laser treatment. Child, Preschool;Diagnosis, Differential;Face;Female;Herpes Simplex;Humans;Low-Level Light Therapy;Port-Wine Stain;Pseudomonas Infections;Skin Diseases, Infectious;Sturge-Weber Syndrome

[Effect of low intensity helium-neon laser and decimeter electromagnetic irradiation on functional indices of immune cells in patients with rheumatoid arthritis]. Clinical, laboratory, and immunoassay of 58 patients with rheumatoid arthritis, first and second degree of activity was carried out. Low-energy helium-neon laser exposure and decimeter electromagnetic radiation (DMEM) of peripheral blood was given along with the use of non-steroidal antiinflammatory drugs and methotrexate. Peculiarities of this magnetic-laser effect on proliferation response and apoptosis of mononuclear leucocytes in vitro and in vivo have been revealed. It was also established that the application of DMEM-therapy brought patients with RA in shorter period of time to clinical improvement evaluated by ACR criteria. Mitogens Adolescent;Adult;Apoptosis;Arthritis, Rheumatoid;Electromagnetic Fields;Female;Humans;Immunity, Cellular;Leukocytes, Mononuclear;Low-Level Light Therapy;Male;Middle Aged;Mitogens;Treatment Outcome

Biological and clinical aspects in laser hair removal. INTRODUCTION: In the past century, unwanted hair has been traditionally treated with multitudes of techniques that were found to be slow, tedious, painful, impractical, and resulted in poor long-term efficacy. Consequently, there has been a public demand for a novel, rapid, reliable, safe, and affordable hair removal technique. In the last decade, laser and light-based technology for hair removal became one of the fastest growing procedures in modern cosmetic dermatology. OBJECTIVE: To discuss the latest scientific and clinical issues in the field of photoepilation as evolved in the past decade: hair biology, laser physics and skin optics, technology and clinical experience. RESULTS: From substantial clinical experience, it becomes apparent that in the ideal subject with fair skin and dark hair, a single treatment can reduce hair by 10-40%; three treatments by 30-70%; and repeated treatments by as much as 90%. These results persist for as long as 12 months. Diffuse and perifollicular cutaneous erythema and pigmentary

changes are the most common adverse side effects. Most complications are generally temporary. CONCLUSIONS: Photoepilation, when properly used, offers clear advantages when compared with older, traditional techniques. Although an ever-increasing number of published studies have confirmed the safety and short and long-term efficacy of photoepilation, the technology still has limits and risks. Hair Follicle;Hair Removal;Humans;Low-Level Light Therapy

Defocused diode laser therapy (830 nm) in the treatment of unresponsive skin ulcers: a preliminary trial. BACKGROUND: Skin ulcers with compromised healing remain a major problem for plastic and dermatological surgeons. Low incident levels of laser energy have been shown to increase the blood flow rate and volume and to accelerate the wound healing process, thus raising the possibility in augmenting treatment for skin ulcers. METHODS: Preliminary controlled experiments with a 830 nm GaAlAs diode laser in axial pattern flap survival in the rat model showed statistically significant improvement in survival for the irradiated versus unirradiated control animals. In the present study, a newly developed defocused GaAlAs diode laser (830 nm, continuous wave, 669 mW/cm(2)) was applied once or twice per week in an uncontrolled study of five patients (aged between 5 and 81 years old, average 46.6 years old, doses from 6.3 J/cm(2) to 21 J/cm(2)) with previously unresponsive ulcers of various aetiologies. RESULTS: In all five patients, the ulcers healed completely between 3 weeks and 7 months (22.8 +/- 19.3 weeks), without recurrence during a minimum 12-month follow-up. CONCLUSIONS: Defocused 830 nm diode laser therapy was well tolerated, and was very effective in the treatment of this small number of compromised skin ulcers of different aetiologies and in a large range of patient ages. Further controlled studies in larger populations are required. Defocused diode laser therapy nonetheless appears to be a very useful adjunctive method in the treatment of slow-to-heal and non-healing skin ulcers. Adolescent;Aged;Aged, 80 and over;Child, Preschool;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin Ulcer;Treatment Outcome;Wound Healing

Beyond musculoskeletal injury: two dimensional modalities. Diathermy;Humans;Low-Level Light Therapy;Musculoskeletal System

Treatment of acne vulgaris with a pulsed dye laser: a randomized controlled trial. CONTEXT: The high prevalence of acne vulgaris and its significant morbidity underscore the need for convenient, low-risk, and efficacious therapy. Treatment with various lasers has been reported to improve acne. OBJECTIVE: To evaluate the clinical efficacy of pulsed dye laser therapy in the treatment of acne. DESIGN, SETTING, AND PATIENTS: Randomized, single-blind, controlled, split-face clinical trial of a volunteer sample of 40 patients aged 13 years or older with facial acne conducted at an academic referral center from August 2002 to September 2003. INTERVENTION: One or 2 nonpurpuric pulsed dye laser treatments to half of the face (fluence of 3 J/cm2), serial blinded clinical assessments (lesion counts), and grading of acne severity using standardized bilateral serial photographs. MAIN OUTCOME MEASURES: Comparison of the changes in lesion counts from baseline to 12 weeks between treated and untreated sides of the face and changes in photographic evidence of acne severity as graded by a panel of dermatologists blinded to treatment assignment. RESULTS: After 12 weeks, using intent-to-treat analysis with last observation carried forward, there were no significant differences between laser-treated and untreated skin for changes in mean papule counts (-4.2 vs -2.2; P =.08), mean pustule counts (0 vs -1.0; P =.12), or mean comedone counts (2.9 vs 1.6; P =.63). Grading of serial photographs confirmed the clinical assessments, showing no significant mean (SE) differences in Leeds scores (range, 1-12) for treated skin (3.98 [0.32] at baseline and 3.94 [0.27] at week 12) compared with untreated skin (3.83 [0.32] at baseline and 3.79 [0.28] at week 12) (P>.99). CONCLUSIONS: In this study, the nonpurpuric pulsed dye laser therapy did not result in significant improvement of facial acne. More research is needed before this laser therapy may be recommended

as an acne treatment. Acne Vulgaris;Adolescent;Adult;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Single-Blind Method

Treatment of molluscum contagiosum with 585 nm collagen remodeling pulsed dye laser. The inevitable regression of molluscum contagiosum (MC) has been the major argument in favor of leaving the lesions to spontaneous involution. But the infection is often widespread and recurrent. Conventional therapies are frequently ineffective and require multiple visits. Flashlamp-pumped pulsed dye laser is now recommended in the therapy of MC in case reports. There is no evaluation of a pulsed dye laser collagen remodeling (wavelength of 585 nm) as a possible therapeutic alternative. We treated 76 patients with cutaneous MC with 1 to 176 MC (mean 27 MC) in a prospective study from April 2002 to September 2002 (over a period of six months). The female/male sex ratio was of 1.2:1 (42 girls, and 34 boys). Patients were aged from 1 to 15 years, with a mean of 4.9 years. We used 585 nm collagen remodeling, double flashlamp excited pumped dye laser ED2000 (manufactured by Deka(c) MELA Calenzano, Italy), spot size 5 mm, energy density (fluence J/cm(2)) from 2 to 4 J/cm(2), emission modality (repetition rate) at 0.5 Hz, with a short pulse duration of 250 microsec in all cases. The therapy was well tolerated. No scars or pigment anomalies were observed. 96.3% of the lesions healed after the first treatment, the remaining 3.7% after the second (two weeks later). Laser photocoagulation causes selective damage to abnormal vessels and surrounding connective tissue. The heating effect in these skin layers triggers the release of various growth factors that stimulate collagen remodeling and tightening. It appears to be a cell-mediated reaction, which brings about an elevation in the T lymphocytes, capable of affecting pox viridae. Dye laser photocoagulation however, cannot protect against relapse. Hyperpigmentation may occur at nearly all sites, however this fades after 1 to 6 months. The pulsed dye laser for collagen remodeling is an effective, bloodless, quick, and easy therapeutic alternative for MC. The advantage of using a collagen remodeling pumped dye laser is the absence of pain, because of the short pulse duration (half that of a normal pulsed dye laser), and the use of low fluence (less than 4 J/cm(2)). It enables the treatment of young patients with a large number of lesions, which is impossible with a normal pulsed dye laser. There are no side effects. Collagen Adolescent;Child;Child, Preschool;Collagen;Female;Humans;Infant;Low-Level Light Therapy;Male;Molluscum Contagiosum;Skin

Enhancement of bone formation in rat calvarial bone defects using low-level laser therapy. OBJECTIVE: To evaluate the effect of low-level laser therapy (LLLT), using a GaAlAs diode laser device, on bone healing and growth in rat calvarial bone defects. STUDY DESIGN: An animal trial of 4 weeks' duration was conducted using a randomized blind, placebo-controlled design. Standardized round osseous defects of 2.7 mm diameter were made in each parietal bone of 20 rats (n=40 defects). The animals were randomly divided into an experimental and a control group of 10 animals each. In the experimental group, a GaAlAs diode laser was applied immediately after surgery and then daily for 6 consecutive days. The control group received the same handling and treatment, but with the laser turned off. Five rats from each group were killed on day 14 and the remainder on day 28 postoperatively. From each animal, tissue samples from one defect were prepared for histochemistry and samples from the contralateral defect for histology. Levels of calcium, phosphorus, and protein were determined by using atomic absorption spectrometry, colorimetry, and photometry, respectively. Student t-test and Mann-Whitney were used for statistical analyses. RESULTS: At both time points the tissue samples from the experimental animals contained significantly more calcium, phosphorus, and protein than the controls. Similarly, histological analyses disclosed more pronounced angiogenesis and connective tissue formation, and more advanced bone formation in the experimental group than in the controls. CONCLUSION: LLLT may enhance bone formation in rat calvarial bone defects. Placebos;Proteins;Phosphorus;Gallium;Aluminum;Arsenic;Calcium

Aluminum;Animals;Arsenic;Bone Diseases;Calcium;Colorimetry;Connective Tissue;Gallium;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Osteogenesis;Parietal Bone;Phosphorus;Photometry;Placebos;Proteins;Random Allocation;Rats;Rats, Sprague-Dawley;Single-Blind Method;Spectrophotometry, Atomic;Wound Healing

[Excimer laser. Treatment of iatrogenic hypopigmentation following skin resurfacing]. As skin resurfacing has become more common, the number of patients developing post-treatment hypopigmentation has increased. No effective treatment for this complication has been developed. Some hypopigmented disorders, including vitiligo, have been treated with the excimer laser. We used the XeCl excimer laser to successfully treat a 78-year-old woman with perioral leukoderma following CO(2) laser skin resurfacing. The repigmentation was stable for at least 16 months. Larger prospective studies of this new therapeutic intervention are recommended to evaluate its efficacy and long-term stability. Aged;Cosmetic Techniques;Female;Follow-Up Studies;Humans;Hypopigmentation;Iatrogenic Disease;Keloid;Lip Diseases;Low-Level Light Therapy;Radiation Injuries;Retreatment;Skin Aging

Treatment of facial scarring and ulceration resulting from acne excoriÃ©e with 585-nm pulsed dye laser irradiation and cognitive psychotherapy. BACKGROUND: Self-inflicted skin ulcers and scars are often observed in patients with compulsive skin picking. The term "neurotic excoriation" has been used to describe this condition and may or may not coexist with other true skin pathologies, such as acne. The condition poses a diagnostic and treatment challenge because patients often also have an undiagnosed underlying psychologic disorder. CASE REPORTS: Two patients with numerous linear and stellate facial ulcers and hypertrophic and erythematous scars were diagnosed with acne excoriÃ©e in the setting of an obsessive-compulsive disorder linked to emotional stress and anxiety. The scars were treated with a 585-nm flashlamp-pumped pulsed dye laser using a 7-mm spot size, 1.5-msec pulse duration, and fluence range of 4.5 to 6.0 J/cm(2). The patients received concomitant cognitive psychodynamic therapy to halt the cycle of impulse-driven skin picking and ulcer/scar formation. Marked clinical improvement of the scars and successful treatment of the acne excoriÃ©e were achieved with this combination approach. Relapses occurred when psychodynamic intervention was interrupted. CONCLUSION: The 585-nm flashlamp-pumped pulsed dye laser improves the appearance of hypertrophic erythematous facial scars and ulcers in patients with severe acne excoriÃ©e. Proper diagnosis of underlying impulse-control disorders and ongoing psychodynamic therapy is necessary to maintain improvement. Anti-Bacterial Agents;Clindamycin;Doxycycline Acne Vulgaris;Adult;Anti-Bacterial Agents;Behavior Therapy;Cicatrix;Clindamycin;Diagnosis, Differential;Doxycycline;Female;Humans;Low-Level Light Therapy;Obsessive-Compulsive Disorder

Recalcitrant adverse reaction to vitamin K: response to pulsed dye laser. BACKGROUND: Adverse cutaneous reaction to vitamin K manifests in sclerodermatous or erythematous plaque-like reactions. Most of the cases with erythematous plaque-like dermatitis arising at the site of intramuscular vitamin K injection were recalcitrant and did not respond to various attempts with topical and intralesional corticosteroid. OBJECTIVE: The objective was to describe a 25-year-old woman with recalcitrant adverse reaction owing to vitamin K who was successfully treated with pulsed dye laser. METHODS: Two consecutive pulsed dye laser treatments were performed 3 weeks apart with 450-microec pulse duration, 585-nm pulse width, and fluence of 5 and 7 J/cm(2), respectively, using a 7-mm handpiece. RESULTS: One week after the second treatment, her skin lesion was cleared and she was followed without recurrence for 7 months. CONCLUSION: Although the precise mechanism remains yet to be proven, we have demonstrated successful treatment of localized adverse cutaneous reaction to vitamin K in one patient with the pulsed dye laser. Vitamin K Adult;Buttocks;Diagnosis, Differential;Drug Eruptions;Female;Humans;Injections, Intramuscular;Low-Level Light Therapy;Recurrence;Vitamin K

Recurrent pigmented macules after q-switched alexandrite laser treatment of congenital melanocytic nevus. BACKGROUND: Q-switch-mode laser treatment of congenital nevi does not result in complete histological clearance, and many patients have partial repigmentation within several months. In addition, the number of recurrent pigmented macules (RPMs) may increase, a major drawback to good cosmetic results. While the mechanism of recurrence is not known. OBJECTIVE: To help elucidate the mechanism of RPM development, we evaluated the expression of TNF-alpha and E-cadherin on RPM after treatment of congenital nevi with a Q-switched alexandrite laser (QSAL). METHODS: Thirteen Korean subjects with congenital nevi received QSAL treatment at intervals ranging from 2 to 6 months (mean, 4.5 treatments). Two-millimeter punch biopsy specimens were obtained at their first visit and from RPMs 3-6 months after the last treatment. Expression of E-cadherin and TNF-alpha were determined histochemically in the original nevi and RPM. In addition, one RPM was examined by electron microscopy. RESULTS: Reduced pigmentation in the treated areas was seen in all cases, but partial repigmentaion was seen as black spots within 6 months after the last QSAL treatment. Compared to the original nevi, the RPMs had increased numbers of melanocytes in the epidermis and reduced nevomelanocytic nests in the dermis. The expression of TNF-alpha and E-cadherin was downregulated in the RPMs compared to the original nevi. Electron microscopy confirmed the increase in melanocytes in the epidermis of RPMs. CONCLUSION: Our findings suggest that the down-regulation of E-cadherin and TNF-alpha may induce the proliferation of melanocytes, resulting in the formation of RPMs. Cadherins;Tumor Necrosis Factor-alpha Adolescent;Adult;Cadherins;Child;Child, Preschool;Ear, External;Face;Female;Humans;Leg;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Recurrence, Local;Nevus, Pigmented;Skin Neoplasms;Thorax;Tumor Necrosis Factor-alpha

Confocal microscopy study of nerves and blood vessels in untreated and treated port wine stains: preliminary observations. BACKGROUND AND OBJECTIVE: Vascular ectasia in port wine stain birthmarks (PWS) might result from reduced innervation with loss of autonomic stimulation. We investigated this theory and evaluated nerve and blood vessel density, and mean blood vessel size in untreated and treated PWS skin. METHODS: Skin biopsy specimens were obtained from uninvolved skin, untreated PWS, PWS with a good response to laser treatment and PWS with a poor response to laser treatment. Confocal microscopy was performed to determine nerve and blood vessel density, and mean blood vessel size. RESULTS: Nerve density was significantly decreased in all PWS sites compared to uninvolved skin. Mean blood vessel diameter was larger in untreated compared to treated PWS. PWS with a good response to treatment had decreased nerve density but blood vessel density and mean diameter was relatively normal. PWS with a poor response to treatment had decreased nerve density but increased blood vessel density and mean blood vessel diameter compared to normal skin. CONCLUSION: Nerve density was decreased in all evaluated PWS sites and this may be a factor in lesion pathogenesis. PWS blood vessel size correlated with pulsed dye laser response and may prove to be a useful prognostic indicator of therapeutic outcome. Adult;Arm;Capillaries;Cheek;Humans;Low-Level Light Therapy;Male;Microscopy, Confocal;Middle Aged;Nerve Fibers;Port-Wine Stain;Regional Blood Flow;Skin

Treatment of neck lines and forehead rhytids with a nonablative 1540-nm Er:glass laser: a controlled clinical study combined with the measurement of the thickness and the mechanical properties of the skin. BACKGROUND: Nonablative remodeling has been recently proposed as a new, no-down-time, anti-aging treatment. Objective. The objective was to evaluate the efficacy and safety of nonablative skin remodeling with a 1540-nm Er:Glass laser on neck lines and forehead rhytids. METHODS: Twenty female patients (mean age 45 years) were enrolled. Skin thickness and mechanical properties were measured before the first treatment, 1 month after the third treatment, 1 month after the fifth treatment, and 3 months after the fifth treatment. RESULTS: All patients reported an

improvement in both skin tone and texture. Using ultrasound imaging, dermal thickness of neck and forehead increased, respectively, by 70+/-13 microm (p<0.001) and 110+/-19 microm (p<0.003). A dramatic increase of initial stress of the forehead skin (firmness) was obtained, from 7.62+/-3.68 before treatment to 16.68+/-7.44 3 months after the fifth treatment (p<0.0002). No immediate or late adverse effects were noted throughout the treatment regimen. CONCLUSION: This study demonstrates that irradiation with a 1540-nm Er:Glass laser emitting in a pulsed mode and coupled with an efficient contact cooling system increases dermal thickness and firmness, leading to a clinical improvement of neck lines and forehead rhydits. Adult;Aged;Facial Dermatoses;Female;Forehead;Humans;Low-Level Light Therapy;Middle Aged;Neck;Rhytidoplasty;Skin;Skin Aging

Clinical evaluation of the effects of low-intensity laser (GaAlAs) on wound healing after gingivoplasty in humans. Low-intensity laser therapy aims at pain suppression, edema reduction and acceleration of wound healing. The main goal of this study was to clinically evaluate the effects of Aluminum Gallium Arsenate laser - 670nm in wound healing after gingivoplasty in 11 patients. Surgery was performed in anterior superior and/or inferior regions. The right side of the patient (test group) received a laser energy density of 4J/cmÂ², in a 48-hour interval, during one week, totalizing four sessions. The irradiation was punctual in a contact mode in three points. The left side did not receive irradiation (control group). Clinical evaluation was performed by five specialists in periodontology through photography of the treated areas at post-surgical periods of 7, 15, 21,30,60 days. The observers pointed the best healed side. The Sign test was used for statistical analysis with a confidence level of 5% (P<0.05). The examiners found a better pattern of healing sometimes in the test and sometimes in the control group until 21 days after surgery. After this period there was no apparent difference between them. There was no statistical difference between the sides (p>0.05). These results have shown that low-intensity laser therapy did not accelerate oral mucosa healing after gingivoplasty.

Photobiological basis and clinical role of low-intensity lasers in biology and medicine. The purpose of this article is to provide a comprehensive review on the clinical role of low intensity laser therapy (laser photostimulation) in biology and medicine. Studies on wound healing and pain relief are highlighted to show the clinical efficacy of laser therapy. Controversies about the use of low intensity laser as a therapeutic modality for wound healing and pain relief are presented and a brief explanation is provided to overcome these controversies. The importance of standard parameters is emphasized for the applications of low intensity lasers in biology and medicine. A justification has been made to warrant further research on the use of low intensity laser as a therapeutic modality. Although the therapeutic applications of low intensity laser are imminent, the heterogeneity in treatment protocols and study design calls for a vigilant interpretation of the findings. Adipose Tissue;Humans;Low-Level Light Therapy;Pain;Wound Healing

Low-level laser treatment can reduce edema in second degree ankle sprains. OBJECTIVE: Low-level laser therapy (LLLT) has been used for the last few years to treat sports injuries. The purpose of this study was to compare three therapeutic protocols in treating edema in second degree ankle sprains that did not require immobilization with a splint, under placebo-controlled conditions. MATERIALS AND METHODS: Forty-seven soccer players with second degree ankle sprains, selected at random, were divided into the following groups: The first group (n = 16) was treated with the conventional initial treatment (RICE, rest, ice, compression, elevation), the second group (n = 16) was treated with the RICE method plus placebo laser, and the third group (n = 15) was treated with the RICE method plus an 820-nm GaA1As diode laser with a radiant power output of 40 mW at 16 Hz. Before the treatment, and 24, 48, and 72 h later, the volume of the edema was measured. RESULTS: A three by three repeated measures ANOVA with a follow up post hoc test revealed that the group

treated with the RICE and an 820-nm GaA1As diode laser presented a statistically significant reduction in the volume of the edema after 24 h (40.3 +/- 2.4 mL, $p < 0.01$), 48 h (56.4 +/- 3.1 mL, $p < 0.002$), and 72 h (65.1 +/- 4.4 mL, $p < 0.001$). CONCLUSIONS: LLLT combined with RICE can reduce edema in second-degree ankle sprains. Adolescent;Adult;Ankle Injuries;Combined Modality Therapy;Cryotherapy;Edema;Humans;Low-Level Light Therapy;Soccer;Sprains and Strains

Effect of low-intensity (3.75-25 J/cm2) near-infrared (810 nm) laser radiation on red blood cell ATPase activities and membrane structure. OBJECTIVE: The biostimulation and therapeutic effects of low-power laser radiation of different wavelengths and light doses are well known, but the exact mechanism of action of the laser radiation with living cells is not yet understood. The aim of the present work was to investigate the effect of laser radiation (810 nm, radiant exposure 3.75-25 J/cm(2)) on the structure of protein and lipid components of red blood cell membranes and it functional properties. The role of membrane ATPases as possible targets of laser irradiation was analyzed. BACKGROUND DATA: A variety of studies both in vivo and in vitro showed significant influence of laser irradiation on cell functional state. At the same time another group of works found no detectable effects of light exposure. Some different explanations based on the light absorption by primary endogenous chromophores (mitochondrial enzymes, cytochromes, flavins, porphyrins) have been proposed to describe biological effects of laser light. It was suggested that optimization of the structural-functional organization of the erythrocyte membrane as a result of laser irradiation may be the basis for improving the cardiac function in patients under a course of laser therapy. MATERIALS AND METHODS: Human red blood cells or isolated cell membranes were irradiated with low-intensity laser light (810 nm) at different radiant exposures (3.75-25 J/cm(2)) and light powers (fluence rate; 10-400 mW) at 37 degrees C. As the parameters characterizing the structural and functional changes of cell membranes the activities of Na(+)-, K(+)-, and Mg(2+)-ATPases, tryptophan fluorescence of membrane proteins and fluorescence of pyrene incorporated into membrane lipid bilayer were used. RESULTS: It was found that near-infrared low-intensity laser radiation changes the ATPase activities of the membrane ion pumps in the dose- and fluence rate-dependent manner. At the same time no changes of such integral parameters as cell stability, membrane lipid peroxidation level, intracellular reduced glutathione or oxyhaemoglobin level were observed. At laser power of 10 mW, an increase of the ATPase activity was observed with maximal effect at 12-15 J/cm(2) of light dose (18-26% for the total ATPase activity). At laser power of 400 mW (fluence rate significantly increased), inhibition of ATPases activities mainly due to the inhibition of Na(+)-, K(+)-ATPase was observed with maximal effect at the same light dose of 12-15 J/cm(2) (18-23% for the total ATPase activity). Fractionation of the light dose significantly changed the membrane response to laser radiation. Changes in tryptophan fluorescent parameters of erythrocyte membrane proteins and the increase in lipid bilayer fluidity measured by pyrene monomer/excimer fluorescence ratio were observed. CONCLUSIONS: Near-infrared laser light radiation (810 nm) induced long-term conformational transitions of red blood cell membrane which were related to the changes in the structural states of both erythrocyte membrane proteins and lipid bilayer and which manifested themselves as changes in fluorescent parameters of erythrocyte membranes and lipid bilayer fluidity. This resulted in the modulation of membrane functional properties: changes in the activity of membrane ion pumps and, thus, changes in membrane ion flows. Adenosine Triphosphatases Adenosine Triphosphatases;Dose-Response Relationship, Radiation;Erythrocyte Membrane;Humans;Low-Level Light Therapy

Investigation of the supplementary effect of GaAs laser therapy on the rehabilitation of human digital flexor tendons. OBJECTIVE: To investigate the effect of laser photostimulation in rehabilitation of human digital flexor tendons with a placebo-controlled double-blind prospective study model. BACKGROUND DATA: Low-energy laser therapy has been applied in several rheumatoid and soft tissue disorders with a varying rate of success and it has also been shown to have a positive effect on

tendon healing in animal experiments, but no clinical study on laser photostimulation in the treatment of human tendons has been reported to date. MATERIALS AND METHODS: This study was performed in a total of 25 patients with 41 digital flexor tendon injuries in five anatomical zones. In Group I (21 digits in 13 patients), whirlpool and infrared GaAs diode laser with a frequency of 100 Hz. was applied between the 8th and 21st days postoperatively and all patients were given the Washington rehabilitation program until the end of the 12th week. In Group II (20 digits in 12 patients), the same treatment protocol was given but the laser instrument was switched off during applications. RESULTS: The results of the study showed a significant improvement in the laser-treated group only for the parameter of edema reduction ($p < 0.01$) but the difference between the two groups was non-significant for pain reduction, hand grip strength, and functional evaluation performed according to Strickland and Buck-Gramcko systems using total active motion and fingertip-to distal palmar crease distance parameters ($p > 0.05$). CONCLUSIONS: Significant improvement obtained in edema reduction both immediately and 12 weeks after supplementary GaAs laser application in our study has been interpreted as an important contribution to the rehabilitation of human flexor tendon injuries because edema is known to have a detrimental effect on functional recovery during both early and late stages of tendon healing. However, our study has failed to show a significant positive effect of supplementary GaAs laser application on the other functional recovery parameters of human flexor tendon injury rehabilitation and we suggest further clinical study in this topic be done using different laser types and dosages in order to delineate the role of this promising treatment modality. Adolescent;Adult;Child;Double-Blind Method;Edema;Female;Finger Injuries;Humans;Low-Level Light Therapy;Male;Prospective Studies;Rehabilitation;Tendon Injuries

Effectiveness of hand therapy interventions in primary management of carpal tunnel syndrome: a systematic review. The purpose of this study was to determine the effectiveness of hand therapy interventions for carpal tunnel syndrome (CTS) based on the best available evidence. A qualitative systematic review was conducted. A literature search using 40 key terms was conducted from the earliest available date to January 2003 using seven databases. Articles were randomly assigned to two of five reviewers and evaluated according to predetermined criteria for inclusion at each of the title, abstract, and article levels. Included studies were independently scored by two reviewers using a structured effectiveness quality evaluation scale and also graded according to Sackett's Levels of Evidence. There were 2027 articles identified from the literature search, of which 345 met the inclusion criteria. Twenty-four studies were used to formulate 30 recommendations. Current evidence demonstrates a significant benefit (grade B recommendations) from splinting, ultrasound, nerve gliding exercises, carpal bone mobilization, magnetic therapy, and yoga for people with CTS. Acupuncture Therapy;Carpal Tunnel Syndrome;Combined Modality Therapy;Humans;Low-Level Light Therapy;Magnetics;Physical Therapy Modalities;Splints;Yoga

Effectiveness of rehabilitation for patients with subacromial impingement syndrome: a systematic review. Prior systematic reviews of rehabilitation for nondescript shoulder pain have not yielded clinically applicable results for those patients with subacromial impingement syndrome (SAIS). The purpose of this study was to examine the evidence for rehabilitation interventions for SAIS. The authors used data source as the method. The computerized bibliographic databases of Medline, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Cochrane Database of Systematic Reviews were searched from 1966 up to and including October 2003. Key words used were "shoulder," "shoulder impingement syndrome," "bursitis," and "rotator cuff" combined with "rehabilitation," "physical therapy," "electrotherapy," "ultrasound," "acupuncture," and "exercise," limited to clinical trials. Randomized clinical trials that investigated physical interventions used in the rehabilitation of patients with SAIS with clinically relevant outcome measures of pain and quality of life were selected. The search resulted in 635 potential studies, 12 meeting inclusion criteria. Two

independent reviewers graded all 12 trials with a quality checklist averaged for a final quality score. The mean quality score for 12 trials was 37.6 out of a possible 69 points. Various treatments were evaluated: exercise in six trials, joint mobilizations in two trials, laser in three trials, ultrasound in two trials, and acupuncture in two trials. The limited evidence currently available suggests that exercise and joint mobilizations are efficacious for patients with SAIS. Laser therapy appears to be of benefit only when used in isolation, not in combination with therapeutic exercise. Ultrasound is of no benefit, and acupuncture trials present equivocal evidence. The low to mediocre methodologic quality, small sample sizes, and general lack of long-term follow-up limit these findings for the development of useful clinical practice guidelines. Further trials are needed to investigate these rehabilitation interventions, the superiority of one intervention over another, and the long-term outcomes of rehabilitation. Moreover, it is imperative that clinical guidelines are developed to indicate those patients who are likely to respond to rehabilitation. Acupuncture Therapy;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Shoulder Impingement Syndrome;Ultrasonic Therapy

Effects of different protocol doses of low power gallium-aluminum-arsenate (Ga-Al-As) laser radiation (650 nm) on carrageenan induced rat paw ooedema. The purpose of the present study was to investigate the effect of the low power laser therapy on the acute inflammatory process. Male Wistar rats were used. The rat paw oedema was induced by sub-plantar injection of carrageenan, the paw volume was measured before and 1, 2, 3 and 4 h after the injection using a hydroplethysmometer. To investigate the mechanism action of the Ga-Al-As laser on inflammatory oedema, parallel studies were performed using adrenallectomized rats or rats treated with sodium diclofenac. Different laser irradiation protocols were employed for specific energy densities (EDs), exposure times and repetition rates. The rats were irradiated with the Ga-Al-As laser during 80 s each hour. The ED that produced an anti-inflammatory effect were 1 and 2.5 J/cm(2), reducing the oedema by 27% ($P<0.05$) and 45.4% ($P<0.01$), respectively. The ED of 2.5 J/cm(2) produced anti-inflammatory effects similar to those produced by the cyclooxigenase inhibitor sodium diclofenac at a dose of 1 mg/kg. In adrenalectomized animals, the laser irradiation failed to inhibit the oedema. Our results suggest that low power laser irradiation possibly exerts its anti-inflammatory effects by stimulating the release of adrenal corticosteroid hormones. Arsenates;Diclofenac;Carrageenan;Gallium;Aluminum;arsenic acid
Adrenalectomy;Aluminum;Animals;Arsenates;Carrageenan;Diclofenac;Edema;Extremities;Gallium;Inflammation;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Time Factors

Transcranial infrared laser therapy improves clinical rating scores after embolic strokes in rabbits. BACKGROUND AND PURPOSE: Because photon energy delivered using a low-energy infrared laser may be useful to treat stroke, we determined whether transcranial laser therapy would improve behavioral deficits in a rabbit small clot embolic stroke model (RSCEM). METHODS: In this study, the behavioral and physiological effects of laser treatment were measured. The RSCEM was used to assess whether low-energy laser treatment (7.5 or 25 mW/cm2) altered clinical rating scores (behavior) when given to rabbits beginning 1 to 24 hours postembolization. Behavioral analysis was conducted from 24 hours to 21 days after embolization, allowing for the determination of the effective stroke dose (P50) or clot amount (mg) that produces neurological deficits in 50% of the rabbits. Using the RSCEM, a treatment is considered beneficial if it significantly increases the P50 compared with the control group. RESULTS: In the present study, the P50 value for controls were 0.97+/-0.19 mg to 1.10+/-0.17 mg; this was increased by 100% to 195% (P50=2.02+/-0.46 to 2.98+/-0.65 mg) if laser treatment was initiated up to 6 hours, but not 24 hours, postembolization (P50=1.23+/-0.15 mg). Laser treatment also produced a durable effect that was measurable 21 days after embolization. Laser treatment (25 mW/cm2) did not affect the physiological variables that were measured. CONCLUSIONS: This study shows that laser treatment improved behavioral performance if

initiated within 6 hours of an embolic stroke and the effect of laser treatment is durable. Therefore, transcranial laser treatment may be useful to treat human stroke patients and should be further developed. Blood Glucose Animals;Behavior, Animal;Blood Glucose;Body Temperature;Disease Models, Animal;Intracranial Embolism;Low-Level Light Therapy;Male;Rabbits;Stroke
[Study of microcirculation with laser Doppler flowmetry in patients with facial nerve neuritis under the influence of physiotherapy]. Adolescent;Adult;Aged;Combined Modality Therapy;Electric Stimulation Therapy;Electrodes;Facial Nerve Diseases;Female;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Treatment Outcome
Effect of laser treatment for dry age related macular degeneration on foveolar choroidal haemodynamics. AIM: Previous studies have suggested that laser photocoagulation therapy is associated with the resolution of drusen in some age related macular degeneration (AMD) patients. The main aim of the study was to determine whether low intensity laser treatment applied according to the Complications of AMD Prevention Trial (CAPT) protocol produces changes in the choroidal circulation that may help explain the mechanism leading to the resolution of drusen material. METHODS: This ancillary study included 30 CAPT patients with bilateral drusen that were treated and followed at the University of Pennsylvania. Laser Doppler flowmetry was used to measure relative choroidal blood velocity (Ch(vel)), volume (Ch(vol)), and flow (Ch(flow)) in the centre of the fovea. Measurements were obtained through a dilated pupil in both eyes of each patient at the initial CAPT visit before laser treatment was applied in one eye. Measurements were repeated in both eyes of each subject three months later. Analysis of laser Doppler measurements was performed in a masked fashion. RESULTS: In comparison to baseline, no significant differences in Ch(vel), Ch(vol), or Ch(flow) were observed three months following the application of low intensity laser according to the CAPT protocol in the untreated and treated eyes. In comparison to the untreated eyes, no significant differences were detected in the treated eyes. Based on the variability of flow measurements in the untreated eyes, the authors estimated an 85% power to detect a 15% change in relative blood flow. CONCLUSIONS: The results suggest that large alterations in choroidal blood flow do not occur at three months after low intensity laser therapy following the CAPT protocol. Aged;Aged, 80 and over;Choroid;Female;Follow-Up Studies;Humans;Laser Coagulation;Macular Degeneration;Male;Middle Aged;Regional Blood Flow;Retinal Drusen
308-nm excimer laser for the treatment of scalp psoriasis. Female;Humans;Low-Level Light Therapy;Middle Aged;Psoriasis;Scalp Dermatoses;Severity of Illness Index
Low Level Laser Therapy--a conservative approach to the burn scar? Burn scars are known to be difficult to treat because of their tendency to worsen with hypertrophy and contracture. Various experimental and clinical efforts have been made to alleviate their effects but the problem has not been solved. Since patients keep asking for Low Level Laser Therapy (LLLT) and believe in its effectiveness on burn scars, and since former studies show contradictory results of the influence of LLLT on wound healing, this prospective study was designed to objectify the effects of LLLT on burn scars. Nineteen patients with 19 burn scars were treated with a 400 mW 670 nm Softlaser twice a week over 8 weeks. In each patient a control area was defined, that was not irradiated. Parameters assessed were the Vancouver Scar Scale (VSS) for macroscopic evaluation and the Visual Analogue Scale (VAS) for pruritus and pain. Photographical and clinical assessments were recorded in all the patients. Seventeen out of 19 scars exhibited an improvement after treatment. The average rating on the VSS decreased from 7.10+/-2.13 to 4.68+/-2.05 points in the treated areas, whereas the VSS in the control areas decreased from 6.10+/-2.86 to 5.88+/-2.72. A correlation between scar duration and improvement through LLLT could be found. No negative effects of LLLT were reported. The present study shows that the 400 mW 670 nm softlaser has a positive, yet sometimes limited effect

on burn scars concerning macroscopic appearance, pruritus, and pain. Adolescent;Adult;Aged;Burns;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Pruritus;Severity of Illness Index;Treatment Outcome

Low-level laser therapy stimulates bone-implant interaction: an experimental study in rabbits. The aim of the present study was to investigate the effect of low-level laser therapy (LLLT) with a gallium-aluminium-arsenide (GaAlAs) diode laser device on titanium implant healing and attachment in bone. This study was performed as an animal trial of 8 weeks duration with a blinded, placebo-controlled design. Two coin-shaped titanium implants with a diameter of 6.25 mm and a height of 1.95 mm were implanted into cortical bone in each proximal tibia of twelve New Zealand white female rabbits (n=48). The animals were randomly divided into irradiated and control groups. The LLLT was used immediately after surgery and carried out daily for 10 consecutive days. The animals were killed after 8 weeks of healing. The mechanical strength of the attachment between the bone and 44 titanium implants was evaluated using a tensile pullout test. Histomorphometrical analysis of the four implants left in place from four rabbits was then performed. Energy-dispersive X-ray microanalysis was applied for analyses of calcium and phosphorus on the implant test surface after the tensile test. The mean tensile forces, measured in Newton, of the irradiated implants and controls were 14.35 (SD+/-4.98) and 10.27 (SD+/-4.38), respectively, suggesting a gain in functional attachment at 8 weeks following LLLT (P=0.013). The histomorphometrical evaluation suggested that the irradiated group had more bone-to-implant contact than the controls. The weight percentages of calcium and phosphorus were significantly higher in the irradiated group when compared to the controls (P=0.037) and (P=0.034), respectively, suggesting that bone maturation processed faster in irradiated bone. These findings suggest that LLLT might have a favourable effect on healing and attachment of titanium implants. Dental Implants;Placebos;Phosphorus;Gallium;Aluminum;Titanium;Arsenic;Calcium Aluminum;Animals;Arsenic;Calcium;Dental Implants;Electron Probe Microanalysis;Female;Gallium;Low-Level Light Therapy;Microscopy, Electron, Scanning;Osseointegration;Osteogenesis;Phosphorus;Placebos;Rabbits;Random Allocation;Single-Blind Method;Tensile Strength;Tibia;Titanium;Wound Healing

[Molecular and cellular mechanisms of the low intensity laser radiation effect]. The main aspects of the free radical conception of the molecular and cellular mechanisms of the stimulating action of low-intensity radiation in the red region of the spectrum were considered. These are: (1) Primary acceptors of incident radiation are endogenous porphyrins, which may act as photosensitizers giving initiator-radicals for secondary free radical reactions. (2) Target cells for light irradiation during quantum therapy may be blood leukocytes, fibroblasts, keratinocytes, endotheliocytes, etc. (3) The initiation of the secondary free radical reactions due to lipid peroxidation of cell membranes (in particular, of leukocytes) brings about an increase in ion permeability including that for calcium. The increase in intracellular calcium concentration leads to phagocytes priming, i.e., to increased production of reactive oxygen species (ROS) under subsequent stimulation of the cell. (4) Photosensitized generation of ROS in the cytoplasm of some cells induces a free-radical activation of synthesis of proteins, the most significant in the light of the present concept being the de novo synthesis of inducible NO-synthase, superoxide dismutase, and various cytokines. The experimental evidence for the basic statements of the conception of free radical mechanisms for the stimulating action of low-intensity laser and noncoherent radiations is presented. A relation between the primary mechanisms of the stimulating action of light and the secondary effects that determine the sanative effect of quantum therapy in the process of wound healing (bactericidity, cell proliferation, and improved microcirculation) was established. Moreover, it was shown that nitrosyl complexes of heme proteins, such as hemoglobin and cytochrome c, are the primary chromophores of laser radiation.

Upon irradiation, they can easily dissociate to produce free nitric oxide. In turn, released nitric oxide may be responsible for blood vessel relaxation and activation of mitochondrial respiration. This phenomenon is just observed during phototherapy by means of low-intensity laser radiation.
Free Radicals;Hemeproteins;Membrane Lipids;Porphyrins;Reactive Oxygen Species;Nitric Oxide;Superoxide Dismutase;Calcium Animals;Calcium;Cell Division;Free Radicals;Hemeproteins;Humans;Lasers;Lipid Peroxidation;Low-Level Light Therapy;Membrane Lipids;Nitric Oxide;Phagocytes;Porphyrins;Reactive Oxygen Species;Superoxide Dismutase

Effects of low-intensity polarized visible laser radiation on skin burns: a light microscopy study. OBJECTIVE: This study was carried out to investigate the influence of low-intensity polarized visible laser radiation on the acceleration of skin wound healing. BACKGROUND DATA: Low-level laser therapy (LLLT) at adequate wavelength, intensity, and dose can accelerate tissue repair. However, there is still unclear information about light characteristics, such as coherence and polarization. Some studies indicate that linearly polarized light can survive through long propagation distance in biological tissue. MATERIALS AND METHODS: Three burns about 6 mm in diameter were created on the back of rats with liquid N(2). Lesion "L(//)" was irradiated by He-Ne laser (lambda = 632.8 nm), D= 1.0 J/cm(2), with linear polarization parallel to the spinal column of the rat. Lesion "L(inverted v)" was irradiated using the same laser and dose, but the light polarization was aligned perpendicularly to the relative orientation. Lesion "C" was not irradiated in order to be considered as control. The animals were sacrificed at day 3-17 after lesion creation. Samples were collected and prepared for histological analysis. RESULTS: Histological analysis showed that the healing of irradiated wounds was faster than that of non-irradiated wounds. Moreover, it was observed that skin wound repair is dependent on polarization orientation with respect to a referential axis as the animal's spinal column. Consequently, "L(//)" was completely healed after 17 days, whereas "L (perpendicular) " showed a moderate degree of healing after the same period. CONCLUSIONS: These results indicate that the relative direction of the laser polarization plays an important role in the wound healing process when highly coherent He-Ne laser is used. Animals;Burns;Low-Level Light Therapy;Male;Rats;Rats, Inbred Lew;Skin;Wound Healing

SEM analysis of dentin treated with the Er:YAG laser: a pilot study of the consequences resulting from laser use on adhesion mechanisms. OBJECTIVES: The purpose of this study was to compare the morphological characteristics of lased dentinal surfaces obtained by chemical etching, which was applied either before or after laser treatment. The adhesive interface after the application of an adhesive-composite system on the above mentioned dentinal surfaces was also evaluated. MATERIALS AND METHODS: Eighteen caries-free permanent molars were transversally cut to obtain the dentinal surfaces. Ten of these surfaces were divided into three main groups according to their preparation modality: laser only, laser followed by chemical etching, and chemical etching before laser. The Er:YAG laser was used with two different energy outputs: 200 and 400 mJ at 1 Hz. The eight remaining surfaces were divided into two groups and followed the same preparation as the first three groups. The only difference was a change in frequency: 4 Hz was used for treating these surfaces. An adhesive system (Scotchbond 1, 3M), a thin layer of flowable composite (Tetric Flow, Vivadent), and a regular composite (Z250, 3M) were applied to each dentinal surface and then separately light cured. In order to evaluate the dentine-restoration interface, the samples were cut longitudinally and prepared for SEM observation. RESULTS: The dentinal surfaces that were etched by the laser treatment did not demonstrate the characteristics necessary for guaranteeing a good bond with the adhesive materials. A closer observation of the dentine-restoration interface revealed some micro-fractures located just below the lased dentinal surface. CONCLUSION: The decision to use the Er:YAG laser as an alternative to conventional techniques of acid etching is currently arguable. Given that the available adhesive systems require acid conditioning, it would not be advisable to skip this operative

step. Dentin-Bonding Agents;Resin Cements;Scotchbond Acid Etching, Dental;Dentin;Dentin-Bonding Agents;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Molar;Pilot Projects;Resin Cements

Dose and wavelength of laser light have influence on the repair of cutaneous wounds. OBJECTIVE: The objective of the present study was to compare histologically the effect of GaAlAs (lambda 830 nm, phi approximately 2 mm(2), 35 mW) and InGaAlP (lambda 685 nm, phi approximately 2 mm(2), 35 mW) lasers, alone or in association with doses of 20 or 50 J/cm(2) on cutaneous wounds in the dorsum of the Wistar rat. BACKGROUND DATA: The healing time of surgical wounds is of extreme importance and it is usually associated with a post-operative period free of infection and with less pain and inflammation. MATERIALS AND METHODS: Sixty Wistar rats were divided into seven groups: Group I - control (non-irradiated); Group II - lambda 685 nm, 20 J/cm(2); Group III - lambda 830 nm, 20 J/cm(2); Group IV - lambda 685 nm and lambda 830 nm, 20 J/cm(2); Group V - lambda 685 nm, 50 J/cm(2)); Group VI - lambda 830 nm, 50 J/cm(2); and Group VII - lambda 685 nm and 830 nm, 50 J/cm(2). The animals were sacrificed 3, 5, and 7 days after surgery. RESULTS: Light microscopic analysis using H&E and PicrosÃ-rius stains showed that, at the end of the experimental period, irradiated subjects showed increased collagen production and organization when compared to non-irradiated controls. Inflammation was still present in all groups at this time. CONCLUSION: Group IV (lambda 830 nm and lambda 685 nm, 20 J/cm(2)) presented better results at the end of the experimental period. It is concluded that low-level light therapy (LLLT) can have a positive biomodulatory effect on the repair of cutaneous wounds. Animals;Low-Level Light Therapy;Male;Radiation Dosage;Rats;Rats, Wistar;Skin;Wound Healing

The comparison of effects between pulsed and CW lasers on wound healing. OBJECTIVE: In order to evaluate the effects of pulsed continuous wave (CW) laser and detect the role of wound healing in rats using both pulsed and CW 635-nm low-level laser therapy (LLLT), a pilot study was undertaken. BACKGROUND DATA: Some acceleration effects of wound healing on animals were found after treatment using various lasers with CW. There are other reports, however, using pulsed CW laser to evaluate the effects of wound healing in rats. MATERIALS AND METHODS: An elliptic wound was created aseptically with a scalpel on the shaved back of the rats after anesthesia. The rats treated were restrained in a Plexiglas cage without anesthesia during the laser irradiation period. An Erchonia pulse laser (635 nm) was used in the experiment. The laser beam was delivered through an expander. The percentage of relative wound healing was calculated. RESULTS: The percentage of relative wound healing was 4.32 in 100 Hz, 3.21 in 200 Hz, 3.83 in 300 Hz, 2.22 in 400 Hz, 1.73 in 500 Hz and 4.81 in CW. CONCLUSION: LLLT using pulsed, CW laser at the appropriate dosimetry and frequency can provide acceleration in wound healing in rats. The 100-Hz frequency had a better effect than other pulse frequencies used in the study. The effects of treatment using CW laser was higher than pulse frequency. The frequency of pulsed CW laser was not found to increase wound healing in rats compared with normal CW laser, as reported in our previous studies. Animals;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Skin;Wound Healing

Efficacy of combined photodynamic and hyperthermic therapy with a new light source in an in vivo osteosarcoma tumor model. OBJECTIVE: In this study, we investigated the efficacy of Super Lizer (SL) as a new light source in photodynamic therapy (PDT) with hyperthermia in an in vivo osteosarcoma tumor model. MATERIALS AND METHODS: Nude mice in three study groups (PDT only, PDT with hyperthermia in low energy, and PDT with hyperthermia in high energy) and three control groups (no treatment, photosensitizer only, and hyperthermia only) were implanted subcutaneously with human osteosarcoma cells and injected with a photosensitizing hematoporphyrin derivative (HPD) at a total dose of 10 mg/kg, in all study groups and in control group 2. At 72 h after light treatment, mice were sacrificed. RESULTS: The tumor volume growth rates in the heat-only (1.50) and

PDT-only (1.40) groups were significantly lower than the growth rate in the no-treatment group (1.82). Further, the tumor volume growth rate in the PDT with hyperthermia in high-energy group (1.19) was significantly lower than in the heat- or PDT-only groups. CONCLUSION: Although non-laser PDT, including SL-PDT, may be beneficial only in the treatment of superficial tumors because of limited light penetration, PDT combined with hyperthermia may extend the utility of PDT in antitumor treatment. The use of SL as a new light source in PDT may significantly advance antitumor therapy due to its simplicity, ease, and cost benefit. Photosensitizing Agents;Hematoporphyrin Derivative Animals;Bone Neoplasms;Combined Modality Therapy;Female;Hematoporphyrin Derivative;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Mice, Nude;Neoplasm Transplantation;Osteosarcoma;Photochemotherapy;Photosensitizing Agents

[Combined therapy of interstitial cystitis using the "Aeltis-Synchro-02-Iarilo" device]. Multiple modality therapy of interstitial cystitis (IC)--the disease characterized by nicturia, pelvic pains, imperative pollakiuria--is considered. As IC nature is not well known, its treatment remains empiric. Among the underlying causes, most probable are autoimmune, allergic, infectious, neurological, vascular. Therefore, the treatment should be multi-modality. Most usable now is combined chemotherapy. Perspective is also IC treatment with medicines in combination with physiotherapy (electromagnetolaser AELTIS-SYNCHRO-02-YARILO"). Endovesical electrophoresis can be also applied. Anesthetics, Local;Anti-Bacterial Agents;Anti-Inflammatory Agents;Histamine H1 Antagonists Adult;Anesthetics, Local;Anti-Bacterial Agents;Anti-Inflammatory Agents;Combined Modality Therapy;Cystitis, Interstitial;Electrodes;Equipment Design;Female;Histamine H1 Antagonists;Humans;Iontophoresis;Low-Level Light Therapy;Middle Aged;Treatment Outcome;Urodynamics

Effect of low-level laser therapy on abdominal adipocytes before lipoplasty procedures. Low-level laser therapy is a new subspecialty for the medical application of lasers that provides therapeutic rather than surgical outcomes for many medical indications. Recently, low-level laser therapy was reported to "liquefy" or release stored fat in adipocytes by the opening of specialized yet not identified cell membrane-associated pores after a brief treatment. Currently, low-level laser therapy is a U.S. Food and Drug Administration-approved technology for improving pain alleviation. To explore these data further, a series of in vitro studies on human preadipocytes and institutional animal care and use committee-approved protocols in a porcine Yucatan model and an institutional review board-approved clinical study were performed. Using a 635-nm low-level laser of 1.0 J/cm supplied to the authors by the vendor, these studies were designed to determine whether alteration in adipocyte structure or function was modulated after low-level laser therapy. Cultured human preadipocytes after 60 minutes of laser therapy did not change appearance compared with nonirradiated control cells. In the porcine model, low-level laser therapy (30 minutes) was compared with traditional lipoplasty (suction-assisted lipoplasty) and ultrasound-assisted lipoplasty. From histologic and scanning electron microscopic evaluations of the lipoaspirates, no differences were observed between low-level laser therapy-derived and suction-assisted lipoplasty-derived specimens. Using exposure times of 0, 15, 30, and 60 minutes in the presence or absence of superwet wetting solution and in the absence of lipoplasty, total energy values of 0.9 mW were delivered to tissue samples at three increasing depths from each experimental site. No histologic tissue changes or specifically in adipocyte structure were observed at any depth with the longest low-level laser therapy (60 minutes with superwet fluid). Three subjects undergoing large-volume lipoplasty were exposed to superwet wetting fluid infiltration 14 minutes before and 12 minutes after, according to vendor instructions. Tissue samples from infiltrated areas were collected before suction-assisted lipoplasty and lipoaspirates from suction-assisted lipoplasty. No consistent observations of adipocyte disruptions were observed in the histologic or scanning electron microscopy photographs. These data

do not support the belief that low-level laser therapy treatment before lipoplasty procedures disrupts tissue adipocyte structure. Abdomen;Adipocytes;Animals;Cells, Cultured;Female;Humans;Lipectomy;Low-Level Light Therapy;Microscopy, Electron, Scanning;Swine

The medical and surgical therapy of pseudofolliculitis barbae. Pseudofolliculitis barbae (PFB) is a common, chronic, inflammatory skin disorder seen mainly in individuals with curly hair. This condition is seen most frequently in black men who shave their beards but may also be seen in women of all races who wax or shave the axillary and pubic skin. The etiology of PFB is multifactorial, and heretofore a cure has been considered impossible for those desiring a clean-shaven face. The following article serves to discuss the current medical and surgical therapies available for this condition. Medical treatments for this condition include various combinations of topical antibiotics, corticosteroids, and retinoids. In the surgical arena, laser therapy has revolutionized the treatment of PFB and has enabled cure for the first time for those plagued by this disorder and for whom a beardless face is acceptable. Adrenal Cortex Hormones;Anti-Bacterial Agents;Keratolytic Agents;Retinoids Administration, Cutaneous;Adrenal Cortex Hormones;Anti-Bacterial Agents;Black People;Drug Therapy, Combination;Folliculitis;Hair Removal;Humans;Keratolytic Agents;Low-Level Light Therapy;Retinoids

[Efficacy of noninvasive hemolaserotherapy in patients with bronchial asthma and concomitant rhinosinusitis]. AIM: To study efficacy of low-intensive infrared laser radiation impact on the tympanic membrane in patients with bronchial asthma (BA) and concomitant rhinosinusitis (RS). MATERIAL AND METHODS: 78 patients with moderate BA of a mixed type and concomitant chronic RS were divided into 3 groups: group 1 patients received medication plus infrared laser radiation of the tympanic membrane and paranasal sinuses; group 2 patients were exposed to supravenous laser radiation (0.63 mcm); group 3 received pharmacotherapy alone. The effect of the treatment was assessed by spirometry, peakflowmetry and paranasal sinuses findings. RESULTS: The highest response was achieved in group 1 which manifested with positive changes in clinical, device and spirometric data on BA and x-ray data on RS courses. The least effective treatment was observed in group 3. CONCLUSION: Use of infrared laser radiation of the tympanic membrane and paranasal sinuses projection in the treatment of BA patients with RS is effective, nontoxic and easy to use both in hospitals and outpatient departments. Anti-Asthmatic Agents Adolescent;Adult;Anti-Asthmatic Agents;Asthma;Blood;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Rhinitis;Sinusitis;Treatment Outcome;Tympanic Membrane

The influence of low-level laser therapy on biomodulation of collagen and elastic fibers. The study of low-level laser therapy upon extracellular matrix elements is important to understand the wound healing process under this agent. However, little is known about the interference of laser light in relation to collagen and elastic fibers. Cutaneous wounds were performed on the back of 72 Wistar rats and a Ga-Al-As low-level laser was punctually applied with different energy densities. The animals were killed after 24, 48, 72 hours and 5, 7 and 14 days. Tissues were stained with hematoxilin-eosin, sirius red fast green and orcein and then analyzed. It was observed that the treated group exhibited larger reduction of edema and inflammatory infiltrate. The treated animals presented a larger expression of collagen and elastic fibers, although without statistical significance ($p > 0.05$). Treatment with a dosage of 4 J/cm(2) exhibited more expressive results than that with 8 J/cm(2). In this study, the authors concluded that low-level laser therapy contributed to a larger expression of collagen and elastic fibers during the early phases of the wound healing process. Collagen Analysis of Variance;Animals;Collagen;Disease Models, Animal;Dose-Response Relationship, Radiation;Elastic Tissue;Extracellular Matrix;Female;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Statistics, Nonparametric;Wound Healing

Low-dose excimer 308-nm laser for the treatment of oral lichen planus. BACKGROUND: Lichen planus is a difficult-to-treat chronic inflammatory disorder that affects mucous membranes, causing inanition, halitosis, and dyspareunia. OBJECTIVE: To evaluate the novel use of low-dose 308-nm excimer laser radiation for the treatment of symptomatic oral lichen planus (OLP). DESIGN: A single-center, before-after trial. SETTING: Academic clinical research center. PATIENTS: Nine patients with symptomatic, biopsy-proven OLP, unresponsive to conventional therapies, were recruited from the dermatology clinics of the Massachusetts General Hospital in Boston. Eight participants completed the entire study, and 1, despite early improvement, did not complete the study because of hospitalization for an unrelated reason. Intervention With a narrow, fiberoptic handpiece to target precisely only diseased sites, 308-nm excimer laser radiation was delivered at an initial dose of 100 mJ/cm(2) once a week. MAIN OUTCOME MEASURE: A visual analog scale was used to grade subjective disease severity. Clinical improvement was graded in quartiles as follows: poor (<25%), fair (25%-50%), good (51%-75%), and excellent (>75%). Follow-up visits occurred for up to 18 months. A paired t test was performed to evaluate efficacy of treatment. RESULTS: Treatments were painless and well tolerated. Five patients demonstrated overall excellent clinical and subjective improvement after 7 treatments. Two participants with nonerosive OLP were deemed fair responders. The only poor responder in the study also had chronic active hepatitis C infection. Overall improvement was statistically significant (P<.05), and for the responders, remission times ranged from 2 to 17 months. Conclusion Low-dose treatment with the excimer 308-nm laser can be very effective in treating symptomatic and especially erosive OLP, an otherwise notoriously difficult-to-control disease. Adult;Aged;Aged, 80 and over;Female;Follow-Up Studies;Humans;Laser Therapy;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Probability;Risk Assessment;Sampling Studies;Sensitivity and Specificity;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome

Phototherapy of psoriasis: review and update. Along with topical and systemic therapy, phototherapy is one of the three fundamental treatment options for managing psoriasis. The use of UVB continues to be one of the most important therapeutic interventions for mild to moderate psoriasis. An advance in UVB phototherapy has been the introduction of narrowband UVB lamps (311 nm). UVB lamps are superior to conventional broadband UVB in clearing psoriasis. PUVA is very effective therapy and is still the most effective form of phototherapy for severe, extensive form od the disease. There has been a trend towards whole-body PUVA-bath. Advantages of PUVA bath are lack of gastrointestinal side effects and no need for post-treatment eye photoprotection because there is no systemic photosensitization. UVB and PUVA can be administered in combination with a variety of topical and systemic treatments to achieve more effective results more quickly. The most recent form of phototherapy, 308-nm excimer laser, holds promise for becoming a useful tool in the treatment of stable, localized psoriasis. Humans;Low-Level Light Therapy;Photochemotherapy;Phototherapy;Psoriasis;Ultraviolet Therapy

Quantitative and qualitative changes of the seminiferous epithelium induced by Ga. Al. As. (830 nm) laser radiation. BACKGROUND AND OBJECTIVES: Low level laser radiation stimulates both nucleic acid synthesis and cellular proliferation in E. coli, Hela tumor cells, fibroblasts, lymphocytes, and thyroid cells. It has been introduced as a therapeutic modality; nevertheless few studies have been carried out to determine the effects of laser radiation on the testes or spermatogenesis. The aim of this study was to determine the quantitative and qualitative changes of the seminiferous epithelium after Ga. Al. As. (830 nm) laser radiation. STUDY DESIGN/MATERIALS AND METHODS: The left testes of Sprague-Dawley rats were daily exposed to laser light for 15 days; so the cumulative doses used 28.05 and 46.80 J/cm(2) in two experimental groups. Sampling carried out 24 hours after the last treatment and samples were processed for LM and TEM study. RESULTS: The number of germ cells

specially the pachytene spermatocytes and elongated spermatids increased after 28.05 J/cm(2) laser radiation. Ultrastructural features of germ and Sertoli cells in this group were similar to that of control; while laser irradiation at 46.80 J/cm(2) had a destructive effect on the seminiferous epithelium such as dissociation of immature spermatids and evident ultrastructural changes in them. CONCLUSIONS: The findings confirmed the existence of a biostimulatory threshold of applied laser energy and the importance of determining it for clinical applications. Moreover, it was revealed that low doses of laser light have a biostimulatory effect on the spermatogenesis and may provide benefits to the patients with oligospermia and azoospermia. Animals;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Sprague-Dawley;Seminiferous Epithelium;Spermatogenesis

A new mathematical approach to the diffusion approximation theory for selective photothermolysis modeling and its implication in laser treatment of port-wine stains. BACKGROUND AND OBJECTIVES: Monte Carlo (MC) simulations of light-tissue interactions and analytical solutions for the diffusion approximation theory have been used to determine the optimal laser wavelength and radiant exposure to treat port-wine stains (PWS). Both approaches suggest that optimal parameters are a wavelength of 585 or 595-nm with pulse times of 0.45-20 milliseconds. However, which parameters are optimal is still unclear. As differences in vessel size and in temperature distribution within vessels appeared to be the main reasons for the varied responses to the same laser treatments, we sought to develop a solution to the diffusion approximation in order to calculate temperature distribution and the resulting coagulation pattern within specific blood vessels. STUDY DESIGN/MATERIALS AND METHODS: The light and heat diffusion equations were simultaneously solved with the finite element method (FEM). The latent heat of evaporation was included in the thermal analysis. The temperature and coagulation patterns across specific blood vessels, within a heterogeneous medium, were calculated for laser wavelengths of 585 and 595-nm with clinical parameters. RESULTS: At 1.2 mm deep, the calculations predicted that vessels ranging from 50 to 100 microm in diameter would be coagulated from top to bottom, small vessels (10 microm) would be spared, and vessels larger than 150 microm would be partially coagulated. Coagulation across vessels was more uniform for the 595-nm than for the 585-nm wavelength. Maximal temperatures did not exceed 100 degrees C because of the inclusion of latent heat in the thermal calculations. CONCLUSIONS: To study laser treatments of PWS with the diffusion approximation, FEM is an effective method to calculate the coagulation patterns within specific blood vessels. To improve coagulation efficacy at 585 and 595-nm wavelengths, the radiant exposure should be increased without increasing the irradiance. Body Temperature;Humans;Laser Coagulation;Low-Level Light Therapy;Models, Theoretical;Monte Carlo Method;Port-Wine Stain

Effect of low-power He-Ne laser irradiation on rabbit articular chondrocytes in vitro. BACKGROUND AND OBJECTIVES: In the orthopaedic field, the repair of articular cartilage is still a difficult problem, because of the physiological characters of cartilaginous tissues and chondrocytes. To find an effective method of stimulating their regeneration, this in vitro study focuses on the biostimulation of rabbit articular chondrocytes by low-power He-Ne laser. STUDY DESIGN/MATERIALS AND METHODS: The articular chondrocytes isolated from the cartilage of the medial condyle of the femur of the rabbit were incubated in DMEM/HamF(12) medium. The second passage culture were spread on 24 petri dishes and were irradiated with laser at power output of 2-12 mW for 6.5 minutes, corresponding to the energy density of 1-6 J/cm(2). Laser treatment was performed three times at a 24-hour interval. After lasering, incubation was continued for 24 hours. Non-irradiated cells were kept under the same conditions as the irradiated ones. The cell proliferation activity was evaluated with a XTT colorimetric method and the cell secretion activity was analyzed by metachromasia and immunocytochemistry. RESULTS: Irradiation of 4-6 J/cm(2) increased the cell numbers and revealed a considerably higher cell proliferation activity comparing to control cultures. Thereinto, the energy

density of 4 and 5 J/cm(2) remarkably increased cell growth, with positive effect on synthesis and secretion of extracellular matrix. CONCLUSIONS: The present study showed that a particular laser irradiation stimulates articular chondrocytes proliferation and secretion. These findings might be clinically relevant, indicating that low-power laser irradiation treatment is likely to achieve the repair of articular cartilage in clinic. Animals;Cartilage, Articular;Cell Culture Techniques;Chondrocytes;Low-Level Light Therapy;Male;Rabbits;Regeneration

High-tech helps to estimate cellular mechanisms of low power laser therapy. Humans;Low-Level Light Therapy;Microscopy, Confocal;Molecular Probe Techniques

[Laser biostimulation in the treatment of pleurisy]. INTRODUCTION: Low-intensity lasers have been utilized in medicine in two ways: for local stimulation and for stimulation of acupuncture points. Literature data reveal that this method has been indiscriminately applied in psychiatry, rheumatology, gynecology, dermatology, otorhinolaryngology, in diverse acute and chronic pains, inflammations, vascular disorders, angina pectoris, bronchial asthma. Most commonly reported clinical effects are analgesia, spasmolytic and anti-inflammatory effects, as well as faster wound and bone healing. MATERIAL AND METHODS: This prospective study analyses effects of laser biostimulation on patients with pleurisy. The analysis included 25 patients treated at the Institute of Lung Diseases in Sremska Kamenica during 2000, 2001 and 2002. Apart from conservative treatment, these patients were treated with laser biostimulation of acupuncture points and local region for ten days. During treatment, changes of present clinical signs, general symptoms, radiological findings, as well as changes of some relevant biochemical parameters were recorded. RESULTS: Results were compared with the control group which included the same number of patients, who differed from the examined group only by not being exposed to laser biostimulation. The examined group of patients with pleuritis presented with quicker resorption of pleural effusion, less pleural adhesions, more significant decrease of clinical symptoms, especially pain, as well as more significant increase of cortisol and immunoglobulin A and decrease of circulating immune complexes (CIC), leukocytes and sedimentation rate than the control group. DISCUSSION: Mechanisms of laser biostimulation in treatment of pleurisy were described in detail and the obtained results were correlated to those reported by other authors. CONCLUSION: 1. Patients with pleurisy undergoing laser stimulation presented with faster resorption of effusion and remission of the subjective symptoms, as well as significant decrease of biochemical acute inflammation parameters in the peripheral blood and therefore with faster recovery. 2. In patients with pleurisy laser treatment increases regenerative mechanisms of the pleural surface, thus decreasing the quantity of formed adhesions and resulting in better mobility of the diaphragm. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pleurisy;Radiography

Low level laser therapy for treatment of primary and secondary Raynaud's phenomenon. BACKGROUND: We recently performed a pilot study which suggested that clinical and thermographic improvements occurred in patients with primary and secondary Raynaud's phenomenon (RP) following treatment with low level laser irradiation (LLLI). In view of these findings, we have proceeded with a double blind, placebo-controlled study. METHODS: Forty seven patients suffering from primary or secondary RP were randomly assigned in a double-blind manner to receive either 10 sessions of distant LLLI (16 f, 8 m, median age 45 years) or placebo irradiation (21 f, 2 m, median age 46 years) during winter months. The attack frequency of RP was measured by a diary count; its severity was assessed by means of visual analogue scale. Response to cold challenge test before and after LLL or placebo treatment was assessed by infrared thermography. RESULT: Overall a significant reduction of the frequency as well as the severity of RP in patients with either LLLI (frequency $p < 0.0001$, severity $p < 0.0001$) or placebo treatment (frequency $p < 0.0001$, severity $p = 0.02$) was found, but patients in the LLLI group exhibited a statistically more significant improvement of the

frequency at 6 weeks p = 0.007 and 3 months p = 0.02 and the severity p = 0.02, p = 0.04 of RP. Thermographic response to cold challenge improved only in patients treated with LLL but not in those treated with placebo. CONCLUSION: LLLI significantly lowers the frequency and severity of Raynaud's attacks in patients with primary and secondary RP. Since this therapeutic modality is a safe, and non-invasive treatment, it might be considered as an alternative to existing therapeutic regimes. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Mathematical Computing;Middle Aged;Outcome Assessment, Health Care;Pilot Projects;Prospective Studies;Raynaud Disease;Thermography

Effect of low level laser therapy on the repair of bone defects grafted with inorganic bovine bone. The aim of this study was to assess histologically the effect of LLLT (lambda 830 nm) on the repair of standardized bone defects on the femur of Wistar albinus rats which were grafted with inorganic bovine bone Gen-ox(R). Three randomized groups were studied: group I (control, n=6); group II (Gen-ox, n=9) and group III (Gen-ox + LLLT, n=9). The animals were irradiated every 48 h during 15 days; the first irradiation was performed immediately after the procedure. The animals were irradiated transcutaneuosly at four points around the defect. At each point a dose of 4 J/cm(2) was given (Ã˜ approximately 0.6 mm, 40 mW) and the total dose per session was 16 J/cm(2). The animals were killed by an overdose of general anesthetic 15, 21 and 30 days after surgery. The specimens were routinely processed by embedding in paraffin, serially cut and stained with H&E and Picrosirius and analyzed under light microscopy. The results showed evidence of a more advanced repair in the irradiated group when compared to the non-irradiated groups. The repair of the irradiated group was characterized by both increased bone formation and amount of collagen fibers around the graft within the cavity from the 15th day after surgery, also considering the osteoconductive capacity of the Gen-ox. We conclude that LLLT had a positive effect on the repair of bone defects implanted with inorganic bovine bone. Collagen Animals;Bone Diseases;Bone Marrow;Bone Regeneration;Bone Transplantation;Cattle;Collagen;Female;Femur;Low-Level Light Therapy;Male;Osteogenesis;Random Allocation;Rats;Rats, Wistar;Time Factors;Transplantation, Heterologous

Role of laser therapy in dermatology -- clinical aspects. BACKGROUND: Laser therapy has become an integral part of therapeutic alternatives in dermatology. Nevertheless, there are only few statistical data on the role of lasers in everyday practice of dermatological clinics. OBJECTIVE: Analysis of laser patients, indications and lasers used. METHODS: We analysed 10244 patients treated with laser therapy in the Department of Dermatology at the University of Regensburg from 1992 to 2000. This figure represents 9.6 % of all patients seen during that period. RESULTS: Vascular lesions (hemangiomas, port-wine stains, telangiectasias) represented the most common indication (more than 70%) followed by infectious disorders (mostly papillomavirus lesions) as well as the removal of hairs and tattoos. Accordingly, the most frequently used laser was the flashlamp-pumped pulsed dye laser (585 nm) followed by the argon ion, the long-pulse tunable flashlamp-pumped pulsed dye laser, the Q-switch ruby laser, and the CO(2)-laser. In recent years, the percentage of indications and lasers used has changed significantly, reflecting the development of new lasers and the introduction of new indications. CONCLUSIONS: The results confirm the important role of laser therapy in dermatology. Adolescent;Adult;Age Factors;Child;Child, Preschool;Dermatology;Female;Humans;Infant;Laser Therapy;Lasers;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Prognosis;Retrospective Studies;Risk Assessment;Sex Factors;Skin Diseases;Skin Diseases, Vascular;Skin Neoplasms;Treatment Outcome

[Biochemical and immunological induces of the blood in Parkinson's disease and their correction with the help of laser therapy]. The influence of laser therapy on the course of Parkinson's disease (PD) was studied in 70 patients. This influence appeared adaptogenic both in the group with elevated

and low MAO B and Cu/Zn SOD activity. Laser therapy resulted in reduction of neurological deficit, normalization of the activity of MAO B, Cu/Zn-SOD and immune indices. There was a correlation between humoral immunity and activity of the antioxidant enzymes (SOD, catalase). This justifies pathogenetically the use of laser therapy in PD. Antigen-Antibody Complex;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Catalase;Superoxide Dismutase;Monoamine Oxidase Aged;Antigen-Antibody Complex;Catalase;Female;Humans;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Low-Level Light Therapy;Male;Middle Aged;Molecular Weight;Monoamine Oxidase;Parkinson Disease;Predictive Value of Tests;Reference Values;Superoxide Dismutase

[Characteristics of the rehabilitation in patients with facial trauma of middle and upper regions and lesions in the locomotor and muscular apparatus of the eye and orbit]. Eye Injuries;Eye Movements;Facial Injuries;Facial Muscles;Humans;Low-Level Light Therapy;Orbital Fractures

American Society for Laser Medicine and Surgery 24th Annual Meeting. Dallas, Texas, USA. March 31-April 4, 2004. Abstracts. Animals;Humans;Laser Therapy;Low-Level Light Therapy

Low-intensity laser therapy for painful symptoms of diabetic sensorimotor polyneuropathy: a controlled trial. OBJECTIVE: Low-intensity laser therapy (LILT) has been advocated for treatment of chronic pain disorders. Although the mechanism of pain relief is uncertain, this therapy has been suggested for relief of painful symptoms of diabetic sensorimotor polyneuropathy (DSP). The objective of this study was to determine whether LILT relieves the pain of DSP. RESEARCH DESIGN AND METHODS: We conducted a randomized, double-masked, sham therapy-controlled clinical trial in 50 patients with painful DSP diagnosed with the Toronto Clinical Neuropathy Score. All patients received sham therapy over a 2-week baseline period and were then randomized to receive biweekly sessions of either sham or LILT for 4 weeks. The primary efficacy parameter was the difference in the weekly mean pain scores on a visual analog scale (VAS). RESULTS: The patients had similar baseline characteristics for pain intensity, HbA(1c), and duration of DSP. Both groups noted a decrease in weekly mean pain scores during sham treatment. After the 4-week intervention, the LILT group had an additional reduction in weekly mean pain scores of -1.0 +/- 0.4 compared with -0.0 +/- 0.4 for the sham group (P = 0.07). LILT had no effect on the Toronto Clinical Neuropathy Score, nerve conduction studies, sympathetic skin response, or quantitative sensory testing. CONCLUSIONS: Although an encouraging trend was observed with LILT, the study results do not provide sufficient evidence to recommend this treatment for painful symptoms of DSP. Adult;Diabetic Neuropathies;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain;Pain Measurement;Palliative Care;Treatment Outcome

Mitochondrial membrane potential after low-power laser irradiation. We used the lipophilic cationic fluorescent dye 5,5',6,6'-tetrachloro-1,1',3,3'-tetraethyl-benzimidazol-carbocyanine iodide (JC-1) to determine mitochondrial membrane potential (mdeltapsi) in Hep-2 cells after irradiation with low-power laser (lambda=635 nm). Through this methodology it was possible to analyze the variation on mitochondrial number and mdeltapsi, in cells irradiated for 100, 150 and 200 s with energy density of 100 mJ/cm(2). Our results show that JC-1 dye allows the identification of populations with different mitochondria morphology as well as the functionality of this organelle in the cells incubated for 1, 6 and 24 h, after irradiation with low-power laser. Benzimidazoles;Carbocyanines;Fluorescent Dyes;5,5',6,6'-tetrachloro-1,1',3,3'-tetraethylbenzimidazolocarbocyanine Benzimidazoles;Carbocyanines;Fluorescent Dyes;Humans;Low-Level Light Therapy;Membrane Potentials;Membranes;Mitochondria

Differences between cytotoxicity in photodynamic therapy using a pulsed laser and a continuous wave laser: study of oxygen consumption and photobleaching. Oxygen consumption at the targeted site has a significant effect on dosimetry in photodynamic therapy (PDT). However, oxygen

consumption in PDT using a pulsed laser as a light source has not been clarified. We therefore investigated the dependence of cytotoxicity on the oxygen consumption and the photosensitizer photobleaching of PDT using a pulsed laser by comparing with that using a continuous wave (CW) laser. Mouse renal carcinoma cells (Renca) were incubated with a second-generation photosensitizer, PAD-S31. The cells were then irradiated with either a 670-nm nanosecond pulsed light from the 3rd harmonics of a Nd:YAG laser-pumped optical parametric oscillator with a peak fluence rate of approximately 1 MW/cm(2) at 30 Hz or a 670-nm CW diode laser with a total light dose of 40 J/cm(2). Regardless of laser source, cytotoxic effects exhibited cumulative dose responses to the photosensitizer ranging from 12 to 96 microg/ml. However, cytotoxic effect of PDT using the pulsed light was significantly less than that using the CW light with the photosensitizer concentrations of 24 and 48 microg/ml under identical fluence rates. During PDT, the cells exposed to the pulsed light consumed oxygen more slowly, resulting in a lower amount of oxygen consumption when compared with PDT using CW light. In accordance with oxygen consumption, the pulsed light induced significantly less photobleaching of the photosensitizer than the CW light did. These results indicate that the efficiency of PDT using pulsed light is less when compared with CW light, probably being related to suppressed oxygen consumption during the pulsed light irradiation. Photosensitizing Agents;Porphyrins Animals;Cell Death;Cell Line, Tumor;Cell Survival;Low-Level Light Therapy;Mice;Oxygen Consumption;Photobleaching;Photochemotherapy;Photosensitizing Agents;Porphyrins

[Histological investigation of the micromorphological effects of the application of a laser needle--results of an animal experiment]. In an experimental animal study (Sus scrofa domesticus) we investigated the effects of the new technique of laser needle stimulation (wavelength: 685 nm; energy density: 4.6 kJ/cm2 per point; application duration: 20 min). The results revealed changes in microcirculatory parameters of the skin resulting in an increase in blood flow. However, the quality and intensity of the laser light did not induce micromorphological alterations in the skin. Acupuncture Therapy;Animals;Laser-Doppler Flowmetry;Low-Level Light Therapy;Microcirculation;Needles;Skin;Skin Temperature

Hair loss remedies--separating fact from fiction. Hair loss is a common complaint in the outpatient setting. Frequently, patients conduct their own research on hair loss diagnosis and treatment and are faced with a number of manufacturers' claims that their products will benefit hair loss. This paper explores the truth behind those claims of hair regrowth. We intend for this information to serve as a "consumer report" for healthcare providers and patients and to help separate some of the valid claims for hair regrowth from those that are purely fiction. Azasteroids;Enzyme Inhibitors;Mineralocorticoid Receptor Antagonists;Vasodilator Agents;Spironolactone;Finasteride;Minoxidil;Dutasteride Alopecia;Azasteroids;Dietary Supplements;Dutasteride;Enzyme Inhibitors;Female;Finasteride;Humans;Low-Level Light Therapy;Male;Mineralocorticoid Receptor Antagonists;Minoxidil;Spironolactone;Treatment Outcome;Vasodilator Agents

[Repigmentation of persistent laser-induced hypopigmentation after tattoo ablation with the excimer laser]. Hypopigmented skin developed following tattoo removal with the Q-switched Nd:YAG laser. The hypopigmented area remained unchanged for over 4 years, until the use of the 308-nm xenon-chloride excimer laser induced a significant repigmentation in 40 sessions over 14 months. The excimer laser has the potential to influence the reduced activity of the melanocytes, as demonstrated with electron microscopy. Adult;Humans;Hypopigmentation;Laser Therapy;Lasers;Low-Level Light Therapy;Male;Tattooing;Treatment Outcome

CO2-laser treatment of ulcerative lesions. This article reports the successful use in our clinic of CO(2)-laser to reduce severe pain in the treatment of oral aphthosis. The patients, presenting stress-

related, chemoradiotherapy-induced, and immuno-related oral aphthosis, reported immediate pain relief and rapid recovery. Treatment technique and laser parameters are described. Carbon Dioxide Aged;Carbon Dioxide;Female;Humans;Labial Frenum;Lip Diseases;Low-Level Light Therapy;Male;Middle Aged;Oral Ulcer;Stomatitis, Aphthous;Tongue Diseases;Wound Healing

Comparison of single and multiple applications of GaAlAs laser on rat medial collateral ligament repair. BACKGROUND AND OBJECTIVES: To examine single versus multiple applications of the gallium aluminum arsenide (GaAlAs) laser on the healing of surgically injured medial collateral ligaments (MCLs) in rats. STUDY DESIGN/MATERIALS AND METHODS: Sixteen rats were studied, with 12 receiving surgical transection to their right MCL and 4 receiving a sham injury. Group 1 (n = 4) received a single dose of GaAlAs laser therapy (wavelength 660 nm, average power 8.8 mW, pulse 10 kHz, dosage 31.6 J/cm(2)) directly to their MCL during surgery. Group 2 (n = 4) received 9 doses of GaAlAs laser therapy applied transcutaneously on alternate days (wavelength 660 nm, average power 8.8 mW, pulse 10 kHz, dosage 3.5 J/cm(2)). The controls (Group 3, n = 4) received one session of placebo laser at the time of surgery, with the laser equipment shut down, while the sham injured Group 4 (n = 4) received no treatment. Biomechanical tests for structural stiffness, ultimate tensile strength (UTS), and load-relaxation were done at 3 weeks after injury. The stiffness and UTS data were normalized by expressing as a percentage of the left side of each animal before statistical analysis. RESULTS: The load-relaxation data did not show any differences between the groups (P = 0.18). The normalized stiffness levels of Groups 2 (81.08+/-11.28%) and 4 (92.66+/-13.19%) were significantly higher (P = 0.025) than that of the control Group 3 (58.99+/-15.91%). The normalized UTS of Groups 2 (81.38+/-5.68%) and 4 (90.18+/-8.82%) were also significantly higher (P = 0.012) than that of the control (64.49+/-9.26%). Although, Group 1 had higher mean stiffness and UTS values than the control, no statistically significant difference was found between these two groups. CONCLUSIONS: Multiple laser therapy improves the normalized strength and stiffness of repairing rat MCLs at 3 weeks after injury. The multiple treatments seem to be superior to a single treatment when the cumulative dosages are comparable between the two modes of application. Animals;Biomechanical Phenomena;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Rats;Rats, Sprague-Dawley;Time Factors;Wound Healing

Effect of low power 655 nm diode laser irradiation on the neuromuscular junctions of the mouse diaphragm. BACKGROUND AND OBJECTIVES: Low level laser therapy (LLLT) in specific wavelengths and fluence maintains the electrophysiological activity of injured peripheral nerve in rats, preventing scar formation (at injury site) as well as degenerative changes in the corresponding motor neurons of the spinal cord, thus accelerating regeneration of the injured nerve. We studied the effect of LLLT on the neurotransmitter release in neuromuscular junctions of the mouse diaphragm. STUDY DESIGN/MATERIALS AND METHODS: Thirty-nine diaphragm muscles were studied. LLLT with GaAlAs 655 nm (1-12 J/cm(2)) was used. Neurotransmitter release was studied by conventional intracellular recording techniques on curarised or high magnesium media. Quantal content, amplitude, latency and rise time were analysed for end-plate potentials (EPPs). Frequency and amplitude were evaluated for the miniature end-plate potentials (MEPPs). Short-term plasticity of the neurotransmitter release (fast facilitation) was also evaluated by paired pulse stimulation. RESULTS AND CONCLUSIONS: This study showed that LLLT (655 nm) in these doses has no detectable physiological effect on the motor end-plate neurotransmitter release in mice. Neurotransmitter Agents Animals;Diaphragm;Electrophysiology;Low-Level Light Therapy;Male;Mice;Motor Endplate;Neuromuscular Junction;Neurotransmitter Agents

Flashlamp pulsed dye laser (FPDL) did not cure papulopustular rosacea. BACKGROUND AND OBJECTIVES: Pharmacological treatment has a fairly good effect on the papulopustular lesions in rosacea, but not as good an effect on the erythema and telangiectases. The aim was to treat rosacea

patients with both erythematotelangiectatic and papulopustular lesions with flashlamp pulsed dye laser (FPDL) until telangiectases/erythema disappeared, and to evaluate whether the treatment might also be effective on papulopustular lesions. STUDY DESIGN/MATERIALS AND METHODS: Ten patients were treated on one side of the face with FPDL. The final examination was blinded and performed on the average 10 months after the last treatment. RESULTS: Two of the patients had more lesions after treatment, three were unchanged, three had only slightly less, and two had markedly less papulopustular lesions. CONCLUSION: Our conclusion from this small sample of patients is that FPDL probably has limited value on papulopustular lesions in rosacea. This indicates that the origin of rosacea may not be only vascular. Female;Humans;Low-Level Light Therapy;Middle Aged;Rosacea;Treatment Failure

Effect of low-power laser irradiation on protein synthesis and ultrastructure of human gingival fibroblasts. BACKGROUND AND OBJECTIVES: Low-power lasers improve wound healing. Cell proliferation and protein secretion are important steps of this process. The aim of this study was to analyze both protein synthesis and ultrastructural morphology of human gingival fibroblasts irradiated by a low-power laser. STUDY DESIGN/MATERIALS AND METHODS: The cell line FMM1 was grown in nutritional deficit. Laser irradiation was carried out with a gallium-aluminum-arsenate (Ga-Al-As) diode laser (904 nm, 120 mW, energy density of 3 J/cm(2)). The protein synthesis analysis and ultrastructural morphology of control (non-irradiated) and irradiated cultures were obtained. RESULTS: There were changes in the structure of cytoplasm organelles of treated cells. The procollagen was not altered by the laser irradiation; however, there were a significant reduction of the amount of protein in the DMEM conditioned by irradiated cells. CONCLUSIONS: Low-power laser irradiation causes ultrastructural changes in cultured fibroblasts. We suggest that these alterations may lead to disturbances in the collagen metabolism. Culture Media, Conditioned;Procollagen;Collagen Cells, Cultured;Collagen;Culture Media, Conditioned;Fibroblasts;Gingiva;Humans;Lasers;Microscopy, Electron;Procollagen

[Research on the effect of root canal seal achieved by irradiation of Er, Cr:YSGG laser]. PURPOSE: To evaluate the effect of root canal seal achieved by routine root canal preparation and irradiation of Er, Cr:YSGG laser in root canal therapy. METHODS: One hundred and five freshly single-rooted extracted human teeth were selected for the study, which were randomly divided into seven groups of fifteen each. The anatomic crowns were removed at the cementoenamel junction and the remaining roots were prepared endodontically with conventional methods. Then they were treated with Er, Cr:YSGG laser in different parameters and patterns. The effect of root canal seal achieved by Er, Cr:YSGG laser was evaluated with microleakage measurements. Newman-Keuls test and one-way analysis of variance were used to determine the statistical differences between various groups. A value of $P<0.05$ was considered to be significant. RESULTS: The amount of dye penetration from an apical stop with irradiation of Er, Cr:YSGG laser was significantly lower ($P<0.05$) except 3W laser without water flow, and in 1W Er, Cr:YSGG laser without water flow, the amount of apical dye penetration was significantly decreased ($P<0.01$). CONCLUSIONS: The utilizing of Er, Cr:YSGG laser in small parameters prior to root canal filling could promote the effect of apical seal. Based on our results, it appeared that the seal effect of 1W Er, Cr:YSGG laser without water flow was superior to the effects of others. Dental Leakage;Humans;Low-Level Light Therapy;Root Canal Preparation;Root Canal Therapy

[Acute catarrhal appendicitis: is appendectomy required?]. Anti-Bacterial Agents;Gentamicins Animals;Anti-Bacterial Agents;Appendicitis;Gentamicins;Humans;Low-Level Light Therapy;Peritoneal Lavage;Rabbits

Therapeutic light. Humans;Low-Level Light Therapy;Pain;Skin;Wounds and Injuries

[Evaluation of low level laser therapy in temporo-mandibular joint disorders]. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Temporomandibular Joint Disorders
[Clinico-morphological assessment of early and late results of laser therapy of the anastomosis area after radical surgeries for stomach cancer]. The study included 52 patients after gastrectomy for carcinoma of the proximal part of the stomach. Endoscopic laser therapy was made in 32 patients to reduce inflammation in the anastomosis zone 2-3 weeks after surgery. Drug therapy was made in 20 patients within the same time period. Histochemical study of the biopsy material of esophageal and intestinal part of the anastomosis was carried out. It is revealed that application of copper vapor laser early after surgery reduces edema and inflammation in the anastomosis zone for 2 weeks as well as accelerates the growth of granulation tissue forming a delicate scar thus preventing formation of scar stenosis. Gastrointestinal Agents Biopsy;Constriction, Pathologic;Gastrectomy;Gastric Mucosa;Gastroenteritis;Gastroenterostomy;Gastrointestinal Agents;Humans;Intestinal Mucosa;Low-Level Light Therapy;Postoperative Care;Stomach Neoplasms;Time Factors;Treatment Outcome
[Morphological diagnosis of the inhalation trauma and criteria of efficacy of the endobronchial laser therapy based on the biopsy material]. The results of 424 biopsies obtained at fibrobronchoscopy (FBS) from 45 patients with inhalation trauma (IT) are presented. The standard and endoscopic laser treatment (ELT) have been used (24 and 21 patients, respectively). It is demonstrated that precise visual assessment of IT severity is possible under dynamic endoscopic observation only. Healing of mucous defects of the tracheo-bronchial tree was shorter in the ELT group. Morphologically, early and continuous ELT was not associated with signs of severe purulent inflammation and, therefore, produced no early additional, damage to the wall. This may explain accelerated formation of the granulation tissue at the ulcer bottom and epithelization at the margin areas. Adult;Aged;Bronchi;Bronchoscopy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Smoke Inhalation Injury;Treatment Outcome;Wound Healing
Successful treatment of oral lesions of chronic lichenoid graft-vs.-host disease by the addition of low-level laser therapy to systemic immunosuppression. We report a case of severe oral stomatitis caused by lichenoid chronic graft-vs.-host disease in which low-level laser therapy applied to the oral mucosa, in addition to standard systemic immunosuppressive treatment, resulted in quick healing and symptomatic relief. Immunosuppressive Agents Adult;Chronic Disease;Female;Graft vs Host Disease;Humans;Immunosuppression Therapy;Immunosuppressive Agents;Lichenoid Eruptions;Low-Level Light Therapy;Stomatitis;Treatment Outcome
The treatment of rosacea. The roundtable discussion encompassed many topics-from seminal research by Ronald Marks to the latest National Rosacea Society-funded studies on the pathophysiology of rosacea. All participants commented on the value of the new National Rosacea Society classification system for subtypes of rosacea, designed to direct future research and help physicians better diagnose and manage these subtypes. A lively discussion centered on treatment options for the various subtypes of rosacea ensued. Anti-Infective Agents;Anti-Infective Agents, Local;Metronidazole;Sulfacetamide;Sulfur Anti-Infective Agents;Anti-Infective Agents, Local;Humans;Low-Level Light Therapy;Metronidazole;Rosacea;Sulfacetamide;Sulfur
[Effect of membrane-stabilizing magnetolaser therapy on cardiodynamics in patients with ischemic heart disease]. AIM: To evaluate cardiodynamic changes in response to magnetolaser therapy (MLT) and these changes links with lipid shifts in cell membrane. MATERIAL AND METHODS: The study enrolled 50 patients with effort angina (functional class II-III). Of them, 37 patients were exposed to 10-day courses of MLT, 13 patients were exposed to sham procedures. Before the treatment and 3 months after it measurements were made of lipid peroxidation (LPO) products, structure of erythrocytic membrane and cardiodynamic parameters. RESULTS: MLT resulted in a

significant reduction of LPO products, stabilization of cell membrane structure and positive shifts in cardiodynamics. Correlation was found between the above parameters. CONCLUSION: Improvement of inotropic, diastolic functions of the myocardium and abatement of cardiac remodeling in coronary heart disease patients in response to MLT is realized primarily due to structural stabilization of cell membrane lipid biolayer. Phospholipids Angina Pectoris;Blood Pressure;Echocardiography, Doppler;Electromagnetic Fields;Erythrocyte Membrane;Humans;Lipid Peroxidation;Low-Level Light Therapy;Male;Middle Aged;Phospholipids;Vascular Resistance;Ventricular Function, Left

Laser treatment of benign pigmented lesions in children: effective long-term benefits of the Q-switched frequency-doubled Nd:YAG and long-pulsed alexandrite lasers. Adolescent;Adult;Cafe-au-Lait Spots;Child;Humans;Low-Level Light Therapy;Nevus, Pigmented;Skin Neoplasms

[Effect of infrared low power laser irradiation on blood acid-base balance and respiratory gases tension]. Small volume (0.5 ml) of arterial or venous rat's blood was subjected to impulse LPILR (lambda = 0.89 microns) in the light transparent cuvette. In arterial blood, a decrease of the pO2 (by 15.5 +/- 2.6%) and an increase of the pCO2 (by 22.0 +/- 4.8%) in respect to initial values, were determined. The acid-base shift from 7.39 +/- 0.02 to 7.34 +/- 0.02 was recorded. Only in few experiments, there were changes of pO2, pCO2 and pH in venous blood. Probable mechanism(s) of the mentioned parameters changes are discussed. Carbon Dioxide;Oxygen Acid-Base Equilibrium;Animals;Blood;Carbon Dioxide;Hydrogen-Ion Concentration;In Vitro Techniques;Infrared Rays;Low-Level Light Therapy;Male;Oxygen;Partial Pressure;Rats;Rats, Wistar

[Effect of the He-Ne laser irradiation on resistance of the isolated heart to the ischemic and reperfusion injury]. The aim of this work was to investigate the myocardial protection against ischemia/reperfusion using low level laser irradiation (LLLI). It has been shown that pulse pressure was higher in the period of post-ischemic reperfusion as compared with the control group. It provided a better restoration of myocardial contractility as well as increasing of coronary flow in the reperfusion period. The amount of ventricular rhythm disorder episodes decreased. These effects of laser application were registered in conditions of coronary flow reduction less than 50%. One of the suggested mechanisms of laser effect is an ATP-sensitive channel activation. Animals;Coronary Circulation;Heart;In Vitro Techniques;Low-Level Light Therapy;Myocardial Contraction;Myocardial Reperfusion;Myocardial Reperfusion Injury;Rats;Ventricular Pressure

[Structural and functional evaluation of combined local application of miliacylum and laser irradiation in the treatment of trophic ulcers]. In 54 patients, suffering from trophic ulcers of lower extremities of different origin, the efficiency of local application of miliacylum and laser irradiation in combined in the treatment, was evaluated. As the result of clinical, histological, histochemical and histoautoradiographic studies, it was established that the process of trophic wound healing was more favorable in patients receiving a combined treatment by miliacylum and laser irradiation in comparison with that when only miliacylum or 1% dioxidine solution and oleum Hippophae were used. When the combination of miliacylum and laser irradiation was applied, the treatment periods were reduced 1.3 and 2 times, respectively, as compared to those ones when miliacylum or dioxidine and oleum Hippophae were used. Plant Oils Administration, Topical;Combined Modality Therapy;Foot Ulcer;Humans;Low-Level Light Therapy;Necrosis;Panicum;Plant Oils;Treatment Outcome

In vivo caries formation in enamel following argon laser irradiation and combined fluoride and argon laser treatment: a clinical pilot study. OBJECTIVE: This in vivo pilot study investigated the role of argon laser irradiation and combined fluoride and argon laser treatment in accelerated natural caries development in sound enamel surfaces beneath plaque-retentive orthodontic bands. METHOD AND MATERIALS: Five patients (3 female, 2 male, ages 19 to 28 years) requiring tooth extraction prior to

orthodontic treatment, participated in the study. Buccal surfaces were treated with either: (1) argon laser (250 mW for 10 seconds, ARGO-MOD); (2) topical fluoride (0.5% fluoride ion, Thera-Flur-N) followed by argon lasing; or (3) no treatment (control). Orthodontic bands with plaque-retentive slots on buccal surfaces were placed on the teeth slated for extraction (n = 14). Following a minimum of 5 weeks of intraoral exposure, the teeth were extracted for laboratory analysis. The teeth underwent serial longitudinal sectioning (12 sections per tooth). The sections were imbibed in water, and lesion depths were determined with each section, using polarized light microscopy. Comparisons were made among treatment groups (analysis of variance, Duncan's multiple range test for paired samples). RESULTS: Mean lesion depths were: 261 +/- 24 microm for the no treatment control group (n = 84 sections); 147 +/- 18 microm for the argon laser group (n = 24 sections); and 99 +/- 12 microm for the fluoride and argon laser group (n = 60 sections). Both the argon laser (44%) and the fluoride and argon laser groups (62%) had significant lesion depth reductions compared to controls. The addition of fluoride treatment prior to argon lasing resulted in a 32% reduction in lesion depth compared to argon laser treatment alone. CONCLUSIONS: Within this clinical pilot study, in vivo natural caries formation was affected significantly by a single exposure to low fluence argon laser irradiation. Topical fluoride treatment in combination with argon lasing provided an even greater degree of resistance against in vivo enamel caries development. A simple technique for reducing the caries susceptibility of enamel may be a clinical reality. Fluorides, Topical;Argon Adult;Analysis of Variance;Argon;Combined Modality Therapy;Dental Caries;Dental Caries Susceptibility;Dental Plaque;Female;Fluorides, Topical;Humans;Low-Level Light Therapy;Male;Orthodontic Brackets;Pilot Projects;Statistics, Nonparametric

Does pulse stacking improve the results of treatment with variable-pulse pulsed-dye lasers? BACKGROUND: It has been suggested that multiple stacked pulses of lower fluence may have a similar effect on targets as a single pulse of higher fluence. When treating vascular lesions, increasing the fluence beyond a certain point will increase the risk of purpura given a constant pulse duration. Stacking pulses of lower fluence may have the advantage of heating vessels to a critical temperature without creating purpura. OBJECTIVE: To determine whether stacking low-fluence pulses of a variable-pulse pulsed-dye laser would improve clinical results without significantly increasing side and adverse effects. METHODS: Twenty-five patients between the ages of 18 and 65 years with facial telangiectasia and skin types I-IV were enrolled in the study. For each subject, the cheek or nasal ala areas on either side of the facial midline with similar telangiectasia density ratings were randomized to single pulse and multiple stacked pulse groups. One side of the cheek or nasal ala was treated with single nonoverlapping pulses with the Candela Vbeam 595-nm pulsed-dye laser. The opposite side of the cheek or nose was treated with the same parameters but with three or four pulses stacked on top of each other at a 1.5-Hz repetition rate. Patients were asked to rate the pain of the procedure on each side on a 0 to 3 scale. Investigators rated the erythema and edema after the procedure as well as vessel clearing and overall telangiectasia density scale at 1 and 6 weeks after the procedure. RESULTS: Twenty-three patients completed the study. The mean pain rating was 1.58 for the pulse stacked side and 1.38 for the single-pass side. The mean erythema score after the procedure was 1.17 for the pulsed stacked side and 1.09 for the single pulsed side. The mean vessel clearing 1 week after the treatment was 74.3% for the pulse stacked side and 58.5% for the single pulsed side. The mean vessel clearing 6 weeks after the treatment was 87.6% for the pulse stacked side and 67.4% for the single pulsed side. The mean telangiectasia density scale score before treatment was 2.67 for the pulse stacked side and 2.59 for the single pulsed side. At 1 week after treatment, the mean telangiectasia density scale score was 1.06 for the pulsed stacked side and 1.5 for the single pulsed side. At 6 weeks after treatment, the mean telangiectasia density scale score was 0.72 for the pulsed stacked side and 1.30 for the single pulsed side. No patients experienced purpura in either group, and

there were no cases of hyperpigmentation, hypopigmentation, or scar formation. One patient experienced significant edema on the side of the cheeks treated with pulse stacking. CONCLUSIONS: Treating superficial facial telangiectasia with a pulse stacking technique may improve clinical results without significantly increasing adverse effects.
Adolescent;Adult;Aged;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Telangiectasis;Treatment Outcome

Evaluating the efficacy of treatment of resistant port-wine stains with variable-pulse 595-nm pulsed dye and 532-nm Nd:YAG lasers. BACKGROUND: Some port wine stains (PWSs), despite multiple treatments with the 585-nm 0.45-ms pulsed dye laser (PDL), fail to improve substantially. OBJECTIVE: To determine the efficacy and tolerability of variable pulse width 595-nm PDL and 532-nm Nd:YAG laser in the treatment of resistant PWS. METHODS: Twenty-two patients whose PWS failed to achieve more than 75% lightening after more than 15 treatments with the 585-nm 0.45-ms PDL were recruited. A homogenous patch of PWS was divided into five areas. Area 1 (control area) was treated with 585-nm, 0.45-ms PDL (fluence 7.5 J/cm2). Areas 2 and 3 were treated with 595-nm PDL at fluence 15 J/cm2 (with cryogen spray cooling) and pulse durations of 1.5 and 10 ms, respectively. Areas 4 and 5 were treated with a 532-nm Nd:YAG laser at 2 ms, 7 J/cm2 and 10 ms, 16 J/cm2, respectively (with a contact cooling tip). The response was assessed by photographic evaluation. RESULTS: Three patients had further lightening in area 2, and two patients had further lightening in area 3. Each of three patients had further lightening in areas 4 and 5, respectively. One patient had further lightening in the control area. CONCLUSION: In individual patients, it may be effective to treat resistant PWS with the variable-pulse width 595-nm PDL and the 532-nm Nd:YAG laser.
Adolescent;Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Treatment Outcome

Efficacy of low level laser therapy in reducing postoperative pain after endodontic surgery-- a randomized double blind clinical study. The aim of the study was to evaluate the effect of low level laser application on postoperative pain after endodontic surgery in a double blind, randomized clinical study. Fifty-two healthy adults undergoing endodontic surgery were included into the study. Subsequently to suturing, 26 patients had the operation site treated with an 809 nm-GaAlAs-laser (oralaser voxx, Oralia GmbH, Konstanz, Germany) at a power output of 50 mW and an irradiation time of 150 s. Laser treatment was simulated in further 26 patients. Patients were instructed to evaluate their postoperative pain on 7 days after surgery by means of a visual analogue scale (VAS). The results revealed that the pain level in the laser group was lower than in the placebo group throughout the 7 day follow-up period. The differences, however, were significant only on the first postoperative day (Mann-Whitney U-test, $p<0.05$). Low level laser therapy can be beneficial for the reduction of postoperative pain. Its clinical efficiency and applicability with regard to endodontic surgery, however require further investigation. This is in particular true for the optimal energy dosage and the number of laser treatments needed after surgery. Adult;Apicoectomy;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Retrograde Obturation;Statistics, Nonparametric

[Laser infrared irradiation in the complex treatment of gastroduodenal ulcer].
Adolescent;Adult;Antibody Formation;Balneology;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Neutrophils;Peptic Ulcer;Phagocytosis;Treatment Outcome

[The excimer laser in dermatology and esthetic medicine]. First reports about the use of the excimer laser in dermatology date back to 1997. It is seen as an improvement on conventional phototherapy and photochemotherapy because of the lower cumulative UV-dose involved, the shorter time frame required for treatment and the option of targeting individual lesions without affecting the surrounding healthy skin. In addition to the indications of psoriasis vulgaris, vitiligo and

atopic eczema (for which there is now FDA approval in the US), the spectrum of possible uses for the excimer laser is growing rapidly, especially in the field of light-sensitive dermatoses. Case studies so far have ranged from post-operative hypopigmentation to acne vulgaris and from alopecia areata to parapsoriasis en plaque. The foremost priorities in the future will be to evaluate reproducible therapeutic regimens with realistic prospects of success in large-scale studies; assess potential iatrogenic risks in treatment; develop pathogenetic models for the mechanism of action; and define therapeutic approaches to new indications. This paper summarizes the publications to date and discusses our observations and experiences. Acne Vulgaris;Alopecia Areata;Esthetics;Humans;Low-Level Light Therapy;Parapsoriasis;Psoriasis;Secondary Prevention;Skin Diseases;Vitiligo

[Low power laser biostimulation in the treatment of bronchial asthma]. INTRODUCTION: Modern concept of acupuncture is based on the fact there are designated locations on the surface of human body, which are related to integrative systems of an organism by means of sensory nerves, correlating and synchronizing organ functioning, depending on external and internal conditions, by means of nervous and neurohumoral regulation of metabolic and regenerative processes, including also mobilisation of immunological, protective and antistress reactions. Apart from standard needle acupuncture, other methods of stimulating acupuncture points are also applied. Due to invention of low power lasers, irradiation laser acupuncture has been introduced into routine medical practice, characterised by painless and aseptic technique and outstanding clinical results. MATERIAL AND METHODS: The investigation was aimed at defining therapeutic effects of low power laser irradiation by stimulating acupuncture points or local treatment of asthma. A prospective analysis included 50 patients treated at the Institute of Pulmonary Diseases in Sremska Kamenica during 2000, 2001 and 2002. Together with conservative treatment of present disease, these patients were treated with laser stimulation of acupuncture points in duration of ten days. During treatment changes of functional respiratory parameters were recorded. Results were compared with those in the control group. The control group consisted of the same number of patients and differed from the examination group only by not using laser stimulation. RESULTS: Patients with bronchial asthma presented with significant improvement ($p < 0000,5$) of all estimated lung function parameters just 30 minutes after laser stimulation. Improvements achieved on the third and the tenth day of treatment were significantly higher ($p < 0.001$ to $p < 0.00005$) in the examination group in comparison with the control group. Further investigation confirmed that improvement of measured lung function parameters was significantly higher in younger patients, in patients whose disease lasted shorter, as well as in women. Patients with asthma, who were treated every three months for a one year period, presented with significantly lower frequency and intensity of attacks. DISCUSSION: The mechanism of laser stimulation activity in treatment of bronchial asthma is explained in detail, correlating our results to those obtained by other authors. CONCLUSIONS: A ten-day course of low-power laser stimulation of acupuncture points in patients with bronchial asthma improves both the lung function and gas exchange parameters. Positive effects of laser treatment in patients with bronchial asthma are achieved in a short time and they last long, for several weeks, even months. Successive laser stimulation in asthmatics prolongs periods of remission and decreases the severity of asthmatic attacks. Better positive effects of laser stimulation are achieved in younger asthmatics, in those with shorter disease history and in female patients. There is a negative correlation between effects of laser stimulation and patients' age and disease history. However, these characteristics do not affect response rate and speed but positive laser stimulation effects are achieved in a shorter period in female asthmatics. Acupuncture;Acupuncture Points;Adult;Asthma;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged

[Possibilities of the low-intensity infrared laser therapy in atherosclerotic lesions of the cardiovascular system]. Angina Pectoris;Animals;Arteriosclerosis;Arteriosclerosis Obliterans;Cardiovascular Diseases;Coronary Artery Disease;Diabetic Angiopathies;Disease Models, Animal;Humans;Infrared Rays;Intracranial Arteriosclerosis;Leg;Low-Level Light Therapy;Male;Photochemotherapy;Rats;Time Factors;Tomography, Emission-Computed;Treatment Outcome;Ultrasonography, Doppler

Laser therapy on darker ethnic skin. Like all medical procedures laser therapy comes with inherent risks and complications. Because of the increased risk in epidermal side effects when performing laser therapy on patients with darker skin, a higher level of laser expertise and clinical experience in treating darker ethnic skin is recommended to ensure that patients are treated safely. Test spots should always be done as an aid to selecting safe and efficacious treatment parameters. Because of the limited experience in treating patients with darker skin a conservative approach should always be used. Unfortunately, there are no national policies establishing credentialing requirements for those planning to practice laser surgery. The US Food and Drug Administration are responsible for granting individual laser manufacturers' permission to market their lasers for specific indications. The Food and Drug Administration also recommends operator training to use these lasers, but credentialing is a state function and consequently standards for laser therapy vary greatly from state to state. Until the bar is raised and national credentialing polices on laser therapy are established clinicians must police themselves and fully be aware of their capabilities and limitations to ensure that all patients regardless of skin color or ethnicity receive safe and effective treatments. Adult;Black or African American;Aged;Female;Follow-Up Studies;Humans;Incidence;Low-Level Light Therapy;Male;Middle Aged;Risk Assessment;Skin Diseases;Skin Pigmentation;Treatment Outcome;United States

Effect of 830-nm laser light on the repair of bone defects grafted with inorganic bovine bone and decalcified cortical osseous membrane. OBJECTIVE: The aim of this study was to assess histologically the effect of LLLT (lambda830 nm) on the repair of standardized bone defects on the femur of Wistar albinus rats grafted with inorganic bovine bone and associated or not to decalcified bovine cortical bone membrane. BACKGROUND DATA: Bone loss may be a result of several pathologies, trauma or a consequence of surgical procedures. This led to extensive studies on the process of bone repair and development of techniques for the correction of bone defects, including the use of several types of grafts, membranes and the association of both techniques. There is evidence in the literature of the positive effect of LLLT on the healing of soft tissue wounds. However, its effect on bone is not completely understood. MATERIALS AND METHODS: Five randomized groups were studied: Group I (Control); Group IIA (Gen-ox); Group IIB (Gen-ox + LLLT); Group IIIA (Gen-ox + Gen-derm) and Group IIIB (Gen-ox + Gen-derm + LLLT). Bone defects were created at the femur of the animals and were treated according to the group. The animals of the irradiated groups were irradiated every 48 h during 15 days; the first irradiation was performed immediately after the surgical procedure. The animals were irradiated transcutaneously in four points around the defect. At each point a dose of 4 J/cm2 was given (phi approximately 0.6 mm, 40 mW) and the total dose per session was 16 J/cm2. The animals were humanely killed 15, 21, and 30 days after surgery. The specimens were routinely processed to wax, serially cut, and stained with H&E and Picrosirius stains and analyzed under light microscopy. RESULTS: The results showed evidence of a more advanced repair on the irradiated groups when compared to non-irradiated ones. The repair of irradiated groups was characterized by both increased bone formation and amount of collagen fibers around the graft within the cavity since the 15th day after surgery, through analysis of the osteoconductive capacity of the Gen-ox and the increment of the cortical repair in specimens with Gen-derm membrane. CONCLUSION: It is concluded that LLLT had a positive effect on the repair of bone defect

submitted the implantation of graft. Biocompatible Materials;Membranes, Artificial Animals;Biocompatible Materials;Decalcification Technique;Female;Low-Level Light Therapy;Male;Membranes, Artificial;Random Allocation;Rats;Rats, Wistar;Wound Healing
Usefulness of low-level laser for control of painful stomatitis in patients with hand-foot-and-mouth disease. OBJECTIVE: The aim of this study was to evaluate the usefulness of low-level laser therapy (LLLT) for the control of painful stomatitis in patients with hand-foot-and-mouth disease (HFMD). BACKGROUND DATA: LLLT has been successfully applied to various painful oral mucosal diseases, although there have been few reports on LLLT for HFMD patients. MATERIALS AND METHODS: Through a randomized double-blind placebo controlled trial, the painful period of HFMD stomatitis was compared between the LLLT group (n=11) and the placebo LLLT one (n=9), which had similar clinical backgrounds. The LLLT parameters supplied were as follows: wavelength of 830 nm, power of 30 mW, frequency of 30 Hz, and energy output of 1.1 J/cm2. Acceptability and safety of the treatment were also evaluated. RESULTS: The painful period was shorter in the LLLT group (4.0 +/- 1.3 days) than in the placebo LLLT one (6.7 +/- 1.6 days) with a statistically significant difference ($p<0.005$). The treatment was judged acceptable for 90.0% (18 of 20) of patients. No adverse events were observed in any cases. CONCLUSION: LLLT is a useful method to control HFMD stomatitis by shortening the painful period, with its high acceptability and lack of adverse events. Child;Child, Preschool;Double-Blind Method;Female;Hand, Foot and Mouth Disease;Humans;Low-Level Light Therapy;Male;Stomatitis;Treatment Outcome
Low-intensity near-infrared laser radiation-induced changes of acetylcholinesterase activity of human erythrocytes. OBJECTIVE: The aim of the present study was to investigate the transformations of red blood cells produced by low-intensity infrared laser radiation (810 nm). BACKGROUND DATA: Low-intensity (the output power of a laser device in the milliwatt range) laser radiation as a local phototherapeutic modality is characterized by its ability to induce non-thermic, nondestructive photobiological processes in cells and tissues. However, the exact theory concerning the therapeutic effects of laser biostimulation has not been developed. MATERIALS AND METHODS: The suspensions of human erythrocytes in PBS (10% hematocrit) were irradiated with near-infrared (810 nm) therapy laser at different light doses (0-20 J) and light power (fluence rate; 200 or 400 mW) at 37 degrees C. As the parameters characterizing the cell structural and functional changes membrane acetylcholinesterase (AchEase) activity, the membrane potential, the level of intracellular glutathione, the level of products of membrane lipid peroxidation, and the cell osmotic stability were measured. RESULTS: It was found that near-infrared low-intensity laser radiation produced complex biphasic dose-dependent changes of the parameters of AchEase reaction in the dose-dependent manner: at smaller doses of radiation (6 J) the maximal reaction rate and Michaelis-Menten constant value decreased, and at higher radiation doses these parameters increased. No significant changes of erythrocyte stability, cellular redox state (reduced glutathione or lipid peroxidation product levels), or cell membrane electrochemical potential were observed. CONCLUSION: Low-intensity near-infrared laser radiation (810 mn) produced AchEase activity changes, reflecting the effect of light on the enzyme due to energy absorption. Protein molecule conformational transitions and enzyme activity modifications in cells have been suggested as laser radiation-induced events. Acetylcholinesterase Acetylcholinesterase;Dose-Response Relationship, Radiation;Erythrocyte Membrane;Erythrocytes;Humans;Low-Level Light Therapy;Membrane Potentials;Molecular Conformation
Why doesn't everyone use it? Humans;Low-Level Light Therapy
The effects of low laser irradiation on angiogenesis in injured rat tibiae. The influence of He-Ne laser radiation on the formation of new blood vessels in the bone marrow compartment of a regenerating area of the mid-cortical diaphysis of the tibiae of young adult rats was studied. A small

hole was surgically made with a dentistry burr in the tibia and the injured area received a daily laser therapy over 7 or 14 days transcutaneously starting 24 h from surgery. Incident energy density dosages of 31.5 and 94.5 Jcm(-2) were applied during the period of the tibia wound healing investigated. Light microscopic examination of histological sections of the injured area and quantification of the newly-formed blood vessels were undertaken. Low-level energy treatment accelerated the deposition of bone matrix and histological characteristics compatible with an active recovery of the injured tissue. He-Ne laser therapy significantly increased the number of blood vessels after 7 days irradiation at an energy density of 94.5 Jcm(-2), but significantly decreased the number of vessels in the 14-day irradiated tibiae, independent of the dosage. These effects were attributed to laser treatment, since no significant increase in blood vessel number was detected between 8 and 15 non-irradiated control tibiae. Molecular mechanisms involved in low-level laser therapy of angiogenesis in post-traumatic bone regeneration needs further investigation. Helium;Neon Animals;Helium;Laser Therapy;Low-Level Light Therapy;Male;Neon;Neovascularization, Physiologic;Rats;Rats, Wistar;Tibia;Time Factors;Wound Healing

Practice of acupuncture and laser hair removal. Acupuncture;Humans;Licensure, Medical;Low-Level Light Therapy;Michigan

Treatment of cervical dentin hypersensitivity using neodymium: Yttrium-aluminum-garnet laser. Clinical evaluation. BACKGROUND AND OBJECTIVE: The incidence of cervical dentinal hypersensitivity is related to the high number of non-carious cervical lesions. This clinical research was developed in order to evaluate the Nd:YAG laser treatment of cervical dentin hypersensitivity after attempting the removal and control of etiologic factor after two different stimuli. STUDY DESIGN/MATERIALS AND METHODS: Twenty patients participated in this study in a total of 145 teeth, where 104 received the Nd:YAG laser treatment and 41 remained as control. RESULTS: The results showed that there was statistically significant reduction of hypersensitivity as for the groups that received the treatment with Nd:YAG laser, as for the control teeth. However, the reduction of cervical dentinal hypersensitivity was statistically greater when there was the association of the removal of etiologic factors with the application of Nd:YAG laser. CONCLUSIONS: We concluded that the laser irradiation was effective in the treatment of cervical dentin hypersensitivity after 6 months. Adult;Dentin Sensitivity;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Effects of the Ga-As laser irradiation on myonecrosis caused by Bothrops Moojeni snake venom. BACKGROUND AND OBJECTIVES: Viper snake envenoming induces in the victims systemic coagulopathy, and severe local tissue damage such as edema, hemorrhage, intense pain, and myonecrosis. Serumtherapy and other first-aid managements are ineffective in neutralizing these local effects. The effects of the gallium-arsenide (Ga-As) laser irradiation on mice gastrocnemius injected intramuscularly (i.m.) with Bothrops moojeni snake venom were investigated. STUDY DESIGN/MATERIALS AND METHODS: Macroscopical, histopatological, and myonecrosis quantification through serum creatine kinase (CK) evaluation was done at 3, 12, and 24 hours (two, five, and eight irradiation sessions, 4 J/cm(2), 1 minute 32 seconds per period, respectively), were done after the venom or saline injection, and in venom-unirradiated mice. RESULTS: In unirradiated gastrocnemius, the venom induced massive hemorrhage, vascular congestion, time-progressing myonecrosis, edema, abundant inflammatory infiltrate, and high CK serum levels. Ga-As irradiation significantly decreased the amount of myonecrosis in all the periods tested ($P < 0.05$). CONCLUSIONS: The laser treatment significantly inhibited the ability of B. moojeni venom to rapidly disrupt the integrity of the plasma membrane. Crotalid Venoms Animals;Bothrops;Crotalid Venoms;Injections,

Intramuscular;Low-Level Light Therapy;Male;Mice;Models, Animal;Muscle, Skeletal;Muscular Diseases;Necrosis;Treatment Outcome

Comparison of the photostimulatory effects of visible He-Ne and infrared Ga-As lasers on healing impaired diabetic rat wounds. BACKGROUND AND OBJECTIVES: In this study, the ability of photostimulation to promote healing of impaired wounds was investigated using a Ga-As laser in rats with experimental diabetes and the results were compared with previously reported findings of the effects of a He-Ne laser on the repair of healing-impaired diabetic rat wounds 1. STUDY DESIGN/MATERIALS AND METHODS: Diabetes was induced in male rats by streptozotocin injection following which two full thickness punch wounds of 6-mm diameter were created in the skin, one on either side of the spine of each animal. The left wound of each animal was treated with infrared radiation at 904 nm produced by a Ga-As laser at an energy density of 1.0 J/cm(2). The right wound of each animal served as the control. The wounds were treated with a laser 5 days a week for 3 weeks. Following animal sacrifice, the strips of skin containing the wound sites were collected and analyzed. RESULTS: The results from the biomechanical analysis indicated that the Ga-As laser used in this study significantly increased wound tensile strain and toughness compared to the control wounds. Marginal increases in wound tensile strength (9%) and stress (7%) were observed in the Ga-As laser-treated wounds compared to the controls. No significant changes were found in Young's modulus and energy absorption capacity between the control and laser-treated wounds. Analysis of wound collagen revealed a significant increases in total collagen (14%), salt soluble collagen (31%), acid soluble (14%), and insoluble collagen (50%) with simultaneous decrease in pepsin soluble collagen (19%) in the Ga-As laser-treated wounds compared to controls. Comparisons of these results with the earlier findings revealed that the He-Ne laser appears to be superior to the Ga-As laser, at the parameters of treatment tested, in promoting the wound healing in diabetic rats. CONCLUSIONS: The differences in stimulatory effects noted between the He-Ne and Ga-As lasers suggest that the photochemical response the cells for each laser may depend on the wavelength and coherent properties of the electromagnetic radiation. Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Sprague-Dawley;Wound Healing;Wounds and Injuries

Efficacy of low level laser therapy in myofascial pain syndrome: an algometric and thermographic evaluation. BACKGROUND AND OBJECTIVES: The efficacy of low level laser therapy (LLLT) in myofascial pain syndrome (MPS) seems controversial. Our aim was to clarify the effect of LLLT in MPS by using algometry and thermography. STUDY DESIGN/MATERIALS AND METHODS: Sixty-two patients with MPS having an active trigger point in the neck or upper back region were randomly divided into two equal groups according to therapy applied (group 1: LLLT + stretching exercises, group 2: stretching exercises alone). The outcome measures were pain measured with visual analogue scale (VAS), algometry on the trigger point, algometric difference, thermographic difference, and thermal asymmetry. Comparison was made within and between the groups pre- and post-therapeutically and 3 weeks after therapy. RESULTS: Mean pain values decreased more significantly in group 1 from baseline to 3 weeks follow up (7.54-3.06) while these values were 7.03-5.19 in group 2 ($P < 0.05$). Group comparisons revealed significant favorable differences in group 1 patients in terms of all other parameters at the first and the second evaluation post therapeutically ($P < 0.05$). CONCLUSIONS: LLLT seemed to be beneficial for pain in MPS by using algometry and thermography. Adult;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Myofascial Pain Syndromes;Pain Measurement;Thermography;Treatment Outcome

Efficacy of different therapy regimes of low-power laser in painful osteoarthritis of the knee: a double-blind and randomized-controlled trial. BACKGROUND AND OBJECTIVES: A prospective, double-blind, randomized, and controlled trial was conducted in patients with knee osteoarthritis (OA) to evaluate the efficacy of infrared low-power Gallium-Arsenide (Ga-As) laser therapy (LPLT) and

compared two different laser therapy regimes. STUDY DESIGN/MATERIALS AND METHODS: Ninety patients were randomly assigned to three treatment groups by one of the nontreating authors by drawing 1 of 90 envelopes labeled 'A' (Group I: actual LPLT consisted of 5 minutes, 3 J total dose + exercise; 30 patients), 'B' (Group II: actual LPLT consisted of 3 minutes, 2 J total dose + exercise; 30 patients), and 'C' (Group III: placebo laser group + exercise; 30 patients). All patients received a total of 10 treatments, and exercise therapy program was continued during study (14 weeks). Subjects, physician, and data analysts were unaware of the code for active or placebo laser until the data analysis was complete. All patients were evaluated with respect to pain, degree of active knee flexion, duration of morning stiffness, painless walking distance and duration, and the Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC) at week 0, 6, 10, and 14. RESULTS: Statistically significant improvements were indicated in respect to all parameters such as pain, function, and quality of life (QoL) measures in the post-therapy period compared to pre-therapy in both active laser groups ($P < 0.01$). Improvements in all parameters of the Group I and in parameters, such as pain and WOMAC of the Group II, were more statistically significant when compared with placebo laser group ($P < 0.05$). CONCLUSIONS: Our study demonstrated that applications of LPLT in different dose and duration have not affected results and both therapy regimes were a safe and effective method in treatment of knee OA. Aged;Aged, 80 and over;Double-Blind Method;Exercise Therapy;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain;Pain Management;Prospective Studies;Treatment Outcome

A pilot study of ICG laser therapy of acne vulgaris: photodynamic and photothermolysis treatment. BACKGROUND AND OBJECTIVES: The near-infrared (NIR) laser radiation due to its high penetration depth is widely used in phototherapy. In application to skin appendages, a high selectivity of laser treatment is needed to prevent light action on surrounding tissues. Indocyanine green (ICG) dye may provide a high selectivity of treatment due to effective ICG uploading by a target and its narrow band of considerable absorption just at the wavelength of the NIR diode laser. The goal of this study is to demonstrate the efficacy of the NIR diode laser phototherapy in combination with topical application of ICG suggested for soft and thermal treatment of acne vulgaris. STUDY DESIGN/MATERIALS AND METHODS: Twenty-two volunteers with facile or back-located acne were enrolled. Skin sites of subjects were stained by ICG and irradiated by NIR laser-diode light (803 or 809 nm). One mg/ml solution of ICG was applied for 5 or 15 minutes to the cleaned skin site. Untreated, only stained and only light irradiated skin areas served as controls. For soft acne treatment, the low-intensity (803 nm, 10-50 mW/cm(2), 5-10 minutes) or the medium-intensity (809 nm, 150-190 mW/cm(2), 15 minutes) protocols were used. The single and multiple (up to 8-9) treatments were provided. The individual acne lesions were photothermally treated at 18 W/cm(2) (803 nm, 0.5 seconds) without skin surface cooling or at 200 W/cm(2) (809 nm, 0.5 seconds) with cooling. RESULTS: The observations during 1-2 months showed that soft acne treatment decreased the number of active elements, reduced erythema and inflammation, and considerably improved the skin state without any side effects. At high power densities (up to 200 W/cm(2)), ICG stained acne inflammatory elements were destroyed for light exposures of 0.5 seconds. CONCLUSIONS: Based on the concept that hair follicle, especially sebaceous gland, can be intensively and selectively stained by ICG due to dye diffusion through pilosebaceous canal and its fast uptake by living microorganisms, by vital keratinocytes of epithelium of the canal and sebaceous duct, and by rapidly proliferating sebocytes, new technologies of soft and thermal acne lesions treatment that could be used in clinical treatment of acne were proposed. Photosensitizing Agents;Indocyanine Green Acne Vulgaris;Adolescent;Adult;Female;Humans;Indocyanine Green;Laser Therapy;Male;Photochemotherapy;Photolysis;Photosensitizing Agents;Phototherapy;Pilot Projects;Treatment Outcome

Investigation of the effect of GaAs laser therapy on cervical myofascial pain syndrome. Low-energy laser therapy has been applied in several rheumatoid and soft tissue disorders with varying rates of success. The objective of our study was to investigate the effect of laser therapy on cervical myofascial pain syndrome with a placebo-controlled double-blind prospective study model. It was performed with a total of 53 patients (35 females and 18 males) with cervical myofascial pain syndrome. In group 1 (n = 23), GaAs laser treatment was applied over three trigger points bilaterally and also one point in the taut bands in trapezius muscle bilaterally with a frequency of 1000 Hz for 2 min over each point once a day for 10 days during a period of 2 weeks. In group 2 (n = 25), the same treatment protocol was given, but the laser instrument was switched off during applications. All patients in both groups were instructed to perform daily isometric exercises and stretching just short of pain for 2 weeks at home. Evaluations were performed just before treatment (week 0), immediately after (week 2), and 12 weeks later (week 14). Evaluation parameters included pain, algometric measurements, and cervical lateral flexion. Statistical analysis was done on data collected from three evaluation stages. The results were evaluated in 48 patients (32 females, 16 males). Week 2 and week 14 results showed significant improvement in all parameters for both groups. However, comparison of the percentage changes both immediately and 12 weeks after treatment did not show a significant difference relative to pretreatment values. In conclusion, the results of our study have not shown the superiority of GaAs laser therapy over placebo in the treatment of cervical myofascial pain syndrome, but we suggest that further studies on this topic be done using different laser types and dosages in larger patient populations. Arsenicals;Placebos;gallium arsenide;Gallium Arsenicals;Double-Blind Method;Female;Gallium;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Neck Pain;Pain Measurement;Placebos;Pliability;Treatment Outcome

CO2 laser therapy for Milia en plaque. Carbon Dioxide Carbon Dioxide;Ear, External;Epidermal Cyst;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases;Treatment Outcome

Comparative study on a single treatment response to long pulse Nd:YAG lasers and intense pulse light therapy for hair removal on skin type IV to VI--is longer wavelengths lasers preferred over shorter wavelengths lights for assisted hair removal. OBJECTIVE: To investigate the safety and effectiveness of a long pulsed Nd:YAG (1064nm) laser compared to a shorter wavelength intense pulse light system for assisted hair removal in volunteers with skin type 1V, V and VI. METHODS: Eleven patients of Fitzpatrick skin type IV-VI were recruited into the study. The area treated included the face (upper lips, chin and jaw area), axillae and legs. One half of the body was treated with the long pulse Nd:YAG laser and the other half was treated with the IPL system randomly under topical anesthesia. Degree of pain experienced during treatment, the treatment outcome and any complications were observed. Patients were reviewed at 2 weeks and 6 weeks post-treatment. RESULTS: Volunteers generally described pain from the IPL system as "prolonged burning sensation" but tolerable. Pain from Nd:YAG laser treatment was described as "pinprick" and more intense but tolerable. "Slowing of hair growth"was reported with IPL and Nd:YAG, but with a greater effect from Nd:YAG. Sixty-four percent and 73%(8/11) noticed hair reduction <20% after 6 weeks on IPL and Nd:YAG treated side respectively (ns). Post-inflammatory pigmentation occurred in some volunteers on the IPL treated sides whereas this was not seen on any Nd:YAG treated side, and three of these patients experienced blistering, followed by post-inflammatory pigmentation. CONCLUSION: In our experience the long pulse width 1064 nm Nd:YAG laser, which can penetrate 5-7 mm into the dermis depths to reach the whole length of the hair follicle, would be expected to produce sufficient follicular injury with less epidermal damage in patients with darker skin type compared to shorter wavelength laser and light system. Adult;Combined Modality Therapy;Esthetics;Female;Hair Follicle;Hair Removal;Humans;Hypertrichosis;Laser Therapy;Low-Level

Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Risk Assessment;Treatment Outcome

Effect of Er:YAG laser and organic matrix on porosity changes in human enamel. OBJECTIVES: Cariostatic effects of lasers have been well documented in the past few decades; however, the mechanisms remain unclear. Our previous study revealed the statistically significant effect of organic matrix (OM) in the laser-induced caries prevention. The aim of the present study is to further investigate the role of organic matters in the laser-induced porosity changes. METHODS: Enamel powder from five sound molars was randomly divided into two samples. One sample was treated with approximately 10% NaClO solution to remove OM and the other was left untreated. Both groups were then subjected to irradiation by an Er:YAG laser. The samples were characterized by thermogravimetric analysis (TGA) and N(2) physico-adsorption. RESULTS: TGA results confirmed that the NaClO treatment had at least partially removed the OM in enamel powder. The surface area and pore volume of normal enamel powder decreased significantly after laser treatment. In contrast, in the NaClO-treated enamel powder, laser treatment did not significantly decrease the surface area and the pore volume remained almost unchanged. The substantial difference between the normal enamel powder and the NaClO-treated enamel powder after laser treatment confirmed the laser-induced blocking of OM in the micro-diffusion pathway in enamel. CONCLUSION: The findings in this study seemed to substantiate the "organic blocking theory" as one of the mechanisms in the laser-induced caries prevention. Hydrocarbons;Erbium;Sodium Hypochlorite Dental Enamel;Diffusion;Erbium;Hot Temperature;Humans;Hydrocarbons;Laser Therapy;Low-Level Light Therapy;Porosity;Sodium Hypochlorite;Thermogravimetry;Tooth Demineralization

Implementation of a practical model for light and heat distribution using laser-induced thermotherapy near to a large vessel. This paper introduces a simulation model for light and heat transport in tissues including perfusion effects. The model enables an efficient simulation of the damaged zone induced with an optical fibre for laser interstitial thermotherapy (LITT). It is designed specially for, but not limited to, tissue ablation in the neck region near to vessels. We describe in detail the effects of the rise in temperature caused by the absorption of light in tissue, using the heat equation and including the cooling effects of flow in vessels and of microperfusion in tissue in order to determine the extent of thermal damage. The extent of the necrosis zone is calculated with a damage function at each point of a finite element method (FEM) mesh. The FEM mesh is implemented with FEMLAB 2.3 as an add-on for finite element modelling for Matlab 6.5. LITT for tumour ablation in liver and some other anatomical regions is a well-known and established method (BundesÃ¤rztekammer und KassenÃ¤rztliche Bundesvereinigung 2002 Assessment der BundesÃ¤rztekammer und der KassenÃ¤rztlichen Bundesvereinigung, KÃ¶ln). Investigations of treatments using LITT in the neck region are still in progress. We propose a refined model to validate the LITT method in the future in another anatomic region, e.g., in the highly sensitive region of the neck. Our calculations show that in order to induce a lesion with a maximum diameter of about 1 cm near to a large vessel, an application time between 3 and 4 min is needed using a laser power of about 10 W with a Nd:YAG 1064 nm radiation wavelength. Body Temperature;Body Temperature Regulation;Computer Simulation;Energy Transfer;Head and Neck Neoplasms;Hot Temperature;Humans;Hyperthermia, Induced;Laser Coagulation;Light;Low-Level Light Therapy;Models, Biological;Phototherapy;Radiometry;Radiotherapy Dosage;Radiotherapy Planning, Computer-Assisted;Therapy, Computer-Assisted;Thermal Conductivity

Effect of 830-nm laser light on the repair of bone defects grafted with inorganic bovine bone and decalcified cortical osseus membrane. OBJECTIVE: The aim of this study was to histologically assess the effect of low-level laser therapy (LLLT) (lambda830 nm) on the repair of standardized bone defects of the femur of Wistar albinus rats grafted with inorganic bovine bone and associated (or not)

with decalcified bovine cortical bone membrane. BACKGROUND DATA: Bone loss may be a result of pathology, trauma, or surgical procedure. Extensive studies on the process of bone repair have been undertaken, and several techniques for the correction of bone defects have been proposed. Amongst them is the use of several types of grafts, the use of membranes, and the combination of both techniques. There is evidence in the literature of the positive effect of LLLT on the healing of soft tissue wounds. However, its effect on bone healing is not completely understood. MATERIALS AND METHODS: Five randomized groups were studied: group I (control); group IIA (Gen-ox); group IIB (Gen-ox + LLLT); group IIIA (Gen-ox + Gen-derm); and group IIIB (Gen-ox + Gen-derm + LLLT). Bone defects were created at the femur and were treated according to the group. The animals of irradiated groups were irradiated every 48 h for 15 days; the first irradiation was performed immediately after the procedure. The animals were irradiated transcutaneuosly at four points around the defect. At each point, a dose of 4 J/cm2 was given (phi approximately equal to 0.6 mm, 40 mW), and the total dose per session was 16 J/cm2. The animals were humanely killed at 15, 21, and 30 days after surgery. The specimens were routinely processed to wax, serially cut, stained with H&E and Picrosirius stains, and analyzed under light microscopy. RESULTS: The results showed more advanced repair of the irradiated groups when compared to the non-irradiated ones. The repair of the irradiated group was characterized by both increased bone formation and on the amount of collagen fibers around the graft within the cavity, as early as the 15th day after surgery, considering the osteoconductive capacity of the Gen-ox and the increment of the cortical repair in specimens with Gen-derm membrane. CONCLUSION: It is concluded that LLLT had a positive effect on the repair of bone defect by graft associated or not with the use of biological membrane. Animals;Bone Regeneration;Bone Transplantation;Cattle;Female;Femur;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Effect of the clinical application of the GaAlAs laser in the treatment of dentine hypersensitivity. OBJECTIVE: The aim of this study was to evaluate the effectiveness of the clinical use of the gallium-aluminum-arsenium (GaAlAs) laser at the maximum and minimum energies recommended by the manufacturer for the treatment of dentine hypersensitivity. BACKGROUND DATA: Dentine hypersensitivity (DH) is a response to a stimulus that would not usually cause pain in a healthy tooth. It is characterized by sharp pain of short duration from the denuded dentin. Its etiology is unknown. The dentin only begins to show sensitivity when exposed to the buccal environment. This exposure can result after removal of the enamel and/or dental cement, or after root denudation. Different treatments are proposed for this disorder. MATERIALS AND METHODS: In this study, 25 patients, with a total number of 106 cases of DH, were treated with GaAlAs low-level laser therapy (LLLT). 65% of the teeth were premolars; 14% were incisors and molars; 6.6% were canines. The teeth were irradiated with 3 and 5 J/cm2 for up to six sessions, with an interval of 72 h between each application, and they were evaluated initially, after each application, and at 15 and 60 days follow-up post-treatment. RESULTS: The treatment was effective in 86.53% and 88.88% of the irradiated teeth, respectively, with the minimum and maximum energy recommended by the manufacturer. There was a statistically significant difference between DH and after a follow-up of 60 days for both groups. The difference among the energy maximum and minimum was not significant. CONCLUSION: The GaAlAs low-level laser was effective in reducing initial DH. A significant difference was found between initial values of hypersensitivity and after 60 days follow-up post-treatment. No significant difference was found between minimum (3 J/cm2) and maximum (5 J/cm2) applied energy. Adolescent;Adult;Dentin Sensitivity;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Effects of low-level laser therapy (LLLT) of 810 nm upon in vitro growth of bacteria: relevance of irradiance and radiant exposure. OBJECTIVE: The aim of this study was to investigate the

irradiance-dependency of low-level laser therapy (LLLT) effects on bacterial growth. BACKGROUND: LLLT is applied to open wounds to improve healing; however, its effect on wound bacteria is not well understood. MATERIALS AND METHODS: Escherichia coli, Pseudomonas aeruginosa, and Staphylococcus aureus were irradiated using a wavelength of 810 nm at irradiances of 0.015 W/cm2 (0-50 J/cm2) and 0.03 W/cm2 (0-80 J/cm2). Bacteria were counted after 20 h of incubation. RESULTS: LLLT effects varied significantly with species. P.aeruginosa growth decreased overall dependent on an interaction of irradiance and radiant exposure; greatest inhibition was produced using high irradiance delivering radiant exposures in the range of 1-20 J/cm2 ($p = 0.001$-0.04). In contrast, E. coli growth increased overall ($p = 0.01$), regardless of irradiance; greatest effects were produced using low radiant exposures (1-20 J/cm2). There was a main effect for irradiance ($p = 0.03$) on S. aureus growth; however, growth was not different compared with controls. Additional analysis showed that there were differences in growth of P.aeruginosa when comparing samples that were matched by exposure times (66, 329, 658, 1316, 1974, and 2632 sec) rather than radiant exposure; this suggests that irradiance rather than exposure time was the significant factor in P. aeruginosa inhibition. CONCLUSION: These findings have immediate relevancy in the use of LLLT for infected wounds. Exposure to 810-nm irradiation (0.03 W/cm2) could potentially benefit wounds infected with P. aeruginosa. However, increased E. coli growth could further delay recovery. Bacteria;Bacterial Physiological Phenomena;Cell Line;Escherichia coli;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus

Effects of pulse frequency of low-level laser therapy (LLLT) on bone nodule formation in rat calvarial cells. OBJECTIVE: The purpose of this study was to determine the effect of pulse frequencies of low-level laser therapy (LLLT) on bone nodule formation in rat calvarial cells in vitro. BACKGROUND DATA: Various photo-biostimulatory effects of LLLT, including bone formation, were affected by some irradiation factors such as total energy dose, irradiation phase, laser spectrum, and power density. However, the effects of pulse frequencies used during laser irradiation on bone formation have not been elucidated. MATERIALS AND METHODS: Osteoblast-like cells isolated from fetal rat calvariae were irradiated once with a low-energy Ga-Al-As laser (830 nm, 500 mW, 0.48-3.84 J/cm2) in four different irradiation modes: continuous irradiation (CI), and 1-, 2-, and 8-Hz pulsed irradiation (PI-1, PI-2, PI-8). We then investigated the effects on cellular proliferation, bone nodule formation, alkaline phosphatase (ALP) activity, and ALP gene expression. RESULTS: Laser irradiation in all four groups significantly stimulated cellular proliferation, bone nodule formation, ALP activity, and ALP gene expression, as compared with the non-irradiation group. Notably, PI-1 and -2 irradiation markedly stimulated these factors, when compared with the CI and PI-8 groups, and PI-2 irradiation was the best approach for bone nodule formation in the present experimental conditions. CONCLUSION: Since low-frequency pulsed laser irradiation significantly stimulates bone formation in vitro, it is most likely that the pulse frequency of LLLT an important factor affecting biological responses in bone formation. Animals;Cell Culture Techniques;Fetus;Low-Level Light Therapy;Osteoblasts;Osteogenesis;Rats;Skull

[Laser therapy in gastroenterology]. Gastroenterology;Gastrointestinal Diseases;Humans;Low-Level Light Therapy;Treatment Outcome

[Laser therapy and cryomassage in rehabilitation of patients with facial nerve neuropathy]. Cryomassage and its combination with low-intensity infra-red laser radiation have been introduced as a novel treatment of facial nerve neuropathy (FNN) in 32 patients. Electrophysiological investigations (facial thermography, classical electrodiagnosis, electromyography of the mimic muscles) and clinical data including those of long-term follow-up show that neither cryomassage nor infra-red laser radiation studied promote transformation of facial tissues in FNN patients. Use of the above factors is effective in a preclinical stage of forming contracture of the mimic muscles. Special techniques of

application of local hypothermia and laser radiation can be used in multimodality treatment of both the established contracture and sluggish paresis of the facial muscles. Cryotherapy;Facial Nerve;Facial Nerve Diseases;Humans;Low-Level Light Therapy;Massage;Microcirculation;Treatment Outcome

[Effect of impulse infrared laser radiation on bioenergetic metabolism in gastric mucosa in patients with gastroduodenal ulcer]. Gastric mucosa and blood plasm were studied in 82 patients with gastroduodenal ulcer for content of adenylic nucleotides (AMP, ADP and ATP), histamine, amino acids. It was found that the above nucleotides occurred in the examinees in subnormal quantities. The necessary substrates, aspartate in particular, were deficient. This may lead to impairment of biosynthetic processes, to imbalance of defense factors. Photon therapy of gastroduodenal ulcer corrects bioenergetic metabolism in gastric mucosa thus producing a marked therapeutic effect. Aspartic Acid;Glutamic Acid Adolescent;Adult;Aspartic Acid;Endoscopy, Gastrointestinal;Energy Metabolism;Female;Gastric Acid;Gastric Mucosa;Glutamic Acid;Humans;Low-Level Light Therapy;Male;Middle Aged;Peptic Ulcer

Clinical evaluation of low-level laser therapy and fluoride varnish for treating cervical dentinal hypersensitivity. The aim of this study was to evaluate in vivo the use of low-level galium-aluminium-arsenide (GaAlAs) (BDP 600) laser and sodium fluoride varnish (Duraphat) in the treatment of cervical dentine hypersensitivity. Twelve patients, with at least two sensitive teeth were selected. A total of 60 teeth were included in the trial. Prior to desensitizing treatment, dentine hypersensitivity was assessed by a thermal stimulus and patients' response to the examination was considered to be a control. The GaAlAs laser (15 mW, 4 J/cm2) was irradiated on contact mode and fluoride varnish was applied at cervical region. The efficiency of the treatments was assessed at three examination periods: immediately after first application, 15 and 30 days after the first application. The degree of sensitivity was determined following predefined criteria. Data were submitted to analysis and no statistically significant difference was observed between fluoride varnish and laser. Considering the treatments separately, there was no significant difference for the fluoride varnish at the three examination periods, and for laser therapy, significant difference ($P < 0.05$) was found solely between the values obtained before the treatment and 30 days after the first application. It may be concluded that both treatments may be effective in decreasing cervical dentinal hypersensitivity. Moreover, the low-level GaAlAs laser showed improved results for treating teeth with higher degree of sensitivity. Fluorides, Topical;Sodium Fluoride Adult;Dentin Sensitivity;Female;Fluorides, Topical;Follow-Up Studies;Hot Temperature;Humans;Low-Level Light Therapy;Male;Sodium Fluoride;Treatment Outcome

Verrucae vulgares: flashlamp-pumped pulsed dye laser treatment in 134 patients. BACKGROUND: Various approaches have been taken in the management of verrucae vulgares, but there is still no first-choice treatment. Thus, a study was designed to evaluate the efficacy of a flashlamp-pumped pulsed dye laser (FPDL) in the treatment of verrucae vulgares. METHODS: Within 18 months, 134 patients with recalcitrant or untreated verrucae vulgares on their hands or feet, or in other sites, were exposed to a 585-nm FPDL every 3.26 weeks. The following parameters were used: energy density, 8 J/cm2; spot size, 7 mm; pulse duration, 450 micro s. Concomitant topical treatment was not recommended. RESULTS: Eight patients were lost to follow-up. The data of 126 patients were evaluated. Up to eight laser treatments led to total remission in 62.69% of patients and partial remission in 21.42%; 9.52% did not respond to this type of management; 6.34% of patients classified the method as too painful and withdrew after the first one or two treatments. In a median follow-up period of 5.38 months (2-16 months), one relapse occurred. CONCLUSIONS: FPDL is safe and effective for the removal or reduction of verrucae vulgares, and requires less patient compliance compared

with other treatment options. Adolescent;Adult;Aged;Child;Child, Preschool;Humans;Low-Level Light Therapy;Middle Aged;Reproducibility of Results;Skin Diseases;Treatment Outcome;Warts
Resurfacing of pitted facial acne scars using Er:YAG laser with ablation and coagulation mode. Although the conventional, short-pulsed erbium: yttrium-aluminum-garnet (Er:YAG) laser provides substantial clinical improvement for pitted, facial acne scars, it shows less effective hemostasis and limited residual thermal effect in the dermis. Recently, dual-mode Er:YAG laser systems with both ablation and coagulation modes have been developed. The purpose of this study was to evaluate the clinical and histologic effects of resurfacing pitted, facial acne scars with a dual-mode Er:YAG laser. Twenty patients with pitted facial acne scars underwent laser resurfacing using a computerized-scanning, dual-mode Er:YAG laser. All patients had Fitzpatrick skin types ranging III-V. Initially, the epidermis was removed in two passes using the ablative settings. This step was followed by two passes in a mixed ablation and coagulation mode, to produce further ablation and controlled, residual thermal damage. A final pass in a ablation mode was used to remove necrotic tissue. Laser overlapping was approximately 30%. The results of laser treatment were evaluated for the degree of clinical improvement, duration of erythema, pigmentary change, and any adverse events at two weeks, one month, and three months. In two patients, skin biopsies were obtained at the following intervals: immediately and two weeks postoperatively for histologic examination. There was a 75% average clinical improvement observed in pitted, facial acne scars after laser treatment. Complete wound healing occurred between six and eight days. On histologic examination, complete re-epithelialization was observed at two weeks. Erythema occurred in all patients after laser treatment and lasted longer than three months in 10 patients (50%). Postinflammatory hyperpigmentation occurred in 12 patients (60%) two to four weeks after laser treatment and lasted longer than three months in one patient (5%). One patient (5%) experienced mild hypopigmention. Mild to moderate, postoperative acne flare-up occurred in seven patients (35%). No other adverse effects were observed. In conclusion, resurfacing with a dual-mode Er:YAG laser is a safe and effective treatment modality for pitted, facial acne scars. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Rhytidoplasty;Treatment Outcome
Rapid remission of severe pruritus from angiolymphoid hyperplasia with eosinophilia by pulsed dye laser therapy. A 48-year-old Japanese woman with angiolymphoid hyperplasia with eosinophilia (ALHE) was successfully treated with a flashlamp pulsed dye laser (585 nm, 450 micros pulse duration). The lesion was severely pruritic and had been enlarging slowly for 2 years but was resistant to conventional therapies, including topical, intralesional, and systemic corticosteroid, and cryotherapy. The severe pruritus immediately improved after the first treatment using the pulsed dye laser. The erythema and papules gradually improved without scarring and this was followed by further five treatments over approximately a 4-month interval. No clinical recurrences have been observed 1 year after completion of the treatment. We think that pulsed dye laser therapy is an effective treatment for ALHE in both Japanese as well as Caucasian patients. Pulsed dye laser therapy is also helpful in reducing the pruritus in ALHE patients. Angiolymphoid Hyperplasia with Eosinophilia;Ear, External;Female;Humans;Low-Level Light Therapy;Middle Aged;Treatment Outcome
Malignant melanoma occurring at the periphery of a giant congenital naevus previously treated with laser therapy. Adult;Female;Humans;Low-Level Light Therapy;Melanoma;Neoplasms, Radiation-Induced;Nevus, Pigmented;Skin Neoplasms
Efficacy of pulsed dye laser treatment of port wine stain malformations of the lower limb. BACKGROUND: There is relatively little information about treatment of port wine stains (PWS) of the lower limb. Few studies have specifically addressed the efficacy of pulsed dye laser (PDL) treatment of a PWS on the lower limb and there is no information on the relative efficacy at different sites on the lower limb. It has been suggested that treatment is not as successful when compared with the face

and postinflammatory hyperpigmentation has been reported to be a significant problem. OBJECTIVES: To review retrospectively patients who attended for PDL treatment of PWS affecting the lower limb and assess the efficacy and adverse effects with particular reference to skin site. METHODS: A retrospective review was carried out of patients attending the Leeds Dermatology Laser Centre for treatment of a PWS on the lower limb with a 585-nm PDL. RESULTS: A total of 52 sites in 39 patients were treated: 17 on the thigh, 31 on the lower leg and four on the foot. The mean number of sessions per patient was 14, with an excellent outcome in seven treatment sites (13.5%), good in 13 (25%), moderate in 21 (40.4%) and poor outcome in 11 (21.1%). Patients were generally pleased with their results with a mean improvement of 7 on a scale of 0-10. Perifollicular persistence of the PWS was observed in six sites (11.5%). Adverse effects occurred in 36 patients (92.3%), most commonly hyperpigmentation (87%). Six patients (15.4%) developed atrophic scarring and four (10.3%) hypopigmentation. Atrophie blanche-like changes were seen in four patients on the lower leg. Hypertrophic scarring was not seen. CONCLUSIONS: Although physician-assessed good or excellent responses of 38.5% are lower than frequently reported for other skin sites and adverse effects may be more frequent, patient satisfaction with treatment was generally high. Patients with PWS on the lower limb merit a trial of PDL treatment. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Infant;Leg Dermatoses;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Port-Wine Stain;Retrospective Studies;Treatment Outcome

Activation of molecular oxygen by infrared laser radiation in pigment-free aerobic systems. With the goal of mimicking the mechanisms of the biological effects of low energy laser irradiation, we have shown that infrared low intensity laser radiation causes oxygenation of the chemical traps of singlet oxygen dissolved in organic media and water saturated by air at normal atmospheric pressure. The photooxygenation rate was directly proportional to the oxygen concentration and strongly inhibited by the singlet oxygen quenchers. The maximum of the photooxygenation action spectrum coincided with the maximum of the oxygen absorption band at 1270 nm. The data provide unambiguous evidence that photooxygenation is determined by the reactive singlet (1)Delta(g)state formed as a result of direct laser excitation of molecular oxygen. Hence, activation of oxygen caused by its direct photoexcitation may occur in natural systems. Naphthacenes;Pigments, Biological;Singlet Oxygen;Carbon Tetrachloride;Oxygen Aerobiosis;Atmospheric Pressure;Carbon Tetrachloride;Infrared Rays;Lasers;Naphthacenes;Oxygen;Photochemistry;Pigments, Biological;Singlet Oxygen;Spectrum Analysis

Klippel-Trenaunay syndrome. A 28-year old woman with extensive right-leg capillary malformation associated with limb hypertrophy and limb-length discrepancy consistent with Klippel-Trenaunay syndrome is presented. Treatment with the new long-pulsed-dye lasers may lead to improvement of the superficial hemangioma component of the affected areas. Adult;Female;Humans;Klippel-Trenaunay-Weber Syndrome;Low-Level Light Therapy

[Hemangioma in the infant. Freezing, laser treatment--or waiting?]. Cryosurgery;Emergencies;Facial Neoplasms;Female;Follow-Up Studies;Hemangioma;Humans;Infant;Infant, Newborn;Laser Therapy;Low-Level Light Therapy;Male;Remission, Spontaneous;Skin Neoplasms

Transdermal approaches to pain in sports injury management. There is much lore about training room treatments for common overuse and traumatic musculoskeletal injuries. This review looks at the evidence behind many of the common transdermal treatments that are purported to reduce pain and inflammation and improve function. These include cryotherapy, laser treatments, electrical stimulation, ultrasound and phonophoresis, extracorporeal shock wave therapy, and iontophoresis. In addition, there are numerous over the counter sports creams and prescribed topical treatments that are routinely used. With the pressure to treat athletes safely and efficiently, sports practitioners must

rely on well-proven evidence to build the most effective treatment plans. Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Capsaicin;Dimethyl Sulfoxide Administration, Cutaneous;Analgesics, Non-Narcotic;Anti-Inflammatory Agents, Non-Steroidal;Athletic Injuries;Capsaicin;Cryotherapy;Dimethyl Sulfoxide;Electric Stimulation Therapy;Humans;Iontophoresis;Low-Level Light Therapy;Magnetics;Pain;Pain Management;Sports Medicine;Ultrasonic Therapy
[Therapeutic efficiency of a combined use of low-intensity laser radiation and actovegin in gastroduodenal ulcers with inhibited cicatrix formation]. AIM: To validate use of intravenous laser blood irradiation (ILBI) combined with actovegin administration in indolent gastroduodenal ulcers. MATERIAL AND METHODS: Modern endoscopic, morphological, device, biochemical techniques and radioimmunoassay were used in examination of 92 patients with indolent gastroduodenal ulcers aged 24 to 69 years. ILBI plus actovegin was given in failure of standard medicinal therapy. RESULTS: ILBI plus actovegin combination produced marked analgetic, anti-inflammatory and detoxication effects. Favourable trends were observed in the composition of gastric mucus, detoxication, reparative and metabolic processes in the gastroduodenal mucosa, neurohumoral regulation. CONCLUSION: Combination of ILBI with actovegin proved highly effective in indolent gastroduodenal ulcers. Anti-Ulcer Agents;Heme;Actovegin Adult;Aged;Anti-Ulcer Agents;Blood;Cicatrix;Combined Modality Therapy;Duodenal Ulcer;Female;Heme;Humans;Injections, Intramuscular;Low-Level Light Therapy;Male;Middle Aged;Stomach Ulcer;Treatment Outcome;Wound Healing
Abstracts of the 18th International Congress Laser Medicine. November 6-8, 2003, Florence, Italy. Animals;Humans;Laser Therapy;Lasers;Low-Level Light Therapy
Treatment of nasolabial folds and jowls with a noninvasive radiofrequency device. Face;Female;Humans;Low-Level Light Therapy;Male;Skin Aging
Laser-mediated photodynamic therapy of actinic keratoses. OBJECTIVE: To assess the safety and efficacy of the long-pulsed pulsed dye laser (LP PDL) (595 nm) with photodynamic therapy (PDT) for treatment of actinic keratoses (AKs). DESIGN: Prospective, controlled study with 10-day and 2-, 4-,6-, and 8-month follow-ups. SETTING: Clinical research center. PATIENTS Volunteer sample of 41 patients (age range, 35-91 years; skin types I-III) with AKs. INTERVENTION: Single treatment with application of topical 20% 5-aminolevulinic acid for 3 hours or 14 to 18 hours, followed by LP PDL irradiation at 595 nm. Controls received LP PDL irradiation alone. MAIN OUTCOME MEASURES: Safety assessments, treatment and recovery times, and efficacy assessments, including patient mean percentage of lesions cleared and distribution of patients by percentage of lesions cleared for different anatomic sites. RESULTS: We observed no to slight pain; slight to moderate erythema; no purpura, crusting, or scarring; treatment time of 1 lesion per second; and resolution of erythema by 7 to 14 days. The patient mean (95% confidence interval) percentage of head lesions (2620 lesions) cleared after 1 treatment was 99.47% (99.44%-99.50%) at 10 days, 98.19% (98.15%-98.23%) at 2 months, 92.94% (92.73%-93.14%) at 4 months, 91.65% (91.15%-92.15%) at 6 months, and 90.32% (78.10%-100%) at 8 months. For extremities (949 lesions), these were 83.1% (81.4%-84.9%) at 10 days, 75.5% (73.4-77.6) at 2 months, 70.9% (68.9%-72.8%) at 4 months, 92.0% (84.0%-100%) at 6 months, and 100% at 8 months. For trunk (53 lesions), these were 85% (74%-100%) at 10 days, 85% (74%-100%), and 65% (50%-80%) at 4 months. No difference in safety or efficacy was found between the 3-hour and 14- to 18-hour incubation times. In the laser-only control group, no decrease in lesions was observed. Among 31 patients with head lesions, 28 (90%) at 10 days, 19 (70%) at 2 months, 9 (47%) at 4 months, 5 (42%) at 6 months, and 5 (56%) at 8 months were completely (100%) clear following a single treatment. Skin biopsy specimens of nonresponding lesions demonstrated a high rate of squamous cell carcinoma and other non-AK neoplasms. CONCLUSIONS: Treatment of AKs using LP

PDL (595 nm) at nonpurpuric parameters following topical application of 5-aminolevulinic acid is safe and effective. The advantages may include minimal discomfort, rapid incubation treatment and recovery times, excellent posttreatment cosmesis, high efficacy rates with respect to head lesions, and practical applicability to large body surface areas. Adult;Aged;Aged, 80 and over;Follow-Up Studies;Humans;Keratosis;Low-Level Light Therapy;Male;Middle Aged;Outcome Assessment, Health Care;Patient Satisfaction;Photochemotherapy;Photosensitivity Disorders;Prospective Studies;Time Factors

Combination 532-nm and 1064-nm lasers for noninvasive skin rejuvenation and toning. BACKGROUND: Noninvasive techniques for skin rejuvenation are quickly becoming standard in the treatment of mild rhytids and overall skin toning. Multiple laser wavelengths and modalities have been used with varying degrees of success, including 532-nm, 585-nm, 1064-nm, 1320-nm, 1450-nm, and 1540-nm wavelengths. OBJECTIVES: To evaluate a combination technique using a long-pulsed, 532-nm potassium titanyl phosphate (KTP) laser and a long-pulsed 1064-nm Nd:YAG laser, separately and combined, for noninvasive photorejuvenation and skin toning and collagen enhancement and to establish efficacy and degree of success. DESIGN: Prospective nonrandomized study with longitudinal follow-up. SETTING: Private dermatologic surgery and laser practice. METHODS: A total of 150 patients, with skin types I through V, were treated with long-pulsed KTP 532-nm and long-pulsed Nd:YAG 1064-nm lasers, separately and combined. For the KTP 532-nm laser, the fluences varied between 7 to 15 J/cm2 at 7- to 20-millisecond pulse durations with a 2-mm handpiece and 6 to 15 J/cm2 at 30- to 50-millisecond pulses with a 4-mm handpiece. The 1064-nm Nd:YAG laser fluences were set at 24 to 30 J/cm2 for a 10-mm handpiece. These energies were delivered at 30- to 65-millisecond pulse durations. All subjects were treated at least 3 times and at most 6 times, depending on patient satisfaction level, at monthly intervals and were observed for up to 18 months after the last treatment. MAIN OUTCOME MEASURES: All patients were asked to fill out a "severity scale" on which redness, pigmentation, rhytids, skin tone/tightness, texture, and patient satisfaction were noted before and after each treatment. Redness, pigmentation, rhytids, skin tone/tightness, and texture were also evaluated by the physician and another observer. RESULTS: After 3 to 6 treatments, 50 patients treated with the 532-nm KTP laser alone showed improvement of 70% to 80% in redness and pigmentation, 30% to 50% in skin tone/tightening, 30% to 40% in skin texture, and 20% to 30% in rhytids. Another 50 patients treated with the 1064-nm Nd:YAG laser alone showed improvement of 10% to 20% in redness, 0% to 10% in pigmentation, 10% to 30% in skin tone/tightening, 20% to 30% in skin texture, and 10% to 30% in rhytids. The third group of 50 patients treated with both KTP and Nd:YAG lasers showed improvement of 70% to 80% in redness and pigmentation, 40% to 60% in skin tone/tightening, 40% to 60% in skin texture, and 30% to 40% in rhytids. Skin biopsy specimens taken at 1-, 2-, 3-, and 6-month intervals demonstrated new collagen formation. CONCLUSIONS: All 150 patients exhibited mild to moderate improvement in the appearance of rhytids, moderate improvement in skin toning and texture, and great improvement in the reduction of redness and pigmentation. The KTP laser used alone produced results superior to those of the Nd:YAG laser. Results from combination treatment with both KTP and Nd:YAG lasers were slightly superior to those achieved with either laser alone. Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Laser Therapy;Longitudinal Studies;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Skin Aging;Treatment Outcome

[Interventional MR-mammography: manipulator-assisted large core biopsy and interstitial laser therapy of tumors of the female breast]]. The present study investigated the clinical application of magnetic resonance (MR)-guided breast interventions, such as manipulator-assisted large core breast biopsy (LCBB) inside a 1.5 T whole-body magnet and MR-guided interstitial laser therapy (ILT).

Sixteen patients underwent LCBB and 1 additional patient underwent 4 sessions of ILT of a recurrent undifferentiated lymph node metastasis in the axilla using a Nd-YAG laser (1064 nm). Temperature changes of the tumor tissue during ILT were monitored using phase images of a gradient echo sequence (GRE) (TR/TE/FA = 25/12/30). In 5 patients the biopsy findings were histopathologically confirmed after open surgery. In 3 patients, the biopsy missed one tubular and one ductal carcinoma; one invasive carcinoma was underestimated. Eight patients with benign findings are still in the follow-up period. The heating zone during ILT was well delineated on subtracted phase images. No severe adverse events were observed with LCBB or ILT. MR-guided breast biopsies are feasible with the manipulator system inside a whole-body 1.5 Tesla MR scanner. GRE information is suitable for therapy monitoring during ILT within the tumor. Further studies are necessary to evaluate the accuracy of the manipulator system and the efficacy of ILT in the treatment of breast lesions. Aged;Biopsy;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Mammography;Monitoring, Physiologic

Photodynamic therapy with topical aminolevulinic acid and pulsed dye laser irradiation for sebaceous hyperplasia. Successful and long-standing eradication of sebaceous hyperplasia has remained difficult due to the propensity of these lesions to be extensive. Current treatments include excision, electrodesiccation, laser vaporization, and oral isotretinoin, each often associated with unacceptable side effects or lesional recurrence. The purpose of this study was to evaluate the safety and effectiveness of laser-assisted photodynamic therapy using topical 5-aminolevulinic acid (5-ALA) and 595 nm pulsed dye laser (PDL) irradiation for the treatment of sebaceous hyperplasia. Ten patients with sebaceous hyperplasia received 1 or 2 treatments at 6 week intervals with topical 20% 5-ALA followed 1 hour later by 595 nm PDL irradiation. Matched lesions served as controls and were either treated with PDL alone or were left untreated. Patients were evaluated at regular intervals for 3 months. Results demonstrated that combination topical 5-ALA and PDL treatment effected better clinical results than PDL treatment alone. No changes were observed in untreated control lesions. Side effects were mild and limited to transient erythema, edema, and focal crusting. It is the conclusion of the authors that laser-assisted photodynamic therapy with topical 5-ALA and PDL irradiation can achieve safe and effective improvement of sebaceous hyperplasia. Further study is warranted to determine the longevity of the clinical results observed. Photosensitizing Agents;Aminolevulinic Acid Administration, Cutaneous;Adult;Aminolevulinic Acid;Female;Humans;Hyperplasia;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Sebaceous Gland Diseases;Treatment Outcome

Scar management. Scarring has major psychological and physical repercussions--for example, scarring on the face and visible regions of the body can be very distressing for the patient, whether it is simple acne scars or large, raised surgical or traumatic scars. This article discusses the process of scar formation, the differences between scars and proposes a number of ways in which the nurse can manage scars. Silicones Beauty;Cicatrix;Cicatrix, Hypertrophic;Humans;Keloid;Low-Level Light Therapy;Massage;Pressure;Silicones;Surgery, Plastic;Wound Healing

Effects of infrared and low-power laser irradiation on cell viability, glutathione and glutathione-related enzyme activities in primary rat hepatocytes. BACKGROUND AND PURPOSE: Both infrared and low-power laser have been applied to improve circulation, wound repair, and pain control. Infrared and low-power laser therapies have the potential for stimulating enzyme activities which might contribute to increased glutathione (GSH) concentration and provide protection against oxidative damage. This study investigated cell viability, and GSH and its related enzyme activities in rat hepatocytes after irradiation. METHODS: Hepatocytes were isolated from 8-week-old male Sprague-Dawley rats and the cultures were divided into infrared, laser, and control groups. The cells were treated with infrared and low-power laser at a distance of 35 cm for 20 minutes. The cell

morphology, lactate dehydrogenase (LDH) leakage, lipid peroxidation, GSH concentration, GSH peroxidase, GSH reductase (GRd), and GSH S-transferase activities were measured after irradiation. RESULTS: The morphology and LDH leakage of hepatocytes in the irradiation groups did not differ significantly from those of the control group. After infrared irradiation, a significant decrease in thiobarbituric acid-reactive substances and an increase in GSH concentration were found after 48 hours of incubation compared to the control group ($p < 0.05$). Furthermore, laser irradiation resulted in a significant increase in GRd activity after 48 hours of incubation compared to the control group ($p < 0.05$). A 48-hour incubation period produced greater GRd activity in all groups compared to a 24-hour period ($p < 0.05$). CONCLUSIONS: Irradiation did not damage rat hepatocytes in this study. Infrared was shown to stimulate GSH production, while laser irradiation increased GRd activity.
L-Lactate Dehydrogenase;Glutathione Peroxidase;Glutathione Reductase;Glutathione Transferase;Glutathione Analysis of Variance;Animals;Cell Survival;Cells, Cultured;Glutathione;Glutathione Peroxidase;Glutathione Reductase;Glutathione Transferase;Infrared Rays;L-Lactate Dehydrogenase;Lipid Peroxidation;Liver;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley

Laser light prevents apoptosis in Cho K-1 cell line. OBJECTIVE: The present study investigated the effects of low-level laser therapy (LLLT) on the mitochondria, nucleus, and cytoskeleton of CHO K-1 cells by the use of specific fluorescent probes. BACKGROUND DATA: The use of LLLT has been recommended by several authors for acceleration of the healing process. The literature on the effects of LLLT in this process is highly contradictory because of difficulties in identifying its effects on cells. MATERIALS AND METHODS: CHO K-1 cells were cultivated using MEM containing 5% FBS and were irradiated or not with a semiconductor laser (lambda = 830 nm; phi approximately 0.8 mm; 10 mW; 2 J/cm2). The cells were incubated with specific fluorescent probes--0.1 microM for 30 min with 5,5', 6,6'-tetrachloro-1, 1',3,3'-tetraethyl-benzimidazol-carbocyanine iodide (JC-1) for the mitochondria; 5 mM for 5 min of 4',6'-diamidino, 2'-phenylindole (DAPI)for the nucleus, and 0.1 M of 1:100 PHEM of rhodamine-phalloidin during 1 h for the cytoskeleton--and were analyzed by epifluorescence. RESULTS: Positive biomodulatory effects were observed on irradiated cells compared to their controls as seen on JC-1, DAPI, and rhodamine-phalloidin labeling. Irradiated cells showed an increased level of cellular division, as evidenced by analyzing the intermediary filaments of the cytoskeleton and the chromosomes. Another important observation was that cells maintained under the condition of nutritional deficiency had both membrane and genetic material that was more preserved in comparison to the controls, in which the presence of an apoptotic nucleus could be observed in some cells. CONCLUSION: The results of the present study demonstrate that LLLT, in addition to providing positive biomodulation, acts in the re-establishment of cellular homeostasis when the cells are maintained under the condition of nutritional stress; it also prevents apoptosis in CHO K-1 cells.
Fluorescent Dyes;Immunologic Factors Animals;Apoptosis;CHO Cells;Cell Nucleus;Cricetinae;Cytoskeleton;Fluorescent Dyes;Immunologic Factors;Low-Level Light Therapy;Mitochondria

Transmeatal cochlear laser (TCL) treatment of cochlear dysfunction: a feasibility study for chronic tinnitus. Low-level-laser-therapy (LLLT) targeting the inner ear has been discussed as a therapeutic procedure for cochlear dysfunction such as chronic cochlear tinnitus or sensorineural hearing loss. Former studies demonstrate dose-dependent biological and physiological effects of LLLT such as enhanced recovery of peripheral nerve injuries, which could be of therapeutic interest in cochlear dysfunction. To date, in patients with chronic tinnitus mastoidal and transmeatal irradiation has been performed without systematic dosimetric assessment. However, light-dosimetric studies on human temporal bones demonstrated that controlled application of laserlight to the human cochlea depends on defined radiator position within the external auditory meatus. This feasibility study first

presents a laser application system enabling dose-controlled transmeatal cochlear laser-irradiation (TCL), as well as preliminary clinical results in patients with chronic cochlear tinnitus. The novel laser TCL-system, consisting of four diode lasers (lambda=635 nm-830 nm) and a new specific head-set applicator, was developed on the basis of dosimetric data from a former light-dosimetric study. In a preliminary clinical study, the TCL-system was applied to 35 patients with chronic tinnitus and sensorineural hearing loss. The chronic symptoms persisted after standard therapeutic procedures for at least six months, while retrocochlear or middle-ear pathologies have been ruled out. The patients were randomised and received five single diode laser treatments (lambda=635 nm, 7.8 mW cw, n=17 and lambda=830 nm, 20 mW cw, n=18) with a space irradiation of 4 J/cm2 site of maximal cochlear injury. For evaluation of laser-induced effects complete otolaryngologic examinations with audiometry, tinnitus masking and matching, and a tinnitus-self-assessment were performed before, during and after the laser-irradiation. The first clinical use of the TCL-system has been well tolerated without side-effects and produced no observable damage to the external, middle or inner ear. Changes of tinnitus loudness and tinnitus matching have been described. After a follow-up period of six months tinnitus loudness was attenuated in 13 of 35 irradiated patients, while two of 35 patients reported their tinnitus as totally absent. Hearing threshold levels and middle ear function remained unchanged. Further investigations by large double-blind placebo-controlled studies are mandatory for clinical evaluation of the presented TCL-system and its therapeutic effectiveness in acute and chronic cochlear dysfunction. Chronic Disease;Cochlear Diseases;Feasibility Studies;Humans;Laser Therapy;Middle Aged;Random Allocation;Tinnitus

Short-term plastic changes of the human nociceptive system following acute pain induced by capsaicin. OBJECTIVE: To investigate possible neuroplastic changes induced by pain in cerebral areas devoted to nociceptive input processing. METHODS: CO(2) laser-evoked potentials (LEPs) were recorded from 10 healthy subjects after stimulation of the right and left hand dorsum. Acute pain was obtained by topical application of capsaicin on the skin of right hand dorsum. LEPs were recorded after right and left hand stimulation before capsaicin, at the peak pain and 10-20 min after capsaicin removal. Right hand LEPs were evoked by laser stimuli delivered over the zone of secondary hyperalgesia during capsaicin and on both the zones of primary and secondary hyperalgesia after capsaicin removal. RESULTS: After right hand stimulation, the vertex LEPs, which are generated in the cingulate cortex, were significantly decreased in amplitude during capsaicin application and after capsaicin removal. Moreover, the topography of these potentials was modified after capsaicin removal, shifting from the central toward the parietal region. Dipolar modelling showed that the dipolar source in the anterior cingulate cortex moved backward after capsaicin removal. All these changes were not observed after stimulation of the left hand, contralateral to the application of capsaicin, thus suggesting that functional changes are selective for the painful skin and the adjacent territories. CONCLUSIONS: Our results suggest that acute cutaneous pain may inhibit the neural activity in regions of central nervous system processing nociceptive inputs and cortical representation of these inputs can be rapidly modified in presence of acute pain. Capsaicin Adult;Brain Mapping;Capsaicin;Cerebral Cortex;Evoked Potentials;Female;Functional Laterality;Hand;Humans;Hyperalgesia;Injections, Intradermal;Low-Level Light Therapy;Male;Neural Inhibition;Pain;Pain Measurement;Pain Threshold;Psychophysics;Reaction Time;Skin;Time Factors

Treatment of postmastectomy lymphedema with low-level laser therapy: a double blind, placebo-controlled trial. BACKGROUND: The current study describes the results of a double blind, placebo-controlled, randomized, single crossover trial of the treatment of patients with postmastectomy lymphedema (PML) with low-level laser therapy (LLLT). METHODS: Participants received placebo or one cycle or two cycles of LLLT to the axillary region of their affected arm. They were monitored for reductions in affected limb volume, upper body extracellular tissue fluid

distribution, dermal tonometry, and range of limb movement. RESULTS: There was no significant improvement reported immediately after any of the treatments. However, the mean affected limb volume was found to be significantly reduced at 1 month or 3 months of follow-up after 2 cycles of active laser treatment. Approximately 31% of subjects had a clinically significant reduction in the volume of their PML-affected arm (> 200 mLs) approximately 2-3 months after 2 cycles of treatment. There was no significant effect of placebo treatment, or one cycle of laser treatment, on affected limb volume. The extracellular fluid index of the affected and unaffected arms and torso were reported to be significantly reduced at 3 months after 2 cycles of laser therapy, and there was significant softening of the tissues in the affected upper arm. Treatment did not appear to improve range of movement of the affected arm. CONCLUSIONS: Two cycles of laser treatment were found to be effective in reducing the volume of the affected arm, extracellular fluid, and tissue hardness in approximately 33% of patients with postmastectomy lymphedema at 3 months after treatment. Adult;Aged;Aged, 80 and over;Axilla;Breast Neoplasms;Cross-Over Studies;Double-Blind Method;Extracellular Space;Female;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Postoperative Complications;Tonometry, Ocular

COX-2 inhibitors prolong trauma-induced elevations of iris hyaluronan. PURPOSE: To investigate whether and how treatment with COX-2 inhibitors influences hyaluronan responses to a standardized trauma, argon laser induced iritis, in rabbits. METHODS: Two different COX-2 inhibitors were used, SC-236 and rofecoxib. The drugs were administered orally, 6 mg/kg/day and 1.5 mg/kg/day respectively. Iris and aqueous humor hyaluronan concentrations were measured with a radiometric assay at different time points after laser irradiation. RESULTS: The hyaluronan concentration in the iris increased 3-4-fold with a peak concentration of 129.1 microg/g wet weight 2 days after laser irradiation. It then decreased to normal values after 1 week. In eyes treated with either of the COX-2 inhibitors, iris hyaluronan concentrations did not decrease as rapidly and were significantly higher at day 4 and 7 when compared to drug untreated eyes. CONCLUSION: Treatment with COX-2 inhibitors prolongs trauma induced elevation of iris content of endogenous hyaluronan. This may be, at least partly, due to an inhibition of interstitial fluid pressure regulation. Cyclooxygenase Inhibitors;Lactones;Pyrazoles;Sulfonamides;Sulfones;rofecoxib;Hyaluronic Acid Animals;Aqueous Humor;Cyclooxygenase Inhibitors;Hyaluronic Acid;Iris;Iritis;Lactones;Low-Level Light Therapy;Pyrazoles;Rabbits;Sulfonamides;Sulfones

Linear polarized infrared irradiation using Super Lizer is an effective treatment for multiple-type alopecia areata. BACKGROUND: Super Lizer trade mark is a linear polarized light instrument, which has been used with good effect in orthopedics and anesthesiology to treat arthralgia and neuralgia with a high output of infrared radiation. AIM: To test Super Lizer trade mark 's efficacy for the treatment of alopecia areata. METHODS: Fifteen patients over 18 years of age, diagnosed with alopecia areata and displaying symptoms of patchy hair loss, were topically irradiated with infrared radiation using the Super Lizer trade mark. The patients were irradiated intermittently for an interval of 3 min once every week or every 2 weeks. RESULTS: Seven of 15 (46.7%) of the irradiated areas showed hair regrowth 1.6 months earlier than the nonirradiated areas (chi2 official approval, P = 0.003). With regard to adverse effects caused by Super Lizer trade mark treatment, only one patient complained of a sensation of heat in the irradiated area. CONCLUSIONS: These findings suggest that Super Lizer trade mark, with its noninvasive properties, is a useful apparatus for the treatment of mild forms of alopecia areata. Adult;Aged;Alopecia;Female;Hair;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Acute ultrastructural changes of the trabecular meshwork after selective laser trabeculoplasty and low power argon laser trabeculoplasty. BACKGROUND AND OBJECTIVES: To compare the histopathological changes in the human trabecular meshwork after low power argon laser

trabeculoplasty (ALT) and selective laser trabeculoplasty (SLT) with a Q-switched, frequency-doubled, neodymium:yttrium-aluminium-garnet (Nd:YAG) laser. STUDY DESIGN/MATERIALS AND METHODS: In gonioscopically normal trabecular meshwork of three patients awaiting enucleation due to malignant melanoma of the choroid, SLT and ALT were performed 1-5 days prior to enucleation. In each eye, the lower half of trabecular meshwork received SLT, one quadrant low power (460 mW) ALT and one quadrant was left untreated. Specimens were evaluated with light and transmission electron microscopy. RESULTS: A sharp demarcation line was visible between the laser treated and untreated intact trabecular meshwork after ALT and SLT. Both lasers caused disruption of trabecular beams, but the extent of the damage was smaller after SLT. The collagen component of trabecular beams was mostly amorphous, the long-spacing collagen was scanty after ALT, but more abundant after SLT. In the intertrabecular spaces fragmented cells and tissue debris with only a few pigmented cells were observed. Some endothelial cells were desquamated, but appeared slightly better preserved after SLT than ALT. CONCLUSIONS: Our ultrastructural comparison of the morphological changes after low power ALT and SLT in patients demonstrated that both lasers caused splitting and fragmentation of the trabecular beams of the trabecular meshwork, but the extent of the damage was smaller and the preservation of long-spacing collagen better after SLT than after ALT. Argon Argon;Humans;Laser Therapy;Low-Level Light Therapy;Trabecular Meshwork;Trabeculectomy

Effects of low power Er:YAG laser on the tooth pulp-evoked jaw-opening reflex. BACKGROUND AND OBJECTIVES: Analgesic properties of laser irradiation have been of great interest in the field of dentistry. This study aimed at evaluating the analgesic effects of the Er:YAG laser system in rats during and after laser irradiation. STUDY DESIGN/MATERIALS AND METHODS: A pulsed Er:YAG laser was applied to the oral mucosa of the mandibular incisor at an energy density of approximately 0.1 J/cm(2)/pulse for 10 minutes at 10 Hz, and the integrated digastric muscle electromyogram in tooth pulp-evoked jaw-opening reflex was used as an index of the nociceptive response. RESULTS: Significant reflex suppression was observed 10 minutes after laser irradiation. The reflex amplitude started to return to its original level about 45 minutes after cessation of laser irradiation. CONCLUSIONS: The Er:YAG laser used at low output levels presented inhibitory effects on the tooth pulp-evoked jaw-opening reflex, suggesting that this laser system may be of use for pain control during various dental treatments. Analgesia;Animals;Dental Pulp;Jaw;Low-Level Light Therapy;Muscle, Skeletal;Rats;Rats, Wistar;Reaction Time;Reflex

Therapeutic modalities in the management of nonspecific neck pain. This article has surveyed several therapeutic modalities, including physical modalities, thermal modalities, electrical modalities, exercise therapy, behavioral therapy, education, and laser therapy. Of these, exercise, mobilization, and manipulation have the greatest support in the literature, whereas thermal treatments (including therapeutic ultrasound), and electrical therapies (including TENS) have little evidence of effectiveness and no evidence for more than a transient benefit. There is a need for well-controlled studies of educational programs and behavioral interventions specifically for patients with chronic neck pain, particularly because these interventions are often employed as part of a multimodal treatment program. Low-power laser treatment and magnetic therapy require some well-controlled studies before they can be recommended to neck pain patients or discarded as worthless interventions. Cervical traction and soft collars seem to be generally ineffective for nonspecific neck pain. Cervical Vertebrae;Clinical Trials as Topic;Humans;Neck Pain

[Effect of low level infrared laser irradiation on hemostasis (experimental study)]. Roentgenostructural, spectral analyses, functional testing of the hemostatic system in experimental animals demonstrated that infrared low-intensity laser radiation changes functional activity of proteins of the hemostatic system. The effect of the radiation depends on the dose and frequency of the radiation impulses. One of the complications is DIC-syndrome which may develop if the exposure

dose on the radiation point in tissues with blocked circulation reaches 9.5 mJ/cm2 and higher. Animals;Dose-Response Relationship, Radiation;Hemostasis;Infrared Rays;Low-Level Light Therapy;Male;Rats;Rats, Wistar

[Role of genetic factors in responses to low-level magnetic and laser therapy in patients with cardiac diseases]. NOS3 protein, human;Nitric Oxide Synthase;Nitric Oxide Synthase Type III;Peptidyl-Dipeptidase A Blood Pressure;Cardiovascular Diseases;Erythrocytes;Gene Expression;Genes;Humans;Hypertension;Infrared Rays;Low-Level Light Therapy;Lymphocytes;Myocardial Ischemia;Nitric Oxide Synthase;Nitric Oxide Synthase Type III;Peptidyl-Dipeptidase A;Polymorphism, Genetic

[Efficacy of laser therapy in patients with ischemic heart disease]. Modification of erythrocytic membrane and the trend in clinicofunctional indices were studied in 93 patients with angina of effort (FC i-IV) in the course of treatment with laser radiation (group 1) and imitation of laser radiation (group 2). In patients of group 1 the treatment resulted in stabilization of cell membrane accompanied with positive cardiodynamic changes. Lipid Peroxides Erythrocyte Membrane;Humans;Lipid Peroxidation;Lipid Peroxides;Low-Level Light Therapy;Male;Myocardial Contraction;Myocardial Ischemia;Osmotic Fragility;Ventricular Function, Left

[Effect of low-power laser irradiation on the structure and properties of protein molecules under non-specific energy absorbance]. The influence of the helium-neon laser emission on HSA was investigated at present work by means of the fluorescent probe MNBIS (4-morpholino-7-oxy-7-H-benzo-[de]-benzo-[4,5]-imidazo-[2,1-a]- izoquinolin-5-sulfonic acid) sensitive to protein conformational changes using. Fluorescence spectra parameters of the probe and kinetics of probe interaction with protein molecules were analyzed. Possible mechanisms of the helium-neon laser irradiation on water-protein solution structure are discussed. Fluorescent Dyes;Proteins;Serum Albumin;Solutions;Water;Helium;Tyrosine;Neon;Tryptophan Fluorescent Dyes;Helium;Humans;Hydrogen-Ion Concentration;Kinetics;Lasers;Molecular Structure;Neon;Protein Binding;Protein Conformation;Proteins;Radiation Dosage;Serum Albumin;Solutions;Spectrometry, Fluorescence;Tryptophan;Tyrosine;Water

[Diffused traumatic dirt and decorative tattooing. Removal by Q-switched lasers]. BACKGROUND AND OBJECTIVE: Pigment fanning or spread is one complication of decorative tattooing, but is also seen after traumatic tattoos. The reason for this spreading remains unclear. While excision of the diffused pigment was previously considered the treatment of choice, today destruction of the pigment with Q-switched laser systems is the therapy with the highest efficiency and lowest rate of side effects. Therefore areas of pigment spread should be excised only in rare exceptional cases. PATIENTS/METHODS: 4 patients with pigment fanning after permanent make up and traumatic tattooing of the periorbital region were treated with the Q-switched ruby (694 nm) and Q-switched Nd:YAG (1064 nm) lasers. RESULTS: All patients showed a significant (70-80%) clearance of the spread pigment; two had complete clearing. Side effects such as hyper- or hypopigmentation, scarring or ink darkening were not seen. CONCLUSIONS: The Q-switched ruby- and Q-switched Nd:YAG-lasers are a therapeutic modality for pigment fanning with high efficiency and low rate of side effects. Attempts of explanation for pigment spread after tattoos are given, but further histological and electron microscopical investigations are needed to find the pathogenetic mechanism. Cosmetics;Pigments, Biological Child;Cosmetics;Diffusion;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Pigments, Biological;Skin;Tattooing;Treatment Outcome

[Magnetic laser therapy in the treatment of apical periodontitis]. A new method for the treatment of apical periodontitis, making use of Optodan laser, differs from the known method by more rapid periapical tissue regeneration, which is paralleled by high antiinflammatory effect of

magnetic laser therapy at early stages of treatment. Adolescent;Adult;Aged;Humans;Low-Level Light Therapy;Magnetics;Middle Aged;Periapical Periodontitis;Regeneration;Tooth;Treatment Outcome

Pulsed dye laser treatment of superficial basal cell carcinoma: realistic or not? Adult;Aged;Aged, 80 and over;Carcinoma, Basal Cell;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Skin Neoplasms

Low-level 809 nm GaAlAs laser irradiation increases the proliferation rate of human laryngeal carcinoma cells in vitro. The aim of the study was to investigate the effect of low-level 809 nm laser irradiation on the proliferation rate of human larynx carcinoma cells in vitro. Epithelial tumor cells were obtained from a laryngeal carcinoma and cultured under standard conditions. For laser treatment the cells were spread on 96-well tissue culture plates. Sixty-six cell cultures were irradiated with an 809 nm GaAlAs laser. Another 66 served as controls. Power output was 10 mW(cw) and the time of exposure 75-300 s per well, corresponding to an energy fluence of 1.96-7.84 J/cm2. Subsequent to laser treatment, the cultures were incubated for 72 h. The proliferation rate was determined by means of fluorescence activity of a redox indicator (Alamar Blue Assay) added to the cultures immediately after the respective treatment. The indicator is reduced by metabolic activity related to cellular growth. Proliferation was determined up to 72 h after laser application. The irradiated cells revealed a considerably higher proliferation activity. The differences were highly significant up to 72 h after irradiation (Mann-Whitney U test, $p < 0.001$). A cellular responsiveness of human laryngeal carcinoma cells to low-level laser irradiation is obvious. The cell line is therefore suitable for basic research investigations concerning the biological mechanisms of LLLT on cells. Arsenicals;gallium arsenide;Gallium Aged;Arsenicals;Carcinoma;Cell Division;Epithelial Cells;Gallium;Humans;Laryngeal Neoplasms;Low-Level Light Therapy;Male;Time Factors;Tumor Cells, Cultured

Increased fibroblast proliferation induced by light emitting diode and low power laser irradiation. BACKGROUND AND OBJECTIVE: As Light Emitting Diode (LED) devices are commercially introduced as an alternative for Low Level Laser (LLL) Therapy, the ability of LED in influencing wound healing processes at cellular level was examined. STUDY DESIGN/MATERIALS AND METHODS: Cultured fibroblasts were treated in a controlled, randomized manner, during three consecutive days, either with an infrared LLL or with a LED light source emitting several wavelengths (950 nm, 660 nm and 570 nm) and respective power outputs. Treatment duration varied in relation to varying surface energy densities (radiant exposures). RESULTS: Statistical analysis revealed a higher rate of proliferation ($p < 0.001$) in all irradiated cultures in comparison with the controls. Green light yielded a significantly higher number of cells, than red ($p < 0.001$) and infrared LED light ($p < 0.001$) and than the cultures irradiated with the LLL ($p < 0.001$); the red probe provided a higher increase ($p < 0.001$) than the infrared LED probe and than the LLL source. CONCLUSION: LED and LLL irradiation resulted in an increased fibroblast proliferation in vitro. This study therefore postulates possible stimulatory effects on wound healing in vivo at the applied dosimetric parameters. Animals;Cell Count;Cell Division;Cells, Cultured;Chick Embryo;Dose-Response Relationship, Radiation;Fibroblasts;Infrared Rays;Light;Low-Level Light Therapy;Time Factors

Effect of low-power GaAlAs laser (660 nm) on bone structure and cell activity: an experimental animal study. Low-level laser therapy (LLLT) is increasingly being used in the regeneration of soft tissue. In the regeneration of hard tissue, it has already been shown that the biomodulation effect of lasers repairs bones more quickly. We studied the activity in bone cells after LLLT close to the site of the bone injury. The femurs of 48 rats were perforated (24 in the irradiated group and 24 in the control group) and the irradiated group was treated with a GaAlAs laser of 660 nm, 10 J/cm2 of radiant exposure on the 2nd, 4th, 6th and 8th days after surgery (DAS). We carried out histomorphometry

analysis of the bone. We found that activity was higher in the irradiated group than in the control group: (a) bone volume at 5 DAS (p=0.035); (b) osteoblast surface at 15 DAS (p=0.0002); (c) mineral apposition rate at 15 and 25 DAS (p=0.0008 and 0.006); (d) osteoclast surface at 5 DAS and 25 DAS (p=0.049 and p=0.0028); and (e) eroded surface (p=0.0032). We concluded that LLLT increases the activity in bone cells (resorption and formation) around the site of the repair without changing the bone structure. Arsenicals;gallium arsenide;Gallium Animals;Arsenicals;Bone Remodeling;Disease Models, Animal;Femur;Gallium;Low-Level Light Therapy;Male;Osteoblasts;Osteoclasts;Rats;Rats, Wistar

No effect of GA-AS (904 nm) laser irradiation on the intact skin of the injured rat sciatic nerve. We evaluated the electrophysiological and histopathological effects of low-energy gallium arsenide (904 nm) laser irradiation on the intact skin injured rat sciatic nerve. Twenty-four male Wistar rats were divided into three groups (n=8 each). At the level of proximal third of the femur the sciatic nerve was crushed bilaterally with an aneurysm clip (Aesculap FE 751, Tuttingen, Germany) for half a second. A gallium arsenide laser (wavelength 904 nm, pulse duration 220 ns, peak power per pulse 27 W, spot size 0.28 cm2, pulse repetition rate 16, 128 and 1000 Hz; total applied energy density 0.31, 2.48 and 19 J/cm2) was applied to the right sciatic nerve for 15 min daily at the same time on 7 consecutive days. The same procedure was performed on the left sciatic nerve of same animal, but without radiation emission, and this was accepted as control. Compound muscle action potentials were recorded from right and left sides in all three groups before surgery, just at the end of injury, at the 24th hour and on the 14th and 21st days of injury in all rats using a BIOPAC MP 100 Acquisition System Version 3.5.7 (Santa Barbara, USA). BIOPAC Acknowledge Analysis Software (ACK 100 W) was used to measure CMAP amplitude, area, proximal and distal latency, total duration and conduction velocity. Twenty-one days after injury, the rats were sacrificed. The sciatic nerves of the operated parts were harvested from the right and left sides. Histopathological evaluation was performed by light microscopy. Statistical evaluation was done using analysis of variance for two factors (right and left sides) repeated-measures (CMAP variables within groups) and the Tukey-Kramer Honestly Significant Difference test (CMAP variables between laser groups). The significance was set at $p < 0.05$. No statistically significant difference ($p > 0.05$) was found regarding the amplitude, area, duration and conduction velocity of CMAP for each applied dose (0.31, 2.48 and 19 J/cm2) on the irradiated (right) side and the control (left) side, or between irradiated groups. Twenty-one days after injury there were no qualitative differences in the morphological pattern of the regenerated nerve fibres in either irradiated (0.31, 2.48 and 19 J/cm2) or control nerves when evaluated by light microscopy. This study showed that low-energy GaAs irradiation did not have any effect on the injured rat sciatic nerve. Arsenicals;gallium arsenide;Gallium Action Potentials;Animals;Arsenicals;Disease Models, Animal;Gallium;Low-Level Light Therapy;Male;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve;Skin Physiological Phenomena;Transcutaneous Electric Nerve Stimulation

Effect of low-level laser irradiation on osteoglycin gene expression in osteoblasts. Many studies have attempted to elucidate the mechanism of the biostimulatory effects of low-level laser irradiation (LLLI), but the molecular basis of these effects remains obscure. We investigated the stimulatory effect of LLLI on bone formation during the early proliferation stage of cultured osteoblastic cells. A mouse calvaria-derived osteoblastic cell line, MC3T3-E1, was utilised to perform a cDNA microarray hybridisation to identify genes that induced expression by LLLI at the early stage. Among those genes that showed at least a twofold increased expression, the osteoglycin/mimecan gene was upregulated 2.3-fold at 2 h after LLLI. Osteoglycin is a small leucine-rich proteoglycan (SLRP) of the extracellular matrix which was previously called the osteoinductive factor. SLRP are abundantly contained in the bone matrix, cartilage cells and connective tissues, and are thought to regulate cell

proliferation, differentiation and adhesion in close association with collagen and many other growth factors. We investigated the time-related expression of this gene by LLLI using a reverse transcription polymerase chain reaction (RT-PCR) method, and more precisely with a real-time PCR method, and found increases of 1.5-2-fold at 2-4 h after LLLI compared with the non-irradiated controls. These results suggest that the increased expression of the osteoglycin gene by LLLI in the early proliferation stage of cultured osteoblastic cells may play an important role in the stimulation of bone formation in concert with matrix proteins and growth factors. Glycoproteins;Intercellular Signaling Peptides and Proteins;Ogn protein, mouse 3T3 Cells;Animals;Computer Systems;Gene Expression;Glycoproteins;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mice;Oligonucleotide Array Sequence Analysis;Osteoblasts;Reverse Transcriptase Polymerase Chain Reaction;Time Factors;Up-Regulation
Efficacy of low-level laser therapy in the management of stage III decubitus ulcers: a prospective, observer-blinded multicentre randomised clinical trial. Low-level laser therapy (LLLT) has been suggested as a promising treatment option for open wounds. In view of the absence of randomised studies with sufficiently large sample sizes, we assessed the efficacy of LLLT in the treatment of stage III decubitus ulcers. We performed a prospective, observer-blinded multicentre randomised clinical trial to assess the effect of LLLT as adjuvant to standard decubitus care. A total of 86 patients were enrolled into the study. Treatment was the prevailing consensus decubitus treatment (n=47); one group (n=39) had LLLT in addition, five times a week over a period of 6 weeks. The primary outcome measure was the absolute (mm2) and relative (%) wound size reduction at 6 weeks compared to baseline. Secondary outcome measures were the number of patients developing a stage IV ulcer during the study period, and the median change in Norton scores at 6 weeks compared to baseline. Based on the intention-to-treat principle, using last-observation-carried-forward analyses, Mann-Whitney U tests showed that the differences between the two groups in terms of absolute improvement (p=0.23) and relative improvement (p=0.42) were not significant. Because the wound size areas were non-normally distributed, we also analysed the data after logarithmic transformation of the wound size measurements. No significant difference in log(e) improvement scores between groups could be demonstrated (unpaired t-test: p=0.59). During the treatment period 11% of the patients in the control group and 8% of the patients in the LLLT group developed a stage IV decubitus ulcer (Fisher's exact test: p=0.72). The patients' Norton scores did not change during the treatment period. In this trial we found no evidence that justifies using low-level laser therapy as an adjuvant to the consensus decubitus ulcer treatment. Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pressure Ulcer;Prospective Studies;Radiotherapy, Adjuvant;Severity of Illness Index;Single-Blind Method;Treatment Outcome;Wound Healing
[Magnetic and laser therapy of acute ischemic stroke]. The paper presents the technique of frequency-modulated magnetolaser therapy (FMMLT) used in combined treatment of 121 patients with ischemic stroke in acute period. The results were compared with those in the control group of 30 patients who received conventional drug treatment. The results of the comparison allowed the author to recommend FMMLT in ischemic stroke especially in the period of "therapeutic window". Acute Disease;Adult;Aged;Brain Ischemia;Cerebrovascular Circulation;Electromagnetic Fields;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Stroke
[Laser-, ultraphono-, and acupuncture in complex treatment of patients with hypertension]. 368 patients with hypertensive disease stage I and II were examined and treated either with laser puncture or acupuncture. Laser puncture was effective at stage I of hypertensive disease while acupuncture had a more potent hypotensive effect and can be used both in hypertensive disease stage I and II. Action on the acupuncture points and zones normalizes also parameters of the central and peripheral hemodynamics in hypertensive patients. Acoustic Stimulation;Acupuncture

Therapy;Adult;Aged;Electrocardiography;Female;Hemodynamics;Humans;Hypertension;Low-Level Light Therapy;Male;Middle Aged;Physical Therapy Modalities;Severity of Illness Index;Treatment Outcome
[Combined low-intensity laser radiation in renal tuberculosis]. Combined external radiation in the projection of the kidneys and intravascular laser blood radiation by applying an AZOR-2K apparatus were used in the combined treatment of 54 patients with tuberculosis of the urinary system. Analysis of the biochemical and immunological parameters of the patients' peripheral blood before and 3 weeks and 3 months after the combined treatment provided evidence suggesting a decrease in the magnitude of lipid peroxidation, an increase in the antioxidative status, and a reduction in the level of metabolites that affect on the development of the intoxication syndrome. The clinical findings suggest that the combined treatment has a beneficial impact on the course of renal tuberculosis, as appeared as better functional indices of urinary organs. Immunoglobulin M Adult;Female;Humans;Immunoglobulin M;Low-Level Light Therapy;Male;T-Lymphocytes;Tuberculosis, Renal
Interventions for treating plantar heel pain. BACKGROUND: Ten percent of people may experience pain under the heel (plantar heel pain) at some time. Injections, insoles, heel pads, strapping and surgery have been common forms of treatment offered. The absolute and relative effectiveness of these interventions are poorly understood. OBJECTIVES: The objective of this review was to identify and evaluate the evidence for effectiveness of treatments for plantar heel pain. SEARCH STRATEGY: We searched the Cochrane Musculoskeletal Injuries Group specialised register (September 2002), the Cochrane Central Register of Controlled Trials Register (The Cochrane Library issue 3, 2002), MEDLINE (1966 to September 2002), EMBASE (1988 to September 2002) and reference lists of articles and dissertations. Four podiatry journals were handsearched to 1998. We contacted all UK schools of podiatry to identify dissertations on the management of heel pain, and investigators in the field to identify unpublished data or research in progress. No language restrictions were applied. SELECTION CRITERIA: Randomised and quasi-randomised trials of interventions for plantar heel pain in adults. DATA COLLECTION AND ANALYSIS: Two reviewers independently evaluated randomised controlled trials for inclusion, extracted data and assessed trial quality. Additional information was obtained by direct contact with investigators. No poolable data were identified. Where measures of variance were available we have calculated the weighted mean differences based on visual analogue scale (VAS) scores. MAIN RESULTS: Nineteen randomised trials involving 1626 participants were included. Trial quality was generally poor, and pooling of data was not conducted. All trials measured heel pain as the primary outcome. Seven trials evaluated interventions against placebo/dummy or no treatment. There was limited evidence for the effectiveness of topical corticosteroid administered by iontophoresis, i.e using an electric current, in reducing pain. There was some evidence for the effectiveness of injected corticosteroid providing temporary relief of pain. There was conflicting evidence for the effectiveness of low energy extracorporeal shock wave therapy in reducing night pain, resting pain and pressure pain in the short term (6 and 12 weeks) and therefore its effectiveness remains equivocal. In individuals with chronic pain (longer than six months), there was limited evidence for the effectiveness of dorsiflexion night splints in reducing pain. There was no evidence to support the effectiveness of therapeutic ultrasound, low-intensity laser therapy, exposure to an electron generating device or insoles with magnetic foil. No randomised trials evaluating surgery, or radiotherapy against a randomly allocated control population were identified. There was limited evidence for the superiority of corticosteroid injections over orthotic devices. REVIEWER'S CONCLUSIONS: Although there is limited evidence for the effectiveness of local corticosteroid therapy, the effectiveness of other frequently employed treatments in altering the clinical course of plantar heel pain has not been established in randomised

controlled trials. At the moment there is limited evidence upon which to base clinical practice. Treatments that are used to reduce heel pain seem to bring only marginal gains over no treatment and control therapies such as stretching exercises. Steroid injections are a popular method of treating the condition but only seem to be useful in the short term and only to a small degree. Orthoses should be cautiously prescribed for those patients who stand for long periods; there is limited evidence that stretching exercises and heel pads are associated with better outcomes than custom made orthoses in people who stand for more than eight hours per day. Well designed and conducted randomised trials are required. Adrenal Cortex Hormones Adrenal Cortex Hormones;Adult;Electromagnetic Phenomena;Foot Diseases;Humans;Laser Therapy;Orthotic Devices;Pain Management;Pain Measurement;Randomized Controlled Trials as Topic;Ultrasonic Therapy

Flashlamp-pumped pulsed dye laser in treatment of port-wine stains. OBJECTIVE: To assess the effectiveness of the flashlamp-pumped pulsed dye laser (Photogeneca V, Synosure Corp, Boston, United States) in the treatment of port-wine stains. METHODS: One hundred and ninety-four consecutive patients with port-wine stains were treated with a flashlamp-pumped pulsed dye laser in Peking Union Medical College Hospital from January 1998 to August 1999. RESULTS: Of 194 patients who completed treatment, 56.2% had more than 60% fading of the lesion and only 6.7% had less than 20% fading. An average of 3.6 treatments were needed to achieve more than 60% fading. The response was better in children than in adults, although the difference was not significant. Pigmentary change (usually transient) occurred in 3.1% of patients. CONCLUSIONS: This study confirms the efficacy of the flashlamp-pumped pulsed dye laser in the treatment of port-wine stains in children and adults. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Treatment Outcome

[Low level laser irradiation and its effect on repair processes in the skin]. INTRODUCTION: Application of laser beams for therapeutic purposes is of relatively recent date, but today there is no field of medicine where lasers cannot be used. PHYSICAL CHARACTERISTICS OF LASER RADIATION: Laser radiation is a type of electromagnetic radiation with some specific characteristics such as coherence, monochromaticity and parallelity. TYPES OF LASER DEVICES: Nowadays, there are many laser devices on the market used in medicine and dentistry. According to the type of their active medium, lasers can be classified as solid, gas, semiconductor and liquid. EFFECTS OF LOW LEVEL LASER THERAPY ON BIOLOGICAL SYSTEMS: The exact mechanism of action of low level laser therapy is still not completely understood. Its basic feature is to modulate cell behaviour, without causing significant temperature increase. During irradiation of a tissue with a laser beam, an interaction between cells and photons takes place--photochemical reaction. After a cell absorbs the photon, the photon stops existing, and its energy is incorporated into the molecule which has absorbed it. Once this energy is transferred to different biomolecules, it can be transferred to other molecules as well. The energy transferred to the molecule can increase its kinetic energy, and activate or deactivate enzymes or alter physical or chemical properties of main macromolecules. EFFECTS OF LOW LEVEL LASER THERAPY ON WOUND HEALING: Effects of low level laser therapy on wound healing process is one of the most fully studied aspects of this type of therapy. It affects all phases of this very complex process. This paper offers a more detailed analysis of these aspects. Humans;Low-Level Light Therapy;Skin;Wound Healing

Angiolymphoid hyperplasia with eosinophilia responsive to pulsed dye laser. Angiolymphoid hyperplasia with eosinophilia is an uncommon, benign, but potentially disfiguring vascular proliferation. Angiolymphoid hyperplasia with eosinophilia commonly affects women in the third decade. Although a benign process, significant morbidity can occur including bleeding, pain, and disfigurement. Several therapies have been attempted including curettage, cryotherapy, retinoids,

excision, and various lasers. We report on a case of angiolymphoid hyperplasia with eosinophilia responding to pulsed dye laser therapy (585 nm) (SPTL-1a, Candela Corp, Wayland, Mass). Adult;Angiolymphoid Hyperplasia with Eosinophilia;Ear, External;Esthetics;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Severity of Illness Index;Treatment Outcome
Thermal response of human skin epidermis to 595-nm laser irradiation at high incident dosages and long pulse durations in conjunction with cryogen spray cooling: an ex-vivo study. BACKGROUND AND OBJECTIVES: Improved laser treatment of cutaneous hypervascular lesions is expected by utilizing higher incident dosages, longer pulse durations and longer wavelengths than those currently used in clinical settings. However, simply increasing the incident dosage will also increase the risk of nonspecific thermal injury to the epidermis due to light absorption by melanin. In this study, we investigated the thermal response of human skin epidermis to 595-nm wavelength laser irradiation at high incident dosages (up to 20 J/cm(2)) and long pulse durations (up to 40 milliseconds) in conjunction with cryogen spray cooling (CSC) using ex-vivo human skin samples. STUDY DESIGN/MATERIALS AND METHODS: The Candela V-beam trade mark laser (595-nm wavelength) was used in the experiments. Ex-vivo human skin samples (Fitzpatrick types I-VI) were irradiated at the incident dosages D(0) = 4, 6, 10, 15, and 20 J/cm(2), laser pulse durations tau(laser) = 1.5, 10, and 40 milliseconds, without and with CSC (refrigerant-134A, spurt duration tau(CSC) = 100 milliseconds). Thermal injury to the epidermis was evaluated by histological observations. RESULTS: Under the same incident dosage, longer pulse durations led to reduced thermal injury to the epidermis. Without CSC, no demonstrable thermal injury to the epidermis was observed in skin types I-II irradiated at the incident dosage as high as 15 J/cm(2), and in skin types III-IV at 10 J/cm(2). When CSC was applied, no evidence of thermal injury to the epidermis was present in skin types I-II even when irradiated at the maximum available incident dosage of the laser system (20 J/cm(2)). In skin types III-IV, no demonstrable thermal injury to the epidermis was observed when using incident dosage as high as 15 J/cm(2) in conjunction with CSC. In skin type VI, thermal injury to the epidermis could not be avoided even at the setting D(0) = 4 J/cm(2), tau(laser) = 40 milliseconds in conjunction with CSC. CONCLUSIONS: For a given incident dosage, longer pulse durations help reduce thermal injury to the epidermis. When a 100-millisecond cryogen spurt is applied, thermal injury to the epidermis can be prevented in ex-vivo skin types I-IV when irradiated at higher incident dosages (15-20 J/cm(2)) than those currently used in clinical settings. Further studies on optimizing the CSC parameters in conjunction with the laser irradiation parameters are needed to protect skin types V-VI from thermal injury to the epidermis. Adult;Aged;Cryosurgery;Dose-Response Relationship, Radiation;Epidermis;Female;Hot Temperature;Humans;In Vitro Techniques;Low-Level Light Therapy;Middle Aged;Time Factors;Trauma Severity Indices
Nonablative laser and light therapy: an approach to patient and device selection. Nonablative laser and light therapy is a relatively novel modality for the improvement of the visual appearance of photodamaged, scarred, and injured skin. A number of different wavelengths and devices have been purported to be efficacious for the delivery of nonablative therapy. Among the features that can be addressed are red spots and telangiectasia, pigmentation and lentigines, and their daily routines while benefiting from the cumulative effects of skin rejuvenation. Cosmetic Techniques;Humans;Laser Therapy;Low-Level Light Therapy;Skin Aging
[Chest neuropathy and thoracalgia. Physical methods of treatment]. Anti-Inflammatory Agents, Non-Steroidal Anti-Inflammatory Agents, Non-Steroidal;Baths;Chest Pain;Exercise Therapy;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Thoracic Diseases;Thorax
[Application of natural and preformed physical factors during medical rehabilitation in participants of military conflicts]. The authors have performed individually adjusted complexes of balneophysiotherapeutic procedures in soldiers and officers who had taken part in local military

conflicts. Functional and biochemical investigations show that in those military who had no wounds but had a weak posttraumatic stress reaction the above complexes are rather effective.
Insulin;Hydrocortisone Adult;Baths;Combat Disorders;Electrocardiography;Exercise Therapy;Humans;Hydrocortisone;Insulin;Low-Level Light Therapy;Male;Middle Aged;Military Personnel;Mud Therapy;Physical Therapy Modalities;Stress Disorders, Post-Traumatic

[Antioxidant action and therapeutic efficacy of laser irradiation of blood in patients with ischemic heart disease]. Laser irradiation in therapeutic doses (gamma = 632.8 nm, 14 mW) has an antioxidant effect in blood irradiation in vitro as shown by activation of superoxide dismutase (SOD) which is a key enzyme of the antioxidant system (AOS) and suppression of lipid peroxidation. Adjuvant supravascular He-Ne laser irradiation of blood in combined therapy of 82 patients with ischemic heart disease (IHD) produces a positive trend in the clinical picture, hemostasis, lipid metabolism, blood SOD activity. Thereby, this method of laser hemotherapy is recommended for use in IHD patients. The dependence of the treatment results on the initial blood AOS necessitates consideration of AOS state in deciding on laser therapy in this group of patients.
Antioxidants;Free Radical Scavengers;Lipid Peroxides;Superoxide Dismutase Adult;Aged;Animals;Antioxidants;Blood;Electrocardiography;Female;Free Radical Scavengers;Humans;In Vitro Techniques;Lipid Peroxides;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia;Rabbits;Superoxide Dismutase

[Infrared laser therapy in complex treatment of patients with ischemic heart disease after aortocoronary bypass surgery]. Lipids Atrial Function, Left;Coronary Artery Bypass;Coronary Circulation;Exercise Test;Humans;Infrared Rays;Lipids;Low-Level Light Therapy;Middle Aged;Myocardial Ischemia

Low-power laser irradiation improves histomorphometrical parameters and bone matrix organization during tibia wound healing in rats. The influence of daily energy doses of 0.03, 0.3 and 0.9 J of He-Ne laser irradiation on the repair of surgically produced tibia damage was investigated in Wistar rats. Laser treatment was initiated 24 h after the trauma and continued daily for 7 or 14 days in two groups of nine rats (n=3 per laser dose and period). Two control groups (n=9 each) with injured tibiae were used. The course of healing was monitored using morphometrical analysis of the trabecular area. The organization of collagen fibers in the bone matrix and the histology of the tissue were evaluated using Picrosirius-polarization method and Masson's trichrome. After 7 days, there was a significant increase in the area of neoformed trabeculae in tibiae irradiated with 0.3 and 0.9 J compared to the controls. At a daily dose of 0.9 J (15 min of irradiation per day) the 7-day group showed a significant increase in trabecular bone growth compared to the 14-day group. However, the laser irradiation at the daily dose of 0.3 J produced no significant decrease in the trabecular area of the 14-day group compared to the 7-day group, but there was significant increase in the trabecular area of the 15-day controls compared to the 8-day controls. Irradiation increased the number of hypertrophic osteoclasts compared to non-irradiated injured tibiae (controls) on days 8 and 15. The Picrosirius-polarization method revealed bands of parallel collagen fibers (parallel-fibered bone) at the repair site of 14-day-irradiated tibiae, regardless of the dose. This organization improved when compared to 7-day-irradiated tibiae and control tibiae. These results show that low-level laser therapy stimulated the growth of the trabecular area and the concomitant invasion of osteoclasts during the first week, and hastened the organization of matrix collagen (parallel alignment of the fibers) in a second phase not seen in control, non-irradiated tibiae at the same period. The active osteoclasts that invaded the regenerating site were probably responsible for the decrease in trabecular area by the fourteenth day of irradiation. Animals;Dose-Response Relationship, Radiation;Fracture Healing;Lasers;Male;Rats;Rats, Wistar;Tibia;Tibial Fractures

Treatment of rosacea with intense pulsed light. Rosacea is a chronic disease that affects millions of men and women. Topical and oral antibiotics are effective, yet often leave individuals with treatment plateau associated erythema and persistent flushing. We investigated the use of intense pulsed light for treatment of the redness, flushing, and breakouts associated with rosacea. Thirty-two consecutive patients of Fitzpatrick skin types I-III underwent 1 to 7 treatments with intense pulsed light. Patients were assessed clinically and photographically. In addition, patients completed a detailed questionnaire regarding their response to treatment. Following treatment, eighty-three percent of patients had reduced redness, 75% noted reduced flushing and improved skin texture, and 64% noted fewer acneiform breakouts. Complications were minimal and transitory. It appears that intense pulsed light is an effective treatment for the signs and symptoms of rosacea and represents a new category of therapeutic options for the rosacea patient. Adult;Aged;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Rosacea

Remissions of psoriasis with excimer laser treatment. Humans;Low-Level Light Therapy;Multicenter Studies as Topic;Psoriasis;Remission Induction

[Lasers in skin resurfacing]. Biopsy;Humans;Laser Coagulation;Low-Level Light Therapy;Microcirculation;Rhytidoplasty;Skin;Skin Aging;Wound Healing

Transpupillary thermotherapy of juxtafoveal recurrent choroidal neovascularization. PURPOSE: To evaluate the effectiveness of low power transpupillary thermotherapy (TTT) in treating juxtafoveal recurrent choroidal neovascularization (CNV) after laser photocoagulation in patients with age-related macular degeneration (ARMD). METHODS: Eight eyes of eight patients with ARMD and juxtafoveal recurrent CNV were treated with low power TTT, delivered using an 810-nm diode laser with 350 mW, 2.0 mm spot, and 1-minute duration. Visual acuity (VA) ranged from 20/100 to 20/50. Treatment effect was evaluated by fluorescein angiography, indocyanine green angiography, and VA measurements (Early Treatment Diabetic Retinopathy Study) at 1-week, 2-week, and monthly follow-up visits. RESULTS: No retinal damage was visible ophthalmoscopically during treatment. At the first follow-up visit, seven eyes had obliteration of CNV and one eye required a second TTT application. VA was unchanged in six eyes, improved in one eye, and worsened in one eye. Recurrences occurred in all eyes between 1 and 7 months after TTT and were treated with photodynamic therapy (PDT). More than two PDT treatments were performed in each eye in the year after recurrence. CONCLUSIONS: Low power TTT is as able to close juxtafoveal recurrent CNV as is high power conventional laser photocoagulation but does not prevent recurrences. Further intervention with TTT in order to treat recurrences is under investigation. Coloring Agents;Indocyanine Green Aged;Choroidal Neovascularization;Coloring Agents;Female;Fluorescein Angiography;Follow-Up Studies;Fovea Centralis;Humans;Hyperthermia, Induced;Indocyanine Green;Low-Level Light Therapy;Macular Degeneration;Male;Pupil;Recurrence;Visual Acuity

[Treatment of inflammatory pyodestructive processes of the oral cavity, maxillofacial area, and neck by laser and magnetic-laser exposure of the carotid sinus using the Optodan laser apparatus]. This paper presents the priority original methods (patent No. 2101046, Russia) for the treatment of inflammatory pyodestructive processes in the oral cavity, maxillofacial area, and neck (odontogenic abscesses and phlegmons including those complicated by mediastinitis and sepsis), sinusitis, carbuncles and furuncles of face and neck skin, parotitis, sialadenitis, adenophlegmons, lymphadenitis, periotitis, alveolitis, arthritis, arthrosis of the temporomandibular joint, odontogenic and traumatic osteomyelitis, infected purulent traumas (including gunshot ones), fractures of the jaws, etc. making use of Optodan laser (patent No. 2014107, Russia) for laser and magnetic-laser therapy. Carotid Sinus;Cellulitis;Contraindications;Equipment Design;Face;Furunculosis;Humans;Low-Level Light Therapy;Magnetics;Neck;Skin Diseases, Infectious;Stomatognathic Diseases;Treatment Outcome

Low-level laser irradiation attenuates production of reactive oxygen species by human neutrophils. OBJECTIVE: The aim of this study was to examine the effects of low-level laser therapy (LLLT) on production of reactive oxygen (ROS) species by human neutrophils. BACKGROUND DATA: LLLT is an effective therapeutic modality for inflammatory conditions. MATERIALS AND METHODS: The laser device used was the infrared diode laser (GaAlAs), 830-nm continuous wave (150 mW/cm(2)). After irradiation, ROS production by neutrophils was measured using luminol-dependent chemiluminescence (LmCL) and expression of CD11b and CD16 on neutrophil surface was measured by flow cytometry. RESULTS: The LmCL response of neutrophils was reduced by laser irradiation at 60 min prior to the stimulation with opsonized zymosan and calcium ionophore. The attenuating effect of LLLT was larger in neutrophils of smokers than non-smokers, while the amount of produced ROS was larger in neutrophils of smokers. Expression of CD11b and CD16 on neutrophil surface was not affected by LLLT. CONCLUSION: Attenuation of ROS production by neutrophils may play a role in the effects of LLLT in the treatment of inflammatory tissues. There is a possible usage of LLLT to improve wound healing in smokers. CD11b Antigen;Reactive Oxygen Species;Receptors, IgG Adult;CD11b Antigen;Humans;Low-Level Light Therapy;Luminescent Measurements;Male;Neutrophils;Reactive Oxygen Species;Receptors, IgG;Smoking

Efficacy of the flashlamp-pumped pulsed-dye laser in nonsurgical delay of skin flaps. OBJECTIVE: The purpose of this article was to determine the effectiveness of laser delay by use of the flashlamp-pumped pulsed-dye laser operating at a wavelength of 585 nm; to elucidate the comparable or dissimilar macroscopic, microscopic, and hemodynamic changes between laser and surgical delay methods; and to clarify the possible mechanisms underlying the delay effect of laser. METHODS: A standardized caudally based random dorsal rat flap model was used in this study: Acute random skin flaps served as control subjects (group 1). Surgical delay was employed by incision of lateral longitudinal borders both without (group 2) and with (group 3) undermining, and laser delay methods were performed by laser irradiation of both lateral longitudinal borders (group 4) and the entire surface (group 5) of the proposed flap. Evaluation was done by histologic examination, India ink injection, laser Doppler perfusion imaging, and measurement of flap survival. RESULTS: Histologically, dilation and hypertrophy of subpapillary and subdermal vessels were evident in groups 2, 3, and 4; on the other hand, degranulation of mast cells in the vicinity of occluded vessels at the 1st hour of laser delay and a striking mast cell proliferation and degranulation in association with newly formed vessels (angiogenesis) at the 14th day of laser delay were prominent in group 5. India ink injections revealed longitudinally arranged large-caliber vessels and cross-filling between the vessels of adjacent territories in groups, 2, 3, and 4, but only small-caliber vessels in group 5. Compared with the acute flaps, both surgical and laser delay significantly increased the mean flap perfusion to the maximal levels after a 14-day delay period, and all delay procedures improved flap survival; the most significant increase in surviving area was observed in group 3, whereas the less significant increase in surviving area was in group 5. CONCLUSION: This study demonstrates that laser delay is as effective as surgical delay and that laser delay by lasering lateral borders leads to dilation and longitudinal rearrangement of the existing vessels rather than angiogenesis, whereas laser delay by lasering the entire surface results in delay effect by inducing angiogenesis due to activation and degranulation of the mast cells. Coloring Agents;chinese ink;Carbon Animals;Carbon;Coloring Agents;Graft Survival;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Statistics, Nonparametric;Surgical Flaps

Multipass treatment of photodamage using the pulse dye laser. BACKGROUND: Pulse dye lasers (PDLs) alter structural proteins in scars and photodamaged skin, in addition to their effects on dermal vasculature. The PDL has become an option in the treatment of photodamage. Although improvements to skin texture are generally modest when compared with ablative resurfacing, PDL offers a treatment with few side effects. A number of methods have been proposed in an effort to

improve treatment outcomes. These range from single, low-fluence treatment with no purpura to multiple passes and treatment sessions as well as purpuric doses. OBJECTIVE: To evaluate several of the PDL treatment methods to improve photorejuvenation outcomes while limiting the risk of side effects. METHODS: Twenty patients with photodamage were separated into two groups. Each group received a series of four single-pass treatments or four double-pass treatments at 2-week intervals. Treatments were done using a 595-nm PDL (PhotoGenica V-Star) and a 585-nm PDL (PhotoGenica V) at a pulse duration of 0.5 ms and a 10-mm handpiece. Treatment fluences were maintained below the individual's purpuric threshold, ranging from 3 to 4 J/cm2. Photos were taken before treatment and during follow-up. Efficacy of treatment was based on subjective grading of photos and by patient self-reporting. RESULTS: Multiple treatments resulted in improvements to skin tone and texture, including a reduction in the appearance of rhytids and, in particular, improved pigmentary evenness. There was no significant difference between laser or treatment methods. No side effects were noted. CONCLUSION: PDL treatments provide effective photorejuvenation with minimal risk of side effects. Adult;Aged;Face;Female;Humans;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Rhytidoplasty;Skin Aging;Statistics, Nonparametric;Treatment Outcome;Ultraviolet Rays

Variable pulse frequency-doubled Nd:YAG laser versus flashlamp-pumped pulsed dye laser in the treatment of port wine stains. The flashlamp-pumped pulsed dye laser (FPDL) is regarded as the gold standard in the treatment of port wine stains. The purpose of this prospective, intra-individual, comparative clinical study was to investigate whether a frequency-doubled variable pulsed Nd:YAG laser (frequency-doubled Nd:YAG) is equally as safe and effective as established lasers. Forty-three patients with port wine stains were included in the study. Test treatments were performed using the frequency-doubled Nd:YAG laser (532 nm; 4 mm psi; 5-50 ms; 5.5 to 15 J/cm2) versus the FPDL (585 nm; 450 micros; 7 mm psi; 6 J/cm2). After 6 weeks, a full lesional treatment was performed using the device and the parameters showing the best clearance and the fewest side effects. The clearance of the lesions was generally good to fair. With the exception of poor results at 5 ms and 5.5 J/cm2 with the frequency-doubled Nd:YAG laser, there were no significant differences between the two laser devices. Scar formation, nevertheless, occurred in only 3% of the FPDL-treated sites versus up to 18% of the frequency-doubled Nd:YAG sites, increasing with pulse duration. In port wine stains, the FPDL remains the therapy of choice because of the somewhat better results and a lower frequency of side effects, especially scarring. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain

308-nm excimer laser for the treatment of psoriasis: induration-based dosimetry. OBJECTIVE: To determine the response of stubborn psoriatic plaques to the 308-nm excimer laser. DESIGN: Controlled study with a before-after design. SETTING: A university-based clinical research center. PATIENTS: Adult subjects with recalcitrant plaque psoriasis that have not responded to other therapies for at least 2 months. INTERVENTIONS: Selected psoriatic plaques were treated with the 308-nm excimer laser. One lesion was left as a control. Each plaque was treated 2 times a week, with an initial dose based solely on the induration component of the modified Psoriasis Area and Severity Index score for that lesion. Subsequent treatments were twice a week with dosage increments up to 50%, based on the change in induration. Four final consolidation doses were given once the induration score was reduced to zero. RESULTS: Eighteen subjects were treated. There were 4 dropouts because of various scheduling problems. In the remaining 14 subjects, 44 plaques received a mean of 10 treatments (range, 4-14). Treatments were quick and well tolerated. The mean cumulative dose was 8.8 J/cm2 (range, 2.2-22.8 J/cm2). Compared with controls, treated plaques showed significant improvement (P<.001). The only adverse event was a mild sunburn-like reaction in 2 subjects after 1 treatment. CONCLUSIONS: Selective targeting of laser-generated 308-nm excimer radiation with this convenient subblistering dosage schedule based on induration allows for

individualized treatment plans for each plaque. Clearing of stubborn psoriatic lesions occurs rapidly and safely. Adult;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Outcome Assessment, Health Care;Psoriasis;Radiometry;Recurrence;Severity of Illness Index;Time Factors

Low level laser therapy (Classes I, II and III) for treating osteoarthritis. BACKGROUND: Osteoarthritis (OA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment for OA about 10 years ago, but its effectiveness is still controversial. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of OA. SEARCH STRATEGY: We searched MEDLINE, EMBASE, the Cochrane Musculoskeletal registry, the registry of the Rehabilitation and Related Therapies field and the Cochrane Controlled Trials Register up to December 31, 2002. SELECTION CRITERIA: Following an a priori protocol, only controlled clinical trials of LLLT for the treatment of patients with a clinical diagnosis of OA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials and abstracted data using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. MAIN RESULTS: Five trials were included, with 112 patients randomized to laser, 85 patients to placebo laser. Treatment duration ranged from 4 to 10 weeks. Pain was assessed by four trials. The pooled estimate (random effects) of three trials showed no statistically different effect on pain measured using a scale (SMD: -0.2, 95% CI: -1.0, +0.6), but there was statistically significant heterogeneity (p>0,05). Two of the trials showed no effect and one demonstrated very beneficial effects with laser. In another trial, with no scale-based pain outcome, significantly more patients reported pain relief (yes/no) with laser with an odds ratio of 0.05, (95% CI: 0.0 to 1.56). Other outcomes of joint tenderness, joint mobility and strength were not significant. REVIEWER'S CONCLUSIONS: For OA, the results are conflicting in different studies and may depend on the method of application and other features of the LLLT application. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. There is clearly a need to investigate the effects of these factors on LLLT effectiveness for OA in randomized controlled clinical trials. Hand;Humans;Low-Level Light Therapy;Osteoarthritis;Osteoarthritis, Hip;Osteoarthritis, Knee;Randomized Controlled Trials as Topic

Water status and LPO in rat tissues during massive blood loss and irradiation with He-Ne laser. We revealed a relationship between water balance and LPO in the myocardium, liver, and blood plasma during massive blood loss and irradiation with He-Ne laser. Low-intensity laser irradiation of the plasma inhibits LPO and normalizes water balance in rat tissues during massive blood loss. Thiobarbituric Acid Reactive Substances;Water Animals;Hemorrhage;Lasers;Lipid Peroxidation;Liver;Male;Myocardium;Plasma;Radiation;Rats;Thiobarbituric Acid Reactive Substances;Water

Office-based pulsed dye laser treatment for hemorrhagic telangiectasias and epistaxis. Deamino Arginine Vasopressin Ambulatory Care;Child;Deamino Arginine Vasopressin;Epistaxis;Follow-Up Studies;Humans;Laryngoscopes;Low-Level Light Therapy;Male;Premedication;Recurrence;Retreatment;Telangiectasia, Hereditary Hemorrhagic;Treatment Outcome
Growth-associated protein-43 is elevated in the injured rat sciatic nerve after low power laser irradiation. Low power laser irradiation (LPLI) has been used in the treatment of peripheral nerve injury. In this study, we verified its therapeutic effect on neuronal regeneration by finding elevated immunoreactivities (IRs) of growth-associated protein-43 (GAP-43), which is up-regulated during neuronal regeneration. Twenty Sprague-Dawley rats received a standardized crush injury of the sciatic nerve, mimicking the clinical situations accompanying partial axonotmesis. The injured nerve received calculated LPLI therapy immediately after injury and for 4 consecutive days thereafter. The walking movements of the animals were scored using the sciatic functional index (SFI). In the laser treated rats, the SFI level was higher in the laser treated animals at 3-4 weeks while the SFIs of the laser treated and untreated rats reached normal levels at 5 weeks after surgery. In immunocytochemical study, although GAP-43 IRs increased both in the untreated control and the LPLI treated groups after injury, the number of GAP-43 IR nerve fibers was much more increased in the LPLI group than those in the control group. The elevated numbers of GAP-43 IR nerve fibers reached a peak 3 weeks after injury, and then declined in both the untreated control and the LPLI groups at 5 weeks, with no differences in the numbers of GAP-43 IR nerve fibers of the two groups at this stage. This immunocytochemical study using GAP-43 antibody study shows for the first time that LPLI has an effect on the early stages of the nerve recovery process following sciatic nerve injury. GAP-43 Protein Animals;GAP-43 Protein;Immunohistochemistry;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Sciatic Nerve
A systematic review of low level laser therapy with location-specific doses for pain from chronic joint disorders. We investigated if low level laser therapy (LLLT) of the joint capsule can reduce pain in chronic joint disorders. A literature search identified 88 randomised controlled trials, of which 20 trials included patients with chronic joint disorders. Six trials were excluded for not irradiating the joint capsule. Three trials used doses lower than a dose range nominated a priori for reducing inflammation in the joint capsule. These trials found no significant difference between active and placebo treatments. The remaining 11 trials including 565 patients were of acceptable methodological quality with an average PEDro score of 6.9 (range 5-9). In these trials, LLLT within the suggested dose range was administered to the knee, temporomandibular or zygapophyseal joints. The results showed a mean weighted difference in change of pain on VAS of 29.8 mm (95% CI, 18.9 to 40.7) in favour of the active LLLT groups. Global health status improved for more patients in the active LLLT groups (relative risk of 0.52; 95% CI 0.36 to 0.76). Low level laser therapy with the suggested dose range significantly reduces pain and improves health status in chronic joint disorders, but the heterogeneity in patient samples, treatment procedures and trial design calls for cautious interpretation of the results. Arthralgia;Chronic Disease;Dose-Response Relationship, Radiation;Health Status;Humans;Inflammation;Joint Capsule;Low-Level Light Therapy;Pain Measurement;Randomized Controlled Trials as Topic;Treatment Outcome
Lasers, light, and acne. Acne vulgaris is a highly prevalent disease with significant potential for physical and emotional scarring. Acne lesions have long been noted to improve after exposure to sunlight. This improvement may be secondary to activation of endogenous porphyrins produced by Propionibacterium acnes. Recently, several investigators have presented studies in which light of particular wavelengths has been used to treat acne vulgaris. In this article, we review the results of

these studies as we look to the future of light-based acne treatment. Acne Vulgaris;Humans;Low-Level Light Therapy;Phototherapy

Methodology for characterizing heat removal mechanism in human skin during cryogen spray cooling. Cryogen spray cooling (CSC) reduces epidermal damage during laser treatment of various dermatoses. The goal of this study was to determine the heat removal mechanism in skin and quantify the amount in response to CSC. Thermocouples were imbedded in four model substrates with a range of thermal diffusivities, greater than three orders of magnitude in difference, to measure the temperature profiles in response to CSC and sapphire contact cooling, which removes heat completely by conduction. An algorithm solving an inverse heat conduction problem was subsequently used to quantify the amount of heat removal from the substrates using the measured temperatures. The interface thermal conductance and internal temperatures within the substrates were computed by a finite difference algorithm that solved the heat conduction equation. Results verify a marked increase in heat removal and interface thermal conductance with increasing thermal diffusivity. By estimation from the model substrate results, heat removal and interface thermal conductance values for skin were obtained. Data demonstrate that during CSC, evaporation is the dominant heat transfer mechanism in materials with higher thermal diffusivities; however, conductive cooling dominates in substrates with lower thermal diffusivities such as skin. Aerosol Propellants;Hydrocarbons, Fluorinated;norflurane Administration, Cutaneous;Aerosol Propellants;Algorithms;Animals;Burns;Cold Temperature;Computer Simulation;Cryotherapy;Freezing;Hot Temperature;Humans;Hydrocarbons, Fluorinated;Low-Level Light Therapy;Models, Biological;Skin;Skin Temperature;Temperature;Thermal Conductivity

A systematic histologic analysis of nonablative laser therapy in a porcine model using the pulsed dye laser. BACKGROUND: To our knowledge, no systematic analysis of nonablative laser therapy has been performed. OBJECTIVE: To alter the parameters (fluence, spot size, pulse duration, and use of cooling spray) for the pulsed dye laser to determine the precise settings that would yield the most favorable dermal remodeling in a porcine model. METHODS: Research was conducted in an animal laboratory at Albany Medical College. An anesthetized Yucatan miniature pig was subjected to a pulsed dye laser at various parameters. After 10 weeks, the laser-treated areas were harvested and processed for blinded, randomized, histologic evaluation. Negative (nontreated skin) and positive (ablative carbon dioxide laser-treated skin) controls were compared with the nonablative pulsed dye laser-treated areas. MAIN OUTCOME MEASURES: Quantitative assessment of collagen band width and cells per high-power field and qualitative assessment of epidermal and dermal changes. RESULTS: A significant difference (P<.001) in collagen band width was evident when nonablative laser-treated skin and carbon dioxide ablative laser-treated skin specimens were compared with untreated skin specimens, but no significant (P =.18) difference existed between the nonablative and ablative modalities. Similarly, cellular hypertrophy, as measured by high-power field, corroborated the previous findings. Furthermore, a higher fluence, a larger spot size, and a longer pulse duration proved statistically significant for increased collagen band width (P =.01, P<.001, and P<.001, respectively), and a larger spot size and a longer pulse duration exhibited significance for cells per high-power field (P =.02 and P =.009, respectively), with a trend toward significance for higher fluence (P =.09). Overall, the dermis was considerably thicker for nonablative and ablative laser-treated areas compared with untreated skin, but this could not be quantified because the depth exceeded the punch biopsy instrument. The epidermis remained unchanged. CONCLUSIONS: The nonablative pulsed dye laser has demonstrated favorable histologic evidence of dermal remodeling, and its effects were similar to histologic changes seen with the carbon dioxide ablative laser, both of which were statistically significant compared with untreated skin, as seen in this preliminary animal model. Animals;Low-Level Light Therapy;Skin;Swine, Miniature

[Low-intensive laser irradiation in combined treatment of lower limbs atherosclerotic lesions]. Seventy-one subjects entered this study. The control group consisted of 12 healthy subjects, the comparative group included 15 patients who received standard therapy of vascular diseases but without physiotherapy. The study group consisted of 44 patients whose treatment was supplemented with laser irradiation. Angiography, ultrasonic dopplerography, laser flowmetry, oxygenometry were applied for control of treatment efficacy. Regional ischemia was evaluated with detection of pO2 of foot. LT increased oxygenation of foot soft tissues in patients with low primary pO2 and decreased in ones with higher. As a result the number of patients with low pO2 ($0 < pO2 < 20$) decreased from 13.7 to 4.5%, with middle pO2 ($20 < pO2 < 40$) increased from 27.3 to 50.0%, with high pO2 ($pO2 = 40$) decreased from 59.0 to 45.5%. Redistribution in favor of $20 < pO2 < 40$ is regarded as normalizing effect of LT. It is concluded that LT increases oxygenation of foot soft tissues in patients with low primary pO2 and decreased in ones with higher. Arteriosclerosis Obliterans;Combined Modality Therapy;Humans;Low-Level Light Therapy;Lower Extremity;Microcirculation;Peripheral Vascular Diseases;Treatment Outcome

Ultrastructural and immunological features of experimental cutaneous leishmaniasis after treatment with intralesional hypertonic sodium chloride and CO2 laser rays. This study investigated the mechanism of action and efficacy of CO2 laser rays and hypertonic sodium chloride (NaCl) with different concentrations in treatment of cutaneous leishmaniasis (CL) as assessed clinically, parasitologically, histopathologically by light & transmission electron microscopy (TEM) and immunologically by RT-PCR for gene expression of interleukin-13 (IL-13). Eighty mice were divided into four groups. The first was non infected control group (n=16) and the second was infected and served as non-treated control (n=16). The third (n=32) and fourth groups (n=16) were subjected to NaCl injection and CO2 laser respectively. Results showed that clinical healing by CO2 laser were nearly similar to normal appearance, but differed according to concentration of NaCl, as confirmed by ultrastructure and immunohistopathologic features of the host cells and surrounding skin tissue. IL-13 mRNA was significantly decreased after treatment denoting that Th2 cytokine (IL-13) is important for the development of strategies to prevent the induction of pathologic processes. It is concluded that CO2 laser then 7% NaCl are good modalities for CL treatment and is recommended wherever possible. Hypertonic Solutions;Interleukin-13;RNA, Messenger;Sodium Chloride Animals;Dose-Response Relationship, Drug;Female;Humans;Hypertonic Solutions;Interleukin-13;Leishmania;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Male;Mice;RNA, Messenger;Skin;Sodium Chloride

Laser literature watch. Animals;Humans;Laser Therapy;Lasers;Low-Level Light Therapy

He-Ne laser on microcrystalline arthropathies. OBJECTIVE: The objective of this work is to assess the anti-inflammatory capacity of He-Ne laser therapy as determined by the plasmatic levels of inflammatory markers, fibrinogen, and TNFalpha and by histopathological study in rats with arthropathy induced by calcium pyrophosphate crystals. BACKGROUND DATA: Microcrystalline arthropathies are a group of diseases characterized by the deposit of different crystals in joints. MATERIALS AND METHODS: Two milligrams of dicalcium pyrophosphate crystals (DCPP) were injected in both joints of the lower limbs of rats during 2 days. A group was treated with laser of He-Ne (6 mW) on the injected joints during 3 consecutive days. After 96 h of the first injection, animals were sacrificed to determine TNFalpha using the ELISA method and fibrinogen was assessed using spectrophotometry. Sections from the lower limbs were used for histopathology. RESULTS: A statistically significant increase ($p < 0.001$) in plasma fibrinogen levels and TNFalpha was noted between the control group and the laser-treated group. The histological transversal section of a posterior limb joint of a rat injected with DCPP showed fibroadipose tissue with diffuse chronic

infiltrate. The histopathology of the group of rats injected with DCPP and subsequently treated with He-Ne laser showed no inflammatory response. CONCLUSION: He-Ne laser treatment in the microcrystalline arthropathy induced in rats by DCPP injection might have an antiinflammatory effect, evaluated by fibrinogen plasma levels and TNF-alpha (inflammatory markers) and by the histopathology regressive process. Tumor Necrosis Factor-alpha;Helium;Neon;Fibrinogen;Calcium Pyrophosphate Analysis of Variance;Animals;Arthralgia;Calcium Pyrophosphate;Enzyme-Linked Immunosorbent Assay;Female;Fibrinogen;Helium;Low-Level Light Therapy;Neon;Rats;Statistics, Nonparametric;Tumor Necrosis Factor-alpha

Effect of NASA light-emitting diode irradiation on molecular changes for wound healing in diabetic mice. OBJECTIVE: The purpose of this study was to assess the changes in gene expression of near-infrared light therapy in a model of impaired wound healing. BACKGROUND DATA: Light-Emitting Diodes (LED), originally developed for NASA plant growth experiments in space, show promise for delivering light deep into tissues of the body to promote wound healing and human tissue growth. In this paper we present the effects of LED treatment on wounds in a genetically diabetic mouse model. MATERIALS AND METHODS: Polyvinyl acetal (PVA) sponges were subcutaneously implanted in the dorsum of BKS.Cg-m +/+ Lepr(db) mice. LED treatments were given once daily, and at the sacrifice day, the sponges, incision line and skin over the sponges were harvested and used for RNA extraction. The RNA was subsequently analyzed by cDNA array. RESULTS: Our studies have revealed certain tissue regenerating genes that were significantly upregulated upon LED treatment when compared to the untreated sample. Integrins, laminin, gap junction proteins, and kinesin superfamily motor proteins are some of the genes involved during regeneration process. These are some of the genes that were identified upon gene array experiments with RNA isolated from sponges from the wound site in mouse with LED treatment. CONCLUSION: We believe that the use of NASA light-emitting diodes (LED) for light therapy will greatly enhance the natural wound healing process, and more quickly return the patient to a preinjury/illness level of activity. This work is supported and managed through the Defense Advanced Research Projects Agency (DARPA) and NASA Marshall Space Flight Center-SBIR Program. Polyvinyls Animals;Diabetes Mellitus, Experimental;Gene Expression;Infrared Rays;Low-Level Light Therapy;Mice;Molecular Biology;Polyvinyls;Skin;United States;United States National Aeronautics and Space Administration;Wound Healing

Effectiveness of low-level laser therapy in temporomandibular disorder. OBJECTIVE: To investigate the effectiveness of low-level laser therapy in the treatment of temporomandibular disorder and to compare treatment effects in myogenic and arthrogenic cases. METHODS: Thirty-five patients were evaluated by magnetic resonance imaging and randomly allocated to active treatment (n=20) and placebo treatment (n= 15) groups. In addition to a daily exercise program, all patients were treated with fifteen sessions of low-level laser therapy. Pain, joint motion, number of joint sounds and tender points were assessed. RESULTS: Significant reduction in pain was observed in both active and placebo treatment groups. Active and passive maximum mouth opening, lateral motion, number of tender points were significantly improved only in the active treatment group. Treatment effects in myogenic and arthrogenic cases were similar. CONCLUSION: Low-level laser therapy can be considered as an alternative physical modality in the management of temporomandibular disorder. Adult;Combined Modality Therapy;Exercise Therapy;Facial Pain;Female;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Radiography;Temporomandibular Joint;Temporomandibular Joint Disorders;Treatment Outcome

[Principles of treatment and prophylaxis of chronic prostatitis]. Adult;Chronic Disease;Humans;Infrared Rays;Laser Therapy;Low-Level Light Therapy;Male;Prostatitis;Retrospective Studies;Spermatozoa

[Effect of low-intensity laser radiation on the functional potential of neutrophilic granulocytes in blood of tumor-bearing animals]. Peripheral blood was sampled for cytochemical assay of cationic proteins from three groups of animals--intact ones, those with tumor C45 and bearers of the same tumor treated with helium-laser radiation and chemotherapy. Radiotherapy involved such manifestations of enhanced nonspecific antitumor resistance and, in particular, mobilization of the cellular component, as increased number of neutrophils containing cationic protein granules and relatively high levels of such proteins in them. Cytochemical assay of cationic proteins in neutrophil granules may serve as a criterion of nonspecific antitumor resistance assessment. Blood Proteins;Cations;Neoplasm Proteins;Helium Animals;Antineoplastic Combined Chemotherapy Protocols;Blood Proteins;Cations;Chemotherapy, Adjuvant;Female;Granulocytes;Helium;Low-Level Light Therapy;Neoplasm Proteins;Neoplasms, Experimental;Neutrophils;Rats;Treatment Outcome

[Physiological and therapeutic value of the so-called weak impacts in physiotherapy]. Humans;Leg;Low-Level Light Therapy;Osteochondritis;Pain Measurement;Physical Therapy Modalities;Short-Wave Therapy;Treatment Outcome

Treatment of lupus erythematosus with pulsed dye laser. BACKGROUND AND OBJECTIVES: The treatment of cutaneous lupus erythematosus (CLE) with dye and argon laser has been evaluated in a number of articles in recent years. The improvement of telangiectasias and chronic erythema of the cutaneous lesions was based on the selective photothermolysis ablation of the dilated capillaries and venules. STUDY DESIGN/MATERIALS AND METHODS: We describe the results of the treatment of cutaneous lesions of 14 patients; eight with discoid lupus erythematosus (DLE) and six with systemic lupus erythematosus (SLE). Three patients received a treatment with flashlamp pulsed dye laser (FPDL) (585 nm, 450 microseconds) with fluences in the range from 5 to 7.75 J/cm(2); the other 11 patients were treated with long pulsed dye laser (LPDL) (595 nm, 1.5-10 milliseconds) with fluences in the range from 6 to 13 J/cm(2) depending on the pulse duration. RESULTS: During a median follow-up of 10 months, we observed an average improvement in over 60% of the lesions. A few side effects were observed in all patients: four had transient hyperpigmentation and one patient had light scarring. Three patients had a relapse after more than 1 year; they were then offered conventional treatment. CONCLUSIONS: We confirm that pulsed dye laser is a good alternative treatment for the erythema in active cutaneous lesions of lupus erythematosus (LE).
Adult;Female;Humans;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Lupus Erythematosus, Discoid;Lupus Erythematosus, Systemic;Male;Middle Aged;Retrospective Studies

Effects of low intensity infrared laser radiation on the water transport in the isolated toad urinary bladder. BACKGROUND AND OBJECTIVES: The aim of this work was to study the effects of low intensity laser radiation on water transport in the toad bladder in vitro. STUDY DESIGN/MATERIALS AND METHODS: The water flow through the membrane was measured gravimetrically in bag preparations of the membrane. RESULTS: Laser radiation did not alter the water transport in the presence nor in the absence of vasopressin. In contrast, when the hemibladders were previously treated with vasopressin, the laser decreased by approximately 33.70% arginine-vasopressin (AVP)-mediated water transport. Laser radiation increased 3'5'-cyclic adenosine monophosphate (3'5'-cAMP) mediated water transport by approximately 23%. The association of laser radiation with indomethacin (IND) did not affect AVP-mediated water transport. CONCLUSIONS: This data suggests that the laser may have two effects on AVP-mediated water transport: one inhibitory effect on 3'5'-cAMP synthesis by inhibiting the adenylate cyclase complex and another stimulatory effect by inhibiting nucleotide-phosphodiesterase activity. Our results also indicate that the laser does not

interfere in the prostaglandins biosynthesis induced by AVP. Arginine Vasopressin;Indomethacin Animals;Arginine Vasopressin;Biological Transport;Bufo marinus;Indomethacin;Low-Level Light Therapy;Male;Urinary Bladder;Water-Electrolyte Balance

Effects of a therapeutic laser on the ultrastructural morphology of repairing medial collateral ligament in a rat model. BACKGROUND AND OBJECTIVES: Low energy laser therapy has been shown to enhance mechanical strength of healing medial collateral ligament (MCL) in rats. The present study investigated its effects on the ultrastructural morphology and collagen fibril profile of healing MCL in rats. STUDY DESIGN/MATERIALS AND METHODS: Thirty-two mature male Sprague-Dawley (SD) rats were used. Twenty-four underwent surgical transection to their right MCLs and eight received only skin wound. Immediately after surgery, eight of the MCL transected rats were treated with a single dose of laser therapy at 63.2 J cm(-2), eight were treated with a single dose of laser therapy at 31.6 J cm(-2), the rest had no treatment and served as control. At 3 and 6 weeks after surgery, the MCLs were harvested and examined with electron microscopy for collagen fibril size, distribution, and alignment. RESULTS: Significant differences ($P < 0.001$) were found in fibril diameters from the same anatomical site and time period among different groups. The mass-averaged diameters of the laser-treated (64.99-186.29 nm) and sham (64.74-204.34 nm) groups were larger than the control group (58.66-85.89 nm). The collagen fibrils occupied 42.55-59.78, 42.63-53.94, and 36.92-71.64% of the total cross-sectional areas in the laser-treated, control and sham groups, respectively. Mode obliquity was 0.53-0.84 among the three groups. CONCLUSIONS: Single application of low energy laser therapy increases the collagen fibril size of healing MCLs in rats. Collagen Animals;Collagen;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Microscopy, Electron;Rats;Rats, Sprague-Dawley;Wound Healing

Effect of low-level GaAlAs laser irradiation on the proliferation rate of human periodontal ligament fibroblasts: an in vitro study. AIM: The aim of this in vitro study was to evaluate a potential stimulatory effect of low-level laser irradiation on the proliferation of human periodontal ligament fibroblasts (PDLF). MATERIALS AND METHODS: PDLF obtained from third molar periodontal ligaments were cultured under standard conditions and spread on 96-well tissue culture plates. Subconfluent monolayers were irradiated with an 809-nm diode laser operated at a power output of 10 mW in the continuous wave (cw) mode at energy fluences of 1.96-7.84 Jcm-2. The variable irradiation parameters were the time of exposure (75-300 s per well) and the number of irradiations (1-3). After laser treatment, the cultures were incubated for 24 h. The proliferation rate of the lased and control cultures was determined by means of fluorescence activity of a reduction-oxidation (REDOX) indicator (Alamar Blue Assay) added to the cell culture. Proliferation, expressed in relative fluorescence units (RFU), was determined 24, 48 and 72 h after irradiation. RESULTS: The irradiated cells revealed a considerably higher proliferation activity than the controls. The differences were significant up to 72 h after irradiation (Mann-Whitney U-test, $p<0.05$). CONCLUSION: A cellular effect of the soft laser application is clearly discernible. Clinical studies are needed to evaluate whether the application of low-level laser therapy might be beneficial in regenerative periodontal therapy. Coloring Agents;Indicators and Reagents;Oxazines;Xanthenes;resazurin;Gallium;Aluminum;Arsenic Aluminum;Arsenic;Cell Division;Cells, Cultured;Coloring Agents;Fibroblasts;Fluorescence;Gallium;Humans;Indicators and Reagents;Lasers;Oxazines;Periodontal Ligament;Radiation Dosage;Statistics, Nonparametric;Time Factors;Xanthenes

Role of gallium arsenide laser irradiation at 890 nm as an adjunctive to anti-tuberculosis drugs in the treatment of pulmonary tuberculosis. BACKGROUND: Tuberculosis is a global emergency with about nine million people developing disease every year. The long duration of treatment has emerged as a major obstacle in the control of tuberculosis. There is a need for development of new

drugs and or shortened therapy. METHODS: The present study was carried out to explore whether any benefit could be achieved by the addition of low level energy laser therapy (LLLT) to the conventional anti-tubercular chemotherapy. One-hundred-thirty new sputum smear positive patients of pulmonary tuberculosis were enrolled to evaluate the bio-stimulatory effects of Gallium Arsenide laser irradiation at 890 nm, as an adjuvant therapy. These patients were randomly divided into two groups to receive either LLLT or sham irradiation (control) concomitantly with anti-tuberculosis chemotherpy. RESULTS: The patients treated with semiconductor laser as an adjuvant therapy along with anti-tuberculosis drugs had a faster clearance of tubercle bacilli from the sputum as compared to the control group (P value at :45 days=0.1392, 60 days=0.0117, 75 days=0.00805, 90 days=0.00739). CONCLUSIONS: These findings provide preliminary evidence that low level laser therapy with Gallium Arsenide laser may be a promising adjunctive therapy for patients with tuberculosis. Faster conversion of sputum should prevent the development of resistant mutants. Antitubercular Agents Antitubercular Agents;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Tuberculosis, Pulmonary

[Low intensity laser radiation in complex therapy of patients with vascular obliterating atherosclerosis of low extremities]. It is shown that laser therapy used in a multiple-modality treatment of patients with obliterating atherosclerosis of vessels of the interior limbs presenting with stage I-III ischemia permits achieving a substantial clinical effect manifested subjectively by fewer compliants or disappearance thereof in a proportion of patients, which fact is corraborated by objective findings such as increase in peripheral, volumetric blood flow and lower degree, in some patients, of ischemia of the extremities, improvement in processes of microcirculation and hemocoagulation. The use of laser radiation and pneumocompression combined in treatment of patients with chronic arterial insufficiency of the lower extremities of atherosclerotic genesis has been shown to have a more marked and appreciable effect. The studies made broaden our possibilities of conservative non-medicamentous treatment of obliterating atherosclerosis of vessels of the lower extremities. Aged;Arteriosclerosis Obliterans;Blood Vessels;Combined Modality Therapy;Female;Hemorheology;Humans;Leg;Low-Level Light Therapy;Male;Middle Aged;Regional Blood Flow;Treatment Outcome

[Low intensity laser irradiation in therapy of elderly patients with occlusive artery diseases]. Shown in the paper is a novel complex approach to the treatment of occlusion affections of arteries by He-Ne and infrared laseropuncture. As many as 80 patients having a history of the above health problem 5 years in duration were kept under medical supervision. Patient age ranged between 50 to 78 years. Laseropuncture was carried out with the aid of the infrared laser stimulator [symbol: see text]-001 (wavelenth 0.89 mm with continuous-wave pulse operation, pulse power 8 W) and 111 He-Ne laser (wavelength 0.63 mm, power density 5 mW/cm2, spot diameter 25 mm). 88.2 percent of patients derived apparent therapeutic benefit, 11.8 percent demonstrating a satisfactory clinical effect. Aged;Aorta, Abdominal;Arterial Occlusive Diseases;Humans;Low-Level Light Therapy;Middle Aged;Tibial Arteries;Treatment Outcome

[Effect of infrared laser irradiation on the arterial blood pressure in liquidators of the accident at the Chernobyl power plant]. Liquidators of Tchernobyl accident with discirculatory post-irradiation encephalopathy were treated with infra-red lazer irradiation together with a half doze of pharmacological agents usually used. Infra-red lazer irradiation has been shown to result in a significant reduce in the arterial pressure level, so it can be effective in correcting the disturbances in haemodynamics. Adult;Blood Pressure;Cerebrovascular Disorders;Humans;Low-Level Light Therapy;Middle Aged;Occupational Diseases;Occupational Exposure;Radioactive Hazard Release

Treatment of acquired bilateral nevus of Ota-like macules (Hori's nevus) using a combination of scanned carbon dioxide laser followed by Q-switched ruby laser. BACKGROUND: Acquired

bilateral nevus of Ota-like macules (Hori's nevus) is a dermal pigmented lesion commonly seen in middle-aged women of Asian descent. The Q-switched ruby laser (QSRL) has been used successfully to treat a variety of benign pigmented lesions. Multiple, sequential treatments are typically required for complete clearance of the dermal pigmented dermatoses. OBJECTIVE: The purpose of this study was to determine the efficacy of QSRL in the treatment of Hori's nevus and the beneficial effect of epidermal ablation using the scanned carbon dioxide (CO(2)) laser before QSRL. METHODS: A total of 13 women from Thailand with Hori's nevus were randomly treated with the scanned CO(2) laser followed by QSRL on one side of their face, and QSRL alone on the other side. The same fluence of QSRL was used on both sides in individual patients. The treatment response was objectively evaluated by measuring the melanin index using a Mexameter (Courage & Khazaka Electronic GmbH, KÃ¶ln, Germany), and subjectively assessed by the patients before treatment and 3 and 16 months after treatment. Adverse sequelae of the treatment and the patients' tolerance were also evaluated at the same follow-up visit. RESULTS: The 3- and 16-month posttreatment melanin index was significantly decreased compared with that of pretreatment on both treated sites and this corresponded to the patients' subjective evaluations. The response rate, defined as "the percentage of reduction in melanin index," was significantly higher on the sides treated with scanned CO(2) laser followed by QSRL, compared with the sides irradiated with QSRL alone at both follow-up visits. At the 3-month follow-up, the most common adverse effect was hypopigmentation, found in 15% (2 of 13) of the patients on the sites treated with QSRL alone, and on the sites treated with scanned CO(2) laser followed by QSRL (8%, 1/13). Erythema was observed in 15% (2/13) of the patients only on the sites that received combination treatment. However, no adverse sequelae were observed at the 16-month posttreatment follow-up. CONCLUSION: Epidermal ablation with scanned CO(2) laser before the use of the pigment-specific laser may be an effective technique for increasing therapeutic efficacy in the treatment of dermal pigmented dermatoses. Adult;Combined Modality Therapy;Facial Neoplasms;Female;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Nevus of Ota;Skin;Skin Neoplasms

Reticular thalamic responses to nociceptive inputs in anesthetized rats. The present study compares nociceptive responses of neurons in the reticular thalamic nucleus (RT) to those of the ventroposterior lateral nucleus (VPL). Extracellular single-unit activities of cells in the RT and VPL were recorded in anesthetized rats. Only units with identified tactile receptive fields in the forepaw or hindpaw were studied. In the first series of experiments, RT and VPL responses to pinching with a small artery clamp were tested with the rats under pentobarbital, urethane, ketamine, or halothane anesthesia. Under all types of anesthesia, many RT units were inhibited. Second, the specificity of the nociceptive response was tested by pinching and noxious heating of the unit's tactile receptive field. Of the 39 VPL units tested, 20 were excited by both types of noxious stimuli. In sharp contrast, of the 30 RT units tested, none were excited and 17 were inhibited. In a third series of experiments, low-intensity and beam-diffused CO(2) laser irradiation was used to activate peripheral nociceptive afferents. Wide-dynamic-range VPL units responded with short- and long-latency excitations. In contrast, RT units had short-latency excitation followed by long-latency inhibition. Nociceptive input inhibited RT units in less than 500 ms. We conclude that a significant portion of RT neurons were polysynaptically inhibited by nociceptive inputs. Since all the cells tested were excited by light tactile inputs, the somatosensory RT may serve in the role of a modality gate, which modifies (i.e. inhibits) tactile inputs while letting noxious inputs pass. Anesthetics, Dissociative;Anesthetics, Inhalation;Anesthetics, Intravenous;Hypnotics and Sedatives;Urethane;Ketamine;Pentobarbital;Halothane Action Potentials;Afferent Pathways;Anesthesia;Anesthetics, Dissociative;Anesthetics, Inhalation;Anesthetics, Intravenous;Animals;Forelimb;Halothane;Hot Temperature;Hypnotics and Sedatives;Inhibition,

Psychological;Intralaminar Thalamic Nuclei;Ketamine;Low-Level Light Therapy;Neurons;Nociceptors;Pain;Pentobarbital;Physical Stimulation;Rats;Reaction Time;Urethane;Ventral Thalamic Nuclei

Human fibroblast alterations induced by low power laser irradiation at the single cell level using confocal microscopy. Low power laser irradiation is regarded to have a significant role in triggering cellular proliferation and in treating diseases of diverse etiologies. The present work contributes to the understanding of the mechanisms of action by studying low power laser effects in human fibroblasts. Confocal laser scanning microscopy is used for irradiation and observation of the same area of interest allowing the imaging of laser effects at the single cell level and in real time. Coverslip cultures were placed in a small incubation chamber for in vivo microscopic observation. Laser stimulation of the cells was performed using the 647 nm line of the confocal laser through the objective lens of the microscope. Mitochondrial membrane potential (delta psi(m)), intracellular pH, calcium alterations and generation of reactive oxygen species (ROS) were monitored using specific fluorescent vital probes. The induced effects were quantified using digital image processing techniques. After laser irradiation, a gradual alkalinization of the cytosolic pH and an increase in mitochondrial membrane potential were observed. Recurrent spikes of intracellular calcium concentration were also triggered by laser. Reactive oxygen species were generated as a result of biostimulation. No such effects were monitored in microscopic fields other than the irradiated ones. Reactive Oxygen Species Cells, Cultured;Dose-Response Relationship, Radiation;Fibroblasts;Humans;Hydrogen-Ion Concentration;Intracellular Membranes;Lasers;Membrane Potentials;Microscopy, Confocal;Reactive Oxygen Species

Osseointegration of endosseous ceramic implants after postoperative low-power laser stimulation: an in vivo comparative study. Stimulation with low-power laser (LPL) can enhance bone repair as reported in experimental studies on bone defects and fracture healing. Little data exist concerning the use of LPL postoperative stimulation to improve osseointegration of endosseous implants in orthopaedic and dental surgery. An in vivo model was used for the present study to evaluate whether Ga-Al-As (780 nm) LPL stimulation can improve biomaterial osseointegration. After drilling holes, cylindrical implants of hydroxyapatite (HA) were placed into both distal femurs of 12 rabbits. From postoperative day 1 and for 5 consecutive days, the left femurs of all rabbits were submitted to LPL treatment (LPL group) with the following parameters: 300 J/cm2, 1 W, 300 Hz, pulsating emission, 10 min. The right femurs were sham-treated (control group). Three and 6 weeks after implantation, histomorphometric and microhardness measurements were taken. A higher affinity index was observed at the HA-bone interface in the LPL group at 3 ($P<0.0005$) and 6 weeks ($P<0.001$); a significant difference in bone microhardness was seen in the LPL group vs. the control group ($P<0.01$). These results suggest that LPL postoperative treatment enhances the bone-implant interface. Dental Implants;Durapatite;Gallium;Aluminum;Arsenic Aluminum;Analysis of Variance;Animals;Arsenic;Bone Density;Ceramics;Dental Implants;Dental Prosthesis Design;Durapatite;Femur;Gallium;Low-Level Light Therapy;Models, Animal;Osseointegration;Postoperative Care;Rabbits;Surface Properties;Time Factors

Treatment of striae rubra and striae alba with the 585-nm pulsed-dye laser. BACKGROUND: The treatment of striae distensae has recently been reported with various lasers such as the 585-nm pulsed dye laser. At lower fluences (2.0 to 4.0 J/cm2), this laser has been purported to increase the amount of collagen in the extracellular matrix. OBJECTIVE: To determine whether the 585-nm pulsed dye laser is effective in both striae rubra and striae alba after two treatments and, in addition, to determine whether there is a net effect on collagen density in treated samples. METHODS: Twenty patients (skin types II to VI) with either striae rubra (9) or striae alba (11) were treated at baseline and at week 6. The total length of the study was 12 weeks. Untreated striae on the same patient were

used as control subjects. Striae clinical parameters such as color and area were measured before the first and after the last treatment by an independent examiner using a visual analog scale. A hydroxyproline assay was used to measure collagen changes in two of the striae quantitatively. RESULTS: The 585 nm had a moderate beneficial effect in reducing the degree of erythema in striae rubra. There was no apparent clinical change on striae alba. Total collagen per gram of dry weight of sampled tissue increased in striae treated with pulsed dye laser versus control subjects. CONCLUSION: We recommend the use of the 585-nm pulsed dye laser for striae rubra in patients skin types II to IV. Extreme caution or avoidance should be observed in pulsed dye laser treatments for patients with phototypes V to VI even with the use of low fluences. Tissue collagen changes measured may be an early change, which precedes significant clinical improvement.
Collagen;Hydroxyproline Adolescent;Adult;Collagen;Female;Humans;Hydroxyproline;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Pregnancy;Pregnancy Complications;Skin;Skin Pigmentation

NondÃ©bridement of laser char after two carbon dioxide laser passes results in faster reepithelialization. Skin repair following laser injury can be accelerated by using techniques that promote rapid reepithelialization. In this article, the benefit of intraoperative nondÃ©bridement of laser debris after two laser passes is discussed. After carbon dioxide laser resurfacing of the face, skin specimens were examined using indirect immunofluorescence with antibodies to specific epidermal and basement membrane proteins. Biopsy specimens obtained immediately after resurfacing showed a greater injury to epidermal and basement membrane proteins when skin was wiped with saline-soaked gauze after laser passes than when there was no dÃ©bridement after two passes. Later examination of skin specimens obtained from nine patients 2 days after carbon dioxide resurfacing showed that nondÃ©brided, occluded skin had faster reepithelialization than the other treatments. NondÃ©bridement of the skin at the time of resurfacing along with the use of postoperative occlusive dressings led to the rapid reestablishment of a multilayered epidermis only 2 days after resurfacing. NondÃ©bridement along with occlusive dressings results in rapid reepithelialization of the skin after two carbon dioxide laser passes for skin rejuvenation. KRT14 protein, human;Keratin-14;Keratins Biopsy;Blepharoplasty;Combined Modality Therapy;Debridement;Epithelium;Follow-Up Studies;Humans;Keratin-14;Keratins;Low-Level Light Therapy;Microscopy, Fluorescence;Postoperative Complications;Regeneration;Rhytidoplasty;Skin;Skin Aging;Wound Healing

Reducing eye pressure slows glaucoma progression. Clinical Trials as Topic;Disease Progression;Glaucoma;Humans;Intraocular Pressure;Low-Level Light Therapy;Practice Guidelines as Topic;Treatment Outcome;United States

Anaesthetic management of a child with Hallermann-Streiff Francois syndrome.
Anesthetics, Combined Anesthesia, General;Anesthetics, Combined;Glaucoma;Hallermann's Syndrome;Humans;Infant;Intubation, Intratracheal;Low-Level Light Therapy;Male

[Psoriasis vulgaris. An indication for lasers?]. Treatment of psoriasis is often complicated and remains a challenge. Along with the many new immunomodulatory approaches, various laser systems have been employed in an attempt to treat chronic plaque psoriasis. These include CO(2), Er:YAG, pulsed dye, 1302 nm Nd:YAG and excimer lasers. After reviewing and critically evaluating the literature, we conclude that the 308 nm excimer laser has proven its efficacy, not only in comparison with other laser systems, but also when compared with conventional 311 nm narrow-band UVB treatment. It is an efficient and promising therapeutic option for treating different forms of psoriasis.
Clinical Trials as Topic;Dermabrasion;Follow-Up Studies;Humans;Laser Coagulation;Laser Therapy;Low-Level Light Therapy;Psoriasis;Treatment Outcome

Therapeutic photobiomodulation for methanol-induced retinal toxicity. Methanol intoxication produces toxic injury to the retina and optic nerve, resulting in blindness. The toxic metabolite in methanol intoxication is formic acid, a mitochondrial toxin known to inhibit the essential mitochondrial enzyme, cytochrome oxidase. Photobiomodulation by red to near-IR radiation has been demonstrated to enhance mitochondrial activity and promote cell survival in vitro by stimulation of cytochrome oxidase activity. The present studies were undertaken to test the hypothesis that exposure to monochromatic red radiation from light-emitting diode (LED) arrays would protect the retina against the toxic actions of methanol-derived formic acid in a rodent model of methanol toxicity. Using the electroretinogram as a sensitive indicator of retinal function, we demonstrated that three brief (2 min, 24 s) 670-nm LED treatments (4 J/cm(2)), delivered at 5, 25, and 50 h of methanol intoxication, attenuated the retinotoxic effects of methanol-derived formate. Our studies document a significant recovery of rod- and cone-mediated function in LED-treated, methanol-intoxicated rats. We further show that LED treatment protected the retina from the histopathologic changes induced by methanol-derived formate. These findings provide a link between the actions of monochromatic red to near-IR light on mitochondrial oxidative metabolism in vitro and retinoprotection in vivo. They also suggest that photobiomodulation may enhance recovery from retinal injury and other ocular diseases in which mitochondrial dysfunction is postulated to play a role. Formates;formic acid;Methanol Animals;Electroretinography;Formates;Infrared Rays;Male;Methanol;Microscopy, Electron;Mitochondria;Phototherapy;Rats;Rats, Long-Evans;Retina

Laser hair removal for recurrent pilonidal sinus disease. Female;Hair Removal;Humans;Low-Level Light Therapy;Male;Pilonidal Sinus;Treatment Outcome

CO2 laser vaporization for disfiguring lupus pernio. Presented in this paper are two cases of longstanding gross and disfiguring lupus pernio of the nose successfully treated by CO2 laser resurfacing Both patients were resistant to previous medical therapy and have had an excellent postoperative cosmetic result. Carbon Dioxide Adult;Carbon Dioxide;Fatal Outcome;Female;Humans;Low-Level Light Therapy;Middle Aged;Nose Diseases;Sarcoidosis

Laser therapy of freckles and lentigines with quasi-continuous, frequency-doubled, Nd:YAG (532 nm) laser in Fitzpatrick skin type IV: a 24-month follow-up. BACKGROUND: Newly developed lasers produce excellent results with minimal complications compared with traditional treatments for freckles and lentigines. OBJECTIVES: To assess the efficacy and safety of the frequency-doubled Nd:YAG (532 nm) laser in the treatment of freckles and lentigines in type IV skin. PATIENTS AND METHODS: Twenty adult patients (14 with freckles and six with lentigines) were subjected to a variable number of treatments with a minimum 4-week interval until no additional improvement occurred or > 75% improvement was obvious. Patients manifesting > 50% improvement were followed up once every 3 months for 24 months. The rest were regarded as treatment failures and not followed up. RESULTS: Sixteen (80%) of 20. patients (freckles, n = 10; lentigines, n = 6) manifested more than 50% improvement. They were treat- irradiated between three and eight times with a 4-12-week interval. Complications included hypopigmentation (25%), mild textural changes (15%) and hyperpigmentation (10%). All these were mild and resolved within 2-6 months. Of 10 patients with freckles followed up for 24 months, four (40%) patients showed partial recurrence. However, all the patients maintained > 50% improvement. None of the patients with lentigines showed recurrence. CONCLUSION: The quasi-continuous, frequency-doubled Nd:Y AG (532 nm) laser safely and effectively treats freckles and lentigines in Fitzpatrick skin type IV. Adult;Facial Dermatoses;Female;Follow-Up Studies;Humans;Lentigo;Low-Level Light Therapy;Male;Melanosis;Treatment Outcome

Contribution of phototherapy to the treatment of episiotomies. OBJECTIVE: The purpose of this study was an objective consideration of possible benefits of phototherapy implemented with

therapeutic laser or possibly polarized light in treating episiotomy, which is the most frequent obstetric intervention. MATERIALS AND METHODS: In the present study, the authors treated a total of 2,436 women. The light sources were as follows: a laser of a wave length 670 nm, power 20 mW, with continuous alternations of frequencies 10 Hz, 25 Hz, and 50 Hz, a polarized light source of a 400-2,000 nm wavelength in an interval of power 20 mW and frequency 100 Hz and a monochromatic light source of a 660 nm wavelength and power 40 mW, with simultaneous application of a magnetic field at an induction 8 mT. RESULTS: The work demonstrated high healing effects with minimum secondary complications in the treatment of episiotomies using a therapeutic laser at an energy density of 2 J/cm(2). The application of polarized light at an energy density of 5 J/cm(2) also exerted favorable therapeutic effects. Adolescent;Adult;Episiotomy;Female;Humans;Low-Level Light Therapy;Magnetics;Wound Healing

Anticancer effect of combined intratumor cisplatin injection and interstitial KTP laser therapy on xenografted squamous cell carcinoma. OBJECTIVE: This study was conducted to evaluate the synergistic effect of cisplatin and interstitial KTP laser therapy induced hyperthermia in vitro and in vivo (interstitial laser chemotherapy, ILCT). METHODS: In vitro study: human hypopharyngeal squamous carcinoma cell line (SNU-1041) was incubated in 1 mL of media containing various concentrations (0, 1, 2, 5, 10, 20, 50, 100 ng/mL) of cisplatin in 37 degrees and 43 degrees C for 2 hours. The viability of the cell was evaluated by MTT assay. In vivo study: human squamous cell carcinoma tumors were grown as subcutaneous transplants in nude mice and injected into tumor with cisplatin-epigel 100 microg, followed by interstitial laser therapy (ILT) via 0.6-mm diffuser fiber tips (532 nm, 1.0J/mm(3)). RESULTS: In vitro study: the viability of tumor cells incubated with 10 ng/mL of cisplatin was 62% and 28% in 37 degrees C and 43 degrees C, respectively ($p = 0.02$). In vivo study: the tumor volume in 4 weeks after treatment was 179 mm(3) in ILT group and 27 mm(3) in ILCT group. The ILCT group showed 8 (80%) complete remission of tumors at 4 weeks follow up, while tumor remission occurred in only 3 (30%) in ILT group ($p < 0.05$). CONCLUSION: These results suggest ILCT may become an effective treatment for head and neck carcinoma with minimal functional deficit. Antineoplastic Agents;Cisplatin Animals;Antineoplastic Agents;Brachytherapy;Carcinoma, Squamous Cell;Cisplatin;Combined Modality Therapy;Humans;Hyperthermia, Induced;Hypopharyngeal Neoplasms;Injections, Intralesional;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Mice, Nude;Neoplasm Transplantation;Tumor Cells, Cultured

[Laser radiation to correct disorders of blood albumin transport in severe mechanical trauma]. The paper provides evidence for that it is expedient to perform multi-stage intravascular low-intensity laser blood radiation in patients with severe mechanical trauma and massive blood loss in the early posttraumatic period. The use of laser radiation at a wavelength of 632.0 nm by inserting a disposable light guide (its end power was 1.5-2.0 mW, and the duration of a session--30 min) as part of complex therapy in this group of patients romotes the increase of plasma albumin transport ability and the general stimulation of natural detoxifixation mechanisms. Serum Albumin APACHE;Adult;Hemorrhage;Humans;Low-Level Light Therapy;Protein Transport;Serum Albumin;Trauma Severity Indices;Treatment Outcome;Wounds and Injuries

Influence of low level laser therapy on wound healing and its biological action upon myofibroblasts. BACKGROUND AND OBJECTIVE: In re-evaluating the effects of laser therapy in wound healing, the role of extracellular matrix elements and myofibroblasts, was analyzed. STUDY DESIGN/MATERIALS AND METHODS: Cutaneous wounds were inflicted on the back of 72 Wistar rats. Low level laser was locally applied with different energy densities. Lesions were analyzed after 24, 48, 72 hours and 5, 7, and 14 days. Tissues were studied by histology, immunohistochemistry, and electron microscopy. RESULTS: In treated animals, the extent of edema and the number of inflammatory cells were reduced ($P < 0.05$), but the amount of collagen and elastic fibers appeared slightly increased.

Desmin/smooth muscle alpha-actin-phenotype myofibroblasts were statistically more prominent on the 3rd day after surgery ($P < 0.05$) in treated wounds than in controls. Treatment with a dosage of 4 J/cm(2) was superior to that with 8 J/cm(2). CONCLUSIONS: Laser therapy reduced the inflammatory reaction, induced increased collagen deposition and a greater proliferation of myofibroblasts in experimental cutaneous wounds. Analysis of Variance;Animals;Biopsy, Needle;Disease Models, Animal;Female;Fibroblasts;Immunohistochemistry;Low-Level Light Therapy;Male;Myoblasts;Probability;Rats;Rats, Wistar;Reference Values;Sensitivity and Specificity;Skin;Treatment Outcome;Wound Healing;Wounds and Injuries

Efficacy of low power laser therapy and exercise on pain and functions in chronic low back pain. BACKGROUND AND OBJECTIVES: The aim of this study was to determine whether low power laser therapy (Gallium-Arsenide) is useful or not for the therapy of chronic low back pain (LBP). STUDY DESIGN/MATERIALS AND METHODS: This study included 75 patients (laser + exercise-25, laser alone-25, and exercise alone-25) with LBP. Visual analogue scale (VAS), Schober test, flexion and lateral flexion measures, Roland Disability Questionnaire (RDQ) and Modified Oswestry Disability Questionnaire (MODQ) were used in the clinical and functional evaluations pre and post therapeutically. A physician, who was not aware of the therapy undertaken, evaluated the patients. RESULTS: Significant improvements were noted in all groups with respect to all outcome parameters, except lateral flexion ($P < 0.05$). CONCLUSIONS: Low power laser therapy seemed to be an effective method in reducing pain and functional disability in the therapy of chronic LBP. Adult;Chi-Square Distribution;Chronic Disease;Combined Modality Therapy;Exercise;Female;Follow-Up Studies;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Multivariate Analysis;Pain Measurement;Probability;Reference Values;Sensitivity and Specificity;Severity of Illness Index;Single-Blind Method;Treatment Outcome

Koebnerization of reactive perforating collagenosis induced by laser hair removal. Laser hair removal, due to demonstrated efficacy and safety, has become a commonly performed office procedure. We report an unusual occurrence after laser hair removal with the 800 nm diode laser that previously has never been described. After laser hair removal treatment to the ventral surface of the ears, a patient developed lesions of previously diagnosed reactive perforating collagenosis. Interestingly, the lesions appeared on the dorsal surface of the ears. Perhaps the koebner phenomenon was invoked as the laser energy penetrated to the untreated dorsal surface, which was not protected by epidermal contact cooling. Biopsy, Needle;Collagen Diseases;Ear;Follow-Up Studies;Hair Removal;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Middle Aged;Risk Assessment

American Society for Laser Medicine and Surgery 23rd Annual Meeting. Anaheim, California, USA. April 9-13, 2003. Abstracts. Animals;Humans;Laser Therapy;Low-Level Light Therapy

High-intensity pulsed laser irradiation accelerates bone formation in metaphyseal trabecular bone in rat femur. Low-energy laser irradiation has positive effects on bone fracture healing, osteoblast proliferation, bone nodule formation, and alkaline phosphatase activity. However, the mechanism by which low-energy laser irradiation affects bone is not clearly known. It was recently found that light at a low radiation dosage is absorbed by intracellular chromophores. High-intensity pulsed laser irradiation can produce acoustic waves in the target surface by rapidly heating the tissue. We considered that the acoustic waves induced by high-intensity pulsed laser irradiation, in addition to the photochemical effects that are induced, accelerate bone formation. To clarify whether high-intensity pulsed laser irradiation accelerates bone formation, we investigated bone formation in the irradiated femur of rat, using histomorphometric analysis. Rat femurs were irradiated with a Q-switched Nd: YAG laser, which has a wavelength of 1064 nm, under two conditions: once a day, with the average fluence rate set at 100 mW/cm(2) (LA1), and twice a day, i.e., every 12 h, with the

average fluence rate set at 50 mW/cm(2) (LA2). The mean bone volume and mineral apposition rate in the LA1 group were significantly higher than those in the nonirradiated group (control). These values were highest for the LA2 group, and were about 1.52 and 1.25-fold those of the control, respectively. These data demonstrated that the number of pulses, rather than the intensity of the laser irradiation, affects bone formation. Thus, this study indicated that high-intensity pulsed laser irradiation accelerates bone formation in the metaphysis. This bone formation induced by high-intensity pulsed laser irradiation might be due to laser-induced pressure waves.
Animals;Bone Development;Female;Femur;Lasers;Muscle, Skeletal;Rats;Rats, Sprague-Dawley;Skin Physiological Phenomena

[A study on expression of basic fibroblast growth factors in periodontal tissue following orthodontic tooth movement associated with low power laser irradiation]. OBJECTIVE: The purpose of this study was to investigate the effects of low power laser on basic fibroblast growth factors (bFGF) expression in periodontal tissue during tooth movement. METHODS: 18 white rabbits were randomly divided into 6 groups with 3 rabbits in each group, including groups of 1, 3, 5, 7, 14 and 21 days. Under an anesthesia condition by 2% pentobarbital sodium, the stainless coil springs were fixed between the first maxillary molar and the incisor producing the force of 80 g. The right side of maxilla was considered as the experimental group under the irradiation of low power laser with the left side as the control groups. The expression of bFGF was investigated half-quantitatively through immunohistochemical analysis. RESULTS: The expression of bFGF in periodontal tissue with irradiation of low power laser was higher than the control side. There were significant differences among the 5, 7, and 14 day groups. In the tension area of the experimental side, the expression of bFGF in the osteoblastic surface of alveolar bone was characteristically greater than that of the control side. CONCLUSION: The laser of low power promotes the expression of bFGF in the periodontal tissue and alveolar bone remodeling. Fibroblast Growth Factor 2 Alveolar Process;Animals;Female;Fibroblast Growth Factor 2;Low-Level Light Therapy;Male;Orthodontics, Corrective;Periodontal Ligament;Periodontium;Rabbits;Random Allocation;Tooth Movement Techniques

Infrared imaging of 2-D temperature distribution during cryogen spray cooling. Cryogen spray cooling (CSC) is used in conjunction with pulsed laser irradiation for treatment of dermatologic indications. The main goal of this study was to determine the radial temperature distribution created by CSC and evaluate the importance of radial temperature gradients upon the subsequent analysis of tissue cooling throughout the skin. Since direct measurement of surface temperatures during CSC are hindered by the formation of a liquid cryogen layer, temperature distributions were estimated using a thin, black aluminum sheet. An infrared focal plane array camera was used to determine the 2-D backside temperature distribution during a cryogen spurt, which preliminary measurements have shown is a good indicator of the front-side temperature distribution. The measured temperature distribution was approximately gaussian in shape. Next, the transient temperature distributions in skin were calculated for two cases: 1) the standard 1-D solution which assumes a uniform cooling temperature distribution, and 2) a 2-D solution using a nonuniform surface cooling temperature distribution based upon the back-side infrared temperature measurements. At the end of a 100-ms cryogen spurt, calculations showed that, for the two cases, large discrepancies in temperatures at the surface and at a 60-micron depth were found at radii greater than 2.5 mm. These results suggest that it is necessary to consider radial temperature gradients during cryogen spray cooling of tissue.
Aerosol Propellants Aerosol Propellants;Cold Temperature;Computer Simulation;Cryotherapy;Humans;Hypothermia, Induced;Laser Coagulation;Low-Level Light Therapy;Models, Biological;Reproducibility of Results;Sensitivity and Specificity;Skin Temperature;Temperature;Thermography

[Resonance response of cell-tissue structures to impulse frequency of infrared laser radiation of low intensity (experimental study)]. A morphological evaluation of the results of transcutaneous radiation of male mice with infra-red impulse laser beam for 10 min (10,100, 1000, 10,000 Hz) 5 min, 3 and 24 hours after the procedure has confirmed the existence of "resonance" frequencies for different types of endocrine cells and has shown that the response depends not only on the dose of infrared low-intensity laser radiation. Thus, account for resonance frequencies is one of perspective approaches to optimization of laser therapy which may raise effectiveness and safety of laser exposure. Adrenal Cortex;Animals;Cell Degranulation;Dose-Response Relationship, Radiation;Enteroendocrine Cells;Infrared Rays;Lasers;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Pancreas;Pylorus;Time Factors;Whole-Body Irradiation

[Preventive use of ozone, short waves, and laser therapy alone and in combination in early postoperative period after dental implantation]. Solutions;Ozone Adult;Combined Modality Therapy;Dental Implantation;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Ozone;Physical Therapy Modalities;Postoperative Complications;Postoperative Period;Radiofrequency Therapy;Solutions;Wound Healing

Direct stimulatory effect of low-intensity 670 nm laser irradiation on human endothelial cell proliferation. BACKGROUND: Endothelial cell (EC) proliferation plays a key role in the process of tissue repair. Low-intensity laser irradiation has been demonstrated to accelerate wound healing and to improve microvascularization. OBJECTIVES: The present study evaluated a possible stimulatory influence of low-intensity laser irradiation on human umbilical vein endothelial cell (HUVEC) proliferation in a systematic manner. METHODS: Subconfluent cultures of HUVEC were irradiated every other day with a 670-nm diode laser (intensity: 10-65 mW cm(-2), dose: 2-8 J cm(-2)) during a period of 6 days. Cell proliferation was evaluated quantitatively by counting in a haemocytometer. RESULTS: Our data demonstrate a dose-dependent and intensity-dependent stimulatory effect of laser irradiation on HUVEC cell proliferation. Doses of between 2 and 8 J cm(-2) induced statistically significant cell proliferation. Testing different intensities at a constant dose of 8 J cm(-2), 20 and 65 mW cm(-2) induced most pronounced cell proliferation. CONCLUSIONS: Low-intensity laser irradiation influences EC proliferation and might thereby contribute to the increase in angiogenesis and the acceleration of wound healing in vivo. Cell Division;Cells, Cultured;Dose-Response Relationship, Radiation;Endothelium, Vascular;Humans;Lasers;Umbilical Veins

Low-energy laser irradiation enhances de novo protein synthesis via its effects on translation-regulatory proteins in skeletal muscle myoblasts. Low-energy laser irradiation (LELI) drives quiescent skeletal muscle satellite cells into the cell cycle and enhances their proliferation, thereby promoting skeletal muscle regeneration. Ongoing protein synthesis is a prerequisite for these processes. Here, we studied the signaling pathways involved in the LELI regulation of protein synthesis. High levels of labeled [35S]methionine incorporation were detected in LELI cells as early as 20 min after irradiation, suggesting translation of pre-existing mRNAs. Induced levels of protein synthesis were detected up until 8 h after LELI implying a role for LELI in de novo protein synthesis. Elevated levels of cyclin D1, associated with augmented phosphorylation of the eukaryotic initiation factor 4E (eIF4E) and its inhibitory binding protein PHAS-I, suggested the involvement of LELI in the initiation steps of protein translation. In the presence of the MEK inhibitor, PD98059, eIF4E phosphorylation was abolished and levels of cyclin D1 were dramatically reduced. The LELI-induced PHAS-I phosphorylation was abolished after preincubation with the PI3K inhibitor, Wortmannin. Concomitantly, LELI enhanced Akt phosphorylation, which was attenuated in the presence of Wortmannin. Taken together, these results suggest that LELI induces protein translation via the PI3K/Akt and Ras/Raf/ERK pathways. Adaptor Proteins, Signal Transducing;Carrier Proteins;Cell Cycle Proteins;Eif4ebp1 protein, mouse;Eukaryotic Initiation Factor-4E;Eukaryotic Initiation

Factors;Phosphoproteins;Mitogen-Activated Protein Kinases Adaptor Proteins, Signal Transducing;Animals;Carrier Proteins;Cell Cycle Proteins;Eukaryotic Initiation Factor-4E;Eukaryotic Initiation Factors;Lasers;Mice;Mitogen-Activated Protein Kinases;Muscle, Skeletal;Myoblasts;Phosphatidylinositol 3-Kinases;Phosphoproteins;Phosphorylation;Protein Biosynthesis;Signal Transduction

Comparative evaluation of different hair removal lasers in skin types IV, V, and VI. BACKGROUND: Lasers permit treatment of unwanted excess hair with less discomfort than other methods of epilation. Many lasers with different parameters are now available from which the dermatologist can choose. Improved clinical results are made possible by the high specificity and selectivity of the laser systems to pigmented hair because of the use of an appropriate wavelength with the proper pulse and duration. OBJECTIVES: We aimed to compare the results of treatment of skin types IV, V, and VI using three different laser systems. METHODS: One hundred female patients were compared using different laser systems: 35 patients underwent epilation using a Nd-Yag laser, 33 patients using an Alexandrite laser, and 32 patients using a Diode laser. RESULTS: Follow up 12 months after the multiple treatments (three to six sessions) showed an insignificant difference between these three groups (35-40%). CONCLUSION: Our findings indicate that all three laser systems tested can be used for dark skin; however, one should select a system that minimizes side-effects, primarily hypo- and hyper-pigmentation, especially when used for skin types IV, V, and VI. Adult;Equipment Design;Equipment Safety;Face;Female;Hair Removal;Humans;Hypertrichosis;Low-Level Light Therapy;Middle Aged;Risk Assessment;Sensitivity and Specificity;Skin;Treatment Outcome

[Effects of electric stimulations or low-frequency laser irradiation on the pH of the nerve]. Animals;Axons;Decapodiformes;Electric Stimulation;Extracellular Space;Extremities;Hydrogen-Ion Concentration;In Vitro Techniques;Intracellular Fluid;Kinetics;Low-Level Light Therapy;Optic Nerve;Rabbits;Rana temporaria

Measurements of laser light attenuation following cryogen spray cooling spurt termination. BACKGROUND AND OBJECTIVES: Cryogen spray cooling (CSC) is used to minimize the risk of epidermal damage during laser dermatological surgery. However, while CSC can protect the epidermis from non-specific thermal damage, the cryogen film on the skin surface may pose a potential problem of laser light attenuation due to optical scattering. STUDY DESIGN/MATERIALS AND METHODS: This study is focused on measuring the light transmittance changes that occur following cryogen spurt termination. The wavelengths studied were chosen for their clinical relevance to treatment of hypervascular skin lesions (594 nm) and laser-assisted hair removal (785 nm). Following delivery of cryogen spurts to the surface of an epoxy skin phantom, continuous records of light transmittance for 594 and 785 nm were obtained using an integrating sphere-based light collection apparatus. RESULTS: Shortly after spurt termination, there was negligible light attenuation by the cryogen film at the two wavelengths studied. CONCLUSIONS: For the typical clinical use of a 30 milliseconds spurt duration and 30 milliseconds delay between spurt termination and delivery of the laser pulse, a minimum average transmittance value of approximately 97% was measured. Epoxy Resins;Hydrocarbons, Fluorinated;norflurane Cryotherapy;Epoxy Resins;Humans;Hydrocarbons, Fluorinated;Light;Low-Level Light Therapy;Models, Biological;Scattering, Radiation;Skin;Spectrum Analysis

Cooling efficiency of cryogen spray during laser therapy of skin. BACKGROUND AND OBJECTIVES: Cryogen spray cooling (CSC) is used extensively for epidermal protection during laser-induced photothermolysis of port wine stains and other vascular skin lesions. The efficacy of CSC depends critically on the heat transfer coefficient (H) at the skin surface for which, however, no reliable values exist. Reported values for H, based on tissue phantoms, vary from 1,600 to 60,000 W/m(2) K. STUDY DESIGN/MATERIALS AND METHODS: A simple experimental model was designed and constructed,

consisting of a pure silver-measuring disk (diameter 10 mm, thickness approximately 1 mm), embedded in a thermal insulator. The disk was covered with a 10 microm thick stratum corneum layer, detached from in vivo human skin. The heat transfer coefficient of the stratum corneum/cryogen interface was measured during CSC with short spurts of atomized tetrafluoroethane. RESULTS: H was found to be dependent on the specific design of the cryogen valve and nozzle. With nozzles used in typical clinical settings, H was 11,500 W/m(2) K, when averaged over a 100 ms spurt, and 8,000 W/m(2) K when averaged over a 200 ms spurt. CONCLUSIONS: The presented model enables accurate prediction of H and thus improve control over temperature depth profile and cooling efficiency during laser therapy. Thereby, it may contribute to improvement of therapeutic outcome. Hydrocarbons, Chlorinated;1,1,1,2-tetrachloroethane;Silver;Ethane Cryotherapy;Equipment Design;Ethane;Humans;Hydrocarbons, Chlorinated;Low-Level Light Therapy;Silver;Skin Temperature;Thermal Conductivity;Thermography

Analysis of epidermal protection using cold air versus chilled sapphire window with water or gel during 810 nm diode laser application. BACKGROUND AND OBJECTIVES: Many cutaneous laser devices incorporate a temperature-based epidermal protection system to minimize surface damage while continuing to affect targeted tissue. The use of cold air is a new technique to aid in epidermal protection during the application of cutaneous lasers. This study investigates the efficacy of cold air versus chilled sapphire in regards to epidermal preservation when used with an 810 nm diode laser. STUDY DESIGN/MATERIAL AND METHODS: White-haired pink piglets and dark-haired pigmented piglets were treated using the 810 nm diode laser in conjunction with either (1) no cryogen protection; (2) cold air alone; (3) chilled sapphire window alone; (4) cold air with water/gel; or (5) chilled sapphire window with water/gel. Laser fluence was varied by adjusting laser duration time while maintaining the intensity at 60 W. Biopsies were obtained from the sacrificed animals, stained with Masson's trichrome, and analyzed for extent of epidermal damage. RESULTS: Among white-haired pink pigs, the cold air afforded the same degree of epidermal preservation as the chilled sapphire window. Epidermal protection was further enhanced with the addition of either gel or water. Among dark-haired pigmented pigs, the chilled sapphire window alone likewise provided significant epidermal protection, although the cold air alone did not. However, with the addition of water/gel, epidermal preservation was demonstrated in both. CONCLUSIONS: Cold air is an effective means in promoting epidermal preservation, though slightly inferior to the chilled sapphire window on darkly pigmented subjects. Combining either method with water or gel further enhances surface protection, enabling safe use of higher fluences. Gels;Humatrix;Water;Epidermal Growth Factor;Insulin-Like Growth Factor I Air Movements;Animals;Burns;Cryotherapy;Data Interpretation, Statistical;Epidermal Growth Factor;Epidermis;Gels;Insulin-Like Growth Factor I;Low-Level Light Therapy;Models, Animal;Skin Temperature;Swine;Water

Novel model for evaluation of epidermal preservation and dermal collagen remodeling following photorejuvenation of human skin. BACKGROUND AND OBJECTIVES: In order to optimize photorejuvenation of human skin, a method must be developed to reliably compare the potential for epidermal preservation and dermal fibroblast stimulation of different laser devices and irradiation parameters. We describe a novel human skin tissue culture model developed for this purpose. MATERIALS AND METHODS: An artificial skin model, consisting of human keratinocytes in the epidermis and human fibroblasts and rat-tail collagen in the dermis, was cultured using the floating collagen gel (RAFT) method. Repetitive low-fluence Er:YAG laser irradiation was applied to test the applicability of our RAFT model for characterization of epidermal preservation and dermal fibroblast stimulation post-laser treatment. RESULTS: Histopathologic evaluation revealed a thin layer of epidermal keratinocyte preservation immediately after low fluence sub-ablative Er:YAG laser irradiation. One-week post-laser irradiation, the average increase in number of dermal fibroblasts as

compared to control was statistically significant (P < 0.01). CONCLUSIONS: The RAFT model can be used to assess the potential for epidermal preservation and dermal fibroblast stimulation of different photorejuvenation devices and irradiation parameters and offers several advantages over traditional animal and human skin models. Collagen Animals;Cells, Cultured;Collagen;Epidermal Cells;Epidermis;Fibroblasts;Humans;Keratinocytes;Low-Level Light Therapy;Models, Biological;Rats;Reference Values;Skin, Artificial

In vitro study examining the effect of sub-lethal QS 755 nm lasers on the expression of p16INK4a on melanoma cell lines. BACKGROUND AND OBJECTIVES: Q-switched lasers had been used in the treatment of lentigo maligna but their role remains controversial. While previous studies have addressed the change in adhesion molecule expression after sub-lethal laser damage, no study has addressed the impact of sub-lethal laser damage at a molecular level. The p16 gene has been proposed as the candidate gene for melanoma. Our objective is to examine the effect of sub-lethal laser damage on p16 expression in melanoma cell lines. STUDY DESIGN/MATERIALS AND METHODS: Three human melanoma cell lines-HTB 66, Sk-mel-24 (HTB 71), and G361-were irradiated by a Q-switched 755 nm Alexandrite laser at fluencies that ranged from 0.85 to 2.0 J/cm(2). HTB 66 was the only cell line with significant expression of p16INK4a while the other two cells lines were p16INK4a negative and served as negative control. Protein and mRNA expression for p16 were assessed by flow cytometry and RT-PCR, respectively. RESULTS: The level of p16INK4a protein in cell line HTB 66 increased significantly after laser irradiation as compared with non-irradiated cells. The level of p16INK4a protein did not change in p16INK4a-negative cell lines (Sk-mel-24 and G361). However, there was only a slight increase in the percentage of G0/G1 phase cells. CONCLUSIONS: Sub-lethal laser damage could increase DNA damage leading to an increase in p16 expression, and such effect would be particularly undesirable for patients with p16 mutation. Further studies are warranted to examine the role of sub-lethal laser damage in inducing p16 mutation. Cyclin-Dependent Kinase Inhibitor p16;RNA, Messenger Analysis of Variance;Cyclin-Dependent Kinase Inhibitor p16;Dose-Response Relationship, Radiation;Flow Cytometry;Gene Expression Regulation, Neoplastic;Humans;Low-Level Light Therapy;Melanoma;RNA, Messenger;Reverse Transcriptase Polymerase Chain Reaction;Skin Neoplasms;Tumor Cells, Cultured

Early pulsed-dye laser treatment of childhood haemangiomas. Hemangioma;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Treatment Outcome

Early pulsed-dye laser treatment of childhood haemangiomas. Hemangioma;Humans;Infant, Newborn;Low-Level Light Therapy

Intense pulsed light source for treatment of facial telangiectasias. OBJECTIVE: The purpose of this clinical study was to evaluate the effectiveness of the first intense pulsed light source (IPL) with dual mode light filtering for treatment of facial telangiectasias, and to evaluate the incidence of adverse including purpura, pigmentation and scars. MATERIALS AND METHODS: Twenty-four patients with facial telangiectasias were treated between one and four times with a new IPL system. This system differs from previous IPLs by eliminating wavelengths longer than 950 nm, which would otherwise lead to non-specific heating of tissue water. The treatments were performed at one-month intervals. Two months after the last treatment, the clinical effect was evaluated from close-up photographs. RESULTS: After one to four IPL treatments (mean: 2.54; SD: 0.96) for facial telangiectasias, 79.2% of the patients obtained a more than 50% reduction in number of vessels, and 37.5% obtained between a 75% and 100% reduction. Moderate erythema and oedema were the only adverse effects of the treatment. No purpura was registered and no long-term adverse effects such as scars or pigmentary disturbances occurred. CONCLUSIONS: An IPL with dual mode filtering is efficient and safe for treatment of facial telangiectasias. Adult;Edema;Erythema;Face;Facial

Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Telangiectasis;Time Factors;Treatment Outcome
Mechanoreceptors and length of the patellar ligament after Ho-YAG laser treatment: a long-term follow-up in rabbits. We studied the shortening and the number of mechanoreceptors in the patellar ligament up to 18 months after Ho-YAG irradiation of the ligament's surface in 35 rabbits. The ligaments shortened an average 13% immediately after irradiation. After treatment, we divided the rabbits into a mobilized or immobilized group. At 2 weeks and 12 months after treatment both groups showed no shortening of the ligament, as compared to the intact ligament while that in the mobilized group had elongated at 12 months. Fewer Pacinian and Ruffini corpuscles were found in the irradiated ligaments than in the intact ones at 2 weeks after treatment, but we found no difference between irradiated and intact ligaments at 18 months after treatment. Animals;Disease Models, Animal;Follow-Up Studies;Immobilization;Low-Level Light Therapy;Mechanoreceptors;Pacinian Corpuscles;Patellar Ligament;Rabbits;Time Factors
[Application of the low-intensive laser irradiation for the prophylaxis of the small intestinal anastomosis sutures insufficiency]. Anastomosis, Surgical;Animals;Low-Level Light Therapy;Male;Peritonitis;Postoperative Complications;Rats;Rats, Wistar;Suture Techniques
Helium-neon laser irradiation stimulates migration and proliferation in melanocytes and induces repigmentation in segmental-type vitiligo. Low-energy helium-neon lasers (632.8 nm) have been employed in a variety of clinical treatments including vitiligo management. Light-mediated reaction to low-energy laser irradiation is referred to as biostimulation rather than a thermal effect. This study sought to determine the theoretical basis and clinical evidence for the effectiveness of helium-neon lasers in treating vitiligo. Cultured keratinocytes and fibroblasts were irradiated with 0.5-1.5 J per cm2 helium-neon laser radiation. The effects of the helium-neon laser on melanocyte growth and proliferation were investigated. The results of this in vitro study revealed a significant increase in basic fibroblast growth factor release from both keratinocytes and fibroblasts and a significant increase in nerve growth factor release from keratinocytes. Medium from helium-neon laser irradiated keratinocytes stimulated [3H]thymidine uptake and proliferation of cultured melanocytes. Furthermore, melanocyte migration was enhanced either directly by helium-neon laser irradiation or indirectly by the medium derived from helium-neon laser treated keratinocytes. Thirty patients with segmental-type vitiligo on the head and/or neck were enrolled in this study. Helium-neon laser light was administered locally at 3.0 J per cm2 with point stimulation once or twice weekly. The percentage of repigmented area was used for clinical evaluation of effectiveness. After an average of 16 treatment sessions, initial repigmentation was noticed. Marked repigmentation (>50%) was observed in 60% of patients with successive treatments. Basic fibroblast growth factor is a putative melanocyte growth factor, whereas nerve growth factor is a paracrine factor for melanocyte survival in the skin. Both nerve growth factor and basic fibroblast growth factor stimulate melanocyte migration. It is reasonable to propose that helium-neon laser irradiation clearly stimulates melanocyte migration and proliferation and mitogen release for melanocyte growth and may also rescue damaged melanocytes, therefore providing a microenvironment for inducing repigmentation in vitiligo. Fibroblast Growth Factor 2;Helium;Neon Adolescent;Adult;Cell Division;Cell Movement;Cells, Cultured;Child;Child, Preschool;Female;Fibroblast Growth Factor 2;Helium;Humans;Infant;Laser Therapy;Male;Melanocytes;Neon;Pigmentation;Vitiligo
585-nm pulsed dye laser in the treatment of surgical scars starting on the suture removal day. BACKGROUND: The optimal time frame to improve the quality and cosmetic appearance of scars by laser therapy has not been clearly elucidated by prior controlled clinical trials. OBJECTIVE: To determine the efficacy of the 585-nm pulsed dye laser (PDL) in the treatment of surgical scars starting on the day of suture removal. METHODS: Eleven patients (skin types I-IV) with 12 postoperative linear

scars that were greater than 2 cm were treated three times on monthly intervals with the 585-nm PDL (450 micro s, 10-mm spot size, 3.5 J/cm2 with 10% overlap) on one scar half, whereas the other half received no treatment. Scars were later evaluated by a blinded examiner using the Vancouver Scar Scale (VSS) for pigmentation, vascularity, pliability, and height. Scars were then blindly examined for cosmetic appearance using a visual analog scale. RESULTS: One month after the last treatment, final scar analysis by the blinded examiner revealed a significant difference between treated and untreated sites, with the treated halves scoring better in all scar parameters in the VSS and in cosmetic appearance. The treated halves demonstrated an overall average improvement in the VSS between the first treatment score and the final score of 54% versus 10% in the controls (P=0.0002). The cosmetic appearance score (0=worst; 10=best) at final assessment was significantly better for the treated scars, scoring 7.3 versus the averaged control score of 5.2 (P=0.016). CONCLUSION: The 585-nm PDL is effective and safe in improving the quality and cosmetic appearance of surgical scars in skin types I-IV starting on the day of suture removal. Adult;Aged;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Prospective Studies;Sutures;Treatment Outcome

Long-term psychological impact and perceived efficacy of pulsed-dye laser therapy for patients with port-wine stains. BACKGROUND: The rationale for treatment of patients with port-wine stain (PWS) birthmarks has focused on the belief that eventual soft-tissue hypertrophy and negative psychological effects might be diminished or avoided. Pulsed-dye laser (PDL) therapy has become widely accepted as the treatment of choice for PWS, and a variety of studies have been conducted that evaluate its short-term efficacy. Long-term data regarding outcome and patient satisfaction are lacking. OBJECTIVE: Our objective was to evaluate the long-term efficacy of pulsed-dye laser therapy from the patient's perspective. METHODS: A survey was mailed to all patients or parents of minor patients whose last known laser treatment was performed between January 1, 1989, and January 1, 1996. Patients were asked to quantify changes in their PWS as well as their psychological well-being. A formal qualitative analysis was performed on their written comments as well. RESULTS: A total of 164 surveys were mailed to the most recent address available by the patient record. Fifty-two surveys were returned as undeliverable, and 55 evaluable surveys were returned, yielding a 49% overall return rate for patients who could be located. The mean age of respondents was 28.8 years, 96% of whom were white and 62% female. The mean number of years since last treatment was 7.04. The vast majority of patients noted little or no change in texture, height, or dimension of their PWS, whereas 62% noted color improvement. A majority or patients (60%) worried less about their appearance after treatment, whereas a similar number (61%) believed their ability to make friends or meet others was unaffected by treatment. Only 19% thought others looked at or treated them differently because of their PWS. Overall, 48% of patients indicated satisfaction with treatment, 24% dissatisfaction, and 28% neutral. On a 10-point scale indicating their likelihood of recommending treatment to someone similarly affected, the mean score was 7.42. Men were significantly and consistently less satisfied with treatment than women, despite rating the degree of color improvement similarly to women. Qualitative analysis of patient comments helped validate quantitative data and revealed gender differences in satisfaction, as well as correlations with adverse events from treatment, desire for additional treatment, and a trend toward more positive comments with the passage of time. CONCLUSION: The pulsed-dye laser improves the color of PWS over long periods of time in a majority of patients. Patients tended to worry less about their appearance after treatment, although most believed treatment did not substantially affect their relationship with others or others' view of them. Most patients were satisfied or neutral with regard to satisfaction with therapy and would recommend treatment to others. A minority of patients was dissatisfied with treatment, and men were more likely to be dissatisfied. Additional long-term and prospective studies

will be helpful in assessing the physical and psychosocial impact of PDL for PWS. Adolescent;Adult;Aged;Aged, 80 and over;Child;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Port-Wine Stain;Surveys and Questionnaires

Laser scar revision: comparison study of 585-nm pulsed dye laser with and without intralesional corticosteroids. BACKGROUND: Hypertrophic scars affect 1.5% to 4.5% of the general population and remain notoriously difficult to eradicate because of the high recurrence rates and the incidence of side effects associated with treatment. Pulsed dye laser (PDL) treatment and intralesional corticosteroids have individually been reported to be effective in reducing hypertrophic scar bulk and symptoms. OBJECTIVE: To determine whether combination PDL and intralesional corticosteroid treatment produces better hypertrophic scar improvement than PDL treatment alone. METHODS: Bilateral hypertrophic inframammary scars in 22 females were randomly assigned to receive treatment with 585-nm PDL alone or in combination with intralesional corticosteroid. Clinical evaluations and scar pliability scores were determined before each of the two treatment sessions and 6 weeks after the final treatment. Histologic evaluation of skin biopsies obtained before and after treatment was performed in four patients. RESULTS: All scars showed clinical improvement with increased pliability and decreased symptoms (pruritus) after each of the two treatments. Clinical improvement scores were not significantly better with the concomitant use of corticosteroids. Side effects were limited to mild purpura and transient hyperpigmentation. Decreased sclerosis was seen in scars after PDL treatment (with or without concomitant corticosteroids). CONCLUSIONS: Treatment of hypertrophic inframammary scars with 585-nm PDL irradiation alone effected substantial clinical and histologic improvement. The adjunctive use of intralesional corticosteroids did not significantly enhance clinical outcome except in those scars that were most symptomatic. Glucocorticoids;Triamcinolone Acetonide Adult;Cicatrix, Hypertrophic;Combined Modality Therapy;Female;Glucocorticoids;Humans;Low-Level Light Therapy;Mammaplasty;Middle Aged;Treatment Outcome;Triamcinolone Acetonide

[Impact of high-energy laser irradiation on pulmonic fibroblast in human embryo]. This impact was attained by medicinal laser application to alexandrite, dye, erbium and gallium arsenid in various conditions on cultures of pulmonic fibroblasts of human embryo. Obtained results were estimated by transmission and scanning microscopy. The highest cell destruction was observed in dye and alexandrite, being less expressed in gallium arsenid under laser irradiation. Impulsive action of erbium laser did not cause any substantional cell destruction. So, laser application to dye alexandrite and gallium arsenide for healing scar and contracture damages is completely justified for skin pathogeny. Arsenicals;Coloring Agents;alexandrite;gallium arsenide;Erbium;Gallium;Beryllium Arsenicals;Beryllium;Cells, Cultured;Coloring Agents;Erbium;Fibroblasts;Gallium;Humans;Lasers;Low-Level Light Therapy;Lung;Microscopy, Electron

Splinting vs surgery for carpal tunnel syndrome. Carpal Tunnel Syndrome;Decompression, Surgical;Humans;Low-Level Light Therapy;Splints;Transcutaneous Electric Nerve Stimulation

Dermatologic history of the ruby laser: the long story of short pulses. History, 20th Century;Humans;Laser Coagulation;Laser Therapy;Lasers;Low-Level Light Therapy;Skin Diseases

[Alternative methods for prevention and treatment of dental caries using laser and magnetic laser exposure]. Alternative methods for prevention and treatment of dental caries are presented, based on the use of laser and magnetic laser exposure (patent No. 2053818, in Russia) with a new generation laser device with Optodan microprocessor monitoring (patent No. 2014107, Russia). The methods are intended for wide clinical application in children and adolescents in pedodontic departments and outpatient centers and particularly for group and individual use in dental rooms at

school. Contraindications;Dental Caries;Dental Enamel;Dental Pulp;Humans;Laser Therapy;Low-Level Light Therapy;Magnetics;Saliva
[Effect of low intensity infrared laser radiation on cell membrane lipids in experiment]. Lipid Peroxides;Membrane Lipids;Sulfhydryl Compounds;alpha-Tocopherol Animals;Dose-Response Relationship, Radiation;Heart;Lipid Peroxidation;Lipid Peroxides;Liver;Low-Level Light Therapy;Membrane Lipids;Mice;Mice, Inbred C57BL;Myocardium;Rabbits;Rats;Rats, Wistar;Sulfhydryl Compounds;alpha-Tocopherol
[Magneto- laser-phoresis with heparin in the treatment of patients with chronic pharyngitis]. The results of treatment of various forms of chronic pharyngitis by magnetolaserophoresis (MLP) with heparin show that MLP is more effective in hypertrophic chronic pharyngitis. It is emphasized that when planning treatment of chronic pharyngitis one should take into consideration the state of the gastrointestinal tract. Anticoagulants;Fibrinolytic Agents;Heparin Adolescent;Adult;Aged;Anticoagulants;Chronic Disease;Female;Fibrinolytic Agents;Heparin;Humans;Iontophoresis;Low-Level Light Therapy;Magnetics;Male;Middle Aged;Pharyngitis;Time Factors
[Omentoplasty in surgical treatment of osteomyelitis of the ribs and sternum]. Seven-year experience in the treatment of 21 patients with chronic osteomyelitis of the ribs and sternum is summarized. Great omentum was used as plastic and disinfecting material in combination with laser radiation. Indications, techniques, short- and long-term results are presented. There were no recurrences of purulent process in the bones. Omentoplasty is the method of choice in surgical treatment of purulent lesions of costal cartilage and sternum. Cartilage;Chronic Disease;Humans;Low-Level Light Therapy;Omentum;Osteomyelitis;Retrospective Studies;Ribs;Sternum;Treatment Outcome
MRI thermodosimetry in laser-induced interstitial thermotherapy. BACKGROUND AND OBJECTIVES: The aim of this study was to establish a correlation between a thermal measurement and a magnetic resonance imaging (MRI) signal during laser-induced interstitial thermotherapy (LITT) in liver. STUDY DESIGN/MATERIALS AND METHODS: Pig liver was irradiated for 15 minutes with a diode laser at two different powers, 0.5 W (450 J) and 1.5 W (1,350 J). Tissue temperature was monitored every 20 seconds using thermocouples. Thermosensitive MRI sequences (T(1)-weighted Turbo-Flash) were acquired with the same irradiation parameters. Correlation between MRI signals (SI) and temperature measures was defined at two different distances from the fiber (5 and 10 mm). RESULTS: At 0.5 W, temperatures rose progressively up to a maximum increase of 9.5 degrees C at 5 mm and 4 degrees C at 10 mm after 15 minutes. The corresponding MRI signal decreased progressively to -27.6 SI at 5 mm and -18.5 SI at 10 mm. At 1.5 W, temperatures rose dramatically at 5 mm, reaching a plateau. The temperature elevation measured at the end of the irradiation was of 30 degrees C whereas at 10 mm it was only 14.5 degrees C. The MRI signal varied accordingly, remaining inversely proportional to temperature (-76 SI at 5 mm and -35.5 SI at 10 mm). CONCLUSIONS: An inversely proportional relationship was observed between MRI signal in sequential Turbo-Flash and temperature. MRI should allow to analyze heat diffusion in the liver, and thus to monitor real-time LITT treatments. Animals;Diffusion;Disease Models, Animal;Extracellular Space;Hyperthermia, Induced;In Vitro Techniques;Liver;Liver Neoplasms;Low-Level Light Therapy;Magnetic Resonance Imaging;Radiometry;Swine
Spectral response for laser enhancement in hepatic regeneration for hepatectomized rats. BACKGROUND AND OBJECTIVES: The low intensity laser therapy (LILT) has been widely used in all medical fields due to its therapeutic effects in reparative process, pain relief, and biostimulation. Even though there is a therapeutic window of wavelengths for clinical application, little has been done concerning the frequency spectrum response to biological effects. In this work, we investigate the

dependence of different wavelengths irradiation in the enhancement of the tissue regeneration after partial hepatectomy in Wistar rats. STUDY DESIGN/MATERIALS AND METHODS: The proliferating cell nuclear antigen (PCNA) labeling index and the respiratory control (oxygen consumption in extracted mitochondria) were the tests used to evaluate the liver regeneration after laser irradiation with different wavelengths. RESULTS AND CONCLUSIONS: The results show a correlated spectral response that can be explained based on the combined effect of light penetration on biological tissues and the biomolecular excitation efficiency for each wavelength used. Proliferating Cell Nuclear Antigen Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Hepatectomy;Liver Diseases;Liver Regeneration;Low-Level Light Therapy;Male;Mitochondria, Liver;Oxygen Consumption;Proliferating Cell Nuclear Antigen;Rats;Rats, Wistar;Spectrum Analysis;Time Factors

Ultrastructural changes elicited by a non-ablative wrinkle reduction laser. BACKGROUND AND OBJECTIVES: Cosmeceuticals, chemical peels and collagen injections are used to rejuvenate skin, but none of these methods is effective or permanent. Recently, laser resurfacing has been found to be effective, but the incidence of side effects is relatively high. Two years ago, the non-ablative wrinkle reduction laser (N-Lite, ICN Photonics, UK) was developed, and there have been several reports about its clinical effectiveness. In this study, we have investigated ultrastructural changes elicited by exposure to the N-Lite laser. STUDY DESIGN/MATERIALS AND METHODS: Eight adult volunteers were recruited for this study. They were treated with the N-Lite laser and 3-mm skin punch biopsies were obtained 3 hours, 1 day, 3 days, 1 week, 2 weeks, 4 weeks and 5 weeks after the laser exposure. These specimens were examined by electron microscopy. RESULTS: Three hours after the laser therapy, the capillaries showed endothelial cell edema with hemostasis and marked edema was observed around them. Neutrophils, monocytes and mast cells were observed in the extravascular dermis. These acute dermal inflammatory changes were observed until 1 week after the laser treatment. Two weeks after the laser treatment, the capillaries showed an almost normal structure, and dermal edema was not observed around them. New elastic fibers and collagen fibers had increased around the capillaries. Four weeks after the laser treatment, interstitial fibrosis was observed around the capillaries. CONCLUSIONS: N-Lite laser irradiation leads to interstitial fibrosis, especially around the capillaries, 4 weeks after the laser irradiation. Collagen Adult;Aged;Capillaries;Collagen;Dermis;Edema;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Skin Aging;Skin Diseases;Time Factors;Treatment Outcome

Basic study on vibrations during tooth preparations caused by high-speed drilling and Er:YAG laser irradiation. BACKGROUND AND OBJECTIVES: An Er:YAG laser effectively removes dental hard substance, and causes less pain during tooth preparations than high-speed drilling. This laser was introduced to eliminate the noise, vibration, pressure, and heat associated with the high-speed drilling. However, the difference in tooth vibration caused by the Er:YAG laser and the high-speed drill is unclear. Therefore, the aim of this study was to evaluate tooth vibration obtained with the Er:YAG laser and high-speed drill. STUDY DESIGN/MATERIALS AND METHODS: Each of the five extracted permanent upper first premolars were built up in a plaster box. In this study, a silicone impression material was selected to simulate periodontal tissue. The vibration speed was measured by using a laser Doppler vibrometer. RESULTS: The Er:YAG laser irradiation energy was 50, 100, 145, 199, 300, and 350 mJ. As irradiation energy increased, vibration of the tooth also rose; a high-correlation coefficient was observed between them. We found that only a small amount of the tooth vibration occurred with the Er:YAG laser preparations. The mean vibration speed and standard deviation with the laser were 166 +/- 28 microm/second when the output energy was 145 mJ, whereas those with the high-speed drill were 65 +/- 48 mm/second. The frequency characteristic approached 230 Hz and 5 kHz, respectively. CONCLUSIONS: These results show that the high-speed drilling causes greater tooth vibration and has a frequency spectrum near the high sensitivity of hearing compared to the

Er:YAG laser. This suggests a potential factor in provoking pain and displeasure during tooth preparation. Future study to examine the relationship of pain and amount of tooth vibration will be planned. Dental Instruments;Humans;Lasers;Low-Level Light Therapy;Models, Biological;Pain;Stress, Mechanical;Time Factors;Tooth Preparation;Vibration

Detection and diagnosis of oral cancer by light-induced fluorescence. BACKGROUND AND OBJECTIVE: New techniques for non-invasive early detection and diagnosis of oral dysplasia and carcinoma are required. Our objective was to determine in the hamster cheek pouch model whether differentiation between the healthy tissue and the different stages of oral premalignancy and malignancy is possible using laser-induced fluorescence after tissue exposure to 5-Aminolevulinic acid (ALA). STUDY DESIGN/MATERIALS AND METHODS: DMBA carcinogenesis was applied to one cheek pouch in 18 hamsters for 0-20 weeks. Prior to sacrifice, 20% ALA was applied to the cheek tissues. Excised cheek tissues were cryosectioned and imaged using fluorescence microscopy with excitation at 405 nm, detection at 635 nm. After fluorescence measurement, H&E staining and histopathological evaluation were performed. RESULTS: Fluorescence intensity was significantly lower in healthy tissue than in pathological tissues. Significantly higher intensities and more "fluorescence hot spots" occurred in severe dysplasia and carcinoma than in healthy tissue, hyperkeratosis, mild and moderate dysplasia. CONCLUSIONS: Light-induced fluorescence after ALA exposure can differentiate between the different stages of premalignancy and malignancy. Its ability to differentiate between healthy tissue and early pathology is particularly interesting Carcinogens;Photosensitizing Agents;9,10-Dimethyl-1,2-benzanthracene;Aminolevulinic Acid 9,10-Dimethyl-1,2-benzanthracene;Aminolevulinic Acid;Animals;Carcinogens;Carcinoma, Squamous Cell;Cheek;Cricetinae;Diagnosis, Differential;Disease Models, Animal;Low-Level Light Therapy;Microscopy, Fluorescence;Mouth Neoplasms;Neoplasm Staging;Photosensitizing Agents;Time Factors

Temporally and spectrally resolved fluorescence spectroscopy for the detection of high grade dysplasia in Barrett's esophagus. BACKGROUND AND OBJECTIVES: Temporal and spectral fluorescence spectroscopy can identify adenomatous colonic polyps accurately. In this study, these techniques were examined as a potential means of improving the surveillance of high grade dysplasia (HGD) in Barrett's esophagus (BE). STUDY DESIGN/MATERIALS AND METHODS: Using excitation wavelengths of 337 and 400 nm, 148 fluorescence spectra, and 108 transient decay profiles (at 550 +/- 20 nm) were obtained endoscopically in 37 patients. Corresponding biopsies were collected and classified as carcinoma, HGD, or low risk tissue (LRT) [non-dysplastic BE, indefinite for dysplasia (IFD), and low grade dysplasia (LGD)]. Diagnostic algorithms were developed retrospectively using linear discriminant analysis (LDA) to separate LRT from HGD. RESULTS: LDA produced diagnostic algorithms based solely on spectral data. Moderate levels of sensitivity (Se) and specificity (Sp) were obtained for both 337 nm (Se = 74%, Sp = 67%) and 400 nm (Se = 74%, Sp = 85%) excitation. CONCLUSIONS: In the diagnosis of HGD in BE, steady-state fluorescence was more effective than time-resolved data, and excitation at 400 nm excitation was more effective than 337 nm. While fluorescence-targeted biopsy is approaching clinical usefulness, increased sensitivity to dysplastic changes-possibly through modification of system parameters-is needed to improve accuracy levels. Adenocarcinoma;Algorithms;Barrett Esophagus;Endoscopy, Digestive System;Esophageal Neoplasms;Esophagus;Humans;Low-Level Light Therapy;Sensitivity and Specificity;Spectrometry, Fluorescence

Modulated low-energy near-infrared (NIR) lasers and cancer: an invitation to discuss a new treatment approach. Humans;Laser Therapy;Low-Level Light Therapy;Neoplasms

Contraindications in noninvasive laser therapy: truth and fiction. OBJECTIVE: Noninvasive laser therapy is a treatment method employed in many disciplines. This review article points out instances

when it appears to be effective to administer such therapy. MATERIALS AND METHODS: Noninvasive laser therapy has a number of suitable applications that cause minimal damage to the patient. Many patients are not sent to institutions equipped with relevant instruments, since physicians are burdened by a number of contraindications, many of which are incorrect. The purpose of this article was to divide these contraindications into the following three groups: correct indications, indications doubtful under certain conditions, and incorrect indications. DISCUSSION: We consider the following contraindications as correct: history of a histologically demonstrated malignant carcinoma; irradiation of the neck region in hyperthyreosis; epilepsy; exposure of the retina; and exposure of the abdomen during pregnancy. The contraindications that are doubtful under certain conditions are as follows: fever and infectious diseases; certain blood diseases; heavy blood losses; neuropathies; and irradiation in the region of gonads. The other contraindications reported in the literature are considered to be incorrect. Contraindications;Humans;Laser Therapy;Low-Level Light Therapy

Effects of 630-, 660-, 810-, and 905-nm laser irradiation delivering radiant exposure of 1-50 J/cm2 on three species of bacteria in vitro. OBJECTIVE: To examine the effects of low-intensity laser therapy (LILT) on bacterial growth in vitro. BACKGROUND DATA: LILT is undergoing investigation as a treatment for accelerating healing of open wounds. The potential of coincident effects on wound bacteria has received little attention. Increased bacterial proliferation could further delay recovery; conversely inhibition could be beneficial. MATERIALS AND METHODS: Pseudomonas aeruginosa, Escherichia coli, and Staphylococcus aureus were plated on agar and then irradiated with wavelengths of 630, 660, 810, and 905 nm (0.015 W/cm(2)) and radiant exposures of 1-50 J/cm(2). In addition, E. coli was irradiated with 810 nm at an irradiance of 0.03 W/cm(2) (1-50 J/cm(2)). Cells were counted after 20 h of incubation post LILT. Repeated measures ANOVA and Tukey adjusted post hoc tests were used for analysis. RESULTS: There were interactions between wavelength and species ($p = 0.0001$) and between wavelength and radiant exposure ($p = 0.007$) in the overall effects on bacterial growth; therefore, individual wavelengths were analyzed. Over all types of bacteria, there were overall growth effects using 810- and 630-nm lasers, with species differences at 630 nm. Effects occurred at low radiant exposures (1-20 J/cm(2)). Overall effects were marginal using 660 nm and negative at 905 nm. Inhibition of P. aeruginosa followed irradiation using 810 nm at 5 J/cm(2) (-23%; $p = 0.02$). Irradiation using 630 nm at 1 J/cm(2) inhibited P. aeruginosa and E. coli (-27%). Irradiation using 810 nm (0.015 W/cm(2)) increased E. coli growth, but with increased irradiance (0.03 W/cm(2)) the growth was significant ($p = 0.04$), reaching 30% at 20 J/cm(2) ($p = 0.01$). S. aureus growth increased 27% following 905-nm irradiation at 50 J/cm(2). CONCLUSION: LILT applied to wounds, delivering commonly used wavelengths and radiant exposures in the range of 1-20 J/cm(2), could produce changes in bacterial growth of considerable importance for wound healing. A wavelength of 630 nm appeared to be most commonly associated with bacterial inhibition. The findings of this study might be useful as a basis for selecting LILT for infected wounds. Escherichia coli;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus;Wound Healing;Wound Infection

Wavelength, frequency, and color: absolute or relative concepts? OBJECTIVE: The purpose of the present study is to call attention to well-established concepts in optics, which, however, are not necessarily known by medical laser users but may be important for interpretation of some data. BACKGROUND DATA: In reviewing some aspects of the physical concepts of wavelength, frequency, photon energy, and color, it was possible to establish, beyond doubt, the right conditions to use these terms to classify specific laser radiations. This may help in the correct interpretation of some low-level laser therapy (LLLT) experimental results. MATERIALS AND METHODS: In order to achieve our objective--maintaining the reader's interest--we use the simplest physical concepts and equations necessary for nonphysicists to understand this subject. RESULTS: The most important result pointed

out through this study is the fact that the numerical value for wavelength, normally assigned to commercial lasers, should not be used to describe the light propagation inside the tissue. CONCLUSION: The knowledge of the relation among the magnitudes discussed in the present study and their effects, although it does not add much to the use of a laser merely as a cutting instrument, becomes of fundamental significance when used to determine the effects that depend on light propagation within biological tissue and that do not result only from absorption of light energy. This will certainly help in the understanding of phenomena whose causes are attributed to the electric and magnetic polarization of laser radiation, as seems to be the case observed in laser biostimulation. Biophysical Phenomena;Biophysics;Color;Humans;Lasers;Mathematics;Radiation;Refractometry

Combination visible and infrared lasers for skin rejuvenation. Noninvasive techniques for skin rejuvenation are quickly being established as a new standard in the treatment of mild rhytides and overall skin toning. Multiple laser wavelengths and modalities have been tried for this procedure with varying degrees of success. These lasers include 532 nm, 585 nm, 1064 nm, 1320 nm, 1450 nm, and 1540 nm wavelengths. This study evaluates a combination technique by using a long-pulsed 532 nm potassium titanyl phosphate (KTP) laser and a long-pulsed 1064 nm Neodynium:yttrium aluminum garnet (Nd:YAG) laser, both separately and combined, for noninvasive photorejuvenation and skin toning/collagen enhancement, and establishes efficacy and degree of success. A total of 150 patients were treated with the long-pulsed KTP 532 nm (Aura; Laserscope, San Jose, CA) and long-pulsed Nd:YAG 1064 nm (Lyra; Laserscope) lasers both separately and combined. Patients included skin types I through V. The fluences varied between 7 and 15 J/cm2 at 7 to 20 ms pulse duration with a 2-mm handpiece, and 6 to 15 J/cm2 and 30 to 50 ms with a 4-mm handpiece for KTP. The Nd:YAG fluences were set at 24 to 30 J/cm2 for a 10-mm handpiece and 30 J/cm2 for a SmartScan Plus scanner (Laserscope, San Jose, CA). These energies were delivered at 30 to 65 ms pulse durations. All patients were treated at least 3 times and at most 6 times at monthly intervals, and were observed for up to 18 months after the last treatment. All 150 patients exhibited a mild to moderate degree of improvement in the appearance of rhytides, moderate degree of improvement in skin toning and texture, and great improvement in the reduction of redness and pigmentation. The KTP used alone was superior to the Nd:YAG laser in terms of results. The KTP and Nd:YAG laser combination was superior to either laser used alone. Adult;Combined Modality Therapy;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Rhytidoplasty;Skin Aging

Intense pulsed-light photorejuvenation. Intense pulsed light photorejuvenation represents a novel mode of treatment of photodamaged skin. A broad-spectrum flashlamp (500-1200 nm) targets chromophores reversing pigmentation, vascular and pilosebaceous aberrations. Both cytokine mediated as well as thermally induced deep dermal remodeling may be achieved using the varied polychromatic wavelengths associated with this technology. Inflammatory dermatosis such as rosacea may also be addressed as well. A structural approach to non-ablative rejuvenation utilizing intense pulsed light is associated with high patient satisfaction and minimal adverse sequelae. Facial Dermatoses;Humans;Laser Therapy;Low-Level Light Therapy;Rhytidoplasty;Skin Aging

Biophysics of nonablative dermal remodeling. This article explores the physics of nonablative skin remodeling as well as the histologic sequelae. Although there have been several studies of nonablative skin remodeling, the exact mechanisms of action and thus the optimum device-specific parameters are not yet known. The article is divided into a discussion of the physics of laser-tissue interactions, followed by a review of the types of devices used for nonablative skin remodeling, and the histologic findings that follow treatment. Biophysical Phenomena;Biophysics;Humans;Laser Therapy;Low-Level Light Therapy;Rhytidoplasty;Skin;Skin Aging;Skin Physiological Phenomena

Abstracts from the 3rd International Conference on Nearfield Optical Analysis. Sao Paulo, Brazil. June 25-26, 2002. Animals;Humans;Laser Therapy;Low-Level Light Therapy;Microscopy, Confocal

Laser irradiation inhibition of open gingival embrasure space after orthodontic treatment. The purpose of this study was to investigate the inhibitory effect of low-energy laser irradiation on an incidence of open gingival embrasure space after orthodontic treatment. The patient was a 20-year, 7-month-old Japanese female with an Angle Class I malocclusion and crowding in the mandible. Treatment consisted of extraction of maxillary and mandibular first premolars and use of the Edgewise technique. A Ga-Al-As diode laser was used to irradiate an area of 0.5 cm2 at the labial and lingual gingival papilla between the canines. The time of exposure was 6 minutes for 3 days, carried out between the relevelling and en masse stages of movement. The total energy corresponding to 6 minutes of exposure varied from 1.90 J/cm2. There was no further evidence of open gingival embrasure space, except at the mandibular central incisor. Further: an improvement in the gingival inflammation caused by a periodontal disease was observed, and periodontal pocket depth was maintained. These results suggest that low-energy laser irradiation may inhibit the incidence of open gingival embrasure space after orthodontic treatment.
Adult;Cuspid;Female;Gingiva;Gingival Diseases;Gingivitis;Humans;Low-Level Light Therapy;Malocclusion, Angle Class I;Orthodontics, Corrective;Periodontal Index;Periodontal Pocket;Radiotherapy Dosage;Serial Extraction;Tooth Movement Techniques

Effects of CO2 laser treatment on fibroblast attachment to root surfaces. A scanning electron microscopy analysis. BACKGROUND: The aim of this study was to analyze the CO2 laser effects on root surfaces affected by periodontal disease in comparison to scaling and root planing for fibroblast attachment. METHODS: Thirty single-rooted human teeth extracted because of advanced periodontal disease were included in this study. A total of 60 specimens, obtained from all selected teeth, were randomly assigned to 3 groups: 1) control (untreated); 2) hand scaling and root planing (SRP); or 3) laser (CO2 defocused pulsed) and ultrasonic scaling. All the specimens were incubated in Petri dishes with fibroblast suspension, and then observed by scanning electron microscopy (SEM). RESULTS: The control group showed the lowest number of attached cells, with no tightly attached fibroblasts. The laser plus scaling group showed the highest number of attached fibroblasts, with the tightly attached fibroblast prevailing. The laser-treated and scaled root specimens did not show any damage or morphologic alteration of the root surfaces. CONCLUSION: CO2 laser treatment in defocused, pulsed mode with a low power of 2W combined with mechanical instrumentation constitutes a useful tool to condition the root surface and increase fibroblast attachment to root surfaces. Carbon Dioxide Analysis of Variance;Animals;Bacteria;Carbon Dioxide;Cell Adhesion;Dental Scaling;Fibroblasts;Humans;L Cells;Laser Therapy;Low-Level Light Therapy;Mice;Microscopy, Electron, Scanning;Periodontal Diseases;Random Allocation;Surface Properties;Tooth Root;Ultrasonic Therapy

[Efficiency of supra-venous blood laser radiation used in the treatment of disseminated pulmonary tuberculosis in adolescents]. In 19 of 40 adolescent patients with disseminated pulmonary tuberculosis, supravenous blood laser radiation was used in the complex treatment 2-3 weeks after the initiation of chemotherapy. The use of this type of laser therapy enhanced the efficiency of the treatment, accelerated positive changes of tuberculosis by 2.5-3.5 months, as evidenced by clinical and laboratory parameters, led to a smooth course of tuberculosis to develop less pronounced residual changes in the lung. Antitubercular Agents Adolescent;Antitubercular Agents;Humans;Low-Level Light Therapy;Russia;T-Lymphocytes;Treatment Outcome;Tuberculosis, Pulmonary;Veins

The effect of combination treatment of the recalcitrant pigmentary disorders with pigmented laser and chemical peeling. BACKGROUND: The pigmentary disorders including melasma, freckles, postinflammatory hyperpigmentation, or acquired bilateral nevus of Ota-like macules, etc. are usually resistant to all treatment modalities, and are therefore very frustrating to the patient and clinician. OBJECTIVE: The purpose of this study was to demonstrate the effect of the combination treatment of recalcitrant pigmentary disorders with pigmented laser and chemical peeling and to observe any side-effects. METHODS: Twenty-four patients with recalcitrant facial pigmentary disorders were treated with the Q-switched alexandrite laser at fluences of 7.0-8.0 J/cm2 or the pigmented lesion dye laser (PLDL) at fluences of 2.0-2.5 J/cm2, and at the same session, 15-25% trichloroactic acid (TCA) with or without Jessner's solution were used for the chemical peeling. And the results were clinically analyzed. RESULTS: In the assessment by the patients, 63% of them considered the result as "clear, excellent, or good" in respect to the color and 54% of them assessed that the size of the lesion had cleared more than 50%. In the assessment by a clinician, 67% of the patients were categorized into the grade of clear, excellent, or good. There were no significant complications with this combination method. CONCLUSIONS: The combination treatment with pigmented laser and chemical peeling is effective, safe, and relatively inexpensive treatment modalities in the recalcitrant pigmentary disorders. Trichloroacetic Acid Adult;Aged;Chemexfoliation;Combined Modality Therapy;Facial Dermatoses;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Recurrence;Surveys and Questionnaires;Treatment Outcome;Trichloroacetic Acid

Dermal collagen production following irradiation by dye laser and broadband light source. BACKGROUND: Improvement in the appearance of wrinkles has been observed following exposure to short-pulsed 585 nm laser light. The assumed effect is a specific absorption of light in the blood vessels of the superficial dermis, resulting in release of inflammatory mediators into the interstitium followed by stimulated fibroblast activity. The fibroblasts effectively initiate tissue repair mechanisms, which include enhanced new collagen production. METHODS: Quantitative measures of collagen synthesis rate in the skin can be obtained from determinations of the aminoterminal propeptide of type III procollagen level in suction blister fluid using a radioimmunoassay. RESULTS: A single laser treatment at subpurpura energy level showed that the 585 nm laser source induced an increase of 84% ($p < 0.05$) in the type III procollagen production rate compared with a non-treated control site. A broadband, pulsed, white light source at 4 J/cm(2) showed no measurable increase, whilst the skin area treated with 7 J/cm(2) increased the procollagen production rate by 17% (NS, $p > 0.05$). A second treatment 2 weeks later further improved the laser-induced increase in procollagen production rate to 148% ($p < 0.05$) compared with the control site. The broadband, pulsed, white light-irradiated skin sites showed that at 4 J/cm(2) the procollagen production rate was increased by 21.4% and at 7 J/cm(2) by 32.1% compared with the corresponding non-treated control site (NS, $p > 0.05$). CONCLUSIONS: Irradiation by the haemoglobin-specific short-pulsed 585 nm laser induced a fivefold increase in procollagen production rate compared with a biologically comparable fluence delivered in a broadband spectrum. An additional treatment after 2 weeks further increased the effect of the short-pulsed 585 nm laser to 148% of the control. Vascular-specific light/tissue interactions seem to play a key role in stimulating skin collagen production. Procollagen;Collagen Adult;Collagen;Humans;Low-Level Light Therapy;Phototherapy;Procollagen;Skin Aging;Statistics, Nonparametric;Wound Healing

Abstracts of COSMOderm2/LASERderm1. August 31-September 3, 2002. Trieste, Italy. Animals;Dermatology;Humans;Low-Level Light Therapy;Phototherapy;Surgery, Plastic

Promotion of angiogenesis by low energy laser irradiation. The effect of low energy laser (He-Ne) irradiation (LELI) on the process of angiogenesis in the infarcted rat heart and in the chick

chorioallantoic membrane (CAM), as well as the proliferation of endothelial cells in tissue culture, was investigated. Formation of new blood vessels in the infarcted rat heart was monitored by counting proliferating endothelial cells in blood vessels. In the CAM model, defined areas were laser-irradiated or nonirradiated and blood vessel density was recorded in each site in the CAM at various time intervals. Laser irradiation caused a 3.1-fold significant increase in newly formed blood vessels 6 days post infarction, as compared with nonirradiated rats. In the CAM model, a slight inhibition of angiogenesis up to 2 days post irradiation and a significant enhancement of angiogenesis in the laser-irradiated foci as compared with control nonirradiated spots were evident. The LELI caused a 1.8-fold significant increase in the rate of proliferation in endothelial cells in culture over nonirradiated cells. It is concluded that LELI can promote the proliferation of endothelial cells in culture, which may partially explain the augmentation of angiogenesis in the CAM model and in the infarcted heart. These results may have clinical significance by offering therapeutic options to ameliorate angiogenesis in ischemic conditions. Allantois;Animals;Chick Embryo;Chorion;Disease Models, Animal;Lasers;Male;Myocardial Infarction;Neovascularization, Physiologic;Rats;Rats, Sprague-Dawley

Field trials with low power lasers concerning the blink reflex. Laser belonging to class 2 emit in the visible part of the spectrum. The power is limited to 1 mW in the CW mode. Up to now the protection of the eyes has been supposed to be given by the blink reflex for incidentally intrabeam viewing in many regulations. In 3 field trials with 519 test persons we have shown that only 15.9% at 670 nm, 17.2% at 635 nm, and 20.3% at 532 nm had a blink reflex under laser irradiation. An analysis of the results showed neither significant differences concerning the age and the gender of the test persons nor whether they were wearer of glasses or right sighted. The frequent lack of the blink reflex demands organizational measures like instruction using laser class 2 in medical and other applications. Accidents, Occupational;Blinking;Eye Injuries;Humans;Low-Level Light Therapy;Reaction Time;Risk Assessment

Lower-extremity varicosities: endoluminal therapy. Diagnostic Imaging;Humans;Leg;Low-Level Light Therapy;Saphenous Vein;Sclerotherapy;Varicose Veins

[Use of physical factors in the complex therapy of patients with diabetic angio- and polyneuropathies of the lower extremities]. Results are submitted of treatment of 110 patients with diabetes mellitus (61 male and 49 female subjects) presenting with angio- and polyneuropathies of the lower extremities. 70 patients, in addition to a drug therapy, were administered physiotherapeutic treatments, such as amplipulsetherapy, darsonvalization, and laserotherapy. Forty patients received medicamentous therapy only. Based on clinical findings and laboratory methods of investigation expediency has been shown of employment of physiotherapeutic methods in the treatment of the above pathology. Blood Glucose;Insulin Acupuncture;Acupuncture Points;Adolescent;Adult;Blood Glucose;Child;Diabetes Mellitus, Type 1;Diabetic Angiopathies;Diabetic Foot;Diabetic Neuropathies;Female;Glycosuria;Humans;Insulin;Low-Level Light Therapy;Male;Middle Aged;Physical Therapy Modalities

[Degree of endogenous intoxication in children with acute pneumonia in the presence of hypotrophy]. Children with acute pneumonia in the presence of hypotrophy derive no benefit from conventional therapy, with no change for the better being noted in the degree of endogenous intoxication. Endotoxemia has been shown to be alleviated by endovascular laser irradiation of blood included in the complex of therapeutic means of remediation used in acute pneumonia against the background of hypotrophy, which fact permits reducing the volume of medicamentous therapy. The above treatment option has also been found to exert a beneficial effect on the course of the illness. Acute Disease;Blood;Body Weight;Combined Modality Therapy;Humans;Infant;Low-Level Light Therapy;Pneumonia;Toxemia

Treating intraepithelial lesions of the uterine cervix by laser CO2. Evaluation of the past, appraisal for the future. BACKGROUND AND OBJECTIVE: Carbon dioxide laser (CO2) has been widely used in the past for the treatment of squamous intraepithelial lesions (SIL) of the uterine cervix. We present our 10-year experience of using this modality while evaluating its current and future use. MATERIALS AND METHODS: From 1988 to 1998, 3,078 women were treated for an intraepithelial lesion of the uterine cervix (SIL) by laser CO2 either by vaporization or conization. The procedure was performed on an outpatient basis and was well tolerated by the great majority of patients. The mean age of the women treated by vaporization was 27.5 years whereas of those managed by conization, 34.8 years. RESULTS: From the 3,078 women, 750 (24.4%) underwent laser vaporization and the remaining 2,328 (75.6%), conization of the cervix. Complications were minimal and consisted of intraoperative and postoperative bleeding (0.56%), pelvic infections (0.04%) and cervical stenosis (1.1%). Mean follow-up time was 83 months (range 24-142). Relapsing disease (either persistent or recurrent) was detected in 5.6% of the vaporization and 3.9% of the conization group. CONCLUSIONS: The management of SIL of the uterine cervix by laser CO2 offers excellent success rates with minor complications. The preservation of the anatomical integrity of the cervical tissue offers a better follow-up of these patients and the potential for repeat treatment. Although other treatment modalities are available, we believe that laser CO2 represents an excellent surgical tool for the management of intraepithelial lesions of the uterine cervix. Carbon Dioxide Adult;Aged;Carbon Dioxide;Carcinoma, Squamous Cell;Cohort Studies;Evaluation Studies as Topic;Female;Forecasting;Greece;Humans;Low-Level Light Therapy;Middle Aged;Prognosis;Retrospective Studies;Risk Assessment;Treatment Outcome;Uterine Cervical Neoplasms;Uterine Cervical Dysplasia

Cutis marmorata telangiectatica congenita: report of two persistent cases. Cutis marmorata telangiectatica congenita (CMTC) is defined as a localized or generalized reticulated, blue-violet vascular network in skin that is present at birth. The evolution is characterized by rapid improvement within 2 years. Rarely the lesions do not improve very much with age. Few reports include long-term follow-up of CMTC. We report two patients with persistent CMTC, including one with nervous breakdown and failure of laser treatment. The cause and incidence of persistent CMTC is unknown. Parents can be counseled that over time the lesions of CMTC may or not improve. There seems to be no predictive clinical sign. CMTC is usually a benign condition and therapy is rarely discussed. Treatment of persistent CMTC seems difficult and the effectiveness of laser therapy needs to be evaluated. Humans;Infant, Newborn;Low-Level Light Therapy;Male;Telangiectasia, Hereditary Hemorrhagic

[Effect of low-intensity laser therapy on urinary tract function]. The paper reports the results of the study of low-intensity infrared laser radiation effects on partial kidney functions. The course of the laser radiation resulted in improved blood supply to the kidney in 57.9% of the cases. Stimulation of the secretion and urodynamics was registered in 63.1 and 79% of the cases, respectively. Positive changes were also noted in diuresis, nitrogen-excretory and concentration functions of the kidneys. Humans;Kidney;Kidney Diseases;Lasers;Urinary Tract

[Verrucae vulgares. Treatment with 585 nm flashlamp pumped pulsed dye laser]. BACKGROUND AND OBJECTIVE: Various approaches have been taken in the management of verrucae vulgares, but a treatment of choice has not been established. PATIENTS/METHODS: Over a period of 12 months, 99 Patients with recalcitrant or untreated verrucae vulgares on their hands or feet (2:1) were treated with a 585 nm flashlamp pumped pulsed dye laser (FPDL) every 2 to 4 weeks. Laser parameters were: energy density 8 J/cm2, spot size 7 mm, pulse duration 450 microseconds. No topical measures were employed during the course of laser treatment. RESULTS: 93 patients finished the study, as 6 were lost to follow-up. Up to 8 laser treatments led to 63% total remission and 22% partial remission, 15%

did not respond to this type of management. Relapses were not found in a follow-up period of 2 to 6 months. CONCLUSIONS: FPDL is efficient for the removal/reduction of verrucae vulgares and does not requires less patient compliance than other treatment options.
Adolescent;Adult;Aged;Child;Child, Preschool;Female;Follow-Up Studies;Foot Dermatoses;Hand Dermatoses;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Warts

Evaluation of the long pulsed high fluence alexandrite laser therapy of leg telangiectasia. BACKGROUND AND OBJECTIVES: The treatment of larger leg veins with laser or intense pulsed light often shows varying degrees of success and inconsistent clinical response rates. Aim of this study was to evaluate the effectiveness and safety of the 755 nm long pulsed high fluence alexandrite laser in the treatment of larger leg veins. STUDY DESIGN/MATERIALS AND METHODS: Twenty female volunteers aged 25-51 years (mean 39) with 0.3-1.3 mm leg telangiectasias received laser treatment, 10 of them with an additional pass done right after the first pass. Their skin type ranged from 1 to 3 (five type 1, seven type 2, eight type 3). After test spots with increasing fluences (40-90 J/cm(2)) to determine the individual safe fluence, the maximum fluence of 90 J/cm(2) could be used in all 20 subjects. The spot size was 3 x 10 mm, a spray cooling system was used with 80 milliseconds spray and delay time, respectively. The number of pulses administered ranged from 30 to 467 per subject (mean 139). The treated area was controlled 1 day, 1 month, and 3 months post-treatment and the side effects were quantified. At each visit, the treatment area was photographed. The percent clearance in the treated areas was scored by two observers. Subject satisfaction was evaluated at the 3 months post-treatment visit. RESULTS: After 3 months, in all 20 test subjects some clearance was visible. It ranged from low-grade to complete clearance. Most subjects (15 of 20) had a clearance between 26 and 75%. Hyperpigmentation was observed in 15 subjects. Hypopigmentation was seen in two subjects. No edema, no purpura, no erythema, no scarring, no blistering, and no crusts were observed. Mean subject satisfaction score was assessed and all volunteers reported to be "satisfied." CONCLUSIONS: The long pulsed high fluence alexandrite laser is effective and safe in the treatment of leg veins 0.3-1.3 mm in diameter. Adult;Female;Follow-Up Studies;Humans;Leg;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pigmentation Disorders;Severity of Illness Index;Skin;Telangiectasis;Time Factors;Treatment Outcome

Comparing the effectiveness of 585-nm vs 595-nm wavelength pulsed dye laser treatment of port wine stains in conjunction with cryogen spray cooling. BACKGROUND AND OBJECTIVES: The objective of this study was to compare the efficacy and safety of cryogen spray cooled laser treatment (CSC-LT) at wavelengths of 585 nm vs. 595 nm for port wine stain (PWS) birthmarks in a large series of patients. STUDY DESIGN/MATERIALS AND METHODS: A retrospective review was conducted of 64 patients with PWS treated with the ScleroPLUS [Candela (Wayland, MA)] pulsed dye laser (lambda = 585 or 595 nm wavelength; spot size 7 mm, tau(p) = 1,500 microseconds) over a 3-year period. Subjects' ages ranged between 3 months and 64 years; there were 42 females and 22 males, all of whom were Asian. Number of treatments ranged from 1 to 6. Duration of treatment ranged from 6 months to 2 years 11 months, with a mean of 12 months. Patients (n = 32) received CSC-LT (585 nm) using radiant exposures of 7-10 J/cm(2). A second group of patients (n = 32) received CSC-LT (595 nm) using radiant exposures of 7-10 J/cm(2). The primary efficacy measurement was the quantitative assessment of blanching response scores for CSC-LT (585 nm) versus CSC-LT (595 nm). Patients were monitored for adverse effects. RESULTS: Based on chi-squared analysis, there were clinical, and statistically significant, differences in blanching response scores favoring PWS receiving CSC-LT (585 nm) as compared to CSC-LT (595 nm) ($P < .001$). Transient hyperpigmentation was noted in 43.7% (n = 14) and 37.5% (n = 12) of patients in the CSC-LT (585 nm) and CSC-LT (595 nm) groups, respectively. In both groups, transient hyperpigmentation resolved in all patients within 1 year. Permanent hypopigmentation or scarring was not observed in either group. CONCLUSIONS: CSC-LT

(585 nm) resulted in superior blanching as compared to CSC-LT (595 nm). Further study is required to optimize wavelength selection on an individual patient basis during PWS therapy in order to improve treatment results. Adolescent;Adult;Child;Child, Preschool;Cicatrix;Cryotherapy;Female;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pigmentation Disorders;Port-Wine Stain;Retrospective Studies;Severity of Illness Index

Effects of 810 nm laser irradiation on in vitro growth of bacteria: comparison of continuous wave and frequency modulated light. BACKGROUND AND OBJECTIVES: Low intensity laser therapy may modify growth of wound bacteria, which could affect wound healing. This study compares the effects on bacteria of 810 nm laser using various delivery modes (continuous wave or frequency modulated light at 26, 292, 1000, or 3800 Hz). STUDY DESIGN/MATERIALS AND METHODS: Staphylococcus (S.) aureus, Escherichia (E.) coli, and Pseudomonas (P.) aeruginosa were plated on agar and then irradiated (0.015 W/cm(2); 1-50 J/cm(2)) or used as controls (sham irradiated); growth was examined after 20 hours of incubation post exposure. RESULTS: There were interactions of species and modulation frequency in the overall effects of irradiation (P = 0.0001), and in the radiant exposure mediated effects (P = 0.0001); thus individual frequencies and each bacterium were analysed separately. Bacteria increased following 3800 Hz (P = 0.0001) and 1000 Hz (P = 0.0001) pulsed irradiation; at particular radiant exposures P. aeruginosa proliferated significantly more than other bacteria. Pulsed laser at 292 and 26 Hz also produced species-dependent effects (P = 0.0001; P = 0.0005); however, the effects for different radiant exposures were not significant. Bacterial growth increased overall, independent of species, using continuous mode laser, significantly so at 1 J/cm(2) (P = 0.02). Analysis of individual species demonstrated that laser-mediated growth of S. aureus and E. coli was dependent on pulse frequency; for S. aureus, however, there was no effect for different radiant exposures. Further tests to examine the radiant exposure effects on E. coli showed that growth increased at a frequency of 1000 Hz (2 J/cm(2); P = 0.03). P. aeruginosa growth increased up to 192% using pulsed irradiation at 1000-3800 Hz; whereas 26-292 Hz laser produced only a growth trend. CONCLUSIONS: The findings of this study point to the need for wound cultures prior to laser irradiation of infected wounds. Similar investigations using other common therapeutic wavelengths are recommended. Dose-Response Relationship, Radiation;Drug Administration Schedule;Escherichia;Humans;In Vitro Techniques;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus;Wound Healing;Wound Infection

Endovascular treatment using low-power ultraviolet laser for delayed vasospasm in the rabbit carotid artery model. BACKGROUND AND PURPOSE: We previously reported that pretreatment with external ultraviolet (UV) irradiation at 325 nm before blood exposure prevented the development of chronic vasospasm in rabbit common carotid arteries. The purpose of this study was to investigate the preventive effect of endovascular UV light on vasospasm after blood immersion by using the same animal model. METHODS: The right common carotid arteries in 63 rabbits were enclosed in silicon cuffs on day 0. Sheaths were empty or filled with clotted blood. Thirty minutes after the placement of the sheaths, either alone or with blood, the common carotid arteries were subjected to UV or visible light (442 nm) irradiation via an endovascular approach at a fluence rate of 0.17 W/cm(2). The animals were killed on day 2, 9, or 30. Digital subtraction angiography was performed on days 0 and 2 and at the end point to evaluate the degree of vasospasm. RESULTS: UV treatment significantly prevented the development of vasospasm on day 2. On days 9 and 30, there were no significant differences between UV-treated animals and control animals. The preventive effect reached an approximate plateau with an irradiation time of 10 s. No severe vascular injury, such as perforation, occurred in response to UV treatment during the observation period. UV light was significantly more effective than visible light in preventing vasospasm (P <.001). CONCLUSION: These

results suggest that endovascular UV irradiation after blood exposure has a prophylactic effect on vasospasm and suggest a dependence on irradiation wavelength and duration of irradiation. Animals;Blood Pressure;Carotid Artery, Common;Disease Models, Animal;Fiber Optic Technology;Light;Low-Level Light Therapy;Male;Rabbits;Severity of Illness Index;Time Factors;Treatment Outcome;Ultraviolet Therapy;Vasospasm, Intracranial

Selective photothermal interaction using an 805-nm diode laser and indocyanine green in gel phantom and chicken breast tissue. Laser immunotherapy, a novel therapy for breast cancer, utilises selective photothermal interaction to raise the temperature of tumour tissue above the cell damage threshold. Photothermal interaction is achieved with intratumoral injection of a laser-absorbing dye followed by non-invasive laser irradiation. When tumour heating is used in combination with immunoadjuvant to stimulate an immune response, antitumour immunity can be achieved. In this study, the selective photothermal effect was investigated using gel phantom and chicken breast tissue. An 805-nm diode laser and indocyanine green (ICG) were used. An ICG-containing gelatin phantom was constructed to simulate targeted tumour tissue. The target gel was buried inside chicken breast tissue and the tissue-gel construct was irradiated by the laser. Temperatures at different locations in the construct were measured during the laser irradiation. For comparison, the thermal effect of an Nd:YAG laser on the tissue-gel construct was also investigated. Selective heating of target gel containing 0.27% ICG and buried 1 cm below the chicken tissue surface was achieved with the 805-nm diode laser using a power of 0.85 W and beam radius of 1 cm. The target gel experienced a temperature increase of more then 6 degrees C whereas the surrounding chicken breast tissue experienced only a minor temperature increase. The feasibility of this experimental set-up has been shown. It will be used in the future to optimise treatment parameters such as laser power, laser beam radius, and dye concentration. Fat Emulsions, Intravenous;Gelatin;Indocyanine Green Animals;Breast Neoplasms;Chickens;Fat Emulsions, Intravenous;Gelatin;Indocyanine Green;Low-Level Light Therapy;Models, Structural;Muscle, Skeletal;Temperature;Thorax

Selective nonablative treatment of acne scarring with 585 nm flashlamp pulsed dye laser. BACKGROUND: Selective nonablative wrinkle reduction with low-fluence pulsed dye laser has been shown to provide cosmetic benefits by stimulating the production of dermal collagen. The clinical efficacy for improving the appearance of acne scarring using selective nonablative laser treatments has yet to be established. OBJECTIVE: To evaluate the improvement in the appearance and topography of acne scarring following application of a 585 nm pulsed dye laser with a temporal profile and pulse duration designed specifically to target healthy microvasculature in the dermis. METHODS: Ten patients (mean age 34.8 years) with Fitzpatrick skin types I-IV and shallow to moderately deep, saucerized facial acne scars were enrolled in a prospective trial to receive a single laser treatment of both cheeks. Patients were evaluated at 30, 60, 90, and 120 days to assess the degree of clinical improvement. The evaluation process included assessment of pre- and posttreatment photography by two independent observers, patient assessment surveys, and surface profilometry using silicone imprints in order to quantify the degree of clinical improvement. RESULTS: All 10 patients reported visible cosmetic improvement in the treated areas while surface profilometry showed that, on average, the depth of the acne scars was reduced by 47.8%. No adverse effects of this treatment were reported. CONCLUSION: The treatment of acne scars utilizing a 585 nm pulsed dye laser with a temporal profile and pulse duration designed specifically to target healthy microvasculature in the dermis may be a safe and effective noninvasive alternative for a natural result. Acne Vulgaris;Adult;Cicatrix;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome

Successful surgical treatment of verrucous hemangioma: a combined approach. BACKGROUND: Verrucous hemangioma, also known as angiokeratoma circumscriptum naeviforme, is a rare congenital vascular abnormality. Episodes of bleeding and infection following trauma or scratching are frequent. Superficial ablative therapies using laser, cryotherapy, and electrocautery are always followed by recurrence. OBJECTIVE: To report the clinical and histopathologic characteristics and treatment results of verrucous hemangioma. METHODS: This study included 23 patients with verrucous hemangioma treated by en toto surgical excision in combination with laser therapy. Palpation, inspection, computed tomography (CT), or magnetic resonance imaging (MRI) was performed to delineate surgical margins. RESULTS: The clinical presentation of verrucous hemangioma ranged from a small solitary verrucous plaque or cluster of lesions with unilateral limb involvement to Klippel-Trenaunay syndrome with bone hypertrophy. Histologically all specimens revealed the existence of hemangioma-like components in the subcutaneous tissue and dilated subepidermal blood cysts. The 14 patients presenting with small, localized lesions were cured by one session of surgery without recurrence, while the 9 patients with wider and more extensive lesions required combination therapy in several stages for optimal results. CONCLUSION: Surgical excision in combination with laser therapy is the preferred treatment for verrucous hemangioma because the crucial pathologic change is concentrated in the subcutaneous tissue. The use of clinical inspection, palpation, and imaging studies before surgery is helpful in delineating the underlying mass. Adolescent;Adult;Child;Child, Preschool;Combined Modality Therapy;Female;Hemangioma;Humans;Infant;Low-Level Light Therapy;Male;Skin Neoplasms;Treatment Outcome

[Prospects for preoperative low-intensity laser therapy in preventing postoperative thrombohemorrhagic complications in adenomectomy]. The authors analyse the results of preoperative preoperation of 143 patients with benign prostatic hyperplasia (BPH). Conventional preoperative preparation (antibiotics, uroantiseptics and phytotherapy) was used in combination with intravascular laser irradiation of blood (group 1, 30 patients), local laser therapy (transurethral and transrectal) (group 2, 27 patients), variation of laser methods (group 3, 28 patients) and alone (61 patients, group 4). Such preoperative preparation was aimed at prophylaxis of thrombohemorrhagic complications after adenomectomy. The efficiency of the treatment was assessed by hemostasis parameters. It was found that conventional antiinflammatory therapy had a weak effect on hemostasis, the greatest positive effects being achieved with combined laser preoperative preparation. Hyperfibrinogenemia, thrombinemia and activation of XII + a-dependent finrinolysis were stopped in patients of group 3. Because of less number of postoperative hemorrhages, hemotransfusions and transfusions of blood preparations were used less frequently, red cell parameters improved, exacerbations of chronic pyelonephritis occurred less often. Adult;Aged;Aged, 80 and over;Hemorrhage;Humans;Lasers;Male;Middle Aged;Postoperative Complications;Preoperative Care;Prostatic Hyperplasia;Thrombosis

[Low-energy laser radiation in otorhinolaryngology: history and current opportunities]. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Otorhinolaryngologic Diseases

[Changes in oxygen affinity for hemoglobin during exposure to low frequency magnetic field and low energy laser radiation]. Hemoglobins;Heme;Oxygen Electromagnetic Fields;Heme;Hemoglobins;Humans;In Vitro Techniques;Low-Level Light Therapy;Oxygen

[Micro-morphological analisys of enamel and dentin exposed to picosecond-pulsed Nd: YAG laser]. The efficiency of the ablation obtained with a picosecond-pulsed laser system minimizes material collateral damage because of the etching and plasma formation mechanism. It prevents the excessive generation of shock waves and promotes a considerable decrease of mechanical side effects. In this study, a Nd:YAG picosecond-pulsed Q-switched and mode-locked laser (Antares 76-s, Coherent, Palo

Alto, CA) was used. Fifteen microcavities were prepared in the enamel, and nine microcavities were prepared in the dentin of three recently extracted human molars. The parameters for irradiating enamel followed a fixed frequency of 100 Hz and an average power level of 1.3 W; for dentin, the frequency was fixed in 15 Hz, and the average power level varied between 800, 700 and 600 mW. Enamel proved more capable to dissipate shock waves than dentin, since cracks originating from microcavities were more frequent in dentin. In conclusion, it seems that in order to keep defined edges, it is important to choose shorter irradiation periods when average power levels are kept high, which results in lower and best-localized total energy delivery. Dental Enamel;Dentin;Humans;Low-Level Light Therapy;Microscopy, Electron

[Laser therapy and electric stimulation in rehabilitation treatment of peripheral neuropathy]. 73 patients with compression-ischemic myeloradiculopathy received treatment including infrared laser radiation on the paravertebral fields, motor points of the affected nerves and biologically active points Y63, Y67, YB34, YB42, YB43, E34, E42 (1.0-5.0 mW/cm2; 5 and 5000 Hz), electrostimulation of motor nerve points and innervated by them muscles by double square impulses with a fixed gap 5 ms. Impulse infrared laser therapy relieves pain syndrome, stimulates repair processes in the affected nerve structures. Further modified electric stimulation activates a regenerative growth of the nerve fibers, reinnervation of the limb muscles. Combined Modality Therapy;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Muscular Atrophy;Osteochondritis;Pain;Pain Management;Peripheral Nervous System Diseases;Spinal Cord Diseases

[Use of infrared laser therapy in patients with ischemic heart disease associated with diabetes mellitus type 2 in health resort]. Infrared laser therapy (300 Hz) combined with balneotherapy and patients' education is more effective than standard sanatorium rehabilitation in patients with ischemic heart disease associated with diabetes mellitus type 2. 81.8% patients showed good response manifesting in less frequent anginal attacks, episodes of pain and painless ischemia and lower doses of antianginal drugs. Systolic and diastolic arterial pressure lowered by 18 and 10 mm Hg on the average, respectively. Multimodality rehabilitation of IHD patients with type 2 diabetes mellitus improves hemostasis, carbohydrate and lipid metabolism. Coronary circulation response lasted for 24 weeks. Combined Modality Therapy;Diabetes Mellitus, Type 2;Female;Health Resorts;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia

Does low output laser stimulation enhance the healing of crural ulceration? Some critical remarks. The objective of the experiment was to evaluate the impact of laser stimulation on crural ulceration healing. Three groups were established at random from patients with crural ulceration: A, B and C. Group A included 21 patients, group B included 22 patients and group C, 22 patients. Patients in all groups were treated with pharmaceuticals and with compressive therapy. The ulcers in group A were additionally irradiated with laser light of wavelength 810 nm, so that a dose of 4 J/cm2 was applied in each procedure. Patients in group B were additionally subjected to a blind test (with placebo in the form of quasi-laser therapy). At the end of the treatment a statistically significant reduction of the area and volume of the ulcers was found in all groups. No statistically significant difference was found between the groups in terms of average rate of change per week of the relative area of ulceration and average rate of change per week of the relative volume of ulceration. Reduction of infected area was observed in all groups, but a significant change was only observed in group C. No significant impact of laser light (lambda=810 nm, P=65 mW, p=4 J/cm2) on any of the stages of ulceration healing was observed. Adult;Aged;Aged, 80 and over;Bandages;Combined Modality Therapy;Female;Granulation Tissue;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Pressure;Single-Blind Method;Suppuration;Treatment Outcome;Varicose Ulcer;Wound Healing

Treatment of experimentally induced transient cerebral ischemia with low energy laser inhibits nitric oxide synthase activity and up-regulates the expression of transforming growth factor-beta 1.

BACKGROUND AND OBJECTIVES: Nitric oxide (NO) has been shown to be neurotoxic while transforming growth factor-beta 1 (TGF-beta1) is neuroprotective in the stroke model. The present study investigates the effects of low energy laser on nitric oxide synthase (NOS) and TGF-beta1 activities after cerebral ischemia and reperfusion injury. STUDY DESIGN/MATERIALS AND METHODS: Cerebral ischemia was induced for 1 hour in male adult Sprague-Dawley (S.D.) rats with unilateral occlusion of middle cerebral artery (MCAO). Low energy laser irradiation was then applied to the cerebrum at different durations (1, 5, or 10 minutes). The activity of NOS and the expression of TGF-beta1 were evaluated in groups with different durations of laser irradiation. RESULTS: After ischemia, the activity of NOS was gradually increased from day 3, became significantly higher from day 4 to 6 ($P < 0.001$), but returned to the normal level after day 7. The activity and expression of the three isoforms of NOS were significantly suppressed ($P < 0.001$) to different extents after laser irradiation. In addition, laser irradiation was shown to trigger the expression of TGF-beta1 ($P < 0.001$). CONCLUSIONS: Low energy laser could suppress the activity of NOS and up-regulate the expression of TGF-beta1 after stroke in rats. Tgfb1 protein, rat;Transforming Growth Factor beta;Transforming Growth Factor beta1;Nitric Oxide Synthase Animals;Disease Models, Animal;Ischemic Attack, Transient;Low-Level Light Therapy;Male;Middle Cerebral Artery;Nitric Oxide Synthase;Rats;Rats, Sprague-Dawley;Reperfusion Injury;Time Factors;Transforming Growth Factor beta;Transforming Growth Factor beta1;Up-Regulation

Thermal and chemical modification of dentin by 9-11-microm CO2 laser pulses of 5-100-micros duration. BACKGROUND AND OBJECTIVES: Previous studies have shown that dentin can be thermally modified by pulsed CO(2) laser irradiation to form a more highly mineralized tissue. The implications are important for the potential laser modification or removal of dentinal and root caries and the transformation of dentin to a more acid resistant mineralized tissue. STUDY DESIGN/MATERIALS AND METHODS: Time resolved radiometry measurements with TEA CO(2) laser pulses were used to determine the magnitude of the absorption coefficients of dentin at the highly absorbed CO(2) laser wavelengths and to measure the temperature excursions during lambda = 9.3, 9.6, 10.3, and 10.6 microm laser irradiation at irradiation intensities of 0.1-8 J/cm(2) per pulse. In addition, photoacoustic and transient reflectance measurements were used to monitor the loss of water and organics and to detect the thresholds for surface modification and tissue ablation. RESULTS: The absorption coefficients were measured to be 5,000; 6,500; 1,200; and 800 cm(-1) at lambda = 9.3, 9.6, 10.3, and 10.6 microm, respectively. The surface temperatures of dentin were markedly higher than those measured on enamel for similar irradiation intensities due to the lower reflectance losses of dentin and the lower thermal diffusivity of dentin at the respective wavelengths. Hence, lower fluences are required for the thermal decomposition of dentin. Ablation typically occurred with the first few laser-pulses during multiple pulse irradiation and eventually ceased after modification of dentin to a more highly mineralized enamel-like tissue. The debris ejected during the initial laser pulses shielded the surface by as much as 60% at the low fluences employed in this study. Optical and electron microscopy and IR spectroscopy indicated that incident laser pulses with incident fluence as low as 0.5 J/cm(2) at 9.3 and 9.6 microm wavelengths with a duration of 5-8-micros were sufficient to induce chemical and morphological changes in dentin. CONCLUSIONS: In this study, the laser parameters for the efficient thermal modification of dentin with minimum heat deposition at CO(2) laser wavelengths were firmly established. Dental Caries;Dentin;Feasibility Studies;Hot Temperature;Humans;In Vitro Techniques;Low-Level Light Therapy;Radiometry;Time Factors

The possibility of dowel removal by pulsed Nd:YAG laser irradiation. BACKGROUND AND OBJECTIVES: Nd:YAG laser is one of the popularly used laser, in dentistry for treatment and technologic processing. Removal of dowel from root canal is very troublesome at endodontic

retreatment. This study aimed to examine the possibility and efficiency of dowel removal from the root canal using the Nd:YAG laser in vitro. STUDY DESIGN/MATERIALS AND METHODS: Irradiation time and energies required for complete removal of the dowel set in the root canal using the laser were measured. The dowel ablation was observed by contact microradiographs (CMRs). The surface of the root canal after lasing was observed by a scanning electron microscope (SEM). RESULTS: A significant difference existed in irradiation times and energies to remove dowels among various combinations of metal and cement ($P < 0.05$). The CMRs showed that both dowel and dentin were ablated, and the SEM observation demonstrated that root canal surface was melted. CONCLUSIONS: The Nd:YAG laser irradiation could remove set dowels from the root canal. Dental Pulp Cavity;Device Removal;Feasibility Studies;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Post and Core Technique;Radiography;Time Factors

Effect of low-power laser irradiation on cell growth and procollagen synthesis of cultured fibroblasts. BACKGROUND AND OBJECTIVES: In dentistry, low-power lasers have been used in the treatment of dentin hypersensitivity, gingivitis, periodontitis, and different forms of oral ulcers. This in vitro study focuses on the biostimulation of NIH-3T3 fibroblasts by a low-power Ga-As-pulsed laser. STUDY DESIGN/MATERIALS AND METHODS: We have studied cell growth and procollagen synthesis of cultured fibroblasts submitted to low-power laser irradiation with energy densities varying from 3 to 5 J/cm(2) over a period of 1-6 days. The light source was a 120 mW Ga-As diode laser (lambda = 904 nm). Growth curves and procollagen immunoprecipitation were obtained. RESULTS: Irradiation of 3 and 4 J/cm(2) increased the cell numbers about threefold to sixfold comparing to control cultures. However, this effect was restricted to a small range of energy densities since 5 J/cm(2) had no effect on cell growth. The energy density of 3 J/cm(2) remarkably increased cell growth, with no effect on procollagen synthesis, as demonstrated by the immunoprecipitation analysis. CONCLUSIONS: Our results showed that a particular laser irradiation stimulates fibroblast proliferation, without impairing procollagen synthesis. Procollagen 3T3 Cells;Animals;Cell Division;Cells, Cultured;Fibroblasts;In Vitro Techniques;Low-Level Light Therapy;Mice;Procollagen;Time Factors;Wound Healing

Laser assisted delivery of topical anesthesia for intramuscular needle insertion in adults. BACKGROUND AND OBJECTIVES: Currently there is no safe, effective, and rapid means to eliminate the pain associated with a needle insertion through the skin. It is hypothesized that ablation of the stratum corneum layer using a low energy Erbium(Er):YAG laser would allow rapid local anesthesia from a lidocaine product. STUDY DESIGN/MATERIALS AND METHODS: Eighty volunteers participated in a placebo-controlled, double blind, cross-over study employing the Norwood-Abbey (Chelsea Heights, Victoria, Australia) laser anesthesia device (LAD) and two lidocaine preparations. Upper-arm skin ablation was followed by a 5-minute application of study treatment. Pain scores were registered immediately following a needle insertion. RESULTS: Comparing the combined lidocaine preparations to placebo, there was a statistically significant reduction in pain when the LAD was employed ($P < 0.001$). The median pain reduction for lidocaine was 51.3% (95% CI = [40.9, 76.1]). CONCLUSIONS: Use of the low energy Er:YAG LAD device in combination with a 5-minute application of lidocaine significantly reduced the pain associated with a needle insertion. Anesthetics, Local;Lidocaine Adult;Anesthetics, Local;Cross-Over Studies;Double-Blind Method;Feasibility Studies;Female;Follow-Up Studies;Humans;Injections, Intramuscular;Lidocaine;Low-Level Light Therapy;Male;Pain;Pain Measurement;Time Factors

The treatment of facial verrucae with the pulsed dye laser. OBJECTIVES/HYPOTHESIS: To evaluate the treatment of facial verrucae with the pulsed dye laser. STUDY DESIGN: A prospective, nonrandomized, nonblinded pilot study evaluating the treatment of facial verrucae with the pulsed dye laser. METHODS: Twelve patients with facial verrucae (four recalcitrant) were identified and

followed in the study in the setting of a tertiary referral center. The treatment consisted of the flash-lamp pumped pulsed dye laser (585 mn) with a spot size of 5 mm at fluences between 9.0 and 13 J/cm. Each lesion received one or two pulses with 2 mm of surrounding normal skin included in the treatment. One patient had paring prior to pulse treatment. The patients were examined 3 to 4 weeks after each procedure, and clinical assessment of the lesion was documented. RESULTS: Patient ages ranged from 18 to 47 years. Four patients had refractory lesions, and eight patients had never undergone previous treatment. All 12 patients had full resolution of their facial warts after one to three treatment sessions. No complications such as scarring, alopecia, or recurrence were encountered. Follow-up ranged from 10 to 33 months. CONCLUSIONS: Pulsed dye laser therapy is highly effective and safe therapy for facial verrucae. This method appears to selectively destroy warts without damaging surrounding skin. Adolescent;Adult;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Prospective Studies;Treatment Outcome;Warts

Massive air embolism during interventional laser therapy of the liver: successful resuscitation without chest compression. We report on a rare, acute, life-threatening complication during percutaneous thermal therapy for hepatic metastases. Massive cardiac air embolism occurred during a maneuver of deep inspiration after the dislodgment of an introducer sheath into a hepatic vein. The subsequent cardiac arrest was treated successfully by immediate transthoracic evacuation of the air by needle aspiration followed by electrical defibrillation. In procedures that may be complicated by gas embolism, cardiopulmonary resuscitation should not be initiated before considering the likelihood of air embolism, and eventually aspiration of the gas. Brachytherapy;Cardiopulmonary Resuscitation;Electric Countershock;Embolism, Air;Heart;Heart Arrest;Humans;Liver;Low-Level Light Therapy;Male;Middle Aged;Suction;Tomography, X-Ray Computed

Clinical use of the Q-switched Nd:YAG laser for the treatment of acquired bilateral nevus of Ota-like macules (ABNOMs) in Koreans. BACKGROUND: There are still insufficient clinical reports about quality-switched Nd:YAG laser (QSNYL) in the treatment of acquired bilateral nevus of Otalike macules (ABNOMs) in Asians. OBJECTIVE: To analyze the efficacy and side-effect profiles of QSNYL treatment of ABNOMs in Korean skin. METHODS: A prospective study was designed to follow 10 Korean patients with ABNOMs through laser treatment until maximal eradication of the lesions had been achieved. RESULTS: Five patients (50%) with ABNOMs were treated with excellent or good results. The more treatments a patient underwent, the greater the possibility of improvement. There were no cases of persistent skin textural change or persistent erythema. CONCLUSION: The clinical data support QSNYL being a beneficial alternative tool for treating ABNOMs in brown skin. This is, to the best of the authors' knowledge, the first report about laser treatment of ABNOMs using QSNNL. Adult;Facial Neoplasms;Humans;Low-Level Light Therapy;Middle Aged;Nevus of Ota;Prospective Studies;Skin Neoplasms

The use of Q-switched Nd:YAG laser in the treatment of superficial pigmented lesions in Koreans. AIM: There are still insufficient clinical reports concerning quality-switched Nd:YAG laser (QSNYL) in the treatment of superficial pigmented lesions in Asians. The purpose of this study was to analyse the efficacy and side effect profiles of QSNYL-assisted pigment removal in brown skin. METHODS: A total of 71 patients, presenting a wide gamut of superficial epidermal lesions, were treated with QSNYL. Clinical responses were assessed by comparing photographs that were taken serially in every treatment. RESULTS: Treatment using the QSNYL is reported individually for the various superficial pigmented lesions in the skin of Korean patients. CONCLUSION: QSNYL may be a beneficial alternative tool for the treatment of a number of benign pigmented lesions including freckles, lentigines and unilateral lentiginosis. Adult;Child;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Nevus, Pigmented;Skin Neoplasms

Randomised controlled study of early pulsed dye laser treatment of uncomplicated childhood haemangiomas: results of a 1-year analysis. INTRODUCTION: The role of pulsed dye lasers (PDL) in the treatment of childhood haemangiomas is controversial. Our aim was to compare treatment with PDL with a wait-and-see policy. METHODS: We did a prospective, randomised controlled trial in which we enrolled 121 infants aged 1-14 weeks with early haemangiomas. We assigned infants to PDL treatment (n=60) or observation (n=61), and followed them up to age 1 year. The main outcome measures assessed were proportion of lesions completely clear or with minimum residual signs, adverse reactions, including pigmentary disturbance and skin atrophy, complications such as ulceration and infection, proportion of children whose parents considered the haemangioma a problem, characteristics of the haemangioma, and an independent assessment of the haemangioma problem by a panel of five parents. Analysis was by intention to treat. FINDINGS: All infants completed the study. The number of children whose lesions showed complete clearance or minimum residual signs at 1 year was not significantly different in the PDL treated and observation groups (25, 42%, vs 27, 44%; p=0.92). However, PDL treated infants were more likely to have skin atrophy (17, 28%, vs 5, 8%; p=0.008) and hypopigmentation (27, 45%, vs 9, 15%; p=0.001). The frequency of complications was similar between groups. The only objective measure of resolution that improved with PDL treatment was haemangioma redness. The number of children whose parents considered the haemangioma to be a problem at 1 year did not differ much between groups (11 of 60, 18%, vs 9 of 61, 15%; p=0.78). The independent parent panel validated this result. INTERPRETATION: PDL treatment in uncomplicated haemangiomas is no better than a wait-and-see policy. Atrophy;Hemangioma;Humans;Hypopigmentation;Infant;Infant, Newborn;Low-Level Light Therapy;Prospective Studies;Skin;Skin Neoplasms;Treatment Outcome

Laser treatment of childhood haemangioma: progress or not? Hemangioma;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Prospective Studies;Skin Neoplasms;Treatment Outcome

Postirradiation malignant fibrous histiocytoma of the larynx: a case report. A 63-year-old man presented with malignant fibrous histiocytoma of the larynx occurring 16 years after radiation treatment for squamous cell carcinoma of the larynx. Postirradiation sarcoma of the larynx is an unusual tumor. The location, the histopathologic and immunohistochemical appearance of the tumor, and the time elapsed since the initial treatment make it probable that this tumor is associated with prior radiation treatment. The possibility of postirradiation sarcomas after radiation therapy should not be a major factor influencing treatment decisions in the patients with head and neck cancer. Wide surgical resection of the tumor seems to be an efficient means in the management of this tumor. Carcinoma, Squamous Cell;Histiocytoma, Benign Fibrous;Humans;Laryngeal Neoplasms;Low-Level Light Therapy;Male;Middle Aged

Does LLLT stimulate laryngeal carcinoma cells? An in vitro study. Low level laser therapy (LLLT) has been used successfully in biomedicine and some of the results are thought to be related to cell proliferation. The effects of LLLT on cell proliferation is debatable because studies have found both an increase and a decrease in proliferation of cell cultures. Cell culture is an excellent method to assess both effects and dose of treatment. The aim of this study was to assess the effect of 635nm and 670 nm laser irradiation of H.Ep.2 cells in vitro using MTT (3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide). The cells were obtained from squamous cell carcinoma (SCC) of the larynx and were routinely processed from defrost to the experimental condition. Twenty-four hours after transplantation the cells were irradiated with doses ranging from 0.04 to 0.48J/cm2 for seven consecutive days (5 mW diode lasers: 635nm or 670 nm, beam cross-section approximately 1 mm) at local light doses between 0.04 and 0.48 J/cm2. The results showed that 635nm laser light did not significantly stimulate the proliferation of H.Ep.2 cells at doses of 0.04 J/cm2 to 0.48 J/cm2, However,

670nm laser irradiation led to an increased cell proliferation when compared to both control and 635nm irradiated cells. The best cell proliferation was found with 670nm laser irradiated cultures exposed to doses of doses of 0.04 to 0.48 J/cm2. We conclude that both dose and wavelength are factors that may affect cell proliferation of H.Ep.2 cells. Coloring Agents;Tetrazolium Salts;Thiazoles;thiazolyl blue Analysis of Variance;Carcinoma, Squamous Cell;Cell Division;Cell Survival;Coloring Agents;Dose-Response Relationship, Radiation;Humans;Laryngeal Neoplasms;Low-Level Light Therapy;Optics and Photonics;Radiation Dosage;Spectrum Analysis;Tetrazolium Salts;Thiazoles;Tumor Cells, Cultured

[Postintubation tracheal stenosis; problems associated with choice of management]. We experienced a case with tracheal stenosis due to postintubation damage, or so-called cuff stenosis. A 50-year-old man who attempted suicide by pounding nails into his head and chest using carpenter's tools was treated by endotracheal intubation and immediately underwent emergency surgery in July 2000. The patient was placed on artificial ventilation with oral endotracheal intubation, and a tracheostomy was performed 4 days after the operation. After that, his respiration recovered and he was weaned from the respirator. He was discharged 22 days after surgery with no respiratory symptoms. Two days after discharge, he complained of wheezing and dyspnea. Medical examination revealed that the cervical trachea had a severe circumferential stenosis 2.5 cm from the second tracheal cartilage. On retrospective inspection, the region of stenosis was compatible with the cuff site of the endotracheal tube used for the emergency operation. At first we tried nonoperative treatment, considering his mental state. However, we found that surgical treatment was ultimately necessary. A 2.5 cm sleeve resection of the trachea (5 tracheal cartilage rings) was performed, followed by end-to-end suture using 21 stitches with 4-0 MEDIFIT C thread. Pathologically, the surgical specimen showed degeneration and necrosis of tracheal cartilage with excessive growth of granulation tissue. These findings revealed that the etiologic basis of the tracheal stenosis was attributed to pressure necrosis by the cuff. The postoperative course was uneventful. Sixteen months after the surgery, the granulation tissue had not recurred, and problematic stenosis was not visible in the trachea. In this report, we discussed a reasonable management of postintubation tracheal stenosis. Tracheoplasty has been proposed as the most reliable method for treating tracheal stenosis. However, the best treatment in each case is still somewhat controversial because various nonoperative treatment methods are recently available, including laser phototherapy, argon plasma coagulation, mechanical dilatation, stent replacement, and drug treatment. Therefore, it is very important to judge properly the absolute indication for surgical treatment. If granulations are removed successfully by the above-described nonoperative methods, attempts at repair lead only to regrowth of granulation tissue as long as there is necrotic tracheal cartilage. Thus, the determinant of treatment methods is whether postintubation damage extends to tracheal cartilage or not. For now, there is no accurate diagnostic study for viability of cartilage preoperatively. In the literature, symptoms due to airway stenosis occurred rapidly within one month in the case of patients with necrosis of tracheal cartilage. We concluded that the period between extubation and development of symptoms is very informative in the management of postintubation tracheal stenosis. Surgical approaches should be selected for a patient with a rapid and progressive course after extubation when the patient can tolerate it. Humans;Intubation, Intratracheal;Male;Middle Aged;Trachea;Tracheal Stenosis

[Low-intensity laser irradiation in the treatment of patients with tuberculosis of the urinary system]. Female;Humans;Low-Level Light Therapy;Male;Nephrectomy;Time Factors;Treatment Outcome;Tuberculosis, Renal;Ureteral Diseases

Treatment response of keloidal and hypertrophic sternotomy scars: comparison among intralesional corticosteroid, 5-fluorouracil, and 585-nm flashlamp-pumped pulsed-dye laser treatments.

OBJECTIVE: To compare the clinical response of keloidal and hypertrophic scars after treatment with intralesional corticosteroid alone or combined with 5-fluorouracil (5-FU), 5-FU alone, and the 585-nm flashlamp-pumped pulsed-dye laser (PDL). DESIGN: Prospective, paired-comparison, randomized controlled trial. SETTING: A private ambulatory laser facility. PATIENTS: Ten patients with previously untreated keloidal or hypertrophic median sternotomy scars at least 6 months after surgery that were considered problematic by the patients. INTERVENTIONS: Five segments were randomly treated with 4 different regimens: (1) laser radiation with a 585-nm PDL (5 J/cm(2)); (2) intralesional triamcinolone acetonide (TAC) (20 mg/mL); (3) intralesional 5-FU (50 mg/mL); and (4) intralesional TAC (1 mg/mL) mixed with 5-FU (45 mg/mL). One segment of each scar received no treatment and served as a control. MAIN OUTCOME MEASURES: Scar height, erythema, and pliability were evaluated before and every 8 weeks after treatment. Patients' subjective evaluations were tabulated. Histologic sections of segments were examined in 1 biopsy sample per segment at week 32. RESULTS: There was a statistically significant clinical improvement in all treated segments. No significant difference in treatment outcome vs method of treatment was noted. However, intralesional formulas resulted in faster resolution than the PDL: scar induration responded better to intralesional formulas, scar texture responded better to the PDL, and scar erythema responded the same as the control with all treatments. Adverse sequelae, including hypopigmentation, telangiectasia, and skin atrophy, were observed in 50% (5/10) of the segments that received corticosteroid intralesionally alone. No long-term adverse sequelae were demonstrated in the segments treated with other modalities. CONCLUSIONS: Clinical improvement of keloidal and hypertrophic scars after treatment with intralesional corticosteroid alone or combined with 5-FU, 5-FU alone, and PDL seemed comparable, with the exceptions of the incidence of adverse reactions, which were most common with intralesional corticosteroid. Intralesional 5-FU is comparable to the other therapies. Adrenal Cortex Hormones;Fluorouracil Adrenal Cortex Hormones;Adult;Aged;Biopsy, Needle;Cicatrix, Hypertrophic;Drug Therapy, Combination;Female;Fluorouracil;Follow-Up Studies;Humans;Immunohistochemistry;Injections, Intralesional;Keloid;Low-Level Light Therapy;Male;Middle Aged;Probability;Prospective Studies;Reference Values;Sensitivity and Specificity;Statistics, Nonparametric;Sternum;Thoracotomy;Treatment Outcome;Wound Healing

Quantitation of calcitonin gene-related peptide mRNA and neuronal cell death in facial motor nuclei following axotomy and 633 nm low power laser treatment. BACKGROUND AND OBJECTIVES: A persistent increase in calcitonin gene-related peptide (CGRP) immunoreactivity in motoneurons may serve as an indicator for regeneration after peripheral nerve injury [Borke et al., J Neurocytol 1993;22:141-153]. STUDY DESIGN/MATERIALS AND METHODS: We examined the effects of low power laser treatment (633 nm) on axotomy-induced changes in alpha-CGRP mRNA and long-term neuronal survival in facial motoneurons. A quantitative reverse transcriptase-polymerase chain reaction (RT-PCR) assay for alpha-CGRP mRNA was used to detect changes in the response to axotomy and laser irradiation. Cell counts of neurons in injured and non-injured facial motor nuclei of laser-treated and non-treated rats were done to estimate neuronal survival. RESULTS: A 10-fold increase ($P < 0.0001$) in mRNA for alpha-CGRP at 11 days post-transection and an almost threefold increase ($P < 0.0001$) in neuronal survival at 6-9 months post-transection were found in 633 nm light treated rats. DISCUSSION: These findings demonstrate that 633 nm laser light upregulates CGRP mRNA and support the theory that laser irradiation increases the rate of regeneration, target reinnervation, and neuronal survival of the axotomized neuron. RNA, Messenger;Calcitonin Gene-Related Peptide Animals;Axotomy;Calcitonin Gene-Related Peptide;Female;Low-Level Light Therapy;Motor Neurons;Nerve Regeneration;Peripheral Nerve Injuries;Peripheral Nerves;RNA, Messenger;Rats;Rats, Sprague-Dawley;Reverse Transcriptase Polymerase Chain Reaction;Up-Regulation

Treatment of spider leg veins with the KTP (532 nm) laser--a prospective study. BACKGROUND AND OBJECTIVES: Spider leg veins are telangiectasias located intracutaneously. This condition poses a cosmetic problem. STUDY DESIGN/PATIENTS AND METHODS: The purpose of this study was to determine what influence the KTP (532 nm) laser has on spider leg veins dependent on the vascular diameter and to what extent the skin has been affected. Seventy female patients were treated in three laser sessions. Analysis was done 30 weeks after the last laser treatment session. RESULTS: Fifty-six patients completed the study. In group 1 (vascular diameter < or = 0.6 mm), spider leg veins were no longer visible in 33%; in 40%, a decrease in vascular diameter could be observed; in 27%, no change in size occurred. In group 2 (vascular diameter 0.7-1.0 mm), laser-treated spider leg veins were visible in all patients. Hyperpigmentation occurred in 13 patients. CONCLUSIONS: The KTP (532 nm) laser is an effective for treating spider leg veins having a vascular diameter under 0.7 mm. Adolescent;Adult;Female;Humans;Hyperpigmentation;Leg;Low-Level Light Therapy;Middle Aged;Prospective Studies;Telangiectasis;Time Factors;Treatment Outcome

[CO(2) and Er:YAG lasers in dermatology and aesthetic surgery]. In the past few years, the spectrum of indications for ablative lasers in dermatology and aesthetic medicine has been expanded due to technological innovations. In the following, technical basics, laser-tissue interactions, indications for the CO(2) and Er:YAG laser and laser treatment management are described. In addition, side effects and reactions associated with the use of these laser systems are listed and compared. Humans;Laser Therapy;Low-Level Light Therapy;Skin Aging;Skin Diseases;Surgery, Plastic;Treatment Outcome

Effects of low power laser and low dose amitriptyline therapy on clinical symptoms and quality of life in fibromyalgia: a single-blind, placebo-controlled trial. The purpose of this study was to examine the effectiveness of low power laser (LPL) and low-dose amitriptyline therapy and to investigate effects of these therapy modalities on clinical symptoms and quality of life (QOL) in patients with fibromyalgia (FM). Seventy-five patients with FM were randomly allocated to active gallium-arsenide (Ga-As) laser (25 patients), placebo laser (25 patients), and amitriptyline therapy (25 patients). All groups were evaluated for the improvement in pain, number of tender points, skin fold tenderness, morning stiffness, sleep disturbance, muscular spasm, and fatigue. Depression was evaluated by a psychiatrist according to the Hamilton Depression Rate Scale and DSM IV criteria. Quality of life of the FM patients was assessed according to the Fibromyalgia Impact Questionnaire (FIQ). In the laser group, patients were treated for 3 min at each tender point daily for 2 weeks, except weekends, at each point with approximately 2 J/cm(2) using a Ga-As laser. The same unit was used for the placebo treatment, for which no laser beam was emitted. Patients in the amitriptyline group took 10 mg daily at bedtime throughout the 8 weeks. Significant improvements were indicated in all clinical parameters in the laser group (P = 0.001) and significant improvements were indicated in all clinical parameters except fatigue in the amitriptyline group (P = 0.000), whereas significant improvements were indicated in pain (P = 0.000), tender point number (P = 0.001), muscle spasm (P = 0.000), morning stiffness (P = 0.002), and FIQ score (P = 0.042) in the placebo group. A significant difference was observed in clinical parameters such as pain intensity (P = 0.000) and fatigue (P = 0.000) in favor of the laser group over the other groups, and a significant difference was observed in morning stiffness (P = 0.001), FIQ (P = 0.003), and depression score (P = 0.000) after therapy. A significant difference was observed in morning stiffness (P = 0.001), FIQ (P = 0.003), and depression (P = 0.000) in the amitriptyline group compared to the placebo group after therapy. Additionally, a significant difference was observed in depression score (P = 0.000) in the amitriptyline group in comparison to the laser group after therapy. Our study suggests that both amitriptyline and laser therapies are effective on clinical symptoms and QOL in fibromyalgia and that Ga-As laser therapy is a safe and effective treatment in cases with FM. Additionally, the present study suggests that the Ga-As laser

therapy can be used as a monotherapy or as a supplementary treatment to other therapeutic procedures in FM. Placebos;Amitriptyline Adult;Amitriptyline;Analysis of Variance;Dose-Response Relationship, Drug;Female;Fibromyalgia;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Pain Measurement;Placebos;Quality of Life;Reference Values;Severity of Illness Index;Single-Blind Method;Statistics, Nonparametric;Treatment Outcome;Turkey

Therapeutic low energy laser improves the mechanical strength of repairing medial collateral ligament. BACKGROUND AND OBJECTIVES: Low energy laser therapy has been shown to enhance collagen production but its effect on tissue strength is not well reported. We tested the effects of therapeutic laser on the strength of healing medial collateral ligaments (MCLs) in rats. STUDY DESIGN/MATERIALS AND METHODS: Twenty-four rats received surgical transection to their right MCL and eight received sham operation. After surgery, 16 received a single dose of gallium aluminum arsenide laser to their transected MCL for 7.5 minutes (n = 8) or 15 minutes (n = 8) and eight served as control with placebo laser, while the sham group didn't receive any treatment. The MCLs were biomechanically tested at either 3 or 6 weeks post-operation. RESULTS: The normalized ultimate tensile strength (UTS) and stiffness of laser and sham groups were larger than control ($P < 0.001$). The UTS of laser and sham groups were comparable. Laser and sham groups had improved in stiffness from 3 to 6 weeks ($P < 0.001$). CONCLUSIONS: A single dose of low energy laser therapy improves the UTS and stiffness of repairing MCL at 3 and 6 weeks after injury. Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Elasticity;Low-Level Light Therapy;Male;Medial Collateral Ligament, Knee;Rats;Rats, Sprague-Dawley;Stress, Mechanical;Tensile Strength;Time Factors;Viscosity;Wound Healing

Morphological analysis of cementum and root dentin after Er:YAG laser irradiation. BACKGROUND AND OBJECTIVES: To investigate the morphology of cementum and root dentin after Er:YAG laser irradiation with and without water coolant, compared to that after CO(2) laser irradiation and an untreated surface. STUDY DESIGN/MATERIALS AND METHODS: Ten extracted healthy human teeth were used. Er:YAG and CO(2) lasers were applied with energy outputs of 0.4 W, with and without coolant and 0.5 W, without coolant, respectively. Scanning electron microscopy (SEM) analysis was performed at high and ultra-high magnifications. RESULTS: The surface of cementum was micro-irregular with numerous projections while that of dentin appeared scaly after Er:YAG laser irradiation. Unlike after CO(2) laser treatment, no major melting or cracking was observed with Er:YAG laser treatment. The use of water spray produced fine micro-irregularities without attached debris. Ultra-high magnification revealed similar microparticles-composed aspects for both cementum and dentin. However, the more porous structure of the surface was observed after Er:YAG laser irradiation without water spray. CONCLUSIONS: Cementum and root dentin presented distinct micro-roughness after Er:YAG laser irradiation, possibly due to structural differences in the original tissue. However, under ultra-high magnifications, both cementum and dentin presented similar characteristics of the irradiated surface. In addition, the use of water spray during laser irradiation minimized thermal effects and resulted in a cleaner and less porous surface. Water Dental Cementum;Dentin;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Periodontal Diseases;Water

Systemic effects of low-intensity laser irradiation on skin microcirculation in patients with diabetic microangiopathy. Low-intensity laser irradiation has been shown to induce wound healing in conditions of reduced microcirculation, which is in part explained by systemic effects. We therefore investigated such a potential systemic effect of low-intensity laser irradiation on skin blood circulation in patients with diabetic microangiopathy. Patients with diabetic microangiopathy were randomized to receive either a single helium-neon (HeNe, 632.8 nm) low-intensity laser irradiation with a dose of 30 J/cm(2) or a sham irradiation over the forefoot region in a double-blind, placebo-controlled clinical

study. Skin blood circulation by means of temperature recordings over forefoot regions was detected by infrared thermography. Following a single transcutaneous low-intensity laser irradiation, a rise in skin temperature in both feet of the subjects in the laser group was noted, whereas in both feet of the subjects in the placebo group a drop in skin temperature occurred. The baseline-adjusted skin temperature 15 min after the end of the irradiation was significantly higher in the laser-treated forefeet compared to the placebo-"treated" forefeet ($p < 0.0001$); the baseline-adjusted difference in the temperature was 1.94 +/- 0.35 degrees C. Simultaneously, the baseline-adjusted skin temperature was significantly higher in the laser-untreated forefeet compared to the placebo-"untreated" forefeet ($P < 0.0001$); the baseline-adjusted difference was 1.70 +/- 0.33 degrees C. Our data show a significant increase in skin circulation due to athermic laser irradiation in patients with diabetic microangiopathy and point to the possibility of inducing systemic effects.
Hemoglobins;Helium;Neon Adult;Aged;Aged, 80 and over;Body Temperature;Diabetic Angiopathies;Female;Foot;Helium;Hemoglobins;Humans;Lasers;Male;Microcirculation;Middle Aged;Neon;Skin;Temperature;Time Factors

[Contemporary, noninvasive methods of wrinkles treatment, possibilities and esthetic dermatology]. Wrinkles are the most visible sign of the aging skin. The author presented characteristic changes in the epithelium and dermis for that type of skin and therapeutic possibilities utilised in the esthetic dermatology. They also undertook an attempt to classify patients for particular types of revitalization interventions (implants, botulin toxin, peelings). Botulinum Toxins, Type A Botulinum Toxins, Type A;Chemexfoliation;Cosmetic Techniques;Dermabrasion;Face;Humans;Low-Level Light Therapy;Skin Aging

Laser stimulation on bone defect healing: an in vitro study. The aim of this in vitro study was to evaluate whether low-power laser (LPL) stimulation can accelerate bone healing. Bone defects of a standard area were created in the distal epiphysis of 12 femora explanted from six rats, and they were cultured in BGJb medium for 21 days. Six defects were treated daily with Ga-Al-As, 780 nm LPL for 10 consecutive days (lased group, LG), while the remainder were sham-treated (control group, CG). Alkaline phosphatase/total protein (ALP/TP), calcium (Ca), and nitric oxide (NO) were tested on days 7, 14 and 21 to monitor the metabolism of cultured bone. The percentage of healing of the defect area was determined by histomorphometric analysis. After 21 days significant increases were observed in ALP/TP in LG versus CG ($p<0.001$), in NO in the LG versus CG ($p<0.0005$) and in Ca in CG versus LG ($p<0.001$). The healing rate of the defect area in the LG was higher than in the CG ($p=0.007$). These in vitro results suggest that Ga-Al-As LPL treatment may play a positive role in bone defect healing. Proteins;Nitric Oxide;Alkaline Phosphatase;Calcium Alkaline Phosphatase;Animals;Bone Regeneration;Bone and Bones;Calcium;Female;Femur;Low-Level Light Therapy;Nitric Oxide;Organ Culture Techniques;Proteins;Rats;Rats, Sprague-Dawley;Wound Healing

Effects of diode laser therapy on blood flow in axial pattern flaps in the rat model. Axial pattern skin flaps are a very important reparative tool for the plastic and reconstructive surgeon in the reconstruction of tissue defects. From whatever unfortunate reason, part or all of such flaps occasionally suffers from irreversible ischaemia with loss of the flap. Infrared diode laser therapy has been shown to improve local and systemic circulation. The present study was designed to assess the effect of an 830 nm diode laser (power density, 18.5 W/cm(2), energy density 185 J/cm(2)) on the blood flow of axial pattern flaps in the rat model and their survival, compared with unirradiated controls. The flaps were raised in all animals (n=40), and blood flow assessed with laser speckle flowmetry (LSF). In the experimental groups (3 groups, n=10 per group), the flaps were irradiated either directly over the dominant feeder vessel (iliolumbar artery), at the proximal end or at the distal end of the flap itself and blood flow assessed during irradiation. Flowmetry was performed again in all animals at 5 and 10 min postirradiation, and the flaps sutured back in position. The unirradiated

controls were handled in exactly the same way, but the laser was not activated. The survival rate of the flaps was assessed on the fifth postoperative day. LSF demonstrated significant increased blood flow in the flaps at 5 and 10 min postirradiation in all experimental groups compared with the control animals. At five days postirradiation, there was significantly better survival of the flaps in all the experimental groups compared with the controls ($p<0.01$), but no significant difference was seen between any of the experimental groups. We conclude that laser therapy increases the blood flow and perfusion of transferred flaps, and that this has significant effects on the survival of the flaps. One possible mechanism of modulation of the autonomic nervous system is discussed.
Animals;Blood Flow Velocity;Graft Survival;Ischemia;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Regional Blood Flow;Surgical Flaps

Treatment of pigmented hypertrophic scars with the 585 nm pulsed dye laser and the 532 nm frequency-doubled Nd:YAG laser in the Q-switched and variable pulse modes: a comparative study. BACKGROUND: Pigmented hypertrophic scars are a difficult condition to treat. They may result from traumatic injuries or from surgical and cosmetic procedures. The 585 nm flashlamp-pumped pulsed dye laser (FLPDL) has been used to treat this condition, with significant improvement of varying degrees. It remains to be determined whether other laser modalities may have a similar or even greater success in the treatment of pigmented hypertrophic scars. OBJECTIVE: To determine the efficacy of the 532 nm frequency-doubled Nd:YAG laser in the treatment of pigmented hypertrophic scars as compared to the 585 nm FLPDL. METHODS: Six patients with pigmented hypertrophic scars and skin phototypes II-IV were chosen. A scar was selected for treatment in each patient and divided into four equal 2 cm segments. Three segments were each treated with a different laser modality and one was left untreated to serve as the control. A 585 nm FLPDL was used with an energy of 3.5 J, a pulse duration of 450 microsec, and a 10 mm spot size. A 532 nm Q-switched frequency-doubled Nd:YAG laser was set to an energy of 2.8 J, a 10-nsec pulse, and a 3 mm spot size. The same 532 nm laser was set to the variable pulse mode to treat a 2 cm scar segment, with an energy of 9.5 J, a 10-msec pulse, and a 4 mm spot size. An average of 3.3 treatments were performed on each scar segment, at intervals of 4-6 weeks and long-term follow-up at 22 weeks. Treatment outcome was graded by a blind observer using the Vancouver General Hospital (VGH) Burn Scar Assessment Scale. A SigmaStat t-test was used to determine the statistical significance of the values obtained. RESULTS: Treatment of pigmented hypertrophic scars with the 532 nm Q-switched Nd:YAG laser led to a significant improvement of 38% in the VGH scores when compared to baseline ($P = .005$). The 585 nm FLPDL also had a favorable effect on the scars, with an average improvement of 36.1% in the VGH scores. There was no significant difference noted between the outcome of treatment with either of these two lasers. Treatment with the 532 nm variable pulse Nd:YAG laser led to a 19% improvement in the VGH scores of scars, which did not differ significantly from the 16.1% improvement observed in control scars on the last follow-up visit. No side effects or complications from treatment were noted or reported during the course of the study. At the conclusion of the study, five of six patients chose the segment treated with the 532 nm Q-switched Nd:YAG laser as the best segment overall. CONCLUSION: The 532 nm Q-switched Nd:YAG laser and the 585 nm FLPDL offer comparable favorable results in the treatment of pigmented hypertrophic scars. The 532 nm Q-switched Nd:YAG laser may be preferred by patients particularly distressed by the dark color of their scars.
Adolescent;Adult;Cicatrix;Humans;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Treatment Outcome

Fat liquefaction: effect of low-level laser energy on adipose tissue. Low-level laser energy has been increasingly used in the treatment of a broad range of conditions and has improved wound healing, reduced edema, and relieved pain of various etiologies. This study examined whether 635-nm low-level lasers had an effect on adipose tissue in vivo and the procedural implementation of

lipoplasty/liposuction techniques. The experiment investigated the effect of 635-nm, 10-mW diode laser radiation with exclusive energy dispersing optics. Total energy values of 1.2 J/cm(2), 2.4 J/cm(2), and 3.6 J/cm(2) were applied on human adipose tissue taken from lipectomy samples of 12 healthy women. The tissue samples were irradiated for 0, 2, 4, and 6 minutes with and without tumescent solution and were studied using the protocols of transmission electron microscopy and scanning electron microscopy. Nonirradiated tissue samples were taken for reference. More than 180 images were recorded and professionally evaluated. All microscopic results showed that without laser exposure the normal adipose tissue appeared as a grape-shaped node. After 4 minutes of laser exposure, 80 percent of the fat was released from the adipose cells; at 6 minutes of laser exposure, 99 percent of the fat was released from the adipocyte. The released fat was collected in the interstitial space. Transmission electron microscopic images of the adipose tissue taken at x60,000 showed a transitory pore and complete deflation of the adipocytes. The low-level laser energy affected the adipose cell by causing a transitory pore in the cell membrane to open, which permitted the fat content to go from inside to outside the cell. The cells in the interstitial space and the capillaries remained intact. Low-level laser-assisted lipoplasty has a significant impact on the procedural implementation of lipoplasty techniques. Adipose Tissue;Cell Membrane;Female;Humans;Lipectomy;Low-Level Light Therapy;Microscopy, Electron;Microscopy, Electron, Scanning;Time Factors

Low-intensity laser therapy/combined phototherapy in the management of chronic venous ulceration: a placebo-controlled study. OBJECTIVE: The current placebo-controlled study was undertaken to investigate the efficacy of combined phototherapy and low-intensity laser therapy (LILT) in the management of chronic venous ulceration when used in conjunction with standardized nursing intervention. MATERIALS AND METHODS: Approval was granted by Research Ethical Committees at the University of Ulster and Altnagelvin Hospitals Health and Social Services Trust. Patients (n = 15; 10 female/5 male; age +/- SD = 69.9 +/- 13.8 years) were recruited from an outpatient "leg ulcer clinic," where they attended once per week for irradiation/sham treatments for 4 weeks. Treatment was withheld for a total of 8 weeks, and patients were reviewed during this time (weeks 8 and 12) for ulcer and pain assessment only. A multisource diode array (660-950 nm) was used for irradiation; parameters were kept constant for the duration of the study (532 mW; 5 kHz; 12 J/cm(2)). Wound and pain assessment were carried out by an independent investigator. Digitizing was used to quantify surface areas from wound tracings. RESULTS: Although there was no statistically significant difference between Treatment and Placebo groups, an apparent clinical difference in wound healing rate was noted; at postirradiation, a continued reduction in wound size was evident for the treatment group. These effects were believed to be due to an apparent delayed effect. There was no statistically significant difference between groups for pain. CONCLUSION: These findings provide only limited evidence for the use of this modality as an adjunctive therapy with current nursing intervention. Further group studies are indicated to investigate the apparent delayed effect reported here for various etiologies of ulceration. Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Phototherapy;Varicose Ulcer;Wound Healing

Wound healing in cell studies and animal model experiments by Low Level Laser Therapy; were clinical studies justified? a systematic review. Based on results of cell studies and animal experiments, clinical trials with Low Level Laser Therapy (LLLT) were performed, which finally did not demonstrate a beneficial effect on outcome of wound healing. The aim of this study was to investigate whether the evidence from cell studies and animal experiments with respect to wound healing was unequivocally in favour of LLLT, which would imply that these models might be adequate to predict treatment response in patients, or that the data of cell studies and animal experiments

were inconclusive, which would mean that the clinical trials were based on insufficient evidence. We performed a systematic review of cell studies and animal experiment with LLLT on wound healing. Manuscripts were identified by searching Medline, Embase, and SPIE (the International Society for Optical Engineering). We assessed whether studies showed a beneficial effect of active treatment or not. The effect size was expressed in standardised mean difference [(SMD) the mean outcome measure of the treatment group minus the mean outcome measure of the control group, divided by the pooled standard deviation of these measurements]. In-depth analyses were performed on (1) studies in which inflicted wounds on animals were irradiated and evaluated; (2) studies with primary outcome measures on dimensions with direct reference to wound healing (ranging from acceleration of wound closure to epithelialisation, but excluding surrogate dimensions with regard to wound healing; in this case: tensile strength); (3) animal studies with 'true controls'; (4) studies in which animals functioned as their 'own controls' and (5) studies with the highest methodological quality score. The 36 included studies contained 49 outcome parameters of which 30 reported a positive effect of laser irradiation and 19 did not. Eleven studies presented exact data about the effect of active treatment and controls. The pooled effect size (SMD) over 22 outcome measures of these studies was - 1.05 (95% Cl: - 1.67 to - 0.43) in favour of LLLT. Methodological quality of the studies was poor. In-depth analysis of studies showed no significant pooled effect size in studies with highest methodological quality scores [0.06 (95% CI:- 0.42 to 0.53)]. Summarising the data of cell studies and animal experiments, reviewed in this manuscript, these studies failed to show unequivocal evidence to substantiate the decision for trials with LLLT in a large number of patients. In fact, there were no differences between the results of these experiments and clinical studies. Remarkably, we found that (almost from the introduction on) animal experiments and clinical studies that address the biological effects of LLLT on wound healing, ran simultaneously, rather than in sequence. We conclude that this type of phototherapy should not be considered a valuable (adjuvant) treatment for this selected, generally therapy-refractory condition in humans. Animals;Humans;Laser Therapy;Wound Healing

Low level laser therapy for treating tuberculosis. BACKGROUND: The main treatment for tuberculosis is antituberculous drugs. Low energy laser therapy is used as an adjunct to antituberculous drugs, predominantly in the former Soviet Union and India. OBJECTIVES: To assess the benefits and harms of low level laser therapy for treating tuberculosis in randomized and quasi-randomized controlled trials. To seek information about potential benefits or harms from observational studies. SEARCH STRATEGY: We searched the Cochrane Infectious Diseases Group specialized trials register (up to June 2001), the Cochrane Controlled Trials Register (Issue 1, 2001), MEDLINE (1966 to December 2001), EMBASE (1988 to December 2001), CINAHL (up to November 2001), PEDro (up to November 2001), the Science Citation Index (up to December 2001), National Centre for Science Information at the Indian Institute of Science (15 April 2002), electronic catalogue of the Central Medical Library (Moscow; 1988 to January 2002), the internet using 'Google' (21 January 2002), and reference lists of articles. We contacted relevant organizations and researchers. SELECTION CRITERIA: (1) Randomized and quasi-randomized controlled trials comparing low level laser therapy with no low level laser therapy in people with tuberculosis. We also conducted a subsidiary analysis of of the potential benefits and harms from observational studies. DATA COLLECTION AND ANALYSIS: Two reviewers independently assessed trial quality and extracted data. We contacted study authors for additional information. Adverse event information was collected from the studies. MAIN RESULTS: No randomized or quasi-randomized controlled trials met the inclusion criteria for the review. The potential benefits and harms from 29 observational studies involving over 3500 people are described. REVIEWER'S CONCLUSIONS: We have not identified any well designed trials using low level laser therapy (LLLT) to treat tuberculosis. Therefore, the use of

LLLT to treat tuberculosis is not supported by reliable evidence. Humans;Laser Therapy;Lasers;Randomized Controlled Trials as Topic;Tuberculosis, Pulmonary;Tuberculosis, Urogenital;Urinary Bladder Diseases

Use of a 585 nm pulsed dye laser for the treatment of morphea. INTRODUCTION: The clinical presentation of morphea varies from localized plaques to generalized eruptions. Its cause remains unknown and medical treatments have often proved unsatisfactory. Studies have previously shown that improvement of hypertrophic scars and fibrotic skin can be achieved with the use of a 585 nm pulsed dye laser (PDL). METHODS: A case of plaque-type morphea was treated with 585 nm pulsed dye laser irradiation at an average fluence of 5.0 J/cm2 at bimonthly time intervals. RESULTS: Marked clinical improvement as evidenced by improved pliability and skin coloration was seen after 4 successive PDL treatments. No side effects or complications were encountered. CONCLUSION: Pulsed dye laser therapy is a viable treatment option for morphea. The mechanism of its effect in this condition remains unknown. Adult;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Scleroderma, Localized;Treatment Outcome

Leukotrichia developed following application of intense pulsed light for hair removal. BACKGROUND: Lasers and light sources are now used worldwide for permanent or prolonged hair removal. Patients now prefer lasers and light sources for hair removal because of their noninvasiveness and fewer reported side effects. OBJECTIVE: To study and report on leukotrichia that developed following application of intense pulsed light (IPL). METHODS: From February 9, 2001 to February 14, 2002 a total of 821 patients were treated for unwanted hair. The system used was a noncoherent IPL system, with a 650 nm flashlamp filter; the parameters used varied with different Fitzpatrick skin types. The patients were treated monthly, with the rate of hair loss, measured by hair counts, and possible side effects recorded. RESULTS: Twenty-nine of 821 patients treated developed leukotrichia. Thirteen patients had no white or gray hairs before IPL therapy; the remaining 16 patients, who had few white hairs before treatment reported accelerated development of new white hairs starting after the first or second IPL therapy. Restoration of hair color occurred in 9 patients and the remaining 20 patients had no improvement or worsening of the condition within the next 2-6 months. CONCLUSION: Temporary or permanent leukotrichia may develop following IPL and laser hair removal therapy. This finding may be explained by the difference in the thermal relaxation times of melanocytes and germinative cells. The light absorbed and the heat produced by melanin may be sufficient enough to destroy or impair the function of melanocytes but insufficient to damage the hair follicle cells. Adolescent;Adult;Female;Hair Color;Hair Removal;Humans;Hypopigmentation;Low-Level Light Therapy;Male;Melanocytes;Middle Aged

Treatment of leg telangiectases with a 532 nm KTP laser in multipulse mode. BACKGROUND: The multiple mode emission emphasizes the efficacy of the KTP laser. OBJECTIVE: To evaluate the efficacy of a 532 nm KTP laser emitting in multipulse mode for the treatment of superficial 0.5-1 mm leg telangiectases. METHODS: A 532 nm KTP laser was used in a nonuniform pulse sequence or multipulse mode emission (three stacked pulses of 100 msec, 30 msec, 30 msec, and a delay between pulses of 250 msec), a fluence of 60 J/cm2, and a 0.75 mm collimated spot. No cooling was used. Fourteen female patients (average age 46 years, range 27-57 years), phototypes I-IV were examined with Doppler ultrasound to ensure their big veins were competent. A topography of the telangiectatic network was reported on a tracing plastic frame before each session and 6 weeks after the last one. These frames were digitized and the number of vessels (before and 6 weeks after each session) was determined using imaging software. Side effects, pain, and patient satisfaction were noted. RESULTS: Moderate pain, immediate erythema and edema, sometimes light scabbing, temporary hypopigmentation rarely, and no matting were observed. After one treatment, vessel clearing was 53% ($P < .001$). It increased to 78% ($P < .001$) 6 weeks after two treatments, to 85% ($P < .05$) 6 weeks

after three treatments, and to 93% (NS) 6 weeks after four treatments. CONCLUSION: This nonuniform pulse sequence or multipulse mode emission emphasizes the efficacy of the KTP laser in this study. It provides a safe and effective treatment that achieved an important reduction of red leg veins telangiectases from 0.5 to 1 mm in diameter, with very few side effects. Adult;Edema;Erythema;Female;Humans;Hypopigmentation;Leg;Low-Level Light Therapy;Middle Aged;Photography;Telangiectasis;Treatment Outcome

["Skin rejuvenation" by non-ablative laser and light systems. Literature research and overview]. Currently, ablative laser therapy (with CO2/Er:YAG lasers) and deep chemical peeling are effective and promising methods of skin rejuvenation. The induction of collagen synthesis was observed after peelings with trichloroacetic acid or phenol as well as after treatments with the CO2 laser. In past years, the undesirable side effects and risks of these methods have led to intensified research in the fields of non-ablative facial rejuvenation and subsurfacing by means of ablative laser systems and intense pulsed light systems. The objective is to achieve selective, heat-induced denaturalisation of dermal collagen that leads to subsequent reactive synthesis but does not damage the epidermis. Recently, the results of numerous clinical and histological studies have indicated that these new technologies are successful. After critical review and assessment of current literature, we can say that in terms of their efficacy, non-ablative methods are not a comparable alternative to ablative skin resurfacing. Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Rejuvenation;Skin Aging

Photoeradication of Helicobacter pylori using 5-aminolevulinic acid: preliminary human studies. BACKGROUND AND OBJECTIVES: Helicobacter pylori (HP) is an endemic pathogenic bacterium causing gastritis and gastroduodenal ulceration in humans and is linked to the development of gastric malignancies. These first human in vivo studies investigated the photoeradication of HP using laser and white light. STUDY DESIGN/MATERIALS AND METHODS: In 13 HP-positive volunteers, a zone of gastric antrum was irradiated with laser (410 nm, 50 J/cm(2)) or endoscopic white light (10 J/cm(2)) 45 minutes after oral 5-aminolevulinic acid (5-ALA) 20 mg/kg. HP-eradication was assessed by biopsy urease test and HP-culture from irradiated and control zones 5 minutes, 4 and 48 hours post-irradiation. RESULTS: A maximum eradication effect was achieved at 4 hours post-irradiation when 85% of biopsies in the monochromatic and 66% in the white light exposed zones, and 58 and 33% in the respective control zones were HP-negative. CONCLUSIONS: HP numbers were greatly reduced following exposure to 5-ALA and either laser or white light in vivo. Photoeradication appears feasible, but further light dosimetry and the development of convenient application methods is required. Photosensitizing Agents;Aminolevulinic Acid Adult;Aminolevulinic Acid;Biopsy;Female;Gastritis;Gastroscopy;Helicobacter Infections;Helicobacter pylori;Humans;Light;Low-Level Light Therapy;Male;Middle Aged;Peptic Ulcer;Photosensitizing Agents;Phototherapy;Stomach;Time Factors

Acute electrophysiologic effect of pulsed gallium-arsenide low energy laser irradiation on configuration of compound nerve action potential and nerve excitability. BACKGROUND AND OBJECTIVES: We evaluated the acute electrophysiologic effects of low-energy pulsed laser irradiation, measured by extracellular recording technique on compound action potential configuration and nerve excitability in the isolated frog sciatic nerve STUDY DESIGN/MATERIALS AND METHODS: A pulsed gallium-arsenide (GaAs) laser (wavelength, 904 nm; pulse duration, 220 nanoseconds; peak power per pulse, 27 W; spot size, 0.28 cm(2); total applied energy density, 0.005-2.5 J/cm(2)) was used for the experiment. Sixty isolated nerves were divided into six groups (n = 10), each of which received a different repetition frequency. In each group, action potentials were recorded, before laser irradiation, which served as the control data. The extracellular action potentials were recorded for each combination of 1, 3, 5, 7, 10, 13, and 15 minutes of irradiation time and 4, 8, 16, 32, 64, 128

repetition frequency by using a BIOPAC MP 100 Acquisition System Version 3.5.7 (Santa Barbara USA). Action potential latency, duration of depolarization and repolarization, and the stimulating voltage were measured. Statistical evaluation was performed using linear correlation analysis by SPSS 9.05. RESULTS: Although there was no correlation between applied energy density and action potential latency, the duration of depolarization and repolarization phases ($P > 0.05$), there was a weak correlation between applied energy density and stimulating voltage. CONCLUSIONS: The study showed that low-energy GaAs irradiation at 42 different energy density between 0.005 and 2.5 J/cm(2) generates no effect on action potential configuration and nerve excitability. Action Potentials;Animals;In Vitro Techniques;Low-Level Light Therapy;Neural Conduction;Radiation Dosage;Ranidae;Sciatic Nerve

Low level 809-nm diode laser-induced in vitro stimulation of the proliferation of human gingival fibroblasts. BACKGROUND AND OBJECTIVE: The authors investigated the effects of low level laser irradiation on the proliferation rate of human gingival fibroblasts (HGF) in vitro. STUDY DESIGN/MATERIALS AND METHODS: HGF were obtained from gingival connective tissue explants and cultured under standard conditions. 110 cell cultures in their logarithmic growth phase were spread on 96-well tissue culture plates and were irradiated at energy fluences of 1.96-7.84 J/cm(2). Another 110 cultures served as control. An 809-nm semiconductor laser operated at a power output of 10 mW in the cw-mode was used. The time of exposure varied between 75 and 300 seconds. Laser treatment was performed alternatively once, twice, and three times at a 24-hour interval. After lasing, incubation was continued for 24 hours. The proliferation rate was determined by means of fluorescence activity of a redox indicator added to the cell culture. Proliferation was determined 24, 48, and 72 hours after irradiation and expressed in relative fluorescence units (RFU). RESULTS: The irradiated cells revealed a considerably higher proliferation activity. The differences were highly significant 24 hour after irradiation (Mann-Whitney U-test, $P < 0.05$) but decreased in an energy-dependent manner after 48 and 72 hour after irradiation. CONCLUSIONS: A cellular effect of the soft laser irradiation on HGF is evident. Its duration, however, seems to be limited. These findings might be clinically relevant, indicating that repeated treatments are necessary to achieve a positive laser effect in clinical applications. Cells, Cultured;Fibroblasts;Gingiva;Humans;In Vitro Techniques;Lasers;Statistics, Nonparametric

Double-blind, randomised, placebo controlled low level laser therapy study in patients with primary Raynaud's phenomenon. BACKGROUND: No causal treatment of primary Raynaud's phenomenon is available due to its unclear aetiology. Low level laser therapy (LLLT) is applied in a multitude of medical conditions often without sufficient evidence of efficacy and established mechanisms. To asses the effect of this therapy in patients with primary Raynaud's phenomenon a randomised, double blind, placebo controlled cross over study was designed. PATIENTS AND METHODS: Absolute and relative frequency and intensity of vasospastic attacks during three weeks of either LLLT or placebo therapy and results of infrared thermography before onset and at the end of both therapy sequences were evaluated in 15 patients with primary Raynaud's phenomenon. RESULTS: Frequency of Raynaud's attacks was not significantly affected by low level laser therapy. Compared to placebo a significantly lower intensity of attacks during laser irradiation was observed, but no transfer effect occurred. Additionally the mean temperature gradient after cold exposure was reduced after laser irradiation, while the number of fingers showing prolonged rewarming was unaffected. CONCLUSION: Though further studies are necessary to confirm these results we could demonstrate for the first time in a double blind placebo controlled clinical trial that low laser therapy is a potential candidate for an effective therapy of Raynaud's phenomenon, although effects seem to be of short duration. Adult;Aged;Cross-Over Studies;Double-Blind Method;Female;Follow-

Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Raynaud Disease;Treatment Outcome

Carpal tunnel syndrome pain treated with low-level laser and microamperes transcutaneous electric nerve stimulation: A controlled study. OBJECTIVE: To investigate whether real or sham low-level laser therapy (LLLT) plus microamperes transcutaneous electric nerve stimulation (TENS) applied to acupuncture points significantly reduces pain in carpal tunnel syndrome (CTS). DESIGN: Randomized, double-blind, placebo-control, crossover trial. Patients and staff administered outcome measures blinded. SETTING: Outpatient, university-affiliated Department of Veterans Affairs medical center. PARTICIPANTS: Eleven mild to moderate CTS cases (nerve conduction study, clinical examination) who failed standard medical or surgical treatment for 3 to 30 months. INTERVENTION: Patients received real and sham treatment series (each for 3-4wk), in a randomized order. Real treatments used red-beam laser (continuous wave, 15mW, 632.8nm) on shallow acupuncture points on the affected hand, infrared laser (pulsed, 9.4W, 904nm) on deeper points on upper extremity and cervical paraspinal areas, and microamps TENS on the affected wrist. Devices were painless, noninvasive, and produced no sensation whether they were real or sham. The hand was treated behind a hanging black curtain without the patient knowing if devices were on (real) or off (sham). MAIN OUTCOME MEASURES: McGill Pain Questionnaire (MPQ) score, sensory and motor latencies, and Phalen and Tinel signs. RESULTS: Significant decreases in MPQ score, median nerve sensory latency, and Phalen and Tinel signs after the real treatment series but not after the sham treatment series. Patients could perform their previous work (computer typist, handyman) and were stable for 1 to 3 years. CONCLUSIONS: This new, conservative treatment was effective in treating CTS pain; larger studies are recommended.
Adult;Aged;Carpal Tunnel Syndrome;Cross-Over Studies;Double-Blind Method;Electrodiagnosis;Female;Humans;Laser Therapy;Light;Male;Median Nerve;Middle Aged;Pain;Pain Management;Pain Measurement;Phototherapy;Reaction Time;Transcutaneous Electric Nerve Stimulation;Treatment Outcome

585-nm pulsed dye laser treatment of glottal papillomatosis. Treatment of recurrent respiratory papillomatosis of the glottis is often challenging. The surgeon and patient must cooperatively balance decisions regarding airway safety, effects of multiple general anesthesias, employment disturbance, and vocal dysfunction. A pilot study was done in 41 adult cases (23 patients; 78 vocal folds) without complication to evaluate the effectiveness of a 585-nm pulsed dye laser (PDL; 450-micros pulse width; fluence of 38 to 255 J/cm2; 1- to 2-mm spot size) in the treatment of this disorder. Thirty-seven of the 41 cases (90%) were bilateral disease. Twenty-six of the 41 cases (63%; including 20 cases with involvement of the anterior commissure) were treated by bilateral photocoagulation of the lesions' microcirculation without microflap resection of tissue. Clinical observation revealed that irradiated but unresected disease involuted without development of an anterior commissure web. In the initial 13 of the 41 cases (32%), PDL treatment was followed by cold instrument microflap resection. The PDL enhanced the epithelial excision by improving hemostasis and by creating an optimal dissection plane between the basement membrane and the underlying superficial lamina propria. The PDL at 585 nm was less effective in the management of exophytic lesions because of its limited depth of penetration (approximately 2 mm). In this initial trial, the PDL was a relatively safe and efficacious treatment for glottal recurrent respiratory papillomatosis. Since the lesions involute without complete resection of the diseased epithelium, the anterior commissure can be treated to minimize the number of procedures. To study patterns of recurrence will require longer follow-up.
Female;Glottis;Humans;Laryngeal Neoplasms;Low-Level Light Therapy;Male;Papilloma

The long-term results of ruby laser depilation in a consecutive series of 346 patients. The goal of this study was to prospectively assess the long-term results of ruby laser depilation in 346 consecutive patients who underwent hair removal at 402 anatomical sites. The patients were treated

using a ruby laser, with mean power ranging from 8.6 J to 15.7 J according to skin type. Results were assessed using two outcome measures-the percentage reduction in hair density and the hair-free interval. The median reduction in hair density was 55 percent (range, 0 to 100 percent) at a median time of 1 year after the last treatment session. The median hair-free interval was 8 weeks. Patients underwent a median number of four treatment sessions. Forty-three of the 346 patients were treated at more than one anatomical site. Of the sites treated, 75 percent reduction in hair density was achieved in 22 percent, 90 percent reduction was achieved in 2.2 percent, and complete depilation was achieved in only 0.7 percent. Darker colored hair was more effectively treated. Treatment efficacy was not affected by anatomical site, with the exception of the faces of male patients, which were found to be particularly resistant to treatment. There was a significant correlation between the number of treatments given and the outcome. The overall complication rate was 9.0 percent (36 of 402 sites) with respect to pigmentary changes and blistering, but varied according to Fitzpatrick skin type. The complication rate was highest in skin types V and VI (24.7 percent), with no complications in skin type I. Although a greater than 50 percent reduction in hair density was achieved in half of the 346 patients treated, complete depilation was achieved in only an extremely limited number of patients. Adult;Female;Follow-Up Studies;Hair Removal;Humans;Low-Level Light Therapy;Male;Postoperative Complications;Prospective Studies

Lasers for median lobe hyperplasia. Laser treatment encompases a variety of techniques using different laser wavelengths, application systems, and surgical techniques to achieve contrasting tissue effects such as incision, resection, vaporization, or coagulation. Many studies have proven the clinical efficacy of the various laser techniques for the treatment of benign prostatiuc hyperplasia, including randomized studies versus transurethral prostatectomy (TURP). Recently, long-term follow-up of up to 5 years has demonstrated the durability of the results, although in some of the studies, retreatment rates were higher than after TURP. Median lobes were never seen as a contraindication for treatment in the laser based procedures. Technically, laser treatment techniques such as side-firing transurethral coagulation, contact- and free-beam laser vaporization, interstitial laser coagulation, and the holmium laser-based resection and enucleation are fully suitable for treatment of median lobes. Surprisingly, no studies focussing specifically on laser treatment of median lobes have been published. Humans;Low-Level Light Therapy;Male;Prostate;Prostatic Hyperplasia

[Polychemotherapy combined with low-intensity laser therapy in treating patients with renal tuberculosis]. A prospective study of 150 patients with verified nephrotuberculosis has demonstrated feasibility of essential expansion of the therapeutic limit and of 1/3 reduction in the number of operations due to adjuvant radiation with low-intensity laser beam used in a complex of etiopathogenetic treatment of the urinary system. Antitubercular Agents Antitubercular Agents;Combined Modality Therapy;Drug Therapy, Combination;Feasibility Studies;Humans;Lasers;Prospective Studies;Tuberculosis, Renal

Pilot study of laser effects on oral mucositis in patients receiving chemotherapy. PURPOSE: The purpose of this study was to examine the effectiveness of laser therapy in the prevention and/or healing of chemotherapy-induced oral mucositis lesions. This study also evaluated the ease and feasibility of the laser therapy and the impact of the treatment on improving the patient's quality of life. PATIENTS AND METHODS: Fifteen patients with an episode of prior chemotherapy-induced grade 3 or 4 mucositis with 5-fluorouracil continuous infusion consented to participate in this study. All patients were provided with standardized mouth care instructions at the initiation of chemotherapy treatments. Enrolled patients received laser therapy treatments 24 hours before the chemotherapy and then recommenced weekly with evenly distributed exposure to the standardized designated areas by one operator during the entire cycle of chemotherapy at the same doses until the mucositis

resolved or the chemotherapy cycle was completed. Intraoral perfusion was measured by laser Doppler technology. Patients were assessed for response to laser therapy according to standardized mucositis grading criteria by evaluating development of lesions, extent and duration of lesions, and time to healing. The effect of laser therapy on ability to continue planned chemotherapy, the reduction in dose, delays, and ability to maintain planned dose intensity were assessed. The impact of laser therapy on pain control was evaluated using the visual analogue score. A quality-of-life survey was completed by each patient at the initiation of chemotherapy and then weekly throughout the chemotherapy. RESULTS: Eleven of 15 patients experienced grade 0 mucositis, three patients experienced grade 1 to 2 mucositis, and one patient experienced grade 3 to 4 mucositis. Fourteen patients completed the lasertherapy as planned, and none of the patients withdrew from the laser therapy treatments because of noncompliance. One patient continued to experience grade 4 mucositis that necessitated an interruption in the planned chemotherapy regimen and, consequently, the laser treatment. Patients tolerated the laser therapy very well and did not report any increased discomfort. No significant changes in perfusion were observed as a result of laser therapy. DISCUSSION: In this pilot study, laser therapy significantly reduced the incidence and the severity of mucositis in chemotherapy patients. The laser therapy does not appear to promote wound healing by affecting the intraoral perfusion, as assessed by Doppler measurements. The mechanisms involved in the mediating of the observed effects remain unknown at this time. Continued research is warranted to determine the optimal laser wavelength and parameters. Fluorouracil Adult;Antineoplastic Combined Chemotherapy Protocols;Chi-Square Distribution;Feasibility Studies;Fluorouracil;Follow-Up Studies;Humans;Low-Level Light Therapy;Mouth Mucosa;Neoplasm Staging;Pilot Projects;Risk Factors;Stomatitis

Low level laser therapy: a real hope in the management of chemo-induced and radiation-induced mucositis? Antineoplastic Combined Chemotherapy Protocols;Humans;Low-Level Light Therapy;Mouth Mucosa;Radiation Injuries;Risk Factors;Stomatitis

Combined endoscopic laser and radiotherapy palliation of advanced rectal cancer. BACKGROUND: In the palliative treatment of patients with advanced, inoperable rectal cancer, combined endoscopic laser and radiotherapy have been claimed to be more effective than laser therapy alone. The number of laser treatments, laser energy used, relapse rate, treatment of relapse, morbidity and survival in consecutive patients who were treated either by laser therapy alone or laser plus radiotherapy was compared. METHODS: Prospective data were analysed with regard to number of treatments, laser energy used, relapse rate, morbidity and survival for 56 consecutive patients. RESULTS: The crude relapse rate was significantly higher in the laser only group than in the laser plus radiotherapy group (58 and 15%, respectively; P = 0.002). There was no difference between the groups in the median total number of laser treatments or the mean total laser energy used. In patients experiencing a relapse, there was no difference in the median number of relapses, the number of laser treatments post-relapse or the total energy used post-relapse. Survival did not differ between the groups and there were no treatment-related deaths. CONCLUSIONS: These findings demonstrate a clear reduction in relapse after using combined laser and radiotherapy to palliate patients with advanced rectal cancer with no appreciable additional morbidity and have encouraged continuing use of this treatment. Aged;Aged, 80 and over;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Recurrence, Local;Outcome Assessment, Health Care;Palliative Care;Proctoscopy;Prospective Studies;Rectal Neoplasms;Survival Rate

[A comparative study of efferent methods of treatment and bezonal on the absorptive and excretory liver function in patients with acute diffuse peritonitis]. Patients with acute general peritonitis display in the postoperative period manifest disturbances in the pharmacokinetics of cardiogreen.

Conventional therapies, blood ultra-violet irradiation procedures, intravascular irradiation of blood with laser, and hyperbaric oxygenation have no positive effect on the detected inadequacies. Hemosorption embarked on in the complex of therapeutic measures in the above category of patients appeared to have but insignificant positive effect. Benzonal has been shown to have an apparent corrective effect on disordered pharmacokinetics of cardiogreen in patients with acute general peritonitis in the postoperative period. Coloring Agents;Indocyanine Green Coloring Agents;Enzyme Induction;Hemoperfusion;Humans;Hyperbaric Oxygenation;Indocyanine Green;Liver;Low-Level Light Therapy;Peritonitis;Phototherapy;Ultraviolet Therapy

Transplantation of embryonal spinal cord nerve cells cultured on biodegradable microcarriers followed by low power laser irradiation for the treatment of traumatic paraplegia in rats. This pilot study examined the effects of composite implants of cultured embryonal nerve cells and laser irradiation on the regeneration and repair of the completely transected spinal cord. Embryonal spinal cord nerve cells dissociated from rat fetuses and cultured on biodegradable microcarriers and embedded in hyaluronic acid were implanted in the completely transected spinal cords of 24 adult rats. For 14 consecutive post-operative days, 15 rats underwent low power laser irradiation (780 nm, 250 mW), 30 min daily. Eleven of the 15 (73%) showed different degrees of active leg movements and gait performance, compared to 4 (44%) of the 9 rats with implantation alone. In a controlgroup of seven rats with spinal cord transection and no transplantation or laser, six (86%) remained completely paralyzed. Three months after transection, implantation and laser irradiation, SSEPs were elicited in 69% of rats ($p = 0.0237$) compared to 37.5% in the nonirradiated group. The control group had no SSEPs response. Intensive axonal sprouting occurred in the group with implantation and laser. In the control group, the transected area contained proliferating fibroblasts and blood capillaries only. This suggests: 1. These in vitro composite implants are a regenerative and reparative source for reconstructing the transected spinal cord. 2. Post-operative low power laser irradiation enhances axonal sprouting and spinal cord repair. Hyaluronic Acid Absorbable Implants;Animals;Cells, Cultured;Evoked Potentials, Somatosensory;Fetal Tissue Transplantation;Hyaluronic Acid;Low-Level Light Therapy;Nerve Regeneration;Neurons;Paraplegia;Pilot Projects;Rats;Rats, Wistar;Recovery of Function;Spinal Cord;Spinal Cord Injuries

Determination of laser-induced thymine-thymine dimer in DNA by LC. A new simple and selective high-performance liquid chromatography (HPLC) method has been developed for the determination of thymine-thymine (T-T) dimer in deoxyribonucleic acid (DNA) for the study of relationship between the yield of T-T dimer and laser irradiation conditions. The HPLC method is not disturbed by other hydrolysate formed in DNA with the good stability and reproducility. The detection of limit of the method is about 8.8 ng of T-T dimer in DNA blank. Three lever of laser intensity to irradiate DNA were selected for calf thymine to test the influence of the pulse number. The mechanism of DNA lesion and repair caused by laser irradiating was studied. Pyrimidine Dimers;DNA Animals;Cattle;Chromatography, High Pressure Liquid;DNA;Low-Level Light Therapy;Pyrimidine Dimers;Technology, Pharmaceutical

Dental lasers: Part 2. Soft tissue laser applications. Hemostasis, Surgical;Humans;Laser Coagulation;Laser Therapy;Lasers;Low-Level Light Therapy;Mouth;Mouth Diseases;Mouth Mucosa

Laser hair removal. The presence of unwanted hair continues to plague many individuals for whom traditional methods of hair removal remain unsatisfactory. Laser and flashlamp technology now offers the potential for rapid, safe, and effective treatment of unwanted hair. An ever-increasing number of published studies have confirmed the long-term efficacy of laser and flashlamp treatment. For the most part, however, the benefits of this technology have been limited to individuals with dark hair and relatively fair skin. The remaining challenge is to develop the means to eliminate light-

colored hair as well as the capability to safely treat individuals with darker skin. The rapid pace of technological advancement as well as continued studies of hair follicle biology promise to improve this field over the years to come. Hair Removal;Humans;Laser Therapy;Low-Level Light Therapy

[Recovery physiotherapy of myopathy in flying personnel of the Air Forces]. Aerospace Medicine;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Military Personnel;Myopia;Physical Therapy Modalities

[Changes in local humoral immunity during stomach ulcer healing with laser and drug therapy]. The increase of the contents of serum IgA, IgG, IgM on the edge of long non-cicatrizing gastric ulcer was determined. At the same time the level of SIgA decreased in comparison with unaltered gastric mucosa. It is shown that the immunoglobulin content in the healed ulcer cicatrice depended on treatment method. The medicamentous therapy was accompanied by lowering of the contents of IgG, IgA, SIgA and by some increase of IgM level. The laser therapy is characterized by lowering of IgA, IgG, IgM level on a background of significant increase of SIgA content. The local humoral immunity after laser therapy was the same as in persons with unaltered gastric mucosa. Antacids;Anti-Ulcer Agents;Histamine H2 Antagonists;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Organometallic Compounds;bismuth tripotassium dicitrate Adult;Aged;Antacids;Anti-Ulcer Agents;Antibody Formation;Combined Modality Therapy;Gastric Mucosa;Histamine H2 Antagonists;Humans;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Low-Level Light Therapy;Middle Aged;Organometallic Compounds;Stomach;Stomach Ulcer

[Diagnostic implications of changed red cell count in low-intensity laser radiation of blood in elderly patients with coronary heart disease]. Intravenous laser therapy in combination with medication was conducted in 41 elderly patients with coronary heart disease (633 nm, 1 mW, 124 mW/cm2). The study of qualitative and quantitative (osmotic resistance) erythrocyte indices of blood demonstrated the change of erythrocyte number in circulating blood by the third laser procedure. Frequency of these changes correlated with duration of the treatment course. Intravenous laser therapy had a wider spectrum of effects on erythrocyte number than medication. Changes in erythrocyte number in the peripheral blood upon intravenous laser radiation reflects efficiency of treatment of coronary heart disease patients. Aged;Aged, 80 and over;Erythrocyte Count;Humans;Low-Level Light Therapy;Middle Aged;Myocardial Ischemia

[Effects of riboxin, essentiale, and phylloquinone on the immunomodulating and antioxidant effect of laser and magneto-laser irradiation in liver toxicosis induced by gentamycin]. The introduction of gentamycine to Wistar rats leads to the toxic liver damage, suppresses humoral immune response to goat erythrocytes, and induces immunosuppressant properties in erythrocytes (caused by increased lipid peroxidation in their membranes and violated cell energy balance) Under these conditions, a combination of the laser or magneto-laser irradiation with the administration of phylloquinone of riboxin provides for a more effective correction of the immune reaction and antioxidant status as compared to the radiation treatment without drugs or with essential. Elimination of the gentamycine induced immunosuppressant properties of erythrocytes is explained by the ability of phylloquinone and essential to reduce the intensity of lipid peroxidation in the cell membranes and with the ability of riboxin to normalize the cell energy balance. An important factor of immunosuppression development in the case of a toxic liver damage caused by D-galactosamine it the interaction of thrombocytes and light erythrocytes with serum factors. The introduction of essential and riboxin favors this interaction and stimulates the development of immunosuppression in thrombocytes. Adjuvants, Immunologic;Antioxidants;Gentamicins;Phosphatidylcholines;essential 303 forte;Vitamin K 1;Inosine Diphosphate Adjuvants, Immunologic;Animals;Antioxidants;Chemical and Drug

Induced Liver Injury;Erythrocytes;Gentamicins;Inosine Diphosphate;Lipid Peroxidation;Low-Level Light Therapy;Magnetics;Phosphatidylcholines;Radiation, Ionizing;Rats;Rats, Wistar;Vitamin K 1

[Effect of intravascular low level laser irradiation used in avulsion injury]. OBJECTIVE: To explore the effect of intravascular low level He-Ne laser irradiation on skin flap survival after orthotopic transplantation in avulsion injury. METHODS: Fifty eight cases suffered avulsion injury were treated by debridement and orthotopic transplantation of avulsed flap within 6 hours, 31 of them were received intravascular low level He-Ne laser irradiation and routine treatment, and 27 of them were received routine treatment as control group. RESULTS: The survival area and quality of avulsed flap in the experimental group were superior to that of control group after 15 days of operation, and the hemorheological items were markedly changed at 5 days after operation. CONCLUSION: The better flap survival after orthotopic transplantation in avulsion injury can be improved by intravascular low level He-Ne laser irradiation through changed superoxide dismutase activity and hemorheological items in optimal irradiation intensity. Accidents, Traffic;Adolescent;Adult;Female;Forearm Injuries;Hand Injuries;Humans;Laser Therapy;Leg Injuries;Male;Middle Aged;Soft Tissue Injuries;Surgical Flaps

Computerized morphometric assessment of the effect of low-level laser therapy on bone repair: an experimental animal study. OBJECTIVE: The aim of this study was to evaluate morphometrically the amount of newly formed bone after GaAlAs laser irradiation of surgical wounds created in the femur of rats. BACKGROUND DATA: Low-level laser therapy (LLLT) has been used in several medical specialties because of its biomodulatory effects on different biological tissues. However, LLLT is still controversial because of contradictory reports. This is a direct result of the different methodologies used in these works. MATERIALS AND METHODS: In this study, 40 Wistar rats were divided into four groups of 10 animals each: group A (12 sessions, 4.8 J/cm2 per session, observation time of 28 days); group C (three sessions, 4.8 J/cm2 per session, observation time of 7 days). Groups B and D acted as nonirradiated controls. The specimens were routinely processed to wax and cut at 6-microm thickness and stained with H&E. For computerized morphometry, Imagelab software was used. RESULTS: Computerized morphometry showed a significant difference between the areas of mineralized bone in groups C and D ($p = 0.017$). There was no difference between groups A and B (28 days; $p = 0.383$). CONCLUSION: It is concluded that, under this experimental condition, LLLT increased bone repair at early bone healing. Animals;Bone and Bones;Calcification, Physiologic;Female;Image Processing, Computer-Assisted;Laser Therapy;Male;Rats;Rats, Wistar;Wound Healing

Effect of red laser light on Na+,K(+)-ATPase activity in human erythrocyte membranes sensitized with Zn-phthalocyanine. OBJECTIVE: The influence of laser light (670 nm) on human erythrocyte membrane Na+,K(+)-ATPase activity in the presence and absence of Zn-phthalocyanine (ZnPc) was studied. BACKGROUND DATA: The response of erythrocyte membranes to low-power laser irradiation has not been fully elucidated. In our study, we focused on the studies on photo-induced changes of Na+,K(+)-ATPase activity. The erythrocyte membrane suspensions were incubated with 2 mM of ZnPc and next irradiated with energy doses of 19.1, 38.2, 57.3, 76.4, and 95.5 J x cm(-2). MATERIALS AND METHODS: The activity of Na+,K(+)-ATPase was assayed colorimetrically at the wavelength of 820 nm and expressed in micromol of inorganic phosphate released from ATP per mg of protein. RESULTS: The measurements of Na+,K(+)-ATPase activity in erythrocyte membranes incubated with ZnPc in the dark demonstrated that all concentrations of the dye (0.5, 1, 2, and 3 microM) stimulated enzyme activity. The concentration of 2 microM caused the smallest increase of enzyme activity, so this concentration was accepted for further studies. Irradiation of erythrocyte membranes in the presence of the dye (2 microM) significantly decreased Na+,K(+)-ATPase activity. Only for energy doses of 19.1 and 38.2 J x cm(-2) was the enzyme activity comparable to the activity of the control.

CONCLUSION: It was found that irradiation with all energy doses applied caused a rise of enzyme activity. In the presence of ZnPc, significant decrease of Na+,K(+)-ATPase activity was observed. Indoles;Isoindoles;Organometallic Compounds;Photosensitizing Agents;Zinc Compounds;Sodium;Adenosine Triphosphatases;Potassium Adenosine Triphosphatases;Colorimetry;Erythrocyte Membrane;Humans;Indoles;Isoindoles;Lasers;Organometallic Compounds;Photosensitizing Agents;Potassium;Sodium;Zinc Compounds

Effect of low-power laser irradiation on bony implant sites. This study was designed to examine the effects of low-energy laser irradiation on osteocytes and bone resorption at bony implant sites. Five male baboons with a mean age of 6.5 years were used in the study. Four holes for accommodating implants were drilled in each iliac crest. Sites on the left side were irradiated with a 100 mW low-energy laser (690 nm) for 1 min (6 Joule) immediately after drilling and insertion of four sandblasted and etched (Frialit-2 Synchro) implants. Five days later, the bone was removed en bloc and was evaluated histomorphometrically. The mean osteocyte count per unit area was 109.8 cells in the irradiated group vs. 94.8 cells in the control group. As intra-individual cell counts varied substantially, osteocyte viability was used for evaluation. In the irradiated group, viable osteocytes were found in 41.7% of the lacuna vs. 34.4% in the non-irradiated group. This difference was statistically significant at $P < 0.027$. The total resorption area, eroded surface, was found to be 24.9% in the control group vs. 24.6% in the irradiated group. This difference was not statistically significant. This study showed that osteocyte viability was significantly higher in the samples that were subjected to laser irradiation immediately after implant site drilling and implant insertion, in comparison to control sites. This may have positive effects on the integration of implants. The bone resorption rate, in contrast, was not affected by laser irradiation. Dental Implants Animals;Bone Resorption;Bone and Bones;Cell Survival;Dental Implantation, Endosseous;Dental Implants;Implants, Experimental;Low-Level Light Therapy;Male;Osseointegration;Osteocytes;Papio;Tibia

Effect of pulsed laser radiation on regeneration of injured muscles with different regeneration capacities and the state of the thymus. Animals;Lipid Peroxidation;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Regeneration;Thymus Gland;Wound Healing

Thermal therapies in interventional MR imaging. Laser. Laser ablation of cerebral tumors is an alternative to surgical excision and radiosurgery; however, more clinical testing is necessary. Various MR parameters can be used during laser ablation to detect structural as well as temperature changes in near real-time for diagnostic and therapeutic applications. Unfortunately, MR-guided ablation does not solve the problem of defining a precise target in high-grade tumors of the central nervous system. Brain Neoplasms;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Magnetic Resonance Imaging;Radiography, Interventional

The utilization of a new yellow light laser (578 nm) for the treatment of class I red telangiectasia of the lower extremities. BACKGROUND: A dual-wavelength approach is necessary in order to achieve consistent results when utilizing lasers and intense pulsed light sources to treat red and blue lower extremity vessels. In this regard, short-wavelength technologies (500-800 nm) may be employed to treat red telangiectasia of less than 2 mm on the lower extremities. OBJECTIVE: To demonstrate a new yellow light laser utilizing a copper bromide medium and its potential efficacy in the treatment of red lower extremity telangiectasia of less than 2 mm. METHODS: Forty-six women (mean age 37 years) were treated in two private practice settings with a 578 nm yellow light laser with a circulating cooling window (1-4 degrees C). Class I red telangiectases of the thighs 1.5 mm or less in diameter were considered for treatment. Patients were treated with up to three treatments at 6-week intervals on a 5 cm2 surgical area of vessels utilizing a fluence of 50-55 J/cm2. Results were analyzed by macrophotographic imaging, double-blinded observer evaluation/optical

chromatography, and a patient evaluation scale. RESULTS: An average of 1.7 patient treatment sessions produced significant clearing of 75-100% in 71.8% of patients. The mean erythema index showed significant lightening (51-65a+) in the study population. Finally, 76.1% of patients reported great satisfaction with the results of their treatment session. CONCLUSION: A new 578 nm copper bromide (CuBr) yellow light laser produces excellent results in eradicating red telangiectases of the lower extremities that are less than 2 mm in diameter. Copper;Bromine Adult;Aged;Bromine;Copper;Female;Humans;Leg;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Skin Pigmentation;Telangiectasis;Treatment Outcome

Transmeatal low-power laser irradiation for tinnitus. OBJECTIVE: To evaluate effectiveness of 60-mW laser irradiation in the treatment of tinnitus. STUDY DESIGN: Prospective, randomized double-blind study. METHODS: This investigation included 68 ears in 45 patients with disabling unilateral or bilateral tinnitus. The active or placebo laser treatment was administered transmeatally once a week for 6 minutes. Laser irradiation was performed four times during a 4-week period. A questionnaire was administered to evaluate the loudness, duration, quality, and annoyance of tinnitus before and after irradiation. The loudness and pitch match for tinnitus were obtained, and distortion product otoacoustic emissions were also examined. RESULTS: No significant difference was observed between the active and placebo laser groups with regard to outcome of loudness, duration, quality, and annoyance of tinnitus. In one patient who received active laser treatment, acute hearing deterioration occurred after the third irradiation. CONCLUSION: Transmeatal low-power laser irradiation with 60 mW is not effective for the treatment of tinnitus. Adult;Aged;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Hearing;Humans;Laser Therapy;Loudness Perception;Male;Middle Aged;Tinnitus;Treatment Failure

[Parameters of membrane permeability, microcirculation, external respiration, and trace element levels in the drug-laser treatment of pneumonia]. AIM: To study effects of laser therapy in combined treatment of pneumonia on external respiration function, membrane permeability, microcirculation and serum trace elements. MATERIAL AND METHODS: 142 pneumonia patients were randomly divided into two groups: 96 patients treated with drugs and laser radiation (the study group) and 46 patients treated with drugs only (control group). RESULTS: In the study group there was more pronounced reduction in cell membrane permeability, a rise in concentrations of iron and chromium in the blood serum, improvement of microcirculation. These changes closely correlated with those in immunity, external respiration function. CONCLUSION: Laser therapy is an effective method of pneumonia treatment and can be included in relevant combined schemes. Trace Elements Adolescent;Adult;Cell Membrane Permeability;Combined Modality Therapy;Female;Forced Expiratory Flow Rates;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Pneumonia;Trace Elements

[Efficacy of low intensity laser irradiation and sodium nedocromil in the complex treatment of patients with bronchial asthma]. AIM: To study efficiency of low-intensity laser radiation (LILR) and sodium nedokromil (tailed) in combined treatment of bronchial asthma (BA). MATERIAL AND METHODS: The choice of the treatment depended on the activity of bronchial inflammation and the presence of contraindications. Laser was used on the skin in the area of the lung and great vessels projection, endobronchially. Tailed was given in inhalations and irrigations of the tracheobronchial tree during therapeutic fibrobronchoscopy. These methods were used in combined treatment of 220 BA patients. RESULTS: Combined use of LILR and tailed proved highly effective and safe in BA. Cytological markers of cell reactions of the bronchopulmonary system on the action of LILR were revealed. CONCLUSION: Availability, good reproducability, cost-effect efficacy and safety make LILR one of the most beneficial nonpharmacological treatments for bronchial asthma. Anti-Asthmatic Agents;Nedocromil Adult;Anti-Asthmatic Agents;Asthma;Bronchitis, Chronic;Combined Modality

Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nedocromil;Streptococcus pneumoniae
Endoscopic Nd:YAG laser with aggressive multimodality therapy for locally advanced esophageal cancer. BACKGROUND: Laser therapy of esophageal carcinoma has been limited to management of malignant dysphagia. To investigate its cytoreductive potential, Nd:YAG laser tumor debulking was added to multimodality therapy. METHODS: From 1994-1998, 29 patients with advanced locoregional esophageal carcinoma were enrolled in a prospective experimental study of high-dose neoadjuvant chemoradiotherapy together with endoscopic Nd:YAG laser photoablation. Comparisons were made to a retrospective cohort of 31 patients treated from 1990 to 1994 who underwent similar neoadjuvant chemoradiotherapy without laser debulking. RESULTS: Laser dosage ranged from 3457 to 67,443 J (mean 21,832 [SD 16,999]) delivered in 1 to 6 (mean 2.6 [1.4]) treatment sessions. Actuarial analysis showed improved survival in the laser-treated group versus the reference group (30.1 months vs. 16.5 months; p = 0.047). Multivariable analysis of the impact of age, T-stage, N-stage, completion of neoadjuvant therapy, and laser debulking that included all patients in both treatment groups showed completion of therapy to be the most significant variable associated with survival. There were 3 complications related to laser therapy. Relief of dysphagia was achieved in 19 of 29 patients (66%) in the laser group versus 13 of 31 (42%) in the reference group. CONCLUSIONS: Malignant dysphagia may be more effectively treated by the addition of Nd:YAG laser therapy to aggressive multimodality therapy. Improved survival with the addition of laser debulking warrants longer follow-up and a prospective comparative trial. Adult;Aged;Aged, 80 and over;Carcinoma;Cohort Studies;Combined Modality Therapy;Endoscopy, Digestive System;Esophageal Neoplasms;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Staging;Prospective Studies;Survival Rate
Phototherapy of psoriasis: update with practical pearls. Humans;Low-Level Light Therapy;PUVA Therapy;Phototherapy;Psoriasis
Treatment of anogenital warts by pulsed dye laser. BACKGROUND: Treatment of anogenital warts is difficult in that the disease spectrum is wide. Moreover, varying degrees of improvement are obtained. OBJECTIVE: To study the treatment of persistent anogenital warts by pulsed dye laser. METHODS: Pulsed dye laser was used with the following settings: spot size 7 mm, pulse duration 1500 microsec, and fluence 7.5 J/cm2. Two different wavelengths were used: 585 and 595 nm. RESULTS: Lesions healed completely using both wavelengths after one treatment. CONCLUSION: Pulsed dye laser has been found to be safe, effective, satisfactory, and less traumatic compared to other options for treatment of perianal warts in children. Anus Diseases;Child, Preschool;Condylomata Acuminata;Humans;Low-Level Light Therapy;Male
Treatment of port-wine stain birthmarks using the 1.5-msec pulsed dye laser at high fluences in conjunction with cryogen spray cooling. BACKGROUND: The majority of port-wine stain (PWS) patients treated with the pulsed dye laser (PDL) do not achieve complete blanching. Safe administration of higher fluences has been proposed as a means of improving treatment efficacy. OBJECTIVE: To determine the safety and efficacy of PWS treatment with the 1.5-msec PDL at high fluences in conjunction with cryogen spray cooling. METHODS: Twenty PWS patients were treated with the PDL in combination with cryogen spray cooling utilizing a 7 or 10 mm spot size and fluences ranging from 6 to 15 J/cm2. Before and after treatment photographs were compared on a blinded basis. RESULTS: No scarring or skin textural changes occurred. Blanching scores were as follows: 20% of patients achieved 75% or greater blanching after an average of 3.3 treatments, 30% achieved 50-74% blanching, 20% achieved 25-49% blanching, and 30% achieved less than 25% blanching. CONCLUSION: In conjunction with cryogen spray cooling, the PDL can be safely used at high fluences. At this time it is not clear that the use of higher fluences improves treatment efficacy; however, as

other aspects of PWS laser treatment are optimized, safe administration of higher fluences is likely to be advantageous. Adolescent;Adult;Child;Child, Preschool;Face;Female;Humans;Infant;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain

Effect of helium/neon laser irradiation on nerve growth factor synthesis and secretion in skeletal muscle cultures. Low energy laser irradiation therapy in medicine is widespread but the mechanisms are not fully understood. The aim of the present study was to elucidate the mechanism by which the light might induce therapeutic effects. Skeletal muscle cultures were chosen as a target for light irradiation and nerve growth factor (NGF) was the biochemical marker for analysis. It was found that there is a transient elevation of intracellular calcium in the myotubes immediately after irradiation ($P<0.001$). Preincubation of the myotubes with either the photosensitizers 5-amino-levulinic acid (5-ALA), or with hematoporphyrin (Hp) enhanced the elevation of cytosolic calcium ($P<0.001$) after helium/neon irradiation (633 nm) with an energy of 3 J/cm(2). In addition, helium/neon irradiation augmented the level of NGF mRNA fivefold and increased NGF release to the medium of the myotubes. Thus, it is speculated that transient changes in calcium caused by light can modulate NGF release from the myotubes and also affect the nerves innervating the muscle. The NGF is probably responsible for the beneficial effects of low-level light. DNA Primers;RNA, Messenger;Helium;Neon;Nerve Growth Factor Animals;Animals, Newborn;Base Sequence;Cells, Cultured;DNA Primers;Helium;Lasers;Mice;Muscle, Skeletal;Neon;Nerve Growth Factor;Polymerase Chain Reaction;RNA, Messenger;Rats;Transcription, Genetic

[Ecotoxicology, human ecology, laser biotechnology in primary prevention of environmental health hazards]. Interdisciplinary studies in ecotoxicology (including the influence of complex physical, chemical and biological factors on ecosystems and human food chain), human ecology (related to estimation of individuals exposition to different pollutants both in the natural environment and in-door environment, as well as by food) and environmental biotechnology (based on application of high sensitive biological, especially embryological criteria in biotests for water quality, including image computisation and biosensors)--are scientific base for primary prevention of disturbances of the ecological balance as well as environmental risk factors for human health. Large scale applications of laser biostimulation in environmental engineering is a new chance for system approach in primary prevention by more efficient nutritional prevention, protection of proper water quality (including biotests) and protection of the human environment in working and living places. Biotechnology;Ecology;Environmental Exposure;Environmental Health;Environmental Pollution;Humans;Poland;Primary Prevention;Public Health;Risk Factors

Full-face photorejuvenation of photodamaged skin by intense pulsed light with integrated contact cooling: initial experiences in Asian patients. BACKGROUND AND OBJECTIVES: For Asian skin, recent "non-ablative" skin rejuvenation techniques have become the focus of attention for darker complected patients. In our earlier research, we have shown that intense pulsed light (IPL) technology can be applied to Asian skin with a high degree of safety and efficacy. In this study, we performed full-face photorejuvenation using a new IPL device incorporating a 560 nm filter and integrated contact cooling system for the improvement of various symptoms associated with photoaging in Asian patients. STUDY DESIGN/MATERIALS AND METHODS: A total of 73 patients were treated with a series of five or more full-face treatments at 3-4 week intervals using IPL with integrated contact cooling. One month after the third and fifth treatments, the patient and the treating physicians subjectively evaluated improvement in five areas-in pigmentation, telangiectasia, fine wrinkles, skin texture, and over-all improvement. In addition, histological changes were evaluated. RESULTS: Pigmentation improvement, telangiectasia reduction, fine wrinkle reduction, smoother skin texture, and over-all improvement were evaluated according to five grades of percentage improvement. In addition, the subjective rating by the patients and the physicians was averaged, and the combined results were

evaluated. After the fifth treatment, a combined rating of greater than 60% improvement was given to more than 80% of patients for pigmentation improvement, telangiectasia reduction or removal, smoother skin texture, and overall improvement. Histological evaluations showed strong staining of Type I and Type III collagen. Complications were minor and transitory, with burning sensations and erythema in only two patients. CONCLUSION: Full-face photorejuvenation for Asian patients using this device is not only effective but is also associated with fewer post-treatment complications than other more invasive modalities. We conclude that IPL photorejuvenation can be the basis for safe and effective skin rejuvenation in Asian patients. Adult;Aged;Asian People;Cosmetic Techniques;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin;Skin Aging;Skin Pigmentation;Telangiectasis
[Various mechanisms of cytoprotective effect of omeprazole and low intensity laser radiation on the gastroduodenal mucosa in the treatment of patients with duodenal ulcer]. Clinical studies were made in 130 patients with duodenal ulcer in the phase of exacerbation of the disease. There were 98 men and 32 women who ranged from 17 to 50 years old. Results of examination of 7 essentially healthy subjects were regarded as control. The patients were divided into three groups. Group I patients (n = 48) received a conventional therapy; in group II patients, the adopted therapy was supplemented by omeprazol, 20 mg twice daily, group III patients (n = 43) were (in addition to the above therapeutic regimen) exposed to a session of endoscopic low-intensity laser irradiation (LILI) for 5 min (overall 6 to 8 LILI procedures). It has been ascertained that omeprazol exerts a cytoprotective effect on the mucozal barrier of the gastroduodenal zone brought about by increase in the synthesis of glucoproteins in the mucous membrane, improvement of the water-and-elastic properties, and enhancement of resistance of the mucosal barrier to the action of the aggressive factors. Administration of endoscopic LILI treatments in DU patients has also been found out to have a cytoprotective effect but superior to omeprazol. A protective action of LILI is believed to be caused by stimulation of synthesis of the most important components of glycoproteins. A cytoprotective effect of omeprazol and endoscopic LILI is ccompanied by a significant shortening of time for the clinical symptoms to get dispelled, the ulcer cicatrization frequency increased. Anti-Ulcer Agents;Omeprazole Adolescent;Adult;Anti-Ulcer Agents;Cytoprotection;Duodenal Ulcer;Duodenum;Gastric Juice;Gastric Mucosa;Humans;Intestinal Mucosa;Middle Aged;Omeprazole
[Correction of the gastric and duodenal motility by laser puncture in pancreatobiliary diseases]. 96.7 percent of patients with affections of organs of the pancreatobiliary zone displayed motor function disorders of upper portions of the alimentary canal (AC). A characteristic sign of the pathological process in pancreatobiliary organs is decreased frequency of recordable biopotentials and qualitative changes in electrogastrogrames. Changes in qualitative characteristics of the electrogastrogram are clearly related to increase in the intraduodenal pressure recordable with the aid of the "open catheter" technique. Laseropuncture is an effective supplementary method for correction of motility disorders in the upper portions of AC in those patients presenting with affections of the pancreatobiliary organs. Acupuncture Therapy;Adolescent;Adult;Biliary Tract Diseases;Cholecystitis;Duodenum;Gastrointestinal Motility;Humans;Low-Level Light Therapy;Middle Aged;Pancreatic Diseases;Pancreatitis;Postcholecystectomy Syndrome;Stomach
Laser removal of radiation tattoos. Humans;Low-Level Light Therapy;Radiotherapy;Tattooing
Breakthrough treatment for improving color of scars and uneven skin pigment. Humans;Hypopigmentation;Low-Level Light Therapy;Skin Pigmentation
EBM in action: is laser treatment effective and safe for musculoskeletal pain? Evidence-Based Medicine;Humans;Low-Level Light Therapy;Pain

Rosacea now successfully controlled with therapy and lifestyle changes. Anti-Bacterial Agents;Anti-Infective Agents;Metronidazole;Tetracycline Anti-Bacterial Agents;Anti-Infective Agents;Drug Therapy, Combination;Humans;Low-Level Light Therapy;Metronidazole;Rosacea;Tetracycline

Effects of 1047-nm neodymium laser radiation on skin wound healing. Previous research in our laboratory has shown that the polarization component of the electrical field plays an important role on the healing process of inflammatory lesions created in the end of the spinal column of Lewis rats, using a He-Ne laser at lambda = 632.8 nm. It is well known that polarization is lost in a turbid medium, such as living tissue. However, the Nd:YLF wavelength (lambda = 1,047 nm) allows more polarization preservation than lambda = 632.8 nm, and the Nd:YLF laser beam has been used in clinical trials as a biostimulating agent. In this work, we investigated the influence of a low-intensity, linearly polarized Nd:YLF laser beam on skin wound healing, considering two orthogonal directions of polarization. We have considered a preferential axis as the animals' spinal column, and we aligned the linear laser polarization first parallel, then perpendicular to this direction. Burns of about 6 mm in diameter were created with liquid N2 on the back of the animals, and the lesions were irradiated on days 3, 7, 10, and 14 postwounding, D = 1.0 J/cm2. Lesions 1 and 2 were illuminated using Nd:YLF pulsed laser radiation. Lesion 1 was irradiated with linear polarization parallel with the rat spinal column. Lesion 2 was irradiated using the same protocol, but the light polarization was aligned with the perpendicular relative orientation. Control lesions were not irradiated. We have taken photographs from the wound areas on the 3rd, 7th, 10th, 14th, and 17th postoperative day for a biometrical analysis. The results have shown that lesion 1 healed faster than the control lesions ($p < 0,05$), which presented a smaller degree of healing after 14 days postwounding. Neodymium Analysis of Variance;Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Neodymium;Probability;Rats;Rats, Inbred Lew;Reference Values;Skin;Wound Healing;Wounds and Injuries

Effects of low-level laser therapy on malignant cells: in vitro study. The aim of this study was to assess the effect of 635- and 670-nm laser irradiation on H.Ep.2 cells in vitro using MTT. In addition to our previous report on the effects of LLLT on the proliferation of laryngeal carcinoma cells in which it was found that irradiaton H.Ep.2 cells with 670-nm laser results in increased cell proliferation, it was decided to evaluate the effect of increased doses of laser light on these cells. The cells, obtained from SCC of the larynx, were routinely processed from defrost to the experimental condition. The cultures were kept either at 5% or 10% of FBS. Twenty-four hours after transplantation, the cells were irradiated with laser light (5-mW diode lasers; 635 and 670-nm; beam cross section approximately 1 mm) at local light doses between 0.04 and 4.8.10(4) Jm(-2). For 670 nm, significant differences in the proliferation were observed between the two concentrations of FBS ($p = 0.002$) and between irradiated cultures and controls ($p = 0.000$). Although the results were not significant, 635-nm irradiated cells also proliferated more than nonirradiated ones. This occurred under both conditions of nutrition. It is concluded, that irradiation with 670-nm laser light applied at doses between 0.04 and 4.810(4) Jm(-2) could significantly increase proliferation of laryngeal cancer cells. Cell Division;Humans;Low-Level Light Therapy;Pharyngeal Neoplasms;Reference Values;Sensitivity and Specificity;Tumor Cells, Cultured

Low-energy laser irradiation promotes the survival and cell cycle entry of skeletal muscle satellite cells. Low energy laser irradiation (LELI) has been shown to promote skeletal muscle cell activation and proliferation in primary cultures of satellite cells as well as in myogenic cell lines. Here, we have extended these studies to isolated myofibers. These constitute the minimum viable functional unit of the skeletal muscle, thus providing a close model of in vivo regeneration of muscle tissue. We show that LELI stimulates cell cycle entry and the accumulation of satellite cells around

isolated single fibers grown under serum-free conditions and that these effects act synergistically with the addition of serum. Moreover, for the first time we show that LELI promotes the survival of fibers and their adjacent cells, as well as cultured myogenic cells, under serum-free conditions that normally lead to apoptosis. In both systems, expression of the anti-apoptotic protein Bcl-2 was markedly increased, whereas expression of the pro-apoptotic protein BAX was reduced. In culture, these changes were accompanied by a reduction in the expression of p53 and the cyclin-dependent kinase inhibitor p21, reflecting the small decrease in viable cells 24 hours after irradiation. These findings implicate regulation of these factors as part of the protective role of LELI against apoptosis. Taken together, our findings are of critical importance in attempts to improve muscle regeneration following injury. Culture Media, Serum-Free Animals;Cell Cycle;Cell Differentiation;Cell Division;Cell Fusion;Cell Survival;Cells, Cultured;Culture Media, Serum-Free;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Muscle Fibers, Skeletal;Muscle, Skeletal;Muscular Diseases;Regeneration

Comet assay measurements of DNA damage in cells by laser microbeams and trapping beams with wavelengths spanning a range of 308 nm to 1064 nm. DNA damage induced in NC37 lymphoblasts by optical tweezers with a continuous-wave Ti:sapphire laser and a continuous-wave Nd:YAG laser (60-240 mW; 10-50 TJ/m2; 30-120 s irradiation) was studied with the comet assay, a single-cell technique used to detect DNA fragmentation in genomes. Over the wavelength range of 750-1064 nm, the amount of damage in DNA peaks at around 760 nm, with the fraction of DNA damage within the range of 750-780 nm being a factor of two larger than the fraction of DNA damage within the range of 800-1064 nm. The variation in DNA damage was not significant over the range of 800-1064 nm. When the logarithm of damage thresholds measured in the present work, as well as values reported previously in the UV range, was plotted as a function of wavelength, a dramatic wavelength dependence became apparent. The damage threshold values can be fitted on two straight lines, one for continuous-wave sources and the other for pulsed sources, irrespective of the type of source used (e.g. classical lamp or laser). The damage threshold around 760 nm falls on the line extrapolated from values for UV-radiation-induced damage, while the data for 800-1064 nm fall on a line that has a different slope. The change in the slope between 320 and 340 nm observed earlier is consistent with a well-known change in DNA-damaging mechanisms. The change observed around 780 nm is therefore suggestive of a further change in the mechanism(s). The data from this work together with our previous measurements provide, to the best of our knowledge, the most comprehensive view available of the DNA damage produced by microfocused light. Calibration;Cell Survival;Comet Assay;DNA Damage;Dose-Response Relationship, Radiation;Humans;Lasers;Low-Level Light Therapy;Sensitivity and Specificity;Time Factors;Tumor Cells, Cultured

Ultrastructural changes of human dentin after irradiation by Nd:YAG laser. BACKGROUND AND OBJECTIVE: The use of Nd:YAG laser has been proposed for endodontic treatment. However, its ability to reduce dentin permeability, which is important for the success of root canal treatment, remains controversial. STUDY DESIGN/MATERIALS AND METHODS: Nd:YAG laser irradiation was performed in pulsed mode on human dentin. The parameters were: pulse energy (100 mJ), rate (10 pps), and total irradiation time (4 seconds). The crystalline phases, electron diffraction patterns, morphology, and microstructure of specimens after laser irradiation were observed by dark-field emission transmission electron microscope (TEM). RESULTS: Three ultrastructural zones could be delineated in the dentin: (1) an outer zone with an ordered columnar structure composed of hydroxyapatite and beta-tricalcium phosphate, (2) an intermediate zone composed of an amorphous substance (about 40-70 nm in diameter), and (3) an inner zone of well-crystallized hydroxyapatite grains. These three zones were free of pores or voids. CONCLUSIONS: Our study demonstrated that

laser-irradiation might be used to reduce dentin permeability. Dental Enamel Permeability;Dentin;Humans;Low-Level Light Therapy;Microscopy, Electron
Selective removal of residual composite from dental enamel surfaces using the third harmonic of a Q-switched Nd:YAG laser. BACKGROUND AND OBJECTIVE: Conventional methods of residual composite removal after the debonding of orthodontic brackets involve the use of abrasives that damage the underlying enamel. The objective of this study was to demonstrate that 355-nm laser pulses with a pulse width of 10 ns are well suited for the removal of composite through selective laser ablation. STUDY DESIGN/MATERIALS AND METHODS: The residual composite remaining on the surface of extracted human third molars and bovine incisors was removed using multiple laser pulses from the third harmonic (355-nm) of a Q-switched Nd:YAG laser. RESULTS: There is selective ablation of composite from the enamel surface without any discernable damage to the underlying enamel. CONCLUSION: This study demonstrates that 355-nm, 10 ns laser pulses can be used for the selective ablation of dental composite without thermal or mechanical damage to the underlying enamel. Acrylic Resins;Composite Dental Resin;Composite Resins;Polyurethanes Acrylic Resins;Animals;Cattle;Composite Resins;Dental Enamel;Hot Temperature;Humans;Low-Level Light Therapy;Polyurethanes
Electrophysiologic effect of gallium arsenide laser on frog gastrocnemius muscle. BACKGROUND AND OBJECTIVE: In this study, the effect of low energy Gallium arsenide (GaAs) laser irradiation on the compound action potential of frog gastrocnemius muscle were investigated. STUDY DESIGN/MATERIALS AND METHODS: Sixty frogs were divided into different six dose groups: laser 1 (1 Hz), laser 2 (4 Hz), laser 3 (16 Hz), laser 4 (64 Hz), laser 5 (128 Hz), and laser 6 (1,000 Hz, DC, continue) (in each group n=10). Low energy GaAs laser (wavelenght: 904 nm, pulsed duration: 220 nanoseconds, peak power per pulse: 27 W, total applied energy density: 0.001-25.7 J/cm2) was used for the experiment. Compound muscle action potentials were recorded before laser irradiation and these data were accepted as control group. After recording the control data, each muscle was irradiated by the laser. Action potentials were recorded at 1, 5, 10, 15, and 20 minutes of irradiation time in each group by using standartized needle electromyography and nerve conduction study techniques. Distal motor latency, peak to peak amplitude, area, and total duration of action potential were measured. Repeated measures analysis of variance were used for the statistical evaluation. RESULTS: No significant differences were detected between control and laser dose groups in muscle action potential parameters. CONCLUSIONS: This study revealed that at the different repetition rate and exposure time, low energy GaAs laser does not have any significant effect on frog gastrocnemius action potential. Arsenicals;gallium arsenide;Gallium Animals;Arsenicals;Electrophysiology;Gallium;Low-Level Light Therapy;Muscle, Skeletal;Ranidae;Time Factors
Improvement of macromolecular clearance via lymph flow in hamster gingiva by low-power carbon dioxide laser-irradiation. BACKGROUND AND OBJECTIVE: Although therapeutic effects of low-power laser-irradiation on periodontal disease have been reported, little is known about the biological effects of laser-irradiation in the gingiva. Recently we reported that topical warming stimulated macromolecular clearance via lymph flow in hamster gingiva. This study was conducted to investigate whether low-power laser-irradiation affects macromolecular clearance via the lymph flow in the gingiva. STUDY DESIGN/MATERIALS AND METHODS: We injected 14C-methylated albumin into the mandibular gingiva of anesthetized hamsters followed by topical carbon dioxide (CO2) laser-irradiation (30 seconds, 0.5-1.5 W). We measured the clearance of radiolabeled albumin from the gingiva and its drainage into submandibular lymph nodes during 10 minutes. RESULTS: The clearance of the radiolabeled albumin from the gingiva and the influx into the submandibular lymph nodes were increased by CO2 laser-irradiation. CONCLUSION: Low-power CO2 laser-irradiation improves

macromolecular clearance via the lymph flow in hamster gingiva. Albumins;Carbon Dioxide Albumins;Animals;Carbon Dioxide;Cricetinae;Gingiva;Low-Level Light Therapy;Lymph;Mesocricetus;Periodontal Diseases
[New potentialities of laser therapy and electrostimulation after cheilorhinoplasty]. A method for stimulation of the central regulation mechanisms has been used in 53 patients during the early period after cheilorhinoplasty. Electrostimulation by the flickering reflex method is a nonspecific method stimulating sanogenesis which can be used for repair of the neuromuscular function after correction of secondary deformation of the upper lip and palate. Transcerebral laser stimulation indirectly affected the reparative processes in the maxillofacial area by improving metabolism in the cerebrocortical projection zones. Blinking;Brain;Electric Stimulation Therapy;Face;Humans;Lip;Low-Level Light Therapy;Neuromuscular Junction;Postoperative Care;Rhinoplasty;Synaptic Transmission
[Indications for medical lasers in dermatology]. FOUR CATEGORIES OF LASERS ARE USED IN DERMATOLOGY: These are vascular, depigmentation, depilatory or resurfacing or vaporization lasers. Today, there are more potential or suggested indications than good methodological studies that confirm these indications. Nevertheless, there are indisputable indications for these lasers. VASCULAR LASERS: They are indicated in the treatment of capillary nevus in adults and children and, with pulsed dye lasers, infants can be treated within the first weeks of life. Another indication for vascular lasers is treatment of Stage II rosacea, i.e., at the stage of telangiectasic erythrosis or couperose. Other indications include radiodermatitis, ulcerated hemangioma and erythrosis of the neck. DEPILATORY LASERS: Treatment of patients with pale phototype and dark hairs appears possible. However, around 4 to 6 sessions are required to obtain significant lasting hair removal. DEPIGMENTATION LASERS: The best indications are the removal of tattoos, Ota's nevus and, to a lesser degree, liver spots and Becker's nevus. Melasma and chloasma are not indications or exeresis of nevo-cellular nevi using this technique, since no histological control is possible. PULSED VAPORIZATION LASERS (CO2 OR ERBIUM LASER): They permit dermabrasion in the treatment of verrucous harmatoma, extensive benign superficial dermo-epidermal lesions and the esthetic treatment of non-muscular wrinkles, i.e., excepting wrinkles of the forehead and nasal sulcus. Continuous CO2 lasers destroy small dermo-epidermal lesions. They are particularly indicated for profuse lesions, in which there is a risk of hemorrhage or when direct contact should be avoided because of potential HIV infection. CONCLUSION: There are many potential indications, but a consensus has only been reached on those mentioned. The others remain to be confirmed. Adult;Child;Humans;Laser Coagulation;Laser Therapy;Low-Level Light Therapy;Skin Diseases
[Laser irradiation in the treatment of ischemic heart disease]. Cardiodynamic changes due to beta-blocker carvedilol and low-intensity infrared laser radiation were compared in 115 patients with ischemic heart disease (IHD). The comparison has shown a similar positive effect on heart contractility and diastolic function. This gave arguments for feasibility of laser beam usage as a neurohormonal modulator in IHD patients to reduce cardiac remodulation and prevent cardiac failure. Adrenergic beta-Antagonists;Carbazoles;Propanolamines;Carvedilol Adrenergic beta-Antagonists;Carbazoles;Carvedilol;Heart Function Tests;Humans;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia;Propanolamines
Multiple color changes following laser therapy of cosmetic tattoos. OBJECTIVE: To emphasize the wisdom of small test areas when treating cosmetic tattoos and the need for multiple laser systems. METHODS: A 48-year-old woman requested removal of permanent makeup (cosmetic tattoos) of her eyebrows and around her lips. Physical examination revealed a brown tattoo of both eyebrows and dark red lip liner around both lips. A test area was performed on the red tattoo of the lips. A frequency-doubled Nd:YAG laser (532 nm, 2.0 J/cm2, 2 mm spot size) was used for the lip area, while

the same laser at 1064 nm, 3.9 J cm2, 2 mm spot size was utilized for the eyebrows. The lip area immediately turned black. The patient returned for follow-up 1 month later; the black ink on the lip was treated with the same laser at 1064 nm, 3 mm spot size, 4.2 J/cm2, with satisfactory resolution in two monthly treatments. Both brown eyebrow turned bright orange and were treated with 532 nm, 3 mm, 3.0 J/cm2. One month later the eyebrows were a mixture of yellow ink and dark green. The yellow area was treated with 532 nm, 3 mm, 2.3 J/cm2, while the dark green was treated with the 1064 nm, 3 mm spot size, 4.2 J/cm2. One month later little improvement was noted, so Q-switched ruby laser at 694 nm, 6 mm spot size, 16 J/cm2 was utilized. An additional four monthly treatments were given utilizing a combination of both ruby and 532 nm ND:YAG lasers for green and yellow pigment, respectively. RESULTS: Significant but incomplete resolution of the tattoo ink was achieved. CONCLUSION: Multiple laser systems are needed to remove cosmetic tattoos. Test areas must be done before treatment. Pigments, Biological Eyebrows;Female;Humans;Lip;Low-Level Light Therapy;Middle Aged;Pigments, Biological;Tattooing

Short-term histologic effects of nonablative resurfacing: results with a dynamically cooled millisecond-domain 1320 nm Nd:YAG laser. BACKGROUND: It is widely believed that nonablative laser techniques can lead to dermal collagen remodeling without the obvious epidermal injury and the wound created with ablative approaches. This occurs when dermal collagen injury is induced without visible injury to the overlying epidermis. OBJECTIVE: To examine the acute histologic effects both 1 hour and several days after standardized treatment protocols of dynamically cooled millisecond domain Nd:YAG 1320 nm laser to provide further insight into the mechanism of action of nonablative resurfacing. METHODS: Multiple adjacent sites on the preauricular area of the cheek of 10 patients were biopsied following one to three laser passes of dynamically cooled millisecond-domain Nd:YAG 1320 nm laser. Biopsies were performed at 1 hour and at 3 days following a single treatment. The number of passes was varied from one to three and Tmax (peak temperature measured by integrated radiometer) during treatment was targeted for 45-48 degree C. RESULTS: At 1 hour after treatment, epidermal spongiosis and edema of the basal cell layer were present in all the specimens treated with three passes. At 3 days the three pass samples also showed microthrombosis, widened vessels, sclerosis of the vessel walls, and infiltration of neurophilic granulocytes. The occurrence of these histologic findings correlated well with the presence of clinical improvement (judged by photographs) at 8 weeks after treatment. Acute histologic changes and clinical improvement were not observed below treatment temperatures of Tmax 45 degree C or after one pass alone. Repeated temperatures above a Tmax of 48 degree C incurred risk of epidermal injury. CONCLUSION: Even though longer-term histologic findings have confirmed the collagen synthesis component of 1320 nm Nd:YAG laser, our data indicate that there may be some additional factors other than dermal collagen heating with subsequent collagen repair. The concept of true "nonablative resurfacing" may involve some form of subclinical epidermal injury that improves the clinical outcome. Acute changes involving superficial blood vessel injury with cytokine release may also be implicated. Our histologic findings suggest that three passes with fluence and cooling adjusted to a Tmax of 45 degree C-48 degree C yields improved clinical results. Facial Dermatoses;Humans;Low-Level Light Therapy;Skin;Temperature

Professional errors caused by lasers and intense pulsed light technology in dermatology and aesthetic medicine: preventive strategies and case studies. BACKGROUND: The use of lasers and intense pulsed light (IPL) technology has become established practice in dermatology and aesthetic medicine. The increase in popularity and widespread use of such equipment has been accompanied by a sharp increase in the number of case reports about professional errors. OBJECTIVE: We present 14 case studies of professional errors. METHODS: Selected representative case reports are used to illustrate and discuss typical professional errors and serve as the basis for creating preventive strategies.

RESULTS: Recommendations have been developed for the following areas: physician training, patient information, documentation, diagnosis, indication, test treatment, and performing treatment. CONCLUSION: The use of lasers and IPL technology in dermatology and aesthetic medicine requires practitioners not only to have high levels of training and experience, but also to exercise professional judgment. In spite of all of the precautions taken, the risk of complications and side effects can be reduced but not completely eliminated. Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Medical Errors;Phototherapy;Skin Diseases

[Laser's biostimulation in healing or crural ulcerations]. The objective of this paper was to evaluate effect of laser's biostimulation on the process of healing of crural ulcerations. Three comparative groups of patients, A, B and C, were made at random from the patients with venous crural ulcerations. The group A consisted of 17, the group B 15, the group C 17 patients. The patients in all comparative groups were treated pharmacologically and got compress therapy. Ulcerations at patients in group A were additionally irradiated by light of biostimulation's laser (810 nm) in this way that every time ulcerations got dose of energy 4 J/cm2. The patient's in-group B additionally got blind trial (with placebo in the form of quasi-laserotherapy). The evaluated factors were to estimate how laser's biostimulation causes any changes of the size of the ulcers and of the volume of tissue defect. The speed of changes of size and volume of tissue defect per week was calculated. After the treatment there was statistically significant decrease of size of ulcers in all comparative groups while there was no statistically significant difference between the groups observed. After the treatment there was statistically significant decrease of volume of ulcers only in groups A and C but there was no statistically significant difference between the groups observed. Adult;Aged;Aged, 80 and over;Dose-Response Relationship, Radiation;Female;Humans;Leg;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Time Factors;Treatment Outcome;Varicose Ulcer;Wound Healing

Acute electrophysiological effect of pulsed gallium-arsenide low-energy laser irradiation on isolated frog sciatic nerve. We evaluated the acute electrophysiological effects of low-energy pulsed laser irradiation on isolated frog sciatic nerve measured by extracellular recording technique. A pulsed gallium-arsenide (GaAs) laser (wavelength: 904 nm, pulse duration 220 ns, peak power per pulse: 27W, spot size: 0.28 cm(2), total applied energy density: 0.005-2.5J/cm(2)) was used for the experiment. Sixty isolated nerves were divided into six groups (n=10), each of which received a different laser dose. In each group, action potentials were recorded before laser irradiation which served as the control data. The extracellular action potentials were recorded for each combination of 1, 3, 5, 7, 10, 13 and 15 minutes of irradiation time and 4, 8, 16, 32, 64 and 128 repetition frequency by using a BIOPAC MP 100 Acquisition System Version 3.5.7 (Santa Barbara, USA). Action potential amplitude, area, duration and conduction velocity were measured. Statistical evaluation was performed using repeated measures variance analysis by SPSS 9.0. There were no statistically significant differences for action potential amplitude, area and conduction velocity among the laser groups and control data ($p>0.05$). The study showed that low-energy GaAs irradiation at 4-128 Hz repetition frequencies administered for irradiation times of 1-15 min generates no effect on action potential amplitude, area, duration and conduction velocity in isolated frog sciatic nerve. Action Potentials;Animals;In Vitro Techniques;Low-Level Light Therapy;Neural Conduction;Radiation Dosage;Ranidae;Sciatic Nerve

Efficacy of low power laser therapy in fibromyalgia: a single-blind, placebo-controlled trial. Low energy lasers are widely used to treat a variety of musculoskeletal conditions including fibromyalgia, despite the lack of scientific evidence to support its efficacy. A randomised, single-blind, placebo-controlled study was conducted to evaluate the efficacy of low-energy laser therapy in 40 female patients with fibromyalgia. Patients with fibromyalgia were randomly allocated to active (Ga-As) laser

or placebo laser treatment daily for two weeks except weekends. Both the laser and placebo laser groups were evaluated for the improvement in pain, number of tender points, skinfold tenderness, stiffness, sleep disturbance, fatigue, and muscular spasm. In both groups, significant improvements were achieved in all parameters ($p<0.05$) except sleep disturbance, fatigue and skinfold tenderness in the placebo laser group ($p>0.05$). It was found that there was no significant difference between the two groups with respect to all parameters before therapy whereas a significant difference was observed in parameters as pain, muscle spasm, morning stiffness and tender point numbers in favour of laser group after therapy ($p<0.05$). None of the participants reported any side effects. Our study suggests that laser therapy is effective on pain, muscle spasm, morning stiffness, and total tender point number in fibromyalgia and suggests that this therapy method is a safe and effective way of treatment in the cases with fibromyalgia. Female;Fibromyalgia;Humans;Low-Level Light Therapy;Pain;Single-Blind Method

[The role of erythrocyte rheological determinants in the regulation of bloodflow structure]. Correlations of rheological determinants of the erythrocyte viscous characteristics were studied in normal subjects and coronary patients treated traditionally and with photohemotherapy. A rigid relationship between erythrocyte deformability and aggregation was detected in the patients. Blood exposure to He-Ne laser and UV is a potent method for correcting the blood rheology. Physiological significance of the rigid relationship of erythrocyte deformability and aggregation consists in the maintenance of the structure of flowing blood, characteristic of its native status, and represents an additional mechanism of realization of the adaptive potential of blood viscosity regulation in mammals. Adult;Aged;Angina, Unstable;Blood Cells;Erythrocyte Aggregation;Erythrocyte Deformability;Erythrocytes;Hemorheology;Humans;Low-Level Light Therapy;Middle Aged;Ultraviolet Therapy

[Ocular complications of diode laser epilation in the area of the face. Loss of pupillary symmetry and pigment layer defect as well as coagulation of the ciliary body with intraocular inflammation caused by laser treatment]. Adult;Diagnosis, Differential;Endophthalmitis;Female;Follow-Up Studies;Humans;Hypertrichosis;Iris;Low-Level Light Therapy

[Milta-F: a magnetic infrared laser therapeutic apparatus with a photorecorder for diagnosis, prognostication and treatment of inflammatory diseases of the adnexa uteri]. Laser biophotometry is an objective method to diagnose and to predict the course of inflammatory diseases of the uterine appendages. By taking into account its simplicity, reliability, and validity of findings, a MILTA apparatus should be recommended in additional studies of patients. Hemoglobins Adolescent;Adult;Aged;Diagnosis, Differential;Female;Hemoglobins;Humans;Infrared Rays;Low-Level Light Therapy;Middle Aged;Models, Theoretical;Pelvic Inflammatory Disease;Prognosis

Laser technology in orthopedics: preliminary study on low power laser therapy to improve the bone-biomaterial interface. Low Power Laser (LPL) seems to enhance the healing of bone defects and fractures. The effect of LPL in other orthopedic areas such as osteointegration of implanted prosthetic bone devices is still unclear. In the present study, 12 rabbits were used to evaluate whether Ga-Al-As (780 nm) LPL stimulation has positive effects on osteointegration. Hydroxyapatite (HA) cylindrical nails were drilled into both distal femurs of rabbits. From postoperative day 1 and for 5 consecutive days, the left femura of all rabbits were given LPL treatment (Laser Group-LG) with the following parameters: 300 Joule/cm2, 1 Watt, 300 Hertz, pulsating emission, 10 minutes. The right femura were sham-treated (Control Group-CG). At 4 and 8 weeks after implantation, histologic and histomorphometric investigations evaluated bone-biomaterial-contact. Histomorphometry showed a higher degree of osteointegration at the HA-bone interface in the LG Group at 4 ($p < 0.0005$) and 8 weeks ($p < 0.001$). These preliminary positive results seem to support the hypothesis that LPL

treatment can be considered a good tool to enhance the bone-implant interface in orthopedic surgery. Biocompatible Materials Animals;Biocompatible Materials;Bone and Bones;Disease Models, Animal;Fracture Healing;Fractures, Bone;Immunohistochemistry;Low-Level Light Therapy;Male;Osseointegration;Prostheses and Implants;Rabbits;Sensitivity and Specificity;Surface Properties

[Differential therapy of hemangiomas--when cryotherapy, laser therapy or operation?]. Hemangiomas are the most common soft tissue tumours in childhood, which arise after birth, grow for several months and regress spontaneously. Serious problems can occur with closure of the eye resulting in amblyopia or with psychologica problems due to disfiguring of the face. Therapeutic possibilities are cryo therapy, laser therapy and surgical removal. Cryotherapy can be used for small and flat hemangiomas. Bigger hemangiomas are treated with the Nd-YAG laser. Its effect is an acceleration of involution. Typical residues of hemangiomas must be secondarily corrected surgically. Indications for primary surgical therapy are hemangiomas of the eye lid and in the scalp. Child, Preschool;Combined Modality Therapy;Cryotherapy;Eyelid Neoplasms;Head and Neck Neoplasms;Hemangioma;Humans;Infant;Low-Level Light Therapy;Neoplasm, Residual;Treatment Outcome

ER-YAG laser pretreatment effect on in vitro secondary caries formation around composite restorations. PURPOSE: This in vitro study determined if Er-YAG laser used in instead of acid-etching influenced artificial secondary caries formation in enamel and root surfaces. MATERIALS AND METHODS: Class V cavities were prepared in buccal and lingual surfaces of 10 extracted caries-free molars, with cervical margins in the root surface and occlusal margins in enamel. The specimens were randomly assigned to 2 groups: Group 1: Enamel and dentin etched with 35% phosphoric acid gel (Scotchbond 15s, rinse 10s; n=5 teeth with 2 cavities per specimen, 10 occlusal and 10 root surface margins at caries risk). Group 2: Enamel and dentin surfaces conditioned using a pulsed Er-YAG laser (KAVO) with 2.94 microm wavelength, 250 micros pulse duration, 300 mJ for enamel and 250 mJ for root surface pulse energy, 2 Hz repetition rate, and water cooling (n=5 teeth with 2 cavities per specimen, 10 occlusal and 10 root surface margins at caries risk). The cavity preparations were restored with a wet-bonding technique (Scotchbond 1 adhesive system) and a hybrid resin, light-cured composite (Z100, A3 shade), according to the manufacturer's instructions. Acid-resistant varnish was applied leaving the restoration and a 1 mm rim of adjacent surface enamel and root surface exposed. The specimens were thermocycled (5-50 degrees C, 500 cycles, dwell time 30s). Following artificial caries formation (2.2 mM calcium, 2.2 mM phosphate, 50 mM acetic acid, 5.0 mg/L fluoride, pH 4.25, 10 days), longitudinal sections (3/tooth, 30 occlusal and cervical caries risk sites per group) were taken for polarized light microscopic examination (water imbibition). Primary surface lesion depth and wall lesion frequency was determined and compared between groups (Student's t-test). RESULTS: Er-YAG laser irradiation resulted in a 56% reduction in primary enamel surface lesion depth (116 microm mean depth) when compared with the acid-etched group (263 microm mean depth), and a 39% decrease in root surface lesion depth (194 microm mean depth) compared with that (316 microm mean depth) for acid-etching pretreatment ($P < 0.05$). Wall lesion frequency was similar ($P > 0.05$) between treatment groups. Acetates;Aluminum Silicates;Composite Resins;Phosphoric Acids;Resin Cements;Z100 composite resin;Yttrium;Silicon Dioxide;Erbium;Scotchbond;Zirconium Acetates;Acid Etching, Dental;Aluminum Silicates;Composite Resins;Dental Caries;Dental Caries Susceptibility;Dental Cavity Preparation;Dental Enamel;Dental Restoration, Permanent;Dentin;Erbium;Humans;Hydrogen-Ion Concentration;Low-Level Light Therapy;Microscopy, Polarization;Molar;Phosphoric Acids;Recurrence;Resin Cements;Silicon Dioxide;Statistics as Topic;Thermodynamics;Tooth Demineralization;Tooth Root;Yttrium;Zirconium

Low-level laser effect on neural regeneration in Gore-Tex tubes. PURPOSE: The purpose of this investigation was to determine the effects of low-level laser (LLL) irradiation on neural regeneration in surgically created defects in the rabbit inferior alveolar nerve. STUDY DESIGN: Five adult female New Zealand White rabbits underwent bilateral exposure of the inferior alveolar nerve. A 6-mm segment of nerve was resected, and the nerve gap was repaired via entubulation by using a Gore-Tex conduit. The experimental side received 10 postoperative LLL treatments with a 70-mW gallium-aluminum-arsenide diode at 4 sites per treatment. At 15 weeks after surgery, the nerve segments were harvested bilaterally and prepared for light microscopy. Basic fuchsin and toluidine blue were used to highlight myelinated axons. The segments were examined histomorphometrically by using computer analysis to determine mean axonal diameter, total fascicular surface area, and axonal density along the repair sites. RESULTS: Gross examination of all nerves showed intact neural bundles with variable degrees of osseous remodeling. Light microscopic evaluation revealed organized regenerated neural tissue in both groups with more intrafascicular perineural tissue in the control group. Histomorphometric evaluation revealed increased axonal density in the laser treated group as compared with the control. CONCLUSIONS: LLL irradiation may be a useful noninvasive adjunct to promote neuronal wound healing in surgically created defects repaired with expanded polytetrafluoroethylene entubulation. Polytetrafluoroethylene Animals;Cranial Nerve Injuries;Female;Low-Level Light Therapy;Mandibular Nerve;Nerve Regeneration;Polytetrafluoroethylene;Rabbits;Statistics, Nonparametric;Stents;Trigeminal Nerve Injuries

The bactericidal effect of Ho:YAG laser irradiation within contaminated root dentinal samples. OBJECTIVE: This in vitro study investigates the bactericidal effect of pulsed Ho:YAG laser irradiation in the depth of contaminated dentin specimens. BACKGROUND DATA: Previous studies have shown the effectiveness of laser irradiation in bacterial reduction of infected root canal. METHODS: Root dentin of bovine teeth were sliced longitudinally in 180 samples of 100 microm, 300 microm, and 500 microm thickness, sterilized, dried, and inoculated on one side, with 1 microL of Enterococcus faecalis suspension. The opposite side's were irradiated four times for 5 seconds each with Ho:YAG laser irradiation, a wavelength of 2.10 microm, using four different energy settings: 1 W/5 Hz; 1 W/10 Hz; 1.5 W/5 Hz, and 2.0 W/5 Hz through a 320-microm quartz fiber at an angle of approximately 5 degrees. In addition, two control groups were investigated, the first was inoculated and not submitted to any treatment, the second was inoculated and treated with NaOCl and H2O2. The remaining bacteria from each dentin sample in a transport media were removed by vibration, serially diluted, and plated out on culture dishes selective for Enterococcus faecalis. RESULTS: When compared with the untreated control group or even with the group treated with NaOCl plus H2O2, counting of colonies forming units (CFU) from the laser-treated samples revealed a high significant bacterial elimination with a maximum of 98.46% and a minimum of 83.65%. CONCLUSIONS: Our findings demonstrate a significant decrease of the bacterial population in depth, suggesting that the Ho:YAG laser irradiation could be effective to eliminate the microorganisms harbored within dentin or contaminated canals. Animals;Cattle;Colony Count, Microbial;Dentin;Enterococcus faecalis;In Vitro Techniques;Low-Level Light Therapy

Wound healing of animal and human body sport and traffic accident injuries using low-level laser therapy treatment: a randomized clinical study of seventy-four patients with control group. BACKGROUND AND OBJECTIVE: The main objective of current animal and clinical studies was to assess the efficacy of low level laser therapy (LLLT) on wound healing in rabbits and humans. STUDY DESIGN/MATERIALS AND METHODS: In the initial part of our research we conducted a randomized controlled animal study, where we evaluated the effects of laser irradiation on the healing of surgical wounds on rabbits. The manner of the application of LLLT on the human body are analogous to those

of similar physiologic structure in animal tissue, therefore, this study was continued on humans. Clinical study was performed on 74 patients with injuries to the following anatomic locations: ankle and knee, bilaterally, Achilles tendon; epicondylus; shoulder; wrist; interphalangeal joints of hands, unilaterally. All patients had had surgical procedure prior to LLLT. Two types of laser devices were used: infrared diode laser (GaAlAs) 830 nm continuous wave for treatment of trigger points (TPs) and HeNe 632.8 nm combined with diode laser 904-nm pulsed wave for scanning procedure. Both were applied as monotherapy during current clinical study. The results were observed and measured according to the following clinical parameters: redness, heat, pain, swelling and loss of function, and finally postponed to statistical analysis via chi2 test. RESULTS: After comparing the healing process between two groups of patients, we obtained the following results: wound healing was significantly accelerated (25%-35%) in the group of patients treated with LLLT. Pain relief and functional recovery of patients treated with LLLT were significantly improved comparing to untreated patients. CONCLUSION: In addition to accelerated wound healing, the main advantages of LLLT for postoperative sport- and traffic-related injuries include prevention of side effects of drugs, significantly accelerated functional recovery, earlier return to work, training and sport competition compared to the control group of patients, and cost benefit. Accidents, Traffic;Adolescent;Adult;Aged;Animals;Athletic Injuries;Disease Models, Animal;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Care;Rabbits;Wound Healing;Wounds and Injuries

Caries-preventive effect of Er:YAG laser irradiation with or without water mist. OBJECTIVE: This investigation was performed to evaluate the effect of Er:YAG laser irradiation on the acquired acid resistance of sound dental hard tissues to artificial caries formation by spectrophotometry, and the ultrastructure of lased areas was investigated by scanning electron microscopy (SEM) in vitro. BACKGROUND DATA: Although an Er:YAG laser has shown the most promise for hard tissue ablation, there have not been any dissolution studies to determine if this laser is suitable for caries preventive treatments. METHODS: An Er:YAG laser was used to irradiate the enamel and dentin samples from 20 extracted human molars at 400 mJ pulse energy with or without water mist. Samples were subjected to 2 microL of 0.1 M lactic acid solution (pH 4.8) for 24 hours at 36 degrees C. The parts per million (ppm) of calcium ion (Ca2+) dissolved in each solution was determined by atomic absorption spectrophotometry and the morphological changes were investigated by SEM. RESULTS: The lowest mean Ca2+ ppm was recorded in the samples irradiated without water mist, in those by irradiated with water mist, and in the unlased samples. SEM observation showed that the lased areas had melted and seemed to be thermally degenerated when irradiated without water mist. After acid demineralization, the thermally degenerated enamel or dentin surfaces were almost unchanged. CONCLUSIONS: The results of this study suggest that Er:YAG laser irradition with and without water mist appears to be more effective for caries prevention. Water Dental Caries;Dental Enamel;Dentin;Humans;In Vitro Techniques;Low-Level Light Therapy;Water

A comparative study on the effects of three types of laser irradiation at the apical stop and apical leakage after obturation. OBJECTIVE: The purposes of this study were to determine the degree of apical leakage using a dye penetration method after argon, pulsed Nd:YAG with or without black ink, or Er:YAG laser treatment and obturation, and to compare the results of three types of laser irradiation in vitro. SUMMARY BACKGROUND DATA: There have been only a few reports of the laser effect on apical leakage after laser treatment and obturation. METHODS: Seventy-five human extracted single root teeth were divided into five groups of 15 teeth each and prepared up to a #60 K-file size. One group served as the control and was not irradiated. The other four groups were irradiated with an argon laser at 0.3 W for 3 seconds at continuous mode, pulsed Nd:YAG laser at 2 W and 20 Hz for 4 seconds with or without black ink, and Er:YAG laser at 50 mJ per pulse and 4 Hz for 5

seconds. In each group, ten teeth for the apical leakage study were obturated and immersed in rhodamine B solution for 48 hours at 37 degrees C, and the others were used for the observation by scanning electron microscopy (SEM). All teeth were longitudinally bisected and observed by stereoscopy or SEM. RESULTS: After pulsed Nd:YAG laser treatment with black ink and obturation, the apical leakage degree (mean score: 0) was reduced compared to that in the control (mean score: 1.2) significantly ($p < 0.05$). SEM findings showed that specimens irradiated by pulsed Nd:YAG laser with black ink presented clean root canal walls with debris and smear layer evaporated, melted, fused, and recrystallized in most cases. CONCLUSION: These results suggest that pulsed Nd:YAG laser irradiation with black ink at the apical stop is useful for the reduction of apical leakage after obturation. Dental Leakage;Humans;In Vitro Techniques;Low-Level Light Therapy;Root Canal Obturation;Tooth;Tooth Apex

Human teeth exposed to argon laser irradiation: determination of power-time-temperature working conditions. OBJECTIVE: This study was conducted to establish the operating parameters of the argon laser without thermal damage to the pulp tissue for clinical applications. SUMMARY BACKGROUND DATA: Previous studies have mainly compared the temperature modifications of the pulp chamber in a very limited situation, where a complete view of the thermal history cannot be obtained nor even extrapolated to new applications. METHODS: We used samples of molar and premolar tooth where a class V cavity was prepared and illuminated with an argon laser at different power levels, fixing the exposition area for all cases. Situations including open cavity and teeth restoration were analyzed. High-precision thermistors were placed in four different positions, one of which was inside the pulp chamber. The temperature evolution was monitored continuously by an interfaced computer during all laser exposure. Special attention was paid to the intrapulpal temperature variation because it is considered the most vulnerable thermal region. The temperature time evolution allowed the determination of the operating conditions (power-time-temperature variation) in which the use of the argon laser causes no pulpal damage. As a function of temperature variation, we divided the whole parameter space (power-time-temperature) into zones and the optimum zone of operation was determined. CONCLUSIONS: We created a diagram called power-time-temperature (PTT) where zones of temperature increased under laser irradiation allow the verification of which condition is safe for clinical laser application. The results have a broad use when this type of analysis is applicable. Argon Argon;Hot Temperature;Humans;In Vitro Techniques;Low-Level Light Therapy;Time Factors;Tooth;Tooth Injuries

Effects of copper vapor laser irradiation in human enamel and dentin: ablation and morphological studies. OBJECTIVE: This investigation was performed to determine the ranges of ablation quantitatively and to evaluate the morphological changes in human enamel and dentine irradiated by a green copper vapor laser. SUMMARY BACKGROUND DATA: Recently, green copper vapor laser (CVL), which is said to have characteristics similar to the argon laser has been introduced in dentistry. METHODS: Extracted noncarious human teeth were used in this study. A CVL was used to ablate human dental hard tissues with the output powers of 2.0 W. Ablation extent without water spray using red or black ink was measured, and the morphological changes on enamel and dentin were also investigated by stereoscopy and scanning electron microscopy (SEM). RESULTS: In the samples, irradiated by a CVL after painting red ink on the surface, the ablation depth was increased more than that of irradiation after painting with black ink. Morphological findings by SEM indicated that when irradiated with red ink, brown carbonization was recognized on enamel and dentin surfaces. In addition, cavities with a molten lava-like appearance were produced and an irregular structure with many microholes was observed in the enamel and dentin. Alternatively, a shallow cavity with little carbonization was produced with black ink. CONCLUSIONS: Removal of dental hard tissues appears to be possible using the CVL. However, further studies should be performed on the selection of radiation

conditions that achieve the desired ablation with minimal side effects. Copper
Copper;Dental Caries;Dental Enamel;Dentin;Humans;In Vitro Techniques;Low-Level Light Therapy

Pulsed 1064-nm Nd:YAG laser therapy for noninvasive treatment of a massive hemangioma: case report. OBJECTIVE: The author determined whether cutaneous Nd:YAG laser therapy is a viable treatment option for a massive hemangioma located in the musculus soleus muscle of a patient's left leg. SUMMARY BACKGROUND DATA: Giant hemangiomas generally require aggressive medical or surgical therapy to address complications. Because of the size of the lesions, there are risks inherent with conventional treatment options. In selected patients, Nd:YAG laser therapy is a noninvasive approach to treating large, subcutaneous hemangiomas. METHODS: A 59-year-old female patient, who was diagnosed with a large, venous-type hemangioma in the musculus soleus muscle of the left leg, was treated during two treatment sessions with Nd:YAG laser therapy. A Plexiglas ring was placed on the leg, over the hemangioma, to force the hemangioma closer to the surface and laser irradiation was applied to the skin. RESULTS: At 6-month follow-up after the second treatment, magnetic resonance imaging (MRI) demonstrated 75%-80% reduction in lesion size. There were no permanent adverse effects encountered with the treatment method. CONCLUSIONS: The author concludes that in carefully selected cases Nd:YAG laser therapy can be used to treat large hemangiomas whose size poses risks with surgical and other treatments. Female;Hemangioma;Humans;Low-Level Light Therapy;Middle Aged;Muscle Neoplasms;Muscle, Skeletal

In vivo caries-like lesion prevention with argon laser: pilot study. OBJECTIVE: This clinical pilot study was conducted to investigate the effectiveness of argon laser irradiation to reduce demineralization or loss of tooth structure in vivo. SUMMARY BACKGROUND DATA: In vitro research previously demonstrated the ability of argon laser irradiation to reduce demineralization or loss of tooth structure. METHODS: Using the Ogaard model of producing demineralization, the experimental teeth were irradiated with argon laser of 250 mW (producing approximately 12 J/cm2) prior to banding. Polarized light evaluation of the sectioned, extracted teeth was used to determine the amount of demineralization. RESULTS: Results showed a 29.1% reduction in demineralization in the experimental teeth as compared to the bilateral control teeth. CONCLUSION: Low-power argon laser irradiation significantly reduced demineralization clinically. Bicuspid;Dental Caries;Humans;Low-Level Light Therapy;Pilot Projects;Tooth Demineralization

Laser literature watch. Laser Therapy;Lasers;Low-Level Light Therapy

A comparative study of nanosecond and picosecond laser ablation in enamel: morphological aspects. OBJECTIVE: We have investigated and compared the main morphological features of human enamel tissue under Nd:YAG nanosecond and picosecond laser ablation. BACKGROUND DATA: The use of ultrashort laser pulses on teeth ablation is an alternative to avoid overheating and presents the advantage of minimizing the volume of damaged material during laser ablation. Comparison of the morphology obtained in laser ablation using nanosecond and picosecond laser pulses is a way to investigate the advantages of ultrashort laser pulses for ablation. METHODS: Trains of pulses with picosecond duration from a Q-switched and mode-locked Nd:YAG laser and pulses with nanosecond duration from a Q-switched Nd:YAG laser, both operating at 15 Hz kept at the same average power, were focused in human sound molars for 30 sec. Drilled holes with different morphological characteristics were observed using several laser intensity regimes. Enamel surfaces were examined using a scanning electron microscope (SEM) and their morphological characteristics compared. RESULTS: An interesting contrast between the morphology of the enamel when treated with different level of laser power and pulse duration was observed. Picosecond pulses promote a better-defined material removal with a minimum intermediate region, whereas nanosecond pulses at the equivalent average power level cause a large intermediate modified region between ablated and normal tissue, as well as a complete superficial modification of the existent original structure. CONCLUSION: Our

results show an important correlation between the surface morphology and the pulse width of the lasers, suggesting advantages toward the use of ultrashort laser pulses in dentistry. Dental Caries;Dental Enamel;Humans;In Vitro Techniques;Low-Level Light Therapy;Time Factors

Effect of He-Ne laser (632.8 nm) and Polygen on CHO cells. OBJECTIVE: We determined the effect of He-Ne laser biostimulation in combination with Polygen (PG) on Chinese hamster ovary (CHO) cells. BACKGROUND DATA: Several studies have shown that He-Ne laser (632.8 nm), growth factors, and growth hormone can enhance cellular proliferation and that the use of low-level laser stimulation combined with growth factor stimulation has scientific support. PG, an animal protein extract containing a blend of growth factors and growth hormone, was used together with a He-Ne laser to determine their efficacy in the enhancement of cellular proliferation. METHODS: The dose-response curves for the colony-forming ability of CHO cells in 5% FCS-MEM with 6-125 microg/ml PG and He-Ne laser with an optimum power density of 1.25 mW/cm2 and cumulative doses of 60-600 mJ/cm2 was given for 3 consecutive days. The combined effects of He-Ne laser 180 mJ/cm2 with 6 and 12 microg/ml PG were determined. Quadruplicate cultures were performed. The student's t-test was used to ascertain differences of treated groups from controls. RESULTS: The mean number of colonies (MNC) was increased using 180 mJ/cm2 laser by 13.2% ($p < 0.01$); 6 and 12 microg/ml PG by 19.2% ($p < 0.0025$) and 13.2% ($p = 0.01$); laser + PG 6 microg/ml by 23.2% ($p < 0.001$) and laser + PG 12 microg/ml by 20.5% ($p < 0.001$). An additional significant increase of 8.8% ($p < 0.05$) and an insignificant 6.4% ($p = 0.086$) by laser + PG 6 microg/ml and laser + PG 12 microg/ml were observed, respectively, when compared to the solitary effect of laser. CONCLUSIONS: Results suggest that the He:Ne laser or PG can stimulate CHO cell proliferation and that further stimulation can be achieved by using the He:Ne laser and PG simultaneously. This combination could be useful as a new treatment modality. Growth Substances Animals;CHO Cells;Cricetinae;Cricetulus;Female;Growth Substances;Low-Level Light Therapy

Morphological and atomic analytical studies on enamel and dentin irradiated by an erbium, chromium:YSGG laser. OBJECTIVE: The purposes of this study were to investigate the morphological and atomic analytical changes and to evaluate the cutting effect on dental hard tissues of this laser in vitro. BACKGROUND DATA: There have been few reports on morphological and atomic analytical study of dental hard tissues after erbium,chromium:yttrium,scandium,gallium,garnet (Er,Cr:YSGG) laser irradiation. METHODS: Eighteen extracted human molars were sectioned into 3-mm-thick slices, which were irradiated with water-air spray by an Er,Cr:YSGG laser at 6.0 W and 20 Hz for 5 sec for enamel and 5.0 W and 20 Hz for 5 sec for dentin. The samples were then morphologically observed and examined atomic-analytically. RESULTS: Regular holes having sharp edges and smooth walls, but no melting or carbonization, were observed in both samples. An atomic analytical examination showed that the calcium ratio to phosphorus showed no significant changes between the lased areas and unlased areas ($p > 0.01$). CONCLUSION: These results showed that the Er,Cr:YSGG laser has a good cutting effect on dental hard tissues and offers advantages of no burning or melting after laser irradiation. Dental Enamel;Dentin;Humans;In Vitro Techniques;Low-Level Light Therapy

[Low-intensity laser irradiation in patients with urinary tuberculosis]. Combined surface radiation of renal projection area and intravascular laser radiation of blood (AZOR-2K unit) were used in combined treatment of 54 patients with urinary tuberculosis. Analysis of immunological and hematological indices of peripheral blood of patients before and after the combined treatment showed that low-intensity laser radiation activates local system of T-helpers which after specific antigenic impact differentiate into T-helpers-1. The latter synthesize in loco gamma-interferon, TNF-alpha and beta and IL-2 stimulating bactericidal mechanisms directed at destruction of M. tuberculosis and resolution of the infection focus. Interleukin-2;Tumor Necrosis Factor-

alpha;Interferon-gamma Female;Humans;Interferon-gamma;Interleukin-2;Low-Level Light Therapy;Male;T-Lymphocytes, Helper-Inducer;Tuberculosis, Renal;Tuberculosis, Urogenital;Tumor Necrosis Factor-alpha;Urinary Bladder Diseases

Preventive effect of tooth fracture by pulsed Nd:YAG laser irradiation with diamine silver fluoride solution. OBJECTIVE: The purpose of the present study was to evaluate the preventive effect of pulsed Nd:YAG laser irradiation with 38% diamine silver fluoride [Ag(NH3)2F] solution for the fracture of endodontically treated teeth in vitro. BACKGROUND DATA: There have been no reports on the preventive effect of tooth fracture using Nd:YAG laser with Ag(NH3)2F solution. MATERIALS AND METHODS: Twenty-eight human extracted teeth were used in this study. The teeth were randomly classified into four groups: control group, where tooth surfaces were not submitted to any treatment; group 1, where tooth surfaces were coated with 38% Ag(NH3)2F solution; group 2, where tooth surfaces were coated with Ag(NH3)2F solution and irradiated by pulsed Nd:YAG laser for 2 sec; and group 3, where tooth surfaces were coated with Ag(NH3)2F solution and irradiated by pulsed Nd:YAG laser for 10 sec. After preparation, shear tests were performed and the maximum load for the fracture was measured. Results were analyzed using the Scheffe test, and difference at $p < 0.05$ was considered significant. RESULTS: The failure load for group 2 (mean, 182.5 kg) had the highest mean value and differed significantly from those for the control group (mean, 146.3 kg) and group 1 (mean, 147.1 kg; $p < 0.05$). The failure loads for groups 1 and 3 (mean, 150.0 kg) did not differ significantly from that for the control group ($p > 0.05$). CONCLUSION: The results show that the application of 38% Ag(NH3)2F solution followed by pulsed Nd:YAG laser irradiation for 2 sec is useful for prevention of tooth fracture at endodontically treated teeth. Fluorides, Topical;Quaternary Ammonium Compounds;Silver Compounds;Solutions;Neodymium;silver diamine fluoride Fluorides, Topical;Humans;Low-Level Light Therapy;Molar;Neodymium;Probability;Quaternary Ammonium Compounds;Random Allocation;Reference Values;Sensitivity and Specificity;Silver Compounds;Solutions;Tooth Fractures

Effect of NASA light-emitting diode irradiation on wound healing. OBJECTIVE: The purpose of this study was to assess the effects of hyperbaric oxygen (HBO) and near-infrared light therapy on wound healing. BACKGROUND DATA: Light-emitting diodes (LED), originally developed for NASA plant growth experiments in space show promise for delivering light deep into tissues of the body to promote wound healing and human tissue growth. In this paper, we review and present our new data of LED treatment on cells grown in culture, on ischemic and diabetic wounds in rat models, and on acute and chronic wounds in humans. MATERIALS AND METHODS: In vitro and in vivo (animal and human) studies utilized a variety of LED wavelength, power intensity, and energy density parameters to begin to identify conditions for each biological tissue that are optimal for biostimulation. RESULTS: LED produced in vitro increases of cell growth of 140-200% in mouse-derived fibroblasts, rat-derived osteoblasts, and rat-derived skeletal muscle cells, and increases in growth of 155-171% of normal human epithelial cells. Wound size decreased up to 36% in conjunction with HBO in ischemic rat models. LED produced improvement of greater than 40% in musculoskeletal training injuries in Navy SEAL team members, and decreased wound healing time in crew members aboard a U.S. Naval submarine. LED produced a 47% reduction in pain of children suffering from oral mucositis. CONCLUSION: We believe that the use of NASA LED for light therapy alone, and in conjunction with hyperbaric oxygen, will greatly enhance the natural wound healing process, and more quickly return the patient to a preinjury/illness level of activity. This work is supported and managed through the NASA Marshall Space Flight Center-SBIR Program. Animals;Cells, Cultured;Fibroblasts;Humans;Hyperbaric Oxygenation;Infrared Rays;Low-Level Light Therapy;Mice;Muscle, Skeletal;Osteoblasts;Radiation Dosage;Rats;Reference Values;Sensitivity and

Specificity;Skin;United States;United States National Aeronautics and Space Administration;Wound Healing

Analysis of surface roughness of enamel and dentin after Er,Cr:YSGG laser irradiation. OBJECTIVE: The purpose of this investigation was to compare the surface roughness of enamel and dentin following the Er,Cr:YSGG laser irradiation and acid etching. BACKGROUND DATA: Laser-roughened enamel or dentin surfaces have been expected to enhance restorative materials bond strength. MATERIALS AND METHODS: Er,Cr:YSGG laser irradiation was performed in one half of each polished enamel or dentin sample at 3 W (33.9 J/cm2, with air 70% and water 20%,) pulse energy for 6 sec. Then the other half was treated with 37% phosphoric acid for 30 sec. Surface roughness and morphological studies were performed. RESULTS: It was found that surface roughness was significantly increased with the laser system. Scanning electron microscopy analysis showed that irradiated surface produces a rough surface that was completely lacking of a smear layer; there was also no cracking of enamel or dentin. CONCLUSION: Er,Cr:YSGG laser irradiation could provide an effective and alternative method to the acid etch technique. Acids;Carbon Dioxide;Neodymium;Erbium Acids;Carbon Dioxide;Dental Enamel;Dentin;Erbium;Humans;Low-Level Light Therapy;Materials Testing;Microscopy, Electron;Molar;Neodymium;Sensitivity and Specificity

Low level laser treatment of primary and secondary Raynaud's phenomenon. BACKGROUND: Patients who had been treated with low level laser (LLL) for their digital ulcers reported an impressive improvement of their symptoms of episodic digital ischaemia. Therefore this pilot study was performed to evaluate the efficacy of LLL as a new non-drug non-invasive treatment for patients with primary and secondary Raynaud's phenomenon (RP). PATIENTS AND METHODS: Forty patients (29 female, 11 male, mean age 51 years) with active primary (28%) and secondary (72%) Raynaud's phenomenon received 10 sessions of LLL distant irradiation during winter months. Assessment of subjective and objective parameters was performed at baseline, one week after the last session and three months later. Variations of subjective parameters as number of daily acute episodes and severity of discomfort were assessed by a coloured visual analogue scale. A standardised cold challenge test using computed thermography of continuous temperature recordings by means of infrared telethermography was used to assess the digital blood flow. RESULTS: A significant improvement was noticed clinically and thermographically after 6 weeks and 3 months, respectively ($p < 0.0001$). CONCLUSIONS: These data suggest that LLL treatment has a good short and medium term effectiveness in patients with Raynaud's phenomenon.
Adult;Aged;Female;Fingers;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Raynaud Disease;Regional Blood Flow;Skin Temperature;Treatment Outcome

Chemotherapy- and radiotherapy-induced mucositis in head and neck cancer patients: new trends in pathophysiology, prevention and treatment. Mucositis is the intensity-limiting toxicity in the management of locally advanced non-resectable head and neck cancer with radiotherapy and chemotherapy. New radiation modalities (hyperfractionation and/or acceleration) as well as combined modality regimens in this situation induce higher rates of acute toxicity. Hyperfractionation, for example, allows higher control rates, with few late toxicities, but it slightly increases acute mucositis. The addition of chemotherapy introduces systemic toxicity and can exacerbate local tissue reactions when used concurrently with radiotherapy. Mucositis is recognized as the principal limiting factor to further treatment intensification. As local regional control and overall survival are related to dose-intensity in this case, further research into the assessment, analysis, prevention and treatment of mucosal toxicity is not only crucial to improvement in quality of life, but certainly also to improved rates of disease control. Several topical and systemic treatments are directed to the decrease and the acceptance of this acute toxicity, but few have shown a

significant preventive effect. The efficacy of low-level laser therapy in the management of such toxicity could hence yield important developments with this method in the field of oncology. Antineoplastic Combined Chemotherapy Protocols;Chemotherapy, Adjuvant;Clinical Trials as Topic;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mouth Mucosa;Quality of Life;Radiotherapy, Adjuvant;Risk Factors;Stomatitis
The use of low-power laser irradiation for faster vascularization of tissue transplants. We studied the effect of low-power laser irradiation on vascularization and take of transplanted rabbit renal and pancreatic tissue in athymic nude mice. The mean size of the transplant and the number of blood vessels in it were higher in irradiated mice compared to nonirradiated controls. Moreover, the organ-specific structure of the transplants was preserved in irradiated mice, but not in the control group. These findings suggest that low-power laser irradiation can be used for promotion of vascularization and take of tissue transplants. Animals;Kidney Transplantation;Mice;Mice, Nude;Neovascularization, Physiologic;Pancreas Transplantation;Rabbits;Time Factors
Nonoperative techniques for scar management and revision. Facial plastic surgeons are frequently called upon to manage facial scars, whether iatrogenic or traumatic. Numerous treatment modalities are available for scar management depending upon scar characteristics, age, and patient expectations. The focus of this article is to review commonly used nonsurgical methods of scar revision. These include topical applications (silicone, vitamin E, pressure dressing, herbal extracts), intralesional medication (steroids, antimitotics), soft tissue augmentation (collagen, fat), laser applications (585-nm flashlamp-pumped pulsed dye, CO(2)), cryotherapy, and make-up camouflage. Nonsurgical modalities can be used as prophylactic prevention of adverse scar formation, as definitive treatment, as intervening therapy until further surgical repair can be made, or as adjunctive treatment following surgical scar revision. Adrenal Cortex Hormones;Antineoplastic Agents;Ointments;Silicones Adrenal Cortex Hormones;Antineoplastic Agents;Cicatrix;Cosmetic Techniques;Cryosurgery;Face;Fluid Therapy;Humans;Injections, Intralesional;Low-Level Light Therapy;Ointments;Pressure;Retreatment;Silicones;Tissue Expansion
Design and application of low-frequency ultrasound and its combination with laser radiation in surgery and therapy. Further development of combined laser-ultrasonic medical technologies is presented. An analysis is made of the main effects produced by low-frequency ultrasound on biological tissues. These effects include cavitation, acoustic streamings, acoustic pressure, and mechanical influence. Possible application of low-frequency ultrasound is considered in regard to tumor therapy, bactericidal treatment of infectious tissues, and spray treatment of head and neck wounds. Some limitations of ultrasound application in medicine are discussed, and the feasibility of combining laser radiation with ultrasound is studied. A number of new laser-ultrasonic combinations are put forward and developed. They embrace the combination of photodynamic therapy with ultrasonic tumor therapy (sonophotodynamic therapy), laser-ultrasonic wound treatment (spray treatment), and laser-ultrasonic drug delivery (photophonophoresis). Some of the above-mentioned technologies were tested experimentally, and the results obtained are considered. Combined Modality Therapy;Drug Delivery Systems;Equipment Design;Humans;Infections;Low-Level Light Therapy;Neoplasms;Ultrasonic Therapy;Wounds and Injuries
Laser radiation control in photodynamic therapy of tumors. This article presents the ideology and basic principles of designing diagnostic and therapeutic medical systems for treating malignant tumors by means of photosensitizers. The designed system is based on optoelectronic devices, which realize selective laser tumor destruction during photodynamic therapy. A distinguishing feature of this system is that laser-beam formation is performed in real time. This enables one to follow changes in the tumor shape during the treatment. As a result of this study, a photodynamic technique for

selective phototreatment was developed and tested. Moreover, we detemined light doses for such treatment. Algorithms;Humans;Low-Level Light Therapy;Neoplasms;Radiotherapy Dosage
The irreplaceable image: Amelioration of oral mucosal lesions of acute graft-versus-host disease by low-level laser therapy. Acute Disease;Adult;Fatal Outcome;Graft vs Host Disease;Humans;Laser Therapy;Low-Level Light Therapy;Male;Mouth Diseases;Mouth Mucosa
Stimulation of the growth of human tumor by low-power laser irradiation. We studied the effect of low-power laser on the growth of human gastric adenocarcinoma transplanted to athymic mice. Irradiation shortened the latency of tumor growth in recipients from 4-6 months to 21-24 days. After 17 serial passages on athymic mice, the size of tumor node in irradiated recipients on day 33 after transplantation was 161.1 mm(3) (vs. 10.2 mm(3) in nonirradiated mice). These findings suggest that low-power laser irradiation can stimulate the growth of metastases in patients with a history of malignancy. Adenocarcinoma;Animals;Cell Division;Humans;Lasers;Mice;Mice, Nude;Neoplasm Transplantation;Radiation Dosage;Stomach Neoplasms;Time Factors
Nonablative laser and light rejuvenation: the newest approach to photodamaged skin. Collagen Animals;Collagen;Face;Humans;Laser Therapy;Low-Level Light Therapy;Skin;Skin Aging
Optimal dosing of intravascular low-power red laser light as an adjunct to coronary stent implantation: insights from a porcine coronary stent model. BACKGROUND: It is believed that restenosis following coronary interventions is the result of endothelial denudation that leads to thrombus formation, vascular remodeling, and smooth muscle cell proliferation. Low-power red laser light (LPRLL) irradiation enhances endothelial cell growth in vitro and in vivo, and reduces restenosis in animal models. The present study investigated the optimal dose of intravascular LPRLL therapy in the prevention of in-stent stenosis in a porcine coronary stent model. METHODS AND RESULTS: Selected right coronary artery segments were pretreated with a LPRLL balloon, delivering a dose of 0 mW during 1 min (group 1, n = 10), 50 mW during 1 min (group II, n = 10), or 100 mW during 1 min (group III, n = 10) before stenting. Quantitative coronary analysis of the stented vessel was performed before stenting, immediately after stenting, and at 6 weeks follow-up. The pigs were sacrificed, and histologic and morphometric analyses were conducted. At 6 weeks, minimal luminal stent diameter was significantly narrower in the control group compared to the 50-mW dose group ($p < 0.05$). These results were confirmed by morphometric analysis. Neointimal area was also significantly decreased in the 50-mW dose group. CONCLUSIONS: Intravascular LPRLL contributes to reduction of angiographic in-stent restenosis and neointimal hyperplasia in this animal model. The optimal dose using the LPRLL balloon system seems to be approximately 5 mW delivered during 1 min. Animals;Coronary Restenosis;Dose-Response Relationship, Radiation;Endothelium, Vascular;Low-Level Light Therapy;Models, Animal;Stents;Swine
The effect of He-Ne laser (632.8 nm) and Solcoseryl in vitro. He-Ne laser (632.8 nm) and Solcoseryl (SS), a non-protein calf haemodialysate, were used in the enhancement of wound healing. Nonetheless, a study on the use of He-Ne laser with SS has not been done. The purpose of this study is to determine the effect of He-Ne laser biostimulation in combination with SS on Chinese hamster ovary (CHO) and human skin fibroblast (HSF). A dose response for the cloning efficiency (CE) of CHO and HSF cells in 5% fetal bovine serum in minimum essential medium (FBS-MEM) with 6-125 micrograms/ml SS and He-Ne laser using an optimum power density of 1.25 mW/cm2 and cumulative doses (CD) of 60-600 mJ/cm2 given for three consecutive days, were done. The combined effects of He-Ne laser 180 mJ/cm2 with 6 and 12 micrograms/ml SS were determined. Quadruplicate cultures were done. Student t-test was used to determine differences of treatment groups from controls. CHO and HSF CE were increased using 180 mJ/cm2 laser by 13.1% +/- 4.5% ($p < 0.0025$) and 39.1% +/- 7.9% ($p < 0.0005$); SS 6 micrograms/ml by 14.4% +/- 8.7% ($p = 0.01$) and 20.7% +/- 10.9% ($p = 0.01$); SS 12 micrograms/ml by 17.7% +/- 6.3% ($p = 0.001$) and 23.9% +/- 5.6% ($p < 0.0025$); laser + SS 6

micrograms/ml by 15.1% +/- 8.8% ($p < 0.01$) and 60.9% +/- 9.4% ($p < 0.0001$); laser + SS 12 micrograms/ml by 23.0% +/- 1.5% ($p < 0.0001$) and 70.7% +/- 11.4% ($p < 0.0001$), respectively. Additional significant increases in CE were observed on CHO using laser + SS 12 micrograms/ml by 8.6% +/- 1.3% ($p < 0.025$) and on HSF using laser + SS 6 micrograms/ml and laser + SS 12 micrograms/ml by 15.6% +/- 6.8% ($p < 0.025$) and 22.7% +/- 10.6% ($p = 0.01$), respectively, when compared to the effect of 180 mJ/cm2 laser. Results suggest that further stimulation can be achieved by using He-Ne laser with SS. This could be exploited as a new treatment modality.
Helium;Actihaemyl;Neon Actihaemyl;Animals;CHO Cells;Cricetinae;Fibroblasts;Helium;Humans;Low-Level Light Therapy;Neon;Wound Healing

[New generation laser technology and author's patented methods for treatment of oral and dental diseases]. Equipment Design;Humans;Low-Level Light Therapy;Stomatognathic Diseases

Assessment of anti-inflammatory effect of 830nm laser light using C-reactive protein levels. The anti-inflammatory effect of non-surgical lasers has been proposed previously, however it was not scientifically proven. One method to assess levels of inflammation is the measurement of C-reactive protein (CRP), which is increased with the course of inflammation. The aim of this study was to assess the effect of 830 nm laser irradiation after the removal of impacted third molars using the CRP as the marker of inflammation. Twelve patients were irradiated with 4.8 J of laser light per session 24 and 48 h after surgery. A control group (N = 12) was treated with a sham laser. Blood samples were taken prior to, and 48 and 72 h after surgery. CRP values were more symmetric and better distributed for the irradiated group (0.320 mg/dl) than for the control (0.862.mg/dl) 48 h after surgery, however there was no statistically significant difference. After 72 h, both groups had statistically similar CRP levels (0.272 and 0.608 mg/dl), because of the normal tendency of decreasing CRP levels.
Biomarkers;C-Reactive Protein Adolescent;Adult;Biomarkers;C-Reactive Protein;Humans;Inflammation;Low-Level Light Therapy;Molar, Third;Statistics, Nonparametric;Tooth Extraction

Heat shock protein hyperexpression on chorioretinal layers after transpupillary thermotherapy. PURPOSE: To assess a biological effect induced by temperature elevation during transpupillary thermotherapy (TTT). METHODS: Six pigmented rabbits were anesthetized, and TTT was performed on the right eye using an 810-nm diode laser installed on a slit lamp (spot size, 1.3 mm; duration, 60 seconds; power, 92-150 mW). A series of laser pulses were aimed at the posterior pole of the retina. The left eyes were used as the control. Twenty-four hours after laser irradiation, a histologic study was performed on the chorioretinal layers. Tissue samples were fixed in formalin and embedded in paraffin. A monoclonal antibody was used to detect heat shock protein (Hsp)70 immunoreactivity, followed by a biotinylated goat anti-mouse antibody, revealed by the avidin-biotin complex and the 3-amino-9-ethyl-carbazole (AEC) chromogen. Retinal structures were further identified by hematoxylin erythrosin saffron (HES) coloration. RESULTS: The photocoagulation threshold was found to be at the 150-mW laser power. Under this threshold, Hsp70 immunostaining was the strongest at the 127-mW power, with staining of some choroidal cells, including capillary endothelial cells. No Hsp70 immunoreactivity was observed on the retina. At the 107-mW power, Hsp70 reactivity was observed only in occasional choroidal cells. At the 98-mW power, only mild, diffuse Hsp70 immunoreactivity was observed in the choroid. At the 92-mW power, as in nonirradiated eyes, no Hsp70 immunoreactivity was detected. CONCLUSIONS: Subthreshold transpupillary 810-nm laser irradiation induces choroidal Hsp hyperexpression. This confirms that choroidal Hsp hyperexpression can be induced during TTT, as has been recently hypothesized by several investigators.
Biomarkers;HSP70 Heat-Shock Proteins Animals;Biomarkers;Choroid;HSP70 Heat-Shock

Proteins;Hyperthermia, Induced;Immunoenzyme Techniques;Low-Level Light Therapy;Male;Pupil;Rabbits;Retina
Treatment of vascular lesions with combined dynamic precooling, postcooling thermal quenching, and ND:YAG 1,064-nm laser. The purpose of this study is to evaluate the effectiveness and safety of the newly developed neodymium:yttrium-aluminum-garnet (Nd:YAG) 1,064-nm laser system for nonablative laser treatment of vascular lesions in Asians. Five patients with vascular lesions in the periorbital area received serial treatments. The fluences were set between 80 and 90 J/cm(2). The patients were followed for 6 months. Improvements were noted in all patients. Transient erythema and swelling were noted in all patients during the postoperative period. Transient purpura occurred in one patient. The Nd:YAG 1,064-nm laser system, when coupled with dynamic precooling and postcooling thermal quenching, is effective and safe in treating periorbital vascular lesions even when multiple treatments are performed. No significant adverse effects were noted in this study. Aerosols Adolescent;Adult;Aerosols;Facial Dermatoses;Female;Hemangioma, Capillary;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Skin Diseases, Vascular;Skin Temperature;Telangiectasis
Peri-implant care of ailing implants with the carbon dioxide laser. One of the many applications for which lasers have been proposed in implant dentistry is for the decontamination process. The purposes of this study were to assess possible alterations in titanium implants in vitro and in vivo by use of the carbon dioxide (CO_2) laser and to determine whether new bone formation can occur on previously contaminated implants. In vitro, temperature changes at the bone-titanium implant interface were recorded during use of a CO_2 laser-scanning system (Swiftlase). Additionally, the effects of laser irradiation on titanium implants at various power settings were examined. In 6 beagle dogs, a total of 60 implants and bony defects resulting from plaque accumulation were treated by air-powder abrasive (the conventional treatment), laser irradiation, or both. Depending on the parameters chosen, melting and other surface alterations were seen in vitro, especially in the superpulse mode. Otherwise, no alterations were found, even at high power settings in the continuous mode. In vivo, corresponding histologic examination of 4-month sections showed evidence of new direct bone-to-implant contact after laser-assisted therapy, especially when the implants had been treated concomitantly with submerged membranes. These results support the hypothesis that peri-implant defects can be treated successfully by laser decontamination without damaging the surrounding tissues in the dog model. Nevertheless, further investigations will be required to determine the clinical efficacy of the treatment. Coated Materials, Biocompatible;Dental Implants;Membranes, Artificial;Dental Porcelain;Carbon Dioxide;Frialit;Titanium;Aluminum Oxide Aluminum Oxide;Alveolar Bone Loss;Animals;Body Temperature;Carbon Dioxide;Coated Materials, Biocompatible;Dental Implants;Dental Plaque;Dental Porcelain;Dental Prophylaxis;Disease Models, Animal;Dogs;Female;Low-Level Light Therapy;Mandible;Membranes, Artificial;Microscopy, Electron, Scanning;Osteogenesis;Periodontal Diseases;Radiotherapy Dosage;Statistics as Topic;Surface Properties;Titanium;Treatment Outcome
Study says laser decreases surface cavities. Dental Caries;Dental Enamel;Dental Enamel Solubility;Humans;Low-Level Light Therapy
[Intensity of lipid peroxidation and concentration of free radicals in quail liver exposed to low-intensity laser irradiation to the embryo]. The influence of low level red laser irradiation of Quails japanese embryos on lipid peroxidation level and free radicals concentration in the liver of young quails was estimated. It is detected that irradiation of the embryos in the dose of 15 mJ leads to the significant increase of peroxide lipid level and free radicals contents in the liver of one-day quails. In the liver of three-weeks quails an expressed antioxidant effect of red laser light irradiation of embryos is detected. The decrease of lipid peroxidation products and synthesis of ceruloplasmin in

the liver of experimental group poultry confirm it. These changes are accompanied with cytochrome P-450 level increase and don't lead to inhibition of energetic system. Free Radicals;Cytochrome P-450 Enzyme System Animals;Coturnix;Cytochrome P-450 Enzyme System;Dose-Response Relationship, Radiation;Embryo, Nonmammalian;Free Radicals;Lasers;Lipid Peroxidation;Liver

[Regulatory role of low-intensity laser radiation on the status of the antioxidant system]. On the base of modern literary data it is shown that low level laser red radiation can render the manifested effect on the activity of main antioxidant enzymes. It is determined that the main enzymes of antioxidant system--superoxide dismutase, catalase, ceruloplasmine--absorb in the red part of spectrum and are capable to be reactive under some regimes of red low level laser irradiation. It is one of the main possible mechanisms of biological efficiency of low level red laser radiation of the red part of spectrum. Antioxidants;Catalase;Superoxide Dismutase;Ceruloplasmin Antioxidants;Catalase;Ceruloplasmin;Lasers;Superoxide Dismutase

Impact of low level laser irradiation on infarct size in the rat following myocardial infarction. Low energy level irradiation (LLLI) has been found to modulate biological processes. The effect of LLLI on the development of acute myocardial infarction (MI) was investigated following chronic ligation of the left anterior descending (LAD) coronary artery in laboratory rats. The hearts of 22 rats were laser irradiated (LI) using a diode laser (804 nm, 38 mW power output) through the intercostal muscles in the chest following MI and on day 3 post MI. In the control non laser irradiated (NLI) group (19 rats) MI was induced experimentally and laser irradiation was not applied. All rats were sacrificed 21 days post MI. Size, thickness and relative circumferential length of the infarct, as well as other parameters, were determined from histological sections stained with Masson's trichrome and hearts stained with triphenyl tetrazolium chloride (TTC) using histomorphometric methods. The infarct size (expressed as percent of total left ventricle area) of the LI rats was 10.1+/-5.8, which was significantly lower (65%; $P<0.01$) than the infarct size of NLI rats which was 28.7+/-9.6. Correlatively, the ratio of circumferential length of the infarcted area was significantly lower (2-fold; $P<0.01$) in the LI rats as compared to the NLI rats. LLLI of the infarcted area in the myocardium of experimentally induced MI rats, at the correct energy, duration and timing, markedly reduces the loss of myocardial tissue. This phenomenon may have an important beneficial effect on patients after acute MI or ischemic heart disease. Animals;Coronary Vessels;Ligation;Low-Level Light Therapy;Male;Myocardial Infarction;Rats;Rats, Sprague-Dawley

Low-level laser therapy for wound healing: feasibility of wound dressing transillumination. OBJECTIVE: The purpose of this study was to assess the feasibility of exposing wounds during low-level laser therapy (LLLT) by transillumination of the wound dressings. BACKGROUND DATA: LLLT has been associated with accelerated wound healing in chronic ulcers. The usual approach is to remove wound dressings prior to exposure and to treat three to five times weekly. Frequent change of wound dressings is time consuming and costly; it disrupts the healing process, increases the risk of wound infection, and may be traumatic for the patient. METHODS: A double integrating sphere setup was employed to quantify the diffuse transmittance and reflectance of various wound dressings. Differences in transmittance for large area sources and point sources were demonstrated through the use of a diode laser and an incoherent light source. RESULTS: There were a number of gels and membrane style wound dressings with diffuse transmittance of more than 50%. Hence, for these dressings the prescribed radiant exposure to the wound surface could be achieved by increasing the exposure duration, while maintaining reasonable overall treatment times. CONCLUSIONS: Although LLLT by transillumination of wound dressings is feasible for a variety of wound dressings without significant commitments in additional treatment time, the specific transmission of products not included in this study needs to be determined at the intended treatment wavelength. A transillumination approach may facilitate a faster rate of wound healing than LLLT applied to exposed

wounds by reducing trauma and the risk of infection. Absorption;Feasibility Studies;Humans;Laser Therapy;Occlusive Dressings;Scattering, Radiation;Transillumination;Wound Healing

Low-level laser therapy after molar extraction. OBJECTIVE: The aim of the study was to evaluate effect of the different frequencies of low-level laser radiation (diode 670 nm and Helium-Neon 632.8 nm) on the healing process after human molar extractions. Frequencies of 5 Hz, 292 Hz, and 9,000 Hz were used in experiments. Monitoring of secretory IgA and albumin level in saliva and changes in bone density were used as objective markers of biostimulatory effect. SUMMARY BACKGROUND DATA: From the literature, it is known that if the alveolus is irradiated after extraction along with the lingual and buccal bony wall, faster coagulation, less postoperative discomfort, and quicker healing can be expected. METHODS: Subjective evaluation of therapy was observed using a scale (from -, negative therapeutic effect, to ++++, excellent treatment effect). Changes of secretory immunoglobulin A (sIgA), albumin levels, and bone density were compared in a group of 150 patients (nonlaser therapy, 30 patients). RESULTS: Differences in levels of the saliva markers (sIgA and albumin) were found to be significant when comparing irradiated and nonirradiated groups, and in comparison with those groups irradiated by various modulatory frequencies. Significant differences were observed between the increase of sIgA res. albumin and subjective feelings during treatment. Bone density after extraction and 6 months after surgical treatment was examined using dental digital radiovisiography. No significant differences were detected between bone density in irradiated and nonirradiated groups, perhaps due to our therapy protocol. CONCLUSIONS: The low-level laser has no influence on the process of osseointegration. This effect was observed on fracture healing in rats using He-Ne laser radiation. We found no differences in the bone density when compared to the control group. Albumins;Immunoglobulin A, Secretory Adolescent;Adult;Aged;Albumins;Bone Density;Humans;Immunoglobulin A, Secretory;Laser Therapy;Middle Aged;Molar;Postoperative Period;Saliva;Tooth Extraction;Wound Healing

Low-power laser irradiation increases cyclic GMP synthesis in penile smooth muscle cells in vitro. OBJECTIVE: The objective of the present study was to determine the effect of low-power laser irradiation (LPLI) on cyclic guanosine monophosphate (cGMP) produced by human corpus cavernosum smooth muscle cells (HCC SMC) in vitro. BACKGROUND DATA: Numerous reports suggest that LPLI is capable of affecting cellular processes in the absence of significant thermal effect METHODS: HCC SMC cultures were irradiated with single-dose LPLI using a He-Ne continuous wave laser (632 nm) with different energy densities (0.52-2.1 J/cm2). Assessment of effect on cell viability was performed utilizing Alamar Blue assay. Effect of LPLI on cGMP production was studied by radioimmunoassay. RESULTS: We observed that: (1) LPLI of HCC SMC results in a statistically significant increase of cGMP synthesis in culture and is dose dependent (maximal effect was observed with LPLI irradiance of 1.57 J/cm2. (2) There were no changes in Normalized Viability Index (NVI) immediately after and 24 h following laser irradiation. CONCLUSION: Our studies demonstrate that LPLI irradiation stimulates elevation of cGMP in vitro. Cyclic GMP Adult;Cells, Cultured;Cyclic GMP;Dose-Response Relationship, Radiation;Humans;Lasers;Male;Muscle, Smooth;Penis

Low power diode laser treatment using indocyanine green for eradication of esophageal varices. BACKGROUND AND STUDY AIMS: Endoscopic variceal ligation (EVL) is an alternative to sclerotherapy for the treatment of esophageal varices, but is associated with higher rates of recurrence and subsequent bleeding than sclerotherapy. To prevent recurrence of varices after EVL, we have developed a low-dose diode laser therapy combined with the injection of indocyanine green, which allows enhanced tissue absorption of the laser beam selectively around varices. In this study we investigated the efficacy and safety of this technique. PATIENTS AND METHODS: Eight patients with

F2 or F3 esophageal varices were enrolled. At 1 week after EVL, indocyanine green solution (1 mg/ml) was injected submucosally around the remaining varices. A diode laser (power 10 watts) was applied to the surface from the esophagogastric junction to 5 cm above it. The spot size was kept to 5 mm in diameter. RESULTS: Laser irradiation was performed safely, without bleeding from the varices, or perforation. There were no major complications. Endoscopy 1 month later showed F0 forms in seven patients, F1 in one patient, and no red color sign in any patient. No recurrence of varices has been observed in any of the patients during the follow-up period of at least 12 months. CONCLUSION: This technique may provide a simple, safe and effective procedure, as an additional treatment to EVL, for the prevention of recurrence of esophageal varices. Coloring Agents;Indocyanine Green Adult;Coloring Agents;Esophageal and Gastric Varices;Female;Humans;Indocyanine Green;Low-Level Light Therapy;Male;Middle Aged

Light-emitting diode treatment reverses the effect of TTX on cytochrome oxidase in neurons. Light close to and in the near-infrared range has documented benefits for promoting wound healing in human and animals. However, mechanisms of its action on cells are poorly understood. We hypothesized that light treatment with a light-emitting diode array at 670 nm (LED) is therapeutic in stimulating cellular events involving increases in cytochrome oxidase activity. LED was administered to cultured primary neurons whose voltage-dependent sodium channels were blocked by tetrodotoxin. The down-regulation of cytochrome oxidase activity by TTX was reverted to control levels by LED. LED alone also up-regulated enzyme activity. Thus, the results are consistent with our hypothesis that LED has a stimulating effect on cytochrome oxidase in neurons, even when they have been functionally silenced by TTX. Sodium Channel Blockers;Sodium Channels;Tetrodotoxin;Electron Transport Complex IV Aging;Animals;Animals, Newborn;Cells, Cultured;Dose-Response Relationship, Drug;Down-Regulation;Electron Transport Complex IV;Infrared Rays;Nerve Degeneration;Neurons;Photic Stimulation;Rats;Sodium Channel Blockers;Sodium Channels;Tetrodotoxin;Visual Cortex;Wound Healing

[Laser correction of dysregulations of involutionary genesis in females and males aged 40-60 years]. Adult;Aging;Endocrine System Diseases;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

[The efficiency of low-intensity laser radiation in the treatment of arterial hypertension complicated by ischemic heart disease]. The efficiency of low-intensity laser radiation (LILR) was studied in the treatment of 291 patients with arterial hypertension and ischemic heart disease. Clinical grounds are given for use of LILR red and infrared rays in rehabilitation of hypertensive patients with ischemia. The rehabilitation regimens can be differentiated according to the disease severity, type of hemodynamics, state of cerebral circulation. Adult;Aged;Blood Pressure;Female;Humans;Hypertension;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia

Comparison of the low level laser therapy effects on cultured human gingival fibroblasts proliferation using different irradiance and same fluence. BACKGROUND AND OBJECTIVE: The low level laser therapy (LLLT) has been used in Dentistry to improve wound healing. In order to analyse the effect of LLLT on the in vitro proliferation of gingival fibroblasts we developed a primary culture of human gingival fibroblasts. STUDY DESIGN/MATERIALS AND METHODS: The cell line named LMF was grown in Dulbecco's Modified Eagle's medium (DME) with either 5% (nutritional deficit) or 10% fetal bovine serum (fbs). Laser irradiation was carried out with diode lasers with the following wavelengths: 670 nm (L1), 780 nm (L2), 692 nm (L3), and 786 nm (L4). The fluence was fixed in 2 J/cm(2). For growth analysis, control (not irradiated) and treated cultures (irradiated) were plated in 60 mm diameter culture dishes for 12 h before the irradiation. RESULTS: We found that cells cultured in nutritional deficit condition grown in medium supplemented by only 5% fbs presented a cell proliferation rate significantly smaller that cell grown in ideal culture conditions (10% fbs). However, when irradiated,

cells in nutritional deficit presented cell growth similar or higher than that of control cells grown in ideal culture conditions. Using the same fluence, the infrared laser induced a higher cell proliferation than visible laser when the power outputs were different. However, lasers of equal power output presented similar effect on cell growth independently of their wavelengths. CONCLUSIONS: The LLLT acts by improving the in vitro fibroblast proliferation and a smaller laser exposure time results in higher proliferation. Animals;Cattle;Cell Division;Cells, Cultured;Fibroblasts;Gingiva;Humans;In Vitro Techniques;Laser Therapy

Signal transduction pathways involved in low intensity He-Ne laser-induced respiratory burst in bovine neutrophils: a potential mechanism of low intensity laser biostimulation. BACKGROUND AND OBJECTIVE: Low intensity He-Ne laser irradiation has been reported to induce respiratory burst of neutrophils for a long time, but the mechanism remains obscure. We speculated that it is mediated by some signal transduction pathways. STUDY DESIGN/MATERIALS AND METHODS: The protein tyrosine kinases (PTKs) inhibitor, genistein, the phospholipase C (PLC) inhibitor, U-73122, and the protein kinase C (PKC) inhibitor, calphostin C, were used to probe signal transduction pathways of respiratory burst of bovine neutrophils which were induced by He-Ne laser at a dose of 300 J/m(2), respectively. RESULTS: The inhibitor of PTKs can completely inhibit the He-Ne laser-induced respiratory burst of neutrophils. PLC and PKC inhibitors can obviously reduce it, but not fully inhibit it. CONCLUSION: These results suggest that PTKs play a key role in the He-Ne laser-induced respiratory burst of neutrophils and [PTK-PLC-PKC-NADPH oxidase] signal transduction pathways may be involved in this process. Animals;Cattle;Lasers;Neutrophils;Respiratory Burst;Signal Transduction

Does low intensity laser irradiation really cause cell damage? Animals;Lasers;Mice;Skin;Thrombosis

The effects of low level laser irradiation on osteoblastic cells. Low level laser therapy has been used in treating many conditions with reports of multiple clinical effects including promotion of healing of both hard and soft tissue lesions. Low level laser therapy as a treatment modality remains controversial, however. The effects of wavelength, beam type, energy output, energy level, energy intensity, and exposure regime of low level laser therapy remain unexplained. Moreover, no specific therapeutic window for dosimetry and mechanism of action has been determined at the level of individual cell types. The aim of this study was to investigate the effects of low level laser irradiation on the human osteosarcoma cell line, SAOS-2. The cells were irradiated as a single or daily dose for up to 10 days with a GaAlAs continuous wave diode laser (830 nm, net output of 90 mW, energy levels of 0.3, 0.5, 1, 2, and 4 Joules). Cell viability was not affected by laser irradiation, with the viability being greater than 90% for all experimental groups. Cellular proliferation or activation was not found to be significantly affected by any of the energy levels and varying exposure regimes investigated. Low level laser irradiation did result in a heat shock response at an energy level of 2 J. No significant early or late effects of laser irradiation on protein expression and alkaline phosphatase activity were found. Investigation of intracellular calcium concentration revealed a tendency of a transient positive change after irradiation. Low level laser irradiation was unable to stimulate the osteosarcoma cells utilised for this research at a gross cell population level. The heat shock response and increased intracellular calcium indicate that the cells do respond to low level laser irradiation. Further research is required, utilising different cell and animal models, to more specifically determine the effects of low level laser irradiation at a cellular level. These effects should be more thoroughly investigated before low level laser therapy can be considered as a potential accelerator stimulus for orthodontic tooth movement.

[Supravascular laser exposure in combined modality treatment of patients with arteriosclerosis obliterans of blood vessels of lower extremities]. The efficiency of supravascular laser exposure in multiple-modality treatment of patients with atherosclerosis obliterans with distal vascular lesions is demonstrated and the method of noninvasive laser exposure of the lower limbs is validated.

Difficulties in the treatment of this category of patients prompted supplementing traditional therapy by supravascular laser exposure in 32 patients. No laser therapy was used in the controls. Arteriosclerosis Obliterans;Combined Modality Therapy;Humans;Leg;Low-Level Light Therapy;Regional Blood Flow

[Incoherent infrared therapy in the treatment of jaw inflammation diseases]. Alveolar Process;Humans;Infrared Rays;Jaw Diseases;Low-Level Light Therapy;Periostitis

[Laser therapy of elderly patients with pneumonia]. The aim of the study was to evaluate the efficiency of laser therapy included into the treatment of pneumonia in the elderly. A follow-up included the analysis of their clinical status and external respiratory function, pulmonary blood flow, and immunological parameters in 2 matched groups of pneumonia patients aged 60 to 72 years. Low-intensity laser therapy (transcutaneous sliding contact procedure) was used as part of routine treatment in one of the groups. The findings demonstrate that non-drug treatment had an undeniably positive impact. There was an earlier regress of clinical symptoms and a sound recovery of functional parameters. In the absence of side effects of this method, these data allow infrared laser therapy to be recommended for rehabilitation of elderly patients with pneumonia. Aged;Humans;Low-Level Light Therapy;Middle Aged;Pneumonia

Healing of bone fractures of rat shin and some immunological indices during magnetic laser therapy and osteosynthesis by the ilizarov method. The effect of magnetic and laser therapy on healing of bone fractures and blood levels of T and B lymphocytes was studied in rats during osteosynthesis by the Ilizarov method. Laser therapy induced changes in cells attesting to stimulation of reparative processes and normalization of immunological parameters. Animals;Femoral Fractures;Fracture Fixation, Internal;Fracture Healing;Low-Level Light Therapy;Magnetics;Rats;Rats, Wistar

[Metrological software of laser medical equipment]. The paper considers the laser medical equipment situation that has established in Russia and that is characterized by the wide medical application of laser technologies and appropriate software and by inadequate development and imperfection of required metrological software and maintenance of laser equipment. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Software;Weights and Measures

[Prevention of inflammatory complications after mandibular osteosynthesis by a combination of low-frequency ultrasound and laser exposure]. Clinical and laboratory study of the efficiency of separate and combined use of low-frequency ultrasound and laser exposure of the operative wound for prevention of pyoinflammatory complications during mandibular osteosynthesis was carried out. Clinical parameters of wound reparation in the course of healing and microbiological and cytological findings in various methods of treatment are presented. The results evidence a high efficiency of these physical methods, particularly of their combination. Combined Modality Therapy;Humans;Inflammation;Low-Level Light Therapy;Mandibular Injuries;Surgical Wound Infection;Treatment Outcome;Ultrasonic Therapy

Conservative closure of antro-oral communication stimulated with laser light. OBJECTIVE: To evaluate application of laser biostimulation in the treatment of antro-oral communications. BACKGROUND DATA: Sixty-one patients between the ages of 14 and 58 were subjected to biostimulation with laser light. Therapy was performed with a CTL 1106 biostimulative laser of 30 mW power with a tip-emitting light of 830-nm wavelength. METHODS: Three cycles of laser irradiation were performed in a continuous mode. During one cycle, 3.5 min of extraoral irradiation of 4J with the contact "sweeping" method or the "woodpecker technique" was made through the facial skin to the suborbital region, 3.5 min of intraoral irradiation of 4J with the contact "point" method to the region of maxillary sinus floor, and 3.5 min of intraoral one of 4J with the contact "point" method to the alveolar process at the site of the antro-oral communication. The above cycle of irradiation was

repeated for 4 days. RESULTS: After 4 days of laser therapy, a complete closure of antro-oral communication occurred. CONCLUSION: Laser therapy can be recommended as an effective method of treatment in this type of complication following tooth extraction.
Adolescent;Adult;Female;Humans;Laser Therapy;Male;Middle Aged;Oroantral Fistula;Tooth Extraction

[Low-energy laser therapy in combined treatment of of patients with urinary tuberculosis]. 62 patients received polychemotherapy for tuberculosis of the kidney (control group) and 88 patients with the same diagnosis received the same polychemotherapy plus local laser therapy (study group). Efficiency of the treatment in the control group was 40.4 +/- 6.3%, in the study group--76.5 +/- 4.7%. Thus, the effect in the group with laser radiation was by 36.1% higher than in the controls. Indices of urinalysis, bacterial discharge and intoxication to the end of the hospital stay differed significantly ($p < 0.05$). Combined Modality Therapy;Humans;Laser Therapy;Tuberculosis, Urogenital

[Reaction of peripheric immune organ on action of low-energy red spectrum lasers]. Influence of low-energy laser irradiation of red diapason on the popliteal lymph nodes (LN) structure of sexually matured white rats depending on the given locally irradiation dose, using light conductor of laser apparatus ALOK-1, was investigated. In the irradiated LN the regular dose-dependent quantitative and qualitative changes in parenchyma were observed. In contralateral LN the same, but less pronounced, changes were observed, witnessing about systemic character of peripheral immune organs reactions on the laser irradiation influence. During irradiation in 0.3 and 3 J/cm2 doses the activation of processes in the LN parenchyma, and in 30 J/cm2 dose the destruction processes of LN were observed. Animals;Disease Models, Animal;Laser Therapy;Lymph Nodes;Lymphocytes;Male;Necrosis;Rats

Inhibition of interleukin-1beta production and gene expression in human gingival fibroblasts by low-energy laser irradiation. Human gingival fibroblast (hGF) cells reside in gingival tissues which are challenged frequently by oral bacteria. Lipopolysaccharide (LPS) from periodontal pathogens can penetrate gingival tissues and stimulate the production of interleukin-1beta (IL-1beta), which has been implicated in inflammation and bone resorption. The anti-inflammatory effects of low-energy laser irradiation have been reported, but the mechanisms of this biostimulatory effect have not been fully elucidated. Primary cultured hGF cells were challenged with LPS isolated from Campylobacter rectus, a known periodontal disease-associated pathogen, and irradiated by a Ga-Al-As diode low-energy laser (830 nm, 3.95-7.90 J/cm2). The hGF cells cultured medium showed a marked elevation of IL-1beta production by LPS, which was significantly inhibited by laser irradiation in a dose-dependent manner. By reverse transcription-polymerase chain reaction (RT-PCR) analysis, this inhibitory effect was involved in the reduction of IL-1beta mRNA levels but not that of the IL-1beta converting enzyme.
Interleukin-1;Lipopolysaccharides;RNA Adolescent;Analysis of Variance;Cells, Cultured;Child;Dose-Response Relationship, Radiation;Female;Fibroblasts;Gene Expression;Gingiva;Humans;Interleukin-1;Lasers;Lipopolysaccharides;Male;RNA;Reverse Transcriptase Polymerase Chain Reaction

Stimulation of MCM3 gene expression in osteoblast by low level laser irradiation. Biostimulatory effect of cell proliferation and bone formation by laser irradiation has been reported, however, very little is known about the molecular basis of mechanisms. We previously constructed the cDNA library of mouse osteoblastic cells (MC3T3-E1) which enhanced gene expression by laser irradiation using a subtracted gene cloning procedure. In the present study, we focused on a gene clone, designated as MCL-140, which exhibited the high homology of DNA sequence with mouse minichromosome maintenance (MCM) 3 gene. MCM3 is involved in the initiation of DNA replication as licensing factor in eukaryotic cells. Nucleotide sequence of MCL-140 insert was determined and assessed in the nucleic acid databases. The transcription level of MCL-140 was examined by Northern blot analysis.

The DNA sequences of clone MCL-140 insert exhibited 96.2% homology with MCM 3 gene coding P1 protein. Higher MCM3 mRNA levels were observed in laser-irradiated cells compared to the levels in non-irradiated cells: furthermore, radiolabelled thymidine incorporation was increased by laser irradiation. These findings suggest that low-level laser irradiation may enhance DNA replication and play a role in stimulating proliferation of osteoblast through the enhancement of the MCM3 gene expression. Cell Cycle Proteins;DNA-Binding Proteins;Mcm3 protein, mouse;Nuclear Proteins;DNA;Minichromosome Maintenance Complex Component 3 Animals;Blotting, Northern;Bone Regeneration;Cell Cycle Proteins;Cell Division;Cells, Cultured;Clone Cells;DNA;DNA-Binding Proteins;Dose-Response Relationship, Radiation;Gene Expression;Laser Therapy;Mice;Minichromosome Maintenance Complex Component 3;Nuclear Proteins;Osteoblasts;Sequence Homology

Unusual primary lung neoplasms. Bronchial carcinoids and hamartomas are, respectively, the most common malignant and benign unusual primary lung neoplasms. These tumors are often asymptomatic but can cause central airway obstruction. Helical computed tomographic and radionuclide scintigraphic advances in their detection and evolution, together with newer interventional bronchoscopy techniques such as neodymium:yttrium-aluminum-garnet laser phototherapy and cryotherapy, represent important improvements in the diagnosis and management of patients with such tumors. Female;Humans;Lung Neoplasms;Male

Low-power holmium laser for the management of urinary tract calculi, structures, and tumors. BACKGROUND AND PURPOSE: Introduction of the holmium laser has provided an indispensable tool for the management of urinary tract stones, strictures, and superficial urothelial tumors. While full-power holmium lasers are required for laser resection of the prostate, lower-power devices can be utilized for all cases of stone fragmentation and stricture incision and most cases of superficial urothelial tumors. Herein, we report our initial experience in utilizing a low-power holmium laser in our endourologic practice. PATIENTS AND METHODS: Over a 6-month period, we have utilized both low-power (25 W) and full-power (80 W) holmium lasers to fragment urinary tract stones, incise ureteral or urethral strictures, and ablate superficial urothelial tumors. A series of 80 consecutive patients were assessed prospectively. Laser fibers with a diameter of 200 microm and 365 microm were employed with power settings of 6.4 to 10 W. Laser fiber size and power settings were similar for the low- and full-power devices. RESULTS: Overall, 95% of the stones were completely fragmented, with a stone-free rate at 3 months of 92%. All strictures were incised, with a 91% patency rate at 3 months. Complete tumor ablation was attained in 70%, with a tumor-free rate of 60% at 3 months. Results were equivalent for the low- and full-power lasers. The 200-microm laser fiber allowed adequate access throughout the upper urinary tract during flexible ureteroscopy and flexible nephroscopy. The 365-microm laser fiber was employed via rigid and semirigid endoscopes. CONCLUSIONS: A low-power holmium laser supplies adequate fragmentation and incision power for virtually all endourologic cases. It also provides ablative power in most situations. The only current urologic application that cannot be performed with the low-power device is laser prostatic resection, which requires 60 to 80 W of power. The reduced-power holmium laser should be considered as a low-cost alternative for the management of urinary tract stones, strictures, and urothelial tumors, especially in centers where laser prostatic resection is not performed. Holmium Adult;Aged;Aged, 80 and over;Female;Holmium;Humans;Lithotripsy, Laser;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Urethral Stricture;Urinary Calculi;Urologic Neoplasms

The clinical efficacy of low-power laser therapy on pain and function in cervical osteoarthritis. Pain is a major symptom in cervical osteoarthritis (COA). Low-power laser (LPL) therapy has been claimed to reduce pain in musculoskeletal pathologies, but there have been concerns about this point. The aim of this study was to evaluate the analgesic efficacy of LPL therapy and related

functional changes in COA. Sixty patients between 20 and 65 years of age with clinically and radiologically diagnosed COA were included in the study. They were randomised into two equal groups according to the therapies applied, either with LPL or placebo laser. Patients in each group were investigated blindly in terms of pain and pain-related physical findings, such as increased paravertebral muscle spasm, loss of lordosis and range of neck motion restriction before and after therapy. Functional improvements were also evaluated. Pain, paravertebral muscle spasm, lordosis angle, the range of neck motion and function were observed to improve significantly in the LPL group, but no improvement was found in the placebo group. LPL seems to be successful in relieving pain and improving function in osteoarthritic diseases. Adult;Analgesia;Female;Humans;Laser Therapy;Male;Middle Aged;Neck;Neck Pain;Osteoarthritis;Range of Motion, Articular

Low intensity laser therapy (830nm) in the management of minor postsurgical wounds: a controlled clinical study. BACKGROUND AND OBJECTIVE: The stimulatory effects of low intensity laser therapy (LILT) have been widely published for the treatment of chronic ulceration. In contrast to this previous work, the current study investigated its potential efficacy (by using a dosage of 9 J/cm2) in the management of acute wounds. For this purpose, uncomplicated postoperative wounds after minor podiatric surgery were examined. STUDY DESIGN/MATERIALS AND METHODS: The study was designed as a controlled group study. Ethical approval was granted by the University of Ulster's Research Ethics Committee. Patients (n = 9) presenting with a total of 12 wounds after minor surgical procedures (partial/total nail avulsions/electrosurgery) were recruited from the Podiatry Teaching Clinic, Northern Ireland. Patients attended the clinic once per week for assessment and treatment. Weekly irradiation was performed by using a CBM Master 3 (CB Medico, Copenhagen, Denmark) diode laser (GaAlAs). The physical parameters of the output of this unit were as follows: wavelength, 830 nm; average power output, 30 mW; spot size, 0.1 cm2; irradiance, 300 mW/cm2; continuous wave output. Wound assessment and recording of pain levels were conducted weekly. Wound measurement was completed by using planimetry and digitising methods. RESULTS: Current findings indicated no statistically significant differences between Laser and Control groups for wound closure (P = 0.28 digitising; P = 0.49 planimetry) nor for pain levels reported (P = 0.88). CONCLUSION: It would seem that LILT provides no advantages in the management of minor postoperative wounds over current practice. Despite no apparent benefit of infrared laser at this dosage in the management of acute stage wounds, further research is required to determine its potential efficacy in the management of other wound types. Adult;Female;Foot;Humans;Laser Therapy;Male;Middle Aged;Minor Surgical Procedures;Pain Measurement;Pain, Postoperative;Wound Healing

Mechanism of therapeutic effect of low-intensity infrared laser radiation. The effect of infrared low-intensity laser irradiation on functional activity of blood polymorphonuclear leukocytes was studied in vitro. A dose-dependent priming of polymorphonuclear leukocytes induced by infrared low-intensity laser irradiation was demonstrated. Similar effects were also observed in the presence of the photosensitizer photosense. Photosensitizing Agents In Vitro Techniques;Infrared Rays;Lasers;Neutrophils;Photosensitizing Agents;Phototherapy

[Cartilage cell stimulation with low-power laser: experimental assessment]. The aim of this study was to verify the effects of laser therapy performed with Ga-Al-As diode laser (780 nm, 2500 mW) on cartilage cells in vitro. The cartilage sample used for biostimulation was taken from the knee of an adult patient. The cultures were divided into four groups: Groups I, II, III were subjected to biostimulation with different laser parameters; Group IV did not received any treatment. The laser biostimulation was conducted for five consecutive days. At the end of the treatment, cell count and MTT tests were performed to assess cell metabolism. The data showed good results in terms of cell viability in the groups treated with laser biostimulation compared to the untreated group. The results

obtained with the use of this new low-power diode laser Ga-Al-As device in the biostimulation of the cartilage tissue, permits us to consider the use of this device clinically. Adult;Cartilage;Cell Count;Cell Division;Cells, Cultured;Humans;Lasers

Topical hyperbaric oxygen and low energy laser therapy for chronic diabetic foot ulcers resistant to conventional treatment. Chronic foot ulcers are common in long-standing diabetes, may herald severe complications and are often resistant to therapy. To evaluate the effects of adjunctive topical hyperbaric oxygen treatment (THBO) and low energy laser (LEL) irradiation on ulcer healing, a 100 consecutive patients with chronic diabetic foot ulcers (DFU) refractory to 4.5 +/- 1.2 months of comprehensive treatment, were enrolled in a prospective open study. While conventional treatment was continued as necessary, THBO was administered by pumping 100 percent oxygen into a disposable sealed polythylene hyperbaric chamber (150 min x 2 to 3/wk at up to 1.04 atm). Helium-neon LEL irradiation was given concurrently using a Unilaser Scan Unit at 4 J/cm2 for 20 min. Some patients continued THBO at home or their treatment was confined to THBO at home. Patients were monitored every two weeks revealing 81 percent cure after 25 +/- 13 treatments over 3.2 +/- 1.7 months. On follow-up (median 18 months), only 3/81 (4 percent) had reulceration, which responded to THBO/LEL retreatment. Nonresponders had significantly lower ankle brachial indices (ABI) than patients whose ulcers were healed (0.55 vs. 0.78, $p < 0.01$) and ultimately required amputation. Patient compliance was full and no adverse events occurred. In conclusion, although the study was open and uncontrolled, an 81 percent healing of DFU in patients who previously did not respond to a comprehensive treatment program, constitutes an intriguing preliminary result. Thus, THBO/LEL therapy may be a safe, simple, and inexpensive early adjunctive treatment for patients with chronic diabetic foot ulcers. Our findings should prompt its evaluation by large randomized controlled trials. Aged;Diabetic Foot;Female;Humans;Hyperbaric Oxygenation;Laser Therapy;Male;Middle Aged;Treatment Outcome

Pulse irradiation of low-power laser stimulates bone nodule formation. Although low-power laser irradiation provides many anabolic effects such as acceleration of bone formation, the effects of different pulse frequencies used during laser irradiation on bone formation have not been elucidated. Osteoblastic cells isolated from fetal rat calvariae were irradiated once with a low-power Ga-Al-As laser (830 nm, 500 mW) in two different irradiation modes; continuous irradiation (CI), and 1 Hz pulsed irradiation (PI). We then investigated the effects on cellular proliferation, bone nodule formation, alkaline phosphatase (ALP) activity, and ALP gene expression. Laser irradiation in both groups significantly stimulated cellular proliferation, bone nodule formation, ALP activity, and ALP gene expression, as compared with the nonirradiation group. Notably, PI markedly stimulated these factors, when compared with the CI group. Since 1 Hz pulsed laser irradiation significantly stimulates bone formation in vitro, it is most likely that pulse frequency is an important factor affecting biological responses in bone formation. Gallium;Aluminum;Alkaline Phosphatase;Arsenic Alkaline Phosphatase;Aluminum;Analysis of Variance;Animals;Arsenic;Cell Division;Cells, Cultured;Electrophoresis, Agar Gel;Gallium;Gene Expression Regulation, Enzymologic;Image Processing, Computer-Assisted;Laser Therapy;Osteoblasts;Osteogenesis;Radiation Dosage;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Skull;Statistics as Topic

Systematic reviews of wound care management: (5) beds; (6) compression; (7) laser therapy, therapeutic ultrasound, electrotherapy and electromagnetic therapy. BACKGROUND: Chronic wounds such as leg ulcers, diabetic foot ulcers and pressure sores are common in both acute and community healthcare settings. The prevention and treatment of these wounds involves many strategies: pressure-relieving beds, mattresses and cushions are universally used as measures for the prevention and treatment of pressure sores; compression therapy in a variety of forms is widely used for venous leg ulcer prevention and treatment; and a whole range of therapies involving laser,

ultrasound and electricity is also applied to chronic wounds. This report covers the final three reviews from a series of seven. AIMS: To assess the clinical effectiveness and cost- effectiveness of: (1) pressure-relieving beds, mattresses and cushions for pressure sore prevention and treatment; (2) compression therapy for the prevention and treatment of leg ulcers; (3) low-level laser therapy, therapeutic ultrasound, electrotherapy and electromagnetic therapy for the treatment of chronic wounds. METHODS - DATA SOURCES: Nineteen electronic databases, including MEDLINE, CINAHL, EMBASE and the Cochrane Controlled Trials Register (CENTRAL), were searched. Relevant journals, conference proceedings and bibliographies of retrieved papers were handsearched. An expert panel was also consulted. METHODS - STUDY SELECTION: Randomised controlled trials (RCTs) which evaluated these interventions were eligible for inclusion in this review if they used objective measures of outcome such as wound incidence or healing rates. RESULTS - BEDS, MATTRESSES AND CUSHIONS FOR PRESSURE SORE PREVENTION AND TREATMENT: A total of 45 RCTs were identified, of which 40 compared different mattresses, mattress overlays and beds. Only two trials evaluated cushions, one evaluated the use of sheepskins, and two looked at turning beds/kinetic therapy. RESULTS - COMPRESSION FOR LEG ULCERS: A total of 24 trials reporting 26 comparisons were included (two of prevention and 24 of treatment strategies). RESULTS - LOW-LEVEL LASER THERAPY, THERAPEUTIC ULTRASOUND, ELECTROTHERAPY AND ELECTROMAGNETIC THERAPY: Four RCTs of laser (for venous leg ulcers), 10 of therapeutic ultrasound (for pressure sores and venous leg ulcers), 12 of electrotherapy (for ischaemic and diabetic ulcers, and chronic wounds generally) and five of electromagnetic therapy (for venous leg ulcers and pressure sores) were included. Studies were generally small, and of poor methodological quality. CONCLUSIONS (1) Foam alternatives to the standard hospital foam mattress can reduce the incidence of pressure sores in people at risk, as can pressure-relieving overlays on the operating table. One study suggests that air-fluidised therapy may increase pressure sore healing rates. (2) Compression is more effective in healing venous leg ulcers than is no compression, and multi-layered high compression is more effective than single-layer compression. High-compression hosiery was more effective than moderate compression in preventing ulcer recurrence. (3) There is generally insufficient reliable evidence to draw conclusions about the contribution of laser therapy, therapeutic ultrasound, electrotherapy and electromagnetic therapy to chronic wound healing. Bandages;Beds;Electric Stimulation Therapy;Electromagnetic Fields;Humans;Laser Therapy;Pressure Ulcer;Randomized Controlled Trials as Topic;Ultrasonic Therapy;United Kingdom;Wound Healing

Long-term effect of low energy laser irradiation on infarction and reperfusion injury in the rat heart. Low-energy laser irradiation (LELI) has been found to modulate biological processes. The present study investigated the effect of LELI on infarct size after chronic myocardial infarction (MI) and ischemia-reperfusion injury in rats. The left anterior descending (LAD) coronary artery was ligated in 83 rats to create MI or ischemia-reperfusion injury. The hearts of the laser-irradiated (LI) rats received irradiation after LAD coronary artery occlusion and 3 days post-MI. At 14, 21, and 45 days post-LAD coronary artery permanent occlusion, infarct sizes (percentage of left ventricular volume) in the non-laser-irradiated (NLI) rats were 52 +/- 12 (SD), 47 +/- 11, and 34 +/- 7%, respectively, whereas in the LI rats they were significantly lower, being 20 +/- 8, 15 +/- 6, and 10 +/- 4%, respectively. Left ventricular dilatation (LVD) in the chronic infarcted rats was significantly reduced (50-60%) in LI compared with NLI rats. LVD in the ischemia-reperfusion-injured LI rats was significantly reduced to a value that did not differ from intact normal noninfarcted rats. Laser irradiation caused a significant 2.2-fold elevation in the content of inducible heat shock proteins (specifically HSP70i) and 3.1-fold elevation in newly formed blood vessels in the heart compared with NLI rats. It is concluded that LELI caused a profound reduction in infarct size and LVD in the rat heart after chronic MI and caused complete reduction of LVD in ischemic-reperfused heart. This phenomenon may be partially explained by the

cardioprotective effect of the HSP70i and enhanced angiogenesis in the myocardium after laser irradiation. Desmin;Heat-Shock Proteins Animals;Blotting, Western;Coronary Vessels;Desmin;Heat-Shock Proteins;Immunohistochemistry;Laser Therapy;Ligation;Male;Myocardial Infarction;Myocardial Reperfusion Injury;Neovascularization, Physiologic;Rats;Rats, Sprague-Dawley

Low-power helium: neon laser irradiation enhances production of vascular endothelial growth factor and promotes growth of endothelial cells in vitro. BACKGROUND AND OBJECTIVE: Numerous reports suggest that low-power laser irradiation (LPLI) is capable of affecting cellular processes in the absence of significant thermal effect. The objective of the present study was to determine the effect of LPLI on secretion of vascular endothelial growth factor (VEGF) and proliferation of human endothelial cells (EC) in vitro. STUDY DESIGN/MATERIALS AND METHODS: Cell cultures were irradiated with single different doses of LPLI (Laser irradiance from 0.10 to 6.3 J/cm(2)) by using a He:Ne continuous wave laser (632 nm). VEGF secretion by smooth muscle cells (SMC) and fibroblasts was quantified by sandwich enzyme immunoassay technique. The endothelial cell proliferation was measured by Alamar Blue assay. VEGF and transforming growth factor beta (TGF-beta) expression by cardiomyocytes was studied by reverse transcription-polymerase chain reaction (RT-PCR). RESULTS: We observed that (1) LPLI of vascular and cardiac cells results in a statistically significant increase of VEGF secretion in culture (1.6-fold for SMC and fibroblasts and 7-fold for cardiomyocytes) and is dose dependent (maximal effect was observed with LPLI irradiance of 0.5 J/cm(2) for SMC, 2.1 J/cm(2) for fibroblasts and 1.05 J/cm(2) for cardiomyocytes). (2) Significant stimulation of endothelial cell growth was obtained with LPLI-treated conditioned medium of SMC (maximal increase was observed with LPLI conditioned medium with irradiance of 1.05 J/cm(2) for SMC and 2.1 J/cm(2) for fibroblasts. CONCLUSIONS: Our studies demonstrate that low-power laser irradiation increases production of VEGF by SMC, fibroblasts, and cardiac myocytes and stimulates EC growth in culture. These data may have significant importance leading to the establishment of new methods for endoluminal postangioplasty vascular repair and myocardial photoangiogenesis. Endothelial Growth Factors;Lymphokines;Protein Isoforms;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factors Cells, Cultured;Endothelial Growth Factors;Endothelium, Vascular;Fibroblasts;Humans;In Vitro Techniques;Lasers;Lymphokines;Muscle, Smooth, Vascular;Myocardium;Protein Isoforms;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factors

Magnetic resonance imaging (MRI) controlled outcome of side effects caused by ionizing radiation, treated with 780 nm-diode laser -- preliminary results. BACKGROUND AND OBJECTIVE: Ionizing radiation therapy by way of various beams such as electron, photon and neutron is an established method in tumor treatment. The side effects caused by this treatment such as ulcer, painful mastitis and delay of wound healing are well known, too. Biomodulation by low level laser therapy (LLLT) has become popular as a therapeutic modality for the acceleration of wound healing and the treatment of inflammation. Evidence for this kind of application, however, is not fully understood yet. This study intends to demonstrate the response of biomodulative laser treatment on the side effects caused by ionizing radiation by means of magnetic resonance imaging (MRI). STUDY DESIGN/PATIENTS AND METHODS: Six female patients suffering from painful mastitis after breast ionizing irradiation and one man suffering from radiogenic ulcer were treated with lambda=780 nm diode laser irradiation at a fluence rate of 5 J/cm2. LLLT was performed for a period of 4-6 weeks (mean sessions: 25 per patient, range 19-35). The tissue response was determined by means of MRI after laser treatment in comparison to MRI prior to the beginning of the LLLT. RESULTS: All patients showed complete clinical remission. The time-dependent contrast enhancement curve obtained by the evaluation of MR images demonstrated a significant decrease of enhancement features typical for inflammation in the affected area. CONCLUSION: Biomodulation by LLLT seems to be a promising treatment modality for

side effects induced by ionizing radiation. Adult;Aged;Breast Neoplasms;Female;Humans;Laser Therapy;Magnetic Resonance Imaging;Male;Mastitis;Middle Aged;Oropharyngeal Neoplasms;Radiation, Ionizing;Radiotherapy, Adjuvant;Ulcer

Double-blind randomized study evaluating regeneration of the rat transected sciatic nerve after suturing and postoperative low-power laser treatment. This double-blind randomized study evaluated the therapeutic effect of low-power laser irradiation (LPLI) on peripheral nerve regeneration, after complete transection and direct anastomosis of the rat sciatic nerve. After this procedure, 13 of 24 rats received postoperative LPLI, with a wavelength of 780 nm laser, applied transcutaneously, 30 min daily for 21 consecutive days, to corresponding segments of the spinal cord and to the injured sciatic nerve. Positive somatosensory evoked responses were found in 69.2 percent of the irradiated rats ($p = 0.019$), compared to 18.2 percent of the non-irradiated rats. Immunohistochemical staining in the laser-treated group showed an increased total number of axons ($p = 0.026$), and better quality of the regeneration process, due to an increased number of large-diameter axons ($p = 0.021$), compared to the non-irradiated control group. The study suggests that postoperative LPLI enhances the regenerative processes of peripheral nerves after complete transection and anastomosis. Animals;Double-Blind Method;Evoked Potentials, Somatosensory;Laser Therapy;Male;Nerve Regeneration;Postoperative Period;Rats;Rats, Wistar;Sciatic Nerve

830-nm irradiation increases the wound tensile strength in a diabetic murine model. BACKGROUND AND OBJECTIVE: The purpose of this study was to investigate the effects of low-power laser irradiation on wound healing in genetic diabetes. STUDY DESIGN/MATERIALS AND METHODS: Female C57BL/Ksj/db/db mice received 2 dorsal 1 cm full-thickness incisions and laser irradiation (830 nm, 79 mW/cm(2), 5.0 J/cm(2)/wound). Daily low-level laser therapy (LLLT) occurred over 0-4 days, 3-7 days, or nonirradiated. On sacrifice at 11 or 23 days, wounds were excised, and tensile strengths were measured and standardized. RESULTS: Nontreated diabetic wound tensile strength was 0.77 +/- 0.22 g/mm(2) and 1.51 +/- 0.13 g/mm(2) at 11 and 23 days. After LLLT, over 0-4 days tensile strength was 1.15 +/- 0.14 g/mm(2) and 2.45 +/- 0.29 g/mm(2) ($P = 0.0019$). Higher tensile strength at 23 days occurred in the 3- to 7-day group (2.72 +/- 0.56 g/mm(2) LLLT vs. 1.51 +/- 0.13 g/mm(2) nontreated; $P < \text{or} = 0.01$). CONCLUSION: Low-power laser irradiation at 830 nm significantly enhances cutaneous wound tensile strength in a murine diabetic model. Further investigation of the mechanism of LLLT in primary wound healing is warranted. Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Female;Laser Therapy;Mice;Mice, Inbred NOD;Probability;Reference Values;Risk Assessment;Tensile Strength;Wound Healing;Wounds and Injuries

Effects of laser irradiation on the spinal cord for the regeneration of crushed peripheral nerve in rats. BACKGROUND AND OBJECTIVE: The purpose of the present study was to examine the recovery of the crushed sciatic nerve of rats after low-power laser irradiation applied to the corresponding segments of the spinal cord. STUDY DESIGN/MATERIALS AND METHODS: After a crush injury to the sciatic nerve in rats, low-power laser irradiation was applied transcutaneously to corresponding segments of the spinal cord immediately after closing the wound by using 16 mW, 632 nm He-Ne laser. The laser treatment was repeated 30 minutes daily for 21 consecutive days. RESULTS: The electrophysiologic activity of the injured nerves (compound muscle action potentials--CMAPs) was found to be approximately 90% of the normal precrush value and remained so for up to a long period of time. In the control nonirradiated group, electrophysiologic activity dropped to 20% of the normal precrush value at day 21 and showed the first signs of slow recovery 30 days after surgery. The two groups were found to be significantly different during follow-up period ($P < 0.001$). CONCLUSION: This study suggests that low-power laser irradiation applied directly to the spinal cord can improve recovery of the corresponding insured peripheral nerve. Animals;Disease Models, Animal;Laser

Therapy;Nerve Regeneration;Peripheral Nervous System Diseases;Rats;Rats, Sprague-Dawley;Reference Values;Sciatic Nerve;Sensitivity and Specificity;Spinal Cord

Intravascular low-power laser irradiation after coronary stenting: long-term follow-up. BACKGROUND AND OBJECTIVE: A high restenosis rate remains a limiting factor for percutaneous transluminal coronary angioplasty and stenting. The objective of this study was to evaluate the effect of intravascular red laser therapy (IRLT) on restenosis after stenting procedures in de novo lesions. STUDY DESIGN/MATERIALS AND METHODS: A total of 68 consecutive patients were treated with IRLT in conjunction with coronary stenting procedures. Mean lesion length was 16.5 +/- 2.4 mm. Reference vessel diameter (RVD) and pre-minimal lumen diameter (MLD) were 2.90 +/- 0.15 mm and 1.12 +/- 0.26 mm, respectively. RESULTS: After treatment, MLD was 2.76 +/- 0.32 mm with no procedural complications or in-hospital adverse events. Angiographic follow-up (n = 61) revealed restenosis in nine patients (14.7%) with rate by artery size of > 3 mm (n = 21) 0%; 2.5--3.0 mm (n = 28) 14.2%; and < 2.5 mm (n = 12) 41.6%. CONCLUSION: Intravascular red light therapy is safe, feasible, and reduces expected restenosis rate after coronary stenting. Aged;Angioplasty, Balloon, Coronary;Combined Modality Therapy;Coronary Angiography;Coronary Disease;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Middle Aged;Secondary Prevention;Sensitivity and Specificity;Stents;Treatment Outcome;Vascular Patency

Attenuation of infarct size in rats and dogs after myocardial infarction by low-energy laser irradiation. BACKGROUND AND OBJECTIVE: The aim of the present study was to investigate the possibility that low-energy laser irradiation attenuates infarct size formation after induction of chronic myocardial infarction (MI) in small and large experimental animals. STUDY DESIGN/MATERIALS AND METHODS: Laser irradiation was applied to the infarcted area of rats and dogs at various power densities (2.5 to 20 mW/cm(2)) after occlusion of the coronary artery. RESULTS: In infarcted laser-irradiated rats that received laser irradiation immediately and 3 days after MI at energy densities of 2.5, 6, and 20 mW/cm(2), there was a 14%, 62% (significant; P < 0.05), and 2.8% reduction of infarct size (14 days after MI) relative to non--laser-irradiated rats, respectively. In dogs, a 49% (significant; P < 0.01) reduction of infarct size was achieved. CONCLUSION: The results of the present study indicate that delivery of low-energy laser irradiation to infarcted myocardium in rats and dogs has a profound effect on the infarct size after MI. Animals;Disease Models, Animal;Dogs;Female;Immunohistochemistry;Laser Therapy;Male;Myocardial Infarction;Probability;Rats;Rats, Sprague-Dawley;Reference Values;Sensitivity and Specificity

Effect of He-Ne laser treatment on the level of lipid peroxidation products in experimental cataract of rabbit eyes. The effect of low-intensity laser irradiation on the processes of lipid peroxidation in lens homogenate and aqueous humor during experimental diquat-induced cataract of rabbit eyes was studied. The levels of primary and secondary products of lipid peroxidation (LPO), conjugated dienes and thiobarbituric acid reactive substances (TBARS), were evaluated. We found that the experimental cataract model leads to a significant increase in the content of conjugated dienes and in the content of TBARS both in lens homogenate and in aqueous humor. The data obtained support the important role of oxidative stress in the development of the diquat-induced cataract model. Low-intensity laser treatment does not provoke a significant decrease in conjugated dienes or in TBARS in either lens homogenate or aqueous humor. Although our therapeutic scheme led to a slightly decreased level of LPO products, we conclude that the effect of low-intensity laser-irradiation may depend on the dose applied, individual tissues and other factors. Herbicides;Thiobarbituric Acid Reactive Substances;Diquat Animals;Aqueous Humor;Cataract;Chinchilla;Diquat;Eye;Herbicides;Lasers;Lens, Crystalline;Lipid Peroxidation;Male;Rabbits;Thiobarbituric Acid Reactive Substances

Laser biostimulation of cartilage: in vitro evaluation. An in vitro study was performed to evaluate the laser biostimulation effect on cartilage using a new gallium-aluminium-arsenic diode laser. Chondrocyte cultures were derived from rabbit and human cartilage. These cells were exposed to laser treatment for 5 days, using the following parameters: 300 joules, 1 watt, 100 (treatment A) or 300 (treatment B) hertz, pulsating emission for 10 minutes, under a sterile laminar flow. Control cultures (no treatment) received the same treatment with the laser device off. Cell viability was measured by MTT assay at the end of the laser treatment and then after 5 days. Neither rabbit nor human cultured chondrocytes showed any damage under a light microscope and immunostaining control following laser treatment. The MTT test results indicated a positive biostimulation effect on cell proliferation with respect to the control group. The increase in viability of irradiated chondrocytes was maintained for five days following the end of the laser treatment. The results obtained with the Ga-Al-As diode laser using the above tested parameters for in vitro biostimulation of cartilage tissues provide a basis for a rational approach to the experimental and clinical use of this device.
Analysis of Variance;Animals;Cells, Cultured;Chondrocytes;Electric Stimulation;Humans;Lasers;Male;Rabbits

[The first experience of application of photo-modified erythrocytes for the treatment of the chronic arterial ischemia syndrome]. Efficacy of application of intraarterial erythrocytes infusion, photomodified by using low-energy laser irradiation, was proved, basing on comparative analysis of treatment results of the different groups of patients with obliterating disease of the lower extremities vessels. Chronic Disease;Erythrocytes;Humans;Infusions, Intra-Arterial;Ischemia;Laser Therapy;Leg;Middle Aged;Photic Stimulation

Skeletal muscle cell activation by low-energy laser irradiation: a role for the MAPK/ERK pathway. Low-energy laser irradiation (LELI) has been shown to promote skeletal muscle regeneration in vivo and to activate skeletal muscle satellite cells, enhance their proliferation and inhibit differentiation in vitro. In the present study, LELI, as well as the addition of serum to serum-starved myoblasts, restored their proliferation, whereas myogenic differentiation remained low. LELI induced mitogen-activated protein kinase/extracellular signal-regulated protein kinase (MAPK/ERK) phosphorylation with no effect on its expression in serum-starved myoblasts. Moreover, a specific MAPK kinase inhibitor (PD098059) inhibited the LELI- and 10% serummediated ERK1/2 activation. However, LELI did not affect Jun N-terminal kinase (JNK) or p38 MAPK phosphorylation or protein expression. Whereas a 3-sec irradiation induced ERK1/2 phosphorylation, a 12-sec irradiation reduced it, again with no effect on JNK or p38. Moreover, LELI had distinct effects on receptor phosphorylation: it caused phosphorylation of the hepatocyte growth factor (HGF) receptor, previously shown to activate the MAPK/ERK pathway, whereas no effect was observed on tumor suppressor necrosis alpha (TNF-alpha) receptor which activates the p38 and JNK pathways. Therefore, by specifically activating MAPK/ERK, but not JNK and p38 MAPK enzymes, probably by specific receptor phosphorylation, LELI induces the activation and proliferation of quiescent satellite cells and delays their differentiation.
Culture Media, Serum-Free;Receptors, Tumor Necrosis Factor;Proto-Oncogene Proteins c-met;Mitogen-Activated Protein Kinase 1;Mitogen-Activated Protein Kinase 3;Mitogen-Activated Protein Kinase 8;Mitogen-Activated Protein Kinases;p38 Mitogen-Activated Protein Kinases
Animals;Cell Differentiation;Cell Division;Cells, Cultured;Culture Media, Serum-Free;Gene Expression;Lasers;MAP Kinase Signaling System;Mice;Mitogen-Activated Protein Kinase 1;Mitogen-Activated Protein Kinase 3;Mitogen-Activated Protein Kinase 8;Mitogen-Activated Protein Kinases;Muscle, Skeletal;Phosphorylation;Proto-Oncogene Proteins c-met;Receptors, Tumor Necrosis Factor;Time Factors;p38 Mitogen-Activated Protein Kinases

Low-energy laser irradiation reduces formation of scar tissue after myocardial infarction in rats and dogs. BACKGROUND: Low-energy laser irradiation (LELI) has been found to attenuate various

biological processes in tissue culture and experimental animal models. The aim of the present study was to investigate the effect of LELI on the formation of scar tissue in experimentally induced chronic infarct in rats and dogs. METHODS AND RESULTS: Myocardial infarction (MI) was induced in 50 dogs and 26 rats by ligation of the left anterior descending coronary artery. After induction of MI, the laser-irradiated (LI) group received laser irradiation (infrared laser, 803-nm wavelength) epicardially. Control MI-induced non-laser irradiated (NLI) dogs were sham-operated, and laser was not applied. All dogs were euthanized at 5 to 6 weeks after MI. Infarct size was determined by TTC staining and histology. The laser treatment (P:<0.05) lowered mortality significantly, from 30% to 6.5%, after induction of MI. The infarct size in the LI dogs was reduced significantly (P:<0.0001) (52%) compared with NLI dogs. Histological observation of the infarct revealed a typical scar tissue in NLI dogs and cellularity in most of the LI dogs. Only 14+/-3% of the mitochondria in the cardiomyocytes in the ischemic zone (4 hours after MI) of LI MI-induced rats were severely damaged, compared with 36+/-1% in NLI rats. Accordingly, ATP content in that zone was 7.6-fold (significantly) higher in LI than in NLI rats. CONCLUSIONS: Our observations indicate that epicardial LELI of rat and dog hearts after chronic MI caused a marked reduction in infarct size, probably due to a cardioprotective effect of the LELI. Desmin Animals;Chronic Disease;Cicatrix;Desmin;Dogs;Immunohistochemistry;Laser Therapy;Microscopy, Electron;Myocardial Infarction;Myocardium;Rats;Rats, Sprague-Dawley;Staining and Labeling;Survival Analysis;Tissue Distribution

A case report of low intensity laser therapy (LILT) in the management of venous ulceration: potential effects of wound debridement upon efficacy. OBJECTIVE: This single case report (ABA design) was undertaken as a preliminary investigation into the clinical effects of low intensity laser upon venous ulceration, applied to wound margins only, and the potential relevance of wound debridement and wound measurement techniques to any effects observed. METHODS: Ethical approval was granted by the University of Ulster's Research Ethical Committee and the patient recruited was required to attend 3 times per week for a total of 8 weeks. Treatments were carried out using single source irradiation (830 nm; 9 J/cm2, CB Medico, Copenhagen, Denmark) in conjunction with dry dressings during each visit. Assessment of wound surface area, wound appearance, and current pain were completed by an independent investigator. Planimetry and digitizing were completed for wound tracings and for photographs to quantify surface areas. Video image analysis was also performed on photographs of wounds. RESULTS: The primary findings were changes in wound appearance, and a decrease in wound surface area (range 33.3-46.3%), dependent on the choice of measurement method. Video image analysis was used, but rejected as an accurate method of wound measurement. Treatment intervention produced a statistically significant reduction in wound area using the C statistic on digitizing data for photographs (at Phase one only; $Z = 2.412$; $p < 0.05$). Wound debridement emerged as an important procedure to be carried out prior to measuring wounds. Despite fluctuating pain levels recorded throughout the duration of the study, VAS scores showed a decrease of 15% at the end of the study. This hypoalgesic effect was, however, statistically significant (using the C statistic) at Phase one only ($Z = 2.554$; $p < 0.05$). CONCLUSIONS: Low intensity laser therapy at this dosage, and using single source irradiation would seem to be an effective treatment for patients suffering venous ulceration. Further group studies are indicated to establish the most effective therapeutic dosage for this and other types of ulceration. Bandages;Debridement;Female;Humans;Image Processing, Computer-Assisted;Laser Therapy;Middle Aged;Pain;Pain Measurement;Photography;Radiation Dosage;Severity of Illness Index;Treatment Outcome;Varicose Ulcer;Wound Healing

[Use of transcutaneous laser biostimulation of blood and a running alternating magnetic field in preparing periodontitis patients for surgery]. A total of 103 patients with exacerbation of chronic generalized periodontitis of moderate and high severity were treated using running alternating

magnetic field generated by ATOS device and transcutaneous laser biostimulation of the blood. These treatment modalities accelerated preoperative treatment and allowed performing the operations on the periodontal tissues in the optimal status under conditions of improved defense forces of the organism. Adolescent;Adult;Blood;Chronic Disease;Female;Humans;Lasers;Magnetics;Male;Middle Aged;Periodontitis;Preoperative Care

[Low-intensity laser therapy in pediatric oncology]. Application of low-intensity laser radiotherapy (LILR) allowed to cut down time needed for management of radiation injury and chemotherapy complications in pediatric patients 1.5-2-fold. It was shown that exposure to LIILR caused mononuclear (MN) levels of donors' blood to rise which in turn led to release, in higher concentrations, of IL-1 and FNO cytokins, major factors of immune response development. Cytokines Child;Child, Preschool;Cytokines;Humans;Laser Therapy;Neoplasms

Lasers in dermatology--a critical update. Lasers are accepted for treating nevus of Ota, other pigmented lesions, hair removal, vascular lesions, leg veins, tattoos, and for skin resurfacing. These are photothermal treatments, in which certain skin "targets" are heated, followed by selective wound healing. Small pigmented targets such as the dermal melanocytes in nevus of Ota, are best treated with short (< 1 microsecond) laser pulses. Large targets, such as hair follicles, have long thermal relaxation times and are best treated with longer pulses. In general, the ideal pulse duration is about equal to the thermal relaxation time for pigmented targets. However, sometimes the actual target is not pigmented and is at some distance from a pigmented structure. For example the follicular stem cells, which are not pigmented, line the outer root sheath far away from the pigmented hair shaft. These cells appear to be an important target for permanent hair destruction. Pulses longer than the thermal relaxation time of the hair shaft allow heat conduction and better damage of follicular stem cells. Epidermal cooling works far better with pulses longer than about 10 ms, delivered through a cold medium (e.g., cold sapphire in contact with the skin). Thus, the combination of cooling and long near-infrared laser pulses allows safe and effective pigmented hair removal in all skin types. In contrast, epidermal protection from short pulses is best with dynamic pre-cooling (e.g., cryogen spray), for example during portwine stain treatment. A major challenge for the future of photothermal laser treatments is to develop ways of treating non-pigmented skin "targets". New uses for lasers are emerging. Diagnostic laser imaging and spectroscopy will soon emerge in dermatology. A near-infrared laser confocal microscope provides histology-like images of human skin. Imaging is painless and takes only a few minutes. Lesions including melanoma, basal cell and squamous cell carcinoma, microvascular and inflammatory lesions, dermatophytes, verrucae, etc, have distinct appearances. However, sensitivity and specificity of laser-based diagnostic imaging has not yet been compared with histopathology. Laser phototherapy is also emerging in dermatology. The 308 nm excimer laser has recently been shown to clear psoriasis faster than conventional phototherapy. Scalp psoriasis may soon be treated by fiber-optic delivery of this UV laser. The variety and utility of lasers in dermatology will probably continue to grow. Dermatology;Humans;Lasers

Effects of near-infrared low-level laser irradiation on microcirculation. BACKGROUND AND OBJECTIVE: Recently, there has been an increase in the clinical application of low-level laser irradiation (LLLI) in various fields. The present study was conducted to explore the effects of LLLI on microcirculation. STUDY DESIGN/MATERIAL AND METHODS: We investigated the effects of LLLI on rat mesenteric microcirculation in vivo, and on cytosolic calcium concentration ([Ca2+]i) in rat vascular smooth muscle cells (VSMCs) in vitro. RESULTS: LLLI caused potent dilation in the laser-irradiated arteriole, which led to marked increases in the arteriolar blood flow. The changes were partly attenuated in the initial phase by the superfusion of 15 microM L-NAME, but they were not affected by local denervation. Furthermore, LLLI caused a power-dependent decrease in [Ca2+]i in VSMCs. CONCLUSION: The circulatory changes observed seemed to be mediated largely by LLLI-induced

reduction of [Ca2+]i in VSMCs, in addition to the involvement of NO in the initial phase. Enzyme Inhibitors;Nitric Oxide Synthase;Calcium;NG-Nitroarginine Methyl Ester Animals;Arterioles;Blood Flow Velocity;Calcium;Denervation;Enzyme Inhibitors;In Vitro Techniques;Lasers;Male;Mesentery;Microcirculation;Muscle, Smooth, Vascular;NG-Nitroarginine Methyl Ester;Nitric Oxide Synthase;Radiation Dosage;Rats;Rats, Wistar;Vasodilation

Low power laser protects human erythrocytes In an In vitro model of artificial heart-lung machines. The protective effect of the low power helium-neon (He-Ne) laser against the damage of human erythrocytes in whole blood was examined in a perfusion model using an artificial heart-lung machine. Preserved human whole blood was diluted and perfused in 2 closed circuits with a double roller pump. The laser irradiated one of the circuits (laser group), and none the other (control group). In the laser group, erythrocyte deformability and erythrocyte adenosine triphosphate (ATP) levels were significantly higher, and free hemoglobin levels were significantly lower than those in the control group. Subsequent morphological findings by means of scanning electron microscope were consistent with these results. Low power He-Ne laser protected human erythrocytes in the preserved diluted whole blood from the damage caused by experimental artificial heart-lung machines. The clinical application of low power laser treatment for extracorporeal circulation is suggested. Hemoglobins;Polypropylenes;Helium;Neon;Adenosine Triphosphate Adenosine Triphosphate;Analysis of Variance;Cytoprotection;Equipment Design;Erythrocyte Deformability;Erythrocytes;Extracorporeal Circulation;Heart-Lung Machine;Helium;Hemoglobins;Humans;Laser Therapy;Microscopy, Electron, Scanning;Neon;Polypropylenes;Surface Properties

Recovery from sarafotoxin-b induced cardiopathological effects in mice following low energy laser irradiation. OBJECTIVE: Low energy laser irradiation has been shown to accelerate various biological processes, including regeneration of injured tissues. In the present work we studied the effect of low energy laser irradiation on ischemic mice hearts, following administration of sarafotoxin-b, a powerful vasoconstrictor peptide of the endothelin/sarafotoxin family. METHODS: Immediately after injection of the toxin and two days later, hearts were exposed to low energy laser irradiation. Eight days after the injection the mice were sacrificed and their hearts were processed for light and electron microscopy. RESULTS: Sarafotoxin-b induced an approximate 2-fold increase in the relative cavity volume of the left ventricle. Low energy laser irradiation of the sarafotoxin-injected mice caused a significant decrease (62%) in the left ventricular dilatation. Electron microscopy of the sarafotoxin-injected mice hearts revealed that the extent of formation of large vacuoles in the cytoplasm of the cardiomyocytes as well as disorganization of the myofibrils were much higher than in the laser irradiated mice. CONCLUSIONS: Our study indicates that low energy laser irradiation enhanced recovery of the damaged cardiomyocytes from the ischemia induced by sarafotoxin-b. Endothelins;Vasoconstrictor Agents Animals;Endothelins;Heart;Heart Ventricles;Lasers;Male;Mice;Mice, Inbred ICR;Microscopy, Electron;Myocardial Ischemia;Myocardium;Vasoconstrictor Agents

Laser therapy: a randomized, controlled trial of the effects of low intensity Nd:YAG laser irradiation on lateral epicondylitis. OBJECTIVE: To assess the effectiveness of low intensity laser therapy in the treatment of lateral epicondylitis. DESIGN: A double-masked, placebo-controlled, randomized clinical trial. SETTING: A physical medicine and rehabilitation clinic. PARTICIPANTS: Fifty-two ambulatory men and women (age range, 18-70 yr) with symptomatic lateral epicondylitis of more than 30 days in duration and a normal neurologic examination. INTERVENTION: Subjects were bloc randomized into 2 groups with a computer-generated schedule. All underwent irradiation for 60 seconds at 7 points along the symptomatic forearm 3 times weekly for 4 weeks by a masked therapist. The sole difference between the groups was that the probe of a 1.06-microm continuous

wave laser emitted 204 mW/cm2 (12.24 J/cm2) for the treated subjects and was inactive for the control subjects. Subjects were assessed at the beginning, midpoint (session 6), and end (session 12) of treatment, as well as at follow-up 28 to 35 days after their last treatment. MAIN OUTCOME MEASURES: Pain in last 24 hours, tenderness to palpation, and patient's perception of change (benefit). RESULTS: The treated and untreated groups were well matched demographically. Masking was maintained for subjects and therapists; however, the groups did not vary to a statistically significant extent in terms of the main outcome measures either during treatment or at follow-up. Secondary outcome variables, such as grasp and pinch strength, medication use, and pain with grasp and pinch, also failed to statistically differ significantly between the groups. No significant treatment side effects were noted. CONCLUSION: Treatment with low intensity 1.06-microm laser irradiation within the parameters of this study was a safe but ineffective treatment of lateral epicondylitis. Further research seems warranted in this controversial area.
Adolescent;Adult;Aged;Double-Blind Method;Female;Follow-Up Studies;Hand Strength;Humans;Laser Therapy;Male;Middle Aged;Neurologic Examination;Pain;Pain Management;Reproducibility of Results;Tennis Elbow;Treatment Outcome

Ultrastructural aspects of reactivity of regional lymph nodes on pulmonary inflammation and following endobronchial laser therapy. The purpose of this study is the evaluation of reactivity of the regional lymph nodes on infectious-destructive process in the lung, and the efficacy of different therapeutical tactics. Examination of 7 regional lymph nodes from 7 patients with pulmonary inflammation showed marked manifestations of acute lymphadenitis. Generally speaking, these lymph nodes were enlarged and manifested signs of severe cell alteration and damaged processes of lymphocyte reproduction and migration. In 10 lymph nodes from 10 patients with similar pulmonary pathology receiving the same therapeutical measures combined with laser therapy course, neither lymphadenitis nor cell alteration signs were found. The results indicate the high plastic abilities of the lymph nodes and the efficacy of laser biostimulation. Biopsy;Bronchoscopy;Humans;Laser Therapy;Lung Abscess;Lymph Nodes;Lymphocytes;Microscopy, Electron;Pneumonia

[Contemporary approach to the treatment of complicated diabetic angiopathy of the lower extremities]. The experience of treatment of 278 patients with diabetes mellitus, complicated by the lower extremities diabetic angiopathy, was summarized. The authors had proposed the complex of treatment, including combined application of the high- and low-energy laser irradiation and catheterization of the shin arteries branches and the anterior abdominal wall superficial arteries for an adequate introduction of medicinal agents towards the affection focus. Application of the method proposed had promoted the results of treatment improvement, had permitted to proceed with economical amputation of extremity and to escape the reoperations performance.
Adult;Aged;Aged, 80 and over;Diabetic Angiopathies;Diabetic Foot;Female;Humans;Laser Therapy;Male;Middle Aged

Effects of low-energy CO2 laser irradiation and the organic matrix on inhibition of enamel demineralization. In the past two decades, accumulated evidence has clearly demonstrated the inhibitory effects of laser irradiation on enamel demineralization, but the exact mechanisms of these effects remain unclear. The purpose of this study was to investigate the effects of low-energy CO2 laser irradiation on demineralization of both normal human enamel and human enamel with its organic matrix removed. Twenty-four human molars were collected, cleaned, and cut into two halves. One half of each tooth was randomly selected and its lipid and protein content extracted. The other half of each tooth was used as the matched control. Each tooth half had two window areas. All the left windows were treated with a low-energy laser irradiation, whereas the right windows served as the non-laser controls. After caries-like lesion formation in a pH-cycling environment, microradiographs of tooth sections were taken for quantification of demineralization. The mean

mineral losses (with standard deviation) of the enamel control, the lased enamel, the non-organic enamel control, and the lased non-organic enamel subgroups were 3955 (1191), 52(49), 4565(1311), and 1191 (940), respectively. A factorial ANOVA showed significant effects of laser irradiation ($p = 0.0001$), organic matrix ($p = 0.0125$), and the laser-organic matrix interaction ($p = 0.0377$). The laser irradiation resulted in a greater than 98% reduction in mineral loss, but the laser effect dropped to about 70% when the organic matrix in the enamel was removed. The results suggest that clinically applicable CO2 laser irradiation may cause an almost complete inhibition of enamel demineralization. Carbon Dioxide Analysis of Variance;Carbon Dioxide;Dental Enamel;Humans;Hydrogen-Ion Concentration;In Vitro Techniques;Lasers;Microradiography;Microscopy, Electron, Scanning;Microscopy, Polarization;Molar;Surface Properties;Tooth Demineralization

[Treatment of tinnitus with low-intensity laser]. This study evaluated the effect of low-power laser in the treatment of tinnitus in a randomized, prospective, double-blind, placebo-controlled trial. The active laser applied 50 mW (cw, 830 nm) over a period of 10 minutes per session. Forty-nine patients were included. The main outcome was measured using psychoacoustical match of tinnitus loudness, Visual Analog Scale (VAS) ratings of subjective loudness, annoyance and attention involved, scores on tinnitus-specific questionnaires, and a number of psychosocial questionnaires. Only few subjects (18%) experienced subjective improvement. There were no statistically significant differences between the effects of the active laser and placebo treatments. CONCLUSION: Low-power laser treatment is not indicated in the treatment of tinnitus. Reports of significant benefits of this treatment in previous studies may be explained by the placebo effect. Adult;Aged;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Placebo Effect;Prospective Studies;Psychiatric Status Rating Scales;Psychoacoustics;Social Support;Surveys and Questionnaires;Tinnitus

In vitro effects of low-level laser irradiation at 660 nm on peripheral blood lymphocytes. BACKGROUND AND OBJECTIVE: The effects of low-level laser light irradiation are still highly contested, and the mechanisms of its action still unclear. This study was conducted to test the effects of low-level laser irradiation at 660 nm on human lymphocytes and to investigate the possible mechanisms by which these effects are produced. STUDY DESIGN/MATERIALS AND METHODS: Whole blood obtained by phlebotomy was irradiated at 660 nm by using energy fluences between 0 and 5.0 J/cm(2). The lymphocytes were isolated after irradiation of the whole blood. For the control experiment, the lymphocytes were first isolated and then irradiated at the same wavelength and energy fluence for comparison. The proliferation of lymphocytes and the formation of free radicals and lipid peroxides were monitored. Hemoglobin was also irradiated in a cell-free environment to test for the production of lipid peroxides. RESULTS: Lymphocyte proliferation was significantly higher ($P<0.05$) as expressed by a Stimulation Index in samples irradiated in the presence of whole blood compared with lymphocytes irradiated after isolation from whole blood. Free radical and lipid peroxide production also increased significantly when samples were irradiated in the presence of red blood cells. CONCLUSION: The present study supports the hypothesis that one mechanism for the photobiostimulation effect after irradiation at 660 nm is the reaction of light with hemoglobin, resulting in oxygen radical production. Hemoglobins;Lipid Peroxides;Reactive Oxygen Species;Superoxide Dismutase Blood;Cell Division;Dose-Response Relationship, Radiation;Erythrocytes;Hemoglobins;Humans;In Vitro Techniques;Laser Therapy;Lipid Peroxides;Lymphocyte Count;Lymphocytes;Phototherapy;Reactive Oxygen Species;Superoxide Dismutase;Wound Healing;Wounds and Injuries

Assessment of low-power laser biostimulation on chondral lesions: an "in vivo" experimental study. The purpose of this study was to evaluate whether intraoperative laser biostimulation can enhance healing of cartilaginous lesions of the knee. Surgery was performed on eighteen rabbits: a bilateral

chondral lesion of 1.25 +/- 0.2 mm in length and 0.8 +/- 0.2 mm in width was created in the femoral medial condyle with a scalpel. The lesion in the left knee of each animal was treated intraoperatively using the diode Ga-Al-As 780nm. laser (300 Joules/cm2, 1 Watt, 300 Hertz, 10 minutes), while the right knee was left untreated, as control group. The animals were divided into three groups, A, B and C, according to the survival time after surgery, two, six and twelve weeks, respectively. The explants from the femoral condyles, both treated employing laser energy and left untreated, were examined histologically. Results showed a progressive filling with fibrous tissue of the cartilaginous lesion treated with laser irradiation, while no changes in the original lesion of the untreated group were observed at the end of the study. Maybe, in this experimental research, underexposure to laser irradiation was the cause for the absence of the necessary conditions for biostimulation. Animals;Cartilage;Cartilage Diseases;Disease Models, Animal;Knee Joint;Laser Therapy;Light;Rabbits

Low intensity laser therapy for chronic venous leg ulcers. Ulceration of the lower extremities is one of the most important medicosocial problems (Skobelkin et al 1990). In this article, two case studies show that it is the length of time that laser therapy is used that can have a significant impact on ulcer size. Aged;Aged, 80 and over;Cross-Over Studies;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Time Factors;Treatment Outcome;Varicose Ulcer;Wound Healing

Low-intensity laser therapy: a review. Low-intensity laser radiation is characterized by its ability to induce athermic, nondestructive photobiological processes. Although it has been in use for more than 30 years, this phototherapy is still not an established therapeutic modality. We have summarized the main arguments being brought up against the use of this therapy and have reviewed the literature addressing both its in vitro and in vivo effects. We conclude that low-intensity laser irradiations might be of benefit in selected indications if the existing preliminary data can be confirmed by more prospective and well-controlled studies. Animals;Combined Modality Therapy;Dose-Response Relationship, Radiation;Humans;In Vitro Techniques;Laser Therapy;Radiotherapy Dosage;Skin Diseases;Treatment Outcome;Wound Healing

Transpupillary laser phototherapy of tumors and vascular anomalies of retina and choroid: theoretical approach and clinical implications. BACKGROUND: Small retinal and choroidal tumors situated near the optic nerve or macula, such as retinoblastomas and malignant melanomas, as well as various other anomalies, in particular vascular malformations, may successfully be treated by photocoagulation. Model assumptions geared towards maximizing efficiency and minimizing undesirable side effects are forwarded, and the most important parameters subserving photothermal destruction, such as radiation field and thermal energy, analyzed. The influence exerted by physical traits of various tissues involved are also considered. METHODS: The model approximations presented are based on classical radiation and absorption laws, as well as on the scattering properties of the various tissues implicated, these being considered as a function of wavelength and their relevance to the photodestructive task at hand. Particular attention is paid to the rate processes and reaction kinetics of irradiated proteins. CONCLUSIONS: Radiation sources emitting in the near-infrared range of the electromagnetic spectrum, such as the diode (810 nm) and the cw Nd:YAG (1064 nm) lasers, are optimal for the treatment of tumors and large, voluminous entities (such as Hippel-Lindau angiomas), owing to the good tissue penetration properties of their light. Those emitting in the shorter wavelength range, such as the argon ion (488 and 514 nm) and first harmonic--mode Nd:YAG (532 nm) lasers, are not suitable for such tasks, but they are ideal for the destruction of fine sanguinous structures, within which their light is strongly absorbed but through which it penetrates poorly. For the treatment of large anomalous structures, a combined short/long wavelength--strategy should also be considered as a viable alternative. Such a "wavelength mixture" is emitted by the xenon high pressure lamp of the once renowned Meyer-Schwickerath light

coagulator. The precision and safety of photothermal destruction methods depend, in the first approximation, upon the details of the pulse energy deposition (wavelength, pulse height and duration, pulse dynamics, mode composition, focussing), the choice of which is determined by the optical and thermal constants of the irradiated tissues. Higher pulse energies will, of course, be more effective in destroying neoplastic cells, but the risk of producing undesired collateral heat damage will also increase concomitantly. Until we can ascertain the physical properties of the pathological tissues treated with certainty, we will hardly be able to achieve more than an approximation of an ideal treatment strategy. But with increasing developments in in vivo-diagnostic techniques, we expect that this goal will be attainable in the not too distant future. Animals;Arteriovenous Malformations;Choroid Plexus Neoplasms;Humans;Laser Therapy;Models, Biological;Phototherapy;Pupil;Rabbits;Retinal Neoplasms;Sensitivity and Specificity

Low level laser therapy for osteoarthritis and rheumatoid arthritis: a metaanalysis. OBJECTIVE: Osteoarthritis (OA) and rheumatoid arthritis (RA) affect a large proportion of the population. Low level laser therapy (LLLT) was introduced as an alternative noninvasive treatment for RA and OA about 10 years ago, but its effectiveness is still controversial. We assessed the effectiveness of LLLT in the treatment of RA and OA. METHODS: A systematic review was conducted, following an a priori protocol, according to the methods recommended by the Cochrane Collaboration. Trials were identified by a literature search of Medline, Embase, and the Cochrane Controlled Trials Register. Only randomized controlled trials of LLLT for the treatment of patients with a clinical diagnosis of RA or OA were eligible. Thirteen trials were included, with 212 patients randomized to laser and 174 patients to placebo laser, and 68 patients received active laser on one hand and placebo on the opposite hand. Treatment duration ranged from 4 to 10 weeks. Followup was reported by only 2 trials for up to 3 months. RESULTS: In patients with RA, relative to a separate control group, LLLT reduced pain by 70% relative to placebo and reduced morning stiffness by 27.5 min (95% CI -52.0 to -2.9), and increased tip to palm flexibility by 1.3 cm (95% CI -1.7 to -0.8). Other outcomes such as functional assessment, range of motion, and local swelling were not different between groups. There were no significant differences between subgroups based on LLLT dosage, wavelength, site of application, or treatment length. In RA, relative to a control group using the opposite hand, there was no difference between control and treatment hand, but all hands were improved in terms of pain relief and disease activity. For OA, a total of 197 patients were randomized. Pain was assessed by 3 trials. The pooled estimate (random effects) showed no effect on pain (standardized mean difference -0.2, 95% CI -1.0 to +0.6), but there was statistically significant heterogeneity ($p > 0.05$). Other outcomes of joint tenderness, joint mobility, and strength were not significant. CONCLUSION: LLLT should be considered for short term relief of pain and morning stiffness in RA, particularly since it has few side effects. For OA, the results are conflicting in different studies and may depend on the method of application and other features of the LLLT. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this metaanalysis lacked data on how effectiveness of LLLT is affected by 4 factors: wavelength, treatment duration of LLLT, dosage, and site of application over nerves instead of joints. There is a need to investigate the effects of these factors on effectiveness of LLLT for RA and OA in randomized controlled clinical trials. Aged;Arthritis, Rheumatoid;Follow-Up Studies;Humans;Joints;Laser Therapy;Middle Aged;Osteoarthritis;Pain;Pain Measurement;Randomized Controlled Trials as Topic;Range of Motion, Articular;Treatment Outcome

Hypericin and photodynamic therapy decreases human pancreatic cancer in vitro and in vivo. BACKGROUND: The treatment of pancreatic cancer has remained dismal despite advances in medical and surgical care. Recent preclinical data have revealed that hypericin, a photochemical dye, is

activated by green light and generates toxic radical species in tumors. We hypothesized that interstitial hypericin and laser phototherapy would decrease pancreatic cancer growth. METHODS: MiaPaCa-2 and PANC-1 cells were grown in tissue culture. In vitro experiments were performed with addition of 10 microg of hypericin/500,000 cancer cells. Cells were incubated with hypericin for 2 h. Cells were then exposed to KTP532 green laser light for 1 min at 0.6 W using a cylindrical diffuser tip. Cell growth was measured by MTT assay 24 h after laser treatment, N = 12. MiaPaCa-2 cells were implanted subcutaneously and orthotopically in pancreas of nude mice. After 5 weeks, both tumors were injected with 100 microg of hypericin followed by insertion of a cylindrical diffuser tip into the tumor center. Mice received 200J KTP laser light at 1.0 W in two sites. Tumors were measured before and 4 weeks after laser treatment. RESULTS: Both in vitro and in vivo mice data showed a significant decrease in growth of pancreatic cancer. Pancreatic cancer cell growth was suppressed by 66.1 +/- 0.2%, n = 12, P < 0.01, ANOVA. Subcutaneous shoulder tumors were suppressed by 91.2 +/- 2.3%, n = 12, P < 0.001, and orthotopically grown pancreatic tumors were suppressed by 42.2 +/- 8.1%, n = 12, P < 0.05, compared to pretreatment sizes. Data expressed as percentage reduction vs paired controls in the MTT assay and vs pre-photodynamic therapy in mice experiments. Paired Student's t tests were performed vs pretreatment sizes. CONCLUSION: Both in vitro and in vivo results revealed a significant decrease in pancreatic cancer cell growth. Laser or dye alone had no effect, indicating that intratumor hypericin and laser therapy may prove useful in unresectable pancreatic cancer. Anthracenes;Antineoplastic Agents;Perylene;hypericin Animals;Anthracenes;Antineoplastic Agents;Humans;Mice;Mice, Nude;Pancreatic Neoplasms;Perylene;Photochemotherapy;Tissue Distribution;Tumor Cells, Cultured

Osteochondral lesion repair of the knee in the rabbit after low-power diode Ga-Al-As laser biostimulation: an experimental study. The purpose of this study was to evaluate whether low-power laser biostimulation of the osteo-chondral lesions of the knee could by itself reduce repair healing time. Surgery was performed on eighteen rabbits; a bilateral osteo-chondral lesion of 2.5mm in diameter and 2mm depth was created in the femoral medial condyle with a drill. The left knee of each animal was treated intraoperatively using the diode Ga-Al-As laser (780nm) with the following parameters: 300 Joules/cm2, 1 Watts, 300 Hertz, 10 minutes; the right knee was left untreated, as control group. The animals were divided into three groups, A, B and C, according to the survival time after surgery, two, six and twelve weeks, respectively. The explants from the femoral condyles, either treated employing laser energy or left untreated, were examined histomorphometrically. Results after laser treatment showed faster healing of the lesion at week 2 (p=0.043) and an overall improvement in cellular morphology (p=0.044), while a more regular aspect of the osteocartilaginous tissue was observed at week 12 (p=0.004). A relationship between laser biostimulation properties and healing of the osteo-chondral defect has been demonstrated. Gallium;Aluminum;Arsenic Aluminum;Animals;Arsenic;Bony Callus;Cartilage, Articular;Disease Models, Animal;Femur;Gallium;Knee Injuries;Laser Therapy;Male;Phototherapy;Rabbits;Wound Healing

Ventricular remodeling after acute myocardial infarction: effect of low-intensity laser irradiation. BACKGROUND AND OBJECTIVE: Low-intensity laser irradiation is claimed to enhance wound healing. Healing after myocardial infarction results in ventricular enlargement and wall thinning. If laser treatment accelerated cardiac healing, we speculated that ventricular remodeling would be attenuated. STUDY DESIGN/MATERIALS AND METHODS: In vitro, fibroblasts were irradiated for 1 minute twice a day for 4 days (5 mW; wavelength, 780 nm). One day after infarction, rats were randomly assigned to 5 or 10 mW transdermal irradiation twice a day for 4 days or to sham. One week after infarction, we measured the remodeling parameters; cavity volume, infarct thickness, and vascular structure, and the healing parameters; collagen content and inflammation. RESULTS: Laser-treated fibroblasts occupied more area than controls. Hearts receiving the 10 mW treatment had

smaller volumes than sham hearts. Laser treatment reduced infarct thinning and preserved arterial lumen area; however, collagen was not increased and inflammation was inhibited. CONCLUSIONS: Low-intensity irradiation attenuated infarct-associated remodeling. In contrast to expectations from in vitro study, these effects were not a result of enhanced healing. Collagen Animals;Cardiomegaly;Collagen;Coronary Vessels;Dose-Response Relationship, Radiation;Female;Fibroblasts;In Vitro Techniques;Inflammation;Laser Therapy;Myocardial Infarction;Random Allocation;Rats;Rats, Sprague-Dawley;Wound Healing

[Proliferative effect of low energy laser and colony stimulating factor on human umbilical cord blood hematopoietic cells]. OBJECTIVE: To study the proliferative effect of low energy laser on human cord blood hematopoietic cells in vitro and the relationship between the effect of low energy laser and colony stimulating factor (CSF). METHODS: Human umbilical cord blood hematopoietic cells were irradiated with copper vapour laser and cultured in vitro. The number of colony and cells was calculated. RESULTS: Laser irradiation synergized with CSF in expansion of cord blood hematopoietic cell. The GM-CFUc number from the group treated with irradiation plus CSF increased significantly as compared with that from other groups including laser irradiation or CSF treatment alone or control ($P < 0.01$). Reincubation of cord blood cells in the soft agar medium revealed that secondary colonies were formed and the absolute number of colony was obviously increased as compared with that before liquid culture. The number of colony in irradiation group was more than these of non-irradiation group. CONCLUSION: Low energy laser irradiation for cord blood stem cells is effective in vitro expansion of cord blood stem cells. Colony-Stimulating Factors Cell Division;Colony-Stimulating Factors;Fetal Blood;Hematopoietic Stem Cells;Humans;Infant, Newborn;Lasers

Ultrastructure of the blood and lymphatic capillaries of the respiratory tissue during inflammation and endobronchial laser therapy. For wide application of low-energy laser irradiation in the pulmonary clinic, study of the structural basis of the therapeutic effect is necessary. The aim of this research is to describe the structural changes of the blood and lymphatic capillaries in the respiratory tissues during inflammation and following laser biostimulation. Comparative ultrastructural study was carried out on 127 open respiratory biopsy specimens from 45 patients with infectious-destructive lung diseases. These patients were divided into two groups, depending on tactic of pre-operative therapy: patients treated by only traditional anti-inflammatory measures and patients receiving additional laser therapy. Heightened permeability of the blood capillary endotheliocytes was noted as the initial stage in the development of the inflammatory reaction. Intensification of the process of permeability is accompanied by interstitial edema, deformation of the interalveolar septa, and structural disorganization of alveolar epithelium cells. Local lesions of microcirculation result in tissue hypoxia and induce processes of fibrosis. Laser biostimulation promotes reversion of the inflammatory process and stabilizes fibroplastic processes. Basic principles of pathogenetic therapy were stated. It was shown that low-energy laser irradiation satisfies these requirements as an additional method in the therapy of destructive lung diseases. Acute Disease;Bronchi;Capillaries;Chronic Disease;Endothelium;Endothelium, Lymphatic;Endothelium, Vascular;Humans;Laser Therapy;Lung;Lung Abscess;Pulmonary Alveoli;Regeneration

Interventions for treating plantar heel pain. BACKGROUND: Ten percent of people may experience pain under the heel (plantar heel pain) at some time. Injections, insoles, heel pads, strapping and surgery have been common forms of treatment offered. The absolute and relative effectiveness of these interventions are poorly understood. OBJECTIVES: The objective of this review was to identify and evaluate the evidence for effectiveness of treatment in treating plantar heel pain. SEARCH STRATEGY: MEDLINE (from 1966 to December 1997), EMBASE and the Cochrane Library were searched. Three podiatry journals (The Foot, The Chiropodist (later The Journal of British Podiatric Medicine), and The British Journal of Podiatric Medicine) were handsearched. We contacted known

investigators in the field to identify unpublished data or research in progress. Non English language reports were excluded from the review. SELECTION CRITERIA: Randomised and quasi randomised trials of interventions for plantar heel pain in adults. DATA COLLECTION AND ANALYSIS: Two reviewers independently evaluated studies for inclusion, extracted data and assessed study quality. Additional information was obtained by direct contact with investigators. No poolable data were identified. Where measures of variance were available we have calculated the weighted mean differences based on visual analogue scale (VAS) scores. MAIN RESULTS: Eleven randomised trials involving 465 participants were included. Study quality was generally poor, and pooling of data was not possible. All studies measured a reduction in heel pain as the primary outcome. Seven trials evaluated interventions against placebo/dummy or no treatment. There was limited evidence for the effectiveness of topical corticosteroid, administered by iontophoresis in reducing pain. There was no evidence for the effectiveness of injected corticosteroid. There was limited evidence for the effectiveness of low energy extracorporeal shock wave therapy in reducing night pain, resting pain and pressure pain in the short term (12 weeks). In individuals with chronic pain (longer than six months), there was limited evidence for the effectiveness of dorsiflexion night splints in reducing pain. There was no evidence to support the effectiveness of therapeutic ultrasound, low-intensity laser therapy, exposure to an electron generating device or insoles with magnetic foil. No randomised trials evaluating orthotic devices, surgery, or radiotherapy against a control population were identified. There was limited evidence for the superiority of corticosteroid injections over orthotic devices. REVIEWER'S CONCLUSIONS: Although there is limited evidence for the effectiveness of local corticosteroid therapy, the effectiveness of other frequently employed treatments in altering the clinical course of plantar heel pain has not been established in comparative studies. Well designed and conducted randomised studies are required. Adrenal Cortex Hormones Adrenal Cortex Hormones;Adult;Electromagnetic Phenomena;Foot Diseases;Humans;Laser Therapy;Orthotic Devices;Pain Management;Pain Measurement;Randomized Controlled Trials as Topic;Ultrasonic Therapy

Low-power laser therapy for gastrointestinal neoplasia. The purpose of this study was to evaluate changes in the degree of neoplasia-induced stenosis and clinical symptoms before and after therapy with a contact low-power neodymium yttrium aluminum garnet (Nd:YAG) laser. Fifty patients with pathologically proven gastrointestinal (GI) neoplasia were studied; 21 with benign lesions and 29 with malignant tumors. The low-power contact Nd:YAG laser was applied toward the lesion, using an antegrade method as the scope was moved circumferentially and downward along the length of the lesions, step-by-step. The energy of the laser was 20W, with a duration of 1 to 2 min for each shot. Either the tumor was eradicated completely, or the neoplasia-induced stenosis was recanalized by laser via the endoscope. All benign lesions were completely remitted by laser therapy. The clinical symptoms in the 29 patients with malignant GI neoplasia showed a significant improvement ($P < 0.001$; Wilcoxon matched-pairs signed-rank test, one-tailed) after laser therapy in comparison with the symptoms before treatment. Malignant GI stenosis treated by laser resulted in recanalization in 93.1% of the 29 patients. Unfortunately, in 1 patient with gastric cancer, the disease progressively worsened after treatment. One of 3 patients with early cancer of the stomach who received laser therapy was found to have distant metastasis 2 years later. A patient with esophageal cancer developed an esophagobronchial fistula that was not a direct complication of the laser effect. Four patients with malignancies died of cancer progression during the 2 years of follow-up. We conclude that the low-power contact laser is a safe, convenient method for the treatment of both benign and malignant tumors. Patients with advanced obstructive lesions have a better quality of life after laser therapy. Neodymium;Yttrium Adult;Aged;Aged, 80 and over;Female;Gastrointestinal Neoplasms;Humans;Laser Therapy;Male;Middle Aged;Neodymium;Yttrium

Low-intensity laser therapy for recurrent herpes labialis. Herpes Labialis;Humans;Laser Therapy
Lack of effect of pulsed low-intensity infrared (820 nm) laser irradiation on nerve conduction in the human superficial radial nerve. BACKGROUND AND OBJECTIVE: To investigate the effect of pulsed low-intensity laser irradiation on nerve conduction in the human superficial radial nerve and on temperature in the skin overlying the nerve. STUDY DESIGN/MATERIALS AND METHODS: Thirty-two healthy human volunteers were recruited and randomly assigned to either placebo, laser 1 (9.12 Hz), laser 2 (73 Hz), or control groups (n = 8 all groups). A GaAlAs laser diode (820 nm, 50 mW peak) was used to irradiate the skin overlying the right superficial radial nerve at three points (1.2 J per point; energy density, 9.55 J/cm(2)). Antidromic action potentials were recorded from the superficial radial nerve preirradiation and at 5, 10, and 15 minutes after irradiation. Skin temperature was monitored concomitantly by using two surface thermistor probes attached to the skin overlying the nerve. RESULTS: Repeated measures analysis of variance showed no significant differences between groups for negative peak latency nor skin temperature data after laser irradiation. CONCLUSION: This study has demonstrated that laser irradiation at the radiant exposure and pulsing parameters indicated did not produce any specific neurophysiologic effects in this model of nerve function. Action Potentials;Adult;Analysis of Variance;Humans;Laser Therapy;Lasers;Neural Conduction;Radial Nerve;Skin Temperature
Laser modulation of angiogenic factor production by T-lymphocytes. BACKGROUND AND OBJECTIVE: In previous investigations, small variations in the energy densities of low level light therapy (LLLT) were found to produce significant differences in the proliferation of resting T-lymphocytes in vitro. Pulsing these cells with mitogen in addition to laser therapy produced inhibitory effects regardless of the amplitude of the energy density used. In the current study, the effect of LLLT on the production of angiogenic factor(s) by T-lymphocytes was investigated in vitro. STUDY DESIGN/MATERIALS AND METHODS: Human T-cells isolated from peripheral blood were prepared in suspension either with or without addition of mitogen. Cell suspensions were irradiated with laser by using the following energy densities: 1.2, 3.6, 6.0, and 8.4 J/cm(2). Wavelength, pulsing frequency, and power output were kept constant at 820 nm, 5,000 Hz, and 50 mW, respectively. After either 3 or 5 days of incubation, lymphocyte supernatants were collected and added as conditioned media to cultured endothelial cells (ECs). The effect on the proliferation of these ECs was assessed over a 72-hour period by using a methylene blue assay. RESULTS: Endothelial cell proliferation increased significantly when incubated with conditioned media collected from resting T-cells exposed to 1.2 and 3.6 J/cm(2). Day 5 conditioned media produced similar patterns of EC proliferation to that of day 3 but at lower magnitude. Pulsing of T-lymphocytes with mitogen in addition to laser irradiation significantly lessened their angiogenic capability. Conditioned media from 3.6 J/cm(2) laser-treated T-cells induced the maximal EC proliferation in all groups studied. CONCLUSION: It would seem that laser therapy stimulates lymphocytes to produce factor(s) that can modulate EC proliferation in vitro; this effect on the lymphocytes is influenced by (1) the amplitude of energy density used for T-cell irradiation, (2) exposing T-cells to both mitogen and laser, and (3) the duration of T-cell incubation in culture. Angiogenesis Inducing Agents;Coloring Agents;Culture Media, Conditioned;Mitogens;Methylene Blue Angiogenesis Inducing Agents;Animals;Cattle;Cell Division;Cells, Cultured;Coloring Agents;Culture Media, Conditioned;Endothelium, Vascular;Humans;Lasers;Lymphocyte Activation;Methylene Blue;Mitogens;Phototherapy;Statistics as Topic;T-Lymphocytes;Time Factors
Laser therapy for venous leg ulcers. OBJECTIVES: To assess the effectiveness of low level laser therapy in the treatment of venous leg ulcers. SEARCH STRATEGY: Searches of 19 databases, hand searching of journals and conference proceedings from 1948 onwards, and examination of

bibliographies. SELECTION CRITERIA: Randomised controlled trials comparing low level laser therapy with: sham laser; no laser; non-coherent light. There was no restriction on date or language. The main outcome measure used was complete healing of the ulcers. DATA COLLECTION AND ANALYSIS: Data extraction was done by one reviewer and checked by a second. Meta analysis was used to combine the results of trials where the interventions and outcome measures were sufficiently similar. MAIN RESULTS: There were 4 eligible trials. Two RCTs compared laser therapy with sham, 1 with ultraviolet therapy and 1 with non-coherent, unpolarised red light. Neither of the two RCTs comparing laser with sham found a significant difference in healing rates; there was no significant of laser evident when the trials were pooled. A three-arm study compared: - laser therapy alone - laser therapy plus infrared light - non-coherent, unpolarised red light. Significantly more ulcers completely healed in the group receiving a combination of laser and infrared light compared with non-coherent, unpolarised red light. A fourth trial compared laser and ultraviolet light and found no difference. REVIEWER'S CONCLUSIONS: We have found no evidence of any benefit associated with low level laser therapy on venous leg ulcer healing. One small study suggests that a combination of laser and infrared light may promote the healing of venous ulcers, however more research is needed. Humans;Infrared Rays;Laser Therapy;Leg Ulcer

Low level laser therapy (classes I, II and III) in the treatment of rheumatoid arthritis.
BACKGROUND: Rheumatoid arthritis (RA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) was introduced as an alternative non-invasive treatment for RA about 10 years ago. LLLT is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. The effectiveness of LLLT for rheumatoid arthritis is still controversial. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of RA. SEARCH STRATEGY: We searched MEDLINE, EMBASE, the registries of the Cochrane Musculoskeletal group and the field of Rehabilitation and Related Therapies as well as the Cochrane Controlled Trials Register up to January 30, 2000. SELECTION CRITERIA: Following an a priori protocol, we selected only randomized controlled trials of LLLT for the treatment of patients with a clinical diagnosis of RA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently select trials for inclusion, then extracted data and assessed quality using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. MAIN RESULTS: A total of 204 patients were included in the five placebo-controlled trials, with 112 randomized to laser therapy. Relative to a separate control group, LLLT reduced pain by 70% relative to placebo and reduced morning stiffness duration by 27.5 minutes (95%CI: 2.9 to 52 minutes) and increased tip to palm flexibility by 1.3 cm (95% CI: 0. 8 to 1.7 cm). Other outcomes such as functional assessment, range of motion and local swelling did not differ between groups. There were no significant differences between subgroups based on LLLT dosage, wavelength, site of application or treatment length. For RA, relative to a control group using the opposite hand, there was no difference between the control and treatment hand, but all hands improved in terms of pain relief and disease activity. REVIEWER'S CONCLUSIONS: In summary, LLLT for RA is beneficial as a minimum of a four-week treatment with reductions in pain and morning stiffness. On the one hand, this meta-analysis found that pooled data gave some evidence of a clinical effect, but the outcomes were in conflict, and it must therefore be

concluded that firm documentation of the application of LLLT in RA is not possible. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. Arthritis, Rheumatoid;Humans;Laser Therapy

Low level laser therapy (classes I, II and III) for the treatment of osteoarthritis. BACKGROUND: Osteoarthritis (OA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment for OA about 10 years ago, but its effectiveness is still controversial. OBJECTIVES: To assess the effectiveness of LLLT in the treatment of OA. SEARCH STRATEGY: We searched MEDLINE, EMBASE, the Cochrane Musculoskeletal registry, the registry of the Rehabilitation and Related Thereapies field and the Cochrane Controlled Trials Register up to January 30, 2000. SELECTION CRITERIA: Following an a priori protocol, only controlled clinical trials of LLLT for the treatment of patients with a clinical diagnosis of OA were eligible. Abstracts were excluded unless further data could be obtained from the authors. DATA COLLECTION AND ANALYSIS: Two reviewers independently selected trials and abstracted data using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. MAIN RESULTS: Five trials were included, with 112 patients randomized to laser, 85 patients to placebo laser. Treatment duration ranged from 4 to 10 weeks. Pain was assessed by four trials. The pooled estimate (random effects) of three trials showed no effect on pain measured using a scale (SMD: -0.2, 95% CI: -1.0, +0.6), but there was statistically significant heterogeneity (p>0,05). Two of the trials showed no effect and one demonstrated very beneficial effects with laser. In another trial, with no scale-based pain outcome, significantly more patients reported pain relief (yes/no) with laser with an odds ratio of 0.05, (95% CI: 0.0 to 1.56). Other outcomes of joint tenderness, joint mobility and strength were not significant. REVIEWER'S CONCLUSIONS: For OA, the results are conflicting in different studies and may depend on the method of application and other features of the LLLT application. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints. There is clearly a need to investigate the effects of these factors on LLLT effectiveness for OA in randomized controlled clinical trials. Humans;Laser Therapy;Osteoarthritis

Transpupillar laser phototherapy for retinal and choroidal tumors: a rational approach. BACKGROUND: The physical laws are considered that need to be taken into account for optimal photothermal treatment of solid and vascular tumors, as well as other vascular anomalies of various etiology of the retina and choroid. Optimal irradiation therapy should take into account the distribution of both radiant and thermal energy in tumors, such as retinoblastomas, malignant melanomas and vascular malformations. Strict confinement of the extent of photothermal damage is

critical since such pathological entities are frequently located close to the macula or optic nerve head. METHODS: A formal treatment of the optical quantities related to these requirements is presented. In this analysis we emphasize the following topics: Arrhenius' law, the kinetics of protein denaturation, the electromagnetic radiation field, wavelength, laser pulse duration (exposure time), optical properties of tissue, photocoagulation and thermotherapy. RESULTS: Generally, the conditions are best fulfilled when using radiation in the near-infrared range of the electromagnetic spectrum, such as that emitted from the diode (810 nm) and Nd:YAG (1064 nm) laser, because of the good optical penetration properties of this radiation in tissue. The xenon arc lamp was a very effective and particularly appropriate energy source for such purposes, and its withdrawal from the world market may have been untimely. Short wavelength sources of radiation, such as the argon ion (488, 514 nm) or the frequency-doubled Nd:YAG (532 nm) laser, are unsuitable for the irradiation of large vascular structures, as they have poor penetration depths. However, for vascular formations with a short path length (1 mm or less), short wavelength sources appear to be the most appropriate choice. Optical coupling of radiant energy to the eye by means of indirect ophthalmoscopic systems or contact lenses to the eye is crucial. Strong positive lenses may lead to severe constriction of the laser beam which leads to high irradiance within the anterior segment, increasing the chances of it being damaged; with negative contact lenses, such as the -64 D Goldmann type, this danger is reduced. CONCLUSIONS: Photothermotherapy is not without risk unless the temperature field can be well adapted to the tumorous structure, as temperature elevations outside a small therapeutic range that affect vital structures are considered to be a risk factor. Absorption;Animals;Body Temperature;Choroid Neoplasms;Hot Temperature;Hyperthermia, Induced;Lasers;Light;Phototherapy;Physical Phenomena;Physics;Pupil;Rabbits;Retinal Neoplasms

Sports and other soft tissue injuries, tendinitis, bursitis, and occupation-related syndromes. This review highlights three areas: plantar fasciitis, Achilles tendinitis, and carpal tunnel syndrome. The diagnosis and treatment of plantar fasciitis are reviewed; nonsurgical treatments remain the mainstay of management. Several recent articles support the use of night splints. Some novel treatments recently investigated, including low intensity laser irradiation and extracorporeal shock wave lithotripsy, are reviewed, as well as the effectiveness of steroid injection. Novel treatments for Achilles tendinitis are also reviewed, including the use of injection therapy and the treatment approach of one author for the management of Achilles tendon rupture. Nonsurgical techniques in the treatment of carpal tunnel syndrome, such as yoga, ultrasound, noninvasive laser neurolysis, manipulation, nerve and tendon gliding exercises, and medications, are reviewed. Prednisolone was shown to be effective in the treatment of mild to moderate disease and nonsteroidal anti-inflammatory drugs were found to be ineffective. Athletic Injuries;Bursitis;Humans;Occupational Diseases;Soft Tissue Injuries;Tendinopathy

Rapid healing of gingival incisions by the helium-neon diode laser. Fifty-eight extraction patients had one of two gingival flap incisions lased with a 1.4 mw helium-neon (670 nm) diode laser for 30 seconds (fluence = 0.34 J/cm2). Healing rates were evaluated clinically and photographically. Sixty-nine percent of the irradiated incisions healed faster than the control incisions. No significant difference in healing was noted when patients were compared by age, gender, race, and anatomic location of the incision. This study concludes that helium-neon diode lasers, at the previously mentioned energy level, increase the rate of gingival wound healing in 69 percent of patients, without any side effects. For the last 30 years, low-power lasers in dentistry have appeared to stimulate healing rates and increase the rate of repair of injured tissue. Helium-neon and similar lasers emit light in the red (600-700 nm) spectrums and produce energy densities (fluences) below 20 Joules/cm2. They have been studied in a variety of animal tissue culture and human evaluations to determine their ability to increase the rates of wound healing by biostimulation. Over the last three

decades, researchers have found that ruby and gas helium-neon (low-power laser radiation) have a biostimulatory effect on living tissue. Studies show that under specific conditions, red spectrum laser light speeds the healing of wounds. Photons from the red light lasers, which include ruby lasers (694 nm), helium-neon gas lasers (632 nm), and helium-neon diode lasers (650-670 nm), appear to stimulate rapid epithelialization and fibroblast (collagen) proliferation in animal and human tissue cultures. Low-power lasers have been reported to reduce post-extraction pain and swelling and to increase rates of wound healing (including scar formation, phagocytosis) in cell culture, animal, and human clinical studies. The new, compact, and inexpensive (under $50) helium-neon diode lasers have produced similar effects. These FDA Class IIIa lasers have no hazards associated with them, although one should avoid direct exposure to the eye for a prolonged period of time. In the past, many biostimulation studies using red spectrum lasers produced confusing data and conflicting results. Some studies reported that the biostimulation effect did not occur in all cases of laser irradiation, while other research reported that it did. Results seem to depend on the delivery of appropriate energy fluence levels (between 1 and 20 J/cm2) and the type of laser (wavelength) used. Several of these studies never described the levels of laser energy used to promote the described biostimulatory results. This caused controversy when determining whether or not helium-neon lasers influence wound healing. Studies suggest that low-power laser exposure can significantly increase the healing rate during the first few days of the healing process; however, studies do not show appreciable net benefit as compared to controls toward the end of a two-week wound repair cycle. The increased healing effect appears to be centered around the early, most sensitive stages of the healing process. Several studies showed optimum tissue healing rates at helium-neon laser exposure levels between 1 J/cm2 and 20 J/cm2. Laser-enhanced biostimulation has been reported to produce metabolic changes within the cells. This results in faster cell division, rapid matrix production (increased collagen, myofibroblasts, etc.), and cell movement. There have been few controlled studies using adequate numbers of human subjects in identifying the beneficial effects of helium-neon laser biostimulation. Ethical concerns, bulky equipment, and problems with biased study designs have frustrated a practical evaluation of laser biostimulation for general dental practice. A recently published "preliminary" study involving 52 patients was designed to reduce these issues. The purpose of this study is to complement the above research and to evaluate whether helium-neon diode laser radiation at average fluences of 0.34 J/c Helium;Neon Adult;Aged;Aged, 80 and over;Analysis of Variance;Female;Gingiva;Helium;Humans;Laser Therapy;Male;Middle Aged;Neon;Tooth Extraction;Wound Healing

Effects of low-energy laser irradiation on bone remodeling during experimental tooth movement in rats. BACKGROUND AND OBJECTIVE: Low-energy laser irradiation has many anabolic effects such as the acceleration of bone formation. However, its effects on tooth movement, performed by bone resorption and formation, have not been well characterized. STUDY DESIGN/MATERIALS AND METHODS: A total of 10 g of orthodontic force was applied to rat molars to cause experimental tooth movement. A Ga-Al-As diode laser was used to irradiate the area around the moved tooth, and after 12 days, the amount of tooth movement was measured. Calcein was injected subcutaneously to label the newly formed alveolar bone for quantitative analysis. Immunohistochemical staining of proliferating cell nuclear antigen was performed to evaluate cellular proliferation. TRAPase staining was also performed to facilitate the identification of osteoclasts. RESULTS: In the laser irradiation group, the amount of tooth movement was significantly greater (1. 3-fold) than that of the nonirradiation group in the end of the experiment. The amount of bone formation and rate of cellular proliferation in the tension side and the number of osteoclasts in the pressure side were all significantly increased in the irradiation group when compared with the nonirradiation group ($P < 0.01$). CONCLUSION: These findings suggest that low-energy laser irradiation can accelerate tooth

movement accompanied with alveolar bone remodeling. Alveolar Process;Animals;Bone Remodeling;Immunohistochemistry;Laser Therapy;Lasers;Male;Molar;Rats;Rats, Wistar;Time Factors;Tooth Movement Techniques

Biostimulation of human chondrocytes with Ga-Al-As diode laser: 'in vitro' research. The aim of this study was to verify the effects of laser therapy performed with Ga-Al-As Diode Lasers (780 nm, 2500 mW) on human cartilage cells in vitro. The cartilage sample used for the biostimulation treatment was taken from the right knee of a 19-year-old patient. After the chondrocytes were isolated and suspended for cultivation, the cultures were incubated for 10 days. The cultures were divided into four groups. Groups I, II, III were subject to biostimulation with the following laser parameters: 300 J, 1 W, 100 Hz, 10 min. exposure, pulsating emission; 300 J, 1 W, 300 Hz, 10 min. exposure, pulsating emission; and 300 J, 1 W, 500 Hz, 10 min. exposure, pulsating emission, respectively. Group IV did not receive any treatment. The laser biostimulation was conducted for five consecutive days. At the end of the treatment, the Calcium, Alkaline Phosphate, MTT tests and proteoglycan were performed to assess cell metabolism and toxicity level. The data showed good results in terms of cell viability and levels of Ca and Alkaline Phosphate in the groups treated with laser biostimulation compared to the untreated group. The results obtained confirm our previous positive in vitro results that the Ga-Al-As Laser provides biostimulation without cell damage. Antibodies;Tritium;Collagen;Gallium;Aluminum;Alkaline Phosphatase;Arsenic;Calcium;Thymidine Adult;Alkaline Phosphatase;Aluminum;Antibodies;Arsenic;Calcium;Cartilage;Cell Count;Chondrocytes;Collagen;Gallium;Humans;Knee;Lasers;Microscopy;Thymidine;Tritium

Low intensity laser irradiation in the treatment of recalcitrant radiation ulcers in patients with breast cancer--long-term results of 3 cases. Radiotherapy can be followed by recalcitrant skin ulcers. As low intensity laser irradiation has been demonstrated to have a beneficial effect on impaired wound healing, we investigated its efficacy and safety in three patients with chronic radiation ulcers. The three patients, previously mastectomized due to breast cancer, with recalcitrant radiation ulcers of the skin were treated with a 30 mW helium-neon laser (wavelength: 632.8 nm, intensity: 3 mW/cm2, dose: 30 J/ cm2) three times weekly. In all patients, complete wound closure was achieved within a period of 7, 5, and 8 weeks. One patient died 6 weeks after laser treatment due to tumor cachexia. Neither of the other patients showed recurrence of radiation ulcers or neoplasm during a follow-up of 36 months. Low intensity helium-neon laser irradiation has been shown to be effective in the induction of wound healing in radiotherapy-induced ulcers in three patients with breast cancer. Adult;Breast Neoplasms;Female;Humans;Laser Therapy;Middle Aged;Radiation Injuries;Radiotherapy Dosage;Skin Ulcer

Inhibitory effect of low-level laser irradiation on LPS-stimulated prostaglandin E2 production and cyclooxygenase-2 in human gingival fibroblasts. It has been reported that lipopolysaccharide (LPS) from periodontal pathogens can penetrate gingival tissues and stimulate the production of prostaglandin E2 (PGE2), which is known as a potent stimulator of inflammation and bone resorption. Although biostimulatory effects of low-level laser irradiation such as anti-inflammatory results have been reported, the physiological mechanism is not yet clarified. The purpose of the present study was to determine the effect of laser irradiation on PGE2 production and cyclooxygenase (COX)-1 and COX-2 gene expression in LPS-challenged human gingival fibroblast (hGF) cells in vitro. hGF cells were prepared from healthy gingival tissues and challenged with LPS, and Ga-Al-As diode laser was irradiated to the hGF cells. The amount of PGE2 released in the culture medium was measured by radioimmunoassay, and mRNA levels were analyzed by reverse transcriptase-polymerase chain reaction (RT-PCR). Irradiation with Ga-Al-As diode low-level laser significantly inhibited PGE2 production in a dose-dependent manner, which led to a reduction of COX-2 mRNA levels. In conclusion, low-level laser irradiation inhibited PGE2 by LPS in hGF cells through a reduction of COX-2

mRNA level. The findings suggest that low-level laser irradiation may be of therapeutic benefit against the aggravation of gingivitis and periodontitis by bacterial infection. Isoenzymes;Lipopolysaccharides;Membrane Proteins;RNA, Messenger;Cyclooxygenase 1;Cyclooxygenase 2;PTGS1 protein, human;PTGS2 protein, human;Prostaglandin-Endoperoxide Synthases;Dinoprostone Analysis of Variance;Cells, Cultured;Child;Cyclooxygenase 1;Cyclooxygenase 2;Dinoprostone;Dose-Response Relationship, Radiation;Enzyme Induction;Fibroblasts;Gene Expression;Gingiva;Humans;Isoenzymes;Lasers;Lipopolysaccharides;Membrane Proteins;Prostaglandin-Endoperoxide Synthases;RNA, Messenger;Reverse Transcriptase Polymerase Chain Reaction

[Therapeutic manipulation of episodic tension type headache. A randomized, controlled clinical trial]. In a randomized controlled clinical trial, 75 subjects fulfilling the IHS criteria for episodic tension-type headache were treated for four weeks. One group received spinal manipulation plus soft tissue therapy in the neck, the other received soft tissue therapy plus low-power laser therapy to the same region. In the three month follow-up period both groups showed significant improvement, but there were no differences between the groups. Thus, spinal manipulation had no effect on episodic tension-type headache, in contrast to the significant effect of spinal manipulation which has previously been demonstrated in cases of cervicogenic headache. These two headaches should therefore be diagnostically differentiated in the future. Adult;Cervical Vertebrae;Female;Humans;Male;Manipulation, Spinal;Middle Aged;Neck Muscles;Tension-Type Headache;Treatment Outcome

Effect of low-intensity laser irradiation (660 nm) on a radiation-impaired wound-healing model in murine skin. BACKGROUND AND OBJECTIVE: The use of low-intensity laser therapy (LILT) as a therapeutic modality has become popular in a variety of clinical applications including the promotion of wound repair. Although the clinical evidence base for such application remains sparse, recent studies have demonstrated a number of quantifiable photobiological effects associated with such therapy. In the present study, the effect of laser irradiation at various radiant exposures on a radiation-impaired wound-healing model in murine skin was investigated. STUDY DESIGN/MATERIALS AND METHODS: The study included two phases; in phase one, male Balb/c mice (n = 36; age-matched at 10 weeks) were randomly allocated to three experimental groups (n = 12, each group). In all groups, a well-defined area on the dorsum was exposed to 20 Gy x-rays. Seventy-two hours postirradiation, all mice were anaesthetised and a 7 x 7 mm area wound was made on the dorsum. All wounds were videotaped alongside a marker scale (three times weekly) until closure was complete. In groups 2 and 3, mice were treated with laser irradiation (0.5 and 1.5 J/cm(2), respectively) three times weekly by using a 660-nm GaAlAs laser unit (5 kHz; 15 mW; Omega Laser Systems, London, UK). Wound areas were then calculated by using an image analysis system (Fenestra 2.1), and results were analyzed by using repeated measures and one-factor analysis of variance statistical tests. In phase two, two experimental groups were included (n = 12 each group); the protocol was identical to that described for phase 1; however, mice in group 2 were treated with a radiant exposure of 4 J/cm(2). RESULTS: Results from this investigation demonstrated that treatment with 0.5, 1.5. and 4 J/cm(2) had no beneficial effect on the rate of wound closure ($P > 0.05$). CONCLUSION: These findings provide little evidence of the putative stimulatory effects of LILT in vivo at the parameters investigated. Animals;Dermatologic Surgical Procedures;Lasers;Male;Mice;Mice, Inbred BALB C;Radiation Dosage;Skin;Time Factors;Wound Healing

Low level laser therapy wound treatment update. Humans;Laser Therapy;Lasers;Ulcer;Wounds and Injuries

Reduction of Plasminogen Activator Activity Stimulated by Lipopolysaccharide from Periodontal Pathogen in Human Gingival Fibroblasts by Low-energy Laser Irradiation. Human gingival fibroblasts (hGF) reside in gingival tissues which are challenged frequently by oral bacteria. Lipopolysaccharide (LPS) from periodontal pathogens can penetrate gingival tissues and stimulate plasminogen activator (PA) activity which is implicated in the PA/plasmin proteolytic system. The PA/plasmin system plays an important role in the degradation of the extracellular matrix and synthesis of kinin in the process of inflammation. Anti-inflammatory effects by low-energy laser irradiation have been reported. However, the mechanisms of biostimulatory effects have not been elucidated in detail. The primarily cultured hGF cells were challenged with LPS isolated from Campylobacter rectus which was known as a periodontal pathogen and Ga-Al-As diode low energy laser was irradiated (830â€‰nm, 7.90â€‰J/cm(2)). The cultured medium of hGF cells showed a marked elevation in PA activity by LPS, which was significantly inhibited by the laser irradiation in a dose-dependent manner. This effect was involved in the reduction of tPA mRNA levels.

[Effect of the low intensity laser irradiation on the cell]. Calcium Channels Adipose Tissue;Animals;Calcium Channels;Cell Degranulation;Cell Membrane;In Vitro Techniques;Intestine, Small;Lasers;Rats;Rats, Wistar

Radioadaptation in Indian muntjac fibroblast cells induced by low intensity laser irradiation. Earlier reports have indicated that an adaptive, protective response to ionizing radiation is inducible by pre-treatment with low intensity laser irradiation (LILI). We have investigated the potential of LILI to induce an adaptive response against the damaging effects of ionizing radiation in Indian muntjac fibroblasts. LILI at 660, but not 820 nm, at 11.5 and 23.0 J/cm2, induced an apparent adaptive response in the form of a reduction in the frequency of radiation-induced chromosome aberrations, but not in cell survival. There was also a trend towards a reduction in the level of single-stranded and double-stranded DNA breaks induced by ionizing radiation when cells were preconditioned with LILI. However, this did not contribute to the reduced chromosome aberration frequency. Further analysis revealed that the reduced aberration frequency was caused by a laser-induced extension of G2 delay. The adaptive response was therefore the result of cell cycle modulation by LILI, at a wavelength where there is no known DNA damaging effect to induce the checkpoint mechanisms that are normally responsible for altering cell cycle progression. Okadaic Acid Animals;Cell Cycle;Cell Survival;Cells, Cultured;Chromosome Aberrations;Comet Assay;DNA Damage;Deer;Dose-Response Relationship, Radiation;Fibroblasts;Lasers;Okadaic Acid;Radiation Tolerance

The low-power laser in the treatment of tinnitus. The purpose of this study was to evaluate the low-power laser on the treatment of tinnitus. In a randomized, prospective, double-blind, placebo-controlled trial, either active or placebo low-power laser irradiation was given through the external acoustic meatus of the affected ear towards the cochlea. The active laser applied 50 mW (cw, 830 nm) over a period of 10 min per session. Forty-nine patients with severe, chronic uni- or bilateral tinnitus were studied. The main outcome was measured using psychoacoustical match of tinnitus loudness and pitch, Visual Analogue Scale (VAS) ratings of subjective loudness, annoyance and attention involved, scores on the Tinnitus Handicap Inventory (THI), the Tinnitus Coping Style Questionnaire (TCSQ), and a number of psychosocial questionnaires. The results showed only moderate (18%) subjective improvement with no statistically significant differences between the effects of the active laser and placebo treatments. Also, there were no statistically significant differences in prepost measurements of tinnitus loudness, VAS scores, THI scores, or TCSQ scores for patients treated with active laser compared with those treated with placebo. We conclude that low-power laser treatment is not indicated in the treatment of tinnitus. Reports of significant benefits of this treatment in previous, mostly uncontrolled or single-blinded studies may be explained by the placebo effect. Adaptation, Psychological;Adult;Aged;Attitude to Health;Double-Blind

Method;Female;Humans;Laser Therapy;Male;Middle Aged;Personality Tests;Surveys and Questionnaires;Tinnitus;Treatment Outcome

Low-intensity laser therapy is an effective treatment for recurrent herpes simplex infection. Results from a randomized double-blind placebo-controlled study. Recurrent infection with herpes simplex virus is a common disease. Recently, alternative therapies have been introduced. Among those, low-intensity laser therapy mainly used for the acceleration of wound healing and in pain therapy has previously been shown to be of benefit in herpes zoster infections. In this study we evaluated the influence of low-intensity laser therapy (wavelength 690 nm, intensity: 80 mW per cm2, dose: 48 J per cm2) in 50 patients with recurrent perioral herpes simplex infection (at least once per month for more than 6 mo) in a randomized, double-blind placebo-controlled trial design. Patients in the laser group received daily irradiations for 2 wk, whereas patients in the placebo group were sham-irradiated. After completion of the laser/sham treatment, patients were asked to return to the Department of Dermatology, University of Vienna Medical School at the time of recurrence. All except two patients completed the study and were monitored for 52 wk. The median recurrence-free interval in the laser-treated group was 37.5 wk (range: 2-52 wk) and in the placebo group 3 wk (range: 1-20 wk). This difference was found to be statistically significant ($p < 0.0001$; Wilcoxon's Rank Sum Test). In conclusion, we demonstrated that a total of 10 irradiations with low-intensity laser therapy significantly lowers the incidence of local recurrence of herpes simplex infection. Since this athermic phototherapeutic modality represents a safe, noninvasive treatment, it might be considered as an alternative to established therapeutic regimens in this indication. Placebos Adult;Double-Blind Method;Female;Herpes Simplex;Humans;Laser Therapy;Lip;Male;Middle Aged;Placebos;Recurrence;Treatment Outcome

Application of low intensity laser radiation in extravasal infiltrates caused by cytostatics in children with acute leukemia. Application of low intensity laser radiation in the field of infantile oncohematology has not been discussed in the available medical literature. The possible adverse effect of the physical factors on the main disease and the controversial character of their application prevent their being used in the treatment of these diseases. The aim of the present study was to assess the feasibility of using low intensity laser radiation (LILR) in treating extravasal infiltrates caused by cytostatics (vincristin, daunorubicin) administered in children with acute leukaemia (AL). We applied laser therapy in a group of children with AL in the stage of exacerbation. The children were undergoing chemotherapy with cytostatics. Immediately after formation of the extravasal infiltrates the constant leaders in the venous duct were removed and low intensity laser therapy with LMS "Prometheus" was administered. This apparatus is a semi-conducting soft laser in the infrared spectrum (890-910 nm wavelength, depth of penetration 25-30 mm) working in an impulse mode. We used minimal doses in the range of the anti-inflammatory enthrophic frequencies. We found that the extravasal infiltrates rapidly decreased the local inflammatory response and the pain was relieved. The strong anti-inflammatory effect can be accounted for by the nonspecific action of the LIRR on the tissues, which is manifested by better microcirculation, removal of toxic substances and stimulated regeneration capabilities of the cells. This study is an attempt to work successfully in this very delicate field of the contemporary medicine despite the abstention from using it before. Antineoplastic Agents;Vincristine;Daunorubicin Acute Disease;Antineoplastic Agents;Child;Child, Preschool;Daunorubicin;Granuloma;Humans;Lasers;Leukemia;Vincristine

Interstitial laser hyperthermia, a new method in the management of fibroadenoma of the breast: A pilot study. BACKGROUND AND OBJECTIVE: This study attempts to evaluate the effect of interstitial laser hyperthermia in breast fibroadenomas as an outpatient procedure. STUDY DESIGN/MATERIALS AND METHODS: In an uncontrolled prospective study, 27 patients younger than 35 years were subjected to laser phototherapy of their breast fibroadenomas. Under real-time

ultrasound monitoring, Nd:YAG laser (1,064 nm wavelength) was used at 2 W for 300 sec (600 J) in a continuous wave mode to produce interstitial hyperthermia. Follow-ups were done at 2, 4, and 8 weeks. Subsequently, excision biopsy of residual lumps was performed. RESULTS: There was significant decrease in clinical and sonographic sizes ($P < 0.001$). Follow-up ultrasound showed a progressive change of hyperechoic texture, from a heterogeneous to a nearly homogeneous one. There were minimal scars (2-3 mm) and no keloid or abscess formation. CONCLUSION: Interstitial laser hyperthermia is a safe, precise, and minimally invasive outpatient procedure for in situ destruction of breast fibroadenomas. Adolescent;Adult;Breast Neoplasms;Female;Fibroadenoma;Humans;Hyperthermia, Induced;Laser Therapy;Phototherapy;Pilot Projects;Prospective Studies;Treatment Outcome;Ultrasonography

Clinical efficacy of low power laser therapy in osteoarthritis. BACKGROUND AND PURPOSE: Of the various physical interventions used to relieve the symptoms of osteoarthritis (OA), a common degenerative joint disease causing considerable pain and disability, low power laser therapy has been reported to be extremely successful in Russia and Eastern Europe. METHOD: Although the overall number of studies was small, this literature review and analysis highlights the relevant controlled clinical trials and related basic research in English-language publications. This review indicates that, despite their shortcomings, the six studies analysed did report post-treatment improvements in a variety of osteoarthritic problems, including pain, mobility, tenderness and function, with few adverse effects. Possible mechanisms documented for the observed results included peripheral nerve stimulation, resolution of inflammation, enhanced chondrocyte proliferation and increased matrix synthesis. CONCLUSION: Not all studies were affirmative and few detailed how reliable their measurements were. Clearly, much more work is needed in this area. Humans;Laser Therapy;Osteoarthritis;Treatment Outcome

Ultrastructural study of the destructive and repair processes in pulmonary inflammation and following endobronchial laser therapy. Examination of 127 biopsy specimens from 45 patients with inflammatory lung diseases showed changes consistent with increased permeability of the capillary endothelial cells as an initial stage in the development of the inflammatory reaction. Associated interstitial oedema, deformation of the interalveolar septa, and structural disorganization of alveolar epithelium cells occur, and local microcirculatory problems result in tissue hypoxia and fibrosis. The ultimate morphological picture is determined largely by the intensity of repair. Laser biostimulation minimizes the inflammation and stabilizes fibroplastic process. Bronchi;Fibrosis;Humans;Inflammation;Laser Therapy;Lung;Lung Abscess;Lung Diseases;Microscopy, Electron;Photic Stimulation;Pulmonary Alveoli

Low-intensity laser therapy for benign fibrotic lumps in the breast following reduction mammaplasty. BACKGROUND AND PURPOSE: Fibrotic masses in the breast secondary to fat necrosis or hematoma are a complication of breast reduction mammaplasty. The treatment commonly recommended for this condition is early surgical debridement of necrotic tissue from the entire area, which causes scarring. This case report describes the use of low-intensity laser therapy for fibrotic lumps following reduction mammaplasty. CASE DESCRIPTION: The patient was a 46-year-old woman who had breast reduction surgery 80 days prior to referral for physical therapy. At the time of referral, the largest mass was 8.0 cm in diameter. The patient reported pain and said she was distressed about the breast disfigurement. Laser irradiation was initiated at an energy density (ED) of 20 J/cm2 and a pulse repetition rate of 5,000 pulses per second. The laser settings were adjusted during the 8-month treatment period. The final ED was 50 J/cm2. OUTCOMES: The mass was 33% of its original size after 3 treatments over the initial 11-day period. Pain relief was immediate. The rate of resolution decreased after the initial period. The patient had some tissue thickening at the time of discharge after 6 months of treatment. DISCUSSION: This case demonstrates the potential use of laser therapy

as a treatment for benign breast lumps following mammaplasty. Fat Necrosis;Female;Fibrosis;Hematoma;Humans;Laser Therapy;Mammaplasty;Middle Aged;Postoperative Complications;Treatment Outcome

The effect of low level laser therapy (LLLT) on wound healing in horses. Laser therapy is used in many countries, including South Africa, for the treatment of skin wounds. Low level galium aluminium arsenide (GaAlAs) laser was administered to full thickness skin wounds (3 x 3 cm) induced surgically on the dorsal aspect of the metacarpophalangeal joints of 6 crossbred horses in a randomised, blind, controlled study. Treated wounds that received a daily laser dosage of 2 J/cm2 were compared with nontreated control wounds on the opposite leg. There were no wound complications. Both groups of wounds were cleaned daily using tap water. Wound contraction and epithelialisation were evaluated using photoplanimetry. There were no significant differences in wound contraction or epithelialisation between the laser treated and the control wounds. It was therefore concluded that laser therapy had no clinically significant effect on second intention wound healing in this study. Animals;Forelimb;Horses;Laser Therapy;Single-Blind Method;Skin;Wound Healing;Wounds and Injuries

Diabetic neuropathic foot ulcer: successful treatment by low-intensity laser therapy. OBJECTIVE: To evaluate the efficacy of low-intensity laser irradiation for the induction of wound healing of a diabetic neuropathic foot ulcer. CASE: We report a case of a man with insulin-dependent diabetes mellitus, sensory neuropathy, macroangiopathy and microangiopathy who had been suffering from an ulcer of his first left toe accompanied by osteomyelitis for 6 weeks. RESULTS: After a total of 16 sessions of low-intensity laser therapy using a 670-nm diode laser administered within a 4-week period the ulcer healed completely. During a follow-up period of 9 months, there was no recurrence of the ulcer even though the patient's metabolic condition remained unstable. CONCLUSIONS: Although laser therapy was not applied as a monotherapy, the present observation suggests that it might constitute a useful side-effect-free alternative treatment modality for the induction of wound healing of neuropathic ulcers in diabetic patients. Therefore large properly controlled randomized studies seem justified. Aged;Diabetic Foot;Humans;Laser Therapy;Male;Treatment Outcome;Wound Healing

Laser therapy: a randomized, controlled trial of the effects of low-intensity Nd:YAG laser irradiation on musculoskeletal back pain. OBJECTIVE: To assess the effectiveness of low-intensity laser therapy in the treatment of musculoskeletal low back pain. DESIGN: A double-masked, placebo-controlled, randomized clinical trial. SETTING: A physical medicine and rehabilitation clinic. PARTICIPANTS: Sixty-three ambulatory men and women between the ages of 18 and 70yrs with symptomatic nonradiating low back pain of more than 30 days' duration and normal neurologic examination results. INTERVENTION: Subjects were bloc randomized into two groups with a computer-generated schedule. All underwent irradiation for 90 seconds at eight symmetric points along the lumbosacral spine three times a week for 4 weeks by a masked therapist. The sole difference between the groups was that the probes of a 1.06 microm neodymium:yttrium-aluminum-garnet laser emitted 542mW/cm2 for the treated subjects and were inactive for the control subjects. MAIN OUTCOME MEASURES: Subject's perception of benefit, level of function as assessed by the Oswestry Disability Questionnaire, and lumbar mobility. RESULTS: The treated group had a time-dependent improvement in two of the three outcome measures: perception of benefit and level of function. These results were most marked at the midpoint evaluation ($p < .005$, $p < .01$) and end of treatment ($p < .017$, $p < .001$) but tended to lessen at the 1-month follow-up ($p < .10$, $p < .004$). Lumbar mobility did not differ between the groups at any time. All tests were two-sample t tests with unequal variances. CONCLUSIONS: Treatment with low-intensity 1.06 microm laser irradiation produced a moderate reduction in pain and improvement in function in patients with musculoskeletal

low back pain. Benefits, however, were limited and decreased with time. Further research is warranted. Adolescent;Adult;Aged;Back Pain;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Treatment Outcome

A systematic review of laser therapy for venous leg ulcers. A systematic review of randomised controlled trials (RCTs) was conducted to establish the effectiveness of low-level laser therapy as a treatment for venous leg ulcers. Wound-care journals, conference proceedings and electronic databases (including Medline and Cinahl) were searched up to October 1997 for RCTs comparing low-level laser therapy with sham laser, no laser, or non-coherent light of other wavelengths. In addition, companies who manufacture or distribute therapeutic lasers were contacted for any unpublished or ongoing studies. Results from searches were scrutinised by one reviewer to identify possible RCTs and full reports of these were obtained. Details of eligible studies were extracted and summarised using a data extraction sheet. Data extraction was checked by a second reviewer. Meta-analysis was used to combine the results of trials where the interventions and outcome measures were sufficiently similar. A total of four eligible RCTs were identified. Two compared treatment with laser therapy to sham or placebo laser treatment. One study compared laser therapy with ultraviolet therapy. The fourth was a three-armed study which compared the effects of laser therapy alone, laser therapy plus infrared light, and non-coherent unpolarised red light. The comparisons of laser therapy with placebo, and laser therapy with ultraviolet therapy, showed no significant difference between treatments with regard to ulcer healing rates. The comparison of laser with red light showed a significant increase in complete healing at nine months for the combination of laser and infrared light compared to non-coherent unpolarised red light. We have not found any evidence of the benefit of low-level laser therapy per se on venous leg ulcer healing. It appears that a combination of HeNe laser and infrared light may promote the healing of venous ulcers, however more research is needed. Evidence-Based Medicine;Humans;Laser Therapy;Research Design;Treatment Outcome;Varicose Ulcer;Wound Healing

Corrigendum to: 'Low-energy laser irradiation affects satellite cell proliferation and differentiation in vitro'.

Lack of effect of combined low intensity laser therapy/phototherapy (CLILT) on delayed onset muscle soreness in humans. BACKGROUND AND OBJECTIVES: This study, which was approved by the University's Ethical committee, was conducted to investigate the effectiveness of Combined Low Intensity Laser Therapy/Phototherapy (CLILT) in alleviating the signs and symptoms of Delayed Onset Muscle Soreness (DOMS) over an 11-day period. STUDY DESIGN/MATERIALS AND METHODS: Thirty-six subjects (18 M: 18 F) were randomly allocated, under strictly controlled double-blind conditions, to one of three experimental conditions: Control, Placebo, and CLILT (660-950 nm; 11 J/cm2; pulsed at 73 Hz). DOMS was induced in a standardised fashion in the non-dominant elbow flexors using repeated eccentric contractions until exhaustion was reached. Subjects returned on five consecutive days, and two days during the following week, for treatment according to group, and assessment of outcome variables including range of motion, pain, and tenderness. RESULTS: While analysis of results using repeated measures and one factor ANOVA with post-hoc tests showed significant changes in all variables over time ($P < 0.05$) as a result of the induction procedure, there were no significant differences observed between groups. CONCLUSIONS: CLILT failed to show any beneficial treatment effect on DOMS, at least at the parameters used here. These results therefore provide no evidence for the claimed biostimulating effects of such therapy. Adult;Double-Blind Method;Elbow;Exercise;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Muscle Fatigue;Muscular Diseases;Pain;Pain Management;Pain Measurement;Pain Threshold;Phototherapy;Range of Motion, Articular;Surveys and Questionnaires;Treatment Outcome

[Evaluation of selected rehabilitation procedures for pain syndrome caused by cervical spine instability]. In the examined group of 71 patients with pain syndrome caused by instability of the cervical spine, an attempt was made to evaluate the impact of rehabilitation on the alleviation of complaints and symptoms, and to indicate the effectiveness of selected physicotherapeutical procedures used in this rehabilitation. From the examinations performed and their statistical analysis it can be inferred that there is significant improvement in the alleviation of complaints and symptoms when rehabilitation is used. The need also becomes apparent to provide a set of recommendations to be observed in daily and professional life. The best results in the alleviation of complaints and symptoms were achieved by patients in whom laser biostimulation was used as the basic physicotherapeutical procedure in rehabilitation. Adult;Cervical Vertebrae;Female;Humans;Joint Instability;Male;Middle Aged;Pain;Physical Therapy Modalities

Low power laser therapy and analgesic action. OBJECTIVE: The semiconductor or laser diode (GaAs, 904 nm) is the most appropriate choice in pain reduction therapy. SUMMARY BACKGROUND DATA: Low-power density laser acts on the prostaglandin (PG) synthesis, increasing the change of PGG2 and PGH2 into PG12 (also called prostacyclin, or epoprostenol). The last is the main product of the arachidonic acid into the endothelial cells and into the smooth muscular cells of vessel walls, that have a vasodilating and anti-inflammatory action. METHODS: Treatment was performed on 372 patients (206 women and 166 men) during the period between May 1987 and January 1997. The patients, whose ages ranged from 25 to 70 years, with a mean age of 45 years, suffered from rheumatic, degenerative, and traumatic pathologies as well as cutaneous ulcers. The majority of patients had been seen by orthopedists and rheumatologists and had undergone x-ray examination. All patients had received drug-based treatment and/or physiotherapy with poor results; 5 patients had also been irradiated with He:Ne and CO2 lasers. Two-thirds were experiencing acute symptomatic pain, while the others suffered long-term pathology with recurrent crises. We used a pulsed diode laser, GaAs 904 nm wavelength once per day for 5 consecutive days, followed by a 2-day interval. The average number of applications was 12. We irradiated the trigger points, access points to the joint, and striated muscles adjacent to relevant nerve roots. RESULTS: We achieved very good results, especially in cases of symptomatic osteoarthritis of the cervical vertebrae, sport-related injuries, epicondylitis, and cutaneous ulcers, and with cases of osteoarthritis of the coxa. CONCLUSIONS: Treatment with 904-nm diode laser has substantially reduced the symptoms as well as improved the quality of life of these patient, ultimately postponing the need for surgery. Gallium;Arsenic Adult;Aged;Analgesia;Arsenic;Arthralgia;Chronic Disease;Female;Gallium;Humans;Laser Therapy;Male;Middle Aged;Osteoarthritis;Pain;Semiconductors;Tennis Elbow;Varicose Ulcer

[Low-energy laser irradiation of blood as a method of prevention of blood circulation decompensation in hemorrhagic shock]. Effect of low-intensity laser exposure of the blood on the central hemodynamics, oxygen transporting function of the blood, oxygen balance of the organism, and surface configuration of erythrocyte membranes was studied in dogs exposed to 2-h arterial hypotension (arterial pressure 40 mm Hg). Blood exposure was started from the tenth min of hypotension and went on for 45 min (group 2) or 120 min (group 3); group 1 was control. The best results were attained after 45-min laser exposure. A longer exposure creates prerequisites for complications, such as dysadaptation of the vascular tone and delayed decrease of hemoglobin concentration. Oxygen Animals;Blood;Dogs;Erythrocyte Membrane;Female;Hemodynamics;Hemoglobinometry;Lasers;Male;Oxygen;Shock, Hemorrhagic;Time Factors

Low-power laser irradiation induces leukocyte priming. Laser radiation (LR) of various spectral composition has been broadly used in clinical practice. However, the mechanism of the stimulating

effects of LR remains obscure. The effect of He-Ne LR (633 nm) on human blood leukocytes was investigated both in the absence and presence of 8.65 nmol/l phthalocyanine (PhC). Irradiation of non-stimulated leukocytes with 0.025 to 0.5 J/cm2 did not lead to any activation of their luminol-dependent chemiluminescence (LCL). On the other hand, LR increased in most cases the subsequent CL response of the cells to opsonized zymosan (priming action of He-Ne-laser light). The effect of LR on the leukocytes was not standard. In irradiated leukocytes isolated from patients with severe acute or chronic pneumonia, or chronic bronchitis, the maximal LCL exceeded that for non-irradiated cells by 80% (0.05 J/cm2), 20-25% (0.15 J/cm2), and 0%, respectively (doses are shown in parentheses). Further increase of the exposure brought about a dose-dependent inhibition of LCL in cells from patients with severe acute and chronic pneumonia. There was an intriguing relationship between maximal CL responses of leukocytes subjected to laser irradiation in the presence and without PhC. When the priming effect of LR on isolated cells was small, it increased in the presence of exogenous photosensitizer, phthalocyanine; in cells of severely ill patients where the initial effect of LR was strong, Pc inhibited the priming action of LR. Apparently, different cells contained different amounts of endogenous photosensitizer(s); the addition of exogenous sensitizer increased the priming action of LR at low concentrations and decreased it at higher concentrations of the endogenous photosensitizer. Indoles;Isoindoles;Radiation-Sensitizing Agents;Helium;Neon;Zymosan;phthalocyanine Bronchitis;Dose-Response Relationship, Radiation;Helium;Humans;Indoles;Isoindoles;Lasers;Leukocytes;Luminescent Measurements;Neon;Pneumonia;Radiation-Sensitizing Agents;Zymosan

Increased dermal angiogenesis after low-intensity laser therapy for a chronic radiation ulcer determined by a video measuring system. Acute and chronic radiation-induced dermatitis can occur after high doses of ionizing radiation of the skin. We describe a patient with a long-lasting radiotherapy-induced ulcer that healed after low-intensity laser therapy. A video measuring system was used to determine the number of dermal vessels in the ulcer before and after laser treatment. We found a statistically significant increase in the number of dermal vessels after low-intensity laser therapy in both the central and marginal parts of the ulcer compared with its pretreatment status. Adult;Biopsy;Chronic Disease;Dermis;Female;Humans;Laser Therapy;Microscopy, Video;Neovascularization, Physiologic;Radiodermatitis;Skin Ulcer;Time;Wound Healing

[The effect of low-intensity laser radiation in the infrared and red ranges on arterial pressure regulation in patients with borderline hypertension]. Effectiveness was studied of low-intensity laser irradiation on regulation of arterial blood pressure (BP) in 185 patients (51 men, 134 women). The above patients were prescribed four therapeutic complexes: group I was exposed to infra-red irradiation by zones; group II--to scanning Helium-Neon laser across the portal zone and paravertebrally CIII-Th5; group III--to helium-neon laser in the area of right sinocarotid zone; group IV underwent hydrolaser shower (in red and intra-red range). Complaints were studied as were data from laboratory investigations, the condition of different bodily systems, BP level, the functional state of the cardiovascular system as per electrocardiography and rheography findings. A positive clinical effect was achieved in all the groups studied. Employment of low-intensity laser irradiation in the rehabilitation of patients with borderline hypertension during the sanatorium stage was noted to strikingly enhance the efficiency of the therapy administered. It can be prescribed to patients irrespective of their hemodynamic types. Irradiation of the right sinocarotid zone and hydrolaser therapy are indicated to patients presenting with hypo- and eukinetic types of hemodynamics and baseline sympatheticotonia. Adult;Blood Pressure;Evaluation Studies as Topic;Female;Humans;Hypertension;Infrared Rays;Laser Therapy;Male;Middle Aged;Time Factors

Induction of complete wound healing in recalcitrant ulcers by low-intensity laser irradiation depends on ulcer cause and size. Chronic skin ulcers still represent a therapeutic challenge in

dermatology. Among the various non-invasive treatment modalities used for the improvement of impaired wound healing, low-intensity laser irradiations are gaining an increasing body of interest. We used low-intensity laser irradiations delivered by a 30 mW helium-neon laser at an energy density of 30 J/cm2 three times weekly for the induction of wound healing in ulcers of diverse causes. Twenty patients with the same number of ulcers, which had previously been treated by conventional wound care for a median period of 34 weeks (range: 3-120 weeks) without any significant evidence of healing, were included in the study. Concerning the underlying disorders, patients were divided into four groups: diabetes, arterial insufficiency, radio damage and autoimmune vasculitis. In all ulcers, complete epithelization could be induced by laser therapy. No amputation or any other surgical intervention was necessary and no adverse effects of any kind were noted during low-intensity laser treatment. Regarding the different diagnoses, a statistically significant difference was noted (P = 0.008): ulcers due to radio damage healed significantly faster than those caused by diabetes (6 weeks [range: 3-10 weeks] vs. 16 weeks [range: 9-45 weeks], P = 0.005). Wound healing in autoimmune vasculitis (24 weeks [range: 20-35 weeks]) required longer than in radiodermitis, although the difference was not significant. In addition to the diagnosis, wound size was found to be an important factor influencing the duration of wound closure (P = 0.028), whereas duration of previous conventional treatment (P = 0.24) and depth (P = 0.14) showed no effect. Our results indicate that low-intensity laser irradiation could be a valuable non-invasive tool for the induction of wound healing in recalcitrant ulcers, and that healing time is correlated with the ulcer cause and size. Helium;Neon Adult;Analysis of Variance;Chronic Disease;Confidence Intervals;Dose-Response Relationship, Radiation;Female;Helium;Humans;Laser Therapy;Male;Middle Aged;Neon;Skin Ulcer;Treatment Outcome;Wound Healing

Low-energy laser irradiation affects satellite cell proliferation and differentiation in vitro. Low-energy laser (He-Ne) irradiation was found to promote skeletal muscle regeneration in vivo. In this study, its effect on the proliferation and differentiation of satellite cells in vitro was evaluated. Primary rat satellite cells were irradiated for various time periods immediately after preparation, and thymidine incorporation was determined after 2 days in culture. Laser irradiation affected thymidine incorporation in a bell-shaped manner, with a peak at 3 s of irradiation. Three seconds of irradiation caused an induction of cell-cycle regulatory proteins: cyclin D1, cyclin E and cyclin A in an established line of mouse satellite cells, pmi28, and proliferating cell nuclear antigen (PCNA) in primary rat satellite cells. The induction of cyclins by laser irradiation was compatible with their induction by serum refeeding of the cells. Laser irradiation effect on cell proliferation was dependent on the rat's age. At 3 weeks of age, thymidine incorporation in the irradiated cells was more than twofold higher than that in the controls, while at 6 weeks of age this difference had almost disappeared. Myosin heavy chain (MHC) protein levels were twofold lower in the irradiated than in the control cells, whereas the proliferation of the irradiated cells was twofold higher. Fusion percentage was lower in the irradiated compared to non-irradiated cells. In light of these data, the promoting effect of laser irradiation on skeletal muscle regeneration in vivo may be due to its effect on the activation of early cell-cycle regulatory genes in satellite cells, leading to increased proliferation and to a delay in cell differentiation. Cyclins Age Factors;Animals;Cell Differentiation;Cell Division;Cell Fusion;Cells, Cultured;Cyclins;Gene Expression;In Vitro Techniques;Lasers;Major Histocompatibility Complex;Mice;Muscle, Skeletal;Rats;Regeneration

The biostimulatory effect of red laser irradiation on pig blood platelet function. The molecular mechanisms of laser-induced changes in the cell structure and function are not well known. The authors examined the effects of low-power laser irradiation on unnucleated pig blood platelets. The obtained results showed that laser irradiation (1-5 J) caused in blood platelets lipid peroxidation (measured as thiobarbituric acid reactive substances) and superoxide anion generation, concomitant

with the release of adenine nucleotides and proteins from platelets. The maximum platelet response to laser irradiation was observed when doses of 1.8-2 J were used. Our results indicate that red laser irradiation induces: (1) platelet secretory process and the release of substances stored in the specific granules (adenine nucleotides, proteins); and (2) lipid peroxidation partly due to stimulation of endogenous arachidonate and production of its metabolites reacting with thiobarbituric acid. Adenine Nucleotides;Blood Proteins;Thiobarbituric Acid Reactive Substances;Superoxides Adenine Nucleotides;Animals;Blood Platelets;Blood Proteins;Dose-Response Relationship, Radiation;In Vitro Techniques;Lasers;Lipid Peroxidation;Superoxides;Swine;Thiobarbituric Acid Reactive Substances

It's all in the parameters: a critical analysis of some well-known negative studies on low-level laser therapy. OBJECTIVE: Scientific studies include references to historical studies on low-level laser therapy (LLLT) in general and to old studies on the specific subject in particular. Some studies are quoted often. It is fair to take a second look at these, since few people seem to have read them carefully, and others have read them only in the abstract form. This paper critically reviews the parameter pitfalls found in many of the classic "negative" studies. SUMMARY BACKGROUND DATA: A study of 1,200 papers on LLLT has resulted in 85 positive and 35 negative double-blind studies. The negative studies have been scrutinized carefully in an effort to pinpoint possible reasons for the failures. In the following, the majority are double-blind studies, but some non-blinded and animal studies have been included to give typical examples of pitfalls. Animals;Clinical Trials as Topic;Double-Blind Method;Humans;Laser Therapy;Lasers;Research Design

Healing of Bone Affections and Gangrene with Low-Intensity Laser Irradiation in Diabetic Patients Suffering from Foot Infections. OBJECTIVE: Evalution of low-intensity laser irradiation on the healing of bone affections and gangrene in patients suffering from diabetic microangiopathy. DESIGN: Case-report study. PATIENTS: Two consecutive diabetic male patients with gangrene, osteomyelitis, and bone fractures. INTERVENTION: Helium-neon laser irradiation (36 J/cm2) 50 min/day. MAIN OUTCOME PARAMETER: Healing of gangrene and corticalis lesion as well as remineralisation of bone affections. RESULTS: Within a mean period of 14 weeks not only a complete healing of the diabetic gangrenes but also a radiographically determined reestablishment of corticalis and remineralisation of preexisting bone affections could be achieved. CONCLUSION: We therefore conclude that low-intensity laser irradiation should be further tested as an additional beneficial therapeutic modality for the healing of gangrene and bone affections in diabetic patients.

[Membranotropic effect of the low energy laser irradiation of the blood]. Blood Platelets;Erythrocyte Membrane;Erythrocytes;Hemolysis;Humans;In Vitro Techniques;Lasers;Lipid Peroxidation;Platelet Aggregation;Viscosity

Low-level laser therapy in ankle sprains: a randomized clinical trial. OBJECTIVE: To test the efficacy of low-level laser therapy on lateral ankle sprains as an addition to a standardized treatment regimen, a trial was conducted in which high-dose laser (5J/cm2), low-dose laser (0.5J/cm2), and placebo laser therapy (0J/cm2) at skin level were compared. DESIGN: Randomized, double-blind, controlled clinical trial with a follow-up of 1 year. Patients, therapists, assessors, and analysts were blinded to the assigned treatment. SETTING: An ambulatory care setting. PATIENTS: After informed consent and verification of exclusion criteria, 217 patients with acute lateral ankle sprains were randomized to three groups from September 1, 1993, through December 31, 1995. INTERVENTIONS: Twelve treatments of 904nm laser therapy in 4 weeks as an adjunct to a standardized treatment regimen of 4 weeks of brace therapy combined with standardized home exercises and advice. The laser therapy device used was a 904nm Ga-As laser, with 25-watt peak power and 5,000 or 500Hz frequency, a pulse duration of 200nsec, and an irradiated area of 1cm2. PRIMARY OUTCOME MEASURES: Pain and function as reported by the patient. RESULTS: Intention-to-treat analysis of the

short-term results showed no statistically significant difference on the primary outcome measure, pain (p = .41), although the placebo group showed slightly less pain. Function was significantly better in the placebo group at 10 days (p = .01) and 14 days (p = .03) after randomization. The placebo group also performed significantly better on days of sick leave (p = .02) and at some points for hindrance in activities in daily life and pressure pain, as well as subjective recovery (p = .05). Intention-to-treat analysis showed that total days of absenteeism from work and sports were remarkably lower in the placebo group than in the laser groups, ranging from 3.7 to 5.3 and 6 to 8 days, respectively. The total number of relapses at 1 year in the low-dose laser group (n = 22) was significantly higher (p = .04) than in the other two groups (high laser, n = 13; placebo, n = 13). Subgroup analysis to correct for possible confounders did not alter these findings. CONCLUSIONS: Neither high- nor low-dose laser therapy is effective in the treatment of lateral ankle sprains. Adult;Ankle Injuries;Bandages;Double-Blind Method;Female;Humans;Laser Therapy;Male;Pain;Pain Management;Sprains and Strains

Low-level laser therapy is an important tool to treat disorders of the maxillofacial region. OBJECTIVES: The authors report on the effects of low-level laser therapy (LLLT) in the treatment of maxillofacial disorders. SUMMARY AND BACKGROUND DATA: Further to our previous studies, this paper reports the results of the use of LLLT on the treatment of several disorders of the oral and maxillofacial region. This paper presents LLLT as an effective method of treating such disorders. METHODS: Two hundred and five female and 36 male patients ages between 7 and 81 years old (average 38.9 years old), suffering from disorders of the maxillofacial region, were treated with 632.8, 670, and 830 nm diode lasers at the Laser Center of the Universidade Federal de Pernambuco, Recife, Brazil (UFPE). The disorders included temporomandibular joint (TMJ) pain, trigeminal neuralgia, muscular pain, aphatae, inflammation, and tooth hypersensitivity postoperatively and in small hemangiomas. Most treatment consisted of a series of 12 applications (twice a week) and in 15 cases a second series was applied. Patients were treated with an average dose of 1.8 J/cm2. RESULTS: One hundred fifty four out of 241 patients were asymptomatic at the end of the treatment, 50 improved considerably, and 37 were symptomatic. CONCLUSIONS: These results confirm that LLLT is an effective tool and is beneficial for the treatment of many disorders of the maxillofacial region. Adolescent;Adult;Aged;Aged, 80 and over;Child;Dose-Response Relationship, Radiation;Evaluation Studies as Topic;Facial Pain;Female;Humans;Laser Therapy;Male;Middle Aged;Radiotherapy Dosage;Semiconductors;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome;Trigeminal Neuralgia

[Morphofunctional characteristics of the rat ovarian capillary bed during low intensity laser irradiation]. Alkaline Phosphatase Alkaline Phosphatase;Animals;Capillaries;Female;Lasers;Microcirculation;Ovarian Follicle;Ovary;Rats;Time Factors

[Mechanism of changes in the platelet functional activity caused by low energy laser irradiation]. Cyclooxygenase Inhibitors;Imidazoles;Thromboxane A2;imidazole;Prostaglandin-Endoperoxide Synthases;Thromboxane-A Synthase;Aspirin Aspirin;Blood Platelets;Cyclooxygenase Inhibitors;Humans;Imidazoles;In Vitro Techniques;Lasers;Platelet Aggregation;Platelet Count;Prostaglandin-Endoperoxide Synthases;Thromboxane A2;Thromboxane-A Synthase

[Effects of low-intensity laser irradiation on hormonal responsiveness of patients with pulmonary tuberculosis]. To examine the impact of low-intensive laser radiation (LILR) on endocrine function in patients with pulmonary tuberculosis, the time course of blood levels of thyroid hormones, cortisol, and insulin was studied in 117 patients of whom 64 received complex treatment by using LILR. Pulmonary tuberculosis was ascertained to be characterized by a marked hormonal imbalance, including impaired metabolism of thyroid hormones, hypercorticism, altered pancreatic

incretion, which negatively affects the efficiency of antituberculosis therapy. Intravenous and epicutaneous therapy promotes recovery of endocrine responsiveness and enhances the efficiency of treatment in patients with pulmonary tuberculosis. Antitubercular Agents;Insulin;Triiodothyronine;Thyrotropin;Thyroxine;Hydrocortisone Antitubercular Agents;Combined Modality Therapy;Endocrine Glands;Humans;Hydrocortisone;Insulin;Laser Therapy;Thyrotropin;Thyroxine;Time Factors;Triiodothyronine;Tuberculosis, Pulmonary

Import of radiation phenomena of electrons and therapeutic low-level laser in regard to the mitochondrial energy transfer. OBJECTIVE: The authors describe a consistent theoretical model of the cellular energy transfer (respiratory chain) by taking into consideration the radiation phenomena of electrons and therapeutic low level laser. SUMMARY BACKGROUND DATA: Biochemical models of the cellular energy transfer regard the classical corpuscular aspect of electrons as the responsible energy carriers, thereby ignoring the wave-particle dualism of the electrons and the import of radiation energy in this process. METHODS: The authors show the influence of radiation phenomena on the cellular energy transfer, explaining consistently some of the intermediate steps of this complex process. RESULTS: Because of the inherent wave-particle dualism of the electrons, it is appropriate to regard radiation phenomena to explain the cellular energy transfer. The classical biochemical models use only the particle part of the electrons as energy carriers. The connection between energy transport by radiation and the order in structures may be understood if, for instance, structurally bound energy is released during the dissolution of structures (oxidation of foodstuffs) or is again manifested (final reduction of oxygen to water). With a attention to the energy values relevant for the respiratory chain, the import of electromagnetic radiation of characteristic ranges of wavelengths on the cellular energy transfer becomes evident. Depending on its wavelength, electromagnetic radiation in the form of light can stimulate macromolecules and can initiate conformation changes in proteins or can transfer energy to electrons. Low level laser from the red and the near infrared region corresponds well with the characteristic energy and absorption levels of the relevant components of the respiratory chain. This laser stimulation vitalizes the cell by increasing the mitochondrial ATP(adenosine-tri-phosphate)-production. CONCLUSIONS: With regard to radiation phenomena and its inhanced electron flow in the cellular energy transfer (respiratory chain), it is possible to explain the experimentally found increase of ATP-production by means of low-level laser light on a cellular level. Intense research for this biostimulative effect is still necessary. Adenosine Triphosphate;NADH Dehydrogenase Adenosine Triphosphate;Electron Transport;Energy Transfer;Infrared Rays;Lasers;Mitochondria;Models, Chemical;NADH Dehydrogenase;Physical Phenomena;Physics;Protein Conformation

Treatment of medial and lateral epicondylitis--tennis and golfer's elbow--with low level laser therapy: a multicenter double blind, placebo-controlled clinical study on 324 patients. BACKGROUND AND OBJECTIVE: Among the other treatment modalities of medial and lateral epicondylitis, low level laser therapy (LLLT) has been promoted as a highly successful method. The aim of this clinical study was to assess the efficacy of LLLT using trigger points (TPs) and scanner application techniques under placebo-controlled conditions. STUDY DESIGN/MATERIAL AND METHODS: The current clinical study was completed at two Laser Centers (Locarno, Switzerland and Opatija, Croatia) as a double-blind, placebo controlled, crossover clinical study. The patient population (n = 324), with either medial epicondylitis (Golfer's elbow; n = 50) or lateral epicondylitis (Tennis elbow; n = 274), was recruited. Unilateral cases of either type of epicondylitis (n = 283) were randomly allocated to one of three treatment groups according to the LLLT technique applied: (1) Trigger points; (2) Scanner; (3) Combination Treatment (i.e., TPs and scanner technique). Bilateral cases of either type of epicondylitis (n = 41) were subject to crossover, placebo-controlled conditions. Laser devices used to perform these treatments were infrared (IR) diode laser (GaAlAs) 830 nm continuous wave for

treatment of TPs and HeNe 632.8 nm combined with IR diode laser 904 nm, pulsed wave for scanner technique. Energy doses were equally controlled and measured in Joules/cm2 either during TPs or scanner technique sessions in all groups of patients. The treatment outcome (pain relief and functional ability) was observed and measured according to the following methods: (1) short form of McGill's Pain Questionnaire (SF-MPQ); (2) visual analogue scales (VAS); (3) verbal rating scales (VRS); (4) patient's pain diary; and (5) hand dynamometer. RESULTS: Total relief of the pain with consequently improved functional ability was achieved in 82% of acute and 66% of chronic cases, all of which were treated by combination of TPs and scanner technique. CONCLUSIONS: This clinical study has demonstrated that the best results are obtained using combination treatment (i.e., TPs and scanner technique). Good results are obtained from adequate treatment technique correctly applied, individual energy doses, adequate medical education, clinical experience, and correct approach of laser therapists. We observed that under- and overirradiation dosage can result in the absence of positive therapy effects or even opposite, negative (e.g., inhibitory) effects. The current clinical study provides further evidence of the efficacy of LLLT in the management of lateral and medial epicondylitis. Helium;Gallium Adolescent;Adult;Aged;Chi-Square Distribution;Cross-Over Studies;Double-Blind Method;Female;Gallium;Golf;Helium;Humans;Infrared Rays;Laser Therapy;Male;Middle Aged;Myofascial Pain Syndromes;Pain Measurement;Semiconductors;Tennis Elbow;Treatment Outcome

Palliative laser therapy for recurrent head and neck cancer: a Phase II clinical study. OBJECTIVES: Laser therapy is becoming a more precise, minimally invasive alternative for tumor ablation. Recent reports confirm successful palliation of pain and functional disabilities in patients with advanced deep carcinoma of the head and neck using interstitial laser phototherapy (ILT). STUDY DESIGN, PATIENTS, AND METHODS: The current study describes an ongoing Phase II trial of neodymium/yttrium-aluminum-garnet (Nd:YAG) laser therapy for palliation of advanced head and neck cancer. A total of 40 advanced cancer patients have been entered into this protocol (25 men and 15 women). RESULTS: Nineteen of these patients had no evidence of recurrence after ILT with an average follow-up of 11 months (range, 2 to 24 mo). Currently, 19 of these patients are alive, 14 with tumor remission and six with persistent disease. A total of 79 tumor sites received ILT with 43 (54.5%) completely ablated. Stratified by tumor site, ILT led to a complete response in 21 of 24 in the oral cavity, eight of 28 neck tumors, four of 10 in skin, and 10 of 17 in other sites. The procedure was well tolerated in most cases and was repeated at intervals in patients with residual disease or recurrences for a total of 118 laser treatments (average, 2.95 treatments per patient). CONCLUSIONS: The results suggest that ILT can be performed safely and repeated as needed, and may be less costly than conventional surgery for head and neck cancer. However, additional follow-up is needed to obtain convincing evidence of long-term therapeutic benefits. Adult;Aged;Aged, 80 and over;Carcinoma, Squamous Cell;Female;Follow-Up Studies;Head and Neck Neoplasms;Humans;Laser Therapy;Male;Middle Aged;Neoplasm Recurrence, Local;Palliative Care;Preoperative Care;Remission Induction;Treatment Outcome;Ultrasonography

[Diagnostic and biostimulating lasers]. In this brief report authors present data regarding the application of diagnostic and biostimulating laser instruments in medicine. For diagnostic purposes there are several types of laser instruments and procedures available: Laser Microscopic Masonic Analyzer (LAMMA), Flow cytometry. Doppler effects of laser rays (Laser Doppler velocytometry, Laser Doppler spermokhinezymetry, Laser Doppler spectrometry), Laser fluorescent microscopy, Laser nephelometry, Transilumination by lasers (diaphanography), Laser spectroscopy, Laser holography, Laser rethinoscopy, Microirradiation by lasers. Literary data concerning favorable effects of low power laser radiation on series of diseases covering different medical specialties are cited, pointing to possibility of significant enrichment of already available arsenal of physical methods, thera-pies and

rehabilitation procedures. Mechanisms of biostimulation of human tissues and organs under low power laser radiation are also presented. All these stimulatory and regulatory mechanisms of the cell metabolism are involved in the wound epitelization, reduction of edema and inflammation and reestablishement of arterial, venous and lymph microcirculation and consequently inducing better tissue nutrition. The use of laser spectroscopy for quantitative analysis of cations from a single drop of dried blood on a piece of filter paper was not realized, although individual analyses of frozen skin biopsies for calcium, arsenic and gold were accomplished. In Europe, this technique has also found its application in forensic medicine. Furthermore, laser-based methods have been used to study air pollution with carcinogens in occupational exposures and also for the detection of narcotic drugs. Laser cytofluorometry utilizes the argon laser for scanning of single stained cells and has achieved utilization in mass examination programs for Pap-smear determinations. The same technique is used in cell sorting system that is now important in monoclonal antibody determination in hybridoma technology. Other possible diagnostic applications include laser particle size measurement techniques, and laser nephelometry for determination of immunoglobulins classes and autoantibodies such as rheumatoid factors. Laser Doppler velocimetry is used to measure blood flow by means of a simple probe that rests on the lip. Biostumulating laser instruments The world famous Hungarian scientist Mester Endre, from Budapest, is one of the pioneers with the greatest experimental and clinical experience in the use of biostimulating effects of lasers. His former student, O. Ribari first used biostimulating effects of He-Na laser (390 mJ power) for the epitelization of perforated tympanic membrane and treatment of postoperative fistulas of the neck and of the mastoid. Generally speaking, biostimulating effect of low level laser treatment (LLLT) is in its anti-inflammatory, analgesic and anti-edematous effect on tissues. There is absolute increase in microcirculation, higher rates of ATP, RNA and DNA synthesis, and thus better tissue oxygenation and nutrition. There is also increase in the absorption of interstitial fluid, better tissue regeneration and stimulation of the analgesic effect. The past three decades of laser medicine and surgery have shown great progress and promise for the future. Humans;Laser Therapy;Lasers

[Change in the absorption spectrum of a monolayer of live cells under low-intensity laser irradiation]. Dose-Response Relationship, Radiation;HeLa Cells;Humans;Lasers;Spectrum Analysis

[Ultrastructural changes of neutrophilic granulocytes in dilated cardiomyopathy and their dynamics after blood irradiation with Helium-Neon laser in vitro]. Venous blood from 10 patients with dilated cardiomyopathy was irradiated with a laser in vitro. The control group consisted of 20 healthy donors. The neutrophil granulocytes were separated at gradient centrifugation. Alterations of neutrophils manifested with an increase of specific cytoplasmic granules number, thickening of submembrane actin, cell configuration changes with a relative increase of their surface. Laser irradiation of the blood resulted in destruction of the altered (less resistant) cells while morphometric parameters of the remaining cells approaches those of donor cells. Thus, low-intensity laser irradiation results in the renewal of the neutrophil population in patients with dilated cardiomyopathy and normalization of structural-functional changes in the circulating neutrophil population. Helium;Neon Blood;Cardiomyopathy, Dilated;Case-Control Studies;Helium;Humans;In Vitro Techniques;Lasers;Neon;Neutrophils

[Low-level laser therapy in osteoarticular diseases in geriatric patients]. INTRODUCTION: Laser light absorption through the skin causes tissue changes, targeting the nervous, the lymphatic, the circulatory and the immune systems with an antalgic, anti-inflammatory, anti-edemic effect and stimulating tissue repair. Therefore low level laser therapy is now commonly used in numerous rehabilitation centers, including the "Istituto Gerontologico Pio Albergo Trivulzio", Milan, Italy. However, to activate the treatment program, the basic medical research results must always be considered to choose the best optical wavelength spectrum, technique and dose, for rehabilitative

laser therapy. We analyzed the therapeutic effects of different wavelengths and powers in various treatment schedules. In particular, a protocol was designed to test such physical parameters as laser type, doses and individual schedule in different pathologic conditions. We report the results obtained with low level laser therapy in the rehabilitation of geriatric patients, considering the various physical and technical parameters used in our protocol. MATERIAL AND METHODS: We used the following laser equipment: an HeNe laser with 632.8 nm wavelength (Mectronic), a GaAs Laser with 904 nm wavelength (Mectronic) and a CO2 Laser with 10,600 nm wavelength (Etoile). To evaluate the patient clinical status, we use a different form for each involved joint; the laser beam is targeted on the region of interest and irradiation is carried out with the sweeping method or the points technique. Irradiation technique, doses and physical parameters (laser type, wavelength, session dose and number) are indicated on the form. The complete treatment cycle consists of 5 sessions per week--20 sessions in all. At the end of the treatment cycle, the results were scored on a 5-grade semiquantitative scale--excellent, good, fair, poor and no results. We examined 3 groups of patients affected with gonarthrosis (149 patients), lumbar arthrosis (117 patients), and algodystrophy (140 patients) respectively. RESULTS: In gonarthrosis patients, the statistical analysis of the results showed no significant differences between CO2 laser and GaAs laser treatments ($p = .975$), but significant differences between CO2 laser and HeNe laser treatments ($p = .02$) and between GaAs laser and HeNe laser treatments ($p = .003$). In lumbar arthrosis patients treated with GaAs or HeNe laser, significant differences were found between the two laser treatments and the combined sweeping-points techniques appeared to have a positive trend relative to the sweeping method alone, especially in sciatic suffering. In the algodystrophy syndrome, in hemiplegic patients, significant differences were found between CO2 and HeNe laser treatments ($p = .026$), between high and low CO2 laser doses ($p = .024$), and between low CO2 laser dose and high HeNe laser dose ($p = .006$). CONCLUSIONS: Low level laser therapy can be used to treat osteoarticular pain in geriatric patients. To optimize the results, the diagnostic picture must be correct and a treatment program defining the physical parameters used (wavelength, dose and irradiation technique) must also be designed.
Age Factors;Aged;Arthritis;Evaluation Studies as Topic;Humans;Knee Joint;Laser Therapy;Lumbosacral Region;Methods;Reflex Sympathetic Dystrophy

[Results of the clinical use of laser therapy in malignant tumors]. The raise of natural antitumoral resistance level, the reduction of intoxication severity, the raise of an organism tolerance to irradiation and polychemotherapy were permitted by adjuvant low-energy laser therapy absorption in the complex of treatment of 27 patients with colonic cancer in early postoperative period, 16--cervix uteri cancer while irradiation therapy conduction, and 14--with cutaneous melanoma during polychemotherapy. Adult;Aged;Antineoplastic Combined Chemotherapy Protocols;Colorectal Neoplasms;Combined Modality Therapy;Evaluation Studies as Topic;Female;Humans;Laser Therapy;Male;Melanoma;Middle Aged;Postoperative Care;Radiotherapy Dosage;Radiotherapy, Adjuvant;Skin Neoplasms;Uterine Cervical Neoplasms

In vitro cellular processes sprouting in cortex microexplants of adult rat brains induced by low power laser irradiation. The effect of He-Ne low power laser irradiation on the growth of cellular processes of microexplants of the brain cortex of adult rats in tissue culture was studied. Two 8-min doses of direct laser irradiation, 3.6 J/cm2 each given on two successive days, caused a significant amount of sprouting of cellular processes outgrowth in microexplants compared to small amounts produced by nonirradiated controls. This preliminary observation suggests that low power laser irradiation applied to the area of an experimentally injured nerve may induce neurite processes sprouting, thereby improving nerve tissue recovery. Animals;Dose-Response Relationship, Radiation;Laser Therapy;Male;Nerve Regeneration;Neurons;Prosencephalon;Rats;Rats, Wistar

Treatment of chronic postmastectomy lymphedema with low level laser therapy: a 2.5 year follow-up. Ten women with unilateral arm lymphedema after axillary clearance (radical mastectomy) and radiotherapy for breast cancer received 16 treatment sessions with Low Level Laser Therapy (LLLT) over 10 weeks and seven patients were followed for 36 months. The effect of LLLT was monitored by arm circumference, plethysmography, tonometry, bioimpedance and a questionnaire dealing with subjective symptoms. After treatment, edema volume (both extracellular and intracellular) was decreased, the tissue (except for the upper arm) progressively softened or approached a normal texture, and the patients reported improvement in aches/pains, tightness, heaviness, cramps, pins/needles, and mobility of the arm. Skin integrity was also improved and the index for risk of infection decreased. Follow-up assessment at 1, 3, 6, and 30-36 months showed varying trends although at 30-36 months most subjective parameters and bioimpedance derived data on ECF and ICF tended to return toward pre-treatment levels. Arm circumference continued to show overall improvement, however, with a volume reduction of the affected arm reaching 29%. Tonometry also showed maintenance of near normal values for the involved forearm and anterior and posterior chest; however, the upper arm showed progressive induration. The data suggest that laser treatment, at least initially, improved most objective and subjective parameters of arm lymphedema. Arm;Electric Impedance;Female;Follow-Up Studies;Humans;Laser Therapy;Lymphedema;Mastectomy;Pain Measurement;Surveys and Questionnaires;Tonometry, Ocular

Biochemistry and biomechanics of healing tendon: Part II. Effects of combined laser therapy and electrical stimulation. PURPOSE: In previous studies we demonstrated that early mechanical loading and laser photo-stimulation independently promoted tendon healing. Thus, we tested the hypothesis that a combination of laser phototherapy and mechanical load would further accelerate healing of experimentally tenotomized and repaired rabbit Achilles tendons. METHODS: Following surgical tenotomy and repair, the tendons of experimental and control rabbits were immobilized in polyurethane casts for 5 d. The repaired tendons of experimental rabbits received mechanical load via electrical stimulation-induced contraction of the triceps surae for 5 d. In addition, experimental tendons were treated with daily doses of 1 J.cm-2 low intensity helium-neon laser throughout the 14-d experimental period. RESULTS: The combination of laser photostimulation and mechanical load increased the maximal stress, maximal strain, and Young's modulus of elasticity of the tendons 30, 13, and 33%, respectively. However, MANOVA revealed no statistically significant differences in these biomechanical indices of repair of control and experimental tendons. Biochemical assays showed a 32% increase in collagen levels ($P < 0.05$) and an 11% decrease in mature cross-links in experimental tendons compared with that in controls ($P > 0.05$). Electron microscopy and computer morphometry revealed no significant differences in the morphometry of the collagen fibers and no visible differences in the ultrastructure of cellular and matrical components of control and experimental tendons. CONCLUSIONS: These findings indicate that the combination of laser photostimulation and early mechanical loading of tendons increased collagen production, with marginal biomechanical effects on repaired tendons. Collagen Achilles Tendon;Animals;Biomechanical Phenomena;Collagen;Electric Stimulation Therapy;Laser Therapy;Male;Phototherapy;Rabbits;Tendon Injuries;Treatment Outcome;Weight-Bearing

[The function of the thiol-disulfide and ascorbate systems in patients operated on for acute pancreatitis after the use of low-intensity infrared laser radiation and pentoxifylline]. In patients with an acute destructive pancreatitis the lowering of sulphhydride (SH) groups in proteinic and nonproteinic fraction of the blood plasma, the reduction of the ascorbic acid level and increase of its oxidized forms concentration was noted. After the operation the disordered indexes have restored, moreover, and after the programmed relaparotomy conduction--as after a single operative

intervention. Acceleration of the disordered indexes restoration was promoted by application of pentoxifylline and low-intensity laser irradiation as well. Disulfides;Phosphodiesterase Inhibitors;Sulfhydryl Compounds;Ascorbic Acid;Pentoxifylline Acute Disease;Adult;Ascorbic Acid;Combined Modality Therapy;Disulfides;Female;Humans;Infrared Rays;Laser Therapy;Male;Middle Aged;Oxidation-Reduction;Pancreatectomy;Pancreatitis;Pentoxifylline;Phosphodiesterase Inhibitors;Sulfhydryl Compounds

[Combined therapy of trophic ulcers with protracted healing]. The results of treatment of 126 patients with trophic ulcers of the low extremities were analyzed. Trophic ulcers in 74 patients (58.7%) appeared due to postthrombophlebitic disease, in 25 patients (19.8%) due to primary varicose veins of lower limbs, in 15 (11.9%) patients due to obliterative diseases of peripheral vessels and in 12 (9.5%)--other diseases. The duration of the illness made up from 1 to 50 years. In 26 patients (group 1) low-intensity laser irradiation (LLI) was used together with combined conservative therapy; in 32 patients (group 2) hyperbaric oxygenation (HBO), in 21 (3 group)--combined application of LLI and HBO was used. The examination of regional macrohemodynamics and microcirculation in 39 patients showed decrease of rheographic index (RI) in the shin, increase of the arterioles tone and venous outflow disturbance. The use of LLI and HBO resulted in undoubtful increase of RI and improvement of microcirculatory indexes. As a result of combined application of LLI and HBO microflora of the ulcers lowered from 10 and 10 per 1 gr in patients of group 1 and 2, respectively, in patients of group 3 there was no growth of pathogenic microflora. The investigation of humoral and cellular immunity after the application of LLI and HBO demonstrated strong immunocorrective action. Adult;Aged;Aged, 80 and over;Chronic Disease;Female;Follow-Up Studies;Humans;Hyperbaric Oxygenation;Laser Therapy;Leg Ulcer;Male;Middle Aged;Regional Blood Flow;Treatment Outcome;Wound Healing

Low-intensity laser irradiation improves skin circulation in patients with diabetic microangiopathy. OBJECTIVE: Diabetic foot problems due to angiopathy and neuropathy account for 50% of all nontraumatic amputations and constitute a significant economic burden to society. Low-intensity laser irradiation has been shown to induce wound healing in conditions of reduced microcirculation. We investigated the influence of low-intensity laser irradiation by means of infrared thermography on skin blood circulation in diabetic patients with diabetic microangiopathy. RESEARCH DESIGN AND METHODS: Thirty consecutive patients with diabetic ulcers or gangrenes and elevated levels of glycosylated hemoglobin were randomized by blocks of two to receive either a single low-intensity laser irradiation with an energy density of 30 J/cm2 or a sham irradiation over both forefoot regions in a double-blind placebo-controlled clinical study. Skin blood circulation as indicated by temperature recordings over the forefoot region was detected by infrared thermography. RESULTS: After a single transcutaneous low-intensity laser irradiation, a statistically significant rise in skin temperature was noted ($P < 0.001$ by ANOVA for repeated measurements), whereas in the sham-irradiated control group, a slight but significant drop in temperature ($P < 0.001$) was found. Subsequently performed contrasts for comparison of measurements before and after irradiation revealed significant temperature increases at 20 min of irradiation time ($P < 0.001$), at the end of the irradiation ($P < 0.001$), and 15 min after stopping the irradiation ($P < 0.001$). In the sham-irradiated feet, the drop in local skin temperature was not significant at 20 min ($P = 0.1$), but reached significance at the end of the sham-irradiation procedure ($P < 0.001$) and 15 min after the end of sham irradiation ($P < 0.001$). CONCLUSIONS: The data from this first randomized double-blind placebo-controlled clinical trial demonstrate an increase in skin microcirculation due to athermic laser irradiation in patients with diabetic microangiopathy. Blood Glucose;Glycated Hemoglobin A Analysis of Variance;Blood Glucose;Diabetes Mellitus, Type 1;Diabetes Mellitus, Type 2;Diabetic

Angiopathies;Diabetic Foot;Double-Blind Method;Female;Foot Ulcer;Gangrene;Glycated Hemoglobin;Humans;Laser Therapy;Male;Middle Aged;Regional Blood Flow;Skin;Skin Temperature;Thermography;Time Factors
[The laser therapy of hypertension patients in the initial stages]. The effect of low-energy laser irradiation used as monotherapy was studied in 42 patients with early essential hypertension. Hypotensive and antioxidant effects of laser therapy, its ability to decrease total peripheral resistance were more pronounced in patients with stage I hypertension. Adult;Blood Platelets;Blood Pressure;Erythrocyte Membrane;Humans;Hypertension;Laser Therapy;Lipid Peroxidation;Male;Remission Induction
A histopathological study of the effects of low-power laser irradiation on wound healing of exposed dental pulp tissues in dogs, with special reference to lectins and collagens. This study investigated the effects of low-power laser irradiation on exposed pulp tissue in dogs. Gallium-aluminium-arsenide diode laser (300 mW) irradiation was applied to the exposed surface of the pulp, and histopathological changes were observed at 1, 3, and 7 wk after the operation. In addition, the lectin (concanavalin A, Dolichos biflorus agglutinin, peanut agglutinin, Ricinus communis agglutinin I, soybean agglutinin, Ulex europeus agglutinin I, and wheat germ agglutinin) binding pattern and distribution of collagens (type I, III, and V) were examined to determine the histochemical and immunohistochemical nature of wound healing. The fibrous matrix formation and the continuing changes in the dentin bridge formation of the irradiation group were observed earlier (1 wk after the operation) than in the nonirradiation control group. Lectin histochemistry and collagen immunohistochemistry showed that concanavalin A, peanut agglutinin, wheat germ agglutinin, and collagens (types I, III, and V) were distributed in the fibrous matrix and dentin bridge. The expression of these lectins and collagens occurred earlier in the laser irradiation group than in the control group. These results suggest that laser irradiation accelerates wound healing of the pulp and the expression of the lectins and collagens. Furthermore, D-glucose-, D-mannose-, N-acetyl-D-galactosamine-, and N-acetyl-neuraminic acid-binding sugars and type I, III, and V collagens play an important role in the healing of pulp wounds. Lectins;Collagen Animals;Collagen;Dental Pulp;Dogs;Dose-Response Relationship, Radiation;Immunohistochemistry;Lasers;Lectins;Time Factors;Wound Healing
Low-energy laser irradiation stimulates bone nodule formation at early stages of cell culture in rat calvarial cells. Although the acceleration of bone regeneration by laser treatment has been reported, the mechanisms of action of laser on bone are unclear. To determine the target cells responsible for the action of laser irradiation and roles of irradiation on these cells during bone formation, we investigated the effects of low-energy laser irradiation at various cell culture stages on cellular proliferation, bone nodule formation, alkaline phosphatase activity, and osteocalcin gene expression, employing rat calvarial cells. Osteoblast-like cells isolated from fetal rat calvariae were irradiated once with a low-energy Ga-Al-As laser (830 nm, 500 mW) at various cell culture stages (days 1-16). Laser irradiation at early stages of culture significantly stimulated cellular proliferation, ALP activity, and osteocalcin gene expression thereafter. Furthermore, laser irradiation at earlier stages of culture significantly stimulated a greater number (1.7-fold) and larger area (3.4-fold) of bone nodules that had developed in the culture dish on day 21. However, these effects could not be found by irradiation at a later date. These results suggest that laser irradiation may play two principal roles in stimulating bone formation. One is stimulation of cellular proliferation, especially proliferation of nodule-forming cells of osteoblast lineage, and the other is stimulation of cellular differentiation, especially to committed precursors, resulting in an increase in the number of more differentiated osteoblastic cells and an increase in bone formation. Both bone-formation-stimulating roles may be exhibited by laser irradiation to immature cells only. RNA, Messenger;Osteocalcin;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone

Development;Cell Count;Cell Differentiation;Cell Division;Cells, Cultured;Female;Laser Therapy;Osteoblasts;Osteocalcin;Pregnancy;RNA, Messenger;Rats;Rats, Wistar;Skull

A randomized controlled evaluation of low-intensity laser therapy: plantar fasciitis. OBJECTIVE: To determine whether low-intensity laser irradiation, a widespread but controversial physical therapy agent, is an effective treatment of plantar fasciitis. DESIGN: A randomized, double-blinded, placebo-controlled clinical study. SETTING: A sports medicine clinic. SUBJECTS: Thirty-two otherwise healthy individuals with plantar fasciitis of more than 1 month's duration. INTERVENTION: Dummy or active irradiation with a 30 mW .83 microm GaAlAs continuous-wave infrared (IR) diode laser three times a week for 4 weeks. MEASUREMENTS: Morning pain, pain with toe walking, tenderness to palpation, windlass test response, medication consumption, and orthotic use were evaluated immediately before the study, as well as at the midpoint and end of treatment. Subjects were also evaluated at a follow-up 1 month after their last treatment. RESULTS: No significant differences were found between the groups in any of the outcome measures either during treatment or at the 1-month follow-up. Treatment, however, was well tolerated and side effects were minimal. CONCLUSIONS: Low-intensity IR laser therapy appears safe but, at least within the parameters of this study, is not beneficial in the treatment of plantar fasciitis. Adult;Double-Blind Method;Fasciitis;Female;Foot Diseases;Humans;Laser Therapy;Male;Middle Aged;Pain Measurement

Hypoxia and hypothermia enhance spatial heterogeneities of repolarization in guinea pig hearts: analysis of spatial autocorrelation of optically recorded action potential durations. INTRODUCTION: Regional dispersions of repolarization (DOR) are arrhythmogenic perturbations that are closely associated with reentry. However, the characteristics of DOR have not been well defined or adequately analyzed because previous algorithms did not take into account spatial heterogeneities of action potential durations (APDs). Earlier simulations proposed that pathologic conditions enhance DOR by decreasing electrical coupling between cells, thereby unmasking differences in cellular repolarization between neighboring cells. Optical mapping indicated that gradients of APD and DOR are associated with fiber structure and are largely independent of activation. We developed an approach to quantitatively characterize APD gradients and DOR to determine how they are influenced by tissue anisotropy and cell coupling during diverse arrhythmogenic insults such as hypoxia and hypothermia. METHODS AND RESULTS: Voltage-sensitive dyes were used to map APs from 124 sites on the epicardium of Langendorff-perfused guinea pig hearts during (1) cycles of hypoxia and reoxygenation and (2) after 30 minutes of hypothermia (32 degrees to 25 degrees C). We introduce an approach to quantitate DOR by analyzing two-dimensional spatial autocorrelation of APDs along directions perpendicular and parallel to the longitudinal axis of epicardial fibers. A spatial correlation length L was derived as a statistical measure of DOR. It corresponds to the distance over which APDs had comparable values, where L is inversely related to DOR. Hypoxia (30 min) caused a negligible decrease in longitudinal thetaL (from 0.530 +/- 0.138 to 0.478 +/- 0.052 m/sec) and transverse thetaT (from 0.225 +/- 0.034 to 0.204 +/- 0.021 m/sec) conduction velocities and did not alter thetaL/thetaT or activation patterns. In paced hearts (cycle length [CL] = 300 msec), hypoxia decreased APDs (123 +/- 18.2 to 46 +/- 0.6 msec; $P < 0.001$) within 10 to 15 minutes and enhanced DOR, as indicated by reductions of L from 1.8 +/- 0.9 to 1.1 +/- 0.5 mm ($P < 0.005$). Hypothermia caused marked reductions of thetaL (0.53 +/- 0.138 to 0.298 +/- 0.104 m/sec) and thetaT (0.225 +/- 0.034 to 0.138 +/- 0.027 m/sec), increased APDs (128 +/- 4.4 to 148 +/- 14.5 msec), and reduced L from 2.0 +/- 0.3 to 1.3 +/- 0.6 mm ($P < 0.05$). L decreased with increased time of hypoxia and recovered upon reoxygenation. Hypoxia and hypothermia reduced L measured along the longitudinal (L(L)) and transverse (L(T)) axes of cardiac fibers while the ratio of L(L)/L(T) remained constant. CONCLUSION: Conventional indexes of DOR (i.e., APD "range" or "standard deviation," evaluated with extracellular electrodes) did not convey the spatial inhomogeneities of repolarization revealed by L. Spatial autocorrelation analysis

provides a statistically significant measurement of DOR, which can take into account intrinsic heterogeneities of APDs and fiber orientation. The data show that hypoxia and hypothermia produce reductions of L, even though they have different effects on mean APD and conduction velocity. The preservation of a constant L(L)/L(T) ratio during hypoxia and hypothermia, despite large reductions in L, is consistent with a mechanism in which reduced cell-to-cell coupling unmasks intrinsic dispersions of APD and reduces L(L) and L(T) by the same factor. Thus, the spatial autocorrelation of APDs provides a sensitive index of DOR under normal and arrhythmogenic conditions. It incorporates the anisotropic nature of the myocardium and therefore is preferable to conventional indexes of DOR. Action Potentials;Animals;Anisotropy;Cardiac Pacing, Artificial;Electrophysiology;Female;Guinea Pigs;Heart;Heart Conduction System;Heart Ventricles;Hypothermia, Induced;Hypoxia;In Vitro Techniques;Male;Neural Pathways;Purkinje Fibers

Anthrapyrazoles and interstitial laser phototherapy for experimental treatment of squamous cell carcinoma. Interstitial laser therapy (ILT) is an effective palliative treatment for advanced head and neck cancer, but recurrence often is seen at the margin. The objective of the current study was to test combined drug and laser therapy as an experimental approach for improved treatment of human squamous cell carcinoma (SCCA). Human SCCA tumor transplants were grown in nude mice and injected with the photosensitive anthrapyrazole CI-941 before ILT. Intralesional drug injections alone at levels ranging from 60 to 1200 microg/gm of tumor induced a growth delay at the higher doses, but recurrence was seen in all 35 tumors tested. SCCA tumor transplants injected with 240 microg/gm CI-941 followed after 4 hours by ILT with the KTP532 laser led to a complete response rate of 72% (21/29) compared with 45% (13/29) for ILT alone. Laser chemotherapy was a significant improvement compared with ILT when partial and complete responses were combined ($P < 0.03$). The results provide preclinical evidence that laser chemotherapy may become a useful minimally invasive treatment for advanced squamous cell carcinoma of the head and neck. Anthraquinones;Antineoplastic Agents;Pyrazoles;Pyrazolones;losoxantrone Animals;Anthraquinones;Antineoplastic Agents;Carcinoma, Squamous Cell;Combined Modality Therapy;Humans;Laser Coagulation;Mice;Mice, Inbred BALB C;Mice, Nude;Neoplasm Transplantation;Pyrazoles;Pyrazolones

Suppressive effects of low-power laser irradiation on bradykinin evoked action potentials in cultured murine dorsal root ganglion cells. The effects of Ga-Al-As diode laser (830 nm, 16.2 mW) irradiation on the distal portion of the processes of cultured murine dorsal root ganglion (DRG) neurons associated with C-fibers were studied by patch-clamp whole-cell recording of membrane potentials at the cell body. The chemical as well as laser light stimulations were limited to the processes of the neuron isolated from the cell body with a separator. The action potentials elicited by bradykinin (BK) in the cell body were reversibly suppressed by the irradiation of laser light. The laser irradiation may block the conduction of nociceptive signals in primary afferent neurons. The present experimental method offers a simple and easy to use procedure for studying the pain relief effects by laser irradiation. Sodium Channels;Tetrodotoxin;Bradykinin Action Potentials;Animals;Bradykinin;Cells, Cultured;Dose-Response Relationship, Radiation;Electric Stimulation;Evoked Potentials;Ganglia, Spinal;Infrared Rays;Lasers;Male;Mice;Mice, Inbred ICR;Patch-Clamp Techniques;Sodium Channels;Tetrodotoxin;Time Factors

Effect of low-power laser irradiation on the mechanical properties of bone fracture healing in rats. BACKGROUND AND OBJECTIVE: Low-power laser irradiation (LPLI) has been found to have a positive effect on bone fracture healing in animal models, based on morphogenic, biochemical, roentgenographic, and electron microscopic measurements. We investigated the effect of LPLI on bone fracture healing in rats using biomechanical methods. STUDY DESIGN/MATERIALS AND METHODS: Two groups of male Wistar rats, divided in a randomized block design in a blinded fashion,

each consisting of 25 animals, were subjected to anesthesia and tibial bone fracture with internal fixation. The first group was treated with LPLI (HeNe laser 632.8 nm, 35 mW), applied transcutaneously over 30 minutes to the area of the fracture daily for 14 days. The second group served as a control. After 4 weeks, the tibia was removed and tested at tension up to failure (by a Lloyd LR 50K testing apparatus, U.K.) in 16 rats from group I and 15 from group II. The maximal load at failure, the structural stiffness of the tibia (callus stiffness), and the extension maximal load were measured. RESULTS: The maximal load at failure and the structural stiffness of the tibia were found to be elevated significantly in the irradiated group (P = .014 and P = .0023, respectively), whereas the extension maximal load was reduced (P = .015). In addition, gross non-union was found in four fractures in the control group, compared to none in the irradiated group. CONCLUSION: These results suggest that LPLI treatment may play a role in enhancing bone healing. Animals;Fracture Fixation, Internal;Fracture Healing;Laser Therapy;Male;Rats;Rats, Wistar;Stress, Mechanical;Tibial Fractures

Effect of low-level laser therapy (LLLT) on viscoelasticity of the contracted knee joint: comparison with whirlpool treatment in rats. BACKGROUND AND OBJECTIVE: The purpose of this study was to compare the effect of Low-Level Laser Therapy (LLLT) with sham and whirlpool treatment on the contracted knee joint in rat. STUDY DESIGN/MATERIALS AND METHODS: Forty-eight Wistar rats were operated on to immobilize knee joint, and 1 week after operation they were randomly assigned to four treatment groups: laser 40 mW (3.9 W/cm2), laser 60 mW (5.8 W/cm2), whirlpool (42 degrees C), and sham laser. Tunable Ga-Al-As semiconductor (810 nm) laser was used for another 2 weeks of treatment. Removing and preparing bilateral hind legs, degree of knee contracture was assessed by measuring the knee flexion angle, weight of the gastrocnemius muscle, and periarticular connective tissue viscoelasticity measuring phase-lag and stiffness. RESULTS AND CONCLUSION: Laser irradiation showed no significant changes except the phase-lag of laser 60 mW. Under the conditions of this study, LLLT stimulation did not provide a significant effect for minimizing the degree of experimental joint contracture over whirlpool treatment.
Animals;Contracture;Hindlimb;Hydrotherapy;Joints;Laser Therapy;Male;Rats;Rats, Wistar

Influence of low level laser irradiation on biochemical processes in brainstem and cortex of intact rabbits. The influence of low level laser (LLL) irradiation at wavelength at 660 and 904 nm on oxidative stress (lipid peroxidation activity-LP, production of superoxide anion radicals-NBT reduction), activity of enzymes of antioxidative defense (superoxide dismutase-SOD, glutathione reductase-GR) and functional activity of sodium pump (Na+K+ ATPase) in relation with applied wavelength of LLL was investigated. The investigation was performed at the adult rabbits (n = 21) classificated in three groups: control group (C), the group of rabbits irradiated with LLL wavelength 904 nm (CL1) and the group of rabbits irradiated with LLL wavelength 660 nm (CL2). The irradiation was performed in the upper cervical region in the anatomical projection of the brainstem. It was established that LLL induced oxidative stress in the brainstem and the cortex of treated rabbits, independently of applied wavelength of laser beams. The registrated changes in functional activity of sodium pump were dependent on the applied wavelength. The irradiation at 904 nm caused the significant increase of the substrate uptake rate of sodium pump in the brainstem tissue. The irradiation at 660 nm caused the "competitive inhibition" of the sodium pump. Decrease of norepinefrine content in the brainstem of treated rabbits pointed on the indirect mechanism of functional activity of sodium pump as well as the oxidative stress. Biogenic Amines;Superoxide Dismutase;Glutathione Reductase;Sodium-Potassium-Exchanging ATPase Animals;Biogenic Amines;Brain Stem;Cerebral Cortex;Glutathione Reductase;Lasers;Lipid Peroxidation;Oxidative Stress;Rabbits;Sodium-Potassium-Exchanging ATPase;Superoxide Dismutase

[Combined low-power laser therapy and local infiltration of corticosteroids in the treatment of radial-humeral epicondylitis]. The prospective study included 32 patients with radiohumeral epicondylitis. They are by single-blind method divided into three groups: Group I (n = 11) was treated with low power laser therapy (904 nm, 5 kHz, in the dose of 1 J/cm2); Group II (n = 11) was treated with corticosteroid infiltration and group III (n = 10) was treated with combination of initial infiltration and subsequent laser therapy. The estimation of therapy effect was done by pain intensity follow-up with modified McGuill's questionnaire. The results of the first control examination, 7 days after the therapy onset, demonstrated significantly higher analgesic effect to be achieved in the group of patients treated with combination of corticosteroid infiltration and laser therapy. Similar results were noticed in the other two groups after the repeated same treatment. Glucocorticoids;Betamethasone Adult;Betamethasone;Combined Modality Therapy;Female;Glucocorticoids;Humans;Laser Therapy;Male;Prospective Studies;Radiotherapy Dosage;Tennis Elbow

Low level laser therapy. Adult;Fibroblasts;Humans;Journalism, Dental;Laser Therapy;Mouth Mucosa;Publishing

Phototherapy with low intensity laser irradiation for a chronic radiation ulcer in a patient with lupus erythematosus and diabetes mellitus. Aged;Chronic Disease;Diabetes Mellitus, Type 2;Female;Humans;Laser Therapy;Lupus Erythematosus, Systemic;Radiation Injuries;Skin Ulcer

Adaptation to chromosomal damage in an Indian muntjac fibroblast cell line conditioned with low intensity laser irradiation. DNA Animals;Cell Line;Chromosome Aberrations;DNA;DNA Damage;Dose-Response Relationship, Radiation;Fibroblasts;Gamma Rays;Lasers;Metaphase;Muntjacs

Laser treatment in eyes with large drusen. Short-term effects seen in a pilot randomized clinical trial. Choroidal Neovascularization Prevention Trial Research Group. OBJECTIVE: This study aimed to describe the short-term effects of low-intensity laser treatment in eyes with drusen at risk of having choroidal neovascularization (CNV) develop secondary to age-related macular degeneration. DESIGN: The study design was a multicentered, randomized clinical trial of laser treatment versus observation. PARTICIPANTS: One hundred fifty-six patients without exudative age-related macular degeneration and with more than 10 large (> 63 microns) drusen in each eye were enrolled in the Bilateral Drusen Study. One hundred twenty patients with exudative age-related macular degeneration in 1 eye and more than 10 large drusen in the other eye were enrolled in the Fellow Eye Study. INTERVENTION: The treatment protocol for most (85%) of the eyes consisted of 20 laser burns, 100 microns in diameter, in a pattern of 3 rows placed between the 12- and 6-o'clock positions beyond the temporal perimeter of the foveal avascular zone. The desired intensity of the burns was a gray-white lesion. Whenever the area of drusen had not been reduced by 50% or more at 6 months, a second treatment was applied nasal to the fovea in a mirror image of the first treatment. During the last 6 months of enrollment, a second laser treatment protocol was adopted that specified 24 laser burns, 100 microns in diameter, in a circular pattern of 2 rows surrounding the macular drusen. MAIN OUTCOME MEASURES: Change in visual acuity is the primary outcome measure. Incidence of CNV, change in contrast threshold, and change in critical print size are secondary outcome measures. RESULTS: In the Bilateral Drusen Study, CNV developed in 4 of 156 treated eyes and in 2 of 156 observed eyes (P = 0.62); in the Fellow Eye Study, the proportions are 10/59 treated eyes and 2/61 observed eyes (P = 0.02). Changes in visual acuity are similar in treated and observed eyes in the Bilateral Drusen Study through 18 months. However, by 18 months, observed eyes in the Fellow Eye Study have lost more visual acuity than treated eyes (P = 0.02). Changes in contrast threshold are similar in treated and observed eyes in each study. CONCLUSIONS: Laser treatment to high-risk fellow eyes may increase the short-term incidence of CNV. Long-term effects in fellow eyes and effects in patients with bilateral drusen require additional observation. Aged;Aged, 80 and over;Choroid;Contrast

Sensitivity;Female;Fluorescein Angiography;Follow-Up Studies;Fundus Oculi;Humans;Laser Coagulation;Macular Degeneration;Male;Middle Aged;Neovascularization, Pathologic;Pilot Projects;Retinal Drusen;Visual Acuity

Photomodulation of oxidative metabolism and electron chain enzymes in rat liver mitochondria. Low-level laser irradiation has been applied in a variety of laboratory studies and clinical trials for photobiostimulation over the last three decades. Considerable skepticism exists regarding the concept of photostimulation within the medical community. One of the major difficulties with photoirradiation research is that it lacks experimentally supportable mechanisms for the alleged photobiostimulatory effects. This study was undertaken to determine whether oxidative metabolism and electron chain enzymes in rat liver mitochondria can be modulated by photoirradiation. Oxygen consumption, phosphate potential, and energy charge of rat liver mitochondria were determined following photoirradiation. Activities of mitochondrial enzymes were analyzed to assess the specific enzymes that are directly involved with the photostimulatory process. An argon-dye laser at a wave-length of 660 nm and at a power density of 10 mW/cm2 was used as a photon source. Photoirradiation significantly increased oxygen consumption (0.6 J/cm2 and 1.2 J/cm2, $P < 0.05$), phosphate potential, and the energy charge (1.8 J/cm2 and 2.4 J/cm2, $P < 0.05$) of rat liver mitochondria and enhanced the activities of NADH: ubiquinone oxidoreductase, ubiquinol: ferricytochrome C oxidoreductase and ferrocytochrome C: oxygen oxidoreductase (0.6 J/cm2, 1.2 J/cm2, 2.4 J/cm2 and 4.8 J/cm2, $P < 0.05$). The activities of succinate ubiquinone oxidoreductase, ATPase, and lactate dehydrogenase were not affected by photoirradiation. L-Lactate Dehydrogenase;Adenosine Triphosphatases;Oxygen Adenosine Triphosphatases;Animals;Electron Transport;Energy Metabolism;L-Lactate Dehydrogenase;Mitochondria, Liver;Oxidation-Reduction;Oxygen;Rats;Rats, Sprague-Dawley

Comments on the use of low-level laser therapy (LLLT) in painful musculo-skeletal disorders. Humans;Laser Therapy;Musculoskeletal Diseases;Pain

The current status of low level laser therapy in dentistry. Part 2. Hard tissue applications. While most applications of low level laser therapy (LLLT) in dentistry are directed toward soft tissues, in recent years there has been increasing interest in tooth-related or hard tissue applications of LLLT. This report provides an overview of applications of LLLT in the treatment of dentine hypersensitivity and pain arising from the periodontal ligament, and describes the phenomenon of lethal laser photosensitization and its applications in the treatment of dental caries. Technical aspects of LLLT equipment and safety concerns are also discussed. Bacteria;Dental Caries;Dentin Sensitivity;Equipment Safety;Humans;Laser Therapy;Mouth Diseases;Pain;Periodontal Diseases;Periodontal Ligament;Sterilization;Technology, Dental;Tooth Diseases;Tooth Movement Techniques

[Pain suppressive effect of low power laser irradiation. A quantitative analysis of substance P in the rat spinal dorsal root ganglion]. The influence of low power laser irradiation on pain was studied by the quantification of substance P in the rat spinal dorsal root ganglion (DRG). Forty-one Sprague-Dawley rats were divided into three groups: control (n = 12), stimulated group (n = 16), and laser application group (laser group) (n = 13). Under pentobarbital anesthesia, the right sciatic nerve of rats was exposed. The sciatic nerve was stimulated electrically in the stimulated group and the laser group. The laser irradiation was continued during the electrical stimulation in the laser group. Immediately after the electrical stimulation with or without the laser application, DRG of the fourth to sixth lumbar spinal roots were excised. Immunohistochemical substance P staining and substance P-like immunoreactivity (SP-LI) quantification were done in the excised DRG. There was a statistically significant difference of SP-LI between the control group (14.9 +/- 5.02 pg/mg tissue) and the stimulated group (20.9 +/- 7.54 pg/mg tissue) ($p < 0.05$). There was no statistically significant

difference between the control and the laser group (16.2 +/- 4.83 pg/mg tissue). These results suggest that the laser irradiation suppresses the excitation of the unmyelinated C-fibers in the afferent sensory pathway. Substance P Analgesia;Animals;Enzyme-Linked Immunosorbent Assay;Ganglia, Spinal;Laser Therapy;Male;Nerve Fibers;Neural Conduction;Radiation Dosage;Rats;Rats, Sprague-Dawley;Substance P
Successful treatment of a persistent radiation ulcer by low power laser therapy. Helium;Neon Chronic Disease;Female;Follow-Up Studies;Foot Diseases;Foot Ulcer;Helium;Humans;Laser Therapy;Middle Aged;Neon;Radiation Injuries;Radiotherapy;Skin;Treatment Outcome;Warts;Wound Healing
The current status of low level laser therapy in dentistry. Part 1. Soft tissue applications. Despite more than 30 years of experience with low level laser therapy (LLLT) or 'biostimulation' in dentistry, concerns remain as to its effectiveness as a treatment modality. Controlled clinical studies have demonstrated that while LLLT is effective for some specific applications, it is not a panacea. This paper provides an outline of the biological basis of LLLT and summarizes the findings of controlled clinical studies of the use of LLLT for specific soft tissue applications in dentistry. Areas of controversy where there is a pressing need for further research are identified. Absorption;Analgesia;Animals;Biology;Bone and Bones;Controlled Clinical Trials as Topic;Dental Research;Fibroblasts;Humans;Laser Therapy;Mouth Diseases;Mouth Mucosa;Nerve Regeneration;Pain, Postoperative;Tooth;Tooth Diseases;Wound Healing
Photochemical reactions of nitrosyl hemoglobin during exposure to low-power laser irradiation. Relaxation of blood vessel walls is one of the physiological effects induced by visible radiation. This effect is similar to the endothelium-derived relaxation (based on endothelium-derived relaxing factor, EDRF) and depends on the presence of nitric oxide donors. We assumed that nitric oxide hemoglobin (HbNO) might participate in the mechanism of this phenomenon and investigated the photochemical reactions using low-power He-Cd (441.6 nm) and He-Ne (632.8 nm) lasers. It was found that in the presence of oxygen the He-Cd laser but not He-Ne laser induced a photolytic decrease of the HbNO EPR signal amplitude by 25-35%. Using optical absorption measurements, we showed that methemoglobin was formed during irradiation. The comparison of the kinetics of this process and the irreversible reduction of paramagnetic centers suggest that the laser radiation leads to dissociation of the heme-NO complexes, but not to oxidation of the heme iron. In the absence of oxygen the photodissociation effect did not exceed 5-10% and was reversible. We suppose that this finding can be explained by fast reassociation of NO with unligated Hb. The EPR spectrum of iminonitroxide was observed upon irradiation of HbNo with nitronyl nitroxide in a vacuum, suggesting the formation of free NO. Thus, our experiments confirm that NO-hemoglobin can reversibly dissociate and release free NO during exposure to He-Cd laser radiation. Hemoglobins;nitrosyl hemoglobin;Nitric Oxide;Oxygen Electron Spin Resonance Spectroscopy;Hemoglobins;Humans;In Vitro Techniques;Kinetics;Lasers;Nitric Oxide;Oxygen;Photochemistry;Vasodilation
[Low-intensity laser irradiation in the treatment and prevention of complications of catheterization of the subclavian vein]. Adult;Aged;Blood;Catheterization, Central Venous;Child;Humans;Laser Therapy;Subclavian Vein;Thrombophlebitis;Thrombosis;Venous Insufficiency
Stimulatory effects of low-power laser irradiation on bone regeneration in midpalatal suture during expansion in the rat. The purpose of this study was to investigate the effects of low-power laser irradiation on bone regeneration during expansion of a midpalatal suture in rats. Gallium-aluminum-arsenide diode laser 100 mW irradiation was applied to the midpalatal suture during expansion carried out over 7 days (3 or 10 minutes per day), 3 days (7 minutes per day for day 0-2 or 4-6), and 1 day (21 uninterrupted minutes on day 0). The bone regeneration in the midpalatal suture estimated

by histomorphometric method in the 7-day irradiation group showed significant acceleration at 1.2- to 1.4-fold compared with that in the nonirradiated rats, and this increased rate was irradiation dose-dependent. Irradiation during the early period of expansion (days 0 to 2) was most effective, whereas neither the later period (days 4 to 6) nor the one-time irradiation had any effect on bone regeneration. These findings suggest that low-power laser irradiation can accelerate bone regeneration in a midpalatal suture during rapid palatal expansion and that this effect is dependent not only on the total laser irradiation dosage but also on the timing and frequency of irradiation. We suggest laser therapy may be of therapeutic benefit in inhibiting relapse and shortening the retention period through acceleration of bone regeneration in the midpalatal suture. Arsenicals;Coloring Agents;Gallium;Aluminum Aluminum;Animals;Arsenicals;Bone Regeneration;Calcification, Physiologic;Cephalometry;Coloring Agents;Cranial Sutures;Dose-Response Relationship, Radiation;Gallium;Haversian System;Laser Therapy;Male;Osteogenesis;Palatal Expansion Technique;Palate;Radiation Dosage;Rats;Rats, Wistar;Time Factors

Low level laser therapy in the treatment of temporomandibular disorders (TMD): a double-blind pilot study. The aim of this paper was to evaluate the efficacy of a Low-Level Laser therapy in patients with Temporomandibular Disorders (TMD) using a double-blind design. A sample of 20 patients with a chief complaint of pain was divided into myogenous and arthrogenous groups. The sample was also divided on the basis of the treatment rendered: real versus placebo treatment. An 830 nm Ga-Al-As Laser device with a energy power of 4 joules was used (OMNILASE, LASERDYNE PTY LTD.) in three treatment sessions. To evaluate the effectiveness of laser treatment, a Visual Analogue Scale (VAS) was used for pain and active range of motion (AROM) was used to measure changes in mandibular function. Using real laser treatment, the author found that there was a reported improvement in pain only for the myogenous pain patients ($p < or = 0.02$). For the arthrogenous pain patients, real laser treatment resulted in an improvement in Total Vertical Opening (TVO) ($p < 0.05$), Protrusive excursion (PROT) ($p < 0.02$) and Left lateral excursion (LATLEF) ($p < 0.02$). The placebo control group showed improvement in TVO and PROT for those patients having myogenous pain and LATLEF for those patients having arthrogenous pain. A repeated measurement one-way ANOVA demonstrated no significant differences between real and placebo groups. Considering the non-invasive and harmless characteristics of this modality, more research is recommended, using higher power and increased frequency of laser applications. Adult;Analysis of Variance;Double-Blind Method;Facial Pain;Female;Humans;Laser Therapy;Male;Temporomandibular Joint Disorders;Temporomandibular Joint Dysfunction Syndrome

Laser bronchoscopy with transglottic/supraglottic ventilation to relieve dysphonia and subglottic obstruction. Dysphonia after endotracheal intubation usually indicates a glottic lesion but it can also herald an obstructing subglottic airway mass. Outpatient strobovideolaryngoscopy may be anatomically extended by transglottic videotracheobronchoscopy to achieve a thorough examination of the proximal bronchi, trachea, subglottis, glottis, and supraglottis in selected cases. Combining these techniques with lateral soft tissue x-ray studies of the neck in two patients with dysphonia and stridor, nearly identical postendotracheal intubation subglottic severely obstructing granulation "tumors" were diagnosed. Operative subglottic resection with a rigid ventilating laser bronchoscope combined with transglottic/supraglottic anesthetic ventilation techniques and contact-tip Nd-YAG laser phototherapy relieved the dysphonia and airway obstruction simultaneously. Normal vocal quality and full anatomical airway patency were achieved in both cases. Follow-up postoperative vocal rehabilitation and medical therapy sustained the surgical results. Aged;Airway Obstruction;Anesthesia, Local;Bronchoscopy;History, 16th Century;History, 17th Century;History, 19th Century;History, 20th Century;Humans;Laryngoscopy;Laser Therapy;Male;Middle Aged;Muscle Relaxation;Phototherapy;Respiration, Artificial;Voice Disorders

Evaluation of low level laser therapy on primary healing of experimentally induced full thickness teat wounds in dairy cattle. OBJECTIVE: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) on sutured wounds of the teat in dairy cattle. STUDY DESIGN: By using the Latin square design, the effect of LLLT was evaluated by radiography, measurement of microcirculation flow, histopathology, tensiometry, and hydroxyproline analysis. ANIMALS OR SAMPLE POPULATION: Sixteen teats of four dairy cattle. METHODS: Full thickness wounds were made on the cranial surface of the teats. Teats were distributed into four groups; group A and B wounds were closed with a Gambee pattern, group C and D wounds were closed with three-layers of continuous suture pattern. Group B and D wounds were treated with 3.64 J/cm2 of LLLT using a helium-neon system continuous wave (632.8 nm) output of 8.5 nW. RESULTS: The teat wall in non-LLLT groups was significantly thicker than in LLLT groups on day 7, 14 and 21. The mean blood flow differences between control and sutured sites in LLLT groups were significantly lower than those in non-LLLT groups. The morphology of the epidermis in LLLT groups more closely resembled the normal epidermis than that of non-LLLT groups. Collagen fibers in LLLT groups were denser, thicker, better arranged and more continuous with existing collagen fibers than those in non-LLLT groups. The mean tensile strength was significantly greater in LLLT groups than in non-LLLT groups. CONCLUSION: The LLLT affects various aspects of the healing process, including minimizing inflammation, formation of edema, improvement of skin regeneration and enhancement of collagen synthesis. CLINICAL RELEVANCE: The LLLT could accelerate healing of sutured wounds of the teat in dairy cattle.
Animals;Cattle;Evaluation Studies as Topic;Female;Laser Therapy;Mammary Glands, Animal;Radiography;Wound Healing;Wounds and Injuries

Analysis of the low-energy laser treatment of some cancers and infectious diseases. In this article, the results of a 5-year investigation of low-energy laser therapy for the treatment of some oncological and infection diseases are presented. We used special infrared (IR) lasers with a wavelength of 890 nm in our investigations. All laser actions on organisms occurred through the skin only (a noninvasive method). Adolescent;Adult;Female;HIV Infections;Hepatitis, Viral, Human;Humans;Laser Therapy;Male;Middle Aged;Neoplasms;Phototherapy

Structural and cytochemical modifications in the lingual glands of the newborn chicken irradiated with He-Ne laser. Despite the increasing and successful use of laser in Medicine and Odontology, the possible iatrogenic and otherwise deleterious side effects of this radiation remain mostly unknown. In previous studies, it was shown that both the embryonic and the post-hatched chicken constitute reliable experimental models for this type of studies. Hence, the purpose of the present work was to analyze the structural and cytochemical alterations of the lingual glands of the newborn chicken irradiated with low energy He-Ne laser. This laser produced regressive structural changes of the glands towards the embryonic stage as well as hyperplasia of the reserve glandular basal cells. Furthermore, a decrease in the glycoprotein content and a rise in the sulphated glycosaminoglycans were also found. These results corroborate the pathogenic effects of the He-Ne- laser on the experimental model employed and, at the same time, emphasize the importance of considering, regarding clinical applications, possible previous neoplastic alterations as well as adverse reactions which might appear once laser therapy has been installed.
Glycoconjugates;Glycosaminoglycans;Sialoglycoproteins;Helium;Neon
Animals;Chickens;Erythrocyte Aggregation;Glycoconjugates;Glycosaminoglycans;Helium;Histocytochemistry;Hyperplasia;Lasers;Lip;Low-Level Light Therapy;Neon;Salivary Glands, Minor;Sialoglycoproteins

Comparison of wound healing process using Argon and Krypton lasers. OBJECTIVE: We compared the wound healing process on Sprague-Dawley rats between Argon Laser and Krypton Laser, and calculated the laser actual doses after correction on wound healing on rats and estimated the clinical

doses on wound healing for human skin. SUMMARY BACKGROUND DATA: Laboratory work provided some support for the use of low-intensity laser radiation in wound healing. Some studies found that laser irradiation may either enhance, inhibit, or has no effect on the function of a variety of microorganisms and cells. Animal studies also offered some basis for treatment. Improvements, particularly in the earliest phases of wound healing, have been reported following laser irradiation. METHODS: We used Argon Laser (488-514 nm) and Krypton Laser (670 nm) in the study. The laser beam was delivered through a system of fiber optic in Argon Laser and reflector in Krypton Laser. The rats treated were restrained in a Plexiglas cage without anesthesia during the laser irradiation period. The percentage of the wound healing acceleration in days and size, actual doses, and estimated clinical doses were calculated as follows: AccD = (1-TD/CD) x 100%, AccS = (1-TA/CA) x 100%, AD = D(in) - D(gl) - D(SR) and ECD = AD = D(sr), respectively. RESULTS: The acceleration effects of wound healing in days (AccD) were 22.93% and 14.54%, size reductions (AccS) were 41.93% and 30.41% at the optimal stimulative incident dose of 20 J/cm2. Zero bioactivation shown at the incident doses of 80 J/cm2 and 100 J/cm2. The inhibitory effects of wound healing in days were -7.72% and -3.37%, in size reduction were -13.35% and -12.88% at the maximal inhibitory incident dose of 140 J/cm2 for Argon and Krypton Lasers, respectively. The actual doses were 5.21 J/cm2 and 4.03 J/cm2, the estimated clinical doses were 5.50 J/cm2 and 4.25 J/cm2 at optimal stimulative incident dose 20 J/cm2 for Argon and Krypton Lasers, respectively. CONCLUSIONS: Low power laser therapy at the appropriate dosimetric parameters can provide the acceleration effects of wound healing on rats. The effects were dependent with the doses and laser wavelengths used. In this experiment, the optimum stimulative dose was 20 J/cm2 and the Argon Laser with 488 nm was more effective than the Krypton Laser with 670 nm. The zero bioactivation and inhibition effect of wound healing on rats occurred in Argon Laser and Krypton Laser. Krypton;Argon Animals;Argon;Dose-Response Relationship, Radiation;Fibroblasts;Humans;Krypton;Laser Therapy;Rats;Rats, Sprague-Dawley;Skin;Time Factors;Wound Healing

Low-level laser therapy in the management of disorders of the maxillofacial region. OBJECTIVE: The authors analysed the effects of low-level laser therapy (LLLT) on the treatment of maxillofacial disorders. SUMMARY BACKGROUND DATA: Pioneer work published by Mester et al. opened a new frontier in the clinical treatment of many disorders with the use of LLLT. Although LLLT is not well accepted in many places, its use is growing steadily in others, including Europe and more recently in Brazil. METHODS: One hundred forty-one female and 24 male patients, between 7 and 81 years of age (average = 39.2 years old), suffering from disorders of the maxillofacial region were treated with 632.8-nm, 670-nm, and 830-nm diode lasers at the Laser Center of the Universidade Federal de Pernambuco. The disorders included temperomandibular joint pain, trigeminal neuralgia, muscular pain, aphatae, inflammation, and tooth hypersensitivity both postoperatively and in small hemangiomas. Most treatment consisted of a series of 12 applications (twice a week), and in eight cases a second series was applied. Patients were treated with an average dose of 2.5 J/cm2. RESULTS: One hundred twenty out of 165 patients were asymptomatic at the end of the treatment, 25 improved considerably, and 20 were symptomatic. CONCLUSIONS: These preliminary results indicate that LLLT is an important tool and brings many benefits for the treatment of many disorders of the maxillofacial region. Adolescent;Adult;Aged;Aged, 80 and over;Child;Dentin Sensitivity;Facial Pain;Female;Hot Temperature;Humans;Laser Therapy;Male;Middle Aged;Stomatitis, Aphthous;Temporomandibular Joint Disorders;Trigeminal Neuralgia

Intravital treatment of the pulp with simultaneous laser biostimulation. The aim of the study was clinical and radiological evaluation of the pulp treatment using direct capping and amputation under anaesthesia with simultaneous laser biostimulation. Thirty procedures were performed using laser and thirty-six without it. In all cases non-setting Ca(OH)2 was applied as a biological dressing. The

results obtained provide justification for the application of laser biostimulation to biological treatment of the pulp. Zinc Oxide-Eugenol Cement;Calcium Hydroxide Adult;Anesthesia, Dental;Calcium Hydroxide;Cementation;Dental Caries;Dental Pulp;Dental Pulp Capping;Dental Pulp Exposure;Dental Restoration, Temporary;Dentin, Secondary;Follow-Up Studies;Humans;Laser Therapy;Periapical Tissue;Pulpotomy;Radiography;Zinc Oxide-Eugenol Cement

Nonmonotonic behavior of the dose dependence of the radiation effect on cells in vitro exposed to pulsed laser radiation at lambda = 820 nm. BACKGROUND AND OBJECTIVE: In recent years, clinical low-intensity laser therapy practice has used pulsed radiation, mainly from semiconductor lasers. Experimental works devoted to the study of relationships between biological and clinical effects and parameters of pulsed radiation are practically absent. STUDY DESIGN/MATERIALS AND METHODS: The radiation source was a laser diode emitting at 820 nm (292 and 700 Hz, duty factor 80%; doses from 7 J/m2 to 5 x 10(5) J/m2; intensities 4, 12, 51, 152, 633, and 1,900 W/m2; irradiation time from 1 to 30 s). Four biological models were used: nucleated cells of murine spleen (splenocytes) and bone marrow (karyocytes), murine blood, and HeLa cells cultivated in vitro. The intensity of luminol-amplified chemiluminescence (in case of murine models) and the adhesion of HeLa cell membranes were measured as a function of the irradiation dose. RESULTS: Within the wide exposure dose range used we obtained seven maxima in the dose vs. biological effect curves: at fluences near 20, 1 x 10(2), 3 x 10(2), 8 x 10(2), 3 x 10(3), 1 x 10(4), and 3 x 10(4) J/m2. The peaks coincided for all four models. CONCLUSION: The dose curves obtained with different cellular systems are of the same type and are characterized by seven peaks in the dose interval studied (7 J/m2 to 5 x 10(5) J/m2). Animals;Blood;Bone Marrow Cells;Cell Adhesion;Cells, Cultured;Dose-Response Relationship, Radiation;HeLa Cells;Humans;Lasers;Luminescent Measurements;Male;Mice;Mice, Inbred Strains;Spleen

Low-energy diode laser irradiation reduced plasminogen activator activity in human periodontal ligament cells. BACKGROUND AND OBJECTIVE: The plasminogen activator (PA)-plasmin proteolytic system is implicated in the degradation of the extracellular matrix in inflammation. Since human periodontal ligament (PDL) cells produced high PA activity in response to mechanical stress, excessive mechanical stress to PDL cells such as occlusal trauma may induce collagen breakdown through activation of the PA-plasmin system. As low-energy laser irradiation has anti-inflammatory effects, we examined the effects of low-energy laser irradiation on the PA-plasmin system in stretched PDL cells in vitro. STUDY DESIGN/MATERIALS AND METHODS: Human PDL cells obtained from healthy premolars were mechanically stretched and Ga-Al-As low-energy laser was irradiated (830 nm, 3.95 to 7.90 J/cm2) to the stretched cells. RESULTS: PDL cells showed a marked elevation in PA activity in response to stretching, which was significantly inhibited by a laser irradiation in a dose-dependent manner (55-86%, $p < 0.001$). This effect could involve transcriptional events of tissue type (t) PA gene. CONCLUSION: These results suggests that laser irradiation may reduce collagen breakdown around the PDL associated with traumatic occlusion. Plasminogen Activator Inhibitor 1;RNA, Messenger;Collagen;Plasminogen Activators Cells, Cultured;Collagen;Dose-Response Relationship, Radiation;Gene Expression Regulation, Enzymologic;Humans;Laser Therapy;Lasers;Periodontal Ligament;Plasminogen Activator Inhibitor 1;Plasminogen Activators;RNA, Messenger;Stress, Mechanical

[Influence of regional lympho-immunostimulation and infra-red magnetolaser therapy on structure of lymph nodes of lesser omentum after gastric surgery]. The influence of regional lymphoimmunostimulation and low-intensive laser irradiation on the structure of lesser omentum lymphatic nodes short time after vagotomy and gastrotomy were studied. The lymphostimulation with T-activin decreases signs of congestion in lesser omentum lymphatic nodes and promotes the process of immunocompetent cells' migration, increases the resorptive capacity of the lymphatic

system. Laser irradiation, combined with lymphoimmunostimulation, provides the protective action on the structure of lesser omentum lymphatic nodes, and stimulates differentiation of immunocompetent cells. The action of lymphoimmunostimulation is potentiated by infra-red laser irradiation in their combined use. Adjuvants, Immunologic;Peptides;Thymus Extracts;T-activin Adjuvants, Immunologic;Animals;Cell Division;Combined Modality Therapy;Disease Models, Animal;Dogs;Female;Immunization;Laser Therapy;Lymph Nodes;Male;Omentum;Peptides;Postoperative Complications;Stomach;Thymus Extracts

[Impact of low-energy laser irradiation on the immunological nonspecific responsiveness in patients with tuberculosis]. Humans;Immunocompetence;Laser Therapy;T-Lymphocytes;Tuberculosis

Improvement of host response to sepsis by photobiomodulation. BACKGROUND AND OBJECTIVE: Late sepsis causes immunosuppression and is associated with energy depletion in lymphocytes. Adjuvant treatment with ATP-MgCL2 appears to improve cellular energetics and decrease mortality. Laser irradiation can promote cell proliferation and increase cellular ATP synthesis, which may improve the host immune response in sepsis. The purpose of this study was to determine whether laser irradiation (LI) has a stimulatory effect on the immune response in sepsis using an animal model. STUDY DESIGN/MATERIALS AND METHODS: The cecal ligation and puncture (CLP) rat model was used. Thirty-six SD rats were divided equally among four groups: control (nonoperative), sham operation, CLP treated with laser irradiation, and CLP without laser irradiation. The peritoneal cavity of each animal in CLP/laser group was irradiated immediately after CLP using an Argon-dye laser at a wavelength of 630 nm and at a fluence of 5 J/cm2. Some animals were euthanized 24 hr following CLP and were used to evaluate the immune response (lymphocyte proliferation). In a separate experiment, the survival of septic rats was observed for 60 days. Lymphocytes isolated from normal rat spleens were used to observe for biostimulatory effects in vitro. RESULTS: LI significantly improved ex-vivo lymphocyte proliferation of cells from septic rats (179.7 +/- 17.2 vs. 129.5 +/- 7.8; $P < 0.01$) and enhanced survival in septic rats (79% vs. 42%; $P < 0.001$). LI significantly stimulated lymphocyte proliferation in the presence of mitogenic stimuli and enhanced lymphocyte ATP synthesis ($P < 0.05$). CONCLUSION: LI improves the host immune response and survival rate in sepsis in an animal model. Our studies suggest that LI may be useful as an adjuvant therapy for sepsis. Adenosine Triphosphate Adenosine Triphosphate;Animals;Cecal Diseases;Intestinal Perforation;Laser Therapy;Lymphocyte Activation;Male;Rats;Rats, Sprague-Dawley;Shock, Septic

The effect of low-intensity laser irradiation on the hydrolytic activity of vacuolar membrane proton pumps. The effect of low-intensity irradiation by a helium-neon laser on the hydrolytic activity of the vacuolar membrane proton pumps has been studied. The maximum effect was found for the 3 min irradiation from a close distance (0.3 m); moreover, the PPase activity increased by 33%, whereas the ATPase activity was inhibited by 44%. The effect described is suggested to be due to different conformations of the enzymes in the membrane and their different physiological roles. Proton Pumps;Pyrophosphatases;Inorganic Pyrophosphatase;Proton-Translocating ATPases Hydrolysis;Inorganic Pyrophosphatase;Intracellular Membranes;Lasers;Proton Pumps;Proton-Translocating ATPases;Pyrophosphatases;Vacuoles;Vegetables

[Use of low-energy laser irradiation in patients with colorectal cancer after surgery]. Intravascular blood irradiation with laser was conducted in the early postoperative period in 32 patients with colorectal cancer with the use of semiconductor laser "Looch-2". It promoted the decrease of the purulent complications prevalence, the lowering of the thromboembolism occurrence risk, the diminution of the endogenic intoxication syndrome expression. Fast rehabilitation of patients was promoted by renewal of antitumoral resistance and immunity.

Adult;Aged;Blood;Colorectal Neoplasms;Combined Modality Therapy;Humans;Laser Therapy;Middle Aged;Postoperative Care;Postoperative Complications
[Substantiation of indications for low-intensity laser irradiation in combined preoperative care of patients with ulcerative gastrointestinal hemorrhage]. Indications for the low-intensive laser application in preoperative procedure scheme were speculated on the ground of complex investigation data in 175 patients with gastrointestinal ulcerative hemorrhage (GIUH). Indications for intravascular laser blood irradiation (IVLBI), for the projectional action on thymus, spleen and their combined application are established. For the reliable hemostasis guarantee the conduction of laser therapy is the most effective one. Adolescent;Adult;Aged;Duodenal Ulcer;Female;Humans;Lasers;Male;Middle Aged;Peptic Ulcer Hemorrhage;Preoperative Care;Spleen;Stomach Ulcer;Thymus Gland
[Effects of low-intensity laser irradiation on physical endurance of rats]. Blood Glucose;Lipids;Triglycerides;Triiodothyronine;Lactic Acid;Urea;Cholesterol;Thyroxine Animals;Blood Glucose;Cholesterol;Lactic Acid;Lasers;Lipids;Male;Physical Endurance;Rats;Thyroxine;Triglycerides;Triiodothyronine;Urea
Importance of using rigorous statistical methods to analyze low energy laser experimental data: Part two. BACKGROUND AND OBJECTIVE: Numerous authors have reported successful alteration of peripheral nerve action potential characteristics through application of low energy laser irradiation (LELI). The statistical analysis that accompanies many of these reports frequently does not account for the special nature of the data generated in typical LELI experiments. The objective of this study was to evaluate the application of repeated measures linear regression techniques to the analysis of this type of data. Issues of analyzing raw versus normalized data, proper accounting for correlation between measurements, and discrete time point hypothesis testing were addressed. STUDY DESIGN/MATERIALS AND METHODS: The data analyzed in this work were generated from an experiment in which in vitro frog sciatic nerves were irradiated with a helium-neon laser using a variety of treatment protocols. Compound action potential (CAP) amplitude, latency, depolarization rate, and repolarization rate were recorded at 1-minute intervals for 135 minutes for each nerve. Laser-induced changes in CAP parameters were analyzed using various repeated measures linear regression models. RESULTS: The findings of statistical significance were highly dependent on the rigor of the regression model applied. Application of the same regression model to raw and normalized data produced different findings of significance. Determination of significant contrasts was highly dependent on how well the regression model accounted for the correlation between repeated measurements made on the same nerve. In general, models that failed to account adequately for this correlation produced more findings of significant contrasts than increasingly rigorous models. Finally, discrete time point hypothesis testing on normalized data can suggest improper statistical conclusions if the proper correlation structure is not applied to the data set. CONCLUSION: Linear regression analysis offers advantages over discrete time point hypothesis testing in the analysis of highly correlated serial data of this type. Trends in the behavior of the measured parameters are evident, rigorous accounting for correlation between measurements is facilitated, and hypothesis testing is highly flexible. Action Potentials;Animals;In Vitro Techniques;Lasers;Linear Models;Models, Neurological;Peripheral Nervous System;Rana catesbeiana;Sciatic Nerve;Time Factors
In vitro frog sciatic nerve as a peripheral nerve model for studies of the mechanism of action of low energy lasers: Part one. BACKGROUND AND OBJECTIVE: There have been numerous reports of modulation of peripheral nerve action potential characteristics through application of low energy laser irradiation (LELI), although no mechanism has yet been advanced to explain these observations. In order to investigate the mechanism of LELI effects in peripheral nerve tissue, a well-characterized,

reliable, and robust peripheral nerve preparation is required. The objective of this study was to evaluate the in vitro frog sciatic nerve as a candidate model for future LELI mechanism studies. MATERIALS AND METHODS: Following 60-minute baseline recordings of compound action potential (CAP) amplitude, latency, depolarization rate, and repolarization rate, helium-neon (HeNe) laser irradiation (632 nm, 15 min, 1-7 J, 44-320 J/cm2) was delivered to one of two sites on the nerve. Laser-induced changes in CAP parameters were analyzed during irradiation and for 60 minutes post-irradiation using a repeated measures linear regression model. RESULTS: In the treatment group that received 7 J of HeNe energy over the recording electrode, CAP latency increased relative to nonirradiated controls during the postirradiation period. No other treatment group demonstrated laser-induced changes in CAP characteristics at any time during the experiment. CONCLUSION: HeNe irradiation demonstrated limited ability to alter the CAP under these conditions. As such, the in vitro frog sciatic nerve is an inappropriate model for mechanism of action studies. Action Potentials;Animals;In Vitro Techniques;Lasers;Linear Models;Models, Neurological;Peripheral Nervous System;Rana catesbeiana;Sciatic Nerve;Time Factors

[Effect of low-intensity laser irradiation as affected by maximum tolerable exercise]. The investigations on albino noninbred male rats showed that low-intensity laser radiation ("Uzor" semiconductor laser, wavelength 0.89 mu, 1500 Hz, exposure 8 min) substantially increased physical work capacity during the maximum tolerable exercise. In addition, the plasma concentrations of thyroxine and malonic dialdehyde increased and the levels of lactic acid and triiodothyronine decreased. Animals;Dose-Response Relationship, Radiation;Exercise Tolerance;Lasers;Male;Physical Conditioning, Animal;Rats;Rats, Wistar

Efficacy of transmeatal low power laser irradiation on tinnitus: a preliminary report. Thirty-eight patients suffering from tinnitus resistant to several medical therapies for more than 6 months were treated by low power laser irradiation. A 40 mW laser with a wavelength of 830 nm was irradiated via their external auditory meatus toward the cochlea for 9 min once a week, 10 times or more. Patients were asked to score their symptoms on a 5 point scale before and after the treatment for a subjective evaluation of the effect. The results were estimated by the change of the loudness and duration of tinnitus, and the degree of annoyance due to tinnitus. Although only 26% of the patients had improved duration, loudness and degree of annoyance were relieved in up to 58 and 55%, respectively, without major complication. Laser therapy seemed to be worth trying on patients with intractable tinnitus. Adult;Aged;Audiometry, Pure-Tone;Female;Humans;Lasers;Male;Middle Aged;Severity of Illness Index;Tinnitus

Helium-neon laser irradiation at fluences of 1, 2, and 4 J/cm2 failed to accelerate wound healing as assessed by both wound contracture rate and tensile strength. BACKGROUND AND OBJECTIVE: Reports in the literature indicate that low energy laser irradiation has a biostimulatory effect on wound healing; however, no mechanism of this effect has been elucidated. STUDY DESIGN/MATERIALS AND METHODS: We attempted to establish a model from which to study the mechanism of biostimulation. The effects of low energy helium-neon irradiation on wound healing were observed in two rat models. In the first model, 1.5 cm diameter full thickness excisional skin defects were created in the dorsal midline of rats (n = 32). All animals were anesthetized and all eschars were debrided daily. Wound area was determined by caliper measurements for 2 weeks postoperatively. Rats that received a treatment of 1 J/cm2 had two defects in the dorsal skin. One wound was treated and the second was used as its own control. These measurements were not blinded. Rats that received 2 J/cm2, 4 J/cm2, or anesthesia alone had one defect on the dorsal skin. Caliper measurements of these wounds were blinded. We were unable to demonstrate any difference in the rate of wound contracture in rats that received a daily dose of 1 J/cm2, 2 J/cm2, 4 J/cm2, or anesthesia alone ($P > 0.8$ by student's t-test). In the second model, a single 2 cm

longitudinal full thickness skin incision was created in the dorsal midline of each rat (n = 24). No difference was found between rats that received anesthesia alone and those treated daily with 2 J/cm2 as assessed by tensile strength measurements on postoperative days 7 and 14 (P > 0.8 by student's t-test between groups at both time points). These determinations were blinded. RESULTS: Despite our intentions of studying the mechanism of low energy HeNe biostimulation, we were unable to demonstrate a beneficial effect. CONCLUSION: In this study, helium-neon laser irradiation produced no measurable benefit on wound healing. Animals;Laser Therapy;Male;Rats;Rats, Sprague-Dawley;Tensile Strength;Wound Healing

Effects of low power laser-irradiation on differential blood count and body temperature in endotoxin-preimmunized rabbits. Low power laser irradiation has been shown to have various immune-modulatory effects under in vitro conditions but little is known about such effects in animal models. Escherichia coli endotoxin-preimmunized rabbits were used to determine the influence of transcutaneously applied low power laser light on differential blood count and rectal temperature. After three initial immunizations animals were either boostered with 5 ng/kg of endotoxin or injected with pyrogen-free saline and subsequently underwent irradiation using two different wavelengths of red laser light and sham irradiation, respectively. Differential blood count of laser-treated animals was characterized by significantly higher lymphocyte values and lower neutrophil values at twenty hours (boostered rabbits) and twenty-three hours (non-boostered rabbits) after irradiation. Differential blood cell counts returned to baseline values within 23 hours in the boostered animals, whereas in the non-boostered rabbits lymphocytes showed a trend to further increase. Recording of rectal temperature revealed a further rise after laser application, changes being of greater magnitude and longer duration in the non-boostered animals. These results seem to indicate that a single low power laser irradiation can modulate immune-responses depending on the immunological status of the organism. Endotoxins Animals;Body Temperature;Endotoxins;Immunization;Lasers;Leukocyte Count;Lymphocyte Count;Male;Monocytes;Neutrophils;Rabbits;Random Allocation

Effect of laser irradiation on latency of herpes simplex virus in a mouse model. Low power Laser irradiation is used in medical practice for different indications. Several firms which commercialise Laser claim that Laser irradiation may be beneficial towards Herpes virus pathogenicity. We observe that, in the ear experimental model of HSV latency [3], repeated exposure to infrared Laser radiation of cervical ganglia following HSV inoculation appears to specifically hinder the establishment of virus latency in mouse. Animals;Disease Models, Animal;In Vitro Techniques;Lasers;Male;Mice;Simplexvirus;Virus Latency

Failure to demonstrate any hypoalgesic effect of low intensity laser irradiation (830nm) of Erb's point upon experimental ischaemic pain in humans. BACKGROUND AND OBJECTIVE: This study assessed the putative analgesic effect of low intensity, near-infrared laser irradiation (830nm; 1.5 & 9.0J/cm2; continuous wave). STUDY DESIGN/MATERIALS AND METHODS: The current study was completed under double-blind conditions using a standardised form of the submaximal effort tourniquet technique. Healthy naive female volunteers (n = 48) attended on two occasions for pain induction in the non-dominant upper limb, the first during which baseline data were obtained and on a second occasion during which subjects were randomly allocated to either control, placebo, or one of two treatment groups. In the treatment groups, irradiation was applied to ten points on the ipsilateral Erb's point immediately prior to the pain induction procedure at the parameters stated: For the placebo condition, sham "irradiation" was delivered by applying the laser unit without activating the probe. Pain was measured using computerised visual analogue scales and McGill Pain Questionnaires to assess "current pain intensity" and "worst pain experience," respectively. RESULTS: Whereas analysis of variance and appropriate posthoc tests showed a trend toward hypoalgesia at a

radiant exposure of 1.5J/cm2, no significant effects of laser therapy were found. CONCLUSIONS: These results do not provide convincing evidence for the clinical potential of low intensity laser irradiation as a pain relieving modality, at least at the parameters used. Further work is thus necessary to provide objective quantifiable data on the putative clinical efficacy of this modality and the relevance (if any) of irradiation parameters. Analgesia;Arm;Brachial Plexus;Double-Blind Method;Female;Humans;Ischemia;Laser Therapy;Pain;Pain Measurement

Effects of photostimulation on wound healing in diabetic mice. BACKGROUND AND OBJECTIVE: Low-level laser irradiation at certain fluences and wavelengths can enhance the release of growth factors from fibroblasts and stimulate cell proliferation in vitro. We evaluated whether low-level laser irradiation can improve wound healing in diabetes mellitus. STUDY DESIGN/MATERIALS AND METHODS: Genetically diabetic mice (C57BL/Ksj/db/db) were used as the animal model for this wound healing study. The experimental animals were divided among four groups: negative control, positive control (topical basic fibroblast growth factor [bFGF] on wound), laser therapy group; and a combination group of laser therapy and topical bFGF. An argon dye laser (Lexel Auora Model 600) at a wavelength of 630 nm and an output of 20 m W/cm2 was used as the light source. The speed of wound closure and histological evaluation were used to analyze the experimental results. RESULTS: Laser irradiation enhanced the percentage of wound closure over time as compared to the negative control group (58.4 +/- 2.6 vs. 40.8 +/- 3.4 at day 10 and 95.7 +/- 2 vs. 82.3 +/- 3.6 at day 20, $P < .01$). Histological evaluation showed that laser irradiation improved wound epithelialization, cellular content, granulation tissue formation, and collagen deposition in laser-treated wounds as compared to the negative control group (6.4 +/- 0.16 vs. 3.8 +/- 0.13 at day 10 and 12 +/- 0.21 vs. 8.2 +/- 0.31, $P < .01$). CONCLUSION: This study of laser biostimulation on wound healing in diabetic mice suggests that such therapy may be of great benefit in the treatment of chronic wounds that occur as a complication of diabetes mellitus. Fibroblast Growth Factor 2 Administration, Topical;Animals;Diabetes Mellitus, Experimental;Fibroblast Growth Factor 2;Laser Therapy;Mice;Mice, Inbred C57BL;Skin;Wound Healing

Delayed-onset muscle soreness: lack of effect of combined phototherapy/low-intensity laser therapy at low pulse repetition rates. A double-blind, placebo-controlled study using male subjects (n = 60), was conducted to investigate the efficacy of three different frequencies of combined phototherapy/low-intensity laser therapy (CLILT) in alleviating the signs and symptoms of delayed-onset muscle soreness (DOMS). The study was approved by the University's ethical committee. After screening for relevant pathologies, recent analgesic or steroid drug usage, current pain, diabetes, or current involvement in regular weight-training activities, subjects were randomly allocated to one of five experimental groups: Control, Placebo, or 2.5-Hz, 5-Hz, or 20-Hz CLILT groups (660-950 nm; 31.7 J/cm2; pulsed at the given frequencies for a duration of 12 min; n = 12 all groups). Once baseline measurements were obtained, DOMS was induced in the nondominant arm, which was exercised in a standardized fashion until exhaustion, using repeated eccentric contractions of the elbow flexors. The procedure was repeated twice more to ensure exhaustion was achieved, after which subjects were treated according to group allocation. In the CLILT/placebo groups, the treatment head was applied directly to the affected arm at the level of the musculotendinous junction. Subjects returned on two consecutive days for further treatment and assessment. The range of variables used to assess DOMS included range of movement (universal goniometer), mechanical pain threshold/tenderness (algometer) and pain (visual analogue scale and McGill Pain Questionnaire). Measurements were taken before and after treatment on each day, except for the McGill Pain questionnaire, which was completed at the end of the study. Analysis of results using repeated measures and one-factor analysis of variance with relevant post hoc tests showed significant changes in ranges of movement accompanied by increases in subjective pain and tenderness for all groups over time ($p = 0.0001$);

however, such analysis failed to show any significant differences between groups on any of the days. These results thus provide no convincing evidence for any putative hypoalgesic effect of CLILT upon DOMS at the parameters used here. Adult;Analysis of Variance;Arm;Double-Blind Method;Elbow Joint;Humans;Laser Therapy;Male;Muscle, Skeletal;Muscular Diseases;Pain;Pain Measurement;Phototherapy;Range of Motion, Articular;Semiconductors;Surveys and Questionnaires;Time Factors
The concept of laser phototherapy. Laser phototherapy and diagnosis are emerging as new tools for cancer detection and treatment. Tumor uptake of laser dyes and chemotherapy drugs followed by laser fiberoptic insertion provides a less invasive and more effective treatment option for many cancer patients. Further development will be needed to identify optimal drug and laser combinations before this new approach becomes clinically useful. Antineoplastic Agents;Coloring Agents;Photosensitizing Agents Antineoplastic Agents;Coloring Agents;Equipment Design;Humans;Laser Therapy;Lasers;Neoplasms;Oxidation-Reduction;Photochemotherapy;Photosensitizing Agents
[The effect of infrared low-intensity laser Irradiation in constant regime on animal organism]. Animals;Infrared Rays;Lasers;Male;Metabolism;Rats
Low power laser irradiation enhances migration and neurite sprouting of cultured rat embryonal brain cells. We used fetal brain cells grown in tissue culture to study some basic features of the interaction between low-power laser irradiation and biological systems. Seven- to nine-day-old rat fetal brain cell aggregates in culture were subjected to direct focused irradiation of low-power helium-neon laser (0.3 mW, 632.8 nm). An 8-minute dose of laser irradiation enhanced the appearance of brain cells around the treated aggregates, as monitored under the microscope of the stained cultures. Two and three doses of laser irradiations were correlated with 97% and 142% respective increases of the numbers of cells surrounding the aggregates. To identify the type of cells grown in the outgrowth of the treated aggregate, specific tetanus-anti-tetanus antibodies were used. Rhodamine-labeled antibodies bound to receptors on cells indicated massive neurite sprouting and outgrowth of migrating brain cells in culture. Culture Media, Serum-Free Animals;Brain;Cell Aggregation;Cell Count;Cell Movement;Cells, Cultured;Culture Media, Serum-Free;Embryonic and Fetal Development;Lasers;Neurites;Rats;Rats, Sprague-Dawley
Use of the silicone tracheal T-tube for tracheostenosis or tracheomalacia. BACKGROUND: Tracheobtenosib and tracheomalacia are trivial diseases. The conventional choice of managements with tracheostomy, either temporary or long-term usage, can only partially resolve the problems of airway obstruction. Silicone tracheal T-tube presents a substitute for it. METHODS: We present 5 patients with tracheostenosis or tracheomalacia managed with nine procedures of long silicone Montgomery T-tube prothesis between 1984 and 1994 in VGH-Taipei. The primary diagnosis included tracheal injury (2), postintubation tracheal stenosis (2), and stenosis due to endotracheal tuberculosis (1). Three patients received a long segmental T-tube for permanent endotracheal stenting and the other two patients used T-tube insertion for temporary stenting of the trachea for 7 and 11 months, respectively, with satisfactory results. RESULTS: All patients got immediate benefit from the prothesis in respiration with simple postoperative care. Two patients with temporary T-tube placement had it successfully removed in 7 and 11 months, respectively. Placement of the T-tube for subglottic stenosis also protected the function of phonation. The tracheal T-tube restored airway patency reliably with good long-term results and could be the preferred management of chronic upper airway obstructive disease not amenable to surgical repair. The most common complication was airway obstruction caused by either granulations or sticky mucoid substance. Three patients and six tubes (60%) developed granulation obstruction and the average duration of granuloma formation was 7.7 months. Laser phototherapy or surgical intervention, such as tracheoplasty, with change of the T-tube

was carried out for granuloma obstruction. CONCLUSIONS: T-tube is a good endoprothesis for tracheostenosis and tracheomalacia with minimal complication for cases of long tracheostenosis or complex tracheal injury. Silicones Adult;Aged;Female;Humans;Male;Silicones;Stents;Tracheal Diseases;Tracheal Stenosis

Evaluation of wound healing of the teat with and without low level laser therapy in dairy cattle by laser Doppler flowmetry in comparison with histopathology, tensiometry and hydroxyproline analysis. Perforated teat wounds in eight lactating Holstein-Friesian cows were closed by four suture patterns with or without low level laser therapy (LLLT). Wound healing was evaluated by laser Doppler flowmetry (LDF), tensiometry and hydroxyproline analysis, and compared with histopathological examination. The three-layer pattern provided the best healing of the entire teat. Mucosal hyperplasia was observed in Gambee and continuous two-layer pattern while eversion of the skin, presence of suture tracts and a greater amount of granulation tissue were observed with the continuous and interrupted two-layer patterns. The epidermis in LLLT groups more closely resembled the normal epidermis, and collagen fibres were denser, thicker and better arranged in LLLT than in non-LLLT groups. LDF, tensiometry and hydroxyproline analysis correlated well with histopathological examination. The results suggest that LDF, a more rapid, less invasive and painless procedure, can replace tensile strength measurement or hydroxyproline analysis to assess the progress of teat wound healing. Hydroxyproline Animals;Cattle;Female;Hydroxyproline;Laser-Doppler Flowmetry;Mammary Glands, Animal;Tensile Strength;Wound Healing

Low level laser therapy with trigger points technique: a clinical study on 243 patients. Among the various methods of application techniques in low level laser therapy (LLLT) (HeNe 632.8 nm visible red or infrared 820-830 nm continuous wave and 904 nm pulsed emission) there are very promising "trigger points" (TPs), i.e., myofascial zones of particular sensibility and of highest projection of focal pain points, due to ischemic conditions. The effect of LLLT and the results obtained after clinical treatment of more than 200 patients (headaches and facial pain, skeletomuscular ailments, myogenic neck pain, shoulder and arm pain, epicondylitis humery, tenosynovitis, low back and radicular pain, Achilles tendinitis) to whom the "trigger points" were applied were better than we had ever expected. According to clinical parameters, it has been observed that the rigidity decreases, the mobility is restored (functional recovery), and the spontaneous or induced pain decreases or even disappears, by movement, too. LLLT improves local microcirculation and it can also improve oxygen supply to hypoxic cells in the TP areas and at the same time it can remove the collected waste products. The normalization of the microcirculation, obtained due to laser applications, interrupts the "circulus vitiosus" of the origin of the pain and its development (Melzak: muscular tension > pain > increased tension > increased pain, etc.). Results measured according to VAS/VRS/PTM: in acute pain, diminished more than 70%; in chronic pain more than 60%. Clinical effectiveness (success or failure) depends on the correctly applied energy dose--over/underdosage produces opposite, negative effects on cellular metabolism. We did not observe any negative effects on the human body and the use of analgesic drugs could be reduced or completely excluded. LLLT suggests that the laser beam can be used as monotherapy or as a supplementary treatment to other therapeutic procedures for pain treatment. Acute Disease;Adolescent;Adult;Aged;Aged, 80 and over;Chronic Disease;Female;Humans;Infrared Rays;Laser Therapy;Male;Middle Aged;Myofascial Pain Syndromes;Pain;Pain Measurement;Palliative Care;Semiconductors;Single-Blind Method

Effect of low-level laser treatment on neurosensory deficits subsequent to sagittal split ramus osteotomy. OBJECTIVES: Low-level laser treatment has been advocated as a possible treatment for patients with paresthesia. An objectively verified improvement in sensory function is relevant if, at the same time, it is perceived as a subjective improvement by the patient. The aim of this double blind clinical study was to see if low-level laser treatment with a GaAlAs laser (820 nm, RÃ¸nvig,

Denmark) resulted in objectively verified improvement in sensory function and whether this correlated with the patient's subjective evaluation subsequent to treatment. STUDY DESIGN: The 13 patients in this study had all undergone saggittal split ramus osteotomy resulting in either compression or traction of the inferior alveolar nerve as reported by the surgery notes. The material was collected from a consecutive series of patients at the Karolinska Hospital, all of whom had shown reduced sensibility at their final 2-year postoperative checkup. The patients were randomly divided into two groups; one (eight subjects) group received real low-level laser treatment (4 x 6 J per treatment along the distribution of the inferior alveolar nerve, at the following points extraoral: lateral third of lower lip, intraoral; buccally to the apex of the second premolar tooth and the apex of the second molar tooth; lingually in the region of the mandibular foramen; for a total of 20 treatments). The other group received an equivalent placebo treatment. The study was conducted in a double blind fashion for both patient and doctor as the low-level laser equipment had two settings, A and B, one of which was an unknown void setting. The degree of mechanoceptor neurosensory deficit was assessed by Semmes Weinstein monofilaments (North Coast Medical, USA) and the degree of thermoceptor neurosensory deficit was assessed by a Thermotester (Somedic, Sweden). The degree of subjective neurosensory deficit was assessed by means of a visual analogue scale. Both variables and the degree of subjective injury were comparable between the two groups before starting treatment. RESULTS: The patients in the real low-level laser treatment group experienced a subjective improvement in both lip ($p = 0.01$) and chin ($p = 0.02$) after completion of the course of treatment. In addition, this group showed a significant decrease in the area of mechanoperception neurosensory deficit ($p = 0.01$) compared with no difference in the placebo group. The real low-level laser treatment group exhibited a strong tendency toward improvement in mechanoreceptor neurosensory deficit in the areas of most damage for both lip and chin. This improvement was especially pronounced in the lip region ($p = 0.06$). No similar tendency was demonstrated in the placebo group. Neither group showed any significant change or tendency to improvement in thermoception on completion of the course of treatment. CONCLUSION: In conclusion GaAlAs low-level laser treatment results in both a subjective and objective improvement in mechanical sensory perception in long-standing neurosensory deficit in the inferior alveolar nerve.
Adult;Double-Blind Method;Female;Humans;Hypesthesia;Laser Therapy;Male;Mandible;Mechanoreceptors;Middle Aged;Osteotomy;Pain Measurement;Statistics, Nonparametric;Thermosensing;Treatment Outcome;Trigeminal Nerve Injuries

Corneal-tissue absorption coefficients for 193- and 213-nm ultraviolet radiation. The small-signal absorption coefficients of 193- and 213-nm nanosecond laser pulses in bovine corneal tissue have been studied. The absolute reflectance of a planar quartz-cornea interface was measured at various angles of incidence for low-intensity laser irradiation (i.e., pulse fluences 3 orders of magnitude below the ablation threshold). The reflectance-versus-angle data were analyzed by the use of Fresnel theory to estimate the effective complex index of refraction of the tissue. This analysis indicated corneal absorption coefficients of 39,900 Â± 9800 cm(-1) at 193 nm and 21,400 Â± 4900 cm(-1) at 213 nm.

Effect of low-power laser irradiation on procollagen synthesis in human fibroblasts. The conflicting views of the effect of low-power laser (LPL) irradiation on procollagen synthesis have existed at the present time, whereas many clinical studies have tested usefulness of LPL irradiation for the wound healing. To evaluate the effect of LPL irradiation on the procollagen synthesis of human fibroblasts in vitro, LPL irradiation on human fibroblast was carried out using two different culture medium, serum-starved medium and fetal calf serum (FCS)-contained medium. In addition, to investigate the mechanism of the LPL on the procollagen synthesis of human fibroblasts, dexamethasone and methylene blue contained medium were used for inhibition of procollagen product at the pretranslational level and cGMP-mediated processes, respectively. Enhanced effect of

LPL was consistently observed in the serum-starved medium (50% increase by a 3 min irradiation), not in the FCS-contained medium. The LPL enhanced effect was not blocked by dexamethasone (3% inhibition) but methylene blue (40% inhibition). Our data suggest that some factors in FCS might interfere with the enhanced effect of LPL on procollagen synthesis and the LPL might act as a direct stimulator of the procollagen synthesis. It seems probable that the LPL enhanced effects might be occurred at the translational level or at the pretranslational level, which is not affected by dexamethasone and cGMP, might be involved in the LPL enhanced effect of the procollagen synthesis in fibroblast. Procollagen;Helium;Neon;Dexamethasone;Methylene Blue Cells, Cultured;Dexamethasone;Fibroblasts;Helium;Humans;Lasers;Lung;Methylene Blue;Neon;Procollagen

Effect of low-power laser irradiation on impulse conduction in anesthetized rabbits. Low-power laser analgesic effect was generally accepted in clinical cases, whereas there was no direct evidence to indicate that low-power laser irradiation suppressed an impulse conduction within a peripheral nerve. The effect of low-power laser irradiation on electrically evoked responses within the sural nerve was electrophysiologically analyzed in anesthetized rabbits. High threshold evoked responses (conduction velocity was about 11 m/sec, unmyelinated A delta), which were induced by an electrical stimulation to the peripheral stump of the nerve, were significantly suppressed (9 to 19% inhibition) during low-power laser irradiation, which applied to the exposed sural nerve between the stimulus site and the recording site. The suppressive effect was reversible and recovered to the control level after the irradiation. Experimental evidence indicated that low-power laser irradiation suppressed the impulse conduction of unmyelinated A delta afferents in peripheral sensory nerve, which caused a pain sensation. Our data suggest that low-power laser acts as a reversible direct suppressor of neuronal activity. Helium;Neon Animals;Helium;Lasers;Neon;Nerve Fibers;Neural Conduction;Rabbits;Sural Nerve

One-stage laser-assisted uvulopalatoplasty. OBJECTIVE: To assess the efficacy of an author-modified LAUP technique using the principles of UPPP surgery. This new one-stage method of LAUP is described in detail. DESIGN: A retrospective review of all one-stage LAUPs performed. SETTING: The Division of Otolaryngology, University of British Columbia, Vancouver, BC. METHOD: This one-stage LAUP was performed on all patients. MAIN OUTCOME MEASURES: Improvement of snoring, postoperative pain, polysomnography, home oximetry, the Respiratory Disturbance Index, and the need for a second treatment. RESULTS: Two hundred twenty patients have undergone this more aggressive excisional approach, and only 10 needed a second treatment. A 75 to 100% improvement in snoring was noted by 83% of cases. In patients with some residual noise, 78% described only heavy breathing when lying on their back. Postoperative pain was mild (7 days) to moderate (7-10 days) in 79% of cases. Eighty-three percent of patients missed no work after treatment. Documented sleep-apnea was present in 74 people (33%), and 96% of these reported a more restful sleep with less daytime fatigue postoperatively. Ten of 14 patients (71%) with postoperative sleep studies had apneas eliminated or reduced by more than 50%. Overall patient satisfaction was 97%. A low-level laser from Europe (LLLT) has been introduced as an adjunct to help control postoperative pain. A clinical trial on its use in UPPP surgery is also described. Humans;Laser Therapy;Male;Pain, Postoperative;Palate, Soft;Retrospective Studies;Sleep Apnea Syndromes;Snoring;Treatment Outcome;Uvula

Cranial irradiation with Gaalas laser leads to naloxone reversible analgesia in rats. Laser irradiation of the rat cranium can produce analgesia. The present experiment investigated the mechanism of such action. 27 rats received all possible combinations of laser (0, 6.4, and 12J/cm2) and naloxone (0, 5, and 10 mg/kg) prior to a hot plate test. Laser (820 nm, KHz pulsing, Omega Laser Systems, London) was applied to the rats' skulls and hind paw lick latencies (in seconds) were recorded immediately, 30 min., and 24 hr. after the administration of treatment. When animals were

tested immediately following laser irradiation at 12J/cm2 significant analgesia resulted. Treatment with naloxone at either dose antagonised this effect, but naloxone produced no significant hyperalgesia when given alone. This suggests that opioid peptide mechanisms mediate the analgesic action of low-intensity laser irradiation of the cranium. Receptors, Opioid;Naloxone Animals;Brain;Cranial Irradiation;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Lasers;Male;Naloxone;Pain Threshold;Rats;Rats, Sprague-Dawley;Receptors, Opioid

[Experience in the use of low-energy laser irradiation in the treatment of patients with diseases of the upper respiratory airways and ear]. Chronic Disease;Humans;Laser Therapy;Pharyngitis;Rhinitis;Rhinitis, Allergic, Perennial;Rhinitis, Vasomotor;Sinusitis;Time Factors;Tonsillitis

Biostimulation of wound healing by low-energy laser irradiation. A review. This paper reviews studies on the basic principles of biostimulation of wound healing by various low-energy lasers. It looks at the mechanism of action of biostimulation as well as the laser's effect on cell proliferation, collagen synthesis, and would healing. Collagen Animals;Biochemical Phenomena;Biochemistry;Biology;Cell Division;Collagen;Humans;Laser Therapy;Mouth Mucosa;Skin;Wound Healing

Treatment of stretch marks with the 585-nm flashlamp-pumped pulsed dye laser. BACKGROUND: Striae, or stretch marks, are very common skin disorders that do not impair bodily function, but are of considerable cosmetic concern to many patients. Traditionally, treatment options have been very limited. This study examines the results of treating striae using the 585-nm pulsed dye laser. Stimulation of a variety of wound healing processes has been attributed to low energy laser therapy. Clinically, improvement of hypertrophic and erythematous scars with the 585-nm pulsed dye laser at energy densities of 6-7 J/cm2 is well established. Since striae are dermal scars, evaluation of this same therapy to treat striae was undertaken. OBJECTIVE: To evaluate the effectiveness of the 585-nm flashlamp-pumped pulse dye laser in treating cutaneous striae. METHODS: Thirty-nine striae were treated with four treatment protocols. These treated striae were compared with untreated striae controls in the same patient. The patients ages ranged from 23 to 52 years, with an average age of 36 years. The average age of the treated striae prior to initial treatment was 14 years (range, 8 months to 32 years). Treatment parameters included spot sizes of 7 and 10 mm and fluences of 2.0, 2.5, 3.0, and 4.0 J/cm2. Response to therapy was evaluated through clinical grading, sequential photography, and optical profilometry at a blinded laboratory. Skin biopsies were also examined with light microscopy from two of the 39 striae that were treated. RESULTS: Subjectively, striae appeared to return toward the appearance of normal skin with all protocols. However, the protocol with 10-mm spot size using 3.0 J/cm2 fluence improved the appearance of striae better than the other treatment protocols. Objectively, shadow profilometry revealed that all treatment protocols reduced skin shadowing in striae. This result corresponds with surface patterns of striae returning to that closely resembling adjacent normal skin surface patterns. Histologically, using hematoxylin and eosin stains as well as elastin strains, striae treated with a low fluence pulsed dye laser treatment protocol regained normal appearing elastin content when compared with normal (non-striae) skin adjacent to the treated striae. CONCLUSION: Treatment with the 585-nm pulsed dye laser at low energy densities was shown to improve the appearance of striae. Apparent increased dermal elastin was also observed 8 weeks posttherapy and possibly contributed to the improvement seen in the study patients. Elastin Adult;Biopsy;Cicatrix;Elastin;Female;Humans;Laser Therapy;Male;Middle Aged;Skin

Histopathological effect of low-level laser therapy on sutured wounds of the teat in dairy cattle. Perforating wounds were made on the cranial surface of 32 teats in eight dairy cattle. The teats were distributed into eight groups with four kinds of suture patterns. The used suture patterns were

Gambee in Groups A and E, continuous 2-layer (Cushing for submucosal layer, continuous horizontal mattress for intermediate layer and skin) in Groups B and F, separated 2-layer (simple continuous for mucosal layer, vertical mattress for intermediate layer and skin) in Groups C and G, and 3-layer (simple continuous for mucosal and intermediate layers, simple interrupted for skin) in Groups D and H. The wounds of Groups E, F, G and H were subjected to 3.64 J/cm2 dose of low-level laser, using a helium-neon system with an output of 8.5 mW, continuous wave at 632.8 nm. Histopathologically, healing was different between various suture patterns and between low level laser therapy (LLLT) and non-LLLT-groups. The results suggest that the 3-layer pattern was the best and LLLT could accelerate healing of perforating wounds of the teat in dairy cattle. Animals;Cattle;Cattle Diseases;Female;Laser Therapy;Mammary Glands, Animal;Suture Techniques;Wound Healing;Wounds and Injuries
[Low-energy laser therapy of chronic gastritis in children]. Morphological and morphometric study of gastric mucosa was performed before and after laser therapy in children with chronic gastritis. Features of childhood gastritis are provided and laser therapeutic action in different after treatment periods is characterized. Adolescent;Child;Child, Preschool;Chronic Disease;Female;Gastric Mucosa;Gastritis;Humans;Infant;Laser Therapy;Male;Treatment Outcome
[Low-intensity laser irradiation in otorhinolaryngology]. Low-intensity laser irradiation is a modality widely practiced in otorhinolaryngology. Basing on extensive personal experience and literature data the authors provide ENT specialists with relevant techniques and parameters of the radiation for different otorhinolaryngological diseases. Hearing Loss, Sensorineural;Humans;Laryngitis;Laser Therapy;Meniere Disease;Nasopharyngitis;Nose Diseases;Otitis Media;Otitis Media, Suppurative;Otorhinolaryngologic Diseases;Otorhinolaryngologic Neoplasms;Pharyngeal Diseases;Sinusitis;Time Factors;Tonsillitis;Transillumination
[The negative effects of low-intensity laser therapy in rheumatoid arthritis]. Intravascular laser therapy of 129 patients with rheumatoid arthritis (RA) had a negative effect on articular syndrome, clinical and laboratory activity of inflammation. One female showed new systemic manifestations of RA. In control subjects on placebo the above unfavorable effects were absent. It is concluded that RA patients do not always benefit from laser therapy which should be assigned only after consideration of listed contraindications. Arthritis, Rheumatoid;Evaluation Studies as Topic;Female;Humans;Laser Therapy;Lasers;Lipid Peroxidation;Male;Methods;Middle Aged;Remission Induction
[The regeneration of nerve fibers after low-intensity laser irradiation]. Efficiency of myelinated fibres regeneration was studied in affecting the nerve by different lasers. 890 nm wave length irradiation 0.33 J/cm2 in dose irradiation was shown not to influence the quantity of myelinated fibres regenerating in the nerve distal region. Increase of the dose up to 9.33 J/cm2 causes 49% reduction of myelinated fibres number. Suppression of regeneration was also reported in using 1220 nm wave length laser (summary dose-0.98 J/cm2). This wave length irradiation 7.2 J/cm2 in dose was established not to impair growth and myelinization speed of nerve fibres in distal region of the nerve. Helio-neonic laser irradiation (7 J/cm2) does not affect the quantity of regenerating myelinated fibres. Animals;Infrared Rays;Lasers;Male;Nerve Fibers, Myelinated;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve;Time Factors
Low power laser irradiation reduces ischemic damage in hippocampal slices in vitro. BACKGROUND AND OBJECTIVE: Low power laser irradiation has been reported to reduce injury, promote regeneration, and produce analgesia. While the mechanism is unknown, one hypothesis is that light produces free radicals, which have a beneficial effect at low concentrations. STUDY DESIGN/MATERIALS AND METHODS: We have investigated the effects of low power laser irradiation on the loss of electrical excitability of hippocampal brain slices after a transient exposure to a

perfusion medium lacking oxygen and containing reduced glucose concentrations. Injury in this system is known to result at least in part from free radical production. RESULTS: Low power laser irradiation increased the time required for loss of excitability and increased recovery from the ischemic injury. CONCLUSIONS: Low power laser irradiation has acute protective effects against ischemic damage in brain slices. Free Radicals Animals;Free Radicals;Hippocampus;In Vitro Techniques;Ischemia;Laser Therapy;Methods;Rats

Effect of laser pulse repetition rate and pulse duration on mast cell number and degranulation. BACKGROUND AND OBJECTIVE: Mast cell activation by low-level laser therapy (LLLT), leading to degranulation and the release of mediators, may be one of the mechanisms by which LLLT can accelerate tissue repair in mammals. The objective of this work, part of an investigation to determine the optimum parameters for increasing mast cell number and degranulation in injured skin, was to determine the effect of different pulsing frequencies of LLLT. STUDY DESIGN/MATERIALS AND METHODS: Partial-thickness wounds in anaesthetized adult male Wistar rats were irradiated immediately after injury with monochromatic coherent light (wavelength 820 nm) pulsed at either 2.5, 20, 292, or 20,000 Hz at an average power density of 800 mW/cm2 for 27 seconds; the energy density was 21.6 J/cm2. The effects on mast cell number and degranulation were assessed 2 hours post-treatment by counting the numbers of intact and degranulated mast cells in Carnoy-fixed, toluidine blue-stained, sections of irradiated and sham-irradiated wounds. RESULTS: The total number of mast cells was increased significantly ($P < 0.05$) by all the frequencies when compared to the sham-irradiated group, but there was no significant difference between frequencies ($P > 0.05$). However, although the number of degranulated mast cells was higher in all laser-treated wounds, in comparison with the sham-irradiated group, only the 20 Hz (pulse duration 45 ms) and 292 Hz (pulse duration 3 ms) frequencies were significantly effective ($P < 0.05$). CONCLUSION: Increase in mast cell number is not pulsing frequency dependent, whereas degranulation is. Animals;Cell Count;Cell Degranulation;Lasers;Male;Mast Cells;Rats;Rats, Wistar

[Low-energy laser irradiation of blood in combined treatment of patients with duodenal ulcer]. Antacids;Anti-Ulcer Agents Adolescent;Adult;Antacids;Anti-Ulcer Agents;Blood;Duodenal Ulcer;Female;Humans;Laser Therapy;Male;Middle Aged;Time Factors;Wound Healing

Low energy laser irradiation fails to modulate the inflammatory function of human monocytes and endothelial cells. BACKGROUND AND OBJECTIVE: In view of the important regulatory role of cytokines in wound healing and inflammation, we investigated the effects of low energy laser irradiation on cytokine release by human peripheral blood monocytes (M phi) and human umbilical vein endothelial cells (HUVEC) in vitro. Also, the effects of laser light on the expression of endothelial adhesion molecules, another important feature of inflammatory and regenerative responses, were assessed. STUDY DESIGN/MATERIALS AND METHODS: Cells were irradiated with a pulsed GaAs-laser (904 nm) at energy densities 0 (= sham), 0.3, 3.0, or 9.0 J/cm2 and subsequently incubated in absence or presence of endotoxin (M phi) or the proinflammatory cytokines TNF alpha and IL-1 beta (HUVEC). RESULTS: Irradiation at any of the dosages used did not significantly affect spontaneous or endotoxin-induced release of TNF alpha, IL-6, and IL-8 by M phi. Similarly, secretion of IL-6 and IL-8 by resting or cytokine-activated HUVEC after either single or repeated laser treatment was unchanged as compared to sham-irradiated controls. Moreover, laser treatment did not induce de novo expression or upregulation of the endothelial adhesion molecules E-selectin, ICAM-1, and VCAM-1, and it failed to modify their expression in response to stimulation with TNF alpha or IL-1 beta. CONCLUSION: We conclude that with the specific laser parameters and dose-regimen used, low energy laserlight does not affect the inflammatory function of human monocytes and endothelial cells in vitro. Cytokines;Interleukin-6;Interleukin-8;Lipopolysaccharides;Tumor Necrosis Factor-alpha Cells,

Cultured;Cytokines;Endothelium;Enzyme-Linked Immunosorbent Assay;Humans;Interleukin-6;Interleukin-8;Lasers;Lipopolysaccharides;Monocytes;Tumor Necrosis Factor-alpha
Reactive oxygen species inducible by low-intensity laser irradiation alter DNA synthesis in the haemopoietic cell line U937. BACKGROUND AND OBJECTIVE: The purpose of this study was to evaluate the possible role of reactive oxygen species (ROS) in mediating previously recorded alterations in DNA synthesis, inducible by low-intensity laser irradiation (LILI), in the haemopoietic cell line U937. STUDY DESIGN/MATERIALS AND METHODS: The ability of LILI (660 nm, 12 mW, 5 kHz) to induce ROS from U937 cells was assessed spectrophotometrically at energy densities (E.D.) from 1.0 to 11.5 J/cm2. In order to assess whether laser-induced ROS could alter cellular proliferation DNA synthesis was measured post-irradiation, by the incorporation of tritiated thymidine (3H-TdR) into the cells in both the presence and absence of the antioxidant catalase (CAT). RESULTS: Detectable ROS were produced post-irradiation only from the differentiated form of the cell line. Analysis by Student's t-test for unrelated groups showed a significant difference, at E.D.s 2.9 and 8.6 J/cm2, in the extent of DNA synthesis occurring in cells irradiated in the presence of CAT or in its absence. CONCLUSION: These findings demonstrate that laser-inducible ROS can mediate laser's effects on this cell line. Reactive Oxygen Species;DNA;Hydrogen Peroxide;Catalase;Thymidine Catalase;Cell Line;DNA;Hematopoietic Stem Cells;Hydrogen Peroxide;Lasers;Reactive Oxygen Species;Thymidine
[Low-intensity laser therapy in urology]. Combined Modality Therapy;Female;Female Urogenital Diseases;Humans;Laser Therapy;Male;Male Urogenital Diseases
A clinical investigation of the efficacy of low level laser therapy in reducing orthodontic postadjustment pain. Low level laser therapy (LLLT) has been shown to produce analgesic effects in many clinical applications. The aim of this clinical study was to test the efficacy of LLLT in controlling orthodontic postadjustment pain. Thirty-nine volunteers were selected for this study that used a double-blind design with placebo control. Elastomeric separators were placed at the proximal contacts of one premolar in each quadrant of the dentition to induce orthodontic pain. The tip of a 30 mW gallium-arsenide-aluminium (830 nm) diode laser probe was then placed at the buccal gingiva and directed at the middle third of the root. Three different treatment durations of 15, 30, and 60 seconds and one placebo treatment of 30 seconds were tested within each subject. The study was conducted over 5 days, and the visual analogue scale (VAS) was used to quantify the pain experienced by the subjects before and after laser applications for each day. Analysis of the VAS median scores showed that teeth exposed to laser treatment had lower levels of pain as compared with those with the placebo treatment. However, nonparametric statistical analysis of the data showed that the differences between treatments and placebo within each subject were not statistically significant. Arsenicals;Placebos;gallium arsenide;Rubber;Gallium;Aluminum Adult;Aluminum;Analgesia;Arsenicals;Double-Blind Method;Gallium;Humans;Laser Therapy;Orthodontic Appliances;Pain;Pain Measurement;Placebos;Rubber;Statistics as Topic;Time Factors;Tooth Movement Techniques
Stimulatory effect of low-power density He-Ne laser radiation on human fibroblasts in vitro. Cultures of human embryonic fibroblasts in vitro were subjected to helium-neon laser single and double irradiation to investigate the influence of low-energy laser irradiation on fibroblast proliferation. Mean increase in the cell number values of irradiated cells were compared with increase values of non-irradiated control samples of fibroblasts. He-Ne laser was used as a coherent source of monochromatic radiation at 632.8 nm, and Petri-dishes with cultured fibroblasts were irradiated in way to receive radiation of energy doses of 0.5; 1; 1.5 and 2J/cm2. Single He-Ne laser irradiation exhibited a significant stimulation effect on human fibroblast proliferation in cell-culture. Cell Division;Cells, Cultured;Fibroblasts;Humans;Lasers

The effects of low level laser treatment on recovery of nerve conduction and motor function after compression injury in the rat sciatic nerve. An animal study is presented examining the effect of low level laser (LLL) treatment on nerve regeneration following axonotmesis. Twenty animals received a standardised injury to the right sciatic nerve using a time, load and length sequence (10 min, 150 N, 5 mm) known to cause extensive axonal degeneration of the rat sciatic nerve. The LLL treatment was administered using a hand-held laser probe in light contact with the skin on the dorsal aspect of the hind leg overlying the site of the axonotmesis injury to the sciatic nerve. A group of 10 animals were treated with 6J of LLL (GaAlAs 830 nm) daily for a period of 28 d. Ten more animals were treated daily with a sham exposure setting and served as controls. Nerve function was assessed by a recognised method of walking tract print analysis; the "Sciatic Functional Index" (SFI), and nerve regeneration was assessed by recording the evoked compound action potentials (cAP) in the common peroneal nerve. At 21 d post-injury, the laser-treated group had a significantly lower median SFI than the sham laser-treated group, indicating that the real laser treatment had improved functional recovery in the nerve. However, no differences were found between the evoked cAP parameters that were measured in the laser-treated and sham laser-treated groups. Histological examination reiterated the lack of difference between the two groups. Consequently, the effects of LLL on recovery must have occurred more peripherally to the point measured.
Animals;Axons;Laser Therapy;Male;Motor Activity;Nerve Crush;Nerve Regeneration;Neural Conduction;Rats;Rats, Wistar;Retrograde Degeneration;Sciatic Nerve

Potential and limitations of magnetic resonance imaging for real-time monitoring of interstitial laser phototherapy. RATIONALE AND OBJECTIVES: Magnetic resonance (MR) imaging has been suggested as a method to monitor interstitial laser phototherapy (ILP) in deep tissues. Unfortunately, a reliable relation between temperature and MR parameters has not yet been demonstrated. In this study, we examined whether such a relation exists and whether MR imaging can measure absolute temperature or temperature changes. METHODS: We evaluated, in the range of 21 degrees C to 80 degrees C, the temperature dependence of the MR imaging signal and T1 in samples of liver, water, CuSO4, and oil. Spin-echo and fast low-angle shot (FLASH) sequences were used. RESULTS: The MR imaging signal of liver, CuSO4, and water continuously decreased when the temperature was increased from 21 degrees C to 80 degrees C. By contrast, the MR imaging signal of the oil increased with increasing temperature up to 40-50 degrees C and then decreased at higher temperatures. We observed a reliable linear relation only between T1 and temperature in a range' of 30-60 degrees C for oil and CuSO4. CONCLUSION: MR imaging has the potential to measure thermal variations with an uncertainty of approximately +/- 10 degrees C. However, the use of MR imaging to monitor the real-time thermal effect induced in biologic tissues during laser irradiation requires further investigation before it can be applied clinically. Oils;Water;Copper Sulfate Animals;Cattle;Copper Sulfate;In Vitro Techniques;Laser Therapy;Liver;Magnetic Resonance Imaging;Monitoring, Physiologic;Oils;Phototherapy;Temperature;Water

An investigation of the cytotoxic and mutagenic potential of low intensity laser irradiation in Friend erythroleukaemia cells. The purpose of this study was to investigate the cytotoxic and genotoxic potential of low intensity laser irradiation (660 nm, 12 mW, 5 kHz) on mammalian cells. Thymidine kinase (TK)-positive and TK-deficient Friend erythroleukaemia (FEL) cells, clone 707 and subclone 707BUF respectively, were used in this investigation. Following irradiation of exponentially growing cells in suspension at doses of 2 and 20 J/cm2 a number of sensitive bioassays were used to facilitate the detection of laser-induced mutations, DNA damage and cell killing. Mutations were assessed by the examination of chromosome spreads, the determination of micronucleus frequency and by the determination of the mutant frequency at the hypoxanthine-guanine phosphoribosyltransferase (hgprt) locus. DNA damage was quantified using a sensitive ELISA. The cytotoxic effect of laser

irradiation was assessed using a cloning assay. The results of this investigation did not show any significant increase in mutation frequency, DNA damage or cell survival in the laser-irradiated cells, compared to sham-irradiated controls. The lack of any demonstrable cytotoxic and genotoxic effects of low intensity laser irradiation on mammalian cells in culture would support it as being a safe modality for clinical use. Cell Line;Cell Survival;DNA Damage;Friend murine leukemia virus;Humans;Lasers;Leukemia, Erythroblastic, Acute;Lymphocytes;Mutagenicity Tests;Tumor Cells, Cultured

Inhibition of prostaglandin E2 and interleukin 1-beta production by low-power laser irradiation in stretched human periodontal ligament cells. It is well-known that orthodontic treatment usually causes some discomfort and pain to the patients. Recently, it has been reported that low-power laser irradiation is effective in reducing the pain accompanying tooth movement. However, the mechanism of such pain relief cannot be elucidated. Since high levels of prostaglandin (PG) E2 and interleukin (IL)-1 beta are found in the periodontal ligament (PDL) during tooth movement, and both factors are involved in the induction of pain, the effects of low-power laser irradiation on PGE2 and IL-1 beta production in stretched human PDL cells were studied in vitro. The PDL cells, derived from healthy premolars extracted for orthodontic treatment, were utilized for experiments. Cells were seeded in flexible-bottomed culture plates, and the bottom of each plate was elongated (18% increase) under vacuum at 6 cycles per min for 1, 3, or 5 days. The stretched cells were irradiated with a Ga-Al-As low-power diode laser (60 mW) once a day for 3, 6, or 10 min (from 10.8 to 36.0 J) for 1, 3, or 5 days. PGE2 and IL-1 beta levels in the medium were measured by radioimmunoassay. In response to mechanical stretching, human PDL cells showed a marked elevation in PGE2 production in a time-dependent manner. IL-1 beta production was also elevated, but this remained constant. The increase in PGE2 production was significantly inhibited by laser irradiation in a dose-dependent manner. The increase in IL-1 beta production was also significantly inhibited by laser irradiation, although the inhibition was only partial.(ABSTRACT TRUNCATED AT 250 WORDS) Culture Media;Interleukin-1;Dinoprostone Analysis of Variance;Cells, Cultured;Culture Media;Dinoprostone;Dose-Response Relationship, Radiation;Humans;Interleukin-1;Lasers;Periodontal Ligament;Radioimmunoassay;Stress, Mechanical;Time Factors

Low level laser therapy: a prospective double blind trial of its use in an orthopaedic population. We have conducted a prospective, double blind trial of low level laser therapy (LLLT) in musculoskeletal injuries to assess its efficacy. We assigned patients with a variety of painful skeletal soft tissue conditions to one of two treatment groups, treatment from a functional machine, placebo treatment from an inactive machine. Both machines were identical and both appeared functional. The operative status of each machine was unknown to both the therapist and the patient. The results suggest that LLLT has no significant therapeutic effect and acts primarily as a placebo. Adult;Aged;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Musculoskeletal Diseases;Prospective Studies;Treatment Failure

[Neutrophil and macrophage functional activity during the irradiation of an intestinal anastomosis with a low-intensity laser in the infrared spectral range]. The influence of different methods of treatment of intestinal anastomosis in rabbits (group 1: common single-row sutures; group 2: sutures treated with cyanacrylate glue CO-4; group 3: low-intensity laser irradiation through the skin in the infrared spectral range) on the phagocytic and oxidase activity of cells in the peritoneal washings and peripheral blood on days 2, 4 and 7 after the operation was studied. Laser irradiation of the suture was shown to produce a stimulating effect on the macrophagal-phagocytic system of the blood. The oxidase activity of phagocytes in peritoneal washings in the group of animals subjected to laser irradiation was considerably lower than in two other groups. The use of low-intensity laser radiation in the infrared spectral range produced a positive effect of the healing processes in intestinal sutures.

Cyanoacrylates Anastomosis, Surgical;Animals;Cyanoacrylates;Infrared Rays;Intestines;Laser Therapy;Macrophages;Neutrophils;Phagocytosis;Postoperative Care;Rabbits;Staphylococcus aureus;Suture Techniques;Time Factors
[Effects of low-intensity laser irradiation on several parameters of microcirculation in the bulbar conjunctiva of patients with scleroderma]. Computer-aided analytical system of TV images (CASTI) of the anterior segment of the eye revealed an appreciable increase of the level of aggregation gradient in arterioles and venules of the bulbar conjunctiva of 37 children suffering from various forms of scleroderma, as against 18 healthy children. Exposure to low-energy laser of a close infrared band (approximately 890 nm) had a favorable impact on blood aggregation in patients with scleroderma. CASTI of the anterior segment of the eye proved to be an objective and highly informative method for the diagnosis and monitoring of the efficacy of various treatment modalities. Adolescent;Child;Child, Preschool;Conjunctiva;Humans;Image Processing, Computer-Assisted;Laser Therapy;Microcirculation;Scleroderma, Localized;Scleroderma, Systemic;Television;Time Factors
Laser(-assisted) nerve repair. A review. Over the last decade low power laser irradiation has been used to repair nerves by photothermal welding. Nineteen animal and clinical experimental studies of laser tissue welding of nerves are reviewed. Possible mechanisms of tissue welding are presented, together with the benefits, limitations, and possible future implications of several techniques used in laser nerve repair. The consensus of these studies is that nerve welding has some advantages over standard suture repair. These advantages include less neuroma- und scar formation and shorter repair time. The major disadvantage of laser nerve repair is the initial inferior tensile strength. In the future, use of dyes or proteins could enhance the welding process by reinforcing the union strength, thus may improve the results of this promising technique. Animals;Humans;Laser Therapy;Microsurgery;Peripheral Nerves
Regeneration in denervated toad (Bufo viridis) gastrocnemius muscle and the promotion of the process by low energy laser irradiation. BACKGROUND: It is known that while denervated skeletal muscles have the ability to regenerate, maturation of regenerated myofibres does not take place under these conditions. Denervation also causes elevation of "invasive" and satellite cells, but the role of these cells in the regeneration process after injury to the denervated muscle is still unknown. Low energy lasers have recently been found to modulate and accelerate physiological processes in cells. The aim of the present study was to compare regeneration in denervated and innervated amphibian muscles and to investigate whether this process in denervated muscles can be stimulated by low energy laser irradiation prior to injury in these muscles. METHODS: Denervated gastrocnemius muscles of toads were irradiated with He-Ne laser (6.0 mW, 31.2 J/cm2) 7 days postdenervation (control muscle received red light irradiation at the same wavelength). Nine days after denervation cold injury was performed on the site of irradiation of both groups of muscles. At 14 days postinjury all muscles were removed and processed for histology and histomorphometric analysis of mononucleated cells, myotubes, and young myofibres in the regenerated zone. RESULTS: The volume fraction (percent of total injured zone) of the various histological structures in the injured zones 14 days after cold injury in the denervated (9 days prior to injury) muscles did not differ from innervated injured muscles at the same time interval postinjury. The mononucleated cells and myotubes in the laser irradiated muscles comprised 49 +/- 4% and 6 +/- 1% of the injured area, respectively, which was significantly lower than their volume fraction (67 +/- 2% and 11 +/- 2%, respectively) in the control muscles. The young myofibres populated 34 +/- 4% of the total injured area in the denervated and laser irradiated muscles which was significantly higher than their volume fraction (12 +/- 2%) in control denervated muscles. CONCLUSIONS: It is concluded that initial stages of regeneration can also take place in skeletal denervated and injured muscles of amphibians. The kinetics of the regeneration process are identical in denervated and innervated muscles. The process

of regeneration in denervated muscles can be markedly enhanced if the muscle is irradiated by low energy laser prior to injury, probably by activation (stimulation of proliferation and/or differentiation) cells in the muscles that are "recruited" and participate in the process of regeneration.
Animals;Biomechanical Phenomena;Bufonidae;Cell Count;Hindlimb;Lasers;Male;Muscle Denervation;Muscle, Skeletal;Myofibrils;Regeneration

[Personal experience in clinical use of low power laser therapy]. The results of our own clinical trials regarding therapeutical effects of low power lasers in the treatment of some diseases of motional system, skin and lesions of peripheral circulation were presented in the paper. The laser therapy was used in over 320 patients in period of last 3 years. The infra-red laser (wave-length 904 nm, mean power 4 mW) was used. The procedures were performed daily, for 5 days a week in 2 stages: the scan of sore region (3-min.) and the irradiation of trigger points (2-3 min. each). As a result of 10-25 procedures a significant clinical improvement in 65-90% patients was obtained. On the base of obtained results one can conclude that low-power laser therapy could make a useful supplementary method of treatment of overloading syndrome of motional system, postthrombotic syndrome, lymphatic edema and trophic lesions of skin.
Adolescent;Adult;Child;Female;Gastrointestinal Diseases;Humans;Laser Therapy;Male;Musculoskeletal Diseases;Skin Diseases;Vascular Diseases

He-Ne laser therapy by fibroendoscopy in the mucosa of the equine upper airway.
BACKGROUND AND OBJECTIVE: A study was made of the effects of low-level laser irradiation on the cicatrization of superficial wounds in the pharyngeal mucosa of the horse. STUDY DESIGN/MATERIALS AND METHODS: Duplicate pharyngeal mucosal ulcers were induced in 12 Spanish horses with submucosal injection of sulfuric acid. A fibroendoscope and an He-Ne laser were used to treat one of the ulcers and the second ulcer in each animal was left untreated, serving as a control. Biopsy samples for the histological study were taken after the seventh laser therapy session from the two animals. RESULTS: Irradiated lesions cicatrized at 10.5 days and nonirradiated lesions cicatrized at 18.0 days. Statistical analysis revealed highly significant differences ($P < 0.0001$) between the irradiated and control groups. Histological study of the control samples showed epithelial coagulation necrosis, edema, and microthrombi. However, in samples from the irradiated lesions no inflammatory edema, numerous active fibroblasts, connective tissue, and intensive epithelial regeneration were observed. CONCLUSION: Macroscopic and microscopic results indicated that laser treatment accelerated the cicatrization. Irradiated lesions cicatrized faster than control. These results suggest beneficial effects of low-level laser irradiation therapy on equine pharyngeal ulcerative lesions.
Sulfuric Acids;sulfuric acid Animals;Burns, Chemical;Cicatrix;Endoscopy;Horse Diseases;Horses;Laser Therapy;Mucous Membrane;Pharynx;Sulfuric Acids;Wound Healing

Results of combined low-power laser therapy and extracts of Ginkgo biloba in cases of sensorineural hearing loss and tinnitus. Plant Extracts Audiometry;Combined Modality Therapy;Ear, Inner;Female;Hearing Loss, Sensorineural;Humans;Laser Therapy;Male;Plant Extracts;Tinnitus;Treatment Outcome

Low intensity laser therapy: still not an established clinical tool. The surgical, ophthalmological, and dermatological applications of high power lasers are well known and easily understood. What is neither as well known nor as easily understood is that lasers at powers that are orders of magnitude smaller have also been used in the laboratory and clinic for nearly 30 years to modulate cell function, lessen pain, and accelerate healing of soft tissue injuries. This article analyzes the rationale of this approach, examines the utility of laser therapy in its most common clinical applications, reviews and synthesizes the findings, and concludes that although laboratory findings seem authentic, clinical utility remains unestablished. Biophysical Phenomena;Biophysics;Cells;Eye Diseases;Humans;Laser Therapy;Pain;Skin Diseases;Soft Tissue Injuries;Wound Healing

Double-blind, placebo-controlled investigation of the effect of combined phototherapy/low intensity laser therapy upon experimental ischaemic pain in humans. BACKGROUND AND OBJECTIVE: This study assessed the putative analgesic effect of combined monochromatic light/laser irradiation at low intensity (660-950 nm; 31.9 J/cm2; pulsed at 16 or 73 Hz). STUDY DESIGN/MATERIALS AND METHODS: The investigation was completed under double-blind conditions using a standardised form of the submaximal effort tourniquet technique. Healthy male volunteers naive to the experimental conditions (n = 45) attended on two occasions for the purposes of pain induction, the first during which baseline data were obtained and on a second occasion during which they were randomly allocated to one of two treatments or a placebo condition. For the treatment conditions, irradiation was applied to the ipsilateral Erb's point at the parameters stated; for the placebo condition, sham "irradiation" was delivered using a dummy unit. Pain was measured using computerised visual analogue scales and McGill Pain Questionnaires (MPQ) to assess "current pain intensity" and "worst pain experienced," respectively. RESULTS: Analysis of variance and appropriate post hoc tests demonstrated only a weak (but significant) hypoalgesic effect compared to placebo ($P < 0.05$) in the treatment group irradiated at 16Hz for the sensory component of the MPQ; other comparisons were found to be nonsignificant. CONCLUSIONS: These results do not provide convincing evidence for the hypoalgesic potential of combined monochromatic light/laser irradiation, at least at the parameters used here, and thus indicate the necessity of additional work to investigate this modality further in order to assess the potential benefit, if any, of such treatment in the clinical setting. Placebos Analgesia;Analysis of Variance;Double-Blind Method;Forearm;Hand;Humans;Ischemia;Laser Therapy;Male;Muscle Contraction;Pain;Pain Management;Pain Measurement;Phototherapy;Placebos;Sensation;Tourniquets

[Low-energy laser therapy in medial tibial stress syndrome]. The effect of low-energy laser therapy on shin splints was examined in a randomized study with an unblinded design. Constripts from the Jutland Dragoon regiment with shin splints were given either active laser treatment (40 mW in 60 sec per cm tender tibia edge) or placebo laser. All patients were exempted from normal duty concerning activities like running and march. Forty-nine patients participated in the study, 23 in the laser group and 26 in the control group. From the start the study was designed to be double-blind, but by accident the code was broken towards the end of the study. We found no significant differences between the groups regarding pain visual analog score and readiness to return to active duty after 14 days. Adult;Cumulative Trauma Disorders;Denmark;Humans;Laser Therapy;Male;Military Medicine;Military Personnel;Radiotherapy Dosage;Syndrome;Tibia

Hypericin uptake in rabbits and nude mice transplanted with human squamous cell carcinomas: study of a new sensitizer for laser phototherapy. Tissue uptake and biodistribution of hypericin was measured in rabbits and in nu/nu mice xenografted with P3 human squamous cell carcinoma to assess the value of this dye as an in vivo sensitizer for laser photoinactivation of solid tumors. Hypericin has absorption maxima at 545 and 590 nm with a fluorescence emission peak at 640 nm in ethanol. Dye uptake after intravenous injection was tested at 4 and 24 hours in rabbit tissues by ethanol extraction and quantitative fluorescence spectrophotometry. Maximum dye levels were seen at 4 hours in most vascular organs with lung having fivefold higher uptake than spleen followed by liver, blood, and kidney. Mice were examined after 2, 4, 6, 8, and 24 hours and after 3 and 7 days for dye uptake. The peak concentration of hypericin in murine organs was reached at 4 hours with uptake per gram of tissue as follows: lung > spleen > liver > blood > kidney > heart > gut > tumor > stomach > skin > muscle > brain. Elimination of hypericin was rapid in most murine organs with residual dye under 10% of maximum by 7 days compared to 25% to 30% retention for the squamous cell tumors and several normal tissues. These results suggest that hypericin may be a useful photosensitizer for KTP/532 laser interstitial therapy of human cancer. Anthracenes;Radiation-

Sensitizing Agents;Perylene;hypericin Animals;Anthracenes;Carcinoma, Squamous Cell;Humans;Lung;Mice;Mice, Inbred BALB C;Mice, Nude;Neoplasm Transplantation;Perylene;Photochemotherapy;Rabbits;Radiation-Sensitizing Agents;Spleen;Time Factors;Tissue Distribution

Low level laser therapy for dentinal tooth hypersensitivity. A comparative double blind study testing low level laser therapy (Gallium/Aluminium/Arsenide laser [GaAlAs]) against placebo was carried out in the management of dentinal tooth hypersensitivity. Subjects demonstrating dentinal hypersensitivity and complying with strict selection criteria were randomly assigned to an active and placebo group. Low level laser therapy was applied for one minute to both the apex and cervical area of the tooth; and reapplied at one week, two-week and eight-week intervals. Dentinal hypersensitivity was rated at each visit. There were 28 subjects in the placebo group and 22 and 21 subjects, respectively, in the tactile sensitivity and thermal sensitivity groups. Comparisons between the groups were conducted using independent groups t-test. In both the tactile and thermal sensitivity groups differences between the active and placebo groups were significant from the first week and increased further in the second and eighth weeks. The mean value of thermal sensitivity decreased 67 per cent ($p < 0.001$) compared with placebo (17 per cent) and tactile sensitivity decreased 65 per cent ($p = .002$) compared with placebo (21 per cent) at eight weeks. Results demonstrate that the GaAlAs laser is an effective method for the treatment of both thermal and tactile dentinal hypersensitivity. There were no reported adverse reactions or instances of oral irritation. Adolescent;Adult;Aged;Dentin Sensitivity;Double-Blind Method;Female;Hot Temperature;Humans;Laser Therapy;Male;Middle Aged;Pain Measurement;Touch

Enhancement of angiogenesis in regenerating gastrocnemius muscle of the toad (Bufo viridis) by low-energy laser irradiation. The effect of low-energy laser (He-Ne) irradiation on the process of neoformation of blood capillaries during regeneration in the toad (Bufo viridis) gastrocnemius muscle was studied using histomorphometric methods. The injured zones of the experimental toads were subjected to four direct He-Ne laser irradiations (632.8 nm wavelength; 6.0 mW for 2.3 min) every alternate day, commencing on the second day after injury. Muscles that were injured as above and subjected to red light irradiation served as control. The volume density (cm3/cm3) of the capillaries in the injured zone at 9 days after injury was significantly ($P < 0.01$) higher (0.09 +/- 0.006) than in the control muscles (0.048 +/- 0.007). At 14 days after injury, the volume density in the injured zone of the control muscles further increased, while the value in the laser-irradiated muscles remained unchanged. The surface density (m2/cm3) of the capillaries in the injured zone was 2.3-fold higher in the laser-irradiated muscles than in the control muscles at 9 days after injury. The surface density further increased in the control muscles between 9 and 14 days after injury, while in the laser-irradiated muscles there was a decrease in this value during the above period. The surface-to-volume ratios of the capillaries in the injured zone of control and laser-irradiated muscles indicate a straighter, rather than a convoluted appearance between 9 and 14 days after injury. It is concluded that He-Ne laser irradiation during skeletal muscle regeneration in the toad markedly promotes the process of neoformation of blood vessels in the injured zone.(ABSTRACT TRUNCATED AT 250 WORDS) Animals;Bufo bufo;Lasers;Muscle, Skeletal;Neovascularization, Pathologic;Regeneration

[Laser therapy of Achilles tendinitis]. The effects of low level laser treatment in soldiers with achilles tendinitis were studied in a prospective, randomized and double blind trial. Eighty-nine soldiers were enrolled in the study. Forty-six were randomized to treatment with active laser and 43 to treatment with placebo laser. No statistically significant differences in the number of consultations, morning stiffness, tenderness, crepitation, swelling, redness, VAS-score of pain and degree of unfitness for duty were found between the two treatment groups. Achilles

Tendon;Adolescent;Adult;Double-Blind Method;Humans;Laser Therapy;Male;Military Personnel;Prospective Studies;Tendinopathy
Ophthalmic effects of low-energy laser irradiation. Laser irradiation at subthreshold energies exerts various effects on the eye and other parts of the body, mainly the skin and nervous system, through a mechanism that has yet to be adequately explained. The ocular bioeffects are manifested mostly in the retina, but also in other ocular tissues. This review outlines the reported effects of low-energy laser irradiation on nonophthalmological tissues and organs, including those of the nervous system, with special emphasis on the optic nerve. It also details the ophthalmic phenomena induced by low-energy laser irradiation and examines claims of its therapeutic efficacy in several eye diseases, such as keratitis, glaucoma and macular degeneration. Animals;Eye;Humans;Laser Therapy;Lasers;Nervous System;Skin
Effects of low-power laser irradiation on multiple unit discharges induced by noxious stimuli in the anesthetized rabbit. This study discusses the effects of low-power laser irradiation upon multiple unit discharges within a peripheral nerve that were induced by a noxious stimulation in anesthetized rabbits. Responding to a pinch stimulation of plantar skin, transitory increase of neuronal discharges was induced in the sural nerve. This was reduced within a minute, and persistent increases, which continued during a period of the stimulation, occurred. These increases became significantly smaller than the control value during a low-power laser irradiation that was applied to the exposed sural nerve distal to the recording site. These results suggested an inhibitory effect of low-power laser irradiation on the impulse conduction within a peripheral nerve. Possible analgesic effects of low-power irradiation are discussed. Animals;Female;Humans;Laser Therapy;Lasers;Male;Models, Biological;Neural Conduction;Neural Inhibition;Rabbits;Sural Nerve
Evaluation of four new carbocyanine dyes for photodynamic therapy with lasers. The search for improved photosensitizers for laser phototherapy of malignancies has led to the examination of a new group of carbocyanine dyes as effective fluorochromes. In this study, four carbocyanine dyes with different absorption maxima of 483 nm [DiOC6(3)], 545.5 nm (DiIC5(3)], 556.6 nm [DiSC5(3)], and 651.0 nm [DiSC3(5)] were tested in vitro. The kinetics of uptake and toxicity of these four dyes were assessed for P3 human squamous cell carcinoma, HT29 colon carcinoma, M26 melanoma, and TE671 fibrosarcoma cell lines at 15, 30, 45, 60, and 180 minutes after exposure with each dye. After sensitization with DiOC6(3), the P3 and M26 cell lines were also tested for phototherapy by treatment with 488-nm light from an argon laser. The results showed that these four carbocyanine dyes had rapid and significant uptake by the carcinoma cell lines with no toxicity at concentrations < 0.1 micrograms/mL. Nontoxic DiOC6(3) levels in sensitized tumor cells after laser phototherapy resulted in approximately 85% inhibition of P3 and approximately 95% inhibition of M26 cell lines by MTT assays. The results suggest that these carbocyanine dyes can be used for tumor photosensitization and wavelength-matched laser photodynamic therapy. Further in vivo studies will be necessary to define the clinical potential of carbocyanine dyes as tumor-targeting agents for phototherapy of cancer. Benzothiazoles;Carbocyanines;Fluorescent Dyes;Tetrazolium Salts;dipentyl-3,3,3',3'-tetramethylindocarbocyanine;3,3'-dipentylthiacarbocyanine;3,3'-dipropyl-2,2'-thiadicarbocyanine;3,3'-dihexyl-2,2'-oxacarbocyanine;Argon Adenocarcinoma;Argon;Benzothiazoles;Carbocyanines;Carcinoma, Squamous Cell;Cell Survival;Colonic Neoplasms;Fibrosarcoma;Fluorescent Dyes;Humans;Laser Therapy;Lung Neoplasms;Medulloblastoma;Melanoma;Neoplasms;Photochemotherapy;Tetrazolium Salts;Tumor Cells, Cultured
Dose response of human tumor cells to rhodamine 123 and laser phototherapy. Previous studies have shown that Rhodamine 123 (Rh123) is an efficient tumor targeting agent for argon laser photodynamic therapy in vitro. Effectiveness of this approach for cancer treatment in vivo will

depend on Rh123 tumor uptake kinetics and laser energy delivery via fiberoptics to the tumor site. In the present study, tumor and normal cells were exposed in vitro to 1 micrograms/mL Rh123 until 10%, 50%, and 100% of maximum uptake was achieved. Laser treatment response was monitored by trypan blue exclusion for tumor cell viability and by MTT tetrazolium assays to measure mitochondrial dehydrogenase activity. TE671 fibrosarcoma cells were highly sensitive to argon laser phototherapy (514 nm, 5 W, 1 minute, Tmax = 8 degrees C), with mitochondrial inhibition seen after Rh123 uptake of 12, 50, and 100 ng/million cells. P3 squamous cell carcinoma cells were inhibited 20% and 75% by the laser after Rh123 uptake of 13 or 30 ng/million cells, respectively. M26 melanoma cells were not sensitive to the laser after 15 ng/million cells Rh123 uptake but were inhibited 45% and 75% after Rh123 uptake of 80 and 160 ng/million cells. Micro2 fibroblast mitochondrial activity was reduced less than 25% by the laser after Rh123 uptake of 50 ng/million cells. Cell viability after maximum Rh123 uptake and laser treatment was decreased to 30%, 15%, and 2% for M26 melanoma, P3 squamous cell carcinoma, and TE671 fibrosarcoma cells, but remained over 80% for Micro2 fibroblasts. The results suggest that Rh123 laser treatment response depends on tumor type and drug uptake level, with normal cells being much less sensitive to phototherapy. Antimetabolites, Antineoplastic;Fluorescent Dyes;Rhodamines;Tetrazolium Salts;Rhodamine 123 Antimetabolites, Antineoplastic;Carcinoma, Squamous Cell;Cell Survival;Cells, Cultured;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Fibroblasts;Fibrosarcoma;Fluorescent Dyes;Humans;Laser Therapy;Melanoma;Mitochondria;Neoplasms;Photochemotherapy;Rhodamine 123;Rhodamines;Tetrazolium Salts;Tumor Cells, Cultured

[The role of Nd-YAG in the management of tracheobronchial stenosis]. 122 patients with the main airway stenosis were treated with Nd-YAG laser phototherapy. The endobronchial laser treatment was performed either with flexible bronchoscope (64%), or with rigid instrument (36%). This method can result a final recovery of the patients with benign tumors, or inflammatory processes, at the patients with malignant tumors can be achieved an effective palliation. Taking account the generally accepted indications and contraindications of the endobronchial laser phototherapy the number of the complications can be reduced. Neodymium Aged;Bronchial Neoplasms;Female;Humans;Laser Therapy;Male;Middle Aged;Neodymium;Palliative Care;Tracheal Neoplasms;Tracheal Stenosis

[Use of low-energy laser irradiation in patients with progressive myopia]. A method of infrared laser exposure at a wavelength 1.3 microns for the treatment of progressive myopia has been developed, permitting a contactless trans-scleral irradiation of the ciliary muscle. Laser stimulation was carried out in 117 patients (234 eyes) aged 7 to 16. By the end of the first follow-up year the mean values of the positive part of accommodation increased by 2.0 to 2.5 diopters in patients of all age groups. A reduction of the parameters of ocular function was recorded 6-12 months after laser stimulation, though they remained higher than initially. A repeated curse of therapy helped normalize accommodation reserve parameters again. Prestimulation rheographic coefficient in all the examinees was 2.7 +/- 0.03% on an average, after treatment it was 3.44 +/- 0.02%. Hence, ciliary muscle stimulation by infrared laser helps in the majority of cases stabilize clinical refraction. Accommodation, Ocular;Adolescent;Child;Follow-Up Studies;Humans;Laser Therapy;Myopia;Time Factors

[The role of antioxidant mechanisms in body's reactions to the effects of low-intensity laser irradiation]. Some mechanisms of general and local effects of laser radiation with various wavelength were considered. Both stimulating and stress effects of low-intensive laser radiation realized via antioxidant and free-radical pathways were shown. It was found that the level of SH and SS-groups in tissues and blood is the most sensitive index of laser effect. Measurements of SH and SS-groups concentration are recommended as criterion of harmless laser use in clinics.

Antioxidants;Disulfides;Free Radicals;Sulfhydryl Compounds
Animals;Antioxidants;Disulfides;Free Radicals;Health Personnel;Humans;Lasers;Radiation Dosage;Rats;Sulfhydryl Compounds

[Effect of laser biostimulation on leg blood flow in the course of arteriosclerosis]. Blood flow pattern (maximum moment velocity, mean velocity, artery diameter and minute flow) in the superficial femoral artery and in the foot artery was evaluated in 30 patients, subjected to laser biostimulation for symptoms of atherosclerotic ischemia of the lower limbs. The blood flow examination was performed before the treatment and immediately afterwards (20 procedures) and 6 months following the therapy. It was found that laser biostimulation had a favorable effect on the blood flow pattern, particularly in the initial stage of ischemia (Io), and may be a useful method of medical treatment in atherosclerotic ischemia of the lower limbs.
Adult;Aged;Arteriosclerosis;Blood Flow Velocity;Female;Femoral Artery;Foot;Humans;Ischemia;Laser Therapy;Male;Middle Aged;Regional Blood Flow

[Treatment with soft laser. The effect on complaints after the removal of wisdom teeth in the mandible]. In a placebo controlled double-blind randomized study the effect of low level laser therapy on postoperative complaints after removal of lower third molars was examined. Several parameters were investigated in two groups of patients; in one group low level laser was applied during and following third molar removal, in the other no active additional laser treatment was given. The results of this study show that therapeutic low level laser treatment could not statistically reduce the postoperative pain, swelling, trismus and function impairment after extraction of lower third molars. Adolescent;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Trismus

[Hemopoiesis stimulation by low-intensity laser radiation in acute radiation sickness exacerbated by thermal trauma]. In experiments with gamma-irradiated (dose of 7.0 Gy) and burned (III-B grade, 10% skin injury) hybrid mice the haemopoietic effect (1.5-2-fold increase) of low-intensity laser irradiation (LILI) has been detected. At the same time there was no effect of LILI on normal animals.
Animals;Burns;Hematopoiesis;Infrared Rays;Laser Therapy;Male;Mice;Mice, Inbred C57BL;Mice, Inbred CBA;Radiation Injuries, Experimental

The effect of laser irradiation on the release of bFGF from 3T3 fibroblasts. Studies have shown that low-level laser irradiation increases the proliferation of fibroblasts in cell culture. The mechanism of action is unknown. Basic fibroblast growth factor (bFGF) is a multifunctional polypeptide that has been detected in most tissues and which supports cell proliferation and differentiation. The purpose of this study was to determine whether laser irradiation (660 nm) can stimulate production of bFGF from fibroblast cells in cell culture. Our study showed that fibroblasts irradiated with laser energy at 2.16 J/cm2 demonstrated increased cell proliferation and enhanced production of bFGF, whereas fibroblasts irradiated with laser energy at 3.24 J/cm2 neither demonstrated increased cell proliferation or an enhanced release of bFGF as compared to the control group. These results provide direct evidence that the proliferation of fibroblasts as a result of stimulation by low level laser irradiation may be associated with the autocrine production of bFGF from fibroblasts. Fibroblast Growth Factor 2 3T3 Cells;Animals;Biological Assay;Cell Division;Cells, Cultured;Fibroblast Growth Factor 2;Lasers;Mice

Low level laser therapy is ineffective in the management of rheumatoid arthritic finger joints.
Low level laser therapy (LLLT) is a relatively new and increasingly popular form of electrotherapy. It is used by physiotherapists in the treatment of a wide variety of conditions including RA despite the lack of scientific evidence to support its efficacy. A randomized, double-blind and placebo-controlled study was conducted to evaluate the efficacy of LLLT. The patient sample consisted of chronic RA patients with active finger joint synovitis. Forty RA patients with involvement of some or all of MCP or

PIP joints were recruited. Following random allocation they received either active or placebo laser three times a week for 4 weeks. Measurements were taken prior to entry, after the treatment, 1 month and 3 months at follow-up. The groups were well matched in terms of age, sex, disease duration and severity. Few significant differences were noted in grip strength, duration of morning stiffness, joint tenderness, temperature of inflamed joints, range of movement or pain either within or between groups. Using these irradiation parameters the efficacy of LLLT is ineffective. Adult;Aged;Aged, 80 and over;Arthritis, Rheumatoid;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Finger Joint;Humans;Laser Therapy;Lasers;Male;Middle Aged

[Effects of low-intensity laser irradiation on visual fields of patients with glaucoma]. Twenty-three patients (28 eyes) with open-angle glaucoma and controlled intraocular pressure were administered a course of He-Ne laser treatment. Irradiation parameters were as follows: wavelength 0.63 microns, light spot diameter 5 mm, energy 2 mWt, session duration 240 sec. A course consisted of 10 sessions. Seventeen eyes of the same patients were controls. Visual field was examined before the treatment and after it, immediately and in 3 to 3.5 months using Humphrey field analyzer and full field 120 points threshold related test. The treatment resulted in field deficit reduction by 10% and more in 21 (75%) of the 28 eyes. On an average, visual field deficit reduced by 22.4%. Three to 3.5 months after the treatment the mean value of visual field deficit was still lower than initially by 19.7%. No side effects were observed in any of the cases. In controls a trend to increase of field deficit developed within the same period, though the differences were statistically unreliable. The data indicate a positive effect of local low-energy laser exposure on visual field status of patients with primary open-angle glaucoma and controlled intraocular pressure. Aged;Aged, 80 and over;Glaucoma, Open-Angle;Humans;Laser Therapy;Middle Aged;Time Factors;Visual Fields

Low intensity laser irradiation inhibits tritiated thymidine incorporation in the hemopoietic cell lines HL-60 and U937. The purpose of this study was to determine the effect of low intensity laser irradiation (660 nm, 12 mW, 5 kHz) on tritiated thymidine incorporation in two hemopoietic cell lines, HL-60 and U937. Cells were suspended at a concentration of 1 x 10(6)/ml in their respective serum-free media and irradiated at energy densities from 1.0 to 11.5 J/cm2. Twenty-four hours after irradiation the cells were assayed for their ability to incorporate tritiated thymidine (3H-TdR) in comparison with nonirradiated cells. Analysis by two-way analysis of variance (ANOVA) for unrelated groups showed that laser irradiation at all energy densities > or = 5.8 J/cm2 produced a significant decrease in 3H-TdR incorporation ($P < 0.05$) into HL-60 cells. In U937 cells, irradiation at energy densities of 5.8, 7.2, and 11.5 J/cm2 caused a similar reduction in 3H-TdR incorporation ($P < 0.01$), although not at 8.6 and 9.6 J/cm2. The temperature of each cell suspension was recorded both during and immediately postirradiation, and no significant thermal changes were observed. These findings demonstrate a direct photobiological effect of laser irradiation on these two cell lines. The precise mechanism for this effect is unknown but may have significance in understanding the biological action of laser's known therapeutic effectiveness in promoting wound repair. Tritium;Thymidine Cell Death;Cell Line;Hematopoietic Stem Cells;Humans;Lasers;Thymidine;Tritium

Attenuation of the process of muscle regeneration in the toad gastrocnemius muscle by low energy laser irradiation. The effect of number, frequency, and timing of HeNe (6.0 mW; 31.2J/cm2) and Ga-As-diode (average power at 2.82 Hz-0.005 mW) laser irradiations on the process of muscle regeneration at 14 days following cold injury to the toad gastrocnemius muscle was investigated using histomorphometric methods. The volume fraction (percent of total injured area) of mononucleated cells, myotubes and degenerated fibers was 10 +/- 1%, 0%, and 4 +/- 1%, respectively, in the HeNe laser irradiated muscles (5 irradiations every alternate day, beginning on the 4th day after injury), whereas in the control nonirradiated muscles, these values were significantly higher comprising 57 +/- 2% ($P < 0.01$), 11 +/- 1% and 10 +/- 2% ($P < 0.05$), respectively. The volume

fraction of young myofibers in injured areas that were subjected to the same laser irradiation regime was 8.6-fold significantly higher ($P < 0.01$) than their volume fraction in control muscles. The histomorphometric results were the same for injured zones of muscles that were laser irradiated only once, on the 9th day postinjury, and for those that received five consecutive irradiations every alternate day. Muscle regeneration was equally promoted by single Ga-As-diode laser or HeNe irradiation. Multiple irradiations of Ga-As-diode laser caused some pathological changes in the newly formed muscular structures. It is concluded that the process of skeletal muscle regeneration is markedly promoted by low energy laser irradiations, but that the effect depends on the number, timing, and frequency of irradiations and the type of laser used. Helium;Gallium Animals;Bufonidae;Gallium;Helium;Lasers;Muscles;Regeneration

Effect of low level diode laser irradiation of human oral mucosa fibroblasts in vitro. The effects of low level laser (LLL) irradiation on the proliferation of human buccal fibroblasts were studied. A standardized LLL set-up was developed (812 nm, 4.5 +/- 0.5 mW/cm2). Cultures in petridishes were divided into eight groups (1 group served as control). On day 6 after seeding, routine growth medium was replaced with PBS for 1/2 hour. At the beginning of this period, LLL irradiation was performed for 0, 1, 3, 10, 32, 100, 316, or 1,000 seconds, respectively--corresponding to the radiant exposures 0, 4.5, 13.5, 45, 144, 450, 1,422, 4,500 mJ/cm2. Subsequently the cells received 3H-dT in fresh medium for 16 hours DNA-incorporation. Scintillations from tritium and total protein concentration per culture dish were determined. The individual 3H-cpm/protein-concentration ratios were calculated in % of control. Three experiments were performed (N = 151). Following LLL exposure the 3H-cpm/protein ratio was increased with maximum cpm/protein ratio (132.5% +/- 10.6% SEM) in the group receiving 450 mJ/cm2 ($P < 0.03$ nonparametric Kruskal Wallis one-way ANOVA-test). This study demonstrated an increased incorporation on tritiated thymidine in cultured human oral fibroblasts following LLL exposure and suggests that LLL irradiation can induce increased DNA synthesis. Cell Count;Cell Survival;Cells, Cultured;Fibroblasts;Humans;Lasers;Mouth Mucosa;Protein Biosynthesis;Radiation Dosage

Effect of low level energy laser irradiation on gingival inflammation. The effect of low level energy infra-red laser irradiation on gingival inflammation was studied. Gingivitis was induced in ten female dental students by refraining from all oral hygiene measures for 28 days. On days 21 and 24 the marginal gingiva, buccal to one of the lateral mandibular incisors, was exposed to 4 minutes of laser irradiation (total dose = 1J). Serving as a control site the gingiva of the contralateral incisors was exposed to ordinary light. There was no statistical difference between the laser exposed sites and the control sites related to either plaque formation or gingival bleeding. The gingivitis reaction was evaluated with the aid of a stereophotographic method by calculating changes in the number of gingival vessels. It was found that the number of vessels identified increased over time for both laser exposed and control sites. The difference between sites at day 28 was not statistically significant ($t = 0.82$, $P > 0.05$). These results suggest that low energy laser irradiation (LLLT) does not influence the inflammatory reaction of the gingiva. Adult;Double-Blind Method;Female;Gingiva;Gingivitis;Humans;Laser Therapy;Photogrammetry

Low energy laser therapy in rheumatoid arthritis. Low energy laser (LEL) is a widely used treatment for a variety of musculoskeletal disorders although convincing documentation of the effect is missing. We have examined the LEL effect on Rheumatoid Arthritis (RA) in a double blind placebo controlled study. Twenty-two patients completed the study (10 receiving LEL treatment) according to the protocol. A significant effect on pain score was found due to LEL treatment, but when data were corrected for disease variation the effect disappeared. No effect of LEL could be demonstrated on the other assessed variables: grip strength, morning stiffness, flexibility, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP). In conclusion, we did not find that LEL had any clinically relevant

effects on RA. Adult;Aged;Arthritis, Rheumatoid;Double-Blind Method;Female;Humans;Laser Therapy;Lasers;Male;Middle Aged;Radiation Dosage;Treatment Outcome

[Preoperative low energy laser irradiation of the lungs and its effect on prostaglandin and cyclic nucleotide metabolism]. Thromboxane B2;6-Ketoprostaglandin F1 alpha;Dinoprost;Cyclic AMP;Alprostadil;Cyclic GMP;Dinoprostone;Prostaglandin D2 6-Ketoprostaglandin F1 alpha;Adolescent;Adult;Aged;Alprostadil;Combined Modality Therapy;Cyclic AMP;Cyclic GMP;Dinoprost;Dinoprostone;Female;Humans;Laser Therapy;Lung Diseases;Male;Middle Aged;Pneumonectomy;Preoperative Care;Prostaglandin D2;Thoracoplasty;Thromboxane B2

No effect of low power laser in lateral epicondylitis. Thirty-six patients with lateral epicondylitis of the elbow (19 women, 17 men, median age 48 yrs) were treated either with active laser or placebo, 18 patients in each group. The active laser was a GA-AL-AS 30 mW/830 nm low power laser (LPL). The study design was double blind and randomized. The treatment session consisted of eight treatments, two per week. Patients were irradiated on tender points on the lateral epicondyle and in the forearm extensors. Output power was 3,6 J/point. A follow up was performed by telephone, 10 weeks after the last treatment. No difference between laser and placebo was found on lateral elbow pain (Mann Whitney test, 95% confidence limits). We conclude that low power laser offers no advantage over placebo in the treatment of musculoskeletal pain as lateral epicondylitis. Further studies with low power laser treatment of musculoskeletal pain seem useless. Adult;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Pain Measurement;Tennis Elbow

Effects of nimodipine and dexamethasone on low-level CO2 laser-induced release of 51chromium from canine 2C5 gliosarcoma cells. Low-energy penumbral irradiation of surgical lasers may produce undesirable effects on surrounding tissues. This study used a 51Cr cell labeling technique to determine if gliosarcoma cells could be therapeutically protected prior to their exposure to low-power laser irradiation. Canine 2C5 gliosarcoma cells with intracellular 51Cr were treated with nimodipine and/or dexamethasone and then exposed to low-power levels of CO2 laser. The 51Cr was released from the cells in a dose-dependent fashion following exposure to laser energy. Correlative analysis of the data indicated that a strong direct relationship between laser fluence and 51Cr release did exist for controls and drug-treated groups with coefficients of correlation r > or = +0.90 and coefficients of determination r2 > or = 0.82. However, comparison of the data from the drug-treated and control groups found that there was no significant difference between them (P > .05). Therefore, no protective or detrimental effects were observed with the use of nimodipine and/or dexamethasone on the gliosarcoma cells as tested in this system. Further investigation is necessary in order to define the mechanisms by which low-power level lasers affect these cells. These effects do not appear to be mediated through localization of mechanisms to the cell membranes or their constituent Ca2+ channels. Calcium Channels;Chromium Radioisotopes;Drug Combinations;Chromium;Carbon Dioxide;Nimodipine;Dexamethasone Animals;Calcium Channels;Carbon Dioxide;Cell Membrane;Chromium;Chromium Radioisotopes;Dexamethasone;Dogs;Dose-Response Relationship, Radiation;Drug Combinations;Gliosarcoma;Lasers;Nimodipine;Tumor Cells, Cultured

Histological studies on the rheumatoid synovial membrane irradiated with a low energy laser. The beneficial effects of low energy laser irradiation on rheumatoid arthritis (RA) joints have been reported, but the mechanisms of action of low energy lasers in RA are unclear. The synovial membrane in cases of RA was studied histologically to observe the effects of low energy laser irradiation. Fourteen knee joints of RA cases, which had been scheduled for arthroplasty, were irradiated with a gallium-aluminium-arsenide (Ga-Al-As) laser (790 nm in wavelength and 10 mW of

output power) prior to the surgical operation, at six points of the external aspect of the knee joint for 80 seconds at each points once a day for 6 days. On the day following the last irradiation, pieces of synovial membrane from the lateral irradiated area and from the median nonirradiated area as a control were resected during the arthroplasty. The histological findings of the irradiated synovial membrane showed flattening of epithelial cells, decreased villous proliferation, narrowed vascular lumen, and less infiltration of inflammatory cells compared with those of nonirradiated synovia. The evaluation of slides was done in a blinded manner, and significant differences was seen by Wilcoxon's t-test ($P < 0.01$). Histological findings suggested that the low energy laser irradiation induced suppression of inflammation in the synovial membrane of RA. Arthritis, Rheumatoid;Female;Humans;Knee Joint;Knee Prosthesis;Laser Therapy;Male;Middle Aged;Synovial Membrane;Time Factors

[The effect of low-intensity laser radiation on the regional hemodynamics in strangulated intestinal obstruction]. In the experiment on 214 white rats, the effect of different types of low-intensive laser irradiation and existing methods of treatment on regional hemodynamics in strangulated ileus was studied. Combined use of ultraviolet and helium-neon lasers has to be proved to be the most effective. Ultraviolet laser irradiation contributed to increase in elasticity of the arterial wall and cupping off the vascular spasm, helium-neon irradiation had a stimulating effect on the tissues of the intestinal wall. Animals;Combined Modality Therapy;Disease Models, Animal;Dogs;Hemodynamics;Intestinal Obstruction;Intestine, Small;Intraoperative Care;Ischemia;Laser Therapy;Male;Rats;Ultraviolet Therapy

Evidence for the existence of low-energy laser bioeffects on the nervous system. The reported effects of low-energy laser irradiation on the nervous system are manifested in alterations in cellular and extracellular biochemical constituents and reactions, as well as in changes in cell division rates. These bioeffects were observed in both in vivo and in vitro experiments. Other observed phenomena relate to the function of the nervous system and consist mainly of induced alteration in electrical conduction, stimulation thresholds, and behavioral effects. Clinical aspects of low-energy laser bioeffects relate mainly to pain mitigation and postponement of the posttraumatic neural degeneration processes. Many of the reported observations were obtained by experiments apparently conducted according to less than rigorous scientific criteria, and some could not be duplicated. On the whole, however, there is little doubt that low-energy laser irradiation exerts some effects on the nervous system under specific conditions of irradiation and tissue exposure via a mechanism which is probably photochemical in nature. Action Potentials;Animals;Brain;Guinea Pigs;Humans;Laser Therapy;Lasers;Mice;Nerve Regeneration;Nervous System;Nervous System Physiological Phenomena;Pain;Palliative Care;Rats;Trauma, Nervous System

Laser applications in plastic and reconstructive surgery. Very shortly after the laser's first successful firing in 1960, applications were found in the medical field in the specialities of ophthalmology and dermatology and have since expanded to include indications in plastic and reconstructive surgery. In the photodestructive mode, laser energy is used selectively to vaporize, incise, excise, ablade and coagulate target tissue; the surgical laser can also degrade or denature protein in the target tissue, and the latter photoreaction now forms the basis for laser tissue welding in a variety of tissue types. The author refers to these photodestructive applications as high reactive-level laser treatment, or HLLT. In laser therapeutic applications, the temperature of the cells may rise only very slightly or not at all, and there is no immediate irreversible change in the target tissue architecture. The level of reaction is thus lower than the cell survival threshold, giving a direct photoactivative effect. The author refers to this as low reactive-level laser therapy, or LLLT: LLLT applications include pain attenuation, wound healing acceleration; enhanced remodeling in

accelerated bone and tendon repair; restoration of normal neural function; normalization of abnormal hormonal function; modulation of the autoimmune system; control of hyper- and hypotension and so on. HLLT and LLLT are contrasted and compared, and applications of both HLLT and LLLT in PRS are discussed in brief. Humans;Laser Therapy;Nevus;Skin Neoplasms;Surgery, Plastic

Possible application of the laser in immunobiology. The human immune system acts a defence mechanism against exogenous or indigenous potentially harmful bodies, such as bacteria and viruses. The major histocompatibility complex (MHC class I and class II antigens) form key elements of legitimate body components, and the organization of MHC molecules allows T-lymphocytes to distinguish between legitimate and foreign bodies. On detection of a foreign component, T-cells activate the necessary pathways for destruction of the foreign body. Occasionally however the system breaks down and the result is a disease of an autoimmune nature. Both visible light and infrared low reactive-level laser therapy (LLLT) has been shown to act on immune system cells in a number of ways, activating the irradiated cells to a higher level of activity. Infrared LLLT has been shown to increase both the phagocytic and chemotactic activity of human leukocytes in vitro, for example. This is an example of photobiological activation. Photobiological cell-specific destruction is also possible using doses of low incident laser energy on cells which have been photosensitized for the specific wavelength of the laser, such as in photodynamic therapy (PDT) for superficial cancers. LLLT has also been shown to act directly and selectively on the autoimmune system, restoring immunocompetence to immunocompetence cells. Although much more research needs to be done, there are enough experimental and clinical data to show that the laser, and LLLT in particular, has a possibly exciting role both in immunobiological therapy for diseases of the immune system, and to activate and boost the normal reaction of the immune system components against harmful foreign bodies. Animals;Chemotaxis, Leukocyte;Humans;Immune System Diseases;Laser Therapy;Lymphocyte Activation;Photochemotherapy;T-Lymphocytes

Role of 830 nm low reactive level laser on the growth of an implanted glioma in mice. The effect of low reactive level laser therapy (LLLT:830 nm, 60 mW, continuous wave) was studied using the model of a glioma implanted in mice. Two different models were used. In the first model, therapies were applied post the first day of glioma implantation; in the second model, post the fourteenth day of glioma implantation. Using the first model, therapies were designed as follows. 1) control group (no therapy), 2) direct LLLT (15 seconds twice per day; on the skin covering the implanted glioma), 3) indirect LLLT (15 seconds twice per day; on abdominal skin area rather than the site of the implanted glioma), 4) indirect LLLT (30 seconds twice per day), 5) anti-cancer drug (ACNU) group, 6) mouse beta-interferon (Mu-beta-IFN) group, 7) direct LLLT plus Mu-beta-IFN group, 8) ACNU plus Mu-beta-IFN group, 9) indirect LLLT (15 seconds twice per day) plus ACNU plus Mu-beta-IFN group. Using the second model, therapies were designed as follows. 1) control group (no therapy), 2) indirect LLLT (15 seconds twice per day), 3) indirect LLLT (15 seconds twice per day) plus Mu-beta-IFN group, 4) Mu-beta-IFN plus ACNU group. Our results indicated that, applied on the first day after glioma implantation, both direct and indirect LLLT were effective in inhibiting the tumor growth. In addition, it appeared that the effect of LLLT might be dose-dependent. Finally, the group of direct LLLT plus Mu-beta-IFN was most effective in limiting the tumor growth and the incidence of growth as compared with the other groups.(ABSTRACT TRUNCATED AT 250 WORDS) Animals;Glioma;Laser Therapy;Male;Mice;Mice, Inbred C57BL;Neoplasm Transplantation;Semiconductors;Time Factors

Clinical application of low reactive level laser therapy (LLLT) for atopic dermatitis. Patients with atopic dermatitis (AD) were treated with diode low reactive level laser therapy (LLLT), and the following results were obtained. 1) Itchy sensation decreased in 79 of 112 cases (71%) after this

therapy. 2) Skin eruptions improved in 69 of 112 cases (62%). 3) There were no side effects during and after LLLT. 4) Major histocompatibility complex (MHC) class II antigen and inter-cellular adhesion molecule (ICAM)-1 expression on epidermal cells decreased after the therapy. 5) The number of CD1 positive epidermal dendritic cells did not significantly change before and after LLLT. Cell Adhesion Molecules;Histocompatibility Antigens Class II;Intercellular Adhesion Molecule-1 Adolescent;Adult;Cell Adhesion Molecules;Child;Child, Preschool;Dermatitis, Atopic;Female;Histocompatibility Antigens Class II;Humans;Intercellular Adhesion Molecule-1;Laser Therapy;Male;Middle Aged;Semiconductors

[Laser therapy of ankle sprain]. The effect of low-power laser therapy on acute ankle sprains was evaluated in a double-blind randomised clinical study consisting of 40 patients from the casualty ward. All patients received treatment until their ankle joint was painless. No statistically significant differences regarding discolouring, pain, oedema, and use of analgetics were observed between patients treated with laser and placebo. The patients treated with active laser had a significantly longer sick leave. Adolescent;Adult;Ankle Injuries;Double-Blind Method;Female;Humans;Laser Therapy;Lasers;Male;Middle Aged;Sprains and Strains

[Use of low intensity laser irradiation in the treatment of thrombophlebitic complications during subclavian vein catheterization]. A total of 1050 subclavian catheterizations have been performed in an intensive care unit, thrombophlebitic complications have been clinically diagnosed in 22 patients (2.1%), 3 patients developed signs of chronic venous failure long after the procedure. Intravascular laser blood irradiation (IVLBI) reduced hypercoagulation, increased fibrinolytic activity, improved blood viscosity, stimulated collateral blood flow, etc. That is why IVLBI was used in a complex of therapeutic procedures in 7 patients with thrombophlebitic complications upon subclavian catheterization. In 1 patient IVLBI was used in combination with intravenous sodium hypochlorite administration. The course of IVLBI consisted of 5-7 procedures, the power of irradiation at the end of the light probe was 5-6 mWt. The level of medium mass molecules, leukocyte index of intoxication, hematological index of intoxication, coagulogram parameters have been assessed; contrast phlebography was performed in patients with phlebothrombosis before and after IVLBI. There were no signs of chronic venous failure in this group of patients long after the procedure. The author comes to the conclusion that the use of low intensity laser irradiation and intravenous administration of sodium hypochlorite improve the effect of therapy in postcatheterization thrombophlebitic complications. Adult;Catheterization, Peripheral;Female;Humans;Laser Therapy;Middle Aged;Subclavian Vein;Thrombophlebitis

A double blind randomised trial of low power laser treatment in rheumatoid arthritis.
OBJECTIVES: To define the value of low power laser treatment in small joint rheumatoid arthritis. METHODS: Twenty five women with active disease were recruited. The metacarpophalangeal and proximal interphalangeal joints of one hand were treated with 12 J/cm2 for 30 s with a gallium-aluminium-arsenate laser. The other hand received a sham laser treatment designed so that neither therapist nor patient could distinguish the active laser from the sham laser. Each patient received 12 treatments over four weeks. The following parameters were measured: pain as assessed by visual analogue scale; range of joint movements; grip strength; duration of early morning stiffness, joint circumference, Jebsen's hand assessment; drug usage; total swollen joint counts; Arthritis Impact Measurement Scales; three phase bone scans; haematological and serological tests. RESULTS: A total of 72% of patients reported pain relief but this reduction was reported equally in both hands. No significant changes were seen in other clinical, functional, scintigraphic, or laboratory features. Neither patients nor staff were able to detect which hand was treated with the active laser. CONCLUSION: When this specific laser and dose regimen was used, low power laser treatment had no objective effect on patients with rheumatoid arthritis. It did appear to produce analgesia through a

powerful placebo effect. Adult;Aged;Aged, 80 and over;Arthritis, Rheumatoid;Double-Blind Method;Female;Hand;Humans;Joints;Laser Therapy;Middle Aged;Pain Measurement;Radiotherapy Dosage
Lasers and wound healing. The advances in laser surgery over the past decade have been remarkable and have significantly altered the management of a host of dermatologic disorders. This article focuses on the CO2 laser as a cutting and vaporization tool and reviews the features that distinguish CO2 laser-induced wounds from those created by a scalpel. Tissue welding, wound management after skin treatment with the visible light lasers based on the principle of selective photothermolysis, as well as the controversial field of low-energy laser therapy (biostimulation) are also addressed. Dermatologic Surgical Procedures;Humans;Laser Coagulation;Laser Therapy;Skin;Wound Healing
[Laser biostimulation]. The paper presents a characteristics of the new therapeutic method of laser radiation biostimulation. It presents modern views on the mechanism of action of laser biostimulation, it reports the biological effects of the stimulation as well as the areas of clinical use. Humans;Laser Therapy
A double-blind study of the effectiveness of low level laser treatment of rotator cuff tendinitis. Thirty-five patients with rotator cuff tendinitis were randomly allocated to active (CB Medico Master III 830 nm Ga As AL diode) laser or dummy laser treatment twice weekly for 8 weeks. Movement range, painful arc score, resisted movement score and responses to visual analogue scales for night pain, rest pain, movement pain and functional limitation were measured second weekly. All responses improved from baseline but there was no difference between the two groups. These results fail to demonstrate the effectiveness of laser therapy in rotator cuff tendinitis. Adolescent;Adult;Aged;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Range of Motion, Articular;Rotator Cuff;Tendinopathy;Treatment Outcome
[The effect of the blood serum from patients subjected to intravenous laser therapy on the parameters of synaptic transmission]. The effect of serum of patients with myocardial ischemia after low-level laser therapy on parameters of synaptic conductance of rat hippocampal neurons was investigated. The serum from patients with an initially low level of neuronal activity obtained after determination of laser irradiation increased the amplitude and that from patients with high activity. Thus the process of normalization of these parameters was observed. Our results may help to optimize the course of medical treatment, and subsequently give an insight to understanding of the mechanism of therapeutic effect of laser irradiation. Action Potentials;Adult;Animals;Blood;Electric Stimulation;Hippocampus;Humans;In Vitro Techniques;Laser Therapy;Middle Aged;Myocardial Ischemia;Neurons;Rats;Rats, Wistar;Reaction Time;Synapses;Synaptic Transmission
Cord dorsum potentials suppressed by low power laser irradiation on a peripheral nerve in the cat. The effects of low-power helium-neon laser irradiation on the cord dorsum potentials (CDP) evoked by electrical nerve stimulation of a distal portion of exposed sural nerve were observed in unanesthetized decerebrate cats. These evoked CDP were significantly suppressed (25.6 +/- 2.5%, p less than 0.01) during low-power laser irradiation. It is suggested that the analgesic effects of low power laser irradiation is based on the decrease of ascending signals from the spinal cord to the higher central nervous system. The suppressive effect of low power laser irradiation upon the impulse transmission of nerve fibers is discussed. Analgesia;Animals;Cats;Electric Stimulation;Evoked Potentials, Somatosensory;Laser Therapy;Sural Nerve
A randomised double blind comparative study of low level laser therapy following surgical extraction of lower third molar teeth. A randomised, double blind comparative study was undertaken to

assess the efficacy of low level laser therapy in the reduction of postoperative pain and swelling in patients undergoing the extraction of bilaterally impacted mandibular third molar teeth. Healing of the sockets was also compared after 1 week. A group of 64 patients had one randomly-selected operation side treated with a semi-conductor laser and the other side with an apparently identical but non-operating model. Complete data were obtained from 52 of the 64 patients. The results showed that there was no evidence of a difference in pain and swelling on the third day after operation between laser and placebo sides. There was no difference between the two sides when they were assessed for healing 7 days after surgery. Placebos Adolescent;Adult;Alveolar Process;Double-Blind Method;Edema;Humans;Laser Therapy;Middle Aged;Molar, Third;Pain Measurement;Pain, Postoperative;Periodontal Diseases;Placebos;Tooth Extraction;Tooth, Impacted;Wound Healing

[A bacterial model for research on the effect of laser radiation on the intensity of cell division]. A bacterial model is proposed for the prognosing, at the cellular level, of the effectiveness and safety of low-intensity laser therapy. In experiments with E. coli WP2, a study was made of the effect of continuous optical radiation as well as of pulse radiation at medical installations "Uzor" (890 nm, 1.2 x 10(-1) W/m2, 3400 Hz) and "Omega" (950 nm, 1.2 x 10(3) W/m2, 2-5000 Hz). A technique has been developed to determine a minimum dose of low-intensity radiation that provides normalization of the cell division rate at a pathological site excluding the risk of the uncontrolled proliferation of the surrounding tissues. Cell Division;Dose-Response Relationship, Radiation;Electron Transport;Escherichia coli;Lasers;Models, Biological;Time Factors

Low energy laser therapy for treatment of post-herpetic neuralgia. Post-herpetic neuralgia is a significant and severe disability that afflicts some patients following the acute manifestation of the disease despite what may be considered adequate pharmacological treatment at the time of onset of the vesicular rash. Surgery in general has little to offer in this condition although dorsal route entry zone lesions may be appropriate in some situations. Low dose laser therapy has been of value in a small series, to date, of cases that the treatment has been used on. This has been both in the early phase soon after the vesicles have cleared and often late, many years after the onset of the pain. Reported is a good improvement rate in approximately 60% of cases. The treatment is non-invasive and consideration of initial laser therapy is advocated. Aged;Aged, 80 and over;Female;Herpes Zoster;Herpes Zoster Oticus;Humans;Laser Therapy;Male;Middle Aged;Neuralgia;Pain Measurement;Retrospective Studies

[The use of low-intensity laser therapy under sanatorium-health resort conditions in proctology patients]. Use of helium-neon laser in complex treatment of patients with inflammatory processes of ano-rectal area was accompanied by anaesthetic effect and elimination of inflammation. Endoscopic laser therapy improved also colonic peristalsis. Adult;Fissure in Ano;Health Resorts;Hemorrhoids;Humans;Laser Therapy;Proctoscopy;Pruritus Ani;Ukraine

Muscle fiber formation in vitro is delayed by low power laser irradiation. The myogenic cell culture provides a good in vitro model for studying the differentiation process of the muscle tissue. Although the growth of the mononucleated myoblasts is predetermined, in that they will fuse to form multinucleated muscle fibers, some control on the process of fusion can be achieved in vitro. The low power laser irradiation (LPLI) has been shown to enhance in cultured mammalian cells DNA synthesis and motility of cells. In our rat myogenic cell line (L8) system the LPLI induced a delay of 5 to 6 hours in the onset of fusion of the myoblasts compared to the nonirradiated cells. The creatine kinase activity and the incorporation of labelled thymidine of the irradiated cultures were similar to the pattern of behaviour of these parameters in the control cultures. Thus, we have extended the longevity of the myoblasts population. We assume that the delay in fusion was induced by the increase of the motility of the myoblasts in culture, so that rearrangements of physical contacts or of

membrane components were needed to resume fusion. Culture Media, Conditioned;Tritium;DNA;Creatine Kinase;Thymidine Animals;Cell Differentiation;Cell Division;Cell Fusion;Cell Line;Chick Embryo;Creatine Kinase;Culture Media, Conditioned;DNA;Lasers;Muscles;Rats;Thymidine;Tritium

The synergistic effects of rhodamine-123 and merocyanine-540 laser dyes on human tumor cell lines: a new approach to laser phototherapy. Many new photosensitizers and laser wavelengths are being tested to improve photodynamic therapy by enhancing specific tumor uptake and/or retention, lowering systemic toxicity, and increasing laser tissue penetration. In this study the potential synergistic effects of rhodamine-123 (Rh-123) and merocyanine-540 (MC-540) sensitization of human tumor cell lines after laser exposure were explored. In a first series of experiments, the kinetics of uptake of Rh-123 and M-540 were tested on three human leukemia cell lines (K562, RAJI, 729HF2), P3 squamous carcinoma, and M26 melanoma. Our results demonstrate a clear difference in the rate and amount of uptake of MC-540 (K562 > P3 > RAJI > 729HF2 > M26) and Rh-123 (P3 > RAJI > 729HF2 > K562 > M26) by these cell lines. In a second series of experiments, M26 tumor cells were sensitized with either Rh-123 (1 microgram/ml) or with MC-540 (20 micrograms/ml) alone or with a combination of the two dyes for 60 minutes, then exposed to the argon (514.5 nm) laser at nonthermal energy levels. Our results demonstrate a significant enhancement of the tumoricidal effects of the laser on M26 carcinoma cells after sensitization with both dyes together (MC-540 and Rh-123) when compared to each dye alone. As with combination antibiotherapy, the synergistic effects of two laser dyes that have different intracellular targeting sites appear to enhance tumoricidal effects significantly after exposure to a matching laser wavelength. The data provide evidence for effective laser phototherapy by dye synergy. Antimetabolites, Antineoplastic;Fluorescent Dyes;Photosensitizing Agents;Pyrimidinones;Rhodamines;Rhodamine 123;merocyanine dye Antimetabolites, Antineoplastic;Burkitt Lymphoma;Carcinoma, Squamous Cell;Cell Survival;Drug Synergism;Fluorescent Dyes;Hot Temperature;Humans;Laser Therapy;Leukemia, B-Cell;Leukemia, Erythroblastic, Acute;Lung Neoplasms;Melanoma;Neoplasms;Photochemotherapy;Photosensitizing Agents;Pyrimidinones;Radiation Dosage;Rhodamine 123;Rhodamines;Tumor Cells, Cultured

Promotion of muscle regeneration in the toad (Bufo viridis) gastrocnemius muscle by low-energy laser irradiation. The effect of low-energy laser (He-Ne) irradiation on the process of skeletal muscle regeneration after cold injury to the gastrocnemius muscle of the toad (Bufo viridis) was studied using quantitative histological and morphometric methods. The injured zones in the experimental toads were subjected to five direct He-Ne laser (632.8 nm wavelength) irradiations (6.0 mW for 2.3 min) every alternate day starting on the fourth day postinjury. Muscles that were injured as above, and subjected to red-light irradiation, served as a control group. Morphometric analysis was performed on histological sections of injured areas at 9, 14, and 30 days postinjury. At 9 days postinjury, mononucleated cells populated 69.3% +/- 16.8% of the total area of injury. Thereafter, their volume fraction (percent of total injured zone) decreased gradually but more rapidly in the laser-irradiated muscle than in the control. The volume fraction of the myotubes in the laser-irradiated muscles at 9 days of muscle regeneration was significantly higher (7.0% +/- 2.2%) than in the control muscle (1.2% +/- 0.4%). Young myofibers in the laser-irradiated muscles populated 15.5% +/- 7.9% and 65.0% +/- 9.5% of the injured area at 9 and 14 days of muscle regeneration, respectively, while in control muscles these structures were not evident at 9 days and made up only 5.3% +/- 2.9% of the traumatized area at 14 days postinjury. The volume fraction of the young myofibers further increased by 30 days of muscle regeneration making up 75.7% +/- 13.2% of the traumatized area, while in the laser-irradiated muscles most of the injured zone was filled with mature muscle

fibers.(ABSTRACT TRUNCATED AT 250 WORDS)
Animals;Bufonidae;Knee;Lasers;Male;Muscles;Regeneration

MRI and ultrasound guided interstitial Nd:YAG laser phototherapy for palliative treatment of advanced head and neck tumors: clinical experience. Interstitial laser phototherapy (ILP) is a technique whereby laser energy is directly applied into tumors at variable depths. This technique is attractive, since it is minimally invasive and carries a low morbidity. It may allow treatment of deep and difficult to reach tumors in the head and neck and other areas when improved noninvasive monitoring techniques of laser-tissue interactions are developed. Recent studies demonstrate, respectively, the efficiency of ultrasound (UTZ) and magnetic resonance imaging (MRI) for real time interstitial needle placement in tumors, identification of vessels, monitoring and quantifying laser-induced tissue damages. We present a case in which a patient with recurrent, metastatic base of skull carcinoma has managed successfully with repeat ILP using MRI and UTZ guidance. Under heavy sedation, needles were placed in the tumor using MRI or UTZ guidance. Tumors were treated with a 600 mum flexible Nd:YAG laser fiberoptic passed through the needles. Laser-induced tissue photoablation was monitored using real time color flow Doppler UTZ or near real time fast spin-echo T2-weighted MRI. Posttreatment fine needle aspiration cytologic study demonstrated the presence of cellular debris and no viable cancer cells. Posttreatment follow-up MRI scans showed significant reduction of tumor size, and positron emission tomography (PET) revealed interval decrease in tumor metabolism. Treatments were accompanied by pain relief and improved functional abilities. ILP has now evolved into minimally invasive outpatient surgical procedure.(ABSTRACT TRUNCATED AT 250 WORDS) Contraindications;Female;Head and Neck Neoplasms;Humans;Laser Therapy;Magnetic Resonance Imaging;Middle Aged;Neoplasm Metastasis;Palliative Care;Phototherapy;Tomography, Emission-Computed;Ultrasonography

Factors affecting Low Level Laser Therapy. Low Level Laser Therapy has been reported as causing many therapeutic reactions within living tissue, yet research studies have not been able to support conclusively the results which appear to occur clinically. If the physiotherapist accepts that light quality may have been a variable overlooked in previous studies, it is necessary to consider whether there are other factors which may have contributed to the variable and, at times, conflicting results. These factors include depth of penetration and resultant absorption. Factors such as power output, dose, pulse frequency and frequency of treatment will also influence the therapeutic action of laser. This review evaluates parameters common to most therapeutic lasers as well as other features including the multiple-diode probe. Issues which may help clinicians optimise their treatment when using Low Level Laser Therapy will be addressed.

[The combined use of therapeutic physical factors in patients with spondylogenic circulatory encephalopathies]. Troxevasin vacuum-phonophoresis and low-intensity laser irradiation on reflexogenic collar zones demonstrated statistically significant effectiveness. The treatment was used in 94 patients with spondylogenic discirculatory encephalopathy stage I-II.
Adult;Aged;Cerebrovascular Disorders;Cervical Vertebrae;Chronic Disease;Combined Modality Therapy;Female;Humans;Male;Middle Aged;Osteochondritis;Physical Therapy Modalities;Spondylitis

The effect of low-level laser therapy on musculoskeletal pain: a meta-analysis. A meta-analysis was undertaken of low-level laser therapy (LLLT) on musculoskeletal pain. A literature search revealed 23 LLLT trials and of these 17 were controlled trials. Ten were double blind and 7 were insufficiently blinded. Within the studies identified pain was assessed by visual analogue scale or by "some other indices of pain". Nine double-blind trials and 4 controlled trials presented results in a form which allowed pooling of data. In the double-blind trials, the mean difference in pain between LLLT and placebo was 0.3% (S.E.(d) 4.6%, confidence limits -10.3-10.9%). In the insufficiently blinded trials the mean difference in pain was 9.5% (S.E.(d) 4.5%, confidence limits -2.9-21.8%). We conclude that LLLT

has no effect on pain in musculoskeletal syndromes. Humans;Laser Therapy;Musculoskeletal Diseases;Pain;Pain Measurement;Research Design

Low power laser irradiation alters the rate of regeneration of the rat facial nerve. Low power laser irradiation has been reported to cause biological effects due to the photochemical and/or photophysical action of the radiation. This study determined quantitatively if transcutaneous low power laser irradiation can affect the regeneration of the rat facial nerve. The facial nerve was crushed unilaterally in anesthetized rats and transcutaneously irradiated daily with a laser beam directed at the area of the crush injury. Laser treatment began on the day of the crush injury and was continued daily for 7, 8, or 9 days. Preliminary experiments determined the most effective wavelength, laser power, length of irradiation, and treatment schedule. The wavelengths examined were 361, 457, 514, 633, 720, and 1064. The laser powers and lengths of irradiation examined ranged from 8.5 to 40 mW and 13 to 120 min. Irradiation treatment was done daily, on alternating days and on the first 4 days postcrush. The most effective laser parameters for the low power treatment included daily irradiation with a helium-neon (HeNe) or argon pumped tunable dye laser a wavelength of 633 nm, with a power of 8.5 mW for 90 minutes (45.9 J, 162.4 J/cm2). The number of horseradish peroxidase (HRP) labeled neurons in the facial motor nucleus was used as an assay of the degree of regeneration. In rats in which the facial nerve was crushed but not irradiated, the average number of HRP labeled neurons in the facial nucleus was 22 on day 7 postcrush, 54 on day 8, 116 on day 9, and 1,149 on day 10. After HeNe or argon pumped tunable dye laser irradiation, the average number of HRP-labeled neurons increased to 34 on day 7 postcrush, 148 on day 8, and 1,725 on day 9. There was a statistically significant difference between the control and irradiated rats on day 9 postcrush ($P < 0.01$). These data indicate that transcutaneous low power irradiation with the lasers and parameters involved in this study increased the rate of regeneration of rat facial nerve following crush injury. Horseradish Peroxidase Animals;Facial Nerve;Female;Horseradish Peroxidase;Hot Temperature;Lasers;Motor Neurons;Nerve Regeneration;Rats;Rats, Sprague-Dawley

Analgesic effect of Ga-Al-As diode laser irradiation on hyperalgesia in carrageenin-induced inflammation. This study concerned the effect of Ga-Al-As diode laser irradiation (780 nm, continuous wave, 31.8 J/s/cm2, spot size od 0.2 mm, 3 minutes/dose) on hyperalgesia induced in the hind paw of rats by injecting carrageenin. The pressure-pain thresholds of hind paws were measured by the Randall-Selitto test for evaluation of hyperalgesia. Two doses of laser irradiation, given to the inflamed region immediately before and after the injection of carrageenin, partially (approximately 50%) inhibited the occurrence of hyperalgesia accompanied with a progression of inflammation. This analgesic effect was equal to that of indomethacin (4 mg/kg, i.o.). In another group, the hyperalgesia was removed almost completely for at least 24 hours by one dose of laser irradiation, which was given 3 hours after the carrageenin injection, whereas the edema was not inhibited. This analgesic effect, however, was partially (approximately 50%) antagonized with a dose of 10 mg/kg (i.p.) of naloxone and totally inhibited with 30 mg/kg. These results suggest that low-power laser irradiation on inflamed regions of carrageenin-treated rats has a marked analgesic effect and that certain mechanisms that are not related to endogenous opioids are involved in a part of the mechanisms of the analgesic effects. Naloxone;Carrageenan;Indomethacin Analgesia;Animals;Carrageenan;Hyperalgesia;Indomethacin;Inflammation;Laser Therapy;Male;Naloxone;Pain Measurement;Rats;Rats, Wistar

Dose and temporal parameters in delaying injured optic nerve degeneration by low-energy laser irradiation. Low-energy laser irradiation has been reported to postpone the degenerative processes in crushed optic nerves of rats, which are part of the nonregenerable mammalian central nervous system. In the present study, we evaluated the optimal irradiation parameters for this purpose. Optic nerves of 141 rats were subjected to crush injury and then irradiated through the eye,

starting at different points of time before or after the injury, for different durations and periods, using various intensities of either helium-neon laser or noncoherent infrared light (904 nm). The effect was evaluated by measurements of the compound action potentials of the nerve segments between the site of injury and the optic chiasm. The compound action potential amplitude of the crushed nonirradiated nerves, as measured 2 weeks after the injury, was found to be 0.51 +/- 0.30 mV, in contrast to 3.10 +/- 1.03 mV measured in 232 normal nerves. Irradiation with a 10.5 mW helium-neon laser for 2 and 3 min once a day for 14 consecutive days resulted in maximal preservation of action potentials (1.78 +/- 0.72 and 1.95 +/- 0.71 mV, respectively). Irradiations beginning immediately prior to the injury were as effective as irradiations beginning soon after it. Irradiations for longer than 3 min or twice a day aggravated the damage. Noncoherent infrared light was ineffective or adversely affected the injured nerves. Our experiments suggest that optimal delay of posttraumatic optic nerve degeneration in rats is attainable with 10.5 mW helium-neon laser irradiations for 2 or 3 min once a day for 14 consecutive days. Action Potentials;Animals;Lasers;Male;Nerve Degeneration;Optic Nerve;Optic Nerve Injuries;Radiation Dosage;Rats;Rats, Sprague-Dawley;Time Factors

Effect of irradiation by semiconductor laser on responses evoked in trigeminal caudal neurons by tooth pulp stimulation. The effect of irradiation with a gallium-aluminum-arsenide semiconductor laser on responses evoked in trigeminal subnucleus caudal neurons by tooth pulp stimulation was investigated electrophysiologically in Wistar rats anesthetized with urethane plus alpha-chloralose. The pulp of lower incisor was electrically stimulated and the evoked action potentials were extracellularly recorded in the ipsilateral caudal neurons. The laser beam was applied on the cervical surface of the stimulated incisor. The rate of firing discharges and the numbers of spikes evoked in the caudal neurons were compared before and after laser irradiation. Laser irradiation suppressed the late discharges in the response of the caudal neurons which were evoked by excitatory inputs from C-fiber afferents, but did not suppress the early discharges evoked by inputs from A delta-fiber afferents. This indicates that low power laser irradiation (semiconductor laser: 830 nm, 350 mW, CW, through the tooth structures, for 120 s) inhibited the excitation of unmyelinated fibers of the pulp without affecting fine myelinated fibers. These results suggest that low power laser irradiation has a suppressive effect on injured tissue by blocking the depolarization of C-fiber afferents. Action Potentials;Animals;Dental Pulp;Electric Stimulation;Evoked Potentials;Lasers;Male;Neurons, Afferent;Pain;Rats;Rats, Wistar;Semiconductors;Trigeminal Caudal Nucleus

Effects of 830 nm continuous wave laser diode irradiation on median nerve function in normal subjects. The presence, magnitude, and nature of the effect that low intensity laser irradiation has on nerve function, growth, and repair constitute a contentious area of research. We have addressed one aspect of this controversy by systematically examining the influence of 830 nm laser radiation on median nerve function. In particular, we investigated median nerve motor and sensory distal latencies, action potential amplitudes, action potential areas, and conduction velocities as well as dorsal hand skin temperatures in 33 normal subjects in a double-blinded, randomized controlled study. All subjects received identical treatment: 30 seconds of "irradiation" at 10 points over the course of the right median nerve (five sites on the forearm and five sites distal to the wrist crease) with either an active (1.2 J/point) or inactive (0 J/point) 40 mW 830 nm continuous wave IR laser diode. Latencies, conduction velocities, amplitudes, areas, and skin temperatures were collected bilaterally at a baseline immediately prior to irradiation and at intervals of 1, 5, 10, 15, 20, and 30 minutes following treatment. Analysis of the results reveals that motor and sensory distal latencies were decreased in the treated limbs of the laser-treated group relative to the control group by 3-4% ($P < .016$ and .046, respectively, rank sum test). No significant differences in these quantities were

found between the limbs within either group. Similarly, no alterations of action potential amplitudes, action potential areas, forearm conduction velocities, or skin temperatures were detected within or between the groups.(ABSTRACT TRUNCATED AT 250 WORDS) Action Potentials;Adolescent;Adult;Double-Blind Method;Electric Stimulation;Female;Humans;Lasers;Male;Median Nerve;Motor Neurons;Neural Conduction;Neurons, Afferent;Reaction Time;Skin Temperature

[The optimization of the anti-arrhythmia effect of kordaron and novocainamide by laser biostimulation therapy in a combined program for treating refractory tachyarrhythmias]. Antiarrhythmic action of He-Ne laser in combination with novocainamid and cordaron has been tried in the framework of the program on combined treatment of tachyarrhythmia. He-Ne laser irradiation has been found to optimize in refractory patients the effect of novocainamid which arrests the paroxysms and of cordarone which prevents paroxysms of atrial tachycardia, fibrillation, flutter. Procainamide;Amiodarone Acupuncture Points;Amiodarone;Blood;Combined Modality Therapy;Evaluation Studies as Topic;Heart Rate;Humans;Laser Therapy;Procainamide;Tachycardia

[Effects of low-energy laser irradiation on blood biochemical parameters in experimental chronic obstructive bronchitis]. The study established that shifts in oxidant-antioxidant system induced by chronic obstructive bronchitis are correctable by He-Ne laser irradiation. This conclusion was based on biochemical indices of the blood measured in experimental animals: lipid peroxidation, general antitryptic activity of the serum, activity of the enzymes superoxide dismutase, gamma-glutamyl transferase, pseudocholine esterase, alpha-oxybutyrate dehydrogenase, glucose 6-phosphate dehydrogenase. Antioxidants;Hydroxybutyrate Dehydrogenase;Glucosephosphate Dehydrogenase;Superoxide Dismutase;gamma-Glutamyltransferase;Butyrylcholinesterase Animals;Antioxidants;Biochemical Phenomena;Biochemistry;Bronchitis;Butyrylcholinesterase;Glucosephosphate Dehydrogenase;Hydroxybutyrate Dehydrogenase;Laser Therapy;Lipid Peroxidation;Rats;Superoxide Dismutase;gamma-Glutamyltransferase

Low energy laser irradiation treatment for second intention wound healing in horses. Low energy helium-neon laser irradiation was administered to full thickness skin wounds (3 cm x 3 cm) on the dorsal surface of the metacarpophalangeal/metatarsophalangeal joints and cranial surface of the tarsocrural joints of eight horses. The effects on wound healing were analyzed statistically. There were no differences ($p > 0.55$) observed in the rate of wound healing between the low energy laser irradiated wounds and the control wounds. There was a significant difference ($p < 0.006$) observed in the rate of healing between the anatomical sites. Tarsal wounds healed more rapidly than fetlock wounds.

Enhancement of muscle regeneration in the rat gastrocnemius muscle by low energy laser irradiation. The effect of low-energy laser (He-Ne) irradiation on the rate of skeletal muscle regeneration after partial excision of the rat gastrocnemius muscle was studied using quantitative histological morphometric methods. The injured zones of the experimental rats were subjected to direct He-Ne laser (632.8 nm wavelength) irradiation (6.0 mW for 2.3 min) immediately following injury and once daily thereafter for 5 days. Muscles that were injured as above and subjected to red or room light irradiation served as a control group. The volume fraction (percent of total volume of injured zone) of the mononucleated cells in the injured zone decreased gradually with time after injury, but more rapidly in the laser irradiated muscles than in the control. At 3 days post-injury the myotubes in the laser-irradiated muscles populated a significantly higher percentage (13.9 +/- 1.1%) of the injured area than in the control muscles (7.8 +/- 1.0%). The volume fraction of the young myofibers in the laser irradiated muscles exceeded 30.6 +/- 2.2% and 49.6 +/- 5.6% at 8 and 11 days post-injury, respectively, while in control muscles these structures comprised only 9.6 +/- 1.0% and 27.2 +/- 3.8%

of the injured zone at 8 and 11 days after injury, respectively. It is concluded that He-Ne laser irradiation during the regeneration process promotes muscle maturation in the injured zone following partial excision of the rat gastrocnemius muscle.
Animals;Femur;Lasers;Male;Muscles;Rats;Regeneration;Time Factors

Application of intravenous low-intensity laser irradiation as part of anesthetic care during invasive surgery. The aim of this study was to evaluate the possibility of applying low-intensity He-Ne laser irradiation as part of a complex system of anesthetic care of patients during invasive surgery. The following technique of intravenous low-intensity laser irradiation (i.v. LILI) was used. A filament of He-Ne laser was introduced through the subclavian venous line into the ostium of the vena cava superior. The power output was 20 mV, the exposure period 30 minutes. The irradiation began 10-15 minutes before anesthesia was introduced. In some cases, a second session was required. The 61 patients enrolled in the study were divided into a study group of patients who were irradiated and into a control group of patients who did not receive i.v. LILI. It was shown that i.v. LILI decreases neuroautonomous strain on the patient. Under the influence of i.v. LILI the P 50 appears to increase, the index of tissue oxygen extraction does not change, and the data of the acid base balance tend to improve. Low plasma levels of 11 oxycorticosteroids and the plasma content of 5-HTA and histamine as well as moderate changes in plasma enzyme activity confirm the efficacy of protecting patients from surgical trauma by application of i.v. LILI. Acid-Base Equilibrium;Adult;Aged;Aged, 80 and over;Anesthesia;Female;Hemodynamics;Humans;Infusions, Intravenous;Intraoperative Care;Laser Therapy;Male;Middle Aged;Stress, Physiological

Interstitial photoablative laser therapy guided by magnetic resonance imaging for the treatment of deep tumors. The failure rate of cancer treatment remains unacceptably high, still being a leading cause of mortality in adults and children despite major advances over the past 50 years in the fields of surgery, radiation therapy, and, more recently, chemo and immunotherapy. In the United States, the 5-year survival rate for all cancers in the population has increased by only approximately 10% since 1960. Surgical access to some deep tumors of the head and neck and other areas often require extensive dissections with residual functional and cosmetic deformities. Repeated treatment is not possible after maximum dose radiotherapy and chemotherapy is still limited by its systemic toxicity. An attractive solution to these problems would be the development of a new adjunctive method combining the best features of interstitial laser phototherapy for selective tumor destruction via minimally invasive techniques for access and 3D-magnetic resonance imaging (MRI) as a monitoring system for laser-tissue interactions. Our experience with this new technique is reviewed.
Animals;Head and Neck Neoplasms;Humans;Laser Therapy;Magnetic Resonance Imaging;Phototherapy

[Effects of low intensity infra-red laser irradiation on ultrastructure and proliferation of liver cells in experimental hepatitis and cirrhosis]. With the aid of light, electron transmission and scanning electron microscopy and radioautography and stereometry, the influence of low-intensive laser irradiation (LILI) (infrared) was studied in normal rat liver and in experimental cirrhosis and hepatitis. It was revealed that arsenide-gallium laser irradiation causes the change of intracellular structure. These changes show the intensification on their specific function manifest in an increase of relative volume of intracellular structures. The changes of microvessels show the activation of microcirculation. The elevation of the index of the labelled nuclei testify to increased proliferation. The similar influences of LILI on the liver ultrastructure and proliferation in hepatitis and cirrhosis are accompanied by the reduction of the pathological changes of the liver--the hepatocytes oedema, granular, vacuolar and fatty dystrophy. Animals;Cell Division;Hepatitis, Animal;Laser Therapy;Liver;Liver Cirrhosis, Experimental;Rats;Rats, Wistar

Tracheobronchial obstruction due to silicosis. Broncholithiasis can result in airway obstruction through the erosion of calcified lymph nodes into the bronchial lumen or by extrinsic compression of the tracheobronchial tree. We report an unusual case of broncholithiasis in a patient with silicosis who developed airway obstruction from endobronchial polypoid masses of granulation tissue adjacent to calcified mediastinal lymph nodes. The production of granulation tissue may have been the result of broncholiths in the early stages of erosion into the tracheobronchial tree. Efforts to ablate the endobronchial polyps using YAG laser phototherapy were only temporarily successful and surgical removal of the calcified mediastinal lymph nodes was required to halt further polyp growth. Surgical specimens grew Mycobacterium avium-intracellulare (MAI), a common pathogen in patients with silicosis. MAI may have contributed to the local inflammatory milieu provoking the exuberant tissue response. Aged;Airway Obstruction;Biopsy;Bronchi;Bronchial Diseases;Calcinosis;Female;Humans;Lung;Lymph Nodes;Radiography;Silicosis;Trachea;Tracheal Diseases

[The clinico-experimental validation of the use of low-intensity laser radiation for the treatment of exacerbated recurrent herpetic stomatitis in children]. Experimental data are presented, validating the use of low-intensity laser irradiation at a wave length of 633 nm for the treatment of chronic recurrent herpetic stomatitis. Clinical trials were carried out in 167 children. Laser exposure with the optimal stimulating parameters was found to be an effective means for the treatment of children suffering from this condition. Adenosine Triphosphate Adenosine Triphosphate;Cells, Cultured;Child;Child, Preschool;Fibroblasts;Humans;Infant;Laser Therapy;Luminescent Measurements;Mouth Mucosa;Recurrence;Stomatitis, Herpetic

New trend in neuroscience: low-power laser effect on peripheral and central nervous system (basic science, preclinical and clinical studies). The present review summarizes findings in our continuing study of the use of low-power laser irradiation (LPLI) in the treatment of severely injured peripheral (PNS) and central nervous systems (CNS). The radiation method was proposed by Rochkind and has been modified over the last 13 years. LPLI in specific wavelengths and energy density maintains the electrophysiological activity of severely injured peripheral nerve in rats, preventing scar formation (at injury site) as well as degenerative changes in the corresponding motor neurons of the spinal cord, thus accelerating regeneration of the injured nerve. Laser irradiation applied to the spinal cord of dogs following severe spinal cord injury and implantation of a segment of the peripheral nerve into the injured area diminished glial scar formation, induced axonal sprouting in the injured area and restoration of locomotor function. The use of laser irradiation in mammalian CNS transplantation shows that laser therapy prevents extensive glial scar formation (a limiting factor in CNS regeneration) between a neural transplant and the host brain or spinal cord. Abundant capillaries developed in the laser-irradiated transplants, and was of crucial importance in their survival. Intraoperative clinical use of laser therapy following surgical treatment of the tethered spinal cord (resulting from myelomeningocele, lipomyelomeningocele, thickened filum terminale or fibrous scar) increases functional activity of the irradiated spinal cord. In a previous experimental work, we showed that direct laser treatment on nerve tissue promotes restoration of the electrophysiological activity of the severely injured peripheral nerve, prevents degenerative changes in neurons of the spinal cord and induces proliferation of astrocytes and oligodendrocytes. This suggested a higher metabolism in neurons and improved ability for myelin production under the influence of laser treatment. The tethering of the spinal cord causes mechanical damage to neuronal cell membranes leading to metabolic disturbances in the neurons. For this reason, we believe that using LPLI may improve neuronal metabolism, prevent neuronal degeneration and promote improved spinal cord function and repair. The possible mechanism of LPLI is investigated. Using electron paramagnetic resonance in cell culture models, we found that at low radiation doses, singlet oxygen is produced by

energy transfer from porphyrin (not cytochrome as commonly assumed) which is known to be present in the cell. At low concentration, singlet oxygen can modulate biochemical processes taking place in the cell and trigger accelerated cell division. On the other hand, at high concentration, singlet oxygen damages the cell.(ABSTRACT TRUNCATED AT 400 WORDS) Animals;Central Nervous System;Humans;Laser Therapy;Peripheral Nerves;Spinal Cord Diseases;Spinal Cord Injuries

Effects of visible and near-infrared lasers on cell cultures. The effect of 360, 632 and 780 nm light on NIH fibroblast cells was examined. Mitosis counts of irradiated cells at various energy doses were taken. Scanning electron micrographs of these cells were studied. It is suggested that low-level laser therapy in the visible and in the near-infrared region is due to cell respiration stimulation by either the endogenous porphyrins in the cell, or by the cytochromes. Electron Transport Complex IV 3T3 Cells;Animals;Dose-Response Relationship, Radiation;Electron Transport Complex IV;Fibroblasts;Infrared Rays;Lasers;Mice;Microscopy, Electron, Scanning;Mitosis

Low level laser versus placebo in the treatment of tennis elbow. The effect of low level laser (GaAs) on lateral epicondylitis was investigated in a double-blind, randomized, controlled study. Thirty patients were assigned equally to a laser (n = 15) or a placebo laser (n = 15) group. All patients received eight treatments and were evaluated subjectively and objectively before, at the end of, and four weeks after treatment. Patients also completed a follow-up questionnaire on an average of five to six months after treatment. A significant improvement in the laser compared to the placebo group was found on visual analog scale ($p = 0.02$) and grip strength ($p = 0.03$) tests four weeks after treatment. In this study low level laser therapy was shown to have an effect over placebo; however, as a sole treatment for lateral epicondylitis it is of limited value. Further studies are needed to evaluate the reliability of our findings and to compare laser to other established treatment methods. Placebos Adult;Double-Blind Method;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Middle Aged;Pain Management;Placebos;Surveys and Questionnaires;Tennis Elbow

Laser dyes for experimental phototherapy of human cancer: comparison of three rhodamines. The mitochondrial dye Rhodamine 123 (Rh-123) has been shown to be an effective photosensitizer for argon-laser irradiation of some types of human cancer cells in vitro. We reported that 514.5-nm laser illumination of Rh-123 sensitized human melanoma, and squamous carcinoma cells strongly inhibited tumor-cell proliferation as measured by decreased 3H-thymidine (3H-T) uptake in vitro and may eradicate some tumors when grown as transplants in nude mice. However, several other human tumors were resistant to Rh-123 laser therapy in vitro and in vivo. In the current study, it was possible to obtain 100- to 1000-fold increased sensitivity to 514.5-nm laser illumination by replacement of Rh-123 with the cationic rhodamine dyes Rh-3G and Rh-6G. Cell viability was decreased over 95% and 3H-T incorporation reduced at least 80% by laser phototherapy after sensitizing tumor cells with 1 micrograms/mL Rh-123, 0.01 microgram/mL Rh-3G, or 0.001 microgram/mL Rh-6G. However, Rh-123 alone did not decrease 3H-T uptake significantly unless present at over 10- to 100-fold higher levels than Rh-3G, respectively. The tumor cell dye uptake level was measured by N-butanol extraction and absorption scans at 400 to 600 nm. The results revealed that dye uptake was more rapid, and retention of Rh-3G and Rh-6G was 5- to 10-fold higher than for Rh-123 in the human tumor cells. The data suggest that Rh-3G and Rh-6G may be highly sensitive chromophores for laser phototherapy of human cancer cells. Antineoplastic Agents;DNA, Neoplasm;Fluorescent Dyes;Rhodamines;rhodamine 6G;Rhodamine 123;rhodamine 3G Adenocarcinoma;Antineoplastic Agents;Carcinoma;Cell Division;Cell Survival;DNA, Neoplasm;Dose-Response Relationship, Radiation;Fluorescent Dyes;Hot Temperature;Humans;Laser Therapy;Medulloblastoma;Neoplasms;Photochemotherapy;Rhodamine 123;Rhodamines;Tumor Cells, Cultured

[Use of laser irradiation for the prevention and treatment of complications following surgery of the lungs and pleura]. Low-energy laser irradiation was used in treatment of 77 patients with surgical diseases of the lung and pleura. Laser therapy was performed by means of transcutaneous irradiation of the patients with the use of a semiconductor arsenide-gallium laser and influencing with helium-neon laser on the biologically active points. The use of laser therapy contributed to decrease in incidence of postoperative complications, shortening the duration of treatment of the patients at a hospital. Adult;Aged;Empyema, Pleural;Female;Humans;Laser Therapy;Lung Diseases;Lung Neoplasms;Male;Middle Aged;Postoperative Complications

Low level laser therapy for myofascial pain in the neck and shoulder girdle. A double-blind, cross-over study. In a controlled, cross-over study the effect of low level laser therapy (LLLT) was evaluated. During a five weeks period forty-seven female laboratory technicians received six laser and six placebo treatments to tender points in the neck and shoulder girdle. Subjects rated the placebo treatment significantly more beneficial than LLLT ($p = .04$). There was no reduction in consumption of analgesics associated with either laser or placebo treatment. The results indicate no beneficial effect of LLLT for myofascial pain. Adolescent;Adult;Aged;Double-Blind Method;Female;Humans;Laser Therapy;Middle Aged;Myofascial Pain Syndromes;Neck Muscles;Shoulder

[The effect of low-intensity laser irradiation on the peroxide-oxidant system of the blood in patients with infiltrating tuberculosis of the lungs]. Antioxidants Adolescent;Adult;Antioxidants;Female;Humans;Laser Therapy;Lipid Peroxidation;Male;Middle Aged;Tuberculosis, Pulmonary

Power density and exposure time of He-Ne laser irradiation are more important than total energy dose in photo-biomodulation of human fibroblasts in vitro. The absorption spectrum of human fibroblast monolayers showed several absorption peaks, among them one at a wave-length of 630 nm. Cultures of these fibroblasts were subjected to He-Ne laser (632.8 nm) irradiation of various energy doses by varying power density and exposure time. On three consecutive days the cell monolayers were irradiated for periods between 0.5 and 10 min. Laser power varied from 0.55 to 5.98 mW. Both cell number and collagen type I production were determined for each irradiation condition within one experiment. Results show that laser power below 2.91 mW could enhance cell proliferation (as determined by cell counting), whereas higher laser power (5.98 mW) had no effect. Stimulatory effects were most pronounced at irradiation times between 0.5 and 2 min. Collagen type I production (as determined by an ELISA) was affected in the opposite direction to cell proliferation: when the cell proliferation was increased, collagen type I production was decreased. From these experiments it is clear that exposure time and power density determine the effects of laser irradiation. Both stimulation and inhibition of the observed cell properties can be obtained with the same laser on the same cells. Collagen Cell Division;Cells, Cultured;Collagen;Fibroblasts;Humans;Lasers;Radiation Dosage

Metastatic head and neck malignancy treated using MRI guided interstitial laser phototherapy: an initial case report. Interstitial laser phototherapy (ILP) guided by magnetic resonance imaging (MRI) may become an attractive adjunctive modality for the treatment of deep and surgically inaccessible tumors of the head and neck when accurate methods of laser dosimetry and "real-time" monitoring techniques with the MRI are introduced. We recently demonstrated in ex vivo and in vivo models, a linear relationship between levels of laser energies, thermal profiles, MR signal intensity changes, and histopathological tissue damage. Results of treatment in a patient with an unresectable large right jugulodigastric metastatic squamous carcinoma using new approach of MRI guided ILP are now reported. The patient complained of significant right-sided neck pain and headaches secondary to a rapidly growing metastatic lymphadenopathy which recurred after previous surgery, radiation,

and chemotherapy. Two treatment sessions were used at an interval of 2 weeks. Each treatment was performed in the MRI suite under heavy sedation. Using a 600-microns bare fiber of the Nd:YAG laser implanted interstitially under MR guidance, the metastatic node was treated at three sites. T1- and T2-weighted images were performed prior to, immediately after, 24 and 48 hours, and 4, 5, 7, 9, 16, and 25 days post-treatment. Successful relief of pain and growth arrest of this node was observed after the second treatment and at the 3-month follow-up. These results demonstrate that this technique of ILP guided by MRI may be feasible in humans, and will become clinically practical when appropriate methods of dosimetry and instrumentation are developed. Aluminum Silicates;Neodymium;Yttrium Aluminum Silicates;Carcinoma, Squamous Cell;Catheterization;Combined Modality Therapy;Female;Head and Neck Neoplasms;Humans;Laryngeal Neoplasms;Light Coagulation;Lymphatic Metastasis;Magnetic Resonance Imaging;Middle Aged;Neodymium;Neoplasm Invasiveness;Palliative Care;Yttrium

[The use of low-energy lasers for preventing and treating postoperative and radiation-induced complications in patients with head and neck tumors]. The efficacy of low-energy helium-neon and copper vapor lasers for prevention and treatment of postoperative and irradiation complications was assessed in 195 patients with locally advanced tumors of the head and neck. The control group included 118 patients. Intravenous laser irradiation of the blood was associated with a higher percentage of wound healing by first intention and better course of the postoperative period. Laser treatment of skin irradiation fields was shown to improve skin tolerance to the neutron beam. The study failed to establish tumor growth stimulation by the laser irradiation in terms of recurrence and metastasis development. The data obtained showed low-energy laser irradiation to offer promise for prevention and treatment of postoperative and irradiation complications. Blood;Head and Neck Neoplasms;Humans;Laser Therapy;Neoplasm Metastasis;Neoplasm Recurrence, Local;Neutrons;Postoperative Complications;Radiation;Radiation Injuries;Radiotherapy;Radiotherapy Dosage;Skin

Combined laser phototherapy and growth factor treatment of bronchial obstruction after lung transplantation. Lung transplantation has resulted in dramatic functional improvement in patients with end-stage pulmonary diseases. Among the complications of lung transplantation are dehiscence and stenosis at the site of the bronchial or tracheal anastomosis. In this case report, we describe a single lung transplant recipient in whom partial bronchial dehiscence, followed by exuberant growth of granulation tissue, resulted in obstruction of the bronchial lumen. After mechanical dilation failed to produce lasting relief of bronchial obstruction, a novel approach to this problem was successfully employed: YAG laser phototherapy was used to remove obstructing granulation tissue, followed by application of a preparation derived from autologous blood platelets to promote epithelialization of the bronchial anastomosis. The bronchus remains patent and fully epithelialized six months after therapy. Platelet-Derived Growth Factor Adult;Anastomosis, Surgical;Bronchi;Bronchial Diseases;Combined Modality Therapy;Constriction, Pathologic;Female;Humans;Laser Therapy;Lung Transplantation;Platelet-Derived Growth Factor;Postoperative Complications;Wound Healing

The effect of low-level laser treatment on maxillary arch dimensions after palatal surgery on beagle dogs. The effect of low-level laser treatment on maxillary arch dimensions after palatal surgery was investigated in Beagle dogs at an age of 12 weeks. A total of 30 dogs was used, and they were assigned to either a control group (Group C, n = 6) or one of two experimental groups (Group L, n = 12; and group LL, n = 12). After Von Langenbeck's palatal repair in the two experimental groups, denuded bony areas in the LL group were irradiated with a continuous Ga-As-Al laser beam (830 nm) and energy output set at 30 mW. A dosage of 1 J/cm2 wound surface area was used. Treatment was carried out three times a week, with a total of ten treatments. The animals of the L group served as

non-treated control animals. Dental casts were made of all animals of all groups at regular intervals until they reached 25 weeks of age. Maxillary arch dimensions were studied. Dental arch dimensions in the deciduous dentition of both experimental groups were not disturbed by surgery, but after eruption of permanent teeth, mainly transverse maxillary arch dimensions in the premolar region increased less in both experimental groups than in the control group. It was concluded that low-level laser treatment under the conditions used in this study did not decrease the adverse iatrogenic effects of palatal surgery on maxillary arch dimensions. Analysis of Variance;Animals;Cicatrix;Dental Arch;Dentition, Mixed;Dogs;Female;Laser Therapy;Male;Maxilla;Osteotomy;Palate;Tooth Eruption

[Therapeutic action of laser irradiation and immunomodulators in purulent injuries of the soft tissues in diabetic patients]. A study was made of the immune status and results of therapy of 152 diabetic patients with purulent injuries of soft tissues. Low-intensity laser irradiation of wounds and adjuvant active and passive immune therapy were shown to result in rapid stabilization of the immune status, reducing the duration of treatment. Adjuvants, Immunologic Adjuvants, Immunologic;Adolescent;Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Connective Tissue;Diabetes Complications;Diabetes Mellitus;Female;Humans;Laser Therapy;Male;Suppuration;Wounds and Injuries

Photochemical effects of laser irradiation on neuritic outgrowth of olfactory neuroepithelial explants. The photochemical effect of low-intensity laser irradiation (LILI) on the maturation and regeneration of olfactory-immature estrus day 15 (E15) and olfactory-mature estrus day 22 (E22) rat fetuses was studied. Neuritic outgrowths of olfactory bipolar receptor cells were quantified in olfactory neuroepithelial explants. Explants in the experimental groups were irradiated with a helium-neon laser using different incident energy densities (IEDs). Explants in another group were exposed to fluorescent light. Control explants did not receive laser or fluorescent light irradiation. Neuritic outgrowths were analyzed on a regular basis for 12 days. Analysis of variance was used to evaluate the data. The parameters of neuritic outgrowth in E15 fetuses showed a significant increase of 30% to 50% vs. the control with a single laser irradiation of 0.5 J/cm2 IED. The rate of neuritic outgrowth observed in the E22 fetuses was less than in the E15 fetuses. The parameters of neuritic outgrowth in E22 fetuses showed a significant and substantially greater percentage increase than in the E15 fetuses with daily laser irradiations of 0.05 and 0.5 J/cm2 IED when compared to the control. The magnitude of these increases appears to be of biological significance as well as statistical significance. Analysis of Variance;Animals;Female;Fetus;Growth;Lasers;Neurites;Olfactory Mucosa;Rats;Rats, Inbred Strains;Sensory Receptor Cells

Biological effects of low power laser irradiation on clonal osteoblastic cells (MC3T3-E1). Cultured osteoblastic cells were studied to determine the effects of laser irradiation on their rates of proliferation, differentiation, and calcification. A continuous wave Helium-Neon laser with a wavelength of 632.8 nm was used for this study. Clonal osteoblastic cells (MC3T3-E1) were exposed to laser beam at various energy densities. The cell growth rate and DNA synthesis were increased by laser irradiation only in the growing phase of culture. During long-term culture, 45Ca accumulation was enhanced by laser irradiation at 1.0 J/cm2, with four sessions of irradiation resulting in a 46% increase over controls. In contrast, no significant increase in alkaline phosphatase activity was produced by laser irradiation. Electron microscopy revealed a tendency of enlargement of the Golgi apparatus in the laser-treated cells. These results suggest that laser irradiation photoactivates osteoblastic cells, accelerates osteoblastic cell growth and calcification in vitro, and therefore, may promote bone regeneration. DNA;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone Regeneration;Calcification, Physiologic;Cell Differentiation;Cell Division;Cells, Cultured;Clone Cells;DNA;Dose-Response Relationship, Radiation;Lasers;Mice;Osteoblasts;Radiation Dosage

MR imaging-guided interstitial Nd:YAG laser phototherapy: dosimetry study of acute tissue damage in an in vivo model. A dosimetry study of acute tissue damage induced by interstitial application of the neodymium-yttrium-aluminum-garnet (Nd:YAG) laser was performed with magnetic resonance (MR) imaging. The MR appearance of the lesion was correlated with gross and histopathologic findings. Seventy-six lesions were induced in rabbit muscle with laser power outputs of 5-20 W and exposure times of 20-600 seconds. MR imaging was performed immediately after laser exposure. T2-weighted spin-echo images clearly showed the acute thermal injuries caused by laser energy deposition and correlated best with histopathologic findings. These images showed three distinct layers, corresponding to central ablation, coagulative necrosis, and interstitial edema, respectively, in the pathologic findings. Lesion diameters measured on MR images showed a linear correlation with those in gross sections. Lesion volume increased not only with increasing total energy delivered but with increasing power output for a fixed total energy delivered. MR imaging is an accurate modality for dosimetry studies of laser-induced acute lesions. Animals;Light Coagulation;Magnetic Resonance Imaging;Muscles;Rabbits

[The effect of low-intensity laser irradiation on the basic biological processes and homeostasis in patients]. Blood;Cardiovascular System;Homeostasis;Humans;Laser Therapy;Lasers;Nervous System;Respiratory System

[Surgical correction of external nose deformities]. During surgical elimination of external nose deformation biologically inert prostheses were used. In the post-operative period low-intensity laser therapy was applied. No adverse effects of corundum ceramics were noted. The procedure of posterior tamponade was modified to ensure complete isolation of the nasopharynx during surgical manipulations on the external nose skeleton.
Adolescent;Adult;Ceramics;Female;Humans;Male;Middle Aged;Nose;Nose Deformities, Acquired;Postoperative Care;Prostheses and Implants;Prosthesis Design;Rhinoplasty;USSR

[Laser treatment of sinusitis in general practice assessed by a double-blind controlled study]. The effect of Low Level Laser therapy (Galium-Aluminium-Arsenide laser, 30 mW/830 nm, Unilaser 2000 3B) on sinuitis was evaluated in a double-blind randomised clinical study comprising 60 patients from general practice. All patients received three treatments (90 seconds radiation on each sinus) with one to three days interval. No statistically significant differences in pain relief, well-being or duration of illness were observed between patients treated with laser and a placebo.
Adolescent;Adult;Child;Denmark;Double-Blind Method;Family Practice;Female;Humans;Laser Therapy;Male;Middle Aged;Sinusitis

Development of low reactive-level laser therapy and its present status. A new subspecialty in the medical application of the laser has developed, especially over the last decade, depending on the therapeutic rather than the surgical applications of the laser. Laser therapy, or preferably, Low reactive-Level Laser Therapy (LLLT) is now being recognized as a valid medical tool. Two types of LLLT are presented, simultaneous and pure. In surgical laser applications, ranges of heat are generated in the target tissue, destroying or altering its architecture. This is referred to as high reactive-level laser treatment, or HLLT. In addition, nonphotothermally destructive reactions may also occur, such as photo-osmosis. These are also part of HLLT. Simultaneously, nondestructive thermal and nonthermal bioactivation occur at the periphery of the target tissue: this is "simultaneous LLLT" and occurs along with HLLT, explaining some of the advantages of laser surgery. Laser systems have been developed which deliver power and energy densities below the destructive level, only to activate the irradiated tissue. This is "pure LLLT." The history and background of LLLT are presented, the terminology discussed, and practical applications of LLLT are presented. Female;History, 20th Century;Humans;Laser Therapy;Lasers;Male;Skin Diseases

Future directions of laser phototherapy for diagnosis and treatment of malignancies: fantasy, fallacy, or reality? A new and highly promising adjunctive modality for the diagnosis and therapy of malignancies is under development using lasers and tumor targeting dyes. To reach the eventual goal of clinical treatment, several current "fantasies and fallacies" regarding laser applications in medicine must be identified and their problems clearly outlined. A multidisciplinary scientific approach is also required to enable the clinical practicality of this laser targeting approach. Many new dyes and laser wavelengths are being tested to improve specific tumor uptake and/or retention, lower systemic toxicity, increase tissue penetration, and identify fluorochromes with synergistic properties to further enhance laser tumoricidal effects. Rapid technological advancements in magnetic resonance imaging may now provide an extremely sensitive way to detect and monitor laser-tissue effects, and allow efficient interstitial laser phototherapy of deep and sometimes inaccessible tumors. The current and future prospectives of the emerging field of laser phototherapy are described. Coloring Agents Coloring Agents;Humans;Laser Therapy;Lasers;Neoplasms;Photochemotherapy

Nd: YAG interstitial laser phototherapy guided by magnetic resonance imaging in an ex vivo model: dosimetry of laser-MR-tissue interaction. Interstitial laser phototherapy (ILP) is a promising technique in which laser energy is delivered percutaneously to various depths of tumors. This technique will become clinically useful only when efficient, sensitive, and noninvasive monitoring systems are developed. In this study, the spatial distribution of ILP in bovine liver tissue, induced by a Nd: YAG laser with an interstitial sapphire-frosted contact probe, was evaluated by magnetic resonance imaging (MRI). Tissue was exposed to three energy densities of the Nd:YAG laser by a reproducible method of dosimetry. Thermal profiles were measured with a probe inserted 5 mm from the laser tip. T1-weighted magnetic resonance images were taken after the laser exposure. Tissue specimens were then evaluated for standard quantification of laser-induced damages. A linear correlation between the level of laser energy, induced temperature change, lesion size on T1 magnetic resonance image, and volume of histological damage was observed. Further improvement of this technique of dosimetry in an in vivo model should allow the development of software for MRI which will correlate the above parameters and render this technique of ILP clinically useful. Animals;Cattle;Laser Therapy;Liver;Magnetic Resonance Imaging;Phototherapy;Radiation Dosage

[Reaction of the adrenal glands to laser puncture during combined effects of ionizing radiation]. In experiments in mature female guinea pigs it was shown that a combination of external X-radiation (12.9 mC/kg) and incorporated 131I (6.5 mCi/kg) induced morphohistochemical changes in the adrenals at remote times (6 months) which indicate the state of the organ functional tension. Laser biostimulation in these conditions promotes a transition of the process of cell hyperfunctioning to the depletion and functional deficiency. Iodine Radioisotopes;Dopamine;Norepinephrine;Epinephrine Adrenal Glands;Animals;Dopamine;Epinephrine;Female;Guinea Pigs;Iodine Radioisotopes;Lasers;Norepinephrine;Punctures;Radiation Dosage;Radiation, Ionizing;Time Factors

[Low-intensity laser treatment of patients with duodenal ulcer and erosive lesions of gastric and duodenal mucosa]. Ninety-eight patients were exposed to low-energy laser irradiation. Of these 52 and 31 had duodenal ulcer in aggravation phase with mucosal erosion and without it, respectively, 15 patients developed isolated erosive lesions of gastroduodenal mucosa. The energy was delivered to the target cites optically using fiber optics endoscope. Microcirculation was studied by bulbar biomicroscopy. Therapeutic response in the laser utilization proved positive being the highest for patients with a short disease history, moderate signs, small-size lesions. Normal microcirculation was not achieved though there was a trend to its improvement. Adolescent;Adult;Aged;Duodenal Ulcer;Duodenitis;Gastric Mucosa;Gastritis;Humans;Intestinal Mucosa;Laser Therapy;Middle Aged;Radiotherapy Dosage;Wound Healing

[Low-intensity laser irradiation in the treatment of peptic ulcer]. The course of gastric and duodenal ulcer was investigated in 120 ulcer patients exposed to low-intensity laser irradiation with 0.63 microns wave length. Compared to conventional treatment, laser therapy of ulcer has a number of advantages allowing its wide introduction in both hospital and outpatient settings. Benefits and drawbacks of endoscopic and transcutaneous laser therapy are comparatively assessed. Helium;Neon Duodenal Ulcer;Helium;Humans;Laser Therapy;Neon;Radiotherapy Dosage;Stomach Ulcer;Wound Healing

[Low energy laser treatment--effect in localized fibromyalgia in the neck and shoulder regions]. The effect of low-level laser therapy (GaAlAs, 830 nm, continuous) for chronic myofascial pain in the neck and shoulder girdle was assessed in a double-blind randomized study with 36 female participants. Treatments were given six times during two weeks with a total effect of 4.5-22.5 J per treatment depending on the number of tender points. No significant effect was found, neither in pain relief nor in tablet intake between the laser and the placebo group. None of the participants reported any side-effects. Adult;Double-Blind Method;Female;Fibromyalgia;Humans;Laser Therapy;Middle Aged;Neck Muscles;Shoulder

[Treatment of suppurative wounds of the anterior abdominal wall after obstetrical and gynecological operations using low-intensity laser irradiation]. Abdominal Muscles;Animals;Disease Models, Animal;Female;Genital Diseases, Female;Humans;Laser Therapy;Pregnancy;Pregnancy Complications;Pseudomonas Infections;Rats;Surgical Wound Infection;Wound Healing

Evaluation of analgesic effect of low-power He:Ne laser on postherpetic neuralgia using VAS and modified McGill pain questionnaire. In order to investigate the efficacy of low-power He:Ne laser in treatment of pain, we irradiated 18 outpatients with severe postherpetic neuralgia. The efficacy of the low-power laser treatment was evaluated using a four-grade estimation, visual analog scale (VAS), and modified McGill pain questionnaire (m-MPQ) after every 10 of as many as 50 irradiations. The efficacy rate using a four-grade estimation at the end of 50 treatments was 94.4%. VAS decreased from 6.2 before irradiation therapy to 3.6 after 50 treatments, and the degree of pain relief was reduced to 44.6% and correlated with the number of treatments. The total numbers of words and the total scores of the m-MPQ decreased as the number of treatments increased. No complications attributable to the laser therapy were observed. These results suggest that repeated irradiation with low-power He:Ne laser is an effective and safe therapy for postherpetic neuralgia. Helium;Neon Adult;Aged;Aged, 80 and over;Analgesia;Evaluation Studies as Topic;Female;Helium;Herpes Zoster;Humans;Laser Therapy;Male;Middle Aged;Neon;Neuralgia;Pain Measurement

[The use of intravenous low-intensity laser irradiation of the blood in the total complex of anesthesiological protection of patients against surgical stress]. 60 patients, aged 28 to 80 years, hospitalized for surgical treatment of various esophageal, gastric and intestinal diseases have been examined. In 30 patients (group 1) during surgery conventional neuroleptanalgesia was accompanied by intravenous low-intensity laser blood irradiation (ILILBI). The remaining 30 patients formed the control group. Unlike control patients, in patients of group 1 adequate perfusion and tissue oxygenation were maintained throughout the whole period of surgical intervention, general stress reaction to surgical trauma was less pronounced. The data obtained demonstrate the advisability of ILILBI introduction into a complex of anesthesiological protection. Adult;Aged;Aged, 80 and over;Blood;Female;Humans;Laser Therapy;Male;Middle Aged;Neuroleptanalgesia;Stress, Physiological;Surgical Procedures, Operative

The biological effects of low power laser irradiation on cultivated rat glial and glioma cells. Two cell lines were used as models to investigate the biological effects resulting from irradiation by low power lasers. One was a well-established rat glial cell line (RBA-1) obtained from the dissociated

culture of normal neonatal rat (JAR-2, F-51) brain tissue. The other was a rat C6 glioma cell line obtained from a propagated culture of rat glial tumor induced by N-nitrosomethylurea. Both of them showed relatively constant cellular morphological characteristics and had steady growth and proliferation in the monolayer system. In this study, the monolayer cell culture was exposed to irradiation by various lasers at low power density in various situations. These lasers with their low energy range are used conventionally in bioregulation and acupuncture, so that their output power primarily will not cause a significant elevation of temperature of the irradiated tissue. The effects on cellular morphology, proliferation, and other functional activities after various conditions of irradiation were studied. A biostimulatory effect was noted after He-Ne laser irradiation on C6 glioma cells and was dose related. A biostimulatory effect was noted also after IR (gallium-arsenide infrared) laser irradiation but was not dose related. No significant biostimulatory effects on RBA-1 cells were noted after exposure to the four types of lasers used in this study. Animals;Cell Division;Cells, Cultured;Glioma;Laser Therapy;Neuroglia;Rats;Tumor Cells, Cultured

[Laser therapy in dental practice. What is laser?]. This article briefly discusses laser theory and medical use of different types of laser, laserphysics and laser properties. The indications for lasertherapy as claimed from laser-producers, are numerous. However, we recommend that the effect of treatment with low level laser therapy has to be more documented before general use in a dental practice. Dental Instruments;Humans;Laser Therapy

Successful control of bleeding from gastric antral vascular ectasia (watermelon stomach) by laser photocoagulation. We report a case of gastric antral vascular ectasia in a patient with primary biliary cirrhosis in whom chronic blood loss was a major problem. She required repeated blood transfusions that were complicated by reactions and still had persistent anaemia. She was treated with laser phototherapy in the form of quadrantic photocoagulation with a neodynium yttrium-aluminium-garnet laser. This greatly improved the endoscopic appearance of the gastric lesions and effectively controlled blood loss. She required no further transfusions. Bleeding recurred after 11 months which was controlled by further laser photocoagulation.
Adult;Female;Gastrointestinal Hemorrhage;Humans;Light Coagulation;Liver Cirrhosis, Biliary;Pyloric Antrum;Recurrence;Stomach Diseases

The role of lasers in hemorrhoidectomy. Eighty-eight patients who received treatment for hemorrhoids were randomized into two groups. Group A received the Nd-YAG laser phototherapy for internal hemorrhoid combined with the CO2 laser for external hemorrhoid. Group B was treated with closed Ferguson hemorrhoidectomy. The need of narcotic injections for pain relief was 11 percent in group A vs. 56 percent in group B (P less than 0.001). The incidence of postoperative urinary retention was 7 percent in group A, vs. 39 percent in group B (P less than 0.05). No enema was required postoperatively in group A, vs. 9 percent in group B; 84 percent of the patients in group A were discharged on the second postoperative day, vs. 83 percent of the patients in group B discharged on the fifth postoperative day. The cost was 20 percent less in the former group. The overall complications in both groups were insignificant in difference, except prolonged wound healing in group A was noted. One year follow-up showed satisfactory results. Laser treatment is considered one of the alternatives to conventional treatment, but the surgeon needs to be aware of laser hazards. Meperidine Adult;Aged;Defecation;Evaluation Studies as Topic;Female;Hemorrhoids;Humans;Length of Stay;Light Coagulation;Male;Meperidine;Middle Aged;Pain, Postoperative;Postoperative Complications;Urination Disorders

[Clinical and experimental studies of the effect of low-intensity laser irradiation on the blood and blood vessels]. Animals;Arteries;Arteriosclerosis Obliterans;Coronary Disease;Coronary Vessels;Disease Models, Animal;Erythrocytes;Guinea Pigs;Humans;In Vitro Techniques;Laser Therapy;Lasers;Leg;Radiation Dosage

Action of low-intensity laser radiation on Escherichia coli. The review deals with quantitative laws of monochromatic visible light action on the cellular level, as well as with the primary photoacceptors and possible light signal transduction chains in bacterial cell Escherichia coli WP2 trp-. Experiments described in this paper are a part of experimental work performed for explaining the molecular mechanism of low-intensity laser therapy. The existence of certain parameters of light (dose, intensity, pulse repetition rate, monochromaticity within the absorbtion bandwidth of biomolecules) for stimulation of E. coli WP2 metabolism has been established. The necessity for a certain physiological state of bacteria cells sensitive to irradiation has been shown. The sensitivity of bacteria to irradiation with monochromatic visible light has been proposed to be a delta pH-dependent genetic process. Escherichia coli;Lasers;Light;Photoreceptor Cells

Effect of low level laser therapy on wound healing after palatal surgery in beagle dogs. The effect of low level laser therapy on wound healing and wound contraction after palatal surgery in Beagle dogs of 12 weeks of age was investigated. A total of 30 Beagle dogs was used and assigned to a control group (Group C; n = 6) and two experimental groups (Group L; n = 12 and group LL; n = 12). In both experimental groups, Von Langenbeck's palatal repair was simulated. Then in the LL group the denuded bony areas were treated with low level laser therapy using a continuous Ga-As-A1 laser beam (830 nm) and energy output set at 30 mW. Per treatment a dosage of 1 J/cm2 wound surface area was used. Therapy was carried out three times a week with a total of ten treatments. Wound healing was observed clinically until wound healing was completed at 4 weeks p.o. and wound areas were measured at regular intervals on standardized intra-oral photographs. Wound contraction was measured as the increments of the distances between tattoo points on the opposite wound margins. No significant differences were found in the quality and rate of wound healing between the two experimental groups. The same held true for the increments of the distances between opposite tattoo points. It was concluded that macroscopically low level laser therapy under conditions used in this study did not have an influence on wound closure or wound contraction. Animals;Cicatrix;Connective Tissue;Dogs;Granulation Tissue;Laser Therapy;Mouth Mucosa;Palate;Periosteum;Reproducibility of Results;Time Factors;Wound Healing

Low level laser treatment of chondromalacia patellae. A randomized, double blind study of low level laser treatment of chondromalacia of the patella in 40 patients has been undertaken. Chondromalacia was established by arthroscopy and was related to subjective symptoms. Eight treatments were given during five weeks by a physiotherapist with the use of a GAAS pulsed laser, real or sham. Assessment of the location, quality and intensity of pain, and the influence on mood, gait, sleep, work, and sports was made before and after treatment including an eight to twelve week evaluation. No statistical difference was found between real and sham use of low level laser for the symptoms of chondromalacia of the patella. Adolescent;Cartilage Diseases;Double-Blind Method;Female;Humans;Laser Therapy;Male;Middle Aged;Patella

[Low-energy laser irradiation in the treatment of gallstones in various physico-chemical stages]. The influence of helium-neon laser radiation on the physico-chemical bile characteristics in in vitro conditions and on the course of the development of the disease in patients with the physico-chemical stadium of the gallbladder stone was studied. It has been established that this form of laser in an optimally selected regimen, has a positive therapeutical effect--the improvement of the bile chemical characteristics, a cholekinetic and antiinflammatory activity which enables it's wide recommendation in the treatment of the physico-chemical stadium of the gallbladder stone and as a prophylactic procedure regarding concrement formation. Bile;Cholelithiasis;Female;Humans;Laser Therapy;Male

[The clinical efficacy of treating patients with nonspecific lung diseases using low-energy laser irradiation and intrapulmonary drug administration]. Intrapulmonary administration of

glucocorticosteroids and antibiotics combined with low-energy laser radiation was employed in the treatment of patients with infection-dependent bronchial asthma in the phase of exacerbation and frequent asphyxia attacks, long medical history and of patients with lung abscesses. The purpose of the work was to study and compare the clinical effectiveness of the method in the gravest group of patients suffering from nonspecific pulmonary diseases: suppurative (acute lung abscess) and infectious allergic (infection-dependent bronchial asthma of medium gravity with frequent attacks, long medical history, tendency towards aggravation of the status and low efficacy of broncholytics). The results of the treatment and follow-up have shown that the use of the combined treatment suggested is most optimal in patients with acute lung abscesses (the percentage of the cured is 94.1). In patients with infection-dependent bronchial asthma, the use of laser therapy combined with intrapulmonary administration of steroids also noticeably improved the clinical, functional and immunological characteristics, prolonged the phase of remission. Anti-Bacterial Agents;Glucocorticoids Administration, Inhalation;Anti-Bacterial Agents;Antibody Formation;Asthma;Combined Modality Therapy;Drug Therapy, Combination;Evaluation Studies as Topic;Glucocorticoids;Humans;Immunity, Cellular;Laser Therapy;Lung Abscess;Lung Diseases;Time Factors

[Effect of low-energy laser irradiation of bronchial mucosa on systemic and local immunity in patients with chronic bronchitis]. The effectiveness of endobronchial low-energy laser therapy was studied in 28 patients with chronic nonobstructive bronchitis concurrent with thinning of bronchial mucosa. The course of treatment made it possible to obtain positive dynamics of most parameters of immunologic reactivity in CNB patients. Systemic immunity parameters, except for the NST and concentration of circulating immune complexes, underwent essential normalization. Marked positive changes were found in the parameters characterizing functional activity of alveolar macrophages: there was a 2.5-fold increase in adhesive properties and over 1.3-fold increase in the percentage of phagocytes. The level of secretory IgA rose significantly (by 3.5 times). Hence, a manifested therapeutic effect of this therapeutic method is mainly associated with its immune-stimulating action. Bronchi;Bronchitis;Chronic Disease;Humans;Laser Therapy

[The use of low-intensity laser irradiation in the immediate postoperative period in patients with gastroduodenal ulcer]. In patients with an ulcer of the stomach and duodenum at the immediate postoperative period in the complex of treatment, the low intensity laser irradiation of the anastomosis (after gastric resection) and ulcer (after the organ-preserving operations) according to the developed method by means of the modified LG-75 apparatus was used. The use of a helium-neon laser contributed to development of the severe form of anastomositis and subsequent gastrostasis. In study of gastric secretion, no considerable changes in acid formation were revealed. Combined Modality Therapy;Gastric Emptying;Humans;Laser Therapy;Lasers;Peptic Ulcer;Postoperative Period

[The clinico-pathogenetic validation and efficacy of using low-energy laser irradiation and glucocorticoids in treating bronchial asthma patients]. Intrapulmonary administration of glucocorticoids and low-energy laser radiation were used in the treatment of infection-dependent bronchial asthma in the phase of exacerbation. To estimate the efficacy of the combined method suggested, the parameters of external respiration, cellular, humoral and local immunity were determined, the provocation inhalation tests with acetylcholine and histamine and exercise tests were performed. The results of the treatment and subsequent follow-up data have shown that the combined use of local (endolymphatic) administration of steroids makes it possible to reduce immunological disorders, to decrease bronchial reactivity, to prolong the disease remission. Bronchodilator Agents;Glucocorticoids;Methylprednisolone Asthma;Bronchial Provocation

Tests;Bronchodilator Agents;Combined Modality Therapy;Evaluation Studies as Topic;Glucocorticoids;Humans;Laser Therapy;Methylprednisolone;Remission Induction
[Treatment of non-healing wounds and trophic ulcers by low- intensity laser irradiation in an outpatient clinic]. Experience in treating 351 patients with persistent wounds and trophic ulcers by low-intensity laser radiation in out-patient clinics is generalized. Complete epithelialization of the wound or ulcer surface occurred in 236 patients. There were 246 patients aged 60, all were treated without leave from work. Thus, the inclusion of laser therapy in the complex of measures for persistent wounds and trophic ulcers is a highly effective method which may be applied in preoperative management and which will reduce considerably the term of in-patient treatment. Adolescent;Adult;Aged;Ambulatory Care;Female;Humans;Laser Therapy;Male;Middle Aged;Radiotherapy Dosage;Varicose Ulcer;Wound Healing;Wounds and Injuries
[The treatment of diabetic angiopathies by endovascular low-intensity laser irradiation]. A study was made of the effect of endovascular laser irradiation of the blood with a He-Ne laser on blood rheological properties, tissue microcirculation and leukocyte function in 28 patients suffering from diabetes mellitus with diabetic angiopathies. A course of endovascular laser irradiation of the blood resulted in the improvement of a clinical course of angiopathies, indices of biomicroscopy of the eye conjunctiva as well as capillaroscopy and thermogenic activity of the limbs. Blood viscosity was significantly decreased; noticeable stimulation of leukocyte beta-galactosidase from 16.4 +/- 3.4 up to 26.8 +/- 4.4 nmol/h was observed. A conclusion has been made that laser therapy leads to significantly improved tissue microcirculation and prevents the development of pathological vascular changes. Adult;Aged;Blood Viscosity;Diabetic Angiopathies;Female;Humans;Laser Therapy;Leukocytes;Male;Microcirculation;Middle Aged
[The local treatment of chemical burns of the esophagus via an endoscope by means of laser therapy and adhesive application]. An examination of 180 patients with chemical burns of the esophagus was performed. Local endoscopic treatment with the help of low energy laser irradiation and glue applications was used in 120 patients. Preference is given to the method of local laser therapy because of the best results of treatment and the absence of risk of putting out of order the expensive apparatus resulting from an ingress of glue on it. Tissue Adhesives Adolescent;Adult;Aged;Aged, 80 and over;Burns, Chemical;Combined Modality Therapy;Esophagoscopy;Esophagus;Female;Follow-Up Studies;Humans;Laser Therapy;Male;Middle Aged;Tissue Adhesives;Wound Healing
Low power laser biostimulation of chronic oro-facial pain. A double-blind placebo controlled cross-over study in 40 patients. The efficacy of low power laser stimulation in the treatment of chronic oro-facial pain conditions was investigated in a double-blind placebo controlled modified cross-over study in 40 patients. The laser was an invisible infrared (IR) diode laser with an emission at 904 nanometer (nm). Treatment effect was evaluated by means of VAS-scales and global assessment of pain. Outcome of treatment was correlated to changes in urinary excretion of 5-hydroxyindoleacetic acid (5-HIAA). The clinical impression was that placebo was superior to laser stimulation. No statistically significant difference between the analgesic effect of the laser and placebo irradiation was found on VAS-scales. A significant (P = 0.05) increase in 5-HIAA excretion was found in the placebo group. It is concluded that the possibility of a substantial placebo response should be taken into consideration using 904 nm (IR) lasers for pain treatment in patients with this type of chronic oro-facial pain. Hydroxyindoleacetic Acid Adult;Aged;Chronic Disease;Double-Blind Method;Facial Pain;Female;Humans;Hydroxyindoleacetic Acid;Laser Therapy;Male;Middle Aged;Mouth Diseases;Pain;Pain Management;Pain Measurement
[Low power laser biostimulation in chronic oro-facial pain]. Facial Pain;Humans;Laser Therapy;Physical Stimulation

[The effect of low-intensity laser radiation on spermatogenesis in men]. Fifty-three males suffering from aspermatogenic sterility were exposed to low-intensity laser irradiation. The results suggest a conclusion on a stimulating effect of He-Ne laser on testicular function. Relevant laser stimulation is thought to hold promise for clinical purposes. Adult;Chronic Disease;Humans;Hypogonadism;Infertility, Male;Laser Therapy;Male;Oligospermia;Sperm Count;Spermatogenesis

Argon laser phototherapy of human malignancies using rhodamine-123 as a new laser dye: the intracellular role of oxygen. Recent studies demonstrated that the cationic, mitochondrial-specific dye Rhodamine-123 (Rh-123), is an efficient tumor photosensitizer for Argon laser treatment of human cancer cells both in vitro and in tumors grown as xenografts in athymic mice. To demonstrate the photodynamic mechanism of action of this reaction, the intracellular role of oxygen and temperature changes in treated cells have to be defined. In the current study, a large panel of human tumor cell lines of diverse histologic origin were tested for in vitro sensitivity to Rh-123 and the Argon laser (514.5 nm) in oxygen, deuterium oxide (D2O), and nitrogen (N2) environment. Tumor cells in suspension were first sensitized to Rh-123 (1 or 20 micrograms/ml for 1 hour), cooled on ice to 4 degrees C, and then exposed to the Argon laser (delta T = 14 +/- 1 degree C). Cell proliferation measured by [3H]-thymidine uptake 24 hours after sensitization with Rh-123 and laser treatment was significantly decreased in tumor cells kept in oxygen and D2O atmospheres. No decrease in DNA synthesis was seen in Rh-123 and laser treated cells kept in an N2 environment. Control tumor cells treated with Rh-123 or the Argon laser separately did not show any decreased [3H]-thymidine uptake in oxygen, D2O or N2 environment. These results provide evidence of a photodynamic process since Rh-123 sensitization and Argon laser activation occur at nonthermal levels of energy and are oxygen dependent. The high effectiveness of this technique of photodynamic therapy with the Argon laser, and low toxicity of Rh-123 could make its clinical use very attractive for the treatment of superficial malignancies. Fluorescent Dyes;Rhodamines;Xanthenes;Water;Rhodamine 123;Deuterium;Deuterium Oxide;Nitrogen;Oxygen Deuterium;Deuterium Oxide;Fluorescent Dyes;Head and Neck Neoplasms;Humans;In Vitro Techniques;Laser Therapy;Nitrogen;Oxygen;Photochemotherapy;Rhodamine 123;Rhodamines;Tumor Cells, Cultured;Water;Xanthenes

Tumors of diverse histology are sensitive to rhodamine 123 laser phototherapy in vitro. Rhodamine 123 has been shown to be an efficient photosensitizer for the argon laser treatment of a human squamous carcinoma and a melanoma cell line in vitro. Rhodamine 123 laser phototherapy also eradicates these human squamous cell carcinomas when grown as subcutaneous tumor transplants in athymic mice. This study extends these observations by testing a panel of 19 human tumor cell lines of various histologic origins for in vitro sensitivity to rhodamine 123 and the argon laser. Rhodamine 123 with an absorption maxima of 502 nm in water was found to undergo a redshift to 516 nm after uptake by the mitochondria of human tumor cells. Rhodamine 123-sensitized brain tumor cells were inhibited by over 80% after 15 seconds and by 98% after 60 seconds of laser exposure (514.5 nm, 4 W, Tmax = 39 degrees C), as measured by reduced [3H]thymidine incorporation into cellular DNA. Laser or rhodamine 123 alone did not significantly inhibit (greater than 20%) tumor cell [3H]thymidine uptake. Sensitization with 20 micrograms rhodamine 123 for 1 hour before 45 seconds of laser illumination decreased cell [3H]thymidine uptake by 40% to 99% in four melanoma lines, five carcinomas, five leukemias, and four of five other human tumor lines. Two melanomas, two leukemias, and a lymphoma cell line also exhibited a 70% to 80% reduction in [3H]thymidine uptake after sensitization in vitro with 1 microgram/mL rhodamine 123 and laser illumination. Rhodamine 123-sensitized tumor cells were inhibited even more strongly by fractional dose laser irradiation at nonthermal temperatures.(ABSTRACT TRUNCATED AT 250 WORDS)

Fluorescent Dyes;Rhodamines;Rhodamine 123 Cell Line;Drug Screening Assays, Antitumor;Fluorescent Dyes;Humans;In Vitro Techniques;Laser Therapy;Photochemotherapy;Rhodamine 123;Rhodamines;Tumor Cells, Cultured

Low-energy laser irradiation--a new measure for suppression of arachidonic acid metabolism in the optic nerve. Helium-neon low-energy laser (LEL) irradiation, known for its therapeutic effects in arthritis, wound healing, and muscular strain, was applied to eyes of rats that had sustained an optic nerve crush injury. Crush injury to the optic nerve resulted in a long-lasting in vitro elevation of prostaglandin E2 (PGE2) production (1.8-3.9-fold above control values during the 12 day study period). LEL irradiation per se had no effect in vitro on PGE2 production by the optic nerve; however, LEL irradiation of eyes with crushed optic nerve inhibited the enhanced production of PGE2 and leukotriene B4 in vitro by 55% and 75% during the late and immediate phase after trauma, respectively. Our findings of the suppressive effect of LEL irradiation on arachidonic acid metabolism are reminiscent of the actions of steroidal and nonsteroidal anti-inflammatory drugs, and might indicate, for the first time, the possible biochemical mechanisms associated with the clinical anti-inflammatory effects of LEL irradiation. Arachidonic Acids;Leukotriene B4;Arachidonic Acid;Dinoprostone Animals;Arachidonic Acid;Arachidonic Acids;Dinoprostone;Lasers;Leukotriene B4;Male;Nerve Crush;Optic Nerve;Rats;Time Factors

[Direct action of low-intensity laser irradiation on the morphofunctional status of the zona fasciculata of the adrenal cortex of white rats]. Increase of capillaries blood volume, nuclear mass and nuclear cytoplasmic relationship and decrease of lipid content and adrenocortical sizes were determined in superficial adrenocortical layers on helium-neon LAZER irradiation of uncovered left adrenal glands in white female rats. It was confirmed by corticosteroid function increase. Similar morphometric changes were identified all over adrenocortical bundles on arsenate-helium irradiation of covered left adrenal gland from the back of the animal. According to obtained results LAZER irradiation may be recommended to use for functional stimulation of adrenal cortex. Arsenates;Helium;Neon;arsenic acid Adrenal Cortex;Animals;Arsenates;Female;Helium;Lasers;Microcirculation;Neon;Rats

[Electrosurgical endoscopic interventions using low-energy laser irradiation]. Adult;Ampulla of Vater;Burns, Chemical;Cholestasis, Extrahepatic;Electrocoagulation;Esophageal Stenosis;Female;Humans;Laser Therapy;Male;Middle Aged;Postoperative Care;Radiotherapy Dosage;Wound Healing

Interstitial laser phototherapy assisted by magnetic resonance imaging: a new technique for monitoring laser-tissue interaction. The rapid technological advances of magnetic resonance imaging, laser fiberoptics, and compatible probes may allow treatment of deep and sometimes surgically unreachable tumors of the head and neck with minimal morbidity through interstitial laser phototherapy. In this study, a new application of magnetic resonance imaging was developed to monitor and quantify laser-induced tissue damages. Pig skin was exposed to increased levels of argon laser (514.5 nm) at energy densities between 62.5 and 375 J/cm2 as determined by an accurate and reproducible method of dosimetry. Thermal profiles were recorded using an infrared sensor and T1- and T2-weighted magnetic resonance images were taken; afterward, biopsies were performed to quantitate the level of tissue damage. Our results demonstrate that above a certain threshold of laser energy, the magnetic resonance imaging findings are temperature dependent. Appropriate development of a scale matching laser energies, temperature profiles, T1- and T2-weighted magnetic resonance images, and histological quantitation of tissue destruction will allow us to optimize the three-dimensional control and monitoring of laser-tissue interactions. Animals;Dose-Response Relationship, Radiation;Female;Lasers;Magnetic Resonance Imaging;Monitoring, Physiologic;Phototherapy;Skin;Swine

[Laser Biostimulation in dentistry]. Humans;Laser Therapy;Mouth Diseases
[Treatment of erosive-ulcerative forms of lichen planus with low-energy laser irradiation]. Helium;Neon Adult;Aged;Female;Helium;Humans;Laser Therapy;Lichen Planus;Male;Middle Aged;Mouth Diseases;Mouth Mucosa;Neon;Radiotherapy Dosage;Ulcer
The use of infrared laser therapy in the treatment of venous ulceration. Management of intractable venous ulceration remains an unrewarding task which is increasingly delegated to the realm of the vascular surgeon. The purpose of this pilot study was to assess the ulcer-healing effects of the newest form of biostimulation--the low power laser. Twelve patients with chronic venous ulcers unresponsive to conservative measures were treated with infrared laser irradiation for twelve weeks. Two ulcers healed completely and there was a 27% (p less than 0.01) reduction in size of the remaining ulcers. Treatment resulted in a 44% (p less than 0.01) increase in ulcer floor area occupied by healthy granulation tissue. The most dramatic effect of laser treatment was the reduction in ulcer pain, from 7.5 to 3.5 (linear analogue scale) (p less than 0.001). Laser irradiation had no effect on TcPO2, number of skin capillaries or pericapillary fibrin deposition in the lipodermatosclerotic area around the ulcer. The results of this pilot study are encouraging and a carefully controlled randomized study is indicated to compare low power laser irradiation to conventional treatment in the management of venous ulcers. Oxygen Blood Gas Monitoring, Transcutaneous;Chronic Disease;Humans;Laser Therapy;Oxygen;Pilot Projects;Skin;Varicose Ulcer
[Prevention of lactation mastitis by the use of low-intensity laser irradiation]. Optic characteristics of breast tissues have been examined in mothers. An internation was designed to prevent and treat nipple fissures using individualized laser therapy regimens. Individualized laser therapy of 329 mothers at risk of mastitis and 68 mothers with a normal postpartum course reduced five-fold the incidence of mastitis in the risk group (from 18.6% to 3.7%, or to values characteristic of a normal puerperium). The wave length of 0.63 micron was found to be of a higher preventive and therapeutic efficacy, compared to the wave length of 0.89 micron. Laser rays activated the immune system, as reflected by rising serum levels of immunoglobulins A, M, G and lactoferrin. It is suggested that mothers with high trophoblastic beta-glycoprotein concentrations are at high risk of puerperal septic complications. Breast;Breast Diseases;Female;Humans;Laser Therapy;Mastitis;Nipples;Pregnancy;Puerperal Disorders;Radiotherapy Dosage
[Effects of low-intensity laser irradiation on the functional activity of leukocytes and blood antioxidant system in acute myocardial infarction]. Activation of lipid peroxidation and inadequate antioxidant activity essentially contribute to the pathogenesis of acute myocardial infarction, this fact dictating the necessity of correcting these processes. High efficacy of of He-Ne laser therapy was demonstrated in the treatment of 92 patients with myocardial infarction in the acute and subacute periods. This treatment modality corrected lipid peroxidation parameters, which fact manifested by reduction of leukocytic functional activity and elevation of blood plasma antioxidant characteristics. Antioxidants Antioxidants;Evaluation Studies as Topic;Female;Humans;Laser Therapy;Leukocytes;Lipid Peroxidation;Male;Middle Aged;Myocardial Infarction;Radiotherapy Dosage
[Low-intensity laser irradiation in the combined treatment of suppurative peritonitis]. The results of treatment of 32 patients with diffuse forms of purulent peritonitis are analyzed. Prolonged laparoscopic sanitation of the peritoneal cavity, combined with He-Ne laser irradiation of the peritoneum and parenchymatous organs, were effectively used in the complex of therapeutic measures. For immunity stimulation intravascular laser irradiation of the blood was carried out. The terms of normalization of local inflammatory shifts in the peritoneum shortened and the number of lethal outcomes decreased. Prospects for the use of this method are outlined. Nitrofurazone

Adolescent;Adult;Aged;Female;Humans;Laser Therapy;Male;Middle Aged;Nitrofurazone;Peritoneal Cavity;Peritoneal Lavage;Peritonitis;Postoperative Care;Radiation Dosage
[The use of low-intensity laser irradiation of the blood in myocardial infarction]. A total of 119 patients with myocardial infarction hospitalized within 24 hrs from the disease onset were examined. He-Ne laser irradiation of the blood (daily 40 min sessions for 3-5 days) was carried out in 45 patients (Group 1). The rest 74 patients (Group 2) were administered common therapy. A number of biologically active substances were radioimmunoassayed in the blood of 12 Group 1 and 11 Group 2 patients on days 1, 3, and 7 of the disease. The pain syndrome was alleviated in Group 1 patients, in contrast to Group 2 patients, and the frequencies of ventricular arrhythmias, of heart failures, and of the condition recurrences were reduced, as was the mortality rate. Laser therapy resulted in reduction of the activities of the hypophyseoadrenocortical and aldosteron-renin-angiotensin systems. Besides blood levels of dilatants and proaggregants (PGF2 alpha, vasopressin, angiotensin II) reduced in these patients, whereas vasodilating and antiaggregation hormones (PGE, PGI2) levels increased and the PGI2/TxB2 ratio improved. Adult;Aged;Blood;Homeostasis;Humans;Laser Therapy;Male;Middle Aged;Myocardial Infarction;Radiotherapy Dosage
[Dosage of low-energy laser irradiation in acute disorders of cerebrovascular circulation]. Acute Disease;Cerebrovascular Disorders;Dose-Response Relationship, Radiation;Humans;Laser Therapy;Radiotherapy Dosage
Spinal cord response to laser treatment of injured peripheral nerve. The authors describe the changes occurring in the spinal cord of rats subjected to crush injury of the sciatic nerve followed by low-power laser irradiation of the injured nerve. Such laser treatment of the crushed peripheral nerve has been found to mitigate the degenerative changes in the corresponding neurons of the spinal cord and induce proliferation of neuroglia both in astrocytes and oligodendrocytes. This suggests a higher metabolism in neurons and a better ability for myelin production under the influence of laser treatment. Animals;Astrocytes;Laser Therapy;Motor Neurons;Nerve Crush;Oligodendroglia;Rats;Sciatic Nerve;Spinal Cord
[Low-energy laser irradiation in surgery of the liver and biliary tract]. Biliary Tract;Biliary Tract Diseases;Humans;Intraoperative Care;Laser Therapy;Liver;Liver Diseases;Postoperative Care;Radiotherapy Dosage
Low-energy laser treatment and exercise for chronic low back pain: double-blind controlled trial. Twenty patients with chronic low back pain were enrolled in a randomized double-blind trial to test the efficacy of low-energy laser biostimulation combined with exercise. Ten patients received low-energy gallium-arsenide laser treatment, and ten received placebo laser treatment. Both groups were also placed on an active exercise program. Visual analogue and disability pain scores were assessed pretreatment and one month posttreatment and showed significant (p less than .02) improvements in both groups, but no relative advantage was found for either group. Objective parameters using computerized triaxial measurements of range of motion, isometric torque, and isodynamic velocity were also performed before and after treatment. There were significant improvements in objective parameters in both the laser and placebo groups, but no relative advantage accrued to either group. Under the conditions of this study, low-energy laser stimulation plus exercise did not provide a significant advantage over exercise alone. Adult;Back Pain;Double-Blind Method;Exercise Therapy;Female;Humans;Laser Therapy;Male;Middle Aged;Randomized Controlled Trials as Topic
[The effect of laser irradiation on arthritis in rats]. Based on the analgesic effect of laser therapy in clinic, the effect of laser irradiation at acupoints on the experimental arthritis in rats was further observed. The experiments were carried out on Wistar rats, which were divided into three groups: The normal group (n = 6): without any treatment. The laser group (n = 8): 24 hours after an injection of Freund's adjuvant, the typical symptoms of acute arthritis (red, swelling, pain and hyperalgesia)

occurred. Then transcutaneous irradiation with a low power Helium-neon laser (3 mw, 6328 A) at ipsilateral Kun-Lun point was applied ten minutes every day for five days. The control group (n = 8): with the same treatment as the laser group except laser irradiation. All the indexes, such as foot volume, pain score and pain threshold (Heat-leg-withdrawal latency, HWL and electric-shock vocalization, VOC) were measured every day. Comparing with the symptoms in the control group, the intensity of pain as measured on pain score and the swelling of the ankles (foot volume) were significantly reduced by laser irradiation (P less than 0.01), but the pain threshold (HWL and VOC) did not show any improvement in laser group. However, immediately after laser irradiation, the average pain threshold (VOC) was significantly raised (P less than 0.01). It is concluded that low power laser irradiation at local points can produce the relief from arthralgia and reduction in the swelling of ankles, and it can also produce instant analgesic effect in test of pain threshold (VOC). Acupuncture Points;Animals;Arthritis;Arthritis, Experimental;Humans;Laser Therapy;Male;Pain;Rats;Rats, Inbred Strains;Sensory Thresholds

The clinical status of low energy laser therapy in 1989. Low energy laser therapy has gained varying acceptance as a treatment for a broad range of soft tissue, musculoskeletal and neurological conditions. A controversial, but surprisingly large body of research with cell cultures suggests that laser irradiation can nondestructively alter cellular processes. Unfortunately, animal and human studies are often contradictory and difficult to evaluate due to differing study designs. As a result, the clinical effectiveness of low energy laser therapy remains debatable. Nevertheless, the findings are intriguing and deserve further investigation. Analgesia;Animals;Arthritis, Rheumatoid;Equipment Safety;Humans;Inflammation;Laser Therapy;Ligaments;Wound Healing

Noncardiogenic pulmonary edema following laser therapy of a tracheal neoplasm. Nd-YAG laser phototherapy has been demonstrated to be effective for the treatment of airways obstruction caused by tracheal tumors. Pulmonary edema has been reported as a complication following acute relief of an upper airway obstruction. We describe a case where laser photoresection of an endotracheal malignancy resulted in acute pulmonary edema. It is important to recognize this potential cause of respiratory deterioration following successful phototherapy to obstructing lesions of the upper airways. Adenocarcinoma;Aged;Female;Humans;Laser Therapy;Neoplasm Recurrence, Local;Pulmonary Edema;Tracheal Neoplasms

Low-energy He-Ne-laser irradiation of the bovine mammary gland. The bovine mammary gland was used to examine the effects of low-energy laser irradiation. Laser irradiation with 25 mW on an area of 7.5 cm in diameter on the right front quarter lasted 30 minutes daily for five consecutive days. Six cows were used to assess the effects of this treatment on the healthy mammary gland. Subclinical mastitis was induced in twelve quarters of the same six cows with oyster glycogen and the same laser protocol was followed on the right front quarters. In both experiments the left hind quarter served as a control. Four cases of spontaneous subclinical mastitis were treated in the same way. Parameters measured included milk yield, somatic cell count, conductivity, Na/K-ratio in milk serum, and fat, protein and lactose concentrations in milk. The bovine mammary gland was chosen in view of its particular suitability for the assessment of changes in biosynthetic capacity and inflammation course. In several respects, mastitis may be compared to currently recommended indications. No evidence for any stimulation of the healthy mammary gland or therapeutic effects on mastitis by low-energy He-Ne-laser could be found. Animals;Cattle;Female;Lactation;Laser Therapy;Lasers;Mammary Glands, Animal;Mastitis, Bovine;Pregnancy

[Effects of low-intensity laser irradiation on the state of blood proteins]. The action of a low-intensity 632.8 nm-wavelength laser radiation on blood elements was studied. The degree of binding the fluorescence probes 1.8 ANS by blood proteins and cells was taken to be the index of the response to irradiation. The change of fluorescence of the oppositely charged probes indicates that a

He-Ne laser radiation causes processes leading to a change of charge in proteins of a blood plasma with the negative charge decreased in most cases. The effect depends on individual characteristics of a biological object, on the exposure dose and the incubation time following the irradiation.
Blood Proteins;Fluorescent Dyes Blood Proteins;Fluorescent Dyes;Humans;Lasers;Models, Biological;Radiation Dosage;Time Factors

Laser biostimulation: a photobiological phenomenon. Animals;Lasers;Wound Healing

[Effect of endobronchial laser therapy on the local protection system of the lungs in patients with protracted pneumonia]. A study of the local pulmonary defense system in 64 patients with protracted pneumonia revealed that endobronchial low-energy laser therapy promoted activation of local defense of the lungs, increased the functional capacity of alveolar macrophages and neutrophils, lysozyme synthesis and improved rheological properties of bronchial secretion.
Adolescent;Adult;Bronchoalveolar Lavage Fluid;Bronchoscopy;Humans;Laser Therapy;Lung;Middle Aged;Pneumonia;Radiotherapy Dosage

Typical and atypical bronchial carcinoids. From January 1955 to April 1987 111 patients with bronchial carcinoid were operated on in our department. There were 62 males and 49 females with a mean age of 45.5 years. Preoperative histological diagnosis was achieved in 22 cases, while in five patients, a false positive diagnosis of small cell lung cancer was reported. Fifteen patients required pneumonectomy, 70 had lobectomy, 16 bilobectomy, and four segmentectomy. One patient required tracheal resection, while in another patient the tumour was removed through bronchotomy. Four patients were completely treated with YAG laser phototherapy. There were three postoperative deaths. The following variables were analysed and discussed in order to evaluate their influence on prognosis: (1) size of the tumour, (2) typical or atypical appearance, (3) endoluminal or extraluminal growth, (4) vascular invasion, (5) node metastases. Atypical onset, node metastases and extraluminal invasion are significant factors in worsening the prognosis.
Adolescent;Adult;Aged;Bronchial Neoplasms;Carcinoid Tumor;Child;Female;Humans;Lung;Male;Middle Aged;Prognosis;Retrospective Studies

[The effectiveness of GaA1As semiconductor laser treatment to pain decrease after irradiation]. Recently, sedative and antiphlogistic treatment is conducted with low energy laser irradiation. The purpose of the this study was to evaluate the effectiveness to decrease of pain just after irradiation by a GaA1As semiconductor laser. The irradiation apparatus was SEMI LASER NANOX (LX-800: G-C. Co.) with the following features: a wave length of (around) 780nm: the laser energy, 30mW; exposure time, 30sec to 180sec/per treatment. Diagnosis of pre- and post-operative sensitivity were classified into the following four grades: Grade 0 no pain. Grade I mild pain. Grade II strong but tolerable pain. Grade III intolerable pain (simultaneous with stimulation). The results were as follows: 1. In the hypersensitivity of dentin, the treatment was not effective with 2 cases of grade III, but with all of grade I, II (35 cases) the pain decreased just after irradiation. 2. It was effective in all cases with pain like periodontitis after root canal filling and pain after extraction of teeth. 3. It was effective in all cases with gingivitis, stomatitis, and gingival ulcers after infiltration anesthesia etc..
Adolescent;Adult;Dentin Sensitivity;Facial Pain;Female;Humans;Laser Therapy;Male;Pain, Postoperative;Tooth Extraction

New biological phenomena associated with laser radiation. Low-energy laser irradiation produces significant bioeffects. These effects are manifested in biochemical, physiological and proliferative phenomena in various enzymes, cells, tissues, organs and organisms. Examples are given of the effect of He-Ne laser irradiation in preventing the post-traumatic degeneration of peripheral nerves and the postponement of degeneration of the central nervous system. The damage produced by similar radiant exposures to the corneal epithelium and endothelium is also described. It is suggested that the mechanism of laser/tissue interaction at these low levels of radiant exposure is

photochemical in nature, explaining most of the characteristics of these effects. These low-energy laser bioeffects are of importance on a basic scientific level, from a laser safety aspect and as a medical therapeutic modality. Animals;Humans;Laser Therapy;Nerve Regeneration;Photic Stimulation;Wound Healing

[Combined treatment of endoscopic laser irradiation and radiotherapy in lung cancer]. Sixty-six patients with lung cancer were treated with endoscopic laser irradiation. In this study, photodynamic laser therapy (PDT) was performed on 28 patients with early lung cancer and 38 patients with advance lung cancer having 69 biopsy-proven malignant lesions of the trachea and bronchus. The patients were administered HpD (2. 5 mg/kg of their weight) injected intravenously three days prior to HpD-mediated laser phototherapy. These patients have completed at least one course of this therapy which was carried out by flexible bronchofiberscope. The laser beam was delivered through an optical fiber connected to the output of a dye laser (630 +/- 3 nm). The optical fiber was passed through the large inside channel of the flexible bronchofiberscope. Among the 69 malignant lesions of the trachea and bronchus, complete responses were obtained in 9 malignant lesions, partial responses in 44 cases, regressions in 13 cases, and the remaining 3 cases had progressions. Of the 66 patients, 19 patients are alive with no recurrence or metastasis, while the remaining 47 patients died after photodynamic laser therapy. The patients treated with photodynamic laser therapy (PDT) had unresectable lung cancer which was observable by bronchofiberscopy but not suitable for radical treatment either by chemotherapy or radiation therapy. We studied a selection of patients with unresectable lung cancer for application of a treatment combining endoscopic laser irradiation and radiotherapy. Hematoporphyrins;Radiation-Sensitizing Agents;Hematoporphyrin Derivative Aged;Aged, 80 and over;Bronchoscopy;Combined Modality Therapy;Evaluation Studies as Topic;Hematoporphyrin Derivative;Hematoporphyrin Photoradiation;Hematoporphyrins;Humans;Laser Therapy;Lung Neoplasms;Male;Middle Aged;Photochemotherapy;Prognosis;Radiation-Sensitizing Agents;Remission Induction

[Effect of low-energy laser irradiation on the functional state of the acoustic analyzer (experimental study)]. The acoustic function of guinea-pigs (in terms of ERA) before and after middle ear laser treatment (LHe-75, radiation intensity 15-17 mW, total dose 63 J/cm2, number of exposures 14) was investigated. The experiment was carried out using three groups of animals. Group 1 included healthy young animals. Group 2 consisted of adult animals with no signs of otitis media suppurativa. Group 3 involved adult guinea-pigs with chronic suppurative otitis media. After laser treatment all the animals showed increase of amplitudes of all ERA peaks, specifically of the first peak, an increase of the A1/A4 ratio, and an insignificant shortening of L1 at low sound intensities in group 1 and group 2 animals. This may suggest a greater excitation of the first component of the acoustic system. The group 3 animals exhibited a greater L1; this indicates that laser therapy of an untreated cavity during chronic otitis media may aggravate the pathological process. This pathology requires pretreatment of the middle ear cavity and laser therapy in combination with other therapeutic measures. None of the treated animals showed changes of the second time interval, whereas the third time interval (central time of conduction) became shorter, particularly on the side exposed to laser treatment. Our findings demonstrated differences in responses of adult and young animals to laser treatment (distinct shortening of the central time of conduction in those latter) which obviously needs further study. Animals;Auditory Threshold;Chronic Disease;Evoked Potentials, Auditory;Guinea Pigs;Laser Therapy;Otitis Media;Otitis Media, Suppurative

[Experiences with low-power laser therapy in internal medicine geriatrics]. The use of low power laser therapy in 30 in-patients aged from 72 to 86 years suffering from diseases of the movement apparatus resistant to treatment and from chronic peripheral and cerebral circulation disorders based on arteriosclerosis is proofed as efficient, riskless physicaltherapy method to improve the complaints

and to economize with medicamentation. Aged;Aged, 80 and over;Arteriosclerosis;Arthritis;Cerebrovascular Disorders;Chronic Disease;Diabetic Angiopathies;Humans;Laser Therapy;Osteoarthritis;Paralysis;Parkinson Disease

Temporal parameters of low energy laser irradiation for optimal delay of post-traumatic degeneration of rat optic nerve. Compression injury of a central nerve results in its degeneration with irreversible loss of function due to the inability of the mammalian central nervous system (CNS) to regenerate. In contrast, the CNS of lower vertebrates has a high capacity to regenerate. Recently, low energy laser irradiation was shown to attenuate degeneration in injured CNS nerves. The optic nerves of rats were subjected to moderate crush, calibrated so that some electrophysiological activity was preserved. The nerves were then subjected to low energy laser irradiation (10.5 mW, 2 min daily) for various periods. The electrical activity of the nerves, distal to the site of injury, was determined by measuring the compound action potential at the termination of the experiment. Two weeks of irradiation begun immediately after injury and continued daily thereafter, resulted in a compound action potential which was significantly higher (mean +/- S.E.M. 1856 +/- 535 microV) than that of non-irradiated injured nerves (351 +/- 120 microV). The effect was temporary and subsided within a week. This two-week irradiation was slightly more effective than a treatment lasting one week (1406 +/- 225 microV) and was significantly more effective than 4 days of irradiation (960 +/- 133 microV). The number of treatments is therefore important. The time at which the treatment commences relative to the injury is also critical. Irradiation initiated two hours after the crush was about half as effective as immediate irradiation (810 +/- 42 microV). No apparent effect was evident when the laser was applied for the first time 5 h, or longer, after the crush.(ABSTRACT TRUNCATED AT 250 WORDS) Animals;Laser Therapy;Lasers;Male;Nerve Crush;Nerve Degeneration;Optic Nerve Diseases;Rats;Rats, Inbred Strains;Time Factors

Effect of low-energy laser irradiation on colony formation capability in different human tumor cells in vitro. Fibroblasts and lymphocytes are the most widely used cells for studying the so-called biostimulative effect of low-power laser in vitro. In contrast, stimulation of cancer cells by laser light has not been investigated extensively. The present study attempted to evaluate whether or not human tumor cells could exhibit an increase in colony-forming capability following low-watt laser irradiation. LoVo and HT29 (colon carcinoma), MCF7 (breast carcinoma), M14 and JR1 (malignant melanoma) cell lines were irradiated at different doses of light delivered from an argon or an argon-dye laser. Radiant exposures between 4.2 and 150 kJ/m2 at irradiances ranging from 35 to 500 W/m2 were delivered. Results were mixed. Of the 41 experiments performed, five showed a significant statistical increase in the number of colonies (P less than 0.05), whereas three showed a decrease (P less than 0.05). Nevertheless, the trend of most data was toward an increase in colony formation, and Wilcoxon's signed-ranks test suggested that light increases tumor cell culture growth (P less than 0.03). Breast Neoplasms;Cell Division;Colonic Neoplasms;Colony-Forming Units Assay;Humans;In Vitro Techniques;Lasers;Melanoma;Tumor Cells, Cultured;Tumor Stem Cell Assay

[Functional changes caused by low-intensity laser irradiation on the child's body]. Blood Circulation;Child;Humans;Laser Therapy;Nervous System;Respiration;Respiratory Tract Diseases

[Late results of transscleral hypotensive low-energy laser therapy of glaucoma]. The paper discusses remote observations (within 5 years) over 64 patients (94 eyes) with open-angle glaucoma after transscleral hypotensive low-energy laser therapy. Before treatment, intraocular pressure was moderately increased in 63 eyes (67%), high--in 31 (33%). In 27 eyes with minimum, moderately expressed dystrophic changes in the anterior segment of the eye, a course of transscleral hypotensive low-energy laser therapy, 1-2 sessions, resulted in normalization of intraocular pressure and improvement of hydrodynamics, remaining stable within the whole period of observation. In 49 eyes

with moderately expressed dystrophic changes in the anterior segment of the eye, a course of 3-5 sessions brought about normalization of intraocular pressure, remaining stable within 6-12 months, on the average. In 18 eyes with strongly expressed dystrophic changes in the anterior segment of the eye, a partial hypotensive effect was achieved and the patients were operated a month later. In patients with a normalized intraocular pressure, stabilization of visual functions (visual acuity and visual field) within the whole period of observation is also recorded. Follow-Up Studies;Glaucoma, Open-Angle;Humans;Intraocular Pressure;Laser Therapy;Middle Aged;Visual Acuity;Visual Fields

[Effects of low-energy laser irradiation on platelet aggregation in cerebrovascular disorders]. Cerebrovascular Disorders;Female;Humans;Laser Therapy;Male;Middle Aged;Platelet Aggregation

[Treatment of nonspecific endobronchitis with low-intensity laser irradiation (experimental study)]. Results of endobronchial treatment of experimental purulent endobronchitis (PE) in dogs with low intensity He-Ne laser are presented. The endobronchial use of the laser energy in treatment of PE was shown expedient and valid. Comparison of the visual endoscopic picture with the findings of the histochemical and electron microscopic examination of the bronchial mucosa bioptates in the time course of the treatment provided establishment of the optimal regimen for the treatment of nonspecific PE with He-Ne laser. Animals;Bronchi;Bronchitis;Dogs;Laser Therapy;Radiotherapy Dosage

Systemic effects of low-power laser irradiation on the peripheral and central nervous system, cutaneous wounds, and burns. In this paper, we direct attention to the systemic effect of low-power helium-neon (HeNe) laser irradiation on the recovery of the injured peripheral and central nervous system, as well as healing of cutaneous wounds and burns. Laser irradiation on only the right side in bilaterally inflicted cutaneous wounds enhanced recovery in both sides compared to the nonirradiated control group (P less than .01). Similar results were obtained in bilateral burns: irradiating one of the burned sites also caused accelerated healing in the nonirradiated site (P less than .01). However, in the nonirradiated control group, all rats suffered advanced necrosis of the feet and bilateral gangrene. Low-power HeNe laser irradiation applied to a crushed injured sciatic nerve in the right leg in a bilaterally inflicted crush injury, significantly increased the compound action potential in the left nonirradiated leg as well. The statistical analysis shows a highly significant difference between the laser-treated group and the control nonirradiated group (P less than .001). Finally, the systemic effect was found in the spinal cord segments corresponding to the crushed sciatic nerves. The bilateral retrograde degeneration of the motor neurons of the spinal cord expected after the bilateral crush injury of the peripheral nerves was greatly reduced in the laser treated group. The systemic effects reported here are relevant in terms of the clinical application of low-power laser irradiation as well as for basic research into the possible mechanisms involved. Animals;Burns;Laser Therapy;Nerve Crush;Nerve Regeneration;Rats;Sciatic Nerve;Skin;Spinal Cord;Wound Healing

Low power laser therapy of shoulder tendonitis. 30 patients with supraspinatus or bicipital tendonitis were randomly allocated to active infrared laser therapy at 904 nm three times weekly for 2 weeks, dummy laser or drug treatment for 2 weeks. Objectively maximum active extension, flexion and abduction of the shoulder, and subjectively pain stiffness movement and function were measured at 0 and 2 weeks. Significant improvement of active over dummy laser was noted for all seven assessments. Active laser therapy produced significant improvement over drug therapy for all three objective measures and pain. Naproxen sodium significantly improved only movement and function compared to dummy laser. These results demonstrate the effectiveness of laser therapy in tendonitis of the shoulder. Naproxen Adolescent;Adult;Aged;Female;Humans;Laser

Therapy;Male;Middle Aged;Naproxen;Radiotherapy Dosage;Randomized Controlled Trials as Topic;Shoulder Joint;Tendinopathy
Low-energy laser therapy: controversies and new research findings. Animals;Arthritis, Rheumatoid;Humans;Laser Therapy;Neural Conduction;Wound Healing
Effects of Nd: YAG low power laser irradiation on the ulnar nerve. In our previous study, we have shown that low power laser irradiation of the stellate ganglion produces a rise in temperature in the bilateral facial skin. To clarify the mechanism behind this phenomenon, irradiation was performed on the ulnar nerve at the elbow joint. The sensation felt during irradiation was reported by the subjects. Changes in temperature of the hand dorsum were thermographically recorded. The evoked peripheral autonomic surface potentials (PASP) were also recorded. 77.3% of the subjects reported sensation changes in the hand; the temperature rose in both hands in 3 out of 5 subjects. The PASPs did not show marked changes in latency or amplitude. It is suggested that the effects of the irradiation are brought about mainly through the stimulation of the central nervous system. Action Potentials;Adult;Autonomic Nervous System;Female;Hot Temperature;Humans;Lasers;Male;Thermography;Ulnar Nerve
[A severe complication following laser phototherapy of bladder carcinoma]. Aged;Aged, 80 and over;Biopsy;Carcinoma, Transitional Cell;Follow-Up Studies;Humans;Laser Therapy;Light Coagulation;Male;Postoperative Complications;Reoperation;Urinary Bladder;Urinary Bladder Neoplasms;Wounds, Penetrating
Arterial oxygen saturation during Nd:YAG laser photoresection of endobronchial tumors under local anesthesia. Use of intermittent supplemental oxygen with pulse oximetry guidance. Although Nd:YAG laser photoresection of endobronchial lung tumor can result in significant arterial oxygen desaturation, oxygen supplementation during procedures is often limited due to fear of intrabronchial combustion. We gave intermittent pulse supplemental oxygen to ten patients during 26 laser procedures performed under local anesthesia using SaO2 measured by a pulse oximeter as a guide. In four procedures (15.4 percent), severe oxygen desaturation contraindicated performing or completing laser phototherapy. In the remaining 22 procedures (84.6 percent), laser photoresection was safely and successfully performed without incident. Thus, pulse oximetry is a valuable tool and intermittent oxygen supplementation with pulse oximeter guidance an effective technique for maintaining adequate oxygenation during laser photoresection. Oxygen Adult;Aged;Aged, 80 and over;Anesthesia, Local;Bronchial Neoplasms;Bronchoscopy;Female;Humans;Laser Therapy;Male;Middle Aged;Monitoring, Physiologic;Oximetry;Oxygen;Oxygen Inhalation Therapy
Irradiation effect of low-energy laser on alveolar bone after tooth extraction. Experimental study in rats. A histopathological study of the initial healing of extraction wounds following low-energy laser irradiation, using a gallium-arsenide semi-conductor laser, was carried out in rats. The results suggest that this mode of treatment has a beneficial effect on initial bony wound healing. It was found that proliferation of fibroblasts was more prominent in the irradiated group, and so was the formation of trabecular osteoid tissue. The deposition of lead in the newly formed bone suggests a more rapid ossification in the irradiated group. Alveolar Process;Animals;Laser Therapy;Male;Rats;Rats, Inbred Strains;Tooth Extraction;Wound Healing
[Use of low-intensity laser irradiation in surgery (review of the literature)]. Burns;Digestive System Diseases;Humans;Laser Therapy;Lasers;Wound Healing;Wound Infection
[Effect of low-power laser irradiation to rat mandibular condylar cartilage during bite raising]. Animals;Cartilage, Articular;Laser Therapy;Male;Mandibular Condyle;Orthodontics, Corrective;Pain;Rats;Rats, Inbred Strains;Splints
[Laser biostimulation therapy in cardiology]. Helium;Neon Acupuncture Therapy;Cardiovascular Diseases;Helium;Humans;Laser Therapy;Neon;Photic Stimulation

[Calcium channels of neurons and mechanism of action of low intensity 337 nm laser irradiation]. The effect of low intensity laser irradiation upon calcium current of Helix neurons was studied by means of intracellular dialysis technique under voltage clamp conditions. It was found that irradiation with the rate dose 0.4 J/cm2 decreased calcium currents irreversibly without changing the channels voltage-dependence. The molecule of carotenoid is assumed to be the photosensitive gating particle of the calcium channel. Calcium Channels Action Potentials;Animals;Calcium Channels;Helix, Snails;In Vitro Techniques;Lasers;Neurons

[Use of low-intensity laser irradiation after rhinosurgical interventions]. Adolescent;Adult;Aged;Child;Female;Humans;Laser Therapy;Male;Middle Aged;Nose Diseases;Postoperative Complications;Rhinitis, Atrophic

Irradiation effect of low-energy laser on rat submandibular salivary gland. Histopathological studies of rat submandibular salivary glands following low-energy laser irradiation using gallium-arsenide semi-conductor laser were conducted. The mitoses of duct epithelial cells without atypia increased between 1 and 24 h after irradiation, reaching a maximum of greater than 5 times control values by 24 h. Mitoses of duct epithelial cells had a tendency to be more frequent in granular ducts, less in striated ducts, and still less in intercalated ducts. Qualitative differences in the effect of low-energy lasers on salivary gland epithelia were also noted. This is the first experimental study of the effect of low-energy laser on salivary glands. Animals;Epithelial Cells;Epithelium;Lasers;Male;Mitosis;Organ Size;Rats;Rats, Inbred Strains;Submandibular Gland

Laser biostimulation of healing wounds: specific effects and mechanisms of action. The purpose of this article was to synthesize the scientific knowledge relevant to laser biostimulation of healing wounds. The literature reviewed suggests that biostimulation with lasers: 1) accelerates the inflammatory phase of wound healing by altering the levels of various prostaglandins, 2) increases ATP synthesis by enhancing electron transfer in the inner membrane of mitochondria, 3) quickens protein (collagen) synthesis by quickening DNA and RNA synthesis, 4) augments fibroplasia by a mechanism that is still being explored, and 5) enhances the ability of immune cells to combat invading pathogens. Although these findings were made in vitro and in vivo in various animal models, their clinical implications are quite clear. Laser biostimulation is potentially a useful tool in the treatment of wounds, particularly those cutaneous and subcutaneous wounds that are either complicated by infection or inherently require a prolonged period of time to heal. The precise dosage and frequency of treatment required to promote healing even in animal models remain elusive, as is experimental determination of the depth of penetration of lasers.J Ortho Sports Phys Ther 1988;9(10):333-338.

[Effect of low-intensity laser irradiation together with photosensitizers on the skin in experimental animals]. Lipid Peroxides;Quaternary Ammonium Compounds;Histidine Ammonia-Lyase;brilliant green Animals;Histidine Ammonia-Lyase;Lasers;Lipid Peroxides;Mice;Photochemotherapy;Quaternary Ammonium Compounds;Skin

[Structural and functional changes in spinal cord neurons following low-intensity laser irradiation]. In acute experiments with cats the dynamics of changes in the evoked activity of spinal neurons was determined during low-intensity laser irradiation of the cord. With histological preparations, in conditions of automatic processing of the morphometrical information, the data were obtained indicating the decrease in the post-impulse synaptic depression accompanied by the intensification of the nuclear plasmic exchange of the exposed neurons. Animals;Cats;Evoked Potentials;Female;Lasers;Male;Motor Neurons;Spinal Cord

Low power laser irradiation does not affect the generation of signals in a sensory receptor. The effect of low power Helium-Neon (He-Ne) and Gallium-Arsenide (Ga-As) laser on the slowly adapting crustacean stretch receptor was studied. The results showed that low power laser irradiation did not

affect the membrane potential of the stretch receptor. These results are discussed in relation to the use of low power laser irradiation on the skin overlaying acupuncture points in treatment of pain syndrome. Acupuncture Therapy;Animals;Astacoidea;In Vitro Techniques;Lasers;Mechanoreceptors;Membrane Potentials

The use of low energy laser therapy to treat aphthous ulcers. Humans;Laser Therapy;Stomatitis, Aphthous

New methods of treatment of severely injured sciatic nerve and spinal cord. An experimental study. It has been demonstrated that low-energy laser irradiation (LELI) applied simultaneously to the injured sciatic nerve and the corresponding segment of the spinal cord, accelerates the process of regeneration of the injured peripheral nerve. A beneficial influence of LELI was also observed when it was applied to the spinal cord following transection and implantation of a segment of an autologous sciatic nerve, but further studies are necessary to evaluate if real regeneration or only earlier distal cord automatism occurred. Both methods are proposed for treatment of peripheral nerve lesions (PNS) and spinal cord injuries. Action Potentials;Animals;Dogs;Laser Therapy;Nerve Crush;Rats;Rats, Inbred Strains;Sciatic Nerve;Spinal Cord Injuries

The in-vivo-nerve response to direct low-energy-laser irradiation. To study the in-vivo effects of direct Low-Energy Laser Irradiation (LELI) on the Peripheral Nervous System, the sciatic nerve in rats was surgically exposed, crushed and then subjected to the direct irradiation of either of two continuous-wave HeNe lasers--0.3 mW or 17 mW. We found that the 0.3 mW laser significantly boosts the electrical activity in both the injured and non-injured nerves. The temperature changes of the nerve were measured during irradiation, and no thermal effect was detected. These findings could have direct therapeutic applications in various surgical situations. Animals;Lasers;Peripheral Nerves;Rats;Rats, Inbred Strains;Sciatic Nerve

Serratia marcescens infected silk suture rejected by combined acupuncture, moxibustion and low-power laser therapy from the abdominal fascia. Upper abdominal pains lasting 12 years after cholecystectomy, were improved in an 82-year-old woman following the rejection of indigestable silk surgical sutures induced by combined therapy of acupuncture, moxibustion and low-power laser beam irradiation directed to an old post-cholecystectomy scar. An inflammatory reaction followed by granulation tissue mass was developed. Embedded in the granulation tissue were the above mentioned silk sutures which finally were expelled through the skin at the operation scar. A surgical procedure suggested to the patient, in case of acupuncture therapy failure, was obviously avoided. Serratia-marcescens infection of the expelled material was bacteriologically defined. Abdomen;Acupuncture Therapy;Aged;Aged, 80 and over;Enterobacteriaceae Infections;Female;Foreign-Body Reaction;Humans;Laser Therapy;Moxibustion;Postoperative Complications;Serratia marcescens;Sutures

Effect of low power laser irradiation on nociceptive cells in Hirudo medicinalis. The effect of low power Helium-Neon (He-Ne) and Gallium-Arsenide (Ga-As) laser on the nociceptors in Hirudo medicinalis was studied. The results show that low power laser irradiation does not: affect the membrane potential or the excitability of the nociceptive neurons, affect the mechanical pressure required to activate the nociceptors or their action potentials. The results indicate that the analgesic effects reported in humans with "laser-acupuncture" with similar modes of low power laser are likely not explained by effects on nervous tissue. Arsenicals;Helium;gallium arsenide;Neon;Gallium;Arsenic Action Potentials;Animals;Arsenic;Arsenicals;Gallium;Ganglia;Helium;Lasers;Leeches;Membrane Potentials;Neon;Nociceptors

Rhodamine 123 as a chemosensitizing agent for argon laser therapy. A new technique for treatment of superficial malignancies. Rhodamine 123 (Rh 123), a mitochondrial-specific dye with an

absorption maxima at 511 nm, was tested as a new chemosensitizing agent for argon laser treatment of P3 human squamous carcinoma cells. After exposure of P3 cells in vitro to Rh 123 at doses of 1, 3, 6, and 10 micrograms/mL for one hour, we observed significant inhibition of DNA synthesis, except at the lowest dose. Rhodamine 123 at 1 microgram/mL was selected to sensitize P3 tumor cells for treatment with the monochromatic argon laser at 514.5 nm. Exposure of P3 cells to laser energy levels of 700 to 950 J/cm2 (36 degrees C to 40 degrees C) after sensitization with Rh 123 completely inhibited tumor development of the P3 cells transplanted subcutaneously into nude mice. Control P3 cells treated with the laser alone at 36 degrees C to 40 degrees C or only with Rh 123 formed visible tumors by one week and continued to grow for the entire-week observation period. These results show that Rh 123 is a highly sensitive new fluorochrome for argon laser phototherapy of human squamous carcinoma cells. Antineoplastic Agents;DNA, Neoplasm;Fluorescent Dyes;Rhodamines;Xanthenes;Rhodamine 123 Animals;Antineoplastic Agents;Carcinoma, Squamous Cell;Cell Survival;DNA, Neoplasm;Fluorescent Dyes;Head and Neck Neoplasms;Humans;Laser Therapy;Mice;Mice, Nude;Photochemotherapy;Rhodamine 123;Rhodamines;Xanthenes

Palliative endoscopic management of obstructive esophagogastric cancer: laser or prosthesis? One hundred forty-four patients with unresectable malignant strictures of the upper digestive tract were managed by palliative endoscopic methods: 116 by intubation and 28 by YAG laser phototherapy. The success rate was 95% for intubation and 100% for laser. The morbidity rate was 13.8% for intubation (perforation 7.8%, bleeding 3.4%, and aspiration pneumonia 2.2%) and 3.6% (one perforation) for laser. The mortality rate was 4.3% for intubation and 0% for laser. Specific indications for intubation were esobronchial fistulas, extensive strictures, and very long stenotic lesions. Very high cervical strictures and nonocclusive asymmetrical tumors were better treated with laser. In select cases, combined therapy can be useful. We conclude that both methods are highly efficient in restoring patency and relieving dysphagia. Further large scale randomized trials are necessary to compare functional results and survival rate. Aged;Aged, 80 and over;Esophageal Neoplasms;Esophagoscopy;Female;Gastroscopy;Humans;Intubation;Laser Therapy;Lasers;Male;Middle Aged;Palliative Care;Prostheses and Implants;Retrospective Studies;Stomach Neoplasms

[Clinical application of low-intensity lasers. 2. Acceleration of wound healing by low-intensity laser irradiation]. Adult;Aged;Aged, 80 and over;Animals;Female;Guinea Pigs;Humans;Laser Therapy;Male;Skin Ulcer;Wound Healing

[Use of low-intensity laser irradiation in the treatment of suppurative wounds]. The article presents results of treatment of 372 patients with purulent wounds. In 187 patients a helium-cadmium laser was used (main group); in 185 patients (control group) other methods were used. The comparison of terms of cleansing the wounds from pyo-necrotic masses, appearance of granulations, epithelization++ and terms of wound healing and periods of staying at the hospital has shown high efficiency of the helium-cadmium laser for the treatment of purulent wounds. The average period at the hospital was 13.1 days, 66.8% of the patients were discharged after the complete healing of the wounds. Adolescent;Adult;Aged;Humans;Laser Therapy;Middle Aged;Postoperative Care;Preoperative Care;Wound Healing;Wound Infection

[Stimulation of wound healing after tooth extraction using low-intensity laser therapy]. Adolescent;Adult;Age Factors;Aged;Child;Female;Humans;Lasers;Male;Middle Aged;Oral Hygiene;Sex Factors;Tooth Extraction;Wound Healing

[Comparative analysis of the effect of pulsed and continuous low-intensity laser irradiation on the regeneration of irradiated skeletal muscle]. Animals;Laser Therapy;Male;Muscle Contraction;Muscles;Radiation Injuries, Experimental;Rats;Regeneration;Transplantation, Autologous

[The effect of low-intensity laser irradiation on non-stationary metabolic processes in Escherichia coli cells]. Escherichia coli;Lasers;Oxygen Consumption;Photochemistry

Argon laser phototherapy of phthiriasis palpebrarum. Argon laser phototherapy is an alternative new, quick, and effective method of treating phthiriasis palpebrarum in one sitting. A beam at a setting of 200-microns size, 0.1 second time, and 200 mW power is employed to destroy individual adult parasites and nits. The only drawbacks are an occasional but tolerable stinging and the slicing of the eyelash stems carrying the nit. The eyelashes regain their normal length within a few days. Argon Adult;Argon;Eyelashes;Eyelid Diseases;Humans;Laser Therapy;Lice Infestations;Male;Phototherapy;Phthiraptera

Laser ablation and palliation in colorectal malignancy. Results of a multicenter inquiry. The role of laser photocoagulation in the palliative treatment of gastrointestinal tumors was investigated in a multicenter inquiry involving seven laser centers and 181 patients. Patients with colorectal malignancies were divided into three groups: those referred for palliation of obstruction (N = 60), those referred for bleeding (N = 81), and those referred for obstruction and bleeding (N = 40). Good palliation was obtained in 89%, with a complication rate of 9.4% and a laser-related mortality of 1.1%. Tumor response, complication rate, mortality, and duration of survival were less favorable in the group with obstructing tumors when compared to those with bleeding or with bleeding and obstruction. Laser phototherapy should play a role as an alternative to surgery in selected patients with bleeding and/or obstructing colorectal cancer. Adult;Aged;Colonic Neoplasms;Gastrointestinal Hemorrhage;Humans;Intestinal Obstruction;Laser Therapy;Middle Aged;Palliative Care;Rectal Neoplasms

[Use of intracavitary low-energy laser therapy in the complex treatment of inflammatory diseases of the sphenoid sinus]. Adolescent;Adult;Aged;Female;Humans;Laser Therapy;Male;Middle Aged;Sinusitis;Sphenoid Sinus

Laser photocoagulation of vascular malformations of the tongue. Vascular malformations of the tongue (hemangiomas, lymphangiomas, AV fistulae, etc.) compromise a significant portion of head and neck angiodysplastic lesions. Complications requiring treatment include bleeding, pain, and difficulties related to increased tongue volume. Treatment modalities have included embolization, excision, cryotherapy, sclerosis, radiation, and chemotherapy. The more aggressive therapies often result in major functional disability to loss of lingual tissue. A series of nine patients has been treated for one or more of the complications of lingual vascular malformations with either argon of Nd:YAG laser photocoagulation. The therapeutic objective was provision of symptomatic relief with conservation of functioning lingual tissue. Results have varied from good to excellent with markedly decreased bleeding frequency as well as reduction in lesion size. No serious complications, such as bleeding or invasive infection, have been noted. Laser phototherapy is beneficial in the palliation of selected benign lingual vascular malformations. Argon Adolescent;Adult;Argon;Child;Child, Preschool;Evaluation Studies as Topic;Female;Follow-Up Studies;Hemangioma;Hemangioma, Cavernous;Humans;Infant;Laser Therapy;Lasers;Lymphangioma;Male;Middle Aged;Tongue Neoplasms

[Principles of low-intensity laser therapy based on biophotometry]. Helium;Neon Equipment and Supplies;Helium;Humans;Laser Therapy;Mathematics;Neon;Photometry;Radiotherapy Dosage

[Modification of the damaging effect of alpha-particles on Escherichia coli K-12 by low-intensity laser irradiation]. A study was made of the combined effect of laser (helium-neon laser, lambda = 633 nm) and alpha-radiation on survival of Escherichia coli K-12 cells of different genotypes. Pre- and post-irradiation exposures to laser-radiation diminished the damaging effect of alpha-particles. In the

latter case, modification of survival was more pronounced. Alpha Particles;Escherichia coli;Lasers;Mutation;Radiation Tolerance
[Use of low-energy laser irradiation for the local treatment of chronic gastroduodenal ulcers]. Adolescent;Adult;Aged;Chronic Disease;Female;Humans;Laser Therapy;Male;Middle Aged;Peptic Ulcer;Wound Healing
Further studies on the effect of low-dose laser irradiation on cultured retinal pigment cells of the chick. The effect of low-intensity laser irradiation on pigment cells cultured by chorioallantoic method was studied. Laser irradiation influenced the cell shapes and sizes of the pigment cells. Metabolically, this treatment increased thymidine uptake and incorporation but reduced those of leucine. The phagocytic activity as measured by latex particles uptake was not affected. It was concluded that the biological effect of laser irradiation on cell cultures depends on the dose applied, the individual tissue and other factors. Leucine;Thymidine Animals;Animals, Newborn;Cells, Cultured;Chickens;Lasers;Leucine;Microscopy, Electron, Scanning;Mitotic Index;Phagocytosis;Pigment Epithelium of Eye;Radiation Dosage;Thymidine
HeNe laser irradiation delivered transcutaneously: its effect on the sciatic nerve of rats. For our study of the effect of low energy laser irradiation (LELI) on living tissue we used HeNe laser on rats. The exponential absorption was reaffirmed in the living tissues overlying the sciatic nerve. An optimal range of energy between 3.5 and 7 J--associated with energy concentration of 4-10 J/cm2 delivered transcutaneously--was found to cause a significant increase in action potential in the sciatic nerve. The effect lasted for more than 8 months after the irradiation session. Helium;Neon Action Potentials;Animals;Helium;Lasers;Neon;Peripheral Nerves;Rats;Rats, Inbred Strains;Sciatic Nerve
[Low-intensity laser irradiation in the treatment of suppurative wounds]. Adolescent;Adult;Aged;Female;Humans;Laser Therapy;Male;Middle Aged;Preoperative Care;Wound Healing;Wound Infection
[Molecular mechanism of the therapeutic effect of low-intensity laser irradiation]. DNA DNA;Escherichia coli;HeLa Cells;Humans;Laser Therapy;Oxidation-Reduction
[Light-guide instruments for low-intensity laser therapy in ORL practice]. Manipulators with monofibre light-guides have been specially designed for otorhinolaryngologic instruments commonly used in routine drug therapy for intracavital treatments. Quartz enclosed in a protective polyethylene sheath is used as the monofibre light-guide with a light conductor 400 microns in diameter and 2 to 3 m in length. It can be built in the following instruments: an ear catheter, a maxillary sinus lavage cannula, a subclavian artery catheter, and a laryngeal bougie. The use of monofibres allows considerable widening the application field of the low power laser therapy in otorhinolaryngologic practice. Moreover, in compliance with human engineering requirements it managed to preserve most standard manipulations otolaryngologist makes use in the course of routine clinical practice with conventional instruments. Fiber Optic Technology;Humans;Laser Therapy;Otorhinolaryngologic Diseases
[Changes in the peripheral blood after exposure to low-energy laser irradiation (experimental data)]. Animals;Erythrocyte Count;Erythrocytes;Erythropoiesis;Lasers;Rabbits;Reticulocytes;Time Factors
[Changes in the regeneration of rhodopsin in the rabbit retina exposed to low-energy laser irradiation]. Retinal Pigments;Rhodopsin Animals;Dark Adaptation;Lasers;Pigment Epithelium of Eye;Rabbits;Retinal Pigments;Rhodopsin
[Effect of low-energy laser irradiation on the dynamics of reparative processes in a peripheral nerve]. Animals;Cats;Laser Therapy;Male;Nerve Regeneration;Sciatic Nerve;Time Factors
Endoscopic laser therapy for respiratory distress due to obstructive airway tumors. Neodymium-YAG laser therapy for unresectable malignant airway obstructions has a promising future. Nine

patients with moderate to severe respiratory distress all experienced rapid relief of dyspnea and substantial improvement in pulmonary function within hours to days after treatment with laser phototherapy. The quality of life and survival was improved in otherwise hopeless cases. A nonfatal case of pneumothorax was the only major complication. Adult;Aged;Airway Obstruction;Carcinoma;Endoscopy;Female;Forced Expiratory Volume;Humans;Laser Therapy;Male;Maximal Expiratory Flow Rate;Middle Aged;Prognosis;Prospective Studies;Quality of Life;Respiratory Insufficiency;Tracheal Neoplasms;Vital Capacity

Laser-induced shape distortions of flowing droplets deduced from morphology-dependent resonances in fluorescence spectra. Low-energy laser irradiation (~0.15 microJ) on a Rhodamine 6G ethanol droplet (radius, 21.1 microm) flowing in a linear stream has been shown to induce damped oscillations in the wavelengths at which the morphology-dependent resonances (MDR's) in the fluorescence are located. Such oscillatory behavior of the MDR's is consistent with those calculated for the elastic scattering from a large sphere that oscillates with small amplitudes (5 parts in 10(4)) from a sphere to a prolate spheroid and then to an oblate spheroid. The observed damped oscillations provide information on the surface tension and viscosity of an ethanol droplet.

Laser therapy in 100 tracheobronchial tumours. One hundred patients with tracheobronchial tumours were treated with the neodymium YAG (yttrium-aluminium-garnet) or argon laser for symptoms of airways obstruction caused by tumour (59 cases), complete collapse of a lung (17 cases), or recurrent haemoptysis (24 cases). Seventy four of them had relapsed or failed to respond to radiotherapy or chemotherapy and all were inoperable. Objective improvement in results of lung function tests or haemoptysis diary charts was seen in 37 patients with airways obstruction (63%), five (29%) with collapsed lung, and 14 (58%) with haemoptysis. Overall, 68 patients had symptomatic benefit and there was objective improvement in 56. Two deaths occurred in 288 treatment sessions both occurring as a result of asphyxia from minor haemorrhage in patients with advanced cylindromas and critical narrowing of the trachea or single remaining bronchus. In suitable patients with intraluminal tumour laser phototherapy is a valuable addition to conventional treatment. Adult;Aged;Airway Obstruction;Bronchial Neoplasms;Female;Hemoptysis;Humans;Laser Therapy;Lasers;Male;Middle Aged;Tracheal Neoplasms

Lasers in cardiovascular surgery--current status. The argon, carbon dioxide and neodymium-YAG lasers have been proposed as effective instruments for surgical procedures of the intact cardiovascular system. While argon and CO(2) lasers cause superficial (0 to 1 mm) thermal injury, the Nd:YAG laser is better suited for effecting deep thermal necrosis (3 to 4 mm). Microsurgical vessel anastomoses can be done by "tissue welding" with any of the three clinical lasers. Myocardial revascularization may be accomplished by drilling "neocapillaries" in ischemic myocardium. Endocardial resection for destroying arrhythmic pathways and removing hypertrophied septal muscle has also been successfully accomplished with laser phototherapy. Last, laser-mediated vaporization of atherosclerotic plaque in the coronary arteries and peripheral circulation may offer a percutaneous approach to the treatment of arterial occlusive disease. Cardiovascular uses of lasers are purely investigational at the current time. Much more needs to be known before widespread clinical use of lasers in the cardiovascular system can occur. Angioplasty, Balloon;Animals;Arteriosclerosis;Cardiac Surgical Procedures;Cardiovascular Diseases;Endoscopy;Humans;Laser Therapy;Methods;Microsurgery;Myocardial Revascularization;Rats;Vascular Surgical Procedures

[Low-energy laser irradiation in the complex treatment of patients with ear diseases]. Adolescent;Adult;Child;Female;Humans;Laser Therapy;Male;Middle Aged;Otitis Externa;Stapes Surgery;Tympanoplasty;Wound Healing

Effects of low-power diode lasers on flap survival. We investigated the effect of low-power laser irradiation on the survival of experimental skin flaps in rats. A gallium-aluminum-arsenide diode laser that was developed by the Japan Medical Laser Laboratory was used. The laser power was 15 mW and the wavelength 830 nm. Irradiation was carried out, either before or after flap elevation, in two groups of 20 Wistar strain rats. A third group of 20 rats served as controls. A caudally based skin flap, 3 X 9 cm, was designed on the back of each rat. Laser irradiation therapy was performed for 5 consecutive days for 6 minutes per flap per day, preoperatively in one group and postoperatively in the other. Seven days postoperatively, the survival areas of the flaps were measured and compared. The survival area was increased significantly in both groups receiving laser therapy, probably due to the observed proliferation of blood vessels around the irradiated points and an increase in blood flow. Animals;Graft Survival;Laser Therapy;Male;Microcirculation;Rats;Rats, Inbred Strains;Skin;Surgical Flaps

Laser photoablation of pathological endocardium: in vitro findings suggesting a new approach to the surgical treatment of refractory arrhythmias and restrictive cardiomyopathy. In selected patients, malignant ventricular tachyarrhythmias have been successfully abolished by excision of subendocardial arrhythmogenic foci. Likewise, in certain patients in whom restrictive cardiomyopathy is due to endocardial thickening, endocardial resection has resulted in hemodynamic improvement. The present study was designed to explore the utility, in vitro, of laser photoablation of pathologically thickened endocardium. Endocardial photoablation was easily accomplished regardless of etiological or anatomical variations using either the focused beam of a carbon dioxide laser or argon laser light delivered through a 200-microns optical fiber. Photoablation of areas as large as 3.9 X 1.3 cm was performed within 40 seconds. The extent or depth of endocardial photoablation could be limited to 2 mm2 in area or 1 mm in depth using either form of laser therapy. These in vitro results suggest that either carbon dioxide or argon laser phototherapy can be successfully applied to the surgical treatment of refractory arrhythmias and restrictive cardiomyopathy. Advantages of laser photoablation include speed and precision. Furthermore, laser photoablation obviates the difficulty associated with conventional techniques in establishing tissue planes. Carbon Dioxide;Argon Argon;Arrhythmias, Cardiac;Carbon Dioxide;Cardiomyopathies;Endocardium;Endomyocardial Fibrosis;Humans;In Vitro Techniques;Laser Therapy

Laser-assisted debridement of aortic valve calcium. Experimental debridement of aortic valve calcium by means of laser phototherapy was investigated in vitro. Near-total debridement of calcific deposits observed on pretreatment x-ray films was accomplished using carbon-dioxide laser phototherapy. Analysis of liberated photoproducts suggests that debridement is effected by thermal degradation of the surrounding connective tissue envelope and thermal expansion of the calcific nodules. These results suggest that in selected patients with calcific aortic stenosis, it may be possible to perform intraoperative laser-assisted debridement of aortic valve calcium in order to preserve the native aortic valve and thus avoid prosthetic valve replacement. Carbon Dioxide;Argon;Calcium Aged;Aortic Valve Stenosis;Argon;Calcinosis;Calcium;Carbon Dioxide;Debridement;Female;Humans;Laser Therapy;Male

[Effect of laser irradiation on collagen production by fibroblasts in vitro]. The effects of the low power laser irradiation (Space Mix 5 Mid Laser) on the 3H-proline incorporation in the collagenic proteins produced by two lines of normal human fibroblasts in vitro were studied. The 3H-thymidine incorporation in cultures of control and irradiated fibroblasts of the same lines was also evaluated. The obtained results show that in the experimental conditions considered, laser irradiation may have a positive effect on the production of collagen by the fibroblasts in vitro. This effect is dependent on the time of exposure, the frequency of infra-red impulses and the age of subjects from which fibroblasts were obtained. The laser irradiation in the same experimental conditions does not affect

the incorporation of 3H-thymidine in the fibroblasts in vitro. Therefore, the observed increase of collagen production is not dependent on an increase of cellular population. Collagen;Proline Aged;Cells, Cultured;Collagen;Fibroblasts;Humans;Lasers;Middle Aged;Proline
Experimental laser phototherapy of the Morris 7777 hepatoma in the rat. The tumoricidal effect of the activation of hematoporphyrin derivative (HpD), by an argon-ion-dye-laser (wavelength 630 nm), was investigated in the Buffalo rat bearing subcutaneous implants of the Morris 7777 hepatoma. Tumor growth was monitored by measuring the tumor volume with constant force calipers. In control animals and those that were pretreated with HpD alone (10 or 20 mg per kg by i.p. injection) or laser light alone (2,000 J at 100 mW), a predictable exponential growth pattern of the cancer was observed. Animals were pretreated with HpD (10 mg per kg by i.p. injection) 48 hr prior to the fiberoptic, intratumor delivery of laser radiation (2,000 J at 100 mW), when the tumor had reached a volume greater than 1.5 cm3. Forty-eight hours after combined laser and HpD treatment, the hepatoma underwent coagulation necrosis, and the tumor volume rapidly increased from a mean value of 1.8 +/- 0.7 cm3 S.D. to a value of 5.8 +/- 1.5 cm3 S.D., compared with a mean of 3.7 +/- 0.7 cm3 S.D. in animals who had not received laser phototherapy. Rats treated with HpD and laser light survived longer (mean survival time 48 +/- 12 days S.D.) than did the other animals treated with the laser alone or HpD alone (mean survival time 31 +/- 16.5 S.D.). Tissue biodistribution studies with tritiated hematoporphyrin derivative, given with doses of 10 and 20 mg per kg of HpD, showed higher concentrations of the dye in the liver, kidneys and spleen than in the tumor at 48 hr after administration of the dye.(ABSTRACT TRUNCATED AT 250 WORDS) Hematoporphyrins;Radiation-Sensitizing Agents;Hematoporphyrin Derivative Animals;Hematoporphyrin Derivative;Hematoporphyrins;Laser Therapy;Liver Neoplasms, Experimental;Neoplasm Transplantation;Photochemotherapy;Radiation-Sensitizing Agents;Rats;Tissue Distribution
[Method of treatment of common warts with low-energy laser irradiation]. Adolescent;Adult;Humans;Laser Therapy;Middle Aged;Time Factors;Warts
Intragastric levarterenol prior to laser phototherapy. Norepinephrine Adolescent;Aged;Gastrointestinal Hemorrhage;Humans;Laser Therapy;Middle Aged;Norepinephrine;Therapeutic Irrigation
[Effect of low-energy laser irradiation on normal skin and tumor tissues]. Animals;Dose-Response Relationship, Radiation;Laser Therapy;Neoplasm Transplantation;Neoplasms, Experimental;Radiodermatitis;Skin;Time Factors
[Use of low-energy laser irradiation in the complex treatment of non-healing wounds of soft tissues]. Adolescent;Adult;Humans;Laser Therapy;Male;Time Factors;Wound Healing;Wounds and Injuries
Lasers in endoscopic gastrointestinal surgery. Lasers have been used for endoscopic gastrointestinal surgery at our institution since 1977. The argon and Nd-YAG lasers are valuable for coagulating upper gastrointestinal hemorrhage, arteriovenous malformations, and benign and malignant lesions, as well as a variety of anatomic anomalies. Between December 1977 and September 1983, 222 procedures were performed in 122 patients. Hospital charts were reviewed and a scale constructed to assess the results of treatment. When information was available, a comparison of transfusion requirements before and after laser therapy was made. Success was achieved in 84 percent of the patients regardless of initial diagnosis. Laser therapy was not effective in 12 patients (10 percent). In 27 patients with gastrointestinal atrioventricular malformations, transfusion requirements fell from a mean of 17 +/- 5.9 units in the year before laser therapy to 1 +/- 0.8 units in the year after laser phototherapy (p less than 0.01). Complications rarely occurred (6 percent of all procedures). There were no perforations of the gastrointestinal tract and only one death (0.8 percent) partially attributable to laser application. Endoscopic laser surgery is minimally invasive and can be performed on an outpatient basis without anesthesia. It is especially valuable in patients with

a high operative risk. Adult;Aged;Arteriovenous Malformations;Blood Transfusion;Digestive System Surgical Procedures;Endoscopy;Female;Gastrointestinal Diseases;Gastrointestinal Hemorrhage;Gastrointestinal Neoplasms;Humans;Intestinal Mucosa;Laser Therapy;Male;Middle Aged
[Use of intravascular low-energy laser irradiation of the blood in treating destructive pancreatitis]. Acute Disease;Blood;Cholestasis;Humans;Laser Therapy;Male;Methods;Middle Aged;Pancreatitis
A CT guided stereotactic apparatus: new approach to biopsy and removal of brain tumors. Advancements in diagnostic and surgical technology in recent decades have greatly enhanced the ability for patients with central nervous system disorders to live longer, more meaningful lives. The CT guided stereotactic system has proven to be extremely useful in the localization and biopsy and/or total removal of brain lesions of small size. Incorporation of this system with other technologic advancements such as the CO2 laser, phototherapy and NMR may be very promising in early detection and treatment of CNS tumors. Adolescent;Adult;Aged;Biopsy;Brain Neoplasms;Child;Child, Preschool;Female;Humans;Male;Middle Aged;Nursing Care;Stereotaxic Techniques;Tomography, X-Ray Computed
Laser phototherapy following HpD administration in superficial neoplastic lesions. We report our preliminary clinical experience with hematoporphyrin derivative (HpD) injection and argon or dye laser irradiation for the treatment of 61 surface neoplastic lesions in 7 patients. Forty-three sites were multiple basal cell carcinoma in 5 patients, and the remaining 18 were cutaneous and subcutaneous recurrent breast carcinoma after mastectomy in the thoracic wall. The patients were selected on the basis of the lack of indication for conventional therapeutic modalities. The selection of irradiation procedures and laser source was based on the thickness of the lesion and extension of the disease. The photochemical reaction between HpD injected i.v. at a dose of 3 mg/kg body weight and the laser beam at a dose of 60 to 120 J/cm2 resulted in 75% favorable responses at the treated sites. Optimal therapeutic effects appeared to be critically dependent on total light dose and tumor infiltration patterns. The phototherapeutic technique proved to be effective in selected cases of neoplastic lesions, especially when conventional treatment modalities were poorly indicated or contraindicated. Hematoporphyrins Aged;Breast Neoplasms;Carcinoma, Basal Cell;Female;Hematoporphyrins;Humans;Lasers;Male;Middle Aged;Photochemotherapy;Skin Neoplasms
Neodymium: YAG laser treatment of benign urethral strictures. A total of 17 patients with benign urethral strictures underwent treatment with circumferential application of neodymium: YAG laser irradiation to the strictured area. Foley catheter drainage was used postoperatively in only 2 patients and no treatment complications were observed. Although early postoperative results were good 11 patients (64 per cent) suffered recurrent stricture within 6 months of treatment. With the method described, neodymium: YAG laser phototherapy of urethral strictures appears to offer no treatment advantages over conventional therapy and is associated with a high recurrence rate. Adult;Aged;Female;Humans;Laser Therapy;Male;Middle Aged;Urethral Stricture
Laser myoplasty for hypertrophic cardiomyopathy. In vitro experience in human postmortem hearts and in vivo experience in a canine model (transarterial) and human patient (intraoperative). The feasibility of performing a myotomy/myectomy for hypertrophic cardiomyopathy (HC) by means of laser phototherapy was evaluated experimentally in vitro and in vivo, and the procedure then applied to a patient intraoperatively. In vitro experience revealed that the beam of an argon laser, delivered directly or via an optical fiber, could both cut and vaporize myocardium, producing a myotomy/myectomy morphologically similar to that produced by the conventional blade technique. In vivo experiments, in which the beam of an argon laser was delivered via an optical fiber to the ventricular septum of a canine heart, confirmed that a laser myoplasty could be achieved in 4 of 5 dogs by a transarterial approach. Finally, laser myoplasty was performed intraoperatively in a patient

with HC, using a 200-mu fiber interfaced with an argon laser. Measured laser power was 1.5 W; cumulative exposure was less than 4 minutes; the myoplasty was 4 X 1 X 0.5 cm. These investigations establish the feasibility of using laser therapy to create a myoplasty trough that is similar in appearance to that typically achieved by the conventional blade technique. Illumination of the intraventricular operative field and precise modeling of the myoplasty trough constitute the principal advantages of laser myoplasty for HC. Adult;Animals;Cardiomyopathy, Hypertrophic;Dogs;Female;Heart Septum;Heart Ventricles;Humans;In Vitro Techniques;Laser Therapy;Methods
Argon laser phototherapy of superficial transitional cell carcinoma of the bladder. An argon laser was used to treat 11 patients with known superficial transitional cell bladder tumors. Effective destruction of existing lesions occurred in all patients and practical advantages over conventional treatment have been observed. Argon laser phototherapy of bladder cancer is safe and effective but the superficial effects of argon energy limit its use to patients with small tumors or carcinoma in situ. Argon Aged;Argon;Carcinoma in Situ;Carcinoma, Transitional Cell;Humans;Laser Therapy;Middle Aged;Urinary Bladder Neoplasms
Laser therapy in the horse: histopathologic response. Surgical incisions were made in the skin and superficial digital flexor tendons in horses. A low intensity laser therapy device was used to treat the limbs. After laser therapy was completed, skin and superficial digital flexor tendons from incised laser-irradiated, incised-control, and nonincised-control limbs were compared microscopically. Qualitative differences between laser irradiated and nonirradiated tissues were not found. The laser therapy device used in this study may be of insufficient power to affect wound healing. Animals;Horse Diseases;Horses;Laser Therapy;Muscles;Tendons;Wound Healing;Wounds and Injuries
Relief from chronic pain by low power laser irradiation. In a double blind study, repeated irradiation with a low-power (1 mW) helium-neon laser produced relief in subjects with chronic pain. Analgesia was observed after exposure of the skin overlying the radial, medial and saphenous nerves and in some cases, irradiation of the appropriate painful nerve. Exposure of areas of skin not innervated by these nerves did not result in pain relief. Of the patients with trigeminal neuralgia, post-herpetic neuralgia, sciatica and ostearthritis, 19 of 26 experienced pain relief without the use of drugs. Patients who received sham stimulation reported no analgesia. Subjects who were exposed to laser irradiation had a large increase in the urinary excretion of 5-hydroxyindoleacetic acid, the degradation product of serotonin. Hydroxyindoleacetic Acid Chronic Disease;Diabetic Neuropathies;Double-Blind Method;Humans;Hydroxyindoleacetic Acid;Laser Therapy;Neuralgia;Osteoarthritis;Pain Management;Sciatica;Trigeminal Neuralgia
[New data on the photosensitivity of the animal cell and the mechanism of laser biostimulation]. Phytohemagglutinins;DNA Animals;Cell Membrane;Cells, Cultured;DNA;Humans;L Cells;Lasers;Lymphocyte Activation;Lymphocytes;Mice;Phytohemagglutinins;Rosette Formation
[Case of hemangioma of the oral mucosa treated by low-intensity laser irradiation]. Aged;Hemangioma;Humans;Laser Therapy;Male;Mouth Mucosa;Mouth Neoplasms
Effectiveness of laser photoradiation therapy following hematoporphyrin derivative administration in the experimental MS-2 tumor model. The effectiveness of laser photoradiation therapy with hematoporphyrin derivative sensitization was tested in the MS-2 sarcoma. This solid tumor, transplanted into the pad of the hind leg of BALB/c mice, was found to be a sensitive experimental model for a quantitative evaluation of response to phototherapy and for determination of critical parameters in laser phototherapy treatment. Under our experimental conditions, optimal therapeutic effects appeared to be critically dependent on drug dose, number of treatments, light intensity, and irradiation of the peripheral border of the tumor. Hematoporphyrins Animals;Dose-Response Relationship, Radiation;Evaluation Studies as Topic;Hematoporphyrins;Laser

Therapy;Mice;Mice, Inbred BALB C;Neoplasm Transplantation;Phototherapy;Sarcoma, Experimental;Time Factors
[Use of low-energy laser therapy to reduce pressure in incipient open-angle glaucoma]. Adult;Aged;Female;Glaucoma, Open-Angle;Humans;Laser Therapy;Male;Middle Aged
Hematoporphyrin-derivative phototherapy for local treatment of cancer of the tracheobronchial tree. In this paper the potential use of hematoporphyrin-derivative (HpD) phototherapy in the local treatment of bronchogenic carcinoma is discussed. Ten patients with cancer involving the tracheobronchial tree have completed at least one course of HpD-mediated laser phototherapy administered by means of the flexible fiberbronchoscope. Complete response was obtained in four cases, and in each case the tumor was small and superficial. Larger tumors with greater degrees of invasion showed only a partial response. Two patients with tumors eroding through the bronchial wall died following treatment. It appears that HpD phototherapy may be useful for control of only small, superficial squamous cell carcinomas of the tracheobronchial tree and only those within the range of the flexible fiberbronchoscope. Hematoporphyrins;Hematoporphyrin Derivative Bronchial Neoplasms;Bronchoscopy;Carcinoma, Bronchogenic;Carcinoma, Squamous Cell;Hematoporphyrin Derivative;Hematoporphyrins;Humans;Laser Therapy;Lung Neoplasms;Photochemotherapy;Tracheal Neoplasms
The effect of laser photocoagulation on the gastric mucosa and bleeding gastric lesions: an experimental study. An argon ion laser beam was tested experimentally with regard to its histological effect on and penetration of the gastric mucosa of the rat and man and its ability to induce haemostasis in traumatically produced gastric lesions and transected small blood vessels. Localized laser photocoagulation for periods of up to 5 minutes at 1 watt produced a coagulative necrosis of the gastric mucosa and half of the muscularis propria, but transmural necrosis required prolonged exposure. Laser phototherapy markedly reduced the bleeding time in experimental ulcers and small blood vessels, provided the superficial blood could be adequately dispersed from the direct beam of the laser. Animals;Arteries;Colon;Gastric Mucosa;Gastrointestinal Hemorrhage;Hemostasis, Surgical;Intestinal Mucosa;Laser Therapy;Lasers;Mesenteric Arteries;Rats;Stomach Ulcer
Gastric hemostasis by laser phototherapy in man. A preliminary report. Argon Argon;Female;Fiber Optic Technology;Gastrointestinal Hemorrhage;Hematemesis;Hemostatic Techniques;Humans;Laser Therapy;Lasers;Middle Aged;Peptic Ulcer Hemorrhage;Phototherapy
Endoscopic argon-ion laser phototherapy of bleeding gastric lesions. An argon-ion laser, coupled to a flexible fiberoptic endoscope, was used to photocoagulate experimentally produced bleeding gastric ulcers in dogs. Argon-ion laser phototherapy rapidly and effectively achieved hemostasis in all bleeding ulcers. Bleeding arteries up to 2 mm in diameter were photocoagulated. Intact normal gastric mucosa was exposed to laser energy for varying periods of time to determine if transmural photothermal injury occurred. Exposure for greater than 15 seconds at 1.0 w of throughput power caused microscopical evidence of transmural injury. Healed, laser-treated ulcers could not be differentiated from nontreated control ulcers or normal stomach one month after injury. The Beer law and the heattransfer factors relating to soft tissues are discussed. The coupled argon-ion laser-endoscope may be a safe tool to treat self-limited superficial bleeding gastric lesions. Animals;Disease Models, Animal;Dogs;Endoscopy;Fiber Optic Technology;Gastric Mucosa;Gastrointestinal Hemorrhage;Laser Therapy;Lasers;Stomach Ulcer
[Histochemistry of proteins and their functionally active groups in the skin of the neck and mucous membrane of the oral cavity of white rats in the zone exposed to a helium-neon laser]. The author made experiments on 49 white rats exposing their cervical skin ano oral cavity mucous membrane to the irradiation beam of a 40 mvt helium-neon laser (lambda 6328A) during 10-15

minutes. The reactive capacity of proteins was found to have intensified and the content of functionally active groups, especially SH. to have increased as well as well as the activity of the cytochromozydase. When the exposition to laser irradiation was raised to 30 minutes pronounced morphohistochemical lesions were noted in the cervical skin and oral cavity mucous membrane. The data received may be useful in clinical practice for the application of low-power laser irradiation of 6328A wave length for stimulation of metabolic processes. Proteins;Electron Transport Complex IV Animals;Electron Transport Complex IV;Histocytochemistry;Lasers;Mouth Mucosa;Proteins;Rats;Skin

The effect of laser irradiation on the regeneration of muscle fibers (preliminary report). The authors studied the process of muscular regeneration on experimental models after simple muscle injury and under the effect of low-energy laser-irradiation. It is stated that the stimulating effect not only accelerated the wound healing, but most likely influenced also the qualitative improvement of regeneration. Animals;Laser Therapy;Lasers;Muscles;Rats;Regeneration;Time Factors;Wound Healing

The effect of laser irradiation on the regeneration of muscle fibers (preliminary report). The authors studied the process of muscular regeneration on experimental models after simple muscle injury and under the effect of low-energy laser-irradiation. It is stated that the stimulating effect not only accelerated the wound healing, but most likely influenced also the qualitative improvement of regeneration. Animals;Laser Therapy;Lasers;Muscles;Rats;Regeneration;Time Factors;Wound Healing

Bullous erythema multiforme secondary to fluconazole intake: A unique case report managed with photobiomodulation therapy. While fluconazole use is generally considered safe and well-tolerated, there has been an increasing number of reports regarding several adverse events. Therefore, the present study aimed to present a unique case in which photobiomodulation therapy (PBMT) was employed to manage bullous erythema multiforme lesions secondary to fluconazole intake. A 32-year-old female patient sought emergency dental care due to painful orofacial lesions that had developed two days after oral fluconazole use for recurrent vulvovaginal candidiasis. Given the acute clinical features, a diagnosis of bullous erythema multiforme secondary to fluconazole was established. Prednisone 20 mg was then prescribed for five days, and fluconazole intake was immediately discontinued. As the initial treatment strategies failed to show improvement in the clinical condition, three PBMT sessions were proposed every other day. Within seven days, almost complete wound healing was observed, and any pain complaints were no longer present. The resolution of orofacial lesions within a short period suggests that PBMT could be a promising tool for managing drug-induced bullous erythema multiforme. However, more studies are needed to confirm this statement.

Fatigue Alleviation by Low-Level Laser Pre-Exposure in Ischemic Neuromuscular Electrical Stimulation. PURPOSE: Despite its susceptibility to muscle fatigue, combined neuromuscular electrical stimulation (NMES) and blood flow restriction (BFR) is an effective regimen for managing muscle atrophy when traditional resistance exercises are not feasible. This study investigated the potential of low-level laser therapy (LLLT) in reducing muscle fatigue after the application of combined NMES and BFR. METHODS: Thirty-six healthy adults were divided into control and LLLT groups. The LLLT group received 60 J of 850 nm wavelength LLLT before a training program of combined NMES and BFR of the non-dominant extensor carpi radialis longus (ECRL). The control group followed the same protocol but received sham laser therapy. Assessments included maximal voluntary contraction (MVC), ECRL mechanical properties, and isometric force-tracking for wrist extension. RESULTS: The LLLT group exhibited a smaller normalized difference in MVC decrement (-4.01 Â± 4.88%) than the control group (-23.85 Â± 7.12%) ($P < .001$). The LLLT group demonstrated a smaller decrease in

muscle stiffness of the ECRL compared to the control group, characterized by the smaller normalized changes in frequency (P = .002), stiffness (P = .002), and relaxation measures (P = .011) of mechanical oscillation waves. Unlike the control group, the LLLT group exhibited a smaller post-test increase in force fluctuations during force-tracking (P = .014), linked to the predominant recruitment of low-threshold MUs (P < .001) without fatigue-related increases in the discharge variability of high-threshold MUs (P > .05). CONCLUSIONS: LLLT pre-exposure reduces fatigue after combined NMES and BFR, preserving force generation, muscle stiffness, and force scaling. The functional benefits are achieved through fatigue-resistant activation strategies of motor unit recruitment and rate coding.

Comparative effectiveness of low-level laser therapy versus muscle energy technique among diabetic patients with frozen shoulder: a study protocol for a parallel group randomised controlled trial. BACKGROUND: Diabetes mellitus is one of the fastest-growing health challenges of the twenty-first century with multifactorial impact including high rates of morbidity and mortality as well as increased healthcare costs. It is associated with musculoskeletal complications, with frozen shoulder being commonly reported. WhileÂ low-level laser therapy (LLLT) and muscle energy technique (MET) are commonly used to manageÂ this condition, there remains a lack of agreement on the most effective approach, with limited research available on their comparative efficacy. OBJECTIVES: To evaluate the comparative effectiveness of LLLT versus MET among diabetic patients with frozen shoulder. METHODS: This is a single-centre, prospective, single-blind, randomised controlled trial with three parallel groups to be conducted at Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria. SixtyÂ diabetic patients with frozen shoulder will be randomly assigned into LLLT group, MET group, or control group in a 1:1:1 ratio. All the groupsÂ will receive treatment three times weekly for 8Â weeks. The primary outcome will be shoulder function and the secondary outcomes will include pain intensity, shoulder ROM, interleukin-6 (IL-6), depression, anxiety, and quality of life (QoL). All outcomes will be assessed at baseline, at postÂ 8-week intervention, and at 3Â months follow-up. DISCUSSION: This will be the first randomised controlled trialÂ to evaluate the comparative effectiveness of LLLT versus MET on both clinical and psychological parameters among diabetic patients with frozen shoulder. The findings of the study may provide evidence on the efficacy of these interventions and most likely, the optimal treatmentÂ approach forÂ frozen shoulder related to diabetes, which may guide clinical practice. TRIAL REGISTRATION: Pan African Clinical Trials Registry (PACTR202208562111554). Registered on August 10, 2022. Humans;Bursitis;Low-Level Light Therapy;Prospective Studies;Single-Blind Method;Treatment Outcome;Male;Adult;Female;Middle Aged;Diabetes Complications;Randomized Controlled Trials as Topic;Range of Motion, Articular;Quality of Life;Aged;Diabetes Mellitus

Prevention and Treatment of Oral Mucositis in Pediatric Patients: Systematic Review and Meta-Analysis of Randomized Controlled Trials. BACKGROUND/AIM: Oral mucositis (OM) is a common and serious side effect of cancer treatment. The incidence of chemotherapy-induced OM in pediatric patients can reach up to 91.5% and has a major impact on patients' quality of life. The aim of the study was to assess the efficacy of current interventions and agents for the management of OM in children undergoing chemo/radiotherapy or hematopoietic stem cell transplantation (HSCT). MATERIALS AND METHODS: A systematic search of randomized controlled trials (RCTs) was conducted in the MEDLINE and Scopus databases from January 2000 until March 2023. Thirty-four randomized studies meeting the inclusion criteria were identified and five RCTs investigating the efficacy of Low Level Laser Therapy (LLLT) intervention or the agent honey were included in the meta-analysis. RESULTS: The meta-analysis of two RCTs indicated that topical application of honey on oral mucosa was effective in shortening the mean duration of hospital stay in children with severe OM (MD=-4.33, p=0.002). However, LLLT was not found to be effective for the prevention or treatment of OM grade â‰¥II (RR=0.99, p=0.99). Moreover, the therapeutic application of LLLT did not show

significant benefit for lower risk of OM grade â‰¥II (RR=0.48, p=0.58). CONCLUSION: Various interventions and agents were examined in the present study for the management of OM. Honey could be a promising candidate for the treatment of OM in pediatric patients. Further high-quality RCTs are required to enhance our findings. Antineoplastic Agents Humans;Stomatitis;Child;Randomized Controlled Trials as Topic;Honey;Neoplasms;Low-Level Light Therapy;Treatment Outcome;Quality of Life;Antineoplastic Agents;Disease Management

Efficacy of rehabilitative therapies on otologic symptoms in patients with temporomandibular disorders: A systematic review of randomised controlled trials. BACKGROUND: The term temporomandibular disorder (TMD) indicates a set of musculoskeletal conditions involving temporomandibular joint (TMJ), masticatory musculature, and related anatomical structures. Pain is the most common clinical manifestation of TMD, and the auditory system might be involved and affected, through tinnitus, dizziness, otalgia and ear fullness sensation. OBJECTIVES: The aim of this systematic review of randomised controlled trails (RCTs) was to evaluate the efficacy of rehabilitative approaches on otologic symptoms in patients with TMD. METHODS: PubMed, Scopus and Web of Science were systematically searched from the inception until 8th October 2023 to identify RCTs presenting participants with a diagnosis of TMD associated with otologic signs and symptoms, rehabilitative approaches as interventions, and modification of the otological symptoms as outcome. RESULTS: Out of 931 papers suitable for title/abstract screening, 627 articles were assessed for eligibility. Five studies were included reporting the efficacy of occlusal splint therapy, low-level laser therapies, and physical therapy in patients diagnosed whit secondary otalgia or tinnitus associated with TMD. No RCTs evaluating other otologic symptoms, ear fullness, dizziness or vertigo were found. CONCLUSIONS: Results of this systematic review suggested that rehabilitative approaches might be effective in improving secondary otalgia and tinnitus in TMD patients. Thus, further RCTs with a higher level of evidence and more representative samples should be conducted to better understand the effects of TMD therapy on otologic complains.

Evaluation of Photobiomodulation on myocardial function of Patients with Advanced Ischemic Cardiomyopathy, A Case Series. BACKGROUND: Heart failure is a growing cardiovascular disease burden with high mortality rates, primarily attributed to myocardial ischemia. Previous studies have shown promising effects of Photobiomodulation in heart failure treatment. In this study, we aimed to investigate the effect of Photobiomodulation on myocardial function of patients with advanced ischemic heart failure. METHOD: A non-randomized case series study involving 10 advanced heart failure patients was conducted. Patients received 15 sessions of transcutaneous and intravenous Photobiomodulation therapy using low-level red (658 nm) and infrared lasers (810 nm). All participants were evaluated by six-minute walk tests, dyspnea function classes, and echocardiography. 3 months after the sessions, the mentioned tests were reevaluated RESULT: The study included ten cardiomyopathic patients, 90% male and the mean age was 63.20Â±6.01 years. The six-minute walk test change and shortness of breath function class change has 0.852 (p-value=0.006) correlation and the correlation between the Six-minute walk test change and the Systolic ejection fraction rate change, was 0.73 (p-value=0.025). CONCLUSION: Based on the results of the study, it can be concluded that interventions in cardiomyopathic patients have shown promising improvements in certain cardiac function parameters. Specifically, the significant enhancement in the six-minute walk test post-intervention (p=0.013) suggests a positive impact on functional capacity. Although the increase in systolic ejection fraction rate was not statistically significant (p=0.197), the correlations identified provide valuable insights into the interplay between variables such as shortness of breath function class and the six-minute walk test. These findings underscore the complexity of managing cardiomyopathy and highlight the importance of further research to

elucidate the relationships between different clinical parameters and patient outcomes in this population.

Low-level laser therapy and laser acupuncture therapy for pain relief after initial archwire placement : AÂ randomized clinical trial. OBJECTIVE: Pain is among the most unpleasant experience during fixed orthodontic therapy. This study compared the effectiveness of low-level laser therapy (LLLT) and laser acupuncture therapy (LAT) in pain reduction after initial archwire placement. METHODS: This randomized, parallel-group, single-blind clinical trial included 60Â female patients who required four premolar extractions to relieve crowding. The subjects were randomly designated into four groups of 15. After placement of the initial orthodontic archwire, patients in groupÂ 1 took ibuprofen (400â€¯mg), whereas those in groupÂ 2 received LLLT (808â€¯nm, 200â€¯mW, 2â€¯J/cm(2)) on both buccal and lingual sides of the teeth. In groupÂ 3 (LAT), the laser (808â€¯nm, 200â€¯mW, 24â€¯J/cm(2)) was applied bilaterally to acupuncture points (SIÂ 18, STÂ 6, LIÂ 4, SJÂ 2, and SJÂ 5). Subjects in groupÂ 4 received placebo laser treatment. Patients were requested to record the intensity of spontaneous pain, pain while biting with anterior teeth, and pain while biting with posterior teeth at different times using aÂ visual analogue scale (VAS). RESULTS: The intensity of spontaneous and biting pain increased up to the first or second days following initial archwire placement and diminished to aÂ negligible value by the seventh day. No significant difference was found between the study groups concerning spontaneous and biting pain at any timepoint of investigation (Pâ€>â€‰0.05). CONCLUSIONS: With the protocols used in the study, low-level laser therapy and laser acupuncture therapy were as effective as ibuprofen and placebo laser treatment for pain reduction in orthodontic patients. TRIAL REGISTRATION: IRCT, IRCT20200622047886N1. Registered 2020-06-29; https://www.irct.ir/trial/49121.

Definition of refractory melasma and its treatment: a review. Although patients with refractory melasma have been treated using various methods, there is still no precise definition or summary of the therapies. To define refractory melasma and conduct a review of the treatments, we searched for relevant publications in PubMed, Web of Science, and the Cochrane Library, and a total of 35 references were obtained. Refractory melasma can be roughly defined as an ineffective treatment for melasma, including topical bleaching agents, chemical peels, laser therapy, microdermabrasion for more than six months, or chemical peels treated more than six times. Meanwhile, physicians should be careful when treating patients withÂ darker skin and dermal or mixed types of melasma since these individuals do not respond well to treatment. Lasers combined with other methods, especially different types of lasers or topical agents, are considered more effective than monotherapy. Oral tranexamic acid (TXA) is a prospective cure for refractory melasma. Other methods include a combination of chemical peels, microneedling, or injections with additional therapies. In conclusion, we were able to provide a rough definition of refractory melasma and list the available therapies. According to the literature, the most prevalent treatment is laser combination therapy. However, laser treatment should be considered only after topical agents and chemical peeling have failed. Considering its side effects, efficacy, and safety, oral TXA may be a better option, but more research is needed to make a firm conclusion. Moreover, maintenance therapy is required after treatment. Tranexamic Acid Melanosis;Humans;Chemexfoliation;Tranexamic Acid;Laser Therapy;Low-Level Light Therapy;Combined Modality Therapy;Dermabrasion

Enhancing nerve regeneration in infraorbital nerve injury rat model: effects of vitamin B complex and photobiomodulation. Orofacial nerve injuries may result in temporary or long-term loss of sensory function and decreased quality of life in patients. B vitamins are required for DNA synthesis and the repair and maintenance of phospholipids. In particular, vitamins B1, B6, and B12 are essential for neuronal function. Deficiency in vitamin B complex (VBC) has been linked to increased oxidative stress, inflammation and demyelination. Photobiomodulation (PBM) has antioxidant activity and is

neuroprotective. In addition, a growing literature attests to the positive effects of PBM on nerve repair. To assess the effect of PBM and VBC on regenerative process we evaluated the expression of brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF), myelin basic protein (MBP), laminin and neurofilaments (NFs) using Western blotting to identify regenerative pattern after chronic constriction injury of the infraorbital nerve (CCI IoN) treated by PBM, VBC or its combination. After CCI IoN, the rats were divided into six groups naive, sham, injured (CCI IoN), treated with photobiomodulation (904Â nm, 6.23Â J/cm(2), CCI IoNâ€‰+â€‰PBM), treated with VBC (containing B1, B6 and B12) 5 times, CCI IoNâ€‰+â€‰VBC) and treated with PBM and VBC (CCI IoNâ€‰+â€‰VBCâ€‰+â€‰PBM). The treatments could revert low expression of BDNF, MBP and laminin. Also reverted the higher expression of neurofilaments and enhanced expression of NGF. PBM and VBC could accelerate injured infraorbital nerve repair in rats through reducing the expression of neurofilaments, increasing the expression of BDNF, laminin and MBP and overexpressing NGF. These data support the notion that the use of PBM and VBC may help in the treatment of nerve injuries. This finding has potential clinical applications. Brain-Derived Neurotrophic Factor;Nerve Growth Factor;Vitamin B Complex;Laminin;Myelin Basic Protein Animals;Rats;Nerve Regeneration;Low-Level Light Therapy;Brain-Derived Neurotrophic Factor;Nerve Growth Factor;Disease Models, Animal;Male;Vitamin B Complex;Laminin;Facial Nerve Injuries;Rats, Wistar;Myelin Basic Protein

Unlocking the Power of Light on the Skin: A Comprehensive Review on Photobiomodulation. Photobiomodulation (PBM) is a procedure that uses light to modulate cellular functions and biological processes. Over the past decades, PBM has gained considerable attention for its potential in various medical applications due to its non-invasive nature and minimal side effects. We conducted a narrative review including articles about photobiomodulation, LED light therapy or low-level laser therapy and their applications on dermatology published over the last 6 years, encompassing research studies, clinical trials, and technological developments. This review highlights the mechanisms of action underlying PBM, including the interaction with cellular chromophores and the activation of intracellular signaling pathways. The evidence from clinical trials and experimental studies to evaluate the efficacy of PBM in clinical practice is summarized with a special emphasis on dermatology. Furthermore, advancements in PBM technology, such as novel light sources and treatment protocols, are discussed in the context of optimizing therapeutic outcomes and improving patient care. This narrative review underscores the promising role of PBM as a non-invasive therapeutic approach with broad clinical applicability. Despite the need for further research to develop standard protocols, PBM holds great potential for addressing a wide range of medical conditions and enhancing patient outcomes in modern healthcare practice. Humans;Low-Level Light Therapy;Skin;Animals;Skin Diseases;Light;Phototherapy

Oral Mucositis Management in Children under Cancer Treatment: A Systematic Review. Children undergoing antineoplastic treatment often present severe side effects due to the dosage and duration of treatments, with oral mucositis emerging as one of the most prevalent and painful inflammatory conditions. There is a growing body of evidence on therapeutic interventions such as cryotherapy, low-level laser therapy, and natural compounds for this condition. The aim of this systematic review was to identify and compare therapies for the management of cancer treatment-induced oral mucositis in pediatric patients. From 2655 articles obtained in initial searches, 39 articles were considered in this systematic review, after applying inclusion/exclusion criteria. Low-level laser therapy, palifermin, honey, and zinc demonstrated reductions in oral mucositis incidence, duration, severity, and pain reported by the patient. Although there are several therapies in place for the prevention and treatment of oral mucositis in children, evidence of their efficacy is still inconclusive to establish accurate clinical protocols.

Light and the Brain: A Clinical Case Depicting the Effects of Light on Brainwaves and Possible Presence of Plasma-like Brain Energy. Light is an electromagnetic radiation that has visible and invisible wavelength spectrums. Visible light can only be detected by the eyes through the optic pathways. With the presence of the scalp, cranium, and meninges, the brain is seen as being protected from direct exposure to light. For that reason, the brain can be viewed as a black body lying inside a black box. In physics, a black body tends to be in thermal equilibrium with its environment and can tightly regulate its temperature via thermodynamic principles. Therefore, a healthy brain inside a black box should not be exposed to light. On the contrary, photobiomodulation, a form of light therapy for the brain, has been shown to have beneficial effects on some neurological conditions. The proposed underlying mechanisms are multiple. Herein, we present our intraoperative findings of rapid electrocorticographic brainwave changes when the brain was shone directly with different wavelengths of light during awake brain surgery. Our findings provide literature evidence for light's ability to influence human brain energy and function. Our proposed mechanism for these rapid changes is the presence of plasma-like energy inside the brain, which causes fast brain activities that are akin to lightning strikes.

Targeting Wnt/Î²-catenin signaling and its interplay with TGF-Î² and Notch signaling pathways for the treatment of chronic wounds. Wound healing is a tightly regulated process that ensures tissue repair and normal function following injury. It is modulated by activation of pathways such as the transforming growth factor-beta (TGF-Î²), Notch, and Wnt/Î²-catenin signaling pathways. Dysregulation of this process causes poor wound healing, which leads to tissue fibrosis and ulcerative wounds. The Wnt/Î²-catenin pathway is involved in all phases of wound healing, primarily in the proliferative phase for formation of granulation tissue. This review focuses on the role of the Wnt/Î²-catenin signaling pathway in wound healing, and its transcriptional regulation of target genes. The crosstalk between Wnt/Î²-catenin, Notch, and the TGF-Î² signaling pathways, as well as the deregulation of Wnt/Î²-catenin signaling in chronic wounds are also considered, with a special focus on diabetic ulcers. Lastly, we discuss current and prospective therapies for chronic wounds, with a primary focus on strategies that target the Wnt/Î²-catenin signaling pathway such as photobiomodulation for healing diabetic ulcers. Receptors, Notch;Transforming Growth Factor beta;beta Catenin Humans;Wound Healing;Wnt Signaling Pathway;Receptors, Notch;Animals;Transforming Growth Factor beta;Chronic Disease;beta Catenin;Signal Transduction

Efficacy of laser biostimulation for mandibular narrow ridges treated with one-stage ridge splitting and two-implant overdentures: A one-year preliminary study. STATEMENT OF PROBLEM: The management of patients with narrow-mandibular ridges who seek prosthetic rehabilitation is challenging. PURPOSE: The purpose of this one-year preliminary clinical study was to compare the effects of laser biostimulation and a placebo on peri-implant tissues for a 2-implant-retained mandibular polyetheretherketone (PEEK) overdenture on expanded narrow mandibular ridges. MATERIAL AND METHODS: Eighteen completely edentulous participants were enrolled for mandibular ridge splitting in the canine regions, followed by expansion, the placement of implants, and the application of a bone graft. In the test group, laser therapy was applied labially and lingually at the surgical sites, while a placebo laser was used in the control group. PEEK overdentures retained by LOCATOR attachments were provided after 6 months. Clinical evaluations were performed using probing depth, plaque, bleeding, and gingival indices at insertion and 3, 6, and 12 months after insertion. Vertical bone loss (VBL) was evaluated with periapical radiograph at insertion and 6 and 12 months later. The Mann-Whitney test was used to test the difference between the 2 different groups at each evaluation time (Î±=.05). The Friedman-test was used, followed by Wilcoxon signed rank test, to test the change over time in the same group, and the Bonferroni adjusted significance level was used for multiple comparisons. RESULTS: Some clinical and radiographic parameters significantly

increased with time in both groups (P<.001). Significant differences between the 2 groups were revealed in bleeding scores at 3 months (P=.006) and 6 months (P=.018). Also, significant differences between the 2 groups were observed in gingival scores at 3 months (P=.002), 6 months (P=.015), and 12 months (P=.019) after overdenture insertion in favor of the laser group. Peri-implant VBL was significantly higher in the non-laser group at 6 months (P=.015), and 12 months (P=.001). CONCLUSIONS: Within the limitations of this clinical study, respecting the small sample size and the short follow-up period, laser bio-stimulation after 1-stage ridge splitting in narrow mandibular ridges enhanced the soft and hard peri implant tissues when used with LOCATOR attachments and PEEK overdentures.

Effectiveness of photobiomodulation therapy in the treatment of patients with an ankle sprain: a systematic review and meta-analysis. BACKGROUND: Photobiomodulation therapy (PBMT) is widely used in the treatment of patients with musculoskeletal and sports disorders with a lack of significance in patients with sprain ankle. PURPOSE: This review investigated the effect of PBMT on pain, oedema, and function in patients with an ankle sprain. METHODS: A systematic search of the databases (MEDLINE, PubMed, EBSCO, Web of Science, Wiley Online Library, Science Direct, Physiotherapy Evidence (PEDro), and the Cochrane Databases) was performed from inception to the end of 2023 to identify any clinical study investigating the effect of PBMT on ankle sprain. PBMT parameters and measured outcomes were extracted. The primary measured outcome was pain and function, and oedema were secondary measured outcomes. Methodological quality was assessed using the PEDro scale. The level of evidence was determined by the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system. A random effect meta-analysis with forest plot was used to calculate standardized mean difference (SMD) at a 95% confidence interval and the overall effect size (ES). RESULTS: Six studies (598 patients) were included in the review and five studies in the meta-analysis. There were two fair-quality and four good-quality studies, with a moderate level of evidence on pain, and a low level of evidence on oedema and function. The meta-analysis revealed a significant overall effect of PBMT on pain with high ES [SMD -â€‰0.88 (-1.76, -0.00), pâ€‰=â€‰0.05], with a non-significant effect on oedema and function with a medium ES [SMD -â€‰0.70 (-1.64, 0.24), pâ€‰=â€‰0.14] on oedema and low ES on function [SMD -â€‰0.22 (-0.69, 0.24), pâ€‰=â€‰0.35]. Significant heterogeneity was observed in all measured outcomes with high heterogeneity (I(2)â€‰>â€‰75%) in pain and oedema and moderate heterogeneity in function. CONCLUSION: PBMT is quite effective for patients with an ankle sprain. PBMT showed high effect size with a moderate level of evidence on pain intensity. The lack of significant effects of PBMT on function and edema with low level of evidence limit the confidence to the current results and recommend further large high-quality studies with higher PBMT intensity and fluency for standardisation of the irradiation parameters and treatment protocol. REGISTRATION: PROSPERO registration number (CRD42021292930). Humans;Low-Level Light Therapy;Ankle Injuries;Sprains and Strains;Treatment Outcome;Edema

A Meta-Analysis of Randomized Controlled Trials on the Effects of Photobiomodulation Therapy on Running Performance. OBJECTIVE: To conduct a meta-analysis to investigate the effects of Photobiomodulation (PBM) therapy on running performance. INTRODUCTION: PBM has recently been advocated as a valuable non-pharmacological ergogenic strategy, however, the efficacy of PBM on running performance remains unproven. METHODS: A computerized literature search was conducted until June 2023. The databases searched were PubMed/Medline, Embase, Scopus, SPORTDiscus, and Web of Science. Inclusion/exclusion criteria were determined through the PICO process. The running variables analyzed were time-trial or time-to-exhaustion. Results were combined with the standardized mean differences (SMD) and the 95% confidence intervals. RESULTS: Twelve studies fulfilled the inclusion criteria. No significant effects in favor of PBM were found (SMD

= 0.13; p = 0.11). There was no effect considering the presence (SMD = 0.16; p = 0.38) and absence (SMD = 0.11; p = 0.25) of training, and there was no dose-response effect (p = 0.82). CONCLUSION: Our findings indicate that PBM alone or combined with a training program does not improve running performance in terms of time-trial and time-to-exhaustion testing. More studies involving PBM plus training and doses higher than 1000 J are needed to determine if PBM is effective in improving running performance.

A retrospective study of cumulative absolute reduction in axial length after photobiomodulation therapy. BACKGROUND: To assess the age and timeline distribution of ocular axial length shortening among myopic children treated with photobiomodulation therapy in the real world situations. METHODS: Retrospective study of photobiomodulation therapy in Chinese children aged 4 to 13 years old where axial length measurements were recorded and assessed to determine effectiveness at two age groups (4â€‰â^¼â€‰8 years old group and 9â€‰â^¼â€‰13 years old group). Data was collected from myopic children who received photobiomodulation therapy for 6â€‰â^¼â€‰12 months. Effectiveness of myopia control was defined as any follow-up axial lengthâ€‰â‰¤â€‰baseline axial length, confirming a reduction in axial length. Independent t-test was used to compare the effectiveness of the younger group and the older group with SPSS 22.0. RESULTS: 342 myopic children were included with mean age 8.64â€‰Â±â€‰2.20 years and baseline mean axial length of 24.41â€‰Â±â€‰1.17Â mm. There were 85.40%, 46.30%, 71.20% and 58.30% children with axial length shortening recorded at follow-up for 1 month, 3 months, 6 months and 12 months, respectively. With respect to the axial length shortened eyes, the mean axial length difference (standard deviation) was -â€‰0.039 (0.11) mm, -0.032 (0.11) mm, -0.037 (0.12) mm, -0.028 (0.57) mm at 1, 3, 6, and 12-month follow-up, respectively. Greater AL shortening was observed among the older group who had longer baseline axial lengths than the younger group (Pâ€‰<â€‰0.001). CONCLUSIONS: Overall myopia control effectiveness using photobiomodulation therapy was shown to be age and time related, with the maximum absolute reduction in axial elongation being cumulative. Humans;Retrospective Studies;Child;Axial Length, Eye;Female;Male;Myopia;Adolescent;Child, Preschool;Low-Level Light Therapy;Refraction, Ocular;Follow-Up Studies

[Clinical application of photobiomodulation in trauma repair and medical aesthetics]. In recent years, with the deepening of researches on the molecular biological mechanisms of photobiomodulation (PBM), PBM has gradually been applied in clinical practice, providing effective treatment methods and approaches for various diseases. Compared with traditional photothermal therapy, PBM has the characteristics of good therapeutic effect, almost no adverse reaction, and simple operation, and its clinical efficacy is becoming increasingly significant. This article provides a detailed explanation on the mechanism of PBM, its application characteristics and development trends in trauma repair and medical aesthetics, in order to provide a theoretical basis for the extensively clinical application of this therapy. Humans;Low-Level Light Therapy;Esthetics;Wound Healing;Wounds and Injuries

Low-Level Laser Therapy for Allergic Rhinitis: A Systematic Review and Meta-Analysis. INTRODUCTION: Allergic rhinitis (AR) is a common allergic disorder that impairs social and physical functioning as well as quality of life. It is characterized by sneezing, rhinorrhea, congestion, and itching which respond suboptimally to drug therapy. Low-level laser therapy (LLLT) has anti-inflammatory and immunosuppressive properties that have shown promise in some studies. We aimed to systematically review LLLT's effectiveness in treating AR and meta-analyze our findings. METHODS: A systematic search of PubMed, Scopus, and Web of Science was conducted on November 24, 2023. All studies investigating LLLT on AR were included, and a pre-post meta-analysis of nasal symptoms (rhinorrhea, nasal congestion, nasal itching, and sneezing) in the LLLT-treated arm was

conducted. Rhinoconjunctivitis quality of life questionnaire (RQLQ) scores before and after LLLT were also meta-analyzed alongside a pairwise meta-analysis of LLLT with placebo, acupuncture, steroids/antihistamines, and ultraviolet lasers. A random-effects model was used with a conservative pre-post correlation of 0.4 and standardized mean difference (SMD) as the effect size. RESULTS: Sixteen studies were included in this review, and we found that nasal symptoms are alleviated post-LLLT in people with AR (SMD: -1.4, 95 CI: [-2.07 to -1.13], p value <0.001). RQLQ scores were also reduced after LLLT (SMD = -0.72, 95 CI: [-0.94 to -0.50], p value <0.001), and very few adverse events were reported. This meta-analysis, however, had significant publication bias and heterogeneity. When compared to a placebo, LLLT did not significantly improve nasal symptoms (SMD: -0.69, p value = 0.167), which might mean the post-LLLT nasal symptom alleviation is due to a placebo effect. Comparisons to other treatment modalities were too few to deduce anything meaningful, although it does appear that LLLT is less effective than UV lasers. CONCLUSION: LLLT is most likely effective at alleviating nasal symptomology and has a low likelihood of adverse event incidence, yet more high-quality studies with larger sample sizes are needed to compare LLLT to a placebo to ensure its superiority to the placebo effect, as well as non-inferiority clinical trials to compare it to standard treatments.

The Efficiency of Erbium Lasers in the Removal of Root Canal System and Surface Biofilms: A Systematic Review and Meta-Analysis. Background: Studies have shown positive effects of erbium lasers in removal of biofilms. A review article was required with quantitative data for confirmation of their effects, but there is still no a comprehensive study reviewing their effects based on the root canal and implant surface. This systematic review and meta-analysis was conducted to evaluate the efficiency of erbium lasers in removal of the root canal system and surface biofilms. Methods: Studies were searched with keywords in databases of PubMed, Scopus, Europe PMC, Cochrane Central, Embase, and Web of Science and screened by referees. Data were included based on meanâ€‰Â±â€‰standard deviation and size of control and laser groups. Effect sizes were assessed as standardized mean differences and calculated for each study and for the root and dental surface. Laser characteristics and bacteria were considered as moderators. Results: Nineteen articles in the current study comprised 565 samples (283 control samples and 282 laser samples). The analyses showed the significant effects of erbium lasers on bacterial biofilms on the implant surface [-0.496, 95% confidence interval, CI (-0.720 to -0.273); I(2)â€‰=â€‰26.94; pâ€‰=â€‰0.029; Qâ€‰=â€‰13.28] and root canal [-0.551, 95% CI (-0.656 to -0.445); I(2)â€‰=â€‰23.89; pâ€‰=â€‰0.031; Qâ€‰=â€‰10.46]. Results showed that highest efficiency lasers were obtained at higher wavelengths of 2940â€‰nm, 75-100â€‰mJ energy, and 100-150â€‰Î¼sec and <50-Hz pulses. Conclusions: Erbium lasers can be used to remove biofilms on dental implant surfaces and root canal systems and are safe options for untouchable sites in the root canal.
Biofilms;Lasers, Solid-State;Humans;Dental Pulp Cavity;Low-Level Light Therapy

Photobiomodulation Can Prevent Medication-Related Osteonecrosis of the Jaw Formation in Tooth Extraction Site of Rat Model. Objective: This study aims to explore the preventive potential of photobiomodulation (PBM) in bisphosphonate-related osteonecrosis of the jaw (BRONJ) using a rat model. Methods: An experimental rat model was established, exposing rats to zoledronic acid (ZA), a primary risk factor for BRONJ. An 810â€‰nm diode laser was applied with parameters of 0.33 W/cm(2) power density and 10â€‰J/cm(2) energy density for 30â€‰sec. PBM was initiated 1 day pre-extraction and continued for 2 weeks. The impact of PBM on wound healing in both soft and hard tissues was evaluated post tooth extraction. Results: ZA exposure hindered wound healing in both soft and hard tissues after tooth extraction. PBM intervention effectively mitigated the adverse effects of ZA, promoting healing processes in both tissue types. This suggests the potential of PBM as a preventive strategy for BRONJ in patients on long-term bisphosphonate treatment. Moreover, PBM

exhibited enhanced wound healing in normal rats, indicating its broader applicability beyond BRONJ cases. Conclusions: PBM shows promise in preventing and improving wound healing in BRONJ and normal cases. These findings underscore the significance of optimizing PBM parameters and suggest its potential clinical relevance as a preventive intervention for BRONJ and a promoter of wound healing. Zoledronic Acid;Bone Density Conservation Agents;Diphosphonates;Imidazoles Animals;Low-Level Light Therapy;Bisphosphonate-Associated Osteonecrosis of the Jaw;Rats;Tooth Extraction;Zoledronic Acid;Disease Models, Animal;Wound Healing;Rats, Sprague-Dawley;Bone Density Conservation Agents;Diphosphonates;Lasers, Semiconductor;Imidazoles;Male

Illuminating microflora: shedding light on the potential of blue light to modulate the cutaneous microbiome. Cutaneous diseases (such as atopic dermatitis, acne, psoriasis, alopecia and chronic wounds) rank as the fourth most prevalent human disease, affecting nearly one-third of the world's population. Skin diseases contribute to significant non-fatal disability globally, impacting individuals, partners, and society at large. Recent evidence suggests that specific microbes colonising our skin and its appendages are often overrepresented in disease. Therefore, manipulating interactions of the microbiome in a non-invasive and safe way presents an attractive approach for management of skin and hair follicle conditions. Due to its proven anti-microbial and anti-inflammatory effects, blue light (380 - 495nm) has received considerable attention as a possible 'magic bullet' for management of skin dysbiosis. As humans, we have evolved under the influence of sun exposure, which comprise a significant portion of blue light. A growing body of evidence indicates that our resident skin microbiome possesses the ability to detect and respond to blue light through expression of chromophores. This can modulate physiological responses, ranging from cytotoxicity to proliferation. In this review we first present evidence of the diverse blue light-sensitive chromophores expressed by members of the skin microbiome. Subsequently, we discuss how blue light may impact the dialog between the host and its skin microbiome in prevalent skin and hair follicle conditions. Finally, we examine the constraints of this non-invasive treatment strategy and outline prospective avenues for further research. Collectively, these findings present a comprehensive body of evidence regarding the potential utility of blue light as a restorative tool for managing prevalent skin conditions. Furthermore, they underscore the critical unmet need for a whole systems approach to comprehend the ramifications of blue light on both host and microbial behaviour. Animals;Humans;Blue Light;Dysbiosis;Microbiota;Skin;Skin Diseases

Photobiomodulation in the treatment of palmar-plantar erythrodysesthesia: a randomised controlled clinical study protocol. INTRODUCTION: Hand-foot syndrome, also known as palmar-plantar erythrodysesthesia (PPE), is a complication caused by chemotherapy. Clinically, it manifests as erythema and oedema on the palms of the hands and feet, dry and scaly skin, accompanied by a sensation of tightness and pain. Extreme cases have blisters and ulcerations that may require hospitalisation and/or pause in cancer treatment. It can also be accompanied by paraesthesia. Considering the characteristics, photobiomodulation (PBM) may reduce the PPE effects. The objective of this protocol will be to evaluate the efficacy of PBM in reducing PPE induced by capecitabine and 5-fluorouracil chemotherapy. METHODS AND ANALYSIS: This will be a randomised controlled, double-blind, double-centre clinical trial (Centro Asistencial del Sindicato MÃ©dico del Uruguay and Instituto Nacional del CÃ¡ncer from Uruguay). The sample population (40 individuals) will be divided into two groups: group 1 will receive moisturising cream plus PBM treatment and group 2 moisturising cream plus PBM sham treatment, at the ratio of 1:1. PBM will be performed at 630â€‰nm two times per week in palmoplantar areas of the hands and feet (4 J/cm(2)), for 4 weeks. The PPE degree and the data referring to the chemotherapy treatment plan will be measured, prior to the start of treatment in the middle and at the end of it. Quality of life questionnaires will be applied at the beginning of the trial and at the end of treatment. The data will be analysed based on the intention-to-treat analysis

and Î±<0.05â€‰will be considered statistically significant. ETHICS AND DISSEMINATION: The protocol was approved by the Research Ethics Committee of Universidad CatÃ³lica del Uruguay (220316b), of Centro Asistencial del Sindicato MÃ©dico del Uruguay (221989) and of Instituto Nacional del CÃ¡ncer (2023-04). The recruitment has already started (March 2023). PROTOCOL VERSION: V.2, 27 October 2023. TRIAL REGISTRATION NUMBER: ClinicalTrials.gov Registry (NCT05337423). Fluorouracil;Capecitabine Humans;Double-Blind Method;Hand-Foot Syndrome;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Fluorouracil;Quality of Life;Capecitabine;Multicenter Studies as Topic

755-nm picosecond laser plus topical 20% azelaic acid compared to topical 20% azelaic acid alone for the treatment of melasma: a randomized, split-face and controlled trial. PURPOSE: Melasma remains a refractory skin condition that needs to be actively explored. Azelaic acid has been used for decades as a topical agent to improve melasma through multiple mechanisms, however, there is a lack of research on its combination with laser therapy. This study evaluated the effectiveness of isolated treatment with topical 20% azelaic acid and its combination with 755-nm picosecond laser in facial melasma patients. METHODS: A randomized, evaluator-blinded, controlled study was conducted on 30 subjects with facial melasma in a single center from October 2021 to April 2022. All subjects received topical 20% azelaic acid cream (AA) for 24 weeks, and after 4 weeks, a hemiface was randomly assigned to receive 755-nm picosecond (PS) laser therapy once every 4 weeks for 3 treatments. Treatment efficacy was determined by mMASI score evaluations, dermoscopic assessment, reflectance confocal microscopy (RCM) assessments and patient's satisfaction assessments (PSA). RESULTS: Treatment with 20% azelaic acid, with or without picosecond laser therapy, significantly reduced the hemi-mMASI score (Pâ€‰<â€‰0.0001) and resulted in higher patient satisfaction. Improvements in dermoscopic and RCM assessments were observed in both sides of the face over time, with no difference between the two sides. RCM exhibited better dentritic cell improvement in the combined treatment side. No patients had serious adverse effects at the end of treatment or during the follow-up period. CONCLUSION: The additional use of picosecond laser therapy showed no clinical difference except for subtle differences detected by RCM assessments.The study was registered in the Chinese Clinical Trial Registry (ChiCTR2100051294; 18 September 2021). azelaic acid;Dicarboxylic Acids;Dermatologic Agents Humans;Melanosis;Female;Dicarboxylic Acids;Adult;Middle Aged;Lasers, Solid-State;Male;Treatment Outcome;Low-Level Light Therapy;Dermatologic Agents;Combined Modality Therapy;Patient Satisfaction;Administration, Topical;Single-Blind Method

Therapeutic Effects of Exosome Therapy and Photobiomodulation Therapy on the Spermatogenesis Arrest in Male Mice After Scrotum Hyperthermia. Introduction: In men, several factors cause infertility, among which we can mention damage to sperm due to high temperature. So far, various treatments have been proposed for it, but they have not been highly effective. The current study aimed to evaluate the effect of exosome therapy (EXO) and photobiomodulation therapy (PBMT) on spermatogenesis arrest in male mice after scrotum hyperthermia. Methods: In this experimental study, the animals were divided into four groups: control, scrotal hyperthermia, scrotal hyperthermia+EXO (100 Î¼L/d) (mice were treated for 30 days), scrotal hyperthermia+PBMT (laser of 0.03 J/cm2 for 30 seconds/for 30 days). Hyperthermia was induced by exposure to the temperature of 43 Â°C for 20 minute every day for 5 times. After 6 weeks, the animals were sacrificed. Results: The treated groups showed a significant increase in sperm parameters, as compared to the hyperthermic groups. Moreover, these favorable effects were observed in relation to the volume of testicular tissue, the number of germ cells, Leydig cells and Sertoli cells, and the level of testosterone. Research on antioxidants showed a significant reduction in oxidized glutathione (GSSG) and reactive oxygen species (ROS) in the treatment groups in comparison to the hyperthermia group (P<0.001). Also,

there has been a significant increase in the amount of hydrogen peroxide enzyme observed in the hyperthermia group as opposed to the treatment group (P<0.001). Conclusion: These findings show that EXO and PBMT can improve spermatogenesis caused by hyperthermia, reduce ROS and GSSG, and increase glutathione (GSH) and sperm quality.

Evaluation of the Effect of Photobiomodulation on Radiation-Induced Xerostomia in Head and Neck Cancer Patients: A Randomized Clinical Trial. Introduction: Radiotherapy-induced xerostomia is an important side effect of head and neck cancer (HNC) treatment. Photobiomodulation (PBM) is one of the new emerging methods for preventing or reducing this problem. The aim of this study is to evaluate the effect of PBM on radiation-induced xerostomia in HNC patients. Methods: Thirty-seven patients with HNC who were referred for radiotherapy to Mashhad cancer center. In the case group, an infrared diode laser was used in contact mode on 16 points (covering minor and major salivary glands). The device emitted a wavelength of 810 nm and operated at the power of 200 mW and continuous wave mode. Each area was irradiated for 4 seconds in contact mode with gentle pressure, and the laser energy was 0.8 J with an energy density of 2.85 J/cm(2) at the surface of the probe (spot size, 0.28 cm(2)). The total dose was 45.6 J/cm(2). The power density was 714.2 w/cm(2). In the control group, the sham laser device was used. Subjective xerostomia was evaluated through the LENT SOMA scale (LSS). Stimulated and unstimulated saliva was also assessed. Data were analyzed with SPSS ver22 statistical software. Results: The study included 26 men and 11 women with a mean age of 55.6Â±15.3 years. In the sixth week, the case group produced more stimulated saliva than the control group (P=0.006). They also had less subjective xerostomia than the control group in weeks four to six. Conclusion: In the present study, PBM had a preventive effect on stimulated saliva and subjective xerostomia and can be recommended as an adjunctive treatment. Further studies with a higher sample size and the use of a low-level laser in more sessions are needed for definitive comment.

In Vitro Photobiomodulation Effects of Blue and Red Diode Lasers on Proliferation and Differentiation of Periodontal Ligament Mesenchymal Stem Cells. Introduction: This study aimed to assess the photobiomodulation effects of blue and red lasers on the proliferation and osteogenic differentiation of periodontal ligament mesenchymal stem cells (PDLMSCs). Methods: PDLMSCs were cultured and tested in 4 groups. The first two groups were exposed to 445 nm diode laser irradiation (200 mW, 6 and 12 J/cm(2)), and the third group was exposed to 660 nm diode laser irradiation (50 mW, 4 J/cm(2)). The fourth group was also considered as the control group without irradiation. Cell viability/proliferation was assessed by MTT assay. RUNX2, alkaline phosphatase (ALP), collagen type 1 (col1), and osteocalcin (OCN) were evaluated by RT-PCR, and Alizarin red was used to evaluate the colonization. The data were analyzed by means of one-way analysis of variance. Results: The results of our study showed that cell survival/proliferation in the second group was significantly lower than that in the control group on days 1 and 7 (P<0.05). RT-PCR showed a significant increase in osteogenic genes in all three laser groups compared to the control group (P<0.05). All groups showed a significant increase in calcium content compared to the control group (P<0.05). ALP activity also confirmed the osteoblastic differentiation of cells in laser groups. Conclusion: 445 nm and 660 nm lasers with the studied parameters showed positive effects on the proliferation and osteoblastic differentiation of PDLMSCs.

Improving Healing: The Putative Effects of Low-Level Laser Therapy for Ulcer in Parkinson's Disease. The progressive nature of Parkinson's disease and its associated motor and non-motor symptoms can lead to various complications when patients experience immobilization, exacerbating existing motor impairments and potentially giving rise to secondary health issues. The variability, progression, and management of tremors in PD can be challenging. Due to low bone mass density, patients with Parkinson's disease are susceptible to vitamin D deficiency. The lack of movement can worsen muscle

rigidity and stiffness, leading to contractures and a decreased range of motion in joints. Additionally, immobility may contribute to cardiovascular deconditioning, orthostatic hypotension, and an increased risk of pressure ulcers due to prolonged pressure on specific areas of the body.Â In this case report, we hereby report a case of Parkinson's disease further complicated by sinus discharge from the ulcer. This case report describes the putative effects of low-level laser therapy on discharging sinus from the wound secondary to a diabetic ulcer in idiopathic Parkinson's disease. Achieving an ideal level of functional independence and preventing problems associated with extended immobility are essential goals of structured physical therapy postoperative care. This may assist the patient in returning to their pre-injury position more quickly. Our patient underwent several interventions for wound healing, including proprioception training, tremor management, improving dynamic trunk balance, and pain control measures. Clinical outcome measures like the Barthel Index, lower extremity functional scale, and Visual-Analog Scale were used to assess the progress of the patient. Managing these interconnected conditions requires a multi-disciplinary approach.

Evaluation of the effect of different kinds of treatment modalities for temporomandibular joint pain and its relevance to chronic cervical pain: A randomized controlled trial. AIM: The aim of this study was to evaluate the effect of different treatment modalities for temporomandibular joint (TMJ) pain and their relevance to chronic cervical pain after 12 months. SETTINGS AND DESIGN: This was a randomized controlled trial. MATERIALS AND METHODS: Forty-eight participants with chronic cervical and TMJ pain were selected using research diagnostic criteria and randomized into four groups (n = 12), which included control, soft splints, transcutaneous electrical nerve stimulation (TENS), and low-level laser (LLL). The cervical and TMJ pain was recorded using visual analog scale (VAS) scores at baseline, 3 months, 6 months, and 12 months. Occlusal equilibration was done for all groups except for the control. STATISTICAL ANALYSIS USED: The mean pain scores were statistically analyzed using one-way analysis of variance and posthoc test. RESULTS: The mean VAS scores in TMJ pain patients between the four groups at baseline and at final follow-up were 7.27 Â± 1.29 in Group 1, 7.53 Â± 0.70 in Group 2, 7.76 Â± 0.80 in Group 3, and 7.61 Â± 0.61 in Group 4. The mean difference between Groups 1 and 3, Groups 1 and 4, and Groups 2 and 3 was statistically significant ($P < 0.00$). Pearson correlation test yielded a mild and negative correlation between TMJ and cervical pain. CONCLUSION: TENS and LLL were found to be equally effective in reducing pain in the jaw joint region, followed by soft splints, and there was no correlation between TMJ and cervical pain.
Humans;Transcutaneous Electric Nerve Stimulation;Female;Temporomandibular Joint Disorders;Neck Pain;Male;Chronic Pain;Adult;Low-Level Light Therapy;Pain Measurement;Middle Aged;Occlusal Splints;Treatment Outcome

Photobiomodulation in promoting increased Skin Flap Viability: a systematic review of animal studies. Necrosis is common in skin flap surgeries. Photobiomodulation, a noninvasive and effective technique, holds the potential to enhance microcirculation and neovascularization. As such, it has emerged as a viable approach for mitigating the occurrence of skin flap necrosis. The aim of this systematic review was to examine the scientific literature considering the use of photobiomodulation to increase skin-flap viability. The preferred reporting items for systematic reviews and meta-analyses (PRISMA), was used to conducted systematic literature search in the databases PubMed, SCOPUS, Elsevier and, Scielo on June 2023. Included studies investigated skin-flap necrosis employing PBMT irradiation as a treatment and, at least one quantitative measure of skin-flap necrosis in any animal model. Twenty-five studies were selected from 54 original articles that addressed PBMT with low-level laser (LLL) or light-emitting diode (LED) in agreement with the qualifying requirements. Laser parameters varied markedly across studies. In the selected studies, the low-level laser in the visible red spectrum was the most frequently utilized PBMT, although the LED PBMT showed a similar

improvement in skin-flap necrosis. Ninety percent of the studies assessing the outcomes of the effects of PBMT reported smaller areas of necrosis in skin flap. Studies have consistently demonstrated the ability of PBMT to improve skin flap viability in animal models. Evidence suggests that PBMT, through enhancing angiogenesis, vascular density, mast cells, and VEGF, is an effective therapy for decrease necrotic tissue in skin flap surgery. Animals;Low-Level Light Therapy;Surgical Flaps;Necrosis;Skin

Three-Dimensional Cell Culture of Adipose-Derived Stem Cells in a Hydrogel with Photobiomodulation Augmentation. Adipose-derived stem cells (ADSCs), possessing multipotent mesenchymal characteristics akin to stem cells, are frequently employed in regenerative medicine due to their capacity for a diverse range of cell differentiation and their ability to enhance migration, proliferation, and mitigate inflammation. However, ADSCs often face challenges in survival and engraftment within wounds, primarily due to unfavorable inflammatory conditions. To address this issue, hydrogels have been developed to sustain ADSC viability in wounds and expedite the wound healing process. Here, we aimed to assess the synergistic impact of photobiomodulation (PBM) on ADSC proliferation and cytotoxicity within a 3D cell culture framework. Immortalized ADSCs were seeded into 10 ÂµL hydrogels at a density of 2.5 x 10(3) cells and subjected to irradiation using 525 nm and 825 nm diodes at fluencies of 5 J/cm(2) and 10 J/cm(2). Morphological changes, cytotoxicity, and proliferation were evaluated at 24 h and 10 days post-PBM exposure. The ADSCs exhibited a rounded morphology and were dispersed throughout the gel as individual cells or spheroid aggregates. Importantly, both PBM and 3D culture framework displayed no cytotoxic effects on the cells, while PBM significantly enhanced the proliferation rates of ADSCs. In conclusion, this study demonstrates the use of hydrogel as a suitable 3D environment for ADSC culture and introduces PBM as a significant augmentation strategy, particularly addressing the slow proliferation rates associated with 3D cell culture. Hydrogels Hydrogels;Adipose Tissue;Cell Culture Techniques, Three Dimensional;Humans;Stem Cells;Low-Level Light Therapy

Comparative Efficacy of Non-Invasive Therapies in Temporomandibular Joint Dysfunction: A Systematic Review. Temporomandibular disorder (TMD) is a multifaceted disorder impacting the temporomandibular joint (TMJ), causing substantial discomfort and functional limitations. This systematic review aims to comprehensively assess the effectiveness of non-invasive treatment modalities for TMJ dysfunction, prioritizing a definitive protocol to ensure patient safety and enhance quality of life. Employing the PRISMA guidelines, we meticulously analyzed 20 studies from a pool of 1,417 articles sourced from databases such as PubMed, Google Scholar, ScienceDirect, and Medline. These studies underscore the multifarious nature of TMD and the varied responses to treatments such as physical therapy, laser therapy, ultrasound and electrical stimulation, splint therapy, injections, and arthrocentesis. Notably, the review highlights the paramount importance of precise diagnosis, often through surface electromyography, followed by a tailored treatment approach integrating manual therapy, counseling, and splint therapy. The systematic analysis revealed that while certain treatments such as transcutaneous electrical nerve stimulation and low-level laser therapy showed limited efficacy, combination therapies, especially those involving manual therapy, counseling, and splint therapy, demonstrated substantial improvement in reducing pain, depression, and anxiety. The findings advocate for a non-invasive, patient-centric approach, emphasizing education and symptom management before considering more invasive procedures such as injections and arthrocentesis. The review identifies the need for more comprehensive, longitudinal studies to establish a standardized, evidence-based treatment protocol for TMJ dysfunction, aiming to improve patient outcomes holistically.

The power of light - From dental materials processing to diagnostics and therapeutics. Harnessing the power of light and its photonic energy is a powerful tool in biomedical applications. Its

use ranges from biomaterials processing and fabrication of polymers to diagnostics and therapeutics. Dental light curable materials have evolved over several decades and now offer very fast (â‰¤ 10 s) and reliable polymerization through depth (4-6 mm thick). This has been achieved by developments on two fronts: (1) chemistries with more efficient light absorption characteristics (camphorquinone [CQ], ~30 L mol(-1) cm(1) [ÊŽmax 470 nm]; monoacylphosphine oxides [MAPO], ~800 L mol(-1) cm(-1) [ÊŽmax 385 nm]; bisacylphosphine oxide [BAPO], ~1,000 L mol(-1) cm(-1) [ÊŽmax 385 nm]) as well mechanistically efficient and prolonged radical generation processes during and after light irradiation, and; (2) introducing light curing technologies (light emitting diodes [LEDs] and less common lasers) with higher powers (â‰¤ 2 W), better spectral range using multiple diodes (short: 390-405 nm; intermediate: 410-450 nm; and long: 450-480 nm), and better spatial power distribution (i.e. homogenous irradiance). However, adequate cure of materials falls short for several reasons, including improper selection of materials and lights, limitations in the chemistry of the materials, and limitations in delivering light through depth. Photonic energy has further applications in dentistry which include transillumination for diagnostics, and therapeutic applications that include photodynamic therapy, photobiomodulation, and photodisinfection. Light interactions with materials and biological tissues are complex and it is important to understand the advantages and limitations of these interactions for successful treatment outcomes. This article highlights the advent of photonic technologies in dentistry, its applications, the advantages and limitations, and possible future developments.

[Physiotherapy in rehabilitation of patients with degenerative disk diseases from positions of evidence-based medicine: a literature review]. Back pain is one of the most urgent problems of rehabilitation. Patients with this pathology have a leading place among neurological patients in terms of the number of days of disability. The high economic costs in society are explained by the need for lumbar surgery (discectomy, spinal fusion and disc prosthesis) and rehabilitation after it. The effectiveness of rehabilitative measures is determined both by the patient's rehabilitative potential and by the choice of rehabilitative methods. OBJECTIVE: To evaluate the effectiveness of physiotherapy in patients with degenerative disk diseases from positions of evidence-based medicine according to the scientific and technical literature. MATERIAL AND METHODS: The analysis of scientific and technical literature sources and the study of materials of meta-analyses, systematic reviews (depth of search was 20 years) on the evaluation of effectiveness of physiotherapeutical methods in the rehabilitation of patients with degenerative disk diseases have been conducted. RESULTS: The ability of pulsed magnetic field to reduce the intensity of pain and improve the functional capacities of the spine in patients with low back pain has been identified. There was a pronounced analgesic end-point of low-level laser therapy in acute and chronic back pain at short and medium-term (up to 12 months) observation, as well as the ability of the method to reduce temporary disability in degenerative disk diseases. CONCLUSION: The use of magnetotherapy and low-level laser therapy can be recommended for the treatment of patients with degenerative disk diseases (C grade of recommendations, 3rd level of evidence). The recommendation is based on the results of 10 RCTs (1.111 patients with degenerative disk diseases), 3 meta-analyses, 1 systematic review and 1 Cochrane review (a total of 3.431 patients). Humans;Evidence-Based Medicine;Physical Therapy Modalities;Low Back Pain;Spinal Fusion;Lumbar Vertebrae;Treatment Outcome

Clinical and ex-vivo effect of LASERs on prevention of early-enamel caries: systematic review & meta-analyses. To investigate the in vivo and in situ effect of different types of lasers in prevention of enamel demineralization in high caries risk cases (around orthodontic brackets, around restoration and in caries susceptible pits and fissures). PubMed was searched using the following keyword sequence; (Laser therapy OR laser irradiation OR laser application) AND (enamel caries prevention OR

enamel demineralization OR enamel remineralization OR early enamel caries OR early-enamel caries OR enamel resistance OR enamel decalcification OR white spot lesions WSLs OR incipient lesion OR enamel decay OR enamel Dissolution OR enamel microhardness) AND (clinical trial OR Randomized clinical trial OR In situ study). The latest literature search was ended by "30 January 2023". PubMed was used as a primary data base for study selection. Scopus, EBSCO, and Google scholar are checked in our study after results of systematic search on PubMed. Only duplicates were found. Two meta-analyses were carried out. The first, clinical meta-analysis on incidence of white spot lesions (WSLs) following CO2 laser irradiation of enamel. The second meta-analysis on ex-vivo/in situ effect of CO2 laser on microhardness of enamel. In each meta-analysis three studies were included. Risk of bias was assessed. The search identified eight studies (four ex-vivo and four clinical trials). Regarding the clinical meta-analysis, the overall standardized mean difference was 0.21 [95% confidence interval (CI): 0.15-0.30, pâ€‰<â€‰0.00001]. This indicates that the incidence of new WSLs in patients who received low power CO(2) laser treatment was highly significantly lower than placebo groups. The heterogeneity was considerable (I(2)â€‰=â€‰71%). In the second meta-analysis, the overall standardized mean difference was 49.55 [95% confidence interval (CI): 37.74, 61.37, pâ€‰<â€‰0.00001]. This indicates that microhardness of enamel receiving low power (0.4-5 W) CO(2) laser irradiation is highly significantly lower than control untreated enamel. The heterogeneity was substantial (I(2)â€‰=â€‰48%). Within the limitations of this study, Low level laser therapy concept with CO2 laser seems to be effective in preventing enamel caries.Prospero registration number: CRD42023437379. Carbon Dioxide Humans;Carbon Dioxide;Dental Caries Susceptibility;Lasers;Dental Caries;Low-Level Light Therapy;Randomized Controlled Trials as Topic

[Role of neodymium laser in surgery: stimulation of postoperative surgical wounds healing. Results of clinical studies]. OBJECTIVE: To prove the effectiveness of the low-intensity laser radiation application in the treatment of wounds of different origin. MATERIAL AND METHODS: The clinical study involved 110 persons, divided into 55 subjects in both the study and control groups. The patients of the study group were exposed to the long-wave short-pulse neodymium laser immediately and within 35 days after interventions with a skin incision using it, in a way that wound treated with laser received low-level laser therapy. The control group patients' wounds were treated with standard methods by the means of topical drugs corresponding to the clinical manifestations of the wound process in each particular case. The study was carried out in the hospital of the department of maxillofacial and plastic surgery of the dental complex of the Â«Russian University of MedicineÂ» from 2019 to 2022, and further conservative treatment was conducted in the department of dermatology and cosmetology of the University Hospital of the Medical Graduate School (Institute) of the RSSU. All wounds were classified into three groups for the convenience of systematization and formation of a generalized treatment protocol for postoperative surgical wounds. RESULTS: The objectivity and optimality of the chosen by us actions were confirmed in the conducted work. The formed scars were visually assessed on the POSAS scale at the end of the treatment by patients and 4 independent doctors, as well as each scar was visually assessed by four independent doctors and patients. At the end of the study we formed and proposed an algorithm for the treatment of surgical wounds of various origins. The parameters of the Aerolase Neo Light Pod neodymium laser for the treatment of patients with different types of skin wounds were clinically determined. Experimentally proven properties of the Aerolase Neo Light Pod neodymium laser on accelerating the healing process of surgical wounds through photobiomodulation mechanism support their regeneration with the formation of negligible normotrophic scars, as well as reduce the length of patients' treatment in surgical hospitals, as compared to patients receiving standard external drugs. Neodymium Humans;Cicatrix;Neodymium;Surgical Wound;Wound Healing;Lasers

The effect of low-level laser therapy on the oxidative stress level and quality of life in patients with Hashimoto's thyroiditis. This study aimed to examine the effects of low-level laser therapy (LLLT) combined with levothyroxine replacement therapy on thyroid function, oxidative stress (OS), and quality of life in patients with Hashimoto's thyroiditis (HT). Forty-six patients diagnosed with HT were randomized to receive active LLLT (nâ€‰=â€‰23) and sham LLLT (nâ€‰=â€‰23) twice a week for three weeks. Clinical and laboratory evaluations of the participants were performed before treatment and three months after treatment. Biochemical parameters were taken from the patient file requested by the physician as a routine examination. Malondialdehyde and nitricoxide indicating oxidant stress and superoxide dismutase, catalase, and glutathione, which indicate antioxidant capacity, were used in OS evaluation. The Oxidative Stress Index was calculated by measuring the Total Antioxidant Status and the Total Oxidant Status. At the end of our study, a significant improvement in oxidant and antioxidant biomarker levels showing OS and quality of life was observed in the treatment groups (pâ€‰<â€‰0.05). There was no change in thyroid function and autoimmunity at the end of the treatment between the two groups (pâ€‰>â€‰0.05). Improvements in glutathione levels and quality of life were significantly higher in the active treatment group than in the sham-controlled group. LLLT was found to be more effective on OS and quality of life in patients with HT than in patients in the sham-controlled group. It was concluded that LLLT is a safe and effective method that can be used in the treatment of patients with HT.

Photobiomodulation therapy in improvement of harmful neural plasticity in sodium salicylate-induced tinnitus. Tinnitus is a common annoying symptom without effective and accepted treatment. In this controlled experimental study, photobiomodulation therapy (PBMT), which uses light to modulate and repair target tissue, was used to treat sodium salicylate (SS)-induced tinnitus in a rat animal model. Here, PBMT was performed simultaneously on the peripheral and central regions involved in tinnitus. The results were evaluated using objective tests including gap pre-pulse inhibition of acoustic startle (GPIAS), auditory brainstem response (ABR) and immunohistochemistry (IHC). Harmful neural plasticity induced by tinnitus was detected by doublecortin (DCX) protein expression, a known marker of neural plasticity. PBMT parameters were 808 nm wavelength, 165 mW/cm2 power density, and 99 J/cm2 energy density. In the tinnitus group, the mean gap in noise (GIN) value of GPIAS test was significantly decreased indicated the occurrence of an additional perceived sound like tinnitus and also the mean ABR threshold and brainstem transmission time (BTT) were significantly increased. In addition, a significant increase in DCX expression in the dorsal cochlear nucleus (DCN), dentate gyrus (DG) and the parafloccular lobe (PFL) of cerebellum was observed in the tinnitus group. In PBMT group, a significant increase in the GIN value, a significant decrease in the ABR threshold and BTT, and also significant reduction of DCX expression in the DG were observed. Based on our findings, PBMT has the potential to be used in the management of SS-induced tinnitus. Sodium Salicylate Rats;Animals;Sodium Salicylate;Tinnitus;Low-Level Light Therapy;Cochlear Nucleus;Neuronal Plasticity

The effects of photobiomodulation on the improvement of sperm parameters: A review study. The prevalence of male infertility has become a significant clinical concern worldwide, with a noticeable upward trend in recent times. The rates of fertilization and subsequent development of embryos are dependent on many parameters associated with the quality and viability of sperm. Photobiomodulation (PBM) is a promising approach with a great potential for translational applications in the treatment of spermatozoa exhibiting low quality and motility. In this study, a comprehensive analysis of the existing literature, specifically examining the mechanisms of action of PBM has been presented. Our objective was to enhance knowledge in the field of laser light therapy in order to promote the usage of irradiation in clinical settings in a more effective way. Within the realm of reproductive science, the utilization of PBM has been employed to enhance the metabolic

processes, motility, and viability of spermatozoa. This is attributed to its advantageous effects on mitochondria, resulting in the activation of the mitochondrial respiratory chain and subsequent synthesis of ATP. This therapeutic approach can be highly advantageous in circumventing the reliance on chemical substances within the culture medium for spermatozoa while also facilitating the viability and motility of spermatozoa, particularly in circumstances involving thawing or samples with significant immotility.

Immediate pain alleviation in oral mucositis and other oral ulcerative diseases through photobiomodulation therapy: the preemptive treatment concept. OBJECTIVE: Photobiomodulation (PBM) therapy is recommended by multiple international societies for managing oral mucositis (OM). These recommendations are based on extensive evidence. However, the search for an optimal PBM protocol continues. This mapping review focuses on a novel aspect of PBM therapy which is the immediate effect on pain levels associated with oral ulcerative conditions. DATA SOURCES: This literature review systematically compiles and evaluates the evidence about OM, alongside other oral ulcerative conditions, as the protocols that achieved pain relief for these oral conditions may have potential applicability to OM management. The scientific database used was PubMed. CONCLUSION: Whereas most of the randomized controlled trials about PBM therapy for OM and other ulcerative oral diseases reported delayed pain relief, certain PBM therapy protocols reported immediate pain relief. The results of this review highlight the concept of preemptive PBM therapy, in which PBM therapy is delivered early in the development of OM throughout the oncotherapy and may achieve immediate pain relief consistently in most of the patients and close to a negligible pain level. PBM therapy, as a powerful non-pharmacologic tool for immediate pain relief, has a great beneficial value in patients suffering from OM and other painful oral ulcerative diseases such as recurrent aphthous stomatitis and chronic graft-versus-host disease.

Progressive Physiotherapy Rehabilitation Program for a Patient With Biceps Tenodesis Recovery: A Case Report. The present case report investigates the effectiveness of a progressive physiotherapy rehabilitation program in aiding the recovery of a patient who underwent biceps tenodesis. It is a surgical procedure involving the reattachment or relocation of the biceps tendon to alleviate pain and enhance function in conditions, like tendinitis or tears. The rehabilitation program is specifically tailored to address the distinct challenges associated with biceps tenodesis recovery, focusing on gradual exercises aimed at improving strength, range of motion (ROM), and functional capacity. Through a comprehensive analysis, this case report seeks to offer insights into the potential advantages and obstacles of employing a specialized physiotherapy approach in the holistic care of individuals undergoing biceps tenodesis, contributing to the ongoing development of postoperative rehabilitation strategies.

Comparison of a daily and alternate-day photobiomodulation protocol in the prevention of oral mucositis in patients undergoing radiochemotherapy for oral cancer: a triple-blind, controlled clinical trial. BACKGROUND: Preventive Photobiomodulation Therapy (PBMT) significantly reduces oral mucositis (OM) severity in patients undergoing Radiochemotherapy (RCT) for the treatment of oral cancer, but daily applications generate cost, overload the dental team, and reduce the number of patients assisted.To evaluate the effectiveness of two PBMT protocols in preventing OM in patients undergoing RCT for oral cancer. MATERIAL AND METHODS: 16 patients diagnosed with oral cancer undergoing RCT were included, equally divided into two groups: a group treated daily with PBMT, and another group also submitted to daily treatment, however, performing the application of PBMT every three days, interspersed with a simulation of PBMT (placebo). A red laser was used (~660 nm), 0.1W power, 1J of energy applied per point, 9 points per area (labial mucosa, buccal mucosa, lateral borders of the tongue, body of the tongue, and floor of the mouth) from the beginning of RCT until the end of the oncological treatment. Daily assessments were performed regarding OM scores, the

World Health Organization (WHO) pain scale, and the visual analog scale (VAS). Weight, salivary flow (SGAPP), OHIP-14, and DMFT were evaluated on the initial and final days of RT. OM incidence and clinical data were compared by Pearson's chi-square test or Fisher's exact test. Pain and other scale scores were compared using the Mann-Whitney and Friedman/Dunn tests (SPSS v20.0 $p<0.05$). RESULTS: In the group with PBMT on alternate days, there was an increase in the frequency of grade 2 and grade 3 oral mucositis and an increased risk of grade 2 oral mucositis, in addition to higher mean pain scores and greater reduction in salivary flow. CONCLUSIONS: The daily PBMT protocol proved more effective in controlling the frequency and severity of OM, pain, and salivary flow.

Effects of photobiomodulation therapy on muscle function in individuals with multiple sclerosis. BACKGROUND: In people with multiple sclerosis (pwMS), muscle fatigue and weakness are common issues that can interfere with daily activities. Photobiomodulation therapy (PBMT), comprising light in a 600-1100 nm bandwidth, is a low-level laser therapy thought to improve muscle performance in non-disease populations, in part, by improving mitochondrial function and thus, might be beneficial in pwMS. Given this potential, we aimed to investigate the effects of PBMT on muscle performance in pwMS, both in the short-term and over an extended period. METHODS: This study consisted of two parts with a randomized double-blind crossover design. In study I, muscle function was assessed in four sessions before and after PBMT in ambulatory pwMS (N = 17, F = 14) as follows: maximal voluntary contraction (MVC) and muscle fatigue of the right tibialis anterior (TA) muscle was compared at baseline and following a two-min submaximal fatiguing contraction. Then, PBMT was administered to the belly of TA muscle at different doses of energy of an active device (40 J, 80 J, 120 J) or placebo. The muscle function assessment was then repeated. OUTCOME VARIABLES: muscle force recovery (%), muscle fatigue (%). Statistical tests included McNemar's exact test, Wilcoxon signed-rank test, and the Friedman test. In study II, a subgroup from study I (N = 12, F = 11) received individualized doses (i.e., best dose-effect observed in study I) of active, or placebo PBMT, which was administered on the TA muscle for two weeks. Muscle function assessments were performed pre- and post-PBMT in four sessions similar to study I. OUTCOME VARIABLES: Baseline strength (N), endurance time (s), and muscle fatigue (%). The Wilcoxon signed-rank test was used for statistical analysis. Values are reported as mean (SD). RESULTS: In study I, participants who received a high dose of PBMT showed significant improvement in force recovery (101.89 % (13.55 %)) compared to the placebo group (96.3 % (18.48 %); p = 0.03). Muscle fatigue did not significantly improve with either active PBMT or placebo. In study II, active PBMT resulted in a significant improvement in muscle strength compared to both the baseline (pre-PBMT = 162.70 N (37.52 N); post-PBMT = 185.56 N (33.95 N); p = 0.01) and the placebo group (active PBMT: mean-change = 22.87 N (23.67 N); placebo: mean-change = -4.12 N (31.95 N); p = 0.02). Endurance time and muscle fatigue did not show significant improvement with either active PBMT or placebo. CONCLUSION: Our findings suggest that an individualized dose of PBMT might improve muscle performance, including force recovery and strength in individuals with mild-moderate MS. Therefore, PBMT might be a novel therapeutic modality, either as a standalone treatment or in combination with other interventions, to improve muscle performance in pwMS.

A Novel Therapeutic Approach of 980 nm Photobiomodulation Delivered with Flattop Beam Profile in Management of Recurrent Aphthous Stomatitis in Paediatrics and Adolescents-A Case Series with 3-Month Follow-Up. Background/Objectives: Recurrent aphthous stomatitis (RAS) is one of the most common oral mucosal lesions and a very debilitating lesion, especially in paediatric and adolescent patients. The current pharmacotherapy offers a pain relief but not without side effects, and therefore photobiomodulation (PBM) can be an alternative therapy. To the authors' best knowledge, no published study has explored the efficacy of Î» 980 nm laser PBM in the management of all RAS subtypes in paediatric and adolescent patients, and therefore, this prospective

observational clinical study was conducted to bridge this gap by evaluating Î» 980 nm laser PBM efficacy in symptomatic RAS management in paediatric and adolescent patients. The objectives were to evaluate (1) pain intensity alleviation; (2) wound healing rate; (3) wound size closure; (4) a complete resolution; (5) evidence of recurrence; and (6) patients' treatment satisfaction. Methods: The study's variables were assessed at the following timepoints: T0: pre-treatment; T1: immediately after first PBM session; T2: 5 hours (h) post first PBM session (via telephone call); T3: immediately after second PBM session (three days post first PBM session); T4: three-day follow-up (after complete PBM treatments); T5: two-week follow-up; and T6: three-month follow-up. The following PBM dosimetry and treatment protocols were employed: Î» 980 nm; 300 mW; 60 s; 18 J; CW; flattop beam profile of 1 cm(2) spot size; 18 J/cm(2); and twice-a-week irradiation (72 h interval). Results: At T1, significant immediate pain intensity relief was reported. 33.33% recorded "4" and 66.67% reported "5" on the quantitative numeric pain intensity scale (NPIS), and this continued to improve significantly (83.33%) at T2. All the subjects reported "0" on the NPIS at T3, T4, T5 and T6. There was a significant reduction in the lesion surface area (>50% complete healing) at T3 compared to T0. Complete healing (100%) with no evidence of scarring and lesion recurrence observed at T4, T5 and T6. Very good patients' satisfaction was reported at all timepoints. Conclusions: This is the first report demonstrating Î»980 nm efficacy in all RAS subtype management in paediatric and adolescent patients with a 3-month follow-up, whereby its PBM dosimetry and treatment protocols were effective from scientific and practical standpoints, and hence multicentre RCTs with large data are warranted to validate its reproducibility and to enrich the knowledge of PBM application in all RAS subtypes.

Physical Therapies for Delayed Onset Muscle Soreness: A Protocol for an Umbrella and Mapping Systematic Review with Meta-Meta-Analysis. BACKGROUND: Delayed onset muscle soreness (DOMS), also known as exercise-induced muscle damage (EIMD), is typically caused by strenuous and/or unaccustomed physical exercise. DOMS/EIMD manifests itself in reduced muscle strength and performance levels, increased muscle soreness, swelling, and elevated levels of inflammatory biomarkers. Numerous randomised controlled trials (RCTs) and systematic reviews (SRs) of a wide variety of physiotherapy interventions for reducing the signs and symptoms of DOMS/EIMD have been published. However, these SRs often arrive at contradictory conclusions, impeding decision-making processes. OBJECTIVE: We will systematically review the current evidence on clinical outcomes (efficacy, safety) of physiotherapy interventions for the treatment of DOMS/EIMD in healthy adults. We will also assess the quality of the evidence and identify, map, and summarise data from the available SRs. METHOD: Umbrella review with evidence map and meta-meta-analyses. MEDLINE, Embase, Cochrane Database of Systematic Reviews, Epistemonikos and PEDro will be searched from January 1998 until February 2024. SRs of RCTs of any treatment used by physiotherapists (e.g., low-level laser therapy, electrical stimulation, heat/cold therapy, ultrasound, magnets, massage, manual therapies) to treat DOMS/EIMD in healthy adults will be eligible. Narrative/non-systematic reviews, studies of adolescents/children and medically compromised individuals, of complementary therapies, dietary, nutritional, or pharmacological interventions, as well as self-administered interventions, or those published before 1998, will be excluded. AMSTAR 2 will be used to evaluate the methodological quality of the included SRs. Corrected covered area, will be computed for assessing overlaps among included SRs, and an evidence map will be prepared to describe the credibility of evidence for interventions analysed in the relevant SRs. DISCUSSION: DOMS/EIMD is a complex condition, and there is no consensus regarding the standard of clinical/physiotherapeutic care. By critically evaluating the existing evidence, we aim to inform clinicians about the most promising therapies for DOMS/EIMD. This umbrella review has the potential

to identify gaps in the existing evidence base that would inform future research. The protocol has been registered at PROSPERO (CRD42024485501].

Evaluation of photobiomodulation in the salivary production of patients with hyposalivation induced by antihypertensive drugs - A blind, randomized, controlled clinical trial. BACKGROUND: Arterial hypertension is a systemic condition that affects about 35% of the world population. The drugs that are used for its control can produce hyposalivation. This work evaluated the effect of photobiomodulation on salivary flow rate, salivary pH, total protein concentration, and calcium concentration in individuals using antihypertensive medications. MATERIAL AND METHODS: 41 subjects were randomly allocated in one of two groups: control (placebo) and photobiomodulation. The subjects had their salivary glands (20 sites) irradiated with a laser emitting at 808Â nm, 4J/site once a week for 4 weeks and had their salivary flow measured before and after the whole treatment. RESULTS: The intragroup analysis (before and after treatment) shows a significant difference for both non-stimulated and stimulated salivary flow in the photobiomodulation group (pÂ =Â 0.0007 and pÂ =Â 0.0001, respectively). Comparing the placebo with the photobiomodulation group, significant differences were found for both non-stimulated (pÂ =Â 0.0441) and stimulated salivary flow (pÂ =Â 0.0441) after the treatment. No significant differences were found in pH, total protein concentration, calcium concentration. CONCLUSION: Despite the usage of drugs that influence the nervous system and typically result in a reduction of saliva production, photobiomodulation demonstrated a remarkable ability to enhance saliva production by a significant 75%.

Unveiling the Efficacy of Physiotherapy Strategies in Alleviating Low Back Pain: A Comprehensive Review of Interventions and Outcomes. Low back pain (LBP) presents a significant burden globally, affecting individuals of all ages, but it is more common in adults aged 30-60 years oldÂ and demographics including race, ethnicity, and socioeconomic status. Physiotherapy interventions are commonly employed to manage LBP due to their non-invasive nature and potential for addressing underlying biomechanical dysfunctions. This comprehensive review aims to evaluate the efficacy of various physiotherapy strategies in alleviating LBP, considering a range of interventions and their associated outcomes. Through a thorough examination of existing literature from January 2017 to October 2023, this review synthesises evidence on the effectiveness of interventions such as manual therapy, exercise therapy, electrotherapy modalities, and education-based approaches. The review also scrutinizes the comparative effectiveness of different physiotherapy modalities and their suitability for specific patient populations, considering factors such as chronicity, severity, and underlying pathology. By critically evaluating the evidence base, this review aims to provide insights into the most effective physiotherapy strategies for alleviating LBP, chronic low back pain (CLBP)Â and chronic nonspecific low back pain (CNLBP) and guiding clinical practice towardÂ evidence-based interventions. The Visual Analogue Scale and Numerical Pain Rating Scale for pain, Oswestry Disability Index andÂ Roland-Morris Disability Questionnaire for disability, Modified-Modified Schober Test for measurement of lumbar flexion and extensionÂ and static and dynamic balance for assessing postural stability and balance were among the measures used to foresee enhancements in pain, disability, balance, and LBP symptoms. Twenty-one studies that fulfilled the criteria for inclusion (aged 20 to 50 years and of both genders) were added to the review. Exercises for core stability, strengthening, orthosis (a medical device designed to support, align, stabilise, or correct musculoskeletal structures and functions), transcutaneous electrical nerve stimulation, heat massage therapy, interferential current (a form of electrical stimulation used in physical therapy), Mulligan's mobilization (a manual therapy technique), low-level laser therapy, and McGill stabilization exercises (core exercises) were among the therapeutic strategies. The McKenzie method (back exercises), ultrasound, sensory-motor training, Swiss ball exercises, and other techniques reduced pain and enhanced strength, balance, and ease of daily activities. Every

therapeutic approach has an impact on recovery rates ranging from minimal to maximal. Conventional physical therapy is less effective than most recent advancedÂ techniques like mobilisation and exercises. In summary, the integration of manual techniques, orthoses and alternative intervention strategies with conservative therapeutic approaches can effectively alleviate pain, enhance function and yield better overall outcomes. To get more information about the optimal dosage, therapeutic modalitiesÂ and long-term effects of these treatments, more admirable research is required. This paper aims to expand the scientific discourse by exploring non-traditional physiotherapy interventions and assessing their efficacy in light of the rigorous standards set forth by the latest WHO guidelines.

Devices used for photobiomodulation of the brain-a comprehensive and systematic review. A systematic review was conducted to determine the trends in devices and parameters used for brain photobiomodulation (PBM). The revised studies included clinical and cadaveric approaches, in which light stimuli were applied to the head and/or neck. PubMed, Scopus, Web of Science and Google Scholar databases were used for the systematic search. A total of 2133 records were screened, from which 97 were included in this review. The parameters that were extracted and analysed in each article were the device design, actuation area, actuation site, wavelength, mode of operation, power density, energy density, power output, energy per session and treatment time. To organize device information, 11 categories of devices were defined, according to their characteristics. The most used category of devices was laser handpieces, which relate to 21% of all devices, while 28% of the devices were not described. Studies for cognitive function and physiological characterisation are the most well defined ones and with more tangible results. There is a lack of consistency when reporting PBM studies, with several articles under defining the stimulation protocol, and a wide variety of parameters used for the same health conditions (e.g., Alzheimer's or Parkinson's disease) resulting in positive outcomes. Standardization for the report of these studies is warranted, as well as sham-controlled comparative studies to determine which parameters have the greatest effect on PBM treatments for different neurological conditions. Humans;Low-Level Light Therapy;Brain;Cognition;Lasers

Correction: Photobiomodulation combination therapy as a new insight in neurological disorders: a comprehensive systematic review.

Comparison of the efficacy among different interventions for radiodermatitis: A Bayesian network metaâ€‘analysis of randomized controlled trials. BACKGROUND: Radiation dermatitis (RD) is a prevalent and difficult-to-manage consequence of radiation therapy (RT). A variety of interventions have been proven effective in preventing and treating RD. However, the optimal approach remains unclear. This network meta-analysis (NMA) conducted a comparison and ranking of the effectiveness and patient-reported outcomes (PROs) of the interventions currently utilized in RD. METHODS: PubMed, Web of Science, Embase, and Cochrane Library were searched to identify pertinent randomized controlled trials (RCTs) focused on the prevention and treatment of RD. The primary outcome measures included the incidence of gradeâ‰¥2 RD (i.e., percentage of moist desquamation) and RD score. The secondary outcome measures encompassed patients' subjective assessment scores of pains, itching and burning sensations. RESULTS: Our meta-analysis encompassed 42 studies and 4884 participants. Regarding the primary outcomes, photobiomodulation treatment (PBMT) ranked first in surface under curve cumulative ranking area (SUCRA:0.92) for reducing the incidence of gradeâ‰¥2 RD. It demonstrated a significant difference when compared to Trolamine (OR 0.18,95%CrI 0.09-0.33) and XonridÂ® (OR 0.28,95%CrI 0.12-0.66). Mepitelfilm (SUCRA: 0.98) achieved the highest rank in reducing the RD score, demonstrating superiority over StrataXRTÂ® (MD -0.89, 95% CrI -1.49, -0.29). Henna (SUCRA: 0.89) demonstrated the highest effectiveness in providing pain relief, with a significant difference compared to Hydrofilm (MD

-0.44, 95% CrI -0.84, -0.04) and Mepitelfilm (MD -0.55, 95% CrI -0.91, -0.19). Hydrofilm (SUCRA: 0.84) exhibited the fewest itching sensations, demonstrating superiority over Mepitelfilm (MD -0.50, 95% CrI -0.84, -0.17). No statistically significant difference was observed among various interventions in the assessment of burning sensations. CONCLUSION: PBMT and Mepitelfilm demonstrated better efficacy in reducing the incidence of gradeâ‰¥2 RD and RD score, respectively. In terms of PROs, Henna and Hydrofilm had fewer complaints in pain and itching sensations, respectively. However, studies with larger sample size on different interventions are warranted in the future. TRIAL REGISTRATION: PROSPERO registration number CRD42023428598. Humans;Network Meta-Analysis;Radiodermatitis;Randomized Controlled Trials as Topic;Pain;Pruritus

Photobiomodulation therapy moderates cancer cachexia-associated muscle wasting through activating PI3K/AKT/FoxO3a pathway. Cancer cachexia-associated muscle wasting as a multifactorial wasting syndrome, is an important factor affecting the long-term survival rate of tumor patients. Photobiomodulation therapy (PBMT) has emerged as a promising tool to cure and prevent many diseases. However, the effect of PBMT on skeletal muscle atrophy during cancer progression has not been fully demonstrated yet. Here, we found PBMT alleviated the atrophy of myotube diameter induced by cancer cells in vitro, and prevented cancer-associated muscle atrophy in mice bearing tumor. Mechanistically, the alleviation of muscle wasting by PBMT was found to be involved in inhibiting E3 ubiquitin ligases MAFbx and MuRF-1. In addition, transcriptomic analysis using RNA-seq and GSEA revealed that PI3K/AKT pathway might be involved in PBMT-prevented muscle cachexia. Next, we showed the protective effect of PBMT against muscle cachexia was totally blocked by AKT inhibitor in vitro and in vivo. Moreover, PBMT-activated AKT promoted FoxO3a phosphorylation and thus inhibiting the nucleus entry of FoxO3a. Lastly, in cisplatin-treated muscle cachexia model, PBMT had also been shown to ameliorate muscle atrophy through enhancing PI3K/AKT pathway to suppress MAFbx and MuRF-1 expression. These novel findings revealed that PBMT could be a promising therapeutic approach in treating muscle cachexia induced by cancer. Forkhead Box Protein O3;Proto-Oncogene Proteins c-akt;Phosphatidylinositol 3-Kinases;FoxO3 protein, mouse;Muscle Proteins;Ubiquitin-Protein Ligases Animals;Cachexia;Forkhead Box Protein O3;Proto-Oncogene Proteins c-akt;Mice;Muscular Atrophy;Low-Level Light Therapy;Phosphatidylinositol 3-Kinases;Signal Transduction;Humans;Neoplasms;Male;Cell Line, Tumor;Muscle Proteins;Muscle, Skeletal;Ubiquitin-Protein Ligases

Accelerated Orthodontic Treatment Using Photobiomodulation: A Randomized Clinical Trial. BACKGROUND: Orthodontic treatment (OT) aims to align and correct teeth positions. However, conventional treatment methods often require a considerable amount of time. Photobiomodulation (PBM) has emerged as a potential solution to OT. MATERIALS AND METHODS: The study included 60 patients, divided equally into two groups: the PBM group and the control group. Patients in the PBM group received light therapy sessions applied directly to the OT area during each visit. Both groups underwent regular orthodontic adjustments. Treatment duration, changes in tooth alignment, and patient discomfort were evaluated. Statistical analysis was performed to compare the outcomes between the groups. RESULTS: The results of the study indicated that the PBM group experienced a statistically significant reduction in treatment duration compared to the control group. Moreover, there were noticeable improvements in tooth alignment in both groups. Patients in the PBM group reported minimal discomfort during the treatment process. These findings suggest that PBM has the potential to expedite OT without compromising its effectiveness. CONCLUSION: In conclusion, this randomized clinical trial demonstrates that PBM can be an effective approach to accelerate OT. The technique led to a significant reduction in treatment duration and was well-tolerated by patients.

Non-pharmacological strategies to alleviate dysgeusia in patients undergoing chemotherapy: A systematic review. PURPOSE: Dysgeusia is a common side effect in oncology patients,

significantly impacting their quality of life. This systematic review aims to evaluate the effectiveness of non-pharmacological strategies in treating dysgeusia in patients undergoing chemotherapy or radiotherapy. METHODS: Adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, we conducted a comprehensive literature search across five databases: PubMed, Embase, Cochrane Library, CINAHL, and the British Nursing Database. We used the Joanna Briggs Institute Critical Appraisal Tools to assess the quality of the included studies. A harvest plot was used to synthesise evidence about the differential effects of population-level interventions. RESULTS: Nine studies of non-pharmacological strategies to manage dysgeusia were included. These studies encompassed a variety of interventions, including oral applications and supplements, instrumental techniques, and educational programs. The review identified promising interventions such as cryotherapy and Miraculine supplementation, which showed potential in mitigating taste alterations. Instrumental techniques like photobiomodulation therapy and complementary and integrative medicine approaches, including acupuncture and herbs, were also found to be beneficial. Educational and self-management strategies emerged as effective interventions for empowering patients to manage dysgeusia. Despite the diversity of interventions and the limitations of the included studies, such as small sample sizes and geographical differences, these findings underscore the potential of non-pharmacological strategies in managing dysgeusia. CONCLUSION: The results support the integration of these strategies into clinical practice, highlighting the importance of multidisciplinary approaches to improve patient care. Further research should prioritize rigorous studies to enhance evidence and explore long-term effects.

Neutrophil response to Porphyromonas gingivalis is modulated by low-level laser application. OBJECTIVES: Neutrophil response is critical in inflammatory regulation and immune response to bacterial infections. During periodontal disease, pathogenic bacteria lead to exaggerated neutrophil responses. We hypothesized that low-level laser application (LLLT), therapeutic strategy for dampening inflammatory processes, will regulate neutrophil activity in response to periodontopathogens. MATERIALS AND METHODS: The impact of LLLT on neutrophil responses was measured by light delivered at wavelength of 850â€‰nm. The direct effect of LLLT on P. gingivalis A7436 was determined by flow cytometry using LIVE/DEADTM Cell Vitality kit. The phagocytosis of P. gingivalis A7436 by human neutrophils was measured using flow cytometry. Superoxide generation was measured by cytochrome-C-reduction in the presence of N-formyl-L-methionyl-L-leucyl-L-phenylalanine (fMLP; 1â€‰mM). Cytokine release by neutrophils was measured by multiplex immunoassay. RESULTS: The phagocytosis of P. gingivalis by primary human neutrophils was significantly reduced in response to LLLT (pâ€‰<â€‰0.05). While LLLT led to increased superoxide production in neutrophils that were not challenged by P. gingivalis, it dampened the increased superoxide and IL-6 release by the neutrophils in response to P. gingivalis. LLLT did not directly affect the viability of P. gingivalis. CONCLUSION: These results suggested that LLLT can provide therapeutic strategy in periodontal disease, regulating the neutrophil response to P. gingivalis.

Comparison of High-intensity Laser Therapy with Extracorporeal Shock Wave Therapy in the Treatment of Patients with Plantar Fasciitis: A Double-blind Randomized Clinical Trial. BACKGROUND: The most common cause of heel pain is plantar fasciitis (PF). Although conservative treatments relieve pain in more than 90% of patients, it may remain painful in some cases. This study aimed to compare High-intensity Laser Therapy (HILT) with Extracorporeal Shock Wave Therapy (ESWT) in patients with PF. METHODS: In this double-blinded randomized clinical trial (conducted in Yazd, Iran, from May 2020 to March 2021), patients were classified into two groups, including the ESWT and HILT, using online randomization. Nine sessions, three times a week for 3 weeks, were the treatment period in both groups. Visual Analogue Score (VAS), Heel Tenderness Index (HTI), and the SF36 questionnaire were compared and analyzed statistically at the beginning and 9 months after

treatment. RESULTS: 38 patients (19 in each group) completed the study. Results showed that pain and patient satisfaction improved significantly 3 months after treatment. The VAS and HTI decreased 3 months after treatment in both groups, which was statistically significant (P<0.001). The SF36 score in both groups increased 3 months after treatment, and this increase was statistically significant (P<0.001). Although the two modalities were effective based on VAS, HTI, and SF36, a significant statistical difference was observed between them (P=0.03, P=0.006, P=0.002, respectively), and the HILT was more effective. CONCLUSION: ESWT and HILT decrease pain and increase patient satisfaction in PF. Besides, both methods are non-invasive and safe. However, there is a significant difference between them, and HILT is more effective. Trial registration number: IRCT20210913052465N1. Humans;Fasciitis, Plantar;Extracorporeal Shockwave Therapy;Treatment Outcome;Pain;Low-Level Light Therapy

Photobiomodulation inhibits neuronal firing in the superficial but not deep layer of a rat spinal dorsal horn. Photobiomodulation (PBM) has attracted attention as a treatment for chronic pain. Previous studies have reported that PBM of the sciatic nerve inhibits neuronal firing in the superficial layers (lamina I-II) of the spinal dorsal horn of rats, which is evoked by mechanical stimulation that corresponds to noxious stimuli. However, the effects of PBM on the deep layers (lamina III-IV) of the spinal dorsal horn, which receive inputs from innocuous stimuli, remain poorly understood. In this study, we examined the effect of PBM of the sciatic nerve on firing in the deep layers of the spinal dorsal horn evoked by mechanical stimulation. Before and after PBM, mechanical stimulation was administered to the cutaneous receptive field using 0.6-26.0Â g von Frey filaments (vFFs), and vFF-evoked firing in the deep layers of the spinal dorsal horn was recorded. The vFF-evoked firing frequencies were not altered after the PBM for any of the vFFs. The inhibition rate for 26.0Â g vFF-evoked firing was approximately 13 % in the deep layers and 70 % in the superficial layers. This suggests that PBM selectively inhibits the transmission of pain information without affecting the sense of touch. PBM has the potential to alleviate pain while preserving the sense of touch. Rats;Animals;Rats, Sprague-Dawley;Low-Level Light Therapy;Spinal Cord Dorsal Horn;Neurons;Sciatic Nerve;Pain;Spinal Cord

Long-Term Outcome of Photobiomodulation Therapy for Refractory Diabetic Wound After Secretory Carcinoma of the Parotid Gland Surgery: A Case Report. Objective: To evaluate the efficacy and safety of photobiomodulation therapy (PBMT) in the treatment of diabetic patients with refractory wound. Background: Refractory wound is one of the most challenging clinical complications of diabetes mellitus. Studies have shown that PBMT can promote wound healing in many ways. Methods: We reported a 55-year-old male patient with refractory diabetic wound after secretory carcinoma of the parotid gland surgery responding to 810â€‰nm laser. Results: After PBMT, the refractory diabetic wound healed gradually without adverse events. During follow-up 5-years, the healed wound remained stable and showed no signs of recurrence. Conclusions: PBMT can be potentially considered as a therapeutic method in diabetic patients with refractory diabetic wound.

Amplifying Photon Upconversion in Alloyed Nanoparticles for a Near-Infrared Photodetector. Photon upconverison has attracted a substantial amount of interest in diverse fields due to its characteristic anti-Stokes emissions. However, obtaining intense emission under low-power laser irradiation has remained a challenge. Here we report a mechanistic design of activator-sensitizer alloyed nanoparticles to achieve bright upconversion under weak infrared irradiation. This design allows a nearest sensitizer-activator separation to facilitate efficient energy transfer that results in remarkably enhanced upconversion (>2 orders of magnitude) under 0.26 W cm(-2) irradiation compared to that of the Er sublattice, and the upconversion quantum yield also shows a 20-fold increase. Interestingly, the alloyed nanoparticles exhibit a gradual change in emission color with an increase in Yb(3+) content, and moreover, their emission colors can be dynamically controlled by

simply modulating the excitation laser power and pulse widths. Such alloyed nanoparticles show great promise for application in a near-infrared photodetector.

Radiation-induced chronic ulcerations and fistulae successfully treated with photobiomodulation.

Near-Infrared II Photobiomodulation Preconditioning Ameliorates Stroke Injury via Phosphorylation of eNOS. BACKGROUND: The current management of patients with stroke with intravenous thrombolysis and endovascular thrombectomy is effective only when it is timely performed on an appropriately selected but minor fraction of patients. The development of novel adjunctive therapy is highly desired to reduce morbidity and mortality with stroke. Since endothelial dysfunction is implicated in the pathogenesis of stroke and is featured with suppressed endothelial nitric oxide synthase (eNOS) with concomitant nitric oxide deficiency, restoring endothelial nitric oxide represents a promising approach to treating stroke injury. METHODS: This is a preclinical proof-of-concept study to determine the therapeutic effect of transcranial treatment with a low-power near-infrared laser in a mouse model of ischemic stroke. The laser treatment was performed before the middle cerebral artery occlusion with a filament. To determine the involvement of eNOS phosphorylation, unphosphorylatable eNOS S1176A knock-in mice were used. Each measurement was analyzed by a 2-way ANOVA to assess the effect of the treatment on cerebral blood flow with laser Doppler flowmetry, eNOS phosphorylation by immunoblot analysis, and stroke outcomes by infarct volumes and neurological deficits. RESULTS: Pretreatment with a 1064-nm laser at an irradiance of 50 mW/cm(2) improved cerebral blood flow, eNOS phosphorylation, and stroke outcomes. CONCLUSIONS: Near-infrared II photobiomodulation could offer a noninvasive and low-risk adjunctive therapy for stroke injury. This new modality using a physical parameter merits further consideration to develop innovative therapies to prevent and treat a wide array of cardiovascular diseases.

Treating neuropathic pain and comorbid affective disorders: Preclinical and clinical evidence. INTRODUCTION: Neuropathic pain (NP) significantly impacts quality of life and often coexists with affective disorders such as anxiety and depression. Addressing both NP and its psychiatric manifestations requires a comprehensive understanding of therapeutic options. This study aimed to review the main pharmacological and non-pharmacological treatments for NP and comorbid affective disorders to describe their mechanisms of action and how they are commonly used in clinical practice. METHODS: A review was conducted across five electronic databases, focusing on pharmacological and non-pharmacological treatments for NP and its associated affective disorders. The following combination of Mesh and title/abstract keywords were used: "neuropathic pain," "affective disorders," "depression," "anxiety," "treatment," and "therapy." Both animal and human studies were included to discuss the underlying therapeutic mechanisms of these interventions. RESULTS: Pharmacological interventions, including antidepressants, anticonvulsants, and opioids, modulate neural synaptic transmission to alleviate NP. Topical agents, such as capsaicin, lidocaine patches, and botulinum toxin A, offer localized relief by desensitizing pain pathways. Some of these drugs, especially antidepressants, also treat comorbid affective disorders. Non-pharmacological techniques, including repetitive transcranial magnetic stimulation, transcranial direct current stimulation, and photobiomodulation therapy, modulate cortical activity and have shown promise for NP and mood disorders. CONCLUSIONS: The interconnection between NP and comorbid affective disorders necessitates holistic therapeutic strategies. Some pharmacological treatments can be used for both conditions, and non-pharmacological interventions have emerged as promising complementary approaches. Future research should explore novel molecular pathways to enhance treatment options for these interrelated conditions.

Dental management of people with complex or rare inherited bleeding disorders. Advances in haematological therapies for people with complex or rare inherited bleeding disorders (IBD) have

resulted in them living longer, retaining their natural teeth with greater expectations of function and aesthetics. Dental management strategies need to evolve to meet these challenges. Utilising low level laser diode therapy to reduce pre-operative inflammation to reduce the intraoperative and postoperative burden on haemostasis is described in a case series of 12 patients. For these individuals who previously required further medical management to support haemostasis or experienced such prolonged haemorrhage sufficient to warrant hospital admission, haemostasis was achieved in the dental surgery such that they were able to return home with no further medical intervention or overnight stays. Global inequities in accessing novel treatments for complex or rare IBD necessitates a comprehensive understanding of the local haemostatic agents available to dentists and the most commonly used agents and techniques are described including the use of single tooth anaesthesia (STA). STA is a computerised delivery mechanism that allows routine dental procedures that would previously have required block injections needing factor replacement therapy to be undertaken safely and effectively with no additional haemostatic intervention. The challenges of inhibitors in oral surgery are explained and discussed although more research and evidence is required to establish new treatment protocols. The importance of establishing good dental health in the quality of life of people with complex or rare IBD is highlighted with respect to the dental specific impact that more novel therapies may have on people with IBD. Hemostatics Humans;Quality of Life;Tooth Extraction;Blood Coagulation Disorders, Inherited;Hemostatics;Dental Care

Diabetes in spotlight: current knowledge and perspectives of photobiomodulation utilization. INTRODUCTION: Diabetes is a global health concern characterized by chronic hyperglycemia resulting from insulinopenia and/or insulin resistance. The rising prevalence of diabetes and its associated complications (ulcers, periodontitis, healing of bone defect, neuropathy, retinopathy, cardiopathy and nephropathy) necessitate innovative therapeutic approaches. Photobiomodulation (PBM), involves exposing tissues and cells to low-energy light radiation, leading to biological effects, largely via mitochondrial activation. METHODS: This review evaluates preclinical and clinical studies exploring the potential of PBM in diabetes and its complications, as well all clinical trials, both planned and completed, available on ClinicalTrials database. RESULTS: This review highlights the variability in PBM parameters across studies, hindering consensus on optimal protocols. Standardization of treatment parameters and rigorous clinical trials are needed to unlock PBM's full therapeutic potential. 87 clinical trials were identified that investigated PBM in diabetes mellitus (with 5,837 patients planned to be treated with PBM). Clinical trials assessing PBM effects on diabetic neuropathy revealed pain reduction and potential quality of life improvement. Studies focusing on wound healing indicated encouraging results, with PBM enhancing angiogenesis, fibroblast proliferation, and collagen density. PBM's impact on diabetic retinopathy remains inconclusive however, requiring further investigation. In glycemic control, PBM exhibits positive effects on metabolic parameters, including glucose tolerance and insulin resistance. CONCLUSION: Clinical studies have reported PBM-induced reductions in fasting and postprandial glycemia without an increased hypoglycemic risk. This impact of PBM may be related to its effects on the beta cells and islets in the pancreas. Notwithstanding challenges, PBM emerges as a promising adjunctive therapy for managing diabetic neuropathy, wound healing, and glycemic control. Further investigation into its impact on diabetic retinopathy and muscle recovery is warranted. Humans;Diabetic Retinopathy;Low-Level Light Therapy;Diabetic Neuropathies;Insulin Resistance;Quality of Life;Diabetes Mellitus

[Androgenetic alopecia: where do we stand in 2024?]. Androgenetic alopecia, the most prevalent type of hair loss, is characterized by a receding hairline in men and diffuse thinning of hair in women. Despite being considered a benign condition, it can exert a considerable psychological toll, especially on women and young men. Despite its high prevalence, only a limited number of

medications have received approval for its treatment. In this article, we review the available treatment options, assessing their efficacy and potential side effects. Additionally, we explore minimally-invasive strategies such as photobiomodulation, micro-needling and platelet-rich plasma therapy. Furthermore, we delve into discussions on hair transplantation and camouflage methods. Male;Humans;Female;Alopecia;Hair;Platelet-Rich Plasma;Treatment Outcome

Implementation of a light therapy team to administer photobiomodulation therapy: A standardized protocol to prevent and treat oral mucositis in the pediatric hematopoietic stem cell transplant population. BACKGROUND: Oral mucositis (OM) is a painful and common complication of hematopoietic stem cell transplant (HSCT). The Children's Oncology Group recently published guidelines recommending photobiomodulation (PBM) for preventing and treating OM in pediatric HSCT patients. However, this is a rarely used intervention in pediatric hospitals. PROCEDURE: Patients undergoing allogeneic HSCT, or autologous HSCT for a neuroblastoma diagnosis, had PBM administered from the first day of conditioning to transplant Day +20. We successfully developed a standardized treatment protocol and workflow to ensure consistent and uniform delivery of PBM. In addition, clinical patient data were compared before and after PBM implementation. RESULTS: The administration of PBM at our center was feasible, but required dedicated staff. A registered nurse (RN) was determined to be the best fit to deliver PBM. Sixty-two patients received PBM from October 2022 to September 2023; patients from 2021 before PBM implementation were used for comparison. Patients receiving PBM were more likely (pÂ =Â .03) to engage in teeth brushing (56/62Â =Â 90%) compared to baseline (61/81Â =Â 75%). Mean days of OM decreased from 11.3 to 9Â days; patients who received PBM were less likely (pÂ <Â .001) to be discharged on total parental nutrition (TPN) (11/62Â =Â 18%) compared to baseline (50/82Â =Â 61%). OM-related supportive care costs (TPN and patient-controlled anesthesia [PCA]) were lower (pÂ =Â .02) for those who received PBM (median costÂ =Â $31,229.87 vs. $37,370.66). CONCLUSION: PBM, as the standard of care in the pediatric HSCT population, is safe, feasible, and well-tolerated. At our center, a dedicated RN was critical to providing standardized treatment and ensuring sustainability. Humans;Hematopoietic Stem Cell Transplantation;Stomatitis;Child;Male;Female;Low-Level Light Therapy;Child, Preschool;Adolescent;Transplantation Conditioning;Infant;Follow-Up Studies;Prognosis

A systematic review and meta-analysis on the effects of phototherapy on postoperative pain in conventional endodontic reintervention. OBJECTIVES: This systematic review and meta-analysis (SRM) aimed to evaluate the efficacy of laser phototherapy (LPT) on the reduction in postoperative pain (PP) of endodontic origin after conventional/non-surgical reintervention of root canals. METHODS: This SRM was registered with PROSPERO (CRD42021243500) and followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis. Meta-analysis was conducted using R software with the "META" package, the mean difference (MD) measure of effect was calculated, and the fixed effect model was applied with a 95% confidence interval (CI). The Cochrane collaboration scale was used to assess the risk of bias and the GRADE tool to assess the quality of evidence. RESULTS: Initially, 1028 articles were found, and five articles were included. Most studies were classified as "low" risk of bias. Of the five clinical studies, four showed a significant decrease in PP after endodontic reintervention in the LPT groups compared to the control group, especially in the first four days after the intervention. In symptomatic teeth with multiple roots, LPT led to less PP at 24Â h (MD -0.52 [-1.03; -0.02] pâ€‰=â€‰.04). However, no significant difference between the groups was found at 48 and 72Â h (pâ€‰>â€‰.05). The certainty of the evidence was classified as low. CONCLUSION: Despite the limitations of this SRM, LPT was shown to be a promising alternative for reducing and controlling PP in conventional endodontic reintervention. CLINICAL SIGNIFICANCE: The use of LPT in endodontic reintervention may be a safe and promising alternative

to clinically efficacious agent for use in the management of PP in this procedure. Humans;Pain, Postoperative;Phototherapy

Current perspectives on neuromodulation in ALS patients: A systematic review and meta-analysis. Amyotrophic Lateral Sclerosis (ALS) is a progressive neurodegenerative disease that affects motor neurons, resulting in muscle weakness, paralysis, and eventually patient mortality. In recent years, neuromodulation techniques have emerged as promising potential therapeutic approaches to slow disease progression and improve the quality of life of ALS patients. A systematic review was conducted until August 8, 2023, to evaluate the neuromodulation methods used and their potential in the treatment of ALS. The search strategy was applied in the Cochrane Central database, incorporating results from other databases such as PubMed, Embase, CTgov, CINAHL, and ICTRP. Following the exclusion of papers that did not fulfil the inclusion criteria, a total of 2090 records were found, leaving a total of 10 studies. R software was used to conduct meta-analyses based on the effect sizes between the experimental and control groups. This revealed differences in muscle stretch measures with manual muscle testing ($p = 0.012$) and resting motor threshold ($p = 0.0457$), but not with voluntary isometric contraction ($p = 0.1883$). The functionality of ALS was also different ($p = 0.007$), but not the quality of life. Although intracortical facilitation was not seen in motor cortex 1 (M1) ($p = 0.1338$), short-interval intracortical inhibition of M1 was significant ($p = 0.0001$). BDNF showed no differences that were statistically significant ($p = 0.2297$). Neuromodulation-based treatments are proposed as a promising therapeutic approach for ALS that can produce effects on muscle function, spasticity, and intracortical connections through electrical, magnetic, and photonic stimulation. Photobiomodulation stands out as an innovative approach that uses specific wavelengths to influence mitochondria, with the aim of improving mitochondrial function and reducing excitotoxicity. The lack of reliable placebo controls and the variation in stimulation frequency are some of the drawbacks of neuromodulation. Humans;Amyotrophic Lateral Sclerosis;Quality of Life;Neurodegenerative Diseases;Exercise Therapy;Muscle Spasticity

Combined treatment of dexamethasone mouthwash and low-level laser therapy in the management of aphthous-like ulcers caused by nonsteroidal anti-inflammatory drugs: A case report. A case of major aphthous-like ulcer was described in a 50-year-old patient. The patient showed the main signs of aphthous stomatitis painful ulcer, 1-2â€‰cm in diameter, located on the ventral of the tongue, buccal mucosa, and the palate. These ulcers persisted for more than 3â€‰weeks. The patient's self-administration of a nonsteroidal anti-inflammatory drug (NSAID) was suggested as the leading cause of aphthous-like ulcers in this case. ulcers were treated with dexamethasone mouthwash and low-level laser therapy (LLLT).

Effect of Low-Level Diode Laser and Red Light-Emitting Diode on Survival and Osteogenic/Odontogenic Differentiation of Human Dental Pulp Stem Cells. Background: This investigation set out to compare the impacts of low-level diode laser (LLDL) and red light-emitting diode (LED) on the survival of human dental pulp stem cells (hDPSCs) and osteogenic/odontogenic differentiation. Methods and materials: In this ex vivo experimental study, the experimental groups underwent the irradiation of LLDL (4â€‰J/cm(2) energy density) and red LED in the osteogenic medium. Survival of hDPSCs was assessed after 24 and 48â€‰h (nâ€‰=â€‰9) using the methyl thiazolyl tetrazolium (MTT) assay. The assessment of osteogenic/odontogenic differentiation was conducted using alizarin red staining (ARS; three repetitions). The investigation of osteogenic and odontogenic gene expression was performed at two time points, specifically 24 and 48â€‰h (nâ€‰=â€‰12). This analysis was performed utilizing real-time reverse-transcription polymerase chain reaction (RT-PCR). The groups were compared at each time point using SPSS version 24. To analyze the data, the Mann-Whitney U test, analysis of variance, Tukey's test, and t-test were utilized. Results: The MTT assay showed that LLDL significantly decreased the survival of hDPSCs after

48â€‰h, compared with other groups (pâ€‰<â€‰0.05). The qualitative results of ARS revealed that LLDL and red LED increased the osteogenic differentiation of hDPSCs. LLDL and red LED both upregulated the expression of osteogenic/odontogenic genes, including bone sialoprotein (BSP), alkaline phosphatase (ALP), dentin matrix protein 1 (DMP1), and dentin sialophosphoprotein (DSPP), in hDPSCs. The LLDL group exhibited a higher level of gene upregulation (pâ€‰<â€‰0.0001). Conclusions: The cell survival of hDPSCs was reduced, despite an increase in osteogenic/odontogenic activity. Clinical relevance: Introduction of noninvasive methods in regenerative endodontic treatments. Humans;Dental Pulp;Cell Differentiation;Osteogenesis;Lasers, Semiconductor;Stem Cells;Cell Survival;Odontogenesis;Low-Level Light Therapy;Cells, Cultured;Red Light

Effect of photobiomodulation therapy as a multimodal approach to treatment of dermal abrasions in cownose rays (Rhinoptera bonasus). Photobiomodulation therapy (PBMT) has become increasingly utilized in the zoo and aquarium fields to treat ailments in various species; however, its use in teleosts and elasmobranchs is relatively underrepresented in the literature. This study examined the efficacy of PBMT as an adjunct treatment to reduce the healing time of dermal abrasions in cownose rays (Rhinoptera bonasus). Ten cownose rays were included in this study and separated into control (nâ€‰=â€‰5) and treatment groups (nâ€‰=â€‰5). Animals in both treatment and control groups received intramuscular injections of enrofloxacin every 72â€‰h to provide broad-spectrum antibiotic coverage. Cownose rays in the treatment group additionally received PBMT using the CompanionÂ® CTC-12 unit using the large, noncontact head. Control group rays were subjected to identical handling without the use of PBMT. A total of 196 Joules were delivered at a power of 2â€‰W based on a dose of 5â€‰J/cm(2) at each session. Observational analysis revealed a lack of appreciable difference in healing time between the treatment and control groups in the aforementioned settings; however, it is recommended that PBMT protocols should be re-evaluated if there is little to no response in healing after three to four sessions. PBMT use on acute superficial dermal abrasions in cownose rays was well-tolerated in this study and may have utility in a multimodal treatment approach to wound healing. This study also produced a wound scoring metric based on photographs captured at each treatment. Future studies should utilize increased fluence (J/cm(2)) and irradiance (W/cm(2)) and incorporate synchronous histological analysis and increased sample size.

Efficacy of Laser Therapy in Trigeminal Neuralgia: a Systematic Review. STATEMENT OF THE PROBLEM: Trigeminal neuralgia is the most common and disabling type of neuralgia in craniofacial region. Because of adverse effects of first and second lines of treatment, new modalities including laser therapy have been investigated for treatment of trigeminal neuralgia. PURPOSE: The aim of this study was to review the effect of laser in trigeminal neuralgia. PubMed, Scopus, Web of Science, Science Direct, and Embase databases from December 1983 to August 2020 were searched using keywords "trigeminal neuralgia" and "laser". Our inclusion criteria were interventional studies with a randomized clinical trial design, which used laser for treatment of trigeminal neuralgia. MATERIALS AND METHOD: In this systematic review, a total of 269 records were identified through systematically searching aforementioned databases among which, 30 were from PubMed and 44 were from Web of Science. A total of 111 records were duplicated and were therefore removed. RESULTS: Only 17 records were considered relevant after reading title and abstracts. After reading full texts of the articles, 13 met the eligibility criteria and were included in our review. CONCLUSION: This review revealed that low-level laser therapy reduces pain in trigeminal neuralgia specially diode lasers, although there are no standardized protocols for laser procedures.

Therapeutic Effects of Low-Level Laser Therapy on Pain and Disability of Patients with Failed Back Surgery Syndrome. PURPOSE: This study intended to evaluate the effects of Low-Level Laser

Therapy (LLLT) on Failed Back Surgery Syndrome (FBSS). FBSS refers to symptoms and disabilities which remain or occur after lumbar spinal surgery. Prevalent treatments for FBSS are based mostly on conservative management while LLLT has gained significant interest in the treatment of a wide variety of musculoskeletal disorders. METHODS: In the present study, the authors included 50 individuals with FBSS. Target points were determined by an ultrasonic study including bilateral L(2)-L(3) through L(5)-S(1) facet joints, sacroiliac joints, and the region immediately above bilateral supra crestal iliac bones representing cluneal nerves. LLLT was performed three times a week for 3 weeks. A near-infrared laser (wavelength 808 nm, power 500 mw) was used in continuous mode for laser therapy sessions. The Numeric Rating Scale (NRS) and Oswestry Disability Index (ODI) were registered before treatment and after last treatment session, 1 month and 6 months later, respectively. RESULTS: NRS and ODI were significantly improved after treatment, as well as therapeutic effects, after 1 month and 6 months were also evident and comparison of the NRS and ODI showed significant difference. CONCLUSION: LLLT has a positive impact on pain and disability in patients with FBSS.

Laser Therapy Effects on Periodontal Status: A Randomized Study Using Gaussian Network Analysis and Structural Equation Modeling Approach. Background and Objectives: This paper aims to assess the role of laser therapy in periodontitis through an innovative approach involving computational prediction and advanced modeling performed through network analysis (Gaussian graphical models-GGMs) and structural equations (SEM). Materials and Methods: Forty patients, exhibiting periodontal pockets with a minimum depth of 5 mm, were randomly divided into two groups: a control group and a laser group. Four specific indicators were measured for each tooth, namely periodontal pocket depth (PPD), clinical attachment level (CAL), bleeding on probing (BOP), and plaque index (PI), and the mean of six measured values was recorded at five time markers (baseline, 6 months, 1 year, 2 years, and 4 years). The assessment algorithm included enrollment, measurements, and differential non-surgical periodontal treatment, according to the group allocation. Scaling, root planing, and chlorhexidine 1% were conducted for the control group, and scaling, root planing and erbium, chromium:yttrium-scandium-gallium-garnet (Er,CR:YSGG) laser therapy were conducted for the laser group. Results: The main results highlight that the addition of laser treatment to scaling and root planing led to notable clinical improvements, decreasing the PPD values, reducing the BOP scores, and increasing the CAL. Conclusions: Notable relationships between the specific indicators considered were highlighted by both the GGMs and by SEM, thus confirming their suitability as proxies for the success of periodontal treatment. Humans;Latent Class Analysis;Periodontitis;Laser Therapy;Low-Level Light Therapy;Root Planing;Follow-Up Studies

The Healthspan Project: A Retrospective Pilot of Biomarkers and Biometric Outcomes after a 6-Month Multi-Modal Wellness Intervention. Wellness-centric proactive healthcare is increasingly sought after, with individuals frequently embracing complementary modalities to achieve this goal. In this six-month study, healthy adult participants (n = 25) received specific therapies, including whole-body cryotherapy, infrared sauna, and photobiomodulation, along with guidance on physical activity, diet, and alcohol intake. Serum biomarkers were measured for all participants, while a subset also received biometric assessments for body composition (n = 10) and heart rate variability (n = 7). Over the course of the study (mean (SD) follow-up days = 174 (130)), participants exhibited significant improvements in health. LDL cholesterol (-9.77 (15.43) md/dL) and hsCRP (-1.75 (2.66) mg/L) decreased significantly ($p < 0.05$). HbA1c increased slightly ($p < 0.05$), but the effect size was small (0.12 (0.13)%). The body composition subset lost overall body weight (-3.29 (3.75) kg), primarily body fat, while preserving lean muscle mass ($p < 0.05$). Heart rate variability increased for those with existing cardiovascular risk factors ($p < 0.05$). In conclusion, participation in the multimodal

Healthspan protocol is associated with substantial improvements in health-related biomarkers and biometrics.

Evaluation of the Impact of Near-Infrared Multiwavelength Locked System Laser Therapy on Skin Microbiome in Atopic Dogs. Photobiomodulation (PBM) is a newly adopted consensus term to replace the therapeutic application of low-level laser therapy. It has been suggested that PMB influences the microbiome which, in turn, has increasingly been shown to be linked with health and disease. Even though the use of PBM has also grown dramatically in veterinary medicine, there is still a lack of evidence supporting its effect in vivo. Our objective was to investigate the impact of a dual-wavelength near-infrared laser source (Multiwavelength Locked Laser System, MLS(Â®)) on the skin microbiome in atopic dogs. Twenty adult-client-owned atopic dogs were enrolled in the study. The dogs were treated with MLS(Â®) laser therapy on one half of the abdominal region, whereas the contralateral side was left untreated and served as a control. Skin microbiome samples were collected before and after MLS(Â®) treatments, and then subjected to NGS-based ITS and 16S rRNA analysis. The results showed that while microbiome composition and diversity were not significantly affected, PBM could play a role in modulating the abundance of specific bacterial species, in particular Staphylococcus, that represent a major skin pathogenic strain. To the best of the authors' knowledge, this is the first study to investigate the potential impact of MLS(Â®) laser therapy on the skin microbiome in atopic dogs.

Early Intensive Neurorehabilitation in Traumatic Peripheral Nerve Injury-State of the Art. Traumatic nerve injuries are common lesions that affect several hundred thousand humans, as well as dogs and cats. The assessment of nerve regeneration through animal models may provide information for translational research and future therapeutic options that can be applied mutually in veterinary and human medicine, from a One Health perspective. This review offers a hands-on vision of the non-invasive and conservative approaches to peripheral nerve injury, focusing on the role of neurorehabilitation in nerve repair and regeneration. The peripheral nerve injury may lead to hypersensitivity, allodynia and hyperalgesia, with the possibility of joint contractures, decreasing functionality and impairing the quality of life. The question remains regarding how to improve nerve repair with surgical possibilities, but also considering electrical stimulation modalities by modulating sensory feedback, upregulation of BDNF, GFNF, TrKB and adenosine monophosphate, maintaining muscle mass and modulating fatigue. This could be improved by the positive synergetic effect of exercises and physical activity with locomotor training, and other physical modalities (low-level laser therapy, ultrasounds, pulsed electromagnetic fields, electroacupuncture and others). In addition, the use of cell-based therapies is an innovative treatment tool in this field. These strategies may help avoid situations of permanent monoplegic limbs that could lead to amputation.

Simultaneous effect of medicinal plants as natural photosensitizers and low-level laser on photodynamic inactivation. Photodynamic inactivation (PDI) technology is a promising alternative to antibiotics. This technology is defined as the inhibition of bacterial growth with photosensitizers while irradiated with low-level laser light in the wavelength of 532â€‰Â±â€‰2.08Â nm. A challenging area in this field is selecting photosensitizers with antibacterial potential. In this paper, to enhance the antibacterial efficiency, the photosensitizers (the selected plant extracts) with a high absorption peak at the selected laser frequency, 532Â nm, were prepared. Low-concentration ethanolic plant extracts of Hibiscus sabdariffa and Opuntia ficus-indica were found to exhibit significant antibacterial activity against, Acinetobacter baumannii ATCC 19606 and, Staphylococcus aureus ATCC 33591 as two important human pathogenic bacteria. The effectiveness of these natural photosensitizers was measured by determining their Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) values and by performing a time-killing assay in the absence and the presence of laser irradiation. Our results

showed that the combination of low-level laser irradiation and the selected photosensitizers had excellent potential for treating in vitro bacterial infections. Therefore, PDI technology has great potential as a viable alternative to traditional antibiotics for combating bacterial infections. This study presents a promising avenue for further exploration of PDI and the use of laser technology in medical science. Photosensitizing Agents;Anti-Bacterial Agents;Plant Extracts Humans;Photosensitizing Agents;Plants, Medicinal;Anti-Bacterial Agents;Plant Extracts;Staphylococcal Infections;Microbial Sensitivity Tests

Complementary and alternative therapies for managing postoperative pain after lower third molar surgery: a systematic review and network meta-analysis. OBJECTIVE: The objective of this study was to evaluate the impact of complementary and alternative treatments on postoperative pain following lower third molar surgeries. METHODS: A comprehensive search of Electronic databases (Embase, MEDLINE via PubMed, and Cochrane Library) and grey literature was conducted up until May 2022. Randomized clinical trials investigating the effect of acupuncture, ozone therapy, laser (LLLT), drainage tube, kinesio-taping, ice therapy, and compressions on pain after LTM surgeries were included. The estimated mean differences (MD) for alternative therapies were pooled using the frequentist approach to random-model network meta-analysis NMA. RESULTS: Eighty-two papers were included in the qualitative analysis; 33 of them were included in the quantitative analyzes. NMA revealed that drainage tube and kinesio-taping were superior in controlling pain 24-hours postoperatively than no-treatment. At 48-hours follow-up, kinesio-taping and LLLT more effective than placebo and drainage tube; and kinesio-taping and LLLT were superior to no treatment. At 72Â h postoperatively, ozone therapy was superior to placebo; and drainage tube, kinesio-taping, and LLLT were better than no treatment. At 7-days follow-up, ozone and LLLT were superior to placebo; and LLLT and kinesio-taping were superior to no treatment. The SUCRA-ranking placed drainage tube as top-ranking intervention at 48-hours (98.2%) and 72-hours (96%) follow-ups, and ozone (83.5%) at 7-days follow-up. CONCLUSION: The study findings suggest that these alternative and complementary therapies may be useful in reducing postoperative pain after LTM surgeries, and may offer advantages when combined to traditional pain management methods. CLINICAL RELEVANCE: Non-pharmacological therapies are gaining popularity among healthcare professionals and patients. This study found that some of these therapies, specifically kinesio-taping and drainage tube were effective in controlling postoperative pain after third molar surgeries. These findings have important implications for clinical practice, as they highlight the potential benefits of incorporating these therapies into postoperative pain management plans. Ozone Humans;Pain Management;Molar, Third;Network Meta-Analysis;Pain, Postoperative;Complementary Therapies;Ozone

Translation from Preclinical Research to Clinical Trials: Brain-Gut Photobiomodulation Therapy for Alzheimer's Disease. Recently, novel non-pharmacological interventions, such as photobiomodulation (PBM) therapy, have shown promise for the treatment of Alzheimer's disease (AD). This article outlines the translation from the preclinical to clinical stages of an innovative brain-gut PBM therapy in a mouse model of AD, a pilot clinical trial involving mild-to-moderate AD patients, and a continuing pivotal clinical trial with a similar patient population. In a mouse model of AD (AÎ²25-35), daily application of brain-gut PBM therapy to both the head and the abdomen produced a neuroprotective effect against the neurotoxic effects of an AÎ²25-35 peptide injection by normalizing all the modified behavioral and biochemical parameters. The pilot clinical trial to evaluate brain-gut PBM therapy demonstrated the tolerability and feasibility of the novel PBM-based treatment for mild-to-moderate AD patients. Compared to the sham patients, the PBM-treated patients had lower Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog) comprehension sub-scores, higher forward verbal spans, and lower Trail Making Test (TMT) Part B (TMT-B) execution times,

which suggest an improvement in cognitive functions. This pilot study provided important information for the design of a novel pivotal clinical trial, currently in progress, to assess the efficacy of brain-gut PBM therapy in a larger sample of AD patients. This pivotal clinical trial could demonstrate that brain-gut PBM therapy is a safe, well-tolerated, and efficient disease-modifying treatment for mild-to-moderate AD patients and that it has medical and economic benefits. Animals;Mice;Humans;Alzheimer Disease;Low-Level Light Therapy;Pilot Projects;Brain;Cognition

Photobiomodulation Literature Watch July 2023. Humans;Low-Level Light Therapy

Effects of Photobiomodulation Therapy on the Expression of Hypoxic Inducible Factor, Vascular Endothelial Growth Factor, and Its Specific Receptor: A Randomized Control Trial in Patients with Diabetic Foot Ulcer. Background: Impaired angiogenesis is a significant factor contributing to delayed healing in diabetic foot ulcers (DFUs) due to inadequate oxygenation. Objective: This study aimed to investigate the impact of photobiomodulation (PBM) using a Ga-As laser on the release of serum hypoxia-inducible factor 1-Î± (HIF-1Î±), vascular endothelial growth factor (VEGF), vascular endothelial growth factor receptor-2, and nitric oxide (NO) in diabetic patients with DFUs. Materials and methods: In this double-blind RCT, a total of 30 patients with grade II DFUs were enrolled. The patients were randomly divided into two groups: the PBM (nâ€‰=â€‰15) and the placebo (nâ€‰=â€‰15). In the PBM group, a Ga-As laser (904â€‰nm, 2â€‰J/cm(2), 90 W) was given for 3 days/week for 4 weeks (11 sessions). In the placebo group, the power was turned off. Both groups received similar standard wound care. Before and after interventions, the levels of serum HIF-1Î±, VEGF, NO, and sVEGFR-2 were measured. In addition, the percentage decrease in the wound surface area (%DWSA) was measured. Results: Following the intervention, the results revealed that the PBM group had significantly lower levels of VEGF than the placebo group (pâ€‰=â€‰0.005). The %DWSA was significantly higher in the PBM group compared to the placebo group (pâ€‰=â€‰0.003). Moreover, VEGF showed a significant negative correlation with %DWSA (pâ€‰<â€‰0.001). Conclusions: The observed decrease in serum levels of VEGF and an increase in %DWSA, compared to the placebo group, suggests that PBM effectively improves angiogenesis. Furthermore, the significant correlation found between VEGF levels and %DWSA emphasizes the importance of evaluating wound surface in patients as a dependable indicator of enhanced wound angiogenesis. Clinical Trial Registration: NCT02452086. Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2;Hypoxia-Inducible Factor 1, alpha Subunit;Nitric Oxide Humans;Diabetic Foot;Male;Female;Double-Blind Method;Low-Level Light Therapy;Middle Aged;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2;Wound Healing;Hypoxia-Inducible Factor 1, alpha Subunit;Aged;Nitric Oxide

Surface Treatment of Dental Mini-Sized Implants and Screws: A Systematic Review with Meta-Analysis. Miniscrews are devices that allow for absolute skeletal anchorage. However, their use has a higher failure rate (10-30%) than dental implants (10%). To overcome these flaws, chemical and/or mechanical treatment of the surface of miniscrews has been suggested. There is no consensus in the current literature about which of these methods is the gold standard; thus, our objective was to carry out a systematic review and meta-analysis of the literature on surface treatments of miniscrews. The review protocol was registered (PROSPERO CRD42023408011) and is in accordance with the PRISMA guidelines. A bibliographic search was carried out on PubMed via MEDLINE, Cochrane Library, Embase and Web of Science. The initial search of the databases yielded 1684 results, with 98 studies included in the review, with one article originating from the search in the bibliographic references of the included studies. The results of this systematic review show that the protocols of miniscrew surface treatments, such as acid-etching; sandblasting, large-grit and acid-etching; photofunctionalization with ultraviolet light; and photobiomodulation, can increase stability and the success of orthodontic treatment. The meta-analysis revealed that the treatment with the

highest removal torque is SLA, followed by acid-etching. On the other hand, techniques such as oxidative anodization, anodization with pre-calcification and heat treatment, as well as deposition of chemical compounds, require further investigation to confirm their effectiveness.

Effects of Semiconductor Laser Irradiation on Differentiation of Human Dental Pulp Stem Cells in Co-Culture with Dentin. This study aimed to determine the effect of photobiomodulation therapy induced by semiconductor laser irradiation on human dental pulp stem cell (hDPSC) proliferation and their differentiation into odontoblast-like cells (OLCs). The effects of various semiconductor laser irradiation conditions on hDPSCs were examined. Three groups were evaluated: a single laser irradiation at 6 h post-seeding, multiple laser irradiations up to four times every 4 days after the first dose, and a control with no laser irradiation. The cells were irradiated at 10, 30, and 150 mW using a semiconductor laser. The effect of laser irradiation on hDPSC differentiation into OLCs was also determined. Four groups were evaluated, including co-culture using basic medium and dentin discs, simple culture using OLC differentiation-inducing medium, co-culture using OLC differentiation-inducing medium and dentin discs, and control culture with basic medium. The expression of the nestin, ALP, DSPP, and DMP-1 genes was measured using real-time PCR. The multiple irradiation group irradiated at 30 mW exhibited significantly more cell proliferation than the control. The expression of nestin associated with differentiation into OLCs during each culture period tended to be lower, whereas DSPP and ALP expression was higher compared with that of the control. Multiple laser irradiations at a low power of 30 mW induced significant hDPSC proliferation and might induce differentiation into OLCs.

A brief literature review of low-level laser therapy for treating amyotrophic lateral sclerosis and confirmation of its effectiveness. INTRODUCTION: Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease with a steadily progressive course due to the death of central and peripheral motor neurons responsible for voluntary movements. Low-level laser therapy (LLLT) is a treatment method unique in its universality and efficacy, particularly for neurodegenerative diseases. METHODS: In this review, we discuss the effect and application of LLLT in the treatment of ALS. A literature search for English and Russian publications for the keywords "Amyotrophic Lateral Sclerosis", "Low-Level Laser Therapy" was performed using PubMed, Scopus, Google Scholar, Web of Science and Russian Science Citation Index (RSCI) databases. RESULTS: The article provided a brief literature review, substantiated the potential use of low-level laser therapy for ALS. The particular techniques of LLLT were developed. CONCLUSION: Based on the results of several studies and many years of successful experience with low-level laser therapy in Russia we conclude that a LLLT technique, including intravenous laser blood illumination (ILBI), noninvasive laser blood illumination (NLBI), and local exposure, is a promising treatment method for ALS.

The effect of combined red, blue, and near-infrared light-emitting diode (LED) photobiomodulation therapy on speed of wound healing after superficial ablative fractional resurfacing. Objective of the study isÂ to assess the effects of wound healing with a commercially available light emitting diode (LED) photo biomodulation (PBM) device that emits three wavelengths (465, 640 and 880nm) after ablative fractional laser (AFL) treatment to healthy skin on the bilateral inner biceps. We conducted a prospective intraindividual randomized controlled study with 25 volunteers. AFL treatment was performed on healthy skin of the bilateral inner biceps. Subjects applied the LED light device for 30 min to the assigned bicep 3 times a week over 4 weeks, beginning on day 0. Subjects were followed up on days 2, 4, 6, 9, 13, 20 and 27 for treatment with the PBM device, clinical digital photography of the test and control sites, and in-person subject assessment, with follow ups on days 34 and 55 for clinical photography and assessment. Three blinded evaluators were asked to determine which bicep healed faster between day 0 to day 13. Pain, discomfort, and itch were also assessed. The three blinded evaluators chose the treatment arm as the faster healed arm in greater than 50% of the

images, although the results were not statistically significant. There was no statistically significant difference between test and control arms in terms of pain, discomfort and itch. In conclusion,Â PBM therapy has the potential to improve wound healing. In this study, a three wavelength PBM device resulted in some subjects achieving faster healing after AFL but the results were not statistically significant. Humans;Low-Level Light Therapy;Prospective Studies;Wound Healing;Skin;Pain

Photobiomodulation for Blood Pressure and Heart Rate Reduction in Mastectomized Women on Hormone Blockers: A Randomized Controlled Trial. Objective: To assess the impact of intravascular laser irradiation of blood (ILIB) on the primitive carotid artery (PCA) hemodynamic variables, specifically blood pressure (BP) and heart rate (HR), in mastectomized patients undergoing hormone blocker treatments. Materials and methods: This study is a controlled, experimental, and randomized clinical trial. Patients were allocated into two groups: the experimental group (G1)-patients who received ILIB therapy using a 660â€‰nm laser targeted at the PCA, and the control group (G2)-patients who did not receive ILIB therapy. Clinical research was conducted weekly, with measurements of systolic blood pressure (SBP), diastolic blood pressure (DBP), and HR. The Mann-Whitney U test for independent samples was used, with a significance level of Î±â€‰=â€‰0.05. Results: Systemic photobiomodulation on the PCA did not demonstrate a statistically significant difference in relation to SBP and DBP. However, for HR, the p-value was <0.05, indicating a significant difference between G1 and G2. The initial mean p > decreased from 142.3 to 116.4â€‰mmHg in G1, and from 130.4 to 119.8â€‰mmHg in G2. The DBP varied from 78.8 to 72.8â€‰mmHg in G1, and from 79.1 to 74.2â€‰mmHg in G2. A statistically significant difference was observed in HR, decreasing from 81.3 to 62.06â€‰bpm in G1, and changing minimally from 74.1 to 75.1â€‰bpm in G2. A considerable reduction was present in the timing of application. Conclusions: ILIB therapy applied to the PCA induces a reduction in BP and, more notably, HR in mastectomized women using the tamoxifen or aromatase inhibitors. Humans;Female;Middle Aged;Heart Rate;Low-Level Light Therapy;Blood Pressure;Mastectomy;Adult;Aged;Carotid Arteries

Photobiomodulation Therapy in the Management of "Black Triangles" Due to the Absence of the Gingival Interdental Papilla. The absence of an interdental papilla, termed "black triangle," presents a challenge in aesthetic restorations. Photobiomodulation therapy (PBMT) is the non-thermal therapeutic use of light in order to positively modulate biological activity and has shown promise in tissue regeneration, wound healing, and inflammation reduction. This case report introduces a modified PBM protocol known as "hemolasertherapy" aimed at regenerating the gingival interdental papilla to fill the black triangle. In this case report, aÂ 34-year-old female with an unaesthetic black triangle between the maxillary central incisors presented for treatment. Before surgical intervention, our suggested protocol was proposed and explained, detailing potential risks and outcomes. After proper scaling root planning, a suggested protocol with PBMÂ was made. PBM application with a 635 nm wavelength diode laser at four points around the area between the two maxillary central incisors was made: coronal third and apical third of the papilla and mesial and distal of the papilla. Then, bleeding was provoked with a curette inside the sulcus between 11 and 21 (concerned area) by applying pressure on the junctional epithelium and the supracrestal connective tissue. After a few seconds, blood spontaneously filled the "black triangle" coronal to the interdental papilla and was left undisturbed.Â At this point, PBMÂ was applied again on the same four points already described. The irradiation parameters during all PBM treatments wereÂ contact mode and continuous mode, 635 nm wavelength, spot size of 8mm, power of 50 mW, irradiation time on each point of 50 seconds, and energy density of 4.976 J/cm(2). After the intervention, the patient was prohibited from smoking, using mouthwash, drinking, and brushing for two hours. The exact same procedure was repeated five and 10 days after the first intervention. Follow-up was made for three months after the intervention. The assessment indicated a minor increase in the papilla height, which

was not enough for a complete closure of the "black triangle."Â However, there was a reduction in the appearance of the black triangle. This case report suggests that PBM if used within our suggested protocol can increase the height of the gingival interdental papilla leading to a more pleasant aesthetic appearance. It is important to note thatÂ its effectiveness might be limited to specific conditions. In summary, the presented case report showcased a slight extension of the gingival interdental papilla. Further studies are essential to validate these observations.

A radiographic and histological study to compare red (650Â nm) versus near infrared (810Â nm) diode lasers photobiomodulation for alveolar socket preservation. Previous findings indicated that the laser photobiomodulation is more effective than the control or placebo in preserving the alveolar socket. This study aimed to compare two different lasers regarding their effectiveness in aiding alveolar socket preservation. Twenty extraction sockets were selected then divided into two equal groups. Group A was exposed to 650Â nm Diode laser, and Group B to 810Â nm Diode laser following the same protocol and parameters after a standard alveolar socket preservation procedure with collagen plug. Radiographic analysis with cone beam computed tomography was done to compare the alveolar bone surface area immediately after extraction and three months post-operatively, while bone samples collected before implant drilling were histologically examined for newly formed bone evaluation and histomorphometric analysis in terms of percentage of new bone surface area, percentage of unmineralized bone and finally, immunohistochemical analysis of Osteocalcin reaction surface area as well as optical density. Radiographically, infrared (810Â nm) Diode effect on alveolar bone surface area has significantly exceeded the red laser, while histologically, red (650Â nm) Diode has demonstrated statistical significance regarding all parameters; newly formed bone surface area percentage, unmineralized bone area percentage and finally Osteocalcin bone marker reaction surface area percentage and optical density. Under the specified conditions and laser parameters, photobiomodulation using the 810Â nm Diode got the upper hand radiographically, yet histologically, the red 650Â nm Diode managed to dominate all histological parameters when both employed as an adjunct to alveolar socket preservation procedures. Osteocalcin Humans;Alveolar Process;Tooth Socket;Lasers, Semiconductor;Osteocalcin;Low-Level Light Therapy;Tooth Extraction;Alveolar Bone Loss

Photobiomodulation and low-intensity pulsed ultrasound synergistically enhance dental mesenchymal stem cells viability, migration and differentiation: an invitro study. Novel methods and technologies that improve mesenchymal stem cells (MSCs) proliferation and differentiation properties are required to increase their clinical efficacy. Photobiomodulation (PBM) and low-intensity pulsed ultrasound (LIPUS) are two strategies that can be used to enhance the regenerative properties of dental MSCs. This study evaluated the cytocompatibility and osteo/odontogenic differentiation of dental pulp, periodontal ligament, and gingival MSCs after stimulation by either PBM or LIPUS and their combined effect. MTT assay, cell migration assay, osteo/odontogenic differentiation by AR staining and ALP activity, and expression of osteo/odontogenic markers (OPG, OC, RUNX2, DSPP, DMP1) by RT-qPCR were evaluated. Statistical analysis was performed using ANOVA, followed by Tukey's post hoc test, with a p-value of less than 0.05 considered significant. The results showed that combined stimulation by PBM and LIPUS resulted in significantly the highest viability of MSCs, the fastest migration, the most dense AR staining, the most increased ALP activity, and the most elevated levels of osteogenic and odontogenic markers. The synergetic stimulation of PBM and LIPUS can be utilized in cell-based regenerative approaches to promote the properties of dental MSCs.

Adjunctive Effect of Photobiomodulation Therapy with Nd:YAG Laser in the Treatment of Inferior Alveolar Nerve Paresthesia. Background: Disruption of peripheral branches of the trigeminal nerve in the field of maxillofacial surgery is a known risk due to the close connection of these

branches with the bony structures of the maxilla and mandible. As a result, injuries of the lingual nerve and inferior alveolar nerve take place within routine maxillofacial surgery procedures, including local anesthetic injection, wisdom tooth surgery, and dental implant placement, resulting in paresthesia and dysesthesia. During the last three decades, low-level lasers (LLL) have been frequently used in various medical fields. Lately, this application has increased in several sectors. Methods and materials: This experiment was designed to explore the effect of low-level laser therapy (LLLT) with Nd:YAG on the paresthesia and dysesthesia of the lower lip. This ethics committee of Tbzmed, Tabriz, Iran, proved the present experiment with ethical code: IR.TBZMED.REC.1401.839. Results: After completing 10 sessions of laser therapy for the case group consisting of 25 patients with lower lip anesthesia, the visual analog scale index results revealed that following six sessions of laser therapy, a significant difference appeared in contrast to the control group. Also, according to the two-point tests, significant difference among the experimental and the control group appeared after ninth session of the laser therapy. Conclusions: Altogether, these data suggested LLLT with Nd:YAG as an effective treatment option for decreasing the anesthesia of the lower lip.
Humans;Low-Level Light Therapy;Paresthesia;Lasers, Solid-State;Mandibular Nerve;Anesthesia, Local

Photobiomodulation effects on synovial morphology, iNOS gene, and protein expression in a model of acute inflammation. PURPOSE: To evaluate morphological aspects and inducible nitric oxide synthase (iNOS) gene and protein expression in a model of acute inflammation. METHODS: Thirty-six female Wistar rats were assigned into three groups: control (saline, n = 12), sham (arthritis, n = 12), and PBM (arthritis and photobiomodulation, n = 12). Arthritis induction was performed with 200 Î¼g of intra-articular Zymosan in sham and PBM animals. PBM was performed 24 h after induction with a laser device (Î» = 808 nm, 25 mW of nominal power, fluence of 20 J/cm2, beam area of 0.02 mm2, time of 33 s, total energy of 0.825 J) with punctual and single dose application. Morphological analysis of joint structure (HE) and immunohistochemistry (anti-iNOS antibody) were performed on knee samples, and synovial tissue was submitted to RNA extraction, cDNA synthesis and gene expression analysis by quantitative polymerase chain reaction. Statistical analyses were performed with $p < 0.05$. RESULTS: It was observed an increase in the thickness of the synovial lining epithelium and inflammatory infiltrate in sham compared to PBM. Gene expression analysis showed higher iNOS expression in PBM, and iNOS protein expression decreased in PBM compared to sham. CONCLUSIONS: Photobiomodulation decreased inflammation in PBM animals, upregulated iNOS gene expression, however down egulated protein expression compared to sham.
Rats;Animals;Female;Rats, Wistar;Low-Level Light Therapy;Arthritis;Inflammation

Photobiomodulation combination therapy as a new insight in neurological disorders: a comprehensive systematic review. Preclinical and clinical studies have indicated that combining photobiomodulation (PBM) therapy with other therapeutic approaches may influence the treatment process in a variety of disorders. The purpose of this systematic review was to determine whether PBM-combined therapy provides additional benefits over monotherapies in neurologic and neuropsychiatric disorders. In addition, the review describes the most commonly used methods and PBM parameters in these conjunctional approaches.To accomplish this, a systematic search was conducted in Google Scholar, PubMed, and Scopus databases through January 2024. 95 potentially eligible articles on PBM-combined treatment strategies for neurological and neuropsychological disorders were identified, including 29 preclinical studies and 66 clinical trials.According to the findings, seven major categories of studies were identified based on disease type: neuropsychiatric diseases, neurodegenerative diseases, ischemia, nerve injury, pain, paresis, and neuropathy. These studies looked at the effects of laser therapy in combination with other therapies like pharmacotherapies, physical therapies, exercises, stem cells, and experimental materials on neurological disorders in both animal models and humans. The findings suggested that most

combination therapies could produce synergistic effects, leading to better outcomes for treating neurologic and psychiatric disorders and relieving symptoms.These findings indicate that the combination of PBM may be a useful adjunct to conventional and experimental treatments for a variety of neurological and psychological disorders. Animals;Humans;Low-Level Light Therapy;Combined Modality Therapy;Nervous System Diseases;Paresis

Comparison of different dual-wavelength photobiomodulation protocols application in third molar extractions. A split-mouth randomized controlled trial. OBJECTIVE: To compare the use of PBMT in the soft tissue and bone healing after third molar extraction using the dual-wavelength laser directly into the post-extraction alveoli (PBMT-I), or PBMT with a red laser directly into the alveoli and with an infrared laser externally on the patient's face (PBMT-IE). METHODS: Twenty patients underwent extraction of four third molars were involved in this split-mouth double-blind randomized controlled trial. The Post-extraction alveoli were treated with the following protocols: PBMT-IE: Application of a red laser directly into the alveolus, and infrared laser irradiation transcutaneously and PBMT-I: Application of dual-wavelength laser intraorally. Patients were clinically evaluated 3, 7, 14, 30, and 90 days after the surgical procedure. The analyses in this study were divided into qualitative (centered on the patient's report and on the evaluators' analysis), and quantitative analyses (measurement of the vertical and horizontal dimensions of the face with the objective of measuring post-surgical edema and radiographic analyses for evaluation of the density and structure of the newly formed bone). RESULTS: A progressive improvement was observed in all parameters evaluated in this study, however, this improvement was time dependent, with no distinct effect observed between the PBMT treatments applied. CONCLUSION: The different dual-wavelength PBMT protocols induced a similar postoperative clinical course in third molar extraction surgeries, with a reduced occurrence of complications and a good healing pattern of hard and soft tissues.

Evaluation of different substance combinations in a multiple-session mesotherapy protocol for the management of osteoarthritis in dogs: a retrospective study. OBJECTIVE: To describe the effect of different substance combinations administered through mesotherapy in dogs with hip osteoarthritis. ANIMALS: 104 dogs. METHODS: In this retrospective study, 4 groups (dogs treated with a combination of lidocaine, piroxicam, and thiocolchicoside [MG]; dogs treated with lidocaine, piroxicam, and Traumeel [TG]; dogs treated with lidocaine, piroxicam, and glucosamine [GG]; and dogs treated with the same combination as in MG combined with a photobiomodulation session [MPG]) were set. For all groups, the same treatment frequency was followed. Response to treatment was measured with the Canine Brief Pain Inventory (divided into pain interference score and pain severity score), Liverpool Osteoarthritis in Dogs (LOAD), and Canine Orthopedic Index (divided into function, gait, stiffness, and quality of life) before treatment and 15, 30, 60, 90, and 120 days after treatment. Cox proportional hazard regression analysis was used to investigate the influence of treatment, age, sex, body weight, breed, and Orthopedic Foundation for Animals score. RESULTS: Dogs had a mean age of 7.6 Â± 3.1 years and body weight of 28.6 Â± 5.5 kg. Hip osteoarthritis was classified as mild (4), moderate (70), or severe (30). Greater improvements were observed in MG and MPG. Kaplan-Meier estimators showed MG and MPG had longer periods with clinically significant results. Treatment was the covariable that contributed more frequently to the outcomes observed. CLINICAL RELEVANCE: The combination used in MG, particularly combined with photobiomodulation, produced longer-lasting clinically significant results.

Nanographene-Au fine-tuning to intensify plasmonic-resonance of polymeric hybrid bionanosystem for synergistic phototherapy and nerve photobiomodulation. Here, we report the multi-photo-bioactivity of the plasmonic-nano graphitic coordinated polycaprolactone-based aligned nanofibrous scaffolds-based bionanosystem for photothermal breast and colon cancer therapies and peripheral nerve photobiomodulation. The size-optimized colloidal reduced graphene oxide (nRGO, 180â€¯nm)

nanosheets, for enhanced photothermal impact, were surface-functionalized with gold nanospheres (AuNPs) to prepare the nRGO@AuNP monodispersed nano-composite and then doped 2.0â€¯mg of nRGO@AuNP in biocompatible and biodegradable polymer polycaprolactone (PCL) to fabricate the nRGO@AuNP-PCL (2.0â€¯mg) plasmonic aligned nanofibrous scaffolds. More than 90% of cancer cells, breast cancer (MCF-7) as well as colon cancer (CT-26), ablated after 5â€¯min of low NIR (808â€¯nm) laser power (0.72â€¯W/cm(2)) illumination with nRGO@AuNP-PCL (2.0â€¯mg) aligned nanofibrous scaffolds. Besides, the nRGO@AuNP-PCL (2.0â€¯mg) provided an extraordinary microenvironment for adhesion, nerve growth, proliferation, and differentiation of PC12 and S42 cells which mimics the natural extracellular matrix. The 2.5-fold increase in neurite length was observed with NIR illumination after 3 days whereas 1.7-fold was found without NIR illumination after 7 days in comparison to PCL (pure). The current findings will be useful to provide a new crucial approach for preparing biocompatible multifunctional composite plasmonic nanofibers as a highly efficient distinct platform for photothermal therapies and promising bioimplants to overcome the loss of sensation after cancer surgery through nerve photobiomodulation. Gold;Polymers;Polyesters Humans;Low-Level Light Therapy;Gold;Metal Nanoparticles;Phototherapy;Polymers;Polyesters;Nanofibers;Colonic Neoplasms;Tissue Scaffolds;Tumor Microenvironment

Effect of low-level laser therapy in wound healing of primary molar teeth extraction. INTRODUCTION: Tooth extraction in children requires attention to wound healing and pain management, which are influenced by patient-related factors and behavioral guidance. AIM OF THE STUDY: The study aimed to evaluate the effect of LLLT on healing sockets in pediatric patients with bilateral primary molar teeth extraction and determine its impact on pain management. METHODS: 6-10Â years of age, systemically healthy, and with atraumatic extraction indications of bilateral primary molar teeth were included in the study (nâ€‰=â€‰40). In the first session, randomly selected teeth were extracted under local anesthesia. In the control group, only clot formation in the socket was observed and photographed. The other group extractions were performed 2Â weeks later. The low-level laser therapy (LLLT) group was treated with a 980Â nm wavelength, in a continuous emission mode, 0.5 W power, 300Â J of energy, 400Â Âµm tip, 60Â s diode laser and photographed. Nonepithelialized surface measurements were performed using ImageJ. Pain assessment was performed using the Wong-Baker Pain Scale. Statistical analyses were performed using SPSS software. RESULTS: There was a statistically significant difference between the groups in the Wong-Baker values in 3rd day (pâ€‰<â€‰0.05). In soft tissue healing on the 3rd and 7th day, the nonepithelialized surface of the laser socket was smaller than that of the control group, and the measurement results were found to be statistically significant (pâ€‰<â€‰0.05). CONCLUSION: Although LLLT was not found to be very effective in reducing postoperative discomfort after extraction of primary molars, it provided better wound healing in extraction sockets. Humans;Child;Low-Level Light Therapy;Wound Healing;Tooth Extraction;Pain Management;Molar

LEDT and Idebenone treatment modulate autophagy and improve regenerative capacity in the dystrophic muscle through an AMPK-pathway. PURPOSE: Considering the difficulties and challenges in Duchenne muscular dystrophy (DMD) treatment, such as the adverse effects of glucocorticoids, which are the main medical prescription used by dystrophic patients, new treatment concepts for dystrophic therapy are very necessary. Thus, in this study, we explore the effects of photobiomodulation (PBM; a non-invasive therapy) and Idebenone (IDE) treatment (a potent antioxidant), applied alone or in association, in dystrophic muscle cells and the quadriceps muscle, with special focus on autophagy and regenerative pathways. METHODS: For the in vitro studies, the dystrophic primary muscle cells received 0.5J LEDT and 0.06Î¼M IDE; and for the in vivo studies, the dystrophic quadriceps muscle received 3J LEDT and the mdx mice were treated with 200mg/kg IDE.

RESULTS: LEDT and IDE treatment modulate autophagy by increasing autophagy markers (SQSTM1/p62, Beclin and Parkin) and signaling pathways (AMPK and TGF-Î²). Concomitantly, the treatments prevented muscle degeneration by reducing the number of IgG-positive fibers and the fibers with a central nucleus; decreasing the fibrotic area; up-regulating the myogenin and MCH-slow levels; and down-regulating the MyoD and MHC-fast levels. CONCLUSION: These results suggest that LEDT and IDE treatments enhance autophagy and prevented muscle degeneration in the dystrophic muscle of the experimental model. These findings illustrate the potential efficacy of LEDT and IDE treatment as an alternative therapy focused on muscle recovery in the dystrophic patient. AMP-Activated Protein Kinases;idebenone;Ubiquinone Animals;Mice;Humans;Muscle, Skeletal;Mice, Inbred mdx;AMP-Activated Protein Kinases;Muscular Dystrophy, Duchenne;Autophagy;Disease Models, Animal;Ubiquinone

Ameliorating orthodontic relapse using laser bio-stimulation and mesenchymal stem cells in rats. BACKGROUND: Orthodontic relapse is a frequent problem that many patients experience. Although orthodontic therapy has advanced, recurrence rates can still reach 90%. We undertook a study to look at the possibilities of laser bio-stimulation and stem cells because they have showed promising outcomes in lowering recurrence rates. OBJECTIVES: Our objective was to analyze the effects of Low-level laser therapy (LLLT) and Mesenchymal stem cells (MSC) alone and collectively on the rate of orthodontic relapse in rats radiographically and histologically. METHODS: Rat maxillary central incisors were moved distally for two weeks. One week later, the incisors were retained. Animals (nÂ =Â 40) were split into four groups. Control group (C); laser treatment Group (L), Bone marrow mesenchymal stem cells Group (BMSCs) and combination of Stem cells and laser-irradiation group (BMSCs-L). Removed retainer permitted relapse. Before stem cell application or laser irradiation, each animal underwent two CBCT scans. Rat maxillae were stained with Hx&E, Masson trichrome, and tartrate-resistant acid phosphatase antibody for histology, histochemistry, and immunohistochemistry. RESULTS AND CONCLUSIONS: LLLT could reduce the relapse tendency, as shown by increased bone density and enhanced remodeling of hetero-formed periodontal ligament (PDL). Furthermore, the transfer of BMMSCs on the pressure side had positive effects on PDL remodeling and decreased, but did not inhibit, the relapse rate. Finally, the synergistic effects of the application of LLLT and BMMSC were better than the control but still moderate and long-lasting. CLINICAL SIGNIFICANCE: Based on the improved relapse rate as proven in the present study, the Application of both LLLT and stem cells can be adopted to reduce the relapse tendency either lonely or collectively.

The role of photobiomodulation in accelerating bone repair. Bone repair is faced with obstacles such as slow repair rates and limited bone regeneration capacity. Delayed healing even nonunion could occur in bone defects, influencing the life quality of patients severely. Photobiomodulation (PBM) utilizes different light sources to derive beneficial therapeutic effects with the advantage of being non-invasive and painless, providing a promising strategy for accelerating bone repair. In this review, we summarize the parameters, mechanisms, and effects of PBM regulating bone repair, and further conclude the current clinical application of PBM devices in bone repair. The wavelength of 635-980Â nm, the output power of 40-100Â mW, and the energy density of less than 100Â J/cm(2) are the most commonly used parameters. New technologies, including needle systems and biocompatible and implantable optical fibers, offer references to realize an efficient and safe strategy for bone repair. Further research is required to establish the reliability of outcomes from in vivo and in vitro studies and to standardize clinical trial protocols. Humans;Low-Level Light Therapy;Reproducibility of Results

Brain-gut photobiomodulation restores cognitive alterations in chronically stressed mice through the regulation of Sirt1 and neuroinflammation. BACKGROUND: Chronic stress is an important risk

factor for the development of major depressive disorder (MDD). Recent studies have shown microbiome dysbiosis as one of the pathogenic mechanisms associated with MDD. Thus, it is important to find novel non-pharmacological therapeutic strategies that can modulate gut microbiota and brain activity. One such strategy is photobiomodulation (PBM), which involves the non-invasive use of light. OBJECTIVE/HYPOTHESIS: Brain-gut PBM could have a synergistic beneficial effect on the alterations induced by chronic stress. METHODS: We employed the chronic unpredictable mild stress (CUMS) protocol to induce a depressive-like state in mice. Subsequently, we administered brain-gut PBM for 6Â min per day over a period of 3Â weeks. Following PBM treatment, we examined behavioral, structural, molecular, and cellular alterations induced by CUMS. RESULTS: We observed that the CUMS protocol induces profound behavioral alterations and an increase of sirtuin1 (Sirt1) levels in the hippocampus. We then combined the stress protocol with PBM and found that tissue-combined PBM was able to rescue cognitive alterations induced by CUMS. This rescue was accompanied by a restoration of hippocampal Sirt1 levels, prevention of spine density loss in the CA1 of the hippocampus, and the modulation of the gut microbiome. PBM was also effective in reducing neuroinflammation and modulating the morphology of Iba1-positive microglia. LIMITATIONS: The molecular mechanisms behind the beneficial effects of tissue-combined PBM are not fully understood. CONCLUSIONS: Our results suggest that non-invasive photobiomodulation of both the brain and the gut microbiome could be beneficial in the context of stress-induced MDD. Sirtuin 1;Sirt1 protein, mouse Mice;Animals;Depression;Sirtuin 1;Depressive Disorder, Major;Neuroinflammatory Diseases;Low-Level Light Therapy;Brain;Hippocampus;Cognition;Stress, Psychological;Disease Models, Animal

Can diode laser 810â€‰nm decrease post endodontic pain in patients with asymptomatic necrotic maxillary incisors? A four-arm randomized controlled trial. AIM: To find the best method for applying the diode laser 810â€‰nm to relieve post-endodontic pain on necrotic maxillary incisors with periapical lesions within a single-visit treatment. METHODS: Eighty patients with a necrotic incisor, diagnosed with asymptomatic apical periodontitis, received standardized cleaning and shaping procedures, then divided randomly with a 1:1:1:1 allocation ratio into four groups: Group 1: control group with no laser application, Group 2: applying the diode laser as an irrigation activation system (IAS), Group 3: applying the diode laser from the buccal and palatal mucosa, Group 4: applying the diode laser as an IAS and from buccal and palatal mucosa. The postoperative pain was assessed using the visual analog scale (VAS) 1, 3, 7, and 14 days after the treatment. The mean values of the VAS score were statistically analyzed used Kruskal-Walis and Mann-Whitney U tests. The level of significance was set at aâ€‰=â€‰0.05. RESULTS: During 14 days after treatment, there was a statistically significant difference between mean values of VAS scores in the four groups (P valueâ€‰<â€‰0.05); Group 1 scored the highest score, whereas Group 4 showed the lowest one. Moreover, Group 4 showed favorable outcomes compared with Group 2 and Group 3 during the first three days after treatment. CONCLUSION: Diode laser reduced postoperative pain after necrotic teeth with large-sized apical lesion treatment, whereas using diode laser either as an IAS or LLLT reduced the postoperative pain compared with the control group. Moreover, the usage of a diode laser in both previous techniques represents the best protocol for postoperative pain relief during 14 days of treatment. CLINICAL RELEVANCE: The clinical significance of this study is to investigate the best method to reduce postoperative pain using diode lasers 810â€‰nm; where the results of this study indicated that the more diode laser exposer in LLLT and IAS, the less postoperative pain after endodontic procedures.

Effect of photobiomodulation therapy on pain perception during anesthetic puncture of dental local anesthesia: A systematic review. BACKGROUND: Local anesthetic puncture is often related to the experience of pain. This study aimed to systematically analyze the literature on changes in pain

perception during the anesthetic puncture of dental local anesthesia after Photobiomodulation Therapy (PBMT). MATERIAL AND METHODS: An electronic search was performed in eight primary databases (Embase, LILACS, BBO, LIVIVO, MedLine via PubMed, SciELO, Scopus, and Web of Science) and three additional ones (EASY, Google Scholar, and OATD) to partially capture the "gray literature". The PICO strategy was used to identify randomized clinical trials evaluating the analgesic effect of PBMT in the anesthetic puncture site of dental local anesthesia compared to placebo or control groups, without restrictions on publication language and year. Two reviewers extracted the data and assessed the individual risk of bias of the eligible studies using the Cochrane Collaboration Risk of Bias Tool version 2.0. RESULTS: The electronic search found 3,485 records, of which eight met the eligibility criteria and were included in the qualitative synthesis. The studies were published from 2011 to 2022. None of the included studies had a low risk of bias. PBMT groups showed no significant difference in pain scores compared to placebo and control groups of most studies. CONCLUSION: Based on a low to very low certainty of evidence, PBMT seems to have no effect on pain perception during anesthetic puncture in patients undergoing dental local anesthesia. Anesthetics, Local Humans;Anesthesia, Local;Low-Level Light Therapy;Pain;Anesthetics, Local;Pain Perception;Punctures

Traumatic Brain Injury Recovery with Photobiomodulation: Cellular Mechanisms, Clinical Evidence, and Future Potential. Traumatic Brain Injury (TBI) remains a significant global health challenge, lacking effective pharmacological treatments. This shortcoming is attributed to TBI's heterogeneous and complex pathophysiology, which includes axonal damage, mitochondrial dysfunction, oxidative stress, and persistent neuroinflammation. The objective of this study is to analyze transcranial photobiomodulation (PBM), which employs specific red to near-infrared light wavelengths to modulate brain functions, as a promising therapy to address TBI's complex pathophysiology in a single intervention. This study reviews the feasibility of this therapy, firstly by synthesizing PBM's cellular mechanisms with each identified TBI's pathophysiological aspect. The outcomes in human clinical studies are then reviewed. The findings support PBM's potential for treating TBI, notwithstanding variations in parameters such as wavelength, power density, dose, light source positioning, and pulse frequencies. Emerging data indicate that each of these parameters plays a role in the outcomes. Additionally, new research into PBM's effects on the electrical properties and polymerization dynamics of neuronal microstructures, like microtubules and tubulins, provides insights for future parameter optimization. In summary, transcranial PBM represents a multifaceted therapeutic intervention for TBI with vast potential which may be fulfilled by optimizing the parameters. Future research should investigate optimizing these parameters, which is possible by incorporating artificial intelligence. Humans;Low-Level Light Therapy;Artificial Intelligence;Brain Injuries, Traumatic;Neurons;Axons

Application of Infrared Thermography in the Rehabilitation of Patients in Veterinary Medicine. Infrared Thermography (IRT) has become an assistance tool in medicine and is used to noninvasively evaluate heat elimination during and after inflammatory processes or during the recovery period. However, its application in veterinary patients undergoing physiotherapy is a field that requires deep research. This review aims to analyze the application of IRT in the monitoring of animal physiotherapy, using the thermal changes that are present in patients undergoing gait or lameness issues (e.g., inflammation, pain, increased local temperature) as a neurobiological basis. Rehabilitation techniques such as acupuncture, physical therapies, thermotherapy, photo-biomodulation, and electrostimulation have been reported to have an anti-inflammatory effect that decreases the amount of local heat production, which is heat that can be recorded with IRT. Therefore, IRT could be used as a complementary tool to evaluate the effectiveness of the therapy, and it is suggested that further studies evaluate the accuracy, sensibility, and sensitivity of IRT.

New approaches to second-degree burn healing: Polyvinyl alcohol membrane loaded to arnica combined to laser therapy. Second-degree burns require greater care, as the damage is more extensive and worrisome and the use of a biomaterial can help in the cell repair process, with better planning, low cost, and better accessibility. Arnica has anti-inflammatory and analgesic properties in skin lesions treatments and laser therapy is another therapeutic alternative for burns. Evaluate the effects of arnica incorporated into PVA associated or not with low intensity laser on burns in rats. PVA and PVA with arnica (PVA+A) were obtained and characterized physicochemically. Through in vivo studies, the effects of PVA and PVA+A with or without the application of laser on the lesions allowed histological and immunohistochemical analyzes. PVA+A was biocompatible and with sustained release of the active, being a promising pharmacological tool and confirmed that laser therapy was effective in accelerating the healing process, due to its potential biomodulator, improving inflammatory aspects, promoting rapid healing in skin lesions. Polyvinyl Alcohol;Biocompatible Materials;Plant Extracts;Membranes, Artificial Animals;Polyvinyl Alcohol;Burns;Wound Healing;Rats;Rats, Wistar;Male;Skin;Biocompatible Materials;Plant Extracts;Laser Therapy;Membranes, Artificial;Low-Level Light Therapy

Efficacy of transcranial photobiomodulation in the treatment for major depressive disorder: A TMS-EEG and pilot study. BACKGROUND: Major depressive disorder (MDD) was a prevalent mental condition that may be accompanied by decreased excitability of left frontal pole (FP) and abnormal brain connections. An 820â€‰nm tPBM can induce an increase in stimulated cortical excitability. The purpose of our study was to establish how clinical symptoms and time-varying brain network connectivity of MDD were affected by transcranial photobiomodulation (tPBM). METHODS: A total of 11 patients with MDD received 820â€‰nm tPBM targeting the left FP for 14 consecutive days. The severity of symptoms was evaluated by neuropsychological assessments at baseline, after treatment, 4-week and 8-week follow-up; 8-min transcranial magnetic stimulation combined electroencephalography (TMS-EEG) was performed for five healthy controls and five patients with MDD before and after treatment, and time-varying EEG network was analyzed using the adaptive-directed transfer function. RESULTS: All of scales scores in the 11 patients decreased significantly after 14-day tPBM (pâ€‰<â€‰.01) and remained at 8-week follow-up. The time-varying brain network analysis suggested that the brain regions with enhanced connection information outflow in MDD became gradually more similar to healthy controls after treatment. CONCLUSIONS: This study showed that tPBM of the left FP could improve symptoms of patients with MDD and normalize the abnormal network connections. Humans;Depressive Disorder, Major;Pilot Projects;Low-Level Light Therapy;Electroencephalography;Transcranial Magnetic Stimulation

Outcome of novel pulp capping modalities after full pulpotomy in teeth diagnosed with irreversible pulpitis: A prospective randomized clinical trial. OBJECTIVE: The study aimed to compare and evaluate the effect of biodentine (BD) alone, BD along with Lyophilised freeze dried platelet rich concentrate (LPC + BD), and BD along with low-level laser therapy (BD + LLLT) after pulpotomy in mature permanent molars with irreversible pulpitis. MATERIALS AND METHODS: The study was designed as a randomized, pragmatic, parallel, double-blinded clinical trial registered under the Clinical Trial Registry-India (CTRI/2020/02/023245). 120 permanent molars fulfilling the inclusion and exclusion criteria with symptoms of irreversible pulpitis were randomized after performing pulpotomy into three pulp capping groups: Group 1, BD; Group 2, lyophilized freeze-dried platelet-rich concentrate + BD (LPC + BD); and Group 3, Low level laser therapy + BD Group 3, LLLT + BD. The intergroup comparison was done using one-way analysis of variance followed by the Bonferroni test. The level of significance and confidence interval were 5% and 95%, respectively. Interobserver reliability was measured using Cohen's kappa analysis. RESULTS: At 1 week, there was a significant difference ($P < 0.005$) observed in the mean postoperative pain levels between the three groups with

Group 1 (BD) exhibiting the highest postoperative pain followed by Group 2 (LPC + BD) and least pain was exhibited by Group 3 (LLLT + BD). A similar pattern was observed regarding the analgesic intake with maximum frequency in Group 1 (BD) and least with Group 3 (LLLT + BD). No significant difference in success rates was reported among the groups. CONCLUSION: Pulpotomy as a treatment option for mandibular molars with irreversible pulpitis has an acceptable clinical success rate; however, long-term overall success rate remains questionable. The outcomes of incorporating adjunctive modalities with BD are remarkable and show tremendous potential for continued development and research.

Effect of 980â€‰nm photobiomodulation delivered by a handpiece with Gaussian vs. Flat-Top profiles on proliferation and differentiation of buccal fat pad stem cells. The aim of this study was to compare the effectiveness of the Gaussian and Flat-Top profiles in proliferation and differentiation of mesenchymal stem cell of buccal fat pad. Based on the timing schedule and type of laser handpieces, the cells were assigned to a control group with no radiation, and two irradiation test groups (980â€‰nm) with Flat-Top (F) (power of 1.1â€‰W, beam area of 1â€‰cm(2)) and standard Gaussian (G) (power of 0.7â€‰W, beam area of 0.5â€‰cm(2)) handpieces. Each test group was divided into three subgroups, receiving one time (60â€‰J/cm(2)), two times (120â€‰J/cm(2)), and three times (180â€‰J/cm(2)) irradiation. 3-(4,5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide (MTT) and Annexin V tests were performed. The Alizarin Red staining and polymerase chain reaction tests were done both at the beginning and the end of the first and second weeks. The degree of mineralization and expression of osteogenic markers, RUNX2, OCN, and OPN were evaluated. Based on the MTT and Annexin V test results, both test groups outperformed the control group in degrees of cell proliferation during the first day of laser irradiation (pâ€‰<â€‰0.05). After one and two times irradiation, the expression of osteogenic markers in the test groups was significantly higher than the control group. PBM with Flat-Top and Gaussian handpieces can enhance ossification and cell differentiation regardless of the type of handpieces.

Inflammation in obsessive-compulsive disorder: A literature review and hypothesis-based potential of transcranial photobiomodulation. Obsessive-compulsive disorder (OCD) is a disabling neuropsychiatric disorder that affects about 2%-3% of the global population. Despite the availability of several treatments, many patients with OCD do not respond adequately, highlighting the need for new therapeutic approaches. Recent studies have associated various inflammatory processes with the pathogenesis of OCD, including alterations in peripheral immune cells, alterations in cytokine levels, and neuroinflammation. These findings suggest that inflammation could be a promising target for intervention. Transcranial photobiomodulation (t-PBM) with near-infrared light is a noninvasive neuromodulation technique that has shown potential for several neuropsychiatric disorders. However, its efficacy in OCD remains to be fully explored. This study aimed to review the literature on inflammation in OCD, detailing associations with T-cell populations, monocytes, NLRP3 inflammasome components, microglial activation, and elevated proinflammatory cytokines such as TNF-Î±, CRP, IL-1Î², and IL-6. We also examined the hypothesis-based potential of t-PBM in targeting these inflammatory pathways of OCD, focusing on mechanisms such as modulation of oxidative stress, regulation of immune cell function, reduction of proinflammatory cytokine levels, deactivation of neurotoxic microglia, and upregulation of BDNF gene expression. Our review suggests that t-PBM could be a promising, noninvasive intervention for OCD, with the potential to modulate underlying inflammatory processes. Future research should focus on randomized clinical trials to assess t-PBM's efficacy and optimal treatment parameters in OCD. Biomarker analyses and neuroimaging studies will be important in understanding the relationship between inflammatory modulation and OCD symptom improvement following t-PBM sessions. Cytokines;Tumor Necrosis Factor-alpha

Humans;Low-Level Light Therapy;Cytokines;Obsessive-Compulsive Disorder;Tumor Necrosis Factor-alpha;Inflammation

Clinical and thermographic evaluation after lower third molar extractions and the application of different photobiomodulation protocols: double-blind randomised clinical trial. OBJECTIVES: to compare the parameters of pain, oedema, temperature, and soft tissue closure in dental sockets that received two different photobiomodulation (PBM) protocols following extractions. MATERIALS AND METHODS: Thirty-one participants had their teeth 38 and 48 extracted. Subsequently, one of the dental sockets received PBM at a wavelength (WL) of 808 nanometers (808 group- nm) and the other dental socket received the PBM at WLs of 808Â nm and 660Â nm, simultaneously (808â€‰+â€‰660 group). The PBM was applied immediately after the surgical procedure and on the 3rd and 7th days. RESULTS: The mean of Visual Analogue Scale (VAS) values for pain were 1.45 for the 3rd day and 0.52 for the 7th day in the 808â€‰+â€‰660 and 808 group, respectively. The mean the pogonion-tragus measurement, used to assess facial oedema on the 3rd day, was 15.38Â cm (range 13.5-17.5) in the 808â€‰+â€‰660 group and 15.48Â cm (range 14.0-17.5) in the 808 group. The mean facial temperatures in the 808â€‰+â€‰660 group were 34.9 degrees Celsius (ÂºC) (range 33.5-36.4) on the 3rd day and 35 ÂºC (range 33.4-36.4) on the 7th day. In the 808 group, the mean temperatures were 34.9 ÂºC (range 33.9-36.2) on the 3rd day and 34.9 ÂºC (33.7-36.2) on the 7th day. Regarding the dimensions of the dental socket, the mean were similar for both groups. Significant differences between the groups were only observed in the pain parameter and only on the 7th day, being greater for the 808â€‰+â€‰660 group (pâ€‰=â€‰0.031). CONCLUSIONS: The association of the 660Â nm with 808Â nm, and the increase in energy did not showed more benefits in pain reduction oedema, or acceleration of the closure of the soft tissues of the dental sockets of lower third molars, in the protocols used here. CLINICAL RELEVANCE: There is no need to combine lasers at wavelengths of 660 and 808Â nm to reduce oedema, pain and repair of soft tissues after extraction of lower third molars. CLINICAL TRIAL REGISTRATION: This trial was registered in the Brazilian Registry of Clinical Trials (ReBEC) with the following code: RBR-66pyrh8, on 29th December, 2022.
Humans;Edema;Low-Level Light Therapy;Molar, Third;Pain;Pain, Postoperative;Tooth Extraction

Effects of photobiomodulation on pain, lactate and muscle performance (ROM, torque, and EMG parameters) of paretic upper limb in patients with post-stroke spastic hemiparesis-a randomized controlled clinical trial. The objective of the study was to investigate the impact of photobiomodulation (PBM) on the paretic upper limb in post-stroke patients with spastic hemiparesis and to understand the potential of PBM as a long-term non-invasive therapy for reducing the side effects caused by spasticity in the hemiparetic upper limb after a stroke. This is a double-blind randomized clinical trial constituted of 27 participants, being Control group (CGâ€‰=â€‰12 healthy individuals) and PBM group (PBMGâ€‰=â€‰15 post-stroke individuals). In the CG, the baseline blood lactate (BL) was evaluated, followed by the evaluation of the IC torque of the biceps and triceps muscles, with the isokinetic dynamometer associated with surface electromyography (EMG) and, subsequently, a new measurement of BL. The PBMG received 10 sessions of treatment with PBM (780Â nm, Power: 100Â mV, Power Density: 3.18 W/cm(2), Energy: 4Â J, Fluency: 127.4Â J/cm(2), Time: 40Â s per point and 1.280Â s total, Spot: 0.0314 cm(2), 32 Points: 16 points (brachial biceps) and 16 points (brachial triceps) applied with contact at 90Â°, Total Energy: 64Â J), which in the pre-treatment evaluation measured BL, the visual analogue scale (VAS) of pain; torque and EMG of the same muscles in the IC, subsequently, a new measurement of VAS and BL, and measurement of range of motion (ROM) during the reaching movement. At the conclusion of the ten sessions, all participants underwent a reassessment, wherein all tests originally administered during the initial evaluation were repeated. Subsequently, the data were analyzed using the Shapiro-Wilk normality test. For related data, the paired t-test was used for normal distributions and the Wilcoxon test for

non-normal data. For unrelated data, the t test was used for normal distributions and the Mann-Whitney test for non-normal data. Muscle torque was higher for the CG, with a significant difference (CGxPBMGâ€‰=â€‰pâ€‰<â€‰0.0001). There was no significant difference between the EMG values of the CG in relation to the Pre-PBM phase and with the Post-PBM phase of the PBMG (pâ€‰>â€‰0.05). On the other hand, there was a 38% reduction in pain reported by hemiparetic patients (pâ€‰=â€‰0.0127) and a decrease in BL in the PBMG. Post-PBM ROM increased by 46.1% in the elbow extension of the paretic limb. In conclusion, Photobiomodulation (PBM) demonstrated significant improvements in muscle performance, reducing fatigue and pain levels, and enhancing range of motion in post-stroke patients with spastic hemiparesis. These findings support the potential integration of PBM into rehabilitation protocols, but further research and clinical trials are needed to validate and expand upon these promising outcomes. Lactic Acid Humans;Muscle Spasticity;Lactic Acid;Torque;Low-Level Light Therapy;Muscle, Skeletal;Stroke;Electromyography;Upper Extremity;Range of Motion, Articular;Pain;Paresis

Fibroblast function recovery through rejuvenation effect of nanovesicles extracted from human adipose-derived stem cells irradiated with red light. Fibroblasts (hDFs) are widely employed for skin regeneration and the treatment of various skin disorders, yet research were rarely investigated about restoration of diminished therapeutic efficacy due to cell senescence. The application of stem cell and stem cell-derived materials, exosomes, were drawn attention for the restoration functionality of fibroblasts, but still have limitation for unintended side effect or low yield. To advance, stem cell-derived nanovesicle (NV) have developed for effective therapeutic reagents with high yield and low risk. In this study, we have developed a method using red light irradiated human adipose-derived stem cells (hADSCs) derived NV (R-NVs) for enhancing the therapeutic efficacy and rejuvenating hDFs. Through red light irradiation, we were able to significantly increase the content of stemness factors and angiogenic biomolecules in R-NVs. Treatment with these R-NVs was found to enhance the migration ability and leading to rejuvenation of old hDFs to levels similar to those of young hDFs. In subsequent in vivo experiments, the treatment of old hDFs with R-NVs demonstrated a superior skin wound healing effect, surpassing that of young hDFs. In summary, this study successfully induced rejuvenation and leading to increased therapeutic efficacy to R-NVs treated old hDFs previously considered as biowaste. Humans;Rejuvenation;Recovery of Function;Red Light;Stem Cells;Fibroblasts

Short term effects of extremely low irradiance photobiomodulation on retinal function, in age related macular degeneration. BACKGROUND: recently much studies evidenced the potential role of photo-biomodulation (PBM) in patients affected by Age-related Macular Degeneration (AMD). We designed a new wearable device for self-medication that employs the same broadband red light described in literature, but with extremely low irradiance. AIM: to demonstrate the safety and effectiveness of low-fluence light stimulations emitted by a LED source with appropriate wavelengths through our new device in improving short-term visual function in patients affected by severe non neovascular AMD. MATERIALS AND METHODS: we prospectively enrolled patients affected by severe non-neovascular AMD with a relative sparing of the foveal region. All the patients were randomly assigned in placebo or in treatment group. The treatment consisted of 10 sessions of 10-min each, using the new device comprised of micro-LEDs that emitted light onto an amorphous support assembled within Metallic eyeglasses. The placebo group blindly underwent the same number of PBM sessions with the micro-LED turned off. Before and after each placebo/treatment sessions all the patients received: optical coherence tomography (OCT), Best-Corrected Visual Acuity (BCVA) and Microperimetry (MP). RESULTS: no significant differences in the anatomical parameters were observed in the two groups. The MP mean sensitivity and the central visual function both far and near significantly improved in the treated group (respectively pâ€‰<â€‰0.001, pâ€‰<â€‰0.001).

CONCLUSIONS: our pivotal demonstrated that the LED PBM delivered through our new device is a safe and effective tool for improving short-term visual function in patients affected by severe non-neovascular AMD.

Subthreshold micropulse laser therapy for early postoperative macular thickening following surgical removal of epiretinal membrane. BACKGROUND: This study aimed to investigate the functional and anatomical outcomes of subthreshold micropulse laser (SMPL) therapy in eyes with early postoperative macular thickening after idiopathic epiretinal membrane (iERM) removal. METHODS: This was a prospective and interventional study. Forty-eight eyes from 48 patients with macular edema at 1 month after iERM removal were randomly divided into two groups. Patients in the SMPL group (nâ€‰=â€‰24) received SMPL therapy while no special intervention was used for the observation group (nâ€‰=â€‰24). Baseline demographic data and clinical findings before and at 1 and 3 months after SMPL treatment or observation, including best-corrected visual acuity (BCVA) and the changes in central subfield thickness (CST) and average macular thickness (AMT), were analyzed. RESULTS: An improvement in BCVA with a decrease in CST and AMT from baseline to the 3-month follow-ups were observed in both SMPL and observation groups. No significant difference in BCVA was observed between the SMPL group and observation group either in the 1-month (0.26 [0.15, 0.52] vs. 0.26 [0.15, 0.39], Pâ€‰=â€‰0.852) or the 3-month (0.15 [0.10, 0.30] vs. 0.23 [0.15, 0.30], Pâ€‰=â€‰0.329) follow-up. There was a greater reduction in CST in the SMPL group versus observation group between baseline and the 3-month follow-up (-77.8â€‰Â±â€‰72.3Â Î¼m vs. -45.0â€‰Â±â€‰46.9Â Î¼m, Pâ€‰=â€‰0.049). The alteration in AMT did not differ between the two groups in either 1-month (-16.5â€‰Â±â€‰20.1Â Î¼m vs. -19.7â€‰Â±â€‰16.3Â Î¼m, Pâ€‰=â€‰0.547) or 3-month (-36.9â€‰Â±â€‰26.9Â Î¼m vs. -34.0â€‰Â±â€‰20.1Â Î¼m, Pâ€‰=â€‰0.678) follow-up. CONCLUSIONS: SMPL therapy led to a significant decrease in CST at the 3-month follow-up while did not significantly improve the visual acuity in patients with postoperative macular thickening following iERM surgery. TRIAL REGISTRATION: The study was registered on Aug 27, 2020 (Trial Registration Number: ChiCTR 2000037227). Humans;Epiretinal Membrane;Prospective Studies;Laser Therapy;Low-Level Light Therapy;Eye;Vision Disorders

Medication-related osteonecrosis of the jaw: evolving research for multimodality medical management. PURPOSE: Medication-related osteonecrosis of the jaw (MRONJ) is a debilitating side effect of antiresorptive and antiangiogenic agents that can lead to progressive bone destruction in the maxillofacial region. Dental surgery, including tooth extractions, commonly trigger the onset of MRONJ. While guidelines suggest avoiding extraction when possible, complete avoidance is not always feasible, as necrosis can develop from dental and periodontal disease without dental procedures. The goal of this article is to provide an update review of current preventive and therapeutic approaches for MRONJ. METHODS: A comprehensive electronic search was conducted on PubMed/MEDLINE, Embase, and Scopus databases. All English articles encompassing randomized controlled trials, systematic reviews, observational studies, and case studies were reviewed. The current medical treatments and adjuvant therapies for managing MRONJ patients were critically assessed and summarized. RESULTS: Pentoxifylline and alpha tocopherol (PENT-E), teriparatide, photobiomodulation (PBM), photodynamic therapy (PDT), and the use of growth factors have shown to enhance healing in MRONJ patients. Implementing these methods alone or in conjunction with surgical treatment has been linked to reduced discomfort and improved wound healing and increased new bone formation. DISCUSSION: While several adjuvant treatment modalities exhibit promising results in facilitating the healing process, current clinical practice guidelines predominantly recommend antibiotic therapy as a non-surgical approach, primarily addressing secondary infections in necrotic areas. However, this mainly addresses the potential infectious complication of MRONJ. Medical approaches including PENT-E, teriparatide, PBM, and PDT can result in successful

management and should be considered prior to taking a surgical approach. Combined medical management for both preventing and managing MRONJ holds potential for achieving optimal clinical outcomes and avoiding surgical intervention, requiring further validation through larger studies and controlled trials. Adjuvants, Immunologic;Adjuvants, Pharmaceutic;Teriparatide Humans;Adjuvants, Immunologic;Adjuvants, Pharmaceutic;Combined Modality Therapy;Osteonecrosis;Teriparatide;Jaw Diseases

Osteoblastic differentiation and changes in the redox state in pulp stem cells by laser treatment. The aim of this study was to determine the effect of low-level laser therapy (LLLT) on cell proliferation, mitochondrial membrane potential changes (âˆ†Î¨m), reactive oxygen species (ROS), and osteoblast differentiation of human dental pulp stem cells (hDPSCs). These cells were irradiated with 660- and 940-nm lasers for 5Â s, 50Â s, and 180Â s. Cell proliferation was assessed using the resazurin assay, cell differentiation by RUNX2 and BMP2 expression, and the presence of calcification nodules using alizarin-red S staining. ROS was determined by the dichlorofluorescein-diacetate technique and changes in âˆ†Î¨m by the tetramethylrhodamine-ester assay. Data were analyzed by a Student's t-test and Mann-Whitney U test. The 940-nm wavelength for 5 and 50Â s increased proliferation at 4Â days postirradiation. After 8Â days, a significant decrease in proliferation was observed in all groups. Calcification nodules were evident in all groups, with a greater staining intensity in cells treated with a 940-nm laser for 50Â s, an effect that correlated with increased RUNX2 and BMP2 expression. ROS production and Î”Ïˆm increased independently of irradiation time. In conclusion, photobiomodulation (PBM) with LLLT induced morphological changes and reduced cell proliferation rate, which was associated with osteoblastic differentiation and increased ROS and Î”Ïˆm, independent of wavelength and time. Core Binding Factor Alpha 1 Subunit;Reactive Oxygen Species Humans;Core Binding Factor Alpha 1 Subunit;Reactive Oxygen Species;Stem Cells;Cell Differentiation;Oxidation-Reduction;Calcinosis

Association of a Skin Dressing Made With the Organic Part of Marine Sponges and Photobiomodulation on the Wound Healing in an Animal Model. The present study aims to characterize and to evaluate the biological effects of a skin dressing manufactured with the organic part of the Chondrilla caribensis marine sponge (called spongin-like collagen (SC)) associated or not to photobiomodulation (PBM) on the skin wound healing of rats. Skin dressings were manufactured with SC and it was characterized using scanning electron microscopy (SEM) and a tensile assay. In order to evaluate its biological effects, an experimental model of cutaneous wounds was surgically performed. Eighteen rats were randomly distributed into three experimental groups: control group (CG): animals with skin wounds but without any treatment; marine collagen dressing group (DG): animals with skin wounds treated with marine collagen dressing; and the marine collagen dressing + PBM group (DPG): animals with skin wounds treated with marine collagen dressing and PBM. Histopathological, histomorphometric, and immunohistochemical evaluations (qualitative and semiquantitative) of COX2, TGFÎ², FGF, and VEGF were done. SEM demonstrates that the marine collagen dressing presented pores and interconnected fibers and adequate mechanical strength. Furthermore, in the microscopic analysis, an incomplete reepithelialization and the presence of granulation tissue with inflammatory infiltrate were observed in all experimental groups. In addition, foreign body was identified in the DG and DPG. COX2, TGFÎ², FGF, and VEGF immunostaining was observed predominantly in the wound area of all experimental groups, with a statistically significant difference for FGF immunostaining score of DPG in relation to CG. The marine collagen dressing presented adequate physical characteristics and its association with PBM presented favorable biological effects to the skin repair process. Collagen;Vascular Endothelial Growth Factor A;Cyclooxygenase 2;Transforming Growth Factor beta;Fibroblast Growth Factors;Ptgs2 protein, rat Animals;Wound Healing;Rats;Porifera;Collagen;Skin;Bandages;Low-Level Light Therapy;Male;Vascular Endothelial

Growth Factor A;Cyclooxygenase 2;Disease Models, Animal;Rats, Wistar;Transforming Growth Factor beta;Tensile Strength;Fibroblast Growth Factors;Microscopy, Electron, Scanning

Preventive versus curative photobiomodulation for oral mucositis in patients with multiple myeloma undergoing hematopoietic stem cell transplantation: which approach is more effective? PURPOSE: There is increasing evidence that photobiomodulation (PBM) therapy is both an effective and safe approach in hematopoietic stem cell transplantation (HSCT) for both prevention and management of oral mucositis (OM), but its use in clinical practice is still limited and the timing of application is under discussion. The aim of this retrospective study was to evaluate possible differences between patients treated either with preventive or curative PBM therapy. METHODS: The retrospective case series included 24 patients suffering from multiple myeloma who underwent the same conditioning and transplantation protocol. Patients were treated either with preventive PBM starting from the first day of conditioning up to two days post-HSCT or with curative PBM (starting at OM onset for four consecutive days). OM score, pain, and functional parameters were recorded. RESULTS: All patients developed OM. Preventive PBM was significantly more effective in reducing OM severity (pâ€‰<â€‰0.0001) and pain (pâ€‰<â€‰0.0001) post-HSCT than curative PBM. Furthermore, we found a lower number of patients reporting discomfort in all subjective parameters (pain during swallowing, chewing, and speaking) in the preventive PBM group. No adverse events related to PBM therapy were recorded in both groups. CONCLUSION: The timing for PBM therapy in patients undergoing HSCT is crucial: when started on the first day of conditioning, it significantly reduces both pain and OM severity, providing an important benefit also in subjective oral functions such as speaking, swallowing, and chewing, thus increasing the overall adherence to the oncological therapies. Humans;Multiple Myeloma;Retrospective Studies;Low-Level Light Therapy;Hematopoietic Stem Cell Transplantation;Stomatitis;Pain

Photobiomodulation preconditioned diabetic adipose derived stem cells with additional photobiomodulation: an additive approach for enhanced wound healing in diabetic rats with a delayed healing wound. In this preclinical investigation, we examined the effects of combining preconditioned diabetic adipose-derived mesenchymal stem cells (AD-MSCs) and photobiomodulation (PBM) on a model of infected ischemic delayed healing wound (injury), (IIDHWM) in rats with type I diabetes (TIDM). During the stages of wound healing, we examined multiple elements such as stereology, macrophage polarization, and the mRNA expression levels of stromal cell-derived factor (SDF)-1Î±, vascular endothelial growth factor (VEGF), hypoxia-induced factor 1Î± (HIF-1Î±), and basic fibroblast growth factor (bFGF) to evaluate proliferation and inflammation. The rats were grouped into: (1) control group; (2) diabetic-stem cells were transversed into the injury site; (3) diabetic-stem cells were transversed into the injury site then the injury site exposed to PBM; (4) diabetic stem cells were preconditioned with PBM and implanted into the wound; (5) diabetic stem cells were preconditioned with PBM and transferred into the injury site, then the injury site exposed additional PBM. While on both days 4, and 8, there were advanced histological consequences in groups 2-5 than in group 1, we found better results in groups 3-5 than in group 2 (pâ€‰<â€‰0.05). M1 macrophages in groups 2-5 were lower than in group 1, while groups 3-5 were reduced than in group 2 (pâ€‰<â€‰0.01). M2 macrophages in groups 2-5 were greater than in group 1, and groups 3-5 were greater than in group 2. (pâ€‰â‰¤â€‰0.001). Groups 2-5 revealed greater expression levels of bFGF, VEGF, SDF- 1Î±, and HIF- 1Î± genes than in group 1 (pâ€‰<â€‰0.001). Overall group 5 had the best results for histology (pâ€‰<â€‰0.05), and macrophage polarization (pâ€‰<â€‰0.001). AD-MSC, PBM, and AD-MSCâ€‰+â€‰PBM treatments all enhanced the proliferative stage of injury repairing in the IIDHWM in TIDM rats. While AD-MSCâ€‰+â€‰PBM was well than the single use of AD-MSC or PBM, the best results were achieved with PBM preconditioned AD-MSC, plus additional PBM of the injury. Vascular Endothelial

Growth Factor A;Chemokine CXCL12;Fibroblast Growth Factor 2 Animals;Rats;Vascular Endothelial Growth Factor A;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Wound Healing;Chemokine CXCL12;Fibroblast Growth Factor 2;Stem Cells
Laser light: Illuminating the path to enhanced periodontal care. The utilisation of laser technology in the realm of periodontal care represents a significant advancement in clinical practice. This article delves into the historical context of laser therapy in medicine, from its inception in 1960 to its evolution into low-level laser therapy (LLLT). LLLT, often referred to as photobiomodulation (PBM), has garnered attention due to its potential to enhance periodontal treatment outcomes. The article thoroughly examines the mechanisms of action of photobiomodulation therapy PBM(T), covering its impact on cellular and tissue levels. The authors explore the evidence-based recommendations for the use of PBM(T) in periodontal care, shedding light on its potential to improve periodontal conditions, especially when applied as an adjunct to conventional treatments. They investigate the role of PBM(T) in individuals and its possible contribution to periodontal health. Additionally, the article delves into its application in periodontal regenerative procedures and its ability to expedite soft tissue wound healing and the effects of PBM(T) in reducing periodontal inflammation and mitigating post-periodontal surgery discomfort. In conclusion, the article calls for enhanced clinical research to streamline laser procedures, develop antimicrobial photodynamic therapy, and conduct well-designed randomised controlled trials (RCTs). It also emphasises the importance of understanding the impact of laser therapy on therapeutic and biological goals, the potential to reduce invasive procedures, and the necessity of adequate research funding.
Influence of Intravascular Laser Irradiation of Blood (ILIB) on inflammatory cytokines and nitric oxide in vivo: a systematic review. The use of Intravascular Laser Irradiation of Blood (ILIB) as a treatment or adjunct tool has been used around the world since the 1980s. So that more professionals can deliver benefits to their patients in different areas of health, it is necessary to understand in depth the mechanisms of laser action at the molecular level, for correct indication and success in the treatment.Â To analyze works that evaluated the influence of ILIB on inflammatory cytokines and nitric oxide (NO) in animals and humans. The literature search was carried out between February and April 2023 in Pubmed, Medline, Web of Science, SciELO, Lilacs database. The risk of bias was assessed using the bias table where the authors performed the analyzes of all articles with the risk of bias domains. The methodology was defined following the PRISMA guidelines (Preferred Systematic Reviews and MetaAnalysis Report). The search retrieved 135 possibly relevant articles. After removing duplicates, according to the eligibility criteria, evaluation of titles and review of abstracts, in the end, 6 articles were included.Â An increase in anti-inflammatory cytokines, a decrease in pro-inflammatory cytokines and an increase in NO can be observed. The wavelengths used ranged from 660 to 808Â nm when using a low intensity laser and when using a VIP light source 480-3400Â nm, they also differed in terms of the light emission pattern.Â ILIB may be a complementary treatment option for patients who have comorbidities that lead to systemic inflammation. Cytokines;Nitric Oxide Animals;Humans;Cytokines;Inflammation;Nitric Oxide
Can photobiomodulation improve quadriceps strength and endurance outcomes in asymptomatic adults? A double-blind randomized controlled trial. AIM: To explore the effect of photobiomodulation on quadriceps strength and endurance torques in asymptomatic adults. METHODS: Twenty-eight asymptomatic adults were randomized to one of two interventions: photobiomodulation (nÂ =Â 14) or sham (nÂ =Â 14). Quadriceps strength was evaluated by maximum voluntary isometric contraction test (60Â°) and endurance by an elastic resistance in multiple-set knee extension/flexion repetitions using a traction dynamometer. The outcomes were measured at three time points: pre-baseline; baseline and; final assessment. The photobiomodulation was applied to the quadriceps and triceps surae muscles of each participant's dominant lower limb, using a cluster

with 1 infrared laser diode and 3 led amber of 170Â mW for 240Â s over four consecutive days. The sham group went through the same procedures, but the equipment was off, and patients and assessors were blinded to the intervention. Reliability and minimal detectable change of the measures were obtained from the pre-baseline and baseline time points. Differences between interventions were tested by an analysis of covariance. RESULTS AND DISCUSSION: There was no difference between photobiomodulation compared to sham in maximum isometric torque (mean difference (95% CI)Â =Â 0.008 (-0.29 to 0.31) and endurance torques (mean difference (95% CI)Â =Â 0.04 (-0.03 to 0.12). The mean difference was lower than the minimal detectable change for the maximum isometric torque (1.02 Nm.kg(-1)) and endurance torque (0.49 Nm.kg(-1)). CONCLUSION: Photobiomodulation does not improve quadriceps strength and endurance outcomes in asymptomatic adults. Adult;Humans;Low-Level Light Therapy;Reproducibility of Results;Quadriceps Muscle;Lower Extremity;Double-Blind Method

Higher percentage of CD34+ stem cells and elevated efficacy in androgenetic alopecia treatment observed in CGF prepared from 640â€‰nm laser-pretreated blood: A preliminary study. BACKGROUND: Concentrated growth factor (CGF) injection has proven effective in treating androgenetic alopecia (AGA). The primary mechanism of CGF in treating AGA is thought to be the CD34+ stem cells and platelets-associated growth factors being injected into the scalp. CGF efficacy in treating AGA may rely on the activation level of these stem cells and platelets. The 640â€‰nm laser is a United States Food and Drug Administration approved AGA treatment that activates follicle stem cells. Therefore, we hypothesize that pretreating CGF with a 640â€‰nm laser may further activate CD34+ stem cells and platelets, thereby improving the efficacy of CGF in treating AGA. OBJECTIVE: This study aims to investigate whether 640â€‰nm laser pretreated CGF (640CGF) has a greater effect in treating AGA than 640â€‰nm laser non-pretreated CGF (N640CGF) and evaluate whether 640â€‰nm laser pretreatment changed CD34+ cell percentage. METHODS: This study enrolled 10 patients (8â€‰male, 2â€‰female) with AGA aged 18-60â€‰years who received CGF injections. The 640CGF group was pretreated with a 640â€‰nm laser at an energy density of 4â€‰J/cm(2) , with a 30â€‰cm irradiation distance for 30â€‰min. Half of the scalp was treated with 640CGF, whereas the other half was treated with N640CGF. The injection was prepared by a doctor who did not know which blood tube had been pretreated. The treatment efficacy was evaluated using a trichoscope 1â€‰month after injection. RESULTS: All 10 (100%) patients participated in the follow-up visit, and a higher quantity of new hairs was observed on the side injected with 640CGF than N640CGF (pâ€‰=â€‰0.019). Additionally, fewer malnourished hairs were observed on the 640CGF pretreated side (pâ€‰=â€‰0.015). No serious adverse events were reported. CONCLUSIONS: A higher percentage of CD34+ stem cells and improvedâ€‚efficacyâ€‚in AGA treatment could be observed with CGF prepared from 640â€‰nm laser-pretreated blood.

Effect of photobiomodulation on postoperative endodontic pain: A systematic review of clinical trials. BACKGROUND: This review aims to perform a complete evaluation of the impact of photobiomodulation (PMB) on postoperative endodontic pain. MATERIALS AND METHODS: The PRISMA checklist was used to perform this systematic review. The electronic databases were searched, including Google Scholar, PubMed, and Embase. Sixty-three papers were obtained through a main electronic search and a hand search. Nine trials met the criteria after screening the titles, abstracts, and/or full texts. RESULTS: Seven out of nine studies showed that PMB has a significant impact on relieving postoperative endodontic pain, with no statistically significant difference in the severity of pain between the laser and control groups in the two remaining studies. In addition, eight studies showed no adverse effects, indicating that we can remove the adverse effects of drugs such as nonsteroidal anti-inflammatory drugs. However, one study showed evidence of the consequences of PMB application on teeth with symptomatic irreversible pulpitis. Therefore, it can be concluded

that PMB should not be used in teeth with pain because of irreversible pulpitis. CONCLUSION: Although there is some understanding from a cellular viewpoint of the effects of PMB, there is still some uncertainty about whether these cell-level modifications impact reducing the postendodontic pain.

Investigation of healing strategies in a rat corneal opacity model with polychromatic light and stem cells injection. Corneal opacities are a major cause of vision loss worldwide. However, the current therapies are suboptimal to manage the corneal wound healing process. Therefore, there is an obvious need to develop new treatment strategies that are efficient in promoting wound healing in patients with severe corneal disorders. In this study, we investigated and compared the efficacy of adipose-derived mesenchymal stem cells (ADMSCs) and photobiomodulation (PBM) with polychromatic light in the NIR (600-1200Â nm) alone and in combination, on corneal opacity, inflammatory response, and tissue architecture in a rat corneal opacity model created by mechanical injury. All animals were divided into four groups randomly following the injury: injury only (no treatment), ADMSCs treatment, PBM treatment and combined (ADMSCs+PBM) treatment (nÂ =Â 12 eyes per group). At the 10th and 30th day following injury, corneal opacity formation, neovascularization, and corneal thickness were assessed. On the 30th day the harvested corneas were analyzed by transmission electron microscopy (TEM), histological evaluation, immunohistochemical (IHC) staining and real-time polymerase chain reaction (RT-PCR). On day 30, the corneal opacity score, neovascularization grade, and corneal thickness in all treatment groups were significantly lower in comparison with the untreated injured corneas. The TEM imaging and H&E staining together clearly revealed a significant enhancement in corneal regeneration with improved corneal microenvironment and reduced vascularization in the combined administration of PBM and ADMSCs compared to treatment of PBM and ADMSCs alone. In addition, the IHC staining, and RT-PCR analysis supported our hypothesis that combining ADMSCs therapy with PBM alleviated the inflammatory response, and significantly decreased scar formation compared to either ADMSCs or PBM alone during the corneal wound healing. Rats;Humans;Animals;Wound Healing;Stem Cells;Mesenchymal Stem Cells;Corneal Opacity;Cornea

The effects of combined and independent low-level laser and mesenchymal stem cell therapy on induced knee osteoarthritis: An animal study. BACKGROUND: Mesenchymal stem cell (MSC) injection has emerged as a novel treatment for knee osteoarthritis (OA). In addition, low-level laser therapy (LLLT) has been reported to delay the progression of OA. Thus, the current study on animal models of OA investigated the effectiveness of these methods when administered independently and combined. METHODS: Twenty-five guinea pig models of OA were randomly sorted into five study groups. The test groups received intra-articular MSC, LLLT, and a combination of these therapeutics for 8Â weeks. Radiological and histopathologic evaluations were carried out for the test groups and the control after the completion of treatments. RESULTS: The MSC-treated groups showed better outcomes in terms of all radiological and histological indexes compared with the control, apart from subchondral bone (PÂ <Â 0.05). Similarly, but to a different extent, the LLLT-treated group showed better results than the controls (PÂ <Â 0.05). The combination of MSC therapy and LLLT improved the cartilage, surface, matrix, space width, osteophytes, and radiologic OA scores more effectively than each of these methods alone (PÂ <Â 0.05). CONCLUSIONS: According to our results, the combination of intra-articular MSC and LLLT can effectively improve OA in animal models. Further preclinical and clinical studies are recommended to assess the effectiveness of these therapeutics alone and in combination.

Activation of testosterone-androgen receptor mediates cerebrovascular protection by photobiomodulation treatment in photothrombosis-induced stroke rats. RATIONALE: Numerous epidemiological studies have reported a link between low testosterone levels and an increased risk of

cerebrovascular disease in men. However, there is ongoing controversy surrounding testosterone replacement therapy due to potential side effects. PBMT has been demonstrated to improve cerebrovascular function and promote testosterone synthesis in peripheral tissues. Despite this, the molecular mechanisms that could connect PBMT with testosterone and vascular function in the brain of photothrombosis (PT)-induced stroke rats remain largely unknown. METHODS: We measured behavioral performance, cerebral blood flow (CBF), vascular permeability, and the expression of vascular-associated and apoptotic proteins in PT-induced stroke rats treated with flutamide and seven consecutive days of PBM treatment (350â€‰mW, 808â€‰nM, 2â€‰min/day). To gain further insights into the mechanism of PBM on testosterone synthesis, we used testosterone synthesis inhibitors to study their effects on bEND.3 cells. RESULTS: We showed that PT stroke caused a decrease in cerebrovascular testosterone concentration, which was significantly increased by 7-day PBMT (808â€‰nm, 350â€‰mW/cm(2) , 42â€‰J/cm(2)). Furthermore, PBMT significantly increased cerebral blood flow (CBF) and the expression of vascular-associated proteins, while inhibiting vascular permeability and reducing endothelial cell apoptosis. This ultimately mitigated behavioral deficits in PT stroke rats. Notably, treatment with the androgen receptor antagonist flutamide reversed the beneficial effects of PBMT. Cellular experiments confirmed that PBMT inhibited cell apoptosis and increased vascular-associated protein expression in brain endothelial cell line (bEnd.3) subjected to oxygen-glucose deprivation (OGD). However, these effects were inhibited by flutamide. Moreover, mechanistic studies revealed that PBMT-induced testosterone synthesis in bEnd.3 cells was partly mediated by 17Î²-hydroxysteroid dehydrogenase 5 (17Î²-HSD5). CONCLUSIONS: Our study provides evidence that PBMT attenuates cerebrovascular injury and behavioral deficits associated with testosterone/AR following ischemic stroke. Our findings suggest that PBMT may be a promising alternative approach for managing cerebrovascular diseases.
Testosterone;Androgens;Receptors, Androgen;Flutamide
Humans;Male;Rats;Mice;Animals;Testosterone;Androgens;Receptors, Androgen;Endothelial Cells;Low-Level Light Therapy;Flutamide;Stroke

Effect of low-level laser therapy on pain reduction in orthodontic patients during molar distalization: A randomized controlled trial. AIM: To investigate the effects of low-level laser therapy (LLLT) on pain reduction in orthodontic patients during molar distalization. MATERIALS AND METHODS: Twenty patients requiring bilateral maxillary first molar distalization were randomly assigned to two groups: the intervention group (mean age 15.61Â Â±Â 1.03Â years) received multiple LLLT after every activation of the distalizing appliance (immediately and on the 3rd, 7th, and 14th days) and the control group (mean age 15.64Â Â±Â 1.08Â years) who did not receive LLLT. Patients reported pain levels every day for 7Â days following activation of the appliance using an 11-point numeric rating scale (NRS), then the pain experience of both the intervention and control groups was compared using Mann-Whitney U test. RESULTS: The mean pain scores on the 1st day were higher in the intervention group (9.27Â Â±Â 1.01) compared to that of the control group (8.80Â Â±Â 1.03). However, the mean pain scores of the intervention group (6.55Â Â±Â 1.29, 4.00Â Â±Â 1.26, 2.55Â Â±Â 1.29, 0.91Â Â±Â 1.04, 0.00Â Â±Â 0.00 and 0.00Â Â±Â 0.00, respectively) were lower than the control group (7.40Â Â±Â 1.90, 5.60Â Â±Â 2.07, 4.20Â Â±Â 1.99, 2.80Â Â±Â 1.93, 1.60Â Â±Â 1.58 and 0.40Â Â±Â 0.84, respectively) from the 2nd to the 7th day. All the differences were not statistically significant except on the 6th day (P-valueÂ =Â 0.003). The peak pain level was experienced by both groups on the 1st day, followed by a statistically significant gradual decrease in pain levels. Patients in the intervention group reported a shorter overall duration of pain. CONCLUSION: Although LLLT, with the used parameters, reduced the overall duration of pain experience following maxillary first molar distalization, it was not effective during peak pain levels.

The effect of photobiomodulation with 830-nm LED on corneal alkali burnt rat model. Alkalies Rats;Animals;Alkalies;Low-Level Light Therapy;Corneal Injuries;Cornea;Disease Models, Animal;Corneal Neovascularization
A Novel Air-Cooled Nd:YAG Laser for the Treatment of the Venous Lakes of the Lips. Objective: To evaluate the therapeutic effect of a novel air-cooled Nd:YAG laser in the venous lakes of the lips (VLL). Background: The thermal injury is one of the most important issues during laser therapy for venous lakes. Methods: Six pieces of fresh pork livers were used to provide 30 regions with a diameter of 6â€‰mm for experiment in vitro, among which 15 regions were treated by Nd:YAG laser with air cooling until the tissue turned gray-white, whereas the rest were treated without air cooling as control. The operation time of laser irradiation, the degree of temperature increase, and the depth of coagulation tissue were compared between two groups. Then, 60 VLL patients were selected for Nd:YAG laser treatment with or without air cooling. The operation time of laser irradiation, the degree of temperature increase, the postoperative pain visual analog scale (VAS) score, and the percentage of lesions removed within 1 month were compared. Results: In tissue studies, the treated group showed a longer operation time of laser irradiation (pâ€‰<â€‰0.01), a lower degree of temperature increase (pâ€‰<â€‰0.01), and there was no significant statistical difference in the depth of coagulation tissue (pâ€‰=â€‰0.624). In clinical studies, the treated group showed a longer operation time of laser irradiation (pâ€‰<â€‰0.01), a lower degree of temperature increase (pâ€‰<â€‰0.01), and a lower VAS score on the 1st and 2nd day, compared with the control group (pâ€‰<â€‰0.01). Conclusions: Air cooling during Nd:YAG laser for the treatment of VLL can prolong the surgical time, but lowered tissue temperature and reduced patient pain within 2 days under the premise of ensuring the treatment effect. Humans;Lasers, Solid-State;Lip;Laser Therapy;Temperature;Low-Level Light Therapy
Photobiomodulation in the Treatment of Dysgeusia in Patients with Long COVID: A Single-Blind, Randomized Controlled Trial. Objective: The aim of this study is to evaluate local and systemic photobiomodulation (PBM) in patients with COVID-19-related dysgeusia, with the expectation of improving taste dysfunction. Background: PBM has garnered attention as a potential therapy in long COVID, a condition characterized by many persistent symptoms following the acute phase of COVID-19. Among these symptoms, dysgeusia, or altered taste perception, can significantly affect patients' quality of life. Emerging research suggests that PBM may hold promise in ameliorating dysgeusia by modulating cellular processes and reducing inflammation. Further clinical studies and randomized controlled trials are essential to establish the efficacy and safety of PBM for the treatment of dysgeusia in long COVID, but initial evidence suggests that this noninvasive modality may offer a novel avenue for symptom management. Methods: Seventy patients experiencing dysgeusia were randomly assigned to receive active local and systemic PBM (nâ€‰=â€‰34) or simulated PBM (nâ€‰=â€‰36). Low-power laser (red wavelength) was used at 18 spots on the lateral borders of the tongue (3â€‰J per spot), salivary glands (parotid, sublingual, and submandibular glands-3â€‰J per spot), and over the carotid artery for 10â€‰min (60â€‰J). Alongside laser therapy, all patients in both groups received weekly olfactory therapy for up to 8 weeks. Results: Dysgeusia improved in both groups. At weeks 7 and 8, improvement scores were significantly higher in the PBM group than in the sham group (pâ€‰=â€‰0.048). Conclusions: Combined local and systemic PBM, as applied in this study, proved effective and could serve as a viable treatment option for alleviating dysgeusia in long-COVID patients. Clinical Trial Registration: RBR-2mfbkkk. Humans;COVID-19;Dysgeusia;Low-Level Light Therapy;Post-Acute COVID-19 Syndrome;Quality of Life;Randomized Controlled Trials as Topic;Single-Blind Method
Influence of Different Photobiomodulation Parameters on Multi-Potent Adipose Tissue Mesenchymal Cells In Vitro. Objective: Investigating the effect of different parameters of photobiomodulation

(PBM) with low-power laser on multi-potent mesenchymal stem cells (MSCs) derived from adipose tissue in terms of proliferation and cell death. Methods: MSCs were submitted to PBM applications with combinations of the following physical parameters: control group (no intervention), wavelengths of 660 and 830â€‰nm; energy of 0.5, 2, and 4â€‰J; and power of 40 and 100â€‰mW. MSC analysis was performed using MetaXpress(Â®) software at 24, 48, and 72â€‰h. Results: Irradiation promoted a significant increase in cell proliferation (pâ€‰<â€‰0.05), with 830â€‰nm laser, 100â€‰mW, with energy of 0.5, 2, and 4â€‰J in relation to the control group at all times. PBM with 660â€‰nm, power of 40â€‰mW, and energy of 0.5, 2, and 4â€‰J produced greater cell death at 24â€‰h compared with the control group. At the time of 72â€‰h, there was no significant difference concerning cell death. Conclusions: According to the results found, we can conclude that both wavelengths were effective; however, the 830â€‰nm laser was more effective in terms of cell proliferation compared with the 660â€‰nm laser. The 660â€‰nm wavelength showed a significant increase in cell death when compared with the 830â€‰nm laser. Low-Level Light Therapy;Cells, Cultured;Mesenchymal Stem Cells;Lasers;Adipose Tissue

Is it possible to anchor a tooth with photobiomodulation? During orthodontic treatment, we can achieve differential movements by using photobiomodulation (PBM) as an adjuvant before applying force. We can expect a greater bone density that initially resists movement while applying PBM to the other teeth to achieve an accelerating effect. The proposed protocol is to use an 810 nm laser at 0.1W power, applying between 4 and 6J per tooth for 22 s on the vestibular and lingual root surfaces, following the axial axis of the tooth. The energy density depends on the tip selected in the instrument. Normal bone remodeling cannot be avoided by applying high doses of PBM. PBM should be applied before orthodontic force to reduce tooth movement. In addition, PBM can be used during force application to teeth that require acceleration to achieve differential movement in orthodontic treatments. The protocol is the same in both scenarios.

An evaluation of root resorption associated with the use of photobiomodulation during orthodontic treatment with clear aligners: a retrospective cohort pilot study. OBJECTIVES: To evaluate the change in tooth root volume using cone-beam computed tomography (CBCT) in a group of patients treated concurrently with clear aligners and an adjunctive photobiomodulation (PBM) device. MATERIALS AND METHODS: This retrospective cohort pilot study included the records of 32 consecutively treated clear aligner patients (23 female, 9 male) from the private practice of one orthodontist. The PBM group (n = 16) used the device once per day for 5 minutes per arch and was compared with a matched control group (n = 16). A semiautomated segmentation technique was used to obtain tooth volume of anterior teeth from CBCT imaging prior to (T0) and during or immediately following (T1) orthodontic treatment with clear aligners. The change in root volume between time points was assessed. RESULTS: There was no statistically significant difference between the pre- and posttreatment root volumes of maxillary and mandibular anterior teeth, regardless of which intervention group the patient belonged to (P > .05). There was also no difference in the mean percentage change in root volume between clear aligner patients in this study who were treated with the PBM device compared with a matched control group (P > .05). CONCLUSIONS: Clear aligner patients in this study who changed their aligners every 3 to 5 days and used adjunctive photobiomodulation therapy did not experience clinically relevant orthodontically induced external root resorption. Due to the small sample size and measurement error in the root segmentation process, the results should be interpreted with caution. Humans;Male;Female;Root Resorption;Pilot Projects;Retrospective Studies;Low-Level Light Therapy;Tooth Movement Techniques;Cone-Beam Computed Tomography;Orthodontic Appliances, Removable

Efficacy of 660â€‰nm Photobiomodulation in Burning Mouth Syndrome Management: A Single-Blind Quasi-Experimental Controlled Clinical Trial. Background: Burning mouth syndrome (BMS) is

characterized by a burning sensation of the oral mucosa without any evidence of clinical signs or underlining condition. Several treatment modalities have been utilized with various results and levels of evidence. Lately, photobiomodulation (PBM) has emerged as a noninvasive effective therapy due to its anti-inflammatory and biostimulatory effects, especially the low-power laser setting of red wavelength. Objective: This single-blind quasi-experimental controlled clinical trial aimed to evaluate the PBM effectiveness at a low level of red laser light in patients with BMS compared with sham control. Materials and methods: Thirty patients diagnosed with BMS were consecutively assigned to intervention (PBM therapy) and control (sham) groups. The protocol for PBM dosimetry was as follows: laser 660â€‰nm; spot size: 0.04â€‰cm(2); power output: 100â€‰mW; emission mode: continuous wave; power density: 6â€‰J/cm(2); irradiation time: 10â€‰sec per point within 1â€‰cm(2) surface area of the symptomatic area. The treatment protocol was based on once a week for a total of 10 sessions. Results: Our results showed no statistically significant difference in reduction of pain intensity between the two groups at all the evaluated timepoints during the course of treatment. However, in both groups, we observed a statistically significant reduction of maximum pain intensity of 50% compared with patient-self reporting before the treatment. Conclusions: Further randomized clinical trials to validate our positive results with a large sample size with a long-term follow-up and understanding further the sham placebo effect are warranted. Anti-Inflammatory Agents Humans;Burning Mouth Syndrome;Low-Level Light Therapy;Single-Blind Method;Anti-Inflammatory Agents;Clinical Protocols

Effect of Low-level Light Therapy on Post-operative Healing of Secondary Chronic Osteomyelitis of the Jaws - A Prospective Study. INTRODUCTION: Osteomyelitis of the jaws is a common disease of the maxillofacial region. The goal of treatment is to alleviate pain, reduce infection, inhibit the progression of the disease and induce bone and mucosal healing. In addition to surgical management and antibiotic and oxygen hyperbaric therapy, new therapeutic strategies for the treatment of osteomyelitis are developed. One of the novel approaches is photobiomodulation therapy or low-level light therapy (LLLT). MATERIALS AND METHODS: After surgical treatment, experimental group patients (n = 4) were treated with LLLT for five sessions with an extraoral pulsed 635-nm LED lamp (Repuls7, Repuls Lichtmedizintechnik GmbH, Austria), maximum output power: 140 mW/cm(2), frequency: 2.5 Hz, duty cycle: 50%. Clinical achievement and patient pain perception (through Visual Analogue Scale score) were evaluated at 1-, 3- and 6-month follow-up appointments and compared with control group (n = 4) patients, treated with standard therapy. RESULTS: At three and six months, clinical achievement was better in patients treated with LLLT. Pain and discomfort resolution was significantly greater in the experimental group. DISCUSSION: Taking into consideration the results of this study, it can be concluded that LLLT shows potential for improving clinical outcome of surgical and medical treatment of secondary chronic osteomyelitis of the jaws. Furthermore, pain and discomfort were significantly reduced in patients treated with LLLT. Further research with a larger sample size is needed to obtain a more accurate insight into this promising field.

Scientific validation of clinical visual scales and Antera 3Dâ„¢ consistency with derived measurements in the assessment of infantile haemangioma after laser therapy. BACKGROUND: Laser therapy is a treatment for infantile haemangiomas. The efficacy of laser therapy for red lesions is determined by visual evaluation; however, this assessment is inaccurate and lacks objectivity. OBJECTIVE: To scientifically validate the consistency between pre- and post-treatment visual assessment grades for infantile haemangioma treated with pulsed dye laser (PDL) and the values calculated from images obtained with Antera 3Dâ„¢. METHODS: This study involved 81 cases of infantile haemangiomas treated with PDL alone from 2012 to 2015 and with Antera 3Dâ„¢ images of the lesions. Using images obtained before treatment and 4-6 weeks after the last treatment, the lesions were rated using a visual four-step scale. Ratings were categorised as Poor/Fair/Good/Excellent by the degree of

improvement in the red colour tone. The red colour ratio was calculated using the haemoglobin distribution in the lesion and surrounding skin, and the improvement difference and improvement rate were then obtained. The correlation between the improvement difference and improvement rate, and visual evaluation was statistically analysed. RESULTS: No serious adverse effects were observed, with an average of 4.3 treatments per patient; 60.1% of the patients achieved Good/Excellent results. There were statistically significant differences in the post-treatment red colour ratio and improvement ratio in each category after visual evaluation classification. The improvement rate and the four visual grades were statistically correlated. CONCLUSION: This study confirmed the scientific validity of visual evaluation and the evaluation criteria calculated from Antera 3Dâ„¢. This method could objectively determine treatment effectiveness.
Humans;Skin;Treatment Outcome;Low-Level Light Therapy;Skin Neoplasms;Erythema;Hemangioma

Lack of minority enrollment in lasers for tattoo removal clinical trials: a cross-sectional analysis and call to action. Humans;Cross-Sectional Studies;Laser Therapy;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Tattoo Removal;Tattooing;Clinical Trials as Topic

Different Effects of Phototherapy for Rat Glioma during Sleep and Wakefulness. There is an association between sleep quality and glioma-specific outcomes, including survival. The critical role of sleep in survival among subjects with glioma may be due to sleep-induced activation of brain drainage (BD), that is dramatically suppressed in subjects with glioma. Emerging evidence demonstrates that photobiomodulation (PBM) is an effective technology for both the stimulation of BD and as an add-on therapy for glioma. Emerging evidence suggests that PBM during sleep stimulates BD more strongly than when awake. In this study on male Wistar rats, we clearly demonstrate that the PBM course during sleep vs. when awake more effectively suppresses glioma growth and increases survival compared with the control. The study of the mechanisms of this phenomenon revealed stronger effects of the PBM course in sleeping vs. awake rats on the stimulation of BD and an immune response against glioma, including an increase in the number of CD8+ in glioma cells, activation of apoptosis, and blockage of the proliferation of glioma cells. Our new technology for sleep-phototherapy opens a new strategy to improve the quality of medical care for patients with brain cancer, using promising smart-sleep and non-invasive approaches of glioma treatment.

Photobiomodulation alleviates Burning Mouth Syndrome pain: Immediate and weekly outcomes explored. Burning Mouth Syndrome (BMS) is an intraoral chronic burning or dysesthetic sensation, without clinically evident causative lesions on clinical examination and investigation. AIM: To assess immediate and weekly effects of photobiomodulation (PBM) on BMS patients. METHODS: Thirty BMS patients were treated intra-orally with photobiomodulation 940(Â±10) nm (InGaAsP) 3â€‰W, semi-conductor diode, weekly, for up to 10â€‰weeks. Pain intensity, measured using the Visual Analogue Scale (VAS), and characteristics were recorded immidiately after each treatment, along with a weekly average VAS. RESULTS: Immediate mean VAS score decreased from a starting score of 7.80â€‰Â±â€‰1.83 to 2.07â€‰Â±â€‰2.55 (pâ€‰<â€‰0.001). The mean weekly VAS score for the week after the final treatment session was higher (5.73â€‰Â±â€‰2.80, pâ€‰<â€‰0.001) than the immediate response, but still significantly lower than the starting score (pâ€‰=â€‰0.017). We observed a trend of pain improvement with more treatments, but this was only statistically significant up to the third treatment. Male gender and unilateral pain correlated with better PBM efficacy (pâ€‰=â€‰0.017, 0.022, respectively). CONCLUSION: PBM provides significant immediate pain relief for BMS patients after each treatment; however, the efficacy decreases notably over the following week. A trend of increasing pain relief across treatments was observed, statistically significant up to the third treatment.

Efficacy of adjunctive modalities during tooth extraction for the prevention of osteoradionecrosis: A systematic review and meta-analysis. BACKGROUND: Jaw osteoradionecrosis (ORN) is a complication in patients with previous head and neck radiotherapy. Its incidence increases with dental extractions. Hence, this review aimed to evaluate the efficacy of adjunctive treatment modalities undertaken at the time of extraction in previous head and neck radiotherapy patients in preventing ORN. METHODS: A systematic review was conducted, where studies with data on ORN incidence after extraction with or without adjunctive interventions were included. Meta-analyses were conducted to estimate the pooled prevalence of ORN per intervention and the pooled odds ratio for incidence of ORN between interventions. RESULTS: In total, 1520 patients in 29 studies were included. Interventions identified were hyperbaric oxygen (HBO), pentoxifylline-tocopherol (PENTO), antibiotics (ABX), platelet-rich fibrin and photobiomodulation. The pooled prevalence of ORN for HBO (4.6%), PENTO (3.4%) and ABX (3.8%) was significantly lower than the Control (17.6%). For studies with direct comparisons between groups, HBO had lower but not significant odds of developing ORN than the Control (OR 0.27) and ABX (OR 0.57). CONCLUSIONS: HBO, PENTO and ABX may reduce the incidence of ORN compared to no intervention. Given that all three have similar incidences of ORN, ABX may be the most cost-effective and accessible adjunctive modality.

Treatment of painful temporomandibular joint disc displacement without reduction: network meta-analysis of randomized clinical trials. There is currently no consensus on the best treatment for painful temporomandibular disc displacement without reduction (DDwoR), and no network meta-analysis (NMA) of randomized clinical trials (RCTs) comparing all types of treatments for this condition has been conducted. The objective of this study was to compare and rank all treatments for DDwoR, including conservative treatments, occlusal splints, low-level laser therapy (LLLT), arthrocentesis (Arthro) alone, Arthro plus intra-articular injection (IAI) of platelet-rich plasma (PRP), Arthro plus IAI of hyaluronic acid (HA), Arthro with exercises, Arthro plus occlusal splints, and manipulative therapy. Outcome variables were pain intensity on a visual analogue scale (VAS) and maximum mouth opening (MMO, mm). The mean difference with 95% confidence interval was estimated using Stata software. The GRADE system was used to assess the certainty of the evidence. A total of 742 patients from 16 RCTs were included in the NMA. Both direct meta-analysis and NMA showed that Arthro with IAI of co-adjuvants provided better pain reduction in the short term (â‰¤3 months) than Arthro alone. However, the quality of the evidence was very low. In the intermediate term, Arthro alone or combined with co-adjuvants provided better pain reduction than conservative treatment, but with low-quality evidence. Conservative treatment significantly increased MMO in the short term compared to other treatments. In conclusion, the results of this NMA suggest that arthrocentesis with intra-articular injection of adjuvant medications may be superior to conservative treatments in reducing pain intensity at long-term follow-up, while no significant differences were found for the MMO outcome. However, the quality of evidence was generally low to very low, and further RCTs are needed to confirm these findings.

The Effects In Vitro of Photobiomodulation Over Fibroblasts and Extracellular Matrix. Objective: The objective of this study is to evaluate the potential effects of photobiomodulation (PBM) on cell proliferation and extracellular matrix production of human fibroblasts (FN1) cultured in 2D. Background: Patients with healing difficulties suffer injuries that take time to recover. In addition, aging can be seen in our faces daily when we look in the mirror; in both situations, collagen production is reduced. Fibroblasts act in the beginning and at the end of the inflammation phase, signaling to immune agents, and platelets, and producing collagen, coordinating repair. PBM increases cell viability, proliferation, and mRNA production. Methods: Human fibroblasts were irradiated three times after cell seed (after 24, 48, and 72â€‰h) using a gallium-aluminum arsenideGaAlAs low-level laser (LLL). Cell viability, proliferative response, synthesis of collagen types I

and III, and soluble collagen production were analyzed. The statistical significance of differences between groups was determined using unpaired one-way analysis of variance (ANOVA) pâ€‰<â€‰0.05. Results: PBM increased significantly the number of fibroblasts, and the production of collagen types I (Col I) and III (Col III), after three sessions of LLL with 2.5â€‰J per session, every 24â€‰h, for 3 consecutive days; total energy delivered after 72â€‰h is 7.5â€‰J. Conclusions: This energy density of LLL increases fibroblast proliferation and collagen production in vitro without side effects. Collagen Humans;Low-Level Light Therapy;Collagen;Extracellular Matrix;Cell Proliferation;Fibroblasts

Efficacy of photobiomodulation in the management of oral Lichen Planus in comparison to topical corticosteroids: Systematic review, meta-analysis, and GRADE-based assessment of certainty of evidence. BACKGROUND: There is an urgent need to update the evidence available on the efficacy of photobiomodulation (PBM) in comparison to topical corticosteroids in the management of Oral Lichen Planus (OLP). METHODS: Cochrane Oral Health's Trials Register, Cochrane Central Register of Controlled Trials in the Cochrane Library, MEDLINE Pubmed, SCOPUS, Lilacs and Google Scholar were searched. Other sources included US National Institutes of Health Ongoing Trials Register, World Health Organization International Clinical Trials Registry Platform and Clinical Trial Registry - India were searched using variations of the keywords "Laser" and "Oral Lichen Planus". Randomized controlled trials comparing PBM and topical corticosteroids in the resolution of pain among OLP patients were included. The studies were assessed using the Cochrane Risk-of-Bias assessment tool. Publication bias was assessed using a funnel plot, and the certainty of evidence was evaluated according to the GRADE guidelines. RESULTS: Ten studies were included for qualitative assessment and of these eight were included in the meta-analysis. The included studies used laser parameters of varying strengths and duration. Meta-analysis favoured PBM (n = 274, MD =-0.48, CI -0.66- -0.30) for pain score. No adverse effects were reported for laser therapy. There was high heterogeneity and moderate certainty of evidence, and most studies had a high risk of bias. CONCLUSION: There is improvement in the clinical parameters of OLP when treated with PBM in comparison to topical corticosteroids. However, the strength of the evidence for these findings in limited. It is recommended to conduct better long-term trials with large sample size.

Transcranial photobiomodulation increases intrinsic brain activity within irradiated areas in early Alzheimer's disease: Potential link with cerebral metabolism. Alzheimer Disease;Humans;Brain;Low-Level Light Therapy;Aged;Male;Female

Biphasic photobiomodulation of inflammation in mouse models of common wounds, infected wounds, and diabetic wounds. Bidirectional photobiomodulation (PBM) therapy is an active research area. However, most studies have focused on its dependence on optical parameters rather than on its tissue-dependent effects. We constructed mouse models of wounds in three inflammatory states (normal, low, and high levels of inflammations) to assess the bidirectional regulatory effect of PBM on inflammation. Mice were divided into three groups to prepare common wounds, diabetic wounds, and bacteria-infected wounds. The same PBM protocol was used to regularly irradiate the wounds over a 14 d period. PBM promoted healing of all three kinds of wounds, but the inflammatory manifestations in each were significantly different. In common wounds, PBM slightly increased the aggregation of inflammatory cells and expression of IL-6 but had no effect on the inflammatory score. For wounds in a high level of inflammation caused by infection, PBM significantly increased TNF-Î± expression in the first 3 d of treatment but quickly eliminated inflammation after the acute phase. For the diabetic wounds in a low level of inflammation, PBM intervention significantly increased inflammation scores and prevented neutrophils from falling below baseline levels at the end of the 14 d observation period. Under fixed optical conditions, PBM has a bidirectional (pro- or anti-inflammatory) effect on inflammation, depending on the immune state of the target organism and

the presence of inflammatory stimulants. Our results provide a basis for the formulation of clinical guidelines for PBM application. Mice;Animals;Low-Level Light Therapy;Disease Models, Animal;Wound Healing;Inflammation;Wound Infection;Diabetes Mellitus

Photobiomodulation Literature Watch June 2023. Low-Level Light Therapy

The effect of physical interventions on pain control after orthodontic treatment: A systematic review and network meta-analysis. OBJECTIVE: Pain is a frequent adverse reaction during orthodontic treatment, which can significantly reduce treatment compliance and compromise the expected treatment effect. Physical interventions have been used to alleviate pain after orthodontic treatment, but their effectiveness is controversial. This study used a network meta-analysis to assess the efficacy of various physical interventions typically used in managing pain after orthodontic treatment, with a view to provide evidence-based recommendations for representative interventions for orthodontic pain relief during peak pain intensity. METHODS: A systematic search of six electronic databases, from their respective inception dates, was conducted to identify relevant literature on the efficacy of various typical physical interventions for managing pain after orthodontic treatment. Literature screening was performed according to the Cochrane System Evaluator's Manual. Stata 16.0 was used to assess heterogeneity, inconsistency, publication bias, and sensitivity to generate an evidence network diagram and conduct a network meta-analysis. RESULTS: In total, 771 articles were reviewed to collect literature on interventions, including low-level laser therapy (LLLT), vibration, acupuncture, and chewing. Of these, 28 studies using a visual analog scale (VAS) as an outcome indicator were included. The results showed that LLLT, vibration, acupuncture, and chewing effectively relieved the pain symptoms in patients after orthodontic treatment. At 24 h post-treatment, LLLT (surface under the cumulative ranking curve [SUCRA] = 80.8) and vibration (SUCRA = 71.1) were the most effective interventions. After 48 h of treatment, acupuncture (SUCRA = 89.6) showed a definite advantage as the best intervention. CONCLUSION: LLLT, vibration, acupuncture, and chewing can alleviate pain associated with orthodontic treatment. Among these interventions, acupuncture was found to be the most effective at 48 h after orthodontic treatment. In addition, acupuncture demonstrated long-lasting and stable pain-relieving effects. However, further studies are needed to determine the most suitable equipment-specific parameters for acupuncture in relieving pain associated with orthodontic treatment. Humans;Pain Management;Network Meta-Analysis;Acupuncture Therapy;Pain Measurement;Pain

Dosimetry in cranial photobiomodulation therapy: effect of cranial thickness and bone density. This research aims to examine the influence of human skull bone thickness and density on light penetration in PBM therapy across different wavelengths, focusing on how these bone characteristics affect the absorption of therapeutic light. Analyses explored the effect of skull bone density and thickness on light penetration in PBM, specifically using Low-Level Laser Therapy (LLLT) for efficacy prediction. Measurements of bone thickness and density were taken using precise tools. This approach emphasizes LLLT's significance in enhancing PBM outcomes by assessing how bone characteristics influence light penetration. The study revealed no significant correlation between skull bone density and thickness and light penetration capability in photobiomodulation (PBM) therapy, challenging initial expectations. Wavelengths of 405Â nm and 665Â nm showed stronger correlations with bone density, suggesting a significant yet weak impact. Conversely, wavelengths of 532Â nm, 785Â nm, 810Â nm, 830Â nm, 980Â nm, and 1064Â nm showed low correlations, indicating minimal impact from bone density variations. However, data variability (R(2)â€‰<â€‰0.4) suggests that neither density nor thickness robustly predicts light power traversing the bone, indicating penetration capability might be more influenced by bone thickness at certain wavelengths. The study finds that the effectiveness of photobiomodulation (PBM) therapy with bone isn't just based on bone density and thickness but involves a complex interplay of factors. These include the bone's chemical and

mineral composition, light's wavelength and energy dose, treatment duration and frequency, and the precise location where light is applied on the skull. Humans;Low-Level Light Therapy;Bone Density;Skull;Head;Radiometry

A study of the biological effects of low-level light. Low-level light therapy (LLLT), also known as photo biomodulation (PBM), is a type of optical therapy that uses red or near-infrared lasers or light-emitting diodes (LEDs) for medical treatment. The laser wavelengths involved in PBM typically range between 600-700Â nm and 780-1100Â nm, with power densities ranging between 5 mW/cm(2) and 5 W/cm(2). PBM is a series of biochemical cascades exhibited by biological tissues after absorbing a certain amount of energy from light. PBM has been widely used in clinical practice in the past 20Â years, and numerous clinical trials have demonstrated its biological efficacy. However, the underlying mechanisms have not yet been fully explored. In this paper, we have summarized the research into PBM over the past two decades, to identify the important mechanisms of the biological effects of PBM from the perspective of molecular mechanisms, cellular levels, and tissue changes. We hope our study provide a theoretical basis for future investigations into the underlying mechanisms. Lasers;Light;Low-Level Light Therapy

Effect of photobiomodulation therapy on the morphology, intracellular calcium concentration, free radical generation, apoptosis and necrosis of human mesenchymal stem cells-an in vitro study. The aim of the study was to investigate the impact of multiwave locked system (MLS M1) emitting synchronized laser radiation at 2 wavelength simultaneous (Î»â€‰=â€‰808Â nm, Î»â€‰=â€‰905Â nm) on the mesenchymal stem cells (MSCs). Human MSCs were exposed to MLS M1 system laser radiation with the power density 195-318 mW/cm(2) and doses of energy 3-20Â J, in continuous wave emission (CW) or pulsed emission (PE). After irradiation exposure in doses of energy 3Â J, 10Â J (CW, Æ'â€‰=â€‰1000Â Hz), and 20Â J (Æ'â€‰=â€‰2000Â Hz), increased proliferation of MSCs was observed. Significant reduction of Fluo-4 Directâ„¢ Ca(2+) indicator fluorescence over controls after CW and PE with 3Â J, 10Â J, and 20Â J was noticed. A decrease in fluorescence intensity after the application of radiation with a frequency of 2000Â Hz in doses of 3Â J, 10Â J, and 20Â J was observed. In contrary, an increase in DCF fluorescence intensity after irradiation with laser radiation of 3Â J, 10Â J, and 20Â J (CW, Æ'â€‰=â€‰1000Â Hz and Æ'â€‰=â€‰2000Â Hz) was also shown. Laser irradiation at a dose of 20Â J, emitted at 1000Â Hz and 2000Â Hz, and 3Â J emitted at a frequency of 2000Â Hz caused a statistically significant loss of MSC viability. The applied photobiomodulation therapy induced a strong pro-apoptotic effect dependent on the laser irradiation exposure time, while the application of a sufficiently high-energy dose and frequency with a sufficiently long exposure time significantly increased intracellular calcium ion concentration and free radical production by MSCs. Calcium;Free Radicals Humans;Low-Level Light Therapy;Calcium;Free Radicals;Apoptosis;Necrosis;Mesenchymal Stem Cells

Repercussion of inflammatory bowel disease on lung homeostasis: The role of photobiomodulation. Inflammatory bowel diseases (IBD) are chronic and multifactorial diseases characterized by dysfunction of the intestinal mucosa and impaired immune response. Data show an important relationship between intestine and respiratory tract. The treatments of IBD are limited. Photobiomodulation (PBM) is an effective anti-inflammatory therapy. Our objective was to evaluate the repercussion of IBD as well as its treatment with PBM on pulmonary homeostasis. Male Wistar rats were submitted to IBD induction by acetic acid and treated or not with PBM. Rats were irradiated with red LED on both right and left sides of the ventral surface and beside the external anal region during 3 consecutive days (wavelenght 660Â nm, power 100 mw, total energy 15Â J and time of irradiation 150Â s per point). Our results showed that IBD altered pulmonary homeostasis, since we observed an increase in the histopathological score, in myeloperoxidase activity (MPO), in mast cell degranulation, and in the release and gene expression of cytokines. We also showed that PBM

treatment reduced biomarkers of IBD and reverted all augmented parameters in the lung, restoring its homeostasis. Thus, we confirm experimentally the important gut-lung axis and the role of PBM as a promising therapy. Antioxidants Rats;Male;Animals;Rats, Wistar;Low-Level Light Therapy;Inflammatory Bowel Diseases;Antioxidants;Lung

Infrared diode laser enhances human periodontal ligament stem cells behaviour on titanium dental implants. Low level laser treatment (LLLT) is known for its photobiostimulatory and photobiomodulatory characteristics, which stimulate cell proliferation, increase cellular metabolism, and improve cellular regeneration. The objective of the present research was to assess the possible influence of infrared diode laser irradiation on the behaviour, attachment, and osteogenic differentiation of human periodontal ligament stem cells (hPDLSCs) seeded on different types of dental implants. Two distinct types of implants, one subjected to laser surface treatment and the other treated with acid etching, were longitudinally divided into two halves and submerged in six wells culture plates. Both implants were subjected to infrared diode laser treatment, and subsequently, the morphology and attachment of cells were examined using scanning electron microscopy (SEM) after 14 and 21Â days. The behaviour of (hPDLSCs) towards two types of implants, when exposed to osteogenic medium and low-level laser therapy (LLLT), was assessed using quantitative real-time polymerase chain reaction to measure the expression of stemness markers and osteogenic markers. The scanning electron microscopy (SEM) demonstrated that the application of infrared diode laser irradiation substantially improved the attachment of cells to both types of implants. The stemness gene markers were significantly down regulated in cells seeded on both surfaces when challenged with osteogenic media in relation to control. At 14 days, early osteogenic markers, were upregulated, while late osteogenic markers, were downregulated in both challenged groups. At the 21-day mark, hPDLSCs seeded on an acid-etched implant exhibited increased expression of all osteogenic markers in response to stimulation with osteogenic media and infra-red diode laser, in contrast to hPDLSCs seeded on a laser surface treated implant under the same conditions. Finally, the findings of our research revealed that when subjected to infrared diode laser, human periodontal ligament stem cells cultured on both types of implants demonstrated improved cellular attachment and differentiation. This suggested that infrared diode laser enhanced the activity of the cells surrounding the implants. Hence, the use of infrared diode laser could be pivotal in improving and expediting the clinical osseointegration process around dental implants. Titanium;Dental Implants Humans;Osteogenesis;Titanium;Dental Implants;Lasers, Semiconductor;Periodontal Ligament;Stem Cells;Cell Differentiation;Cell Proliferation;Cells, Cultured

Efficacy of Repeated Low-Level Red Light (RLRL) therapy on myopia outcomes in children: a systematic review and meta-analysis. BACKGROUND: Myopia is the most prevalent form of refractive error that has a major negative impact on visual function and causes blurring of vision. We aimed to determine if Repeated Low-Level Red Light (RLRL) treatment is beneficial in treating childhood myopia in terms of axial length (AL), spherical equivalent refraction (SER), and sub foveal choroidal thickness (SFCT). METHODS: This systematic review was performed on RLRL for treatment of myopia in children compared to single vision spectacles (SVS). We employed the search strategy with key terms myopia and low-level light therapy then we searched PubMed, Scopus, Cochrane, and Web of Science databases. The mean differences (MD) were used to evaluate the treatment effects. Heterogeneity was quantified using I(2) statistics and explored by sensitivity analysis. RESULTS: Five randomized controlled trials (RCTs) were included in our meta-analysis with a total of 833 patients, 407 in treatment group and 426 in control group. At a 3Â month follow up period, pooled studies show a statistical difference in AL between RLRL and SVS group (MDâ€‰=â€‰-0.16; 95% CI [-0.19, -0.12], SER (MDâ€‰=â€‰0.33; 95% CI [0.27, 0.38]), and SFCT (MDâ€‰=â€‰43.65; 95% CI [23.72, 45.58]). At a 6Â month follow up period, pooled studies show a statistical difference in AL between

RLRL and SVS group (MDâ€‰=â€‰-0.21; 95% CI [-0.28, -0.15]), SER (MDâ€‰=â€‰0.46; 95% CI [0.26, 0.65]), and SFCT (MDâ€‰=â€‰25.07; 95% CI [18.18, 31.95]). At a 12Â month follow up period, pooled studies show a statistical difference in AL between RLRL and SVS group (MDâ€‰=â€‰-0.31; 95% CI [-0.42, -0.19]) and SER (MDâ€‰=â€‰0.63; 95% CI [0.52, 0.73]). CONCLUSION: This is the first systematic review and meta-analysis investigating onlyÂ RCTs evidence supporting the efficacy of 650 nm RLRL for myopia control in the short term of 3, 6, and 12 months follow up. The present review revealed the clinical significance of RLRL as a new alternative treatment for myopia control with good user acceptability and no documented functional or structural damage. However, the effect of long-term RLRL treatment and the rebound effect after cessation require further investigations. Child;Humans;Red Light;Myopia;Refractive Errors;Refraction, Ocular

Light stimulation of mitochondria reduces blood glucose levels. Mitochondria regulate metabolism, but solar light influences its rate. Photobiomodulation (PBM) with red light (670â€‰nm) increases mitochondrial membrane potentials and adenosine triphosphate production and may increase glucose demand. Here we show, with a glucose tolerance test, that PBM of normal subjects significantly reduces blood sugar levels. A 15â€‰min exposure to 670â€‰nm light reduced the degree of blood glucose elevation following glucose intake by 27.7%, integrated over 2â€‰h after the glucose challenge. Maximum glucose spiking was reduced by 7.5%. Consequently, PBM with 670â€‰nm light can be used to reduce blood glucose spikes following meals. This intervention may reduce damaging fluctuations of blood glucose on the body.

Utilization of Photobiomodulation for the Prevention and Treatment of Oral Mucositis. Background: Oral mucositis is a significant and common toxicity experienced by patients who receive high-dose chemotherapy as a preparatory regimen for a hematopoietic cell transplant (HCT). Photobiomodulation (PBM) has been found to be feasible with significant efficacy in preventing the progression of oral mucositis in adult patients undergoing HCT. The purpose of this study was to determine the feasibility and efficacy of PBM in pediatric oncology patients undergoing HCT. Method: Forty children and adolescents admitted to the transplant unit for an allogeneic HCT for acute lymphoblastic leukemia or acute myeloid leukemia were treated daily at six sites until dayâ€‰+â€‰20 or engraftment. Results: There were 1,035 patient encounters, with successful treatment of four or more sites during 979 patient encounters for a feasibility 93.3% CI [0.926, 0.039]. We had estimated a meaningful effect size of 20% for PBM and estimated 51% of patients treated with PBM would have at least one day or more of Grade 3 mucositis. The rate of patients who received PBM and developed Grade 3 mucositis was 20% CI [0.091, 0.356]. Patients treated with PBM had fewer days of hospitalization (pâ€‰=â€‰.009) and less severe mucositis in comparison to the matched control group (pâ€‰=â€‰.03). Conclusion: PBM is feasible and effective in preventing and treating oral mucositis and is now supported by the Children's Oncology Group for prevention and treatment of oral mucositis in patients undergoing an allogeneic HCT or receiving head/neck radiation. Adult;Child;Adolescent;Humans;Mucositis;Hematopoietic Stem Cell Transplantation;Low-Level Light Therapy;Stomatitis;Hospitalization

Efficacy of photobiomodulation therapy in recurrent herpes labialis management: a randomized controlled trial. OBJECTIVES: This study is aimed at assessing the therapeutic efficacy of photobiomodulation therapy (PBMT) for the management of recurrent herpes labialis (RHL) by evaluating both pain and clinical recovery. MATERIAL AND METHODS: A randomized, double-blind, controlled trial was conducted on 40 patients with RHL, and they were randomly divided into two groups, where 20 patients received treatment with PBMT (650 nm, 100 mW, 4.7 J/cm(2)), continuous mode, for 120 s, and placebo cream, while another 20 patients (control group) were treated with acyclovir cream 5% (5 times/5 days) and passive laser. Pain was assessed at five different times. The day when the complete disappearance of the pain was observed and the day when the crust fell off

spontaneously were also recorded. RESULTS: The pain level in the control group was significantly higher than that in the PBMT group after the second application of the laser, while the differences were not significant between the two groups at other times. The pain in the PBMT group disappeared faster than that in the control group, but the difference was not significant in terms of clinical recovery. CONCLUSIONS: Photobiomodulation therapy of herpes labialis reduced pain significantly faster than acyclovir, but there was no difference in healing time between the groups in light of the parameters used in this study. CLINICAL RELEVANCE: PBMT is a promising treatment that may be an effective alternative to acyclovir in the management of recurrent herpes labialis. TRIAL REGISTRATION ISRCTN: com ID: ISRCTN87606522. Acyclovir Humans;Herpes Labialis;Low-Level Light Therapy;Acyclovir;Pain;Wound Healing

Laser acupuncture to reduce temporomandibular disorder (TMD) symptoms: systematic review and meta-analysis. The application of low-level laser therapy (LLLT) to acupuncture points may produce effects similar to that of needle stimulation in patients with temporomandibular disorders (TMD). This systematic review was conducted according to the Cochrane Collaboration guidelines and aimed to address clinical questions using the following strategy: Patient/Problem, Intervention, Comparison, and Outcome (PICO). A comprehensive literature search was performed upto April 26, 2023, across nine electronic databases (BVS, PubMed, Scopus, Embase, Web of Science, ScienceDirect, Cochrane Library, Latin American and Caribbean Health Sciences Literature (LILACS), and Google Scholar) supplemented with gray literature. The risk of bias in randomized and nonrandomized clinical trials was assessed using two tools: risk-of-bias (RoB) 2 and Risk Of Bias In Non-randomised Studies-of Interventions (ROBINS-I). Meta-analysis involved the extraction of mean and standard deviation values for spontaneous pain and mouth opening levels. Seven studies were included in this review, all of which used LLLT. The applied wavelengths ranged from 690 to 810Â nm without significant variations in light emission patterns. LLLT demonstrated a significant reduction in instantaneous pain levels (standard mean difference [SMD]â€‰=â€‰3.85; 95% confidence interval [CI]â€‰=â€‰2.09, 5.62; pâ€‰<â€‰0.003) and an improvement in instantaneous mouth opening ability (mean difference [SMD]â€‰=â€‰-7.15; 95% CIâ€‰=â€‰-11.73, -2.58; pâ€‰<â€‰0.002), with low certainty of evidence. LLLT may alleviate symptoms in patients with TMD; however, caution should be exercised when interpreting the results because of protocol variations among studies and the limited number of studies included in the meta-analysis. Humans;Acupuncture Therapy;Laser Therapy;Pain;Temporomandibular Joint Disorders;Lasers

A novel investigational preclinical model to assess fluence rate for dental oral craniofacial tissues. OBJECTIVE: Photodynamic Therapy (PDT) and Photobiomodulation (PBM) are recognized for their potential in treating head and neck conditions. The heterogeneity of human tissue optical properties presents a challenge for effective dosimetry. The porcine mandible cadaver serves as an excellent model and has several similarities to human tissues of the dental oral craniofacial complex. This study aims to validate a novel modeling system that will help refine PDT and PBM dosimetry for the head and neck region. METHODS AND MATERIALS: Light transmission was analyzed through several tissue combinations at distances of 2 mm to 10 mm. Maximum light fluence rates (mW/cm(2)) were compared across tissue types to reveal the effects of tissue heterogeneity. RESULTS: The study revealed that light fluence is affected by tissue composition, with dentin/enamel showing reduced transmission and soft tissue regions exhibiting elevated values. The porcine model has proven to be efficient in mimicking human tissue responses to light, enabling the potential to optimize future protocols. CONCLUSION: The porcine mandible cadaver is a novel model to understand the complex interactions between light and tissue. This study provides a foundation for future investigations into dosimetry optimization for PDT and PBM.

Non-lethal exposure to short-wavelength light-emitting diodes modulates tight-junction structure in human corneal epithelial cells via cAMP-dependent signaling. Light-emitting diodes (LED)-derived lights have been widely used as a medical treatment in photobiomodulation (PBM). However, the PBM effects in ophthalmology are less well investigated. Herein, we explored the effect of LED-generated light on the tight-junction (TJ) formation in human corneal epithelial cells (HCEs). The HCEs were separately exposed to monochromatic LEDs at wavelengths of 365Â nm (UVA), 420Â nm (violet), 470Â nm (blue), 530Â nm (green), 590Â nm (amber), 660Â nm (deep red), and 740Â nm (far red) at 10Â J/cm(2)/day for 1 and 2Â days. Long-term cultivation of HCEs without LED exposure for up to 14Â days was established as a control. The effects of both LED wavelength and culture duration on cell morphology, cAMP-regulated proteins, TJ-associated proteins, and cell growth-associated proteins were also analyzed. Together with the increase in cell number during prolonged cultivation, cAMP, ZO-1, ZO-2, CLDN1, and CLDN4 all increased significantly during long-term cultivation without LED exposure. There was no difference in HCE viability after exposure to all monochromatic LEDs at an accumulated dose of 20Â J/cm(2). As determined by immunoblotting, UVA, violet, and blue light increased intracellular cAMP, ZO-1, ZO-2, CLDN1, and CLDN4 expression, respectively. UVA and violet, but not blue, light increased PKAreg-pS77 expression. However, none of the other treatments changed the expression of PKAcat-pT197, VASP-pS157, Bax, Bcl-2, or Bcl-xL. Immunofluorescence staining confirmed the formation of TJ structures. The expressions of ZO-1, ZO-2, CLDN1, and CLDN4 as well as TJ structures 2Â days following UVA, violet, and blue exposure were similar to those of control cells after 9Â days of cultivation. We conclude that short-wavelength LEDs at non-lethal exposure intensities accelerated the formation of TJ structure in HCEs via a cAMP-dependent regulatory cascade. Zonula Occludens-1 Protein Humans;Zonula Occludens-1 Protein;Tight Junctions;Epithelial Cells;Cell Culture Techniques

Photobiomodulation's potential as a non-invasive therapy for alzheimer's disease and minimal cognitive impairment: A 12-week investigation. BACKGROUND: Alzheimer's Disease (AD), undergoing a faster increase in occurrence than any other type of dementia, lacks a curative remedy despite advanced discoveries. To explore the realm of non-pharmacologic therapies, our study evaluates the 12-week impact of non-invasive Photobiomodulation (PBM) on cognitive and psychological aspects in individuals with AD and minimal cognitive impairment (MCI). The urgency of exploring innovative interventions is underscored by the rising occurrence of AD, particularly in regions with aging populations like Iran. METHOD: 13 patients (6 case patients and 7 control patients) participated in the study. Sham treatment was administered to seven individuals, while another six received PBM treatment over 12 weeks, with daily at-home LED (810 nm wavelength) device usage lasting 20 min. Initially, the patient and their caregiver participated in two hospital sessions to acquaint them with the device's operation. RESULTS: The mean reduction of Hamilton's anxiety questionnaire score was 3.33Â±6.08 in the intervention group and 2.00Â±3.46 in the control group (p-value=0.836). The mean score reduction of the Hamilton depression questionnaire was 3.16Â±3.86 in the intervention group and 4.85Â±6.20 in the control group (p-value=0.836). The mean score of the DAD questionnaire in the intervention group before the study was 25.50Â±13.13 and after the intervention was 29.83Â±12.12 (p-value=0.084) and in the control group it was 29.71Â±8.19 and after the study was 29Â±0.972 (p-value = 0.526). The mean changes in the DAD questionnaire score in the intervention group increased by 4.33Â±4.92 and decreased by 0.71Â±2.81 in the control group (p-value=0.041). CONCLUSION: In general, PBM appears to hold promise as a potentially safe method for enhancing the cognitive, functional, and psychological status of individuals with Alzheimer's disease, though further research with larger sample size and cautious interpretation are warranted.

Photobiomodulation versus corticosteroid in the management of erosive oral lichen planus: a randomized controlled clinical trial. BACKGROUND: Oral lichen planus (OLP) is a chronic illness of

immune origin that is typically treated with corticosteroids as a gold standard therapy. Photobiomodulation (PBM) may represent an alternative remedy that has the potential to treat a variety of pathological conditions by alleviating pain, reducing inflammation, and promoting tissue healing without the drawbacks of steroid therapies. Thus, the aim of the current study was to compare the effect of photobiomodulation to topical 0.1% triamcinolone acetonide on erosive oral lichen planus. METHODS: This randomized controlled clinical trial involved 44 patients complaining of erosive oral lichen planus. Patients were assigned to one of two groups: control group (nâ€‰=â€‰22) received 0.1% topical triamcinolone acetonide three times daily with miconazole oral gel once daily for 4Â weeks, and photobiomodulation group (nâ€‰=â€‰22) received laser therapy by 980Â nm diode laser utilizing output power 300 mW twice weekly for 5Â weeks (a total of 10 sessions). The evaluation of patients was performed at baseline, 6Â weeks, and 12Â weeks postoperatively in terms of pain, clinical scores, and biochemical evaluation of salivary malondialdehyde levels. All recorded data were analyzed using Mann-Whitney test to compare the two studied groups regarding pain, lesion size, and salivary levels of malondialdehyde. Friedman test, followed by post hoc test, was used for comparison of the data within the same group along the 3 periods at baseline, 6Â weeks, and 12Â weeks. RESULTS: Both groups showed significant improvement in pain and clinical scores, with no statistical difference between them. Moreover, there was a significant improvement in salivary malondialdehyde levels for both groups, with no significant difference between them. CONCLUSIONS: Photobiomodulation could be a promising therapeutic modality for management of erosive oral lichen planus without the side effects of steroid therapy. The salivary malondialdehyde level could be used as a biomarker to evaluate the disease severity and its response to the treatment. TRIAL REGISTRATION: The study has been registered at ClinicalTrials.gov (NCT05951361) (19/07/2023). Triamcinolone Acetonide;Adrenal Cortex Hormones;Malondialdehyde Humans;Lichen Planus, Oral;Triamcinolone Acetonide;Low-Level Light Therapy;Adrenal Cortex Hormones;Pain;Malondialdehyde

Photobiomodulation Increases M2-Type Polarization of Macrophages by Inhibiting Versican Production After Spinal Cord Injury. Spinal cord injury (SCI) is a catastrophic accidence with little effective treatment, and inflammation played an important role in that. Previous studies showed photobiomodulation (PBM) could effectively downregulate the process of inflammation with modification of macrophage polarization after SCI; however, the potential mechanism behind that is still unclear. In the presented study, we aimed to investigate the effect of PBM on the expression level of versican, a matrix molecular believed to be associated with inflammation, and tried to find the mechanism on how that could regulate the inflammation process. Using immunofluorescence technique and western blot, we found the expression level of versican is increased after injury and markedly downregulated by irradiation treatment. Using virus intrathecal injection, we found the knock-down of versican could produce the effect similar to that of PBM and might have an effect on inflammation and macrophage polarization after SCI. To further verify the deduction, we peptide the supernatant of astrocytes to induce M0, M1, and M2 macrophages. We found that the versican produced by astrocytes might have a role on the promotion of M2 macrophages to inflammatory polarization. Finally, we investigated the potential pathway in the regulation of M2 polarization with the induction of versican. This study tried to give an interpretation on the mechanism of inflammation inhibition for PBM in the perspective of matrix regulation. Our results might provide light on the inflammation regulation after SCI.

Integrating antimicrobial photodynamic therapy into the adjuvant phototherapeutic approach for orofacial manifestations of toxic epidermal necrolysis and Stevens-Johnson syndrome. Characterized by an immune reaction to medications, toxic epidermal necrolysis (TEN) and Steven-Johnson Syndrome (SJS) are potentially fatal mucocutaneous reactions, and their management

remains challenging. Considering the promising studies regarding the use of laser in managing orofacial lesions, this study aimed to report two cases in which children presenting with TEN and SJS were treated using a combination of antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) concurrently with conventional supportive care. The treatment proposed herein resulted in significant clinical improvement of the children's oral condition within a few days, enabling the reintroduction of oral feeding. Within the limitations of the study, the cases reported suggest that the adjuvant combination of PBMT and aPDT may be beneficial for improving the oral condition of children afflicted with oral injuries induced by TEN and SJS.

Effect of photobiomodulation therapy on headache, and fatigue in patients with chronic rhinosinusitis: a randomized controlled study. Chronic rhinosinusitis (CRS) is a debilitating disease that resists medical treatment. Photobiomodulation therapy is one of the promising treatment modalities for CRS. The purpose is to investigate the effect of photobiomodulation therapy on headache, fatigue, sinus opacification, and ostiomeatal complex obstruction in patients with CRS. Thirty-one patients with CRS were randomly divided into photobiomodulation therapy and control groups. The photobiomodulation therapy group received photobiomodulation therapy (2.5Â J, frequency 9.12Â Hz, and 904Â nm for 10Â min for 12 sessions) on eight rhinosinusitis sites, and the control group received a sham laser. Headache, fatigue, and sinus opacification outcomes were measured before and after treatment. There was a significant improvement in headache, fatigue, and sinus opacification in the photobiomodulation therapy group in comparison with the control group (pâ€‰<â€‰0.05). Photobiomodulation therapy is an effective physical therapy treatment modality for the management of CRS.Clinical trial registry: NCT05861817.
Humans;Rhinosinusitis;Low-Level Light Therapy;Headache;Research Design;Fatigue;Chronic Disease

IL-37 evaluation in chronic periodontitis after periodontal treatment with and without low level laser therapy. BACKGROUND: Periodontal disease poses a significant global health challenge. Traditional treatments focus on reducing inflammation and bacterial load, yet novel approaches are continually being investigated. Recent research suggests that IL-37, a potent anti-inflammatory cytokine, may play a crucial role in modulating the inflammatory processes associated with periodontal disease. In conjunction with IL-37, low-level laser therapy (LLLT) has gained attention for its potential in promoting tissue repair, reducing inflammation, and enhancing cellular processes. This study aims to investigate the effects of LLLT on IL-37 in periodontal disease management. METHODS: Thirty patients were enrolled: the G1 group patients were treated with only scaling and root planning-SRP, the G2 group was treated with SRP and LLLT. Before treatment (T0) all periodontal probing pocket depth and bleeding on probing were obtained. Before (T0) and 10 (T1), 30 (T2) and 60 (T3) days after treatment, was achieved plaque sample and specimens of gingival crevicular fluid. Diode laser wavelength range was used between 600-1000 nm and 0.04-60 J/cm(2) energy density for 3-s spotlights. RESULTS: In all patients PPD, BOP and IL-37 have shown healing improved parameters. CONCLUSIONS: Although LLLT is widely recommended for its biostimulatory and anti-inflammatory roles, it only showed additional short-term merits in reducing the pocket depth after conventional SRP. Its long-term adjunctive benefits remain unclear. Future RCTs with better study designs, adequate sample power and longer durations of follow-up are required to assess the effectiveness of LLLT as an adjunctive treatment strategy in patients with periodontal disease.

Outcomes of whole-body photobiomodulation on pain, quality of life, leisure physical activity, pain catastrophizing, kinesiophobia, and self-efficacy: a prospective randomized triple-blinded clinical trial with 6 months of follow-up. BACKGROUND: The management of fibromyalgia (FM) symptoms on a global scale remains a complex endeavor. This study endeavors to assess the impact of whole-body photobiomodulation (PBM) compared to placebo PBM on pain, functionality, and psychological symptoms in individuals afflicted with fibromyalgia. OBJECTIVES: The primary objectives of this

research were to conduct a comparative analysis of the effects of whole-body photobiomodulation (PBM) and placebo PBM on pain, functionality, and psychological symptoms in patients suffering from fibromyalgia (FM). METHODS: A total of 42 subjects were recruited from a private care practice for participation in this triple-blinded, placebo-controlled, randomized clinical trial. Participants underwent 12 treatment sessions, and assessments were conducted at various intervals, including baseline (T0), midway through the 12-session treatment (T1), at the completion of the 12 sessions (T2), and follow-ups at 2â€‰weeks (T3), 3â€‰months (T4), and 6â€‰months (T5). RESULTS: Statistical analysis revealed significant reductions in pain at T2, T3, and T5. Additionally, quality of life exhibited marked improvements after sessions at T1, T2, T3, T4, and T5. Leisure activity also demonstrated statistically significant improvements at T2, T3, T4, and T5. Furthermore, kinesiophobia showed significant differences between groups immediately after treatment at T2, T3, T4, and T5. Self-efficacy, when compared between groups, demonstrated significant differences at T3, T4, and T5 (two weeks after treatment). Lastly, pain catastrophizing exhibited significant differences only at T5. CONCLUSION: The findings of this study indicate that whole-body PBM treatment for 4 weeks resulted in significant pain reduction and improved quality of life in individuals suffering from FM. Furthermore, kinesiophobia and self-efficacy demonstrated improvements in both short-term and long-term assessments, while pain catastrophizing showed improvement at the 6-month follow-up. Consequently, whole-body PBM emerges as a promising multifactorial treatment option for FM patients, though further studies are required to validate and strengthen these results.Clinical Trial Registration:Clinicaltrials.gov, NCT0424897.

Photobiomodulation improves depression symptoms: a systematic review and meta-analysis of randomized controlled trials. BACKGROUND: Depression is a common mental illness that is widely recognized by its lack of pleasure, fatigue, low mood, and, in severe cases, even suicidal tendencies. Photobiomodulation (PBM) is a non-invasive neuromodulation technique that could treat patients with mood disorders such as depression. METHODS: A systematic search of ten databases, including randomized controlled trials (RCTs) for depression, was conducted from the time of library construction to September 25, 2023. The primary outcome was depression. The secondary outcome was sleep. Meta-analysis was performed using RevMan (version 5.4) and Stata (version 14.0). Subgroup analyses were performed to identify sources of heterogeneity. The certainty of the evidence was assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE). RESULTS: Three thousand two hundred and sixty-five studies were retrieved from the database and screened for inclusion in eleven trials. The forest plot results demonstrated that PBM alleviated depression (SMDâ€‰=â€‰-0.55, 95% CI [-0.75, -0.35], I(2)â€‰=â€‰46%). But it is not statistically significant for patients' sleep outcomes (SMDâ€‰=â€‰-0.82, 95% CI [-2.41, 0.77], I(2)â€‰=â€‰0%, pâ€‰>â€‰0.05). Subgroup analysis showed that s-PBM was superior to t-PBM in relieving symptoms of depression. The best improvement for t-PBM was achieved using a wavelength of 823â€‰nm, fluence of 10-100â€‰J/cm(2), irradiance of 50-100â€‰mW/cm(2), irradiance time of 30â€‰min, treatment frequencyâ€‰<â€‰3/week, and number of treatments >15 times. The best improvement for s-PBM was achieved using a wavelength of 808â€‰nm, fluence â‰¤1â€‰J/cm(2), irradiance of 50-100â€‰mW/cm(2), irradiance timeâ€‰â‰¤â€‰5â€‰min, treatment frequencyâ€‰â‰¥â€‰3/week, number of treatments >15 times. All results had evidence quality that was either moderate or very low, and there was no bias in publication. CONCLUSION: We conclude that PBM is effective in reducing depression symptoms in patients. However, the current number of studies is small, and further studies are needed to extend the current analysis results. SYSTEMATIC REVIEW REGISTRATION: https://www.crd.york.ac.uk/PROSPERO/, CRD42023444677.

Phototherapy. In general, laser therapy and phototherapy are considered acceptable during breastfeeding.[1,2] Phototherapy for psoriasis is also generally acceptable; however, nursing should be withheld for 24 hours after ingestion of an oral psoralen, such as methoxsalen.[3]
Effect of Novel Laser Shoe Photobiomodulation on Neuropathic Pain and Plantar Pressure Profile in Type 2 Diabetes Mellitus with Peripheral Neuropathy. BACKGROUND: Photobiomodulation (PBM) or Low-level laser is used to treat diabetic foot complications. The existing method of laser application to the foot did not cover the foot's entire area to improve the foot's microcirculation. Therefore, we have developed a cost-effective Special LASER Shoe device, focusing exclusively on the entire foot region to manage neuropathic pain and other symptoms in individuals with type 2 diabetes mellitus. OBJECTIVE: The main objective of the present study was to evaluate the effect of this newly developed special laser shoe PBM on neuropathic pain and plantar pressure profile in individuals with type 2 diabetes mellitus with neuropathy. METHODS: We included 60 participants with diabetic peripheral neuropathy of both genders and age more than 20 years. Participants were treated with PBM by a specially designed novel Laser Shoe. Outcomes were clinical variables like Vibration Perception Threshold (VPT), Visual Analogue Scale (VAS), Michigan neuropathy screening instrument A&B, Ankle-Brachial Index (ABI), and Static dynamic gait parameters. RESULTS: Participants were with an average age of 62, and the average duration of diabetes was 11 years. Analysis showed a significant difference in VPT, VAS, Michigan neuropathic screening inventory, and ankle-brachial index. ($P < 0.05$). CONCLUSION: We conclude that Novel laser shoe photobiomodulation using 'Laser Shoe' effectively reduces peripheral neuropathic pain. It is also effective in reducing average and maximum plantar pressure. Reduction in neuropathic pain and improvement in plantar pressure distribution can reduce further complications.
Therapeutic effect of intense pulsed light on different types of chalazion in children. This study aims to investigate the effectiveness of Intense Pulsed Light (IPL) therapy for chalazion treatment while also exploring potential variations in sensitivity among different types of chalazion. A total of 149 patients were selected to receive tobramycin combined with IPL treatment and tobramycin combined with hot compress. The treatment groups were divided into cystic type and granulomatous type according to different clinical manifestations. The course of treatment was 3Â weeks. The improvement was based on the ultrasound measurement of the masses reduction of more than 50% or disappearance. In the IPL group, 17 (22.67%) cases were cured, 39 (52.00%) were effective, and 19 (25.33%) were ineffective. This includes: cystic type was cured in 3 (15.79%), effective in 5 (26.32%) cases, ineffective in 11 (57.89%) cases; granulomatous type was cured in 14 (25.00%) cases, effective in 34 (60.71%) cases, ineffective in 8 (14.29%) cases. In the hot compress group, 5 (6.76%) cases were cured, 16 (21.62%) cases were effective and 53 (71.62%) cases were ineffective. The cystic type was cured in 2 (8.00%) cases, effective in 3 (12.00%) cases and ineffective in 20 (80.00%) cases; the granulomatous type was cured in 3 (6.12%) cases, effective in 13 (26.53%) cases and ineffective in 33 (67.35%) cases. The cure rate and efficacy rate of IPL treatment is higher than that of hot compress treatment, the treatment effect of IPL treatment on granulomatous chalazion is better than that on cystic type. Tobramycin Child;Humans;Chalazion;Intense Pulsed Light Therapy;Low-Level Light Therapy;Tobramycin
Long-Pulsed 532-nm Laser for Treatment of Dermatosis Papulosa Nigra and Small Seborrheic Keratoses: Experience With 71 Patients. Humans;Keratosis, Seborrheic;Female;Male;Middle Aged;Adult;Aged;Treatment Outcome;Low-Level Light Therapy;Laser Therapy;Young Adult;Lasers, Solid-State
The effect of photobiomodulation therapy in common maxillofacial injuries: Current status. The use of photobiomodulation therapy (PBMT) may be used for treating trauma to the maxillofacial region. The effects of PBMT on maxillofacial injuries were discussed in this review article. The

electronic databases Pubmed, Scopus, and Web of Science were thoroughly searched. This review included in vitro, in vivo, and clinical studies describing how PBMT can be used in maxillofacial tissue engineering and regenerative medicine. Some studies suggest that PBMT may offer a promising therapy for traumatic maxillofacial injuries because it can stimulate the differentiation and proliferation of various cells, including dental pulp cells and mesenchymal stem cells, enhancing bone regeneration and osseointegration. PBMT reduces pain and swelling after oral surgery and tooth extraction in human and animal models of maxillofacial injuries. Patients with temporomandibular disorders also benefit from PBMT in terms of reduced inflammation and symptoms. PBMT still has some limitations, such as the need for standardizing parameters. PBMT must also be evaluated further in randomized controlled trials in various maxillofacial injuries. As a result, PBMT offers a safe and noninvasive treatment option for patients suffering from traumatic maxillofacial injuries. PBMT still requires further research to establish its efficacy in clinical practice and determine the optimal parameters. Humans;Low-Level Light Therapy;Cell Differentiation;Mesenchymal Stem Cells

Effect of photobiomodulation on alleviating primary dysmenorrhea caused by PGF(2Î±). Photobiomodulation (PBM) has attracted widespread attention in suppressing various pain and inflammation. Primary dysmenorrhea (PD) primarily occurs in adolescents and adult females, and the limited effectiveness and side effects of conventional treatments have highlighted the urgent need to develop and identify new adjunct therapeutic strategies. In this work, the results of pain and PGs demonstrated that 850â€‰nm, 630â€‰nm, and 460â€‰nm all exhibited pain inhibition, decreased PGF(2Î±) and upregulated PGE(2) , while 630â€‰nm PBM has better effectiveness. Then to explore the underlying biological mechanisms of red light PBM on PD, we irradiated prostaglandin-F(2Î±) induced HUSM cells and found that low-level irradiance can restore intracellular calcium ion, ROS, ATP, and MMP levels to normal levels. And, red light enhanced cell viability and promoted cell proliferation for normal HUSM cells. Therefore, this study proposes that red light PBM may be a promising approach for the future clinical treatment of PD.

Materiobiomodulated ROS Therapy for De Novo Hair Growth. Hair loss is characterized by the inability of hair follicles (HFs) to enter the telogen-anagen transition (TAT) and lack of de novo HFs. Current pharmaceutical therapies and surgical modalities have been largely limited to regulating hair regrowth efficiently without side effects and lacking treatment compliance. Here, this work proposes a materiobiomodulation therapy (MBMT), wherein polydopamine (PDA) nanoparticles with redox activity can be modulated to have a stoichiometric ROS (H(2) O(2)) donating ability. These nanoparticles can intracellularly deliver ROS with high-efficiency via the clathrin-dependent endocytosis process. Utilizing homozygote transgenic HyPerion (a genetically-encoded H(2) O(2) biosensor) mice, this work also achieves in vivo dynamic monitoring of intracellular H(2) O(2) elevation induced by ROS donators. Subcutaneous administration with ROS donators results in rapid onset of TAT and subsequent hair regrowth with a specific ROS "hormesis effect." Mechanistically, ROS activate Î²-catenin-dependent Wnt signaling, upregulating hair follicle stem cell expression. This work further develops a microneedles patch for transdermal ROS delivery, demonstrating long-term, low-dose ROS release. Unlike photobiomodulation therapy (PBMT), MBMT requires no external stimuli, providing a convenient and efficient approach for clinical hair loss treatment. This material-HF communication implicates new avenues in HF-related diseases, achieving targeted ROS delivery with minimal side effects.

The effect of photobiomodulation therapy associated with casein phosphopeptide-amorphous calcium phosphate fluoride paste on the treatment of posthome whitening tooth sensitivity and color change: A randomized clinical trial. OBJECTIVE: This study assessed whether combining photobiomodulation therapy (PBMT) with casein phosphopeptide-amorphous calcium phosphate fluoride (CPP-ACPF) paste can effectively reduce post-home whitening tooth sensitivity (TS) without

compromising shade change. METHODS: Fifty participants were selected and assigned to one of four groups: (1) PLACEBO group-received a placebo paste and PBMT simulation; (2) PBMT group-received a placebo pasteâ€‰+â€‰PBMT; (3) CPP-ACPF group-received CPP-ACPF paste and PBMT simulation; (4) CPP-ACPFâ€‰+â€‰PBMT group-received both CPP-ACPF paste and PBMT. The participants used whitening trays containing 22% carbamide peroxide for 2â€‰h a day for 21 days. TS was measured daily using a visual analog scale, while shade change was assessed using a spectrophotometer: before bleaching treatment (T0), after the first (T1), second (T2), and third (T3) weeks of treatment, and 30 days (T4) after completing the whitening treatment. RESULTS: Intragroup analysis revealed that the PLACEBO group had the highest increase in sensitivity during the whitening treatment. The CPP-ACPF and PBMT groups showed no significant difference tooth whitening (TW) between weeks regarding aesthetic change. The CPP-ACPF and PBMT group exhibited a significant reduction in TS between the first and third and between the second and third weeks TW, but not between the first and second. Conversely, the PLACEBO group showed a higher sensitivity than the other groups (pâ€‰<â€‰.05). The CPP-ACPF and PBMT groups did not differ from each other. Furthermore, the CPP-ACPF and PBMT group showed a greater decrease in sensitivity than the PLACEBO group at T1, T2, and T3 (pâ€‰<â€‰.01), and was significantly differed from CPP-ACPF and PBMT groups only at T2 and T3. All groups confirmed TW effectiveness. Student's and paired t-test did not reveal any significant difference between groups (pâ€‰>â€‰.05). CONCLUSION: Therefore, PBMT associated with CPP-ACPF paste can reduce TS without compromising the efficacy of TW. Fluorides;amorphous calcium phosphate;Caseins;Phosphopeptides;calcium phosphate;Calcium Phosphates Humans;Fluorides;Dentin Sensitivity;Caseins;Phosphopeptides;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Calcium Phosphates

Effectiveness of Photobiomodulation With Low-Level Laser Therapy on the Implant Stability Quotient at Different Time Intervals: A Randomized Clinical Trial. Background Photobiomodulation techniques, particularly low-level laser therapy (LLLT), have gained traction due to their ability to accelerate osseointegration by stimulating cellular metabolism and promoting tissue healing. This study explores the effectiveness of LLLT around dental implants at various intervals after placement. Using resonance frequency analysis (RFA), the implant stability quotient (ISQ) was measured to assess implant stability. Methodology This split-mouth, randomized, single-blinded clinical trial included 20 participants undergoing dental implant placement. The test group received LLLT while the control group had no laser treatment. Implant stability was assessed using RFA at one, two, four, and twelve weeks post-implant placement. Statistical analysis involved descriptive statistics, repeated-measures analysis of variance (ANOVA), and t-tests. Results The repeated-measures ANOVA analysis showed significant differences in the ISQ values between the LLLT group and the control group at two weeks and three months post-implant placement. The LLLT group exhibited higher ISQ values, indicating greater implant stability and improved osseointegration compared to the control group. These findings suggest the potential benefits of LLLT in enhancing dental implant outcomes. Conclusions LLLT shows promise in improving dental implant outcomes, with enhanced stability and osseointegration. Further research is needed to validate these results and integrate LLLT into routine dental implant procedures.

Effectiveness of photo-ozone therapy against equine Pythium insidiosum. Cutaneous pythiosis is a life-threatening infectious disease. Low-level laser therapy (LLLT) and ozone (O(3)) have been used individually in the treatment of infected wounds. The goals of the study were a) to characterize the antimicrobial action of the photo-ozone therapy (LLLT-O(3)) against equine Pythium insidiosum, and b) to assess the cytotoxic potential of the LLLT-O(3) in keratinocytes. Specimens of pathogen were isolated from 10 horses. After culturing, 120 hyphae plugs were distributed among four groups (n=30 hyphae plugs/group): LLLT (laser irradiation for 160 sec;), O(3) (exposition to O(3) for 15 min;), LLLT-

O(3) (LLLT and O(3) treatments in sequence) and control (untreated plugs). The hyphae growth was measured during the first 14 days post-treatment. Where there was an absence of hyphae growth, the plug was recultured for an additional 7 days. The cytotoxic potential of the treatments against HaCaT keratinocytes was assessed by colorimetric assays. The LLLT-O(3) and O(3) treatments inactivated, respectively, 92.3% (28/30) and 30% (9/30) of the samples. No growth was detected after 7 days reculture of inactivated hyphae plugs on new media. Hyphae growth was visualized in 100% of the control and LLLT hyphae plugs. The viability of HaCaT cells was not affected by the isolated treatments (LLLT and O(3)), while the LLLT-O(3) showed slight cytotoxic effect (20%) when compared to the control group (P<0.05). Photo-ozone therapy inactivated equine P. insidiosum hyphae with minimal cytotoxicity in skin cells in vitro. Animals;Horses;Pythium;Pythiosis;Horse Diseases

Effectiveness of 780â€‰nm photobiomodulation as adjunct treatment for bone exposed fractures: A pilot study on radiograph, pain, and cytokines analysis. The aim of this study was to evaluate the effectiveness of photobiomodulation with a 780â€‰nm laser as an adjunct to surgical treatment in the regeneration of bone fractures. Twenty patients diagnosed with open fractures in the lower limbs were selected and randomly divided into two groups: control and LLLT. LLLT parameter: 780â€‰nm, 0.04â€‰cm(2) of light beam diameter, 40â€‰mW of power, 10â€‰s per point, 0.4â€‰J of energy, fluence of 10â€‰J/cm(2) and irradiance of 1â€‰W/cm(2) . The evaluated data were: pain, using McGill scale, use of analgesics and anti-inflammatories, levels of cytokines TNF-Î±, IFN-Î³, IL-1Î², IL-10, and IL-17, and bone level regeneration. Data were analyzed using Wilcoxon and Mann-Whitney tests (5%). We can conclude that LLLT was effective as an adjuvant in the bone fracture regeneration process, altered IL-1Î² levels, reduced the use of analgesics and anti-inflammatories, reducing the pain pattern throughout the sessions.

Photobiomodulation for Neurodegenerative Diseases: A Scoping Review. Neurodegenerative diseases involve the progressive dysfunction and loss of neurons in the central nervous system and thus present a significant challenge due to the absence of effective therapies for halting or reversing their progression. Based on the characteristics of neurodegenerative diseases such as Alzheimer's disease (AD) and Parkinson's disease (PD), which have prolonged incubation periods and protracted courses, exploring non-invasive physical therapy methods is essential for alleviating such diseases and ensuring that patients have an improved quality of life. Photobiomodulation (PBM) uses red and infrared light for therapeutic benefits and functions by stimulating, healing, regenerating, and protecting organizations at risk of injury, degradation, or death. Over the last two decades, PBM has gained widespread recognition as a non-invasive physical therapy method, showing efficacy in pain relief, anti-inflammatory responses, and tissue regeneration. Its application has expanded into the fields of neurology and psychiatry, where extensive research has been conducted. This paper presents a review and evaluation of studies investigating PBM in neurodegenerative diseases, with a specific emphasis on recent applications in AD and PD treatment for both animal and human subjects. Molecular mechanisms related to neuron damage and cognitive impairment are scrutinized, offering valuable insights into PBM's potential as a non-invasive therapeutic strategy. Animals;Humans;Neurodegenerative Diseases;Low-Level Light Therapy;Quality of Life;Alzheimer Disease;Parkinson Disease

Use of Surface Electromyography to Evaluate Effects of Therapeutic Methods on Masticatory Muscle Activity in Patients with Temporomandibular Disorders: A Narrative Review. The presented narrative review aims to present the impact of therapeutic methods on the masticatory muscle activity measured using surface electromyography (sEMG) in patients with temporomandibular disorders (TMDs). Original interventional studies with baseline data for diagnosed TMD groups with full-text articles in English published in scientific journals in the last ten years were included in the evaluation process. The following narrative review considered only clinical, controlled, and

randomized studies. Articles that included the following parameters were qualified for this review: adult participants, diagnosis of temporomandibular disorder, the presence of a musculoskeletal dysfunction, no other severe comorbidities, use of therapeutic interventions, and sEMG measurement before and after the intervention. Ten papers were accepted and analyzed for the final evaluation in the presented review. Several studies using surface electromyographic examination prove the effectiveness of various therapies to normalize the bioelectrical activity of the masticatory muscles, either reduction during rest or increase during a functional task in patients diagnosed with temporomandibular disorders. This narrative review shows the influence of manual and physical treatments on electromyographic masticatory muscle activity, including soft tissue mobilization, transcutaneous electrical nerve stimulation, low-level laser therapy, and moist heat therapy. Changes in masticatory muscle activity coincided with changes in TMD-associated pain and range of mandibular mobility.

Effects of lowâ€‘power red laser and blue LED on mRNA levels from DNA repair genes in human breast cancer cells. Photobiomodulation (PBM) induced by non-ionizing radiations emitted from low-power lasers and light-emitting diodes (LEDs) has been used for various therapeutic purposes due to its molecular, cellular, and systemic effects. At the molecular level, experimental data have suggested that PBM modulates base excision repair (BER), which is responsible for restoring DNA damage. There is a relationship between the misfunction of the BER DNA repair pathway and the development of tumors, including breast cancer. However, the effects of PBM on cancer cells have been controversial. Breast cancer (BC) is the main public health problem in the world and is the most diagnosed type of cancer among women worldwide. Therefore, the evaluation of new strategies, such as PBM, could increase knowledge about BC and improve therapies against BC. Thus, this work aims to evaluate the effects of low-power red laser (658Â nm) and blue LED (470Â nm) on the mRNA levels from BER genes in human breast cancer cells. MCF-7 and MDA-MB-231 cells were irradiated with a low-power red laser (69Â JÂ cm-2, 0.77 W cm-2) and blue LED (482Â JÂ cm-2, 5.35 W cm-2), alone or in combination, and the relative mRNA levels of theÂ APTX,Â PolB, andÂ PCNAÂ genes were assessed by reverse transcription-quantitative polymerase chain reaction. The results suggested that exposure to low-power red laser and blue LED decreased the mRNA levels fromÂ APTX,Â PolB, andÂ PCNAÂ genes in human breast cancer cells. Our research shows that photobiomodulation induced by low-power red laser and blue LED decreases the mRNA levels of repair genes from the base excision repair pathway in MCF-7 and MDA-MB-231 cells. RNA, Messenger;Proliferating Cell Nuclear Antigen Humans;Female;RNA, Messenger;Breast Neoplasms;Proliferating Cell Nuclear Antigen;Lasers;DNA Repair;Low-Level Light Therapy

Treatment of chronic symptoms following mild traumatic brain injury with transcranial LED: a sham run-in pilot study of photobiomodulation therapy. PRIMARY OBJECTIVE: We evaluated whether photobiomodulation with red/near infrared light applied transcranially via light emitting diodes (LED) was associated with reduced symptoms and improved cognitive functioning in patients with chronic symptoms following mild traumatic brain injury. RESEARCH DESIGN: Participants (3 men, 6 women; 22-61â€‰years-old) underwent a 6-week intervention involving 18 40-minute transcranial LED treatment sessions. METHODS AND PROCEDURES: Reliable change indices were calculated for 10 neuropsychological test scores and 3 self-report questionnaires of subjective cognition, post-concussion symptoms, and depression at baseline and following treatment. Questionnaires were also administered after 2-week sham and at 1-month and 2-month follow-ups. MAIN OUTCOME AND RESULTS: Only 2 participants improved on neuropsychological testing. On questionnaires, 4 reported improved cognition, 5 reported improved post-concussion symptoms, and 3 reported improved depression. Significant improvement in 2 or more domains was reported by 4 participants and mostly maintained at both follow-ups. CONCLUSIONS: Most participants did not improve on

neuropsychological testing. A minority self-reported improvement in symptoms, potentially explained by the intervention, psychiatric medication changes, placebo effects, or other factors. Selecting participants with different clinical characteristics, and dosing and delivery system changes, may produce different results. A study design accounting for placebo effects appears warranted in future trials. Male;Humans;Female;Young Adult;Adult;Middle Aged;Brain Concussion;Post-Concussion Syndrome;Low-Level Light Therapy;Pilot Projects;Cognition

Dr. Joseph Biederman's Enduring Legacy: Illuminating the Path to Addressing Autistic Traits in Attention Deficit Hyperactivity Disorder With Transcranial Photobiomodulation. OBJECTIVE: To review the existing literature on transcranial photobiomodulation (tPBM) treatment effects on Autism Spectrum Disorder (ASD), in search for an effective treatment of a symptom cluster identified largely by contributions from late Dr. Biederman who asserted that they frequently present with Attention Deficit Hyperactivity Disorder (ADHD). METHOD: A survey of two databases, PubMed and PsycINFO, for clinical trials reporting on tPBM treatment in ASD was performed. Identified manuscripts that met eligibility criteria were then reviewed. RESULTS: Three original manuscripts reporting findings on a heterogenous group of study methods met the eligibility criteria. Despite the heterogenous nature of study designs, findings from all three studies reported tPBM treatment to be associated with improvements in ASD symptoms. No serious or treatment limiting adverse events were reported. CONCLUSIONS: A nascent body of research suggests further clinical studies investigating efficacy of tPBM in treatment of ASD symptoms should be supported. Humans;Attention Deficit Disorder with Hyperactivity;Autism Spectrum Disorder;Autistic Disorder;Low-Level Light Therapy;Treatment Outcome

THE BIO-STIMULATORY EFFECT OF ADVANCE PLATELET RICH FIBRIN COMBINED WITH LASER ON DENTAL IMPLANT STABILITY: AN EXPERIMENTAL STUDY ON SHEEP. Implant stability is the major important requirement for the progress of a dental implant in the bone bed before loading the dental implant without clinical micro motion of the macula. Advance platelet rich fibrin (A-PRF) can be considered a "tissue engineering marvel" due to the typical properties of an osteo promoting matrix that improve the sustained release of growth factors that modulate and support osteoblast proliferation, migration, and adhesion, and at the same time regulates the production of collagen proteins. Low level laser therapy (LLLT) biostimulation increases blood circulation, promotes the revitalization process, reduces the risk of infection, improves metabolic activity, and accelerates the healing of damaged tissues. This study aimed to assess the effect of Advance platelet rich fibrin (A-prf) with low level laser therapy biostimulation (LLL Biostimulation) on implant stability. Four healthy male sheep were randomly divided into 2 groups (two in each group).Group 1 (control), at of which ten implants were placed on one side of the tibia and ten dental implants on the other side of the tibia with no additions for a total of 10 implants and Group 2 (study) where ten implants were placed on one side and ten dental implants on the other side of the tibia augmented with Advanced Platelet Rich Fibrin Membrane and LLLT Bio stimulation. Primary and secondary dental implant stability were recorded by radiofrequency evaluation using Osstell device immediately after placement, four and eight weeks postoperatively. The results of the current study showed no significant difference between control and study group in implant stability at baseline (day of surgery) but after four and eight weeks there was a significant difference between the control group and the study group. Advance platelet rich fibrin (A- prf) with low level laser therapy biostimulation (LLL Biostimulation) plays a role in new bone formation and enhance implant stability. Dental Implants Male;Animals;Sheep;Osseointegration;Dental Implants;Platelet-Rich Fibrin;Lasers;Wound Healing

Accelerating Healing and Relieving Pain: High-Intensity Laser Therapy for Paraneoplastic Cutaneous Vasculitis Associated with Multiple Myeloma. BACKGROUND Leukocytoclastic vasculitis (LCV) is an atypical form of cutaneous paraneoplastic manifestation. Its association with multiple myeloma

(MM) is even rarer and is associated with poor prognosis and short survival, regardless of the therapy instituted. Different treatment approaches are necessary. We present a case in which LCV was the first manifestation of MM, and high-intensity laser therapy (HILT) was used as an option to accelerate healing and control pain. CASE REPORT A 76-year-old woman presented with pain and paresthesia in her lower limbs, associated with palpable purpura. The clinical diagnosis was small-vessel vasculitis. Laboratory tests showed an elevated gamma globulin monoclonal peak on protein electrophoresis. The immunophenotypic study of bone marrow aspirates led to the diagnosis of MM. Due to pain refractory to conventional analgesics, and the progressive evolution of the lesions, despite corticosteroid therapy, we performed photo-biomodulation with a neodymium-doped yttrium aluminum garnet laser (Nd: YAG), wavelength 1064 nanometers, using a 7-mm probe and energy density 6 J/cmÂ². After the first session, the patient was referred for pain management, and after 5 weeks, we observed complete healing in ulcerated lesions and involution of bullous lesions. CONCLUSIONS This case report shows the positive effects of the Nd: YAG laser in modulating healing and reducing pain. HILT is an innovative, non-invasive, and effective treatment and should be considered a promising technique to accelerate healing and controlling pain. Autoantibodies Female;Humans;Aged;Multiple Myeloma;Wound Healing;Laser Therapy;Vasculitis, Leukocytoclastic, Cutaneous;Pain;Autoantibodies

Letter to the Editor Regarding "LIGHTSITE II Randomized Multicenter Trial: Evaluation of Multiwavelength Photobiomodulation in Non-exudative Age-Related Macular Degeneration".

A Response to: Letter to the Editor Regarding "LIGHTSITEÂ II Randomized Multicenter Trial: Evaluation of Multiwavelength Photobiomodulation in Non-exudative Age-Related Macular Degeneration".

Introducing Matrix Metalloproteinases as Crucial Targets for Intra-articular Laser Therapy in Patients with Synovial Fluid of Knee Osteoarthritis. BACKGROUND: Many elder people have knee osteoarthritis (OA). The patients are faced with pain and disability in movement. Given the challenging lifestyle of the patients, finding an efficient therapy approach is necessary. Since low-level laser therapy applies to the treatment of many diseases, it seems it can be a suitable option for the treatment of knee OA. The present study aimed to evaluate the molecular mechanism of laser therapy on knee OA via a protein expression change study. METHODS: The present study examines the gene expression profile of patients with OA in the knee using bioinformatics. The protein expression change profile of synovial fluid of knee OA patients is extracted from the literature and is analyzed based on the rate of expression and interactions between the differentially expressed proteins (DEPs). The results are compared with the DEPs of similar tissue of the treated knee OA patients (from published documents) after laser therapy. RESULTS: Apolipoprotein B (APOB) and matrix metallopeptidase 2 (MMP2) were determined as the hub bottlenecks of the protein-protein interaction (PPI) network of synovial fluid of knee OA patients. MMP2, complement 5, transthyretin, and apolipoprotein A-1 from laser-treated patients were related to the PPI network of knee OA patients. The reduction of Interleukin-6 activity was highlighted as a critical event as a function of laser on the human body. CONCLUSION: In conclusion, it was noted that the main phenomenon associated with laser therapy-induced improvement in the condition of knee OA patients is the downregulation of MMP2.

Photobiomodulation Therapy for Managing Motor and Sensory Dysfunctions Following Temporomandibular Joint Surgery: A Case Report. Introduction: Surgical procedures involving the temporomandibular joint (TMJ) are frequently associated with nerve injuries and subsequent dysfunctions. Considering that traumatic peripheral nerve injuries may resolve slowly and their prognosis is generally unpredictable, the current study aimed to report a clinical case in which both motor (affecting the temporal and zygomatic branches of the facial nerve) and sensory dysfunctions

(affecting the auriculotemporal nerve of the trigeminal nerve) following TMJ surgery were effectively treated by using photobiomodulation therapy (PBMT). Case Report: PBMT sessions, involving a total of 30 facial points, were administered twice a week for 10 weeks. The following parameters were utilized: wavelength of 808 nm, energy density of 75 J/cm(2), power output of 100 mW, total energy of 3 J, and duration of 30 seconds per point. A considerable improvement in both facial asymmetry and muscle function was achieved within 5 weeks, along with a total restoration of cutaneous sensitivity. By the 10th week of PBMT, the facial movement dysfunction was completely resolved. Conclusion: According to the current case, PMBT seems to be an effective intervention to manage motor and sensory nerve dysfunctions following TMJ surgery.

Transcranial photobiomodulation for brain diseases: review of animal and human studies including mechanisms and emerging trends. The brain diseases account for 30% of all known diseases. Pharmacological treatment is hampered by the blood-brain barrier, limiting drug delivery to the central nervous system (CNS). Transcranial photobiomodulation (tPBM) is a promising technology for treating brain diseases, due to its effectiveness, non-invasiveness, and affordability. tPBM has been widely used in pre-clinical experiments and clinical trials for treating brain diseases, such as stroke and Alzheimer's disease. This review provides a comprehensive overview of tPBM. We summarize emerging trends and new discoveries in tPBM based on over one hundred references published in the past 20 years. We discuss the advantages and disadvantages of tPBM and highlight successful experimental and clinical protocols for treating various brain diseases. A better understanding of tPBM mechanisms, the development of guidelines for clinical practice, and the study of dose-dependent and personal effects hold great promise for progress in treating brain diseases.

Physical therapy for acute and sub-acute low back pain: A systematic review and expert consensus. OBJECTIVE: To review the effectiveness of different physical therapies for acute and sub-acute low back pain supported by evidence, and create clinical recommendations and expert consensus for physiotherapists on clinical prescriptions. DATA SOURCES: A systematic search was conducted in PubMed and the Cochrane Library for studies published within the previous 15 years. REVIEW METHODS: Systematic review and meta-analysis, randomized controlled trials assessing patients with acute and sub-acute low back pain were included. Two reviewers independently screened relevant studies using the same inclusion criteria. The Physiotherapy Evidence Database and the Assessment of Multiple Systematic Reviews tool were used to grade the quality assessment of randomized controlled trials and systematic reviews, respectively. The final recommendation grades were based on the consensus discussion results of the Delphi of 22 international experts. RESULTS: Twenty-one systematic reviews and 21 randomized controlled trials were included. Spinal manipulative therapy and low-level laser therapy are recommended for acute low back pain. Core stability exercise/motor control, spinal manipulative therapy, and massage can be used to treat sub-acute low back pain. CONCLUSIONS: The consensus statements provided medical staff with appliable recommendations of physical therapy for acute and sub-acute low back pain. This consensus statement will require regular updates after 5-10 years. Humans;Low Back Pain;Physical Therapy Modalities;Consensus;Randomized Controlled Trials as Topic;Female;Acute Pain;Male

Subthreshold micropulse diode laser treatment in diabetic macular edema: biological impact, therapeutic effects, and safety. PURPOSE: To introduce the treatment of diabetic macular edema (DME) with subthreshold micropulse diode laser (SMPL), to summarize the biological impact, therapeutic effects, and safety of this treatment, and to discuss the response to DME when SMPL is combined with anti-vascular endothelial growth factor (anti-VEGF) or steroid. METHODS: The literature search was performed on the PubMed database, with a selection of English-language articles published from 2000 to 2023 with the following combinations of search terms: diabetes macular (o) edema, micropulse laser or subthreshold micropulse laser, anti-vascular endothelial

growth factor, and steroid. RESULTS: SMPL is a popular, invisible retinal laser phototherapy that is inexpensive, safe, and effective in the treatment of DME. It can selectively target the retinal pigment epithelium, reduce the expression of pro-inflammatory factors, promote the absorption of macular edema, and exert a similar and lasting clinical effect to traditional lasers. No significant difference was found in the therapeutic effects of SMPL between different wavelengths. However, HbA1c level and pretreatment central macular thickness (CMT) may affect the therapeutic outcomes of SMPL. CONCLUSION: SMPL has a slow onset and produces lasting clinical effects similar to conventional photocoagulation. It has been reported that SMPL combined with the intravitreal anti-VEGF injection can significantly reduce the number of injections without influencing the therapeutic effect, which is essential for clinical applications and research. Although 577Â nm SMPL is widely used clinically, there are no standardized protocols for SMPL. Additionally, some important problems regarding the treatment of SMPL require further discussion and exploration. Endothelial Growth Factors;Steroids Humans;Diabetic Retinopathy;Macular Edema;Lasers, Semiconductor;Endothelial Growth Factors;Laser Coagulation;Steroids;Treatment Outcome;Tomography, Optical Coherence;Diabetes Mellitus

Photobiomodulation CME Part I: Overview and Mechanism of Action. Photobiomodulation (PBM), previously known as low-level laser light therapy, represents a non-invasive form of phototherapy that utilizes wavelengths in the red light (RL, 620-700 nm) portion of the visible light (VL, 400-700 nm) spectrum and the near-infrared (NIR, 700-1440 nm) spectrum. PBM is a promising and increasingly used therapy for the treatment of various dermatologic and non-dermatologic conditions. Photons from RL and NIR are absorbed by endogenous photoreceptors including mitochondrial cytochrome C oxidase (COX). Activation of COX leads to the following changes: modulation of mitochondrial adenosine triphosphate (ATP), generation of reactive oxygen species (ROS), and alterations in intracellular calcium levels. The associated modulation of ATP, ROS and calcium levels promotes the activation of various signaling pathways (e.g., insulin-like growth factors, phosphoinositide 3-kinase pathways), which contribute to downstream effects on cellular proliferation, migration and differentiation. Effective PBM therapy is dependent on treatment parameters (e.g., fluence, treatment duration and output power). PBM is generally well-tolerated and safe with erythema being the most common and self-limiting adverse cutaneous effect.

Retrospective clinical evaluation of Q-switched Nd:YAG laser safety and efficacy in tattoo removal: A new perspective on the Kirby-Desai scale. BACKGROUND: With nearly 50% of the population in the United States, Italy, and Sweden tattooed with at least one tattoo, the demand for its removal has risen by 32% since 2011. Traditional removal methods, such as Q-switched (QS) laser-based tattoo removal, can be lengthy, requiring up to 20 sessions. AIM: This study presents a retrospective clinical evaluation of seven short-pulsed QS, dual-wavelength Nd:YAG laser, as an efficient alternative, that can potentially reduce the number of sessions needed as calculated by a founded scale. METHODS: The QS modality delivers high-intensity pulses in four wavelengths, ideal for removing multicolored tattoos, of which two were used.Â We studied 11 patients who underwent 3-8 treatments (average 5.09) every 2-3â€‰months. Each tattoo was assessed using the Kirby-Desai scale, considering the following factors: location, Fitzpatrick skin type, ink amount, layering, scarring, tissue changes, and tattoo color. Follow-ups were conducted after 6â€‰months and at 4-5â€‰years following last session. RESULTS: The long-term follow-up presented a significantly higher tattoo removal efficiency than the short-term follow-up (pâ€‰<â€‰0.001), indicating a sustained process of ink breakdown and elimination. Notably, the actual number of treatments were significantly lower than that predicted by the Kirby-Desai scale (average 5.09 vs. 9.9, pâ€‰<â€‰0.001). No severe adverse events were reported. CONCLUSIONS: In conclusion, the QS Nd:YAG laser offers a safe and

effective alternative for tattoo removal, requiring fewer treatments than initially expected. Humans;Retrospective Studies;Lasers, Solid-State;Tattoo Removal;Tattooing;Low-Level Light Therapy

The effectiveness of low-level laser therapy and low-intensity pulsed ultrasound in reducing pain induced by orthodontic separation: a randomized controlled trial. BACKGROUND: The low-level laser therapy (LLLT) and low-intensity pulsed ultrasound (LIPUS) have been recently applied to control pain during orthodontic treatment. OBJECTIVE: To evaluate and compare the effectiveness of LLLT and LIPUS in reducing pain induced by orthodontic separation. STUDY DESIGN: A single-blinded randomized controlled trial. METHODS: One hundred and fifty patients were randomly assigned into three groups; LLLT group, LIPUS group, and control group. After 5Â min from the separators' placement, the first dose of the laser or the ultrasound was applied, the second dose was applied after 24Â h, and the third dose was applied after 48Â h on both maxillary and mandibular first molars. The exposure of laser was for 20Â s at each point (maxillary and mandibular first molars), with an 810-nm aluminum-gallium-arsenide (AlGaAs) diode laser on continuous mode. The output power set at 150 mW, the energy density of 4Â J/cm(2), and a laser spot diameter of 7Â mm were applied. Whereas the frequency of ultrasonic toothbrush was 1.6Â MHz; and average output intensity was 0.2Â W/cm(2). The application was for 20Â min (5Â min on each first molar). The control group received the separators without another intervention. A Visual Analog Scale (VAS 100Â mm) was used to assess pain intensity at several time intervals during the first four days after the separators' placement. RESULTS: A total of 145 patients were assessed. There was a significant difference in pain perception among the three groups after 5Â min (Pâ€‰=â€‰.002). The maximum pain level was reached after 24Â h. However, the laser group and the ultrasound group showed a statistically significant decrease in pain scores compared to the control group at all the assessment time points (Pâ€‰<â€‰.001). Whereas there was no difference between the laser group and the ultrasound group in reducing the pain scores (Pâ€‰>â€‰.05). CONCLUSIONS: The LLLT and the LIPUS effectively reduce the separation pain when applied in multiple doses without differences between them. TRIAL REGISTRATION: This trial was registered with the German Clinical Trials Register (DRKS). (https://www.drks.de/drks_web/navigate.do?navigationId=trial.HTML&TRIAL_ID= DRKS00029991). Date of registration: 26/08/2022. Humans;Low-Level Light Therapy;Pain;Lasers, Semiconductor;Pain Measurement;Maxilla

Photobiomodulation CME part II: Clinical applications in dermatology. Photobiomodulation (PBM) is an emerging treatment modality in dermatology with increasing office and home-based use. PBM is the use of various light sources in the red light (620-700Â nm) and near-infrared (700-1440Â nm) spectrum as a form of light therapy. PBM is often administered through low-level lasers or light-emitting diodes. Studies show that PBM can be used effectively to treat conditions secondary to cancer therapies, alopecia, ulcers, herpes simplex virus, acne, skin rejuvenation, wounds, and scars. PBM offers patients many benefits compared to other treatments. It is noninvasive, cost-effective, convenient for patients, and offers a favorable safety profile. PBM can be used as an alternative or adjuvant to other treatment modalities including pharmacotherapy. It is important for dermatologists to gain a better clinical understanding of PBM for in-office administration and to counsel patients on proper application for home-use devices to best manage safety and expectations as this technology develops. PBM wavelengths can induce varied biological effects in diverse skin types, races, and ethnicities; therefore, it is also important for dermatologists to properly counsel their skin of color patients who undergo PBM treatments. Future clinical trials are necessary to produce standardized recommendations across conditions and skin types.

Innovative integration: optimizing performance through warm-up and photobiomodulation in high-intensity test. We investigated whether the application of photobiomodulation therapy (PBMT) immediately after a standardized warm-up (WUâ€‰+â€‰PBMT) or traditional PBMT (no pre-

warming) would influence performance in intermittent testing and intensity variables. In a counterbalanced randomized crossover design, twelve female futsal players (mean age: 23.9â€‰Â±â€‰3.8 years) attended four sessions. Each session involved either a standardized warm-up or maintaining seated rest for five minutes. Subsequently, PBMT or placebo (with the PBMT device turned off) was applied, followed by the YoYo Intermittent Recovery Level 1 test (YYIR1) during which we assessed heart rate, rating of perceived exertion, and blood lactate levels. The performance in YYIIR1 was superior (pâ€‰=â€‰0.02) in the WUâ€‰+â€‰PBMT condition (440.0â€‰Â±â€‰59.0â€…m) compared to the WUâ€‰+â€‰Placebo (353.3â€‰Â±â€‰94.7â€…m), and placebo alone (no warm-up) (325.0â€‰Â±â€‰67.2â€…m). We conclude that a combination of a specific warm-up before PBMT application improves high-intensity intermittent performance in amateur female futsal players without affecting intensity variables.

Management of oxidative stress for cell therapy through combinational approaches of stem cells, antioxidants, and photobiomodulation. Over the recent decades, stem cell-based therapies have been considered as a beneficial approach for the treatment of various diseases. In these types of therapies, the stem cells and their products are used as treating agents. Despite the helpful efficacy of stem cell-based therapies, there may be challenges. Oxidative stress (OS) is one of these challenges that can affect the therapeutic properties of stem cells. Therefore, it seems that employing strategies for the reduction of OS in combination with stem cell therapy can lead to better results of these therapies. Based on the available evidence, antioxidant therapy and photobiomodulation (PBM) are strategies that can regulate the OS in the cells. Antioxidant therapy is a method in which various antioxidants are used in the therapeutic processes. PBM is also the clinical application of light that gained importance in medicine. Antioxidants and PBM can regulate OS by the effect on mitochondria as an important source of OS in the cells. Considering the importance of OS in pathologic pathways and its effect on the treatment outcomes of stem cells, in the present review first the stem cell therapy and effects of OS on this type of therapy are summarized. Then, antioxidant therapy and PBM as approaches for reducing OS with a focus on mitochondrial function are discussed. Also, a novel combination treatment with the hope of achieving better and more stable outcomes in the treatment process of diseases is proposed.

Effective Treatment of Solitary Rectal Ulcer Syndrome by Using Photobiomodulation Therapy: A Case Report. Objective: To investigate the efficacy of Photobiomodulation therapy (PBMT) for the treatment of solitary rectal ulcer syndrome (SRUS). Background: SRUS is a benign disease, diagnosed by symptoms, clinical, and histological findings. PBMT has been reported for the treatment of various inflammation-based diseases including aphthous ulcer, but still no such study on the treatment of SRUS is published. Materials and methods: A 29-year Asian women, diagnosed for SRUS of 0.57â€‰cm diameter, was treated by a laser at 635â€‰nm through seven sessions. Laser fluence of 85â€‰J/cm(2) was delivered to ulcer lesion during each session for 10â€‰min. Clinical results were valued by physician with sigmoid probe throughout PBMT sessions and no medicines were prescribed to the patient. Results: After seven sessions, the lesion was completely healed with 100% clinical response. In follow-up, patient did not respond to any additional/recurring abnormality, and no side effects were observed. Conclusions: In conclusion, PBMT by using laser at 635â€‰nm is an effective treatment for SRUS without any side effects and patient remained comfortable throughout treatment sessions. Patient registration No. H-744/23. Female;Humans;Low-Level Light Therapy;Rectal Diseases;Syndrome;Treatment Outcome;Ulcer;Adult

Photobiomodulation Recovers the Submandibular Gland in Vismodegib-Treated Rats. Objective: The submandibular gland (SMG) produces the most saliva, and factors such as aging and chemotherapy can affect its structure and function. However, there are only temporary treatments available for salivary hypofunction. This study aimed to evaluate the effects of photobiomodulation

(PBM) on the function of SMG by using a rat animal model and vismodegib, an antagonist of the sonic hedgehog (SHH) pathway. Methods: Vismodegib (10â€‰mg/kg) drug was gavaged orally for 14 days in rats to significantly decrease the SHH signaling proteins [SHH, protein patched homolog 1 (PTCH1), smoothened protein (SMO), glioma-associated oncogene homolog 1 (GLI1)], induce damage in SMG tissue, and affect salivary functional markers AQP5 and Keratin5. After that, in conjunction with vismodegib administration, PBM was performed using an 850â€‰nm high-power light-emitting diode (LED) device treated daily for 6 days at varying total energy densities of 60, 120, and 180â€‰J/cm(2) in at least 3 rats per group. The test results were confirmed by Western blot, immunofluorescence staining, and hematoxylin and eosin staining, and the statistics were t-test or one-way analysis of variance (ANOVA) with Tukey's multiple comparisons tests. Results: Significant decreases in the expression of SHH-related proteins (PTCH1, SMO, GLI1, pâ€‰<â€‰0.05) with damage of SMG ductal cells were observed with vismodegib administration. However, a significant increase in the expression levels of SHH-related proteins (SHH, SMO, GLI1, pâ€‰<â€‰0.05) and recovery of SMG ductal cells damaged after vismodegib administration were observed for PBM-treated groups. Salivary functional marker AQP5 also showed the same increase or decrease. Conclusions: This study found that vismodegib damages SMG ductal cells and decreases SHH-related proteins and associated salivary functional markers. Also, 850â€‰nm high-power LED recovered the damaged structure of SMG and increased SHH-related proteins and salivary functional markers. The study results suggest that PBM can restore SMG structure and function through SHH signaling. HhAntag691;Zinc Finger Protein GLI1;Anilides;Pyridines Rats;Animals;Submandibular Gland;Zinc Finger Protein GLI1;Low-Level Light Therapy;Signal Transduction;Anilides;Pyridines

Photobiomodulation with 630-nm LED Inhibits M1 Macrophage Polarization via STAT1 Pathway Against Sepsis-Induced Acute Lung Injury. Background: Sepsis-induced acute lung injury (ALI) is a clinical syndrome characterized by excessive uncontrolled inflammation. Photobiomodulation such as light-emitting diode (LED) irradiation has been used to attenuate inflammatory disease. Objective: The protective effect of 630â€‰nm LED irradiation on sepsis-induced ALI remains unknown. The purpose of this study was to investigate the role of 630â€‰nm LED irradiation in sepsis-induced ALI and its underlying mechanism. Methods and results: C57BL/6 mice were performed cecal ligation and puncture (CLP) for 12â€‰h to generate experimental sepsis models. Histopathology analysis showed that alveolar injury, inflammatory cells infiltration, and hemorrhage were suppressed in CLP mice after 630â€‰nm LED irradiation. The ratio of wet/dry weigh of lung tissue was significantly inhibited by irradiation. The number of leukocytes was reduced in bronchoalveolar lavage fluid. Reverse transcription-quantitative polymerase chain reaction (RT-qPCR) results and enzyme-linked immunosorbent assay showed that 630â€‰nm LED irradiation significantly inhibited the mRNA and protein levels of M1 macrophage-related genes in the lung of CLP-induced septic mice. Meanwhile, LED irradiation significantly inhibited signal transducer and activator of transcription 1 (STAT1) phosphorylation in the lung of septic mice. In vitro experiments showed that 630â€‰nm LED irradiation significantly inhibited M1 genes mRNA and protein expression in THP-1-derived M1 macrophages without affecting the cell viability. LED irradiation also significantly inhibited the level of STAT1 phosphorylation in THP-1-derived M1 macrophages. Conclusions: We concluded that 630â€‰nm LED is promising as a treatment against ALI through inhibiting M1 macrophage polarization, which is associated with the downregulation of STAT1 phosphorylation. RNA, Messenger Mice;Animals;Low-Level Light Therapy;Mice, Inbred C57BL;Acute Lung Injury;Macrophages;Sepsis;RNA, Messenger

Combined effect of Cerium oxide nanoparticles loaded scaffold and photobiomodulation therapy on pain and neuronal regeneration following spinal cord injury: an experimental study. BACKGROUND: Spinal cord injury (SCI) remained one of the challenges to treat due to its complicated

mechanisms. Photobiomodulation therapy (PBMT) accelerates neuronal regeneration. Cerium oxide nanoparticles (CeONPs) also eliminate free radicals in the environment. The present study aims to introduce a combined treatment method of making PCL scaffolds as microenvironments, seeded with CeONPs and the PBMT technique for SCI treatment. METHODS: The surgical hemi-section was used to induce SCI. Immediately after the SCI induction, the scaffold (Sc) was loaded with CeONPs implanted. PBMT began 30Â min after SCI induction and lasted for up to 4Â weeks. Fifty-six male rats were randomly divided into seven groups. Glial fibrillary acidic protein (GFAP) (an astrocyte marker), Connexin 43 (Con43) (a member of the gap junction), and gap junctions (GJ) (a marker for the transfer of ions and small molecules) expressions were evaluated. The behavioral evaluation was performed by BBB, Acetone, Von Frey, and radiant heat tests. RESULT: The SCâ€‰+â€‰Nanoâ€‰+â€‰PBMT group exhibited the most remarkable recovery outcomes. Thermal hyperalgesia responses were mitigated, with the combined approach displaying the most effective relief. Mechanical allodynia and cold allodynia responses were also attenuated by treatments, demonstrating potential pain management benefits. CONCLUSION: These findings highlight the potential of PBMT, combined with CeONPs-loaded scaffolds, in promoting functional motor recovery and alleviating pain-related responses following SCI. The study underscores the intricate interplay between various interventions and their cumulative effects, informing future research directions for enhancing neural repair and pain management strategies in SCI contexts. ceric oxide;Cerium Rats;Male;Animals;Low-Level Light Therapy;Pain;Spinal Cord Injuries;Hyperalgesia;Cerium

Novel Application of 1064-nm Picosecond Nd:YAG Laser for Male Androgenetic Alopecia Treatment. BACKGROUND: There are limitations and side effects of currently approved treatments for AGA, such as topical minoxidil, oral finasteride, and low-level light therapy. OBJECTIVE: This study aimed to investigate the potential of fractional picosecond laser (FPL) therapy for promoting hair regrowth. METHODS: This was a pilot study in which five male participants were treated with a 1064-nm FPL for mild-to-moderate AGA. The patients underwent three treatments at four-week intervals, followed by a four-week post-procedure assessment. Expert panel assessment score and patient satisfaction was assessed using a seven-point scale. Dermoscopic analysis was conducted to evaluate hair shafts. Adverse effects were also monitored. RESULTS: Clinical improvement was observed at 1 to 4 months after treatment, with a significant increase in expert panel assessment scores ($p<0.001$). Patient satisfaction with hair density and thickness also improved significantly at 1 and 4 months ($p=0.038$ and $p=0.007$, respectively). Adverse effects were minimal and resolved within a week. Dermoscopic analysis showed minimal petechiae with no hair shaft damage. CONCLUSION: The preliminary study demonstrates the potential of 1064-nm FPL for promoting hair regrowth in male pattern hair loss. Nonetheless, further research is recommended to elucidate and ratify for the optimization of this promising treatment approach.

Photobiomodulation therapy's impact on angiogenesis and osteogenesis in orthodontic tooth movement: in vitro and in vivo study. BACKGROUND: This study explores the effectiveness of Photobiomodulation Therapy (PBMT) in enhancing orthodontic tooth movement (OTM), osteogenesis, and angiogenesis through a comprehensive series of in vitro and in vivo investigations. The in vitro experiments involved co-culturing MC3T3-E1 and HUVEC cells to assess PBMT's impact on cell proliferation, osteogenesis, angiogenesis, and associated gene expression. Simultaneously, an in vivo experiment utilized an OTM rat model subjected to laser irradiation at specific energy densities. METHODS: In vitro experiments involved co-culturing MC3T3-E1 and HUVEC cells treated with PBMT, enabling a comprehensive assessment of cell proliferation, osteogenesis, angiogenesis, and gene expression. In vivo, an OTM rat model was subjected to laser irradiation at specified energy densities. Statistical analyses were performed to evaluate the significance of observed differences. RESULTS: The results revealed a significant increase in blood vessel formation and new bone generation within

the PBMT-treated group compared to the control group. In vitro, PBMT demonstrated positive effects on cell proliferation, osteogenesis, angiogenesis, and gene expression in the co-culture model. In vivo, laser irradiation at specific energy densities significantly enhanced OTM, angiogenesis, and osteogenesis. CONCLUSIONS: This study highlights the substantial potential of PBMT in improving post-orthodontic bone quality. The observed enhancements in angiogenesis and osteogenesis suggest a pivotal role for PBMT in optimizing treatment outcomes in orthodontic practices. The findings position PBMT as a promising therapeutic intervention that could be seamlessly integrated into orthodontic protocols, offering a novel dimension to enhance overall treatment efficacy. Beyond the laboratory, these results suggest practical significance for PBMT in clinical scenarios, emphasizing its potential to contribute to the advancement of orthodontic treatments. Further exploration of PBMT in orthodontic practices is warranted to unlock its full therapeutic potential. Rats;Animals;Osteogenesis;Low-Level Light Therapy;Tooth Movement Techniques;Angiogenesis;Bone and Bones

Outcome of curcumin-based photodynamic therapy in endodontic microsurgery: A case report. INTRODUCTION: Persistent apical periodontitis after root canal treatment may require surgical retreatment when non-surgical options are ineffective or impractical due to anatomical challenges or iatrogenic errors. Endodontic microsurgery (EMS) is a precise technique that aims to overcome extraradicular biofilm and root morphology issues. Photodynamic therapy (PDT) is an emerging supplementary disinfection approach that utilizes a photosensitizer agent and light to eliminate microorganisms through oxidative reactions. REPORT: A 60-year-old male with persistent apical periodontitis in a left maxillary first molar underwent non-surgical root canal retreatment followed by surgical reintervention due to anatomical complexities. During surgery, PDT was performed using a novel curcumin-based photosensitizer agent. After the procedure, the tooth was retrofilled with bioceramic cement, and photobiomodulation was applied to enhance tissue healing. One year post-surgery, the patient exhibited complete periradicular repair and remained asymptomatic. DISCUSSION: EMS is considered a last resort to salvage an endodontically treated tooth and has shown moderate success rates. PDT has demonstrated promise in improving periapical healing and reducing microorganisms. In this case, curcumin, diluted with 2 % chlorhexidine gel, served as an effective photosensitizer agent with antimicrobial properties. Moreover, performing photobiomodulation aided in cell recovery and reduced postoperative discomfort. CONCLUSION: The proposed EMS treatment protocol with PDT using curcumin yielded positive outcomes in this case report. Further randomized clinical trials are necessary to assess the efficacy of this approach in EMS. Additionally, further research on curcumin-based photosensitizer agents encapsulated in nanoparticles and enhanced antimicrobial agents is recommended to refine this treatment protocol for routine use. Curcumin;Photosensitizing Agents Male;Humans;Middle Aged;Curcumin;Microsurgery;Photosensitizing Agents;Photochemotherapy;Periapical Periodontitis

Effectiveness of lasers in direct pulp capping among permanent teeth - A systematic review and meta-analysis. BACKGROUND: Laser-assisted direct pulp capping (DPC) has considerable advantages compared to traditional methods such as: decontaminant effect; hemostatic and coagulant effect; reduced rise in pulp temperature; reduction of intracavitary pressure; dentinal melting; and biostimulation effect. OBJECTIVE: The aim of this study was to conduct a systematic review of the literature and meta-analysis to evaluate the effectiveness of laser as adjuvant therapy in DPC among permanent teeth. METHODS: Research question was formulated based on the population, intervention, comparison, and outcomes strategy. A comprehensive electronic literature search was conducted through Cochrane, PubMed, and Google scholar using MeSH words, text words, and Boolean operators, independently by two reviewers. Based on the specified inclusion and exclusion criteria, the selected articles were subjected to quality assessment and the risk of bias (ROB) was

evaluated. Cochrane ROB 2.0 and Risk Of Bias In Non-randomised Studies - of Interventions (ROBINS-I) tools were used to assess the ROB. RESULTS: Initially, 45 studies recovered, 9 articles were selected for systematic review and 7 articles could be included in the meta-analysis. Teeth treated with low level laser therapy pulp capping therapy showed lower clinical/radiological failure as compared to nonlaser pulp capping therapy with an odds ratio of 0.24 (95% confidence interval = 0.15-0.38; Z = 6.15); and the difference between two groups was statistically significant (P < 0.00001). DISCUSSION: This systematic review and meta-analysis included both the randomized and nonrandomized controlled trial (RCT). The non-RCTs had low ROB when compared to the RCTs included in the study. All included RCT studies met the inclusion and exclusion criteria, but some did not adequately describe their methods in detail. CONCLUSION: Based on the limited evidence, the results of the meta-analysis demonstrated DPC treatment could achieve better clinical outcomes with the aid of lasers.

Selective neural inhibition via photobiomodulation alleviates behavioral hypersensitivity associated with small sensory fiber activation. OBJECTIVE: Photobiomodulation at higher irradiances has great potential as a pain-alleviating method that selectively inhibits small diameter nerve fibers and corresponding sensory experiences, such as nociception and heat sensation. The longevity and magnitude of these effects as a function of laser irradiation parameters at the nerve was explored. METHODS: In a rodent chronic pain model (spared nerve injury-SNI), light was applied directly at the sural nerve with four delivery schemes: two irradiance levels (7.64 and 2.55â€‰W/cm(2)) for two durations each, corresponding to either 4.8 or 14.4â€‰J total energy, and the effect on sensory hypersensitivities was evaluated. RESULTS: At emitter irradiances of 7.64â€‰W/cm(2) (for 240â€‰s), 2.55â€‰W/cm(2) (for 720â€‰s), and 7.64â€‰W/cm(2) (for 80â€‰s) the heat hypersensitivity was relieved the day following photobiomodulation (PBM) treatment by 37â€‰Â±â€‰8.1% (statistically significant, pâ€‰<â€‰0.001), 26%â€‰Â±â€‰6% (pâ€‰=â€‰0.072), and 28â€‰Â±â€‰6.1% (statistically significant, pâ€‰=â€‰0.032), respectively, and all three treatments reduced the hypersensitivity over the course of the experiment (13 days) at a statistically significant level (mixed-design analysis of variance, pâ€‰<â€‰0.05). The increases in tissue temperature (5.3â€‰Â±â€‰1.0 and 1.3â€‰Â±â€‰0.4Â°C from 33.3Â°C for the higher and lower power densities, respectively) at the neural target were well below those typically associated with permanent action potential disruption. CONCLUSIONS: The data from this study support the use of direct PBM on nerves of interest to reduce sensitivities associated with small-diameter fiber activity. Humans;Low-Level Light Therapy;Chronic Pain;Nerve Tissue

New Laser Treatment for Prurigo Nodularis. Humans;Prurigo;Female;Low-Level Light Therapy;Middle Aged;Adult;Lasers, Solid-State;Laser Therapy;Male

Exploring the Safety and Efficacy of Organic Light-Emitting Diode in Skin Rejuvenation and Wound Healing. PURPOSE: Photobiomodulation (PBM), encompassing low-energy laser treatment and light-emitting diode (LED) phototherapy, has demonstrated positive impacts on skin rejuvenation and wound healing. Organic light-emitting diodes (OLEDs) present a promising advancement as wearable light sources for PBM. However, the biological and biochemical substantiation of their skin rejuvenation and wound healing effects remains limited. This study aimed to ascertain the safety and efficacy of OLEDs as a next-generation PBM modality through comprehensive in vitro and in vivo investigations. MATERIALS AND METHODS: Cell viability assays and human ex vivo skin analyses were performed after exposure to OLED and LED irradiation to examine their safety. Subsequent evaluations examined expression levels and wound healing effects in human dermal fibroblasts (HDFs) using quantitative reverse transcription-polymerase chain reaction, enzyme-linked immunosorbent assay, and wound healing assays post-irradiation. Additionally, an in vivo study was conducted using a ultra violet (UV)-irradiated animal skin model to explore the impact of OLED

exposure on dermal collagen density and wrinkles, employing skin replica and tissue staining techniques. RESULTS: OLED irradiation had no significant morphological effects on human skin tissue, but caused a considerably higher expression of collagen than the control and LED-treated groups. Moreover, OLED irradiation reduced the expression levels of matrix metalloproteinases (MMPs) more effectively than did LED on HDFs. OLED irradiation group in HDFs had significantly higher expression levels of growth factors compared to the control group, but similar to those in the LED irradiation group. In addition, OLED irradiation on photo-aged animal skin model resulted in increased collagen fiber density in the dermis while reducing ultra violet radiation-mediated skin wrinkles and roughness, as shown in the skin replica. CONCLUSION: This study established comparable effectiveness between OLED and LED irradiation in upregulating collagen and growth factor expression levels while downregulating MMP levels in vitro. In the UV-irradiated animal skin model, OLED exposure post UV radiation correlated with reduced skin wrinkles and augmented dermal collagen density. Accelerated wound recovery and demonstrated safety further underscore OLEDs' potential as a future PBM modality alongside LEDs, offering promise in the realms of skin rejuvenation and wound healing. Collagen Animals;Humans;Aged;Rejuvenation;Wound Healing;Skin;Phototherapy;Collagen

Effects of Photobiomodulation on High-Intensity Intermittent Anaerobic Performance of Lower Limbs in Brazilian Jiu-Jitsu Athletes: A Randomized, Crossover, Double-Blind Clinical Trial. Photobiomodulation (PBM) has ergogenic effects on aerobic and anaerobic efforts and may improve sports performance. As Brazilian jiu-jitsu (BJJ) fighting requires both aerobic and anaerobic metabolism, so PBM may be effective in increasing the physical performance of BJJ athletes. Thus, this study aimed to verify the effects of PBM with different energy doses (6 or 12 J per point) on high-intensity intermittent anaerobic performance in BJJ athletes. METHODS: Eleven male athletes performed three lower limb Wingate testing sessions. At the beginning of each session, in a randomized, crossover, double-blind fashion, the athletes received PBM with a dose of 6 J (4.5 J/cm(2)) or 12 J (9.1 J/cm(2)), or placebo (PLA) at 17 points in each lower limb. In each session, the squat jump (SJ) and three Wingate test series were performed, with a 3-minute interval between series. Heart rate (HR) was collected immediately before, after each Wingate test, and at 1, 3, and 5 minutes after the last test. The rate of perceived exertion (RPE) was reported after each Wingate test. Differences between Wingate tests and treatment sessions were set at $p<0.05$. RESULTS: No differences were observed between treatments in SJ height, Wingate performance, HR, and RPE ($p>0.05$; for all comparisons). The Wingate test session promoted a reduction in anaerobic capacity in the second and third sets in all conditions, indicating fatigue ($p<0.05$). CONCLUSION: Treatment with PBM did not produce a dose-dependent ergogenic response in high-intensity intermittent performance in BJJ athletes.

A systematic review of trends in photobiomodulation in dentistry between 2018 and 2022: advances and investigative agenda. BACKGROUND: Photobiomodulation (PBM) involves laser therapy utilized in medical sciences to modulate biological processes acting as a palliative and immune response-enhancing treatment. This study conducts a comprehensive bibliometric analysis to explore current trends in PBM-related scientific production, encompassing publications, citations, impact, keywords and clusters. Additionally, it aims to predict future research trends in this domain. METHODS: The data for this quantitative and qualitative bibliometric analysis were obtained from 608 scientific documents retrieved in November 2022, with 123 sourced from Web of Science and 485 from Scopus, Utilizing Excel, the data was processed in Excel to extract essencial information. Productivity and impact were evaluated for eligibility, and VOSviewer aided in determining associativity for the bibliometric analysis. RESULTS: The findings of this study demostrate that the scientific production related to PBM adheres to a growth power law, exhibiting characteristics of both

exponential and linear phases. Notably, recent research trends emphasize critical concepts such as laser therapy, orthodontics, and dental pulp stem cells. Particularly significant is the burgeoning interest in utilizing PBM within dentistry as a complementary alternative to existing protocols. CONCLUSIONS: PBM stands as a promising laser therapy within medical applications. Through a detailed bibliometric analysis, this study underscores the increasing significance of PBM, especially within the realm of dental treatments. These insights offer a glimpse into the evolving landscape of PBM research and provide valuable guidance for potential future directions of study. Low-Level Light Therapy;Bibliometrics;Dentistry

In vitro differentiation of human amniotic epithelial stem cells into keratinocytes regulated by OPN3. Human amniotic epithelial stem cells (hAESCs) are regarded as potential alternatives to keratinocytes (KCs) used for skin wound healing. Light is an alternative approach for inducing stem cell differentiation. Opsins (OPNs), a family of light-sensitive, G protein-coupled receptors, play a multitude of light-dependent and light-independent functions in extraocular tissues. However, it remains unclear whether the light sensitivity and function of OPNs are involved in light-induced differentiation of hAESCs to KCs. Herein, we determine the role of OPNs in differentiation of hAESCs into KCs through cell and molecular biology approaches inÂ vitro. It is shown that mRNA expression of OPN3 in the amniotic membrane and hAESCs was higher than the other four primary OPNs by RT-qPCR analysis. Changes in OPN3 gene expression had a significant impact on cell proliferation, stemness and differentiation capability of hAESCs. Furthermore, we found a significant upregulation of OPN3, KRT5 and KRT14 with hAESCs treated at 3â€‰Ã—â€‰33â€‰J/cm(2) irradiation from blue-light LED. Taken together, these results suggest that OPN3 acts as a positive regulator of differentiation of hAESCs into KCs. This study provides a novel insight into photosensitive OPNs associated with photobiomodulation(PBM)-induced differentiation in stem cells. OPN3 protein, human;Receptors, G-Protein-Coupled;Rod Opsins Humans;Cell Differentiation;Cell Proliferation;Keratinocytes;Receptors, G-Protein-Coupled;Rod Opsins;Stem Cells

The effect of adjunctive LASER application on periodontal ligament stem cells. Periodontal regeneration involves the composite action of cell, scaffolds and signaling molecules. There are numerous autologous sources of regenerative cells which are present close to the vicinity of the periodontally debilitated site, the primary one being the periodontal ligament stem cell, which is believed to have a key role in regeneration. Various methods can be harnessed to optimize and enhance the regenerative potential of PDLSCs such as the application of LASERs. In the last few years there have been various studies which have evaluated the effect of different types of LASERs on PDLSCs and the present review summarizes the photo-biomodulative activity of LASERs in general and its beneficial role in the stimulation of PDLSC specifically.

Photobiomodulation Using Light-Emitting Diode (LED) for Treatment of Retinal Diseases. Photobiomodulation (PBM) is a type of phototherapy that employs light-emitting diodes (LEDs) or low-power lasers to selectively administer specific wavelengths of visible light, ranging from 500 to 1000 nm, including near-infrared (NIR) wavelengths. LEDs are advantageous compared to lasers due to their ability to treat large areas at a lower cost, lack of tissue damage potential in humans, and reduced risk of eye-related accidents. The ophthalmology community has recently taken interest in PBM as a promising novel approach for managing various retinal conditions such as age-related macular degeneration, retinopathy of prematurity, retinitis pigmentosa, diabetic retinopathy, Leber's hereditary optic neuropathy, amblyopia, methanol-induced retinal damage, and potentially others. This review critically assesses the existing body of research on PBM applications in the retina, focusing on elucidating the underlying mechanisms of action and evaluating the clinical outcomes associated with this therapeutic modality.

Effect of photobiomodulation on inflammatory cytokines produced by HaCaT keratinocytes. OBJECTIVE: to evaluate the effects of the red and near-infrared wavelength lasers in isolated and simultaneous way on the modulation of inflammatory cytokines produced by human keratinocytes (HaCaT) challenged by cytokines of human monocytes stimulated by lipopolysaccharide from Escherichia coli. DESIGN: HaCaT cells was previously exposed to the laser with wavelengths red (660Â nm), near-infrared (808Â nm). Then, HaCat cells were stimulated with the supernatant of lipopolysaccharide-challenged peripheral blood cells. The cytokines expressed by HaCat cells were measured using multiplex CBA assay. RESULTS: HaCaT cells increased the production of inflammatory cytokines when stimulated with infrared laser compared to the control group (IFN-Î±2, IFN-Î³, TNF-Î±, MCP-1, IL-6, IL-8, IL-10, IL -12p70, IL -17A, IL-23, IL-33), the red laser group (IFN-Î³ and IL-23) and the group of two lasers used simultaneously (IFN-Î±2, IFN-Î³, IL-6 and IL-8, IL-17A, IL-18 and IL-23) (pÂ <Â 0.05). The red laser also stimulated an increase in the expression of IFN-Î±2 by HaCaT cells in relation to the control group (pÂ <Â 0.05). CONCLUSION: Infrared laser, with an energy density of 5Â J/cm(2), appear to be able to modulate inflammatory cytokines produced by HaCaT cells challenged by human monocyte cytokines.

Improving human sperm motility via red and near-infrared laser irradiation: in-vitro study. Improved sperm motility is necessary for successful sperm passage through the female genital system, efficacious fertilization, and a greater probability of pregnancy. By stimulating the mitochondrial respiratory chain, low-level laser photobiomodulation has been shown to increase sperm motility and velocity. The respiratory chain in mitochondria is the primary site of action for cytochrome c oxidase because it can absorb light in the visible and infrared ranges. The present study aimed to investigate the effects of red laser 650 nm, near infrared laser (NIR) 980 nm, and combination of both on human spermatozoa motility and DNA integrity at different doses. An in-vitro controlled trial was performed in Al Zahraa university hospital laboratory using thirty fresh human semen specimens. Samples were exposed to red laser 650 nm, near infrared laser (NIR) 980 nm, and combination of both for various irradiation times. Sperm motility for the test and control aliquots was assessed as recommended in the manual of WHO-2021. Sperm chromatin integrity was evaluated using the Sperm Chromatin Structure Assay. Results revealed almost 70%, 80% and 100% increase in the total motility after 3 min of the 650-nm, 980-nm and the combined laser irradiation, respectively. Additionally, the Sperm Chromatin Dispersion assay was carried out on sperm heads utilizing human sperm DNA fragmentation, demonstrating that none of the three laser types had any discernible effects. Chromatin Pregnancy;Humans;Male;Female;Sperm Motility;Semen;Spermatozoa;Lasers;Chromatin

Efficacy of photobiomodulation in the treatment of avulsed teeth: A systematic review of animal studies. The objective of this systematic review was to evaluate the effectiveness of photobiomodulation therapy (PBM) in managing avulsed teeth. This systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (i.e., "PRISMA") statement 2020 and was registered in the International Prospective Register of Systematic Reviews (i.e., PROSPERO) with number CRD42022362198. The participants, intervention, comparison, outcomes, and study design (i.e., PICOS) for the present study considered the following question: "Does the use of laser PBM in the treatment of teeth with avulsion influence tissue repair performance?" A literature search was performed in PubMed/MEDLINE, Embase, Web of Science, Cochrane Library, and ProQuest databases until January 2023. The SYRCLE's RoB tool (Systematic Review Center for Laboratory Animal Experimentation) for animal studies were used for quality assessment. A total of 7 in vivo studies published between 2011 and 2018 were included in this systematic review for qualitative analysis. All studies used Wistar rats, totaling 368 specimens that simulated tooth avulsion trauma. The effect of photodynamic therapy in the treatment of avulsed

teeth was positive in 5 studies (significant increase in tissue repair) and negative in 2 studies, in which both studies with negative results kept teeth in saline solution before reimplantation and showed the longest time and power of laser application. PBM appears to be effective for tissue repair in the treatment of avulsed teeth, depending on the means of conservation of the avulsed tooth and the laser application protocol. Animals;Rats;Low-Level Light Therapy;Photochemotherapy;Rats, Wistar;Tooth;Tooth Avulsion
Therapeutic efficacy and safety of home-based portable laser irradiation on patients with wrist pain: a single-blinded randomized controlled trial. The purpose of this study is to confirm the effect of small, portable low-level laser therapy (light sources in square configuration: 830Â nm GaAs diode 3.2 mW at the center, 4â€‰Ã—â€‰650Â nm InGaAIP diodes over the corners) treatment in reducing and enhancing hand function in patients with wrist pain. This study was a prospective, randomized, sham-controlled, and home-based self-therapy trial. A total of thirty subjects with wrist pain were enrolled. All participants received low-level laser therapy on painful area at the wrist. The experimental group (nâ€‰=â€‰15) received laser stimulation, while the control group (nâ€‰=â€‰15) received sham stimulation using identical equipment that generated only a red light without the laser output. Both groups self-treated for 30Â min a day, 5Â days per week for 3Â weeks, total of 15 sessions. The primary outcome was assessed using a visual analogue scale (VAS) for wrist pain from 0 (painless) to 10 (extreme pain). The secondary outcomes were measured with patient-rated wrist evaluation (PRWE), grip strength, lateral, palmar, and tip pinch strength. Measures were taken before and after treatment. A total of thirty participants provided outcome data. After the intervention, both groups showed a significant decrease in VAS score, from 4.93 to 3.67 in experimental group, from 5.53 to 4.00 in control group (the experiment group: pâ€‰=â€‰0.020, the control group: pâ€‰=â€‰0.003). The experimental group showed a significant improvement in function scale score (pâ€‰=â€‰0.012), the control group did not. Lateral and pinch strength was significantly improved in the experimental group (pâ€‰=â€‰0.017) and in the control group (pâ€‰=â€‰0.034) respectively. There were no side effects in the patients. Medical laser irradiation is a portable and easy-to-use laser irradiator without side effects. Clinical Trial Registration number: KCT0006604. Humans;Wrist;Prospective Studies;Pain;Low-Level Light Therapy;Activities of Daily Living;Treatment Outcome
Achieving the maximum efficacy by combining non-ablative fractional laser with vitamin C, vitamin E and ferulic acid serum for skin quality improvement in Asian population. ferulic acid;Ascorbic Acid;Vitamin E;Coumaric Acids Humans;Ascorbic Acid;Vitamin E;Female;Coumaric Acids;Skin Aging;Asian People;Combined Modality Therapy;Adult;Middle Aged;Male;Low-Level Light Therapy;Cosmetic Techniques;Treatment Outcome
A randomized clinical trial on the changing of median nerve cross-sectional area and pain after extracorporeal shock wave and low-level laser therapy added to conventional physical therapy in patients with mild-to-moderate carpal tunnel syndrome. BACKGROUND: Carpal tunnel syndrome (CTS) is the most common mononeuropathy in the upper limb. It remains uncertain whether adding extracorporeal shockwave therapy (ESWT) or low-level laser therapy (LLLT) to conventional treatment benefits CTS patients. PURPOSE: This study aimed to compare the effectiveness of ESWT and LLLT in conjunction with conventional treatments (including carpal mobilization, transcutaneous electrical nerve stimulation, and ultrasound) on the cross-sectional area (CSA) of the median nerve and pain in mild-to-moderate CTS patients. STUDY DESIGN: This was a single-blinded randomized clinical trial with registration number IRCT20220504054734N1. METHODS: Thirty-six patients were randomly assigned using block balanced randomization to receive either four sessions of ESWT or 10 sessions of LLLT in addition to 10 sessions of conventional treatments over 2Â weeks. Patients received numbered closed envelopes indicating their treatment group. CSA (primary) and pain (secondary) in

18 patients who completed the treatment were assessed at baseline and after 2Â weeks by a blinded assessor. Paired and independent sample t-tests were used for analyses due to the normal distribution of data was checked by Kolmogorov-Smirnoff. Cohen's d effect size was used to assess the intervention's magnitude. RESULTS: Both ESWT and LLLT groups showed significant improvements in CSA (pÂ =Â 0.002) and pain (pÂ <Â 0.001) from baseline to posttreatment. CSA improvement was moderate for ESWT (mean difference: 1.2, 95% CI 0.51-1.9) and mild for LLLT (mean difference: 0.76, 95% CI 0.4-1.14). Conversely, pain improvement was substantial in both groups (ESWT: mean difference 4.4, 95% CI 3.6-5.3; LLLT: mean difference 4.4, 95% CI 3.7-5.2). No substantial differences between ESWT and LLLT were observed, highlighting their comparable efficacy. CONCLUSION: The addition of either LLLT or ESWT to conventional treatment effectively reduced pain and median nerve CSA in mild-to-moderate CTS. The absence of significant differences between ESWT and LLLT indicates their comparable efficacy in pain relief and CSA reduction.

Red light mediates the exocytosis of vasodilatory vesicles from cultured endothelial cells: a cellular, and ex vivo murine model. We have previously established that 670Â nm energy induces relaxation of blood vessels via an endothelium derived S-nitrosothiol (RSNO) suggested to be embedded in vesicles. Here, we confirm that red light facilitates the exocytosis of this vasodilator from cultured endothelial cells and increases ex vivo blood vessel diameter. Ex vivo pressurized and pre-constricted facial arteries from C57Bl6/J mice relaxed 14.7% of maximum diameter when immersed in the medium removed from red-light exposed Bovine Aortic Endothelial Cells. In parallel experiments, 0.49Â nM RSNO equivalent species was measured in the medium over the irradiated cells vs dark control. Electron microscopy of light exposed endothelium revealed significant increases in the size of the Multi Vesicular Body (MVB), a regulator of exosome trafficking, while RSNO accumulated in the MVBs as detected with immunogold labeling electron microscopy (1.8-fold of control). Moreover, red light enhanced the presence of F-actin related stress fibers (necessary for exocytosis), and the endothelial specific marker VE-cadherin levels suggesting an endothelial origin of the extracellular vesicles. Flow cytometry coupled with DAF staining, an indirect sensor of nitric oxide (NO), indicated significant amounts of NO within the extracellular vesicles (1.4-fold increase relative to dark control). Therefore, we further define the mechanism on the 670Â nm light mediated traffic of endothelial vasodilatory vesicles and plan to leverage this insight into the delivery of red-light therapies. Nitric Oxide Animals;Cattle;Mice;Endothelial Cells;Disease Models, Animal;Red Light;Nitric Oxide;Cells, Cultured;Exocytosis;Endothelium

Parkinson's Disease and Photobiomodulation: Potential for Treatment. Parkinson's disease is the second most common neurodegenerative disease and is increasing in incidence. The combination of motor and non-motor symptoms makes this a devastating disease for people with Parkinson's disease and their care givers. Parkinson's disease is characterised by mitochondrial dysfunction and neuronal death in the substantia nigra, a reduction in dopamine, accumulation of Î±-synuclein aggregates and neuroinflammation. The microbiome-gut-brain axis is also important in Parkinson's disease, involved in the spread of inflammation and aggregated Î±-synuclein. The mainstay of Parkinson's disease treatment is dopamine replacement therapy, which can reduce some of the motor signs. There is a need for additional treatment options to supplement available medications. Photobiomodulation (PBM) is a form of light therapy that has been shown to have multiple clinical benefits due to its enhancement of the mitochondrial electron transport chain and the subsequent increase in mitochondrial membrane potential and ATP production. PBM also modulates cellular signalling and has been shown to reduce inflammation. Clinically, PBM has been used for decades to improve wound healing, treat pain, reduce swelling and heal deep tissues. Pre-clinical experiments have indicated that PBM has the potential to improve the clinical signs of Parkinson's disease and to provide neuroprotection. This effect is seen whether the PBM is directed to the head of the animal or

to other parts of the body (remotely). A small number of clinical trials has given weight to the possibility that using PBM can improve both motor and non-motor clinical signs and symptoms of Parkinson's disease and may potentially slow its progression.

Low-level laser for the management of head-and-neck burn wounds. Burn injuries are of serious concern worldwide not only because of the physical impact but also because of severe mental and emotional distress and reduced quality of life. The usual management comprises topical and systemic medications, and supportive care; however, conventional therapy may be expensive and insufficient for many cases. Thus, we describe herein a unique case in which a low-level laser was used concomitantly with the conventional approach for the management of head and neck burn wounds and could improve the patient's clinical condition within a short period.

Effectiveness of concentrated growth factor and laser therapy on wound healing, inferior alveolar nerve injury and periodontal bone defects post-mandibular impacted wisdom tooth extraction: A randomized clinical trial. The extraction of wisdom teeth with mandibular impact frequently results in complications including damage to the inferior alveolar nerve (IAN) and malformations of the bone. The objective of this research endeavour was to assess the efficacy of low-level laser therapy and concentrated growth factor (CGF) in facilitating nerve recovery and wound healing in such instances. A total of thirty-one patients (mean age 27.52â€‰Â±â€‰5.79â€‰years) who presented with IAN injury after extraction were randomly assigned to one of three groups: control group (which received oral mecobalamin), CGF group (which received CGF gel applied to the extraction sockets) and laser group (which received low-level lasers (808â€‰nm, 30â€‰mW, 10â€‰J/cm(2))) at the extraction site. Patients' recovery from IAN paresthesia was evaluated seven times over the course of 14â€‰days utilizing visual analogue scale (VAS) and the pinprick test (PP). At multiple intervals following surgery, periodontal probing and bone level measurements were utilized to assess the recovery of both soft and hard tissues. The findings revealed that, compared with the control group, both the CGF and laser treatment groups exhibited a markedly greater improvement in VAS scores and wound healing of soft tissues, as well as in PP results (pâ€‰<â€‰0.001), indicating enhanced wound healing processes. Despite these improvements, there was no significant difference in wound healing outcomes between the CGF and laser groups. Notably, the CGF group showed a statistically significant improvement in healing bone defects at 30 and 90â€‰days post-treatment compared with the control group (pâ€‰=â€‰0.003 and pâ€‰=â€‰0.004, respectively), underscoring its effectiveness in bone healing as a critical aspect of the overall wound healing process. However, in terms of other wound healing comparisons, no significant differences were observed. CGF and laser therapy significantly enhanced the healing of wounds, including soft tissue and bone recovery, in addition to accelerating the recovery of IAN injuries following mandibular wisdom tooth extraction. Although both treatments were equally effective in nerve recovery, CGF notably excelled in promoting bone healing, suggesting its pivotal role in comprehensive wound healing. This highlights that both CGF and laser therapy are viable options for not only nerve recovery but also for overall wound healing in such dental procedures. Intercellular Signaling Peptides and Proteins Humans;Young Adult;Adult;Molar, Third;Low-Level Light Therapy;Tooth, Impacted;Wound Healing;Intercellular Signaling Peptides and Proteins;Mandibular Nerve

Photobiomodulation and conditioned medium of adipose-derived stem cells for enhancing wound healing in rats with diabetes: an investigation on the proliferation phase. This investigation tried to evaluate the combined and solo effects of photobiomodulation (PBM) and conditioned medium derived from human adipose tissue-derived stem cells (h-ASC-CM) on the inflammatory and proliferative phases of an ischemic infected delayed healing wound model (IIDHWM) in rats with type I diabetes mellitus (TIDM). The present investigation consisted of four groups: group 1 served as the

control, group 2 treated with h-ASC-CM, group 3 underwent PBM treatment, and group 4 received a combination of h-ASC-CM and PBM. Clinical and laboratory assessments were conducted on days 4 and 8. All treatment groups exhibited significantly higher wound strength than the group 1 (pâ€‰=â€‰0.000). Groups 4 and 3 demonstrated significantly greater wound strength than group 2 (pâ€‰=â€‰0.000). Additionally, all therapeutic groups showed reduced methicillin -resistant Staphylococcus aureus (MRSA) in comparison with group 1 (pâ€‰=â€‰0.000). While inflammatory reactions, including neutrophil and macrophage counts, were significantly lower in all therapeutic groups rather than group 1 on days 4 and 8 (pâ€‰<â€‰0.01), groups 4 and 3 exhibited superior results compared to group 2 (pâ€‰<â€‰0.01). Furthermore, proliferative activities, including fibroblast and new vessel counts, as well as the measurement of new epidermal and dermal layers, were significantly increased in all treatment groups on 4 and 8 days after the surgery (pâ€‰<â€‰0.001). At the same times, groups 4 and 3 displayed significantly higher proliferative activities compared to group 2 (pâ€‰<â€‰0.001). The treatment groups exhibited significantly higher mast cell counts and degranulation phenotypes in comparison with the group 1 on day 4 (pâ€‰<â€‰0.05). The treatment groups showed significantly lower mast cell counts and degranulation phenotypes than group 1 on day 8 (pâ€‰<â€‰0.05).The combined and individual application of h-ASC-CM and PBM remarkably could accelerate the proliferation phase of wound healing in the IIDHWM for TIDM in rats, as indicated by improved MRSA control, wound strength, and stereological evaluation. Furthermore, the combination of h-ASC-CM and PBM demonstrated better outcomes compared to the individual application of either h-ASC-CM or PBM alone. Culture Media, Conditioned Humans;Animals;Rats;Culture Media, Conditioned;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Diabetes Mellitus;Leukocyte Count;Stem Cells;Wound Healing;Cell Proliferation

Low-level Laser Therapy to Alleviate Pain of Local Anesthesia Injection in Children: A Randomized Control Trial. AIM: The aim of our study was to evaluate and compare pain perception following photobiomodulation (PBM), topical anesthesia, precooling of the injection site, and vibration during administration of local anesthesia injection in pediatric patients aged 6-13 years. MATERIALS AND METHODS: In this split-mouth study, a total of 120 patients between the age group of 6 and 13 years were selected and randomly divided into three equal groups with 40 subjects in each. Pain was assessed using visual analog scale (VAS) and the Wong-Baker Faces Pain Rating Scale after the administration of local anesthesia. Behavior during the procedure was assessed using the Face, Legs, Activity, Cry, Consolability (FLACC) scale filled by the operator. Pulse rate was recorded before and during the administration of local anesthesia using pulse oximeter. After the procedure, patient compliance was also recorded using validated questionnaire. The level of significance was set at $p < 0.05$. RESULTS: The study showed PBM exhibited the lowest mean scores of anxiety/pain using VAS, Wong-Baker Faces Pain Rating Scale, FLACC scale and pulse rate as compared to precooling, vibration, and topical anesthesia. The differences in pain scores recorded were found to be statistically significant. Children were not anxious about the PBM method and exhibited good compliance ($p < 0.001$). CONCLUSION: Photobiomodulation (PBM) was found to be effective means of reducing injection pain, demonstrating much better efficacy than other tested methods. CLINICAL SIGNIFICANCE: Photobiomodulation (PBM) can be used effectively to better manage procedures that patients frequently find painful without the need for prescription drugs, which frequently have several side effects. HOW TO CITE THIS ARTICLE: Khan BS, Setty JV, Srinivasan I, et al. Low-level Laser Therapy to Alleviate Pain of Local Anesthesia Injection in Children: A Randomized Control Trial. Int J Clin Pediatr Dent 2023;16(S-3):S283-S287.

Efficacy of photobiomodulation therapy combined with mobile health education in patients with head and neck cancer suffering from chronic xerostomia after radiotherapy: protocol for a three-arm,

randomised, placebo-controlled, double-blinded study. INTRODUCTION: The role of photobiomodulation (PBM) therapy for oral tissue damage induced by cancer treatment is currently unclear, and there is low-quality to moderate-quality evidence supporting the use of this approach for treating xerostomia and/or hyposalivation. Consequently, patients with head and neck cancer increasingly turn to basic oral hygiene to alleviate salivary gland dysfunction, and their adherence can be improved by mobile health (mHealth) education. The primary objective of this study will be to analyse the effects of different doses of PBM therapy (7.5 J/cm(2) vs 3 J/cm(2)) plus mHealth education on quality of life (QoL), oral health, salivary secretion and salivary gland ultrasound assessment at postintervention and at the 6-month follow-up in patients with head and neck cancer after radiotherapy compared with those in control group. METHODS AND ANALYSIS: A prospective, three-arm, randomised, placebo-controlled, double-blinded study will be conducted among patients with head and neck cancer suffering from chronic xerostomia. A total of 20 patients per arm will be included and randomly assigned to receive 7.5 J/cm(2) of PBM, 3 J/cm(2) of PBM or placebo therapy. PBM therapy will be applied during 24 sessions at 22 points extra and intraorally two times per week for 3 months, combined with a mobile application (https://www.laxer.es). The assessments will be recorded at the beginning of the study, at postintervention and at the 6-month follow-up. The primary outcomes will be QoL, oral health, salivary secretion and salivary gland ultrasound. The pain pressure threshold, functional performance, mood and sleep quality will be secondary indicators. ETHICS AND DISSEMINATION: This study received ethics approval from the Andalusian Biomedical Research Ethics Portal (2402-N-21 CEIM/CEI Provincial de Granada) according to the Declaration of Helsinki for Biomedical Research. The results of this study will be presented at national and international conferences and published in peer-reviewed journals. TRIAL REGISTRATION NUMBER: ClinicalTrials.gov NCT05106608. Humans;Low-Level Light Therapy;Quality of Life;Prospective Studies;Health Education;Xerostomia;Head and Neck Neoplasms;Randomized Controlled Trials as Topic

Effects of amber LED on inflammatory and regulatory monocytes and lymphocytes. The primary objective of the present study was to assess the impact of amber LED photobiomodulation (PBM) on human monocytes and lymphocytes that were polarized into proinflammatory and regulatory/reparative phenotypes. Human leukocytes were polarized with LPS or LPSÂ +Â IL-4 for 2Â h and irradiated after 2 and 6Â h with amber LED (590Â nm). Cell absorbance spectrum and gene and protein expression of IL-1Î², IL-6, IL-10, IL-17, TNF-Î± and IFNÎ³ determined after 24Â h. The results showed that irradiation did not significantly alter absorbance of non-polarized monocytes, whereas irradiated polarized monocytes presented reduction in absorbance in 625-850Â nm region. Irradiated monocytes polarized with LPSÂ +Â IL-4 presented reduction in absorbance in 600-725Â nm region compared to non-irradiated group. Irradiated non-polarized lymphocytes presented absorbance peaks between 650 and 820Â nm not seen in non-irradiated group. No difference was found in absorbance pattern of polarized lymphocytes after irradiation. Irradiation led to reduction in protein synthesis of IL-6 and TNFÎ± in monocytes polarized to proinflammatory phenotype and increase in production of IL-17 in lymphocytes. Irradiation reduced production of IL-10 in monocytes and lymphocytes polarized to immunoregulatory phenotype. In conclusion, amber LED modulates light absorbance and expression of important cytokines in inflammatory/repair processes in monocytes and lymphocytes. Interleukin-10;Interleukin-6;Interleukin-17;Interleukin-4;Lipopolysaccharides;Cytokines;Tumor Necrosis Factor-alpha Humans;Monocytes;Interleukin-10;Interleukin-6;Interleukin-17;Interleukin-4;Lipopolysaccharides;Cells, Cultured;Cytokines;Lymphocytes;Tumor Necrosis Factor-alpha

Efficacy of photobiomodulation therapy in the management of oral mucositis in patients with head and neck cancer: A systematic review and meta-analysis of randomized controlled trials.

Numerous studies have examined the effectiveness of photobiomodulation therapy (PBMT) in reducing chemoradiotherapy (CRT)-induced oral mucositis (OM) in patients with head and neck cancer (HNC). Despite this, there is an urgent need to update the meta-analyses on this topic. This meta-analysis aims to explore the impact of PBMT on CRT-induced OM in these patients. We conducted a systematic search in PubMed, Embase, Cochrane, LILACS, and Web of Science from January 2000 to October 2023. This search focused on randomized controlled trials (RCTs) that assessed the effects of PBMT on CRT-induced OM. The study included a total of 14 RCTs encompassing 869 patients with HNC. The incidence of OM in the PBMT group was significantly lower from the second week onwards compared to the control group (RRâ€‰=â€‰0.49, CIâ€‰=â€‰0.25-0.97, I(2) â€‰=â€‰71%, pâ€‰=â€‰0.04), and this was present until the seventh week (RRâ€‰=â€‰0.77, CIâ€‰=â€‰0.61-0.99, I(2) â€‰=â€‰89%, pâ€‰=â€‰0.04). Furthermore, the occurrence of severe mucositis in the PBMT group decreased from the third week (RRâ€‰=â€‰0.51, CIâ€‰=â€‰0.29-0.90, I(2) â€‰=â€‰12%, pâ€‰=â€‰0.02) until the conclusion of the intervention (RRâ€‰=â€‰0.45, CIâ€‰=â€‰0.24-0.85, I(2) â€‰=â€‰80%, pâ€‰=â€‰0.01). Additionally, PBMT showed beneficial effects in alleviating OM-related pain (WMDâ€‰=â€‰-1.09, 95% CIâ€‰=â€‰-1.38 to -0.880, I(2) â€‰=â€‰13%, pâ€‰<â€‰0.00001). The use of He-Ne or InGaAlP lasers with a power range of 10-25â€‰mW demonstrated the most favorable outcomes in preventing and treating OM. PBMT has shown considerable efficacy in reducing the incidence, severity, and pain associated with OM in patients with HNC. Future studies are encouraged to further investigate the most effective parameters for PBMT in the management of OM. Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Head and Neck Neoplasms;Stomatitis;Mucositis;Pain

Editorial: Photobiomodulation and phototherapy in skin diseases.

Comments on: "The effectiveness of high-intensity laser therapy in individuals with neck pain: a systematic review and meta-analysis". Humans;Neck Pain;Low-Level Light Therapy;Laser Therapy

Photobiomodulation therapy (red/NIR LEDs) reduced the length of stay in intensive care unit and improved muscle function: A randomized, triple-blind, and sham-controlled trial. CONTEXT: Photobiomodulation therapy (PBMT) has been widely used to improve strength, fatigue resistance and increase muscle mass in healthy individuals. These effects could help critically ill patients admitted to intensive care units (ICUs) who show reduced mobility and muscle strength. ICU-acquired weakness lessens overall health and increases the patient's length of stay in the ICU. OBJECTIVE: This study evaluated the effects of PBMT using low intensity light-emitting diodes (LEDs) on the mobility and muscle strength (functional capacity) and length of stay of patients admitted to hospital ICU. METHODS: This randomized, triple-blind, sham-controlled trial was conducted in a hospital ICU. Sixty patients were randomly assigned to two equal groups: (a) PBMT and (b) Sham. PBMT was applied daily to patients until their discharge from the ICU, using a flexible neoprene array of 264 LEDs (120 at 635â€‰nm, 1.2â€‰mW each; 144 at 880â€‰nm, 15â€‰mW each) for 90s (207.36 Joules) at each site. Ten sites were located bilaterally on the thighs, legs, arms, and forearms ventrally and dorsally, 15â€‰min totaling 2,073.6Â Joules per session. Outcomes were length of stay (in h) until discharge from the ICU, muscle strength by the Medical Research Council (MRC) score and handgrip dynamometry (HGD), patient mobility by Intensive Care Unit Mobility Scale (IMS) and the Simplified Acute Physiology Score 3 (SAPS 3) for predicting mortality of patients admitted to the ICU. RESULTS: PBMT reduced the average length of stay in the ICU by ~30% (pâ€‰=â€‰0.028); increased mobility (IMS: 255% vs. 110% pâ€‰=â€‰0.007), increased muscle strength (MRC: 12% vs. -9% pâ€‰=â€‰0.001) and HGD (34% vs. -13% pâ€‰<â€‰0.001), and the SAPS3 score was similar

(pâ€‰>â€‰0.05). CONCLUSION: The results suggest that daily PBMT can reduce the length of stay of ICU patients and increase muscle strength and mobility.

Outcome of eight working dogs with fibrotic myopathy following extracorporeal shockwave and rehabilitation therapy: a case series. INTRODUCTION: Fibrotic myopathy of the gracilis, semitendinosus, and semimembranosus is described primarily in working German Shepherd dogs. The purpose of this case series is to describe the rehabilitation modalities and treatments utilized in working dogs with fibrotic myopathy and the time frame they were able to continue working. METHODS: Medical records of patients with hindlimb lameness that were presented to the Schwarzman Animal Medical Center in New York City from 2012 to 2023 were retrospectively searched. Signalment, history, clinical evaluation, gait analysis, goniometry of stifles, and follow-up evaluation were compared among patients. Ten male working dogs met inclusion criteria. Extracorporeal Shockwave Therapy (ECSWT) was administered under sedation or general anesthesia. Rehabilitation therapy (RT), including massage, hamstring stretch, photobiomodulation, pulsed electromagnetic field therapy, warm compress, therapeutic ultrasound, underwater treadmill, and therapeutic exercises, were performed once every one to 3 weeks with varying protocols according to patient assessments. Follow-up phone calls and emails were conducted to determine long-term outcome. RESULTS: On average, dogs were able to work full-time for 32.1 months (range 6-82; SD 23.6) from the time of diagnosis. No activity limitation was reported by the owners/handlers. DISCUSSION: This report is the first to describe non-invasive medical treatments that may extend the working ability of dogs diagnosed with fibrotic myopathy. Further prospective randomized controlled studies are needed to demonstrate the efficacy of ECSWT and RT for treating fibrotic myopathy. CONCLUSION: The results of this retrospective study suggest that the combination of ECSWT and RT may allow working dogs with fibrotic myopathy to continue their working capacity for an extended period of time.

Identification by methods of steady-state and kinetic spectrofluorimetry of endogenous porphyrins and flavins sensitizing the formation of reactive oxygen species in cancer cells. The question about acceptor molecules of optical radiation that determine the effects of photobiomodulation in relation to various types of cells still remains the focus of attention of researchers. This issue is most relevant for cancer cells, since, depending on the parameters of optical radiation, light can either stimulate their growth or inhibit them and lead to death. This study shows that endogenous porphyrins, which have sensitizing properties, may play an important role in the implementation of the effects of photobiomodulation, along with flavins. For the first time, using steady-state and kinetic spectrofluorimetry, free-base porphyrins and their zinc complexes were discovered and identified in living human cervical epithelial carcinoma (HeLa) cells, as well as in their extracts. It has been shown that reliable detection of porphyrin fluorescence in cells is hampered by the intense fluorescence of flavins due to their high concentration (micromolar range) and higher (compared to tetrapyrroles) fluorescence quantum yield. Optimization of the spectral range of excitation and the use of extractants that provide multiple quenching of the flavin component while increasing the emission efficiency of tetrapyrroles makes it possible to weaken the contribution of the flavin component to the recorded fluorescence spectra.

The Remodulation of Actin Bundles during the Stimulation of Mitochondria in Adult Human Fibroblasts in Response to Light. Î²-actin belongs to cytoskeletal structures that change dynamically in cells according to various stimuli. Human skin can be considered as an organ that is very frequently exposed to various stress factors, of which light plays an important role. The present study focuses on adult human fibroblasts exposed to two types of light stress. Orange light with a wavelength of 590 nm was used here to stimulate the photosensitizer localized in the cells as a residual dose of photodynamic therapy (PDT). On the other hand, near-infrared light with a

wavelength of 808 nm was considered for photobiomodulation (PBM), which is often used in healing processes. Confocal fluorescence microscopy was used to observe changes in intercellular communication, mitochondrial structures, and cytoskeletal dynamics defined by the remodulation of Î²-actin of fibroblasts. The number of Î²-actin bundles forming spherical structures was detected after light exposure. These structures as Î²-actin oligomers were confirmed with super-resolution microscopy. While PDT led to the disintegration of actin oligomers, PBM increased their number. The interaction of Î²-actin with mitochondria was observed. The combination of PDT and PBM treatments is important to minimize the side effects of cancer treatment with PDT on healthy cells, as shown by the cell metabolism assay in this work. In this work, Î²-actin is presented as an important parameter that changes and is involved in the response of cells to PDT and PBM.

Optimization of a Photobiomodulation Protocol to Improve the Cell Viability, Proliferation and Protein Expression in Osteoblasts and Periodontal Ligament Fibroblasts for Accelerated Orthodontic Treatment. Numerous pieces of evidence have supported the therapeutic potential of photobiomodulation (PBM) to modulate bone remodeling on mechanically stimulated teeth, proving PBM's ability to be used as a coadjuvant treatment to accelerate orthodontic tooth movement (OTM). However, there are still uncertainty and discourse around the optimal PBM protocols, which hampers its optimal and consolidated clinical applicability. Given the differential expression and metabolic patterns exhibited in the tension and compression sides of orthodontically stressed teeth, it is plausible that different types of irradiation may be applied to each side of the teeth. In this sense, this study aimed to design and implement an optimization protocol to find the most appropriate PBM parameters to stimulate specific bone turnover processes. To this end, three levels of wavelength (655, 810 and 940 nm), two power densities (5 and 10 mW/cm(2)) and two regimens of single and multiple sessions within three consecutive days were tested. The biological response of osteoblasts and periodontal ligament (PDL) fibroblasts was addressed by monitoring the PBM's impact on the cellular metabolic activity, as well as on key bone remodeling mediators, including alkaline phosphatase (ALP), osteoprotegerin (OPG) and receptor activator of nuclear factor Îº-B ligand (RANK-L), each day. The results suggest that daily irradiation of 655 nm delivered at 10 mW/cm(2), as well as 810 and 940 nm light at 5 mW/cm(2), lead to an increase in ALP and OPG, potentiating bone formation. In addition, irradiation of 810 nm at 5 mW/cm(2) delivered for two consecutive days and suspended by the third day promotes a downregulation of OPG expression and a slight non-significant increase in RANK-L expression, being suitable to stimulate bone resorption. Future studies in animal models may clarify the impact of PBM on bone formation and resorption mediators for longer periods and address the possibility of testing different stimulation periodicities. The present in vitro study offers valuable insights into the effectiveness of specific PBM protocols to promote osteogenic and osteoclastogenesis responses and therefore its potential to stimulate bone formation on the tension side and bone resorption on the compression side of orthodontically stressed teeth.

[Low Level Laser Therapy in Nursing Care]. The high pressure nature of their work makes nursing staffs relatively susceptible to high levels of anxiety and insomnia and to poor mental health. Low level laser therapy (photobiomodulation therapy, PBMT) is an alternative approach to reducing pain and inducing specific brainwaves that has been shown to improve anxiety, insomnia, and poor mental health. The author, who has studied PBMT for over 20 years, provides research evidence that PBMT may be effectively applied on medical professionals as well as on the general public.
Humans;Low-Level Light Therapy;Sleep Initiation and Maintenance Disorders;Nursing Care;Anxiety;Mental Health

[Complementary Therapy: Application of Photobiomodulation in Self-Care and Patient Care]. Photobiomodulation (PBM), also known as low-level laser therapy, is a non-invasive light therapy that applies near-infrared light sources near target tissues. PBM allows photons to penetrate tissues and

interact with cells, promoting photophysical and chemical changes that result in desired changes at the molecular, cellular, and tissue levels (Oliveira et al., 2022; Shetty et al., 2023). This complementary therapy has garnered significant research attention both domestically and internationally. The results of recent research indicate non-invasive transcranial light stimulation can enhance high-frequency oscillations such as Î± and Î² waves, leading potentially to improved cognitive and neurological functions, memory, attention, and emotional status in healthy adults (Shetty et al., 2023). This mode of therapy is recommended as a non-pharmacological intervention for pain relief (Ross, 2022) and has been found to improve oral pain and quality of life in patients with burning mouth syndrome and in those undergoing hematopoietic stem cell transplantation (Camolesi et al., 2022; Chan et al., 2023). Also, PBM has been promoted as a method of enhancing wound healing (Oliveira et al., 2022) and of reducing the respiratory disturbance index in patients with obstructive sleep apnea (de Camargo et al., 2020). Researchers in Taiwan have also applied PBM to alleviate the pain associated with heel prick blood sampling in newborns and suggested using low-level laser therapy as a pain relief measure for full-term newborns undergoing invasive procedures (Wu et al., 2023). For the column in this issue, we have invited domestic nursing and optoelectronic scholars who have conducted extensive research in the field of PBM to explain the related mechanisms, share research findings, and introduce PBM devices that may be used in clinical, home, and school settings. Considering the impact of shift work on sleep among healthcare professionals, we also hope to provide nurses with different insights and options for self-care and patient care through the research and product introductions provided. Finally, an article on assessing aging and promoting health from a traditional Chinese medicine perspective is included to offer nursing professionals a holistic approach to self-care and preventive concepts based on natural rhythms. Infant, Newborn;Adult;Humans;Self Care;Low-Level Light Therapy;Quality of Life;Complementary Therapies;Patient Care;Pain

Effect of Laser Photobiomodulation on Postoperative Pain in Endodontics: A Systematic Review. Objective: Photobiomodulation therapy has proven benefits in various dental treatments. The current systematic review aims to explore the role of laser photobiomodulation in modulating postoperative pain followed by endodontic treatment. Methods: In this systematic review, randomized controlled clinical trials on low-level laser therapy/photobiomodulation in endodontic therapy were analyzed. Database search was performed in PubMed/Medline, Web of Science, Scopus, and Cochrane Library, followed by literature search in Google Scholar. Results: A total of 12 studies were included as per the set criteria. The included studies utilized diode laser (808-970â€‰nm) and indium gallium aluminum. All the included studies evaluated postendodontic pain after root canal therapy and endodontic surgery. A majority of the included studies showed significant benefits of photobiomodulation in postoperative pain management in endodontic therapy.Heterogeneity of the laser parameters and lack of power calculations for sampling among the included studies preclude solid recommendation of use of photobiomodulation therapy (PBMT) for postendodontic pain management. Conclusions: Although PBMT has proven potential benefits being a possible adjunct in postoperative pain management in endodontic therapy, it requires robust standardized randomized control trials to confirm the results of the systematic review. Humans;Low-Level Light Therapy;Endodontics;Pain, Postoperative;Root Canal Therapy;Lasers, Semiconductor

Comparative Effects of Cognitive Rehabilitation and Photobiomodulation on Drug Craving in Treatment-Seeking Opioid Addicts. Background: Drug addiction refers to a maladaptive pattern of drug use that frequently leads to substance abuse problems and accompanying cognitive and behavioral symptoms. Among the crucial criteria of drug addiction, craving stands out as a potent factor contributing to ongoing drug abuse and relapse following period of abstinence. To date, there is no definitive method for eradicating opioid cravings. The introduction of novel neurocognitive

interventions, such as cognitive rehabilitation and photobiomodulation (PBM), into the realm of psychiatric treatments holds promise due to the parallels between drug addiction and other psychiatric disorders. These innovative techniques offer potential value in addressing drug addiction. Objective: This study aimed to assess and compare the efficacy of cognitive rehabilitation and PBM in alleviating drug cravings among individuals undergoing addiction treatment in clinical settings. Methods: The research used randomized clinical trial as the chosen research method. The statistical population encompassed all clients receiving treatment for addiction at clinics, selected through the convenience sampling method, with Î±â€‰=â€‰0.05 significance level and an effect size of 85%. Gpower software was utilized to determine three equal groups. Sixty-three participants, each having a mean total score higher than 3 out of 5 on the Desire for Drug Questionnaire (DDQ), were randomly assigned to two experimental groups (nâ€‰=â€‰21 each) and a control group (nâ€‰=â€‰21). For the assessment of immediate and periodic opioid craving, the DDQ and the Obsessive Compulsive Drug Use Scale were used. In the low-level laser group, an 810â€‰nm wavelength with continuous irradiation was applied twice a week at a distance of 1â€‰cm by 1â€‰cm to the prefrontal part of the brain for duration of 6 weeks (12 sessions). In the brain rehabilitation group, the stop signal and n-back tasks software were used twice a week for period of 6 weeks (comprising 12 sessions, each lasting 30â€‰min). Results: The results demonstrated that each intervention significantly reduced drug craving in both the post-test and follow-up phases compared to the control group. The Bonferroni post hoc test indicated that PBM was more effective than cognitive rehabilitation in terms of working memory (WM) and inhibitory control for reducing drug craving (pâ€‰<â€‰0.05). Conclusions: While both PBM and cognitive rehabilitation targeting WM and inhibitory control effectively reduced opioid drug craving, low-level laser therapy proved to be more effective than cognitive rehabilitation in this regard. Analgesics, Opioid Humans;Analgesics, Opioid;Craving;Cognitive Training;Low-Level Light Therapy;Opioid-Related Disorders

Effect of Low-Level Laser Therapy on Knee Range of Motion and Functional Abilities After Total Knee Arthroplasty. OBJECTIVE: The aim of this study was to determine the effectiveness of combined low-level laser therapy (LLL) and rehabilitation in patients following recent total knee replacement (TKR). METHODS: A double-blind randomized controlled study was conducted at the Orthopedic Department of Mansoura University Hospital. Forty-four patients were chosen from a total of 58 patients who met the inclusion criteria and were assigned randomly into control and experimental groups of equal size. Ultimately, 40 patients completed the study (20 from each group). Both groups participated in an intensive functional rehabilitation program, and the experimental group also received LLL therapy around the knee at the incisional line, the medial and lateral intra-articular space, above and below the patella, and at the popliteal fossa at low fluence (6 J/cm(2), 650 nm continuous wave) and 60 s per point with a total dose of 48 J per session over 12 treatment sessions for six weeks. Knee range of motion (ROM) was measured with a digital goniometer, and functional abilities were assessed with the Arabic version of the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index. RESULTS: There were significant differences in all variables pre- and post-treatment within each group. Before treatment, there was no significant difference in any of the measured variables between the groups (P>0.05). After treatment, there were significant differences in knee flexion ROM and WOMAC index (P<0.05)Â but no significant difference in knee extension ROM between the groups (P>0.05). CONCLUSION: The addition of low-level laser therapy to a rehabilitation program post-TKR resulted in substantial enhancements in knee flexion range of motion and the WOMAC index.

Photobiomodulation Therapy Improves Repair of Bone Defects Filled by Inorganic Bone Matrix and Fibrin Heterologous Biopolymer. Biomaterials are used extensively in graft procedures to correct bone defects, interacting with the body without causing adverse reactions. The aim of this pre-clinical

study was to analyze the effects of photobiomodulation therapy (PBM) with the use of a low-level laser in the repair process of bone defects filled with inorganic matrix (IM) associated with heterologous fibrin biopolymer (FB). A circular osteotomy of 4 mm in the left tibia was performed in 30 Wistar male adult rats who were randomly divided into three groups: G1 = IM + PBM, G2 = IM + FB and G3 = IM + FB + PBM. PBM was applied at the time of the experimental surgery and three times a week, on alternate days, until euthanasia, with 830 nm wavelength, in two points of the operated site. Five animals from each group were euthanized 14 and 42 days after surgery. In the histomorphometric analysis, the percentage of neoformed bone tissue in G3 (28.4% Â± 2.3%) was higher in relation to G1 (24.1% Â± 2.91%) and G2 (22.2% Â± 3.11%) at 14 days and at 42 days, the percentage in G3 (35.1% Â± 2.55%) was also higher in relation to G1 (30.1% Â± 2.9%) and G2 (31.8% Â± 3.12%). In the analysis of the birefringence of collagen fibers, G3 showed a predominance of birefringence between greenish-yellow in the neoformed bone tissue after 42 days, differing from the other groups with a greater presence of red-orange fibers. Immunohistochemically, in all experimental groups, it was possible to observe immunostaining for osteocalcin (OCN) near the bone surface of the margins of the surgical defect and tartrate-resistant acid phosphatase (TRAP) bordering the newly formed bone tissue. Therefore, laser photobiomodulation therapy contributed to improving the bone repair process in tibial defects filled with bovine biomaterial associated with fibrin biopolymer derived from snake venom.

Investigator-blinded, controlled, and randomized comparative study on 1565â€‰nm non-ablative fractional laser versus 5% minoxidil for treatment of androgenetic alopecia. BACKGROUND: Characterized by progressive hair loss due to an excessive response to androgens, androgenetic alopecia (AGA) affects up to 50% of males and females. Minoxidil is one of approved medications for AGA but inadequate responses occur in many patients. AIMS: To determine whether 1565â€‰nm non-ablative fractional laser (NAFL) could yield better therapeutic benefits for patients with AGA as compared with 5% minoxidil. METHODS: Thirty patients with AGA were enrolled; they were randomly assigned into the laser or minoxidil treatment groups. For the laser treatment group, patients were treated by 1565â€‰nm NAFL at 10â€‰mJ, 250â€‰spots/cm(2) with 2â€‰weeks intervals for 4 sessions in total. For the minoxidil treatment group, 1-milliliter of topical 5% minoxidil solution was applied to hair loss area twice a day. RESULTS: The primary outcomes were the changes in numerous hair growth indexes at the Week 10 as compared with the baselines. Both 1565â€‰nm NAFL and 5% minoxidil led to significantly greater hair densities and diameters in patients at the Week 10 than the baselines (pâ€‰<â€‰0.01). As compared with 5% minoxidil, 1565â€‰nm NAFL showed significantly greater improvements in total hair number, total hair density (hair/cm(2)), terminal hair number, terminal hair density (hair/cm(2)), number of hair follicle units, and average hair number/number of hair follicle units. CONCLUSIONS: Our data demonstrate that 1565â€‰nm NAFL exhibits superior clinical efficacy in some aspects of hair growth to the topical minoxidil. It is a safe and effective modality in treating AGA. Minoxidil;Vasodilator Agents Humans;Alopecia;Minoxidil;Female;Adult;Male;Middle Aged;Treatment Outcome;Single-Blind Method;Hair;Lasers, Solid-State;Low-Level Light Therapy;Young Adult;Vasodilator Agents

Effects of repeated low-level red-light therapy on macular retinal thickness and microvascular system in children with myopia. OBJECTIVE: The objective of the study was to use optical coherence tomography angiography (OCTA) to analyze the effects of repeated low-level red-light (LLLT) therapy on macular retinal thickness and the microvascular system in children with myopia to evaluate the safety of this therapy. METHODS: This prospective study included 40 school-age children with myopia (80 eyes), aged 7-14 years, who received therapy using a LLLT instrument. At baseline and therapy for 1 month, 3 months, 6 months, all children underwent comprehensive ophthalmological examinations, including slit-lamp examination, uncorrected visual acuity, best-corrected visual acuity, spherical

equivalent degree, axial length, and OCTA. The vessel densities of the superficial retinal capillary plexus, macular inner retinal thickness, and full-layer retinal thickness were measured. RESULTS: The macular inner retinal thickness increased at 1 month and remained unchanged thereafter, It differed significantly in nine areas at 1, 3, and 6 months compared to the thicknesses before therapy ($P < 0.05$); however, we observed no significant differences between the different time points ($P > 0.05$). The macular full-layer retinal thickness increased at 1 month and remained unchanged thereafter; the changes showed significant differences at 1 month and 3 months compared to before therapy, for the inner nasal region ($P < 0.05$). The other eight areas showed significant differences at 1, 3, and 6 months compared with before therapy ($P < 0.05$); however, no significant difference was observed between the different time points after therapy ($P > 0.05$). The vessel density of the superficial retinal capillary plexus did not differ significantly among the four groups ($P > 0.05$). CONCLUSIONS: LLLT therapy was safe. The school-aged children exhibited macular thickening after LLLT therapy, which had no significant effect on macular microcirculation. Photosensitizing Agents Child;Humans;Low-Level Light Therapy;Prospective Studies;Retinal Vessels;Photochemotherapy;Photosensitizing Agents;Retina;Myopia

Low-level Nd:YAG laser inhibiting inflammation and oxidative stress in human gingival fibroblasts via AMPK/SIRT3 axis. OBJECTIVE: Photobiomodulation is extensively employed in the management of chronic inflammatory diseases such as periodontitis because of its anti-inflammatory and antioxidant effects. This study used low-level Nd:YAG laser to investigate the mechanism of photobiomodulation as well as the role of adenosine monophosphate-activated protein kinase (AMPK) and Sirtuins (SIRT) 3 in it, providing new clues for the treatment of periodontitis. METHODS: Human gingival fibroblasts (HGFs) were extracted from gingiva and stimulated with LPS. The suitable parameters of Nd:YAG laser were chosen for subsequent experiments by detecting cell viability. We assessed the level of inflammation and oxidative stress as well as AMPK and SIRT3. The mechanism for AMPK targeting SIRT3 modulating the anti-inflammatory and antioxidant effects of photobiomodulation was explored by the AMPK inhibitor (Compound C) test, cell transfection, western blot, and immunofluorescence. RESULTS: HGFs were isolated and identified, followed by the identification of optimal Nd:YAG laser parameters (60Â mJ, 15Â Hz, 10s) for subsequent experimentation. With this laser, inflammatory factors (IL-6, TNF-Î±, COX2, and iNOS) decreased as well as the phosphorylation and nuclear translocation of NFÎºB-P65. SOD2 was up-regulated but reactive oxygen species (ROS) was down-regulated. The laser treatment exhibited enhancements in AMPK phosphorylation and SIRT3 expression. The above effects could all be reversed by Compound C. Silencing AMPK or SIRT3 by siRNA, the down-regulation of COX2, iNOS, and ROS by laser was inhibited. SIRT3 was down-regulated when the AMPK was silenced. CONCLUSION: Low-level Nd:YAG laser activated AMPK-SIRT3 signaling pathway, facilitating the anti-inflammatory and antioxidative activity. AMP-Activated Protein Kinases;Sirtuin 3;Reactive Oxygen Species;Antioxidants;Cyclooxygenase 2;Anti-Inflammatory Agents;SIRT3 protein, human Humans;AMP-Activated Protein Kinases;Sirtuin 3;Reactive Oxygen Species;Lasers, Solid-State;Antioxidants;Gingiva;Cyclooxygenase 2;Oxidative Stress;Inflammation;Anti-Inflammatory Agents;Periodontitis;Fibroblasts

Impact of low-level laser therapy on the quality of life of patients with xerostomia undergoing head and neck radiotherapy: a systematic review. PURPOSE: To carry out a systematic review to assess whether low-level laserÂ therapy can improve the quality of life of patients with xerostomia undergoing head and neck radiotherapy. METHODS: A systematic search was performed through Embase, Medline/PubMed, Cochrane, Scopus, Web of Science, nonpeer-reviewed clinicaltrials.gov and LILACS. The strategy included clinical studies were selected that prospectively followed or evaluated the quality of life by directly comparing the use of low-level laserÂ therapy for xerostomia

induced by head and neck radiotherapy with alternative therapies without the use of a laser. The risk of bias in the studies was assessed by RoB 2.0 and Robins I. RESULTS: After all application of the predetermined criteria, four studies were included, dated between the years 2014 and 2023. Three studies described as randomized clinical trials were included, one of which was a randomized pilot study and only one was a prospective clinical trial. A total of 126 patients were evaluated, all four studies used the infrared wavelength, with two studies using the combination with the red wavelength. It was observed that low-level laser therapy can change the sensation of dry mouth, improving patients' quality of life. In addition, changes related to increased stimulated and unstimulated salivary flow were also identified. CONCLUSION: The use of low-level laser therapy has promising results on xerostomia, consequently improving the quality of life of patients undergoing radiotherapy in the head and neck region. Humans;Head and Neck Neoplasms;Low-Level Light Therapy;Prospective Studies;Quality of Life;Randomized Controlled Trials as Topic;Xerostomia

Evaluation of the use of chamomile in isolation and in association with laser photobiomodulation in the healing of rats oral mucosa. Laser photobiomodulation (LPBM) has been shown to be one of the possible modulating agents of inflammation. Similarly, medicinal plants, such as chamomile (Matricaria recutita) are also used with the same purpose. To evaluate tissue repair in the dorsum of the tongue of rats under topical use of chamomile alone and in association with LPBM. Seventy-five male Wistar rats received a standardized wound on the dorsum of the tongue and were allocated into experimental groups: Control (G1), Chamomile Fluid extract (G2), Chamomile Infusion (G3), Laser (G4), Chamomile Infusion + Laser (G5). Euthanasia was done on days 3, 7, and 14 after surgery. Ulcers were evaluated and measured with a caliper. Sections stained with hematoxylin and eosin and Picrosirius Red allowed evaluation of edema, inflammatory infiltrate, cellularity, and re-epithelialization and characterization of total collagen. Histomorphometric analysis of the percentage of total collagen, the distance from the basal layer to the epithelial surface, and the thickness of the stratum corneum were performed. The G2 and G4 groups modulated the exudative and proliferative phases of inflammation, both clinically and histologically. The G3 and G5 groups did not show significant differences in relation to the G1 group in most of the evaluated parameters. Chamomile fluid extract and LPBM alone showed better clinical and histological responses for tissue repair than the association between these therapeutic modalities. There were differences in the parameters of clinical, histological, and histomorphometric patterns between the experimental groups of the present investigation. The LPBM proved to be superior in the performed analysis.

Additional contribution of phonophoresis and low-level laser therapy to exercise in the treatment of carpal tunnel syndrome: A clinical, electrophysiological, and ultrasonographic evaluation. OBJECTIVES: Carpal Tunnel Syndrome (CTS) is the most common peripheral nerve compression syndrome. This study aims to evaluate the additive contribution of phonophoresis and low-level laser therapy (LLLT) to tendon and nerve gliding exercises electrophysiologically, ultrasonographically, and clinically in the treatment of moderate CTS. METHODS: The sample consisted of 45 patients with moderate CTS, randomized into three groups. Group 1 received phonophoresis and exercise, Group 2 received LLLT and exercise, and Group 3 received exercise alone. Participants were evaluated electrophysiologically, clinically, and ultrasonographically before treatment and at the 6th and 12th weeks after the treatment. RESULTS: An improvement was observed in clinical parameters (Boston Functional Status Scale, Boston Symptom Severity Scale, visual analog scale at rest, and visual analog scale during activity) for all groups at the 6th and 12th weeks after the treatment ($p<0.05$). An improvement was also noted in the ultrasonographic parameter (cross-sectional area) for all groups at the 12th week after the treatment ($p=0.017$). CONCLUSION: Phonophoresis and LLLT do not provide additional effects to exercise therapy. Exercise therapy alone may positively contribute to ultrasonographic and clinical outcomes in the treatment of moderate CTS. Humans;Carpal

Tunnel Syndrome;Low-Level Light Therapy;Pain Measurement;Phonophoresis;Treatment Outcome;Exercise Therapy

Response to Comments on: "The effectiveness of high-intensity laser therapy in individuals with neck pain: a systematic review and meta-analysis". Humans;Neck Pain;Low-Level Light Therapy;Laser Therapy

IL-1Î² Antagonist Receptor Peptide Associated with Photobiomodulation Accelerates Diabetic Wound Tissue Repair. Chronic hyperglycemia caused by diabetes mellitus (DM) slows down the healing process due to prolonged inflammation which impedes the regeneration progression. Photobiomodulation (PBM) is considered a non-pharmacological intervention and has anti-inflammatory and biostimulatory effects that accelerate the healing process. Currently found IL-1Î² inhibitors are difficult to implement due to their cytotoxic potential, excessive amounts, and invasive administration, and therefore, the application of this peptide in diabetic wounds represents a promising intervention to help resolve the inflammatory response. This study aimed to investigate the effect of an IL-1Î² inhibitor molecule associated with PBM irradiation in a model of epithelial injury in diabetic mice. After the induction of the DM model with streptozotocin (STZ), the skin lesion model was implemented through surgical excision. Sixty C57BL/6 mice divided into five experimental groups (nâ€‰=â€‰12) were used: excisional wound (EW), DMâ€‰+â€‰EW, DMâ€‰+â€‰EWâ€‰+â€‰DAP 1-2 (inhibitor peptide), DMâ€‰+â€‰EWâ€‰+â€‰PBM, and DMâ€‰+â€‰EWâ€‰+â€‰PBMâ€‰+â€‰DAP 1-2. Treatment started 12Â h after wound induction and was performed daily for 5 days. Twenty-four hours after the last application, the animals were euthanized and the outer edge of the wound was removed. The results obtained demonstrate that the DMâ€‰+â€‰EWâ€‰+â€‰PBMâ€‰+â€‰DAP 1-2 group caused a reduction in the levels of pro-inflammatory cytokines, an increase in anti-inflammatory cytokines, and an increase in TGF-Î² and maintenance of the cellular redox state with a consequent reduction in levels of inflammatory infiltrate and concomitant stimulation of type III collagen gene expression, as well as a decrease in the size of the wound in square centimeter 6 days after the injury. Only the combination of therapies was able to favor the process of tissue regeneration due to the development of an approach capable of acting at different stages of the regenerative process, through the mechanisms of action of interventions on the inflammatory process by avoiding its stagnation and stimulating progression of regeneration.

Low-level laser therapy alleviates periodontal age-related inflammation in diabetic mice via the GLUT1/mTOR pathway. Diabetes mellitus (DM) is a chronic age-related disease that was recently found as a secondary aging pattern regulated by the senescence associated secretory phenotype (SASP). The purpose of this study is to detect the potential efficacy and the specific mechanisms of low-level laser therapy (LLLT) healing of age-related inflammation (known as inflammaging) in diabetic periodontitis. Diabetic periodontitis (DP) mice were established by intraperitoneal streptozotocin (STZ) injection and oral P. gingivalis inoculation. Low-level laser irradiation (810Â nm, 0.1Â W, 398Â mW/cm(2), 4Â J/cm(2), 10Â s) was applied locally around the periodontal lesions every 3Â days for 2 consecutive weeks. Micro-CT and hematoxylin-eosin (HE) stain was analyzed for periodontal soft tissue and alveolar bone. Western blots, immunohistochemistry, and immunofluorescence staining were used to evaluate the protein expression changes on SASP and GLUT1/mTOR pathway. The expression of aging-related factors and SASP including tumor necrosis factor-Î±, interleukin (IL)-1Î², and IL-6 were reduced in periodontal tissue of diabetic mice. The inhibitory effect of LLLT on GLUT1/mTOR pathway was observed by detecting the related factors mTOR, p-mTOR, GLUT1, and PKM2. COX, an intracytoplasmic photoreceptor, is a key component of the anti-inflammatory effects of LLLT. After LLLT treatment a significant increase in COX was observed in macrophages in the periodontal lesion. Our findings suggest that LLLT may regulate chronic low-

grade inflammation by modulating the GLUT1/mTOR senescence-related pathway, thereby offering a potential treatment for diabetic periodontal diseases. Glucose Transporter Type 1;Interleukin-1beta Animals;Mice;Low-Level Light Therapy;Glucose Transporter Type 1;Diabetes Mellitus, Experimental;Inflammation;Interleukin-1beta;Periodontitis

Evaluating the effect of strontium ranelate and photobiomodulation on cementogenic and osteogenic differentiation of buccal fat pad-derived stem cells: An in vitro study. This study aimed to analyze the impact of strontium ranelate (Str), photobiomodulation (PBM), or their combination of the proliferation, osteogenic differentiation, and cementogenic differentiation of buccal fat pad-derived stem cells. BFPdSCs were exposed to one of the following interventions: (1) PBM (660â€‰nm), (2) PBM (660â€‰nm)â€‰+â€‰Str, (3) PBM (880â€‰nm), (4) PBM (880â€‰nm)â€‰+â€‰Str, (5) Str. All study groups had significantly higher osteogenic differentiation than the control group (pâ€‰<â€‰0.05), and no significant difference existed between the 660 and 808â€‰nm groups (pâ€‰=â€‰0.97). Compared to the Str group, 660â€‰nm and 880â€‰nm group samples had significantly lower osteogenic differentiation (pâ€‰<â€‰0.0001), while other groups did not show a significant difference. Regarding cementogenic differentiation, the 660â€‰nm group showed higher values than the 808â€‰nm group (pâ€‰<â€‰0.01). Compared with the Str group, 660â€‰nm, 660â€‰nmâ€‰+â€‰Str, and 808â€‰nmâ€‰+â€‰Str groups showed significantly higher gene expression (pâ€‰<â€‰0.05). In the case of osteogenic differentiation, although photobiomodulation alone had a lower inducing effect than strontium ranelate, combining 808â€‰nm diode lasers and strontium ranelate may provide the best results. Moreover, using a 660â€‰nm diode laser and exposing stem cells to strontium ranelate can be the most effective approach to induce cementogenic differentiation.

Histological effects of photobiomodulation on delayed tooth replantation: a systematic review. This systematic review evaluated preclinical studies to assess whether PBM has a more favorable histological response than other treatments used before delayed replantation of avulsed teeth. This review followed the PRISMA checklist and was registered in PROSPERO. MEDLINE (PubMed), Embase, Scopus and Web of Science were searched from their inception to July 14, 2022. Data were independently extracted by two reviewers. Data were collected about species, number of animals, number and type of teeth, groups evaluated, extra-alveolar time, parameters for PBM and other study groups, presence and characteristics of containment, observation time points, evaluation methods, characteristics evaluated, and significant results. The ARRIVE and SYRCLE tools were used to assess the methodological quality and risk of bias (RoB) of the studies. After screening, six studies were included in the review synthesis. Three of the four studies that evaluated root resorption as an outcome found that PBM decreases its occurrence after delayed tooth replantation. A meta-analysis was not conducted because some data were missing in the included studies. Half of the studies evaluating ankylosis found an increase in its occurrence after PBM. Two studies evaluated inflammatory responses and found a reduction of inflammation after PBM. In general, studies had high methodological heterogeneity, intermediate reporting quality and high RoB. Despite the methodological quality and RoB limitations of the studies, the histological responses after delayed tooth replantation were more favourable in the PBM groups. Preclinical studies supported by guidelines should define laser parameters for future clinical studies. Animals;Low-Level Light Therapy;Root Resorption;Tooth Avulsion;Tooth Replantation

Potential Role of Tranexamic Acid and Nonablative Fractional Resurfacing in Managing Facial Hyperpigmentation. Tranexamic Acid Humans;Tranexamic Acid;Laser Therapy;Low-Level Light Therapy;Hyperpigmentation;Skin Aging;Treatment Outcome;Rejuvenation

Potential Role of Tranexamic Acid and Nonablative Fractional Resurfacing in Managing Facial Hyperpigmentation-Reply. Tranexamic Acid Humans;Tranexamic Acid;Laser Therapy;Low-Level Light Therapy;Hyperpigmentation;Skin Aging;Treatment Outcome;Rejuvenation

Red light-emitting diode therapy minimizes the functional deleterious effects of the antiretroviral ritonavir on osteoblasts in vitro. PURPOSE: Long-term human immunodeficiency virus (HIV)-infected patients are considered at higher risk for osteoporosis. Among the various causes that lead these patients to lower bone health, there is the use of antiretroviral drugs (ARVs), especially protease inhibitors (PI), such as ritonavir (RTV). In this context, emerge the potential benefits of LED therapy, whose effects on bone cells are currently being extensively studied, showing a modulation in cell differentiation. However, it remains unclear if photobiostimulation might interfere with RTV effects on osteoblast differentiation. METHODS: In the present study, we investigated the effects of red LED (625Â nm) irradiation (15 mW/cm(2), 0.2Â J/cm(2), and 8 mW/cm(2), 0.12Â J/cm(2)) on osteoblast cell line MC3T3-E1 treated with RTV (2.5, 5, and 10Â Î¼g/mL). RESULTS: Our results indicated that red LED irradiation was able to reverse, or at least minimize, the deleterious effects of RTV on the osteoblasts. Neither the ARV treatments 5 and 10Â Î¼g/mL (104.4% and 95.01%) nor the LED protocols (100.3% and 105.7%) statistically altered cell viability, assessed by the MTT assay. Also, the alkaline phosphatase activity and mineralization showed a decrease in osteoblast activity followed by ARV exposure (39.3-73%), which was attenuated by LED in more than 70% with statistical significance (pâ€‰<â€‰0.05). CONCLUSION: In conclusion, photobiostimulation with red LED at 625Â nm was associated with improved beneficial biological effects as a potential inducer of osteogenic activity on RTV-affected cells. This is the first study that investigated the benefits of red LED irradiation over ARV-treated in vitro osteoblasts. Ritonavir Humans;Ritonavir;Red Light;Osteoblasts;Osteocytes;HIV Infections

Current protocol to achieve dental movement acceleration and pain control with Photo-biomodulation. When designing a study on dental movement acceleration or pain control during orthodontic treatment, it is crucial to consider effective parameters. The objective of this editorial is to compile the most effective parameters supported by evidence that should be considered in future studies to achieve complete parameter homogenization. The protocol currently recommended to homogenize the parameters and facilitate the development of further meta-analysis in terms of acceleration of movement and pain control in orthodontics is Wavelength: 810 nm, 2.2 J per surface, 0.1 W in continuous mode/0.1 W average power in a super-pulsed, sweeping movement, 1mm from the mucosa, 22 seconds along the vestibular surface and 22 seconds along the lingual surface, the recommended speed of movement is 2 mm/sec, 1 application during each orthodontic control, to achieve dental movement acceleration and repeat the dose at 24 h to ensure pain elimination. The energy density and power density will depend on the spot size used in the equipment and the distance from the mucosa. It will strengthen the evidence of photobiomodulation as the best therapy to accelerate tooth movement and at the same time control the pain produced by orthodontic treatments.

Low-laser action analysis associated with Himatanthus drasticus extract in wound healing. The aim of this study was to analyze the healing action of low-intensity laser therapy associated with Himatanthus drasticus in wound healing in mice. The study was experimental, analytical, controlled, randomized, and prospective. Twenty Wistar rats were divided into four groups: control with injury, injuryâ€‰+â€‰laser, woundâ€‰+â€‰Himatanthus drasticus, and woundâ€‰+â€‰laserâ€‰+â€‰Himatanthus drasticus. The animals underwent surgical skin wounds on their backs, and different treatments were applied based on the group. The healing process was evaluated histologically through the analysis of collagen fibers, neovascularization, and inflammatory reaction. The results showed that low-intensity laser therapy and Himatanthus

drasticus treatment improved the healing process in terms of collagen synthesis, decreased inflammatory cell migration, fibroblast proliferation, neovascularization, wound size reduction, and edema reduction. However, the combination of laser and Himatanthus drasticus did not show significant improvement compared to individual treatments. There were no statistical differences in polymorphonuclear cells between the treatment groups. Low-intensity laser therapy and Himatanthus drasticus have demonstrated positive properties in improving the healing process. Further research is needed to better understand their individual and combined effects. The study contributes to the exploration of alternative wound healing methods and encourages further investigation in this field. Collagen;Plant Extracts Animals;Rats;Apocynaceae;Collagen;Plant Extracts;Prospective Studies;Rats, Wistar;Surgical Wound;Wound Healing;Disease Models, Animal;Low-Level Light Therapy

Technology of the photobiostimulation of the brain's drainage system during sleep for improvement of learning and memory in male mice. In this study on healthy male mice using confocal imaging of dye spreading in the brain and its further accumulation in the peripheral lymphatics, we demonstrate stronger effects of photobiomodulation (PBM) on the brain's drainage system in sleeping vs. awake animals. Using the Pavlovian instrumental transfer probe and the 2-objects-location test, we found that the 10-day course of PBM during sleep vs. wakefulness promotes improved learning and spatial memory in mice. For the first time, we present the technology for PBM under electroencephalographic (EEG) control that incorporates modern state of the art facilities of optoelectronics and biopotential detection and that can be built of relatively cheap and commercially available components. These findings open a new niche in the development of smart technologies for phototherapy of brain diseases during sleep.

Evaluation of photobiomodulation therapy (PBMT) on salivary flow and composition in head and neck cancer patients undergoing radiation therapy. OBJECTIVE: Assess the impact of photobiomodulation therapy (PBMT) on xerostomia, salivary flow rate (SFR) and composition in patients undergoing radiotherapy (RT) for head and neck cancer (HNC). STUDY DESIGN: Thirty patients undergoing RT (65 Gy) for HNC were enrolled. Saliva and xerostomia evaluations collected pre- and post-PBMT-RT. PBMT involved irradiation of extra and intraoral points, 15-20 sessions, 2-3 times/week. SFR, trace elements, total protein, alkaline phosphatase, xerostomia, and pH were analyzed. RESULTS: The average age was 60.7 years. After treatment, there was not a significant reduction in SFR and there was no difference on xerostomia. Significant reductions in Al, Cd, Fe, Ni, P, and Sb concentrations were observed, along with a significant increase in Mg concentration. Sample data were organized into 3 groups based on a self-organizing map. Low concentrations of Al, As, Co, Cr, Cu, Fe, Mn, Mo, S, Sr, and Zn were the primary discriminatory factors for group A, while group B consisted of post-PBMT-RT samples with high concentrations of Ca, K, Mg, Na, and S. CONCLUSIONS: PBMT prevented a significant reduction in SFR and xerostomia induced by radiation therapy. These findings suggest that PBMT prevents salivary gland damage minimizing the decline in salivary flow. Humans;Middle Aged;Low-Level Light Therapy;Parotid Gland;Salivary Glands;Xerostomia;Head and Neck Neoplasms

An inÂ vitro study on the effects of photobiomodulation by diode lasers (red, infrared, and red-infrared combination) on periodontal ligament mesenchymal stem cells treated with bisphosphonates. This study evaluated the effect of photobiomodulation therapy (PBMT) using 660 and 808â€‰nm diode lasers (individual and in combination) on periodontal ligament mesenchymal stem cells (PDLSCs) in the presence of zoledronic acid (ZA). PDLSCs were cultured for 48â€‰h in DMEM complete medium containing 5â€‰Î¼M ZA. PBMT was done three times with a 24-h interval in groups 1 (660â€‰nm, 5â€‰J/cm(2)), 2 (880â€‰nm, 3â€‰J/cm(2)), and 3 (660â€‰+â€‰808â€‰nm) either in normal or ZA-treated culture medium. Control groups did not

receive PBMT. Twenty-four hours post-irradiation, cell proliferation and expression of RANKL and OPG were assessed using MTT and real-time PCR tests, respectively. The results showed a significant decrease in cell viability in ZA-treated cells (pâ€‰<â€‰0.001). Additionally, ZA induced the expression of OPG (pâ€‰=â€‰0.03) while reducing RANKL (pâ€‰<â€‰0.001). Cell proliferation was significantly increased in 808 and 660â€‰+â€‰808â€‰nm groups. Moreover, all PBMT groups could significantly increase and decrease the RANKL and OPG, respectively, in the presence of ZA (all pâ€‰<â€‰0.001). A combination of 660â€‰+â€‰808â€‰nm showed the highest effects on both genes. In conclusion, it seems that PBMT can modulate the effects of ZA by inducing PDLSC proliferation and increasing RANKL-to-OPG gene expression ratio.

Laser acupuncture and photobiomodulation therapy in Bell's palsy with a duration of greater than 8Â weeks: a randomized controlled trial. To investigate the efficacy of laser acupuncture and photobiomodulation therapy in alleviating symptoms among patients diagnosed with Bell's palsy with duration of greater than 8Â weeks. The randomized controlled trial has been performed from May 2021 to April 2023. Patients were eligible who had Bell's palsy with duration of greater than 8Â weeks on out-patient Department of Otorhinolaryngology in Beijing Tongren Hospital. The laser acupuncture group received class IV laser treatment for 3 times per weeks, a total of 72 times. The control group received the same treatment procedure except the laser parameter. The primary outcome measures comprised House-Brackmann facial nerve grading system and electroneurography. Secondary outcome measures comprised Sunnybrook facial grading system, electromyography, and the blink reflex. A total of 84 participants were included (42 control group, 42 laser acupuncture group). After treatment, House-Brackmann facial nerve grading system (OR, 0.11; 95% CI, 0.04-0.30; Pâ€‰<â€‰0.001), and the pathologic numbers of electroneuronography were statistically different between the laser acupuncture group and control group, including orbicularis oculi (OR,0.08; 95% CI, 0.02-0.21; Pâ€‰<â€‰0.001), Frontalis muscle (OR,0.14; 95% CI, 0.05-0.39; Pâ€‰<â€‰0.001), Orbicularis oris (OR,0.13; 95% CI, 0.04-0.36; Pâ€‰<â€‰0.001), Ala nasi muscle (OR,0.06; 95% CI, 0.02-0.18; Pâ€‰<â€‰0.001). In secondary outcomes, Sunnybrook facial grading system, has significant difference between the two groups (20.26; 95% CI, 14.69 to 25.83; Pâ€‰<â€‰0.01). Latency by ENoG, include orbicularis oculi (-0.61; 95% CI, -0.43 to -0.09; Pâ€‰<â€‰0.001), frontalis muscle (-0.12; 95% CI, -0.21 to -0.03; Pâ€‰<â€‰0.01), orbicularis oris (-0.28; 95% CI, -0.41 to -0.16; Pâ€‰<â€‰0.001), and ala nasi muscle (-0.26; 95% CI, -0.38 to -0.16; Pâ€‰<â€‰0.001). All amplitudes of MUAPs and durations by electromyography (EMG) showed statistically significant differences compared with the control group after treatment. For the frontalis muscle, the amplitude of MUAPs was -64.23 (95% CI, -80.89 to -47.56; Pâ€‰<â€‰0.001) and duration was -1.18 (95% CI, -1.49 to -0.87; Pâ€‰<â€‰0.001). For orbicularis oris, amplitude of MUAPs was -29.82 (95% CI, -55.03 to -4.62; Pâ€‰=â€‰0.02) and duration was -0.57 (95% CI, -0.94 to -0.20; Pâ€‰<â€‰0.001). For depressor angulli oris, amplitude of MUAPs was -47.06 (95% CI, -62.15 to -31.97; Pâ€‰<â€‰0.001) and duration was -2.21 (95% CI, -2.69 to -1.72; Pâ€‰<â€‰0.001). Blink reflex, including R1 (OR, 0.03; 95% CI, 0.01-0.16; Pâ€‰<â€‰.001), R2 (OR, 0.04; 95% CI, 0.004-0.29; Pâ€‰<â€‰.001), and R2 latency differences (OR, 0.15; 95% CI, 0.05-0.51; Pâ€‰<â€‰.001), have significant difference between the two groups, respectively. The findings suggest that laser acupuncture relieve symptoms for patients with Bell's palsy with a duration of greater than 8Â weeks.Trial registration: ClinicalTrials.gov Identifier: NCT05846217. Humans;Bell Palsy;Low-Level Light Therapy;Facial Nerve;Acupuncture Therapy;Electromyography

Photobiomodulation increases brain metabolic activity through a combination of 810 and 660 wavelengths: a comparative study in male and female rats. Photobiomodulation (PBM), an emerging and non-invasive intervention, has been shown to benefit the nervous system by modifying the mitochondrial cytochrome c-oxidase (CCO) enzyme, which has red (620-680Â nm) or infrared

(760-825Â nm) spectral absorption peaks. The effect of a single 810-nm wavelength with a combination of 810Â nm and 660Â nm lights in the brain metabolic activity of male and female rats was compared. PBM, with a wavelength of 810Â nm and a combination of 810Â nm and 660Â nm, was applied for 5Â days on the prefrontal cortex. Then, brain metabolic activity in the prefrontal area, hippocampus, retrosplenial, and parietal cortex was explored. Sex differences were found in cortical and subcortical regions, indicating higher male brain oxidative metabolism, regardless of treatment. CCO activity in the cingulate and prelimbic area, dentate gyrus, retrosplenial and parietal cortex was enhanced in both treatments (810â€‰+â€‰660Â nm and 810Â nm). Moreover, using the combination of waves, CCO increased in the infralimbic area, and in CA1 and CA3 of the hippocampus. Thus, employment of a single NIR treatment or a combination of red to NIR treatment led to slight differences in CCO activity across the limbic system, suggesting that a combination of lights of the spectrum may be relevant. Electron Transport Complex IV Rats;Male;Female;Animals;Low-Level Light Therapy;Electron Transport Complex IV;Oxidation-Reduction;Brain;Hippocampus

Effects of 625 nm light-emitting diode irradiation on preventing ER stress-induced apoptosis via GSK-3Î² phosphorylation in MC3T3-E1. Prolonged endoplasmic reticulum (ER) stress contributes to cell apoptosis and interferes with bone homeostasis. Although photobiomodulation (PBM) might be used for ER stress-induced diseases, the role of PBM in relieving cell apoptosis remains unknown. During ER stress, glycogen synthase kinase-3Î² (GSK-3Î²) is critical; however, its functions in PBM remain uncertain. Thus, this study aimed to investigate the role of GSK-3Î² in 625â€‰nm light-emitting diode irradiation (LEDI) relieving tunicamycin (TM)-induced apoptosis. Based on the results, pre-625â€‰nm LEDI (Pre-IR) phosphorylated GSK-3Î² via ROS production. Compared with the TM group, Pre-IRâ€‰+â€‰TM group reduced the phosphorylation of the Î±-subunit of eukaryotic translation initiation factor 2 (eIF-2Î±) and B-cell lymphoma protein 2 (Bcl-2)-associated X (Bax)/Bcl-2 ratio through regulating GSK-3Î². Furthermore, a similar tendency was observed between Pre-IRâ€‰+â€‰TM and Pre-LiCl+TM groups in preventing TM-induced early and late apoptosis. In summary, this study suggests that the Pre-IR treatment in TM-induced ER stress is beneficial for preventing cell apoptosis via GSK-3Î² phosphorylation.

Comprehensive Strategies in Endodontic Pain Management: An Integrative Narrative Review. This narrative review comprehensively examines the current and emerging strategies for pain management in endodontics, encompassing a wide range of pharmacological and non-pharmacological approaches. Through an extensive exploration of 20 distinct parts, the review discusses traditional analgesics, antibiotics, the use of corticosteroids, and the role of novel treatments such as platelet-rich fibrin (PRF) and cryotherapy. The review also delves into the intricacies of clinical methods, such as trephination and occlusal reduction, and discusses the potential of advanced techniques such as GABAergic signaling, acupuncture, in silico modulation, and low-level laser therapy (LLLT) for the effective management of endodontic pain. The analysis reveals a trend toward integrative methods that combine established practices with cutting-edge research, highlighting the importance of a tailored approach in endodontic pain management. The findings underscore the significance of understanding the complex nature of dental pain and the need for multifaceted treatment strategies. The review emphasizes that while traditional pharmacological methods remain foundational, emerging therapies offer promising adjuncts or alternatives, especially in cases where conventional treatments may be inadequate or unsuitable. This review aims to serve as a comprehensive resource for endodontic practitioners and researchers, offering insights into the multifarious aspects of pain management in endodontics. It underscores the ongoing evolution in the field and suggests directions for future research, particularly in refining and validating new pain management techniques.

Comparative efficacy of 2% minoxidil alone against combination of 2% minoxidil and low-level laser therapy in female pattern hair loss-A randomized controlled trial in Chinese females.
OBJECTIVES: To investigate the effectiveness and safety of combination of 655Â nm low level laser helmet device with topical 2Â % minoxidil solution at FPHL in Chinese population. MATERIALS AND METHODS: Randomized, parallel, controlled, single-blind clinical trial was conducted. FPHL subjects were randomly allocated into 2Â % minoxidil group and combination group. The 2Â % minoxidil group received 1Â ml topical 2Â % minoxidil solution twice daily for 24 weeks. The combination group received 1Â ml topical 2Â % minoxidil solution twice daily together with 20Â min 655Â nm low-level laser helmet once every other day for 24 weeks. Hair parameters in two scalp areas including midscalp and vertex were evaluated at baseline, 12th week and 24th week. RESULTS: In midscalp area, the combination group showed a lower increase in intermediate hair percentage than 2Â % minoxidil group, which was statistically significant. Besides, the combination group had statistically significant increase than 2Â % minoxidil group in mean hair diameter. Reported relative adverse events included slightly hair loss (27.8Â %), desquamation (19.0Â %), pruritus (15.2Â %), seborrhea (2.5Â %) and hypertrichosis (2.5Â %). CONCLUSION: In our trial, LLLT was demonstrated as a useful supplementary treatment for FPHL and the combination with 2Â % minoxidil accomplished better improvement in intermediate hair enlargement and hair diameter of midscalp for FPHL.
Minoxidil;Photosensitizing Agents Female;Humans;Minoxidil;Low-Level Light Therapy;Single-Blind Method;Photochemotherapy;Photosensitizing Agents;Alopecia;Scalp;China

Effect of High-intensity Laser Therapy on Carpal Tunnel Syndrome Patients: A Systematic Review and Meta-analysis. OBJECTIVE: To provide a strong foundation for the use of high-intensity laser therapy (HILT) in carpel tunnel syndrome (CTS,) we conducted a systematic review and meta-analysis to investigate the outcomes of short- and long-term follow-up studies. DESIGN: Systematic review and meta-analysis. RESULTS: Sample sizes of included studies ranged from 16 to 98 patients (total N = 308). Overall, a significant difference between the treatment and control groups were found across majority of the measures. Studies using a four-week follow-up period, however, only found significantly greater benefits for HILT in visual analogue scale (VAS) compared to placebo ($p = 0.0191$), Transcutaneous electrical nerve stimulation (TENS) ($p = 0.0026$), and low-intensity laser therapy-20 J/cm2 ($p < 0.0002$), and exercise ($p < 0.0001$). For improvement in VAS score over a long treatment period, HILT was also preferred over control group ($p < 0.0071$). Insufficient evidence exists to determine effect of HILT on nerve conduction examinations. The only statistically significant differences observed in examinations were in relation to sensory nerve action potential ($p = 0.0083$) and sensory nerve conduction velocity (SNCV) ($p = 0.0468$). CONCLUSION: Moderate evidence exists regarding efficacy of HILT compared to placebo, HILT + wrist splint, and exercise in a short period of follow-up time but evidence on long-term follow-up is limited.

Association of Papacarie DuoÂ® and low-level laser in antimicrobial photodynamic therapy (aPDT). Dental caries is a multifactorial, non-communicable disease. Effective treatment options for minimally invasive removal of carious tissue include Papacarie DuoÂ® gel and antimicrobial photodynamic therapy (aPDT). aPDT involves a combination of a light source and photosensitizer. Given that Papacarie DuoÂ® contains a percentage of blue dye, this study aims to explore the antimicrobial potential of Papacarie DuoÂ® when associated with a light source against Streptococcus mutans strains. The chosen light source was a low-power diode laser (Î»â€‰=â€‰660Â nm, Eâ€‰=â€‰3Â J, Pâ€‰=â€‰100 mW, tâ€‰=â€‰30Â s). To assess antimicrobial capacity, planktonic suspensions of Streptococcus mutans were plated on Brain Heart Infusion Agar (BHI) to observe the formation of inhibition halos. The studied groups included methylene blue (0.005%), Papacarie DuoÂ®, distilled water (negative control), 2% chlorhexidine (positive control), Papacarie DuoÂ®â€‰+â€‰laser, and methylene blue (0.005%)â€‰+â€‰laser. Following distribution onto

plates, each group was incubated at 37Â Â°C for 48Â h under microaerophilic conditions. Inhibition halos were subsequently measured using a digital caliper. The results showed that chlorhexidine had the greatest antimicrobial effect followed by the group of irradiated methylene blue and irradiated Papacarie DuoÂ®. All experimental groups demonstrated antimicrobial potential, excluding the negative control group. The study concludes that Papacarie DuoÂ® exhibits antimicrobial properties when associated with a low-power diode laser. Papacarie;Chlorhexidine;Methylene Blue;Anti-Infective Agents Humans;Chlorhexidine;Dental Caries;Methylene Blue;Photochemotherapy;Anti-Infective Agents;Lasers, Semiconductor

In vivo attenuation profile of 660 nm and 830 nm wavelengths on human elbow skin and calcaneus tendon of different phototypes. Physical factors and tissue characteristics determine the transmission of light through tissues. One of the significant clinical limitations of photobiomodulation is the quantification of fluence delivered at application sites and optical penetration depth in vivo. There is also the difficulty of determining the distances of the application points to cover a uniformly irradiated area. Thus, the aim was to evaluate in vivo the influence of melanin on light transmission of the 660 nm and 830 nm laser wavelengths on skin and tendon. Thirty young individuals of both sexes were recruited, divided into two groups based on melanin index, and submitted to photobiomodulation protocols in the posterior region of the elbow (skin-skin) and the calcaneus tendon (skin-tendon-skin). The irradiation area was evaluated using a homemade linear array of five sensors. We found significant transmission power values for different melanin indexes and wavelengths ($p<0.0001$). Also, different equipment can generate significant differences in the transmitted power at an 830-nm wavelength. Average scattering values are 14 mm and 21 mm for 660 nm, in higher and lower melanin index, respectively. For 830 nm, values of 20 mm and 26 mm are indicated. Laser light transmission in vivo tissues is related to wavelength, beam diameter, tissue thickness, and composition, as well as melanin index. The 830-nm laser presents higher light transmission on the skin than 660 nm. The distances between the application points can be different, with higher values for 830 nm than 660 nm. Melanins Female;Male;Humans;Elbow;Calcaneus;Melanins;Achilles Tendon;Skin

Assessing the rebound phenomenon in different myopia control treatments: A systematic review. PURPOSE: To review the rebound effect after cessation of different myopia control treatments. METHODS: A systematic review that included full-length randomised controlled studies (RCTs), as well as post-hoc analyses of RCTs reporting new findings on myopia control treatments rebound effect in two databases, PubMed and Web of Science, was performed according to the PRISMA statement. The search period was between 15 June 2023 and 30 June 2023. The Cochrane risk of bias tool was used to analyse the quality of the selected studies. RESULTS: A total of 11 studies were included in this systematic review. Unifying the rebound effects of all myopia control treatments, the mean rebound effect for axial length (AL) and spherical equivalent refraction (SER) were 0.10â€‰Â±â€‰0.07â€‰mm [-0.02 to 0.22] and -0.27â€‰Â±â€‰0.2 D [-0.71 to -0.03] after 10.2â€‰Â±â€‰7.4â€‰months of washout, respectively. In addition, spectacles with highly aspherical lenslets or defocus incorporated multiple segments technology, soft multifocal contact lenses and orthokeratology showed lower rebound effects compared with atropine and low-level light therapy, with a mean rebound effect for AL and SER of 0.04â€‰Â±â€‰0.04â€‰mm [0 to 0.08] and -0.13â€‰Â±â€‰0.07 D [-0.05 to -0.2], respectively. CONCLUSIONS: It appears that the different treatments for myopia control produce a rebound effect after their cessation. Specifically, optical treatments seem to produce less rebound effect than pharmacological or light therapies. However, more studies are required to confirm these results. Atropine Humans;Myopia;Atropine;Contact Lenses, Hydrophilic;Refraction, Ocular;Eyeglasses

Evaluation of Patient-Reported Outcome Measures (PROMs) Associated With the Acceleration of Canine Retraction by Piezosurgery in Comparison With Low-Level Laser Therapy: A Three-Arm Randomized Controlled Clinical Trial. Background and objectives Recently, both surgical and non-surgical interventions have gained popularity in accelerating orthodontic tooth movement, but there is no randomized controlled trial (RCT) comparing both modalities in terms of patient-reported outcome measures (PROMs) during maxillary canine retraction. Therefore, this trial aimed to assess the PROMs associated with either low-level laser therapy (LLLT) or piezocision-assisted acceleration in the context of maxillary canine retraction. Materials and methods This was a single-blinded, single-center, three-arm RCT. A total of 54 patients (12 males, 42 females, mean age 20.65 Â± 2.85) whose treatment needed upper-first-premolar extraction to facilitate canine retraction were enrolled and randomly divided into three groups: piezocision group (PG), LLLT group (LLLTG), and the control group (CG). Standardized questionnaires using a visual analog scale were distributed to patients at five assessment times: 1 (T1), 3 (T2), 7 (T3), 14 (T4), and 28 days following the canine retraction initiation (T5). The patients' pain, discomfort, swelling, chewing difficulty, satisfaction, and acceptance were recorded. Results Regarding pain and discomfort, the levels were significantly lower in the LLLTG during the first two weeks of canine retraction compared to the other two groups ($p<0.017$). At the same time, these levels were significantly greater in the PG than the CG in the first week of canine retraction ($p<0.017$). Patients in the PG had a "mild to moderate" perception of swelling at T1 and T2, which was significantly different than that of the other two groups ($p<0.001$). Regarding chewing difficulty, the levels in the LLLTG were significantly lower than those in PG at the first three assessment times ($p<0.017$). Patients' satisfaction with canine speed was significantly greater in the intervention groups compared to the CG ($p<0.001$). In contrast, no statistically significant differences were found between the three groups regarding satisfaction with gum appearance surrounding the canine ($p=0.061$) and acceptance ($p=0.125$). Conclusion The LLLT-assisted canine retraction was associated with significantly lower negative patient-reported outcomes during the first two weeks of retraction than piezocision-assisted retraction. However, the levels of pain and discomfort were significantly greater in the piezocision-assisted retraction group than those in the conventional canine retraction group, which in turn were greater than those with the LLLT-assisted canine retraction group during the first week of retraction. Patient satisfaction and acceptance were high with both piezocision and LLLT interventions.

A 595â€‰nm pulsed dye laser as an adjuvant intervention for post-comedone extraction erythema and comedone reduction: A randomized, split-face controlled trial. BACKGROUND: Comedone extraction provides greater satisfaction for acne treatment than conventional treatment alone; however, post-comedone extraction erythema (PCEE) remains a concern for patients. OBJECTIVES: To evaluate the efficacy of pulsed-dye laser (PDL) in PCEE and comedone reduction. METHODS: Mild-to-moderate acne patients were randomly allocated in split-face fashion. Three comedones were extracted on each facial side. On the PDL-treated side, 595-nm PDL was delivered to the entire side with an additional shot on three comedone-extracted sites. Erythema index (EI) and total acne lesion counts (TALC) were evaluated at baseline, week 2 and 4. The comprehensive acne severity scale (CASS) was assessed by three blinded independent pediatric dermatologists. Participant satisfaction surveys were completed at the end of the study. RESULTS: Thirty-five participants (age 12.9-24.2â€‰years) showed no differences in the EI and TALC at baseline on both sides. At weeks 2 and 4, the EI on the PDL-treated side was significantly lower (pâ€‰<â€‰0.001) with a greater EI reduction (pâ€‰<â€‰0.001) when compared to the control side regardless of gender and menstruation. There was significantly lower TALC on the PDL-treated side at week 2 (pâ€‰<â€‰0.001) and week 4 (pâ€‰=â€‰0.02). No complications were noted with high participant satisfaction reported (median 8; IQR 7-9). PDL remained significantly associated with EI improvements after controlling for gender,

menstruation cycle, and examination stress. CONCLUSION: PDL can be an adjunctive intervention for the treatment of PCEE and comedone reduction due to its effectiveness and high participant satisfaction. Humans;Female;Lasers, Dye;Erythema;Male;Young Adult;Patient Satisfaction;Acne Vulgaris;Adolescent;Child;Severity of Illness Index;Treatment Outcome;Low-Level Light Therapy

Investigation of the efficacy of two different laser types in the treatment of lower lip paresthesia after sagittal split ramus osteotomy. Orthognathic surgery involves invasive and major surgical procedures commonly used to correct maxillofacial deformities. Bilateral sagittal split ramus osteotomy (BSSO) is often used to treat dentofacial anomalies related to the mandible, but it can result in various complications, the most common of which is inferior alveolar nerve damage. Nerve damage-induced paresthesia of the lower lip significantly affects patient comfort. Medical treatments such as steroids and vitamin B, low-level laser therapy (LLLT), and platelet-rich fibrin (PRF) can be used as supportive therapies for nerve regeneration after damage. This study aimed to investigate the effectiveness of two different types of lasers in treating lower lip paresthesia after BSSO. This clinical trial was a controlled, single-center, prospective, single-blind, randomized study. Thirty patients were included in the study and randomly assigned to three groups: Group I (laser GRR, nâ€‰=â€‰10) received transcutaneous and transmucosal GRR laser treatment, Group II (Epic10 laser, nâ€‰=â€‰10) received transmucosal and transcutaneous Epic10 laser treatment, and Group III (vitamin B, nâ€‰=â€‰10) received B-complex vitamin tablets orally once a day. Two-point and brush tests were performed six times at specific intervals, and a visual analog scale was used to evaluate pain and sensitivity. Both vitamin B and laser therapies accelerated nerve regeneration. The contribution of the laser groups to the healing rate was better than that of the vitamin B group. Although there was no statistically significant difference between the two laser groups, clinical observations indicated better results in the GRR laser group. Vitamins Humans;Lip;Paresthesia;Osteotomy, Sagittal Split Ramus;Prospective Studies;Single-Blind Method;Lasers;Vitamins

The supportive use of photobiomodulation on salivary glands: a narrative review and meta-analysis. PURPOSE: Radiotherapy is one of the main strategies used in the treatment of cancer patients and it can cause early or late xerostomia and/or hyposalivation. Therapeutic management of xerostomia includes oral hygiene, sialogenic agents among others. METHODS: This study reviews the use of extra-oral salivary glands photobiomodulation in treating xerostomia and/or hyposalivation after radiotherapy and performs a meta-analysis of this data. RESULTS: After a broad search of the literature, eight clinical studies were selected. DISCUSSION: In a safe way, the studies found that extra-oral stimulation of the salivary glands has benefits in the hyposalivation and changes in salivary flow resulting from lesions by radiotherapy. A meta-analysis found significant values in pain comparing the pre- and post-treatment momentsÂ (MD - 3.02, I2 95%, IC - 5.56; - 0.48)Â and for stimulated salivary flow at 30 days after the end of radiotherapyÂ (MD 2.90, I2 95%, IC 1.96; 3.84). CONCLUSION: The most promising parameters comprise wavelengths between 630 and 830Â nm, radiant exposure from 2 to 10Â J/cm(2), two-to-three times a week, before the radiotherapy damage, and homogeneously in the glands. Therefore, Light-Emitting Diode (LED) stimulation of larger areas than the punctual stimulation of small millimeters of the Low-Level Laser Therapy (LLLT) appears to be promising.

Effect of Laser and Energy-based Device Therapies to Minimize Surgical Scar Formation: A Systematic Review and Network Meta-analysis. Utilization of lasers and energy-based devices for surgical scar minimization has been substantially evaluated in placebo-controlled trials. The aim of this study was to compare reported measures of efficacy of lasers and energy-based devices in clinical trials in preventing surgical scar formation in a systematic review and network meta-analyses. Five electronic

databases, PubMed, Scopus, Embase, ClinicalTrials.gov, and the Cochrane Library, were searched to retrieve relevant articles. The search was limited to randomized controlled trials that reported on clinical outcomes of surgical scars with treatment initiation no later than 6 months after surgery and a follow-up period of at least 3 months. A total of 18 randomized controlled trials involving 482 participants and 671 postsurgical wounds were included in the network meta-analyses. The results showed that the most efficacious treatments were achieved using low-level laser therapy) (weighted mean difference -3.78; 95% confidence interval (95% CI) -6.32, -1.24) and pulsed dye laser (weighted mean difference -2.46; 95% CI -4.53, -0.38). Nevertheless, low-level laser therapy and pulsed dye laser demonstrated comparable outcomes in surgical scar minimization (weighted mean difference -1.32, 95% CI -3.53, 0.89). The findings of this network meta-analyses suggest that low-level laser therapy and pulsed dye laser are both effective treatments for minimization of scar formation following primary closure of surgical wounds with comparable treatment outcomes. Humans;Network Meta-Analysis;Cicatrix;Lasers, Dye;Databases, Factual;Low-Level Light Therapy

Case report: use of high-intensity laser therapy for treatment of trigeminal neuralgia. Trigeminal neuralgia represents a form of chronic facial pain that is characterized by its incapacitating nature. The current therapeutic approaches encompass pharmacological agents with carbamazepine or non-pharmacologic options including utilization of percutaneous rhizotomy, Gamma knife radiosurgeryÂ or microvascular decompression may be indicated in certain cases. While the interventions may be effective, medications have negative side effects and procedures are invasive which can pose challenges for patients with various comorbidities. High-intensity laser therapy (HILT) has demonstrated safety and efficacy for many types of chronic pain such as musculoskeletal, autoimmune and neuropathic. Herein, we demonstrate the benefits of HILT therapy in the management of trigeminal neuralgia in a 72Â year-old patient with a complex history of facial surgery and radiation who had failed pharmacological treatments and denied any invasive procedures.

 Trigeminal neuralgia causes severe facial pain, often requiring medications or invasive procedures. High-intensity laser therapy (HILT), known for treating many chronic pains, was explored for a 72Â year-old patient with a complex medical history. Previous treatments had failed, and alternatives carried risks. HILT, a safe approach improving blood flow, was given for 3 days, targeting the painful area in the face. The patient experienced improved tissue oxygen supply and pain relief. The follow-up visit at 4 weeks showed sustained relief, enhanced jaw movement and no side effects. Although promising, further research is needed to confirm HILT's effectiveness for trigeminal neuralgia on a larger scale. Humans;Aged;Trigeminal Neuralgia;Laser Therapy;Low-Level Light Therapy;Chronic Pain

Self-applied photobiomodulation device: the next generation in oral mucositis prevention and treatment. Humans;Low-Level Light Therapy;Stomatitis

Photobiomodulation Therapy Plus Usual Care Is Better than Usual Care Alone for Plantar Fasciitis: A Randomized Controlled Trial. BACKGROUND: Plantar fasciitis (PF) results in pain-related disability and excessive healthcare costs. Photobiomodulation therapy (PBMT) has shown promise for decreasing both pain and disability related to PF. PURPOSE: The purpose was to assess the clinical impact of PBMT on pain and function in people with PF. STUDY DESIGN: Prospective, randomized controlled clinical trial. METHODS: A convenience sample of adults with PF were randomly assigned to one of three groups: (1) usual care, (2) usual care plus nine doses of PBMT with 25W output power over three weeks, or (3) usual care plus nine doses of PBMT with 10W output power over three weeks. Both 10W and 25W PBMT participants received the same total dose (10J/cm(2)) by utilizing a simple area equation. Pain (with Defense and Veterans Pain Rating Scale) and function (by Foot and Ankle Ability Measure) were measured at baseline, weeks 3, and 6 for all groups, and at 13 and 26 weeks for PBMT groups. RESULTS: PBMT groups experienced a reduction in pain over the first three

weeks (from an average of 4.5 to 2.8) after which their pain levels remained mostly constant, while the UC group experienced a smaller reduction in pain (from an average of 4 to 3.8). The effects on pain were not different between PBMT groups. PBMT in both treatment groups also improved function more than the UC group, again with the improvement occurring within the first three weeks. CONCLUSIONS: Pain and function improved during the three weeks of PBMT plus UC and remained stable over the following three weeks. Improvements sustained through six months in the PBMT plus UC groups. LEVEL OF EVIDENCE: Level II- RCT or Prospective Comparative Study.

The prophylactic effect of photobiomodulation therapy on pain perception due to infiltration injection: a randomized clinical trial. OBJECTIVES: Fear of pain in dentistry especially the injection involved in most of the processes has always been an important issue preventing the patients from consulting a dentist at the right time. This study aims to evaluate the effect of photobiomodulation therapy on reduction of pain in infiltration injection. MATERIALS AND METHODS: This trial is a crossover study including 30 patients. The patients are divided into two groups (laser therapy in the first period and placebo effect in the next period or vice versa with split-mouth design) using the covariate adaptive randomization method. All the patients received bilateral maxillary canine anesthesia in two periods performed with an ICT injection device (amount of anesthesia solution loaded: 1.8 mL) at a speed of 1 mL/min and a temperature of the solution of 37 Â°C. In each period, patients received either a prophylactic dose of 940-nm laser (500 mW, 10 J/cm(2)) or its placebo effect before the injection. The degree of pain perception after each sort of treatment is evaluated by both SEM (Sound, Eye, Motor, and Pain) and VAS (Visual Analogue Scale) scales. RESULTS: According to analysis, all the patients scored a VAS scale under 3 in the period they received intervention. Also considering the SEM scale, most of the patients scored 0 in the intervention period. No adverse effect was reported during or after the process. CONCLUSIONS: The study showed a significant effect of photobiomodulation on reducing pain perception during infiltration injection. CLINICAL RELEVANCE: This method can be useful in order to lower the pain for the patients consulting a dentist and therefore facilitate consulting at early stages of the dental issues. TRIAL REGISTRATION: The registration number (date) of the clinical trial in a Primary Registry in the WHO Registry Network is IR.ARAKMU.REC.1398.248(13/03/2020). The related URL is https://en.irct.ir/trial/45362 . Humans;Low-Level Light Therapy;Cross-Over Studies;Pain Perception;Pain;Anesthesia, Dental

The effectiveness of interventions in reducing pain related to orthodontic separation: a systematic review and meta-analysis. BACKGROUND: Pain is an unpleasant experience and annoying sensation. To control this pain during orthodontic separation, different pharmacological and non-pharmacological methods have been used. OBJECTIVE: This systematic review and meta-analysis aimed to critically assess the evidence of the effectiveness of pharmacological and non-pharmacological methods in reducing pain induced by orthodontic separation. SEARCH STRATEGY: An electronic search was conducted using the following databases: PubMedÂ® (Medline), ScopusÂ®, EMBASEÂ®, Web of ScienceTM, Google ScholarTM, ProQuest, and Cochrane Central Register of controlled trials (CENTRAL) searching for the studies published between January 2012 and April 2023. SELECTION CRITERIA: Only randomized controlled trials (RCTs) were included, each experimental group included patients who received elastomeric separators and one kind of pharmacological or non-pharmacological interventions for pain reduction during the separation stage. DATA COLLECTION AND ANALYSIS: Cochrane's risk of bias tool (RoB2 tool) was applied. The Grading of Recommendations Assessment, Development, and Evaluation [GRADE] approach was used to evaluate the strength of the evidence. RESULTS: Thirty-one studies (RCTs) were included in this systematic review. Nineteen of them were appropriate for quantitative synthesis and used VAS for pain assessment. Meta-analysis showed that low-level laser therapy (LLLT) was an effective approach

for pain relief after separators placement with standard mean difference of 13.79 mm (95% confidence interval (CI): -15.64, -11.94) at 6 h and 23.34 mm at 24 h (95% CI: -25.91, -20.77). LLLT was also effective when applied in split-mouth and the standard mean difference was 8.9 mm at 6 h (95% CI: -12.86, -3.33) and 17.15 mm at 24 h (95% CI: -30.12, -4.17). Ibuprofen had a pain control effect at 6 h and at 24 h compared with the placebo group. The standard mean difference was 14.37 mm (95% CI: -20.54, -8.19) and 20.46 mm (95% CI: -27.79, -13.13), respectively. There was no difference in pain control between ibuprofen and acetaminophen. Naproxen had lower visual analog scale scores in pain perception at 6 h and the standard mean difference was 7.03 mm (95% CI: -12.67, -1.40). CONCLUSIONS: The application of LLLT decreased the pain induced by the separation during the first day of teeth separation; the pain reduction showed an increase from 6 h to the end of the 24 h. However, the evidence is weak to moderate. The analgesics reduced the pain compared to placebo; this pain reduction had shown an increase from 6 h to the end of the 24 h. The strength of the evidence is moderate. Naproxen gel effectively reduced the pain compared to placebo; the evidence in this regard is moderate. Naproxen gel effectively reduced the pain compared to placebo, but it was less effective than the oral intake of non-steroidal anti-inflammatory drugs. However, the evidence in this regard is moderate. REGISTRATION: This systematic review was registered with PROSPERO (CRD42022335553) during the first stages of its conduction.
Ibuprofen;Naproxen;Acetaminophen;Analgesics
Humans;Ibuprofen;Naproxen;Pain;Acetaminophen;Analgesics

Long-term effects of photobiomodulation therapy on blood pressure in obese rats induced by a high-fat diet. The main cardiovascular disease risk associated with obesity is hypertension. The therapeutic use of photobiomodulation therapy (PBM) is suggested for the treatment of wound healing, osteoarthritis, and arterial diseases. However, few studies have measured how red laser (at 660Â nm) acts over hypertension, and any of those studies used experimental obesity model. The aim of the study was an attempt to evaluate the long-term effect of PBM on systolic blood pressure in an animal model of obesity, induced by a high-fat diet (HFD). Our results indicate that PBM carried out 3Â days a week was able to prevent the increase in blood pressure (133.75â€‰Â±â€‰4.82Â mmHg, nâ€‰=â€‰8) induced by a high-fat diet (150.00â€‰Â±â€‰4.57Â mmHg, nâ€‰=â€‰8; pâ€‰<â€‰0.05), restore nitric oxide levels (control: 31.7â€‰Â±â€‰5.5Â Î¼M, nâ€‰=â€‰8; HFDâ€‰+â€‰PBM: 29.9â€‰Â±â€‰3.7Â Î¼M, nâ€‰=â€‰8â€‰>â€‰HFD: 22.2â€‰Â±â€‰2.9Â Î¼M, nâ€‰=â€‰8, pâ€‰<â€‰0.05), decrease lipoperoxidation (control: 1.65â€‰Â±â€‰0.25Â nM, nâ€‰=â€‰8; HFDâ€‰+â€‰PBM: 2.05â€‰Â±â€‰0.55Â nM, nâ€‰=â€‰8â€‰<â€‰HFD: 3.20â€‰Â±â€‰0.47Â nM, nâ€‰=â€‰8; pâ€‰<â€‰0.05), and improve endothelial function (pD2 control: 7.39â€‰Â±â€‰0.08, nâ€‰=â€‰8â€‰>â€‰pD2 HFDâ€‰+â€‰PBM: 7.15â€‰Â±â€‰0.07, nâ€‰=â€‰8â€‰>â€‰HFD: 6.94â€‰Â±â€‰0.07, nâ€‰=â€‰8; pâ€‰<â€‰0.05). Our results indicate that PBM prevents the elevation of blood pressure in an obese animal model by a mechanism that involves improvement of endothelial function through an antioxidant effect. Rats;Animals;Blood Pressure;Diet, High-Fat;Low-Level Light Therapy;Obesity;Hypertension

Efficacy of guided autofluorescence laser therapy in MRONJ: a systematic review. OBJECTIVE: This review aims to explore the efficacy of fluorescence-guided excision in the treatment of necrotic bone and highlights the importance of fluorescence in distinguishing viable margins from necrotic ones for a more targeted and predictable management of MRONJ. MATERIALS AND METHODS: The review was conducted according to PRISMA guidelines using PubMed, Scopus, and Web of Science databases from January 1, 2008, to May 17, 2023. The Boolean search strategy with the following keywords "osteonecrosis" AND "fluorescence" was performed. Then, the articles were subjected to screening and eligibility phases. The papers about the use of autofluorescence-guided laser therapy in

patients with jaw osteonecrosis were included. RESULTS: A total of 320 articles were initially identified through an electronic search, and ultimately, 17 papers were included in the qualitative analysis. CONCLUSIONS: In conclusion, our findings demonstrate that the VELscope system allows for clear visualization of the bone, making guided autofluorescence a precise, safe, and reliable technique. Bone Density Conservation Agents;Diphosphonates Humans;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Laser Therapy;Low-Level Light Therapy

Status of research on the development and regeneration of hair follicles. Hair loss, or alopecia, is a prevalent condition in modern society that imposes substantial mental and psychological burden on individuals. The types of hair loss, include androgenetic alopecia, alopecia areata, and telogen effluvium; of them, androgenetic alopecia is the most common condition. Traditional treatment modalities mainly involve medical options, such as minoxidil, finasteride and surgical interventions, such as hair transplantation. However, these treatments still have many limitations. Therefore, exploring the pathogenesis of hair loss, specifically focusing on the development and regeneration of hair follicles (HFs), and developing new strategies for promoting hair regrowth are essential. Some emerging therapies for hair loss have gained prominence; these therapies include low-level laser therapy, micro needling, fractional radio frequency, platelet-rich plasma, and stem cell therapy. The aforementioned therapeutic strategies appear promising for hair loss management. In this review, we investigated the mechanisms underlying HF development and regeneration. For this, we studied the structure, development, cycle, and cellular function of HFs. In addition, we analyzed the symptoms, types, and causes of hair loss as well as its current conventional treatments. Our study provides an overview of the most effective regenerative medicine-based therapies for hair loss. Finasteride Humans;Hair Follicle;Hair;Finasteride;Alopecia Areata;Regeneration

The combined treatment of gold nanoparticles associated with photobiomodulation accelerate the healing of dermonecrotic lesion. Introduction: The search for fast and efficient treatment for dermonecrotic lesions caused by the venom of the spider from the Loxosceles simillis, is a demand in health. Prednisolone is one of the most used drugs, however it has side effects. In this context, addictionally gold nanoparticles (GNPs) have anti-inflammatory, antioxidant, and antibacterial properties. The use of photobiomodulation has show to be efficient in the process of tissue repair. Therefore, the purpose of this study was to investigate the anti-inflammatory effect of photobiomodulation and GNPs associated or not with a low concentration of prednisolone in animal models of dermonecrotic lesion.Methodology: For this, rabbits with venon-induced dermonecrotic lesion were subjected to topical treatment with prednisoloneâ€‰+â€‰laser or GNPsâ€‰+â€‰laser or Pred-GNPsâ€‰+â€‰laser. The area of edema, necrosis and erythema were measured. On the last day of treatment, the animals were euthanized to remove the organs for histopathological and biochemical analysis.Results: All treatments combinations were effective in promoting the reduction of necrotic tissue and erythema.Conclusion: With this results, we suggest that the use of laser and nanoparticles, associated or not with prednisolone, should be considered for the treatment of dermonecrotic injury. Phosphoric Diester Hydrolases;Gold;Spider Venoms;Prednisolone;Anti-Inflammatory Agents Animals;Rabbits;Phosphoric Diester Hydrolases;Gold;Low-Level Light Therapy;Spider Venoms;Metal Nanoparticles;Erythema;Prednisolone;Anti-Inflammatory Agents

Testing the effects of photobiomodulation on angiogenesis in a newly established CAM burn wound model. Burn wounds are a common challenge for medical professionals. Current burn wound models hold several limitations, including a lack of comparability due to the heterogeneity of wounds and differences in individual wound healing. Hence, there is a need for reproducible in vivo models. In this study, we established a new burn wound model using the chorioallantoic membrane assay (CAM) as a surrogate model for animal experiments. The new experimental setup was tested by

investigating the effects of the auspicious biophysical therapy, photobiomodulation (PBM), on the wound healing of an induced CAM burn wound with a metal stamp. PBM has been shown to positively influence wound healing through vascular proliferative effects and the increased secretion of chemotactic substances. The easily accessible burn wounds can be treated with various therapies. The model enables the analysis of ingrowing blood vessels (angiogenesis) and diameter and area of the wounds. The established model was used to test the effects of PBM on burn wound healing. PBM promoted angiogenesis in burn wounds on day 4 (pâ€‰=â€‰0.005). Furthermore, there was a not significant trend toward a higher number of vessels for day 6 (pâ€‰=â€‰0.065) in the irradiated group. Changes in diameter (pâ€‰=â€‰0.129) and the burn area (pâ€‰=â€‰0.131) were not significant. Our results suggest that CAM can be a suitable model for studying burn wounds. The novel experimental design enables reproducible and comparable studies on burn wound treatment.
Animals;Chorioallantoic Membrane;Low-Level Light Therapy;Angiogenesis;Wound Healing;Burns

In Vitro Effect of Low-Level Lasers on Total Bilirubin Concentration in Human Blood Plasma Using 375 and 650â€‰nm Lasers. Background: The current research extends previous laboratory investigations by investigating the effects of low-level laser irradiation (LLLI) on human blood plasma. Total bilirubin is of special importance because of its potential biostimulatory and modulatory actions. Objective: This study aims to analyze changes in total bilirubin content as a consequence of LLLI on human blood plasma. This study aims to determine how changes in exposure duration and laser wavelength affect these adjustments. Methodology: Plasma was isolated from a healthy adult donor's whole blood using the anticoagulant ethylenediaminetetraacetic acid (EDTA). Plasma samples were exposed to LLLI at 375 and 650â€‰nm for 5, 10, 15, 20, and 25â€‰min. Total bilirubin concentrations were measured both before and after irradiation using spectrophotometric analysis. The difference between 375 and 630â€‰nm lasers was also investigated. Results: Five, 10, 15, 20, and 25â€‰min of exposure to LLLI at 375 and 650â€‰nm wavelengths resulted in statistically significant differences in total bilirubin content (p Ë, 0.05, p Ë, 0.001, p Ë, 0.0001). There was no statistically significant difference in total bilirubin concentration between the 375 and 630â€‰nm lasers. Conclusions: Human blood plasma total bilirubin levels were considerably lower following LLLI at 375 and 630â€‰nm than controls. Multiple exposures provide the same results. These findings demonstrate the role of biostimulation by laser irradiation in blood plasma applications and suggest that low-level laser treatment may control total bilirubin levels, particularly at 375 and 630â€‰nm.
Adult;Humans;Lasers;Low-Level Light Therapy;Plasma

Effects of photobiomodulation therapy on the functional performance of healthy individuals: a systematic review with meta-analysis. The aim of this study is to assess the effect of photobiomodulation therapy (PBMT) on functional performance concerning strength, fatigue, and functional capacity in healthy individuals. This systematic review with meta-analysis involved searches on data platforms and active searches of randomized clinical trials, focusing on PBMT as the sole intervention. Primary outcomes assessed included strength, fatigue, and functional capacity. Three reviewers screened studies by title and abstract using Rayyan, and data were extracted using a specific form. Bias risk was assessed using RoB2, and confidence in the evidence was evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE). The RevMan was used for meta-analysis. Sixteen studies were included, totaling 340 individuals (183 males and 157 women). Most articles presented a low risk of bias. Variability was observed in device types and application domains, including wavelengths (655-905Â nm), power (10-200 nW), energy (0.6-30Â J per point), and time (30-100Â s per point). PBMT improved fatigue recovery (mean difference: 5.87; 95% CI 3.83, 7.91). There was no enhancement in strength (peak torque: mean difference 12.40; 95% CI -5.55, 30.55; one-repetition maximum test: mean difference 39.97, 95% CI -2.44, 82.38; isometric and isokinetic strength: mean difference 2.77, 95% CI -14.90, 20.44) nor improvement in short-term

(mean difference 0.67, 95% CI -0.58, 1.91) and long-term (mean difference 18.44, 95% CI -55.65, 92.54) functional capacity. PBMT may aid in favoring fatigue recovery in healthy individuals; however, there's no evidence to support PBMT enhancing strength or improving functional capacity. Female;Humans;Male;Fatigue;Low-Level Light Therapy;Physical Functional Performance;Muscle Strength

An Overview about New Methods in Management of Gag Reflex during Dental Treatment: A Systematic Review. STATEMENT OF THE PROBLEM: Management of gag reflex is a challenging process during many dental treatments. Various studies have been carried out to evaluate different pharmacological and non-pharmacological techniques to control gagging. PURPOSE: The aim of this study is to review the available evidence on methods proposed for managing the gag reflex. MATERIALS AND METHOD: This systematic review adheres to the preferred reporting items for systematic review and meta-analysis (PRISMA) guidelines. A comprehensive search was conducted in English and Persian based on articles published from 2015 to 2022 (February) in PubMed, Scopus, Science Direct, Web of Science, Google Scholar, ISC and SID. All studies were first screened based on their title and abstract. The quality assessment of articles was carried out by two independent authors. Then, risk of bias evaluation was conducted according to Cochrane parameters. RESULTS: In total, 1704 studies were identified via search. After reviewing title and abstract, 16 studies found eligible based on inclusion and exclusion criteria. Following quality and risk of bias assessment, 9 studies included in the systematic review. CONCLUSION: Based on the finding of this review, distraction techniques, nitrous oxide, and low-level laser therapy were found effective in management of gag reflex. The dentist should consider gag reflex management based on the type of dental treatment, gag severity, patient's age, and available capabilities.

Photobiomodulation effect of infra-red laser on the level of gonad maturity in the Simese Catfish (Pangasianodon hypophthalmus). The purpose of this study is to determine how photo biomodulation therapy utilizing infrared diode laser irradiation (975.2Â nm) affects the gonadal maturity level (GML) of male Siamese catfish (Pan-gasianodon hypothalamus). The interest in applying laser therapy in medicine and dentistry has remarkably increased in the last decade. Different types of lasers are available, and their usage is well-defined by different parameters, such as wavelength, energy density, power output, duration of radiation, power density and radiation mode. Infrared diode laser irradiation is used at the reproductive point (governor's vessel), situated 2/3 of the way between the anus and the pectoral fin. This study examined the metrics GML, gonads somatic index, and hepatosomatic index. The treatments were Control+ (ovaprim), Control- (without the treatment), P1 (0.2Â J/cm(2)), P2 (0.4Â J/cm(2)), P3 (0.6Â J/cm(2)), and P4 (0.8Â J/cm(2)). Therapy with infrared diode laser irradiation can modify gonad maturity (GML), gonadosomal index, and hepatosomatic index in male Siamese catfish. The photobiomodulation effect of an infrared laser stimulated the gonadal maturation of Siamese catfish. This is based on the values of wavelength (nm), power (mW), beam area (cm(2)), time (s), radiation mode (rad) and energy dose (J/cm(2)) in Control- (no treatment), control+ (ovaprim), P1, P2, P3, and P4. The increase in the observed parameter values is due to the vitellogenesis process. The fish gonads at the GML IV had the highest GML at P2 (dose 0.4Â J/cm(2)), with a GSI value of 1.02% and an HSI value of 1.46%. According to the study's findings, photo biomodulation therapy with infrared diode laser exposure at a dose of 0.4Â J/cm(2) is the best way to increase the gonad maturity of male Siamese catfish.

Photobiomodulation effects on fibroblasts and keratinocytes after ionizing radiation and bacterial stimulus. OBJECTIVE: Photobiomodulation therapy (PBMT) has proven to reduce inflammation and pain and increase wound healing. Thus, the aim of this study was to analyze the effects of PBMT parameters on migration, proliferation, and gene expression after ionizing radiation and bacterial-induced stress in an in vitro study. DESIGN: Keratinocytes (HaCaT) and Fibroblasts (HGFs) were grown

in DMEM with 10 % fetal bovine serum until stressful condition induction with lipopolysaccharide (LPS) of Escherichia coli (1Â Âµg/mL), Porphyromonas gingivalis protein extract (5Â Âµg/mL) and ionizing radiation (8Â Gy). Low-laser irradiation (660Â nm, 30Â mW) was carried out in four sessions, with 6Â h intervals, and energy density of 2, 3, 4, and 5Â J/cmÂ². Scratch assays, immunofluorescence, and RT-qPCR were performed. RESULTS: Treated fibroblasts and keratinocytes showed significant response in proliferation and migration after scratch assays (pÂ <Â 0.05). Higher expressions of Î±-SMA in fibroblasts and F-actin in keratinocytes were observed in cells subjected to 3Â J/cmÂ². PI3K-pathway genes expression tended to enhance in fibroblasts, presenting a higher relative expression when compared to keratinocytes. In keratinocytes, PBMT groups demonstrated deregulated expression for all inflammatory cytokines' genes tested while fibroblasts presented a tendency to enhance those genes expression in a dose dependent way. CONCLUSIONS: The present study showed that delivering 660Â nm, 30Â mW was effective to stimulate cell migration, proliferation and to accelerate wound healing. PBMT can modulate cytokines and pathways involved in wound repair. The different energy densities delivering distinct responses in vitro highlights that understanding laser parameters is fundamental to improve treatment strategies. Phosphatidylinositol 3-Kinases Low-Level Light Therapy;Phosphatidylinositol 3-Kinases;Keratinocytes;Fibroblasts;Cell Proliferation;Radiation, Ionizing

Use of Phototherapy and Er-YAG Laser in the Management of Mandible Osteoradionecrosis: A Case Report. Introduction: Osteoradionecrosis (ORN) is a secondary complication from radiotherapy, which is difficult to manage and significantly reduces the life quality of the affected patients. Case Report: A 59-year-old female patient, diagnosed with infiltration by squamous cell carcinoma in the left cervical region, underwent adjuvant cervical-facial radiotherapy with a total dose of 66.6 Gy of radiation. Eight years after the diagnosis, the patient underwent multiple extractions and, subsequently, the installation of osseointegrated implants, evolving to extensive intraoral bone exposure associated with oral cutaneous fistula. The patient was initially exposed to photobiomodulation therapy (PBMT), with a low-power laser at wavelengths of 660 nm and 808 nm, and thereafter to antimicrobial photodynamic therapy (aPDT). After an improvement in the clinical condition and resolution of the oral cutaneous fistula, a surgical procedure with the Er: YAG laser was performed to remove the remaining necrotic bone. Once the ORN condition was completely treated, the patient's oral rehabilitation was implemented by the installation of an upper mucous-supported total prosthesis and a lower implant-supported prosthesis. Conclusion: The patient is in a clinical follow-up and has no signs of bone necrosis recurrence, suggesting that low and high-power laser treatment can be an effective therapeutic alternative to resolve this condition.

Effect of Low-Level Laser Irradiation (810 nm) on the Proliferation and Differentiation of Osteoblast-Like Cells Cultured on SLA Titanium Discs Exposed to a Peri-implantitis Environment. Introduction: Elimination of inflammation and re-osseointegration are the major objectives of peri-implantitis therapy. Existing data, however, do not support any decontamination approach. Thus, the present in vitro study aims to assess whether the air-debriding decontamination method with erythritol powder restores the biocompatibility of infected titanium discs and to investigate the potent biomodulatory ability of diode laser (810 nm) irradiation to promote cell proliferation and differentiation of premature osteoblast-like cells (MG63) towards osteocytes. Methods: The experimental groups consisted of cells seeded on titanium discs exposed or not in a peri-implantitis environment with or without biomodulation. Infected discs were cleaned with airflow with erythritol powder. Cell cultures seeded on tricalcium phosphate (TCP) surfaces with or without biomodulation with a laser (810 nm) were used as controls. The study evaluated cell viability, proliferation, adhesion (SEM) at 24, 48 and 72 hours, and surface roughness changes (profilometry), as well as the effects of low-level laser therapy (LLLT) on ALP, OSC, TGF-b1, Runx2, and BMP-7 expression in MG63 cells'

genetic profile on days 7, 14, and 21. Results: The MTT assay as well as the FDA/PI method revealed that cell proliferation did not show significant differences between sterile and decontaminated discs at any timepoint. SEM photographs on day 7 showed that osteoblast-like cells adhered to both sterile and disinfected surfaces, while surface roughness did not change based on amplitude parameters. The combination of airflow and LLLT revealed a biomodulated effect on the differentiation of osteoblast-like cells with regard to the impact of laser irradiation on the genetic profile of the MG63 cells. Conclusion: In all groups tested, osteoblast-like cells were able to colonize, proliferate, and differentiate, suggesting a restoration of biocompatibility of infected discs using airflow. Furthermore, photomodulation may promote the differentiation of osteoblast-like cells cultured on both sterile and disinfected titanium surfaces.

The Anti-Inflammatory Effect of Multi-Wavelength Light-Emitting Diode Irradiation Attenuates Dry Eye Symptoms in a Scopolamine-Induced Mouse Model of Dry Eye. Dry eye disease is a common condition in patients of all ages, causing discomfort and potential visual problems. Current treatments, including artificial tears and anti-inflammatory drugs, have certain limitations, encouraging research into alternative therapies. We investigated the therapeutic potential of multi-wavelength light-emitting diode (LED) irradiation of mice with dry eye. First, we showed that multi-wavelength LED irradiation was non-toxic to human corneal epithelial cells and improved cell viability. We then used a scopolamine-induced mouse model of dry eye to assess the effects of multi-wavelength LED irradiation on various clinical parameters. This treatment increased the tear volume and reduced corneal irregularity, thus improving dry eye. Histological analysis revealed that multi-wavelength LED irradiation protected against corneal epithelial damage and the associated reduction in epithelial thickness and would thus improve the corneal health of dry eye patients. Multi-wavelength LED irradiation significantly reduced the corneal levels of pro-inflammatory cytokines IL-6, IL-1Î², and TNF-Î±; the treatment was thus anti-inflammatory. Our results suggest that multi-wavelength LED irradiation may serve as a safe and effective treatment for dry eye, alleviating symptoms, reducing inflammation, and promoting corneal health. Scopolamine;Anti-Inflammatory Agents Humans;Mice;Animals;Scopolamine;Dry Eye Syndromes;Tears;Cornea;Disease Models, Animal;Anti-Inflammatory Agents;Corneal Injuries

Multi-Wavelength Photobiomodulation Ameliorates Sodium Iodate-Induced Age-Related Macular Degeneration in Rats. Age-related macular degeneration (AMD) is a global health challenge. AMD causes visual impairment and blindness, particularly in older individuals. This multifaceted disease progresses through various stages, from asymptomatic dry to advanced wet AMD, driven by various factors including inflammation and oxidative stress. Current treatments are effective mainly for wet AMD; the therapeutic options for dry AMD are limited. Photobiomodulation (PBM) using low-energy light in the red-to-near-infrared range is a promising treatment for retinal diseases. This study investigated the effects of multi-wavelength PBM (680, 780, and 830 nm) on sodium iodate-induced oxidatively damaged retinal tissue. In an in vivo rat model of AMD induced by sodium iodate, multi-wavelength PBM effectively protected the retinal layers, reduced retinal apoptosis, and prevented rod bipolar cell depletion. Furthermore, PBM inhibited photoreceptor degeneration and reduced retinal pigment epithelium toxicity. These results suggest that multi-wavelength PBM may be a useful therapeutic strategy for AMD, mitigating oxidative stress, preserving retinal integrity, and preventing apoptosis. sodium iodate;Iodates Animals;Rats;Low-Level Light Therapy;Wet Macular Degeneration;Iodates;Retina

Analgesic Effect of Low-Level Laser Therapy before Heel Lance for Pain Management in Healthy Term Neonates: A Randomized Controlled Trial. Currently, the prevention, assessment, and management of procedural pain in neonates continues to challenge clinicians and researchers. Objective. To investigate the analgesic effect of low-level laser therapy (LLLT) during heel lance

compared to breast milk (BM) feeding in healthy term neonates. In this randomized controlled trial, healthy term neonates who underwent heel lance were randomly assigned to an LLLT or a BM group. The LLLT group received laser therapy to the heel lance site for 20 s before heel lance. The BM group received 5 mL expressed BM via a syringe before heel lance. The primary outcomes were behavioral responses. The secondary outcomes were physiological responses and levels of salivary cortisol and Î±-amylase. A total of 125 neonates were included, of whom 55 in the LLLT group and 59 in the BM group completed the study. There were no significant differences in latency to first cry and cry duration between the two groups. The squeeze time was significantly shorter in the LLLT group than in the BM group ($p = 0.047$). There were no significant differences in pain scores, heart rate, respiratory rate, oxygen saturation, and blood pressure before and after heel lance between the two groups. There were no significant differences in salivary cortisol and Î±-amylase levels in the LLLT group before and after heel lance; however, the differences were significant in the BM group. These findings suggest that the analgesic effect of LLLT is similar to that of BM during heel lance in healthy term neonates. LLLT has potential as an analgesic treatment.

Laser treatment for adverse reactions to injectable facial filling: a systematic review. Facial filling is widespread in society, albeit associated with inherent risks. This review analyzes clinical studies using laser therapy for filler complications to assess its safety and efficacy as an alternative treatment. A literature search was conducted up until April 2023, encompassing five different databases: PubMed, Scopus, Embase, Web of Science, and Medline, to find clinical trials addressing patients who underwent laser treatment for adverse reactions to injectable facial filling. The outcome variables were the clinical assessment of the lesion and the occurrence of post-intervention complications/sequelae. The risk of bias was assessed using the ROBINS-I tool. In total, six studies were included, all classified as having a "moderate risk" of bias. A total of 533 patients underwent laser treatment for adverse reactions to injectable facial fillers. The diode laser was the most frequently utilized equipment, with positive results reported in five studies. Among all treated patients, 96.24% achieved partial or complete resolution, 0.22% experienced some sequelae or complications, and only 0.01% showed no improvement. Laser treatment can eliminate the necessity for surgical intervention for adverse reactions to injectable facial fillers, resulting in partial or complete improvement of the condition. Humans;Laser Therapy;Low-Level Light Therapy;Lasers

Efficacy of root coverage with the use of the conventional versus laser-assisted flap technique with platelet-rich fibrin in class I and class II gingival recession: A randomized clinical trial. BACKGROUND: The coronally advanced flap (CAF) technique is the preferred option in treating recession defects, especially when the attached gingiva is adequate. A laser-assisted vestibular releasing incision after surgery could enhance the outcome. Platelets, when used as adjunctive treatment, have shown good results. However, laser biostimulation post-surgery has not been studied. OBJECTIVES: The present study compared the benefits of using the conventional and laser-assisted flap technique with platelet-rich fibrin (PRF) in the treatment of class I and class II gingival recession. MATERIAL AND METHODS: The study included 24 subjects, both males and females. The participants, diagnosed with Miller's class I and II gingival recession, were categorized into 2 groups: group A ($n = 12$) treated with CAF and PRF; and group B ($n = 12$) treated with laser-assisted CAF and PRF. Root coverage (RC), the probing depth (PD), the clinical attachment loss (CAL), and the keratinized tissue width (KTW) were assessed preand 6 months postoperatively. The wound healing index (WHI) and the visual analog scale (VAS) scores were assessed 1 week post-surgery. RESULTS: Most clinical parameters improved significantly within the groups at 6 months postoperatively as compared to baseline ($p < 0.05$), except for PD and percentage root coverage (PRC). However, when intergroup comparisons were made, it was observed that both groups performed equally well and

the differences between them were not significant. CONCLUSIONS: Both treatment modalities improved the clinical parameters post-surgery. However, further trials are warranted to affirm the benefits of the laser-assisted CAF technique. Male;Female;Humans;Gingival Recession;Platelet-Rich Fibrin;Treatment Outcome;Gingiva;Surgical Flaps

Application of a physiotherapeutic protocol associated with photobiomodulation for the treatment of leprosy patients. Leprosy is a chronic infectious disease characterized by acute inflammatory episodes that affect the skin and peripheral nerves and can develop progressive and irreversible disabilities and deformities. In addition, drug therapy and physiotherapy offer resources and techniques capable of mitigating the consequences of neural lesions, but neural lesions can occur before, during, and even after drug treatment. Thus, new treatments are needed. Photobiomodulation (PBM) might be a promissor therapy since it aims to reduce the inflammatory process and restore motor and sensory functions in the affected area. This study aims to compare the evolution of neural status, pain, and functionality in patients with leprosy and neuritis after a physiotherapeutic protocol and PBM treatment. This was a randomized controlled clinical trial that analyzed a group of patients receiving a physiotherapeutic protocol (PPG) and another receiving physiotherapeutic protocol associated with PBM (PLG) (wavelength 904Â nm, potency 70 mW, time per point 9Â s). Our results showed when evaluating functional capacity limitations with the SALSA scale, the PLG patients improved from moderate to mild limitations. On the other hand, the PPG remained as moderate limitations. Also, the PLG showed a significant reduction in pain on the VAS scale. The neurological assessment showed that PLG improved palpation of the median, radial, and peroneal nerves. In the strength test, PLG patients improved in the 5th finger abduction and ankle dorsiflexion. Assessing sensitivity, it was identified an improvement in PLG for the ulnar nerve and tibial nerve. All those changes were statistically significant when compared to the PPG patients. Finally, the PLG patients improved disabilities, identified by the neurological assessment of the eyes, hands, and feet. In conclusion, this study demonstrated that combining a physiotherapeutic protocol with PBM treatment effectively improved functional status and reduced pain in leprosy patients. Humans;Low-Level Light Therapy;Leprosy;Peripheral Nerves;Skin;Pain;Randomized Controlled Trials as Topic

CO(2) Laser for Esthetic Healing of Injuries and Surgical Wounds with Small Parenchymal Defects in Oral Soft Tissues. A number of studies have recently demonstrated the effectiveness of CO(2) laser irradiation for the repair and regeneration of scar tissue from injuries or surgical wounds. However, such studies of the oral mucosa are highly limited. Previous studies using CO(2) laser irradiation have indicated that two factors contribute to esthetic healing, namely, artificial scabs, which are a coagulated and carbonized blood layer formed on the wound surface, and photobiomodulation therapy (PBMT) for suppressing wound scarring and promoting wound healing. This review outlines basic research and clinical studies of esthetic healing with the use of a CO(2) laser for both artificial scab formation by high-intensity laser therapy and PBMT in the treatment of injuries and surgical wounds with small parenchymal defects in oral soft tissues. The results showed that the wound surface was covered by an artificial scab, enabling the accumulation of blood and the perfusion necessary for tissue regeneration and repair. Subsequent PBMT also downregulated the expression of transformation growth factor-b1, which is involved in tissue scarring, and decreased the appearance of myofibroblasts. Taken together, artificial scabs and PBMT using CO(2) lasers contribute to the suppression of scarring in the tissue repair process, leading to favorable esthetic and functional outcomes of wound healing.

Patient-Reported Outcome Measures of Flapless Corticotomy with Low-Level Laser Therapy in En Masse Retraction of Upper Anterior Teeth: A Three-Arm Randomized Controlled Trial. (1) Background: This study aimed to compare patient-reported outcome measures when accelerating en

masse retraction between the piezocision procedure and the subsequent application of low-level laser therapy (FC+LLLT), with the piezocision alone (FC), and in a control group. (2) Methods: A three-arm randomized controlled trial (RCT) was conducted involving 60 patients (41 females and 19 males) with Class II division I malocclusion. The en masse retraction was performed using NiTi closed coil springs attached to miniscrews. The LLLT was performed using an 808 nm Ga-Al-As diode laser. Patient responses regarding pain, discomfort, swelling, and chewing difficulties were reported at ten assessment points. (3) Results: The greatest pain levels were observed 24 h after the application of force during the first and third months of retraction. The mean pain, discomfort, swelling, and chewing difficulties were significantly smaller in the control group than in the FC and FC+LLLT groups. High satisfaction levels were reported in all three groups ($p < 0.05$). (4) Conclusions: The accelerated en masse retraction via piezocision, followed by a small course of LLLT, was accompanied by significantly fewer pain, discomfort, and chewing difficulties than the control group. LLLT is a valuable addition to piezocision, with an improved patient experience.

Effect of various photobiomodulation regimens on breast cancer-related lymphedema: A systematic review and meta-analysis. Breast cancer-related lymphedema (BCRL) is common among patients who have completed their cancer treatment. Although low-level laser therapy (LLLT) has been explored as a treatment option for BCRL, we could not find a regimen that is more effective than others. This meta-analysis aimed to organize existing research and determine the optimal combination of LLLT parameters for BCRL treatment. Studies were collected from four online databases: Embase, Ovid Medline, Cochrane, and Cinahl. The collected studies were reviewed by two of the authors. We focused on the aspects of the treatment area, treatment regimen, and total treatment sessions across the included studies. The comparisons between LLLT and non-LLLT were performed through a meta-analysis. Post-treatment QOL was significantly better in the axillary group. The group treated "three times/week with a laser density of 1.5-2Â J/cm(2)" had significantly better outcomes in terms of swelling reduction, both immediately post-treatment and at 1-3Â months follow-ups. The group withâ€‰>â€‰15 treatment sessions had significantly better post-treatment outcomes regarding reduced swelling and improved grip strength. According to these results, LLLT can relieve the symptoms of BCRL by reducing limb swelling and improving QOL. Further exploration found that a treatment approach targeting the axilla, combined with an increased treatment frequency, appropriate laser density, and extended treatment course, yielded better outcomes. However, further rigorous, large-scale studies, including long-term follow-up, are needed to substantiate this regimen. Humans;Female;Lymphedema;Low-Level Light Therapy;Quality of Life;Breast Neoplasms;Treatment Outcome

Effects of low-level laser therapy on acupuncture points on knee pain and function in knee osteoarthritis. OBJECTIVE: Knee osteoarthritis is a common and disabling disease. We aimed to examine the effect of low-level laser therapy in addition to routine physical therapy modalities (transcutaneous electrical stimulation, superficial heating modality of infrared, ultrasound, and exercise) on the functional status and pain in knee osteoarthritis. METHODS: Patients with knee osteoarthritis (n=71) who underwent physical therapy (transcutaneous electrical stimulation, infrared, ultrasound, exercise therapy, and low-level laser therapy) were retrospectively screened. Patients who received low-level laser therapy on acupuncture points, transcutaneous electrical stimulation, infrared, ultrasound, and exercise were included in the low-level laser therapy (+) (n=35), and patients who received only transcutaneous electrical stimulation, ultrasound, infrared, and exercise were included in the low-level laser therapy (-) group (n=36). The Visual Analog Scale for activity pain, Lysholm Knee Scoring Scale, and walking and stair climbing tests were used before and after treatment obtained from patient files. RESULTS: The post-treatment Visual Analog Scale activity score and walking and stair climbing test results were statistically significantly lower in the low-level

laser therapy (+) group than in the low-level laser therapy (-) group. There was no significant difference in post-treatment Lysholm Knee Scoring Scale scores between the two groups. In both groups, the Visual Analog Scale activity, Lysholm Knee Scoring Scale, and walking and stair climbing test scores statistically significantly decreased after treatment. CONCLUSION: Knee osteoarthritis increases with aging and creates significant functional limitations. low-level laser therapy with routine physiotherapy contributed to the improvement in the pain and functional status of the patients with knee osteoarthritis. Low-level laser therapy can be recommended in osteoarthritis treatment guidelines with the support of further studies, which is an easy-to-apply, effective, and reliable method. Humans;Osteoarthritis, Knee;Low-Level Light Therapy;Acupuncture Points;Retrospective Studies;Pain;Exercise Therapy;Treatment Outcome;Acupuncture Therapy

The Photobiomodulation effect of 980Â nm Diode Laser on Patients with Xerostomia. PURPOSE: Xerostomia is not a disease in itself. This condition is associated with systemic diseases, medication use, and radiotherapy. Oral and general health suffer when the salivary glandÂ´s function is reduced. The effectiveness of therapeutic methods in resolving this issue thus far has been inadequate. This study aimed to determine the photobiomodulation (PBM) effect of a 980Â nm laser on xerostomia. METHODS: A quasi-experimental study was carried out using a 980Â nm diode laser on 28 patients with xerostomia. A diode laser (980Â nm) was used extortionally over the submandibular glands and parotids and it was used internally in the sublingual glands. The laser beam (extrorally 6Â J, 300mW, 20Â s, and introrally 4Â J, 200mW, 20Â s) was applied bilaterally every other day for 10 sessions. It should be noted that 8 points of the parotid, 2 points of the submandibular glands, and 2 points of the sublingual glands were irradiated. The saliva was collected each session using the Navazesh technique, 5Â min before and after PBM. The Wilcoxon test was used to study the effect of laser therapy on saliva flow rate (volume and weight). The Pâ€‰<â€‰0.05 level was considered a significant level. RESULTS: The volume (Pâ€‰<â€‰0.0001) and the weight (Pâ€‰<â€‰0.0001) of the saliva were increased by using a 980Â nm diode laser.Â While, in smokers and diabetic patients with hypertension, no significant difference was observed in either saliva volume (Pâ€‰=â€‰0.593, Pâ€‰=â€‰0.092) or weight (Pâ€‰=â€‰0.785, Pâ€‰=â€‰0.089). CONCLUSION: In this study, the volume and weight of the unstimulated saliva in most patients with xerostomia increased with using PBM. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Xerostomia;Saliva;Hypertension

Transcranial Irradiation Mitigates Paradoxical Sleep Deprivation Effect in an Age-Dependent Manner: Role of BDNF and GLP-1. The growing prevalence of aged sleep-deprived nations is turning into a pandemic state. Acute sleep deprivation (SD) accompanies aging, changing the hippocampal cellular pattern, neurogenesis pathway expression, and aggravating cognitive deterioration. The present study investigated the ability of Near Infra Red (NIR) light laser to ameliorate cognitive impairment induced by SD in young and senile rats. Wistar ratsâ€‰â‰¤â€‰2 months (young) and â‰¥â€‰14 months (senile) were sleep-deprived for 72Â h with or without transcranial administration of NIR laser of 830Â nm. Our results showed that NIR photobiomodulation (PBM) attenuated cognitive deterioration made by SD in young, but not senile rats, while both sleep-deprived young and senile rats exhibited decreased anxiety (mania)-like behavior in response to PBM. NIR PBM had an inhibitory effect on AChE, enhanced the production of ACh, attenuated ROS, and regulated cell apoptosis factors such as Bax and Bcl-2. NIR increased mRNA expression of BDNF and GLP-1 in senile rats, thus facilitating neuronal survival and differentiation. The present findings also revealed that age exerts an additive factor to the cellular assaults produced by SD where hippocampal damages made in 2-month rats were less severe than those of the aged one. In conclusion, NIR PBM seems to promote cellular longevity of senile hippocampal cells by combating ROS, elevating neurotrophic factors, thus improving cognitive performance. The present findings provide NIR as a possible candidate for

hippocampal neuronal insults accompanying aging and SD. Brain-Derived Neurotrophic Factor;Reactive Oxygen Species;Glucagon-Like Peptide 1;Transcription Factors Rats;Animals;Sleep Deprivation;Brain-Derived Neurotrophic Factor;Reactive Oxygen Species;Rats, Wistar;Glucagon-Like Peptide 1;Sleep, REM;Hippocampus;Transcription Factors

An evaluation of photobiomodulation effects on human gingival fibroblast cells under hyperglycemic condition: an in vitro study. An in vitro study was designed to evaluate the effects of photobiomodulation (PBM) with 915-nm diode laser on human gingival fibroblast (HGF) cells under hyperglycemic condition. The HGF cells were cultured in Dulbecco's modified eagle medium (DMEM) medium containing 30Â mM glucose concentration for 48Â h to mimic the hyperglycemic condition. Subsequently, the cells received three sessions of PBM (915Â nm, continuous emission mode, 200 mW, energy density values of 3.2, 6, and 9.2Â J/cm(2)). Twenty-four hours post-irradiation, cell proliferation, expression of interleukin 6 (IL-6), and vascular endothelial growth factor (VEGF) were assessed with MTT and real-time polymerase chain reaction (PCR) tests, respectively. Also, reactive oxygen species (ROS) production was measured using CM-H2DCFDA fluorimetry. No changes were detected in the cell proliferation rate between the high glucose control group and laser-treated cells, while VEGF and IL-6 gene expression levels increased significantly after PBM in the high glucose-treated cells group. ROS level was significantly decreased in the irradiated cells in high-glucose medium compared with the high glucose control group. Our study revealed the inductive role of 915-nm-mediated PBM on VEGF and the inflammatory response while concurrently reducing reactive oxygen species production in HGF cells in hyperglycemic conditions. Interleukin-6;Vascular Endothelial Growth Factor A;Reactive Oxygen Species;Blood Glucose Humans;Interleukin-6;Vascular Endothelial Growth Factor A;Reactive Oxygen Species;Low-Level Light Therapy;Blood Glucose;Fibroblasts;Cells, Cultured

A Randomized, Double-Blind, Placebo-Controlled Clinical Trial Evaluating Transcranial Photobiomodulation as Treatment for Concussion. INTRODUCTION: Literature indicating that transcranial photobiomodulation (tPBM) may enable the brain to recover normal function after concussion, resulting in symptoms reduction, and improved cognitive function after concussion is limited by small sample sizes and lack of controls. METHODS: We conducted a randomized, double-blind, placebo-controlled trial examining the effect of 6 wk of tPBM in patients 11 yr or older who received care for persistent postconcussion symptoms between September 2012 and December 2015. Our primary outcome measure was the mean difference in Postconcussion Symptom Scale total score and the raw Immediate Postconcussion Assessment and Cognitive Testing composite scores between study entry and treatment completion. Participants received two, 10-min sessions either with tPBM units or via two placebo units, three times per week. We screened for potential confounding variables using univariable analyses. We entered covariables that differed between the two groups on univariable screening into a regression analysis. We considered adjusted odds ratio that did not cross one statistically significant. RESULTS: Forty-eight participants completed the study. Most were female (63%), and a majority sustained their injury during sports or exercise (71%). Despite randomization, those that received tPBM therapy reported a greater number of previous concussions. After adjusting for the effect of previous concussions and multiple comparisons, there were no significant differences between tPBM and placebo groups at 3 or 6 wk of treatment. CONCLUSIONS: Despite showing promise in previous investigations, our study did not show benefit to tPBM over placebo therapy in patients experiencing persistent postconcussion symptoms. Further investigation is needed to determine if varying the dose or timing alters the efficacy of tPBM after concussion. Female;Humans;Male;Athletic Injuries;Brain Concussion;Low-Level Light Therapy;Neuropsychological Tests;Post-Concussion Syndrome;Sports;Child;Adolescent;Young Adult

Photobiomodulation and Vascularization in Conduit-Based Peripheral Nerve Repair: A Narrative Review. Background: Peripheral nerve injuries pose a significant clinical issue for patients, especially in the most severe cases wherein complete transection (neurotmesis) results in total loss of sensory/motor function. Nerve guidance conduits (NGCs) are a common treatment option that protects and guides regenerating axons during recovery. However, treatment outcomes remain limited and often fail to achieve full reinnervation, especially in critically sized defects (>3â€‰cm) where a lack of vascularization leads to neural necrosis. Conclusions: A multitreatment approach is, therefore, necessary to improve the efficacy of NGCs. Stimulating angiogenesis within NGCs can help alleviate oxygen deficiency through rapid inosculation with the host vasculature, whereas photobiomodulation therapy (PBMT) has demonstrated beneficial therapeutic effects on regenerating nerve cells and neovascularization. In this review, we discuss the current trends of NGCs, vascularization, and PBMT as treatments for peripheral nerve neurotmesis and highlight the need for a combinatorial approach to improve functional and clinical outcomes.
Humans;Low-Level Light Therapy;Peripheral Nerves;Trauma, Nervous System

Biomimetic Copper-Doped Polypyrrole Nanoparticles for Enhanced Cancer Low-Temperature Photothermal Therapy. INTRODUCTION: Photothermal therapy (PTT) has a significant potential for its application in precision tumour therapy. However, PTT-induced hyperthermia may damage healthy tissues and trigger the expression of heat shock proteins (HSPs), thereby compromising the long-term therapeutic efficacy of PTT. METHODS: In this study, a biomimetic drug delivery system comprising CuP nanozymes as the inner core and platelet membrane (PM) as the outer shell was successfully developed for administering synergistic chemodynamic therapy and mild PTT. PM is encapsulated on CuP to form this biomimetic nanoparticle (PM-coated CuP nanoparticles, PC). PC possesses peroxidase (POD) activity, can facilitate the conversion of hydrogen peroxide into Â·OH, thereby inhibiting the expression of HSPs. RESULTS: Upon exposure to low-power laser irradiation (0.5 W/cm(2), 1064 nm), PC can convert near-infrared II laser energy into heat energy, thereby enabling the administration of enhanced mild PTT. In vitro and in vivo experiments have demonstrated that this synergistic approach can induce over 90% tumour eradication with favourable biocompatibility. DISCUSSION: PC exhibits high efficacy and biocompatibility, making it a promising candidate for future applications. polypyrrole;Polymers;Pyrroles;Copper
Humans;Polymers;Pyrroles;Phototherapy;Copper;Photothermal Therapy;Biomimetics;Temperature;Nanoparticles;Neoplasms;Cell Line, Tumor

Osteoinductive activity of photobiomodulation in an organotypic bone model. Photobiomodulation (PBM) is a technique that harnesses non-ionizing light at specific wavelengths, triggering the modulation of metabolic pathways, engendering favourable biological outcomes that reduce inflammation and foster enhanced tissue healing and regeneration. PBM holds significant promise for bone tissue applications due to its non-invasive nature and ability to stimulate cellular activity and vascularization within the healing framework. Notwithstanding, the impact of PBM on bone functionality remains largely undisclosed, particularly in the absence of influencing factors such as pathologies or regenerative therapies. This study aims to investigate the potential effects of PBM using red (660Â nm) (RED) and near-infrared (808Â nm) (NIR) wavelengths within an ex vivo bone culture system - the organotypic embryonic chicken femur model. A continuous irradiation mode was used, administering a total energy dose of 1.0Â J, at an intensity of 100Â mW for 10Â s, which was repeated four times over the course of the 11-day culture period. The primary focus is on characterizing the expression of pivotal osteoblastic genes, the maturation and deposition of collagen, and the formation of bone mineral. Exposing femora to both RED and NIR wavelengths led to a notable increase in the expression of osteochondrogenic transcription factors (i.e., SOX9 and RUNX2), correlating with enhanced mineralization. Notably, NIR irradiation further elevated the

expression of bone matrix-related genes and fostered enhanced deposition and maturation of fibrillar collagen. This study demonstrates that PBM has the potential to enhance osteogenic functionality within a translational organotypic bone culture system, with the NIR wavelength showing remarkable capabilities in augmenting the formation and maturation of the collagenous matrix. Photosensitizing Agents Animals;Chick Embryo;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Bone and Bones;Chickens

The impact on quality-of-life following treatment of surgical facial scars with laser-based therapy: a scoping review. Post-surgical scarring impacts quality of life (QOL) and is a significant source of morbidity. Existing treatments targeted at improving the appearance and morbidity of scarring include laser-based therapies. Although lasers are frequently used to improve scar appearance, the effects on QOL are unclear. A scoping review was conducted to assess the impact of laser-based therapy for patients with surgical facial scarring on QOL. Throughout literature review was conducted with the guidance of a medical librarian. Relevant articles underwent two rounds of screening by two, independent reviewers. Data were extracted from each article and later analyzed. Of the four articles analyzed, laser-based therapies were demonstrated as effective in improving QOL for patients with facial scars resultant from surgical intervention. Laser-based therapy should be considered when treating facial scarring resultant from surgical intervention, as it has been shown to improve patient QOL. Standardization of QOL assessment and further studies expanding scar inclusion should be pursued given the paucity of information found through this review. Humans;Cicatrix;Quality of Life;Laser Therapy;Low-Level Light Therapy;Lasers;Treatment Outcome

Interventions to improve quality of life in patients with head and neck cancers receiving radiation therapy: a scoping review. BACKGROUND: Quality of life (QOL) is impaired in patients with head and neck cancers (HNC) due to illness and treatment-associated morbidity. Although there is evidence from the studies on interventions' role in improving QOL receiving radiation therapy, these are not systematically synthesised. In this scoping review, we searched and synthesised the evidence on interventions to improve the QOL and its impact among patients with HNCs. METHODS: This scoping review was conducted using the framework proposed by Arksey and O'Malley, and the extensions suggested by Levac et al. were incorporated. Two reviewers independently searched four electronic databases using key thesaurus and free-text terms, and the data was extracted, tabulated, synthesised and reported as categories. RESULTS: Seventy-nine papers reported various interventions of diverse nature such as pharmacological, physical,Â nutritional, complementary and alternative therapies, psychosocial, oral care related, laser and photobiomodulationÂ therapies, rehabilitative, educational, technology-based, surgical, device-related and nurse lead interventions. Most studies reported clinically meaningful impact of interventions on QOL, although the outcome differences were often statistically insignificant. Few studies reported a combination of interventions to address the multidimensional concerns faced by patients with HNCs. None of the studies examined the impact of interventions on QOL among long-term survivors of HNCs. CONCLUSION: As QOL concerns in patients with HNCs are multifaceted, more extensive studies with complex multi-component interventions and robust research designs are warranted. Humans;Quality of Life;Head and Neck Neoplasms;Complementary Therapies;Survivors

Management of chronic pain associated with temporomandibular disorders: a clinical practice guideline. CLINICAL QUESTION: What is the comparative effectiveness of available therapies for chronic pain associated with temporomandibular disorders (TMD)? CURRENT PRACTICE: TMD are the second most common musculoskeletal chronic pain disorder after low back pain, affecting 6-9% of adults globally. TMD are associated with pain affecting the jaw and associated structures and may present with headaches, earache, clicking, popping, or crackling sounds in the temporomandibular joint, and impaired mandibular function. Current clinical practice guidelines are largely consensus-

based and provide inconsistent recommendations. RECOMMENDATIONS: For patients living with chronic pain (â‰¥3 months) associated with TMD, and compared with placebo or sham procedures, the guideline panel issued: (1) strong recommendations in favour of cognitive behavioural therapy (CBT) with or without biofeedback or relaxation therapy, therapist-assisted mobilisation, manual trigger point therapy, supervised postural exercise, supervised jaw exercise and stretching with or without manual trigger point therapy, and usual care (such as home exercises, stretching, reassurance, and education); (2) conditional recommendations in favour of manipulation, supervised jaw exercise with mobilisation, CBT with non-steroidal anti-inflammatory drugs (NSAIDS), manipulation with postural exercise, and acupuncture; (3) conditional recommendations against reversible occlusal splints (alone or in combination with other interventions), arthrocentesis (alone or in combination with other interventions), cartilage supplement with or without hyaluronic acid injection, low level laser therapy (alone or in combination with other interventions), transcutaneous electrical nerve stimulation, gabapentin, botulinum toxin injection, hyaluronic acid injection, relaxation therapy, trigger point injection, acetaminophen (with or without muscle relaxants or NSAIDS), topical capsaicin, biofeedback, corticosteroid injection (with or without NSAIDS), benzodiazepines, and Î² blockers; and (4) strong recommendations against irreversible oral splints, discectomy, and NSAIDS with opioids. HOW THIS GUIDELINE WAS CREATED: An international guideline development panel including patients, clinicians with content expertise, and methodologists produced these recommendations in adherence with standards for trustworthy guidelines using the GRADE approach. The MAGIC Evidence Ecosystem Foundation (MAGIC) provided methodological support. The panel approached the formulation of recommendations from the perspective of patients, rather than a population or health system perspective. THE EVIDENCE: Recommendations are informed by a linked systematic review and network meta-analysis summarising the current body of evidence for benefits and harms of conservative, pharmacologic, and invasive interventions for chronic pain secondary to TMD. UNDERSTANDING THE RECOMMENDATION: These recommendations apply to patients living with chronic pain (â‰¥3 months duration) associated with TMD as a group of conditions, and do not apply to the management of acute TMD pain. When considering management options, clinicians and patients should first consider strongly recommended interventions, then those conditionally recommended in favour, then conditionally against. In doing so, shared decision making is essential to ensure patients make choices that reflect their values and preference, availability of interventions, and what they may have already tried. Further research is warranted and may alter recommendations in the future. Anti-Inflammatory Agents, Non-Steroidal;Hyaluronic Acid Adult;Humans;Anti-Inflammatory Agents, Non-Steroidal;Chronic Pain;Hyaluronic Acid;Temporomandibular Joint Disorders

Effectiveness of photobiomodulation therapy on pain intensity in postpartum women with nipple or perineal trauma: protocol for a multicentre, double-blinded, parallel-group, randomised controlled trial. INTRODUCTION: Photobiomodulation (PBM) using low-level laser can affect tissue repair mechanisms and seems promising in reducing pain intensity. However, few studies support the effectiveness of PBM on postpartum period complications, such as nipple and/or perineal trauma and pain, probably due to the low doses used. The primary objective of this study is to analyse the effectiveness of PBM on pain intensity in the nipple and perineal trauma in women in the immediate postpartum period. Secondary objectives are to evaluate the effect on tissue healing and the women's satisfaction. METHODS AND ANALYSIS: A double-blind, multicentre, parallel-group, randomised controlled trial will be performed in two public referral maternity hospitals in Brazil with 120 participants, divided into two arms: 60 participants in the nipple trauma arm and 60 participants in the perineal trauma arm. Participants will be women in the immediate postpartum period, who present with nipple trauma or perineal trauma and report pain intensity greater than or equal to 4

points on the Numerical Rating Scale for Pain. Block randomisation will be performed, followed by blinding allocation. In the experimental group, one application of PBM will be performed between 6â€‰hours and 36 hours after birth. For the sham group, the simulation will be carried out without triggering energy. Both participants and the research evaluator will be blinded to the allocation group. Intention-to-treat method and the between-group and within-group outcome measures analysis will be performed. ETHICS AND DISSEMINATION: This research protocol was approved by the Research Ethics Committees of the University of Campinas, Brazil, and of the School Maternity Assis Chateaubriand, Brazil (numbers CAAE: 59400922.1.1001.5404; 59400922.1.3001.5050). Participants will be required to sign the informed consent form to participate. Results will be disseminated to the health science community. TRIAL REGISTRATION NUMBER: Brazilian Registry of Clinical Trials (RBR-2qm8jrp). Humans;Pregnancy;Female;Low-Level Light Therapy;Nipples;Pain Measurement;Postpartum Period;Pain;Randomized Controlled Trials as Topic;Multicenter Studies as Topic

BMP4 up-regulated by 630Â nm LED irradiation is associated with the amelioration of rheumatoid arthritis. Rheumatoid arthritis (RA) is caused by inflammatory response of joints with cartilage and damage of synovium and bone erosion. In our previous studies, it has showed that irradiation of 630Â nm LED reduce inflammation of synovial fibroblasts and cartilage and bone destruction in RA. However, the key genes and mechanism in ameliorating RA by irradiation of 630Â nm LED remains unknown. In this study, human fibroblast-like synoviocytes (FLS) cell line MH7A and primary human RA-FLSs were treated with TNF-Î± and 630Â nm LED irradiation with the different energy density. The mRNA sequencing was performed to screen the differentially expressed genes (DEGs). In all datasets, 10 DEGs were identified through screening. The protein interaction network analysis showed that 8 out of the 10 DEGs interacted with each other including IL-6, CXCL2, CXCL3, MAF, PGF, IL-1RL1, RRAD and BMP4. This study focused on BMP4, which is identified as important morphogens in regulating the development and homeostasis. CCK-8 assay results showed that 630Â nm LED irradiation did not affect the cell viability. The qPCR and ELISA results showed that TNF-Î± stimulation inhibited BMP4 mRNA and protein level and irradiation of 630Â nm LED increased the BMP4 mRNA and protein level in MH7A cells. In CIA and transgenic hTNF-Î± mice models, H&E staining showed that irradiation of 630Â nm LED decreased the histological scores assessed from inflammation and bone erosion, while BMP4 expression level was up-regulated after 630Â nm LED irradiation. Pearson correlation analysis shown that BMP4 protein expression was negatively correlated with the histological score of CIA mice and transgenic hTNF-Î± mice. These results indicated that BMP4 increased by irradiation of 630Â nm LED was associated with the amelioration of RA, which suggested that BMP4 may be a potential targeting gene for photobiomodulation. BMP4 protein, human;Bone Morphogenetic Protein 4;RNA, Messenger;Tumor Necrosis Factor-alpha Animals;Humans;Mice;Arthritis, Experimental;Arthritis, Rheumatoid;Bone Morphogenetic Protein 4;Cell Proliferation;Cells, Cultured;Fibroblasts;Inflammation;RNA, Messenger;Synovial Membrane;Tumor Necrosis Factor-alpha;Light

Window therapeutic of extraoral photobiomodulation for prevention of oral mucositis in HSCT patients: additional arm. PURPOSE: This study aimed to evaluate the efficacy of 1W extraoral photobiomodulation (EOPBM) and to compare with our previous results of 2W EOPBM and intraoral photobiomodulation (IOPBM) protocols in the management of oral mucositis (OM) related to hematopoietic stem cell transplantation (HSCT). METHODS: A total of 30 patients underwent autologous or allogenic HSCT. Experimental protocol of 1W EOPBM was performed daily beginning in the first day of the conditioning regimen until 5Â days after transplantation. The application areas included six points on the face and three points on the cervical area. Additional application of IOPBM was performed if patients had ulcered mucositis. Its severity was assessed daily according to WHO

(World Health Organization) and NCI (National Cancer Institute) scales. Oral and oropharynx pains were scored daily by visual analogue scale (VAS). RESULTS: The 1W EOPBM protocol was well tolerated without any complaints. Of total, 13 patients were male and 17 were female and the mean age was 49.3Â years old. Most patients (21 patients - 70%) received autologous HSCT, and 24 patients (80%) underwent myeloablative conditioning (MAC) regime and 6 patients (20%) reduced intensive conditioning regime. Nineteen patients (63.3%) developed OM according to WHO criteria, 3 patients grade I, 10 grade II and 6 grade III. NCI mucositis grades were similar to WHO grades. OM outcomes of 1W EOPBM were similar when compared to our previous groups and no significant differences were observed. No differences were found between pain and the protocols (1W EOPBM, IOPBM and 2W EOPBM). CONCLUSION: This 1W EOPBM protocol seemed to be as effective as IOPBM and 2W EOPBM in the prevention of OM in HSCT patients. In addition, we might assume that there is a window of application on EOPBM. Female;Humans;Male;Middle Aged;Hematopoietic Stem Cell Transplantation;Low-Level Light Therapy;Mucositis;Stomatitis;Transplantation Conditioning

Photostimulation of lymphatic clearance of Î²-amyloid from mouse brain: a new strategy for the therapy of Alzheimer's disease. Alzheimer's disease (AD) is an age-related neurodegenerative disorder that poses a significant burden on socio-economic and healthcare systems worldwide. However, the currently available therapy of AD is limited, and new strategies are needed to enhance the clearance of Î²-amyloid (AÎ²) protein and improve cognitive function. Photobiomodulation (PBM) is a non-invasive and effective therapeutic method that has shown promise in treating various brain diseases. Here, we demonstrate that 1267-nm PBM significantly alleviates cognitive decline in the 5xFAD mouse model of AD and is safe as it does not induce a significant increase in cortical temperature. Moreover, with the combination of 3D tissue optical clearing imaging and automatic brain region segmentation, we show that PBM-mediated reductions of AÎ² plaques in different subregions of prefrontal cortex and the hippocampus are different. The PBM-induced lymphatic clearance of AÎ² from the brain is associated with improvement of memory and cognitive functions in 5xFAD mice. Our results suggest that the modulation of meningeal lymphatic vessels (MLVs) should play an important role in promoting AÎ² clearance. Collectively, this pilot study demonstrates that PBM can safely accelerate lymphatic clearance of AÎ² from the brain of 5xFAD mice, promoting improvement of neurocognitive status of AD animals suggesting that PBM can be an effective and bedside therapy for AD.

A novel transcranial photobiomodulation device to address motor signs of Parkinson's disease: a parallel randomised feasibility study. BACKGROUND: Parkinson's disease is a progressive neurological disease with limited treatment options. Animal models and a proof-of-concept case series have suggested that photobiomodulation may be an effective adjunct treatment for the symptoms of Parkinson's disease. The aim was to determine the safety and feasibility of transcranial photobiomodulation (tPBM) to reduce the motor signs of Parkinson's disease. METHODS: In this double-blind, randomised, sham-controlled feasibility trial, patients (aged 59-85 years) with idiopathic Parkinson's disease were treated with a tPBM helmet for 12 weeks (72 treatments with either active or sham therapy; stage 1). Treatment was delivered in the participants' homes, monitored by internet video conferencing (Zoom). Stage 1 was followed by 12 weeks of no treatment for those on active therapy (active-to-no-treatment group), and 12 weeks of active treatment for those on sham (sham-to-active group), for participants who chose to continue (stage 2). The active helmet device delivered red and infrared light to the head for 24Â min, 6 days per week. The primary endpoints were safety and motor signs, as assessed by a modified Movement Disorders Society revision of the Unified Parkinson's Disease Rating Scale Part III (MDS-UPDRS-III)-motor scale. This trial is registered with ANZCTR, ACTRNÂ 12621001722886. FINDINGS: Between Dec 6, 2021, and Aug 12, 2022, 20 participants were randomly allocated to each of the two groups (10 females plus 10 males

per group). All participants in the active group and 18 in the sham group completed 12 weeks of treatment. 14 participants in the sham group chose to continue to active treatment and 12 completed the full 12 weeks of active treatment. Treatment was well tolerated and feasible to deliver, with only minor, temporary adverse events. Of the nine suspected adverse events that were identified, two minor reactions may have been attributable to the device in the sham-to-active group during the active treatment weeks of the trial. One participant experienced temporary leg weakness. A second participant reported decreased fine motor function in the right hand. Both participants continued the trial. The mean modified MDS-UPDRS-III scores for the sham-to-active group at baseline, after 12 weeks of sham treatment, and after 12 weeks of active treatment were 26.8 (sd 14.6), 20.4 (sd 12.8), and 12.2 (sd 8.9), respectively, and for the active-to-no-treatment group these values were 21.3 (sd 9.4), 16.5 (sd 9.4), and 15.3 (sd 10.8), respectively. There was no significant difference between groups at any assessment point. The mean difference between groups at baseline was 5.5 (95% confidence interval (CI)Â -2.4 to 13.4), after stage 1 was 3.9 (95% CIÂ -3.5 to 11.3 and after stage 2 wasÂ -3.1 (95% CI 2.7 toÂ -10.6). INTERPRETATION: Our findings add to the evidence base to suggest that tPBM is a safe, tolerable, and feasible non-pharmaceutical adjunct therapy for Parkinson's disease. While future work is needed our results lay the foundations for an adequately powered randomised placebo-controlled clinical trial. FUNDING: SYMBYX Pty Ltd.

Pharmaceutical management of acute radiation dermatitis in the German speaking radiation oncology community. BACKGROUND: Radiation dermatitis (RD) remains the most common side effect in radiation therapy (RT) with various pharmaceutical options available for prevention and treatment. We sought to determine pharmaceutical management patterns of radiation dermatitis among radiation oncology professionals. METHODS: We conducted a survey on RD among the German-speaking community of radiation oncologists inquiring for their opinion on preventive and therapeutic pharmaceutical approaches for acute RD. RESULTS: 244 health professionals participated. Dexpanthenol lotion is the agent most widely used both for prevention (53.0%) and treatment (76.9%) of RD, followed by urea (29.8%) for prevention and corticosteroids (46.9%) for treatment. A wide range of substances is used by participants, though the overall experience with them is rather limited. 32.5% of participants do generally not recommend any preventative treatment. 53.4% of participants recommend alternative medicine for RD management. While seldomly used, corticosteroids were considered most effective in RD therapy, followed by dexpanthenol and low-level laser therapy. A majority of participants prefers moist over dry treatment of moist desquamation and 43.8% prescribe antiseptics. CONCLUSIONS: Pharmaceutical management of RD in the German-speaking radiation oncology community remains controversial, inconsistent, and partially not supported by evidence-based medicine. Stronger evidence level and interdisciplinary consensus is required amongst practitioners to improve these care patterns. dexpanthenol;Adrenal Cortex Hormones;Pharmaceutical Preparations;Pantothenic Acid Humans;Radiation Oncology;Radiodermatitis;Adrenal Cortex Hormones;Pharmaceutical Preparations;Pantothenic Acid

Acute atrophic evolution of drusenoid pigment epithelium detachment after photobiomodulation. PURPOSE: To report the acute onset of macular atrophy soon after photobiomodulation (PBM) administration in a patient with intermediate age-related macular degeneration (AMD). METHODS: Optical coherence tomography (OCT) was performed in the study eye before and after PBM. RESULTS: A patient with drusenoid pigment epithelium detachment (D-PED) underwent PBM. A few weeks after PBM the D-PED collapsed, resulting in incomplete retinal pigment epithelium and outer retinal atrophy with visual acuity worsening. CONCLUSION: Thinning of the outer retinal layers over a D-PED and posterior hypertrasmission may represent bad prognostic factors for PBM, accelerating the lesion's natural history towards atrophic evolution.

Photobiomodulation effects of blue light on osteogenesis are induced by reactive oxygen species. Blue light-mediated photobiomodulation (PBM) is a promising approach to promote osteogenesis. However, the underlying mechanisms of PBM in osteogenesis are poorly understood. In this study, a human osteosarcoma cell line (i.e., Saos-2 cells) was subjected to intermittent blue light exposure (2500Â ÂµM/m(2)/s, 70 mW/cm(2), 4.2Â J/cm(2), once every 48Â h) and the effects on Saos-2 cell viability, metabolic activity, differentiation, and mineralization were investigated. In addition, this study addressed a possible role of blue light induced cellular oxidative stress as a mechanism for enhanced osteoblast differentiation and mineralization. Results showed that Saos-2 cell viability and metabolic activity were maintained upon blue light exposure compared to unilluminated controls, indicating no negative effects. To the contrary, blue light exposure significantly increased (pâ€‰<â€‰0.05) alkaline phosphatase activity and Saos-2 cell mediated mineralization. High-performance liquid chromatography (HPLC) assay was used for measurement of reactive oxygen species (ROS) activity and showed a significant increase (pâ€‰<â€‰0.05) in superoxide (O(2â€¢-)) and hydrogen peroxide (H(2)O(2)) formed after blue light exposure. Together, these results suggest that the beneficial effects of blue light-mediated PBM on osteogenesis may be induced by controlled release of ROS. Reactive Oxygen Species;Hydrogen Peroxide Humans;Osteogenesis;Reactive Oxygen Species;Low-Level Light Therapy;Hydrogen Peroxide;Cell Proliferation;Cell Differentiation

Use of Picosecond Laser for Melasma Treatment: A Narrative Review. Background: Melasma results from the imbalance of the mechanisms that regulate skin pigmentation, causing the appearance of hyperpigmented patches. Treatment includes topical and oral agents, chemical peelings, microneedling, and laser therapy. The picosecond laser was developed to minimize pain and skin discoloration, which can sometimes be associated with laser treatments. It emits short pulses of energy that last from 300 to 500 picoseconds, leading to a more significant fragmentation of melanin, with miniminal risk of scarring and thermal lesions in the surrounding skin. Objective: The authors aimed to review the use of picosecond laser in the treatment of melasma and further provide an overview of the other current available options. Conclusions: While the use of picosecond laser for the treatment of melasma has yielded good results, further studies with longer follow-up periods and a higher number of patients are needed. Humans;Lasers, Solid-State;Melanosis;Skin;Laser Therapy;Low-Level Light Therapy

Photobiomodulation Activates Microglia/Astrocytes and Relieves Neuropathic Pain in Inferior Alveolar Nerve Injury. Objective: This study aimed to determine microglial/astrocyte changes and their associated analgesic effect in inferior alveolar nerve injury (IANI) model rats treated with photobiomodulation therapy (PBMT) using a 940-nm diode laser. Background: Very few basic studies have investigated microglial/astrocyte dynamics following PBMT aimed at relieving neuropathic pain caused by IANI. Methods: Rats were divided into an IANI-PBM group, IANI+PBM group, and sham+PBM group. Observations were made on the day before IANI or the sham operation and on postoperative days 3, 5, 7, 14, and 28. PBMT was delivered for 7 consecutive days, with an energy density of 8â€‰J/cm(2). Behavioral analysis was performed to determine pain thresholds, and immunohistological staining was performed for the microglia marker Iba1 and astrocyte marker glial fibrillary acidic protein, which are observed in the spinal trigeminal nucleus. Results: Behavioral analysis showed that the pain threshold returned to the preoperative level on postoperative day 14 in the IANI+PBM group, but decreased starting from postoperative day 1 and did not improve thereafter in the IANI-PBM group (pâ€‰â‰¤â€‰0.001). Immunological analysis showed that microglial and astrocyte cell counts were similar in the IANI+PBM group and IANI-PBM group shortly after IANI (day 3), but the expression area was larger (pâ€‰â‰¤â€‰0.001) and hypertrophy of microglia and astrocyte cell bodies and end-feet extension (i.e., indicators of activation) were more prominent in the IANI+PBM group. Conclusions: PBMT after IANI prevented hyperalgesia and allodynia by

promoting glial cell activation shortly after injury. Rats;Animals;Microglia;Astrocytes;Rats, Sprague-Dawley;Low-Level Light Therapy;Neuralgia;Hyperalgesia;Mandibular Nerve

Retracted: Effects of Low-Level Laser Therapy on Osseous Defects Distal to Mandibular Second Molar after Extraction of Impacted Third Molar. [This retracts the article DOI: 10.1155/2022/9900146.].

Transcranial photobiomodulation improves insulin therapy in diabetic microglial reactivity and the brain drainage system. The dysfunction of microglia in the development of diabetes is associated with various diabetic complications, while traditional insulin therapy is insufficient to rapidly restore the function of microglia. Therefore, the search for new alternative methods of treating diabetes-related dysfunction of microglia is urgently needed. Here, we evaluate the effects of transcranial photobiomodulation (tPBM) on microglial function in diabetic mice and investigate its mechanism. We find tPBM treatment effectively improves insulin therapy on microglial morphology and reactivity. We also show that tPBM stimulates brain drainage system through activation of meningeal lymphatics, which contributes to the removal of inflammatory factor, and increase of microglial purinergic receptor P2RY12. Besides, the energy expenditure and locomotor activity of diabetic mice are also improved by tPBM. Our results demonstrate that tPBM can be an efficient, non-invasive method for the treatment of microglial dysfunction caused by diabetes, and also has the potential to prevent diabetic physiological disorders. Insulin Mice;Animals;Microglia;Insulin;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Brain

Cost analysis of photobiomodulation in tibia fracture in the Brazilian public health system. Managing tibial fractures requires substantial health resources, which costs the health system. This study aimed to describe the costs of photobiomodulation (PBM) with LEDs in the healing process of soft tissue lesions associated with tibial fracture compared to a placebo. Economic analysis was performed based on a randomized controlled clinical trial, with a simulation of the cost-effectiveness and incremental cost model. Adults (n = 27) hospitalized with tibia fracture awaiting definitive surgery were randomized into two distinct groups: the PBM Group (n = 13) and the Control Group with simulated phototherapy (n = 14). To simulate the cost-effectiveness and incremental cost model, the outcome was the evolution of wound resolution by the BATES-JENSEN scale and time of wound resolution in days. The total cost of treatment for the Control group was R$21,164.56, and a difference of R$7,527.10 more was observed when compared to the treatment of the PBM group. The proposed intervention did not present incremental cost since the difference in the costs to reduce measures between the groups was smaller for the PBM group. When analyzing the ICER (Incremental cost-effectiveness ratio), it would be possible to save R$3,500.98 with PBM and decrease by 2.15 points in the daily average on the BATES-JENSEN scale. It is concluded, therefore, that PBM can be a supportive therapy of clinical and economic interest in a hospital setting. Adult;Humans;Tibia;Low-Level Light Therapy;Brazil;Public Health;Tibial Fractures;Costs and Cost Analysis;Cost-Benefit Analysis

A comprehensive review on therapeutic potentials of photobiomodulation for neurodegenerative disorders. A series of experimental trials over the past two centuries has put forth Photobiomodulation (PBM) as a treatment modality that utilizes colored lights for various conditions. While in its cradle, PBM was used for treating simple conditions such as burns and wounds, advancements in recent years have extended the use of PBM for treating complex neurodegenerative diseases (NDDs). PBM has exhibited the potential to curb several symptoms and signs associated with NDDs. While several of the currently used therapeutics cause adverse side effects alongside being highly invasive, PBM on the contrary, seems to be broad-acting, less toxic, and non-invasive. Despite being projected as an ideal therapeutic for NDDs, PBM still isn't considered a mainstream treatment modality due to some of the challenges and knowledge gaps associated with it. Here, we review the advantages of PBM summarized above with an emphasis on the common mechanisms that underlie

major NDDs and how PBM helps tackle them. We also discuss important questions such as whether PBM should be considered a mainstay treatment modality for these conditions and if PBM's properties can be harnessed to develop prophylactic therapies for high-risk individuals and also highlight important animal studies that underscore the importance of PBM and the challenges associated with it. Overall, this review is intended to bring the major advances made in the field to the spotlight alongside addressing the practicalities and caveats to develop PBM as a major therapeutic for NDDs. Animals;Humans;Low-Level Light Therapy;Neurodegenerative Diseases

Antioxidant effects of LEDT in dystrophic muscle cells: involvement of PGC-1Î± and UCP-3 pathways. PURPOSE: Reactive oxygen species and mitochondrial dysfunction play a crucial role in the pathophysiology of Duchenne muscular dystrophy (DMD). The light-emitting diode therapy (LEDT) showed beneficial effects on the dystrophic muscles. However, the mechanisms of this therapy influence the molecular pathways in the dystrophic muscles, particularly related to antioxidant effects, which still needs to be elucidated. The current study provides muscle cell-specific insights into the effect of LEDT, 48Â h post-irradiation, on oxidative stress and mitochondrial parameters in the dystrophic primary muscle cells in culture. METHODS: Dystrophic primary muscle cells were submitted to LEDT, at multiple wavelengths (420Â nm, 470Â nm, 660Â nm and 850Â nm), 0.5Â J dose, and evaluated after 48Â h based on oxidative stress markers, antioxidant enzymatic system and biogenesis, and functional mitochondrial parameters. RESULTS: The mdx muscle cells treated with LEDT showed a significant reduction of H(2)O(2) production and 4-HNE, catalase, SOD-2, and GR levels. Upregulation of UCP3 was observed with all wavelengths while upregulation of PGC-1Î± and a slight upregulation of electron transport chain complexes III and V was only observed following 850Â nm LEDT. In addition, the mitochondrial membrane potential and mitochondrial mass mostly tended to be increased following LEDT, while parameters like O(2)(Â·-) production tended to be decreased. CONCLUSION: The data shown here highlight the potential of LEDT as a therapeutic agent for DMD through its antioxidant action by modulating PGC-1Î± and UCP3 levels. Antioxidants;Hydrogen Peroxide Antioxidants;Muscle, Skeletal;Hydrogen Peroxide;Oxidative Stress;Muscle Cells

Impact of photobiomodulation for prevention of oral mucositis on the quality of life of patients with head and neck cancer: a systematic review. The aim of this study was to perform a systematic review to evaluate the impact of photobiomodulation therapy (PBMT) for the prevention of oral mucositis (OM) on the quality of life (QoL) of patients with head and neck cancer (HNC) undergoing radiation therapy. This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines. The search strategy was performed in five electronic databases (Cochrane, Embase, PubMed, Scopus, and Web of Science). The included studies assessed the QoL of patients undergoing radiation therapy (RT) for HNC and undergoing PBMT for the management of OM. Seven articles met the eligibility criteria. Data extraction was performed in the selected studies including the PBMT parameters (active medium, application procedure, wavelength, fluence, power, irradiance, irradiation time, spot size, energy per point, schedule of irradiation, and total energy). The included studies were qualitatively analyzed, and descriptive analyses were performed. Also, summary results were evaluated for group comparison analysis. All included studies confirmed a decrease in the QoL of the patients that developed OM throughout the RT progress when compared to baseline. Of the informed cases, most of the patients who received PBMT showed grades 1 and 2 OM, while the control group showed more individuals with severe forms of OM (grades 3 and 4). In this sense, patients submitted to PBMT reported better QoL at the end of the treatment compared with the control group. PBMT used for the management of OM preserves the QoL of patients with head and

neck cancer. Humans;Low-Level Light Therapy;Quality of Life;Stomatitis;Head and Neck Neoplasms;Chemoradiotherapy

Preclinical Study of Dual-Wavelength Light-Emitting Diode Therapy in an Osteoarthritis Rat Model. OBJECTIVE: To evaluate the efficacy of light-emitting diode (LED) and their dual-wavelengths as a treatment strategy for osteoarthritis. METHODS: We induced osteoarthritis in male Sprague-Dawley rats by intra-articular injection of sodium iodoacetate into the right rear knee joint. The animals with lesions were divided into an untreated group and an LED-treated group (n=7 each). In the LED-treated group, the lesioned knee was irradiated with lasers (850 and 940 nm) and dose (3.15 J/cm2) for 20 minutes per session, twice a week for 4 weeks. Knee joint tissues were stained and scanned using an in vivo micro-computed tomography (CT) scanner. Serum interleukin (IL)-6 and IL-18 levels were determined using enzyme-linked immuno-sorbent assay. Several functional tests (lines crossed, rotational movement, rearing, and latency to remain rotating rod) were performed 24 hours before LED treatment and at 7, 14, 21, and 28 days after treatment. RESULTS: LED-treated rats showed improved locomotor function and suppressed matrix-degrading cytokines. Micro-CT images indicated that LED therapy had a preserving effect on cartilage and cortical bone. CONCLUSION: LED treatment using wavelengths of 850 and 940 nm resulted in significant functional, anatomical, and histologic improvements without adverse events in a rat model. Further research is required to determine the optimal wavelength, duration, and combination method, which will maximize treatment effectiveness.

The effect of a helmet type, home-use low-level light therapy device for chemotherapy-induced alopecia: study protocol for a randomized controlled trial. BACKGROUND: Alopecia is one of the most common adverse effects of chemotherapy. It reduces the patient's self-esteem and quality of life and the effect of therapy. Scalp cooling is the only verified current method for prevention but success is not guaranteed, particularly after receiving anthracycline-based combinations. Low-level light therapy has been clinically proven to inhibit the progress of androgenic alopecia. A previous study using human subjects shows limited benefits for low-level light therapy for patients who suffer chemotherapy-induced alopecia but an increase in the number of probes and the optimization of light sources may improve the efficacy. This study determines the efficacy of low-level light therapy for the prevention of chemotherapy-induced hair loss for patients with breast cancer using a randomized controlled trial. METHODS: One hundred six eligible breast cancer patients were randomly distributed into a low-level light therapy group and a control group, after receiving chemotherapy. Subjects in the low-level light therapy group received 12 courses of intervention within 4 weeks. Subjects in the control group received no intervention but were closely monitored. The primary outcome is measured as the difference in the hair count in a target area between the baseline and at the end of week 4, as measured using a phototrichogram (Sentra scalp analyzer). The secondary outcomes include the change in hair count at the end of week 1, week 2, and week 3 and hair width at the end of week 1, week 2, week 3, and week 4, as measured using a phototrichogram, and the change in distress, the quality of life, and self-esteem due to chemotherapy-induced alopecia, at the end of week 4, as measured using a questionnaire. DISCUSSION: This study improves cancer patients' quality of life and provides clinical evidence. TRIAL REGISTRATION: Registered at ClinicalTrials.gov- NCT05397457 on 1 June 2022. Antibiotics, Antineoplastic Humans;Female;Low-Level Light Therapy;Quality of Life;Head Protective Devices;Alopecia;Scalp;Antibiotics, Antineoplastic;Breast Neoplasms;Randomized Controlled Trials as Topic

Photobiomodulation Therapy to Treat Snakebites Caused by Bothrops atrox: A Randomized Clinical Trial. IMPORTANCE: Bothrops venom acts almost immediately at the bite site and causes tissue damage. OBJECTIVE: To investigate the feasibility and explore the safety and efficacy of low-level

laser therapy (LLLT) in reducing the local manifestations of B atrox envenomations. DESIGN, SETTING, AND PARTICIPANTS: This was a double-blind randomized clinical trial conducted at FundaÃ§Ã£o de Medicina Tropical Doutor Heitor Vieira Dourado, in Manaus, Brazil. A total of 60 adult participants were included from November 2020 to March 2022, with 30 in each group. Baseline characteristics on admission were similarly distributed between groups. Data analysis was performed from August to December 2022. INTERVENTION: The intervention group received LLLT combined with regular antivenom treatment. The laser used was a gallium arsenide laser with 4 infrared laser emitters and 4 red laser emitters, 4 J/cm2 for 40 seconds at each application point. MAIN OUTCOMES AND MEASURES: Feasibility was assessed by eligibility, recruitment, and retention rates; protocol fidelity; and patients' acceptability. The primary efficacy outcome of this study was myolysis estimated by the value of creatine kinase (U/L) on the third day of follow-up. Secondary efficacy outcomes were (1) pain intensity, (2) circumference measurement ratio, (3) extent of edema, (4) difference between the bite site temperature and that of the contralateral limb, (5) need for the use of analgesics, (6) frequency of secondary infections, and (7) necrosis. These outcomes were measured 48 hours after admission. Disability assessment was carried out from 4 to 6 months after patients' discharge. P values for outcomes were adjusted with Bonferroni correction. RESULTS: A total of 60 patients (mean [SD] age, 43.2 [15.3] years; 8 female individuals [13%] and 52 male individuals [87%]) were included. The study was feasible, and patient retention and acceptability were high. Creatine kinase was significantly lower in the LLLT group (mean [SD], 163.7 [160.0] U/L) 48 hours after admission in relation to the comparator (412.4 [441.3] U/L) (Pâ€‰=â€‰.03). Mean (SD) pain intensity (2.9 [2.7] vs 5.0 [2.4]; Pâ€‰=â€‰.004), circumference measurement ratio (6.6% [6.6%] vs 17.1% [11.6%]; Pâ€‰<â€‰.001), and edema extent (25.8 [15.0] vs 40.1 [22.7] cm; Pâ€‰=â€‰.002) were significantly lower in the LLLT group in relation to the comparator. No difference was observed between the groups regarding the mean difference between the bite site temperature and the contralateral limb. Secondary infections, necrosis, disability outcomes, and the frequency of need for analgesics were similar in both groups. No adverse event was observed. CONCLUSIONS AND RELEVANCE: The data from this randomized clinical trial suggest that the use of LLLT was feasible and safe in a hospital setting and effective in reducing muscle damage and the local inflammatory process caused by B atrox envenomations. TRIAL REGISTRATION: Brazilian Registry of Clinical Trials Identifier: RBR-4qw4vf. Analgesics;Creatine Kinase Adult;Animals;Female;Humans;Male;Analgesics;Bothrops atrox;Coinfection;Creatine Kinase;Edema;Low-Level Light Therapy;Necrosis;Snake Bites;Treatment Outcome;Middle Aged

Effects of NGF and Photobiomodulation Therapy on Crush Nerve Injury and Fracture Healing: A Stereological and Histopathological Study in an Animal Model. STUDY DESIGN: A stereological and histopathological study in an animal model. OBJECTIVE: This study explores the effects of the nerve growth factor and photobiomodulation therapy on the damaged nerve tissue and fracture healing. METHODS: A total of 24 rabbits were divided into 4 groups: control group (n = 5), nerve growth factor (NGF) group (n = 7), photobiomodulation (PBMT) group (n = 6), and nerve growth factor and photobiomodulation therapy (NGF+PBMT) group (n = 6). The vertical fracture was performed between the mental foramen and the first premolar, and the mental nerve was crushed for 30 seconds with a standard serrated clamp with a force of approximately 50Â N in all groups. The control group received an isotonic solution (.02Â mL, .09% NaCl) to the operation site locally. The NGF group received 1Â Î¼g human NGF-Î²/.9% .2Â mL NaCl solution for 7 days locally. The PBMT group received PBMT treatment (GaAlAs laser, 810Â nm, .3Â W, 18Â J/cm(2)) every 48 hours for 14 sessions following the surgery. The NGF+PBMT group received both NGF and PBMT treatment as described above. After 28 days, the bone tissues and mental nerves from all groups were harvested and histologically and stereologically analyzed. RESULTS: According to the stereological results, the

volume of the new vessel and the volume of the new bone were significantly higher in the PBMT group than in other groups (P < .001). According to the histopathological examinations, higher myelinated axons were observed in experimental groups than in the control group. CONCLUSIONS: As a result, PBMT has beneficial effects on bone regeneration. Based on the light microscopic evaluation, more regenerated axon populations were observed in the NGF group than in the PBMT and PBMT + NGF groups in terms of myelinated axon content.

Application of Low-Level Laser Therapy in Endodontics: A Narrative Review. Low-level laser therapy (LLLT) stands out in the realm of dentistry for its unique attributes that set it apart from traditional therapeutic approaches. This non-invasive and painless modality harnesses the power of low-intensity lasers, offering a distinct advantage in terms of safety and patient comfort. Unlike many conventional methods, LLLT does not rely on pharmaceutical interventions or invasive procedures, making it a gentle yet effective option for various dental applications. Its non-thermal, photobiomodulatory effects on cellular and tissue functions mark a notable departure from the more aggressive treatment modalities commonly associated with dentistry. This article provides an extensive exploration of LLLT's applications in dentistry, focusing on its mechanisms of action and biological effects, and emphasizes the uniqueness of LLLT as a transformative tool in modern dental care.

Low-level laser therapy combined with scleral graft transplantation in the treatment of contracted socket: a clinical study. OBJECTIVE: To analyse the efficacy of the therapeutic use of low-level laser therapy (LLLT) on the tissue repair process of allogeneic scleral grafts in patients with contracted sockets by analysing the speed of graft vascularisation and fornice depth of contraction percentage. METHODS: A retrospective chart review was performed from April 2015 to April 2021 including 39patients with socket contraction. Allogeneic scleral grafts were used to repair the sockets in all patients. They were randomly enrolled into two groups. The laser group included 18 patients treated with LLLT after the surgery, whereas the control group included 21 patients without LLLT after the surgery who healed naturally. The LLLT equipment used in the research had a wavelength of 650Â nm, 10 mW power, and 3.8Â J/cm(2) dosimetry, and the procedure was performed once daily for 5Â min over 7Â days, beginning 1Â week postoperatively. All patients were followed up over 6Â months to examine the changes in the size of the area of the non-vascularised graft and upper and inferior fornice depth. RESULTS: The laser group presented a significantly increased speed of conjunctival vascularisation compared with the control group (Pâ€‰=â€‰0.003). The fornice depth of contraction percentage was more apparent in the control group than that in the laser group (Pâ€‰=â€‰0.000). CONCLUSION: LLLT accelerates conjunctival vascularisation, stimulates conjunctival incision healing within a short period, shortens the tissue repair process, reduces the local inflammatory response, and causes no significant shrinkage of the conjunctival sac. Humans;Wound Healing;Low-Level Light Therapy;Retrospective Studies

The effects of low-level laser therapy on severe acute respiratory syndrome coronavirus 2 infection in HEK293/ACE2 cells. SARS-CoV-2 is a threat to public health due to its ability to undergo crucial mutations, increasing its infectivity and decreasing the vaccine's effectiveness. There is a need to find and introduce alternative and effective methods of controlling SARS-CoV-2. LLLT treats diseases by exposing cells or tissues to low levels of red and near-infrared light. The study aims to investigate for the first time the impact of LLLT on SARS-CoV-2 infected HEK293/ACE2 cells and compare them to uninfected ones. Cells were irradiated at 640â€‰nm, at different fluences. Subsequently, the effects of laser irradiation on the virus and cells were assessed using biological assays. Irradiated uninfected cells showed no changes in cell viability and cytotoxicity, while there were changes in irradiated infected cells. Furthermore, uninfected irradiated cells showed no luciferase activity while laser irradiation reduced luciferase activity in infected cells. Under SEM, there was a clear difference

between the infected and uninfected cells. Angiotensin-Converting Enzyme 2;Peptidyl-Dipeptidase A Humans;COVID-19;Angiotensin-Converting Enzyme 2;SARS-CoV-2;Low-Level Light Therapy;HEK293 Cells;Peptidyl-Dipeptidase A

1064nm Nd:YAG laser promotes chondrocytes regeneration and cartilage reshaping by upregulating local estrogen levels. Cartilage is frequently used as a scaffolds for repairing and reconstructing body surface organs. However, after successful plastic surgery, transplanted cartilage scaffolds often exhibit deformation and absorption over time. To enhance the shaping stability of cartilage scaffolds and improve patients' satisfaction after reconstructions, we employed the ear folding models in New Zealand rabbits to confirm whether the 1064nm neodymium-doped yttrium aluminum garnet (Nd:YAG) laser could promote cartilage reshaping. There was an increase in collagen and aromatase (Cyp19) expression within the ear cartilage after laser treatment. Moreover, we have found that the Cyp19 inhibitor can inhibit the laser's effect on cartilage shaping and reduce collagen and Cyp19 expression. The overall findings suggest that treatment with 1064nm Nd:YAG laser irradiation can enhance estrogen levels in local cartilage tissues by upregulating Cyp19 expression in chondrocytes through photobiomodulation, thereby promoting the proliferation and collagen secretion of chondrocytes to improve cartilage reshaping and stability. Aromatase;Estrogens;Collagen Humans;Animals;Rabbits;Chondrocytes;Aromatase;Lasers, Solid-State;Cartilage;Estrogens;Collagen

Photobiomodulation therapy in dogs undergoing TPLO after cranial cruciate ligament rupture shows promise but no statistically significant difference in a randomized trial. OBJECTIVE: Effect of photobiomodulation therapy (PBMT) in patients with CCLR after TPLO surgery by measuring C-reactive protein (CRP), percentage weight bearing, lameness using a short form of a composite measure pain scale, evaluated by the clinician and owners, and surgical site infection. SAMPLE: 54 client-owned dogs with CCLR undergoing unilateral TPLO surgery were enrolled in this study between April 5, 2021, through April 10, 2022. METHODS: The study population was randomly assigned to either a treatment group receiving PMBT (24 dogs) or a control group (30 dogs). PMBT was performed on the treatment group immediately after induction, and 6 hours, 24 hours, 48 hours, and 8 weeks postoperatively. The control group received sham PMBT (device turned off) at the same time. Evaluation of CRP, CMPS-SF, evidence of SSI, and %WB were evaluated for all dogs 24 hours preoperatively, and then 24 hours, 48 hours, and 8 weeks postoperatively. Owners completed CMPS-SF and subjective evaluations weekly for 8 weeks postoperatively. RESULTS: No statistically significant differences were found between treatment groups when evaluating CRP, %WB, and CMPS-SF by the clinician and weekly evaluation of the CMPS-SF by owners. Although no statistically significant differences were found in patients developing surgical site infections between treatment groups, SSI was only observed in patients in the control group (5/30, 16.6%). Most were minor/superficial infections (4/30 13.3%), and a single dog (1/30, 3.3%) had a major/deep surgical site infection. CLINICAL RELEVANCE: Although with promising but not statistically significant differences between groups, surgical site infections may be reduced after PBMT application.
Animals;Dogs;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Dog Diseases;Low-Level Light Therapy;Osteotomy;Stifle;Surgical Wound Infection;Tibia

THREE-YEAR OUTCOME OF DIODE LASER PULPOTOMY OF PRIMARY MOLARS USING THREE PULP CAPPING AGENTS: A SPLIT-MOUTH RANDOMIZED CLINICAL TRIAL. OBJECTIVES: Pulpotomy is the most commonly performed treatment for asymptomatic primary molars with exposed dental pulp. This study aimed to assess the clinical /radiographic success of diode laser pulpotomy with mineral trioxide aggregate (MTA), calcium hydroxide (CH), and calcium-enriched mixture (CEM) cement as pulp capping agents. METHODS: This split-mouth randomized clinical trial was conducted initially on 34 children aged 3-8 years but 4 patients left the study before the first follow-up visit and the study was accomplished and analyzed with 30 cases. The patients had at least 3 first/second molars with

deep caries that in radiographic evaluation revealed that they required pulpotomy. Following pulpotomy, the pulp stump was irradiated with diode laser (noncontact mode, 632â€¯nm, 30â€¯mW power) as photobiomodulation mode. Pulp tissue was then capped with MTA, CH, or CEM cement (nâ€¯=â€¯30 in each group). Reinforced zinc oxide eugenol was applied over the capping agent, and the teeth were restored with stainless steel crowns. Teeth were clinically/radiographically assessed at 6, 12, 18, and 36 months, after treatment. Data were analyzed by Cochran and McNemar tests. RESULTS: All 30 patients showed up for clinical/radiographic follow-ups for up to 36 months. Regarding clinical outcomes, the 6-, 12-, 18-, and 36-month success rates of all experimental groups were nearly similar with no significant difference ($p > .05$). Regarding radiographic outcomes, the 6-month success rates were similar among the groups ($p > .05$); however, the 12-, 18-, and 36-month outcomes of CEM and MTA groups were similar but significantly superior to that of CH group ($p < .05$). CONCLUSION: Diode laser irradiation and subsequent capping of pulp tissue with MTA or CEM cement can be employed for pulpotomy of primary molars. Calcium Hydroxide;Pulp Capping and Pulpectomy Agents Child;Humans;Calcium Hydroxide;Dental Caries;Lasers, Semiconductor;Molar;Mouth;Pulp Capping and Pulpectomy Agents;Pulpotomy;Treatment Outcome;Child, Preschool

Enhancing osteogenic differentiation in adipose-derived mesenchymal stem cells with Near Infra-Red and Green Photobiomodulation. Worldwide, osteoporosis is the utmost predominant degenerative bone condition. Stem cell regenerative therapy using adipose-derived mesenchymal stem cells (ADMSCs) is a promising therapeutic route for osteoporosis. Photobiomodulation (PBM) has sparked considerable international appeal due to its' ability to augment stem cell proliferation and differentiation properties. Furthermore, the differentiation of ADMSCs into osteoblast cells and cellular proliferation effects have been established using a combination of osteogenic differentiation inducers and PBM. This inÂ vitro study applied dexamethasone, Î²-glycerophosphate disodium, and ascorbic acid as differentiation inducers for osteogenic induction differentiation media. In addition, PBM at a near-infrared (NIR) wavelength of 825Â nm, a green (G) wavelength of 525Â nm, and the novel combination of both these wavelengths using a single fluence of 5Â J/cm(2) had been applied to stimulate proliferation and differentiation effectivity of immortalised ADMSCs into early osteoblasts. Flow cytometry and ELISA were used to identify osteoblast antigens using early and late osteoblast protein markers. Alizarin red Stain was employed to identify calcium-rich deposits by cells within culture. The morphology of the cells was examined, and biochemical assays such as an EdU proliferation assay, MTT proliferation and viability assay, Mitochondrial Membrane Potential assay, and Reactive Oxygen Species assay were performed. The Central Scratch Test determined the cells' motility potential. The investigative outcomes revealed that a combination of PBM treatment and osteogenic differentiation inducers stimulated promising early osteogenic differentiation of immortalised ADMSCs. The NIR-Green PBM combination did appear to offer great potential for immortalised ADMSC differentiation into early osteoblasts amongst selected assays, however, further investigations will be required to establish the effectivity of this novel wavelength combination. This research contributes to the body of knowledge and assists in the establishment of a standard for osteogenic differentiation inÂ vitro utilising PBM.

Current advances of photobiomodulation therapy in treating knee osteoarthritis. Knee osteoarthritis (KOA) is manifested by low-grade joint inflammation, irreversible cartilage degeneration, subchondral bone remodeling and osteophyte formation. It is one of the most prevalent degenerative diseases in the elderly. KOA usually results in chronic joint pain, physical impairment even disability bringing a huge socioeconomic burden. Unfortunately, there is so far no effective interventions to delay the progression and development of KOA. There is a pressing need for explorations and developments of new effective interventions. Photobiomodulation therapy (PBMT),

also known as low-level light therapy (LLLT), has attracted widespread attention in treating KOA because it is drug-free, non-invasive, safe and useful with rarely reported side effects. It provides the biological stimulatory effects primarily by enhancing the activity of mitochondrial cytochrome c oxidase. This stimulation, in turn, fosters cell proliferation and tissue regeneration. In addition to this, the paper provides a concise overview of the light parameters and the effectiveness of PBMT when applied in the treatment of KOA patients in clinical settings. It also delves into the experimental evidence supporting the modulatory effects of PBMT and its potential underlying mechanisms in addressing synovitis, cartilage degeneration, and pain resolution.

Correction to: In vitro effect of low-level laser therapy on the proliferative, apoptosis modulation, and oxi-inflammatory markers of premature-senescent hydrogen peroxide-induced dermal fibroblasts.

Use of photobiomodulation (880â€‰nm) for anesthesia puncture pain reduction: A split-mouth case report. The objective of this split-mouth case report is to evaluate the effect of photobiomodulation (PBM, 880â€‰nm) on pain control during pterygomandibular puncture. A patient received anesthesia on both sides of the mouth in a randomized manner. On the right side, an 880-nm infrared laser was applied immediately before local anesthesia. On the left side, a sham laser was applied using the same technique. There was a 50% reduction in pain levels on the PBM-treated side compared to the PBM-sham side, as measured by the visual analog scale. Sensitivity tests revealed that anesthesia was more effective on the PBM side. There was no difference in blood pressure. This case report suggests that PBM (880â€‰nm) before anesthesia may alleviate puncture pain associated with pterygomandibular anesthesia. Although these findings are based on a single case report, they can serve as the initial stepping stone for further randomized clinical trials. Humans;Low-Level Light Therapy;Anesthesia;Mouth;Punctures;Pain

Exploring the effect of photobiomodulation and gamma visual stimulation induced by 808Â nm and visible LED in Alzheimer's disease mouse model. Although photobiomodulation (PBM) and gamma visual stimulatqion (GVS) have been overwhelmingly explored in the recent time as a possible light stimulation (LS) means of Alzheimer's disease (AD) therapy, their effects have not been assessed at once. In our research, the AD mouse model was stimulated using light with various parameters [continuous wave (PBM) or 40Â Hz pulsed visible LED (GVS) or 40Â Hz pulsed 808Â nm LED (PBM and GVS treatment)]]. The brain slices collected from the LS treated AD model mice were evaluated using (i) fluorescence microscopy to image thioflavine-S labeled amy-loid-Î² (AÎ²) plaques (the main hallmark of AD), or (ii) two-photon excited fluorescence (TPEF) imaging of unlabeled AÎ² plaques, showing that the amount of AÎ² plaques was reduced after LS treatment. The imaging results correlated well with the results of Morris water maze (MWM) test, which demonstrated that the spatial learning and memory abilities of LS treated mice were noticeably higher than those of untreated mice. The LS effect was also assessed by in vivo nonlinear optical imaging, revealing that the cerebral amyloid angiopathy decreased spe-cifically as a result of 40Â Hz pulsed 808Â nm irradiation, on the contrary, the angiopathy reversed after visible 40Â Hz pulsed light treatment. The obtained results provide useful reference for further optimization of the LS (PBM or GVS) parameters to achieve efficient phototherapy of AD. Amyloid beta-Peptides Mice;Animals;Alzheimer Disease;Photic Stimulation;Low-Level Light Therapy;Brain;Plaque, Amyloid;Amyloid beta-Peptides;Disease Models, Animal;Mice, Transgenic

Effect of photobiomodulation therapy on TGF-Î² release from dentin, migration and viability of dental pulp stem cells in regenerative endodontics treatment: An ex vivo study. BACKGROUND AND AIM: Regenerative endodontic procedures (REPs) are oriented by the principles of tissue engineering, incorporating dental pulp stem cells (DPSC), crucial growth factors like Transforming growth factor-Î² (TGF-Î²1), and scaffolds to facilitate the regeneration of dental pulp tissues. The present study aimed to investigate the effect of photobiomodulation (PBM) therapy, using an 808Â nm diode laser on

cellular modulation mechanisms in REPs. METHOD AND MATERIAL: A total of 108 human dentin discs obtained from intact single root teeth were randomly assigned into six groups (nÂ =Â 8): 1. Positive control (EDTA), 2. PBM-1 (3Â J/cm(2)), 3. PBM-2 (5Â J/cm(2)), 4. EDTA+PBM-1, 5. EDTA+PBM-2, and 6. Negative control (NaOCl). Then, an extract solution was prepared from each disc and the concentration of released TGF-Î²1 from the discs was measured using enzyme-linked immunosorbent assay (ELISA). Moreover, the extract solution was added to DPSC culture medium to evaluate cell viability and migration through MTT assay and scratch test, respectively. RESULT: The group exposed to PBM-1 showed the highest cell viability, while treatment with EDTA and EDTA+PBM-2 decreased cellular viability. Also, the PBM-treated groups showed significantly higher release of TGF-Î²1 compared to the negative control. EDTA and EDTA+PBM-1 showed the highest release among all the groups. No significant difference was found between EDTA and EDTA+PBM-1, as well as between PBM-1 and PBM-2. Moreover, the PBM-1 group exhibited the highest migration after 24Â h, which was significantly greater than other groups, except for the PBM-2 group. CONCLUSION: According to the obtained data, 808Â nm mediated-PBM (3Â J/cm2), both independently and in conjunction with EDTA, enhanced the release of TGF-Î²1 from dentin and improved cell viability and migration of DPSCs. It seems that, PBM under the specific parameters employed in this study, could be an effective adjunctive therapy in REPs. Transforming Growth Factor beta1;Transforming Growth Factor beta;Edetic Acid Humans;Regenerative Endodontics;Transforming Growth Factor beta1;Transforming Growth Factor beta;Edetic Acid;Low-Level Light Therapy;Dentin;Dental Pulp;Stem Cells

The Effect of Photobiomodulation on the Treatment of Hereditary Mitochondrial Diseases. Introduction: Despite a wide variety of clinical presentations in hereditary Mitochondrial Diseases, muscle fatigue is a common theme and impairs a patient's quality of life and ability to function. Current treatments are only supportive and include nutritional supplementation and physical therapy. Photobiomodulation therapy (PBMT) using low-intensity, narrow spectrum light in the red/near infrared (NIR) range, from a low-level laser or light-emitting diode sources, enhances mitochondrial function in preclinical and clinical studies on a range of conditions. However, little research has been done on the effectiveness of photobiomodulation in hereditary mitochondrial disorders. Methods: We performed a scoping review of the evidence of the beneficial effects of photobiomodulation for treating the muscle-related symptoms of hereditary mitochondrial disease. Results: No studies regarding photobiomodulation in hereditary mitochondrial disease were identified. However, in other clinical conditions featuring acquired mitochondrial impairment, we identified studies that suggested improved function, although sample sizes were small in number and statistical power. Conclusion: There is emerging evidence of efficacy for PBMT for diseases involving acquired mitochondrial insufficiency. We identified no published research on PBMT in hereditary mitochondrial disease, but this review confirms a theoretical rationale for a positive effect and suggests further research.

Anti-inflammatory, Antioxidant, and Wound-Healing Effects of Photobiomodulation on Type-2 Diabetic Rats. Introduction: In the current study, the effects of photobiomodulation (PBM) treatments were examined based on biomechanical and histological criteria and mRNA levels of catalase (CAT), superoxide dismutase (SOD), and NADPH oxidase (NOX) 1 and 4 in a postponed, ischemic, and infected wound repair model (DIIWHM) in rats with type 2 diabetes (DM2) during the inflammation (day 4) and proliferation (day 8) stages. Methods: To study ischemic wound repair in a diabetic rat model (DIIWHM), 24 rats with type-2 diabetes were randomly divided into four groups and infected with methicillin-resistant Staphylococcus aureus (MRSA). The control groups consisted of CG4 (control group on day 4) and CG8 (control group on day 8), while the PBM groups comprised PBM(4) (PBM treatment group on day 4) and PBM(8) (PBM treatment group on day 8). These group

assignments allowed for comparisons between the control groups and the PBM-treated groups at their respective time points during the study. Results: On days 4 and 8 of wound restoration, the PBM(4) and PBM(8) groups showed substantially modulated inflammatory responses and improved formation of fibroblast tissue compared with the CG groups ($P<0.05$). Concurrently, the effects of PBM(8) were significantly superior to those of PBM(4) ($P<0.05$). The antioxidant results on days 4 and 8 revealed substantial increases in CAT and SOD in the PBM groups compared with the CGs ($P<0.05$). Substantial decreases were observed in the antioxidant agents NOX1 and NOX4 of the PBM(4) and PBM(8) groups compared with both CGgroups ($P<0.05$). Conclusion: PBM treatments significantly sped up the inflammatory and proliferating processes in a DHIIWM in DM2 animals by modifying the inflammatory reaction and boosting fibroblast proliferation. Overall, the current findings indicated substantially better results in the PBM groups than in the CG groups.

Therapeutic Effects of Low-Level Laser on Male Infertility: A Systematic Review. Introduction: The objective of this study was to assess the effectiveness and safety of photobiomodulation (PBM) in the treatment of male infertility. Methods: We searched Google Scholar, PubMed, and the reference sections of relevant papers published from January 1, 2000 to September 23, 2022. We retrieved all publications related to the impact of PBM on male infertility. After reviewing the titles, abstracts, and full texts, we included fifteen papers in the research. The studies involved 477 semen samples (in vitro studies) and 70 male participants (randomized clinical trials). Results: All 14 in vitro studies that evaluated effectiveness reported that PBM was successful in increasing the proportion of progressive sperms in semen samples. Various methods were used to evaluate the safety. One study with a sample size of 58 concluded that PBM was not a safe treatment, whereas the other ten studies confirmed its safety. Only one clinical trial evaluated the effect of laser acupuncture on male infertility and found improvements in sperm progressive motility without any serious adverse effects. Conclusion: All 15 studies evaluating effectiveness reported that the low-level laser was effective for increasing the proportion of progressive sperm in semen samples and that it was safe to use. However, due to the heterogeneity of population characteristics, source characteristics, duration of exposure, sample size, and instruments for measuring safety and efficacy, we cannot conclude that the positive results obtained from the reviewed studies are solely attributable to the low-level laser on the sperm samples.

Unveiling Therapeutic Potential: A Systematic Review of Photobiomodulation Therapy and Biological Dressings for Diabetic Foot Ulcers. Introduction: Diabetes poses a global health challenge, giving rise to various complications, including diabetic foot ulcers (DFUs). DFUs, marked by ischemic ulcers susceptible to infection and amputation, underscore the urgency for innovative treatments. This study investigated the impact of photobiomodulation therapy (PBT) and autologous platelet gel (APG) on DFUs recovery. Methods: We systematically searched Web of Science, EMBASE, MEDLINE, Cochrane Library, Scopus, and Google Scholar (2015-2023) by using pertinent terms like "photobiomodulation therapy," "low level light therapy," and "platelet gel." After meticulous data extraction and review, 57 articles were chosen and categorized. Among these, three randomized controlled trials involving 186 participants were selected for APG analysis. Results: Findings demonstrate that APG application carries minimal risk and offers promising improvements in healing time, grade, pain reduction, and granulation tissue formation. Similarly, diverse PBT modalities involving distinct probes and wavelengths exhibit the potential to enhance tissue perfusion, expedite healing, and impede wound progression, reducing the need for invasive interventions. Conclusion: PBT and APG emerge as valuable tools to augment wound healing, mitigate inflammation, and avert amputation, representing compelling therapeutic options for DFUs.

Non-thermal CO2 Laser Therapy (NTCLT): A Novel Photobiomodulative Approach for Immediate Pain Relief of Patchy Oral Mucositis Due to Chemotherapy of Solid Tumors. Introduction:

Chemotherapy-induced oral mucositis (COM) is a prominent complication of chemotherapy (CT). Non-thermal CO2 laser therapy (NTCLT) has been demonstrated as an innovative and safe photobiomodulative approach in some kinds of painful oral lesions. The purpose of this study was to evaluate the palliative effects of one session of NTCLT on COM lesions. Methods: Patients with painful COM (WHO grade:â‰¥2) were included in this before-after clinical trial based on the eligibility criteria. The oral lesions were irradiated with a CO2 laser (power: 1 W, scanning the lesions with the rapid circular motion of the defocused handpiece) through a thick layer (3-4 mm) of a transparent gel containing a high-water content. The severity of pain in the lesions was self-assessed using a 0-to-10 visual analogue scale (VAS) for 7 consecutive days. The evaluating physician visited the patients on the 3(rd) and 7(th) days in search of any kind of complications. Results: Seventeen adult patients with 35 patches of OM due to chemotherapy of solid tumors completed the trial. Immediately after NTCLT, the mean for non-contact VAS pain scores of the lesions significantly declined from 4.91Â±2.356 to 0.29Â±0.622 (P<0.001) and the mean for contact VAS pain scores from 7.77Â±1.57 to 1.31Â±1.18 (P<0.001). The mean VAS pain scores of the lesions showed statistically significant differences between the follow-up periods compared to the baseline (P<0.001). The process was completely pain-free and required no anesthesia. After NTCLT, no kind of thermal adverse effects such as irritation, destruction, aggravation and even erythema were observed. Conclusion: Based on the results of this before-after clinical trial, NTCLT has the potential to be considered as a non-invasive and safe palliative option for the pain management of patchy OM due to chemotherapy of solid tumors.

Effect of Low-Level Laser Therapy on Differentiation and Proliferation of Human Dental Pulp Stem Cells: A Systematic Review. Introduction: Considering the positive impact of laser treatment on the proliferation of certain cell types, we opted to perform a systematic review aimed at evaluating the effects of laser therapy and photobiomodulation on the proliferation and differentiation of human dental pulp stem cells (hDPSCs). Methods: We included all research studies examining the impact of laser therapy on hDPSCs, without limitations on publication dates or article languages. The major international databases, including PubMed, ISI Web of Science, and Scopus, were searched from inception to April 2022 by the relevant keywords. Results: In total, 1886 studies were identified in the initial search from the mentioned databases and other sources. Finally, 17 relevant studies were included in the present systematic review after removing duplicates and non-relevant articles. The results indicated the useful effect of low-level laser therapy (LLLT) on the hDPSCs. Conclusion: The findings of this systematic review indicate the useful role of LLLT in cell therapy, proliferation, and differentiation associated with hDPSCs.

A Brief Review of Low-Level Light Therapy in Depression Disorder. Introduction: Low-level laser therapy (LLLT), also called Photobiomodulation, has gained widespread acceptance as a mainstream modality, particularly in the form of photobiostimulation (PBM). Here in our review, we aim to present the application of LLLT to help with depression, explore potential action mechanisms and pathways, discuss existing limitations, and address the challenges associated with its clinical implementation. Methods: In biological systems, the visible light with a wavelength range of 400-700 nm activates photoreceptors involved in vision and circadian rhythm regulation. The near-infrared (NIR) light with a wavelength range of 800-1100 nm exhibits superior tissue penetration capabilities compared to the visible light, which enables the non-invasive application of LLLT to various tissues. Results: By enhancing adenosine triphosphate (ATP) production using the respiratory chain, LLLT is able to enhance blood flow, reduce inflammation, support repair and healing, and enhance stem cell growth and proliferation. Preclinical studies using animal models have shown promising neuroprotective effects of the LLLT method on central nervous system (CNS) diseases, suggesting potential improvements in brain function for patients suffering from Alzheimer's disease. In addition,

it helps Parkinson's patients with their movement problems and ameliorates mental disorders in individuals with depression. Conclusion: patients' quality of life can be significantly enhanced. A comprehensive understanding of the protective effects and underlying mechanisms of LLLT will facilitate its therapeutic application in the future.

Prefrontal photobiomodulation produces beneficial mitochondrial and oxygenation effects in older adults with bipolar disorder. There is growing evidence of mitochondrial dysfunction and prefrontal cortex (PFC) hypometabolism in bipolar disorder (BD). Older adults with BD exhibit greater decline in PFC-related neurocognitive functions than is expected for age-matched controls, and clinical interventions intended for mood stabilization are not targeted to prevent or ameliorate mitochondrial deficits and neurocognitive decline in this population. Transcranial infrared laser stimulation (TILS) is a non-invasive form of photobiomodulation, in which photons delivered to the PFC photo-oxidize the mitochondrial respiratory enzyme, cytochrome-c-oxidase (CCO), a major intracellular photon acceptor in photobiomodulation. TILS at 1064-nm can significantly upregulate oxidized CCO concentrations to promote differential levels of oxygenated vs. deoxygenated hemoglobin (HbD), an index of cerebral oxygenation. The objective of this controlled study was to use non-invasive broadband near-infrared spectroscopy to assess if TILS to bilateral PFC (Brodmann area 10) produces beneficial effects on mitochondrial oxidative energy metabolism (oxidized CCO) and cerebral oxygenation (HbD) in older (â‰¥50â€‰years old) euthymic adults with BD (Nâ€‰=â€‰15). As compared to sham, TILS to the PFC in adults with BD increased oxidized CCO both during and after TILS, and increased HbD concentrations after TILS. By significantly increasing oxidized CCO and HbD concentrations above sham levels, TILS has the potential ability to stabilize mitochondrial oxidative energy production and prevent oxidative damage in the PFC of adults with BD. In conclusion, TILS was both safe and effective in enhancing metabolic function and subsequent hemodynamic responses in the PFC, which might help alleviate the accelerated neurocognitive decline and dysfunctional mitochondria present in BD.

Non-Invasive Treatment of Early Diabetic Macular Edema by Multiwavelength Photobiomodulation with the Valeda Light Delivery System. PURPOSE: Diabetes is associated with ocular complications including diabetic macular edema (DME). Current therapies are invasive and include repeated intravitreal injections and laser therapy. Photobiomodulation (PBM) is a treatment (Tx) that utilizes selected wavelengths of light to induce cellular benefits including reduction of inflammation and edema. This single-center, open-label, post-hoc analysis explored the utility of multiwavelength PBM in subjects with DME. METHODS: Analysis included review of data from patients undergoing standard clinical care with an approved and marketed PBM medical device, the Valeda(Â®) Light Delivery System. Subjects with early-stage DME with good vision (Best-corrected visual acuity (BCVA) > 20/25, logMAR > 0.1) were evaluated in clinic and treated with one series of multiwavelength PBM (Tx delivered 3x/week over 3-4 weeks; total of 9 Tx sessions). Clinical, anatomical, and safety parameters were assessed in addition to subjective quality of life. RESULTS: A total of 30 eyes (19 subjects) were analyzed. Subjects were predominately male (68.4%) with a mean age of 56 Â± 14 years. Reductions in central retinal thickness (CRT), resolution of intraretinal fluid (IRF) and improvement in diabetic retinopathy severity scale scores were observed following PBM treatment in select patients. Baseline BCVA remained stable over the follow-up observation period of 3 months post-PBM. Approximately 64% of patients reported subjective improvements in their ocular condition and decreased influence in everyday life. Detailed OCT evaluations confirmed no safety issues related to phototoxicity up to 16 months. CONCLUSION: Early-stage DME subjects treated with Valeda multiwavelength PBM showed improvements in clinical and anatomical parameters. The Valeda multiwavelength PBM approach demonstrates a favorable safety profile with no signs of phototoxicity following an independent OCT review. PBM therapy may offer an alternative, non-

invasive treatment strategy with a unique mechanism and modality for patients with early-stage DME.

Potential application of PBM use in hair follicle organoid culture for the treatment of androgenic alopecia. Androgenic alopecia is a hereditary condition of pattern hair loss in genetically susceptible individuals. The condition has a significant impact on an individual's quality of life, with decreased self-esteem, body image issues and depression being the main effects. Various conventional treatment options, such as minoxidil, finasteride and herbal supplements, aim to slow down hair loss and promote hair growth. However, due to the chronic nature of the condition the financial cost of treatment for androgenic alopecia is very high and conventional treatment options are not universally effective and come with a host of side effects. Therefore, to address the limitations of current treatment options a novel regenerative treatment option is required. One promising approach is organoids, organoids are 3D cell aggregates with similar structures and functions to a target organ. Hair follicle organoids can be developed in vitro. However, the main challenges are to maintain the cell populations within the organoid in a proliferative and inductive state, as well as to promote the maturation of organoids. Photobiomodulation is a form of light therapy that stimulates endogenous chromophores. PBM has been shown to improve cell viability, proliferation, migration, differentiation and gene expression in dermal papilla cells and hair follicle stem cells. Therefore, photobiomodulation is a potential adjunct to hair follicle organoid culture to improve the proliferation and inductive capacity of cells.

Low-Level Laser Therapy Effects on Reducing Surgical Complications and Wound Infection after Cesarean Section. Background:One of the main problems in cesarean section cases is represented by postoperative pain that can cause delay in recovery and intense complications for patients. Therefore, the present study evaluates the effect and quality of treating infectious tissue and surgical complications using low-level lasers after cesarean section. Methods:In this clinical study, 240 candidates for the same type of surgery using the spinal anesthesia technique, were randomly divided into a laser treatment group and a control group. Finally, the surgical incision in the laser group was irradiated by laser (810 nm). Furthermore, the same method was used for the control group. The first request for analgesia, total analgesic consumption and severity of postoperative pain by visual analogue scale (VAS) were monitored in all patients for 24 hours. Findings: The 240 participants in the present study were equally allocated (1:1 ratio) to the case and control groups. There was a significant difference in average age ($P=0.013$) between subjects of the two study groups, with controls having a lower average age than participants in the case group based on the obtained results. However, the body mass index did not significantly differ between the two groups ($p=0.1$). The average use of painkillers (a painkiller is a pill or other form of drug that reduces or stops physical pain), suture removal time, and postoperative pain on days 3, 7, 14, and six weeks after surgery were lower in the case group than in the control group. The obtained difference was statistically significant ($p<0.001$). Conclusion:According to the findings of this study, using low-level laser therapy with cluster current (wavelength 810 nm and power 300 mW and power density for low-level laser 4 W/cm2) can help reduce postoperative pain and the need for painkillers.

Photobiomodulation Can Enhance Stem Cell Viability in Cochlea with Auditory Neuropathy but Does Not Restore Hearing. Sensorineural hearing loss is very difficult to treat. Currently, one of the techniques used for hearing rehabilitation is a cochlear implant that can transform sound into electrical signals instead of inner ear hair cells. However, the prognosis remains very poor if sufficient auditory nerve cells are not secured. In this study, the effect of mouse embryonic stem cells (mESC) and photobiomodulation (PBM) combined treatment on auditory function and auditory nerve cells in a secondary neuropathy animal model was investigated. To confirm the engraftment of stem cells in vitro, cochlear explants were treated with kanamycin (KM) to mimic nerve damage and then

cocultured with GFP-mESC. GFP-mESCs were observed to have attached and integrated into the explanted samples. An animal model for secondary neurodegeneration was achieved by KM treatment and was treated by a combination therapy of GFP-mESC and NIR-PBM at 8 weeks of KM treatment. Hearing recovery by functional testing using auditory brain stem response (ABR) and eABR was measured as well as morphological changes and epifluorescence analysis were conducted after 2 weeks of combination therapy. KM treatment elevated the hearing threshold at 70-80â€‰dB and even after the combination treatment with GFP-mESC and PBM was applied, the auditory function was not restored. In addition, the stem cells transplanted into cochlea has exponentially increased due to PBM treatment although did not produce any malignancy. This study confirmed that the combined treatment with mESC and PBM could not improve hearing or increase the response of the auditory nerve. Nevertheless, it is noteworthy in this study that the cells are distributed in most cochlear tissues and the proliferation of stem cells was very active in animals irradiated with PBM compared to other groups wherein the stem cells had disappeared immediately after transplantation or existed for only a short period of time.

Near-infrared light does not induce DNA damage in human dermal fibroblasts. Photobiomodulation (PBM) can be used to treat a range of conditions in dermatology. PBM refers to the changes induced by red (RL, 620-700â€‰nm) and near-infrared (NIR, 700-1440â€‰nm) light. Light radiation-induced DNA damage is a major contributor to aging and skin cancer. It is crucial to study the effects of PBM on DNA to ensure safety. Our lab previously demonstrated that RL (633â€‰Â±â€‰6â€‰nm) did not result in human dermal fibroblasts (HDFs) DNA damage. This study employed similar methods to investigate NIR effects. Commercially available LED-NIR (830â€‰Â±â€‰5â€‰nm) panels (66, 132, and 264â€‰J/cm(2)) did not result in DNA damage measured by cyclobutane pyrimidine dimers and pyrimidine-6,4-pyrimidone photoproducts in HDFs compared to temperature-matched controls immediately, 3â€‰h, and 24â€‰h following irradiation and compared to positive and negative controls. This demonstrates that LED-NIR does not damage DNA in HDFs in vitro. DNA Humans;DNA Damage;Skin;Infrared Rays;Fibroblasts;DNA

Photobiomodulation for melasma treatment: Integrative review and state of the art. PURPOSE: Photobiomodulation therapy (PBM) is a versatile technique for treating skin diseases. Melasma, a chronic hyperpigmentation condition, has recently been associated with vascular features and dermal photoaging and poses significant management challenges. We review the recent literature on melasma etiology and the evidence supporting PBM as a therapeutic modality for melasma treatment. METHODS: We conducted a comprehensive literature search in three different databases from May to August 2023, focusing on studies published in the past 10â€‰years. The inclusion criteria comprised full-text studies investigating low-power lasers and/or light-emitting diodes (LEDs) in inÂ vitro or inÂ vivo models, as well as clinical trials. We excluded studies discussing alternative melasma therapies or lacking experimental data. We identified additional studies by searching the reference lists of the selected articles. RESULTS: We identified nine relevant studies. Clinical studies, in agreement with inÂ vitro experiments and animal models, suggest that PBM effectively reduces melasma-associated hyperpigmentation. Specific wavelengths (red: 630â€‰nm; amber: 585 and 590â€‰nm; infrared: 830 and 850â€‰nm) at radiant exposures between 1 and 20â€‰J/cm(2) exert modulatory effects on tyrosinase activity, gene expression, and protein synthesis of melanocytic pathway components, and thus significantly reduce the melanin content. Additionally, PBM is effective in improving the dermal structure and reducing erythema and neovascularization, features recently identified as pathological components of melasma. CONCLUSION: PBM emerges as a promising, contemporary, and non-invasive procedure for treating melasma. Beyond its role in inhibiting melanogenesis, PBM shows potential in reducing erythema and vascularization and improving dermal conditions. However, robust and well-designed clinical trials are needed to

determine optimal light parameters and to evaluate the effects of PBM on melasma thoroughly. Animals;Low-Level Light Therapy;Melanosis;Lasers;Hyperpigmentation;Erythema

Effect of photobiomodulation associated with strengthening pelvic floor muscles in volunteers with urinary incontinence: a randomized, double-blinded, and placebo-controlled clinical trial. The dysfunctions of the female pelvic floor have a great influence on the quality of life of women, in all areas, social, psychological, and sexual. Stress urinary incontinence is the clinical condition in which the woman involuntarily loses urine to efforts, such as coughing and sneezing, causing great embarrassment and affecting her quality of life. The physiotherapeutic treatments include muscle strengthening; however, muscle fatigue is present when performing the exercises. Here we investigate the effects of photobiomodulation to prevent muscle fatigue in the pelvic floor in the treatment of stress urinary incontinence, associated with a muscle strengthening exercise protocol. We used an infrared laser (808Â nm, 100 mW) and 3Â J/point and fluence of 107.1Â J/cm(2). The application was performed at 3 points on the vaginal introits and at another 3 points inside the vaginal canal cavity for the treatment of stress urinary incontinence associated with strengthening exercises with vaginal cones. Twenty-two volunteers participated in the study, divided into two groups: group 1 (laser therapyâ€‰+â€‰strengthening) and group 2 (placebo laserâ€‰+â€‰strengthening). In the group 1 quality of life score, the assessment (11.63â€‰Â±â€‰4.33) was the highest score at 17 and in the reevaluation (7.81â€‰Â±â€‰5.14) the lowest was 0 (pâ€‰<â€‰0.05). The muscular strength increased considerably (pâ€‰<â€‰0.05) for group 1, where the vast majority of patients gained more than twice the strength in the pelvic apparatus (8.36â€‰Â±â€‰6.65 before X 13.81â€‰Â±â€‰8.92 after). The volunteers acquired an increase in the contraction of the muscles of the pelvic apparatus (pâ€‰<â€‰0.05) (3.45â€‰Â±â€‰1.07); after laser application, this number increased considerably (4.27â€‰Â±â€‰0.61). Endurance had an increase of almost 50% compared to placebo, demonstrating the resistance gain in the perineal muscles (3.90â€‰Â±â€‰2.35 X 5â€‰Â±â€‰1.90). We concluded that photobiomodulation treatment showed significant efficacy in relation to muscle fatigue in the pelvic apparatus right after a strengthening program in women with stress urinary incontinence. Humans;Female;Urinary Incontinence, Stress;Pelvic Floor;Quality of Life;Urinary Incontinence;Exercise Therapy;Treatment Outcome

Acute Delirium and Transcranial Photobiomodulation. Humans;Low-Level Light Therapy;Delirium;Brain

Therapeutic Photobiomodulation Before Strenuous Exercise Attenuates Shoulder Muscle Fatigue. CONTEXT: Photobiomodulation therapy (PBMT) applied as a preconditioning treatment before exercise has been shown to attenuate fatigue and improve skeletal muscle contractile function during high-intensity resistance exercise. Practical implications for preconditioning muscle with PBMT prior to fatiguing exercise include a safe and non-invasive means to enhance performance and reduce the risk of musculoskeletal injury. OBJECTIVE: To examine the muscle fatigue attenuating effects of PBMT on performance of the shoulder external rotator muscle group when applied as a preconditioning treatment before high-intensity, high-volume resistance exercise. DESIGN: Sham-controlled, cross-over design. SETTING: Laboratory. PARTICIPANTS: Twenty healthy men (n=8) and women (n=12) between the age of 18 and 30. INTERVENTION: PBMT was administered using a near-infrared laser (Î»=810/980nm, 1.8 W/cm2, treatment area = 80cm2-120 cm2) to the shoulder external rotator muscles at a radiant exposure of 10 J/cm2. Subjects performed 12 sets of isokinetic shoulder exercise. Each set consisted of 21 concentric contractions of internal and external rotation at 60Â°/s. The sets were subdivided into 3 blocks of exercise [Block 1: sets 1-4; Block 2: sets 5-8; Block 3: sets 9-12]. MAIN OUTCOME MEASURES: normalized peak torque [Nm/kg], average peak torque [Nm], total work [Nm], and average power [W]. RESULTS: During the last block of exercise (sets 9-12), all performance

measures for the active PBMT condition were 6.2% to 10% greater than the sham PBMT values (p < 0.02 to 0.001). CONCLUSIONS: PBMT attenuated fatigue and improved muscular performance of the shoulder external rotators in the latter stages of strenuous resistance exercise.

Comparison of low-level laser therapy and standard treatment for temporomandibular disorders: An assessment of therapeutic and placebo effects. BACKGROUND: Despite extensive research on the use of low-power lasers for TMD treatment, the extent of their effectiveness remains uncertain. OBJECTIVE: This study aimed to investigate the therapeutic or placebo effect of LLLT for TMD, and to compare it with standard treatment methods. A unique aspect of this study was the inclusion of a control group that received only standard treatment, allowing for an assessment of the placebo effect of LLLT. METHODS: A total of 42 patients with TMD were referred to Kerman Dental School Pain Clinic and were randomly assigned to three groups: group A received LLLT, group B was a placebo group and group C was a control group that received only standard treatment. The laser groups received gallium-aluminium-arsenide laser treatment twice a week for 10 sessions. Patients' jaw movement rate indicators and VAS index were evaluated at the start of treatment, and indicators were re-recorded every week for 5â€‰weeks. SPSS 21 was used for statistical analysis, including ANOVA and Tukey's post hoc tests for inter-group comparisons. The repeated measurement test was used to analyse the data. RESULTS: All groups showed significant improvement in VAS indicators (pâ€‰=â€‰.0001), lateral jaw movements (pâ€‰=â€‰.0001), forward jaw movement (pâ€‰=â€‰.007) but not for maximum mouth opening. No significant difference was observed between the groups at the end of the study (pâ€‰=â€‰.000). CONCLUSION: Our study provides insights into LLLT's effectiveness for TMD, suggesting it cannot replace standard treatment alone. These findings contribute to the literature and emphasise the importance of including a control group in future studies to assess the placebo effect of LLLT. Humans;Low-Level Light Therapy;Placebo Effect;Temporomandibular Joint Disorders

Photobiomodulation and alopecia: a crowdsourced survey study on patient preferences. Photobiomodulation is a treatment option for hair loss and is currently FDA cleared for androgenetic alopecia. There are a variety of photobiomodulation devices intended for at-home patient use. However, data examining user preferences is lacking. A social media-based, online survey study was completed to understand patient preferences when selecting a photobiomodulation device. Secondary outcomes examined patient experience with the device. Sixty participants responded to the 21-question survey. The majority of participants had never used a photobiomodulation device (nâ€‰=â€‰50; 86.2%). Most respondents (nâ€‰=â€‰40; 67.8%) felt the efficacy of the device was the most important aspect to consider when selecting a photobiomodulation device. Additionally, a majority of participants thought 15 (nâ€‰=â€‰22; 37.3%) or 20â€‰minutes (nâ€‰=â€‰17; 28.8%) would be a reasonable treatment duration and would prefer a hand-free device (nâ€‰=â€‰51; 86.4%). Of the eight participants who had used a photobiomodulation device, only one was dissatisfied with the device and discontinued treatment. Humans;Low-Level Light Therapy;Patient Preference;Crowdsourcing;Alopecia;Surveys and Questionnaires;Treatment Outcome

Bibliometric Analysis to Global Research Status Quo on Photobiomodulation. Background: Photobiomodulation (PBM) becomes a remedial technology with growing popularity. The primary goal of this article is to conduct a PBM literature review, providing an overall systematic understanding of current and future trends. Methods: A dataset was made with topic retrieval, concerning PBM research retrieved from the Web of Science Core Collection. We analyzed to forecast research frontiers in this field using the softwares: VOSviewer, CiteSpace, and Biblioshiny. Results: Four thousand five hundred thirty pieces of literature were retrieved from our database. Current trends were characterized by keywords of "light," "spinal cord injury," "skeletal muscle," and so on. Future trends were characterized probably by six cutting-edge terms: "wound healing," "pain," "oral

mucositis," "Alzheimer's disease," "Parkinson's disease," and "orthodontics." Conclusions: This study finds that the inadequacy of in-depth reliable interpretation of current clinical data calls for molecular biological mechanisms together with well-designed, large-sample, multicenter clinical trials. The study of oral, wound, and neural-related mechanisms and the exploration of therapeutic effects may be the popular trend at present and in the next few years. Humans;Alzheimer Disease;Bibliometrics;Low-Level Light Therapy;Muscle, Skeletal;Pain

Effect of photobiomodulation at 830â€‰nm on gene expression correlated with JAK/STAT signalling in wounded and diabetic wounded fibroblasts in vitro. Treatment of chronic diabetic wounds is an ongoing socio-economic challenge. Dysregulated signalling pathways characterise cells from chronic diabetic wounds. Photobiomodulation (PBM) stimulates healing by eliciting photochemical effects that affect gene regulation. JAK/STAT signalling is a primary signal transduction pathway involved in wound healing. This in vitro study aimed to determine if PBM at 830â€‰nm and a fluence of 5â€‰J/cm(2) regulates genes related to JAK/STAT signalling in wounded and diabetic wounded fibroblast cells. A continuous wave diode laser (12.53â€‰mW/cm(2)) was used to irradiate cells. Forty-eight hours post-PBM, RT-qPCR was used to analyse 84 genes related to JAK/STAT signalling. Five genes were upregulated and four downregulated in wounded cell models, while six genes were downregulated in diabetic wounded models. The results show drastic gene expression differences between wounded and diabetic wounded cell models in response to PBM using 830â€‰nm. Humans;Low-Level Light Therapy;Diabetes Mellitus;Signal Transduction;Fibroblasts;Gene Expression

Enhanced periodontal tissue healing via vascular endothelial growth factor expression following low-level erbium-doped: yttrium, aluminum, and garnet laser irradiation: In vitro and in vivo studies. BACKGROUND: This study aimed to investigate the effects of low-level erbium-doped: yttrium, aluminum, and garnet (Er:YAG) laser irradiation on periodontal tissue healing and regeneration through angiogenesis in vivo and in vitro studies. METHODS: Intrabony defects were surgically created in the bilateral maxilla molar of rats. The defects were treated by open flap debridement (OFD)Â with Er:YAG laser, including low-level laser irradiation (LLLI) to bone and blood clot surfaces, or conventional procedures. The mRNA expression of vascular endothelial growth factor (VEGF) in the surgical sites was quantified using real-time polymerase chain reaction. The decalcified specimens were prepared for histometric analysis. Also, LLLI was performed on human umbilical vein endothelial cells to evaluate the effects on angiogenesis. Cell proliferation, VEGF expression, and tube formation were assessed. In addition, capsazepine (CPZ), a selective inhibitor of transient receptor potential vanilloid 1 (TRPV1), treatment was performed before LLLI for the same assays. RESULTS: OFD using Er:YAG laser did not generate thermal damage on bone or root surfaces. LLLI accelerated hemostasis by coagulation of the superficial layers of blood clots in the laser-treated group. Postoperative healing was sound in all animals in both groups. VEGF expression and bone formation were significantly increased in the laser-treated group compared to those in the conventional treatment group. In vitro, cell proliferation and VEGF expression were significantly increased in the LLLI group compared to the control group. Tube-formation assays showed that LLLI significantly promoted angiogenesis. CPZ treatment significantly suppressed VEGF expression and tube formation following LLLI. CONCLUSIONS: This study suggests that Er:YAG laser irradiation may promote periodontal tissue healing by enhancing angiogenetic effect of endothelial cells via TRPV1.

Ear keloids: An innovative 3-steps combined treatment. INTRODUCTION: An excessive proliferation of fibroblasts and collagen synthesis after an injury may lead to a benign fibrous tumor, known as keloid, which does not regress spontaneously. Earlobes are a very frequent site of onset, since after a trauma (i.e., piercing) keloids may develop either on the helix and on the anterior or posterior lobe, from a few months up to several years after the injury. OBJECTIVES: To report the effectiveness of a combined protocol of CO2 laser + Dye laser + a portable Blue LED Light medical

device for Photobiomodulation Therapy (EmoLEDÂ®). METHODS: Fifty-two patients with a total of 56 ear keloids have been treated in the same session with a single CO2 laser procedure + a pulsed Dye laser procedure with an adjunctive EmoLEDÂ® procedure for 3 up to 6 min. A monthly follow-up has been performed with an adjunctive EmoLEDÂ® session in case of signs of inflammation. RESULTS: Among 56 treated keloids, 89.3% of them (50/56) did not recur during a follow-up period (from 6 up to 24 months, mean 16.3 months) while six keloids recurred (6/56, 10.7%) with mild thickening of the scar, thus requiring further treatments. CONCLUSIONS: Even if an excellent outcome obtained by the synergistic effect of combined laser treatments has already been described (i.e., CO2 laser + Dye Laser), the present study showed the adjuvant procedure with EmoLEDÂ® can reduce significantly the risk of keloids recurrences. Humans;Keloid;Inflammation;Lasers, Gas;Recurrence;Light;Treatment Outcome

The Impact of Blue Light Irradiation on Keratinocytes in Vitro. BACKGROUND: This study examined the effects of irradiation with blue light on HaCaT keratinocytes. As irradiation with blue light is known to be antimicrobial, it offers a promising alternative therapy for contaminated wounds. There is evidence that red light promotes wound healing, but the potential benefits of irradiation with blue light have not yet been adequately investigated. METHODS: The rate of wound closure in sterile and contaminated cells was measured using an in vitro scratch assay wound-healing model. Additionally, cell viability after treatment was determined using a Sulforhodamine B (SRB) assay. RESULTS: In both the sterile and contaminated groups, treated cells showed delayed wound closure when compared with cells not irradiated with blue light. Additionally, treatment with blue light resulted in poorer viability in the treatment groups. CONCLUSION: Although irradiation with blue light may offer a promising alternative therapy for reducing bacterial colonization, our data indicate that re-epithelization may be negatively influenced by blue light. Further research is needed to clarify possible wound healing applications. Humans;Keratinocytes;Wound Healing;Light;Low-Level Light Therapy

Efficacy of Low-Level Laser Therapy for Oral Mucositis in Hematologic Patients Undergoing Transplantation: A Single-Arm Prospective Study. Oral mucositis significantly affects the quality of life in hematologic cancer patients undergoing hematopoietic stem cell transplantation. Despite global evidence supporting the efficacy of low-level laser therapy (LLLT) for mucositis prevention, its clinical adoption in Japan is limited. This study aimed to fill this gap by evaluating the safety and efficacy of LLLT in a Japanese patient population. In a single-group, non-blinded, exploratory trial, we compared 21 LLLT-treated patients against a historical control of 96 patients. The primary endpoint was the incidence of Grade â‰¥ 2 mucositis, based on NCI-CTCAE ver. 4.0. The LLLT group showed a significantly lower incidence of Grade â‰¥ 2 mucositis (23.8%) compared to the control group (64.6%) ($p = 0.0006$). Furthermore, Grade â‰¥ 2 mucositis correlated with increased oral dryness and longer hospital stays. Our study confirms the efficacy of LLLT in reducing the onset of severe oral mucositis among Japanese hematologic cancer patients, advocating for its clinical introduction as a preventive measure in Japan.

Non-Invasive Systems Application in Traumatic Brain Injury Rehabilitation. Traumatic brain injury (TBI) is a significant public health concern, often leading to long-lasting impairments in cognitive, motor and sensory functions. The rapid development of non-invasive systems has revolutionized the field of TBI rehabilitation by offering modern and effective interventions. This narrative review explores the application of non-invasive technologies, including electroencephalography (EEG), quantitative electroencephalography (qEEG), brain-computer interface (BCI), eye tracking, near-infrared spectroscopy (NIRS), functional near-infrared spectroscopy (fNIRS), magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), magnetoencephalography (MEG), and transcranial magnetic stimulation (TMS) in assessing TBI consequences, and repetitive transcranial

magnetic stimulation (rTMS), low-level laser therapy (LLLT), neurofeedback, transcranial direct current stimulation (tDCS), transcranial alternative current stimulation (tACS) and virtual reality (VR) as therapeutic approaches for TBI rehabilitation. In pursuit of advancing TBI rehabilitation, this narrative review highlights the promising potential of non-invasive technologies. We emphasize the need for future research and clinical trials to elucidate their mechanisms of action, refine treatment protocols, and ensure their widespread adoption in TBI rehabilitation settings.

Postoperative Pain Management in Coronary Artery Bypass Grafting: An Integrative Review. PURPOSE: To identify pharmacological and nonpharmacological interventions adopted for pain relief in the postoperative period of coronary artery bypass graft surgery. DESIGN: Integrative review. METHODS: Studies published in English, Spanish, and Portuguese from January 2010 to December 2019 in Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Literature on Health Science, PubMed, and Web of Science. Two hundred studies were identified and eleven were included. Methodological analysis was performed using the Medical Education Research Study Quality Instrument. FINDINGS: The studies found were organized into three thematic categories: pharmacological interventions (methadone, morphine, lidocaine gel, remifentanil, sufentanil, and nefopam), nonpharmacological interventions (low-level laser therapy, light-emitting diode, Class IV laser, and transcutaneous nerve stimulation) and anesthetic techniques (dexmedetomidine, ultrasound-guided pectoral nerve block, high thoracic epidural analgesia, and perioperative parasternal block with levobupivacaine). CONCLUSIONS: A greater tendency to use drug strategies for postoperative pain relief was identified. The drugs used demonstrated efficacy and safety in the treatment of pain, with the exception of nefopam, which showed little benefit in this population. Nonpharmacological interventions, used as adjuvants to drug treatment, were shown to be safe, effective, and well tolerated by the patients. Nefopam;Sufentanil;Lidocaine;Analgesics, Opioid Humans;Pain, Postoperative;Nefopam;Sufentanil;Lidocaine;Coronary Artery Bypass;Analgesics, Opioid

Fundamentals or Icing on Top of the Cake? A Narrative Review of Recovery Strategies and Devices for Athletes. The sport and athletic performance industry has seen a plethora of new recovery devices and technologies over recent years, and it has become somewhat difficult for athletes, coaches, and practitioners to navigate the efficacy of such devices or whether they are even required at all. With the increase in recovery devices and tools, it has also become commonplace for athletes to overlook more traditional, well-established recovery strategies. In this narrative review, we discuss recovery strategies in relation to the hierarchy of scientific evidence, classifying them based on the strength of the evidence, ranging from meta-analyses through to case studies and reports. We report that foam rolling, compression garments, cryotherapy, photobiomodulation, hydrotherapy, and active recovery have a high level of positive evidence for improved recovery outcomes, while sauna, recovery boots/sleeves, occlusion cuffs, and massage guns currently have a lower level of evidence and mixed results for their efficacy. Finally, we provide guidance for practitioners when deciding on recovery strategies to use with athletes during different phases of the season.

The effect of photobiomodulation on tinnitus: a systematic review. OBJECTIVE: To establish outcomes following photobiomodulation therapy for tinnitus in humans and animal studies. METHODS: A systematic review and narrative synthesis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. The databases searched were: Medline, Embase, Cochrane Central Register of Controlled Trials ('Central'), ClinicalTrials.gov and Web of Science including the Web of Science Core collection. There were no limits on language or year of publication. RESULTS: The searches identified 194 abstracts and 61 full texts. Twenty-eight studies met the inclusion criteria, reporting outcomes in 1483 humans (26 studies) and 34 animals (2 studies). Photobiomodulation therapy parameters included 10 different

wavelengths, and duration ranged from 9 seconds to 30 minutes per session. Follow up ranged from 7 days to 6 months. CONCLUSION: Tinnitus outcomes following photobiomodulation therapy are generally positive and superior to no photobiomodulation therapy; however, evidence of long-term therapeutic benefit is deficient. Photobiomodulation therapy enables concentrated, focused delivery of light therapy to the inner ear through a non-invasive manner, with minimal side effects.

Effects of photobiomodulation with blue Light Emitting Diode (LED) on the healing of skin burns. The management of skin burns is still challenging. Among the therapeutic methods used, there are topical treatments with pharmacological and herbal agents, low-intensity therapeutic ultrasound, use of biomaterials, reconstructive techniques and photobiomodulation therapy. The aim of this study was to evaluate the effects of photobiomodulation with blue Light Emitting Diode (LED) on burn healing. Fifty Wistar rats were divided into control (CTRL) (nâ€‰=â€‰25) and blue LED (LED) (nâ€‰=â€‰25), with subgroups (nâ€‰=â€‰5) for each time of euthanasia (7, 14, 21, 28 and 32Â days). Treated animals were daily irradiated (470Â nm, 1W, 0.44 W/cm(2), 50Â J/cm(2)). Clinical evaluations were performed and the Wound Retraction Index (WRI) was determined. Histological sections were submitted to hematoxylin-eosin, toluidine blue and the immunohistochemical technique, with anti-Î±-SMA and anti-TGF-Î²1 antibodies. All data were directly collected by previously calibrated evaluators in a blind manner. The values were included in a statistical program. For all statistical tests used, 5% significance level (pâ€‰<â€‰0.05) was considered. No statistically significant differences in WRI between groups were observed (pâ€‰>â€‰0.05). Re-epithelialization was higher using LED at 7 and 14Â days (pâ€‰<â€‰0.05) and greater amount of inflammatory cells was observed at 7Â days (pâ€‰=â€‰0.01). With LED at 21 and 32Â days, greater number of mast cells were observed (pâ€‰<â€‰0.05), as well as smaller number of myofibroblasts at 14, 21, 28 and 32Â days (pâ€‰<â€‰0.05) and lower percentage of TGF-Î²1 positive cells in the conjunctiva at 7, 14 and 21Â days (pâ€‰<â€‰0.05). Negative correlations were observed in LED between the percentage of TGF-Î²1 in the epithelium and the mean number of inflammatory cells and number of myofibroblasts (pâ€‰<â€‰0.05). The results suggest that, depending on the period, blue LED can modulate the healing processes of third-degree skin burns, such as re-epithelialization, inflammatory response, mast cell concentration, myofibroblast differentiation and TGF-Î²1 immunoexpression. Despite these effects, this therapy does not seem to have significant influence on the retraction of these wounds. Future studies, using different protocols, should be carried out to expand the knowledge about the photobiomodulatory mechanisms of this type of light in the healing process. Transforming Growth Factor beta1 Rats;Animals;Transforming Growth Factor beta1;Rats, Wistar;Wound Healing;Skin;Low-Level Light Therapy;Burns

Monte Carlo based dosimetry of extraoral photobiomodulation for prevention of oral mucositis. Photobiomodulation therapy (PBMT) is recommended for prevention and treatment of oral mucositis, a painful condition that occurs in cancer patients. Intraoral PBMT is limited to treating distal oral mucosa and oropharynx. Extraoral PBMT may provide a more efficient intervention. The goal of this study was to develop a clinically viable protocol for extraoral PBMT. Monte Carlo modeling was used to predict the distribution of 850Â nm light for four treatment sites, using anatomical data obtained from MRI and optical properties from the literature. Simulated incident light power density was limited to 399Â mW/cm(2) to ensure treatment safety and to prevent tissue temperature increase. The results reveal that total tissue thickness determines fluence rate at the oral mucosa, whereas the thickness of individual tissue layers and melanin content are of minor importance. Due to anatomical differences, the fluence rate varied greatly among patients. Despite these variations, a universal protocol was established using a median treatment time methodology. The determined median treatment times required to deliver efficacious dose between 1 and 6Â J/cm(2) were within 15Â min. The developed PBMT protocol can be further refined using the

combination of pretreatment imaging and the Monte Carlo simulation approach implemented in this study. Humans;Monte Carlo Method;Stomatitis;Neoplasms;Low-Level Light Therapy;Radiometry

Investigation of the optimal light parameters for photobiomodulation to induce osteogenic differentiation of the human bone marrow stem cell and human umbilical vein endothelial cell co-culture. Bones have an important role in the human body with their complex nature. Mesenchymal stem cells and endothelial cells together support their unique and complex nature. Photobiomodulation (PBM) is a promising method that provides cell proliferation, osteogenic differentiation, and bone regeneration. However, there are still unknowns in the mechanism of osteogenic differentiation induced by PBM. The main aim of the study is to understand the molecular mechanism of PBM at 655 and 808Â nm of wavelengths and identify the most effective energy densities of both wavelengths for osteogenic differentiation. The effect of PBM on osteogenic differentiation of Human Bone Marrow Stem Cell (hBMSC) and Human Umbilical Vein Endothelial Cell (HUVEC) co-culture was examined at 1, 3, and 5Â J/cm(2) energy densities of red and near-infrared light through different analysis such as cell viability, scratch assay, intracellular reactive oxygen species production, and ATP synthesis, nitric oxide release, temperature monitoring, and osteogenic differentiation analyses. Even though all PBM-treated groups exhibited better results compared to the control group, 5Â J/cm(2) energy density induced faster cell proliferation and migration at both wavelengths. The increases in ATP and NO levels as signaling molecules, and the increases in DNA, ALPase, and calcium contents as osteogenic markers were higher in the groups treated with 5Â J/cm(2) energy density at both wavelengths. Only a slight change was obtained in the level of intracellular ROS after any light applications. It can be concluded that NO release has a very important role together with ATP production in PBM therapy to trigger DNA synthesis, ALPase activity, and mineralization for osteogenic differentiation of the hBMSC and HUVEC co-culture at 655 and 808Â nm of wavelengths. DNA;Adenosine Triphosphate Humans;Osteogenesis;Human Umbilical Vein Endothelial Cells;Coculture Techniques;Cell Differentiation;DNA;Bone Marrow Cells;Adenosine Triphosphate

Intense pulsed light and low-level light therapy for treating meibomian gland dysfunction and evaporative dry eye. Humans;Meibomian Gland Dysfunction;Low-Level Light Therapy;Dry Eye Syndromes;Meibomian Glands;Tears

Effects of photobiomodulation in the experimental acetic acid-induced colitis: comparison between male and female. Ulcerative colitis (UC) is an important chronic and multifactorial disease, which alters the colon mucosal with a significant impact on life quality affecting both men and women. The difference between genders causes changes in the inflammatory processes, modulating the development of several diseases. The available drugs to treat UC exhibit limited outcomes and side effects; thus, new therapies are needed. Photobiomodulation (PBM) emerges as potential treatment by modulating the inflammatory process without side effects and low costs. The aim of this study was to evaluate the effects of PBM in acetic acid-induced UC comparing the responses between male and females. For this purpose, male and female Wistar rats (36) were submitted to induction of UC by rectal administration of 10% acetic acid (colitis group) and treated or not with PBM (colitis-PBM group) (LED, 660Â nm, 100 mW, 150Â s) in three points: right side and left of the ventral surface and in the external anal region. Non-manipulated rats were used as control (basal group). We investigated the disease activity index (DAI score), myeloperoxidase enzyme activity (MPO) and release of cytokines in the intestine homogenates, and histological analysis. PBM reduces DAI score, MPO activity, and mast cell degranulation while increased mucous production in both females and males. Moreover, PBM reduced histopathological score as well as the levels of IL-6 and IL-4 in the bowel only in males. We also showed reduced levels of IL-1beta and TNF-alpha after PBM in both males and

females, while the levels of IL-10 and IFN-gamma were increased. In conclusion, despite our study has shown some differences between males and females, PBM attenuated the biomarkers of UC in both genders constituting a potential combined treatment that is non-invasive and low cost. Acetic Acid;Cytokines;Antioxidants Humans;Female;Rats;Male;Animals;Acetic Acid;Rats, Wistar;Colitis;Colitis, Ulcerative;Cytokines;Colon;Antioxidants

Effect of low-power laser irradiation on the shear bond strength and thermal changes across different zirconia thicknesses using different irradiation times. PURPOSE: To investigate the effect of irradiation time and zirconia thickness using low power Er,Cr:YSGG laser irradiation (for debonding purposes) on the thermal changes and shear bond strength of resin-bonded 3% mol yttrium oxide stabilized tetragonal zirconia polycrystal (3Y-TZP) specimens. MATERIALS AND METHODS: 3Y-TZP slices of 0.5, 2, and 3 mm thick were used. The temperature during laser irradiation using single spot irradiation at different times (30, 60, 90, and 120 s) and line scanning irradiation from one spot tanother at three different distances (2-, 4-, and 6- mm) were recorded. Single spot and line scanning irradiation data were analyzed using three-way ANOVA (Î±: 0.05) and generalized linear mixed model, respectively. Non-irradiated (control) and irradiated resin-bonded 3Y-TZP specimens were shear tested, and the data were analyzed using two-way ANOVA (Î±: 0.05). RESULTS: Under single spot irradiation, the laser-induced temperature was higher through thin 3Y-TZP at any time compared to thick 3Y-TZP. For the line scanning method, short distances (2 and 4 mm) resulted in a significant increase in temperature in 0.5 mm thick specimens. Laser irradiation significantly decreased the shear bond strength of the 0.5 mm group compared to the non-irradiated group. After irradiation, the bond strength of the 2- and 3-mm thick 3Y-TZP was similar to the non-irradiated group. CONCLUSION: The temperature and bond strength of low-power laser irradiated 3Y-TZP specimens was affected by the specimen thickness but not by the irradiation time tested. Low-power laser irradiation is an effective debonding method for thin Y-TZP restorations.

Effect of Laser Therapy on Postoperative Pain and Endodontic Retreatment: A Systematic Review and Meta-Analysis. BACKGROUND: Root canal re-treatment (RCR) cases are considered some of the most challenging cases in the field of endodontics, as they are mostly associated with various iatrogenic errors such as ledge formation, incomplete biomechanical preparation, file separation, and incomplete obturation. These iatrogenic errors lead to defective niches within root canals that may act as reservoirs for various viable microorganisms. Such residual microbial niches may cause postoperative pain even after thorough debridement and reshaping the canals, ultimately leading to a poor prognosis for the tooth. Nowadays, prevention of postoperative pain in re-treatment cases and prognosis are effectively managed by photobiomodulation therapy (PBMT). METHOD: Relevant studies in the English language published before November 2022 were identified using electronic databases like PubMed, SCOPUS, and EBSCO to conduct bibliographic research. This systematic review is based on 3 studies that were found eligible as per the inclusion and exclusion criteria. This systematic review is in accordance with PRISMA guidelines. RESULTS: The systematic review indicated a positive impact by significantly decreasing postoperative pain in RCR cases when treated with PBMT. The variation was statistically significant at 24 hours (P = .0002), 48 hours (P = .03), and 72 hours (P = .02). The mean difference at 24 hours was 0.65 (95% CI, 0.32-0.99), at 48 hours was 0.46 (95% CI, 0.05-0.87), and at 72 hours was 0.40 (95% CI, 0.07-0.74). There was no statistical heterogenicity at 24 hours (P > .05), but a medium heterogenicity was observed at 48 hours and 72 hours. PRACTICAL IMPLICATION: PBMT or low-level laser therapy has shown superior results as compared to the conventional pharmacologic approach in postoperative pain management in RCR cases. Humans;Low-Level Light Therapy;Root Canal Therapy;Pain, Postoperative;Dental Care;Iatrogenic Disease

Correction to: Effect of photobiomodulation on the behaviour of mesenchymal stem cells in threeâ€‘dimensional cultures.

Correction to: Photobiomodulation, Transmucosal Laser Irradiation of Blood, or B complex as alternatives to treat Covidâ€‘19 Related Longâ€‘Term Taste Impairment: doubleâ€‘blind randomized clinical trial.

The implication of blue light-emitting diode on mesenchymal stem cells: a systematic review. The application of blue light (400-480Â nm) in photobiotherapy remains controversial. This systematic review aimed to collect and analyze the biological effects of blue light-emitting diode (LED) on mesenchymal stem cells (MSCs). Inclusion and exclusion criteria were formulated, and relevant English articles from January 1982 to September 2022 were searched in PubMed, Scopus, and Web of Science. Nine articles with a medium (nâ€‰=â€‰4) to low (nâ€‰=â€‰5) risk of bias were included. Most of the MSCs reported were derived from human tissue; only one article used MSCs derived from mouse. The wavelength of the LED used was in the 400-480Â nm range, and the irradiation modes were continuous (nâ€‰=â€‰8) and pulse waves (nâ€‰=â€‰1). A chiral polarizer was used in one such study in which the irradiance was 14 mW/cm(2) and the irradiation time was 24Â h. The energy densities used in other studies were between 0.378 and 72Â J/cm(2), and the irradiation times were between 10 and 3600Â s. Blue LED light can inhibit proliferation and promote differentiation of MSCs in an appropriate energy density range, which may be related to the activation of transient receptor potential vanilloid 1 (TRPV1). Additionally, polarized light may reduce the toxic effects of blue light on MSCs. However, the heterogeneity of the design schemes and LED parameters, as well as the small number of studies, limited the conclusiveness of the review. Therefore, further studies are needed to determine the optimal irradiation strategy for promoting MSC function. Animals;Humans;Mice;Cell Differentiation;Heart Rate;Light;Mesenchymal Stem Cells

Effectiveness of high-intensity laser therapy in the treatment of patients with frozen shoulder: a systematic review and meta-analysis. The purpose of this study is to evaluate the effects of high-intensity laser therapy (HILT) in patients with frozen shoulder. PRISMA guidelines were adhered to, and a systematic search was conducted in the PubMed, Web of Science, Scopus, CINAHL, Science Direct, and PEDro databases (last update: September 4, 2023; search period: December 2022-September 2023). The inclusion criteria encompassed RCTs comparing HILT with other physical therapy interventions in frozen patients with frozen shoulders, with or without sham HILT, assessing pain intensity, shoulder ROM, and disability outcomes. The quality of the RCTs was assessed with the Cochrane Risk of Bias tool, and evidence was assessed using the GRADE approach. Five trials met the eligibility criteria and were included in the review and meta-analysis, which pooled results from the visual analog scale (VAS), goniometry, and the shoulder pain and disability index (SPADI). Mean differences (MDs) for pain intensity and disability show a pooled effect in favor of HILT both for VAS (MDâ€‰=â€‰â€‰-â€‰2.23Â cm, 95% CI:â€‰-â€‰3.25,â€‰-â€‰1.22) and SPADI (MDâ€‰=â€‰â€‰-â€‰10.1% (95% CIâ€‰=â€‰â€‰-â€‰16.5,â€‰-â€‰3.7), changes that are statistical (pâ€‰<â€‰0.01) and clinical. The MD for flexion (MDâ€‰=â€‰9.0Â°; 95% CI:â€‰-â€‰2.36Â°, 20.3Â°; pâ€‰=â€‰0.12), abduction (MDâ€‰=â€‰3.4Â°; 95% CI:â€‰-â€‰6.9Â°, 13.7Â°; pâ€‰=â€‰0.51), and external rotation (MDâ€‰=â€‰â€‰-â€‰0.95Â°; 95% CI:â€‰-â€‰5.36Â°, 3.5Â°; pâ€‰=â€‰0.67) does not show statistical and clinical differences between groups after treatment. PI and disability changes were graded as important due to their clinical and statistical results. HILT into a physical therapy plan reduce pain and disability, but it does not outperform conventional physical therapy in improving shoulder ROM. It is suggested that future RCTs compare the effects of HILT and LLLT to assess their possible differences in their analgesic

effects. Humans;Low-Level Light Therapy;Bursitis;Laser Therapy;Physical Therapy Modalities;Shoulder Pain
Vascular Lesions. Vascular lesions impact up to 5% of children and range in clinical impact from minor cutaneous aberrations to large masses impacting both form and function. Vascular lesions may be characterized as tumors or malformations. Establishing a clear diagnosis is imperative to understanding the natural history of a vascular lesion and developing a treatment plan. Medical, surgical, intralesional, and laser therapy are all effective and indicated on a case-by-case basis. There are a number of important surgical considerations for operative management of these lesions. Child;Humans;Hemangioma;Port-Wine Stain;Laser Therapy;Skin;Low-Level Light Therapy
Preconditioning with Photobiomodulation as an Effective Method in Preventing Chemotherapy-Induced Oral Mucositis: A Systematic Review. Background: Given the suffering experienced by cancer patients, effective solutions must be found to prevent the most painful and debilitating side effects of anticancer treatment. The use of photobiomodulation (PBM) with specific parameters has been proposed to prevent oral mucositis in adults undergoing hematopoietic stem cell transplantation as well as in head and neck cancer patients receiving radiotherapy alone without chemotherapy. No recommendations were possible for patients undergoing chemotherapy alone. This systematic review aims to analyze the effectiveness of preconditioning by PBM in preventing chemotherapy-induced oral mucositis. Methods: This study was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, PRISMA, Checklist and registered at the International Prospective Register of Systematic Reviews (PROSPERO). We searched and identified articles of the subsequent bibliographic databases: PubMed and Cochrane. Revised Cochrane risk-of-bias tool for randomized trials (RoB 2.0) was used to assess the risk of bias of studies included in this review. Results: There were only six clinical trials examining the efficacy of PBM therapy in the primary prevention of chemotherapy-induced oral mucositis. All of the studies used lasers, except for one study that compared lasers with light-emitting diodes. The wavelength ranges from 630 to 830â€‰nm. Irradiation parameters varied among the included studies. All studies showed good results for the use of PBM in the prevention of oral mucositis except for one study that found no benefit for the laser application. Conclusions: PBM has been shown to be effective in preventing oral mucositis when applied to healthy tissues. Finding the optimal protocol has been difficult due to the variability between studies, and therefore, further well-designed, controlled, blinded studies are recommended to precisely determine irradiation parameters and the number of sessions. This review has been registered at the International Prospective Register of Systematic Reviews (PROSPERO) under number CRD42023397771. Antineoplastic Agents Adult;Humans;Stomatitis;Head and Neck Neoplasms;Low-Level Light Therapy;Antineoplastic Agents
Management of Oral Lesions in Chikungunya Virus Disease Using Photobiomodulation Therapy: A Therapy Worth Exploring. Humans;Chikungunya virus;Low-Level Light Therapy;Chikungunya Fever
Acceleration of a delayed healing wound repair model in diabetic rats by additive impacts of photobiomodulation plus conditioned medium of adipose-derived stem cells. PURPOSE: This study aimed to investigate the effects of photobiomodulation (PBM) and conditioned medium (CM) derived from human adipose-derived stem cells (h-ASCs), both individually and in combination, on the maturation stage of an ischemic infected delayed healing wound model (IIDHWM) in type I diabetic (TIDM) rats. METHODS: The study involved the extraction of h-ASCs from donated fat, assessment of their immunophenotypic markers, cell culture, and extraction and concentration of CM from cultured 1â€‰Ã—â€‰10^6Â h-ASCs. TIDM was induced in 24 male adult rats, divided into four groups: control, CM group, PBM group (80Â Hz, 0.2Â J/cm(2), 890Â nm), and rats receiving both CM and PBM. Clinical and laboratory evaluations were conducted on days 4, 8, and 16, and euthanasia

was performed using CO(2) on day 16. Tensiometrical and stereological examinations were carried out using two wound samples from each rat. RESULTS: Across all evaluated factors, including wound closure ratio, microbiological, tensiometrical, and stereological parameters, similar patterns were observed. The outcomes of CMâ€‰+â€‰PBM, PBM, and CM treatments were significantly superior in all evaluated parameters compared to the control group (pâ€‰=â€‰0.000 for all). Both PBM and CMâ€‰+â€‰PBM treatments showed better tensiometrical and stereological results than CM alone (almost all, pâ€‰=â€‰0.000), and CMâ€‰+â€‰PBM outperformed PBM alone in almost all aspects (pâ€‰=â€‰0.000). Microbiologically, both CMâ€‰+â€‰PBM and PBM exhibited fewer colony-forming units (CFU) than CM alone (both, pâ€‰=â€‰0.000). CONCLUSION: PBM, CM, and CMâ€‰+â€‰PBM interventions substantially enhanced the maturation stage of the wound healing process in IIDHWM of TIDM rats by mitigating the inflammatory response and reducing CFU count. Moreover, these treatments promoted new tissue formation in the wound bed and improved wound strength. Notably, the combined effects of CMâ€‰+â€‰PBM surpassed the individual effects of CM and PBM. SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1007/s40200-023-01285-3.

The effect of bone remodeling with photobiomodulation in dentistry: a review study. Photobiomodulation (PBM) has been emerging as a promising alternative therapy in dentistry. However, various parameters of PBM are used in different studies, and there is limited cumulative data on PBM for improving bone formation in clinical trials. The aim of this review was to evaluate the effectiveness of PBM in the process of bone remodeling in dentistry using randomized controlled trials. Initially, a total of 1,011 articles published from January 2008 to December 2021 were retrieved from five electronic databases (PubMed, Scopus, Cochrane Library, EMBASE, and CINAHL). After a two-step review, nine articles met the inclusion criteria. The parameter of PBM, group, treatment sessions, assessment times and outcomes of the included studies were reviewed. Eighty-nine percent of the studies revealed positive effects on bone formation between the laser group and the control group. Only one article reported that light-emitting diode did not significantly enhance osteogenesis. Additionally, the present study shows that Gallium aluminum arsenide of near infrared (NIR) laser with continuous mode is the most commonly used form of PBM. The biostimulatory effects are dependent on several parameters, with wavelength and dose being more important than others. Based on this review, it is suggested that the NIR range and an appropriate dose of PBM could be used to increase the efficiency of stimulating bone healing and remodeling. However, standardization of treatment protocols is needed to clarify therapeutic strategies in dentistry. Low-Level Light Therapy;Osteogenesis;Light;Bone Remodeling;Dentistry

LIGHTSITE III: 13-Month Efficacy and Safety Evaluation of Multiwavelength Photobiomodulation in Nonexudative (Dry) Age-Related Macular Degeneration Using the Lumithera Valeda Light Delivery System. PURPOSE: The LIGHTSITE III study evaluated multiwavelength photobiomodulation (PBM) therapy in nonexudative (dry) age-related macular degeneration (AMD) using the LumiThera Valeda Light Delivery System. METHODS: LIGHTSITE III is a randomized, controlled trial to assess the safety and effectiveness of PBM in dry AMD. Subjects were given multiwavelength PBM (590, 660, and 850 nm) or Sham treatment delivered in a series of nine sessions over 3 to 5 weeks every four months over 24 months. Subjects were assessed for efficacy and safety outcomes. Data from the 13-month analysis are presented in this report. RESULTS: A total of 100 subjects (148 eyes) with dry AMD were randomized. LIGHTSITE III met the primary efficacy best-corrected visual acuity endpoint with a significant difference between PBM (n = 91 eyes) and Sham (n = 54 eyes) groups (Between group difference: 2.4 letters (SE 1.15), CI: -4.7 to -0.1, P = 0.02) (PBM alone: 5.4 letters (SE 0.96), CI: 3.5 to 7.3, P < 0.0001; Sham alone: 3.0 letters (SE 1.13), CI: 0.7-5.2, P < 0.0001). The PBM group showed a significant decrease in new onset geographic atrophy (P = 0.024, Fisher exact test, odds ratio 9.4). A

favorable safety profile was observed. CONCLUSION: LIGHTSITE III provides a prospective, randomized, controlled trial showing improved clinical and anatomical outcomes in intermediate dry AMD following PBM therapy. Humans;Low-Level Light Therapy;Prospective Studies;Visual Acuity;Macular Degeneration;Eye;Geographic Atrophy

Promising improvement in infected Wound Healing in Type two Diabetic rats by Combined effects of conditioned medium of human adipose-derived stem cells plus Photobiomodulation. BACKGROUND: We aimed to examine the accompanying and solo impacts of conditioned medium of human adipose-derived stem cells (h-ASC-COM) and photobiomodulation (PBM) on the maturation stage of an ischemic infected delayed-healing wound model (IIDHWM) of rats with type 2 diabetes (TIIDM). RESULTS: Outcomes of the wound closure ratio (WCR) results, tensiometrical microbiological, and stereological assessment followed almost identical patterns. While the outcomes of h-ASC-COMâ€‰+â€‰PBM, PBM only, and h-ASC-COM only regimes were significantly better for all evaluated methods than those of group 1(all, pâ€‰<â€‰0.001), PBM alone and h-ASC-COMâ€‰+â€‰PBM therapy achieved superior results than h-ASC-COM only (ranged from pâ€‰=â€‰0.05 to pâ€‰<â€‰0.001). In terms of tensiometrical and stereological examinations, the results of h-ASC-COMâ€‰+â€‰PBM experienced better results than the PBM only (all, pâ€‰<â€‰0.001). CONCLUSIONS: h-ASC-COMâ€‰+â€‰PBM, PBM, and h-ASC-COM cures expressively accelerated the maturation stage in the wound healing process of IIDHWM with MRSA in TIIDM rats by diminishing the inflammatory reaction, and the microbial flora of MRSA; and increasing wound strength, WCR, number of fibroblasts, and new blood vessels. While the h-ASC-COMâ€‰+â€‰PBM and PBM were more suitable than the effect of h-ASC-COM, the results of h-ASC-COMâ€‰+â€‰PBM were superior to PBM only.

A randomized, blinded study of photobiomodulation in a mouse model of Alzheimer's disease showed no preventive effect. Photobiomodulation (PBM), the process of exposing tissue to red or near-infrared light, has become a topic of great interest as a therapy for diverse pathologies, including neurodegenerative disorders. Here, we aimed to evaluate the potential beneficial effect of PBM on Alzheimer's disease (AD) using behavioral and histological readouts from a well-established transgenic murine AD model (5xFAD mice) in a randomized and fully blinded long-term in-vivo study following GLP (Good Laboratory Practices) guidelines. The heads of the mice were illuminated with no (sham), low or high power 810Â nm light, three times a week for 5Â months from the first to the sixth month of life corresponding to the prodromal phase of the pathology. The results showed that there were no significant differences between the groups in behavioral tests, including the Morris water maze, novel object recognition, and Y-maze. Similarly, histological analyses showed no differences in amyloid load, neuronal loss or microglial response. In conclusion, under the conditions of our experiment, we were unable to demonstrate any therapeutic effect of PBM for AD. This study calls for further evidence and caution when considering PBM as an effective treatment for AD. Amyloid beta-Peptides Mice;Animals;Alzheimer Disease;Mice, Transgenic;Microglia;Treatment Outcome;Disease Models, Animal;Amyloid beta-Peptides

Retrospective Study of Intertarsal Joint Inflammation in Avian Species From a Zoological Institution. A retrospective cross-sectional study was performed to measure the prevalence of avian intertarsal inflammation over a 5-year period, identify risk factors, and discuss treatment options. The authors hypothesized that: 1) long-legged birds would be more affected, 2) participation in a bird show would be a significant risk factor, and 3) young animals would be more frequently affected. Thirty-five clinical cases from 9 avian orders were included in the study. Statistical analysis indicated that the orders Ciconiiformes (9/150; 6%, 95% confidence interval [CI]: 3.2-11), Gruiformes (4/132; 3%, 95% CI: 1.2-7.5), and Pelecaniformes (7/152; 2.8%, 95% CI: 1.4-5.6) were significantly more affected than other orders (P < 0.01). Similarly, long-legged birds (21/35) had 9.8 times greater chance (P < 0.001,

95% CI: 4.7-21) of developing the condition compared with other birds. Participation in a free-flight show (22/35) was a significant risk factor (P < 0.001; odds ratio: 7.0, 95% CI: 3.3-15). Mean age at onset of clinical signs was 5.7 years, and being < 2 years-of-age during the study period was not a significant predictor of disease (P = 0.054). The tibial cartilage, a fragile fibrocartilaginous structure, was frequently affected (34%, 12/35). Treatment protocols included anti-inflammatory drugs, analgesic drugs, or both (94%, 33/35), low-level laser therapy (54%, 19/35), joint immobilization (34%, 12/35), intra-articular corticoid injections (20%, 7/35), surgical stabilization (17%, 6/35), physiotherapy (9%, 3/35), intra-articular hyaluronic acid (6%, 2/35) or platelet-rich plasma (3%, 1/35) injections, and chiropractic care (3%, 1/35). Overall recovery rate was 49% (17/35), and the condition was associated with a poor prognosis in chronic cases. Hyaluronic Acid Animals;Retrospective Studies;Cross-Sectional Studies;Inflammation;Hyaluronic Acid;Birds

Photobiomodulation therapy assisted orthodontic tooth movement: potential implications, challenges, and new perspectives. Over the past decade, dramatic progress has been made in dental research areas involving laser therapy. The photobiomodulatory effect of laser light regulates the behavior of periodontal tissues and promotes damaged tissues to heal faster. Additionally, photobiomodulation therapy (PBMT), a non-invasive treatment, when applied in orthodontics, contributes to alleviating pain and reducing inflammation induced by orthodontic forces, along with improving tissue healing processes. Moreover, PBMT is attracting more attention as a possible approach to prevent the incidence of orthodontically induced inflammatory root resorption (OIIRR) during orthodontic treatment (OT) due to its capacity to modulate inflammatory, apoptotic, and anti-antioxidant responses. However, a systematic review revealed that PBMT has only a moderate grade of evidence-based effectiveness during orthodontic tooth movement (OTM) in relation to OIIRR, casting doubt on its beneficial effects. In PBMT-assisted orthodontics, delivering sufficient energy to the tooth root to achieve optimal stimulation is challenging due to the exponential attenuation of light penetration in periodontal tissues. The penetration of light to the root surface is another crucial unknown factor. Both the penetration depth and distribution of light in periodontal tissues are unknown. Thus, advanced approaches specific to orthodontic application of PBMT need to be established to overcome these limitations. This review explores possibilities for improving the application and effectiveness of PBMT during OTM. The aim was to investigate the current evidence related to the underlying mechanisms of action of PBMT on various periodontal tissues and cells, with a special focus on immunomodulatory effects during OTM. Humans;Inflammation;Low-Level Light Therapy;Orthodontics;Root Resorption;Tooth Movement Techniques

Treatment with a red-laser-based wound therapy device exerts positive effects in models of delayed keratinocyte and fibroblast wound healing. BACKGROUND: Light therapy is widely used in medicine. Specifically, photobiomodulation has been shown to exert beneficial effects in wound healing disorders, which present a major challenge in health care. The study's aim was providing information on the effect of a novel, red-laser-based wound therapy device (WTD) on keratinocytes and fibroblasts during wound healing under optimal and non-optimal conditions. METHODS: The scratch wound assay was employed as a wound healing model for mechanical damage with readjustment of specific cell milieus, explicitly chronic TH1 inflammation and TH2-dominant conditions. Furthermore, gene expression analysis of pro-inflammatory cytokines (IL1A, IL6, CXCL8), growth factors (TGFB1, PDGFC), transcription factors (NFKB1, TP53) and heat shock proteins (HSP90AA1, HSPA1A, HSPD1) as well as desmogleins (DSG1, DSG3) in keratinocytes and collagen (COL1A1, COL3A1) in fibroblasts was performed after WTD treatment. RESULTS: It was shown that WTD treatment is biocompatible and supports scratch wound closure under non-optimal conditions. A distinct enhancement of desmoglein and collagen gene expression as well as induction of early growth factor gene expression was observed under chronic inflammatory conditions. Moreover, WTD

increased HSPD1 transcript levels in keratinocytes and augmented collagen expression in fibroblasts during wound healing under TH2 conditions. WTD treatment also alleviated the inflammatory response in keratinocytes and induced early growth factor gene expression in fibroblasts under physiological conditions. CONCLUSION: Positive effects described for wound treatment with WTD could be replicated inÂ vitro and seem to be to be conferred by a direct influence on cellular processes taking place in keratinocytes and fibroblasts during wound healing. Collagen;Intercellular Signaling Peptides and Proteins Humans;Cell Proliferation;Cell Movement;Keratinocytes;Wound Healing;Collagen;Inflammation;Intercellular Signaling Peptides and Proteins;Lasers;Fibroblasts

What Factors Determine the Use of Volitional and Non-Volitional Devices in Vocal Interventions Performed by Brazilian Speech-Language Pathologists? OBJECTIVE: To analyze the determining factors for using devices in vocal interventions and characterize their use by Brazilian speech-language pathologists (SLPs). METHODS: This cross-sectional observational study had a sample of 148 SLPs with clinical practice in voice. They answered an online questionnaire via Google Forms about sociodemographic data, training, work in the area, and the use of devices in vocal interventions. Data were analyzed descriptively and inferentially. RESULTS: Tubes, straws, and masks were the most commonly used devices. SLPs specializing in voice are more inclined to use thermotherapy and kinesio tapings while being less inclined to use therapeutic ultrasounds and nebulizers. Voice specialists are less likely to employ electrostimulation. The choice to use photobiomodulation and auditory monitoring devices is influenced by the years of clinical experience, whereas the speech-language therapy training duration affects the use of electrostimulation. The age of the professional also plays a role in the utilization of vibratory stimulation. Vibratory stimulation, auditory monitoring devices, thermotherapy, and nebulization are more frequently utilized among individuals who rely on their voices for occupational purposes, whereas electrostimulation is less common. The use of photobiomodulation is infrequent in children; vibratory stimulation is more common in adolescents, and thermotherapy is relatively common among older individuals. Most of these devices are typically prescribed in execution time during vocal intervention. CONCLUSION: The specialization, the time since graduation and in the occupation, and the target population of the service are the determining factors for the use of devices. They are used in vocal therapy and training, targeting vocal function.

Blue light photobiomodulation induced apoptosis by increasing ROS level and regulating SOCS3 and PTEN/PI3K/AKT pathway in osteosarcoma cells. Blue light photobiomodulation (PBM) has attracted great attention in diminishing proliferation and inducing death of cancer cells recently. Osteosarcoma (OS) primarily occurring in children and adolescents, the limitations of drug resistance and limb salvage make it urgent to develop and identify new adjuvant therapeutic strategies. In this work, we attempted to research the anticancer effects and biological mechanisms of blue light PBM in human OS MG63 cells. The effects of various blue light parameters on MG63 cells indicated that suppressed cell proliferation and cell migration, induced cell apoptosis which are experimentally assessed using multiple assays including CCK, LDH, wound healing assay and Hoechst staining. Concurrently, the increases of ROS level and the inhibition of PI3K and AKT expression were identified under high-dose blue light PBM in MG63 cells. Meanwhile, SOCS3 is a major inducible anti-tumor molecule, we also found that blue light LED substantially promoted its expression. Thus, this study proposed that bule light PBM may be a hopeful therapeutic approach in OS clinical treatment in the future. Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;PTEN Phosphohydrolase;PTEN protein, human;Reactive Oxygen Species;SOCS3 protein, human;Suppressor of Cytokine Signaling 3 Protein Adolescent;Child;Humans;Apoptosis;Bone Neoplasms;Cell Line, Tumor;Cell Movement;Cell Proliferation;Osteosarcoma;Phosphatidylinositol 3-Kinases;Proto-

Oncogene Proteins c-akt;PTEN Phosphohydrolase;Reactive Oxygen Species;Suppressor of Cytokine Signaling 3 Protein
Molecularly generated light and its biomedical applications. Molecularly generated light, referred to here as "molecular light", mainly includes bioluminescence, chemiluminescence, and Cerenkov luminescence. Molecular light possesses unique dual features of being both a molecule and a source of light. Its molecular nature enables it to be delivered as molecules to regions deep within the body, overcoming the limitations of natural sunlight and physically generated light sources like lasers and LEDs. Simultaneously, its light properties make it valuable for applications such as imaging, photodynamic therapy, photo-oxidative therapy, and photobiomodulation. In this review article, we provide an updated overview of the diverse applications of molecular light and discuss the strengths and weaknesses of molecular light across various domains. Lastly, we present forward-looking perspectives on the potential of molecular light in the realms of molecular imaging, photobiological mechanisms, therapeutic applications, and photobiomodulation. While some of these perspectives may be considered bold and contentious, our intent is to inspire further innovations in the field of molecular light applications. Photochemotherapy;Molecular Imaging
Accelerated Orthodontics: Stepping Into the Future Orthodontics. Orthodontic treatment signifies a transformative journey for individuals seeking not only enhanced oral health but also a boost in aesthetics and self-confidence. Nonetheless, the protracted timeline associated with conventional orthodontic care has been a persistent concern for both patients and practitioners. In this comprehensive review, we embark on an exploration of innovative strategies aimed at expediting orthodontic tooth movement (OTM). By doing so, we aspire to curtail treatment duration and mitigate potential risks, ultimately culminating in an elevated and more fulfilling patient experience. Traditionally, orthodontists heavily leaned on surgical techniques to hasten tooth movement. However, the recent landscape of orthodontics has been profoundly shaped by technological advancements and groundbreaking research findings, ushering in an era characterized by the embrace of minimally invasive approaches. These progressive methodologies encompass procedures like Piezocision, Discision, and Microosteoperforation (Alveocentesis). Beyond the obvious benefits of reduced patient discomfort, these techniques significantly truncate treatment periods, a development that addresses a primary concern of many patients. Moreover, this review delves into non-invasive alternatives, including cyclic vibrations, photobiomodulation, direct light electric current, and static or pulsed magnetic fields, as well as systemic and local administration of biological substances and hormones, all of which hold substantial promise in optimizing OTM. Furthermore, our exploration extends to a diverse spectrum of medications that have demonstrated their efficacy in expediting OTM. These encompass NSAIDs, acetaminophen, corticosteroids, bisphosphonates, herbal medicine biomaterials, and synthetic biomaterials like graphene dioxide. Every technique and medication is subjected to meticulous evaluation, taking into account its indications, contraindications, advantages, disadvantages, clinical implications, and limitations. Through this review, we endeavor to equip orthodontic professionals with a profound understanding of these innovative strategies. By doing so, we enable them to make informed decisions, tailored meticulously to meet the unique needs of each patient. In an ever-evolving field like orthodontics, staying abreast of these advancements becomes paramount, ultimately contributing to heightened treatment efficacy and enhanced patient satisfaction. The adoption of these innovative strategies not only holds the potential for improved clinical outcomes but also champions a patient-centric approach that could fundamentally reshape the landscape of orthodontic care.
Macrophage polarization in osteoarthritis progression: a promising therapeutic target. Osteoarthritis (OA) is one of the leading causes of pain and disability in the elderly. Synovitis, cartilage destruction and osteophyte formation histologically manifest OA. Unfortunately, there is currently no

effective therapy to delay its progression and the underlying mechanisms of OA require further exploration. Macrophage is a main cellular component of joint synovium. It is highly plastic and can be stimulated to polarize to different phenotypes, namely, the pro-inflammatory phenotype (M1) and the anti-inflammatory/tissue-repairing phenotype (M2). Ample evidence has demonstrated the vital roles of macrophages in the progression of OA. Imbalanced M1/M2 ratio is significantly related to OA severity indicating macrophage polarization might be a promising therapeutic target for OA. In this review, we summarized the involvements of polarized macrophages in synovitis, cartilage degradation, osteophyte formation and OA-related chronic pain. Promising therapies targeting macrophage polarization including the intra-articular cell/derivates-based therapy and the alternative non-invasive intervention such as photobiomodulation therapy were reviewed as well.

Photobiomodulation, Transmucosal Laser Irradiation of Blood, or B complex as alternatives to treat Covid-19 Related Long-Term Taste Impairment: double-blind randomized clinical trial. COVID-19 Related Long-Term Taste Impairment (CRLTTI) is a condition that can be expressed after COVID-19 contagion, lasting for months or even years, affecting the routine and quality of life of individuals. Participants expressing CRLTTI, with a minimum of 2Â months, attested by PCR-RT test were assessed for taste and smell, and underwent experimental treatments in 6 distinct groups: Photobiomodulation (PBM) in tongue dorsum and lateral (660Â nm, 808Â nm, association of 660 and 808Â nm), Transmucosal Laser Irradiation of Blood (TLIB)-ventral surface of tongue (660Â nm), B complex supplementation, and Sham laser. No intergroup statistical differences were observed at the final evaluation, despite the tendencies of better results with PBM and TLIB observed. PBM, TLIB, and B complex might be treatment options in the management of CRLTTI, despite the lack of total remission of taste and smell perception after 8 sessions (PBM and TLIB) or 30Â days of B complex supplementation. Humans;COVID-19;Low-Level Light Therapy;Quality of Life;Taste;Double-Blind Method

Glucose Improves the Efficacy of Photobiomodulation in Changing ATP and ROS Levels in Mouse Fibroblast Cell Cultures. In this study, we tested the idea that photobiomodulation-the application of red to near infrared light (~Î» = 600-1300 nm) to body tissues-is more effective in influencing cell metabolism when glucose is readily available. To this end, we used a mouse fibroblast (L-929) cell culture model and had two sets of conditions: non-stressed (10% FBS (foetal bovine serum)) and stressed (1% FBS), both either with or without glucose. We treated (or not) cells with photobiomodulation using an 810 nm laser at 15 mW/cm(2) (~7.2 J/cm(2)). Our results showed that photobiomodulation was neither cytotoxic nor effective in enhancing measures of cell viability and proliferation, together with protein levels in any of the cell cultures. Photobiomodulation was, however, effective in increasing adenosine triphosphate (ATP) and decreasing reactive oxygen species (ROS) levels and this was-most importantly-only in conditions where glucose was present; corresponding cultures that did not contain glucose did not show these changes. In summary, we found that the benefits of photobiomodulation, in particular in changing ATP and ROS levels, were induced only when there was glucose available. Our findings lay a template for further explorations into the mechanisms of photobiomodulation, together with having considerable experimental and clinical implications. Reactive Oxygen Species;Adenosine Triphosphate Animals;Mice;Reactive Oxygen Species;Adenosine Triphosphate;Infrared Rays;Cell Culture Techniques;Fibroblasts

Non-pharmacologic interventions for management of radiation-induced dry mouth: A systematic review. OBJECTIVES: Radiation-induced dry mouth negatively impacts patients' oral health and quality of life. Currently, evidence-based recommendation for non-pharmacologic interventions is still lacking. This study aimed to systematically review clinical trials evaluating the efficacy of non-pharmacologic interventions in cancer patients with radiation-induced dry mouth. METHODS:

Randomized controlled trials from 2000 were searched from 4 databases, including MEDLINE, Cochrane, Embase via OVID, and SCOPUS, up to December 16th, 2022 (PROSPERO registration CRD42022378405). The risk of bias was assessed using the revised Cochrane risk of bias assessment tool. RESULTS: Twenty-one studies were included: 11 on artificial saliva, 4 on electrical nerve stimulation (TENS), 2 on acupuncture, and one study each on low-level laser therapy, stem cells, chewing gum, and probiotics. Overall bias was low, medium, and high in 33%, 48%, and 19% of the studies, respectively. Certain artificial saliva products and TENS were shown to improve dry mouth symptoms and salivary flow rate (SFR). One study showed that stem cell transplantation significantly increased SFR. CONCLUSIONS: The evidence suggested that certain artificial saliva products and TENS are promising management. However, the evidence was still limited due to heterogeneity of interventions and outcome measurements. Thus, future studies using standard measurements and long-term follow-up are warranted.

Using Facial Skin Analysis to Capture Rosacea Patients' Response to Vascular Laser Therapy-A Single-Center Prospective Study. Humans;Prospective Studies;Laser Therapy;Low-Level Light Therapy;Rosacea;Skin

Photobiomodulation therapy in the treatment of radiotherapy-related trismus of the head and neck. This study evaluated photobiomodulation therapy (PBMT) for treatment of trismus in patients undergoing radiotherapy for head and neck cancer (HNC). Sixteen patients, 10 men and 6 women, who had a mouth openingâ€‰<â€‰35Â mm and underwent RT were included. The patients were evaluated daily before and after the PBMT application, measuring mouth opening and performing pain scores for the masticatory muscles using the visual analog scale (VAS). We used the infrared laser (~â€‰808Â nm) extraorally, 0.1 W power, 3Â J energy, 30Â s (107Â J/cm(2)) per point, applied to temporalis anterior, masseter muscles, and temporomandibular joints (TMJ). An intraoral point was made in the trigonoretromolar region towards the medial pterygoid muscle. The mean mouth opening of the patients increased by more than 7Â mm throughout the treatment. The pain scores on the initial days showed an immediate reduction after PBMT on the ipsilateral side in the muscles and TMJ. Throughout PBMT applications, there was a significant reduction in pain scores in all muscles and the TMJ. The radiation dose of all patients was above 40Â Gy, which is the threshold dose for the risk of developing trismus. SPSS software was used and adopted a confidence of 95%. The Kolmogorov-Smirnov normality test, Wilcoxon test, and Spearman correlation were performed. PBMT controls muscular pain and reduced mouth opening limitation in HNC during radiotherapy. Further studies are needed to evaluate the preventive capacity of PBMT protocols for RT trismus-related HNC. Male;Humans;Female;Trismus;Low-Level Light Therapy;Head and Neck Neoplasms;Masticatory Muscles;Pain

Could violet-blue lights increase the bacteria resistance against ultraviolet radiation mediated by photolyases? Studies have demonstrated bacterial inactivation by radiations at wavelengths between 400 and 500Â nm emitted by low-power light sources. The phototoxic activity of these radiations could occur by oxidative damage in DNA and membrane proteins/lipids. However, some cellular mechanisms can reverse these damages in DNA, allowing the maintenance of genetic stability. Photoreactivation is among such mechanisms able to repair DNA damages induced by ultraviolet radiation, ranging from ultraviolet A to blue radiations. In this review, studies on the effects of violet and blue lights emitted by low-power LEDs on bacteria were accessed by PubMed, and discussed the repair of ultraviolet-induced DNA damage by photoreactivation mechanisms. Data from such studies suggested bacterial inactivation after exposure to violet (405Â nm) and blue (425-460Â nm) radiations emitted from LEDs. However, other studies showed bacterial photoreactivation induced by radiations at 348-440Â nm. This process occurs by photolyase enzymes, which absorb photons at wavelengths and repair DNA damage. Although authors have reported bacterial

inactivation after exposure to violet and blue radiations emitted from LEDs, pre-exposure to such radiations at low fluences could activate the photolyases, increasing resistance to DNA damage induced by ultraviolet radiation. Deoxyribodipyrimidine Photo-Lyase;DNA Ultraviolet Rays;Deoxyribodipyrimidine Photo-Lyase;Light;Photons;DNA

Unraveling the parameters and biological mechanisms of CO(2) laser therapy for acute pain relief. Acute pain-related pathology is a significant challenge in clinical practice, and the limitations of traditional pain-relief drugs have made it necessary to explore alternative approaches. Photobiomodulation (PBM) therapy using CO(2) laser has emerged as a promising option. In this study, we aimed to identify the optimal parameters of CO(2) laser irradiation for acute pain relief through in vivo and in vitro experiments. First, we validated the laser intensity used in this study through bone marrow mesenchymal stem cells (BMSCs) experiments to ensure it will not adversely affect stem cell viability and morphology. Then we conducted a detailed evaluation of the duty cycle and frequency of CO(2) laser by the hot plate and formalin test. Results showed a duty cycle of 3% and a frequency of 25â€‰kHz produced the best outcomes. Additionally, we investigated the potential mechanisms underlying the effects of CO(2) laser by immunohistochemical staining, and found evidence to suggest that the opioid receptor may be involved in its analgesic effect. In conclusion, this study provides insights into the optimal parameters and underlying mechanisms of CO(2) laser therapy for effective pain relief, thereby paving the way for future clinical applications.

Chronic red laser treatment induces hypotensive effect in two-kidney one-clip model of renovascular hypertension in rat. To evaluate whether the chronic effect of photobiomodulation therapy (PBM) onÂ systolic arterial pressure (SAP)Â from two kidneys one clip (2Â K-1C) hypertension animal models can cause a hypotensive effect. Serum levels of nitric oxide were also analyzed and the assessment of lipid peroxidation of the thoracic aorta artery. Male Wistar rats were used. Hypertensive animals (2Â K-1C) with Systolic arterial pressure (SAP) greater than or equal to 160Â mmHg were used. Systolic arterial pressure (SAP) was determined by the tail plethysmography technique. Normotensive (2Â K) and hypertensive (2Â K-1C) rats were treated to PBM for 4Â weeks using a laser whose irradiation parameters were: red wavelength (Î»)â€‰=â€‰660Â nm: operating continuously; 56Â s per point (3 points) spot sizeâ€‰=â€‰0.0295 cm(2); average optical power of 100 mW; energy of 5.6Â J per point; irradiance of 3.40 W/cm(2); fluency of 190Â J/cm(2) per point. The application was on the animals tails, at 3 different points simultaneously, in contact with the skin. To assess serum nitrite and nitrate (NOx) levels, blood collection was performed after chronic PBM treatment, 24Â h after the last laser application. The evaluation of the lipid peroxidation of the thoracic aorta artery was performed by measuring the concentration of hydroperoxide by the FOX method. Chronic photobiomodulation therapy (PBM) by red laser (660Â nm) can induce a hypotensive effect in 64% of 2Â K-1C hypertensive animals, which we say responsive animals. There was no difference in serum NO levels 24Â h after the last red laser application, between treated and non-treated groups. Aortic rings from 2Â K-1C hypertensive animals present a higher lipid peroxidation. The chronic PBM treatment by red laser decreased aortic rings lipid peroxidation in hypertensive responsive groups, compared to control. our results indicate that chronic PBM made by red laser has an important hypotensive effect in renovascular hypertensiveÂ models, by a mechanism that involves decrease in oxidative stress from vascular beds. Animals;Male;Rats;Blood Pressure;Hypertension;Hypertension, Renovascular;Hypotension;Kidney;Rats, Wistar

Synthesis of surgeon and rehabilitation therapist treatment methods of bicipital tenosynovitis in dogs allows development of an initial consensus therapeutic protocol. OBJECTIVE: To compare the therapeutic approach of surgical specialists, sports medicine and rehabilitation specialists, and veterinarians with rehabilitation certification when treating bicipital tendon disease or tenosynovitis in dogs and to combine this information with existing research to develop a treatment algorithm that

provides a framework for treating bicipital tenosynovitis. SAMPLE: 223 respondents to an internet survey of board-certified veterinary surgeons, board-certified sports medicine and rehabilitation therapists, and veterinarians with rehabilitation certification. METHODS: The survey was promoted via multiple listservs, specialist college newsletters, and private relevant social media sites. Answers were compiled and submitted for statistical analysis. RESULTS: Compared to rehabilitation therapists (RTh), surgeons placed less value on the stabilizing function of the biceps tendon and its role in preventing other shoulder morbidities. Similarly, compared to RTh, surgeons were more inclined to select surgery as the primary therapeutic approach and attributed a less optimistic prognosis to conservative therapy outcomes. There were multiple differences between surgeons and RTh in executing a conservative therapy program, with RTh more likely to recommend therapeutic exercise, extracorporeal shockwave, regenerative medicine, therapeutic ultrasound, exercise restriction, photobiomodulation, and pulsed electromagnetic field therapy. RTh were less likely to prescribe NSAIDS or inject corticosteroids. Despite the above noted differences, there were also multiple areas of agreement. CLINICAL RELEVANCE: Consensus agreement, combined with existing research, was used to create a treatment algorithm suggesting how to best address multiple manifestations of bicipital tendinopathy. Such guidelines can be considered to direct therapeutic strategies for this common condition.
Humans;Dogs;Animals;Tenosynovitis;Consensus;Tendons;Prognosis;Surgeons;Dog Diseases

Pulsed Red and Blue Photobiomodulation for the Treatment of Thigh Contusions and Soft Tissue Injury: A Randomized Controlled Trial. CONTEXT: Contusion and soft tissue injuries are common in sports. Photobiomodultion, light and laser therapy, is an effective aid to increase healing rates and improve function after various injury mechanisms. However, it is unclear how well photobiomodulation improves function after a contusion soft tissue injury. This study aimed to determine the effects of a pulsed red and blue photobiomodulation light patch on muscle function following a human thigh contusion injury. DESIGN: Single-blinded randomized control trial design. METHODS: We enrolled 46 healthy participants. Participants completed 5 visits on consecutive days. On the first visit, participants completed a baseline isokinetic quadriceps strength testing protocol at 60Â°/s and 180Â°/s. On the second visit, participants were struck in the rectus femoris of the anterior thigh with a tennis ball from a serving machine. Immediately following, participants were treated for 30Â minutes with an active or placebo photobiomodulation patch (CareWear light patch system, CareWear Corp). Following the treatment, participants completed the same isokinetic quadriceps strength testing protocol. Participants completed the treatment and isokinetic quadriceps strength test during the following daily visits. We normalized the data by calculating the percent change from baseline. We used a mixed model analysis of covariance, with sex as a covariate, to determine the difference between treatment groups throughout the acute recovery process. RESULTS: We found the active photobiomodulation treatment significantly increased over the placebo group, quadriceps peak torque during the 180Â°/s test (P = .030), and average power during both the 60Â°/s (P = .041) and 180Â°/s (P â‰¤ .001) assessments. The mean peak torque and average power of 180Â°/s, at day 4, exceeded the baseline levels by 8.9% and 16.8%, respectively. CONCLUSIONS: The red and blue photobiomodulation light patch improved muscle strength and power during the acute healing phase of a human thigh contusion injury model. Humans;Thigh;Low-Level Light Therapy;Quadriceps Muscle;Muscle Strength;Contusions;Soft Tissue Injuries

Transcranial photobiomodulation ameliorates midbrain and striatum neurochemical impairments and behavioral deficits in reserpine-induced parkinsonism in rats. Photobiomodulation (PBM) of deep brain structures through transcranial infrared irradiation might be an effective treatment for Parkinson's disease (PD). However, the mechanisms underlying this intervention should be elucidated to optimize the therapeutic outcome and maximize therapeutic efficacy. The present study aimed at

investigating the oxidative stress-related parameters of malondialdehyde (MDA), nitric oxide (NO), and reduced glutathione (GSH) and the enzymatic activities of sodium-potassium-ATPase (Na(+), K(+)-ATPase), Acetylcholinesterase (AChE), and monoamine oxidase (MAO) and monoamine levels (dopamine (DA), norepinephrine (NE) and serotonin (5-HT) in the midbrain and striatum of reserpine-induced PD in an animal model treated with PBM. Furthermore, the locomotor behavior of the animals has been determined by the open field test. Animals were divided into three groups; the control group, the PD-induced model group, and the PD-induced model treated with the PBM group. Non-invasive treatment of animals for 14 days with 100Â mW, 830Â nm laser has demonstrated successful attainment in the recovery of oxidative stress, and enzymatic activities impairments induced by reserpine (0.2 mg/kg) in both midbrain and striatum of adult male Wistar rats. PBM also improved the decrease in DA, NE, and 5-HT in the investigated brain regions. On a behavioral level, animals showed improvement in their locomotion activity. These findings have shed more light on some mechanisms underlying the treatment potential of PBM and displayed the safety, easiness, and efficacy of PBM treatment as an alternative to pharmacological treatment for PD.
Reserpine;Serotonin;Acetylcholinesterase;Dopamine;Adenosine Triphosphatases
Rats;Male;Animals;Reserpine;Rats, Wistar;Serotonin;Low-Level Light Therapy;Acetylcholinesterase;Parkinsonian Disorders;Mesencephalon;Dopamine;Adenosine Triphosphatases;Disease Models, Animal

Temporal and spectral analyses of EEG microstate reveals neural effects of transcranial photobiomodulation on the resting brain. INTRODUCTION: The quantification of electroencephalography (EEG) microstates is an effective method for analyzing synchronous neural firing and assessing the temporal dynamics of the resting state of the human brain. Transcranial photobiomodulation (tPBM) is a safe and effective modality to improve human cognition. However, it is unclear how prefrontal tPBM neuromodulates EEG microstates both temporally and spectrally. METHODS: 64-channel EEG was recorded from 45 healthy subjects in both 8-min active and sham tPBM sessions, using a 1064-nm laser applied to the right forehead of the subjects. After EEG data preprocessing, time-domain EEG microstate analysis was performed to obtain four microstate classes for both tPBM and sham sessions throughout the pre-, during-, and post-stimulation periods, followed by extraction of the respective microstate parameters. Moreover, frequency-domain analysis was performed by combining multivariate empirical mode decomposition with the Hilbert-Huang transform. RESULTS: Statistical analyses revealed that tPBM resulted in (1) a significant increase in the occurrence of microstates A and D and a significant decrease in the contribution of microstate C, (2) a substantial increase in the transition probabilities between microstates A and D, and (3) a substantial increase in the alpha power of microstate D. DISCUSSION: These findings confirm the neurophysiological effects of tPBM on EEG microstates of the resting brain, particularly in class D, which represents brain activation across the frontal and parietal regions. This study helps to better understand tPBM-induced dynamic alterations in EEG microstates that may be linked to the tPBM mechanism of action for the enhancement of human cognition.

Physiotherapy Rehabilitation Following Lower Extremity Split Skin Grafting in Necrotizing Fasciitis. Necrotizing fasciitis is defined as a highly progressive microbial infection. The diagnosis of necrotizing fasciitis is mostly based on clinical signs, and early diagnosis is key. There are several difficulties that patients confront following surgery. Physical therapy helps to regain the functional range of motion, enhance muscle strength, reduce stiffness and make the patient self-independent. We presented a case of a 54-year-old male with presenting complaints of pain over right lower limb while doing movements and difficulty in performing daily activities. The patient was diagnosed with necrotizing fasciitis of the right leg which was managed surgically by a skin-split graft but later the patient developed post-operative stiffness and pain for which physiotherapy was advised. A goal-oriented

tailored rehabilitation approach was planned for the patient for four weeks. The patient and his family were informed about their present condition. Positioning was given to reduce edema. Wound healing was enhanced by the use of ultrasound and low-level laser therapy. In order to mobilize scarÂ myofascial release technique and massage were applied. To increase functional range and strength, a mobility and strengthening exercise was performed. To make the patient functionally independent balance and gait exercise was given.Â The outcome measures included a numerical pain rating scale (NPRS), range of motion, manual must testing, and lower extremity functional scale. There was an improvement in all the outcome measures taken. The treatment protocol proved to be beneficial for the patient.

Effects of Photobiomodulation Therapy on Hard Tissue Healing in Rat Tooth Extraction Sockets. Objective: To investigate the effects of photobiomodulation therapy (PBMT) on hard tissue healing in rat maxillary first molar extraction sockets. Methods: A total of 20 male Wistar rats were used in the study. The right extraction sockets were irradiated with a Ga-Al-As laser (500â€‰mW, 980â€‰nm) for 51.7â€‰J/cm(2) every 24â€‰h for 7 days, while the left sockets served as controls. Rats were sacrificed on days 3, 7, 14, and 28 after tooth extraction, and microcomputed tomography (CT) analysis, histopathological evaluation, and enzyme-linked immunosorbent assay (ELISA) were conducted at different time points. Results: Micro-CT analysis showed that the percentage of bone volume/tissue volume (TV) and bone mineral density were significantly higher in the experimental group compared to the control group on day 28 (pâ€‰<â€‰0.05). Histopathological evaluation revealed that PBMT promoted new bone formation and accelerated bone remodeling. ELISA demonstrated a significant increase in alkaline phosphatase expression in the laser sides on days 7 and 14 (pâ€‰<â€‰0.05). Conclusions: One application postextraction followed by seven consecutive daily applications of PBMT can effectively promote hard tissue healing in rat maxillary first molar extraction sockets. Rats;Male;Animals;Rats, Wistar;X-Ray Microtomography;Low-Level Light Therapy;Tooth Socket;Tooth Extraction

Transcranial photobiomodulation therapy associated with cardiorespiratory rehabilitation in spastic subjects. The objective of this study was to evaluate the effects of cardiorespiratory rehabilitation (CR) and transcranial photobiomodulation (tPBM) on exercise tolerance (ET), heart rate variability (HRV), and peripheral muscle activity in individuals with spasticity. Fifteen participants with spasticity were randomly assigned to two groups: the tPBM group (tPBMG) consisted of eight volunteers who underwent tPBM (on mode) and CR, while the control group (CG) consisted of seven volunteers who underwent simulated tPBM (off mode) and CR. The CR program included 12Â weeks of treatment, twice a week for one hour, involving aerobic exercises and lower limb strengthening. For tPBM, a cluster with three lasers (Î»â€‰=â€‰680Â nm, 808Â nm), with a power of 100 mW/laser and energy of 36Â J, applied to the F7, F8, and Fpz points. The following parameters were evaluated after 8 and 12Â weeks: ET, HRV, and surface electromyography (EMG) of the rectus femoris muscle during orthostasis (ORT), isometric squatting (ISOM), and isotonic squatting (ISOT). Both groups showed a 40% increase in ET for the CG and a 30% increase for the tPBMG. The CG had more pronounced parasympathetic modulation alterations during post-exercise effort and recovery compared to the tPBMG. The EMG results showed that the tPBMG exhibited progressive improvement in muscle activity during ISOM and ISOT, as well as a decrease in the interlimb difference. In conclusion, both CR and tPBMG demonstrated improvements in ET. However, tPBMG specifically showed promising effects on HRV modulation and peripheral muscle electrical activity, providing additional benefits compared to CR alone. Humans;Muscle Spasticity;Low-Level Light Therapy;Electromyography;Lower Extremity;Quadriceps Muscle

Photobiomodulation therapy alleviates repeated closed head injury-induced anxiety-like behaviors. Repeated closed head injury (rCHI) is one of the most common brain injuries. Although extensive

studies have focused on how to treat rCHI-induced brain injury and reduce the possibility of developing memory deficits, the prevention of rCHI-induced anxiety has received little research attention. The current study was designed to assess the effects of photobiomodulation (PBM) therapy in preventing anxiety following rCHI. The rCHI disease model was constructed by administering three repeated closed-head injuries within an interval 5â€‰days. 2-min daily PBM therapy using an 808â€‰nm continuous wave laser at 350â€‰mW/cm(2) on the scalp was implemented for 20â€‰days. We found that PBM significantly ameliorated rCHII-induced anxiety-like behaviors, neuronal apoptosis, neuronal injury, promotes astrocyte/microglial polarization to anti-inflammatory phenotype, preserves mitochondrial fusion-related protein MFN2, attenuates the elevated mitochondrial fission-related protein DRP1, and mitigates neuronal senescence. We concluded that PBM therapy possesses great potential in preventing anxiety following rCHI.
Humans;Low-Level Light Therapy;Apoptosis;Neurons;Anxiety;Head Injuries, Closed

Blue light photobiomodulation for reactivation of healing in wounds not responding to standard therapy. OBJECTIVE: Blue light (410-430nm) has been suggested to be effective in the healing process of hard-to-heal wounds. The aim of this study was to test this hypothesis. METHOD: This single-centre observational study assessed the efficacy of photobiomodulation with blue light (120 seconds at a distance of 4cm from the wound bed once a week for four weeks) in activating healing in patients with hard-to-heal skin lesions (mean duration 23.9 months) of the lower limb that had not responded to four weeks of standard treatment. RESULTS: A total of 59 patients were assessed. Wounds were divided into groups according to aetiology: hard-to-heal venous wound (30.5%); hard-to-heal arterial and mixed wounds (16.9%); hard-to-heal inflammatory wound (22.0%); other hard-to-heal wounds (13.6%); and acute wound (16.9%). The mean reduction in wound area at the end of the four-week treatment period with blue light compared with baseline was 51.38% ($p<0.001$) across all wounds. Among subgroups, the best performance was obtained for hard-to-heal venous wounds, achieving a 63.36% ($p<0.001$) mean reduction in wound size, and acute wounds, achieving a mean reduction of 82.76% ($p<0.001$). The greatest mean change in wound bed score was seen at the end of the four-week treatment period with blue light, with an increase in the mean score from 8.6 at baseline to 12.8 at week four (77.2%; $p<0.001$). There was a clear decrease in pain during blue light treatment, achieving a reduction in the average numeric rating scale (NRS) from 4.3 at baseline to 1.8 at week 4 (53.23%; $p <0.001$). At week 4, the highest proportion of complete healing was seen in acute (100.0%) and venous wounds (83.3%). CONCLUSION: Based on these results, photobiomodulation with blue light appears to reactivate the healing process in acute and hard-to-heal wounds that do not respond to standard treatment. Photobiomodulation with blue light treatment is easy to perform and safe, with no reported adverse events or side-effects.
Humans;Wound Healing;Standard of Care;Pain

Effects of high-intensity laser therapy on pain, functional status, hand grip strength, and median nerve cross-sectional area by ultrasonography in patients with carpal tunnel syndrome. The aim of this study was to evaluate the effects of high intensity laser therapy (HILT) on pain, functional status, hand grip strength, and median nerve cross-sectional area by ultrasonography in patients with carpal tunnel syndrome. Sixty patients who were diagnosed with carpal tunnel syndrome were included in the study. The patients observed during the research were randomly divided into two groups with 30 patients in each group. Splint+ exercise and HILT (pulsed mode with a power of 8.0 W and energy density of 8 J/cm(2) for 1.40 minutes for every 25 cm(2), continuous mode with a power of 3.0 W and energy density of 80 J/cm(2) for 11 minutes for each 25 cm(2); total 10 sessions 5 days a week) were applied for 2 weeks for the first group, and splint+exercise and sham laser treatment were applied for 2 weeks for the second group. Randomization was undertaken with the assistance of a computer-generated random number table before beginning the treatment processes. The patients

were evaluated with the determined scales before the treatment, at the end of the treatment, and at the 3rd month. Hydraulic hand dynamometer was used to measure hand grip strength, visual analog scale (VAS) for pain, Boston CTS Questionnaire to assess function, and ultrasonography to measure median nerve cross-sectional area. The impact of time on the change in VAS levels was found to be of statistical significance within each group of patients (p<0.001), but between-group comparisons did not yield significant results (p<0.454). The effects of time on variations in Boston CTS Questionnaire scores were found to have been of statistical significance for both groups (p<0.001), but significance was not subsequently observed when the results of the two groups were compared on a between-group basis (p=0.226 and p=0.973 for the FSS and SSS, respectively). While time had a statistically significant effect on the change in hand grip strength for both groups (p=0.000), between-group comparisons statistical significance finding in favor of HILT was found in the early period (p=0.012). The time-group association patterns of the groups showed significant difference (p=0.025). While time had a statistically significant effect on the changes in the median cross-sectional areas of the nerve for the patients of both treatment groups (p<0.001), between-group comparisons yielded no findings of statistical significance (p=0.438). The time-group relationship patterns of the groups were found to reflect statistical significance (p=0.001). In conclusion, the results of the research presented here have confirmed that hand grip strength may increase and the median nerve's cross-sectional area may decrease upon the application of high-intensity laser for individuals experiencing CTS. However, this effect was demonstrated here only in the short-term and the evidence was not maintained through the course of follow-up of a longer duration. Humans;Median Nerve;Carpal Tunnel Syndrome;Hand Strength;Functional Status;Low-Level Light Therapy;Ultrasonography;Pain;Treatment Outcome

Histological, Physiological and Biomechanical Effects of Low-Level Laser Therapy on Tendon Healing in Animals and Humans: A Systematic Review. Low-level Laser Therapy (LLLT) was widely used in clinical practice for tendon disorders. However, the underlying mechanisms and effectiveness of LLLT in treating tendon injury remain unclear. Therefore, the present study was conducted aiming to summarize the evidence regarding the histological, physiological, and biomechanical effects of LLLT on tendon healing in animal and human models. Four databases were searched for relevant literature. Four independent reviewers screened abstracts and full-text articles, extracted relevant data, evaluated the risk of bias, and quantified the quality of evidence. Database searches yielded 1400 non-duplicated citations. Fifty-five studies were included (50 animal and five human studies). Animal studies revealed that LT had stimulating effects on collagen organization, collagen I and collagen II formation, matrix metalloproteinase (MMP)-8, transforming growth factor Î²1, vascular endothelial growth factor, hydroxyproline, maximum load, maximum elongation before breaking, and tendon stiffness. However, LLLT had inhibitory effects on the number of inflammatory cells, histological scores, relative amount of collagen III, cyclooxygenase-2, prostaglandin E2 (PGE2), interleukin-6, tumor necrosis factor-Î±, MMP-1, and MMP-3. Although one human study found that LLLT reduced the concentration of PGE2 in peritendinous tissue of the Achilles tendon, other human studies revealed that the effects of LLLT on the physiology and biomechanics of human tendons remained uncertain. LLLT facilitates tendon healing through various histological, physiological, and biomechanical effects in animal models. Only post-LLLT anti-inflammatory effects were found in human studies. Dinoprostone;Vascular Endothelial Growth Factor A;Collagen Humans;Rats;Animals;Low-Level Light Therapy;Rats, Wistar;Tendinopathy;Dinoprostone;Vascular Endothelial Growth Factor A;Collagen;Achilles Tendon

Photomodulatory effects in the hypothalamus of sleep-deprived young and aged rats. Insufficient sleep is associated with impaired hypothalamic activity and declined attentional performance. In this study, alterations in the hypothalamus of REM sleep-deprived (SD) young and

aged rats, and the modulatory effect of near-infrared (NIR) laser were investigated. Forty-eight male Wistar rats (24 young at 2 months and 24 senile at 14 months) were divided into three groups: the control, the SD group subjected to 72Â hr of sleep deprivation, and the transcranial-NIR laser-treated (TLT) group subjected to SD for 72Â hr and irradiated with 830Â nm laser. The hypothalamic levels of oxidative stress, inflammatory biomarkers, antioxidant enzymes, mitochondrial cytochrome C oxidase (CCO), apoptotic markers (BAX, BCL-2), and neuronal survival-associated genes (BDNF, GLP-1) were evaluated. Furthermore, the hypothalamic tissue alterations were analyzed via histological examination. The results revealed that TLT treatment has enhanced the antioxidant status, prevented oxidative insults, suppressed neuroinflammation, regulated CCO activity, reduced apoptotic markers, and tuned the survival genes (BDNF & GLP-1) in hypothalamic tissue of SD young and aged rats. Microscopically, TLT treatment has ameliorated the SD-induced alterations and restored the normal histological features of hypothalamus tissue. Moreover, the obtained data showed that SD and NIR laser therapy are age-dependent. Altogether, our findings emphasize the age-dependent adverse effects of SD on the hypothalamus and suggest the use of low-laser NIR radiation as a potential non-invasive and therapeutic approach against SD-induced adverse effects in young and aged animals.
Antioxidants;Brain-Derived Neurotrophic Factor;Glucagon-Like Peptide 1
Rats;Male;Animals;Antioxidants;Brain-Derived Neurotrophic Factor;Rats, Wistar;Hypothalamus;Sleep Deprivation;Glucagon-Like Peptide 1

Comparison between local abdominal and transcutaneous tail vein photobiomodulation in experimental rat model of ulcerative colitis. Ulcerative colitis (UC) is a chronic autoimmune disease that impacts the quality of life, but current pharmacological treatments are limited. Photobiomodulation (PBM) is a light-based treatment that can be applied either locally or systemically. Here, we compare the effects of local and vascular PBM (VPBM) in an experimental rat model of UC. Male Wistar rats were induced with UC by rectal instillation of acetic acid and treated with either local abdominal PBM or VPBM to the tail vein using a 660-nm LED. The findings indicated that local PBM but not VPBM reduced intestinal histological scores. Both local and VPBM increased mucus production, decreased mast cell degranulation, and modulated TNF-Î± and IL-1 Î² levels in the intestines. Local PBM also affected the expression of the mRNAs for IL-6, TNF-Î±, and IFN-Î³. In conclusion, we suggest that local PBM appears to be more promising than VPBM for treating UC. However, further research is needed to fully understand the mechanisms and to optimize the parameters of PBM for UC treatment. Tumor Necrosis Factor-alpha
Rats;Male;Animals;Colitis, Ulcerative;Tumor Necrosis Factor-alpha;Quality of Life;Tail;Intestinal Mucosa;Rats, Wistar

Photobiomodulation of Neurogenesis through the Enhancement of Stem Cell and Neural Progenitor Differentiation in the Central and Peripheral Nervous Systems. Photobiomodulation (PBM) is the regulation of biological processes using light energy from sources such as lasers or light-emitting diodes. Components of the nervous system, such as the brain and peripheral nerves, are important candidate PBM targets due to the lack of therapeutic modalities for the complete cure of neurological diseases. PBM can be applied either to regenerate damaged organs or to prevent or reduce damage caused by disease. Although recent findings have suggested that neural cells can be regenerated, which contradicts our previous understanding, neural structures are still thought to have weaker regenerative capacity than other systems. Therefore, enhancing the regenerative capacity of the nervous system would aid the future development of therapeutics for neural degeneration. PBM has been shown to enhance cell differentiation from stem or progenitor cells to near-target or target cells. In this review, we have reviewed research on the effects of PBM on neurogenesis in the central nervous system (e.g., animal brains) and the peripheral nervous system (e.g., peripheral sensory neural structures) and sought its potential as a therapeutic tool for intractable neural degenerative

disorders. Animals;Stem Cells;Neurogenesis;Brain;Cell Differentiation;Peripheral Nervous System;Low-Level Light Therapy

A Preliminary Report on the Combined Effect of Intra-Articular Platelet-Rich Plasma Injections and Photobiomodulation in Canine Osteoarthritis. Osteoarthritis (OA) is highly prevalent in the canine population. Due to the multiple dimensions of the disease, a multimodal approach is usually favored by clinicians. To evaluate the combined treatment with intra-articular platelet-rich plasma (PRP) and photobiomodulation in dogs with bilateral hip OA, thirty dogs were assigned to a PRP group (PRPG, n = 10), a photobiomodulation group (PBMTG, n = 10), or a combined therapies group (PRP+PBMTG, n = 10). The PRPG received two intra-articular administrations of platelet-rich plasma 14 days apart. The PBMTG received photobiomodulation with a therapeutic laser, with three sessions every other day in week one; two sessions in week two; a single session in week three; and one session/month on follow-up evaluation days. The PRP+PBMTG received the two combined therapies. The response to treatment was evaluated with weight-bearing distribution and the Canine Brief Pain Inventory, the Liverpool Osteoarthritis in Dogs, and the Canine Orthopedic Index. Evaluations were conducted before treatment and +8, +15, +30, +60, and +90 days after initial treatment. Normality was assessed with a Shapiro-Wilk test, and the groups' results in each evaluation moment were compared using a Mann-Whitney U test. Animals of both sexes (male n = 19, female n = 11) were included in the sample, with a mean age of 7.8 Â± 2.5 years and a body weight of 26.5 Â± 4.7 kg. Joints were classified as mild (n = 6, three in PRPG, two in PBMTG, and one in PRP+PBMTG), moderate (n = 18, six in PRPG, five in PBMTG, and seven in PRP+PBMTG), and severe (n = 6, one in PRPG, three in PBMTG, and two in PRP+PBMTG). No differences were found between groups at the initial evaluation. All treatments produced clinically significant improvements compared to the assessment on treatment day. The combination of PRP and photobiomodulation produced greater, longer-lasting improvements. PRP and photobiomodulation can improve objective outcomes and client-reported outcome measures in dogs with OA. Their combined use leads to greater, longer-lasting, clinically significant improvements.

Near-Infrared Light Exposure Triggers ROS to Downregulate Inflammatory Cytokines Induced by SARS-CoV-2 Spike Protein in Human Cell Culture. The leading cause of mortality from SARS-CoV-2 is an exaggerated host immune response, triggering cytokine storms, multiple organ failure and death. Current drug- and vaccine-based therapies are of limited efficacy against novel viral variants. Infrared therapy is a non-invasive and safe method that has proven effective against inflammatory conditions for over 100 years. However, its mechanism of action is poorly understood and has not received widespread acceptance. We herein investigate whether near-infrared (NIR) light exposure in human primary alveolar and macrophage cells could downregulate inflammatory cytokines triggered by the SARS-CoV-2 spike (S) protein or lipopolysaccharide (LPS), and via what underlying mechanism. Our results showed a dramatic reduction in pro-inflammatory cytokines within days of NIR light treatment, while anti-inflammatory cytokines were upregulated. Mechanistically, NIR light stimulated mitochondrial metabolism, induced transient bursts in reactive oxygen species (ROS) and activated antioxidant gene transcription. These, in turn, downregulated ROS and inflammatory cytokines. A causal relationship was shown between the induction of cellular ROS by NIR light exposure and the downregulation of inflammatory cytokines triggered by SARS-CoV-2 S. If confirmed by clinical trials, this method would provide an immediate defense against novel SARS-CoV-2 variants and other inflammatory infectious diseases.

Efficacy of hyaluronic acid gel and photobiomodulation therapy on wound healing after surgical gingivectomy: a randomized controlled clinical trial. BACKGROUND: Surgical gingivectomy can be considered the gold standard treatment for gingival enlargement. The healing of wound site after gingivectomy occurs slowly by secondary intention. To accelerate the wound healing process, several

studies have been conducted evaluating the effect of various treatment modalities. Photobiomodulation therapy (PBMT) was proposed to provide minimally invasive and painless treatment as well as to decrease discomfort of the patient following the surgical process. Another factor that is expected to improve the healing after surgery is topical application of chemotherapeutic agents such as Hyaluronic acid (HA). This study aims to assess the effect of topically applied HA gel after PBMT on the healing of wound site after surgical gingivectomy. METHODS: This randomized controlled clinical trial included twenty-six surgical gingivectomy wound sites, equally divided into two groups, Group-I (test group): the surgical sites after gingivectomy were irradiated with a diode laser (980Â nm, 0.2Â W) then covered by 2% HA gel loaded in a special custom-made soft transparent tissue guard appliance for each patient. Group II (control group): the surgical sites were irradiated with a diode laser (980Â nm, 0.2Â W) only. Wound healing was assessed subjectively by Landry healing index on the 3rd, 7th, 14th and 21st days after surgery, and pain perception was assessed by the patients using visual analog scale (VAS) throughout the 21 days of the follow up period. Comparisons between the two study groups were performed using Mann-Whitney U test, while comparisons between different time points were performed using Friedman test. Significance was inferred at p valueâ€‰<â€‰0.05. RESULTS: By the end of the follow-up period, surgical sites of the test group showed excellent healing compared to the control group. There were no significant differences in VAS scores between both groups (pâ€‰>â€‰0.05). CONCLUSIONS: Application of 2% HA gel as an adjunctive to PBMT was found to have significant clinical effects and higher power of repair among test group when compared to that achieved by PBMT alone in control group. TRIAL REGISTRATION: This study was retrospectively registered on ClinicalTrials.gov and first posted on 28th of March 2023 with an identifier number: NCT05787912. Hyaluronic Acid Humans;Gingivectomy;Hyaluronic Acid;Low-Level Light Therapy;Wound Healing;Gingival Hyperplasia

Outcomes of low-level light therapy before and after cataract surgery for the prophylaxis of postoperative dry eye: a prospective randomised double-masked controlled clinical trial. BACKGROUND: Despite increasing evidence shows that optimising ocular surface before cataract surgery is fundamental in patients with pre-existing dry eye disease (DED) to achieve the desired postoperative outcomes, the prophylactic treatment of healthy patients undergoing surgery aiming at preventing iatrogenic DED is worth investigating. METHODS: This was a prospective, interventional, randomised, controlled, double-masked clinical trial. Patients were randomly assigned 1:1 to receive either low-level light therapy (LLLT) or sham treatment (LLLT with a power output <30%). Patients underwent two treatment sessions: 7Â±2â€‰days before cataract surgery (T0) and 7Â±2â€‰days after (T1). Outcome measures evaluated 30Â±4 days after surgery (T2) included Ocular Surface Disease Index (OSDI) questionnaire, non-invasive break-up time (NIBUT), tear meniscus height, meibomian gland loss (MGL) and redness score. RESULTS: Out of 153 patients randomised to receive LLLT (n=73) or sham treatment (n=80), 131 (70 men, 61 women, mean age 73.53Â±7.29 years) completed regularly the study. Patients treated with LLLT had significantly lower OSDI scores compared with controls at T1 and T2 (respectively, 7.2Â±8.8 vs 14.8Â±13.0â€‰and 9.0Â±9.0 vs 18.2Â±17.9; both p<0.001), higher NIBUT values at T2 (12.5Â±6.6 vs 9.0Â±7.8; p=0.007) and lower MGL Meiboscore values at T1 (1.59Â±0.70 vs 1.26Â±0.69; p=0.008). Unlike controls, patients treated with LLLT had significantly lower OSDI scores and higher NIBUT values at T2 compared with T0 (respectively, 9.0Â±9.0 vs 21.2Â±16.1; p<0.001â€‰and 12.5Â±6.6 vs 9.7Â±7.2; p=0.007). CONCLUSION: Two sessions of LLLT performed before and after cataract surgery were effective in ameliorating tear film stability and ocular discomfort symptoms. TRIAL REGISTRATION NUMBER: NCT05754437.

Development and Application of Prototype System Based on Light-Emitting Diode Arrays (660â€‰nm) with a Top Hat Beam Profile in Order to Optimize Photobiomodulation Protocols for

Treatment of Radiation-Induced Oral Mucositis in Rats. Background: Oral mucositis (OM) is a common adverse effect of radiation to the head and neck. Recent research has shown that extra oral photobiomodulation (EO-PBM) reduces the severity of OM. However, appropriate EO-PBM therapy parameters for OM severity reduction have not been documented. Objective: This work aims to optimize EO-PBM radiation parameters for lowering the severity of radiation-induced OM in rats by establishing a photobiomodulation (PBM) treatment system based on light-emitting diode arrays with top-hat beam profile. Methods: The 36 rats are separated into 2 control groups and 4 groups receiving PBM treatment. The PBM groups are exposed to irradiance between 4 and 24â€‰J/cm(2) at 660â€‰nm. The cheek pouch mucosa is removed after scarification for biochemical and histological examination. Student's t-test, and one-way analysis of variance (ANOVA) followed by Tukey's Multiple were applied to compare the statistical significance of differences between control groups and PBM treatment groups. Results: Statistical analysis reveals that PBM irradiation at 12â€‰J/cm(2) (200â€‰sec) with a flatness of 0.8 and a diameter of 3â€‰cm substantially decreased the level of inflammatory cytokines compared with the positive control group. Conclusions: Our results indicate that the designed treatment PBM system is capable of delivering the optical parameters necessary for therapeutic treatment. Cytokines Rats;Animals;Stomatitis;Low-Level Light Therapy;Drug-Related Side Effects and Adverse Reactions;Cytokines

Proposal of a prophylactic photobiomodulation protocol for chemotherapy-induced oral and oropharyngeal mucositis: a randomized clinical trial. Photobiomodulation therapy (PBMT) is widely used in oncology settings, but lack of assessment standardization is the main barrier to optimization of clinical protocols. This study analyzed three PBMT protocols for preventing oral and oropharyngeal mucositis (OM) in patients undergoing chemotherapy (CT) and/or hematopoietic stem cell transplantation (HSCT). This is a preliminary randomized blind clinical trial. Group 1 received intraoral prophylactic PBMT, Group 2 received intraoral and oropharyngeal PBMT, and Group 3 received intraoral, oropharyngeal, and extraoral PBMT. The applications were from the first day of CT to dayâ€‰+â€‰10. Clinicodemographic data, CT regimens, types of HSCT, hematological exams, occurrence/severity of OM, odynophagia, and OM-related opportunistic infections were assessed. Sixty participants (age range: 18-74Â years) were included; 70% of them underwent CT and 30% HSCT. About 43.3% of patients had OM, while odynophagia was reported by 23.3%. Both Groups 1 and 2 revealed better results. Multivariate analysis showed that HSCT directly influenced the occurrence of OM. Individuals who had undergone allogeneic HSCT were 1.93 times more likely to develop OM (pâ€‰<â€‰0.001). Group 3 exhibited a higher frequency of OM, albeit of lower grades. This group consisted of half the population who had undergone HSCT, had the highest percentage of melphalan use, and had the lowest mean leukocyte count. The three proposed protocols were effective in preventing and reducing OM, with good tolerance and no reported adverse effects. PBMT is a safe and effective approach to OM prophylaxis in adults undergoing CT/HSCT. Antineoplastic Agents;Melphalan Adolescent;Adult;Aged;Humans;Middle Aged;Young Adult;Antineoplastic Agents;Hematopoietic Stem Cell Transplantation;Low-Level Light Therapy;Melphalan;Mucositis;Randomized Controlled Trials as Topic;Stomatitis

Effect of photobiomodulation on neuropathic pain of diabetic origin: a narrative review of the literature. To update the literature on the effectiveness of photobiomodulation (PBM) therapy in relieving pain in patients with diabetic peripheral neuropathy (DPN) compared to the effects of post-intervention, control/placebo groups, and other therapies. Search on the following databases: PORTAL PERIODICOS CAPES, PUBMED, GOOGLE ACADEMIC/SCHOLAR, SCOPUS, SCIELO, CENTRAL, and MEDLINE. Manual search: 1) manually capture the references of relevant articles originally selected to be included in the eligible studies. Two independent researchers performed the screening and

selection of studies, methods assessment, and data extraction with unblinded authors and impressions. Subsequently, the full text of the originally selected studies was screened. The screening form registered the criteria for excluding literature from the full-text screening. The screening resulted in a total of 1692 citations. Out of these, 1402 citations were examined for titles and abstracts, followed by the removal of duplicated studies; therefore, 68 articles remained for full-text evaluation. 54 articles were excluded after full-text screening. Fourteen articles met the selection criteria, hence being selected and included in this narrative review. PBM showed to be a promising modality in relieving painful symptoms in DPN, especially when implemented in combination with other therapies, by improving the quality of life of diabetic patients. Humans;Quality of Life;Neuralgia;Diabetes Mellitus

Directed physiological networks in the human prefrontal cortex at rest and post transcranial photobiomodulation. Cerebral infra-slow oscillation (ISO) is a source of vasomotion in endogenic (E; 0.005-0.02 Hz), neurogenic (N; 0.02-0.04 Hz), and myogenic (M; 0.04-0.2 Hz) frequency bands. In this study, we quantified changes in prefrontal concentrations of oxygenated hemoglobin (Î”[HbO]) and redox-state cytochrome c oxidase (Î”[CCO]) as hemodynamic and metabolic activity metrics, and electroencephalogram (EEG) powers as electrophysiological activity, using concurrent measurements of 2-channel broadband near-infrared spectroscopy and EEG on the forehead of 22 healthy participants at rest. After preprocessing, the multi-modality signals were analyzed using generalized partial directed coherence to construct unilateral neurophysiological networks among the three neurophysiological metrics (with simplified symbols of HbO, CCO, and EEG) in each E/N/M frequency band. The links in these networks represent neurovascular, neurometabolic, and metabolicvascular coupling (NVC, NMC, and MVC). The results illustrate that the demand for oxygen by neuronal activity and metabolism (EEG and CCO) drives the hemodynamic supply (HbO) in all E/N/M bands in the resting prefrontal cortex. Furthermore, to investigate the effect of transcranial photobiomodulation (tPBM), we performed a sham-controlled study by delivering an 800-nm laser beam to the left and right prefrontal cortex of the same participants. After performing the same data processing and statistical analysis, we obtained novel and important findings: tPBM delivered on either side of the prefrontal cortex triggered the alteration or reversal of directed network couplings among the three neurophysiological entities (i.e., HbO, CCO, and EEG frequency-specific powers) in the physiological network in the E and N bands, demonstrating that during the post-tPBM period, both metabolism and hemodynamic supply drive electrophysiological activity in directed network coupling of the PFC. Overall, this study revealed that tPBM facilitates significant modulation of the directionality of neurophysiological networks in electrophysiological, metabolic, and hemodynamic activities.

The effect of photobiomodulation on hearing loss: A systematic review. OBJECTIVES: To assess outcomes associated with photobiomodulation therapy (PBMT) for hearing loss in human and animal studies. DESIGN: Systematic review and narrative synthesis in accordance with PRISMA guidelines. SETTING: Data bases searched: MEDLINE, EMBASE, CENTRAL, ClinicalTrials.gov and Web of Science. No limits were placed on language or year of publication. Review conducted in accordance with the PRISMA 2020 statement. PARTICIPANTS: All human and animal subjects treated with PBMT for hearing loss. MAIN OUTCOME MEASURES: Pre- and post-PBMT audio metric outcomes. RESULTS: Searches identified 122 abstracts and 49 full text articles. Of these, 17 studies met the inclusion criteria, reporting outcomes in 327 animals (11 studies), 30 humans (1 study), and 40 animal specimens (5 studies). PBMT parameters included 6 different wavelengths: 908 nm (1 study), 810 nm (1 study), 532 & 635 nm (1 study), 830 nm (3 studies), 808 nm (11 studies). The duration ranged from 4 to 60 minutes in a session, and the follow-up ranged from 5-28â€‰days. Outcomes improved significantly when wavelengths within the range of 800-830 nm were used, and with greater duration of PBMT exposure. Included studies predominantly consisted of non-randomized controlled trials (10

studies). CONCLUSIONS: Hearing outcomes following PBMT appear to be superior to no PBMT for subjects with hearing loss, although higher level evidence is required to verify this. PBMT enables concentrated, focused delivery of light therapy to the inner ear through a non-invasive manner with minimal side effects. As a result of heterogeneity in reporting PBMT parameters and outcomes across the included studies, direct comparison is challenging. Animals;Humans;Low-Level Light Therapy;Hearing;Hearing Loss

Photobiomodulation Facilitates Rat Cutaneous Wound Healing by Promoting Epidermal Stem Cells and Hair Follicle Stem Cells Proliferation. BACKGROUND: Cutaneous wound healing represents a common fundamental phenomenon requiring the participation ofÂ cells of distinct types and a major concern for the public. Evidence has confirmed that photobiomodulation (PBM) usingÂ near-infrared (NIR)Â can promote wound healing, but the Â cells involved and theÂ precise molecular mechanisms remain elusive. METHODS: Full-thickness skin defects with a diameter of 1.0Â cm were made on the back of rats and randomly divided into the control group, 10Â J, 15Â J, and 30Â J groups. TheÂ wound healing rate at days 4, 8, and 12 postoperativelyÂ wasÂ measured.Â HE and Masson staining was conducted to revealÂ the histological characteristics. Immunofluorescence staining was performedÂ to label the epidermal stem cells (ESCs) and hair follicle stem cells (HFSCs). Western blot was performed to detect the expressions ofÂ proteins associated withÂ ESCs and HFSCs. Cutaneous wound tissues were collected for RNA sequencing. Gene ontology and the Kyoto Encyclopedia of Genes and Genomes analysis was performed, and the hub genesÂ wereÂ identified usingÂ CytoHubba and validated by qRT-PCR. RESULTS: PBM can promote reepithelialization, extracellular matrix deposition, and wound healing, increase the number of KRT14+/PCNA+â€‰ESCs and KRT15+/PCNA+â€‰HFSCs, and upregulate the protein expression of P63, Krt14, and PCNA. Three hundred and sixty-six differentially expressed genes (DEGs) and 7Â hubÂ genes includingÂ Sox9, Krt5, Epcam, Cdh1, Cdh3, Dsp, and Pkp3Â were identified. These DEGs are enriched in skin development, cell junction, and cadherin binding involved in cell-cell adhesion etc., while these hub genes are related toÂ skin derived stem cells and cell adhesion. CONCLUSION: PBM accelerates wound healing by enhancing reepithelialization through promoting ESCs and HFSCs proliferation and elevating the expression of genes associated with stem cells and cell adhesion. This may provide a valuable alternative strategy to promote wound healing and reepithelialization by modulating the proliferation ofÂ skin derived stem cells and regulating genes related to cell adhesion. Proliferating Cell Nuclear Antigen Rats;Animals;Hair Follicle;Proliferating Cell Nuclear Antigen;Low-Level Light Therapy;Stem Cells;Wound Healing;Cell Proliferation

Clinical application of 675Â nm laser therapy for dorsal hand skin hyperpigmentation. BACKGROUND: Noninvasive skin rejuvenation treatment is growing in recognition to aesthetic medicine. AIM: The objective of the study was to assess the efficacy and the safety of the 675-nm laser source treatment of photodamaged hands. MATERIALS AND METHODS: The study included 21 patients (6 males and 15 females) with a mean age of 63Â (Â±Â 9) years. Patients were treated with - two to three sessions of the 675-nm laser with a 1-month interval between sessions. Photos of each patient were collected at baseline, and 3 months after the last laser session. The 5-point Global Aesthetic Improvement Scale (GAIS) was recorded with their final assessment session (3 months). RESULTS: The total GAIS scores showed satisfactory results: 15 patients (71%) experienced 4 score (excellent improvement) changes and 6 patients (29%) experienced 3 score (good improvement) changes. Clinical images showed good efficacy and visible aesthetic results for the management of photodamaged skin. No serious adverse effects were recorded. CONCLUSION: This study demonstrates the safety and efficacy of for the aesthetic improvement of skin pigmentation and texture for photodamaged hands. Male;Female;Humans;Middle Aged;Skin Aging;Skin;Laser

Therapy;Low-Level Light Therapy;Hyperpigmentation;Rejuvenation;Lasers, Solid-State;Treatment Outcome

Intravascular laser irradiation of blood as novel migraine treatment: an observational study. BACKGROUND: Migraine is one of four major chronic diseases that cause disability. Decreases in regional cerebral blood flow (rCBF) occur during migraine attacks. Laser therapy is extensively employed in treating other vascular diseases; nevertheless, its effectiveness in migraine management remains largely unknown. Therefore, we evaluated the effect of low-level intravascular laser irradiation of blood (ILIB) therapy in patients with migraine. METHODS: We performed an observational case-control study in 24 patients suffering from migraine. Patients were divided into an ILIB treatment group and a traditional rehabilitation group. This study performed clinical assessments and single-photon emission computed tomography (SPECT) prior to and after the treatment and 1Â month later. Changes in rCBF-SPECT between groups and between timepoints were compared to clinical outcomes. RESULTS: Nine patients undergoing rehabilitation and fifteen patients undergoing ILIB were studied from baseline to 1Â month follow-up. The ILIB group, visual analog scale for pain (Pâ€‰=â€‰0.001), Montreal Cognitive Assessment (Pâ€‰=â€‰0.003), and Athens Insomnia Scale (Pâ€‰<â€‰0.001) symptom scores significantly improved after treatment. SPECT imaging showed a 1.27â€‰Â±â€‰0.27 fold increase in rCBF after ILIB treatment, and no significant differences in the rehabilitation group. CONCLUSIONS: Low-level ILIB therapy is associated with better clinical and vascular outcomes, and may be a feasible treatment option for migraine. Although our sample size was small, our data provide a starting point for migraine laser therapy research. Humans;Case-Control Studies;Migraine Disorders;Chronic Disease;Laser Therapy;Low-Level Light Therapy;Tomography, Emission-Computed, Single-Photon;Cerebrovascular Circulation

Osteogenic potential of apical papilla stem cells mediated by platelet-rich fibrin and low-level laser. To evaluate the osteogenic potential of platelet-rich fibrin (PRF) and low-level laser therapy (LLLT) on human stem cells from the apical papilla (SCAP)Â we isolated, characterized, and then cultured in an osteogenic mediumÂ cells with PRF and/or LLLT (660 nm, 6 J/m2-irradiation). Osteogenic differentiation was assessed by bone nodule formation and expression of bone morphogenetic proteins (BMP-2 and BMP-4), whereas the molecular mechanisms were achieved by qRT-PCR and RNA-seq analysis. Statistical analysis wasÂ performed by ANOVA and Tukey's post hoc tests (pâ€‰<â€‰0.05* and pâ€‰<â€‰0.01**). Although PRF and LLLT increased bone nodule formation after 7 days and peaked at 21 days, the combination of PRFâ€‰+â€‰LLLT led to the uppermost nodule formation. This was supported by increased levels of BMP-2 and -4 osteogenic proteins (pâ€‰<â€‰0.005). Furthermore, the PRFâ€‰+â€‰LLLT relative expression of specific genes involved in osteogenesis, such as osteocalcin, was 2.4- (pâ€‰=â€‰0.03) and 28.3- (pâ€‰=â€‰0.001) fold higher compared to the PRF and LLLT groups, and osteopontin was 22.9- and 1.23-fold higher, respectively (pâ€‰<â€‰0.05), after 7 days of interaction. The transcriptomic profile revealed that the combination of PRFâ€‰+â€‰LLLT induces MSX1, TGFB1, and SMAD1 expression, after 21 days of osteogenic differentiation conditions exposition. More studies are required to understand the complete cellular and molecular mechanisms of PRF plus LLLT on stem cells. Overall, we demonstrated for the first time that the combination of PRF and LLLT would be an excellent therapeutic tool that can be employed for dental, oral, and craniofacial repair and other tissue engineering applications. Humans;Osteogenesis;Platelet-Rich Fibrin;Cell Proliferation;Cells, Cultured;Stem Cells;Cell Differentiation;Lasers

Effects of Photobiomodulation Therapy on Performance in Successive Time-to-Exhaustion Cycling Tests: A Randomized Double-Blinded Placebo-Controlled Trial. The goal of this study was to investigate the effects of photobiomodulation therapy (PBMT) on performance, oxygen uptake (VO(2)) kinetics, and lower limb muscle oxygenation during three successive time-to-exhaustions

(TTEs) in cyclists. This was a double-blind, randomized, crossover, placebo-controlled trial study. Sixteen cyclists (~23 years) with a cycling training volume of ~460 km/week volunteered for this study. In the first session, cyclists performed a maximal incremental test to determine maximal oxygen uptake and maximal power output (PO(MAX)). In the following sessions, cyclists performed three consecutive TTEs at PO(MAX). Before each test, PBMT (135 J/thigh) or a placebo (PLA) was applied to both thighs. VO(2) amplitude, O(2) deficit, time delay, oxyhemoglobin (O(2)Hb), deoxyhemoglobin (HHb), and total hemoglobin (tHb) were measured during tests on the right vastus lateralis. The PBMT applied before three successive TTE increased performance of the first and second TTE (~10-12%) tests, speed of VO(2) and HHb kinetics during the first test, and increased peripheral muscle oxygenation (increase in HHb and tHb) in the first and second exhaustion tests. However, the PBMT effects were attenuated in the third TTE, as performance and all the other outcomes were similar to the ones from the PLA intervention. In summary, PBMT application increased the first and second successive TTEs, speed of VO(2,) and muscle oxygenation.

Recent Updates on Tinnitus Management. In this comprehensive review, we discuss recent updates on tinnitus evaluation and treatment. Tinnitus evaluation commences with comprehensive medical history taking and audiological evaluation, which can provide valuable insight into the nature and extent of auditory disturbances. Additionally, tinnitus evaluation includes investigation of psychosomatic comorbidities to determine the intricate interplay between psychological factors and tinnitus perception. Various therapeutic approaches are available to minimize the burden of tinnitus. Cognitive behavioral therapy reshapes negative thought patterns and behaviors that are closely associated with tinnitus-induced distress. Acceptance and commitment therapy fosters mindfulness and value-aligned actions to address emotional effects. Tinnitus retraining therapy combines counseling and sound therapy for habituation. Tailor-made notched music therapy offers customized auditory experiences for symptom relief. Hearing aids and cochlear implants compensate for hearing loss and associated stress. Both neuromodulation and neurofeedback may be potentially useful. The role of pharmacotherapy and dietary supplements remains uncertain. Physiotherapy and head-neck manipulation relieve tinnitus associated with orofacial factors. Virtual reality, smartphone applications, and photobiomodulation may serve as novel therapeutic avenues. Although promising interventions are available, further research is warranted to confirm their effectiveness and long-term effects.

Medical Treatment for Androgenetic Alopecia. Androgenetic alopecia is a common type of hair loss, which is generally influenced by genetic factors and systemic androgens resulting in follicular miniaturization.1 It can cause cosmetic problems leading to psychological distress among affected men and women. Effective standard medical treatments available are topical minoxidil 2 to 5%, oral finasteride, oral dutasteride, and hair transplantation.1 However, some patients do not achieve favorable results with standard treatments. For these reasons, other novel treatments have been developed, including new medications, regenerative medicines (autologous platelet-rich plasma, adipose-derived stem cells, micrograft generation, and exosome), and low-level laser therapy. Finasteride;Minoxidil Male;Humans;Female;Alopecia;Finasteride;Minoxidil;Low-Level Light Therapy;Platelet-Rich Plasma;Treatment Outcome

Photobiological modulation of hepatoma cell lines and hepatitis B subviral particles secretion in response to 650Â nm low level laser treatment. BACKGROUND: Chronic hepatitis B virus (HBV) infection is a serious global health concern, with an increased incidence and risk of developing cirrhosis and hepatocellular carcinoma (HCC). Patients chronically infected with HBV are likely to experience chronic oxidative stress, leading to mitochondrial dysfunction. Photobiomodulation is induced by the absorption of low-level laser therapy (LLLT) with a red or infrared laser by cytochrome C oxidase enzyme, resulting in mitochondrial photoactivation. Although it is widely used in clinical

practice, the use of LLL as adjuvant therapy for persistent HBV infection is uncommon. This study aimed to investigate the effect of LLLT dosage from 2Â J/cm(2) to 10Â J/cm(2) of red diode laser (650Â nm) on both hepatoma cell lines (HepG2.2.15 [integrated HBV genome stable cell model] and non-integrated HepG2), with a subsequent impact on HBVsvp production. METHODS: The present study evaluated the effects of different fluences of low-level laser therapy (LLLT) irradiation on various aspects of hepatoma cell behavior, including morphology, viability, ultrastructure, and its impact on HBVsvp synthesis. RESULTS: In response to LLLT irradiation, we observed a considerable reduction in viability, proliferation, and HBVsvp production in both hepatoma cell lines HepG2.2.15 and HepG2. Ultrastructural modification of mitochondria and nuclear membranes: This effect was dose, cell type, and time-dependent. CONCLUSIONS: The use of LLLT may be a promising therapy for HCC and HBV patients by reducing cell proliferation, HBVsvp production, and altering mitochondrial and nuclear structure involved in cellular death inducers. Further research is required to explore its clinical application. Humans;Carcinoma, Hepatocellular;Liver Neoplasms;Hepatitis B, Chronic;Cell Line;Hepatitis B;Hepatitis B virus

Photobiomodulation Literature Watch April 2023.

[Photobiomodulation Promotes Hippocampal Neurogenesis and Improves Cognitive Function and Anti-Inflammatory Injury in Rats With Chronic Cerebral Hypoperfusion]. OBJECTIVE: To investigate the effect of photobiomodulation (PBM) on hippocampal neurogenesis, cognitive function, and inflammatory injury in rats with chronic cerebral hypoperfusion. METHODS: Bilateral ovariectomy (OVX) was performed on female Sprague-Dawley (SD) rats. One week later, the rats were randomly assigned to three groups, Sham surgery (or Sham) group, bilateral common carotid artery occlusion (BCCAO) group, and PBM intervention (or BCCAO+PBM) group. There were 8 rats in each group. In the BCCAO group, chronic cerebral hyporeperfusion was induced by permanent ligation of bilateral common carotid arteries and no PBM was given. Rats in the Sham group underwent the same surgical procedure except for the occlusion of the two carotids arteries and no PBM was given. In addition to the BCCAO surgery, rats in the BCCAO+PBM group received 808 nm laser therapy (5 min each time at a laser dose of 20 mW/cm (2)) of the frontal cortex every other day for 1 month. Between 86 and 90 days after BCCAO, Morris water maze (MWM) was used to observe the spatial learning and memory function of the rats. The rats were sacrificed on day 90 and immunofluorescence staining and Western blot were performed thereafter. Immunofluorescence staining was used to determine the expression of 5-bromodeoxyuracil nucleoside (BrdU), a cell proliferation marker, glial fibrillary acidic protein (GFAP), an astrocyte marker, doublecortin (DCX), a specific marker of newborn neuron precursor cells, NeuN, a marker of mature neurons, and Iba1, a microglia marker, in the hippocampal dentate gyrus (DG) region. Western blot was performed to analyze the protein expressions of inflammasome components, NLRP3, ASC, cleaved caspase-1, and Iba1 in the hippocampus. RESULTS: In the latency trial of MWM test, BCCAO+PBM rats spent shorter periods of time finding the underwater platform than the BCCAO rats did. In the probe trial, after the platform that was original placed in a quadrant was removed, the BCCAO+PBM rats spent longer periods of time exploring the quadrant than the BCCAO animals did ($P<0.05$). Compared with BCCAO rats, BCCAO+PBM rats showed significant decrease in the immunofluorescence intensities of GFAP and Iba1 ($P<0.01$). PBM intervention significantly increased the number of BrdU-positive cells in the hippocampal DG region compared with those of Sham and BCCAO groups ($P<0.05$). Furthermore, the number of NeuN positive cells showed no significant difference among the three groups, while in BCCAO+PBM group, the number of DCX-positive cells was significantly increased ($P<0.001$) and the number of DCX (+)/NeuN (+) co-located cells was significantly increased compared to that of the BCCAO group ($P<0.001$). Compared with those of the BCCAO group, Western blot results showed that the protein expression levels of Iba1, NLRP3, and cleaved caspase-1 in the BCCAO+PBM group

were significantly decreased (P<0.05), while the ASC protein expression level showed no significant difference. CONCLUSION: PBM can effectively improve the spatial learning and memory function in rats with chronic cerebral hypoperfusion, inhibit the activation of glial cells, reduce inflammatory damage mediated by NLRP3 inflammasome, and promote the regeneration of endogenous neural stem cells in the hippocampal DG region of rats. Inflammasomes;NLR Family, Pyrin Domain-Containing 3 Protein;Bromodeoxyuridine;Anti-Inflammatory Agents;Caspases Rats;Female;Animals;Rats, Sprague-Dawley;Inflammasomes;NLR Family, Pyrin Domain-Containing 3 Protein;Bromodeoxyuridine;Brain Ischemia;Cognition;Anti-Inflammatory Agents;Hippocampus;Maze Learning;Neurogenesis;Caspases

Photobiomodulation promotes the functionality and viability of human pancreatic islets in basal conditions and under cytokine stress conditions. Cytokines Humans;Low-Level Light Therapy;Islets of Langerhans;Cytokines

Applications of laser technology in the manipulation of human spermatozoa. The application of laser technology in the field of assisted reproductive technology (ART) has experienced rapid growth over the past decades owing to revolutionary techniques such as intracytoplasmic sperm injection (ICSI), preimplantation genetic testing (PGT), and in vitro manipulation of gametes and embryos. For male gametes, in vitro manipulation techniques include spermatozoa selection, sorting, immobilization, and quality assessment. A number of studies have been conducted to investigate the application of different laser technologies in the manipulation of human spermatozoa. However, there is a lack of a unified understanding of laser application in the in vitro manipulation of sperm and safety considerations in ART and, subsequently, the inability to make clear and accurate decisions on the clinical value of these laser technologies. This review summarizes the advancements and improvements of laser technologies in the manipulation of human spermatozoa, such as photobiomodulation therapy, laser trap systems for sperm analysis and sorting, laser-assisted selection of immotile sperm and laser-assisted immobilization of sperm prior to ICSI. The safety of those technologies used in ART is also discussed. This review will provide helpful and comprehensive insight into the applications of laser technology in the manipulation of human spermatozoa. Humans;Male;Semen;Spermatozoa;Sperm Injections, Intracytoplasmic;Sperm Motility;Lasers

Does photobiomodulation require glucose to work effectively?

Evaluation of the effectiveness of photobiomodulation therapy as an alternative method to local anesthesia injection in pediatric dentistry. BACKGROUND: The idea of receiving local anesthesia (LA) via an injection is a major source of dental fear and anxiety. In children, dental anxiety is considered the main reason for avoiding dental treatments. Moreover, there are potential complications during/after LA administration. Thus, it is necessary to search for painless, low-risk, and nonpharmacological anesthetic approaches. AIM: This study was performed to evaluate the effectiveness of photobiomodulation (PBM) therapy as an alternative method to LA injection for conventional restorative treatments in pediatric patients. SETTINGS AND DESIGN: This was a split-mouth randomized clinical study. MATERIALS AND METHODS: The study included 15 children between 6 and 12 years old. Each child had 2 similar contralateral caries lesions in the first permanent molars in the same jaw, total (30) teeth. For each child, one tooth was treated under conventional LA injection and the other was treated under PBM-based anesthesia. The Wong-Baker's Faces Pain Scale was used for reporting the pain and discomfort levels at the end of the treatments. STATISTICAL ANALYSIS: Data statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20. Mann-Whitney U-test was used to compare between the groups. RESULTS: The PBM-based anesthesia group recorded a mean pain score of 2.27 Â± 1.28. The conventional LA group recorded a mean pain score of 1.73 Â± 0.7. The difference between the groups was not statistically significant (P = 0.168). CONCLUSIONS: PBM-based anesthesia may be an optional

alternative to LA injection for conventional restorative treatments in children with dental anxiety, needle phobia, or special needs, and it deserves further studies and improvement. Anesthetics, Local Child;Humans;Anesthesia, Local;Pediatric Dentistry;Low-Level Light Therapy;Pain;Molar;Anesthesia, Dental;Anesthetics, Local

[Photobiomodulation in the prevention and the management of side effects of cancer treatments: Bases, results and perspectives]. BACKGROUND: Assess the current and potential indications of photobiomodulation (PBM) therapy and their level of evidence in the prevention or treatment of side effects related to oncology treatments (radiation therapy, and to a minimal extent favored and hematopoietic stem cell transplants). And report on the recommended modalities (parameters and doses) of PBM therapy. MATERIALS AND METHODS: The Embase, Medline/PubMed, Cochrane, EBSCO, Scopus, and LILACS databases were systematically reviewed to include and analyze publications of clinical studies that evaluated PBM in the prevention or management side effects related to cancer treatments. The keywords used were "photobiomodulation"; "low level laser therapy"; "acute oral mucositis"; "acute dysphagia"; "acute radiation dermatitis"; "lymphedema"; "xerostomia"; "dysgeusia"; "hyposalivation"; "lockjaw"; "bone necrosis"; "osteoradionecrosis"; "radiation induced fibrosis"; "voice and speech alterations"; "palmar-plantar erythrodysesthesia"; "graft versus host disease"; "peripheral neuropathy"; "chemotherapy induced alopecia". Prospective studies were included, while retrospective cohorts and non-original articles were excluded from the analysis. RESULTS: PBM in the red or infrared spectrum has been shown to be effective in randomized controlled trials in the prevention and management of certain complications related to radiotherapy, in particular acute mucositis, epitheliitis and upper limb lymphedema. The level of evidence associated with PBM was heterogeneous, but overall remained moderate. The main limitations were the diversity and the lack of precision of the treatment protocols which could compromise the efficiency and the reproducibility of the results of the PBM. For other effects related to chemo/radiation therapy (dysgeusia, osteonecrosis, peripheral neuropathy, alopecia, palmar-plantar erythrodysaesthesia) and haematopoietic stem cell transplantation (graft versus host disease), treatment with PBM suffers from a lack of studies or limited studies at the origin of a weakened level of proof. However, based on these results, it was possible to establish safe practice parameters and doses of PBM. CONCLUSION: Published data suggest that PBM could therefore be considered as supportive care in its own right for patients treated with radiation, chemotherapy, immunotherapy, hormone therapy or targeted therapies, whether in clinical practice or clinical trials. therapies. However, until solid data have been published on its long-term safety, the use of PBM should be considered with caution and within the recommended parameters and doses, particularly when practiced in areas of known or possible tumours. In this case, the patient should be informed of the theoretical benefits and risks of PBM in order to obtain informed consent before treatment. Humans;Low-Level Light Therapy;Retrospective Studies;Prospective Studies;Reproducibility of Results;Neoplasms;Lymphedema;Graft vs Host Disease;Alopecia

A Retrospective Review of Laser Therapy for Treatment of Hidradenitis Suppurativa. PURPOSE: Hidradenitis suppurativa (HS) is a chronic inflammatory disease characterized by painful and foul-smelling cystic nodules and sinus tracts in the apocrine gland-bearing regions. The treatment options include topical, intralesional, systemic, and surgical modalities. Currently, the most novel therapy is laser therapy to provide localized treatment without systemic adverse effects. However, data regarding patient outcomes after laser treatment are limited because of the low prevalence of this disease. This study aimed to evaluate the efficacy of laser therapy as a treatment modality for patients with HS. METHODS: A retrospective review cohort analysis of patients with HS undergoing laser treatment between 2016 and 2021 was conducted. Patient demographics, lesion location(s), Hurley stage, age of onset and diagnosis, treatment length, type, outcomes, and complications were

analyzed. RESULTS: Ninety-four patients met the inclusion criteria; on average, patients were treated with 5.8 laser sessions for 14.8 months with no complications and minor blood loss. Hidradenitis suppurativa progression commonly starts during puberty, with a median onset of 13.8 years and diagnosis of HS at 16.2 years. All patients (n = 94) showed an improvement in HS disease severity: 59.6% completed treatment, 12.0% are currently undergoing treatment, and 26.0% were lost to follow-up. CONCLUSIONS: Laser therapy is an effective and safe therapy for HS leading to improved quality of life and should be considered in the treatment and management of HS. Humans;Hidradenitis Suppurativa;Retrospective Studies;Quality of Life;Laser Therapy;Low-Level Light Therapy;Severity of Illness Index

Beyond the Dusty Fog: Local Eye Drop Therapy and Potentially New Treatment Alternatives in Pseudoexfoliative Glaucoma. Pseudoexfoliative glaucoma (PEG) is a type of secondary open-angle glaucoma characterized by the accumulation of whitish-gray material on the trabecular meshwork and lens, leading to an increase in intraocular pressure (IOP) and optic nerve damage. Local eye drop therapy is one of the first-line treatments for PEG, which include prostaglandin analogues, beta-blockers, and alpha-adrenergic agonists to lower IOP. New treatments beyond conventional techniques, however, are constantly being developed. One potential treatment proposed for PEG is based on magnetic phage display, which involves using magnetic nanoparticles conjugated to specific peptides or proteins selected using phage display techniques to remove aggregates in the anterior chamber of the eye or inflammatory cells and cytokines that contribute to PEG pathogenesis. Other potential treatments include microRNAs (miRNAs) that are involved in the regulation of gene expression at the post-transcription stages. Gene therapies, nanotechnology, immunotherapy and methods based on stem cells can also be potentially used to target and treat specific tissues and cells responsible for regulating IOP. In addition, photobiomodulation therapy (PBMT), a non-invasive procedure that utilizes low-level laser therapy to improve cellular function and promote tissue repair, can prove an interesting alternative in treating PEG. The aim of our mini-review is to provide a brief overview of these innovative methods that appear to offer potentially promising treatment options for PEG. Ophthalmic Solutions;MicroRNAs Humans;Ophthalmic Solutions;Exfoliation Syndrome;Glaucoma, Open-Angle;Genetic Therapy;Low-Level Light Therapy;Animals;Immunotherapy;Intraocular Pressure;MicroRNAs

Efficacy of photobiomodulation in the treatment of oral mucositis in patients undergoing antineoplastic therapy: systematic review and meta-analysis. PURPOSE: To evaluate the effectiveness of photobiomodulation in the treatment of oral mucositis. METHODS: Systematic review and meta-analysis encompassing in the electronic databases: LILACS, MEDLINE, EMBASE, COCHRANE, SCOPUS, WEB OF SCIENCE, and CINAHL and in http://clinicaltrials.gov . Eligibility criteria were randomized, non-randomized, and observational studies that used photobiomodulation for the treatment of oral mucositis. The endpoints were reduction in the severity of oral mucositis, duration of lesions, and pain reduction. For data analysis, the Review Manager 5.4 program was used. RESULTS: A total of 316 studies were identified, 297 in the electronic databases and 19 in http://clinicaltrials.gov . After removing duplicates, 260 studies were selected for title and abstract reading, of which 223 were excluded. A total of 37 studies were chosen for full reading, of which 6 were included in the review, totaling 299 patients. The treatment used was photobiomodulation. The patients were divided into two groups: the laser group used only photobiomodulation or associated with other therapies, and the control group did not use photobiomodulation. For the endpoint reduction in the severity of oral mucositis (OM), the chance of reduction of the OM was greater in the laser group as compared to the control group. For the endpoints duration of OM lesions and pain reduction, it was not possible to carry out a meta-analysis due to the high heterogeneity between studies. In the interpretation of the meta-analysis, the reduction in the severity of oral mucositis was

greater in the group that received photobiomodulation. CONCLUSION: Photobiomodulation was effective in the treatment of oral mucositis. Antineoplastic Agents Humans;Low-Level Light Therapy;Stomatitis;Antineoplastic Agents;Pain;Oral Ulcer
Photobiomodulation and Wound Healing: Low-Level Laser Therapy at 661Â nm in a Scratch Assay Keratinocyte Model. This study aims to investigate the effectiveness of low power red light (661Â nm) in accelerating the wound healing process of an in vitro scratch assay model of keratinocytes. Furthermore, the study aims to clarify the role of light irradiation parameters, optimize them and gain additional insight into the mechanisms of wound closure as a result of photobiomodulation. Wound healing was studied using scratch assay model of NCTC 2544 keratinocytes. Cells were irradiated with a laser at various power densities and times. Images were acquired at 0, 24, 48 and 72Â h following the laser treatment. Cellular proliferation was studied by MTT. ROS were studied at 0 and 24Â h by fluorescence microscopy. Image analysis was used to determine the wound closure rates and quantify ROS. The energy range of 0.18-7.2Â J/cm(2) was not phototoxic, increased cell viability and promoted wound healing. Power and irradiation time proved to be more important than energy. The results indicated the existence of two thresholds in both power and irradiation time that need to be overcome to improve wound healing. An increase in ROS production was observed at 0Â h only in the group with the lowest healing rate. This early response seemed to block proliferation and finally wound healing. Low level laser light at 661Â nm enhanced both proliferation and migration in keratinocytes, providing evidence that it could possibly stimulate wound healing in vivo. The observed results are dependent on irradiance and irradiation time rather than energy dose in total. Reactive Oxygen Species Low-Level Light Therapy;Reactive Oxygen Species;Keratinocytes;Wound Healing;Cell Proliferation
Photobiomodulation therapy and low-level light therapy in wound healing. Low-Level Light Therapy;Wound Healing
Photobiomodulation therapy with light-emitting diode in stimulating adipose tissue mitochondria. Low-level laser therapy (LLLT) is known for its ability to induce a photochemical process, primarily targeting mitochondria, a process referred to as photobiomodulation (PBM). Recently, its use has been attributed as an adjunct in obesity treatment, to stimulate lipolysis and apoptosis. However, the pathway of stimulation remains uncertain. Thus, the objective of this study was to understand whether mitochondrial stimulation occurs in adipose tissue cells after PBM therapy, which could lead to the processes of lipolysis and apoptosis. A non-randomized clinical trial was conducted using a split abdomen design in obese women who received red and infrared LED photobiomodulation therapy (PBMT). The patients underwent bariatric surgery, and adipose tissue samples were collected for immunohistochemical analysis with primary mitochondrial antibodies. Adipose tissue samples subjected to LED intervention exhibited positivity in mitochondrial antibodies for cAMP, DRP1, FAS, FIS1, MFN2, and OPA1 ($p<0.001$) compared to the control group. In conclusion, we observed that PBMT was capable of generating mitochondrial stimulation in adipose tissue cells, as evidenced by the positive antibody signals. This finding suggests that mitochondrial stimulation could be the mechanism and action underlying adipose tissue lipolysis and apoptosis. Humans;Female;Low-Level Light Therapy;Adipose Tissue;Adipocytes;Apoptosis;Mitochondria
Evaluation of photobiomodulation for postoperative discomfort following laser-assisted vital pulp therapy in immature teeth: A preliminary retrospective study. BACKGROUND: Minimally invasive endodontics is recommended for young, immature teeth to preserve healthy pulp and dentin tissue. OBJECTIVES: The aim of the study was to examine the cold sensitivity of immature teeth that received photobiomodulation (PBM) after vital pulp therapy (VPT). MATERIAL AND METHODS: The study followed the STROBE guidelines and included 123 healthy patients aged 8-13. The immature teeth (incisors, premolars and molars) that qualified for VPT received the bioceramic material - Biodentine.

In this experiment, teeth were treated immediately and at 24 h post-VPT with a 635-nm diode laser using a power of 100 mW, a power density of 200 mW/cm2 and a total energy of 4 J (PBM group, n = 43), while those not treated were the control group (n = 43). The tooth sensitivity to cold was measured using a visual analogue scale (VAS) before and at 6 h, 1 day, 7, 30, and 90 days after treatment. The predictor variable was PBM skills regarding the ability to decrease cold sensitivity after VPT. The primary endpoint was the time to reverse hypersensitivity to cold, and the secondary endpoint was the occurrence of possible side effects. The Mann-Whitney U test, Friedman test along with Dunn's post hoc test, and the Ï‡2 test were used to investigate tooth sensitivity. RESULTS: Eighty-six immature permanent teeth of 86 children were included in the study. It was shown that the difference was significant for sensitivity to a cold stimulus between the groups at 6 h, 24 h, 7 days, and 30 days, but no difference was found preoperatively and at 90 days (6 h, 24 h, 7 days, and 30 days, $p < 0.001$, and 90 days, $p = 0.079$). However, patients in both groups reported a decrease in discomfort provoked by cold stimuli throughout the follow-up period. CONCLUSIONS: Photobiomodulation decreased postoperative sensitivity and was more acceptable for patients. Further randomized clinical studies with placebo-controlled groups are needed.

Photobiomodulation therapy combined with static magnetic field is better than placebo in patients with fibromyalgia: a randomized placebo-controlled trial. BACKGROUND: Fibromyalgia is a syndrome characterized by generalized chronic pain and tenderness in specific areas. Photobiomodulation therapy (PBMT) using low-level laser therapy and/or light emitting diode therapy is an electrophysical agent that can be used alone or together with a static magnetic field (PBMT-sMF) to promote analgesia in several health conditions. Little evidence exists regarding the effects of using PBMT and PBMT-sMF in patients with fibromyalgia; this evidence is conflicting. AIM: We aimed to investigate the effects of using PBMT-sMF versus a placebo on reduction of the degree-of-pain rating, impact of fibromyalgia, pain intensity, and satisfaction with treatment in patients with fibromyalgia. DESIGN: A prospectively registered, monocentric, randomized placebo-controlled trial, with blinding of patients, therapists, and assessors, was performed. SETTING: The study was conducted at the Laboratory of Phototherapy and Innovative Technologies in Health (LaPIT) in Brazil, between March and October 2020. POPULATION: Ninety female patients with fibromyalgia were randomized to undergo either PBMT-sMF (N.=45) or placebo (N.=45) treatment. METHODS: Patients from both groups received nine treatment sessions, three times a week, for 3 weeks. Clinical outcomes were collected at baseline, the end of treatment, and at the follow-up appointment 4 weeks post-treatment. The primary outcome was the degree-of-pain rating, measured by the reduction of the tender point count. RESULTS: A decrease in the degree-of-pain rating was observed in patients allocated to the PBMT-sMF group, decreasing the number of tender points when compared to placebo group at the end of treatment ($P<0.0001$) and at the follow-up assessment ($P<0.0001$). Patients did not report any adverse events. CONCLUSIONS: PBMT-sMF is superior to placebo, supporting its use in patients with fibromyalgia. CLINICAL REHABILITATION IMPACT: PBMT-sMF might be considered an important adjuvant to the treatment regimens of patients with fibromyalgia. Humans;Female;Fibromyalgia;Low-Level Light Therapy;Chronic Pain;Clinical Protocols;Magnetic Fields

Effectiveness of photobiomodulation for people with age-related cognitive impairment: a systematic review and meta-analysis. The increasing incident of age-related cognitive impairment worldwide and the lack of pharmaceutical treatments emphasizes the value of non-pharmaceutical therapy. Emerging evidence suggested photobiomodulation (PBM) is a popular intervention to brain disorder; however, it remains unclear the efficacy of PBM for patients with age-related cognitive impairment. The purpose of this systematic review is to compare the different parameters used in PBM, analyze the beneficial effects of PBM as a potential therapy for age-related cognitive

impairment. Five electronic database, PubMed, Web of Science, Cochrane Library, CINAHL, and PsycINFO, were systematically searched from inception to November 2021. Relevant randomized controlled trials (RCTs) were screened and assessed for risk of bias. Eleven RCTs evaluating PBM interventions were included. The systematic review and meta-analysis has been registered in PROSPERO(CRD42022374562). Results showed that PBM had a significant moderated effect on global cognition function (SMD=0.51, 95% CI [0.162, 0.864], p=0.004). We found that multiple wavelength PBM (SMD=0.648, 95% CI [0.220, 1.075], p=0.003) had significant effects while single wavelength PBM was non-significant (SMD=0.385, 95% CI [-0.168, 0.987], p=0.172). Laser effect (SMD=0.682, 95% CI [0.37, 0,994], p<0.001) was larger than LED effect (SMD=0.582, 95% CI [0.269, 0.895], p<0.001). PBM in clinical setting (SMD=0.468, 95% CI [0.050, 0.887], p=0.028) had significant effect, but there was no significant effect of home-used PBM (SMD=0.616, 95% CI [-0.121, 1.354], p=0.101). The pool effect of multi-modality PBM (SMD=0.720, 95% CI [0.027, 1.414], p=0.040) was significantly higher in the studies of transcranial irradiation (SMD=0.616, 95% CI [-0.121, 1.354], p=0.010). Cumulative irradiation time was a moderator between the PBM and cognitive function improvement. Photobiomodulation have the potential to improve cognitive function in aging adults. Cumulative irradiation duration, light source, device type, penetration modality, and intervention site can affect the effectiveness of PBM intervention. Adult;Humans;Cognitive Dysfunction;Cognition;Aging

Psychophysical therapy and underlying neuroendocrine mechanisms for the rehabilitation of long COVID-19. With the global epidemic and prevention of the COVID-19, long COVID-19 sequelae and its comprehensive prevention have attracted widespread attention. Long COVID-19 sequelae refer to that three months after acute COVID-19, the test of SARS-CoV-2 is negative, but some symptoms still exist, such as cough, prolonged dyspnea and fatigue, shortness of breath, palpitations and insomnia. Its pathological mechanism is related to direct viral damage, immunopathological response, endocrine and metabolism disorders. Although there are more effective methods for treating COVID-19, the treatment options available for patients with long COVID-19 remain quite limited. Psychophysical therapies, such as exercise, oxygen therapy, photobiomodulation, and meditation, have been attempted as treatment modalities for long COVID-19, which have the potential to promote recovery through immune regulation, antioxidant effects, and neuroendocrine regulation. Neuroendocrine regulation plays a significant role in repairing damage after viral infection, regulating immune homeostasis, and improving metabolic activity in patients with long COVID-19. This review uses oxytocin as an example to examine the neuroendocrine mechanisms involved in the psychophysical therapies of long COVID-19 syndrome and proposes a psychophysical strategy for the treatment of long COVID-19. Humans;Post-Acute COVID-19 Syndrome;COVID-19;SARS-CoV-2;Neurosecretory Systems;Disease Progression

Immunotherapy-Related Oral Adverse Effects: Immediate Sequelae, Chronicity and Secondary Cancer. (1) Background: Immunotherapy-related adverse effects (irAEs) have been reported to manifest in oral tissues, mainly as lichenoid and non-lichenoid lesions and salivary gland dysfunction; however, the characterization of oral irAEs and their clinical impact is limited. (2) Methods: This is a retrospective clinical chart review of 14 patients with oral irAEs, describing the impact of the oral irAEs in terms of the immediate effect, treatment, chronicity of the irAEs and the development of oral cancer. (3) Results: Common symptoms were pain and dry mouth, causing no-to-severe pain and/or dry mouth sensation. The immediate sequala ranged from sensitivity to certain foods up to elimination of oral intake. Treatment included conventional palliation techniques with or without systemic steroids. Discontinuation of the immunotherapy agents was required in 6 patients. Innovative treatment modalities included photobiomodulation for oral mucosal pain relief, and salivary gland intraductal irrigations for relief of salivary gland hypofunction. Late sequala included

the development of proliferative leukoplakia and oral cancer. (4) Conclusions: Patients treated with immunotherapy may develop debilitating oral irAEs. They should be followed for oral involvement so treatment may be initiated when the symptoms are mild to avoid discontinuation of the immunotherapy. Patients that develop oral lichenoid lesions should receive long-term follow-up, as they may have higher risk for oral cancer.

Efficacy of 1064 nm Photobiomodulation Dosimetry Delivered with a Collimated Flat-Top Handpiece in the Management of Peripheral Facial Paralysis in Patients Unresponsive to Standard Treatment Care: A Case Series. Peripheral facial paralysis (PFP) is a common condition where oxidative stress (OS) is involved in the pathophysiology of facial paralysis, inhibiting peripheral nerve regeneration, which can be featured in Bell's palsy, Ramsay Hunt syndrome and Lyme disease. The current standard care treatments lack consensus and clear guidelines. Hence, the utilization of the antioxidant immunomodulator photobiomodulation (PBM) can optimize clinical outcomes in patients who are unresponsive to standard care treatments. Our study describes three unique cases of chronic PFP of various origins that were unresponsive to standard care treatments, but achieved a significant and complete recovery of facial paralysis following PBM therapy. Case presentations: Case #1: a 30-year-old male who presented with a history of 12 years of left-side facial paralysis and tingling as a result of Bell's palsy, where all the standard care treatments failed to restore the facial muscles' paralysis. Eleven trigger and affected points were irradiated with 1064 nm with an irradiance of ~0.5 W/cm(2) delivered with a collimated prototype flat-top (6 cm(2)) in a pulsed mode, with a 100 Âµs pulse duration at a frequency of 10 Hz for 60 s (s) per point. Each point received a fluence of 30 J/cm(2) according to the following treatment protocol: three times a week for the first three months, then twice a week for another three weeks, and finally once a week for the following three months. The results showed an improvement in facial muscles' functionality (FMF) by week two, whereas significant improvement was observed after 11 weeks of PBM, after which the House-Brackmann grading scale (HBGS) of facial nerve palsy dropped to 8 from 13 prior to the treatment. Six months after PBM commencement, electromyography (EMG) showed sustainability of the FMF. Case #2: A five-year-old female who presented with a 6-month history of severe facial paralysis due to Lyme disease. The same PBM parameters were utilized, but the treatment protocol was as follows: three times a week for one month (12 consecutive treatment sessions), then the patient received seven more sessions twice a week. During the same time period, the physiotherapy of the face muscles was also delivered intensively twice a week (10 consecutive treatments in five weeks). Significant improvements in FMF and sustainability over a 6-month follow-up were observed. Case #3: A 52-year-old male who presented with severe facial palsy (Grade 6 on HBGS) and was diagnosed with Ramsay Hunt syndrome. The same laser parameters were employed, but the treatment protocol was as follows: three times a week for three weeks, then reduced to twice a week for another three weeks, then weekly for the next three months. By week 12, the patient showed a significant FMF improvement, and by week 20, complete FMF had been restored. Our results, for the first time, showed pulsed 1064 nm PBM delivered with a flat-top handpiece protocol is a valid and its treatment protocol modified, depending on the origin and severity of the condition, which is fundamental in optimizing facial paralysis recovery and alleviating neurological symptoms. Further extensive studies with large data are warranted to validate our PBM dosimetry and treatment protocols.

Regenerative Therapies for Basal Thumb Arthritis-A Systematic Review. Basal thumb arthritis is a painful and debilitating pathology that can severely reduce a patients' quality of life. Common therapies include oral pain control, local steroid injections and/or surgery. Yet, therapeutic data on long-term improvement and even cartilage repair are scarce. This review aims to present the currently available literature on novel therapies for basal thumb arthritis, including platelet-rich plasma (PRP), fat grafting and phototherapy, and investigate their potential efficacy. The entire OVID

database and PubMed were searched for studies containing the topics PRP injection, lipofilling, laser treatment and regenerative treatment for carpometacarpal arthritis. Seven studies on the effect of fat tissue on basal thumb arthritis were found. Four authors reported on PRP injections, one RCT examined a combinational treatment of PRP and fat grafting, another phototherapy for the thumb joint and one prospective trial on chondrocyte transplantation was found. Pain improvement and decreased impairment were reported in the majority of PRP and/or fat grafting studies as well as after chondrocyte implantation. Phototherapy did not significantly improve the condition. This review revealed that only limited data on regenerative therapies for carpometacarpal arthritis are currently available, yet PRP and lipofilling show promising results and merit further investigation. Humans;Thumb;Prospective Studies;Quality of Life;Arthritis;Pain;Platelet-Rich Plasma

Short-term effects of low-level laser versus ultrasound therapy on children's neck posture after long-term use of electronic devices. The purpose of the study was to compare the effect of low-level laser therapy (LLLT), ultrasound therapy (US), and strengthening and stretching exercise in children diagnosed with cervical straightening caused by long-term use of electronic devices. A total of 60 patients from 12 to 18 years of both gender diagnosed with straight neck syndrome which is losing the normal C shape of cervical vertebrae. Patients were randomized into three groups. In group A, patients received LLLT plus exercise, while in group B, they received US plus exercise, and group C received exercise. In group A and B, Cobb angle and VAS showed a significant improvement (more significant in group A) with $P < 0.001$, while in group C $P = 0.006$. LLLT, US, and exercise improved the cervical straight curve, and reduced pain with maximum effect was done by LLLT. Child;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Neck;Ultrasonic Therapy;Male;Female;Adolescent

Comparison of therapeutic effects of 940 nm diode laser acupuncture with transcutaneous electrical nerve stimulation in the myofascial pain dysfunction syndrome: a comparative randomized clinical trial. Myofascial pain dysfunction syndrome (MPDS) is one of the most common sources of orofacial pain. There are different types of physical therapy for patients with MPDS, but there is insufficient evidence that any one treatment method is superior. This study aimed to compare the clinical efficacy of transcutaneous electrical nerve stimulation (TENS) and laser acupuncture (LA) using a 940-nm diode on MPDS improvement. In this randomized clinical trial, 22 MPDS patients were randomly assigned to TENS (180 HZ, 300Â Âµs, 20 min) and LA (940Â nm, continuous wave, 0. 5 w, 40 s, 105 J/cm2) groups. Data on overall facial pain, tenderness in the masticatory muscles, deviation, joint sound, and maximum mouth opening without pain (MMO) were collected from all patients at baseline, before and after each treatment session, and 1Â month after the end session. Data were analyzed using an independent t-test, repeated measures ANOVA, and Fisher's exact test at a significance level of $P < 0.05$. The decreases in overall facial pain ($P = 0.000$), muscle tenderness ($P = 0.000$), and increase in MMO ($P = 0.01$,Â $P = 0.001$) were statistically significant compared to the baseline in the TENS and AL groups. No significant differences were detected between TENS and LA for overall facial pain, muscle tenderness, or MMO at 1 month follow-up (PÂ > 0.05). Both LA and TENS are effective physical therapies with promising effects on sign and symptom improvements in MPDS patients. Humans;Transcutaneous Electric Nerve Stimulation;Myalgia;Lasers, Semiconductor;Acupuncture Therapy;Treatment Outcome;Fibromyalgia;Facial Pain

Assessing the Impact of High Photon Energy Wavelengths on the Treatment of Chronic Neck and Shoulder Pain. The effect of low-level laser therapy with high photon energy wavelengths, green and violet, for treating chronic musculoskeletal pain was examined in the first-ever clinical trial of its kind. Participants (nâ€‰=â€‰43) underwent a single 13-minute laser session. The primary measure of effectiveness was the change in initial visual analog pain (VAS) scores observed three minutes posttreatment. The success of a participant was defined in advance as a reduction of â‰¥30% in VAS

scores, while the success of the study was predetermined as achieving a 65â€‰Â±â€‰5% success rate among individual participants. Results demonstrated subjects' VAS pain scores decreased from 71.79 to 34.02 ($p < 0.0001$), while most participants in the study (81.4%) achieved a â‰¥30% decrease in pain scores. The findings from this clinical investigation provided substantial support for the first Food and Drug Administration clearance (K221987) for the combined application of green and violet lasers.

Effect of transcranial photobiomodulation on electrophysiological activity of brain in healthy individuals: A scoping review. BACKGROUND OBJECTIVE: Transcranial photobiomodulation (tPBM) is a safe and non-invasive treatment that has recently emerged as an effective technique to apply near-infrared or red light to activate neural tissues. The objective is to review the literature on the effect of tPBM on electrophysiological activity in healthy individuals. METHODS: Literature was searched through PubMed, Scopus, Web of Science, Cumulated Index to Nursing and Allied Health Literature (CINAHL), Embase, and Ovid for transcranial photobiomodulation therapy in healthy individuals age group 18-80Â years of either gender having electroencephalography as an outcome. Critical appraisal of included Randomized Controlled Trials and non-randomized experimental studies was done using Joanna Briggs Institute (JBI) critical appraisal tool. RESULTS: A database search yielded a total of 4156 results. After eliminating 2626 duplicates, 1530 records were left. 32 articles were considered for full-text screening after 1498 records were excluded through title and abstract screening. 10 articles were included in this review. tPBM has been found to increase the higher electrophysiological oscillations and there is inconclusive evidence targeting the lower oscillatory electrophysiological frequencies. CONCLUSION: Transcranial photobiomodulation can have promising effects on the electrophysiological activity of the brain in healthy individuals.
Humans;Adolescent;Young Adult;Adult;Middle Aged;Aged;Aged, 80 and over;Brain;Electrophysiological Phenomena;Electroencephalography

Mechanism of action of photobiomodulation with light-emitting diode on the glutamine-dependent CT26 cell. We investigated the mechanism of action of photobiomodulation (PBM) with light-emitting diode (led) 640â€‰nm of glutamine-dependent CT26 cells. Cells were exposed to 0.147-10.979â€‰mW/cm(2) of 640â€‰Â±â€‰15â€‰nm laser light for 15â€‰min/day for 10â€‰days. Cell proliferation and apoptosis were detected by MTT (3-(4,5)-dimethylthiahiazo (-z-y1)-3,5-diphenytetrazoliumromide) and annexin V-FITC assays. mRNA and protein levels of cell proliferation-related genes were measured by RT-PCR and western blotting, respectively. With Gln 7.94â€‰mM, on Day 8 and 10, genes GLUT1, MEK1, ERK2, BCL2, E2F1, HO-1, Ctnnb1, and Per2 was significantly upregulated (pâ€‰<â€‰0.01) of glutamine addiction. In PBM therapy, compared with the non-illuminated group, 2.17â€‰mW/cm(2) can significantly reduce cell apoptosis, the mRNA level of gene mTOR1 was significantly upregulated, and the protein level of raptor of GLUT1 and mTOR1, MEK1/2, and ERK1/2 were upregulated. LED 640â€‰nm inhibits cell apoptosis without increasing cell proliferation by regulating GLUT1, MEK/ERK, and PI3K/AKT/mTOR signals.
Glutamine;Phosphatidylinositol 3-Kinases;Glucose Transporter Type 1;RNA, Messenger
Glutamine;Low-Level Light Therapy;Phosphatidylinositol 3-Kinases;Glucose Transporter Type 1;RNA, Messenger;Cell Proliferation

Assessment of Effects of Low-Level Light Therapy on Scalp Condition and Hair Growth. BACKGROUND: The appearance of the scalp and hair is very important aesthetically regardless of age or sex. Although there are many drugs and treatment methods for scalp problems and hair loss, the treatment response is still insufficient. AIMS AND OBJECTIVES: To evaluate the efficacy of low-level light therapy in a helmet-like device. MATERIALS AND METHODS: This study was designed as a 24-week trial with 50 participants. All participants used a helmet-shaped device emitting 630-690, 820-880, and 910-970 nm light wavelengths, for 20 minutes, daily for 24 weeks. A phototrichogram for

hair density and thickness, Global Aesthetic Improvement Scale score, erythema index, and sebum secretions of the scalp were evaluated at baseline and at 12 and 24 weeks. RESULTS: After 24 weeks of treatment, hair density and hair thickness were found to have significantly increased (P <.01 and P =0.013, respectively) and sebum secretion of vertex area had decreased significantly (P <.01). Of 49 participants, 73.47% of the participants showed improvement in the overall appearance of the scalp (n = 36). CONCLUSION: A helmet-like low-level light therapy device can improve the appearance of the hair, with thickening and increase in the density of the hair, and can improve scalp condition by decreasing sebum secretion.

Effects of low level laser on periodontal tissue remodeling in hPDLCs under tensile stress. This study aimed to investigate the effect of Low-Level Laser Therapy (LLLT) on human Periodontal Ligament Cells (hPDLCs) under tension stress. Primary hPDLCs were obtained using the tissue culture method, and P3 cells were utilized for the subsequent experiments. The study comprised four groups: a blank control group (Group B), a laser irradiation group (Group L), a tension stress group (Group T), and a laserâ€‰+â€‰tension stress group (Group LT). Mechanical loading was applied using an in-vitro cell stress loading device at a frequency of 0.5Â Hz and deformation of 2% for two hours per day for two days. Laser irradiation at 808Â nm GaAlAs laser was administered 1Â h after force loading. Cell samples were collected after the experiment. Bone and fiber remodeling factors were analyzed using PCR and Western blot. Flow cytometry was employed to assess the cell cycle, while ROS and Ca(2+) levels were measured using a multifunctional enzyme labeling instrument. The results revealed that laser intervention under tension stress inhibited the expression of osteogenic differentiation factors, promoted the expression of osteoclast differentiation factors, and significantly increased the production of collagen factors, MMPs, and TIMPs. The LT group exhibited the most active cell cycle (Pâ€‰<â€‰0.05). LLLT not only enhanced Ca(2+) expression in hPDLCs under tension stress, but also stimulated the production of ROS. Overall, our findings demonstrate that LLLT effectively accelerated the proliferation of hPDLCs and the remodeling of periodontal tissue, possibly through the regulation of ROS and Ca(2+) levels in hPDLCs. Reactive Oxygen Species Humans;Osteogenesis;Periodontal Ligament;Cells, Cultured;Reactive Oxygen Species;Lasers;Cell Differentiation

Morphological features of the photoplethysmographic signal: a new approach to characterize the microcirculatory response to photobiomodulation. Introduction and Objectives: Advanced analysis of the morphological features of the photoplethysmographic (PPG) waveform may provide greater understanding of mechanisms of action of photobiomodulation (PBM). Photobiomodulation is a non-ionizing, red to near-infrared irradiation shown to induce peripheral vasodilatation, promote wound healing, and reduce pain. Using laser Doppler flowmetry combined with thermal imaging we found previously in a clinical study that PBM stimulates microcirculatory blood flow and that baseline palm skin temperature determines, at least in part, why some individuals respond favorably to PBM while others do not. "Responders" (n = 12) had a skin temperature range of 33Â°C-37.5Â°C, while "non-responders" (n = 8) had "cold" or "hot" skin temperature (<33Â°C or >37.5Â°C respectively). The continuous PPG signals recorded from the index fingers of both hands in the original clinical study were subjected to advanced post-acquisitional analysis in the current study, aiming to identify morphological features that may improve the accuracy of discrimination between potential responders and non-responders to PBM. Methods: The PPG signals were detrended by subtracting the lower envelope from the raw signal. The Root Mean Square (RMS) and Entropy features were extracted as were two additional morphological features -- Smoothness and number of local extrema per PPG beat (#Extrema). These describe the signal jaggedness and were developed specifically for this study. The Wilcoxon test was used for paired comparisons. Correlations were determined by the Spearman correlation test (r(s)). Results: The PPG waveforms of responders to PBM had increased

amplitude and decreased jaggedness (Baseline vs. 10' post-irradiation: Entropy, 5.0 Â± 1.3 vs. 3.9 Â± 1.1, p = 0.012; #Extrema, 4.0 Â± 1.1 vs. 3.0 Â± 1.6, p = 0.009; RMS, 1.6 Â± 0.9 vs. 2.3 Â± 1.2, p = 0.004; Smoothness, 0.10 Â± 0.05 vs. 0.19 Â± 0.16, p = 0.016). In addition, unilateral irradiation resulted in a bilateral response, although the response of the contralateral, non-irradiated hand was shorter in duration and lower in magnitude. Although subjects with 'cold,' or 'hot,' baseline skin temperature appeared to have morphologically distinct PPG waveforms, representing vasoconstriction and vasodilatation, these were not affected by PBM irradiation. Conclusion: This pilot study indicates that post-acquisitional analysis of morphological features of the PPG waveform provides new measures for the exploration of microcirculation responsiveness to PBM.

Infrared laser therapy decreases systemic oxidative stress and inflammation in hypercholesterolemic mice with periodontitis. BACKGROUND: Near-infrared irradiation photobiomodulation (NIR-PBM) has been successfully used in periodontal treatment as an adjuvant tool to locally improve cell function and regeneration. Although the relationship between periodontitis and systemic disease constitutes an important aspect of periodontal clinical research, the systemic effects of NIR-PBM in periodontitis are not well known. In this study, we aimed to investigate the effects of NIR-PBM on systemic oxidative stress and inflammation in an apolipoprotein E (ApoE) knockout mouse model of periodontal disease (PD). METHODS: We evaluated alveolar bone loss by measuring the distance from the cementoenamel junction (CEJ) to the alveolar bone crest (ABC), reactive oxygen species (ROS) production in blood cells, inflammatory activity, plasma cholesterol levels, and lipid peroxidation levels in three experimental groups: (1) ApoEC, control group without intervention; (2) ApoEP, first molar ligation-induced periodontitis for 4 weeks; and (3) ApoEPâ€‰+â€‰PBM, exposed to 808Â nm continuous wave, Ã¸ ~ 3 mm2, 100 mW, 60Â s of NIR-PBM for 7 consecutive days after 4 weeks of periodontitis. At the end of the experimental protocols, ApoEP mice presented significantly increased alveolar bone loss, ROS production, inflammatory activity, plasma cholesterol, and lipid peroxidation levels compared to the ApoEC group (Pâ€‰<â€‰0.05). NIR-PBM for 7 days in the ApoEPâ€‰+â€‰PBM mice significantly decreased systemic ROS production, inflammatory response, plasma cholesterol, and lipid peroxidation levels, similar to those found in the ApoEC group (Pâ€‰>â€‰0.05). However, it was not capable of preventing alveolar bone loss (Pâ€‰>â€‰0.05 compared to ApoEP mice). CONCLUSION: A 7-day treatment with NIR-PBM effectively reduces systemic oxidative stress and inflammatory parameters in hypercholesterolemic mice with PD. However, more studies with longer evaluation times are needed to confirm the systemic effects of locally applied NIR-PBM on PD associated with hypercholesterolemia. Reactive Oxygen Species;Cholesterol Mice;Animals;Reactive Oxygen Species;Alveolar Bone Loss;Inflammation;Oxidative Stress;Periodontitis;Laser Therapy;Cholesterol

Correction to: Pulsed transcranial photobiomodulation generates distinct beneficial neurocognitive effects compared with continuous wave transcranial light.

Photobiomodulation therapy enhances neural differentiation of dental pulp stem cells via ERK1/2 signaling pathway. Photobiomodulation therapy (PBMT) is the application of a low-level laser device to generate physiological changes and provide therapeutic effects. Till now, the effects of PBMT on the neural differentiation of mesenchymal stem cells have been rarely reported. Herein, the potential effect and mechanism of PBMT on the neural differentiation of dental pulp stem cells (DPSCs) were preliminarily investigated in our research. The optimal dose of 3.75â€‰J/cm(2) was first screened for use in the following neural-inducing studies. Then, DPSCs were cultured in neural induction medium and treated with laser irradiation for 7â€‰days. From the results of morphology and immunofluorescence, we found that irradiation promoted the formation of neural stem cell-like spheroids derived from DPSCs and enhanced potential neural differentiation. Furthermore, neural differentiation gene expressions of Nestin, microtubule-associated protein-2, and neural cell adhesion

molecule were increased after PBMT irradiation. The protein expressions of class III Î²-tubulin and neurogenic differentiation factor 1 were also improved. Meanwhile, the involvement of extracellular signal-regulated kinase (ERK1/2) was investigated by western blot. Our study showed that the neural differentiation of DPSCs was promoted by PBMT, and the underlying mechanism in this process was associated with activating the ERK1/2 signaling pathway.

Effects of low-level laser therapy on burning pain and quality of life in patients with burning mouth syndrome: a systematic review and meta-analysis. BACKGROUND: Burning mouth syndrome (BMS) is a complex chronic pain disorder that significantly impairs patients' quality of life. Low-level laser therapy (LLLT) uses infrared or near-infrared light to produce analgesic, anti-inflammatory, and biological stimulation effects. The aim of this systematic review is to evaluate the effect of LLLT on burning pain, quality of life, and negative emotions in patients with BMS. METHODS: The PubMed, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochrane Library, Web of Science, and Scopus databases were searched up January 2023 to identify relevant articles. All randomized controlled trials that were published in English and examined the use of LLLT treatment for BMS were included. The methodological quality of the included trials was assessed using the Cochrane risk of bias tool for randomized controlled trials (RCTs). A meta-analysis was performed to evaluate burning pain, quality of life, and negative emotions. Sensitivity, subgroup, and funnel plot analyses were also carried out. RESULTS: Fourteen RCTs involving a total of 550 patients with BMS met the inclusion criteria. The results showed that LLLT (measured by the Visual Analog Scale; SMD: -0.87, 95% CI: -1.29 to -0.45, Pâ€‰<â€‰0.001) was more effective for reducing burning pain than placebo LLLT or clonazepam. LLLT improved quality of life (evaluated by the Oral Health Impact Profile-14; SMD: 0.01, 95% CI: -0.58 to 0.60, Pâ€‰=â€‰0.97) and negative emotions (evaluated by the Hospital Anxiety and Depression Scale; SMD: -0.12, 95% CI: -0.54 to 0.30, Pâ€‰=â€‰0.59), but these effects were not statistically significant. CONCLUSIONS: The meta-analysis revealed that LLLT may be an effective therapy for improving burning pain in patients with BMS, and producing a positive influence on quality of life and negative emotions. A long-term course of intervention, a larger sample size, and a multidisciplinary intervention design are urgently needed in future research. TRIAL REGISTRATION: PROSPERO registration number: CRD42022308770. Humans;Low-Level Light Therapy;Burning Mouth Syndrome;Quality of Life;Chronic Pain

Retinitis pigmentosa: Significant improvement with photobiomodulation. We describe the case of a 38-year-old patient with retinitis pigmentosa. Diagnosed at the age of 20, she presented a progressive decrease in visual acuity and visual field, until she developed a shotgun barrel campimetry. After starting a photobiomodulation treatment of 9 sessions every other day, the patient reported improvement in visual acuity, night vision and quality of life. Clinical evaluation showed a visual acuity of 10/10 in both eyes and a substantial improvement in visual field.

Chronic Pain Syndromes: Myofascial Pain Syndrome. Myofascial pain syndrome (MPS) is a regional musculoskeletal pain disorder characterized by trigger points within the muscle or fascia. There are no universally accepted diagnostic criteria. Diagnosis currently is based on a physical examination finding of at least one localized trigger point that, when palpated, recreates the pain at the site or produces pain away from the site in a referral pattern. MPS is thought to be related to sustained muscle contraction from under- or overuse. This syndrome commonly coexists with other chronic pain conditions, including fibromyalgia. The difference between MPS and fibromyalgia is that MPS involves localized pain with discrete areas of tenderness, whereas fibromyalgia symptoms are more diffuse and widespread. Most management recommendations for MPS are based on low-quality clinical trials or expert opinion. A multimodal approach is recommended, involving patient education, exercise, behavior modification, pharmacotherapy, and procedural interventions. Commonly used drugs include topical analgesics, nonsteroidal anti-inflammatory drugs, and muscle

relaxants. Procedural interventions include manual therapy (eg, deep tissue massage, spray and stretch technique, myofascial release), dry needling, trigger point injections, onabotulinumtoxinA injections, acupuncture, kinesiology tape, transcutaneous electrical nerve stimulation, extracorporeal shockwave therapy, and low-level laser therapy. Symptoms often resolve with these interventions if they are used early in the course of the condition. As MPS enters the chronic stage, it becomes increasingly refractory to treatment. Humans;Fibromyalgia;Chronic Pain;Myofascial Pain Syndromes;Trigger Points;Chronic Disease

Ablative Laser Therapy of Skin. Laser skin rejuvenation was introduced in the mid-1990s. Early ablative laser devices relied on scanner technology that provided significant ablation and longer time on tissue treatments. These early treatments provided significant improvement in the appearance of the skin, but because of the longer treatment times and in some cases excessive treatment, complications such as scarring and hypopigmentation were significant. More recent advances in skin resurfacing technology have now minimized these risks providing certain key principles are observed. These parameters are reviewed in detail to improve the reader's ability to propose and execute proper skin resurfacing treatments. Humans;Skin;Laser Therapy;Low-Level Light Therapy;Cicatrix;Dermatologic Surgical Procedures;Skin Aging;Rejuvenation;Lasers, Gas

[Prospective randomized controlled trial on 2 940 nm fractional erbium laser combined with fractional micro-plasma radiofrequency in the treatment of facial atrophic acne scars].
Objective: To compare the efficacy and safety of 2 940 nm fractional erbium laser combined with fractional micro-plasma radiofrequency (FMR) therapy and 2 940 nm fractional erbium laser in the treatment of atrophic acne scars. Methods: A prospective randomized controlled research was conducted. A total of 100 atrophic acne scar patients (38 males and 62 females, aged 18-37 years) who were treated in the Scar Laser Clinic of the Department of Plastic and Reconstructive Surgery of Shanghai Ninth People's Hospital of Shanghai Jiao Tong University School of Medicine from March 2018 to March 2021 and conformed to the inclusion criteria were recruited. The patients were randomly divided into erbium laser+FMR group and erbium laser alone group, with 50 cases in each group. The facial acne scars of patients in erbium laser alone group were treated with 2 940 nm fractional erbium laser, while the facial acne scars of patients in erbium laser+FMR group were treated with erbium laser as above, besides, the scars of U and M types were treated with FMR, once every 3 months for a total of 3 times. Before the first treatment and 3 months after each treatment, the Echelle D'Assessment Clinique des Cicatrices D'Acne (ECCA) was used to score the scar. The occurrence of adverse reaction during the treatment process was observed and recorded, and the incidence was calculated. Three months after the last treatment, the 5-level classification method was used to evaluate the satisfaction of patients with the treatment effect, and the satisfaction rate was calculated. Data were statistically analyzed with independent sample t test and chi-square test. Results: A total of 89 patients completed the study, including 46 patients in erbium laser+FMR group (19 males and 27 females, aged (26Â±5) years) and 43 patients in erbium laser alone group (15 males and 28 females, aged (27Â±6) years). The ECCA scores before the first treatment and 3 months after the first treatment of patients were similar between the two groups (P>0.05). The ECCA scores of patients in erbium laser+FMR group at 3 months after the second and third treatment were 72Â±23 and 61Â±18, respectively, which were significantly lower than 85Â±26 and 76Â±25 in erbium laser alone group (with t values of -2.45 and -3.26, respectively, P<0.05). During the treatment process, the incidence of adverse reaction of patients in erbium laser+FMR group and erbium laser alone group were 23.91% (11/46) and 16.28% (7/43), respectively, and there was no statistically significant difference between the two groups (P>0.05). The satisfaction rate of patients in erbium laser+FMR group was 78.26% (36/46) at 3 months after the last treatment, which was significantly higher than 53.49% (23/43) in erbium laser alone group (Ï‡(2)=6.10, P<0.05). Conclusions: The 2 940 nm fractional

erbium laser combined with FMR is superior to 2 940 nm fractional erbium laser alone in the treatment of facial atrophic acne scars, achieving significantly higher efficacy without significantly increasing the incidence of adverse reaction, and patients are more satisfied with the efficacy. It can be used as a recommended therapy in clinical practice. Erbium Male;Female;Humans;Cicatrix;Treatment Outcome;Erbium;Prospective Studies;Low-Level Light Therapy;China;Lasers, Solid-State;Acne Vulgaris;Atrophy

Molecular signaling and mechanisms of low-level laser-induced gene expression in cells involved in orthodontic tooth movement. BACKGROUND: The study aimed to observe molecular signaling, including reactive oxygen species (ROS) and mitochondrial membrane potential (Î”Î¨m), to evaluate the alteration of gene expression by low-level laser therapy (LLLT) and the correlation between its mechanisms and the NF-kB pathway in cells involved in orthodontic tooth movement. METHODS: Osteoblast-like cells (MG63), immortalized periodontal ligament cells (iPDL), and M1 macrophage-like cells were irradiated by 980-nm LLLT with energy densities of 1 and 10Â J/cm(2) Î”Î¨m and intracellular ROS were monitored using fluorescent probes. The changes of mRNA expression were assessed using reverse transcription polymerase chain reaction (RT-PCR). NF-kB inhibitor, ROS scavenger, and Î”Î¨m suppressor were used to analyze signals associated with the regulation of gene expression. Finally, Western blot analysis was performed to confirm NF-kB signaling after LLLT. RESULTS: We found the increases of Î”Î¨m and ROS in all three cell types after LLLT, but no significant difference was observed between 1 and 10Â J/cm(2) LLLT. Regarding gene expression, some target genes were upregulated in MG63 6Â h, 12Â h, and 1 day after LLLT and in iPDL cells 12Â h and 1 day after LLLT. However, no changes occurred in M1 cells. The inhibitor that significantly reduced most changes in gene expression was NF-kB inhibitor. Western blot analysis showed the increase in p-IkBÎ± level after LLLT in iPDL and MG63, but not in M1. CONCLUSION: The 980-nm LLLT increased Î”Î¨m and ROS production in all three cell types. However, changes in gene regulation were found only in MG63 and iPDL cells, which related to the NF-kB pathway. Reactive Oxygen Species;NF-kappa B Humans;Reactive Oxygen Species;NF-kappa B;Tooth Movement Techniques;Lasers;Gene Expression

[Evaluation of low intensity Nd: YAG laser and traditional drugs in the treatment of myofascial pain]. PURPOSE: To evaluate the efficacy of low intensity Nd: YAG laser and traditional drugs in the treatment of myofascial pain (MP). METHODS: Eighty patients with MP were divided into laser group(n=40) and traditional medicine group(n=40) according to the principle of randomization and double-blindness. The patients in the laser group were treated with low intensity Nd :YAG laser(1 064 nm, 8 J/cm(2), 250 mW) , with an interval of 48 h between the two laser treatments. The whole course of treatment was 10 times. Patients in the traditional medicine group uesd celecoxib capsules, 1 capsulet each time(0.2 g), twice a day for 2 weeks. Before and after each treatment, mouth opening, protrusion excursion, lateral movement of the affected side and lateral movement of the contralateral side were measured, and pain visual analogue scores (VAS) were measured and recorded. The data were statistically analyzed with SPSS 22.0 software package. RESULTS: Patients in laser group had significantly improved mandibular function and movement status(Pï¼œ0.05) and pain symptoms(Pï¼œ0.05); patients in traditional medicine group had the same significant improvement on mandibular functional movement status(Pï¼œ0.05) and pain symptoms (Pï¼œ0.05). The total effective rate of the two groups had no significant difference(Pï¼ž0.05). The VAS score of patients in laser group was lower than that of traditional medicine group, but the difference was not significant(Pï¼ž0.05). CONCLUSIONS: Low intensity Nd: YAG laser and traditional medicine can effectively relieve the symptoms of myofascial pain and improve mandibular function and movement. Laser treatment has the advantages of short course of treatment, high efficiency, no pain and fewer side effects, which is worthy of clinical application. Humans;Treatment Outcome;Lasers, Solid-State;Pain;Low-Level Light Therapy;Medicine, Traditional

Use of (31) P magnetisation transfer magnetic resonance spectroscopy to measure ATP changes after 670â€‰nm transcranial photobiomodulation in older adults. Mitochondrial function declines with age, and many pathological processes in neurodegenerative diseases stem from this dysfunction when mitochondria fail to produce the necessary energy required. Photobiomodulation (PBM), long-wavelength light therapy, has been shown to rescue mitochondrial function in animal models and improve human health, but clinical uptake is limited due to uncertainty around efficacy and the mechanisms responsible. Using (31) P magnetisation transfer magnetic resonance spectroscopy (MT-MRS) we quantify, for the first time, the effects of 670â€‰nm PBM treatment on healthy ageing human brains. We find a significant increase in the rate of ATP synthase flux in the brain after PBM in a cohort of older adults. Our study provides initial evidence of PBM therapeutic efficacy for improving mitochondrial function and restoring ATP flux with age, but recognises that wider studies are now required to confirm any resultant cognitive benefits. Adenosine Triphosphate
Animals;Humans;Aged;Brain;Adenosine Triphosphate;Magnetic Resonance Spectroscopy

Treatments for painful temporomandibular disc displacement with reduction: a network meta-analysis of randomized clinical trials. There is currently no consensus on the best treatment for painful temporomandibular disc displacement with reduction (DDwR), and no network meta-analysis of randomized clinical trials (RCTs) comparing all types of treatment for this condition has been conducted. The objective of this study was to compare and rank all treatments for DDwR, including conservative treatments, occlusal splints, low-level laser therapy (LLLT), manual therapy, no treatment (control), arthrocentesis (Arthro) alone, Arthro plus intra-articular injection of platelet-rich plasma (Arthro-PRP) or hyaluronic acid (Arthro-HA), and Arthro plus occlusal splint. Predictor variables were pain intensity and maximum mouth opening (MMO). The mean difference with 95% confidence interval was estimated using Stata software. The GRADE system was used to assess the certainty of the evidence. Twenty RCTs reporting 1107 patients were identified in the literature search; 980 of these patients were included in the network meta-analysis. Direct meta-analysis showed that Arthro-PRP significantly reduced pain intensity compared to Arthro alone, while occlusal splint and manual therapy were superior to conservative treatment (all very low quality evidence). Arthro with intra-articular injection of PRP/HA ranked as the most effective treatment in terms of pain reduction, whereas LLLT ranked the best choice for increasing MMO for patients with DDwR. However, it is important to note that the evidence for the superiority of these treatments is generally of very low quality. Therefore, further high-quality research is needed to confirm these findings and provide more reliable recommendations for the treatment of DDwR.
Humans;Temporomandibular Joint Disorders;Network Meta-Analysis;Randomized Controlled Trials as Topic;Pain;Arthrocentesis;Treatment Outcome

Therapeutic Outcomes of Photobiomodulation in Cancer Treatment-induced Oral Mucositis: A Systematic Review. BACKGROUND: This systematic review was performed to analyze the therapeutic efficacy of photobiomodulation (PBM) in managing oral mucositis (OM) that appears in this context. MATERIAL AND METHODS: The search strategy of the systematic review was conducted according to PRISMA guidelines. The eligibility criteria according to PICO process has been defined as follows: Population (P): adult patients with head and neck cancer; Intervention (I): PBM; Comparison (C): placebo group; Outcome (O): pain, oral quality of life (QoL), evolution of the grade OM and pain. The set criteria for inclusion were peer-reviewed articles. RESULTS: The following database were searched from November 2021 to February 2022, for clinical trials: Pubmed, Scopus and Cochrane. From 296 records, 10 studies were included involving in the systematic review. Data from 759 patients who received chemoradiotherapy were analyzed. These studies used different classifications for oral mucositis (WHO, NCI, RTOF/EORTC), pain (VAS) and quality of life (EORTC QLQ-C30, UW-QOL (v4), FACT-HN). PBM therapy protocol used five different lasers (GaAlAs, InGaAlP, He-Ne, diode laser,

red and near-IR LED probe) with wavelengths ranging from 632,8nm to 850nm. Pain evaluation in was based on the visual analogue scale (VAS) mainly. Prophylactic PBM was effective as it reduced the incidence of grades 3-4 and reduced the overall mean grade of OM during the chemoradiotherapy course compared to the control group. On the other hand, when PBM was used for treatment purposes, it decreased the mean duration of OM compared to the placebo arm. CONCLUSIONS: PBM reduced the incidence of more severe grade of OM induced by chemoradiotherapy. Also, PBM therapy reduced the mean duration of severe OM, mean pain scores and subsequently improved QoL. Key words:Oral mucositis, photobiomodulation, low-level laser therapy, chemotherapy, radiotherapy.

Patient-reported outcome measures in children, adolescents, and young adults with palliative care needs-a scoping review. BACKGROUND: Measuring outcomes facilitates evaluation of palliative services for children, adolescents, and young adults (CAYAs) with life-limiting and/or life-threatening (LL/LT) conditions. Implementation of patient-reported, proxy-reported, or patient-centered outcome measures (hereafter PROMs) is recommended to ensure palliative services. The purpose of this scoping review was to provide an overview of PROMs relevant for CAYAs living with LL/LT conditions eligible for pediatric palliative care (PPC). METHODS: Arksey and O'Malley's 6-stage scoping review framework was used to guide the review. The identified citations had to report on PROMs in any context including CAYAs with LL/LT conditions up to 25Â years of age. A systematic search of Medline, EMBASE, CINAHL, APA PsycInfo, Health and Psychosocial Instruments, and AMED took place in January 2021 and was updated in June 2022. Citations were screened independently by pairs of researchers. The scoping review protocol was registered, and peer-review published. RESULTS: Of 3690 identified citations, 98 reports were included, of which the majority were from Western countries and about PROMs in CAYAs living with cancer or organ failure. A total of 80 PROMs were identified, assessing a range of phenomena, where quality of life and symptoms (especially pain) during the stage of ongoing care were the most frequent. There were only a few reports about outcome measures at time of diagnosis or in end-of-life care. CAYAs self-reported on the PROMs or collaborated with their parents in about half of the reports, while the remaining had proxies answering on behalf of the CAYAs. In the identified reports, PROMs were used to characterize a sample through cross-sectional or longitudinal research, and less often to assess effects of interventions. CONCLUSION: The identified PROMs in the CAYA population eligible for PPC is characterized by studies in high-income countries during ongoing care, primarily in patients with cancer or organ failure. More research is needed in patients living with other LL/LT conditions, and during different stages of the disease course, especially at time of diagnosis, during transition to adulthood, and in end-of-life care. This scoping review of PROMs relevant for young patients eligible for PPC may inform future research about patient-/proxy-reported or patient-centered outcome measures in PPC. TRIAL REGISTRATION: Review registration: (https://osf.io/yfch2/) and published protocol (Holmen et al. Syst Rev. 10:237, 2021). Humans;Child;Adolescent;Young Adult;Palliative Care;Quality of Life;Cross-Sectional Studies;Patient Reported Outcome Measures;Neoplasms

Photobiostimulation conjugated with stem cells or their secretome for temporomandibular joint arthritis in a rat model. BACKGROUND: Temporomandibular joint (TMJ) arthritis is a debilitating, challenging condition and different methods have been implicated for its treatment. This study aimed to test the therapeutic potentials of low-level laser therapy (LLLT) associated with adipose derived stem cells (ADSC) or their derived secretome on a murine model induced arthritis. METHODS: Forty eight rats were divided into four groups where group I was the sham control, the rest of animals were subjected to arthritis induction using complete Freund's adjuvant, then divided as follows: group II received phosphate buffered saline (PBS) intraarticular injection and irradiation of 0 j/cm2, group III

received ADSCs derived secretome and irradiation of 38 j/cm2, and group IV received ADSCs and irradiation of 38 j/cm2 as well. One and three weeks after treatment, animals were euthanized, and paraffin blocks were processed for histological assessment by hematoxylin and eosin stain with histomorphometrical analysis. Histochemical evaluation of joint proteoglycan content was performed through toluidine blue stain, and immunohistochemical staining by the proinflammatory marker tumor necrosis factor-Î± (TNF-Î±) was performed followed by the relevant statistical tests. RESULTS: The arthritis group showed histological signs of joint injury including cartilage atrophy, articular disc fibrosis, irregular osteochondral interface, and condylar bone resorption together with high inflammatory reaction and defective proteoglycan content. In contrast, the treated groups III and IV showed much restoration of the joint structure with normal cartilage and disc thickness. The inflammation process was significantly suppressed especially after three weeks as confirmed by the significant reduction in TNF-Î± positive immunostaining compared to the arthritic group, and the cartilage proteoglycan content also showed significant increase relative to the arthritic group. However, no significant difference between the results of the two treated groups was detected. CONCLUSION: LLLT conjugated with ADSCs or ADSCs derived secretome can efficiently enhance the healing of arthritic TMJs. Stem cell secretome can be applied as a safe, potent therapy. However, further investigations are required to unravel its mechanism of action and pave its way as a safe, novel, cell free therapy. Tumor Necrosis Factor-alpha;Proteoglycans Rats;Animals;Mice;Tumor Necrosis Factor-alpha;Secretome;Arthritis;Temporomandibular Joint Disorders;Temporomandibular Joint;Stem Cells;Proteoglycans

Management of recurrent aphthous ulcers with therapeutic Nd:YAG laser, using two different methods. BACKGROUND: Low-level laser therapy (LLLT) has been applied for the management of craniomaxillofacial disorders, including intraoral wounds, as well as recurrent aphthous stomatitis (RAS) lesions. However, the proper combination of laser features and tissue characteristics remains the major challenge in the realm of photobiomodulation (PBM). OBJECTIVES: The aim of the present study was to assess the feasibility of neodymium-doped yttrium aluminum garnet (Nd:YAG) laser therapy in treating RAS lesions, and to compare 2 techniques, different with regard to the distance between the fiber tip and the ulcer. MATERIAL AND METHODS: A total of 138 patients (94 males and 44 females) with untreated RAS were divided into 3 groups: focused laser (energy density: 48 J/cm2; power density: 0.797 W/cm2; spot size: 0.1256 cm2); defocused laser (energy density: 21 J/cm2; power density: 0.354 W/cm2; spot size: 0.2826 cm2); and placebo. In the focused group, laser irradiation was performed with the laser tip kept 1 mm away from the lesion. Acrylic cylinders were prepared to precisely fit the handpiece tip and hold it in the proper position. In the defocused group, acrylic cylinders were prepared to set the laser tip 6 mm away from the lesion to obtain defocused irradiation. Finally, in the placebo group, a routine laser therapy procedure was carried out with a helium-neon (He-Ne) red light laser. The lesion size, and pain intensity and duration were recorded. RESULTS: Photobiomodulation showed a significantly more efficient pain relief as compared to the placebo group ($p < 0.001$) and also significantly better results in decreasing pain duration ($p < 0.001$). Besides, the diameter of the lesions in the exposed cases decreased during the 3 consecutive days of the study, while an increase in the diameter of the lesions was noticed in the placebo group. CONCLUSIONS: The Nd:YAG laser therapy, with the conditions and adjustments of the present study, may be successfully applied to manage RAS lesions, using either focused and defocused scanning techniques. Female;Humans;Male;Laser Therapy;Lasers, Solid-State;Pain;Stomatitis, Aphthous

Not all lasers are the same: a scoping review evaluating laser therapy for vulvodynia. INTRODUCTION: Lasers are commonly used for treating various vaginal/vulvar conditions. To date, there is to our knowledge no available literature review on the effects of different types of lasers for

the treatment of women with vulvodynia, a condition that causes chronic pain in the vulvar area. OBJECTIVES: We sought to review the literature and summarize the existing published evidence regarding the effects of lasers for the treatment of women with vulvodynia. METHODS: A scoping review with a systematic search was conducted that included studies investigating the use of laser treatment in women with vulvodynia. The National Heart, Lung, and Blood Institute Study Quality Assessment Tools were used for the quality assessment. The type of laser, effects on pain and function, and participants' perceived improvement as well as adverse events were analyzed. RESULTS: Eight studies investigating laser therapy were included in the analysis: 1 randomized controlled trial, 5 before-after studies, 1 nonrandomized intervention study, and 1 case report. Several types of laser therapies were identified, ranging from mild noninvasive photobiomodulation to more invasive ablative procedures. Of the 6 studies that included pain outcomes, 3 studies showed statistically significant improvements from baseline to follow-up, and 3 demonstrated a reduction in pain from subjectively interpreted data. Similarly, each of the 2 studies investigating sexual function also reported an improvement (based only on subjective interpretation). Of the 2 studies with a comparison group, neither study was adequately powered to detect between-group differences. Furthermore, 57%-78% of participants reported improvement, with 1 study showing a greater statistically significant improvement in the low-level laser therapy patient group compared to the sham laser group. Outcomes and adverse events varied depending on the type of laser used. CONCLUSIONS: Although these studies demonstrated some benefits of laser therapy for the treatment of vulvodynia, these findings should be interpreted with caution given the scarcity of the included studies that were robust and sufficiently powered. Future research should focus on conducting well-designed randomized controlled trials to evaluate the efficacy of different types of lasers in the treatment of vulvodynia. Female;Humans;Lasers;Low-Level Light Therapy;Pain;Pain Measurement;Vulvodynia;Clinical Trials as Topic;Case Reports as Topic

Pulsed dye laser for facial erythema in Netherton syndrome. Humans;Lasers, Dye;Netherton Syndrome;Erythema;Low-Level Light Therapy;Treatment Outcome;Laser Therapy

Patient Education with New Media Integration Self-Management Support Model Improves Therapeutic Outcomes of Rosacea Patients. OBJECTIVE: To retrospectively analyze the factors influencing the treatment of rosacea patients with regular follow-up by self-management support in the new media chronic disease management model, to explore the effect of self-management support and to provide an objective basis for clinical application. METHODS: Female patients with rosacea who were regularly followed up for more than 6 months at the rosacea follow-up clinic of the Department of Dermatology, West China Hospital, Sichuan University, from March 2022 to June 2023, with erythema and capillary dilation as the main clinical phenotype, met the rosacea diagnostic criteria of the American Rosacea Expert Committee 2017 edition, and received medications recommended by the Chinese Rosacea Treatment Guidelines (2021 edition). A total of 125 patients were treated with combined photobiomodulation therapy (PBMT), and the patients were divided into a standardized group (CEA<1, IGA<1) and a non-standardized group (CEAâ‰¥1, IGAâ‰¥1) based on significant rosacea efficacy (CEA<1, IGA<1) within 6 months. The age, gender, education level, duration of rosacea, treatment regimen, education intensity, CEA, and IGA baseline data were compared between the two groups, and logistic regression analysis was performed to analyze the factors influencing the significant efficacy of rosacea. RESULTS: There was a significant difference in the mean length of education between the two groups (P<0.05), and the differences between the rest of the baseline information of the two groups were not statistically significant (P>0.05). Logistic regression analysis showed that the variable that significantly influenced the efficacy of treatment was the mean length of education (â‰¥130.5 min/month), and the intensity of education was significantly associated with the efficacy of treatment. CONCLUSION: Self-management support in the

new media chronic disease management model has a positive impact on the treatment of rosacea patients.

Management of Cancer Therapy-Induced Oral Mucositis Using Photobiomodulation Therapy: An Overview of Systematic Reviews. Objective: To systematically summarize the evidence for photobiomodulation therapy (PBMT) in the prevention and treatment of oral mucositis (OM) in patients undergoing cancer treatment. An electronic search was conducted in 8 databases and grey literature. Background: PBMT is recommended for the management of OM resulting from cancer treatment, with several systematic reviews (SRs) being published in recent years on this topic. Methods: Only SRs with outcomes from clinical trials were included, with no language or year restriction. The AMSTAR 2 tool was used to assess the methodological quality of the SRs. Results: Five thousand eight hundred fifty-six references were found, and 16 were selected for this review. OM prevention and treatment were favorable for PBMT in most studies, with a significant reduction in OM severity. Most studies obtained moderate confidence. Conclusions: PBMT represents an effective strategy in the management of OM, and this evidence is supported by studies with acceptable methodological quality. Humans;Low-Level Light Therapy;Systematic Reviews as Topic;Stomatitis;Neoplasms

MicroRNA-26 and Related Osteogenic Target Genes Could Play Pivotal Roles in Photobiomodulation and Adipose-Derived Stem Cells-Based Healing of Critical Size Foot Defects in the Rat Model. Objective: In this study, we aimed to explore the role of MicroRNA-26 in photobiomodulation (PBM)- and adipose-derived stem cell (ADS)-based healing of critical-sized foot fractures in a rat model. Background: PBM and ADS treatments are relatively invasive methods for treating bone defects. Specific and oriented cellular and molecular functions can be induced by applying an appropriate type of PBM and ADS treatment. Methods: A critical size foot defect (CSFD) is induced in femoral bones of 24 rats. Then, a human demineralized bone matrix scaffold (hDBMS) was engrafted into all CSFDs. The rats were randomly allocated into four groups (nâ€‰=â€‰6): (1) control (hDBMS); (2) hDBMS+human ADSs (hADSs), hADSs engrafted into CSFDs; (3) hDBMS+PBM, CSFD exposed to PBM (810â€‰nm wavelength, 1.2â€‰J/cm(2) energy density); and (4) hDBMS+(hADSs+PBM), hADSs implanted into the CSFD and then exposed to PBM. At 42 days after CSFD induction, the rats were killed, and the left CSFD was removed for mechanical compression tests and the right CSFD was removed for molecular and histological studies. Results: The results indicate that miRNA-26a, BMP, SMAD, RUNX, and OSTREX had higher expression in the treated groups than in the control group. Further, the biomechanical and histological properties of CSFDs in treated groups were improved compared with the control group. Correlation tests revealed a positive relationship between microRNA and improved biomechanical and cellular parameters of CSFDs in the rat model. Conclusions: We concluded that the MicroRNA-26 signaling pathway probably plays a significant role in the hADS-, PBM-, and hADS+PBM-based healing of CSFDs in rats. Clinical Trial Registration number: IR.SBMU.MSP.REC.1398.980. MicroRNAs;MIRN26 microRNA, rat Animals;Rats;Low-Level Light Therapy;MicroRNAs;Stem Cells;Wound Healing

Veterinary Dental Photobiomodulation: Assessing Post-Treatment Gingival Inflammation in Canines. Objective: This research aims to determine the effect photobiomodulation treatment has on oral inflammation after routine dental prophylaxis in canines. Background: Photobiomodulation therapy after dental procedures has been documented to reduce inflammation in human and animal models. Methods: Canines were randomly assigned into three groups: control group (CG; nâ€‰=â€‰15), left side treated group (LTG; nâ€‰=â€‰15), and right side treated group (RTG; nâ€‰=â€‰15). The canines in the treatment groups received four points of irradiation [GaAlInP-650â€‰nm, continuous wave (CW), 0.1 W, 0.2 W/cm(2), 100â€‰sec, 10â€‰J, 20â€‰J/cm(2)]. The gingiva was evaluated by a veterinary investigator blinded to the treatment groups for erythema and edema on the day

following treatment. Student's t-test and Student's paired t-test were used for data analysis. Results: Reductions in composite inflammation (pâ€‰=â€‰0.008) and erythema (pâ€‰=â€‰0.030) were observed in the LTG relative to the CG at the location of the left dental arcade. Reductions in composite inflammation (pâ€‰=â€‰0.025) and erythema (pâ€‰=â€‰0.013) were also observed in the combined treated arcades of the LTG and RTG when compared to the CG. Conclusions: The results indicate that the canines who received a single photobiomodulation treatment on the left dental arcade demonstrated a decrease in inflammation and erythema.
Animals;Erythema;Gingiva;Inflammation;Low-Level Light Therapy

Evaluation of photobiomodulation therapy (117 and 90s) on pain, regeneration, and epigenetic factors (HDAC 2, DNMT3a) expression following spinal cord injury in a rat model. BACKGROUND: Photobiomodulation therapy (PBMT), due to its anti-inflammatory, analgesic effects, and most importantly as a non-invasive procedure, has currently gained a special setting in pain relief and the treatment of Spinal cord injuries (SCI). However, the mechanism of action of the PBM is not yet completely understood. METHODS: In this study, SCI is induced by an aneurysm clip, and PBM therapy was applied by a continuous-wave (CW) laser with a wavelength of 660Â nm. Adult male rats were divided into four groups: Control, SCI, SCIâ€‰+â€‰PBMT 90s, and SCIâ€‰+â€‰PBMT 117s. After 7Â weeks, hyperalgesia, allodynia, and functional recovery were assessed. Fibroblasts infiltrating the spinal cord were counted after H&E staining. The expression of epigenetic factors (HDAC2, DNMT3a), protein relevant for pain (GAD65), and astrocytes marker (GFAP) after 4Â weeks of daily PBMT (90 and 117s) was probed by western blotting. RESULTS: Both PBMTs (90 and 117s) significantly improved the pain and ability to move and fibroblast invasion was reduced. SCIâ€‰+â€‰PBMT 90s, increased GAD65, HDAC2, and DNMT3a expression. However, PBMT 117s decreased GFAP, HDAC2, and DNMT3a. CONCLUSION: PBMT 90 and 117s improved the pain, and functional recovery equally. The regulation of epigenetic mechanisms appears to be a significant effect of PBMT117s, which emphasizes on impact of radiation duration and accumulative energy.
Anti-Inflammatory Agents, Non-Steroidal Rats;Male;Animals;Low-Level Light Therapy;Spinal Cord Injuries;Hyperalgesia;Anti-Inflammatory Agents, Non-Steroidal;Neuralgia;Epigenesis, Genetic

Repeated Low-Level Red-Light Therapy for Controlling Onset and Progression of Myopia-a Review. Repeated low-level red-light (RLRL), characterized by increased energy supply and cellular metabolism, thus enhancing metabolic repair processes, has gained persistent worldwide attention in recent years as a new novel scientific approach for therapeutic application in myopia. This therapeutic revolution led by RLRL therapy is due to significant advances in bioenergetics and photobiology, for instance, enormous progresses in photobiomodulation regulated by cytochrome c oxidase, the primary photoreceptor of the light in the red to near infrared regions of the electromagnetic spectrum, as the primary mechanism of action in RLRL therapy. This oxidase is also a key mitochondrial enzyme for cellular bioenergetics, especially for the nerve cells in the retina and brain. In addition, dopamine (DA)-enhanced release of nitric oxide may also be involved in controlling myopia by activation of nitric oxide synthase, enhancing cGMP signaling. Recent evidence has also suggested that RLRL may inhibit myopia progression by inhibiting spherical equivalent refraction (SER) progression and axial elongation without adverse effects. In this review, we provide scientific evidence for RLRL therapy as a unique paradigm to control myopia and support the theory that targeting neuronal energy metabolism may constitute a major target for the neurotherapeutics of myopia, with emphasis on its molecular, cellular, and nervous tissue levels, and the potential benefits of RLRL therapy for myopia. Dopamine Humans;Myopia;Retina;Refraction, Ocular;Dopamine;Low-Level Light Therapy

Recent advances in light energy biotherapeutic strategies with photobiomodulation on central nervous system disorders. Transcranial photobiomodulation refers to irradiation of the brain

through the skull using low-intensity red or near-infrared light, which is the most commonly studied method of light energy biotherapy for central nervous system disorders. The absorption of photons by specific chromophores within the cell elevates ATP synthesis, reduces oxidative stress damage, alleviates inflammation or mediates the activation of transcription factors and signaling mediators through secondary mediators, which in turn trigger downstream signaling pathways to cause a series of photobiological effects including upregulation of neurotrophic factors. Multiple mechanisms are simultaneously involved in the pathological process of central nervous system disorders. The pleiotropic treatment of transcranial photobiomodulation towards multiple targets plays a beneficial role in improving hemodynamics, neural repair and improving behaviors in central nervous system disorders such as ischemic stroke, traumatic brain injury, neurodegenerative diseases, epilepsy and depression. This review mainly introduces the mechanism and recent preclinical and clinical advances of transcranial photobiomodulation for central nervous system disorders, which will provide a reference for clinicians to understand and engage in related studies, and calls for more and larger studies to validate and develop a wider application of transcranial photobiomodulation in central nervous system. Humans;Low-Level Light Therapy;Brain;Brain Injuries, Traumatic;Skull;Ischemic Stroke

Effect of LASER photobiomodulation on the cell viabilities of periodontal ligament fibroblasts of older and younger individuals - An in vitro study. BACKGROUND AND OBJECTIVES: Fibroblasts form the major cell type of the periodontal ligament and most often studied for periodontal regeneration. The aim of the present study was to investigate the effects of photobiomodulation (PBM) on aged periodontal fibroblasts and compare the viability of periodontal fibroblasts of older and younger individuals. MATERIALS AND METHODS: A total of 32 patients were divided into four groups: A, B, C, and D. Groups A and C and B and D comprised of extracted teeth of older (>60 year) and younger individuals (<25 year), respectively. Extracted teeth from Groups A and B received PBM, (diode laser, 660 nm, 100 mW at 4J) whereas Groups C and D did not. Tissue from extracted teeth of all groups was processed and cultured and subjected to 3-(4,5 dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide assay to assess their viability. RESULTS: The difference between the groups in terms of viability was significant ($P < 0.0001$). The mean viability of A and B (PBM) was 1.04 and 1.19, respectively. The mean viability for C and D (non-PBM) was 0.95 and 0.85, respectively. CONCLUSION: Older fibroblasts have lower viability than younger fibroblasts. PBM improves viability in both older and younger fibroblasts and more so in younger fibroblasts. However, more than one PBM would be required to sustain the effect longer.

Excision of Pyogenic Granuloma (PG) With Diode Laser on the Lower Lip in an Unusual Location: A Case Report. Pyogenic granuloma (PG) is a tumor with regular growth expressed usually in the oral cavity, expressing characteristics of a non-neoplastic lesion. The first treatment option is surgical excision, which can be proceeded with surgical diode lasers (940 nm). This case report focuses on the surgical excision of a PG located in the lower lip using diode lasers. Post-operative follow-up of 6 months demonstrated adequate healing without esthetical compromise and no lesion recurrence, showing that diode lasers can be a safe and effective alternative forÂ PG removal.

Non-surgical local treatments of digital ulcers in systemic sclerosis: a systematic literature review. INTRODUCTION: Digital ulcers (DUs) are difficult to treat in patients with systemic sclerosis (SSc) and systemic (i.e., pharmacological) therapy is currently considered the 'standard of care'. Our aim was to examine the safety and efficacy of local, non-surgical treatment for SSc-DUs. METHODS: A systematic literature review (SLR) of original research articles up to August, 29 2022 was performed according to the PICO framework. References were independently screened by two reviewers and risk of bias was assed using validated tools. Due to study heterogeneity narrative summaries are used to present data. RESULTS: Among 899 retrieved references, 14 articles were included (2 randomised trials (RTs),

and 12 observational (OBS) studies). The most frequently studied procedure (5 studies) was botulin A toxin (hand or single finger) injection with a reported healing rate (HR) of 71%-100%. Amniotic and hydrocolloid membranes were examined in one study each and associated with a good HR. Tadalafil 2% cream was studied in a single study with a reduction in the number of DUs. Vitamin E gel was associated with a reduction in ulcer healing time. Low-level light therapy, hydrodissection and corticosteroid injection, extracorporeal shock wave (ESW) and photobiomodulation were evaluated in a single study each and showed a positive trend. Dimethyl sulfoxide was associated with significant local toxicity. CONCLUSIONS: A range of non-surgical, local treatments for SSc-DUs have been explored and showed efficacy to some extent. We have identified methodological flaws that should be avoided in the design of future studies to explore locally-acting treatments for SSc-DUs. Humans;Skin Ulcer;Fingers;Hand;Scleroderma, Systemic

Comparison of Ä±ntracanal ozone and low-level laser therapy on postoperative pain in vital teeth with symptomatic apical periodontitis:placebo-controlled randomize trial. The aim of this study was to compare the effect of ozone and low-level-laser therapy (LLLT) on postoperative pain after root canal treatment in symptomatic apical periodontitis on vital teeth. Eighty patients were divided into four groups using a web program as follows: LLLT placebo (mock laser therapy), LLLT, Ozone placebo (mock ozonated water irrigation), and Ozone. Postoperative pain levels for 7 days after treatment and percussion pain levels at the 7th day were recorded on the visual analog scale. A regression analysis, Cochran's Q test, Chi-square test, Kruskal-Wallis tests were performed to analyze the data (P=.05). A regression analysis demonstrated that the most effective variables are "group" and "jaw" (P=0.01). Pain in the lower jaw is higher than the upper jaw. There was difference between the groups on postoperative pain at the days 1, 2, and 3; however, there was no significant difference on other days. LLLT and ozone groups had less postoperative pain and pain on percussion. Low-level laser and ozone therapy are useful methods on postoperative-pain in vital symptomatic teeth ,but they don't have superiority to each other. Ozone Humans;Low-Level Light Therapy;Ozone;Periapical Periodontitis;Pain, Postoperative;Root Canal Therapy;Chronic Periodontitis

Dose response of transcranial near infrared light stimulation on brain functional connectivity and cognition in older adults-A randomized comparison. Photobiomodulation, also called low-level light therapy, has been reported in animal studies to have an effect on brain activity and cognition. However, studies in humans regarding its effect on cognition and brain functional connectivity, and the required dose threshold for achieving the same have been very limited. We compared the effects of different doses of photobiomodulation (PBM) on cognition and resting state brain functional connectivity in 25 cognitively normal adults aged 55-70â€‰years. They were randomized to a single session of the sham group, "low-dose" and "high-dose" groups receiving NIR light with transcranial fluence of 26 and 52â€‰J/cm(2) respectively, and intranasal fluence of 9 and 18â€‰J/cm(2) respectively. There was a significant increase in resting state functional connectivity of the left superior frontal gyrus (SFG) with the left planum temporale (PT), pâ€‰=â€‰0.0016, and with the left inferior frontal gyrus, pars triangularis, pâ€‰=â€‰0.0235 in the "high-dose" group only compared to the "sham" group. There was also a significant improvement in visual search and processing speed (pâ€‰=â€‰0.012) in the "high-dose" group. Replication of these findings in an adequately powered randomized sham-controlled study in healthy older adults can pave the way for clinical application of NIRL as a therapeutic modality in patients with Alzheimer's disease. Aged;Humans;Alzheimer Disease;Brain;Cognition;Prefrontal Cortex;Middle Aged

Current evidence for non-pharmaceutical, non-surgical treatments of canine osteoarthritis. Osteoarthritis is a progressive degenerative disease process that affects a significant proportion of the canine population, impacting these animals' quality of life. Currently, there is no cure and treatment consists of managing the clinical signs of pain and reduced mobility. There are many

treatments for canine osteoarthritis and in this review we discuss the evidence base behind non-pharmaceutical, non-surgical treatments of this disease. These treatments include weight management, nutraceuticals, acupuncture, physiotherapies such as therapeutic exercise, hydrotherapy as well as other therapeutic modalities including photobiomodulation therapy, electromagnetic field therapy and others. Animals;Dogs;Quality of Life;Osteoarthritis;Hydrotherapy;Pain;Acupuncture Therapy;Dog Diseases

Photostimulation of brain lymphatics in male newborn and adult rodents for therapy of intraventricular hemorrhage. Intraventricular hemorrhage is one of the most fatal forms of brain injury that is a common complication of premature infants. However, the therapy of this type of hemorrhage is limited, and new strategies are needed to reduce hematoma expansion. Here we show that the meningeal lymphatics is a pathway to remove red blood cells from the brain's ventricular system of male human, adult and newborn rodents and is a target for non-invasive transcranial near infrared photobiomodulation. Our results uncover the clinical significance of phototherapy of intraventricular hemorrhage in 4-day old male rat pups that have the brain similar to a preterm human brain. The course of phototherapy in newborn rats provides fast recovery after intraventricular hemorrhage due to photo-improvements of lymphatic drainage and clearing functions. These findings shed light on the mechanisms of phototherapy of intraventricular hemorrhage that can be a clinically relevant technology for treatment of neonatal intracerebral bleedings. Infant, Newborn;Infant;Humans;Male;Adult;Animals;Rats;Rodentia;Cerebral Hemorrhage;Brain;Infant, Premature;Cerebral Ventricles

Antibacterial and anti-corona virus (229E) activity of Nigella sativa oil combined with photodynamic therapy based on methylene blue in wound infection: in vitro and in vivo study. Microbial skin infections, antibiotic resistance, and poor wound healing are major problems, and new treatments are needed. Our study targeted solving this problem with Nigella sativa (NS) oil and photodynamic therapy based on methylene blue (MB-PDT). Antibacterial activity and minimum inhibitory concentration (MIC) were determined via agar well diffusion assay and broth microdilution, respectively. Transmission electron microscopy (TEM) proved deformations in Staphylococcus aureus ATCC 6538. Gas chromatography-mass spectrometry identified useful compounds that were suggested to be responsible for the potency of the oil. NS oil was tested as an antivirus against low pathogenic coronavirus (229E). Therapies examined, MB-PDT, NS, and MB-PDTâ€‰+â€‰NS oil, to accelerate wound healing. The antibacterial efficacy against S. aureus was promising, with a MIC of 12.5% and TEM showing injured cells treated with NS oil. This oil inhibited 229E virus up to 42.85% and 32.14%. All tested therapies were successful in accelerating wound healing. The most successful was combined therapy (MB-PDTâ€‰+â€‰NS oil), with a faster healing time. The combined therapy (MB-PDTâ€‰+â€‰NS oil) reduced bacterial counts, which may be a key factor in accelerating wound healing. Skin wound histology was investigated; blood hematology and biochemical analysis did not change significantly after the safe combination treatment. A combination treatment could facilitate healing in a simple and inexpensive way in the future. Based on the results of the in vitro and in vivo studies, it was determined that NS oil had antibacterial and anti-corona virus activity when used in conjunction with photodynamic treatment based on methylene blue to treat wound infections. Nigella sativa oil;Methylene Blue;Anti-Bacterial Agents Humans;Staphylococcus aureus;Methylene Blue;Coronavirus;Anti-Bacterial Agents;Photochemotherapy;Wound Infection

Noninvasive Red Laser Intervention before Radiotherapy of Triple-negative Breast Cancer in a Murine Model. Radiotherapy is a well-established cancer treatment; it is estimated that approximately 52% of oncology patients will require this treatment modality at least once. However, some tumors, such as triple-negative breast cancer (TNBC), may present as radioresistant and thus require high doses of ionizing radiation and a prolonged period of treatment, which may result in more severe side

effects. Moreover, such tumors show a high incidence of metastases and decreased survival expectancy of the patient. Thus, new strategies for radiosensitizing TNBC are urgently needed. Red light therapy, photobiomodulation, has been used in clinical practice to mitigate the adverse side effects usually associated with radiotherapy. However, no studies have explored its use as a radiosensitizer of TNBC. Here, we used TNBC-bearing mice as a radioresistant cancer model. Red light treatment was applied in three different protocols before a high dose of radiation (60 Gy split in 4 fractions) was administered. We evaluated tumor growth, mouse clinical signs, total blood cell counts, lung metastasis, survival, and levels of glutathione in the blood. Our data showed that the highest laser dose in combination with radiation arrested tumor progression, likely due to inhibition of GSH synthesis. In addition, red light treatment before each fraction of radiation, regardless of the light dose, improved the health status of the animals, prevented anemia, reduced metastases, and improved survival. Collectively, these results indicate that red light treatment in combination with radiation could prove useful in the treatment of TNBC. Radiation-Sensitizing Agents Humans;Animals;Mice;Triple Negative Breast Neoplasms;Disease Models, Animal;Cell Line, Tumor;Radiation-Sensitizing Agents;Light

Shedding Light on Photobiomodulation Therapy for Age-Related Macular Degeneration: A Narrative Review. BACKGROUND: Photobiomodulation (PBM) relies on the pathophysiological mechanism whereby red to near-infrared light can target mitochondrial activity and promote ATP synthesis. Preclinical and clinical studies have shown promising results in treating intermediate age-related macular degeneration (AMD), since PBM can produce photochemical reactions in endogenous retinal chromophores. Currently, PBM is approved by the Food and Drug Administration and by the European Medicines Agency for the treatment of intermediate AMD. This narrative review aimed to evaluate the available evidence on the effectiveness and safety of PBM in treating intermediate AMD. METHODS: A comprehensive search was conducted using the PubMed database, employing the keywords "photobiomodulation" and "age-related macular degeneration." All English-language studies published up to June 2023 were reviewed, and the search was expanded to include relevant references from selected articles. The included publications were analyzed for this review. RESULTS: The available studies on PBM in AMD demonstrated promising but inconsistent results. PBM showed potential in improving best-corrected visual acuity (BCVA) and contrast sensitivity (CS) in patientsÂ with AMD. Some studies also suggested a reduction in AMD lesions, such as drusen volume. However, the long-term efficacy and optimal treatment parameters of PBM in AMD remained to be fully determined due to the limitations of the available studies. These included variations in irradiation techniques, wavelengths, exposure times, and treatment sessions, making it challenging to generalize the effectiveness of PBM. Furthermore, the lack of accurate classification of AMD phenotypes in the available studies hindered the understanding of which phenotypes could truly benefit from this treatment. Finally, the strength of evidence varied among studies, with limited sample sizes, unpublished results, and only three randomized sham-controlled trials. CONCLUSIONS: Currently, the effectiveness of PBM in promoting drusen resorption or preventing progression to advanced forms of AMD, as observed in the cited studies, remains uncertain.

The Mechanisms and Efficacy of Photobiomodulation Therapy for Arthritis: A Comprehensive Review. Rheumatoid arthritis (RA) and osteoarthritis (OA) have a significant impact on the quality of life of patients around the world, causing significant pain and disability. Furthermore, the drugs used to treat these conditions frequently have side effects that add to the patient's burden. Photobiomodulation (PBM) has emerged as a promising treatment approach in recent years. PBM effectively reduces inflammation by utilizing near-infrared light emitted by lasers or LEDs. In contrast to photothermal effects, PBM causes a photobiological response in cells, which regulates their functional response to light and reduces inflammation. PBM's anti-inflammatory properties and

beneficial effects in arthritis treatment have been reported in numerous studies, including animal experiments and clinical trials. PBM's effectiveness in arthritis treatment has been extensively researched in arthritis-specific cells. Despite the positive results of PBM treatment, questions about specific parameters such as wavelength, dose, power density, irradiation time, and treatment site remain. The goal of this comprehensive review is to systematically summarize the mechanisms of PBM in arthritis treatment, the development of animal arthritis models, and the anti-inflammatory and joint function recovery effects seen in these models. The review also goes over the evaluation methods used in clinical trials. Overall, this review provides valuable insights for researchers investigating PBM treatment for arthritis, providing important references for parameters, model techniques, and evaluation methods in future studies. Animals;Humans;Low-Level Light Therapy;Quality of Life;Inflammation;Arthritis, Rheumatoid;Osteoarthritis

Effects of Low-Level Laser Therapy and Purified Natural Latex (Hevea brasiliensis) Protein on Injured Sciatic Nerve in Rodents: Morpho-Functional Analysis. The present study analyzed the effects of low-level laser therapy (LLLT) and the purified natural latex protein (Hevea brasiliensis, F1 protein) on the morpho-function of sciatic nerve crush injuries in rats. One-hundred and eight male Wistar rats were randomly allocated to six groups (n = 18): 1. Control; 2. Exposed (nerve exposed); 3. Injury (injured nerve without treatment); 4. LLLT (injured nerve irradiated with LLLT (15 J/cm(2), 780 nm)); 5. F1 (injured nerve treated with F1 protein (0.1%)); and 6. LLLT + F1 (injured nerve treated with LLLT and F1). On the 1st, 7th, 14th, and 56th days after injury, a functional sensory analysis of mechanical allodynia and mechanical hyperalgesia and a motor analysis of grip strength and gait were performed. After 3, 15, and 57 days, the animals were euthanized for morphometric/ultrastructural analyses. The treatments applied revealed improvements in morphometric/ultrastructural parameters compared to the injured group. Sensory analyses suggested that the improvements observed were associated with time progression and not influenced by the treatments. Motor analyses revealed significant improvements in grip strength from the 7th day in the LLLT group and in gait from the 56th day in all treated groups. We concluded that even though the morphological analyses showed improvements with the treatments, they did not influence sensory recovery, and LLLT improved motor recovery.

Photobiomodulation Therapy on the Palliative Care of Temporomandibular Disorder and Orofacial/Cervical Skull Pain: Preliminary Results from a Randomized Controlled Clinical Trial.
The main symptoms of temporomandibular disorders (TMDs) are pain from musculoskeletal and/or joint-in the head and neck region-and complaints of difficulty in mandibular movements. The photobiomodulation therapy (PBMT) has been reported as a promising treatment in the management of these symptoms. The objective of this research was to assess the effect of PBMT immediately after irradiation on TMDs symptoms under a prospective clinical trial, randomized, triple-blinded, placebo-controlled, and with two parallel arms. According to the RDC/TMD, maximum mouth opening (MMO) and pain in the orofacial/cervical muscles and temporomandibular joint (TMJ) were recorded. One hundred forty-five participants (71 placebo and 74 PBMT experimental) were analyzed after irradiation protocols (sham-PBMT or PBMT) at the orofacial/cervical skull musculature and at the TMJ. The results showed a reduction in the total pain score ($p = 0.026$), a reduction in the number of painful points ($p = 0.013$), and an increase in the MMO ($p = 0.016$) in the PBMT protocol group when compared to the placebo protocol (sham-PBMT). The PBMT was shown to be effective in reducing orofacial/cervical skull pain immediately after the irradiation. It is clinically relevant and should be taken into consideration by professionals who are dedicated to treating this pathology because, in addition to bringing comfort to patients who need dental treatment, it also consists of a low-cost and low technical complexity clinical approach.

Repeated Transcranial Photobiomodulation with Light-Emitting Diodes Improves Psychomotor Vigilance and EEG Networks of the Human Brain. Transcranial photobiomodulation (tPBM) has

been suggested as a non-invasive neuromodulation tool. The repetitive administration of light-emitting diode (LED)-based tPBM for several weeks significantly improves human cognition. To understand the electrophysiological effects of LED-tPBM on the human brain, we investigated alterations by repeated tPBM in vigilance performance and brain networks using electroencephalography (EEG) in healthy participants. Active and sham LED-based tPBM were administered to the right forehead of young participants twice a week for four weeks. The participants performed a psychomotor vigilance task (PVT) during each tPBM/sham experiment. A 64-electrode EEG system recorded electrophysiological signals from each participant during the first and last visits in a 4-week study. Topographical maps of the EEG power enhanced by tPBM were statistically compared for the repeated tPBM effect. A new data processing framework combining the group's singular value decomposition (gSVD) with eLORETA was implemented to identify EEG brain networks. The reaction time of the PVT in the tPBM-treated group was significantly improved over four weeks compared to that in the sham group. We observed acute increases in EEG delta and alpha powers during a 10 min LED-tPBM while the participants performed the PVT task. We also found that the theta, beta, and gamma EEG powers significantly increased overall after four weeks of LED-tPBM. Combining gSVD with eLORETA enabled us to identify EEG brain networks and the corresponding network power changes by repeated 4-week tPBM. This study clearly demonstrated that a 4-week prefrontal LED-tPBM can neuromodulate several key EEG networks, implying a possible causal effect between modulated brain networks and improved psychomotor vigilance outcomes.

Evaluation of How Methacrylate Gelatin Hydrogel Loaded with Ximenia americana L. Extract (Steam Bark) Effects Bone Repair Activity Using Rats as Models. The use of bioactive materials, such as Ximenia americana L., to stimulate the bone repair process has already been studied; however, the synergistic effects of its association with light emitting diode (LED) have not been reported. The present work aims to evaluate the effect of its stem bark extract incorporated into methacrylate gelatin hydrogel (GelMA) on the bone repair process using pure hydrogel and hydrogel associated with LED therapy. For this purpose, the GelMA hydrogel loaded with Ximenia americana L. extract (steam bark) was produced, characterized and applied in animal experiments. The tests were performed using 50 male Wistar rats (divided into 5 groups) submitted to an induced tibia diaphyseal fracture. The therapy effects were verified for a period of 15 and 30 days of treatment using histological analysis and Raman spectroscopy. After 15 days of induced lesion/treatment, the new bone formation was significantly higher in the GXG (GelMA + X. americana L.) group compared to the control group ($p < 0.0001$). After 30 days, a statistically significant difference was observed when comparing the GXLEDG (GelMA + X. americana L. + LED) and the control group ($p < 0.0001$), the GXG and the control group ($p < 0.001$), and when comparing the GG, GXG ($p < 0.005$) and GXLEDG ($p < 0.001$) groups. The results shows that the Ximenia americana L. stem extract incorporated into GelMA hydrogel associated with LED therapy is a potentiator for animal bone repair.

Whole-Body Photobiomodulation Therapy for Fibromyalgia: A Feasibility Trial. Effective treatment for fibromyalgia (FM) is lacking and further treatment options are needed. Photobiomodulation therapy (PBMT) represents one potential treatment option. Whilst favourable findings have been reported using localised PBMT, no investigations have established the value of whole-body PBMT for the complete set of symptom domains in FM. A single-arm feasibility study was conducted in accordance with CONSORT (Consolidated Standards of Reporting Trials) guidelines. A non-probability sampling method was used to access individuals with FM. The primary outcome measure was identified as the Revised Fibromyalgia Impact Questionnaire (FIQR). Forty-nine participants were screened and twenty-one trial participants entered the trial. Nineteen participants completed the intervention (18 whole-body PBMT sessions over approximately six weeks). Descriptive statistics and qualitative analysis was undertaken to represent feasibility outcomes.

Acceptability of the trial device and processes were established. Outcome measures towards efficacy data were guided by core and peripheral OMERACT (outcomes measures in rheumatological clinical trials) domains, utilising a combination of participant-reported and performance-based outcome measures. Data for the embedded qualitative component of the trial were captured by participant-reported experience measures and audio-recorded semi-structured interviews. Positive changes were observed for FM-specific quality of life, pain, tenderness, stiffness, fatigue, sleep disturbance, anxiety, depression and cognitive impairment. Patient global assessment revealed improvements at 6 weeks, with continued effect at 24 weeks. FM-specific quality of life at 24 weeks remained improved compared with baseline scores. The findings provided evidence to support a full-scale trial and showed promise regarding potential efficacy of this novel non-invasive treatment in an FM population.

Photodynamic therapy adjuvant to non-surgical periodontal therapy: Systematic review of randomized clinical trials. OBJECTIVES: To systematically evaluate randomised controlled trials (RCTs) on whether adjuvant application of antimicrobial photodynamic therapy (aPDT) through the technique of irradiation in the external region of the periodontal pocket with optic-fibre tip offers benefits to scaling and root planning (SRP). METHODS: Five databases were searched by two independent reviewers according to pre-specified eligibility criteria up to April 2023. No restrictions regarding date of publication, language and minimum follow-up period were imposed. The Cochrane Collaboration's Risk of Bias tool (RoB 2.0) was used for quality appraisal and Grading of Recommendations, Assessment, Development and Evaluation for assessing the certainty of evidence. RESULTS: A total of 1388 publications were identified and reviewed for eligibility. Four of them fulfilled the inclusion criteria. The sample consisted of a total of 83 patients with periodontitis. In these, 330 periodontal sites were evaluated. The clinical findings of the majority of the included studies demonstrated that patients who received the association of aPDTâ€‰+â€‰RAR with the protocol evaluated here, obtained clinical results similar to patients who received only the SRP alone. In none of the evaluated RCTs, clinical advantages were observed that would categorise this aPDT protocol as superior to conventional treatment. CONCLUSION: Applying aPDT after SRP with external irradiation of the periodontal pocket does not seem to result in any clinical benefit compared to the use of SRP alone in patients with periodontitis. Anti-Infective Agents Humans;Periodontal Pocket;Root Planing;Randomized Controlled Trials as Topic;Photochemotherapy;Dental Scaling;Periodontitis;Combined Modality Therapy;Anti-Infective Agents;Chronic Periodontitis

Comparing the Effectiveness of Low-Level Laser Therapy and Topical Steroid Therapy Combination Regimen With Routine Topical Steroid Therapy in the Management of Oral Lichen Planus Symptomatic Patients. BACKGROUND: For symptomatic oral lichen planus (OLP), a wide range of therapeutic approaches have been suggested. To minimize discomfort and symptoms among individuals with symptomatic OLP, extensive therapy is frequently needed. Therefore, finding a new therapeutic approach that may effectively manage OLP's symptoms and signs while having few adverse effects continues to be a difficult task. Recently, low-level laser therapy (LLLT) has become a popular alternative therapy option for OLP with no serious side effects. AIM: The present research was designed to compare the effectiveness of a combination regimen of LLLT in addition to topical steroids with routine topical steroid therapy separately in order to manage patients with bothersome OLP with an extended period of follow-up. MATERIALS AND METHODS: In our trial, 60 patients were chosen and given sequential numbers as they signed up to take part. The participants were divided randomly into two categories: category A (LLLT plus topical steroids) and category B (only topical steroids). The data were entered into the aforementioned prepared case template after receiving informed consent. The aforementioned prepared case template included the following criteria for evaluating the result of the treatment: pain, recurrence, burning sensation, clinical remission, and

size of the lesion. Applying the visual analog scale (VAS), pain, as well as burning sensations, were assessed in both categories. With the aid of the Electronic Digital Vernier Caliper (Mitutoyo, China), these individuals were assessed for the dimension of the lesion. RESULTS: The pain score on day 21 of intervention in category A was 2.5, while it was 4.63 in category B. The difference in findings was significant statistically at day 21 (p = 0.0032). The pain score on day 28 of intervention in category A was 1.3, while it was 3.0 in category B. The difference in findings was significant statistically at day 28 (p = 0.003). The pain score was greater in the control category as compared to the intervention category. The burning sensation score on day 21 of intervention in category A was 2.5, while it was 4.5 in category B. The difference in findings was significant statistically (p = 0.0024). The burning sensation score at the follow-up phase on day 45 of intervention in category A was 1.1, while it was 3.4 in category B. The difference in findings was significant statistically (p = 0.002). CONCLUSION: Newer therapeutic techniques are becoming accessible to oral specialists for controlling oral mucosal disorders as a result of evolving dental trends. The gold standard for treating people with symptomatic OLP continues to be topical corticosteroids. The therapeutic advantages of topical corticosteroids, however, are considerably outweighed by their complementary effect when paired with newer treatment methods like LLLT.

Effect of photobiomodulation on the behaviour of mesenchymal stem cells in three-dimensional cultures. Photobiomodulation (PBM) has been proposed as a strategy to improve the regenerative capacity of human adipose-derived stem cells (hASCs). Yet, this effect has been proved in 2D culture conditions. To analyze the effect of different doses of laser irradiation (660Â nm) with different levels of energy (1Â J, 2Â J and 6Â J) on hASCs cultured at 2D and 3D conditions. We used gellan gum spongy-like hydrogels as a biomaterial to 3D culture hASCs. Different doses (1-7 daily irradiations) and energy levels (1-6Â J) of PBM were applied, and the metabolic activity, viability, proliferation, and release of ROS and IL-8 was evaluated up to 7Â days. In 3D, cell proliferation increased at high energy (6Â J) and after a single dose of irradiation, while in 2D, metabolic activity and proliferation was enhanced only after 3 doses and independently of the energy. More than 1 dose was needed to promote ROS secretion both in 2D and 3D culture conditions. Interestingly, a decrease of IL-8 secretion was detected only in 3D after 3-7 daily irradiations. Overall, hASCs response to PBM was not only dependent on the energy level and the number of applied stimuli, but also on the in vitro culture conditions. Interleukin-8;Reactive Oxygen Species Humans;Interleukin-8;Reactive Oxygen Species;Mesenchymal Stem Cells;Adipocytes;Bandages

Non-invasive Body Contouring Technologies: An Updated Narrative Review. INTRODUCTION: Nowadays, a lot of body contouring devices and methods are introduced all over the world. The object of the present narrative review was to update and classify existing evidence on these methods and devices. METHODS: We searched databases including PubMed, Cochrane, and Google Scholar for 11 essential keywords, including cryolipolysis, high-intensity focused ultrasound (HIFU), shock wave, low-level laser therapy (LLLT), radiofrequency (RF), capacitive resistive electrical transfer (TECAR), high-intensity focused electromagnetic (HIFEM), electromyostimulation (EMS), carboxytherapy, mesotherapy, and acupuncture and their abbreviations, in addition to obesity, overweight, cellulite, subcutaneous fat, and body contouring. RESULTS: Totally 193 references were used in 11 main topics. CONCLUSION: In order to help physicians with finding the best evidence in different methods, the data were summarised in 11 topics. Furthermore, FDA-approved devices, side effects and common protocols were described in each section. LEVEL OF EVIDENCE I: This journal requires that authors 39 assign a level of evidence to each article. For a full 40 description of these Evidence-Based Medicine ratings, 41 please refer to the Table of Contents or the online 42 Instructions to Authors www.springer.com/00266 . Humans;Body Contouring;Subcutaneous Fat;Obesity;Low-Level Light Therapy;Treatment Outcome

Different Effects of Low-Level Laser Therapy on the Proliferation of HT29 Cells in Culture and Xenograft Models. Introduction: Different kinds of treatments have been developed to fight cancers. Low-level laser therapy (LLLT), also known as photobiomodulation therapy (PBMT), is a low-power monochromatic and coherent light that has been used successfully for healing injuries and combating malignancies. However, there are concerns about the application of LLLT to cancers due to the increased proliferation of some cancer cells after LLLT. Methods: This study investigated the effects of 650 nm and 870 nm lasers on the proliferation of HT29 colorectal cancer cell lines in vitro and in vivo. Results: The results showed that the laser with a wavelength of 870 nm did not meaningfully alter the proliferation of cultured cells. However, cell proliferation was promoted when the laser was applied within a wavelength of 650 nm. Treatment of HT29-derived tumors in nude mice with the 650 nm laser resulted in the decline of the tumor progression rate compared to controls. This result was inconsistent with the proliferative effects of the laser on the cultured cells. Conclusion: Cell behavior in response to LLLT might be different between cell culture and xenograft models.

The Effect of Photobiomodulation on Temporomandibular Pain and Functions in Patients With Temporomandibular Disorders: An Updated Systematic Review of the Current Randomized Controlled Trials. Introduction: Temporomandibular disorders (TMDs) are the most prevalent non-dental origin orofacial pain conditions affecting the temporomandibular joints (TMJs) and/or orofacial muscles. Photobiomodulation therapy (PBMT) is a conservative way to improve function and reduce symptoms in TMD patients. This systematic review was conducted to update evidence about the effects of PBMT on pain intensity, TMJ movements, electromyography (EMG) activity, pressure pain threshold (PPT), and TMJ sound in patients with TMDs. Methods: A systematic literature search was conducted in Web of Science, PubMed/Medline, and Scopus databases using appropriate keywords and specific strategies from January 2000 to September 2022. Data extraction was done based on the inclusion/exclusion criteria. Results: A total of 40 studies were included. All included studies except one provided information on pain intensity; 27 studies showed a reduction in pain intensity in PBMT groups compared to control groups. Seven out of 15 studies, which reported maximum mouth opening (MMO), showed a greater MMO in PBMT groups than in placebo groups. In addition, the figures for passive maximum mouth opening (PMMO) and active maximum mouth opening (AMMO) in all the studies reporting PMMO and AMMO were higher in PBMT groups. In eight out of ten studies, lateral movement (LM) was greater in PBMT groups. Moreover, in three studies out of four, protrusive movement (PM) was reported to be greater in the PBMT group. Four out of nine studies showed a greater PPT in the PBMT group. Reduced TMJ sounds in the PBMT group were reported in two out of five studies. In addition, in most studies, no difference in EMG activity was detected between the two groups. Conclusion: This updated systematic review showed the promising effects of PBMT on the alleviation of pain and improvement in MMO. Using the infrared diode laser with a wavelength ranging between 780-980 nm, an energy density of<100 J/ cm(2), and an output power ofâ‰¤500 mW for at least six sessions of treatment seems to be a promising option for treating mentioned TMDs signs and symptoms based on the previously reported findings.

Evaluation of the effect of high-intensity laser therapy (HILT) on function, muscle strength, range of motion, pain level, and femoral cartilage thickness in knee osteoarthritis: randomized controlled study. This study was designed as a double-blind randomized placebo-controlled study. The aim of this study was to evaluate the effects of high-intensity laser therapy (HILT) on pain, range of motion, function, muscle strength, and femoral cartilage thickness in patients with knee osteoarthritis. Sixty patients who were admitted between November 2021 and April 2022 and diagnosed with knee osteoarthritis based on anamnesis, physical examination, and imaging methods were included in the study. The patients observed during the research were randomly divided into

two groups with 30 patients in each group. Hotpack, transcutaneous electrical nerve stimulation (TENS), exercise (5Â days a week for a total of 15 sessions), and HILT (analgesic mode with a power of 10.0 w, energy density of 12 j/cm(2), and 2Â min for every 25 cm(2), biostimulant mode with a power of 5.0 W, energy density of 120 j/cm(2), and 10Â min for each 25 cm(2); total 9 sessions 3Â days a week) were applied for 3Â weeks for the first group, and hot pack, TENS, exercise (5Â days a week for a total of 15 sessions), and sham laser treatment (0 W total 9 sessions 3Â days a week) was applied for 3Â weeks for the second group. The patients were evaluated with the determined scales before the treatment, at the end of the treatment, and at the third month. A goniometer was used to measure joint range of motion measurement, a visual analog scale (VAS) for pain, WOMAC Osteoarthritis Index to assess pain and function, Biodex System 3 isokinetic device for knee flexion-extension muscle strength measurement, and ultrasonography to measure femoral cartilage thickness. There was no statistically significant difference in VAS, range of motion, WOMAC, muscle strength, and femoral cartilage thickness measurement between the groups, whether before treatment, after treatment or at the third-month follow-up (pâ€‰>â€‰0.05). There was a statistically significant decrease in pain intensity, an increase in flexion range of motion, WOMAC, and femoral cartilage thickness in both groups (pâ€‰<â€‰0.005). A statistically significant increase was found in the average peak torque flexion muscle strength measurements at isokinetic 60Â°/s angular velocities in the post-treatment and third-month checkup compared to the pre-treatment analysis in both groups (pâ€‰<â€‰0.05). In conclusion, there was no statistically significant difference between HILTâ€‰+â€‰exercise and placebo laserâ€‰+â€‰exercise observed. However, the exercise program performed under the supervision of a physiotherapist has been shown to be effective in improving all parameters. Humans;Osteoarthritis, Knee;Laser Therapy;Low-Level Light Therapy;Range of Motion, Articular;Muscle Strength

Use of adipose derived stem cellsÂ accelerates the healing process in third-degree burns. INTRODUCTION: Burns are defined as a traumatic injury, usually of thermal origin, that affects the epithelial and adjacent tissue and is classified according to the depthÂ reached. Tissue repair involved in this type of injury is often a challenge both due to its severity and the multiplicity of complications. Regenerative medicine has focused on the use of low-level laser photobiomodulation therapy (LLLT) and adipose-derived stem cells (ADSC), especially in the early stages of the process, to promote better healing and shorten repair time. Therefore, aim of this study was to evaluate the action of LLLT (660Â nm) and ADSC in the repair process of burned skin tissueÂ and investigate the association of the techniques (LLLT and ADSC). MATERIALS AND METHODS: An in vivo study was carried out using 96 rats (Wister) with a scald burn model at a temperature of 95ÂºC, exposing the animal's back for 14Â s. Animals were randomized into seven groups and three periods, five, 14 and 21 days. The groups included GC: Control group, ADSC-: Group treated with CD49d negative cells, ADSC+Â : Group treated with positive CD49d cells, CULT: Group treated with conventional isolation cells, LLLT: Group treated only with LLLT Low Power Laser, ADSC-LLLT: Group treated with CD49d negative cells and LLLT. ADSC+LLLT: Group treated with positive CD49d cells and LLLT. The groups treated with LLLT (660Â nm; 5Â J/cm2) received irradiation three times a week, on alternate days for five, 14 and 21 days, according to the time of biopsy. ADSC-treated groups received one to three applications of the cells in a total volume of 1000Â Î¼L starting soon after the surgical debridement of the burn. Photographic monitoring was carried out at 5, 14 and 21 days after the beginning of the experiment to assess the degree of lesion contraction. Macroscopic, morphometric and histopathological analyzes were performed. RESULTS: We showed significant re-epithelialization as well as an improvement in the healing process in the ADSC+, LLLT and ADSC+LLLT groups. We observed effects in the reduction of the inflammatory phase, increase in angiogenesis, decrease in oedema, greater collagen deposition, and better organization of the extracellular matrix compared to the other

treatments. Moreover, the immunomagnetic separation of ADSC cells through the expression of the CD49d protein proved to be a useful means to obtain a more homogeneous population of cells with a role in tissue regeneration compared to the ADSC- and CULT groups. CONCLUSION: In conclusion, the association of ADSC+Â with LLLT was effective in accelerating the burn repair process, stimulating cell proliferation and formation of more normal skin tissue. Rats;Animals;Rats, Wistar;Burns;Skin;Wound Healing;Soft Tissue Injuries;Low-Level Light Therapy;Stem Cells

Effects of Photobiomodulation Therapy on Lung Function and Inflammatory Factors in Patients with COVID-19 During Acute Stage. Objective: We aimed to evaluate the effects of photobiomodulation therapy on the respiratory function and laboratory parameters in COVID-19 participants with respiratory involvement. Methods: A randomized, double-blind controlled design was used. This study was conducted at Koosar Hospital. Thirty participants with COVID-19 who were hospitalized met the inclusion criteria and were randomly assigned to two groups. Patients were treated with a program of five sessions of high-power photobiomodulation (intervention group) and placebo photobiomodulation (control group). Both groups received standard treatment. Outcomes were assessed before and after the intervention (two sessions), according to the immune system function and laboratory tests for the respiratory rate (RR), oxygen saturation, and inflammatory factors, including C-reactive protein (CRP), white blood cells, and interleukin-6 (IL-6), as well as complete blood count (CBC), hematocrit, hemoglobin, and ferritin. Results: Findings indicated that the values of ferritin, erythrocyte sedimentation ratio, CRP, IL-6, O2 saturation, and RR were significantly improved after the intervention in both groups (pâ€‰<â€‰0.05). Independent T-test analyses also indicated significant differences in the CRP, IL-6, and O2 saturation in the photobiomodulation group compared with the control group after the five-session intervention (pâ€‰<â€‰0.05). Conclusions: Application of photobiomodulation is recommended for treatment of respiratory problems in patients with COVID-19 to improve clinical signs and control inflammatory factors. Clinical Trial Registration: IRCT2017070934969N1. Interleukin-6;Ferritins Humans;Low-Level Light Therapy;Interleukin-6;COVID-19;Ferritins;Lung

Effect of 810â€‰nm Diode Laser Irradiation on the Time of Initiation and Depth of Anesthesia for Endodontic Treatment of Mandibular First Molars with Symptomatic Irreversible Pulpitis: A Clinical Trial. Objective: In endodontic treatments, performing appropriate anesthesia in patients with irreversible pulpitis in mandibular molars may result in pain and severe problems. The irradiation of low-level lasers could be effective in this regard due to its anti-inflammatory and regenerative properties. This study aimed to assess the effect of 810â€‰nm diode laser on the time of initiation and depth of anesthesia for endodontic treatment of mandibular first molars with symptomatic irreversible pulpitis. Materials and methods: This randomized controlled clinical trial evaluated 60 patients requiring endodontic treatment of mandibular first molars with symptomatic irreversible pulpitis and pain score â‰¥114 according to the Heft-Parker visual analog scale (HP-VAS). The teeth were randomized into two groups of diode laser and control. In the diode laser group, 810â€‰nm diode laser with 300â€‰mW power and 15â€‰J/cm(2) energy density was irradiated to the buccal surface of tooth crowns for 20â€‰sec at 2â€‰mm distance immediately before anesthesia administration. Laser in off mode was used in the control group. Inferior alveolar nerve block was then performed using 2% lidocaine with 1:80,000 epinephrine. After anesthetic injection, the mandibular first molar and canine teeth (control) were tested by an electric pulp tester every 2â€‰min. Two consecutive negative responses to 80â€‰mA indicated the initiation of anesthesia. HP-VAS forms were filled out by patients to assess their level of pain during the procedure. Data were analyzed by the Student's t and Chi-square tests, and analysis of variance (Î±â€‰=â€‰0.05). Results: No remarkable difference was noted between the laser group and control groups in pain severity or anesthesia onset (pâ€‰>â€‰0.05). Conclusions: Low-level (810â€‰nm) diode laser did not affect

the time of initiation or depth of anesthesia in endodontic treatment of mandibular first molars with symptomatic irreversible pulpitis. Clinical trials registration: Iranian Registry of Clinical Trials (IRCT20181222042076N1). Humans;Lasers, Semiconductor;Iran;Pulpitis;Anesthesia;Pain

A Nonrandomized Trial of the Effects of Near-Infrared Photobiomodulation Therapy on Bell's Palsy with a Duration of Greater Than 8 Weeks. Objective: To determine whether photobiomodulation therapy (PBMT) by class IV Multiwave Locked System laser treatment as an adjunctive therapy could relieve symptoms in patients with Bell's palsy with a duration of greater than 8 weeks. Materials and methods: This nonrandomized controlled trial was conducted from January 2020 to December 2022. Patients were eligible if they had Bell's palsy with a duration of greater than 8 weeks at the out-patient department of otorhinolaryngology in Beijing Tongren Hospital. The control group consisted of patients recruited between January 1, 2020, and December 31, 2020. The PBMT group consisted of patients recruited between January 1, 2021, and December 31, 2022. In this study, the PBM used has a wavelength of 808 and 905â€‰nm, 1.2 W power (808â€‰nm is 1 W, 905â€‰nm is 200â€‰mW), continuous mode emission (808â€‰nm) and pulsed mode emission (905â€‰nm), 8.35â€‰J/cm(2) dosimetry, administered 3 times per week, 72 times of total treatment. The primary outcome measures included the House-Brackmann facial nerve grading system, the Sunnybrook facial grading system, and the Facial Clinimetric Evaluation Scale (FaCE). Secondary outcome measures comprised electroneurography, electromyography, and the blink reflex. Results: A total of 54 participants were included (27 in the control group and 27 in the photobiomodulation group). After 6 months, the House-Brackmann grading system [risk difference, -0.59, confidence interval (95% CI), -0.81 to -0.38, relative risk, 0.27, 95% CI, 0.13-0.56, pâ€‰<â€‰0.001], Sunnybrook facial grading system (21.14, 95% CI, 11.71-30.58; pâ€‰<â€‰0.001), and FaCE (-0.20, 95% CI, 0.41-0.02; pâ€‰=â€‰0.07) had significant difference between the two groups. Latency of ala nasi muscle (10.92, 95% CI, 5.58-16.27; pâ€‰<â€‰0.001) was not statistically significant after treatment compared with the control group; however, most of the electrophysiological examinations have significant difference between the two groups, respectively. Conclusions: The results of this study suggest that PBMT may relieve symptoms for patients with Bell's palsy with a duration of greater than 8 weeks. Trial Registration: ClinicalTrials.gov Identifier: NCT05585333. Humans;Bell Palsy;Low-Level Light Therapy;Facial Paralysis;Phototherapy;Pain Management

Histomorphometric Analysis of the Healing Capacity of Low-Level Laser on Thermally Induced Tongue Ulcers for Gamma-Irradiated Rats. Objective: This study aimed to assess the efficacy of low-level laser therapy (LLLT) for treating thermal tongue ulcers in gamma-irradiated rats. Background: Postradiotherapeutic trauma may cause cell death, tissue damage, organ dysfunction, and loss of hematological components. Materials and methods: Thermal ulcers were induced on the dorsal surfaces of tongues of gamma-irradiated rats (15 Gy). Rats were divided into three groups, group 1 received no treatment, group 2 was subjected to a single dose of diode laser 807â€‰nm with energy density 4â€‰J/cm(2), and group 3 was subjected to the same dose of LLLT but fractionated into three sessions at days 1, 3, and 5 after ulcers induction. Ulcers were assessed clinically for their areas and healing percentage. Specimens were examined for the quality of ulcer closure and expression of IL-1Î² and TGF-Î²1. Results: Results revealed significant improvement of ulcer healing clinically and histologically in both treatment groups compared to control. Moreover, IL-1Î² and TGF-Î²1 expression in both treatment groups was high at the earlier stage of healing then declined by time to reach a normal level. However, untreated group showed higher expression of IL-1Î² and TGF-Î²1 compared to treatment groups. In addition, IL-1Î² expression decreased by time but still of high level and TGF-Î²1 expression increased then declined. Conclusions: We concluded that gamma radiation-impaired mucosal healing could be related to the over expression of IL-1Î² and TGF-Î²1. LLLT, whether one session or fractionated, could be an effective treatment for postradiotherapeutic ulcers. The healing

power of LLLT might be due to modulation of IL-1Î² and TGF-Î²1. Clinical Trial Registration number is 25A122. Transforming Growth Factor beta1 Animals;Rats;Ulcer;Transforming Growth Factor beta1;Gamma Rays;Lasers, Semiconductor;Tongue

Addendum: The chromatographic constitution of andiroba oil and its healing effects, compared to the LLLT outcomes, in oral mucositis induced in golden Syrian hamsters: a new treatment option.

Interaction of the AKT and Î²-catenin signalling pathways and the influence of photobiomodulation on cellular signalling proteins in diabetic wound healing. The induction of a cells destiny is a tightly controlled process that is regulated through communication between the matrix and cell signalling proteins. Cell signalling activates distinctive subsections of target genes, and different signalling pathways may be used repeatedly in different settings. A range of different signalling pathways are activated during the wound healing process, and dysregulated cellular signalling may lead to reduced cell function and the development of chronic wounds. Diabetic wounds are chronic and are characterised by the inability of skin cells to act in response to reparative inducements. Serine/threonine kinase, protein kinase B or AKT (PKB/AKT), is a central connection in cell signalling induced by growth factors, cytokines and other cellular inducements, and is one of the critical pathways that regulate cellular proliferation, survival, and quiescence. AKT interacts with a variety of other pathway proteins including glycogen synthase kinase 3 beta (GSK3Î²) and Î²-catenin. Novel methodologies based on comprehensive knowledge of activated signalling pathways and their interaction during normal or chronic wound healing can facilitate quicker and efficient diabetic wound healing. In this review, we focus on interaction of the AKT and Î²-catenin signalling pathways and the influence of photobiomodulation on cellular signalling proteins in diabetic wound healing. Proto-Oncogene Proteins c-akt;beta Catenin;Protein Serine-Threonine Kinases Proto-Oncogene Proteins c-akt;beta Catenin;Signal Transduction;Protein Serine-Threonine Kinases;Wound Healing;Diabetes Mellitus

Successful Treatment of a Cervical Injury and Myopathy Using Integrative Medicine Techniques in an Eclectus Parrot (Eclectus roratus) Following Cervical Entrapment. A 2-year-old female eclectus parrot (Eclectus roratus) was presented for suspected cervical myopathy due to trauma. Severe ventroflexion of the cervical spine and mental depression were identified during the physical examination. The bird was responsive to stimuli but otherwise quiet. Plasma biochemistry results were suggestive of a myopathy, based on marked elevations of both aspartate transaminase (25 652 U/L) and creatine kinase (253 240 U/L). Whole-body radiographic images were unremarkable. Treatment was initiated with supportive therapy for presumptive shock, dehydration, pain, myopathy, and possible spinal swelling. Allopathic therapy included subcutaneous fluids; vitamins A, D, and E; dexamethasone sodium phosphate; hydromorphone; and gavage feeding to treat the acute inflammatory process and provide nutritional support during healing. Supportive care through the Integrative Medicine Department (Louisiana State University, Baton Rouge, LA, USA) was also performed on the patient. Photobiomodulation, acupuncture, Tui-na massage, and rehabilitation exercises were instituted to provide adjunct treatment for relieving pain, promoting muscle healing, improving patient demeanor, and improving cervical mobility. Integrative therapies were well tolerated by the patient, with no sedation required. By day 3, mentation had subjectively improved by 50% despite the persistent cervical ventroflexion. By day 8, the elevated serum enzyme activities had decreased, the patient could eat and drink on its own, and it could readily step up and seek attention during handling. The bird was able to lift its head and could hold it at approximately 50% of normal posture. Integrative therapies were continued throughout hospitalization. The bird was released from the hospital 20 days after initial intake, with head carriage in approximately 80% of the expected normal position and no apparent cervical pain based on palpation. This case demonstrates the benefits of integrative therapies as an adjunct treatment for cervical pain and myopathy in a

psittacine species. Aspartate Aminotransferases Animals;Female;Neck Pain;Integrative Medicine;Parrots;Anesthesia;Aspartate Aminotransferases

Chemotherapy-Induced Taste Alteration. Taste alteration is a common side effect of chemotherapy and can have a direct impact on patients' quality of life. Consistent evaluation of alteration in taste is lacking in clinical practice. The literature strongly suppo. Antineoplastic Agents Humans;Quality of Life;Taste;Drug-Related Side Effects and Adverse Reactions;Antineoplastic Agents

Opinion of speech-language pathologist on the use of photobiomodulation in the vocal clinic. PURPOSE: to investigate the opinion of Brazilian speech-language pathologists on the training, performance, and parameters used for the application of photobiomodulation (PBM) in the vocal clinic. METHODS: observational, cross-sectional, and quantitative study, carried out through a web survey hosted on the Google Forms digital platform, composed of questions related to training, professional performance, and knowledge about PBM in the voice area. Twenty-nine speech-language pathologists of both sexes participated. Data were analyzed using descriptive statistics. RESULTS: all participants knew the theoretical foundations of PBM, and among them, 28 (96.6%) knew its use specifically in the voice area; twenty-five respondents (86.2%) had a device to perform the irradiation, and all of them used it routinely in their clinical practice in voice. The majority (96.6%, 28) participated in a PBM training course, including specific approaches to the voice area. Participants stated that PBM is a resource that can be used in the area of â€‹â€‹voice to improve performance in sung (86.2%, 25) and spoken (82.8%, 24), in addition to its application in cases of inflammatory processes in the vocal folds (79.3%, 23). As for dosimetry parameters, the most used wavelength was 808 - 830nm (37.9%, 11) and 660/808nm simultaneously (37.9%, 11), with a dose of 3-5 J per point for the patients with inflammatory processes in the vocal folds (51.7%, 15) and 6-9 J (44.8%, 13) per point for patients whose objective was improvement/conditioning. CONCLUSION: the study participants demonstrated knowledge and training in PBM and its applicability to the voice area. Female;Male;Humans;Cross-Sectional Studies;Pathologists;Speech;Brazil;Knowledge

A bibliometric study: Relevant studies on scar laser therapy since the 21st century. To summarise research studies on scar laser therapy since the 21st century using bibliometric methods, and to speculate on the possible development in the future. The literature about scar laser therapy in Web of Science database was searched. CiteSpace and VOSviewer were used to analyse main countries, institutions, journalsï¼Œsubject hotspots and trends, etc. A total of 884 papers have been published since the 21st century. These publications were written by 653 authors from 515 institutions in 58 countries. The United States published 287 papers in this field and ranks first. Laser in Surgery and Medicine is the most widely published journal, with Shumaker as the core author. The main keyword clustering includes terms such as combination therapy, wound healing, fractional photothermolysis, experience, scar formation, etc. CiteSpace and VOSviewer were used to sort out and summarise the countries, institutions, authors, journals, research hotspots and frontier topics of related literature about scar laser therapy since the 21st century. The current situation of its application and basic scientific research in clinical treatments were summarised briefly. This provides a new idea for the development and research of scar laser therapy in the future. Humans;Cicatrix;Laser Therapy;Low-Level Light Therapy;Wound Healing;Bibliometrics

Mechanisms of phototherapy of Alzheimer's disease during sleep and wakefulness: the role of the meningeal lymphatics. With the increase in the aging population, the global number of people with Alzheimer's disease (AD) progressively increased worldwide. The situation is aggravated by the fact that there is no the effective pharmacological therapy of AD. Photobiomodulation (PBM) is non-pharmacological approach that has shown very promising results in the therapy of AD in pilot clinical and animal studies. However, the mechanisms of therapeutic effects of PBM for AD are poorly

understood. In this study on mice, we demonstrate that photodynamic effects of 5-aminolevulenic acid and laser 635Â nm cause reduction of network of the meningeal lymphatic vessels (MLVs) leading to suppression of lymphatic removal of beta-amyloid (AÎ²) from the right lateral ventricle and the hippocampus. Using the original protocol of PBM under electroencephalographic monitoring of wakefulness and sleep stages in non-anesthetized mice, we discover that the 7-day course of PBM during deep sleep vs. wakefulness provides better restoration of clearance of AÎ² from the ventricular system of the brain and the hippocampus. Our results shed light on the mechanism of PBM and show the stimulating effects of PBM on the brain lymphatic drainage that promotes transport of AÎ² via the lymphatic pathway. The effects of PBM on the brain lymphatics in sleeping brain open a new niche in the study of restorative functions of sleep as well as it is an important informative platform for the development of innovative smart sleep technologies for the therapy of AD.

Transcranial photobiomodulation for the brain: a wide range of clinical applications.

Transcranial photobiomodulation mitigates learning and memory impairments induced by hindlimb unloading in a mouse model of microgravity exposure by suppression of oxidative stress and neuroinflammation signaling pathways. Prolonged microgravity exposure causes cognitive impairment. Evidence shows that oxidative stress and neuroinflammation are involved in the causation. Here, we explore the effectiveness of transcranial near-infrared photobiomodulation (PBM) on cognitive deficits in a mouse model of simulated microgravity. 24 adult male C57BL/6 mice were assigned into three groups (8 in each); control, hindlimb unloading (HU), and HUÂ +Â PBM groups. After surgery to fit the suspension fixing, the animals were housed either in HU cages or in their normal cage for 14Â days. The mice in the HUÂ +Â PBM group received PBM (810Â nm laser, 10Â Hz, 8Â J/cm2) once per day for 14Â days. Spatial learning and memory were assessed in the Lashley III maze and hippocampus tissue samples were collected to assess oxidative stress markers and protein expression of brain-derived neurotrophic factor (BDNF), nuclear factor erythroid 2-related factor 2 (Nrf2), Sirtuin 1 (Sirt1), and Nuclear factor kappa-light-chain-enhancer of activated B cells (NF-ÎºB). Behavioral testing showed that the PBM-treated animals had a shorter latency time to find the target and fewer errors than the HU group. PBM decreased hippocampal lipid peroxidation while increasing antioxidant defense systems (glutathione peroxidase, superoxide dismutase, and total antioxidant capacity) compared to HU mice. PBM increased protein expression of Sirt1, Nrf2, and BDNF while decreasing NF-ÎºB compared to HU mice. Our findings suggested that the protective effect of PBM against HU-induced cognitive impairment involved the activation of the Sirt1/Nrf2 signaling pathway, up-regulation of BDNF, and reduction of neuroinflammation and oxidative stress in the hippocampus. Antioxidants;Brain-Derived Neurotrophic Factor;NF-kappa B;NF-E2-Related Factor 2;Sirtuin 1 Mice;Male;Animals;Antioxidants;Hindlimb Suspension;Brain-Derived Neurotrophic Factor;NF-kappa B;Weightlessness;NF-E2-Related Factor 2;Sirtuin 1;Neuroinflammatory Diseases;Mice, Inbred C57BL;Oxidative Stress;Memory Disorders;Maze Learning;Signal Transduction;Hippocampus

Efficacy of photobiomodulation using diode laser 650 nm combined with nano-cellulose and nano-amorphous calcium phosphate in bone healing of rabbit tibial defects assessed by H&E staining and computed tomography. BACKGROUND: The purpose of the current study was to evaluate the effect of Diode LLLT 650 nm, TEMPO oxidized Nano-fibrillated cellulose mixed with Nano-Amorphous calcium phosphate, and their combination on bone healing in rabbit tibia using H&E staining and computed tomography. METHODS: Eighteen adult male New Zealand rabbits were selected, two circular bone defects were created in each tibia, resulting in four bony defects in each rabbit, representing the four tested groups; group A (negative control), group B (filled with mineralized nano-cellulose), group C (combination), group D (laser). Animals were euthanized after two weeks and one month, defects were assessed by CT for bone density, then histological samples were

examined by H&E stain. RESULTS: In both evaluation periods, group D recorded the greatest mean area percent of new bone formation and bone density, followed by group A, while group C recorded the lowest value. Groups A and D showed full closure of the defects, while groups B and C showed partial defect closure with retained bone graft material. H&E and CT showed that Laser group had the best results of defects healing, bone density and new bone formation, followed by the negative control group. CONCLUSIONS: Diode laser 650nm photobiomodulation significantly improved bone defects healing. Mineralized nano-cellulose experimental bone substitute material showed a delayed effect in bone healing and graft material resorption. The combination of LLLT with the graft material had no positive outcome on bone defect healing. Calcium Phosphates Rabbits;Male;Animals;Tibia;Low-Level Light Therapy;Lasers, Semiconductor;Tomography, X-Ray Computed;Calcium Phosphates;Staining and Labeling

Impact of low-level laser therapy as an adjunct to non-surgical periodontal treatment on the levels of tissue plasminogen activator and plasminogen activator inhibitor 1 in Stage 3-4, Grade C periodontitis patients: a split-mouth, randomized control study. AIM: To investigate the effects of low-level laser therapy (LLLT) as an adjunct to non-surgical periodontal treatment (NSPT) on the plasminogen-activating system. MATERIALS AND METHODS: Stage 3-4 Grade C periodontitis and age-gender-matched healthy individuals participated in the split-mouth study (ClinicalTrials.gov identifier, NCT05233501). The study groups were Periodontitis/NSPT (Sham); Periodontitis/NSPTâ€‰+â€‰LLLT (LLLT); Healthy (Control). Following NSPT, LLLT was applied on Days 0, 2 and 7. Clinical parameters were recorded at baseline and on Day 30. Gingival crevicular fluid (GCF) was collected at baseline, on days 7, 14, and 30; tissue-type plasminogen activator (tPA) and plasminogen activator inhibitor-1 (PAI-1) levels were measured with ELISA. RESULTS: Clinical parameters, total GCF tPA (tPA(t)) and PAI-1 (PAI-1(t)) levels significantly reduced in LLLT and Sham groups (<â€‰0.001). GCF tPA(t) levels in LLLT were significantly lower (<â€‰0.05) than Sham on Day 7. GCF tPA(t) levels in periodontitis groups were significantly higher than the Control at baseline, on Days 7 and 14 (<â€‰0.01). By Day 30, both groups decreased to control levels (>â€‰0.05). GCF PAI-1(t) levels were significantly lower in LLLT than the Sham on day 30 (<â€‰0.01), comparable to healthy controls (>â€‰0.05). CONCLUSION: Adjunctive LLLT modulates the plasminogen activating system in severe periodontitis by altering GCF tPA and PAI-1 levels. CLINICAL RELEVANCE: LLLT as an adjunct to non-surgical periodontal treatment in patients with Stage 3-4 Grade C leads to reduced plasminogen activation. Tissue Plasminogen Activator;Plasminogen Activator Inhibitor 1;Plasminogen Humans;Tissue Plasminogen Activator;Plasminogen Activator Inhibitor 1;Low-Level Light Therapy;Chronic Periodontitis;Plasminogen;Gingival Crevicular Fluid

Absorption and reduced scattering coefficient estimation in pigmented human skin tissue byÂ experimental colorimetric fitting. This study aims to estimate the optical properties, absorption (Î¼ (a)), and reduced scattering (Î¼ s ') coefficients of ex vivo human skin through the individual typology angle (ITA) by only using the skin color parameters. Human skin samples were grouped according to their ITA value and measured using a colorimeter for validation. An integrating sphere and the inverse adding-doubling algorithm were applied to compute the samples Î¼ (a) and Î¼ s '. The Î¼ (a) increases as the ITA decreases. An axis swap was performed to generate the Î¼ (a) versus the ITA for all wavelengths between 500Â nm and 800Â nm with a spectral resolution of 10Â nm. Linearization was performed and a correlation was found. An equation to fit Î¼ (a) based solely on the ITA values was estimated. The Î¼ s ' does not change with ITA, but it could be fit with an inverse power law as a function of the wavelength. Both equations have a coefficient of determination (R (2)) higher than 0.93, indicating a good agreement with our model. An experimental model to estimate the absorption and reduced scattering coefficients of ex vivo human skin through ITA was found. The model has high agreement with the experimental data, with an R (2) between

0.932 and 0.997, and these findings may be relevant for photobiomodulation and light treatment applications to estimate the effect of the melanin on the therapy.
Humans;Colorimetry;Algorithms;Skin;Skin Pigmentation

Fiat Lux: Light and Pedagogy for the 21st Century. BACKGROUND: The relationship between the quality of the learning environment and student outcomes is receiving more serious attention from educational psychologists, neurologists, ophthalmologists, orthopedists, surgeons, oncologists, architects, ergonomists, nutritionists, and Michelin star chefs. There is a role for ergonomic office and school design to positively impact worker and student productivity, and one design attribute drawing attention is the indoor lit environment. In this review, we expand upon the role that light plays in education, as it has enabled millions of pupils to read at late hours, which were previously too dark. However, still unappreciated is the biological effects of artificial light on circadian rhythm and its subsequent impacts on health and learning outcomes. SUMMARY: This review describes the current state of light in the educational environment, its impact, and the effect of certain inexpensive and easy-to-implement adaptations to better support student growth, learning and development. We find that the current lighting environment for pupils is sub-optima based on biological mechanism and may be improved through cost effective interventions. These interventions can achieve greater biological harmonization and improve learner outcomes. KEY MESSAGE: The impact of the lighting environment in educational institutions on pupil biology has received minimal attention thus far. The current lighting environment in schools is not conducive to student health and educational performance. Cost-effective approaches can have an outsized impact on student health and educational attainment. We strongly recommend educational institutions take the lit environment into account when designing educational programs.

Efficacy and safety of home-based 590â€‰nm light-emitting diodes and in-hospital 1064â€‰nm Q-switched Nd:YAG laser in the treatment of facial melasma: A single-centre, prospective, randomized clinical trial. Humans;Face;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Prospective Studies;Treatment Outcome

Noninvasive Red Laser Intervention before Radiotherapy of Triple-negative Breast Cancer in a Murine Model. Radiotherapy is a well-established cancer treatment; it is estimated that approximately 52% of oncology patients will require this treatment modality at least once. However, some tumors, such as triple-negative breast cancer (TNBC), may present as radioresistant and thus require high doses of ionizing radiation and a prolonged period of treatment, which may result in more severe side effects. Moreover, such tumors show a high incidence of metastases and decreased survival expectancy of the patient. Thus, new strategies for radiosensitizing TNBC are urgently needed. Red light therapy, photobiomodulation, has been used in clinical practice to mitigate the adverse side effects usually associated with radiotherapy. However, no studies have explored its use as a radiosensitizer of TNBC. Here, we used TNBC-bearing mice as a radioresistant cancer model. Red light treatment was applied in three different protocols before a high dose of radiation (60 Gy split in 4 fractions) was administered. We evaluated tumor growth, mouse clinical signs, total blood cell counts, lung metastasis, survival, and levels of glutathione in the blood. Our data showed that the highest laser dose in combination with radiation arrested tumor progression, likely due to inhibition of GSH synthesis. In addition, red light treatment before each fraction of radiation, regardless of the light dose, improved the health status of the animals, prevented anemia, reduced metastases, and improved survival. Collectively, these results indicate that red light treatment in combination with radiation could prove useful in the treatment of TNBC.

Exosomes Derived from M2 Microglial Cells Modulated by 1070-nm Light Improve Cognition in an Alzheimer's Disease Mouse Model. Near-infrared photobiomodulation has been identified as a potential strategy for Alzheimer's disease (AD). However, the mechanisms underlying this therapeutic

effect remain poorly characterize. Herein, it is illustrate that 1070-nm light induces the morphological alteration of microglia from an M1 to M2 phenotype that secretes exosomes, which alleviates the Î²-amyloid burden to improve cognitive function by ameliorating neuroinflammation and promoting neuronal dendritic spine plasticity. The results show that 4Â JÂ cm(-2) 1070-nm light at a 10-Hz frequency prompts microglia with an M1 inflammatory type to switch to an M2 anti-inflammatory type. This induces secretion of M2 microglial-derived exosomes containing miR-7670-3p, which targets activating transcription factor 6 (ATF6) during endoplasmic reticulum (ER) stress. Moreover, it is found that miR-7670-3p reduces ATF6 expression to further ameliorate ER stress, thus attenuating the inflammatory response and protecting dendritic spine integrity of neurons in the cortex and hippocampus of 5xFAD mice, ultimately leading to improvements in cognitive function. This study highlights the critical role of exosomes derive from 1070-nm light-modulated microglia in treating AD mice, which may provide a theoretical basis for the treatment of AD with the use of near-infrared photobiomodulation. MicroRNAs Mice;Animals;Alzheimer Disease;Microglia;Exosomes;Disease Models, Animal;Cognition;MicroRNAs

Histochemical mapping of the duration of action of photobiomodulation on cytochrome c oxidase in the rat brain. INTRODUCTION: This is the first study mapping the duration of action of in vivo photobiomodulation (PBM) on cytochrome-c-oxidase (CCO). In cellular bioenergetics, CCO is the terminal rate-limiting enzyme in the mitochondrial electron transport chain, which catalyzes oxygen utilization for aerobic energy production. PBM using transcranial infrared laser stimulation (TILS) is a promising intervention for non-invasively modulating CCO in the brain. TILS of the human prefrontal cortex directly causes CCO photo-oxidation, which is associated with increased cerebral oxygenation and improved cognition. METHODS: This experiment aimed to map the duration of action of in vivo PBM on CCO activity in discrete neuroanatomic locations within rat brains up to 4â€‰weeks after a single TILS session (50â€‰s, 1064â€‰nm CW, 250â€‰mW/cm(2)). Control brains from rats treated with a sham session without TILS (laser off) were compared to brains from TILS-treated rats that were collected 1â€‰day, 2â€‰weeks, or 4â€‰weeks post-TILS. Cryostat sections of the 36 collected brains were processed using quantitative enzyme histochemistry and digitally imaged. Densitometric readings of 28 regions of interest were recorded and converted to CCO activity units of oxygen utilization using calibration standards. Data analysis (ANCOVA) compared each laser-treated group to sham with whole-brain average as a covariate. RESULTS: The prefrontal infralimbic cortex showed the earliest significant increase in CCO activity between 1-day post-TILS and sham groups, which continued elevated for 2-4â€‰weeks post-TILS. Significant differences in CCO activity between 2-weeks and sham groups were also found in the lateral septum, accumbens core, CA3 of the hippocampus, and the molecular layer of the hippocampus. The medial amygdala showed a significant decrease in CCO activity between 4-weeks and sham. Further analyses showed significant inter-regional CCO activity correlations among the brain regions as the result of TILS, with the most pronounced changes at 4-weeks post-stimulation. DISCUSSION: The time course of changes in CCO activity and network connectivity suggested that TILS caused different neuroplasticity types of bioenergetic changes at different time scales, depending on brain region and its depth from the cortex. In conclusion, this controlled CCO histochemical study demonstrated a long-lasting duration of action of PBM in the rat brain.

Shedding light on the management of acute radiation dermatitis: insight from the MASCC Oncodermatology study group. This paper highlights a collection of eleven recently published manuscripts on the prevention and management of acute radiation dermatitis. These meta-analyses provide additional evidence for the updated clinical practice guidelines by the Multinational Association of Supportive Care in Cancer (MASCC) Oncodermatology study group for prevention and management of acute radiation dermatitis. The collection of papers elucidate the currently available

evidence on acute radiation dermatitis, highlighting consolidated knowledge, effective treatments, and proposed areas for future clinical trials. Overall, a total of 51 randomized controlled trials were retrieved and included for quantitative analysis of an initial systematic review of literature from 1946 to January 2023. Discussion of the clinical impact of various therapeutic interventions include: antiperspirant and deodorant use, barrier films and dressings, natural and miscellaneous agents, photobiomodulation therapy, topical corticosteroids, topical non-steroidal agents, skin hygiene and washing, as well as StrataXRT and Mepitel film in breast cancer patients. The comprehensive nature of the meta-analyses and their related findings may help reduce the discrepancies in in treatment of acute radiation dermatitis and facilitate consistency of therapeutic interventions employed in clinical practice worldwide. Female;Humans;Bandages;Breast Neoplasms;Dermatitis;Knowledge;Low-Level Light Therapy;Review Literature as Topic

Comparison and Evaluation of Effect of Low Level Laser Therapy (LLLT) with Intracanal Medicament on Periapical Healing. Photobiomodulation (PBM), also commonly referred to as low-level laser therapy (LLLT), uses light energy to elicit biological responses from the cell and normalize cell function. 40 persons with periapical lesions were selected and were assigned randomly into two groups.Group I - Conventional root canal therapy and low-level laser therapy. Group II - Conventional root canal therapy Root canal therapy was completed, and radiographs were obtained and assessed 3, 6, and 9 months postoperative. VAS pain scale was assessed postoperatively on 0, 7(th), and 14(th) days respectively. An independent t-test was used for the evaluation of the data. No significant difference was noted for postoperative pain and PAI scale between both groups Significant difference was noted in the reduction of the periapical lesions for 3 and 9 months follow up, but was not significant for 6 months. The healing was better in Group I which received Low-level laser therapy with the conventional root canal treatment. Low-level laser therapy can be the newer additional treatment modality that can be applied to the periapical lesion for its faster healing.

Effect of photobiomodulation on the efficacy of anesthesia in maxillary permanent molar teeth with molar incisor hypomineralization: A randomized clinical trial. BACKGROUND: Difficulty in anesthetizing teeth that have been diagnosed with molar incisor hypomineralization (MIH) is a frequently reported clinical problem. The effects of low-level laser application (photobiomodulation) on the efficacy of anesthesia during the dental treatment of patients with MIH have not yet been studied. AIM: To assess the effects of photobiomodulation therapy (PBMT) on the efficacy of anesthesia in maxillary permanent molar teeth with MIH. DESIGN: This prospective, parallel-arm control, randomized, triple-blind clinical trial included children aged 7-12â€‰years. Maxillary permanent first molar teeth with MIH that required pulpotomy treatment were included. Seventy participants were randomly divided into two groups: experimental (with PBMT) and control (placebo). In the experimental group, before the administration of local infiltration anesthesia, PBMT (diode laser: 940â€‰nm; continuous mode; 0.5â€‰W; 78â€‰J/cm(2)) was applied to the oral mucosa for 60â€‰s each. In the control group, the laser probe was channeled toward the mucosa but was not activated. Pain scores were evaluated during the access cavity preparation of the pulpotomy treatment (when using the dentin cutting handpiece and while entering into the pulp) using the Face, Legs, Activity, Cry, Consolability (FLACC) scale. Additional anesthesia requirements were assessed in both groups. The data obtained were analyzed for statistical significance (pâ€‰<â€‰.05). The chi-squared test was used to determine the effect of PBMT on categorical outcomes. RESULTS: The no-pain scores of the experimental group were higher than those of the control group (29% vs. 20%). Moderate-to-high pain was more frequent in the control group than in the experimental group (43% vs. 20%). While 31% of the experimental group required supplemental anesthesia, 49% of the control group required supplemental anesthesia during pulpotomy of the tooth with MIH. No statistical difference, however, was found between the two groups in terms of

pain scores and the need for supplemental anesthesia (pâ€‰=â€‰.235, pâ€‰=â€‰.143). CONCLUSIONS: Anesthesia with and without PBMT caused no difference in pain during the treatment of maxillary molar teeth with MIH. Child;Humans;Low-Level Light Therapy;Incisor;Molar Hypomineralization;Prospective Studies;Dental Enamel Hypoplasia;Prevalence;Molar;Anesthesia, Dental;Pain

New Insights into Photobiomodulation of the Vaginal Microbiome-A Critical Review. The development of new technologies such as sequencing has greatly enhanced our understanding of the human microbiome. The interactions between the human microbiome and the development of several diseases have been the subject of recent research. In-depth knowledge about the vaginal microbiome (VMB) has shown that dysbiosis is closely related to the development of gynecologic and obstetric disorders. To date, the progress in treating or modulating the VMB has lagged far behind research efforts. Photobiomodulation (PBM) uses low levels of light, usually red or near-infrared, to treat a diversity of conditions. Several studies have demonstrated that PBM can control the microbiome and improve the activity of the immune system. In recent years, increasing attention has been paid to the microbiome, mostly to the gut microbiome and its connections with many diseases, such as metabolic disorders, obesity, cardiovascular disorders, autoimmunity, and neurological disorders. The applicability of PBM therapeutics to treat gut dysbiosis has been studied, with promising results. The possible cellular and molecular effects of PBM on the vaginal microbiome constitute a theoretical and promising field that is starting to take its first steps. In this review, we will discuss the potential mechanisms and effects of photobiomodulation in the VMB. Female;Humans;Autoimmunity;Dysbiosis;Microbiota;Vagina;Low-Level Light Therapy

Effects of low-level laser therapy in adults with rheumatoid arthritis: A systematic review and meta-analysis of controlled trials. Rheumatoid arthritis (RA) is an inflammatory, systemic and chronic disease that mainly affects the joints. It is characterized mainly by pain, edema and joint stiffness, which can lead to significant loss of functional capacity and quality of life. Several physical therapy resources are used in the treatment of AR, such as low-level laser therapy (LLLT) and its analgesic and anti-inflammatory effects. However, the efficacy of LLLT in AR is still controversial. The objective of this study is to evaluate the efficacy of low-level laser therapy in adults with RA. Methods and findings: We searched MEDLINE, EMBASE, CENTRAL, PEDro, LILACS, IBECS, CUMED, SCIELO and ClinicalTrials.gov. Two researchers independently selected studies, extracted data, evaluated the risk of bias and assessed the certainty of evidence using GRADE approach. Disagreements were resolved by a third author. Meta-analyses were performed. Currently available evidence was from 18 RCTs, with a total of 793 participants. We found low-quality evidence suggesting there may be no difference between using infrared laser and sham in terms of pain, morning stiffness, grip strength, functional capacity, inflammation, ROM, disease activity and adverse events. The evidence is very uncertain about the effects of red laser compared to sham in pain, morning stiffness. The evidence is also very uncertain about the effects of laser acupuncture compared to placebo in functional capacity, quality of life, range of motion and inflammation. Conclusions: Thus, infrared laser may not be superior to sham in RA patients. There is insufficient information to support or refute the effectiveness of red laser, laser acupuncture and reflexology for treating patients with RA. Humans;Adult;Low-Level Light Therapy;Quality of Life;Arthritis, Rheumatoid;Inflammation;Pain;Randomized Controlled Trials as Topic

SMOOTH protocol: A pilot randomised prospective intra-patient single-blinded observational study for examining the mechanistic basis of ablative fractional carbon dioxide laser therapy in treating hypertrophic scarring. BACKGROUND: Burn injuries are the fourth most common type of trauma and are associated with substantial morbidity and mortality. The impact of burn injury is clinically significant as burn injuries often give rise to exuberant scarring. Hypertrophic scarring (HTS) is a

particular concern as up to 70% of burns patients develop HTS. Laser therapy is used for treating HTS and has shown positive clinical outcomes, although the mechanisms remain unclear limiting approaches to improve its effectiveness. Emerging evidence has shown that fibroblasts and senescent cells are important modifiers of scarring. This study aims to investigate the cellular kinetics in HTS after laser therapy, with a focus on the association of scar reduction with the presence of senescent cells. METHODS: We will conduct a multicentre, intra-patient, single-blinded, randomised controlled longitudinal pilot study with parallel assignments to achieve this objective. 60 participants will be recruited to receive 3 interventional ablative fractional CO2 laser treatments over a 12-month period. Each participant will have two scars randomly allocated to receive either laser treatment or standard care. Biopsies will be obtained from laser-treated, scarred-no treatment and non-scarred tissues for immune-histological staining to investigate the longitudinal kinetics of p16INK4A+-senescent cells and fibroblast subpopulations (CD90+/Thy1+ and Î±SMA+). Combined subjective scar assessments including Modified Vancouver Scar Scale, Patient and Observer Scar Assessment Scale and Brisbane Burn Scar Impact Profile; and objective assessment tools including 3D-Vectra-H1 photography, DermaScanÂ® Cortex, CutometerÂ® and ColoriMeterÂ®DSMIII will be used to evaluate clinical outcomes. These will then be used to investigate the association between senescent cells and scar reduction after laser therapy. This study will also collect blood samples to explore the systemic biomarkers associated with the response to laser therapy. DISCUSSION: This study will provide an improved understanding of mechanisms potentially mediating scar reduction with laser treatment, which will enable better designs of laser treatment regimens for those living with HTS. TRIAL REGISTRATION: ClinicalTrials.gov: NCT04736251. Carbon Dioxide Humans;Pilot Projects;Lasers, Gas;Prospective Studies;Cicatrix, Hypertrophic;Low-Level Light Therapy;Carbon Dioxide;Randomized Controlled Trials as Topic;Multicenter Studies as Topic;Observational Studies as Topic

Photon spectra effects tested on the vegetal model Allium cepa. The use of artificial light sources in plants is considered a type of photobiomodulation (PBM), a trend in agriculture and food industries, aiming at decontamination, pest control, and increased production yield. However, literature lacks a broader assessment to address the effects of photon light spectra on plant characteristics. Here, we aimed to describe the effects of visible light, infrared, and ultraviolet light upon Allium cepa, a known bioindicator, under various light doses. Samples irradiated under visible and infrared light did not show cytotoxicity, genotoxicity, or mutagenicity in any of the evaluated doses. Light induction at 460 and 635â€‰nm significantly stimulated root development of the test organism. In contrast, 254â€‰nm irradiation proved to be cytotoxic, genotoxic, and mutagenic. This work reveals and quantifies the spectral response of A. cepa seeds, suggesting that it can be proposed as a model for future research on mechanisms of PBM in plants. Mutagens Onions;Plant Roots;Mutagens;Photons;Light;DNA Damage

Does photobiomodulation on the root surface decrease the occurrence of root resorption in reimplanted teeth? A systematic review of animal studies. This review aimed to answer the following question "Does photobiomodulation treatment of the root surface decrease the occurrence of root resorption in reimplanted teeth?" Electronic searches were performed in the MEDLINE/PubMed, Cochrane Library, Scopus, Web of Science, Embase, and Grey Literature Report databases. Risk of bias was evaluated using SYRCLE Risk of Bias tool. The Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) tool was used to assess the certainty of evidence. In total, 6 studies were included. Five studies reported a reduced occurrence of root resorption in teeth that received photobiomodulation treatment of the root surface prior to replantation. Only 1 study reported contradictory results. The photobiomodulation parameters varied widely among studies. GRADE assessment showed a low certainty of evidence. It can be inferred that

photobiomodulation treatment of the root surface prior to replantation of teeth can reduce the occurrence of root resorption. Nonetheless, further clinical studies are needed. TRIAL REGISTRATION: PROSPERO Identifier: CRD42022349891.

Could red and near-infrared emitting fabric technology improve the severity ofÂ psoriasis, polymorphous light eruption, and alopecia areata? AIM: Low-level light therapy (LLLT) may offer an adjunctive therapeutic tool for inflammatory skin conditions. This pilot study assessed the efficacy of a red/near-infrared (NIR)-emitting fabric for psoriasis, polymorphous light eruption (PMLE), and alopecia areata (AA). METHODS: Fourteen patients (five with psoriasis, five with PMLE, and four with AA) were instructed to wear a red/NIR-emitting (LumitonÂ®) garment during the 12-week study. Efficacy was assessed subjectively by patient-reported improvement and objectively by the redness, thickness, and scale of elbow psoriasis plaques, the frequency of PMLE flares, and the Severity of Alopecia Tool (SALT) score. RESULTS: Three patients with psoriasis completed the study while two self-discontinued. The three patients who completed the study noted improvement and two had improvements in lesion redness, thickness, or scale, while one was clinically stable. Three patients with PMLE completed the study, and none had a disease flare during the study period. Three patients with AA completed the study: two reported disease improvement and all three had an improved SALT score. CONCLUSION: Use of a wellness apparel that emits red and NIR light may be associated with improved disease severity in patients with mild elbow psoriasis, PMLE, and limited AA. Limitations of this study include continuation on topical, intralesional, or systemic medications and small sample size. Humans;Alopecia Areata;Pilot Projects;Psoriasis;Erythema;Dermatitis, Contact;Technology

Pulsed transcranial photobiomodulation generates distinct beneficial neurocognitive effects compared with continuous wave transcranial light. Previous research has demonstrated the beneficial effect brought by transcranial photobiomodulation (tPBM). The present study is a further investigation of pulsed transcranial light delivery, from the perspective of wavelength, operation mode, and pulse frequency. A total of 56 healthy young adults (28 males and 28 females) were included in this randomized, sham-controlled experimental study. The wavelength of tPBM was 660Â nm and 850Â nm, and under each wavelength, subjects were randomly assigned to one of the following four treatments: (1) sham control; (2) continuous-wave (CW) tPBM; (3) pulsed-wave (PW) tPBM (40Â Hz); and (4) PW tPBM (100Â Hz). The tPBM duration was 8Â minÂ and the mean power density was fixed at 250 mW/cm(2). Karolinska Sleepiness Scale (KSS) questionnaire, psychomotor vigilance task (PVT), and delayed match-to-sample (DMS) task were completed by subjects before and after the intervention to test whether PW tPBM produced distinct beneficial effects with measures of sleepiness, attention, and memory. 32-channel electroencephalography (EEG) signals were obtained from subjects before, during and after receiving tPBM or sham intervention. Paired sample T test showed that the KSS score, the number of correct responses of PVT, and DMS rate correct score (RCS) of PW tPBM groups improved significantly after intervention (pâ€‰<â€‰0.05). With regard to EEG analysis, paired one-way repeated ANOVA test showed that during the intervention of PW tPBM, the average power within the Gamma band was higher than the baseline (pâ€‰<â€‰0.05). Our study presented that PW tPBM could generate better beneficial cognitive effects and change brain electrical activity under certain circumstances. Female;Male;Young Adult;Humans;Sleepiness;Electroencephalography;Gamma Rays;Health Status;Heart Rate

Melasma treatment with a 1064â€‰nm, picosecond-domain laser with a fractionated multibeam lens array. BACKGROUND AND OBJECTIVES: Picosecond-domain lasers have been fitted with fractionated optics for dermal remodeling. This study evaluates the safety and efficacy of a multiwavelength picosecond-domain laser, using a 1064 nm multibeam lens array, for improving the appearance of melasma. STUDY DESIGN/MATERIALS AND METHODS: Twenty adults with a clinical

diagnosis of melasma were enrolled and received 4 monthly 1064-nm, 450â€‰ps laser treatments delivered with a 10â€‰Ã—â€‰10 fractional array of 150â€‰Âµm microbeams. Cosmetic units with melasma were treated with fluences ranging from 1.7 to 2.9 mJ/microbeam with a repetition rate of 6â€‰Hz. Treatment effect was evaluation of digital images by dermatologists blinded as to the treatment conditions, comparing baseline and 3- and 8-month post-treatment images. Modified melasma area and severity index (mMASI) scores were determined by the study investigator based on clinical photography. Subject self-assessment of treatment effects was also recorded. RESULTS: Blinded reviewers correctly identified the post-treatment image in 16 of the 20 image sets (80%). Ratings demonstrated statistically significant (pâ€‰<â€‰0.001) improvement on an 11-point scale at both the 3- and 8-month timepoints for a mean improvement of 3.7 point (range -8 to 10) or 37% improvement at the 3-month follow-up, and 2.7 (range -8 to 9) or 27% at the 8-month follow-up for all subjects. The average mMASI score showed highly significant reduction at both the 3- and 8-month follow-ups compared to baseline (pâ€‰<â€‰0.01). Most subjects (90%) were satisfied with the treatment outcome in melasma at both follow-ups, which is consistent with the treatment outcome and mMASI scores. CONCLUSION: The fractionated, picosecond-domain, 1064â€‰nm laser is safe and effective for improving melasma and should be considered as an adjunct to topical treatment regimens and sun-protection for management of melasma. Adult;Humans;Lasers, Solid-State;Melanosis;Treatment Outcome;Low-Level Light Therapy;Administration, Topical

Effectiveness of photobiomodulation with low-level lasers on the acceleration of orthodontic tooth movement: a systematic review and meta-analysis of split-mouth randomised clinical trials. Although several studies have evaluated the effect of low-level laser therapy (LLLT) on orthodontic movement acceleration, results are still inconsistent. Such inconsistencies may be attributed to the differences in the LLLT application protocols, especially in terms of wavelength ranges. Objective: (i) to assess the clinical effects of LLLT on the acceleration of orthodontic movement and (ii) to establish the most effective LLLT wavelength to accelerate tooth movement during orthodontic treatments. MEDLINE (PubMed), Scopus, ScienceDirect, and LILACS were searched from inception to October 2022. Inclusion criteria: Split-mouth randomised clinical trials (RCTs) on systemically healthy patients reporting the effect of LLLT in accelerating orthodontic movements, specifically retraction of canines. The risk of bias was assessed using RoB-2. A random effect model was applied. Nineteen RCTs met the inclusion criteria for qualitative synthesis, and eighteen RCTs were included in the quantitative synthesis. Seventeen studies were rated as at some concerns of bias and two studies were classified as having a low risk of bias. In general terms, this systematic review and meta-analysis presents a moderate risk of bias. Findings of this systematic review and meta-analysis point to a tendency for faster orthodontic dental movement in the groups receiving LLLT treatment during the first (OR of 0.28 95% CI (0.07 to 0.48)), second (OR of 0.52 95% CI (0.31 to 0.73)), and third (OR of 0.41 95% CI (0.03 to 0.79)) month follow-up. Wavelengthsâ€‰â‰¤â€‰810Â nm and energy density valuesâ€‰â‰¤â€‰5.3Â J/cm(2) were associated with faster orthodontic tooth movement. Acceleration;Tooth Movement Techniques;Randomized Controlled Trials as Topic;Low-Level Light Therapy;Treatment Outcome

Impact of Low-Level Laser Therapy on Orthodontic Tooth Movement and Various Cytokines in Gingival Crevicular Fluid: A Split-Mouth Randomized Study. BACKGROUND AND OBJECTIVES: A few investigations have detailed the influence of low-level laser therapy (LLLT) on orthodontic tooth movement (OTM), with varying results. The objectives of this study were twofold: to assess the impact of LLLT on OTM and various cytokine levels in gingival crevicular fluid and to contrast the pain levels experienced by patients receiving orthodontic treatment with and without LLLT. MATERIALS AND METHODS: This split-mouth randomized controlled prospective study comprised 40 patients with an average age of 19.7Â±2.4 years with Angle Class I malocclusion combined with bimaxillary

protrusion who were advised for extraction of the maxillary first premolar and bilateral canine distalization. The control-side canine was distalized solely by the coil spring. On the test arm, a low-level gallium-aluminum-arsenide semiconductor diode laser operating at 980 nm and 100 mW with a continuous-wave energy of 8 J/cm(2) was used. The canine distalization on either side was measured with a digital caliper following the first premolar extraction (TO), one month after treatment (TOTM1), two months later (TOTM2), and three months later (TOTM3). The gingival index and the level of various cytokines were determined by an enzyme-linked immunosorbent assay at the beginning of the study, on the third and seventh days, and at four, eight, and 12 weeks following the canine distalization. The intra-group and inter-group comparisons were carried out using one-way analysis of variance (ANOVA) and t-tests, respectively, at a 5% significance level. RESULTS: The results show a highly statistically significant difference in the extent of canine distalization in the test group (TOTM1=2.92Â±0.44; TOTM2=1.04Â±0.1; TOTM3â€‹=0.62Â±0.21 mm) in contrast to the control group (TOTM1=3.23Â±0.8; TOTM2=2.65Â±0.2; TOTM3â€‹â€‹â€‹=2.11Â±0.24 mm) ($p<0.01$). After three months of canine distalization, the laser and control group had 34 and 27 patients with mild gingivitis, respectively. Interleukin-1Î² and interleukin-6 concentrations surged with values of 0.74Â±0.13 and 0.049Â±0.001 pg/g at seven days following treatment in the laser group, respectively. The difference in tumor necrosis factor concentration between the groups was shown to be highly statistically significant in all treatment phases ($p<0.001$). The differences in the epidermal growth factor and microglobulin levels were found to be statistically significant within both groups from T0 to T5.Â The average visual analog scale (VAS) scores at several subsequent evaluations of the laser and control groups were found to be highly statistically significant. CONCLUSION: The findings imply that when the periodontal microenvironment is stimulated by orthodontic force, several paramount cytokines are released, triggering an ordered sequence of biological processes that appear to expedite OTM with reduced associated pain.

Comparing Current Therapeutic Modalities of Androgenic Alopecia: A Literature Review of Clinical Trials. Androgenic alopecia (AGA), commonly known as male pattern baldness (MPB), is a hereditary condition characterized by hair follicles that are sensitive to androgens. This article focuses on examining the recent advancements in the comprehension and management of AGA. The genetic factors and pathophysiology of AGA, including the role of dihydrotestosterone (DHT) and the androgen receptor gene, are discussed. The consequences of hair loss on self-esteem and identity, as well as on mental health, are examined. Diagnostic methods, such as the hair-pull test and trichoscopy, are discussed. The article also presents the Hamilton-Norwood classification, which is the most commonly employed system for classifying MPB. The article then delves into the various treatment options available, including topical minoxidil, oral finasteride, platelet-rich plasma therapy, low-level light therapy, hair transplant, and other alternative treatments. The efficacy and combination therapies for these treatments are examined. Additionally, emerging treatments such as caffeine-based solutions and prostaglandin inhibitors are discussed. By examining the recent advancements in AGA treatment, this article provides a comprehensive overview for healthcare professionals to make informed decisions when selecting the best treatment options for their patients.

Photobiomodulation at Defined Wavelengths Regulates Mitochondrial Membrane Potential and Redox Balance in Skin Fibroblasts. Starting from the discovery of phototherapy in the beginning of the last century, photobiomodulation (PBM) has been defined in late 1960s and, since then, widely described in different in vitro models. Robust evidence indicates that the effect of light exposure on the oxidative state of the cells and on mitochondrial dynamics, suggesting a great therapeutic potential. The translational scale-up of PBM, however, has often given contrasting and confusing results, mainly due to light exposure protocols which fail to adequately control or define factors such

as emitting device features, emitted light characteristics, exposure time, cell target, and readouts. In this in vitro study, we describe the effects of a strictly controlled light-emitting diode (LED)-based PBM protocol on human fibroblasts, one of the main cells involved in skin care, regeneration, and repair. We used six emitter probes at different wavelengths (440, 525, 645, 660, 780, and 900â€‰nm) with the same irradiance value of 0.1â€‰mW/cm(2), evenly distributed over the entire surface of the cell culture well. The PBM was analyzed by three main readouts: (i) mitochondrial potential (MitoTracker Orange staining), (ii) reactive oxygen species (ROS) production (CellROX staining); and (iii) cell death (nuclear morphology). The assay was also implemented by cell-based high-content screening technology, further increasing the reliability of the data. Different exposure protocols were also tested (one, two, or three subsequent 20â€‰s pulsed exposures at 24â€‰hr intervals), and the 645â€‰nm wavelength and single exposure chosen as the most efficient protocol based on the mitochondrial potential readout, further confirmed by mitochondrial fusion quantification. This protocol was then tested for its potential to prevent H(2)O(2)-induced oxidative stress, including modulation of the light wave frequency. Finally, we demonstrated that the controlled PBM induced by the LED light exposure generates a preconditioning stimulation of the mitochondrial potential, which protects the cell from oxidative stress damage. Hydrogen Peroxide Humans;Membrane Potential, Mitochondrial;Hydrogen Peroxide;Reproducibility of Results;Fibroblasts;Oxidation-Reduction

The effectiveness of shockwave therapy on patellar tendinopathy, Achilles tendinopathy, and plantar fasciitis: a systematic review and meta-analysis. BACKGROUND: Tendinopathy is a growing global concern affecting many people, like athletes, workers, and the elderly. Despite its commonality among the sporting population, there is no practical clinical guideline for patellar tendinopathy (PT). Furthermore, there is conflicting evidence between clinical guidelines on shockwave therapy's application and clinical utility for Achilles tendinopathy (AT) and plantar fasciitis (PF). Thus, our aim of this study is to evaluate the evidence for shockwave therapy; to provide a Grading of Recommendation, Assessment, Development and Evaluation (GRADE) level of the evidence and effectiveness of shockwave therapy for patellar tendinopathy, Achilles tendinopathy, and Plantar fasciitis. METHOD: Medical Literature Analysis and Retrieval System Online (Medline), Embase, The Cumulative Index to Nursing and Allied Health Literature (CINAHL), Physiotherapy Evidence Database (PEDro) and China National Knowledge Infrastructure database (CNKI) were searched to find relevant studies published before December 14(th), 2022. RESULTS: Our study showed that for PT in the short term, extracorporeal shockwave therapy (ESWT) or ESWT + eccentric exercise (EE) has a negligible effect on pain and function compared to a placebo or placebo + EE. On the contrary, ESWT significantly affects pain compared to conservative treatment (CT). For AT, ESWT has a small inconclusive effect on pain and function in the short term compared to EE. On the other hand, a placebo outperformed ESWT in improving function for AT but not pain outcomes. PF showed that ESWT significantly affects short- and long-term pain and function. When ESWT was compared to other interventions such as low laser therapy (LLLT), corticosteroid injection (CSI), or CT, there was a small inconclusive effect on pain and function in the short term. CONCLUSION: There is low-moderate evidence that ESWT has a negligible effect on pain and function for PT and AT. However, high-quality evidence suggests ESWT has a large effect on pain and function for PF. SYSTEMATIC REVIEW REGISTRATION: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42023396835, identifier CRD42023396835. Aged;Humans;Achilles Tendon;Extracorporeal Shockwave Therapy;Fasciitis, Plantar;High-Energy Shock Waves;Musculoskeletal Diseases;Tendinopathy

OLED catheters for inner-body phototherapy: A case of type 2 diabetes mellitus improved via duodenal photobiomodulation. Phototherapeutics has shown promise in treating various diseases without surgical or drug interventions. However, it is challenging to use it in inner-body

applications due to the limited light penetration depth through the skin. Therefore, we propose an organic light-emitting diode (OLED) catheter as an effective photobiomodulation (PBM) platform useful for tubular organs such as duodenums. A fully encapsulated highly flexible OLED is mounted over a round columnar structure, producing axially uniform illumination without local hotspots. The biocompatible and airtight OLED catheter can operate in aqueous environments for extended periods, meeting the essential requirements for inner-body medical applications. In a diabetic Goto-Kakizaki (GK) rat model, the red OLED catheter delivering 798 mJ of energy is shown to reduce hyperglycemia and insulin resistance compared to the sham group. Results are further supported by the subdued liver fibrosis, illustrating the immense potential of the OLED-catheter-based internal PBM for the treatment of type 2 diabetes and other diseases yet to be identified.
Animals;Rats;Catheters;Diabetes Mellitus, Type 2;Duodenum;Hyperglycemia;Phototherapy

Comparative analysis of photobiomodulation therapy and transcutaneous electrical nerve stimulation for burning mouth: a randomized clinical trial. OBJECTIVE: To compare the effect of photobiomodulation (PBM) and transcutaneous electrical nerve stimulation (TENS) in the treatment of burning mouth. MATERIALS AND METHODS: Randomized clinical trial of 25 patients with burning mouth treated by TENS (n=12) and PBM (n=13). The patients were treated weekly for 8 weeks. Two-factor ANOVA was used to determine whether the two interventions promoted significant differences in symptoms (measured with a visual analogue scale), unstimulated salivary flow, xerostomia, and dysgeusia between T0 (baseline), T1 (after the 4th treatment session), T2 (after the 8th treatment session), and T3 (30 days after the end of treatment). RESULTS: Intragroup comparison of VAS scores for pain showed a significant difference between T0xT1, T0xT2, and T0xT3 in the TENS group and between T0xT2 and T0xT3 in the PBM group (pË,0.001). Intergroup comparison of VAS scores for pain between T2xT3 showed a better response to PBM than to TENS (p=0.003). Patients of the TENS group showed an increase in salivary flow between T1 and T2 (p=0.052). There were no expressive variations in xerostomia or dysgeusia in the two groups analyzed. CONCLUSION: TENS and PBM were effective in reducing the symptoms of burning mouth during and after treatment. The PBM group showed a better response during follow-up. TRIAL REGISTRATION: This clinical trial was registered at http://clinicaltrials.gov (Number: NCT05816200). CLINICAL RELEVANCE: TENS was found to be a safe and effective therapy for burning mouth. Trial registration number (TRN) and date of registration: This clinical trial was registered at http://clinicaltrials.gov (Number: NCT05816200; date: May 08, 2023).

Effect of high-intensity laser therapy in patients with non-specific chronic neck pain: study protocol for a randomized controlled trial. BACKGROUND: Chronic non-specific neck pain (CNNP) is a prevalent musculoskeletal disorder known for its significant disability and economic burden, ranking second only to low back pain in musculoskeletal conditions. Physical therapy offers effective interventions for CNNP, including low-level laser therapy (LLLT). High-intensity laser therapy (HILT) is a recent treatment for musculoskeletal pain, but studies that support its use in CNNP are limited. The objective of this study is to assess the effect of high-intensity laser therapy on pain intensity in patients with CNNP, given the existing evidence on LLLT for this condition. METHODS: This is a 2-arm, randomized, placebo-controlled trial with blinded evaluators. The research will be carried out in the laboratory of physical agents at the AndrÃ©s Bello University, Campus Casona de las Condes. Eligible participants include the entire internal and external community associated with AndrÃ©s Bello University suffering from chronic non-specific NP. Participants will be stratified by sex (4 subgroups) and randomized into 2 study groups: group 1 (HILT and stretching exercises) and group 2 (sham HILT and stretching exercises). Treatments will be performed twice a week for 4Â weeks with 3 assessments: before treatment (T0), at the end of treatment (T1), and 12Â weeks after treatment (follow-up) (T2). The main outcomes will be pain intensity at rest, pain intensity at movement (active

cervical movements: flexion, extension, right and left side bending, and right and left rotation), and pain pressure threshold (average obtained for six evaluation points). Secondary outcome measures will include neck range of motion in the sagittal, coronal, and transverse planes and neck disability. DISCUSSION: In this study, HILT's effects on patients with non-specific NP will be compared to those of a sham laser intervention. This RCT will offer new evidence regarding the potential benefits of HILT in terms of pain intensity, range of movement, and disability in people suffering with non-specific NP. TRIAL REGISTRATION: ClinicalTrials.gov NCT05689788.Â January 19, 2023. Humans;Laser Therapy;Musculoskeletal Pain;Neck;Neck Pain;Randomized Controlled Trials as Topic

Efficacy of Transcranial Photobiomodulation on Depressive Symptoms: A Meta-Analysis. Background: Transcranial photobiomodulation (tPBM) is a novel, noninvasive, device-based intervention, which has been tested as a possible treatment for various neurological and psychiatric conditions. Recently, it has been investigated as an innovative treatment for major depressive disorder (MDD). There have been several animal and clinical studies that evaluated the underlying mechanism and the efficacy of its antidepressant effects, but results have been conflicting. Objective: Thus, we conducted the first meta-analysis on effects of tPBM on depressive symptoms. Materials and methods: Thirty original articles on tPBM were retrieved, eight of them met criteria for inclusion to a random effects meta-analysis. Results: tPBM appeared effective in decreasing depressive symptom severity regardless of diagnosis (Hedges' gâ€‰=â€‰1.415, pâ€‰<â€‰0.001, kâ€‰=â€‰8), but a significant heterogeneity has been found. The meta-analysis of single-arm studies (baseline to endpoint changes) limited to participants with MDD has supported the significant effect of tPBM in reducing the depression severity, without a significant heterogeneity (Hedges' gâ€‰=â€‰1.142, 95% confidence intervalâ€‰=â€‰0.780-1.504, zâ€‰=â€‰6.19, pâ€‰<â€‰0.001, kâ€‰=â€‰5). However, the meta-analysis of the few double-blind, sham-controlled studies in MDD has not supported the statistically significant superiority of tPBM over sham (Hedges' gâ€‰=â€‰0.499, pâ€‰=â€‰0.211, kâ€‰=â€‰3), although a sample size bias is likely present. Conclusions: Overall, this meta-analysis provides weak support for the promising role of tPBM in the treatment of depressive symptoms. Dose finding studies to determine optimal tPBM parameters followed by larger, randomized, sham-controlled studies will be needed to fully demonstrate the antidepressant efficacy of tPBM. Animals;Humans;Depressive Disorder, Major;Depression;Randomized Controlled Trials as Topic

Effect of LED photobiomodulation on dental implant osseointegration: An in vivo study. BACKGROUND: Photobiomodulation (PBM) may be prescribed after dental surgery to accelerate tissue healing and improve implant stability. The objective of this study is to evaluate the efficiency of LED-PBM on the dental implant osseointegration. METHODS: A total of 48 implants (Kontact(TM)) were inserted in 8 Yucatan minipigs (6 implants per minipig) divided into 2 groups (test and control). The test group received LED-PBM with a total energy of 124.2 J/cm(2) delivered over 4 sessions (at day0, day+8, day+15 and day+28) lasting 12 minutes each. At day+28, all animals were sacrificed, and their mandibles removed to perform histologic and histomorphometric analysis. Implant osseointegration was evaluated using the computation of bone/implant contact (BIC) index and bone surface/total surface (BS/ TS) ratio. The groups were compared using Student's unpaired t test. RESULTS: BIC index and BS/TS ratio were significantly higher within the test group as compared to the control group (P<0.01). Histologic observations on bone tissues demonstrated that LED-PBM may improve and accelerate dental implant osseointegration: 25% of dental implants analyzed within the test group were completely osseointegrated, versus 12.5% within the control group. CONCLUSION: This experimental study indicates that LED-PBM contributes to enhancing implant treatment outcomes.

Defect-Rich SnO(2) Nanofiber as an Oxygen-Defect-Driven Photoenergy Shield against UV Light Cell Damage. Usually, most studies focus on toxic gas and photosensors by using electrospinning and metal oxide polycrystalline SnO(2) nanofibers (PNFs), while fewer studies discuss cell-material interactions and photoelectric effect. In this work, the controllable surface morphology and oxygen defect (V(O)) structure properties were provided to show the opportunity of metal oxide PNFs to convert photoenergy into bio-energy for bio-material applications. Using the photobiomodulation effect of defect-rich polycrystalline SnO(2) nanofibers (PNFs) is the main idea to modulate the cell-material interactions, such as adhesion, growth direction, and reactive oxygen species (ROS) density. The V(O) structures, including out-of-plane oxygen defects (op-V(O)), bridge oxygen defects (b-V(O)), and in-plane oxygen defects (ip-V(O)), were studied using synchrotron analysis to investigate the electron transfer between the V(O) structures and conduction bands. These intragrain V(O) structures can be treated as generation-recombination centers, which can convert various photoenergies (365-520 nm) into different current levels that form distinct surface potential levels; this is referred to as the photoelectric effect. PNF conductivity was enhanced 53.6-fold by enlarging the grain size (410 nm(2)) by increasing the annealing temperature, which can improve the photoelectric effect. In vitro removal of reactive oxygen species (ROS) can be achieved by using the photoelectric effect of PNFs. Also, the viability and shape of human bone marrow mesenchymal stem cells (hMSCs-BM) were also influenced significantly by the photobiomodulation effect. The cell damage and survival rate can be prevented and enhanced by using PNFs; metal oxide nanofibers are no longer only environmental sensors but can also be a bio-material to convert the photoenergy into bio-energy for biomedical science applications.

Nonoperative Management of Lateral Epicondyle Tendinopathy: An Umbrella Review. OBJECTIVE: The primary objective of this review was to summarize systematic reviews and meta-analyses reporting on nonoperative management of lateral epicondyle tendinopathy. METHODS: An umbrella review of all published systematic reviews and meta-analyses was performed. Three databases were searched using the key words "tennis elbow," "lateral epicondylitis," "non-operative," and "non-surgical modalities." The search was limited to English-language systematic reviews and meta-analyses between the years of 2000 and 2022. RESULTS: There were 114 systematic reviews/meta-analyses, of which 35 met our inclusion criteria. These articles reviewed the following nonoperative management strategies: ultrasound, shockwave therapy, injection procedures, low-level laser therapy, joint mobilizations, exercise therapy, and electrophysical modalities. Exercise therapy was beneficial in decreasing pain regardless of dosage or type. Conflicting results were seen with ultrasound, laser, and shockwave therapy. Corticosteroid injections provided the most short-term pain relief, and platelet-rich plasma and autologous blood injections were most effective in the long term. CONCLUSION: A variety of nonoperative interventions were found to be effective for short- and long-term pain relief as well as functional improvement, with most interventions indicating mixed results. Due to variations in study populations and study quality, results should be interpreted with caution.

Adjunctive phototherapies for oral manifestation of HIV-related histoplasmosis and leishmaniasis: An unusual case report. BACKGROUND: Secondary infections of leishmaniasis and histoplasmosis in patients with advanced HIV are still a concern in low- and middle-income countries. The most common drugs for the treatment of both infections may be problematic mainly due to their toxicity. AIM AND CASE REPORT: The present study aimed to report a case in which a concurrent oral manifestation of leishmaniasis and histoplasmosis in a hospitalized patient with HIV was managed with a combination of photobiomodulation therapy (PBMT) and antimicrobial photodynamic therapy (aPDT) as an adjuvant treatment. In addition to the use of conventional systemic oral drugs, a single aPDT session followed by two PBMT sessions was proposed, which resulted in complete wound

healing within four days. CONCLUSION: Given the complexity of the current case, PBMT in combination with aPDT may be considered as an effective adjuvant option for managing oral infectious lesions of histoplasmosis and leishmaniasis in immunocompromised patients. Photosensitizing Agents Humans;Histoplasmosis;AIDS-Related Opportunistic Infections;Photochemotherapy;Photosensitizing Agents;Leishmaniasis

Low-Level Laser Therapy for the Treatment of Oral Mucositis Induced by Hematopoietic Stem Cell Transplantation: A Systematic Review with Meta-Analysis. Oral mucositis is a common and debilitating side effect induced by stem cell transplantation that is experienced by cancer patients undergoing chemotherapy or radiation therapy. This condition involves inflammation and ulceration of the oral mucosa, leading to pain, difficulty with eating and speaking, and an increased risk of infections. Mucositis not only compromises the quality of life for cancer patients, but also affects treatment outcomes and may necessitate dose reductions or treatment delays. This scientific article provides a comprehensive overview of mucositis. The purpose of this literature review with a meta-analysis is to evaluate the efficacy of laser therapy in treating post-transplant mucositis. Materials and methods: A search of the literature from 3 May 2023 was carried out on three online databases, PubMed, Scopus, and Web of Science. Only studies that treated patients with laser therapy were considered; only studies with the placebo-treated control group were considered. Review Manager version 5.2.8 (Cochrane Collaboration) was used for the pooled analysis. We measured the std. mean difference between the two groups (laser and placebo). Results: There were 230 papers included in this review. Two hundred twenty-seven were excluded. Furthermore, a manual search was performed. After the search phase, three articles were considered in the study. The overall effect showed differences in the degree of mucositis in the laser-treated patients compared with the placebo group. The meta-analysis shows a reduction in the degree of mucositis in the patients treated with laser therapy (std. mean difference -1.34 [-1.98; -0.98]; C.I. 95%). Conclusions: The application of laser therapy results in decreased severity of oral mucositis from radiation and chemotherapy. Our study shows that the application of low-level laser therapy in the treatment of transplant mucositis has excellent efficacy in relieving the symptoms and severity of mucositis. Humans;Hematopoietic Stem Cell Transplantation;Low-Level Light Therapy;Quality of Life;Stomatitis

Micropulse Laser Therapy as an Integral Part of Eye Disease Management. Ocular diseases can significantly impact vision and quality of life through pathophysiological alterations to the structure of the eye. The management of these conditions often involves a combination of pharmaceutical interventions, surgical procedures, and laser therapy. Laser technology has revolutionized many medical fields, including ophthalmology, offering precise and targeted treatment options that solve some of the unmet needs of other therapeutic strategies. Conventional laser techniques, while effective, can generate excessive thermal energy, leading to collateral tissue damage and potential side effects. Compared to conventional laser techniques, micropulse laser therapy delivers laser energy in a pulsed manner, minimizing collateral damage while effectively treating target tissues. The present paper highlights the advantages of micropulse laser therapy over conventional laser treatments, presents the implications of applying these strategies to some of the most prevalent ocular diseases, and highlights several types and mechanisms of micropulse lasers. Although micropulse laser therapy shows great potential in the management of ocular diseases, further research is needed to optimize treatment protocols, evaluate long-term efficacy, and explore its role in combination therapies. Humans;Quality of Life;Eye Diseases;Laser Therapy;Low-Level Light Therapy;Disease Management

Green Synthesis of Gold Nanoparticles with Curcumin or AÃ§ai in the Tissue Repair of Palatal Wounds. This study aimed to evaluate and compare the effects of treatment with gold nanoparticles (GNPs) reduced with Curcumin (Curcuma longa L.) or AÃ§ai (Euterpe oleracea) to a

standard commercial treatment of the pharmacological type (Omcilon(Â®)) and an electrophysical agent (photobiomodulation) in the palatal wounds of rats. As for the in vitro assay, a cell viability test was performed to assess the toxicity of the synthesized nanoparticles. In vivo assay: 60 Wistar rats were divided into five groups (n = 12): I. Palatal Wound (PW); II. PW + Photobiomodulation (PBM); III. PW + Omcilon(Â®); IV. PW + GNPs-Cur (0.025 mg/mL); V. PW + GNPs-AÃ§ai (0.025 mg/mL). Animals were first anesthetized, and circular lesions in the palatine mucosa were induced using a 4 mm-diameter punch. The first treatment session started 24 h after the injury and occurred daily for 5 days. The animals were euthanized, and the palatal mucosa tissue was removed for histological, biochemical, and molecular analysis. GNPs-AÃ§ai were able to significantly reduce pro-inflammatory cytokines and increase anti-inflammatory ones, reduce oxidant markers, and reduce inflammatory infiltrate while increasing the collagen area and contraction rate of the wound, along with an improved visual qualification. The present study demonstrated that the proposed therapies of GNPs synthesized greenly, thus associating their effects with those of plants, favor the tissue repair process in palatal wounds.

Laser Biostimulation Induces Wound Healing-Promoter Î²2-Defensin Expression in Human Keratinocytes via Oxidative Stress. The innate immune system is the first line of defense of the body composed of anatomical barriers, such as skin and mucosa, as well as effector cells, antimicrobial peptides, soluble mediators, and cell receptors able to detect and destroy viruses and bacteria and to sense trauma and wounds to initiate repair. The human Î²-defensins belong to a family of antimicrobial small cationic peptides produced by epithelial cells, and show immunomodulatory and pro-healing activities. Laser biostimulation is a therapy widely used to contrast microbial infection and to accelerate wound healing through biological mechanisms that include the creation of oxidative stress. In this paper, we explored laser biostimulation's ability to modulate the production of two Î²-defensins, hBD-1 and hBD-2, in human keratinocytes and whether this modulation was, at least in part, oxidative-stress-dependent. Human spontaneously immortalized keratinocytes (HaCaT) were stimulated using laser irradiation at a 980 nm wavelength, setting the power output to 1 W (649.35 mW/cm(2)) in the continuous mode. Cells were irradiated for 0 (negative control), 5, 10, 25 and 50 s, corresponding to an energy stimulation of 0, 5, 10, 25 and 50 J. Positive control cells were treated with lipopolysaccharide (LPS, 200 ng/mL). After 6 and 24 h of treatment, the cell conditioned medium was collected and analyzed via ELISA assay for the production of hBD-1 and hBD-2. In another set of experiments, HaCaT were pre-incubated for 45 min with antioxidant drugs-vitamin C (Vit. C, 100 ÂµM), sodium azide (NaN(3), 1 mM); Ï‰-nitro-L-arginine methyl ester (L-NAME, 10 mM) and sodium pyruvate (NaPyr, 100 ÂµM)-and then biostimulated for 0 or 50 s. After 6 h, the conditioned medium was collected and used for the ELISA analysis. The hBD-1 and hBD-2 production by HaCaT was significantly increased by single laser biostimulation after 6 h in an energy-dependent fashion compared to basal levels, and both reached production levels induced by LPS. After 24 h, only hBD-2 production induced by laser biostimulation was further increased, while the basal and stimulated hBD-1 levels were comparable. Pre-incubation with antioxidative drugs was able to completely abrogate the laser-induced production of both hBD-1 and hBD-2 after 6 h, with the exception of hBD-1 production in samples stimulated after NaN(3) pre-incubation. A single laser biostimulation induced the oxidative-stress-dependent production of both hBD-1 and hBD-2 in human keratinocytes. In particular, the pro-healing hBD-2 level was almost three times higher than the baseline level and lasted for 24 h. These findings increase our knowledge about the positive effects of laser biostimulation on wound healing.

Protocol for a Single-Arm Feasibility Study of Photobiomodulation for Fatigue, Depression, and Pain in Inflammatory Bowel Disease. BACKGROUND: There are limited treatment options for mental health comorbidities associated with Inflammatory Bowel Disease (IBD), although they have been

shown to negatively affect the course of IBD and multiple important areas of functioning. Photobiomodulation (PBM) is a new therapeutic intervention using laser-generated low-powered light therapy that has shown early promise in alleviating fatigue, depression, and pain in chronic illness. METHODS: This prospective, single-arm pilot study aims to assess the feasibility and efficacy of PBM in the treatment of fatigue, depression, and pain in youth with IBD. We will recruit 28 young adults with IBD who will receive PBM in addition to treatment as usual. The primary outcome will be fatigue, while secondary outcomes will include depression, pain, quality of life, inflammatory markers, alterations in microbiome composition, physical activity, and functioning. Outcome measures will be assessed at baseline, after a 10-week control period (pre-PBM), at 20 weeks (post-PBM), and at 30 weeks. Feasibility will be assessed by attendance, recruitment rates, and participants' views of PBM. Mixed-effects linear regression modelling will be used to assess the PBM effect on continuous outcomes (fatigue, depression, anxiety and stress scores, and inflammation levels). RESULTS: The study will provide preliminary indicators of PBM feasibility and efficacy in IBD.

Comparison of three different dosages of low-level laser therapy on expression of cell proliferation and inflammatory markers following ovariohysterectomy in rats. The objective of the current study was to evaluate Low-level laser therapy (LLLT) on the healing of incisional wounds following ovariohysterectomy in rats, by means of subjective histopathological and immunohistochemical analysis. A total of 72 female Wistar rats were categorised into four treatment groups (Group I; sacrification 4â€‰hours following only one LLLT application, Group II; sacrification 7â€‰days following only one LLLT application, Group III; sacrification 4â€‰hours after two LLLT applications, and Group IV; sacrification 7â€‰days after two LLLT applications). Each group was further divided into four different doses subgroups (Group Control [C, off mode LLLT application], L(1) [1 J/cm(2)], L(3) [3 J/cm(2)], and L(6) [6 J/cm(2)]), with equal representation in each subgroup. Ovariohysterectomy was employed using two 2-cm-length midline abdominal incisions in the left and right sides of line alba. The Group C was assigned to the left side incision to each rat in the study. After irradiation, the tissue was subjected to histopathological analysis to determine the extent of mononuclear cell infiltration, edoema, and epithelialization. Additionally, immunohistochemical analysis was performed to evaluate the expression of proliferating cell nuclear antigen (pCNA) and inducible nitric oxide synthase (iNOS). Group L(1) and L(3) significantly decreased mononuclear cell infiltration compared with Group C in all treatment groups (pâ€‰<â€‰0.05). Group L(3) significantly decreased edoema compared with Group C in all groups except for treatment Group I (pâ€‰<â€‰0.05). Group L(2) and L(3) significantly increased epithelization in treatment Group IV (pâ€‰<â€‰0.05). Moreover, Group L(2) and L(3) significantly increased pCNA in all groups, while L(2) and L(3) significantly decreased iNOS expression in treatment Group II, III, and IV (pâ€‰<â€‰0.05). However, no statistical difference was found between subgroups of treatment Group I in iNOS expiration (pâ€‰>â€‰0.05). The results of the current examination demonstrated that LLLT can modulate mononuclear cell infiltration and edoema, and improve epithelization, as well as increase pCNA expression, whereas decrease iNOS expression during the wound healing process, therefore enhancing wound healing following ovariohysterectomy in rats. Proliferating Cell Nuclear Antigen Rats;Female;Animals;Rats, Wistar;Low-Level Light Therapy;Proliferating Cell Nuclear Antigen;Wound Healing;Cell Proliferation

Efficacy of Combined Photobiomodulation Therapy with Supplements versus Supplements alone in Restoring Thyroid Gland Homeostasis in Hashimoto Thyroiditis: A Clinical Feasibility Parallel Trial with 6-Months Follow-Up. Hashimoto thyroiditis (HT) is a thyroid-specific autoimmune disorder, triggering hypothyroidism in a population with an adequate dietary intake. Despite the current conventional treatment focuses on the permanent replacement of levothyroxine (LT4) deficiency, it appears that thyroid autoimmunity remains the cause of persistent symptoms in patients with HT,

even when they achieve to be euthyroid from a biochemical standpoint. Photobiomodulation (PBM) showed to be an effective therapy in the management of autoimmune diseases, but with limited evidence. Hence, our study was conducted to appraise the efficacy of PBM therapy with supplements in restoring thyroid gland homeostasis in patients with HT compared with supplements alone. Seventy-four female subjects aged between 20 and 50 years old were recruited and divided equally into two groups: PBM and supplements group (group 1); and supplements alone group (group 2). The PBM dosimetry and treatment protocols were as follows: wavelength, 820 nm; power output, 200 mW; continuous emission mode; irradiating time, 20 s per point; fluence, 32 J/cm(2) per point; treatment frequency, twice a week (excluding weekends); and treatment duration, three consecutive weeks. Whereas, the supplements protocol for both groups was the same, as follows: subjects with a serum level of vitamin D3 <40 ng/dL, who received replacement according to their serum levels, and all the subjects had a daily intake of 100 Âµg of oral selenium. The biochemical (FT3, FT4, antiTPO and antiTG) and anthropometric measurements were evaluated. Our findings showed significant improvement in group 1 parameters (PBM+ supplements) compared with group 2 (supplements only) in terms of weight loss and reduction in the following parameters: BMI, hip and waist circumference, waist/hip ratio, TSH, antiTPO, antiTG and treatment dose of LT4 ($p < 0.05$). Our results, for the first time, demonstrated an efficacy of PBM delivered at a lower fluence with supplements in restoring thyroid function, anthropometric parameters and lifestyle factors in patients with HT. Hence, extensive studies with a longer follow-up period are warranted.

Effect of Photobiomodulation on the Depth of Local Anesthesia during Endodontic Treatment of Teeth with Symptomatic Irreversible Pulpitis. AIM: To determine whether photobiomodulation (PBM) therapy could increase the depth of analgesia during endodontic therapy of teeth affected with symptomatic irreversible pulpitis. MATERIALS AND METHODS: Forty-nine patients with symptomatic irreversible pulpitis were randomized into two groups. In the laser group, before administering anesthesia, the lower molars' crowns were continuously treated with a diode laser (980 nm) for 20 s with a low-level laser tip in the buccal aspect close to the gingival margin. While the teeth of the second group who was blinded to the type of treatment received placebo treatment wherein the laser device was switched off. The visual analogue scale (VAS) was used to assess pain in both groups before the endodontic procedure, during dentin cutting, and at dropping pulp, wherein, the success was defined as no or mild pain. The Chi-square and independent sample t-tests were used to assess the data. RESULTS: During dentin cutting and pulp dropping, the group receiving the laser therapy presented with less mean pain score than the placebo group which was statistically significant. Additionally, it was observed that the need for supplementary injection was less frequent in the laser-treated group than in the placebo group ($p = 0.01$). CONCLUSION: The irradiation by diode laser (980 nm) prior to administration of local anesthesia appears to be useful in minimizing discomfort and additional injection during root canal therapy (RCT). CLINICAL SIGNIFICANCE: Pain management is essential for providing the best possible treatment to patients before, during, and after endodontic therapy. Adequate pain control during treatment also aids in reducing postoperative discomfort. This implies the need for additional methods to reduce discomfort during endodontic treatment; hence, adjuncts are crucial to achieving this goal. Photobiomodulation may be used as an adjuvant to reduce discomfort and supplementary injections during RCT.
Humans;Pulpitis;Anesthesia, Local;Dental Care;Dental Pulp;Pain

Effectiveness of Photobiomodulation Therapy on Neuropathic Pain, Nerve Conduction and Plantar Pressure Distribution in Diabetic Peripheral Neuropathy - A Systematic Review. BACKGROUND: Diabetic peripheral neuropathy is a severe complication of type 2 diabetes mellitus. The most common symptoms are neuropathic pain and altered sensorium due to damage to small nerve fibers. Altered plantar pressure distribution is also a major risk factor in diabetic peripheral neuropathy,

leading to diabetic foot ulcers. OBJECTIVE: The objective of this systematic review was to analyze the various studies involving photobiomodulation therapy on neuropathic pain and plantar pressure distribution in diabetic peripheral neuropathy. METHODS: We conducted a systematic review (PubMed, Web of Science, CINAHL, and Cochrane) to summarise the evidence on photobiomodulation therapy for Diabetic Peripheral Neuropathy with type 2 diabetes mellitus. Randomized and non-randomized studies were included in the review. RESULTS: This systematic review included eight studies in which photobiomodulation therapy showed improvement in neuropathic pain and nerve conduction velocity. It also reduces plantar pressure distribution, which is a high risk for developing foot ulcers. CONCLUSION: We conclude that photobiomodulation therapy is an effective, non-invasive, and costefficient means to improve neuropathic pain and altered plantar pressure distribution in diabetic peripheral neuropathy. Humans;Diabetic Neuropathies;Low-Level Light Therapy;Diabetes Mellitus, Type 2;Neuralgia;Neural Conduction

Photobiomodulation effects on cancer cells through modifications of their bioelectric properties: Comment on "The distinguishing electrical properties of cancer cells" by E. di Gregorio, S. Israel, M. Staelens, et al.

Use of low-level light therapy in management of central centrifugal cicatricial alopecia: A case series of four patients. Humans;Low-Level Light Therapy;Alopecia;Cicatrix;Dermatitis

Effects of photobiomodulation by low-power lasers and LEDs on the viability, migration, and invasion of breast cancer cells. Among the malignant tumors, breast cancer is the most commonly diagnosed worldwide, being the most prevalent in women. Photobiomodulation has been used for wound healing, swelling and pain reduction, and muscle repair. The application of photobiomodulation in cancer patients has been controversial. Therefore, a better understanding of radiation-induced effects involved in photobiomodulation on cancer cells is needed. Thus, this study aimed to investigate the effects of exposure to low-power lasers and LEDs on cell viability, migration, and invasion in human breast cancer cells. MCF-7 and MDA-MB-231 cells were irradiated with a low-power red laser (23, 46, and 69Â J/cm(2), 0.77 W/cm(2)) and blue LED (160, 321, and 482Â J/cm(2), 5.35 W/cm(2)), alone or in combination. Cell viability was assessed using the WST-1 assay, cell migration was evaluated using the wound healing assay, and cell invasion was performed using the Matrigel transwell assay. Viability and migration were not altered in MCF-7 and MDA-MB-231 cultures after exposure to low-power red laser and blue LED. However, there was a decrease in cell invasion from the cultures of the two cell lines evaluated. The results suggest that photobiomodulation induced by low-power red laser and blue LED does not alter cell viability and migration but decreases cell invasion in human breast cancer cells. Humans;Female;Breast Neoplasms;Cell Line;Cell Movement;Cell Survival;Lasers

Effectiveness of low-intensity laser photobiomodulation in reducing inflammatory events (pain, edema, and trismus) after orthognathic surgery: a systematic review and meta-analysis of randomized clinical trials. OBJECTIVE: This systematic review aimed to answer whether, in (P) individuals undergoing orthognathic surgery, (I) low-level laser therapy (LLLT) during or shortly after the surgical procedure compared to (C) pharmacologic therapy alone or no therapy for improvement of post-intervention complications relieves (O) postoperative inflammatory events in (S) randomized clinical trials. MATERIAL AND METHODS: A preliminary electronic search was conducted for references with language following a Latin (Roman) alphabet in seven databases index, and gray literature without restriction on language or publication period. Risk of bias was performed by RoB 2.0 tool, and meta-analysis used mean differences (MD) for edema and mouth opening and standardized mean differences (SMD) for pain scores (pâ€‰<â€‰0.05, RevmanÂ®). RESULTS: A total of 91 control patients and 114 LLLT patients were included. The wavelengths ranged from 660 to 940Â nm, and the applied energy density was between 5 and 100Â J/cm(2) at mostly extraoral

distributed points. LLLT significantly reduced edema (MDâ€‰=â€‰â€‰-â€‰4.27, CI95%â€‰-â€‰5.13 toâ€‰-â€‰3.41Â mm) in the period from 5Â days to 2Â weeks postoperatively (pâ€‰<â€‰0.001) and showed strongly reduced pain scores (SMDâ€‰=â€‰â€‰-â€‰1.37, I95%â€‰=â€‰â€‰-â€‰1.99 toâ€‰-â€‰0.75) between 1Â day and 5Â weeks (pâ€‰<â€‰0.001), without significantly interfering with mouth opening (pâ€‰=â€‰0.110). Despite the low risk of bias, high heterogeneity among studies (I(2)â€‰>â€‰70%) and small sample sizes made the certainty of GRADE evidence low. CONCLUSION: This SR demonstrated that LLLT effectively controls pain and edema after orthognathic surgery. CLINICAL RELEVANCE: Systematic review that summarizes the use of photobiomodulation on orthognathic surgery.

Nd:YAG-photobiomodulation enhanced ADSCs multilineage differentiation and immunomodulation potentials. To investigate the effects of Nd: YAG (1064Â nm) photobiomodulation on multilineage differentiation and immunomodulation potentials of adipose tissue-derived stem cells (ADSCs) in vitro and in vivo. For in vitro experiments, cells were divided into the control group (non-irradiated control ADSCs) and photobiomodulation groups. 0.5Â J/cm(2), 1Â J/cm(2), 2Â J/cm(2), and 4Â J/cm(2) were used for proliferation assays; for ADSCs adipogenic differentiation assays, 0.5Â J/cm(2), 1Â J/cm(2) were applied; 1Â J/cm(2) was used for migration and immunomodulation assays. The differentiation abilities were assessed by qPCR, Oil Red O staining, and Alizarin Red staining. The immunomodulation potential was assessed by qPCR and human cytokine array. DSS-induced colitis model. was used to test the effect of photobiomodulation on ADSCs immunomodulation potentials in vivo.Â Nd:YAG-based photobiomodulation dose-dependently promoted ADSCs proliferation and migration; 1Â J/cm(2) showed the best promotion effect on proliferation. Moreover, Nd:YAG photobiomodulation promoted ADSCs osteogenic differentiation and brown adipose adipogenic differentiation. The potential immunomodulation assays showed Nd:YAG photobiomodulation improved Anti-inflammation capacity of ADSCs and photobiomodulation irradiated ADSCs effectively alleviated DSS-induced colitis severity in vivo.Â Our study suggests Nd:YAG photobiomodulation might enhance the ADSCs multilineage differentiation and immunomodulation potentials. These results might help to enhance ADSCs therapeutic effects for clinical application. However, further studies are needed to explore the mechanisms of Nd:YAG photobiomodulation promoting multilineage differentiation and immunomodulation potentials of ADSCs. Humans;Osteogenesis;Cell Differentiation;Adipose Tissue;Colitis;Immunomodulation

The effects of low-level laser therapy and photodynamic therapy on oral health of fixed orthodontics patients. A systematic review and meta-analysis. Objective To investigate the effect of low-level laser and photodynamic therapy on the oral health, and periodontal tissue of fixed orthodontic patients and the effect of using photobiomodulation methods compared to routine plaque removal methods and the amount of plaque in fixed orthodontic patients. Method and materials First, the title and summary of related articles were collected by using the search strategy electronic databases PUBMED, EMBASE, Cochrane's CENTRAL, Scopus, ISI and all the articles that were published from the beginning to February 2023 were evaluated. The title, abstracts and full texts of all the relevant studies were reviewed respectively, and those meeting the criteria were entered into our study. Finally, the quality of the studies was examined and the results of the studies were pooled by means of random effects inverse variance meta-analysis. Results Eighteen randomized studies, conducted between 2015 and December 2022, were selected for meta-analysis. Five studies were conducted as split-mouth, twelve as parallel-group, and one as a cross-over design. Among the studies, five examined the effects of low-level laser therapy and twelve assessed the effects of photodynamic therapy. The meta-analysis revealed that photodynamic therapy significantly reduced probing depth compared to scaling (MD=-0.2Â mm, P<0.001), though the difference does not seem to be clinically

significant. But no significant differences between photodynamic therapy and scaling or low-level laser therapy and control groups in terms of plaque index, or bleeding on probing, gingival crevicular fluid volume, gingival recession, clinical attachment loss, bacterial load and concentrations of inflammatory substances across multiple follow-up periods. Conclusion Moderate evidence indicates that photodynamic therapy (PDT) is comparable to conventional methods in improving oral health, as measured by periodontal indices, inflammatory proteins, bacterial colonies, and white spot lesions, making it a suitable alternative. Limited evidence suggests low-level laser therapy (LLLT) may improve oral health, particularly addressing caries, but further research is needed. Photosensitizing Agents Humans;Photochemotherapy;Low-Level Light Therapy;Oral Health;Photosensitizing Agents;Orthodontics;Dental Scaling

Toxicity evaluation of indocyanine green mediated photodynamic therapy. BACKGROUND: The aim of the study is to determine the cytotoxic, genotoxic and inflammatory effects of indocyanine green (ICG) mediated photodynamic therapy (PDT) in direct contact with L-929 mouse fibroblast cells and over a dentin barrier. METHODS: Eight groups were evaluated; control (C), group with a dentin barrier (D), ICG applied directly on the cells (ICG), ICG applied over a dentin barrier (D-ICG), only laser applied (L), laser applied over a dentin barrier (D-L), ICG and laser applied directly on the cells (ICG-L), ICG and laser applied over a dentin barrier (D-ICG-L). Cell viability was evaluated via ATP Assay, DNA damage was evaluated via Comet Assay, and inflammatory markers IL-1Î² and TNF-Î± were assessed via ELISA test. RESULTS: Cell viability decreased in group ICG ($p<0.001$). Cell viability decrease was higher in Group ICG-L ($p<0.001$). Cell viability decrease was lower in group D-ICG-L ($p>0.05$). Group L caused an increase in cell number ($p<0.001$). DNA damage was observed in ICG, D-ICG, and ICG-L groups ($p<0.05$). None of the groups displayed an increase of inflammatory markers IL-1Î² and TNF-Î± ($p>0.05$). CONCLUSIONS: The presence of dentin between ICG and cells acted as a barrier and protected the cells. ICG-mediated PDT did not cause any cytotoxic, genotoxic or inflammatory effect. The use of ICG-mediated PDT for cavity disinfection is acceptable, but at this concentration its use in periodontal pocket disinfection is not recommended due to its cytotoxic and genotoxic properties. Photosensitizing Agents;Indocyanine Green;Tumor Necrosis Factor-alpha Animals;Mice;Photosensitizing Agents;Photochemotherapy;Indocyanine Green;Tumor Necrosis Factor-alpha;Lasers

Fractional CO(2) laser versus 1064-nm long-pulsed Nd:YAG laser for inflammatory acne vulgaris treatment: a randomized clinical trial. Acne vulgaris is challenging to treat for several individuals. Laser therapy may be a desirable alternative to traditional therapies with limited success. This study aimed to assess efficacy of fractional CO(2) laser versus Nd:YAG laser for acne vulgaris therapy. Thirty cases with acne vulgaris underwent both fractional CO(2) laser and Nd: YAG laser treatments in a randomized split face design at a 14-day interval for four sessions. The clinical efficacy was evaluated by counting acne lesions and utilizing the Global Acne Severity Scale (GEA Scale). GEAs decreased significantly after both fractional CO(2) and Nd:YAG modalities after treatment and at a 3-month follow-up; fractional CO(2) demonstrated significant more decrease in GEAs with (Pâ€‰=â€‰0.006, 0.00 (respectively. Moreover, fractional CO(2) showed a significantly higher satisfaction level (Pâ€‰=â€‰0.004) and a better clinical improvement percentage regarding inflammatory and noninflammatory acne lesions (Pâ€‰=â€‰0.007 and 0.000, respectively) after 3Â months of follow-up. Apart from transient erythema, there were insignificant adverse effects concerning both treated sides. Fractional CO(2) and Nd:YAG lasers are efficient physical modalities of acne treatment. However, fractional CO(2) laser was more effective and more satisfying to the patients. Carbon Dioxide Humans;Carbon Dioxide;Lasers, Solid-State;Acne Vulgaris;Light;Low-Level Light Therapy

Medical and procedural treatment of androgenetic alopecia - Where are we? Novel medical and procedural options for androgenetic alopecia have arrived. Low-dose oral minoxidil has made its

clinical debut, while data on spironolactone, finasteride, and nutritional supplements have advanced. Minimally invasive technological advancements include photobiomodulation and platelet-rich plasma. Within hair transplantation, follicular unit extraction and robotics are now at the clinicians' fingertips. Finasteride;Minoxidil Humans;Alopecia;Finasteride;Behavior Therapy;Minoxidil;Dietary Supplements

Biomodulating healing after arthroscopic rotator cuff repair: the protocol of a randomised proof of concept trial (BIOHACK). PURPOSE/INTRODUCTION: Over the last decades, there has been increasing interest in biological stimulation or bioaugmentation after rotator cuff repair. So far, there is no consensus on the appropriate composition of biologicals or which patients would benefit most, and moreover, these biologicals are often expensive. However, there are other, non-pharmacological strategies that are also believed to achieve biological stimulation. This randomised controlled trial evaluates the possible cumulative effect of pragmatic application of cryobiomodulation, photobiomodulation and electrobiomodulation-collectively called biomodulation-on the bone-to-tendon healing process after rotator cuff repair. METHODS: In this randomised, controlled proof of concept study, 146 patients undergoing arthroscopic repair of a full thickness posterosuperior or anterosuperior rotator cuff tear will be 1:1 randomly assigned to either a control group or to the additional biomodulation protocol group. The adjuvant biomodulation protocol consists of seven self-applicable therapies and will be administered during the first 6 weeks after surgery. Primary outcome will be healing of the rotator cuff as evaluated by the Sugaya classification on MRI at 1-year postoperatively. ETHICS AND DISSEMINATION: This study has been accepted by the National Ethical Review Board CPP Sud-Est IV in France and has been registered at Clinicaltrials.gov. The results of this study will be published in a peer-reviewed journal. TRIAL REGISTRATION NUMBER: NCT04618484. Biological Products Humans;Arthroplasty;Biological Products;Consensus;Randomized Controlled Trials as Topic;Rotator Cuff;Rotator Cuff Injuries

LED phototherapy in tissue repair of chronic wounds in people with diabetes: a systematic review. OBJECTIVE: To identify scientific evidence of LED photobiomodulation in the treatment and tissue repair of chronic wounds in people with Diabetes Mellitus, types I and II. METHOD: Systematic review conducted from September/2021 to April/2022 in PubMed, LILACS, SCIELO, COHRANE, EMBASE and Web of Science. Randomized and observational clinical trials using LED in wound healing in diabetics, published between 2015 and 2022 were included. Data were descriptively analyzed with title/abstract screening, full text articles reading and definitive selection after meeting the predefined inclusion and exclusion criteria. RESULTS: Fromthe total of 840 references, eight articles were selected, that evaluated the effectiveness of LED phototherapy in wounds of diabetic patients. CONCLUSION: LED light proved to be beneficial in tissue repair, with increased production in collagen and fibroblasts, angiogenesis, reduction of inflammation and, consequently, a decrease in lesion size. Humans;Diabetic Foot;Wound Healing;Phototherapy;Diabetes Mellitus

Effects of Photobiomodulation With Two Wavelengths of 630 and 810 nm on Diabetic Neuropathy. Introduction: Diabetic peripheral neuropathy (DPN) is the most common complication of diabetes patients. Among different therapeutic approaches for treating DPN, low-level laser therapy (LLLT) or photobiomodulation (PBM) is a new promising non-invasive technique. This study aims to evaluate the effect of visible and infra-red LLLT on DPN. Methods: Sixty DPN patients enrolled in a randomized-controlled study. The patients were randomly divided into the same population of control and laser groups. The patients in the laser group received LLLT with two wavelengths of 630 and 819 nm and conventional therapy, and those in the control group received conventional therapy alone. Irradiation of the patients lasted 15 minutes per session, and it was performed over the surface of each foot three times a week for 12 sessions. The patients were evaluated at baseline and at the end of the study with the Michigan Neuropathy Screening Instrument (MNSI) and microfilament test. Results:

Patients' sensation in the right foot in the monofilament test had increased from 22 (84.6%) to 26 (86.7%) (P=0.000), and in the left foot it had increased from 20 (80%) to 25 (86.2%) (P=0.001). The mean and standard deviation of the scores of section A of the Michigan questionnaire showed a statistically significant difference between the two groups (P<0.05), but the B part scores of the Michigan test did not show a significant difference. Conclusion: This study showed that the visible and infra-red LLLT significantly improved the symptoms of diabetic neuropathy without any side effects.

Extracellular Vesicle-Derived Cord Blood Plasma and Photobiomodulation Therapy Down-Regulated Caspase 3, LC3 and Beclin 1 Markers in the PCOS Oocyte: An In Vitro Study. Introduction: Polycystic ovary syndrome (PCOS) is the communal endocrine illness in women and the most common cause of infertility due to lack of ovulation. The exact cause of PCOS is still unknown. Affected women may have difficulty getting pregnant due to ovulation problems. Various methods have not been effective in the treatment of PCOS due to the positive role of photobiomodulation therapy (PBMT) and extracellular vesicles (ECV) obtained from cord blood plasma in the treatment of various diseases. The aim of this study was to study the role of ECV and PBMT in maturation and improvement of infertility in women with PCOS. Methods: In this research, a number of oocytes were obtained after ovarian stimulation from women who had been referred to the hospital for infertility treatment after obtaining personal consent, and they were divided into three groups: control, ECV and PBMT. Subsequently, in vitro maturation (IVM) was assessed, then some oocytes were cultured with a routine medium and others were treated with ECV and PBMT. Real-time PCR was used to evaluate BCL-2, BAX, caspase-3, and autophagy gene (ATG5, LC3, Beclin 1). Oocyte glutathione (GSH), oxidised gluathione (GSSG), and reactive oxygen species (ROS) were measured. Results: The metaphase II (MII) oocyte ratio formation significantly increased in the ECV and PBMT groups (P<0.05). The expression of the BCL-2 gene was significantly up-regulated in the ECV and PBMT groups, but the expression of BAX and caspase-3 significantly decreased (P<0.05). The expression of the ATG5, LC3, BECLIN-2 genes significantly decreased in the ECV and PBMT groups (P<0.05). ROS, GSSG decreased in ECV and PBMT groups but GSH increased (P<0.05). Conclusion: The use of ECV and PBMT can increase the rate of fertilization and maturation of an oocyte and cause a decrease in apoptosis, autophagy, and ROS in a PCOS oocyte.

Efficacy of Low-Level Laser Therapy in Wound Healing and Pain Reduction After Gingivectomy: A Systematic Review and Meta-analysis. Introduction: Complete healing of a gingivectomy wound usually takes between one and two months. To speed up this process, different topical medications have been reported. In addition, there are different studies assessing the efficacy of low-level laser therapy (LLLT) in terms of wound healing and pain relief subsequent to gingivectomy, yielding inconsistent outcomes. In the present study, we systematically reviewed the existing evidence in the literature to resolve the given conflicts. Methods: We searched for the studies published from inception to 1 April 2023 in Embase, PubMed, and Scopus databases without language limitation by the use of appropriate keywords. We included randomized or non-randomized clinical trial studies that appraised the efficacy of LLLT in pain reduction and wound healing in adult patients who underwent gingivectomy. We pooled the continuous data concerning the pain visual analogue scale and the healing index extracted from the individual studies to provide a standardized mean difference (SMD) with a 95% confidence interval (CI), using a random-effects model. Results: Out of 188 sources initially captured from the database search, six studies were ultimately included. Regarding wound healing, the LLLT group exhibited a significantly higher mean value of the healing index compared to the control group on days 3 (SMD, 0.93; 95% CI, 0.39 to 1.47) and 7 (SMD, 1.03; 95% CI, 0.49 to 1.57) post-surgery. Also, significant differences were noted in the postoperative pain reduction between the two groups on days 3 (SMD, -2.00; 95% CI, -2.48 to -1.51) and 7 (SMD, -2.44; 95% CI, -4.66 to -0.22) post-surgery. Conclusion: According to the present systematic review, LLLT

could potentially be an efficient adjunctive treatment after gingivectomy for wound healing acceleration and patient pain alleviation.

Photobiomodulation With a Continuous Wave Red Laser (660 nm) as Monotherapy for Adult Alopecia Areata: A Case Presentation. Introduction: Alopecia areata (AA) is an autoimmune, inflammatory, non-scarring hair loss in which T-cells target hair follicles. Given that the available therapeutic options generally do not induce and sustain remission of AA effectively and many adverse effects may occur, monochromatic light sources have been recently gaining attention from clinicians. Therefore, the present paper aimed to report the first case in which photobiomodulation therapy (PBMT) with a continuous wave red laser (660 nm) was used as monotherapy for AA. Case Presentation: An isolated round area of complete hair loss was subjected to daily PBMT sessions, resulting in significant regrowth (hair of normal coloration and thickness) within 7 days. On the 21(st) day, the patient's aesthetic concern was completely resolved. Conclusion: PBMT with a continuous wave red laser seems to be a promising therapeutic option for the treatment of AA; however, additional studies are necessary to obtain more robust evidence.

Effect of Low-Level Laser Therapy on Patients With Class II Mandibular Deficiency Treated with Farmand Functional Appliance. Introduction: Considering the positive effects of a low-level laser on new bone formation, we aimed to investigate the effects of a low-level laser in the treatment of patients with class II mandibular deficiency treated with Farmand functional appliance. Methods: Twenty-two growing patients aged 10-14 years were randomly divided into "Farmand" and "Farmand+Laser" groups. All patients were treated with Farmand functional appliance. Patients in the "Farmand+laser" group were exposed to laser irradiation (980 nm, 100 mw, 4 points around temporomandibular joints, 100 seconds each point) weekly for three months after 3-4 weeks of using the appliance. Lateral cephalometry radiographs were taken from all patients before and after the treatment period, and changes in skeletal and dental parameters were measured. Results: The association of the particular laser irradiation with the functional appliance led to a greater increase in the effective length of the mandible (Co-Gn, P=0.048), the anterior sagittal position of the mandible (SNB, P=0.029), and the length of the ramus (Co-Go, P=0.028), and it showed a further decrease in the discrepancy between the jaws (ANB, P=0.000) compared with the functional appliance alone. Conclusion: The application of the laser with the chosen parameters and protocol in conjunction with the functional appliance improved the effects of the functional appliance and reduced the discrepancy between the two jaws.

Combined Use of Photobiomodulation and Curcumin-Loaded Iron Oxide Nanoparticles Significantly Improved Wound Healing in Diabetic Rats Compared to Either Treatment Alone. Introduction: Here, we assess the therapeutic effects of photobiomodulation (PBM) and curcumin (CUR)-loaded superparamagnetic iron oxide nanoparticles (SPIONs), alone or together, on the maturation step of a type 1 diabetes (DM1) rat wound model. Methods: Full-thickness wounds were inflicted in 36 rats with diabetes mellitus (DM) induced by the administration of streptozotocin (STZ). The rats were randomly allocated to four groups. Group one was untreated (control); group two received CUR; group 3 received PBM (890 nm, 80 Hz, 0.2 J/cm(2)); group 4 received a combination of PBM plus CUR. On days 0, 4, 7, and 15, we measured microbial flora, wound closure fraction, tensile strength, and stereological analysis. Results: All treatment groups showed a substantial escalation in the wound closure rate, a substantial reduction in the count of methicillin-resistant Staphylococcus aureus (MRSA), a substantial improvement in wound strength, a substantially improvement in stereological parameters compared to the control group, however, the PBM+CUR group was superior to the other treatment groups (all, Pâ‰¤0.05). Conclusion: All treatment groups showed significantly improved wound healing in the DM1 rat model. However, the PBM+CUR group was superior to the other treatment groups and the control group in terms of wound strength and stereological parameters.

Effect of Photobiomodulation Therapy With an 810-nm Diode Laser on Pain Perception Associated With Dental Injections in Children: A Double-Blind Randomized Controlled Clinical Trial. Introduction: This study investigated the photobiomodulation effect of an 810-nm diode laser in adjunction with topical anesthesia on pain perception during infiltration anesthesia of primary maxillary molars in children. Methods: This double-blind randomized controlled clinical trial was conducted on 64 children (aged 5-9 years) requiring extraction or stainless steel crown for their primary maxillary molars. The patients were randomly allocated into two groups (n=32) of laser and control. In the laser group, the injection site (buccal and palatal mucosa) was irradiated with an 810-nm laser (200 mW, 5.2 J/cm(2)) after 20% benzocaine topical anesthetic application, while the control group received a placebo laser following topical anesthesia. The pain intensity experienced by children during needle insertion into the buccal and palatal mucosa was determined using a visual analog scale (VAS) and modified behavioral pain scale (MBPS). Results: According to the results of the VAS and MBPS, no significant difference was detected in pain scores between the laser and control groups neither in the buccal nor in the palatal mucosa (P>0.05). Conclusion: Photobiomodulation therapy with an 810-nm laser with the current setting adjunct to topical anesthesia did not promote significant additional effects on the pain intensity.

Photobiomodulation Therapy Improves Inflammatory Responses by Modifying Stereological Parameters, microRNA-21 and FGF2 Expression. Introduction: Photobiomodulation treatment (PBMT) is a relatively invasive method for treating wounds. An appropriate type of PBMT can produce desired and directed cellular and molecular processes. The aim of this study was to investigate the impacts of PBMT on stereological factors, bacterial count, and the expression of microRNA-21 and FGF2 in an infected, ischemic, and delayed wound healing model in rats with type one diabetes mellitus. Methods: A delayed, ischemic, and infected wound was produced on the back skin of all 24 DM1 rats. Then, they were put into 4 groups at random (n=6 per group): 1=Control group day4 (CG(day4)); 2=Control group day 8 (CG(day8)); 3=PBMT group day4 (PG(day4)), in which the rats were exposed to PBMT and killed on day 4; 4=PBMT group day8 (PG(day8)), in which the rats received PBMT and they were killed on day 8. The size of the wound, the number of microbial colonies, stereological parameters, and the expression of microRNA-21 and FGF2 were all assessed in this study throughout the inflammation (day 4) and proliferation (day 8) stages of wound healing. Results: On days 4 and 8, we discovered that the PG(day4) and PG(day8) groups significantly improved stereological parameters in comparison with the same CG groups. In terms of ulcer area size and microbiological counts, the PG(day4) and PG(day8) groups performed much better than the same CG groups. Simultaneously, the biomechanical findings in the PG(day4) and PG(day8) groups were much more extensive than those in the same CG groups. On days 4 and 8, the expression of FGF2 and microRNA-21 was more in all PG groups than in the CG groups (P<0.01). Conclusion: PBMT significantly speeds up the repair of ischemic and MARS-infected wounds in DM1 rats by lowering microbial counts and modifying stereological parameters, microRNA-21, and FGF2 expression.

The efficacy of low-level laser therapy for the healing of second-degree burn wounds on lower limbs of glucocorticoid-dependent patients. This study was designed to investigate the effect of 630â€‰~â€‰650-nm red light on treating second-degree burns on lower limbs of glucocorticoid-dependent patients. Sixty-two glucocorticoid-dependent patients with the second-degree burns on lower limbs were divided into the control group (nâ€‰=â€‰25) and the observation group (nâ€‰=â€‰37) according to the treatment sequence and the patients' willingness. The patients in both groups were conventionally treated with 1% sulfadiazine silver cream dressing, with the only difference that the observation group received an additional 630-650-nm red light irradiation for 20Â min before dressing. Each group was observed for 21Â days, and observation ended if the wound healing was terminated. The wound healing rates, wound secretions, marginal response, and

pain/itching levels were monitored and assessed. Compared with the control group, the observation group showed higher wound healing rate, fewer wound secretions, and more relief in marginal response. Clinical observation showed that 630-650-nm red light could effectively reduce wound purulent drainage/discharge, relieve the marginal response as well as pain, and promote wound healing. Glucocorticoids;Silver Sulfadiazine Humans;Burns;Glucocorticoids;Low-Level Light Therapy;Lower Extremity;Pain;Silver Sulfadiazine;Wound Healing

Epilepsy: Mitochondrial connections to the 'Sacred' disease. Over 65 million people suffer from recurrent, unprovoked seizures. The lack of validated biomarkers specific for myriad forms of epilepsy makes diagnosis challenging. Diagnosis and monitoring of childhood epilepsy add to the need for non-invasive biomarkers, especially when evaluating antiseizure medications. Although underlying mechanisms of epileptogenesis are not fully understood, evidence for mitochondrial involvement is substantial. Seizures affect 35%-60% of patients diagnosed with mitochondrial diseases. Mitochondrial dysfunction is pathophysiological in various epilepsies, including those of non-mitochondrial origin. Decreased ATP production caused by malfunctioning brain cell mitochondria leads to altered neuronal bioenergetics, metabolism and neurological complications, including seizures. Iron-dependent lipid peroxidation initiates ferroptosis, a cell death pathway that aligns with altered mitochondrial bioenergetics, metabolism and morphology found in neurodegenerative diseases (NDDs). Studies in mouse genetic models with seizure phenotypes where the function of an essential selenoprotein (GPX4) is targeted suggest roles for ferroptosis in epilepsy. GPX4 is pivotal in NDDs, where selenium protects interneurons from ferroptosis. Selenium is an essential central nervous system micronutrient and trace element. Low serum concentrations of selenium and other trace elements and minerals, including iron, are noted in diagnosing childhood epilepsy. Selenium supplements alleviate intractable seizures in children with reduced GPX activity. Copper and cuproptosis, like iron and ferroptosis, link to mitochondria and NDDs. Connecting these mechanistic pathways to selenoproteins provides new insights into treating seizures, pointing to using medicines including prodrugs of lipoic acid to treat epilepsy and to potential alternative therapeutic approaches including transcranial magnetic stimulation (transcranial), photobiomodulation and vagus nerve stimulation. Selenium;Iron Animals;Mice;Selenium;Mitochondria;Epilepsy;Seizures;Iron

Photobiomodulation therapy on skeletal muscles exposed to diabetes mellitus: a systematic review of animal studies. Diabetes-related muscle damage has been overlooked despite its known association with increased morbidity and mortality in DM individuals. PBMT is a recognized alternative to improve skeletal muscle health in other populations, but its effectiveness in DM is still unclear. To address this issue, we reviewed preclinical studies, available in any language and period, in ten sources of information. The methods were previously registered at PROSPERO (CRD42021271041), based on PRISMA recommendations. Studies in murine models of T1DM or T2DM that reported quantitative analyses of skeletal muscles treated with low-level light therapy could be included after a blind selection process. Most of the seven included studies focus on decompensated T1DM rats with acute muscle injury (cryoinjury or contusion). In these five studies, PBMT improved muscle regeneration, by reducing inflammation and stimulating factors pro-angiogenesis and pro-myogenesis. Some positive effects could also be observed in two studies on muscles without acute injury: control of oxidative stress (T1DM) and reduction of myosteatosis (T2DM). Although infrared laser applied locally appears to be a promising approach, optimal parameters are undefined due to the heterogeneity of outcomes and high risk of bias, which prevented a quantitative synthesis. Several aspects of this growing field have yet to be investigated, particularly regarding the DM model (e.g., aged animals, T2DM), intervention (e.g., comparison with LED), and outcomes (e.g., muscle mass, strength, and function). Future research should aim to improve the internal validity by following guidelines for animal studies and enhance the translatability

to clinical trials by using animal models that closely mimic patients with DM in rehabilitation settings. Rats;Animals;Mice;Diabetes Mellitus, Type 1;Low-Level Light Therapy;Muscle, Skeletal;Inflammation;Diabetes Mellitus, Type 2

Preventing Post-Traumatic Stress Disorder (PTSD) in rats with pulsed 810â€‰nm laser transcranial phototherapy. Post-traumatic stress disorder (PTSD) is a debilitating condition that occurs following exposure to traumatic events. Current treatments, such as psychological debriefing and pharmacotherapy, often have limited efficacy and may result in unwanted side effects, making early intervention is a more desirable strategy. In this study, we investigated the efficacy of a single dose of pulsed (10â€‰Hz) 810â€‰nm laser-phototherapy (P-PT) as an early intervention for preventing PTSD-like comorbidities in rats induced by single inescapable electric foot shock following the single prolonged stress (SPS&S). As indicated by the results of the open filed test, elevated plus maze test, and contextual fear conditioning test, P-PT prevented the development of anxiety and freezing behaviors in rats exposed to the SPS&S. We also compared the effects of P-PT and continuous wave 810â€‰nm laser-phototherapy (CW-PT) in preventing PTSD-like comorbidities in rats. The results revealed that P-PT was effective in preventing both freezing and anxiety behavior in stressed rats. In contrast, CW-PT only had a preventive effect on freezing behavior but not anxiety. Additionally, P-PT significantly reduced the c-fos expression in cingulate cortex area 1(Cg1) and infralimbic cortex (IL) of stressed rats, while CW-PT had no significant effects on c-fos expression. Taken together, our results demonstrate that P-PT is a highly effective strategy for preventing the occurrence of PTSD-like comorbidities in rats. Rats;Animals;Stress Disorders, Post-Traumatic;Anxiety;Fear;Phototherapy;Disease Models, Animal

Photobiomodulation enhances M2 macrophage polarization properties of tonsil-derived mesenchymal stem cells. In this study, the effect of photobiomodulation (PBM) treatment using 630Â nm light emitting diode (LED) array (continuous wave type, 10Â mW power) on tonsil-derived mesenchymal stem cells (TMSCs) and its interaction with RAW 264.7 macrophage cells via co-culture in vitro were investigated. PBM treatment was used as a priming method for TMSCs to improve therapeutic efficacy. TMSCs were subjected to multi-dose PBM treatments before co-culture with M1 activated (1Â Î¼g/mL lipopolysaccharide, LPS) macrophage cells with total energy doses of 0, 15, 30, and 60Â J. Irradiation set at 15Â J (1500Â s treatment time) was performed once, twice for 30Â J, and four times for 60Â J in an incubator kept at 37Â Â°C and 5% CO(2). No significant anti-inflammatory response was observed for TMSCs co-cultured with macrophage cells without PBM. But PBM treatment of TMSCs with 630Â nm LED array at 30Â J reduced expression of inducible nitric oxide synthase, iNOS (M1) and increased expression of Arginase-1, Arg-1 (M2) phenotype macrophage markers. Anti-inflammatory cytokine interleukin-1 receptor antagonist (IL-1RA) gene expression also increased significantly. Based on the results, PBM priming of TMSCs supports M2 macrophage polarization. PBM can be used to improve the therapeutic efficacy of TMSCs for potential applications in oral mucositis and wound healing. Cytokines Mice;Animals;Palatine Tonsil;Macrophages;Mesenchymal Stem Cells;Cytokines;RAW 264.7 Cells

Comparing Circumferential Supracrestal Fiberotomy with Surgical Scalpel Versus Photobiomodulation in Orthodontic Relapse Reduction: A Clinical Trial. Objective: This investigation aimed to compare the efficacy of circumferential supracrestal fiberotomy (CSF) with surgical scalpel, laser CSF, and photobiomodulation for reduction of relapse after orthodontic tooth rotation. Background: Relapse is the tendency of teeth to move back to their preoperative position after removal of orthodontic appliances. Materials and methods: This randomized controlled clinical trial was conducted on 90 rotated teeth at the final stages of fixed orthodontic treatment. The teeth were randomly divided into six groups (nâ€‰=â€‰15) of (1) control (no intervention), (2) photobiomodulation alone (wavelength of 940â€‰nm, 0.2 W, and 4â€‰J/cm(2)), (3) conventional

CSF, (4) laser CSF (wavelength of 940â€‰nm, 1.5 W, and 4â€‰J/cm(2), and power density of 160â€‰mW/cm(2)), (5) conventional CSF plus photobiomodulation, and (6) laser CSF plus photobiomodulation. Measurements were made on clinical photographs and dental casts using the AutoCAD software. Level of pain of patients was measured within the first 24â€‰h after fiberotomy using a visual analog scale. Data were analyzed by ANOVA and Kruskal-Wallis test (Î±â€‰=â€‰0.05). Results: The magnitude (pâ€‰=â€‰0.014) and percentage (pâ€‰=â€‰0.035) of relapse were significantly different among the six groups, and they were the highest in the control group followed by photobiomodulation alone, laser CSF, conventional CSF, conventional CSF plus photobiomodulation, and finally, laser CSF plus photobiomodulation. Moreover, photobiomodulation plus laser CSF and photobiomodulation plus conventional CSF had significantly different results from the other groups. The six groups had no significant difference in sulcus depth changes, gingival recession (difference in primary and secondary crown height), or pain score (pâ€‰>â€‰0.05). Conclusions: This study suggests that utilizing photobiomodulation combined with laser CSF or conventional CSF can be effective in reducing relapse. However, further clinical trials are required to support this idea. Iranian Registry of Clinical Trials (IRCT20210621051653N1). Humans;Iran;Malocclusion;Gingival Recession;Pain;Recurrence

Low-Level Laser Therapy for Acute Pain: A Comprehensive Review. PURPOSE OF REVIEW: An analysis of data conducted in 2015 by the National Health Interview Survey (NHIS) found that an estimated 25.3 million adults (11.2%) have experienced pain every day for the preceding 3Â months, and nearly 40 million adults (17.6%) have experienced a severe level of pain. RECENT FINDINGS: Multiple reviews have analyzed the current management of acute pain; however, much of the current literature only focuses on pharmacological methods of analgesia, such as opiates, ketamine, or non-steroidal anti-inflammatory drugs (NSAIDs). Publications that discuss non-pharmacological options often criticize the limitations of available research for these therapies, making further exploration of this type of treatment necessary. The present investigation aims to summarize current knowledge on the use of low-level laser therapy (LLLT), a cold laser non-pharmacological approach, in managing acute pain and to discuss important clinical findings and considerations when it comes to utilizing this treatment option in patients. Anti-Inflammatory Agents, Non-Steroidal Adult;Humans;Acute Pain;Low-Level Light Therapy;Anti-Inflammatory Agents, Non-Steroidal;Pain Management

Effect of low-level laser therapy on orthodontic dental alignment: a systematic review and meta-analysis. The aim of this study is to systematically summarize the available evidence regarding low-level laser therapy (LLLT) speed-up effect on dental alignment in comprehensive orthodontic treatment. An extensive electronic search was conducted in PubMed, ScienceDirect, Cochrane, Web of Science, and Scopus up to February 20, 2023. The Cochrane risk of bias tool and the Newcastle-Ottawa Quality Assessment Form were used by two authors independently to assess the risk of bias (RoB). Statistical analysis was performed by Review Manager 5.3. The eight eligible trials were reviewed and included in qualitative synthesis. Four studies reported the overall time of leveling and alignment (OLAT, days), enabling a synthesizing of the data. The meta-analysis results showed that LLLT significantly reduced the overall time of leveling and alignment compared to control group (MD=-30.36, 95% CI range -41.50 to -19.22, P<0.0001), with moderate heterogeneity (Ï‡2=4.10, P=0.25, I(2)=27%). Based on the data available, statistically significant evidence with moderate risk of bias suggests that LLLT may have a positive effect on accelerating dental alignment. However, due to the differences in intervention strategy and evaluating method, the conclusions should be interpreted with caution. Low-Level Light Therapy;Time Factors;Tooth Movement Techniques

LED therapy plus idebenone treatment targeting calcium and mitochondrial signaling pathways in dystrophic muscle cells. Intracellular calcium dysregulation, oxidative stress, and mitochondrial dysfunction are some of the main pathway contributors towards disease progression in Duchenne

muscular dystrophy (DMD). This study is aimed at investigating the effects of light emitting diode therapy (LEDT) and idebenone antioxidant treatment, applied alone or together in dystrophic primary muscle cells from mdx mice, the experimental model of DMD. Mdx primary muscle cells were submitted to LEDT and idebenone treatment and evaluated for cytotoxic effects and calcium and mitochondrial signaling pathways. LEDT and idebenone treatment showed no cytotoxic effects on the dystrophic muscle cells. Regarding the calcium pathways, after LEDT and idebenone treatment, a significant reduction in intracellular calcium content, calpain-1, calsequestrin, and sarcolipin levels, was observed. In addition, a significant reduction in oxidative stress level markers, such as H(2)O(2), and 4-HNE levels, was observed. Regarding mitochondrial signaling pathways, a significant increase in oxidative capacity (by OCR and OXPHOS levels) was observed. In addition, the PGC-1Î±, SIRT-1, and PPARÎ´ levels were significantly higher in the LEDT plus idebenone treated-dystrophic muscle cells. Together, the findings suggest that LEDT and idebenone treatment, alone or in conjunction, can modulate the calcium and mitochondrial signaling pathways, such as SLN, SERCA 1, and PGC-1Î±, contributing towards the improvement of the dystrophic phenotype in mdx muscle cells. In addition, data from the LEDT plus idebenone treatment showed slightly better results than those of each separate treatment in terms of SLN, OXPHOS, and SIRT-1. Calcium;idebenone;Hydrogen Peroxide Mice;Animals;Mice, Inbred mdx;Muscle, Skeletal;Calcium;Mice, Inbred C57BL;Hydrogen Peroxide;Signal Transduction;Muscle Cells;Disease Models, Animal

Photobiomodulation does not provide incremental benefits to patients with knee osteoarthritis who receive a strengthening exercises program: a randomized controlled trial. BACKGROUND: There is lack of agreement in the literature about the effectiveness of photobiomodulation (PBM) for reducing pain-related symptoms in patients with knee osteoarthritis (OA). OBJECTIVE: To evaluate whether PBM, when combined to exercises, provides incremental therapeutic benefits for pain, physical function, and quality of life (QoL) in patients with knee OA. METHODS: A six-month double-blind placebo-controlled randomized trial was conducted. Patients with knee OA were randomly assigned to one of three treatment groups: Exercise, Exercise plus Active PBM, or Exercise plus Placebo PBM. Treatment was provided over an eight-week period, three times per week. The primary outcomes were pain at rest and upon movement, assessed by a visual analogue scale (VAS). WOMAC global score, QoL, and a core-set of performance-based tests were measured as secondary outcomes. All outcomes were collected at baseline, immediately after treatment, and after three- and six-month post-treatment. RESULTS: 127 participants were allocated as follows: Exercise, NÂ =Â 41; Exercise plus Active PBM, NÂ =Â 44; and Exercise plus Placebo PBM, NÂ =Â 42. There was no between-groups difference in improvement in pain, physical function, and QoL for all follow-up times. However, all groups presented significant, clinically relevant improvements in pain, physical function, and QoL immediately and three months after treatment compared with baseline measures. CONCLUSION: Patients with knee OA who received a strengthening exercises program did not experience incremental benefits regarding pain, physical function, or QoL when adding PBM to their therapeutic exercises. Humans;Osteoarthritis, Knee;Quality of Life;Exercise Therapy;Pain;Movement;Treatment Outcome

Effect of low-level laser therapy on quadriceps and foot muscle fatigue in children with spastic diplegia: a randomized controlled study. Spastic diplegia is the most common form of cerebral palsy; children with spastic diplegia are suffering from muscle fatigue and spasticity which lead to decreasing power of muscles, impaired motor control, and many functional abilities. The effect of low-level laser (LLL) has a good result as it improves muscles pain and spasticity and in decreasing lactate levels. Forty children were selected with spastic diplegia and were divided into two groups: A and B. Group A received low-level laser treatment (LLLT) with physiotherapy treatment. Group B got physiotherapy sessions. Pain intensity was assessed by the visual analog scale (VAS) of pain which is

reliable from age 5, before treatment and after 1-month follow-up. Muscle fatigue and power were assessed by maximum voluntary isometric contraction (MVIC) before treatment and after 1-month follow-up. Also, we tested blood lactate level in both groups; all evaluations were done before treatment and after 1-month follow-up. We found a significant difference between the two groups in VAS and MVIC and blood lactate level test regarding low-level therapy after 1-month follow-up. There is a good effect of low-level laser in increasing muscle power, decreasing blood lactate level, and improving pain. Lactates Humans;Child;Child, Preschool;Muscle Fatigue;Low-Level Light Therapy;Cerebral Palsy;Muscle Spasticity;Pain;Lactates

Relationship between Laser Intensity at the Peripheral Nerve and Inhibitory Effect of Percutaneous Photobiomodulation on Neuronal Firing in a Rat Spinal Dorsal Horn. Photobiomodulation is an effective treatment for pain. We previously reported that the direct laser irradiation of the exposed sciatic nerve inhibited firing in the rat spinal dorsal horn evoked by mechanical stimulation, corresponding to the noxious stimulus. However, percutaneous laser irradiation is used in clinical practice, and it is unclear whether it can inhibit the firing of the dorsal horn. In this study, we investigated whether the percutaneous laser irradiation of the sciatic nerve inhibits firing. Electrodes were inserted into the lamina II of the dorsal horn, and mechanical stimulation was applied using von Frey filaments (vFFs) with both pre and post laser irradiation. Our findings show that percutaneous laser irradiation inhibited 26.0 g vFF-evoked firing, which corresponded to the noxious stimulus, but did not inhibit 0.6 g and 8.0 g vFF-evoked firing. The post- (15 min after) and pre-irradiation firing ratios were almost the same as those for direct and percutaneous irradiation. A photodiode sensor implanted in the sciatic nerve showed that the power density reaching the sciatic nerve percutaneously was attenuated to approximately 10% of that on the skin. The relationship between the laser intensity reaching the nerve and its effect could be potentially useful for a more appropriate setting of laser conditions in clinical practice.

Effects including photobiomodulation of galactomannan gel from Cassia grandis seeds in the healing process of second-degree burns. The epithelium recovery of skin-burned wounds has been currently achieved by several therapies, for example, hydrogel-based dressings and photobiomodulation therapy (PBMT). Thus, this work aimed to evaluate the healing activity of Cassia grandis seeds' galactomannan gel, associated or not with PBMT, in second-degree burns. Sixty male Wistar rats were assigned to four groups: Control (CG), Gel (GG), Laser/PBMT (LG), and Laser+Gel (GLG). Burns were made with an aluminum bar (90Â Â°C), and submitted to clinical observations diary and area measurements at specific days. Microscopic analysis was based on histological criteria. The results showed that GG, LG, and GLG had a higher contraction rate (pÂ <Â 0.05) than CG on the 14th experimental day, not differing from each other (â¼95Â %). At 21Â days, all groups showed complete contraction (pÂ >Â 0.05). Considering the histological results, LG and GLG showed excellent pro-wound healing properties after 14Â days; at 21Â days, all groups showed wound recovery compared to previous days. In view of the macroscopic and microscopic observations, the isolated treatments (Gel or Laser) effectively accelerated healing; however, the association (Laser+Gel) promoted re-epithelialization and stromal remodeling with better evolution of epithelium recovery due to the positive synergistic effect, thus emerging as a promising therapeutic alternative in the repair of burns.

Effects of a mucoadhesive phytomedicine (Curcuma longa L. and Bidens pilosa L.) on radiotherapy-induced oral mucositis and quality of life of patients undergoing head and neck cancer treatment: randomized clinical trial. PURPOSE: To assess the effect of a mucoadhesive herbal medicine containing curcuminoids and a glycerinated extract of Bidens pilosa L. (FITOPROT) in association with photobiomodulation (PBM) therapy and a Preventive Oral Care Program (POCP) compared to PBM and POCP in the treatment of radiotherapy (RT)-induced oral mucositis (ROM) and in the quality of

life of these patients. METHODS: A double-blind clinical trial was performed with head and neck cancer patients undergoing RT or chemoradiotherapy. Participants were randomized into two groups: Group 1 (n=27): PBM and POCP; and Group 2 (n=25): PBM, POCP and FITOPROT. The PBM protocol was daily irradiation, 660 nm, 25mW, 0.25 J/point from the first until the last day of RT. The FITOPROT was used as mouthwash twice a day. ROM was evaluated based on the scales of the World Health Organization and National Cancer Institute. The quality of life was evaluated using the University of Washington Questionnaire, OHIP-14 and Patient-Reported Oral Mucositis Symptom Scale. The MMAS-8 questionnaire was used to evaluated the adherence to POCP and FITOPROT. Data were collected at baseline, 7(th), 14(th), 21(st), and 30(th) RT sessions. RESULTS: No statistical differences were found between the groups for the ROM evaluation. Both groups experienced worsening of the quality of life during the RT. No statistically significant differences between groups were observed for any of the instruments evaluated. CONCLUSION: The results suggest that PBM associated with FITOPROT and POCP control the severity of ROM and stabilize the QoL of patients with head and neck cancer. TRIAL REGISTRATION: Brazilian Registry of Clinical Trials (ReBEC-RBR-9vddmr; UTN code: U1111-1193-2066), registered in August 8th, 2017. Plant Extracts Humans;Bidens;Quality of Life;Curcuma;Stomatitis;Head and Neck Neoplasms;Plant Extracts;Low-Level Light Therapy

Efficacy of Occlusal Splints and Low-Level Laser Therapy on the Mandibular Range of Motion in Subjects with Temporomandibular Joint Disc Displacement with Reduction. AIMS AND OBJECTIVES: The study was carried out to evaluate the efficacy of four conservative therapeutic modalities on the mandibular range of motion (MRM) in subjects with anterior disc displacement with reduction (ADDwR) of the temporomandibular joint (TMJ). MATERIALS AND METHODS: One hundred patients (64 women and 36 men) were selected, and randomly distributed into four groups. Group I: Subjects receiving behavioral therapy (BT). Group II: Subjects receiving low-level laser therapy (LLLT). Group III: Subjects receiving maxillary anterior repositioning splint (MARS). Group IV: Subjects receiving stabilization splint (SS). The MRM was evaluated for each patient before treatment and after 6 months. Paired t test and one-way analysis of variance (ANOVA) tests were used for statistical analysis followed by a post hoc Tukey test (P â‰¤ 0.05). RESULTS: All groups showed significant improvement in MRM after 6 months of treatment (P â‰¤ 0.05) except for BT. There was a significant improvement for SS and MARS on the different movements of MRM, more than for LLLT and BT (P â‰¤ 0.05). CONCLUSION: The MARS and the SS are effective in increasing the MRM for patients with ADDwR.

The effectiveness of biophysical agents in the treatment of carpal tunnel syndrome- an umbrella review. BACKGROUND: Our objective was to summarize, synthesize, and integrate the evidence evaluating the effectiveness of biophysical agents compared to other conservative treatments, for the management of carpal tunnel syndrome (CTS). METHODS: This was an overview of systematic reviews (SRs). We searched several online databases and obtained SRs relating to managing CTS using biophysical agents. Two independent researchers screened and appraised the quality of the SRs using the A MeaSurement Tool to Assess systematic Reviews-2 appraisal tool. We extracted information related to study characteristics as well as the effectiveness of biophysical agents for CTS, the effect sizes, and between-group significances. We categorized the information based on the type of biophysical agent. We also performed a citation mapping and calculated the corrected covered area index. RESULTS: We found 17 SRs addressing 12 different biophysical agents. The quality of the SRs was mainly critically low (nâ€‰=â€‰16) or low (nâ€‰=â€‰1). The evidence was inconclusive for the effectiveness of Low-level Laser therapy and favorable for the short-term efficacy of non-thermal ultrasound in improving symptom severity, function, pain, global rating of improvement, satisfaction with treatment, and other electrophysiological measures compared to manual therapy or placebo.

Evidence was inconclusive for Extracorporeal Shockwave therapy, and favorable for the short-term effectiveness of Shortwave and Microwave Diathermy on pain and hand function. The corrected covered area index was lower than 35% indicating a low overlap of the SRs. CONCLUSIONS: The findings were based on low-quality primary studies, with an unclear or high risk of bias, small sample sizes, and short follow-ups. Therefore, no recommendations can be made for the long-term effectiveness of any biophysical agents. High-quality evidence is needed to support evidence-based recommendations on the use of biophysical agents in the management of CTS. PROSPERO REGISTRATION NUMBER: CRD42022319002, registered on 17/04/2022. Humans;Carpal Tunnel Syndrome;Extracorporeal Shockwave Therapy;Low-Level Light Therapy;Pain Management;Systematic Reviews as Topic

Photodynamic Inactivation of Mycobacterium tuberculosis Using Alluminium Phthalocyanine. In a series of in vitro experiments, the optimum regimes of laser treatment were determined for effective photodynamic inactivation of Mycobacterium tuberculosis at a constant dose of aluminum phthalocyanine. Reference laboratory drug-susceptible strain H37Rv and clinical isolates of M. tuberculosis with varying degrees of resistance to antibiotics were used. Suspensions of M. tuberculosis were incubated with aluminum phthalocyanine in a concentration of 5 Î¼g/ml and then subjected to photodynamic inactivation with high- or low- intensity laser irradiation at Î»=662 nm at various parameters of light power density. Mycobacteria survival rate was assessed by CFU assay on solid media. It was shown that at the specified dose of the photosensitizer, the photodynamic inactivation of mycobacterium was characterized by inhibition and complete cessation of their growth depending on the dose density of the laser energy. Effective photodynamic inactivation started from a light dose density of 46.9 J/cm(2) at a radiation power of 0.01 W and from 56.25 J/cm(2) at a radiation power of 0.1 W. Photodynamic inactivation at low laser power is more effective against drug-susceptible strains of M. tuberculosis. aluminum phthalocyanine;phthalocyanine;Photosensitizing Agents Humans;Mycobacterium tuberculosis;Photosensitizing Agents;Tuberculosis;Photochemotherapy

Effect of low-level laser therapy on the distalization of maxillary canines in adolescents. Low-Level Light Therapy;Cuspid;Orthodontic Anchorage Procedures;Maxilla;Tooth Movement Techniques;Cephalometry

The effectiveness of photobiomodulation therapy on inferior alveolar nerve injury: A systematic review and META-analysis. OBJECTIVE: The aim of this META-analysis was to evaluate the efficacy of photobiomodulation (PBM) therapy in the treatment of inferior alveolar nerve (IAN) injury due to orthognathic surgeries, extraction of impacted third molars and mandibular fractures. METHODS AND MATERIALS: A electric search was conducted by a combination of manual search and four electric databases including Pubmed, Embase, Cochrane library and Web of Science, with no limitation on language and publication date. Gray literature was searched in ClinicalTrials.gov and googlescholar. All retrieved articles were imported into ENDNOTE software (version X9) and screened by two independent reviewers. All analysis was performed using the REVMAN software (version 5.3). RESULTS: Finally, 15 randomized controlled trials met the inclusion criteria for qualitative analysis and 14 for META-analysis from 219 articles. The results showed that PBM therapy had no effect on nerve injury in a short period of time (0-48h, 14 days), but had significant effect over 30 days. However, the effect of photobiomodulation therapy on thermal discrimination was still controversial, most authors supported no significant improvement. By calculating the effective rate of PBM, it was found that there was no significant difference in the onset time of treatment, whether within or over 6 months. CONCLUSIONS: The results of this META-analysis show that PBM therapy is effective in the treatment of IAN injures no matter it begins early or later. However, due to the limited number of well-designed RCTs and small number of patients in each study, it would be necessary to conduct randomized

controlled trials with large sample size, long follow-up time and more standardized treatment and evaluation methods in the future to provide more accurate and clinically meaningful results.
Humans;Low-Level Light Therapy;Tooth Extraction;Mandibular Nerve;Mandibular Fractures

Comparative evaluation of photobiomodulation therapy at 660 and 810 nm wavelengths on the soft tissue local anesthesia reversal in pediatric dentistry: an in-vivo study. BACKGROUND: Local anesthesia has been reliably used to control pain during dental procedures and is important in pediatric dentistry. However, children occasionally complain of prolonged numbness after dental treatment, leading to several problems. Studies conducted to reverse the effect of local anesthesia using phentolamine mesylate and photobiomodulation therapy (PBM) are encouraging but limited. PBM is a type of light therapy that utilizes visible and near-infrared non-ionizing electromagnetic spectral light sources. Hence, this study used this modality to compare the reversal of local anesthesia at two different wavelengths. This study compared the effect of PBM at 660 and 810 nm wavelengths on the reversal of soft tissue local anesthesia using a diode LASER in pediatric dentistry. METHOD: Informed consent and assent were obtained, and the participants were then divided randomly into three groups of 20 children each: control group-without LASER irradiation, LASER irradiation at 660 nm, and LASER irradiation at 810 nm. Sixty children aged 4-8 years with deciduous mandibular molars indicated for pulp therapy were administered an inferior alveolar nerve block. After 45 min of injection, a duration that was similar to the approximate duration of treatment, they were exposed to 660- and 810-nm LASER irradiation according to their groups until reversal of local anesthesia was achieved. The control group did not undergo LASER irradiation. The reversal of the soft tissue local anesthetic effect was evaluated using palpation and pin prick tests every 15 min, and the LASER irradiation cycle continued until reversal of the soft tissue local anesthesia was achieved. RESULTS: A significant reduction of 55.5 min (27.6%) in the mean soft tissue local anesthesia reversal time was observed after the application of 810 nm wavelength PBM and 69 min (34.7%) after 660 nm wavelength LASER irradiation. CONCLUSION: PBM with a 660 nm wavelength was more effective in reducing the mean soft tissue local anesthesia reversal duration, and thus can be used as a reversal agent for soft tissue local anesthesia in pediatric dentistry.

Synergistic photobiomodulation with 808-nm and 1064-nm lasers to reduce the Î²-amyloid neurotoxicity in the in vitro Alzheimer's disease models. BACKGROUND: In Alzheimer's disease (AD), the deposition of Î²-amyloid (AÎ²) plaques is closely associated with the neuronal apoptosis and activation of microglia, which may result in the functional impairment of neurons through pro-inflammation and over-pruning of the neurons. Photobiomodulation (PBM) is a non-invasive therapeutic approach without any conspicuous side effect, which has shown promising attributes in the treatment of chronic brain diseases such as AD by reducing the AÎ² burden. However, neither the optimal parameters for PBM treatment nor its exact role in modulating the microglial functions/activities has been conclusively established yet. METHODS: An inflammatory stimulation model of Alzheimer's disease (AD) was set up by activating microglia and neuroblastoma with fibrosis Î²-amyloid (fAÎ²) in a transwell insert system. SH-SY5Y neuroblastoma cells and BV2 microglial cells were irradiated with the 808- and 1,064-nm lasers, respectively (a power density of 50 mW/cm(2) and a dose of 10 J/cm(2)) to study the PBM activity. The amount of labeled fAÎ² phagocytosed by microglia was considered to assess the microglial phagocytosis. A PBM-induced neuroprotective study was conducted with the AD model under different laser parameters to realize the optimal condition. Microglial phenotype, microglial secretions of the pro-inflammatory and anti-inflammatory factors, and the intracellular Ca(2+) levels in microglia were studied in detail to understand the structural and functional changes occurring in the microglial cells of AD model upon PBM treatment. CONCLUSION: A synergistic PBM effect (with the 808- and 1,064-nm lasers) effectively inhibited the fAÎ²-induced neurotoxicity of neuroblastoma by promoting the viability of neuroblastoma and

regulating the intracellular Ca(2+) levels of microglia. Moreover, the downregulation of Ca(2+) led to microglial polarization with an M2 phenotype, which promotes the fAÎ² phagocytosis, and resulted in the upregulated expression of anti-inflammatory factors and downregulated expression of inflammatory factors.

[Diode laser in orthodontics: clinical applications and perspectives]. INTRODUCTION: The diode laser, which appeared at the end of the last century, is becoming more and more important in the various dental specialties, more particularly in orthodontics where the first publications date back to 2004. Today it has become an indispensable instrument for the orthodontist, who can make his patients benefit from this technology and its essential contribution both in terms of ablative treatment and photobiomodulation. MATERIALS AND METHODS: The article will describe all the current applications of the diode laser in orthodontics, including the new perspectives that it can generate. RESULTS: Through the bibliography, we were able to identify the main surgery and photobiomodulation actions according to the different pathologies and our desired orthodontic treatments. We have not developed the different protocols in an exhaustive way. CONCLUSION: There are certainly still many applications of laser in our specialty that are not sufficiently developed or known. Humans;Orthodontics;Lasers, Semiconductor;Low-Level Light Therapy;Dental Care

Efficacy of Laser Acupuncture for Children With Autism Spectrum Disorder: Clinical, Molecular, and Biochemical Study. BACKGROUND: Low-level laser acupuncture (LLLA) biostimulation could contribute to improving the symptoms and communication of children manifesting autism spectrum disorder (ASD). Photobiomodulation might influence the level of brain-derived neurotrophic factor (BDNF) and miR-320 expression. The aim was to investigate the influence of LLLA biostimulation on the severity, language abilities, BDNF levels, and miR-320 in a sample of children with ASD. METHODS: The participants with ASD (NÂ =Â 30) were randomly divided equally into groups: Group I received LLLA therapy twice a week for 12 sessions and Group II did not receive it. Assessments of the severity, language abilities, BDNF level by enzyme-linked immunosorbent assay, and miR-320 expression by reverse transcriptase quantitative polymerase chain reaction were performed before and after the intervention. A comparison between ASD cases (NÂ =Â 30) before starting the therapy and neurotypical children (NÂ =Â 15) regarding miR-320 expression was performed. RESULTS: Following the intervention, the severity of ASD was reduced and language performance was elevated in both groups. The improvement in Group I was higher with (PÂ =Â 0.002; 0.03). The plasma BDNF level was reduced only in Group I (PÂ <Â 0.001). The expression level of miR-320 in Group I did not show a change (PÂ =Â 0.641). A significant difference in miR-320 expression between children with ASD and the neurotypical group (PÂ =Â 0.000) was observed. CONCLUSION: This study introduces LLLA therapy as a safe and promising therapeutic procedure for improving the core manifestations and communication abilities and for modulating BDNF levels in children with ASD. The reduced expression of miR-320 showed a good diagnostic value in children with ASD. Brain-Derived Neurotrophic Factor;MicroRNAs Humans;Child;Autism Spectrum Disorder;Brain-Derived Neurotrophic Factor;Acupuncture Therapy;Lasers;MicroRNAs

Effects of photobiomodulation and caffeine treatment on acute kidney injury in a hypoxic ischemic neonatal rat model. Hypoxic ischemic encephalopathy (HIE) occurs in 2-5/1000 births, with acute kidney injury (AKI) occurring in 40%. AKI increases morbidity and mortality. Caffeine, an adenosine receptor antagonist, and photobiomodulation (PBM), working on cytochrome c oxidase, are potential treatments for AKI. To examine effects of caffeine and PBM on AKI in rats, Day 7 pups underwent a HIE intervention (Modified Rice-Vannucci model) replicating pathology observed in humans. Caffeine was administered for 3â€‰days and/or PBM for 5â€‰days following HIE. Weights and urine for biomarkers (NGAL, albumin, KIM-1, osteopontin) were collected prior to HIE, daily post intervention

and at sacrifice. Both treatments reduced kidney injury seen on electron microscopy, but not when combined. HIE elevated urinary NGAL and albumin on Days 1-3 post-HIE, before returning to control levels. This elevation was significantly reduced by PBM or caffeine. KIM-1 was significantly elevated for 7â€‰days post-HIE and was reduced by both treatments. Osteopontin was not altered by HIE or the treatments. Treatments, individually but not in combination, improved HIE-induced reductions in the enzymatic activity of mitochondrial complexes II-III. PBM and caffeine also improved weight gain. PBM and caffeine reduces AKI diagnosed by urinary biomarkers and confirmed by EM findings. Lipocalin-2;Caffeine;Biomarkers;Albumins Humans;Animals;Rats;Animals, Newborn;Lipocalin-2;Caffeine;Ischemia;Hypoxia-Ischemia, Brain;Biomarkers;Acute Kidney Injury;Albumins

Photobiomodulation may enhance cognitive efficiency in older adults: a functional near-infrared spectroscopy study. INTRODUCTION: The relative oxygenated hemoglobin (HbO) measured using functional near-infrared spectroscopy (fNIRS) has been considered as an index for cognitive loading, with the more difficult the task, the higher the level. A previous study reported that young adults who received transcranial photobiomodulation (tPBM) showed a reduced HbO of a difficult task, suggesting that tPBM may enhance cognitive efficiency. The present study further investigated the effect of tPBM on cognitive efficiency in older adults. METHODS: Thirty participants received a single tPBM on the forehead for 350 s. Before and after tPBM, their HbO in the visual span task with various difficulties was measured with fNIRS. RESULTS: After tPBM, participants exhibited significantly lower HbO in a harder (span 7) but not an easier level (span 2) of the task, but their behavioral performance remained unchanged. In addition, factors affecting the reduction of HbO were examined, and the results showed that individuals with better memory (as measured by a 30-min delayed recall test) showed more reduction of HbO. DISCUSSION: The results suggest that tPBM may enhance cognitive efficiency, with individuals with better memory tend to benefit more.

Comparison of Light-Based Devices in the Treatment of Meibomian Gland Dysfunction. PURPOSE: To compare different light-based devices, namely, intense pulsed light (IPL) and IPL with low-level light therapy (LLLT), in the treatment of meibomian gland dysfunction (MGD). METHODS: This was a prospective, observational study that included patients with MGD. Group 1 included 58 eyes treated with IPL (eye-lightÂ®, Espansione Marketing S.p.A., Bologna, Italy), followed by LLLT (my-maskÂ®, Espansione Marketing S.p.A., Bologna, Italy); Group 2Â included 60 eyes treated with IPL (E>EyeÂ®, E-Swin, Houdan, France); and Group 3 included 58 eyes treated with IPL (Thermaeye PlusÂ®, OptiMed, Sydney, Australia). The presence of symptoms (Ocular Surface Disease Index (OSDI)) and ocular surface changes were evaluated at baseline, three weeks, and six months after treatment. RESULTS: At week three, there was an improvement in the OSDI in all groups ($p<0.001$), without differences among them ($p=0.339$). The lipid layer thickness (LLT) increased in Groups 1 and 2 ($p<0.001$), with a similar variation ($p=0.144$). Patients with superior OSDI and lower LLT at baseline had the greatest improvement in the respective parameters ($p<0.001$). The basal tear flow increased in Group 1 ($p=0.012$). Corneal staining (CS) significantly decreased in Groups 2 ($p<0.001$) and 3 ($p<0.001$). At six months, compared to three weeks, there was further improvement in the OSDI ($p<0.001$) and the LLT ($p=0.007$), in Group 1, and an increase in the presence of CS in Group 3 ($p=0.011$). CONCLUSION: IPL treatment led to a sustained decrease in patients' symptoms, even after six months. Different IPL devices seem to have different beneficial effects. Adding LLLT to IPL appears to have an additional long-term beneficial effect as well as positive effects on the lacrimal gland.

The effects of low-level laser therapy on polycystic ovarian syndrome in rats: three different dosages. The main objective of this in vivo study was to investigate the effect of different low-level laser therapy (LLLT) doses on polycystic ovary syndrome (PCOS). In the present experimental study, a single dosage of estradiol valerate (EV) was administered to induce PCOS in female rats. After administration of the EV for induction of PCOS, rats were divided into 5 groups (n = 8/group): C group

(animals that were not exposed to any form of procedure), PC group (no treatment following EV induction), L(1) group (1 J/cm(2) LLLT treatment following EV induction), L(2) group (2 J/cm(2) LLLT treatment following EV induction), L(3) group (6 J/cm(2) LLLT treatment following EV induction). The results indicated that no significant difference was found in the serum levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), and progesterone (P4) between the C and L(2) groups ($p < 0.05$). Although the serum levels of testosterone (T) were significantly higher in the C group compared with other groups ($p < 0.05$), the L(2) group was determined to be the closest to the C group. Additionally, the LH, FSH, and T receptor level of the L(2) group was closest to the C group. In conclusion, a 2 J/cm(2) dosage of LLLT (L(2) group) can be considered the most potentially effective treatment of PCOS in the rat. However, more studies are needed to determine the optimal dose of LLLT for the treatment of PCOS. Estradiol;Follicle Stimulating Hormone;Luteinizing Hormone;Testosterone Animals;Female;Rats;Estradiol;Follicle Stimulating Hormone;Low-Level Light Therapy;Luteinizing Hormone;Polycystic Ovary Syndrome;Testosterone

Dual-NIR wavelength (pulsed 810Â nm and superpulsed 904Â nm lasers) photobiomodulation therapy synergistically augments full-thickness burn wound healing: A non-invasive approach. A thermal burn is the most frequent, distressing form of trauma. Globally, there is a critical necessity to explore novel therapeutic strategies for burn wound care. Combination therapy has marked therapeutic efficacy in positively regulating various phases of wound repair. Photobiomodulation (PBM) is a biophysical, non-thermal therapeutic healing modality to treat chronic non-healing wounds. It hypothesized that PBM using combined NIR wavelengths may absorb through different cellular photoacceptors with varying degrees of tissue penetration, which can potentially regulate the pace of healing. Therefore, the current study investigates the efficacy of dual-NIR wavelength treatment employing pulsed 810Â nm and superpulsed 904Â nm lasers PBM on transdermal burn repair in rats and unveils the associated molecular mechanistic insights. Rats were randomized into five groups: uninjured skin, burn control (sham-exposed), standalone treatment with pulsed 810Â nm laser, superpulsed 904Â nm laser, and dual combination groups. The present findings revealed that PBM with dual-NIR wavelength synergistically augmented burn wound healing compared to control and standalone treatments. The efficacy of combined treatment was exhibited by significantly enhanced wound area contraction (Î±-smooth muscle actin), proliferation (PCNA, cytokeratin-14, TGF-Î²2), angiogenesis (HIF-1Î±, CD31), ECM accumulation/ organization (collagen type 3, fibronectin), dermal hydration (AQP3), calcium homeostasis (TRPV3, calmodulin), and bioenergetics activation (CCO, AMPK-Î±, ATP). Collectively, PBM with dual-NIR wavelength (pulsed/ superpulsed-mode) treatment accelerates full-thickness burn wound healing, which could be used as a non-invasive translational approach in clinical significance in conjunction with existing burn wound care management. Rats;Animals;Low-Level Light Therapy;Wound Healing;Skin;Lasers;Burns

Efficacy of Low-level Laser Versus High-intensity Laser Therapy in the Management of Adhesive Capsulitis: A Randomized Clinical Trial. BACKGROUND: Low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) are effective in alleviating pain and improving functionality in patients with adhesive capsulitis (AC); however, no study has compared the efficacy of these two laser treatments. OBJECTIVE: To compare the effectiveness of LLLT and HILT in improving the shoulder joint range of motion and functional status and in reducing pain level in patients with AC. TRIAL DESIGN: Prospective, randomized, parallel group, patient- and assessor-blinded. METHODS: A total of 45 patients (aged: 18-65 years) with complaint of shoulder pain were evaluated for inclusion criteria, which included being aged 18-65 years and a diagnosis of AC based on physical examinations. Using computer-generated random numbers, eligible patients were randomized into two groups: HILT + stretching exercise and LLLT + stretching exercise groups. Both HILT and LLLT were performed three times/week for 3 weeks. Functional status and pain of the patients were evaluated with Shoulder

Pain and Disability Index (SPADI) and Visual Analog Scale (VAS), while shoulder joint range of motion was measured with goniometry. All assessments were done before and 3 weeks after treatment. RESULTS: A total of 40 patients (20 in each group) completed the study. At baseline, there was no statistically significant difference in the demographic and clinical characteristics between both groups. Both the LLLT and HILT groups showed significant improvement in the VAS and SPADI scores 3 weeks after treatment; however, the improvement was significantly higher in the HILT group than the LLLT group. There was no significant improvement in goniometric scores in both groups compared with baseline. No injury or other musculoskeletal complications were recorded during or after the treatments. CONCLUSION: HILT + stretching exercise treatment was more effective than LLLT + stretching exercise for improving functional parameters and pain in patients with AC. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT05469672. FUNDING: None.

The brain functional connectivity alterations in traumatic patients with olfactory disorder after low-level laser therapy demonstrated by fMRI. BACKGROUND: Low-level laser therapy (LLLT) has been clinically accepted to accelerate the nerve regeneration process after a nerve injury or transection. We aimed to investigate the neuronal basis and the influence of LLLT on brain functional networks in traumatic patients with olfactory dysfunction. METHODS: Twenty-four Patients with traumatic anosmia/hyposmia were exposed to pleasant olfactory stimuli during a block-designed fMRI session. After a 10-week period, patients as control group and patients who had completed the sessions of LLLT were invited for follow-up testing using the same fMRI protocol. Two-sample t-tests were conducted to explore group differences in activation responding to odorants (p-FDR-corrected <0.05). Differences of functional connectivity were compared between the two groups and the topological features of the olfactory network were calculated. Correlation analysis was performed between graph parameters and TDI score. RESULTS: Compared to controls, laser-treated patients showed increased activation in the cingulate, rectus gyrus, and some parts of the frontal gyrus. Shorter pathlength (p = 0.047) and increased local efficiency (p = 0.043) within the olfactory network, as well as decreased inter-network connectivity within the whole brain were observed in patients after laser surgery. Moreover, higher clustering and local efficiency were related to higher TDI score, as manifested in increased sensitivity to identify odors. CONCLUSIONS: The results support that low-level laser induces neural reorganization process and make new connections in the olfactory structures. Furthermore, the connectivity parameters may serve as potential biomarkers for traumatic anosmia or hyposmia by revealing the underlying neural mechanisms of LLLT. Humans;Magnetic Resonance Imaging;Anosmia;Low-Level Light Therapy;Olfaction Disorders;Brain

Influence of photobiomodulation therapy on the physical performance of women during the follicular phase of the menstrual cycle: A double-blind Sham-controlled randomized clinical trial. To evaluate the effects of photobiomodulation on the physical performance of healthy women, considering the menstrual cycle. 27 physically active healthy women (age 25.68â€‰Â±â€‰3.99 years; mass 63.76â€‰Â±â€‰12.77 kg; height 1.65â€‰Â±â€‰0.59 cm) during the initial follicular phase (FF1 and FF2) of the menstrual cycle underwent performance evaluations, through a supramaximal test, subjective perception of exertion, blood lactate, and evaluations in the isokinetic dynamometer. Photobiomodulation (PBM) (200J) and Sham (0J) therapy were applied 10 min before the performance evaluations on the quadriceps femoris, hamstrings, and triceps surae muscles. A significance level of 5% was adopted and the effect size was calculated by Cohen's d. It was not possible to observe a significant difference (pâ€‰>â€‰0.05) in any of the performance variables evaluated in the comparison between groups, only small effects for total distance, final subjective perception of exertion, lactate peak and lactate delta in the PBM group. PBM did not improve muscle performance, resistance to fatigue, perceived exertion, and blood lactate concentrations during a predominantly anaerobic test in healthy women during the FF of the menstrual cycle. Lactic Acid

Humans;Female;Young Adult;Adult;Follicular Phase;Low-Level Light Therapy;Double-Blind Method;Menstrual Cycle;Lactic Acid;Physical Functional Performance

Photobiomodulation in diabetic rats: Effects on morphological, pancreatic parameters, and glucose homeostasis. Photobiomodulation (PBM) has therapeutic effects on wound healing, diabetic microangiopathy, and retinopathy. However, little is known about the use of PBM for the treatment of diabetes mellitus (DM). In this context, we aimed to evaluate the effects of PBM on pancreas morphology and insulin and glucose tolerance in an experimental model of DM. Thus, DM was induced by streptozotocin (STZ) (60â€‰mg/kg). Subsequently, the rats were treated with PBM (808â€‰nm and 30â€‰J/cm(2)). After euthanasia, morphometric parameters and immunoreactivity for insulin and 8-OHdG were evaluated in the pancreas. The results showed that treated animals had higher values of body mass and higher values in the number of beta cells in the pancreas. In conclusion, PBM resulted in decreased weight loss in STZ-induced diabetic rats and presented a stimulatory effect on the pancreas of the treated animals, highlighting the promising effects of this therapy in the clinical condition of DM. Insulins;Glucose;Blood Glucose;Insulin Rats;Animals;Diabetes Mellitus, Experimental;Rats, Wistar;Low-Level Light Therapy;Pancreas;Homeostasis;Insulins;Glucose;Blood Glucose;Insulin

Low-Level Photobiomodulation Therapy Modulates H(2)O(2) Production, TRPC-6, and PGC-1Î± Levels in the Dystrophic Muscle. Objective: This study evaluated photobiomodulation therapy (PBMT) effects on the factors involved in mitochondrial biogenesis, on the mitochondrial respiratory complexes, and on the transient receptor potential canonical channels (such as TRPC-1 and TRPC-6) in in vitro (mdx muscle cells) and in vivo studies (gastrocnemius muscle) from mdx mice, the dystrophin-deficient model of Duchenne muscular dystrophy (DMD). Background: There is no successful treatment for DMD, therefore demanding search for new therapies that can improve the muscle role, the quality of life, and the survival of dystrophic patients. Methods: The dystrophic primary muscle cells received PBMT at 0.6â€‰J and 5â€‰J, and the dystrophic gastrocnemius muscle received PBMT at 0.6â€‰J. Results: The dystrophic muscle cells treated with PBMT (0.6â€‰J and 5â€‰J) showed no cytotoxicity and significantly lower levels in hydrogen peroxide (H(2)O(2)) production. We also demonstrated, for the first time, the capacity of PBMT, at a low dose (0.6â€‰J), in reducing the TRPC-6 content and in raising the peroxisome proliferator-activated receptor Î³ coactivator-1Î± (PGC-1Î±) content in the dystrophic gastrocnemius muscle. Conclusions: PBMT modulates H(2)O(2) production, TRPC-6, and PGC-1Î± content in the dystrophic muscle. These results suggest that laser therapy could act as an auxiliary therapy in the treatment of dystrophic patients. Hydrogen Peroxide;Trpc6 protein, mouse;Ppargc1a protein, mouse Animals;Mice;Hydrogen Peroxide;Low-Level Light Therapy;Mice, Inbred mdx;Muscle, Skeletal;Quality of Life

Evaluation of photobiomodulation effect on cesarean-sectioned wound healing: a clinical study. The effects of low-level laser on the wound healing and burn injuries have been previously examined to demonstrate some satisfactory results. Despite there are a few articles available to study photobiomodulation (PBM) effects on the pain relief of cesarean sectioned wound, however no systematic examination has been carried out so far regarding its healing. Here, the aim of this clinical study was to evaluate PBM effect on the cesarean-sectioned wound healing. PBM effects of semiconductor lasers are investigated at 658 and 660 nm with 100, 150 and 350 mW output powers on 40 patients. Due to the global increasing number of cesarean sections, we have decided to investigate the effect of laser as a reliable technique to recover the wounds fast. We considered women as the target group who had their first delivery giving the birth of their children by cesarean section. We selected patients are who treated by laser therapy using indium gallium aluminum phosphide (InGaAlP) semiconductor linear scanning type with beam cross section of 12 cm(2) and the output power of 100 mW at 658Â nm exposing a therapeutic dose of 2Â J/cm(2). The purpose is to

accelerate the healing process of the wounds after delivery as an intervention group against the people who chose the conventional methods (using ointments, pills, etc.) to heal their cesarean sectioned wounds as the control group. Regarding the wounds of these two groups, the questionnaires were filled by patients to assess the severity of pain from visual analogue scale (VAS) based on the healing of wounds from redness, edema, ecchymosis, discharge, and distance between the two edges of the wound (REEDA) scale in the early hours after surgery and the post-treatment follow-up on the third, seventh, and the tenth days. The data collected by these questionnaires were analyzed using statistical package for social science)SPSS(as a statistical software to give out the comparative histograms. This study reports a clinical examination of PBM under intervention group of 40 patients ranging 18-40Â years old with body mass index (BMI) of 29-36, during post-cesarean surgery to elucidate successful healing of the wounds and scars against conventional methods which considered as control group. Comparison of mean REEDA scores on the third day (pâ€‰=â€‰0.035), seventh day (pâ€‰=â€‰0.03), and tenth day (pâ€‰=â€‰0.02) after delivery exhibits that the two groups benefit a statistically significant difference with each other. For instance, the mean wound healing score in the intervention group was almost half of the mean wound healing score on the tenth day in the control group (1.09â€‰Â±â€‰0.586 vs. 2.25â€‰Â±â€‰0.422). The post-cesarean follow-up indicates that the patients treated by the laser therapy (intervention group) encounter better recovery than the control group.
Adolescent;Adult;Female;Humans;Pregnancy;Young Adult;Cesarean Section;Cicatrix;Low-Level Light Therapy;Pain;Wound Healing

Assessing the role of combination of stem cell and light-based treatments on skin wound repair: A meta-analysis. The meta-analysis aims to evaluate and compare the impact of the combination of stem cells (SCs) and light-based treatments (LBTs) on skin wound (SW) repair. Examinations comparing SCs to LBT with SCs for SW repair was among the meta-analysis from various languages that met the inclusion criteria. Using continuous random-effect models, the results of these investigations were examined, and the mean difference (MD) with 95% confidence intervals was computed (CIs). Seven examinations from 2012 to 2022 were recruited for the current analysis including 106 animals with SWs. Photobiomodulation therapy (PBT) plus SCs had a significantly higher wound closure rate (WCR) (MD, 9.08; 95% CI, 5.55-12.61, pâ€‰<â€‰0.001) compared to SCs in animals with SWs. However, no significant difference was found between PBT plus SCs and SCs on wound tensile strength (WTS) (MD, 2.01; 95% CI, -0.42 to 4.44, pâ€‰=â€‰0.10) in animals with SWs. The examined data revealed that PBT plus SCs had a significantly higher WCR, however, no significant difference was found in WTS compared to SCs in animals with SWs. Nevertheless, caution should be exercised while interacting with its values since all the chosen examinations were found with a low sample size and a low number of examinations were found for the comparisons studied for the meta-analysis. Animals;Soft Tissue Injuries;Skin Transplantation

Reverse skin aging signs by red light photobiomodulation. BACKGROUND: Photobiomodulation is a process by which the absorption of red light energy produces a series of physiological effects at the cellular level such as the enhancement of mitochondrial Adenosine Triphosphate (ATP) production, cell signaling and growth factor synthesis, and the reduction of oxidative stress. Light emitting diodes (LEDs) photobiomodulation is an increasingly popular therapy for treating skin problems, especially for reversing the signs of skin aging. OBJECTIVE: The objective of this study is to demonstrate the effectiveness of a photobiomodulation treatment using red LEDs on the facial skin at a rate of two sessions per week for 3 months. The LED mask used is the Skin Light Dior x Lucibel mask diffusing a cold red light with a wavelength of 630Â Â±Â 10Â nm and a power of 15.6 J/cm(2) for a duration of 12 min. METHOD: In order to demonstrate the effectiveness of the mask in reversing the signs of skin aging, a clinical study was conducted on 20 healthy Caucasian women: the antiwrinkle effect by

measuring the depth of the crow's feet wrinkle, the relaxation of the oval of the face by clinical scoring, the firmness and elasticity of the skin by cutometric measurement, the density of the dermis by ultrasound analysis, the smoothness of the skin by measuring the roughness at the cheek, the homogeneity of the complexion by chromametric measurement, the diameter of the pores by macrophotographs and finally the sebo-regulating effect by measurement of the rate of sebum and quantification of the number of pores containing porphyrin in the subjects presenting a mixed to oily skin. The satisfaction of the volunteers was also evaluated at the end of the study via a self-questionnaire. RESULTS: The efficacy results measured after 1, 2, and 3 months of use are progressive and confirm the interest of LED photobiomodulation to reverse the visible signs of skin aging. All the volunteers observed an overall improvement in skin quality. CONCLUSION: All the results observed confirm the interest of using photobiomodulation to reverse the visible signs of aging. These results last for up to 1 month after stopping the use of the mask, which is a sign of lasting structural and functional rejuvenation of the skin. Humans;Female;Skin Aging;Light;Skin;Aging;Face;Low-Level Light Therapy

A randomised trial of the bone formation after maxillary sinus floor augmentation with bovine hydroxyapatite (CeraboneÂ®) and Photobiomodulation: histomorphometric and immunohistochemical analysis. BACKGROUND: The use of non-autogenous biomaterial to increase bone height in the maxillary sinus has been shown to be effective, but the results are still inconclusive. MATERIAL AND METHODS: Eight participants were selected and included in the research. After surgical access with osteotomy on the lateral wall of both maxillary sinuses, these were filled with CeraboneÂ®. Then, by blind randomization, they received one of the following treatments: Filling with CeraboneÂ® (Control group); treatment with Photobiomodulation (PBM), filling with CeraboneÂ® and treatment with low-power laser (PBM group). Biopsies were obtained 30 days after the surgery, using a 2.8 mm internal diameter trephine bur. Qualitative and quantitative histological analyzes were performed and immunohistochemical analyzes of osteocalcin (OCN) and tartrate-resistant acid phosphatase (TRAP) were performed with scores for each of the biological events. RESULTS: The CeraboneÂ® biomaterial demonstrated a high degree of biocompatibility. New bone formation was observed in both groups. In the PBM group, there was greater bone formation and newly formed tissue in an advanced state of bone maturation. The immunostaining of OCN was greater at 30 days in the PBM group than in the control. There was no significant difference in TRAP immunostaining at 30 days between the groups. CONCLUSIONS: Low-power laser-mediated by PBM promoted greater bone formation; the newly formed tissue showed a more advanced state of bone maturation in maxillary sinuses filled with CeraboneÂ® biomaterial and treatment with PBM, within the 30-day evaluation period. Key words:Sinus floor augmentation, dental implants, bone and bones, low-level light therapy.

Corrigendum to Twenty-year analysis of clinic studies of photobiomodulation for oral mucositis: a scoping review, Oral Surg Oral Med Oral Pathol Oral Radiol. 135 (2023) 626-641.

The effect of different treatment protocols with diode laser on regeneration in axonetmesis Ä±njuries of the Ä±nferior alveolar nerve: an animal study. The inferior alveolar nerve can be damaged during dental procedures, leading to symptoms, such as tingling, numbness, and reduced quality of life. Recovery depends on factors such as medications, surgery, and photobiomodulation therapy. Photobiomodulation therapy has shown the potential to improve nerve function and reduce regeneration time; however, there is no standard treatment protocol yet. This study aimed to examine the effect of diode lasers on nerve regeneration in patients with axonetmesis injuries. In this experiment on animals, Wistar rats' damaged sensory systems were treated with lasers to restore them. Animals were randomly divided into six groups: a sham group, a control group, and four laser treatment groups(1st group: performed every day, 10 sessions; 2nd group: performed every 2 days,

10 sessions; 3rd group: performed every day, 20 sessions; and 4th group: performed every 2 days, 20 sessions). Sensory function was determined using the Semmes-Weinstein monofilament test, which was repeated after the surgical procedure. The results showed that the 20-session group had the best improvement, most closely resembling the group without sensory test damage. The histomorphometric results showed that the number of axons was significantly lower in the group that received 10 daily sessions and in the control group than in the undamaged nerve. Axon diameter was lower in all groups than in the sham group. In conclusion, the remarkable aspect of this study is that consecutive-day 20-session laser treatment showed better improvement than the over-the-day 20-session treatment protocol. Rats;Animals;Rats, Wistar;Lasers, Semiconductor;Quality of Life;Mandibular Nerve;Low-Level Light Therapy;Nerve Regeneration

Comparison between Low-Level and High-Intensity Laser Therapy as an Adjunctive Treatment for Knee Osteoarthritis: A Randomized, Double-Blind Clinical Trial. BACKGROUND: Low-level (LLLT) and high-intensity laser therapy (HILT) can be beneficial additions to knee osteoarthritis (KOA) rehabilitation exercises; however, it is still being determined which electrophysical agent is more effective. AIM: To compare the effects of LLLT and HILT as adjuncts to rehabilitation exercises (LL + EX and HL + EX) on clinical outcomes in KOA. METHODS: Thirty-four adults with mild-to-moderate KOA were randomly allocated to either LL + EX or HL + EX (n = 17 each). Both groups underwent their respective intervention weekly for twelve weeks: LL + EX (400 mW, 830 nm, 10 to 12 J/cm(2), and 400 J per session) or HL + EX (5 W, 1064 nm, 19 to 150 J/cm(2), and 3190 J per session). The laser probe was placed vertically in contact with the knee and moved in a slow-scan manner on the antero-medial/lateral sides of the knee joint. Participants' Knee Injury and Osteoarthritis Outcome Score (KOOS), Numerical Pain Rating Scale (NPRS), active knee flexion, and Timed Up-and-Go test (TUG) were assessed. RESULTS: Post intervention, both groups showed improvements in their KOOS, NPRS, active knee flexion, and TUG scores compared to baseline ($p < 0.01$). The mean difference of change in KOOS, NPRS, and active knee flexion scores for the HL + EX group surpassed the minimal clinically important difference threshold. In contrast, the LL + EX group only demonstrated clinical significance for the NPRS scores. CONCLUSIONS: Incorporating HILT as an adjunct to usual KOA rehabilitation led to significantly higher improvements in pain, physical function, and knee-related disability compared to LLLT applied in scanning mode.

Effects of Near-Infrared Pulsed Light on the Attention of Human Beings Using Electroencephalography. In our previous studies, photobiomodulation (PBM) stimulation can induce significant brain activation in normal subjects. In an open-eye study, the PBM stimulation was able to increase the power of alpha rhythms and theta waves, as well as decrease the beta activities after PBM stimulation. However, in the closed eyes study, the alpha rhythms in the laser group were reduced. This means the PBM stimulation can induce specific brainwaves under different conditions. Thus, to investigate the effects of PBM stimulation on human's attention, forty students were recruited in this single-blind randomized trial. A PBM stimulator, with seven pcs laser diodes (LDs), frequency 10 Hz, 30 mW/each LD, and wavelength 830 nm, was used to radiate the palm of the subject. PBM stimulation was found to induce significant variation in beta activity in most of the regions of the brain in the laser group. Compared to the placebo group, the PBM stimulation has a significant change in beta activity on electroencephalography (EEG). Three types of tests, the random number test, the Stroop color-word test, and the Multiple-Dimension Attention Test (MDAT), were used to evaluate the effects of the PBM stimulation. The scores of MDAT in the laser group increased more significantly than those in the placebo group after PBM stimulation ($p < 0.01$). An improvement in attention was observed in this study.

Protocol Report on the Transcranial Photobiomodulation for Alzheimer's Disease (TRAP-AD) Study. BACKGROUND: Alzheimer's disease's (AD) prevalence is projected to increase as the population ages

and current treatments are minimally effective. Transcranial photobiomodulation (t-PBM) with near-infrared (NIR) light penetrates into the cerebral cortex, stimulates the mitochondrial respiratory chain, and increases cerebral blood flow. Preliminary data suggests t-PBM may be efficacious in improving cognition in people with early AD and amnestic mild cognitive impairment (aMCI). METHODS: In this randomized, double-blind, placebo-controlled study with aMCI and early AD participants, we will test the efficacy, safety, and impact on cognition of 24 sessions of t-PBM delivered over 8 weeks. Brain mechanisms of t-PBM in this population will be explored by testing whether the baseline tau burden (measured with (18)F-MK6240), or changes in mitochondrial function over 8 weeks (assessed with (31)P-MRSI), moderates the changes observed in cognitive functions after t-PBM therapy. We will also use changes in the fMRI Blood-Oxygenation-Level-Dependent (BOLD) signal after a single treatment to demonstrate t-PBM-dependent increases in prefrontal cortex blood flow. CONCLUSION: This study will test whether t-PBM, a low-cost, accessible, and user-friendly intervention, has the potential to improve cognition and function in an aMCI and early AD population.

The Beneficial Role of Photobiomodulation in Neurodegenerative Diseases. Photobiomodulation (PBM), also known as Low-level Laser Therapy (LLLT), involves the use of light from a laser or light-emitting diode (LED) in the treatment of various disorders and it has recently gained increasing interest. Progressive neuronal loss with attendant consequences such as cognitive and/or motor decline characterize neurodegenerative diseases. The available therapeutic drugs have only been able to provide symptomatic relief and may also present with some side effects, thus precluding their use in treatment. Recently, there has been an exponential increase in interest and attention in the use of PBM as a therapy in various neurodegenerative diseases in animal studies. Because of the financial and social burden of neurodegenerative diseases on the sufferers and the need for the discovery of potential therapeutic inventions in their management, it is pertinent to examine the beneficial effects of PBM and the various cellular mechanisms by which it modulates neural activity. Here, we highlight the various ways by which PBM may possess beneficial effects on neural activity and has been reported in various neurodegenerative conditions (Alzheimer's disease, Parkinson's disease, epilepsy, TBI, stroke) with the hope that it may serve as an alternative therapy in the management of neurodegenerative diseases because of the biological side effects associated with drugs currently used in the treatment of neurodegenerative diseases.

The Effects and Mechanisms of PBM Therapy in Accelerating Orthodontic Tooth Movement. Malocclusion is one of the three major diseases, the incidence of which could reach 56% of the imperiled oral and systemic health in the world today. Orthodontics is still the primary method to solve the problem. However, it is clear that many orthodontic complications are associated with courses of long-term therapy. Photobiomodulation (PBM) therapy could be used as a popular way to shorten the course of orthodontic treatment by nearly 26% to 40%. In this review, the efficacy in cells and animals, mechanisms, relevant cytokines and signaling, clinical trials and applications, and the future developments of PBM therapy in orthodontics were evaluated to demonstrate its validity. Simultaneously, based on orthodontic mechanisms and present findings, the mechanisms of acceleration of orthodontic tooth movement (OTM) caused by PBM therapy were explored in relation to four aspects, including blood vessels, inflammatory response, collagen and fibers, and mineralized tissues. Also, the cooperative effects and clinical translation of PBM therapy in orthodontics have been explored in a growing numbers of studies. Up to now, PBM therapy has been gaining popularity for its non-invasive nature, easy operation, and painless procedures. However, the validity and exact mechanism of PBM therapy as an adjuvant treatment in orthodontics have not been fully elucidated. Therefore, this review summarizes the efficacy of PBM therapy on the acceleration of OTM comprehensively from various aspects and was designed to provide an evidence-based platform for

the research and development of light-related orthodontic tooth movement acceleration devices. Cytokines;Adjuvants, Immunologic;Collagen Animals;Tooth Movement Techniques;Low-Level Light Therapy;Cytokines;Adjuvants, Immunologic;Collagen

From functional neuroimaging to neurostimulation: fNIRS devices as cognitive enhancers. Functional near-infrared spectroscopy (fNIRS) relies on near-infrared (NIR) light for changes in tissue oxygenation. For decades, this technique has been used in neuroscience to measure cortical activity. However, recent research suggests that NIR light directed to neural populations can modulate their activity through "photobiomodulation" (PBM). Yet, fNIRS is being used exclusively as a measurement tool. By adopting cognitive tests sensitive to prefrontal functioning, we show that a 'classical' fNIRS device, placed in correspondence of the prefrontal cortices of healthy participants, induces faster RTs and better accuracy in some of the indexes considered. A well-matched control group, wearing the same but inactive device, did not show any improvement. Hence, our findings indicate that the 'standard' use of fNIRS devices generates PBM impacting cognition. The neuromodulatory power intrinsic in that technique has been so far completely overlooked, and future studies will need to take this into account. Nootropic Agents Humans;Nootropic Agents;Spectroscopy, Near-Infrared;Functional Neuroimaging;Cognition;Neurosciences

Photobiomodulation Therapy in Carpal Tunnel Release: A Randomized Controlled Trial. Background: Carpal tunnel release (CTR) is widely accepted as an effective treatment for carpal tunnel syndrome. However, the recovery is often delayed and incomplete. Photobiomodulation therapy (PBMT) produces a nonthermal effect on living tissues; it promotes healing, remodels and reduces inflammation of an injured nerve. The purpose of this study was to compare the outcome of CTR between patients who underwent postoperative PBMT and without PBMT. Materials and methods: We recruited 105 patients who had open CTR from January 2019 to January 2021. Fifty-six patients fulfilled the study criteria and were randomized into two groups: with PBMT (nâ€‰=â€‰28) and without PBMT (nâ€‰=â€‰28). Demographic and clinical data were obtained preoperatively. The PBMT group had ten 3-min sessions over 3 weeks using 808â€‰nm, 50â€‰mW PBMT to deliver 9â€‰J per session to the CTR incision scar. Clinical outcomes were assessed at 1, 3, and 6 months postoperatively. Data analysis was performed with SPSS software. Results: There were significant improvements in the Functional Status Scale in the Boston Carpal Tunnel Questionnaire (pâ€‰=â€‰0.018) and pain (visual analogue scales) in the morning (pâ€‰=â€‰0.019) at 1 month postoperatively in the PBMT group compared with the non-PBMT group. Improvement of tip pinch strength at 3 months (pâ€‰=â€‰0.022) and 6 months (pâ€‰=â€‰0.024), lateral pinch strength at 1 month (pâ€‰=â€‰0.042) and 3 months (pâ€‰=â€‰0.05), and tripod pinch strength at 3 months (pâ€‰=â€‰0.005) was significantly better in the PBMT group. Thumb 2-point discrimination (2PD) at 3 months (pâ€‰=â€‰0.018) and 6 months (pâ€‰=â€‰0.016) and index finger 2PD at 3 months (pâ€‰=â€‰0.039) were also significantly improved in the PBMT group. There were no side effects of PBMT reported. Conclusions: Patients who underwent PBMT post-CTR had better outcomes. PBMT may be a valuable adjunct to post-CTR care. Humans;Carpal Tunnel Syndrome;Low-Level Light Therapy;Treatment Outcome;Pain;Wrist

The Use of Diode Low-Power Laser Therapy before In-Office Bleaching to Prevent Bleaching-Induced Tooth Sensitivity: A Clinical Double-Blind Randomized Study. INTRODUCTION: The present study aimed to investigate the effectiveness of low-level laser therapy (LLLT) use before in-office bleaching to prevent an increase in the risk and intensity of tooth sensitivity. METHODS: Thirty patients were selected. Before bleaching with 38% hydrogen peroxide, the participants were randomly divided into two groups of 15 subjects. Test group: the patients' teeth were subjected to a preliminary LLLT procedure by an 810 nm diode laser with 0.5 W for 30 s for an energy density of 15 J/cm(2) and a group placebo. All patients were instructed to report their cold sensitivity experiences immediately, 1

h, 24 h, and 48 h after the end of bleaching via a VAS score. RESULTS: The results obtained show an increase in VAS values for both groups (290 and 490 vs. 224 and 234 of baseline time of test and placebo group, respectively); afterward, the VAS value seemingly decreases at 1 h after the end of bleaching, approaching the baseline VAS for the test group (274) in comparison to the placebo group. CONCLUSIONS: The use of preliminary diode LLLT could represent a valid possibility to reduce the occurrence of tooth sensitivity post-whitening and shorten recovery time in cases where tooth sensitivity occurs.

High-intensity laser therapy in low back pain management: a systematic review with meta-analysis. Low back pain (LBP) is a widespread health issue affecting people globally and is the second leading cause of missed workdays. High-intensity laser therapy (HILT) promises to decrease pain intensity in LBP patients. The aim of this work was to evaluate the effect of HILT in adult LBP patients. We searched for randomized controlled studies (RCTs) published before January of 2023. Our primary outcome was pain intensity, while our secondary outcomes included disability and flexibility scores. We synthesized the evidence using RevMan v.5.4 and assessed methodological quality with the Oxford/Jadad scale and the Cochrane collaboration's risk of bias tool 1. The model favors the HILT group over the control group in terms of pain intensity after treatment (MD with 95% CI is -1.65 [-2.22, -1.09], p-value < 0.00001, I(2)=67%), Oswestry disability index (MD with 95% CI is -0.67 [-1.22, -0.12], p-value = 0.02, I(2)=73%), and Roland disability index (MD with 95% CI is -1.36 [-1.76, -0.96], p-value <0.00001, I(2)=0%). The patients in the high-intensity laser therapy had statistically significantly lower (low back) pain intensity compared to the patients in the control group. Based on three RCTs, our model also showed the positive effect of the HILT on LBP in terms of the Oswestry disability index and Roland disability index. Adult;Humans;Low Back Pain;Laser Therapy;Low-Level Light Therapy;Exercise Therapy;Pain Measurement

Low-intensity laser diode plus extracorporeal shock wave therapy: a new treatment strategy in the management of Peyronie's disease. PURPOSE: To assess the clinical effectiveness of extra corporeal shockwave therapy (ESWT) administration compared with ESWT plus a low-intensity laser diode therapy (LILDT) in the management of Peyronie's disease (PD) stable stage. METHODS: In this study, 214 patients affected by PD in stable stage (â‰¥â€‰12Â months), were divided into two groups. Group 1 (G1) counted 111 patients treated only with ESWT; Group 2 (G2) consisted of 103 patients that received ESWT with the same protocol of G1 plus LILDT for six weeks. The patients of both groups were assessed at baseline and follow-up for erectile function, painful erections, penile plaque size and penile curvature. The results were evaluated at baseline and 3, 6, 12Â months after the treatment. RESULTS: Three months after the treatment in G2 pain in an erection or during intercourse was resolved completely in 78.6% of the patients, whereas in 55.8% cases of G1 (pâ€‰<â€‰0.003). G2 patients had a reduction of curvature degree after the 3Â months treatment (pâ€‰<â€‰0.002). However, mean plaque size decreased in both groups without statistically differences with baseline values. Meanâ€‰Â±â€‰SD IIEF-5 score further improved significantly in the group treated with ESWT plus LILDT (pâ€‰<â€‰0.001). There were no permanent adverse sequelae after treatments. CONCLUSION: This study demonstrates an interesting therapeutic strategy when combined to the synergistic action of a shock wave therapy with low-intensity laser therapy on the stable plaques with significant benefits in terms of pain perception, penile curvature and sexual activity. Male;Humans;Penile Induration;Extracorporeal Shockwave Therapy;Lithotripsy;Penis;Penile Erection;Treatment Outcome;Pelvic Pain

Photobiomodulation inhibits the expression of chondroitin sulfate proteoglycans after spinal cord injury via the Sox9 pathway. Both glial cells and glia scar greatly affect the development of spinal cord injury and have become hot spots in research on spinal cord injury treatment. The cellular deposition of dense extracellular matrix proteins such as chondroitin sulfate proteoglycans inside and

around the glial scar is known to affect axonal growth and be a major obstacle to autogenous repair. These proteins are thus candidate targets for spinal cord injury therapy. Our previous studies demonstrated that 810 nm photobiomodulation inhibited the formation of chondroitin sulfate proteoglycans after spinal cord injury and greatly improved motor function in model animals. However, the specific mechanism and potential targets involved remain to be clarified. In this study, to investigate the therapeutic effect of photobiomodulation, we established a mouse model of spinal cord injury by T9 clamping and irradiated the injury site at a power density of 50 mW/cm(2) for 50 minutes once a day for 7 consecutive days. We found that photobiomodulation greatly restored motor function in mice and downregulated chondroitin sulfate proteoglycan expression in the injured spinal cord. Bioinformatics analysis revealed that photobiomodulation inhibited the expression of proteoglycan-related genes induced by spinal cord injury, and versican, a type of proteoglycan, was one of the most markedly changed molecules. Immunofluorescence staining showed that after spinal cord injury, versican was present in astrocytes in spinal cord tissue. The expression of versican in primary astrocytes cultured in vitro increased after inflammation induction, whereas photobiomodulation inhibited the expression of versican. Furthermore, we found that the increased levels of p-Smad3, p-P38 and p-Erk in inflammatory astrocytes were reduced after photobiomodulation treatment and after delivery of inhibitors including FR 180204, (E)-SIS3, and SB 202190. This suggests that Smad3/Sox9 and MAPK/Sox9 pathways may be involved in the effects of photobiomodulation. In summary, our findings show that photobiomodulation modulates the expression of chondroitin sulfate proteoglycans, and versican is one of the key target molecules of photobiomodulation. MAPK/Sox9 and Smad3/Sox9 pathways may play a role in the effects of photobiomodulation on chondroitin sulfate proteoglycan accumulation after spinal cord injury.

Myths and truths on biophysics-based approach in rehabilitation of musculoskeletal disorders. Musculoskeletal disorders (MSD) are a crucial issue in current literature due to their impact on physical function, social, and economic costs. Rehabilitation plays a pivotal role in the therapeutic management of these disabling conditions with growing evidence underlining positive effects in improving functional outcomes. However, to date, several questions are still open about the mechanisms underpinning functional improvements while recent research is now focusing on a deeper understanding of the biophysical processes underpinning the macroscopical effects of these treatments. Thus, this narrative review aims at providing a comprehensive overview about the state of the art of biophysical dimensions of currently available treatments for MSD. PubMed, Scopus, CENTRAL, PEDro, and Web of Science were searched between March 2022 and October 2022 for in vitro and in vivo studies, clinical trials, systematic reviews, and meta-analysis addressing the issue of biophysics-based approach in rehabilitation of MSD. Our findings showed that a biophysical approach might be integrated into regenerative rehabilitation, aiming at enhancing regenerative processes by mechanical and biophysical stimuli. In addition, a biophysical-based approach has been proposed to improve knowledge about several instrumental physical therapies, including shock wave therapies, low-level laser therapy, ultrasound, short-wave diathermy, electrical stimulation, pulsed electromagnetic field, and vibration therapy. In accordance, emerging research is now focusing on the biophysical properties of several medical procedures to improve pain management in patients with MSD. Taken together, our results showed promising results of the integration of a biophysical-based approach in rehabilitation, albeit several limitations currently limit its implementation in routine clinical setting. Unfortunately, the state of the art is still inconclusive, and the low quality of clinical studies based on the biophysical approach did not provide clear treatment protocols. Further studies are needed to promote a precise rehabilitation approach targeting biological modification and enhancing the functional improvement of patients with MSDs.

Regeneration of taste through sonic hedgehog upregulation by photobiomodulation. This study investigated photobiomodulation (PBM) effects in Sonic hedgehog (Shh) signaling as a potential approach to taste preservation and regeneration. Primary taste cell (TC) cultures were treated with Shh antagonist vismodegib and irradiated using a continuous wave type 630â€‰nm light-emitting diode (10â€‰mW/cm(2)) array, with single or multiple doses of 30â€‰J/cm(2) to determine dose inducing significant upregulation effect. Shh, Ptch, Smo, and Gli1 were significantly upregulated at 120â€‰J/cm(2) , used as the minimum dose in vivo. Vismodegib was administered via daily oral gavage for 21â€‰days (30â€‰mg/kg) to induce Shh inhibition in the tongue of rat animal models resulting in taste bud damage and taste dysfunction. PBM treatment using a 630â€‰nm laser (3â€‰W/cm(2)) at a radiant exposure of 120â€‰J/cm(2) (24â€‰J/cm(2) â€‰Ã—â€‰5) successfully upregulated the Shh protein expression, regenerated taste buds, and recovered taste function. HhAntag691;Hedgehog Proteins Animals;Rats;Taste;Hedgehog Proteins;Up-Regulation;Taste Buds

A scoping review on hyposalivation associated with systemic conditions: the role of physical stimulation in the treatment approaches. BACKGROUND: Several systemic conditions can result in distinct degrees of salivary gland damage and consequent hypofunction. The development of successful management schemes is highly challenging due to the complexity of saliva. This study aimed to systematically map the literature on the physical stimulation of salivary glands for hyposalivation management and the response of individuals according to different systemic conditions causing salivary impairment. METHODS: A systematic search in the literature was performed. Two reviewers independently selected clinical trials, randomized or not, that used physical stimulation to treat hyposalivation caused by systemic conditions. Studies evaluating healthy subjects without hyposalivation were included as controls. Single-arm clinical studies or case series were also included for protocol mapping (PRISMA extension for scoping reviews). RESULTS: Out of 24 included studies, 10 evaluated healthy subjects, from which 9 tested transcutaneous electrical nerve stimulation (TENS) and 1 tested acupuncture and electroacupuncture. Fourteen studies evaluated individuals with hyposalivation: 6 applied TENS, 6 applied low-level laser therapy (LLLT), and 2 applied acupuncture, carried out in post-chemotherapy, medication use, postmenopausal women, hemodialysis patients, smokers, diabetics, SjÃ¶gren's syndrome (SS). All showed increased salivation after treatment, except for two LLLT studies in individuals with SS. CONCLUSIONS: Among the different patient groups, individuals with SjÃ¶gren's syndrome (SS) exhibited the poorest responses, while those with medication-induced hyposalivation demonstrated the most favorable treatment outcomes, independently of the management strategy for saliva stimulation. It means that physical stimulation of salivary glands holds promise as an alternative for managing hyposalivation in cases of reversible gland damage. However, to make informed decisions in current practice, it is necessary to conduct new well-designed randomized clinical trials with appropriate methodologies. Humans;Female;Sjogren's Syndrome;Xerostomia;Saliva;Healthy Volunteers;Physical Stimulation

Clinical use of photobiomodulation for the prevention and treatment of oral mucositis: the real-life experience of MASCC/ISOO members. AIM: To assess clinical use and patient outcome of photobiomodulation (PBM) for oral mucositis (OM) prevention and treatment among specialized practitioners. METHODS: A poll was emailed to the members of the Mucositis Study Group of MASCC/ISOO. The PBM parameters used by the respondents were analyzed using exploratory statistical methods to identify combinations of PBM parameters (patterns) that characterize the variance in the protocols (principal component analysis). RESULTS: Responses were received from 101 MSG members, with 78 providing analyzable data. Most of the responders were dental practitioners or oral medicine specialists. PBM was used by 59% of the responders for OM or targeted therapy stomatitis. Technical parameters varied widely. Most responders used wavelengths âˆ¼650 nm intra-

orally. The spot-size and distance from the tissue were the main factors driving the variation. All PBM users noted that PBM relieved pain, either immediately or a delayed effect. High likelihood of pain relief (measured as responder's report of pain relief in 67-100% of patients) was reported by 22% and 19% of PBM users for immediate pain relief and delayed pain relief, respectively. The most common reported barriers to using PBM were financial considerations, time constraints, lack of training or experience and concern about the potential for malignant transformation or increased risk of cancer recurrence. CONCLUSIONS: The use of PBM for OM prevention or treatment is in early phases of adoption in practices, facing some obstacles to implement it. A wide variation in technical parameters was found. Nonetheless, responses indicate that PBM provided pain relief. Humans;Dentists;Professional Role;Pain Management;Stomatitis;Pain

Amber photobiomodulation versus tranexamic acid for the treatment of melasma: protocol for a double-blind, randomised controlled trial. INTRODUCTION: Photobiomodulation (PBM) has been suggested as an alternative treatment for melasma. In vitro studies have shown PBM with amber light inhibits the tyrosinase enzyme, induces autophagy and reduces the melanin content, but randomised controlled clinical trials are still needed. This study aims to evaluate the efficacy of amber PBM (590â€‰nm) in the treatment of melasma compared with liposomal tranexamic acid. METHODS AND ANALYSIS: This study is a controlled, randomised, double-blind, non-inferiority trial. This study will be performed in two centres (Universidade Nove de Julho Facility, Campus Vergueiro, and Galache Odontology Clinic, SÃ£o Caetano do Sul, both in SÃ£o Paulo State, Brazil). The sample (54 participants) will be divided into two groups in a 1:1 ratio; one group will receive active PBM and a placebo cosmetic and the other will receive sham PBM and liposomal tranexamic acid. Women presenting facial melasma, aged 35-50 years, with skin phototypes II-IV, will be eligible for inclusion. Women who use oral contraceptives, intrauterine devices, hormone replacement or photosensitive drugs, those with autoimmune disease and those who have undergone facial treatments in the last 3 months will be excluded from the study. The participants will receive PBM weekly for 12 weeks and will use the cosmetic two times per day at home during this period. The severity of melasma will be evaluated through the Melasma Area and Severity Index (MASI) as the primary outcome; pigmentation of the epidermis evaluated by corneomelametry, the photographic records, the global diagnosis of the face and the quality-of-life questionnaire (Brazilian Portuguese version of the Melasma Quality of Life Questionnaire) will assessed as secondary outcomes. All assessments will be made before starting the study (week 0), mid-study at 6 weeks and at the completion of treatment (week 12). MASI will also be evaluated during follow-up (weeks 16 and 20). The data will be analysed based on the intention-to-treat analysis using a generalised mixed model, and Î± <0.05â€‰will be considered statistically significant. ETHICS AND DISSEMINATION: The protocol was approved by the Research Ethics Committee of Universidade Nove de Julho (5â€‰332â€‰384). All participants will fill out the patient informed consent form. The results obtained in this trial will be presented at conferences and submitted for publication. TRIAL REGISTRATION NUMBER: ClinicalTrials.gov Registry (NCT05326997). Amber;Tranexamic Acid Female;Humans;Amber;Tranexamic Acid;Quality of Life;Brazil;Melanosis;Double-Blind Method;Randomized Controlled Trials as Topic

Attenuation AÎ²1-42-induced neurotoxicity in neuronal cell by 660nm and 810nm LED light irradiation. Oligomeric amyloid-Î² 1-42 (AÎ²1-42) has a close correlation with neurodegenerative disorder especially Alzheimer's disease (AD). It induces oxidative stress and mitochondrial damage in neurons. Therefore, it is used to generate AD-like in vitro model for studying neurotoxicity and neuroprotection against amyloid-Î². A low-level light therapy (LLLT) is a non-invasive method that has been used to treat several neurodegenerative disorders. In this study, the red wavelength (660nm) and near infrared wavelength (810nm) at energy densities of 1, 3, and 5 J/cm2 were used to modulate biochemical processes in the neural cells. The exposure of AÎ²1-42 resulted in cell death,

increased intracellular reactive oxygen species (ROS), and retracted neurite outgrowth. We showed that both of LLLT wavelengths could protect neurons form AÎ²1-42-induced neurotoxicity in a biphasic manner. The treatment of LLLT at 3 J/cm2 potentially alleviated cell death and recovered neurite outgrowth. In addition, the treatment of LLLT following AÎ²1-42 exposure could attenuate the intracellular ROS generation and Ca2+ influx. Interestingly, both wavelengths could induce minimal level of ROS generation. However, they did not affect cell viability. In addition, LLLT also stimulated Ca2+ influx, but not altered mitochondrial membrane potential. This finding indicated LLLT may protect neurons through the stimulation of secondary signaling messengers such as ROS and Ca2+. The increase of these secondary messengers was in a functional level and did not harmful to the cells. These results suggested the use of LLLT as a tool to modulate the neuronal toxicity following AÎ²1-42 accumulation in AD's brain. Reactive Oxygen Species;Calcium;Amyloid beta-Peptides;Peptide Fragments Humans;Reactive Oxygen Species;Calcium;Apoptosis;Amyloid beta-Peptides;Peptide Fragments;Alzheimer Disease;Neurotoxicity Syndromes;Neurons;Cell Survival

Effects of light-emitting diode therapy on hand stiffness and pain in non-steroidal anti-inflammatory drug-refractory patients with tenosynovitis. OBJECTIVE: The objective of this study was to evaluate the safety and efficacy of light-emitting diode therapy (LEDT) in the management of pain and stiffness in patients with refractory hand tenosynovitis to non-steroidal anti-inflammatory drugs. METHODS: A total of 12 patients were enrolled in the study and received LEDT twice a week for four weeks. Sociodemographic, clinical, and laboratory data were collected, and the visual analog scale (VAS) pain and stiffness scores of each hand were assessed every two weeks. The thickness of the flexor tendon in the patients' hand was evaluated using ultrasonography. To investigate the molecular effects of LEDT, we measured the expression levels of type III collagen in tendon cells, with and without LEDT treatment. RESULTS: After undergoing LEDT, participants showed clinically significant improvements in VAS pain scores at weeks 2, 4, and 8 compared to their baseline, and in VAS stiffness scores at weeks 4 and 8. According to the ultrasonography results, there was a decreasing tendency in tendon thickness for each finger in week 8 compared to the baseline, but the difference was not statistically significant. No adverse events were reported. Additionally, our results indicated a significant increase in type III collagen levels in the LEDT group compared to the control group (1.48Â±0.18 vs. 0.99Â±0.02, p=0.031), indicating a potential molecular mechanism for the observed clinical improvements. CONCLUSION: LEDT may provide a viable alternative to pharmacological treatments in the future, due to its simple and easy method of administration.

Photobiomodulation reduces neuropathic pain after spinal cord injury by downregulating CXCL10 expression. BACKGROUND: Many studies have recently highlighted the role of photobiomodulation (PBM) in neuropathic pain (NP) relief after spinal cord injury (SCI), suggesting that it may be an effective way to relieve NP after SCI. However, the underlying mechanisms remain unclear. This study aimed to determine the potential mechanisms of PBM in NP relief after SCI. METHODS: We performed systematic observations and investigated the mechanism of PBM intervention in NP in rats after SCI. Using transcriptome sequencing, we screened CXCL10 as a possible target molecule for PBM intervention and validated the results in rat tissues using reverse transcription-polymerase chain reaction and western blotting. Using immunofluorescence co-labeling, astrocytes and microglia were identified as the cells responsible for CXCL10 expression. The involvement of the NF-ÎºB pathway in CXCL10 expression was verified using inhibitor pyrrolidine dithiocarbamate (PDTC) and agonist phorbol-12-myristate-13-acetate (PMA), which were further validated by an in vivo injection experiment. RESULTS: Here, we demonstrated that PBM therapy led to an improvement in NP relative behaviors post-SCI, inhibited the activation of microglia and astrocytes, and decreased the expression level of CXCL10 in glial cells, which was accompanied by mediation of the NF-ÎºB signaling pathway. Photobiomodulation inhibit the activation of the NF-ÎºB

pathway and reduce downstream CXCL10 expression. The NF-ÎºB pathway inhibitor PDTC had the same effect as PBM on improving pain in animals with SCI, and the NF-ÎºB pathway promoter PMA could reverse the beneficial effect of PBM. CONCLUSIONS: Our results provide new insights into the mechanisms by which PBM alleviates NP after SCI. We demonstrated that PBM significantly inhibited the activation of microglia and astrocytes and decreased the expression level of CXCL10. These effects appear to be related to the NF-ÎºB signaling pathway. Taken together, our study provides evidence that PBM could be a potentially effective therapy for NP after SCI, CXCL10 and NF-kB signaling pathways might be critical factors in pain relief mediated by PBM after SCI. NF-kappa B;prolinedithiocarbamate;Thiocarbamates;Cxcl10 protein, rat Animals;Rats;Neuralgia;NF-kappa B;Spinal Cord;Spinal Cord Injuries;Thiocarbamates

Effect of an low-energy Nd: YAG laser on periodontal ligament stem cell homing through the SDF-1/CXCR4 signaling pathway. BACKGROUND: The key to the success of endogenous regeneration is to improve the homing rate of stem cells, and low-energy laser is an effective auxiliary means to promote cell migration and proliferation. The purpose of this study was to observe whether low-energy neodymium (Nd: YAG) laser with appropriate parameters can affect the proliferation and migration of periodontal ligament stem cells (PDLSCs) through SDF-1/CXCR4 pathway. METHODS: h PDLSCs were cultured and identified. CCK8 assay was used to detect the proliferation of h PDLSCs after different power (0, 0.25, 0.5, 1, and 1.5 W) Nd: YAG laser (MSP, 10Â Hz, 30Â s, 300 Î¼ m) irradiation at 2th, 3rd,5th, and 7th days, and the optimal laser irradiation parameters were selected for subsequent experiments. Then, the cells were categorized into five groups: control group (C), SDF-1 group (S), AMD3100 group (A), Nd: YAG laser irradiation group (N), and Nd: YAG laser irradiationâ€‰+â€‰AMD3100 group (Nâ€‰+â€‰A). the migration of h PDLSCs was observed using Transwell, and the SDF-1 expression was evaluated using ELISA andRT-PCR. The SPSS Statistics 21.0 software was used for statistical analysis. RESULTS: The fibroblasts cultured were identified as h PDLSCs. Compared with the C, when the power was 1 W, the proliferation rate of h PDLSCs was accelerated (Pâ€‰<â€‰0.05). When the power was 1.5 W, the proliferation rate decreased (Pâ€‰<â€‰0.05). When the power was 0.25 and 0.5 W, no statistically significant difference in the proliferation rate was observed (Pâ€‰>â€‰0.05). The number of cell perforations values as follows: C (956.5â€‰Â±â€‰51.74), A (981.5â€‰Â±â€‰21.15), S (1253â€‰Â±â€‰87.21), N (1336â€‰Â±â€‰48.54), and Nâ€‰+â€‰A (1044â€‰Â±â€‰22.13), that increased significantly in group N (Pâ€‰<â€‰0.05), but decreased in group Nâ€‰+â€‰A (Pâ€‰<â€‰0.05). The level of SDF-1 and the expression level of SDF-1 mRNA in groups N and Nâ€‰+â€‰A was higher than that in group C (Pâ€‰<â€‰0.05) but lower than that in group A (Pâ€‰<â€‰0.05). CONCLUSIONS: Nd: YAG laser irradiation with appropriate parameters provides a new method for endogenous regeneration of periodontal tissue. SDF-1/CXCR4 signaling pathway may be the mechanism of LLLT promoting periodontal regeneration. Benzylamines;CXCR4 protein, human;plerixafor;Receptors, CXCR4 Humans;Benzylamines;Lasers, Solid-State;Periodontal Ligament;Receptors, CXCR4;Stem Cells;Cell Movement

Effectiveness of Photobiomodulation in Reducing Pain of Oral Mucosal Diseases: A Case Series. INTRODUCTION: Pain management becomes important in the treatment of oral mucosal diseases since it can impair the quality of life. Photobiomodulation (PBM) as an alternative therapy, has potency in reducing pain through several mechanisms targeting peripheral nerves in the target tissue. PURPOSE: To discuss the effectiveness of PBM in the management of four cases of oral mucosal diseases. CASE: Four patients, two females and two males, with an age ranging from 24 to 63 years came to the Oral Medicine Department complaining of painful lesions in their oral cavity. Three cases showed ulceration of the oral mucosa and had been diagnosed with recurrent aphthous stomatitis, recalcitrant chronic ulcer, and non-specific chronic sialadenitis. One patient who complained of

intense pain and swelling on the right side of the face was diagnosed with post-herpetic neuralgia (PHN). CASE MANAGEMENT: PBM was administered in all four cases (976 nm diode laser, three cases with spot size 0.01 cm(2), fluency 10 J/cm(2), and one case with spot size 0.5 cm(2); fluency 3 J/cm(2)). Visual analog scale (VAS) control was performed before and after the PBM at each visit. The recorded VAS results show a reduction in pain that started at the post-laser time, with VAS before PBM ranging from 5 to 7 and after PBM ranging from 0 to 4. Three patients were given triamcinolone acetonide 0.1%, chlorhexidine gluconate 0.2% mouthwash, petroleum jelly, and multivitamins. One patient was given mefenamic acid and multivitamins. CONCLUSION: PBM can be a useful adjunctive treatment to relieve the pain of oral mucosal diseases due to its ability to reduce pain intensity.

Effects of photobiomodulation therapy (PBMT) on the management of pain intensity and disability in plantar fasciitis: systematic review and meta-analysis. To review the effects of photobiomodulation therapy (PBMT) on pain intensity and disability in people with plantar fasciitis (PF) when compared with control conditions, other interventions, and adjunct therapies. Systematic searches were conducted in five database randomized controlled trials (RCT). We only included randomized controlled trials (RCTs) in adults with PF that compared PBMT to placebo, as well as RCTs that compared PBMT to other interventions; and as an adjunct to other therapies. The methodological quality and certainty were assessed through PEDro Scale and GRADE approach, respectively. The data of comparison were pooled and a meta-analysis was conducted when possible. Nineteen RCTs involving 1089 participants were included in this review. PBMT alone (MDâ€‰=â€‰â€‰-â€‰22.02 [-â€‰35.21 toâ€‰-â€‰8.83]) or with exercise (MDâ€‰=â€‰â€‰-â€‰21.84 [-â€‰26.14 toâ€‰-â€‰17.54]) improved pain intensity in short-term treatment. PBMT was superior to (extracorporeal shock wave therapy) EWST for relief of pain (MDâ€‰=â€‰â€‰-â€‰20.94 [-â€‰32.74 toâ€‰-â€‰9.13]). In the follow-up, PBMT plus exercise had a superior to exercise therapy alone (MDâ€‰=â€‰â€‰-â€‰18.42 [-â€‰26.48 toâ€‰-â€‰10.36]). PBMT may be superior to (ultrasound therapeutic) UST in medium- and long-term follow-ups for disability, but can be not clinically relevant. There is uncertainty that PBMT is capable of promoting improvement in disability. PBMT when used with adjuvant therapy does not enhance outcomes of interest. PBMT improves pain intensity with or without exercise. PBMT has been shown to be superior to ESWT for pain relief, but not superior to other interventions for pain intensity and disability. The evidence does not support PBMT as an adjunct to other electrotherapeutic modalities. Adult;Humans;Pain Measurement;Fasciitis, Plantar;Low-Level Light Therapy;Pain;Extracorporeal Shockwave Therapy

Biomodulation of Induced Tooth Movement by Three Methods, Corticopuncture, Photobiomodulation, and Their Combination: An Animal Study. Objective: The aim of this study was to assess the effects of accelerated tooth movement (ATM) methods: corticopuncture (CP), photobiomodulation (PBM), and their combination (CP + PBM) by evaluating tooth displacement, alveolar bone changes, and molecular and cellular response compared with conventional induced tooth movement. Materials and methods: Tooth movement and bone changes were evaluated on days 1, 3, and 7 (9 animals per time point) using microtomography, histological, and immunohistochemical evaluation, at compression and tension sites. CP groups received two perforations in the palate and one mesial to the molars. PBM was performed using GaAlAs diode laser applied every other day for 7 days (Î»â€‰=â€‰808â€‰nm, 100â€‰mW) in two points for 15â€‰sec/point and total energy of 3â€‰J. Results: Tooth movement was significantly increased in all three ATM groups after 7 days compared with the control group (mean 0.24â€‰mm) by 27% PBM (0.31â€‰mm), 45% CP (0.35â€‰mm), and 57% CP + PBM (0.38â€‰mm) (pâ€‰<â€‰0.05). At the compression side, all ATM groups showed significant decrease in bone density on day 3 (pâ€‰<â€‰0.05) and significant less bone volume on day 7 compared with Control

(pâ€‰<â€‰0.05). At the tension side, PBM group showed a significant increase in bone density and volume on day 3 (pâ€‰<â€‰0.05). Immunohistochemistry analysis showed that at the compression side, tartrate-resistant acid phosphatase-positive cells, RANKL, and tumor necrosis factor-alpha expression were highly marked of the PBM and the combined method groups (pâ€‰<â€‰0.05). PBM and CP + PBM groups showed a significant increase in expression Runt-related transcription factor 2 and osterix (pâ€‰<â€‰0.05) at the tension side. Conclusions: All ATM groups showed increase on tooth displacement with CP + PBM group showing greatest tooth displacement. CP method appears to stimulate bone catabolism, PBM has more effect on bone formation, and the combined method showing a synergistic effect on bone remodeling. Animals;Low-Level Light Therapy;Tooth Movement Techniques;Lasers, Semiconductor;Molar;Osteogenesis

Photobiomodulation Literature Watch February 2023.

Shear bond strengths of bur or Er:YAG laser prepared dentine to composite resin with or without low-level laser conditioning: an in vitro study. This study aims to compare the different modes of cavity preparation while evaluating the effect of low-level laser therapy (LLLT) on dentine before bonding in terms of shear bond strength between composite resin and dentine. Fifty human molar teeth were mounted on acrylic blocks and dentine specimen were prepared after which they were randomized into four equal groups. Cavity preparation mode differed in respective groups. After etching, bonding; composite resin was placed and polymerized on the prepared dentine surfaces. The specimens were kept in an environment simulating oral cavity and then shear tested in a universal testing machine. The failure surfaces of the specimen teeth were subjected to SEM micrographic evaluation. The cavity prepared with diamond abrasive points had a higher shearing load at failure that was statistically significantly different from the ones prepared with laser. That with diamond abrasive points followed by LLLT of the cavity surface with Nd:YAG laser had a higher bond strength than the ones prepared with just Er:YAG laser and there was no statistically significant difference between these and the ones prepared with diamond abrasive points alone. SEM analysis of the failure mode in bur-cut dentine showed the presence of a hybrid layer at the interface. Surface conditioning of the same with Nd:YAG laser before etching suggested a recrystallisation of dentine due to the heat produced. Cavity preparation with Er:YAG laser leads to reduced shear bond strength to adhesive restorative materials when compared with that using burs and high-speed handpiece. Composite Resins;Diamond;Resin Cements;Dentin-Bonding Agents Humans;Lasers, Solid-State;Composite Resins;Dentin;Microscopy, Electron, Scanning;Diamond;Dental Bonding;Resin Cements;Dentin-Bonding Agents;Materials Testing

Integration of blue light with near-infrared irradiation accelerates the osteogenic differentiation of human dental pulp stem cells. Blue light is used less in photobiomodulation than red or near-infrared light because of concerns about its high energy. However, some reports have suggested that blue light releases NO from nitrosated proteins, affects cell signal regulation, and promotes stem cell differentiation. Because blue and red lights could have different mechanisms of action, their combination is expected to have new consequences. In this study, human dental pulp stem cells (hDPSCs) were sequentially exposed to blue and near-infrared light to study their effects on proliferation, osteogenic differentiation, and immunomodulation. We found that NIR irradiation applied after blue light can reduce blue light toxicity improving the cell viabiltiy. Delayed luminescence and transmission electron microscopy studies showed that this combination excited hDPSCs and activated mitochondrial biogenesis. Those modulations accelerated hDPSC differentiation, as shown by an increase of about 1.3-fold in alkaline phosphatase activity in vitro and an about 1.5-fold increase in the osteocalcin-positive regions in cells implanted in nude mice compared with mice exposed to near-infrared alone.

Photons Induce Vesicular Exocytotic Release of Glutamate in a Power-Dependent Way. Increasing evidence indicates that photobiomodulation, based on tissue irradiation with photons in the red to near-infrared spectrum, may be an effective therapeutic approach to central nervous system disorders. Although nervous system functionality has been shown to be affected by photons in animal models, as well as in preliminary evidence in healthy subjects or in patients with neuropsychiatric disorders, the mechanisms involved in the photobiomodulation effects have not yet been clarified. We previously observed that photobiomodulation could stimulate glutamate release. Here, we investigate mechanisms potentially involved in the glutamate-releasing effect of photons from adult mouse cerebrocortical nerve terminals. We report evidence of photon ability to induce an exocytotic vesicular release of glutamate from the terminals of glutamatergic neurons in a power-dependent way. It can be hypothesized that photobiomodulation, depending on the potency, can release glutamate in a potentially neurotoxic or physiological range. Glutamic Acid Animals;Mice;Cerebral Cortex;Glutamic Acid;Nerve Endings;Neurons;Photons;Synaptosomes

Phototherapy of Alzheimer's Disease: Photostimulation of Brain Lymphatics during Sleep: A Systematic Review. The global number of people with Alzheimer's disease (AD) doubles every 5 years. It has been established that unless an effective treatment for AD is found, the incidence of AD will triple by 2060. However, pharmacological therapies for AD have failed to show effectiveness and safety. Therefore, the search for alternative methods for treating AD is an urgent problem in medicine. The lymphatic drainage and removal system of the brain (LDRSB) plays an important role in resistance to the progression of AD. The development of methods for augmentation of the LDRSB functions may contribute to progress in AD therapy. Photobiomodulation (PBM) is considered to be a non-pharmacological and safe approach for AD therapy. Here, we highlight the most recent and relevant studies of PBM for AD. We focus on emerging evidence that indicates the potential benefits of PBM during sleep for modulation of natural activation of the LDRSB at nighttime, providing effective removal of metabolites, including amyloid-Î², from the brain, leading to reduced progression of AD. Our review creates a new niche in the therapy of brain diseases during sleep and sheds light on the development of smart sleep technologies for neurodegenerative diseases. Amyloid beta-Peptides Humans;Alzheimer Disease;Amyloid beta-Peptides;Brain;Sleep;Phototherapy

Photodynamic therapy in the coadjuvant treatment of Sporothrix schenckii complex. INTRODUCTION: Sporotrichosis, a zoonosis caused by animal, mainly cat, scratches or bites, is caused by fungi belonging to the Sporothrix complex. Treatment usually consists in antifungal administration, although treatment failure and hepatotoxicity reports have been noted. Alternative sporotrichosis treatment methods, such as antimicrobial photodynamic therapy (aPDT), may, therefore, be indicated. CASE REPORT: In this context, this study followed a 56-year-old male renal transplanted patient displaying disseminated sporotrichosis, presenting erythematous skin lesions with ulcerated backgrounds and hardened consistency on the nose, oral and scalp. The lesions were present for about 2 months and the patient coexisted with cats. Intravenous amphotericin B administration was initiated, and immunosuppression was suspended. Seven aPDT sessions were also performed in 48 h intervals on the oral lesions, employing 0.01% methylene blue gel as the photosensitizing agent. After the 4th aPDT session, the patient was discharged, amphotericin B administration was suspended, and the treatment was continued with itraconazole, without immunosuppression. Red laser was applied to the oral lesions after the 7th aPDT session. Significant lesion improvement was observed after the final aPDT session and complete palate lesion repair was noted after two red laser sessions. CONCLUSION: These findings indicate that aPDT is a valuable strategy as an adjunct sporotrichosis treatment. Antifungal Agents;Amphotericin B Male;Animals;Humans;Middle Aged;Sporotrichosis;Antifungal Agents;Amphotericin B;Sporothrix;Photochemotherapy

The effects of infrared radiation on the human skin. BACKGROUND: Infrared radiation (IR) is the portion of the electromagnetic spectrum between visible light (VL) and microwaves, with wavelengths between 700â€‰nm and 1â€‰mm. Humans are mainly exposed to ultraviolet (UV) radiation (UVR) and IR through the sun. Unlike UVR which is well known for its carcinogenic properties, the relationship between IR and skin health has not been as extensively studied; as such, we gather the available published evidence here to better elucidate this relationship. METHODS: Several databases including Pubmed, Google Scholar, and Embase were searched for articles relating to infrared radiation and the skin. Articles were selected for their relevance and novelty. RESULTS: Detrimental effects such as thermal burns, photocarcinogenesis, and photoaging have been reported, though evidence suggests that these may be due to the thermal effects produced secondary to IR exposure rather than the isolated effect of IR. There are currently no chemical or physical filters specifically available for protection against IR, and existing compounds are not known to have IR-filtering capacity. Interestingly, IR may have some photoprotective properties against the carcinogenic effects of UVR. Furthermore, IR has been used with encouraging results in skin rejuvenation, wound healing, and hair restoration when given at an appropriate therapeutic dose. CONCLUSION: A better understanding of the current landscape of research surrounding IR can help illuminate its effects on the skin and highlight areas for further research. Here, we review relevant data on IR to assess its deleterious and beneficial effects on human skin, along with possible means for IR photoprotection. Humans;Skin;Infrared Rays;Ultraviolet Rays;Skin Diseases;Wound Healing

Botulinum A Toxin and Laser Therapy: Evidence and Recommendations for Combination Treatment. Botulinum Toxins, Type A;Neuromuscular Agents Humans;Botulinum Toxins, Type A;Clostridium botulinum;Laser Therapy;Neuromuscular Agents;Low-Level Light Therapy

Comparative effectiveness among available treatments in difficult-to-treat port-wine stains (PWS): a Network Meta-Analysis of observational evidence. BACKGROUND: Although pulsed dye laser (PDL) is the treatment of choice for port-wine stains (PWS), clinical resistance to PDL has been observed in 20-30% of cases. Several alternative treatment modalities have been introduced; however, there is still a lack of definite recommendations regarding the optimal treatment for difficult-to-treat PWS. OBJECTIVE: We aimed to systematically review and analyze the comparative effectiveness among treatments for problematic PWS. METHODS & MATERIALS: We systematically searched for comparative studies assessing treatments for patients with difficult-to-treat PWS through relevant biomedical databases until August 2022. A Network Meta-Analysis (NMA) was conducted to estimate the odds ratio (OR) for all pairwise comparisons. The primary outcome is the improvement of lesions of more than 25%. RESULTS: Of the 2498 studies identified, six treatments from five studies were available for NMA. Compared with 585â€‰nm short-pulsed dye laser (SPDL), intense pulsed light (IPL) was the most effective in clearing lesions (OR 11.81, 95% CI 2.15 to 64.89, very low confidence rating), followed by 585â€‰nm long-pulsed dye laser (LPDL) (OR 9.95, 95% CI 1.75 to 56.62, very low confidence rating). The 1064 nm NdYAG, 532 nm NdYAG, and LPDL >585â€‰nm exhibited potential superiority over SPDL 585â€‰nm, although statistical significance was not observed. CONCLUSIONS: IPL and 585â€‰nm LPDL are likely to be more effective than 585â€‰nm SPDL for treating difficult-to-treat PWS. Well-designed clinical trials are warranted to confirm our findings. Humans;Lasers, Dye;Low-Level Light Therapy;Network Meta-Analysis;Port-Wine Stain;Treatment Outcome

Broadening the lens through which we view pain and its management: an interview with Mark Johnson. Mark Johnson, PhD is Professor of Pain and Analgesia and Director of the Centre for Pain Research at Leeds Beckett University. Having initially trained as a neurophysiologist, Professor Johnson has expanded his research into the science of pain and its management, leading a team of

pain scholars at the university. His research covers a wide range of topics including studying the effects of nonpharmacological interventions (transcutaneous electrical nerve stimulation [TENS], acupuncture, low-level laser therapy and Kinesio tape) for pain management, individuality and pain, epidemiology of pain and more recently health promotion and pain. His expertise spans a range of research methodologies including evidence syntheses such as meta-ethnography and meta-analysis includingÂ Cochrane Reviews, as well as conducting clinical trials and laboratory studies. In addition to his research, Professor Johnson is involved in pain education for healthcare professionals, patients, and the general public toÂ provide people with up-to-date knowledge for a better understanding of the science of pain and its management. Humans;Transcutaneous Electric Nerve Stimulation;Pain Management;Acupuncture Therapy;Low-Level Light Therapy;Pain

Scales to graduate oral mucositis: What are the limitations? Oral mucositis is a common acute complication of a head and neck squamous cell carcinoma treatment. Multiple scales can be used to diagnose and grade this lesion, but they all have some limitation regarding this group of patients. Most of these issues are associated with the hardness to differentiate signs and symptoms from oral mucositis vs. the inherent neoplasm. This study highlights the importance of a specifically developed scale for patients with head and neck squamous cell carcinoma. Humans;Squamous Cell Carcinoma of Head and Neck;Head and Neck Neoplasms;Carcinoma, Squamous Cell;Stomatitis;Mucositis

Effect of Nd:YAG laser on bone formation in rat tibia defects: three-dimensional micro-computed tomography image analysis. Nd:YAG laser is in common clinical use for the treatment of tissue incision, transpiration, and haemostasis in soft tissues. However, few studies have reported the effects of low-level laser therapy (LLLT) from Nd:YAG laser on bone healing. The aim of this study was to perform three-dimensional (3D) morphological evaluation of the photobiomodulation of Nd:YAG laser in bone defects in rat tibiae using micro-computed tomography CT (micro-CT) imaging. A bone defect was created in each tibia of 30 rats. The right side was treated with LLLT from Nd:YAG laser (LT group) daily until sacrifice and the left tibiae served as controls (control group). All tibiae underwent micro-CT imaging at 7, 14, and 21Â days after the operation. Three-dimensional image analysis of bone volume (BV) and bone surface area (BS) of new bone formation in the defects was performed and histologic analysis was conducted for all tibiae. Tibial BV and BS values were highest in both groups at 7Â days after the operation and decreased at 14Â days after operation. BV and BS values were both significantly higher in the LT group than in the control group at 7 and 14Â days. There was no significant difference between the groups for either metric at 21Â days. The present findings demonstrate that Nd:YAG laser simulates bone formation during the early healing period. Rats;Animals;Osteogenesis;Lasers, Solid-State;X-Ray Microtomography;Tibia;Imaging, Three-Dimensional

Red, infrared, and simultaneous laser-wavelengths irradiation effects on 5-fluorouracil-induced oral mucositis in hamsters. The association of more than one wavelength for photobiomodulation therapy (PBMT) to treat oral mucositis (OM) is unusual in the literature. Thus, this study aims to compare the simultaneous irradiation effects with their isolated application to treat OM. In order of that, 48 male Syrian hamsters were divided into 4 groups: Chemotherapy (Ch), which received only a OM induction protocol (5-fluorouracil chemotherapy and superficial oral mucosa scratches); red laser (RL), which received the OM induction and a PBMT protocol at 660â€‰nm; infrared laser (IRL), which received the OM induction, and a PBMT protocol at 808â€‰nm; and the RLâ€‰+â€‰IRL group, which received the simultaneous application, of 660 and 808â€‰nm wavelengths. Clinical (OM grade classification), histological (light microscopy analysis with H&E and collagen staining), immunohistochemical (TNF-Î± expression), and biochemical (TNF-Î± and hydroxyproline concentration) analyzes were performed after 7 and 10â€‰days. Mainly on the 10th day, the RL and

IRL groups showed lower OM grades and faster microscopic repair process, with greater expression of collagen fibers and lower TNF-Î± levels, besides the higher hydroxyproline concentrations, mainly in comparison with the Ch group. In conclusion, in this study, the simultaneous protocol did not present superior results than the isolated irradiations.

The Effects of Photobiomodulation on Knee Function, Pain, and Exercise Tolerance in Older Adults: A Meta-analysis of Randomized Controlled Trials. OBJECTIVE: To assess whether photobiomodulation therapy (PBMT) enhances the benefits of exercise in older adults. DATA SOURCES: PubMed, Scopus, Medline, and Web of Science, dated to February 2023. STUDY SELECTION: All included studies were randomized controlled trials of PBMT combined with exercise co-intervention in persons 60 years and older. OUTCOME MEASURES: Western Ontario and McMaster University Osteoarthritis Index (WOMAC-total, pain, stiffness and function), perceived pain intensity, timed Up and Go (TUG) Test, 6-min walk test (6MWT), muscle strength, and knee range of motion were included. DATA EXTRACTION: Two researchers independently performed data extraction. Article data were extracted in Excel and summarized by a third researcher. DATA SYNTHESIS: The meta-analysis included 14 of the 1864 studies searched in the database. No statistical differences were found between the treatment and control groups in terms of WOMAC-stiffness (mean difference [MD]=-0.31, 95% confidence interval [CI] -0.64 to 0.03), TUG (MD=-0.17, 95% CI -0.71 to 0.38), 6MWT (MD=32.2, 95% CI -44.62 to 109.01), or muscle strength (standardized mean difference=0.24, 95% CI -0.02 to 0.50). However, statistically significant differences were found for WOMAC-total (MD=-6.83, 95% CI -12.3 to -1.37), WOMAC-pain (MD=-2.03, 95% CI -4.06 to -0.01), WOMAC-function (MD=-5.03, 95% CI -9.11 to -0.96), visual analog scale/numeric pain rating scale (MD=-1.24, 95% CI -2.43 to -0.06), and knee range of motion (MD=1.47, 95% CI 0.07 to 2.88). CONCLUSIONS: In older adults who exercise regularly, PBMT can potentially provide additional pain relief, improve knee joint function, and increase knee joint range of motion.
Humans;Aged;Low-Level Light Therapy;Exercise Tolerance;Randomized Controlled Trials as Topic;Knee Joint;Pain

Hybrid ceramic repair strength, surface roughness, and bond failure, using methylene blue-activated low-level laser therapy, Carbon dioxide, and Ti: Al(2)O(3) laser. AIMS: To evaluate the impact of various pretreatment regimes (LLLT, Ti-sapphire laser, CO(2,) and HFA-S) on hybrid ceramics, specifically focusing on their ability to enhance repair strength and minimize surface roughness (Ra). MATERIAL AND METHODS: Discs were made from hybrid ceramics and after disinfection were randomly divided into four groups based on different surface conditioning techniques. Each group consisted of 15 discs, resulting in a total sample size of 60. dics in group 1 was surface treated with Low-level laser therapy (LLLT) using methylene blue (MB), Discs in group 2 with Ti-sapphire laser, Discs in group 3 with CO(2) laser, and discs in group 4 with HFA-S. Five samples from each group were assessed for Ra. The remaining 10 samples from each group underwent repair using a porcelain repair kit in adherence to the planned instructions. The bond strength of each sample in all groups was measured using a universal testing machine. Following the bond strength testing, the specimens from all study groups were analyzed to determine the mode of failure. To evaluate the data, a two-way analysis of variance (ANOVA) was used, followed by post hoc multiple comparisons. RESULTS: The highest repair bond strength was observed in group 4 hybrid ceramics pretreated with HFA-S (19.05Â±0.79Â MPa). The lowest repair bond scores were observed in group 1 hybrid ceramics preconditioned with LLLT in the presence of Photosensitizer (13.41Â±0.36Â MPa). The highest Ra scores were exhibited in group 2 surface treated with Ti-sapphire laser (0.0515Â±0.16Â Âµm) and the lowest Ra scores were observed in Group 4 HFA-S (0.0311Â±0.79Â Âµm). Predominant bond failure among different investigated groups was cohesive. CONCLUSION: The current gold standard for hybrid ceramic conditioning is the use of hydrofluoric acid (HFA) combined with a silane coupling

agent. Low-level laser therapy with methylene blue photosensitizer is not recommended for the treatment of hybrid ceramics. Carbon Dioxide;Methylene Blue;Photosensitizing Agents;Titanium;Aluminum Oxide;Hydrofluoric Acid;Silanes Carbon Dioxide;Low-Level Light Therapy;Methylene Blue;Surface Properties;Photosensitizing Agents;Shear Strength;Titanium;Photochemotherapy;Aluminum Oxide;Lasers, Gas;Ceramics;Hydrofluoric Acid;Silanes;Materials Testing

Effects of photobiomodulation at various irradiances on normal and dihydrotestosterone-treated human hair dermal papilla cells in vitro. Androgenetic alopecia (AGA) is the most common type of hair loss caused by dihydrotestosterone (DHT) binding to androgen receptors in dermal papilla cells (DPCs). Photobiomodulation (PBM) is a promising treatment for AGA but suffers from inconsistent outcomes and inconsistent effective light parameters. This study investigated the impact of red light at various irradiances on normal and DHT-treated DPCs. Our results suggested that red light at 8â€‰mW/cm(2) was most effective in promoting DPCs growth. Furthermore, a range of irradiances from 2 to 64â€‰mW/cm(2) modulated key signaling pathways, including Wnt, FGF, and TGF, in normal and DHT-treated DPCs. Interestingly, 8â€‰mW/cm(2) had a greater impact on these pathways in DHT-treated DPCs and altered the Shh pathway, suggesting that the effect of PBM varies with the cellular environment. This study highlights specific factors that influence PBM effectiveness and provides insight into the need for personalized PBM treatment approaches. Dihydrotestosterone;Receptors, Androgen Humans;Dihydrotestosterone;Hair;Hair Follicle;Alopecia;Receptors, Androgen

A new 532â€‰nm, variable-pulse-structure, dual-wavelength, KTP laser incorporating cryogen spray cooling, effectively treats rosacea. BACKGROUND: A new dual-wavelength, high-energy, solid-state laser incorporating both 532 and 1064â€‰nm wavelengths was developed with cryogen spray cooling and the unique ability to deliver three types of pulse structures including single pulses of a specific pulse-duration or pulses composed of a train of subpulses in the millisecond or microsecond domain with an intervening delay over the selected pulse-duration. We investigate the efficacy of this laser using all three pulse structures and the 532â€‰nm wavelength for treating rosacea. METHODS: Twenty-one subjects were enrolled in this IRB-approved study. A total of up to three treatments were administered at monthly intervals. Each treatment consisted of a first pass tracing linear vessels with a 40â€‰ms pulse-duration immediately followed by a second pass using a 5â€‰ms pulse, using all three available pulse structures. Assessment of cross-polarized digital images by blinded physician observers compared baseline and 3-month follow-up images. RESULTS: Blinded observers correctly identified the posttreatment images 89% of the time, in 17 of 19 subjects completing the study, with an average overall improvement rating of 39% after only three treatments. Side effects were limited to short-term erythema and edema. CONCLUSION: This study demonstrates that this new, variable-pulse-structure, dual wavelength, solid state, KTP laser with dynamic cooling is a safe and effective for treating rosacea. Humans;Lasers, Solid-State;Rosacea;Erythema;Low-Level Light Therapy;Laser Therapy;Treatment Outcome

Male facial rejuvenation using a combination 633, 830, and 1072Â nm LED face mask. Home-based photobiomodulation is a popular treatment modality for patients seeking non-invasive aesthetic treatment. Studies demonstrate that photobiomodulation is effective for skin rejuvenation, which is aimed at improving the overall appearance of the skin by reducing fine lines and wrinkles and improving skin texture, skin tone, and dyspigmentation. Most current skin rejuvenation research focuses on treatments in women. However, men's aesthetics remains an underserved market. A combined red light (RL) and near-infrared (NIR) light-emitting diode (LED) has been designed specifically to target male skin, which may have different physiological and biophysical properties compared to female skin. Herein, the safety and efficacy of a commercially available RL and NIR (633,

830, and 1072Â nm) LED array designed to be worn as a face mask was assessed. Primary outcomes included adverse events and facial rejuvenation as determined by participant-reported satisfaction scales and quantitative digital skin photography and computer analysis after 6Â weeks of treatment. The participants reported overall favorable results and improvements in all individual categories, were satisfied with the treatment, and would recommend the product to others. The participants perceived the greatest improvement in fine lines and wrinkles, skin texture, and youthful appearance. Photographic digital analysis demonstrated favorable improvements in wrinkles, UV spots, brown spots, pores, and porphyrins. These results support the use of RL and NIR to treat male skin. Advantages of the LED facemask include its safety, efficacy, convenient home-based use, minimal associated downtime, simple operation, non-invasiveness, and appreciable results in as few as 6Â weeks. Humans;Male;Female;Masks;Rejuvenation;Skin;Pigmentation Disorders;Skin Aging;Treatment Outcome;Patient Satisfaction;Cosmetic Techniques

Effects of photobiomodulation with different application parameters on injection pain in children: a randomized clinical trial. Photobiomodulation (PBM) has gained increasing interest due to its effectiveness in pain reduction in various fields of dentistry. However, the number of studies evaluating the effect of PBM on injection pain in children is very limited. The aim of the study was to evaluate the efficacy of PBM with three different application parameters (doses) + topical anesthesia on reducing injection pain and to compare these results with the placebo PBM + topical anesthesia in children during supraperiosteal anesthesia administration. 160 children were randomly divided into 4 groups, 3 experimental and 1 control, with 40 subjects in each. In the experimental groups, before the anesthesia administration, PBM with a power of 0.3 W was applied for 20, 30 and 40 s in groups 1, 2 and 3, respectively. In group 4, a placebo application of laser was performed. The pain felt during the injection was assessed using the Wong-Baker Faces Pain Rating Scale (PRS), and also the Face, Legs, Activity, Cry, Consolability (FLACC) Scale. Statistical analyses were performed to evaluate the data ($p < 0.05$). The mean FLACC Scale pain scores were 3.02 Â± 2.93, 2.92 Â± 2.54, 2.12 Â± 1.89 and 1.77 Â± 1.90 for the placebo group, and Groups 1, 2, and 3, respectively. Furthermore, the mean PRS scores were 1 Â± 1.03, 0.95 Â± 0.98, 0.80 Â± 0.822 and 0.65 Â± 0.921 for the placebo group, and Groups 1, 2 and 3, respectively. The "no pain response" rate was higher in Group 3 as compared to Groups 1, 2, and placebo according to the FLACC Scale and PRS; however, no difference was found between the groups ($p = 0.109$, $p = 0.317$). Injection pain in children did not differ with placebo and PBM applied with a power of 0.3 W for 20, 30 and 40 s. Anesthetics, Local Child;Humans;Anesthetics, Local;Pain Measurement;Anesthesia, Local;Facial Pain;Anesthesia, Dental

Comparative effectiveness of low-level laser therapy and transcutaneous electrical nerve stimulation in symptomatic Temporomandibular Disorders: A Randomised Control Trial. BACKGROUND: Myofascial pain is one of the most common facial region pains, presenting itself with various signs and symptoms like tenderness of masticatory muscles and difficulty in mouth opening. Considering its multifactorial aetiology various treatment modalities are present. OBJECTIVE: The aim of this study is to compare the effectiveness of transcutaneous electrical nerve stimulation (TENS)and low-level laser therapy (LLLT) for the patients of temporomandibular disorders (TMDS). METHODS: The study was conducted with 20 patients diagnosed with TMDS. Group A received LLLT at 660â€‰nm, 6â€‰J/point, two sessions/week for 4â€‰weeks and group B received TENS at 2-250â€‰Hz, two sessions/week for 4â€‰weeks. RESULTS: Pain Score decreased and mouth opening increased in both groups with time, however, the difference between the two groups was not statistically significant. Right and left lateral excursions showed improvement at different intervals in both groups. However, the LLLT group showed significant improvement. CONCLUSION: Clinical trial showed improvement in visual analogue scale (VAS), maximum mouth opening (MMO) and lateral excursion in the different

time intervals in both the groups with LLLT showed more improvement with lateral excursions movements.

Effect of Photobiomodulation on Protein Kinase CÎ´, Cytochrome C, and Mitochondria in U87 MG Cells. Photobiomodulation (PBM) therapy is a relatively new modality for the combined treatment of cancer. Pre-treatment of certain types of cancer cells with PBM potentiates the treatment efficacy of photodynamic therapy (PDT). The mechanism of action of this synergetic effect is not yet fully understood. In the present study, we focused on protein kinase CÎ´ (PKCÎ´) as a proapoptotic agent that is highly expressed in U87MG cells. The distribution of PKCÎ´ in the cytoplasm was changed and its concentration was increased by PBM using radiation at 808 nm (15 mW/cm(2), 120 s). This process was accompanied by the organelle specific phosphorylation of PKCÎ´ amino acids (serine/tyrosine). Enhanced phosphorylation of serine 645 in the catalytic domain of PKCÎ´ was found in the cytoplasm, whereas the phosphorylation of tyrosine 311 was mainly localized in the mitochondria. Despite a local increase in the level of oxidative stress, only a small amount of cytochrome c was released from the mitochondria to cytosol. Although a partial inhibition of mitochondrial metabolic activity was induced in PBM-exposed cells, apoptosis was not observed. We hypothesized that PBM-induced photodamage of organelles was neutralized by autophagy maintained in these cells. However, photodynamic therapy may effectively exploit this behaviour to generate apoptosis in cancer treatment, which may increase the treatment efficacy and open up prospects for further applications. Cytochromes c;Protein Kinase C-delta;Serine;Tyrosine Cytochromes c;Mitochondria;Protein Kinase C-delta;Serine;Tyrosine;Humans;Low-Level Light Therapy

Letter Regarding: Low-Level Light Therapy Versus Intense Pulse Light for the Treatment of Meibomian Gland Dysfunction. Humans;Meibomian Gland Dysfunction;Low-Level Light Therapy;Meibomian Glands;Dry Eye Syndromes;Intense Pulsed Light Therapy;Tears

Brain photobiomodulation therapy on neurological and psychological diseases. Photobiomodulation (PBM) therapy is an innovative treatment for neurological and psychological conditions. Complex IV of the mitochondrial respiratory chain can be stimulated by red light, which increases ATP synthesis. In addition, the ion channels' light absorption causes the release of Ca(2+,) which activates transcription factors and changes gene expression. Neuronal metabolism is improved by brain PBM therapy, which also promotes synaptogenesis and neurogenesis as well as anti-inflammatory. Its depression-treating potential is attracting attention for other conditions, including Parkinson's disease and dementia. Giving enough dosage for optimum stimulation using the transcranial PBM technique is challenging because of the rapidly increasing attenuation of light transmission in tissue. Different strategies like intranasal and intracranial light delivery systems have been proposed to overcome this restriction. The most recent preclinical and clinical data on the effectiveness of brain PBM therapy are studied in this review article. Low-Level Light Therapy;Brain;Neurons;Neurogenesis

Editorial Expression of Concern: The effectiveness and safety of lowâ€‘level laser therapy on breast cancer-related lymphedema: An overview and update of systematic reviews.

Medication-Related Osteonecrosis of the Jaw: Successful Medical Management of Complex Maxillary Alveolus with Sinus Involvement. Medication-related osteonecrosis of the jaw (MRONJ) in cancer patients presents a considerable challenge in management. Current management is primarily based on interventions in a limited number of cases assessing a single approach. Medical management typically is reported to include antimicrobial therapy with or without surgery. Advances in the understanding of pathogenesis have led to the investigation of additional medical interventions for early-stage necrosis. We present 3 patients with advanced-stage MRONJ of the maxilla using combined medical modalities including antimicrobial therapy, photobiomodulation therapy, pentoxifylline, vitamin E, and synthetic parathyroid hormone. All patients had a good outcome and

avoided surgical intervention. We also report biological and functional imaging that may assist in more effective diagnosis and management of MRONJ. The 3 patients reported suggest that combined medical management should be considered in all cases of MRONJ (including stage III) prior to determining if surgical intervention is required. Functional imaging with a technetium bone scan or positron emission tomography scan correlated with diagnosis and confirmed resolution in patients. We present 3 challenging MRONJ patients that were effectively managed with a combined medical and nonsurgical therapy that demonstrated good clinical outcomes avoiding surgical interventions.

Rehabilitation Interventions for Head and Neck Cancer-Associated Lymphedema: A Systematic Review. IMPORTANCE: Head and neck cancer-associated lymphedema (HNCaL) affects up to 90% of survivors of head and neck cancer and is a substantial contributor to disability following head and neck cancer treatment. Despite the prevalence and morbidity associated with HNCaL, rehabilitation interventions are not well studied. OBJECTIVE: To identify and appraise the current evidence for rehabilitation interventions in HNCaL. EVIDENCE REVIEW: Five electronic databases were searched systematically from inception to January 3, 2023, for studies on HNCaL rehabilitation interventions. Study screening, data extraction, quality rating, and risk of bias assessment were performed by 2 independent reviewers. FINDINGS: Of 1642 citations identified, 23 studies (1.4%; nâ€‰=â€‰2147 patients) were eligible for inclusion. Six studies (26.1%) were randomized clinical trials (RCTs) and 17 (73.9%) were observational studies. Five of the 6 RCTs were published during 2020 to 2022. Most studies had fewer than 50 participants (5 of 6 RCTs; 13 of 17 observational studies). Studies were categorized by intervention type, including standard lymphedema therapy (11 studies [47.8%]) and adjunct therapy (12 studies [52.2%]). Lymphedema therapy interventions included standard complete decongestive therapy (CDT) (2 RCTs, 5 observational studies), modified CDT (3 observational studies), therapy setting (1 RCT, 2 observational studies), adherence (2 observational studies), early manual lymphatic drainage (1 RCT), and inclusion of focused exercise (1 RCT). Adjunct therapy interventions included advanced pneumatic compression devices (APCDs) (1 RCT, 5 observational studies), kinesio taping (1 RCT), photobiomodulation (1 observational study), acupuncture/moxibustion (1 observational study), and sodium selenite (1 RCT, 2 observational studies). Serious adverse events were either not found (9 [39.1%]) or not reported (14 [60.9%]). Low-quality evidence suggested the benefit of standard lymphedema therapy, particularly in the outpatient setting and with at least partial adherence. High-quality evidence was found for adjunct therapy with kinesio taping. Low-quality evidence also suggested that APCDs may be beneficial. CONCLUSIONS AND RELEVANCE: The results of this systematic review suggest that rehabilitation interventions for HNCaL, including standard lymphedema therapy with kinesio taping and APCDs, appear to be safe and beneficial. However, more prospective, controlled, and adequately powered studies are needed to clarify the ideal type, timing, duration, and intensity of lymphedema therapy components before treatment guidelines can be established. Humans;Lymphedema;Head and Neck Neoplasms;Exercise;Survivors;Observational Studies as Topic

Integrated Dose-Effect Relationship of Near-Infrared Light-Emitting Diode Light on Bone Regeneration in Disuse Osteoporosis Rats. Objective: To examine the integrated dose-effect relationship of near-infrared (NIR) light-emitting diode (LED) light therapy in promoting bone defect repair in the rat model for osteoporosis (OP). Background: Low-intensity laser therapy has been shown to promote bone regeneration in OP rats. However, its integrated dose-effect relationship is not clear. Methods: Twenty-week-old male Sprague-Dawley rats were randomly assigned to 11 groups: (1) no-treatment control group (C group), (2) tail suspension (TS)-induced disuse OP experimental group (TS-OP group), and (3) OP rats with LED light treatment at nine dosages (L1-L9 groups). The tail of the rat was tied and suspended on the beam of the cage to suspend their hind limbs to induce bone loss for 4 or 7 weeks. The rats were then released and returned to their regular positions. An NIR LED at 810â€‰nm

was used on the bilateral hind limbs daily for 4 weeks. The C group rats were not given any treatment. The TS-OP group rats were subjected to identical procedures with L groups, with the exception that the light power was not turned on. After the experiment, the dual-energy X-rays or the microcomputed tomography scan analysis was performed to evaluate bone tissue status. Data analysis was done using SPSS and the health scale. Results: The trabecular thickness, trabecular number, bone volume/total volume, and connectivity density of cancellous bone and the biomechanical properties of femur in light groups were significantly increased compared with the TS-OP group, while the trabecular separation and structure model index were significantly decreased. Conclusions: NIR LED light therapy may promote trabecular bone repair of TS-OP rats. Light intensity influences photobiomodulation. In our dose levels, the greater the light intensity, usually the more effective. Rats;Male;Animals;Rats, Sprague-Dawley;Bone Density;X-Ray Microtomography;Osteoporosis;Bone Regeneration

Alveolar Ridge Augmentation Assessment Using a Minimalistic Approach, with and without Low-Level Laser Therapy (LLLT)-A Comparative Clinical Trial. Background and Objective: A narrow alveolar ridge is an obstacle to optimal rehabilitation of the dentition. There are several complex and invasive techniques to counter the ridge augmentation dilemma, with most of them exhibiting low feasibility. Hence, this randomized clinical trial aims to evaluate the effectiveness of a Minimalistic Ridge Augmentation (MRA) technique, in conjunction with low-level laser therapy (LLLT). Materials and Methods: A total of 20 patients (n = 20) were selected, with 10 assigned to the test group (MRA+LLLT) and the other 10 to the control group (MRA). A vertical incision of approximately 10 mm was placed mesial to the defect and tunneled to create a subperiosteal pouch across the entire width of the defect. At the test sites, a diode laser (AnARC Fox(TM) Surgical Laser 810 nm) was used to deliver LLLT (parameters: 100 mW, with a maximum energy distribution of 6 J/cm(2) in the continuous wave mode for 60 s per point) to the exposed bone surface inside the pouch, followed by graft (G-Graft, Surgiwear(TM), Shahjahanpur, India) deposition with a bone graft carrier. The control sites were not irradiated with a laser. Results: A horizontal ridge width gain of >2 mm was observed in both groups. The changes in bone density for the test and control groups were -136 Â± 236.08 HU and -44.30 Â± 180.89 HU, respectively. Furthermore, there was no statistically significant difference between the test and control groups in these parameters. Conclusion: The study findings reveal that the MRA technique is relatively simple and feasible for alveolar ridge augmentation. The role of LLLT in the process requires further elucidation. Humans;Low-Level Light Therapy;Alveolar Ridge Augmentation;Bone Transplantation;Lasers, Semiconductor;India

Effects of Intravascular Photobiomodulation on Insomnia, Muscle Soreness, and Biochemistry Profiles: An Eight-Year Retrospective Cohort. BACKGROUND: Although cognitive-behavioral therapy is the first-line treatment for insomnia, pharmacotherapy is often prescribed to treat insomnia and related symptoms. In addition, muscle relaxants are commonly prescribed to alleviate muscle soreness when the pain is unbearable. However, pharmacotherapy can lead to numerous side effects. The non-drug strategy intravascular laser irradiation of blood (iPBM) has been advocated to improve pain, wound healing, blood circulation, and blood cell function to relieve insomnia and muscle soreness symptoms. Therefore, we assessed whether iPBM improves blood parameters and compared drug use before and after iPBM therapy. METHODS: Consecutive patients who received iPBM therapy between January 2013 and August 2021 were reviewed. The associations between laboratory data, pharmacotherapies, and iPBM therapy were retrospectively analyzed. We compared patient characteristics, blood parameters, and drug use within the three months before the first treatment and the three months after the last treatment. We also compared the changes before and after treatment in patients who received â‰¥10 or 1-9 iPBM treatments. RESULT: We assessed 183 eligible patients who received iPBM treatment. Of them, 18 patients reported insomnia disturbance,

and 128 patients reported pain in any part of their body. After the treatment, HGB and HCT significantly increased after treatment in both the â‰¥10 and 1-9 iPBM treatment groups (HGB $p < 0.001$ and $p = 0.046$; HCT $p < 0.001$ and $p = 0.029$, respectively). Pharmacotherapy analysis revealed no significant differences in drug use before and after treatment, though drug use tended to decrease after iPBM. CONCLUSIONS: iPBM therapy is an efficient, beneficial, and feasible treatment that increases HGB and HCT. While the results of this study do not support the suggestion that iPBM reduces drug use, further larger studies using symptom scales are needed to confirm the changes in insomnia and muscle soreness after iPBM treatment. Neuromuscular Agents;Hypnotics and Sedatives;Analgesics Low-Level Light Therapy;Retrospective Studies;Sleep Initiation and Maintenance Disorders;Myalgia;Humans;Taiwan;Male;Female;Adult;Middle Aged;Aged;Hematologic Tests;Neuromuscular Agents;Hypnotics and Sedatives;Analgesics

Photothermal Effects of High-Energy Photobiomodulation Therapies: An In Vitro Investigation. The purpose of this study was to investigate photothermal aspects of photobiomodulation therapies (PBMT) in vitro to assist in the development of safe clinical parameters with respect to higher-power devices with large surface applicators. Laser wavelengths in the range of 650 nm-1064 nm were investigated using a thermal camera. Thermographic measures of surface and sub-surface temperature variations of similar lean porcine muscle tissue samples were recorded for a series of calibrated experiments. A thermal comparison was then made between Flat-top and Gaussian beam spatial distribution devices. Outcome data were subjected to statistical analysis using an ANOVA model. Results acquired at similar parameters of irradiance indicated that the application of the 980 nm wavelength was associated with the highest rise in temperature, which decreased with other wavelengths in the order 980 > 1064 â‰ˆ 650 >>> 810 nm ($p < 5$ Ã— 10(-20)). All wavelengths assessed were associated with a significant temperature increase, and with the exception of 810 nm, all exceeded the threshold of a 6 Â°C rise within the prescribed parameter limits. Optical scanning by movement of the applied source over a relevant area was found to offer effective mitigation of these temperature increases. An extended discussion is presented, analysing the clinical significance of the study outcomes. Recommendations are made within the limits of this in vitro study in order to assist future clinical investigations.

Photobiomodulation Improves Anti-Tumor Efficacy of Photodynamic Therapy against Resistant MCF-7 Cancer Cells. Cancer resistance is a primary concern in cancer treatment, and developing an effective modality or strategy to improve therapeutic outcomes is imperative. Photodynamic therapy (PDT) is a treatment modality that targets the tumor with a photoactive molecule and light for the specific destruction of cancer cells. Photobiomodulation (PBM) is a light exposure of cells to energize their biomolecules to respond to therapy. In the present study, we used PBM to mediate and improve the anti-tumor efficacy of zinc phthalocyanine tetrasulfonic acid (ZnPcS4)-PDT on resistant MCF-7 breast cancer cells and explore molecular changes associated with cell death. Different laser irradiation models were used for PBM and PDT combination. The combined treatment demonstrated an additive effect on the viability and Annexin-V/PI-staining cell death assessed through MTT assay and mitochondrial release of cytochrome c. Rhodamine (Rh123) showed increased affinity to mitochondrial disruption of the strategic treatment with PBM and PDT. Results from the autophagy assay indicate an interplay between the mitochondrial and autophagic proteins. These findings were indicative that PBM might improve the anti-tumor of PDT by inducing autophagy in resistant MCF-7 breast cancer cells that evade apoptosis.

Treatment of a Large Defect Induced by Atrophic Nonunion of Femoral Fracture in a Dog with Autogenous Coccygeal Bone Grafting. An 11-month-old castrated male Pomeranian presented with nonunion following a femoral fracture that occurred after femoral head and neck osteotomy. Radiography and computed tomography revealed severe atrophy of the proximal bone fragment and

retardation of the ipsilateral distal fragment and tibia. An autogenous bone graft using coccygeal bone was performed, in which three and a half coccyges were placed in succession and fixed using an orthogonal locking plate. To promote bone healing and facilitate proper weight bearing and ambulation, bone morphogenetic proteins, biphasic calcium phosphate, platelet-rich plasma, passive-range-of-motion exercises, transcutaneous electrical nerve stimulation, neuromuscular electrical stimulation, and low-level laser therapy were applied. During the four-year follow-up, it was observed that the previously engrafted bone healed well and maintained stability over a prolonged period, resulting in the patient being able to walk comfortably with good outcomes. However, some degree of lameness was noted in the dog when running owing to limb shortening and joint contracture.

Tissue Engineering: Is It a Reliable Alternative to Animal and Human Models to Study Disease Using Photobiomodulation and Photodynamic Therapy? Animals;Humans;Tissue Engineering;Photochemotherapy;Low-Level Light Therapy

Mesenchymal Stem Cells Combined with a P(VDF-TrFE)/BaTiO(3) Scaffold and Photobiomodulation Therapy Enhance Bone Repair in Rat Calvarial Defects. BACKGROUND: Tissue engineering and cell therapy have been the focus of investigations on how to treat challenging bone defects. This study aimed to produce and characterize a P(VDF-TrFE)/BaTiO(3) scaffold and evaluate the effect of mesenchymal stem cells (MSCs) combined with this scaffold and photobiomodulation (PBM) on bone repair. METHODS AND RESULTS: P(VDF-TrFE)/BaTiO(3) was synthesized using an electrospinning technique and presented physical and chemical properties suitable for bone tissue engineering. This scaffold was implanted in rat calvarial defects (unilateral, 5 mm in diameter) and, 2 weeks post-implantation, MSCs were locally injected into these defects (n = 12/group). Photobiomodulation was then applied immediately, and again 48 and 96 h post-injection. The Î¼CT and histological analyses showed an increment in bone formation, which exhibited a positive correlation with the treatments combined with the scaffold, with MSCs and PBM inducing more bone repair, followed by the scaffold combined with PBM, the scaffold combined with MSCs, and finally the scaffold alone (ANOVA, p â‰¤ 0.05). CONCLUSIONS: The P(VDF-TrFE)/BaTiO(3) scaffold acted synergistically with MSCs and PBM to induce bone repair in rat calvarial defects. These findings emphasize the need to combine a range of techniques to regenerate large bone defects and provide avenues for further investigations on innovative tissue engineering approaches.

Photobiomodulation for Pain Relief After Third Molar Extraction: A Randomized Double-Blind Split-Mouth Clinical Trial. Objective: To evaluate the local and systemic application of photobiomodulation (PBM) to reduce pain after third molar extraction. Background: PBM has been applied locally to reduce pain after third molar extraction, but there are no published studies evaluating its systemic application for this purpose. Methods: Thirty patients with two erupted third molars indicated for extraction were included in this split-mouth clinical trial. Extractions were performed 3 weeks apart in each patient, with one extraction socket being randomly assigned to local and systemic PBM (PBM group) and the other to no PBM (control group). Postoperative analgesia consisted of oral acetaminophen for 3 days. Outcomes included pain (visual analog scale), swelling, and quality of life (14-item Oral Health Impact Profile) assessed before and immediately, 24â€‰h, 48â€‰h, and 7 days after extraction. Results were analyzed by Kruskal-Wallis test, followed by Student-Newman-Keuls test. Results: In the control group, pain increased significantly at 24 and 48â€‰h after extraction (pâ€‰=â€‰0.0000), decreasing after 7 days (before: 0.36; immediately after: 1.06; 24â€‰h: 4.26; 48â€‰h: 2.53; 7 days: 0.36). In the PBM group, patients reported no pain at all time points, indicating effectiveness of local and systemic PBM in relieving pain after third molar extraction (pâ€‰=â€‰0.2151) (before: 0.30; immediately after: 0.36; 24â€‰h: 0.86; 48â€‰h: 0.30; 7 days: 0.03). PBM also had a modulatory effect on the inflammatory process and improved comfort after extraction. Conclusions: Combined local and systemic PBM can be useful for pain relief, swelling

control, and quality-of-life improvement in patients undergoing third molar extraction. Humans;Molar, Third;Pain Management;Quality of Life;Pain;Tooth Extraction

Treatments of COVID-19-Associated Taste and Saliva Secretory Disorders. Since the worldwide spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, treating taste and saliva secretory disorders associated with coronavirus disease 2019 (COVID-19) has become a critical issue. The aim of the present study was to update information on treatments applicable to such oral symptoms and discuss their pathogenic mechanisms. The literature search indicated that different treatments using tetracycline, corticosteroids, zinc, stellate ganglion block, phytochemical curcumin, traditional herbal medicine, nutraceutical vitamin D, photobiomodulation, antiviral drugs, malic acid sialagogue, chewing gum, acupuncture, and/or moxibustion have potential effects on COVID-19-associated ageusia/dysgeusia/hypogeusia and xerostomia/dry mouth/hyposalivation. These treatments have multiple modes of action on viral cellular entry and replication, cell proliferation and differentiation, immunity, and/or SARS-CoV-2 infection-induced pathological conditions such as inflammation, cytokine storm, pyroptosis, neuropathy, zinc dyshomeostasis, and dysautonomia. An understanding of currently available treatment options is required for dental professionals because they may treat patients who were infected with SARS-CoV-2 or who recovered from COVID-19, and become aware of their abnormal taste and salivary secretion. By doing so, dentists and dental hygienists could play a crucial role in managing COVID-19 oral symptoms and contribute to improving the oral health-related quality of life of the relevant patients.

Human Interleukin-1Î² Profile and Self-Reported Pain Monitoring Using Clear Aligners with or without Acceleration Techniques: A Case Report and Investigational Study. INTRODUCTION: There is a growing demand for more aesthetic, comfortable, and faster orthodontic treatments, and clear aligners emerged as a solution to fulfill this need. However, the effectiveness of clear aligners to treat complex malocclusions is yet contentious. The use of acceleration methods could improve the efficacy of clear aligners by stimulating cells' mechanobiology through numerous pathways, but this hypothesis is still poorly explored. OBJECTIVE: We aimed to monitor the release profile of an inflammatory marker-the interleukin-1Î²-and to evaluate its relationship with self-reported pain scores with and without the use of acceleration techniques during an orthodontic treatment requiring difficult tooth movements with clear aligners. Case Report. Here, we report a case of a 46-year-old female patient who presented functional and aesthetic complaints. Intraoral examination revealed a diminished overjet and overbite, rotation of teeth 45 and 24, absence of teeth 25, 35, and 36, buccolingual dislocation of tooth 21, a tendency to a Class III malocclusion, and a 2 mm left deviation of the lower midline. This study is divided into three stimulation phases: no stimulation, mechanical vibration stimulation, and photobiomodulation. Interleukin-1Î² levels in gingival crevicular fluid samples from the pressure side of six selected teeth were evaluated at four time points after the orthodontic treatment onset. Pain monitoring in those teeth was performed using a visual analogue scale at the same time points. RESULTS: Interleukin-1Î² protein production peaked 24â€‰h after treatment onset. Complex movements were associated with increased self-reported pain. CONCLUSION: Clear aligners show limitations in solving complex tooth movements, even when combined with acceleration. The development of customized and programmable stimulation microdevices integrated into "smart aligners," which could be designed to specifically stimulate the direction of movement and stimulation parameters and could constitute a solution to optimize the orthodontic tooth movement with clear aligners.

Effect of low-level laser therapy on post-extraction hemostasis in patients with hemophilia - A prospective cohort study. Dental extraction in hemophiliacs can be complicated by perilous bleeding. Although developments in local hemostatics and factor replacement have made outpatient extraction feasible, there is no standard protocol for preventing hemorrhagic exigency. Low-level

laser therapy (LLLT) has firmly established role in hemostasis due to its ability to seal vessels, but this function has not been conclusively established in hemophiliac patients. The objective of our study was to evaluate the effectiveness of LLLT as compared with the standard protocol alone in achieving post-extraction hemostasis. A prospective interventional cohort study was designed and consisted of 60 patients with hemophilia A or B, who reported to the Maulana Azad Institute of Dental Sciences, New Delhi between October 2021 and March 2022. These were divided equally into test and control groups, both following the standard protocol. In the test group, extraction sockets were exposed to LLLT. The study assessed time required, instance of rebleeding, and additional methods employed for hemostasis in each group. The results showed a 22.42% reduction in average time taken to achieve hemostasis in the test group as compared with the control group. The tranexamic acid pack was replaced in two cases in both groups after 60Â min of procedure. Three cases in the control group required suturing, and one case required cauterization. Rebleeding occurred in four cases in the test group and in 13 cases among the controls. Postoperative factor was infused in three and 12 cases in the test and control groups, respectively. The authors believe that perioperative use of LLLT should be encouraged because it demonstrated a significantly reduced time for hemostasis among hemophilia patients. Humans;Hemophilia A;Low-Level Light Therapy;Prospective Studies;Cohort Studies;Tooth Extraction;Hemostasis

Assessment of the effect of frequency of low-level laser therapy exposure at different intervals on orthodontic tooth movement - A systematic review and meta-analysis. OBJECTIVE: To assess the optimal intervals of exposure of low-level LASER therapy (LLLT) that would optimally accelerate orthodontic tooth movement. Second objective was to quantitatively analyze the difference in the time taken for alignment of anterior teeth with and without the application of LASER. MATERIALS AND METHODS: PROSPERO database registry was done (CRD42020196472) and review was conducted based on PRISMA guidelines. A search was systematically conducted in five major electronic databases without restrictions up to June 2020 along with a hand search of selected journals. The quality of evidence was assessed using the Grading of Recommended Assessment, Development, and Evaluation tool, risk of bias using Cochrane risk of bias tool, and meta-analysis was carried out using RevMan 5.4 software. RESULTS: Ten randomized controlled trials which met the inclusion criteria were evaluated and tabulated. A random-effects meta-analysis demonstrated that there is a statistically significant increase in the orthodontic tooth movement when patients were exposed to minimum of four intervals of LLLT in the first month, at P =0.03 by a standard mean difference of 0.46 mm with an overall heterogeneity of I(2) = 0% at 95% confidence interval. There was a statistically highly significant reduction in the number of days taken for alignment of anterior teeth with the application of LASER (P <.00001). CONCLUSION: Application of LLLT for minimum of four irradiations in the first month has yielded better results in accelerating orthodontic tooth movement than application of LLLT once a month.

The Condylar Effects of Mesenchymal Stem Cells, Low-Level Laser Therapy and Grape Seed Extract on Functional Mandibular Advancement of the Rat Mandible. OBJECTIVE: Functional treatment of Class II malocclusion is expected to lead to adaptation in the condyle. This study aimed to evaluate the effects of adipose tissue-derived mesenchymal stem cells (ADMSCs), low-level laser therapy (LLLT), and grape-seed extract (GSE) on condylar growth after functional mandibular advancement. METHODS: Forty-five rats were randomly divided into 8 groups. Functional appliances were applied to all groups (n=6) except the control group (n=3). One group was treated with appliances only; the other six groups received various combinations of ADMSCs, LLLT, and GSE. Analyses for new osteoblasts and new bone formation, vascular endothelial growth factor, and Type II collagen were performed on condylar tissues, after an experimental period of four weeks. The quantitative data obtained from the results of the experiments were evaluated by H-score and analyzed using One-Way

ANOVA by Tukey-Kramer multiple comparisons test (pâ‰¤0.05). RESULTS: Levels of all investigated parameters increased in all groups (pâ‰¤0.05). The highest increases were achieved by a combined application of functional appliance, ADMSCs, LLLT and GSE (pâ‰¤0.05). Single LLLT administrations or single GSE applications did not create a statistical difference from appliance alone (p>0.05). A positive effect of ADMSCs or LLLT on osteoblast formation, neovascularization, and Type II collagen level was apparent (pâ‰¤0.05), however, neither affected new bone formation (p>0.05). CONCLUSION: This study shows that ADMSCs with LLLT and GSE applications provide differing levels of new osteoblast and bone formation, new vascular formation, and Type II collagen formation in rat condyles after functional mandibular advancement.

All Lit Up: Exploring the Photophysical Properties of Protein Polymers. Microtubules and actin filaments are protein polymers that play a variety of energy conversion roles in the biological cell. While these polymers are being increasingly harnessed for mechanochemical roles both inside and outside physiological conditions, their capabilities for photonic energy conversion are not well understood. In this Perspective, we first introduce the reader to the photophysical properties of protein polymers, examining light harvesting by their constituent aromatic residues. We then discuss both the opportunities and the challenges in interfacing protein biochemistry with photophysics. We also review the literature reporting the response of microtubules and actin filaments to infrared light, illustrating the potential of these polymers to these polymers serve as targets for photobiomodulation. Finally, we present broad challenges and questions in the field of protein biophotonics. Understanding how protein polymers interact with light will pioneer both biohybrid device fabrication and light-based therapeutics. Polymers Polymers;Microtubules;Photons;Physical Phenomena

Physics-guided neural network for tissue optical properties estimation. Finding the optical properties of tissue is essential for various biomedical diagnostic/therapeutic applications such as monitoring of blood oxygenation, tissue metabolism, skin imaging, photodynamic therapy, low-level laser therapy, and photo-thermal therapy. Hence, the research for more accurate and versatile optical properties estimation techniques has always been a primary interest of researchers, especially in the field of bioimaging and bio-optics. In the past, most of the prediction methods were based on physics-based models such as the pronounced diffusion approximation method. In more recent years, with the advancement and growing popularity of machine learning techniques, most of the prediction methods are data-driven. While both methods have been proven to be useful, each of them suffers from several shortcomings that could be complemented by their counterparts. Thus, there is a need to bring the two domains together to obtain superior prediction accuracy and generalizability. In this work, we proposed a physics-guided neural network (PGNN) for tissue optical properties regression which integrates physics prior and constraint into the artificial neural network (ANN) model. With this method, we have demonstrated superior generalizability of PGNN compared to its pure ANN counterpart. The prediction accuracy and generalizability of the network were evaluated on single-layered tissue samples simulated with Monte Carlo simulation. Two different test datasets, the in-domain test dataset and out-domain dataset were used to evaluate in-domain generalizability and out-domain generalizability, respectively. The physics-guided neural network (PGNN) showed superior generalizability for both in-domain and out-domain prediction compared to pure ANN.

Photobiomodulation and vitamin B treatment alleviate both thermal and mechanical orofacial pain in rats. PURPOSE: The present study investigates the efficacy of Photobiomodulation (PBM) and Vitamin B Complex (VBC) to relieve pain, both in separately and combined (PBM and VBC). METHODS: Rats with chronic constriction injury of the right infraorbital nerve (CCI-IoN) or Sham surgery were used. PBM was administered at a wavelength of 904Â nm and energy density of 6.23Â J/cm(2) and VBC (containing B1, B6 and B12) subcutaneously, both separately and combined. Behavioral tests

were performed to assess mechanical and thermal hypersensitivity before and after CCI and after PBM, VBC, or PBMâ€‰+â€‰VBC. The expression of inflammatory proteins in the trigeminal ganglion and the immunohistochemical alterations of Periaqueductal Gray (PAG) astrocytes and microglia were examined following CCI and treatments. RESULTS: All testeds treatments reversed the painful behavior. The decrease in pain was accompanied by a decrease of Glial Fibrillary Acidic Protein (GFAP), a specific astrocytic marker, and Ionized calcium-binding adaptor molecule 1 (Iba-1), a marker of microglia, and decreased expression of Transient Receptor Potential Vanilloid 1 (TRPV1), Substance P, and Calcitonin Gene-Related Peptide (CGRP) induced by CCI-IoN in PAG and Trigeminal ganglion. Furthermore, both treatments showed a higher expression of Cannabinoid-type 1 (CB1) receptor in the trigeminal ganglion compared to CCI-IoN rats. Our results show that no difference was observed between groups. CONCLUSION: We showed that PBM or VBC regulates neuroinflammation and reduces inflammatory protein expression. However, the combination of PBM and VBC did not enhance the effectiveness of both therapies alone. Vitamin B Complex Rats;Animals;Vitamin B Complex;Rats, Sprague-Dawley;Facial Pain

Non-surgical adjunctive interventions for accelerating tooth movement in patients undergoing orthodontic treatment. BACKGROUND: Deviation from a normal bite can be defined as malocclusion. Orthodontic treatment takes 20 months on average to correct malocclusion. Accelerating the rate of tooth movement may help to reduce the duration of orthodontic treatment and associated unwanted effects including orthodontically induced inflammatory root resorption (OIIRR), demineralisation and reduced patient motivation and compliance. Several non-surgical adjuncts have been advocated with the aim of accelerating the rate of orthodontic tooth movement (OTM). Â Â Â Â OBJECTIVES: To assess the effect of non-surgical adjunctive interventions on the rate of orthodontic tooth movement and the overall duration of treatment. SEARCH METHODS: An information specialist searched five bibliographic databases up to 6 September 2022 and used additional search methods to identify published, unpublished and ongoing studies. SELECTION CRITERIA: We included randomised controlled trials (RCTs) of people receiving orthodontic treatment using fixed or removable appliances along with non-surgical adjunctive interventions to accelerate tooth movement. We excluded split-mouth studies and studies that involved people who were treated with orthognathic surgery, or who had cleft lip or palate, or other craniofacial syndromes or deformities. DATA COLLECTION AND ANALYSIS: Two review authors were responsible for study selection, risk of bias assessment and data extraction; they carried out these tasks independently. Disagreements were resolved by discussion amongst the review team to reach consensus.Â MAIN RESULTS: We included 23 studies, none of which were rated as low risk of bias overall. We categorised the included studies as testing light vibrationalÂ forces or photobiomodulation, the latter including low level laser therapy and light emitting diode. The studies assessed non-surgical interventions added to fixed or removable orthodontic appliances compared to treatment without the adjunct. A total of 1027 participants (children and adults) were recruited with loss to follow-up ranging from 0% to 27% of the original samples.Â Certainty of the evidence For all comparisons and outcomes presented below, the certainty of the evidence is low to very low. Light vibrationalÂ forcesÂ ElevenÂ studies assessed how applying light vibrational forces (LVF) affected orthodontic tooth movement (OTM). There was no evidence of a difference between the intervention and control groups for duration of orthodontic treatment (MD -0.61 months, 95% confidence interval (CI) -2.44 to 1.22; 2 studies, 77 participants); total number of orthodontic appliance adjustment visits (MD -0.32 visits, 95% CI -1.69 to 1.05; 2 studies, 77 participants); orthodontic tooth movement during the early alignment stage (reduction of lower incisor irregularity (LII)) at 4-6 weeks (MD 0.12 mm, 95% CI -1.77 to 2.01; 3 studies, 144 participants), or 10-16 weeks (MD -0.18 mm, 95% CI -1.20 to 0.83; 4 studies, 175 participants); rate of canine distalisation (MD -0.01 mm/month, 95% CI -0.20 to 0.18; 2

studies, 40 participants); or rate of OTM during en masse space closure (MD 0.10 mm per month, 95% CI -0.08 to 0.29; 2 studies, 81 participants). No evidence of a difference was found between LVF and control groups in rate of OTM when using removable orthodontic aligners. Nor did the studies show evidence of a difference between groups for our secondary outcomes, including patient perception of pain, patient-reported need for analgesics at different stages of treatment and harms or side effects.Â Photobiomodulation Ten studies assessed the effect of applying low level laser therapy (LLLT) on rate of OTM. We found that participants in the LLLT group had a statistically significantly shorter length of time for the teeth to align in the early stages of treatment (MD -50 days, 95% CI -58 to -42; 2 studies, 62 participants) and required fewer appointments (-2.3, 95% CI -2.5 to -2.0; 2 studies, 125 participants). There was no evidence of a difference between the LLLT and control groups in OTM when assessed as percentage reduction in LII in the first month of alignment (1.63%, 95% CI -2.60 to 5.86; 2 studies, 56 participants) or in the second month (percentage reduction MD 3.75%, 95% CI -1.74 to 9.24; 2 studies, 56 participants). However, LLLT resulted in an increase in OTM during the space closure stage in the maxillary arch (MD 0.18 mm/month, 95% CI 0.05 to 0.33; 1 study; 65 participants; very low level of certainty) and the mandibular arch (right side MD 0.16 mm/month, 95% CI 0.12Â to 0.19; 1 study; 65 participants). In addition,Â LLLT resulted in an increased Â rate of OTM during maxillary canine retraction (MD 0.01 mm/month, 95% CI 0 to 0.02; 1 study, 37 participants). These Â findings were not clinically significant. The studies showed no evidence of a difference between groups for our secondary outcomes, including OIIRR, periodontal health and patient perception of pain at early stages of treatment. Two studies assessed the influence of applying light-emitting diode (LED) on OTM. Participants in the LED group required a significantly shorter time to align the mandibular arch compared to the control group (MD -24.50 days, 95% CI -42.45 to -6.55, 1 study, 34 participants). There is no evidence that LED application increased the rate of OTM during maxillary canine retraction (MD 0.01 mm/month, 95% CI 0 to 0.02; P = 0.28; 1 study, 39 participants). In terms of secondary outcomes, one study assessed patient perception of pain and found no evidence of a difference between groups. Â AUTHORS' CONCLUSIONS: The evidence from randomised controlled trials concerning the effectiveness of non-surgical interventions to accelerate orthodontic treatment is of low to very low certainty. It suggests that there is no additional benefit of light vibrational forces or photobiomodulation for reducing the duration of orthodontic treatment. Although there may be a limited benefit from photobiomodulation application for accelerating discrete treatment phases, these results have to be interpreted with caution due to their questionable clinical significance. Further well-designed, rigorous RCTs with longer follow-up periods spanning from start to completion of orthodontic treatment are required to determine whether non-surgical interventions may reduce the duration of orthodontic treatment by a clinically significant amount, with minimal adverse effects. Humans;Tooth Movement Techniques;Malocclusion;Dental Care;Pain;Low-Level Light Therapy

Adjunctive effect of 470-nm and 630-nm light-emitting diode irradiation in experimental periodontitis treatment: a preclinical study. PURPOSE: This study investigated the adjunctive effect of light-emitting diodes (LEDs) in the treatment of experimental periodontitis. METHODS: Experimental periodontitis was induced by placing ligatures around the mandibular second, third, and fourth premolars of 6 beagles for 3 months. After ligature removal, periodontitis progressed spontaneously for 2 months. The animals' hemimandibles were allocated among the following 3 groups: 1) no treatment (control), 2) scaling and root planing (SRP), and 3) SRP with LED irradiation at 470-nm and 630-nm wavelengths (SRP/LED). The probing pocket depth (PPD) and gingival recession (GR) were measured at baseline, 6 weeks, and 12 weeks. The clinical attachment level (CAL) was calculated. After 12 weeks, histological and histomorphometric assessments were performed. The distances from the gingival margin to the apical extent of the junctional epithelium (E) and to the connective

tissue (CT) attachment were measured, as was the total length of soft tissue (ST). RESULTS: PPD and CAL increased at 12 weeks compared with baseline in the control group (6.31Â±0.43 mm to 6.93Â±0.50 mm, and 6.46Â±0.60 mm to 7.61Â±0.78 mm, respectively). PPD and CAL decreased at 12 weeks compared with baseline in the SRP group (6.01Â±0.59 to 4.81Â±0.65 mm, and 6.51Â±0.98 to 5.39Â±0.93 mm, respectively). PPD and CAL decreased at 12 weeks compared with baseline in the SRP/LED group (6.03Â±0.39 to 4.46Â±0.47 mm, and 6.11Â±0.47 to 4.78Â±0.57 mm, respectively). The E/ST and CT/ST ratios significantly differed among the 3 groups (P<0.05). The clinical parameters and histologic findings demonstrated that 470-nm and 630-nm wavelength LED irradiation accompanying SRP could improve treatment results. CONCLUSIONS: Within the study limitations, 470 nm and 630 nm wavelength LED irradiation might provide additional benefits for periodontitis treatment.

Evaluation of epigenetic (HDAC, DNMT) and pain (Gad65,Â TGF) factors following photobiomodulation therapy in a neuropathic pain model. Photobiomodulation therapy (PBMT) is converted to the most common analgesic treatment before the whole mechanism is yet to be discovered. This study for the first time was designed to investigate alternations of epigenetic factors after pain and PBMT. The CCI model was chosen to induce pain. Pain evaluation tests including plantar, acetone, von Frey, and pinch were done weekly. Then spinal cord tissue was isolated for evaluating mRNA expression of DNMT3a, HDAC1, and NRSF using RT-qPCR method, and protein expression factors of HDAC2 and DNMT3a using western blotting. GAD65 and TGF-Î² proteins were assessed by the IHC method. PBMT increased the pain threshold up to the point where it roughly met the pain threshold of the control group. After three weeks of treatment, both PBMT protocols demonstrated a reduction in allodynia and hyperalgesia. While some molecules, such as TGF-Î² and Gad65, increased following PBMT, we observed no inhibition of NRSF, HDAC1, and DNMT3a expression despite implementing two different protocols. Transforming Growth Factor beta Humans;Low-Level Light Therapy;Neuralgia;Pain Threshold;Hyperalgesia;Transforming Growth Factor beta;Epigenesis, Genetic

Effect of photobiomodulation therapy of overprepared dental implant bed on torque removal and implant stability quotient: an experimental study in sheep. BACKGROUND: Primary stability of dental implant is an important prerequisite for achieving osseointegration. This study was conducted to evaluate the effects of photobiomodulation therapy on bone formation-around implants by measuring the implant removal torque and implant stability quotient. METHODS: This study was conducted in six adult male sheep. Four implants were placed on each side of the lower border of the mandible. The implant beds were prepared to a size of 10 mm in length and 4.8 mm in width, to receive an implant of 8 mm in length and 4 mm in width. Laser application to the socket was performed just before implant placement, and was immediately administered to the surface of the implant and the peri-implant bone before suturing of the wound. The therapy was continued twice daily for the next seven consecutive days. The animals were sacrificed at 4, 8, and 12 weeks, with two animals per time point. The implant-removal torque was determined with an electronic wrench, and the implant stability quotient (ISQ) was assessed with an Ostell device. RESULTS: The laser treated sides showed significantly higher removal torque and ISQ, at the three-time points (P<0.05). At 4 weeks, the ISQ was 61.44 (Â±10.4) in the laser group and 48.2 (Â±16.7) in the control group. At 8 weeks, the ISQ increased to 62.2 (Â±5.5) in the laser group and 56.1 (Â±4.3) in the control group. At 12 weeks, the ISQ was 67 (Â±4.5) in the laser group and 61.875 (Â±6.3) in the control group. The removal torque at 4 weeks was 218.6 (Â±62.6) in the laser group and 147.6 (Â±40.9) in the control group. At 8 weeks, the removal torque increased to 370.5 (Â±33.3) in the laser group and 250.2 (Â±25.0) in the control group. At 12 weeks, the removal torque increased to 912.6 (Â±177.2) in the laser group and 512.1 (Â±122.6) in the control group. CONCLUSIONS: Photobiomodulation enhances bone formation and improves implant stability in implants with overzealously prepared oversized

implant beds. Dental Implants Male;Animals;Sheep;Dental Implantation, Endosseous;Dental Implants;Torque;Low-Level Light Therapy;Osseointegration

Therapies for Parkinson's disease and the gut microbiome: evidence for bidirectional connection. The gut brain axis (GBA), a bidirectional communication pathway has often been linked to health and disease, and gut microbiota (GM), a key component of this pathway shown to be altered in Parkinson's disease (PD), are suggested to contribute to the pathogenesis of PD. There are few studies that report the impact of oral medication therapy on GM, however, there are even fewer studies that discuss the impact of other treatments such as device assisted therapies (DAT) including deep brain stimulation (DBS), levodopa-carbidopa intestinal gel infusion (LCIG) and photobiomodulation (PBM) and how these might impact GM. Here, we review the literature and summarize findings of the potential contributions of GM to the heterogenous clinical response to pharmaceutical therapies among individuals with PD. We also discuss the potential interactions between the GM and DATs such as DBS and LCIG and present evidence for alterations in GM in response to DATs. Given the complexity and highly individual nature of the GM of patients with PD and the potential influence that other external factors such as diet, lifestyle, medications, stage of the disease and other comorbidities, further investigations into the response of GM to therapies are worthy of future study in prospective, controlled trials as well as medication naÃ¯ve individuals. Such detailed studies will help us further comprehend the relationship between GM in PD patients, and will help investigate the potential of targeting GM associated changes as a treatment avenue for PD.

Vascular uses of LP1064 applicator on the harmony XL pro device. INTRODUCTION: Vascular lesions of the lower extremities and face, such as varicose veins and telangiectasias, are a common dilemma for the dermatologist. In recent years, laser therapy has emerged as a viable treatment option for these vascular anomalies. MATERIALS AND METHODS: Although there are several types of lasers, the 1064-nm Nd:YAG in particular is popularly selected for its safety profile and versatility. The longer 1064â€‰nm wavelength penetrates deeper into the skin while also being less absorbed by hemoglobin and melanin, thus resulting in minimized damage to surrounding structures and less pigmentation changes. The new LP1064 applicator on the Harmony XL Pro Device is one such laser. RESULTS: Numerous publications have corroborated the efficacy of 1064â€‰nm Nd:YAG lasers. These studies cite at least over 75% of patients experiencing significant improvement in common vascular lesions. Efficacy of this laser is also seen for other vascular lesions such as port wine stains, hemangiomas, venous lakes, poikiloderma of Civatte, and angiokeratomas. Overall, the reported studies also show a low incidence of adverse events. CONCLUSION: The 1064â€‰nm Nd:YAG laser, such as the Harmony LP1064 applicator, is a safe and effective tool to treat vein anomalies of the face and leg. Although commonly used for vein ablation, it has demonstrated a robust response in other indications as well. Humans;Telangiectasis;Veins;Port-Wine Stain;Laser Therapy;Low-Level Light Therapy;Lasers, Solid-State;Treatment Outcome

Effects of the invasive and non-invasive systemic photobiomodulation using low-level laser in experimental models: A systematic review. Systemic photobiomodulation (PBM) of the blood or over blood vessels has been associated with bio-stimulating, vasodilating, and anti-inflammatory properties. This treatment modality has been used for modulating inflammatory processes, tissue repair, atherosclerosis, and systemic arterial hypertension, and is described more often in clinical studies than experimental models. Therefore, the aim of the present study was to conduct a literature review regarding the effect of systemic PBM involving the intravascular laser irradiation of blood (ILIB) or non-invasive vascular photobiomodulation (VPBM) using low-level laser (LLL) in experimental (animal) models. The PubMed/MEDLINEÂ®, Scopus, SPIE Digital Library, and Web of Science databases were searched for articles on the use of VPBM with LLL in animal models. Nine original articles met the inclusion criteria and were critically evaluated. The variables of interest were

the dosimetric laser parameters, different methods for delivering energy, and the main results. The use laser in the red spectrum was more prevalent and VPBM (non-invasive) predominated over ILIB (invasive). No standardization was found in the dosimetric parameters. However, the studies showed the positive effects of VPBM on arterial pressure and blood circulation, the positive effects of ILIB on blood composition and hematological markers, as well as positive effects of both forms of systemic PBM (ILIB and VPBM) on the tissue repair process. In conclusion, the studies evaluated in the present review showed that the use of systemic PBM with ILIB or non-invasive VPBM induced positive effects, modulating metabolic conditions and tissue repair. However, there is a need for standardization in the dosimetric parameters for the different conditions and processes evaluated using experimental models. Animals;Low-Level Light Therapy;Models, Animal;Hypertension

Clinical characterization of stomatitis cases with an epithelial growth factor receptor inhibitor in metastatic colorectal cancer patients: A study of 7 cases and literature review. OBJECTIVE: The aim of this study was to report a case series of patients with metastatic colorectal cancer (mCRC) undergoing panitumumab-containing regimens affected by oral lesions and to review the current literature. STUDY DESIGN: Electronic medical records of mCRC patients referred to treat mouth sores during the treatment with the anti-epithelial growth factor receptor (EGFR)-panitumumab-were retrospectively reviewed. Patients' characterization, clinical profile of oral lesions, and management outcomes were documented. Additionally, modifications or discontinuation of the antineoplastic treatment as well as the occurrence of other adverse events (AEs) were analyzed. RESULTS: A total of 7 patients were included. The oral lesions appeared in a median time of 10 days (range 7-11 days) after the drug administration. The median reported pain score was 5 (range 1-9), causing feeding discomfort. Oral lesions with a marked aphthous-like appearance, among others, occurred in all cases and involved nonkeratinized mucosa more likely. At least 1 patient had dose reduction of the treatment and 1 patient needed discontinuation due to panitumumab-associated stomatitis. Dermatologic AEs were the most prevalent. Clinical improvement was obtained with topical corticosteroid therapy and/or photobiomodulation. CONCLUSIONS: In summary, panitumumab-containing regimens were associated with a particular pattern of oral lesions consistent with stomatitis. This event may eventually affect the tolerability of the treatment in patients with mCRC. Panitumumab;Antibodies, Monoclonal;ErbB Receptors;Receptors, Growth Factor Humans;Panitumumab;Antibodies, Monoclonal;Colorectal Neoplasms;Retrospective Studies;ErbB Receptors;Receptors, Growth Factor;Stomatitis;Antineoplastic Combined Chemotherapy Protocols

Photobiomodulation and glass ionomer sealant as complementary treatment for hypersensitivity in molar incisor hypomineralisation in children: protocol for a blinded randomised clinical trial. INTRODUCTION: Photobiomodulation has been widely used as a complementary treatment for dentin hypersensitivity, with reports of clinical success. However, the literature offers only one study, in which photobiomodulation was used for the treatment of sensitivity in molars with molar incisor hypomineralisation (MIH). The aim of the proposed study is to determine whether photobiomodulation enhances the results of treatment with glass ionomer sealant on molars with MIH that present sensitivity. METHODS AND ANALYSIS: The study involves 50 patients from 6 to 12 years of age that will be randomly allocated in two groups. Group 1 (control group) (n=25): toothpaste with a concentration of fluoride â‰¤1000â€‰ppm two times a day, glass ionomer sealant and sham low-level laser (LLL) and group 2 (n=25): toothpaste with a concentration of fluoride â‰¤1000â€‰ppm two times a day, glass ionomer sealant and active LLL. The evaluations will involve MIH record, Simplified Oral Hygiene Index (OHI), Schiff Cold Air Sensitivity Scale (SCASS) and visual analogue scale (VAS) before the procedure. Immediately after the procedure, the hypersensitivity index (SCASS/VAS) will be registered. Records of OHI and SCASS/VAS will be registered after 48 hours as well as 1â€‰month after the procedure. The persistence of the sealant will also be registered. It is

expected that by the second consultation, a decrease in sensitivity will be observed due to the treatments received in the two groups. ETHICS AND DISSEMINATION: This protocol has been approved by the local medical ethical committee (certificate: CEUCU 220516). The findings will be published in a peer-reviewed journal. TRIAL REGISTRATION NUMBER: NCT05370417. Fluorides;glass ionomer;Toothpastes Humans;Child;Fluorides;Molar Hypomineralization;Toothpastes;Research Design;Randomized Controlled Trials as Topic

Twenty cases of perennial and seasonal allergic rhinitis treated with LumiMedÂ® Nasal Device. BACKGROUND: Allergic rhinitis is the most common allergic disease, with a prevalence up to 40% in the general population. Allergic rhinitis requires daily treatment to block inflammatory mediators and suppress the inflammatory response. However, these medications may have harmful side effects. Photobiomodulation as a treatment modality to reduce inflammation has been beneficial in many chronic disorders, yet therapy has not been US Food and Drug Administration approved for the treatment of allergic rhinitis. The LumiMed Nasal Device was designed to address the limitations associated with the treatment of allergic rhinitis with photobiomodulation. This in-office study hopes to show efficacy, usability, and comfortability of the LumiMed Nasal Device. CASE PRESENTATION: Twenty patients with allergic rhinitis were treated during high allergy season with LumiMed Nasal Device. The average age of patients was 35Â years (10-75); 11 were female and 9 were male. The population's ethnicities were white (nâ€‰=â€‰11), Black (nâ€‰=â€‰6), Oriental (nâ€‰=â€‰2), and Iranian (nâ€‰=â€‰1). Patients were treated with twice-daily dosing, 10Â seconds in each nostril, for 10 consecutive days. After 10Â days, patients were evaluated for symptom relief, device comfort and device ease of use. The Total Nasal Symptom Score was used to assess severity of main symptoms of allergic rhinitis. The sum of Total Nasal Symptom Scores for each symptom category was calculated (total possible scores per patient were 0-9). Rhinorrhea/nasal secretions, nasal congestion, and nasal itching/sneezing were evaluated on a scale of 0-3 (0â€‰no symptoms, 1 mild symptoms, 2â€‰moderate symptoms, 3â€‰severe symptoms). Device comfort was evaluated on a scale of 0-3 (0â€‰no discomfort, 1â€‰mild discomfort, 2â€‰moderate discomfort, 3 severe discomfort). Device ease of use was evaluated on a scale of 0-3 (0â€‰very easy, 1â€‰somewhat difficult, 2â€‰difficult, 3â€‰very difficult). CONCLUSIONS: The results from these case studies indicated that of the 20 patients in this case study, 100% of patients experienced improvement in overall Total Nasal Symptom Score after using LumiMed Nasal Device. Of those patients, 40% brought their Total Nasal Symptom Score down to 0. Furthermore, 95% felt the LumiMed Nasal Device was comfortable to use, while 85% of patients felt the LumiMed Nasal Device was easy to use. United States;Humans;Female;Male;Child;Adolescent;Young Adult;Adult;Middle Aged;Aged;Rhinitis, Allergic, Seasonal;Iran;Nose;Rhinitis, Allergic;Inflammation

Photobiomodulation at molecular, cellular, and systemic levels. Since the reporting of Endre Mester's results, researchers have investigated the biological effects induced by non-ionizing radiation emitted from low-power lasers. Recently, owing to the use of light-emitting diodes (LEDs), the term photobiomodulation (PBM) has been used. However, the molecular, cellular, and systemic effects involved in PBM are still under investigation, and a better understanding of these effects could improve clinical safety and efficacy. Our aim was to review the molecular, cellular, and systemic effects involved in PBM to elucidate the levels of biological complexity. PBM occurs as a consequence of photon-photoacceptor interactions, which lead to the production of trigger molecules capable of inducing signaling, effector molecules, and transcription factors, which feature it at the molecular level. These molecules and factors are responsible for cellular effects, such as cell proliferation, migration, differentiation, and apoptosis, which feature PBM at the cellular level. Finally, molecular and cellular effects are responsible for systemic effects, such as modulation of the inflammatory process, promotion of tissue repair and wound healing, reduction of edema and pain, and

improvement of muscle performance, which features PBM at the systemic level. Apoptosis;Cell Differentiation;Cell Proliferation;Signal Transduction;Muscles

Efficacy of Low-Level Laser Therapy in Androgenetic Alopecia - A Randomized Controlled Trial. BACKGROUND: Androgenetic alopecia (AGA) is caused by the susceptibility of hair follicles to androgenic miniaturization, which leads to hair loss. The most common modalities for the treatment of AGA include the use of topical minoxidil and oral finasteride. Low-level laser therapy (LLLT) is a newer modality of treatment for AGA. We tried to evaluate the added benefit of LLLT in AGA compared with topical minoxidil 5% alone. AIM: The aim of this study was to compare the efficacy of LLLT combined with topical 5% minoxidil in AGA versus topical 5% minoxidil used alone. MATERIALS AND METHODS: After ethics committee approval, 54 patients of AGA were randomly divided into two groups. Group A participants received LLLT therapy twice a week plus topical 5% minoxidil and Group B participants received only minoxidil 5% solution. Both the groups were followed up for 16 weeks and evaluated with gross photographs, TrichoScan analysis, and dermoscopy to look for any improvement in hair density. RESULTS: After 16 weeks, improvement in hair density of 14.78% Â± 10.93% in Group A was recorded compared to 11.43% Â± 6.43% in Group B. However, while comparing both means, P value was 0.45 which was not significant. The physician global assessment and patient satisfaction score revealed no significant difference between both the groups. CONCLUSION: Although LLLT appears to be safe and effective in the treatment of male pattern hair loss, we did not observe any significant difference in terms of improvement in hair density between both the groups.

Effects of Red LED Irradiation in Enhancing the Mineralization of Human Dental Pulp Cells In Vitro. Dentin regeneration is the preferred method used to preserve dental pulp vitality after pulp exposure due to caries. Red light-emitting diode irradiation (LEDI), which is based on photobiomodulation (PBM), has been used to promote hard-tissue regeneration. However, the underlying mechanism still needs elucidation. This study aimed to explore the mechanism involved in red LEDI affecting dentin regeneration. Alizarin red S (ARS) staining revealed that red LEDI induced mineralization of human dental pulp cells (HDPCs) in vitro. We further distinguished the cell proliferation (0-6 d), differentiation (6-12 d), and mineralization (12-18 d) of HDPCs in vitro and treated cells either with or without red LEDI in each stage. The results showed that red LEDI treatment in the mineralization stage, but not the proliferation or differentiation stages, increased mineralized nodule formation around HDPCs. Western blot also indicated that red LEDI treatment in the mineralization stage, but not the proliferation or differentiation stages, upregulated the expression of dentin matrix marker proteins (dentin sialophosphoprotein, DSPP; dentin matrix protein 1, DMP1; osteopontin, OPN) and an intracellular secretory vesicle marker protein (lysosomal-associated membrane protein 1, LAMP1). Therefore, the red LEDI might enhance the matrix vesicle secretion of HDPCs. On the molecular level, red LEDI enhanced mineralization by activating the mitogen-activated protein kinase (MAPK) signaling pathways (ERK and P38). ERK and P38 inhibition reduced mineralized nodule formation and the expression of relevant marker proteins. In summary, red LEDI enhanced the mineralization of HDPCs by functioning to produce a positive effect in the mineralization stage in vitro. Extracellular Matrix Proteins;Alkaline Phosphatase;Phosphoproteins Humans;Dental Pulp;Odontoblasts;Cell Differentiation;Cell Proliferation;MAP Kinase Signaling System;Cells, Cultured;Extracellular Matrix Proteins;Alkaline Phosphatase;Phosphoproteins

Neurodegenerative and Neurodevelopmental Diseases and the Gut-Brain Axis: The Potential of Therapeutic Targeting of the Microbiome. The human gut microbiome contains the largest number of bacteria in the body and has the potential to greatly influence metabolism, not only locally but also systemically. There is an established link between a healthy, balanced, and diverse microbiome and overall health. When the gut microbiome becomes unbalanced (dysbiosis) through

dietary changes, medication use, lifestyle choices, environmental factors, and ageing, this has a profound effect on our health and is linked to many diseases, including lifestyle diseases, metabolic diseases, inflammatory diseases, and neurological diseases. While this link in humans is largely an association of dysbiosis with disease, in animal models, a causative link can be demonstrated. The link between the gut and the brain is particularly important in maintaining brain health, with a strong association between dysbiosis in the gut and neurodegenerative and neurodevelopmental diseases. This link suggests not only that the gut microbiota composition can be used to make an early diagnosis of neurodegenerative and neurodevelopmental diseases but also that modifying the gut microbiome to influence the microbiome-gut-brain axis might present a therapeutic target for diseases that have proved intractable, with the aim of altering the trajectory of neurodegenerative and neurodevelopmental diseases such as Alzheimer's disease, Parkinson's disease, multiple sclerosis, autism spectrum disorder, and attention-deficit hyperactivity disorder, among others. There is also a microbiome-gut-brain link to other potentially reversible neurological diseases, such as migraine, post-operative cognitive dysfunction, and long COVID, which might be considered models of therapy for neurodegenerative disease. The role of traditional methods in altering the microbiome, as well as newer, more novel treatments such as faecal microbiome transplants and photobiomodulation, are discussed. Animals;Humans;Brain-Gut Axis;Neurodegenerative Diseases;Autism Spectrum Disorder;Dysbiosis;Post-Acute COVID-19 Syndrome;COVID-19;Microbiota;Brain

Recent Mechanisms of Neurodegeneration and Photobiomodulation in the Context of Alzheimer's Disease. Alzheimer's disease (AD) is a neurodegenerative disease and the world's primary cause of dementia, a condition characterized by significant progressive declines in memory and intellectual capacities. While dementia is the main symptom of Alzheimer's, the disease presents with many other debilitating symptoms, and currently, there is no known treatment exists to stop its irreversible progression or cure the disease. Photobiomodulation has emerged as a very promising treatment for improving brain function, using light in the range from red to the near-infrared spectrum depending on the application, tissue penetration, and density of the target area. The goal of this comprehensive review is to discuss the most recent achievements in and mechanisms of AD pathogenesis with respect to neurodegeneration. It also provides an overview of the mechanisms of photobiomodulation associated with AD pathology and the benefits of transcranial near-infrared light treatment as a potential therapeutic solution. This review also discusses the older reports and hypotheses associated with the development of AD, as well as some other approved AD drugs. Humans;Alzheimer Disease;Neurodegenerative Diseases;Infrared Rays

625 nm Light Irradiation Prevented MC3T3-E1 Cells from Accumulation of Misfolded Proteins via ROS and ATP Production. Osteoblasts must acquire a considerable capacity for folding unfolded and misfolded proteins (MPs) to produce large amounts of extracellular matrix proteins and maintain bone homeostasis. MP accumulation contributes to cellular apoptosis and bone disorders. Photobiomodulation therapy has been used to treat bone diseases, but the effects of decreasing MPs with photobiomodulation remain unclear. In this study, we explored the efficacy of 625 nm light-emitting diode irradiation (LEDI) to reduce MPs in tunicamycin (TM) induced-MC3T3-E1 cells. Binding immunoglobulin protein (BiP), an adenosine triphosphate (ATP)-dependent chaperone, is used to evaluate the capacity of folding MPs. The results revealed that pretreatment with 625 nm LEDI (Pre-IR) induced reactive oxygen species (ROS) production, leading to the increased chaperone BiP through the inositol-requiring enzyme 1 (IRE1)/X-box binding protein 1s (XBP-1s) pathway, and then restoration of collagen type I (COL-I) and osteopontin (OPN) expression relieving cell apoptosis. Furthermore, the translocation of BiP into the endoplasmic reticulum (ER) lumen might be followed by a high level of ATP production. Taken together, these results suggest that Pre-IR could be beneficial to prevent MP accumulation through ROS and ATP in TM-induced MC3T3-E1cells.

Reactive Oxygen Species;Adenosine Triphosphate;Endoplasmic Reticulum Chaperone BiP;Tunicamycin Reactive Oxygen Species;Endoplasmic Reticulum Stress;Adenosine Triphosphate;Endoplasmic Reticulum Chaperone BiP;Endoplasmic Reticulum;Tunicamycin

Photobiomodulation Therapy Restores Olfactory Function Impaired by Photothrombosis in Mouse Olfactory Bulb. An ischemic stroke typically accompanies numerous disorders ranging from somatosensory dysfunction to cognitive impairments, inflicting patients with various neurologic symptoms. Among pathologic outcomes, post-stroke olfactory dysfunctions are frequently observed. Despite the well-known prevalence, therapy options for such compromised olfaction are limited, likely due to the complexity of olfactory bulb architecture, which encompasses both the peripheral and central nervous systems. As photobiomodulation (PBM) emerged for treating ischemia-associated symptoms, the effectiveness of PBM on stroke-induced impairment of olfactory function was explored. Novel mouse models with olfactory dysfunctions were prepared using photothrombosis (PT) in the olfactory bulb on day 0. The post-PT PBM was performed daily from day 2 to day 7 by irradiating the olfactory bulb via an 808Â nm laser with a fluence of 40Â J/cm2 (325Â mW/cm2 for 2Â smin per day). The buried food test (BFT) was used to score behavioral acuity in food-deprived mice to assess the olfactory function before PT, after PT, and after PBM. Histopathological examinations and cytokine assays were performed on the mouse brains harvested on day 8. The results from BFT were specific to an individual, with positive correlations between the baseline latency time measured before PT and its alteration at the ensuing stages for both the PT and PTÂ +Â PBM groups. Also, the correlation analysis in both groups showed highly similar, significant positive relationships between the early and late latency time change independent of PBM, implicating a common recovery mechanism. Particularly, PBM treatment accelerated the recovery of impaired olfaction following PT by suppressing inflammatory cytokines and enhancing both glial and vascular factors (e.g., GFAP, IBA-1, and CD31). PBM therapy during the acute phase of ischemia improves the compromised olfactory function by modulating microenvironments and inflammation status of the affected tissue. Mice;Animals;Olfactory Bulb;Low-Level Light Therapy;Stroke;Disease Models, Animal;Ischemia

Photobiomodulation does not improve anaerobic performance in well-trained cyclists. To determine if photobiomodulation (PBM) has ergogenic effects on the anaerobic performance of well-trained cyclists. Fifteen healthy male road or mountain bike cyclists participated in this randomized, double-blinded, placebo-controlled, crossover study. Athletes were randomly assigned to receive photobiomodulation (630Â nm, 4.6Â J/cm(2), 6Â J per point, 16 points, PBM session) or placebo intervention (PLA session) in the first session. The athletes then performed a 30-s Wingate test to determine mean and peak average power, relative power, mean and peak velocity, mean and peak RPM, fatigue index, total distance, time to peak power, explosive strength, and power drop. After 48Â h, athletes returned to the laboratory for the crossover intervention. The repeated-measures ANOVA test followed by Bonferroni post hoc test or Friedman test with Dunn's post hoc test (pâ€‰<â€‰0.05), and Cohen's d statistic were used for comparisons. Performance in the Wingate test was not significantly different (pâ€‰>â€‰0.05) between PBM and PLA sessions for any variable. Only a small effect size was detected for time to peak power (-0.40; 1.11 to 0.31) and explosive strength (0.38; -0.34 to 1.09). We conclude that irradiation with red light, under a low energy density, does not promote ergogenic effects on the anaerobic performance of cycling athletes. Performance-Enhancing Substances;Polyesters Humans;Male;Athletic Performance;Cross-Over Studies;Performance-Enhancing Substances;Anaerobiosis;Double-Blind Method;Polyesters

Largest comparative analysis: Novel large spot size 595â€‰nm, high-energy, pulsed dye laser reduces number of treatments for improvement of adult and pediatric port wine birthmarks. OBJECTIVE: Port wine birthmarks (PWBs) are vascular malformations affecting 0.3%-0.5% of newborns with the

tendency to persist into adulthood without adequate treatment of the heterogenous ectatic vessels. This study compares treatment outcomes and parameters of the prior generation pulsed dye laser (PPDL) and the larger spot novel generation pulsed dye laser (NPDL) to establish whether a larger spot size laser provides greater clearance with fewer treatments. METHODS: One hundred and sixty patients were treated with either the PPDL (80 patients) and NPDL (80 patients) with retrospective review of age, body site, laser treatment parameters, number of treatments, and improvement following laser therapy. RESULTS: Patients treated with PPDL were older on average than patients treated with NPDL (mean 24.8â€‰Â±â€‰19.7 vs. mean 17.1Â±â€‰19.3 years, pâ€‰<â€‰0.05). The majority of lesions treated with PPDL were located on the face and neck, whereas truncal and extremity sites were more frequently treated with the NPDL. Use of NPDL was associated with a mean maximum spot size of 13.1â€‰mm and mean maximum fluence of 7.3â€‰J/cm(2) with pulse durations of 0.45-3â€‰ms, whereas use of the PPDL was associated with a mean spot size of 10.8â€‰mm and mean maximum fluence of 8.8â€‰J/cm(2) with pulse durations of 0.45-6â€‰ms. Fifty percent improvement was seen with 8.8 PPDL treatments compared to 4.3 NPDL treatments (pâ€‰â‰¤â€‰0.01) with no significant difference in overall mean improvement between both devices at the chosen parameters. Multiple regression analysis showed that device type, not age or lesion location, was the only statistically significant independent variable to affect the endpoint of at least 50% improvement of the lesion. CONCLUSIONS: Use of the larger spot NPDL is associated with achieving 50% improvement with fewer treatments. Infant, Newborn;Humans;Child;Adult;Lasers, Dye;Treatment Outcome;Laser Therapy;Port-Wine Stain;Low-Level Light Therapy

Transnasal targeted delivery of therapeutics in central nervous system diseases: a narrative review. Currently, neurointervention, surgery, medication, and central nervous system (CNS) stimulation are the main treatments used in CNS diseases. These approaches are used to overcome the blood brain barrier (BBB), but they have limitations that necessitate the development of targeted delivery methods. Thus, recent research has focused on spatiotemporally direct and indirect targeted delivery methods because they decrease the effect on nontarget cells, thus minimizing side effects and increasing the patient's quality of life. Methods that enable therapeutics to be directly passed through the BBB to facilitate delivery to target cells include the use of nanomedicine (nanoparticles and extracellular vesicles), and magnetic field-mediated delivery. Nanoparticles are divided into organic, inorganic types depending on their outer shell composition. Extracellular vesicles consist of apoptotic bodies, microvesicles, and exosomes. Magnetic field-mediated delivery methods include magnetic field-mediated passive/actively-assisted navigation, magnetotactic bacteria, magnetic resonance navigation, and magnetic nanobots-in developmental chronological order of when they were developed. Indirect methods increase the BBB permeability, allowing therapeutics to reach the CNS, and include chemical delivery and mechanical delivery (focused ultrasound and LASER therapy). Chemical methods (chemical permeation enhancers) include mannitol, a prevalent BBB permeabilizer, and other chemicals-bradykinin and 1-O-pentylglycerol-to resolve the limitations of mannitol. Focused ultrasound is in either high intensity or low intensity. LASER therapies includes three types: laser interstitial therapy, photodynamic therapy, and photobiomodulation therapy. The combination of direct and indirect methods is not as common as their individual use but represents an area for further research in the field. This review aims to analyze the advantages and disadvantages of these methods, describe the combined use of direct and indirect deliveries, and provide the future prospects of each targeted delivery method. We conclude that the most promising method is the nose-to-CNS delivery of hybrid nanomedicine, multiple combination of organic, inorganic nanoparticles and exosomes, via magnetic resonance navigation following preconditioning treatment with photobiomodulation therapy or focused ultrasound in low intensity as a strategy for

differentiating this review from others on targeted CNS delivery; however, additional studies are needed to demonstrate the application of this approach in more complex in vivo pathways.

Use of Photobiomodulation to Reduce Postoperative Pain, Edema, and Trismus After Third Molar Surgery: A Systematic Review and Meta-Analysis. PURPOSE: Third molar extraction can cause surgical trauma, which is associated with pain, edema, trismus, and functional limitations. The aim of the present systematic review was to investigate the effects of photobiomodulation (PBM) following the extraction of impacted mandibular third molars. METHODS: An electronic search was conducted in 10 databases from inception up to October 2021 and the grey literature, with no restrictions regarding language or year of publication. Randomized controlled clinical trials (RCT) were included. Studies that were not RCTs were excluded. Reviewers independently analyzed titles and abstracts, followed by full-text analysis. This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The exposure variable was the use of PBM and the outcomes were pain, edema, and trismus. Meta-analysis was performed using a random-effects model. The estimate was calculated considering standardized mean differences (SMD) and respective 95% confidence intervals (CI) obtained for each outcome on the first, second, third and seventh postoperative days. The level of evidence was assessed using the GRADE approach. RESULTS: The search resulted in the 3,324 records. Thirty-three RCTs were included in the systematic review and 23 of these were included in the meta-analyses. The studies involved a total of 1,347 participants (56.6% female and 43.4% male) between 16 and 44Â years of age. A greater reduction in pain was found in the PBM group compared to the control group on the third postoperative day (SMD: -1.09; 95% CI: -1.63; -0.55; PÂ <Â .001; low certainty). Edema was discretely lower in the PBM group on the second postoperative day (SMD: -0.61; 95% CI: -1.09; -0.13; PÂ <Â .001; low certainty) and trismus was discretely lower in the PBM group on the seventh postoperative day (SMD: 0.48; 95% CI: 0.00; 0.96; PÂ <Â .001; very low certainty). CONCLUSION: The evidence of the effect of PBM regarding the control of pain, edema, and trismus following third molar extractions is low or very low. Male;Female;Humans;Molar, Third;Trismus;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Edema

Combination therapy in female pattern hair loss. Patterned hair loss is a common type of non-scarring alopecia, characterized by miniaturization of hair follicles. The etiology of female pattern hair loss (FPHL) is not clearly linked to androgens or other hormones thereby making it a challenging condition to treat. Various treatment modalities, like minoxidil (topical or oral), spironolactone, finasteride, have been tried alone or in combination with variable results. Combination therapy is superior to the monotherapy, since these multiple treatment modalities act by targeting different pathogenetic pathways, making the treatment aggressive and more effective. Minoxidil;Finasteride;Spironolactone Female;Humans;Alopecia;Minoxidil;Finasteride;Combined Modality Therapy;Spironolactone;Treatment Outcome

Photobiomodulation self-treatment at home after rotator cuff arthroscopic repair accelerates improvement in pain, functionality, and quality of life:Â A double-blind, sham-controlled, randomized clinical trial. OBJECTIVE: To determine whether self-applied photobiomodulation (PBM) therapy at home, following rotator cuff arthroscopic surgery (RCAS) can accelerate improvement in patient-reported outcomes within the first 6 months postsurgery. METHODS: This study was a prospective, double-blind, sham-controlled, randomized clinical trial (NCT04593342). Patients (nâ€‰=â€‰50, age 55â€‰Â±â€‰7 years, male:female 29:21) who underwent primary RCAS were randomized to receive active (nâ€‰=â€‰22) or sham (nâ€‰=â€‰28) PBM devices (B-Cure Laser Pro, Erica B-Cure LASER Ltd., Haifa, Israel) in addition to standard care. Patients self-applied the treatments (808â€‰nm, 15â€‰min, 16.5â€‰J/cm(2)) at home for 3 months postsurgery. Evaluations were conducted before the surgery (baseline) and at 1-3 and 6 months post-RCAS (FU-1M, FU-3M, FU-6M),

and included Constant-Murley score (CMS), range of motion (ROM), subjective pain by visual analogue scale (VAS), disability by QuickDASH, and quality of life (QOL) by SF-12. The difference from baseline to follow-up (Î”FU), %patients achieving minimal clinical important difference (MCID), and patient acceptable symptom score (PASS) were calculated. Comparisons were conducted with superiority 2-sample t test and Ï‡(2) . RESULTS: Baseline values were not significantly different between groups. Both groups had similar improvements in CMS and ROM. However, compared to Sham, PBM significantly accelerated subjective pain reduction at 3 and 6 months (VAS meanâ€‰Â±â€‰SD, PBM-vs-Sham: Î”FU-3M 32â€‰Â±â€‰33 vs. 16â€‰Â±â€‰27, pâ€‰=â€‰0.040; Î”FU-6M: 41â€‰Â±â€‰36 vs. 23â€‰Â±â€‰26, pâ€‰=â€‰0.038), with a significantly higher proportion of patients achieving MCID at 3 months (76% vs. 48%, pâ€‰=â€‰0.027) and PASS at 6 months (48% vs. 23%, pâ€‰=â€‰0.044). PBM also significantly accelerated improvement in functionality and QOL at 6 months (QuickDASH Î”FU-6M: 30â€‰Â±â€‰24 vs. 18â€‰Â±â€‰14, pâ€‰=â€‰0.029; SF-12 physical component 6.8â€‰Â±â€‰12.5 vs. 0.4â€‰Â±â€‰8.6, pâ€‰=â€‰0.031; SF-12 mental component 8.5â€‰Â±â€‰9.1 vs. 2.2â€‰Â±â€‰12, pâ€‰=â€‰0.032). CONCLUSIONS: Self-applied photobiomodulation following RCAS significantly accelerates decrease in pain and disability, and improves QOL. This nonpharmacologic add-on therapeutic modality is easy to use and encourages active patient involvement. Its potential use in rehabilitation following other surgeries should be considered. LEVEL OF EVIDENCE: Level I, high-quality RCT. Humans;Male;Female;Middle Aged;Rotator Cuff;Rotator Cuff Injuries;Quality of Life;Prospective Studies;Treatment Outcome;Pain;Range of Motion, Articular

Treatment of Androgenetic Alopecia: Current Guidance and Unmet Needs. Androgenetic alopecia (AGA) is the most common cause of hair loss in men and women. Traditionally, topical minoxidil and oral finasteride have been the standard of care yielding mixed results. New treatments such as Low-Level Laser Therapy (LLLT), microneedling, platelet-rich plasma (PRP), and others have been extensively studied in the literature, and the purpose of this review is to provide a comprehensive discussion of the latest treatment methods and their efficacy in treating AGA. Novel therapies such as oral minoxidil, topical finasteride, topical spironolactone, botulinum toxin, and stem cell therapy offer interesting alternatives to standard of care therapies for patients. In this review, we present data from recent studies on the clinical efficacy of these treatments. Furthermore, as new treatments have emerged, clinicians have tested combination therapies to assess whether there may be a synergistic relationship between multiple modalities. While there has been a great increase in the treatments available for AGA, the quality of evidence varies greatly and there is still a great need for randomized double blinded clinical trials to adequately assess the clinical efficacy of some treatments. While PRP and LLLT have demonstrated encouraging results, standardized treatment protocols are needed to adequately inform clinicians on how to use such therapies. Given the abundance of new therapeutic options, clinicians and patients must weigh the benefits and risks of each treatment option for AGA.

Site-specific effects of 800- and 850-nm forehead transcranial photobiomodulation on prefrontal bilateral connectivity and unilateral coupling in young adults. SIGNIFICANCE: Transcranial photobiomodulation (tPBM) is a noninvasive neuromodulation method that facilitates the improvement of human cognition. However, limited information is available in the literature on the wavelength- and site-specific effects of prefrontal tPBM. Moreover, 2-channel broadband near-infrared spectroscopy (2-bbNIRS) is a new approach for quantifying infra-slow oscillations (ISO; 0.005 to 0.2Â Hz) of neurophysiological networks in the resting human brain in vivo. AIM: We aim to prove the hypothesis that the hemodynamic and metabolic activities of the resting prefrontal cortex are significantly modulated by tPBM and that the modulation is wavelength- and site-specific in different

ISO bands. APPROACH: Noninvasive 8-min tPBM with an 800- or 850-nm laser or sham was delivered to either side of the forehead of 26 healthy young adults. A 2-bbNIRS unit was used to record prefrontal ISO activity 7Â min before and after tPBM/sham. The measured time series were analyzed in the frequency domain to determine the coherence of hemodynamic and metabolic activities at each of the three ISO frequency bands. Sham-controlled coherence values represent tPBM-induced effects on neurophysiological networks. RESULTS: Prefrontal tPBM by either wavelength and on either lateral side of the forehead (1)Â increased ipsilateral metabolic-hemodynamic coupling in the endogenic band and (2)Â desynchronized bilateral activity of metabolism in the neurogenic band and vascular smooth-muscle hemodynamics in the myogenic band. Site-specific effects of laser tPBM were also observed with significant enhancement of bilateral hemodynamic and metabolic connectivity by the right prefrontal 800-nm tPBM. CONCLUSIONS: Prefrontal tPBM can significantly modulate neurophysiological networks bilaterally and coupling unilaterally in the human prefrontal cortex. Such modulation effects are site- and wavelength-specific for each ISO band.

Do astrocytes respond to light, sound, or electrical stimulation? Astrocytes are not only the most populous cell type in the human brain, but they also have the most extensive and diverse sets of connections, across synapses, axons, blood vessels, as well as having their own internal network. Unsurprisingly, they are associated with many brain functions; from the synaptic transmission to energy metabolism and fluid homeostasis, and from cerebral blood flow and blood-brain barrier maintenance to neuroprotection, memory, immune defenses and detoxification, sleep, and early development. And yet, notwithstanding these key roles, so many current therapeutic approaches to a range of brain disorders have largely neglected their potential involvement. In this review, we consider the role of astrocytes in three brain therapies; two are emerging treatments (photobiomodulation and ultrasound), while the other is well-established (deep brain stimulation). In essence, we explore the issue of whether external sources, such as light, sound, or electricity, can influence the function of astrocytes, as they do neurons. We find that, when taken all together, each of these external sources can influence many, if not, all of the functions associated with astrocytes. These include influencing neuronal activity, prompting neuroprotection, reducing inflammation (astrogliosis) and potentially increasing cerebral blood flow and stimulating the glymphatic system. We suggest that astrocytes, just like neurons, can respond positively to each of these external applications and that their activation could each impart many beneficial outcomes on brain function; they are likely to be key players underpinning the mechanisms behind many therapeutic strategies.

The effectiveness of two types of low-level laser therapy in patients with persistent tinnitus. Tinnitus is a perception disorder of sound with no hearing impulse. It is a very common otology complaint that leads to worsening quality of life. The experience of sound is only the product of neural system activity, with no matching mechanical or vibratory activity in the cochlea, and is unrelated to any external stimuli. Low-level laser therapy (LLLT) is a medical treatment of tinnitus that uses low-energy-level lasers or light-emitting diodes to stimulate or inhibit cellular function. The study included nine patients aged 20-68 years with unilateral or bilateral tinnitus. It was a self-controlled clinical trial study on subjective tinnitus. All patients attended the ENT outpatient Department, Rzgari Teaching Hospital, Erbil, Iraq. Two types of low-level laser therapy (LLLT) devices were used for patients. The first tool, a soft laser called a Tinnitool, has a wavelength of 660 nm and a power of 100 mW. The second tool is a Tinnitus Pen, which has a wavelength of 650 nm and a power of 5 mW. Seven females (77.7%) and two males (22.2%) participated in this study during one month. The mean age of the study sample was 44 years, with a standard deviation of 15.59 years. There was a significant improvement in the comparison of both types of therapy low-level laser before and after treatment, which reduced the tinnitus level among patients from 70% before treatment to 59% and 65.50%, respectively, after one month of treatment. A paired t test was applied to assess this

difference before and after treatment. LLLT devices can be an effective device tool for the treatment of tinnitus and can reduce the symptoms of annoyance that affect the life of the sufferer. Male;Female;Humans;Adult;Tinnitus;Low-Level Light Therapy;Quality of Life;Laser Therapy;Lasers;Treatment Outcome

Effect of combination of photobiomodulation 904â€‰nm superpulsed laser therapy and Hippophae rhamnoides L. on third-degree burn wound healing. BACKGROUND: Burn is a traumatic injury and aesthetic scarless repair poses a great challenge in area of cosmetic dermatology. Focus on multimode therapeutic strategies to promote healing of burns by regulating various stages of healing is warranted. Photobiomodulation therapy (PBMT), a non-invasive modality grabs the attention to repair impaired wounds. Seabuckthorn extract (SBTL-ALE) is known to possess antioxidant, anti-inflammation, and tissue-repair abilities. Current study aims to assess the effect of combination treatment of PBM 904â€‰nm superpulsed laser and SBTL-ALE (2.5%) on repair of third-degree burn in rats. METHODS: Rats were randomized into five groups: uninjured, control, SBTL-ALE, 904â€‰nm PBMT, and combination. A transdermal burn wound was induced on the dorsal side of rats of all groups except the uninjured group and respective treatment was applied for 7â€‰days postwounding. RESULTS: Dual treatment increased wound area contraction compared to control and either treatment alone. Immunohistochemical analyses exhibited increased angiogenesis, dermal hydration, collagen synthesis, and maintained redox homeostasis as evidenced by enhanced expression (pâ€‰<â€‰0.05) of CD31, aquaporin3, collagen type 3, Nrf2, and HO1 in combination group compared with control. Conversely, pro-inflammatory and oxidative stress markers exhibited reduced (pâ€‰<â€‰0.05) TNF-Î±, IL-6, IL-1Î², NOS-2, ROS levels, and increased catalase activity in combined treatment. Furthermore, energy metabolizing enzymes viz. citrate synthase, CCO, and ATP contents were substantially (pâ€‰<â€‰0.05) increased, and LDH activity was reduced in the combination group. CONCLUSIONS: Dual treatment (PBMTâ€‰+â€‰SBTL-ALE) prominently accelerates third-degree burn wound healing in rats, which could pave the path for multimode therapeutic strategies for the management of burns and dermal cosmetic care. Collagen Rats;Animals;Low-Level Light Therapy;Wound Healing;Hippophae;Laser Therapy;Lasers;Burns;Collagen

Effect of blue light on the cell viability of A549 lung cancer cells and investigations into its possible mechanism. Blue light has attracted extensive attention as a new potential cancer therapy. Recent studies have indicated that blue light has a significant inhibition effect on A459 cells. However, the effect of light parameters on the treatment of A549 cells and the mechanism of how blue light made the effect was still unclear. This study aimed to investigate A549 cells responses to blue light with varying irradiance and dose-dense, and tried to find out the mechanism of the effects blue light made. The results suggested that the responses of A549 cells to blue light with different irradiance and dose-dense were different and the decrease of cell viability reached saturation when the irradiance reached 3â€‰mW/cm(2) and the dose-dense reached 3.6â€‰J/cm(2) . It was assumed that blue light suppressed PI3K/AKT pathway and promoted the expression of JNK and p53 to affect the proliferation of A549 cells. Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt Humans;A549 Cells;Cell Survival;Phosphatidylinositol 3-Kinases;Signal Transduction;Cell Proliferation;Lung Neoplasms;Proto-Oncogene Proteins c-akt;Apoptosis

Three-dimensional irradiance and temperature distributions resulting from transdermal application of laser light to human knee-A numerical approach. The use of light for therapeutic applications requires light-absorption by cellular chromophores at the target tissues and the subsequent photobiomodulation (PBM) of cellular biochemical processes. For transdermal deep tissue light therapy (tDTLT) to be clinically effective, a sufficiently large number of photons must reach and be absorbed at the targeted deep tissue sites. Thus, delivering safe and effective tDTLT requires

understanding the physics of light propagation in tissue. This study simulates laser light propagation in an anatomically accurate human knee model to assess the light transmittance and light absorption-driven thermal changes for eight commonly used laser therapy wavelengths (600-1200â€‰nm) at multiple skin-applied irradiances (Wâ€‰cm(-2)) with continuous wave (CW) exposures. It shows that of the simulated parameters, 2.38â€‰Wâ€‰cm(-2) (30â€‰W, 20â€‰mm beam radius) of 1064â€‰nm light generated the least tissue heating -4Â°C at skin surface, after 30â€‰s of CW irradiation, and the highest overall transmission-approximately 3%, to the innermost muscle tissue. Humans;Temperature;Skin;Laser Therapy;Low-Level Light Therapy;Lasers

Orthopedic implant hypersensitivity: Characterization of clinical presentation and effects of photobiomodulation therapy. OBJECTIVES: Orthopedic implants have improved the quality of life in aging society but also induces several kinds of tissue reactions, referred to as orthopedic implant hypersensitivity (OIH). The aim of our study is to report the clinical characteristics of OIH and the effects of photobiomodulation therapy (PBMT) on these groups of patients. MATERIALS AND METHODS: We collected cases that complained of skin rashes with pruritus after orthopedic implants from January 2017 to June 2022 at the Dermatology clinic in Hualien Tzu Chi Hospital. We recorded the sites and material of orthopedic implants, skin lesions onset time, symptoms, location after implantation, and the disease duration. Laboratory tests were measured, including complete blood count, differential count, serum immunoglobulin E (IgE) level, as well as inflammatory and autoimmune markers. PBMT, including UVB311 nm or low-level laser therapy 808 nm, was performed. Dose, duration, and response were documented. RESULTS: Fourteen patients were diagnosed with OIH; twelve presented with localized eczema at the implant sites, and two with generalized eczema. Eleven patients (78.6%) had either elevated eosinophils percentage (>6%) or IgE level (>200 U/mL) or both. Seven patients (50%) had favorable outcome after PBMT and successfully withdrew from systemic steroid. CONCLUSION: In our case series, localized eczema at implant sites was a common cutaneous presentation in OIH. Hence, a surgical scar at the eczema site or long-term waxing and waning generalized eczema should prompt physicians on the possibility of OIH. Blood eosinophils percentage and serum IgE level can be reference biomarkers for OIH. PBMT provides a noninvasive and effective treatment strategy for immune regulation and tissue regeneration.

The mitochondrial-related effect of the 905â€‰nm photobiomodulation therapy on 50B11 sensory neurons. Photobiomodulation therapy (PBMT) is known as a complementary tool to alleviate pain sensation in patients, nevertheless, there is still a gap of knowledge on its mechanism of action, thus limiting its clinical employment. In this study, a possible molecular mechanism of the 905â€‰nm PBMT (0.25â€‰W/cm(2) ; 3, 6, 12, and 18â€‰J/cm(2) , 5â€‰Hz) analgesic effect was tested on 50B11 cells, by investigating its impact on mitochondria. A decrement of adenosine triphosphate was detected, moreover, an increment of total reactive oxygen species and mitochondrial superoxide anion was found after PBMT with all protocols tested. PBMT at 18â€‰J diminished the mitochondrial membrane potential, and influenced mitochondrial respiration, decreasing the oxygen consumption rate. Finally, a decrement of extracellular signal-regulated kinase 1/2 phosphorylation was observed with the protocol using 12â€‰J. Taken together these findings highlighted the intracellular effects, mainly correlated to mitochondrial, induced by 905â€‰nm PBMT in sensory neurons, indicating the central role of this organelle in the cellular response to 905â€‰nm near-infrared laser light. Reactive Oxygen Species Humans;Low-Level Light Therapy;Sensory Receptor Cells;Reactive Oxygen Species;Mitochondria;Light

A new method to treat onychopapilloma with pulsed dye laser irradiation: a 13-case series report. Purpose: Onychopapilloma is a rare benign nail tumor affecting the distal matrix and the nail bed. Currently, the only available treatment is surgical resection, which has a recurrence rate of 20% and may lead to various complications. Here we report a new method to treat onychopapilloma with

pulsed dye laser (PDL).Materials and methods: We retrospectively analyzed 13 cases and evaluated disease classification, dermoscopic examination, laser treatment parameters, photographs before and after treatment, and treatment outcome.Results: The site distribution of onychopapilloma was consistent with previous reports. PDL treatment was performed with 595â€‰nm laser, with 1.5â€‰ms pulse duration, spot diameter 3-5â€‰mm, and 11.5-13.5 J/cm(2) fluence. Irradiation covered the telangiectatic area up to the edge of the nail folds, with the terminal response of purpura occurrence. The overall effective rate was 77%; the effective rates for erythronychia, leukonychia, and melanonychia were 88%, 67%, and 50%, respectively.Conclusions: PDL treatment for onychopapilloma provides an alternative to traditional surgery with comparable effectiveness but much less risk for complications. Humans;Lasers, Dye;Retrospective Studies;Treatment Outcome;Purpura;Low-Level Light Therapy;Nail Diseases

Dose-response relationship of photobiomodulation therapy and oxidative stress markers in healing dynamics of diabetic neuropathic ulcers in Wistar rats. PURPOSE: Diabetic foot ulcers are reported to be the most expensive complications of diabetes, with high morbidity and mortality rates. If the necessary care is not provided for the wound to heal, the individual may end up amputating the affected feet. Photobiomodulation therapy is a promising non-pharmacological treatment option for wound healing. The objective of the present study is to establish a dose-response relationship between photobiomodulation therapy and oxidative stress markers in the healing dynamics of diabetic neuropathic ulcers in Wistar rats. METHODOLOGY: Diabetic neuropathy was induced in 126 Albino Wistar rats. An excisional wound of an area of 2cm(2) was made on the neuropathy-induced leg. Photobiomodulation therapy of dosages 4, 6, 8, 10, 12, and 15Â J/cm(2) of wavelengths 655 and 808Â nm was irradiated. The control group animals were kept un-irradiated. The outcome measures were assessed during wound healing's inflammatory, proliferative and remodelling phases. RESULTS: In the experimental group, animals treated with photobiomodulation therapy at doses of 4, 6, and 8Â J/cm(2) showed better wound healing dynamics. Photobiomodulation therapy modulated the reactive oxygen species and antioxidant levels, thereby improving the oxidative status of the wound. CONCLUSION: Photobiomodulation therapy of dosages 4, 6, and 8Â J/cm(2) is effective and is a promising adjuvant modality in treating diabetic neuropathic ulcers. There was a strong dose-response relationship in the experimental groups treated with 4, 6 and 8Â J/ cm(2). SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1007/s40200-022-01157-2.

Effects of red and infrared laser on post extraction socket repair in rats subjected to alendronate therapy. This study evaluated the effect of photobiomodulation therapy (PBMT) with a red or infrared laser on the repair of post extraction sockets in rats administered alendronate (ALN). Forty male rats were randomly allocated into four groups: Control Group (CTR): subcutaneous administration of saline solution throughout the experimental period; Alendronate Group (ALN): subcutaneous administration of alendronate during the entire experimental period; Alendronate/Red Laser Group (ALN/RL): administration of ALN and irradiation with a GaAlAs laser (Î» 660 nm); and Alendronate/Infrared Laser Group (ALN/IRL): administration of ALN and irradiation with a GaAlAs laser (Î» 830 nm). The first lower molars were extracted 60 days after the beginning of the administration of the drugs. The PBMT was applied after tooth extraction (7 sessions with intervals of 48 hours between sessions). Thirty days after tooth extraction, the animals were euthanized. Micro-CT and histometric analysis were performed to assess the bone healing and soft tissue repair of the tooth socket. The ALN group presented with more bone than the CTR; however, most of this bone was necrotic. ALN does not affect the bone microarchitecture. On the other hand, PBMT with IRL enhances the bone density due to the increase in the number and reduction in the spacing of the trabeculae. The amount of vital bone and connective tissue matrix was higher in the ALN/RL and

ALN/IRL groups than in the ALN and CTR groups. PBMT enhanced the healing of the post extraction sockets in rats subjected to ALN administration. Furthermore, IRL improved the new bone microarchitecture. Alendronate;Bone Density Conservation Agents Humans;Rats;Male;Animals;Alendronate;Wound Healing;Bone Density Conservation Agents;Dental Care;Lasers, Semiconductor

Photobiomodulation therapy activates YAP and triggers proliferation and dedifferentiation of MÃ¼ller glia in mammalian retina. Photobiomodulation therapy has been proposed as a promising therapeutic approach for retinal degenerative diseases. However, its effect on the regenerative capacity in mammalian retina and its intracellular signalling mechanisms remain unknown. Here, we show that photobiomodulation with 670 nm light stimulates MÃ¼ller glia cell cycle re-entry and dedifferentiation into a progenitor-like state in both the uninjured and injured retina. We also find that 670 nm light treatment inhibits the Hippo pathway, which is activated in MÃ¼ller glia following NaIO(3)-induced retinal injury. YAP, a major downstream effector of the Hippo signalling pathway was translocated into the nucleus of MÃ¼ller glia along with YAP dephosphorylation in retina treated with 670 nm light. Deficiency of YAP attenuated MÃ¼ller glia cell cycle re-entry and dedifferentiation. Our data reveal that the Hippo-YAP signalling pathway is associated with the photostimulatory effect on regenerative response in mammalian retina, and suggest a potential therapeutic strategy for retinal degenerative diseases. [BMB Reports 2023; 56(9): 502-507]. Animals;Humans;Low-Level Light Therapy;Cell Proliferation;Retina;Neuroglia;Retinal Diseases;Mammals

Photobiomodulation effects of pulsed and continuous wave near-infrared laser on the proliferation and migration of human gingival fibroblasts: An in vitro study. There are limited data on comparison of pulsed and continuous wave in photobiomodulation therapy (PBM). This study aimed to investigate the effect of PBM with 980â€‰nm laser in pulsed and continuous wave on the proliferation and migration of human gingival fibroblasts (HGF) cells. Cultured HGF were divided into three main groups: (1) irradiated in pulsed mode (frequencies of 50 and 25â€‰KHz; energy densities of 3 and 5â€‰J/cm(2)), (2) irradiated in continuous mode (energy densities of 3.2 and 5.2â€‰J/cm(2)), and (3) no irradiation as control group. HGF proliferation rate was measured by MTT assay at 24, 48, and 72â€‰h post irradiation. In addition, HGF migration rate was measured by scratch test at 24â€‰h post PBM. At 24â€‰h, the group received continuous irradiation at 5.2â€‰J/cm(2) showed significantly higher proliferation compared with the control group (pâ€‰=â€‰0.012). At 48 and 72â€‰h, the groups received continuous, and 50â€‰Hz pulsed irradiation at energy densities of 5.2 and 5â€‰J/cm(2) respectively, had significantly higher HGF proliferation rates compared to the control (pâ€‰<â€‰0.05). Only the continuous irradiations were effective in significant increase of the cell migration. In conclusion, continuous PBM at energy density of 5.2â€‰J/cm(2) showed promising effect on HGF proliferation and migration. Humans;Low-Level Light Therapy;Cell Proliferation;Cell Survival;Lasers;Fibroblasts

Response to: Photobiomodulation Reduces Periocular Wrinkle Volume by 30%: A Randomized Controlled Trial (re: DOI: 10.1089/photob.2022.0114). Low-Level Light Therapy;Double-Blind Method;Skin Aging

The different effects of low-level laser therapy before and after overinstrumentation on the expression of substance P and interleukin-10. BACKGROUND: One of the causes of endodontic flare-ups is overinstrumentation during canal preparation. In general, to reduce the level of pain and swelling that is caused by endodontic flare-ups, patients it has taken analgesics and antibiotics after treatment. However, some patients have been reported to have allergic reactions to nonsteroidal anti-inflammatory drugs. Lasers have been reported to be significantly effective in reducing pain and inflammation after root canal treatment. Low-level laser therapy (LLLT) 650Â nm pre- or post-

conditioning is widely used as a therapy. OBJECTIVE: This study investigated the effect of pre- or post-conditioning with a 650Â nm diode laser to reduce pain caused by overinstrumentation. METHODS: Thirty incisor teeth from Wistar rats were overinstrumented and exposed to a 650Â nm diode laser before or after overinstrumentation and then divided into six groups. Groups I and II were control groups (30 and 120Â min), groups III and IV were precondition groups (30 and 120Â min) and Groups V and VI were postcondition groups (30 and 120Â min). Immunohistochemical analysis was conducted to check the expression of substance P and interleukin-10 (IL-10). RESULT: The expression of substance P in the precondition LLLT groups was significantly lower than that in the control and postcondition groups. On the other hand, the expression of IL-10 in the precondition LLLT groups was significantly higher than that in the control and postcondition groups. CONCLUSION: There was a decrease in pain after preconditioning laser diode 650Â nm exposure.

Photobiomodulation, alone or combined with adipose-derived stem cells, reduces inflammation by modulation of microRNA-146a and interleukin-1ÃŸ in a delayed-healing infected wound in diabetic rats. Diabetic wounds are categorized by chronic inflammation, leading to the development of diabetic foot ulcers, which cause amputation and death. Herewith, we examined the effect of photobiomodulation (PBM) plus allogeneic diabetic adipose tissue-derived stem cells (ad-ADS) on stereological parameters and expression levels of interleukin (IL)-1ÃŸ and microRNA (miRNA)-146a in the inflammatory (day 4) and proliferation (day 8) stages of wound healing in an ischemic infected (with 2Ã—10(7) colony-forming units of methicillin-resistant Staphylococcus aureus) delayed healing wound model (IIDHWM) in type I diabetic (TIDM) rats. There were five groups of rats: group 1 control (C); group 2 (CELL) in which rat wounds received 1Ã—10(6) ad-ADS; group 3 (CL) in which rat wounds received the ad-ADS and were subsequently exposed to PBM(890 nm, 80 Hz, 3.5 J/cm(2), in vivo); group 4 (CP) in which the ad-ADS preconditioned by the PBM(630 nm + 810 nm, 0.05 W, 1.2 J/cm(2), 3 times) were implanted into rat wounds; group 5 (CLP) in which the PBM preconditioned ad-ADS were implanted into rat wounds, which were then exposed to PBM. On both days, significantly better histological results were seen in all experimental groups except control. Significantly better histological results were observed in the ad-ADS plus PBM treatment correlated to the ad-ADS alone group ($p<0.05$). Overall, PBM preconditioned ad-ADS followed by PBM of the wound showed the most significant improvement in histological measures correlated to the other experimental groups ($p<0.05$). On days 4 and 8, IL-1 Î² levels of all experimental groups were lower than the control group; however, on day 8, only the CLP group was different ($p<0.01$). On day 4, miR-146a expression levels were substantially greater in the CLP and CELL groups correlated to the other groups, on day 8 miR-146a in all treatment groups was upper than C ($p<0.01$). ad-ADS plus PBM, ad-ADS, and PBM all improved the inflammatory phase of wound healing in an IIDHWM in TIDM1 rats by reducing inflammatory cells (neutrophils, macrophages) and IL-1ÃŸ, and increasing miRNA-146a. The ad-ADS+PBM combination was better than either ad-ADS or PBM alone, because of the higher proliferative and anti-inflammatory effects of the PBM+ad-ADS regimen. MicroRNAs Rats;Animals;Diabetes Mellitus, Experimental;Rats, Wistar;Methicillin-Resistant Staphylococcus aureus;Wound Healing;Stem Cells;Inflammation;Low-Level Light Therapy;MicroRNAs

Morphofunctional Improvement of the Facial Nerve and Muscles with Repair Using Heterologous Fibrin Biopolymer and Photobiomodulation. Peripheral nerve injuries impair the patient's functional capacity, including those occurring in the facial nerve, which require effective medical treatment. Thus, we investigated the use of heterologous fibrin biopolymer (HFB) in the repair of the buccal branch of the facial nerve (BBFN) associated with photobiomodulation (PBM), using a low-level laser (LLLT), analyzing the effects on axons, muscles facials, and functional recovery. This experimental study used twenty-one rats randomly divided into three groups of seven animals, using the BBFN bilaterally (the left nerve was used for LLLT): Control group-normal and laser (CGn and CGl);

Denervated group-normal and laser (DGn and DGl); Experimental Repair Group-normal and laser (ERGn and ERGl). The photobiomodulation protocol began in the immediate postoperative period and continued for 5 weeks with a weekly application. After 6 weeks of the experiment, the BBFN and the perioral muscles were collected. A significant difference ($p < 0.05$) was observed in nerve fiber diameter (7.10 Â± 0.25 Âµm and 8.00 Â± 0.36 Âµm, respectively) and axon diameter (3.31 Â± 0.19 Âµm and 4.07 Â± 0.27 Âµm, respectively) between ERGn and ERGl. In the area of muscle fibers, ERGl was similar to GC. In the functional analysis, the ERGn and the ERGI (4.38 Â± 0.10) and the ERGI (4.56 Â± 0.11) showed parameters of normality. We show that HFB and PBM had positive effects on the morphological and functional stimulation of the buccal branch of the facial nerve, being an alternative and favorable for the regeneration of severe injuries.

Laser Devices and Autologous Platelet Concentrates in Prevention and Treatment of Medication-Related Osteonecrosis of the Jaws: A Systematic Review. Background and Objectives: Medication-related osteonecrosis of the jaws (MRONJ) is a disease that affects many patients taking anti-angiogenic and antiresorptive medicines. Since the pathogenetic mechanism is still partially unknown, preventive strategies, as well as treatment alternatives, are needed. Therefore, the aim of this research is to describe the main evidence from the last 10 years of clinical trials regarding the use of auxiliary devices such as autologous platelet concentrates (APCs) and laser, other than their effects against MRONJ disease onset or therapy. Advantages in the healing process and recurrence rates were also analyzed. Materials and Methods: A systematic search of the electronic databases of PubMed and Scopus was carried out. Data from the studies were analyzed, and the risk of bias was evaluated. Results: Nineteen studies between interventional studies, observational studies, and cohort studies have been considered in this review. Conclusions: Based on the studies included, the literature analysis shows that APCs could be a beneficial alternative in preventing and treating MRONJ. Laser technology, as a surgical tool or used on the antimicrobial photodynamic or photobiomodulation side, has been becoming increasingly popular in the last few years. The latest proposal concerning the combination of both auxiliary tools suggests interesting effects, but more studies should be conducted to evaluate eventual relapses and long-term consequences. Bone Density Conservation Agents Humans;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Jaw;Cohort Studies;Lasers

Striae Distensae: Clinical Results and Evidence-Based Evaluation of a Novel 675 nm Laser Wavelength. Background: A current popular aesthetic problem, especially among younger women, is striae distensae (SD), also referred to as "stretch marks.". Aim: The potential use of the 675 nm laser has been investigated in the treatment of SD. Methods: Patients underwent three sessions of the 675 nm laser with a 1-month interval between sessions. A total of three sessions were performed. The Manchester Scar Scale was used to assess stretch mark changes, and the mean scores related to each parameter at baseline and 6M FU after the last treatment session were measured. A clinical photographic evaluation was performed to show the aesthetic improvement of SD. Results: The patients' treated areas were the abdomen, thighs, buttocks, and breasts. Mean scores related to each Manchester Scar Scale parameter, with their relative percentage change, at baseline and 6M FU after the last treatment session were significantly improved. The total mean Manchester Scar Scale score significantly diminished from 14.16 (Â±1.30) to 10.06 (Â±1.32) at 6M FU ($p < 0.01$). The clinical photographs showed promising aesthetic SD improvement. Conclusions: 675 nm laser therapy demonstrated a good tolerance for the treatment of stretch marks applied to various body areas preventing any discomfort for the patient and with a significant improvement in skin texture. Humans;Female;Striae Distensae;Cicatrix;Laser Therapy;Low-Level Light Therapy;Lasers, Solid-State;Treatment Outcome

Influence of Three Laser Wavelengths with Different Power Densities on the Mitochondrial Activity of Human Gingival Fibroblasts in Cell Culture. Phototherapy plays a key role in wound healing and tissue regeneration. The use of lasers has the potential to become an effective and minimally invasive treatment in periodontal and peri-implant disease. The aim of this study was to evaluate the influence of three laser wavelengths with the combination of parameters such as power density and energy density on human gingival fibroblasts (hGFs) in vitro culture. Isolated cells were seeded in 96-well plates with culture medium (DMEM, Dulbecco's modified Eagle's medium) supplemented with 10% fetal bovine serum (FBS). After 24 h cells were irradiated (1064, 980 and 635 nm, various energy density value). After 24, 48 and 72 h, cells were evaluated for viability. Data were analyzed by ANOVA followed by Tukey's HSD test. We found the best outcomes for hGFs irradiated with laser 1064 nm for all combinations of power output (50/400/1000 mW) and energy dose (3/25/64 J/cm(2)) after 48 h and 72 h compared with control group. Cell viability increase ranged from 0.6Ã— (3 J/cm(2), 50 mW) to 1.3Ã— (64 J/cm(2), 1000 mW). Our findings indicate that the appropriate use of low-level laser irradiation (LLLI) can increase the proliferation rate of cultured cells. The use of LLLI can be extremely useful in tissue engineering and regenerative medicine.

A Holistic Perspective on How Photobiomodulation May Influence Fatigue, Pain, and Depression in Inflammatory Bowel Disease: Beyond Molecular Mechanisms. BACKGROUND: Numerous mechanisms, mostly molecular, have been tested and proposed for photobiomodulation. Photobiomodulation is finding a niche in the treatment of conditions that have no gold-standard treatment or only partially effective pharmacological treatment. Many chronic conditions are characterised by symptoms for which there is no cure or control and for which pharmaceuticals may add to the disease burden through side effects. To add quality to life, alternate methods of symptom management need to be identified. OBJECTIVE: To demonstrate how photobiomodulation, through its numerous mechanisms, may offer an adjunctive therapy in inflammatory bowel disease. Rather than considering only molecular mechanisms, we take an overarching biopsychosocial approach to propose how existing evidence gleaned from other studies may underpin a treatment strategy of potential benefit to people with Crohn's disease and ulcerative colitis. MAIN FINDINGS: In this paper, the authors have proposed the perspective that photobiomodulation, through an integrated effect on the neuroimmune and microbiome-gut-brain axis, has the potential to be effective in managing the fatigue, pain, and depressive symptoms of people with inflammatory bowel disease.

Effects of low-level laser therapy and therapeutic ultrasound on Freund's complete adjuvant-induced knee arthritis model in rats. OBJECTIVES: The aim of this study was to evaluate and monitor the effect of low-level laser therapy (LLLT) and therapeutic ultrasound (TU) alone, or combined with intra-articular prednisolone (P) in Freund's complete adjuvant (FCA)-induced knee arthritis model in rats. MATERIALS AND METHODS: A total of 56 adult male Wistar rats were divided into seven groups: control (C), disease control (RA), P, TU, LLLT (L), P + TU (P+TU), P + LLLT (P+L) groups. The skin temperature, radiography, joint volume, serum rheumatoid factor (RF), interleukin (IL)-1Î², serum tumor necrosis factor-alpha (TNF-Î±), and histopathological evaluation of joint were performed. RESULTS: Thermal imaging and radiographic examination provided results consistent with the severity of the disease. The mean joint temperature (Â°C) was the highest in the RA (36.2Â±1.6) group on Day 28. The P+TU and P+L groups significantly decreased radiological scores at the end of the study. The rat serum TNF-Î±, IL-1Î², and RF levels in all groups were significantly higher compared to the C group ($p<0.05$). Compared to the RA group, serum TNF-Î±, IL-1Î², and RF levels were significantly lower in the treatment groups ($p<0.05$). The P+TU and P+L group was showed minimal chondrocyte degeneration and cartilage erosion and mild cartilage fibrillation and mononuclear cell infiltration of synovial membrane compared to the P, TU, and L group. CONCLUSION: The LLLT and TU effectively reduced inflammation. In addition, a more effective result was obtained from the use of LLLT and TU

combined with intra-articular P. This result may be due to insufficient dose of LLLT and TU, thus further studies should be focus on at higher dose ranges on FCA arthritis model in rats.

Photobiomodulation and Inorganic Bovine Bone in Guided Bone Regeneration: Histomorphometric Analysis in Rats. The objective of this study was to evaluate the efficacy of photobiomodulation in the bone regeneration of critical-sized defects (CSD) filled with inorganic bovine bone associated or not with collagen membranes. The study has been conducted on 40 critical defects in the calvaria of male rats, divided into four experimental groups (n = 10): (1) DBBM (deproteinized bovine bone mineral); (2) GBR (DBBM+collagen membrane); (3) DBBM+P (DBBM+photobiomodulation); and (4) GBR+P (GBR+photobiomodulation). At 30 days postoperative, the animals were euthanized, and after the tissue had been processed, histological, histometric, and statistical analyses were performed. The analyses have taken into account newly formed bone area (NBA), linear bone extension (LBE), and residual particle area (RPA) as variables. The Kruskal-Wallis test has been performed, followed by the Dwass-Steel-Critchlow-Fligner test for comparison between groups ($p < 0.05$). When the DBBM+P group was compared to the DBBM group, it was possible to observe significant statistical differences in all the variables analyzed ($p < 0.05$). The application of photobiomodulation in guided bone regeneration (GBR+P) has shown a decrease in the median value for the RPA variable (26.8) when compared to the GBR group (32.4), with a significant statistical difference; however, for NBA and LBE, the therapy has not provided significant results.

Management of Medication-Related Osteonecrosis of the Jaw with Photobiomodulation and Minimal Surgical Intervention. Medication-related osteonecrosis of the jaw (MRONJ) is a relatively common pathology occurring in around 5% of patients taking bisphosphate and other antiresorptive or anti-angiogenic medications. Despite the efforts, as of today there is still no consensus on its management. In this case report, the successful management of stage II MRONJ was performed for an eighty-three-year-old female patient suffering from pain and alteration in her normal oral functions (swallowing and phonation). The treatment consisted of three sessions of photobiomodulation therapy (PBM), followed by minimal surgical intervention and three other sessions of PBM. PBM was applied on the sites of osteonecrosis with the follow parameters: 4 J/cm(2); a power of 50 mW; 8 mm applicator diameter; a continuous contact mode. Irradiation was performed on three points, including the vestibular, occlusal and lingual parts of each of the bone exposure areas. Each point was irradiated for 40 s, and, in total, nine points were made per session, and nine sessions were conducted. To assess the pain, a visual analogue scale was used in which zero represented no pain at all and ten represented the greatest pain. At the first session and before any intervention, the patient stated that her pain was 8 out of 10. At the end of the treatment, a significant reduction in VAS was noted (2/10) and, clinically, a healing of the soft tissue in the previously exposed bone was observed. This case report suggests that the combination of PBM with surgical intervention is promising in the management of MRONJ.

ExÂ Vivo Evaluation of the Efficacy of Photodynamic Therapy in Eliminating Enterococcus faecalis from Dentinal Tubules by Confocal Laser Scanning Microscopy. INTRODUCTION: The aim of the present study was to investigate exÂ vivo by confocal laser scanning microscopy the antibacterial effect of photodynamic therapy (PDT) on dentinal tubules in the apical 5Â mm of human mandibular premolars contaminated with Enterococcus faecalis. METHODS: Thirty-four teeth were standardized to 20Â mm and foraminal anatomic diameters using a #20Â K-file (Dentsply Maillefer). Samples were contaminated for 21Â days and divided into the following 3 experimental groups (nÂ =Â 10): the PDT group (instrumented canals and PDT), the passive ultrasonic irrigation (PUI) group (instrumented canals and PUI), and the PUI-PDT group (instrumented canals, PUI, and PDT), along with a control group (nÂ =Â 4) (noninstrumented canals). The canals in the experimental groups were instrumented with ProTaper Next (Dentsply Maillefer) up to X3 and rinsed with EDTA and sodium hypochlorite. The

photosensitizer used was 0.01% methylene blue with a preirradiation time of 5Â minutes and a diode laser with 4 J energy and a 660-nm wavelength. Cross sections were made 5Â mm from the apex of all samples, which were analyzed using confocal laser scanning microscopy. The results were analyzed using the Shapiro-Wilk and Kruskal-Wallis (Dunn) tests. RESULTS: There was a lower percentage of live bacteria in the PUI-PDT group, with a statistical difference compared with the control and PDT groups (PÂ <Â .05). There was no statistical difference in the percentage of live bacteria between PUI-PDT and PUI (PÂ >Â .05). CONCLUSIONS: It was concluded that the PUI-PDT association was most effective in disinfecting root canals compared with the control group and PDT. CMW cement;Sodium Hypochlorite;Root Canal Irrigants Humans;Enterococcus faecalis;Dental Pulp Cavity;Sodium Hypochlorite;Microscopy, Confocal;Root Canal Irrigants;Photochemotherapy;Root Canal Preparation

Treatment of canine periocular dermatitis with rhytidectomy (surgical face-lift) and fluorescence photobiomodulation: A case report. Canine periocular dermatitis may be associated with excessive facial folds and heavy brows (EFF-HB). There is no gold standard therapy for EFF-HB-associated periocular dermatitis, and conventional medical management may fail. Herein, we describe periocular fluorescence photobiomodulation and rhytidectomy as novel approaches to treat EFF-HB-associated periocular dermatitis refractory to medical management. Animals;Dogs;Dermatitis, Perioral;Rhytidoplasty;Fluorescence;Dog Diseases

Skin cancer in patients treated with photobiomodulation for alopecia: a retrospective chart review. Humans;Retrospective Studies;Alopecia;Patients;Skin Neoplasms

Photobiomodulation Therapy for Muscular Dystrophy: Time for a Trial? Humans;Low-Level Light Therapy;Muscular Dystrophies

Effects of radial extracorporeal shockwave therapy versus high intensity laser therapy in individuals with plantar fasciitis: A randomised clinical trial. This study aimed to compare the effects of radial extracorporeal shockwave therapy (rESWT) to the effects of high-intensity laser therapy (HILT) in the treatment of individuals with plantar fasciitis. Thirty-two individuals with unilateral plantar fasciitis were randomized into two groups: rESWT and HILT. In each group, the individuals underwent the intervention two sessions per week, for three weeks. Outcome measures included morning pain, resting pain, pain at 80 newtons (N) pressure, skin blood flow and temperature, plantar fascia (PF) and flexor digitorum brevis (FDB) thickness, and Foot Function Index (FFI). There was no significant difference in baseline characteristics of the individuals in both groups. All outcome measures, except skin blood flow and temperature, and FDB thickness, were significantly different (pâ€‰<â€‰0.05) over time. Skin blood flow was significantly different between groups at the end of the program. Either HILT or rESWT could alleviate pain in individuals with plantar fasciitis significantly. However, HILT was better at reducing FFI (functional limitation domain) rather than rESWT. This study was a randomized clinical trial and was approved by Mahidol University-Central Institutional Review Board (MU-CIRB) following the Declaration of Helsinki, COA no. MU_CIRB 2020/207.0412, the Thai Clinical Trials Registry (TDTR) numbered TCTR2021012500. Humans;Extracorporeal Shockwave Therapy;Fasciitis, Plantar;Laser Therapy;Low-Level Light Therapy;Pain

Clinical outcomes of diode laser as an adjunct to nonsurgical periodontal therapy for residual periodontal pockets in mandibular second molars-a randomized controlled clinical trial. OBJECTIVES: The aim of this study was to evaluate the clinical outcomes of diode laser as an adjunct to nonsurgical periodontal therapy (NSPT) for residual periodontal pockets in mandibular second molars. MATERIALS AND METHODS: Sixty-seven mandibular second molars (154 residual periodontal pockets) were recruited into the study and randomly assigned to the Laserâ€‰+â€‰NSPT group and the NSPT group. The Laserâ€‰+â€‰NSPT group underwent NSPT adjunct with diode laser radiation (wavelength: 810Â nm, power: 1.5 W, 40Â s maximum), while the NSPT group underwent nonsurgical

periodontal therapy alone. Clinical parameters were measured at baseline (T0) and 4(T1), 12(T2), and 24(T3), weeks after treatment. RESULTS: Periodontal pocket depth (PPD), clinical attachment loss (CAL), and bleeding on probing (BOP) in both groups showed significant improvements at the end of study compared to baseline. The reductions of PPD, CAL, and BOP in the Laserâ€‰+â€‰NSPT group were significantly greater than NSPT group. At T3, the Laserâ€‰+â€‰NSPT group had a mean PPD of 3.06â€‰Â±â€‰0.86Â mm, CAL of 2.58â€‰Â±â€‰0.94Â mm and BOP of 15.49%, while the NSPT group had a mean PPD of 4.46â€‰Â±â€‰1.57Â mm, CAL of 3.03â€‰Â±â€‰1.25Â mm and BOP of 64.29%. CONCLUSIONS: The diode laser as an adjunct to nonsurgical periodontal therapy may contribute to clinical outcomes for residual periodontal pockets. However, the approach may cause reductionÂ of keratinized tissue width. TRIAL REGISTRATION NUMBER: This study was registered in the Chinese Clinical Trial Registry ChiCTR2200061194. CLINICAL RELEVANCE: Diode laser as an adjunct to nonsurgical periodontal therapy may contribute to the clinical outcomes for residual periodontal pockets in mandibular second molars. Humans;Chronic Periodontitis;Periodontal Pocket;Lasers, Semiconductor;Laser Therapy;Low-Level Light Therapy;Dental Scaling

Low-level laser therapy in the management of muscle fatigue caused after long Endodontic procedure. BACKGROUND: The masticatory muscles may undergo fatigue due to prolonged mouth opening during the endodontic procedures. Low-level laser can be used to treat muscle fatigue due its capacity to produce reactive oxygen species and improve function of mitochondria. Aim: To determine the effectiveness of low-level laser therapy in the management of masticatory muscle fatigue caused after long endodontic procedure under Local anesthesia. MATERIAL AND METHODS: 44 patients complaining of reduced mouth opening and pain while mouth opening, after long endodontic therapy were considered for the study and were randomly allocated into study and control group. In the study group, low-level laser was applied while patients of control group didn't receive any therapy. In the study group, Visual analogue scale (VAS) score of pain was taken after endodontic therapy, immediately after laser therapy and 4 hours after endodontic therapy. Mouth opening of the patients was measured, before and after endodontic procedure and immediately after laser therapy. In the control group, VAS score of pain was recorded immediately after endodontic therapy and 4 hours after endodontic therapy. Statistical analysis used: ANOVA test and un-paired t-test was used for the data analysis. RESULTS: When both groups were compared, a statistically significant (P=0.0000) reduction with fatigue was found. CONCLUSIONS: The low-level laser can be a useful procedure immediately post long endodontic procedure causing masticatory muscle fatigue. Hence, this therapy can be considered as an add-on therapeutic procedure along with prolonged endodontic appointments to relieve the patient from the discomfort. Key words:Muscle fatigue, Masticatory muscles, Low-level laser therapy.

Exploring the Potential of Energy-Based Therapeutics (Photobiomodulation/Low-Level Laser Light Therapy) in Cardiovascular Disorders: A Review and Perspective. Based on the review of the literature, this article examines the potential therapeutic benefits of photobiomodulation therapy (PBMT) or low-level laser therapy (LLLT) for the treatment of cardiovascular disorders. The methodology involved searching PubMed, Google Scholar, and Central databases for relevant articles published from inception till date. The articles included in this review were preclinical and clinical studies investigating the effects of PBMT and LLLT on the heart. The article summarizes the findings of nineteenÂ studies investigating the effects of PBMT and LLLT on various parameters related to heart failure (HF) and myocardial infarction (MI), including inflammation, oxidative stress, angiogenesis, cardiac function, and remodeling. The studies suggest that PBMT and LLLT have potential therapeutic benefits for the treatment of cardiovascular diseases and could be used in combination with traditional pharmacological therapies to enhance their effects or as a stand-alone treatment for patients who are not responsive to or cannot tolerate traditional therapies. In

conclusion, this review article highlights the promising potential of PBMT for the treatment of HF and MI and the need for further research to fully understand its mechanisms of action and optimize treatment protocols.

Photobiomodulation During Chemoradiation for Head and Neck Cancer: Effect on Mucositis, Weight Loss, and Feeding Tube Dependence. PURPOSE: The standard therapeutic approach in head and neck cancer (HNC) involves multimodality therapy, including surgery, radiation therapy (RT), or chemoradiation therapy (CRT). Treatment complications (mucositis, weight loss, and feeding tube dependence [FTD]) can result in treatment delays, incomplete treatment, and decreased quality of life. Studies on photobiomodulation (PBM) have shown promising reductions in mucositis severity but with little quantitative supporting data. We compared complications for patients with HNC receiving PBM with those in patients who did not, hypothesizing that PBM improves mucositis severity, weight loss, and FTD. METHODS AND MATERIALS: Medical records of 44 patients with HNC treated with CRT or RT from 2015 to 2021 were reviewed (22 PBM, 22 controls; median age, 63.5 years; range, 45-83 years). Between-group outcomes of interest included maximum mucositis grade, weight loss, and FTD 100 days after initiation of treatment. RESULTS: Median RT doses were 60 Gy (PBM) and 66 Gy (control). Eleven patients treated with PBM received CRT; 11 received RT alone (median of 22 PBM sessions [range, 6-32]). Sixteen control group patients received CRT; 6 received RT alone. Median maximal mucositis grades were 1 in the PBM group and 3 in the control group ($P < .0001$). The adjusted odds of higher mucositis grade were only 0.024% ($P < .0001$; 95% confidence interval, 0.004-0.135) in PBM compared with the control group. CONCLUSIONS: PBM may have a role in decreasing complications related to RT and CRT for HNC, mainly mucositis severity.

Photobiomodulation therapy at 632â€‰nm wavelength ameliorates intrauterine adhesion via activation of cAMP/PKA/CREB pathway. Intrauterine adhesion (IUA), a major cause of uterine infertility, is pathologically characterized by endometrial fibrosis. Current treatments for IUA have poor efficacy with high recurrence rate, and restoring uterine functions is difficult. We aimed to determine the therapeutic efficacy of photobiomodulation (PBM) therapy on IUA and elucidate its underlying mechanisms. A rat IUA model was established via mechanical injury, and PBM was applied intrauterinely. The uterine structure and function were evaluated using ultrasonography, histology, and fertility tests. PBM therapy induced a thicker, more intact, and less fibrotic endometrium. PBM also partly recovered endometrial receptivity and fertility in IUA rats. A cellular fibrosis model was then established with human endometrial stromal cells (ESCs) cultured in the presence of TGF-Î²1. PBM alleviated TGF-Î²1-induced fibrosis and triggered cAMP/PKA/CREB signaling in ESCs. Pretreatment with the inhibitors targeting this pathway weakened PBM's protective efficacy in the IUA rats and ESCs. Therefore, we conclude that PBM improved endometrial fibrosis and fertility via activating cAMP/PKA/CREB signaling in IUA uterus. This study sheds more lights on the efficacy of PBM as a potential treatment for IUA. Transforming Growth Factor beta1 Female;Rats;Animals;Humans;Transforming Growth Factor beta1;Low-Level Light Therapy;Uterine Diseases;Endometrium;Tissue Adhesions

Validating Homogeneity for a Novel 3-Dimensional Tissue Phantom Modeling System of the Human Maxilla. Silicon phantom models have been utilized to calculate light fluence in patients being treated with Photodynamic Therapy (PDT). This application can be utilized for other non-ionizing wavelength therapies such as Photobiomodulation (PBM). We have developed a novel protocol to validate homogeneity for 3-dimensional silicon phantom models of the human maxilla. Accurately quantifying the light profiles of human tissue can accommodate for varying optical properties that occur between subjects. More importantly, this can help optimize light fluence dosimetry calculations to achieve intended results. Silicon models of identical composition were fabricated into two different shapes: 1 flat-planar cylindrical shaped model, 2) non-flat planar (3-dimensional) mold of

the human maxilla. Fabricating homogenous silicon phantom models continues to be a challenge as micro-bubbles can contaminate the compound during the curing process. Integrating both proprietary CBCT and handheld surface acquisition imaging devices confirmed our results to be within 0.5mm of accuracy. This protocol was specifically used to cross-reference and validate homogeneity at various depths of penetration. These results present the first known successful validation of identical silicon tissue phantoms with a flat-planar surface vs. a non-flat 3D planar surface. This proof-of-concept phantom validation protocol is sensitive to the specific variations of 3-dimensional surfaces and can be applied to a workflow used to capture accurate light fluence calculations in the clinical setting.

Photobiomodulation augments the effects of mitochondrial transplantation in the treatment of spinal cord injury in rats by facilitating mitochondrial transfer to neurons via Connexin 36. Mitochondrial transplantation is a promising treatment for spinal cord injury (SCI), but it has the disadvantage of low efficiency of mitochondrial transfer to targeted cells. Here, we demonstrated that Photobiomodulation (PBM) could promote the transfer process, thus augmenting the therapeutic effect of mitochondrial transplantation. In vivo experiments, motor function recovery, tissue repair, and neuronal apoptosis were evaluated in different treatment groups. Under the premise of mitochondrial transplantation, the expression of Connex36 (Cx36), the trend of mitochondria transferred to neurons, and its downstream effects, such as ATP production and antioxidant capacity, were evaluated after PBM intervention. In in vitro experiments, dorsal root ganglia (DRG) were cotreated with PBM and 18Î²-GA (a Cx36 inhibitor). In vivo experiments showed that PBM combined with mitochondrial transplantation could increase ATP production and reduce oxidative stress and neuronal apoptosis levels, thereby promoting tissue repair and motor function recovery. In vitro experiments further verified that Cx36 mediated the transfer of mitochondria into neurons. PBM could facilitate this progress via Cx36 both in vivo and in vitro. The present study reports a potential method of using PBM to facilitate the transfer of mitochondria to neurons for the treatment of SCI.

Investigation of the effect of Low-Level Laser Therapy on arm lymphedema in breast cancer patients: A noninvasive treatment for an intractable morbidity. PURPOSE: This article aims to study the effect of Low-Level Laser Therapy (LLLT) on arm lymphedema in patients who have breast cancer. METHODS AND MATERIALS: Twenty-threeÂ patients were selected in a nonrandomized phase-2 clinical trial. After measuring the circumference of the affected and unaffected limbs at 6-points, the volume of the limbs, the degree of mental symptoms on visual analog scale by the patient upon entering the study, and performing an ultrasound on the patient's axilla to locate the fibrotic areas, a low-level laser device at a therapeutic dose of 2â€‰J/cm(2) was used to treat the patients three times a week for 4 weeks, and after an 8-week gap, for another similar period. Measurement of circumference and volume of affected and unaffected limbs and mental symptoms were carried out at the end of the 4th week, the beginning of the 12th week, and the end of the 16th week, and the obtained results were compared with those before the treatment. RESULTS: We noted that the average reductions in the circumference and volume of the affected limb, as compared with the unaffected limb, were about 16% and 21.7%, respectively, and improvement in the patient's mental symptoms was about 32%. Another notable observation was the great enthusiasm of most patients to continue their treatment, particularly from the second cycle onward. CONCLUSIONS: LLLT can, at least in association with current standard methods, be used for arm lymphedema to introduce further reductions in pain and volume.

Photobiomodulation in dental extraction therapy: Postsurgical pain reduction and wound healing. BACKGROUND: This scoping review and analysis were designed to assess the amount of time spent delivering photobiomodulation (PBM) light therapy after dental extraction to improve postoperative

pain and wound healing. TYPES OF STUDIES REVIEWED: The scoping review was performed according to the Cochrane Collaboration and Preferred Reporting Items for Systematic Reviews and Meta-Analyses criteria. Publications were specific for human randomized controlled clinical trials, PBM after dental extraction therapy, and related clinical outcomes. Online databases searched included PubMed, Embase, Scopus, and Web of Science. Analyses were conducted to analyze the prescribed intervals of time (seconds) per application of PBM. RESULTS: Of the 632 studies initially identified, 22 studies fulfilled the inclusion criteria. Postoperative pain and PBM were reported in 20 articles for 24 treatment groups, with treatment times ranging from 17 through 900 seconds and wavelengths from 550 through 1,064 nm. Clinical wound healing outcomes were reported in 6 articles for 7 groups with treatment times ranging from 30 through 120 seconds and wavelengths from 660 through 808 nm. PBM therapy was not associated with adverse events. CONCLUSIONS AND PRACTICAL IMPLICATIONS: There is future potential to integrate PBM after dental extraction therapy to improve postoperative pain and clinical wound healing. The amount of time spent delivering PBM will vary by wavelength and the type of device. Further investigation is needed to translate PBM therapy into human clinical care. Humans;Wound Healing;Low-Level Light Therapy;Pain, Postoperative;Tooth Extraction

High-power laser photobiomodulation therapy for immediate pain relief of refractory oral mucositis. PURPOSE: We aimed to evaluate the efficacy of high-power (class IV) laser photobiomodulation (PBM) therapy for immediate pain relief due to oral mucositis (OM) refractory to recommended first-line therapy. METHODS: This retrospective study included 25 cancer patients with refractory chemotherapy- or radiotherapy-induced OM (16 and 9 patients, respectively) that were treated for pain relief with an intraoral InGaAsP diode laser (power densityâ€‰=â€‰1.4â€‰W/cm(2)). Pain was self-assessed immediately before and after laser treatment using a 0-to-10 numeric rating scale ([NRS], "0"â€‰=â€‰no pain, "10"â€‰=â€‰intolerable pain). RESULTS: Patients reported an immediate decrease in pain following 94% (74 of 79) of the PBM sessions, in 61% (48 sessions) the pain reduction was over 50%, and in 35% (28 sessions) the initial pain was completely eliminated. There were no reports of increased pain post-PBM. For chemotherapy and radiotherapy-treated patients, mean reduction in pain NRS post-PBM was 4.8â€‰Â±â€‰2.5 (pâ€‰<â€‰0.001) and 4.5â€‰Â±â€‰2.8 (pâ€‰=â€‰0.001), indicating a post-PBM reduction of 72% and 60% of the initial pain level, respectively. The analgesic benefit of PBM remained for a mean of 6.0â€‰Â±â€‰5.1â€‰days. One patient reported a transient burning sensation after one PBM session. CONCLUSIONS: High-power laser PBM may provide nonpharmacologic, patient-friendly, long-lasting, rapid pain relief for refractory OM.

Comparison of effects of low level laser therapy and local corticosteroid injection in the treatment of plantar fasciitis. OBJECTIVES: The purpose of the study was to compare low-level laser therapy (LLLT) and local corticosteroid injection in the treatment of plantar fasciitis. PATIENTS AND METHODS: This retrospective study was performed with 56 patients (6 males, 50 females; mean age: 44.7Â±10.1 years; range, 18 to 65 years) between January 2015 and March 2016. The patients were equally divided into two groups: Group 1, comprising patients who underwent a one-time local corticosteroid injection into the heel by the same physician, and Group 2, including patients who had gallium arsenide laser therapy at a wavelength of 904 nm lasting 10 sessions. Evaluations were done at pre-treatment, post-treatment, and two weeks, one month, and three months after the post-treatment evaluation. The post-treatment evaluation was accepted as the 10(th) day after the injection in Group 1 and as the time after the last session of the laser treatment in Group 2. Each visit was compared with the previous visit for within-group analysis. The Visual Analog Scale (VAS), Heel Tenderness Index (HTI), and Foot Function Index (FFI) were assessed. RESULTS: Pain scores in Group 1 and Group 2 were not associated with statistically significant differences (p>0.05). Within-groups analysis

demonstrated statistically significant differences concerning VAS subgroups ($p < 0.05$), except for Group 2's resting VAS values ($p=0.159$). No statistically significant differences were found between groups in the means of FFI scores ($p>0.05$). Statistically significant differences were observed regarding within-group analyses for all subscores ($p < 0.001$). No statistically significant differences were observed between the two groups for all visits regarding HTI scores ($p>0.05$). Statistically significant differences were found between baseline and the first after-treatment visit in all groups ($p < 0.05$). Statistically significant differences were found in the first ($p=0.020$) and third ($p=0.010$) months compared to the one-week follow-up in Group 2 regarding HTI scores. CONCLUSION: Both LLLT and local corticosteroid injection for plantar fasciitis have positive effects for three months after treatment. However, LLLT is more effective than local corticosteroid injection at the end of the third month in local tenderness.

Photobiomodulation: A Potential Non-invasive Method to Alleviate Neurological Events Following COVID-19 Infection.

Prevention and Treatment of Chemotherapy-Induced Alopecia: What Is Available and What Is Coming? Millions of new cancer patients receive chemotherapy each year. In addition to killing cancer cells, chemotherapy is likely to damage rapidly proliferating healthy cells, including the hair follicle keratinocytes. Chemotherapy causes substantial thinning or loss of hair, termed chemotherapy-induced alopecia (CIA), in approximately 65% of patients. CIA is often ranked as one of the most distressing adverse effects of chemotherapy, but interventional options have been limited. To date, only scalp cooling has been cleared by the US Food and Drug Administration (FDA) to prevent CIA. However, several factors, including the high costs not always covered by insurance, preclude its broader use. Here we review the current options for CIA prevention and treatment and discuss new approaches being tested. CIA interventions include scalp cooling systems (both non-portable and portable) and topical agents to prevent hair loss, versus topical and oral minoxidil, photobiomodulation therapy (PBMT), and platelet-rich plasma (PRP) injections, among others, to stimulate hair regrowth after hair loss. Evidence-based studies are needed to develop and validate methods to prevent hair loss and/or accelerate hair regrowth in cancer patients receiving chemotherapy, which could significantly improve cancer patients' quality of life and may help improve compliance and consequently the outcome of cancer treatment. Antineoplastic Agents United States;Humans;Quality of Life;Alopecia;Cryotherapy;Neoplasms;Antineoplastic Agents

Safety and Efficacy of a Novel, Variable-Sequenced, Long-Pulsed, 532-nm and 1,064-nm Laser With Cryogen Spray Cooling for Pigmented and Vascular Lesions. BACKGROUND: Patients frequently seek treatment for vascular and pigmented lesions. More recently, a novel, variable-sequenced, long-pulsed, 532-nm and 1,064-nm laser with cryogen spray cooling was developed to offer greater flexibility in treatments. OBJECTIVE: A prospective clinical trial evaluated the safety and efficacy of a novel, variable-sequenced, long-pulsed, 532-nm and 1,064-nm laser with cryogen spray cooling (DermaV, Lutronic, South Korea). MATERIALS AND METHODS: Subjects with vascular and/or pigmented lesions were enrolled and underwent laser treatments. RESULTS: Twenty-three subjects were enrolled with vascular lesions (39.1%), pigmented lesions (17.4%), and both (43.5%). Mean age was 53.1 years, and 91.3% were women. Fitzpatrick skin types II-IV were included. All subjects were treated with 532 nm, and 4 were also treated with 1,064 nm. According to 4 blinded physician reviewers, correct before and after photographs were selected in 94.7%, 92.1%, 84.2%, and 76.3% of cases. Overall, 86.8% were responders, meaning that at least 3 of 4 reviewers agreed. For Global Aesthetic Improvement Scale, improvement occurred in 81.6%, 81.6%, 81.6%, and 76.3% of cases. No serious adverse events occurred. Overall, 87.0% of subjects reported being very satisfied or satisfied. CONCLUSION: A novel, variable-sequenced, long-pulsed, 532-nm and 1,064-nm laser with cryogen spray cooling can safely and effectively improve vascular and pigmented lesions.

Humans;Female;Middle Aged;Male;Prospective Studies;Low-Level Light Therapy;Lasers;Republic of Korea;Laser Therapy

[Photobiomodulation and vulvovaginal disorders after anticancer treatments]. Anticancer treatments induce vulvovaginal complications that alter the quality of life and sexuality of patients. New technologies, such as photobiomodulation, could address this problem, for which few effective therapeutic solutions exist. The objective of this study was to describe the characteristics of patients seeking treatment and to observe the effects of photobiomodulation. This is a prospective cohort of patients treated for cancer, in failure of first-line medical treatment, managed at the University Hospital of NÃ®mes. The history, symptoms and impact of the disorders on their quality of life were collected. At follow-up, improvement was assessed using the PGI-I and FSFI questionnaires. Twenty-eight patients were treated. They were all menopausal, half of them after anticancer treatments [chemotherapy (78%), radiotherapy (36%), hormone therapy (36%)]. The main symptom reported was vaginal dryness (72%). Seventy-one percent of patients (n=20) felt that their daily life was affectedâ‰¥8/10. All patients had sexual dysfunction. Twenty-two patients received at least 6 sessions of photobiomodulation. Seventy-two percent (n=18) of patients felt better or much better after treatment (PGI-Iâ‰¤2). The median improvement estimated by the patients was 65% (Q1=50%; Q3=72.5%). There was also a significant clinical improvement. No serious adverse events were reported. Due to the small number of patients in a heterogeneous population with no control group, we cannot extrapolate our results. However, the objective was to assess the status of these pathologies and the contribution of photobiomodulation in patients who have failed first-line treatment; and these results are encouraging. Female;Humans;Vagina;Quality of Life;Prospective Studies;Vaginal Diseases;Menopause

The Efficacy and Safety of Dr. SKS Hair Booster Serum (a Cocktail of Micronutrients and Multivitamins) in Adult Males and Females With Androgenetic Alopecia: An Open-Label, Non-randomized, Prospective Study. Background Androgenetic alopecia (AGA) is frequently encountered in dermatological practice; however, there is a lack of approved treatment. At present, only three therapies have been approved for on-label use in androgenetic alopecia: minoxidil, finasteride, and lower-level laser therapy. Micronutrients are primary elements in the normal hair follicle cycle, and their role in androgenetic alopecia is a growing matter of research nowadays. This study aims to investigate the clinical efficacy and safety of Dr. SKS Hair Booster Serum, a cocktail of micronutrients and multivitamins (copper, niacinamide, hyaluronic acid, thiamine, riboflavin, and biotin), in male and female patients with androgenetic alopecia. Methods We did an open-label, non-randomized, multicenter, prospective study across five hair clinic chains in India (Mumbai, Hyderabad, Jabalpur, Balaghat, and Nagpur). Eligible participants were patients with a confirmed diagnosis of androgenetic alopecia based on clinical examination and trichoscopic findings, age of 18 years or older, and any gender. Each patient received Dr. SKS Hair Booster Serum, 1 ml in volume, once a month by mesotherapy or derma roller/derma pen for up to six months. All patients were subjected to a 60-second hair countÂ test (comb test), hair pullÂ test, global photographic assessment (GPA), trichoscopy assessment, patient self-assessment questionnaire, and safety assessment at baseline and six months after the treatment. Results One thousand patients (500 males and females each) with androgenetic alopecia were analyzed. There was a significant reduction in hair fall with bulb (<0.0001) and without bulb (<0.0001) six months after the treatment versus baseline. There was a significant improvement in the number of hairs removed per pull (<0.0001), global photographic assessment score (<0.0001), hair growth rate (<0.0001), follicular hair density (<0.0001), vellus hair density (<0.0001), and terminal hair density (<0.0001) six months after the treatment versus baseline. The majority of patients (95%) were satisfied with six-monthÂ treatment of Dr. SKS Hair Booster Serum. No major adverse events were reported during the study. Conclusion Dr. SKS Hair Booster

Serum was found to be a safe and effective treatment for androgenetic alopecia, with 95% patient self-assessment score.

MASCC clinical practice guidelines for the prevention and management of acute radiation dermatitis: part 1) systematic review. Acute radiation dermatitis (ARD) commonly develops in cancer patients undergoing radiotherapy and is often characterized by erythema, desquamation, and pain. A systematic review was conducted to summarize the current evidence on interventions for the prevention and management of ARD. Databases were searched from 1946 to September 2020 to identify all original studies that evaluated an intervention for the prevention or management of ARD, with an updated search conducted in January 2023. A total of 235 original studies were included in this review, including 149 randomized controlled trials (RCTs). Most interventions could not be recommended due to a low quality of evidence, lack of supporting evidence, or conflicting findings across multiple trials. Photobiomodulation therapy, MepitelÂ® film, mometasone furoate, betamethasone, olive oil, and oral enzyme mixtures showed promising results across multiple RCTs. Recommendations could not be made solely based on the published evidence due to limited high-quality evidence. As such, Delphi consensus recommendations will be reported in a separate publication.

Evaluation of Photobiomodulation and Boldine as Alternative Treatment Options in Two Diabetic Retinopathy Models. Diabetic retinopathy causes progressive and irreversible damage to the retina through activation of inflammatory processes, overproduction of oxidative species, and glial reactivity, leading to changes in neuronal function and finally ischemia, edema, and hemorrhages. Current treatments are invasive and mostly applied at advanced stages, stressing the need for alternatives. To this end, we tested two unconventional and potentially complementary non-invasive treatment options: Photobiomodulation, the stimulation with near-infrared light, has shown promising results in ameliorating retinal pathologies and insults in several studies but remains controversial. Boldine, on the other hand, is a potent natural antioxidant and potentially useful to prevent free radical-induced oxidative stress. To establish a baseline, we first evaluated the effects of diabetic conditions on the retina with immunofluorescence, histological, and ultrastructural analysis in two diabetes model systems, obese LepR(db/db) mice and organotypic retinal explants, and then tested the potential benefits of photobiomodulation and boldine treatment in vitro on retinal explants subjected to high glucose concentrations, mimicking diabetic conditions. Our results suggest that the principal subcellular structures affected by these conditions were mitochondria in the inner segment of photoreceptors, which displayed morphological changes in both model systems. In retinal explants, lactate metabolism, assayed as an indicator of mitochondrial function, was altered, and decreased photoreceptor viability was observed, presumably as a consequence of increased oxidative-nitrosative stress. The latter was reduced by boldine treatment in vitro, while photobiomodulation improved mitochondrial metabolism but was insufficient to prevent retinal structural damage caused by high glucose. These results warrant further research into alternative and complementary treatment options for diabetic retinopathy. boldine;Antioxidants;Glucose Mice;Animals;Diabetic Retinopathy;Retina;Antioxidants;Oxidative Stress;Glucose;Diabetes Mellitus

Photobiomodulation for Major Depressive Disorder: Linking Transcranial Infrared Light, Biophotons and Oxidative Stress. Incompletely treated major depressive disorder (MDD) poses an enormous global health burden. Conventional treatment for MDD consists of pharmacotherapy and psychotherapy, though a significant number of patients do not achieve remission with such treatments. Transcranial photobiomodulation (t-PBM) is a promising novel therapy that uses extracranial light, especially in the near-infrared (NIR) and red spectra, for biological and therapeutic effects. The aims of this Review are to evaluate the current clinical and preclinical literature on t-PBM in MDD and to discuss candidate mechanisms for effects of t-PBM in MDD, with specific attention to

biophotons and oxidative stress. A search on PubMed and ClinicalTrials.gov identified clinical and preclinical studies using t-PBM for the treatment of MDD as a primary focus. After a systematic screening, only 19 studies containing original data were included in this review (9 clinical and 10 preclinical trials). Study results demonstrate consensus that t-PBM is a safe and potentially effective treatment; however, varying treatment parameters among studies complicate definitive conclusions about efficacy. Among other mechanisms of action, t-PBM stimulates the complex IV of the mitochondrial respiratory chain and induces an increase in cellular energy metabolism. We suggest that future trials include biological measures to better understand the mechanisms of action of t-PBM and to optimize treatment efficiency. Of particular interest going forward will be studying potential effects of t-PBM-an external light source on the NIR spectra-on neural circuitry implicated in depression. Humans;Depressive Disorder, Major;Oxidative Stress;Treatment Outcome;Infrared Rays

Dose and time-response effect of photobiomodulation therapy on glycemic control in type 2 diabetic patients combined or not with hypoglycemic medicine: A randomized, crossover, double-blind, sham-controlled trial. Photobiomodulation therapy (PBMt) combined or not with oral hypoglycemic medication has not been investigated in type 2 diabetes (T2DM) patients. All 10 T2DM patients were assessed randomly at 6 different occasions (3 with and 3 without regular oral hypoglycemic medication). Capillary glycemia was assessed after overnight fast (pre-prandial), 1â€‰h postprandially (standardized meal, 338 kcal), and 30â€‰min, 3â€‰h, 6â€‰h, 12â€‰h post-PBMt (830â€‰nm; 25 arrays of LEDs, 80â€‰mW/array). Three doses (0â€‰J-sham, 100â€‰J, 240â€‰J per site) were applied bilaterally on quadriceps femoris muscles, hamstrings, triceps surae, ventral upper arm and forearm; and randomly combined or not with oral hypoglicemic medication, totaling six different therapies applied for all 10 TDM2 patients (PBMt sham, PBMt 100â€‰J, PBMt 240â€‰J, PBMt shamâ€‰+â€‰medication, PBMt 100â€‰Jâ€‰+â€‰medication, PBMt 240â€‰Jâ€‰+â€‰medication). Cardiac autonomic control was assessed by heart rate variability (HRV) indices. Without medication, there was reduction in glycemia after all PBMt doses, with 100â€‰J as the best dose that persisted until 12â€‰h and presented lower area under the curve (AUC). With medication, glycemia decreased similarly among doses. No differences between 100â€‰J and shamâ€‰+â€‰medication, but AUC was significantly lower after 100â€‰J, suggesting better glycemic control. Low frequency component of HRV increased after shamâ€‰+â€‰medication and 100â€‰J, suggesting higher sympathetic activation. PBMt showed time- and dose-response effect to reduce glycemia in T2DM patients. Effects on HRV were consistent with glycemic control. Hypoglycemic Agents Humans;Hypoglycemic Agents;Low-Level Light Therapy;Diabetes Mellitus, Type 2;Glycemic Control;Muscle, Skeletal

Blue light therapy in the management of chronic wounds: a narrative review of its physiological basis and clinical evidence. INTRODUCTION: Chronic wounds are a significant problem worldwide, with substantial cost to health care systems; thus, a minimally invasive and well-tolerated treatment is attractive. Blue light has shown promise in wound healing through the principle of photobiomodulation. OBJECTIVE: This review examines the physiological effects of blue light on tissue and the hypothesis that appropriate application of blue light in conjunction with SOC improves wound healing compared with SOC alone. METHODS: The authors searched in PubMed, Google Scholar, and the Cochrane Library to identify literature on the mechanism of action of blue light and then examined the clinical evidence. RESULTS: Key physiological pathways of blue light include generation of ROS and nitric oxide, resulting in promotion of angiogenesis, reduced inflammation, and direct antimicrobial effects. These reactions are seen only at low doses; in fact, higher doses may be harmful to tissue. The only primary study with statistical analyses demonstrated wound area reduction of 51% (P =.007) in blue light-irradiated wounds compared with SOC alone. CONCLUSIONS:

Blue light applied following a strict protocol is safe and shows promise in the management of chronic wounds. The current evidence is poor, however, and randomized trials are required to confirm its clinical utility. Wound Healing;Phototherapy

Photobiomodulation increases uprighting tooth movement and modulates IL-1Î² expression during orthodontically bone remodeling. This study investigated the effects of photobiomodulation (PBM) in acceleration of orthodontic movement of inferior molar uprighting movement. Thirty-four individuals, with indication of molar uprighting movement for oral rehabilitation, were randomly divided in two groups: verticalizationâ€‰+â€‰PBM (808â€‰nm, 100â€‰mW, 1â€‰J per point, 10 points and 25â€‰J/cm(2)) or verticalizationâ€‰+â€‰PBM simulation. Elastomeric chain ligatures were changed every 30â€‰days for 3â€‰months. FBM was performed immediately, 24â€‰h, 72â€‰h, 1 and 2â€‰months after activation. The primary outcome was the amount of uprighting movement. Secondary outcomes were pain, amount of medication, OHIP-14 questionnaire, and cytokine IL-1Î². PBM group increase uprighting movement when compared to control after 3â€‰months and modulate IL-1Î² expression. For pain control, the amount of medication and OHIP-14 no difference were found. This study suggests that PBM accelerates tooth movement during molar uprighting, due to modulation of IL-1Î² during bone remodeling. Humans;Bone Remodeling;Low-Level Light Therapy;Molar;Pain;Pain Management;Tooth Movement Techniques

In vitro effects of photobiomodulation on cell migration and gene expression of ALP, COL-1, RUNX-2, and osterix in cementoblasts. The aim of this study was to evaluate the effects of photobiomodulation (PBM) on cell migration and alkaline phosphatase (ALP), type I collagen (Col-1), runt-related transcription factor 2 (RUNX-2), and Osterix (OSX) gene expression in a cementoblast culture (OCCM-30), in a microenvironment mimicking an injury on the cementoblast layer, such as it occurs during root resorption. For this, OCCM-30 cells were cultured in 6-well plates and the following parameters were assayed: (1) migration by scratch assay and ALP, Col-1, Runx2, and Osx by real-time PCR. PBM was performed in two protocols using a LED device emitting light at 660 nm (Â± 30 nm). OCCM-30 cementoblasts were grown and divided into four groups: (1) negative control; (2) positive control (scratch); (3) scratch + PBM with a total energy of 36 J and energy density 1.6 J/cm(2); and (4) scratch + PBM with a total energy of 72 J and energy density of 3.2 J/cm(2). Data were statistically analyzed, with the level of significance set at 5%. Cementoblasts migrated from the edge of the scratch toward the center, and the wound closed after 24 h, with the PBM3.2J/cm(2) group showing the higher cell migration compared with the other groups at 2 h, 6 h, 8 h, and 13 h ($p < 0.05$). The control and PBM1.6J/cm(2) groups showed similar levels of cell migration, with no significant differences ($p > 0.05$). PBM3.2J/cm(2) group exhibited greater ALP, Col-1, OSX, and RUNX2 in comparison with the other experimental groups ($p < 0.05$). Similar levels of all genes evaluated were observed between the PBM1.6J/cm(2) group and the positive control group ($p > 0.05$). In conclusion, our findings support the effectiveness of photobiomodulation on cementoblast migration and gene expression, which may contribute to the formation of a new cementum layer. Alkaline Phosphatase;Coloring Agents;Core Binding Factor Alpha 1 Subunit Alkaline Phosphatase;Cell Movement;Coloring Agents;Core Binding Factor Alpha 1 Subunit;Dental Cementum;Gene Expression;Animals;Mice

Time-dependent photobiomodulation management of neuropathic pain induced by spinal cord injury in male rats. Neuropathic pain (NP) following spinal cord injury (SCI) often lasts for a long time and causes a range of problems that reduce the quality of life. Current treatments are not generally effective; however, photobiomodulation therapy (PBMT) has made some progress in this area. Due to the novelty of this treatment, standard therapeutic protocols have not yet been agreed upon. In the present study, we compare the analgesic effect of two PBMT protocols (2 and 4 weeks of radiation). A total of thirty-two adult male Wistar rats were divided into four groups: control, SCI, 2 W PBMT, and 4

W PBMT. SCI was induced by an aneurism clip and PBMT used a 660-nm, initiated 30 min post-SCI, and continued daily for 2 or 4 weeks. Functional recovery, hyperalgesia, and allodynia were measured weekly. At the end of the study, the Gad65, interleukin 1-alpha (IL1Î±), interleukin 10 (IL10), IL4, and purinergic receptor (P2xR and P2yR) expressions were measured. Data were analyzed by Prism6. The results showed PBM irradiation for 2 and 4 weeks had the same effects in improving hyperalgesia. In the case of allodynia and functional recovery, 4 W PBMT was more effective ($p<0.01$). 4 W PBMT increased the Gad65 expression ($p <0.001$) and reduced P2Y4R ($p <0.05$) compared to SCI animals. The effects of 2 and 4 W PBMT were the same for IL1Î±, IL10, and P2X3 receptors. 4 W PBMT was more effective in reducing the complications of SCI such as pain and disability. PBMT therapy is an effective method aimed at immune system function modulation to reduce NP and motor dysfunction.
Interleukin-10 Male;Rats;Animals;Hyperalgesia;Interleukin-10;Quality of Life;Rats, Wistar;Neuralgia

Photobiomodulation for Skin Pigmentation Disorders: A Dual-Function Treatment.
Humans;Pigmentation Disorders;Low-Level Light Therapy

Thermal effect on eyelid and tear film after low-level light therapy and warm compress.
CLINICAL RELEVANCE: The warming effect of low-level light therapy may contribute to its therapeutic mechanism which is beneficial for dry eye management. BACKGROUND: Low-level light therapy is proposed to work via cellular photobiomodulation and a potential thermal effect in dry eye management. This study examined the change in eyelid temperature and tear film stability after low-level light therapy compared to warm compress. METHODS: Participants with no to mild dry eye disease were randomised into control, warm compress, and low-level light therapy groups. The low-level light therapy group was treated with Eyelight mask (633â€‰nm) for 15â€‰minutes, the warm compress group with Bruder mask for 10â€‰minutes, and the control group with an Eyelight mask having inactive LEDs for 15â€‰minutes. Eyelid temperature was measured using the FLIR OneÂ® Pro thermal camera (Teledyne FLIR, Santa Barbara, CA, USA), and clinical measures of tear film stability were evaluated before and after treatment. RESULTS: Thirty-five participants (mean ageâ€‰Â±â€‰SD, 27.3â€‰Â±â€‰4.3â€‰years) completed the study. Eyelid temperatures for external upper, external lower, internal upper and internal lower eyelids were significantly greater in the low-level light therapy and warm compress groups immediately after treatment compared to the control group (all pâ€‰<â€‰0.001). No difference in temperature was observed between the low-level light therapy and warm compress groups at all time points (all pâ€‰>â€‰0.05). Tear film lipid layer thickness was significantly greater after treatment (mean (95% CI), 13.1â€‰nm (5.3 to 21.0), pâ€‰<â€‰0.005) but not different between groups (pâ€‰>â€‰0.05). CONCLUSION: A single treatment of low-level light therapy increased eyelid temperature immediately after treatment, but the increase was not significantly different from warm compress. This suggests that thermal effects may in part contribute to the therapeutic mechanism of low-level light therapy.
Humans;Body Temperature;Dry Eye Syndromes;Eyelids;Hyperthermia, Induced;Low-Level Light Therapy;Tears;Young Adult;Adult

[Evaluation of the efficacy of Nd:YAG laser in the treatment of 80 patients with oral mucosal venous malformation]. PURPOSE: To evaluate the efficacy of Nd:YAG laser treatment for venous malformations. METHODS: Eighty patients with oral mucosal venous malformations underwent one or more Nd:YAG laser treatments, and photographs of the lesions before and after laser treatment were collected and compared, patients' satisfaction were assessed using visual analog scale (VAS). SPSS 22.0 software package was used for data analysis. RESULTS: A total of 58 cases were cured in 80 patients, 21 cases showed remarkable improvement. Nine patients(11.25%) experienced adverse effects after laser therapy, including atrophic scars in 2 patients, oral mucosal ulcers in 4 patients, transient hyperpigmentation in 2 patients, and transient hypopigmentation in 1 patient, which met

the expected response to effective therapy, and the follow-up results showed that most patients achieved maximum satisfaction values. CONCLUSIONS: Nd:YAG laser is an effective and safe treatment for oral mucosal venous malformation with definite efficacy and few side effects, which is worthy of popularization and application. Humans;Lasers, Solid-State;Treatment Outcome;Patient Satisfaction;Laser Therapy;Low-Level Light Therapy
Photobiomodulation: An Emerging Treatment Modality for Depression. Major depressive disorder (MDD) is considered a global crisis. Conventional treatments for MDD consist of pharmacotherapy and psychotherapy, although a significant number of patients with depression respond poorly to conventional treatments and are diagnosed with treatment-resistant depression (TRD). Transcranial photobiomodulation (t-PBM) therapy uses near-infrared light, delivered transcranially, to modulate the brain cortex. The aim of this review was to revisit the antidepressant effects of t-PBM, with a special emphasis on individuals with TRD. A search on PubMed and ClinicalTrials.gov tracked clinical studies using t-PBM for the treatment of patients diagnosed with MDD and TRD. Antidepressive Agents Humans;Depressive Disorder, Major;Depression;Brain;Psychotherapy;Antidepressive Agents;Depressive Disorder, Treatment-Resistant
Mood Disorders in Youth: Complementary and Integrative Medicine. Omega-3 polyunsaturated fatty acids, probiotics, vitamin C, vitamin D, folic acid and L-methyl folate, broad-spectrum micronutrients, N-acetylcysteine, physical activity, herbs, bright light therapy, melatonin, saffron, meditation, school-based interventions, and transcranial photobiomodulation are reviewed, with a focus on their use for treating mood disorders in children and adolescents. For each treatment, all published randomized controlled trials are summarized. Fatty Acids, Omega-3 Adolescent;Child;Humans;Dietary Supplements;Fatty Acids, Omega-3;Integrative Medicine;Mood Disorders;Randomized Controlled Trials as Topic
[Low level laser therapy: molecular mechanisms of anti-inflammatory and regenerative effects]. Laser therapy as a physiotherapeutic method has been successfully used for a long time in the treatment of various pathologies, but the action mechanisms of low level laser therapy (LLLT) remain understudied. OBJECTIVE: To perform the analysis of published results of LLLT investigations, to describe the physical principles of photobiomodulation, its action mechanisms on various cells and tissues, therapeutic intervention and efficiency of the technique. MATERIAL AND METHODS: The search of articles was done for the period from 2014 to 2022. The preference was given to the articles for the last 5 years in the PubMed database depending on keywords: low level laser therapy, photobiomodulation, exosomes, monocytes, macrophages. RESULTS AND DISCUSSION: This article represents the current conceptions about the action mechanisms and reproduced effects of low level laser therapy, the photobiomodulation influence on the inflammation and reparative processes in human body by intervention on cells and their signal pathways. The discussion of research results and probable causes of conflicting data are performed, as well as the efficacy assessment of laser irradiation in different conditions and diseases is made. CONCLUSION: Laser therapy has certain variety of advantages, among which: non-invasiveness and availability, long-term service of equipment, stable intensity of light radiation and the ability to use in various wavelength ranges. The technique efficacy was proven for a large number of diseases. However, for the successful application of photobiomodulation in clinical practice in current evidence-based medicine, additional investigations are necessary to determine the best dosimetric radiation parameters, as well as further study of action mechanisms on various human cells and tissues. Anti-Inflammatory Agents Humans;Low-Level Light Therapy;Evidence-Based Medicine;Anti-Inflammatory Agents
Effect of photobiomodulation adjunct to periodontal therapy on individuals with type 2 diabetes mellitus regarding periodontal clinical parameters: a systematic review and meta-analysis. The

purpose of this study is to evaluate the scientific evidence on the impact of photobiomodulation adjunct to non-surgical periodontal treatment on individuals with type 2 diabetes mellitus (T2DM). The Preferred Reporting Items for Systematic Reviews and Meta-analyses statement was followed. A protocol was registered in the International Prospective Registry of Systematic Reviews (PROSPERO #CRD42022310756). The research was carried out in seven databases, with no restrictions regarding the year of publication. Our work included studies that compared periodontal clinical parameters among individuals undergoing non-surgical periodontal therapy associated with photobiomodulation and a control group of individuals undergoing non-surgical periodontal treatment. Study selection, data extraction, and risk of bias assessment (RoB 2.0) were performed by two review authors. Meta-analysis was performed. Mean difference (MD) and a 95% confidence interval (CI) were provided. Three hundred forty-one studies were identified, of which eight studies were included. The meta-analysis demonstrated that photobiomodulation adjunctive to periodontal therapy in individuals with diabetes resulted in a greater reduction in probing depth and greater attachment gain in comparison to periodontal treatment alone ($p < 0.05$). The included studies exhibited a low risk of bias. Photobiomodulation adjunct to periodontal therapy contributes to the improvement of periodontal clinical parameters in individuals with T2DM. Humans;Diabetes Mellitus, Type 2;Periodontal Diseases;Low-Level Light Therapy

Laser therapy of burn scars: CPT coding and reimbursement challenges. Humans;Cicatrix;Cicatrix, Hypertrophic;Laser Therapy;Low-Level Light Therapy;Burns;Treatment Outcome;Lasers, Gas

Effect of 650Â nm laser photobiomodulation therapy on the HT-7 (shenmen) acupoint in the Mus musculus model of Parkinson's disease. BACKGROUND: Parkinson's disease is one of the neurodegenerative conditions that impacts 1-2% of the world's population. The only effective therapy for this condition today is to restore the biochemical function of the diseased dopamine neurons by giving them Levodopa or L-3,4-dihydroxyphenylalanine (l-DOPA). The risk of progenitor stem cells, though, is the growth of teratomas or the uncontrolled growth of cells. As a result, an alternative or additional method is needed, such as photobiomodulation therapy using a laser diode. In this research, male mice (Mus musculus), which were used as models for Parkinson's disease in an in vivo paraquat study, to determine the optimal dose of photobiomodulation therapy and a laser diode was used as a treatment. METHODS: The three sample groups are Group P-L- (control group, induced by 0.9% NaCl), Group PÂ +Â L- (only caused by paraquat), and Group PÂ +Â L+. (Treatment group, treated by paraquat and photobiomodulation therapy with a laser diode). Photobiomodulation treatment doses of 0.14Â J, 0.29Â J, 0.37Â J, 0.76Â J, 1.14Â J, and 1.52Â J were used in the P+L+ subgroups (6 groups). The laser diode generated a continuous wave with a wavelength of 658Â nm, a beam spot of 2.10Â mm, and an output power of 15.42Â mW. After treatment, the histopathology results of each sample were inspected under a microscope. RESULT: In Parkinson's disease-affected mice, paraquat has been shown to reduce the number of neurons. According to the results of the histopathological examination, photobiomodulation therapy using a laser diode (PÂ +Â L+) on the HT-7 (Shenmen) may raise the quantity of neurons and the proportion of healthy cells in the mouse brain. CONCLUSION: The effective radiated energy of the photobiomodulation therapy using laser diode treatment on the muscle musculus cell model of Parkinson's disease is 0.76 J.

Patient Experience of Photobiomodulation Therapy in Head and Neck Chronic Lymphedema. Purpose: Lymphedema is a common late effect of head and neck cancer treatment that causes various symptoms, functional impairment, and poor quality of life. We completed a pilot, prospective, single-arm clinical trial to determine the feasibility and potential efficacy of the use of photobiomodulation (PBM) therapy for head and neck lymphedema. In this study, we report patients' perceived treatment experience of PBM therapy and provide suggestions to better understand head

and neck cancer survivors' experience of PBM therapy. Methods: Head and neck cancer patients who underwent PBM therapy completed face-to-face semi-structured interviews. Interviews were audio-recorded and then transcribed verbatim. Qualitative content analysis was used to analyze the transcriptions from the interviews. Results: Among 12 participants who consented for the study, 11 (91.7%) completed the PBM therapy. Participants described positive experiences and unique benefits about the PBM therapy, for example, decreased swelling, reduced tightness, increased range of motion, increased saliva production, and improved ability to swallow. Some participants (nâ€‰=â€‰5, 45.5%) delineated challenges related to traffic, travel time, and distance from study location. Many participants proposed suggestions for future research on PBM therapy, for example, research on internal edema and its relationship with swallowing, and indicated patients with severe lymphedema and fibrosis may be more likely to benefit. Conclusions: Findings from this study suggested the potential benefits of PBM therapy in treatment of chronic head and neck lymphedema. Rigorously designed clinical trials are needed to evaluate the effect of PBM therapy for head and neck cancer-related lymphedema. Trial Registration Number and Date of Registration: ClinicalTrials.gov Identifier: NCT03738332; date of registration: November 13, 2018. Humans;Chronic Disease;Head and Neck Neoplasms;Low-Level Light Therapy;Lymphedema;Patient Outcome Assessment;Prospective Studies;Quality of Life

Quality assessment of PBM protocols for oral complications in head and neck cancer patients: part 2. PURPOSE: To investigate the role of photobiomodulation (PBM) in patients undergoing head and neck cancer (HNC) treatment. We focused on the consequences of the main complications, such as quality of life (QoL), analgesia, functional impairment, and nutritional status, as well as on the impact on survival/ recurrences, radiotherapy (RT) interruption, adherence, cost-effectiveness, safety, feasibility, and tolerability. METHODS: An electronic search in PubMed and Scopus databases was performed. Full texts were carefully assessed, and data were assimilated into a tabular form for discussion and consensus among the expert panel. RESULTS: A total of 22 papers were included. Overall, a beneficial effect of PBM was evidenced in the amelioration of QoL, nutritional status, the reduction of pain, and functional impairment. Preventive PBM may reduce the incidence and duration of RT interruptions, potentially contributing to improved cancer treatment outcomes. PBM treatments are safe and recommended for routine use, with the caveat of avoiding direct tumor exposures where feasible. However, it does not appear to impact cancer survivorship/recurrences directly. Despite additional clinical efforts involving routine PBM use, the individual and public health benefits will positively impact oncology care. CONCLUSIONS: Quality of life, pain and functional impairment, nutritional status, and survival may be effectively improved with PBM. Given its established efficacy also in reducing RT interruptions and its safety, feasibility, and tolerability, PBM should be included in the field of supportive cancer care in HNC patients. Improved understanding of PBM mechanisms and precise dose parameters is enabling the generation of more robust, safe, and reproducible protocols; thus, it is imperative to support further clinical implementation as well as both applied and basic science research in this novel field. Humans;Quality of Life;Neoplasm Recurrence, Local;Head and Neck Neoplasms;Treatment Outcome;Low-Level Light Therapy

Photobiomodulation-Based Synergic Effects of Pt-Coated TiO(2) Nanotubes and 850 nm Near-Infrared Irradiation on the Osseointegration Enhancement: In Vitro and In Vivo Evaluation. Photobiomodulation (PBM) therapy is known to have the potential to improve bone regeneration after implant surgery. However, the combinatory effect of the nanotextured implant and PBM therapy on osseointegration has not yet been proved. This study evaluated the photobiomodulation-based synergistic effects of Pt-coated titania nanotubes (Pt-TiO(2) NT) and 850 nm near-infrared (NIR) light on osteogenic performance in vitro and in vivo. The FE-SEM and the diffuse UV-Vis-NIR

spectrophotometer were used to perform the surface characterization. The live-dead, MTT, ALP, and AR assays were tested to perform in vitro tests. The removal torque testing, the 3D-micro CT, and the histological analysis were used to conduct in vivo tests. The live-dead and MTT assay resulted in Pt-TiO(2) NTs being biocompatible. The ALP activity and AR assays demonstrated that the combination of Pt-TiO(2) NT and NIR irradiation significantly enhanced osteogenic functionality ($p < 0.05$). The results of in vivo test, employing the removal torque testing, the 3D-micro CT, and histological analysis, showed overall improved outcomes; however, no significant difference was observed between the control and experimental groups ($p > 0.05$). Therefore, we confirmed the possibility of the combination of Pt-TiO(2) NT and NIR light as a promising technology for implant surgery in dentistry.

Effect of Photobiomodulation Combined with Physiotherapy on Functional Performance in Children with Myelomeningo-Cele-Randomized, Blind, Clinical Trial. BACKGROUND: This study aimed to evaluate the electrical activity of the rectus femoris, tibialis anterior, and lateral gastrocnemius muscles during the sit-to-stand task and functional mobility after a neurofunctional physiotherapy protocol associated with PBM. METHODS: Twenty-five children were randomly allocated to either Active PBM + physiotherapy (n = 13) or PBM sham + physiotherapy (n = 12). PBM was carried out with a LED device (850 nm, 25 J, 50 s per point and 200 mW) at four points over the area with absence of a spiny process. Both groups completed a twelve-week supervised program with two weekly 45-60 min sessions. Pre-training and post-training assessments involved the Pediatric Evaluation of Disability Inventory (PEDI). Muscle activity was assessed using portable electromyography (BTS Engineering) and the electrodes were positioned on the lateral gastrocnemius, anterior tibialis, and rectus femoris muscles. The RMS data were recorded and analyzed. RESULTS: After 24 sessions of the treatment protocol, improvements were found in the PEDI score. The participants presented greater independence in performing the tasks, requiring less assistance from their caregivers. More significant electrical activity was found in the three muscles evaluated between the rest period and execution of the sit-to-stand tasks, both in the more compromised or less compromised lower limbs. CONCLUSION: Neurofunctional physiotherapy with or without PBM improved functional mobility and electrical muscle activity in children with myelomeningocele.

A Randomized Placebo-Controlled Study of a Transcranial Photobiomodulation Helmet in Parkinson's Disease: Post-Hoc Analysis of Motor Outcomes. Emerging evidence is increasingly supporting the use of transcranial photobiomodulation (tPBM) to improve symptoms of neurodegenerative diseases, including Parkinson's disease (PD). The objective of this study was to analyse the safety and efficacy of tPBM for PD motor symptoms. The study was a triple blind, randomized placebo-controlled trial with 40 idiopathic PD patients receiving either active tPBM (635 nm plus 810 nm LEDs) or sham tPBM for 24 min per day (56.88J), six days per week, for 12 weeks. The primary outcome measures were treatment safety and a 37-item MDS-UPDRS-III (motor domain) assessed at baseline and 12 weeks. Individual MDS-UPDRS-III items were clustered into sub-score domains (facial, upper-limb, lower-limb, gait, and tremor). The treatment produced no safety concerns or adverse events, apart from occasional temporary and minor dizziness. There was no significant difference in total MDS-UPDRS-III scores between groups, presumably due to the placebo effect. Additional analyses demonstrated that facial and lower-limb sub-scores significantly improved with active treatment, while gait and lower-limb sub-scores significantly improved with sham treatment. Approximately 70% of participants responded to active treatment (â‰¥5 decrease in MDS-UPDRS-III score) and improved in all sub-scores, while sham responders improved in lower-limb sub-scores only. tPBM appears to be a safe treatment and improved several PD motor symptoms in patients that responded to treatment. tPBM is proving to be increasingly attractive as a possible non-pharmaceutical adjunct therapy.

Effects of Red and Infrared Laser Therapy in Patients with Tinnitus: A Double-Blind, Clinical, Randomized Controlled Study Combining Light with Ultrasound, Drugs and Vacuum Therapy. BACKGROUND: tinnitus is a symptom with no specific cause known to date, and there are no associated pharmacogenomics of hearing disorders and no FDA-approved drugs for tinnitus treatment. The effectiveness of drug treatments is not reproducible on idiopathic patients and inexistent in refractory patients. Personalized treatments for these patients are a great clinical need. Our study investigated the outcome of potential alternative and complementary treatment modalities for idiopathic and refractory tinnitus patients. METHODS: we were the first to evaluate the tinnitus handicap inventory (THI) score changes over the course of treatment up to 15 days after complete cessation of treatment for novel transmeatal low-level laser therapy (LLLT) modalities using light alone, as well as LLLT combined with vacuum therapy (VT), ultrasound (US), Ginkgo biloba (GB) and flunarizine dihydrochloride (FD), while also comparing all treatment outcomes with laser puncture (LP), FD alone and GB alone. RESULTS: a positive treatment outcome (superior to a placebo effect) was achieved by using either LP or transmeatal LLLT, whereas short-term antagonistic effects of VT, US, GB and FD when combined with LLLT. For transmeatal LLLT, an improvement in the treatment outcome was observed by increasing the irradiation time from 6 min to 15 min (with 100-mW of applied laser power at 660 nm). Finally, a lasting therapeutic effect higher than the placebo was observed at 15 days after treatment upon combining LLLT with VT, GB or by using FD alone, by using the transmeatal LLLT alone or by using LP. CONCLUSIONS: LP and Transmeatal LLLT can be promising alternative treatments for idiopathic and refractory tinnitus patients. Future studies should investigate the long-term effects of LLLT in tinnitus patients, as well as the dosimetry and wavelength of transmeatal LLLT.

The Role of Physical Therapies in Wound Healing and Assisted Scarring. Wound healing (WH) is a complex multistep process in which a failure could lead to a chronic wound (CW). CW is a major health problem and includes leg venous ulcers, diabetic foot ulcers, and pressure ulcers. CW is difficult to treat and affects vulnerable and pluripathological patients. On the other hand, excessive scarring leads to keloids and hypertrophic scars causing disfiguration and sometimes itchiness and pain. Treatment of WH includes the cleaning and careful handling of injured tissue, early treatment and prevention of infection, and promotion of healing. Treatment of underlying conditions and the use of special dressings promote healing. The patient at risk and risk areas should avoid injury as much as possible. This review aims to summarize the role of physical therapies as complementary treatments in WH and scarring. The article proposes a translational view, opening the opportunity to develop these therapies in an optimal way in clinical management, as many of them are emerging. The role of laser, photobiomodulation, photodynamic therapy, electrical stimulation, ultrasound therapy, and others are highlighted in a practical and comprehensive approach. Humans;Wound Healing;Cicatrix, Hypertrophic;Keloid;Pressure Ulcer;Physical Therapy Modalities

The Role of Low-Level Laser Therapy in Bone Healing: Systematic Review. Low-level laser therapy (LLLT) is a treatment that is increasingly used in orthopedics practices. In vivo and in vitro studies have shown that low-level laser therapy (LLLT) promotes angiogenesis, fracture healing and osteogenic differentiation of stem cells. However, the underlying mechanisms during bone formation remain largely unknown. Factors such as wavelength, energy density, irradiation and frequency of LLLT can influence the cellular mechanisms. Moreover, the effects of LLLT are different according to cell types treated. This review aims to summarize the current knowledge of the molecular pathways activated by LLLT and its effects on the bone healing process. A better understanding of the cellular mechanisms activated by LLLT can improve its clinical application. Osteogenesis;Low-Level Light Therapy;Fracture Healing;Stem Cells;Cell Differentiation

Advances in the prevention and treatment of breast cancer-related lymphedema. PURPOSE: Breast cancer-related lymphedema (BCRL) represents a lifelong risk for breast cancer survivors and once acquired becomes a lifelong burden. This review summarizes current BCRL prevention and treatment strategies. FINDINGS: Risk factors for BCRL have been extensively studied and their identification has affected breast cancer treatment practice, with sentinel lymph node removal now standard of care for patients with early stage breast cancer without sentinel lymph node metastases. Early surveillance and timely management aim to reduce BCRL incidence and progression, and are further facilitated by patient education, which many breast cancer survivors report not having adequately received. Surgical approaches to BCRL prevention include axillary reverse mapping, lymphatic microsurgical preventative healing (LYMPHA) and Simplified LYMPHA (SLYMPHA). Complete decongestive therapy (CDT) remains the standard of care for patients with BCRL. Among CDT components, facilitating manual lymphatic drainage (MLD) using indocyanine green fluorescence lymphography has been proposed. Intermittent pneumatic compression, nonpneumatic active compression devices, and low-level laser therapy appear promising in lymphedema management. Reconstructive microsurgical techniques such as lymphovenous anastomosis and vascular lymph node transfer are growing surgical considerations for patients as well as liposuction-based procedures for addressing fatty fibrosis formation from chronic lymphedema. Long-term self-management adherence remains problematic, and lack of diagnosis and measurement consensus precludes a comparison of outcomes. Currently, no pharmacological approaches have proven successful. CONCLUSION: Progress in prevention and treatment of BCRL continues, requiring advances in early diagnosis, patient education, expert consensus and novel treatments designed for lymphatic rehabilitation following insults. Humans;Female;Breast Neoplasms;Breast Cancer Lymphedema;Lymphedema;Manual Lymphatic Drainage;Risk Factors;Lymph Node Excision

Photobiomodulation therapy reverses spermatogenesis arrest in hyperthermia-induced azoospermia mouse model. Testicular heat stress leads to impairment of spermatogenesis in mammals. Involved mechanism in this vulnerability to heat-induced injury remains unclear, and research is being conducted to find an approach to reverse spermatogenesis arrest caused by hyperthermia. Recently, different studies have utilized photobiomodulation therapy (PBMT) therapy for the improvement of sperm criteria and fertility. This study aimed at evaluating the effect of PBMT on the improvement of spermatogenesis in mouse models of hyperthermia-induced azoospermia. A total of 32 male NMRI mice were equally divided into four groups consisting of control, hyperthermia, hyperthermia + Laser 0.03 J/cm(2), and hyperthermia + Laser 0.2 J/cm(2). To induce scrotal hyperthermia, mice were anesthetized and placed in a hot water bath at 43 Â°C for 20 min for 5 weeks. Then, PBMT was operated for 21 days using 0.03 J/cm(2) and 0.2 J/cm(2) laser energy densities in the Laser 0.03 and Laser 0.2 groups, respectively. Results revealed that PBMT with lower intensity (0.03 J/cm(2)) increased succinate dehydrogenase (SDH) activity and glutathione (GSH)/oxidized glutathione (GSSG) ratio in hyperthermia-induced azoospermia mice. At the same time, low-level PBMT reduced reactive oxygen species (ROS), mitochondrial membrane potential, and lipid peroxidation levels in the azoospermia model. These alterations accompanied the restoration of spermatogenesis manifested by the elevated number of testicular cells, increased volume and length of seminiferous tubules, and production of mature spermatozoa. After conducting experiments and analyzing the results, it has been revealed that the use of PBMT at a dosage of 0.03 J/cm(2) has shown remarkable healing effects in the heat-induced azoospermia mouse model. Glutathione Humans;Male;Mice;Animals;Azoospermia;Low-Level Light Therapy;Hot Temperature;Semen;Testis;Glutathione;Hyperthermia, Induced;Mammals

The Influence of Low-Level Laser Therapy on CBCT Radiographic and Biochemical Profiles of Type II Controlled Diabetic Patients After Dental Implant Insertion: A Randomized Case-Control Study.

Background Low-level laser treatment (LLLT) was thought to increase bone quality during osseointegration when combined with dental implants. However, there is no sufficient information on its impact on dental implants in diabetics. Osteoprotegerin (OPG) has been described as a marker for bone turnover to determine implant prognosis. The current research aims to evaluate the effect of low-level laser therapy (LLLT) on bone density (BD) and osteoprotegerin levels in peri-implant crevicular fluid (PICF) in type II diabetic patients. Methods This study comprised 40 individuals with type II diabetes mellitus (T2DM). Implants were randomly placed in 20 non-lasered T2DM patients (control) and 20 lasered T2DM patients (LLLT group). At the follow-up stages, BD and OPG levels in the PICF were evaluated in both groups. Results Significant variations were shown among control and LLLT groups concerning OPG level and BD (pâ‰¤0.001). OPG was significantly decreasing with follow-up points (pâ‰¤0.001). There was a significant decrease in OPG with time in both groups with a higher decrease in the control group. Conclusion LLLT is promising in controlled T2DM patients due to its outstanding influence on BD and estimated crevicular levels of OPG. Regarding its clinical significance, LLLT significantly improved bone quality during osseointegration on dental implants in T2DM.Â LLLT is considered potentially important for T2DM patients during implant placement. Trial registration The study was registered on ClinicalTrial.govÂ under registration number NCT05279911 (registration date: March 15, 2022) (https://clinicaltrials.gov/ct2/show/NCT05279911).

Whole-body photobiomodulation improves post-exercise recovery but does not affect performance or physiological response during maximal anaerobic cycling. This study aims to examine the effects of acute whole-body photobiomodulation (wbPBM), applied pre-exercise, on bouts of anaerobic cycling (Wingate) performances. Forty-eight healthy, active males and females participated in this single-blind, randomized, crossover study. Participants visited the laboratory three times to complete repeat (4â€‰Ã—) Wingate testing, with one week between each visit. All participants completed baseline testing during their first visit and randomly received either the wbPBM or placebo condition before testing on the second visit, followed by the opposite condition on the third visit. There were no significant conditionâ€‰Ã—â€‰time interactions for any variable (peak power, average power, power decrement, lactate, heart rate, ratings of perceived exertion, heart rate variability (HRV), root-mean square of differences between R-R intervals (rMSSD), power in the high-frequency range (HF) average, power in the low-frequency range (LF) average, total power, LF/HF, or power in the very-low-frequency range average). A main condition effect was only noted for heart rate, where peak heart rate was significantly higher for wbPBM (145, 141-148Â bpm) than placebo (143, 139-146Â bpm; pâ€‰=â€‰0.006) and baseline testing (143, 140-146; pâ€‰=â€‰0.049) throughout the entire testing session (i.e., collapsed across all timepoints). Furthermore, HRV (rMSSD) the following morning after testing was significantly higher for the wbPBM session compared to placebo (pâ€‰=â€‰0.043). There were no differences in perceived recovery (pâ€‰=â€‰0.713) or stress (pâ€‰=â€‰0.978) scores between wbPBM and placebo. Implementing 20Â min of wbPBM immediately prior to maximal bouts of anaerobic cycling did not improve performance (i.e., power output) or physiological responses (e.g., lactate). However, wbPBM elicited the ability to work at a higher heart rate throughout testing and seemed to enhance recovery through improved HRV the following morning. Lactic Acid Male;Female;Humans;Cross-Over Studies;Anaerobiosis;Single-Blind Method;Bicycling;Lactic Acid;Heart Rate

Physical therapy in diabetic foot ulcer: Research progress and clinical application. Diabetes foot ulcer (DFU) is one of the most intractable complications of diabetes and is related to a number of risk factors. DFU therapy is difficult and involves long-term interdisciplinary collaboration, causing patients physical and emotional pain and increasing medical costs. With a rising number of diabetes patients, it is vital to figure out the causes and treatment techniques of DFU in a precise and complete manner, which will assist alleviate patients' suffering and decrease excessive medical

expenditure. Here, we summarised the characteristics and progress of the physical therapy methods for the DFU, emphasised the important role of appropriate exercise and nutritional supplementation in the treatment of DFU, and discussed the application prospects of non-traditional physical therapy such as electrical stimulation (ES), and photobiomodulation therapy (PBMT) in the treatment of DFU based on clinical experimental records in ClinicalTrials.gov. Humans;Diabetes Mellitus;Diabetic Foot;Physical Examination;Physical Therapy Modalities;Risk Factors

Do Antimicrobial Photodynamic Therapy and Low-Level Laser Therapy Influence Oral Health-Related Quality of Life After Molar Extraction? PURPOSE: Most individuals experience significant deterioration in their oral health-related quality of life (OHRQoL) in the first few days after tooth extraction. This study aimed to evaluate the impact of antimicrobial photodynamic therapy (aPDT) and low-level laser therapy (LLLT) protocols on OHRQoL after extraction of lower molars. METHODS: The investigators designed a double-blind, randomized controlled clinical trial study. Patients with indications for lower molar extraction were included in the study and randomized into four groups: control group, antimicrobial photodynamic therapy group, LLLT group (LLLT.G), and aPDT and LLLT group (aPDTÂ +Â LLLT.G).The Oral Health Impact Profile (OHIP-14) questionnaire was used through an interview with the participants before the extraction (T0 - baseline) and on the 7th (T1) and 30th (T2) days after extraction. Other variables were age, sex, ethnicity, decayed-missing-filled teeth (DMFT) and tooth types. Appropriate univariate and bivariate statistics were computed, and statistical significance was set at a value PÂ <Â .05. RESULTS: The sample was composed of 40 patients with a mean age of 41.25Â Â±Â 13.97 and 25 (62.5%) were women. The mean OHIP-14 scores were significantly different in the intervals at T0 versus T1 and T0 versus T2 for all domains (PÂ <Â .001), demonstrating a positive impact on the OHRQoL. The total scores indicated a significant improvement in the OHRQoL in the aPDT (7.10, standard deviation 4.18, PÂ =Â .043), LLLT (6.40, SD 5.87, PÂ =Â .025), and aPDTÂ +Â LLLT (5.30, SD 3.59, PÂ =Â .012) groups compared to that in the control group (12.90, SD 6.64) at T1. Patients undergoing extraction of lower mandibular molars with aPDTÂ +Â LLLT had the lowest mean OHIP-14 total score at T1 (5.30) and T2 (0.70). CONCLUSION: The aPDT and LLLT protocols had a positive impact on the participants' OHRQoL. These procedures can be applied in everyday surgical practice. Anti-Infective Agents Humans;Female;Adult;Middle Aged;Male;Low-Level Light Therapy;Quality of Life;Molar;Photochemotherapy;Anti-Infective Agents

The anti-inflammatory effects of photobiomodulation are mediated by cytokines: Evidence from a mouse model of inflammation. There is an urgent need for therapeutic approaches that can prevent or limit neuroinflammatory processes and prevent neuronal degeneration. Photobiomodulation (PBM), the therapeutic use of specific wavelengths of light, is a safe approach shown to have anti-inflammatory effects. The current study was aimed at evaluating the effects of PBM on LPS-induced peripheral and central inflammation in mice to assess its potential as an anti-inflammatory treatment. Daily, 30-min treatment of mice with red/NIR light (RL) or RL with a 40 Hz gamma frequency flicker for 10 days prior to LPS challenge showed anti-inflammatory effects in the brain and systemically. PBM downregulated LPS induction of key proinflammatory cytokines associated with inflammasome activation, IL-1Î² and IL-18, and upregulated the anti-inflammatory cytokine, IL-10. RL provided robust anti-inflammatory effects, and the addition of gamma flicker potentiated these effects. Overall, these results demonstrate the potential of PBM as an anti-inflammatory treatment that acts through cytokine expression modulation.

A Machine Learning-optimized system for on demand, pulsatile, photo- and chemo-therapeutic treatment using near-infrared responsive MoS (2) -based microparticles in a breast cancer model. Cancer therapy research is of high interest because of the persistence and mortality of the disease and the side effects of traditional therapeutic methods, while often multimodal treatments are necessary based on the patient's needs. The development of less invasive modalities for recurring

treatment cycles is thus of critical significance. Herein, a light-activatable microparticle system was developed for localized, pulsatile delivery of anticancer drugs with simultaneous thermal ablation, by applying controlled ON-OFF thermal cycles using near-infrared laser irradiation. The system is composed of poly(caprolactone) microparticles of 200 Î¼m size with incorporated molybdenum disulfide (MoS (2)) nanosheets as the photothermal agent and hydrophilic doxorubicin or hydrophobic violacein, as model drugs. Upon irradiation the nanosheets heat up to â‰¥50 Â°C leading to polymer matrix melting and release of the drug. MoS (2) nanosheets exhibit high photothermal conversion efficiency and allow for application of low power laser irradiation for the system activation. A Machine Learning algorithm was applied to acquire optimal laser operation conditions; 0.4 W/cm (2) laser power at 808 nm, 3-cycle irradiation, for 3 cumulative minutes. In a mouse subcutaneous model of 4T1 triple-negative breast cancer, 25 microparticles were intratumorally administered and after 3-cycle laser treatment the system conferred synergistic phototherapeutic and chemotherapeutic effect. Our on-demand, pulsatile synergistic treatment resulted in increased median survival up to 40 days post start of treatment compared to untreated mice, with complete eradication of the tumors at the primary site. Such a system could have potential for patients in need of recurring cycles of treatment on subcutaneous tumors.

Diode Laser Irradiation Effects on Miniscrew Stability and IL-1Î² and TGF-Î²1 Levels: A Split-Mouth Randomized Controlled Clinical Trial. Introduction: This study aimed to assess the effect of low-level laser therapy (LLLT) on miniscrew stability and concentrations of interleukin-1Î² (IL-1Î²) and transforming growth factor-beta (TGF-Î²1) in peri-miniscrew crevicular fluid in the course of orthodontic treatment. Methods: This randomized split-mouth double-blind clinical trial evaluated 18 patients requiring anterior retraction along with maximum anchorage. Miniscrews were placed between the maxillary second premolar and first molar. A diode laser was irradiated with a 980-nm wavelength and 100-mW output power in continuous-wave mode at four time points: T0 (1 hour after miniscrew placement), T1 (1 week later), T2 (at 1 month) and T3 (at 3 months) in one quadrant of the maxilla (laser group). The other quadrant of the maxilla underwent the pseudo-application of the laser (control group). The primary stability of miniscrews was measured by Periotest M and reported as Periotest value (PTV). Also, at each time point, samples were collected from the peri-miniscrew crevicular fluid one hour after laser irradiation to assess the concentration of IL-1Î² and TGF-Î²1. Results: The mean PTV (inverse of the stability) was smaller in the laser group compared with the control group at all time points; this difference was significant at T2 and T3. The mean concentration of IL-1Î² in the laser group was lower than that in the control group at all time points, and this difference was significantly remarkable at T0 and T3. The mean concentration of TGF-Î²1 in the laser group was lower than that in the control group at T0, T1 and T3; however, the difference was not statistically significant. Conclusion: The current results supported the efficacy of LLLT in increasing the miniscrew stability and decreasing the level of IL-1Î² pro-inflammatory cytokine.

Photobiomodulation Therapy for Multiple Painful Fixed Drug Eruptions: The First Case Report. Introduction: Fixed drug eruption (FDE), a very specific adverse drug reaction and one of the most common types of drug eruption, generally resolves spontaneously within 7-10 days upon withdrawal of the causative agent; however, extensive and severe cases may also require systemic drug therapy. The present study aimed to report a case in which a broad spectrum of severe, painful lesions of FDE was managed with photobiomodulation therapy (PBMT). Case Report: A 31-year-old Caucasian woman presented with many extremely painful mucocutaneous lesions of FDE which had arisen 8 days before, following a long period of hospitalization. The lesions were not responsive to either corticosteroids or analgesics within 5 days, and then seven daily sessions of PBMT were proposed. Pain alleviation was achieved on the 1(st) day of PBMT, and the lesions showed an advanced course of healing on the 3(rd) day. Within 7 days of PBMT, the lesions were almost completely repaired. In a

3-month follow-up period, no relapse of any FDE lesion was reported. Conclusion: PBMT may be a promising strategy for the management of painful lesions of FDE refractory to conventional medication therapy. However, further studies are needed to confirm this hypothesis.

Photobiomodulation Therapy as an Adjuvant Treatment of Cervicofacial Liposuction Complications. Introduction: Cervical suction lipectomy (CSL) procedures result in practically inevitable complications after the operation, such as facial edema and bruise. Photobiomodulation therapy (PBMT) can be used for analgesia, modulation of inflammatory processes, and improved tissue healing. Case Report: We have reported two cases of patients in which this therapy was used to manage complications-related CSL. As they had already been medicated and still had these side effects, the PBMT was proposed for local analgesia, nerve repair, and modulation of the inflammatory process. Within 72 hours after a single PBMT session, there was an important reduction in the severity of all situations. Conclusion: PBMT seems safe and effective in managing pain and edema-related CSL.

Photobiomodulation Therapy for the Symptoms Related to Temporomandibular Joint Disk Displacement. Pain related to temporomandibular disorders (TMD) is a common problem that can significantly influence a patient's quality of life. Laser photobiomodulation (PBM) has been reported as a promising method in medicine for wound and bone healing, pain relief, and treatment of the temporomandibular joint (TMJ). Our clinical case aimed to demonstrate the effectivity of PBM using 1064â€‰nm Nd:YAG laser for the treatment of pain and restricted mandible movement in a patient with anterior disk displacement of the left TMJ, using subjective (pain on visual analogue scale - VAS) and objective outcome measures [dynamic magnetic resonance imaging (MRI)]. PBM was performed on the left condyle in four sessions using a 1064â€‰nm Nd:YAG laser with a flat-top handpiece. Results after 10 weeks showed an increase in mouth opening and a painless joint on palpation, with no reported adverse effects. An MRI of the TMJ confirmed the left disk displacement, however, with no signs of inflammation or effusion and with less pronounced disk deformity as compared with the first MRI examination. Use of PBM with Nd:YAG laser may be an efficient method for the management of orofacial pain in patients with acute and chronic TMJ disk displacements and may reduce the recovery time.

The use of low level laser therapy in conjunction with diode laser-assisted and conventional vestibuloplasty: Comparison of wound healing and vestibular depth gain. BACKGROUND: The aim of this study is to compare wound healing and vestibular depth gain in individuals undergoing vestibule deepening surgery using diode laser and conventional technique and to further investigate the possible wound healing effect of low-level laser therapy (LLLT). MATERIAL AND METHODS: 52 systemically healthy individuals with insufficient vestibular depth in the region of teeth 33-43 in the lower jaw were included. Following nonsurgical periodontal treatment, patients were divided into four groups as follows: a) diode laser (L); b) diode laserÂ +Â LLLT; c) conventional surgery and d) conventional surgeryÂ +Â LLLT. Vestibular depth and horizontal wound size measurements of the individuals were recorded using digital calipers. Reepithelization was evaluated via an image analysis program. RESULTS: Vestibular depth measurements were found to be higher in the conventional surgery groups compared to that of diode laser groups after the operation, while the results were not statistically different between groups (p >0.05). Reepithelization area did not differ between groups in the evaluated time periods (p >0,05). On the other hand, horizontal wound shrinkage was significantly higher in the conventional surgery group than that of diode laser. CONCLUSIONS: Within the limits of this study, both methods yielded in vestibule depth gain. On the other hand, LLLT did not have an additional positive effect on mucosal wound healing. As a clinical relevance, the results are valuable for clinicians in terms of showing that suturing of the mucosal flap formed following vestibule deepening should not be necessary in laser assisted surgery for attaining more vestibule

depth. Humans;Low-Level Light Therapy;Lasers, Semiconductor;Vestibuloplasty;Wound Healing;Laser Therapy

Effects of pulsed dye laser treatment in psoriasis: A nerve-wrecking process? Pulsed dye laser (PDL) therapy can be effective in treating psoriasis, with a long duration of remission. Although PDL therapy, albeit on a modest scale, is being used for decades now, the underlying mechanisms responsible for the long-term remission of psoriasis remain poorly understood. The selective and rapid absorption of energy by the blood causes heating of the vascular wall and surrounding structures, like perivascular nerves. Several studies indicate the importance of nerves in psoriatic inflammation. Interestingly, denervation leads to a spontaneous remission of the psoriatic lesion. Among all dermal nerves, the perivascular nerves are the most likely to be affected during PDL treatment, possibly impairing the neuro-inflammatory processes that promote T-cell activation, expression of adhesion molecules, leukocyte infiltration and cytokine production. Repeated PDL therapy could cause a prolonged loss of innervation through nerve damage, or result in a 'reset' of neurogenic inflammation after temporary denervation. The current hypothesis provides strong arguments that PDL treatment affects nerve fibres in the skin and thereby abrogates the persistent and exaggerated inflammatory process underlying psoriasis, causing a long-term remission of psoriasis. Humans;Lasers, Dye;Treatment Outcome;Psoriasis;Skin;Low-Level Light Therapy

Efficacy of electrophysical agents in fibromyalgia: A systematic review and network meta-analysis. OBJECTIVE: To examine the effectiveness of electrophysical agents in fibromyalgia. DATA SOURCES: CINAHL, Cochrane Library, Embase, Medline, PEDro, and Web of Science were searched from their inceptions to March 27, 2023. METHODS: This study was registered in PROSPERO (CRD42022354326). Methodological quality of included trials was assessed using PEDro scale, and the quality of evidence was determined according to the Grading of Recommendations Assessment, Development, and Evaluation system. The primary outcomes were pain, functional status, and mood. RESULTS: Fifty-four studies involving 3045 patients with fibromyalgia were eligible for qualitative synthesis and 47 (pain), 31 (functional status), and 26 (mood) for network meta-analysis. The network consistency model revealed that, when compared with true control, transcutaneous electrical nerve stimulation and microcurrent improved pain symptoms (Pâ€‰=â€‰0.006 and Pâ€‰=â€‰0.037, respectively); repetitive transcranial magnetic stimulation improved patient functional status (Pâ€‰=â€‰0.018); and microcurrent (Pâ€‰=â€‰0.001), repetitive transcranial magnetic stimulation (Pâ€‰=â€‰0.022), and no treatment (Pâ€‰=â€‰0.038) significantly improved mood after intervention. Surface under the cumulative ranking indicated that microcurrent was most likely to be the best for managing pain and mood (surface under the cumulative ranking: 70% and 100%, respectively); low-level laser therapy for pain and mood (80% and 70%, respectively); and repetitive transcranial magnetic stimulation for improving functional status and mood (80% and 70%, respectively). CONCLUSION: This review found low to moderate quality evidence that microcurrent, laser therapy, and repetitive transcranial magnetic stimulation are the most effective electrophysical agents for improving at least one outcome in fibromyalgia. Humans;Fibromyalgia;Network Meta-Analysis;Transcutaneous Electric Nerve Stimulation;Pain;Pain Management

Carpal tunnel syndrome conservative treatment: a literature review. PURPOSE: Carpal tunnel syndrome (CTS) is the most common compression neuropathy, which is associated with a significant psy- chosocial and economic burden. In this paper, the literature on the current knowledge about the physiology and pathology of peri- pheral nerves during the course of CTS is reviewed, with a focus on currently used treatment options and the rationale for their use. Epidemiology, risk factors, etiology, clinical features and conservative treatment have been searched for, with all full-text, English language articles being included in the study. This paper aims to present the recent findings on CTS treatment while also suggesting a direction for further clinical trials. VIEWS: The search in PubMed

and Google Scholar Databases revealed 229 articles of which 71 met the research criteria. The evidence regarding standard treatment methods of conservative CTS treatment is presented. CTS is a relatively common condition, which affects women more often than men. It is a multifactorial disease, and its clinical presentation mostly consists of symptoms distal to the entrapment site, including numbness, tingling, weakness and pain. Electrodiagnostic studies are considered to be the gold standard in CTS diagnosis. The conservative treatment methods reviewed are acupuncture, extracorporeal shock wave the- rapy, hydrodissection, kinesiotaping, corticosteroid injection, low level laser therapy, splints, platelet-rich plasma injection, manual therapy, ultrasound and phonophoresis. CONCLUSIONS: Based on the current body of knowledge, we conclude that the conservative CTS treatment is very safe, but the effec- tiveness of reviewed methods differs. The first promising results presented by various studies motivate the need for further research on novel treatment methods.

High-frequency near-infrared semiconductor laser irradiation suppressed experimental tooth movement-induced inflammatory pain markers in the periodontal ligament tissues of rats. High-frequency near-infrared (NIR) semiconductor laser-irradiation has an unclear effect on nociception in the compressed lateral periodontal ligament region, a peripheral nerve region. This study aimed to investigate the effects of NIR semiconductor laser irradiation, with a power of 120Â J, on inflammatory pain markers and neuropeptides induced in the compressed lateral periodontal ligament area during ETM. A NIR semiconductor laser [910Â nm wavelength, 45 W maximum output power, 300 mW average output power, 30Â kHz frequency, and 200Â ns pulse width (Lumix 2; Fisioline, Verduno, Italy)] was used. A nickel-titanium closed coil that generated a 50-g force was applied to the maxillary left-side first molars and incisors in 7-week-old Sprague-Dawley (280-300Â g) rats to induce experimental tooth movement (ETM) for 24Â h. Ten rats were divided into two groups (ETMâ€‰+â€‰laser, nâ€‰=â€‰5; ETM, nâ€‰=â€‰5). The right side of the ETM group (i.e., the side without induced ETM) was evaluated as the untreated group. We performed immunofluorescent histochemistry analysis to quantify the interleukin (IL)-1Î², cyclooxygenase-2 (COX2), prostaglandin E2 (PGE2), and neuropeptide [calcitonin gene-related peptide (CGRP)] expression in the compressed region of the periodontal tissue. Post-hoc Tukey-Kramer tests were used to compare the groups. Compared with the ETM group, the ETMâ€‰+â€‰laser group showed significant suppression in IL-1Î² (176.2â€‰Â±â€‰12.3 vs. 310.8â€‰Â±â€‰29.5; Pâ€‰<â€‰0.01), PGE2 (104.4â€‰Â±â€‰14.34 vs. 329.6â€‰Â±â€‰36.52; Pâ€‰<â€‰0.01), and CGRP (36.8â€‰Â±â€‰4.88 vs. 78.0â€‰Â±â€‰7.13; Pâ€‰<â€‰0.01) expression. High-frequency NIR semiconductor laser irradiation exerts significant effects on ETM-induced inflammation. High-frequency NIR semiconductor laser irradiation can reduce periodontal inflammation during orthodontic tooth movement. Calcitonin Gene-Related Peptide;Dinoprostone Rats;Animals;Periodontal Ligament;Rats, Sprague-Dawley;Calcitonin Gene-Related Peptide;Lasers, Semiconductor;Tooth Movement Techniques;Dinoprostone;Pain;Infrared Rays

Photobiomodulation for knee osteoarthritis: a model-based dosimetry study. LED-based photobiomodulation (LED-PBM) for the treatment of knee osteoarthritis (KOA) is a promising technology. However, the light dose at the targeted tissue, which dominates the phototherapy effectiveness, is difficult to measure. This paper studied the dosimetric issues in the phototherapy of KOA by developing an optical model of the knee and performing Monte Carlo (MC) simulation. The model was validated by the tissue phantom and knee experiments. In the study, we investigated the effect of luminous characteristics of the light source, such as divergence angle, wavelength and irradiation position, on the treatment doses for PBM. The result showed that the divergence angle and the wavelength of the light source have a significant impact on the treatment doses. The optimal irradiation location was on both sides of the patella, where the largest dose could reach the articular

cartilage. This optical model can be used to determine the key parameters in phototherapy and help the phototherapy of KOA patients.

Effects of intravascular photobiomodulation on cognitive impairment and crossed cerebellar diaschisis in patients with traumatic brain injury: a longitudinal study. The association between intravascular photobiomodulation (iPBM) and crossed cerebellar diaschisis (CCD) and cognitive dysfunction in patients with traumatic brain injury (TBI) remains unknown. We postulate that iPBM might enable greater neurologic improvements. The objective of this study was to evaluate the clinical impact of iPBM on the prognosis of patients with TBI. In this longitudinal study, patients who were diagnosed with TBI were recruited. CCD was identified from brain perfusion images when the uptake difference of both cerebella wasâ€‰>â€‰20%. Thus, two groups were identified: CCD(â€‰+) and CCD(â€‰-). All patients received general traditional physical therapy and three courses of iPBM (helium-neon laser illuminator, 632.8Â nm). Treatment assemblies were conducted on weekdays for 2 consecutive weeks as a solitary treatment course. Three courses of iPBM were performed over 2-3Â months, with 1-3Â weeks of rest between each course. The outcomes were measured using the Rancho Los Amigos Levels of Cognitive Functioning (LCF) tool. The chi-square test was used to compare categorical variables. Generalized estimating equations were used to verify the associations of various effects between the two groups. pâ€‰<â€‰0.05 indicated a statistically significant difference. Thirty patients were included and classified into the CCD(â€‰+) and CCD(â€‰-) groups (nâ€‰=â€‰15, each group). Statistics showed that before iPBM, CCD in the CCD(â€‰+) group was 2.74 (exp 1.0081) times higher than that of CCD(â€‰-) group (pâ€‰=â€‰0.1632). After iPBM, the CCD was 0.64 (exp-0.4436) times lower in the CCD(â€‰+) group than in the CCD(â€‰-) group (pâ€‰<â€‰0.0001). Cognitive assessment revealed that, before iPBM, the CCD(â€‰+) group had a non-significantly 0.1030 lower LCF score than that of CCD(â€‰-) group (pâ€‰=â€‰0.1632). Similarly, the CCD(â€‰+) group had a non-significantly 0.0013 higher score than that of CCD(â€‰-) after iPBM treatment (pâ€‰=â€‰0.7041), indicating no significant differences between the CCD(â€‰+) or CCD(â€‰-) following iPBM and general physical therapy. CCD was less likely to appear in iPBM-treated patients. Additionally, iPBM was not associated with LCF score. Administration of iPBM could be applied in TBI patients to reduce the occurrence of CCD. The study failed to show differences in cognitive function after iPBM, which still serves as an alternative non-pharmacological intervention. Humans;Brain Injuries, Traumatic;Cognitive Dysfunction;Diaschisis;Longitudinal Studies;Low-Level Light Therapy;Treatment Outcome;Male;Female;Adult;Middle Aged;Endovascular Procedures

Neuroprotective effects of photobiomodulation by hormesis on scopolamine induced neurodegenerative diseases of memory disorders in rats a paradigm shift. The loss and progressive dysfunction of neurons are hallmarks of neurodegenerative diseases. The aim of the current study is to explore the effects of photobiomodulation at 460-660â€‰nm (100-1000 lux units) on the progression of scopolamine-induced cognitive dysfunctions in Wistar male rats. Photobiomodulation (PBM) is defined as "the use of monochromatic or quasi-monochromatic light from a low-power laser or light-emitting diode (LED) source to modify or modulate biological functions." Neuroprotective activity was assessed by in vivo models such as the Morris water maze, the elevated plus maze (EPM), and the T-maze. After using scopolamine (1â€‰mg/kg/day) as a dementia induction model for 21â€‰days, the induction was primarily due to impairments in cholinergic transmission, oxidative stress, and inflammation. The in vitro determinations, including acetylcholinesterase (AChE), butyrylcholinesterase (BChE), reduced glutathione (GSH), malondialdehyde (MDA), superoxide dismutase (SOD), tumor necrosis factor-alpha (TNF-Î±), Interleukin 1 beta (IL-1Î²), and alkaline phosphatase (ALP), were assessed biochemicals and biomarkers. The structural and morphological integrity of the cortex and hippocampus was

investigated through histopathology. In vivo studies of exteroceptive behavior models such as the Morris water maze, the EPM, and the T-maze revealed that administration of scopolamine resulted in enhanced escape latency time (ELT), transfer latency (TL), and decreased percentage alternation, respectively. The levels of AChE, BChE, reduced, GSH, SOD, TNF-Î±, IL-1Î² and ALP were increased, while MDA level was decreased. In contrast to normal and control groups with treatment groups, histopathology of the cortex and hippocampus examination revealed the maintenance of structural integrity and densities of CA1 and CA3 neuronal cells. However, network pharmacology predicted Ca(+2) modulation of various pathways, among the treatments with red LED light showed highly significant amelioration compared with normal and control groups. Photobiomodulation by hormesis, chromophores in cells, and tissues excitation can influence neuroprotective effect mainly by scavenging of ROS, variation in the level of GSH MDA and SOD mitochondrial electron transfer, the improved abscopal effects on improved in gut microbiome by resembles the of fecal ALP level correlation of intestinal microbiome, cholinergic neurotransmissions, anti-inflammatory, and antioxidant activities. Scopolamine;Neuroprotective Agents;Acetylcholinesterase;Butyrylcholinesterase;Tumor Necrosis Factor-alpha;Cholinergic Agents;Superoxide Dismutase Rats;Male;Animals;Scopolamine;Neuroprotective Agents;Neurodegenerative Diseases;Acetylcholinesterase;Hormesis;Butyrylcholinesterase;Tumor Necrosis Factor-alpha;Rats, Wistar;Maze Learning;Memory Disorders;Oxidative Stress;Cholinergic Agents;Superoxide Dismutase;Hippocampus

Photobiomodulation at 660Â nm promotes collagen synthesis via downregulation of HIF-1Î± expression without photodamage in human scleral fibroblasts in vitro in a hypoxic environment. PURPOSE: The increasing prevalence of myopia is a global public health issue. Because of the complexity of myopia pathogenesis, current control methods for myopia have great limitations. The aim of this study was to explore the effect of photobiomodulation (PBM) on human sclera fibroblasts (HSFs) under hypoxia, in the hope of providing new ideas for myopia prevention and control. METHODS: Hypoxic cell model was established at 0, 6, 12, and 24Â h time points to simulate myopia microenvironment and explore the optimal time point. Control, hypoxia, hypoxia plus light, and normal plus light cell models were set up for the experiments, and cells were incubated for 24 or 48Â h after PBM (660Â nm, 5Â J/cm(2)), followed by evaluation of hypoxia-inducible factor 1Î± (HIF-1Î±) and collagen I a1 (COL1A1) proteins using Western blotting and immunofluorescence, and photo damage was detected by CCK-8, scratch test, and flow cytometry assays. We also used transfection technology to further elucidate the regulatory mechanism. RESULTS: The change of target proteins is most obvious when hypoxia lasts for 24Â h (pâ€‰<â€‰0.01). PBM at 660Â nm increased extracellular collagen content (pâ€‰<â€‰0.001) and downregulated expression of HIF-1Î± (pâ€‰<â€‰0.05). This treatment did not affect the migration and proliferation of cells (pâ€‰>â€‰0.05), and effectively inhibited apoptosis under hypoxia (pâ€‰<â€‰0.0001). After overexpression of HIF-1Î±, the effect of PBM was attenuated (pâ€‰>â€‰0.05). CONCLUSIONS: Photobiomodulation at 660Â nm promotes collagen synthesis via downregulation of HIF-1Î± expression without photodamage. Hypoxia-Inducible Factor 1, alpha Subunit Humans;Down-Regulation;Cell Hypoxia;Sclera;Hypoxia;Fibroblasts;Myopia;Hypoxia-Inducible Factor 1, alpha Subunit

Low-Intensity Visible and Near-Infrared Light-Induced Cell Signaling Pathways in the Skin: A Comprehensive Review. Objective: To describe current knowledge regarding established and putative cell signaling pathways involved in skin photobiomodulation. Background: The skin is the largest and most accessible organ of the body. It is the first line of defense against the external environment, including solar radiation. Among solar rays, visible and infrared non-ionizing photons may reach human skin and trigger a cascade of non-thermal cell signaling pathways called

photobiomodulation (PBM). The use of PBM using artificial light sources has been known for more than 50 years, but it has not yet been widely accepted due to uncertainty about the cellular mechanisms of action. However, much knowledge has been gained in this field in recent years, which will be summarized in this review. Methods: An extensive literature review was performed using Medline, Embase, and Google Scholar as research databases to acquire relevant publications in this particular field. Results: A comprehensive description of chromophores, primary and secondary effectors is provided in addition to a visual representation of known and putative cell signaling mechanisms involved in such complex light-skin interactions. Also, a summary of clinical indications of skin PBM, key light parameters, and promising skin applications (local and systemic) are mentioned. Conclusions: In PBM, skin cells are the first to absorb photons, triggering specific cell-signaling pathways through primary and secondary effectors, leading to enhanced cell repair and survival, notably in hypoxic or stressed cells. A better understanding of the mechanisms of action will help us optimize known indications and discover new ones. Humans;Low-Level Light Therapy;Skin;Infrared Rays;Signal Transduction;Photons

Can Collagen Membrane on Bone Graft Interfere with Light Transmission and Influence Tissue Neoformation During Photobiomodulation? A Preliminary Study. Objective: This study qualitatively and quantitatively evaluated the transmission of light through a collagen membrane and the consequent local bone formation in a critical bone defect in vitro and in an animal model. Background: Currently, bone substitutes and collagen membranes are used to promote new bone formation; however, when associated with photobiomodulation, biomaterials can act as a barrier, hindering the passage of light radiation to the area to be treated. Methods: Light transmittance was evaluated in vitro with a power meter and a 100â€‰mW, 808â€‰nm laser source with and without membrane. Twenty-four male rats received a critical surgical defect of 5â€‰mm in diameter in the calvarial bone, subsequently a biomaterial (Bio-Oss; Geistlich(Â®), Switzerland) was applied, and the animals were divided into the following three groups: G1-collagen membrane and no irradiation; G2-collagen membrane and photobiomodulation (irradiation with 4â€‰J of 808â€‰nm); and G3-photobiomodulation (4â€‰J) followed by a collagen membrane. Histomophometric analyses were performed at 7 and 14 days after euthanasia. Results: The membrane reduced the light transmittance (808â€‰nm) by an average of 78%. Histomophometric analyses showed significant differences in new blood vessels on day 7 and bone neoformation on day 14. Irradiation without membrane interposition resulted in a 15% more neoformed bone compared with the control (G1), and 6.5% more bone compared with irradiation over the membrane (G2). Conclusions: The collagen membrane interferes with light penetration during photobiomodulation, decreases light dosimetry on the wound area, and interferes with bone neoformation. Biocompatible Materials;Collagen Animals;Male;Rats;Biocompatible Materials;Bone and Bones;Collagen;Osteogenesis;Rats, Wistar

Effects of photobiomodulation therapy (PBMT) over endothelial function in healthy individuals: a preliminary crossover clinical trial. Photobiomodulation therapy (PBMT) causes stimulatory effects that raise cell metabolism. The study aimed to evaluate the effects of PBMT on the endothelial function of healthy individuals. It was aÂ controlled, randomized, crossover, triple-blind trial with 22 healthy volunteers (female: 77.3%), aged 25.45Â years which were randomly divided into three groups. PBMT with gallium-aluminum-arsenide (GaAlAs) diode laser (810Â nm, continuous-wave mode, 1000 mW, 0.28 cm(2)) was applied over the radial and ulnar artery regions in two parallel spots: group 1-30Â J (nâ€‰=â€‰22, 107Â J/cm(2)) per spot; group 2-60Â J (nâ€‰=â€‰22, 214Â J/cm(2)) per spot; and group 3-placebo (nâ€‰=â€‰22, sham). The endothelial function was measured before and immediately after PBMT by the flow-mediated dilation technique (%FMD) with high-resolution ultrasound. Statistical analysis was made with ANOVA for repeated measures, the effect size was measured by Cohen's d, and results are presented as mean and standard error (or 95%

confidence intervals). A p-valueâ€‰<â€‰0.05 was considered statistically significant. The %FMD increases 10.4% with 60Â J (mean differenceâ€‰=â€‰0.496Â mm, 95% CIâ€‰=â€‰0.42 to 0.57, pâ€‰<â€‰0.001), 7.3% with 30Â J (mean differenceâ€‰=â€‰0.518Â mm, 95% CIâ€‰=â€‰0.44 to 0.59, pâ€‰<â€‰0.001), and 4.7% with placebo (mean differenceâ€‰=â€‰0.560Â mm, 95% CIâ€‰=â€‰0.48 to 0.63, pâ€‰<â€‰0.001). We found a small effect size (pâ€‰=â€‰0.702; d de Cohenâ€‰=â€‰0.24) without statistical difference between interventions. PBMT with the energy density of 60Â J and 30Â J did not improve endothelial function.Trial registration number:Â NCT03252184 (01/09/2017). Humans;Female;Low-Level Light Therapy;Lasers, Semiconductor;Research Design;Cross-Over Studies

Low-level laser selectively inhibiting colorectal cancer cell metabolic activity and inducing apoptosis for delaying the development of intestinal cancer. Low-level laser irradiation (LLLI) is a novel approach that shows promise for the treatment of colorectal cancer (CRC). However, the molecular mechanisms underlying its biochemical effects and gene expression remain unclear. Here, LLLI (632.8Â nm) was used to treat CRC RKO cells and normal small intestinal NCM460 cells. LLLI showed a significant dose- and time-dependent effect on cell viability, in which a single dose of irradiation at 15Â J/cm(2) selectively inhibited the growth of RKO cells but largely unaffected the activity of NCM460 cells. And then, LLLI produced an internal response, effectively reducing the level of H(2)O(2) in tumor cells, downregulating the mitochondrial membrane potential, and improving the efficiency of apoptosis in CRC, but no internal response was observed in NCM460 cells under the same conditions. Furthermore, the expression of several important genes in the classical WNT pathway was significantly downregulated, and the pathway was inactivated after LLLI intervention, thereby inhibiting tumor cell growth. Simultaneously, TNF-Î± was effectively activated to stimulate the caspase family members of the death effector to initiate apoptosis led by the extrinsic pathway. LLLI successfully achieves tumor cell normalization while delivering a potent anticancer effect, expected to be a novel therapeutic modality for CRC. Hydrogen Peroxide Humans;Hydrogen Peroxide;Cell Proliferation;Lasers;Colorectal Neoplasms;Apoptosis;Cell Line, Tumor

Photobiomodulation using 940-nm laser as an adjuvant therapy on orthognathic surgery: A randomized clinical trial. This study aimed to evaluate the effectiveness of photobiomodulation (PBM) therapy using 940-nm laser in patients undergoing orthognathic surgery. Twenty individuals were randomly distributed into laser (nâ€‰=â€‰10) and control (nâ€‰=â€‰10) groups. The PBM was conducted immediately after surgery, after 24â€‰h, 48â€‰h, and weekly for up to 4â€‰weeks. All participants were evaluated for pain, edema, trismus and paresthesia. Data were compared by Fisher's and Mann-Whitney or chi-square tests (5%). The pain decreased from 24â€‰h to 4â€‰weeks, with the laser group reaching any pain after 3â€‰weeks (pâ€‰<â€‰0.001). A significant difference was noticed for trismus on days 14 and 30 (pâ€‰=â€‰0.002; pâ€‰=â€‰0.019), without difference in paresthesia (pâ€‰=â€‰0.198). Edema was lower on the laser group compared to control, without a significant difference for most measurements. Data indicate that 940-nm PBM therapy decreased the occurrence of postoperative pain and significantly improved trismus. Humans;Trismus;Orthognathic Surgery;Paresthesia;Pain, Postoperative;Low-Level Light Therapy;Lasers, Semiconductor;Edema

Effects of 660-nm LED photobiomodulation on drebrin expression pattern and astrocyte migration. Photobiomodulation (PBM) is a therapeutic tool that uses red or near-infrared light in medical applications. It's applications in both central (CNS) and peripheral nervous system (PNS) are widely studied. Among glial cells, astrocytes are known to be activated in injured or damaged brains. Astrocytic cell migration is crucial for maintaining homeostasis in the brain. Our previous study showed that PBM led to astrocyte proliferation and differentiation, but the effects on migration has not been investigated. The aim of this study was to evaluate the effect of PBM on astrocyte

migration, drebrin (DBN) expression and cytoplasmic morphology using primary cultured rat astrocyte. We applied a 660-nm light-emitting diode (LED) with fluence of 6, 12 and 18Â J/cm(2). PBM effects on astrocyte migration were analyzed by two different migration assays (scratch assay and transwell assay). We used immunofluorescence microscopy for visualizing DBN and glial-fibrillary acidic protein (GFAP) and analysis of DBN expression and astrocyte cytoplasmic morphology. Both scratch assay and transwell assay showed significant difference in astrocyte migration following PBM irradiation. With these specific fluence conditions, differences in DBN expression and cell morphology were revealed. PBM could increase the astrocyte migration by altering the cell morphology and DBN expression pattern. drebrins Rats;Animals;Astrocytes;Cell Proliferation;Brain;Cell Movement

3-month post-procedural evaluation of a combined intense pulsed light and photo-biomodulation system in the treatment of meibomian gland dysfunction. PURPOSE: Meibomian gland dysfunction (MGD) is the leading cause of dry eye syndrome. It is a frequent and underdiagnosed condition with a significant socioeconomic impact. We propose here the evaluation of a platform combining intense pulsed light and photo-biomodulation in the treatment of Meibomian gland dysfunction. METHODS: We conducted a retrospective study at Brest University Hospital analyzing a cohort of 74 eyes (37 patients) at 1Â month and 3Â months after a protocol of 3 Eye-LightÂ® (Espansione Group, Italy) sessions 14Â days apart between JanuaryÂ 2019 and AprilÂ 2020. The primary outcome was the change in OSDI quality of life score. Secondary outcomes were the SPEED questionnaire score; tear break-up time (BUT), Oxford score, non-invasive break-up time (NIBUT), lipid layer thickness, lacrimal meniscus height and Meibomian gland atrophy rate. Tolerance of the treatment was also evaluated. RESULTS: We found a significant improvement in OSDI scores at 1Â month (-17.32; 95% CI (-25.84; -8.79), P<0.0001) and 3Â months (-16.95; 95% CI (-25.26; -8.64), P<0.0001). The SPEED score, BUT, Oxford score, Meibomian gland atrophy and NIBUT were also statistically significantly improved. Tolerance to treatment was very good despite two cases of herpetic keratitis, which resolved on treatment. CONCLUSION: Treatment with the Eye-LightÂ® in three sessions every two weeks significantly reduced symptoms and ocular surface damage in patients with MGD. This data suggests that the use of Eye-LightÂ® may represent a good option for patients with MGD. Humans;Meibomian Gland Dysfunction;Retrospective Studies;Quality of Life;Meibomian Glands;Dry Eye Syndromes;Tears;Atrophy

Management of oral mucositis: a systematic review. INTRODUCTION: Oral mucositis is one of the most common complications following chemotherapy and/or head and neck radiotherapy. Various treatments for oral mucositis have been proposed. However, there has still been no review of the most frequent and most effective type of therapy to treat oral mucositis. This systematic review aims to determine the most frequent and effective types of therapy to treat and reduce the severity of oral mucositis. EVIDENCE ACQUISITION: The literature search was carried out using PRISMA guidelines. Publications included from 2010 to June 2021 with a clinical trial, prospective, and retrospective observational research design. The following databases were used: PubMed, Cochrane Library, and Wiley Online Library. The search was for limited articles published in English, which were screened and analyzed by three authors. The risk of bias of each study was also assessed by three authors simultaneously, using different types of instruments depending on its study design. EVIDENCE SYNTHESIS: Forty-seven of 1274 journals were included. From 3577 subjects, oral mucositis was more common in males than females (2.12: 1), with a mean age of 56.39 (18-90 years). The most commonly used types of therapy are low-level laser therapy (396 subjects) and lysozyme-based compounds (314 subjects). Meanwhile, the most effective type of therapy is low-level laser therapy. CONCLUSIONS: Low-level laser therapy is the most commonly used oral mucositis therapy and is also the most effective in reducing the degree of oral mucositis and associated pain.

Photobiomodulation ameliorates inflammatory parameters in fibroblast-like synoviocytes and experimental animal models of rheumatoid arthritis. INTRODUCTION: Rheumatoid arthritis (RA) is a chronic destructive inflammatory disease that afflicts over one percent of the world's population. Current pharmacological treatments remain relatively ineffective. In this context, photobiomodulation (PBM) is a potential resource for the treatment of RA. This study investigates investigate the anti-arthritic effects and related mechanisms of PBM on fibroblast-like synoviocytes (FLSs) from RA patients and a mouse model of collagen-induced arthritis (CIA). METHODS: The RA-FLSs were irradiated with a light emitting diode (LED) at a wavelength of 610 nm for 20Â min, and the corresponding power intensities were 5 and 10 mW/cm(2). After the LED irradiation, cell viability, proliferation, migration, and invasion assays were performed. Male DBA/1J mice were used to establish an animal model of CIA. Light stimulation with 10 mW/cm(2) was applied to the ankle joints via direct contact with the skin for 40Â min, daily for 2 weeks. RESULTS AND DISCUSSION: PBM significantly reduced tumor necrosis factor (TNF)-Î±-induced increase in proliferation, migration, and invasion in RA-FLSs, and downregulated the activation of nuclear factor-ÎºappaB (NF-ÎºB) and NLRP3 inflammasome by TNF-Î±. Moreover, PBM greatly inhibited the induction and development of CIA, resulting in the inhibition of synovial inflammation and cartilage degradation. PBM therapy decreased the serum levels of pro-inflammatory cytokines, while increasing the anti-inflammatory cytokines. PBM suppressed the translocation of NF-ÎºB and activation of NLRP3 inflammasome in the ankle joint. Furthermore, PBM showed a more pronounced anti-arthritic effect when combined with methotrexate (MTX), a disease-modifying anti-rheumatic drug (DMARD). The results showed that the effectiveness of MTX + PBM in CIA is superior to that of either MTX or PBM and that both work synergistically. Therefore, PBM with LED may be a potential therapeutic intervention for against RA. NF-kappa B;Inflammasomes;NLR Family, Pyrin Domain-Containing 3 Protein;Cytokines;Antirheumatic Agents;Tumor Necrosis Factor-alpha Mice;Animals;Male;Synoviocytes;NF-kappa B;Inflammasomes;NLR Family, Pyrin Domain-Containing 3 Protein;Mice, Inbred DBA;Arthritis, Rheumatoid;Disease Models, Animal;Arthritis, Experimental;Cytokines;Antirheumatic Agents;Tumor Necrosis Factor-alpha;Fibroblasts

Systemic vascular photobiomodulation accelerates the recovery of motor activity in rats following spinal cord injury. OBJECTIVES: Spinal cord injury (SCI) causes the discontinuity of the spinal canal, leading to functional and sensorial losses in areas below the injury, which are often irreversible. Photobiomodulation (PBM) can enhance the neuromuscular repair process, especially in cases of peripheral nerve injuries. However, there is little knowledge regarding the effects of this therapeutic modality on recovery following a SCI, especially the noninvasive systemic form denominated vascular PBM (VPBM). To analyze the effects of VPBM in the immediate, acute and intermediate phases following a compression-induced SCI on morphological aspects of neuromuscular tissue repair, functional recovery and the protein expression of brain-derived neurotrophic factor (BDNF). METHODS: Wistar rats were divided into five groups: control, SCI, SCIâ€‰+â€‰VPBM-Im (immediate administration of VPBM), SCIâ€‰+â€‰VPBM-2h (VPBM administered 2â€‰h after injury) and SCIâ€‰+â€‰VPBM-14d (VPBM administered 14 days after injury). VPBM was administered in the region of the caudal vein/artery with low-level laser (AsGaAl, 780â€‰nm, 80â€‰J/cmÂ², 40â€‰mW for 80â€‰s, totaling an energy of 3.2â€‰J over a single point) for 14 consecutive days. During the analysis periods (1, 3, 7, 14, 21, 28 and 35 days after injury), functioning was evaluated using the Basso-Beattie-Bresnahan (BBB) index. At the end of each experimental period, blood samples were collected for the determination of the concentration of circulating BDNF using ELISA. Muscle tissue and nerve tissue samples were also extracted for morphological and histological analyses using H&E staining. RESULTS: SCIâ€‰+â€‰VPBM-Im and SCIâ€‰+â€‰VPBM-2â€‰h led to the recovery of motor function beginning on the 7th day after

injury (pâ€‰<â€‰0.05), an increase in the cross-sectional area (CSA) of the muscle fibers in the second week (pâ€‰<â€‰0.05) and an increase in muscle fiber diameter beginning on Day 14 (pâ€‰<â€‰0.05). Early irradiation had a greater effect on the reduction in the size of the cavity, with stabilization of the cavity found on Day 7 (pâ€‰<â€‰0.05). Considering the circulating BDNF levels, no changes was found during the experimental periods. CONCLUSION: The present results showed that VPBM was capable of modulating morphological and functional recovery following SCI, especially when administered early. The positive effects on functional recovery were demonstrated by the BBB index; the reestablishment of the structure of the muscle and nerve tissue was demonstrated by the preservation of CSA and diameter of muscle fiber and reduction in the area of the injury (cavity size) respectively. Thus, noninvasive VPBM may be an important component of treatment for spinal cord injuries. Brain-Derived Neurotrophic Factor Rats;Animals;Brain-Derived Neurotrophic Factor;Rats, Sprague-Dawley;Rats, Wistar;Spinal Cord Injuries;Motor Activity;Recovery of Function

The use of photobiomodulation therapy for the management of chemotherapy-induced alopecia: a randomized, controlled trial (HAIRLASER trial). PURPOSE: The purpose of this trial was to evaluate if photobiomodulation (PBM) can accelerate hair regrowth after chemotherapy in breast cancer patients and if this is correlated with a better quality of life (QoL). METHODS: A randomized controlled trial with breast cancer patients that underwent an anthracycline and taxane-containing chemotherapy regimen was set up at the Jessa Hospital (Hasselt, Belgium). Patients were randomized into the control group (no intervention) or the PBM group (three PBM sessions each week for 12Â weeks, starting the last day of their chemotherapy). Hair regrowth was evaluated based on photographic assessments. Two blinded researchers independently scored the hair regrowth using a numerical rating scale (NRS). In addition, the QoL was measured using the European Organization for Research and Treatment-QOL questionnaire and Breast Cancer-specific module (EORTC QLQ-C30 and QLQ-BR23). Data were collected on the day of their last chemotherapy session and 1, 2, and 3Â months post-chemotherapy. RESULTS: A total of 32 breast cancer patients were included in the trial between June 2020 and February 2022. Significantly higher NRS scores were observed in the PBM group at 1-month post-chemotherapy compared to baseline, whereas they remained constant in the control group. Patients allocated to the PBM group scored their global health significantly higher at all time points compared to the control. CONCLUSION: Based on the results of the HAIRLASER trial, PBM seems to accelerate hair regrowth after chemotherapy in breast cancer patients resulting in an improved global health status and better body image. The study was registered in July 2019 at ClinicalTrials.gov (NCT04036994). Antibiotics, Antineoplastic Humans;Female;Quality of Life;Low-Level Light Therapy;Breast Neoplasms;Antibiotics, Antineoplastic;Alopecia

Photobiomodulation for the management of xerostomia and oral mucositis in patients with cancer: a randomized clinical trial. To evaluate the applicability of photobiomodulation therapy (PBM-T) in the management of xerostomia and OM. Fifty-three patients with head and neck squamous cell carcinoma were randomized into two groups: Sham and PBM-T. The Sham group received artificial saliva and laser simulation, while the PBM-T group received artificial saliva and PBM-T. Xerostomia-related quality of life (QoL), the presence or absence of OM lesions, the decayed-missing-filled teeth (DMFT) index, and periodontal charts were evaluated. The results of the QoL questionnaire, DMFT index, and periodontal chart were analyzed with the Kruskal-Wallis test, followed by the Student-Newman-Keuls test, while OM findings were compared using the Mann-Whitney test. QoL scores significantly increased in the Sham group (pâ€‰<â€‰0.0001), denoting more severe xerostomia symptoms (pâ€‰=â€‰0.0074), and decreased in the PBM-T group, indicating no or very mild xerostomia. Higher grades of OM were found in the Sham group than the PBM-T group

(pâ€‰=â€‰0.0001). There was no significant difference in DMFT index or periodontal charts between the groups (pâ€‰>â€‰0.05). PBM-T improved QoL in patients with head and neck cancer treated with radiotherapy, whether as radiation alone or as an adjunct to chemotherapy and surgery. Saliva, Artificial Humans;Quality of Life;Saliva, Artificial;Stomatitis;Head and Neck Neoplasms;Xerostomia;Low-Level Light Therapy

Acoustic evaluation of photobiomodulation effect on in vitro human blood samples. Although positive photobiomodulation response on wound healing, tissue repair, and therapeutic treatment has been widely reported, additional works are still needed to understand its effects on human blood. This research carried out acoustic measurements using A-scan (GAMPT) ultrasonic techniques to elucidate the photobiomodulation effects on in vitro human blood samples as therapeutic treatment measures. The human blood samples were irradiated using a 532-nm laser with different output laser powers (60 and 80 mW) at various exposure times. The ultrasonic velocity measured in the human blood samples after laser irradiation showed significant changes, most of which were within the acceptance limit for soft tissues (1570 [Formula: see text] 30Â m/s). Abnormal cells (echinocyte and crenation) were observed due to excessive exposure during laser treatment. Humans;Low-Level Light Therapy;Wound Healing;Lasers, Semiconductor;Acoustics;Light

Photobiomodulation at 660 nm Stimulates In Vitro Diabetic Wound Healing via the Ras/MAPK Pathway. Diabetic foot ulcers (DFUs) are open chronic wounds that affect diabetic patients due to hyperglycaemia. DFUs are known for their poor response to treatment and frequently require amputation, which may result in premature death. The present study evaluated the effect of photobiomodulation (PBM) at 660 nm on wound healing via activation of Ras/MAPK signalling in diabetic wounded cells in vitro. This study used four human skin fibroblast cell (WS1) models, namely normal (N), wounded (W), diabetic (D), and diabetic wounded (DW). Cells were irradiated at 660 nm with 5 J/cm(2). Non-irradiated cells (0 J/cm(2)) served as controls. Cells were incubated for 24 and 48 h post-irradiation, and the effect of PBM on cellular morphology and migration rate, viability, and proliferation was assessed. Basic fibroblast growth factor (bFGF), its phosphorylated (activated) receptor FGFR, and phosphorylated target proteins (Ras, MEK1/2 and MAPK) were determined by enzyme-linked immunosorbent assay (ELISA) and Western blotting; nuclear translocation of p-MAPK was determined by immunofluorescence. PBM resulted in an increase in bFGF and a subsequent increase in FGFR activation. There was also an increase in downstream proteins, p-Ras, p-MEK1/2 and p-MAPK. PBM at 660 nm led to increased viability, proliferation, and migration as a result of increased bFGF and subsequent activation of the Ras/MAPK signalling pathway. Therefore, this study can conclude that PBM at 660 nm stimulates in vitro diabetic wound healing via the bFGF-activated Ras/MAPK pathway. Humans;Diabetes Mellitus;Wound Healing;Signal Transduction

Photobiomodulation Reduces the Cytokine Storm Syndrome Associated with COVID-19 in the Zebrafish Model. Although the exact mechanism of the pathogenesis of coronavirus SARS-CoV-2 (COVID-19) is not fully understood, oxidative stress and the release of pro-inflammatory cytokines have been highlighted as playing a vital role in the pathogenesis of the disease. In this sense, alternative treatments are needed to reduce the level of inflammation caused by COVID-19. Therefore, this study aimed to investigate the potential effect of red photobiomodulation (PBM) as an attractive therapy to downregulate the cytokine storm caused by COVID-19 in a zebrafish model. RT-qPCR analyses and protein-protein interaction prediction among SARS-CoV-2 and Danio rerio proteins showed that recombinant Spike protein (rSpike) was responsible for generating systemic inflammatory processes with significantly increased levels of pro-inflammatory (il1b, il6, tnfa, and nfkbiab), oxidative stress (romo1) and energy metabolism (slc2a1a and coa1) mRNA markers, with a pattern similar to those observed in COVID-19 cases in humans. On the other hand, PBM treatment was able to decrease the mRNA levels of these pro-inflammatory and oxidative stress markers

compared with rSpike in various tissues, promoting an anti-inflammatory response. Conversely, PBM promotes cellular and tissue repair of injured tissues and significantly increases the survival rate of rSpike-inoculated individuals. Additionally, metabolomics analysis showed that the most-impacted metabolic pathways between PBM and the rSpike treated groups were related to steroid metabolism, immune system, and lipid metabolism. Together, our findings suggest that the inflammatory process is an incisive feature of COVID-19 and red PBM can be used as a novel therapeutic agent for COVID-19 by regulating the inflammatory response. Nevertheless, the need for more clinical trials remains, and there is a significant gap to overcome before clinical trials can commence. Cytokines;RNA, Messenger;ROMO1 protein, human;Membrane Proteins;Mitochondrial Proteins Animals;Humans;COVID-19;Zebrafish;SARS-CoV-2;Cytokine Release Syndrome;Cytokines;RNA, Messenger;Membrane Proteins;Mitochondrial Proteins

Efficacy of Photobiomodulation Therapy in the Treatment of Pain and Inflammation: A Literature Review. The main objective of this literature review was to analyze the efficacy of (PBM) therapy application on subjects with chronic pain and inflammation, and furthermore, to evaluate the methodological quality of the collected literature. The search was conducted using five databases: PubMed, ProQuest, Scopus, Web of Science, and PEDro. The keywords "low level laser therapy", "chronic pain", and "inflammation" provided the selection of RCTs that were published within the last 5 years, conducted in humans, and written in English. The PEDro Internal Validity Scale (IVS) checklist was used to evaluate the risk of bias in the included studies. A total of 11 articles were selected, all of them RCTs. Of the articles, five showed that PBM positively influences chronic pain, while another showed the same but only in the short term. In two other articles, the patient's inflammation improved markedly. In one article there was no improvement in chronic pain and in another, there was no improvement in inflammation. Four articles demonstrated that PBM is beneficial in acute pain. Furthermore, six studies were given an "excellent" score and the remaining five a "good" score based on the IVS. Photobiomodulation has beneficial effects on chronic pain and inflammation, although more research needs to be completed in this line for this to be clarified as the existence of RCTs on this subject is limited.

Er: YAG laser assisted photodynamic therapy for the management of severe oral epithelial dysplasia with innate and adaptive immune responses. Oral epithelial dysplasia (OED) in oral potentially malignant disorders (OPMDs) increases the risk of malignant transformation. However, the management of OED is not well defined. Photodynamic therapy (PDT) is a hypotoxic, highly selective and minimally-invasive operation which reduces morbidity and disfigurement greatly. Additionally, laser ablation guaranteed a better penetration for topical application of 5-aminolaevulinic acid (ALA)-PDT. Herein, we present a case of a large lesion of oral leukoplakia (OLK) in left tongue dorsum and lateral margin, pathologically manifested as severe epithelial dysplasia (SED). We firstly discussed the feasibility of Er: YAG laser assisted PDT for the treatment of SED in OPMDs. The patient achieved complete remission at 1 year follow-up. Downregulated number of p53 and Ki67 positive cells were observed in the tissues after Er: YAG laser assisted PDT. In addition, increased CD8+ positive cells infiltrated around the tissues and increased natural killer (NK) cells level were detected in the peripheral blood. In summary, Erbium:yttrium-aluminum-garnet (Er:YAG) laser assisted PDT is an effective and promising treatment for the management of SED in OPMDs with innate and adaptive immune responses. Photosensitizing Agents;Aminolevulinic Acid Humans;Photosensitizing Agents;Photochemotherapy;Lasers, Solid-State;Aminolevulinic Acid;Laser Therapy;Precancerous Conditions;Carcinoma in Situ;Immunity

Low-Level Laser Therapy for Rheumatoid Arthritis: A Review of Experimental Approaches. Introduction: Rheumatoid arthritis (RA) is an inflammatory and autoimmune disorder that is characterized by joint inflammation, pain, physical disability, and morning stiffness. In the present

study, the effect of low-level laser therapy (LLLT) on RA was reviewed. Methods: "Low-level laser therapy", "rheumatoid arthritis disease", and "photobiomodulation" keywords were searched in Google Scholar, PubMed, and Medline. Results: A literature survey led to a discussion about the immunology of the RA, laser therapy, mechanism of LLLT action, and anti-inflammatory and immunomodulatory properties of LLLT. Conclusion: It was concluded that LLLT could improve RA patients' quality of life, reduce pain, and enhance physical movement.

Effective Combination Therapy with Human Amniotic Membrane Mesenchymal Stem Cells and Low-Level Laser Therapy in Wound Healing in Animal Models. Introduction: Many studies have recognized the importance of new methods in wound healing. This study aims to investigate the healing effects of allograft extra embryonic mesenchymal stem cells (MSCs) with and without low-level diode laser irradiation when grafted into full-thickness skin defects in diabetic animal models. Methods: In this experimental study, in order to make the rats diabetic, we used an intra-peritoneal injection of streptozotocin. Human amniotic membrane derived mesenchymal stem cells (hAMSCs) were irradiated with a low-level diode laser. Two full-thickness excisions were made on the backs of the rats. Next, the rats were divided into the following groups: group 1: low-level laser (LLL) irradiated hAMSCs and group 2: hAMSCs alone transplanted into skin wound. Histopathologic, ultrasound and elasticity evaluations were performed 7, 14 and 21 days after grafting. Results: In the evaluated rats, epithelial formation was on day 7 and increased until day 14. On days 7, 14 and 21, the percentage of epithelial formation in the irradiated cell group was significantly higher than that in the cell group, so that, on day 21, the epithelium in this group completely covered the wound surface while in the control group the wound surface was still not completely covered. In terms of angiogenesis, on day 7, the irradiated cells were significantly lower than the cells. Also, the formation of collagen in the cellular hydrogel group could confirm the effectiveness of amniotic MSCs in collagen production and thus accelerate the wound healing process. In comparison with hAMSCs alone, irradiated hAMSCs increased the thickness and elasticity of the skin. Conclusion: Low-power laser along with MSCs can be effective in improving chronic wound condition in the animal model.

The Effect of Low-Level Laser Therapy on the Viability of Human Dental Pulp Stem Cells. Introduction: This study assessed the effect of low-level laser (LLL) irradiation on the viability of dental pulp stem cells (DPSCs). Methods: In this in vitro experimental study, human DPSCs were purchased from the cell bank of Iranian Genetic Resources and cultured in flasks containing Dulbecco's modified Eagle's medium supplemented with 20% fetal bovine serum (FBS) at 37Â°C, 5% CO2, and 95% humidity. The cells were stored in semi-confluent form, and the culture medium was refreshed every two days. The cells in the control group were not laser-irradiated, but the cells in the experimental groups were irradiated with 660-nm and 808-nm diode lasers with 4.1 J/cm(2) energy density. Cell viability was assessed at baseline and after 24, 48, and 72 hours using the methyl thiazolyl tetrazolium (MTT) assay. The effects of laser irradiation, laser wavelength, and time on the percentage of cell viability were analyzed by two-way ANOVA and Tukey's test. Results: The effects of laser irradiation and its wavelength ($P=0.04$), time of assessment ($P<0.001$), and the interaction effect of group and time ($P=0.02$) on cell viability were significant. Cell viability in 660-nm and 808-nm laser groups at 48 and 72 hours was higher than that of the control group; however, only the difference in cell viability between the 660-nm laser group and the control group at 72 hours was statistically significant ($P=0.03$). Conclusion: Considering the optimal effect of diode laser irradiation (particularly 660 nm) on the viability of DPSCs, we conclude that it may be suitable for relevant clinical applications.

Transcranial Infrared Laser Stimulation for the Treatment of Traumatic Brain Injury: A Case Series. Introduction: This study intended to evaluate the safety and possible therapeutic effect of transcranial infrared laser stimulation (TILS) based on photobiomodulation (PBM) among patients

with traumatic brain injury (TBI). Methods: Eleven participants who were diagnosed with TBI after full neurological examination and MRI evaluation by a board-certified neurologist completed five to eight 20-minute TILS sessions using the Cytonsys CytonPro-5000 apparatus (pilot laser control, focused wavelength of 1064 nm, maximum output power of 10W, maximum optical power density of 500 mW/cm(2), effective area 4.5 cm(2) in diameter). Per TILS session, participants underwent a laser dose of 250 mW/cm(2) continuous laser wave to each hemisphere using predetermined patient-specific coordinates. Structural imaging was used to neuronavigate individual treatment targets in the frontal cortex (Brodmann area 10). The primary safety measure for this study was the occurrence of adverse events (AEs) or serious adverse events (SAEs). The primary efficacy outcome measure was the participant-rated global rating of change (GRC) post-intervention. Secondary outcome measures included a battery of neuropsychological testing and mood questionnaires done both pre- and post-intervention. Results: All patients enrolled in this study protocol were able to tolerate the study procedures without any AEs or SAEs. Nine out of eleven participants had clinically significant improvements in GRC score (â‰¥ +2). Neuropsychological testing and mood questionnaire outcomes also suggested a positive therapeutic effect. Conclusion: This study provides preliminary evidence supporting the safety and potential efficacy of TILS as a non-invasive clinical intervention for individuals with TBI.

Bone Neoformation Induced by Low-Level Laser and Methylene Blue Suggests Early Ossification in Rats. Introduction: Bone healing depends on inflammation control and tissue repair time. Low-level laser therapy (LLLT) has been investigated to accelerate this process. Methylene blue (MB), together with LLLT, has been investigated for its antioxidant and anti-inflammatory potential; however, the effects of photosensitizers (photodynamic therapy, PDT) are controversial. This study aimed to verify whether the combination of MB and LLLT changes the course of the consolidation of experimental bone defects. Methods: Sixteen Wistar rats underwent femoral bone defects. In the control group (n=4), LLLT simulations were performed without MB. The MB group (n=4) received MB and simulation of LLLT. The LLLT group (n=4) was exposed to LLLT. The PDT+LLLT group (n=4) received MB and LLLT. At the end of 7 or 14 days, the animals were euthanized, and samples were collected. Results: PDT and LLLT induced osteogenic formation with cellularity (after seven days) and union of bony edges (14 days). On the seventh day, LLLT combined with PDT induced an increase ($P<0.05$) of 484% in the area of bone neoformation compared to the control. On the fourteenth day, LLLT combined with PDT or alone increased ($P<0.05$) the area of bone neoformation by 214% and 240% respectively, compared to the control group. The PDT/LLLT combination was associated with increased radiopacity ($P<0.038$). Conclusion: The combined use of MB with LLLT initiated during the transoperative phase may stimulate the bone repair process in rats.

Preclinical and Clinical Applications of Photobiomodulation Therapy in Sperm Motility: A Narrative Review. About 50% of infertility problems are related to male factors and reduced sperm motility. The important factor that affects the structure and function of sperm is reactive oxygen species (ROS), and over-concentration of ROS reduces the quality and motility of sperm. Photobiomodulation therapy (PBMT) using red to near-infrared (NIR) light is useful in oxidative stress restoration. It plays a therapeutic role in disorders such as asthenospermia, oligospermia cases, and cryopreserved sperm. It also enhances the metabolic capacity of sperm and increases the low-level and non-harmful intracellular content of Ca(2+), nitric oxide (NO), and ROS in the stressed cells. Likewise, it modulates survival intracellular pathways and maintains the motility, viability, DNA, and acrosome integrity of sperm. This article reviews the state-of-the-art preclinical and clinical evidence regarding the efficacy of semen PBMT.

Photobiomodulation: The Forth Side of Tissue Engineering Foursquare.

Impact of Blue Light Therapy on Wound Healing in Preclinical and Clinical Subjects: A Systematic Review. Introduction: While a wound caused by a minor cutaneous incision routinely heals in a short time, wounds from major surgical operations might need numerous days to heal and may leave an obvious cicatrix. The use of blue light therapy (BLT) to destroy infectious microorganisms and disrupt biofilm formation could be an efficient method for healing ulcers. This systematic review focused on the effects of BLT in different preclinical in vivo studies and clinical models of skin wound healing. Furthermore, this study attempted to determine what main light parameters should be tested in preclinical and clinical studies. Methods: The online databases PubMed.gov, Google Scholar, Scopus, Web of Science, and Cochrane were searched using the keywords "blue light" and "wound healing" according to PRISMA guidelines. No publication time limit was enforced. Results: A total of 858 articles were identified, and 17 articles in three distinct categories were included for review. They comprised two articles on humans, fourteen articles on healthy animals, and one article on diabetic animals. Conclusion: Some studies have shown that the application of BLT on preclinical and clinical models of wound healing in vivo is able to significantly accelerate the healing process. Few studies, however, have explored the bactericidal effect of BLT on skin injury repair in burn patients. Further preclinical investigations designed to provide a better understanding of the bactericidal effect of BLT using standardized protocols, different BLT wavelengths, and different stages of the wound healing process of infected wounds and ulcers in healthy and diabetic animals should be carried out before clinical trials can be considered. BLT could eventually be a good option for treating infected chronic wounds, including those in diabetic patients.

Combination of Dental Capping Agents With LowLevel Laser Therapy Increases the Cell Viability Percent of Stem Cells From Apical Papilla (SCAPs). Introduction: Dental pulp capping is a technique that is highly applicable in dental restorations. In this technique, a material is directly placed over the exposed pulp tissue, which promotes pulp healing and generates reparative dentin. Herein, we aimed to investigate the combined effect of different pulp capping agents, including mineral trioxide aggregate (MTA), Emdogain (EMD), calcium-enriched mixture (CEM), and low-level laser therapy (LLLT), on enhancing viability and proliferation of stem cells from apical papilla (SCAPs). Methods: SCAPs were isolated from two immature third molar teeth through collagenase type I enzymatic activity. Isolated stem cells were then cultured with DMEM and Î±-MEM media enriched with 15% and 10% FBS respectively. After reaching 70%-80% confluency, the cells were seeded in a 96-well plate. Cell viability percent was assessed using the MTT assay after treatment with MTA, EMD, CEM and LLLT (Î»=630 nm, 5 mW, 4 J/cm(2)) alone and in combination for 24, 48 and 168 hours. Results: Combination of MTA, CEM, EMD and LLLT resulted in significantly increased SCAPs viability as compared with other treatment groups. Increased SCAPs proliferation and viability were also observed in groups treated with the combination of MTA and CEM with EMD. However, the SCAPs survival rate in all defined time spans was reduced after treatment with MTA and CEM alone. Conclusion: LLLT can be a stimulator of SCAPs cell viability when applied in combination with dental capping agents such as MTA, EMD and CEM, providing a therapeutic option for stem cell-based dental regeneration.

Efficacy of Low-Level Laser Therapy for the Treatment of Nonspecific Chronic Neck Pain: Low-Level Laser Therapy vs. Sham Laser. Introduction: The most common type of neck pain is chronic nonspecific pain. There are conflicting opinions about the beneficial effects of a low-level laser in reducing chronic nonspecific neck pain. The aim of this study was to evaluate the efficacy of low-level laser therapy (LLLT) for the treatment of non-specific chronic neck pain. Methods: This study was conducted as a prospective randomized clinical trial. Forty-four patients were randomly divided into two groups: (1) Intervention group (n=22): LLLT in the red spectra range with a wavelength of 980 (nm) and a power of 16 (J/cm(2)) was irradiated in the affected areas of the neck, the muscles along

the spine, and the upper trapezius; (2) sham group (n=22): A low-level laser was irradiated with a passive probe (non-laser red light) in the affected areas of the neck, the muscles along the spine, and the upper trapezius. The treatment protocol consisted of 12 sessions (15 minutes, three times a week, for four weeks). These patients were evaluated for pain using the visual analog scale (VAS) (0-10). The patients were followed up for four weeks. Results: This study showed a statistically significant reduction in chronic nonspecific neck pain in the LLLT group (P<0.05). Conclusion: It is concluded that LLLT was effective in reducing chronic nonspecific neck pain. LLLT is a non-invasive, safe and effective method that can improve chronic nonspecific neck pain in patients in the short term.

Muscle Function Recovery Following Botulinum Toxin Type A Facial Injections: A Case Managed With Photobiomodulation Therapy. Introduction: Aesthetic applications of botulinum toxin type A (BoNT-A) may lead to some complications, including unwanted muscle paralysis. Moreover, BoNT-A effects may last several months, and there is no medical intervention so far to accelerate muscle function recovery. Case Report: A female patient with a movement disorder of the mimic muscles resulting from BoNT-A injections received daily sessions of photobiomodulation therapy (PBMT). A fast improvement in both facial asymmetry and muscle function was noted within a few weeks. After nine weeks, almost complete recovery was achieved. Conclusion: According to the current case, PMBT seems to be an effective intervention to accelerate muscle function recovery following BoNT-A use.

Application of combined photobiomodulation and curcumin-loaded iron oxide nanoparticles considerably enhanced repair in an infected, delayed-repair wound model in diabetic rats compared to either treatment alone. Herein, we attempted toÂ evaluate the therapeutic potential of photobiomodulation (PBM) and curcumin-loaded iron nanoparticles (CUR), alone and in combination, on wound closure rate (WCR), microbial flora by measuring colony-forming units (CFUs), the stereological and biomechanical properties of repairing wounds in the maturation stage of the wound healing course in an ischemic infected delayed healing wound model (IIDHWM) of type I diabetic (TIDM) rats. There were four groups: group 1 was the control, group 2 received CUR, rats in group 3 were exposed to PBM (80Â Hz, 890Â nm, and 0.2Â J/cm(2)), and rats in group 4 received both PBM and CUR (PBMâ€‰+â€‰CUR). We found CFU was decreased in groups 2, 3, and 4 compared to group 1 (pâ€‰=â€‰0.000 for all). Groups 2, 3, and 4 showed a considerable escalation in WCR compared to group 1 (pâ€‰=â€‰0.000 for all). In terms of wound strength parameters, substantial increases in bending stiffness and high-stress load were observed in groups 2, 3, and 4 compared to group 1 (pâ€‰=â€‰0.000 for all). Stereological examinations revealed decreases in neutrophil and macrophage counts and increases in fibroblast counts in groups 2, 3, and 4comparedÂ to group 1 (pâ€‰=â€‰0.000 for all). Blood vessel counts were more dominant in the PBM and PBMâ€‰+â€‰CURÂ groups over group 1 (pâ€‰=â€‰0.000 for all). CFU and wound strength as well as macrophage, neutrophil, and fibroblast counts were found to be improved in the PBMâ€‰+â€‰CUR and PBMÂ groups compared to the CUR group (ranging fromÂ pâ€‰=â€‰0.000 toÂ pâ€‰<â€‰0.05). Better results were achieved in the PBMâ€‰+â€‰CUR Â treatmentÂ over the PBM therapy. We determined therapy with PBMâ€‰+â€‰CUR, PBM alone, and CUR alone substantially accelerated diabetic woundÂ healing in an IIDHWM of TIDM rats compared to controlÂ group. Concomitantly, the PBMâ€‰+â€‰CUR and PBM groups attained significantly enhanced results for WCR, stereological parameters, and wound strength than the CUR group, with the PBMâ€‰+â€‰CUR results being superior to those of the PBM group. Curcumin Rats;Animals;Wound Healing;Diabetes Mellitus, Experimental;Rats, Wistar;Curcumin;Low-Level Light Therapy;Magnetic Iron Oxide Nanoparticles

Repeated Photobiomodulation Induced Reduction of Bilateral Cortical Hemodynamic Activation During a Working Memory Task in Healthy Older Adults. Transcranial photobiomodulation (tPBM) is an emerging non-invasive light-based neuromodulation technique that shows promising potential for improving working memory (WM) performance in older adults. However, the neurophysiological mechanisms associated with tPBM that underlie the improvement of WM and the persistence of such improvement have not been investigated. Sixty-one healthy older adults were recruited to receive a baseline sham stimulation, followed by one-week active tPBM (12 min daily, 1064-nm laser, 250 mW/cm(2)) and three-week follow-ups. N-back WM task was conducted on post-stimulation of the baseline, the first (Day 1) and seventh (Day 7) days of the active treatment, and at the follow-ups. During the task, functional near-infrared spectroscopy (fNIRS) imaging was employed to record the cortical hemodynamic changes. Brain activations during the active and follow-up sessions were compared with the baseline to determine how tPBM had changed cortical hemodynamic activity and how long these changes persisted. We found that tPBM stimulation on Day 1 induced significantly decreased activation in the right hemisphere during the 3-back. The decreased activation expanded from only the right hemisphere on Day 1 to both hemispheres on Day 7. The decreased activation persisted for one week in the right supramarginal gyrus and the left angular gyrus and two weeks in the left somatosensory association cortex. These activation changes were accompanied by significantly improved task accuracy during the N-back. These findings provide important evidence for understanding neural mechanisms underlying cognitive enhancement after tPBM. Humans;Aged;Memory, Short-Term;Prefrontal Cortex;Hemodynamics;Diagnostic Imaging

PHOTOBIOMODULATION THERAPY FOR LARGE SOFT DRUSEN AND DRUSENOID PIGMENT EPITHELIAL DETACHMENT IN AGE-RELATED MACULAR DEGENERATION: A Single-Center Prospective Pilot Study. PURPOSE: To evaluate visual acuity and morphologic changes after photobiomodulation (PBM) for patients affected with large soft drusen and/or drusenoid pigment epithelial detachment associated with dry age-related macular degeneration. METHOD: Twenty eyes with large soft drusen and/or drusenoid pigment epithelial detachment age-related macular degeneration were included and treated using the LumiThera Valeda Light Delivery System. All patients underwent two treatments per week for 5 weeks. Outcome measures included best-corrected visual acuity, microperimetry-scotopic testing, drusen volume, central drusen thickness, and quality of life score at baseline and month 6 (M6) follow-up. Data of best-corrected visual acuity, drusen volume, and central drusen thickness were also recorded at week 5 (W5). RESULTS: Best-corrected visual acuity significantly improved at M6 with a mean score gain of 5.5 letters (P = 0.007). Retinal sensitivity decreased by 0.1 dB (P = 0.17). The mean fixation stability increased by 0.45% (P = 0.72). Drusen volume decreased by 0.11 mm 3 (P = 0.03). Central drusen thickness was reduced by a mean of 17.05 Âµ m (P = 0.01). Geographic atrophy area increased by 0.06 mm 2 (P = 0.01) over a 6-month follow-up, and quality of life score increased by 3,07 points on average (P = 0.05). One patient presented a drusenoid pigment epithelial detachment rupture at M6 after PBM treatment. CONCLUSION: The visual and anatomical improvements in our patients support previous reports on PBM. PBM may provide a valid therapeutic option for large soft drusen and drusenoid pigment epithelial detachment age-related macular degeneration and may potentially slow the natural course of the disease. Humans;Pilot Projects;Low-Level Light Therapy;Prospective Studies;Quality of Life;Macular Degeneration;Retinal Drusen;Retinal Detachment;Geographic Atrophy;Tomography, Optical Coherence;Follow-Up Studies

A randomized controlled study evaluating outcomes of intense pulsed light and low-level light therapy for treating meibomian gland dysfunction and evaporative dry eye. PURPOSE: This randomized, controlled, blinded study evaluates the efficacy of intense pulsed light (IPL) therapy with low-level light therapy (LLLT) in the treatment of meibomian gland dysfunction (MGD) and

evaporative dry eye (EDE) compared to a control group. METHODS: Hundred patients with MGD and EDE were randomized into control (50 subjects, 100 eyes) and study group (50 subjects, 100 eyes). The study group underwent three sittings of IPL with LLLT 15 days apart and were followed up 1 month and 2 months after the last treatment sitting. The control group underwent sham treatment and was followed up at the same intervals. The patients were evaluated at baseline and 1 month and 3 months (post 1(st) treatment) for dry eye. Schirmer's test and tear breakup time (TBUT), OSDI, meibomian gland expression, and meibography. RESULTS: The study group showed significant improvement in OSDI scores ($P < 0.0001$) compared to the control group and a significant improvement in TBUT ($P < 0.005$) compared to the control group. There was no change in schirmer's test and an improvement in the meibomian gland expression but not significant. CONCLUSION: The results show that a combined therapy of IPL with LLT is effective in treating MGD with EDE compared to controls, and repeated treatment sessions have a cumulative effect on the disease outcomes. Humans;Meibomian Gland Dysfunction;Low-Level Light Therapy;Meibomian Glands;Phototherapy;Dry Eye Syndromes;Tears

Comments to "The Randomized Controlled Study of Low-Level Laser Therapy, Kinesio-Taping and Manual Lymphatic Drainage in Patients With Stage II Breast Cancer-Related Lymphedema".

Treatment outcome for dentin hypersensitivity with laser therapy: Systematic review and meta-analysis. BACKGROUND: Laser protocols for the treatment of dentin hypersensitivity (DH) have not yet been studied systematically. OBJECTIVES: The present study aimed to review clinical trials on the treatment of DH with laser therapy through a systematic review and meta-analysis. MATERIAL AND METHODS: The search of electronic databases resulted in 562 publications up to April 2020. The inclusion criteria were studies carried out on humans and reporting on the treatment of DH with laser therapy. Case reports, literature reviews and systematic reviews were excluded. Selected by abstract, potentially eligible papers were read in full (n = 160). Independent examiners performed data extraction and the assessment of the risk of bias. RESULTS: A total of 34 studies were included in the analysis, and 11 in the quantitative analysis. It was observed that most studies followed up patients for a maximum of 6 months (55%). Through the meta-analysis, we observed statistically significant differences between the average pain before and after 3 months of treatment with highand low-power lasers. However, through indirect comparisons, it was observed that the high-power laser showed a greater tendency to reduce the pain levels after 3 months of treatment as compared to the low-power laser, but without a statistically significant difference. CONCLUSIONS: It was possible to conclude that regardless of the type of laser used in the treatment of DH, this treatment is an effective option for the control of pain symptoms. However, it was not possible to establish a defined treatment protocol, since the evaluation methods are very different from each other. Text for Rewiew and clinical cases. Humans;Dentin Sensitivity;Laser Therapy;Low-Level Light Therapy;Treatment Outcome;Lasers

Smart Low Level Laser Therapy System for Automatic Facial Dermatological Disorder Diagnosis. Computer-aided diagnosis using dermoscopy images is a promising technique for improving the efficiency of facial skin disorder diagnosis and treatment. Hence, in this study, we propose a low-level laser therapy (LLLT) system with a deep neural network and medical internet of things (MIoT) assistance. The main contributions of this study are to (1) provide a comprehensive hardware and software design for an automatic phototherapy system, (2) propose a modified-U(2)Net deep learning model for facial dermatological disorder segmentation, and (3) develop a synthetic data generation process for the proposed models to address the issue of the limited and imbalanced dataset. Finally, a MIoT-assisted LLLT platform for remote healthcare monitoring and management is proposed. The trained U(2)-Net model achieved a better performance on untrained dataset than other recent models, with an average Accuracy of 97.5%, Jaccard index of 74.7%, and Dice coefficient

of 80.6%. The experimental results demonstrated that our proposed LLLT system can accurately segment facial skin diseases and automatically apply for phototherapy. The integration of artificial intelligence and MIoT-based healthcare platforms is a significant step toward the development of medical assistant tools in the near future.

The additive effects of bioactive glasses and photobiomodulation on enhancing bone regeneration. Bioactive glasses (BG) have been generally used in bone defects repair for its good osteoinductivity and osteoconductivity. However, the early angiogenesis of BG in the repair of large-sized bone defects may not be sufficient enough to support new bone formation, resulting in the failure of bone repair. Photobiomodulation (PBM) therapy, which is superior on promoting early angiogenesis, may contribute to the angiogenesis of BG and further enhance the repair of bone defects. Therefore, we applied BG and PBM in combination and preliminarily investigated their additive effects on bone regeneration both in vitro and in vivo. The in vitro results revealed that BG combined with PBM remarkably enhanced human bone marrow mesenchymal stem cells proliferation, osteogenic-related genes expression and mineralization, which was better than applying BG or PBM respectively. For in vivo studies, the histological staining results showed that BG induced new bone formation in the interior of defects and promoted new bone reconstruction at 6â€‰weeks post-operation. The micro-computed tomography results further confirmed that BG combined with PBM accelerated bone formation and maturation, improved the speed and quality of bone regeneration, and promoted bone repair. In conclusion, with the optimum BG and PBM parameters, BG combined with PBM generated additive effects on promoting bone regeneration.

Use of either transcranial or whole-body photobiomodulation treatments improves COVID-19 brain fog. There is increasing recognition of post-COVID-19 sequelae involving chronic fatigue and brain fog, for which photobiomodulation (PBM) therapy has been utilized. This open-label, pilot, human clinical study examined the efficacy of two PBM devices, for example, a helmet (1070â€‰nm) for transcranial (tPBM) and a light bed (660 and 850â€‰nm) for whole body (wbPBM), over a 4-week period, with 12 treatments for two separate groups (nâ€‰=â€‰7 per group). Subjects were evaluated with a neuropsychological test battery, including the Montreal Cognitive Assessment (MoCA), the digit symbol substitution test (DSST), the trail-making tests A and B, the physical reaction time (PRT), and a quantitative electroencephalography system (WAVi), both pre- and post- the treatment series. Each device for PBM delivery was associated with significant improvements in cognitive tests (pâ€‰<â€‰0.05 and beyond). Changes in WAVi supported the findings. This study outlines the benefits of utilizing PBM therapy (transcranial or whole-body) to help treat long-COVID brain fog. Humans;Brain;COVID-19;Electroencephalography;Low-Level Light Therapy;Post-Acute COVID-19 Syndrome

Emerging potential of phototherapy in management of symptomatic oral lichen planus: A systematic review of randomised controlled clinical trials. Phototherapy incorporating photobiomodulation therapy and antimicrobial photodynamic therapy has been utilised as antioxidants in symptomatic oral lichen planus (OLP) management; however, its role of intervention remains controversial. The aim of this systematic review of CRD42021227788 PROSPERO (an international prospective register of systematic reviews in health and social care) registration number was to oversee and determine phototherapy efficacy in patients with symptomatic OLP, identifying and bridging the literature gaps by proposing recommendations for future studies. A search strategy was developed in consistent with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Various electronic databases were exercised to search for randomised controlled clinical trials (RCTs). Several search engines were employed to analyse a total of 177 studies of which nine included. A wide range of utilised laser and light-emitted diode wavelengths between 630 and 808â€‰nm and irradiance ranged between 10 and 13â€‰mW/cm(2) were noted. 67% of studies reported a high risk

of bias and a high heterogeneity obtained from numerical data for quantitative analysis, therefore meta-analysis was impossible to conduct. Despite inconsistency and diversity in phototherapy parameters, treatment protocols, photosensitiser (type, concentration and method of application) and outcome assessment tools, the majority of the studies showed positive results compared with standard care treatments. Hence, a necessity to perform well-designed RCTs with robust methodology is warranted, after acknowledging the current drawbacks and addressing the suggested recommendations highlighted in our review. Moreover, advanced knowledge in understanding further phototherapy-antioxidants molecular mechanistic in symptomatic OLP is required. Antioxidants Humans;Antioxidants;Lichen Planus, Oral;Low-Level Light Therapy;Photochemotherapy;Phototherapy;Randomized Controlled Trials as Topic

Antimicrobial photodynamic therapy for the treatment of oral mucositis-A comparative study. OBJECTIVES: The aim was to evaluate the effectiveness of photobiomodulation and antimicrobial photodynamic therapy in the treatment of oral mucositis. BACKGROUND: Oral Mucositis is a frequent complication of oral cavity and oropharynx cancer. Considering the OM aggravation by microorganisms contamination, disinfection provide by antimicrobial photodynamic therapy could be an effective approach. MATERIAL AND METHODS: This comparative study included fourteen patients undergoing radiochemotherapy for oral cavity and oropharynx cancer treatment, who developed oral mucositis. CONTROL GROUP: photobiomodulation. Intervention group: photobiomodulation and antimicrobial photodynamic therapy. The lesion size, duration, pain, and identification of microorganisms were evaluated. RESULTS: The mean reduction in oral mucositis size in the intervention group was 0.70Â cmÂ² (Â±0.35) and 0.30Â cmÂ² (Â±1.10) for the control group. The mean duration of oral mucositis was 18.37 days (Â±12.12) for the intervention group and 23 days (Â±14.78) for the control group. The intervention group had a mean reduction of 3.40 points on the pain scale (Â±2.44), while the control group had 0.17 (Â±2.28). In the intervention group, the predominant isolated microbiota was featured as mixed culture (nÂ =Â 4/ 50%), followed of Gram Positive (nÂ =Â 3/ 37.50%), and Gram Negative (nÂ =Â 1/ 12.55%). In the control group, mixed culture was also more frequent (nÂ =Â 4 / 66%), followed by Gram Positive (nÂ =Â 2 /34%). Gram Negative was not predominantly isolated in the control group. CONCLUSION: No statistical significance was found between PBM-T alone and PBM-TÂ +Â PDT. However, the better outcomes reached by PBM-TÂ +Â PDT group would suggest there could be a role for combined treatment in the management of OM lesions. Photosensitizing Agents;Anti-Infective Agents Humans;Photochemotherapy;Photosensitizing Agents;Stomatitis;Anti-Infective Agents;Low-Level Light Therapy;Oropharyngeal Neoplasms

Increased Improvement in Speech-Language Skills After Transcranial Photobiomodulation Plus Speech-Language Therapy, Compared to Speech-Language Therapy Alone: Case Report with Aphasia. Objective: This is a case report showing that transcranial photobiomodulation (tPBM) combined with traditional, speech-language therapy improved and accelerated the results from speech-language therapy, in a stroke person with aphasia (PWA). Background: tPBM is a safe, noninvasive technique using red and near-infrared light to improve the metabolism of cells. tPBM helps by promoting neuromodulation, while decreasing neuroinflammation and promoting vasodilation. Several studies have shown that tPBM can help individuals with stroke or traumatic brain injury achieve significant cognitive improvements. Methods: A 38-year-old female, who sustained an ischemic stroke on the left side of the brain, received two, 5-month series of treatments. The first series of treatments included traditional speech-language therapy, for the first 5 months poststroke. The second series of treatments included tPBM in combination with speech-language therapy, for the next 5 months. The tPBM treatments included application of red (630 and 660â€‰nm) and near-infrared (850â€‰nm)

wavelengths of photons applied to left hemisphere scalp areas. The major cortical language areas were subjacent to the scalp placements along the line of the Sylvian fissure. At each session, first a light-emitting diode (LED) cluster head with red (630 and 660â€‰nm) and near-infrared (850â€‰nm) wavelengths, with an irradiance (power density) of 200â€‰mW/cm(2), a beam size of 4.9â€‰cm(2), and a fluence (energy density) of 12â€‰J/cm(2) per minute, was applied to the left side of the scalp/brain, along the Sylvian fissure for 60â€‰sec at each at the following eight, language network target areas: frontal pole, prefrontal cortex, and inferior frontal gyrus (Broca's area); supramarginal gyrus and angular gyrus in the parietal lobe; inferior motor/sensory cortex (mouth area); and posterior superior temporal gyrus (Wernicke's area) and superior temporal sulcus in the temporal lobe, for a total of 8â€‰min. Second, for the next 20â€‰min (1200â€‰sec), simultaneous with speech-language therapy, an LED PBM helmet was applied to the scalp/head. This helmet contained 256 separate LED lights, near-infrared (810â€‰nm) wavelength, 60â€‰mW power per LED light, total power, 15 W; energy, 72 Joules; fluence, 28.8â€‰J/cm(2); and irradiance, 24â€‰mW/cm(2). Results and conclusions: During the initial, 5-month treatment series with traditional speech-language therapy only, there was little to no improvement in dysarthria and expressive language. During the second, 5-month treatment series, however, with tPBM applied first, to the left hemisphere only, and second, to both hemispheres during each session plus simultaneous speech-language therapy, there was marked improvement in the dysarthria and expressive language. After the first 5-month series, this PWA had utilized a slow rate of speech with a production of âˆ¼25 to 30 words-per-minute during conversations and spontaneous speech. Utterance length was only 4-6 words with simple, grammatical structure. After the second, 5-month series of treatment combining tPBM plus speech-language therapy, the rate of speech increased to 80+ words-per-minute and utterance length was increased to 9-10 words, with more complex grammatical structure. Female;Humans;Adult;Speech;Dysarthria;Language Therapy;Aphasia;Stroke;Cognition

Regenerative Medicine and Rehabilitation Therapy in the Canine. Regenerative medicine is used in the canine to optimize tissue healing and treat osteoarthritis and soft tissue injuries. Rehabilitation therapy is also often implemented in the treatment and management of musculoskeletal conditions in the canine. Initial experimental studies have shown that regenerative medicine and rehabilitation therapy may work safely and synergistically to enhance tissue healing. Although additional study is required to define optional rehabilitation therapy protocols after regenerative medicine therapy in the canine, certain fundamental principles of rehabilitation therapy still apply to patients treated with regenerative medicine. Animals;Dogs;Regenerative Medicine;Wound Healing;Musculoskeletal Diseases;Osteoarthritis;Dog Diseases

Efficacy of laser therapy for temporomandibular disorders: A systematic review and meta-analysis. OBJECTIVE: The aim of this systematic review was to evaluate the efficacy of laser therapy in temporomandibular disorders (TMD). METHODS: Randomized controlled trials (RCTs) in regard to this issue were searched in electronic databases. Three investigators independently screened the eligible studies, and the quality of the included studies was assessed according to the risk of bias tool recommended by the Cochrane handbook. The primary outcome measure was the degree of pain, reported on a visual analog scale (VAS), and the secondary outcome measures were TMJ function, including maximum active vertical opening (MAVO), maximum passive vertical opening (MPVO), left and right lateral movement (LLE, RLE). Pooled effect sizes were calculated using random effects models and 95% confidence interval (95% CI). RESULTS: A total of 28 randomized controlled trials were included. Laser therapy had a more significant effect in terms of VAS (SMD=ï¹£1.88; 95% CI=ï¹£2.46 toï¹£1.30; PÂ <Â 0.00001; I(2) =93%), MAVO (MD = 4.90; 95% CI= 3.29-6.50; PÂ <Â 0.00001; I(2) =72%), MPVO (MD=5.8(2); 95% CI= 4.62-7.01; PÂ <Â 0.00001; I(2) =40%) and RLE (MD = 0.73; 95% CI= 0.23-1.22; PÂ =Â 0.004; I(2) = 0%) as compared to placebo group. However, there was no

significant difference in LLE between two groups (MD= 0.35; 95% CI=ï¹£0.31-1.01; PÂ =Â 0.30; I(2) =0%). CONCLUSIONS: Laser therapy can effectively reduce pain but have small effect on improving mandibular movement of TMD patients. More well-designed RCTs with large sample sizes are needed for further validation. And these studies should report detailed laser parameters and provide complete outcome measure data. Humans;Temporomandibular Joint Disorders;Low-Level Light Therapy;Pain

Multinational Association of Supportive Care in Cancer (MASCC) clinical practice guidelines for the prevention and management of acute radiation dermatitis: international Delphi consensus-based recommendations. Acute radiation dermatitis is a frequent adverse effect of radiotherapy, but standardisation of care for acute radiation dermatitis is lacking. Due to the conflicting evidence and variability in current guidelines, a four-round Delphi consensus process was used to compile opinions of 42 international experts on care for people with acute radiation dermatitis on the basis of the evidence in existing medical literature. Interventions for acute radiation dermatitis prevention or management that reached at least 75% consensus were recommended for clinical use. Six interventions could be recommended for the prevention of acute radiation dermatitis: photobiomodulation therapy and Mepitel film in people with breast cancer, Hydrofilm, mometasone, betamethasone, and olive oil. Mepilex Lite dressings were recommended for the management of acute radiation dermatitis. Most interventions were not recommended due to insufficient evidence, conflicting evidence, or lack of consensus to support use, suggesting a need for further research. Clinicians can consider implementing recommended interventions in their practice to prevent and manage acute radiation dermatitis until additional evidence becomes available. Female;Humans;Breast Neoplasms;Consensus;Delphi Technique;Radiodermatitis

Combining topical dermal infused exosomes with injected calcium hydroxylapatite for enhanced tissue biostimulation. BACKGROUND: Exosome research continues to flourish. Subsequent knowledge surrounding indications, dose-response, safety, efficacy, and the ability to combine exosome treatment as a "skin primer"-for biostimulation modalities such as calcium hydroxylapatite (CaHA), platelet-rich plasma (PRP), and platelet-rich fibrin matrix (PRFM) is growing rapidly. The objective of this study was to develop safe, reproducible methods of improving topical exosome absorption to enhance the quality of skin either by themselves, or in combination with injectable CaHA. METHODS: Under IRB Approval (International Cell Surgical Society: ICSS-2022-007), 40 patients were enrolled in this study. Twenty patients underwent facial biostimulatory dermal infusion alone, to determine if this method allowed adequate exosome absorption. Five patients underwent facial biostimulatory infusion followed immediately by Dilute CaHA injection (1:1 dilution) to the face. Five patients underwent exosome biostimulatory dermal infusion followed immediately by hyperdilute CaHA (dilution 1:4) injection to the neck. Five patients underwent Facial Dilute CaHA injection (1:1 dilution) alone, without dermal infusion. Five patients underwent neck hyperdilute CaHA injection (1:4 dilution) alone, without dermal infusion. All patients had pretreatment Quantificare 3-D photo-documentation and skin analysis (Quantificare, France). In all patients, the skin was first cleansed with a gentle glycolic acid facial wash (Gregory MD). To induce a "homing inflammatory environment" for the exosomes, sea salt exfoliation was performed (SaltFacialÂ®, SaltMed, Cardiff, CA). A nitric oxide-generating serum (N101 Pneuma Nitric Oxide, Austin, TX) was then applied to act as an enhanced vehicle for absorption. A 3Â MHz ultrasound (SaltFacialÂ®, SaltMed, Cardiff, CA) was then utilized to further deepen the absorption of the nitric oxide serum. A topical emulsion containing equal volumes (1.0Â cc containing 1 million) of exosomes (Kimera Labs, Miramar, FL), 25â€‰units of botulinum toxin (Xeomin, Merz Aesthetics, Raleigh, NC) and hyaluronic acid (Belatero, Merz Aesthetics, Raleigh, NC) was mixed via back-and-forth propulsion in a 3-cc syringe. When adequately mixed, the emulsion was then applied to the treatment areas. The cavitating ultrasound was then used to aid in the

absorption of the emulsion. The patients were then treated with high-intensity LED therapy (SaltFacialÂ®, SaltMed, Cardiff, CA), utilizing the collagen restoration preset program of combination red (660â€‰nm) near-infrared (930â€‰nm) wavelength for 20â€‰min. Post-treatment Quantificare analysis was performed at 15 and 30â€‰days after treatment. RESULTS: Without exception, all dermal infusion alone and CaHA injection alone patients showed an improvement in the tone, quality, and texture of their skin. Quantificare results showed consistent improvement in wrinkles, pores, skin evenness, improved vascularity, and a reduction in oiliness and unwanted pigment. When employed as a skin primer prior to injections (CaHA), enhanced and more rapid results were seen. CONCLUSIONS: Biostimulatory dermal infusion can be achieved utilizing topical placental mesenchymal stem cell-derived exosomes. These exosomes can be used alone, or mixed with ancillary ingredients such as botulinum toxin, hyaluronic acid dermal filler, and CaHA to customize and personalize treatments based upon individual patient needs. Topical absorption is enhanced with sea salt exfoliation, a topical nitric oxide-generating serum, and 3Â MHz cavitating ultrasound. Post-absorption activity is enhanced with high-intensity LED treatment. The addition of CaHA injections after the topical exosome "priming of the skin" yielded enhanced skin quality faster than exosomes or CaHA alone. Botulinum Toxins;Durapatite;Emulsions;Hyaluronic Acid;Nitric Oxide;Solutions;glycolic acid;Dermatologic Agents;Cosmetics;Pharmaceutical Vehicles;Salts Humans;Botulinum Toxins;Cosmetic Techniques;Durapatite;Emulsions;Exosomes;Hyaluronic Acid;Nitric Oxide;Placenta;Skin Aging;Infusions, Subcutaneous;Administration, Topical;Regeneration;Skin;Skin Physiological Phenomena;Face;Neck;Solutions;Skin Care;Dermatologic Agents;Photography;Cosmetics;Skin Absorption;Pharmaceutical Vehicles;Ultrasonic Therapy;Low-Level Light Therapy;Salts;Mesenchymal Stem Cells;Combined Modality Therapy

Photobiomodulation in Alzheimer's Disease-A Complementary Method to State-of-the-Art Pharmaceutical Formulations and Nanomedicine? Alzheimer's disease (AD), as a neurodegenerative disorder, usually develops slowly but gradually worsens. It accounts for approximately 70% of dementia cases worldwide, and is recognized by WHO as a public health priority. Being a multifactorial disease, the origins of AD are not satisfactorily understood. Despite huge medical expenditures and attempts to discover new pharmaceuticals or nanomedicines in recent years, there is no cure for AD and not many successful treatments are available. The current review supports introspection on the latest scientific results from the specialized literature regarding the molecular and cellular mechanisms of brain photobiomodulation, as a complementary method with implications in AD. State-of-the-art pharmaceutical formulations, development of new nanoscale materials, bionanoformulations in current applications and perspectives in AD are highlighted. Another goal of this review was to discover and to speed transition to completely new paradigms for the multi-target management of AD, to facilitate brain remodeling through new therapeutic models and high-tech medical applications with light or lasers in the integrative nanomedicine of the future. In conclusion, new insights from this interdisciplinary approach, including the latest results from photobiomodulation (PBM) applied in human clinical trials, combined with the latest nanoscale drug delivery systems to easily overcome protective brain barriers, could open new avenues to rejuvenate our central nervous system, the most fascinating and complex organ. Picosecond transcranial laser stimulation could be successfully used to cross the blood-brain barrier together with the latest nanotechnologies, nanomedicines and drug delivery systems in AD therapy. Original, smart and targeted multifunctional solutions and new nanodrugs may soon be developed to treat AD.

Clinical Evaluation of Bilateral Multiple Gingival Recession Treatment with Autogenous Connective Tissue Graft Associated with Low-Level Laser Therapy. BACKGROUND: Gingival recession (GR) is described as an apical displacement of the gingival margin in relation to the cementoenamel junction, exposing the root surface to the oral cavity environment. This study aimed to evaluate the clinical

results of a bilateral root coverage (RC) of GR associated with an autogenous connective tissue graft (aCTG) alone or combined with low-level laser therapy (aCTG + LLLT). METHODS: This cross-sectional, split-mouth, double-blind, clinical pilot study featured three individuals who attended a periodontics post-graduate program with the main complaint of GR and dental hypersensitivity (DHS). Of these, only one patient met the inclusion criteria and the parameters evaluated were: DHS, the keratinized tissue's thickness and width clinical attachment level (CAL), probing on depth (PD), and bilateral GR based on Cairo RT I. The patient was evaluated by a first clinical evaluator and the treatment was randomly divided into two groups, G1: aCTG only (control group, n = 3 teeth per side) and G2: aCTG + LLLT (test group, n = 3 teeth per side). LLLT used a diode laser (660 nm) with a dose of 3 J/cm(2) per point and 4 s per point was applied in four different periods, preoperatively; transoperatively and immediately postoperatively, the application was performed in three points (eight applications) on alternate days for 7 days and a 90-day follow-up was performed for clinical evaluations of the periodontal parameters and the collected data were analyzed by Kruskal-Wallis and Dunn tests. RESULTS: the RC mean percentage was <95% in both groups after 90 days. Comparing treatment sides, G1 (n = 3/3, 100%) had a higher prevalence of RC than G2 had (n = 3/3, 95%). DHS significantly decreased after 90 days in both groups. Both groups showed an improvement in the other periodontal parameters evaluated during the short-term follow-up; mainly, PD had a statistically significant (p Ë, 0.05) increase after 90 days and a CAL decrease during this period; KTW and KTT also had a significant increase in both groups (p Ë, 0.05). CONCLUSIONS: the results indicated that aCTG + LLLT might have an additional benefit to GR root coverage within the evaluated time and this section also includes the within-study limitations.

Wavelength-Dependent Effects of Photobiomodulation for Wound Care in Diabetic Wounds. Photobiomodulation, showing positive effects on wound healing processes, has been performed mainly with lasers in the red/infrared spectrum. Light of shorter wavelengths can significantly influence biological systems. This study aimed to evaluate and compare the therapeutic effects of pulsed LED light of different wavelengths on wound healing in a diabetic (db/db) mouse excision wound model. LED therapy by Repuls was applied at either 470 nm (blue), 540 nm (green) or 635 nm (red), at 40 mW/cm(2) each. Wound size and wound perfusion were assessed and correlated to wound temperature and light absorption in the tissue. Red and trend-wise green light positively stimulated wound healing, while blue light was ineffective. Light absorption was wavelength-dependent and was associated with significantly increased wound perfusion as measured by laser Doppler imaging. Shorter wavelengths ranging from green to blue significantly increased wound surface temperature, while red light, which penetrates deeper into tissue, led to a significant increase in core body temperature. In summary, wound treatment with pulsed red or green light resulted in improved wound healing in diabetic mice. Since impeded wound healing in diabetic patients poses an ever-increasing socio-economic problem, LED therapy may be an effective, easily applied and cost-efficient supportive treatment for diabetic wound therapy. Mice;Animals;Diabetes Mellitus, Experimental;Wound Healing;Phototherapy;Low-Level Light Therapy;Light

Light, Water, and Melatonin: The Synergistic Regulation of Phase Separation in Dementia. The swift rise in acceptance of molecular principles defining phase separation by a broad array of scientific disciplines is shadowed by increasing discoveries linking phase separation to pathological aggregations associated with numerous neurodegenerative disorders, including Alzheimer's disease, that contribute to dementia. Phase separation is powered by multivalent macromolecular interactions. Importantly, the release of water molecules from protein hydration shells into bulk creates entropic gains that promote phase separation and the subsequent generation of insoluble cytotoxic aggregates that drive healthy brain cells into diseased states. Higher viscosity in interfacial waters and limited hydration in interiors of biomolecular condensates facilitate phase separation.

Light, water, and melatonin constitute an ancient synergy that ensures adequate protein hydration to prevent aberrant phase separation. The 670 nm visible red wavelength found in sunlight and employed in photobiomodulation reduces interfacial and mitochondrial matrix viscosity to enhance ATP production via increasing ATP synthase motor efficiency. Melatonin is a potent antioxidant that lowers viscosity to increase ATP by scavenging excess reactive oxygen species and free radicals. Reduced viscosity by light and melatonin elevates the availability of free water molecules that allow melatonin to adopt favorable conformations that enhance intrinsic features, including binding interactions with adenosine that reinforces the adenosine moiety effect of ATP responsible for preventing water removal that causes hydrophobic collapse and aggregation in phase separation. Precise recalibration of interspecies melatonin dosages that account for differences in metabolic rates and bioavailability will ensure the efficacious reinstatement of the once-powerful ancient synergy between light, water, and melatonin in a modern world. Melatonin;Water;Adenosine Triphosphate;Adenosine Humans;Melatonin;Water;Alzheimer Disease;Adenosine Triphosphate;Adenosine

Effects of Low-Level Laser Therapy and Bracket Systems on Root Resorption during Orthodontic Treatment: A Randomized Clinical Trial. This study aimed to assess the outcomes of low-level laser therapy (LLLT) with the conventional bracket (CB) and self-ligating (SL) bracket systems on root resorption (RR) during orthodontic treatment. A total of 32 patients were included in this randomized clinical trial. All the patients were randomly divided into four individual groups (SLL: self-ligating laser, CBL: conventional bracket laser, SLNL: self-ligating non-laser, CBNL: conventional bracket non-laser). RR was measured from the cone-beam computed tomography (CBCT) radiographs which were taken at two stages of the orthodontic treatment: pre-treatment (T1) and after leveling and alignment stage (T2). Wilcoxon rank test for the comparison was conducted to compare the RR at T1 and T2 stages within each group and showed a significant difference ($p < 0.05$) for various variables. Mann Whitney test compared the RR in laser and non-laser groups irrespective of the bracket systems and exhibited no significant differences except the left lateral incisor. Moreover, CB and SL groups showed no significant difference in RR among any tooth. Kruskal Wallis test was performed to compare the RR among all groups which presented no significant differences. LLLT and bracket systems have no consequences on RR until the leveling and alignment stage of orthodontic treatment.

Photobiomodulation for Chemotherapy-Induced Oral Mucositis in Pediatric Patients. Oral mucositis (OM) is a common side effect in patients undergoing chemotherapy (CT), especially in children due to their rapid epithelial mitotic rate. It has been associated with a significant reduction in life quality since it leads to pain, an inadequate intake of nutrients, an increased risk of opportunistic infections, and interruptions of CT. Photobiomodulation (PMB) with low-level laser therapy (LLLT) has shown faster healing, reduction in pain, and the reduced use of analgesic compared to placebo groups. The purpose of this review is to analyze and compare the existing clinical trials and identify their shortcomings in hope to make future research easier. Using MeSH terms and keywords, the Embase, Medline, and PubMed databases we searched for the period of the last 5 years. We identified a total of 15 clinical trials, with a total of 929 pediatric patients analyzed in this review. We compared different light sources and other laser technique characteristics used in clinical trials such as wavelength, energy and power density, spot size, irradiation time, PBM protocol, and OM evaluation. The main findings show inconsistent laser parameter quotations, differences in the PBM protocol along with a laser application technique, and a lack of clinical trials. Based on that, more studies with a high methodological quality should be conducted in order to provide a unified PBM protocol suitable for the pediatric population. Antineoplastic Agents Humans;Child;Stomatitis;Drug-Related Side Effects and Adverse Reactions;Low-Level Light Therapy;Quality of Life;Antineoplastic Agents

Treatment of Vascular Parkinsonism: A Systematic Review. BACKGROUND AND AIMS: Although the distinction between vascular parkinsonism (VP) and idiopathic Parkinson's disease (IPD) is widely described, it is not uncommon to find parkinsonisms with overlapping clinical and neuroimaging features even in response to levodopa treatment. In addition, several treatments have been described as possible adjuvants in VP. This study aims to update and analyze the different treatments and their efficacy in VP. METHODS: A literature search was performed in PubMed, Scopus and Web of Science for studies published in the last 15 years until April 2022. A systematic review was performed. No meta-analysis was performed as no new studies on response to levodopa in VP were found since the last systematic review and meta-analysis in 2017, and insufficient studies on other treatments were located to conduct it in another treatment subgroup. RESULTS: Databases and other sources yielded 59 publications after eliminating duplicates, and a total of 12 original studies were finally included in the systematic review. The treatments evaluated included levodopa, vitamin D, repetitive transcranial magnetic stimulation (rTMS) and intracerebral transcatheter laser photobiomodulation therapy (PBMT). The response to levodopa was lower in patients with VP with respect to IPD. Despite this, there has been described a subgroup of patients with good response, it being possible to identify them by means of neuroimaging techniques and the olfactory identification test. Other therapies showed encouraging results in studies with some risk of bias. CONCLUSIONS: The response of VP to different therapeutic strategies is modest. However, there is evidence that a subgroup of patients can be identified as more responsive to L-dopa based on clinical and neuroimaging criteria. This subgroup should be treated with L-dopa at appropriate doses. New therapies such as vitamin D, rTMS and PBMT warrant further studies to demonstrate their efficacy.

Photobiomodulation Controls Keratinocytes Inflammatory Response through Nrf2 and Reduces Langerhans Cells Activation. Photobiomodulation (PBM) is rapidly gaining traction as a valuable tool in dermatology for treating many inflammatory skin conditions using low levels of visible light or near-infrared radiation. However, the physiological regulatory pathways responsible for the anti-inflammatory effect of PBM have not been well defined. Since previous studies showed that nuclear factor-erythroid 2 like 2 (Nrf2) is a master regulator of the skin inflammatory response, we have addressed its role in controlling inflammation by PBM. Primary human keratinocytes (KCs) stimulated with 2,4-dinitrochlorobenzene (DNCB) to mimic pro-inflammatory stress were illuminated with two wavelengths: 660 nm or 520 nm. Both lights significantly reduced the mRNA expression of the DNCB-triggered TNF-Î±, IL-6, and IL-8 cytokines in KCs, while they enhanced Nrf2 pathway activation. PBM-induced Nrf2 is a key regulator of the inflammatory response in KCs since its absence abolished the regulatory effect of light on cytokines production. Further investigations of the mechanisms contributing to the immunoregulatory effect of PBM in inflamed human skin explants showed that 660 nm light prevented Langerhans cells migration into the dermis, preserving their dendricity, and decreased pro-inflammatory cytokine production compared to the DNCB-treated group. This study is the first to report that the PBM-mediated anti-inflammatory response in KCs is Nrf2-dependent and further support the role of PBM in skin immunomodulation. Therefore, PBM should be considered a promising alternative or complementary therapeutic approach for treating skin-related inflammatory diseases.

Photobiomodulation Therapy and Pulp-Regenerative Endodontics: A Narrative Review. Regenerative endodontic procedures (REPs) were used to recover the dental pulp's vitality in order to avoid the undesirable outcomes of conventional endodontic treatment and to promote dentinal formation, especially for immature permanent teeth. Photobiomodulation therapy (PBMT) exhibits photobiological and photochemical effects for improving the root canal's environmental conditions by compensating for oxidative stress and increasing the blood supply to implanted stem cells and improving their survival. Basic research has revealed that PBMT can modulate human dental pulp

stem cells' (hDPSCs) differentiation, proliferation, and activity, and subsequent tissue activation. However, many unclear points still remain regarding the mechanisms of action induced by PBMT in REPs. Therefore, in this review, we present the applications of laser and PBMT irradiation to the procedures of REPs and in endodontics. In addition, the effects of PBMT on the regenerative processes of hDPSCs are reviewed from biochemical and cytological perspectives on the basis of the available literature. Furthermore, we consider the feasibility of treatment in which PBMT irradiation is applied to stem cells, including dental pulp stem cells, and we discuss research that has reported on its effect.
Efficiency of occlusal splint therapy on orofacial muscle pain reduction: a systematic review. BACKGROUND: This systematic review aims to examine the existing original studies to determine the effectiveness of occlusal splints (OSs) in the management of orofacial myalgia and myofascial pain (MP) in comparison with no treatment or other interventions. MATERIALS AND METHODS: Based on the inclusion and exclusion criteria of this systematic review, randomized controlled trials were qualified, in which the effectiveness of occlusal splint therapy in the management of muscle pain was examined in comparison with no treatment or other interventions. This systematic review was conducted according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analysis 2020. The authors searched three databases (PubMed, CINAHL (The Cumulative Index to Nursing and Allied Health Literature) and Scopus) for English publications published between January 1, 2010, and June 1, 2022. The last database search was carried out on June 4, 2022. Data were extracted from the included studies and assessed for risk of bias using the revised Cochrane risk-of-bias tool for randomized trials. RESULTS: Thirteen studies were identified for inclusion in this review. In total, 589 patients were diagnosed with orofacial muscle pain who underwent education and various forms of therapy including different types of OSs, light emitting diode therapy, acupuncture, low-level laser therapy, device-supported sensorimotor training, Kinesio Taping, myofunctional therapy, and physical therapy. All studies included demonstrated a high risk of bias. CONCLUSIONS: There is insufficient evidence regarding whether OS therapy in the treatment of orofacial myalgia and MP offers an advantage over other forms of interventions or no treatment. Further reliable clinical studies in this area are needed to improve the quality of research, which should be performed with larger groups of blinded respondents and controls. CLINICAL RELEVANCE: Due to the large-scale nature of orofacial muscle pain, it is assumed that each dental clinician will meet patients with orofacial muscle pain repeatedly in daily practice; hence, the review of the effectiveness of OSs in the management of orofacial myalgia and MP is necessary. Humans;Myalgia;Occlusal Splints;Facial Pain
Could Photobiomodulation Be Incorporated into Indoor Lighting? Lighting
Comparison of Lasers and Desensitizing Agents in Dentinal Hypersensitivity Therapy. The main objective of this review is to verify the validity of laser therapy in the treatment of dentin hypersensitivity, an extremely common problem in patients, with Nd: YAG lasers or high- and/or low-power diode lasers to obtain a definitive protocol for the treatment of hypersensitivity, given the multiplicity of laser treatments proposed by the numerous authors evaluated. The authors performed an electronic search on PubMed, favouring it as a search engine. Lasers represent a means of treating dentin hypersensitivity, used alone and/or in conjunction with specific products for the treatment of such a pathology. The selected articles that examined diode lasers were divided according to the wattage (w) used: low-level laser therapy protocols, i.e., those using a wattage of less than 1 W, and high-level laser therapy protocols, i.e., those using a wattage of 1 W or more. Regarding the Nd: YAG laser, it was not necessary to subdivide the studies in this way, as they used a wattage of 1 W or more. A total of 21 articles were included in the final selection. Laser therapy was found to be effective in the treatment of dentin hypersensitivity. However, the level of effectiveness depends on

the laser used. The results obtained from this review show that both the Nd: YAG laser and the diode laser (high and low power) are effective in the treatment of dentin hypersensitivity. However, the high-power laser appears to be more effective in combination with fluoride varnish and the Nd: YAG laser achieved greater long-term benefits than the diode laser.

A retrospective study of 1064-nm Q-switched Nd:YAG laser therapy for acquired bilateral nevus of Ota-like macules. BACKGROUND: The therapeutic efficacy of laser treatments for acquired bilateral nevus of Ota-like macules (ABNOM) varies among studies, and few studies have evaluated the factors affecting therapeutic effects. AIMS: To evaluate the efficacy and safety of 1064-nm Q-switched Nd:YAG laser (QSNYL) therapy for ABNOM and to identify the factors influencing the outcome. METHODS: A total of 110 patients with ABNOM were retrospectively evaluated and received two-to-nine treatment sessions. The effects of different factors on the therapeutic effect were analyzed on the basis of the number of treatments, age at first treatment, skin type, lesion color, affected area, number of lesion sites, and presence of concomitant melasma. RESULTS: The curative effect was positively correlated with the treatment time and negatively correlated with the increasing age at first treatment (pÂ <Â 0.05). The curative effect was better in patients with skin type III than those with type IV (pÂ <Â 0.05) and in patients with a lesion area of less than 10Â cm(2) than those with a larger affected area (pÂ <Â 0.05). Additionally, the treatment effect was poorer in patients with concomitant melasma (pÂ <Â 0.05). The treatment effect was not significantly correlated with the lesion color or number of affected sites (pÂ >Â 0.05). Eleven patients (10%) developed postinflammatory hyperpigmentation (PIH). CONCLUSIONS: Early and repeated QSNYL therapy achieved satisfactory results for ABNOM. The risk of PIH after laser treatment is highest among patients with older age, darker lesion color, and darker skin color. For patients with ABNOM with concurrent melasma, low-energy laser therapy is recommended to reduce the risk of melasma aggravation. Humans;Hyperpigmentation;Laser Therapy;Lasers, Solid-State;Melanosis;Nevus of Ota;Retrospective Studies;Skin Neoplasms;Treatment Outcome;Low-Level Light Therapy

[High-intensity laser therapy in clinical medicine: scientometric analysis of evidence of effectiveness]. INTRODUCTION: High-intensity laser technologies are widely used in modern restorative medicine, and indications for their use are expanding annually. These technologies are effective, potentially safe methods of treating many diseases. with pronounced therapeutic effects. PURPOSE OF RESEARCH: Analysis of scientific evidence of the effectiveness and safety of high-intensity laser therapy in patients with various diseases. MATERIAL AND METHODS: A comprehensive scientometric analysis of evidence-based studies of the effectiveness and safety of high-intensity laser therapy methods was carried out according to electronic databases (Google scholar, PEDro, PubMed, Cochrane DATABASE) for the period from 2006 to 2021. RESULTS: High-intensity laser therapy has a wide range of significantly pronounced therapeutic effects. and it is an effective method of treating patients with various diseases. Various technologies and methods of its application are widely used in various fields of clinical medicine. Individually developed therapy protocols are needed, with optimal exposure parameters for each patient, intervals between procedures. CONCLUSION: It is advisable to develop more reliable and standard evaluation criteria, regular generalization and analysis of existing evidence, careful planning and implementation of further large-scale randomized controlled trials to study the effects of high-intensity laser radiation both as a single effect and as part of combinations with other treatment methods. The effectiveness of combination therapy requires further analysis in the course of conducting new benign clinical trials. Humans;Laser Therapy;Low-Level Light Therapy;Clinical Medicine;Combined Modality Therapy;Randomized Controlled Trials as Topic

Effectiveness of non-pharmacological therapies on cognitive function in patients with dementia-A network meta-analysis of randomized controlled trials. OBJECTIVE: Non-pharmacological

therapies (NPTs) have received increasing attention from researchers as a category of treatment to improve cognitive impairment in patients with dementia because of their fewer side effects. In this study, photobiomodulation (PBM), enriched environment (EE), exercise therapy (ET), computerized cognitive training (CCT), and cognitive stimulation therapy (CST) were selected to compare the effects of NPTs that improve dementia by quantifying information from randomized controlled trials (RCTs). METHODS: We did a systematic review and network meta-analysis. We searched PubMed, Embase, Cochrane Central Register of Controlled Trials (CENTRAL), China National Knowledge Infrastructure Database, Wan Fang Database, Chinese Biomedical Literature Database, Web of Science, and VIP Database from the time of database creation to 1 August 2022. Two investigators independently screened the literature, extracted information, and assessed the RCTs' quality with the Cochrane Collaboration Network Risk of Bias 2.0. Network meta-analysis was performed using R language (X64 version 4.1.3) and STATA 17.0. RESULTS: We identified 1,268 citations and of these included 38 trials comprising 3,412 participants. For improving dementia, the results of the network meta-analysis showed that compared with the control group (CON), PBM (SMD = 0.90, 95% CI: 0.43-1.37), EE (SMD = 0.71, 95% CI: 0.02-1.41), ET (SMD = 0.42, 95% CI: 0.16-0.68), and CST (SMD = 0.36, 95% CI: 0.11-0.62) were significantly different ($P < 0.05$); There was no significant difference in CCT (SMD = 0.41, 95% CI: -0.07-0.88) ($P > 0.05$). The ranked results showed that PBM has more potential to be the best intervention ($P = 0.90$). In addition, there was a significant difference between PBM and CST in improving cognitive function (SMD = 0.54, 95% CI: 0.00; 1.08, $P < 0.05$). CONCLUSION: In this study, NPTs have excellent potential to improve cognition in people with dementia, and PBM may have more significant benefits in improving cognition than the other four NPTs. SYSTEMATIC REVIEW REGISTRATION: https://www.crd.york.ac.uk/prospero/, identifier CRD42022363746.

Synergistic effects of integrin binding peptide (RGD) and photobiomodulation therapies on bone-like microtissues to enhance osteogenic differentiation. Bone tissue engineering aims to diversify and enhance the strategies for bone regeneration to overcome bone-related health problems. Bone mimetic peptides such as Gly-Arg-Gly-Asp-Ser (RGD) are useful tools for osteogenic differentiation. Similarly, photobiomodulation (PBM) at 600-800Â nm of wavelength range improves bone tissue healing via the production of intracellular reactive oxygen species (ROS), ATP synthesis, and nitric oxide (NO) release. Besides, traditional monolayer cell culture models have limited conditions to exhibit the details of a mechanism such as a peptide or PBM therapy. However, scaffold-free microtissues (SFMs) can mimic a tissue more properly and be an efficient way to understand the mechanism of therapy via cell-cell interaction. Thus, the synergistic effects of RGD peptide (1Â mM) and PBM applications (1Â J/cm(2) energy density at 655Â nm of wavelength and 5Â J/cm(2) energy density at 808Â nm of wavelength) were evaluated on SFMs formed with the co-culture of Human Bone Marrow Stem Cells (hBMSC) and Human Umbilical Vein Endothelial Cells (HUVEC) for osteogenic differentiation. Cell viability assays, mechanistic analysis, and the evaluation of osteogenic differentiation markers were performed. Combined therapies of RGD and PBM were more successful to induce osteogenic differentiation than single therapies. Especially, RGDÂ +Â PBM at 655Â nm group exhibited a higher capability of osteogenic differentiation via ROS production, ATP synthesis, and NO release. It can be concluded that the concomitant use of RGD and PBM may enhance bone regeneration and become a promising therapeutic tool to heal bone-related problems in clinics.
Reactive Oxygen Species;Oligopeptides;Integrins;Adenosine Triphosphate
Humans;Osteogenesis;Low-Level Light Therapy;Reactive Oxygen Species;Bone and Bones;Oligopeptides;Human Umbilical Vein Endothelial Cells;Cell Differentiation;Integrins;Adenosine Triphosphate

Intravascular laser irradiation of blood (ILIB) used to treat lung diseases: a short critical review. Intravascular laser irradiation of blood (ILIB) was developed to treat cardiovascular diseases due to its

rheological effects. In its original form, ILIB was applied by an intravenous optical fiber, restricting its application. However, this technique was modified to non-invasive irradiation through the radial artery, now called vascular photobiomodulation (VPBM). Many studies have used both, ILIB and VPBM, to treat lung diseases. It is well established that lung diseases affect more than 300 million people worldwide with high morbidity and mortality rates. In this short critical review, we discuss the potential benefits of photobiomodulation to treat lung diseases using these two approaches. The search was performed in the electronic database of MEDLINE (Medical Literature Analysis and Retrieval System Online) via PubMed. The data search was carried out from 1991 to 2017. We selected a total of 10 clinical studies using either ILIB or VPBM, in addition to 2 experimental studies in animals. The respiratory diseases treated in these studies included bronchitis, asthma, pneumonia, and tuberculosis. The results showed overall beneficial effects on lung diseases, characterized by a reduction in the inflammatory cascade and antioxidant effects, improvement of hemodynamic parameters, the efficiency of gas exchange, and reduction of hospitalization periods. In conclusion, all studies showed promising effects of ILIB in both animal and human studies. The studies did not discuss any disadvantages or contraindications. However, further studies are needed in order to understand the dosimetry, and the literature is lacking in randomized, controlled clinical trials. Thus, this review highlights the need for additional studies using this approach. Humans;Low-Level Light Therapy;Asthma;Cardiovascular Diseases;Hemodynamics;Lasers

Photobiomodulation (Therapeutic Lasers): An Update and Review of Current Literature. Photobiomodulation therapy, also commonly known as laser therapy, continues to grow in popularity in veterinary medicine. It is the use of red and near-infrared light to simulate healing, relieve pain, and reduce inflammation. The potential variety of conditions for which it can be used as an adjunctive, non-invasive modality has propelled its use in both veterinary rehabilitation, sports medicine, and general practice. In the last decade, clinical research has grown with increasing evidence for efficacy for some conditions but mixed to limited in others and many conditions not represented. Low-Level Light Therapy;Lasers

Transcriptome analysis of the effects of polarized photobiomodulation on human dermal fibroblasts. BACKGROUND: Photobiomodulation (PBM), the therapeutic use of light, is used to treat a myriad of conditions, including the management of acute and chronic wounds. Despite the presence of clinical evidence surrounding PBM, the fundamental mechanisms underpinning its efficacy remain unclear. There are several properties of light that can be altered in the application of PBM, of these, polarization-the filtering of light into specified plane(s)-is an attractive variable to investigate. AIMS: To evaluate transcriptomic changes in human dermal fibroblasts in response to polarized PBM. RESULTS: A total of 71 Differentially Expressed Genes (DEGs) are described. All DEGs were found in the polarized PBM group (P-PBM), relative to the control group (PC). Of the 71 DEGs, 10 genes were upregulated and 61 were downregulated. Most DEGs were either mitochondrial or extracellular matrix (ECM)-related. Gene Ontology (GO) analysis was then performed using the DEGs from the P-PBM vs. PC group. Within biological processes there were 95 terms found (pÂ <Â 0.05); in the molecular function there were 18 terms found (pÂ <Â 0.05); while in the cellular component there were 32 terms enriched (pÂ <Â 0.05). A KEGG pathways analysis was performed for the DEGs found in the P-PBM vs. PC group. This revealed 21 significantly enriched pathways (pÂ <Â 0.05). Finally, there were 24 significantly enriched reactome pathways when comparing the DEGs of the P-PBM vs. PC groups (pÂ <Â 0.05). DISCUSSION AND CONCLUSIONS: The P-PBM DEGs were almost always down regulated compared to the comparator groups. This may be explained by the P-PBM treatment conditions decreasing the amount of cellular stress, hence causing a decreased mitochondria and ECM protective response. Alternatively, it could point to an alternate mechanism, outside the mitochondria, by which PBM exerts its effects. Additionally, PBM appears to have a more widespread

effect on the mitochondria than previously thought, opening up many new avenues of investigation in the process. Humans;Gene Expression Profiling;Transcriptome;Fibroblasts;Skin;Low-Level Light Therapy

Photobiomodulation therapy for the prevention of acute radiation dermatitis: a systematic review and meta-analysis. PURPOSE: Approximately 95% of patients undergoing radiotherapy (RT) experience radiation dermatitis (RD). Evidence has suggested that photobiomodulation therapy (PBMT) can stimulate skin renewal and minimize RD. The aim of the present paper was to investigate the efficacy of PBMT in RD prevention through a comprehensive literature review. METHODS: A literature search of Ovid MEDLINE, Embase, and Cochrane databases was conducted from 1980 to March 2021 to identify RCT on the use of PBMT for RD prevention. Forest plots were developed using RevMan software to quantitatively compare data between studies. RESULTS: Five papers were identified: four in breast and one in head and neck cancer patients. Patients receiving PBMT experienced less severe RD than the control groups after 40 Gray (Gy) of RT (grade 3 toxicity: Odds Ratio (OR): 0.57, 95% CI 0.14-2.22, pâ€‰=â€‰0.42) and at the end of RT (grade 0â€‰+â€‰1 vs. 2â€‰+â€‰3 toxicity: OR: 0.28, 95% CI 0.15-0.53, pâ€‰<â€‰0.0001). RT interruptions due to RD severity were more frequent in the control group (OR: 0.81, 95% CI 0.10-6.58, pâ€‰=â€‰0.85). CONCLUSION: Preventive PBMT may be protective against the development of severe grades of RD and reduce the frequency of RT interruptions. Larger sample sizes and other cancer sites at-risk of RD should be evaluated in future studies to confirm the true efficacy of PBMT, also in preventing the onset of RD and to finalize a standardized protocol to optimize the technique. At present, starting PBMT when RT starts is recommendable, as well as performing 2 to 3 laser sessions weekly. Humans;Low-Level Light Therapy;Radiodermatitis;Head and Neck Neoplasms;Skin;Breast

Remote photobiomodulation targeted at the abdomen or legs provides effective neuroprotection against parkinsonian MPTP insult. Photobiomodulation (PBM)-the irradiation of tissue with low-intensity light-mitigates neuropathology in rodent models of Parkinson's disease (PD) when targeted at the head ('transcranial PBM'). In humans, however, attenuation of light energy by the scalp and skull necessitates a different approach. We have reported that targeting PBM at the body also protects the brain by a mechanism that spreads from the irradiated tissue ('remote PBM'), although the optimal peripheral tissue target for remote PBM is currently unclear. This study compared the neuroprotective efficacy of remote PBM targeting the abdomen or leg with transcranial PBM, in mouse and non-human primate models of PD. In a pilot study, the neurotoxin MPTP was used to induce PD in non-human primates; PBM (670â€‰nm, 50â€‰mW/cm(2) , 6â€‰min/day) of the abdomen (nâ€‰=â€‰1) was associated with fewer clinical signs and more surviving midbrain dopaminergic cells relative to MPTP-injected non-human primates not treated with PBM. Validation studies in MPTP-injected mice (nâ€‰=â€‰10 per group) revealed a significant rescue of midbrain dopaminergic cells in mice receiving PBM to the abdomen (~80%, pâ€‰<â€‰.0001) or legs (~80%, pâ€‰<â€‰.0001), with comparable rescue of axonal terminals in the striatum. Strikingly, this degree of neuroprotection was at least as, if not more, pronounced than that achieved with transcranial PBM. These findings confirm that remote PBM provides neuroprotection against MPTP-induced destruction of the key circuitry underlying PD, with both the abdomen and legs serving as viable remote targets. This should provide the impetus for a comprehensive investigation of remote PBM-induced neuroprotection in other models of PD and, ultimately, human patients. Humans;Mice;Animals;Neuroprotection;Leg;Pilot Projects;Parkinson Disease;Abdomen

Effects of photobiomodulation on oxidative stress in rats with type 2 diabetes mellitus. The present study aimed to evaluate photobiomodulation effects on oxidative stress in type 2 diabetes mellitus (DM2). Thirty-one male Wistar rats were used and divided into 4 groups: group 1 - animals without diabetes mellitus 2 without laser 21 J/cm(2) (C-SHAM), group 2 - animals with diabetes

mellitus 2 without laser 21 J/cm(2) (C-DM2), group 3 - animals without diabetes mellitus 2 with laser 21 J/cm(2) (L-SHAM), group 4 - animals with diabetes mellitus 2 with laser 21 J/cm(2) (L-DM2). The protocol was performed 5 days/week, for 6 weeks. The animals that received photobiomodulation had one dose irradiated at two spots in the right gastrocnemius muscle. Twenty-four hours after the last intervention, the animals were euthanized. Heart, diaphragm, liver, right gastrocnemius, plasma, kidneys, weighed, and stored for further analysis. In rats with DM2, photobiomodulation promoted a decrease in thiobarbituric acid reactive substance assay (TBARS) in plasma levels. On the other hand, photobiomodulation demonstrated an increase in non-protein thiol levels (NPSH) in the heart, diaphragm and gastrocnemius. Moreover, photobiomodulation produced in the heart, diaphragm and plasma levels led to an increase in superoxide dismutase (SOD). Interestingly, photobiomodulation was able to increase superoxide dismutase in rats without DM2 in the heart, diaphragm, gastrocnemius and kidneys. These findings suggested that 6Â weeks of photobiomodulation in rats with DM2 promoted beneficial adaptations in oxidative stress, with a decrease in parameters of oxidant activity and an increase in antioxidant activity. Superoxide Dismutase;Thiobarbituric Acid Reactive Substances Rats;Male;Animals;Rats, Wistar;Diabetes Mellitus, Type 2;Diabetes Mellitus, Experimental;Oxidative Stress;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances

Mitochondrial Dysfunction and Parkinson's Disease: Pathogenesis and Therapeutic Strategies. Parkinson's disease (PD) is a common age-related neurodegenerative disorder whose pathogenesis is not completely understood. Mitochondrial dysfunction and increased oxidative stress have been considered as major causes and central events responsible for the progressive degeneration of dopaminergic (DA) neurons in PD. Therefore, investigating mitochondrial disorders plays a role in understanding the pathogenesis of PD and can be an important therapeutic target for this disease. This study discusses the effect of environmental, genetic and biological factors on mitochondrial dysfunction and also focuses on the mitochondrial molecular mechanisms underlying neurodegeneration, and its possible therapeutic targets in PD, including reactive oxygen species generation, calcium overload, inflammasome activation, apoptosis, mitophagy, mitochondrial biogenesis, and mitochondrial dynamics. Other potential therapeutic strategies such as mitochondrial transfer/transplantation, targeting microRNAs, using stem cells, photobiomodulation, diet, and exercise were also discussed in this review, which may provide valuable insights into clinical aspects. A better understanding of the roles of mitochondria in the pathophysiology of PD may provide a rationale for designing novel therapeutic interventions in our fight against PD. Humans;Parkinson Disease;Mitochondria;Mitochondrial Diseases;Oxidative Stress;Dopaminergic Neurons

The Probable Protective Effect of Photobiomodulation on the Immunologic Factor's mRNA Expression Level in the Lung: An Extended COVID-19 Preclinical and Clinical Meta-analysis. BACKGROUND: Different expression of cytokine genes in the body determines the type of immune response (Th1 or Th2), which can play an important role in the pathogenesis of the COVID-19 disease. AIMS: This meta-analysis was conducted to evaluate the probable effect of photobiomodulation (PBMT) therapy on the cytokine's mRNA expression in the lung. METHODS: We systematically searched indexing databases, including PubMed/Medline, ISI web of science, Scopus, EMBASE, and Cochrane central, using standard terms without language, study region or type restrictions. Studies on using PBM in lung injury modeling with samples collected from lung tissue to observe IL-1Î², TNF-Î±, IL-10, and IL-6 mRNA expression were included. RevMan 5.3 software was used for data analysis and standardized mean difference as effect size. RESULTS: Of the 438 studies found through initial searches, 17 met the inclusion criteria. The main properties of 13 articles on 384 animals included in this meta-analysis with a wide range of species include rats (nâ€‰=â€‰10) and rabbits (nâ€‰=â€‰3). The analysis

revealed that PBMT reduced the mRNA expression of TNFÎ± (SMD: -3.70, 95% CI: -6.29, -1.11, Pâ€‰=â€‰.005,I (2)â€‰=â€‰71%) and IL-1Î² (SMD: -5.85, 95% CI: -8.01, -3.69, Pâ€‰<â€‰.00001,I (2)â€‰=â€‰37%) significantly, but no statistically significant reduction in IL-6 (SMD: -2.89, 95% CI: -5.79, 0.01, Pâ€‰=â€‰.05,I (2)â€‰=â€‰88%) was observed compared with the model controls. Also, PBMT increased IL-10 mRNA expression significantly compared with the model controls (SMD: 1.04, 95% CI: 0.43, 1.64, Pâ€‰=â€‰.0008,I (2)â€‰=â€‰17%). CONCLUSION: This meta-analysis revealed that the PBMT utilizes beneficial anti-inflammatory effects and modulation of the immune system on lung damage in animal models and clinical studies. However, animal models and clinical studies appear limited considering the evidence's quality; therefore, large clinical trials are still required.

Low-Level Light Therapy and Minoxidil Combination Treatment in Androgenetic Alopecia: A Review of the Literature. INTRODUCTION: We analyzed randomized clinical trials (RCTs) evaluating the efficacy of combined therapy with low-level light therapy (LLLT) and topical minoxidil for treatment of androgenetic alopecia (AGA). METHODS: A literature search within PubMed identified RCTs evaluating hair regrowth following LLLT and minoxidil. Selection criteria were 600-1,100 nm wavelengths, treatment time â‰¥16 weeks, and objective evaluation for hair regrowth. RESULTS: Five RCTs compared LLLT with minoxidil (2% or 5%) to 5% minoxidil treatment or LLLT treatment. One study showed combination therapy of LLLT, and 5% minoxidil improved hair density more than monotherapy. Another found combination LLLT with 2% minoxidil induced hair regrowth equivalent to 5% minoxidil. Similarly, another study described LLLT with 5% minoxidil versus minoxidil monotherapy to increase the number of hairs with no statistical difference between groups. One trial found that combination group increased hair regrowth in the first 2 months. The last study found a statistically significant increase in hair density with combined therapy compared to monotherapy. CONCLUSION: The studies describe either superiority or equivalence of combination therapy to minoxidil monotherapy for AGA. Early outcomes appear to support the superiority of combination therapy, but this advantage wanes at the end of the study periods.

Effectiveness of Photobiomodulation and Oral Cryotherapy on Oral Mucositis Among Patients Undergoing Chemotherapy Conditioning Prior to Hematological Stem Cell Transplantation. OBJECTIVES: This review evaluated the best available evidence concerning the effectiveness of photobiomodulation compared to oral cryotherapy in oral-mucositis prevention among patients with hematological stem cell transplantation (HSCT) receiving chemo-conditioning. DATA SOURCES: An extensive search for published and unpublished studies was conducted in 11 electronic databases and reference lists. Only randomized controlled trials (RCTs) were included. Two reviewers independently screened relevant studies for eligibility, extracted data using a standardized data collection form, and appraised data using the Cochrane Risk of Bias Tool and Grading Recommendations, Assessment, Development and Evaluation (GRADE). Meta-analyses using a random-effect model was performed using Review Manager software. Subgroup analyses were conducted to examine the differential effect of interventions across subgroups and to explore potential sources of heterogeneity. Meta-analyses included 18 RCTs (involving 1,018 patients). Both photobiomodulation and cryotherapy were effective in reducing oral-mucositis severity, severe oral-mucositis incidence, duration, and pain with small to large effect sizes. No significant differences were detected between photobiomodulation and cryotherapy across all outcomes. Subgroup analyses showed significant differences for chemo-conditioning regimens. The overall Grading Recommendations, Assessment, Development and Evaluation quality of evidence was low. CONCLUSION: Both photobiomodulation and cryotherapy were effective nonpharmacological oral-mucositis prophylaxis and analgesia, with no significant difference in effectiveness. Chemo-conditioning regimens may influence their effectiveness. Future RCTs may directly compare the effectiveness of photobiomodulation and cryotherapy on the HSCT

patients. Rigorous cost-effectiveness studies are also required. IMPLICATIONS FOR NURSING PRACTICE: Photobiomodulation and cryotherapy can be offered to HSCT patients in clinical settings. A clinical guideline of both interventions can be also developed.
Humans;Mucositis;Stomatitis;Hematopoietic Stem Cell Transplantation;Pain;Cryotherapy;Transplantation Conditioning

Photobiomodulation activates undifferentiated macrophages and promotes M1/M2 macrophage polarization via PI3K/AKT/mTOR signaling pathway. Macrophages are the main mediators of the inflammatory response and play a major role in the onset and maintenance of periodontitis. Studies revealed that photobiomodulation (PBM) can change the polarization state of macrophages and inflammation reduction, although the cellular mechanisms are not fully elucidated. Here, the present study explored the effect of PBM (980 nm) on undifferentiated and M1-type macrophages and the underlying mechanism. RAW264.7 cells were exposed to laser irradiation under different laser parameters (0.5, 5.0, and 10.0 J/cm(2)) with or without LY294002 (an inhibitor of PI3K pathway). Then, confocal laser microscopy was used to observe cell differentiation; qPCR was performed to examine the gene expression and western blotting was used to detect the protein in the PI3K/AKT/mTOR pathway and activated macrophage markers. The obtained results revealed that 980 nm PBM increased the mRNA expression of iNOS, Il-10, Arg1, and Il-12 along with the inflammatory cytokines TnfÎ±, IL-1Î², and Il-6 in M0-type macrophages in dose-dependent manner. More interestingly, PBM at 5 J/cm(2) decreased the mRNA expression of iNOS, Il-12, TnfÎ±, IL-1Î², and Il-6 and increased the expression of Arg1 and Il-10 by M1-type macrophages, along with the elevated expression of phosphorylation of AKT and mTOR. Moreover, PBM-induced M1-type macrophage polarization was significantly attenuated via LY294002 treatment. These suggest that 980 nm PBM could activate M0-type macrophages and increase M2/M1 ratio via the PI3K/AKT/mTOR pathway.
Interleukin-10;Interleukin-12;Interleukin-6;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;RNA, Messenger;TOR Serine-Threonine Kinases;Tumor Necrosis Factor-alpha Interleukin-10;Interleukin-12;Interleukin-6;Macrophages;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;RNA, Messenger;Signal Transduction;TOR Serine-Threonine Kinases;Tumor Necrosis Factor-alpha;Animals;Mice;RAW 264.7 Cells

Can photobiomodulation restore anosmia and ageusia induced by COVID-19? A pilot clinical study. Along with other COVID-19 clinical manifestations, management of both olfactory and gustatory dysfunction have drawn a considerable attention. Photobiomodulation (PBM) has emerged to be a possible effective therapy in restoring taste and smell functionality, but the evidence is scarce. Hence, the present pilot study is aimed to evaluate the effectiveness of intranasal and intraoral PBM administrations in management of anosmia and ageusia respectively. Twenty Caucasian subjects who diagnosed with anosmia and ageusia were recruited. Visual analogue scale was utilised to evaluate patients' self-reported for both olfactory and gustatory functionality. The laser-PBM parameters and treatment protocols for anosmia and ageusia were as follows respectively: 660â€‰nm, 100â€‰mW, two points intranasally, 60â€‰J/session, 12 sessions; dual wavelengths (660â€‰nm and 808â€‰nm), 100â€‰mW, three points intraorally, 216â€‰J/session, 12 sessions. Our results showed a significant functionality improvement of both olfactory and gustatory functionality. Extensive studies with large data and long-term follow-up period are warranted.
Humans;COVID-19;Ageusia;Anosmia;Pilot Projects;SARS-CoV-2;Olfaction Disorders

A systematic review of the effects of transcranial photobiomodulation on brain activity in humans. In recent years, transcranial photobiomodulation (tPBM) has been developing as a promising method to protect and repair brain tissues against damages. The aim of our systematic review is to examine the results available in the literature concerning the efficacy of tPBM in changing brain activity in humans, either in healthy individuals, or in patients with neurological diseases. Four databases were

screened for references containing terms encompassing photobiomodulation, brain activity, brain imaging, and human. We also analysed the quality of the included studies using validated tools. Results in healthy subjects showed that even after a single session, tPBM can be effective in influencing brain activity. In particular, the different transcranial approachesÂ - using a focal stimulation or helmet for global brain stimulationÂ - seemed to act at both the vascular level by increasing regional cerebral blood flow (rCBF) and at the neural level by changing the activity of the neurons. In addition, studies also showed that even a focal stimulation was sufficient to induce a global change in functional connectivity across brain networks. Results in patients with neurological disease were sparser; nevertheless, they indicated that tPBM could improve rCBF and functional connectivity in several regions. Our systematic review also highlighted the heterogeneity in the methods and results generated, together with the need for more randomised controlled trials in patients with neurological diseases. In summary, tPBM could be a promising method to act on brain function, but more consistency is needed in order appreciate fully the underlying mechanisms and the precise outcomes. Humans;Brain;Nervous System Physiological Phenomena;Cerebrovascular Circulation;Low-Level Light Therapy

Efficacy of Portable 445â€‰nm Laser Versus Intense Pulsed Light Treatment for Dry Eye: A Prospective Randomized Pilot Study. Objective: The aim of the study is to evaluate the efficacy of intense pulsed light (IPL) compared with a portable 445â€‰nm laser device in the treatment of dry eye. Our hypothesis was that IPL and 445â€‰nm laser can provide equal reduction of symptoms for patients with dry eye disease. Methods: Participants provided written informed consent as per the Helsinki declaration before a baseline testing (visit 1). All participants completed four in-clinic study visits and one telephone call over the course of âˆ¼4 months. The patients were evaluated at baseline and received the first treatment (visit 1) at the same visit. Thereafter, treatment was repeated every 2 weeks until four treatments had been administered (visits 2-4). The evaluation of dry eye included the following tests for both eyes: tear break-up time (TBUT), in seconds, taken in three measurements using a timer; corneal fluorescein staining (CFS); and lissamine green (grading 0-5 as per Oxford grading system). Other tests included visual acuity and the measurement of intraocular pressure. A full medical history and current ocular and systemic medications were obtained. All participants completed the Dry Eye Questionnaire (DEQ5), as per DEWS II, at each visit, as well as during the final telephone assessment âˆ¼2 months after their fourth treatment. Results: Twenty-eight eyes of 14 patients were included in the study. The eyes were randomized with 14 eyes in each group receiving either 445â€‰nm laser or IPL. The group included 10 female and 4 male participants with average age of 64.8 years (standard deviation 13.9). The primary outcome measures of TBUT, CFS, and the DEQ5 questionnaire were statistically significantly improved. TBUT IPL versus 445â€‰nm laser pâ€‰=â€‰0.0097 versus 0.0115, CFS IPL versus 445â€‰nm laser pâ€‰=â€‰0.0027 versus 0.0003. The questionnaire did not discriminate between the two methods but also showed highly statistically significant improvement pâ€‰=â€‰0.0001. Conclusions: The portable 445â€‰nm laser and IPL were equally effective in the treatment of dry eye in this cohort. No significant adverse events were noted in either treatment group. K-Laser Blue(Â®) can be considered as a substitute for IPL treatment for dry eye. Humans;Male;Female;Middle Aged;Prospective Studies;Meibomian Glands;Pilot Projects;Dry Eye Syndromes;Lasers

Photobiomodulation Literature Watch October 2022.

A Review of Applications and Intracellular Mechanisms of Intense Pulsed Light in Eyelid Inflammatory Diseases. Objective: To evaluate relevant clinical outcomes and conclude possible mechanisms of intense pulsed light (IPL) in eyelid inflammation. Background: IPL devices were primarily applied in cutaneous vascular malformations and have been used in ocular diseases for about 20 years, mostly including meibomian gland dysfunction (MGD), blepharitis, and ocular rosacea. Recent findings:

Seventy-two original clinical researches were included, 57 for MGD, 4 for blepharitis or blepharitis-related keratoconjunctivitis, and 11 for rosacea. Dry eye symptoms, (tear) break-up time (BUT), and meibomian structure and/or functions were improved in most patients, but production of reactive oxygen species is an important link in the photobiomodulation mediated by IPL, which can influence numerous signal pathways to achieve anti-inflammatory, anti-infective, and prodifferentiation effects. Conclusions: The evidence suggests that IPL is an effective therapeutic tool for most patients with MGD, but more clinical evidence is needed for other indications. Humans;Meibomian Glands;Eyelid Diseases;Blepharitis;Meibomian Gland Dysfunction;Phototherapy;Rosacea

Photobiomodulation provides neuroprotection through regulating mitochondrial fission imbalance in the subacute phase of spinal cord injury. Increasing evidence indicates that mitochondrial fission imbalance plays an important role in delayed neuronal cell death. Our previous study found that photobiomodulation improved the motor function of rats with spinal cord injury. However, the precise mechanism remains unclear. To investigate the effect of photobiomodulation on mitochondrial fission imbalance after spinal cord injury, in this study, we treated rat models of spinal cord injury with 60-minute photobiomodulation (810 nm, 150 mW) every day for 14 consecutive days. Transmission electron microscopy results confirmed the swollen and fragmented alterations of mitochondrial morphology in neurons in acute (1 day) and subacute (7 and 14 days) phases. Photobiomodulation alleviated mitochondrial fission imbalance in spinal cord tissue in the subacute phase, reduced neuronal cell death, and improved rat posterior limb motor function in a time-dependent manner. These findings suggest that photobiomodulation targets neuronal mitochondria, alleviates mitochondrial fission imbalance-induced neuronal apoptosis, and thereby promotes the motor function recovery of rats with spinal cord injury.

Transcranial photobiomodulation with near-infrared light: a promising therapeutic modality for Alzheimer's disease.

Laser therapy versus pulsed electromagnetic field therapy as treatment modalities for early knee osteoarthritis: a randomized controlled trial. BACKGROUND: This randomized controlled trial aimed to compare the effects of pulsed electromagnetic field therapy (PEMFT) and low-level laser therapy (LLLT) on pain and physical function of participants with knee osteoarthritis (KOA). METHODS: According to the Kellgren-Lawrence classification, participants with grade 2-3 KOA were randomized to receive PEMFT or LLLT for six sessions lasting 15â€‰min/session over a 3-week period. Pain at rest and when walking, standing from a sitting position, and climbing the stairs was assessed using the visual analog scale. Functional level was measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), timed up-and-go test (TUG), and 10-m walk (10â€‰MW) test. Measurements were obtained before and after the interventions. Significance was determined at pâ€‰â‰¤â€‰0.05. RESULTS: Forty participants were included in the study. Pain and physical function improved significantly (pâ€‰<â€‰0.0001) in both groups. PEMFT was significantly more effective in reducing pain at rest, when standing from a sitting position, and when climbing the stairs, and in improving both WOMAC scores and TUG results (pâ€‰â‰¤â€‰0.0003). The improvements in pain during the activities and the WOMAC scores reached the minimal clinically important difference. No adverse events occurred. CONCLUSION: Six sessions of PEMFT and LLLT had immediate positive effects on pain and physical function in individuals with low-grade KOA, with PEMFT resulting in significantly better results. TRIAL REGISTRATION: ISRCTN registry trial ID: ISRCTN17001174. Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Treatment Outcome;Electromagnetic Fields;Laser Therapy;Pain

Light-emitting diode (LED) photobiomodulation regulates thermogenesis and lipogenesis markers in adipose tissue and improves anthropometric and metabolic parameters in obese mice. To evaluate the effects of Light-Emitting Diode (LED) irradiation on the expression of thermogenesis and

lipogenesis-associated markers in adipose tissue and metabolic parameters of obese mice. Twenty-four male mice were divided into four groups:Â i) ST fed standard diet;Â ii) HCD fed hyperglycemic diet;Â iii) LEDâ€‰+â€‰I fed hyperglycemic diet and irradiated with LED in the interscapular region;Â iv) LEDâ€‰+â€‰A fed hyperglycemic diet and irradiated with LED in the abdominal region. The first phase of the study comprehended the induction of obesity for 12Â weeks. Next, the animals were submitted to six irradiation sessions (days 1, 3, 7, 10, 14, and 21) using a 660-nm LED (5.77Â J/cm(2)Â at 48,1Â mW/cm(2)). Anthropometric, biochemical, and histological parameters and the expression of thermogenesis and lipogenesis-associated markers were assessed in adipose tissue. There was diminished weight gain between the HCD and LEDâ€‰+â€‰A groups (ST: 0.37â€‰Â±â€‰0.65; HCD: 3.10â€‰Â±â€‰0.89; LEDâ€‰+â€‰I: -1.26â€‰Â±â€‰0.83; LEDâ€‰+â€‰A: -2.07â€‰Â±â€‰1.27Â g; pâ€‰<â€‰0.018). There was a 33.3% and 23.8% reduction in epididymal adipose tissue weight and a 25% and 10.7% in the visceral adiposity for the LEDâ€‰+â€‰I and LEDâ€‰+â€‰A groups, respectively, when compared with HCD. There was aÂ decreased accumulation of fat droplets in adipose tissue in LED + A and LED + I groups. Additionally, LED irradiation was associated with increased mRNA expression of uncoupling protein 1 (UCP1) in the brown adipose tissue (ST: 2.27â€‰Â±â€‰0.19; HCD: 1.54â€‰Â±â€‰0.12; LEDâ€‰+â€‰I: 2.44â€‰Â±â€‰0.22; pâ€‰=â€‰0.014) and decreased fatty acid synthetase (FAS) expression in epididymal adipose tissue (ST: 0.79â€‰Â±â€‰0.13; HCD: 1.59â€‰Â±â€‰0.13; LEDâ€‰+â€‰A: 0.85â€‰Â±â€‰0.04; pâ€‰=â€‰0.0008). LED treatment improved anthropometric parameters, possibly associated with the histological alterations, thermogenesis and lipogenesis markers in white adipose tissue, and expression modulation in brown adipose tissue. Male;Animals;Mice;Lipogenesis;Mice, Obese;Diet, High-Fat;Adipose Tissue;Adipose Tissue, Brown;Thermogenesis;Mice, Inbred C57BL

Efficacy of one-time application of low-level laser therapy in the management of complications after third molar surgery: A retrospective practice-based study. PURPOSE: To evaluate in a retrospective practice-based clinical study, the effects of additional laser therapy on side effects following the removal of all four impacted third molars. The secondary objective was, based on those results, to rationalize a protocol for low-level laser therapy (LLLT) in terms of irradiation settings. METHODS: 96 subjects requiring simultaneous surgical removal of the four third molars were treated from 2017 to 2019. For each subject, one side was randomly assigned to laser treatment, the other receiving the placebo. LLLT was performed by applying an infrared diode laser of 810 nm. In the LLLT irradiated side of the mouth, three groups were randomly assigned to a specific protocol of irradiation. Controllable settings include power, energy density and also scanning technique. The main outcome was pain, registered on a visual analog scale (VAS) performed by the patients. RESULTS: There was a statistically significant difference for one of the tested protocols. Self-reported annoyance and pain scores were lower for the side submitted to a 30-second laser radiation at a power of 0.3 W with the slow scanning technique (P< 0.05). CLINICAL SIGNIFICANCE: The present treatment approach, using a one-time low-level laser therapy intra-oral application, showed a beneficial effect of LLLT reducing pain after third molar surgery, which should be confirmed through further study. Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Retrospective Studies;Tooth Extraction

Metabolomic study combined with the low-level light therapy of Chinese acupuncture points and combined oral contraceptives in treatment of primary dysmenorrhea: A prospective, multicenter, randomized controlled study. OBJECTIVE: To compare the changes of metabolites between Low-level light therapy (LLLT) and combined oral contraceptive (COC) after treatment of primary dysmenorrhea (PD), and to compare and analyze the biological and biochemical effects of the two treatments by analyzing the differences in metabolite profiles. METHODS: A multicenter, double-

blind, prospective, parallel, randomized controlled study was conducted on 69 women aged 16-35 years old with PD who were randomly divided into COC treatment group or LLLT treatment group. Low-level light therapy with light-emitting diodes (LED) was applied on two acupoints named "Guanyuan" (CV4) and "Qihai" (CV6). After 12 weeks of treatment intervention, blood samples were collected before and after treatment for metabolomic analysis. We used UPLC-MS/MS analysis to compare the differences in metabolite changes between LLLT and COC before and after treatment. RESULTS: 76 differential metabolites were detected in the LLLT group, and 92 differential metabolites were detected in the COC group, which were up-regulated or down-regulated (pÂ <Â 0.001). Prostaglandin D2 (PG D2) was down-regulated and biliverdin was up-regulated after LLLT treatment, 4a-Hydroxytetrahydrobiopterin, Prostaglandin D2, 5-Hydroxy-l-tryptophan, Cholic acid were down-regulated and cortisol was up-regulated after COC treatment, and the differences were statistically significant. Cortisol and testosterone glucuronide in LLLT group were significantly lower than those in COC group. The metabolic pathways affected were glycerophospholipid metabolism, linoleic acid metabolism and arachidonic acid metabolism in the LLLT group, and glycerophospholipid metabolism, folate biosynthesis, arachidonic-acid-metabolism, and tryptophan metabolism in the COC group. The differential metabolic pathway were linoleic acid metabolism, steroid hormone biosynthesis, and alpha-Linolenic acid metabolism after the comparison of LLLT with COC. CONCLUSION: LLLT and COC might relieve dysmenorrhea by down-regulating PGD2, and LLLT might also relieve dysmenorrhea by up-regulating biliverdin. The level of cortisol and testosterone glucuronide after LLLT treatment was lower than that after COC treatment, which might lead to the difference in the clinical efficacy of the two treatments for dysmenorrhea.

Combined Photobiomodulation and Static Magnetic Fields to Reduce Side Effects from Laser and Radiofrequency Treatments for Dermatological Conditions. BACKGROUND: Photobiomodulation therapy (PBMT) can significantly reduce inflammation and relieve pain, including postoperative pain and edema. The study aimed to evaluate the performance of a photobiomodulation-based device that includes a static magnetic field (SMF) to treat laser- or intensive and fractional radiofrequency-related side effects, such as pain, redness, and edema in patients treated for different dermatological conditions. METHODS: The study had a prospective, non-randomized, single-center design. Male and female patients aged 18 years or older underwent one or two PBMT-SMF (anti-inflammatory or anti-edematous) sessions on the same day, once or twice a week, after laser or radiofrequency facial treatments due to various dermatological disorders. Variables and efficacy assessments were pain, redness, edema, and their reduction from baseline to the last visit. RESULTS: Twenty-seven patients were included, seven (25.9%) men and 20 (74.1%) women, with a mean (SD) age of 43.7 (14.1) years. Seven (25.9%) patients were treated with radiofrequency, and 20 (74.1%) patients with a vascular laser (three [15%] for angioma, two [10%] for scars, three [15%] for erythrosis, and 12 [60%] for rosacea). After the PBMT-SMF protocol, overall mean pain reduction was 40 percent, and redness and edema reduction were shown by the pictures taken before and after the PBMT-SMF procedure. LIMITATIONS: The primary limitations were the small number of patients and no quantitative variables for redness and edema. CONCLUSION: PBMT-SMF reduced edema and inflammation after treatment with lasers or intensive or fractional radiofrequency for facial conditions, and probably, analgesic and anti-inflammatory drugs.

Effect of Low-Level Laser Therapy on Early Wound Healing and Levels of Inflammatory Mediators in Gingival Crevicular Fluid Following Open Flap Debridement. Introduction Low-level laser therapy (LLLT) has a beneficial effect on pain relief and wound healing. This study aims at a clinical evaluation of early wound healing and a biochemical evaluation of inflammatory mediators in gingival crevicular fluid (GCF) following LLLT with an open flap debridement (OFD) in periodontal therapy. Material and methods This randomized controlled trial included 40 chronic periodontitis patients with bilateral

attachment loss, pocket depths of 5 mm affecting at least two quadrants, and radiographic evidence of horizontal bone loss. 120 control sites were randomly selected to receive OFD, and contralateral 120 test sites received bio-stimulation with a diode laser (890 nm) after OFD.Â The wound healing index was recorded at the 1stÂ and 2ndÂ weeks, and clinical parameters such as the plaque index, gingival index, pocket probing depth, clinical attachment level, and GCF inflammatory mediators were evaluated at baseline, 3, and 6 months. Results From the start of the study to 6 months later, there was aÂ statistically significant dropÂ in plaque index, gingival index, probing pocket depth, and gain clinical attachment levels in both groups. However, when the two groups were compared, there were no significant differences at any time intervals. GCFÂ inflammatory mediators tumor necrosis factor (TNF) alpha and matrixÂ metalloproteinases (MMP-8) decrease, and osteoprotegerin (OPG)Â levels increase in both the test group and control group from baseline to 3 months and 6 months. In intergroup comparisons, there was a statistically significant reduction in the test group as compared to the control group at 6 months. There was a decline in gingivalÂ crevicular fluidÂ - interleukin-6 (GCF IL-6) levels from baseline to 3 months and 6 months in both the groups but when analysed statistically, the results were not significant on intergroup and intragroup comparison at any time interval.Â The Landry Wound Healing Index values in the 1st andÂ 2nd weeks were showing statistically significant improved healing in the test group as compared to the control group. There was significantly better wound healing at sites where a diode laser was used. Conclusion LLLT increases early wound healing after periodontal surgical procedures.

Laser Thermo-Photobiomodulation of Bone Marrow Mesenchymal Stem Cells. We studied the effect of laser radiation of moderate intensity with a wavelength of 970 nm on the efficiency of colony formation of rat bone marrow mesenchymal stem cells (MSC) in vitro. In this case, photobimodulation and thermal heating of MSC occur simultaneously. This combined laser treatment allows increasing the number of colonies by 6 times in comparison with the control and by more than 3 times in comparison with thermal heating alone. The mechanism of such an increase is associated with combined thermal and light effects of laser radiation of moderate intensity, which stimulates cell proliferation. This phenomenon can be used as the basis for solving the most important task of cell transplantation, associated with the expansion of autologous stem cells and activation of their proliferative potential. Rats;Animals;Mesenchymal Stem Cells;Lasers;Stem Cells;Cell Proliferation;Bone Marrow Cells

Evaluation of bond strength of glass and resin-ceramics with laser phototherapy: A systematic review and meta-analysis of inÂ vitro studies. STATEMENT OF PROBLEM: Laser phototherapy has been studied as a surface treatment capable of increasing the adhesion of cement to the ceramic surface. However, the bond strength of glass and resin-ceramics after laser phototherapy is unclear. PURPOSE: The objective of this systematic review and meta-analysis was to compare the bond strength of glass and resin-ceramics using laser therapy and conventional hydrofluoric acid etching. MATERIAL AND METHODS: This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and was registered in the Open Science Framework (OSF) for inÂ vitro studies. A population, intervention, control, and outcome (PICO) question was formulated: "Does phototherapy promote better bond strength in glass and resin-ceramics than conventional hydrofluoric acid etching?" A literature search was performed in PubMed/MEDLINE, Embase, Web of Science, Scopus, Cochrane Library, and ProQuest databases up to January 2023. The Joanna Briggs Institute critical assessment guidelines for quasi-experimental studies were used for quality assessment. The meta-analysis was based on the inverse variance (IV) method (Î±=.05). RESULTS: A total of 6 inÂ vitro studies published between 2007 and 2019 with a total number of 348 specimens were included for qualitative analysis; 1 study had a positive effect. Five of the studies were included in the meta-analysis, which indicated a significant decrease for

feldspathic ceramics that received laser phototherapy and lithium disilicate (P=.002; MD: -2.15; 95% CI: -3.53 to -0.77; I(2)=89%, P<.01) and (P<.01; MD: -2.13; 95% CI: -2.99 to -1.27; I(2)=82%, P<.01), respectively. CONCLUSIONS: Laser irradiation as surface etching of glass ceramics does not produce a bond strength equal to that of conventional hydrofluoric acid etching.

Treating Nerve Injury after Endodontic Microsurgery Using Laser Photobiomodulation: A Report of 2 Cases. The purpose of this case report was to inform dentists and dental specialists about a noninvasive, viable treatment option that could aid in the recovery of patients who have experienced iatrogenic nerve injuries. Nerve injury is an inherent risk of many dental procedures and a complication that can negatively impact a patient's quality of life and activities of daily living. Managing neural injuries presents a challenge for clinicians because there are no standard protocols reported in the literature. Although spontaneous healing of these injuries can occur, the duration and degree of healing can vary greatly between individuals. Photobiomodulation (PBM) therapy is used as an adjunct in medicine for functional nerve recovery. Once target tissues are illuminated with a low-level laser during PBM, the light energy is absorbed by the mitochondria causing adenosine triphosphate production, modulation of reactive oxygen species, and the release of nitric oxide. These cellular changes explain why PBM has been shown to aid in cell repair, vasodilation, a reduction in inflammation, accelerated healing, and an improvement in postoperative pain. This case report presents 2 patients with neurosensory alterations after endodontic microsurgery with a significant improvement in their condition after PBM treatment using a 940-nm diode laser.
Humans;Microsurgery;Activities of Daily Living;Quality of Life;Lasers;Low-Level Light Therapy

Preclinical study of experimental burns treated with photobiomodulation and Human Amniotic Membrane, both isolated and associated. OBJECTIVE: to evaluate the effect of photobiomodulation with low-level 660 nm laser alone or associated with Human Amniotic Membrane in the repair of partial-thickness burns in rats. METHOD: an experimental study conducted with 48 male Wistar rats, randomized into four groups: Control, Human Amniotic Membrane, Low-Level Laser Therapy, and Low-Level Laser Therapy associated with Human Amniotic Membrane. The histopathological characteristics of the skin samples were analyzed 7 and 14 days after the burn. The data obtained were submitted to the Kolmogorov-Smirnov and Mann-Whitney tests. RESULTS: the histological analysis of the burn injuries showed a decrease in inflammation ($p<0.0001$) and an increase in proliferation of fibroblasts ($p<0.0001$) mainly at 7 days in all treatments related to the control group. At 14 days, the greater effectiveness in accelerating the healing process was significant ($p<0.0001$) in the Low-Level Laser Therapy group associated with the Human Amniotic Membrane. CONCLUSION: the association of photobiomodulation therapies with the Human Amniotic Membrane allowed verifying a reduction in the healing process time of the experimental lesions, stimulating its proposal as a treatment protocol in partial-thickness burns.
Rats;Humans;Male;Animals;Rats, Wistar;Wound Healing;Amnion;Low-Level Light Therapy;Burns

Use of a colorimeter is a viable method to measure melanin and erythema content in the context of laser beam attenuation by use of a class IV laser in different tissues in dogs. OBJECTIVE: Patient factors may alter laser photon attenuation, but these factors have not been adequately evaluated in live dogs. Our objective was to evaluate class IV laser beam attenuation (LBA) by canine tissues using a colorimeter to evaluate melanin and erythema indices. We hypothesized that greater melanin and erythema indices and unclipped hair would increase LBA, and these properties would vary among tissues. ANIMALS: 20 client-owned dogs. PROCEDURES: Between October 1 and December 1, 2017, colorimeter measurements and LBA in various tissues before and after clipping overlying hair were evaluated. Data were analyzed using generalized linear mixed models. Statistical significance was set at $P < .05$. RESULTS: LBA was greater in unclipped (98.6 Â± 0.4%) than clipped hair (94.6 Â± 0.4%). The least LBA occurred in the pinna (93%) while the greatest occurred in the caudal vertebra (100%) and

caudal semitendinosis muscles (100%). Each mm of tissue thickness resulted in LBA of 11.6%. Each unit increase in melanin index resulted in a 3.3% increase in LBA. There was no association of LBA with erythema index. CLINICAL RELEVANCE: To our knowledge, this is the first study that evaluated LBA by different tissues in live dogs using a colorimeter to evaluate melanin and erythema indices. We recommend clipping hair prior to photobiomodulation to decrease laser beam attenuation and using increased laser doses in thicker tissues and dogs with high melanin content. The colorimeter may be helpful in customizing patient treatment dosimetry. Future studies are necessary to determine therapeutic laser doses for adequate photobiomodulation effects. Melanins Dogs;Animals;Melanins;Erythema;Lasers;Dog Diseases

The potential effects of nutrients and light on autophagy-mediated visual function and clearance of retinal aggregates. Increasing findings indicate that a dysfunction in the autophagy machinery is common during retinal degeneration. The present article provides evidence showing that an autophagy defect in the outer retinal layers is commonly described at the onset of retinal degeneration. These findings involve a number of structures placed at the border between the inner choroid and the outer retina encompassing the choriocapillaris, the Bruch's membrane, photoreceptors and Mueller cells. At the center of these anatomical substrates are placed cells forming the retinal pigment epithelium (RPE), where autophagy seems to play most of its effects. In fact, a failure of the autophagy flux is mostly severe at the level of RPE. Among various retinal degenerative disorders, age-related macular degeneration (AMD) is mostly affected by a damage to RPE, which can be reproduced by inhibiting the autophagy machinery and it can be counteracted by the activation of the autophagy pathway. In the present manuscript evidence is provided that such a severe impairment of retinal autophagy may be counteracted by administration of a number of phytochemicals, which possess a strong stimulatory activity on autophagy. Likewise, natural light stimulation administered in the form of pulsatile specific wavelengths is capable of inducing autophagy within the retina. This dual approach to stimulate autophagy is further strengthened by the interaction of light with phytochemicals which is shown to activate the chemical properties of these natural molecules in sustaining retinal integrity. The beneficial effects of photo-biomodulation combined with phytochemicals is based on the removal of toxic lipid, sugar and protein species along with the stimulation of mitochondrial turn-over. Additional effects of autophagy stimulation under the combined effects of nutraceuticals and light pulses are discussed concerning stimulation of retinal stem cells which partly correspond to a subpopulation of RPE cells. Humans;Retinal Degeneration;Retina;Nutrients;Retinal Pigment Epithelium;Autophagy

Effects of Irradiation by Carbon Dioxide Laser Equipped With a Water Spray Function on Bone Formation in Rat Tibiae. BACKGROUND/AIM: Irradiation of tissue with carbon dioxide (CO(2)) laser shows a characteristic thermal effect that causes vaporization of tissue in the target region. However, the thermal effect in places other than the target region induces tissue damage. Two methods are used: high reactive-level laser therapy (HLLT), aimed at surgical treatment, and low reactive-level laser therapy (LLLT), aimed at cell and tissue activation. In both, vaporization of tissue is induced by thermal damage. A water spray function may ameliorate thermal damage from CO(2) laser irradiation. In this study, we irradiated CO(2) laser on rat tibiae with or without a water spray function and examined the effects of this technique on bone metabolism. MATERIALS AND METHODS: Bone defects were created in rat tibiae by dental bur in a Bur group and by laser in laser irradiation groups with (Spray group) and without (Air group) water spray function. At 1 week postoperatively, histological analyses of tibiae were performed using hematoxylin and eosin staining, immunohistochemical staining (IHC) with anti-sclerostin antibody, and 3-dimensional (3D) observation using micro-computed tomography. RESULTS: Histological findings and 3D observation confirmed induction of new bone formation following laser irradiation in both the Air and Spray

groups. No bone formation was seen in the Bur group. IHC revealed that the activity of osteocytes in the region of irradiated cortical bone was markedly impaired in the Air group, but osteocyte impairment was ameliorated in the Spray group and absent in the Bur group. CONCLUSION: The water spray function appears effective in reducing thermal damage to tissues irradiated by CO(2) laser. CO(2) lasers with water spray function may be useful in bone regeneration therapy. Carbon Dioxide;Water Animals;Rats;Lasers, Gas;Carbon Dioxide;X-Ray Microtomography;Osteogenesis;Radiation Injuries;Water

Low-Level Laser Therapy Facilitates Postcontraction Recovery with Ischemic Preconditioning. PURPOSE: Despite early development of muscle fatigue, ischemic preconditioning is gaining popularity for strength training combined with low-load resistance exercise. This study investigated the effect of low-level laser (LLL) on postcontraction recovery with ischemic preconditioning. METHODS: Forty healthy adults (22.9 Â± 3.5 yr) were allocated into sham (11 men, 9 women) and LLL (11 men, 9 women) groups. With ischemic preconditioning, they were trained with three bouts of intermittent wrist extension of 40% maximal voluntary contraction (MVC). During the recovery period, the LLL group received LLL (wavelength of 808 nm, 60 J) on the working muscle, whereas the sham group received no sham therapy. MVC, force fluctuations, and discharge variables of motor units (MU) for a trapezoidal contraction were compared between groups at baseline (T0), postcontraction (T1), and after-recovery (T2). RESULTS: At T2, the LLL group exhibited a higher normalized MVC (T2/T0; 86.22% Â± 12.59%) than that of the sham group (71.70% Â± 13.56%; P = 0.001). The LLL group had smaller normalized force fluctuations (LLL, 94.76% Â± 21.95%; sham, 121.37% Â± 29.02%; P = 0.002) with greater normalized electromyography amplitude (LLL, 94.33% Â± 14.69%; sham, 73.57% Â± 14.94%; P < 0.001) during trapezoidal contraction. In the LLL group, the smaller force fluctuations were associated with lower coefficients of variation of interspike intervals of MUs (LLL, 0.202 Â± 0.053; sham, 0.208 Â± 0.048; P = 0.004) with higher recruitment thresholds (LLL, 11.61 Â± 12.68 %MVC; sham, 10.27 Â± 12.73 %MVC; P = 0.003). CONCLUSIONS: LLL expedites postcontraction recovery with ischemic preconditioning, manifesting as superior force generation capacity and force precision control for activation of MU with a higher recruitment threshold and lower discharge variability. Adult;Male;Humans;Female;Muscle, Skeletal;Electromyography;Low-Level Light Therapy;Muscle Fatigue;Ischemic Preconditioning;Isometric Contraction;Muscle Contraction

Efficacy of surgical periodontal treatment with and without photobiomodulation in the treatment of severe periodontitis: An evaluation of periodontal, microbiological, and cytokine levels. AIM: To compare the efficacy of surgical periodontal treatment (SPT) alone and PDT-assisted surgery in participants with severe periodontitis. MATERIAL AND METHODS: The present clinical trial was completed by 64 participants (nÂ =Â 32 each). The selection was made according to predefined inclusion and exclusion criteria. Patients in group A were treated with SPT only and participants in group B were treated with SPT adjunct to PDT. Microbiological assessment of P.Gingivalis; T. Forsythia and T.Denticola were evaluated using cultural analysis and periodontal parameters plaque score (PSc), bleeding on probing (BoP) periodontal depth (PD), and clinical attachment loss (CAL) at baseline and post-treatment at 6 months and 12 months were performed. The gingival crevicular fluid (GCF) was collected for the estimation of IL-1Î² and tumor necrosis factor-alpha (TNF-Î±) using an enzyme-linked immunosorbent assay (ELISA). For intra-group comparison and post hoc correction, Student's t-test along with Bonferroni was used. For the difference between follow-ups, an analysis of variance (ANOVA) multiple rank tests were incorporated. RESULTS: The mean age of participants in the SPT group was 55.25Â±4.6yrs. Whereas, participants treated with PDT adjunct to SPT were 54.88Â±3.6yrs. Periodontal parameters (BoP, PD, PSc, CAL) showed no significant difference at baseline. At 6 months and 12 months follow-up, a significant difference in all parameters (BoP, PD, PSc, and CAL) was found

in participants treated with SPT alone and PDT adjunct to SPT (p<0.05). Inflammatory biomarkers at 6-month and 12-month follow-ups, a statistically significant difference in the level of biomarkers (IL-1Î² and TNF-Î±) were observed in both groups from baseline (p<0.05). However, at baseline, no significant difference was noted in both groups (p> 0.05). The microbiological assessment showed a significant drop in the bacterial count in participants treated with both regimes i.e., SPT alone and PDT adjunct to SPT. CONCLUSION: Photodynamic therapy (PDT) adjunct to surgical periodontal treatment (SPT) in severe periodontitis improves microbiological and periodontal parameters and lowers the level of proinflammatory cytokines. Cytokines;Tumor Necrosis Factor-alpha;Photosensitizing Agents Humans;Middle Aged;Cytokines;Tumor Necrosis Factor-alpha;Photochemotherapy;Photosensitizing Agents;Periodontitis;Dental Scaling;Chronic Periodontitis;Gingival Crevicular Fluid

Twenty-year analysis of photobiomodulation clinical studies for oral mucositis: a scoping review. OBJECTIVE: Our objective was to review the first 20 years of photobiomodulation (PBM) clinical studies for oral mucositis (OM) mitigation. STUDY DESIGN: A scoping review screened controlled clinical studies. The PBM devices, protocols, and clinical outcomes were analyzed. RESULTS: Seventy-five studies met the inclusion criteria. The first study dated from 1992, and the term "PBM" was first published in 2017. Public services, placebo-controlled randomized trials, and patients with head and neck chemoradiation were predominant among included studies. Prophylactic red intraoral laser protocols were mostly used. Comparing the outcomes of all protocols was unfeasible due to missing treatment parameters and nonhomogeneous measurements. CONCLUSIONS: The main barrier to optimizing clinical protocols of PBM for OM was the lack of standardization in clinical studies. Although PBM use is now globally present in oncology settings and generally marked by good outcomes reported, additional randomized clinical trials with well-described methods are necessary. Humans;Low-Level Light Therapy;Stomatitis;Chemoradiotherapy;Light

Neurite growth induced by red light-caused intracellular reactive oxygen species production through cytochrome c oxidase activation. The applications of red-light photobiomodulation (PBM) to enhance neurite growth have been proposed for many years. However, the detailed mechanisms require further studies. In the present work we used a focused red-light spot to illuminate the junction of the longest neurite and the soma of a neuroblastoma cell (N2a), and demonstrated enhanced neurite growth at 620Â nm and 760Â nm with adequate illumination energy fluences. In contrast, 680Â nm light showed no effect on neurite growth. The neurite growth was accompanied with the increase of intracellular reactive oxygen species (ROS). Using Trolox to reduce the ROS level, this red light-induced neurite growth was hindered. Suppressing the activities of cytochrome c oxidase (CCO) by using either a small-molecule inhibitor or siRNA abrogated the red light-induced neurite growth. These results suggest that red light-induced ROS production through the activation of CCO could be beneficial for neurite growth. Reactive Oxygen Species;Electron Transport Complex IV Reactive Oxygen Species;Electron Transport Complex IV;Neurites;Light;Neurons

Effect of near-infrared laser treatment on improving erectile function in rats with diabetes mellitus. BACKGROUND: Diabetes mellitus-induced erectile dysfunction is difficult to treat. The oxidative stress created by diabetes mellitus is a major cause of injuries to the corpus cavernosum, thereby resulting in erectile dysfunction. Near-infrared laser has already been shown to be effective in treating multiple brain disorders because of its antioxidative stress effect. OBJECTIVES: To investigate whether a near-infrared laser improves the erectile function of diabetes mellitus-induced erectile dysfunction rats through its antioxidative stress effect. MATERIALS AND METHODS: Knowing its advantage of reasonable deep tissue penetration and good photoactivation on mitochondria, a near-infrared laser with wavelength of 808Â nm was used in the experiment. Since the internal and external corpus cavernosum were covered by different tissue layers, the laser penetration rates of the internal and

external corpus cavernosum were measured separately. Different radiant exposure settings were applied: in the initial experiment, 40 male Sprague-Dawley rats were randomly assigned to five groups, normal controls, and streptozotocin-induced diabetes mellitus rats that 10Â weeks later received various radiant exposures (J/cm(2)) from the near-infrared laser (DM0J(DM+NIR 0 J/cm(2)), DM1J, DM2J, and DM4J) in the subsequent 2Â weeks. Erectile function was then assessed 1Â week after near-infrared treatment. It was found that the initial radiant exposure setting was not optimal according to the Arndt-Schulz rule. We performed a second experiment using a different radiant exposure setting. Forty male rats were randomly divided into five groups (normal controls, DM0J, DM4J, DM8J, and DM16J), and the near-infrared laser was again applied according to the new setting, and erectile function was assessed as in the first experiment. Histologic, biochemical, and proteomic analyses were then conducted. RESULTS: Recovery of erectile function of varying degrees was observed in the near-infrared treatment groups, and radiant exposure of 4 J/cm(2) achieved optimal results. The DM4J group showed improvement in mitochondrial function and morphology in diabetes mellitus rats, and it was found that oxidative stress levels were significantly reduced by near-infrared exposure. The tissue structure of the corpus cavernosum was also improved by near-infrared exposure. The proteomics analysis confirming multiple biologic processes were changed by diabetes mellitus and near-infrared. DISCUSSION AND CONCLUSION: Near-infrared laser activated mitochondria, improved oxidative stress, repaired the damage to penile corpus cavernosum tissue structures caused by diabetes mellitus, and improved erectile function in diabetes mellitus rats. These results thus raise the possibility that human patients with diabetes mellitus-induced erectile dysfunction may respond to near-infrared therapy in a manner that parallels the responses we observed in animal study. Rats;Male;Humans;Animals;Erectile Dysfunction;Rats, Sprague-Dawley;Proteomics;Penile Erection;Penis;Diabetes Mellitus, Experimental

Effect of exercise training with laser phototherapy on homeostasis balance resistant to hypercoagulability in seniors with obesity: a randomized trial. The prevalence of obesity has increased the incidence of obesity-related coagulation disorders. The current study assessed the effectiveness of combined aerobic exercise and laser phototherapy on the coagulation profile and body measurements in older adults with obesity compared to aerobic exercise alone, which has not been adequately explored. We included 76 obese people (50% women and 50% men) with a mean age of 67.83â€‰Â±â€‰4.84Â years and a body mass index of 34.55â€‰Â±â€‰2.67Â kg/m(2). The participants were randomly assigned to the experimental group (which received aerobic training with laser phototherapy) and the control group (which received aerobic training alone) for three months. From the baseline to the final analysis, the absolute changes in specific coagulation biomarker levels (fibrinogen, fibrin fragment D, prothrombin time, Kaolin-Cephalin Coagulation Time), and contributing parameters (C-reactive protein and total cholesterol), were assessed. In comparison to the control group, the experimental group showed significant improvements in all evaluated measures (pâ€‰<â€‰0.001). So, in comparison to aerobic exercise alone, combined aerobic exercise and laser phototherapy had superior positive effects on coagulation biomarkers and decreased the risk of thromboembolism throughout a three-month intervention period in senior obese persons. Therefore, we suggest adopting laser phototherapy for individuals with a greater risk of hypercoagulability.The research was entered into the database of clinical trials under the identification NCT04503317. Male;Humans;Female;Aged;Middle Aged;Low-Level Light Therapy;Thrombophilia;Exercise;Homeostasis;Obesity

A Study on the Effectiveness of 650-nm Red-Light Feeding Instruments in the Control of Myopia. INTRODUCTION: This study analyzed the effectiveness of 650-nm red-light feeding instruments in the control of myopia. METHODS: In this study, 164 school-aged participants diagnosed with myopia in the city of Shenzhen were enrolled in a red-light feeding instrument study. Of these, 41 were enrolled

in the mild-to-moderate myopia group that received red-light feeding (RLMM group), 65 were enrolled in the mild-to-moderate myopia group that received single-vision spectacle treatment (SVSMM group), and 58 were included in the severe myopia group that received red-light feeding (RLS group). RESULTS: After the baseline values of the three groups were matched, the right eye data were used for statistical analysis. The average return visit time of each group was 60.42 days, and changes in the observation indexes before treatment and after follow-up treatment were compared. As the primary outcome, the axial length changes in the right eye of the SVSMM group (0.08 Â± 0.40 mm), the RLMM group (-0.03 Â± 0.11 mm), and the RLS group (-0.07 Â± 0.11 mm) were compared and showed a statistical result of p < 0.001. CONCLUSION: The study results verified that red light had a noticeable effect on the control of myopia and that low-level red-light therapy played a vital role in the treatment of severe myopia. Humans;Child;Refraction, Ocular;Myopia;Eye;Red Light;Eyeglasses

TCPP/MgO-loaded PLGA microspheres combining photodynamic antibacterial therapy with PBM-assisted fibroblast activation to treat periodontitis. Bacteria eradication and subsequent periodontal tissue reconstruction is the primary task for periodontitis treatment. Commonly used antibiotic therapy suffers from antibiotic resistance. Meanwhile, promoting fibroblast activity is crucial for re-establishing a damaged periodontal structure. In addition to the fibroblast activation property of Mg(2+), photobiomodulation (PBM) has recently attracted increasing attention in wound healing. Using the same 635 nm laser resource, PBM could simultaneously work with antibacterial photodynamic therapy (aPDT) to achieve antibacterial function and fibroblast activation effect. Herein, multifunctional microspheres were designed by employing poly (lactic-co-glycolic acid) (PLGA) microspheres to load tetrakis (4-carboxyphenyl) porphyrin (TCPP) and magnesium oxide (MgO) nanoparticles, named as PMT, with sustained Mg(2+) release for 20 days. PMT achieved excellent antibacterial photodynamic effect for periodontal pathogens F. nucleatum and P. gingivalis by generating reactive oxygen species, which increases cell membrane permeability and destroys bacteria integrity to cause bacteria death. Meanwhile, PMT itself exhibited improved fibroblast viability and adhesion, with the PMT + light group revealing further activation of fibroblast cells, suggesting the coordinated action of Mg(2+) and PBM effects. The underlying molecular mechanism might be the elevated gene expressions of Fibronectin 1, Col1a1, and Vinculin. In addition, the in vivo rat periodontitis model proved the superior therapeutic effects of PMT with laser illumination using micro-computed tomography analysis and histological staining, which presented decreased inflammatory cells, increased collagen production, and higher alveolar bone level in the PMT group. Our study sheds light on a promising strategy to fight periodontitis using versatile microspheres, which combine aPDT and PBM-assisted fibroblast activation functions. Magnesium Oxide;Anti-Bacterial Agents Rats;Animals;Magnesium Oxide;Microspheres;X-Ray Microtomography;Photochemotherapy;Periodontitis;Anti-Bacterial Agents

Improving Titanium Implant Stability with Photobiomodulation: A Review and Meta-Analysis of Irradiation Parameters. Objective: This analysis was designed to present a summary of available evidence that will inform practice and guide future research for photobiomodulation (PBM) after titanium implant placement procedures. Materials and methods: A systematic review was performed according to the Cochrane Collaboration and in line with Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) criteria. Two investigators screened the titles and abstracts, and reviewed articles for risk of bias. Online databases searched included PubMed, Embase, Scopus, and Web of Science. Terms were specific to the effects of PBM on dental implant stability. Results: Eight hundred fifty-six studies were identified, and 15 studies fulfilled the inclusion criteria. Light sources included both laser and light emitting diode (LED) devices. Wavelengths ranged from 618 to 1064â€‰nm. The meta-analysis concluded that all 15 published studies were able to safely apply

PBM near dental implants without adverse events. Laser and LED wavelengths that reported significant results included 618, 626, 830, 940 (2â€‰Ã—â€‰), and 1064â€‰nm. Conclusions: The use of adjunctive PBM can be safely prescribed after surgical placement of titanium implants. Six groups reported statistical significance for improving implant stability (four laser diode, two LED) in wavelengths ranging from 618 to 1064â€‰nm. The amount of time spent delivering PBM was not a variable that differentiated whether a study reported significant results. Titanium Titanium;Lasers, Semiconductor;Low-Level Light Therapy

Light-Based Therapy: Novel Approach to Treat COVID-19. The pandemic outbreak of Coronavirus disease 2019 (COVID-19) which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), is a new viral infection in all countries around the world. An increase in inflammatory cytokines, fever, dry cough, and pneumonia are the main symptoms of COVID-19. A shared of growing clinical evidence confirmed that cytokine storm correlates with COVID-19 severity which is also a crucial cause of death from COVID-19. The success of anti-inflammatory therapies in the recovery process of COVID-19 patients has been well established. Over the years, phototherapy (PhT) has been identified as a promising non-invasive treatment approach for inflammatory conditions. New evidence suggests that PhT as an anti-inflammatory therapy may be effective in treating acute respiratory distress syndrome (ARDS) and COVID-19. This review aims to a comprehensive overview of the direct and indirect effects of anti-inflammatory mechanisms of PhT in ARDS and COVID-19 patients.

Photobiomodulation therapy retarded axial length growth in children with myopia: evidence from a 12-month randomized controlled trial evidence. To determine whether photobiomodulation (PBM) therapy can retard ocular axial length (AL) in children with myopia. A randomized controlled clinical trial was conducted on two consecutive cohorts of 50 eligible children aged 8-12Â years with â‰¤â€‰-â€‰0.75 Diopter (D) of spherical equivalent refraction (SER). Participants were randomly assigned to the intervention group (nâ€‰=â€‰25) and treated with PBM therapy or the control group (nâ€‰=â€‰25) and treated with single vision spectacles only. At the 12-month follow-up, the changes in AL and cycloplegic SER from baseline were both compared between the two groups. In addition, the subfoveal choroidal thickness (SFChT), anterior chamber depth (ACD), and central corneal refractive power (CCP) were analysed at the 3-, 6-, 9-, and 12-month follow-ups, respectively. Among the 50 children, 78% were included at the final follow-up, with a mean age of 9.7â€‰Â±â€‰1.5Â years and a mean SER of -â€‰2.56â€‰Â±â€‰1.70. The mean difference in AL growth between the two groups at 12Â months was 0.50Â mm (PBM vs. Control, -â€‰0.02Â mmâ€‰Â±â€‰0.11 vs. 0.48Â mmâ€‰Â±â€‰0.16, Pâ€‰<â€‰0.001), and the mean difference in cycloplegic SER at 12Â months was +â€‰1.25 D (PBM vs. Control, +â€‰0.28 Dâ€‰Â±â€‰0.26 vs. -â€‰0.97 Dâ€‰Â±â€‰0.25, Pâ€‰<â€‰0.001). There were no significant differences in any of the other parameters (including SFChT, ACD, and CCP) between the two groups at any time point. PBM therapy is an effective intervention for slightly decreasing the AL to control myopia in children.Trial registration: Chinese Clinical Trial Registration Number: ChiCTR2100043619. Registered on 23/02/2021; prospectively registered. http://www.chictr.org.cn/showproj.aspx?proj=121302 . Mydriatics Humans;Child;Low-Level Light Therapy;Mydriatics;Myopia;Refraction, Ocular;Vision Tests

Comparative effectiveness and safety of topical methimazole 5% monotherapy versus combination of Q-Switched Nd: YAG Laser and topical methimazole 5% in patients with refractory melasma. INTRODUCTION: Melasma is an acquired pigmentary disorder which currently has no definitive treatment. Although topical drugs containing hydroquinone are the basis of treatments, they are usually associated with recurrence. We aimed to evaluate the effectiveness and safety of monotherapy with topical methimazole 5% versus combination of Q-Switched Nd: YAG Laser and

topical methimazole 5% in patients with refractory melasma. METHODS: A total of 27 women with refractory melasma were included. We applied topical methimazole 5% (once a day) with three passes of QSNd: YAG laser (Wavelength: 1064â€‰nm, pulse energy: 750â€‰mJ, fluence: 1.50Â â€‰J/cm(2) , spot size: 4Â Ã—â€‰4â€‰mm, hand piece: fractional, JEISYS company) for six sessions on the right half of the face, and topical methimazole 5% (once a day) on the left half of the face, for each patient. The treatment course was 12â€‰weeks. Evaluation of effectiveness was done with the Physician Global Assessment (PGA), Patient Global Assessment (PtGA), Physician satisfaction (PS), Patients satisfaction (PtS), and mMASI score. RESULTS: PGA, PtGA, and PtS were not significantly different between the two groups at any time (pÂ >â€‰0.05). PS in the laser plus methimazole group was significantly better than methimazole group at 4th, 8th, and 12th weeks (pÂ <â€‰0.05). The rate of PGA improvement in the combination group was significantly better than the monotherapy over time (pÂ <â€‰0.001). The changes of mMASI score between the two groups did not significantly differ at any time (pÂ >â€‰0.05). There was no significant difference in the adverse events between the two groups. CONCLUSION: Combination therapy with topical methimazole 5% and QSNY laser can be considered as an effective way to treat refractory melasma. Methimazole Humans;Female;Methimazole;Lasers, Solid-State;Melanosis;Patient Satisfaction;Low-Level Light Therapy;Treatment Outcome

Photonics-based treatments: Mechanisms and applications in oral infectious diseases. Infectious diseases remain a serious global challenge threatening human health. Oral infectious diseases, a major neglected global problem, not only affect people's lifestyles but also have an intimate association with systemic diseases. Antibiotic therapy is a common treatment. However, the emergence of new resistance problems hindered and enhanced the complication of the treatment. Currently, antimicrobial photodynamic therapy (aPDT) has long been the topic of intense interest due to the advantage of being minimally invasive, low toxicity, and high selectivity. aPDT is also becoming increasingly popular and applied in treating oral diseases such as tooth caries, pulpitis, periodontal diseases, peri-implantitis, and oral candidiasis. Photothermal therapy (PTT), another phototherapy, also plays an important role in resisting resistant bacterial and biofilm infections. In this mini-review, we summarize the latest advances in photonics-based treatments of oral infectious diseases. The whole review is divided into three main parts. The first part focuses on photonics-based antibacterial strategies and mechanisms. The second part presents applications for photonics-based treatments of oral infectious diseases. The last part discusses present problems in current materials and future perspectives.

Investigating the Effectiveness of Low-Level Laser in Reducing Root Resorption of the Upper Incisors During Intrusion Movement Using Mini-Implants in Adult Patients With Deep Overbite: A Randomized Controlled Clinical Trial. BACKGROUND: Deep bite is a common characteristic of malocclusion, and many methods are used to treat it, including mini-implants used for the intrusion of the upper incisors. Orthodontically induced inflammatory root resorption (OIIRR) is an inevitable and unexpected side effect of orthodontic therapy. However, resorption of the root could be affected by the type of tooth movement, such as intrusion. Several studies have indicated the effectiveness of low-level laser therapy (LLLT) in accelerating orthodontic movement, but studies that have evaluated the role of this laser in reducing the risk of OIIRR have been limited. This trial aimed to investigate the effectiveness of LLLT in reducing the resorption of the roots of the upper incisors during their intrusion in the context of deep bite correction. MATERIALS AND METHODS: Thirty patients (13 males, 17 females; mean age 22.4Â±3.37 years) with deep overbite were recruited and allocated to the laser or the control groups. Mini-implants were inserted between the roots of the upper central incisors and the lateral incisors from the labial aspect at the gingival-mucosal junction on both sides with a force of 40 g on each side through an NiTi coil spring. A low-level laser (Ga-Al-As) with 808 nm

wavelength in a continuous mode, with the parametersÂ 250 milliwattÂ power output, 4 Joules/point energy density, and 16 seconds irradiation per point, was applied to the root of each of the upper incisors. The laser was applied on the first day of the upper incisor intrusion (T1), then on days 3, 7, and 14 of the first month. In the second month, the laser was applied every 15 days, adjusting the spring strength every four weeks until the end of the intrusion stage (T2), which was determined by reaching a normal overbite. As for patients in the control group, the strength of the nickel-titanium springs was adjusted every four weeks to the required strength of 40 g on each end until reaching a normal overbite. RESULTS: There was a volumetric decrease in both groups' upper central and lateral incisors roots, and this decrease was statistically significant (P<0.001). However, the difference between the two groups was not statistically significant in each central and lateral incisor volume root (P=0.345 and 0.263 for U1 and U2, respectively). Also, both groups had a linear decrease in upper central and lateral incisors roots, which was statistically significant (P<0.001). At the same time, the difference between the two groups was not statistically significant in each central and lateral incisor root length (P=0.343 and 0.461Â for U1 and U2, respectively). CONCLUSION: The low-level laser irradiation using the current protocol did not significantly affect the amount of root resorption induced by incisor intrusion in the experimental group compared to the control group.

Low-Level Laser Treatment Induces the Blood-Brain Barrier Opening and the Brain Drainage System Activation: Delivery of Liposomes into Mouse Glioblastoma. The progress in brain diseases treatment is limited by the blood-brain barrier (BBB), which prevents delivery of the vast majority of drugs from the blood into the brain. In this study, we discover unknown phenomenon of opening of the BBBB (BBBO) by low-level laser treatment (LLLT, 1268 nm) in the mouse cortex. LLLT-BBBO is accompanied by activation of the brain drainage system contributing effective delivery of liposomes into glioblastoma (GBM). The LLLT induces the generation of singlet oxygen without photosensitizers (PSs) in the blood endothelial cells and astrocytes, which can be a trigger mechanism of BBBO. LLLT-BBBO causes activation of the ABC-transport system with a temporal decrease in the expression of tight junction proteins. The BBB recovery is accompanied by activation of neuronal metabolic activity and stabilization of the BBB permeability. LLLT-BBBO can be used as a new opportunity of interstitial PS-free photodynamic therapy (PDT) for modulation of brain tumor immunity and improvement of immuno-therapy for GBM in infants in whom PDT with PSs, radio- and chemotherapy are strongly limited, as well as in adults with a high allergic reaction to PSs.

Photobiomodulation with Blue Light on Wound Healing: A Scoping Review. BACKGROUND: Photobiomodulation consists of inducing healing by irradiating light. This scoping review investigates the effect of blue light on the healing process. METHODS: The MEDLINE, Web of Science, Scopus, and CINAHL databases were searched. Two reviewers independently examined the search results and extracted data from the included studies. A descriptive analysis was performed. RESULTS: Twenty-two articles were included. Studies were categorized as in vitro/mixed, preclinical, and clinical. The power density used was 10-680 mW/cm(2) in most of the in vitro/preclinical studies, the irradiation time ranged from 5 s to 10 min, and different wavelengths and energy densities were used. In clinical studies, the wavelength ranged from 405 to 470 nm, and the energy density varied from 1.5 to 30 J/cm(2). CONCLUSIONS: A low energy density (<20 J/cm(2)) was able to stimulate the different cell types and proteins involved in healing, while a high energy density, 20.6-50 J/cm(2), significantly reduced cell proliferation, migration, and metabolism. There is a great variety of device parameters among studies, and this makes it difficult to conclude what the best technical specifications are. Thus, further studies should be performed in order to define the appropriate parameters of light to be used.

A System Based on Photoplethysmography and Photobiomodulation for Autonomic Nervous System Measurement and Adjustment. (1) Background: The imbalance of the autonomic nervous system

(ANS) is common worldwide. Many people have high tension when the sympathetic nervous system is hyperactive or low attention when the parasympathetic nervous system is hyperactive. To improve autonomic imbalance, a feasible and integrated system was proposed to measure and affect the ANS status. (2) Methods: The proposed system consists of a signal-processing module, an LED stimulation module, a photoplethysmography (PPG) sensor and an LCD display. The heart rate variability (HRV) and ANS status can be analyzed from PPG data. To confirm HRV analysis from PPG data, an electrocardiogram (ECG) device was also used to measure HRV. Additionally, photobiomodulation (PBM) was used to affect the ANS status, and two acupuncture points (Neiguan (PC6) and Shenmen (HT7)) were stimulated with different frequencies (10 Hz and 40 Hz) of PBM. (3) Results: Two subjects were tested with the developed system. HRV metrics were discussed in the time domain and frequency domain. HRV metrics have a similar change trend on PPG and ECG signals. In addition, the SDNN was increased, and the parasympathetic nervous system (PNS: HF (%)) was enhanced with a 10 Hz pulse rate stimulation at the Neiguan acupoint (PC6). Furthermore, the SDNN was increased, and the sympathetic nervous system (SNS: LF (%)) was enhanced with a 40 Hz pulse rate stimulation at the Shenmen (HT7) acupoint. (4) Conclusion: A prototype to measure and affect the ANS was proposed, and the functions were feasible. The test results show that stimulating the Neiguan (PC6) acupoint can inhibit the SNS. In contrast, stimulating the Shenmen (HT7) acupoint can activate the SNS. However, more experiments must be conducted to confirm the effect by choosing different pulse rates, dosages and acupoints.

Low-Level Laser Therapy Induces Melanoma Tumor Growth by Promoting Angiogenesis. The effects of low-level laser therapy (LLLT) on tumor growth are inconsistent. In this study, we investigated the effects of LLLT on melanoma tumor growth and angiogenesis. C57/BL6 mice were challenged with B16F10 melanoma cells and treated with LLLT for 5 consecutive days; untreated mice were used as controls. Tumor weight, angiogenesis, immunohistochemistry, and protein levels were compared between the treated and untreated mice. In an in vitro experiment, B16F10 cells were treated with LLLT. Proteins were extracted and subjected to Western blot analysis for analyzing signaling pathways. Compared with the findings in the untreated mice, tumor weight substantially increased in the treated mice. Both immunohistochemical and Western blot analyses revealed markedly increased levels of CD31, a biomarker of vascular differentiation, in the LLLT group. In B16F10 cells, LLLT considerably induced the phosphorylation of extracellular signal-regulated kinase (ERK), which, in turn, phosphorylated p38 mitogen-activated protein kinase (MAPK). Furthermore, LLLT induced the expression of vascular endothelial growth factor, but not hypoxia-inducible factor-1Î±, through the ERK/p38 MAKP signaling pathways. Our findings indicate that LLLT induces melanoma tumor growth by promoting angiogenesis. Therefore, it should be avoided in patients with melanoma.

Effects of Low-Level Laser Therapy on Dentin Hypersensitivity in Periodontally Compromised Patients Undergoing Orthodontic Treatment: A Randomised Controlled Trial. OBJECTIVES: This study aimed to assess the effects of low-level laser therapy (LLLT) on dentin hypersensitivity (DH) in periodontally compromised patients undergoing orthodontic treatment. METHODS: This triple-blinded randomised controlled trial included 143 teeth with DH from 23 periodontally compromised patients. Teeth on one side of the dental arch were randomly assigned to the LLLT group (LG), while those on the contralateral side were allocated to the non-LLLT group (NG). After orthodontic treatment commenced, patients' orthodontic pain (OP) perceptions were documented in pain diaries. DH was assessed chairside by a visual analogue scale (VAS(DH)) at fifteen timepoints across the orthodontic treatment and retention. VAS(DH) scores were compared among timepoints by the Friedman test, among patients with varying OP perceptions using the Kruskal-Wallis tests, and between the LG and NG with the Mann-Whitney U test. RESULTS: DH generally decreased over the

observation ($p < 0.001$). The VAS(DH) scores differed among patients with varying OP perceptions at multiple timepoints ($p < 0.05$). The generalized estimating equation model showed teeth in the LG had a significantly lower VAS(DH) score than the NG at the 3rd month of treatment ($p = 0.011$). CONCLUSION: LLLT could be potentially beneficial in managing DH in periodontally compromised patients undergoing orthodontic treatment.

Brain Waste Removal System and Sleep: Photobiomodulation as an Innovative Strategy for Night Therapy of Brain Diseases. Emerging evidence suggests that an important function of the sleeping brain is the removal of wastes and toxins from the central nervous system (CNS) due to the activation of the brain waste removal system (BWRS). The meningeal lymphatic vessels (MLVs) are an important part of the BWRS. A decrease in MLV function is associated with Alzheimer's and Parkinson's diseases, intracranial hemorrhages, brain tumors and trauma. Since the BWRS is activated during sleep, a new idea is now being actively discussed in the scientific community: night stimulation of the BWRS might be an innovative and promising strategy for neurorehabilitation medicine. This review highlights new trends in photobiomodulation of the BWRS/MLVs during deep sleep as a breakthrough technology for the effective removal of wastes and unnecessary compounds from the brain in order to increase the neuroprotection of the CNS as well as to prevent or delay various brain diseases. Humans;Brain;Central Nervous System;Glymphatic System;Sleep;Intracranial Hemorrhages

Effects of Low-Level Laser Therapy on Orthodontic Tooth Movement: Evaluation of Bony Changes via 3DCBCT. OBJECTIVE: The prime objective of this research was to study the effect of low-level laser therapy (LLLT) with an evaluation of bony changes via pre- and post-treatment 3DCBCT in orthodontic malocclusion cases treated with fixed orthodontic appliances. MATERIALS AND METHODS: Subjects who attended the Orthodontic Clinic, were diagnosed with orthodontic malocclusion, treated with fixed orthodontic appliances, and had pre- and post-management CBCT were included in the study. Patients aged 14 to 25 years who met the inclusion criteria were assigned to two groups, group A (LLLT) and group B (non-LLLT). Group A participants were treated with LLLT therapy as per standard protocol after explaining the nature of the treatment. Group B (non-LLLT) participants were not treated with LLLT therapy and therefore served as the control. LLLT was used in the experimental group after placing each archwire. Interradicular bony changes at depth levels of 1 to 4 (2, 5, 8, and 11 mm) using 3DCBCT were measured as outcome parameters. RESULTS: The information collected was analyzed using SPSS computer software. Mostly insignificant differences were noted among groups for the different parameters ($p < 0.05$). Student's t-tests and paired t-tests were used to investigate the differences. Experimental Hypothesis: There will be significant differences in the interradicular width (IRW) measurements between the LLLT and non-LLLT groups. CONCLUSIONS: The hypothesis was rejected. Upon investigation of prospective changes, most of the measured parameters showed insignificant differences.

Photophysical Mechanisms of Photobiomodulation Therapy as Precision Medicine. Despite a significant focus on the photochemical and photoelectrical mechanisms underlying photobiomodulation (PBM), its complex functions are yet to be fully elucidated. To date, there has been limited attention to the photophysical aspects of PBM. One effect of photobiomodulation relates to the non-visual phototransduction pathway, which involves mechanotransduction and modulation to cytoskeletal structures, biophotonic signaling, and micro-oscillatory cellular interactions. Herein, we propose a number of mechanisms of PBM that do not depend on cytochrome c oxidase. These include the photophysical aspects of PBM and the interactions with biophotons and mechanotransductive processes. These hypotheses are contingent on the effect of light on ion channels and the cytoskeleton, the production of biophotons, and the properties of light and biological molecules. Specifically, the processes we review are supported by the resonant

recognition model (RRM). This previous research demonstrated that protein micro-oscillations act as a signature of their function that can be activated by resonant wavelengths of light. We extend this work by exploring the local oscillatory interactions of proteins and light because they may affect global body circuits and could explain the observed effect of PBM on neuro-cortical electroencephalogram (EEG) oscillations. In particular, since dysrhythmic gamma oscillations are associated with neurodegenerative diseases and pain syndromes, including migraine with aura and fibromyalgia, we suggest that transcranial PBM should target diseases where patients are affected by impaired neural oscillations and aberrant brain wave patterns. This review also highlights examples of disorders potentially treatable with precise wavelengths of light by mimicking protein activity in other tissues, such as the liver, with, for example, Crigler-Najjar syndrome and conditions involving the dysregulation of the cytoskeleton. PBM as a novel therapeutic modality may thus behave as "precision medicine" for the treatment of various neurological diseases and other morbidities. The perspectives presented herein offer a new understanding of the photophysical effects of PBM, which is important when considering the relevance of PBM therapy (PBMt) in clinical applications, including the treatment of diseases and the optimization of health outcomes and performance.
A Systematic Literature Review of Complementary and Alternative Veterinary Medicine: Laser Therapy. Light therapy, or photobiomodulation, is a collective name for methods where tissue is irradiated with different types of light, with the aim of stimulating healing. Despite being frequently used, there is no consensus regarding the optimal treatment protocols for light therapy, nor its clinical efficacy. A systematic literature review was conducted, searching the relevant literature regarding light therapy in three databases, published between 1980-2020. The risk of bias in each article was evaluated. Forty-five articles met the inclusion criteria; 24 articles were regarding dogs, 1 was regarding cats, and the rest were regarding horses. The indications for treatment were musculoskeletal and neurologic conditions, skin disease and wounds, and pain. The literature review showed conflicting study results and unclear application for clinical use. This can be explained by the wide variety of treatment parameters used in the searched studies, such as wavelength, laser class, dose, and effect, as well as the frequency and duration of treatment. Although some beneficial effects were reported for light therapy, the studies also had limited scientific quality regarding these therapies, with a high or moderate risk of bias.
The Potential Effects of Light Irradiance in Glaucoma and Photobiomodulation Therapy. Human vision is mediated by the retina, one of the most critical tissues in the central nervous system. Glaucoma is a complex retinal disease attributed to environmental, genetic, and stochastic factors, all of which contribute to its pathogenesis. Historically, glaucoma had been thought of primarily as a disease of the elderly; however, it is now becoming more problematic as the incidence rate increases among young individuals. In recent years, excessive light exposure has been suggested as contributing to the rise in glaucoma among the younger generation. Blue light induces mitochondrial apoptosis in retinal ganglion cells, causing optic damage; red light increases cytochrome c oxidase activity in the electron transport system, reducing inflammation and increasing antioxidant reactions to promote cell regeneration. In conclusion, the minimization of blue light exposure and the general application of red light treatment strategies are anticipated to show synergistic effects with existing treatments for retinal disease and glaucoma and should be considered a necessary prospect for the future. This review introduces the recent studies that support the relationship between light exposure and the onset of glaucoma and discusses new treatments, such as photobiomodulation therapy.
Mitochondrial Transplantation: Could Photobiomodulation Play a Role? Low-Level Light Therapy;Mitochondria
Efficacy and tolerance of Oral minocycline combined with photobiomodulation therapy for rosacea: An evaluator-blinded randomized, controlled clinical trial. Minocycline;Dermatologic

Agents Humans;Minocycline;Low-Level Light Therapy;Rosacea;Dermatologic Agents;Treatment Outcome
Photobiomodulation therapy mitigates cardiovascular aging and improves survival. BACKGROUND: Photobiomodulation (PBM) therapy, a form of low-dose light therapy, has been noted to be effective in several age-associated chronic diseases such as hypertension and atherosclerosis. Here, we examined the effects of PBM therapy on age-associated cardiovascular changes in a mouse model of accelerated cardiac aging. METHODS: Fourteen months old Adenylyl cyclase type VIII (AC8) overexpressing transgenic mice (nâ€‰=â€‰8) and their wild-type (WT) littermates (nâ€‰=â€‰8) were treated with daily exposure to Near-Infrared Light (850â€‰nm) at 25â€‰mW/cm(2) for 2â€‰min each weekday for a total dose of 1 Einstein (4.5â€‰p.J/cm(2) or fluence 3â€‰J/cm(2)) and compared to untreated controls over an 8-month period. PBM therapy was administered for 3.5 months (Early Treatment period), paused, due to Covid-19 restrictions for the following 3 months, and restarted again for 1.5 months. Serial echocardiography and gait analyses were performed at monthly intervals, and serum TGF-Î²1 levels were assessed following sacrifice. RESULTS: During the Early Treatment period PBM treatments: reduced the age-associated increases in left ventricular (LV) mass in both genotypes (pâ€‰=â€‰0.0003), reduced the LV end-diastolic volume (EDV) in AC8 (pâ€‰=â€‰0.04); and reduced the left atrial dimension in both genotypes (pâ€‰=â€‰0.02). PBM treatments substantially increased the LV ejection fraction (pâ€‰=â€‰0.03), reduced the aortic wall stiffness (pâ€‰=â€‰0.001), and improved gait symmetry, an index of neuro-muscular coordination (pâ€‰=â€‰0.005). The effects of PBM treatments, measured following the pause, persisted. Total TGF-Î²1 levels were significantly increased in circulation (serum) in AC8 following PBM treatments (pâ€‰=â€‰0.01). We observed a striking increase in cumulative survival in PBM-treated AC8 mice (100%; pâ€‰=â€‰0.01) compared to untreated AC8 mice (43%). CONCLUSION: PBM treatment mitigated age-associated cardiovascular remodeling and reduced cardiac function, improved neuromuscular coordination, and increased longevity in an experimental animal model. These responses correlate with increased TGF-Î²1 in circulation. Future mechanistic and dose optimization studies are necessary to assess these anti-aging effects of PBM, and validation in future controlled human studies is required for effective clinical translation. Transforming Growth Factor beta1 Humans;Mice;Animals;Infant;Transforming Growth Factor beta1;Low-Level Light Therapy;COVID-19;Aging;Heart
Low-level laser and management of common complications after the mandibular third molar surgery: A double-blind randomized clinical trial. BACKGROUND: There are controversies on the analgesic and anti-inflammatory effects of low-level laser therapy on pain, edema, and trismus after mandibular third molar extraction surgery. This study aimed to evaluate the efficacy of low-level laser therapy (LLLT) on discomforts occurring after the mandibular wisdom tooth removal. MATERIALS AND METHODS: This double-blind, split-mouth design, randomized clinical trial study was performed on 36 healthy controls with bilateral symmetrical mandibular third molar referred to the Department of Oral and Maxillofacial Surgery of Dental Faculty from January to November 2019. After surgical extraction, the laser group underwent laser (Ga-Al-As diode laser, 808 nm, 200 mW) intraorally and extraorally just after surgery and 24 h after surgery. For the placebo group, the handpiece was inserted without laser irradiation. The pain level was assessed by Baker Wong scale at 2, 4, 6, 12, 24, 36, 48, and 60 h postoperatively, and the edema and the extent of mouth opening were examined before surgery, at the 1(st) and 7(th) days after surgery. The data were collected and analyzed by SPSS at the significant level of 0.05. RESULTS: The statistical analysis of 32 participants' data (laser group: n = 32, placebo group: n = 32) indicated that the mean score of pain in 3 days after surgery in the interventional group was significantly lower than the score of the placebo group (P < 0.001). Furthermore, the swelling and the extent of the mouth opening differed significantly between the

two groups at 1(st) and 7(th) days after the procedure (P < 0.001). CONCLUSION: Our findings showed that the LLLT had beneficial effects on the management of pain, edema, and trismus following after 3(rd) molar extraction surgery.

Accelerated Canine Retraction by Using Mini Implant With Low-Intensity Laser Therapy. Background The continuous increase in demand for reduced treatment times has led researchers to think in terms of "accelerated orthodontics." Generally, the duration for fixed orthodontic treatment is around two to three years. Prolonged use of braces leads to external root resorption, a high risk of caries, and decreased patient compliance. Therefore, finding an optimal supplementary approach to achieve faster tooth movement is still considered a subject of interest. Low-intensity laser therapy (LILT) is one of the non-invasive surgical techniques in the field of accelerated orthodontics. Low-level laser therapy (LLLT) has demonstrated faster healing, less bleeding, and biostimulation and anti-inflammatory effects. According to all studies, it accelerates tooth movement, thereby reducing braces treatment time. It is simple, safe, and minimally invasive. Despite these pieces of evidence, studies have shown variable findings in low-level laser therapy. This study evaluates the effect of LLLT on accelerated orthodontics in comparison with conventional canine retraction. An aluminum gallium arsenide-type diode laser with a wavelength of 940 nm has been used in this study. Methodology This study was conducted using the split-mouth method, which included 20 patients with permanent dentition who required first premolar extractions. A miniscrew implant was placed on both the right and left sides for maximum anchorage. Irradiation doses were applied on days 0, 3, 7, and 14 of the first month. Subsequently, irradiations were given every 15 days until the canine's retraction was complete in the test group. Results The study results three months after the canine retraction in the test and control groups (M1) were 0.81 Â± 0.03 mm/month and 0.74 Â± 0.04 mm/month, respectively, indicating a significantly higher rate of canine retraction in the test group than in the control group (P < 0.0001). The average increase in the amount of tooth movement at three months was 40.1% and 36.3% in the test and control groups, respectively. However, the average increase in the amount of movement of teeth following canine retraction was 100% in the test group and 68.2% in the control group. There were significant variations in the pain score between Day 1 and Day 3 (P = 0.003) in the test group; however, there was no analytic variation in the pain score between Day 1 and Day 30 in the test group (P = 0.18). The pain score between Day 3 and Day 30 was significantly lower. Conclusions It was concluded that the rate of canine retraction increases when it is combined with LILT-assisted accelerated orthodontics in comparison to conventional canine retraction. Although LLLT does not provide immediate pain relief, it relieves the sensation of pain after 24-72 hours. LILT is an innovative, non-invasive technique that allows rapid orthodontic tooth movement. The rate of canine retraction increases when it is combined with LILT-assisted accelerated orthodontics in comparison to conventional canine retraction using mini-implants.

Current Therapeutic Modalities for the Management of Chronic Diabetic Wounds of the Foot. Impaired wound healing is common in patients with diabetes mellitus (DM). Different therapeutic modalities including wound debridement and dressing, transcutaneous electrical nerve stimulation (TENS), nanomedicine, shockwave therapy, hyperbaric (HBOT) and topical (TOT) oxygen therapy, and photobiomodulation (PBM) have been used in the management of chronic diabetic foot ulcers (DFUs). The selection of a suitable treatment method for DFUs depends on the hosts' physiological status including the intricacy and wound type. Effective wound care is considered a critical component of chronic diabetic wound management. This review discusses the causes of diabetic wounds and current therapeutic modalities for the management of DFUs, specifically wound debridement and dressing, TENS, nanomedicine, shockwave therapy, HBOT, TOT, and PBM. Humans;Wound Healing;Hyperbaric Oxygenation;Chronic Disease;Diabetic Foot;Debridement;Diabetes Mellitus

Recognition and conservative management for a spectrum of sport-related scapholunate interosseous ligament injuries: a case series. This case series presents four cases of scapholunate interosseous ligament (SLIL) injury. We discuss the process of early recognition and highlight difficulties encountered in current diagnostic and conservative management strategies. The cases profile interdisciplinary management of four scapholunate (SL) injuries that have different clinical presentations and injury mechanisms. Three sport-related SL injuries were managed conservatively by a sport specialist chiropractor and one sport-related case was self-managed. Management strategies included early wrist immobilization, soft tissue manual therapy, low-level laser therapy, proprioceptive and strengthening exercises, and early orthopedic referral. This case series highlights: (1) the spectrum of SL injuries (2) the importance of early specialty referral, (3) the paucity of literature with respect to conservative management of these injuries and (4) the role of manual therapy and rehabilitation professionals as part of the healthcare team in detecting and helping manage these wrist injuries.

Advances in photobiomodulation for cognitive improvement by near-infrared derived multiple strategies. Cognitive function is an important ability of the brain, but cognitive dysfunction can easily develop once the brain is injured in various neuropathological conditions or diseases. Photobiomodulation therapy is a type of noninvasive physical therapy that is gradually emerging in the field of neuroscience. Transcranial photobiomodulation has been commonly used to regulate neural activity in the superficial cortex. To stimulate deeper brain activity, advanced photobiomodulation techniques in conjunction with photosensitive nanoparticles have been developed. This review addresses the mechanisms of photobiomodulation on neurons and neural networks and discusses the advantages, disadvantages and potential applications of photobiomodulation alone or in combination with photosensitive nanoparticles. Photobiomodulation and its associated strategies may provide new breakthrough treatments for cognitive improvement. Humans;Low-Level Light Therapy;Brain;Nervous System Diseases;Cognition;Neurons

Evaluation of shoulder pain, disability, mobility, and quality of life in patients with adhesive capsulitis following suprascapular nerve block combined with low-intensity laser therapy. OBJECTIVE: Adhesive capsulitis is a common health concern affecting shoulder mobility, which targets around 5% of populations worldwide, consequently affecting their quality of life. The aim of this study was to ascertain the effects of combining suprascapular nerve block and low-power laser therapy on pain intensity, mobility, disability, and quality of life in adhesive capsulitis. PATIENTS AND METHODS: Between December 2021 and June 2022, 60 patients with adhesive capsulitis were enrolled in the study. They were randomly allocated into three groups, 20 each. The first group was employed for laser therapy 3 sessions a week for 8 weeks (LT group). The second group was employed for nerve block one time (NB group). The third group was recruited for nerve block intervention one time in addition to laser therapy 3 sessions a week for 8 weeks (LT+NB group). VAS, SPADI, SF-36, and shoulder range of motion were assessed pre- and post-8-week intervention. RESULTS: Of 60 patients that started the study, 55 patients have completed the study program. No significant differences were noticed between LT, NB, and LT+NB groups before intervention (VAS at rest, $p = 0.818$, VAS at motion, $p = 0.878$, SPADI, $p = 0.919$, SF-36 (PCS), $p = 0.731$, SF-36 (MCS), $p = 0.936$, shoulder flexion, $p = 0.441$, shoulder abduction, $p = 0.722$, shoulder internal rotation, $p = 0.396$, and shoulder external rotation, $p = 0.263$). However, noteworthy differences were identified between LT, NB, and LT+NB groups (VAS at rest, $p < 0.001$, VAS at motion, $p < 0.001$, SPADI, $p = 0.011$, SF-36 (PCS), $p = 0.033$, SF-36 (MCS), $p = 0.007$, shoulder flexion, $p < 0.001$, shoulder abduction, $p < 0.001$, shoulder internal rotation, $p < 0.001$, and shoulder external rotation, $p < 0.001$). CONCLUSIONS: Both treatment modalities whether low-power laser therapy or suprascapular nerve block have beneficial effects in the treatment of adhesive capsulitis. The combination of both interventional modalities has beneficial

effects in the treatment of adhesive capsulitis more than laser therapy or suprascapular nerve block alone. Accordingly, this combination should be recommended in pain management of musculoskeletal disorders, particularly adhesive capsulitis. Humans;Shoulder Pain;Quality of Life;Treatment Outcome;Nerve Block;Laser Therapy;Bursitis;Range of Motion, Articular;Shoulder Joint

The stereological, immunohistological, and gene expression studies in an infected ischemic wound in diabetic rats treated by human adipose-derived stem cells and photobiomodulation. We investigated the impacts of photobiomodulation (PBM) and human allogeneic adipose-derived stem cells (ha-ADS) together and or alone applications on the stereological parameters, immunohistochemical characterizing of M1 and M2 macrophages, and mRNA levels of hypoxia-inducible factor (HIF-1Î±), basic fibroblast growth factor (bFGF), vascular endothelial growth factor-A (VEGF-A) and stromal cell-derived factor-1Î± (SDF-1Î±) on inflammation (day 4) and proliferation phases (day 8) of repairing tissues in an infected delayed healing and ischemic wound model (IDHIWM) in type 1 diabetic (DM1) rats. DM1 was created in 48 rats and an IDHIWM was made in all of them, and they were distributed into 4 groups. Group1â€‰=â€‰control rats with no treatment. Group2â€‰=â€‰rats received (10â€‰Ã—â€‰100000Â ha-ADS). Group3â€‰=â€‰rats exposed to PBM (890Â nm, 80Â Hz, 3.46Â J/cm(2)). Group4â€‰=â€‰rats received both PBM and ha-ADS. On day 8, there were significantly higher neutrophils in the control group than in other groups (pâ€‰<â€‰0.01). There were substantially higher macrophages in the PBMâ€‰+â€‰ha-ADS group than in other groups on days 4 and 8 (pâ€‰<â€‰0.001). Granulation tissue volume, on both days 4 and 8, was meaningfully greater in all treatment groups than in the control group (all, pâ€‰=â€‰0.000). Results of M1 and M2 macrophage counts of repairing tissue in the entireÂ treatmentÂ groups were considered preferable to those in the control group (pâ€‰<â€‰0.05). Regarding stereological and macrophage phenotyping, the results of the PBMâ€‰+â€‰ha-ADS group were better than the ha-ADS and PBM groups. Results of the tested gene expression of repairing tissue on inflammation and proliferation steps in PBM and PBMâ€‰+â€‰ha-ADS groups were meaningfully better than the control and ha-ADS groups (pâ€‰<â€‰0.05). We showed that PBM, ha-ADS, and PBM plus ha-ADS, hastened the proliferation step of healing in an IDHIWM in rats with DM1 by regulation of the inflammatory reaction, macrophage phenotyping, and augmented granulation tissue formation. In addition PBM and PBM plus ha-ADS protocols hastened and increased mRNA levels of HIF-1Î±, bFGF, SDF-1Î±, and VEGF-A. Totally, in terms of stereological and immuno-histological tests, and also gene expression HIF-1Î± and VEGF-A, the results of PBMâ€‰+â€‰ha-ADS were superior (additive) to PBM, and ha-ADS alone treatments. Vascular Endothelial Growth Factor A;Chemokine CXCL12 Rats;Humans;Animals;Vascular Endothelial Growth Factor A;Diabetes Mellitus, Experimental;Chemokine CXCL12;Gene Expression;Inflammation;Stem Cells;Low-Level Light Therapy

Effect of low-level laser therapy on orthodontic tooth movement during miniscrew-supported maxillary molar distalization in humans: a single-blind, randomized controlled clinical trial. To investigate the effect of low-level laser therapy (LLLT) on orthodontic tooth movement during maxillary molar distalization over a 12-week observation period. Twenty patients were enrolled in this clinical trial. On the 0th, 3rd, 7th, 14th, 21st, 42nd, and 63rd days following the initial activation of the distalization appliance, laser therapy was applied in a total of 16 different points of the first and second molars for 10Â s per point to the randomly determined molar region of the individuals in the intervention group. The amount of molar distalization was measured using digital scans of the three-dimensional (3D) digital models obtained during the 3rd, 6th, 9th, and 12th weeks. The amount of tooth movement on the laser-applied side of subjects in the intervention group was significantly greater than those in the contralateral and control groups at all time intervals (pâ€‰<â€‰0.001).

The amount of tooth movement between the contralateral side of the intervention group and the control group was determined to be statistically insignificant (pâ€‰>â€‰0.05) at all time intervals. The laser-treated molars of the subjects in the intervention group moved 1.22 times more than the molars in the contralateral side and in the control group in 12Â weeks. The rate of tooth movement in the laser, contralateral, and control groups was 0.033, 0.027, and 0.027Â mm/day, respectively. Although LLLT was found to be statistically significant in terms of accelerating tooth movement, the effect of LLLT is not considered to be clinically significant. This trial was retrospectively registered (September 22, 2022) at Clinical-Trials.gov (Ref no: NCT05550168). Humans;Low-Level Light Therapy;Tooth Movement Techniques;Single-Blind Method;Laser Therapy;Molar;Maxilla

Efficiency of photobiomodulation on accelerating the tooth movement in the alignment phase of orthodontic treatment-A systematic review and meta-analysis. OBJECTIVES: To investigate the efficiency of photobiomodulation on accelerating the tooth movement in the alignment phase of orthodontic treatment. MATERIALS AND METHODS: The data search was performed with PubMed, Embase, Scopus, and the Cochrane Library. Randomized clinical trials and controlled clinical trials evaluating the efficiency of photobiomodulation on accelerating tooth movement in the alignment phase were selected, and the characteristics of the included studies were collected in a customized data form. Data analysis was conducted by the random-effects model after risk of bias and certainty of evidence were assessed. RESULTS: Five randomized clinical trials and three controlled clinical trials were included in the final analysis. All included studies reported positive results except the study of Shehawy et al. The results of the analysis showed that photobiomodulation significantly increased the rate of tooth movement and reduced the treatment duration, compared with the control group. Although the heterogeneity was large among the included studies, it was improved after subgroup analysis. CONCLUSIONS: This systematic review offered evidence that photobiomodulation can accelerate tooth movement in alignment procedures and reduce treatment time. Future studies are needed to find the best PBM protocol for orthodontic practice.

Photobiomodulation attenuates oligodendrocyte dysfunction and prevents adverse neurological consequences in a rat model of early life adversity. Rationale: Adverse experiences in early life including abuse, trauma and neglect, have been linked to poor physical and mental health outcomes. Emerging evidence implies that those who experienced early life adversity (ELA) are more likely to develop cognitive dysfunction and depressive-like symptoms in adulthood. The molecular mechanisms responsible for the negative consequences of ELA, however, remain unclear. In the absence of effective management options, anticipatory guidance is the mainstay of ELA prevention. Furthermore, there is no available treatment that prevents or alleviates the neurologic sequelae of ELA, especially traumatic stress. Hence, the present study aims to investigate the mechanisms for these associations and evaluate whether photobiomodulation (PBM), a non-invasive therapeutic procedure, can prevent the negative cognitive and behavioral manifestations of ELA in later life. Methods: ELA was induced by repeated inescapable electric foot shock of rats from postnatal day 21 to 26. On the day immediately following the last foot shock, 2-min daily PBM treatment was applied transcranially for 7 consecutive days. Cognitive dysfunction and depression-like behaviors were measured by a battery of behavioral tests in adulthood. Subsequently, oligodendrocyte progenitor cells (OPCs) differentiation, the proliferation and apoptosis of oligodendrocyte lineage cells (OLs), mature oligodendrocyte, myelinating oligodendrocyte, the level of oxidative damage, reactive oxygen species (ROS) and total antioxidant capacity were measured and analyzed using immunofluorescence staining, capillary-based immunoassay (ProteinSimpleÂ®) and antioxidant assay kit. Results: The rats exposed to ELA exhibited obvious oligodendrocyte dysfunction, including a reduction in OPCs differentiation, diminished generation and survival of OLs, decreased OLs, and decreased matured oligodendrocyte. Furthermore, a deficit in myelinating oligodendrocytes was observed, in conjunction

with an imbalance in redox homeostasis and accumulated oxidative damage. These alternations were concomitant with cognitive dysfunction and depression-like behaviors. Importantly, we found that early PBM treatment largely prevented these pathologies and reversed the neurologic sequelae resulting from ELA. Conclusions: Collectively, these findings provide new insights into the mechanism by which ELA affects neurological outcomes. Moreover, our findings support that PBM may be a promising strategy to prevent ELA-induced neurologic sequelae that develops later in life. Antioxidants;Reactive Oxygen Species Animals;Rats;Antioxidants;Cognitive Dysfunction;Oxidative Stress;Reactive Oxygen Species;Stress, Physiological

A Clinically-Reasoned Approach to Manual Therapy in Sports Physical Therapy. Symptom modification techniques have been recently dichotomously labeled as either passive or active therapies. Active therapy such as exercise has been rightfully advocated for while "passive" therapies, mainly manual therapy have been regarded as low value within the physical therapy treatment spectrum. In sporting environments where physical activity and exercise are inherent to the athletic experience, the utilization of exercise-only strategies to manage pain and injury can be challenging when considering the demands and qualities of a sporting career which include chronically high internal and external workloads. Participation may be impacted by pain and its influence on related factors such as training and competition performance, career length, financial earning potential, educational opportunity, social pressures, influence of family, friends, and other key stakeholders of their athletic activity. Though highly polarizing viewpoints regarding different therapies create black and white "sides," a pragmatic gray area regarding manual therapy exists in which proper clinical reasoning can serve to improve athlete pain and injury management. This gray area includes both historic positive reported short-term outcomes and negative historical biomechanical underpinnings that have created unfounded dogma and inappropriate overutilization. Applying symptom modification strategies to safely allow the continuation of sport and exercise requires critical thinking utilizing not only the evidence-base, but also the multi-factorial nature of sports participation and pain management. Given the risks associated with pharmacological pain management, the cost of passive modalities like biophysical agents (electrical stimulation, photobiomodulation, ultrasound, etc), and the indications from the evidence-base when combined with active therapies, manual therapy can be a safe and effective treatment strategy to keep athletes active. LEVEL OF EVIDENCE: 5.

Systemic photobiomodulation in nursing professionals with chronic low back pain. INTRODUCTION: Chronic low back pain is a frequent complaint at health care services, leading to absenteeism and high treatment costs. Photobiomodulation is a cost-effective, non-pharmacological treatment option. OBJECTIVES: To assess the cost of systemic photobiomodulation in nursing professionals with chronic low back pain. METHODS: This is a cross-sectional analytical study that analyzed the absorption costing of systemic photobiomodulation in chronic low back pain and was performed in a large university hospital with 20 nursing professionals. Ten systemic photobiomodulation sessions were performed using MM Optics(Â®) laser equipment at 660 nm wavelength, 100 mW power, 33 J/cm(2) dose, for 30 minutes on the left radial artery. Direct (supplies and direct labor costs) and indirect costs (equipment and infrastructure) were measured. RESULTS: The mean cost of photobiomodulation was R$ 25.30 Â± 0.50, and the mean duration was 1,890 seconds Â± 55.0. Regarding the first, fifth, and tenth sessions, labor costs were the highest (66%), followed by infrastructure (22%), supplies (9%), and the laser equipment, which presented the lowest cost (2.8%). CONCLUSIONS: Systemic photobiomodulation was shown to be a low-cost therapy when compared to other therapies. The laser equipment represented the lowest cost in the general composition.

The pulse light mode enhances the effect of photobiomodulation on B16F10 melanoma cells through autophagy pathway. Photobiomodulation (PBM) is the use of low irradiance light of specific

wavelengths to generate physiological changes and therapeutic effects. However, there are few studies on the effects of PBM of different LED light modes on cells. Here, we investigated the difference of influence between continuous wave (CW) and pulse-PBM on B16F10 melanoma cells. Our results suggested that the pulse mode had a more significant PBM than the CW mode on B16F10 melanoma cells. Our study confirmed that ROS and Ca(2+) levels in B16F10 melanoma cells treated with pulse-PBM were significantly higher than those in the control and CW-PBM groups. One mechanism that causes the difference in CW and pulse-PBM action is that pulse-PBM activates autophagy of melanoma cells through the ROS/OPN3/Ca(2+) signaling pathway, and excessive autophagy activation inhibits proliferation and apoptosis of melanoma cells. Autophagy may be one of the reasons for the difference between pulse- and CW-PBM on melanoma cells. More importantly, melanoma cells responded to brief PBM pulses by increasing intracellular Ca(2+) levels. Reactive Oxygen Species;OPN3 protein, human;Rod Opsins Humans;Reactive Oxygen Species;Signal Transduction;Autophagy;Melanoma;Low-Level Light Therapy;Rod Opsins

The reliability of using light therapy compared with LASER in pain reduction of temporomandibular disorders: a randomized controlled trial. BACKGROUND: Temporomandibular Disorders (TMD) refer to a group of symptoms where pain is the most leading cause to demand a treatment by the patient. Light therapies are of great importance at current times due to its biosafety and non-invasive quality when used for the management of TMD symptoms. This study aimed to evaluate the efficacy of red LED light with low-level LASER in treating TMD patients. MATERIALS AND METHODS: A double-blind randomized clinical study was conducted and included 60 patients along 3 groups (20 for each group) presented with myofascial pain related to TMD. Patients were randomly divided into 3 groups. Group A were managed by applying the LED light device into the trigger points without switching the device on. A red LED light was given to group B for 5Â min at the tender muscles. Group C were treated by using low-level LASER therapy for 30Â s. Patients were evaluated for any improvements regarding the pain score, presence of trigger points, and trismus along 4 visits (1Â week interval between each visit). Any side effects related to the 2 devices were also assessed. RESULTS: Both group B and C patients showed a statistically significant improvement in the pain value (Pâ€‰<â€‰0.05) at the 3rd and 4th visits when compared to group A. Regarding tenderness, there was a reduction in the number of trigger points in both study groups; however, the results were insignificant in group B. Statistics showed insignificant differences between group B & C patients regarding pain and number of trigger points at all visits (Pâ€‰>â€‰0.05). CONCLUSION: Both LED light and LASER therapies could effectively relieve pain associated with myogenic TMD as there were no important differences between their outcomes. However, the biosafety and lower cost of the LED light device compared to the LASER should also be considered. Trial Registration This clinical trial was prospectively registered (TCTR ID:Â TCTR20190507002) on 07/05/2019. URL: http://www.thaiclinicaltrials.org/show/TCTR20190507002.
Humans;Lasers;Pain;Phototherapy;Reproducibility of Results;Temporomandibular Joint Disorders;Treatment Outcome;Pain Management

Clinical effects of combined red and infrared wavelengths in the treatment of local injuries caused by Bothrops leucurus snake venom. AIM: to evaluate the effects of visible and invisible wavelengths, individually and combined, on local edematogenic activity, serum and muscle enzymes, and clinical response in mice inoculated with B. leucurus snake venom. METHODS: 112 male mice were inoculated with diluted B. leucurus snake venom in the right gastrocnemius muscle, the same volume of saline solution was applied in the contralateral muscle. The animals were divided into four groups, one control and three treated with: 1) red laser (Î»Â =Â 660Â nm), 2) infrared laser (Î»Â =Â 808Â nm) and 3) red laser (Î»Â =Â 660Â nm)Â +Â infrared (Î»Â =Â 808Â nm). Each group was subdivided into four subgroups, according to the duration of treatment application (applications

every 24Â h over evaluation times of up to 144Â h). A diode laser was used (0.1Â W, CW, 1J/point, DE: 10Â J/cm(2)). RESULTS: the treatments prevented the loss of the proprioception reflex, accelerated the reestablishment of the damaged area, and reduced claudication, local hemorrhage, and edematogenic activity caused by bothropic venom. Both wavelengths reduced serum concentrations of creatine kinase (CK) and aspartate aminotransferase (AST) and increased muscle concentration of CK. The combined wavelengths caused a significant reduction in serum enzyme concentrations and a better clinical response when compared to the isolated treatments. CONCLUSION: Laser photobiomodulation proved to be effective in the treatment of the disorders evaluated and the interaction between red and infrared wavelengths potentiated the therapy effects. Snake Venoms;Creatine Kinase Mice;Male;Animals;Bothrops;Snake Venoms;Muscle, Skeletal;Snake Bites;Creatine Kinase

Feasibility and Safety of Using Combined Light-Emitting Diodes Versus Intense Pulsed Light Technology for the Improvement of Facial Hypervascularization in Adult Patients. Background: Superficial facial vascular lesions can be an aesthetic problem and a symptom of different skin diseases. Objective: It was to compare the efficacy and safety profiles of Dermalux(Â®) Tri-Wave MD, based on three combined light-emitting diodes (LEDs) technology and intense pulsed light (IPL) for reducing the excess of facial vascularization due to superficial cutaneous vascular lesions. Materials and methods: The study had a single-center, proof-of-concept, open-label, and prospective design. Two groups of adult patients were treated for facial hypervascularization, LED-Group with an LED device combining 633 and 830â€‰nm and IPL-Group with an IPL (555-950 and 530-750â€‰nm). Variables assessed were hemoglobin hyperconcentration (HH), hemoglobin-affected area (HAA) through Antera 3D(Â®), and pain using the Numeric Pain Rating Scale. Results: Twenty subjects were included, 10 by group (50% female). LED-Group: Mean age 32.1 years (range, 21-46). IPL-Group: Mean age 34.5 years (range, 25-49). HH: LED-Group 100% had a moderate improvement; in the IPL-Group, 10% was moderate, and 90% was marked. HAA: LED-Group 10% had a slight improvement, 70% moderate, and 20% marked; in the IPL-Group, 100%, the improvement was marked. Seventy percent of LED-Group patients reported no pain, 30% mild; in the IPL-Group, 100% of patients reported severe pain. Conclusions: Treatment with combined red and near-infrared LEDs effectively reduced the excess of facial vascularization with moderate outcomes compared with IPL, but without secondary effects and no pain. This treatment could represent an effective, safe, and well-tolerated approach for facial vascular lesions. Adult;Female;Humans;Male;Face;Feasibility Studies;Intense Pulsed Light Therapy;Low-Level Light Therapy;Pain;Skin;Proof of Concept Study;Prospective Studies

Photobiomodulation Reduces Periocular Wrinkle Volume by 30%: A Randomized Controlled Trial. Objective: This study aimed to evaluate red and amber light-emitting diode protocols for facial rejuvenation at the same light dose. Background: The demand for minimally invasive cosmetic procedures to address skin aging has grown throughout the world. In vitro red and amber photobiomodulation (PBM) has been shown to improve collagen synthesis. Meanwhile, red PBM has already been studied in clinical trials; however, a comparison of the use of different wavelengths at the same light dose to reduce periocular wrinkles has not yet been performed. Methods: This split-face, randomized clinical trial recruited 137 women (40-65 years old) presenting with skin phototypes II-IV and Glogau photoaging scale types II-IV. The individuals received 10 sessions for 4 weeks of red (660â€‰nm) and amber (590â€‰nm) PBM (3.8â€‰J/cm(2)), one at each side of the face. The outcomes, measured before and after the treatments, were the periocular wrinkle volume measured by VisioFace(Â®) RD equipment; hydration measured by the Corneometer CM 825; skin elasticity measured by the Cutometer Dual MPA 580; and quality of life determined by adapted versions of validated questionnaires [Melasma Quality of Life Scale-Brazilian Portuguese (MelasQoL-BP) and

Skindex-29]. Results: There was a significant reduction in wrinkle volume after red (31.6%) and amber (29.9%) PBM. None of the treatments improved skin hydration and viscoelasticity. Both questionnaires showed improvements in participants' quality of life. Conclusions: PBM, both at red and amber wavelengths, is an effective tool for rejuvenation, producing a 30% wrinkle volume reduction. The technique has strong potential in patients with diabetes or those presenting with keloids, conditions for which highly inflammatory rejuvenating procedures are not indicated. Clinical trial registration number: REBEC-6YFCBM. Amber Humans;Female;Adult;Middle Aged;Aged;Skin Aging;Treatment Outcome;Quality of Life;Amber;Prospective Studies

Photobiomodulation Literature Watch September 2022.

Effect of low-level laser physiotherapy on left ventricular function among patients with chronic systolic heart failure. BACKGROUND: Low-level laser therapy (LLLT) is a promising noninvasive physiotherapeutic approach that has been demonstrated to improve cardiac performance. This study aimed to assess the impact of low-level laser therapy on cardiac functions and clinical status in patients with chronic left ventricular systolic heart failure who were not candidates for cardiac revascularization or resynchronization. A case series of 27 patients received a course of low-level laser physiotherapy, the clinical outcomes, echocardiographic parameters, and serum nitric oxide levels were evaluated before and after LLLT. RESULTS: Of the total patients enrolled in the study, 21 (or 77.8%) were male, with a mean age of 57.7â€‰Â±â€‰6.89Â years. NYHA classification significantly improved after low-level laser therapy, 15 patients were in class III,12 were in class IV, and no one was in class II before laser therapy while after laser therapy; 25 patients shifted to class II, two patients were in class III with Pâ€‰<â€‰0.001, Six-minute walk distance test was performed, and the results showed that the mean of 6MWT was less than 200Â m (148.556â€‰Â±â€‰39.092) before the study but increased to more than 300 after laser therapy (385.074â€‰Â±â€‰61.740), left ventricular ejection fraction before laser therapy was 26â€‰Â±â€‰7.5 while after laser therapy it became 30â€‰Â±â€‰8.6 but diastolic function did not change after low-level laser therapy, the mean peak TR pressure was 40.0â€‰Â±â€‰9.0Â mmHg and 33.0â€‰Â±â€‰7.0 before and after laser therapy respectively Pâ€‰<â€‰0.001. A significant change was observed in NO level from 4.1â€‰Â±â€‰1.4Â IU/ml before laser therapy to 5.2â€‰Â±â€‰1.7Â IU/ml after laser therapy Pâ€‰<â€‰0.001. CONCLUSIONS: Low-level laser therapy may add benefits to improve symptoms, clinical condition, and quality of life in patients with left ventricular systolic dysfunction, further studies are necessary to evaluate the changes in cardiac functions at a longer follow-up duration.

Exploring the Effects of 630 nm Wavelength of Light-Emitting Diode Irradiation on the Proliferation and Migration Ability of Human Biceps Tendon Fibroblast Cells. BACKGROUND: Light-emitting diode (LED)-based photobiomodulation is used as an inducer of cell regeneration. Although numerous in vitro and in vivo orthopedic studies have been conducted, the ideal LED wavelength range for tendon healing has not yet been determined. This study, thus, focused on the effects of LED of a 630 nm wavelength on the cell viability, proliferation, and migration of human biceps tendon fibroblast cells. METHODS: Human tendon fibroblast cell culture was performed using the biceps tendon of patients who had undergone biceps tenodesis. Human biceps tendon fibroblasts from two patients (male, aged 42 and 69 years) were isolated and cultured. The cell type was confirmed by a morphological analysis and using tendon and fibroblast specific markers. They were then split into three groups, with each receiving a different irradiation treatment: no LED treatment (control), 630 nm LED, and 630 nm + 880 nm LED for 20 minutes each. After the LED treatment, cell viability, proliferation, and migration assays were performed, and the results were compared between the groups. RESULTS: Twenty-four hours after LED treatment, cell viability and proliferation were significantly increased in the 630 nm LED and 630 nm + 880 nm LED treatment groups compared to that in the control group ($p < 0.05$). Under the same conditions, compared with the control group, the

630 nm LED alone treatment group showed a 3.06 Â± 0.21 times higher cell migration rate ($p < 0.05$), and the 630 nm + 880 nm LED combination treatment group showed a 2.88 Â± 0.20 times higher cell migration rate ($p < 0.05$) in three-dimensional migration assay. CONCLUSIONS: In human tendon fibroblast cells, 20 minutes of LED treatment at 630 nm and 630 nm + 880 nm exhibited significant effects on cell proliferation and migration. Our findings suggest the potential of LED therapy as an adjuvant treatment for tendon healing, and hence, further research is warranted to standardize the various parameters to further develop and establish this as a reliable treatment regimen. Humans;Male;Cells, Cultured;Cell Culture Techniques;Cell Proliferation;Tendons;Fibroblasts

Transcranial Photobiomodulation Treatment: Significant Improvements in Four Ex-Football Players with Possible Chronic Traumatic Encephalopathy. BACKGROUND: Chronic traumatic encephalopathy, diagnosed postmortem (hyperphosphorylated tau), is preceded by traumatic encephalopathy syndrome with worsening cognition and behavior/mood disturbances, over years. Transcranial photobiomodulation (tPBM) may promote improvements by increasing ATP in compromised/stressed cells and increasing local blood, lymphatic vessel vasodilation. OBJECTIVE: Aim 1: Examine cognition, behavior/mood changes Post-tPBM. Aim 2: MRI changes - resting-state functional-connectivity MRI: salience, central executive, default mode networks (SN, CEN, DMN); magnetic resonance spectroscopy, cingulate cortex. METHODS: Four ex-players with traumatic encephalopathy syndrome/possible chronic traumatic encephalopathy, playing 11- 16 years, received In-office, red/near-infrared tPBM to scalp, 3x/week for 6 weeks. Two had cavum septum pellucidum. RESULTS: The three younger cases (ages 55, 57, 65) improved 2 SD (pâ€Š<â€Š0.05) on three to six neuropsychological tests/subtests at 1 week or 1 month Post-tPBM, compared to Pre-Treatment, while the older case (age 74) improved by 1.5 SD on three tests. There was significant improvement at 1 month on post-traumatic stress disorder (PTSD), depression, pain, and sleep. One case discontinued narcotic pain medications and had reduced tinnitus. The possible placebo effect is unknown. At 2 months Post-tPBM, two cases regressed. Then, home tPBM was applied to only cortical nodes, DMN (12 weeks); again, significant improvements were seen. Significant correlations for increased SN functional connectivity (FC) over time, with executive function, attention, PTSD, pain, and sleep; and CEN FC, with verbal learning/memory, depression. Increased n-acetyl-aspartate (NAA) (oxygen consumption, mitochondria) was present in anterior cingulate cortex (ACC), parallel to less pain and PTSD. CONCLUSION: After tPBM, these ex-football players improved. Significant correlations of increased SN FC and CEN FC with specific cognitive tests and behavior/mood ratings, plus increased NAA in ACC support beneficial effects from tPBM.

Hair Transplantation. Hair loss represents a distressing issue affecting a large portion of the population, including up to 85% of males and 40% of females, and its incidence increases with age for both sexes.Â Though many causes of hair loss exist, by far the most common etiology is androgenic alopecia (AGA), an androgen-sensitive pattern of hair loss that affects both men and women. Indeed, non-surgical modalities exist which may halt the progression of androgenic alopecia and even help grow new hairs (i.e., minoxidil, finasteride, dutasteride, low-level laser light therapy, platelet-rich plasma, adenosine, ketoconazole) Nevertheless, Â-recent advancements in surgical hair restoration have made hair transplantation (HT) an increasingly effective, safe, and reliable way for patients distressed by androgenic alopecia to regain a more youthful and natural appearance of their hair.

Successful treatment of hyperpigmentation from fixed drug eruption with a low-dose and large-spot Q-switched 1064â€‰nm Nd:YAG Laser. Humans;Lasers, Solid-State;Hyperpigmentation;Treatment Outcome;Drug Eruptions;Low-Level Light Therapy

Pilates Method and/or Photobiomodulation Therapy Combined to Static Magnetic Field in Women with Stress Urinary Incontinence: A Randomized, Double-Blind, Placebo-Controlled Clinical Trial. This clinical trial aims to provide evidence about the effectiveness of the Pilates method on stress

urinary incontinence (SUI), as well as to elucidate the effects of photobiomodulation therapy associated with static magnetic field (PBMT/sMF) alone or associated with the Pilates Method on Pelvic floor muscle (PFM) in women affected by SUI. For that, a three-arm, parallel randomized, double-blinded, placebo-controlled trial was conducted (NCT05096936). We recruited thirty-three women diagnosed with SUI, randomly allocated to three groups: placebo PBMT/sMF plus method Pilates, PBMT/sMF active plus method Pilates and only PBMT/sMF active. The evaluation consisted of anamnesis and physical examination, muscle strength, completion of the ICIQ-SF questionnaire, and urinary loss. The evaluation of muscle strength and filling the ICIQ-SF were performed on the first and last days, while the Pad test was applied in baseline, one month, two months, and three months of intervention. We observed an increase in strength ($p < 0.01$), tone ($p < 0.01$), and quality of life ($p < 0.01$), in addition to a decrease in urinary lost ($p < 0.01$) for all groups comparing the pre and post-intervention. The PBMT/sMF alone, the Pilates, and the combination of the two therapies proved to be effective in improving the signs and symptoms of women with SUI.

Effects of Physiotherapy on Pain and Mouth Opening in Temporomandibular Disorders: An Umbrella and Mapping Systematic Review with Meta-Meta-Analysis. The aim of this meta-meta-analysis was to assess the current evidence regarding the effect of physical therapy (PT) interventions on pain and functional variables in temporomandibular disorders (TMD). We conducted an umbrella systematic review (SR) and four meta-meta-analyses (MMA) and created an evidence map to determine the effectiveness of PT on pain intensity and maximum mouth opening in patients with TMD. The quality of the included SR was assessed with the AMSTAR 2, and the risk of bias with ROBIS. Of the 31 SR included in the umbrella SR, only 10 were included in the MMA. The MMA showed moderate effects for manual therapy and therapeutic exercise, and large effects for low-level laser therapy on improving pain intensity and maximum mouth opening in patients with TMD, with a limited to moderate quality of evidence. The overlapping analyses showed only a slight overlap for all the MMA according to the corrected covered area (range from 0.07 to 0.2), 23.1% to 41.6%. This umbrella SR showed that manual therapy and exercise interventions, as well as low-level laser therapy interventions, are effective in the reduction in pain intensity and improvement of maximum mouth opening in TMD. This article presents a synthesis of the available evidence related to the various physical therapy interventions used in patients presenting with temporomandibular disorders. These results could help clinicians to select the optimal intervention for their patients and to reject those that are less useful.

Near-Infrared Photobiomodulation of the Peripheral Nerve Inhibits the Neuronal Firing in a Rat Spinal Dorsal Horn Evoked by Mechanical Stimulation. Photobiomodulation has analgesic effects via inhibition of nerve activity, but few reports have examined the effects on the spinal dorsal horn, the entry point for nociceptive information in the central nervous system. In this study, we evaluated the effects of laser irradiation of peripheral nerve axons, which are conduction pathways for nociceptive stimuli, on the neuronal firing in lamina II of the spinal dorsal horn of a rat evoked by mechanical stimulation with von Frey filaments (vFF). In order to record neuronal firing, electrodes were inserted into lamina II of the exposed rat spinal dorsal horn. The exposed sciatic nerve axons were irradiated with an 808 nm laser. The 26.0 g vFF-evoked firing frequency was inhibited from 5 min after laser irradiation and persisted for 3 h. Sham irradiation did not alter the firing frequency. Laser irradiation selectively inhibited 15.0 and 26.0 g vFF-evoked firing, which corresponded to nociceptive stimuli. Histopathological evaluation revealed no damage to the sciatic nerve due to laser irradiation. These results indicate that neuronal firing is inhibited in lamina II of the spinal dorsal horn, suggesting that laser irradiation inhibits Aî´ and/or C fibers that conduct nociceptive stimuli.
Rats;Animals;Rats, Sprague-Dawley;Neurons;Spinal Cord Dorsal Horn;Sciatic Nerve;Axons;Posterior Horn Cells;Spinal Cord

Photomodulative effects of low-level laser therapy on tracheal fenestration developed in in vivo model. The effect of low-level laser therapy (LLLT) on variable mucosal lesions in the upper aerodigestive tract has been reported. However, the effect of LLLT on tracheostomy sites or tracheal fenestration is rarely reported. In this study, we evaluate the effect of LLLT performed using 635Â nm laser light based on a cylindrical diffuser and an animal model with tracheal fenestration. An animal model of tracheal fenestration is developed by suturing the trachea to the skin after performing a vertical tracheostomy from the second to the fifth tracheal ring of Wistar rats (male, body weight 200-250Â g). LLLT (spot size: 2Â cm(2)) is conducted once daily for five days using a handheld cylindrical device. Twenty-four rats are randomly assigned to a no-therapy or LLLT group with an energy density of 20Â J/cm(2). Histological analysis is performed at 7 and 14Â days after tracheal fenestration. Irradiation at the tracheal fenestration site with an energy density of 20Â J/cm(2) improves the wound healing, as shown at 2Â weeks after tracheostomy. Histological analysis shows significantly decreased acute inflammation and granulation tissue, as well as better cartilage regeneration and less tracheal wall thickening. Therefore, LLLT demonstrates therapeutic potential for preventing tracheal stenosis and granuloma after tracheostomy.
Rats;Male;Animals;Trachea;Rats, Wistar;Low-Level Light Therapy;Wound Healing;Skin

Effect of electromagnetic therapy versus low-level laser therapy on diabetic patients with trigeminal neuralgia: a randomized control trial. BACKGROUND: Trigeminal neuralgia (TN) is defined as intense, abrupt, often unilateral, stabbing, short, repeated episodes of pain in one or more distributional branches of the trigeminal nerve. AIM: To see how electromagnetic therapy (EMT) compared to low-level laser therapy (LLLT) affect TN in diabetes patients. DESIGN: This is a randomized controlled trial. SETTING: Physical therapy and Neurology Outpatients Clinics at Faculty of Physical Therapy. POPULATION: One hundred and forty diabetic patients with TN were evaluated for eligibility. As a result, 126 diabetic patients with TN were included in this trial. They were randomly divided into three equal-sized groups using random allocation software. Due to travel to another country, two patients did not complete the treatment protocol, and four opted out of the post-therapy evaluation. So, 120 volunteer diabetic patients with TN of both sexes were diagnosed for the participation in this study by a neurologist (N.=40 in each group). METHODS: For two months, participants in the control group A received the medication only (oral hypoglycemic drugs, Analgesics, vitamin B12), participants in the study group B received the medications as in group A in addition to LLLT, and participants in the study group C received medication as in group A in addition to electromagnetic therapy (EMT). The primary outcome was the amplitude of compound muscle action potentials of temporalis and masseter muscles by using NEXUS 10 (Mind media). The secondary outcome was pain intensity by using the Visual Analog Scale (VAS). RESULTS: According to the results of this study, there is a statistically significant difference in visual analog scale scores and the amplitude of compound muscle action potentials of the temporalis and masseter muscles among groups in favor of group B. CONCLUSIONS: After treatment, all groups improved significantly, with the laser group outperforming the electromagnetic group by a large margin. For irradiation, LLLT was more effective than EMT in reducing diabetic patients' trigeminal pain, and increasing masseter and temporalis muscles compound action potential amplitude in diabetic patients with TN. CLINICAL REHABILITATION IMPACT: LLLT was more effective than EMT at reducing diabetic patient's trigeminal pain, and increasing masseter and temporalis muscles compound action potential amplitude in diabetic patients with TN patients after two months of interventions.
Male;Female;Humans;Trigeminal Neuralgia;Low-Level Light Therapy;Treatment Outcome;Pain;Magnetic Field Therapy;Diabetes Mellitus

Mitigation of photoreceptors abnormalities after low-level laser therapy and chia seeds supplementation in experimental diabetic retinopathy. BACKGROUND: This study aimed to

assess the effect of low-level laser therapy (LLLT) and chia seeds on the mitigation of photoreceptors abnormalities in experimental diabetic retinopathy (DR). MATERIALS AND METHODS: A total of 65 female Wistar rats, 5 rats were served as a control group and 60 rats were injected intraperitoneally with one dose of 55 mg/kg of streptozotocin (STZ) to induce DR after 6-8 weeks. The rats were divided into (n = 20 rats each): (a) DR group: did not receive any treatment, (b) DR+ LLLT group was exposed to 670-nm LLLT for 6 weeks (two sessions/week), and (c) DR+ LLLT+ chia seed group, in which rats were exposed to LLLT and administrated with 250 mg/kg/day of chia seeds flour for 2 weeks before STZ injection and continued to the end of the experiment. Blood glucose (BG) levels and retinal histological examination were employed after 1, 2, 4, and 6 weeks. RESULTS: The BG level in the DR group and the treated groups were significantly higher ($P < 0.001$) than in the control group after the four-time periods. Chia seeds group exhibited BG levels less than the DR and the DR+ LLLT groups after 6 weeks ($P < 0.01$). LLLT improved the degeneration of the photoreceptors after 6 weeks of treatment, while LLLT+ chia seeds supplementation showed early photoreceptors improvement after 2 weeks. CONCLUSION: The early improvement in the photoreceptors after LLLT+ chia seed may be attributed to the potent antioxidant properties of chia seeds. Therefore, the combination between LLLT and chia seeds should be employed to protect the retinal photoreceptors against DR.

Novel laser hair removal in all skin types. BACKGROUND: Laser has been long accepted as a solution for excess or unwanted hair growth yet traditional lasers are not always ideal for safe and effective outcome for all skin types and hair characteristics. A diode laser module combining three wavelengths (755, 810, and 1064â€‰nm) in a single pulse was developed to provide a fast and long-term solution for subjects with various profiles. AIMS: To evaluate the safety and efficacy of a Triple wavelength diode laser module for hair removal treatment in all skin types (Fitzpatrick I-VI). SUBJECTS AND METHODS: This was a prospective, dual centered, single-arm study. Subjects were treated with a novel diode laser module. Thirty-six subjects were enrolled, sixteen with Fitzpatrick skin types I-IV (46%) and twenty with Fitzpatrick skin types V-VI (54%). Treatment areas were axilla and bikini lines. Subjects underwent 4 treatment sessions at 6â€‰weeksâ€‰Â±â€‰5â€‰days intervals and attended a follow-up visit 3Â months after the last treatment session. 2D digital photographs were taken at baseline and at the follow-up visit, and a hair count was conducted by three blinded evaluators. RESULTS: A significant reduction in hair count between baseline and the 3-month follow-up visit was observed in both axilla and bikini lines for all skin types. The mean hair reduction was 41.5Â Â±â€‰19.4% and 48.1Â Â±â€‰20.9% in the axilla and bikini line, respectively. A significant hair reduction was also observed within skin type groups; mean hair reduction 45.5Â Â±â€‰16.9% and 40.3Â Â±â€‰17.2% in skin types I-IV and V-VI, respectively, indicating similar efficacy for both light and dark skin types. No serious adverse events were reported. CONCLUSIONS: This study demonstrates that the Soprano Titanium laser platform is safe and effective for hair removal treatment in all skin types. Humans;Hair;Hair Removal;Lasers, Semiconductor;Prospective Studies;Treatment Outcome;Low-Level Light Therapy;Axilla;Abdomen;Skin Pigmentation;Sunburn;Suntan

Hair regrowth treatment efficacy and resistance in androgenetic alopecia: A systematic review and continuous Bayesian network meta-analysis. BACKGROUND: Androgenetic alopecia (AGA) affects almost half the population, and several treatments intending to regenerate a normal scalp hair phenotype are used. This is the first study comparing treatment efficacy response and resistance using standardized continuous outcomes. OBJECTIVE: To systematically compare the relative efficacy of treatments used for terminal hair (TH) regrowth in women and men with AGA. METHODS: A systematic literature review was conducted (from inception to August 11, 2021) to identify randomized, Placebo-controlled trials with â‰¥ 20 patients and reporting changes in TH density after 24 weeks. Efficacy was analyzed by sex at 12 and 24 weeks using Bayesian network meta-analysis (B-

NMA) and compared to frequentist and continuous outcomes profiles. RESULTS: The search identified 2,314 unique articles. Ninety-eight were included for full-text review, and 17 articles met the inclusion criteria for data extraction and analyses. Eligible treatments included ALRV5XR, Dutasteride 0.5 mg/day, Finasteride 1 mg/day, low-level laser comb treatment (LLLT), Minoxidil 2% and 5%, Nutrafol, and Viviscal. At 24 weeks, the B-NMA regrowth efficacy in TH/cm(2) and significance ((**)) in women were ALRV5XR: 30.09(**), LLLT: 16.62(**), Minoxidil 2%: 12.13(**), Minoxidil 5%: 10.82(**), and Nutrafol: 7.32(**), and in men; ALRV5XR: 21.03(**), LLLT: 18.75(**), Dutasteride: 18.37(**), Viviscal: 13.23, Minoxidil 5%: 13.13(**), Finasteride: 12.38, and Minoxidil 2%: 10.54. Two distinct TH regrowth response profiles were found; Continuous: ALRV5XR regrowth rates were linear in men and accelerated in women; Resistant: after 12 weeks, LLLT, Nutrafol, and Viviscal regrowth rates attenuated while Dutasteride and Finasteride plateaued; Minoxidil 2% and 5% lost some regrowth. There were no statistical differences for the same treatment between women and men. B-NMA provided more accurate, statistically relevant, and conservative results than the frequentist-NMA. CONCLUSION: Some TH regrowth can be expected from most AGA treatments with less variability in women than men. Responses to drug treatments were rapid, showing strong early efficacy followed by the greatest resistance effects from flatlining to loss of regrowth after 12-16 weeks. Finasteride, Minoxidil 2% and Viviscal in men were not statistically different from Placebo. LLLT appeared more efficacious than pharmaceuticals. The natural product formulation ALRV5XR showed better efficacy in all tested parameters without signs of treatment resistance (see Graphical abstract). SYSTEMATIC REVIEW REGISTRATION: www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42021268040, identifier CRD42021268040.

Evaluation of low-level laser therapy and platelet-rich fibrin on donor site healing after vascularized interpositional periosteal connective tissue flap: a randomized clinical study. AIM: To evaluate the effectiveness of platelet-rich fibrin (PRF) and low-level laser therapy (LLLT) on donor site healing after vascularized interpositional periosteal connective tissue (VIP-CT) flap. MATERIALS AND METHODS: For the present clinical study, the selected patients requiring VIP-CT flap were randomly assigned into either of the two treatment groups (VIP-CT/PRF and VIP-CT/LLLT). For VIP-CT/PRF, palatal donor site treated with platelet-rich fibrin (PRF, nâ€‰=â€‰15) after harvesting VIP-CT flap; and for VIP-CT/LLLT, palatal donor site treated with low-level laser therapy (LLLT, nâ€‰=â€‰16) after harvesting VIP-CT flap. RESULTS: The mean thickness of palatal mucosa at surgical site was increased from 2.91â€‰Â±â€‰0.65 to 2.93â€‰Â±â€‰0.55Â mm after 1Â week and to 3.02â€‰Â±â€‰0.55Â mm after 12Â weeks while in PRF-treated site, while in LLLT-treated sites, palatal mucosal thickness decreased after 1Â week from 3.35â€‰Â±â€‰0.56Â mm to 1.83â€‰Â±â€‰0.48Â mm and then increase to 3.35â€‰Â±â€‰0.55Â mm after 12Â weeks, and the mean difference was significantly higher for PRF-treated group compared to LLLT-treated group. In regard to contour, absence of hypertrophic tissue was observed in VIP-CT/LLLT compared with VIP-CT/PRF group (40% of patients, pâ€‰=â€‰0.003) at 4Â weeks. "Absence" of pain and burning sensation were observed as early as at 1Â week in LLLT-treated palatal donor sites compared to PRF-treated palatal donor site after VIP-CT. Improvement in post-surgical complications like ecchymosis, tissue necrosis, swelling, and infection were observed almost 100% at 4Â weeks in both the groups. CONCLUSION: Favourable clinical outcomes in terms of tissue thickness, consistency, color, contour, scar, pain, and burning sensation and patient comfort were obtained in both LLLT- and PRF-treated donor palatal sites at 12Â weeks. Non-significant increase in tissue thickness was observed compared to baseline in PRF-treated donor sites at 12Â weeks compared to LLLT-treated donor sites. CLINICAL SIGNIFICANCE: Both low-level laser therapy (LLLT) using 940Â nm wavelength and autologous platelet-rich fibrin (PRF) can be utilized to enhance early wound healing and reduce the palatal donor

site morbidity. Humans;Platelet-Rich Fibrin;Low-Level Light Therapy;Wound Healing;Connective Tissue;Pain

Biophotonic Effects of Low-Level Laser Therapy on Adipose-Derived Stem Cells for Soft Tissue Deficiency. PURPOSES: The objectives of this study are to use diode lasers for low-level laser therapy (LLLT) and to assess its applicability and effects in adipose-derived stem cell (ADSC) growth processes. METHODS: Studies were conducted on the diode laser with wavelengths of 622.7, 527.1, and 467.3 nm. The mechanism of action of LLL illumination was studied on ADSCs, isolated from human tissue, and then cultured by examining different wavelengths to determine the relevant light parameters for optimal responses. We used enzyme-linked immunosorbent assay and real-time polymerase chain to determine the percentages of fibroblast-mediated procollagen type 1 and matrix metallopeptidase 1 (MMP-1), MMP-2, and MMP-9 production at different wavelengths. The levels of lactate dehydrogenase produced by ADSCs after LLL illumination were assessed as well. Clinical results from 20 patients treated for soft tissue deficiency were collected for assessment of ADSC-assisted lipotransfer. RESULTS: Low-level laser (622.7 nm) illumination on cell cultures in vitro increased ADSCs proliferation, type 1 procollagen expression, collagen production, as well as MMP-1, MMP-2, and MMP-9 relative expression. Statistical analysis demonstrated a significant difference in red light (622.7 nm) versus green light (527.1 nm) and blue light (467.3 nm, $P < 0.05$). No significant differences were noted between the effects of green and blue lights. In clinical application, all patients attained significant improvement with treatment in the final outcome assessment after 6 months. CONCLUSIONS: Low-level laser illumination may affect ADSCs growth processes and ADSC-assisted lipotransfer for soft tissue deformity, scar treatment, wound healing, and other reconstructive surgery. Matrix Metalloproteinase 9;Matrix Metalloproteinase 2;Matrix Metalloproteinase 1;Procollagen Humans;Low-Level Light Therapy;Matrix Metalloproteinase 9;Matrix Metalloproteinase 2;Matrix Metalloproteinase 1;Procollagen;Stem Cells;Adipose Tissue

Potential targets and mechanisms of photobiomodulation for spinal cord injury. As a classic noninvasive physiotherapy, photobiomodulation, also known as low-level laser therapy, is widely used for the treatment of many diseases and has anti-inflammatory and tissue repair effects. Photobiomodulation has been shown to promote spinal cord injury repair. In our previous study, we found that 810 nm low-level laser therapy reduced the M1 polarization of macrophages and promoted motor function recovery. However, the mechanism underlying this inhibitory effect is not clear. In recent years, transcriptome sequencing analysis has played a critical role in elucidating the progression of diseases. Therefore, in this study, we performed M1 polarization on induced mouse bone marrow macrophages and applied low-level laser therapy. Our sequencing results showed the differential gene expression profile of photobiomodulation regulating macrophage polarization. We analyzed these genes using gene ontology and Kyoto Encyclopedia of Genes and Genomes enrichment analyses. Networks of protein-protein interactions and competing RNA endogenous networks were constructed. We found that photobiomodulation inhibited STAT3 expression through increasing the expression of miR-330-5p, and that miR-330-5p binding to STAT3 inhibited STAT3 expression. Inducible nitric oxide synthase showed trends in changes similar to the changes in STAT3 expression. Finally, we treated a mouse model of spinal cord injury using photobiomodulation and confirmed that photobiomodulation reduced inducible nitric oxide synthase and STAT3 expression and promoted motor function recovery in spinal cord injury mice. These findings suggest that STAT3 may be a potential target of photobiomodulation, and the miR-330-5p/STAT3 pathway is a possible mechanism by which photobiomodulation has its biological effects.

Effect of Photobiomodulation With Different Wavelengths on Radiodermatitis Treatment. Approximately 80% of patients submitted to radiotherapy develop radiodermatitis. Photobiomodulation based on light-emitted diode (LED) is one of the therapeutic strategies for

treating inflammation. This study aimed to investigate the effect of the photobiomodulation with two wavelengths, in an acute radiodermatitis animal model. METHODS: Twenty rats were submitted to one radiotherapy session. After 15 days, the rats that developed radiodermatitis were divided into control groups, LED-630â€‰nm, LED-850â€‰nm, and LED-630â€‰+â€‰850â€‰nm. The treatment regimen was one session lasting 10 minutes on alternate days for 21 days. We analyzed macroscopy aspects (RTOG scale), vascular density, dermal appendages, VEGF-a, TNF-alpha, MMP-9, and MMP-9 genic expression level. RESULTS: All LED groups revealed a two-point reduction on the radiodermatitis severity grade compared with the baseline classification. Dermal appendage and vascular analysis showed a higher counting in all LED groups compared to control. This study showed dermal appendages twice in the 630/850â€‰nm group compared with the control group. The 630/850â€‰nm group showed six times more arterioles than the control group. Regarding genic expression, this study showed a 10-fold decrease between LED-630â€‰nm versus LED-630â€‰+â€‰850â€‰nm ($P = 0.02$) interleukin-10 expression and a 12-fold decrease between control versus LED-630â€‰nm ($P = 0.006$) and LED-850â€‰nm ($P = 0.002$) in TNF-alpha. CONCLUSION: LED (630â€‰nm, 850â€‰nm, and 630â€‰nm + 850â€‰nm) showed benefit in the treatment of radiodermatitis, and the association of the 630â€‰nm + 850â€‰nm and 630â€‰nm parameters demonstrated the best macroscopic and microscopic results.

Biphasic dose response in the anti-inflammation experiment of PBM. Non-invasive laser irradiation can induce photobiomodulation (PBM) effects in cells and tissues, which can help reduce inflammation and pain in several clinical scenarios. The purpose of this study is to review the current literature to verify whether PBM can produce dose effects in anti-inflammatory experiments by summarizing the clinical and experimental effects of different laser parameters of several diseases. The so-called Arndt-Schulz curve is often used to describe two-phase dose reactions, assuming small doses of therapeutic stimulation, medium doses of inhibition, and large doses of killing. In the past decade, more and more attention has been paid to the clinical application of PBM, especially in the field of anti-inflammation, because it represents a non-invasive strategy with few contraindications. Although there are different types of lasers available, their use is adjusted by different parameters. In general, the parameters involved are wavelength, energy density, power output, and radiation time. However, due to the biphasic effect, the scientific and medical communities remain puzzled by the ways in which the application of PBM must be modified depending on its clinical application. This article will discuss these parameter adjustments and will then also briefly introduce two controversial theories of the molecular and cellular mechanisms of PBM. A better understanding of the extent of dualistic dose response in low-intensity laser therapy is necessary to optimize clinical treatment. It also allows us to explore the most dependable mechanism for PBM use and, ultimately, standardize treatment for patients with various diseases. Anti-Inflammatory Agents Humans;Low-Level Light Therapy;Lasers;Inflammation;Light;Anti-Inflammatory Agents

Comparison of the effects of 2 frequencies of application of photobiomodulation on facial rejuvenation: Controlled, randomized, and double-blind clinical trial. INTRODUCTION: Skin aging is an irreversible, slow and progressive process, mainly influenced by age, but also by external factors such as ultraviolet radiation, smoking, and alcohol, among others. It is increasingly common to look for procedures that slow down skin aging by limiting or hiding its effects on appearance. Studies have shown the benefits of photobiomodulation (PBM) for the skin, especially with the use of red light-emitting diodes. However, there is a high level of variability in the treatment parameters and frequency of application. METHODS AND ANALYSIS: The objective of this study is to compare the effects of PBM with a light-emitting diode mask (660â€‰nm, 6.4 mW/ cmÂ², 8,02 J/ cmÂ², 5.02 mW, 21 minutes) on facial rejuvenation using 2 frequency applications for 4 weeks: one group will receive PBM application on the face, twice a week and another group will receive PBM application 3 times a

week. A group with simulated PBM applied twice a week for 4 weeks will be used as a control. The treatment will be performed on female participants aged between 45 and 60 years. After 4 weeks, evaluations of photographic images by specialists (Wrinkle Assessment Scale) as well as the quantitative analysis of the wrinkle size by the Image J software, the depth and width of wrinkles (assessment of face impressions by optical coherence tomography) and the level of Satisfaction with Facial Appearance Overall will be compared with data collected before the start of the study. All data will be analyzed statistically according to their distribution, seeking a level of statistical significance of 0.05. ETHICS AND DISSEMINATION: This protocol was approved by the Research Ethics Committee of the Nove de Julho University (acceptance number: 4.365.565). This trial has been registered in ClinicalTrials.gov (ID: NCT04911140). This study is recruiting. Humans;Female;Middle Aged;Low-Level Light Therapy;Rejuvenation;Ultraviolet Rays;Skin Aging;Skin;Double-Blind Method

The safety and effectiveness of low-level light therapy (LLLT) with light-emitting diode (LED) bed system and a novel topical anti-cellulite gel on grades 1-2 thigh/buttock cellulite: a randomized, comparative-controlled split-thigh/buttock IRB study. BACKGROUND: Cellulite of the upper lateral and posterior thighs and lower buttocks represents a common unwanted condition. OBJECTIVES: The author sought to comparea LLLT-LED bed therapy and a novel topical anti-cellulite gel on one thigh/buttock cellulite vs light therapy for cellulite to the opposite side. METHODS: Eight healthy female subjects were randomly treated with a LLLT-LED bed twice weekly for 20 minutes in prone/supine positions with twice daily application of a novel anti-cellulite gel to one randomized thigh/buttock. RESULTS: At the end of the 3-month trial, skin elasticity increased after combined therapy on one thigh but decreased with only LLLT-LED bed treatments on the opposite thigh. Thighs treated with active gel and LLLT-LED bed, were downgraded to a lower cellulite grade, while monotherapy did not demonstrate any change from their baseline cellulite grading. Changes in thigh circumference did not correlate with either treatments regimens.Subject and investigator questionnaire evaluations at month-3 were assessed as "satisfactory" results. There were no adverse reactions to treatments. CONCLUSIONS: The use of LLLT-LED bed therapy and an anti-cellulite gel demonstrated an efficient alternative in the treatment of cellulite-involved thighs/buttocks over similarly affected thighs/buttocks that were treated only with LLLT-LED bed therapy. Humans;Female;Thigh;Low-Level Light Therapy;Buttocks;Adipose Tissue;Cosmetic Techniques;Ethics Committees, Research;Cellulite

The Combined Effects of a Methacrylate Powder Dressing (Altrazeal Powder) and Photobiomodulation Therapy on the Healing of a Severe Diabetic Foot Ulcer in a Diabetic Patient: A Case Report. Weakened wound healing is a popular, severe complication of patients with diabetes which poses a risk for foot infection and amputation. Researchers have searched for new treatments for treating diabetic foot ulcers (DFUs) in recent years. In this case report, for the first time, we applied photobiomodulation therapy (PBMT) and Altrazeal powder together to treat a severe case of DFU in a 47-year-old woman who was suffering from type 1 diabetes. Along with the progress of combination therapy, we observed that the ulcer area was significantly reduced, and the wound healed within 16 weeks. Furthermore, dermatitis and purulent secretion were treated, and the pain was reduced. This reported case study indicated the beneficial effect of the combination of PBMT and Altrazeal powder for the healing of a severe DFU in a patient with type one diabetes. The combined application of PBMT plus Altrazeal powder demonstrated an additive effect. Further clinical trials in the clinical setting are suggested to validate the results further. Besides, more studies in preclinical models are suggested to find the mechanism of the action of combination therapy.

Therapeutic Effect of a Low-Level Laser on Acute Pain and Post-operative Mouth Opening After Closed Reduction of Mandibular-Condylar Fracture. Introduction: The purpose of this study was to determine the therapeutic effect of low-level laser therapy (LLLT) on acute pain and the range of

mouth opening after condylar closed reduction surgery. The use of low-level lasers, especially to reduce inflammation and pain, has received more attention in recent years. The results of many studies performed in this field are contradictory, and the effectiveness of low-level lasers in the treatment of patients is still uncertain. Methods: This study was performed as a randomized, double-blinded clinical trial on 40 patients with condylar closed reduction surgery. Patients were randomly assigned to two groups of 20 patients, including the placebo and intervention groups. In the intervention group, the patients received LLLT (100 mw, 2 J/cm(2), 20 S/point, 14 extraoral points, 7 days). The range of jaw movements after opening the intermaxillary-fixation was measured. Patients' pain was assessed using the visual analog scale (VAS). Data were analyzed using SPSS software version 21, the chi-square test, and repeated measures ANOVA. Results: There was no significant difference between the study groups in terms of the range of jaw motions. The mean VAS score was 56.85 (SD=3.817) in the intervention group and 60.95 (SD=4.861) in the placebo group, showing a statistically significant difference between the two groups at the end of the study (P=0.007) Conclusion: The results of this study indicated the effectiveness of low-level lasers in reducing acute pain in patients undergoing closed condylar surgery. Iranian Registry of Clinical Trials (IRCT20200520047519N1).

Therapeutic Effects of Combination Therapy and Photobiomodulation Therapy on Retinal Regeneration. Introduction: Many systemic and ocular diseases cause macular edema (ME). Macular edema is seen in two primary forms; the first is diffuse thickening of the macula, and the other is a macula with a distinct petaloid (cloverleaf) appearance called cystoid macular edema. Macular edema has a known role in the reduction of visual equity, and many options have been proposed for the reversal of this condition. Methods: Articles on the effects of macular laser grid photocoagulation on diabetic macular edema (DME) or cystoid macular edema published between 2000 and 2022 were collected from PubMed, Google Scholar, and Web of Science. The following keywords were used for the search: "macular laser photocoagulation", "macular edema", "cystoid macular edema", "intravitreal pharmacotherapies", and "antivascular endothelial growth factor". Two hundred nineteen articles were found in google scholar and 165 articles in PubMed, and a total of 58 articles were included in the study after applying the exclusion criteria. Results: We investigated the effects of various lasers photocoagulation such as Focal and/or grid macular laser, subthreshold micropulse laser (SMPL), as well as intravitreal pharmacotherapies with triamcinolone acetonide, and fluocinolone, and extended released intraocular implants such as Ozurdex, Retisert, Iluvien, and anti-vascular endothelial growth factors such as bevacizumab (Avastin), Eyela, and Lucentis. Corticosteroids were more effective than lasers, although some researchers have found that lasers and combined lasers and corticosteroids are more effective. In addition, some studies have shown that the frequency and concentrations of intravitreal pharmacotherapies are effective in increasing visual outcomes. Conclusion: The results of the studies showed that the combined intravitreal corticosteroids are much more effective in improving visual acuity (VA) than a single corticosteroid, and the low concentration of the drug is safer. Still, corticosteroids have side effects such as increased intraocular pressure and glaucoma. Therefore, combining the medication with a laser is much more reasonable than each alone. Also, the subthreshold photocoagulation laser (670 nm) is better at reducing the central macular thickness (CMT) and improving VA than the micro pulse yellow laser and pan-retinal photocoagulation (PRP).

Photobiomodulation Therapy in the Prevention and Treatment of Radiodermatitis in Breast Cancer Patients: Systematic Review. Introduction: Radiodermatitis (RD) is the most common side-effect of radiation therapy, yet its prevention and treatment through photobiomodulation therapy (PBMT) have demonstrated promising results. This study aimed to synthesize the evidence concerning the use of PBMT in managing RD among breast cancer patients undergoing radiation therapy. Methods:

This is a systematic review with no time restrictions, based on the methodology proposed by the Joanna Briggs Institute (JBI), including such databases as PubMed, Cochrane, Web of Science, Scopus, and CINAHL. The studies were selected based on the following inclusion criteria: female participants over 18 years of age and females having breast cancer and undergoing radiation therapy using a three-dimensional technique or an intensity-modulated radiation therapy (IMRT) technique. Two reviewers assessed the methodological quality using the JBI Critical Appraisal Checklist, and the report was described based on PRISMA guidelines. Results: Red and infrared wavelengths were used. Device power ranged from 1.1 W to 0.08 W for continuous modes and 25 W for pulsed mode, resulting in a 3 and 4 J/cm(2) fluence, applied throughout radiation therapy, leading to a reduced severity in cutaneous reactions. Conclusion: PBMT can reduce the severity of RD. New clinical trials are required to standardize protocols, given the scarcity of studies for the adopted site and methodological diversity.

Correlation Analysis Between Pain Intensity, Functional Disability and Range of Motion Using Low-Level Laser Therapy in Patients With Discogenic Lumbar Radiculopathy: A Cross-sectional Study. Introduction: Low-level laser is a pain-free and non-invasive treatment modality. It is used in many acute and chronic painful conditions. This study aimed to determine the correlation between pain intensity, functional disability, and range of motion using low-level laser therapy (LLLT) in patients with discogenic lumbar radiculopathy. Methods: This cross-sectional study was conducted as a part of a randomized controlled trial of LLLT to treat patients with discogenic lumbar radiculopathy in physical therapy departments of three different hospitals in Islamabad, Pakistan, from August 2021 to September 2021. The study was conducted according to STROBE guidelines. Fifty-Five patients from the experimental group of the trial were invited to participate in this study. The outcomes of the treatment were recorded on a semi-structured questionnaire on the first day and last day of their treatment from each patient's pain intensity, functional disability, and Lumbar range of motion (L-ROM) (flexion and extension) by using the visual analogue scale (VAS) for pain intensity, Oswestry Disability Index (ODI) for functional disability, and dual inclinometer for L-ROM. The data were analyzed through SPSS version 26.0. Results: The results of the correlation coefficient/Pearson's correlation of VAS, ODI, and dual inclinometer were varied. The strength of correlation between variables was weak to moderate (r=0.033 to 0.425) with statistically insignificant correlation coefficient ($P > 0.05$, 95% CI) except for lumbar flexion ($P<0.05$, 95% CI). Conclusion: For acute low back pain (LBP) with discogenic lumbar radiculopathy, LLLT at a wavelength of 830-nm and a dose of 3J/point in conjunction with conventional physical therapy had no significant correlation, but rather weak to moderate values with pain intensity, functional disability, and L-ROM.

Therapeutic Effects of Photobiomodulation Therapy on Multiple Sclerosis by Regulating the Inflammatory Process and Controlling Immune Cell Activity: A Novel Promising Treatment Target. Introduction: Multiple sclerosis (MS) is one of the autoimmune and chronic diseases of the central nervous system; this disease occurs more frequently in young people and women and leads to neurological symptoms. Oxidative stress, inflammatory processes, and oligodendrocyte dysfunction have a pivotal role in the pathophysiology of this disease. Nowadays it is reported that photobiomodulation (PBM) as a non-invasive treatment has neuroprotective potential, but the exact mechanisms are not understood. Methods: In this study, we reviewed the effects of PBM on MS. In this regard, we used the keywords "Photobiomodulation", "Laser therapy", and "Low-level laser therapy" on MS to find related studies on this subject in PubMed, Google scholar, Elsevier, Medline, and Scopus databases. Results: PBM has positive effects on MS by regulating the inflammatory process, controlling immune cell activity and mitochondrial functions, as well as inhibiting free radicals production which finally leads to a reduction in neurological defects and an improvement in

the functional status of patients. Conclusion: Overall, researchers have suggested the use of laser therapy in neurodegenerative diseases due to its numerous therapeutic effects.

Low-Level Laser Therapy in the Treatment of Autoimmune Thyroiditis. Introduction: Autoimmune thyroiditis (AIT) is an autoimmune disorder that is characterized by thyroid gland dysfunction. Low-level laser therapy (LLLT), as a safe and non-invasive intervention, has gained much attention in many clinical applications including pain relief, regenerative medicine, and autoimmune. Methods: In this review, we discuss the effect of LLLT on cellular responses and its application in the treatment of AIT. Such keywords as "low-level laser therapy", "photobiomodulation" and "autoimmune thyroiditis" were used to find studies related to laser therapy in AIT in Google Scholar, PubMed and Medline databases. Results: LLLT reduced thyroid gland inflammation and inhibited immune cell trafficking. LLLT modulated inflammatory responses and improved thyroid gland regeneration. Conclusion: Investigations indicated that besides current treatment strategies, LLLT could be a promising therapeutic approach for the treatment of AIT.

Effect of Photobiomodulation Therapy Associated With Biphasic Phosphate Calcium on Bone Repair: A Histomorphometric Study in Rats. Introduction: This study aimed to investigate the effects of photobiomodulation (PBM) therapy associated with biphasic calcium phosphate on calvaria critical defects in rats. Methods: Forty-eight (90 days old) adult male rats (Rattus norvegicus, Albinus variation, Wistar) received critical defects of 5 mm in diameter, which were made on their skull, and they were randomly assigned into the following groups: C-blood clot, B-biphasic calcium phosphate, L-photobiomodulation therapy, and Bâ€ƒ+â€ƒL-biphasic calcium phosphateâ€ƒ+â€ƒphotobiomodulation therapy. A low-level a gallium aluminum arsenide (GaAlAs) laser was applied in a single dose during surgery, in a wavelength of 660 nm and total energy density of 45 J/cm(2). On 30(th) and 60(th) days, the animals from each group were euthanized. Histological and histomorphometric analyses were performed. Results:In 30 days, almost all specimens (C, L, B and Bâ€ƒ+â€ƒL) showed bone neoformation areas in regions near the borders of the surgical defect. In 60 days, in many specimens (C, L, B, Bâ€ƒ+â€ƒL), it was possible to see a narrow neoformed bone structure along almost the whole extension of the surgical defect, though it was thinner than the original calvary bone. Data were recorded as meanâ€ƒÂ±â€ƒstandard deviation, and after normality was tested, a suitable statistical test was applied (Î±â€ƒ=â€ƒ5%). On day 60, there was a statistically significant difference when comparing the proportion of neoformation area between group L (0.52%Â±0.13) and group B+L (0.20%Â±0.08). Group L showed a difference compared with all the groups when we compared the remaining distance between the edges of neoformed bone (CÃ—L, P=0.0431; Bâ€ƒÃ—â€ƒL, P=0.0386; LÃ—B+L, P=0.0352), demonstrating a great defect closure. Conclusion: Our findings suggest that although biphasic calcium phosphate exerts some osteogenic activity during bone repair, PBM therapy is not able to modulate this process.

The Effect of Photobiomodulation Therapy on the Stability of Orthodontic Mini-implants in Human and Animal Studies: A Systematic Review and Meta-analysis. Introduction: The present study aimed to systematically explore available literature on the possible impact of photobiomodulation (PBM) therapy on the stability and success of orthodontic mini-implants. Methods: A comprehensive electronic search was conducted in PubMed, ISI Web of Science, Scopus, Cochrane and Embase databases for human and animal studies published until July 2021. Two independent researchers reviewed the studies based on specific eligibility criteria. Results: 15 studies were included in the systematic review after a comprehensive search. Ten studies were included in the meta-analysis. Four were human RCT studies that evaluated the stability with Preriotest. Three other human RCT studies and two animal studies had evaluated the Implant stability quotient (ISQ). Two human RCTs that had evaluated displacement of mini-implants were also analyzed. The analysis of Periotest stability results showed a positive effect of PBM on mini-implant stability at 30 and 60 days after implantation

(P<0.05). In human studies using the ISQ method, a slight improvement was seen in the PBM groups; however, this was not statistically significant (CI=-1.92-2.70, SMD=0.39). In studies that examined the displacement of mini-implants, no statistically significant difference was observed between irradiated and non-irradiated groups (CI=-1.92-2.70, SMD=0.03). According to the results of animal studies, which had used the ISQ method, the use of laser was statistically effective in increasing the stability of mini-implants (SMD=1.43, CI=1.00-1.85). Conclusion: PBM therapy can be suggested as an adjunctive clinical method to improve the stability of mini-implant treatment. Further well-designed clinical studies can help establish evidence-based dosing and irradiation protocols.

Photobiomodulation Therapy and Cell Therapy Improved Parkinson's Diseases by Neuro-regeneration and Tremor Inhibition. Introduction: Parkinson's disease (PD) is a progressive and severe neurodegenerative disorder of the central nervous system (CNS). The most prominent features of this disease are cell reduction in the substantia nigra and accumulation of Î±-synuclein, especially in the brainstem, spinal cord, and cortical areas. In addition to drug-based treatment, other therapies such as surgery, cell therapy, and laser therapy can be considered. In this study, articles on cell therapy and laser therapy for PD have been collected to evaluate the improvement of motor function, cell differentiation, and dopaminergic cell proliferation. Methods: Articles were collected from four electronic databases: PubMed, Scopus, Google Scholar, and Web of Science from 2010 to 2022. The keywords were "photobiomodulation", "low-level light therapy", "Low-level laser therapy", "near-infrared light", "Parkinson's disease", "Parkinsonism", and "stem cell therapy". About 100 related articles were included in the study. Results: The results of the studies showed that cell therapy and laser therapy are useful in the treatment of PD, and despite their limitations, they can be useful in improving PD. Conclusion: Concomitant use of cell therapy and photobiomodulation therapy can improve the symptoms of PD.

Efficacies of extracorporeal shockwave therapy and low-level laser therapy in patients with plantar fasciitis. BACKGROUND: Various conservative treatment methods can be administered in the early stages of plantar fasciitis (PF). The aim of the treatment is to enable the patient to return to the physical activity as soon as possible. AIM: In this study it was aimed to compare efficacies of Extracorporeal Shockwave Therapy (ESWT) and Low-Level Laser Therapy (LLLT) on patients with PF. DESIGN: A local prospective cross-sectional study SETTING: Department of Physical Medicine and Rehabilitation Outpatient Clinic of Sakarya University, Faculty of Medicine POPULATION: Patients aged 18-70 years, having ongoing heel pain for at least 3 months, and not using oral and/or parenteral corticosteroids in the last 6 months. METHODS: A total of 40 patients with PF included in the current study. Visual Analog Scale (VAS), Roles and Maudsley Score (RMS), American Orthopedic Foot and Ankle Association Score (AOFAS) and Foot Function Index (FFI) questionnaire were performed for all patients. ESWT and LLLT groups comprised of 22 (55%) and 18 (45%) patients, respectively. RESULTS: We found significant improvements in scores based on the VAS, RMS, AOFAS, FFI in patients with PF and it was sustained for 3 months (pÂ =Â 0.001, for all scores). While decrease in scores based on the VAS and FFI in LLLT group was statistically more significant compared to ESWT group (pÂ =Â 0.014, pÂ =Â 0.013), there was statistically less significant decrease in scores on the AOFAS in LLLT group than that of ESWT group (pÂ =Â 0.032). CONCLUSIONS: The results of this study indicated significant improvements in terms of pain, functional status and daily life activities following the administration of either of the treatments. Furthermore, LLLT was found to be significantly more effective for alleviating pain than ESWT in the treatment of PF. Humans;Extracorporeal Shockwave Therapy;Fasciitis, Plantar;Low-Level Light Therapy;Prospective Studies;Treatment Outcome;Cross-Sectional Studies;Pain

Tunable femtosecond laser suppresses the proliferation of breast cancer in vitro. Worldwide, the most frequently diagnosed cancer is female breast cancer, and it poses a serious global health threat.

Traditional cancer therapies are associated with various side effects, so developing better therapies for breast cancer is necessary, such as laser therapy which could be a promising treatment option. The aim of the current study was to investigate the femtosecond laser irradiation effect on breast cancer using T47D cell line as an in vitro model. Cells were seeded at a density of 5Â Ã—Â 10(4) cells/well in 96-well plates and incubated overnight. After that, the cells were exposed to femtosecond laser irradiation at various wavelengths falling in the UV, visible, and IR ranges for 3, 5, or 10Â min and at a constant power of 100Â mW. Cell viability was measured directly and 24Â h after femtosecond laser irradiation using MTT assay. When using different femtosecond laser irradiation parameters, especially the 380 and 400Â nm femtosecond laser irradiation, there was significant inhibition of breast cancer cell growth, either directly or 24Â h after femtosecond laser exposure. Also, 420 and 440Â nm significantly affected the viability of the cells. It was also observed that increasing exposure time enhances the observed effect, so 10Â min exposure time was the best time of exposure. However, 700, 720, 750, and 780Â nm did not significantly affect the cells viability with different exposure times. It was possible to conclude from the aforementioned results that femtosecond laser irradiation exerted a significant anticancer effect against T47D cells. Consequently, the femtosecond laser could be used successfully for breast cancer management. Female;Humans;Breast Neoplasms;Lasers;Laser Therapy;Low-Level Light Therapy;Cell Proliferation

Efficacy of Platelet-Rich Plasma Versus Autologous Fat Transfer With Nanofat in the Treatment of Infraorbital Dark Circles: A Single-Blinded Randomized Comparative Clinical Trial. BACKGROUND: Treating infraorbital dark circles is one of the commonest aesthetic demands worldwide. Autologous fat transfer is commonly used to treat dark circles by filling the grooves, without effect on skin quality. Platelet-rich plasma has been reported to improve skin quality. Autologous fat can be emulsified and filtered to produce nanofat, which is then injected superficially in the dark circles to improve skin quality and discoloration. OBJECTIVE: To compare the efficacy of platelet-rich plasma versus combined fat transfer and nanofat in treating infraorbital dark circles. MATERIALS AND METHODS: 30 patients with infraorbital dark circles of combined etiological factors were randomized into 2 equal groups: Group A treated with platelet-rich plasma and Group B treated with autologous fat transfer with emulsified fat injection. RESULTS: Excellent and moderate responses were observed in 3 (20%) and 2 (13%) patients in group A versus 7 (46.7%) and 4 (27%) in group B, respectively. Nonresponders were 8 (53.3%) in group A and only 1 patient (6.7%) in group B. The difference was statistically significant regarding improvement (p = .048) and patient satisfaction (p = .032). CONCLUSION: Autologous fat transfer with nanofat is significantly superior to platelet-rich plasma in improvement and satisfaction. Humans;Patient Satisfaction;Platelet-Rich Plasma;Low-Level Light Therapy;Skin;Treatment Outcome

Does luminosity and smear layer influence 810Â nm laser energy transmission through human dentine? PURPOSE: The aim of this study was to evaluate the influence of luminosity values and smear layer on transmission characteristics of 810Â nm near infrared laser energy through dentine, using extracted human teeth. METHODS: A total of 200 teeth treated with endodontic medicaments to cause discolouration (Ledermix, Doxypaste or Odontopaste) were selected, to give a range of values for tooth shade (luminosity values). Sectioned teeth had smear layer created or removed. Near-infrared laser energy transmission was assessed using an 810Â nm diode laser (90Â mW, CW mode) with the tip placed at 2Â mm and 4Â mm from the external root surface, and a laser power metre. RESULTS: Both tooth shade and smear layer had independent attenuating effects. Transmission of laser energy was significantly lower in teeth with darker shades. There was a strong positive correlation between relative luminosity (lighter tooth colour) and transmitted laser power (rÂ =Â 0.9271 for the Spearman rank correlation, PÂ =Â 0.0022). When a smear layer was present, this significantly reduced the transmission of laser energy through the sample, compared to when no

smear layer was present. CONCLUSION: The results of this laboratory study highlight the attenuating influence of a darker tooth shade and the presence of smear layer on the transmission of 810Â nm light when directed onto the surface of human dentine. Such effects may be relevant to photo biomodulation, Photodynamic Therapy and other dental laser treatments. Photosensitizing Agents Humans;Dentin;Photochemotherapy;Photosensitizing Agents;Light;Lasers, Semiconductor;Smear Layer;Microscopy, Electron, Scanning;Root Canal Preparation

Low-power laser in increasing doses improve wound healing process in rats. Low-power laser has been studied and applied as an auxiliary tool in wound healing. However, as it is a therapy with several variables to be controlled, there is great difficulty in establishing protocols and comparing its efficacy. Therefore, the objective of this study was to evaluate the effects of the use of low-power laser in fixed and crescent doses in the healing of skin wounds in rats. Seventy-five male Wistar rats were divided into three groups: G1 with animals that did not receive laser radiation; G2 with animals treated with fixed dose of 3 J/cm(2) laser; G3 with animals treated with laser in increasing doses of 1 J/cm(2), 3 J/cm(2), 5 J/cm(2). Macroscopic and histological analysis were performed. The lowest intensity of PMN was observed in the irradiated groups and G3 had lower intensity of this infiltrate compared to G1 and G2 ($p < 0.05$). On the seventh day of injury, PMN infiltrate decreased in all groups, especially in G3 ($p<0.05$). It was observed that G2 had more blood vessels than G1 and G3 after 7 days of wound creation (p Ë, 0.05). Collagen quantification showed that laser-treated groups have increased collagen deposition. Different responses in the wound healing process were observed comparing G2 and G3 groups. The fluence of 1J/cm(2) presented better results in the anti-inflammatory action than 3 J/cm(2), although G3 presented the greatest amount of total collagen after ten days of treatment. Collagen Rats;Male;Animals;Rats, Wistar;Low-Level Light Therapy;Wound Healing;Collagen;Lasers;Skin

Effect of photobiomodulation therapy with different wavelengths on bone mineral density in osteoporotic rats. Osteoporosis is associated with severe pain, bone deformity, fracture, and bone loss. It is important to find strategies to prevent bone resorption and treat osteoporosis. This study sought to assess the effect of photobiomodulation therapy (PBMT) with different wavelengths on bone mineral density (BMD) in osteoporotic rats. This animal study evaluated 63 adult female rats. The rats underwent ovariectomy to induce osteoporosis. Ovariectomized rats were randomly divided into 9 groups of control (OC), treatment with zoledronic acid alone (0.02Â mg/kg), and treatment with 660Â nm, 810Â nm, and 940Â nm PBMT alone (3 times a week for 6Â weeks, energy density of 4Â J/cm(2)), and combined with zoledronic acid. The healthy control group (HC) only underwent sham surgery. The rats underwent cone-beam computed tomography (CBCT) 52Â days after the first treatment session to measure their BMD according to the gray value (GV) of images. To assess the biomechanical properties of bone, the resected bones were subjected to 3-point bending test (3-PBT). The experimental groups had significant differences with the OC group regarding radiographic and biomechanical properties of bone (Pâ€‰<â€‰0.05), indicating a healing course. No significant difference was noted between the experimental groups treated with different laser wavelengths and those treated with zoledronic acid (Pâ€‰>â€‰0.05). In the condition of this study, it was found that PBMT at a constant energy density of 4Â J/cm(2) with 660-, 810-, and 940-nm wavelengths is effective for enhancement of bone mineral density and biomechanical properties. No significant difference was noted between different wavelengths of diode laser regarding radiographic and biomechanical properties of bone. Zoledronic Acid Rats;Female;Animals;Humans;Bone Density;Zoledronic Acid;Low-Level Light Therapy;Osteoporosis;Bone and Bones;Ovariectomy

Photobiomodulation: A Systematic Review of the Oncologic Safety of Low-Level Light Therapy for Aesthetic Skin Rejuvenation. Photobiomodulation (PBM) therapy is an increasingly popular modality for aesthetic skin rejuvenation. PBM induces genomic, proteomic, and metabolomic

processes within target cells, but such manipulation of cell behavior has led to concerns about oncologic safety. This article presents a summary of the clinical and preclinical evidence for the oncologic safety of PBM for aesthetic skin rejuvenation. A focused systematic review was performed, in which safety data from clinical trials of PBM for skin rejuvenation was supplemented by analyses of in vitro data obtained from cells derived from human skin and human neoplastic cells and in vivo data of tumors of the skin, oral cavity, and breast. Within established parameters, red and near infrared light mainly enhances proliferation of healthy cells without a clear pattern of influence on cell viability. The same light parameters mainly reduce neoplastic cell proliferation and viability or else make no difference. Invasiveness potential (appraised by cell migration assays and/or differential gene expression) is equivocal. PBM does not induce dysplastic change in healthy cells. In vivo tumor models yield varied results with no clear pattern emerging. There are no relevant clinical trial data linking PBM with any significant adverse events, including the finding of a new or recurrent malignancy.Current clinical and preclinical evidence suggests that PBM is oncologically safe for skin rejuvenation, and there is no evidence to support the proposition that it should be avoided by patients who have previously undergone treatment for cancer. Humans;Low-Level Light Therapy;Rejuvenation;Proteomics;Neoplasm Recurrence, Local;Skin

[Treatment of neurological postoperative disorders after surgical intervention for head and neck tumors using low-intensity laser radiation]. OBJECTIVE: To evaluate the efficacy of low-intensity laser radiation in rehabilitation treatment of patients undergoing radical treatment for head and neck tumors. MATERIAL AND METHODS: The study included 134 patients (39 (29.1%) men, 95 (70, 9%) women), aged from 23 to 78 years old, with an average age of 54.24Â±12.7 years. Three groups were formed: Group 1 - 45 patients who received the traditional complex of rehabilitation treatment, which includes physical exercise, massage, and drug therapy, without using low-intensity laser radiation; Group 2 - 45 patients who received the traditional complex of rehabilitation treatment in combination with low-intensity laser radiation; Group 3 - 44 patients who underwent only a few low-intensity laser irradiation courses as a rehabilitation treatment. The impact on the tissues of the shoulder joint and cervico-supraclavicular region was carried out by radiation with a wavelength of 660 nm and 970 nm using a matrix radiation source. The course of treatment was 10 treatment sessions lasting 10 minutes. During the first year after radical treatment, the course of laser therapy was repeated every 3 months. In the course of the study, indicators of the patient's subjective assessment of changes occurring with them were studied, depending on the method of rehabilitation used, as well as the restoration of range of motion in the shoulder joint on the side of the operation and the function of soft tissues in the shoulder joint on the radical treatment side. RESULTS: Against the background of the treatment, an improvement in the condition of patients was recorded in the form of a decrease in the severity of motor and sensory disorders. CONCLUSION: Complex rehabilitation treatment with the obligatory use of low-intensity laser radiation provides an improvement in the function of the peripheral nervous system and blood circulation, which, in turn, allows not only to restore the function of these organs, but also to generally improve the quality of life of patients. Male;Humans;Female;Adult;Middle Aged;Aged;Young Adult;Quality of Life;Head and Neck Neoplasms;Shoulder Joint;Laser Therapy;Nervous System Diseases;Lasers

In Vitro Effect of Photobiomodulation Therapy with 980â€‰nm Diode Laser on Gene Expression of Key Regulators of Bone Remodeling by Human Periodontal Ligament Cells under Mild Orthodontic Forces. This study investigated the effect of photobiomodulation (PBM) with 980â€‰nm diode laser as monotherapy and in combination with compressive and tensile orthodontic forces on expression of osteoprotegerin (OPG), receptor activator of nuclear factor-ÎºB ligand (RANKL), sclerostin (SOST) and periostin (POSTN), by human periodontal ligament cells. Isolated cells were cultured and subjected to either tensile (10% elongation) or compressive forces (25â€‰gâ€‰cm(-2)

) for 24 and 48â€‰h. Subsequently, the cells received PBM (100â€‰mW power, 3 or 6â€‰Jâ€‰cm(-2) energy density) immediately after load cycle. RT-PCR was applied to assess the genes expression. Data were analyzed by one-way ANOVA, followed by post hoc Tukey test (PÂ â‰¤â€‰0.05). We found that PBM in combination with orthodontic forces led to upregulation of bone resorption genes (RANKL and SOST) at the pressure side and their downregulation at the tension side. The expression of osteogenic genes (OPG and POSTN) increased at the tension side and decreased at the pressure side. PBM alone did not affect gene expression. In conclusion, these findings suggest that this PBM protocol may be effective in enhancement of the gene expression in favor of bone remodeling acceleration that should be confirmed in future animal and human studies.
Animals;Humans;Periodontal Ligament;Low-Level Light Therapy;Lasers, Semiconductor;Bone Remodeling;Gene Expression;Cells, Cultured

[Evaluation of the effect of Er:YAG laser combined with guided bone regeneration in the treatment of peri-implantitis with osseous defects]. PURPOSE: To evaluate the clinical benefits of Er:YAG laser combined with guided bone regeneration (GBR) in the treatment of peri-implantitis-assocaited osseous defects. METHODS: Twenty-six patients (34 implants in total) who underwent implant restoration in Dental Disease Prevention and Treatment Institute, Jiading District, from 2017 to 2019 and were diagnosed with peri-implantitis with osseous defects, and randomly divided into the experimental group and control group. The two groups of patients received open flap surgery, debridement and GBR treatment. The only difference in the experimental group was the use of Er: YAG laser to modulate and remove inflammatory tissue as well as to decontaminate the implant surface, instead of traditional mechanical treatment in the control group. The probing depth (PD), bleeding on probing (BOP), and plaque index (PI), the height of the bone defect around the implant (reduce of marginal bone level, RBL) were recorded and compared. SPSS 20.0 software package was used to analyze the data. RESULTS: The PD, BOP, PI and RBL of the two groups of patients were significantly improved after treatment with different methods. There was no significant difference in the improvement of PD, BOP and PI between the two groups 6, 12 and 24 months after treatment, while the improvement of RBL in the experimental group was significantly better than that of the control group 12 and 24 months after treatment. CONCLUSIONS: In the treatment of GBR with peri-implantitis and osseous defects, Er: YAG laser therapy is more effective than traditional mechanical methods, and is more conducive to the regeneration of new bone. Dental Implants
Humans;Debridement;Dental Implants;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Peri-Implantitis

Aesthetic Treatment of Acute Burns of the Face Using Electro-Photobiomodulation. The quicker a second-degree burn wound heals, the less surgery is required. Low-energy laser therapy may expedite the healing of wounds, according to recent literature findings. To establish this, it was decided to carry out a clinical trial on acute burn patients to demonstrate whether electro-photobiomodulation (EPBM) therapy can hasten wound closure, thereby obviating the need for surgery without worsening hypertrophic scarring and contracture. In clinical prospective analysis, 42 acute burn patients with recent burns to the face alone (13) or the face and additional areas (29). Twenty-six males and 16 women were included. All patients received twice-weekly sessions of intense pulsed light (IPL) and radiofrequency for the face and other areas. Clinical assessment showed excellent results in 34 (81%) patients, good results in 6 (14.3%) patients, fair results in two (4.7%) patients, and no poor results were reported. The results of this clinical trial showed that IPL and radiofrequency therapy can rapidly heal deep skin burns without the need for surgery. and lowered the incidence of hypertrophic scarring and contractures. EPBM induces better aesthetic and functional outcomes (particularly in burns of the face).
Female;Humans;Male;Burns;Cicatrix, Hypertrophic;Esthetics;Skin;Wound Healing

Effects of low-level laser therapy on orthodontic miniscrew stability: a systematic review. BACKGROUND: Miniscrews as auxiliary anchorage devices in orthodontic treatment have definite advantages and efficacy. The aim of the present study was to investigate the scientific evidence including randomized controlled trials (RCTs) or controlled clinical trials (CCTs) to support the application of low-level laser therapy to improve miniscrews stability in orthodontic treatment. METHODS: An extensive literature research was conducted with the Cochrane Library, PubMed, EMBASE, Web of Science and ScienceDirect without language limitations. All searches were inclusive until June 2020. The Cochrane Risk of Bias Tool was used to assess the risk of bias (RoB) in the included RCTs. RESULTS: Through the electronic searches, 428 titles and abstracts were identified. From these, 4 articles were retrieved for review, and 3 of these met the inclusion criteria. Two RCTs reported increased miniscrews stability with low-intensity laser therapy, but the other one reported no difference. Except one study assessed as "high risk of bias" the other two were rated as "low risk of bias". CONCLUSION: There is insufficient evidence to support or refute the effectiveness of LLLT for improvement of miniscrew stability. Further studies with a better study design, reliable evaluation method, comprehensive evaluation intervals and appropriate loading protocol are required to provide more reliable evidence for the clinical application of LLLT. Humans;Orthodontic Anchorage Procedures;Low-Level Light Therapy

Effects of photobiomodulation as an adjunctive treatment in chronic obstructive pulmonary disease: a narrative review. Chronic obstructive pulmonary disease (COPD) is a disease characterized by chronic airway inflammation and remodeling and lung parenchymal inflammation and destruction, which result in many pulmonary and extrapulmonary manifestations. The anti-inflammatory effect of photobiomodulation (PBM) has been reported in previous studies. This review was conducted to evaluate the direct effect of PBM on lung inflammation in COPD. The other effects of PBM on modulation of peripheral and respiratory muscle metabolism and angiogenesis in lung tissues were also discussed. The databases of PubMed, Cochrane Library, and Google Scholar were searched to find the relevant studies. Keywords included PBM and related terms, COPD-related signs, and lung inflammation. A total of 12 articles were selected and reviewed in this study. Based on the present review, PBM is helpful in reducing lung inflammation through decreasing the inflammatory cytokines and chemokines at multiple levels and increasing anti-inflammatory cytokines. In addition, PBM also improves both peripheral and respiratory muscle metabolism and promote angiogenesis. This review demonstrated that PBM is a promising adjunctive treatment modality for COPD management which merits further validation. Cytokines Humans;Cytokines;Inflammation;Pulmonary Disease, Chronic Obstructive;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation improves frontal lobe cognitive functions and mental health of older adults with non-amnestic mild cognitive impairment: Case studies. INTRODUCTION: This study investigated the effects of transcranial photobiomodulation (tPBM) on improving the frontal lobe cognitive functions and mental health of older adults. METHODS: Three older adults with mild cognitive impairment (MCI) of the non-amnestic type received 18-session tPBM stimulation for 9 weeks and were assessed with neuropsychological tests of memory and executive functions and standardized questionnaires on depressive and anxiety symptoms, global cognitive functions, and daily functioning abilities before and after tPBM stimulation. RESULTS: At baseline, their intrusion and/or perseveration errors in a verbal memory test and a fluency test, as measures of the frontal lobe cognitive functions, were in the borderline to severely impaired range at baseline. After tPBM stimulation, the three older adults showed various levels of improvement in their frontal lobe cognitive functions. One older adult's intrusion and perseveration errors improved from the <1st-2nd percentile (moderately to severely impaired range) to the 41st-69th percentile (average range), another older adult's intrusion errors improved from the 11th percentile to the 83rd percentile, and

the third older adult's intrusion errors improved from the 5th percentile to the 56th percentile. Moreover, improvements in their anxiety and/or depressive symptoms were also observed. One older adult's depressive and anxiety symptoms improved from the severe range at baseline to the mild range after the intervention. The other two older adults' depressive symptoms improved from the mild range at baseline to the normal range after the intervention. DISCUSSION: These findings provide preliminary support for the potential of tPBM to improve the frontal lobe cognitive functions and mental health of older adults with MCI. Given the small sample size of only three older adults and the absence of a placebo control group, larger randomized controlled studies are needed to confirm its potential.

Comparative Study of the Efficacy of Low-Level Laser Therapy and Dexamethasone in Reducing the Severity of Post-Operative Inflammatory Response Following Surgical Extraction of Mandibular Third Molars. OBJECTIVES: To assesses the efficacy of low-level laser therapy (LLLT) over dexamethasone in reducing postoperative edema and trismus following surgical removal of mandibular third molars. STUDY DESIGN: A single-center, parallel group, randomized, prospective, single-blind clinical trial on 50 patients between the age 18-40Â years, requiring surgical extraction of mandibular third molars classified as mesioangular, class II and position B impactions, was selected for the study. The selected patients were randomly divided into two groups:Group 1, n â€‰=â€‰25, Soft Tissue Diode laser was applied intra-orally and extra-orally at the insertion of the masseter.Group 2, n â€‰=â€‰25, 8Â mg of Dexamethasone was given intravenously preoperatively.Trismus and edema were calculated preoperatively and on the 1st and 5th postoperative day. The collected data were subjected to statistical analysis using student's t test. RESULTS: Trismus (4.61â€‰Â±â€‰0.26Â cm [pâ€‰=â€‰0.0001]) in the LLLT group was significantly less than the dexamethasone group (trismus: 3.82â€‰Â±â€‰0.73Â cm). Edema at different anatomic locations in the LLLT group was also significantly less than the dexamethasone group (Angle-tragus [pâ€‰=â€‰0.0008], angle-canthus [pâ€‰=â€‰0.0021], angle-ala [pâ€‰=â€‰0.0258], angle-commissure [pâ€‰=â€‰0.0168], angle-mentus [pâ€‰=â€‰0.0227]). CONCLUSION: This study demonstrates that LLLT was beneficial in reduction in edema and trismus compared to dexamethasone following surgical extraction of third molars.

Bothrops atrox mice experimental envenoming treatment using light-emitting diode (led) as an adjunct therapy to conventional serum therapy. The use of anti-venom is one of the main control measures for snakebite envenoming when applied immediately after the snakebite. Systemic effects of the envenoming are usually reversed; however, neutralization of local effects is hardly achieved. The need for adjuvant therapies associated with serum therapy can improve the treatment for local effects of envenoming, with greater effectiveness in preventing or delaying the progression of damage, reducing the clinical signs and symptoms of victims of snakebites. The purpose of the study was to evaluate the photobiomodulation therapy using LED and/or dexamethasone associated with conventional serum therapy for the treatment of local damage caused by Bothrops atrox envenomation in a murine model. For this, experimental envenoming was carried out in the gastrocnemius muscle of male Swiss mice weighing 18 to 22Â g divided into 8 groups of animals, distributed in groups non-treat, treated with anti-bothropic serum, dexamethasone, and LED, or the associated treatments, by intramuscular inoculation of 50Â Âµg of venom or sterile PBS (control). After 30Â min, the proposed treatments were administered alone or in combination. After 3Â h, blood and muscle samples were collected for myotoxicity, cytotoxicity, histological analysis, and IL-1Î² assays. The evaluation of the treatment alone showed that serum therapy is not effective for the treatment of local damage and photobiomodulation demonstrated to be an effective therapy to reduce leukocyte infiltration, hemorrhage, and myotoxicity in experimental envenoming; dexamethasone proved to be a good resource for the treatment of the inflammatory process

reducing the leukocyte infiltration. The association of serum therapy, LED, and dexamethasone was the best treatment to reduce the local effects caused by Bothrops atrox venom. All in all, the association of photobiomodulation therapy using LED with conventional serum therapy and the anti-inflammatory drug is the best treatment for reducing the undesirable local effects caused by snakebite accidents involving B. atrox species. Crotalid Venoms;Dexamethasone Male;Animals;Mice;Snake Bites;Bothrops;Myotoxicity;Crotalid Venoms;Muscle, Skeletal;Dexamethasone

Could Photobiomodulation Therapy Be Helpful in Epilepsy? Humans;Low-Level Light Therapy;Epilepsy

Evaluating high power laser therapy (HPLT) as treatment for chemotherapy-induced oral mucositis in paediatric patients with oncohematological diseases. BACKGROUND: Oral mucositis (OM) is one of the most debilitating side effects of chemotherapy. Among the current methods used in OM management, the feasibility of high power laser therapy (HPLT) has been proposed but not fully evaluated. AIM: The aim of this study was to evaluate the efficacy of HPLT in the treatment of OM in paediatric patients. DESIGN: Fourteen oncohematological paediatric patients treated with chemotherapy and/or hematopoietic stem cell transplantation and affected by OM at different grades were enrolled in this study. All patients were treated with a class IV laser device in four sessions for four consecutive days, OM was evaluated with the WHO-OTS scale. The perception of pain was assessed by the visual analog scale. Photographs of and information about lesions and patient questionnaires were taken and collected, respectively. Descriptive analyses and the Wilcoxon signed-rank test (nonparametric test) were used, with a statistical significance of Î±Â =Â .05. RESULTS: After a week into the treatment, 57% of patients were completely healed, whereas the whole cohort experienced a drastic decrease in pain, from an average value of 5.8-1.1 (pÂ =Â .0016). The average number of injuries per patient decreased from 7.4 to 3.1 (pÂ =Â .008). CONCLUSION: High power laser therapy appears to be a safe and efficacious method for managing OM. It reduces pain and severity of oral cavity injuries. Further studies are needed to determine the optimal parameters useful in OM treatment and to evaluate the relative effectiveness of HPLT to other treatments like LLLT. Antineoplastic Agents Humans;Child;Low-Level Light Therapy;Laser Therapy;Stomatitis;Pain;Antineoplastic Agents

Possible adverse effects of low-level laser on oral and oropharyngeal cancer cells: A scope review. BACKGROUND: The effects of laser therapy on normal cells are well known and accepted, but the impact of this therapy on malignant cells are not yet fully understood. This review aims to map and outline what the scientific literature addresses on the effects of laser therapy on malignant cells. METHODS: This review article followed the guidelines of the PRISMA-ScR protocol, being all the search, analysis, and selection of articles based on it. RESULTS: After all application of the predetermined criteria, five studies were included, dated between the years 2013 and 2021. With the complete reading of the selected studies, 100% of the articles were classified as category III of the Agency for Healthcare as Research and Quality classification. Similar themes among the papers included were investigated and compared. In these five studies, the visible red and near infrared wavelengths were used, and energy densities varied between 1 and 5â€‰J/cm(2) . It was observed that low-level laser could alter the expression of cell proliferation and migration proteins, such as cyclin D1, E-cadherin, and Î²-catenin. In addition, changes related to increased cell viability and metabolism were also identified. CONCLUSION: The low-level laser seems to positively regulate the proliferative, migratory, and viability capacity of neoplastic cells, depending on the protocol used. All these studies included in the review are equivalent to in vitro studies; the cells are not in such a complex environment as is an organized tissue, making it necessary to carry out more complex tests,

such as in vivo research. Humans;Lasers;Cells, Cultured;Cell Proliferation;Cell Survival;Oropharyngeal Neoplasms;Low-Level Light Therapy

Analysis of the effects of concentrated growth factor and low-level laser therapy on the bone healing. PURPOSE: The aim of this study is to evaluate whether concentrated growth factor (CGF) and photobiomodulation (PBMT) can show synergistic effect on bone healing process. METHODS: In vivo osteogenesis studies were performed in a rabbit critical-sized calvarial defect model. Four 8Â mm critical-sized bone defects were created on each rabbit calvarium, and these 4 defects were randomly divided into 4 groups: 1-control (defect filled with autologous blood clot); 2-CGF (defect filled with CGF); 3-LLLT (defect filled with autologous blood clot and received Nd:YAG low-level laser irradiation); 4-CGFÂ +Â LLLT (defect filled with CGF and received LLLT). 15 Japanese big-ear white rabbits were operated on using the same procedure in this study. Then, 5 rabbits were selected randomly and sacrificed at 4th, 6th and 8th week postoperatively and respectively. The calvariums were harvested and scanned by micro-CT. The volumes of new bone formation of these defects were calculated by analyzing the micro-CT image. Data were analyzed as mean values of each group, comparisons were made for statistical analysis with the group and among the 4 groups using analysis of variance (ANOVA, PÂ <Â 0.05). RESULTS: At the 4th, 6th and 8th weeks, compared with the control group, the volume of new bone formed in each experimental group was significantly increased. Both CGF and LLLT can accelerate bone healing, but the effect of LLLT is better than that of CGF, and the difference between the two is statistically significant (PÂ <Â 0.01). There was no statistically significant difference in the osteogenic effect between the combined application of CGFÂ +Â LLLT and the application of CGF alone. And the osteogenic effect of the former two groups was weaker than that obtained by laser irradiation alone. CONCLUSIONS: Both CGF and LLLT can promote osteogenesis effectively, but the combination of the two did not show a synergistic effect. The pro-osteogenic effect of Nd:YAG low-level laser irradiation is superior to that of CGF, and also superior to the combined effect of the two.

Effect of low-level laser stimulation of acupuncture points in pediatric dentistry: a systematic review. The biomodulatory potential of low-level laser therapy (LLLT) has prompted investigations of different outcomes in health. One line of research is the stimulation of acupuncture points for the relief of different signs and symptoms related to the stomatognathic system. In dentistry, some studies in pediatric dentistry have demonstrated the benefit of LLLT therapies in the management of dental anxiety in children. This systematic review aimed to analyze previous clinical studies on the application of LLLT at acupoints among pediatric dental patients. This systematic review was conducted according to the Cochrane Collaboration guidelines and the population, intervention, comparison, and outcome strategy. A broad literature search up to June 17, 2022, was performed using four electronic databases (PubMed, Scopus, Embase, and Google Scholar). The risk of bias in randomized clinical trials was assessed using the RoB 2 tool. A total of four studies using LLLT for photobiomodulation were included (nâ€‰=â€‰4). The most common wavelengths used were in the infrared range (variation between 716 nm and 980 nm). There were little variations in the application time (14 s to 1 min) and exposure dose (1 to 5 joules). LLLT acted positively on different acupuncture points. LLLT provided various benefits and optimized dental practice by reducing the gag reflex during radiography and impression taking, preanesthetic pain, and symptoms of sleep bruxism in the pediatric dental population. Only one of the evaluated studies had a high risk of bias. The LLLT at acupuncture points is associated with positive results on sleep bruxism, preanesthetic pain, and gag reflex in pediatric dentistry. Future research studies should prioritize standardization of the study design and the methods of analysis. Humans;Child;Acupuncture Points;Pediatric Dentistry;Sleep Bruxism;Pain;Low-Level Light Therapy;Lasers

Investigation of effects of quercetin and low-level laser therapy in cisplatin-induced in vitro peripheral neuropathy model. Chemotherapy-induced peripheral neuropathy (CIPN) is one of the dose-dependent side effects of cisplatin. The loss of sensory neurons is observed in CIPN. There are many methods to minimalize CIPN symptoms such as pharmacological agents and photobiostimulation but the mechanisms of these methods are unclear. Our study is aimed at determining the effects of quercetin and low-level laser therapy (LLLT) in undifferentiated and nerve growth factor-differentiated PC12 cells in cisplatin-induced peripheral neuropathy. PC12 cells with cisplatin were co-treated with quercetin and LLLT (diode pumped all-solid-state laser, 670 nm, output 500 mW, and the laser beam surface area was 1.96 cm(2)). The effects of quercetin and LLLT on GAP-43 and Synapsin I expressions were analyzed by real-time PCR, cell viability was assessed by MTT assay, Annexin and dead assay measured the induction of apoptosis, the alterations in mitopotential were assessed by mitopotential assay, and lactate dehydrogenase activity in cells was analyzed. All experiment data were analyzed by the Tukey test and applied as a post hoc test, and statistical evaluation was made. Our results indicated that cisplatin increased apoptosis (24,210 Â± 2189, 46,504 Â± 8246) cells, mitochondrial dysfunction (44,312 Â± 0.751, 68,788 Â± 1271), and LDH activity (62,821 Â± 8245, 87,838 Â± 8116). Furthermore, it decreased cell viability (42,447 Â± 1780, 36,140 Â± 3682) and inhibited GAP-43 and Synapsin I genes in undifferentiated and differentiated PC12 cells. However, apoptosis, the alterations in mitopotential, and lactate dehydrogenase activity decreased by applications of quercetin and LLLT. It has been recommended that quercetin and low-level laser therapy roles on cisplatin-induced peripheral neuropathy should be investigated in vivo, and the relationship between quercetin and low-level laser therapy should be molecular.
Cisplatin;Quercetin;GAP-43 Protein;Synapsins;Lactate Dehydrogenases;Antineoplastic Agents
Rats;Animals;Cisplatin;Quercetin;Low-Level Light Therapy;GAP-43 Protein;Synapsins;Peripheral Nervous System Diseases;Lactate Dehydrogenases;Antineoplastic Agents

Minimal invasiveness in the surgical treatment of intraosseous defects: A systematic review. The modern approach to regenerative treatment of periodontal intraosseous defects should aim at maximizing the clinical outcomes while minimizing the invasiveness (pain, complications, aesthetic impairment, chair time, and costs) of the procedure. The present systematic review evaluated the effect of flap design, regenerative technology, and perioperative and postoperative adjunctive protocols on invasiveness. Overall, the results of the 13 included trials indicate that: (a) the elevation of a single (buccal or lingual) flap positively influences the intensity of postoperative pain and improves the quality of early wound healing compared with double flaps; (b) while the adjunctive use of a membrane is associated with significantly longer surgery-related chair time and higher postoperative pain, the adjunctive use of enamel matrix derivative at sites receiving a graft significantly reduces postoperative pain; also, graft materials showed no significant impact on invasiveness; (c) open flap debridement performed through the elevation of a single flap may lead to substantial clinical improvements of the lesion with reduced surgery-related chair time and costs, thus representing a promising alternative to regenerative treatment. However, for such an approach, a histological evaluation of the nature of the reconstructed tissues is still lacking, and the presurgery conditions (eg, probing depth, defect severity, and defect morphology), which may benefit in terms of invasiveness, have not yet been defined; and (d) intraoperative and postoperative low-level laser biostimulation of the defect site may favorably modulate the postoperative course.
Humans;Alveolar Bone Loss;Wound Healing;Surgical Flaps;Pain, Postoperative

Photodynamic Therapy, Photobiomodulation and Acetonide Triamcinolone 0.1% in the Treatment of Oral Lichen Planus: A Randomized Clinical Trial. Objective: To evaluate the efficacy of photodynamic therapy (PDT) and photobiomodulation (PBM) in the treatment of oral lichen planus (OLP) in comparison with the use of topical corticosteroids. Material and methods: Sixty patients with

OLP were randomized to three groups: group 1 photodynamic therapy applied once a week for four sessions, with orabase cream; group 2 low-power laser application with orabase cream; and group 3 inactive laser with triamcinolone acetonide 0.1%. Patient pain was evaluated, and the Thongprasom severity score, the Oral Health Impact Profile-14 (OHIP-14), and the Hamilton anxiety and depression scale at one and three months of follow-up. (ClinicalTrials.gov Identifier: NCT05127083). Results: Pain decreased significantly over time in all groups, though the symptoms relapsed over follow-up at one and three months in group 3. The OHIP-14 score improved significantly in groups 1 and 2 ($p < 0.05$), and this improvement was maintained after three months. Lesion resolution evaluated by the Thongprasom score at one month showed significant differences between groups 1 and 3 ($p = 0.032$) and between groups 2 and 3 ($p = 0.024$). Conclusions: Photodynamic therapy and photobiomodulation once a week for four weeks are safe and non-invasive treatment options, with the important advantage of lacking adverse effects. Further studies are needed to confirm it.

The Future of Laser Acupuncture-Robot-Assisted Laser Stimulation and Evaluation. This brief contribution is part of a Special Issue entitled 'Laser Acupuncture: Past, Present and Future' and primarily deals with the future of laser acupuncture from the author's perspective. The procedure from developing the first laser to robot-assisted laser acupuncture is briefly shown. The latter has already become a reality and, in the near future, will be made accessible to a broad group of patients as a home treatment system developed by researchers from Taiwan. The new equipment is based on a smartphone with integrated artificial intelligence methods (e.g., automatic image recognition).

Effects of Near-Infrared Light on Well-Being and Health in Human Subjects with Mild Sleep-Related Complaints: A Double-Blind, Randomized, Placebo-Controlled Study. Modern urban human activities are largely restricted to the indoors, deprived of direct sunlight containing visible and near-infrared (NIR) wavelengths at high irradiance levels. Therapeutic exposure to doses of red and NIR, known as photobiomodulation (PBM), has been effective for a broad range of conditions. In a double-blind, randomized, placebo-controlled study, we aimed to assess the effects of a PBM home set-up on various aspects of well-being, health, sleep, and circadian rhythms in healthy human subjects with mild sleep complaints. The effects of three NIR light (850 nm) doses (1, 4, or 6.5 JÂ·cm(-2)) were examined against the placebo. Exposure was presented five days per week between 9:30 am and 12:30 pm for four consecutive weeks. The study was conducted in both summer and winter to include seasonal variation. The results showed PBM treatment only at 6.5 JÂ·cm(-2) to have consistent positive benefits on well-being and health, specifically improving mood, reducing drowsiness, reducing IFN-Î³, and resting heart rate. This was only observed in winter. No significant effects on sleep or circadian rhythms were noted. This study provides further evidence that adequate exposure to NIR, especially during low sunlight conditions, such as in the winter, can be beneficial for human health and wellness.

Hybrid Therapeutic Device (CUHK-OA-M2) for Relieving Symptoms Induced by Knee Osteoarthritis. The symptoms of knee osteoarthritis (KOA) severely affect the life quality of the elderly population. Low-level laser therapy, heat therapy, and massage therapy are widely used as independent treatments for joint disorders. However, there are very limited reports of a combination of these therapies into an integrated device for KOA so far. This study aims to develop a novel hybrid therapeutic device that can meet various requirements for knee therapy. Our hybrid therapeutic device (CUHK-OA-M2) integrated with low-level laser therapy, heat therapy, and local massage therapy can effectively provide patients with KOA with relief from their clinical symptoms. A pilot test of 50 community-dwelling elderly volunteers with KOA was performed. Finally, 43 volunteers completed two treatment periods (30 days each) and two post-treatment periods (30 days each). The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores were collected and analyzed after each period. The outputs of the low-level laser, heating, and massage therapies

significantly decreased the WOMAC scores in terms of pain, stiffness, function and total WOMAC after two treatment periods ($p < 0.05$). Although the score increased slightly after the post-treatment period, it was still lower than the baseline, indicating the treatment outcome could last for an extended period. Therefore, our CUHK-OA-M2 device, as an integrated multi-functional hybrid therapeutic device, is therapeutically significant for treating osteoarthritis symptoms on the knee joints of elderly subjects.

The Photobiomodulation of MAO-A Affects the Contractile Activity of Smooth Muscle Gastric Tissues. Nowadays, the utilized electromagnetic radiation (ER) in modalities such as photobiomodulation (PBM) finds broader applications in medical practice due to the promising results suggested by numerous reports. To date, the published data do not allow for the in-depth elucidation of the molecular mechanisms through which ER impacts the human organism. Furthermore, there is a total lack of evidence justifying the relation between the enzymatic activity of monoamine oxidase A (MAO-A) and the effect of 5-hydroxytryptamine (5-HT) on the spontaneous contractile activity of smooth muscle gastric tissues exposed to various light sources. We found that exposure of these tissues to lamps, emitting light with wavelengths of 254 nm and 350 nm, lasers, emitting light with 532 nm and 808 nm, and light-emitting diodes (LEDs) with ER at a wavelength of 660 nm, increased the 5-HT effect on the contractility. On the other hand, LEDs at 365 nm and 470 nm reduced it. The analysis of MAO-A enzymatic activity after exposure to the employed light emitters endorsed these findings. Furthermore, MAOA gene expression studies confirmed the possibility of its optogenetic regulation. Therefore, we concluded that the utilized emitters could alternate the functions of significant neuromediators by modulating the activity and gene transcription levels of enzymes that degrade them. Our investigations will help to disclose the selective conditions upon which PBM can effectively treat gastrointestinal and neurological disorders. Monoamine Oxidase;Serotonin Humans;Monoamine Oxidase;Serotonin;Lasers;Stomach;Muscle, Smooth

Potential Therapeutic Strategies for Skeletal Muscle Atrophy. The maintenance of muscle homeostasis is vital for life and health. Skeletal muscle atrophy not only seriously reduces people's quality of life and increases morbidity and mortality, but also causes a huge socioeconomic burden. To date, no effective treatment has been developed for skeletal muscle atrophy owing to an incomplete understanding of its molecular mechanisms. Exercise therapy is the most effective treatment for skeletal muscle atrophy. Unfortunately, it is not suitable for all patients, such as fractured patients and bedridden patients with nerve damage. Therefore, understanding the molecular mechanism of skeletal muscle atrophy is crucial for developing new therapies for skeletal muscle atrophy. In this review, PubMed was systematically screened for articles that appeared in the past 5 years about potential therapeutic strategies for skeletal muscle atrophy. Herein, we summarize the roles of inflammation, oxidative stress, ubiquitin-proteasome system, autophagic-lysosomal pathway, caspases, and calpains in skeletal muscle atrophy and systematically expound the potential drug targets and therapeutic progress against skeletal muscle atrophy. This review focuses on current treatments and strategies for skeletal muscle atrophy, including drug treatment (active substances of traditional Chinese medicine, chemical drugs, antioxidants, enzyme and enzyme inhibitors, hormone drugs, etc.), gene therapy, stem cell and exosome therapy (muscle-derived stem cells, non-myogenic stem cells, and exosomes), cytokine therapy, physical therapy (electroacupuncture, electrical stimulation, optogenetic technology, heat therapy, and low-level laser therapy), nutrition support (protein, essential amino acids, creatine, Î²-hydroxy-Î²-methylbutyrate, and vitamin D), and other therapies (biomaterial adjuvant therapy, intestinal microbial regulation, and oxygen supplementation). Considering many treatments have been developed for skeletal muscle atrophy, we propose a combination of proper treatments for individual needs, which may yield better treatment outcomes.

Efficiency of diode laser in control of post-endodontic pain: a randomized controlled trial. OBJECTIVES: As post-endodontic pain control is one of the main targeted addressed in endodontics, our aim was delignated to compare two different methods for low-level laser application utilizing diode laser: low-level laser therapy (LLLT) and laser-activated irrigation (LAI) in the control of post-endodontic pain. MATERIALS AND SUBJECTS: A total of 180 patients received single-visit root canal treatment; they were randomly allocated into 3 equal groups. Group I received LAI, group II received LLLT, and group III served as control with normal root canal treatment and mock laser intervention (ML group). Postoperative pain was recorded using visual analogue scale (VAS) after 24, 48, and 72Â h. Data were tabulated and statistically analyzed. RESULTS: At 24Â h, there was a statistically significant difference between median pain scores in the three groups (P valueâ€‰<â€‰0.001) with ML group scored highest score followed by LAI and then LLLT group. At 48Â h, there was a statistically significant difference between the three groups (P valueâ€‰<â€‰0.001), with ML group scoring highest median pain scores while LLLT and LAI showed statistical insignificant scores. At 72Â h, there was no statistically significant difference between the 3 groups (P valueâ€‰=â€‰0.179). CONCLUSION: LLLT is superior to LAI and ML group in the control of immediate postoperative pain after 24Â h while after 48Â h both LAI and LLLT were equally effective, but they still showed significant differences when compared to ML group. CLINICAL RELEVANCE: Diode laser can be used by clinicians as it decreases the post-endodontic pain in patients with symptomatic apical periodontitis undergoing endodontic treatment. Humans;Lasers, Semiconductor;Root Canal Therapy;Pain, Postoperative;Periapical Periodontitis;Low-Level Light Therapy

Photobiomodulation promotes spinal cord injury repair by inhibiting macrophage polarization through lncRNA TUG1-miR-1192/TLR3 axis. BACKGROUND: Secondary spinal cord injury (SCI) often causes the aggravation of inflammatory reaction and nerve injury, which affects the recovery of motor function. Bone-marrow-derived macrophages (BMDMs) were recruited to the injured area after SCI, and the M1 polarization is the key process for inducing inflammatory response and neuronal apoptosis. We previously showed that photobiomodulation (PBM) can inhibit the polarization of M1 phenotype of BMDMs and reduce inflammation, but the underlying mechanisms are unclear. The purpose of this study is to explore the potential target and mechanism of PBM in treating SCI. METHODS: Transcriptome sequencing and bioinformatics analysis showed that long noncoding RNA taurine upregulated gene 1 (lncRNA TUG1) was a potential target of PBM. The expression and specific mechanism of lncRNA TUG1 were detected by qPCR, immunofluorescence, flow cytometry, western blotting, fluorescence inÂ situ hybridization, and luciferase assay. The Basso mouse scale (BMS) and gait analysis were used to evaluate the recovery of motor function in mice. RESULTS: Results showed that lncRNA TUG1 may be a potential target of PBM, regulating the polarization of BMDMs, inflammatory response, and the axial growth of DRG. Mechanistically, TUG1 competed with TLR3 for binding to miR-1192 and attenuated the inhibitory effect of miR-1192 on TLR3. This effect protected TLR3 from degradation, enabling the high expression of TLR3, which promoted the activation of downstream NF-ÎºB signal and the release of inflammatory cytokines. InÂ vivo, PBM treatment could reduce the expression of TUG1, TLR3, and inflammatory cytokines and promoted nerve survival and motor function recovery in SCI mice. CONCLUSIONS: Our study clarified that the lncRNA TUG1/miR-1192/TLR3 axis is an important pathway for PBM to inhibit M1 macrophage polarization and inflammation, which provides theoretical support for its clinical application in patients with SCI. Cytokines;MicroRNAs;MIRN1192 microRNA, mouse;RNA, Long Noncoding;TLR3 protein, mouse;Toll-Like Receptor 3;TUG1 noncoding RNA, mouse Animals;Mice;Cytokines;In Situ Hybridization, Fluorescence;Inflammation;Macrophages;MicroRNAs;RNA, Long Noncoding;Spinal Cord Injuries;Toll-Like Receptor 3

Single session of laser photobiomodulation for symptom management of oral lichen planus: a retrospective study. This study aimed to evaluate the effectiveness of a single session of laser photobiomodulation (PBM) with flat top handpiece in reducing painful symptoms in patients with Oral Lichen Planus (OLP). The clinical charts of 20 patients of the Dental Clinic of University of Padua (Italy) who underwent a single laser PBM to manage OLP symptomatology were retrospectively analyzed. A 980Â nm diode laser and a flat top handpiece with a 1-cm(2) spot area were employed to perform the PBM with a single session protocol. VAS pain scores were assessed before and after the laser PBM, the day after, and on the 7th and 30th days after the treatment. No adverse effects occurred within 30Â days after treatment. The mean VAS-pain score was 3.8 (SD 2.3) before PBM; 2.6 (SD 2.0) after PBM; 1.9 (SD 2.2) on day 1; 2.0 (SD 2.3) on day 7; and 1.5 (SD 2.2) on day 30. VAS pain decreased significantly over time (pâ€‰<â€‰0.0001). A single session of laser PBM may be safe and effective in reducing pain for symptomatic OLP patients. Further investigations are required to include placebo or topical corticosteroids as comparators. Humans;Retrospective Studies;Lichen Planus, Oral;Low-Level Light Therapy;Pain;Lasers, Semiconductor

Acute effects of photobiomodulation applied on the dorsal root ganglion in gout model-induced rats. Gouty arthritis is an inflammatory disease that triggers symptoms such as pain, swelling, and joint stiffness. Since its main therapy is medication, research on other forms of treatment that do not generate side effects is necessary. Given this, the objective of this research was to evaluate the effects of combined photobiomodulation (LASER and LED) applied on the dorsal root ganglion (DRG) in an experimental model of gouty arthritis. For this, 40 Wistar rats were randomized into 4 groups: simulation of the model with saline injection, without treatment (CTL; nÂ =Â 10); gout simulation with photobiomodulation treatment (CTL-PBM; nÂ =Â 10); gout model with the injection of monosodium urate crystals (1.25Â mg) in the femorotibial joint, without treatment (GOT; nÂ =Â 10); or gout model with photobiomodulation treatment (GOT-PBM; nÂ =Â 10). After 7Â h of gout induction, photobiomodulation was performed with a cluster of 4 diodes applied to the GRD region in animals from the CTL-PBM and GOT-PBM groups. After analysing the results, it was concluded that the therapy favored the reduction of edema and joint incapacity, as well as the increase in the nociceptive threshold and plantar grip strength. Furthermore, PBM stimulated an increase in the inflammatory response (with increased levels of IL-1Î² and greater recruitment of leukocytes) and greater activation of the antioxidant system. Therefore, PBM can be considered an effective therapeutic alternative to improve the functional status in this model of joint disease. Rats;Animals;Arthritis, Gouty;Ganglia, Spinal;Rats, Wistar;Gout;Pain

Effectiveness of low-level laser therapy in reducing pain perception of children during dental local anesthetic administration using laser acupuncture pen on the LI4 point: a randomized clinical trial. PURPOSE: Laser acupuncture, a non-invasive variant of acupuncture, has been proven effective in the medical and dental fields. Hence, the present study aims to determine the effect of low-level laser therapy on the LI4 point, using a laser acupuncture pen, in reducing children's pain during local anesthetic (LA) administration. METHODS: Children in the age range of 8-12Â years, in need of LA administration, were randomly assigned to two groups: Group I: laser acupuncture, Group II: control. For all the children, baseline simplified Modified Child Dental Anxiety Scale-Faces version (MCDAS((f))) was recorded, followed by laser acupuncture or standard care. Following the conventional protocol, LA was administered. The procedural pain was assessed using the Faces, Legs, Activity, Cry and Consolability scale (FLACC) and Faces Pain Scale-Revised (FPS-R). All the variations in pulse rate were recorded from baseline to the completion of LA administration. After the procedure, simplified MCDAS((f)) was recorded one more time. The data were tabulated and analyzed statistically. RESULTS: A significant reduction in anxiety after LA administration, as observed in MCDAS((f)) score, was noticed only in the laser acupuncture group. The pain scores, as reported in

FPS-R, were low in children randomized to the laser group compared to the control. The FLACC pain scores also showed low values in the experimental group. CONCLUSION: Based on the study findings, within the limitations, low-level laser therapy using a laser acupuncture pen can reduce the pain perception of children undergoing LA administration and alleviate dental anxiety. Anesthetics, Local Child;Humans;Anesthetics, Local;Low-Level Light Therapy;Pain;Pain Perception;Acupuncture Therapy

Safety and effectiveness of nano-pulse stimulationâ„¢ technology to treat acne vulgaris of the back. BACKGROUND AND OBJECTIVES: This feasibility study describes the effects of Nano-pulse stimulationâ„¢ (NPSâ„¢) technology using the CellFXâ„¢ System on acne vulgaris of the back with the objectives of demonstrating safety and effectiveness. The CellFX System applies nanosecond pulses of electrical energy to induce highly localized regulated cell death (RCD) in the cellular structures of the targeted zone with no thermal effect on the tissue and negligible effects on surrounding non-cellular components. STUDY DESIGN/MATERIALS AND METHODS: Seventeen subjects were enrolled at two sites with thirteen subjects completing treatment. Three 7â€‰Xâ€‰7â€‰cm regions containing at least five bacne lesions each were identified, one region treated with the CellFX across three treatment sessions, the second region treated as a sham using microneedle tip placement without delivering energy, and the third as an untreated control. RESULTS: CellFX-treated areas showed an average reduction of acne lesions of 82% by 90â€‰days post-last procedure. Acne improvement was observed in 100% of CellFX-treated regions compared to 39% improvement in Sham regions and 31% improvement in the control regions. The most common skin effects were erythema and hyperpigmentation observed in 23% and 92% of the subjects, respectively, at the last timepoint. No serious adverse events were reported. CONCLUSIONS: CellFX is a safe and effective procedure for clearing back acne. Humans;Treatment Outcome;Acne Vulgaris;Skin;Low-Level Light Therapy;Erythema

Effects of multiwavelength photobiomodulation for the treatment of traumatic soft tissue injuries associated with bone fractures: A double-blind, randomized controlled clinical trial. This study evaluated the efficacy and safety of multiwavelength photobiomodulation (MPBM) in healing soft tissue injuries associated with tibial and/or ankle fractures. Participants were randomized into the MPBM or control group. Primary outcome was wound healing, measured by the Bates-Jensen scale. Assessments were performed daily. Twenty-seven hospitalized adults were included. MPBM showed an improvement in the daily mean Bates-Jensen scale (MPBM 32.1 vs. control 34.2; pÂ =Â 0.029), daily mean pain score change (MPBM 0.5 vs. control 0.2; pÂ =Â 0.04) and occurrence of infection at the site of the external fixator pins (MPBM 15.3% vs. control 57.1%; pÂ =Â 0.02). MPBM group also showed faster-wound resolution (MPBM 13.1 vs. control 23.1â€‰days). Subgroup analysis showed improvement in the MPBM group among less severe patients on the Bates-Jensen scale (MPBM 27.4 vs. control 34.7; pÂ =Â 0.0081) and mean time for wound resolution (MPBM 7.0 vs. control 14.6â€‰days; pÂ =Â 0.03). MPBM appears safe and effective in reducing wound resolution time, infection in the surgical pin sites, reported pain and time before definitive surgery. Adult;Humans;Treatment Outcome;Fractures, Bone;External Fixators;Soft Tissue Injuries;Wound Healing

Photobiomodulation therapy combined with static magnetic field in tibial fracture healing of a dog: A case report. A 10-week-old male, Xoloitzcuintle (Mexican hairless dog), weighing 8.9 kg was presented after its owner accidentally stepped on its paw. The dog presented with acute pain, inflammation and grade IV lameness in the right hind paw. A complete transverse fracture in the right proximal tibia was diagnosed from radiography. The dog underwent a minimally invasive plate osteosynthesis (MIPO) procedure. After surgery, photobiomodulation therapy combined with static magnetic field (PBMT-sMF) was applied twice daily for 21 days. A multi-wavelength PBMT-sMF device

was applied at three sites using different frequencies: proximal and distal of the fracture zone (3000 Hz, 40.35 J per site, and 300 s per site) and in the fracture zone (250 Hz, 39.11 J and 300 s per site). Follow up radiographies were performed after surgery and treatment with PBMT-sMF. Eighteen days post-surgery the healing process of bone was advanced. Fifty-five days post-surgery the callus was enlarged. In addition, radiographic union and clinical union was evidenced by closure of the fracture gap. This case report has reported the use of PBMT-sMF in order to accelerate and improve bone healing following a MIPO procedure on a complete transverse fracture in the proximal tibia of a puppy. Male;Dogs;Animals;Tibia;Fracture Healing;Low-Level Light Therapy;Tibial Fractures;Magnetic Fields;Dog Diseases

Synergistic Sequential Emission of Fractional 1540 nm and 10 600 Lasers for Abdominal Postsurgical Scar Management: A Clinical Case Report. BACKGROUND Abdominal scars can develop following abdominoplasty interventions and can cause severe functional and aesthetic disabilities. Surgery is almost no longer necessary thanks to the accessibility of more recent and sophisticated technology like lasers. Many ablative and non-ablative photothermolysis technologies and equipment have been developed, giving patients and medical professionals more alternatives but also complicating the system to be utilized and the methods to maximize the outcomes. The aim of the current study was to evaluate the volumetric action of 1540 wavelength and the efficacy and safety of the synergic sequential application of a new fractional ablative 10 600 nm CO2 and non-ablative 1540 nm lasers on abdominal postsurgical scar management. CASE REPORT We treated a female patient with an abdominal suprapubic scar following abdominoplasty. The patient underwent 3 treatment sessions (with a frequency of 1 session every 50 days) with 1 pass over the entire suprapubic area using 10 600 nm COâ,, fractional laser emission and 1540 fractional laser emission in simultaneous modality. A photographic evaluation was made to monitor the effect of the treatment on the aesthetic appearance of the patient's suprapubic scar. After 6 months, the photographic assessment showed a significant improvement in scar texture and color. No patient pain or adverse effects were detected. CONCLUSIONS This case report describes the possibility of effectively treating abdominal suprapubic scars following abdominoplasty surgery with simultaneous and combined irradiation of 10 600 nm and 1540 nm wavelengths. Carbon Dioxide Humans;Female;Cicatrix;Treatment Outcome;Carbon Dioxide;Lasers, Gas;Low-Level Light Therapy;Laser Therapy

Photobiomodulation improves the synapses and cognitive function and ameliorates epileptic seizure by inhibiting downregulation of Nlgn3. BACKGROUND: Temporal lobe epilepsy (TLE) remains one of the most drug-resistant focal epilepsies. Glutamate excitotoxicity and neuroinflammation which leads to loss of synaptic proteins and neuronal death appear to represent a pathogen that characterizes the neurobiology of TLE. Photobiomodulation (PBM) is a rapidly growing therapy for the attenuation of neuronal degeneration harboring non-invasiveness benefits. However, the detailed effects of PBM on excitotoxicity or neuroinflammation remain unclear. We investigated whether tPBM exerts neuroprotective effects on hippocampal neurons in epilepsy mouse model by regulating synapse and synapse-related genes. METHODS: In an in vitro study, we performed imaging analysis and western blot in primary hippocampal neurons from embryonic (E17) rat pups. In an in vivo study, RNA sequencing was performed to identify the gene regulatory by PBM. Histological stain and immunohistochemistry analyses were used to assess synaptic connections, neuroinflammation and neuronal survival. Behavioral tests were used to evaluate the effects of PBM on cognitive functions. RESULTS: PBM was upregulated synaptic connections in an in vitro. In addition, it was confirmed that transcranial PBM reduced synaptic degeneration, neuronal apoptosis, and neuroinflammation in an in vivo. These effects of PBM were supported by RNA sequencing results showing the relation of PBM with gene regulatory networks of neuronal functions. Specifically, Nlgn3 showed increase after PBM and silencing the Nlgn3 reversed the positive effect of PBM in in vitro. Lastly, behavioral alterations

including hypoactivity, anxiety and impaired memory were recovered along with the reduction of seizure score in PBM-treated mice. CONCLUSIONS: Our findings demonstrate that PBM attenuates epileptic excitotoxicity, neurodegeneration and cognitive decline induced by TLE through inhibition of the Nlgn3 gene decrease induced by excitotoxicity.

The chromatographic constitution of andiroba oil and his healing effects, compared to the LLLT outcomes, in oral mucositis induced in golden Syrian hamsters: a new treatment option. The oral mucositis is a mucosal alteration that usually arises from oncological treatments, such as chemotherapy, and it is characterized as an inflammatory process. The aim of this study is to demonstrate the chromatographic constitution of Andiroba oil, comparing and evaluating Andiroba oil and laser scarring efficiency in treatments of oral mucositis in hamsters. These animals were submitted to 5-Fluorouracil. A total of 122 animals were used, randomized and divided into the following groups: (a) positive control; (b) laser associated to andiroba oil; (c) laser; (d) andiroba oil; (e) negative control; (f) cyclophosphamide (genotoxicity control). The induction of oral mucositis occurred by the administration of intraperitoneal Fluorouracila (60 mg/kg) and trauma to the mucosa. The laser protocol was performed once a day and the andiroba oil applied 3 times a day (1,5 ml/day). The mucosae were photographed and removed for clinical and histopathological analysis on day 4, 8, 12 and 15. The analysis was based in OM severity, in specific scoring for the clinical and histopathological aspect. Toxicity was evaluated on day 15 using comet assay and it was performed by variant DNA damage parameters. The data were analysed using analysis of variance (ANOVA) Tukey post-test and Kruskal-Wallis Dunn post-test. The "andiroba oil" and "laser" groups presented better results when compared to the control groups and the treatment associations. The andiroba oil presented the best scarring results, even considering its efficiency proximity to the laser treatment. Andiroba and laser, separately, did not present genotoxicity, however their association evidences damage to DNA. Fluorouracil Animals;Cricetinae;Cicatrix;Fluorouracil;Low-Level Light Therapy;Mesocricetus;Stomatitis

Photobiomodulation for Alzheimer's disease: photoelectric coupling effect on attenuating AÎ² neurotoxicity. Alzheimer's disease (AD) and dementia are the most worrying health problems faced by people globally today. Although the pathological features of AD consisting of amyloid-beta (AÎ²) plaques in the extracellular space (ECS) and intracellular tau tangles are well established, the developed medicines targeting these two proteins have not obtained the expected clinical effects. Photobiomodulation (PBM) describes the therapeutic use of red light (RL) or near-infrared light (NIR) to serve as a noninvasive neuroprotective strategy for brain diseases. The present review discusses the mechanisms of the photoelectric coupling effect (light energy-induced special electronic transition-related alterations in protein structure) of PBM on reducing AÎ² toxicity. On the one hand, RL or NIR can directly disassemble AÎ² in vitro and in vivo. On the other hand, formaldehyde (FA)-inhibited catalase (CAT) and H(2)O(2)-inactived formaldehyde dehydrogenase (FDH) are formed a vicious circle in AD; however, light energy not only activates FDH to degrade excessive FA (which crosslinks AÎ² monomer to form AÎ² oligomers and senile plaques) but also sensitizes CAT to reduce hydrogen peroxide levels (H(2)O(2), which can facilitate AÎ² aggregation and enhance FA generation). In addition, it also activates mitochondrial cytochrome-c to produce ATP in the neurons. Clinical trials of phototherapeutics or oral coenzyme Q10 have shown positive effects in AD patients. Hence, a promising strategy combined PBM with nanopacked Q10 has been proposed to apply for treating AD. Hydrogen Peroxide;Amyloid beta-Peptides;Catalase Humans;Alzheimer Disease;Hydrogen Peroxide;Amyloid beta-Peptides;Catalase;Light

Phototherapies for the management of a large painful facial cutaneous lesion from human monkeypox infection. BACKGROUND: The management of patients with Monkeypox (MPX) infection is generally symptomatic as there has been no approved antiviral drug so far. Despite being

generally a self-limited disease, some complications may be encountered such as severe pain and the formation of permanent skin scarring. AIM: To present a case report in which a combination of antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) was used for a large facial cutaneous lesion in an MPX patient. CASE REPORT: A 20-year-old Caucasian man presenting with a large, painful, grayish, rubbery, well-circumscribed, deep-seated, and umbilicated ulcer on his face was treated with four daily sessions of PBMT and two sessions of aPDT every other day. Within a day, the patient's pain complaint was no longer present and a crust central area was visible. On the 4th day of laser treatment, the wound almost completely disappeared, leaving a small reddish area free of inflammation or infection signs and without unaesthetic skin scarring. CONCLUSION: Given the lack of specific strategies for the management of severe MPX-related skin lesions, the current case report suggests that the concomitant use of PMBT and aPDT seems to be a promising therapeutic approach. The most appropriate laser parameters, however, should be further investigated in future studies in order to establish an effective and reliable clinical protocol. Photosensitizing Agents Male;Humans;Young Adult;Adult;Mpox (monkeypox);Cicatrix;Photochemotherapy;Photosensitizing Agents;Pain

The Effect of Photobiomodulation Therapy on Inflammation Following Dental Prophylaxis. To evaluate the effectiveness of photobiomodulation therapy (PBMT) in reducing gingivitis following professional dental prophylaxis in dogs in a prospective, randomly controlled, double-blind study. The study included 47 dogs (male nâ€‰=â€‰23, female nâ€‰=â€‰24), with a mean age of 6.5â€‰Â±â€‰2.6 years and a bodyweight of 28.9â€‰Â±â€‰5.3â€…kg. Breeds included: Belgian Malinois Shepherd Dogs (nâ€‰=â€‰23), German Shepherd Dogs (nâ€‰=â€‰14), Labrador Retriever (nâ€‰=â€‰4), and Dutch Shepherd Dogs (nâ€‰=â€‰3). The left side of the mouth was treated by performing dental prophylaxis (control group). The right side received dental prophylaxis and a single session of PBMT using a Class IV therapeutic laser (treatment group). Each side was graded individually for periodontal disease (PD), gingivitis, and calculus. Follow-up observations were conducted on days 1, 3, 8, and 15 post-treatment. Results were compared using a Mann-Whitney Test. Multiple regression was run to predict PD, gingivitis, and calculus scores using age, sex, and breed. A pâ€‰<â€‰.05 was considered significant. The PBMT group (PG) showed significantly lower gingivitis scores from day 1 to 15 post-treatment. PD had an increasing prevalence with age. Age and breed contributed to the prediction of PD, gingivitis, and calculus grading. This study showed that PBMT significantly reduced the grade of gingivitis following dental prophylaxis, and may be a useful adjuvant procedure following dental prophylaxis. Animals;Dogs;Female;Male;Calculi;Dental Plaque;Dental Prophylaxis;Dog Diseases;Gingivitis;Inflammation;Low-Level Light Therapy;Periodontal Diseases;Prospective Studies;Double-Blind Method

Photobiomodulation Literature Watch August 2022.

Photobiomodulation Therapy for Treatment of Extravasation Injuries in Cancer Chemotherapy. Humans;Low-Level Light Therapy;Neoplasms

Effects of low-level laser therapy on inflammatory symptoms in an arthritis rat model. [Purpose] This study evaluated the effect of low-level laser therapy on inflammatory signs in an arthritis rat model as a foundation for elucidating the mechanism of the anti-inflammatory effect. [Materials and Methods] Eigteen Wistar rats were divided into three groups: group I (arthritis without low-level laser therapy), group II (arthritis with low-level laser therapy), and the control group (sham arthritis control). Arthritis was induced in the right knee by injecting a mixture of kaolin and carrageenan. Low-level laser therapy was continued for seven days after the onset of arthritis by 60 times of repeated irradiation for 10 seconds in the right knee joint area. The joint transverse diameter, pressure pain threshold in the affected knee joint, and mechanical paw withdrawal threshold at the distant site were evaluated the day before the injection and one, three, and seven days after the

injection. Pathological changes were observed. [Results] Group II showed better improvement in swelling and pain in the affected knee joint and secondary hyperalgesia at the distance site when compared to group I. In group II, there was only mild infiltration of synovial cells, and the progression of arthritis was suppressed compared with that of group I. [Conclusion] Low-level laser therapy can mitigate swelling and inflammatory pain in the affected knee joint and prevent secondary hyperalgesia.

Low-level laser therapy prevents medication-related osteonecrosis of the jaw-like lesions via IL-1RA-mediated primary gingival wound healing. BACKGROUND: Medication-related osteonecrosis of the jaw (MRONJ) is a serious debilitating disease caused by anti-resorption and anti-angiogenesis drugs, significantly affecting patients' quality of life. Recent studies suggested that primary gingival wound healing may effectively prevent the development of MRONJ. This study aimed to evaluate the effects of low-level light therapy (LLLT) on promoting gingival wound healing in extraction sockets of MRONJ-like mice and preventing the occurrence of MRONJ. Furthermore, we explored underlying mechanisms. METHODS: Mice were randomly divided into the Ctrl, Zol, and Zolâ€‰+â€‰LLLT groups. Administration of zoledronate and tooth extraction of bilateral maxillary second molars were used to build the MRONJ model, and LLLT was locally administered into the tooth sockets to examine the effect of LLLT. Next, to explore the function of IL-1RA, we performed LLLT with interleukin-1 receptor antagonist (IL-1RA) neutralizing antibody (named Zolâ€‰+â€‰LLLTâ€‰+â€‰IL-1RA NAb group) or negative control antibodies for tooth extraction in subsequent rescue animal experiments. Stereoscope observations, micro-computed tomography, and histological examination were conducted to evaluate gingival wound healing and bone regeneration in tooth sockets. The effects of LLLT on the migration capacities of zoledronate-treated epithelial cells were assessed in vitro. RESULTS: LLLT promoted primary gingival wound healing without exposed necrotic bone. Micro-computed tomography results showed higher bone volume and mineral density of the tooth sockets after LLLT. Histology analysis showed complete gingival coverage, obvious bone regeneration, and reduced soft tissue inflammation, with down-regulated pro-inflammation cytokines, like interleukin-1Â beta (IL-1Î²) and tumor necrosis factor-Î± (TNF-Î±), and up-regulated IL-1RA expression in the gingival tissue in the LLLT group. The rescue assay further showed that the effects of LLLT promoting gingival wound healing and preventing MRONJ might be partially abolished by IL-1RA neutralizing antibodies. In vitro studies demonstrated that LLLT accelerated zoledronate-treated epithelial cell migration. CONCLUSIONS: LLLT might promote primary gingival wound healing and contribute to subsequent bone regeneration of the tooth extractions in MRONJ-like lesions via IL-1RA-mediated pro-inflammation signaling suppression. Bone Density Conservation Agents;Diphosphonates;Interleukin 1 Receptor Antagonist Protein;Zoledronic Acid Animals;Mice;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Gingival Diseases;Interleukin 1 Receptor Antagonist Protein;Low-Level Light Therapy;Quality of Life;Tooth Extraction;Wound Healing;X-Ray Microtomography;Zoledronic Acid

Selective Focal Laser Therapy as the Primary Treatment for Exudative Perifoveal Vascular Anomalous Complex (ePVAC): Case Series and Literature Review. Perifoveal anomalous exudative vascular complex (PEVAC) was first described in 2011. Since then, individual clinical cases and a couple of case series have been published, and their characteristics have been studied in multi-modal images. To date, there is no consensus on its treatment. Initially, it was thought that PEVACs could be left to spontaneous evolution because they presented a slow progression. But it has been shown that the growth of the lesion covers a spectrum from non-exudative lesions to PEVAC with vision impairment over time. We present an updated bibliographic review of this pathology. We explain the changes in the diagnostic criteria that have been undergone. And we focus the discussion on selective treatment with focal laser, which has shown an excellent anatomical response and visual improvement or

stabilization in the cases described and in our series of three patients systematically treated with focal laser. [Ophthalmic Surg Lasers Imaging Retina 2023;54:43-49.]. Humans;Exudates and Transudates;Vascular Malformations;Low-Level Light Therapy;Laser Coagulation
Red LED light therapy associated with epidermal growth factor on wound repair process in rats. Epidermal growth factor (EGF) and light-emitting diode (LED) are currently deployed as promissory treatments for skin repair; however, the mechanisms of their association are not yet evidenced. Thus, the present study aimed to evaluate the effects of combined treatment with EGF and red LED on the wound healing processes in rats. Adult Wistar rats were randomized in control group (CG) wounds without treatment; wounds submitted to EGF treatment (EGF); wounds submitted to LED treatment (LED); wounds submitted to EGF associated with LED treatments (EGF/LED). Treatments were performed immediately after the surgical procedure and each 24Â h, totaling 8 sessions. Moreover, LED was applied before EGF treatment at a single point in the center of the wound. Morphological characteristics and the immunoexpression of COX-2, VEGF, and TGF-Î² were measured. The results demonstrated that EGF/LED group presented a higher wound healing index. Additionally, all experimental groups presented similar findings in the histological evaluation, the degree of inflammation, and the area of dermis-like tissue. However, for EGF-treated animals (with or without LED), neoepithelial length was higher. Furthermore, all the treated groups decreased COX-2 and increased VEGF immunoexpression, and only EGF/LED group enhanced the TGF-Î² protein expression when compared to the untreated group. This research shows that EGF and LED modulate inflammatory process and increase the vascularity. In addition, treatment of EGF associated with LED promoted a more evident positive effect for increasing TGF-Î² expression and may be promising resources in the clinical treatment of cutaneous wounds. Epidermal Growth Factor;Cyclooxygenase 2;Vascular Endothelial Growth Factor A Rats;Animals;Epidermal Growth Factor;Cyclooxygenase 2;Vascular Endothelial Growth Factor A;Rats, Wistar;Wound Healing;Phototherapy
Neuroinflammation mechanisms of neuromodulation therapies for anxiety and depression. Mood disorders are associated with elevated inflammation, and the reduction of symptoms after multiple treatments is often accompanied by pro-inflammation restoration. A variety of neuromodulation techniques that regulate regional brain activities have been used to treat refractory mood disorders. However, their efficacy varies from person to person and lack reliable indicator. This review summarizes clinical and animal studies on inflammation in neural circuits related to anxiety and depression and the evidence that neuromodulation therapies regulate neuroinflammation in the treatment of neurological diseases. Neuromodulation therapies, including transcranial magnetic stimulation (TMS), transcranial electrical stimulation (TES), electroconvulsive therapy (ECT), photobiomodulation (PBM), transcranial ultrasound stimulation (TUS), deep brain stimulation (DBS), and vagus nerve stimulation (VNS), all have been reported to attenuate neuroinflammation and reduce the release of pro-inflammatory factors, which may be one of the reasons for mood improvement. This review provides a better understanding of the effective mechanism of neuromodulation therapies and indicates that inflammatory biomarkers may serve as a reference for the assessment of pathological conditions and treatment options in anxiety and depression. Animals;Deep Brain Stimulation;Depression;Neuroinflammatory Diseases;Electroconvulsive Therapy;Transcranial Magnetic Stimulation;Anxiety
Effectiveness of Conservative Interventions After Acute Hamstrings Injuries in Athletes: A Living Systematic Review. BACKGROUND: Hamstrings injuries are common in sports and the reinjury risk is high. Despite the extensive literature on hamstrings injuries, the effectiveness of the different conservative (i.e., non-surgical) interventions (i.e., modalities and doses) for the rehabilitation of athletes with acute hamstrings injuries is unclear. OBJECTIVE: We aimed to compare the effects of

different conservative interventions in time to return to sport (TRTS) and/or time to return to full training (TRFT) and reinjury-related outcomes after acute hamstrings injuries in athletes. DATA SOURCES: We searched CINAHL, Cochrane Library, EMBASE, PubMed, Scopus, SPORTDiscus, and Web of Science databases up to 1 January, 2022, complemented with manual searches, prospective citation tracking, and consultation of external experts. ELIGIBILITY CRITERIA: The eligibility criteria were multi-arm studies (randomized and non-randomized) that compared conservative treatments of acute hamstrings injuries in athletes. DATA ANALYSIS: We summarized the characteristics of included studies and conservative interventions and analyzed data for main outcomes (TRTS, TRFT, and rate of reinjuries). The risk of bias was judged using the Cochrane tools. Quality and completeness of reporting of therapeutic exercise programs were appraised with the i-CONTENT tool and the certainty of evidence was judged using the GRADE framework. TRTS and TRFT were analyzed using mean differences and the risk of reinjury with relative risks. RESULTS: Fourteen studies (12 randomized and two non-randomized) comprising 730 athletes (mostly men with ages between 14 and 49Â years) from different sports were included. Nine randomized studies were judged at high risk and three at low risk of bias, and the two non-randomized studies were judged at critical risk of bias. Seven randomized studies compared exercise-based interventions (e.g., L-protocol vs C-protocol), one randomized study compared the use of low-level laser therapy, and three randomized and two non-randomized studies compared injections of platelet-rich plasma to placebo or no injection. These low-level laser therapy and platelet-rich plasma studies complemented their interventions with an exercise program. Only three studies were judged at low overall risk of ineffectiveness (i-CONTENT). No single intervention or combination of interventions proved superior in achieving a faster TRTS/TRFT or reducing the risk of reinjury. Only eccentric lengthening exercises showed limited evidence in allowing a shorter TRFT. The platelet-rich plasma treatment did not consistently reduce the TRFT or have any effect on the risk of new hamstrings injuries. The certainty of evidence was very low for all outcomes and comparisons. CONCLUSIONS: Available evidence precludes the prioritization of a particular exercise-based intervention for athletes with acute hamstrings injuries, as different exercise-based interventions showed comparable effects on TRTS/TRFT and the risk of reinjuries. Available evidence also does not support the use of platelet-rich plasma or low-level laser therapy in clinical practice. The currently available literature is limited because of the risk of bias, risk of ineffectiveness of exercise protocols (as assessed with the i-CONTENT), and the lack of comparability across existing studies. CLINICAL TRIAL REGISTRATION: PROSPERO CRD42021268499 and OSF (https://osf.io/3k4u2/). Male;Humans;Adolescent;Young Adult;Adult;Middle Aged;Female;Reinjuries;Prospective Studies;Exercise Therapy;Exercise;Athletes

Tissue Bioengineering with Fibrin Scaffolds and Deproteinized Bone Matrix Associated or Not with the Transoperative Laser Photobiomodulation Protocol. Extending the range of use of the heterologous fibrin biopolymer, this pre-clinical study showed a new proportionality of its components directed to the formation of scaffold with a lower density of the resulting mesh to facilitate the infiltration of bone cells, and combined with therapy by laser photobiomodulation, in order to accelerate the repair process and decrease the morphofunctional recovery time. Thus, a transoperative protocol of laser photobiomodulation (L) was evaluated in critical bone defects filled with deproteinized bovine bone particles (P) associated with heterologous fibrin biopolymer (HF). The groups were: BC(L) (blood clot + laser); HF; HF(L); PHF (P+HF); PHF(L) (P+HF+L). Microtomographically, bone volume (BV) at 14 days, was higher in the PHF and PHF(L) groups (10.45 Â± 3.31 mm(3) and 9.94 Â± 1.51 mm(3)), significantly increasing in the BC(L), HF(L) and PHF(L) groups. Histologically, in all experimental groups, the defects were not reestablished either in the external cortical bone or in the epidural, occurring only in partial bone repair. At 42 days, the bone area (BA) increased in all groups, being significantly higher in the laser-treated groups. The quantification of bone collagen fibers

showed that the percentage of collagen fibers in the bone tissue was similar between the groups for each experimental period, but significantly higher at 42 days (35.71 Â± 6.89%) compared to 14 days (18.94 Â± 6.86%). It can be concluded that the results of the present study denote potential effects of laser radiation capable of inducing functional bone regeneration, through the synergistic combination of biomaterials and the new ratio of heterologous fibrin biopolymer components (1:1:1) was able to make the resulting fibrin mesh less dense and susceptible to cellular permeability. Thus, the best fibrinogen concentration should be evaluated to find the ideal heterologous fibrin scaffold. Fibrin;Collagen Rats;Animals;Cattle;Fibrin;Bone Matrix;Rats, Wistar;Bone Regeneration;Lasers;Bioengineering;Collagen;Tissue Scaffolds

Efficacy of Low-Level Laser Therapy in a Rabbit Model of Rhinosinusitis. Little is known about alternative treatment options for rhinosinusitis (RS). We aimed to evaluate the efficacy of low-level laser therapy (LLLT) for RS in experimentally induced rabbit models of RS. A total of 18 rabbits were divided into four groups: a negative control group (n = 3), an RS group without treatment (n = 5, positive control group), an RS group with natural recovery (n = 5, natural recovery group), and an RS group with laser irradiation (n = 5, laser-treated group). Computed tomography and histopathological staining were performed for each group. mRNA and protein expression levels of local cytokines (IFN-Î³, IL-17, and IL-5) were also measured. Tissue inflammation revealed a significant improvement in the laser-treated group compared with the RS and natural recovery groups ($p < 0.01$). In addition, sinus opacification in the CT scans and cytokine expression was reduced in the laser-treated group, though without statistical significance. LLLT could be an effective option for the management of RS concerning radiological, histological, and molecular parameters. Cytokines Animals;Rabbits;Cytokines;Low-Level Light Therapy;Sinusitis;Rhinitis

Near-Infrared 810 nm Light Affects Porifera Chondrosia reniformis (Nardo, 1847) Regeneration: Molecular Implications and Evolutionary Considerations of Photobiomodulation-Animal Cell Interaction. Chemotrophic choice as a metabolic source of energy has characterised animal cell evolution. However, light interactions with animal cell photoacceptors that are able to increase energetic metabolism (photo-biomodulation (PBM)) have been previously described. In the present study, we cut three specimens of Chondrosia reniformis into four equal parts (12 fragments), and we irradiated the regenerating edge of six fragments with the previously characterised 810 nm near-infrared light, delivered at 1 W, 60 J/cm(2), 1 W/cm(2), and 60 J in a continuous-wave mode for 60 s through a flat-top hand-piece with a rounded spot-size area of 1 cm(2). Six fragments were irradiated with 0 W for 60 s as the controls. We performed irradiation at the time 0 h and every 24 h for a total of five administrations. We monitored the regeneration process for five days (120 h) in aquaria by examining the macroscopic and histological changes. We analysed the gene expression profile of the inflammatory processes, apoptosis, heat stress, growth factors, and collagen production and determined oxidative stress enzyme activity and the total prokaryotic symbiont content. PBM sped up C. reniformis regeneration when compared to the controls. Particularly, transforming growth factor TGF3 and TGF6 upregulation during the early phase of regeneration and TGF5 upregulation 120 h postinjury in the irradiated samples supports the positive effect of PBM in sponge tissue recovery. Conversely, the expression of TGF4, a sponge fibroblast growth factor homologue, was not affected by irradiation, indicating that multiple, independent pathways regulate the TGF genes. The results are consistent with our previous data on a wide range of organisms and humans, suggesting that PBM interaction with primary and secondary cell targets has been conserved through the evolution of life forms. Collagen;Transforming Growth Factors Animals;Humans;Collagen;Porifera;Infrared Rays;Cell Communication;Transforming Growth Factors;Low-Level Light Therapy

Effects of photobiomodulation therapy on human sperm function. INTRODUCTION: Sperm motility is a crucial factor in male infertility and it depends on mitochondrial tail movements.

Photobiomodulation light therapy allows the cells to produce their energy through activation of the mitochondria. The aim of the present study was to examine the impact of photobiomodulation on sperm motility in astenozoospermic individuals. MATERIALS AND METHODS: Following semen analyses of 20 astenozoospermic individuals, collected semen samples were centrifuged. Pellet was obtained and homogenized through mixing with culture media in 1:1 ratio. Each semen samples were divided into 3 groups. In the first group, control samples were not exposed to laser irradiation. The Group 2 and Group 3 were exposed to 650nm wavelength of photobiomodulation from 10cm distance in dark environment via a 36cm(2) aperture sizer with 200mW output power for 30 and 60min duration, respectively. Sperm motilities were evaluated and chromatin condensation of sperms was determined. RESULTS: Sperm motilities were significantly increased in photobiomodulation groups compared with the controls. Sperm motilities tended to be different between the 30 and 60min red light exposure groups; however, it was not statistically significant. When the motility grades were compared, no significant difference was observed in non-progressive motility sperms. While immotile sperms decreased significantly in the photobiomodulation groups compared to the control group, progressive sperms increased. CONCLUSIONS: The results of the present study demonstrated that the photobiomodulation is an efficient method to increase the sperm motility of astenozoospermic individuals independent of the duration of exposure. Humans;Male;Semen;Low-Level Light Therapy;Sperm Motility;Spermatozoa;Semen Analysis

Red light photobiomodulation rescues murine brain mitochondrial respiration after acute hypobaric hypoxia. Low-level laser therapy, or photobiomodulation, utilizes red or near-infrared light for the treatment of pathological conditions due to the presence of intracellular photoacceptors, such as mitochondrial cytochrome c oxidase, that serve as intermediates for the therapeutic effects. We present an in-detail analysis of the effect of low-intensity LED red light irradiation on the respiratory chain of brain mitochondria. We tested whether low-level laser therapy at 650Â nm could alleviate the brain mitochondrial dysfunction in the model of acute hypobaric hypoxia in mice. The irradiation of the mitochondrial fraction of the left cerebral cortex with low-intensity LED red light rescued Complex I-supported respiration during oxidative phosphorylation, normalized the initial polarization of the inner mitochondrial membrane, but has not shown any significant effect on the activity of Complex IV. In comparison, the postponed effect (in 24Â h) of the similar transcranial irradiation following hypoxic exposure led to a less pronounced improvement of the mitochondrial functional state, but normalized respiration related to ATP production and membrane polarization. In contrast, the similar irradiation of the mitochondria isolated from control healthy animals exerted an inhibitory effect on CI-supported respiration. The obtained results provide significant insight that can be beneficial for the development of non-invasive phototherapy. Electron Transport Complex IV Animals;Mice;Brain;Electron Transport Complex IV;Hypoxia;Infrared Rays;Low-Level Light Therapy;Mitochondria;Pressure;Cell Respiration

The Randomized Controlled Study of Low-Level Laser Therapy, Kinesio-Taping and Manual Lymphatic Drainage in Patients With Stage II Breast Cancer-Related Lymphedema. OBJECTIVE: To compare the effects of low-level laser therapy, kinesio-taping and manual lymphatic drainage (MLD) on the affected arm volume, quality of life, arm function, neuropathic pain and shoulder mobility in patients with stage II breast cancer-related lymphedema. MATERIALS AND METHODS: Forty-five breast cancer patients with stage II lymphedema were included. The patients were randomized to three groups and treated with MLD, kinesio-taping or low-level laser therapy. After these different therapeutic modalities, all patients received multilayer compression bandaging, lymphedema remedial exercises, skin care, and a patient education program by the same lymphedema therapist. All treatments were applied 5-days a week for three weeks. The lymphedema compression garments were prescribed to all patients and follow-up visits were planned at the end of the treatment, and at four and 12 weeks.

The efficacy of the treatments was evaluated by volumetric calculations based on circumferential measurements using the formula for a truncated cone, in addition to goniometric assessments for shoulder joint ROM, and questionnaires: Quick-disability of arm, shoulder and hand for arm disability; pain-detect for neuropathic pain; and quality of life for arm lymphedema (LYMQOL-arm). RESULTS: The baseline patient and disease characteristics, and outcome measures were similar between groups. All treatment modalities were found to be effective in decreasing arm volume, and improving quality of life, upper extremity disability and neuropathic pain. The percentage of decreased arm volume or treatment success was better in kinesio-taping group than in the MLD group at the end of the treatment, and at four and 12 weeks after treatment ($p = 0.009$, $p = 0.039$, and $p = 0.042$, respectively). CONCLUSION: Kinesio-taping led to better results than MLD and was similarly effective compared with low-level laser in stage II breast cancer-related lymphedema at the twelfth week of follow-up. Kinesio-taping and low-level laser should be considered as alternative treatments in early-moderate stages of lymphedema. After these modalities, multi-layer compression and compression bandaging remain cornerstones of lymphedema treatment.

The effects of low-level laser therapy on muscle strength and functional outcomes in individuals with knee osteoarthritis: a double-blinded randomized controlled trial. The purpose of this study was to compare the therapeutic effects of low-level laser therapy (LLLT) with 808 and 660Â nm wavelength on muscle strength and functional outcomes in individuals with knee osteoarthritis (OA). A total of 47 participants were randomly assigned to the 808Â nm, 660Â nm, and sham control groups. Two LLLT groups received continuous LLLT with a mean power of 300 mW in different wavelengths at the knee joint 15Â min a session three days per week for eight weeks, while the control group received the sham LED treatment. The knee strength and functional performance involving 30-s sit-to-stand, 40Â m fast-paced walk, stair climbing, and the TUG test were measured at the baseline and one week after the interventions were completed. The results showed that knee extensor strength was more improved in the 808Â nm group as compared to the 660Â nm group (pâ€‰<â€‰0.001, dâ€‰=â€‰0.57) and the sham control (pâ€‰<â€‰0.001, dâ€‰=â€‰0.40), while increased flexor strength was demonstrated in the 808Â nm (pâ€‰=â€‰0.009, dâ€‰=â€‰0.67) and sham control groups (pâ€‰<â€‰0.001, dâ€‰=â€‰0.97). The number of 30-s sit-to-stand was increased only in the 660Â nm group (pâ€‰=â€‰0.006, dâ€‰=â€‰0.49). All three groups exhibited improvements in the other three functional performance-based tests after the interventions with no statistically significant differences among the groups. In conclusion, both intervention groups improved muscle strength and functional performance as compared to the control group. The 808Â nm wavelength group showed better results in knee extensor strength. Therefore, laser therapy is suggested to be integrated into rehabilitation programs to improve muscle strength and functional performance in the population with knee OA. Humans;Knee Joint;Low-Level Light Therapy;Muscle Strength;Osteoarthritis, Knee

Conservative Management of Cervical Radiculopathy: A Systematic Review. OBJECTIVE: The purpose of this systematic review was to assess the effectiveness and safety of conservative interventions compared with other interventions, placebo/sham interventions, or no intervention on disability, pain, function, quality of life, and psychological impact in adults with cervical radiculopathy (CR). METHODS: We searched MEDLINE, CENTRAL, CINAHL, Embase, and PsycINFO from inception to June 15, 2022 to identify studies that were randomized controlled trials, had at least one conservative treatment arm, and diagnosed participants with CR through confirmatory clinical examination and/or diagnostic tests. Studies were appraised using the Cochrane Risk of Bias 2 tool and the quality of the evidence was rated using the Grades of Recommendations, Assessment, Development, and Evaluation approach. RESULTS: Of the 2561 records identified, 59 trials met our inclusion criteria (n = 4108 participants). Due to clinical and statistical heterogeneity, the findings were synthesized

narratively. There is very-low certainty evidence supporting the use of acupuncture, prednisolone, cervical manipulation, and low-level laser therapy for pain and disability in the immediate to short-term, and thoracic manipulation and low-level laser therapy for improvements in cervical range of motion in the immediate term. There is low to very-low certainty evidence for multimodal interventions, providing inconclusive evidence for pain, disability, and range of motion. There is inconclusive evidence for pain reduction after conservative management compared with surgery, rated as very-low certainty. DISCUSSION: There is a lack of high-quality evidence, limiting our ability to make any meaningful conclusions. As the number of people with CR is expected to increase, there is an urgent need for future research to help address these gaps.
Adult;Humans;Conservative Treatment;Radiculopathy;Quality of Life;Acupuncture Therapy;Pain;Randomized Controlled Trials as Topic

Surgical laser therapy for cryptoglandular anal fistula: Protocol of a systematic review and meta-analysis. INTRODUCTION: Anal fistula is the natural evolution of perianal abscess and one of the most common perianal diseases for adults. For complex fistula, it is still very challenging for anorectal surgeons to manage. With the introduction of laser technique in surgery, it is becoming more and more widely used for the treatment of cryptoglandular anal fistula. During the past decade, numerous studies have reported the clinical effectiveness and postoperative outcomes of different forms of laser treatment for anal fistula. However, as these studies were varied in terms of baseline characteristics, the evidence for the true clinical effectiveness of laser treatment for anal fistula need further critical appraisal. Therefore, the purpose of this study is to evaluate the outcomes of surgical laser therapy for cryptoglandular anal fistula stratified by laser type and Parks' classification through a synthesis of quantitative and qualitative evidence. METHODS AND ANALYSIS: This study will be carried out with adherence to the Cochrane Handbook. We will search PubMed, Cochrane Library, and Embase until June, 2022 to identify all relevant interventional and observational studies examining the effects of laser therapy on the clinical outcomes for cryptoglandular anal fistula. Data extraction from eligible studies will be performed independently by two unblinded authors using standardized extraction forms. Risk of bias assessment for each study will be conducted using Cochrane tool for randomized controlled trials (RCTs) and the Newcastle-Ottawa scale (NOS) tool for observational studies. The DerSimonian-Laird random-effects model will be used to calculate the pooled estimates. Heterogeneity will be examined by subgroup analysis stratified by laser type and Parks' classification and other study characteristics. Potential publication bias will be assessed by funnel plot symmetrical and Egger's regression tests. CONCLUSIONS: The synthesis of quantitative and qualitative evidence of this systemic review will yield updated and comprehensive evidence of laser treatment on specific outcomes, which can provide anorectal surgeons with high level evidence-based recommendations to improve patient care and clinical outcomes. OSF registration number: DOI 10.17605/OSF.IO/36ADW. Adult;Humans;Rectal Fistula;Treatment Outcome;Anus Diseases;Laser Therapy;Low-Level Light Therapy;Meta-Analysis as Topic;Systematic Reviews as Topic

Expression and degranulation of mast cells in laser photobiomodulated mucositis chemo-induced: pilot study in hamsters. This study aimed to evaluate the influence of laser photobiomodulation on the expression and degranulation of mast cells in chemo-induced oral mucositis (OM) lesions in hamsters. Twelve adult male Syrian hamsters (Mesocricetus auratus), golden lineage, were submitted to OM induction. They were divided into three groups: control-OM without treatment (C), OM treated with red laser (RL), OM treated with infrared laser (IL) and analyzed in the experimental time of 7 days. Three and 4 days after the intraperitoneal injection of the chemotherapy drug fluorouracil, the OM lesions were induced by making grooves in the right cheek pouch. Immediately after chemoinduction, the hamsters were submitted to photobiomodulation every 48 h for 7 days. The specimens were processed and stained using the hematoxylin-eosin and toluidine blue techniques.

There was a predominance of mild chronic inflammation in the experimental groups and a greater persistence of neutrophils in the control group (C), although not statistically significant. The group irradiated with red laser (RL) had the highest mean mast cell expression (38.28 Â± 19.05) ($p < 0.001$). As for the degranulation activity in mast cells, the control group (C) showed a greater number of fields with more than 50% of degranulated cells, presenting statistical significance when comparing it with the RL ($p < 0.009$) and IL ($p = 0.036$) group. It can be concluded that photobiomodulation, at both wavelengths, decreased mast cell degranulation, accelerating the inflammatory process. The use of infrared laser provided, in addition to less degranulation, the quantitative reduction of mast cells. Cricetinae;Animals;Male;Mucositis;Mast Cells;Pilot Projects;Light;Stomatitis;Lasers

LIGHTSITE II Randomized Multicenter Trial: Evaluation of Multiwavelength Photobiomodulation in Non-exudative Age-Related Macular Degeneration. INTRODUCTION: Photobiomodulation (PBM) represents a potential treatment for non-exudative age-related macular degeneration (AMD). PBM uses wavelengths of light to target components of the mitochondrial respiratory chain to improve cellular bioenergetic outputs. The aim of this study was to further investigate the effects of PBM on clinical, quality of life (QoL) and anatomical outcomes in subjects with intermediate stage non-exudative AMD. METHODS: The multicenter LIGHTSITE II study was a randomized clinical trial evaluating safety and efficacy of PBM in intermediate non-exudative AMD. The LumiThera ValedaÂ® Light Delivery System delivered multiwavelength PBM (590, 660 and 850Â nm) or sham treatment 3â€‰Ã—â€‰per week over 3-4Â weeks (9 treatments per series) with repeated treatments at baseline (BL), 4 and 8Â months. Subjects were enrolled with 20/32 to 20/100 best-corrected visual acuity (BCVA) and no central geographic atrophy (GA) within the central fovea (500Â Î¼m). RESULTS: LIGHTSITE II enrolled 44 non-exudative AMD subjects (53 eyes). PBM-treated eyes showed statistically significant improvement in BCVA at 9Â months (nâ€‰=â€‰32 eyes, pâ€‰=â€‰0.02) with a 4-letter gain in the PBM-treated group versus a 0.5-letter gain in the sham-treated group (ns, pâ€‰<â€‰0.1) for patients that received all 27 PBM treatments (nâ€‰=â€‰29 eyes). Approximately 35.3% of PBM-treated eyes showedâ€‰â‰¥â€‰5-letter improvement at 9Â months. Macular drusen volume was not increased over time in the PBM-treated group but did show increases in the sham-treated group. While PBM and sham groups both showed GA lesion growth in the trial period, there was 20% less growth in the PBM group over 10Â months, suggesting potential disease-modifying effects. No safety concerns or signs of phototoxicity were observed. CONCLUSION: These results confirm previous clinical testing of multiwavelength PBM and support treatment with Valeda as a novel therapy with a unique mechanism of action as a potential treatment for non-exudative AMD. TRIAL REGISTRATION: Clinicaltrial.Gov Registration Identifier: NCT03878420.

The effectiveness of photobiomodulation therapy in modulation the gut microbiome dysbiosis related diseases. Maintaining a healthy balance between commensal, and pathogenic bacteria within the gut microbiota is crucial for ensuring the overall health, and well-being of the host. In fact, by affecting innate, and adaptive immune responses, the gut microbiome plays a key role in maintaining intestinal homeostasis and barrier integrity. Dysbiosis is the loss of beneficial microorganisms and the growth of potentially hazardous microorganisms in a microbial community, which has been linked to numerous diseases. As the primary inducer of circadian rhythm, light can influence the human intestinal microbiome. Photobiomodulation therapy (PBMT), which is the use of red (630-700 nm), and near-infrared light (700 and 1200 nm), can stimulate healing, relieve pain, and reduce inflammation, and affect the circadian rhythm and gut microbiome beneficially. Our focus in this paper is on the effects of PBMT on gut microbiota, to provide an overview of how it can help control gut microbiota dysbiosis-related disorders.

Wound healing dynamics, morbidity, and complications of palatal soft-tissue harvesting. Palatal-tissue harvesting is a routinely performed procedure in periodontal and peri-implant plastic surgery.

Over the years, several surgical approaches have been attempted with the aim of obtaining autogenous soft-tissue grafts while minimizing patient morbidity, which is considered the most common drawback of palatal harvesting. At the same time, treatment errors during the procedure may increase not only postoperative discomfort or pain but also the risk of developing other complications, such as injury to the greater palatine artery, prolonged bleeding, wound/flap sloughing, necrosis, infection, and inadequate graft size or quality. This chapter described treatment errors and complications of palatal harvesting techniques, together with approaches for reducing patient morbidity and accelerating donor site wound healing. The role of biologic agents, photobiomodulation therapy, local and systemic factors, and genes implicated in palatal wound healing are also discussed. Humans;Palate;Wound Healing;Plastic Surgery Procedures;Morbidity;Tissue and Organ Harvesting

Considerations for Laser Therapy, Microneedling, and Chemical Peels When Treating Patients With Skin of Color. Over the past 10 years, we have seen exponential growth in the aesthetic industry. With this growth, we have also seen an influx of patients of differing ethnicities, in all varying shades of color. Some clinicians may not have the necessary knowledge and skill to appropriately treat these patients using modalities such as laser therapy, microneedling, and chemical peels. The aesthetic industry provides courses, conferences, and educational guides for helping aesthetic practitioners determine which patients are eligible to undergo these treatments. However, there is a considerable lack of information available for clinicians about treatment modalities that can be safely and effectively used on patients with Fitzpatrick skin types IV-VI. As the population of patients of various ethnic origins seeking aesthetic treatments continues to grow, it is imperative for clinicians performing these treatments to increase their knowledge and skill related to treating patients with skin of color. The purpose of this article is to educate aesthetic clinicians about appropriate treatments, procedures, and protocols for preventing adverse reactions in patients with skin of color who are undergoing aesthetic treatments using lasers, microneedling, and chemical peels. Humans;Skin Pigmentation;Chemexfoliation;Laser Therapy;Low-Level Light Therapy;Dermabrasion

Low-Level Light Therapy Versus Intense Pulsed Light for the Treatment of Meibomian Gland Dysfunction: Preliminary Results From a Prospective Randomized Comparative Study. PURPOSE: The purpose of this study was to evaluate and compare the safety and efficacy of low-level light therapy (LLLT) and intense pulsed light (IPL) for the treatment of meibomian gland dysfunction (MGD). METHODS: Forty eyes of 40 patients with MGD were randomized to receive either LLLT or IPL. Four weekly sessions of LLLT (MY MASK-E, Espansione Marketing S.p.A., Bologna, Italy) and IPL (Eye-light device, Espansione Marketing S.p.A., Bologna, Italy) were performed. The following parameters were evaluated before and 2 weeks after the last session for each treatment: Standard Patient Evaluation of Eye Dryness questionnaire, noninvasive break-up time, tear meniscus height, redness score, meiboscore, and meibomian gland loss. RESULTS: All patients completed regularly all the scheduled sessions, and no adverse events were reported in any of the groups. The Standard Patient Evaluation of Eye Dryness score significantly decreased after both LLLT and IPL ($P < 0.001$) although the improvement was significantly greater in the LLLT compared with the IPL group (-9.9 Â± 3.2 vs. -6.75 Â± 4.5; $P = 0.014$). Patients in the LLLT group showed a significantly higher increase in tear meniscus height compared with those in the IPL group (0.06 Â± 0.10 mm vs. -0.01 Â± 0.014; $P = 0.040$). In both groups, the noninvasive break-up time, redness score, meiboscore, and meibomian gland loss did not vary significantly after treatment (all $P > 0.05$). CONCLUSIONS: Both LLLT and IPL were safe and effective in improving ocular discomfort symptoms in patients with MGD; however, the former determined a greater improvement in symptoms and an improvement of tear volume. Humans;Meibomian Gland Dysfunction;Low-Level Light Therapy;Prospective Studies;Meibomian Glands;Phototherapy;Dry Eye Syndromes;Tears;Intense Pulsed Light Therapy

The Efficacy of Accelerating Orthodontic Tooth Movement by Combining Self-Ligating Brackets With One or More Acceleration Methods: A Systematic Review. This review aimed to evaluate the effectiveness of using one or more acceleration methods with self-ligating brackets to accelerate orthodontic tooth movement in adults and the associated effects of these interventions. An electronic search of the following databases (PubMed, Scopus, Google Scholar, EMBASE) was performed (From January 1990 to November 2021). ClinicalTrials.gov and the International Clinical Trials Registry Platform were also electronically searched to findÂ any unpublished studies and ongoing trials. The selected randomized controlled trials (RCTs) involved adult patients treated using self-ligating brackets combined with one or more acceleration methods compared with self-ligating brackets or conditional brackets alone. The risk of bias was assessed using Cochrane's risk of bias tool. A total of seven RCTs and one controlled clinical trial (CCT) were included in this review. Combining self-ligating brackets with flapless corticotomy, low-level laser therapy (LLLT), and infrared light accelerated orthodontic movement by 43% and 50% for surgical methods, 20-50% forÂ LLLT, and 22% for infrared light. Regarding side effects on periodontal tissues, neither flapless corticotomy nor low-frequency vibrational forces caused any damage. Combining self-ligating brackets and flapless corticotomy, low-level laser, or infrared light effectively accelerated orthodontic movement by 20% to 50 %. In contrast, the combination of self-ligating brackets with vibrational forces did not affect speeding tooth movement. The acceleration methods did not have any side effects on the periodontal tissues, but the available evidence was insufficient. There is a need for further primary research regarding the effectiveness of combining self-ligating brackets with acceleration methods and the possible untoward side effects.

Photobiomodulation (800â€‰nm Light-Emitting Diode) Treatment Promotes Bone Mesenchymal Stem Cell Proliferation Via Long Noncoding RNA MEG3-MicroRNA-217-5P Pathway. Background: Patients with osteoporosis (OP) have a high risk of bone fracture. Abnormal bone mesenchymal stem cell (BMSC) differentiation is an essential process of OP development. In recent years, photobiomodulation has been shown to effectively promote BMSC proliferation. However, the mechanism by which photobiomodulation promotes BMSC proliferation is unclear. Long noncoding RNAs (lncRNAs) are essential mediators in multiple biological processes. The lncRNA maternally expressed gene 3 (MEG3) is a novel lncRNA gene and is related to cell proliferation. Studies have indicated that MEG3 serves as a promotor in BMSC proliferation. Objective: To investigate the effects and mechanisms of 800â€‰nm light-emitting diode (LED) photobiomodulation in BMSC proliferation. Materials and methods: The BMSCs collected from mouse tibias and femurs were irradiated by 800â€‰nm LED for 180â€‰sec. CCK-8 assay was used to detect the cell viability. A dual-luciferase reporter assay was used to determine lncRNA MEG3 acted as a miR-217-5p sponge. We used reverse transcription-polymerase chain reaction (RT-PCR) and western blot to detect the mRNA and protein levels of MEG3, miR-217-5p, Notch2, Hes1, Hey2. Results: In the present study, we revealed that photobiomodulation (800â€‰nm LED) could increase the mRNA level of MEG3, and protein levels of Notch2, Hes1, and Hey2. Moreover, we also identified that upregulated MEG3 could act as a miR-217-5p sponge to activate the Notch signaling pathway. Conclusions: The current study revealed the MEG3-related mechanism of photobiomodulation treatment in OP and identified potential gene therapies for OP. MicroRNAs;RNA, Long Noncoding;RNA, Messenger;Basic Helix-Loop-Helix Transcription Factors Mice;Animals;MicroRNAs;RNA, Long Noncoding;Cell Proliferation;RNA, Messenger;Mesenchymal Stem Cells;Basic Helix-Loop-Helix Transcription Factors

Combination of Dental-Capping Agents with Low Level Laser Therapy Promotes Proliferation of Stem Cells from Apical Papilla. Background: Direct pulp capping is a vital pulp therapy, which stimulates differentiation of stem cells from apical papilla (SCAPs). SCAPs have multipotential capacity to differentiate into types of cells, contributing to the regeneration of tissues. Objective: Considering

the promising effects of dental-capping materials, we aim to investigate the effect of dental dressing materials combined with laser therapy on the percentage of SCAP viability and the consequent dental regeneration capacity. Methods: We collected two immature third molar teeth and isolated SCAPs through collagenase type I enzymatic activity. Isolated SCAPs were then cultured with Dulbecco's modified Eagle's medium and Î±-minimum essential medium enriched with 15% and 10% fetal bovine serum, respectively. After reaching 70-80% confluency, cells were seeded in a 96-well plate and then treated with mineral trioxide aggregate (MTA), enamel matrix derivative (EMD), biodentine, and low level laser therapy (LLLT) alone and in combination for 24, 48, and 168â€‰h. After that, cell survival rate was assessed using (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) (MTT) assay. Results: We found that combination of MTA, EMD, and LLLT as well as that of biodentine, EMD, and LLLT could lead to significant increase of SCAP viability as compared with other treatment groups. Combination of MTA and biodentine with EMD could also show increased level of SCAP proliferation and viability. However, MTA and biodentine alone reduced SCAP survival rate in all time points. Conclusions: Our conclusion is that LLLT can serve as an enhancer of SCAP proliferation and differentiation rate when added to dental-capping agents such as MTA, EMD, and biodentine. Thus, LLLT combination with effective capping materials will serve as a promising option for dental tissue repair. tricalcium silicate;Calcium Compounds Low-Level Light Therapy;Calcium Compounds;Stem Cells;Cell Proliferation

Effect of low-level laser therapy plus exercise therapy on pain, range of motion, muscle strength, and function in knee osteoarthritis - a systematic review and meta-analysis. BACKGROUND: Knee osteoarthritis (KOA) is commonly associated with multiple musculoskeletal impairments. OBJECTIVE: The purpose of this review was (1) to investigate the effectiveness of LLLT plus ET on pain, ROM, muscle strength, and function in KOA immediately after therapy and (2) whether the effectiveness of LLLT plus ET could be sustained at follow-up (4 - 32 weeks). METHODS: Six databases were systematically searched upto December 2021 to find relevant articles. Included studies were RCTs written in English, which compared LLLT plus ET with placebo LLLT plus ET in KOA. Three independent reviewers extracted data and assessed the quality of included studies. Standard mean difference (SMD) was used in meta-analysis using random effect model. RESULT: Of the 6307 articles, 14 RCTs (820 patients) met the inclusion criteria. The results demonstrated that there was a significant difference in pain immediately after therapy (SMD: -0.58, pâ€‰=â€‰0.001) and at follow-up (SMD: -1.35, pâ€‰=â€‰0.05) in LLLT plus ET group. There were no significant differences in knee ROM, muscle strength, and knee function outcomes immediately and at follow-up. CONCLUSION: Our findings indicate that LLLT plus ET could be considered to alleviate pain in the KOA. LLLT reduces pain at 4-8J with a wavelength of 640-905nm per point applied for 10-16 sessions at a frequency of 2 sessions/week. An exercise therapy program at prescribed dosage involving major muscle groups might help. However, LLLT plus ET is no more effective than placebo LLLT plus ET in improving ROM, muscle strength, and function in KOA. Humans;Osteoarthritis, Knee;Low-Level Light Therapy;Pain;Exercise Therapy;Range of Motion, Articular;Muscle Strength

Dramatic Reduction of Pain and Rapid Reepithelialization in an Acute Burn Wound Treated With Fractional CO 2 Laser After 11 Days of Injury. Humans;Burns;Lasers, Gas;Pain;Re-Epithelialization;Low-Level Light Therapy

The effects of low power laser light at 661Â nm on wound healing in a scratch assay fibroblast model. Wound treatment, especially for chronic and infected wounds, has been a permanent socio-economical challenge. This study aimed to investigate the ability of red light at 661Â nm to accelerate wound healing an in vitro wound model using 3T3 fibroblasts. The purpose is further specified in clarifying the mechanisms of wound closure by means of intracellular ROS production, proliferation and migration of cells, and cellular orientation. Illumination effects of red light from a diode laser

(661Â nm) at different doses on 3T3 cell viability was assessed via MTT assay and tested in a scratch wound model. Wound closure rates were calculated by image analysis at 0, 24, and 48Â h after laser treatment. ROS production was monitored and quantified immediately and 24Â h after the treatment by fluorescence microscopy. Cellular orientation was quantified by image analysis. No phototoxic energy doses used and increased cell viability in most of the groups. Scratch assay revealed an energy interval of 3Â -Â 4.5Â J/cm(2) that promote higher wound healing rate 24Â h post treatment. An increase in ROS production was also observed 24Â h post irradiation higher in the group with the highest wound healing rate. Also, cellular orientation toward the margin of the wound was observed and quantified after irradiation. Low power laser light at 661Â nm activated both the migration and proliferation in the in vitro model used, providing evidence that it could also accelerate wound healing in vivo. Also, ROS production and cellular orientation seem to play an important role in wound healing process. Reactive Oxygen Species Reactive Oxygen Species;Low-Level Light Therapy;Cell Proliferation;Wound Healing;Fibroblasts;Lasers, Semiconductor

Clinical Effect of Photobiomodulation on Wound Healing of Diabetic Foot Ulcers: Does Skin Color Needs to Be Considered? Diabetic foot ulcers (DFUs) are one of the most common complications of diabetes. DFUs impede patients' quality of life and are known to be unresponsive to conventional therapy. Photobiomodulation (PBM) is a pain-free, noninvasive treatment method that has been shown to promote chronic wound healing and has been successfully used for the treatment of DFUs. Since skin tone and color can affect the way light interacts with tissue, studies should take this into consideration when determining protocols for the use of PBM. This review is aimed at critically evaluating data of existing studies conducted to evaluate the clinical effect of PBM on DFUs, taking skin color into consideration. A literature search was conducted and resulted in articles on cell studies, animal studies, and clinical trials. Only 13 clinical trials and 2 clinical case studies were adopted and used in this review. All the clinical trials adopted for this review show evidence that PBM together with conventional treatment results in an increased healing rate of DFUs; however, only one study adjusted their protocol according to skin color. There are not enough studies conducted on people of color to determine the safety and efficacy of PBM therapy in such ethnic groups. Future randomized, placebo-controlled clinical trials are necessary on PBM and DFUs and should take skin color into consideration. Animals;Skin Pigmentation;Diabetic Foot;Quality of Life;Wound Healing;Skin;Diabetes Mellitus

Effects of therapeutic interventions on pain due to plantar fasciitis: A systematic review and meta-analysis. OBJECTIVE: To determine the effects of different therapeutic interventions that have ever been evaluated in randomized controlled trials on pain due to plantar fasciitis. METHODS: We searched different electronic databases until September 2022. Mean differences (MDs) and 95% confidence intervals (CIs) were calculated. The Grading of Recommendations Assessment, Development and Evaluation was used to evaluate the overall certainty evidence. RESULTS: A total of 236 studies met the study criteria, including 15,401 patients. Botulinum toxin MD -2.14 (CI: -4.15, -0.14), micronized dehydrated human amnion/chorion membrane injection MD -3.31 (CI: -5.54, -1.08), dry needling MD -2.34 (CI: -4.64, -0.04), low-dye taping MD -3.60 (CI: -4.16, -3.03), low-level laser therapy MD -2.09 (CI: -2.28, -1.90), myofascial releases MD -1.79 (CI: -2.63, -0.94), platelet-rich plasma MD -2.40 (CI: -4.16, -0.63), radiofrequency MD -2.47 (CI: -4.65, -0.29), and stretching MD -1.14 (CI: -2.02, -0.26) resulted in being effective treatments for pain when compared to the control in the short term. In the medium and long term, only extracorporeal shock wave therapy MD -0.97 (CI: -1.13, -0.81)/MD -2.49 (CI: -3.17, -1.82) was effective for improving pain when compared to the control. CONCLUSIONS: Considering the available studies, this systematic review and meta-analysis showed that different therapeutic interventions seem to be useful strategies for improving pain in patients with plantar fasciitis. In the medium and long term, only extracorporeal shock wave therapy

was effective in improving pain when compared to the control. Humans;Fasciitis, Plantar;Pain Management;Pain;Extracorporeal Shockwave Therapy;Treatment Outcome
Lights for epilepsy: can photobiomodulation reduce seizures and offer neuroprotection? Epilepsy is synonymous with individuals suffering repeated "fits" or seizures. The seizures are triggered by bursts of abnormal neuronal activity, across either the cerebral cortex and/or the hippocampus. In addition, the seizure sites are characterized by considerable neuronal death. Although the factors that generate this abnormal activity and death are not entirely clear, recent evidence indicates that mitochondrial dysfunction plays a central role. Current treatment options include drug therapy, which aims to suppress the abnormal neuronal activity, or surgical intervention, which involves the removal of the brain region generating the seizure activity. However, ~30% of patients are unresponsive to the drugs, while the surgery option is invasive and has a morbidity risk. Hence, there is a need for the development of an effective non-pharmacological and non-invasive treatment for this disorder, one that has few side effects. In this review, we consider the effectiveness of a potential new treatment for epilepsy, known as photobiomodulation, the use of red to near-infrared light on body tissues. Recent studies in animal models have shown that photobiomodulation reduces seizure-like activity and improves neuronal survival. Further, it has an excellent safety record, with little or no evidence of side effects, and it is non-invasive. Taken all together, this treatment appears to be an ideal treatment option for patients suffering from epilepsy, which is certainly worthy of further consideration.
Laser Therapy as a Treatment for Chronic Radiation Fibrosis A Commentary. Humans;Radiation Fibrosis Syndrome;Laser Therapy;Low-Level Light Therapy;Lasers, Gas;Treatment Outcome;Cicatrix
Is low-level laser therapy effective for patients with knee joint osteoarthritis? implications and strategies to promote laser therapy usage.
Efficacy of stabilisation splint and low-level laser therapy for patients with chronic closed lock from non-reducible displacedÂ temporo-mandibular joint discs: A parallel randomised clinical trial. BACKGROUND: Stabilisation splint therapy (SST) and low-level laser therapy (LLLT) are effective-invasive treatment for temporo-mandibular disorder (TMD) patients. However, the specific efficacy of each therapy in patients with chronic closed lock (CCL) from temporo-mandibular joints (TMJ) disc displacement without reduction (DDwoR) remains unknown. OBJECTIVES: The aim of this study was to assess and compare the efficacy of SST and LLLT alone or in combination in patients with CCL from TMJ DDwoR. METHODS: This parallel randomised clinical trial included 42 patients who were diagnosed with CCL from TMJ DDwoR. Patients were allocated equally and randomly into three treatment groups: group I received combined SST and LLLT, group II received LLLT and group III received SST. Maximum mouth opening (MMO), visual analogue scale (VAS), muscle and joint palpation scores and time required to achieve normal state were evaluated at baseline, 1, 2, 4â€‰weeks, 3 and 6Â months after the intervention. Data were collected and analysed using SPSS software. RESULTS: Regarding MMO and VAS, a statistically significant improvement was found between group I versus group II and versus group III at all evaluation times. Regarding muscle and joint palpation scores, a statistically significant difference was found between group I versus group III, while non-significant difference was found between group I and group II. A statistically significant faster improvement was found in group I versus group III and versus group II. CONCLUSION: All treatment modalities can be effective in management of CCL from a TMJ DDwoR cases, but the combined SST and LLLT group seems to provide the best and quickest improvement. CLINICAL TRIAL REGISTRATION NUMBER: NCT05548894. Humans;Splints;Low-Level Light Therapy;Temporomandibular Joint Disc;Temporomandibular Joint Disorders;Occlusal Splints;Treatment Outcome;Cartilage Diseases;Temporomandibular Joint

Can the use of photobiomodulation for localized fat reduction induce changes in lipid profile? A critical integrative review. The objective of this study is to clarify whether PBM for measures reduction can cause significant changes in the lipid profile. This is an integrative review and only original articles, both in vivo and clinical trials, that were published between 2010 and 2022 were selected. The article references were also analyzed to identify additional studies. A total of 15 articles were critically analyzed. The wavelength used ranged from 532Â nm (green) to 956Â nm (near infrared), and many authors failed to describe dosimetric parameters properly, as well as other important characteristics for the reproducibility of those found. Although it is not fully clear about the PBM interference level on the lipid profile, in general, there was no significant difference in lipid parameters when PBM was used alone, and when associated with techniques that promote beta-oxidation, there was an improvement in these biochemical variables. PBM use for localized fat reduction do not affect lipid serum levels. Clinical trials using standardized parameters are crucial to obtain more reliable results. Lipids Reproducibility of Results;Low-Level Light Therapy;Lipids

Use of infrared photobiomodulation with low-level laser therapy for reduction of bleaching-induced tooth sensitivity after in-office bleaching: a double-blind, randomized controlled trial. The purpose of this study is to evaluate the use of infrared photobiomodulation with low-level laser therapy (PBM) to reduce bleaching-induced tooth sensitivity (TS) after in-office bleaching. Eighty-three participants were randomized in blocks into two groups. In the experimental group, the patients received an application after each session of in-office bleaching (35% hydrogen peroxide, 1â€‰Ã—â€‰50Â min; 2 sessions with 1-week interval), while the laser application was simulated in the control group. The PBM system was operated in continuous mode, using 3Â J of energy. A dose of 100Â J/cm(2) was applied for 30Â s with 808Â nm (100 mW of power) in the middle third of the crown. The risk and intensity of TS were recorded immediately after bleaching, 1Â h, 24Â h, and 48Â h after each bleaching session, with a visual scale analog (0-10) and a five-point numerical scale (0-4). The color was recorded at the beginning, weekly, and 1Â month after the end of the bleaching (VITA Classical, VITA Bleachedguide, and digital spectrophotometer). The risk of TS was 98% (95% CI 88 to 99%) for the laser group and 95% (95% CI 83 to 99%) for the control (RRâ€‰=â€‰1.03; 95% CI 0.94 to 1.12; pâ€‰=â€‰1.0). Similarly, no difference in the intensity of TS was detected for both pain scales (pâ€‰>â€‰0.65). Improvement in color change, regardless of the group, was observed (pâ€‰>â€‰0.15).Â The application of an PBM did not reduce the risk and intensity of TS when applied after the procedure using the parameters recommended by the manufacturer.Trial registration number and date of registration: RBR-4HCVSG-04/06/2019. Tooth Bleaching Agents;Hydrogen Peroxide Humans;Dentin Sensitivity;Tooth Bleaching Agents;Low-Level Light Therapy;Treatment Outcome;Tooth Bleaching;Hydrogen Peroxide

Photobiomodulation enhanced endogenous pain modulation in healthy volunteers. To examine the effects of photobiomodulation (PBM) in healthy volunteers using photonic stimulation of acupuncture points on conditioned pain modulation (CPM), temporal summation of pain (TSP), and offset analgesia (OA), which reflect some aspects of endogenous pain modulation. We included 15 men and 15 women (age, 31.5 [27.3-37.0], body mass index, 25.7 [24.4-27.1], Fitzpatrick skin typing, II: 20, III: 8, IV: 2). CPM, TSP, and OA were evaluated after a sham procedure (control session) and after acupuncture point stimulation (LI4 and LI10 on the non-dominant forearm) using linear polarized near-infrared light irradiation (LPNILI; wavelengths peaked at approximately 1000 nm, output: 1.4 W/cm(2), spot diameter: 10 mm, spot size: 1.02 cm(2), maximum temperature: 40.5 Â°C, pulse width: 1 s, frequency: 0.2 Hz) (PBM session). Differences in CPM, TSP, and OA between the two sessions were evaluated by the paired t-test and Fisher's exact test (statistical significance: $p < 0.05$). Values indicate median [interquartile range]. LPNILI significantly increased CPM in all participants (control session: 12.1 [-4.5-37.4], PBM session: 23.9 [8.3-44.8], $p < 0.05$) and women (control session:

16.7 [-3.4-36.6], PBM session: 38.7 [24.6-52.1], p < 0.05). The CPM effect increment was significantly higher in women than in men (p = 0.0253). LPNILI decreased TSP in participants with higher TSP ratios (p = 0.0219) and increased OA in participants with lower OA scores (p = 0.0021). LPNILI enhanced endogenous pain modulation in healthy volunteers, particularly in women, as evaluated using CPM. CPM, TSP, and OA evaluations are potentially useful for discriminating PBM responders from non-responders. Male;Humans;Female;Adult;Pain Threshold;Healthy Volunteers;Pain Measurement;Pain;Pain Management

NF-ÎºB-mediated anti-inflammatory effects of an organic light-emitting diode (OLED) device in lipopolysaccharide (LPS)-induced in vitro and in vivo inflammation models. Inflammation is the body's physiological response to harmful agents. However, if not regulated properly, inflammation can become pathological. Macrophages are key players in the inflammatory process, and modulate the immune response. Due to the side effects of anti-inflammatory drugs, non-pharmaceutical therapies for inflammatory diseases must be developed. Photobiomodulation is a non-invasive therapeutic approach to treating certain pathological conditions using light energy. Light-emitting diodes (LEDs) are commonly used as light sources for photobiomodulation treatment, but their clinical applications are limited. Organic LEDs (OLEDs) are thin, lightweight and flexible, enabling consistent and even delivery of light energy to target areas; this makes OLED promising components for therapeutic devices. In the present study, we examined the effects of OLED treatment on inflammation in vitro using a lipopolysaccharide (LPS)-induced macrophage RAW264.7 cell model, and in vivo using a pinna skin mouse model. We found that LPS-induced morphological changes and inflammatory cytokine expression were significantly reduced in RAW264.7 cells subjected to OLED treatment compared to the LPS-induced controls. This work provides evidence for the anti-inflammatory effects of OLEDs, demonstrating their potential to be incorporated into medical devices in the future. Anti-Inflammatory Agents;Lipopolysaccharides;NF-kappa B Animals;Mice;Anti-Inflammatory Agents;Inflammation;Lipopolysaccharides;NF-kappa B;RAW 264.7 Cells;Low-Level Light Therapy;Lasers, Semiconductor;Disease Models, Animal

The effectiveness of phototherapy for surface decontamination against SARS-Cov-2. A systematic review. COVID-19 appeared in December 2019, needing efforts of science. Besides, a range of light therapies (photodynamic therapy, ultraviolet [UV], laser) has shown scientific alternatives to conventional decontamination therapies. Investigating the efficacy of light-based therapies for environment decontamination against SARS-CoV2, a PRISMA systematic review of Phototherapies against SARS-CoV or MERS-CoV species discussing changes in viral RT-PCR was done. After searching MEDLINE/PubMed, EMBASE, and Literatura Latino-Americana e do Caribe em CiÃªncias da SaÃºde we have found studies about cell cultures irradiation (18), blood components irradiation (10), N95 masks decontamination (03), inanimate surface decontamination (03), aerosols decontamination (03), hospital rooms irradiation (01) with PDT, LED, and UV therapy. The best quality results showed an effective low time and dose UV irradiation for environments and inanimate surfaces without human persons as long as the devices have safety elements dependent on the surfaces, viral charge, humidity, radiant exposure. To interpersonal contamination in humans, PDT or LED therapy seems very promising and are encouraged. RNA, Viral Humans;SARS-CoV-2;COVID-19;Decontamination;RNA, Viral;Phototherapy;Ultraviolet Rays

Twelve-Month Follow-Up of Different Dentinal Hypersensitivity Treatments by Photobiomodulation Therapy, Nd:YAG and Nd:YAP Lasers. In this retrospective study, data for three different laser-assisted approaches for the management of dentinal hypersensitivity (DH) was collected (n = 920 teeth). In total, 387 teeth were treated with photobiomodulation (PBM) therapy with 660 nm red light laser (PBM group), 327 were treated with the Nd:YAG laser (1064 nm) and 206 were treated with the Nd:YAP laser (1340 nm). To assess the effectiveness of each treatment, a visual analogue

scale (VAS) was used, where zero represented no pain at all and ten represented the greatest pain. VAS was used before (T0), immediately after (T1), one week after (T2), four weeks after (T3), six months after (T4) and one year after treatment (T5). Means and standard deviations of VAS at different follow-up times were calculated. Values were compared within and between groups. Statistical significance was considered to be achieved when p-value was less than 0.05. Confidence level was proposed to be 99% with a P value lower than 0.001. Within groups, a statistically significant reduction was obtained when the mean value of VAS at T0 was compared with T5. At T5, the PBM group had the highest reduction of VAS (with mean value of 0), while the Nd:YAG and Nd:YAP groups had scores of 1.065 Â± 0.674 and 4.665 Â± 0.674, respectively. Conclusion: this retrospective study showed that PBM therapy and irradiation with Nd:YAG and Nd:YAP lasers are effective in managing DH pain. However, PBM therapy was the only procedure that showed complete pain relief at six and twelve months after treatment.

Photobiomodulation Attenuated Cognitive Dysfunction and Neuroinflammation in a Prenatal Valproic Acid-Induced Autism Spectrum Disorder Mouse Model. Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by social communication and interaction disorders, as well as repetitive and restrictive behaviors. To date, no effective treatment strategies have been identified. However, photobiomodulation (PBM) is emerging as a promising treatment for neurological and neuropsychiatric disorders. We used mice exposed to valproic acid (VPA) as a model of ASD and found that pathological behavioral and histological changes that may have been induced by VPA were attenuated by PBM treatment. Pregnant mice that had been exposed to VPA were treated with PBM three times. Thereafter, we evaluated the offspring for developmental disorders, motor function, hyperactivity, repetitive behaviors, and cognitive impairment. PBM attenuated many of the pathological behaviors observed in the VPA-induced ASD mouse model. In addition, pathophysiological analyses confirmed that the increase in activated microglia and astrocytes observed in the VPA-induced ASD mouse model was attenuated by PBM treatment. This suggests that PBM can counteract the behavioral changes caused by neuroinflammation in ASD. Therefore, our data show that PBM has therapeutic potential and may reduce the prevalence of neurodevelopmental disorders such as ASD. Valproic Acid Pregnancy;Female;Mice;Animals;Humans;Valproic Acid;Autism Spectrum Disorder;Neuroinflammatory Diseases;Social Behavior;Behavior, Animal;Disease Models, Animal;Cognitive Dysfunction;Prenatal Exposure Delayed Effects

Does Photobiomodulation Affects CK10 and CK14 in Oral Mucositis Radioinduced Repair? The mechanisms of action of photobiomodulation (PBM) in oral mucositis (OM) are not completely elucidated. To enlighten the role of PBM in the evolution of epithelial maturity in OM ulcers, the present study evaluated the effect of PBM with red (Î») wavelength of 660 nanometers (nm) and infrared of 780 nm in radio-induced OM wounds on the tongue of rats, eight and twenty days after irradiation with single dose of 20 Gy. The percentage area corresponding to positive staining for cytokeratin 10 (CK10) and 14 (CK14) proteins was evaluated in the epithelial area of the lesions, using an immunohistochemical technique (IHC), 8 and 20 days after the induction of lesions, and compared with an untreated control group. CK10 was significantly more expressed in the group treated with 660 nm PBM. CK14 did not show quantitative differences between the groups evaluated. However, whereas in the groups treated with PBM, CK14 was already restricted to the basal layer of the epithelium, as expected in healthy epithelia, in control group it was also expressed in upper layers of the epithelium. In this work, PBM was able to improve epithelial maturity of the repaired OM wound, especially in the 660 nm group. Rats;Animals;Low-Level Light Therapy;Stomatitis;Health Status

590 nm LED Irradiation Improved Erythema through Inhibiting Angiogenesis of Human Microvascular Endothelial Cells and Ameliorated Pigmentation in Melasma. Melasma is a common refractory acquired pigmentary skin disease that mainly affects middle-aged women. The pathogenesis of melasma is still uncertain, while abnormal vascular endothelial cells may play a role. We previously demonstrated the yellow light of light-emitting diodes (LED) could inhibit melanogenesis through the photobiomodulation (PBM) of melanocytes and keratinocytes. In the current study, we investigated the effect of 590 nm LED on the function of human microvascular endothelial cells (HMEC-1). We revealed 0-40 J/cm(2) 590 nm LED had no toxic effect on HMEC-1 in vitro. 590 nm LED irradiation significantly reduced cell migration, tube formation, as well as the expression of vascular endothelial growth factor (VEGF) and stem cell factor (SCF), a pro-melanogenic factor. Moreover, we illustrated that 590 nm LED inhibited the phosphorylation of the AKT/PI3K/mTOR signaling pathway, and the inhibitory effect on HMEC-1 could be partially reversed by insulin-like growth factor 1 (IGF-1), an AKT/PI3K/mTOR pathway agonist. Besides, we conducted a pilot clinical study and observed a marked improvement on facial erythema and pigmentation in melasma patients after amber LED phototherapy. Taken together, 590 nm LED inhibited HMEC-1 migration, tube formation and the secretion of VEGF and SCF, predominantly through the inhibition of the AKT/PI3K/mTOR pathway, which may serve as a novel therapeutic option for melasma. Vascular Endothelial Growth Factor A;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases;Phosphatidylinositol 3-Kinases Middle Aged;Humans;Female;Vascular Endothelial Growth Factor A;Proto-Oncogene Proteins c-akt;Endothelial Cells;Melanosis;Erythema;TOR Serine-Threonine Kinases;Pigmentation;Phosphatidylinositol 3-Kinases

Considerations for the Use of Photobiomodulation in the Treatment of Retinal Diseases. Photobiomodulation (PBM) refers to the beneficial effect produced from low-energy light irradiation on target cells or tissues. Increasing evidence in the literature suggests that PBM plays a positive role in the treatment of retinal diseases. However, there is great variation in the light sources and illumination parameters used in different studies, resulting in significantly different conclusions regarding PBM's therapeutic effects. In addition, the mechanism by which PBM improves retinal function has not been fully elucidated. In this study, we conducted a narrative review of the published literature on PBM for treating retinal diseases and summarized the key illumination parameters used in PBM. Furthermore, we explored the potential molecular mechanisms of PBM at the retinal cellular level with the goal of providing evidence for the improved utilization of PBM in the treatment of retinal diseases. Humans;Low-Level Light Therapy;Retina;Retinal Diseases;Neurons

Predictability of Invisalign(Â®) Clear Aligners Using OrthoPulse(Â®): A Retrospective Study. This preliminary retrospective study evaluates how effective the OrthoPulse(Â®) (Biolux Technology, Austria) is in increasing the predictability of orthodontic treatment in patients treated with Invisalign(Â®) clear aligners (Align Technology Inc., Tempe, AZ, USA). A group of 376 patients were treated with Invisalign(Â®) orthodontic clear aligners in association with an OrthoPulse(Â®). The OrthoPulse(Â®) was prescribed for 10 min a day for the entire duration of the orthodontic treatment. The OrthoPulse(Â®) App remotely tracked the percentage compliance of each patient. The number of aligners planned with the ClinCheck software at the beginning of the treatment and the number of total aligners (including the adjunctive aligners) used to finish the treatment were then considered. After applying inclusion/exclusion criteria, a total of 40 patients remained in the study and were compared with a control group of 40 patients with the same characteristics as the study group. A statistical analysis was carried out to investigate whether using OrthoPulse(Â®) led to a statistical reduction in the number of adjunctive aligners, thus leading to a more accurate prediction of the treatment. The statistical analysis showed that patients who used OrthoPulse(Â®) needed fewer

finishing aligners and a greater predictability of the treatment was obtained. In fact, in the treated group the average number of additional aligners represented 66.5% of the initial aligners, whereas in the control group 103.4% of the initially planned aligners were needed. In conclusion, in patients treated with clear aligners, OrthoPulse(Â®) would appear to increase the predictability of orthodontic treatment with clear aligners, thus reducing the number of finishing phase requirements.

Effect of Photobiomodulation on Atrophic-Erosive Clinical Forms of Oral Lichen Planus: A Systematic Review. INTRODUCTION: Oral lichen planus is a chronic autoimmune inflammatory disease of unknown origin, characterized by various clinical forms of which the atrophic-erosive causes patients the greatest symptomatology. For this reason, there are different treatments that improve the associated signs and symptoms. One of these therapies is photobiomodulation (PBM), which, although new, has a high level of acceptance in dentistry based on evidence. However, there are inconsistent results in its application against lichen planus. The aim of this review was to evaluate the effect of photobiomodulation and its effectiveness as a therapeutic alternative for atrophic-erosive lesions. MATERIAL AND METHODS: The databases PubMed, Google Scholar and Cochrane Library were searched to identify studies investigating the photobiomodulation treatment in atrophic-erosive lesions of oral lichen planus. A total of 294 articles were identified, published between 2017 and 2022, and then evaluated; 7 articles that met all the inclusion criteria were included in this study. RESULTS: The type of laser light source used in PBM was the diode laser (four cases), the Nd-YAG laser at the same wavelength of 1064 nm (two cases) and the He-Ne laser (one case). The minimum and maximum wavelengths used were 630 nm and 1064 nm, respectively. Most studies used lesions treated with topical corticosteroids as a control group. The follow-up times of the studies were highly variable. CONCLUSIONS: Photobiomodulation is a treatment that competently combats oral lichen planus lesions by improving signs and symptoms, with no known adverse reactions so far, which makes it more beneficial compared to more conventional therapies, such as corticosteroids, for which side effects have been found.

Photobiomodulation Associated With Conservative Treatment for Achilles Tendon Rupture: A Double-Blind, Superiority, Randomized Controlled Trial. OBJECTIVE: To investigate the effects of photobiomodulation on Achilles tendon rupture (ATR) treated conservatively. DESIGN: Prospective, patient- and assessor-blinded, parallel, randomized controlled trial. SETTING: Patients with acute ATR treated conservatively. PARTICIPANTS: Thirty-four male individuals with acute unilateral ATR treated conservatively (N=34), equally divided in 2 groups: photobiomodulation group (PBMG) and sham group, with mean age of 45.5Â±9.47 and 48.7Â±8.38 years, respectively. INTERVENTION: All participants underwent through an immobilization period, followed by rehabilitation sessions (2 d/wk for 12 weeks) comprising strengthening, range of motion, and balance/weightbearing exercises. In PBMG, the tendon was irradiated with a photobiomodulation cluster (1 904 nm/50 mW infrared laser, 4 858 nm/50 mW infrared diodes, and 4 658 nm/40 mW red diodes; power density of 105 mW/cm(2) per cluster area) during the immobilization period (2 d/wk for 8 weeks) and the sham group received a simulation of the procedure with no irradiation. Outcomes were assessed at the removal of the immobilization 12 and 16 weeks after tendon rupture. MAIN OUTCOME MEASURES: Primary outcome was the Achilles Tendon Rupture Score. Secondary outcomes included Numerical Pain Rating Scale at rest and during effort, plantar flexor strength, and ankle range of motion. RESULTS: Both groups demonstrated an increase in the Achilles Tendon Rupture Score and improvements in range of motion, plantar flexor strength, and pain. There were no significant differences in outcomes between the 2 groups (P>.05) except in pain during walking, which was significantly lower in the PBMG in week 12 (P<.01, effect size=0.56) and week 16 (P<.01, effect size=0.55). CONCLUSION: Photobiomodulation associated with conservative treatment is not superior to conservative treatment alone for improving function in patients with acute ATR.

The associations between diode laser (810â€‰nm) therapy and chronic wound healing and pain relief: Light into the chronic wound patient's life. Chronic wounds have become one of the major issues in medicine today, the treatments for which include dressing changes, negative pressure wound therapy, hyperbaric oxygen, light irradiation, surgery and so forth. Nevertheless, the application of diode lasers in chronic wounds has rarely been reported. This retrospective cohort study aimed to evaluate the therapeutic effect of diode laser (810â€‰nm) irradiation on chronic wounds. Eighty-nine patients were enrolled in the study. The control group (41 patients) received traditional dressing change therapy, while the diode laser treatment group (48 patients) were patients received additional treatment with diode laser (810â€‰nm) irradiation for 10Â min at each dressing change. Wound healing time was compared between two groups, while the pain relief index was creatively introduced to evaluate the effect of relieving wound pain, which was calculated by the difference in pain scores between the first and last dressing changes divided by the number of treatment days. The wound healing time of the diode laser treatment group was 22.71â€‰Â±â€‰8.99â€‰days, which was significantly shorter than that of the control group (37.44â€‰Â±â€‰23.42â€‰days). The pain relief index of the diode laser treatment group was 0.081â€‰Â±â€‰0.055, which was significantly increased compared with that of the control group (0.057â€‰Â±â€‰0.033). Our findings suggest that diode laser irradiation has the potential to promote healing in chronic wounds and relieve wound pain. Humans;Wound Healing;Lasers, Semiconductor;Retrospective Studies;Low-Level Light Therapy;Pain;Laser Therapy

Photobiomodulation in dental implant stability and post-surgical healing and inflammation. A randomised double-blind study. BACKGROUND: The aim of this randomized clinical trial was to evaluate the effect of diode laser photobiomodulation (PBM) on post-surgical healing, inflammation and implant stability. METHODS: Forty dental implants were inserted into 13 patients. The implants were randomly divided into two groups. The test group (PBM+) underwent two sessions of PBM (combined diode laser of 630 and 808â€‰nm), the first of which after surgery, and the second, 7â€‰days after the surgical procedure. The control group (PBM-) received simulated laser treatment. The implant stability quotient (ISQ) was determined immediately after the surgical procedure, and 7â€‰days, 4 and 8â€‰weeks later. Post-surgical inflammation was assessed following the criteria described by Bloemen and Cols. Healing was calculated using the healing index (HI). RESULTS: No differences were found in terms of the mean values of implant stability between the test and control groups over time. Only two of the implants (18.2%) from the PBM- group were classified with the maximum healing index (HIÂ =Â 5), whereas in the PBM+ group, nine implants (45%) were classified with the aforementioned index (Pâ€‰<â€‰0.0001). Using the logistic regression, it was determined that the non-application of the laser in the PBM- group caused an OR of 4.333 times of presenting inflammation (IC95% 1.150-16.323; PÂ =Â 0.030). CONCLUSIONS: The application of 808â€‰nm infra-red laser for bone tissue, and 630â€‰nm for mucosal tissue in two sessions is considered to be an effective way of reducing inflammation and improving early healing. More studies are needed to confirm these results. Dental Implants Humans;Dental Implants;Double-Blind Method;Dental Implantation, Endosseous;Lasers, Semiconductor;Bone and Bones;Low-Level Light Therapy

Investigating effects of locally applied boric acid on fracture healing with and without low-level laser therapy. This study aimed to investigate the effects on fracture healing of locally applied boric acid (BA) with and without low-level laser therapy (LLLT). A unicortical femoral defect was surgically created on the anterolateral surface of proximal femur of each subject. The subjects, totaling 56 Wistar albino rats, were randomly allocated into four groups (nâ€‰=â€‰14 each): control, LLLT (Î»â€‰=â€‰905Â Î¼m, 10,000Â Hz, 25 mW, and peak power 25Â W), BA (40Â mg/kg), and BAâ€‰+â€‰LLLT groups. On the 30th day, the highest radiological score was recorded for the BAÂ +

LLLT group (3.63 [2-4]), followed by the BA (3.38 [2.75-3.75]), control (3 [2-3.25]), and LLLT (2.5 [1.25-3]) groups. On days 15 and 30 post-surgery, malondialdehyde levels were significantly lower among the BAâ€‰+â€‰LLLT group compared to the control group (pâ€‰<â€‰0.001). On day 30, superoxide dismutase, catalase, and alkaline phosphatase levels were highest in the BAâ€‰+â€‰LLLT group compared to the control group (pâ€‰<â€‰0.001). When the histopathological, immunofluorescence, and immunohistochemical findings on the 15th and 30th days were compared with the control group, a statistically significant difference was found for the BA and BAâ€‰+â€‰LLLT groups (p Ë, 0.05). This study suggests that locally applied BA with LLLT may accelerate fracture healing. boric acid;Boric Acids Animals;Rats;Boric Acids;Fracture Healing;Laser Therapy;Low-Level Light Therapy;Rats, Wistar

Aiming to personalized laser therapy for nevus of Ota: melanin distribution dependent parameter optimization. Aiming to the personalized laser therapy of nevus of Ota (NO), a local thermal non-equilibrium model was employed to optimize laser wavelength, pulse duration, and energy density under different melanin depth and volume fraction. According to our simulation, the optimal pulse duration is between 15 and 150Â ns to limit heat transfer inside the hyperplastic melanin, and 50Â ns is recommended to decrease the energy absorption by normal melanin in epidermis. Correlations of the minimum and the maximum energy densities are proposed with respect to melanin depth and volume fraction for the 755-nm and 1064-nm lasers. For the same NO type, the therapy window of the 755-nm laser is larger than that of 1064-nm. For NO with shallow depth or low volume fraction, the 755-nm laser is recommended to make the treatment more stable owing to its lager therapy window. For deeper depth or higher volume fraction, the 1064-nm laser is recommended to avoid thermal damage of epidermis. Through comparison with clinical data, the optimized laser parameters are proved practicable since high cure rate can be achieved when energy density falls into the range of predicted therapy window. With developing of non-invasive measurement technology of melanin content and distribution, personalized treatment of NO maybe possible in the near future. Melanins Humans;Nevus of Ota;Melanins;Laser Therapy;Low-Level Light Therapy;Skin Neoplasms

Photobiomodulation treatment inhibits neurotoxic astrocytic polarization and protects neurons in in vitro and in vivo stroke models. The beneficial effects of photobiomodulation (PBM) on function recovery after stroke have been well-established, while its molecular and cellular mechanisms remain to be elucidated. The current study was designed to investigate the effect of PBM on synaptic proteins and astrocyte polarization of photothrombotic (PT)-stroke induced rats in vivo, and explore the possible effect of PBM treatment on oxygen-glucose deprivation (OGD)-induced neurotoxic astrocytic polarization in vitro. We reported that 2-min PBM treatment (808Â nm) for 7 days significantly increased synaptic proteins and neuroprotective astrocytic marker S100 Calcium Binding Protein A10 (S100A10) and inhibited neurotoxic astrocytic marker C3d in the peri-infarct region after ischemic stroke. Cell culture studies of primary cortical neurons and N2a cells showed that single-dose PBM treatment could increase cellular viability, regulate the apoptotic proteins (Caspase 9, Bcl-xL and BAX) and preserve synaptic proteins following OGD exposure. Additionly, PBM decreased the levels of C3d, inducible nitric oxide synthase (iNOS) and interleukin 1Î² (IL-1Î²) on astrocytes exposed to OGD. In summary, we demonstrated that PBM could inhibit neurotoxic astrocytic polarization, preserve synaptic integrity and protect neurons against stroke injury both in vitro and in vivo. Apoptosis Regulatory Proteins;Glucose;Oxygen Rats;Animals;Astrocytes;Stroke;Neurons;Apoptosis Regulatory Proteins;Glucose;Oxygen

[Low-level laser therapy in oncology - what's new? Analysis of 2018-2021 publications]. Low-level laser therapy (LLLT) is included in the Federal project Â«Fight against oncological diseasesÂ», which provides for equipping all specialized medical institutions in Russia with the appropriate

devices until 2026. PURPOSE OF THE STUDY: Publications analysis on the use of LLLT in oncology. MATERIAL AND METHODS: To search for publications, databases and libraries were used: PubMed, Scopus, ResearchGate, Google Scholar, J-STAGE, eLibrary.ru for the period 2018-2021. For analysis, publications were selected that are of interest from the point of view of improving the methodology of LLLT, the prospects for the development of this method in the prevention, treatment and rehabilitation of patients. A total of 223 publications were found, including 39 reviews and meta-analyses, mostly in English (165) and Portuguese (41). RESULTS AND DISCUSSION: The inclusion of LLLT in the ISOO/MASCC/ASCO recommendations for the treatment of complications such as mucositis, salivary gland hypofunction and xerostomia caused by non-surgical methods of treating cancer patients should be considered as a promising trend. An extremely low level of quality of LLLT techniques was noted, most often the replacement with meaningless Â«dosesÂ», Â«fluencesÂ» instead of the necessary parameters: wavelength, operating mode, power, frequency, exposure, etc. The use of only local illumination instead of systemic methods of LLLT does not allow obtaining the best results of treatment and prevention. Eliminating the shortcomings of treatment protocols with a focus on Russian experience, when laser blood illumination (intravenously or externally) and laser acupuncture are also necessarily carried out with local illumination of the lesion, will bring the effectiveness of LLLT to a qualitatively new, higher level. Humans;Acupuncture Therapy;Laser Therapy;Low-Level Light Therapy;Neoplasms;Russia

Evaluation of the effects of photobiomodulation with different laser application doses on injection pain in children: a randomized clinical trial. The utilization of photobiomodulation (PBM) to decrease the experience of pain during the application of local anesthesia (LA) has been reported in a limited number of studies with children. However, currently, there is no complete consensus regarding its efficacy and application doses. The objective of the clinical trial was to assess the effects of PBM with three different laser application doses (with different power values) plus 10% lidocaine topical anesthetic and to compare them with placeboâ€‰+â€‰10% lidocaine topical anesthetic on LA injection pain in children. A prospective, parallel-arm, randomized, triple-blind clinical trial was conducted with 160 children aged 6 to 12Â years (79 girls and 81 boys; 80 maxillary and 80 mandibular primary first molars). The children were divided into 4 groups with an equal number of subjects in each group. Before topical anesthetic usage, a laser with a power of 0.3Â W, 0.4Â W, and 0.5Â W was applied in Groups 1, 2, and 3, respectively (a diode laser: 940Â nm; continuous mode; 20Â s for each group). The energy density was calculated as 69Â J/cm(2), 92Â J/cm(2), and 115Â J/cm(2). A placebo laser was used in the fourth group. Injection pain was assessed subjectively and objectively with the Wong-Baker Faces Pain Rating Scale (PRS) and the Face, Legs, Activity, Cry, Consolability (FLACC) Scale. The data were analyzed using the Chi-square test (Pâ€‰<â€‰0.05). The mean (Â±â€‰std) PRS scores were 1.35â€‰Â±â€‰1.075, 1.37â€‰Â±â€‰1.05, 1.07â€‰Â±â€‰1.04, and 2.07â€‰Â±â€‰1.09 for Groups 1, 2, and 3 and the placebo group, respectively. Additionally, the mean (Â±â€‰std) FLACC scores were 1.67â€‰Â±â€‰1.50, 1.62â€‰Â±â€‰1.90, 1.35â€‰Â±â€‰1.74, and 2.75â€‰Â±â€‰1.64 for Groups 1, 2, and 3 and the placebo group, respectively. Groups 1, 2, and 3 showed significantly lower pain scores than the placebo group (Pâ€‰=â€‰0.02). However, no significant difference was observed between Groups 1, 2, and 3 according to either pain scale score (Pâ€‰=â€‰0.948). In addition, no relationship was found in pain scores related to sex and jaw differences in any group (Pâ€‰=â€‰0.321, Pâ€‰=â€‰0.248). PBM delivered by a 940-nm diode laser plus 10% lidocaine topical anesthetic before the application of LA decreased injection pain regardless of the applied laser dose in this study. Anesthetics, Local;Lidocaine Child;Female;Humans;Male;Anesthetics, Local;Double-Blind Method;Lasers, Semiconductor;Lidocaine;Pain;Prospective Studies;Low-Level Light Therapy;Anesthesia, Local

Use of low-level laser therapy for patients with chronic rhinosinusitis: a single-blind, sham-controlled clinical trial. Chronic rhinosinusitis (CRS) is one of the most common conditions all over the world. The purpose of this study was to investigate the effects of low-level laser therapy (LLLT) in patients with CRS. Fourteen adult patients with CRS participated in this single-blind, sham-controlled clinical trial (12 male, mean age 40Â years). Patients received five successive sessions of sham laser followed by five successive sessions of real laser after 2Â days. Ga-Al-As laser of 830Â nm in a continuous mode at a power output of 30 mW and energy dose of 1Â J was applied on the cheeks and the forehead for the maxillary and frontal sinuses, respectively. Laser was delivered on six points over each sinus, each point for 33Â s. Four measurements were taken. The total symptom score (TSS) was calculated as the primary outcome measure. The effects of LLLT on TSS were evaluated by using repeated measure ANOVA. The percentage improvement of real laser and sham laser was compared by Wilcoxon signed ranked test. Cohen's d was used to calculate the effect size. Total symptom score significantly improved after real laser (pâ€‰=â€‰0.015, Cohen's dâ€‰=â€‰0.69). The percentage improvement for real laser (34.12â€‰Â±â€‰46.43) was significantly better than the sham laser (5.02â€‰Â±â€‰37.34, Zâ€‰=â€‰â€‰-â€‰2.23, pâ€‰=â€‰0.026). No significant improvements were observed after sham laser. This study indicates that five-session active LLLT when compared with sham is effective in the treatment of CRS symptoms. Adult;Humans;Male;Low-Level Light Therapy;Single-Blind Method;Chronic Disease;Double-Blind Method;Treatment Outcome

Efficacy and Safety of Low Fluence Nd:YAG Laser Treatment in Melasma: A Meta-Analysis and Systematic Review. BACKGROUND: Low-fluence, multisession therapy of Nd:YAG laser has been widely used for treating melasma. OBJECTIVE: To evaluate the efficacy and safety of low-fluence Nd:YAG laser toning for melasma using a systematic review and meta-analysis. METHODS: The PubMed, Web of Science, Embase, and Cochrane Library databases were searched till December 2020. A total of 50 studies (1,772 patients) and 66 studies were selected for the evaluation of the efficacy and complications, retrospectively. RESULTS: The mean Melasma Area and Severity Index/modified Melasma Area and Severity Index scores for laser toning as monotherapy at <4, 4 to <8, 8 to <12, 12 to <24, and â‰¥24 weeks after treatment compared with that at pretreatment were -0.51, -0.91, -0.97, -0.92, 0.01 SD, whereas those as combination therapy were -1.64, -1.26, -0.94, not available, -1.45 SD, respectively. An increase in light value and a decrease in relative lightness index have remained up to 8 weeks after laser toning. Complications including hypopigmentation/leukoderma, postinflammatory hyperpigmentation, and recurrence were noted. The incidence of hypopigmentation/leukoderma correlated with the number of laser sessions (p = .036). CONCLUSION: Low-fluence Nd:YAG laser toning as combination therapy has shown better efficacy than monotherapy and the efficacy seems to diminish with time. This study suggests the positive correlation of hypopigmentation/leukoderma with the number of laser sessions. Humans;Hypopigmentation;Low-Level Light Therapy;Melanosis;Retrospective Studies;Treatment Outcome

More light components and less light damage on rats' eyes: evidence for the photobiomodulation and spectral opponency. The blue-light hazard (BLH) has raised concerns with the increasing applications of white light-emitting diodes (LEDs). Many researchers believed that the shorter wavelength or more light components generally resulted in more severe retinal damage. In this study, based on the conventional phosphor-coated white LED, we added azure (484Â nm), cyan (511Â nm), and red (664Â nm) light to fabricate the low-hazard light source. The low-hazard light sources and conventional white LED illuminated 68 Sprague-Dawley (SD) rats for 7 days. Before and after light exposure, we measured the retinal function, thickness of retinal layers, and fundus photographs. The expression levels of autophagy-related proteins and the activities of oxidation-related biochemical indicators were also measured to investigate the mechanisms of damaging or protecting the retina.

With the same correlated color temperature (CCT), the low-hazard light source results in significantly less damage on the retinal function and photoreceptors, even if it has two times illuminance and blue-light hazard-weighted irradiance ([Formula: see text]) than conventional white LED. The results illustrated that [Formula: see text] proposed by IEC 62471 could not exactly evaluate the light damage on rats' retinas. We also figured out that more light components could result in less light damage, which provided evidence for the photobiomodulation (PBM) and spectral opponency on light damage. Rats;Animals;Rats, Sprague-Dawley;Light;Retina

Evaluating laser photobiomodulation for chemotherapy-induced peripheral neuropathy: a randomised phase II trial. PURPOSE: This study aims to evaluate the efficacy and safety of laser photobiomodulation (PBM) for treatment of established chemotherapy-induced peripheral neuropathy (CIPN) in cancer survivors. METHODS: We conducted a randomised phase II, non-comparative, sham-controlled, single-blinded clinical trial in 44 cancer survivors reporting CIPN symptoms at least 3Â months following completion of neurotoxic chemotherapy. Participants were randomised 2:1 to either PBM laser or sham control delivered twice weekly for 12 sessions. Assessments were conducted at baseline, the end of intervention (6Â weeks), and 6Â weeks post intervention (12Â weeks). Participants completed neuropathy, quality of life and function questionnaires, and a clinical neurological assessment. The primary outcome was proportion of participants with CIPN response, defined as either symptom resolution or reduction of minimally clinically important difference. RESULTS: In the laser and control groups, CIPN response rates wereâ€‰-â€‰48% and 53% at 6Â weeks and 45% and 33% at 12Â weeks, respectively. The null hypothesis that the true response rate is 5% in the laser arm was rejected at both 6 and 12Â weeks (pâ€‰<â€‰0.001 for both). Compared to baseline, patient-reported CIPN improved in both laser and control groups after the intervention. At 12Â weeks, improvement was sustained in the laser group and approaching baseline in the control group. Clinical signs, quality of life, and function remained stable in both groups. Low-grade "side-effects" were observed in both arms. CONCLUSION: PBM may offer clinically meaningful symptom benefit in cancer survivors with established CIPN with improvement potentially continuing beyond completion of the intervention. A larger study is warranted to evaluate this further. Antineoplastic Agents Humans;Antineoplastic Agents;Lasers;Peripheral Nervous System Diseases;Quality of Life

The effects of transcranial laser photobiomodulation and neuromuscular electrical stimulation in the treatment of post-stroke dysfunctions. Post-stroke sequelae includes loss functions, such as cognitive and sensory-motor which lead to emotional and social problems, reducing quality of life and well-being. The main aim of our study was to investigate the effects of transcranial laser photobiomodulation together with neuromuscular electrical stimulation (NMES) in post-stroke patients. We performed a clinical trial and an ex vivo study. For the clinical trial, hemiplegic patients were separated into two groups: Treated Group (TG): Hemiplegics treated with transcranial laser (on) associated with NMES (on) and; Placebo Group (PG): Hemiplegics treated with placebo transcranial laser (off) associated with NMES (on). The cluster prototype includes 12 diode laser beams (4 Ã—â€‰660â€‰nm, 4 Ã—â€‰808â€‰nm and 4 Ã—â€‰980â€‰nm) with average power of 720â€‰mW per cluster applied during one minute, leading to 43.2Â J energy per cluster. Fifteen regions for all head were irradiated by cluster, leading to 648â€‰J energy per session. The parameters of NMES of the paretic limbs to generate extension wrist and ankle dorsiflexion were symmetrical biphasic rectangular waveforms, 50â€‰Hz frequency, 250â€‰Î¼s pulse duration, and adjustable intensity to maintain the maximum range of motion (amplitude between 0 and 150â€‰mA). Our clinical trial showed improvement of cognitive function, pain relief, greater manual dexterity, enhancement of physical and social-emotional health which lead to better quality of life and well-being. There was also increased temperature in the treated regions with laser and NMES.

For the ex vivo study, the distribution of infrared and red radiation after penetration through the cranium and hemihead of cadavers were showed. Therefore, transcranial laser photobiomodulation associated with NMES can be an important therapeutic resource for rehabilitation after stroke.
Humans;Electric Stimulation;Electric Stimulation Therapy;Lasers;Quality of Life;Stroke;Stroke Rehabilitation;Treatment Outcome

Preconditioning Effects of Photobiomodulation on Repeated-Sprint Ability of Professional Basketball Players. Giovanini, B, Altimari, LR, de Paula Ramos, S, Alves Okazaki, VH, Okuno, NM, and Junior, AF. Preconditioning effects of photobiomodulation on repeated-sprint ability of professional basketball players. J Strength Cond Res 37(1): 224-229, 2023-The purpose of this study was to investigate the preconditioning effects of photobiomodulation on repeated-sprint ability of professional basketball players. Ten professional basketball players took part in this randomized, double-blind, placebo-controlled, crossover study. The subjects attended 2 repeated-sprint test sessions. In each session, the subjects performed a general warm-up, followed by a familiarization sprint. Afterward, the subjects received either the photobiomodulation (660 and 850 nm, 12 JÂ·cm-2, 83.4 J per point, 10 points, light-emitting diode [LED] treatment) or placebo intervention and performed the repeated-sprint test. The repeated-sprint test consisted of ten 30-m sprints with 1 change of direction (15 + 15 m), interspersed by 30 seconds of passive recovery. Sprint times and heart rate responses were monitored during the test. To compare moments and conditions, linear mixed-effects models were applied with statistical significance set at $p < 0.05$, and Cohen's d was used as effect size (ES). The LED treatment could not improve total time ($p = 0.662$; ES = -0.06), best time ($p = 0.869$; ES = 0.02), fatigue index ($p = 0.169$; ES = 0.64), or sprint decrement ($p = 0.124$; ES = -0.75) when compared with the placebo condition. In addition, mean heart rate ($p = 0.687$; ES = 0.07) and maximal heart rate ($p = 0.837$; ES = -0.03) were similar between conditions. We concluded that the LED condition could not improve the repeated-sprint ability of professional basketball players.
Humans;Basketball;Athletic Performance;Running;Cross-Over Studies;Fatigue

Laser-based therapy: Is the right answer for pulmonary vein isolation?
Humans;Pulmonary Veins;Atrial Fibrillation;Laser Therapy;Low-Level Light Therapy;Lasers;Catheter Ablation;Treatment Outcome;Recurrence

Low-Level Light Therapy in Association with Intense Pulsed Light for Meibomian Gland Dysfunction. PURPOSE: To study the clinical benefit of low-level light therapy when associated with intense pulsed light for the treatment of meibomian gland dysfunction. METHODS: An observational study. Two groups of patients that were treated with IPL were considered: group 1 (31 subjects, 62 eyes), intense pulsed light followed by low-level light therapy and group 2 (31 subjects, 62 eyes) intense pulsed light alone. In both groups, treatments were performed in 3 sessions and subjects were evaluated at baseline and 3 weeks after the last treatment session. Values are shown as mean difference Â± standard deviation. RESULTS: We observed a significant improvement in OSDI-12 score and lipid layer thickness, in both groups (-22.7Â±17.5, $p<0.001$ in group 1 and -23.6Â±23.8, $p<0.001$ in group 2 for OSDI and +18.6 Â± 37.0, $p<0.001$ in group 1 and +19.9 Â± 26.4, $p<0.001$ in group 2 for lipid layer thickness). Despite no differences between groups at baseline ($p=0.469$), only group 1 had a significant improvement in Schirmer test (+1.6Â±4.8, $p=0.009$ in group 1 and +1.7Â±6.9, $p=0.057$ in group 2). No significant side effects were noted. No patient in any group felt subjectively "worse" after the treatment. CONCLUSION: Intense pulsed light seems effective and safe for the treatment of meibomian gland dysfunction, improving symptoms and the tear film lipid layer. This study shows no strong evidence of the benefit of low-level light therapy, but it shows weak evidence that it may further improve aqueous tear production.

Effect of near-infrared and blue laser light on vero E6 cells SARS-CoV-2 infection model. Photobiomodulation therapy (PBMT) employing laser light has been emerging as a safe strategy to

challenge viruses. In this study the effect of blue and near-infrared (NIR) laser light was assessed in an in vitro model of SARS-CoV-2 infection. PBMT at blue wavelength inhibited viral amplification when the virus was directly irradiated and then transferred to cell culture and when cells already infected were treated. The NIR wavelength resulted less efficacious showing a minor effect on the reduction of the viral load. The cells receiving the irradiated virus or directly irradiated rescued their viability to level comparable to not treated cells. Virion integrity and antigenicity were preserved after blue and NIR irradiation, suggesting that the PBMT antiviral effect was not correlated to viral lipidic envelope disruption. Our results suggested that PBMT can be considered a valid strategy to counteract SARS-CoV-2 infection, at least in vitro. Animals;Chlorocebus aethiops;Humans;COVID-19;SARS-CoV-2;Vero Cells;Light;Lasers

Cellulose nanofibrils reinforced chitosan-gelatin based hydrogel loaded with nanoemulsion of oregano essential oil for diabetic wound healing assisted by low level laser therapy. Diabetic foot ulcers are imperfections in the process of wound healing due to hyperglycemic conditions. Here, a nanoemulgel fabricated with oregano essential oil nanoemulsion, assisted by low-level laser therapy, was investigated for its efficacy in diabetic wound healing. A hydrogel- based healing patch, fabricated using biological polymers namely chitosan and gelatin and, polyvinyl pyrollidone. The hydrogel was reinforced with cellulose nanofibrils for enhanced stability and barrier properties. Nanoemulsion of oregano essential oil, with an average particle size of 293.7Â Â±Â 8.3Â nm, was prepared via homogenization with chitosan as the coating agent. Nanoemulsion impregnated hydrogel, termed as the nanoemulgel, was assessed for its physio-mechanical properties and healing efficiency. The strong linkages in nanoemulgel demonstrated its large swelling capacity, high mechanical strength, and maximum thermal stability. The optimized conditions for low-level laser therapy using 808Â nm were 1Â W. cm(-2) and 5Â min. The optimized drug concentration of 128Â Î¼g. mL(-1) exhibited viability of NIH/3Â T3 fibroblasts as 75.5Â Â±Â 1.2Â % after 24Â h. Cell migration assay demonstrated that dual therapy facilitated wound healing, with a maximum closure rate of 100Â % at 48Â h. In vivo results revealed the rapid healing effects of the dual therapy in diabetic rat models with foot ulcers: a maximum healing rate of 97.5Â %, minimum scar formation, increased granulation, enhanced reepithelialization, and a drastic decrease in inflammation and neutrophil infiltration within the treatment period compared to monotherapy and control. In summary, the combinatorial therapy of nanoemulgel and low-level laser therapy is a promising regimen for managing diabetic foot ulcers with a rapid healing effect. Hydrogels;Chitosan;Gelatin;Oils, Volatile;Cellulose Rats;Animals;Hydrogels;Chitosan;Gelatin;Low-Level Light Therapy;Origanum;Diabetic Foot;Oils, Volatile;Cellulose;Wound Healing;Diabetes Mellitus

Efficacy of Adjunctive Photobiomodulation in the Management of Medication-Related Osteonecrosis of the Jaw: A Systematic Review. Background: Medication-related osteonecrosis of the jaw (MRONJ) is a severe adverse medication response that manifests as progressive bone necrosis in the craniofacial area. There is still no clear treatment protocol for the management of MRONJ. The purpose of this study was to conduct a systematic review to assess the efficacy of photobiomodulation (PBM) as an adjunct to MRONJ therapy. Methods: In line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement, a literature search was performed on PubMed/MEDLINE, Scopus, Web of Science, and Cochrane databases. Two examiners examined eligibility and risk of bias separately before extracting data. Results: Two hundred sixty-nine articles were found through electronic search, out of which only 11 met the inclusion criteria and were included in qualitative synthesis (9 retrospectives, 1 prospective, and 1 case series). A total number of 759 patients and a mean age ranging from 54 to 74 years were reviewed. Females were the most frequent gender in all of the selected studies (72% females to 28% males), and the most

frequent stage in the studies mentioned above was stage II (66%). Most of the studies had shown a significant improvement when PBM was used as an adjunctive treatment. Conclusions: Based on the results of this study, PBM as an adjuvant therapy can significantly improve the outcomes of each treatment plan. However, surgical intervention for the complete healing of the lesions is suggested. Bone Density Conservation Agents Male;Female;Humans;Middle Aged;Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Prospective Studies;Retrospective Studies;Combined Modality Therapy

Photobiomodulation Literature Watch July 2022.

Role of Polarized Light in Photobiomodulation. Phototherapy;Low-Level Light Therapy

Low-Level Laser and Light Therapy After Total Knee Arthroplasty Improves Postoperative Pain and Functional Outcomes: A Three-Arm Randomized Clinical Trial. BACKGROUND: We examined the effect of low-level laser therapy (LLLT) and Bioptron light therapy on pain and function following primary total knee arthroplasty. METHODS: A single-center, single-surgeon, prospective randomized clinical trial was performed with 3 groups of 15 patients: LLLT (804 nm), light (Bioptron; Bioptron AG, Wollerau, Switzerland), and controls. Range of motion (ROM), visual analog scale pain, opiate consumption (oxycodone in milligrams), knee swelling, and the Knee Society Score (KSS) were assessed before the surgery and on postoperative day 2, postoperative day 3, month 3, and month 12 after the operation. RESULTS: The preoperative scores were similar between groups. A higher ROM was observed with the LLLT group at all follow-ups except at the 12-month follow-up (3-month ROM: 116.8Â° vs 104.0Â° vs 92.3Â°; P < .001). The knee swelling at 3 months was similar between the LLLT and light groups (2.1 cm), which was lower than that in controls (2.1 cm, P < .001). Furthermore, visual analog scale pain decreased more in the LLLT group than in other groups (8.5 vs 7.2 vs 6.0 points) at 3 months (PÂ = .04) but was similar at 12 months (P > .05). Also, the LLLT group consumed fewer opiate painkillers during the first month (48.3 vs 60.3 mg of oxycodone, PÂ = .02). In the LLLT group, the KSS at 3 and 12 months and the KSS function score at 3 months exceeded minimally clinically important differences (P < .05). CONCLUSIONS: In the early stages of recovery after total knee arthroplasty, LLLT and Bioptron light therapy could be helpful to control immediate and acute knee pain and swelling, reduce the need for opioids, improve ROM and functional scores, and improve recovery. LEVEL OF EVIDENCE: Therapeutic level I.

Low-level laser therapy has an additional effect with open flap debridement on the treatment of stage III periodontitis: a split-mouth randomized clinical trial. OBJECTIVE: The purpose of this randomized, controlled, split-mouth trial was to clarify the clinical efficacy of using low-level laser therapy (LLLT) as an adjunct to open flap debridement in the treatment of periodontitis. METHOD AND MATERIALS: The study was conducted on 10 patients with stage III periodontitis. Clinical parameters were recorded for 70 sites of periodontal pockets at baseline and after 3 months and included Plaque Index (PI), Gingival Index (GI), bleeding on probing (BOP), probing depth (PD), relative gingival recession (RGR), and relative attachment level (RAL), and evaluated postoperative pain and dental hypersensitivity. After open flap debridement, the sites were randomly divided into test sites receiving the low-level diode laser (wavelength 808 nm) and control sites treated with laser-off. The Wilcoxon test and Mann-Whitney U-test were used for intra- and inter-group comparisons, respectively, and the Friedman test to test between different periods. RESULTS: Both treatments produced a reduction in GI, BOP, and PD, an increased RGR, and a gain in RAL between baseline and 3 months after surgery. There were significant improvements in GI, PD, and RAL after 3 months; postoperative pain after 24 hours and after 3 days; and dental hypersensitivity after 1 week and 1 month of the surgery, which significantly decreased in the test group. CONCLUSION: Both groups were clinically effective in treating stage III periodontitis, with a significant preference in reduction of GI and PD and gain of RAL, and decreased postoperative pain (after 24 hours and 3 days) and dentinal

hypersensitivity (after 1 week and 1 month) for open flap debridement+LLLT. CLINICAL RELEVANCE: The use of LLLT as an adjunct to open flap debridement improved the clinical indices, postoperative pain, and dentinal hypersensitivity better than open flap debridement alone in the treatment of stage III periodontitis. Humans;Low-Level Light Therapy;Chronic Periodontitis;Debridement;Treatment Outcome;Pain, Postoperative;Periodontal Attachment Loss;Follow-Up Studies;Dental Scaling

Cardiopulmonary and hematological effects of infrared LED photobiomodulation in the treatment of SARS-COV2. BACKGROUND: COVID-19 disease is caused by SARS-CoV-2 which can trigger acute respiratory syndrome, which presents with dense alveolar and interstitial infiltrates and pulmonary edema, causing severe hypoxemia and significant alteration to pulmonary mechanics with reduced pulmonary compliance. The photobiomodulation technique alters cellular and molecular metabolism, showing promising results regarding the reduction of acute pulmonary inflammation. OBJECTIVE: To compare the photomodulation technique using near-infrared LED to conventional respiratory physiotherapy treatment in patients with COVID-19 in reversing acute conditions, reducing hospitalization time, and decreasing the need for oxygen therapy. METHODOLOGY: The cohort was comprised of 30 patients undergoing COVID-19 treatment who were divided and allocated into two equal groups randomly: the LED group (LED), treated with infrared LED at 940Â nm and conventional therapy, and the control group (CON), who received conventional treatment (antibiotic therapy for preventing superimposed bacterial infections, and physiotherapy) with LED irradiation off. Phototherapy used a vest with an array of 300 LEDs (940Â nm) mounted on a 36Â cmÂ Ã—Â 58Â cm area and positioned in the patient's anterior thoracic and abdominal regions. The total power was 6Â W, with 15Â min irradiation time. Cardiopulmonary functions and blood count were monitored before and after treatment. The patients were treated daily for 7Â days. Statistical analysis was conducted using a two-tailed unpaired Student's t-test at a significance level of Î±Â =Â 0.05. RESULTS: Post-treatment, the LED group showed a reduction in hospital discharge time and a statistically significant improvement for the following cardiopulmonary functions: Partial Oxygen Saturation, Tidal Volume, Maximum Inspiratory, and Expiratory Pressures, Respiratory Frequency, Heart Rate, and Systolic Blood Pressure (pÂ <Â 0.05). Regarding blood count, it was observed that post-treatment, the LED group presented with significant differences in the count of leukocytes, neutrophils, and lymphocytes. CONCLUSION: Photobiomodulation therapy can be used as a complement to conventional treatment of COVID-19, promoting the improvement of cardiopulmonary functions, and minimization of respiratory symptoms. RNA, Viral Humans;COVID-19;SARS-CoV-2;RNA, Viral;COVID-19 Drug Treatment;Lung

Cutaneous effects of photobiomodulation with 1072Â nm light. Photobiomodulation, also known as low-level light therapy, has gained popularity in treating a variety of dermatologic and non-dermatologic conditions. The near-infrared (NIR) portion ranging from 700 to 1440Â nm has a broad spectrum but most current research focuses on relatively shorter wavelengths. To date, clinical research regarding the application of 1072 NIR is limited to treatments for infections and photorejuvenation treatment in females. However, 1072 NIR light therapy may benefit male patients. This theoretical application is based on the biological properties of this subgroup having increased cutaneous density and thickness and the physical properties of 1072 NIR allowing it to penetrate increased depth. 1072 NIR can reach more cells throughout the epidermis and dermis compared to other parts of the electromagnetic spectrum traditionally used in phototherapy to provide unique and targeted benefits. 1072 NIR light-emitting diodes are commercially available and therefore hold tremendous potential to become accessible, affordable treatment options. Given the increased demand and market size for aesthetics for men that remains untapped, there is opportunity for

future research to elucidate the potential for this wavelength as a safe and effective treatment. Humans;Male;Skin;Phototherapy;Low-Level Light Therapy;Epidermis;Treatment Outcome;Light

Photobiomodulation therapy at red and near-infrared wavelengths for osteogenic differentiation in the scaffold-free microtissues. One of the novel strategies for bone tissue regeneration is photobiomodulation (PBM) which depends on the red and near-infrared light absorption by mitochondria and may trigger bone tissue regeneration via the production of intracellular ROS and ATP, NO release, etc. It is also important to identify the changes in those signal molecule levels in an in vivo mimicking platform such as 3-Dimensional (3D) Scaffold Free Microtissues (SFMs) that may serve more natural osteogenic differentiation responses to PBM. Herein, we aimed to increase the osteogenic differentiation capability of the co-culture of Human Bone Marrow Stem Cells (hBMSC) and Human Umbilical Vein Endothelial Cells (HUVECs) on 3D SFMs by triple light treatment at 655 and 808-nm of wavelengths with the energy densities of 1, 3, and 5Â J/cm(2). We performed the analysis of cell viability, diameter measurements of SFMs, intracellular ROS production, NO release, ATP activity, temperature measurements, DNA content, ALPase activity, calcium content, and relative gene expressions of ALP, Collagen, and Osteopontin by qRT-PCR. It was found that both wavelengths were effective in terms of the viability of SFMs. 1 and 5Â J/cm(2) energy densities of both wavelengths increased the SFM diameter with significant changes in intracellular ROS, ATP, and NO levels compared to the control group. We concluded that PBM therapy was successful to induce osteogenesis. 1Â J/cm(2) at 655Â nm of wavelength and 5Â J/cm(2) at 808Â nm of wavelength were the most effective energy densities for osteogenic differentiation on SFMs with triple light treatment. Reactive Oxygen Species;Adenosine Triphosphate Humans;Osteogenesis;Low-Level Light Therapy;Reactive Oxygen Species;Cell Differentiation;Human Umbilical Vein Endothelial Cells;Adenosine Triphosphate;Cells, Cultured

Angiogenetic and anti-inflammatory effects of photobiomodulation on bone regeneration in rat: A histopathological, immunohistochemical, and molecular analysis. Post-surgical bone defects require new alternative approaches for a better healing process. For this matter, photobiomodulation therapy (PBMT) has been used in order to improve the process of healing, pain, and inflammation reduction and tissue rejuvenation. This study is set to evaluate the effect of PBMT on angiogenic and inflammatory factors for bone regeneration in rat post-surgical cranial defects. Thirty male Wistar rats were distributed accidentally into two groups (Subdivided into 3 groups according to their follow-up durations). During operation, an 8-mm critical-sized calvarial defect was made in each rat. A continuous diode laser was used (power density 100Â mW/cm(2), wavelength 810Â nm, the energy density of 4Â J/cm(2)). Bone samples were assessed histomorphometrically and histologically after hematoxylin and eosin (H&E) staining. ALP, PTGIR, OCN, and IL-1 levels were measured by RT-PCR. VEGF expression was studied by immunohistochemistry analysis. The level of IL-1 expression decreased significantly in the PBMT group compared to the control after 7Â days (pÂ <Â 0.05), while, the PTGIR level was improved significantly compared to the control group after 7Â days. Furthermore, levels of OCN and ALP improved after PBM use; however, the alterations were not statistically meaningful (pÂ >Â 0.05). Evaluation with IHC displayed a significant rise in VEGF expression after 3Â days in the PBMT group compared to the control (pÂ >Â 0.05). In this study's conditions, the results showed a meaningful alteration in osteogenic, inflammatory, and angiogenic mediators in post-surgical calvarial defect following PBMT. It appears that PBM can accelerate angiogenesis in the bone healing procedure which can be helpful in bone tissue engineering. Vascular Endothelial Growth Factor A;Anti-Inflammatory Agents;Interleukin-1 Rats;Male;Animals;Rats, Wistar;Vascular Endothelial Growth Factor A;Bone Regeneration;Low-Level Light Therapy;Anti-Inflammatory Agents;Interleukin-1

Serial Sessions of a Novel Low-Level Light Therapy Device for Home Treatment of Dry Eye Disease. INTRODUCTION: This study aimed to evaluate the changes that a recently developed at-home device using low-level light therapy (LLLT) produced in signs and symptoms of patients with dry eye disease (DED) owing to meibomian gland dysfunction (MGD). METHODS: In this prospective study, patients with DED owing to MGD not successfully responding to first-line therapy (tear substitutes and eye lid hygiene) were treated with four serial sessions (every other day) of mask based on LLLT technology and dedicated for home use (my-mask(Â®), Espansione Marketing S.p.A., Bologna, Italy). Non-invasive ocular surface examination was carried out by means of Keratograph 5M (Oculus, Wetzlar, Germany) before and after four mask sessions for the evaluation of (i) tear meniscus height (TMH); (ii) first and average non-invasive Keratograph breakup time (NIKBUT); (iii) meibomian gland loss (MGL). Ocular Surface Disease Index (OSDI) questionnaire was used to assess ocular discomfort symptoms. RESULTS: Overall, 17 patients (3 male, 14 female; mean age 61.47â€‰Â±â€‰11.93Â years) were enrolled and all of them regularly completed the entire cycle of four sessions without reporting any adverse event. The mean values of NIKBUT first and NIKBUT average increased significantly after treatment (from 5.29â€‰Â±â€‰2.60 at T0 to 9.04â€‰Â±â€‰3.49Â s at T1 [Pâ€‰=â€‰0.001] and from 9.40â€‰Â±â€‰3.81 to 11.28â€‰Â±â€‰2.81Â s [Pâ€‰=â€‰0.017]); in parallel, the mean value of TMH increased significantly from 0.27â€‰Â±â€‰0.06 to 0.32â€‰Â±â€‰0.09Â mm (Pâ€‰=â€‰0.029). Conversely, there were not statistically significant differences for MGL (Pâ€‰=â€‰0.346). In addition, the mean value of OSDI score decreased after treatment (from 32.00â€‰Â±â€‰7.96 at T0 to 20.71â€‰Â±â€‰8.03 at T1; Pâ€‰<â€‰0.001). CONCLUSIONS: One week of serial sessions of a newly developed LLLT device for home use significantly improved tear film production and stability along with ocular discomfort symptoms in patients with DED owing to MGD. These findings open up a new scenario for patients with MGD who can enjoy the unique benefits of LLLT at home.

Photobiomodulation in the management of oral mucositis for adult head and neck cancer patients receiving irradiation: the LiTEFORM RCT. BACKGROUND: Oral mucositis is a debilitating and painful complication of head and neck cancer irradiation that is characterised by inflammation of the mucous membranes, erythema and ulceration. Oral mucositis affects 6000 head and neck cancer patients per year in England and Wales. Current treatments have not proven to be effective. International studies suggest that low-level laser therapy may be an effective treatment. OBJECTIVES: To assess the clinical effectiveness and cost-effectiveness of low-level laser therapy in the management of oral mucositis in head and neck cancer irradiation. To identify barriers to and facilitators of implementing low-level laser therapy in routine care. DESIGN: Placebo-controlled, individually randomised, multicentre Phase III superiority trial, with an internal pilot and health economic and qualitative process evaluations. The participants, outcome assessors and therapists were blinded. SETTING: Nine NHS head and neck cancer sites in England and Wales. PARTICIPANTS: A total of 87 out of 380 participants were recruited who were aged â‰¥â€‰18 years and were undergoing head and neck cancer irradiation with â‰¥â€‰60â€‰Gy. INTERVENTION: Random allocation (1â€‰:â€‰1 ratio) to either low-level laser therapy or sham low-level laser therapy three times per week for the duration of irradiation. The diode laser had the following specifications: wavelength 660â€‰nm, power output 75â€‰mW, beam area 1.5â€‰cm(2), irradiance 50â€‰mW/cm(2), exposure time 60 seconds and fluence 3â€‰J/cm(2). There were 20-30 spots per session. Sham low-level laser therapy was delivered in an identical manner. MAIN OUTCOME MEASURE: The mean Oral Mucositis Weekly Questionnaire-Head and Neck Cancer score at 6 weeks following the start of irradiation. Higher scores indicate a worse outcome. RESULTS: A total of 231 patients were screened and, of these, 87 were randomised (low-level laser therapy arm, nâ€‰=â€‰44; sham arm, nâ€‰=â€‰43). The mean age was 59.4 years (standard deviation 8.8

years) and 69 participants (79%) were male. The mean Oral Mucositis Weekly Questionnaire-Head and Neck Cancer score at 6 weeks was 33.2 (standard deviation 10) in the low-level laser therapy arm and 27.4 (standard deviation 13.8) in the sham arm. LIMITATIONS: The trial lacked statistical power because it did not meet the recruitment target. Staff and patients willingly participated in the trial and worked hard to make the LiTEFORM trial succeed. However, the task of introducing, embedding and sustaining new low-level laser therapy services into a complex care pathway proved challenging. Sites could deliver low-level laser therapy to only a small number of patients at a time. The administration of low-level laser therapy was viewed as straightforward, but also time-consuming and sometimes uncomfortable for both patients and staff, particularly those staff who were not used to working in a patient's mouth. CONCLUSIONS: This trial had a robust design but lacked power to be definitive. Low-level laser therapy is relatively inexpensive. In contrast with previous trials, some patients found low-level laser therapy sessions to be difficult. The duration of low-level laser therapy sessions is, therefore, an important consideration. Clinicians experienced in oral cavity work most readily adapt to delivering low-level laser therapy, although other allied health professionals can be trained. Blinding the clinicians delivering low-level laser therapy is feasible. There are important human resource, real estate and logistical considerations for those setting up low-level laser therapy services. FUTURE WORK: Further well-designed randomised controlled trials investigating low-level laser therapy in head and neck cancer irradiation are needed, with similar powered recruitment targets but addressing the recruitment challenges and logistical findings from this research. TRIAL REGISTRATION: This trial is registered as ISRCTN14224600. FUNDING: This project was funded by the National Institute for Health and Care Research (NIHR) Health Technology Assessment programme and will be published in full in Health Technology Assessment; Vol. 26, No. 46. See the NIHR Journals Library website for further project information.

 Around 9 out of 10 head and neck cancer patients undergoing treatment experience pain, swelling and sores in their mouth (oral mucositis). This can lead to weight loss, painful ulcers, difficulty talking, eating and drinking, and even hospitalisation. Current care includes helping patients to keep their mouth and teeth clean, encouraging them to have a healthy diet and prescribing mouthwashes, painkillers and mouth-coating gels. However, these treatments give limited help in preventing or treating this condition. The LiTEFORM trial looked at whether or not low-level laser therapy could be used to prevent and treat oral mucositis. Patients were allocated to one of two arms at random: active laser or fake (sham) laser. Neither the patients nor the hospital staff knew which laser was being used. Eighty-seven people joined the study during the time allowed (44 received low-level laser therapy and 43 received sham treatment); however, this was a smaller number than the planned target of 380 people. As a result, no meaningful conclusion can be drawn from the results about whether the therapy is beneficial or cost-effective. People receiving the low-level laser therapy reported slightly more soreness in their mouth than those receiving the sham laser, but this could be down to chance. The number of participants is too small to draw conclusions about whether or not the low-level laser is helpful. Some patients found the laser treatment sessions to be difficult. Setting up a new service delivering laser therapy at the same time as cancer treatments was more complicated than originally anticipated. Problems included the scheduling of appointments, finding suitable rooms and having enough trained staff with time to deliver laser therapy. However, this study has provided us with knowledge on how best to set up a laser therapy service in the NHS as part of the cancer treatment pathway and the costs involved. These findings could help future studies looking into low-level laser therapy for those with head and neck cancer. Humans;Adult;Male;Middle Aged;Female;England;Stomatitis;Head and Neck Neoplasms;Wales;Randomized Controlled Trials as Topic

Dose-Response Relationship of Photobiomodulation Therapy on Matrix Metalloproteinase in Healing Dynamics of Diabetic Neuropathic Ulcers-An inÂ vivo Study. Individuals with diabetic foot ulcers have overlapped the inflammatory, proliferative and remodeling phase, making the tissue vulnerable to delayed healing responses. We aimed to establish the dose-response relationship of photobiomodulation therapy of different doses and matrix metalloproteinases in the healing dynamics of diabetic neuropathic ulcers. Diabetes was induced in 126 Albino Wistar rats, and neuropathy was induced to the hind paw by a sciatic nerve injury method. An excisional wound was created on the neuropathy-induced leg. Photobiomodulation therapy of dosages 4, 6, 8, 10, 12 and 15â€‰Jâ€‰cm(-2) and wavelength 655â€‰nm and 808â€‰nm was irradiated. Photobiomodulation therapy of dosages 4, 6 and 8â€‰Jâ€‰cm(-2) showed better wound healing properties with optimized levels of matrix metalloproteinases-1 and 8. We observed a strong dose response in the experimental group treated with 6 and 8â€‰Jâ€‰cm(-2) . The findings from the present study conclude that photobiomodulation therapy of dosages 4, 6 and 8â€‰Jâ€‰cm(-2) is suggestive of usefulness in diabetic neuropathic ulcer healing. Markers like matrix metalloproteinases may give a clear direction on response to the therapy. Based on the findings from the present study, we recommend to validate the findings for safety and efficacy in future through human prospective randomized controlled clinical trials. Matrix Metalloproteinases Animals;Rats;Diabetes Mellitus;Low-Level Light Therapy;Matrix Metalloproteinases;Prospective Studies;Rats, Wistar;Wound Healing

A phase â…¡ prospective trial of photobiomodulation therapy in limiting oral mucositis in the treatment of locally advanced head and neck cancer patients. OBJECTIVE: This study aimed to compare the historical incidence rate of severe oral mucositis (OM) in head and neck cancer patients undergoing definitive concurrent chemoradiation therapy (CRT) versus a prospective cohort of patients with locally advanced head and neck squamous cell carcinoma (HNSCC) treated with prophylactic photobiomodulation therapy (PBMT). METHODS: This US-based, institutional, single-arm, phase â…¡ prospective clinical trial was initiated in 50 patients (ageâ€‰â‰¥â€‰18â€‰years, Karnofsky Performance Scale Indexâ€‰>â€‰60, with locally advanced HNSCC (excluding oral cavity) receiving definitive or adjuvant radiation therapy (RT) with concurrent platinum-based chemotherapy (CT). PBMT was delivered three times per week throughout RT utilizing both an intraoral as well extraoral delivery system. Primary outcome measure was incidence of severe OM utilizing both the National Cancer Institute Common Toxicity Criteria, version 4.0 (NCI-CTCAE) Grade â‰¥3 and the World Health Organization Mucositis Grading Scale (WHO) Grade â‰¥3 versus historical controls; secondary outcome measures included time to onset of severe OM following therapy initiation. RESULTS: At baseline, all patients included in final analysis (Nâ€‰=â€‰47) had OM Grade 0. Average RT and CT dose was (66.3â€‰Â±â€‰5.1)â€‰Gy and (486.1â€‰Â±â€‰106.8)â€‰mg/m(2), respectively. Severe OM was observed in 11 of 47 patients (23%, confidence interval: 12, 38). OM toxicity grade trended upward during treatment, reaching a maximum at 7 weeks (WHO: 1.8 vs. NCI-CTCAE: 1.7). Subsequently, OM grade returned to baseline 3 months following completion of RT.Â The mean time toÂ onset of severe OM was (35â€‰Â±â€‰12) days. The mean time to resolution of severe OM was (37â€‰Â±â€‰37) days. CONCLUSIONS: Compared to historical outcomes, PBMT aides in decreasing severe OM in patients with locally advanced HNSCC. PBMT represents a minimally invasive, prophylactic intervention to decrease OM as a major treatment-related side effect.

Effects of four-week lower limb loading training with and without augmented feedback on mobility, walking device use, and falls among ambulatory individuals with spinal cord injury: a randomized controlled trial. PURPOSE: To compare the effects of lower limb loading training (LLLT) with or without augmented loading feedback during stepping activity on mobility, walking device use, and

falls among ambulatory individuals with chronic spinal cord injury (SCI). STUDY DESIGN: Randomized controlled trial (assessor-blinded) with prospective fall data follow-up, clinical trial registration (NCT03254797). METHODS: Forty-four ambulatory participants (22 participants/group) were prospectively monitored for their baseline fall data over six months, with baseline assessments for their mobility and walking device used after six months. Then participants involved in the LLLT programs with or without loading feedback according to their groups for 30â€‰min/day, 5â€‰days/week, over 4â€‰weeks. Mobility outcomes were re-assessed at week two and week four, with prospective fall data monitoring over six months, and mobility measured thereafter. RESULTS: Mobility outcomes of the participants were significantly improved from their baseline ability, especially in those who were trained using augmented feedback (the difference in main outcome, timed up and go, between the groups was 1.8â€‰s; 95% confidence interval = 1.0-3.5s). CONCLUSIONS: LLLT during stepping activity, especially with augmented loading feedback, could be applied effectively to promote mobility and safety of ambulatory individuals with chronic SCI (post-injury time of approximately four years).

 A training program of bodyweight shifting and lower limb loading training during stepping activity significantly improved mobility, walking ability, and fall rates of ambulatory individuals with chronic spinal cord injury.The improvement in those who were trained using augmented loading feedback was significantly greater than those who were trained without feedback.Such training programs may be applied to distribute effective community-based rehabilitation and home healthcare services. Humans;Feedback;Prospective Studies;Walking;Exercise Therapy;Spinal Cord Injuries;Lower Extremity

A Case Series of 11 Horses Diagnosed with Bone Spavin Treated with High Intensity Laser Therapy (HILT). The aim of this work was to characterize and describe the effect of High Intensity Laser Therapy (HILT) used in the treatment of chronic osteoarthritis in horses. Over a 2 year period, 11 horses with diagnosed bone spavin were treated with HILT as a monotherapy. The horses chosen for this report presented hind limb lameness, were positive in a spavin flexion test and showed improvement after intra-articular anesthesia of the tarsometatarsal joint. Additionally, all the horses presented radiological signs of tarsus osteoarthritis and had not been treated for bone spavin for a minimum of 6 months. Each horse received 10 HILT therapies over 14 days' treatment time with the same laser protocol. At post-treatment orthopedic examination, 4 horses (36%) had improved 2 lameness grades (in the 5 grade American Association of Equine practitioners lameness scale), 4 horses (36%) had improved 1 lameness grade and 3 horses (28%) did not improve. Additionally, 3 horses were totally sound after HILT. Post-treatment spavin test result improvement was observed in 5 horses (45%), and 6 horses (55%) showed the same spavin test grade as before treatment. There were no horses that were sound in the spavin test performed after HILT. Therefore, it seems probable that the application of HILT in horses suffering from bone spavin may decrease joint pain, which influences visual lameness reduction. Animals;Horses;Lameness, Animal;Osteoarthritis;Laser Therapy;Low-Level Light Therapy;Radiography;Horse Diseases

Effect of red and near-infrared irradiation on periodontal ligament stem cells: ROS generation and cell cycle analysis. Reconstruction of lost tooth structures and the periodontium with the help of tissue engineering has found a special place in dentistry in recent years with reports of great therapeutic success. Stem cells from the periodontal ligament have the potential for high differentiation into the bone and periodontal ligament cells and are therefore a suit candidate for regenerative therapies of the periodontium and other tissues. In this regard, the use of photobiomodulation on these cells by light irradiation can be effective in increasing the efficiency of these regenerative methods. The effect of red and near-infrared lasers was investigated in pulsed and continuous modes on the cell viability, ROS production and the cell cycle of Periodontal Ligament Stem cells (PDLSCs) using MTT assay and flowcytometry techniques. The result shows that both red

and near-infra-red (NIR) irradiations at 3â€‰J/cm(2) maintain cell viability. ROS generation assay indicated that in PDL stem cells irradiated with NIR laser (940â€‰nm), ROS production was greater than in the red (660â€‰nm) irradiated groups. Cell cycle analysis revealed that NIR irradiation can enhance the proportion of S-phase cells and declinedecline the proportion of G1-phase cells compared to the red laser irradiation groups. Moreover, this enhancement was greater in the pulsed group compared to the continuous mode group. Overall, the current study results showed that photobiomodulation can support the cell viability of PDLSCs and could affect the ROS production and cell cycle. This effect was more with 940â€‰nm (NIR) irradiation pulsed mode compared to 660â€‰nm (red).Communicated by Ramaswamy H. Sarma. Reactive Oxygen Species Periodontal Ligament;Reactive Oxygen Species;Cells, Cultured;Cell Differentiation;Stem Cells;Cell Cycle;Cell Proliferation

In vitro investigation of the antibacterial and anti-inflammatory effects of LED irradiation. PURPOSE: This study aimed to investigate the proper wavelengths for safe levels of light-emitting diode (LED) irradiation with bactericidal and photobiomodulation effects in vitro. METHODS: Cell viability tests of fibroblasts and osteoblasts after LED irradiation at 470, 525, 590, 630, and 850 nm were performed using the thiazolyl blue tetrazolium bromide assay. The bactericidal effect of 470-nm LED irradiation was analyzed with Streptococcus gordonii, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum, Porphyromonas gingivalis, and Tannerella forsythia. Levels of nitric oxide, a proinflammatory mediator, were measured to identify the anti-inflammatory effect of LED irradiation on lipopolysaccharide-stimulated inflammation in RAW 264.7 macrophages. RESULTS: LED irradiation at wavelengths of 470, 525, 590, 630, and 850 nm showed no cytotoxic effect on fibroblasts and osteoblasts. LED irradiation at 630 and 850 nm led to fibroblast proliferation compared to no LED irradiation. LED irradiation at 470 nm resulted in bactericidal effects on S. gordonii, A. actinomycetemcomitans, F. nucleatum, P. gingivalis, and T. forsythia. Lipopolysaccharide (LPS)-induced RAW 264.7 inflammation was reduced by irradiation with 525-nm LED before LPS treatment and irradiation with 630-nm LED after LPS treatment; however, the effects were limited. CONCLUSIONS: LED irradiation at 470 nm showed bactericidal effects, while LED irradiation at 525 and 630 nm showed preventive and treatment effects on LPS-induced RAW 264.7 inflammation. The application of LED irradiation has potential as an adjuvant in periodontal therapy, although further investigations should be performed in vivo.

Photobiomodulation and nitric oxide signaling. Nitric oxide (NO) is a well-known gaseous mediator that maintains vascular homeostasis. Extensive evidence supports that a hallmark of endothelial dysfunction, which leads to cardiovascular diseases, is endothelial NO deficiency. Thus, restoring endothelial NO represents a promising approach to treating cardiovascular complications. Despite many therapeutic agents having been shown to augment NO bioavailability under various pathological conditions, success in resulting clinical trials has remained elusive. There is solid evidence of diverse beneficial effects of the treatment with low-power near-infrared (NIR) light, defined as photobiomodulation (PBM). Although the precise mechanisms of action of PBM are still elusive, recent studies consistently report that PBM improves endothelial dysfunction via increasing bioavailable NO in a dose-dependent manner and open a feasible path to the use of PBM for treating cardiovascular diseases via augmenting NO bioavailability. In particular, the use of NIR light in the NIR-II window (1000-1700Â nm) for PBM, which has reduced scattering and minimal tissue absorption with the largest penetration depth, is emerging as a promising therapy. In this review, we update recent findings on PBM and NO. Nitric Oxide Humans;Low-Level Light Therapy;Nitric Oxide;Cardiovascular Diseases;Signal Transduction

Application of photobiomodulation for chronic pain-related TMD on pain points versus pre-established points: Randomized clinical trial. Photobiomodulation therapy (PTB) is a therapeutic

possibility for temporomandibular disorders (TMD), but its effectiveness and protocols for use remain controversial. This study is a RCT that compared the effectiveness of PTB on pain points of the masticatory muscles and TMJs, located through palpation versus application of pre-established points in women with painful TMD, diagnosis by DC/TMD (Diagnostic Criteria for Temporomandibular Disorders - Brazilian Portuguese version). Therefore, a total sample of 54 women, aged between 18 and 60Â years, was investigated. Volunteers were randomly randomized and PTB was applied in four different groups with a dose of 4Â J and 6Â J divided into pre-established application points (PE - G1) and pain points (PD - G2) - Groups 4PE, 4PD, 6PE and 6PD. Four laser applications were performed with a wavelength of 780Â nm, one session per week, totaling one month of therapy. The following assessments were performed: DC/TMD, Brief Pain Inventory (BPI), McGill Questionnaire - Short Version (SF-MPQ) and Pain Intensity, Visual Analogue Scale (VAS). Friedman's test was used for within-group comparisons, while the Mann-Whitney test was used for between-group comparisons (pÂ <Â 0.05). According to the results, laser application on pain points (G2) was more effective. McGill's results showed that regardless of dose, the pain point application group had better outcomes (pÂ =Â 0.004). Pain intensity evaluation (last days) also showed that application at the pain points was more effective regardless of dose (pÂ =Â 0.0002). Medians and interquartile deviations showed overall that PTB was more effective at pain points, with a trend towards better outcomes at the 6Â J dose. Therefore, it can be concluded that in women with chronic painful TMD, the application of PTB at pain points is more effective than the application at pre-established points. Therefore, individualized PTB protocols are proposed, based on examination palpation of the masticatory structures. Humans;Female;Adolescent;Young Adult;Adult;Middle Aged;Chronic Pain;Temporomandibular Joint Disorders;Low-Level Light Therapy;Pain Measurement;Masticatory Muscles

Transcranial photobiomodulation enhances visual working memory capacity in humans. Transcranial photobiomodulation (tPBM) is a safe and noninvasive intervention that has shown promise for improving cognitive performance. Whether tPBM can modulate brain activity and thereby enhance working memory (WM) capacity in humans remains unclear. In this study, we found that 1064-nm tPBM applied to the right prefrontal cortex (PFC) improves visual working memory capacity and increases occipitoparietal contralateral delay activity (CDA). The CDA set-size effect during retention mediated the effect between the 1064-nm tPBM and subsequent WM capacity. The behavioral benefits and the corresponding changes in the CDA set-size effect were absent with tPBM at a wavelength of 852 nm or with stimulation of the left PFC. Our findings provide converging evidence that 1064-nm tPBM applied to the right PFC can improve WM capacity.

Protective Effect of Photobiomodulation against Hydrogen Peroxide-Induced Oxidative Damage by Promoting Autophagy through Inhibition of PI3K/AKT/mTOR Pathway in MC3T3-E1 Cells. Photobiomodulation (PBM) has been repeatedly reported to play a major role in the regulation of osteoblast proliferation and mineralization. Autophagy is closely associated with various pathophysiological processes in osteoblasts, while its role in oxidative stress is even more critical. However, there is still no clear understanding of the mechanism of the role of autophagy in the regulation of osteoblast mineralization and apoptosis under oxidative stress by PBM. It was designed to investigate the impact of 808â€‰nm PBM on autophagy and apoptosis in mouse preosteoblast MC3T3-E1 treated with hydrogen peroxide (H(2)O(2)) through PI3K/AKT/mTOR pathway. PBM could inhibit MC3T3-E1 cell apoptosis under oxidative stress and promote the expression of osteogenic proteins, while enhancing the level of autophagy. In contrast, 3-methyladenine (3-MA) inhibited the expression of osteoblast autophagy under oxidative stress conditions, increased apoptosis, and plus counteracted the effect of PBM on osteoblasts. We also found that PBM suppressed the activated PI3K/AKT/mTOR pathway during oxidative stress and induced autophagy in osteoblasts. PBM

promoted autophagy of MC3T3 cells and was further blocked by 740 Y-P, which reversed the effect of PBM on MC3T3 cells with H(2)O(2). In conclusion, PBM promotes autophagy and improves the level of osteogenesis under oxidative stress by inhibiting the PI3K/AKT/mTOR pathway. Our results can lay the foundation for the clinical usage of PBM in the treatment of osteoporosis. Hydrogen Peroxide;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases Animals;Mice;Hydrogen Peroxide;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;Oxidative Stress;TOR Serine-Threonine Kinases;Autophagy;Calcinosis

Intra-Articular Laser Therapy May Be a Feasible Option in Treating Knee Osteoarthritis in Elderly Patients. Knee osteoarthritis (OA) is a common problem in elderly patients. They are often troubled with altered knee function, such as pain and weakness. However, not all these patients are able to receive autologous platelet-rich plasma (PRP) injections as they may be taking antiplatelet or anticoagulant medications. Their physical condition may not allow them to receive total knee replacement surgery as well. Long-term oral intake of nonsteroidal anti-inflammatory drugs may be detrimental to the gastrointestinal tract. As a result, it is crucial to discover new treatment options that can alleviate painful knee symptoms in elderly knee OA patients. In this study, 19 elderly patients diagnosed with moderate degree of knee OA as well as suprapatellar bursitis were recruited. They received low-level laser therapy (LLLT) to their affected knees. Under ultrasound guidance, flexible fiber optic wire was inserted intra-articularly into the knee joint. Red laser followed by infrared irradiation was performed once every 2 weeks for a total of 3 times. The Lequesne index for knee OA and the volume of suprapatellar synovial fluid (SF) were measured. SF proteomic analyses were also performed up to a period of 6 months. The results revealed that after 3 LLLT, the Lequesne index significantly decreased, signifying improvement in the knee joint functional status. The volume of suprapatellar SF and SF proteins associated with inflammation also decreased significantly in the SF. These findings lasted up to a period of at least 3 months. Therefore, LLLT may be considered as a feasible option in treating elderly patients with knee OA who are not suitable for surgical interventions or intra-articular PRP injections. Aged;Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Proteomics;Laser Therapy;Knee Joint;Pain

Promising minimally invasive treatment modalities for symptomatic temporomandibular joint disc displacement with reduction: a randomized controlled clinical trial. BACKGROUND: Pain and clicking are the primary complaints in patients suffering from temporomandibular joint disc displacement with reduction (DDwR), negatively affecting the patients' quality of life, making the treatment essential. This prospective randomized controlled trial (RCT) was conducted to evaluate the effectiveness of botulinum toxin type-A (BTX-A) and low level laser therapy (LLLT) in comparison to anterior repositioning appliance (ARA) for the treatment of DDwR. METHODS: A total of 27 patients were randomly allocated to 3 groups; ARA (control group), BTX-A, and LLLT; with 9 patients each. All patients were evaluated before and 3Â months after the treatment using a visual analogue scale (VAS) and magnetic resonance imaging (MRI). RESULTS: At 3Â months follow-up, all groups showed a significant reduction in pain assessed by VAS (Pâ€‰=â€‰0.007). Measured on MRI, there was a significant improvement in disc position and joint space index (JSI) in BTX-A group (Pâ€‰<â€‰0.001, Pâ€‰=â€‰0.011) and LLLT group (Pâ€‰=â€‰0.002, Pâ€‰=â€‰0.017) in comparison to the control group (Pâ€‰=â€‰0.087, Pâ€‰=â€‰0.066) respectively. As for time of recovery, a statistically significant difference was observed in BTX-A group (Pâ€‰<â€‰0.001) and LLLT (Pâ€‰<â€‰0.001) group in comparison to ARA group, which showed the most prolonged duration for reduction of DDwR symptoms. CONCLUSION: We concluded that BTX-A and LLLT could be considered effective alternative treatment modalities to ARA regarding reducing joint pain, clicking, and improving disc position in patients with symptomatic DDwR. TRIAL REGISTRATION: This prospective double-blinded RCT has been registered at ClinicalTrials.gov with identification number:

NCT05194488, 18/1/2022. Humans;Temporomandibular Joint Disc;Temporomandibular Joint Disorders;Low-Level Light Therapy;Pain Measurement;Pain

Intense Pulse Light Combined With Low-Level Light Therapy in Dry Eye Disease: A Systematic Review. OBJECTIVES: To evaluate the improvement in symptoms and signs associated with intense pulse light (IPL) combined with low-level light therapy (LLLT) in the treatment of dry eye disease (DED). METHODS: A systematic review of full-length original studies reporting the effects of IPL combined with LLLT for DED in two databases, PubMed and Scopus, was performed according to the PRISMA statement. The quality assessment tool for case series studies from the National Heart, Lung, and Blood Institute was used to analyze the quality of the studies selected. RESULTS: The search provided a total of 393 articles, of which six were included. Significant decreases in the Ocular Surface Disease Index (OSDI) score, meibomian gland dysfunction (MGD) score, MGD grade, and meiboscore and increases in tear film stability, lipid layer thickness, and loss area of the meibomian gland have been reported. Concerning tear volume, tear meniscus height, and Schirmer test remained unchanged. In relation to tear osmolarity and corneal fluorescein staining, contradictory outcomes were found. CONCLUSIONS: Intense pulse light combined with LLLT for the treatment of dry eye improves OSDI, tear film stability, and meibomian gland function; thus, this treatment may be recommended for DED patients due to MGD. Humans;Low-Level Light Therapy;Meibomian Gland Dysfunction;Meibomian Glands;Dry Eye Syndromes;Tears

Pulsed Light Therapy in the Management of Dry Eye Disease: Current Perspectives. PURPOSE: To review the indications and efficacy of Intense Pulsed Light (IPL) application in the treatment of Meibomian Gland Dysfunction (MGD). Its main purpose is to describe its physiology, efficacy, indications, and adverse effects. PATIENTS AND METHODS: A two database (PubMed, EMBASE) search was performed from July 2017 to July 2022 using the MeSH terms ("Intense Pulsed Light" AND ("Meibomian Gland Dysfunction" OR "Dry Eye"). We included randomized studies and systematic reviews with meta-analysis. Exclusion criteria were non-randomized trials, studies enrolling non-MGD dry eye disease, and other works older than 5 years. RESULTS: Current literature shows that IPL is an effective and safe treatment modality for severe dry eye. Available evidence shows improvement of symptoms and objective indicators, such as noninvasive breakup time, thickness of lipid layer, and Schirmer test. However, our review concluded that the beneficial effects of IPL may lose some efficacy at 6-months after the initial session, and subsequent sessions may be required. Thus, IPL treatment should not be considered as first-line therapy for MGD but instead as an adjuvant option to the standard of care. The optimal treatment modality remains unknown and should be tailored according to each patient's phenotype, clinician's experience, and available technology. There is evidence that IPL treatment may down-regulate pro-inflammatory markers (such as interleukin (IL) 6, IL17a, IL-1) and Prostaglandin E2 (PGE2). CONCLUSION: MGD is a multifactorial disease and IPL treatment seems a promising treatment modality. Despite this, more evidence is needed to study its benefits - since this is an emerging technology, it is expected an increase in comparative studies in the following years, with longer follow-up periods, which may enable more precise conclusions about this treatment modality.

Evaluation of Different Photobiomodulation Therapy Protocols as Adjuncts in the Healing of Bone Defects Grafted with Inorganic Bovine Bone. PURPOSE: This study evaluated the effect of two photobiomodulation therapy protocols on bone regeneration in criticalsize bone defects grafted with inorganic bovine bone. MATERIALS AND METHODS: A critical-size defect was created in 30 adult male rat calvaria, which were divided equally and randomly into three experimental groups (n = 10): (1) DBBM (deproteinized bovine bone mineral); (2) DBBM + PBMT 4 J (4 J; photobiomodulation therapy; GaAlAs, 730 nm, 100 mW, 140 J/cm(2)); and (3) DBBM + PBMT 6 J (6 J; GaAlAs, 730 nm, 100 mW, 210 J/cm(2)). Animals were euthanized after 30 days. The neoformed bone area (NBA), linear bone

extension (LBE), and area of the remaining particles (ARP) were evaluated. The data were subjected to nonparametric Kolmogorov-Smirnov test and ANOVA, followed by Tukey post hoc test to identify differences between the groups (P < .05). RESULTS: The 6 J group showed the highest average NBA (48.57% Â± 28.22%) and demonstrated a statistically significant difference in NBA and LBE. A higher mean ARP was found in the DBBM group (38.73 Â± 6.95) than in the groups irradiated by photobiomodulation therapy, with statistically significant differences (P < .05). CONCLUSION: The 6 J protocol showed the best results, promoting greater bone formation with greater resorption of residual particles. bone meal;Minerals;Biological Products Male;Animals;Cattle;Rats;Low-Level Light Therapy;Wound Healing;Minerals;Biological Products

Photobiomodulation and visual stimulation against cognitive decline and Alzheimer's disease pathology: A systematic review. INTRODUCTION: Given the ineffectiveness of the available drug treatment against Alzheimer disease (AD), light-based therapeutic modalities have been increasingly receiving attention with photobiomodulation (PBM) and, more recently, visual stimulation (VS) being among the most promising approaches. However, the PBM and VS light parameters tested so far, as well as their outcomes, vary a lot with conflicting results being reported. METHODS: Based on Scopus, PubMed, and Web of Science databases search, this systematic review summarizes, compares, and discusses 43 cell, animal, and human studies of PBM and VS related to cognitive decline and AD pathology. RESULTS: Preclinical work suggests that PBM with 640Â±30-nm light and VS at 40 Hz attenuates AÎ² and Tau pathology and improves neuronal and synaptic plasticity with most studies pointing towards enhancement of degradation/clearance mechanisms in the brain of AD animal models. Despite the gap of the translational evidence for both modalities, the few human studies performed so far support the use of PBM at 810-870 nm light pulsing at 40 Hz for improving brain network connectivity and memory in older subjects and AD patients, while 40 Hz VS in humans seems to improve cognition; further clinical investigation is urgently required to clarify the beneficial impact of PBM and VS in AD patients. DISCUSSION: This review highlights PBM and VS as promising light-based therapeutic approaches against AD brain neuropathology and related cognitive decline, clarifying the most effective light parameters for further preclinical and clinical testing and use. HIGHLIGHTS: Light-based brain stimulation produces neural entrainment and reverts neuronal damageBrain PBM and VS attenuate AD neuropathologyPMB and VS are suggested to improve cognitive performance in AD patients and animal modelsLight stimulation represents a promising therapeutic strategy against neurodegeneration.

980â€‰nm Photobiomodulation Promotes Osteo/Odontogenic Differentiation of the Stem Cells from Human Exfoliated Deciduous Teeth Via the CrossÂ talk Between BMP/Smad and Wnt/Î²-Catenin Signaling Pathways. Increasing evidence suggests stem cells from human exfoliated deciduous teeth (SHEDs) serve as desirable sources of dentin regeneration. Photobiomodulation (PBM) has shown great potential in enhancing the proliferation and osteogenesis of human bone marrow mesenchymal stem cells (hBMMSCs). However, the specific role of PBM in odontogenic differentiation of SHEDs is little know, and we further investigated potential mechanism of PBM osteo/odontogenisis. A 980â€‰nm diode laser with different energy densities of (0.5, 5, 10â€‰Jâ€‰cm(-2)) in a 100-mW continuous wave was used for irradiation every 24â€‰h. Osteo/odontogenic differentiation of SHEDs was achieved by performing alkaline phosphatase (ALP) and alizarin red staining (ARS) and osteo/odontogenic markers were also evaluated by qRT-PCR and western blotting. Additionally, western blot and immunohistochemical staining were performed to evaluate the levels of BMP/Smad and Wnt/Î²-catenin signaling-related proteins. We found that PBM at 5â€‰Jâ€‰cm(-1) increased mineral deposition and upregulated the expression of related osteo/odontogenic markers along with the elevated expression of Î²-catenin and phosphorylation level of Smad1/5/9. Furthermore, Wnt signaling inhibition using DKK1 and BMP signaling inhibition

using noggin inhibited PBM-induced osteo/odontogenic marker expression when used individually or jointly. In conclusion, PBM induces the osteo/odontogenic differentiation of SHEDs through cross talk between BMP/Smad and Wnt/Î²-catenin signaling pathways. beta Catenin Humans;Wnt Signaling Pathway;beta Catenin;Cell Differentiation;Stem Cells;Tooth, Deciduous;Cells, Cultured;Cell Proliferation

Effect of diode low level laser and red light emitting diode irradiation on cell proliferation and osteogenic/odontogenic differentiation of stem cells from the apical papilla. BACKGROUND: This experimental study aimed to assess the effect of irradiation of red light-emitting diode (LED) and Diode low-level laser (LLL) on osteogenic/odontogenic differentiation of stem cells from the apical papilla (SCAPs). MATERIALS AND METHODS: SCAPs were isolated from the human tooth root. The experimental groups were subjected to 4Â J/cm(2) diode low level laser and red LED irradiation in osteogenic medium. The control group did not receive any irradiation. Cell viability/proliferation of SCAPs was assessed by the methyl thiazolyl tetrazolium (MTT) assay on days 1 and 2 (nâ€‰=â€‰9). Osteogenic differentiation was evaluated by alizarin red staining (ARS) (nâ€‰=â€‰3), and expression of osteogenic genes by real-time polymerase chain reaction (RT-PCR) (nâ€‰=â€‰12) on days 1 and 2. SPSS version 18 was used for data evaluation. The Kruskal-Wallis and Mann-Whitney tests were used to compare the groups at each time point. RESULTS: The MTT assay showed no significant difference in cell viability/proliferation of SCAPs in the low level laser, red LED, and control groups at 24 or 48Â h (Pâ€‰<â€‰0.001). The ARS assessment showed that low level laser and red LED irradiation enhanced osteogenic differentiation of SCAPs. low level laser and red LED irradiation both induced over-expression of osteogenic/dentinogenic genes including alkaline phosphatase (ALP), dentin sialophosphoprotein (DSPP), dentin matrix protein 1 (DMP-1), and bone sialoprotein (BSP) in SCAPs. Up-regulation of genes was significantly greater in low level laser irradiation group than red LED group (Pâ€‰<â€‰0.001). CONCLUSION: Diode low level laser irradiation with 4Â J/cm(2) energy density and red LED irradiation enhanced osteogenic differentiation of SCAPs without adversely affecting cell viability. Humans;Osteogenesis;Dental Papilla;Cell Differentiation;Stem Cells;Cell Proliferation

Effects of Photobiomodulation on Oral Mucositis: Visualization and Analysis of Knowledge. This review article mapped and analyzed the most cited articles on the association of photobiomodulation (PBM) with oral mucositis (OM) and the evolution of clinical protocols in the area. A comprehensive search was performed on the Web of Science Core Collection (WoS-CC) database, leading to the extraction of information such as title, authors, abstract, journal name, number, average of citations, study design, year of publication, institutions, continents, countries, type of laser used, irradiated anatomical points, primary anti-cancer therapy, and laser parameters. Among those, clinical trials and literature reviews were the most common study designs. The main type of laser used was the InGaAlP diode, with a wavelength ranging from 630-660 nm, power going in 40-100 mW, and energy density ranging from 0.375-22 J/cm(2). As for the anatomical sites irradiated by PBM, the cheek mucosa, upper and lower lips, lateral tongue, and bottom of the mouth stood out. This analysis highlights an increasing interest in PBM as a supportive treatment in cases of OM, as well as the evolution of the technique, types of laser devices, and protocols used.

Effectiveness of low-level laser therapy in facilitating maxillary expansion using bone-borne hyrax expander: A randomized clinical trial. OBJECTIVE: The objective of this randomized clinical trial was to study the skeletal and dental effects of low-level laser therapy (LLLT) along with a miniscrew-assisted expander (Hyrax) after six months of retention. METHODS: After sequence generation, concealed allocation, and implementation, 24 female patients were randomly divided (1:1) into two-groups: bone-borne rapid palatal expansion (BBE) without LLLT (n = 12) and BBE with LLLT (n = 12). Eligibility criteria included female patients aged 10-13 years old with bilateral posterior crossbites.

Intraoral and extraoral photographs, cone-beam computed tomography images, and digital study models were obtained before expansion and six months after retention. The 7 mm Hyrax appliance was anchored to four palatal mini-screws, which were activated twice daily for 15 days, then locked and kept in place as a retainer. LLLT was performed in the laser group during expansion and retention, according to the guidelines provided. RESULTS: The records of 24 patients were analyzed. According to the post-retention measurements, both groups showed a significant increase in nasal and maxillary widths and total facial height. In the laser group, the Sella-Nasion-Point A and Point A-Nasion-Point B angles and the interpremolar apical distance were significantly increased. CONCLUSIONS: Within the limitations of this study, the results suggest that the parameters and protocol of LLLT do not clinically affect the efficiency of BBE in prepubertal and pubertal patients.

Effects of Photobiomodulation in Patients Presenting with Reticular Pseudodrusen: A Retrospective Observational Case Series Study. Background and Objectives: The purpose of this study is to describe the effects of photobiomodulation on drusen regression with patients presenting with reticular pseudodrusen (RPD). Materials and Methods: This study is a retrospective observational case series study including patients presenting with RPD who underwent treatment by photobiomodulation. All patients underwent a complete ophthalmic examination and multimodal imaging prior to treatment, including spectral-domain optical coherence tomography (SD-OCT). Eyes were treated two times per week for six consecutive weeks. Best corrected-visual acuity (BVCA) was measured prior and after treatment for all patients. The number of RPD on the SD-OCT scans centered on the macula and stages of RPD was noted at baseline and 6 months after the first treatment session. Results: Five eyes of five patients were included in the study. Mean BCVA did not change 6 months after treatment compared to baseline. Mean number of RPD per eye was 112.60 +/- 48.33 RPD at baseline and 111.6 +/- 49.29 in the same area 6 months after treatment. Changes in RPD distribution according to RPD classification were observed before and after treatment with photobiomodulation. Changes in distribution mostly concerned stages 1 and 3 RPD: Total number of stage 1 RPD was 289 and increased to 324 after treatment. Total number of stage 3 RPD was 97 at baseline and decreased to 67 6 months after treatment. Percentage of stage 1 RPD increased from 46% to 56% after treatment. Percentage of stage 3 RPD decreased from 20% to 13% after treatment. Conclusions: Changes in RPD distribution were observed before and after treatment with photobiomodulation. The number of stage 3 reticular pseudodrusen decreased while number of stage 1 reticular pseudodrusen increased after treatment. Humans;Fluorescein Angiography;Retrospective Studies;Retinal Drusen;Tomography, Optical Coherence;Retina

Effects of Dry Needling and Low-Power Laser for the Treatment of Trigger Points in the Upper Trapezius Muscle: A Randomized Clinical Trial. OBJECTIVE: The purpose of this study was to compare the effect of low-power laser therapy, dry needling, and exercise therapy on treating patients with neck and back pain and a diagnosis of the myofascial trigger points in the upper trapezius muscle. METHODS: A randomized clinical trial was conducted in Isfahan, Iran, in 2019. The study sample (78 participants) was randomly allocated to 3 groups of 26, including stretching exercises (3 times a day for 2 weeks, control group), low-power laser (3 sessions for 2 weeks, 6 J/cm(2), mean power of 100 MW in each point), and dry needling (4 sessions, with 25â€¯Ã—â€¯0.25-mm needles). For all patients, the visual analog scale (VAS), neck disability index (NDI), and shoulder pain and disability index (SPDI) were completed at baseline, immediately, and 1 month after treatment. RESULTS: Final participants in this study (nâ€¯=â€¯60) consisted of 33 (55%) female patients and 27 (45%) male patients, with a mean age of 51.25 Â± 7.94 years. In the exercise group, VAS, NDI, and SPDI scores were not remarkably different in the studied periods (P > .05). Moreover, a notable decrease in VAS, NDI, and SPDI scores were observed in the treatment intervals. However, by excluding the effect of the control group, no substantial difference was observed between the 2

treatments (P > .05). CONCLUSION: The use of laser therapy and dry needling methods induced a rapid response to pain relief. There was no difference between the 2 forms of treatment in the short term.

The efficacy of LED microneedle patch on hair growth in mice. Light penetration depth in the scalp is a key limitation of low-level light therapy for the treatment of androgenetic alopecia (AGA). A novel light emitting diode (LED) microneedle patch was designed to achieve greater efficacy by enhancing the percutaneous light delivery. The study aimed to investigate the efficacy and safety of this device on hair growth in mice. Thirty-five male C57BL/6 mice which their dorsal skin was split into upper and lower parts to receive either LED irradiation alone or LED irradiation with a microneedle patch. Red (629Â nm), green (513Â nm), and blue light (465Â nm) at an energy dose of 0.2Â J/cm(2) were applied once daily for 28Â days. Outcomes were evaluated weekly using digital photographs. Histopathological findings were assessed using a 6Â mm punch biopsy. A significant increase in hair growth was observed in the green light, moderate in the red light, and the lowest in the blue light group. The addition of the microneedle patch to LED irradiation enhanced greater and faster anagen entry in all the groups. Histopathology showed an apparent increase in the number of hair follicles, collagen bundles in the dermis, angiogenesis, and mononuclear cell infiltration after treatment with the green-light LED microneedle patches. No serious adverse effects were observed during the experiment. Our study provides evidence that the newly developed green-light LED microneedle patch caused the optimal telogen-to-anagen transition and could lead to new approaches for AGA. Microneedle stimulation may aid percutaneous light delivery to the target hair follicle stem cells. Male;Animals;Mice;Mice, Inbred C57BL;Alopecia;Hair Follicle;Skin;Scalp

Lights on for Autism: Exploring Photobiomodulation as an Effective Therapeutic Option. Autism is a neurodevelopmental condition that starts in childhood and continues into adulthood. The core characteristics include difficulties with social interaction and communication, together with restricted and repetitive behaviours. There are a number of key abnormalities of brain structure and function that trigger these behavioural patterns, including an imbalance of functional connectivity and synaptic transmission, neuronal death, gliosis and inflammation. In addition, autism has been linked to alterations in the gut microbiome. Unfortunately, as it stands, there are few treatment options available for patients. In this mini-review, we consider the effectiveness of a potential new treatment for autism, known as photobiomodulation, the therapeutic use of red to near infrared light on body tissues. This treatment has been shown in a range of pathological conditions-to improve the key changes that characterise autism, including the functional connectivity and survival patterns of neurones, the patterns of gliosis and inflammation and the composition of the microbiome. We highlight the idea that photobiomodulation may form an ideal treatment option for autism, one that is certainly worthy of further investigation.

Photobiomodulation therapy in mood disorders: a systematic review. Mood disorders are common, debilitating and impose a high-cost burden on society. Side effects and resistance to psychiatric drugs justify finding new treatment methods. Photobiomodulation therapy (PBMT) uses photons of light to repair, modulate and improve the function of target tissue. The purpose of this study is to systematically review the use of PBMT for the treatment of mood disorders and to identify the useful parameters of PBMT, the level of evidence of its effectiveness, and the degree of its practical recommendation. "Google scholar," "Pub Med," "Scopus," and "Science direct" online databases were searched based on Preferred Reporting Items for Systematic Reviews and meta-analyses (PRISMA) guidelines. The human or animal studies written in English and published from January 2009 to August 2021 were included. Sixteen studies, which included four randomized controlled trials (RCTs), met the inclusion criteria. Infrared wavelength ranges from 800 to 830Â nm, power density of 250 mW/cm(2) and energy density of 60 to 120Â J/ cm(2) were the most used PBMT

parameters. Bias risk assessment was performed to evaluate the quality of RCTs in which 2 out of 4 RCTs were evaluated as high quality. Based on grade practice recommendations, PBMT can be classified as strongly recommended for moderate grade of major depressive disorder (MDD) and recommended for anxiety disorder. In bipolar disorder, further studies are needed to recommend this therapeutic method. Animals;Humans;Low-Level Light Therapy;Photons;Risk Assessment

Photobiomodulation promotes angiogenesis in wound healing through stimulating the nuclear translocation of VEGFR2 and STAT3. In recent years, Photobiomodulation (PBM) has gained prevalence as a kind of physical therapy for wound healing, however, concerning specific cellular mechanisms induced by PBM remains uncertain. The objective of this study is to evaluate the mechanisms of action of PBM (632.8â€¯nm) on angiogenesis in wound healing in vitro and vivo. In the present work, we indicated that PBM with 1.0â€¯J/cm2 irradiation dose exerts positive effects on cell viability, migration, proliferation and tube formation in human umbilical vein endothelial cells (HUVECs). Furthermore, we demonstrate that the VEGFA/VEGFR2/STAT3 pathway plays an important role in PBM effecting cellular function and promoting angiogenesis in wound healing. In addition, we also found that PBM activated the VEGFA/VEGFR2/STAT3 pathway by stimulating VEGFR2 and STAT3 nuclear translocation in the presence of importin-Î². Our research offer a new insight into the potential molecular mechanisms in which PBM promotes angiogenesis in wound healing. STAT3 protein, human;STAT3 Transcription Factor;KDR protein, human Humans;Cell Survival;Human Umbilical Vein Endothelial Cells;STAT3 Transcription Factor;Wound Healing

The effect of systemic versus local transcutaneous laser therapy on tension-type cephalea and orofacial pain in post-COVID-19 patients: A pragmatic randomized clinical trial. INTRODUCTION: Orofacial pain and tensional cephalea were symptoms commonly reported in COVID-19 patients, even after recovery, and were considered chronic pain in these cases. The aim of this research is to evaluate the effect of the application of photobiomodulation with red and infrared lasers applied locally and systemically. METHODS AND ANALYSIS: For this purpose, individuals who have been diagnosed with COVID-19 and have had a tension headache and/or orofacial pain for more than 3 months will be selected by convenience. The participants will be divided into two different groups: G1-photobiomodulation with red and infrared laser with local application on the pain points (808 nm and 660 nm, 100 mW, 6 J per point) and G2-photobiomodulation with red laser with transcutaneous application on the radial artery (660 nm, 100 mW, 30 minutes). All participants will be treated for a period of 4 weeks, with 8 application sessions. The effects will be measured by means of blood lactate level, Brief Pain Inventory, Visual Analog Scale (VAS), and Cephalea Impact Test. The data will be collected weekly before and after the treatment, and the following tests will be applied: Analysis of variance (ANOVA), Tukey paired t test, Kruskal-Wallis, or Wilcoxon, according to data distribution. Î± = 0.05 will be considered as the level of statistical significance. ETHICS AND DISSEMINATION: This study was approved by the Research Projects Committee of the Nove de Julho University (approval number 4.673.963). Results will be disseminated through peer-reviewed journals and events for the scientific and clinical community, and the general public. It is registered in the ClinicalTrials.gov database with the number NCT05430776. Humans;COVID-19;Facial Pain;Low-Level Light Therapy;Lasers;Immunotherapy

Laser photobiomodulation does not alter clinical and histological characteristics of 4-NQO-induced oral carcinomas and leukoplakia in mice. OBJECTIVE: This study evaluated the effect of laser photobiomodulation (PBM) on oral leukoplakia and squamous cell carcinomas (OSCC) in a model of oral carcinogenesis. MATERIALS AND METHODS: Forty-one C57Bl/6 female mice were distributed in control group, 4-NQO group, Laser group 1.5Â J and Laser group 9Â J. Oral cancer was induced on the tongue by nitroquinoline oxide (4-NQO), diluted in the water for 16Â weeks. In the 18th and 19th

weeks, PBM with a diode laser, 0.028Â cm(2) spot size, continuous emission mode, 660Â nm wavelength was applied on the tongue of animals for seven sessions. Laser group 1.5Â J received 30Â mW power and 1.5Â J energy. In the Laser group 9Â J, 100Â mW power, and 9Â J energy were applied. In the 20th week the animals were euthanized. RESULTS: All animals exposed to carcinogen developed clinical and histological alterations such as leukoplakia and OSCC on the tongue. There was no significant difference among Laser groups 1.5 and 9Â J and 4-NQO group (not irradiated) regarding the area of leukoplakia and carcinomas (P >Â 0.05) or thickness of epithelial tissue and keratin (PÂ >Â 0.05). There were also no association between PBM and histologic classification of the lesions (P =Â 0.87), frequency of OSCC (P =Â 0.57), grade of tumor differentiation (P =Â 0.88) or depth of invasion (P =Â 0.45). CONCLUSION: Laser PBM, in both parameters used, does not influence on clinical and histological characteristics of oral leukoplakia and OSCC. CLINICAL RELEVANCE: Results suggest that PBM may be a safe treatment for adverse effects of antineoplastic therapies in patients with leukoplakia and OSCC. 4-Nitroquinoline-1-oxide;Carcinogens Female;Mice;Animals;4-Nitroquinoline-1-oxide;Mouth Neoplasms;Leukoplakia, Oral;Carcinoma, Squamous Cell;Carcinogens;Lasers, Semiconductor

Heat Shock Protein Is Associated with Inhibition of Inflammatory Cytokine Production by 630â€‰nm Light-Emitting Diode Irradiation in Fibroblast-Like Synoviocytes Based on RNA Sequencing Analysis. Background: Inflammatory cytokine secretion from fibroblast-like synoviocytes (FLS) plays a vital role in the pathological process of rheumatoid arthritis (RA). Photobiomodulation (PBM) has been widely used in the treatment of RA. However, the mechanism of PBM in RA has not been clarified. Objective: In this study, we investigated the underlying mechanism of 630â€‰nm light-emitting diode (LED) irradiation on anti-inflammation using mRNA sequencing analysis. Methods and results: Reverse transcription (RT)-quantitative polymerase chain reaction (RT-qPCR) results showed that 630â€‰nm LED irradiation significantly inhibited interleukin (IL)-1Î², IL-6, and IL-8 mRNA expression in rheumatoid arthritis fibroblast synovial cells (RA-FLS) and MH7A cells. A total of 1730 differentially expressed genes (DEGs) were identified between tumor necrosis factor Î± (TNF-Î±)+LED and TNF-Î±-treated RA-FLS and 1219 DEGs in MH7A cells by mRNA sequencing analysis. A total of 646 intersecting DEGs from the 2 cell models were used for gene ontology and Kyoto Encyclopedia of Genes and Genomes analyses. Protein-protein interaction (PPI) network of DEGs was used, and 502 nodes and 1452 edges were found. A total of 14 clusters were generated in MCODE, and the top 3 clusters were selected as hub modules. PPI network showed that most of the nodes were DEGs of the heat shock protein (HSP) family. RT-qPCR verified that 630â€‰nm LED irradiation significantly increased HSP70 mRNA expression in FLS. Conclusions: Taken together, our results revealed the correlation between HSP70 and the inhibition of inflammation caused by 630â€‰nm LED irradiation. These findings suggested that HSP may be a novel target of 630â€‰nm LED irradiation to alleviate inflammation in the treatment of RA. Tumor Necrosis Factor-alpha;Heat-Shock Proteins;RNA, Messenger Humans;Synoviocytes;Synovial Membrane;Tumor Necrosis Factor-alpha;Heat-Shock Proteins;Cells, Cultured;Fibroblasts;Arthritis, Rheumatoid;Inflammation;RNA, Messenger;Sequence Analysis, RNA

Do Biophotons Play Any Role in Transcranial Photobiomodulation of the Brain? Brain;Low-Level Light Therapy

Blue Light-Emitting Diode Therapy for Chronic Vulvovaginitis Symptoms: A Series of Cases. Objective: This pilot study aimed to evaluate the characteristic signs and symptoms of chronic vulvovaginitis after blue light-emitting diode (LED) treatment. Methods: Women with characteristic signs and symptoms of vulvovaginitis were interviewed to obtain clinical and sociodemographic data. They answered the Female Sexual Function Index (FSFI) and the World Health Organization Quality of Life (WHOQOL)-bref questionnaires. Women with a suspected diagnosis of vulvovaginitis underwent clinical examination by a gynecologist, followed by microbiological evaluation, potassium hydroxide

testing, vaginal pH assessment, and collection of vaginal fluid for oncotic cytology and fungal culture. The study participants were instructed to return after 15 days to undergo the 405â€‰nm blue LED treatment, which consisted of three biweekly sessions. After 28 days of treatment completion, the patients returned for clinical re-evaluation and reassessment of the FSFI and WHOQOL-bref scores. Results: All eight women reported improvement or cure of at least one characteristic sign or symptom of vulvovaginitis, and five showed improvement in total FSFI and WHOQOL-bref scores. Conclusions: Treatment with blue LED may improve or cure symptoms associated with vulvovaginitis, sexual function, and the global quality of life score. Clinical Trial registration: NCT03075046 dated March 9, 2017. Humans;Female;Quality of Life;Pilot Projects;Vulvovaginitis;Surveys and Questionnaires

Long-Term Outcome of Photobiomodulation for Diabetic Macular Edema: A Case Report. Background: Macular edema is the major cause of decreased vision in patients with diabetes. Antioxidative and anti-inflammatory effects of photobiomodulation (PBM) have been reported with near-infrared irradiation. Objective: In this study, the efficacy and safety of PBM with near-infrared radiation in a patient with diabetic macular edema were assessed. Methods: We present the case of a 60-year-old man with diabetic macular edema responding to 670â€‰nm light PBM alone. Results: After PBM, his vision improved and macular edema resolved on optical coherence tomography (OCT) findings without adverse events. In 16 months follow-up, visual acuity remained stable and OCT showed no evidence of recurrence of edema. Conclusions: Six hundred seventy nanometers light PBM can be potentially considered as a therapeutic method in diabetic patients with macular edema. Also, it provides a noninvasive and nonexpensive treatment in home. Male;Humans;Middle Aged;Macular Edema;Diabetic Retinopathy;Visual Acuity;Tomography, Optical Coherence;Diabetes Mellitus

Efficacy of red low-level laser for postoperative pain management: A review of literature. Many patients who undergo surgical procedures experience acute postoperative pain, with less than half receiving adequate pain relief. Recent advancements in postoperative pain management include the market clearance by the US Food and Drug Administration for the utilisation of red low-level laser therapy in providing postoperative pain relief. The Food and Drug Administration market clearance was based on clinical data from randomised controlled trials that supported the safety and effectiveness of visible red laser therapy across various surgical procedures. This review of literature aims to evaluate the mechanisms of action, the dose-response curves and clinical outcomes of red low-level laser for postoperative pain management. A literature search was limited to randomised controlled trials that evaluated the use of red low-level laser therapy on postoperative pain. The results from the literature search found that seven studies met the search qualifications. The literature review findings demonstrated that red low-level laser therapy is a safe and effective treatment alternative for postoperative pain management. In addition to postoperative pain reduction, the findings of the literature revealed that red low-level laser therapy may promote healing and reduce the consumption of postoperative prescription analgesic drugs. Analgesics Humans;Analgesics;Pain, Postoperative;Pain Management;Treatment Outcome;Lasers

Efficacy of low-level laser therapy in the management of postoperative surgical sequelae after surgical removal of impacted mandibular third molars. INTRODUCTION: The study is aimed to evaluate the effectiveness of low-level laser therapy (LLLT) in the control of pain, swelling, and trismus after the surgical removal of impacted mandibular third molars. MATERIALS AND METHODS: A prospective study was conducted on thirty patients requiring surgical removal of the impacted mandibular third molar. Mesioangular impacted third molar with class I level B position (according to the Pell and Gregory classification) were included in the study. The study group (n = 15) received LLLT using diode laser of wavelength 980 nm and the control group (n = 15) received routine postoperative

care without LLLT. The parameters evaluated were intensity of pain, maximum mouth opening, postoperative swelling, healing at the surgical site, and presence of dry socket. RESULTS: The mean score of pain, swelling, and trismus in the study group were statistically lower as compared to the control groups. Healing assessment using Laury and Turnbull healing index inferred that the healing at the seventh postoperative day was superior in the study group as compared to the control group. CONCLUSIONS: LLLT with a diode laser of wavelength 980 nm can effectively reduce pain, swelling, and trismus in the postoperative phase after surgical extraction of the mandibular impacted third molar and promote healing at the operative site.

Combinatorial prophylactic effect of phlorotannins with photobiomodulation against tracheal stenosis. Several conventional treatments are used to manage tracheal stenosis after intubation and surgical procedures; however, patients are at risk of restenosis because of the absence of effective preventative therapy. In this study, we evaluate the biomodulatory effect of PT-combined blue light (BL) PBM in tracheostomal stenosis-induced animal models. The PT-combined BL group showed a significant decrease in the fibrotic protein synthesis by downregulating the release of stenosis-triggering fibrotic signals, without cytotoxicity or thermal damage. Moreover, the combined treatment ameliorated excessive granulation and collagen formation, and consequently preserved the opening of the tracheostoma ten days after fenestration. The current study demonstrated the biomodulatory effect of PT-combined BL on human tracheal fibroblasts and tracheal fenestration rodent models. Hence, PT-combined BL has the potential to be an effective preventative treatment for tracheal stenosis but also as an alternative option for fibrotic disorders.

Anti-inflammatory effect of green photobiomodulation in human adipose-derived mesenchymal stem cells. Photo biomodulation (PBM) as a non-invasive and safe treatment has been demonstrated the anti-inflammatory potential in a variety of cell types, including stem cells. However, further investigations using different laser parameters combined with more accurate methods such as quantitative measurement of inflammatory gene expression at the mRNA level are still necessary. The aim of this study was to evaluate the effect of 532Â nm green laser on cell proliferation as well as expression of inflammatory genes in human adipose-derived mesenchymal stem cells (hADMSCs) using RNA sequencing (RNA-seq) technique and confirmatory RT-PCR. hADMSCs were cultured in DMEM low glocuse medium with 10% fetal bovine serum until the fourth passage. Cultured cells were divided in two groups: control group (no laser irradiation) and laser group, irradiated with 532Â nm laser at 44Â mÂ J/cm(2) with an output power of 50 mW and a density of 6 mW/cm(2), every other day, 7Â s each time. The cell viability was assessed using MTT assay 24Â h after each irradiation on days 3, 5, and 7 after cell seeding, followed by performing RNA-seq and RT-PCR. The MTT assay showed that PBM increased cell proliferation on day 5 after irradiation compared to day 3 and decreased on day 7 compared to day 5. In addition, gene expression analysis in hADMSCs using RNA-seq revealed down-regulation of inflammatory genes including CSF2, CXCL2, 3, 5, 6, 8, and CCL2, 7. These results indicate that 532Â nm PBM with the parameters used in this study has a time-dependent effect on hADMSCs proliferation as well as anti-inflammatory potential. Humans;Mesenchymal Stem Cells;Stem Cells;Cell Proliferation;Cell Survival;Cell Line

A dental implant-on-a-chip for 3D modeling of host-material-pathogen interactions and therapeutic testing platforms. The precise spatiotemporal control and manipulation of fluid dynamics on a small scale granted by lab-on-a-chip devices provide a new biomedical research realm as a substitute for in vivo studies of host-pathogen interactions. While there has been a rise in the use of various medical devices/implants for human use, the applicability of microfluidic models that integrate such functional biomaterials is currently limited. Here, we introduced a novel dental implant-on-a-chip model to better understand host-material-pathogen interactions in the context of peri-implant diseases. The implant-on-a-chip integrates gingival cells with relevant biomaterials - keratinocytes

with dental resin and fibroblasts with titanium while maintaining a spatially separated co-culture. To enable this co-culture, the implant-on-a-chip's core structure necessitates closely spaced, tall microtrenches. Thus, an SU-8 master mold with a high aspect-ratio pillar array was created by employing a unique backside UV exposure with a selective optical filter. With this model, we successfully replicated the morphology of keratinocytes and fibroblasts in the vicinity of dental implant biomaterials. Furthermore, we demonstrated how photobiomodulation therapy might be used to protect the epithelial layer from recurrent bacterial challenges (âˆ¼3.5-fold reduction in cellular damage vs. control). Overall, our dental implant-on-a-chip approach proposes a new microfluidic model for multiplexed host-material-pathogen investigations and the evaluation of novel treatment strategies for infectious diseases. Dental Implants Humans;Dental Implants;Microfluidics;Biomedical Research;Host-Pathogen Interactions

Effects of low-level laser therapy on impaired mobility in dogs with naturally occurring osteoarthritis. BACKGROUND: Osteoarthritis is common in the aging dog and is associated with chronic pain and impaired mobility. The main objective of this study was to determine whether low-level laser therapy (LLLT) would increase physical activity in dogs with osteoarthritis. METHODS: Twenty-three dogs with osteoarthritis were instrumented with an accelerometer 48 h before the first LLLT session (baseline), to record daily activity. Each dog underwent six consecutive weekly laser treatments. The scores of the Canine Brief Pain Inventory and the Liverpool Osteoarthritis in Dogs' were recorded for clinical purposes, as a tool to titrate the analgesic therapy of each individual dog, before LLLT (as baseline) and then weekly for 6 weeks. RESULTS: The number of daily activities increased during week 2 (161,674; SD, 103,666) and remained higher than baseline (93,481; SD, 107,878) until week 6 (179,309; SD, 126,044; $p < 0.001$). Daily step count increased from week 1 (4472; SD, 3427) compared to baseline (1109; SD, 1061) and remained higher than the baseline until the end of week 6 (8416; SD, 3166; $p < 0.001$). Average energy expenditure during the study period was 179 [range, 2-536] kcal/day; there were no statistically significant differences in this variable between weeks of treatment. Systemic analgesics therapy was decreased in 50% of the dogs during the study period. CONCLUSIONS: Laser therapy may advance the management of osteoarthritis by increasing the level of activity of dogs, therefore improving their quality of life. Dogs;Animals;Low-Level Light Therapy;Quality of Life;Osteoarthritis;Chronic Pain;Dog Diseases

Differential effects of 808-nm light on electron transport chain enzymes in isolated mitochondria: Implications for photobiomodulation initiation. Photobiomodulation is a term for using low-power red to near-infrared light to stimulate a variety of positive biological effects. Though the scientific and clinical acceptance of PBM as a therapeutic intervention has increased dramatically in recent years, the molecular underpinnings of the effect remain poorly understood. The putative chromophore for PBM effects is cytochrome c oxidase. It is postulated that light absorption at cytochrome c oxidase initiates a signaling cascade involving ATP and generation of reactive oxygen species (ROS), which subsequently results in improved cellular robustness. However, this hypothesis is largely based on inference and indirect evidence, and the precise molecular mechanisms that govern how photon absorption leads to these downstream effects remain poorly understood. We conducted low-power PBM-type light exposures of isolated mitochondria to 808Â nm NIR light, at a number of irradiances. NIR exposure was found to enhance the activity of complex IV, depress the activity of complex III, and had no effect on the activity of complex II. Further, examining the dose-response of complex IV we found NIR enhancement did not exhibit irradiance reciprocity, indicating the effect on complex IV may not have direct photochemical basis. In summary, this research presents a novel method to interrogate the earliest stages of PBM in the mitochondria, and a unique window into the corresponding molecular mechanism(s) of induction. Electron Transport

Complex IV Electron Transport Complex IV;Electron Transport;Low-Level Light Therapy;Mitochondria;Mitochondrial Membranes
Can transcranial photobiomodulation improve cognitive function? A systematic review of human studies. BACKGROUND: Transcranial photobiomodulation (tPBM) has been studied for over a decade as a possible cognitive intervention. OBJECTIVE: To evaluate the effect of tPBM for enhancing human cognitive function in healthy adults and remediating impaired cognitive function in adults with cognitive disorders. METHODS: A systematic literature search from three electronic databases (PubMed, Scopus, Web of Science) was conducted from 1987 to May 2022. The cognitive function being evaluated included learning and memory, attention, executive function, language, and global cognitive function. RESULTS: Of the 35 studies identified, 29 (82.9 %) studies reported positive improvement in cognitive functions after tPBM. All nine studies on participants with subjective memory complaints, mild cognitive impairment, and dementia, showed positive outcomes. Seven (87.5 %) studies on traumatic brain injury (TBI) patients also showed positive results. A series of clinical trials on stroke patients showed positive trends on improved neurological deficit at first, but was prematurely terminated later at phase III due to the lack of statistical significance. One of the most common protocols for clinical populations employed devices delivering near-infrared light (810Â nm), the irradiance of 20-25Â mW/cm(2), and fluence of 1-10Â J/cm(2). While this was common, the reviewed protocols also included other wavelengths of light ranging from visible, red (630-635Â nm) to invisible near-infrared maximum wavelengths of 1060-1068Â nm. CONCLUSIONS: tPBM seems to improve cognitive function. However, only half of the reviewed clinical trials were randomized control trials, further investigation is warranted. Humans;Cognition;Cognition Disorders;Executive Function;Brain Injuries, Traumatic;Cognitive Dysfunction
Short-Term Effects of Whole-Body Photobiomodulation on Pain, Quality of Life and Psychological Factors in a Population Suffering from Fibromyalgia: A Triple-Blinded Randomised Clinical Trial. BACKGROUND: FibromyalgiaÂ (FM) is a multifunctional chronic musculoskeletal pain condition characterised by sensory hypersensitivity. Photobiomodulation (PBM) has shown a positive impact on relieving pain; however, no studies to our knowledge have analysed a whole-body PBM intervention in subjects with FM. The aims of the study were to compare the effects of whole-body PBM with placebo PBM on pain, functionality and psychological symptoms in patients suffering from FM. METHODS: Forty-two subjects were recruited from a private care practice. The design of the study is a randomised, triple-blinded, placebo-controlled clinical trial. Participants received 12 treatment sessions. Pain, quality of life, level of physical activity and psychological factors were assessed at baseline (T0), after session 6 (T1), after treatment (T2) and at 2-week (T3) follow-up. RESULTS: There were statistically significant differences in pain at 4Â weeks (pâ€‰â‰¤â€‰0.001) (T2) and the 2-week follow-up (T3) (pâ€‰â‰¤â€‰0.001). In relation to the quality of life, there were statistically significant improvements after session 6 (pâ€‰â‰¤â€‰0.001) (T1), immediately after treatment (pâ€‰â‰¤â€‰0.001) (T2) and at the 2-week (T3) follow-up (pâ€‰â‰¤â€‰0.001). Kinesiophobia presented significant differences between groups immediately after treatment (pâ€‰â‰¤â€‰0.001) (T2) and at the 2-week (T3) follow-up (pâ€‰â‰¤â€‰0.001), with self-efficacy only showing significant differences between groups 2 weeks after the treatment (pâ€‰=â€‰0.01) (T2). There were no differences between groups when comparing pain catastrophising at any time. CONCLUSION: Whole-body PBM resulted in a significant reduction in pain and an improvement in quality of life in those participants suffering from FM after receiving 4Â weeks of treatment. Furthermore, psychological factors such as kinesiophobia and self-efficacy were also improved. Thus, a whole-body PBM treatment is presented as a possible new multifactorial treatment with potential benefits for those with FM and more studies are needed to corroborate our findings. TRIAL REGISTRATION: ClinicalTrials.gov (NCT0424897).

Duodenal Dual-Wavelength Photobiomodulation Improves Hyperglycemia and Hepatic Parameters with Alteration of Gut Microbiome in Type 2 Diabetes Animal Model. BACKGROUND: Recently, the duodenum has garnered interest for its role in treating metabolic diseases, including type 2 diabetes (T2DM). Multiple sessions of external photobiomodulation (PBM) in previous animal studies suggested it resulted in improved hyperglycemia, glucose intolerance, and insulin resistance with a multifactorial mechanism of action, despite the target organ of PBM not being clearly proven. This study aimed to determine whether a single session of a duodenal light-emitting diode (LED) PBM may impact the T2DM treatment in an animal model. METHODS: Goto-Kakizaki rats as T2DM models were subjected to PBM through duodenal lumen irradiation, sham procedure, or control in 1-week pilot (630 nm, 850 nm, or 630/850 nm) and 4-week follow-up (630 nm or 630/850 nm) studies. Oral glucose tolerance tests; serum glucagon-like peptide 1 (GLP-1), glucose-dependent insulinotropic polypeptide, and insulin levels; liver chemistry and histology; and gut microbiome in the PBM, sham control, and control groups were evaluated. RESULTS: In the 1-week study, duodenal dual-wavelength (D, 630/850 nm) LED PBM showed improved glucose intolerance, alkaline phosphatase and cholesterol levels, and weight gain than other groups. The D-LED PBM group in the 4-week study also showed improved hyperglycemia and liver enzyme levels, with relatively preserved pancreatic islets and increased serum insulin and GLP-1 levels. Five genera (Bacteroides, Escherichia, Parabacteroides, Allobaculum, and Faecalibaculum) were significantly enriched 1 week after the D-LED PBM. Bacteroides acidifaciens significantly increased, while Lachnospiraceae significantly decreased after 1 week. CONCLUSION: A single session of D-LED PBM improved hyperglycemia and hepatic parameters through the change of serum insulin, insulin resistance, insulin expression in the pancreatic Î²-cells, and gut microbiome in T2DM animal models. Glucagon-Like Peptide 1;Insulin Animals;Rats;Diabetes Mellitus, Type 2;Disease Models, Animal;Duodenum;Gastrointestinal Microbiome;Glucagon-Like Peptide 1;Glucose Intolerance;Hyperglycemia;Insulin;Insulin Resistance;Liver

Changes in Circadian Variations in Blood Pressure, Pain Pressure Threshold and the Elasticity of Tissue after a Whole-Body Photobiomodulation Treatment in Patients with Fibromyalgia: A Tripled-Blinded Randomized Clinical Trial. This study analysed circadian variation changes in blood pressure (BP), the pain pressure threshold (PPT) and the elasticity of tissue in patients with fibromyalgia (FM) after a whole-body photobiomodulation (PBM) treatment. This was a tripled-blinded randomized clinical trial including forty participants with FM. Participants using validated self-measurement BP devices attained readings that were used to calculate the circadian variation. Additionally, a standard pressure algometer of 1cm2 was used to assess 13 tender points by exerting a pressure of up to 4 kg, and strain elastography assessed the elasticity of tissue. Circadian variations in BP showed significant differences after the PBM intervention ($p = 0.036$). When comparing PPT between groups, statistically significant differences were found in the occiput ($p = 0.039$), low cervical ($p = 0.035$), trapezius ($p = 0.037$), second rib ($p < 0.001$) and medial epicondyle points ($p = 0.006$). Furthermore, there were statistically significant differences in both the trapezius and the forearm at the distal dorsal third SEL values (p â‰¤ 0.001) when comparing groups. Whole-body PBM produces changes in circadian blood pressure, the pain pressure threshold and the elasticity of tissue after a treatment program was carried out. However, more studies are needed to corroborate our findings as well as to better understand the underlying mechanisms.

A Novel Approach of Combining Methylene Blue Photodynamic Inactivation, Photobiomodulation and Oral Ingested Methylene Blue in COVID-19 Management: A Pilot Clinical Study with 12-Month Follow-Up. Coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2 virus was first recognized in late 2019 and remains a significant threat. We therefore assessed the use of local methylene blue photodynamic viral inactivation (MB-PDI) in the oral and nasal cavities, in combination with the

systemic anti-viral, anti-inflammatory and antioxidant actions of orally ingested methylene blue (MB) and photobiomodulation (PBM) for COVID-19 disease. The proposed protocol leverages the separate and combined effects of MB and 660nm red light emitted diode (LED) to comprehensively address the pathophysiological sequelae of COVID-19. A total of eight pilot subjects with COVID-19 disease were treated in the Bahamas over the period June 2021-August 2021, using a remote care program that was developed for this purpose. Although not a pre-requisite for inclusion, none of the subjects had received any COVID-19 vaccination prior to commencing the study. Clinical outcome assessment tools included serial cycle threshold measurements as a surrogate estimate of viral load; serial online questionnaires to document symptom response and adverse effects; and a one-year follow-up survey to assess long-term outcomes. All subjects received MB-PDI to target the main sites of viral entry in the nose and mouth. This was the central component of the treatment protocol with the addition of orally ingested MB and/or PBM based on clinical requirements. The mucosal surfaces were irradiated with 660 nm LED in a continuous emission mode at energy density of 49 J/cm(2) for PDI and 4.9 J/cm(2) for PBM. Although our pilot subjects had significant co-morbidities, extremely high viral loads and moderately severe symptoms during the Delta phase of the pandemic, the response to treatment was highly encouraging. Rapid reductions in viral loads were observed and negative PCR tests were documented within a median of 4 days. These laboratory findings occurred in parallel with significant clinical improvement, mostly within 12-24 h of commencing the treatment protocol. There were no significant adverse effects and none of the subjects who completed the protocol required in-patient hospitalization. The outcomes were similarly encouraging at one-year follow-up with virtual absence of "long COVID" symptoms or of COVID-19 re-infection. Our results indicate that the protocols may be a safe and promising approach to challenging COVID-19 disease. Moreover, due its broad spectrum of activity, this approach has the potential to address the prevailing and future COVID-19 variants and other infections transmitted via the upper respiratory tract. Extensive studies with a large cohort are warranted to validate our results.

Effectiveness of conservative therapeutic modalities for temporomandibular disorders-related pain: a systematic review. PURPOSE: The aim of this systematic review was to evaluate the effectiveness of conservative different therapeutic modalities for temporomandibular disorders (TMD) pain. MATERIALS AND METHODS: An electronic systematic search was conducted in the MEDLINE (PubMed) database to identify the randomized clinical trials (RCTs) published between 2001 and 2021. The following, simple or multiple conjunctions, search keywords were selected: TMD pain, TMD management or conservative treatment or treatment strategies and TMD pain, therapeutic modalities or interventions and TMD. Studies included must have patients older than 18Â years, with painful TMD, which diagnosis was performed by Research Diagnostic Criteria for TMD or Diagnostic Criteria for TMD. Outcome variables were pain relief and post treatment pain intensity reduction. Data were analysed with non-parametric tests and the level of significance was set at p<.05. RESULTS: Out of 1599 articles obtained, 28 RCTs fulfilled all selection criteria and were included. The results of this study show that there was a significant decrease in short-term post-treatment TMD pain with the use of occlusal splint alone or in combination with other therapeutic modalities when compared with the control group. Statistically significant differences were also detected between laser and photobiomodulation group and the control, in short-term treatment TMD-related pain. CONCLUSIONS: The primary findings of the present systematic review showed that the occlusal splint alone or combined with other therapeutic intervention presented positive effect on short-term TMD pain reduction. Secondary outcome suggests that laser and photobiomodulation therapy had, also, a significant role in short term pain relief. Humans;Treatment Outcome;Pain;Temporomandibular Joint Disorders;Pain Management;Occlusal Splints

An exploration of the use of photobiomodulation for management of oral mucositis in children and young people undergoing cancer treatment in the UK. PURPOSE: Oral mucositis affects up to 80% of children and young people (CYP) receiving chemotherapy. This can result in pain, reduced oral intake and, in severe cases, hospitalisation for parental nutrition and pain relief. Photobiomodulation is recommended by multiple bodies for mucositis management for those undergoing cancer treatments. The current use of photobiomodulation within the UK, and the barriers and facilitators to implementation is unknown. METHOD: An online mixed-methods survey was administered to representatives from the Children's Cancer and Leukaemia Group (CCLG) between October 2021 and March 2022. This explored: use of photobiomodulation, planned future use, barriers and facilitators to implementation and dental assessment. Quantitative data underwent descriptive statistics. Barriers and facilitators to the implementation of photobiomodulation were analysed using the Theoretical Domains Framework (TDF). RESULTS: All UK CCLG centres responded (nâ€‰=â€‰20, a response rate of 100%). Two units in Scotland were delivering photobiomodulation. A further four units were planning to implement a service. Most units, 65% (nâ€‰=â€‰13) utilised specialist Paediatric Dentistry services for dental assessment. In the TDF analysis, five domains were most frequently populated: knowledge, skills, environmental context and resources, social influences, and social/professional roleÂ and identity. CONCLUSION: Photobiomodulation was only available in Scotland in two children's cancer units. Lack of knowledge and skills, and insufficient environmental resources were identified as barriers. Collaboration with paediatric dental services was identified as a facilitator. The establishment of a national network of Paediatric Dentists and Oncologists would promote collaboration to standardise protocols and to address the identified barriers to wider implementation of photobiomodulation. Humans;Child;Adolescent;Stomatitis;Surveys and Questionnaires;Pain;United Kingdom;Neoplasms

Effects of systemic vascular photobiomodulation using LED or laser on sensory-motor recovery following a peripheral nerve injury in Wistar rats. Peripheral nerve injury (PNI) is associated with considerable functional impairment. Photobiomodulation (PBM) has demonstrated positive effects regarding neuromuscular repair after PNI when applied locally to the nerve or injured muscle. However, the effects of systemic PBM with transcutaneous application over an important artery, which is also denominated vascular PBM (VPBM), remain unclear. The aim of the study was to compare the effects of VPBM with low-level laser (LLL) and light-emitting diode (LED) on gait, sensitivity and muscle morphology following a PNI. PNI was induced on Wistar rats using the sciatic nerve crushing technique. VPBM was performed over the rat's artery tail region with LED (850Â nm, 40Â mW, 3.2Â J) and LLL (780Â nm, 40Â mW, 3.2Â J). Gait functionality, mechanical (nociceptive) sensitivity, and morphology of the tibialis anterior muscle were evaluated at 7, 14, and 21Â days after injury. An improvement in functional gait was shown in the VPBM-LLL group in all periods. Motor sensitivity was found after 14Â days in the VPBM-LLL group. The left/right (L/R) muscle mass ratio revealed a reduction in muscle atrophy in the VPBM-LLL group at 7Â days. Muscle fiber diameter increased in the VPBM-LED group at 14Â days and increases in the cross-section area were found in the VPBM-LED and VPBM-LLL groups at 7Â days. VPBM with both light sources (LED and LLL) positively modulated functioning and neuromuscular recovery following sciatic nerve injury in rats, with more pronounced results when using LLL. Rats;Animals;Rats, Wistar;Peripheral Nerve Injuries;Low-Level Light Therapy;Sciatic Nerve;Lasers

Effects of light-emitting diode (LED) therapy on sensory changes in the inferior alveolar nerve after surgical treatment of mandibular fractures: a randomized controlled trial. PURPOSE: A randomized controlled trial was performed to evaluate the effects of light-emitting diode (LED) therapy on sensory changes in the inferior alveolar nerve after surgical treatment of mandibular fractures. METHODS: Patients admitted with surgically treated mandibular fractures between January

2018 and December 2019 were evaluated. Personal data, fracture location, fracture type, and dislocation degree were obtained. The cases were randomly allocated into two groups: LED therapy (LEDT) (57 points of 660Â nm and 74 points of 850Â nm, 6.4Â mV/cm(2), and 7.64Â J) with the use of a prototype device and control (CTRL). For 6Â months, tactile and thermal tests were used in the mental region. Data were analyzed using the Mannâ”€Whitney U test and likelihood ratio test (pâ€‰â‰¤â€‰0.050). RESULTS: The study included 42 patients, 25 of whom had bilateral fractures and 17 had unilateral fractures, totaling 67 fractures. The mean values of the tactile and thermal sensitivity tests were lower in the LEDT group in all evaluation periods. There was a significant difference between the groups in the parasymphysis location, displacementâ€‰<â€‰5Â mm, and intraoral access. Sensory changes were observed in 68.7% of all fractures upon admission, with 91.2% in the LEDT group and 78.8% in the CTRL group demonstrating complete remission during the final period of the study. CONCLUSION: LED photobiomodulation accelerated the process of sensory change remission. There was an influence of the fracture location, degree of displacement, and surgical access, with a better response in the LEDT group. Humans;Mandibular Fractures;Low-Level Light Therapy;Mandibular Nerve

Comparison of 1064 nm Q-switched Nd:YAG laser and Jessner peeling in melasma treatment. Melasma is an acquired hyperpigmentation disease characterized by hyperpigmented patches in sun-exposed areas that significantly impairs life quality. Topical treatments such as hydroquinone, retinoic acid, azelaic acid, chemical peels and laser treatments are among the main treatment options. In our study, we aimed to compare the effectiveness of Jessner peeling and 1064â€‰nm Q-switched Nd:YAG laser in melasma treatment. For this purpose, Jessner peeling was applied to 20 patients and 1064â€‰nm Q-switched Nd: YAG laser was applied to 19 patients of 39 melasma patients who applied to the cosmetology unit of Ege University department of dermatology and venereal diseases between November 2018-March 2020. Thirty seven patients completed the study. Changes in MASI, pigment and erythema scores measured by mexameter before and after treatment were compared for two groups. A statistically significant decrease in MASI scores, pigment and erythema scores was observed in both groups with no significant difference between two groups. In conclusion, in our study, it has been shown that Jessner peeling and 1064â€‰nm Q-switched Nd:YAG laser are equally effective in treatment of melasma. Humans;Lasers, Solid-State;Melanosis;Chemexfoliation;Hyperpigmentation;Erythema;Treatment Outcome;Low-Level Light Therapy

The efficacy and safety of the combination of photobiomodulation therapy and pulsed electromagnetic field therapy on androgenetic alopecia. BACKGROUND: Photobiomodulation therapy (PBMT) appears to be safe and effective for hair loss. Pulsed electromagnetic field therapy (PEMF) also has a positive biological effect on hair re-growth. OBJECTIVES: We evaluated the efficacy and safety of both PBMT and PEMF for the treatment of androgenetic alopecia (AGA). MATERIALS AND METHODS: This study was a 24-week, randomized, double-blind, sham device-controlled trial. We recruited 80 subjects with androgenetic alopecia. The subjects got treatment every week for the 1st 12â€‰weeks, every other week for the next 8â€‰weeks. PBMT entails 15-min therapy, and PEMF was carried out for 10Â min. RESULTS: The baseline hair density was 114.57 (Â±28.75)/cm(2) and 113.31 (Â±30.07)/cm(2) in both treatment and control groups. After 24â€‰weeks of treatment, the mean hair density increased to 139.37 (Â±31.4)/cm(2) in the treatment group but only to 119.78 (Â±31.92)/cm(2) in the control group. The difference between two groups was statistically significant (pâ€‰<â€‰0.05). Based on the global assessment of independent experts, the score was 0.41 (Â±0.62) in the treatment group and 0.07 (Â±0.45) in the control group. Only very mild erythema or irritation was reported, and no serious adverse reactions were reported. CONCLUSIONS: A combination of PBMT and PEMF is a valid and safe treatment option for AGA.

Humans;Low-Level Light Therapy;Electromagnetic Fields;Alopecia;Hair;Erythema;Double-Blind Method;Treatment Outcome

Investigating the effects of low intensity visible light on human keratinocytes using a customized LED exposure system. Photobiomodulation (PBM) refers to the use of light to modulate cellular processes, and has demonstrated utility in improving wound healing outcomes, and reducing pain and inflammation. Despite the potential benefits of PBM, the precise molecular mechanisms through which it influences cell behavior are not yet well understood. Inconsistent reporting of key light parameters has created uncertainty around optimal exposure profiles. In addition, very low intensities of light,â€‰<â€‰0.1Â J/cm(2), have not been thoroughly examined for their use in PBM. Here, we present a custom-made compact, and modular LED-based exposure system for studying the effects of very low-intensity visible light (cell proliferation, migration, ROS production, and mitochondrial membrane potential) of three different wavelengths in a parallel manner. The device allows for six repeats of three different exposure conditions plus a non-irradiated control on a single 24-well plate. The immortalised human keratinocyte cell line, HaCaT, was selected as a major cellular component of the skin epidermal barrier. Furthermore, an in vitro wound model was developed by allowing the HaCaT to form a confluent monolayer, then scratching the cells with a pipette tip to form a wound. Cells were exposed to yellow (585Â nm, 0.09 mW,â€‰~â€‰3.7Â mJ/cm(2)), orange (610Â nm, 0.8 mW,â€‰~â€‰31Â mJ/cm(2)), and red (660Â nm, 0.8 mW,â€‰~â€‰31Â mJ/cm(2)) light for 10Â min. 48Â h post-irradiation, immunohistochemistry was performed to evaluate cell viability, proliferation, ROS production, and mitochondrial membrane potential. The results demonstrate increased proliferation and decreased scratch area for all exposure conditions, however only red light increased the mitochondrial activity. Oxidative stress levels did not increase for any of the exposures. The present exposure system provides opportunities to better understand the complex cellular mechanisms driven by the irradiation of skin cells with visible light. Reactive Oxygen Species Humans;Low-Level Light Therapy;Reactive Oxygen Species;Keratinocytes;Wound Healing;Cell Proliferation;Light

Evaluation of intravascular irradiation of blood in children with sleep bruxism: Study protocol for a randomized controlled clinical trial. BACKGROUND: The objective of this study will be to evaluate the effect of intravascular irradiation of blood (ILIB) combined with myofunctional exercises for sleep bruxism in pediatrics. METHODS: This study will be a randomized controlled clinical trial. A triage of individuals between 4 and 17 years old with a diagnosis of sleep bruxism will be carried out at the clinic of the Catholic University of Uruguay, and in a private office referred by different private care centers. The selected participants will be evaluated before and after treatment by means of questionnaires on bruxism, sleep quality and nocturnal oxygen saturation measurement. For this, 46 patients with sleep bruxism will be recruited, who will be divided into 2 groups: control group (CG), which will undergo an application of placebo ILIB and an orofacial myofunctional therapy (MFT) exercise protocol; and na ILIB group, which will carry out an active application of ILIB and an exercise protocol, this being once a week for 8 weeks. The laser treatment (808â€‰nm) will be performed twice a week for 8 weeks. The values will be tested for normality by the Kolmogorov-Smirnov test. For the comparison between the groups, t test will be carried out, considering a level of significance of 0.5% ($P < .05$). DISCUSSION: Although local photobiomodulation (PBM), acupuncture PBM and physiotherapy have been studied in the treatment of bruxism, this is the first study to evaluate the effect of ILIB combined with myofunctional exercises for sleep bruxism in pediatrics. Humans;Child;Child, Preschool;Adolescent;Sleep Bruxism;Myofunctional Therapy;Surveys and Questionnaires;Exercise;Randomized Controlled Trials as Topic

Evaluating the Efficacy of Platelet Rich Plasma and 1550 nm Fractional Laser in Combination and Alone for the Management of Androgenetic Alopecia. Androgenetic alopecia (AGA) in men and

women is the most common cause of hair loss. Affected individuals may experience psychological distress and social withdrawal. Current treatment options for AGA, such as minoxidil and finasteride, vary in efficacy and have side effects. Platelet-rich plasma (PRP) and photobiomodulation are among treatment options that have gained popularity in recent years. While less is known about the effectiveness of fractional lasers for combating hair loss, research suggests that by creating microscopic thermal injury zones, fractional lasers may cause an increase in hair growth from a wound healing process. In this study, we evaluated the efficacy and safety of PRP and 1550 nm fractional erbium-glass laser as monotherapy or combination treatment for AGA in 60 patients. All patients experienced improvement in AGA, but patients treated with the combination therapy had greater improvement in hair density. Overall, PRP and 1550 nm in combination or alone are good treatment choices for AGA, with no side effects. J Drugs Dermatol. 2022;21(11):1166-1169. doi:10.36849/JDD.6750. Minoxidil;Finasteride Male;Humans;Female;Alopecia;Minoxidil;Finasteride;Platelet-Rich Plasma;Lasers, Solid-State;Treatment Outcome

Prospective Study of 532-nm Picosecond Laser for the Treatment of Pigmented Lesions of the Face and Dorsal Hands. BACKGROUND: Pigmented lesions from chronic UV photoaging are extremely common on the face and hands. OBJECTIVE: To evaluate the safety and efficacy of a 532-nm picosecond laser for these types of pigmented lesions. METHODS: This was a single-center, prospective, open-label clinical trial. Eligible subjects with pigmentation on the face and hands received 3 monthly treatments, with 1 month (1M) and 3 months (3M) follow-up. Change in investigator-graded overall facial and per lesion pigmentation and subject-graded satisfaction and pigmentation improvement was evaluated by a 5-point scale. Immediate skin response and adverse events (AEs) were evaluated post-treatment. The melanin index was measured using a mexameter. Randomized before and after photographs were graded by 3 blinded physicians for degree of pigmentation improvement. RESULTS: Twenty-five subjects (22F/3M) with Fitzpatrick skin types I-III were enrolled, with 23 subjects completing. Treatments used a 532 nm wavelength, 800 ps pulse duration, 4-6mm spot size, and 0.1 to 0.6J/cm2 fluence. Good-to-excellent clearance at 1M/3M was demonstrated in â‰¥95% of lesions (n = 116). Only mild treatment-related pain was reported, with transient post-treatment AEs (mean downtime of 2.1 Â± 2.0 days) and no serious treatment-related AEs. Subject satisfaction (satisfied or very satisfied) was 95% at 1M and 91% at 3M. CONCLUSION: Treatment with a 532-nm picosecond laser is safe and highly effective for the treatment of the pigmented lesions of the face and dorsal hands. Humans;Lasers, Solid-State;Low-Level Light Therapy;Pigmentation Disorders;Prospective Studies;Skin Aging;Treatment Outcome;Male;Female

Dual-Brain Psychology: A novel theory and treatment based on cerebral laterality and psychopathology. Dual-Brain Psychology is a theory and its clinical applications that come out of the author's clinical observations and from the Split-brain Studies. The theory posits, based on decades of rigorous, peer-reviewed experiments and clinical reports, that, in most patients, one brain's cerebral hemisphere (either left or right) when stimulated by simple lateral visual field stimulation, or unilateral transcranial photobiomodulation, reveals a dramatic change in personality such that stimulating one hemisphere evokes, as a trait, a personality that is more childlike and more presently affected by childhood maltreatments that are usually not presently appreciated but are the proximal cause of the patient's symptoms. The personality associated with the other hemisphere is much more mature, less affected by the traumas, and less symptomatic. The theory can be applied to in-depth psychotherapy in which the focus is on helping the troubled side to bear and process the traumas with the help of the therapist and the healthier personality. A person's symptoms can be evoked to aid the psychotherapy with hemispheric stimulation and the relationship between the dual

personalities can be transformed from conflicted and sabotaging to cooperating toward overall health. Stimulating the positive hemisphere in most therapy patients rapidly relieves symptoms such as anxiety, depression, or substance cravings. Two randomized controlled trials used unilateral transcranial photobiomodulation to the positive hemisphere as a stand-alone treatment for opioid cravings and both revealed high effect sizes. The theory is supported by brain imaging and rTMS studies. It is the first psychological theory and application that comes out of and is supported by rigorous peer-reviewed experimentation.

Photobiomodulation activates the PI3K/AKT pathway in diabetic fibroblast cells in vitro. Photobiomodulation (PBM) has been known to facilitate the healing of numerous ailments including diabetic wounds. PBM is not broadly acknowledged largely due to scepticism regarding its mechanism of action, including the specific molecular targets and the effects rendered at a tissue, cellular and molecular level. Diabetes mellitus (DM) reduces cellular signalling, including the phosphatidylinositol 3 kinase/protein kinase B (PI3K/AKT) signalling pathway that is critical during wound healing. In DM, wound chronicity is common and may lead to non-traumatic limb amputation. This study investigated the hypothesis that PBM at 660Â nm activates PI3K/AKT and downstream signalling proteins in fibroblast cells in vitro. Cells were incubated for 24 and 48Â h after PBM (660Â nm and 5Â J/cm(2)), followed by evaluation of activated PI3K/AKT and downstream mammalian target of rapamycin (mTOR) and glycogen synthase kinase-3 beta (GSK3Î²) signalling proteins using western blotting and ELISA. Irradiated cell models displayed increased activation of PI3K/AKT and downstream mTOR and GSK3Î² signalling proteins. Our findings suggest that the therapeutic effects of PBM in stressed cells are through activation of the PI3K/AKT cell signalling pathway and downstream GSK3Î² and mTOR signalling proteins. This study provides a novel understanding into one of the probable molecular mechanisms in which PBM at a wavelength of 660Â nm (5Â J/cm(2)) enhances therapeutic activities in diabetic wound healing. Proto-Oncogene Proteins c-akt;Phosphatidylinositol 3-Kinases;Glycogen Synthase Kinase 3 beta;TOR Serine-Threonine Kinases Humans;Proto-Oncogene Proteins c-akt;Phosphatidylinositol 3-Kinases;Glycogen Synthase Kinase 3 beta;TOR Serine-Threonine Kinases;Fibroblasts;Diabetes Mellitus

Mast cell stabilization: new mechanism underlying the therapeutic effect of intense pulsed light on rosacea. BACKGROUND: Rosacea, a chronic inflammatory disorder of the facial skin, is effectively treated by intense pulsed light (IPL). OBJECTIVE: To explore the potential molecular mechanism underlying the photobiomodulation effect of IPL for rosacea treatment. METHODS: Skin samples from patients with rosacea were subjected to histological and immunohistological staining. Ten patients were followed up after IPL treatment using the VISIA(Â®) skin analysis system, and the severity was assessed. In vivo, skin changes in mice with rosacea-like inflammation induced by intradermal injection of 320Â Î¼M LL-37 with or without IPL treatment were evaluated using L*a*b colorimetry as well as histological and immunological staining. In vitro, LL-37-stimulated mast cells (MCs) with or without IPL treatment were evaluated for protein expression of matrix metalloproteinase (MMP)-9, kallikrein-related peptidase 5 (KLK5), and cathelicidin using western blotting and qRT-PCR. RESULTS: Profound infiltration of inflammatory cells and evident MC degranulation were found in rosacea skin lesions. The expression of rosacea-related biomarkers and inflammatory cytokines was higher in lesional areas than in non-lesional areas, as demonstrated via immunochemical staining. In all patients, rosacea severity reduced after IPL therapy. In vivo, IPL alleviated inflammation in mice with rosacea-like inflammation, as demonstrated by the significantly decreased MMP-9, KLK5, and cathelicidin expression and reduced percentage of degranulating MCs. In vitro, IPL decreased MMP-9, KLK5, and cathelicidin expression in P815 cells, reducing the release of inflammatory cytokines and inhibiting rosacea-like inflammatory reactions. CONCLUSION: The photobiomodulation effect of IPL for rosacea treatment may inhibit MC degranulation and alleviate inflammatory reactions.

Cathelicidins;Cytokines;Matrix Metalloproteinase 9
Animals;Mice;Cathelicidins;Cytokines;Inflammation;Mast Cells;Matrix Metalloproteinase 9;Rosacea;Humans

Systemic glucose levels are modulated by specific wavelengths in the solar light spectrum that shift mitochondrial metabolism. Systemic glucose levels can be modulated with specific solar wavelengths that influence mitochondrial metabolism. Mitochondrial respiration can be modulated using light that shifts ATP production with exceptional conservation of effect across species, from insects to humans. Known wavelengths have opposing effects of photobiomodulation, with longer wavelengths (660-900 nm red/infrared) increasing ATP production, and 420 nm (blue) light suppressing metabolism. Increasing mitochondrial respiration should result in a greater demand for glucose, and a decrease should result in a reduced demand for glucose. Here we have tested the hypothesis that these wavelengths alter circulating glucose concentration. We first established an oral glucose tolerance test curve in a bumblebee model, which showed sustained increase in systemic glucose beyond that seen in mammals, with a gradual normalisation over eight hours. This extended period of increased systemic glucose provided a stable model for glucose manipulation. Bees were starved overnight and given a glucose load in the morning. In the first group glucose levels were examined at hourly intervals. In the second group, bees were additionally exposed to either 670 nm or 420 nm light and their blood glucose examined. Increasing mitochondrial activity with 670 nm light at the peak of circulating glucose, resulted in a significant 50% reduction in concentration measured. Exposure to 420nm light that retards mitochondrial respiration elevated systemic glucose levels by over 50%. The impact of 670 nm and 420 nm on mitochondria is highly conserved. Hence, different wavelengths of visible light may be used to modulate systemic metabolism bidirectionally and may prove an effective agent in mammals. Glucose;Adenosine Triphosphate
Humans;Animals;Mitochondria;Sunlight;Glucose;Adenosine Triphosphate;Light;Mammals

Laser therapy for genitourinary syndrome of menopause: Emperor's new clothes or a meaningful advance? Female;Humans;Laser Therapy;Low-Level Light Therapy;Menopause

Optimized combined low level light therapy and intense pulsed light therapy for the treatment of dry eye syndrome caused by Meibomian glands dysfunction. Dry eye syndrome (DES) is a common disease that can lead to ocular discomfort, reduced visual acuity and reduced quality of life. Meibomian Gland dysfunction plays an important role in most cases. To evaluate the effects of "EyeLight", a novel device delivering combined intense pulsed light (IPL) and low-level light therapy (LLLT), we conducted a retrospective chart review of patients refractory to conventional medical treatment who were treated with "EyeLight" therapy at Laser Vision, Lebanon. Each patient received between 2 to 5 treatment sessions. Clinical measurements were obtained before and after each session, including tear film breakup time (TBUT), ME-CHECK-meiboscale and the ME-CHECK questionnaire to determine the need for an additional session and to monitor progress. The same clinical evaluation was performed 3 to 5 weeks after the final treatment. A total of 52 eyes were included. A significant improvement in objective clinical signs was found, with an increase in TBUT from 6.98Â±1.41s. to 9.27Â±1.25s. (P<0.001) and a decrease in ME-CHECK-meiboscale (P<0.001). A reduction of severity level on the ME-CHECK-meiboscale classification was observed in 90%, along with a significant improvement in subjective clinical signs on the ME-CHECK questionnaire (P<0.001). No ocular or facial adverse events were noted. "EyeLight" treatment of 2 to 5 sessions depending on the severity of MGD in each eye showed an improvement in objective clinical signs and subjective symptoms and therefore appears to be an effective treatment for DES related to MGD refractory to conventional treatment. Humans;Meibomian Gland Dysfunction;Intense Pulsed Light Therapy;Meibomian Glands;Low-Level Light Therapy;Retrospective Studies;Quality of Life;Dry Eye Syndromes

Neuromodulation of brain power topography and network topology by prefrontal transcranial photobiomodulation. Objective.Transcranial photobiomodulation (tPBM) has shown promising benefits, including cognitive improvement, in healthy humans and in patients with Alzheimer's disease. In this study, we aimed to identify key cortical regions that present significant changes caused by tPBM in the electroencephalogram (EEG) oscillation powers and functional connectivity in the healthy human brain.Approach. A 64-channel EEG was recorded from 45 healthy participants during a 13 min period consisting of a 2 min baseline, 8 min tPBM/sham intervention, and 3 min recovery. After pre-processing and normalizing the EEG data at the five EEG rhythms, cluster-based permutation tests were performed for multiple comparisons of spectral power topographies, followed by graph-theory analysis as a topological approach for quantification of brain connectivity metrics at global and nodal/cluster levels.Main results. EEG power enhancement was observed in clusters of channels over the frontoparietal regions in the alpha band and the centroparietal regions in the beta band. The global measures of the network revealed a reduction in synchronization, global efficiency, and small-worldness of beta band connectivity, implying an enhancement of brain network complexity. In addition, in the beta band, nodal graphical analysis demonstrated significant increases in local information integration and centrality over the frontal clusters, accompanied by a decrease in segregation over the bilateral frontal, left parietal, and left occipital regions.Significance.Frontal tPBM increased EEG alpha and beta powers in the frontal-central-parietal regions, enhanced the complexity of the global beta-wave brain network, and augmented local information flow and integration of beta oscillations across prefrontal cortical regions. This study sheds light on the potential link between electrophysiological effects and human cognitive improvement induced by tPBM. Humans;Brain;Electroencephalography;Brain Mapping;Prefrontal Cortex;Alzheimer Disease

Bibliometric trend analysis of non-conventional (alternative) therapies in veterinary research. Background: There is an increased interest in Non-Conventional Therapies (NCTs), often referred to as complementary and alternative medicines, in veterinary clinical practice.Aim: To map the bibliometric outputs of NCTs in veterinary medicine, and identify which are most prevalent, and the extent to which their publishing has increased.Methods: Text mining algorithms were applied to detect 17 NCTs-related terms (acupuncture, ayurveda/ayurvedic, traditional Chinese medicine, traditional medicine, chiropractic, electroacupuncture, essential oil, plant extract, ethnopharmacology, herbal medicine, homeopathy, low-level laser therapy, medicinal plant, natural product, osteopathy, phytotherapy, and massage) in the title, abstract or keywords of all retrievable literature until 2020 under the PubMed MeSH term 'veterinary' (Nâ€‰=â€‰377 556). Point prevalence, incidence by decade and cumulative incidence were calculated.Results: Bibliometric trend analysis revealed an overall increase in NCTs-related terms over the last 20â€‰years, with a substantial growth of studies mentioning plant extracts, essential oils and medicinal plants. Traditional Chinese medicine, herbal medicine and natural product have also increased in the same period, although their numbers remain low. Conversely, reference to acupuncture has decreased in the last decade when compared with the previous decade, whereas references to homeopathy, electroacupuncture, osteopathy and chiropractic remained scarce, suggesting that their use in veterinary clinical practice may not be based on published evidence.Conclusion: Further reviews to explore this issue are warranted, differentiating secondary from primary literature, and assessing relevance and methodological quality of individual studies, following the principles of evidence-based veterinary medicine. Biological Products Animals;Complementary Therapies;Phytotherapy;Homeopathy;Bibliometrics;Biological Products

Progress of phototherapy for osteosarcoma and application prospect of blue light photobiomodulation therapy. Osteosarcoma (OS) is the most common primary malignant bone tumor that mainly affects the pediatric and adolescent population; limb salvage treatment has

become one of the most concerned and expected outcomes of OS patients recently. Phototherapy (PT), as a novel, non-invasive, and efficient antitumor therapeutic approach including photodynamic therapy (PDT), photothermal therapy (PTT), and photobiomodulation therapy (PBMT), has been widely applied in superficial skin tumor research and clinical treatment. OS is the typical deep tumor, and its phototherapy research faces great limitations and challenges. Surprisingly, pulse mode LED light can effectively improve tissue penetration and reduce skin damage caused by high light intensity and has great application potential in deep tumor research. In this review, we discussed the research progress and related molecular mechanisms of phototherapy in the treatment of OS, mainly summarized the status quo of blue light PBMT in the scientific research and clinical applications of tumor treatment, and outlooked the application prospect of pulsed blue LED light in the treatment of OS, so as to further improve clinical survival rate and prognosis of OS treatment and explore corresponding cellular mechanisms.

Photobiomodulation for modulation of neuropathic pain and improvement of scar tissue. BACKGROUND: This case-report explores the effects of photobiomodulation therapy (PBMT) on the healing of scar tissue. The patient was a 32-year old female two years post cholecystectomy resulting in a 15 cm linear scar that was causing severe pain. METHODS: Treatment was initiated using the BIOFLEXÂ® therapist device which consists of LED arrays and laser probes of a specific wavelength, power and frequency applied directly on the skin overlying the scar. The frequency and duration of treatment was every other day for six weeks in a clinic setting, followed by three times a week for two months at home. Then the patient continued to use the BIOFLEXÂ® therapist home device on an as-needed basis. FINDINGS: The final result of this patient's treatment was significant flattening and decreased redness of her scar. Her self-reported pain decreased to a 6/10. At the one year follow up, the patient reported that she stopped taking her opioids, antidepressant and sleeping pills and that her pain decreased to a 4/10. At the last review her pain score was 1/10; and she had returned to work and took Tylenol (acetaminophen) occasionally for breakthrough pain. CONCLUSIONS: We attribute the patient's improvement in scar appearance and pain symptoms to PBMT. Since pain is often associated with depressed mood and sleep disturbances, it cannot be determined whether PBMT was the direct or indirect cause of this patient's improved mood. For future studies, we propose the use of control subjects with similar scars treated with sham treatment compared to those who will receive the PBMT and observed for the same duration of time and compare the overall results. LAY SUMMARY: Dermatological applications, especially wound healing; are accepted indications for photobiomodulation therapy (PBMT). The expansion into other clinical applications, particularly neurological ones show potential benefit. We present a case of a patient with a hypertrophic scar associated with severe neuropathic pain and concurrent depression, all of which improved directly or indirectly with PBMT. Although the original focus of treatment was dermatological the improvement in pain plus the discontinuation of therapy (opioids, antidepressants and benzodiazepines) were considered to be due to the PBMT.

Resistance exercise and low-level laser therapy improves grip strength and morphological aspects in the ankle joint of Wistar rats with experimental arthritis. Rheumatoid arthritis (RA) is an inflammatory disease mainly affecting synovial joints. Photobiomodulation through low-level laser therapy (LLLT) and resistance exercise may improve the inflammatory process. Therefore, we analyzed the effects of resistance exercise, LLLT, and the combination of both treatments on hind paw grip strength and ankle joint histomorphometric aspects of Wistar rats subjected to experimental RA. A total of 64 male Wistar rats were divided into eight groups: control, control LLLT, control exercise, control LLLT and exercise, arthritis, arthritis LLLT, arthritis exercise, and arthritis LLLT and exercise groups. The experimental RA was induced by a complete Freund's adjuvant injection into the knee joint cavity. Climbing exercises and LLLT (660â€‰nm; 5Â J/cm(2) per point) were performed

as the treatment. In addition, muscle strength was evaluated using the grip strength test, and morphometric evaluations were performed on the ankle joint. Generalized mixed models and multivariate analysis of variance tests were used for statistical analysis. Statistical significance was set at a p-value of .05. Arthritis LLLT, exercise, and LLLT and exercise had positive effects on grip strength between the groups (F[7.56]Â =Â 5.8, pâ€‰<â€‰.004) and within the groups (F[4.3]Â =Â 9.9, pâ€‰<â€‰.002) throughout the evaluations. Morphometry revealed degenerative lesions in the ankle joint as subintima with angiogenesis, inflammatory cells, flocculated articular cartilage, chondrocyte disorganization, and pannus in the arthritis group (pâ€‰<â€‰.001). The treated groups exhibited morphological characteristics similar to those of the control group. LLLT and resistance exercise restored muscle strength and morphological aspects of the ankle joint in rats with experimentally induced RA. Humans;Rats;Male;Animals;Rats, Wistar;Low-Level Light Therapy;Ankle Joint;Resistance Training;Arthritis, Experimental;Hand Strength

A systematic review of the effect of photobiomodulation on the neuroinflammatory response in animal models of neurodegenerative diseases. This systematic review examines the effect of photobiomodulation (PBM), the application of red to near infrared light on body tissues, on the neuroinflammatory response and oxidative stress in animal models of neurodegenerative diseases. The research question and search protocol were prospectively registered on the PROSPERO database. Neurodegenerative diseases are becoming everÂ more prevalent in the ageing populations across theÂ Western world, with no disease-modifying or neuroprotective treatment options being available. Hence there is a real need for the development of effective treatment options for patients. Inflammatory responses and oxidative stress within the central nervous system have a strong correlation with neuronal cell death. PBM is a non-invasive therapeutic option that has shown efficacy and promising effects inÂ animal models of neurodegenerative disease; many studies have reported neuroprotection and improved behavioural outcomes. To the best of our knowledge, thereÂ has been no previous study that has reviewed theÂ anti-inflammatory and the antioxidant effect of PBM inÂ the context of neurodegeneration. This review has examined this relationship in animal models of a range ofÂ neurodegenerative diseases. We found that PBM can effectively reduce glial activation, pro-inflammatory cytokine expression and oxidative stress, whilst increasing anti-inflammatory glial responses and cytokines, and antioxidant capacity. These positive outcomes accompanied the neuroprotection evident after PBM treatment. Our review provides further indication that PBM can be developed intoÂ an effective non-pharmacological intervention for neurodegenerative diseases. Antioxidants;Anti-Inflammatory Agents Animals;Humans;Neurodegenerative Diseases;Oxidative Stress;Antioxidants;Inflammation;Models, Animal;Anti-Inflammatory Agents

Effects of Photobiomodulation and Low-Intensity Stretching on Delayed-Onset Muscle Soreness: A Randomized Control Trial. Objective: This study aimed to investigate the effects of photobiomodulation (PBM), low-intensity stretching, and their combination on delayed-onset muscle soreness (DOMS) in the untrained population. The relationships between DOMS and muscle function and functional performance were also tested. Methods: Fifty-four participants were randomized into four groups. Eccentric exercise was used to induce DOMS. Each group received either no treatment, PBM, stretching or PBM combined with stretching at 24, 48, and 72â€‰h postexercise. Pressure pain threshold (PPT), numerical rating scale (NRS), single-leg forward jump (SLFJ), and maximum isometric voluntary contraction (MIVC) were measured at baseline, 24, 48, 72, and 96â€‰h after eccentric exercise. Between-group differences were tested using two-way repeated measures analysis of variance and the relationships between DOMS and MIVC, and SLFJ were examined using Pearson's correlation analysis. Results: The PPT at the vastus medialis and vastus lateral in the PBM combined with stretching group was significantly lower than that in control group at 72â€‰h

(pâ€‰=â€‰0.045) and 48â€‰h (pâ€‰=â€‰0.037) postexercise. No significant between-group difference in PPT was found for the rest occasions. There was no significant between-group difference in NRS, MVIC, and SLFJ on any occasion (pâ€‰â‰¥â€‰0.052). DOMS was not correlated with MIVC and SLFJ (pâ€‰â‰¥â€‰0.09). Conclusions: PBM or low-intensity stretching did not affect DOMS and functional performance in untrained individuals. The combination of PBM and low-intensity stretching increased pain sensitivity and did not relieve soreness. The DOMS was not associated with either muscle function or functional performance.
Humans;Myalgia;Muscle, Skeletal;Isometric Contraction;Pain Threshold;Exercise

Blue-LED-Light Photobiomodulation of Inflammatory Responses and New Tissue Formation in Mouse-Skin Wounds. Background: Recent studies evidence that blue-LED-light irradiation can modulate cell responses in the wound healing process within 24 h from treatment. This study aims to investigate blue-light (410-430 nm) photobiomodulation used in a murine wound model within six days post-treatment. Methods: A superficial wound was made in 30 CD1 male mice. The injuries were treated with a blue LED light (20.6 J/cm(2)), and biopsies were collected at 24, 72, and 144 h. Histology, fluorescence analysis, and advanced microscopy techniques were used. Results: We can observe an increase in the cellular infiltrate response, and in mast-cell density and their degranulation index correlated to the expression of the major histocompatibility complex after 24 h. Furthermore, after six days, the vessel density increases with the expression of the platelet-derived growth factor in the mast cells. Finally, collagen deposition and morphology in the treated wounds appear more similar to unwounded skin. Conclusions: Blue-light photobiomodulation stimulates several cellular processes that are finely coordinated by mast cells, leading to more rapid wound healing and a better-recovered skin morphology.

The Transcranial Light Therapy Improves Synaptic Plasticity in the Alzheimer's Disease Mouse Model. Alzheimer's disease (AD) is the main cause of dementia worldwide. Emerging non-invasive treatments such as photobiomodulation target the mitochondria to minimize brain damage, improving cognitive functions. In this work, an experimental design was carried out to evaluate the effect of transcranial light therapy (TLTC) on synaptic plasticity (SP) and cognitive functions in an AD animal model. Twenty-three mice were separated into two general groups: an APP/PS1 (ALZ) transgenic group and a wild-type (WT) group. Each group was randomly subdivided into two subgroups: mice with and without TLTC, depending on whether they would undergo treatment with TLTC. Cognitive function, measured through an object recognition task, showed non-significant improvement after TLTC. SP, on the other hand, was evaluated using four electrophysiological parameters from the Schaffer-CA1 collateral hippocampal synapses: excitatory field potentials (fEPSP), paired pulse facilitation (PPF), long-term depression (LTD), and long-term potentiation (LTP). An improvement was observed in subjects treated with TLTC, showing higher levels of LTP than those transgenic mice that were not exposed to the treatment. Therefore, the results obtained in this work showed that TLTC could be an efficient non-invasive treatment for AD-associated SP deficits.

Artificial Intelligence-Assisted Terahertz Imaging for Rapid and Label-Free Identification of Efficient Light Formula in Laser Therapy. Photodynamic therapy (PDT) is considered a promising noninvasive therapeutic strategy in biomedicine, especially by utilizing low-level laser therapy (LLLT) in visible and near-infrared spectra to trigger biological responses. The major challenge of PDT in applications is the complicated and time-consuming biological methodological measurements in identification of light formulas for different diseases. Here, we demonstrate a rapid and label-free identification method based on artificial intelligence (AI)-assisted terahertz imaging for efficient light formulas in LLLT of acute lung injury (ALI). The gray histogram of terahertz images is developed as the biophysical characteristics to identify the therapeutic effect. Label-free terahertz imaging is sequentially performed using rapid super-resolution imaging reconstruction and automatic

identification algorithm based on a voting classifier. The results indicate that the therapeutic effect of LLLT with different light wavelengths and irradiation times for ALI can be identified using this method with a high accuracy of 91.22% in 33 s, which is more than 400 times faster than the biological methodology and more than 200 times faster than the scanning terahertz imaging technology. It may serve as a new tool for the development and application of PDT. Artificial Intelligence;Low-Level Light Therapy;Photochemotherapy;Terahertz Imaging

Effects of photobiomodulation (660 nm laser) on anthracycline extravasation: An experimental study. OBJECTIVE: to investigate the effect of using different agents (topical hyaluronidase, photobiomodulation, and the association of photobiomodulation with topical hyaluronidase) in preventing the formation of lesions caused by doxorubicin extravasation, as well as in the reduction of lesions formed by extravasation of this drug. METHOD: a quasi-experimental study conducted with 60 Wistar rats, randomized into four groups with 15 animals each. Group 1 (Control); Group 2 (Hyaluronidase); Group 3 (Photobiomodulation); and Group 4 (Hyaluronidase + Photobiomodulation). A wound was induced by applying 1 mg of doxorubicin to the subcutaneous tissue of the back of the animals. The concentration of topical hyaluronidase was 65 turbidity units/g and the energy employed was 1 joule of 100 mW red laser per square centimeter. With macroscopic evaluation every two days for 28 days, the following variables were observed: skin integrity, presence of blisters, hyperemia, exudate, bleeding, edema, crust, peeling and granulation tissue. RESULTS: the animals from the groups subjected to photobiomodulation obtained better results in the assessment of the following variables: bleeding, hyperemia, exudate, intact skin and edema. CONCLUSION: it was evidenced that the association of photobiomodulation with topical hyaluronidase was effective in reducing the local effects and assisted in the wound healing process, and that PBM alone was able to prevent appearance of lesions. Anthracyclines;Doxorubicin;Hyaluronoglucosaminidase Animals;Rats;Anthracyclines;Doxorubicin;Hyaluronoglucosaminidase;Hyperemia;Lasers;Low-Level Light Therapy;Rats, Wistar

Customized Photobiomodulation Modulates Pain and Alters Thermography Pattern in Patients with Knee Osteoarthritis: A Randomized Double-Blind Pilot Study. Background: Photobiomodulation therapy (PBMT) modulates a wide variety of biological processes, leading to anti-inflammatory and analgesic effects. Understanding the mechanisms underlying therapeutic effects of PBMT remains challenging due to varying outcomes observed between wavelengths, dosage, and site of application. Our research group has dedicated close attention to customization and individualization of dosimetry for PBMT protocols. Preliminary data showed that using an individualized treatment could solve contradictory results reported by previous studies. Based on literature and our preliminary data on light absorption, the goal of the present pilot is to determine whether our individualized dosimetry is a feasible method to assist osteoarthritis (OA) pain control. Methods: This parallel two-arm controlled-pilot study aimed to assess whether personalized PBMT can be effective in the treatment of painful chronic knee OA. Thirty-one patients were randomly allocated into treatment and placebo group (sham irradiation), and the treatment procedure was performed twice a week, for 5 weeks. The PBMT was applied using 850â€‰nm with continuous wave and a total of 526-1402â€‰J each session. Individualized dosimetry was chosen based on each patient's body mass index and skin color. Quality-of-life (QOL) questionnaires and serum/urine analyses were performed before and after treatment was over. Both examiners and participants were blinded to group allocation. Results: Pain scores were reduced significantly in the 4th, 5th, and 10th sessions and remained lower 6 weeks posttherapy in the treatment group when compared to the placebo group. Moreover, the treatment group's results were improved in QOL questionnaires score, dopamine level, and in microcirculation. Conclusions: The present results provide initial evidence that customized photobiomodulation (PBM) reduce pain levels in short- and medium-term in patients with symptomatic knee OA when compared

to placebo group. Furthermore, we have provided evidence that customized PBM is able to improve the QOL of those patients. Dopamine;Analgesics Humans;Osteoarthritis, Knee;Pilot Projects;Quality of Life;Thermography;Dopamine;Pain;Analgesics

Vascular photobiomodulation in the treatment of children with temporomandibular disorders: Study protocol for a randomized, controlled, blind, clinical trial. BACKGROUND: This study aims to verify if the use of intravascular laser irradiation of blood (ILIB) influences the reduction of pain and increases the range of motion in opening and closing of the mouth in children and adolescents with temporomandibular disorders (TMD). METHODS: This will be a blind, randomized, and controlled clinical trial, which will be carried out on children between 6 and 12 years of age who enter the Catholic University of Uruguay, Faculty of Health Sciences, Postgraduate School, for treatment. To be included, children must present temporomandibular disorders, based on the diagnostic criteria will be the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). Forty-five participants will be randomized to three groups: Group 1-ILIB with 2 sessions of 20 minutes for 12 weeks (n = 15); Group 2-Placebo laser application with 2 sessions of 20 minutes for 12 weeks (n = 15); Group 3-Control with no treatment (n = 15). Irradiation will be performed by continuous and direct transcutaneous application to the radial artery, by means of a bracelet that inserts the laser beam. The laser to be used is infrared, power 100 mW Â± 20%, wavelength 808â€‰nm Â± 10â€‰nm, continuous application. RDC/TMD and pain evaluated through a visual analog scale will be the outcome measures. DISCUSSION: Due to the low level of evidence, new studies are needed on the effect of ILIB in children with TMD. Adolescent;Child;Humans;Low-Level Light Therapy;Double-Blind Method;Temporomandibular Joint Disorders;Pain Measurement;Pain;Randomized Controlled Trials as Topic

[The effect of non-invasive brain stimulation on neuroplasticity in the early recovery period after ischemic stroke]. The post-stroke cognitive impairment syndrome (PSCI) develops in 10-80% cases of ischemic stroke and leads to a significant patients' quality of life impairment. The standard program of cognitive rehabilitation includes nootropic agents therapy and neuro-cognitive training. The additional various methods of non-invasive brain stimulation (NIBS) application can improve the results of PSCI rehabilitation. PURPOSE OF THE STUDY: Studying the different variants of NIBS influence on synaptic neuroplasticity in the early recovery period after ischemic stroke. MATERIAL AND METHODS: The rehabilitation of 62 patients with PSCI syndrome after ischemic stroke outcomes were studied. The patients were assigned to 5 groups. Patients from the control group underwent standardized nootropic therapy and course sessions with a neuropsychologist. The rest of the patients were divided into 4 groups, in which, in addition to the basic program of cognitive rehabilitation, different options for the course use of NIBS were used: photochromotherapy (PCT) with narrow-band optical radiation (NOR) with a wavelength of 530 nm (green light); rhythmic transcranial magnetic stimulation (rTMS) with a low-intensity high-frequency running pulsed magnetic field; infrared radiation with a wavelength of 1-56 microns, modulated by terahertz frequencies (IRMT); bioacoustic correction (BAC). We analyzed the dynamics of changes in scores of MMSE scales, FAB, Roshchina. In order to assess the effect of NIBS on neuroplasticity, the concentrations of BDNF and antibodies to the NR2 fragment of the NMDA receptor were evaluated before and after the completion of the rehabilitation course. RESULTS: Concentration values of antibodies to the NR2 subunit of the NMDA receptor in all groups remained consistently above the norm (more than 2 ng/ml) throughout the entire course of rehabilitation. Differences between groups in the dynamics of BDNF concentration in the peripheral blood were revealed. There was a significant ($p<0.05$) decrease in its concentration by almost 2 times by the end of rehabilitation course in control group. In the rTMS and IRMT groups, a decrease in the BDNF concentration was also recorded in dynamics, which, however, did not reach a significant level. There was no decrease in

BDNF levels in the BAC group. There was an increase of this level in the PCT group. CONCLUSION: The use of different types of NIBS in the program of cognitive rehabilitation of patients with PSCI syndrome contributes to an increase in the rehabilitation potential due to the activation of neurotrophin-mediated synaptic neuroplasticity. Green light PCT and BAC have the greatest effect on increasing neuroplasticity after ischemic stroke. Nootropic Agents;Brain-Derived Neurotrophic Factor;Receptors, N-Methyl-D-Aspartate Humans;Transcranial Direct Current Stimulation;Nootropic Agents;Ischemic Stroke;Brain-Derived Neurotrophic Factor;Receptors, N-Methyl-D-Aspartate;Quality of Life;Stroke Rehabilitation;Transcranial Magnetic Stimulation;Stroke;Neuronal Plasticity;Brain

Extracorporeal Shock Wave Therapy Versus Low Level Laser Therapy in The Treatment of Plantar Fasciitis: A Randomized Controlled Trial. BACKGROUND: Plantar fasciitis (PF) is predominantly treated conservatively through some modalities such as extracorporeal shock wave therapy (ESWT) and low-level laser therapy (LLLT), yet the short effect of these modalities on pain and function is still ambiguous. This study aims to compare the short-term effectiveness of ESWT and LLLT on pain and function in patients with PF. METHODS: Participants (n=47) were randomly assigned into 2 groups as ESWT (n=27) and LLLT (n=20). ESWT (once a week) and LLLT (three times a week) were administered to the participants for 3 weeks. Foot function index (FFI) including pain, disability, and activity limitation subscales was administered at baseline and post-treatment. A reduction of one point in total scores was considered as a minimum clinically important difference. Repeated measures of ANOVA were used to analyze the changes in outcomes and compare the groups. RESULTS: There were significant main effects of time, and significant interaction effects between group and time on pain ($P<0.001$), disability ($P<0.001$), and activity limitation ($P<0.05$). The main effect of the group was not significant for all subscales ($P=0.811$, $P=0.481$, $P=0.865$, respectively). The LLLT group showed a significant decline in pain ($P<0.001$), disability ($P<0.001$), and activity limitation ($P<0.001$) while there was no change in the ESWT group over time ($P=0.319$, $P=0.711$, $P=1.0$ respectively). Consistently, 95% of participants in the LLLT had CID in the pain subscale whereas 48% of the ESWT group had. CONCLUSIONS: LLLT was found to be superior to ESWT as an effective approach in the short-term management of PF.

Brazilian organic propolis for prevention and treatment of radiation-related oral acute toxicities in head and neck cancer patients: A double-blind randomized clinical trial. Background: Oral mucositis (OM) is one of the most important acute toxicities from radiotherapy (RT) in head and neck cancer patients and can impair oncologic treatment. Dysphagia, dysgeusia, pain, and oral candidiasis are other common toxicities. Brazilian Organic Propolis (BOP) is a recently described propolis variant and BOP types 4 and 6 have shown important antioxidant, anti-inflammatory, and antifungal properties. Purpose: To investigate the use of BOP as a preventive and/or complementary therapeutic option for radiotherapy-induced oral mucositis, dysphagia, dysgeusia, pain, and oral candidiasis. Additionally, proinflammatory cytokines were assessed to investigate their anti-inflammatory role. Methods: Sixty patients were included in this randomized, double-blind, controlled clinical trial. Patients were randomized to receive either aqueous suspension of a BOP or placebo throughout RT. Also, all patients underwent low-level laser therapy as routine oral care. OM, dysphagia, and dysgeusia were assessed weekly according to WHO and NCI scales. Pain-related to OM was assessed according to a Visual Analog Scale and the presence or absence of oral candidiasis was checked by intraoral examination. Protein levels of TNF-Î± and IL-1Î² from oral mucosa were assessed by ELISA. Results: Patients in the propolis group had a lower mean score of OM, dysphagia, dysgeusia, and most patients reported moderate pain. Fewer patients developed oral candidiasis in the propolis group, and the number of episodes was lower among patients that used BOP ($p < 0.05$). In addition, the BOP group presented significantly lower levels of IL-1Î² since the beginning of treatment when

compared with placebo patients ($p < 0.05$) and a lower level of TNF-Î± at the end of treatment ($p < 0.001$). Conclusion: Topic use of BOP reduced TNF-Î± and IL-1Î² levels, oral candidiasis episodes, and seems to be a useful complementary option for the prevention and treatment of the main acute oral toxicities of RT. Clinical Trial Registration: http://www.ensaiosclinicos.gov.br/rg/RBR-9f8c78/, identifier RBR-9f8c78.

Plasma Cell Gingivitis Treated with Photobiomodulation, with No Recurrence for a Five-Year Follow-Up. INTRODUCTION: Plasma cell gingivitis (PCG) is a chronic inflammatory disease usually affecting the vestibular portion of the gingival mucosa. Clinical presentation is marked by erythematous macules of intense red color, confluent, and delimited from the healthy neighboring mucosa. Generally asymptomatic, the gum lesions sometimes are accompanied by burning sensations and a sense of local tension. Recommended treatment is the use of topical steroids, but with apparent initial healing that is not stable over time. The present case report concerns a patient diagnosed with PCG in November 2017, with a five-year follow-up. This is the first patient with PCG successfully treated with non-surgical periodontal therapies associated with photobiomodulation (PBM). METHODS: A 64-year-old male patient had intense erythema and edema on the vestibular side of the gingival mucosa area from 1.5 to 2.5. The patient's symptomatic subjectivity parameters were evaluated through dedicated questionnaires. Erythema and gingival bleeding were also evaluated. Periodontal charting was not pathological, but intense bleeding was noted. Multiple biopsies were performed, and microscopic findings confirmed the clinical hypothesis of PCG. RESULTS: The treatment applied was PBM associated with periodontal therapy. The patient demonstrated a progressive improvement in clinical parameters considered and reported symptoms. During the five-year follow-up, no recurrence of the disease was observed. CONCLUSIONS: The combined PBM and periodontal therapies have proved to be sufficiently effective in the control of PCG, showing reduction of the intense inflammatory, erythematous component, and gingival bleeding, and are a valid treatment alternative to topical steroids.

Efficacy of Low-Level Laser Therapy in Management of Temporomandibular Joint Pain: A Double Blind and Placebo Controlled Trial. BACKGROUND: Stomatognathic system is an interaction of the muscles of mastication, dentition, neural component, and temporomandibular joint. Any dysfunction in this system may lead to temporomandibular disorders (TMDs). Various non-surgical modalities have been employed for treating TMDs. AIM AND OBJECTIVES: The aim of the study was to objectively evaluate the effects of low-level laser therapy (LLLT) in treatment of patients with TMDs. MATERIALS AND METHODS: Sixty individuals diagnosed with TMDs were divided randomly into two groups (Group I-placebo and Group II -LLLT). A series of 20 sessions of LLLT applied both in closed mouth and maximum mouth opening position were given over a period of 08Â weeks. Assessment was done in terms of improvement in mouth opening, pain, clicking, and deviation of mandible. The data collected were analyzed statistically. RESULTS: The results showed improvement in the pain reduction, improvement in the maximum mouth opening, reduction in deviation, and clicking in both groups but better treatment outcome in the low-level laser group. CONCLUSION: Though conservative measures improved the symptoms in TMD but LLLT has shown better results in comparison with the placebo group. Being non-surgical can be employed in combination with other modes for effectively treating such disorders. Keywords: Pain, Dysfunction, Temporomandibular joint disorders (TMDs), Low-level laser therapy (LLLT).

A pilot study on the effects of far-infrared-emitting fabric on neuromuscular performance of knee extensor and male fertility. The aim of this study was to evaluate the time course of the effects of far-infrared emitting fabric (FIR) on neuromuscular performance of knee extensor over 120Â h and to investigate whether the use of FIR affects semen. This is a crossover, randomized, double-blind, and placebo-controlled trial split into neuromuscular and fertility assessments. Four

(28.8â€‰Â±â€‰4.7Â years old) and six (29â€‰Â±â€‰3.9Â years old) healthy, resistance-trained males completed all neuromuscular and fertility assessments, respectively. In neuromuscular assessments, for five consecutive days, the participants underwent neuromuscular tests in an isokinetic dynamometer (maximal isometric voluntary contraction (MVC) and fatigue test) every 24Â h in both conditions (FIR and Placebo). In fertility assessments, participants performed three semen collections: Baseline, FIR, and Placebo. FIR and Placebo collections were performed after five consecutive days of use of the pants. Conventional parameters and sperm DNA fragmentation were evaluated. In the FIR condition, the participants showed significant differences in total work at 96Â h (pâ€‰<â€‰0.001; Cohen's dâ€‰=â€‰3.73), 120Â h (pâ€‰=â€‰0.01; Cohen's dâ€‰=â€‰2.65), and pre-MVC at 120Â h (pâ€‰=â€‰0.02; Cohen's dâ€‰=â€‰2.15) when compared to Placebo. FIR did not significantly (pâ€‰>â€‰0.05) affect the conventional semen parameters or sperm DNA fragmentation compared to Baseline or Placebo. FIR improved the knee extensor neuromuscular performance of healthy resistance-trained individuals, with 112.4â€‰Â±â€‰7.8Â h accumulated, and did not affect their seminal parameters (conventional or sperm DNA fragmentation), with 113.1â€‰Â±â€‰10.2Â h accumulated. Male;Humans;Young Adult;Adult;Pilot Projects;Muscle, Skeletal;Exercise;Semen;Muscle Fatigue;Fertility;Muscle Contraction

Photobiomodulation vs NSAIDs in the management of postoperative dentoalveolar pain. BACKGROUND: Postoperative pain, the most common complication of dentoalveolar surgery, is routinely controlled by non-steroidal anti-inflammatory drugs (NSAIDs). However, despite its proven efficacy, the long-term consumption of NSAIDs is associated with several serious and adverse effects. As a result, photobiomodulation (PBM) or low-level laser therapy (LLLT) is used in many treatment modalities to reduce pain, inflammation, and promote healing. AIM OF THE STUDY: To compare the analgesic effects of LLLT and Ibuprofen after surgical dental extraction. MATERIALS AND METHODS: A clinical trial study was conducted at Umm Al-Qura University Dental Clinics, involving 46 healthy patients between 20 and 60Â years of age. The recruited patients were divided into two groups of 23 patients each. Group 1 (positive control group) was prescribed Ibuprofen and Group 2 (experimental group) was treated with LLLT. The pain was measured on days 1, 2, and 7 using the Numeric Pain Rating Scale (NPRS). RESULTS: The mean level of pain decreased with both treatments. On the first postoperative day, the pain level in the laser therapy group was significantly lower than in the control group (UÂ =Â 62.5, pÂ =Â 0.024). The results indicated a significant decrease in pain level on the second postoperative day for both the control and experimental groups (ZÂ =Â -3.61, pÂ <Â 0.005, and ZÂ =Â -3.1, pÂ =Â 0.002, respectively). However, the pain level was lower in the control group, although the difference was not statistically significant (UÂ =Â 79, pÂ =Â 0.102). CONCLUSION: Considering the constraints of this study, NSAIDs were found to be significantly better at reducing pain than LLLT.

What are the best parameters of low-level laser therapy to reduce pain intensity and improve mandibular function in orofacial pain? A systematic review and meta-analysis. PURPOSE: To determine the effectiveness of laser therapy for managing patients with orofacial pain (OFP). In addition, to determine which parameters provide the best treatment effects to reduce pain, improve function, and quality of life in adults with OFP. METHODS: Systematic review. Searches were conducted in six databases; no date or language restrictions were applied. Studies involving adults with OFP treated with laser therapy were included. The risk of bias (RoB) was performed with the Revised Cochrane RoB-2. A meta-analysis was structured around the OFP type, and outcomes. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) assessed the overall certainty of the evidence. RESULTS: Eighty-nine studies were included. Most studies (nâ€‰=â€‰72, 80.9%) were considered to have a high RoB. The results showed that laser therapy was better than placebo in improving pain, maximal mouth open (MMO), protrusion, and tenderness

at the final assessment, but with a low or moderate level of evidence. The best lasers and parameters to reduce pain are diode or gallium-aluminum-arsenide (GaAlAs) lasers, a wavelength of 400-800 or 800-1500â€‰nm, and dosage of <25Â J/cm(2). CONCLUSIONS: Laser therapy was better than placebo to improve pain, MMO, protrusion, and tenderness. Also, it was better than occlusal splint to improve pain, but not better than TENS and medication.Implications for rehabilitationLaser therapy was found to be good in improving pain, maximal mouth opening, jaw protrusion, and tenderness at the end of the treatment.For patients with all types of temporomandibular disorders (TMDs) (myogenous, arthrogenous, and mixed), the following lasers and parameters are recommended: diode or gallium-aluminum-arsenide (GaAlAs) laser, wavelength of 400-800 or 800-1500â€‰nm, and a dosage <25Â J/cm(2).For patients with arthrogenous TMDs, the following lasers and parameters are recommended: Diode laser and a wavelength between 400 and 800â€‰nm.For patients with myogenous TMDs, the following lasers and parameters are recommended: diode laser, wavelength between 800 and 1500â€‰nm, and dosage of <25Â J/cm(2).For patients with mixed TMDs, the following lasers and parameters are recommended: diode, GaAlAs, or infrared laser, a wavelength of 800-1500â€‰nm, a dosage >100Â J/cm(2), and an application time between 15 and 30â€‰s or >60â€‰seconds. Aluminum Adult;Humans;Low-Level Light Therapy;Pain Measurement;Aluminum;Quality of Life;Facial Pain;Temporomandibular Joint Disorders

The effect of transcranial photobiomodulation on cognitive function and attentional performance of older women with mild cognitive impairment: a randomized controlled trial. INTRODUCTION: Mild cognitive impairment (MCI) is a progressive age-related condition caused by physiological and structural changes in the brain, such as neurodegeneration and hypometabolism. Transcranial photobiomodulation (tPBM) is a neuromodulation technique that improves brain metabolism and oxygenation by irradiating red to near-infrared light on a specific area of the head. This study aimed to investigate the effect of multi-session tPBM on the cognitive capacities and attentional function of older women with MCI. MATERIAL AND METHODS: In this randomized controlled trial, 42 older women with MCI were randomly assigned to 2 equal groups: real and sham. The mini-mental state examination (MMSE) and the attentional Go/No-Go task were used to examine the patients. On the right frontal-pole of the cortex, 5 sessions of 850 nm tPBM were given. Re-examinations were conducted on the participants. For the Go/No-Go task, the reaction time to the target (RTT), the percentage of correct trials (PCT), and the efficiency score (ES) were measured. RESULTS: The findings revealed a significant interaction between group Ã— time for MMSE ($F(1, 40) = 20$, $p < 0.001$, $h(2) = 0.33$), and the post-hoc paired-samples t-tests revealed a substantial rise in the mean MMSE in the real group ($t = 15.9$; $p = 0.001$; $d = 9.3$). Additionally, for ES ($F(1, 40) = 19$, $p < 0.001$, $h(2) = 0.32$), RTT ($F(1, 40) = 17$, $p < 0.001$, $h(2) = 0.38$), and PCT ($F(1, 40) = 13$, $p < 0.001$, $h(2) = 0.31$), a significant group Ã— time interaction was discovered, and post-hoc paired-samples t-tests revealed a significant improvement in attention performance of the real group for increases in the mean of ES ($F(1,40) = 20$, $p < 0.001$, $h(2) = 0.33$), ($t = 5.3$, $p < 0.001$, $d = 0.034$), decreases in the mean of RTT ($t = 4.8$; $p = 0.001$; $d = -37.4$), and increases in the mean of PCT ($t = 2.67$; $p = 0.015$; $d = 6.3$). CONCLUSIONS: According to the findings of this study, tPBM had a positive effect on older people's attention and cognitive abilities.

Photobiomodulation Literature Watch May 2022.

Photobiomodulation in Pain Control in Diseases of the Oral Cavity: Overview (Evidence Map) and Its Implementation in Integrative Complementary Medicine. Objective: To assess the evidence available and knowledge gaps in photobiomodulation (PBM) for oral facial pain. Background data: Effective identification of a noninvasive resource for oral facial pain such as PBM may mitigate the risks of invasive therapeutic resources. Methods: Nine electronic databases were searched for systematic reviews reporting oral facial pain outcome for PBM. The 3iE (International Initiative for

Impact Evaluation) evidence gap map methodology with the tableau was used to graphically display the parameters analyzed in the research. Results: Several wavelengths within the range of infrared were used in 37.6% of the studies, accompanied by the 32.4% in the red range. The quality of the effect was positive in 61.4% of the studies, whereas the impact degree was low, according to the measurement tool used to assess systematic reviews 2 (AMSTAR 2), in 60.2%. Conclusions: Despite the positive potential of PBM in the treatment and control of pain in diseases of the oral cavity, complete information on dosimetry in published studies with PBM is still lacking, making it difficult to reproduce the results found. Humans;Low-Level Light Therapy;Systematic Reviews as Topic;Mouth;Facial Pain;Complementary Therapies

Feasibility study of a LED light irradiation device for the treatment of chronic neck with shoulder muscle pain/stiffness. Neck with shoulder muscle stiffness/pain is a common disorder. Commonly used physical therapy, pharmacotherapy, acupuncture, and moxibustion only temporarily alleviate the disorder in most cases, thus the disorder often recurs. Low power laser therapy is often used for neck and shoulder stiffness/pain and has been effective in clinical trials. In this study, we evaluated the safety and effectiveness of a newly developed self-care device for disorders including neck with shoulder muscle stiffness/pain. The device incorporates light-emitting diodes (LEDs), which are safer than lasers, as its light source. Ten adults with neck with shoulder muscle stiffness/pain were subject to LED irradiation (wavelength 780 nm Â± 15 nm, output 750 mW, power density 3.8 W/cm2, energy density 5.7Ã—102 J/cm2) for 3 minutes on the affected shoulder at a standard acupuncture point (GB21, Jianjing). Immediately after irradiation, the subjective symptoms of the neck with shoulder muscle stiffness and pain evaluated by a visual analog scale were improved from 58.3 mm Â± 18.7 mm to 45.5 mm Â± 21.5 mm and from 45.8 mm Â± 23.3 mm to 39.4 mm Â± 21.8 mm, respectively. The symptoms further improved after 15 minutes of irradiation. The skin temperature at the irradiated point increased from 34.3Â°C Â± 1.1Â°C to 41.0Â°C Â± 0.7Â°C. The increase in skin temperature was observed within approximately 5 cm of the irradiated area. There was no effect on the heart rate variability, a measure of the autonomic nervous system; however, the baroreflex sensitivity was slightly increased. No irradiation-related adverse skin events were observed. Our LED irradiation device was found to be safe, and it improved the subjective symptoms of muscle stiff neck with shoulders. Acupuncture Points;Acupuncture Therapy;Adult;Feasibility Studies;Humans;Myalgia;Shoulder;Shoulder Pain

Long-term follow-up of epidermolysis bullosa in real practice shows stability of the Epidermolysis Bullosa Disease Activity and Scarring Index and improvement with some off-label therapies.

Rehabilitation of Atrophic Mandible with Ultrashort Implants Combined with Photobiomodulation Therapy: A Split-Mouth Design Study. BACKGROUND: Atrophic edentulous mandible is a challenging clinical condition. Studies assessing the use of ultrashort implants to support overdentures are scarce; the optimum photobiomodulation (PBM) dose for enhancing osseointegration is yet unknown. OBJECTIVE: This study aimed to evaluate and compare mandibular overdentures assisted by two versus four ultrashort implants with adjunctive PBM therapy using two doses. MATERIALS AND METHODS: A total of 36 implants were placed in 12 edentulous male participants and they were randomly allocated to Group I (mandibular overdentures assisted by two ultrashort implants) or Group II (by four ultrashort implants). Fully guided implant placement was performed, and then a split-mouth design was implemented. The participants received PBM by diode laser (660 nm). Dose A (3.75 J/cm(2)) and Dose B (7.5 J/cm(2)) were applied to the right and left implant (s), respectively. Implant stability, peri-implant probing depth (PIPD), and modified gingival index (MGI) were evaluated at baseline, and at 6 and 12 months after loading. RESULTS: After 12 months, the implant stability values were significantly higher in Group II compared with Group I ($P < 0.001$). A significant difference was observed in between the PIPDs of both groups (Group I: 2.35 Â±

0.54 mm; Group II: 1.69 Â± 0.35 mm;P= 0.001). The mean MGI values were low for both groups (Group I: 0.75 Â± 0.58; Group II: 0.51 Â± 0.41). CONCLUSIONS: Mandibular overdentures supported by four ultrashort implants had a more favorable clinical outcome, while PBM doses A and B were comparable in all evaluated parameters. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT03540316.

[Epidural photobiomodulation accelerates the drainage of brain interstitial fluid and its mechanism]. OBJECTIVE: To evaluate the effect of photobiomodulation (PBM) on the drainage of brain interstitial fluid (ISF) and to investigate the possible mechanism of the positive effect of PBM on Alzheimer's disease (AD). METHODS: Twenty-four SD male rats were randomly divided into PBM group (n=12), sham PBM group (n=6), and negative control group (n=6). According to the injection site of tracer, the PBM group was further divided into PBM-ipsilateral traced group (n=6) and PBM-contralateral traced group (n=6). Rats in the PBM group and the sham PBM group were exposed to the dura minimally invasively on the skull corresponding to the frontal cortical area reached by ISF drainage from caudate nucleus region. The PBM group was irradiated by using 630 nm red light (5-6 mW/cm(2)), following an irradiation of 5 min with a 2 min pause, and a total of 5 times; the sham PBM group was kept in the same position for the same time using the light without power. The negative control group was kept without any measure. After PBM, tracer was injected into caudate nucleus of each group. The changes of ISF drainage in caudate nucleus were observed according to the diffusion and distribution of tracer molecule by tracer-based magnetic resonance imaging, and the structural changes of brain extracellular space (ECS) were analyzed by diffusion rate in ECS-mapping (D(ECS)-mapping) technique. Finally, parameters reflecting the structure of brain ECS and the drainage of ISF were obtained: volume fraction (Î±), tortuo-sity (Î»), half-life (T(1/2)), and D(ECS). The differences of parameters among different groups were compared to analyze the effect of PBM on brain ECS and ISF. One-Way ANOVA post hoc tests and independent sample t test were used for statistical analysis. RESULTS: The parameters including T(1/2), D(ECS), and Î» were significantly different among the PBM-ipsilateral traced group, the PBM-contralateral traced group, and the sham PBM group (F=79.286, P < 0.001; F=13.458, P < 0.001; F=10.948, P=0.001), while there was no difference in the parameter Î± of brain ECS among the three groups (F=1.217, P=0.324). Compared with the sham PBM group and the PBM-contralateral traced group, the PBM-ipsilateral traced group had a significant decrease in the parameter T(1/2) [(45.45Â±6.76) min vs. (76.01Â±3.44) min, P < 0.001; (45.45Â±6.76) min vs. (78.07Â±4.27) min, P < 0.001], representing a significant acceleration of ISF drainage; the PBM-ipsilateral traced group had a significant increase in the parameter D(ECS) [(4.51Â±0.77)Ã—10(-4) mm(2)/s vs. (3.15Â±0.44)Ã—10(-4) mm(2)/s, P < 0.001; (4.51Â±0.77)Ã—10(-4) mm(2)/s vs. (3.01Â±0.38)Ã—10(-4) mm(2)/s, P < 0.001], representing a significantly increased molecular diffusion rate of in the brain ECS; the PBM-ipsilateral traced group had a significant decrease in the parameter Î» (1.51Â±0.21 vs. 1.85Â±0.12, P=0.001; 1.51Â±0.21 vs. 1.89Â±0.11, P=0.001), representing a significant decrease in the degree of tortuosity in the brain ECS. CONCLUSION: PBM can regulate the brain ISF drainage actively, which may be one of the potential mechanisms of the effect of PBM therapy on AD. This study provides a new method for enhancing the brain function via ECS pathway. Gadolinium DTPA Animals;Male;Rats;Alzheimer Disease;Brain;Drainage;Extracellular Fluid;Gadolinium DTPA;Low-Level Light Therapy;Rats, Sprague-Dawley

Photobiomodulation therapy on local effects induced by juvenile and adult venoms of Bothrops alternatus. Bothrops snake envenomation is characterized by severe local manifestations such as pain, edema, inflammation, hemorrhage, and myonecrosis. Furthermore, it is described that venom from juvenile and adult snakes may have differences in their composition that can lead to differences in the evolution of the clinical manifestation of the victim. Photobiomodulation (PBM) has been shown to be an effective adjuvant therapy to serum therapy to reduce the local effects induced by

bothropic snake venom. This study evaluated the effect of PBM on the local reaction, after Bothrops alternatus snake venom (BaV) injection, in its juvenile (BaJV) and adult (BaAV) stages. Balb/C mice were injected with the juvenile or adult venoms of BaV or saline solution (control group). PBM at a wavelength of 660Â nm, 100Â mW, 0.33Â W/cm(2), 40Â s, and a 0.028Â cm(2) beam was applied transcutaneous to a single point with a radiant exposure of 4Â J/cm(2), 30Â min after venom injection. Edema, inflammatory infiltrate, hyperalgesia, and myonecrosis were analyzed. Both venoms induced significant edema and myonecrosis in the gastrocnemius muscle. Hyperalgesia in the mice paw and a prominent leukocyte infiltrate into the peritoneum were also observed. PBM significantly reduced all evaluated parameters. In conclusion, PBM treatment was effective in reducing the local effects induced by B. alternatus venom at different stages of snake development and could be a useful tool as an adjuvant treatment for bothropic envenomation. Crotalid Venoms;Snake Venoms Mice;Animals;Bothrops;Crotalid Venoms;Low-Level Light Therapy;Hyperalgesia;Snake Venoms;Muscular Diseases;Edema

The effect of photomodulation on fibroblast growth factor and the Ras/MAPK signalling pathway: a review. OBJECTIVE: Current therapies and technologies used to treat hard-to-heal diabetic wounds are limited to a 50% healing rate. The rise in the percentage of lower limb non-traumatic amputations in patients with diabetes has caused an increased demand for alternative, effective and safe treatment modalities. Photobiomodulation therapy (PBMT) utilises light to induce physiological changes and provide therapeutic benefits and has been shown to increase the healing of hard-to-heal wounds through the release of growth factors. The aim of this narrative review is to investigate the effect of photobiomodulation (PBM) on fibroblast growth factor (FGF) and the role of the Ras/MAPK signalling pathway in diabetic wound healing. METHOD: Relevant journal articles were obtained through PubMed and Google Scholar. RESULTS: Experimental and clinical findings from the review show that PBM can stimulate the release of growth factors, including FGF, an essential cytokine in wound healing, and one which is present at lower concentrations in diabetic wounds. There is also activation of the Ras/MAPK signalling pathway. CONCLUSION: One mechanism through which healing may be stimulated by PBM is via the FGF-Ras/MAPK signalling pathway, although strong evidence under hyperglycaemic conditions is lacking. Cytokines;Fibroblast Growth Factors Animals;Cytokines;Diabetes Mellitus, Experimental;Fibroblast Growth Factors;Humans;Low-Level Light Therapy;Wound Healing

EEG-Validated Photobiomodulation Treatment of Dementia-Case Study. In this article, we perform a case study of the impact of photobiomodulation (PBM) on brain power spectrum and connectivity in an elderly person with a Self Administered Gerocognitive Exam (SAGE) score indicating probable memory and thinking disorder. First, we designed and realized the prototype of a near-infrared (NIR) device for PBM. Analysing the alpha band of the power spectrum, we found a positive long-term effect in nine out of sixteen electrodes in the eyes-open condition (OE) and in twelve out of sixteen electrodes in the eyes-closed condition (CE), while in the theta band, a positive long-term effect was found in nine out of sixteen electrodes for OE and seven out of sixteen electrodes for CE. When considering the theta-alpha ratio (TAR), the positive long-term effect is found on thirteen of sixteen electrodes for OE and on fourteen of sixteen electrodes for CE. A connectivity analysis using the imaginary component of the complex Pearson correlation coefficient (imCPCC) was also performed, and a global efficiency measure based on connectivity matrices with thresholds was calculated. The global efficiency calculated for the long-term effect was higher than before stimulation by a factor of 5.24 for the OE condition and by a factor of 1.25 for the CE condition. This case study suggests that PBM could have positive effects on improving desired brain activity, measured as improvement in power spectrum and connectivity measures in theta and alpha bands,

for elderly people with memory and thinking disorders. Aged;Brain;Brain Mapping;Dementia;Electroencephalography;Humans
Use of Photobiomodulation Combined with Fibrin Sealant and Bone Substitute Improving the Bone Repair of Critical Defects. In this preclinical protocol, an adjunct method is used in an attempt to overcome the limitations of conventional therapeutic approaches applied to bone repair of large bone defects filled with scaffolds. Thus, we evaluate the effects of photobiomodulation therapy (PBMT) on the bone repair process on defects filled with demineralized bovine bone (B) and fibrin sealant (T). The groups were BC (blood clot), BT (B + T), BCP (BC + PBMT), and BTP (B + T + PBMT). Microtomographically, BC and BCP presented a hypodense cavity with hyperdense regions adjacent to the border of the wound, with a slight increase at 42 days. BT and BTP presented discrete hyperdensing areas at the border and around the B particles. Quantitatively, BCP and BTP (16.96 Â± 4.38; 17.37 Â± 4.38) showed higher mean bone density volume in relation to BC and BT (14.42 Â± 3.66; 13.44 Â± 3.88). Histologically, BC and BCP presented deposition of immature bone at the periphery and at 42 days new bone tissue became lamellar with organized total collagen fibers. BT and BTP showed inflammatory infiltrate along the particles, but at 42 days, it was resolved, mainly in BTP. In the birefringence analysis, BT and BTP, the percentage of red birefringence increased (9.14% to 20.98% and 7.21% to 27.57%, respectively), but green birefringence was similar in relation to 14 days (3.3% to 3.5% and 3.5% to 4.2%, respectively). The number of osteocytes in the neoformed bone matrix proportionally reduced in all evaluated groups. Immunostaining of bone morphogenetic protein (BMPâ€”2/4), osteocalcin (OCN), and vascular endothelial growth factor (VEGF) were higher in BCP and BTP when compared to the BC and BT groups ($p < 0.05$). An increased number of TRAP positive cells (tartrate resistant acid phosphatase) was observed in BT and BTP. We conclude that PBMT positively influenced the repair of bone defects filled with B and T.
Preliminary Investigation on Micro-Needling with Low-Level LED Therapy and Growth Factors in Hair Loss Related to COVID-19. The incidence of hair loss (HL) and telogen effluvium (TE) has increased due to the spread of the coronavirus disease (COVID-19) induced by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). New biotechnologies based on micro-needling (MND) with Low-Level LED Therapy (LLLT) and Growth Factors (GFs) used for hair re-growth (HR-G) in Androgenetic Alopecia (AGA) need to be standardized also in HL and TE related to COVID-19. This article aims to describe the preliminary clinical results obtained from an open-label case-series observational study. MND with LLLT and GFs was used in patients affected by HL and TE-related to COVID-19. In total, 10 patients (6 men were identified in stage I-III vertex according to the Norwood-Hamilton scale, and 4 women were identified in stage I-II according to the Ludwig scale) were enrolled and analyzed after screening (exclusion and inclusion criteria evaluation). HR-G assessment was analyzed through photography, physician's and patient's global assessment scale, and standardized phototrichograms during a short follow-up: T0-baseline; T1-20 weeks (wks). In the targeted area computerized trichograms showed encouraging results with a hair density increase of 11 Â± 2 hairs/cm(2) at T1 after 20 wks (20 wks vs. 0 wks) compared with baseline (58 Â± 2 hairs/cm(2) at T1 versus 47 Â± 2 hairs/cm(2) at baseline) with a not quite statistically significant difference in HR-G ($p = 0.0690$). The preliminary effectiveness of MND with LLLT and GFs use has been demonstrated in mild-to-moderate HL and TE related to COVID-19. Further controlled trials are required to confirm these preliminary results.
Non-Pharmacological Therapeutic Options for the Treatment of Alzheimer's Disease. Alzheimer's disease is a growing global crisis in need of urgent diagnostic and therapeutic strategies. The current treatment strategy mostly involves immunotherapeutic medications that have had little success in halting disease progress. Hypotheses for pathogenesis and development of AD have been expanded to implicate both organ systems as well as cellular reactions. Non-pharmacologic interventions

ranging from minimally to deeply invasive have attempted to address these diverse contributors to AD. In this review, we aim to delineate mechanisms underlying such interventions while attempting to provide explanatory links between the observed differences in disease states and postulated metabolic or structural mechanisms of change. The techniques discussed are not an exhaustive list of non-pharmacological interventions against AD but provide a foundation to facilitate a deeper understanding of the area of study. Alzheimer Disease;Humans

Case Report: Interstitial-intralesional laser therapy and laser-assisted new attachment procedure for the treatment of alveolar bone loss provoked by an aggressive pyogenic granuloma. Background: A pyogenic granuloma (PG) is a common benign vascular lesion found in the oral cavity. The gold standard treatment of this lesion, comprising surgical excision and the elimination of etiological factors, cannot avoid tooth loss in the case of an aggressive pyogenic granuloma. Because of the prominent properties of 980 nm and 635 nm diode lasers in photocoagulation and photobiomodulation, we applied these wavelengths in the treatment of a large pyogenic granuloma with alveolar bone loss. Case presentation: Our objective was to use a combination of interstitial-intralesional laser therapy, photocoagulation and laser-assisted new attachment procedure (LANAP) to preserve the teeth and periodontal tissue in a case of an aggressive pyogenic granuloma. Results: The patient was a 13-year-old Thai male with a pyogenic granuloma involving the interdental papilla and lingual gingiva of the lower left first and second molars. The teeth were also displaced by the lesion. After treatment with three sessions of photocoagulation, three sessions of interstitial-intralesional laser therapy and two sessions of LANAP, the lesion was completely resolved. The periodontal status of the teeth was improved at the six-month follow-up. Conclusion: The combination of interstitial-intralesional laser therapy, photocoagulation and LANAP was able to treat an aggressive pyogenic granuloma with tooth preservation. Adolescent;Alveolar Bone Loss;Granuloma, Pyogenic;Humans;Laser Therapy;Lasers, Semiconductor;Male;Molar

NIR irradiation of human buccal fat pad adipose stem cells and its effect on TRP ion channels. The effect of near infrared (NIR) laser irradiation on proliferation and osteogenic differentiation of buccal fat pad-derived stem cells and the role of transient receptor potential (TRP) channels was investigated in the current research. After stem cell isolation, a 940Â nm laser with 0.1Â W, 3Â J/cm(2) was used in pulsed and continuous mode for irradiation in 3 sessions once every 48Â h. The cells were cultured in the following groups: non-osteogenic differentiation medium/primary medium (PM) and osteogenic medium (OM) groups with laser-irradiated (Lâ€‰+), without irradiation (Lâ€‰-), laser treatedâ€‰+â€‰Capsazepine inhibitor (Lâ€‰+â€‰Cap), and laser treatedâ€‰+â€‰Skf96365 inhibitor (Lâ€‰+â€‰Skf). Alizarin Red staining and RT-PCR were used to assess osteogenic differentiation and evaluate RUNX2, Osterix, and ALP gene expression levels. The pulsed setting showed the best viability results (Pâ€‰<â€‰0.05) and was used for osteogenic differentiation evaluations. The results of Alizarin red staining were not statistically different between the four groups. Osterix and ALP expression increased in the (Lâ€‰+) group. This upregulation abrogated in the presence of Capsazepine, TRPV1 inhibitor (Lâ€‰+â€‰Cap); however, no significant effect was observed with Skf96365 (Lâ€‰+â€‰Skf). capsazepine;Transient Receptor Potential Channels Humans;Adipose Tissue;Cell Differentiation;Cell Proliferation;Cells, Cultured;Osteogenesis;Stem Cells;Transient Receptor Potential Channels;Infrared Rays

Female pattern hair loss and polycystic ovarian syndrome: more than just hirsutism. PURPOSE OF REVIEW: To explore the recent updates in the diagnosis, management, and clinical implications of androgenic alopecia among patients diagnosed with polycystic ovarian syndrome (PCOS). RECENT FINDINGS: PCOS diagnosis continues to be the most common cause of infertility among reproductively aged women, serving as the most common endocrinopathy among this population. Female pattern hair loss (FPHL) has been seen to be associated and more common among patients

with PCOS, however, there are limited studies examining the impact of FPHL among PCOS patients. Although hyperandrogenism is associated with FPHL, the pathophysiology continues to be unclear as FPHL can be present with normal biochemical androgen markers. Treatment can be complex, as common treatments to promote hair growth can exacerbate undesired hirsutism, which can be overcome by cosmetic treatments. New second-line treatment options such as low level laser therapy and platelet rich plasma have been emerging, with limited data supporting efficacy. SUMMARY: PCOS is a complex endocrinological disorder that has significant gynecologic, cutaneous, and metabolic implications that require multidisciplinary collaboration and care. Reproductive goals should be thoroughly discussed prior to starting any treatment, as PCOS is the most common cause of infertility among reproductively-aged women. Androgens Female;Humans;Aged;Hirsutism;Polycystic Ovary Syndrome;Androgens;Hyperandrogenism;Alopecia;Infertility

Implementation of Low-Level Laser Therapy in Dentistry: A Review. A type of light therapy known as low-level laser therapy (LLLT) uses only one wavelength of light. Low-level lasers (LLL) do not have a warming effect on the tissues; instead, they have an effect called photobiostimulation. LLLÂ do not evaporate the tissue. The use of LLL to manage a range of illnesses is known as LLLT. Helium-neon lasers are an illustration of an LLLT product. Gallium arsenide, the infrared semiconductor made of gallium aluminum arsenide, is also an example. The performance powers range from 50 to 500 mW with electromagnetic spectrum wavelengths in the red and near-infrared region spanning from 630 to 980 nm and pulsed or continuous-wave emission. In periodontics, LLLT has gained prominence for several applications, including wound healing and pain relief after non-surgical and surgical procedures.

Intravascular Laser Irradiation of Blood Improves Functional Independence in Subacute Post-Stroke Patients: A Retrospective Observational Study from a Post-Stroke Acute Care Center in Taiwan. Objective: To investigate the effect of intravascular laser irradiation of blood (ILIB) in patients with post-stroke disability. Background: Helium-neon intravascular laser at a wavelength of 632.8â€‰nm has been applied in post-stroke rehabilitation for many years in Taiwan. Data were collected from our practice to validate its effectiveness. Materials and methods: This was a single-center, retrospective, observational study. Data from 34 patients with first-episode ischemic stroke who participated in the post-acute care program and had an initial modified Rankin Scale (mRS) score of 4 between July 2018 and June 2021 were retrospectively reviewed. Twelve patients who received conventional rehabilitation plus ILIB were in the ILIB group. Twenty-two patients who received conventional rehabilitation only were in the control group. Assessments, including the mRS, Barthel Index (BI), Berg Balance Scale (BBS), 6-min walk test (6MWT), and Fugl-Meyer Assessment of the upper extremity (FMA-UE), were performed to evaluate any post-treatment improvement. Results: Patients who received ILIB had significantly superior mRS scores than those who received only conventional rehabilitation (pâ€‰=â€‰0.028). Patients in the ILIB group experienced more improvements in the BI, 6MWT, and FMA-UE; however, these were nonsignificant. In addition, the control group experienced a greater improvement in the BBS than the ILIB group. Further studies are required to elucidate the mechanism of action of ILIB therapy fully. There was no major adverse event reported in patients receiving ILIB therapy. Conclusions: ILIB improved independence in post-stroke patients, suggesting that ILIB is a promising treatment for facilitating post-stroke recovery. Helium;Neon Humans;Retrospective Studies;Functional Status;Subacute Care;Taiwan;Helium;Neon;Stroke

Photobiomodulation for Preventive Therapy of Recurrent Herpes Labialis: A 2-Year In Vivo Randomized Controlled Study. Objective: The present study aimed to evaluate the effectiveness of the application of photobiomodulation therapy (PBMT) in the prevention of recurrent herpes labialis (RHL) through a randomized controlled clinical trial. Background data: RHL is a lifelong infection that effects patients' quality of life. In the literature PBMT has shown positive results

preventing RHL, decreasing recurrences and severity of lesions. Despite the good results reported, there are still few controlled clinical studies published on the subject. Methods: For this study, 158 volunteers were recruited and were randomly divided into three study groups: Laser 1-1â€‰J/point (L1J): nâ€‰=â€‰61, Laser 2-2â€‰J/point (L2J): nâ€‰=â€‰50, and placebo-0â€‰J/point: nâ€‰=â€‰47. The treatment consisted of a protocol of 15 sessions throughout 6 months and 2 years of follow-up posttreatment. Results: The results showed that L1J presented the most satisfactory results concerning the reduction of the number of lesions per year and less severity of recurrences in the long-term evaluation when compared with L2J. Both Laser Groups (L1J and L2J) were statistically more efficient than placebo in all aspects analyzed. All patients who received laser treatment (L1J and L2J) and presented recurrences had significant improvement in frequency and/or severity of lesions. No patient had side effects from treatment. Conclusions: PBMT can be effective in the reduction of the frequency of recurrences of RHL and in the severity of postirradiation lesions that may appear. Humans;Herpes Labialis;Quality of Life;Low-Level Light Therapy;Research Design

Effectiveness of Photobiomodulation Therapy in the Treatment of Myofascial Pain Syndrome of the Upper Trapezius Muscle: A Systematic Review and Meta-Analysis. Objective: This systematic review aimed to investigate the efficacy of photobiomodulation therapy (PBMT) on pain and pressure pain threshold (PPT) in patients with myofascial pain syndrome (MPS) of the upper trapezius muscle. Materials and methods: A total of 17 studies (944 patients) were included; data regarding participants, intervention parameters, outcome measures, time of measurement, and follow-up were extracted. Evaluation of the methodological quality was performed by Physiotherapy Evidence Database (PEDro) scale. Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system was used to assess the quality of evidence. A meta-analysis was performed on 16 studies, and standardized mean difference (SMD), corresponding 95% confidence interval (CI), and overall effect size (ES) were calculated. Results: Meta-analysis using a random-effect model was performed to evaluate the effects of PBMT alone or PBMT plus exercise (EX) compared with placebo, medical treatment, physical therapy (PT) modality, manual therapy, or complementary PT. Assessment according to the PEDro scale revealed 12 high-quality, 3 fair-quality, and 2 low-quality studies. According to the GRADE system, studies exhibited low to medium quality of evidence, with medium ES [SMD -0.54 (95% CI -1.05 to -0.02)] for studies using PBMT alone and large ES [SMD -0.80 (95% CI -1.35 to -0.26)] for PBMT+EX. Conclusions: The present systemic review revealed that PBMT is an effective PT modality for reducing pain and increasing PPT in patients with MPS of the upper trapezius. PBMT, when combined with EX, had more significant effects in reducing pain and increasing PPT compared with controls. The low-quality studies with low to moderate quality of evidence limit the confidence in the effect estimate and recommend further high-quality studies for standardization of treatment protocols and irradiation parameters. PROSPERO registration number: CRD42021241155. Humans;Superficial Back Muscles;Low-Level Light Therapy;Myofascial Pain Syndromes;Physical Therapy Modalities;Pain

Promoted CD4(+) T cell-derived IFN-Î³/IL-10 by photobiomodulation therapy modulates neurogenesis to ameliorate cognitive deficits in APP/PS1 and 3xTg-AD mice. BACKGROUND: The immune system has been implicated in synaptic plasticity, inflammation, and the progression of Alzheimer's disease (AD). However, there were few studies on improving the niche microenvironment of neural stem cells (NSCs) in the brain of AD to promote adult hippocampal neurogenesis (AHN) by regulating the function of non-parenchymal immune cells. METHODS: The lymph nodes of amyloid precursor protein/presenilin 1 (APP/PS1) and 3xTg (APP/PS1/tau) mouse models of AD were treated with photobiomodulation therapy (PBMT) for 10Â J/cm(2) per day for 1Â month (10Â min for each day), T lymphocytes isolated from these two AD models were treated with PBMT for 2Â J/cm(2) (5Â min for

each time). The NSCs isolated from hippocampus of these two AD models at E14, and the cells were co-cultivated with PBMT-treated T lymphocyte conditioned medium for NSCs differentiation. RESULTS: Our results showed that PBMT treatment could promote AHN and reverse cognitive deficits in AD mouse model. The expression of interferon-Î³ (IFN-Î³) and interleukin-10 (IL-10) was upregulated in the brain of these two AD models after PBMT treated, which was induced by the activation of Janus kinase 2 (JAK2)-mediated signal transducer and activator of transcription 4 (STAT4)/STAT5 signaling pathway in CD4(+) T cells. In addition, elevated CD4(+) T cell levels and upregulated transforming growth factor-Î²1 (TGFÎ²1)/insulin-like growth factors-1 (IGF-1)/brain-derived neurotrophic factor (BDNF) protein expression levels were also detected in the brain. More importantly, co-cultivated the PBMT-treated T lymphocyte conditioned medium with NSCs derived from these two AD models was shown to promote NSCs differentiation, which was reflected in the upregulation of both neuronal class-III Î²-tubulin (Tuj1) and postsynaptic density protein 95 (PSD95), but the effects of PBMT was blocked by reactive oxygen species (ROS) scavenger or JAK2 inhibitor. CONCLUSION: Our research suggests that PBMT exerts a beneficial neurogenesis modulatory effect through activating the JAK2/STAT4/STAT5 signaling pathway to promote the expression of IFN-Î³/IL-10 in non-parenchymal CD4(+) T cells, induction of improvement of brain microenvironmental conditions and alleviation of cognitive deficits in APP/PS1 and 3xTg-AD mouse models. Amyloid beta-Protein Precursor;Brain-Derived Neurotrophic Factor;Culture Media, Conditioned;Disks Large Homolog 4 Protein;Presenilin-1;Reactive Oxygen Species;STAT4 Transcription Factor;STAT5 Transcription Factor;Transforming Growth Factor beta1;Tubulin;Interleukin-10;Insulin-Like Growth Factor I;Interferon-gamma;Janus Kinase 2 Alzheimer Disease;Amyloid beta-Protein Precursor;Animals;Brain-Derived Neurotrophic Factor;CD4-Positive T-Lymphocytes;Cognition;Culture Media, Conditioned;Disease Models, Animal;Disks Large Homolog 4 Protein;Insulin-Like Growth Factor I;Interferon-gamma;Interleukin-10;Janus Kinase 2;Low-Level Light Therapy;Mice;Mice, Transgenic;Neurogenesis;Presenilin-1;Reactive Oxygen Species;STAT4 Transcription Factor;STAT5 Transcription Factor;T-Lymphocytes;Transforming Growth Factor beta1;Tubulin

Is low-level laser therapy effective in the treatment of herpes labialis? Systematic review and meta-analysis. The objective of this systematic review is to evaluate the effectiveness of low-level laser therapy in the treatment of herpes labialis. The searches were carried out independently by 2 researchers and the articles were selected through the electronic databases according to the inclusion and exclusion criteria previously established. Initially, 480 articles were found, of which 7 randomized clinical trials and 1 clinical trial were selected. In total, 928 patients were included. In the meta-analysis, the mean healing time for laser use was significant, showing a mean reduction of 1.37 [CI 95%â€‰=â€‰0.92 to 1.82] days for tissue healing (pâ€‰<â€‰0.0001). In the meta-analysis to evaluate the time for crust formation, there was no significant difference between the groups and no significant reduction in the mean time for crust formation (pâ€‰=â€‰0.150). Only one of the selected studies had a low risk of bias. The use of low-level laser proved to be effective in the treatment of herpes labialis. However, due to the high risk of bias in the included studies, there is a need to carry out new standardized studies to prove the effectiveness of this therapy. Humans;Herpes Labialis;Low-Level Light Therapy;Photochemotherapy;Wound Healing

Treatments for Burning Mouth Syndrome: A Network Meta-analysis. The aim of this systematic review and network meta-analysis (NMA) of randomized controlled trials was to evaluate the effectiveness of treatments for pain relief of burning mouth syndrome (BMS). Five databases and gray literature were searched. Independent reviewers selected studies, extracted data, and assessed the risk of bias. The primary outcome was pain relief or burning sensation, and the secondary outcomes were side effects, quality of life, salivary flow, and TNF-Î± and interleukin 6 levels. Four comparable interventions were grouped into different network geometries to ensure the transitivity

assumption for pain: photobiomodulation therapy, alpha-lipoic acid, phytotherapics, and anxiolytics/antidepressants. Mean difference (MD) and 95% CI were calculated for continuous outcomes. The minimal important difference to consider a therapy beneficial against placebo was an MD of at least -1 for relief of pain. To interpret the results, the GRADE approach for NMA was used with a minimally contextualized framework and the magnitude of the effect. Forty-four trials were included (24 in the NMA). The anxiolytic (clonazepam) probably reduces the pain of BMS when compared with placebo (MD, -1.88; 95% CI, -2.61 to -1.16; moderate certainty). Photobiomodulation therapy (MD, -1.90; 95% CI, -3.58 to -0.21) and pregabalin (MD, -2.40; 95% CI, -3.49 to -1.32) achieved the minimal important difference of a beneficial effect with low or very low certainty. Among all tested treatments, only clonazepam is likely to reduce the pain of BMS when compared with placebo. The majority of the other treatments had low and very low certainty, mainly due to imprecision, indirectness, and intransitivity. More randomized controlled trials comparing treatments against placebo are encouraged to confirm the evidence and test possible alternative treatments (PROSPERO CRD42021255039). Clonazepam Humans;Network Meta-Analysis;Clonazepam;Burning Mouth Syndrome;Quality of Life;Pain

Quantitative and Integrative Photobiomodulation. Low-Level Light Therapy

Photobiomodulation for the treatment of neuroinflammation: A systematic review of controlled laboratory animal studies. BACKGROUND: Neuroinflammation is a response that involves different cell lineages of the central nervous system, such as neurons and glial cells. Among the non-pharmacological interventions for neuroinflammation, photobiomodulation (PBM) is gaining prominence because of its beneficial effects found in experimental brain research. We systematically reviewed the effects of PBM on laboratory animal models, specially to investigate potential benefits of PBM as an efficient anti-inflammatory therapy. METHODS: We conducted a systematic search on the bibliographic databases (PubMed and ScienceDirect) with the keywords based on MeSH terms: photobiomodulation, low-level laser therapy, brain, neuroinflammation, inflammation, cytokine, and microglia. Data search was limited from 2009 to June 2022. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. The initial systematic search identified 140 articles. Among them, 54 articles were removed for duplication and 59 articles by screening. Therefore, 27 studies met the inclusion criteria. RESULTS: The studies showed that PBM has anti-inflammatory properties in several conditions, such as traumatic brain injury, edema formation and hyperalgesia, ischemia, neurodegenerative conditions, aging, epilepsy, depression, and spinal cord injury. CONCLUSION: Taken together, these results indicate that transcranial PBM therapy is a promising strategy to treat brain pathological conditions induced by neuroinflammation.

Conservative treatment with mouthwashes followed by tongue photo biomodulation therapyÂ in Covid-19: a case report. BACKGROUND: Oral manifestations of coronavirus disease 2019 (COVID-19), including ulcers, herpetiform lesions, macules, and petechiae, among others, are becoming increasingly recognized, but there is little guidance on their treatment. Reported cases have described treatment with various mouthwashes containing antivirals, antifungals, antibiotics, anesthetics, or steroids. Our case report is unique in that we provide guidance on the judicious use of these medications, followed by photobiomodulation therapy if the manifestations are treatment resistant. CASE PRESENTATION: We describe a 30-year-old Caucasian woman who tested positive for COVID-19 after developing nasal congestion and cough. Ten days after testing positive, she developed a systemic rash on her extremities and torso. At the same time, she developed swelling of the tongue lasting 1 hour, with subsequent appearance of oral lesions that resembled geographic tongue. She also had an irritable sensation on her tongue and some mild loss of sense of taste. We opted for conservative therapy, including mouth rinses containing lidocaine to be used every 6 hours. The patient used the mouth rinse therapy for 1 month and experienced a 90% improvement in her oral

lesions and tongue sensitivity. However, she had repeated flares every 3 weeks over a 6-month period, and the steroid mouthwash achieved incomplete resolution. After three sessions of photobiomodulation therapy, she had no further flares or tongue sensitivity and the lesions healed. CONCLUSIONS: The implication of our report is that we promote the judicious use of topical antibiotics, antivirals, antifungals, and steroids for when they are indicated. We propose lidocaine-containing mouth rinses and steroid mouthwash as an initial, symptomatic treatment regimen for 'COVID-19 tongue.' If there is failure of resolution, we recommend photobiomodulation therapy. Anti-Bacterial Agents;Antifungal Agents;Antiviral Agents;Mouthwashes;Lidocaine Adult;Anti-Bacterial Agents;Antifungal Agents;Antiviral Agents;COVID-19;Conservative Treatment;Female;Humans;Lidocaine;Mouthwashes;Oral Ulcer;Tongue;Tongue Diseases

Anti-hyperalgesic effects of photobiomodulation therapy (904Â nm) on streptozotocin-induced diabetic neuropathy imply MAPK pathway and calcium dynamics modulation. Several recent studies have established the efficacy of photobiomodulation therapy (PBMT) in painful clinical conditions. Diabetic neuropathy (DN) can be related to activating mitogen-activated protein kinases (MAPK), such as p38, in the peripheral nerve. MAPK pathway is activated in response to extracellular stimuli, including interleukins TNF-Î± and IL-1Î². We verified the pain relief potential of PBMT in streptozotocin (STZ)-induced diabetic neuropathic rats and its influence on the MAPK pathway regulation and calcium (Ca(2+)) dynamics. We then observed that PBMT applied to the L4-L5 dorsal root ganglion (DRG) region reduced the intensity of hyperalgesia, decreased TNF-Î± and IL-1Î² levels, and p38-MAPK mRNA expression in DRG of diabetic neuropathic rats. DN induced the activation of phosphorylated p38 (p-38) MAPK co-localized with TRPV1(+) neurons; PBMT partially prevented p-38 activation. DN was related to an increase of p38-MAPK expression due to proinflammatory interleukins, and the PBMT (904Â nm) treatment counteracted this condition. Also, the sensitization of DRG neurons by the hyperglycemic condition demonstrated during the Ca(2+) dynamics was reduced by PBMT, contributing to its anti-hyperalgesic effects. Calcium, Dietary;RNA, Messenger;Tumor Necrosis Factor-alpha;Streptozocin;Mitogen-Activated Protein Kinases;p38 Mitogen-Activated Protein Kinases;Calcium Animals;Calcium;Calcium, Dietary;Diabetes Mellitus;Diabetic Neuropathies;Ganglia, Spinal;Hyperalgesia;Low-Level Light Therapy;Mitogen-Activated Protein Kinases;RNA, Messenger;Rats;Rats, Sprague-Dawley;Streptozocin;Tumor Necrosis Factor-alpha;p38 Mitogen-Activated Protein Kinases

Effectiveness of electrophysical agents for treating pressure injuries: a systematic review. Tissue injuries that affect the skin and/or adjacent tissues and are usually over a bony prominence are called pressure injuries. The prevalence of these dysfunctions remains high, and despite technological advances, there is no consensus on the most appropriate treatment. The objective of this review was to evaluate the efficacy of photobiomodulation (PBM), ultrasound, and high-frequency electrophysical agents in the healing of pressure injuries in adults and the elderly. The search was conducted in the PubMed, Embase, Cochrane Library, Web of Science, and PEDro databases; in clinical trial records, a list of references of the selected articles, as well as through manual search (Google), of the last 5Â years in humans in English and Portuguese. Nine thousand and sixty-seven studies were identified, 13 pre-selected, and 6 were included in this systematic review. PBM showed similar efficacy to other technologies indicated in other studies in healing pressure injuries. PBM with red wavelength (660 nm) in stages 2 and 3 pressure injuries effectively promoted healing compared to standard care. It was observed that the use of PBM accelerates tissue repair in pressure injuries; therapeutic ultrasound showed similar efficacy to other electrophysical agents but was effective in reducing the area of pressure injuries when comparing pre- and post-intervention. No clinical studies using the high-frequency electrophysical agent have been described in the last 5Â years. Adult;Aged;Humans;Crush Injuries;Wound Healing;Pressure Ulcer

Attachment of -tBu groups to aza-BODIPY core at 3,5-sites with ultra-large Stokes shift to enhance photothermal therapy through apoptosis mechanism. By the introduction of the -tBu groups into aza-BODIPY core, di-tert-butyl-substituted aza-BODIPYs at 3,5-sites (tBuazaBDPs) were prepared for the first time. Based on the X-ray analysis of CN-tBuazaBDP, this molecular structure is twisted. Near-infrared dye SMe-tBuazaBDP has the ultra-large Stokes shift (152Â â€‹nm) in aza-BODIPY system, combining with the twisted intramolecular charge transfer and the free rotation of the -tBu groups at 3,5-sites. Although the barrier-free rotors of the distal -tBu groups in SMe-tBuazaBDP result in low fluorescence quantum yield, the photothermal conversion efficiency is markedly enhanced. SMe-tBuazaBDP nanoparticles with low power laser irradiation were proven to block cancer cell cycle, inhibit cancer cell proliferation, and induce cancer cell apoptosis in photothermal therapy (PTT). The strategy of "direct attachment of -tBu groups to aza-BODIPY core" gives a new design platform for a photothermal therapy agent.

Evaluation of the effect of the photobiomodulation therapy on the pain related to dental injections: A preliminary clinical trial. BACKGROUND: Pain from dental injections is a common reason why people fear dentistry and avoid dental treatment. Thus, researchers have attempted to find methods to decrease dental injection pain. OBJECTIVES: Considering the analgesic effect of the photobiomodulation therapy (PBMT), the aim of this study was to evaluate the effects of PBMT on the pain caused by dental anesthetic injections. MATERIAL AND METHODS: This randomized, split-mouth, triple-blind clinical trial evaluated 60 bilateral canine teeth in 30 dental students. After the random selection of the test (laser) quadrant, the injection site was irradiated with a 940 nm diode laser. Buccal infiltration anesthesia was then administered by injecting lidocaine plus epinephrine with a short needle. The level of pain experienced during the injection was determined using a 100-millimeter visual analog scale (VAS). The same procedure was performed for the control (no laser) quadrant, with the difference being that the laser handpiece was turned on, but no radiation was administered. The 2 groups were compared using the non-parametric Wilcoxon signed-rank test. RESULTS: The mean VAS pain scores were 21.2 Â±15.7 for the laser quadrant and 27.9 Â±18.9 for the control quadrant; this difference was statistically significant (p = 0.030), but did not seem to be clinically relevant. CONCLUSIONS: The photobiomodulation therapy prior to dental anesthetic injections has no clinical advantage for reducing injection pain. Analgesics;Anesthetics, Local;Lidocaine;Epinephrine Analgesics;Anesthesia, Dental;Anesthetics, Local;Epinephrine;Humans;Lidocaine;Low-Level Light Therapy;Pain

Efficacy of photobiomodulation therapy on healing of ionizing irradiated bone: a systematic review of in vivo animal studies. This systematic review aimed to answer the research focused question: What are the effects of photobiomodulation (PBM) therapy on bone healing after ionizing irradiation in animal models? The EMBASE, LILACS, LIVIVO, PubMed, Scopus, and Web of Science databases, including gray literature, were searched using the following keywords: "Head and Neck Neoplasms"; "Ionizing Radiation"; "Low-Level Light Therapy"; and "Bone regeneration", focusing on the primary studies that assessed the effects of PBM therapy on animal models of irradiated bone. Six studies have met the eligibility criteria and presented an overall regular quality according to the risk of bias assessment tools. All the studies utilized rat animal model and near-infrared laser PBM at low power output setting. Most of the studies showed increased new bone formation, osteocytes, osteoblasts, and vascularization networking, as a result of PBM therapy. However, only one out of the six studies has not shown any differences in bone healing in both lased and non-lased animal groups. Nevertheless, PBM therapy is a potential tool to improve bone healing induced by ionizing radiation. However, due to the scarce number of studies and the great variability of laser parameters and treatment protocols, a clear conclusion cannot be drawn. Hence, extensive preclinical in vivo studies are warranted to ensure these beneficial effects have been addressed prior to translational clinical

trials. Rats;Animals;Low-Level Light Therapy;Bone Regeneration;Head and Neck Neoplasms;Wound Healing;Lasers

Wearable Surface-Lighting Micro-Light-Emitting Diode Patch for Melanogenesis Inhibition. Wearable light-emitting diode (LED)-based phototherapeutic devices have recently attracted attention as skin care tools for wrinkles, acne, and hyperpigmentation. However, the therapeutic effectiveness and safety of LED stimulators are still controversial due to their inefficient light transfer, high heat generation, and non-uniform spot irradiation. Here, a wearable surface-lighting micro-LED (SÂµLED) photostimulator is reported for skin care and cosmeticÂ applications. The SÂµLEDs, consisting of a light diffusion layer (LDL), 900 thin film ÂµLEDs, and polydimethylsiloxane (PDMS), achieve uniform surface-lighting in 2 Ã— 2 cm(2) -sized area with 100% emission yields. The SÂµLEDs maximize photostimulation effectiveness on the skin surface by uniform irradiation, high flexibility, and thermal stability. The SÂµLED's effect on melanogenesis inhibition is evaluated via in vitro and in vivo experiments to human skin equivalents (HSEs) and mouse dorsal skin, respectively. The anti-melanogenic effect of SÂµLEDs is confirmed by significantly reduced levels of melanin contents, melan-A, tyrosinase, and microphthalmia-associated transcription factor (MITF), compared to a conventional LED (CLED) stimulator. Melanins;Monophenol Monooxygenase Animals;Mice;Humans;Lighting;Melanins;Skin;Monophenol Monooxygenase;Wearable Electronic Devices

Photobiomodulation for Hypertension and Alzheimer's Disease. Although the cause(s) of Alzheimer's disease in the majority of cases remains elusive, it has long been associated with hypertension. In animal models of the disease, hypertension has been shown to exacerbate Alzheimer-like pathology and behavior, while in humans, hypertension during mid-life increases the risk of developing the disease later in life. Unfortunately, once individuals are diagnosed with the disease, there are few therapeutic options available. There is neither an effective symptomatic treatment, one that treats the debilitating cognitive and memory deficits, nor, more importantly, a neuroprotective treatment, one that stops the relentless progression of the pathology. Further, there is no specific preventative treatment that offsets the onset of the disease. A key factor or clue in this quest for an effective preventative and therapeutic treatment may lie in the contribution of hypertension to the disease. In this review, we explore the idea that photobiomodulation, the application of specific wavelengths of light onto body tissues, can reduce the neuropathology and behavioral deficits in Alzheimer's disease by controlling hypertension. We suggest that treatment with photobiomodulation can be an effective preventative and therapeutic option for this neurodegenerative disease. Animals;Humans;Alzheimer Disease;Neurodegenerative Diseases;Hypertension;Disease Models, Animal

A Randomized, Double-Blind, and Sham-Controlled Trial of an Innovative Brain-Gut Photobiomodulation Therapy: Safety and Patient Compliance. BACKGROUND: Recent innovative non-pharmacological interventions and neurostimulation devices have shown potential for application in the treatment of Alzheimer's disease (AD). These include photobiomodulation (PBM) therapy. OBJECTIVE: This pilot study assesses the safety, compliance with, and efficacy of a brain-gut PBM therapy for mild-to-moderate AD patients. METHODS: This double-blind, randomized, monocentric sham-controlled study started in 2018 and ended prematurely in 2020 due to the COVID-19 pandemic. Fifty-three mild-to-moderate AD patients were randomized, 27 in the PBM group and 26 in the sham group. All patients had 40 treatment sessions lasting 25â€Šmin each over 8 weeks and were followed for 4 weeks afterwards. Compliance with the treatment was recorded. Safety was assessed by recording adverse events (AEs), and efficacy was evaluated using neuropsychological tests. RESULTS: The PBM therapy proved to be safe in regard to the number of recorded AEs (44% of the patients), which were balanced between the PBM and sham groups. AEs

were mainly mild, and no serious AEs were reported. The majority of the patients (92.5%) were highly compliant, which confirms the feasibility of the PBM treatment. Compared to the sham patients, the PBM patients showed lower ADAS-Cog comprehension subscores, higher forward verbal spans, and lower TMT-B execution times, which suggests an improvement in cognitive functions. CONCLUSION: This study demonstrates the tolerability of and patient compliance with a PBM-based treatment for mild-to-moderate AD patients. It highlights encouraging efficacy trends and provides insights for the design of the next phase trial in a larger AD patient sample. Humans;Low-Level Light Therapy;Pilot Projects;Pandemics;Treatment Outcome;COVID-19;Alzheimer Disease;Brain;Double-Blind Method;Patient Compliance

Research protocol to evaluate the effectiveness of shockwave therapy, photobiomodulation and physical therapy in the management of non-insertional Achilles tendinopathy in runners: a randomised control trial with elective cross-over design. BACKGROUND: Achilles tendinopathy (AT) is a common overuse injury in runners. While the mainstay of treatment for AT is tendon loading exercises (physical therapy and exercise programme (EXER)), some patients have refractory symptoms. Extracorporeal shockwave therapy (ESWT) and photobiomodulation therapy (PBMT) have each been evaluated to facilitate tendon healing; the influence of combining treatments is unknown and limited studies have been completed in runners. This randomised control study, with an elective cross-over at 3â€‰months, will evaluate the efficacy of three forms of treatment of non-insertional AT: (1) EXER (loading programme specific to Achilles tendon combined with physical therapy); (2) EXER and ESWT; (3) EXER, ESWT and PBMT. Sixty runners will be assigned using block randomisation into one of three treatment groups (n=20). After 3 months, each participant may elect a different treatment than previously assigned and will be followed for an additional 3 months. The EXER Achilles loading programme will be standardised using the Silbernagel at-home programme. The primary outcome of interest is treatment group responses using the Victorian Institute of Sports Assessment-Achilles (VISA-A) Score. Secondary outcomes include the Patient-Reported Outcomes Measurement Information System-29 questions, the University of Wisconsin Running Injury and Recovery Index, heel raise to fatigue test, hopping test and ultrasound measurements. We will also capture patient preference and satisfaction with treatment. We hypothesise that the cohorts assigned EXER+ESWT+PBMT and EXER+ESWTâ€‰will see greater improvements in VISA-A than the EXER cohort, and the largest gains are anticipated in combining ESWT+PBMT. The elective cross-over phase will be an exploratory study and will inform us whether patient preference for treatment will impact the treatment response. TRIAL REGISTRATION NUMBER: NCT04725513.

Light stimulation on tenocytes: A systematic review of in vitro studies. The purpose of this systematic review is to analyze the methodologies, utilized stimulation parameters, and the main cellular outcomes obtained by in vitro studies that apply a light source on tenocyte cultures. METHODS: The PubMed, Scopus, and Web of Science databases were searched up to December 9, 2019 for in vitro studies that used light sources on tenocyte cultures. A 13-item checklist was used to assess methodological quality of the studies and the risk of bias was assessed using the Risk of Bias Assessment tool for Non-randomized Studies tool. RESULTS: Six studies were included. Tenocytes from the Achilles tendon were used by 83.3% of the studies, with 16.7% utilizing the deep digital flexor tendon, with cells in passage 2 to 5. Four studies used lasers and the other 2 used light-emitting diode or intense pulsed light, in wavelengths ranges from 530 to 1100 nm. The application of light to tenocytes resulted in positive effects reported by all studies, including an increase in cell proliferation and migration, and higher protein and gene expression of tendon biomarkers. Studies presented a lack of standardization on reporting light stimulation parameters and experimental methodologies, leading to low methodological quality. There was a high risk of selection, performance, detection, and reporting bias. CONCLUSIONS: All studies showed positive effects after light stimulation on tenocytes,

regardless of the light source used. However, the lack of standardized data on light stimulation parameters, experimental setup, and the studies' main limitations hindered representative conclusions and comparisons amongst studies' main outcomes.

Therapeutic non-invasive brain treatments in Alzheimer's disease: recent advances and challenges. Alzheimer's disease (AD) is one of the major neurodegenerative diseases and the most common form of dementia. Characterized by the loss of learning, memory, problem-solving, language, and other thinking abilities, AD exerts a detrimental effect on both patients' and families' quality of life. Although there have been significant advances in understanding the mechanism underlying the pathogenesis and progression of AD, there is no cure for AD. The failure of numerous molecular targeted pharmacologic clinical trials leads to an emerging research shift toward non-invasive therapies, especially multiple targeted non-invasive treatments. In this paper, we reviewed the advances of the most widely studied non-invasive therapies, including photobiomodulation (PBM), transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), and exercise therapy. Firstly, we reviewed the pathological changes of AD and the challenges for AD studies. We then introduced these non-invasive therapies and discussed the factors that may affect the effects of these therapies. Additionally, we review the effects of these therapies and the possible mechanisms underlying these effects. Finally, we summarized the challenges of the non-invasive treatments in future AD studies and clinical applications. We concluded that it would be critical to understand the exact underlying mechanisms and find the optimal treatment parameters to improve the translational value of these non-invasive therapies. Moreover, the combined use of non-invasive treatments is also a promising research direction for future studies and sheds light on the future treatment or prevention of AD.

A long-term follow-up of early breast cancer patients treated with photobiomodulation during conventional fractionation radiotherapy in the prevention of acute radiation dermatitis. OBJECTIVES: The evidence demonstrating the efficacy of photobiomodulation (PBM) therapy for preventing and managing acute radiation dermatitis (ARD) is growing steadily. The question that arises from many clinicians is, if PBM is safe for oncologic patients. This study aimed to evaluate the disease-free survival (DFS), cancer-free survival (CFS), and overall survival (OS) of breast cancer patients treated with PBM for ARD. METHODS: Clinical data of 120 breast cancer patients treated with prophylactic PBM (nâ€‰=â€‰60, 2x/week, 808-905â€‰nm, 4â€‰J/cm(2)) or placebo (nâ€‰=â€‰60) during conventional fractionation (CF) radiotherapy (RT) between April 2015 and June 2017 were retrospectively analyzed (TRANSDERMIS trial). During follow-up (April 2015 toÂ May 2022), patients underwent a complete clinical evaluation every 6Â months and blood analysis and mammography yearly in the first 5Â years after the end of RT. The DFS, CFS, and OS were estimated. RESULTS: At a median follow-up time of 66 months (range 4-81), there was no significant difference in DFS (73.7% vs. 98.3%, resp., pâ€‰=â€‰0.54), CFS (68.4% vs. 77.8%, resp., pâ€‰=â€‰0.79), and OS (87.9% vs. 98.3%, resp., pâ€‰=â€‰0.30) between the placebo and PBM group. CONCLUSIONS: This paper is the first to describe the results of a long-term follow-up in early-stage breast cancer patients who underwent PBM for ARD. Results suggest that using PBM in breast cancer patients undergoing CF RT does not influence the locoregional recurrence, the development of new primary tumors, or OS. Humans;Female;Breast Neoplasms;Follow-Up Studies;Retrospective Studies;Radiodermatitis

Optimizing parameters of the Pulsed Dye Laser (PDL, 585-nm) for hemangioma treatment using diffuse reflectance spectroscopy. INTRODUCTION: The lack of objectivity options for a specific individualized therapy might cause challenges in laser treatment. In other words, we need optimally determined laser parameters for less side effects. Generally, laser treatment procedures seem to be subjective. Then, the final evaluation of the patient needs for optimized better response with less

laser sections and less side effects. Therefore, employing a reliable objective technique seems to be essential for better response with less laser treatment sessions and also less side effects. METHOD: In this research, UV-visible diffused reflection spectra from normal skin and a lesion were taken. We obtained the differences in absorption intensity at 575â€‰nm, the wavelength corresponds to the absorption peak of blood oxyhemoglobin for normal skin and hemangioma. To calibrate the measurements, after using pulsed dye laser (PDL at 585â€‰nm), the PDL treatment response of the patients were graded as "good (>50%), moderate(25%-50%), and poor (0%-25%)," by a specialist. Finally, patients were categorized based on the energy of the laser for the best treatment response to propose the recommended laser parameters. RESULTS: Based on the differences in the absorption peak hemangioma compare with normal skin, the energy density of PDL for a good treatment response of hemangioma was obtained at peak wavelength 575â€‰nm. CONCLUSION: The analysis of optical reflection spectroscopy can assess the correlation of absorption peak differences of vascular lesions and normal skin. According to this data, it seems to be effective in optimizing lasers parameters for the hemangioma treatment. Humans;Lasers, Dye;Low-Level Light Therapy;Spectrum Analysis;Hemangioma;Light;Treatment Outcome

The effects of taping on de Quervain's disease: A systematic review and meta-analysis. BACKGROUND: Therapeutic taping may be a useful modality in relieving pain, improving strength, and restoring the function of patients with De Quervain's Disease (DQD). Evidence on the effectiveness of therapeutic taping for DQD patients in mitigating its clinical signs and symptoms is not established. However, reviews report Kinesio Taping effects on musculoskeletal pains not specific to DQD. METHODS: The study followed the guideline statement of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Two researchers (RD and SN) searched the electronic databases and hand-searched for relevant journals. The relevant articles were selected using keywords found in titles and abstracts and, consequently, full-text manuscripts. A third researcher (VCDIII) resolved the disagreements between the two researchers. They used Review Manager 5.4 for risk of bias assessment and meta-analysis. Data were pooled to determine the therapeutic taping's overall effect. Heterogeneity was assessed by Higgin's (I(2)) statistic. The random-effects model was used if heterogeneity was high (>60%). The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Approach determined the certainty of evidence. RESULTS: Seven high-risk of bias clinical-controlled trials comprising 241 participants were included in the meta-analysis. The reported outcome measures were the Visual Analogue Scale (VAS) for pain, Patient-Rated Wrist/Hand Examination for Function and Power, and precision grip strength using a hand-held dynamometer and pinch gauge. Therapeutic taping did not improve the pain, power grip, grip strength, and function of participants with DQD (pÂ >Â 0.05). Therapeutic taping compared to other physical therapy interventions did not reduce the VAS scores of 241 participants with DQD [SMD (95% CI)Â =Â -1.08 (-2.55,0.39), pÂ =Â 0.15]. Kinesio taping with low-level laser therapy compared to ultrasound and exercise did not improve the function of 60 participants with DQD [SMD (95% CI)Â =Â 0.56 (-4.71,3.60), pÂ =Â 0.79]. Therapeutic taping compared to ultrasound and Mulligan Pain Releasing Phenomenon did not improve the power grip strength of 50 participants with DQD [SMD (95% CI)Â =Â 1.24 (-0.83,3.31), pÂ =Â 0.24]. Therapeutic taping was not better than phonophoresis in improving the precision grip strength of 50 participants with DQD [SMD (95% CI)Â =Â 0.43 (-1.95,2.80), pÂ =Â 0.72]. CONCLUSIONS: There is insufficient evidence to recommend the use of therapeutic taping in treating patients with DQD. Therapeutic taping was no better than other treatment modalities in mitigating the clinical signs and symptoms of DQD (pÂ >Â 0.05). Therapeutic taping did not affect wrist pain, handgrip, pincer strength, and function of participants with DQD (pÂ >Â 0.05). Athletic Tape;De Quervain Disease;Hand Strength;Humans;Musculoskeletal Pain;Pain Measurement

The effects of polarized photobiomodulation on cellular viability, proliferation, mitochondrial membrane potential and apoptosis in human fibroblasts: Potential applications to wound healing. Photobiomodulation (PBM) is a widely used therapeutic intervention used to treat several chronic conditions. Despite this, fundamental research underpinning its effectiveness is lacking, highlighted by the lack of a definitive mechanism of action. Additionally, there are many treatment variables which remain underexplored, one of those being the effect of polarization the property of light that specifies the direction of the oscillating electric field. When applied to PBM, using linearly polarized light, when compared to otherwise identical non-polarized light, may enhance its biological efficacy. As such, we investigated the potential biological effects of polarized PBM when compared to non-polarized and non-irradiated controls in the domains of cellular viability, proliferation, apoptosis and mitochondrial membrane potential (Î”Î¨) within cells exposed to oxidative stress. It was noted that polarized PBM, when compared to non-polarized PBM and non-irradiated controls, demonstrated mostly increased levels of cellular proliferation and Î”Î¨, whilst decreasing the amount of cellular apoptosis. These results indicate that polarization may have utility in the clinical application of PBM. Future research is needed to further elucidate the underpinning mechanisms of PBM and polarization. Humans;Membrane Potential, Mitochondrial;Wound Healing;Cell Proliferation;Apoptosis;Fibroblasts;Low-Level Light Therapy

[Research progress of infrared light promoting wound healing]. At present, current stimulation, ultra-sound, and light therapy have become effective methods to promote wound healing. Among them, infrared light is the most widely used method and is one of the important methods to promote wound healing. The therapeutic effect of infrared light on wounds is related to the effect of photobiomodulation on cells and molecules on the skin surface, but the mechanism by which photobiomodulation of infrared light promotes wound healing has not been fully elucidated. Therefore, it is necessary to study the action characteristics and the mechanism of photo-biomodulation of infrared light in promoting wound healing. This article reviews the effect of different types of infrared light on wound healing and the mechanism of infrared light in promoting wound healing. Infrared Rays;Low-Level Light Therapy;Wound Healing

Repeated transcranial photobiomodulation improves working memory of healthy older adults: behavioral outcomes of poststimulation including a three-week follow-up. SIGNIFICANCE: Decline in cognitive ability is a significant issue associated with healthy aging. Transcranial photobiomodulation (tPBM) is an emerging non-invasive neuromodulation technique and has shown promise to overcome this challenge. AIM: This study aimed to investigate the effects of seven-day repeated tPBM, compared to those of single tPBM and baseline, on improving N -back working memory in healthy older adults and to evaluate the persistent efficacy of repeated tPBM. APPROACH: In a sham-controlled and within-subject design, 61 healthy older adults were recruited to participate in a longitudinal study involving an experimental baseline, seven days of tPBM treatment (12Â min daily, 1064-nm laser, 250â€‰â€‰mW/cm2) in the left dorsolateral prefrontal cortex and three weeks of follow-ups. Behavioral performance in the N -back (N =Â 1,2,Â 3) was recorded poststimulation during the baseline, the first and seventh days of the tPBM session, and the three weekly follow-ups. A control group with 25 participants was included in this study to rule out the practice and placebo effects. The accuracy rate and response time were used in the statistical analysis. RESULTS: Repeated and single tPBM significantly improved accuracy rate in 1- and 3-back tasks and decreased response time in 3-back compared to the baseline. Moreover, the repeated tPBM resulted in a significantly higher improvement in accuracy rate than the single tPBM. These improvements in accuracy rate and response time lasted at least three weeks following repeated tPBM. In contrast, the control group showed no significant improvement in behavioral performance. CONCLUSIONS: This study demonstrated that seven-day repeated tPBM improved the working

memory of healthy older adults more efficiently, with the beneficial effect lasting at least three weeks. These findings provide fundamental evidence that repeated tPBM may be a potential intervention for older individuals with memory decline.

Photobiomodulation promotes repair following spinal cord injury by restoring neuronal mitochondrial bioenergetics via AMPK/PGC-1Î±/TFAM pathway. Background: Insufficient neuronal mitochondrial bioenergetics supply occurs after spinal cord injury (SCI), leading to neuronal apoptosis and impaired motor function. Previous reports have shown that photobiomodulation (PBM) could reduce neuronal apoptosis and promote functional recovery, but the underlying mechanism remains unclear. Therefore, we aimed to investigate whether PBM improved prognosis by promoting neuronal mitochondrial bioenergetics after SCI. Methods: Sprague Dawley rats were randomly divided into four groups: a Sham group, an SCI group, an SCI + PBM group and an SCI + PBM + Compound C group. After SCI model was established, PBM and Compound C (an AMPK inhibitor) injection were carried out. The level of neuron apoptosis, the recovery of motor function and mitochondrial function were observed at different times (7, 14, and 28Â days). The AMPK/PGC-1Î±/TFAM pathway was hypothesized to be a potential target through which PBM could affect neuronal mitochondrial bioenergetics. In vitro, ventral spinal cord 4.1 (VSC4.1) cells were irradiated with PBM and cotreated with Compound C after oxygen and glucose deprivation (OGD). Results: PBM promoted the recovery of mitochondrial respiratory chain complex activity, increased ATP production, alleviated neuronal apoptosis and reversed motor dysfunction after SCI. The activation of the AMPK/PGC-1Î±/TFAM pathway after SCI were facilitated by PBM but inhibited by Compound C. Equally important, PBM could inhibit OGD-induced VSC4.1 cell apoptosis by increasing ATP production whereas these changes could be abolished by Compound C. Conclusion: PBM activated AMPK/PGC-1Î±/TFAM pathway to restore mitochondrial bioenergetics and exerted neuroprotective effects after SCI.

Photobiomodulation at 830 nm Stimulates Migration, Survival and Proliferation of Fibroblast Cells. PURPOSE: Photobiomodulation (PBM) promotes diabetic wound healing by favoring cell survival and proliferation. This study aimed to investigate the potential of PBM in stimulating cellular migration, viability, and proliferation using the transforming growth factor-Î²1 (TGF-Î²1)/Smad signaling pathway. METHODS: The study explored the in vitro effects of near infrared (NIR) light on cell viability (survival) and proliferation as well as the presence of TGF-Î²1, phosphorylated TGF-Î² receptor type I (pTGF-Î²R1) and phosphorylated mothers against decapentaplegic-homolog (Smad)-2/3 (p-Smad2/3) in different fibroblast cell models. RESULTS: Results show a significant increase in cellular migration in wounded models, and increased viability and proliferation in irradiated cells compared to their respective controls. An increase in the presence of TGF-Î²1 in the culture media, a reduction in pTGF-Î²R1 and a slight presence of p-Smad2/3 was observed in the cells. CONCLUSION: These findings show that PBM at 830 nm using a fluence of 5 J/cm(2) could induce cell viability, migration and proliferation to favor successful healing of diabetic wounds. This study contributes to the growing body of knowledge on the molecular and cellular effect of PBM and showcases the suitability of PBM at 830 nm in managing diabetic wounds.

Efficacy of low-level laser therapy in patients with lower extremity tendinopathy or plantar fasciitis: systematic review and meta-analysis of randomised controlled trials. OBJECTIVES: We investigated the effectiveness of low-level laser therapy (LLLT) in lower extremity tendinopathy and plantar fasciitis on patient-reported pain and disability. DESIGN: Systematic review and meta-analysis. DATA SOURCES: Eligible articles in any language were identified through PubMed, Embase and Physiotherapy Evidence Database (PEDro) on the 20 August 2020, references, citations and experts. ELIGIBILITY CRITERIA FOR SELECTION OF STUDIES: Only randomised controlled trials involving participants with lower extremity tendinopathy or plantar fasciitis treated with LLLT were included.

DATA EXTRACTION AND SYNTHESIS: Random effects meta-analyses with dose subgroups based on the World Association for Laser Therapy treatment recommendations were conducted. Risk of bias was assessed with the PEDro scale. RESULTS: LLLT was compared with placebo (10 trials), other interventions (5 trials) and as an add-on intervention (3 trials). The study quality was moderate to high.Overall, pain was significantly reduced by LLLT at completed therapy (13.15â€‰mm Visual Analogue Scale (VAS; 95%â€‰CI 7.82 to 18.48)) and 4-12 weeks later (12.56â€‰mm VAS (95%â€‰CI 5.69 to 19.42)). Overall, disability was significantly reduced by LLLT at completed therapy (Standardised Mean Difference (SMD)=0.39 (95% CI 0.09 to 0.7) and 4-9 weeks later (SMD=0.32 (95% CI 0.05 to 0.59)). Compared with placebo control, the recommended doses significantly reduced pain at completed therapy (14.98 mm VAS (95%â€‰CI 3.74 to 26.22)) and 4-8 weeks later (14.00â€‰mm VAS (95%â€‰CI 2.81 to 25.19)). The recommended doses significantly reduced pain as an add-on to exercise therapy versus exercise therapy alone at completed therapy (18.15â€‰mm VAS (95%â€‰CI 10.55 to 25.76)) and 4-9 weeks later (15.90â€‰mm VAS (95%â€‰CI 2.3 to 29.51)). No adverse events were reported. CONCLUSION: LLLT significantly reduces pain and disability in lower extremity tendinopathy and plantar fasciitis in the short and medium term. Long-term data were not available. Some uncertainty about the effect size remains due to wide CIs and lack of large trials. PROSPERO REGISTRATION NUMBER: CRD42017077511. Fasciitis, Plantar;Humans;Low-Level Light Therapy;Lower Extremity;Pain;Randomized Controlled Trials as Topic;Tendinopathy

What's New in Therapy for Male Androgenetic Alopecia? Male androgenetic alopecia is a common condition and represents a major concern for patients who experience this condition. While there are different treatments to stop hair loss and improve hair density, the 5-alpha reductase inhibitors have demonstrated to be effective in improving androgenetic alopecia in men and can maintain a positive response for many years. Oral finasteride 1Â mg is a US FDA-approved option, but dutasteride 0.5 mg has been proven to induce better responses, especially in the frontal area. Both have been shown to be safe in clinical trials but there is widespread concern about sexual adverse effects among patients. The use of topical finasteride has increased during the last few years as a useful option to avoid systemic therapy. The efficacy of topical finasteride 0.25% daily has been demonstrated in clinical trials, with a less marked decrease in serum dihydrotestosterone levels than with oral intake. Mesotherapy with dutasteride has also become more widespread recently, although evidence of its effectiveness is limited to retrospective studies in real clinical practice. The use of oral minoxidil in androgenetic alopecia has not been approved by the FDA, however several clinical studies have shown that it is an effective treatment option. The initial dose recommended to treat male hair loss is 2.5 mg daily, although the dose is frequently increased to 5 mg daily. The main adverse effect of oral minoxidil is hypertrichosis, followed by dizziness or lower limb edema, which are much less common. Platelet-rich plasma is a non-pharmacological option to treat male androgenetic alopecia, with some clinical trials demonstrating an improvement in hair count after several months. Among the published studies, the main limitation to compare its efficacy is the heterogeneity of the procedure. The most frequent regimens propose treatment every 4 weeks for 3 months initially to assess the individual response. Another treatment alternative is the use of light devices with wavelengths of between 630 and 660 nm, known as low-level laser therapy. These devices can be used at home every day for 15-30Â min. Their efficacy has been shown in a limited number of clinical trials; however, there is a lack of evidence about the efficacy of these devices compared with other medical options or as a complementary therapy in hair loss. The pipeline of potential new treatments for male androgenetic alopecia is strong. Pyrilutamide and GT20029 are being studied as topical antagonists of the androgen receptor, while cetirizine is another topical option with some initial promising results. Furthermore, according to isolated studies with heterogeneous treatment schemes, the use of botulinum toxin in the scalp might improve

androgenetic alopecia, and lastly, scalp threading might increase the total hair count as growth factors are released during implantation. Dutasteride;Finasteride;Minoxidil Humans;Male;Alopecia;Dutasteride;Finasteride;Minoxidil;Retrospective Studies;Treatment Outcome

Antiangiogenic activity of photobiomodulation in experimental model using chorioallantoic embryonic membrane of chicken eggs. PURPOSE: The purpose of this study was to investigate the vascular effects of photobiomodulation using a light-emitting diode on the chorioallantoic embryonic membrane of chicken eggs grouped into different times of exposure and to detect the morphological changes induced by the light on the vascular network architecture using quantitative metrics. METHODS: We used a phototherapy device with light-emitting diode (670 nm wavelength) as the source of photobiomodulation. We applied the red light at a distance of 2.5 cm to the surface of the chorioallantoic embryonic membrane of chicken eggs in 2, 4, or 8 sessions for 90 s and analyzed the vascular network architecture using AngioTool software (National Cancer Institute, USA). We treated the negative control group with 50 Î¼l phosphate-buffered-saline (pH 7.4) and the positive control group (Beva) with 50 Î¼l bevacizumab solution (Avastin, Produtos Roche QuÃ-micos e FarmacÃªuticos, S.A., Brazil). RESULTS: We found a decrease in total vessel length in the Beva group (24.96% Â± 12.85%) and in all the groups that received 670 nm red light therapy (2Ã— group, 34.66% Â± 8.66%; 4Ã— group, 42.42% Â± 5.26%; 8Ã— group, 38.48% Â± 6.96%), compared with the negative control group. The fluence of 5.4 J/cm2 in 4 sessions (4Ã—) showed more regular vessels. The number of junctions in the groups that received a higher incidence of 670 nm red light (4Ã— and 8Ã—) significantly decreased ($p<0.0001$). CONCLUSION: Photo-biomodulation helps reduce vascularization in chorioallantoic embryonic membrane of chicken eggs and changes in the network architecture. Our results open the possibility of future clinical studies on using this therapy in patients with retinal diseases with neovascular components, especially age-related macular degeneration. Bevacizumab Animals;Humans;Chickens;Low-Level Light Therapy;Phototherapy;Bevacizumab;Models, Theoretical

LOW-LEVEL LASER THERAPY MAY REDUCE PAIN ASSOCIATED WITH ORTHODONTIC SEPARATOR PLACEMENT. ARTICLE TITLE AND BIBLIOGRAPHIC INFORMATION: Farzan, A. K. Khaleghi (2021). "The Effectiveness of Low-Level Laser Therapy in Pain Induced by Orthodontic Separator Placement: A Systematic Review." J Lasers Med Sci 12: e29. SOURCE OF FUNDING: None. TYPE OF STUDY/DESIGN: Systematic review. Humans;Low-Level Light Therapy;Orthodontic Appliances;Pain;Pain Management;Pain Measurement

CAN COMBINING LOW LEVEL LASER THERAPY WITH COMPUTER GUIDED FLAPLESS PIEZOSURGICAL OSTEOTOMY ACHIEVE A PAINLESS IMPLANT SURGERY? FINDINGS OF SPLIT MOUTH RANDOMIZED CONTROLLED TRIAL. OBJECTIVE: Developing a safe and accurate surgical technique that offers higher patient satisfaction will be a great improvement in the field of oral implantology. This study was to investigate the effect of Low-Level Laser Therapy (LLLT) on pain and swelling after flapless computer guided implant site preparation utilizing a novel surgical guide designed to be used with piezotome. METHODS: A total of thirty patients were enrolled in this study having history of bilateral extractions in the lower molar area not less than 6 months ago. One side from each patient was randomly selected for the intervention group to receive LLLT immediately after insertion of bendable one-piece implant (Rough-B Implant, Monoimplant, Novodent SA, Swizerland) using diode laser with a wavelength of 980 nm and a 100 mW energy for 1 minute. The other side received placebo LLLT and was regarded as a control group. Piezo-surgical implant site preparation was done on both sides using a third generation piezotome (Surgic Touch, Guilin Woodpecker Medical Instrument Co., Ltd, China). Pain and swelling scores were measured by utilizing a Visual Analogue Scale (VAS) and a graded swelling scale respectively. The measurements were recorded on both sides after 2, 6 and 24 hour of the day of surgery then at 2, 3, 4 and 7 days post-surgically. RESULTS: In general, the overall scores

were ranging from very mild to mild degree of pain and swelling. Females reported significantly higher pain score than males with a mean score of 20.3 Â± 5.1 for females and 14.7 Â± 3.1 for males (P < .05). Swelling showed no statistically significant results between females and males (P> .05). Pain scores were found to be significantly lower in the LLLT side after 2, 6, 24, 48 hour of implant insertion (P < .05). Moreover, Sweling scores were also found to be significantly lower in the LLLT side after 2, 6, 24, 48 hour, and at day 3 of implant insertion (P < .05). However, day 4 and day 7 showed very minimal if any pain and swelling with insignificant differences between the 2 sides (P > .05). CONCLUSIONS: LLLT was found to be an effective non pharmacological method for relieving pain after implant insertion. Piezosurgical flapless implant placement combined with LLLT is considered an effective, tolerable and minimally invasive procedure (ClinicalTrials.gov NCT01857804). Dental Implants Computers;Dental Implants;Edema;Female;Humans;Low-Level Light Therapy;Male;Mouth;Osteotomy;Pain

Cancer-therapy-induced mucosal injury from 2001 to 2021: A bibliometric analysis. BACKGROUND: Cancer-therapy-induced mucosal injury (CMI) is a common and deleterious complication that affects patients undergoing cancer therapies. This study was aimed at elucidating knowledge bases and predicting research trends of this field, by analyzing the bibliographic data of CMI. METHODS: The bibliographic data of CMI from 2001 to 2021 were extracted from the Web of Science Core Collection database in March 2022. After screening, a total of 8181 articles and reviews were included in the study. CiteSpace and VOSviewer were applied to analyze and visualize cooperation, cooccurrence, cocitation, and coupling networks. RESULTS: A steady increase in publications and a burst of citation since 2019 were seen in the subject. Supportive Care in Cancer, International Journal of Radiation Oncology Biology Physics, Annals of Oncology, Cancer, and Radiotherapy and Oncology were the most influential journals of this field. The University of Adelaide, University of Texas MD Anderson Cancer Center, and Memorial Sloan Kettering Cancer Center were the top three most productive institutions. ST Sonis, RV Lalla, JB Epstein, and DMK Keefe were the authors with impressive publications and citations. The intellectual base was the publication network of improved treatments based on updating knowledge of CMI. The future trends would be the pathogenesis of CMI, mechanism-based interventions, microbiota of oral and gastrointestinal mucosa, and photobiomodulation. CONCLUSION: This study introduced the evolving publication network and predicted the research trends of CMI, which helped researchers to obtain detailed and reliable knowledge of the discipline, and focus on the most urgent unsolved problems in this field. Humans;Mucous Membrane;Bibliometrics;Databases, Factual;Neoplasms

Effects of intravascular photobiomodulation on motor deficits and brain perfusion images in intractable myasthenia gravis: A case report. BACKGROUND: Myasthenia gravis (MG) is an autoimmune disorder caused by neuromuscular junction failure characterized by muscle weakness and fatigability. We herein report a case of MG that received intravascular laser irradiation of blood (ILIB) interventions and regained muscle power and better quality of life. To our knowledge, no previous study has investigated the benefits of ILIB treatment on patients with MG. We also evaluated the changes in brain perfusion scan and the MG activities of daily living (MG-ADL) and quantitative MG (QMG) scales. CASE SUMMARY: A 59-year-old man presented to our outpatient hospital experiencing ptosis, diplopia, fibromyalgia, muscle fatigue, and fluctuating weakness in his limbs for 1 year. Based on his history, physical examination, and laboratory investigations, the final diagnosis was a flare-up of MG with poor endurance and muscle fatigue. The patient agreed to receive ILIB. Brain single-photon emission computed tomography (SPECT) was performed both before and after ILIB therapy. After receiving three courses of ILIB, the brain SPECT images showed greatly increased perfusion of the frontal lobe and anterior cingulate gyri. The patient's MG-ADL scale score decreased markedly from 17/24 to 3/24. The QMG scale score also decreased remarkably from 32/39

to 9/39. The symptoms of MG became barely detectable and the patient was able to perform his activities of daily living and regain muscle power. CONCLUSION: ILIB might have beneficial effects on MG, and brain SPECT images provided direct evidence of a positive correlation between ILIB and clinical performance.

Photobiomodulation effects in metalloproteinases expression in zymosan-induced arthritis. Matrix metalloproteinases (MMPs) play a crucial role in the degenerative course of rheumatic disorders. They are responsible for cartilage and other joint-associated tissues breakdown. Amid arthritis treatments, photobiostimulation (PBM), a non-thermal and non-invasive low-power laser application, appears to be an outstanding therapy alternative once it has succeeded in MMPs modulation. Thus, this study aimed to evaluate the PBM effects of low infrared laser (830Â nm), testing two different energy densities (3 and 30 Jcm(-2)) in MMP-2, MMP-9, MMP-13, and MMP-14 as well as the inhibitor TIMP-2 expressions using zymosan-induced arthritis model. C57BL/6 mice were distributed into four groups (nâ€‰=â€‰8): zymosan-induced arthritis without treatment; zymosan-induced arthritis and dexamethasone-treated; zymosan-induced arthritis and PBM at energy density of 3 Jcm(-2) treated; and zymosan-induced arthritis and PBM at energy density of 30 Jcm(-2) treated. MMPs and TIMP-2 mRNA relative levels by qRT-PCR and proteins expression by immunohistochemical and Western blotting techniques were performed after PBM treatment in the inflamed joint. Our results demonstrated PBM could modulate both mRNA relative levels and proteins expression of the MMP-2, -9, -13, -14, and TIMP-2 in joint tissues, decreasing MMP-9 protein expression and increasing TIMP-2 protein expression. PBM promotes a better arthritis prognostic, modulating metalloproteinase and its inhibitor, especially MMP-9 and TIMP-2 protein expression that is important inflammatory markers. These findings may also corroborate that PBM may regulate MMPs expression using different pathways. Matrix Metalloproteinases;RNA, Messenger;Tissue Inhibitor of Metalloproteinase-1;Tissue Inhibitor of Metalloproteinase-2;Zymosan Animals;Mice;Arthritis;Matrix Metalloproteinases;Mice, Inbred C57BL;RNA, Messenger;Tissue Inhibitor of Metalloproteinase-1;Tissue Inhibitor of Metalloproteinase-2;Zymosan;Low-Level Light Therapy

The Effects of Blue Light on Human Fibroblasts and Diabetic Wound Healing. Diabetes is a serious threat to global health and is among the top 10 causes of death. The Diabetic foot ulcer (DFU) is among the most common and severe complications of the disease. Bacterial infections are common; therefore, timely aggressive management, using multidisciplinary management approaches is needed to prevent complications, morbidity, and mortality, particularly in view of the growing cases of antibiotic-resistant bacteria. Photobiomodulation (PBM) involves the application of low-level light at specific wavelengths to induce cellular photochemical and photophysical responses. Red and near-infrared (NIR) wavelengths have been shown to be beneficial, and recent studies indicate that other wavelengths within the visible spectrum could be helpful as well, including blue light (400-500 nm). Reports of the antimicrobial activity and susceptibility of blue light on several strains of the same bacterium show that many bacteria are less likely to develop resistance to blue light treatment, meaning it is a viable alternative to antibiotic therapy. However, not all studies have shown positive results for wound healing and fibroblast proliferation. This paper presents a critical review of the literature concerning the use of PBM, with a focus on blue light, for tissue healing and diabetic ulcer care, identifies the pros and cons of PBM intervention, and recommends the potential role of PBM for diabetic ulcer care.

DNA Directed Pro-Dopamine Regulation Coupling Subluxation Repair, H-Wave(Â®) and Other Neurobiologically Based Modalities to Address Complexities of Chronic Pain in a Female Diagnosed with Reward Deficiency Syndrome (RDS): Emergence of Induction of "Dopamine Homeostasis" in the Face of the Opioid Crisis. Addiction is a complex multifactorial condition. Established genetic

factors can provide clear guidance in assessing the risk of addiction to substances and behaviors. Chronic stress can accumulate, forming difficult to recognize addiction patterns from both genetic and epigenetic (environmental) factors. Furthermore, psychological/physical/chemical stressors are typically categorized linearly, delaying identification and treatment. The patient in this case report is a Caucasian female, aged 36, who presented with chronic pain and partial disability following a surgically repaired trimalleolar fracture. The patient had a history of unresolved attention deficit disorder and an MRI scan of her brain revealed atrophy and functional asymmetry. In 2018, the patient entered the Bajaj Chiropractic Clinic, where initial treatment focused on re-establishing integrity of the spine and lower extremity biomechanics and graduated into cognitive behavior stabilization assisted by DNA pro-dopamine regulation guided by Genetic Addiction Risk Severity testing. During treatment (2018-2021), progress achieved included: improved cognitive clarity, focus, sleep, anxiety, and emotional stability in addition to pain reduction (75%); elimination of powerful analgesics; and reduced intake of previously unaddressed alcoholism. To help reduce hedonic addictive behaviors and pain, coupling of H-Wave with corrective chiropractic care seems prudent. We emphasize the importance of genetic assessment along with attempts at inducing required dopaminergic homeostasis via precision KB220PAM. It is hypothesized that from preventive care models, a new standard is emerging including self-awareness and accountability for reward deficiency as a function of hypodopaminergia. This case study documents the progression of a patient dealing with the complexities of an injury, pain management, cognitive impairment, anxiety, depression, and the application of universal health principles towards correction versus palliative care.

Can Photobiomodulation Therapy (PBMT) Minimize Exercise-Induced Oxidative Stress? A Systematic Review and Meta-Analysis. Oxidative stress induced by exercise has been a research field in constant growth, due to its relationship with the processes of fatigue, decreased production of muscle strength, and its ability to cause damage to the cell. In this context, photobiomodulation therapy (PBMT) has emerged as a resource capable of improving performance, while reducing muscle fatigue and muscle damage. To analyze the effects of PBMT about exercise-induced oxidative stress and compare with placebo therapy. DATA SOURCES: Databases such as PubMed, EMBASE, CINAHL, CENTRAL, PeDro, and Virtual Health Library, which include Lilacs, Medline, and SciELO, were searched to find published studies. STUDY SELECTION: There was no year or language restriction; randomized clinical trials with healthy subjects that compared the application (before or after exercise) of PBMT to placebo therapy were included. STUDY DESIGN: Systematic review with meta-analysis. DATA EXTRACTION: Data on the characteristics of the volunteers, study design, intervention parameters, exercise protocol and oxidative stress biomarkers were extracted. The risk of bias and the certainty of the evidence were assessed using the PEDro scale and the GRADE system, respectively. RESULTS: Eight studies (n = 140 participants) were eligible for this review, with moderate to excellent methodological quality. In particular, PBMT was able to reduce damage to lipids post exercise (SMD = -0.72, CI 95% -1.42 to -0.02, I(2) = 77%, p = 0.04) and proteins (SMD = -0.41, CI 95% -0.65 to -0.16, I(2) = 0%, p = 0.001) until 72 h and 96 h, respectively. In addition, it increased the activity of SOD enzymes (SMD = 0.54, CI 95% 0.07 to 1.02, I(2) = 42%, p = 0.02) post exercise, 48 and 96 h after irradiation. However, PBMT did not increase CAT activity (MD = 0.18 CI 95% -0.56 to 0.91, I(2) = 79%, p = 0.64) post exercise. We did not find any difference in TAC or GPx biomarkers. CONCLUSION: Low to moderate certainty evidence shows that PBMT is a resource that can reduce oxidative damage and increase enzymatic antioxidant activity post exercise. We found evidence to support that one session of PBMT can modulate the redox metabolism.

Critically Appraised Topic on Low-Level Laser Therapy (LLLT) in Dogs: An Advisable Treatment for Skin Diseases? Low-level laser therapy (LLLT) is a therapeutic option that stimulates cellular function through intracellular photobiological and photochemical reactions, promoting better tissue repair

and an anti-inflammatory, antibacterial, and analgesic effect. Previous studies in human and veterinary medicine have shown the clinical efficacy of LLLT in many fields. In this study, the literature was reviewed using the critically appraised topic (CAT) method to determine the canine skin diseases for which LLLT is an advisable treatment. A meticulous literature search revealed 19 significant clinical trials, which were critically analyzed. The evaluation of the best accessible evidence in July 2022 suggests that fluorescence biomodulation (FBM), a type of LLLT, can, in combination with systemic antibiotic therapy, be a promising and effective adjunctive treatment for canine interdigital pyoderma and canine deep pyoderma. Furthermore, the evidence suggests that the use of LLLT is not recommended as a therapy for pedal pruritus secondary to canine atopic dermatitis. For other canine skin diseases included in the CAT, although LLLT appears to be a promising treatment, there is not yet good scientific evidence to recommend its use.

Low-level laser therapy, piezocision, or their combination vs. conventional treatment for orthodontic tooth movement : AÂ hierarchical 6-arm split-mouth randomized clinical trial. PURPOSE: The use non-invasive or minimally invasive methods to accelerate orthodontic tooth movements (OTM) is desirable. In this regard, low-level laser therapy (LLLT, photobiomodulation) and piezocision are suggested. However, because the efficacies of these methods remain controversial/inconclusive, we investigated and compared these two methods. METHODS: Sixty-four quadrants in 32Â patients were randomized into three parallel intervention groups ofÂ 22, 22, andÂ 20 (6Â parallel arms, nâ€¯=â€‰64 treatment/control sides). Bilateral first premolars were extracted and canine retraction commenced. In each group, one side of the mouth was randomly selected as control, while the other side underwent each of three interventions: LLLT (940â€¯nm, 8Â J, 0.5 W, 16â€¯s, 12Â sites), piezocision, and "LLLTâ€¯+â€‰piezocision". At the 3rd, 6th, and 9th follow-up weeks, canine retraction and anchorage loss were measured. Data were analyzed statistically (Î±â€¯=â€‰0.05). RESULTS: After 9Â weeks, LLLT, piezocision, and LLLTâ€¯+â€‰piezocision improved canine retraction by 0.51, 1.14, and 1.93â€¯mm, respectively. LLLT accelerated canine retraction (compared to control) by 1.6-, 1.4-, and 1.2-fold in the 3rd, 6th, and 9th week, respectively. These statistics were 2.1-, 1.7-, and 1.5-fold for piezocision and 2.7-, 2.1-, and 1.8-fold for LLLTâ€¯+â€‰piezocision. Compared to controls, each intervention showed significant retraction acceleration (pâ€¯<â€‰0.05). The effect of LLLTâ€¯+â€‰piezocision was greater than that of isolated piezocision (pâ€¯<â€‰0.05), which itself was greater than that for isolated LLLT (pâ€¯<â€‰0.05). CONCLUSION: All threeÂ methods accelerated OTM, with the combination of LLLTâ€¯+â€‰piezocision producing the strongest and LLLT producing the weakest acceleration. Humans;Low-Level Light Therapy;Tooth Movement Techniques;Mouth;Bicuspid

Extraoral low-level laser therapy can decrease pain but not edema and trismus after surgical extraction of impacted mandibular third molars: a randomized, placebo-controlled clinical trial. BACKGROUND: This study aimed to assess the effect of extraoral 940Â nm low-level diode laser on pain, edema, and trismus following surgical extraction of impacted mandibular third molars. MATERIALS AND METHODS: This split-mouth, randomized, placebo-controlled clinical trial evaluated 25 patients with bilaterally impacted mandibular third molars. One side of the jaw was randomly assigned to the laser and the other side to the control group. The laser quadrant received 940Â nm diode laser irradiation (0.5Â W, 10Â J/cm(2), continuous-wave mode, 20Â s) at three points in the master muscle in contact mode immediately after surgical extraction of third molar. The third molar in the placebo quadrant was extracted after 2Â weeks by the same surgeon using the same standard approach. The pain score was measured at 2 and 7Â days postoperatively using a visual analog scale (VAS). To assess trismus, the distance between the incisal edges of the upper and lower central incisors was measured in maximum opening. To assess edema, the distance between the tragus and chin point was measured before and immediately after surgery and after 2 and 7Â days. Data were

analyzed using t-test, ANOVA, and Bonferroni test. RESULTS: The mean pain score in the first 7Â days was significantly lower in the laser group (Pâ€‰<â€‰0.05). Edema and trismus were the same in both groups (Pâ€‰>â€‰0.05). Number of analgesics taken was significantly lower in the laser group (Pâ€‰<â€‰0.05). CONCLUSION: Single-session irradiation of 940Â nm diode laser can effectively decrease pain following third molar extraction surgery. TRIAL REGISTRATION NUMBER: IRCT20141209020258N91 on 29/12/2018. Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Tooth, Impacted;Trismus

Therapeutic Effects of Low-Level Laser Therapy on Cognitive Symptoms of Patients with Dementia: A Double-Blinded Randomized Clinical Trial. Objective: To investigate the effects of low-level laser therapy (LLLT) as a new nonpharmaceutical approach to improve cognitive symptoms in patients with dementia. Background: Routine pharmacological treatment of dementia patients is inefficient and has considerable adverse effects. Recent attempts to develop nonpharmaceutical approaches are considered favorable for patients with dementia. Methods: Thirty-two patients with dementia were randomly divided into the same population of LLLT and sham groups. The LLLT group underwent transcranial LLLT, and the sham group received the same protocol with a zero-intensity laser. All patients in the two groups were evaluated using the minimental state examination (MMSE) and clinical dementia rating (CDR) tests at the time of admission as baseline at 2 and 6 weeks postintervention. Results: The rate of change of MMSE scores in sham and LLLT groups was 0.13â€‰Â±â€‰0.96 and 2.31â€‰Â±â€‰1.81 in week 2 (pâ€‰=â€‰0.00005) and also -0.25â€‰Â±â€‰0.86 and 2.53â€‰Â±â€‰1.73 in week 8 (pâ€‰=â€‰0.000003). In the LLLT group, the mean scores of CDR were 1.28â€‰Â±â€‰0.71, 1.28â€‰Â±â€‰0.71, and 1.25â€‰Â±â€‰0.80 at baseline, week 2, and week 8 (pâ€‰=â€‰0.605 and pâ€‰=â€‰0.742), respectively. The mean scores of CDR in the sham group were 1.69â€‰Â±â€‰0.73, 1.75â€‰Â±â€‰0.68, and 1.72â€‰Â±â€‰0.82 at baseline, week 2, and week 8, respectively. Conclusions: These findings suggest that laser therapy could be a promising treatment modality and an adjunct to pharmacotherapy in dementia patients. Clinical Trial Registration: IRCT20191018045148N1 was obtained from the Iranian Registry of Clinical Trials (IRCT.ir).
Humans;Cognition;Dementia;Iran;Low-Level Light Therapy

Antimicrobial Efficacy of Continuous Low-Irradiance Phototherapy Against Multidrug-Resistant Organisms. Objective: The objective of this study is to report on the bactericidal effects of blue light administered at low irradiance for extended periods of time. Background: Multidrug-resistant organisms (MDROs) utilize biofilms that can limit the efficacy of antibiotics, causing infection and impaired wound healing. Unlike high-energy systems, continuous low-irradiance phototherapy (CLIP) avoids thermal injury of healthy tissue and can be delivered for extended periods. Methods: Four MDRO species, two of which contained different antibiotic resistance genes, were exposed to 405â€‰nm irradiation in vitro. The microbes were incrementally exposed to increasing dose-rates (irradiance; mW/cm(2)) over a 24-h time period. Cell viability and biomass reduction assays were conducted to quantify the antibacterial/antibiofilm effects. Primary human dermal fibroblasts were also exposed to CLIP to assess whether these dose-rates would impair cell viability or proliferation. Results: CLIP exposure utilizing irradiances as low as 2.78â€‰mW/cm(2) delivered over 24â€‰h resulted in a >3.0-log (>99.9%) and >2.0-log (>99.0%) microbial load reduction when organisms were grown in planktonic and biofilm-encapsulated conditions, respectively. Crystal violet biofilm assays revealed destruction of extracellular biofilm architecture following CLIP exposure. Human fibroblast viability and proliferation were unaffected by CLIP. Conclusions: This is the first report demonstrating the antimicrobial efficacy of CLIP for MDROs found in infected wounds. CLIP did not compromise cultured human fibroblast growth and survival. This study demonstrated that very low fluence rates (irradiances) delivered over extended periods are potently antimicrobial. There is translational

potential for CLIP to be fabricated as a wearable device that would enable continuous ambulatory care of wounds. Anti-Bacterial Agents;Anti-Infective Agents;Gentian Violet Anti-Bacterial Agents;Anti-Infective Agents;Drug Resistance, Multiple, Bacterial;Gentian Violet;Humans;Phototherapy

Photobiomodulation Literature Watch April 2022.

Effects of different protocols of defocused high-power laser on the viability and migration of myoblasts-a comparative in vitro study. The aim of the present study was to analyze for the first time the effect of photobiomodulation therapy (PBMT) using defocused high-power laser (DHPL) in myoblast cell line C2C12 viability and migration and compare them with low-power laser therapy. Cells were divided into 9 groups: Sham irradiation 10% fetal bovine serum (FBS); Sham irradiation 5%FBS; low-power laser 0.1Â W; DHPL 810 1Â W; DHPL 810 2Â W; DHPL 980 1Â W; DHPL 980 2Â W; DHPL dual 1Â W; DHPL dual 2Â W. To simulate stress conditions, all groups exposed to irradiation were maintained in DMEM 5% FBS. The impact of therapies on cell viability was assessed through sulforhodamine B assay and on cells migration through scratch assays and time-lapse. Myoblast viability was not modified by PBMT protocols. All PBMT protocols were able to accelerate the scratch closure after 6 and 18Â h of the first irradiation (pâ€‰<â€‰0.001). Also, an increase in migration speed, with a more pronounced effect of DHPL laser using dual-wavelength protocol with 2Â W was observed (pâ€‰<â€‰0.001). In conclusion, the diverse PBMT protocols used in this study accelerated the C2C12 myoblasts migration, with 2-W dual-wavelength outstanding as the most effective protocol tested. Benefits from treating muscle injuries with PBMT appear to be related to its capacity to induce cell migration without notable impact on cell viability. Myoblasts;Low-Level Light Therapy;Cell Survival;Cell Movement;Lasers

The Treatment of Complementary and Alternative Medicine on Female Infertility Caused by Endometrial Factors. Recently, with the development of the social economy, the incidence of infertility has increased year by year. With its complex etiology and diversified syndromes, infertility has become one of the most important diseases that plague the physical and mental health of women of childbearing age worldwide. Endometrial factors as an important part affecting female reproductive capacity, due to which induced repeated abortion and multiple uterine cavity operations occur, can destruct endometrium, failing to provide a normal implantation environment for zygote, thus resulting in infertility. Many patients failed to achieve expected results after receiving conventional treatments such as hormone therapy, assisted reproductive technology (ART), granulocyte colony-stimulating factor (G-CSF) therapy, and cell therapy, then turn to complementary and alternative medicine (CAM) therapies for help. Aiming at clarifying the effectiveness and mechanisms of CAM therapy in the treatment of infertility caused by endometrial factors, our paper systematically searched and studied present related literature on the PubMed, CNKI, and other databases, focusing on the aspects of clinical application and mechanism explorations and highlighting the therapeutic effects of Chinese herbal medicine (CHM), acupuncture, and moxibustion on such diseases. Moreover, this paper also introduces the CAM treatments of traditional Chinese medicine (TCM) retention enema, neuromuscular electrical stimulation (NMES), photobiomodulation therapy, dietary intervention, and other measures for infertility caused by endometrial factors, in order to provide a reference for subsequent basic research and clinical work.

Modulation of the autonomic nervous system by one session of spinal low-level laser therapy in patients with chronic colonic motility dysfunction. Patients with a defecation disorder may not evoke a normal defecation reflex, or the reflex may be excessive, as a dysfunction of the spinal autonomic nervous system. Treatment with various forms of lumbar and sacral neuromodulation have shown symptom improvement, but potential changes in autonomic functioning are rarely studied. Here we evaluate the effects on autonomic function of a single session of low-level laser

therapy (LLLT) on the lumbar and sacral spine in 41 patients with chronic gastrointestinal motor dysfunction. The LLLT protocol used red LED light at a wavelength of 660 nm for 10 min and infrared LED light at a wavelength of 840 nm for 10 min, followed by infrared laser light at a wavelength of 825 nm for 10 min. Effects on the autonomic nervous system were assessed by measuring heart rate variability (HRV) changes. Respiratory Sinus Arrhythmia (RSA) and Root Mean Square of Successive Differences (RMSSD) were used to quantify parasympathetic reactivity; the Baevsky's Stress Index (SI) reflected sympathetic activity while the ratios SI/RSA and SI/RMSSD were used to show shifts in autonomic dominance. The results indicate that lumbar and sacral neuromodulation using light arrays reduced, whereas stimulation by the laser probes significantly increased parasympathetic activity. The light arrays increased whereas the laser probes significantly decreased sympathetic activity (SI). The entire protocol shifted the autonomic balance toward parasympathetic activity. The comparison of actual vs. sham neuromodulation proved that the change in HRV parameters was due to actual light stimulation and not due to the arrays and probe touching the skin. In conclusion, a single session of LLLT markedly affects autonomic nervous system activity reflected in changes in HRV which is only possible by generating activity in the spinal autonomic nerves. These results warrant a study into the effects of LLLT on restoring autonomic dysfunction in chronic refractory colonic motility disorders.

Transvaginal Photobiomodulation Improves Pain in Women with Pelvic Muscle Tenderness and Interstitial Cystitis/Bladder Pain Syndrome: A Preliminary Observational Study. PURPOSE: Interstitial Cystitis/ Bladder Pain Syndrome (IC/BPS) is characterized by pelvic/bladder pain, associated with pelvic muscle tenderness, urgency, frequency, and dysuria. Prior studies show that transvaginal photobiomodulation (TV-PBM) reduces pain in women with chronic pelvic pain (CPP). Our objective was to obtain preliminary data on treatment effect and adherence, in women with IC/BPS who selected TV-PBM therapy for management of pelvic pain. MATERIALS AND METHODS: Before-and-after observational cohort study of women with IC/BPS who received TV-PBM in 17 US practices. Pain was measured using a 0-10 numeric rating scale (NRS). The primary outcome was a minimal clinical important difference (MCID); reduction of overall pelvic pain severity by â‰¥2 NRS points from baseline compared to after 8 treatments. Cohen d coefficient measured effect size (low effect size d<0.2, medium 0.2<d<0.8, and high d>0.8). RESULTS: Of 140 patients with IC/BPS who self-selected to start TV-PBM therapy, 89.3% (n=125) completed 4 treatments and 59.3% (n=83) completed 8. Improvement â‰¥1 NRS point was reported by 73.5% (n=61) and meaningful improvement (â‰¥2 points) was reported by 63.9% (n=53) after 8 treatments. In this group, patients with severe / moderate pain decreased from 83.1% (n=44) to 38.5% (n=20); p<0.001. Pain levels decreased as follows: overall pelvic pain MCID=-2.7, d=1.07, pain with urination MCID=-2.6, d=1.0; pain with exercise MCID=-2.6, d=0.91, pain with intercourse MCID=-2.5, d=0.82. CONCLUSION: In real-world clinical settings, 2/3 women with IC/BPS who opted to undergo TV-PBM therapy reported significant decrease in pelvic pain and dysuria. These findings are promising; however, controlled studies are needed. Humans;Female;Cystitis, Interstitial;Myalgia;Dysuria;Pelvic Pain;Pelvis

Effects of photobiomodulation on mitochondrial function in diabetic adipose-derived stem cells in vitro. Herein are reported the effects of photobiomodulation (PBM) on adenosine triphosphate (ATP) and reactive oxygen species (ROS) quantification and mitochondria membrane potential (MMP) of the mitochondria of diabetic adipose-derived stem cells (ADSCs) in vitro. Additionally, the expression of PTEN-induced kinase 1 (PINK1) and RBR E3 ubiquitin-protein ligase (PARKIN) genes, which are involved in mitochondrial quality, were quantified. First, type one diabetes was induced in 10 rats. The rats were then kept for 1Â month, after which fat tissue was excised from subcutaneous regions, and stem cells were selected from the fat, characterized as ADSC, and cultivated and increased in elevated sugar conditions in vitro; these samples were considered diabetic-ADSC. Two groups were formed, namely, diabetic-control-ADSC and PBM-diabetic-ADSC. ATP, ROS

quantification, and MMP of mitochondria of diabetic ADSCs in vitro were measured, and the expression of PINK1 and Parkin genes was quantified in vitro. The results revealed that PBM significantly increased ATP quantification (pÂ =Â 0.05) and MMP activity (pÂ =Â 0.000) in diabetic-ADSCs in vitro compared to the control diabetic-ADSCs; however, it significantly decreased ROS quantification (pÂ =Â 0.002) and PINK1(pÂ =Â 0.003) and PARKIN gene expression (pÂ =Â 0.046) in diabetic-ADSCs. The current findings indicate for the first time that PBM has the potential to maintain the function and quality of mitochondrial diabetic-ADSCs by significantly increasing ATP quantification and MMP activity in diabetic-ADSCs in vitro while significantly decreasing ROS quantification and PINK1 and PARKIN gene expression, making PBM an attractive candidate for use in improving the efficacy of autologous stem cell remedies for diabetic patients with infected diabetic foot ulcers. Reactive Oxygen Species;Ubiquitin-Protein Ligases;Protein Kinases;Adenosine Triphosphate Rats;Animals;Reactive Oxygen Species;Stem Cells;Mitochondria;Ubiquitin-Protein Ligases;Diabetes Mellitus;Protein Kinases;Adenosine Triphosphate

Responses of melanoma cells to photobiomodulation depend on cell pigmentation and light parameters. Melanoma is a highly aggressive skin cancer that requires new approaches for its management. Low-level laser therapy, currently named photobiomodulation therapy (PBM), has been used to improve different conditions but its effects and safe use on melanoma remain unexplored. Herein, we investigated the PBM impact on melanoma cells differing by pigmentation using near-infrared (NIR) and red lasers in vitro. In vivo, we evaluated the effects of the red laser on melanoma-bearing mice. Amelanotic (SK-MEL-37) and melanotic (B16F10) cells were exposed in vitro to a NIR (780Â nm, 40Â mW) or a red laser (660Â nm, 40Â mW) in 3 different light doses: 30, 90, and 150Â J/cm(2) and responses were assessed regarding mitochondrial activity, invasiveness, migration, and VEGF production. In vivo, melanoma-bearing mice received the red laser delivering 150Â J/cm(2) directly to the tumor on 3 consecutive days. Mice were monitored for 15Â days regarding tumor progression and mouse survival. We noticed that amelanotic cells were unresponsive to NIR light. In contrast, NIR irradiation at 30Â J/cm(2) promoted an increase in the invasiveness of pigmented cells, even though all light doses have inhibited cell migration. Regarding the red laser on pigmented cells, the highest light dose (150Â J/cm(2)) decreased the VEGF production and migration. In vivo, melanoma-bearing mice treated with red laser showed smaller tumor volume and longer survival than controls. We conclude that PBM appears to be safe for amelanotic non-pigmented melanoma but triggers different responses in melanotic pigmented cells depending on light parameters. Additionally, a high dose of red laser impairs the invasive behavior of melanoma cells, probably due to the decrease in VEGF synthesis, which may have contributed to tumor arrest and increased mouse survival. These findings suggest that red laser therapy could be a new ally in the supportive care of melanoma patients. Vascular Endothelial Growth Factor A Animals;Light;Low-Level Light Therapy;Melanoma;Mice;Pigmentation;Vascular Endothelial Growth Factor A

Hormesis: wound healing and fibroblasts. Hormetic dose responses are reported here to occur commonly in the dermal wound healing process, with the particular focus on cell viability, proliferation, migration and collagen deposition of human and murine fibroblasts with in vitro studies. Hormetic responses were induced by a wide range of substances, including endogenous agents, pharmaceutical preparations, plant-derived extracts including many well-known dietary supplements, as well as physical stressor agents such as low-level laser treatments. Detailed mechanistic studies have identified common signaling pathways and their cross-pathway communications that mediate the hormetic dose responses. These findings complement and extend a similar comprehensive assessment concerning the occurrence of hormetic dose responses in keratinocytes. These findings demonstrate the generality of the hormetic dose response for key wound healing endpoints, suggesting that the hormesis concept has a fundamental role in wound

healing, with respect to guiding strategies for experimental evaluation as well as therapeutic applications. Plant Extracts Animals;Fibroblasts;Hormesis;Humans;Keratinocytes;Mice;Plant Extracts;Wound Healing

Combined intense pulsed light and low-level light therapy for the treatment of refractory Meibomian gland dysfunction. PURPOSE: To evaluate the efficacy of combined Intense Pulsed Light (IPL) and Low-Level Light Therapy (LLLT) in treatment of Meibomian Gland Dysfunction (MGD). METHODS AND ANALYSIS: In this prospective study, 70 patients with refractory MGD were enrolled; group 1 received 3 consecutive sessions of IPLâ€‰+â€‰LLLT treatment using Eye-lightÂ® on day 1, day 15 and day 45; group 2 received hyaluronate sodium 2â€…mg/ml drops 3 times a day for 6 months. Patients underwent at baseline, and after 3 and 6 months Ocular Surface Disease Index (OSDI) questionnaire, Symptom Assessment in Dry Eye (SANDE), tear-film breakup time (TBUT), fluorescein ocular surface staining, meibum expressibility and quality evaluations. Keratograph 5M (Oculus, Germany) was used to assess NIBUT, tear meniscus height (TMH), meibography, and bulbar redness score. RESULTS: At 6 months a significant improvement of OSDI (pâ€‰=â€‰0.03), SANDE (pâ€‰=â€‰0.02), NIBUT (pâ€‰=â€‰pâ€‰<â€‰0.0001), TMH (pâ€‰=â€‰0.04), TBUT (pâ€‰=â€‰0.02), corneal-conjunctival staining score (pâ€‰=â€‰0.02), lid margin score (pâ€‰<â€‰0.0001), and bulbar redness score (pâ€‰=â€‰0.001) were recorded in group 1. Comparing the two groups, statistically significant differences were observed at 6 months in TBUT (pâ€‰=â€‰0.03), lid margin score (pâ€‰<â€‰0.001), Meibum expressibility (pâ€‰=â€‰0.03) and NIBUT (pâ€‰<â€‰0.001). No adverse events were recorded throughout the follow-up period. CONCLUSION: This study confirmed the efficacy and safety of combined IPL and LLLT demonstrating its superiority compared to topical treatment.

Photobiomodulation therapy in management of cancer therapy-induced side effects: WALT position paper 2022. DISCLAIMER: This article is based on recommendations from the 12(th) WALT Congress, Nice, October 3-6, 2018, and a follow-up review of the existing data and the clinical observations of an international multidisciplinary panel of clinicians and researchers with expertise in the area of supportive care in cancer and/or PBM clinical application and dosimetry. This article is informational in nature. As with all clinical materials, this paper should be used with a clear understanding that continued research and practice could result in new insights and recommendations. The review reflects the collective opinion and, as such, does not necessarily represent the opinion of any individual author. In no event shall the authors be liable for any decision made or action taken in reliance on the proposed protocols. OBJECTIVE: This position paper reviews the potential prophylactic and therapeutic effects of photobiomodulation (PBM) on side effects of cancer therapy, including chemotherapy (CT), radiation therapy (RT), and hematopoietic stem cell transplantation (HSCT). BACKGROUND: There is a considerable body of evidence supporting the efficacy of PBM for preventing oral mucositis (OM) in patients undergoing RT for head and neck cancer (HNC), CT, or HSCT. This could enhance patients' quality of life, adherence to the prescribed cancer therapy, and treatment outcomes while reducing the cost of cancer care. METHODS: A literature review on PBM effectiveness and dosimetry considerations for managing certain complications of cancer therapy were conducted. A systematic review was conducted when numerous randomized controlled trials were available. Results were presented and discussed at an international consensus meeting at the World Association of photobiomoduLation Therapy (WALT) meeting in 2018 that included world expert oncologists, radiation oncologists, oral oncologists, and oral medicine professionals, physicists, engineers, and oncology researchers. The potential mechanism of action of PBM and evidence of PBM efficacy through reported outcomes for individual indications were assessed. RESULTS: There is a large body of evidence demonstrating the efficacy of PBM for preventing OM in certain cancer patient populations, as recently outlined by the

Multinational Association for Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO). Building on these, the WALT group outlines evidence and prescribed PBM treatment parameters for prophylactic and therapeutic use in supportive care for radiodermatitis, dysphagia, xerostomia, dysgeusia, trismus, mucosal and bone necrosis, lymphedema, hand-foot syndrome, alopecia, oral and dermatologic chronic graft-versus-host disease, voice/speech alterations, peripheral neuropathy, and late fibrosis amongst cancer survivors. CONCLUSIONS: There is robust evidence for using PBM to prevent and treat a broad range of complications in cancer care. Specific clinical practice guidelines or evidence-based expert consensus recommendations are provided. These recommendations are aimed at improving the clinical utilization of PBM therapy in supportive cancer care and promoting research in this field. It is anticipated these guidelines will be revised periodically.

Low-Level Laser Therapy Role in Surgical Extractions: An Original Research. INTRODUCTION: Low-level laser therapy (LLLT) has been of interest in the clinical application in dentistry. Hence, we evaluated the LLLT on the wound healing in the mandibular surgical extraction. MATERIALS AND METHODS: We conducted a prospective clinical study with 50 male subjects, equally distributed as controls and cases. Routine surgical extraction was done for control group, and in case group, LLLT was applied after the extraction. Evaluation was done for various parameters and after comparison the P value was less than 0.05 which was considered as significant. RESULTS: Significant difference was seen between the groups for the socket depth on 7(th) day, swelling on 1(st), 3(rd), and 5(th) days, and pain on all the days. CONCLUSION: LLLT can be successfully used for the surgical extractions.

Determination of Effectiveness of Photobiomodulation in the Treatment of Oral Submucous Fibrosis. CONTEXT: Oral submucous fibrosis (OSMF) is chronic, scarring disease of the oral cavity. Cytokines and growth factors produced by inflammatory cells play a major role in its pathogenesis. Low-level laser therapy (LLLT) application, which has an anti-inflammatory, was used to determine the improvement in mouth opening. AIMS: The aim of the study is to evaluate the effectiveness of laser photobiomodulation (PBM) in OSMF treatment. MATERIALS AND METHODS: Thirty patients who were diagnosed with OSMF after obtaining consent form and ethical clearance were included. LLLT was applied for 4 cycles for 15 s each in the left and right buccal mucosa. Therapy was done on day 0, 3, 7, and 15 and measurements were done immediately after each LLLT application. Patients were recalled after 1, 3, and 6 months from the commencement of the therapy for follow-up measurements. RESULTS: The mean increase in mouth opening following application of LLLT from day 0 to day 15 was 9.91 Â± 3.34, and day 1-6 months was 14.29 Â± 6.82, which was statistically significant. CONCLUSIONS: The study shows significant improvements in the mouth opening of the OSMF patient during treatment and postoperatively. Thus, our study confirms LLLT can be used as one of the modality in OSMF management.

Assessment of Healing and Pain Response at Mandibular Third Molar Extraction Sites with and Without Pre- and PostOperative Photobiomodulation at Red and Near-Infrared Wavelengths: A Clinical Study. BACKGROUND: Photobiomodulation (PBM), formerly known as low-level laser therapy, has been successfully used for its anti-inflammatory and analgesic properties in postoperative care. It is also known to have a positive effect on healing and regeneration, at an appropriate power and wavelength. AIM: The main objective was to assess the effect of preoperative as well a postoperative irradiation with low power of 100 milliwatts (mW) and 810-nanometer (nm) (near-infrared) and 660-nanometer(nm) (red) wavelengths on healing as well pain at mandibular third molar extraction sockets. METHODOLOGY: Twenty-six patients who were scheduled for mandibular third molar extractions were enrolled in the study and were randomly assigned to the experimental and control group. The experimental group consisted of 13 patients who were subjected to 810-nm

irradiation at 100 MW at the site immediately before and after the extraction was completed. In addition, they also received a transcutaneous irradiation of 660-nm wavelength light 1-day postoperatively. The control group received no irradiation immediately after postextraction or the day after. Pain and healing were assessed using the visual analog scale and Turnbull and Howley's Index for soft-tissue healing on the 7(th) and the 21(st) days. Data were analyzed using the Mann-Whitney test. RESULTS: The results showed clinically significant improvements in healing index scores and pain scores of the experimental group than the control group ($P < 0.0001$). CONCLUSION: PBM at an appropriate wavelength is a potential tool for the management of pain and accelerating healing at mandibular third molar extraction sites.

Recovery in water polo: how much do we have to know? A systematic review. Water polo (WP) is a high-intensity intermittent aquatic sport, with a predominance of swimming skills and nonswimming activities and incomplete recovery periods. Consequently, recovery after exercise is a fundamental part of sports performance. The main purpose of this systematic review was to evaluate the effects of different recovery strategies in WP performance. The studies were found by searching in the databases of PubMed, Web of Science, and Scopus. Methodological quality and risk of bias were assessed in accordance with the Cochrane Collaboration Guidelines samples. A summary of results including five studies was followed. The results show that supplementation with cherry juice before training does not imply improvements in recovery; the full-body photobiomodulation therapy reduces muscle damage; reducing training load during the season increased the natural logarithm of the root mean square of successive differences and perceived state of recovery, and the heart rate variability stabilizes and could progressively increase at the end of a tournament; and when an increase in internal training load is less than 60%-70% autonomic cardiac disturbances during preseason training do not occur. Recovery in WP is a very limited field of study that needs future research in active recovery, hydrotherapy, massage, rest and sleep to help coaches formulate recommendations.

Photobiomodulation, as additional treatment to traditional dressing of hard-to-heal venous leg ulcers, in frail elderly with municipality home healthcare. The main objectives of the study were to explore whether laser Photobiomodulation (PBM) in addition to traditional dressing of hard-to-heal venous leg ulcer, reduced healing time of the ulcer and if the duration of the ulcer before PBM impacted the treatment time with PBM to healing. The intervention group was frail, elderly patients with home healthcare in the municipality of SkellefteÃ¥, registered in the Swedish quality registry RiksSar for ulcer treatment with hard-to-heal venous leg ulcer. The control group with equivalent physical conditions was obtained from the same quality registry. Definition of hard-to-heal ulcer was six weeks duration or more. The PBM was performed two times per week with laser type infrared GaAs, 904nm, 60mW, and 700Hz, targeting lymphatic area and ulcer area. Laser type red visible, GaAllnp, 635nm, 75mW and 250Hz, targeting ulcer area. The intervention group treated with PBM in addition to traditional dressing healed significantly faster than the control group with a mean of 123 days ($p = 0.0001$). Duration of the ulcer before PBM did not impact the healing time. To conclude, the findings indicate that using PBM in addition to dressing may have multiple benefits on hard-to-heal venous leg ulcer, saving valuable time and resources for patients, healthcare providers, and institutions. Aged;Bandages;Delivery of Health Care;Frail Elderly;Humans;Leg Ulcer;Treatment Outcome;Ulcer;Varicose Ulcer

In Vitro Effect of 445â€‰nm Blue Laser and 660â€‰nm Low-Level Laser on the Quantity and Quality of Human Gingival Fibroblasts. Low-level laser therapy (LLLT) has several benefits in dentistry, including anti-inflammatory effects and increased proliferation. This study aimed to investigate the effect of 445â€‰nm blue laser and 660â€‰nm low-power laser on the quantity and quality of human gingival fibroblasts inâ€‰vitro. In this inâ€‰vitro experimental study, 445â€‰nm and

660â€‰nm lasers were irradiated on the samples six times. After examining the cells on the 7(th) and 14(th) days, the data were analyzed using ANOVA PASS11 and the post hoc Tukey test. The results showed the positive effect of the 660â€‰nm laser on fibroblast proliferation. The viability on the 7(th) day was the highest in the control group, lowest in the 445â€‰nm laser group and highest in the 660â€‰nm laser group on the 14(th) day. In the morphological examination, the cells were spherical with narrow appendages in the control group, spindle-shaped with lamellipodia appendages in the 660â€‰nm laser group and spherical with no cytoplasmic appendages in the 445â€‰nm laser group. Evidence of necrosis and granulation phenomenon was observed in the 445â€‰nm laser group. The use of the 660â€‰nm low-power laser, compared with the 445â€‰nm laser, has a positive effect on the quantity and quality of gingival fibroblasts.
Humans;Gingiva;Lasers;Fibroblasts;Low-Level Light Therapy;Necrosis;Cell Proliferation

Effect of light-emitting photobiomodulation therapy on the rate of orthodontic tooth movement : AÂ randomized controlled clinical trial. PURPOSE: The aim of this study was to evaluate the effect of light-emitting photobiomodulation therapy (LPT) on the rate of canine distalization. METHODS: This study was performed on 60Â extraction spaces formed by extraction of the upper first premolars of 30Â patients (15 in the LPT group and 15Â in the control group). Paul Gjessing (PG)-segmented canine retraction springs were used for canine distalization. In the LPT group, the Biolux OrthoPulseâ„¢ (Biolux Research Ltd, Vancouver, Canada) intraoral device (wavelength 850 nm LED light and an energy density of 63â€¯mW/cm(2) [Â±13â€¯mW/cm(2)]) was used for 5Â min per day over a period of 84Â days. For each patient, the diagnosis was based on standard orthodontic documentation with photographs, digital model casts, and cephalometric and panoramic radiographs. The anchorage loss, canine rotations, canine inclinations, and molar inclinations were also evaluated on plaster models obtained on days 0, 21, 42, 63, and 84. The models were measured by using 3Shape OrthoAnalyzer software (3Shape, Copenhagen, Denmark). Measurements were made by a researcher and a blinded clinician. For statistical comparison, a paired-samples tâ€‘test and one-way analysis of variance (ANOVA) were used at the pâ€¯<â€‰0.05 level. RESULTS: The mean canine distalization rates were 1.36â€¯mm/21Â days and 1.02â€¯mm/21Â days in the LPT and control groups, respectively, and were statistically greater in the LPT group (pâ€¯<â€‰0.001). The amount of anchorage loss, canine rotations, canine inclinations and molar inclinations were not significantly different between the LPT and control groups at any of the timepoints. CONCLUSION: LPT has the potential to accelerate orthodontic tooth movement by 33%.

Promoting Immortalized Adipose-Derived Stem Cell Transdifferentiation and Proliferation into Neuronal-Like Cells through Consecutive 525â€‰nm and 825â€‰nm Photobiomodulation. Neuronal cells can be generated from adipose-derived stem cells (ADSCs) through biological or chemical inducers. Research has shown that this process may be optimized by the introduction of laser irradiation in the form of photobiomodulation (PBM) to cells. This in vitro study is aimed at generating neuronal-like cells with inducers, chemical or biological, and at furthermore treating these transdifferentiating cells with consecutive PBM of a 525â€‰nm green (G) laser and 825â€‰nm near-infrared (NIR) laser light with a fluence of 10â€‰J/cm(2). Cells were exposed to induction type 1 (IT1): 3-isobutyl-1-methylxanthine (IBMX) (0.5â€‰mM)+indomethacin (200â€‰Î¼M)+insulin (5â€‰Î¼g/ml) for 14 days, preinduced with Î²-mercaptoethanol (BME) (1â€‰mM) for two days, and then incubated with IT2: Î²-hydroxyanisole (BHA) (100â€‰Î¼M)+retinoic acid (RA) (10-6â€‰M)+epidermal growth factor (EGF) (10â€‰ng/ml)+basic fibroblast growth factor (bFGF) (10â€‰ng/ml) for 14 days and preinduced with Î²-mercaptoethanol (BME) (1â€‰mM) for two days and then incubated with indomethacin (200â€‰Î¼M)+RA (1â€‰Î¼M)+forskolin (10â€‰Î¼M) for 14 days. The results were evaluated through morphological observations, viability, proliferation, and migration studies, 24â€‰h, 48â€‰h, and 7 days post-PBM. The protein detection of an early

neuronal marker, neuron-specific enolase (NSE), and late, ciliary neurotrophic factor (CNTF), was determined with enzyme-linked immunosorbent assays (ELISAs). The genetic expression was also explored through real-time PCR. Results indicated differentiation in all experimental groups; however, cells that were preinduced showed higher proliferation and a higher differentiation rate than the group that was not preinduced. Within the preinduced groups, results indicated that cells treated with IT2 and consecutive PBM upregulated differentiation the most morphologically and physiologically.

Photobiomodulation in 3D tissue engineering. SIGNIFICANCE: The method of photobiomodulation (PBM) has been used in medicine for a long time to promote anti-inflammation and pain-resolving processes in different organs and tissues. PBM triggers numerous cellular pathways including stimulation of the mitochondrial respiratory chain, alteration of the cytoskeleton, cell death prevention, increasing proliferative activity, and directing cell differentiation. The most effective wavelengths for PBM are found within the optical window (750 to 1100Â nm), in which light can permeate tissues and other water-containing structures to depths of up to a few cm. PBM already finds its applications in the developing fields of tissue engineering and regenerative medicine. However, the diversity of three-dimensional (3D) systems, irradiation sources, and protocols intricate the PBM applications. AIM: We aim to discuss the PBM and 3D tissue engineered constructs to define the fields of interest for PBM applications in tissue engineering. APPROACH: First, we provide a brief overview of PBM and the timeline of its development. Then, we discuss the optical properties of 3D cultivation systems and important points of light dosimetry. Finally, we analyze the cellular pathways induced by PBM and outcomes observed in various 3D tissue-engineered constructs: hydrogels, scaffolds, spheroids, cell sheets, bioprinted structures, and organoids. RESULTS: Our summarized results demonstrate the great potential of PBM in the stimulation of the cell survival and viability in 3D conditions. The strategies to achieve different cell physiology states with particular PBM parameters are outlined. CONCLUSIONS: PBM has already proved itself as a convenient and effective tool to prevent drastic cellular events in the stress conditions. Because of the poor viability of cells in scaffolds and the convenience of PBM devices, 3D tissue engineering is a perspective field for PBM applications. Hydrogels Cell Differentiation;Cell Survival;Hydrogels;Tissue Engineering

The effect of low-level laser irradiation on the proliferation, osteogenesis, inflammatory reaction, and oxidative stress of human periodontal ligament stem cells under inflammatory conditions. Periodontitis often causes damage to the periodontal tissue and affects the function of human periodontal ligament stem cells (hPDLSCs). Low-level laser therapy (LLLT) has been used for periodontal treatment and can upregulate the proliferation and osteogenesis of hPDLSCs. The purpose of this study was to investigate the effects of LLLT on the proliferation, osteogenic differentiation, inflammatory reaction, and oxidative stress of hPDLSCs in an inflammatory environment (pPDLSCs). We designed one control group and three testing groups (treated with Nd:YAG laser at 4, 8, and 16Â J/cm(2)) of hPDLSCs from periodontitis patients who were diagnosed with stable phase periodontitis. Cell proliferation was measured by colony-forming unit fibroblast (CFU-F) assays and 3-(4,5-dimethylthiazol-2yl)-2,5-diphenyltetrazolium bromide (MTT) assays. The osteogenic capacity of the cells was determined by alkaline phosphatase (ALP) staining, ALP activity assays, Alizarin Red S staining and the mRNA transcript levels of runt-related transcription factor 2 (Runx2), ALP, and osteocalcin (OCN). The effects of LLLT on the secretion of tumor necrosis factor-Î± (TNF-Î±) and interleukin (IL)-1Î² by PDLSCs were measured by enzyme-linked immunosorbent assay (ELISA). We also evaluated the oxidative stress of hPDLSCs and pPDLSCs by measuring the reactive oxygen species (ROS) level, malondialdehyde (MDA) level, and superoxide dismutase (SOD) activity after treatment with LLLT at 4, 8, and 16Â J/cm(2). Our results demonstrated that LLLT could modulate the osteogenic potential of pPDLSCs at 8Â J/cm(2). Inflammatory stimuli induced excess

ROS release, and LLLT at 4-8Â J/cm(2) promoted oxidative stress levels in hPDLSCs but decreased the expression of inflammatory cytokines and ROS levels in pPDLSCs. Moreover, LLLT at 16Â J/cm(2) could significantly suppress proliferation and osteogenic differentiation and promote inflammatory cytokines and ROS levels in pPDLSCs. In conclusion, LLLT could regulate proliferation, osteogenesis, inflammatory reaction, and oxidative stress of human periodontal ligament stem cells under inflammatory conditions. Reactive Oxygen Species;Tumor Necrosis Factor-alpha Humans;Periodontal Ligament;Osteogenesis;Reactive Oxygen Species;Cells, Cultured;Stem Cells;Cell Differentiation;Inflammation;Cell Proliferation;Periodontitis;Oxidative Stress;Tumor Necrosis Factor-alpha;Lasers

Low level light therapy/photobiomodulation for diabetic peripheral neuropathy: protocol of a systematic review and meta-analysis. INTRODUCTION: Diabetic peripheral neuropathy (DPN) is one of the most common complications of diabetes that strongly impact the patients' quality of life and working ability. Evidence indicated that low level light therapy (LLLT)/photobiomodulation might be effective for neuropathy. However, the effect of LLLT for DPN is not clear. The objective of this systematic review and meta-analysis is to determine the effects and safety of LLLT/photobiomodulation for DPN, in comparison with other methods such as sham light, no treatment, other active treatment and LLLT as an additional treatment compared with another treatment alone. METHODS AND ANALYSIS: We will search eight databases from their inception to the date before the review submission. Randomised controlled trials (RCTs) will be included. Two reviewers will independently extract data using a structured data extraction method and assess the risk of bias in the included studies. Data will be synthesised using standardised mean difference or risk ratio with 95% CIs for continuous and dichotomous data, respectively. The primary outcome will be change in pain and secondary outcomes will include global symptom improvement, functional impairment and disability, impairment of sensation, quality of life, nerve conduction, and adverse events. Sensitivity and subgroup analysis will be employed to explore the influence of possible clinical and methodological characteristics. Publication bias will be assessed using funnel plot. We will conduct meta-analysis with RevMan V.5.4 and evaluate quality of the evidence using GRADE approach. ETHICS AND DISSEMINATION: This study does not require ethics approval. Our findings will be disseminated in the peer-reviewed publications. PROSPERO REGISTRATION NUMBER: CRD42021276056. Humans;Acupuncture Therapy;Bias;Diabetes Mellitus;Diabetic Neuropathies;Low-Level Light Therapy;Meta-Analysis as Topic;Systematic Reviews as Topic

Fat herniation over striae distansea in focal dermal hypoplasia treated with 2940â€‰nm Er:YAG Laser. Humans;Lasers, Solid-State;Focal Dermal Hypoplasia;Striae Distensae;Low-Level Light Therapy

Reversible hair loss in a patient with cicatricial alopecia: A case of regrowth associated with pioglitazone use.

Comparison of Pulsed and Continuous Wave Diode Laser at 940â€‰nm on the Viability and Migration of Gingival Fibroblasts. Gingival fibroblasts have critical roles in oral wound healing. Photobiomodulation (PBM) has been shown to promote mucosal healing and is now recommended for managing oncotherapy-associated oral mucositis. This study examined the effects of the emission mode of a 940â€‰nm diode laser on the viability and migration of human gingival fibroblasts. Cells were cultured in a routine growth media and treated with PBM (average power 0.1â€‰Wâ€‰cm(-2) , average fluence 3â€‰Jâ€‰cm(-2) , every 12â€‰h for six sessions) in one continuous wave and two pulsing settings with 20% and 50% duty cycles. Cell viability was assessed using MTT, and digital imaging quantified cell migration. After 48 and 72â€‰h, all treatment groups had significantly higher viability (nâ€‰=â€‰6, Pâ€‰<â€‰0.05) compared with the control. The highest viability was seen in the pulsed (20% duty cycle) group at the 72-h time point. PBM improved fibroblast migration in all

PBM-treated groups, but differences were not statistically significant (nâ€‰=â€‰2, Pâ€‰>â€‰0.05). PBM treatments can promote cell viability in both continuous and pulsed modes. Further studies are needed to elucidate the optimal setting for PBM-evoked responses for its rationalized use in promoting specific phases of oral wound healing. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Gingiva;Wound Healing;Fibroblasts

Photobiomodulation regulates adult neurogenesis in the hippocampus in a status epilepticus animal model. Status epilepticus (SE) refers to a single seizure that lasts longer than typical seizures or a series of consecutive seizures. The hippocampus, which is vulnerable to the effects of SE, has a critical role in memory storage and retrieval. The trisynaptic loop in the hippocampus connects the substructures thereof, namely the dentate gyrus (DG), CA3, and CA1. In an animal model of SE, abnormal neurogenesis in the DG and aberrant neural network formation result in sequential neural degeneration in CA3 and CA1. Photobiomodulation (PBM) therapy, previously known as low-level laser (light) therapy (LLLT), is a novel therapy for the treatment of various neurological disorders including SE. However, the effects of this novel therapeutic approach on the recovery process are poorly understood. In the present study, we found that PBM transformed SE-induced abnormal neurogenesis to normal neurogenesis. We demonstrated that PBM plays a key role in normal hippocampal neurogenesis by enhancing the migration of maturing granular cells (early neuronal cells) to the GCL, and that normal neurogenesis induced by PBM prevents SE-induced hippocampal neuronal loss in CA1. Thus, PBM is a novel approach to prevent seizure-induced neuronal degeneration, for which light devices may be developed in the future. Animals;Disease Models, Animal;Hippocampus;Neurogenesis;Seizures;Status Epilepticus

Comparison of the safety and efficacy of low fluence Q-switched 1064-nm and conventional Q-Switched 755-nm lasers in the treatment of cafÃ©-au-lait macules: A prospective self-controlled trial. BACKGROUND: Conventional high fluence Q-switched (HFQS) Alexandrite 755-nm are widely used in clinical cafÃ©-au-lait macules (CALMs) treatment. There have been recent concerns regarding the efficacy and safety of low fluence Q-switched (LFQS) Nd: YAG 1064-nm lasers. OBJECTIVE: To evaluate the efficacy and safety of the conventional HFQS and LFQS laser in the treatment of CALMs. METHODS: Within 3 months, 20 patients underwent prospective self-controlled split-lesion treatments with HFQS once or twice depending on the recovery rate, and with LFQS six times biweekly. Then the more effective laser was selected for continued treatments. Efficacy outcomes were evaluated by a visual analog scale (VAS) biweekly during the comparative trail. Recovery process, side effects and recurrence were recorded during the trial and follow-up visit. Patient and physician preferences for laser selection were also recorded. RESULTS: The average VAS scores of areas treated with HFQS and LFQS were 2.92â€‰Â±â€‰0.86 and 2.93â€‰Â±â€‰1.13, respectivelyÂ (pâ€‰>â€‰0.05). The most significant efficacy change of LFQS was after the fourth laser treatment (VAS score: 1.82-2.37, pâ€‰<â€‰0.001). 11Â lesions treated with LFQS and 7 with HFQS achieved an optimal treatment response (3.67â€‰â‰¤â€‰VASâ€‰â‰¤â€‰4). Three patients relapsed on one side (one on LFQS, two on HFQS) and five on both sides. Adverse effects included temporary hypopigmentation, hyperpigmentation, uneven pigmentation, and mottled hypopigmentation. Doctors thought 80% of patients were suitable for LFQS. 70% of patients preferred LFQS posttreatment. CONCLUSIONS: The efficacy difference between the LFQS 1064-nm laser and HFQS 755-nm laser in treating CALMs in a 3-month comparative trial was statistically insignificant. LFQS is preferred by doctors and patients and is likely to help more patients achieve treatment efficacy than the HFQS within a short time, with fewer temporary adverse reactions, and a more even pigmentation. But it can cause mottled hypopigmentation.Â The LFQS had obvious lesion clearance after the fourth treatment. Cafe-au-Lait

Spots;Humans;Hyperpigmentation;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Treatment Outcome

Near-infrared light-triggered polypyrrole promotes C2C12 cell differentiation and inhibits TNF-Î± induced myotube atrophy. Treatment of skeletal muscle atrophy and strengthening the muscles remain a challenge in modern medicine. Studies have shown that photobiomodulation can inhibit skeletal muscle atrophy and aid in functional recovery. Near-infrared radiation (NIR) therapy has emerged as a complementary therapy for the treatment of skeletal muscle atrophy, but its underlying mechanism remains unclear. Polypyrrole (PPy) is an organic polymer with strong near-infrared absorption, which can generate heat from absorbed NIR. In this study, MHC immunofluorescence staining was performed on C2C12 myoblasts to investigate the differentiation of C2C12 cells after NIR-triggered PPy exposure. As TNF-Î±-induced C2C12 myotubes were used as a model of muscular atrophy. Giemsa staining was used to determine the myotube diameter. Western blot analysis was performed to examine the proteins involved in the differentiation and atrophy of muscle cells, as well as in the Akt/P70S6K signaling pathway. PPy triggered by NIR promoted the differentiation of C2C12 cells, inhibited C2C12 myotube atrophy caused by TNF-Î±, and downregulated the expression levels of Atrogin-1 and MuRF 1 protein. In addition, we determined that Akt/P70S6K signaling pathway activity plays a crucial role in the therapeutic effect of NIR-triggered polypyrrole, which was further confirmed by the administration of the Akt inhibitor GDC0068. The optimal conditions for these effects were a PPy concentration of 0.125Â mg/ml and NIR exposure for 80Â s. We show that the photothermal effect of PPy triggered by near-infrared light can increase the beneficial effects of NIR, promote the differentiation of C2C12 cells, and improve C2C12 myotube atrophy, laying a foundation for its future clinical use. polypyrrole;Polymers;Tumor Necrosis Factor-alpha;Pyrroles;Ribosomal Protein S6 Kinases, 70-kDa;Proto-Oncogene Proteins c-akt Humans;Polymers;Tumor Necrosis Factor-alpha;Pyrroles;Ribosomal Protein S6 Kinases, 70-kDa;Proto-Oncogene Proteins c-akt;Cell Line;Muscle Fibers, Skeletal;Muscular Atrophy;Cell Differentiation;Muscle, Skeletal

Effects of LED photobiomodulation therapy on the subcutaneous fatty tissue of obese individuals - histological and immunohistochemical analysis. Photobiomodulation therapy (PBMT) has become an adjuvant therapeutic possibility in body remodeling procedures. Given this scenario, this study was proposed with the aim of evaluating the effects of PBMT to Light Emitting Diode (LED) associating the red (630Â nm) and infrared (850Â nm) wavelengths in the subcutaneous fatty tissue. This controlled study of comparative intervention that evaluated a sample of subcutaneous fatty tissue from women with grade II obesity. The participants received the LED PBMT treatment with associated red and infrared wavelengths sequentially on the left side of the abdomen and the right side was considered as control, with the collection of biological material performed at the time of bariatric surgery. For histological and immunohistochemical evaluation, Caspase 3, Cleaved Caspase 3, CD68+, HSL and adipophilin markers were used. The participants showed positivity in the expression of Caspase 3 and Cleaved Caspase (pÂ <Â .0001), CD68+Â macrophages (pÂ <Â .0001), HSL (pÂ <Â .0001) and adipophilin (pÂ <Â .0013) in the intervention sample when compared to the control. PBMT and LED associating red and infrared wavelengths were able to promote autophagic lipolysis induced by adipocyte cell apoptosis in the subcutaneous tissue of obese individuals. Caspase 3;Perilipin-2 Female;Humans;Adipose Tissue;Caspase 3;Low-Level Light Therapy;Obesity;Perilipin-2

Analysis of the Potential of Blood Transvascular Sublingual with Light-Emitting Diode Irradiation in COVID-19 Patients: A Pilot Clinical Study. Background: Due to the high morbidity and mortality rates of this century, the COVID-19 pandemic has had a devastating impact on the health of the global population. Objective: The aim was to evaluate the disturbing impact of in-hospital stay length and the appeal of severe problems for supplemental oxygen for our patients with COVID-19 in

moderate stage who were undergoing transvascular blood irradiation onto sublingual vessels. The demand for supplemental oxygen and the serum oxygen levels were measured, and the impact on the length of hospital stay was assessed. Methods: This randomized, prospective, clinical pilot study evaluated the diagnosis of COVID-19 patients admitted to the ventilatory care unit and undergoing treatment protocol usage of light-emitting diode (LED) irradiation by transvascular application onto the sublingual vessels daily. Patients were selected and enrolled into two groups: the Placebo group (nâ€‰=â€‰7) that received conventional treatment by the device off (LED-off), and the photobiomodulation therapy (PBMT) group (nâ€‰=â€‰7) that also received the same therapy plus LED irradiation. Results: There was a statistically significant clinical improvement, such as a reduction in serum creatinine, and oxygen usage per few days less in the PBMT group compared with the Placebo group. All patients in the PBMT group had normalized SatO(2), while a quarter of patients in the Placebo group required longer O(2) supplementation until hospital discharge. Conclusions: The surveillance of clinical improvement in moderate stage indicated that the daily PBMT was able to diminish oxygen supplementation within a short time, besides reducing the hospital stay length in the PBMT group, particularly, when compared with the Placebo group. Clinical Trial Registration number: The study was reviewed by the Ethics Committee in UNINOVE research under number 42325020.6.0000.5511 and approved through number 5,090,119. Creatinine;Oxygen COVID-19;Creatinine;Humans;Oxygen;Pandemics;Pilot Projects;Prospective Studies

TENS and EMS Treatment for Diabetic Peripheral Neuropathy. CONTEXT: Diabetic peripheral neuropathy (DPN) is a common complication occurring in both type 1 and type 2 diabetics. DPN may result in foot ulceration or lower-limb amputation. OBJECTIVE: This case was undertaken to evaluate the efficacy of ReBuilderÂ® therapy in the treatment of diabetic peripheral neuropathy. METHODS: The case report is based on 3 selected patients, 2 males and 1 female. Each patient continued being managed by his/her primary care physician. No changes to allopathic medicine or diet were advised by our team. In addition to the allopathic therapy, we added ReBuilderÂ® therapy, low level light therapy, vibration therapy and supplementation. The treatment period ranged from 17 to 20 weeks. CONCLUSION: The data presented here show promise for future, larger, controlled studies on the use of ReBuilderÂ® devices for the treatment of diabetic peripheral neuropathy pain. Female;Humans;Male;Diabetes Mellitus;Diabetic Neuropathies;Pain;Transcutaneous Electric Nerve Stimulation;Vibration

Low-level laser therapy with different irradiation methods modulated the response of bone marrow mesenchymal stem cells in vitro. Low-level laser therapy (LLLT) also known as photobiomodulation is a treatment to change cellular biological activity. The exact effects of LLLT remain unclear due to the different irradiation protocols. The purpose of this study was to investigate the effects of LLLT by three different irradiation methods on the proliferation and osteogenic differentiation of bone marrow mesenchymal stem cells (BMSCs) in vitro. BMSCs were inoculated in 24-well plates and then irradiated or not (control) with a laser using three different irradiation methods. The irradiation methods were spot irradiation, covering irradiation, and scanning irradiation according to different spot areas (0.07 cm(2) or 1.96 cm(2)) and irradiation areas (0.35 cm(2) or 1.96 cm(2)), respectively. The laser was applied three times at energy densities of 4Â J/cm(2). The cell proliferation by CCK-8. ALP activity assay, alizarin red, and quantitative real-time polymerase chain reaction (RT-PCR) were performed to assess osteogenic differentiation and mineralization. Increases in cell proliferation was obvious following irradiation, especially for covering irradiation. The ALP activity was significantly increased in irradiated groups compared with non-irradiated control. The level of mineralization was obviously improved following irradiation, particularly for covering irradiation. RT-PCR detected significantly higher expression of ALP, OPN, OCN, and RUNX-2 in the group covering than in the others, and control is the lowest. The presented results indicate that the

biostimulative effects of LLLT on BMSCs was influenced by t he irradiation method, and the covering irradiation is more favorable method to promote the proliferation and osteogenic differentiation of BMSCs. Osteogenesis;Low-Level Light Therapy;Bone Marrow Cells;Mesenchymal Stem Cells;Cell Differentiation;Cell Proliferation;Cells, Cultured

Nonpharmacological interventions for acute pain management in patients with opioid abuse or opioid tolerance: a scoping review. OBJECTIVE: The objective of this scoping review was to identify and map the evidence on nonpharmacological interventions for acute pain management in patients with opioid tolerance or opioid abuse. INTRODUCTION: Opioid therapy is the mainstay of pain management for adults experiencing moderate-to-severe acute pain. However, considering the known risks of opioid use and the growing number of patients with opioid tolerance or opioid abuse, nonpharmacological pain management interventions are of increasing interest to health care providers. Nonpharmacological techniques have shown potential in reducing postoperative pain, opioid consumption, stress, and anxiety. INCLUSION CRITERIA: Eligible studies included participants in either inpatient or outpatient health care settings who were experiencing acute pain and a tolerance to opioid medications or opioid abuse. Studies that examined nonpharmacological interventions for treating acute pain in these patients were considered. Nonpharmacological interventions included, but were not limited to, acupuncture, electroacupuncture, massage, mindfulness, electroanalgesia, low-level light therapy, meditation, biofeedback, hypnosis, and relaxation techniques. METHODS: MEDLINE, CINAHL, Scopus, Embase, Europe PubMed Central, PsycINFO, Cochrane Central Register of Controlled Trials, and the US National Library of Medicine (https://ClinicalTrials.gov/) were searched, as were sources of unpublished studies on December 30, 2020. Only studies published in English were included, and there was no limit on date of publication. After screening the titles and abstracts of identified citations, 2 independent reviewers retrieved potentially relevant full-text studies and extracted data. Data are presented in diagrammatic format, and accompany the narrative synthesis. RESULTS: Fourteen articles were included in the study, including 10 expert opinion papers or chapters, 3 case reports, and 1 implementation report. The most common setting was the perioperative setting, specifically orthopedic surgery. Nonpharmacological pain interventions identified in the literature included physical interventions such as acupuncture, physical therapy, therapeutic exercise, yoga, bracing, heat, cold, elevation, compression, chiropractic interventions, massage, manual therapy, transcutaneous electrical nerve stimulation, and pulsed electromagnetic field therapy. Behavioral and psychological modalities included positive affirmations, cognitive behavioral therapy, acceptance and commitment therapy, mindfulness, distraction, guided imagery, meditation, biofeedback, relaxation, hypnosis, breathing exercises, and energy healing. Many expert opinions included only brief mentions or recommendations for nonpharmacological interventions without full explanations, evidence from the literature, or discussion of the level of support for the recommendation. CONCLUSIONS: The findings of this review indicate that nonpharmacological interventions for patients with opioid tolerance or dependence include physical, psychological, and multimodal approaches. Nonpharmacological interventions in this scoping review were often presented as combined with opioid or non-opioid medications for a pain management regimen that is opioid-sparing, opioid-free, or drug-free. More primary research is needed on the nonpharmacological acute pain management of patients with opioid dependence or opioid tolerance. Analgesics, Opioid United States;Adult;Humans;Pain Management;Acute Pain;Analgesics, Opioid;Acceptance and Commitment Therapy;Drug Tolerance;Opioid-Related Disorders

Comparison of the efficacy of carboxytherapy versus fractional CO(2) laser therapy for the treatment of periorbital dark circles: A randomized clinical trial. BACKGROUND: Periorbital dark circles (PDC) is one of the most common cosmetic issues in today's society. Only moderate degree of improvement has been achieved by various available treatment options. The present study aimed to

compare the clinical efficacy of carboxytherapy and fractional CO(2) laser therapy in the management of PDC. METHODS: In this split face study, 30 patients with bilateral PDC aged between 23 and 52â€‰years were recruited who underwent carboxytherapy (nÂ =Â 30) on PDC of one side of the face and fractional CO(2) laser therapy (nÂ =Â 30) on the PDC of other side. The entire treatment comprised of four sessions of each therapy with an interval of 2â€‰weeks each time. The assessment was based on both subjective methods (patients' satisfaction and physician's judgment) and objective method (based on digital standard photographs). The degree of improvement from the patient's point of view (patient satisfaction) and physician's point of view (physician satisfaction) was assessed in different therapy sessions in comparison with the improvement after first session. RESULTS: The study included 30 patients with mean age of 38.22â€‰Â±â€‰8.3â€‰years. The mean disease duration was 45â€‰Â±â€‰12.3Â months. After the second therapy session, patients' satisfaction was remarkably better in the fractional CO(2) laser therapy group than the carboxytherapy group, over the time. According to the physician satisfaction, the improvement rate was higher after the second and sixth weeks in the fractional CO(2) laser therapy group than the carboxytherapy group; whereas in other sessions, there were no statistically significant differences. There were no significant side effects observed in either group post-treatment each time. CONCLUSION: Fractional CO(2) laser therapy is a better option to treat PDC than carboxytherapy. Also, mild side effects (including erythema, pain, and discomfort) were reported in both groups; with no significant difference between the groups. Carbon Dioxide Humans;Young Adult;Adult;Middle Aged;Carbon Dioxide;Treatment Outcome;Patient Satisfaction;Erythema;Low-Level Light Therapy;Lasers, Gas;Laser Therapy

Protocol for randomized controlled trial to evaluate the safety and feasibility of a novel helmet to deliver transcranial light emitting diodes photobiomodulation therapy to patients with Parkinson's disease. INTRODUCTION: Parkinson's disease (PD) is the second most common, progressive, and debilitating neurodegenerative disease associated with aging and the most common movement disorder. Photobiomodulation (PBM), the use of non-thermal light for therapeutic purposes using laser or light emitting diodes (LED) is an emerging non-invasive treatment for a diverse range of neurological conditions. The main objectives of this clinical trial are to investigate the feasibility, safety, tolerability, and efficacy of a novel transcranial LED helmet device (the "PDNeuro") in the alleviation of symptoms of PD. METHODS AND ANALYSIS: This is a 24-week, two-arm, triple-blinded randomized placebo-controlled clinical trial of a novel transcranial "PDNeuro" LED Helmet, comparing an active helmet to a sham helmet device. In a survey, 40 PD participants with Hoehn and Yahr Stage I-III during ON periods will be enrolled and randomly assigned into two groups. Both groups will be monitored weekly for the safety and tolerability of the "PDNeuro" LED Helmet. Clinical signs and symptoms assessed will include mobility, fine motor skills and cognition, with data collected at baseline, 12 weeks, and 24 weeks. Assessment tools include the TUG, UPDRS, and MoCA all validated for use in PD patients. Patient's adherence to the device usage and participant drop out will be monitored weekly. At 12 weeks both placebo and treatment groups will crossover and placebo participants offered the treatment. The main indicator for clinical efficacy of the "PDneuro" Helmet is evidence of sustained improvements in motor and non-motor symptoms obtained from participant self-reported changes, carer reporting of changes and objective reassessment by the investigators. The outcomes will assist in a future larger randomized trial design. CLINICAL TRIAL REGISTRATION: [https://www.anzctr.org.au], identifier [12621001722886].

The Effect of 40-Hz White LED Therapy on Structure-Function of Brain Mitochondrial ATP-Sensitive Ca-Activated Large-Conductance Potassium Channel in Amyloid Beta Toxicity. Photobiomodulation therapy has become the focus of medical research in many areas such as Alzheimer's disease (AD), because of its modulatory effect on cellular processes through light energy

absorption via photoreceptors/chromophores located in the mitochondria. However, there are still many questions around the underlying mechanisms. This study was carried out to unravel whether the function-structure of ATP-sensitive mitoBK(Ca) channels, as crucial components for maintenance of mitochondrial homeostasis, can be altered subsequent to light therapy in AD. Induction of AÎ² neurotoxicity in male Wistar rats was done by intracerebroventricular injection of AÎ²1-42. After a week, light-treated rats were exposed to 40-Hz white light LEDs, 15Â min for 7Â days. Electrophysiological properties of mitoBK(Ca) channel were investigated using a channel incorporated into the bilayer lipid membrane, and mitoBK(Ca)-Î²2 subunit expression was determined using western blot analysis in AÎ²-induced toxicity and light-treated rats. Our results describe that conductance and open probability (Po) of mitoBK(Ca) channel decreased significantly and was accompanied by a Po curve rightward shift in mitochondrial preparation in AÎ²-induced toxicity rats. We also showed a significant reduction in expression of mitoBK(Ca)-Î²2 subunit, which is partly responsible for a leftward shift in BK(Ca) Po curve in low calcium status. Interestingly, we provided evidence of a significant improvement in channel conductance and Po after light therapy. We also found that light therapy improved mitoBK(Ca)-Î²2 subunit expression, increasing it close to saline group. The current study explains a light therapy improvement in brain mitoBK(Ca) channel function in the AÎ²-induced neurotoxicity rat model, an effect that can be linked to increased expression of Î²2 subunit. Amyloid beta-Peptides;KATP Channels;Large-Conductance Calcium-Activated Potassium Channels;Lipids;Adenosine Triphosphate;Calcium Adenosine Triphosphate;Alzheimer Disease;Amyloid beta-Peptides;Animals;Brain;Calcium;KATP Channels;Large-Conductance Calcium-Activated Potassium Channels;Lipids;Male;Mitochondria;Rats;Rats, Wistar

Physical Exercise and Low-Level Laser Therapy Systemic Effects on the Ankle Joint in an Experimental Rheumatoid Arthritis Model. OBJECTIVE: The purpose of this study was to analyze the systemic effects of stair climbing exercise, low-level laser therapy (LLLT), and the association of both treatments on pelvic member functionality and ankle joint histomorphometric aspects of Wistar rats submitted to experimental rheumatoid arthritis (RA) protocol. METHODS: Male Wistar rats were randomly distributed into the following 8 groups: control; control LLLT; control exercise; control LLLT and exercise; arthritis group; arthritis LLLT; arthritis exercise; and arthritis LLLT and exercise, with nÂ =Â 8 for functional and nÂ =Â 5 for histomorphometrical tests. The experimental RA was induced by complete Freund adjuvant injection in the knee joint cavity. Functionality was evaluated by proprioception and motor function using Sciatic Functional Index and maximum angle reached at an inclined plane. Histomorphometrical aspects were evaluated in the ankle joint after histological routine. RESULTS: The arthritis LLLT and exercise group had positive effects in Sciatic Functional Index (F [3.96]Â =Â 11.3, P < .001) and in inclined plane (F [3.4]Â =Â 36.1, P < .001). The arthritis exercise group presented a greater number of chondrocytes in the tibia (Wald [1; 6605.6]Â =Â 25.2, P < .001) and talus (Wald [1; 15958.6]Â =Â 19.8, PÂ =Â .006) in relation to the other groups. The arthritis group morphology showed significant degenerative lesions as subintima with angiogenesis, inflammatory cells, flocculated articular cartilage, chondrocytes disorganization and pannus. Even with the higher chondrocytes number, the arthritis exercise group had morphological characteristics more similar to the control group. CONCLUSION: Low-level laser therapy and exercise restored functionality, and exercise restored morphological aspects of tissues in experimentally induced RA in rats. Freund's Adjuvant Animals;Ankle Joint;Arthritis, Rheumatoid;Freund's Adjuvant;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Vascular photobiomodulation increases muscle fiber diameter and improves the gait during compensatory hypertrophy of plantar muscle in rats. The local photobiomodulation (LPBM) has demonstrated positive effects during compensatory hypertrophy (CH) in skeletal muscle as a response to an overload. The aim was to compare the effects of the transcutaneous vascular

photobiomodulation (VPBM) and the LPBM on muscle fiber size, gait functionality, and on mechanical sensitivity during the CH model in rats. VPBM was administered over the rat's main tail vein and LPBM was applied over the plantar muscle region. VPBM induced an increase in muscle fiber diameter and cross-sectional area (CSA) after 7â€‰days. At 14â€‰days, an increase in the fiber diameter was found in both irradiated groups. The VPBM and LPBM promoted the reestablishment of normal gait evaluated by the sciatic functional index after 14â€‰days. No changes were found in the mechanical (nociceptive) sensitivity in VPBM and LPBM groups in comparison to the CH group but there was an increase in the nociceptive sensitivity in the CH groups in comparison to the control after 7 and 14â€‰days. In conclusion, both PBM, vascular and local, were able to improve the muscle size and gait during the CH process with more pronounced effects when irradiation was performed systemically (VPBM). Rats;Animals;Rats, Wistar;Low-Level Light Therapy;Muscle Fibers, Skeletal;Muscle, Skeletal;Gait;Hypertrophy

Enhanced hair growth effects through low-level vortex beams radiation: An experimental animal study. Photobiomodulation therapy (PBMT) is a non-invasive and pain-less treatment for hair loss. Researches on PBMT rarely considered the impact of different light structures. In this study, we irradiated shaven rats with both 650â€‰nm, mÂ =Â 32 vortex beams and ordinary Gaussian beams. The laser treatment was performed at 24-hour intervals for 20â€‰days. The energy density was set to 4.25â€‰J/cm(2) . The results indicated that low-level vortex beam irradiation led to better stimulation of hair growth than the Gaussian beams, which might be related to deeper penetration. The underlying biological mechanisms are discussed in terms of the activation of Wnt/Î²-catenin/sonic hedgehog pathway. Our results suggest that low-level vortex beam irradiation is advantageous to the treatment of hair loss because it is technically feasible, convenient and effective. Hedgehog Proteins Animals;Rats;Hedgehog Proteins;Hair;Alopecia;Low-Level Light Therapy

The combined use of photobiomodulation and curcumin-loaded iron oxide nanoparticles significantly improved wound healing in diabetic rats compared to either treatment alone. This experimental study examined the effects of curcumin-loaded iron oxide nanoparticles (CUR), photobiomodulation (PBM), and CURâ€‰+â€‰PBM treatments on mast cells (MC)s numbers and degranulation, inflammatory cells (macrophages, neutrophils), and wound strength in the last step of the diabetic wound repair process (maturation phase) in a rat model of type one diabetes mellitus (T1DM). T1DM was induced in 24 rats, and 1Â month later, an excisional wound was created on each rat's back skin. The rats were then distributed into four groups: (1) untreated diabetic control group (UDCG); (2) rats treated with CUR (CUR); (3) rats exposed to PBM (890Â nm, 80Â Hz, 0.2Â J/cm(2)) (PBM); (4) rats treated with CUR plus PBM (CURâ€‰+â€‰PBM). Fifteen days after surgery, skin tissue samples were taken for biomechanical and stereological evaluations. The biomechanical factor of maximum force was observed to be considerably improved in the CURâ€‰+â€‰PBM (pâ€‰=â€‰0.000), PBM (pâ€‰=â€‰0.014), and CUR (pâ€‰=â€‰0.003) groups compared to the UDCG. CURâ€‰+â€‰PBM, PBM, and CUR groups had significantly decreased total numbers of MC compared with the UDCG (all, pâ€‰=â€‰0.001). The results were significantly better in the CURâ€‰+â€‰PBM (pâ€‰=â€‰0.000) and PBM (pâ€‰=â€‰0.003) groups than in the CUR group. Inflammatory cell counts were significantly lower in the CURâ€‰+â€‰PBM, PBM, and CUR groups than in the UDCG (all, pâ€‰=â€‰0.0001). In all evaluating methods, the usage of CURâ€‰+â€‰PBM produced better results than the use of CUR or PBM alone (almost all tests, pâ€‰=â€‰0.0001). CURâ€‰+â€‰PBM, PBM, and CUR significantly improved the repair of diabetic skin wounds in type 1 DM rats through significant decreases of MC number, degranulation, and inflammatory cells as well as a noteworthy improvement in wound strength. The impact of CURâ€‰+â€‰PBM was superior to that of either PBM or CUR alone. It is suggested that CURâ€‰+â€‰PBM could be used as a MC stabilizer for the effective treatment of some related

human diseases. Curcumin Rats;Humans;Animals;Curcumin;Wound Healing;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Diabetes Mellitus, Type 1;Rats, Wistar;Magnetic Iron Oxide Nanoparticles

Dual near-infrared II laser modulates the cellular redox state of T cells and augments the efficacy of cancer immunotherapy. Immunotherapy, including immune checkpoint inhibitors, has revolutionized cancer treatment, but only a minor fraction of patients shows durable responses. A new approach to overcome this limitation is yet to be identified. Recently, we have shown that photobiomodulation (PBM) with near-infrared (NIR) light in the NIR-II window reduces oxidative stress and supports the proliferation of CD8(+) T cells, suggesting that PBM with NIR-II light could augment anti-cancer immunity. Here, we report a novel approach to support tumor-infiltrating CD8(+) T cells upon PBM with NIR-II laser with high tissue penetration depth. Brief treatments of a murine model of breast cancer with dual 1064 and 1270â€‰nm lasers reduced the expression of the programmed cell death protein 1 (PD-1) in CD8(+) T cells in a syngeneic mouse model of breast cancer. The direct effect of the NIR-II laser treatment on T cells was confirmed by the enhanced tumor growth delay by the adoptive transfer of laser-treated CD8(+) T cells ex vivo against a model tumor antigen. We further demonstrated that specific NIR-II laser parameters augmented the effect of the immune checkpoint inhibitor on tumor growth. PBM with NIR-II light augments the efficacy of cancer immunotherapy by supporting CD8(+) T cells. Unlike the current immunotherapy with risks of undesirable drug-drug interactions and severe adverse events, the laser is safe and low-cost. It can be broadly combined with other therapy without modification to achieve clinical significance. In addition, our study established a path to develop a novel laser-based therapy to treat cancer effectively. Animals;CD8-Positive T-Lymphocytes;Immunotherapy;Lasers;Mice;Neoplasms;Oxidation-Reduction

Effects of the association of different volumes of strength training with photobiomodulation therapy on insulin resistance: A protocol for a randomized, triple-blind, placebo-controlled trial. BACKGROUND: Insulin resistance (IR) is the main risk factor for developing type 2 diabetes. Both strength training (ST) and photobiomodulation therapy (PBMt) reduce IR, but the effect of combining different volumes of ST with PBMt is unknown. METHODS: Overweight/obese individuals will be assigned to 4 groups (nÂ =Â 12/group): ST with volume following international guidelines (3 sets per exercise - high volume) or one-third of this volume (1 set per exercise - low volume), combined with PBMt or placebo. ST will be performed for 20 sessions over 10 weeks and will consist of 7 exercises. The PBMt will be applied after training sessions using blankets with light emitters (LEDs) placed over the skin on the frontal and the posterior region of the body, following the parameters recommended by the literature. The placebo group will undergo an identical procedure, but blankets will emit insignificant light. To measure plasma glucose and insulin concentrations, oral glucose tolerance tests (OGTT) will be performed before and after the training period. Thereafter, IR, the area under the curve of glucose and insulin, and OGTT-derived indices of insulin sensitivity/resistance will be calculated. EXPECTED IMPACT ON THE FIELD: This study will determine the effects of different ST volumes on IR and whether the addition of PBMt potentiates the effects of ST. Because previously sedentary, obese, insulin-resistant individuals might not comply with recommended volumes of exercise, the possibility that adding PBMt to low-volume ST enhances ST effects on IR bears practical significance.

Chronic Supraspinatus Tendonitis Pain: An Integrative Approach for Treatment with Cross-Fiber Massage, Electroacupuncture, Far-Infrared Heat, and Photobiomodulation. OBJECTIVE: More than 70 million Americans suffer from chronic pain; many cases are related to sports injuries. This type of injury often involves soft tissues (muscles, tendons, and ligaments). Direct-force injury (e.g., impact trauma) and indirect-force injury (e.g., repetitive motion) are normally the cause of strained

muscles, sprained ligaments, and tendonitis. The standard of acute care is RICE [rest, ice, compression, and elevation] plus anti-inflammatory medication. While this regimen often relieves acute pain, the consequence of the long-term use is chronic pain due to un-remodeled scar-tissue formation. The goal of this article is to show how a combination of integrative modalities can be used to relieve the pain caused by such injuries and their sequelae. MATERIALS AND METHODS: This article focuses on a combination of clinical modalities that integrate osteopathic cross-fiber massage, microcurrent electroacupuncture, far-infrared heat, and photobiomodulation to break up the scar tissue and reactivate the body's intrinsic repair mechanism. Chronic shoulder pain, associated with supraspinatus tendonitis is used here, to illustrate this integrative treatment in an acupuncture clinic setting. RESULTS: This method heals chronic pain from an injury with clinic visits, twice per week, for 3-5 weeks. CONCLUSIONS: More clinical and research studies are recommended to validate this approach for this condition and other soft-tissue traumata.

Reduced Pain and Improved Quality of Life After Laser Acupuncture Therapy for Trigger Finger. BACKGROUND: Trigger fingers is a condition that causes locking/stiffness due to inflammation and hypertrophy of the tendon sheaths. This inflammatory process occurs due to degenerative conditions, such as aging, chronic daily overuse, and other factors such as metabolic disorders. CASE: A 51-year-old woman had grade IIIb trigger finger on her right hand for âˆ¼2 months before going to an outpatient clinic. She also had stiffness and swelling for a longer time but it felt more severe by the time she presented at the clinic, thus, interfering with her work and quality of life (QoL). She was given acupuncture with low-level-laser therapy, using a low-energy laser, 3 times per week, on her right hand. The unilateral points used were LU-10 Yuji, LI-4 Hegu, PC-6 Neiguan, LI-11 Quchi, GB-21 Jianjing, and an Ashi point on the first finger of the metacarpophalangeal [MCP-I] joint). The bilateral body points used were ST 36 Zusanli and LR-3 Taichong. RESULTS: After 12 sessions of therapy, there was a decrease her numerical rating scale (NRS) score of 6/10 to an NRS score of 0/10. She also had an improvement in her QoL, as measured by the Short Form-36 and Quick-Disabilities of the Arm, Shoulder and Hand instruments. CONCLUSIONS: Laser acupuncture may be considered for treating pain and improving QoL of patients with trigger finger. In addition, laser acupuncture causes minimal side-effects, compared with other medical treatments.

The Effects of Laser Acupuncture Therapy on Nocturnal Enuresis: A Systematic Review and Meta-Analysis. INTRODUCTION: Nocturnal enuresis (NE), often known as bedwetting, is a common condition in children and, as a result, they may have subsequent social impairments. The aim of this study was to evaluate the efficacy of low-level laser therapy (LLLT) in children with NE. METHODS: International databases with laser- and NE-related keywords were searched, and only randomized controlled trials (RCTs) that used any type of LLLT to treat NE and compared it with any type of control intervention were included. Eleven studies using laser acupuncture therapy (LAT), involving 927 participants, were included for a systematic review. A meta-analysis was conducted using full and partial response-rate variables. The analysis was performed using Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines, and the Cochrane risk-of-bias tool and Grading of Recommendations Assessment Development and Evaluation recommendations for quality of evidence were used to rate all included publications. RESULTS: The LAT groups showed significant improvement, compared with control groups when full response rates were analyzed. There was no significant difference between the groups treated with LAT and the groups who underwent medication therapy alone when full response rates were analyzed. Red and infrared wavelengths and continuous waves were the most commonly used LAT modalities, and lower abdomen and back acupoints were the most-common sites. CONCLUSIONS: LAT seems to be an effective and safe treatment for NE; however, the quality of evidence available in the literature was relatively low. More-rigorous and higher-quality trials are needed to investigate this treatment modality further.

Photobiomodulation therapy with an 830-nm light-emitting diode for the prevention of thyroidectomy scars: a randomized, double-blind, sham device-controlled clinical trial. This randomized, double-blind, and sham device-controlled trial aimed to evaluate the efficacy and safety of home-based photobiomodulation therapy using an 830-nm light-emitting diode (LED)-based device for the prevention of and pain relief from thyroidectomy scars. Participants were randomized to receive photobiomodulation therapy using an LED device or a sham device without an LED from 1Â week postoperatively for 4Â weeks. Scars were assessed using satisfaction scores, the numeric rating scale (NRS) score for pain, Global Assessment Scale (GAS), and Vancouver Scar Scale (VSS) scores. The scars were also assessed using a three-dimensional (3D) skin imaging device to detect color, height, pigmentation, and vascularity. Assessments were performed at the 1-, 3-, and 6-month follow-ups. Forty-three patients completed this trial with 21 patients in the treatment group and 22 patients in the control group. The treatment group showed significantly higher patient satisfaction and GAS scores and lower NRS and VSS scores than the control group at 6Â months. Improvements in color variation, height, pigmentation, and vascularity at 6Â months were greater in the treatment group than in the control group, although the differences were not significant. In conclusion, early application of 830-nm LED-based photobiomodulation treatment significantly prevents hypertrophic scar formation and reduces postoperative pain without noticeable adverse effects.
Humans;Cicatrix, Hypertrophic;Double-Blind Method;Low-Level Light Therapy;Pain;Thyroidectomy;Treatment Outcome;Home Care Services

Clinical application of low-level laser therapy (Photo-biomodulation therapy) in the management of breast cancer-related lymphedema: a systematic review. BACKGROUND: Breast cancer-related lymphedema (BCRL) is a frequent issue that arises after mastectomy surgery in women and compromises physical and mental function. Previously published studies have shown positive effects with the use of Low-level laser therapy inÂ anotherÂ term Photo-biomodulation therapyÂ (PBM). This research investigated the efficacy of clinical use of LLLT (PBM) in the treatment of metastatic breast cancer-related lymphedema. METHODS: PubMed, PEDro, Medline, and the Cochrane Library were searched for LLLT clinical trials published before October 2021. The methodological quality of randomized trials and the effectiveness of Laser Therapy for BCRL were evaluated. The primary objectives were arm circumference or arm volume, whereas the secondary goals were to assess shoulder mobility and pain severity. RESULTS: Eight clinical trials were analyzed in total. Typically, the included RCTs had good research quality. At four weeks, there was a considerable reduction in arm circumference/volume, and this continued with long-term follow-up. However, no statistically significant change in shoulder mobility or pain severity was seen between the laser and placebo groups at 0-, 1-, 2-, and 3-month short-term follow-up. CONCLUSIONS: The findings of this comprehensive study demonstrated that LLLT (PBM) was successful in diminishing arm circumference and volume than improving shoulder mobility and pain. Data indicates that laser therapy (PBM) may be a beneficial treatment option for females with PML. Because of the scarcity of evidence, there is a strong need for well-conducted and longer-duration trials in this field. TRIAL REGISTRATION: Details of the protocol for this systematic review were registered on PROSPERO and can be accessed at www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42022315076 . Breast Cancer Lymphedema;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy

Phototherapies for erythema multiforme secondary to viral infections: A case report of a child. INTRODUCTION: Erythema multiforme (EM) is a reactive mucocutaneous disorder typically initiated by viral infections. Although the management of EM differs according to the clinical course and trigger factor, it is not clear whether antiviral suppressive therapies may be useful in cases related to such infections. Moreover, the treatment is most often based on supportive care directed towards only the symptoms. AIM: To present a clinical case of a child in which antimicrobial photodynamic

therapy (aPDT) and photobiomodulation therapy (PBMT) were used for orofacial manifestations of EM secondary to viral infections. CASE REPORT: A Brazilian 1-year-old boy was admitted to an ICU due to a severe Influenza A H3N2 infection, pneumonia with pleural effusion, and sepsis. About 10 days later, it was noted bleeding lip lesions covered by crusts and bleeding tongue lesions, diagnosed as EM secondary to both H3N2 and herpes simplex virus infections, confirmed by serology tests. A combination of an aPDT session and six PBMT sessions was proposed and resulted in almost complete resolution of the lesion on the 7th day. CONCLUSION: Given the complexity of the present case, the combination of phototherapies seems to be a promising tool for treating acute orofacial mucosal lesions of viruses-induced EM. More studies, however, are needed to reach a definite conclusion. Male;Humans;Child;Infant;Influenza A Virus, H3N2 Subtype;Photochemotherapy;Erythema Multiforme;Herpes Simplex;Virus Diseases

Traditional or Infrared Saunas and Photobiomodulation: What Do They Have in Common? Low-Level Light Therapy;Steam Bath

Photobiomodulation Therapy on the Treatment of Insulin Resistance: A Narrative Review. Background: Insulin resistance (IR) is the main risk factor for the development of type 2 diabetes mellitus (DM2). Noninvasive and nonpharmacological therapies, such as exercise and diet are effective in treating IR and DM2; however, adherence to them generally is low and diminishes positive effects in the long term. Photobiomodulation therapy (PBMT) is another noninvasive and nonpharmacological therapy, which produces positive effects on mitochondrial metabolism, oxidative stress, and inflammation generally linked to IR and DM2 and may improve or attenuate the severity of these diseases. Objective: In this narrative review, we focus on the available literature related to the effects of PBMT on IR. Results: In fact, recent in vitro and in vivo studies have demonstrated improvements in IR in skeletal muscle, adipose tissue, and hepatic cells mediated by PBMT. Further, there is evidence that PBMT can potentiate exercise-induced improvement in IR through ameliorating mitochondrial dysfunction, reducing inflammation, and modulating oxidative stress. Moreover, reduced adiposity and altered gut microbiota also appear to mediate PBMT effects on IR. Conclusions: Although these results are exciting, randomized clinical trials are urgently needed to confirm the clinical relevance of PBMT in the treatment of IR. Investigation about the effects of PBMT combined with different volumes of physical exercises may also contribute significantly for those patients having difficulty to adhere to the recommended minimal exercise volume. Finally, studies on PBMT parameters (e.g., dosimetry, wavelengths, single-point vs. full-body irradiation) are also necessary for the appropriate prescription of PBMT for the treatment of IR. Diabetes Mellitus, Type 2;Humans;Inflammation;Insulin Resistance;Low-Level Light Therapy;Muscle, Skeletal

940Â nm diode laser induced differentiation of human adipose derived stem cells to temporomandibular joint disc cells. BACKGROUND: Temporomandibular disorder (TMD) refers to a group of disorders that affect temporomandibular joint (TMJ) and its associated muscles with very limited treatment options. Stem cell research is emerging as one of the promising fields in the treatment of degenerative diseases. The ability of human adipose derived stem cells to differentiate into many cell types is driving special interest in several disease management strategies. Photobiomodulation has enhanced the role of these stem cells through their ability to promote cell proliferation and differentiation. Hence, this study examined the differentiation potential of human adipose derived stem cells (ADSCs) into fibroblasts and chondrocytes using a 940Â nm diode laser for possible TMD therapy. MATERIALS AND METHODS: ADSCs were cultured at different seeding densities and for different time intervals. After irradiation at 24, 48, 72Â h, 1, 2 and 3Â weeks, ADSC viability and morphological changes were assessed in groups with and without basic fibroblast growth factor. Additionally, the level of adenosine triphosphate (ATP) in the cells was also recorded. The differentiated fibroblasts and chondrocytes were characterized with flow cytometry and

immunofluorescence techniques, at 1- and 2-weeks post-irradiation. RESULTS: Increased ATP proliferation and cell viability above 90% were observed in all post-irradiation experimental groups. Post irradiation results from flow cytometry and immunofluorescence at 1- and 2-weeks confirmed the expression of chondrogenic and fibroblastic cell surface markers. CONCLUSION: This study describes stimulatory techniques utilized to differentiate ADSCs into fibroblastic and chondrogenic phenotypes using diode lasers at 940Â nm. The study proposes a new treatment model for patients with degenerative disc diseases of the TMJ. The study will offer new possibilities in tissue engineering and TMJ disc management through photobiomodulation of ADSCs using a 940Â nm diode laser. Adenosine Triphosphate Adenosine Triphosphate;Cell Differentiation;Cells, Cultured;Humans;Lasers, Semiconductor;Stem Cells;Temporomandibular Joint Disc

The effects of photobiomodulation therapy on inflammatory mediators, immune infiltration, and angiogenesis in a mouse model of rosacea. BACKGROUND: Rosacea is a chronic skin disorder with increasing prevalence and challenging management. Photobiomodulation therapy (PBMT) may be a promising adjuvant treatment for rosacea. METHODS: This study investigated the efficacy of PBMT for the treatment of rosacea lesions in a well-established mouse model using a combination of wavelengths at 590 and 830 nm. Female BALB/c mice were randomized into three groups, namely, a negative control (NC) group, a model control (MC) group, and a PBMT group. Mice were injected with LL-37 or normal saline for construction of the model and NCs, respectively. Mice in the PBMT group were administered PBMT at wavelengths of 590 nm (25 mW) and 830 nm (50 mW). The severity of erythema, inflammatory cell counts, the expression of key inflammatory mediators, and the degree of angiogenesis and immune cell infiltration of the skin lesions were evaluated by hematoxylin and eosin (H&E) staining, immunohistochemistry, and immunofluorescence staining. RESULTS: PBMT significantly decreased the erythema scores and inflammatory cell infiltration of rosacea lesions in mice. Further studies revealed that PBMT downregulated the increased expression of inflammatory mediators (S100A9 and p65) and angiogenesis markers (CD31), and attenuated the dysregulation of immune cell infiltration [including neutrophils, regulatory T cells (Treg cells), Î³Î´ T cells, and macrophages] in mice with rosacea. CONCLUSIONS: This investigation suggested that PBMT can improve the rosacea condition by regulating key inflammatory mediators and dysregulating immune infiltration and angiogenesis.

Transcranial near-infrared light in treatment of neurodegenerative diseases. Light is a natural agent consisting of a range of visible and invisible electromagnetic spectrum travels in waves. Near-infrared (NIR) light refers to wavelengths from 800 to 2,500Â nm. It is an invisible spectrum to naked eyes and can penetrate through soft and hard tissues into deep structures of the human body at specific wavelengths. NIR light may carry different energy levels depending on the intensity of emitted light and therapeutic spectrum (wavelength). Stimulation with NIR light can activate intracellular cascades of biochemical reactions with local short- and long-term positive effects. These properties of NIR light are employed in photobiomodulation (PBM) therapy, have been linked to treating several brain pathologies, and are attracting more scientific attention in biomedicine. Transcranial brain stimulations with NIR light PBM in recent animal and human studies revealed a positive impact of treatment on the progression and improvement of neurodegenerative processes, management of brain energy metabolism, and regulation of chronic brain inflammation associated with various conditions, including traumatic brain injury. This scientific overview incorporates the most recent cellular and functional findings in PBM with NIR light in treating neurodegenerative diseases, presents the discussion of the proposed mechanisms of action, and describes the benefits of this treatment in neuroprotection, cell preservation/detoxification, anti-inflammatory properties, and regulation of brain energy metabolism. This review will also discuss the novel aspects and pathophysiological role of the glymphatic and brain lymphatics system in treating neurodegenerative

diseases with NIR light stimulations. Scientific evidence presented in this overview will support a combined effort in the scientific community to increase attention to the understudied NIR light area of research as a natural agent in the treatment of neurodegenerative diseases to promote more research and raise awareness of PBM in the treatment of brain disorders.

Repair effect of photobiomodulation combined with human umbilical cord mesenchymal stem cells on rats with acute lung injury. Acute lung injury (ALI) impaired the function of blood oxygen exchange function, resulting in tissue hypoxia and patient death. Recently, human umbilical cord mesenchymal stem cells (hUCMSCs) are thought to mitigate the effects of ALI, which boosts researchers' interest in employing stem cell-based therapies to manage ALI. However, as a novel therapy, hUCMSCs still face various limitations such as migrating weakly and insufficient proliferation in vivo. Photobiomodulation (PBM) effciently promotes cell proliferation, migration and homing, which presents a promising strategy for overcoming above limitations. In this study, PBM was emerged to intervene hUCMSCs through detecting cell proliferation, oxidative stress-related factors and inflammatory factors. These results assuredly confirmed that PBM enhanced the antioxidant capacity of cells and improved cell survival in vitro experiments. In vivo, PBM-intervened hUCMSCs intuitively reduce thickness of alveolar septum, excessive secretion of inflammatory factors, relieves bleeding, edema and fibrosis. As a physical intervention, PBM further strengthens the therapeutic effect of hUCMSCs and depicted a hopeful therapy in ALI treatment. Acute Lung Injury;Animals;Cell Proliferation;Cell Survival;Humans;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Rats;Umbilical Cord

Lights at night: does photobiomodulation improve sleep? Sleep is a critical part of our daily routine. It impacts every organ and system of our body, from the brain to the heart and from cellular metabolism to immune function. A consistent daily schedule of quality of sleep makes a world of difference to our health and well-being. Despite its importance, so many individuals have trouble sleeping well. Poor quality sleep has such a detrimental impact on many aspects of our lives; it affects our thinking, learning, memory, and movements. Further, and most poignantly, poor quality sleep over time increases the risk of developing a serious medical condition, including neurodegenerative disease. In this review, we focus on a potentially new non-pharmacological treatment that improves the quality of sleep. This treatment, called photobiomodulation, involves the application of very specific wavelengths of light to body tissues. In animal models, these wavelengths, when applied at night, have been reported to stimulate the removal of fluid and toxic waste-products from the brain; that is, they improve the brain's inbuilt house-keeping function. We suggest that transcranial nocturnal photobiomodulation, by improving brain function at night, will help improve the health and well-being of many individuals, by enhancing the quality of their sleep.

Photobiomodulation Treatment in Chemotherapy-Induced Oral Mucositis in Young Haematological Patients-A Pilot Study. Background and Objectives: One of the most debilitating side effects of chemotherapy is oral mucositis (OM). Photobiomodulation (PBM) demonstrates high efficacy in the management of OM. The aim of the study was to investigate the incidence of oral mucositis and evaluation of the effectiveness of PBM therapy. Materials and Methods: A total of 23 children diagnosed with leukaemia or lymphoma affected by chemotherapy-induced OM were enrolled in the study. OM grade was assessed with the World Health Organization (WHO) scale. Patients completed an approved questionnaire, and blood cell counts were read every 2 days. OM lesions were treated with class IV laser therapy with a frequency of every 48 h and density of 2, 4, 8, 16 or 30 J/cm(2). The level of pain was measured with VAS scale. Results: The 23 patients developed a total of 41 OM episodes with a mean duration of 7.61 days Â± 4.70. Laser therapy showed a great reduction regarding pain and a better function of patients even with neutropenia. Conclusions: Oral mucositis represents a significant burden to children. PBM brings positive aspects for patients; however, the

optimal treatment parameters require further study. Antineoplastic Agents Antineoplastic Agents;Child;Humans;Low-Level Light Therapy;Pain;Pilot Projects;Stomatitis

Potential of stem cells for treating infected Diabetic Foot Wounds and Ulcers: a systematic review. Infected diabetic foot ulcers (iDFUs) cause great concern, as they generally heal poorly and are precursive of diabetic-related foot amputation and even death. Scientists have tested various techniques in attempts to ascertain the best treatment for iDFUs; however, the results have remained inconclusive. Stem cell therapy (SCT) appears to improve iDFU through its antimicrobial impacts, yet cogent information regarding the repair of iDFUs with SCT is lacking. Herein, published articles are evaluated to report coherent information about the antimicrobial effects of SCT on the repair of iDFUs in diabetic animals and humans. In this systematic review, we searched the Scopus, Medline, Google Scholar, and Web of Science databases for relevant full-text English language articles published from 2000 to 2022 that described stem cell antimicrobial treatments, infected diabetic wounds, or ulcers. Ultimately, six preclinical and five clinical studies pertaining to the effectiveness of SCT on healing infected diabetic wounds or ulcers were selected. Some of the human studies confirmed that SCT is a promising therapy for diabetic wounds and ulcers. Notably, more controlled studies performed on animal models revealed that stem cells combined with a biostimulator such as photobiomodulation decreased colony forming units and hastened healing in infected diabetic wounds. Moreover, stem cells alone had lower therapeutic impact than when combined with a biostimulant. Anti-Infective Agents;Anti-Bacterial Agents Humans;Diabetic Foot;Wound Healing;Anti-Infective Agents;Anti-Bacterial Agents;Stem Cells;Diabetes Mellitus

Photobiomodulation isolated or associated with adipose-derived stem cells allograft improves inflammatory and oxidative parameters in the delayed-healing wound in streptozotocin-induced diabetic rats. The single and associated impressions of photobiomodulation (PBM) and adipose-derived stem cells (ADS) on stereological parameters (SP), and gene expression (GE) of some antioxidant and oxidative stressors of repairing injured skin at inflammation and proliferation steps (days 4 and 8) of a delayed healing, ischemic, and infected wound model (DHIIWM) were examined in type one diabetic (DM1) rats. DM1 was induced by administration of streptozotocin (40 mg/kg) in 48 rats. The DHIIWM was infected by methicillin-resistant Staphylococcus aureus (MRSA). The study comprised 4 groups (each, n = 6): Group 1 was the control group (CG). Group 2 received allograft human (h) ADSs transplanted into the wound. In group 3, PBM (890 nm, 80 Hz, 0.2 J/cm(2)) was emitted, and in group 4, a combination of PBM+ADS was used. At both studied time points, PBM+ADS, PBM, and ADS significantly decreased inflammatory cell count ($p < 0.05$) and increased granulation tissue formation compared to CG ($p < 0.05$). Similarly, there were lower inflammatory cells, as well as higher granulation tissue in the PBM+ADS compared to those of alone PBM and ADS (all, $p < 0.001$). At both studied time points, the GE of catalase (CAT) and superoxide dismutase (SOD) was remarkably higher in all treatment groups than in CG ($p < 0.05$). Concomitantly, the outcomes of the PBM+ADS group were higher than the single effects of PBM and ADS ($p < 0.05$). On day 8, the GE of NADPH oxidase (NOX) 1 and NOX4 was substantially less in the PBM+ADS than in the other groups ($p < 0.05$). PBM+ADS, PBM, and ADS treatments significantly accelerated the inflammatory and proliferative stages of wound healing in a DIIWHM with MRSA in DM1 rats by decreasing the inflammatory response, and NOX1 and 4 as well; and also increasing granulation tissue formation and SOD andÂ CAT. The associated treatment of PBM+ADS was more effective than the individual impacts of alone PBM and ADS because of the additive anti-inflammatory and proliferative effects of PBM plus ADS treatments. Antioxidants;Streptozocin;Catalase;Superoxide Dismutase;NADPH Oxidases Allografts;Animals;Antioxidants;Catalase;Diabetes Mellitus, Experimental;Humans;Ischemia;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus

aureus;NADPH Oxidases;Oxidative Stress;Rats;Rats, Wistar;Stem Cell Transplantation;Stem Cells;Streptozocin;Superoxide Dismutase

Full-Body Photobiomodulation Therapy Is Associated with Reduced Sleep Durations and Augmented Cardiorespiratory Indicators of Recovery. Research is emerging on the use of Photobiomodulation therapy (PBMT) and its potential for augmenting human performance, however, relatively little research exists utilizing full-body administration methods. As such, further research supporting the efficacy of whole-body applications of PBMT for behavioral and physiological modifications in applicable, real-world settings are warranted. The purpose of this analysis was to observe cardiorespiratory and sleep patterns surrounding the use of full-body PBMT in an elite cohort of female soccer players. Members of a women's soccer team in a "Power 5 conference" of the National Collegiate Athletic Association (NCAA) were observed across one competitive season while wearing an OURA Ring nightly and a global positioning system (GPS) sensor during training. Within-subject comparisons of cardiorespiratory physiology, sleep duration, and sleep composition were evaluated the night before and after PBMT sessions completed as a standard of care for team recovery. Compared to pre-intervention, mean heart rate (HR) was significantly lower the night after a PBMT session ($p = 0.0055$). Sleep durations were also reduced following PBMT, with total sleep time (TST) averaging 40 min less the night after a session ($p = 0.0006$), as well as significant reductions in light sleep ($p = 0.0307$) and rapid eye movement (REM) sleep durations ($p = 0.0019$). Sleep durations were still lower following PBMT, even when controlling for daily and accumulated training loads. Enhanced cardiorespiratory indicators of recovery following PBMT, despite significant reductions in sleep duration, suggest that it may be an effective modality for maintaining adequate recovery from the high stress loads experienced by elite athletes.

Could Light-Based Technologies Improve Stem Cell Therapy for Skin Wounds? A Systematic Review and Meta-Analysis of Preclinical Studies(â€). Several diseases or conditions cause dermatological disorders that hinder the process of skin repair. The search for novel technologies has inspired the combination of stem cell (SC) and light-based therapies to ameliorate skin wound repair. Herein, we systematically revised the impact of photobiomodulation therapy (PBM) combined with SCs in animal models of skin wounds and quantitatively evaluated this effect through a meta-analysis. For inclusion, SCs should be irradiated inÂ vitro or inÂ vivo, before or after being implanted in animals, respectively. The search resulted in nine eligible articles, which were assessed for risk of bias. For the meta-analysis, studies were included only when PBM was applied inÂ vivo, five regarding wound closure, and three to wound strength. Overall, a positive influence of SCâ€‰+â€‰PBM on wound closure (mean difference: 9.69; 95% CI: 5.78-13.61, Pâ€‰<â€‰0.00001) and strength (standardized mean difference: 1.7, 95% CI: 0.68-2.72, Pâ€‰=â€‰0.001) was detected, although studies have shown moderate to high heterogeneity and a lack of information regarding some bias domains. Altogether, PBM seems to be an enabling technology able to be applied postimplantation of SCs for cutaneous regeneration. Our findings may guide future laboratory and clinical studies in hopes of offering wound care patients a better quality of life. Animals;Wound Healing;Quality of Life;Skin;Cell- and Tissue-Based Therapy;Low-Level Light Therapy

Effect of low-level light therapy before radiotherapy in oral squamous cell carcinoma: An in vitro study. Radiation therapy for head and neck squamous cell carcinoma (HNSCC) is associated with several complications. Although photobiomodulation (PBM) has radioprotective effects in normal tissue, it could also enhance the growth of neoplastic cells. Thus, the present study aimed to investigate the cellular response of oral squamous cell carcinoma with pre-exposure to low-level phototherapy before radiotherapy. SCC9, Cal-27, A431, and HaCaT cell lines were subjected to low-level light therapy and radiotherapy. The cells were treated with a single energy density (300 J/cm(2)) of a light-emitting diode (660 nm) prior to ionizing radiation at different doses (0, 2, 4, and 6 Gy).

After 24 h, wound scratch, proliferation, clonogenic cell survival, cell death, and reactive oxygen species (ROS) analyses were performed to evaluate cell response. The cell lines pre-exposed to PBM at the analyzed dosage were radiosensitive. The treatment significantly reduced cell proliferation and clonogenic cell survival. Migration and cell death assays also revealed positive results, with the treatment group showing lower rate of migration and higher cell death than did the control group. Moreover, PBM effectively increased the intracellular levels of ROS. PBM at 300 J/cm(2) is a promising radiosensitizing modality to reduce the radiation dose and avoid the intolerable side effects of radiotherapy for HNSCC, thus increasing the probability of successful treatment. However, further studies are needed to support and confirm the results. Reactive Oxygen Species Humans;Squamous Cell Carcinoma of Head and Neck;Mouth Neoplasms;Carcinoma, Squamous Cell;Low-Level Light Therapy;Reactive Oxygen Species;Head and Neck Neoplasms

Reducing the gap between science and clinic: lessons from academia and professional practice - part B: traditional vocal therapy techniques and modern electrostimulation and photobiomodulation techniques applied to vocal rehabilitation. This text is the continuation of the XVIII SBFa Congress publication. In part "A" we presented the analyses on clinical vocal evaluation. Part "B" focuses on vocal rehabilitation: 4. Traditional techniques of vocal therapy; 5. Modern techniques of electrostimulation and photobiomodulation applied to vocal rehabilitation. The numerous studies on the various programs, methods, and techniques of traditional rehabilitation techniques, and many with high quality of evidence, allow us to consider such procedures relatively well described, safe, and with known effects, accounting for the treatment of various vocal disorders. The scientific evidence with traditional techniques is recognized worldwide. New fronts of evolution, with electrostimulation or photobiomodulation used to handle voice problems, seem to be promising as coadjutant approaches. There are more studies on electrostimulation in vocal rehabilitation than with photobiomodulation; however, scientific evidence for these two modern techniques is still limited. Knowledge and caution are required for the application of either technique. Electric Stimulation Therapy;Humans;Professional Practice;Voice Disorders;Voice Training

[My tongue is burning!-Glossodynia/orofacial pain disorder]. Glossodynia or orofacial pain disorder is known as burning mouth syndrome. It is aÂ therapeutic challenge. Its etiology is not well defined. Recent studies show not only aÂ correlation with neuropathic changes, but there are also indications of comorbidities such as depression, anxiety, and carcinophobia. These can also manifest as aÂ reaction to the disease and are not necessarily considered causative. Burning mouth syndrome poses aÂ diagnostic challenge since its differential diagnosis is broad. With regard to dermatological aspects, lichen planus mucosae, oral leucoplakia, pemphigus vulgaris, and aphthous mouth ulcers should be considered. Diabetes, anemia, vitamin deficiency, and endocrinological influences should be considered regarding the predominance of elderly and female patients. Meta-analyses of treatment studies usually show aÂ low level of evidence of the randomized, controlled trials. According to the literature mainly psychotherapy and antidepressants are proposed for therapy. Alpha lipoic acid as aÂ dietary supplement shows short-term improvement and low-level laser therapy might have some benefit. Aged;Burning Mouth Syndrome;Facial Pain;Female;Glossalgia;Humans;Meta-Analysis as Topic;Randomized Controlled Trials as Topic;Tongue

Effect of Simvastatin and Low-Level Laser Therapy on Sutural Bone Formation After Expansion in Rats: Biomechanical, Computed Tomography and Immunohistochemical Assessment. Introduction: The application of low-level laser therapy (LLLT) and some medications have been shown to accelerate bone formation in rapid palatal expansion (RPE). A combination of these two therapeutic modalities may reduce the time required for the retention period. This study sought to assess the effects of simvastatin and LLLT, alone and combined, on sutural bone formation in rats. Methods:

Sixty male Wistar rats averagely weighing 150 g were divided into five groups (n=12) of control (group 1), 5 mg simvastatin (group 2), 10 mg simvastatin (group 3), LLLT (group 4), and LLLT plus 10 mg simvastatin (group 5). The expansion appliance was placed in the parietal bone in all groups. One week after placing the appliance, the spring was fixed with Duralay acrylic resin to serve as a retainer during the rest of the experiment. The rats were sacrificed after 30 (for biomechanical and computed tomography [CT] assessments) or 60 days (for biomechanical, CT and immunohistochemical [IHC] assessments). Results: Groups 3 and 4 showed a significant improvement in osteogenesis (confirmed by CT findings, histological analysis and biomechanical test) compared to the control group. Group 5 was significantly superior to all other groups in terms of all parameters (Pâ€…<â€…0.001). Group 2 and the control group were not significantly different (P>0.05). Conclusion: Although LLLT, simvastatin treatment and the combination of both significantly improved sutural bone formation in rats compared to the control group, the combined treatment showed significantly superior clinical results compared to other interventions.

Effect of Low-Level Laser Therapy on Bone Formation in Rapid Palatal Expansion: A Systematic Review. Introduction: Crossbite is a common malocclusion with a 7-23% prevalence rate. Treatment is based on the expansion of the mid-palatal suture (MPS) with Rapid Palatal Expansion(RPE) followed by a retention period to reach new bone maturation, enough to maintain the results stable. This systematic review was conducted to evaluate the effectiveness of low-level laser therapy (LLLT) in increasing bone formation in MPS. Methods: This article was written by the PRISMA checklist. Electronically, 3 databases, namely PubMed, Scopus, and Embase, were searched with the keywords selected based on PICO. Time (2010-2021) and language restrictions were performed. Results: 528 articles, out of which 374 studies were screened, were found, and 9 full-text articles were subsequently included considering these inclusion criteria: randomized clinical trial (RCT) that examines the efficacy of LLLT in rapid palatal expansion (RPE), age under 15 years, non-surgical RPE with a tooth-supported appliance, and low-intensity laser application. Finally, 4 articles were appraised by Cochrane version 5.2.0 with 7 domains. 3 of 4 articles showed LLLT has a significant impact on bone formation. One of them showed no significant difference in pain perception and bone density between the laser and non-laser groups. Conclusion: While many studies have assessed the effect of LLLT on bone formation in animal models, high-quality clinical trials are missing in this regard. The available clinical trials suggest a positive effect of LLLT on sutural bone formation after RPE.

Different Protocols of Combined Application of Photobiomodulation In Vitro and In Vivo Plus Adipose-Derived Stem Cells Improve the Healing of Bones in Critical Size Defects in Rat Models. Introduction: Long bone segmental deficiencies are challenging complications to treat. Hereby, the effects of the scaffold derived from the human demineralized bone matrix (hDBMS) plus human adipose stem cells (hADSs) plus photobiomodulation (PBM) (in vitro and or in vivo) on the catabolic step of femoral bone repair in rats with critical size femoral defects (CDFDs) were evaluated with stereology and high stress load (HSL) assessment methods. Methods: hADSs were exposed to PBM in vitro; then, the mixed influences of hDBMS+hADS+PBM on CSFDs were evaluated. CSFDs were made on both femurs; then hDBMSs were engrafted into both CSFDs of all rats. There were 6 groups (G)s: G1 was the control; in G2 (hADS), hADSs only were engrafted into hDBMS of CSFD; in G3 (PBM) only PBM therapy for CSFD was provided; in G4 (hADS+PBM in vivo), seeded hADSs on hDBMS of CSFDs were radiated with a laser in vivo; in G5 (hADSs+PBM under in vitro condition), hADSs in a culture system were radiated with a laser, then transferred on hDBMS of CSFDs; and in G6 (hADS+PBM in conditions of in vivo and in vitro), laser-exposed hADSs were transplanted on hDBMS of CSFDs, and then CSFDs were exposed to a laser in vivo. Results: Groups 4, 5, and 6 meaningfully improved HSLs of CSFD in comparison with groups 3, 1, and 2 (all, P=0.001). HSL of G5 was significantly more than G4

and G6 (both, P=0.000). Gs 6 and 4 significantly increased new bone volumes of CSFD compared to Gs 2 (all, P=0.000) and 1 (P=0.001 & P=0.003 respectively). HSL of G 1 was significantly lower than G5 (P=0.026). Conclusion: HSLs of CSFD in rats that received treatments of hDBMS plus hADS plus PBM were significantly higher than treatments with hADS and PBM alone and control groups.

Photobiomodulation and Antimicrobial Photodynamic Therapy for Oral Ulcers in a Patient With Thrombocytopenia Following Bone Marrow Transplantation. Introduction: Thrombocytopenia is usually seen after allogeneic hematopoietic stem cell transplantation (HSCT) and may favor the development of oral bleeding, infections, and ulcerations. Case Report: A patient with chronic myelomonocytic leukemia had been submitted to allogeneic HSCT. Within a few days, she developed severe thrombocytopenia and an extensive ulcerative area comprising both lips, which bled spontaneously, as well as smaller ulcers on the tongue mucosa. The lesions were managed using a combination of phototherapies (photobiomodulation and antimicrobial photodynamic therapies), totalizing 4 laser sessions. After 4 days, there was an important reduction in the severity of the lesions, with spontaneous disappearance of the crusts and reepithelization. Conclusion: The proposed combination of phototherapies would be a suitable therapeutic modality for the management of oral lesions related to platelet disorders induced by oncologic treatments.

The Effect of bisphenol A and Photobiomodulation Therapy on Autophagy-Related Genes Induction in Adipose Tissue-Derived Stem Cells. Introduction: As adipose tissue-derived stem cells (ADSCs) can divide rapidly and be prepared non-invasively, they have extensively been used in regenerative medicine. On the other hand, a new method of therapy, known as photobiomodulation (PHT), has been used to treat many diseases, such as inflammatory conditions, wound healing and pain. Besides, exposure to chemical substances such as bisphenol A (BPA), at low levels, can lead to autophagy. This study investigated the effects of BPA and PHT on the expression of autophagy-related genes, including LC3, NRF2, P62, in rat ADSCs as a model. Methods: ADSCs isolation and purification were confirmed by immunocytochemistry (ICC). The cells were then treated with different concentrations of BPA and also subjected to PHT. Reverse transcription polymerase chain reaction (RT-PCR) was used for the evaluation of LC3, NRF2 and P62 gene expressions. Oil red O staining was used for adipogenic vacuole formation. Result: ICC showed that the isolated cells were CD 49-positive but CD 31 and CD 34-negative. The viability test indicated that the number of live cells after 24 hours in the BPA groups at concentrations of 0, 1, 50, 100 and 200 Î¼M was 100%, 93%, 81%, 72%, and 43% respectively. The difference in cell viability between groups 50, 100 and 200 Î¼M was significant as compared with the control groups (Pâ€…<â€…0.05). Moreover, in the group with 1 Î¼M concentration of BPA, the expressions of LC3, NRF2 and P62 genes were upregulated. However, in the treatment group at the concentration of 200 Î¼M of BPA, the LC3 gene was expressed, but NRF2 and P62 genes were downregulated. Conclusion: BPA and PHT induce autophagy and adiposeness in ADSCs in a dose-dependent manner.

Low-level laser therapy versus extracorporeal shock wave therapy in calcaneal spur.

[Optimizing laser therapy parameters in pharyngeal tonsil diseases in children]. In children, chronic inflammatory diseases of the pharyngeal lymphoid ring are the most common chronic nasopharyngeal diseases. Available therapies are not always effective, associated with an increase in treatment duration and possible complications and recurrences. Laser therapy (LT) techniques have long been successfully used in ENT practice, but they still need to be optimized and standardized. OBJECTIVE: To analyze treatment outcomes in children with chronic inflammatory diseases of the pharyngeal lymphoid ring in out-patient settings using standard methods of LT (by localization, technique, and time of laser exposure) with different lasers. MATERIALS AND METHODS: A total of 214 patients aged 1-15 years with chronic inflammatory diseases of the pharyngeal lymphoid ring were included in the study. The patients were divided into three main groups (1-3) and received LT

using different lasers on the Lasmik device and a control group without LT. Parameters of laser radiation sources (groups) were the following: Group 1 wavelength (Î») 635 nm, pulsed mode (PM), pulse width 100 ns, pulse power (PP) 5 W, mean power (MP) 0.04 mW; Group2 Î»=904 nm, PM, PP=5 W, MP=0.04 mW; Group 3 Î»=635 nm, continuous mode, MP=15 mW. The outcomes were assessed by clinical improvement. RESULTS AND CONCLUSION: A comparative analysis of the comprehensive treatment outcomes showed significantly better outcomes in the 1-3 groups compared to the control group. A higher efficiency of pulsed low-intensity laser radiation (LIRI) in comparison with a continuous mode, mostly red spectrum (Î»=635 nm, PM, MP=5 W) was shown. This laser exposure results in faster improvement and allows performing LIRI exposure percutaneously without using light guides, which require sterilization and are quickly degrading. Adenoids;Child;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation and photodynamic therapy-induced switching of autophagy and apoptosis in human dermal fibroblasts. Nowadays, photobiomodulation (PBM) in combination with chemotherapy or other therapeutic approaches is an attractive adjuvant modality for cancer treatment. Targeted destruction of cancer cells is one of the main advantages of photodynamic therapy (PDT). We have shown in previous studies that the combination of PBM at 808Â nm and hypericin-mediated PDT increases PDT efficacy in human glioblastoma cells U87 MG. The study presented here shows significant differences between U87 MG and non-cancerous human dermal fibroblasts (HDF) cells treated by PBM and PDT. This study focuses on mitochondria because PBM mainly affects these organelles. We demonstrated that an interplay between mitochondrial and autophagic proteins plays a crucial role in the response of HDF cells to PBM and PDT. Fluorescence microscopy, flow cytometry, and Western blot analysis were used to examine the autophagic profile of HDF cells after these treatments. An increase in ubiquitin, SQSTM1, LC3BII, and cytochrome c was accompanied by a decrease in M6PR, ATG16L1, and Opa1 in HDF cells exposed to PBM and PDT. Overall, we observed that the switching of autophagy and apoptosis is dose-dependent and also occurs independently of PBM in HDF cells after hypericin-mediated PDT. However, PBM might preferentially induce autophagy in noncancer cells, which might escape apoptosis under certain conditions. Photosensitizing Agents
Apoptosis;Autophagy;Fibroblasts;Humans;Photochemotherapy;Photosensitizing Agents

The effect of photobiomodulation on the brain during wakefulness and sleep. Over the last seventy years or so, many previous studies have shown that photobiomodulation, the use of red to near infrared light on body tissues, can improve central and peripheral neuronal function and survival in both health and in disease. These improvements are thought to arise principally from an impact of photobiomodulation on mitochondrial and non-mitochondrial mechanisms in a range of different cell types, including neurones. This impact has downstream effects on many stimulatory and protective genes. An often-neglected feature of nearly all of these improvements is that they have been induced during the state of wakefulness. Recent studies have shown that when applied during the state of sleep, photobiomodulation can also be of benefit, but in a different way, by improving the flow of cerebrospinal fluid and the clearance of toxic waste-products from the brain. In this review, we consider the potential differential effects of photobiomodulation dependent on the state of arousal. We speculate that the effects of photobiomodulation is on different cells and systems depending on whether it is applied during wakefulness or sleep, that it may follow a circadian rhythm. We speculate further that the arousal-dependent photobiomodulation effects are mediated principally through a biophoton - ultra-weak light emission - network of communication and repair across the brain.

The Protocol of Low-level Laser Therapy in Orthodontic Practice: A Scoping Review of Literature. Low-level laser therapy (LLLT) has been widely investigated as an adjunct technique for orthodontic treatment due to photobiomodulation effect. LLLT appears to be supportive for an orthodontic

practice in terms of tooth movement acceleration, pain relief, and root resorption management. The decrease in these adverse effects will enhance the compliance in orthodontic patients, which could positively impact treatment outcomes. However, there seemed to be inconsistency in the impact of LLLT as well as its laser and treatment parameters. This scoping review aimed to evaluate the impact of different irradiation parameters on tooth movement acceleration, pain relief, and root resorption as well as to construct a protocol of LLLT in orthodontic practice. The search was conducted across PubMed, Scopus, Web of Science, Embase, Google Scholar, and the reference lists of identified articles. The last search was conducted on October 10, 2021 to identify experiments in humans regarding the application of LLLT as noninvasive treatment in orthodontic practice published between 2010 and 2021. However, they were excluded if they were not clinical research, if they did not report the source of laser, or if they were not relevant to tooth movement, pain perception, and root resorption, or if they were not available in English or in full-text. Following the systematic search and selection process, 60 articles were included in this review. A majority of included articles were published in the past few years. The findings of this review supported the application of LLLT in orthodontic practice with purposes of tooth movement acceleration and pain reduction. The positive impact of LLLT on root resorption had not been clearly evident yet. As this review demonstrated heterogeneity of both laser and treatment parameters, further research should be required to ensure the effectiveness of its specific parameters in orthodontic practice.

Laser Assisted Surgical and Orthodontic Treatment of a Dilacerated Impacted Maxillary Incisor: A Case Report. Impaction of the anterior teeth, which is less frequent in central incisors, can cause serious esthetic and subsequent psychological problems for patients during the mixed dentition period. Traumatic injury to deciduous teeth is the most common etiologic factor. Thus, treatment of maxillary incisor impaction is highly important. Nowadays, application of laser has been suggested in orthodontics and pediatric dentistry for different treatments, such as surgical exposure of impacted teeth and application of low-level laser therapy (LLLT) for acceleration of orthodontic tooth movement. In this paper, the authors present treatment of an impacted and dilacerated maxillary central incisor with laser application for its surgical exposure and LLLT for acceleration of its orthodontic traction and eruption.

Femtosecond laser attenuates oxidative stress, inflammation, and liver fibrosis in rats: Possible role of PPARÎ³ and Nrf2/HO-1 signaling. Liver fibrosis is the excessive accumulation of extracellular matrix (ECM) proteins that occurs in chronic liver injury. Inflammation and oxidative stress play a key role in fibrogenesis which can develop into cirrhosis and carcinoma. Low-level laser therapy (LLLT) has promising therapeutic effects against fibrogenesis; however, the specific underlying mechanism is not fully elucidated. We investigated the potential of LLLT to attenuate carbon tetrachloride (CCl(4))-induced liver fibrosis in rats, focusing on oxidative injury, inflammatory response, and the possible role of PPARÎ³ and Nrf2/HO-1 signaling. Rats were given CCl(4) and exposed to LLLT twice/week for 6Â weeks and blood and liver samples were collected for analysis. CCl(4) caused liver injury and fibrosis manifested by hepatocyte injury, steatosis, inflammatory cell infiltration, and accumulation of collagen, elevated serum transaminases and bilirubin, and decreased albumin. ROS, MDA, NO, NF-ÎºB p65, TNF-Î±, iNOS, TGF-Î²1, and IL-6 were increased in the liver of CCl(4)-administered rats. Exposure to LLLT ameliorated histopathological alterations, collagen deposition, and liver function markers, and downregulated hepatic Î±-SMA, collagen 1A1, and collagen 3A1. In Addition, LLLT decreased ROS, MDA, NO, NF-ÎºB p65, TGF-Î²1, and pro-inflammatory mediators, and enhanced antioxidant defenses. These effects were associated with upregulated PPARÎ³, Nrf2, and HO-1, both gene and protein expression. In conclusion, LLLT attenuated liver fibrosis by suppressing ECM production and deposition, oxidative injury and inflammation, and upregulating PPARÎ³ and Nrf2/HO-1 signaling. Albumins;Antioxidants;Bilirubin;Carbon Tetrachloride;Hmox1 protein, rat;Inflammation

Mediators;Interleukin-6;NF-E2-Related Factor 2;NF-kappa B;PPAR gamma;Reactive Oxygen Species;Transaminases;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha
Animals;Rats;Albumins;Antioxidants;Bilirubin;Carbon Tetrachloride;Heme Oxygenase (Decyclizing);Inflammation;Inflammation Mediators;Interleukin-6;Lasers;Liver;Liver Cirrhosis;NF-E2-Related Factor 2;NF-kappa B;Oxidative Stress;PPAR gamma;Reactive Oxygen Species;Transaminases;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha

Efficacy of low-level laser therapy on pain, disability, pressure pain threshold, and range of motion in patients with myofascial neck pain syndrome: a systematic review and meta-analysis of randomized controlled trials. Low-level laser therapy (LLLT) is one of recent modalities for treatment of myofascial neck pain (MNP). Several RCTs have been conducted on its effectiveness. The aim of this comprehensive meta-analysis was to evaluate the effectiveness of LLLT on MNP. Electronic databases were searched for identifying eligible studies comparing the effectiveness of LLLT using any wavelength with placebo or active control in myofascial neck pain up to June 2022. Data related to pain intensity, pain pressure threshold (PPT), range of motion (ROM), and disability was analyzed as a pooled estimate of mean difference or standard mean difference (SMD) with 95% confidence intervals (CIs) using random/fixed-effect model. Funnel plot and Egger's linear regression test were also conducted to examine the risk of publication bias. A total of 13 randomized controlled trials were included in this systematic review and meta-analysis. The data assessing laser effectiveness on different outcomes of 556 patients were considered for meta-analysis. Pooled results revealed that LLLT was significantly effective in pain reduction (MDâ€‰=â€‰â€‰-â€‰1.29, 95% Câ€‰=â€‰â€‰-â€‰2.36;â€‰-â€‰0.23, Pâ€‰<â€‰0.001). Also, secondary outcomes including PPT (SMD of 2.63, 95% Câ€‰=â€‰0.96; 4.30, Pâ€‰<â€‰0.01) and right bending ROM (SMD of 3.44, 95% Câ€‰=â€‰0.64; 6.24, Pâ€‰<â€‰0.01) were improved, while disability (MD ofâ€‰-â€‰7.83, 95% Câ€‰=â€‰â€‰-â€‰17.1; 0.08, Pâ€‰=â€‰1.34) did not improve significantly after LLLT. Our meta-data revealed that LLLT may reduce myofascial neck pain and its related outcomes. LLLT is suggested to be used by clinicians along with other therapies such as manual and exercise therapy. Humans;Fibromyalgia;Low-Level Light Therapy;Myofascial Pain Syndromes;Neck Pain;Pain Threshold;Randomized Controlled Trials as Topic;Range of Motion, Articular

Hormesis: Wound healing and keratinocytes. Hormetic dose responses (i.e., a biphasic dose/concentration response characterized by a low dose stimulation and a high dose inhibition) are shown herein to be commonly reported in the dermal wound healing process, with the particular focus on cell viability, proliferation, and migration of human keratinocytes in in vitro studies. Hormetic responses are induced by a wide range of substances, including endogenous agents, numerous drug and nanoparticle preparations and especially plant derived extracts, including many well-known dietary supplements as well as physical stressor agents, such as low-level laser treatments. Detailed mechanistic studies have identified common signaling pathways and their cross-pathway communications that mediate the hormetic dose responses. These findings suggest that the concept of hormesis plays a fundamental role in wound healing, with important potential implications for agent screening and evaluation, as well as clinical strategies.
Hormesis;Humans;Keratinocytes;Nanoparticles;Wound Healing

Application of Fibrin Associated with Photobiomodulation as a Promising Strategy to Improve Regeneration in Tissue Engineering: A Systematic Review. Fibrin, derived from proteins involved in blood clotting (fibrinogen and thrombin), is a biopolymer with different applications in the health area since it has hemostasis, biocompatible and three-dimensional physical structure properties, and can be used as scaffolds in tissue regeneration or drug delivery system for cells and/or growth factors. Fibrin alone or together with other biomaterials, has been indicated for use as a biological

support to promote the regeneration of stem cells, bone, peripheral nerves, and other injured tissues. In its diversity of forms of application and constitution, there are platelet-rich fibrin (PRF), Leukocyte- and platelet-rich fibrin (L-PRF), fibrin glue or fibrin sealant, and hydrogels. In order to increase fibrin properties, adjuvant therapies can be combined to favor tissue repair, such as photobiomodulation (PBM), by low-level laser therapy (LLLT) or LEDs (Light Emitting Diode). Therefore, this systematic review aimed to evaluate the relationship between PBM and the use of fibrin compounds, referring to the results of previous studies published in PubMed/MEDLINE, Scopus and Web of Science databases. The descriptors "fibrin AND low-level laser therapy" and "fibrin AND photobiomodulation" were used, without restriction on publication time. The bibliographic search found 44 articles in PubMed/MEDLINE, of which 26 were excluded due to duplicity or being outside the eligibility criteria. We also found 40 articles in Web of Science and selected 1 article, 152 articles in Scopus and no article selected, totaling 19 articles for qualitative analysis. The fibrin type most used in combination with PBM was fibrin sealant, mainly heterologous, followed by PRF or L-PRF. In PBM, the gallium-aluminum-arsenide (GaAlAs) laser prevailed, with a wavelength of 830 nm, followed by 810 nm. Among the preclinical studies, the most researched association of fibrin and PBM was the use of fibrin sealants in bone or nerve injuries; in clinical studies, the association of PBM with medication-related treatments osteonecrosis of the jaw (MRONJ). Therefore, there is scientific evidence of the contribution of PBM on fibrin composites, constituting a supporting therapy that acts by stimulating cell activity, angiogenesis, osteoblast activation, axonal growth, anti-inflammatory and anti-edema action, increased collagen synthesis and its maturation, as well as biomolecules.

A Review of Laser Therapies for the Treatment of Scarring and Vascular Anomalies. Significance: Laser use has become part of the gold standard of treatment as an effective adjuvant in multimodal therapy for pathologic scarring caused by burns, trauma, acne, and surgery, as well as vascular anomalies. Understanding indications and applications for laser therapy is essential for physicians to improve patient outcomes. Recent Advances: Since the 1980s, the medical use of lasers has continuously evolved with improvements in technology. Novel lasers and fractionated technologies are currently being studied in the hopes to improve treatment efficacy, while reducing complications. Recent advancements include acne treatment with novel picosecond lasers, new hypertrophic scar therapies with simultaneous laser and intense pulsed light use, and novel systems such as lasers with intralesional optical fiber delivery devices. In addition, optimizing the timing of laser therapy and its use in multimodal treatments continue to advance the field of photothermolysis. Critical Issues: Selecting the correct laser for a given indication is the fundamental decision when choosing a laser balancing effective treatment with minimal complications. This article covers the principles of laser therapy, the preferred lasers used for the treatment of scarring and vascular anomalies, and discusses the current evidence behind these laser choices. Future Directions: To optimize laser therapy, larger randomized control trials and split scar studies are needed. Continued advancement through better randomized controlled studies will help to improve patient outcomes on a broader scale. Humans;Laser Therapy;Cicatrix, Hypertrophic;Acne Vulgaris;Low-Level Light Therapy;Treatment Outcome;Vascular Diseases;Vascular Malformations

Very Low-Level Transcranial Photobiomodulation for Major Depressive Disorder: The ELATED-3 Multicenter, Randomized, Sham-Controlled Trial. Background: Transcranial photobiomodulation (t-PBM) with near-infrared (NIR) light might represent a treatment for major depressive disorder (MDD). However, the dosimetry of administered t-PBM varies widely. We tested the efficacy of t-PBM with low irradiance, low energy per session, and low number of sessions in individuals with MDD. Methods: A 2-site, double-blind, sham-controlled study was conducted of adjunct t-PBM NIR (830â€‰nm; continuous wave; 35.8 cm(2) treatment area; 54.8â€‰mW/cm(2) irradiance; 65.8 J/cm(2) fluence, 20â€‰min/session; ~2 W total power; 2.3 kJ total energy per session), delivered to

the prefrontal cortex, bilaterally, twice a week for 6 weeks, in subjects diagnosed with MDD per the DSM-IV criteria. Subjects were recruited between August 2016 and May 2018. A sequential parallel comparison design was used: 18 nonresponders to sham in phase 1 (6 weeks) were re-randomized in phase 2. The primary outcome was reduction in depression severity (Hamilton Depression Rating Scale [HDRS-17] and Quick Inventory of Depressive Symptomatology-Clinician Rating [QIDS-C] scores) from baseline. Statistical analyses used R package SPCDAnalyze2, including all subjects withâ€‰â‰¥â€‰1 post-randomization evaluation. Results: Of the 54 subjects recruited, we included 49 MDD subjects in the analysis (71% female, meanâ€‰Â±â€‰SD age 40.8â€‰Â±â€‰16.1 years). There were no significant differences between t-PBM and sham with respect to the change in HDRS-17 (tâ€‰=â€‰-0.319, Pâ€‰=â€‰.751) or QIDS-C (tâ€‰=â€‰-0.499, Pâ€‰=â€‰.620) scores. The sham effect was reasonably low. Conclusions: Mostly uncontrolled studies suggest the efficacy of t-PBM for MDD; however, its optimal dose is still to be defined. A minimal dose threshold is likely necessary, similarly to other neuromodulation techniques in MDD (electroconvulsive therapy, transcranial magnetic stimulation). We established a threshold of inefficacy of t-PBM for MDD, based on combined low irradiance, low energy per session, and low number of sessions. Trial Registration: ClinicalTrials.gov identifier: NCT02959307. Adult;Depressive Disorder, Major;Double-Blind Method;Euphoria;Female;Humans;Male;Middle Aged;Prefrontal Cortex;Transcranial Magnetic Stimulation;Treatment Outcome;Young Adult

The Role of Photobiomodulation on Dental-Derived Stem Cells in Regenerative Dentistry: A Comprehensive Systematic Review. BACKGROUND: Photobiomodulation therapy involves exposing tissues to light sources, including light-emitting diodes or low-level lasers, which results in cellular function modulation. The molecular mechanism of this treatment is revealed, demonstrating that depending on the light settings utilized, it has the potential to elicit both stimulatory and inhibitory reactions. OBJECTIVE: The current systematic review aimed to evaluate the impact of photobiomodulation therapy on dental stem cells and provide an evidence-based conclusion in this regard. METHODS: This systematic review was performed and reported based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) revised guidelines. PICO(S) components were employed to define the inclusion criteria. Web of Science, Scopus, Medline as well as grey literature, and google scholar were searched up to September 2021 to retrieve relevant papers. RESULTS: Photobiomodulation therapy showed promising effects on the proliferation, viability, and differentiation of dental stem cells. This finding was based on reviewing related articles with a low risk of bias. CONCLUSION: Despite the positive benefits of photobiomodulation therapy on dental stem cells, the current data do not provide a definitive conclusion on the best physical parameters for enhancing cell viability, proliferation, and differentiation. Humans;Low-Level Light Therapy;Stem Cells;Dentistry

Ultrasonographic and electrophysiological outcomes of carpal tunnel syndrome treated with low-level laser therapy: A double-blind, prospective, randomized, sham-controlled study. OBJECTIVES: The aim of this study was to investigate the therapeutic effects of low-level laser therapy (LLLT) on clinical, ultrasonographic (US), and electrophysiological findings in carpal tunnel syndrome (CTS). PATIENTS AND METHODS: Between January 2015 and August 2015, 42 patients (7 males, 35 females; mean age: 50.4Â±8.7 years; range, 32 to 65 years) with mild-to-moderate CTS were randomly assigned to one of two groups: active LLLT (therapy group, n=22) 0.8 J/painful point and sham LLLT groups (n=20). Both groups wore neutral wrist orthoses. The patients were evaluated before and after 15 sessions of therapy (670 nm, 4 J/session over the carpal tunnel). Follow-up parameters included the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) Symptom Severity Scale (SSS), Functional Status Scale (FSS), nerve conduction studies and US evaluation of the median nerve cross-sectional area (CSA), vascularization (via power Doppler), flattening ratio (FR), and palmar

bowing of the flexor retinaculum. RESULTS: Nocturnal paresthesia improved in both groups; however, pain and patients with a positive Phalen's test reduced only in the therapy group (p=0.031). The FSS and SSS scores also improved only in the therapy group (p<0.001). Electrophysiologically, median sensory nerve conduction velocities showed a significant improvement only in the therapy group (p=0.002). The CSA, FR, and vascularization of the median nerve showed a significant improvement in the therapy group alone (p<0.001, p=0.048, and p=0.021, respectively). CONCLUSION: Improvements in the signs and symptoms of CTS and hand function, the improvements in sensory nerve conduction studies, and reduction in median nerve CSA, FR and vascularity in the LLLT group can be attributed to the anti-inflammatory and analgesic effects of LLLT. This study provides new US data demonstrating efficacy of LLLT along with a clinical and electrophysiological improvement. The LLLT seems to be an easily applied, non-invasive treatment option.

Effect of preemptive photobiomodulation associated with nimesulide on the postsurgical outcomes, oxidative stress, and quality of life after third molar surgery: a randomized, split-mouth, controlled clinical trial. OBJECTIVE: The aim of this study is to compare the effect of photobiomodulation with low-level laser therapy (LLLT) and nimesulide on inflammatory parameters, biomarkers of oxidative stress and inflammation, and quality of life after lower third molar (L3M) surgery. MATERIAL AND METHODS: A randomized, two-factor, triple-blind, controlled, split-mouth clinical trial was performed with 40 volunteers who required bilateral L3M removal. Patients were allocated depending on the use or not of 100Â mg nimesulide 1Â hbefore surgery, as well as the use or not of LLLT in the preoperative period. RESULTS: Pain peaks occurred after 6Â h (nimesulide-placebo [N-P] group) and 8Â h (nimesulide group). In the N-P group, LLLT resulted in significantly lower mean pain scores than the subgroup without LLLT after 4Â h (pâ€‰=â€‰0.009) and 6Â h (pâ€‰=â€‰0.048). As for edema, a shorter distance between the mandibular angle and the outer canthus of the eyes after 7Â days (pâ€‰=â€‰0.037) and a smaller cumulative effect (pâ€‰=â€‰0.036) were observed in the N-P group associated with LLLT. A direct effect between LLLT (pâ€‰=â€‰0.047) and a reduction in the mean scores of overall dissatisfaction with quality of life was detected. CONCLUSIONS: Preemptive use of nimesulide only delayed peak pain. LLLT reduced edema, trismus, and contributed to a better perception of quality of life. Nimesulide inhibits peroxidation by increasing GSH and stopping neutrophil migration. The benefit of the association of both strategies was not superior to the use of LLLT alone. CLINICAL RELEVANCE: Translational study with impact on clinical-surgical protocols involving L3M surgery related to pharmacological and non-pharmacological methods. nimesulide Humans;Molar, Third;Quality of Life;Tooth, Impacted;Tooth Extraction;Trismus;Low-Level Light Therapy;Edema;Mouth;Oxidative Stress;Pain;Pain, Postoperative;Double-Blind Method

Low-level green laser promotes wound healing after carbon dioxide fractional laser therapy. BACKGROUND: The carbon dioxide (CO(2)) fractional laser resurfacing has become one of the hottest therapies for dermatoses. However, complications such as skin swelling, prolonged erythema, post-inflammatory hyperpigmentation, and scar formation remain. Low-level laser (LLL) therapy is accepted to promote skin wound healing and regeneration, decrease inflammation and pain, and modulate immunoreaction with low-dose laser of different wavelength. 532â€‰nm laser therapy is commonly used to remove pigmented spots and to tender skin, but not utilized in wound care. OBJECTIVE: We aimed to determine the efficacy of the low-level 532â€‰nm green laser in wound healing after CO(2) fractional laser. METHODS: Six adult male mice (C57BL/6, 8â€‰weeks old) were prepared for animal experiments. The dorsum of each mouse was divided into four parts that, respectively, received designed treatments, as controlled (group Ctrl), 532â€‰nm LLL-treated (group GL), CO(2) fractional laser-treated (group FL), and CO(2) fractional laser followed by three times 532â€‰nm LLL-treated (group FG). Hematoxylin-eosin staining (H&E), Masson-trichrome staining,

CD31 immunohistochemical staining were performed to evaluate the efficacy of wound healing after treated by different irradiations. Western blotting was used to detect the expression of related proteins. Mouse skin fibroblasts (MSFs) were treated with LLL using a wavelength of 532â€‰nm once. Cellular responses were observed and analyzed after 48â€‰hours. Cell viability and migration of different groups were assessed by scratch and the Cell Counting Kit-8 (CCK8) assays, respectively. RESULTS: Collagen remodeling and epidermis thickness were significantly enhanced in group FG than that in group FL in morphology. Besides, CD31 immunohistochemical staining indicated prominently increased angiogenesis in both groups FL and FG than non-irradiation group. The expression of extracellular matrix (ECM)-related protein (Col1, Col3 and MMP1) showed a remarkable improvement in wound healing in group FG than that in group FL. Irradiated MSFs showed a better migration ability compared with non-irradiated controls. LLL enhanced the secretion function of MSFs on Collagen I and III. CONCLUSIONS: Low-level green laser promotes wound healing after CO(2) fractional laser by improving the integrity of skin barrier and allowing for scarless healing. Therefore, low-level green laser therapy might serve as a sequential therapy of invasive laser surgery to ensure a better wound care. Carbon Dioxide;Collagen Male;Mice;Animals;Carbon Dioxide;Mice, Inbred C57BL;Wound Healing;Laser Therapy;Low-Level Light Therapy;Collagen;Lasers, Gas

The effects of photobiomodulation therapy in individuals with tinnitus and without hearing loss. To verify the effect of photobiomodulation therapy (PBMT) in individuals with chronic tinnitus without hearing loss, 20 patients who met the inclusion criteria were randomly divided into group 1: active low-level laser (LLL) and group 2: equipment without laser (placebo). Upon anamnesis, data collection, and audiological exams, the Tinnitus Handicap Inventory (THI) and the Visual-Analog Scale (EVA) were applied to measure the level of discomfort with tinnitus and the level of discomfort before and after laser treatment. The protocol used included 12 active LLL sessions for group 1 and not active for group 2, varying red and infrared wavelengths. There was a reduction in the disadvantage of individuals with tinnitus after the intervention and between the initial and final sessions, regardless of the intervention, although group 1 showed a greater reduction than group 2, regardless of point in time of assessment and number of session. There was no statistical difference as to group and point in time for the high-frequency audiometry and acuphenometry outcomes. Individuals with chronic tinnitus reduced the complaint, regardless of point in time and group of intervention; however, the group that received PBMT improved the level of satisfaction, regardless of point in time of assessment and number of session. Humans;Tinnitus;Low-Level Light Therapy;Hearing Loss;Audiometry, Pure-Tone;Visual Analog Scale

A case report of 595â€‰nm pulsed dye laser for the prevention and management of scar developed after vascular complication of filler application. Cicatrix;Cicatrix, Hypertrophic;Humans;Lasers, Dye;Low-Level Light Therapy;Treatment Outcome

Effect of adding a supervised physical therapy exercise program to photobiomodulation therapy in the treatment of cervicogenic somatosensory tinnitus: A randomized controlled study. OBJECTIVES: To evaluate the effectiveness of adding a supervised physical therapy exercise program to photobiomodulation therapy (PBMT) in the treatment of cervicogenic somatosensory tinnitus (CST). METHODS: Forty patients suffering from CST with age 45-55 years were included in the study. They were assigned randomly into 2 groups, 20 per each. (Study group) Group (A) received a supervised physical therapy exercise program in addition to 20 minutes PBMT with a 650-nanometer wavelength and a 5 milliWatt power output, spot size of 1â€‰cm2, and energy density of 6 Joules, 3 sessions per week for 8 consecutive weeks, plus traditional medical treatment. While (control group), group (B) received the same PBMT protocol, 3 sessions per week for 8 consecutive weeks in addition to the traditional medical treatment. Tinnitus visual analog scaling (VAS), tinnitus handicap inventory (THI), and cervical range of motion (ROM) were measured at baseline and after 8 weeks. RESULTS:

Mixed MANOVA showed a statistically significant reduction in tinnitus VAS, THI, and a significant improvement in cervical ROM (flexion, extension, right bending, left bending, right rotation, and left rotation) in favor of Group A (P < .05). There was a significant decrease in posttreatment VAS treatment (P > .001) MD [-2.05(-2.68:-1.41)], and THI relative to pretreatment mean difference [-5.35(-8.51: -2.19)] and a significant increase in posttreatment neck ROM in Groups A and B relative to pretreatment neck ROM (P > .001). Flexion range posttreatment MD[3.65(1.64:5.65)], Extension MD [6.55(1.35:11.75)], right bending MD[3.8(2.51:5.08)], left bending MD[1.75(0.19:3.3)], right rotation MD [3.5(1.28:5.71)] and left rotation [2.75(0.67:4.82)]. CONCLUSIONS: Adding a supervised physical therapy exercise program to PBMT showed positive and beneficial effects in the treatment of CST using VAS, THI, and Cervical ROM assessment tools. Exercise Therapy;Humans;Low-Level Light Therapy;Middle Aged;Physical Therapy Modalities;Range of Motion, Articular;Tinnitus;Treatment Outcome

The effects of some natural products compared to synthetic products on the metabolic activity, proliferation, viability, migration, and wound healing in sheep tenocytes. BACKGROUND: Tendinopathy or tendon injuries can affect many people, causing a huge impact on their movements and maintaining standing posture. Treatment options include physiotherapy, anti-inflammatory drugs, and alternative medicine. The use of physiotherapy or anti-inflammatory drugs may cause some side effects like pain and liver failure, respectively, therefore, alternative medicine will be a better choice. METHOD: Tenocytes were isolated from sheep Achilles tendon and used in Alamar blue assay to assess the metabolic activity, proliferation, and viability of tenocytes over 24Â hrs. and 48Â hrs., using natural and synthetic products [i.e., olive oil, oleic acid, corn oil, Inula viscosa oil, Inula viscosa extract, Nigella sativa oil, naproxen sodium, and paracetamol and LED photobiomodulation]. Furthermore, tenocytes viability was assessed by FDA/PI stain. For migration and healing of a wound, the scratch assay was used. RESULTS: Alamar blue assay over 24Â hrs. showed that Nigella sativa oil increased the metabolic activity, proliferation, and viability of tenocytes significantly, while Alamar blue over 48Â hrs. showed that oleic acid, LED, and their combination increased these parameters for tenocytes significantly. Olive oil increased the viability of tenocytes significantly using FDA/PI stains. Scratch assay revealed that Inula viscosa oil, Inula viscosa extract, and paracetamol increased tenocyte migration and healing significantly. CONCLUSION: Nigella sativa oil, olive oil, oleic acid, Inula viscosa oil, and Inula viscosa extract may be used as an alternative therapy for tendinopathy with less side effects.

Non-invasive transcranial brain modulation for neurological disorders treatment: A narrative review. Noninvasive brain stimulation/modulation is a rapidly emerging technique that has been implemented in different clinical applications. The commonly noninvasive techniques used in neurological manipulations include photobiomodulation (PBM), transcranial electrical stimulation (TES), transcranial magnetic stimulation (TMS), and ultrasound stimulation (USS). These techniques have the ability to excite, inhibit, or modulate neuronal activity in targeted brain areas to obtain the required therapeutic effects. However, each technique owns its unique mechanism of action that relies on specific parameters suitable for treating certain neurological disorders. Neurological disorders such as epilepsy, Parkinson's disease (PD), Alzheimer's disease (AD), and depression have been treated by one or more of these noninvasive techniques. The therapeutic outcomes of these techniques for neurological diseases are promising, yet with limitations. In the present review, the mechanisms of action of these different brain stimulation/modulation modalities were explored and a synopsis of their applications in the treatment of certain neurological disorders was provided. Moreover, methodological issues, limitations, and open questions were presented. Furthermore, some future directions were suggested. Brain;Humans;Nervous System Diseases;Parkinson Disease;Transcranial Direct Current Stimulation;Transcranial Magnetic Stimulation

Near-infrared II photobiomodulation augments nitric oxide bioavailability via phosphorylation of endothelial nitric oxide synthase. There is solid evidence of the beneficial effect of photobiomodulation (PBM) with low-power near-infrared (NIR) light in the NIR-I window in increasing bioavailable nitric oxide (NO). However, it is not established whether this effect can be extended to NIR-II light, limiting broader applications of this therapeutic modality. Since we have demonstrated PBM with NIR laser in the NIR-II window, we determined the causal relationship between NIR-II irradiation and its specific biological effects on NO bioavailability. We analyzed the impact of NIR-II irradiation on NO release in cultured human endothelial cells using a NO-sensitive fluorescence probe and single-cell live imaging. Two distinct wavelengths of NIR-II laser (1064 and 1270â€‰nm) and NIR-I (808â€‰nm) at an irradiance of 10Â mW/cm(2) induced NO release from endothelial cells. These lasers also enhanced Akt phosphorylation at Ser 473, endothelial nitric oxide synthase (eNOS) phosphorylation at Ser 1177, and endothelial cell migration. Moreover, the NO release and phosphorylation of eNOS were abolished by inhibiting mitochondrial respiration, suggesting that Akt activation caused by NIR-II laser exposure involves mitochondrial retrograde signaling. Other inhibitors that inhibit known Akt activation pathways, including a specific inhibitor of PI3K, Src family PKC, did not affect this response. These two wavelengths of NIR-II laser induced no appreciable NO generation in cultured neuronal cells expressing neuronal NOS (nNOS). In short, NIR-II laser enhances bioavailable NO in endothelial cells. Since a hallmark of endothelial dysfunction is suppressed eNOS with concomitant NO deficiency, NIR-II laser technology could be broadly used to restore endothelial NO and treat or prevent cardiovascular diseases. Nitric Oxide;Nitric Oxide Synthase Type III;Proto-Oncogene Proteins c-akt Cells, Cultured;Endothelial Cells;Humans;Nitric Oxide;Nitric Oxide Synthase Type III;Phosphorylation;Proto-Oncogene Proteins c-akt

Light Emitting Diodes Irradiation Regulates miRNA-877-3p to Promote Cardiomyocyte Proliferation. Mammalian cardiomyocytes (CMs) maintain a low capacity for self-renewal in adulthood, therefore the induction of CMs cycle re-entry is an important approach to promote myocardial repair after injury. Recently, photobiomodulation (PBM) has been used to manipulate physiological activities of various tissues and organs by non-invasive means. Here, we demonstrate that conditioned PBM using light-emitting diodes with a wavelength of 630 nm (LED-Red) was capable of promoting the proliferation of neonatal CMs. Further studies showed that low-power LED-Red affected the expression of miR-877-3p and promoted the proliferation of CMs. In contrast, silencing of miR-877-3p partially abolished the pro-proliferative actions of LED-Red irradiation on CMs. Mechanistically, GADD45g was identified as a downstream target gene of miR-877-3p. Conditioned LED-Red irradiation also inhibited the expression of GADD45g in neonatal CMs. Moreover, GADD45g siRNA reversed the positive effect of LED-Red on the proliferation of neonatal CMs. Taken together, conditioned LED-Red irradiation increased miR-877-3p expression and promoted the proliferation of neonatal CMs by targeting GADD45g. This finding provides a new insight into the role of LED-Red irradiation in neonatal CMs biology and suggests its potential application in myocardial injury repair. MicroRNAs Animals;Cell Proliferation;Mammals;MicroRNAs;Myocardium;Myocytes, Cardiac

Reducing the GAP between science and clinic: lessons from academia and professional practice - part A: perceptual-auditory judgment of vocal quality, acoustic vocal signal analysis and voice self-assessment. During the XXVIII Brazilian Congress of SBFa, 24 specialists met and, from a leading position on scientific research as a tool for connecting laboratory and clinic, five fronts of knowledge of the voice specialty were discussed as following: Perceptual-auditory judgment of vocal quality; 2. Acoustic analysis of the vocal signal; 3. Voice self-assessment; 4. Traditional techniques of therapy; 5. Modern techniques of electrostimulation and photobiomodulation (PBMT) in voice. Part "a" of this publication was associated with the consolidation of the analyses of the first three aspects. The trend in the perceptual-auditory judgment of vocal quality was related to the use of standard protocols. The

acoustic evaluation of the vocal signal is accessible and can be done descriptively or by extraction of parameters, thus preferring multiparametric measures. Finally, the analysis of the individual himself closes this triad of voice documentation, which will be the basis for the conclusion of the evaluation, reference for monitoring progress, and evaluation of treatment results. Acoustics;Humans;Judgment;Professional Practice;Self-Assessment;Speech Acoustics;Voice Quality

Effect of photobiomodulation on pain control after clinical crown lengthening surgery. BACKGROUND: Photobiomodulation is a novel technique to reduce pain following different surgeries and treatments. This study aimed to investigate the effect of photobiomodulation on pain control after clinical crown lengthening procedures. METHODS: Twenty patients were included and randomly assigned to two groups in this single-blind randomized clinical trial. The patients had been referred to the Periodontics Department, Tabriz Faculty of Dentistry, for crown lengthening surgery. In the laser group, diode laser therapy with a wavelength of 860 nm and a power of 100 mW was applied immediately after the surgery on the surgery day and three and seven days after the surgery. In the control group, the laser was turned off, and passive radiation was applied to the area as the test group for 30 seconds per session in non-contact mode. The pain was assessed by a visual analog scale (VAS) questionnaire on the study timelines. Data were analyzed with SPSS 20 using ANOVA and post hoc Tukey tests. RESULTS: Twenty patients were included in each study group, where the pain was relieved significantly over time. On the first (5.50Â±1.18) and seventh (1.8Â±0.42) days, the pain intensity was similar in the test and control groups. However, on the third day, the laser group (2.90Â±0.74) experienced a significantly lower pain intensity than the control group (4.0Â±0.67). CONCLUSION: Photobiomodulation relieved pain after clinical crown lengthening surgeries.

Efficacy of prolonged application of low-level laser therapy combined with exercise in knee osteoarthritis: A randomized controlled double-blind study. OBJECTIVES: To investigate the effect of prolonged low-level laser therapy application combined with exercise on pain and disability in patients with osteoarthritis of the knee. DESIGN: A randomized controlled trial. SETTING: Special rehabilitation services. SUBJECTS: Forty-three participants with knee osteoarthritis. INTERVENTION: Following initial assessment, participants were randomly allocated to the Laser group (nâ€‰=â€‰22, 44 knees) and received low-level laser therapy while the Placebo group (nâ€‰=â€‰21, 42 knees) received placebo therapy three times a week for 3 weeks. Both groups then received low-level laser therapy combined with exercise three times a week for the following 8 weeks. MAIN OUTCOME MEASURES: The primary outcome was change in knee pain and disability (Lequesne). Secondary outcomes included change in mobility (Timed Up and Go test), range of motion (goniometer), muscular strength (dynamometer), activity (Western Ontario and McMaster Universities Osteoarthritis questionnaire), and medication intake and relief. RESULTS: Mean (SD) age of participants was 63.02 (9.9) years. Pain scores at baseline, 3 weeks, 11 weeks, and 6 months follow-up were 9.1 (1.3), 2.6 (2.3), 0.2 (0.9), and 0.2 (0.8) for the Laser group and 9.5 (8.0), 7.7 (5.3), 5.6 (2.4), and 7.4 (5.0) for the Placebo group, respectively. Disability scores at baseline, 3 weeks, 11 weeks, and 6 months follow-up were 14.9 (4.7), 7.6 (4.8), 3.9 (4.2), and 3.5 (4.1) for the Laser group and 17.8 (14.7), 15.2 (11.5), 11.6 (6.4), and 15.8 (11.9) for the Placebo Group, respectively. CONCLUSION: In participants with osteoarthritis of the knee, the isolated application of low-level laser therapy in the initial 3 weeks and combined with exercises in the final 8 weeks reduced pain, disability, and intake of medication over a 6-month period. Double-Blind Method;Exercise Therapy;Humans;Low-Level Light Therapy;Middle Aged;Osteoarthritis, Knee;Pain;Pain Measurement;Postural Balance;Time and Motion Studies;Treatment Outcome

Stimulatory effects of wavelength-dependent photobiomodulation on proliferation and angiogenesis of colorectal cancer. In recent decades, the laser treatment of cancer has been introduced as a promising treatment option. Because of the maldistribution of optical energy and an ambiguous

boundary between the normal and tumor tissues, laser irradiation can stimulate residual cancer cells, leading to a cancer regrowth. As photobiomodulation (PBM) is involved in an extensive range of cellular responses, profound comprehension of photo-stimulated mechanisms against the cancer cells is required to establish a safety margin for PBM. Therefore, we aimed to identify the stimulant effects of PBM at various wavelengths against the tumor cells to establish a safety margin for the laser treatment. CT26 murine colon cancer cells were exposed to either 405 (BL), 635 (VIS), or 808 (NIR) nm laser lights at the fluences of 0, 10, 30, and 50Â J/cm(2). In addition, CT26 tumor-bearing mice were irradiated with BL, VIS, or NIR at a fluence of 30Â J/cm(2). Both the proliferation and angiogenesis potential of the CT26 cells and tumors were evaluated using the MTT assay, western blot, and immunohistochemistry (IHC) staining analyses. Although cell viability was not statistically significant, BL significantly induced p-ERK upregulation in the CT26 cells, indicating that PBM with BL can stimulate proliferation. In vivo tests showed that the NIR group exhibited the maximum relative tumor volume, and BL yielded a slight increase compared to the control. In the IHC staining and western blot analyses, both BL and NIR increased the expression of EGFR, VEGF, MMP-9, and HIF-1Î±, which are related to the proliferation and angiogenesis-related factors. Further investigations will be pursued to clarify the molecular pathways that depend on the cancer cell types and laser wavelengths for the establishment of safety guidelines in clinical environments.
Animals;Cell Proliferation;Cell Survival;Colonic Neoplasms;Light;Low-Level Light Therapy;Mice

Effectiveness of low-level laser therapy after surgical removal of impacted mandibular third molars: A randomized clinical trial. INTRODUCTION: The low-level laser therapy has been accepted globally as cell bio-modulator, used to reach ideal therapeutic effects, acting in the reduction of the pain response, with anti-inflammatory effects, stimulating local micro-circulation and wounds repair, promoting a rapid recovery, which brings a better quality of life to the patient. In this study, we aim to to determine the effectiveness of low-level laser therapy on reducing the pain and swelling after removal of impacted third molars. MATERIALS AND METHODS: In this present prospective randomized clinical study, third molar surgeries were performed in thirty patients who were divided into two equal groups (placebo group and study group) a placebo group with routine treatment and a study group with low-level laser therapy which was applied both intraorally and extraorally after the surgical extraction of mandibular third molar. RESULTS: The parameters such as postoperative pain, edema, and trismus were assessed on 1(st) and 7(th) day. All these parameters showed statistically significant results in patients with low-level laser therapy. CONCLUSIONS: Low-level laser therapy was effective in reducing the postoperative pain, edema, and trismus in the third molar surgeries.

Photobiomodulation Therapy Combined with a Static Magnetic Field Applied in Different Moments Enhances Performance and Accelerates Muscle Recovery in CrossFitÂ® Athletes: A Randomized, Triple-Blind, Placebo-Controlled Crossover Trial. The ergogenic effects of photobiomodulation therapy combined with a static magnetic field (PBMT-sMF) on exercises with characteristics similar to those of CrossFitÂ® are unknown. This study was aimed at investigating the effects of PBMT-sMF applied at different times on recovery and physical performance in CrossFitÂ® athletes by analyzing functional aspects, muscle damage, inflammatory processes, and oxidative stress. This was a prospectively registered, triple-blinded, placebo-controlled, crossover trial. CrossFitÂ® athletes were recruited and assigned to receive one of the four possible interventions. Each intervention included protocols before and after the exercise (referred to as the workout of the day (WOD)). The four possibilities of intervention were as follows: placebo before and after WOD (placebo), PBMT-sMF before and placebo after WOD (PBMT-sMF before), placebo before and PBMT-sMF after WOD (PBMT-sMF after), and PBMT-sMF before and after WOD (PBMT-sMF before and after). The order of possibilities for the interventions was randomized. The primary outcome was the functional test performance. The secondary outcomes were the subjective perception of exertion, muscle damage,

inflammation, and oxidative stress. The outcomes were measured before the WOD; immediately after the intervention; and 1, 24, and 48 hours after the WOD. Statistical analysis was performed using repeated measures ANOVA followed by the Bonferroni post hoc test to examine the differences between the interventions at each time point. Twelve participants were randomized and analyzed for each sequence. PBMT-sMF enhanced the performance on functional tests (calculated as a percentage of change) when applied before or after WOD in the assessment performed immediately post-WOD and at 24 and 48 hours later ($p < 0.05$) compared to placebo and PBMT-sMF before and after WOD. In terms of the secondary outcomes, PBMT-sMF applied before or after WOD significantly decreased the creatine kinase, catalase, and superoxide dismutase activities and interleukin-6, thiobarbituric acid, and carbonylated protein levels (all $p < 0.05$) compared to the other possibilities of intervention. In addition, PBMT-sMF applied before and after WOD decreased creatine kinase activity at 24 hours and IL-6 levels at 24 and 48 hours compared to placebo ($p < 0.05$). None of the participants reported any adverse events. PBMT-sMF enhanced the performance of functional tests, decreased the levels of biochemical markers of muscle damage and inflammation, decreased oxidative stress, and increased antioxidant activity in CrossFitÂ® athletes when applied before or after WOD. Creatine Kinase Athletes;Creatine Kinase;Cross-Over Studies;Humans;Inflammation;Low-Level Light Therapy;Magnetic Fields;Muscle Fatigue;Muscle, Skeletal;Physical Functional Performance

Comparing the Use of Diode Lasers to Light-Emitting Diode Phototherapy in Oral Soft and Hard Tissue Procedures: A Literature Review. Objective: In dentistry, patient and physician adoption of diode lasers and light-emitting diodes (LEDs) continues to increase as research indicates that diode lasers and LEDs may be used for surgical and nonsurgical procedures. The goal of this literature review was to critically analyze randomized controlled trials and experimental trials to provide evidence-based recommendations on the therapeutic uses of diode lasers and LEDs in oral applications based on published efficacy and safety data. Methods: A literature review was performed of published literature on patients receiving periodontal and oral surgery treatment that included the use of diode lasers and/or the use of LED phototherapy to determine if the outcomes of phototherapy were superior to conventional therapy and if one form of phototherapy was superior to the other. Results: Eighteen original clinical trials and experimental studies were suitable for review. The diode laser was presented as an effective tool in soft tissue management due to its cutting precision, incision depth, analgesic effects, and elimination of bacterial load and in periodontal applications for probing depth reduction when used as an adjunct to scaling and root planing (SRP). LEDs also served as an effective tool for pain management, wound healing, and efficacy when used as an adjunct to SRP. Other than one study, all the available studies reviewed were either evaluating the efficacy of diode lasers or LEDs, but not both. Therefore, the results for determining the more effective tool were inconclusive. Conclusions: According to existent data, diode lasers and LEDs are equally effective tools for the phototherapy in periodontology and oral surgery. Although fewer studies exist examining the use of LED for phototherapy, the studies all revealed positive results. Further clinical comparative investigations utilizing both diode lasers and LED are needed to determine superiority of this application for periodontal management and oral surgery. Humans;Lasers, Semiconductor;Phototherapy;Root Planing;Wound Healing

The 532â€‰nm Laser Treatment Promotes the Proliferation of Tendon-Derived Stem Cells and Upregulates Nr4a1 to Stimulate Tenogenic Differentiation. Objective: This study aimed to verify the effect of photobiomodulation therapy (PBMT) with a wavelength of 532â€‰nm on the proliferation and differentiation of tendon-derived stem cells (TDSCs) of Sprague-Dawley (SD) rats. Background: The combination of PBMT and stem cell transplantation with TDSCs provides a new treatment strategy for tendon injury. Nevertheless, the effect of PBMT on the biological behavior of TDSCs and its internal mechanisms remain unclear. Methods: TDSCs were isolated from Achilles

tendons of SD rats and identified by cell morphology and flow cytometric analysis. Energy density gradient experiment was performed to determine the ideal energy. Then, TDSCs were treated with PBMT using a wavelength of 532â€‰nm at a fluence of 15â€‰J/cm(2) in 532â€‰nm laser group, and the TDSC in control group were not treated with 532â€‰nm laser. Cell response after irradiation was observed to ascertain cell morphology and cell proliferation in the 532â€‰nm laser group and the control group. The RNA expression levels of the key genes of TDSC differentiation, including scleraxis (Scx), tenomodulin (Tnmd), Mohawk homeobox (Mkx), Decorin (Dcn), peroxisome proliferator-activated receptor gamma (PPARÎ³), SRY-box transcription factor 9 (Sox9), and RUNX family transcription factor 2 (Runx2), were detected by reverse transcription-polymerase chain reaction. Then, gene chip microarray was used to detect the expression of differential genes after 532â€‰nm laser intervention in TDSCs, and the target genes were screened out to verify the role in this process in vitro and in vivo. Results: When the 532â€‰nm laser energy density was 15â€‰J/cm(2), the proliferation capacity of TDSCs was improved (2.73â€‰Â±â€‰0.24 vs. 1.81â€‰Â±â€‰0.71, pâ€‰<â€‰0.05), and the expression of genes related to tenogenic differentiation of TDSCs was significantly increased (pâ€‰<â€‰0.01). After RNA sequencing and bioinformatics analyses, we speculated that nuclear receptor subfamily 4 group A member 1 (Nr4a1) was involved in the tenogenic differentiation process of TDSCs regulated by 532â€‰nm laser treatment. Subsequent experiments confirmed that Nr4a1 regulated the expression of the tenogenic differentiation genes Scx and Tnmd in TDSCs. Conclusions: A 532â€‰nm laser with 15â€‰J/cm(2) regulated the process of TDSC proliferation and upregulated Nr4a1 to stimulate tenogenic differentiation. Transcription Factors Achilles Tendon;Animals;Cell Proliferation;Rats;Rats, Sprague-Dawley;Stem Cells;Transcription Factors

Photobiomodulation for Abdominal Aortic Aneurysm: Can It Work? Aortic Aneurysm, Abdominal;Humans

A Randomized Controlled Trial Evaluating the Levels of the Biomarkers hs-CRP, IL-6, and IL-8 in Patients with Temporomandibular Disorder Treated with LLLT, Traditional Conservative Treatment, and a Combination of Both. Temporomandibular disorders (TMDs) are a type of idiopathic orofacial pain. Inflammation, particularly elevated circulating levels of high-sensitivity C-reactive protein (hs-CRP), interleukin-6 (IL-6), and interleukin-8 (IL-8), has been linked to pain symptoms. The purpose of this study was to compare hs-CRP, IL-6, and IL-8 biomarkers and pain intensity with different treatment strategies (LLLT, standard conservative treatment, and combination) for TMD patients. METHODS: A total of 32 participants were randomly included in the study and divided into three groups (Group I, Group II, and Group III) referred from the Dental Clinic, School of Dental Science, HUSM. Patients received LLLT (Groups II and III) in five sessions for the duration of 10 days. Patients in Groups I and III received standard conservative TMD treatment (diet and stress counseling, jaw exercises, physical therapy, which was a hot towel application) by the principal investigator. All blood samples for biomarkers were performed before starting treatments and directly after finishing the treatment protocols, where all results were recorded. RESULTS: The result showed a significant difference in the mean IL-8 ($p = 0.001$) between the three intervention groups (LLLT, standard treatment, and combined treatment). IL-6 showed an increase in the mean of IL-6 levels from baseline to post-treatment with a better mean in the LLLT treatment group without any significant differences. Additionally, there were no significant mean differences found between the groups and in the group for the hs-CRP biomarker. CONCLUSIONS: A statistically non-significant difference was found in hs-CRP and IL-6 before and after LLLT, conservative, and combined treatment strategies of TMD. A statistically significant difference was observed in the mean levels of IL-8 between the LLLT intervention group and the combined treatment group. Although there was no statistically significant correlation between pain intensity and biomarkers, a statistically significant

difference was found in pain intensity before and after LLLT, conservative, and combined treatment strategies. TMJ degeneration could be exacerbated by elevated IL-8 levels. Thus, this can be an important biomarker to mark or identify the painful condition of TMJ. Biomarkers;Interleukin-6;Interleukin-8;C-Reactive Protein Biomarkers;C-Reactive Protein;Conservative Treatment;Facial Pain;Humans;Interleukin-6;Interleukin-8;Low-Level Light Therapy;Temporomandibular Joint Disorders;Treatment Outcome

A randomized double-blinded controlled trial on the effects of photobiomodulation therapy in dogs with osteoarthritis. OBJECTIVE: To evaluate photobiomodulation therapy in dogs with bilateral hip osteoarthritis. ANIMALS: 20 dogs. PROCEDURES: Forty joints were assigned to a control group (CG; n = 20) or treatment group (photobiomodulation therapy [PBMT]; 20). CG received a 21-day course of meloxicam, and PBMT received treatment with a Class IV therapeutic laser over 3 weeks. Joint range of motion, thigh girth, the Canine Brief Pain Inventory (divided into pain interference score [PIS] and pain severity score [PSS]), Hudson Visual Analogue Scale, Liverpool Osteoarthritis in Dogs, and Canine Orthopedic Index (COI; divided into function, gait, stiffness, and quality of life) were evaluated before treatment, +8, +15, +30, +60, and +90 days after initial treatment. Results were analyzed with repeated measures ANOVA or Wilcoxon signed ranks test, $P < 0.05$. Kaplan-Meier estimators were compared with the Breslow test. RESULTS: Patients had a mean age of 8.3 Â± 1.9 years and body weight of 65.7 Â± 12.1lb. Osteoarthritis was classified as moderate (n = 26) and severe (14). No differences were found at time 0. Better results were observed in PBMT at +8 days ($P = 0.01$ for PSS, $P = 0.04$ for function and COI), +15 days ($P = 0.01$ for PSS and function, $P = 0.02$ for PIS and function, $P = 0.03$ for COI and $P = 0.04$ for Liverpool Osteoarthritis in Dogs [LOAD]) and +30 days ($P = 0.01$ for function and gait, $P = 0.02$ for COI, and $P = 0.04$ for PIS, PSS, and LOAD). Joint range of motion improved in PBMT from +15 to 90 days. Kaplan-Meier estimators showed that PBMT produced longer periods with better results. CLINICAL RELEVANCE: PBMT reduced pain levels and improved clinical findings in dogs with hip osteoarthritis. Animals;Dog Diseases;Dogs;Low-Level Light Therapy;Osteoarthritis, Hip;Pain;Quality of Life

Visible red light does not induce DNA damage in human dermal fibroblasts. Visible red light (RL) therapy is a rapidly expanding treatment option for dermatological conditions, including acne, psoriasis and chronic wounds. It is currently unknown if high fluences of RL induce DNA damage via reactive oxygen species (ROS) stress or other pathways. Our lab previously demonstrated that RL generates ROS in human dermal fibroblasts (HDFs). Other studies show that UV and blue light generate ROS and DNA damage in fibroblasts. This study aims to determine if RL induces DNA damage in HDFs. We found that 320â€‰J/cm(2) , 640â€‰J/cm(2) and 1280â€‰J/cm(2) RL (633â€‰Â±â€‰6Â nm) did not measurably increase DNA damage in the form of cyclobutane pyrimidine dimers (CPD) or 6-4 photoproducts (6-4PP) immediately, 3â€‰hours and 24â€‰hours following irradiation. Our study further supports that RL therapy is safe in human skin fibroblasts. Reactive Oxygen Species Humans;Reactive Oxygen Species;Fibroblasts;Skin;Light;DNA Damage;Ultraviolet Rays

The Effect of Low-Level Laser Therapy in Combination with Leukocyte- and Platelet- Rich Fibrin on Bone Regeneration in Rabbits' Calvarial Defects: Histologic and Histomorphometric Studies. OBJECTIVE: Bone regeneration is a desired treatment outcome in implant dentistry. The primary goal of the current investigation was to assess the joint effect of low-level laser therapy (LLLT) and leukocyte- and platelet-rich fibrin (PRF) on new bone formation. MATERIALS AND METHODS: During this experiment study, forty bone defects (8 mm in diameter) were generated in the calvaria of ten New-Zealand white rabbits. defects were filled with autogenous bone defined as the control group, autogenous bone with leukocyte- and PRF (PRF group), autogenous bone and low-level diode laser radiation (LLLT group), and autogenous bone with leukocyte- and PRF and low-level laser radiation

(LP group). Laser irradiation was done every second day for 2 weeks after surgery. Five rabbits were randomly selected to be sacrificed on postoperative weeks 4 and 8. On one and two-month post-surgery, histological and histomorphometric parameters including bone formation, fibroblast, and osteoblast were assessed. RESULTS: The histological panel depicted that the ratio of fresh bone formation increased at one-and two-month postsurgery in all treatment groups compared to the control group. The most favorable results were seen in the LP group, followed by the PRF group. Based on the ANOVA test, bone neoformation was statistically significant in the LP group in comparison with the control group (P<0.001). One-month post-surgery, a higher degree of fibroblast was seen in the control group, while the last place was for LP group (118.6 Â± 6.9 vs. 24.0 Â± 3.2). In the PRF group, the percentage of bone formation was higher than that in the control group (13.2 Â± 2.8 vs. 2.0 Â± 1.2), but no significant difference when compared to the LP group (13.2 Â± 2.8 vs. 19.0 Â±.3.8). CONCLUSION: The combined L-PRF and LLLT was more likely to have a positive effect on accelerating bone regeneration and reducing fibrosis.

The Low-Fluence Q-Switched Nd:YAG Laser Treatment for Melasma: A Systematic Review. Melasma is a common pigmentary disorder with a complex pathogenesis, of which the treatment is challenging. Conventional treatment often leads to inconsistent results with unexpected pigmentary side effects and high recurrence rates. Recently, the low-fluence Q-switched Nd:YAG laser (LFQSNY) has been widely used for treating melasma, especially in Asia. We reviewed literatures on the LFQSNY treatment of melasma published between 2009 and May 2022 to evaluate the efficacy and adverse events, including its combination therapy. A systematic PubMed search was conducted and a total of 42 articles were included in this study. It was hard to summarize the heterogenous studies, but LFQSNY appeared to be a generally effective and safe treatment for melasma considering the results of previous conventional therapies. However, mottled hypopigmentation has been occasionally reported to develop and persist as an adverse event of LFQSNY, which may be associated with the high accumulated laser energy. When used aggressively, even LFQSNY can induce hyperpigmentation via unwanted inflammation, especially in darker skin. Although few studies have reported considerable recurrence rates three months after treatment, unfortunately, there is a lack of the long-term follow-up results of LFQSNY in melasma. To enhance the effectiveness and reduce the adverse events, LFQSNY has been used in combination with other treatment modalities in melasma, including topical bleaching agents, oral tranexamic acid, chemical peeling, or diverse energy-based devices, which generally reduced side effects with or without significant superior efficacy compared to LFQSNY alone. Combined Modality Therapy;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Immediate Evaluation of the Effect of Infrared LED Photobiomodulation on Childhood Sleep Bruxism: A Randomized Clinical Trial. The gold standard for the management of sleep bruxism (SB) is the use of a rigid occlusal splint; however, there are limitations for its use in children and alternatives to the management of SB are needed. Photobiomodulation therapy has been used with positive results in temporomandibular disorders. This study aimed to evaluate the effects of photobiomodulation therapy with infrared LED in children with SB. Thirty children were divided into three groups: Group 1: control/absence of bruxism (n = 10); Group 2: SB treated with infrared LED (n = 10); Group 3: SB treated with occlusal splint (n = 10). Electromyographic evaluation of masseter, anterior temporalis, and upper trapezius, and salivary dopamine levels were assessed before and after treatments. Data were statistically analyzed using two-way mixed model ANOVA. An increase in the temporalis and right masseter EMG activity at rest was observed in Group 3, with large effect size ($p < 0.05$). Left masseter and temporalis EMG activity did not differ over time in the LED group, similar to the control group. Moreover, the EMG activity of masticatory muscles during chewing and upper trapezius muscle did not differ over time in all groups. The results also pointed to a difference in the levels of

dopamine between children with and without SB, with Group 3 showing higher levels in the pre-treatment time compared to controls ($p < 0.025$). In conclusion, an increase in the masticatory muscles activity at rest was observed in children undergoing splint therapy. Moreover, a difference in the levels of salivary dopamine was found between children with and without SB.

Therapeutic Potential of Photobiomodulation for Chronic Kidney Disease. Chronic kidney disease (CKD) is a growing global public health problem. The implementation of evidence-based clinical practices only defers the development of kidney failure. Death, transplantation, or dialysis are the consequences of kidney failure, resulting in a significant burden on the health system. Hence, innovative therapeutic strategies are urgently needed due to the limitations of current interventions. Photobiomodulation (PBM), a form of non-thermal light therapy, effectively mitigates mitochondrial dysfunction, reactive oxidative stress, inflammation, and gut microbiota dysbiosis, all of which are inherent in CKD. Preliminary studies suggest the benefits of PBM in multiple diseases, including CKD. Hence, this review will provide a concise summary of the underlying action mechanisms of PBM and its potential therapeutic effects on CKD. Based on the findings, PBM may represent a novel, non-invasive and non-pharmacological therapy for CKD, although more studies are necessary before PBM can be widely recommended. Dysbiosis;Gastrointestinal Microbiome;Humans;Inflammation;Low-Level Light Therapy;Renal Dialysis;Renal Insufficiency, Chronic

The Efficacy of Low-Level Laser Therapy Combined with Single Flap Periodontal Surgery in the Management of Intrabony Periodontal Defects: A Randomized Controlled Trial. This study aimed at assessing the clinical outcomes of the Single Flap Approach (SFA) with the additional use of Low-level laser therapy (LLLT). The defects were treated as per the principles of SFA, whereby 20 defects received only SFA (control group) and 20 defects received additional LLLT for bio stimulation/bio modulation (test group). Stable primary closure of the flaps was obtained with vertical internal mattress sutures. Plaque indices (FMPS), clinical attachment levels (CAL), probing pocket depth (PPD), and gingival bleeding scores (FMBS) were calculated at baseline, and at the 3rd and 6th months in both groups. An EHI score of 1 was observed at all sites except for two, where a score of 2 in the control group at week 2 was observed. In the test group, the PPD reduction at 6 months was 3.60 Â± 0.95 and in the control group it was 3.75 Â± 0.91 mm. CAL gain at 6 months was 2.70 Â± 1.36 mm and 3.45 Â± 1.2 mm in the test group and showed no statistical significance. These data suggested the positive effect of LLLT over CAL gain; thus, LLLT may be combined with SFA to potentially enhance the early wound healing and higher clinical outcomes in terms of increase in CAL and decrease in PPD.

Effectiveness of multiwave locked system laser on the treatment of patients with idiopathic Bell's palsy: a randomized double-blind placebo controlled trial. The objective of this study is to investigate the effect of scanning and point application of multiwave locked system (MLS) laser therapy on the recovery of patients with idiopathic Bell's palsy (IBP). A randomized double-blind placebo-controlled trial was carried out on 60 patients with subacute BP. Patients were randomly assigned into three groups of 20 patients each. Facial massage and facial exercises were applied to all patients. Group one received MLS laser as a manual scanning technique (10Â J/cm(2), area 50cm(2), total energy 500Â J). Group two received MLS laser using point application technique (10Â J/point, 8 points, total 80Â J). Group three received placebo laser. House-Brackmann scale (HBS) and facial disability index (FDI) were used to evaluate the facial recovery. Assessment was performed at baseline and after 3 and 6Â weeks of treatment. Comparison within and between groups was performed statistically with significance level pâ€‰<â€‰0.05. Results showed significant improvement in the FDI and HBS after treatment in all groups. Both scanning and point application significantly improved the score of FDI and HBS more than placebo group. Scanning technique combined with facial massage and exercises had a more significant effect than the point application

group or the placebo group in improving FDI and HBS scores after 3 and 6Â weeks of treatment. The MLS laser is an effective physiotherapy method used for the treatment of patients with IBP. MLS laser in scanning or point application techniques was more effective than exercise alone with greater effect of scanning technique than point application technique. Humans;Bell Palsy;Double-Blind Method;Lasers;Low-Level Light Therapy

Single and combined 1064â€‰nm Q-switched Nd: YAG laser therapy in melasma: A meta-analysis. PURPOSE: This article attempted to describe the efficacy and safety of 1064QNYL in combination with other treatments for refractory melasma. METHODS: Two researchers independently retrieved randomized controlled trials (RCTs) according to inclusion and exclusion criteria. Primary outcome was evaluated with MASI and mMASI scores in control group and experiment group. The secondary outcome was evaluated with MI scores. We calculated 95% CI of standardized mean difference (SMD) and heterogeneity of the included literature by Higgins I(2) test, and assessed publication bias by Funnel plots, Egger's, and Begg's tests. RESULTS: A total of 12 articles including 322 subjects were analyzed. Experiment group was treated with 1064QNYL combined with single treatment (e.g., PDL, IPL, RF, and TA). Control group was treated with 1064QNYL alone. A greater reduction of Melasma Area and Severity Index (MASI)/modified Melasma Area and Severity Index (mMASI) scores were shown in experiment group than that in control group at the end of the treatment (SMD, -0.37; 95% CI -0.70 to -0.04, pÂ =Â 0.03, I(2) Â =â€‰33%). The SMD of MI scores further supported this conclusion by -0.32 (95% CI -0.63 to -0.02, pÂ =Â 0.04, I(2) Â =â€‰27%). As for adverse events (AEs), combined treatment gave rise to more mild burning, stinging, and erythema that resolved spontaneously. Several studies reported focal purpura, punctate leukoderma, hyperpigmentation, hypopigmentation, and so on. CONCLUSION: Combined 1064QNYL treatment was better than single laser treatment, with the highest short-term benefit and long-term follow-up to maintain the effect in favor of combined treatment. Humans;Hyperpigmentation;Hypopigmentation;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Photobiomodulation Improves Serum Cytokine Response in Mild to Moderate COVID-19: The First Randomized, Double-Blind, Placebo Controlled, Pilot Study. BACKGROUND: Because the major event in COVID-19 is the release of pre- and inflammatory cytokines, finding a reliable therapeutic strategy to inhibit this release, help patients manage organ damage and avoid ICU admission or severe disease progression is of paramount importance. Photobiomodulation (PBM), based on numerous studies, may help in this regard, and the present study sought to evaluate the effects of said technology on cytokine reduction. METHODS: This study was conducted in the 2nd half of 2021. The current study included 52 mild-to-moderately ill COVID-19, hospitalized patients. They were divided in two groups: a Placebo group and a PBM group, treated with PBM (620-635 nm light via 8 LEDs that provide an energy density of 45.40 J/cm(2) and a power density of 0.12 W/cm(2)), twice daily for three days, along with classical approved treatment. 28 patients were in Placebo group and 24 in PBM group. In both groups, blood samples were taken four times in three days and serum IL-6, IL-8, IL-10, and TNF-Î± levels were determined. RESULTS: During the study period, in PBM group, there was a significant decrease in serum levels of IL-6 (-82.5% +/- 4, P<0.001), IL-8 (-54.4% Â± 8, P<0.001), and TNF-Î± (-82.4% Â± 8, P<0.001), although we did not detect a significant change in IL-10 during the study. The IL-6/IL-10 Ratio also improved in PBM group. The Placebo group showed no decrease or even an increase in these parameters. There were no reported complications or sequelae due to PBM therapy throughout the study. CONCLUSION: The major cytokines in COVID-19 pathophysiology, including IL-6, IL-8, and TNF-Î±, responded positively to PBM therapy and opened a new window for inhibiting and managing a cytokine storm within only 3-10 days. Cytokines;Interleukin-6;Interleukin-8;Tumor Necrosis Factor-alpha;Interleukin-10 COVID-

19;Cytokines;Humans;Interleukin-10;Interleukin-6;Interleukin-8;Pilot Projects;Tumor Necrosis Factor-alpha

Quality Assessment of PBM Protocols for Oral Complications in Head and Neck Cancer Patients: Part 1. BACKGROUND: Radiotherapy and chemotherapy are frequently employed in head and neck cancer (HNC) patients causing significant side effects that impair life quality and prognosis. Photobiomodulation (PBM) has become a growing approach to managing such oral complications. Despite its proven efficacy and absence of contraindications, there is still a lack of universally accepted disease-specific PBM protocols. OBJECTIVE: A narrative review was conducted to identify the current proposals relating to the use of PBM to treat complications of oncological treatments in HNC patients. METHODS: An electronic search in PubMed and Scopus databases was performed with the following keywords: ("photobiomodulation" OR "PBM" OR "laser therapy" OR "LLLT" OR "laser") AND ("head and neck cancer" OR "oral cancer") AND ("mucositis" OR "oral mucositis" OR "dysgeusia" OR "oedema" OR "xerostomia" OR "dermatitis" OR "trismus") until October 2021. RESULTS: A total of 35 papers were included in the narrative review. Oral mucositis was the most studied complication, and advisable protocols are conceivable. Although there is a growing interest in PBM to manage of xerostomia, radiodermatitis, pain, and trismus, literature is still scarce to propose a universally feasible protocol. CONCLUSIONS: PBM therapy could significantly prevent or reduce the severity of many side effects related to cancer therapies. More research is needed to obtain recommendations over the preferable parameters.

Light Emitting Diode Photobiomodulation Enhances Oxidative Redox Capacity in Murine Macrophages Stimulated with Bothrops jararacussu Venom and Isolated PLA(2)s. Photobiomodulation therapy associated with conventional antivenom treatment has been shown to be effective in reducing the local effects caused by bothropic venoms in preclinical studies. In this study, we analyzed the influence of photobiomodulation using light emitting diode (LED) on the oxidative stress produced by murine macrophages stimulated with Bothrops jararacussu venom and it isolated toxins BthTX-I and BthTX-II. Under LED treatment, we evaluated the activity of the antioxidant enzymes catalase, superoxide dismutase, and peroxidase as well as the release of hydrogen peroxide and the enzyme lactate dehydrogenase. To investigate whether NADPH oxidase complex activation and mitochondrial pathways could contribute to hydrogen peroxide production by macrophages, we tested the effect of two selective inhibitors, apocynin and CCCP3, respectively. Our results showed that LED therapy was able to decrease the production of hydrogen peroxide and the liberation of lactate dehydrogenase, indicating less cell damage. In addition, the antioxidant enzymes catalase, superoxide dismutase, and peroxidase increased in response to LED treatment. The effect of LED treatment on macrophages was inhibited by CCCP3, but not by apocynin. These findings show that LED photobiomodulation treatment protects macrophages, at least in part, by reducing oxidative stress caused B. jararacussu venom and toxins. Antioxidants;Crotalid Venoms;Hydrogen Peroxide;Lactate Dehydrogenases;Catalase;Superoxide Dismutase Animals;Antioxidants;Bothrops;Catalase;Crotalid Venoms;Hydrogen Peroxide;Lactate Dehydrogenases;Macrophages;Mice;Oxidation-Reduction;Oxidative Stress;Superoxide Dismutase

Photobiomodulation therapy and 3% potassium nitrate gel as treatment of cervical dentin hypersensitivity: a randomized clinical trial. OBJECTIVES: This randomized controlled trial aimed to evaluate different protocols for dentin hypersensitivity treatment with low-power lasers and desensitizing agents, and the association between low-power lasers and desensitizing agents. MATERIALS AND METHODS: Fifty-four patients (303 teeth) were randomly allocated to three groups: G1, 3% nitrate potassium gel, UltraEZ (nâ€‰=â€‰17); G2, photobiomodulation therapy (PBM) with a low-level infrared laser (nâ€‰=â€‰17), 100 mW, spot size of 0.028 cm(2), and dose of 1Â J per point; and G3, nitrate potassiumâ€‰+â€‰PBM (nâ€‰=â€‰20). Treatments were applied to the

buccal cervical region at intervals of 72Â h, and all protocols were performed in three sessions. The patients' response to evaporative stimuli was rated using the visual analog scale (VAS). Re-evaluations were performed immediately after each application and 1Â week, 1Â month, and 3Â months after treatment. A two-way repeated measures test and Tukey's post hoc test were used for multiple comparisons (Î±â€‰=â€‰5%). RESULTS: There was a reduction in pain levels at the end of treatment in all groups. There were no significant differences in VAS score changes between the groups immediately after treatment and after the third month, compared to the baseline (pâ€‰>â€‰0.05). CONCLUSION: Under the limitations of this in vivo study, the proposed three-session protocol was effective in reducing dentin hypersensitivity after 3Â months, regardless of the desensitization mechanism used. Conservative and long-term protocols are interesting for the control of pain caused by dentin hypersensitivity. CLINICAL RELEVANCE: The increase in cervical dentin hypersensitivity prevalence warrants easy-to-apply and long-lasting desensitizing protocols for pain control. potassium nitrate;Nitrates;Potassium;Dentin Desensitizing Agents Humans;Dentin Sensitivity;Low-Level Light Therapy;Nitrates;Pain;Potassium;Dentin Desensitizing Agents;Treatment Outcome

Photobiomodulation Literature Watch February 2022.

Optimization of the Duration and Dose of Photobiomodulation Therapy (660â€‰nm Laser) for Spinal Cord Injury in Rats. Objective: Spinal cord injury (SCI) causes motor deficits, urinary incontinence, and neuropathic pain. This study was designed to optimize a photobiomodulation therapy (PBMT) protocol using a continuous wave (CW) 660â€‰nm laser in rats with SCI. Specifically, the number of days of irradiation and the daily dose of PBMT were investigated. Methods: The study was performed in two steps. In the first step, a comparison between the effects of PBMT (45â€‰sec) daily for 2 and 4 weeks on pain and movement [Basso, Beattie, and Brenham (BBB) score] was made. In the second step, a comparison between different durations of irradiation (27, 45, 90, and 117â€‰sec) was performed. PBMT used a 100â€‰mW laser delivered to 9 points on and around the lesion site. Oxidative stress, fibroblast invasion, and time to achieve spontaneous urination were also assessed. Results: The improvement in movement and pain stopped with discontinuation of radiation at week 2 and fibroblast invasion resumed. No improvement was seen in movement and pain in the group receiving PBMT for 27â€‰sec compared with the groups receiving higher doses of laser radiation. Animals receiving 117â€‰sec of photobiomodulation showed a higher BBB score even in the first 3 days. Conclusions: The number of days is an important factor for improving mobility; however, the daily dose of radiation is more important for pain relief. Animals;Lasers;Low-Level Light Therapy;Neuralgia;Rats;Spinal Cord Injuries

Shifting patterns of cellular energy production (adenosine triphosphate) over the day and key timings for the effect of optical manipulation. Mitochondria are optically responsive organelles producing energy for cell function via adenosine triphosphate (ATP). But ATP production appears to vary over the day. Here we use Drosophila melanogaster to reveal daily shifts in whole animal ATP production in a tight 24â€‰hours' time series. We show a marked production peak in the morning that declines around midday and remains low through afternoon and night. ATP production can be improved with long wavelengths (>660â€‰nm), but apparently not at all times. Hence, we treated flies with 670â€‰nm light to reveal optimum times. Exposures at 670â€‰nm resulted in a significant ATP increases and a shift in the ATP/adenosine diphosphate (ADP) ratio at 8.00 and 11.00, whilst application at other time points had no effect. Hence, light-induced ATP increases appear limited to periods when natural production is high. In summary, long wavelength influences on mitochondria are conserved across species from fly to human. Determining times for their administration to improve function in ageing and disease are of key importance. This study

progresses this problem. Adenosine Diphosphate;Adenosine Triphosphate Adenosine Diphosphate;Adenosine Triphosphate;Aging;Animals;Drosophila melanogaster;Humans;Mitochondria

Effects of photobiomodulation on re-epithelialization of burn wound: protocol for a randomized controlled trial. BACKGROUND: Burns are a global public health problem and cause approximately 180,000 deaths annually, mainly in low- and middle-income countries. Topical antibiotics and occlusive dressing are standard treatments for burns not requiring a skin graft. However, physiotherapy has low-cost phototherapeutic and electrophysical resources (e.g., light-emitting diode [LED]) that may accelerate burn healing. This study aims to compare the re-epithelialization rate of second-degree burns, pain, pruritus, skin temperature, quality of wound healing, and scar quality and mobility among individuals undergoing treatment with red LED, infrared LED, and simulated photobiomodulation. METHODS: This is a double-blinded, three-arm parallel-group, randomized controlled superiority trial. Individuals of both sexes, aged over 18 years, and with second-degree burns will be included. The sample will be divided into three groups of 13 individuals: two will receive LED therapy (red or infrared) and one placebo. Pain, pruritus, skin temperature, and wound size will be assessed daily. Interventions will take place until complete healing, when scar mobility and quality will be evaluated. Data will be presented as mean and 95% confidence interval and analyzed using mixed linear models. DISCUSSION: This randomized controlled trial has minimal risk of bias and intends to identify the ideal type, procedures, and doses of photobiomodulation to heal burns, which are not standardized in clinical practice. Positive results will allow the implementation of the technique in burn and wound guidelines. TRIAL REGISTRATION: Brazilian Clinical Trials Registry (ReBEC) RBR-8bfznx6 . Registered on October 13, 2021. Adult;Burns;Cicatrix;Female;Humans;Male;Pain;Pruritus;Randomized Controlled Trials as Topic;Re-Epithelialization

Features of cellular and molecular mechanisms of re-gulation of reparative processes in chronic wounds using photobiomodulation therapy. Treatment of chronic wounds is an urgent worldwide problem for medicine. Among the many efforts in wound healing techniques, photobiomodulation therapy has shown promising results. Low-Level Light Therapy;Wound Healing

Red Light Phototherapy Using Light-Emitting Diodes Inhibits Melanoma Proliferation and Alters Tumor Microenvironments. BACKGROUND: Total annual cancer rates have decreased due to improved treatment and prevention. However, the incidence of melanoma is rising, and not all patients respond to immune and targeted approaches. Therefore, we sought to determine the efficacy of red light (RL) phototherapy in preclinical models of melanoma. METHODS: Melanoma cells (A375, B16F10, MNT-1) were irradiated with RL. Melanoma proliferation, apoptosis, oxidative stress, and p53 phosphorylation were measured in vitro. In C57BL/6 mice, phototherapy safety, B16F10 tumor growth, and immunocyte infiltration were assessed following RL. RESULTS: In vitro, 640 J/cm(2) RL decreased cellular proliferation without increasing apoptosis, while 1280 J/cm(2) increased apoptosis. RL increased intracellular reactive oxygen species generation and p53 phosphorylation. In animal models, 2560 J/cm(2) RL significantly prevented melanoma growth and increased the expression of CD103+ dendritic cells. 1280 and 1920 J/cm(2) RL decreased tumor volume, but not significantly. RL did not cause skin inflammation or erythema in normal skin. CONCLUSION: RL represents a potentially safe and effective melanoma therapeutic. RL prevented tumor growth and increased the expression of immune markers, such as CD103, that are associated with favorable melanoma outcomes. Further research is needed to determine the optimal clinical treatment regimen for melanoma using RL.

Phototherapy for Cognitive Function in Patients With Dementia: A Systematic Review and Meta-Analysis. BACKGROUND: Dementia is a major health burden worldwide. As numerous

pharmacological trials for dementia have failed, emerging phototherapy studies have evaluated the efficacy of alternative therapies for cognition. OBJECTIVE: The objective of this study was to evaluate the association between phototherapy and changes in cognitive deficits in patients with dementia. METHODS: PubMed, Embase, Web of Science, PsycINFO, CINAHL, and Cochrane Central Register of Controlled Trials were searched from inception to 27 March 2022. Inclusion criteria were controlled clinical trials of phototherapy interventions reporting pre-post changes in global cognitive function and subdomains in patients with dementia. Data were extracted by two independent reviewers and pooled in random-effects models. Subgroup and meta-regression analyses were conducted to investigate the sources of heterogeneity. RESULTS: Our analyses included 13 studies enrolling a total of 608 participants. Phototherapy showed significant associations with improvements of global cognitive function (standardized mean difference [SMD], 0.63; 95% confidence interval [CI], 0.33-0.94; P < 0.001) and subdomains, especially with respect to attention, executive function, and working memory. Near-infrared (NIR) light-emitting diodes (LEDs) photobiomodulation (SMD, 0.91; 95% CI, 0.46-1.36; P < 0.001) and lasers (SMD, 0.99; 95% CI, 0.56-1.43; P < 0.001) showed more significant associations with improved cognitive functions when compared with normal visible light. In addition, the effect sizes of short-term effects (SMD, 0.63; 95% CI, 0.33-0.94; P < 0.001) were larger than effects assessed in long-term follow-up (SMD, 0.49; 95% CI, -0.24-1.21; P = 0.189). CONCLUSION: In this meta-analysis, phototherapy interventions were associated with cognitive improvement in patients with dementia. NIR LEDs and lasers had advantages over normal visible light. Domain-specific effects were indicated for attention, executive function, and working memory. Short-term improvement after phototherapy was supported, while evidence for long-term benefits was lacking. Stronger evidence for individualized parameters, such as optimal dosing, is needed in the future. SYSTEMATIC REVIEW REGISTRATION: [https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=267596], identifier [CRD42021267596].

Wound contraction rate in excised and unexcised burn wounds with laser photobiomodulation: Systematic review and meta-analysis of preclinical studies. INTRODUCTION: Laser photobiomodulation (laser PBM) is an effective means of accelerating burn wound contraction, however it is still unclear whether laser PBM produces greater benefit when applied directly to excised and unexcised burn wounds . The aim of this systematic review of preclinical studies was to determine the effectiveness of laser PBM in the wound contraction rate in excised and unexcised burn wounds. MATERIALS AND METHODS: A systematic search was conducted in the EMBASE, MEDLINE and LILACS databases. Preclinical studies were included that analysed the effectiveness of laser PBM in burn wound contraction, and assessed wound closure. The SYRCLE risk of bias tool was used. Random effects models were used to estimate the pooled effect. RESULTS: Thirteen studies were included in the qualitative analysis and six in the quantitative analysis. Two weeks after the lesion, laser PBM favoured the wound contraction percentage, increasing the closure rate in excised burn wounds (SMD= 1.34, CI 95% 0.41 to 2.27, 0.41-2.27, I(2)=0%, =0%, low certainty of evidence. In unexcised burns, it was uncertain whether laser PBM increased or diminished the wound contraction rate (SMD=1.22(SMD=1.22 CI 95% -0.05 to 2.49, I(2)=68%; =68%; very low certainty of evidence). CONCLUSIONS: In the animal model, laser PBM is effective in increasing the wound contraction rate in excised burns. However, due to the low certainty of the evidence, uncertainty remains about the true magnitude of the effect of laser on wound contraction in animals; our results should therefore be interpreted with caution. Animals;Burns;Wound Healing;Lasers

Conservative therapy in ulnar neuropathy at the elbow (Review). Ulnar neuropathy at the elbow (UNE) is the second most frequent entrapment syndrome in the upper limb after carpal tunnel syndrome. Clinical features are validated through electromyographic and sonographic examination.

Although the two aforementioned entrapment syndromes share common pathophysiological traits, the conservative treatment approach for mild and moderate cases of UNE differs from that for median nerve entrapment. The present study identified 23 different types of scientific articles aimed to address this issue. The research stressed the importance of patient education and activity modification. Night splinting offers clinical and functional improvement. Although corticosteroid injections play a role in selected cases, their utility remains to be validated. Physiotherapy trials evaluated ultrasound, low-level laser therapy, diathermy, extracorporeal shock wave therapy and dry cupping. Neurodynamic mobilization may add value to therapeutic approaches and should be a part of it.

The In-Vitro Effect of Homeopathically Prepared Rubus idaeus and 680â€‰nm Laser Irradiation on Cervical Cancer Cells. BACKGROUND: â€ƒCervical cancer (CC) is the second leading cancer in women and is the most common in those aged 15 to 44 years. Medicinal plant extracts have been used as homeopathic preparations for health benefits. Rubus idaeus (RI) is used to treat disorders of the female genital tract and produces cytotoxic effects. However, the use of homeopathically prepared RI in combination with low level laser therapy has not previously been explored. AIM: â€ƒThe study aims to investigate the in-vitro effects of homeopathically prepared RI alone and in combination as a potential photosensitizer with Low-level laser irradiation (LLLI) at fluencies of 5, 10, and 15â€‰J/cm(2). METHODS: â€ƒHeLa CC cells were treated with RI (D3, D6, and 30cH homeopathic preparations). Cells were then treated with RI IC(50) and 680â€‰nm laser diode at 5, 10, and 15â€‰J/cm(2) fluencies, and the results compared with untreated control cells. Trypan blue viability, lactate dehydrogenase (LDH) cytotoxicity, and adenosine triphosphate (ATP) proliferation assays were used to analyze the cellular dose-responses along with inverted microscopy, Hoechst staining and Annexin-V/PI staining. RESULTS: â€ƒRI D3 alone demonstrated an ability to reduce cellular viability to 59% and also to reduce ATP levels. The subsequent combined treatment protocol of RI D3 with all fluencies of laser demonstrated an increase in cellular ATP and increased LDH levels compared with the control. CONCLUSION: â€ƒThe increased ATP and LDH levels observed in the combined treatment protocol of 680â€‰nm laser and RI D3 at fluencies of 5, 10 and 15â€‰J/cm(2), show that the Warburg effect might have been induced in the CC cells - an increase in glucose uptake and the preferential production of lactate, even in the presence of oxygen. More research, including work on other cell lines, needs to be conducted to identify if RI and perhaps a different wavelength of laser irradiation could have potential in inducing cell death in cancer cells. Adenosine Triphosphate Female;Humans;Uterine Cervical Neoplasms;Rubus;Cell Proliferation;Homeopathy;Adenosine Triphosphate

Polarized Light Therapy in the Treatment of Wounds: A Review. The most prevalent type of photo therapies are low-level laser therapy (LLLT) and ultraviolet (UV) treatments, which are distinguished by the physical properties of the light employed. However, in latest years, it has been suggested that polarization and an extensive light band including all light spectra are essential aspects in light treatment. Light waves are filtered to align and vibrate in a single plane, resulting in polarized light (PL). Light that has been polarized can penetrate tissues more deeply than light that has not been polarized. The visible light spectrum is very broad. PL varies from other types of light therapy in that it uses a considerably wider spectrum of wavelengths than LLLT or UV. As a result, PLT devices are often less expensive and simple to operate. Since the late 1960s, light therapy has been used to treat anything from neonatal jaundice to psoriasis and vitiligo. FenyÃ¶ created a PL source and found that it can stimulate wound healing in a similar way to the low-energy laser. In comparison to the laser, this source of light had numerous gains: lesser prices, fewer hazards, a greater area to be treated, and no sophisticated user expertise. Despite several findings from fundamental research (in vitro, in vivo, and animal trials), practitioners continue to have reservations regarding PL's potency

and utility in treating musculoskeletal problems. It is even largely believed that the commercial use of these therapies is validated by a sufficient amount of scientific evidence based on reliable clinical papers. The major goal of this study is to gather information on the use of PL for treatment of various wound types in animal and human investigations.

Steering the multipotent mesenchymal cells towards an anti-inflammatory and osteogenic bias via photobiomodulation therapy: How to kill two birds with one stone. The bone marrow-derived multipotent mesenchymal cells (MSCs) have captured scientific interest due to their multi-purpose features and clinical applications. The operational dimension of MSCs is not limited to the bone marrow reservoir, which exerts bone-building and niche anabolic tasks; they also meet the needs of quenching inflammation and restoring inflamed tissues. Thus, the range of MSC activities extends to conditions such as neurodegenerative diseases, immune disorders and various forms of osteopenia. Steering these cells towards becoming an effective therapeutic tool has become mandatory. Many laboratories have employed distinct strategies to improve the plasticity and secretome of MSCs. We aimed to present how photobiomodulation therapy (PBM-t) can manipulate MSCs to render them an extraordinary anti-inflammatory and osteogenic instrument. Moreover, we discuss the outcomes of different PBM-t protocols on MSCs, concluding with some perplexities and complexities of PBM-t in vivo but encouraging and feasible in vitro solutions.

Efficacy and safety of low-level light therapy by delicate pulsed light combined with low-dose oral isotretinoin for the treatment of acne vulgaris: a randomized split-face study. Acne vulgaris (AV) is a common dermatosis that causes psychological problems. Isotretinoin is the first-line treatment for moderate-to-severe AV, but its onset of effect is delayed. Although light-based therapy is widely used in the treatment of AV, there is a lack of reports on delicate pulsed light (DPL) which has a narrow therapeutic spectrum (500-600 nm). Low-level light therapy (LLLT) has shown an emerging role in anti-inflammatory effects and skin repair. This study investigates the efficacy and safety of low-dose oral isotretinoin combined with LLLT using DPL in patients with moderate-to-severe AV. Thirty-six patients with moderate-to-severe AV were enrolled and received low-dose oral isotretinoin (10-20 mg/day). The two sides of the face were randomly assigned to receive DPL (6-9 J/cm(2)) or not at an interval of 2 weeks for 4 treatment sessions (weeks 0, 2, 4, 6). Photos, GAGS score, counts of papules, pustules, comedones, TEWL, melanin and erythema index, side effects, efficacy, and satisfactory score were recorded at each visit and at 4 weeks after the final treatment (week 10). Thirty-three patients completed the study. DPL and oral isotretinoin combined therapy exhibited significantly improved GAGS score as well as the number of the lesions from week 2 and maintained until week 10. At the end of the observation, the improvement of GAGS was 70.88% on the DPL and isotretinoin combined side versus 62.12% on the side with isotretinoin monotherapy ($p = 0.0009$). The improvement for papule number was 61.58% on the DPL combined side versus 43.33% on the control side ($p < 0.0001$), for comedone was 63.15% versus 43.30% ($p = 0.0008$). TEWL and indexes of melanin and erythema also had better outcomes with DPL combined therapy at week 10. All the side effects were temporary and tolerable; no adverse effects were observed. Oral low-dose isotretinoin combined with LLLT by DPL offers a combination with reduced side effects and better outcomes within a limited treatment duration, which advances the onset of effect of isotretinoin monotherapy and improves lesion clearance. Anti-Inflammatory Agents;Melanins;Isotretinoin Acne Vulgaris;Administration, Oral;Anti-Inflammatory Agents;Erythema;Humans;Isotretinoin;Low-Level Light Therapy;Melanins;Treatment Outcome

Clinical safety study of photobiomodulation in acute spinal cord injury by scattering fiber. The study aimed to design a reliable and straightforward PBM method by implanting a medical scattering fiber above surgically exposed spinal cord in SCI patients. Moreover, the safety of this method was examined. Twelve patients with acute SCI (ASIA B) requiring posterior decompression were recruited.

The medical scattering fiber was implanted above the spinal cord, and was continuously irradiated at 810Â nm, 300 mW, 30Â min/day, once per day for 7Â days. The vital signs (temperature, blood pressure, respiratory rate, heart rate, and oxygen saturation), infection indicators (WBC, NEUT, hs-CRP, and PCT), photo-allergic reaction indicators (Eosinophil and Basophil), coagulation function indicators (PT, APTT, TT) and neurological stability indicators (ASIA sensory and motor scores) were recorded to evaluate the safety of PBM. Three months after surgery, 12 patients completed follow-up. In our study, direct PBM on SCI site did not cause clinically pathologic changes in vital signs of the patients. All patients had higher WBC, NEUT, and hs-CRP at day 3 during irradiation than those before surgery, and returned to normal at day 7. The changes in Eosinophil and Basophil that were closely associated with allergic reactions were within normal limits throughout the course of irradiation. The coagulation function (PT, APTT, and TT) of patients were also in the normal range. The ASIA sensory and motor scores of all patients had no changes throughout the irradiation process. However, in the follow-up, both ASIA sensory and motor scores of all patients had minor improvement than those in pre-irradiation, and 7 patients had adverse events, but they were not considered to be related to PBM. Our study might firstly employ direct PBM in the SCI by using scattered optical fibers. In a limited sample size, our study concluded that direct PBM at the site of SCI would not produce adverse effects within the appropriate irradiation parameters. The method is safe, feasible, and does not add additional trauma to the patient. Our preliminary study might provide a new methodology for the clinical PBM treatment of acute SCI. C-Reactive Protein Humans;C-Reactive Protein;Recovery of Function;Spinal Cord;Spinal Cord Injuries;Low-Level Light Therapy

Short and Long-Term Outcomes of 308-nm Laser for Pediatric Vitiligo. Pediatric vitiligo is often challenging to treat. Children with vitiligo experience stigma, bullying, and emotional distress. The long-term outcome of therapeutics used to treat pediatric vitiligo has been poorly documented in the literature. It is, therefore, hard to counsel patients on the expected long-term results of therapy. We sought to address outcomes in pediatric vitiligo treated with a 308-nm laser. An IRB-exempt chart review was conducted in June of 2016 of children undergoing active 308-nm laser in the first half of 2016. Demographic data, location of disease, therapeutic parameters of the 308-nm laser, and outcomes were recorded at that time. In 2021, the long-term outcomes were analyzed through chart review addressing pigmentation retained at later office visits. Initial repigmentation was noted in 86.7% of the face, 80% of the body, and 61.7% of the extremities. An average of 3.38 years of follow-up was recorded. Scoring extent of vitiligo using 18 site-scoring was helpful in identifying individuals who are less likely to respond to 308-nm laser, but needs broader evaluation. During that time, repigmentation was noted to be retained in 80% of facial, 40% of the body, and 20% of extremity lesions. Pediatric vitiligo responds well to the 308-nm laser, with the best retention of repigmentation for facial lesions. Patients and parents should be counseled on the likelihood of long-term retention of repigmentation and regarding the need for the ongoing management of vitiligo even after repigmentation is initially achieved after 308-nm laser therapy. J Drugs Dermatol. 2022;21(7):773-775. doi:10.36849/JDD.6895. Child;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Skin Pigmentation;Treatment Outcome;Vitiligo

Q-Switched Laser Combined with Intense Pulsed Laser in the Treatment of Melasma Based on Reflection Confocal Microscope. Chloasma is a prevalent clinical hyperpigmentation skin disorder that causes symmetrical brown to tan patches on the cheeks, as well as the neck and forearms on rare occasions. The pathophysiology of this condition is complicated, and there is now no cure. Under the light microscope, the full-thickness melanin of the epidermis in the skin lesions was increased, and the dermal chromophages increased. At present, the treatment of melasma mainly includes topical drugs, chemical peels, systemic drugs, laser therapy, and traditional Chinese medicine. With the development of medical technology, intense pulsed light and Q-switched laser

have been widely used in the treatment of melasma, which can emit laser beams to penetrate the dermis uniformly to treat deep pigmented lesions in the dermis. After a stable treatment outcome for melasma is achieved, it is important to minimize side effects such as postinflammatory hyperpigmentation and skin irritation. Therefore, this paper uses a reflection confocal microscope to establish an evaluation index system and then uses a neural network to evaluate the treatment effect. The work of this paper is as follows: (1) this paper introduces various methods of treating melasma at home and abroad and focuses on the application of intense pulsed light therapy and low-energy Q-switched Nd: YAG laser in the treatment of melasma. (2) In this paper, the case data samples are trained with the designed BP network to obtain a reliable evaluation network model. (3) The results and mistakes of the evaluation are produced by training the genetic algorithm optimized backpropagation (GA-BP) network structure model to evaluate the treatment effect of chloasma. Finally, it has been demonstrated that the GA-BP network has great accuracy and stability. Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Photobiomodulation: a promising innovative approach for preventing oral mucositis in patients undergoing hematopoietic stem cell transplantation. PURPOSE: This single-center retrospective study aims to assess the feasibility, safety, and tolerability of CareMin650, a new photobiomodulation device, for both preventing oral mucositis (OM) and reducing its severity in the setting of hematopoietic stem cell transplantation (HCT). METHODS: Patients who underwent autologous HCT for hematological malignancies between November 2020 and October 2021 could be included. Prophylactic photobiomodulation (PBM) was used daily from day 1 of conditioning until the day of neutrophil recovery at a dose of 3Â J/cm(2). Curative PBM was started at a dose of 6Â J/cm(2) when at least one grade 1 OM had occurred. For each OM case, time of onset, National Cancer Institute-Common Terminology Criteria for Adverse Events (NCI-CTCAE) v5.0 grade for OM, analgesic dose, and time to resolution were reported. RESULTS: Twenty-five consecutive patients were included. The median age was 58Â years (range, 39-74) and 14 (56%) were male. Twenty-one patients (84%) received a high-dose melphalan conditioning regimen for multiple myeloma, and 4 (16%) patients received BEAM conditioning for aggressive lymphoma. A total of 178 CareMin650 sessions were performed, with a median of 7Â days of application (range, 4-12), with no device-related adverse events (AEs). According to the NCI-CTCAE v5.0 scale, 76% (19 of 25) of patients presented grade 0 or 1 mucositis (no ulcers), five patients (20%) developed small ulcers (grade 2), and only one patient developed grade 4 mucositis. Satisfaction rates were high among patients and users. CONCLUSION: Photobiomodulation provides excellent safety and tolerance, as well as promising efficacy, both as a preventive and curative strategy, in patients undergoing autologous HCT. Melphalan Female;Hematopoietic Stem Cell Transplantation;Humans;Male;Melphalan;Middle Aged;Mucositis;Retrospective Studies;Stomatitis;Transplantation Conditioning;Transplantation, Autologous

An Evaluation of the Effects of Photobiomodulation Therapy on the Peri-Implant Bone Healing of Implants with Different Surfaces: An In Vivo Study. (1) Background: This study evaluates the effects of photobiomodulation (PBM) therapy on the peri-implant bone healing of implants with a machined surface (MS) and treated surface (TS). (2) Methods: Topographic characterization of the surfaces (scanning electron microscopy [SEM]- energy dispersive X-ray spectroscopy [EDX]) was performed before and after implant removal. Twenty rabbits were randomly divided into four groups: MS and TS groups (without PBM therapy) and LMS and LTS groups (with PBM therapy). After implant placement, the stability coefficient (ISQ) was measured. In the periods of 21 and 42 days, the ISQ was measured again, followed by biomechanical analysis. (3) Results: The surfaces of the TS implants showed topographic differences compared with MS implants. The ISQ values of the LMS were

statistically significant when compared with those of the MS at 42 days ($p < 0.001$). The removal torque values of the LMS were statistically significant when compared with those of the MS at 21 days ($p = 0.023$) and 42 days ($p = 0.023$). For SEM, in general, the LMS, TS and LTS presented high bone tissue coverage when compared to MS. (4) Conclusions: The PBM therapy modulated the osseointegration process and was evidenced mainly on the machined surface.

Photobiomodulation for Managing "Dry Socket": A Randomised Controlled Trial. OBJECTIVE: There are no studies that have evaluated the effect of Alveogyl with and without adjunct photobiomodulation therapy (PBMT) in reducing self-rated post-operative pain (SPP) in patients with alveolar osteitis (AO; dry socket). The aim of the present randomised controlled trial was to assess the effectiveness of Alveogyl with and without PBMT for the management of SPP in patients with AO. METHODS: Adult nonsmokers with diagnosed AO were included. Patients were randomly divided into 4 groups. In Group 1, patients underwent mechanical curettage (MC) with copious normal saline irrigation. In Group 2, patients underwent MCÂ +Â Alveogyl dressings in extraction sites which were changed every 48 hours until cessation of pain. In Group 3, patients underwent MCÂ +Â Alveogyl followed by PBMT using a 660-nm indium-gallium-aluminum-phosphide diode laser. In Group 4, patients were treated solely with PBMT. The visual analogue scale was used up to 3 postoperative days to assess SPP up to 3 days at 6- (T0) and 12-hour (T1) intervals. Statistical analyses were performed using the analysis of variance and Bonferroni post hoc adjustment tests. Correlation between SPP scores and age, sex, and eruption status of teeth was assessed using logistic regression models. P values <.01 were nominated as being statistically significant. RESULTS: In all, 14, 13, 14, and 14 individuals with AO were included in groups 1, 2, 3 and 4, respectively. All patients had undergone extraction of mandibular third molars. At baseline and on day 1, there was no difference in SPP in all groups. On days 2 and 3, mean visual analogue scale (VAS) scores at T1 ($P < .01$) and T2 ($P < .01$) intervals were significantly high in Group 2 compared with Group 3. On days 2 and 3, mean VAS scores at T1 ($P < .01$) and T2 ($P < .01$) intervals were significantly high in Group 4 compared with Group 3. There was no difference in SPP in groups 3 and 4 on day 3 at T0 and T1 intervals. CONCLUSIONS: PBMT following MC and Alveogyl dressing is more efficient in reducing SPP compared with MC with or without Alveogyl dressing in patients with AO. Adult;Humans;Dry Socket;Tooth Extraction;Molar;Pain Measurement

Deconstructing the Ergogenic Effects of Photobiomodulation: A Systematic Review and Meta-analysis of its Efficacy in Improving Mode-Specific Exercise Performance in Humans. BACKGROUND: Photobiomodulation therapy (PBMT) is defined as non-thermal electromagnetic irradiation through laser or light-emitting diode sources. In recent decades, PBMT has attracted attention as a potential preconditioning method. The current meta-analysis was conducted to assess the effectiveness of PBMT in improving mode-specific exercise performance in healthy young adults. METHODS: A computerized literature search was conducted, ending on 15 May 2022. The databases searched were PubMed, Cochrane Central Register of Controlled Trials, Embase, SPORTDiscus, and the Physiotherapy Evidence Database. Inclusion/exclusion criteria limited articles to crossover, double-blind, placebo-controlled studies investigating the PBMT effects as a preconditioning method. The included trials were synthesized according to exercise mode (single-joint, cycling, running, and swimming). All results were combined using the standardized mean differences (SMDs) method and the 95% confidence intervals (CIs) were described. RESULTS: A total of 37 individual studies, employing 78 exercise performance measurements in 586 participants, were included in the analyses. In single-joint exercises, PBMT improved muscle endurance performance (SMD 0.27, 95% CI 0.12-0.41; pâ€‰<â€‰0.01) but not muscle strength performance (pâ€‰=â€‰0.92). In cycling, PBMT improved time to exhaustion performance (SMD 0.35, 95% CI 0.10-0.59; pâ€‰<â€‰0.01) but had no effect on all-out sprint performance (pâ€‰=â€‰0.96). Similarly, PBMT had no effect on time to

exhaustion (pâ€‰=â€‰0.10), time-trial (pâ€‰=â€‰0.61), or repeated-sprint (pâ€‰=â€‰0.37) performance in running and no effect on time-trial performance in swimming (pâ€‰=â€‰0.81). CONCLUSION: PBMT improves muscle endurance performance in single-joint exercises and time to exhaustion performance in cycling but is not effective for muscle strength performance in single-joint exercises, running, or swimming performance metrics. Performance-Enhancing Substances Young Adult;Humans;Performance-Enhancing Substances;Exercise;Running;Low-Level Light Therapy;Exercise Test;Randomized Controlled Trials as Topic

40 Hz Blue LED Relieves the Gamma Oscillations Changes Caused by Traumatic Brain Injury in Rat. BACKGROUND: Photobiomodulation (PBM) using low-level light-emitting diodes (LEDs) can be rapidly applied to various neurological disorders safely and non-invasively. MATERIALS AND METHODS: Forty-eight rats were involved in this study. The traumatic brain injury (TBI) model of rat was set up by a controlled cortical impact (CCI) injury. An 8-channel cortex electrode EEG was fixed to two hemispheres, and gamma oscillations were extracted according to each electrode. A 40 hz blue LED stimulation was set at four points of the frontal and parietal regions for 60 s each, six times per day for 1 week. Modified Neurologic Severity Scores (mNSS) were used to evaluate the level of neurological function. RESULTS: In the right-side TBI model, the gamma oscillation decreased in electrodes Fp2, T4, C4, and O2; but significantly increased after 1 week of 40 hz Blue LED intervention. In the left-side TBI model, the gamma oscillation decreased in electrodes Fp1, T3, C3, and O1; and similarly increased after 1 week of 40 hz Blue LED intervention. Both left and right side TBI rats performed significantly better in mNSS after 40 hz Blue LED intervention. CONCLUSION: TBI causes the decrease of gamma oscillations on the injured side of the brain of rats. The 40 hz Blue LED therapy could relieve the gamma oscillation changes caused by TBI and improve the prognosis of TBI.

Assessment of the Oral Health Impact Profile (OHIP-14) improvement of different treatments for dentin hypersensitivity in noncarious cervical lesions-a randomized clinical study. OBJECTIVES: To assess the improvement on oral health-related quality of life (OHRQoL) of individuals with cervical dentin hypersensitivity (CDH) with the noncarious cervical lesion (NCCLs) subjected to different treatments. MATERIAL AND METHODS: A single-blind randomized clinical trial was conducted with patients (nâ€‰=â€‰74) randomly allocated into three groups according to the treatment performed: PO, potassium oxalate (Oxa-Gel BF); LL, low-power laser irradiation; and POLL, potassium oxalate (Oxa-Gel BF) associated with low-power laser irradiation. The treatments were applied in four steps, weekly. The questionnaire Oral Health Impact Profile (OHIP-14) was applied before initiating and immediately after the fourth session. The greater the sum of the score, the smaller the measurement of OHRQoL. RESULTS: The total mean values of the variables at the final moment were significantly lower than the initial one for all dimensions (p value ranging fromâ€‰<â€‰0.001 to 0.006). Furthermore, the OHIP-14 scores final analysis between the groups indicated that the POLL group compared to LL had a significantly lower final score for the functional limitation (pâ€‰=â€‰0.009), physical pain (pâ€‰=â€‰0.049), and psychological discomfort (pâ€‰=â€‰0.035) dimensions and that group PO compared to group LL had a significantly lower final score for the functional limitation dimension (pâ€‰=â€‰0.024). CONCLUSIONS: There was a reduction in the OHIP-14 score for all dimensions, indicating an improvement in patients' quality of life after the use of desensitizing therapies. Patients in group LL had a higher functional limitation, physical pain, and psychological discomfort. CLINICAL RELEVANCE: This study indicated improvement of desensitizing therapies for CDH to improve patients' OHRQoL. TRIAL REGISTRATION: This trial was registered in the Brazilian Clinical Trials Registry Platform (REBEC protocol number RBR-4ybjmt). oxa-gel;Oxalic Acid Humans;Quality of Life;Oral Health;Dentin Sensitivity;Single-Blind Method;Surveys and Questionnaires;Oxalic Acid;Oral Ulcer;Pain

Fluorescence Biomodulation for Canine Interdigital Furunculosis: Updates for Once-Weekly Schedule. Interdigital furunculosis is a common multifactorial, inflammatory disease of the canine interdigital skin in which lesions commonly become secondarily infected. Fluorescence biomodulation (FBM) administered twice weekly has shown to effectively control clinical manifestation as adjunct therapy to systemic antibiotic. Since twice weekly regimen could be unaffordable for some pet owners, the aim of this study was to evaluate the effect of once weekly application of FBM in combination with systemic antibiotic on clinical manifestations of canine interdigital pyoderma, comparing the results to those present in literature. Twelve dogs diagnosed with interdigital pyoderma received antibiotic plus once weekly FBM application. Dogs were scored until complete healing based on global lesion score and neutrophil engulfing bacterial score. The results obtained demonstrated that once weekly application of FBM exerts the same beneficial effect on interdigital furunculosis healing as per twice weekly, indicating that once weekly regimen is well tolerated and is yielding similar results to twice weekly applications.

Photobiomodulation at 830â€‰nm Reduced Nitrite Production by Peripheral Blood Mononuclear Cells Isolated from Multiple Sclerosis Subjects. Background: Multiple sclerosis (MS) is a neurodegenerative condition characterized by high concentration of nitric oxide leading to the production of reactive oxygen species (ROS) and reactive nitrogen species (RNS), a condition known as nitrosative stress. ROS and RNS produce the inhibition of the mitochondrial electron transport chain leading to mitochondrial dysfunction, reduction of adenosine triphosphate, and death of neurons, producing severe and irreversible damage in the central nervous system of people with MS (PwMS). Current drug treatments for MS focus on the regulation of immune response in acute stages of disease, but they do not regulate nitrosative stress which is present in the acute and chronic stages of disease. Previously, our laboratory showed that photobiomodulation (PBM) on experimental autoimmune encephalomyelitis mice, the animal model of MS, reduced clinical severity of disease, gene expression of inducible nitric oxide synthase (iNOS), and the levels of nitrite in in vivo and in vitro experiments. Objective: We evaluated the effect of PBM on the regulation of nitrosative stress in PwMS. Methods: PBM was applied on peripheral blood mononuclear cells (PBMCs) obtained from PwMS to evaluate PBM on the regulation of nitrate as a marker of nitrosative stress. Results: PBM at 830â€‰nm (10â€‰J/cm(2) at 72â€‰h) reduced the levels of nitrite and this reduction was in relationship with the increase of interleukin-10 and the reduction of interferon-Î³ produced by the PBMCs regardless of the severity of disease present in the participants. Conclusions: PBM at 830â€‰nm can potentially be used to reduce nitrosative stress at any point of disease in PwMS. Nitrites;Reactive Oxygen Species;Nitric Oxide Animals;Humans;Leukocytes, Mononuclear;Mice;Multiple Sclerosis;Nitric Oxide;Nitrites;Reactive Oxygen Species

Efficacy of the cognitive functional therapy (CFT) in patients with chronic nonspecific low back pain: a study protocol for a randomized sham-controlled trial. BACKGROUND: Chronic low back pain is a public health problem, and there is strong evidence that it is associated with a complex interaction of biopsychosocial factors. Cognitive functional therapy (CFT) is a promising new intervention that deals with potentially modifiable multidimensional aspects of pain (e.g., provocative cognitive, movement, and lifestyle behaviors). METHODS: To investigate the efficacy of CFT compared with a sham intervention for pain intensity and disability post-intervention (immediately after the last session) in patients with non-specific chronic low back pain (CLBP). This study is a randomized controlled trial in which 152 (18-60 years old) patients with CLBP will be enrolled. The patients will be randomly allocated to receive (1) CFT intervention or (2) sham intervention. The experimental group will receive individualized CFT in a pragmatic manner (5 to 7 sessions) based on the clinical progression of the participants. The sham group will attend six sessions: consisting of 30 min of photobiomodulation using a detuned device and more than 15 min of talking about neutral topics. Patients from both

groups also will receive an educational booklet (for ethical reasons). Participants will be assessed pre and post-intervention, 3 months, and 6 months after randomization. The primary outcomes will be pain intensity and disability post-intervention. The secondary outcomes will be: pain intensity and disability at 3- and 6-month follow-up, as well as self-efficacy, global perceived effect of improvement, and functioning post-intervention, 3-, and 6-month follow-up. The patients and the assessor will be blinded to the treatment administered (active vs. sham). STATISTICAL ANALYSIS: The between-group differences (effects of treatment), as well as the treatment effect for the primary and secondary outcomes, and their respective 95% confidence intervals will be calculated by constructing linear mixed models. DISCUSSION: To the best of our knowledge, the current study will be the first to compare CFT vs. sham intervention. Sham-controlled RCTs may help to understand the influence of non-specific factors on treatment outcomes. Considering complex interventions as CFT, it is imperative to understand the impact of contextual factors on outcomes. TRIAL REGISTRATION: ClinicalTrials.gov NCT04518891 .Â First Posted: August 19, 2020. Adolescent;Adult;Chronic Pain;Cognition;Cognitive Behavioral Therapy;Humans;Low Back Pain;Middle Aged;Pain Measurement;Randomized Controlled Trials as Topic;Treatment Outcome;Young Adult

Photobiomodulation Therapy After Mesiodens Surgery: Evaluation of Immunological Markers and Three-Dimensional X-Ray Analysis-Placebo-Controlled Study. Objective: Photobiomodulation therapy (PBMT) applies therapeutic lasers or light-emitting diodes radiation to the surface of the body. From the medical point of view, PBMT systems have been employed for reducing pain, inflammation, and edema, promoting healing of wounds, deeper tissues and nerves, preventing tissue damage, etc. Background data: PBMT or biostimulation has a wide range of applications in maxillofacial surgery. It is known that the therapy effect using three-dimensional (3D) image was not really clear during the healing process. Materials and methods: The treatment group comprised 38 patients, 18 of them were treated with laser radiation (diode laser 808â€‰nm) and 20 patients presented the control group. The surgery plan was monitored using cone beam computed tomography, in particular the number, shape, and size of mesiodens were registered. The effectivity of laser therapy was assessed based on immunological tests-secretory immunoglobulin A (sIgA) and lysozyme levels measured in nonstimulated saliva before and after treatment. Results: For sIgA (both in millimeters and milligrams per liter), the measurements displayed differences between pre- and postsurgery values, the postsurgery values being significantly lower than the presurgery values. In addition, interaction with the laser treatment plan was found, meaning that the laser treatment affected the sIgA levels. The decrease in sIgA levels in the control group was statistically significant. However, there was no significant change in sIgA levels in the laser group. The lysozyme trends appeared to be identical to the sIgA levels, that is, rising in the laser group and decreasing in the control group. The initial values for each group, however, go in the opposite direction. Conclusions: The study has shown that the 3D techniques and technologies in combination with therapeutic laser systems could support not only a treatment plan, but they also directly influence the process of healing and reduce inflammation. The study was carried out under clinical project No. 00064203 (FN MOTOL). Biomarkers;Immunoglobulin A, Secretory;Muramidase Biomarkers;Humans;Immunoglobulin A, Secretory;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Muramidase;X-Rays

Mitochondrial Photobiomodulation as a Neurotherapeutic Strategy for Epilepsy.

Comparative Evaluation of Low-Level Laser Therapy and Topical Triamcinolone Acetonide 0.1% in Recurrent Aphthous Stomatitis Subjects. Background Recurrent aphthous stomatitis (RAS), sometimes known as canker sores, is an infection of the oral mucous membranes caused by an inflammatory process. Triamcinolone and low-level laser therapy for recurrent aphthous ulcers were studied in this research, which evaluated their clinical efficacy. Methodology Among 60 subjects, 54

subjects fulfilled the inclusion criteria with an age range between 16 and 46 years. Subjects were randomly divided into two groups, the control group who received four times daily topical application of triamcinolone acetonide 0.1% and the test group who underwent a single application of low-level laser therapy on three alternate days. Evaluations were done on day 1, day 3, day 5, and day 10. Data obtained on oral-health-related quality of life (OHR-QoL) using the OHR-QoL questionnaire were used as baseline data. Clinical parameters like pain score were assessed using a visual analogÂ scale, ulcer size using UNC-15 probe, and erythema and healing score were evaluated using erythema and healing scale. Result According to the OHR-QoL data, there was no statistically significant difference in the quality of life of test and control subjects. We found that pain and ulcer size reduced considerably (p=0.007) from the first day to the third day (p=0.000), and then dropped significantly again (p=0.000) on days 3-10 (p=0.000). On days 3 and 5, the test group showed significant reductions in pain and erythema (p=0.13), as well as an improvement in ulcer healing when compared to the control group. On days 3 and 5, the size of the ulcers decreased similarly in the control and test groups. On the 10th day, patients in both groups had less discomfort, erythema, and ulcer size, as well as improved healing of the ulcer. Conclusion Pain and erythema reductionÂ and ulcer healing improvement were significantly higher in subjects in the test group as compared to those in the control group by day 3. The reduction in ulcer size was comparable to the control group on days 3 and 5, while the complete reduction in ulcer size was seen in both groups by day 10.

Efficacy of Diode Laser Ablation and Low Level Laser Therapy on Healing and Bacterial Load Reduction at Intraoral Biopsy Site. STATEMENT OF THE PROBLEM: Healing complications after the conventional surgical biopsy procedure along with bacterial colonization indicates scope for sophisticated techniques. Amalgamation of photo-disinfection along with healing properties of diode laser with practiced biopsy technique can help in dealing with post biopsy complications. PURPOSE: The present study will analyze the possibility of conjugation of conventional surgical biopsy technique with diode laser regarding its superior properties for achieving better healing and analgesia along with sterilization of the biopsy site. MATERIALS AND METHOD: A randomized control trial was done where punch biopsy procedure was performed for homogenous leukoplakia. Patients were randomly divided into laser group (Test group) and control group. Test group received laser ablation and low level laser therapy (LLLT) on surgical site along with warm saline rinses whereas control group was prescribed with systemic analgesic and antibiotics. Pain on visual analogue scale (VAS), erythema along with the size of defect was evaluated on day 0, 2 and 4. Swabs were collected from the biopsy site and culture was done for evaluation of bacterial load. RESULTS: Highly statistical significant values indicating laser induced analgesia were obtained after analysis for 2nd and 4th day (p= 0.00). Erythema and biopsy defect size evaluation showed significant results for 2nd day (p value 0.023 and 0.004 respectively), which showed absence of erythema and enhancement of healing in test group compared to controls. Statistical significant results were obtained for estimation of bacterial colonization with p value as 0.00, 0.00 for 2nd and 4th day claiming laser supported bacterial disinfection. There was a significant percentage increase on 2nd (p= 0.013) and decrease on 4th post-operative day (p= 0.022). CONCLUSION: The results encourage the conjugation of conventional incisional punch biopsy with low level lasers to avoid systemic intervention for post biopsy complications.

Comparison of Adhesion and Proliferation of Human Gingival Fibroblasts on Acellular Dermal Matrix with and without Low Level Diode Laser Irradiation, an in vitro Study. STATEMENT OF THE PROBLEM: In recent years, regeneration of periodontal soft tissues in the reconstruction of periodontal defects and the finding of suitable membranes and graft materials for the placement of autogenous grafts have been of great interest in various studies. In this regard, the proliferation and adhesion of regenerative cells are two linchpins of the complete regenerative process. PURPOSE: This

study aimed to evaluate the effects of low-level laser beams on the attachment and the proliferation of human gingival fibroblasts in the presence of acellular dermal matrix (ADM). MATERIALS AND METHOD: All the experiments were conducted compared to tissue culture plate in four groups as follows: (1) Fibroblast+ADM+laser, (2) Fibroblast+ADM+ no laser, (3) Fibroblast + laser radiation, and (4) Fibroblast+ no laser. In this experimental study, the primary attachment was evaluated by passing 8h from seeding of 5Ã—10(5) gingival fibroblasts with or without a single dose (15.6 J/cm(2)) of laser radiation. Cell proliferation rate was also examined at 24, 48, and 72 hours after cell culture, following exposure to 5.2 J/cm(2) of laser at each day of examination. Thereafter, fibroblasts were incubated under the normal culture condition (at 37Â°C, 5% CO(2)) in high glucose Dulbecco's Modified Eagle's medium (DMEM) medium supplemented with 10% fetal bovine serum, 1% glutamax, and 1% penicillin/streptomycin. Subsequently, the cellular viability was assessed on each time point using MTS calorimetric assay. The obtained data were statistically analyzed by applying ANOVA and Tukey tests. RESULTS: There was a significant difference among the means of these four groups in terms of the proliferation of fibroblasts at 24, 48 and 72 hours ($p< 0.001$). Moreover, there was no significant difference among the means of two groups in terms of fibroblastic attachment in 8 hours ($p< 0.2$). The fibroblast group has shown the highest proliferation rate among all groups after laser radiation. CONCLUSION: It was indicated that the laser radiation increases the fibroblast cell proliferation. Accordingly, although this increase was higher in the fibroblast group alone compared to the fibroblasts cultured on acellular dermal matrix, the laser radiation did not significantly increase the attachment of fibroblast cells to acellular dermal matrix.

Pulsed low-intensity laser treatment stimulates wound healing without enhancing biofilm development in vitro. OBJECTIVES: Treating infected or chronic wounds burdened with biofilms still is a major challenge in medical care. Healing-stimulating factors lose their efficacy due to bacterial degradation, and antimicrobial substances negatively affect dermal cells. Therefore, alternative treatment approaches like the pulsed low intensity laser therapy (LILT) require consideration. METHODS: The effect of pulsed LILT (904Â nm, in three frequencies) on relevant human cells of the wound healing process (fibroblasts (BJ), keratinocytes (HaCaT), endothelial cells (HMEC), monocytes (THP-1)) were investigated in in-vitro and ex-vivo wound models with respect to viability, proliferation and migration. Antimicrobial efficacy of the most efficient frequency in cell biological analyses of LILT (3200Â Hz) was determined in a human biofilm model (lhBIOM). Quantification of bacterial load was evaluated by suspension method and qualitative visualization was performed by scanning electron microscopy (SEM). RESULTS: Pulsed LILT at 904Â nm at 3200Â HzÂ Â±Â 50% showed the most positive effects on metabolic activity and proliferation of human wound cells in vitro (after 72Â h - BJ: BPT 0.97Â Â±Â 0.05 vs. 0.75Â Â±Â 0.04 (pÂ =Â 0.0283); HaCaT: BPT 0.79Â Â±Â 0.04 vs. 0.59Â Â±Â 0.02 (pÂ =Â 0.0106); HMEC: 0.74Â Â±Â 0.02 vs. 0.52Â Â±Â 0.04 (pÂ =Â 0.009); THP-1: 0.58Â Â±Â 0.01 vs. 0.64Â Â±Â 0.01 (pÂ >Â 0.05) and ex vivo. Interestingly, re-epithelialization was stimulated in a frequency-independent manner. The inhibition of metabolic activity after TNF-Î± application was abolished after laser treatment. No impact of LILT on monocytes was detected. Likewise, the tested LILT regimens showed no growth rate reducing effects on three bacterial strains (after 72Â h - PA: -1.03%; SA: -0.02%; EF: -1,89%) and one fungal (-2.06%) biofilm producing species compared to the respective untreated control. Accordingly, no significant morphological changes of the biofilms were observed after LILT treatment in the SEM. CONCLUSIONS: Frequent application of LILT (904Â nm, 3200Â Hz) seems to be beneficial for the metabolism of human dermal cells during wound healing. Considering this, the lack of disturbance of the behavior of the immune cells and no growth-inducing effect on bacteria and fungi in the biofilm can be assigned as rather positive. Based on this combined mode of action, LILT may be an option for

hard to heal wounds infected with persistent biofilms. Anti-Infective Agents Anti-Infective Agents;Bacteria;Biofilms;Endothelial Cells;Humans;Lasers;Wound Healing
Five hundred and thirty-two-nanometer Q-switched Nd:Yag laser with larger fractional spot: A novel and safe technique to treat CafÃ© au lait macule-A case report. Cafe-au-Lait Spots;Humans;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome
Photobiomodulation for Gulf War Illness? Gulf War;Humans;Persian Gulf Syndrome;Veterans
Comment on "Treatment of diabetic foot ulcers in a frail population with severe co-morbidities using at-home photobiomodulation laser therapy: a double-blind, randomized, sham-controlled pilot clinical study". Aged;Diabetes Mellitus;Diabetic Foot;Double-Blind Method;Frail Elderly;Humans;Low-Level Light Therapy;Morbidity
Inflammation and Fibrosis Induced by Joint Remobilization, and Relevance to Progression of Arthrogenic Joint Contracture: A Narrative Review. Joint immobilization is frequently administered after fractures and ligament injuries and can cause joint contracture as a side effect. The structures responsible for immobilization-induced joint contracture can be roughly divided into muscular and articular. During remobilization, although myogenic contracture recovers spontaneously, arthrogenic contracture is irreversible or deteriorates further. Immediately after remobilization, an inflammatory response is observed, characterized by joint swelling, deposit formation in the joint space, edema, inflammatory cell infiltration, and the upregulation of genes encoding proinflammatory cytokines in the joint capsule. Subsequently, fibrosis in the joint capsule develops, in parallel with progressing arthrogenic contracture. The triggers of remobilization-induced joint inflammation are not fully understood, but two potential mechanisms are proposed: 1) micro-damage induced by mechanical stress in the joint capsule, and 2) nitric oxide (NO) production via NO synthase 2. Some interventions can modulate remobilization-induced inflammatory and subsequent fibrotic reactions. Anti-inflammatory treatments, such as steroidal anti-inflammatory drugs and low-level laser therapy, can attenuate joint capsule fibrosis and the progression of arthrogenic contracture in remobilized joints. Antiproliferative treatment using the cell-proliferation inhibitor mitomycin C can also attenuate joint capsule fibrosis by inhibiting fibroblast proliferation without suppressing inflammation. Conversely, aggressive exercise during the early remobilization phases is counterproductive, because it facilitates inflammatory and then fibrotic reactions in the joint. However, the adverse effects of aggressive exercise on remobilization-induced inflammation and fibrosis are offset by anti-inflammatory treatment. To prevent the progression of arthrogenic contracture during remobilization, therefore, care should be taken to control inflammatory and fibrotic reactions in the joints. Anti-Inflammatory Agents Anti-Inflammatory Agents;Contracture;Fibrosis;Humans;Inflammation;Knee Joint;Range of Motion, Articular
Whole-body photobiomodulation therapy for chronic pain: a protocol for a feasibility trial. INTRODUCTION: Chronic pain conditions are a leading cause of disease and disability. They are associated with symptoms such as fatigue, sleep and mood disturbances. Minimal evidence is available to support effective treatments and alternatives treatment approaches are called for. Photobiomodulation therapy has been highlighted as one promising option. A whole-body therapy device (NovoTHOR) has recently been developed with a number of potential advantages for people with chronic pain. Research is needed to consider the feasibility of this device. METHODS AND ANALYSIS: A single-centre single-armed (no placebo group) feasibility study with an embedded qualitative component will be conducted. The intervention will comprise 18 treatments over 6 weeks, with 6-month follow-up, in the whole-body photobiomodulation device. A non-probability sample of 20 adult participants with a clinician diagnosis of chronic axial pain, polyarthralgia, myofascial pain or widespread pain will be recruited (self-referral and clinician referral). Outcome measures will focus

on acceptability of trial processes with a view to guiding a definitive randomised controlled trial. Analyses will use descriptive statistics for quantitative aspects. The qualitative element will be assessed by means of a participant-reported experience questionnaire postintervention and semistructured audio-recorded interviews at three stages; preintervention, midintervention and postintervention. The latter will be transcribed verbatim and a reflexive thematic analysis will be used to identify emerging themes. Exploratory outcomes (participant-reported and performance-based measures) will be analysed according to data distribution. ETHICS AND DISSEMINATION: The study has received ethical approval from the Leicester Central Research and Ethics Committee. Findings will be disseminated via local chronic pain groups, public register update, submission for presentation at scientific meetings and open-access peer-reviewed journals, and via academic social networks. TRIAL REGISTRATION NUMBER: NCT05069363. Adult;Chronic Disease;Chronic Pain;Feasibility Studies;Humans;Low-Level Light Therapy;Pain Measurement;Randomized Controlled Trials as Topic

Effect of electrophysical resources on healing of neurotendinous injury in an experimental model of type I diabetes and kidney disease. PURPOSE: To evaluate and describe the effect of electrophysical resources laser therapy (LLLT), intravascular laser blood irradiation (ILIB), and cryotherapy on the healing process of neurotendinous injury, as well as possible systemic changes, in the experimental model of type 1 diabetes associated with kidney injury. METHODS: The animals were randomized into four groups: G1) healthy control with untreated injury; G2) healthy control with injury and treatment; G3) disease control with untreated lesion; G4) disease with injury and treatment. Furthermore, the treated groups were divided into three, according to the type of treatment. All animals were induced to neurotendinous injury and treated according to the therapeutic protocols. Healing and inflammation were analyzed by semiquantitative histopathological study. RESULTS: It was observed in sick animals treated with cryotherapy and ILIB reduction of inflammatory exudate, presence of fibroblasts and organization of collagen, when compared to the effects of LLLT. Moreover, there was reduction in glycemic levels in the group treated with ILIB. CONCLUSIONS: Cryotherapy promoted reduction in inflammatory exudate and organization of collagen fibers, in addition to the absence of signs of tissue necrosis, in the groups treated with and without the disease. ILIB therapy showed the same findings associated with significant reduction in glycemic levels in the group of diseased animals. The application of LLLT showed increased inflammatory exudate, low organization of collagen fibers and low sign of tissue degeneration and necrosis. This study in a model of associated diseases (diabetes and kidney disease) whose effects of electrophysical resources studied after neurotendinous injury allows us to verify histopathological variables suggestive of patients with the same comorbidities. Collagen Animals;Collagen;Diabetes Mellitus, Type 1;Kidney Diseases;Low-Level Light Therapy;Models, Theoretical;Necrosis

Efficacy of Photobiomodulation Therapy Versus Soft Acrylic Wafer for Reduction of Pain Associated with Orthodontic Metal Bracket Removal: A Clinical Trial. Objective: This study compared the efficacy of photobiomodulation therapy versus soft acrylic wafer for reduction of pain associated with orthodontic metal bracket removal. Background: It has been demonstrated that different methods of bracket removal are associated with different levels of pain. Photobiomodulation decreases the level of pain due to its biological effects. Methods: This split-mouth randomized clinical trial evaluated 28 orthodontic patients. The four quadrants in each patient were randomly assigned to four groups of diode laser (940â€‰nm, 31.7â€‰J/cm(2) energy density, 1.7â€‰cm(2) spot size, 300â€‰mW power, continuous-wave, contact mode) irradiated to the buccal and palatal surfaces of each tooth, soft acrylic wafer, laser in off mode (placebo), and no intervention (control). The severity of pain experienced by patients was assessed immediately after bracket removal from each tooth using a visual analog scale. Data were analyzed using the generalized estimating equation (Î±â€‰=â€‰0.05).

Results: The mean pain score in the soft acrylic wafer (pâ€‰=â€‰0.017), control (pâ€‰<â€‰0.001), and placebo (pâ€‰<â€‰0.001) groups was significantly higher compared with the laser group. Gender (pâ€‰=â€‰0.209), age (pâ€‰=â€‰0.095), and laterality (right/left quadrant; pâ€‰=â€‰0.383) had no significant effect on the pain score. The pain score in the mandible was significantly lower compared with the maxilla (pâ€‰=â€‰0.027). The first and second premolars had significantly lower pain scores (pâ€‰<â€‰0.05). Conclusions: Within the limitations of this study, photobiomodulation therapy and soft acrylic wafer can both decrease the pain associated with metal bracket removal, but laser is more effective. Metals Humans;Low-Level Light Therapy;Metals;Orthodontic Brackets;Pain;Pain Measurement;Tooth Movement Techniques

Impact of Laser Therapy on Periodontal and Peri-Implant Diseases. Objective: In the last few decades, lasers in dentistry have encompassed all branches in dentistry, with more focus in periodontology. In recent years, the use of lasers against periodontitis and peri-implantitis has undergone a decisive development that has involved various operational areas. The broadest applications were probably found in the clinical approach to soft tissues. Methods: Laser therapy is a novel technique that may provide further beneficial effects to conventional periodontal and peri-implant therapies. However, clinical evidence for the improvement of periodontal wound healing and tissue regeneration through laser treatment is still limited. Results: This review is aimed at assessing the advantages and disadvantages of the use of lasers in dental procedures and pathologies, focusing more on protocols for the management of periodontal and peri-implant diseases. Conclusions: The adjuvant action of laser therapy, in addition to conventional therapies for the management of periodontal and peri-implant disease, could induce benefits, but further investigation would be necessary to standardize better the protocols applied and to understand the actual tissue response to laser therapy. Humans;Laser Therapy;Low-Level Light Therapy;Peri-Implantitis;Periodontics;Periodontitis

Enhancement of Frequency-Specific Hemodynamic Power and Functional Connectivity by Transcranial Photobiomodulation in Healthy Humans. Transcranial photobiomodulation (tPBM) has been considered a safe and effective brain stimulation modality being able to enhance cerebral oxygenation and neurocognitive function. To better understand the underlying neurophysiological effects of tPBM in the human brain, we utilized a 111-channel functional near infrared spectroscopy (fNIRS) system to map cerebral hemodynamic responses over the whole head to 8-min tPBM with 1,064-nm laser given on the forehead of 19 healthy participants. Instead of analyzing broad-frequency hemodynamic signals (0-0.2 Hz), we investigated frequency-specific effects of tPBM on three infra-slow oscillation (ISO) components consisting of endogenic, neurogenic, and myogenic vasomotions. Significant changes induced by tPBM in spectral power of oxygenated hemoglobin concentration (Î”[HbO]), functional connectivity (FC), and global network metrics at each of the three ISO frequency bands were identified and mapped topographically for frequency-specific comparisons. Our novel findings revealed that tPBM significantly increased endogenic Î”[HbO] powers over the right frontopolar area near the stimulation site. Also, we demonstrated that tPBM enabled significant enhancements of endogenic and myogenic FC across cortical regions as well as of several global network metrics. These findings were consistent with recent reports and met the expectation that myogenic oscillation is highly associated with endothelial activity, which is stimulated by tPBM-evoked nitric oxide (NO) release.

Application of Low-Intensity Laser in the Treatment of Skeletal Muscle Injury in Runners. With the continuous improvement of people's economic level, running, as the most common sports, is not limited by sports venues and sports levels and deeply loved by people. However, during running, soft tissue resonates with the impact force, increasing the load on joints and tendons and potentially

leading to sports injuries. The purpose of this article is to study the application of low-intensity laser in the treatment of muscle strain. This article analyzes running, muscle adjustment, and lower limb stiffness. On the basis of theory, 20 healthy male college students were selected as research objects in the experimental part. The subjects were allowed to run at three speeds: slow, medium, and fast. The kinematics, dynamics, and surface EMG signals of the subjects during running were collected to analyze the effect of low-intensity laser therapy on exercise muscle strain. The experimental results showed that a low-intensity laser can effectively alleviate muscle inflammation, reduce the number of cell damage, bring the mean and integral optical density of protein to the normal level significantly, and reduce the strain degree of exercise muscle. In this article, a statistical method was used to obtain the gait cycle time (P & LT; 0.01) and support cycle time (slow P < 0.01).

Space-making effect for new bone formation by suppressing scar contraction of mucosal epithelium of rat tooth extraction wound using diode laser and CO(2) laser treatment.
BACKGROUND/PURPOSE: As an extraction wound closes, the mucosal epithelium of the tooth extraction wound impedes the space for new bone formation by invading into the extraction socket. Thus, the height of the alveolar crest decreases, causing significant depression of the alveolar mucosa. In this study, we created a rat tooth extraction model and examined the effects of laser irradiation by CO(2) and diode on the dynamics of myofibroblast expression through Î±-SMA, and TGF-Î²1. MATERIALS AND METHODS: After tooth extraction of five-week-old male Wistar rats, they were divided into two laser treatment groups (CO(2) laser or diode laser was irradiated into tooth extraction socket) and non-laser treatment group (control group). Surrounding tissues, including the extraction socket, were removed at 3, 5, 7, and 21 days after tooth extraction and the expression of Î±-SMA and TGF-Î²1 was verified using immunohistological techniques (6 animals in each group and each period, 72 animals in total). RESULTS: Î±-SMA-positive cells and TGF-Î²1-positive areas were significantly lower in the two laser treatment groups than in the control group. Particularly, the diode group almost had no TGF-Î²1-positive areas on the 21st day when healing after tooth extraction was deemed to be completed. CONCLUSION: Both CO(2) and diode laser irradiation of tooth extraction wounds decreases Î±-SMA-positive cells and TGF-Î²1-positive areas. Further, it causes a decrease in myofibroblast expression and suppresses the invasion of mucosal epithelium into the extraction socket. Therefore, laser irradiation may exert a space-making effect for new bone formation and also contribute to socket preservation.

Effect of Photobiomodulation on Denervation-Induced Skeletal Muscle Atrophy and Autophagy: A Study in Mice. OBJECTIVE: The purpose of this study was to investigate whether photobiomodulation (PBM) can protect against and attenuate muscle atrophy owing to complete peripheral nerve lesion in mice by acting on autophagy. METHODS: C57BL/10 mice underwent right sciatic nerve transection to induce tibialis anterior muscle atrophy. After 6 hours of denervation, the mice received PBM (wavelength, 830 nm) daily, transcutaneously over the tibialis anterior muscle region for 5 or 14 days. Some mice with sciatic nerve lesion did not receive PBM. Mice that did not have sciatic nerve lesion and PBM were used as controls. After 5 and 14 days, the right tibialis anterior muscle was examined using histomorphometric (cross-sectional area of muscle fibers), Western blot (levels of the autophagy marker LC3), and immunofluorescence analyses (number of LC3 puncta in the muscle fibers). RESULTS: The cross-sectional area of the tibialis anterior muscle fibers decreased after 5 and 14 days of denervation. PBM protected against muscle fiber atrophy after 5 days of denervation and attenuated muscle fiber atrophy after 14 days of denervation. After 5 days of muscle denervation, autophagy did not change, as demonstrated by the comparable levels of LC3-I/II ratio and LC3 puncta between the controls and the mice with atrophic muscle; PBM did not change this profile. After 14 days of denervation, an increased LC3-I/II ratio suggested an ongoing autophagy, which was not affected by PBM. CONCLUSION: PBM attenuated the tibialis anterior

muscle atrophy induced by sciatic nerve transection in the mice after at least 5 and 14 days of muscle denervation, without affecting autophagy. The transient protective effect of PBM was observed as early as 5 days after the of complete nerve lesion. Animals;Autophagy;Mice;Mice, Inbred C57BL;Muscle Denervation;Muscle, Skeletal;Muscular Atrophy;Sciatic Neuropathy

Response of osteoblastic cells to low-level laser treatment: a systematic review. Low-level laser therapy (LLLT)-induced photobiomodulation (PBM) stimulates bone tissue regeneration by inducing osteoblast differentiation and mitochondrial activation. However, the role of reactive oxygen species (ROS) in this process remains controversial. The aim of this systematic review was to collect and analyze the available literature on the cellular and molecular effects of LLLT on osteoblasts and the role of ROS in this process. A search was conducted in PubMed, ScienceDirect, Scopus, and Web of Science. Studies published in English over the past 15Â years were selected. Fourteen articles were included with moderate (nâ€‰=â€‰9) and low risk of bias (nâ€‰=â€‰5). Thirteen studies reported the use of diode lasers with wavelengths (Î») between 635 and 980Â nm. One study used an Nd:YAG laser (Î»1064Â nm). The most commonly used Î» values were 808 and 635Â nm. The energy densities ranged from 0.378 to 78.75Â J/cm(2), and irradiation times from 1.5 to 300Â s. Most studies found increases in proliferation, ATP synthesis, mitochondrial activity, and osteoblastic differentiation related to moderate and dose-dependent increases in intracellular ROS levels. Only two studies reported no significant changes. The data presented heterogeneity owing to the variety of LLLT protocols. Although several studies have shown a positive role of ROS in the induction of proliferation, migration, and differentiation of different cell types, further research is required to determine the specific role of ROS in the osteoblastic cell response and the molecular mechanisms involved in triggering previously reported cellular events. Reactive Oxygen Species;Adenosine Triphosphate Adenosine Triphosphate;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Reactive Oxygen Species

Simultaneous red and infrared light-emitting diodes reduced pain in individuals with temporomandibular disorder: a randomized, controlled, double-blind, clinical trial. The aim of the present study was to evaluate the effects of photobiomodulation (PBM) with the simultaneous use of red and infrared LEDs on pain and mandibular range of motion in individuals with temporomandibular disorder (TMD). Eighteen participants were randomly allocated to an LED group or control group. The device had 18 red LEDs (660Â nm) and 18 infrared LEDs (850Â nm), with a total power irradiated of 126 mW and 75.6Â J per point. The device was placed in the regions of the temporomandibular joint (TMJ) and masticatory muscles once per day three times per week for 2Â weeks. Pain intensity was measured using the visual analog scale (VAS). Mandibular range of motion was determined using digital calipers and considering different conditions (unassisted opening without pain, maximum opening with and without assistance, right and left lateral movements, and protrusion). Evaluations were performed before treatment, immediately after the first LED irradiation session and at the end of six sessions. A significant reduction in pain intensity was found in the LED group at the end of treatment compared to the control group (pâ€‰<â€‰0.001) as well as in the comparison between the pretreatment and end of treatment evaluations (pâ€‰<â€‰0.001). Regarding mandibular movements, no statistically significant differences between the LED group and control group were found at the end of treatment for any of the conditions analyzed or in the comparison between the beginning and end of treatment with LED. Photobiomodulation using a cluster with red and infrared LEDs induced a reduction in pain in individuals with temporomandibular disorder but did not alter mandibular range of motion in these individuals. Trial registration number: NCT03696706; retrospectively registered (ClinicalTrials.gov). Humans;Low-Level Light Therapy;Temporomandibular Joint Disorders;Temporomandibular Joint;Double-Blind Method;Pain

Comparative analysis of Laser and LED phototherapies pain control after insertion of elastomeric separators in orthodontics patients: Clinical trial. The aim of this study was to evaluate the effectiveness of pain modulation following Laser or LED phototherapies during the process of tooth separation. This was a longitudinal randomized controlled clinical trial in four observational times carried out in 60 patients (15 males, 45 females, average 24.1Â years old) who were randomly divided into three groups: G1 (LED, AsGaAl, Î»850Â Â±Â 10Â nm, 150Â mW, 17Â J/cm(2), 57Â s per session), G2 (Laser, AsGaAl, Î»780 nm, 70Â mW, 20.0Â J/cm(2), 240Â s per session) and G3 (Non-irradiated Control). All patients were submitted to tooth separation using elastomeric separators. The pain level was measured by using a visual analogue scale (VAS) immediately after insertion (T1) of the elastic, at 48 (T2), 96 (T3) hours and 6Â days (T4). It was observed an increase of the pain on the Control group from T1 to T2, with statistical significance. Pain levels in the LED and Laser groups were always significantly lower (<0.001), except for T1. According with the results of the present study it may be concluded that, either LED or Laser phototherapies, were effective in reducing the pain level after dental separation process when compared to the control group.
Adult;Female;Humans;Lasers;Low-Level Light Therapy;Male;Pain;Pain Management;Pain Measurement;Phototherapy;Young Adult

Effect of Photobiomodulation Therapy on Peri-Implant Bone Healing in Extra-Short Implants in a Rabbit Model: A Pilot Study. Objective: To evaluate the effects of photobiomodulation therapy (PBMT) at distinct energy levels on peri-implant bone healing in extra-short implants in a experimental rabbit model. Background: The effect of PBMT on peri-implant bone healing in short implants remains unclear. This explored the effect of PBMT on extra-short implants in terms of bone-implant contact (BIC) length and rate, and implant stability quotient (ISQ). Methods: Fifteen white New Zealand rabbits were randomly divided into five groups. In all groups, extra-short implants (3.5â€‰Ã—â€‰4â€‰mm; Nucleoss T6, Ä°zmir/Turkey) were placed in both tibias of the rabbits. PBMT was performed in four groups (group 1, 5â€‰J/cm(2); group 2, 10â€‰J/cm(2); group 3, 20â€‰J/cm(2); and group 4, 25â€‰J/cm(2)); no PBMT was performed in the control group. On the 30th day, the rabbits were sacrificed and peri-implant tissue samples were obtained to determine the BIC length and BIC rate. Implant stability levels were measured by resonance frequency analysis using the Osstell penguin device and were determined as ISQ values on the 1st and 30th days of the study. Results: PBMT significantly increased the BIC length and BIC rate in groups 3 and 4 (pâ€‰<â€‰0.001). For the ISQ values, there were significant differences between the 1st and 30th day (pâ€‰<â€‰0.001). On the 30th day, the ISQ values were significantly higher in groups 3 and 4 compared with the remaining groups (pâ€‰<â€‰0.001). Conclusions: In this study, PBMT improved peri-implant bone healing through increase in BIC length, BIC rate, and ISQ parameter values in extra-short implants. Animals;Rabbits;Low-Level Light Therapy;Pilot Projects

Photobiomodulation Literature Watch January 2022.

Photobiomodulation Effectiveness in Treating Androgenetic Alopecia. Background: Androgenetic alopecia (AGA) is a genetically determined condition, which leads to progressive hair loss (HL) of the vertex, affects hair follicles, and promotes partial or total HL. It may be related to important psychological and social distress. Objective: The aim of the study was to evaluate the effects of photobiomodulation (PBM) in patients with AGA. Methods: Twenty-five men 20-54 years of age participated in this study. The irradiations were punctual, in contact mode, with 1â€‰cm between each point covering the entire affected area. A red low-level laser (Î»â€‰=â€‰660â€‰nm) (Recover(Â®), MMOptics, SÃ£o Carlos, Brazil) was used with 100â€‰mW, 30â€‰sec, and 3â€‰J per point, twice a week on alternate days for 10 weeks. Evaluations were made by photographic records from the same area before any intervention (T1), after 5 weeks (T2), after 10 weeks (T3). Two blinded evaluators using the ImageJ(Â®) software assessed the hair density

evaluation showed a significant increase in hair count between T1 and T2 (pâ€‰=â€‰0.0004) and between T1 and T3 (pâ€‰=â€‰0.0285), however between T2 and T3 no statistical difference was found (pâ€‰>â€‰0.05). Conclusions: PBM provides a stimulus for hair density in 5 weeks. After this period, we observed that after five extra sessions, it does not increase hair density in the treated region. This study showed that the PBM is effective and promoted safe results with a reduced number of sessions for the AGA treatment. Alopecia;Brazil;Hair;Humans;Male

Efficacy of Low-Level Laser Therapy in Reducing Pain in the Initial Stages of Orthodontic Treatment. PURPOSE: There is no consensus about the mechanism and efficacy in alleviating pain of the lower-level laser therapy (LLLT) during orthodontic treatment. This study aimed to evaluate the LLLT effectiveness clinically in reducing pain caused by orthodontic movement that occurs in the early stages of treatment. METHODS: The sample consisted of 54 patients in need of orthodontic treatment divided into two groups. A 28 experimental patients group (initial mean age: 26.84 years old) was undergone gallium-aluminum-arsenide infrared laser application on 12 points for each tooth immediately after the installation of the first alignment archwire, and a 26 patients control group (initial mean age: 29.13 years old) was undergone to no pain control intervention at all. Pain intensity was measured by using a visual analog scale, which was marked pain level (mm) reported in 06, 24, 48, and 72 hours. The perception of pain (beginning, peak, decline, and absence) was evaluated by filling up a questionnaire. To compare the intensity and perception of pain between groups, a nonparametric Mann-Whitney has been performed. RESULTS: The experimental group showed levels (mm) at 6 ($p < 0.001$), 24 ($p=0.004$), and 48 hours ($p=0.007$) and perception of pain (hours) in the peak ($p=0.026$), decline ($p=0.025$), and absence ($p=0.008$) significantly lower compared to the group control. CONCLUSION: Low-level laser therapy is effective in reducing pain severity caused by orthodontic forces activation, and it promotes the analgesic action lasting effect during the most painful feeling time.

Brighten the Future: Photobiomodulation and Optogenetics. Safe, noninvasive, and effective treatments for brain conditions are everyone's dream. Low-level light therapy (LLLT) based on the photobiomodulation (PBM) phenomenon has recently been adopted in practice, with solid scientific evidence. Optogenetics provides high spatiotemporal resolution to precisely switch on and off a particular circuitry in the brain. However, there are currently no human trials of optogenetics on the human brain. These two approaches-PBM and optogenetics-are promising photonic treatments that target the brain using completely different technologies. PBM is based on the mitochondrial reaction to the photons for up- or downregulation on the cytochrome c oxidase synthase in cellular respiration. It is safe, noninvasive, and good for long-term treatments, with wide applications using light wavelengths ranging from 650 nm to â‰ˆ1,100 nm, the red to near-infrared range. Optogenetics is based on the expression of engineered opsins on targeted tissues through viral vectors. The opsins are engineered to be sensors, actuators, or switches and could be precisely controlled by light wavelength ranging from 450 nm to â‰ˆ650 nm, the visible light range. The penetration of visible light is limited, and thus the photons cannot be applied directly outside the head without surgical means to create a physical window. PBM using near-infrared light could reach deeper tissues for light directly applied outside the head. Detailed scientific foundations and the state of the art for both technologies are reviewed. Ongoing developments are discussed to provide insight for future research and applications.

Management of Combined Therapy (Ceritinib, A. cinnamomea, G. lucidum, and Photobiomodulation) in Advanced Non-Small-Cell Lung Cancer: A Case Report. The 5-year survival rate of non-small-cell lung cancer (NSCLC) is still low (<21%) despite recent improvements. Since conventional therapies have a lot of side effects, combined therapy is strongly recommended. Here, we report a patient with advanced NSCLC who received combined therapy, including ceritinib, photobiomodulation (PBM),

ACGL (Antrodia cinnamomea (A. cinnamomea), and Ganoderma lucidum (G. lucidum)). Based on combined therapy, suitable doses of A. cinnamomea, G. lucidum, and PBM are important for tumor inhibition. This case report presents clinical evidence on the efficacy of combined therapy in advanced NSCLC patients, including computed tomography (CT) scan, magnetic resonance imaging (MRI), carcinoembryonic antigen (CEA), and blood tests. The effective inhibition of human lung adenocarcinoma cells is demonstrated. Our case highlights important considerations for PBM and ACGL applications in NSCLC patients, the side effects of ceritinib, and long-term health maintenance.

Short- and Long-Term Effectiveness of Low-Level Laser Therapy Combined with Strength Training in Knee Osteoarthritis: A Randomized Placebo-Controlled Trial. BACKGROUND: Both physical activity and low-level laser therapy (LLLT) can reduce knee osteoarthritis (KOA) inflammation. We conducted a randomized clinical trial to investigate the short- and long-term effectiveness of LLLT combined with strength training in persons with KOA. METHODS: Fifty participants were randomly divided in two groups, one with LLLT plus strength training (n = 26) and one with placebo LLLT plus strength training (n = 24). LLLT and strength training were performed triweekly for 3 and 8 weeks, respectively. In the laser group, 3 joules 904 nm wavelength laser was applied to fifteen points (45 joules) per knee per session. Patient-reported outcomes, physical tests, and ultrasonography assessments were performed at baseline and 3, 8, 26, and 52 weeks after initial LLLT or placebo therapy. The primary outcomes were pain on movement, at rest, at night (Visual Analogue Scale), and globally (Knee injury and Osteoarthritis Outcome Score (KOOS) subscale). Parametric data were assessed with analysis of variance using Å idÃ¡k's correction. RESULTS: There were no significant between-group differences in the primary outcomes. However, in the laser group there was a significantly reduced number of participants using analgesic and non-steroidal anti-inflammatory drugs and increased performance in the sit-to-stand test versus placebo-control at week 52. The joint line pain pressure threshold (PPT) improved more in the placebo group than in the laser group, but only significantly at week 8. No other significant treatment effects were present. However, pain on movement and joint line PPT were worse in the placebo group at baseline, and therefore, it had more room for improvement. The short-term percentage of improvement in the placebo group was much higher than in similar trials. CONCLUSIONS: Pain was reduced substantially in both groups. LLLT seemed to provide a positive add-on effect in the follow-up period in terms of reduced pain medication usage and increased performance in the sit-to-stand test.

Efficacy of Photobiomodulation in Reducing Symptomatology and Improving the Quality of Life in Patients with Xerostomia and Hyposalivation: A Randomized Controlled Trial. Objectives: To evaluate the efficacy of photobiomodulation (PBM) treatment in patients with xerostomia and hyposalivation and assess their quality of life over a one year of follow-up. Material and methods: A single-blind randomized controlled trial. A total of 60 patients with xerostomia were included (30 PBM cases and 30 placebo controls). Photobiomodulation was performed with a diode laser (810 nm, 6 J/cm2), while the controls underwent simulated treatment. One weekly session was carried out for a total of 6 weeks (total six sessions). The study parameters were recorded at baseline, after three and six weeks, and at one year post-treatment. Xerostomia was assessed using a salivary flow visual analog scale (VAS) and the Xerostomia Inventory (XI). The Hospital Anxiety and Depression (HAD) scale, Oral Health Impact Profile (OHIP-14), Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) were also administered. Results: The patients subjected to PBM therapy showed a significant improvement of xerostomia based on the drainage test, and of oral quality of life ($p < 0.001$). The depression score of the HAD (HAD-D) and the ESS showed improvement, though without reaching statistical significance ($p > 0.05$). The placebo group showed significant changes in the xerostomia VAS score at 6 weeks ($p = 0.009$), with no variations in any of the other studied parameters ($p > 0.05$). The beneficial effects of the diode laser in the PBM group persisted at one year

post-treatment. Conclusions: Photobiomodulation with the diode laser is effective in patients with xerostomia and hyposalivation, and thus should be taken into account as a treatment option.

Suitability of Chitosan Scaffolds with Carbon Nanotubes for Bone Defects Treated with Photobiomodulation. Biomaterials have been investigated as an alternative for the treatment of bone defects, such as chitosan/carbon nanotubes scaffolds, which allow cell proliferation. However, bone regeneration can be accelerated by electrotherapeutic resources that act on bone metabolism, such as low-level laser therapy (LLLT). Thus, this study evaluated the regeneration of bone lesions grafted with chitosan/carbon nanotubes scaffolds and associated with LLLT. For this, a defect (3 mm) was created in the femur of thirty rats, which were divided into 6 groups: Control (G1/Control), LLLT (G2/Laser), Chitosan/Carbon Nanotubes (G3/C+CNTs), Chitosan/Carbon Nanotubes with LLLT (G4/C+CNTs+L), Mineralized Chitosan/Carbon Nanotubes (G5/C+CNTsM) and Mineralized Chitosan/Carbon Nanotubes with LLLT (G6/C+CNTsM+L). After 5 weeks, the biocompatibility of the chitosan/carbon nanotubes scaffolds was observed, with the absence of inflammatory infiltrates and fibrotic tissue. Bone neoformation was denser, thicker and voluminous in G6/C+CNTsM+L. Histomorphometric analyses showed that the relative percentage and standard deviations (mean Â± SD) of new bone formation in groups G1 to G6 were 59.93 Â± 3.04a (G1/Control), 70.83 Â± 1.21b (G2/Laser), 70.09 Â± 4.31b (G3/C+CNTs), 81.6 Â± 5.74c (G4/C+CNTs+L), 81.4 Â± 4.57c (G5/C+CNTsM) and 91.3 Â± 4.81d (G6/C+CNTsM+L), respectively, with G6 showing a significant difference in relation to the other groups (a â‰ b â‰ c â‰ d; $p < 0.05$). Immunohistochemistry also revealed good expression of osteocalcin (OC), osteopontin (OP) and vascular endothelial growth factor (VEGF). It was concluded that chitosan-based carbon nanotube materials combined with LLLT effectively stimulated the bone healing process. Nanotubes, Carbon;Vascular Endothelial Growth Factor A;Chitosan Animals;Bone Regeneration;Chitosan;Low-Level Light Therapy;Nanotubes, Carbon;Rats;Rats, Wistar;Tissue Scaffolds;Vascular Endothelial Growth Factor A

Effect of Photobiomodulation in Suppression of Oxidative Stress on Retinal Pigment Epithelium. As the world undergoes aging, the number of age-related diseases has increased. One of them is disease related to retinal pigment epithelium (RPE) degeneration, such as age-related macular degeneration, causing vision loss without physical damage in the ocular system. It is the leading cause of blindness, with no cure. Although the exact pathogenesis is still unknown, the research shows that oxidative stress is one of the risk factors. Various molecules have been reported as anti-oxidative materials; however, the disease has not yet been conquered. Here, we would like to introduce photobiomodulation (PBM). PBM is a non-invasive treatment based on red and near-infrared light and has been used to cure various diseases by regulating cellular functions. Furthermore, recent studies showed its antioxidant effect, and due to this reason, PBM is arising as a new treatment for ocular disease. In this study, we confirm the antioxidant effect of PBM in retinal pigment epithelium via an RPE model with hypoxia. The function of RPE is protected by PBM against damage from hypoxia. Furthermore, we observed the protective mechanism of PBM by its suppression effect on reactive oxygen species generation. These results indicate that PBM shows great potential to cure RPE degeneration to help patients with blindness. Antioxidants Antioxidants;Blindness;Humans;Hypoxia;Oxidative Stress;Retinal Pigment Epithelium

The combination of low level laser therapy and efavirenz drastically reduces HIV infection in TZM-bl cells. BACKGROUND: Human immunodeficiency virus (HIV) infection remains a global health challenge despite the use of antiretroviral therapy, which has led to a significant decline in the mortality rates. Owing to the unavailability of an effective treatment to completely eradicate the virus, researchers continue to explore new methods. Low level laser therapy (LLLT) has been widely used to treat different medical conditions and involves the exposure of cells or tissues to low levels of red and near infrared light. The study aimed to determine the effect of combining two unrelated

therapies on HIV infection in TZM-bl cells. METHODS: In the current study, LLLT was combined with efavirenz, an HIV reverse transcriptase inhibitor to establish their impact on HIV infection in TZM-bl cells. Both the HIV infected and uninfected cells were laser irradiated using a wavelength of 640Â nm with fluencies of 2-10Â J/cm(2). RESULTS: The impact of HIV, efavirenz and irradiation were determined 24Â h post irradiation using biological assays. Luciferase assay results showed that the combination of LLLT and efavirenz significantly reduced HIV infection in cells, despite the undesirable effects observed in the cells as demonstrated by cell morphology, proliferation and cell integrity assay. Flow cytometry results demonstrated that cell death was mainly through necrosis while fluorescence microscopy showed the production of reactive oxygen species in HIV infected cells. CONCLUSION: Efavirenz and LLLT significantly reduced HIV infection in TZM-bl cells. Furthermore, the death of HIV infected cells was due to necrosis. Alkynes;Benzoxazines;Cyclopropanes;efavirenz Alkynes;Benzoxazines;Cyclopropanes;HIV Infections;Humans;Low-Level Light Therapy;Necrosis

Connecting the dots between inflammatory cascades of obesity and COVID-19 in light of mortal consequences-a review. Obesity is a term that has recently been referred to describe a condition in which a person has become a diseased vessel. Obesity's internal pathology is too mysterious as it has a close resemblance with fatal diseases pathology. Obesity and coronavirus disease 2019 (COVID-19) are simultaneous epidemics declared by many organizations after observing their rampage in the recent world. Oxidative stress, cytokine storm, interleukin, and their contribution to the internal adipocyte environment implicated in the cascades of inflammatory pathology are portrayed here. Major determinants like angiotensin-converting enzyme 2 (ACE2) and renin-angiotensin-aldosterone system (RAAS) axis are highly sensitive molecular factors. Data from various countries suggested a clinical overview of how greater body mass index (BMI) is related to greater COVID-19 risk. It also gives insight into how obese individuals are obligately getting admitted and combating COVID-19 in intensive care unit including children less than 13Â years of age under ultimate therapeutic options. There are numerous studies currently taking place for finding a cure for obesity which are mainly focused on natural resources and novel therapies like photobiomodulation (PBM) consisting of laser treatment, infrared treatment, etc. as current pharmacological treatments are reported to have fatal adverse effects. Finally, it is discussed how attenuating obesity will be a solution for future combat strategy. This review gives light on the areas of coagulation, inflammatory parameters, cardiometabolic complications, endothelial dysfunctions, immunological infirmity due to COVID-19 in obese individuals. A conceptual outline about correlation between the inflammatory pathophysiological steps triggering the aggravation of fatal consequences has been drawn in this review. Peptidyl-Dipeptidase A COVID-19;Child;Humans;Obesity;Peptidyl-Dipeptidase A;Renin-Angiotensin System;SARS-CoV-2

Laser oromaxillofacial photobiomodulation therapy: molecular mechanisms, outcomes and considerations. Tweetable abstract Photobiomodulation therapy is largely characterized as a safe therapeutic model that can modulate the activity of inflammatory and immune biomarkers while facilitating a metabolic response that can regenerate damaged tissue. Biomarkers Biomarkers;Lasers;Low-Level Light Therapy

Vaginal laser therapy for gynecologic conditions: re-examining the controversy and where do we go from here. Despite significant controversy, vaginal laser therapy continues to be used for treatment of many gynecologic and pelvic conditions including vaginal atrophy, vaginal dryness, dyspareunia, urinary incontinence and pelvic pain. This commentary reviews the controversy surrounding vaginal laser therapy and summarizes the important distinction between ablative and non-ablative vaginal lasers. While much research is still needed, the article describes what is important for healthcare professionals to know before making the decision to integrate this

technology into their clinical practice. Female;Humans;Laser Therapy;Lasers, Solid-State;Menopause;Vagina;Vaginal Diseases

Indirect Application of Intense Pulsed Light Induces Therapeutic Effects on Experimental Murine Meibomian Gland Dysfunction. PURPOSE: To investigate the indirect effects of intense pulsed light (IPL) on morphological and pathological changes of the meibomian glands (MGs) in apolipoprotein E knockout (ApoE(-/-)) mice and explore the underlying mechanisms. METHODS: ApoE(-/-) mice were treated with or without IPL three times below the lower eyelids and MGs were not directly exposed to irradiation. The eyelids and ocular surface were observed under a stereoscope. The morphology of MGs was examined by photographing and hematoxylin and eosin staining. Lipid droplets in MGs were examined by Oil Red O staining. The ultrastructure of meibocytes and mitochondria was observed under transmission electron microscopy. The relative gene and protein expression in MGs of upper eyelids was determined by immunostaining, Western blot, and qRT-PCR. RESULTS: Three IPL treatments decreased the toothpaste-like plugging of orifices and thickening and irregularity of the upper and lower eyelid margins in ApoE(-/-) mice. The morphology of some MGs improved after IPL treatments, accompanied by increased proliferation of acinar basal cells and decreased ductal keratinization. Furthermore, the accumulation of hyperchromatic lipid droplets in the acini increased, and the lipid droplets distributed in the cells around the acini were round and small. Compared with untreated ApoE(-/-) mice, oxidative stress and apoptosis were downregulated by IPL treatment, accompanied by the improvements in mitochondrial structure. Further research showed that IPL treatments reduced the levels of tumor necrosis factor-alpha (TNF-Î±), interleukin (IL)-17A, IL-6 in MGs and inactivated nuclear factor kappa B (NF-Îº B). CONCLUSION: Collectively, the results demonstrate that indirect effects of IPL can improve the structure and function of MGs and mitigate the progression of MGD, which may be related to the indirect effects of photobiomodulation.

Three-Dimensional Assessment of the Temporomandibular Joint Changes Following Reversed Twin Block Therapy of Patients With Skeletal Class III Malocclusion in Conjunction With the Photobiomodulation Therapy: A Randomized Controlled Clinical Trial. BACKGROUND: Despite the positive effect ofÂ the photobiomodulation therapy (PBMT) application on animals, the primary role of this technique on the human condyle is still unclear. Several experimental reports have shown the efficacy of PBMT in inducing cellular changes in the temporomandibular joint (TMJ) region during functional treatment of patients with skeletal deformities. Still, the lack of information about its effects on human condyles requires further studies. OBJECTIVES: This study aimed to evaluate the effect of PBMT on the TMJ components following Class III treatment with the reversed twin blockÂ (RTB) appliance in growing patients.Â Materials and Method: Forty children (12 females, 28 males) between the age of nine and eleven yearsÂ with skeletal Class III were assigned randomly to the RTB group withÂ photobiomodulation (RTB+PBMT) or the control group (RTB). The PBMT was applied to the TMJ region using an 808-nm wavelengthÂ Ga-Al-As semiconductor laser device with 5 Joules/cm(2) energydensity on days 1, 3, 7, and 14 of the first month. Afterwards, the irradiation was conducted every 15 days until the end of the treatment. Cone-beam computerized tomography (CBCT) images were taken before (T1) treatment and following the end of treatmentÂ (T2)Â to assess TMJ and skeletal changes. RESULTS: Condylar volume was significantly increased in the RTB group only by a mean of 287.97 mm(3) ($p<0.001$). The significantly backward and upward condylar movement was observed in the RTB and RTB+PBMT groups (superior joint space (SJS): 0.26 mm, 0.15 mm; posterior joint space (PJS): 0.42mm, 0.11mm, respectively). The RTB group showed the most remarkable changes. Significant improvement of the sagittal maxilla-mandibular relationship was greaterÂ in the RTB+PBMT group compared to theÂ RTB group ($p=0.02$). CONCLUSION: There were

no considerable differences in the condylar position after Class III treatment between the RTB and the RTB+PBMT groups. But a difference in the condylar volume was noticed between the two group.

EFFICACY OF LASER THERAPY FOR ALVEOLAR OSTEITIS: A SYSTEMATIC REVIEW OF THE AVAILABLE EVIDENCE. OBJECTIVE: Alveolar osteitis (commonly known as dry socket) is a very common painful complication of dental extraction with no definitive cure. This systematic review assessed the efficacy of laser therapy in the management of alveolar osteitis. METHODS: PubMed, Scopus, Web of Science, Embase, Cochrane Central, and China National Knowledge Infrastructure (CNKI) were searched for all studies published till July 2021 using relevant keywords. All clinical trials that assessed the efficacy of laser in the management of alveolar osteitis were included. Due to missing some numerical data and the substantial heterogeneity across the studies, no meta-analysis was performed. RESULTS: Out of the 296 identified articles, 14 clinical trials comprising 981 patients were included. The laser wavelengths, power output, and energy fluence showed a great variability across the included studies: 632.8 - 2940 nm, 16 mW - 10 W, and 0.2 - 85.7 J/cm(2), respectively. All included studies found laser to be efficacious in alleviating pain and accelerating healing in patients with alveolar osteitis. Of the 14 included studies, 13 studies reported superior outcomes in favor of laser therapy as compared to conventional therapies. CONCLUSION: The available evidence suggests a good efficacy of laser therapy in reducing signs and symptoms of alveolar osteitis. However, owing to the marked methodological heterogeneity and the substantial variations in laser parameters among the included studies, more well-designed clinical trials with adequate sample sizes and standardized laser parameters are highly recommended. CLINICAL SIGNIFICANCE: Laser therapy can be applied for the management of dry socket. China;Dry Socket;Humans;Low-Level Light Therapy;Tooth Extraction;Wound Healing

Near-infrared light reduces Î²-amyloid-stimulated microglial toxicity and enhances survival of neurons: mechanisms of light therapy for Alzheimer's disease. BACKGROUND: Low-intensity light can decelerate neurodegenerative disease progression and reduce amyloid Î² (AÎ²) levels in the cortex, though the cellular and molecular mechanisms by which photobiomodulation (PBM) protects against neurodegeneration are still in the early stages. Microglia cells play a key role in the pathology of Alzheimer's disease by causing chronic inflammation. We present new results concerning the PBM of both oxidative stress and microglia metabolism associated with the activation of metabolic processes by 808â€‰nm near-infrared light. METHODS: The studies were carried out using healthy male mice to obtain the microglial cell suspension from the hippocampus. Oligomeric Î²-amyloid (1-42) was prepared and used to treat microglia cells. Light irradiation of cells was performed using diode lasers emitting at 808â€‰nm (30â€‰mW/cm(2) for 5â€‰min, resulting in a dose of 10â€‰J/cm(2)). Mitochondrial membrane potential, ROS level studies, cell viability, apoptosis, and necrosis assays were performed using epifluorescence microscopy. Phagocytosis, nitric oxide and H(2)O(2) production, arginase, and glucose 6-phosphate dehydrogenase activities were measured using standard assays. Cytokines, glucose, lactate, and ATP were measurements with ELISA. As our data were normally distributed, two-way ANOVA test was used. RESULTS: The light induces a metabolic shift from glycolysis to mitochondrial activity in pro-inflammatory microglia affected by oligomeric AÎ². Thereby, the level of anti-inflammatory microglia increases. This process is accompanied by a decrease in pro-inflammatory cytokines and an activation of phagocytosis. Light exposure decreases the AÎ²-induced activity of glucose-6-phosphate dehydrogenase, an enzyme that regulates the rate of the pentose phosphate pathway, which activates nicotinamide adenine dinucleotide phosphate oxidases to further produce ROS. During co-cultivation of neurons with microglia, light prevents the death of neurons, which is caused by ROS produced by AÎ²-altered microglia. CONCLUSIONS: These original data clarify reasons for how PBM protects against neurodegeneration and support the use of light for therapeutic research in the treatment of

Alzheimer's disease. Amyloid beta-Peptides;Cytokines;Reactive Oxygen Species;Hydrogen Peroxide;Glucose Alzheimer Disease;Amyloid beta-Peptides;Animals;Cytokines;Glucose;Humans;Hydrogen Peroxide;Male;Mice;Microglia;Neurodegenerative Diseases;Neurons;Phototherapy;Reactive Oxygen Species

Complementarity of surgical therapy, photobiomodulation, A-PRF and L-PRF for management of medication-related osteonecrosis of the jaw (MRONJ): an animal study. BACKGROUND: This study aimed to evaluate the complementarity of surgical therapy, photobiomodulation (PBM), advanced platelet-rich fibrin (A-PRF), and Leukocyte and platelet-rich fibrin (L-PRF) for the management of medication-related osteonecrosis of the jaw (MRONJ). METHODS: Sixty rats underwent injection of zoledronate followed by left mandibular first and second molar extractions to induce MRONJ lesions. All rats were examined for the signs of MRONJ 8 weeks post-dental extraction. Forty-nine rats with positive signs of MRONJ were appointed to seven different groups as follows: control (Ctrl); surgery alone (Surg); surgery and PBM (Surgâ€‰+â€‰PBM); surgery and A-PRF insertion (Surgâ€‰+â€‰APRF); surgery and L-PRF insertion (Surgâ€‰+â€‰LPRF); surgery, A-PRF insertion, and PBM (Surgâ€‰+â€‰APRFâ€‰+â€‰PBM); surgery, L-PRF insertion, and PBM (Surgâ€‰+â€‰LPRFâ€‰+â€‰PBM). Euthanasia was carried out 30Â days after the last treatment session. The lesions' healing was evaluated clinically, histologically, and radiographically. Data were analyzed using STATA software version 14, and the statistical significance level was set at 5% for all cases. RESULTS: According to the present study, A-PRF and L-PRF treatment resulted in significant improvements in clinical, histological, and radiographical parameters compared to the Ctrl group ($P < 0.05$). The PBM also decreased wound dimensions and the number of empty lacunae compared to the Ctrl group ($P < 0.05$). Surgâ€‰+â€‰APRFâ€‰+â€‰PBM and Surgâ€‰+â€‰LPRFâ€‰+â€‰PBM were the only groups that presented a significantly higher mean number of osteocytes ($P < 0.05$). No significant differences were observed between A-PRF and L-PRF treatment groups ($P > 0.05$). CONCLUSIONS: Surgical resection followed by applying A-PRF or L-PRF reinforced by PBM showed optimal wound healing and bone regeneration in MRONJ lesions.
Bone Density Conservation Agents;Zoledronic Acid Animals;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Humans;Low-Level Light Therapy;Platelet-Rich Fibrin;Rats;Tooth Extraction;Zoledronic Acid

Lasers for cutaneous lesions: An update. There are several types of medical settings which use lasers. Dermatologists use lasers as it is non-invasive with preferential cosmetic outcomes and finer wound healing. The types of lasers are relying on their wavelengths and delivery systems. Over time, by using several distinct devices and strategies, new lasers have been generated; as a consequence, they are manipulated in a wide range of dermatological settings. In this review, laser applications in various vascular, infectious, and hyperpigmented cutaneous lesions were framed. We aimed to represent the fitness of phototherapy for each condition as well as the overall challenges that face laser. In addition, low-level laser therapy, and laser resurfacing were noted as the marketable line of lasers in the current time for cosmetic purposes. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Phototherapy;Wound Healing

Acupuncture Analgesia in Patients With Traumatic Rib Fractures: A Randomized-Controlled Trial. Pain management for traumatic rib fracture is important to prevent complications and reduce associated comorbidities. This trial investigated the analgesic efficacy of acupuncture on traumatic rib fracture. Patients with traumatic rib fracture were randomly assigned to traditional acupuncture (TA), laser acupuncture (LA) or sham laser acupuncture (SLA) groups in a 1:1:1 ratio. The intervention was performed on days 1 to 3 after treatment allocation. The acupoints included bilateral LI4 (Hegu), SJ6 (Zhigou), ST36 (Zusanli) and GB34 (Yanglingquan). The primary outcome was Numeric Rating Scale

(NRS) scores for pain after the intervention. Secondary outcomes included sustained maximal inspiration (SMI) lung volume, stress responses, the use of analgesics, and associated complications. Data were analyzed via one-way analysis of variance (ANOVA) with ScheffÃ©'s post hoc testing or chi-squared testing. Of the 120 study participants, 109 completed all interventions and measurements. The primary outcomes, which indicated average pain intensity levels and pain while deep breathing, were both significantly lower in the TA and LA groups than in the SLA group after 2 treatments. No between-group differences were observed in SMI lung volume, stress response, analgesics use or associated complications. These findings suggest that TA and LA are safe and effective analgesic modalities for pain management for traumatic rib fracture. CLINICAL TRIAL REGISTRATION: [ClinicalTrials.gov], identifier [NCT03822273].

A randomized controlled trial evaluating the effect of two low-level laser irradiation protocols on the rate of canine retraction. The objective of this study was to evaluate the canine retraction rate with two low-level laser therapy (LLLT) irradiation protocols, involving both a high and a low application frequency. Twenty patients were randomly divided into two equal groups. In Group A, one side of the maxillary arch randomly received LLLT on days 0, 3, 7, 14, and every 2Â weeks thereafter, whereas in Group B, one side received LLLT every 3Â weeks. Tooth movement was checked every three weeks since the onset of canine retraction, over the 12-week study period. Moreover, Interleukin-1Î² (IL-1Î²) levels in the gingival crevicular fluid were assessed. Results revealed a significant increase in the canine retraction rate on the laser sides of groups A and B, in comparison with the control sides (pâ€‰<â€‰0.05), with no significant differences reported between the laser sides in both groups (pâ€‰=â€‰0.08-0.55). Also, IL-1Î² levels were significantly higher on the laser sides of both groups, in comparison with the control sides (pâ€‰<â€‰0.05). Therefore, LLLT can effectively accelerate tooth movement, with both frequent and less frequent applications, which is attributed to an enhanced biological response as reflected by the elevated IL-1Î² levels on the compression sides. Gingival Crevicular Fluid;Humans;Laser Therapy;Low-Level Light Therapy;Maxilla;Randomized Controlled Trials as Topic;Tooth Movement Techniques

Physiotherapeutic approach in seamstresses with neck pain: A single-blind, randomized clinical trial. PURPOSE: To investigate and compare the effects of therapeutic exercise, therapeutic ultrasound and photobiomodulation on pain, functionality and recruitment pattern of motor units, after a rehabilitation protocol for seamstresses with neck pain. MATERIALS AND METHODS: All 36 female, randomly divided into three groups; i)exercise control group, ii)exercise and photobiomodulation group, iii)exercise and ultrasound group. The groups were composed of sewing machine operators with complaints neck pain. Clinical evaluations: Visual analog pain scale, questionnaires Nordic Musculoskeletal Questionnaire and the International Physical Activity Questionnaire, and electromyographic evaluations of the sternocleidomastoid and upper trapezius muscles. All variables were compared before and after the protocol. For statistical analysis, the values of mean, standard deviation and standard error of the mean were used. The values obtained were compared using the One-Way ANOVA with post-hoc Tukey, and Cohen's-d, with a significance coefficient of pÂ <Â 0.05. RESULTS: In the Ultrasound and laser groups there was a greater tendency to improve pain (pÂ <Â 0.0001) and size of the effect on pain reduction (ultrasoundÂ =Â d:1.99; photobiomodulationÂ =Â d:1.81). Between groups, there was a significant difference in post-treatment for the onset of right trapezius (pÂ =Â 0.024) in the exercise and photobiomodulation groups (pÂ =Â 0.0347). The photobiomodulation group showed pre and post-intervention differences in the left trapezius maximum onset (pÂ =Â 0.010). CONCLUSION: Interventions with photobiomodulation, ultrasound, and exercise assist to pain, function, and muscular activation in seamstresses with neck pain. Exercise Therapy;Female;Humans;Neck Muscles;Neck Pain;Pain Measurement;Single-Blind Method;Superficial Back Muscles

Photobiomodulation associated with lipid nanoparticles and hyaluronic acid accelerate the healing of excisional wounds. Objectives: This article aimed to investigate the effects of the association between photobiomodulation and hyaluronic acid incorporated in lipid nanoparticles in an epithelial lesion model in inflammatory parameters and oxidative stress. Methods: Eighty Wistar rats were randomly assigned to the following groups: epithelial lesion group (EL); EL+PBM; EL+HA; EL+SLNs; EL+SLNs-HA; EL+PBM+HA; EL+PBM+SLNs; EL+PBM+SLNs-HA. The animals were anesthetized with 4% isofluorane after shaving and induced to an epithelial lesion. Topical treatment with a gel containing HA (0.9%) and/or SLNs (10Â mg/mL) and with laser irradiation occurred daily for 1Â week. Results: The results showed an increase in wound contraction on the seventh day in the LE + LBM + AH-NPL group, a reduction in pro-inflammatory cytokines (IL-6, IL-1Î², and TNF-Î±), an increase in anti-inflammatory cytokines (IL- 4 and IL-10) and TGF-Î². The levels of pro-inflammatory cytokine IL-4 and TGF-Î² also showed an increase in the LE + NPL-AH, LE + FBM + AH, LE + FBM + NPL and LE + FBM + NPL-AH groups. Regarding oxidative stress parameters, the levels of DCF and nitrite decreased in the combined therapy group when compared to the control group, as well as oxidative damage (carbonyl and sulfhydryl). In the antioxidant defense, there was an increase in GSH and SOD in the combination therapy group. Histological analysis showed a reduction in inflammatory infiltrate in the combination therapy group. The number of fibroblasts and the compaction of collagen fibers did not obtain significant responses. Conclusions: Results analyzed together showed that the combined therapy favored the repair process, and that studies can be carried out to enhance the histological analysis therapy favored the tissue repair process and that studies can be carried out to enhance the histological analysis. Antioxidants;Cytokines;Interleukin-6;Lipid Nanoparticles;Liposomes;Nitrites;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Interleukin-10;Interleukin-4;Hyaluronic Acid;Collagen;Superoxide Dismutase Animals;Antioxidants;Collagen;Cytokines;Hyaluronic Acid;Interleukin-10;Interleukin-4;Interleukin-6;Liposomes;Low-Level Light Therapy;Nanoparticles;Nitrites;Rats;Rats, Wistar;Superoxide Dismutase;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Wound Healing

Effect of photobiomodulation treatment on pain control in patients with temporomandibular dysfunction disorder: systematic review. OBJECTIVE: To critically evaluate the literature and answer the question, "How effective is photobiomodulation treatment on pain control in patients with TMJ disorder?". METHODS: PRISMA, PubMed, Web of Science, Scopus, and Embase databases were used for the personalized search strategy. For risk of bias, Rob 2.0 for randomized clinical trials and ROBINS-I for non-randomized clinical trials were used. RESULTS: Eighty-four articles were found and, after removing duplicates, seventy one studies were included for titles and abstracts. For a full reading, 30 articles were selected and, according to the eligibility criteria, 24 remained for qualitative analysis. The studies showed a low risk of bias. Due to the heterogeneity of the studies, it was not possible to perform a meta-analysis. CONCLUSION: Photobiomodulation is an effective adjunct for the treatment of temporomandibular disorders, being a less invasive approach, safe, low-cost, and without side effects.

Efficacy of two low-level laser therapy protocols following lower third molar surgery - a randomized, double-blind, controlled clinical trial. The aim of this study was to test two low-level laser therapy protocols by evaluating pain control, swelling and trismus in the postoperative period of lower third molar surgeries. This was a randomized, double-blind, placebo-controlled, crossover trial. Patients presenting two symmetrically impacted mandibular third molars were included. One side was randomly assigned for LLLT applied immediately after surgery (T1) and then after 24 (T2) and 48 hours (T3) (Protocol A). The other side received LLLT applied immediately after surgery and placebo after 24 and 48 hours (Protocol B). LLLT was given by intraoral application (660nm, 5 J/cm2, 10 s, 20 mW, 4 points) followed by extraoral application (789 nm, 30 J/cm2, 20 s, 60 mW, 8 points). The

placebo application was similar to that of the experimental side but with laser simulation. The primary outcomes were pain control, swelling and trismus intensity at T1, T2, T3 and 7 days after surgery (T4). Data were analyzedbyANOVArepeated measures and Wilcoxon test (p<.05). The final sample consisted of 21 patients (42 teeth). There were no statistical differences for pain level between protocols A and B over time (p= .909), although the amount of analgesic medication was lower with protocol A at T2 (p=.022). There were no differences in swelling (p=.958) or trismus (p=.837) between the protocols used over time. Both protocols performed similarly for pain control, swelling and trismus. Therefore, for practical reasons, a single laser application in the immediate postoperative period could be indicated for the management of postoperative discomfort in lower third molar surgery. Double-Blind Method;Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Randomized Controlled Trials as Topic;Tooth Extraction;Tooth, Impacted;Trismus

Effectiveness of photobiomodulation in reducing pain and producing dental analgesia: a systematic review. PURPOSE: Photobiomodulation (PBM) is reported in many studies to produce dental analgesia without producing thermal damage to tissues. This systematic review aims to assess in vivo studies to support the statement that PBM can produce dental analgesia. METHOD: A systematic search strategy was constructed, and PubMed, Scopus, and Embase databases were searched. Subsequently, inclusion and exclusion criteria were applied, reference lists were scanned, and hand searched to identify other suitable studies. RESULTS: Five studies met the inclusion criteria. Meta-analysis was not undertaken due to the heterogenous nature of the studies and data. Positive analgesia outcome was obtained in four out of five studies, and one study with no significant results was criticized for poor reporting of laser parameters, small sample size (six). CONCLUSION: In general, all studies were criticized for poor discussion of all covariates that could have modified the results, consequently resulting in poor quality of evidence, moderate risk of bias, and poor internal validity, as well as external validity. The systematic review also discussed the potential implications of all variables to be considered for future trials, including pulsing mode, contact modes, and tooth characteristics. Analgesia;Humans;Pain;Pain Management

Photobiomodulation in Acute Traumatic Brain Injury: A Systematic Review and Meta-Analysis. Photobiomodulation (PBM) is a therapeutic modality that has gained increasing interest in neuroscience applications, including acute traumatic brain injury (TBI). Its proposed mechanisms for therapeutic effect when delivered to the injured brain include antiapoptotic and anti-inflammatory effects. This systematic review summarizes the available evidence for the value of PBM in improving outcomes in acute TBI and presents a meta-analysis of the pre-clinical evidence for neurological severity score (NSS) and lesion size in animal models of TBI. A systematic review of the literature was performed, with searches and data extraction performed independently in duplicate by two authors. Eighteen published articles were identified for inclusion: seventeen pre-clinical studies of in vivo animal models and one clinical study in human patients. The available human study supports safety and feasibility of PBM in acute moderate TBI. For pre-clinical studies, meta-analysis for NSS and lesion size were found to favor intervention versus control. Subgroup analysis based on PBM parameter variables for these outcomes was performed. Favorable parameters were identified as: wavelengths in the region of 665â€‰nm and 810â€‰nm; time to first administration of PBM â‰¤4â€‰h; total number of daily treatments â‰¤3. No differences were identified between pulsed and continuous wave modes or energy delivery. Mechanistic substudies within included in vivo studies are presented and were found to support hypotheses of antiapoptotic, anti-inflammatory, and pro-proliferative effects, and a modulation of cellular metabolism. This systematic review provides substantial meta-analysis evidence of the benefits of PBM on functional and histological outcomes of TBI in in vivo mammalian models. Study design and PBM parameters should be closely considered for future

human clinical studies. Animals;Humans;Low-Level Light Therapy;Brain Injuries;Brain Injuries, Traumatic;Brain;Mammals

The Influence of Phototherapy on Recovery From Exercise-Induced Muscle Damage. BACKGROUND: Intense physical activity can result in exercise-induced muscle damage, delayed-onset muscle soreness, and decrements in performance. Phototherapy (PhT), sometimes referred to as photobiomodulation or low-level laser therapy, may enhance recovery from vigorous exercise. PURPOSE: The purpose of this study was to assess the influence of phototherapy on functional movements (vertical jump, agility), and perceptions of muscle soreness following exercise-induced muscle damage caused by high volume sprinting and decelerations. METHODS: In a between-group design, 33 participants performed 40x15m sprints, a protocol intended to cause muscle damage. Immediately following sprinting and in the four days following, vertical jump and agility were assessed, as well as calf, hamstring, quadriceps, and overall perceptions of soreness. Sixteen subjects (age 20.6Â±1.6 yrs; BMI 25.8Â±4.6 kg.m-2) received PhT prior to testing each day, while 17 (age 20.8Â±1.3 yrs; BMI 26.2Â±4.5 kg.m-2) received sham PhT and served as a control (CON). Measurements were recorded during five days of recovery from the repeated sprint protocol, then compared to those recorded during three baseline days of familiarization. Area under the curve was calculated by summing all five scores, and comparing those values by condition via a two-tailed unpaired t-test for normally distributed data, and a two-tailed Mann-Whitney U test for nonparametric data (alpha level = 0.05). RESULTS: Calf soreness was lower in PhT compared to CON ($p = 0.02$), but no other significant differences were observed between groups for vertical jump, agility, quadriceps, hamstring, and overall soreness ($p > 0.05$). DISCUSSION: Phototherapy may attenuate soreness in some muscle groups following exercise-induced muscle damage, but may not enhance recovery after explosive, short-duration activities. CONCLUSION: Phototherapy may not be a useful recovery tool for those participating in explosive, short-duration activities. LEVEL OF EVIDENCE: 2c.

Impact of photobiomodulation on external root resorption during orthodontic tooth movement in humans - A systematic review and meta-analysis. BACKGROUND: Photobiomodulation has been gaining traction as a plausible therapy to control orthodontically induced root resorption. AIM: The aim of the present review was to systematically appraise randomized controlled trials conducted to study the influence of photobiomodulation on external root resorption during orthodontic movement in humans. METHOD: ology - A systematic search was carried out employing keywords in various electronic databases namely MEDLINE (Pubmed), Cochrane Library, Google Scholar, Semantic Scholar, ScienceDirect and Opengrey.eu for studies up to March 2020. Pre-defined inclusion and exclusion criteria were used to select the studies. Data extraction was carried out and the risk of bias was assessed using Cochrane Risk of Bias tool. Meta-analysis was conducted using random effects model for selected studies. Subgroup analysis was conducted for resorption on each axial surface of the tooth root viz. mesial, buccal, distal and palatal as well as for vertical thirds viz. cervical, middle and apical third. Summary of Findings was formulated according to GRADE Profile. RESULTS: The search retrieved 1509 results out of which six studies were included for the systematic review. Two studies showed low overall risk of bias and the remaining four showed unclear risk of bias. The meta-analysis was conducted for three studies with an overall sample size of 120 teeth which showed a pooled mean difference of 0.08 (95% CI 0.15 - (-0.02) to 1.96, p=<0.0001) in favour of photobiomodulation group with respect to mean total resorption per tooth. I(2) index revealed 88% heterogeneity. CONCLUSION: It is concluded that there is moderate grade of evidence to suggest beneficial effect of photobiomodulation on root resorption. Further high-quality randomized controlled trials with standardized intervention parameters are recommended. REGISTRATION: PROSPERO registration number - CRD42020167291.

Effectiveness of different protocols to reduce postoperative pain following orthognathic surgery: A systematic review and meta-analysis. Pain management in orthognathic surgery is essential to enhance recovery, reduce hospital stay, and improve the whole experience of the patient. The aim of this systematic review was to evaluate current evidence on pain management in orthognathic surgery. A systematic review of the literature was performed following PRISMA guidelines, and PubMed, EMBASE, and the Cochrane Controlled Trials Registry were searched to retrieve randomised clinical trials (RCTs) published until July 2020. RCTs that compared different pre-emptive analgesia and low-level laser therapy (LLLT) with placebo after orthognathic surgery were included. Outcome variables were pain scores and duration of surgery. The quality of evidence was rated according to Cochrane's tool for assessing risk of bias. Standardised mean difference (SMD) or mean difference (MD) was used to analyse continuous data. There was significant pain reduction within the first 48 hours after pre-emptive analgesia (very low quality evidence, SMD: -1.329; confidence interval (CI): -2.030 to -0.628; pÂ =Â 0.001) and LLLT (very low quality evidence, SMD: -0.690; CI: -1.172 to -0.207; pÂ =Â 0.005) versus placebo. Evidence to support pre-emptive analgesia or LLLT effectively reducing pain scores within the first postoperative 48 hours after orthognathic surgery when compared with placebo, was of low quality. Humans;Orthognathic Surgery;Orthognathic Surgical Procedures;Orthopedic Procedures;Pain Management;Pain, Postoperative

Correction to: Lowâ€‘level laser therapy is effective in controlling postoperative pain in lower third molar extractions: a systematic review and metaâ€‘analysis.

Effectiveness of the photobiomodulation therapy using low-level laser around dental implants: A systematic review and meta-analysis. BACKGROUND: The photobiomodulation (PBM) therapy has been applied in various fields. Its use in implant dentistry has been proven through various animal, in vitro, and recently also clinical studies. However, the cumulative data of its effect around dental implants in patients is limited. OBJECTIVES: The purpose of the present study was to evaluate whether or not the PBM therapy has a positive effect around dental implants and on implant stability. MATERIAL AND METHODS: The studies included in the review and meta-analysis were selected according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and the PICOS criteria. The RoB 2 tool was used for assessing the risk of bias and the RevMan software, v. 5.0, was used for meta-analysis. Quantitative analysis was done considering the implant stability measurement as the outcome. The mean and standard deviation (M Â±SD) values for implant stability as well as the sample size were extracted from the articles, and the inverse variance method with random effects was used for meta-analysis. The forest plots for all time intervals were inspected to estimate the heterogeneity by assessing the I2 statistic. RESULTS: A total of 148 articles were initially retrieved, out of which 81 remained after duplicate removal. Ten articles were included in the review after rejecting 68 on the basis of title and abstract. Seven were eligible for quantitative analysis. The meta-analysis showed non-significant differences in primary stability in control and laser groups at baseline ($p = 0.63$) and 3 months and above ($p = 0.06$). At 2 weeks, 1 month and 2 months, the results were statistically significant with $p = 0.01$, $p = 0.02$ and $p = 0.04$, respectively. CONCLUSION: The PBM therapy showed a positive effect on implant stability during the early stages of healing and can be considered for patients with dental implants. Dental Implants Dental Implants;Lasers;Low-Level Light Therapy

The Efficacy of Fractional Carbon Dioxide Laser in Surgical Scars Treatment: A system Review and Meta-analysis. BACKGROUND: Surgical scars seriously affect a patient's quality of life, and they have a strong impact on individuals. Many studies have reported the results of using fractional carbon dioxide (CO(2)) laser to treat surgical scars and have generally found it to be effective. OBJECTIVES: We conducted a meta-analysis with the objective of evaluating and proving the efficacy of fractional CO(2) laser therapy for surgical scars. METHODS: We performed a search of databases including

PubMed, Web of Science, Embase and the Cochrane Library. The outcomes of the meta-analysis were overall scores on the Vancouver Scar Scale (VSS) and its four dimensions (pigmentation, vascularity, pliability and height). Statistical analysis was performed using RevMan 5.4 software. RESULTS: A total of ten studies were included in this meta-analysis, including six randomized controlled trials (RCTs) and four nonrandomized controlled trials (N-RCTs). In the meta-analysis of RCTs and N-RCTs, similar results were obtained, and fractional CO(2) laser irradiation significantly decreased VSS scores ($P < 0.00001$). In addition, fractional CO(2) laser irradiation also had a significant effect on scores on the pigmentation ($P = 0.08$), vascularity ($P = 0.001$), flexibility ($P = 0.005$) and height ($P = 0.008$) dimensions. Except for mild pain during treatment and temporary erythema after treatment, most patients had no obvious adverse reactions. CONCLUSION: Our study found that fractional CO(2) laser exhibits excellent efficacy and safety in terms of surgical scar treatment. Thus, we hope it becomes more widely available to patients with surgical scars. LEVEL OF EVIDENCE III: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors Â www.springer.com/00266 . Carbon Dioxide Humans;Cicatrix;Carbon Dioxide;Lasers, Gas;Treatment Outcome;Low-Level Light Therapy

Effect of Ultraviolet-C Light-Emitting Diode Treatment on Disinfection of Norovirus in Processing Water for Reuse of Brine Water. Processes in the food industry that use large amounts of water have been an important cause of waterborne disease outbreaks, as they expose individuals to risks for waterborne disease transmission. Developing technologies to ensure the hygiene and safety of food-processing steps is an urgent concern from an economic perspective. Furthermore, economic benefits can be derived if the processed water can be reused under microbiologically safe conditions. Among the major manufacturing processes in the kimchi industry, the brining process for salted kimchi cabbages requires a considerable amount of brine (approximately 2,000-2,500â€‰l/1,000â€‰kg of raw cabbage). The aim of this study was to establish virucidal conditions with ultraviolet-C light-emitting diodes (UVC LEDs) that can ensure the microbiological safety of brine water samples with various turbidities for reuse after disinfection. For quantitative analysis, first of all, magnetic bead separation (MBS) technique was used to capture and recover the human norovirus (HuNoV) virus particles; propidium monoazide (PMA) combined with RT-qPCR (PMA-RT-qPCR) was subsequently used to selectively detect infectious norovirus. Overall, as the turbidity of the brine water samples increased, the reduction in the HuNoV genogroup II genotype 4 (HuNoV GII.4) levels by UVC LED disinfection decreased. The derived inactivation rate constant (k(inac)) and inactivation curves (calculated using the log-linear model) were studied as a function of turbidity based on the exponential one-phase inactivation kinetics of HuNoV. Using an impeller system set at 100 rotations/min (rpm) with an eight-nephelometric turbidity unit (NTU) sample (the lowest turbidity studied), the k(inact) based on the levels of viral genomic RNA concentrations was approximately 2.15-fold higher than that observed without rotation (0â€‰rpm). Moreover, the k(inact) increased 1.69-fold with a 56-NTU sample (the highest turbidity studied) when the impeller system was set at 100â€‰rpm. UVC LED treatment decreased the HuNoV GII.4 population more effectively in conjunction with the impeller system (100â€‰rpm) than without the impeller system. Our novel findings and model provide fundamental and scientific data that may help reuse brine water and ensure its microbiological safety through disinfection. Our study highlights the benefits of UVC LED treatment in successfully eliminating waterborne viruses in a prompt, resistance-reducing, and energy-efficient approach at the laboratory scale, which lays the foundation for future plant-scale studies of UVC LED-disinfection systems.

Low-level controllable blue LEDs irradiation enhances human dental pulp stem cells osteogenic differentiation via transient receptor potential vanilloid 1. Human dental pulp stem cells

(hDPSCs) have attracted tremendous attention in tissue regeneration engineering due to their excellent multidirectional differentiation potential. Photobiomodulation (PBM) using low-level light-emitting diodes (LEDs) or lasers has been proved to promote the osteogenesis of mesenchymal stem cells. However, the effect of LEDs on osteogenic differentiation of hDPSCs has little published data. In this work, the effect of blue LEDs with different energy densities of 2, 4, 6, 8, 10Â J/cm(2) on osteogenic differentiation of hDPSCs was examined by using in vitro ALP staining, ALP activity, mineralization, and real-time PCR. The results showed that compared with the control group, osteogenic differentiation was significantly enhanced in blue LEDs treated groups. As the energy density increased, the level of osteogenesis initially increased and then decreased reaching the highest level at 6Â J/cm(2). Transient receptor potential vanilloid 1 (TRPV1), a Ca(2+) ion channel, was believed to be a potential player in osteogenesis by photobiomodulation. By immunofluorescence assay, calcium influx assay, PCR, and ALP staining, it was shown that blue LEDs irradiation can increase the activity of TRPV1 and intracellular calcium levels similarly to the agonist of TRPV1 capsaicin. Additionally, pretreatment with capsazepine, a selective TRPV1 inhibitor, was able to abrogate the osteogenic effect of blue LEDs. In conclusion, these findings proposed that blue LEDs can promote the osteogenesis of hDPSCs within the appropriate range (4-8Â J/cm(2)) during culture of osteogenic medium, and TRPV1/Ca(2+) may be an essential signaling pathway involved in blue LEDs-induced osteogenesis, providing new insights for the use of hDPSCs in tissue regeneration engineering. Calcium Calcium;Cell Differentiation;Cell Proliferation;Cells, Cultured;Dental Pulp;Humans;Mesenchymal Stem Cells;Osteogenesis

The influence of two photobiomodulation protocols on orthodontically induced inflammatory root resorption (a randomized controlled clinical trial). BACKGROUND: Controversial results have been reported regarding the impact of photobiomodulation (PBM) on orthodontically induced inflammatory root resorption (OIIRR). The aim of this study was to evaluate the influence of two PBM protocols, one of them requiring a high application frequency (on days 0, 3, 7, 14, then every 2Â weeks), while the second requires less frequent applications (every 3Â weeks), on OIIRR accompanying orthodontic treatment. METHODS: Twenty female patients were recruited for this randomized controlled trial, requiring the therapeutic extraction of maxillary first premolars, and they were randomly divided into 2 equal groups. In Group A, one side of the maxillary arch randomly received PBM on days 0, 3, 7, 14, and every 2Â weeks thereafter, while in Group B, one side was randomly chosen to receive PBM every 3Â weeks. The laser applied was a Diode laser with a wavelength of 980Â nm, in a continuous mode. Canine retraction in both groups was carried out using closed-coil springs, delivering 150Â g of force, and the force level was checked every 3Â weeks, over a 12-week study period. Pre-retraction and post-retraction cone-beam computed tomography (CBCT) was done for the evaluation of OIIRR. RESULTS: No significant differences in the amount of OIIRR have been reported between the laser and control sides in both groups A and B. Also, no significant differences have been reported between the laser sides in both groups. CONCLUSIONS: Photobiomodulation does not affect OIIRR, whether by increasing or decreasing its occurrence, with both laser application protocols. Therefore, it can be stated that PBM does not result in root resorption less than the commonly observed range elicited with conventional orthodontic treatment, and that it has no effect on OIIRR. Trial registration Two Low-level Laser Irradiation Protocols on the Rate of Canine Retraction (NCT04926389), 15/06/2021-retrospectively registered. https://clinicaltrials.gov/ct2/show/NCT04926389 . Bicuspid;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Root Resorption;Tooth Movement Techniques

Low-level Laser Therapy in the Management of Oral Mucositis Induced by Radiotherapy: A Randomized Double-blind Clinical Trial. AIM: The present study evaluated the effect of LLLT at

red and infrared wavelengths associated with therapeutic measures from the Mucositis Study Group of the Multinational Association of Supportive Care of Cancer and International Society of Oral Oncology (MASCC/ISOO) for preventing and treating RT-induced oral mucositis (OM). MATERIALS AND METHODS: For the study, 80 subjects diagnosed with head and neck cancer (HNC) undergoing treatment were randomized into three groups to apply different photobiomodulation protocols for 42 days, as follows: Group I-LLLT of 660 nm; Group II-LLLT of 810 nm; and Group III-association of wavelengths of 660 and 810 nm. The treatments were performed by properly trained professionals and with equipment calibrated for the intervention. RESULTS: Different OM scores were noted for the groups studied, and the third group had lower scores than Groups I and II ($p = 0.012$). No difference was noted in the pain score analyzing the groups ($p = 0.49$). CONCLUSION: The LLLT was effective for OM lesions in individuals treated with radiotherapy associated or not with chemotherapy. When combined, the red and infrared lasers reduce OM scores. CLINICAL SIGNIFICANCE: OM is one of the main adverse effects of antineoplastic therapy in head and neck cancer patients. The evidence supporting the validity of LLLT for OM can improve patients' quality of life. Antineoplastic Agents Antineoplastic Agents;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Quality of Life;Stomatitis

Evaluation of the Effectiveness of Surgical Interventions Versus Non-surgical Ones When Used in Conjunction With Fixed Appliances to Accelerate Orthodontic Tooth Movement: A Systematic Review. The objectives of this review were to evaluate the currently available evidence regarding the effectiveness of surgical versus non-surgical acceleration methods and the side effects associated with these methods. Nine databases were searched: the Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE(Â®), Scopus(Â®), PubMed(Â®), Web of Scienceâ„¢, Googleâ„¢ Scholar, Trip, OpenGrey, and PQDT OPEN from pro-Quest(Â®). ClinicalTrials.gov and the International Clinical Trials Registry Platform Search Portal (ICTRP) were screened to explore ongoing studies and unpublished literature. Randomized controlled trials (RCTs), as well as controlled clinical trials (CCTs) of patients who received surgical interventions (invasive or minimally invasive techniques) in conjunction with traditional fixed appliances and who were compared to the non-surgical interventions, were included. The Cochrane tool for risk of bias (RoB.2) was used for evaluating RCTs, whereas the ROBINS-I tool was used for the CCTs. This systematic review included four RCTs and two CCTs (154 patients). The surgical and non-surgical interventions were found to have the same effect on orthodontic tooth movement (OTM) accelerating in four trials. In contrast, the surgical interventions were superior in the other two studies. High heterogeneity among the included studies prevented conducting the quantitative synthesis of the findings. The reported side effects related to the surgical and non-surgical interventions were similar. A "very low" to "low" evidence indicates that the effectiveness of surgical and non-surgical interventions in the acceleration of orthodontic tooth movement is similar, with no differences in the associated side effects. More high-quality clinical trials to compare the acceleration effectiveness between both modalities in different types of malocclusion is required.

Role and Effectiveness of Intra-articular Injection of Hyaluronic Acid in the Treatment of Knee Osteoarthritis: A Systematic Review. Osteoarthritis (OA) is a degenerative joint disease that causes persistent joint pain and stiffness of mainly the large peripheral weight-bearing joints. It is a leading cause of functional disability and poor quality of life. Various modalities of therapy are recommended by different research organizations at different stages of OA including non-pharmacological, pharmacological, and surgical interventions. Intra-articular injections of hyaluronic acid (HA) is widely used for over three decades in the treatment of OA. However controversies exist regarding its safety and efficacy, the number of injections and courses, type of preparation, duration of its effects, and combining it with other drugs or molecules. This study aimed to review the most recent data available in the published literature to address these. Electronic databases like Medline,

Embase, ProQuest, and Google Scholar were searched for articles using keywords, intraarticular injections, hyaluronic acid, and osteoarthritis knee. The review was carried out as per PRISMA guidelines. Thirty-eight randomized control trials (RCTs) investigating the efficacy and safety of intra-articular injection of HA were included in the systematic review. Out of the 38 studies, 22 (57.9%) were double-blind, eight (21%) single-blind, three (7.9%) non-blind, four (10%) with simple randomization, and one (2.7%) was open-labeled. Total 5,025 patients were included in these studies. The mean age of the patients was 60.28 years and the osteoarthritis grade of the knee joint was 1 to 3. HA was studied as a test preparation in 19 (50%) while in another 19 (50%) it was studied as a control. In 24 (63.2%) studies, HA was used as high molecular weight preparation in eight (21%) as low molecular weight preparation while in six studies the information was not available. HA was used as a standalone preparation in 31 studies, in two studies it was injected with platelet-rich plasma (PRP) and with either low-level laser therapy (LLLT), triamcinolone (TA), betamethasone (CS), poly deoxyribonucleotide (PDRN) or dexamethasone (DX) in one study each. In the majority of the studies, HA was given as a single injection (52.6% studies) or weekly three injections (28.9% studies). In 13.2 %, it was given as weekly 5 injections and in 5.3% as weekly two injections. IA-HA injections have a limited role in the treatment of knee osteoarthritis in those patients who do not have sufficient pain relief with topical or oral medication and physical therapy. It is safe and effective except for minor side effects such as local pain and swelling lasting for a few days. Severe allergic reactions are extremely rare. They provide adequate pain relief and functional improvement for up to six months irrespective of a number of injections and type of preparations used. The combination formulations with corticosteroids or PRP or MSCs show better results than HA alone. Combining HA with newer molecules such as peptides or diclofenac for sustained and disease-modifying effects requires more studies in the future.

Analysis of pain relief and functional recovery in patients with rotator cuff tendinopathy through therapeutic ultrasound and photobiomodulation therapy: a comparative study. This study aimed to compare shoulder tendinopathy treatment with therapeutic ultrasound combined with LED photobiomodulation therapy using LED-infrared (850Â nm) or LED-red (640Â nm). The study assessed 75 patients, aged 45 to 70Â years, distributed into five experimental groups (15 patients each): therapeutic ultrasound (US), infrared light irradiation (IR), visible red light irradiation (VR), infrared light and ultrasound combined (IR-US), and red light in conjunction with ultrasound (VR-US). The ultrasound parameters are 1Â MHz, 0.5Â W/cm(2) (SATA), and 100Â Hz repetition rate, applied for 4Â min each session. LED irradiation protocols were as follows: 3 points, 7.5Â J per point, IR-LED 750 mW, 10Â s, VR-LED 250 mW, 30Â s. LED irradiation is followed by ultrasound in the combined therapies. The efficiency of the five therapies was evaluated assessing 12 parameters: quality of life (Health Assessment Questionnaire, HAQ), pain intensity (Visual Analog Scale, VAS), articular amplitude of shoulder movement (flexion, extension, abduction, adduction, medial rotation, lateral rotation), muscle strength (abduction, lateral rotation), and electromyography (lateral rotation, abduction). Treatments comprised 12 sessions for 4Â weeks. Intra-group analysis showed that the five therapies significantly improved the recovery of all parameters after treatment. Regarding the comparison of irradiated therapies and ultrasound, statistical analysis showed that IR-US was a better treatment than US for all 12 parameters. IR treatment exceeded US on 9 items, whereas that VR and VR-US therapies exceeded US in 7 and 10 parameters, respectively (pâ€‰<â€‰0.05). Because of that, IR-US shows to be the best treatment for rotator cuff tendinopathy. In conclusion, improvements in quality of life, pain intensity relief, shoulder amplitude motion, and muscle strength force obtained with ultrasound therapy are enhanced by adding infrared LED irradiation to ultrasound for patients suffering from rotator cuff tendinopathy. This study was registered with the Brazilian Registry of Clinical Trials (ReBEC) under Universal Trial Number (UTN) U1111-1219-3594

(2018/22/08). Humans;Low-Level Light Therapy;Quality of Life;Range of Motion, Articular;Rotator Cuff;Shoulder Pain;Tendinopathy;Treatment Outcome

Photobiomodulation and Antimicrobial Photodynamic Influence of a 650 nm Wavelength on Staphylocoagulase and Viability of Staphylococcus aurous. Introduction: Staphylococcus aureus is one of the critical pathological bacteria. This bacterium had developed a variety of genetic mutations that made it resistant to drugs and more harmful to humans. In addition, all attempts to design a specific vaccine against S. aureus have failed. Therefore, this experiment was designed as a trial for vaccine production, by using a photodynamic treatment (PDT) through partial biological inhibition. The PDT of bacteria mainly focused on reducing the activity of staphylocoagulase (SC), which has a protective feature for bacteria. This study aimed to examine the photodynamic effect of combining a specific wavelength of a laser and a certain dilution photosensitizer, methylene blue (MB) dye. The possible PDT effect on the inhibition of pathogenic enzymatic activity was predicted. This study also aimed to evaluate the inhibitory effect of PDT on the total bacterial account (viability) simultaneously with SC assay. Methods: A 650nm wavelength diode laser was used with 100 mW output power and 2 minutes of exposure time. Dye dilutions were 50, 100, 150 and 200 Î¼g/mL. The viability of bacteria after and before laser treatment was calculated using single plate-serial dilution spotting methods. The activity of SC was detected by using human plasma for 4 hours incubation of crude-substrate interaction. Results: The results revealed a significant decrease in enzyme activity and colony-forming units (CFU) after irradiating bacterial suspension with 150 g/mL MB, as well as a decline in CFU. However, irradiation with a laser alone showed a significant increase in SC activity and CFU for the same exposure time. Conclusion: Besides reducing the production of SC activity, PDT significantly inhibited the viability of S. aureus. The application of MB photosensitizer at a concentration of 150 g/mL in combination with a laser wavelength of 650 nm resulted in a complete decrease in the SC activity value as well as the viability of bacteria.

Effects of Two Protocols of Low-Level Laser Therapy on the Proliferation and Differentiation of Human Dental Pulp Stem Cells on Sandblasted Titanium Discs: An In Vitro Study. Introduction: Stem cell activities have different effects on tissue response and its outcomes. Low-level laser therapy (LLLT) can be considered a trigger to modify stem cell activities. The objective of the present experimental investigation was to study the effects of two protocols of LLLT on the proliferation and differentiation of human dental pulp stem cells (hDPSCs) cultured on sandblasted titanium discs. Methods: Cells obtained from human dental pulp were seeded/cultured on titanium discs and were set in 2 main groups: (i) Radiated cells using the gallium-aluminium-arsenide (GaAlAs) diode laser at a continuous wavelength of 808 nm at 3 J/cm(2) for 12 sec or 5 J/cm(2) for 20 seconds, and (ii) Non-irradiated cells serving as control groups. The impact of LLLTs on hDPSC-proliferation and viability was investigated using the MTT assay after 24, 72 and 96 hours. The alkaline phosphatase activity was studied with p-nitrophenylphosphate after 14 and 28 days. The ability of hDPSCs to express osteocalcin was investigated using real-time polymerase chain reaction after 28 days, while their attachment was observed under a scanning electron microscope (SEM) after 14 and 28 days. Results: Our study showed that LLLTs caused maximum cell proliferation in 96 hours ($P<0.001$) with 3 J/cm(2) resulting in a higher proliferation rate. The highest activity of alkaline phosphatase and osteocalcin expression was observed in the laser radiation groups after 28 days. Conclusion: The outcomes of the current study showed that cultured hDPSCs on sandblasted titanium discs had a tendency towards increased cellular activity in response to LLLTs. Thus, LLLTs could regulate the activities of hDPSCs on bone repair surrounding the sandblasted titanium discs.

Does photobiomodulation therapy improve the postoperative outcomes of tonsillectomy? A systematic review and meta-analysis. Introduction: Postoperative management of patients undergoing tonsillectomy is challenging. Photobiomodulation therapy (PBMT) has emerged as a new

tool providing therapeutic benefits. However, the contribution of PBMT to the postoperative outcomes of tonsillectomy is still undefined. This systematic review and meta-analysis evaluated the published literature addressing the effects of PBMT on post-tonsillectomy. Methods: Searches in Scopus, PubMed/MEDLINE, Embase, Web of Science, Cochrane Library, and grey literature were carried out for the identification of randomised controlled trials reported up to August/2021. The risk of bias with the Cochrane Collaboration tool and meta-analysis was performed. Outcomes were assessed with the Kaplan-Meier method and the log-rank test. Results: A total of 1183 articles were retrieved, of which only two were included for qualitative and quantitative analysis. The wavelengths were 685 nm and 980 nm with energy density set at 4 J/cm(2). The mandibular angle and the surgical wound were the sites of laser irradiation. Individuals who had not undergone PBMT after tonsillectomy were more likely to report pain and odynophagia in the first 24 hours after surgery than individuals who had undergone PBMT after tonsillectomy (P<0.001). Children who received PBMT after tonsillectomy were equally affected by pain and odynophagia in the first seven days after surgery compared to children who had not undergone PBMT after tonsillectomy (P>0.05). However, both studies found a significant association of PBMT with reduced analgesic consumption. Conclusion: Although PBMT seems promising for the management of individuals undergoing tonsillectomy, a limited number of studies are available in the literature.

Photobiomodulation for Tendinopathy: A Review of Preclinical Studies. The outcomes of clinical studies utilizing Photobiomodulation on tendon disorders are not homogeneous and since its design depends on preclinical studies utilizing animal models as a prerequisite, this review investigates the literature to help extrapolate preclinical evidence-based outcomes (safety and efficacy) into clinical treatment options. PubMed and Embase databases were searched for tendinopathy, Photobiomodulation and preclinical studies with inclusion criteria were restricted to in vivo animal studies using rat's models subjected to partially injured tendons. Data extracted were methodology quality and design, light parameters, study methods, and outcomes. Twenty two articles were included, half of them were partially transected, while the other half were partially traumatized. The most common wavelengths used were 660, 830, and 904â€‰nm with energy density range between 1 and 17â€‰J/cm(2) and applied mostly daily. Fourteen studies (64%) relied merely on a single assessment. Histological measurements were the most common method of evaluation (75%) and 35% of studies used chemical measures. Mechanical outcomes were reported in four, and two studies demonstrate significant effects. Photobiomodulation has the potential to enhance tendon structure and function, however, inevitable embedded heterogeneity related to study design and quality of methods, light parameters delivered, and evaluations methods renders the ability to establish unified treatment parameters difficult. Adjustments for variability within preclinical studies might lead to better designing of clinical studies. It is recommended to embrace a protocol for designing and performing preclinical studies to improve its quality. Moreover, it is recommended to prove efficacy using at least two evaluation methods and apply Photobiomodulation as a combined varying energy/wavelength protocol (several energies with several wavelengths). Clinical relevance: Establishing a proof of concept for Photobiomodulation that may lead to further high-quality clinical studies, in which the applicable parameters can be determined. Animals;Low-Level Light Therapy;Rats;Tendinopathy

Photobiomodulation Effects on Periodontal Ligament Stem Cells: A Systematic Review of In Vitro Studies. BACKGROUND: Stem cell therapy has been considered to play a paramount role in the treatment modalities available for regenerative dentistry. The established beneficial effects of photobiomodulation (PBM) at the cellular level have led to the combined use of these two factors (PBM and stem cells). The main goal of this study was firstly to critically appraise the effects of PBM on periodontal ligament stem cells (PDLSCs), and secondly to explore the most effective PBM

protocols applied. METHODS: Pubmed, Cochrane, Scopus, Science Direct, and Google Scholar search engines were used to identify experimental in vitro studies in which PBM was applied to cultured PDLSCs. After applying specific keywords, additional filters, and inclusion/exclusion criteria, a preliminary number of 245 articles were narrowed down to 11 in which lasers and LEDs were used within the 630 - 1064 nm wavelength range. Selected articles were further assessed by three independent reviewers for strict compliance with PRISMA guidelines, and a modified Cochrane risk of bias to determine eligibility. STATISTICAL ANALYSIS: The dataset analysed was extracted from the studies with sufficient and clearly presented PBM protocols. Simple univariate regression analysis was performed to explore the significance of contributions of potential quantitative predictor variables toward study outcomes, and a one-way ANOVA model was employed for testing differences between the laser or LED sources of the treatments. The significance level for testing was set at Î± = 0.05. RESULTS: The proliferation rate, osteogenic differentiation, and expression of different indicative genes for osteogenesis and inflammation suppression were found to be positively affected by the application of various types of lasers and LEDs. With regard to the PBM protocol, only the wavelength variable appeared to affect the treatment outcome; indeed, the 940 nm wavelength parameter was found not to exert a favourable effect. CONCLUSIONS: Photobiomodulation can enhance the stemness and differentiation capacities of periodontal ligament stem cells. Therefore, for PBM protocols, there remains no consensus amongst the scientific community. Statistical analyses performed here indicated that the employment of a near-infrared (NIR) wavelength of 940 nm may not yield a significant favourable outcome, although those within the 630 - 830 nm range did so. Concerning the fluence, it should not exceed 8 J/cm(2) when therapy is applied by LED devices, and 4 J/cm(2) when applied by lasers, respectively. Humans;Osteogenesis;Periodontal Ligament;Low-Level Light Therapy;Cell Proliferation;Stem Cells

Impact of photobiomodulation on macrophages and their polarization during diabetic wound healing: a systematic review. This review aims to providing essential information and the current knowledge about the potential role of macrophages, especially their M2 subtypes in different diabetic wounds both in clinical and pre-clinical models under the influence of photobiomodulation (PBM). The long-term goal is to advance the macrophage-based therapies to accelerate healing of diabetic foot ulcers. We reviewed all databases provided by PubMed, Google Scholar, Scopus, Web of Science, and Cochrane precisely from their dates of inception to 25/10/2021. The keywords of Diabetes mellitus diseases, wound healing, macrophage, and photobiomodulation or low-level laser therapy were used in this systematic review.A total of 438 articles were initially identified in pubmed.ncbi.nlm.nih.gov (15 articles), Google scholar (398 articles), Scopus (18 articles), and Web of Science (7 articles). Four hundred sixteen articles that remained after duplicate studies (22 articles) were excluded. After screening abstracts and full texts, 14 articles were included in our analysis. Among them, 4 articles were about the effect of PBM on macrophages in type 2 diabetes and also found 10 articles about the impact of PBM on macrophages in type 1 diabetes. The obtained data from most of the reviewed studies affirmed that the PBM alone or combined with other agents (e.g., stem cells) could moderate the inflammatory response and accelerate the wound healing process in pre-clinical diabetic wound models. However, only very few studies conducted the detailed functions of polarized macrophages and M2 subtypes in wound healing of diabetic models under the influence of PBM. Further pre-clinical and clinical investigations are still needed to investigate the role of M2 macrophages, especially its M2c subtype, in the healing processes of diabetic foot ulcers in clinical and preclinical settings. Diabetes Mellitus, Type 2;Diabetic Foot;Humans;Low-Level Light Therapy;Macrophages;Wound Healing

Effects of a Biocomplex Formed by Two Scaffold Biomaterials, Hydroxyapatite/Tricalcium Phosphate Ceramic and Fibrin Biopolymer, with Photobiomodulation, on Bone Repair. There are several

treatment methods available for bone repair, although the effectiveness becomes limited in cases of large defects. The objective of this pre-clinical protocol was to evaluate the grafting of hydroxyapatite/tricalcium phosphate (BCP) ceramic biomaterial (B; QualyBone BCP(Â®), QualyLive, Amadora, Portugal) together with the heterologous fibrin biopolymer (FB; CEVAP/UNESP Botucatu, Brazil) and with photobiomodulation (PBM; Laserpulse(Â®), Ibramed, Amparo, Brazil) in the repair process of bone defects. Fifty-six rats were randomly divided into four groups of seven animals each: the biomaterial group (G1/B), the biomaterial plus FB group (G2/BFB); the biomaterial plus PBM group (G3/B + PBM), and the biomaterial plus FB plus PBM group (G4/BFB + PBM). After anesthesia, a critical defect was performed in the center of the rats' parietal bones, then filled and treated according to their respective groups. The rats were euthanized at 14 and 42 postoperative days. Histomorphologically, at 42 days, the G4/BFB + PBM group showed a more advanced maturation transition, with more organized and mature bone areas forming concentric lamellae. A birefringence analysis of collagen fibers also showed a more advanced degree of maturation for the G4/BFB + PBM group. In the comparison between the groups, in the two experimental periods (14 and 42 days), in relation to the percentage of formation of new bone tissue, a significant difference was found between all groups (G1/B (5.42 Â± 1.12; 21.49 Â± 4.74), G2/BFB (5.00 Â± 0.94; 21.77 Â± 2.83), G3/B + PBM (12.65 Â± 1.78; 29.29 Â± 2.93), and G4/BFB + PBM (12.65 Â± 2.32; 31.38 Â± 2.89)). It was concluded that the use of PBM with low-level laser therapy (LLLT) positively interfered in the repair process of bone defects previously filled with the biocomplex formed by the heterologous fibrin biopolymer associated with the synthetic ceramic of hydroxyapatite and tricalcium phosphate.

Photobiomodulation Therapy in the Treatment of Oral Mucositis-A Case Report. In 2021, our group published a laboratory study on the impact of PBM on human gingival fibroblasts. The in vitro results confirmed the fact that the appropriately selected wavelength and properly selected parameters of the laser settings can increase cell proliferation, modulate inflammatory markers, and decrease the susceptibility of human gingival fibroblasts to apoptosis. Therefore, this case report was aimed at the clinical evaluation of the proposed settings and treatment regimen in a very difficult situation of an immunocompromised patient with extensive changes and stagnation of symptoms for many weeks. A 65-year-old man, during his oncological treatment, was diagnosed with oral mucositis grade 3 according to the World Health Organization and National Cancer Institute scales. Due to pain sensation, long-lasting and not healing oral lesions, and problems with solid food intake, he was qualified for laser photobiomodulation therapy. For the management of oral lesions, a diode laser 635 nm (Smart(M)Pro, Lasotronix, Poland) was intraorally applied at an energy density of 4 J/cm(2), the 20 s of irradiation, the output power of 100 mW, and in continuous wave mode. Seven treatment procedures were performed two times a week using the spot technique in contact and non-contact mode. Within 21 days of monotherapy, all ailments disappeared. The patient was also able to reuse dental dentures and return to a solid diet. The obtained results confirm the efficiency of at least 3 PBM protocols. Our case shows that the use of PMB therapy contributes to faster healing of painful oral lesions in oncological patients, and thus the treatment time and return to the appropriate quality of life is shorter. Child, Preschool;Clinical Protocols;Humans;Infant;Laser Therapy;Low-Level Light Therapy;Male;Quality of Life;Stomatitis

High-Intensity Red Light-Emitting Diode Irradiation Suppresses the Inflammatory Response of Human Periodontal Ligament Stem Cells by Promoting Intracellular ATP Synthesis. Periodontitis is an inflammatory lesion in the periodontal tissue. The behavior of human periodontal ligament stem cells (hPDLSCs), which play an important role in periodontal tissue regeneration, is restricted by the influence of inflammatory mediators. Photobiomodulation therapy exerts anti-inflammatory effects. The purpose of this study was to investigate the effects of light-emitting diode (LED) irradiation on the inflammatory responses of hPDLSCs. The light source was a red LED (peak wavelength: 650 nm),

and the total absolute irradiance was 400 mW/cm(2). The inflammatory response in hPDLSCs is induced by tumor necrosis factor (TNF)-Î±. Adenosine triphosphate (ATP) levels and pro-inflammatory cytokine (interleukin [IL]-6 and IL-8) production were measured 24 h after LED irradiation, and the effects of potassium cyanide (KCN) were investigated. LED irradiation at 6 J/cm(2) significantly increased the ATP levels and reduced TNF-Î±-induced IL-6 and IL-8 production. Furthermore, the inhibitory effect of LED irradiation on the production of pro-inflammatory cytokines was inhibited by KCN treatment. The results of this study showed that high-intensity red LED irradiation suppressed the TNF-Î±-stimulated pro-inflammatory cytokine production in hPDLSCs by promoting ATP synthesis. These results suggest that high-intensity red LED is a useful tool for periodontal tissue regeneration in chronically inflamed tissues.

Photobiomodulation Therapy Combined with Static Magnetic Field Reduces Pain in Patients with Chronic Nonspecific Neck and/or Shoulder Pain: A Randomized, Triple-Blinded, Placebo-Controlled Trial. Photobiomodulation therapy (PBMT) has been used to treat patients with chronic neck and/or shoulder pain. However, it is unknown whether the concurrent use of PBMT and static magnetic field (PBMT-sMF) also has positive effects in these patients. The aim of this study was to investigate the effects of PBMT-sMF versus placebo on pain intensity, range of motion (ROM) and treatment satisfaction in patients with chronic nonspecific neck and/or shoulder pain. A randomized controlled trial, with blinded assessors, therapists and patients was carried out. Seventy-two patients with chronic nonspecific neck and/or shoulder pain were randomized to either active PBMT-sMF (n = 36) or placebo PBMT-sMF (n = 36). Patients were treated twice weekly, over 3 weeks. Primary outcome was pain intensity, measured 15 min after the last treatment session and at 24-, 48-, 72-h, and 7-days after the last treatment. Secondary outcomes were ROM, patientâ€™ treatment satisfaction, and adverse effects. PBMT-sMF was able to reduce pain intensity in all time points tested compared to placebo ($p < 0.05$). There was no difference between groups in the secondary outcomes ($p > 0.05$). Our results suggest that PBMT-sMF is better than placebo to reduce pain in patients with chronic nonspecific neck and/or shoulder pain at short-term.

Transcranial Photobiomodulation for the Treatment of Children with Autism Spectrum Disorder (ASD): A Retrospective Study. Children with Autism Spectrum Disorder (ASD) face several challenges due to deficits in social function and communication along with restricted patterns of behaviors. Often, they also have difficult-to-manage and disruptive behaviors. At the moment, there are no pharmacological treatments for ASD core features. Recently, there has been a growing interest in non-pharmacological interventions for ASD, such as neuromodulation. In this retrospective study, data are reported and analyzed from 21 patients (13 males, 8 females) with ASD, with an average age of 9.1 (range 5âˆ’15), who received six months of transcranial photobiomodulation (tPBM) at home using two protocols (alpha and gamma), which, respectively, modulates the alpha and gamma bands. They were evaluated at baseline, after three and six months of treatment using the Childhood Autism Rating Scale (CARS), the Home Situation Questionnaire-ASD (HSQ-ASD), the Autism Parenting Stress Index (APSI), the Montefiore Einstein Rigidity Scaleâˆ’Revised (MERSâˆ’R), the Pittsburgh Sleep Quality Index (PSQI) and the SDAG, to evaluate attention. Findings show that tPBM was associated with a reduction in ASD severity, as shown by a decrease in CARS scores during the intervention ($p < 0.001$). A relevant reduction in noncompliant behavior and in parental stress have been found. Moreover, a reduction in behavioral and cognitive rigidity was reported as well as an improvement in attentional functions and in sleep quality. Limitations were discussed as well as future directions for research.

Efficacy of low-fluence 1064â€‰nm Q-switched Nd: YAG laser for the treatment of melasma: A meta-analysis and systematic review. BACKGROUND: Melasma is considered as a type of acquired facial pigmentary disorder that is challenging to treat. Low-fluence 1064â€‰nm Q-switched Nd: YAG

laser (LQSNY) has clinical benefits against melasma; however, there are some disputes. OBJECTIVE: To explore these contentious views, we conducted a meta-analysis and systematic review to evaluate the efficacy and safety of LQSNY monotherapy and combined therapy for the treatment of melasma. METHODS: The PubMed, Embase, Cochrane Library, and Web of Science databases were searched for relevant articles from inception to July 2021. The resulting data were analyzed using the Review Manager 5.3 software. RESULTS: Twelve eligible studies comprising 358 patients were included. No significant differences in melasma area and severity index (MASI) were observed between the LQSNY and drug groups (mean difference (MD):-0.26, 95% confidence interval (CI):-1.16-0.64, pÂ =Â 0.57). We found that combination therapy with LQSNY and drugs had a greater MASI improvement compared with LQSNY therapy alone (MD: 1.78, 95% CI 0.93-2.63, pâ€‰<â€‰0.0001); nevertheless, no statistically significant results were found in melanin index (MI) and self-assessment. The melasma improvement was similar when using LQSNY alone and LQSNY combined with other lasers in terms of RMASI (MD 0.05, 95% CI:-0.61, 0.70, pÂ =Â 0.56). Compared with intense pulsed light (IPL) alone, LQSNY with IPL provided an added benefit for melasma severity (MD:3.23, 95% CI:0.65-5.81, pÂ =Â 0.01). CONCLUSION: Low-fluence 1064â€‰nm Q-switched Nd: YAG laser can be applied as an alternative treatment for drug intolerance. Combination therapy with LQSNY and drugs or other lasers may have pleasantly surprising efficacy, but numerous studies are still needed to verify this. Combined Modality Therapy;Face;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Combination of Group Singular Value Decomposition and eLORETA Identifies Human EEG Networks and Responses to Transcranial Photobiomodulation. Transcranial Photobiomodulation (tPBM) has demonstrated its ability to alter electrophysiological activity in the human brain. However, it is unclear how tPBM modulates brain electroencephalogram (EEG) networks and is related to human cognition. In this study, we recorded 64-channel EEG from 44 healthy humans before, during, and after 8-min, right-forehead, 1,064-nm tPBM or sham stimulation with an irradiance of 257 mW/cm(2). In data processing, a novel methodology by combining group singular value decomposition (gSVD) with the exact low-resolution brain electromagnetic tomography (eLORETA) was implemented and performed on the 64-channel noise-free EEG time series. The gSVD+eLORETA algorithm produced 11 gSVD-derived principal components (PCs) projected in the 2D sensor and 3D source domain/space. These 11 PCs took more than 70% weight of the entire EEG signals and were justified as 11 EEG brain networks. Finally, baseline-normalized power changes of each EEG brain network in each EEG frequency band (delta, theta, alpha, beta and gamma) were quantified during the first 4-min, second 4-min, and post tPBM/sham periods, followed by comparisons of frequency-specific power changes between tPBM and sham conditions. Our results showed that tPBM-induced increases in alpha powers occurred at default mode network, executive control network, frontal parietal network and lateral visual network. Moreover, the ability to decompose EEG signals into individual, independent brain networks facilitated to better visualize significant decreases in gamma power by tPBM. Many similarities were found between the cortical locations of SVD-revealed EEG networks and fMRI-identified resting-state networks. This consistency may shed light on mechanistic associations between tPBM-modulated brain networks and improved cognition outcomes.

Effect of low-level diode laser on streptococcus mutans and lactobacillus acidophilus growth: An invitro study. INTRODUCTION: Caries lesions are high prevalent dental infectious. Gram-positive bacteria are the most common pathogenic microorganisms causing caries lesions. Low-Level laser therapy has been shown to have a significant bactericidal effect without causing damage to the oral tissues. This study was designed to evaluate the efficacy of diode laser (980Â nm) at different times and doses on Streptococcus (S.) Mutans and (Lactobacillus) L. Acidophilus microorganisms. METHODS: This study was performed on two groups of microorganisms, including S. mutans and L.

acidophilus, at a concentration of 10(8)Â CFU/ml, which exposed to a diode laser source with a central wavelength of 980Â nm to investigate three different energies with the following time-exposures (at doses of 5, 10 and 20Â J/cm2 with irradiation times of 5, 10 and 20Â s). The growth of bacteria (CFU/ml) was calculated. RESULTS: A significant decrease in CFUs/ml of two microorganisms was observed immediately and 24Â h after irradiation (p-value < 0.05). The most effective laser radiation for S. mutans immediately and 24Â h after exposure was seen at 5Â s with 20Â J/cm(2) and 20Â s with 5Â J/cm(2), respectively. The most effective laser radiation for L. acidophilus was the time of 5Â s with 10Â J/cm(2) both immediately and 24Â h after exposure. CONCLUSION: In the present study, we demonstrated that diode laser (980Â nm) has great efficacy in the growth reduction of S. mutans and L. acidophilus at different times and doses.

Enhancing therapeutic efficacy of human adipose-derived stem cells by modulating photoreceptor expression for advanced wound healing. BACKGROUND: Human adipose-derived stem cells (hADSCs) have been widely used for regenerative medicine because of their therapeutic efficacy and differentiation capacity. However, there are still limitations to use them intactly due to some difficulties such as poor cell engraftment and viability after cell transplantation. Therefore, techniques such as photobiomodulation (PBM) are required to overcome these limitations. This study probed improved preclinical efficacy of irradiated hADSCs and its underlying molecular mechanism. METHODS: hADSCs were irradiated with green organic light-emitting diodes (OLEDs). Treated cells were analyzed for mechanism identification and tissue regeneration ability verification. Expression levels of genes and proteins associated with photoreceptor, cell proliferation, migration, adhesion, and wound healing were evaluated by performing multiple assays and immunostaining. Excision wound models were employed to test in vivo therapeutic effects. RESULTS: In vitro assessments showed that Opsin3 (OPN3) and OPN4 are both expressed in hADSCs. However, only OPN4 was stimulated by green OLED irradiation. Cell proliferation, migration, adhesion, and growth factor expression in treated hADSCs were enhanced compared to control group. Conditioned medium containing paracrine factors secreted from irradiated hADSCs increased proliferation of human dermal fibroblasts and normal human epidermal keratinocytes. Irradiated hADSCs exerted better wound healing efficacy in vivo than hADSCs without OLED irradiation. CONCLUSIONS: Our study introduces an intracellular mechanism of PBM in hADSCs. Our results revealed that photoreceptor OPN4 known to activate G(q)-protein and consequently lead to reactive oxygen species production responded to OLED irradiation with a wavelength peak of 532Â nm. In conclusion, green OLED irradiation can promote wound healing capability of hADSCs, suggesting that green OLED has potential preclinical applications. OPN3 protein, human;Rod Opsins Adipocytes;Adipose Tissue;Cell Differentiation;Humans;Rod Opsins;Stem Cells;Wound Healing

Low-level laser therapy attenuates arthrogenic contracture induced by anterior cruciate ligament reconstruction surgery in rats. Therapeutic approaches to treat joint contracture after anterior cruciate ligament (ACL) reconstruction have not been established. Arthrofibrosis accompanied by joint inflammation following ACL reconstruction is a major cause of arthrogenic contracture. In this study, we examined whether anti-inflammatory treatment using low-level laser therapy (LLLT) can prevent ACL reconstruction-induced arthrogenic contracture. Rats underwent ACL transection and reconstruction surgery in their right knees. Unoperated left knees were used as controls. After surgery, rats were reared with or without daily LLLT (wavelength: 830 nm; power output: 150 mW; power density: 5 W/cm2; for 120 s/day). We assessed the passive extension range of motion (ROM) after myotomy at one and two weeks post-surgery; the reduction in ROM represents the severity of arthrogenic contracture. ROM was markedly decreased by ACL reconstruction at both time points; however, LLLT partially attenuated the decrease in ROM. One week after ACL reconstruction, the gene expression of the proinflammatory cytokine interleukin-1beta in the joint capsule was

significantly upregulated, and this upregulation was significantly attenuated by LLLT. Fibrotic changes in the joint capsule, including upregulation of collagen type I and III genes, shortening of the synovium, and thickening were caused by ACL reconstruction and seen at both time points. LLLT attenuated these fibrotic changes as well. Our results indicate that LLLT after ACL reconstruction could attenuate the formation of arthrogenic contracture through inhibition of inflammation and fibrosis in the joint capsule. Thus, LLLT may become a novel therapeutic approach for ACL reconstruction-induced joint contracture. Animals;Anterior Cruciate Ligament Injuries;Anterior Cruciate Ligament Reconstruction;Contracture;Fibrosis;Inflammation;Knee Joint;Low-Level Light Therapy;Range of Motion, Articular;Rats

Could Photobiomodulation Treat Autism Spectrum Disorder? Autism Spectrum Disorder;Humans

Regulation of interleukin-6 and matrix metalloproteinases syntheses by bioflavonoids and photobiomodulation in human gingival fibroblasts. This study aimed to evaluate the separately effects of bioflavonoids proanthocyanidins, from grape seed extract (GSE) and synthetic naringenin (NA), as well as photobiomodulation (PBM) by low-level laser therapy on interleukin (IL)-6 and matrix metalloproteinases (MMPs) syntheses by human gingival fibroblasts (HGF). For this purpose, a connective tissue exposure (ulceration) model of HGF, stimulated with tumor necrosis factor-alpha (TNF-Î±), was used. Initially, the highest non-cytotoxic and non-genotoxic concentrations of bioflavonoids were determined by cell viability and micronuclei formation assays. Then, HGF were exposed to different stimuli: culture medium (negative control), dimethyl sulfoxide (DMSO), TNF-Î±, NA, GSE, TNF-Î±â€‰+â€‰NA, TNF-Î±â€‰+â€‰GSE, PBM (3Â J/cm(2), 0.025Â W, 780Â nm), and TNF-Î±â€‰+â€‰PBM. Next, IL-6, MMP-2, and MMP-9 syntheses were assessed. The concentration of 10Â Î¼g/mL of bioflavonoids increased cell viability at 24 and 48Â h and did not present cytotoxic or genotoxic effects on HGF after 24, 48, and 72Â h of contact. This concentration was selected for the assessment of bioflavonoids potential in modulating inflammatory mediators. TNF-Î± exposure enhanced IL-6 (170%), MMP-2 (10%), and MMP-9 (20%) syntheses, while a decrease of MMP-2 by 55% after exposure to TNF-Î±â€‰+â€‰GSE and 20% after TNF-Î±â€‰+â€‰NA and TNF-Î±â€‰+â€‰PBM was observed. MMP-9 synthesis was decreased by 35% after TNF-Î±â€‰+â€‰NA, 20% after TNF-Î±â€‰+â€‰GSE, and 30% after PBM. IL-6 was down-regulated by GSE in the presence of TNF-Î± (80%). In conclusion, TNF-Î± up-regulated IL-6 and MMPs, while bioflavonoids and PBM down-regulated MMP-2 and MMP-9 syntheses; GSE also decreased IL-6 synthesis, demonstrating the individual promising potential of these therapies for ulceration management. Flavonoids;Interleukin-6;Tumor Necrosis Factor-alpha;Matrix Metalloproteinases;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Cells, Cultured;Fibroblasts;Flavonoids;Humans;Interleukin-6;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Matrix Metalloproteinases;Tumor Necrosis Factor-alpha

Effect of low-level laser therapy on condylar growth in children treated with functional appliance: a preliminary study. PURPOSE: This study aimed to evaluate the skeletal and dentoalveolar changes achieved by combining low-level laser irradiation applied on the condyle area with twin-block therapy in growing class II malocclusion patients. METHODS: Fourteen patients (9 males, 5 females; mean age, 11.4â€‰Â±â€‰2Â years) with skeletal class II mandibular deficiency were recruited. They were divided into two groups (G 1: twin-blockâ€‰+â€‰low-level laser therapy, G 2: twin-block only). A semiconductor diode laser with a wavelength of 940Â nm was applied on the condyle area (100 mW, 2.5Â J, 3.9Â J/cm(2)). The laser was applied twice a week in the first month and once a week in the second and third months, totalizing 16 sessions. Skeletal, dental, and soft-tissue cephalometric parameters were measured and compared at different treatment points. RESULTS: Mandibular length (Co-Gn) was significantly increased by 3.6Â mm in the experiment group

(3.16 SD) and 4.3Â mm (4.4 SD) in the control group, with no significant difference between groups at every time point (P-value 0.949 at T2). Similarly, a statistically significant positive effect of treatment was found in both groups on ramus height (Co-Go), upper lip to E-Line, SNA angle, ANB angle, and U1/SN angle with no significant difference between groups. CONCLUSION: Based on the results of this preliminary study, low-level laser irradiation with the used parameters seems to have no synergetic impact on the skeletal and dental outcomes of twin-block therapy over 9Â months. However, more studies are needed to investigate the effect of low-level laser therapy on condylar growth during functional orthodontic treatment. SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1007/s41547-022-00158-x.

Effect of GaAlAs 940Â nm Photobiomodulation on palatal wound healing after free gingival graft surgery: a split mouth randomized controlled clinical trial. BACKGROUND: The aim of this study was to evaluate the effects of photobiomodulation (PBM) on wound healing, pain, and discomfort at free gingival graft (FGG) donor sites. METHODS: Sixteen patients in need of bilateral FGG were selected for this randomized, controlled, triple-blinded, and split mouth clinical trial. The FGG donor sites in test group were treated with LLLT GaAlAs 940Â nm, 5Â J/cm(2) immediately after surgery and every other day within the following ten days. The control group received sham irradiation. Remaining Wound Area (RWA), Epithelialization and color match were evaluated on the day of surgery and 7, 14, 21, 28, and 60Â days after surgery. A questionnaire was administered to measure pain and bleeding in the first ten days after surgery. RESULTS: RWA was significantly smaller in the test than control group on the days 7 (pâ€‰<â€‰0.001) and 14 (pâ€‰=â€‰0.048) after the surgery. Bleeding was higher in the test group than in the control group on the day of surgery (pâ€‰=â€‰0.046). Pain and discomfort at the palatal donor site, however, had no significant difference between laser and control group during 11Â days after the surgery (pâ€‰>â€‰0.05), nor did the Color match scores on the 28th and 60th days after the surgery (pâ€‰>â€‰0.05). CONCLUSIONS: It can be concluded that PBM enhances FGG donor site wound healing one and two weeks after the surgery. Trial registration IRCT2017092036203N2, registered 01.11.2017. Gingiva;Humans;Oral Surgical Procedures;Pain;Palate;Wound Healing

Comparative randomized trial study about the efficacy of photobiomodulation and curcumin antimicrobial photodynamic therapy as a coadjuvant treatment of oral mucositis in oncologic patients: antimicrobial, analgesic, and degree alteration effect. INTRODUCTION: As conventional treatments currently available for mucositis are not considerably effective, there is a need to implement an adjuvant protocol for the treatment of oral mucositis in patients undergoing radiotherapy and chemotherapy. PURPOSE: To evaluate the effect of photobiomodulation (PBM) and antimicrobial photodynamic therapy (aPDT) mediated by curcumin and blue LED as an adjunct treatment of oral mucositis for oncology patients using chemotherapy and/or radiotherapy. METHODS: Clinical, randomized study, in a single location, in an oncology service of a general hospital, with a total of 30 patients (over 18Â years old) with stable oral mucosa lesions in the process of chemotherapy and/or radiotherapy. The patients were divided into 3 groups: control group (treated with nystatin), PBM group (treated with low-level laser therapy), and the aPDT group (treated with 450-nm blue LED and curcumin photosensitizer). RESULTS: The results showed, by means of intra-group comparisons, that the two experimental treatments promoted yeast reduction of the genus Candida in the last two evaluations (21Â days and 30Â days), but not in the first two evaluations (7Â days and 14Â days). The intra-group comparisons showed that the control and aPDT group showed a significant difference in the degree of mucositis over the four evaluations performed, with the results pointing out that the mucositis worsened in the control group from the 14th day, while reduced in the aPDT group from the 21st day of treatment. CONCLUSION: A reduction in the degree of mucositis and pain score was observed in the PBM and aPDT groups, with the aPDT group

standing out when presenting early clinical improvement in relation to the PBM group and the control group, thus emphasizing its effectiveness within the desired aspects. Regarding the antimicrobial effect, aPDT showed a greater reduction of yeasts of the genus Candida in the tested parameters. Analgesics;Anti-Bacterial Agents;Anti-Infective Agents;Curcumin Adolescent;Analgesics;Anti-Bacterial Agents;Anti-Infective Agents;Curcumin;Humans;Mucositis;Photochemotherapy;Stomatitis

Low-Level Laser Therapy: A Literature Review of the Prevention and Reduction of Oral Mucositis in Patients Undergoing Stem Cell Transplantation. BACKGROUND: Oral mucositis (OM) is a highly debilitating complication of high-dose chemotherapy and total body irradiation used in conditioning regimens for hematopoietic stem cell transplantation (HSCT). Research has studied low-level laser therapy (LLLT) as an alternative treatment for OM because of its anti-inflammatory activity, biomodulation, and analgesic effects. OBJECTIVES: This study reviews evidence on the effectiveness of LLLT using diode lasers on the prevention and reduction in severity of OM in patients with cancer undergoing HSCT. METHODS: A literature search was performed in PubMedÂ®, CINAHLÂ®, ScopusÂ®, and MEDLINEÂ® databases. Six randomized controlled trials and one cohort study met the inclusion criteria. FINDINGS: The data demonstrate promising outcomes for reducing the incidence and severity of OM using LLLT. Larger, tightly controlled clinical trials are needed in the future. Cohort Studies;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Stomatitis;Transplantation Conditioning

Transcranial photobiomodulation (laser) therapy for cognitive impairment: A review of molecular mechanisms and potential application to canine cognitive dysfunction (CCD). Alzheimer's disease (AD) is a common degenerative brain disorder of aging people which shares many clinical and pathological features with canine cognitive dysfunction (CCD). CCD is considered a naturally occurring model of human AD. Transcranial photobiomodulation therapy (tPBMT), also known as transcranial laser therapy, entails delivering photons of near infrared to infrared light from the skin surface of the scalp to the underlying brain. Specific molecular cellular receptors, called chromophores, absorb this energy, and use it to initiate biological reactions with potential therapeutic benefit. Improvement in cognitive ability using tPBMT has been documented in rodent AD models and human clinical trials. The purposes of this review are to provide an overview of the suspected molecular mechanisms of action of tPBMT for the treatment of cognitive decline and to propose potential application of this treatment modality for dogs affected by CCD. Alzheimer Disease;Animals;Cognitive Dysfunction;Dog Diseases;Dogs;Humans;Laser Therapy;Lasers;Low-Level Light Therapy

Salivary tumor necrosis factor-alpha levels in periodontitis associated with diabetes mellitus after low level laser therapy as an adjunct to scaling and root planning: A randomized clinical trial. CONTEXT: Tumor necrosis factor-alpha (TNF-Î±) has been shown to play a critical role in the pathogenesis of periodontitis and diabetes. Nonsurgical periodontal therapy was shown to reduce inflammation and improves glycemic status. Recently, adjunctive low level laser therapy (LLLT) has been shown to alter the inflammatory process. AIM: To evaluate and compare the alteration in TNF-Î± levels before and after treatment in patients with periodontitis with and without type 2 diabetes mellitus (T2DM). SETTINGS AND DESIGN: Randomised clinico-biochemical study was carried out for 8 weeks from September 2019 to December 2020. MATERIALS AND METHODS: Sixty-four participants were divided into Groups A (periodontitis) and B (periodontitis associated with T2DM), based on probing depth â‰¥5 mm, clinical attachment level â‰¥2 mm, and history of T2DM. Later were subdivided into A1, A2, B1, B2, based on assigned treatments. Clinical periodontal parameters and salivary TNF-Î± levels were evaluated and compared at baseline to 8 weeks. STATISTICAL ANALYSIS: Multiple group comparisons were done using analysis of variance, intra group comparisons were made using t-tests. RESULTS: Comparison of periodontal parameters and salivary TNF-Î± levels from

baseline to 8 weeks showed statistically significant difference (P < 0.05) in all groups, indicating a positive effect of scaling and root planing (SRP) and adjunctive LLLT. CONCLUSION: Both SRP and SRP with adjunctive LLLT effectively altered TNF-Î± levels, correlating reduced periodontal inflammation.

Photobiomodulation (PBMT) and antimicrobial photodynamic therapy (aPDT) in oral manifestations of patients infected by Sars-CoV-2: systematic review and meta-analysis. BACKGROUND: In 2019, a viral and respiratory pathology called COVID-19 emerged in Wuhan, China, and spread to other continents. Its main symptoms include fever, cough, dyspnea, myalgia, anorexia and respiratory distress in the most severe cases, which can lead to death. Furthermore, manifestations in the oral cavity such as ageusia and dysgeusia, as well as lesions in other regions of the oral cavity, can be observed. MAIN BODY: This systematic review and meta-analysis aimed to critically assess the clinical evidence on the use of photobiomodulation (PBMT) and antimicrobial photodynamic therapy (aPDT) for the treatment of oral lesions in patients infected with Sars-Cov-2. The literature extracted from electronic databases such as PubMed, Medline, CINAHL, and Google Scholar was screened for eligibility, and relevant articles were included. The review is limited to manuscripts published in English, Spanish and Portuguese language between December 2019 and October 2021. A total of 5 articles with 11 cases retracting PBMT and aPDT as therapeutic strategies for the regression of oral lesions and painful symptoms. The results show favoring the associated use of PBMT with aPDT (Pâ€‰=â€‰0.004), and the isolated use of PBMT with the result of significant "Pâ€‰=â€‰0.005" and good confidence interval (7.18, 39.20) in ulcerative lesions, herpetic, aphthous, erythematous, petechiae and necrotic areas. CONCLUSIONS: PBMT and aPDT could be effective in the treatment of oral lesions of patients infected with Sars-Cov-2 in a short period of time; however, more long-term randomized clinical trials studies are needed to define the therapeutic strategy.

No Effects of Photobiomodulation on Prefrontal Cortex and Hippocampal Cytochrome C Oxidase Activity and Expression of c-Fos Protein of Young Male and Female Rats. The role of light in our biological processes and systems is extensively known. In addition, the use of light devices has been introduced in the field of healthcare as an opportunity to administer power light at specific wavelengths to improve our body functions and counteract light deficiency. One of these techniques is photobiomodulation (PBM), which uses red to infrared light in a non-invasive way to stimulate, heal, regenerate, and protect tissue. The main proposed mechanism of action is the stimulation of the cytochrome c oxidase (CCO), the terminal enzyme in the mitochondrial electron transport chain. PBM has achieved positive effects on brain activity and behavioral function of several adult animal models of health and disease, the potential use of this technique in developing stages is not surprising. This research aims to examine the effects of PBM on the prefrontal cortex and hippocampus of 23 day-old healthy male (n = 31) and female (n = 30) Wistar rats. Three groups of each sex were used: a PBM group which received 5 days of PBM, a device group submitted to the same conditions but without light radiation, and a control basal group. CCO histochemistry and c-Fos immunostaining were used to analyze brain metabolic activity and immediate early genes activation, respectively. Results displayed no metabolic differences between the three groups in both sexes. The same results were found in the analysis of c-Fos positive cells, reporting no differences between groups. This research, in contrast to the PBM consequences reported in healthy adult subjects, showed a lack of PBM effects in the brain markers we examined in young healthy rat brains. At this stage, brain function, specifically brain mitochondrial function, is not disturbed so it could be that the action of PBM in the mitochondria may not be detectable using the analysis of CCO activity and c-Fos protein expression. Further studies are needed to examine in depth the effects of PBM in brain development, cognitive functions and postnatal disorders, along with the exploration of the optimal light parameters.

Near-Infrared Photobiomodulation of Living Cells, Tubulin, and Microtubules In Vitro. We report the results of experimental investigations involving photobiomodulation (PBM) of living cells, tubulin, and microtubules in buffer solutions exposed to near-infrared (NIR) light emitted from an 810 nm LED with a power density of 25 mW/cm(2) pulsed at a frequency of 10 Hz. In the first group of experiments, we measured changes in the alternating current (AC) ionic conductivity in the 50-100 kHz range of HeLa and U251 cancer cell lines as living cells exposed to PBM for 60 min, and an increased resistance compared to the control cells was observed. In the second group of experiments, we investigated the stability and polymerization of microtubules under exposure to PBM. The protein buffer solution used was a mixture of Britton-Robinson buffer (BRB aka PEM) and microtubule cushion buffer. Exposure of Taxol-stabilized microtubules (~2 Î¼M tubulin) to the LED for 120 min resulted in gradual disassembly of microtubules observed in fluorescence microscopy images. These results were compared to controls where microtubules remained stable. In the third group of experiments, we performed turbidity measurements throughout the tubulin polymerization process to quantify the rate and amount of polymerization for PBM-exposed tubulin vs. unexposed tubulin samples, using tubulin resuspended to final concentrations of ~ 22.7 Î¼M and ~ 45.5 Î¼M in the same buffer solution as before. Compared to the unexposed control samples, absorbance measurement results demonstrated a slower rate and reduced overall amount of polymerization in the less concentrated tubulin samples exposed to PBM for 30 min with the parameters mentioned above. Paradoxically, the opposite effect was observed in the 45.5 Î¼M tubulin samples, demonstrating a remarkable increase in the polymerization rates and total polymer mass achieved after exposure to PBM. These results on the effects of PBM on living cells, tubulin, and microtubules are novel, further validating the modulating effects of PBM and contributing to designing more effective PBM parameters. Finally, potential consequences for the use of PBM in the context of neurodegenerative diseases are discussed.

The effect of photobiomodulation using low-level laser therapy on tooth sensitivity after dental bleaching: a systematic review. The authors aimed to conduct a systematic review to assess data from the current literature on the effectiveness of low-level laser therapy (LLLT) in preventing tooth sensitivity (TS) after tooth whitening (DB). PRISMA guidelines for systematic reviews were followed. Clinical trials evaluating the treatment of LLLT in patients with sensitivity after tooth whitening were selected. A full bibliographic search was performed on May 4, 2021, in the following databases: Embase, MEDLINE via PubMed, SciELO, VHL Regional Portal, Web of Science, Gray Literature, Scopus, ClinicalTrials.gov and Cochrane Library. This study followed Cochrane's recommendations for analyzing risk of bias. A total of 1054 studies were found (255 studies were excluded because they were duplicates and 785 because of titles and abstracts). Only 14 articles were selected for analysis, of which eight were excluded because they had one or more exclusion criteria, resulting in six articles included in this systematic review, the vast majority being classified as low risk of bias. The studies reviewed indicated that LLLT showed promise in preventing TS after TB. However, evidence is limited and more clinical trials with low risk of bias are needed to reach a definitive conclusion on the action of LLLT in pain control after TB. Tooth Bleaching Agents Dentin Sensitivity;Humans;Low-Level Light Therapy;Tooth Bleaching;Tooth Bleaching Agents

The Effects of Photobiomodulation Therapy on Porcine Islet Insulin Secretion. Background and objective: Xenotransplantation of porcine islets to human recipients has been investigated as a potential cure for type 1 diabetes. However, the porcine islets have poor insulin secretion capacity compared with human islets. The objective of this study was to evaluate the effect of photobiomodulation therapy (PBMT) in insulin secretion on isolated porcine islets. Methods: Eight pancreata were harvested from crossbred market porcine and the islets were isolated from the pancreas. The isolated islets were treated with PBMT (wavelength: 633â€‰nm and dosages: 0.0,

15.6, and 31.3â€‰J/cm(2)) followed by 30-min incubation in low (3.0â€‰mM) or high (16.7â€‰mM) glucose. The relative percentage differences on insulin secretion between three dosages were compared in low and high glucose, respectively. Results: Insulin secretion was higher in samples exposed to 15.6â€‰J/cm(2) PBMT in low glucose (pâ€‰<â€‰0.05), but not in high glucose. When evaluating sex differences, male islets had higher insulin secretion by 15.6â€‰J/cm(2) PBMT in low glucose compared with females (pâ€‰<â€‰0.05). No significant differences were seen in high glucose. When compared within the control groups (0.0â€‰J/cm(2) PBMT), the relative changes on insulin secretion in high glucose was significantly higher on male islets (pâ€‰<â€‰0.05), but not on female islets. Conclusions: PBMT may increase insulin secretion on isolated porcine islets in basal condition, but it may not improve islets' glucose responsiveness to secrete insulin. Male porcine islets may respond to PBMT and glucose stimuli better than female islets on insulin secretion. Glucose Animals;Female;Glucose;Insulin Secretion;Islets of Langerhans;Islets of Langerhans Transplantation;Low-Level Light Therapy;Male;Swine

Effect of laser biostimulation and a low-calorie diet vs. a low-calorie diet alone on insulin resistance, inflammatory biomarkers, and depression among obese postmenopausal women: a randomized controlled trial. OBJECTIVE: Postmenopausal women are significantly predisposed to a multitude of disorders. Laser biostimulation (LB) and a healthy diet have been linked to multiple health benefits. This study aimed to investigate the effect of a combined LB and balanced low-calorie diet (LCD) vs. an LCD alone on insulin resistance (IR), inflammatory biomarkers, and depression score in obese postmenopausal women. PATIENTS AND METHODS: In the present study, a total of 66 postmenopausal women, with a mean age of 66.61 Â± 4.80 years and a body mass index (BMI) of 35.93 Â± 2.67 kg/m2, were randomized into two equal groups. The experimental group received LB and LCD (including 50-60% carbohydrates, 15-20% protein, 20-35% fat, and 25 g of fiber/day plus a restriction of 500-1000 kcal/d), while the control group followed the same diet program only for 12 weeks. Before and after the intervention, IR [measured by the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR index)], inflammatory biomarkers [C-reactive protein (CRP), white blood cells (WBCs), lymphocytes, and erythrocyte sedimentation rate (ESR)], and depression level [as assessed by the Hamilton Depression Rating Scale (HAMD-17)] were all measured. RESULTS: Using an intention-to-treat analysis for 60 women who completed the study, the body weight average reduction was -13.14% for the experimental group (p<0.001) vs. -6.36% for the control group (p<0.001). BMI, IR, inflammatory markers, and depression levels were also similarly changed. CONCLUSIONS: In postmenopausal obese women, adding LB to a suitable dietary program provides the most significant benefit in terms of lowering IR, metabolic inflammation, and depression. Biomarkers Aged;Biomarkers;Body Mass Index;Caloric Restriction;Depression;Diet, Reducing;Female;Humans;Insulin Resistance;Low-Level Light Therapy;Middle Aged;Obesity;Postmenopause;Weight Loss

In Vivo Characterization of a Red Light-Activated Vasodilation: A Photobiomodulation Study. Nitric oxide dependent vasodilation is an effective mechanism for restoring blood flow to ischemic tissues. Previously, we established an ex vivo murine model whereby red light (670Â nm) facilitates vasodilation via an endothelium derived vasoactive species which contains a functional group that can be reduced to nitric oxide. In the present study we investigated this vasodilator in vivo by measuring blood flow with Laser Doppler Perfusion imaging in mice. The vasodilatory nitric oxide precursor was analyzed in plasma and muscle with triiodide-dependent chemiluminescence. First, a 5-10Â min irradiation of a 3Â cm(2) area in the hind limb at 670Â nm (50Â mW/cm(2)) produced optimal vasodilation. The nitric oxide precursor in the irradiated quadriceps tissue decreased significantly from 123 Â± 18Â pmol/g tissue by both intensity and duration of light treatment to an average of 90 Â± 17Â pmol/g tissue, while stayed steady (137 Â± 21Â pmol/g tissue) in unexposed

control hindlimb. Second, the blood flow remained elevated 30Â min after termination of the light exposure. The nitric oxide precursor content significantly increased by 50% by irradiation then depleted in plasma, while remained stable in the hindlimb muscle. Third, to mimic human peripheral artery disease, an ameroid constrictor was inserted on the proximal femoral artery of mice and caused a significant reduction of flow. Repeated light treatment for 14Â days achieved steady and significant increase of perfusion in the constricted limb. Our results strongly support 670Â nm light can regulate dilation of conduit vessel by releasing a vasoactive nitric oxide precursor species and may offer a simple home-based therapy in the future to individuals with impaired blood flow in the leg.

Transcranial photobiomodulation changes neuronal morphology in the cerebral cortex of rats. Transcranial photobiomodulation improves cerebral cortex metabolism. We hypothesized that chronic laser treatment may stimulate neuronal growth. To test this hypothesis, we investigated the morphology of neurons in the cerebral cortex of rats submitted to brief (2.5Â min) daily sham or transcranial laser treatment (810Â nm wavelength at 100 mW) for 58 consecutive days. Laser treatment increased the number of dendritic nodes and ends, and reduced the total dendritic length in neurons of the cerebral cortex. Taken together, our data indicate that chronic transcranial photobiomodulation induces morphological neuroplasticity in the cerebral cortex of rats. Animals;Cerebral Cortex;Low-Level Light Therapy;Neurons;Rats

Hybrid Passivated Red Organic LEDs with Prolonged Operation and Storage Lifetime. In addition to mobile and TV displays, there is a trend of organic LEDs being applied in niche markets, such as microdisplays, automobile taillights, and photobiomodulation therapy. These applications mostly do not require to be flexible in form but need to have long operation lifetimes and storage lifespans. Using traditional glass encapsulation may not be able to fulfill the rigorous product specification, and a hybrid encapsulation method by combining glass and thin-film encapsulation will be the solution. Conventional thin-film encapsulation technology generally involves organic and inorganic multilayer films that are thick and have considerable stress. As a result, when subjected to extreme heat and stress, the film easily peels off. Herein, the water vapor transmission rate (WVTR) of a 2 Âμm silicon nitride film prepared at 85 Â°C is less than 5 Ã— 10(-5) g/m(2)/day and its stress is optimized to be 23 MPa. Red organic LEDs are passivated with the hybrid encapsulation, and the T(95) lifetime reaches nearly 10 years if the LED is continuously driven at an initial luminance of 1000 cd/m(2). In addition, a storage lifespan of over 17 years is achieved.

Treatment of Peri-Implant Mucositis with Standard of Care and Bioptron Hyperlight Therapy: A Randomized Clinical Trial. The aim of this study was to evaluate in a cohort of patients with peri-implant mucositis: (a) the efficacy of professional mechanical debridement therapy assisted using Bioptron Hyperlight Therapy on the reduction in periodontal indexes and (b) the reduction in total oxidative salivary stress. Forty subjects with a diagnosis of peri-implant mucositis were enrolled and randomly assigned to the Study Group (mechanical debridement therapy assisted using Bioptron Hyperlight Therapy) or Control Group (mechanical debridement therapy alone). The study duration was 6 months. Data on plaque index (PI), bleeding on probing (BoP), probing pocket depth (PPD), and pain relief on Visual Analogue Scale (VAS) were recorded at T(0), T(1) (14 days), T(2) (1 month), and T(3) (6 months). Group differences were assessed using Student's t-test and Pearson's Chi-squared test of homogeneity. PI and PPD decreased in the Study Group at the [T(0); T(1)] time interval and during the overall time of observation significantly more than in the Control Group; BoP and pain on VAS decreased significantly faster in the Study Group than in the Control Group. Differences in Salivary Antioxidant Test (SAT) changes were not significant at any time interval. Patients' gender and smoking habit were not correlated with the clinical outcomes. Clinical parameters related to peri-implant mucositis significantly improved in the Study Group, which demonstrated the clinical efficacy

of the Bioptron Hyperlight Therapy as an adjunct to standard of care for the treatment of peri-implant mucositis. The RCT was registered at the US National Institutes of Health #NCT05307445. Hemorrhage;Humans;Mucositis;Pain;Peri-Implantitis;Standard of Care;United States

Rationale for 1068 nm Photobiomodulation Therapy (PBMT) as a Novel, Non-Invasive Treatment for COVID-19 and Other Coronaviruses: Roles of NO and Hsp70. Researchers from across the world are seeking to develop effective treatments for the ongoing coronavirus disease 2019 (COVID-19) outbreak, which arose as a major public health issue in 2019, and was declared a pandemic in early 2020. The pro-inflammatory cytokine storm, acute respiratory distress syndrome (ARDS), multiple-organ failure, neurological problems, and thrombosis have all been linked to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) fatalities. The purpose of this review is to explore the rationale for using photobiomodulation therapy (PBMT) of the particular wavelength 1068 nm as a therapy for COVID-19, investigating the cellular and molecular mechanisms involved. Our findings illustrate the efficacy of PBMT 1068 nm for cytoprotection, nitric oxide (NO) release, inflammation changes, improved blood flow, and the regulation of heat shock proteins (Hsp70). We propose, therefore, that PBMT 1068 is a potentially effective and innovative approach for avoiding severe and critical illness in COVID-19 patients, although further clinical evidence is required. Nitric Oxide COVID-19;Humans;Low-Level Light Therapy;Nitric Oxide;Pandemics;SARS-CoV-2

Study of the Effect of Photobiomodulation on a Skin Repair Model in SKH-1 Mice. Background and objective: Laser applied at low power (400-1100â€‰nm), currently named photobiomodulation (PBM), is a noninvasive therapy to speed up wound healing. The purpose of this study was whether two different laser PBM delivery protocols would impact the skin wound healing in a mouse model. Materials and methods: A total of 24 SKH-1 mice were divided into three groups: Group 1 (control: untreated ulcers), Group 2 (a single postsurgical laser application), and Group 3 (laser each other day for 10 days; total five applications). Laser parameters were 940â€‰nm, 0.4 W, 10â€‰mm spot size, 0.008â€‰J/cm(2), 300â€‰sec/wound. Each animal received two skin wounds which were photographed on days 0, 5, and 10 to determine wound closure (ImageJ). Half of the animals in each group were sacrificed on day 5 and the other half on day 10. Samples were routinely processed for histological analysis (re-epithelization, angiogenesis, granulation tissue formation, inflammation, and collagen deposition). Results: The closure of the wounds at the end of the experiment in the animals photobiostimulated each other day was more advanced than in the controls and in those treated only once, in both the macroscopic and microscopic studies. Angiogenesis was higher in both treated groups than in the control in the first study time (day 5). However, inflammation, maturation of the granulation tissue, and collagen deposition only improved when the laser was applied each other day. Conclusions: In our study, with the parameters used, PBM improved the healing of skin wounds when applied every other day and not in a single dose. Collagen Animals;Collagen;Disease Models, Animal;Inflammation;Low-Level Light Therapy;Mice;Wound Healing

A Comparative Analysis of Photobiomodulation-Mediated Biological Effects of Single Versus Double Irradiation on Dental Pulp Stem Cells: An In Vitro Study. Objective: In recent years, fractionated irradiation protocols, rather than a simple plan of exposure, have been proposed as a more effective method in the field of tissue regeneration. Thus, this study aimed at a comparative analysis of single versus double irradiation of an 808-nm diode laser, in terms of dental pulp stem cells' (DPSCs) viability and proliferation in vitro. Methods: Subcultured DPSCs were either irradiated, or not (control group), with energy densities of 3, 7, and 12â€‰JÂ·cm(-2) in a single- or double-session manner (24â€‰h apart). On 0, 12, 24, 48, and 72â€‰h postirradiation, cell viability and proliferation were evaluated through Trypan Blue and alamarBlue assays, respectively. Results: During the first 48â€‰h postirradiation, the highest rates of DPSC proliferation were assigned to double irradiation at 3 or single exposure to 7â€‰Jâ‹…cm(-2), with no cytotoxic effects on cell viability. Inversely, single

irradiation at 12, or a double session of exposure to 7 or 12â€‰Jâ‹…cm(-2), led to a significant descent in the rates of proliferation and cell viability. Conclusions: Within the limitations of this study, evidence suggests a positive impact on the biological responses of DPSCs following double session of exposure to lower energy densities as well as a single irradiation at a higher energy dosage.
Cell Proliferation;Dental Pulp;Lasers, Semiconductor;Low-Level Light Therapy;Stem Cells

Physical properties of root cementum: Part 29. The effects of LED-mediated photobiomodulation on orthodontically induced root resorption and pain: a pilot split-mouth randomized controlled trial. OBJECTIVES: To examine the effects of light-emitting diode (LED)-mediated photobiomodulation (PBM) on orthodontic root resorption and pain. METHODS: Twenty patients (3 males, 17 females, mean age 15 years 6 months) needing bilateral maxillary first premolar extractions for orthodontic treatment were included in this single-centre, split-mouth randomized controlled trial. Both premolars received 150 g of buccal tipping force for 28 days. One side was randomly assigned to receive intraoral 850 nm wavelength, 60 mW/cm2 power, continuous LED illumination via OrthoPulse device (Biolux Research Ltd, Vancouver, British Columbia, Canada) for 5 minutes/day. The other side served as control. After 28 days, both premolars were extracted and scanned with micro-computed tomography for primary outcome assessment of root resorption crater volume measurements. For secondary outcome assessment, visual analogue scale pain questionnaires were used for both sides at 24 hours, 48 hours, 72 hours, and 7 days. Randomization was generated using www.randomization.com and allocation was concealed in sequentially numbered, opaque, sealed envelopes. Blinding was not possible during the experiment due to the use of tape to block light on control side of the devices. Assessors were blinded during outcome assessments. RESULTS: All 40 premolars from 20 patients were included. There was no significant difference in the mean total root resorption between the LED PBM and control sides (mean 0.216 versus 0.284 mm3, respectively, P = 0.306). The LED side was associated with less pain at 24 hours (P = 0.023) and marginally more pain at subsequent time points, which was not statistically significant. No harms were observed. LIMITATIONS: Short study duration and the inability to blind patients and clinician during clinical part of study. CONCLUSION: This 28-day randomized split-mouth controlled trial showed that daily, LED-mediated PBM application, when applied for 5 minute/day, does not influence orthodontic root resorption. It is associated with significantly less pain 24 hours after the application of orthodontic force, but no difference thereafter. These results should be tested on patients undergoing a full course of orthodontic treatment. TRIAL REGISTRATION: Clinical Trials Registry ACTRN12616000652471. Male;Female;Humans;Adolescent;Root Resorption;Dental Cementum;X-Ray Microtomography;Tooth Movement Techniques;Pain

Effect of delayed photobiomodulation therapy on neurosensory recovery in patients with mandibular nerve neurotmesis following traumatic mandibular fracture: A randomized triple-blinded clinical trial. INTRODUCTION: There is a possibility of neurotmesis of the inferior alveolar nerve (IAN) in mandibular fractures, which leads to neurosensory impairment. In this study, we aimed to investigate the efficacy of photobiomodulation therapy (PBMT) in patients with neurotmesis following trauma and mandibular fracture. MATERIALS AND METHODS: This triple-blind randomized trial was carried out on patients who suffered neurotmesis of the IAN following mandibular angle and body fracture at least for 6Â months. In the intervention group, laser irradiation was applied with a low-level GaAlAs diode laser (continuous wave of 810Â nm wavelength, power of 200Â mW, and energy density of 12-14Â J/cm(2)). In the control group, the laser probe was turned off and placed on the affected area. LLLT was done for 12 sessions (2 times/week for 6Â weeks). Light touch sensations, two-point discrimination, thermal discrimination (cold and warm stimulus), electric pulp test (EPT), and oral health impact profile (OHIP)-14 questionnaire were performed before the intervention, immediately after each PBMT session, and after 3, 6, 9 and 12Â months. RESULTS: In both groups, 3 and 23

patients were female and male, respectively. The results showed significantly improved light (cotton swab), light (wooden cotton swab), and sharp (dental needle) touch sensations, and two-point discrimination test in the PBMT group after the 10th, 11th, 10th, and 10th session, respectively. Two-way repeated measure ANOVA revealed that the trend of light touch sensation with cotton swab and two-point discrimination test was statistically significant (p-valueÂ =Â 0.002 and 0.001, respectively). The results of OHIP-14 test showed a significantly higher mean in the PBMT group 3Â months after PBMT. There was no statistically significant difference in EPT and thermal discrimination tests regarding the patients' group. CONCLUSION: PBMT could be an effective treatment for late post-traumatic nerve neurotmesis following a traumatic mandibular fracture.
Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Fractures;Mandibular Nerve;Trauma, Nervous System

Effect of Light-Emitting Diode Phototherapy on Serum Calcium Levels in Neonates With Jaundice. BACKGROUND: To assess the change in serum total calcium levels during light-emitting diode phototherapy treatment for jaundice in term neonates. METHODS: A prospective observational study was done on 104 term neonates with hyperbilirubinemia in a tertiary care center to investigate the effects of phototherapy using a light-emitting diode device. The total serum bilirubin along with total calcium levels was measured at the start and at the end of phototherapy. Additionally, all the newborns enrolled in the study were evaluated for hypocalcaemia-related symptoms such as jitteriness, irritability/excitability, lethargy, and convulsions. RESULTS: A significant lowering of posttreatment total calcium level compared to that of pretreatment level ($p<0.001$) was found in our study. Hypocalcemia (serum calcium <8 mg/dL in term neonates) was found in 12.5% of the study subjects. CONCLUSIONS: In the treatment of neonatal jaundice, similar to conventional blue and white light phototherapy, light-emitting diode phototherapy also has hypocalcemia as an adverse effect. We recommend monitoring these babies for hypocalcemia during light-emitting diode phototherapy.

Effect of Photobiomodulation Therapy with 915â€‰nm Diode Laser on Pain Perception during Local Anesthesia of Maxillary Incisors: A Randomized Controlled Trial. This study aimed to evaluate the effect of photobiomodulation therapy (PBMT) with 915â€‰nm wavelength on pain reduction during maxillary incisors' local infiltration in a randomized clinical trial study. A prospective triple-blinded split-mouth clinical trial was designed to assess pain perception during needle insertion and local anesthetic injection in 32 healthy patients required operative caries management on contralateral maxillary incisors. After laser treatment (915â€‰nm, power of 1.5â€‰W, duty cycle of 60% and energy density of 72â€‰Jâ€‰cm⁻²) in active group and no irradiation in sham group, the injection was performed. Patients' perception of pain was immediately assessed using numerical rating scale (NRS) for pain. Washout period between two appointments was one week. Wilcoxon signed-rank and Pearson correlation statistical analyses were used to assess the comparison of pain score between two appointments and the effect of anxiety level of previous dental injections. The mean scores of pain for the active laser and sham laser groups were 2.5â€‰Â±â€‰2.19 and 4.34â€‰Â±â€‰2.52, respectively, with a statistically significant higher NRS in the sham laser group (Pâ€‰Ë‚â€‰0.05). In this study's condition, diode PBMT reduced pain during infiltration on maxillary incisors. Anxiety experience of dental injection had no significant effect on pain perception scale (Pâ€‰Ëƒâ€‰0.05). Humans;Anesthesia, Local;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Pain;Pain Perception;Prospective Studies

Is photobiomodulation effective during maxillary expansion? A systematic review and meta-analysis. We performed a systematic review on literature associated with meta-analyses to elucidate whether (I) low-level laser therapy (C) compared to placebo accelerates (O) bone neoformation in the region of the midpalatal suture in (P) patients undergoing transverse maxillary expansion. Two reviewers

blindly performed targeted searches using the selection criteria (PICOS) in seven major databases and three grey literature databases, employing specific terms and their entrenchments. The RevManÂ® software (Review Manager, version 5.3, Cochrane Collaboration) was used to adapt the RoB summary illustration to the Cochrane 2.0 tool questions. Meta-analysis was performed using standardized mean difference (SMD) and Cohen's d calculation on random effects, tests for heterogeneity (I(2)) and publication bias (Egger and Begg), and one-of-out sensitivity analysis. GRADE (Grading of Recommendations Assessment, Development and Evaluation) was used for evidence quality analysis. Among the five studies included in the qualitative synthesis, three were included in the meta-analysis. All analysed studies were prospective randomized clinical trials. The risk of bias was such that the Egger (PÂ =Â .1991) and Begg (PÂ =Â .024) tests showed no significant risk of publication bias. The meta-analysis showed high heterogeneity (I(2) Â =Â 81%, Pâ€‰<â€‰.00001), and 3Â months after the operation, there was no significant difference between the photobiomodulation (PBMT) group and control group (PÂ =Â .850) or between the subgroups of the periods evaluated after 3Â months (PÂ =Â 0.490). GRADE showed an SMD of 0.62. Photobiomodulation as an adjuvant therapy in patients undergoing transverse maxillary expansion has few benefits and is limited in shape, as it contributes to bone healing in the midpalatal suture region after a period of 3Â months. Humans;Palatal Expansion Technique;Prospective Studies;Low-Level Light Therapy

Photobiomodulation Drives MiR-136-5p Expression to Promote Injury Repair after Myocardial Infarction. Photobiomodulation (PBM) has emerged as an alternative therapy involved in modulating a variety of biological effects. In this study, we verified whether PBM can affect cardiac physiological activity in mice through noninvasive irradiation using light-emitting diodes at a wavelength of 630 nm (LED-Red). We found that the PBM involved in regulating the repair of injured myocardium is wavelength-limited. LED-Red caused cardiomyocytes (CMs) that had exited the cell cycle to divide and proliferate again, and the cell proliferation ratio increased significantly with the accumulation of intracellular photopower. In addition, LED-Red promoted myocardial revascularization and myocardial regeneration, reduced the area of fibrosis in mice with myocardial infarction (MI), and thus improved cardiac contractile function. In regard to the mechanism, miRNA sequencing analysis showed that low-power LED-Red irradiation could induce differential changes in miRNAs in CMs. Among them, miR-136-5p was identified as a cardiac photo-sensitive miRNA and was obviously inhibited after stimulation, which produced a proliferation-promoting effect on CMs. Subsequent luciferase reporter assays confirmed the involvement of Ino80 as a binding target of miR-136-5p in the regulatory process of CM proliferation. Similarly, LED-Red irradiation elevated intracellular Ino80 expression. After knockdown of Ino80, the proliferation-promoting effect of LED-Red on CMs was inhibited. Collectively, this study demonstrates that LED-Red can promote CM proliferation by inhibiting cardiac photo-sensitive miRNA- miR-136-5p expression through targeting Ino80. The findings provided a new potential strategy for the treatment of ischemic cardiomyopathy (ICD). MicroRNAs;Mirn136 microRNA, mouse Animals;Apoptosis;Low-Level Light Therapy;Mice;MicroRNAs;Myocardial Infarction;Myocardium;Myocytes, Cardiac

Low-Level Laser Therapy for Management of Hypersensitivity in Molar-Incisor Hypomineralization and Oral Health-Related Quality of Life: Case Report. The aim was to report the use low-level laser therapy (LLLT) in the management of hypersensitivity in an adolescent with molar incisor hypomineralization (MIH) and the impact of LLLT on his oral health-related quality of life (OHRQoL). Clinical examination revealed severe MIH with hypersensitivity, in all first permanent molars and incisors. The treatment proposed was desensitization with fluoride and esthetic rehabilitation of the affected teeth. Then, LLLT was applied perpendicularly in a continuous mode (wavelength of 808 nm, power of 100 mW, dose of 1 J, and fluence of 35 J/cm2). The visual analogue scale was applied each session of LLLT. The child perceptions questionnaire (CPQ11-14) was administered at the beginning

and the end of the treatment. It was concluded that LLLT can be indicated in the management of hypersensitivity in an adolescent with severe MIH to control pain and to improve his OHRQoL. Adolescent;Dental Enamel Hypoplasia;Humans;Incisor;Low-Level Light Therapy;Molar;Prevalence;Quality of Life

Viability Improvement of Three-Dimensional Human Skin Substitutes by Photobiomodulation during Cultivation. Three-dimensional (3D) cultured skin containing vascular networks is a useful skin substitute that enables rapid reperfusion after transplantation. During its cultivation, however, insufficient nutrient delivery to the thick cultured tissue from the surrounding culture medium decreases the tissue viability. To solve this problem, in this study, we applied photobiomodulation (PBM), which can optically activate the electron transport chain of mitochondria, to human 3D skin cultures constructed using the layer-by-layer cell coating technique. PBM was applied once 5â€‰days after the start of epidermal differentiation using a light-emitting diode array with a center wavelength of 440, 523, 658 or 823â€‰nm at a constant light intensity of 15â€‰mWâ€‰cm(-2) for 50 or 600â€‰s. Two days after PBM, we assessed the viability of the tissues by a water-soluble tetrazolium-8 assay, adenosine triphosphate measurements and live/dead cell imaging, and the results showed that the PBM at 823â€‰nm for 50â€‰s (0.75â€‰Jâ€‰cm(-2)) significantly improved the viability of the 3D-cultured skin. Humans;Low-Level Light Therapy;Skin, Artificial;Cell Differentiation;Skin

Luminescence of Agrotextiles Based on Red-Light-Emitting Organic Luminophore and Polypropylene Spunbond Enhances the Growth and Photosynthesis of Vegetable Plants. The impact of a light-transforming covering on photosynthetic activity and growth processes in lettuce and white cabbage plants grown in a glass greenhouse was studied. Plants were covered with agrotextile, a polypropylene (PP) nonwoven spunbond coated with polylactide varnish containing a new organic luminophore (LUM), which absorbs sunlight mainly in the 460-560â€‰nm region and efficiently reradiates it in the red spectral region with a maximum at 660â€‰nm. For comparison, simultaneously two references agrotextiles without LUM or containing a non-luminescent chromophore (ABS) with an absorption spectrum close to that of LUM were as well investigated. The use of the agrotextile with LUM resulted in a significant increase in total crude aboveground biomass for 32-, 33-, and 43-day-old plants on the average by 20-40%, and the photosynthesis rate increased on the average by 30-40% compared to the agrotextile without LUM. The use of the agrotextile with ABS mimicking the absorption of LUM also did not reveal a significant impact on photosynthesis and biomass accumulation in the plants as compared to the reference agrotextile coated only with the polylactide varnish. At the same time, the photosystem II activity (F (v)/F (m) and F'(v)/F'(m) quantum yields) was nearly the same in all experiments. When plants were grown under the light-converting agrotextile, the luminescent component of the converted light in the red spectrum region led to an increase in plant growth and photosynthesis rate, which is a fundamentally new result. Possible reasons for the stimulation of growth and photosynthesis due to the redistribution of the light spectral composition were analyzed. The use of covering materials containing luminophores similar to LUM can be promising in agrobiotechnology not only for green and vegetable crops but also for other field and greenhouse crops and various fruit bushes and trees.

Effectiveness of Photobiomodulation Therapy on Human Bone Healing in Dentistry: A Systematic Review. Background: Despite the association, possible causality, and contradictory results, numerous studies evaluate photobiomodulation (PBM) therapy on the process of human bone healing. It is of paramount importance to review the available literature to elucidate the effect of laser on the bone healing process in dentistry. Objective: This systematic review analyzes the effectiveness of PBM therapy to improve bone healing in dentistry. Methods: A systematic search of studies published up to September 2021 and listed in PubMed, Cochrane Library, and Embase

databases and registered on PROSPERO (CRD42020212790). Twenty-five studies were selected. Results: The most used device was diode laser. PBM therapy parameters varied greatly. From the 25 selected studies, 17 had the primary outcome bone healing. Of these, 11 studies revealed improvement in bone healing with PBM therapy and six studies suggested no effect. The other eight studies evaluated secondary parameters. In seven studies, some of the clinical parameters were improved with the PBM therapy. Conclusions: Within the limitations of this systematic review, bone healing in dentistry was improved with the use of PBM. PBM therapy can promote anti-inflammatory and analgesic effects, improve healing, as well as enhance quality of life related to oral health. Within the areas analyzed in dentistry, laser parameters varied greatly, becoming difficult to consider a definite protocol as a proper one. Dentistry;Humans;Lasers;Low-Level Light Therapy;Quality of Life;Wound Healing

A case of mycosis fungoides effectively treated with ultraviolet light A 1-light-emitting diode phototherapy. Humans;Ultraviolet Rays;Mycosis Fungoides;Ultraviolet Therapy;Skin Neoplasms;Phototherapy

Oral lichen planus: comparative efficacy and treatment costs-a systematic review. OBJECTIVE: To compare the reported efficacy and costs of available interventions used for the management of oral lichen planus (OLP). MATERIALS AND METHODS: A systematic literature search was performed from database inception until March 2021 in MEDLINE via PubMed and the Cochrane library following PRISMA guidelines. Only randomized controlled trials (RCT) comparing an active intervention with placebo or different active interventions for OLP management were considered. RESULTS: Seventy (70) RCTs were included. The majority of evidence suggested efficacy of topical steroids (dexamethasone, clobetasol, fluocinonide, triamcinolone), topical calcineurin inhibitors (tacrolimus, pimecrolimus, cyclosporine), topical retinoids, intra-lesional triamcinolone, aloe-vera gel, photodynamic therapy, and low-level laser therapies for OLP management. Based on the estimated cost per month and evidence for efficacy and side-effects, topical steroids (fluocinonideâ€‰>â€‰dexamethasoneâ€‰>â€‰clobetasolâ€‰>â€‰triamcinolone) appear to be more cost-effective than topical calcineurin inhibitors (tacrolimusâ€‰>â€‰pimecrolimusâ€‰>â€‰cyclosporine) followed by intra-lesional triamcinolone. CONCLUSION: Of common treatment regimens for OLP, topical steroids appear to be the most economical and efficacious option followed by topical calcineurin inhibitors. Large-scale multi-modality, prospective trials in which head-to-head comparisons interventions are compared are required to definitely assess the cost-effectiveness of OLP treatments. Calcineurin Inhibitors;Cyclosporins;Steroids;Triamcinolone;Fluocinonide;Dexamethasone;Clobetasol;Tacrolimus Administration, Topical;Calcineurin Inhibitors;Clobetasol;Cyclosporins;Dexamethasone;Fluocinonide;Health Care Costs;Humans;Lichen Planus, Oral;Steroids;Tacrolimus;Treatment Outcome;Triamcinolone

Optimization of photo-biomodulation therapy for wound healing of diabetic foot ulcers in vitro and in vivo. Unclear optical parameters make photo-biomodulation (PBM) difficult to implement in diabetic foot ulcer (DFU) clinically. Here, 12 wavelengths (400-900â€…nm) were used to conduct PBM to heal DFU wounds in vitro and in vivo. PBM at 10â€…mW/cm(2) and 0.5-4 J/cm(2) with all 12 wavelengths promoted proliferation of diabetic wound cells. In a mimic DFU (mDFU) rat model, PBM (425, 630, 730, and 850â€…nm, and a combination light strategy) promoted mDFU healing. The positive cell proliferation, re-epithelialization, angiogenesis, collagen synthesis, and inflammation were possible mechanisms. The combination strategy had the best effect, which can be applied clinically.

Molecular and Cellular Mechanisms of Water-Filtered IR. Water-filtered infrared A (wIRA) has been used to produce tissue hyperthermia to treat cancer, but also to treat a variety of other

conditions, such as wound healing, pain, and inflammation. While the mechanism of anti-cancer hyperthermia is well-established, the mechanism of wIRA to promote healing and pain reduction is less clear. In this chapter, I will cover the use of photobiomodulation to treat several conditions characterized by mitochondrial dysfunction. Next the role of heat-sensitive transient receptor potential (TRP) ion channels is discussed, with regard to nitric oxide production and infrared neural stimulation. Then the use of infrared emitting bioceramic nanoparticles embedded in garments or patches, which are powered solely by body heat to promote healing and reduce pain and inflammation is discussed. The conclusion is that wIRA can activate heat-sensitive TRP channels, possibly mediated by energy absorption by nanostructured water clusters, leading to many of the observed therapeutic benefits.

Photobiomodulation Therapy With Different Wavebands for Hair Loss: A Systematic Review and Meta-Analysis. BACKGROUND: Photobiomodulation is a promising therapy for hair loss with negligible side effects. However, the reported effects of photobiomodulation therapy for hair loss are inconsistent. OBJECTIVE: To assess the curative effect of photobiomodulation therapy for the treatment of hair loss. METHODS: A systematic review of self-controlled studies and randomized controlled trials was conducted. ScienceDirect, PubMed, and Wiley Online Library were searched from the earliest date to May 30, 2021. RESULTS: Thirty-six studies (966 patients) were included. Two to 4 meta-analyses with different indices were performed separately on 4 groups of studies to test the effectiveness of the following hair loss treatments: ultraviolet light for alopecia areata (AA), red light for androgenetic alopecia (AGA), infrared light for AA, and infrared light for AGA. All meta-analyses showed that treatments were superior to control ($p < .05$). CONCLUSION: The meta-analyses strongly suggested that photobiomodulation therapies with ultraviolet and infrared light were effective for treating AA, and photobiomodulation therapies with red light and infrared light were effective for treating AGA. Alopecia;Alopecia Areata;Humans;Low-Level Light Therapy;Treatment Outcome

The Chicken Embryo Chorioallantoic Membrane as an In Vivo Model for Photodynamic Therapy. For many decades the chicken embryo chorioallantoic membrane (CAM) has been used for research as an in vivo model in a large number of different fields, including toxicology, bioengineering, and cancer research. More specifically, the CAM is also a suitable and convenient model system in the field of photodynamic therapy (PDT), mainly due to the easy access of its membrane and the possibility of grafting or growing tumors on the membrane and, interestingly, to study the PDT effects on its dense vascular network. In addition, the CAM is simple to handle and cheap. Since the CAM is not innervated until later stages of the embryo development, its use in research is simplified compared to other in vivo models as far as ethical and regulatory issues are concerned. In this review different incubation and drug administration protocols of relevance for PDT are presented. Moreover, data regarding the propagation of light at different wavelengths and CAM development stages are provided. Finally, the effects induced by photobiomodulation on the CAM angiogenesis and its impact on PDT treatment outcome are discussed. Animals;Chick Embryo;Chickens;Chorioallantoic Membrane;Embryo, Mammalian;Neoplasms;Photochemotherapy

Raman spectroscopy and sciatic functional index (SFI) after low-level laser therapy (LLLT) in a rat sciatic nerve crush injury model. Axonotmesis causes sensorimotor and neurofunctional deficits, and its regeneration can occur slowly or not occur if not treated appropriately. Low-level laser therapy (LLLT) promotes nerve regeneration with the proliferation of myelinating Schwann cells to recover the myelin sheath and the production of glycoproteins for endoneurium reconstruction. This study aimed to evaluate the effects of LLLT on sciatic nerve regeneration after compression injury by means of the sciatic functional index (SFI) and Raman spectroscopy (RS). For this, 64 Wistar rats were divided into two groups according to the length of treatment: 14Â days (nâ€‰=â€‰32) and

21Â days (nâ€‰=â€‰32). These two groups were subdivided into four sub-groups of eight animals each (control 1; control 2; laser 660Â nm; laser 808Â nm). All animals had surgical exposure to the sciatic nerve, and only control 1 did not suffer nerve damage. To cause the lesion in the sciatic nerve, compression was applied with a Kelly clamp for 6Â s. The evaluation of sensory deficit was performed by the painful exteroceptive sensitivity (PES) and neuromotor tests by the SFI. Laser 660Â nm and laser 808Â nm sub-groups were irradiated daily (100 mW, 40Â s, energy density of 133Â J/cm(2)). The sciatic nerve segment was removed for RS analysis. The animals showed accentuated sensory and neurofunctional deficit after injury and their rehabilitation occurred more effectively in the sub-groups treated with 660Â nm laser. Control 2 sub-group did not obtain functional recovery of gait. The RS identified sphingolipids (718, 1065, and 1440Â cm(-1)) and collagen (700, 852, 1004, 1270, and 1660Â cm(-1)) as biomolecular characteristics of sciatic nerves. Principal component analysis revealed important differences among sub-groups and a directly proportional correlation with SFI, mainly in the sub-group laser 660Â nm treated for 21Â days. In the axonotmesis-type lesion model presented herein, the 660Â nm laser was more efficient in neurofunctional recovery, and the Raman spectra of lipid and protein properties were attributed to the basic biochemical composition of the sciatic nerve.
Animals;Crush Injuries;Low-Level Light Therapy;Nerve Crush;Nerve Regeneration;Peripheral Nerve Injuries;Rats;Rats, Wistar;Sciatic Nerve;Sciatic Neuropathy;Spectrum Analysis, Raman

Effect of photobiomodulation on fatigue in individuals with relapsing-remitting multiple sclerosis: a pilot study. Multiple sclerosis is an autoimmune disease of the central nervous system characterized by inflammation and destruction of the myelin sheath. Fatigue is one of the main symptoms of this disease, with a negative impact on quality of life and few treatment options. Photobiomodulation is used for several inflammatory conditions and may be beneficial for the treatment of fatigue in individuals with multiple sclerosis. Conduct a pilot study to analyze the effect of photobiomodulation on fatigue in individuals with relapsing-remitting multiple sclerosis. The participants were recruited from the UNINOVE Integrated Health Clinic and randomly allocated to two groups: group 1, administration of photobiomodulation (808Â nm, 36Â J for 360Â s) under the tongue and group 2, administration of photobiomodulation over the radial artery. Fatigue was measured using the Modified Fatigue Impact Scale (MFIS). No significant differences were found regarding the total MFIS score or subscale scores (pâ€‰<â€‰0.05, two-way ANOVA). Photobiomodulation with the parameters employed in the present study had no effect on fatigue in individuals with multiple sclerosis. ClinicalTrials.gov Identifier: NCT03360487.
Fatigue;Humans;Multiple Sclerosis;Multiple Sclerosis, Relapsing-Remitting;Pilot Projects;Quality of Life

Effects of Low-Level Laser Therapy on Osseous Defects Distal to Mandibular Second Molar after Extraction of Impacted Third Molar. OBJECTIVE: To evaluate the efficiency of low-level laser therapy on the distal osseous defects of the mandibular second molar (M2) after the adjacent impacted third molar (M3) extraction. METHODS: A total of 59 clinic cases were screened out, whose M3 were impacted and the distal alveolar bone of M2 had been destroyed horizontally. They were randomly divided into 2 groups based on whether they would have laser irradiation or not after M3 extraction. Then, postoperative complications of the 2 groups were compared. The alveolar bone level distal to M2 was established before and 3 to 6 months after M3 extraction by radiographic evaluation, which was compared between two groups. RESULTS: The incidence of severe pain and mouth-opening limitation was significantly lower in the LLLT group than that in the control group. The amount of bone formation in the LLLT group was higher than that in the control group 3 months after the operation, and the difference was statistically significant. But the difference was not statistically significant 6 months after surgery. CONCLUSION: LLLT may alleviate postoperative complications and

improve early osteogenesis. It is a viable option for use in the treatment of osseous defects distal to mandibular second molars following extraction of impacted third molars.

Glutamatergic System in Depression and Its Role in Neuromodulatory Techniques Optimization. Depressive disorders are among the most common psychiatric conditions and contribute to significant morbidity. Even though the use of antidepressants revolutionized the management of depression and had a tremendous positive impact on the patient's outcome, a significant proportion of patients with major depressive disorder (MDD) show no or partial or response even with adequate treatment. Given the limitations of the prevailing monoamine hypothesis-based pharmacotherapy, glutamate and glutamatergic related pathways may offer an alternative and a complementary option for designing novel intervention strategies. Over the past few decades, there has been a growing interest in understanding the neurobiological underpinnings of glutamatergic dysfunctions in the pathogenesis of depressive disorders and the development of new pharmacological and non-pharmacological treatment options. There is a growing body of evidence for the efficacy of neuromodulation techniques, including transcranial magnetic stimulation, transcutaneous direct current stimulation, transcranial alternating current stimulation, and photo-biomodulation on improving connectivity and neuroplasticity associated with depression. This review attempts to revisit the role of glutamatergic neurotransmission in the etiopathogenesis of depressive disorders and review the current neuroimaging, neurophysiological and clinical evidence of these neuromodulation techniques in the pathophysiology and treatment of depression.

Brain Photobiomodulation Improves Sleep Quality in Subjective Cognitive Decline: A Randomized, Sham-Controlled Study. BACKGROUND: Sleep appears to be a sensitive biomarker that facilitates early detection and effective intervention for Alzheimer's disease, while subjective cognitive decline (SCD) is a risk factor for Alzheimer's disease. Prefrontal cortex atrophy is associated with both sleep disruption and cognitive decline. Transcranial brain photobiomodulation (PBM) therapy can enhance frontal cortex oxygen consumption, increasing frontal cortex mediated memory function. OBJECTIVE: This study aimed to test whether PBM therapy targeting the frontal cortex could improve sleep and cognitive function in SCD. METHODS: Fifty-eight SCDs were divided into the PBM group (Nâ€Š=â€Š32) in which real light therapy was administered and a sham light therapy group (Nâ€Š=â€Š26). All the participants received either real light or sham light therapy for 6 days consecutively, while the sleep data were recorded. The n-back task was employed to measure each participant's working memory. RESULTS: We found no differences in sleep efficiency change (Fâ€Š=â€Š211, pâ€Š=â€Š0.279), REM stage percent change (Fâ€Š=â€Š420, pâ€Š=â€Š0.91), and wake-up time (Fâ€Š=â€Š212, pâ€Š=â€Š0.277) between the two groups. The sleep efficiency and REM were improved within the true light group on the fifth day. The true light group perform better than the control group in the n-back test, the accuracy was higher in the 2-back test (88.6% versus 79.6%, pâ€Š=â€Š0.001), and the reaction time in 1-back was shorter (544.80Â±202.00 versus 592.87Â±222.05, pâ€Š=â€Š0.003). CONCLUSION: After five days of PBM therapy targeting the prefrontal cortex, sleep efficiency and N-back cognitive performance were improved on the fifth day. Alzheimer Disease;Brain;Cognition;Cognitive Dysfunction;Humans;Sleep Quality

Effects of photobiomodulation therapy on implant stability and postoperative recovery: a systematic review and meta-analysis. The purpose of this study was to systemically analyse the effects of photobiomodulation therapy (PBMT) on implant stability and postoperative recovery. Electronic searches on MEDLINE (PubMed), Cochrane Library, EMBASE, and Web of Science were completed independently by two researchers in February 2021, and a manual search was performed for the references of the included articles. The primary outcome was implant stability. The secondary outcome was postoperative recovery, including postoperative pain, recovery of peri-implant hard tissue (marginal bone loss and bone mineral density), facial swelling, and peri-implant clinical

parameters. Twenty studies were finally obtained (17 randomised controlled, and 3 controlled clinical studies). Meta-analysis revealed that PBMT increased implant stability at 10 days after insertion (MD 2.27, 95% CI: 0.40 to 4.13, PÂ =Â 0.020), and reduced marginal bone loss at 6 months after insertion (MD -0.16, 95% CI: -0.23 to -0.08, PÂ <Â 0.001). However, no significant improvements were noted in implant stability two weeks (PÂ =Â 0.070), three weeks (PÂ =Â 0.090), six weeks (PÂ =Â 0.050), and 12 weeks (PÂ =Â 0.080) after insertion. Qualitative analysis suggested that PBMT could not alleviate postoperative pain, increase bone mineral density, or improve peri-implant clinical parameters. It was effective only in reducing facial swelling. This study suggests that the effects of PBMT on implant stability and postoperative recovery may be limited. Dental Implants Bone Density;Dental Implants;Humans;Low-Level Light Therapy;Pain, Postoperative;Postoperative Period

Photodynamic therapy and photobiomodulation therapy in zoledronic acid-induced osteonecrosis in rats. BACKGROUND: This study investigated the effect of antimicrobial photodynamic therapy (PDT), using methylene blue (MBO) and photobiomodulation therapy (PT), on the alveolar bone of rats submitted to bisphosphonate-induced osteonecrosis of the maxillaries (OMB) model using zoledronic acid (ZA). METHODS: Sixty rats divided into six groups were used: SALINE, PDT, ZA, ZA+PDT, ZA+PT, and ZA+MBO. Three weekly administrations (Days 0, 7, and 14) of ZA 0.20 mg/kg or saline solution were performed. After one month (Day 42), the exodontia of the left lower first molars were performed. An additional dose of ZA was administered at Day 49. PDT was performed on days 42, 45, 49, and 54. One month after exodontia (Day 70), the animals were euthanized to obtain samples for imaging and microscopic analysis. ANOVA/Bonferroni tests were used for statistical analysis. RESULTS: The ZA+PDT group showed a significantly lower percentage of apoptotic osteocytes than the ZA group (pÂ <Â 0.001). The ZA+MBO, ZA+PT, and PDT groups significantly reduced the number of mononuclear cells compared to the ZA group (pÂ <Â 0.001). The ZA+PT and ZA+PDT groups showed a significant reduction in the number of CD 68+ (pÂ <Â 0.001) and CD3+ (pÂ =Â 0.002) cells compared to the ZA group. The number of cells expressing INF-γ had a significant reduction in the groups co-treated with PT and PDT compared to the ZA group (pÂ <Â 0.001). CONCLUSIONS: We conclude that PDT and PT attenuated the severity of OMB and the inflammatory process due to a reduction of macrophages, T lymphocytes, and cytokines that stimulate the activity of these cells. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid Animals;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Imidazoles;Low-Level Light Therapy;Photochemotherapy;Rats;Zoledronic Acid

[The use of rehabilitation programs for patients in the early recovery period after total knee arthroplasty]. Rehabilitation of patients after total knee arthroplasty is still a challenge for modern medicine. At the same time, there are few publications in the medical literature on rehabilitation programs for patients after total knee arthroplasty. Available scientific studies have proven the effectiveness of low-intensity laser therapy and a pulsed low-frequency electrostatic field (PLFEF) in tissue repair by modulating the inflammatory process and relieving pain. OBJECTIVE: Scientific substantiation of the feasibility of the combined use of low-intensity laser radiation (LILR) and PLFEF in patients after total knee arthroplasty. MATERIAL AND METHODS: 90 patients aged from 55 to 80 years after total knee arthroplasty were examined. All patients were randomly assigned to three groups. Patients of the 1st group underwent therapeutic exercises with an instructor and low-intensity laser exposure; in the 2nd group, therapeutic exercises with an instructor, low-intensity laser therapy, and PLFEF were performed without a time interval; patients of the 3rd group received only therapeutic exercises with an instructor. RESULTS: After the course of treatment, a positive dynamics of the state of microcirculation was noted in all patients, which correlated with a significant regression of the pain syndrome and an improvement in the performance of the 10-meter walk test

with external support on crutches. However, a more significant decrease in pain intensity after the first procedures and at the end of the course of treatment was found in the group of patients who received complex therapy, which included LILR, PLFEF, and therapeutic exercises. CONCLUSION: Thus, based on the data of this study, it is possible to recommend the combined use of LILR and PLFEF for the treatment of patients after total knee arthroplasty. Arthroplasty, Replacement, Knee;Exercise Therapy;Humans;Pain;Pain Measurement

Effects of photobiomodulation in experimental spinal cord injury models: A systematic review. This systematic review investigated the repercussions of photobiomodulation using low-level laser therapy (LLLT) for the treatment of spinal cord injury (SCI) in experimental models. Studies were identified from relevant databases published between January 2009 and December 2021. Nineteen original articles were selected and 68.4% used light at an infrared wavelength. There was a considerable variation of the power used (from 25 to 200â€‰mW), total application time (8-3000â€‰s) and total energy (0.3-450â€‰J). In 79% of the studies, irradiation was initiated immediately after or within 2 h of the SCI, and treatment time ranged continuously from 5 to 21â€‰days. In conclusion, LLLT can be an auxiliary therapy in the treatment of SCI, playing a neuroprotective role, enabling functional recovery, increasing the concentration of nerve connections around the injury site and reducing pro-inflammatory cytokines. However, there is a need for standardization in the dosimetric parameters. Attention;Humans;Low-Level Light Therapy;Radiometry;Recovery of Function;Spinal Cord;Spinal Cord Injuries

Efficacy of laser therapy combined with topical antifungal agents for onychomycosis: a systematic review and meta-analysis of randomised controlled trials. INTRODUCTION: Onychomycosis is a common fungal infection of the nail. Laser and topical antifungal agent combination therapy is an emerging treatment for onychomycosis. The objective of this study was to systematically evaluate the efficacy and safety of laser and topical antifungal agent combination therapy for onychomycosis. METHODS: The PubMed, Embase, Cochrane Library, China National Knowledge Infrastructure, Wanfang and VIP databases were searched from inception to November 2021. Randomised controlled trials (RCTs) on laser therapy combined with topical antifungal agents for onychomycosis were included. The Cochrane Collaboration tool was used to assess the risk of bias, and Revman 5.3 software was used in the meta-analysis. RESULTS: Twelve studies involving 869 patients were included in this meta-analysis. The results showed that compared with topical antifungal agents alone, laser and topical antifungal agent combination therapy was superior in terms of the complete cure rate (RR 6.04,95% CI (2.17, 16.85), Pâ€‰=â€‰0.0006), mycological cure rate (RR 1.27, 95% CI (1.10, 1.48), Pâ€‰=â€‰0.001), clinical effective rate (RR 1.38, 95% CI (1.20, 1.57), Pâ€‰<â€‰0.00001) and patient satisfaction rate (RR 1.47,95% CI (1.17, 1.84), Pâ€‰=â€‰0.0009).The subgroup analysis of outcome indicators, including mycological cure rate and clinical effective rate, demonstrated that both carbon dioxide (CO(2)) laser therapy combined with topical antifungal therapy and 1064-nm neodymium-doped:yttrium aluminium garnet (Nd:YAG) laser therapy combined with topical antifungal therapy showed better results than topical antifungal therapy alone. No adverse events were identified except for three studies reporting transient burning sensation without treatment and mild to moderate pain, both of which were well tolerated. CONCLUSION: The present study indicated that laser and topical antifungal agent combination therapy is effective for onychomycosis. However, more large-scale and well-designed RCTs are warranted. Antifungal Agents Antifungal Agents;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Onychomycosis;Randomized Controlled Trials as Topic;Treatment Outcome

Changes in Cytochrome C Oxidase Redox State and Hemoglobin Concentration in Rat Brain During 810â€‰nm Irradiation Measured by Broadband Near-Infrared Spectroscopy. Objective: The effects of 810â€‰nm light-emitting diode (LED) photobiomodulation (PBM) on cerebral metabolism

and cerebral hemodynamic were investigated by using a broadband near-infrared spectroscopy (bb-NIRS) under anesthesia conditions with isoflurane. Background data: PBM was supposed to increase cerebral hemodynamic and cerebral metabolism. There has been no study about the effect of 810â€‰nm LED stimulation on cerebral hemodynamic and cerebral metabolism in vivo by using bb-NIRS measurement. Methods: PBM was applied to seven Sprague-Dawley rats at 50â€‰mW/cm(2) power density. The changes in hemoglobin concentration (Î”(HbO2) and Î”(HHb)) and oxidized cytochrome c oxidase (CCO) concentration (Î”(oxCCO)) were measured using a bb-NIRS. The total hemoglobin and the difference in hemoglobin concentration changes were calculated by summation and difference of Î”(HbO2) and Î”(HHb), respectively. Results: PBM evoked the gradual increases of Î”(HbO2) (+7.7â€‰Î¼M vs. baseline, pâ€‰=â€‰0.008), Î”(HbT) (+9.5â€‰Î¼M vs. baseline, pâ€‰=â€‰0.0044), and Î”(HbD) (+5.9â€‰Î¼M vs. baseline, pâ€‰>â€‰0.05) during light stimulation. Meanwhile, Î”(oxCCO) (-3.5â€‰Î¼M vs. baseline, pâ€‰=â€‰0.0019) was significantly decreased right after the onset of stimulation. Conclusions: PBM with 810â€‰nm LED (50â€‰mW/cm(2)) increased cerebral oxygenation and blood volume as expected. However, oxidized CCO concentration was decreased, which was contrary to most previous studies. The two pathways of PBM effects on mitochondria and the inhibition of complex I by isoflurane were suggested to explain the decreased Î”(oxCCO) during PBM, but further study is required for the verification. Hemoglobins;Isoflurane;Electron Transport Complex IV Animals;Brain;Electron Transport Complex IV;Hemoglobins;Isoflurane;Oxidation-Reduction;Rats;Rats, Sprague-Dawley;Spectroscopy, Near-Infrared

Association of Photodynamic Therapy and Photobiomodulation As a Promising Treatment of Herpes Labialis: A Systematic Review. Background: This systematic review aims to analyze the effectiveness of the association of photodynamic therapy (PDT) and photobiomodulation (PBM) in the treatment of recurrent herpes labialis and to analyze the very many variables of parameters applied, number of sessions, photosensitizer concentration, and the timing of the intervention to offer clinicians an indication of the most likely optimal techniques and parameters required to achieve clinical success. Methods: This study was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA Checklist and registered at the International Prospective Register of Systematic Reviews (PROSPERO). We searched and identified articles of the subsequent bibliographic databases: PubMed and Cochrane. Results: Since there are no clinical trials regarding the association of PDT and PBM in the treatment of herpes labialis, we only included case reports in our review. All studies used methylene blue solution as the photosensitizer and the laser (diode laser or low-power laser) with a wavelength of 660â€‰nm as the light source. Power output, power density, number of irradiation points, number of PBM sessions, and irradiation duration varied between the included studies. Despite the diversity in parameters between studies, all case reports showed good results regarding relieving symptoms, accelerating healing, as well as reducing the incidence of recurrence without side effects. Conclusions: The association of PDT in the vesicular phase and PBM in the crust phase can be considered a promising solution for recurrent labial herpes. Despite the many successful cases reported, establishing an effective clinical protocol for the treatment of herpes labialis using PDT followed by PBM will only be possible through double-blind placebo studies that would elucidate the exact action of this treatment modality, the appropriate irradiation parameters for both therapies, optimal timing, and number of PBM sessions following PDT. This review has been registered at the International Prospective Register of Systematic Reviews (PROSPERO) under number CRD42021290757. Photosensitizing Agents Herpes Labialis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Randomized Controlled Trials as Topic

Effectiveness of Er:YAG Laser Combined with Photobiomodulation on Periodontitis Based on 3-month Observation. PURPOSE: The effectiveness of using different laser therapy strategies in adjunct to scaling and root planing (SRP) for treatment of periodontitis remains unclear. This study compared the treatment outcome of SRP and its combination with Er:YAG laser and/or photobiomodulation on patients with severe periodontitis. MATERIALS AND METHODS: A total of 50 patients were included, whose teeth were divided into 4 quadrants: 1. SRP+Er:YAG laser irradiation+photobiomodulation treatment; 2. SRP+Er:YAG laser irradiation treatment; 3. SRP+photobiomodulation treatment; 4. SRP treatment only. An Er:YAG laser at powers of 50 or 40 mJ and an Nd:YAG laser at 50 mJ were used. Patients were followed-up for 3 months. Periodontal clinical parameters (probing depth [PD], clinical attachment level [CAL], plaque index [PLI] and bleeding index [BI]), inflammation factors (melatonin and MMP-8 levels) and pain intensity were compared among the 4 quadrants. RESULTS: The quadrant treated by SRP combined with Er:YAG laser irradiation and photobiomodulation had statistically significantly lower PD? ($p = 0.0081$ at 1 month; $p < 0.0001$ at 3 months), CAL? ($p = 0.003$), PLI ?($p = 0.0011$) and BI levels ?($p = 0.005$ at 1 month; $p = 0.0236$ at 3 months) compared with the other 3 quadrants. In addition, melatonin ?($p = 0.0006$ at 1 month; $p = 0.0002$ at 3 months) and MMP-8 levels ?($p = 0.0012$; only at 1 month) were also statistically significantly higher. CONCLUSION: Of the treatments tested here, SRP combined with Er:YAG laser irradiation and photobiomodulation had the best short-term outcome for severe periodontitis. Matrix Metalloproteinase 8;Melatonin Humans;Lasers, Solid-State;Matrix Metalloproteinase 8;Melatonin;Periodontitis;Root Planing

The additive effects of photobiomodulation and bioactive glasses on enhancing early angiogenesis. Bioactive glasses (BG) have been widely utilized as a biomaterial for bone repair. However, the early angiogenesis of BG may be inadequate, which weakens its osteogenic effects in large-sized bone defects and often leads to the failure of bone regeneration. In this study, we explored the effects of photobiomodulation (PBM) combined with BG on early angiogenesis to solve this bottleneck problem of insufficient early angiogenesis.In vitro, human umbilical vein endothelial cells (HUVECs) were cultured with BG extracts and treated with PBM using 1 J cm(-2). The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay, real-time reverse transcription-polymerase chain reaction (real-time RT-PCR) and tubule formation assay were utilized to detect HUVECs' proliferation, vascular growth factor genes expression and tubules formation.In vivo, bone defects at the femoral metaphysis in Sprague-Dawley rats were treated with BG particulates and PBM at 120 J cm(-2). Hematoxylin-eosin staining was used to observe the inflammatory response, tissue formation and biomaterial absorption of bone defects. Immunohistochemical staining was applied to observe the vascular-like structure formation. Thein vitroresults showed that PBM combined with BG significantly promoted HUVECs' proliferation, genes expression and mature tubules formation. On days 2, 4 and 7, the mRNA expression of VEGF in BG + PBM group was 2.70-, 2.59- and 3.05-fold higher than control ($P< 0.05$), and significantly higher than PBM and BG groups ($P< 0.05$). On days 4 and 7, the bFGF gene expression in BG + PBM group was 2.42- and 1.82-fold higher than control ($P< 0.05$), and also higher than PBM and BG groups ($P< 0.05$). Tube formation assay showed that mature tubules were formed in BG + PBM and PBM groups after 4 h, and the number in BG + PBM group was significantly higher than other groups ($P< 0.05$).In vivoresults further confirmed PBM induced early angiogenesis, with more vascular-like structures observed in BG + PBM and PBM groups 2 week post-surgery. With the optimum PBM fluence and BG concentration, PBM combined with BG exerted additive effects on enhancing early angiogenesis. Biocompatible Materials Animals;Biocompatible Materials;Bone Regeneration;Human Umbilical Vein Endothelial Cells;Humans;Osteogenesis;Rats;Rats, Sprague-Dawley

A preliminary observation on rod cell photobiomodulation in treating diabetic macular edema. PURPOSE: To evaluate the safety and effectiveness of photobiomodulation (PBM) in the treatment of

diabetic macular edema (DME). METHODS: It was a single-center, self-controlled prospective study. The clinical records of 12 diabetic retinopathy patients (5 males and 7 females, 20 eyes in total) who were treated with PBM for DME at the Second Affiliated Hospital, Zhejiang University School of Medicine, were analyzed. The mean age was 56 (26-68) years. All the participants received PBM treatment during darkness at night in no less than 5 days per week and no less than 8Â â€‹h per day. In the baseline check and follow-up checks (1, 2, 6, 10, and 12 months after the start of treatment), the best-corrected visual acuity, the thickness of the retina in the macula, and the changes of the fundus lesions were observed. Wilcoxon signed rank test was used to compare the results before and after treatment. PÂ â€‹<Â â€‹0.05 was considered statistically significant. RESULTS: No fundus complication was observed during follow-up checks. In baseline and 12-month follow-up checks, the best-corrected visual acuity was 71.75Â â€‹Â±Â â€‹12.47 and 79.50Â â€‹Â±Â â€‹10.85, maximal retinal thickness in macular area was 390.95Â â€‹Â±Â â€‹77.12Â â€‹Î¼m and 354.13Â â€‹Â±Â â€‹55.03Â â€‹Î¼m, average retinal thickness in macular area was 334.25Â â€‹Â±Â â€‹36.45Â â€‹Î¼m and 314.31Â â€‹Â±Â â€‹33.28Â â€‹Î¼m, foveal thickness was 287.00Â â€‹Â±Â â€‹46.79Â â€‹Î¼m and 265.63Â â€‹Â±Â â€‹67.14Â â€‹Î¼m. The best-corrected visual acuity, average retinal thickness in macular area in consecutive follow-up results except that in the 1st month showed significant difference compared with baseline results. There were significant difference between every follow-up result and baseline result of maximal retinal thickness in macular area (PÂ â€‹<Â â€‹0.05). All follow-up results of foveal thickness were not significantly different (PÂ â€‹>Â â€‹0.05) from the baseline result, except that in the 6th month (PÂ â€‹=Â â€‹0.049). Obvious improvement could be observed in retinal fundus fluorescein angiography images. CONCLUSIONS: PBM is a safe and effective treatment of DME, which deserves further investigation.

Evaluating the safety, feasibility, and efficacy of non-invasive neuromodulation techniques in chemotherapy-induced peripheral neuropathy: A systematic review. PURPOSE: This systematic review was conducted to evaluate the best available evidence regarding the use of non-invasive neuromodulation techniques for managing chemotherapy-induced peripheral neuropathy (CIPN). METHODS: A systematic literature search of the following databases from their inception to October 17, 2021 was performed and was updated on March 2, 2022: AMED via Ovid, CINAHL via the EBSCO Host, Cochrane Library, Embase, PEDro, PubMed, and Web of Science. Randomized controlled trials (RCTs) and quasi-experimental studies examining the safety, feasibility, and efficacy of non-invasive neuromodulation techniques for managing established CIPN were identified. Narrative synthesis was used to analyze data collected from the included studies. RESULTS: Nine RCTs and nine quasi-experimental studies were included. A variety of non-invasive peripheral and central neuromodulation techniques were investigated in those studies, including scrambler therapy, electrical stimulations, photobiomodulation, magnetic field therapy, therapeutic ultrasound, neurofeedback, and repetitive transcranial magnetic stimulation. Non-invasive neuromodulation techniques for the management of established CIPN are generally safe and feasible. The efficacy of peripheral neuromodulation techniques such as scrambler therapy and transcutaneous electrical nerve stimulation was mostly unsatisfactory, while central neuromodulation techniques such as neurofeedback and repetitive transcranial magnetic stimulation were promising. CONCLUSIONS: The use of non-invasive neuromodulation techniques for managing CIPN is still in its infancy. Non-invasive central neuromodulation techniques have significant potential for relieving chronic pain and neuropathic symptoms related to CIPN, meriting further exploration. Antineoplastic Agents Antineoplastic Agents;Feasibility Studies;Humans;Pain Management;Peripheral Nervous System Diseases;Transcutaneous Electric Nerve Stimulation

Photobiomodulation for chemotherapy-induced oral mucositis in leukemic children: A randomized controlled clinical trial. OBJECTIVES: Evaluation of the effectiveness of

Photobiomodulation(PBM) for chemotherapy-induced oral mucositis (OM) in leukemic children. MATERIALS AND METHODS: A randomized controlled clinical study including forty-four leukemic children diagnosed with chemotherapy-induced OM at the Hematology/Oncology inpatient unit at Alexandria University Children's Hospital, Alexandria, Egypt. Patients were randomly assigned to either the control or test groups with a 1:1 ratio. The control group received conventional symptomatic treatment, while the test group was treated with PBM in addition to the symptomatic treatment. The response to both treatment modalities was evaluated according to the reduction of pain and lesions severity from baseline to 5, 10, and 14Â days after treatment. RESULTS: A significant reduction of pain was recorded on day 10 in the test group compared to the control group (pÂ <Â 0.001). There was also a significant decline in the OM grades between the two groups on day14 (pÂ =Â 0.003). No adverse events were reported. CONCLUSIONS: The use of PBM along with the conventional treatment was effective in reducing pain and in the recovery of OM lesions in children receiving chemotherapy for the treatment of ALL. It was also safe and applicable to children. Antineoplastic Agents Humans;Child;Low-Level Light Therapy;Stomatitis;Research Design;Pain;Antineoplastic Agents

Low-level laser acupuncture reduces postoperative pain and morphine consumption in older patients with total knee arthroplasty: A randomized placebo-controlled trial. BACKGROUND: Patients commonly develop postoperative pain after total knee arthroplasty (TKA). Acupuncture-related techniques and low-level laser therapy could be beneficial for pain management for older individuals. OBJECTIVE: To examine the effect of low-level laser acupuncture (LA) in reducing postoperative pain, pain-related interference in daily life, morphine consumption, and morphine-related side effects in older patients with knee osteoarthritis who underwent TKA. DESIGN, SETTING, PARTICIPANTS AND INTERVENTION: A single-blind randomized placebo-controlled trial was conducted. Patients (NÂ =Â 82) were recruited and randomly assigned via a computer-generated list to the LA group or a placebo group. The LA group received low-level laser therapy at Sanyinjiao (SP6), Taixi (KI3), Kunlun (BL60), Fengshi (GB31), Futu (ST32) and Neiguan (PC6) after TKA, while the placebo acupuncture group received the same treatment procedure without laser energy output. MAIN OUTCOME MEASURES: The primary outcome was postoperative pain intensity, and it was measured at baseline and hours 2, 6, 10, 24, 48 and 72 after TKA. The secondary outcomes, including relative pain, postoperative pain-related interference in daily life and morphine consumption, were measured at hours 24, 48 and 72 after TKA. RESULTS: Generalized estimating equations revealed significant between-group differences in pain intensity (PÂ =Â 0.01), and trend differences in pain intensity for the LA group starting at hours 10 to 72 (PÂ <Â 0.05) and morphine consumption at hours 48 and 72 (PÂ <Â 0.05). The changes in pain-related interference in daily life were significant (PÂ <Â 0.05) at 72Â h, with the exception of the parameters for worst pain, mood, and sleep. Nausea and vomiting side effects from morphine had significant between-group differences at hours 10 and 24 (PÂ <Â 0.05). CONCLUSION: Low-level LA gradually reduced older patients' postoperative pain intensity and morphine consumption within the first 72Â h after their TKA for osteoarthritis. Low-level LA may have benefits as an adjuvant pain management technique for clinical care. TRIAL REGISTRATION: ClinicalTrials.gov registration number NCT03995446. Analgesics, Opioid;Morphine Acupuncture Therapy;Aged;Analgesics, Opioid;Arthroplasty, Replacement, Knee;Double-Blind Method;Humans;Morphine;Pain, Postoperative;Single-Blind Method

Regulatory Processes of the Canonical Wnt/Î²-Catenin Pathway and Photobiomodulation in Diabetic Wound Repair. Skin is a biological system composed of different types of cells within a firmly structured extracellular matrix and is exposed to various external and internal insults that can break its configuration. The restoration of skin's anatomic continuity and function following injury is a multifaceted, dynamic, well-coordinated process that is highly dependent on signalling pathways,

including the canonical Wnt/Î² catenin pathway, all aimed at restoring the skin's protective barrier. Compromised and inappropriate tissue restoration processes are often the source of wound chronicity. Diabetic patients have a high risk of developing major impediments including wound contamination and limb amputation due to chronic, non-healing wounds. Photobiomodulation (PBM) involves the application of low-powered light at specific wavelengths to influence different biological activities that incite and quicken tissue restoration. PBM has been shown to modulate cellular behaviour through a variety of signal transduction pathways, including the Wnt/Î² catenin pathway; however, the role of Wnt/Î² catenin in chronic wound healing in response to PBM has not been fully defined. This review largely focuses on the role of key signalling pathways in human skin wound repair, specifically, the canonical Wnt/Î²-catenin pathway, and the effects of PBM on chronic wound healing. beta Catenin Diabetes Mellitus;Humans;Skin;Wnt Signaling Pathway;Wound Healing;beta Catenin

Ectopic Eye Tooth Management: Photobiomodulation/Low-Level Laser Emission Role in Root Resorption after Fixed Orthodontic Treatment. Aim: This study evaluates the role of low-level laser emission/photobiomodulation (LE/P) in quantitative measurements of root resorption (QRR). The application of LE/P performed after each orthodontic activation with four types of treatment intervention (TI) on the root resorption (RR) after fixed orthodontic treatment (FOT) of the upper arch with ectopic eye tooth/teeth [EET] was investigated. Materials and Methods: Thirty-two orthodontic patients scheduled for FOT were selected and assigned to the four groups. These were LE/P + Self ligating bracket (SLB), LE/P + Conventional bracket (CB), non-photobiomodulation (non-LE/P) + SLB and non-LE/P + CB. Standard management stages of FOT were followed in the maxilla. Each patient received a single application of LE/P labially/buccally and palatally, a total of five different points were used during each activation or appointment. The main outcome measure was QRR in maxillary anteriors before and after FOT, assessed via cone-beam computed tomography (CBCT) using 3D OnDemand software. Results: Insignificant QRR was found between before and after FOT in SLB, CLB, and LE/P, non-LE/P groups ($p > 0.05$). QRR in the SLB vs. CB and LE/P vs. non-LE/P group was significantly different in 11, 13, and 23 ($p < 0.05$). QRR in the LE/P + SLB group ($p < 0.05$) was significantly different in 11, 13, and 23 than that in the other groups. The most severe QRR was found on 13 (0.88 Â± 0.28 mm and 0.87 Â± 0.27 mm) and 23 (1.19 Â± 0.14 mm and 1.16Â±0.13 mm) in the CB and non-LE/P group ($p < 0.001$). LE/P + SLB showed a highly significant superior outcome ($p < 0.001$) in relation to non-LE/P + CB, the QRR of 23 were 0.813 Â± 0.114 mm and 1.156 Â± 0.166 mm, respectively. Conclusion: Significantly higher amounts of QRR were found in EET patients after FOT treated with the CB, non-LE/P, and non-LE/P + CB system and warrant further investigation to explore potential specific causes.

Vaginal Laser Therapy for Female Stress Urinary Incontinence: New Solutions for a Well-Known Issue-A Concise Review. Background and Objectives: Insufficient connective urethra and bladder support related to childbirth and menopausal estrogen decrease leads to stress urinary incontinence (SUI). The aim of this review is to narratively report the efficacy and safety of new mini-invasive solutions for SUI treatment as laser energy devices, in particular, the microablative fractional carbon dioxide laser and the non-ablative Erbium-YAG laser. Materials and Methods: For this narrative review, a search of literature from PubMed and EMBASE was performed to evaluate the relevant studies and was limited to English language articles, published from January 2015 to February 2022. Results: A significant subjective improvement, assessed by the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-UI-SF) was reported at the 6-month follow up, with a cure rate ranged from 21% to 38%. A reduction of effect was evidenced between 6 and 24-36 months. Additionally, the 1-h pad weight test evidence a significant objective improvement at the 2-6-month follow up. Conclusions: SUI after vaginal laser therapy resulted statistically improved in

almost all studies at short-term follow up, resulting a safe and feasible option in mild SUI. However, cure rates were low, longer-term data actually lacks and the high heterogeneity of methods limits the general recommendations. Larger RCTs evaluating long-term effects are required.
Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome;Urinary Incontinence, Stress

Neuronal differentiation potential of primary and immortalized adipose stem cells by photobiomodulation. Adipose Stem Cells (ASCs) are capable of neuronal differentiation, which makes them an ideal choice for therapies in nerve injuries. Principally, the differentiation of autologous ASCs to neurons offers solutions for the replacement therapies of nervous system with patient's own genetic background. On the contrary, the use of genetically modified (immortalized) ASCs has the benefit of accessibility by surpassing ethical concerns and ease for propagation as a continuous cell culture. Photobiomodulation (PBM) is a therapeutic modality with laser or light, which is widely been used for modulating stem cell bioprocesses viz. proliferation and differentiation. A comparative analysis was performed to evaluate the neuronal differentiation potential of primary ASCs isolated from a healthy human subject with commercially obtained immortalized ASCs with PBM. The outcome of this analysis will help us to know either primary or immortalized ASCs are most suitable for biomedical applications. Both primary and immortalized ASCs were characterized using their surface protein markers CD44/90/133/166 and induced to differentiate into neuronal cells using Fibroblast Growth Factor, basic (bFGF) and forskolin following PBM using Near Infra-Red (NIR) lasers. Based on the expression of nestin, an early neuronal marker an exposure to 5, 10 and 15Â J/cm(2) of NIR and growth inducers for 14Â days the primary ASCs demonstrated a higher neuronal differentiation potential compared to the immortalized ASCs. However, newly differentiated cells from either of these ASCs did not reveal Î²III-tubulin, an intermediate neuronal marker even by 21Â days of differentiation. This study gives an indication that immortalized ASCs have a phenotype and differentiation potential slightly less but comparable to the freshly isolated ASCs. We suggest that PBM along with growth inducers offer a better solution of differentiating ASCs to neurons.
Biomarkers Adipose Tissue;Biomarkers;Cell Culture Techniques;Cell Differentiation;Neurons;Stem Cells

Web Crawling and mRNA Sequencing Analyze Mechanisms of Photobiomodulation. Background: Photobiomodulation (PBM) is praised as a promising physical therapy, which has many advantages, such as being noninvasive and painless. However, the mechanisms are not fully elucidated. Methods: Using web crawling, mRNA sequence, and bioinformatics analysis, we selected genes, functional annotation, and mechanisms. The expressions of inflammatory cytokines were measured using quantitative real-time PCR (RT-qPCR). Results: A total of 146 human genes and 57 pathways were identified about PBM. The 630â€‰nm light-emitting diode (LED)-stimulated-MH7A cells were sequenced to further analyze the mechanism of PBM. Two thousand nine hundred fifty differentially expressed genes were identified, and the gene ontology term enrichment analysis and Kyoto encyclopedia of genes and genomes pathway analysis were performed to better understand functions and pathways. The 12 pathways were matched with the KEGG results of PBM and MH7A cells. A protein-protein interaction network was performed among genes in 12 pathways, and 10 outstanding proteins were identified. Importantly, the 9 genes were predicted with potential research value. And we also demonstrated that expression of inflammatory factors [interleukin (IL)-6, IL-1Î², IL-8, and matrix metalloproteinase-3 (MMP-3)] was reduced; meanwhile, the expression of anti-inflammatory factor IL-10 was promoted after 630 nm LED. Conclusions: Using web crawling, bioinformatics analysis, and mRNA sequence, we obtained 9 key genes and 12 important pathways about PBM. Importantly, we demonstrated the anti-inflammatory effect of 630â€‰nm LED red light

by RT-qPCR. Anti-Inflammatory Agents;Cytokines;RNA, Messenger Anti-Inflammatory Agents;Computational Biology;Cytokines;Humans;Internet;Low-Level Light Therapy;RNA, Messenger

Photobiomodulation Modulates Interleukin-10 and Interferon Gamma Production by Mononuclear Cells from Healthy Donors and Persons with Multiple Sclerosis. Background: Photobiomodulation (PBM) therapy was previously shown to reduce the clinical severity of disease and modulated pro- and anti-inflammatory cytokines in an animal model of multiple sclerosis (MS). Objective: Previous observations were extended to determine the effect of PBM therapy on peripheral blood mononuclear cells and CD4(+) T cells isolated from persons with MS (PwMS) and healthy donors. Methods: Using an in vitro cell culture system, isolated cells were activated and treated with red or near-infrared light wavelengths to determine the effect of PBM on the production of interferon gamma and interleukin-10 (IL-10). Results: PBM modulated cytokine production in MS subjects and healthy donors in a dose- and wavelength-dependent manner, with MS subjects and healthy donors responding differently to administered light. In addition, disease severity affected the response of immune cells, for instance, 670â€‰nm increased IL-10 production associated with increased disease severity. Conclusions: The data show that PBM therapy has the potential to modulate pro- and anti-inflammatory cytokines in PwMS over the course of disease. Further experiments applying PBM treatment directly on patients should be carried out with extreme caution to avoid severe imbalance in the immune response. Anti-Inflammatory Agents;Cytokines;Interleukin-10;Interferon-gamma Animals;Anti-Inflammatory Agents;Cytokines;Humans;Interferon-gamma;Interleukin-10;Leukocytes, Mononuclear;Multiple Sclerosis

Photobiomodulation and Stem Cell on Repair of Osteoporotic Bones. Objective: This study examined the use of photobiomodulation (PBM) plus adipose-derived stem cells (ASCs) to enhance the osteogenic properties of demineralized bone matrix (DBM) scaffold in a critical size femoral defect (CSFD) of ovariectomy-induced osteoporotic (OVX) rats. Background: PBM could be used as a unique strategy to enhance the osteogenic potential of DBMs seeded with ASCs. Materials and methods: The OVX rats with a CSFD were divided into six groups: (1) Control (C); (2) DBM scaffold alone (S); (3) S+PBM; (4) S+alendronate; (5) S+ASC; (6) S+PBM+ASC. Stereological analysis, real-time polymerase chain reaction (RT-PCR), and cone-beam computed tomography (CBCT) were performed after euthanization at 4 and 8 weeks postimplantation surgery. Results: In the 8th week, Groups 4 and 6 showed a greatly high new trabecular bone volume than the scaffold group (all, pâ€‰=â€‰0.009). The CBCT data demonstrated that the CSFD was significantly smaller in the two, three, and six groups relative to the control group (pâ€‰=â€‰0.01, pâ€‰=â€‰0.000, and pâ€‰=â€‰0.000, respectively). RT-PCR revealed that Groups 3 and 6 had higher messenger RNA levels of osteocalcin (OC) and osteoprotegerin (OPG) compared with the control group (pâ€‰=â€‰0.05). Group 6 had significantly lower expression of receptor activator of nuclear factor-ÎºB ligand (RANKL) compared with the control group (pâ€‰=â€‰0.02). Conclusions: The combination of DBM plus PBM plus ASC, as well as DBM plus PBM significantly improved the healing of CSFD in OVX rats, and affected the expression of OPG, OC, and RANKL genes. Adipocytes;Adipose Tissue;Animals;Female;Humans;Osteogenesis;Ovariectomy;Rats;Stem Cells

Photobiomodulation therapy for treatment olfactory and taste dysfunction COVID-19-related: A case report. It is postulated that the inflammatory process resulting from SARS-CoV-2 infection is the main cause of smell and taste dysfunctions in patients. In view of this, photobiomodulation, due to its anti-inflammatory and antioxidant effects, may be a promising therapeutic modality to treat these disorders. In the present case report, we observed clinical improvement in the symptoms of anosmia and ageusia related to COVID-19 after treatment with photobiomodulation. Due to the inflammatory nature of COVID-19 and the anti-inflammatory effects, photobiomodulation antioxidants already

proven in the literature make it a promising therapeutic modality, especially sequela COVID-related, including olfactory (anosmia) and taste (ageusia) dysfunction. In the present case report, the patient's olfactory and gustatory functions were re-established after 10 treatment sessions with photobiomodulation. Ageusia;Anosmia;COVID-19;Humans;Low-Level Light Therapy;Olfaction Disorders;SARS-CoV-2;Smell;Taste Disorders

Inactivation of Shigella flexneri by 405-nm Light-Emitting Diode Treatment and Possible Mechanism of Action. Shigella flexneri, a common Gram-negative foodborne pathogen, is widely distributed in fresh-cut fruits and vegetables, unpasteurized milk, and food processing environments. The aims of this study were to evaluate the antibacterial effects of 405-nm light-emitting diode (LED) treatment on S. flexneri and to investigate the possible mechanism. The results showed that LED irradiation (360â€‰min) reduced the number of S. flexneri in phosphate-buffered saline by 3.29 log colony-forming unit (CFU)/mL (initial bacterial count: 6.81 log CFU/mL). The cells in reconstituted infant formula, cells on fresh-cut carrot slices, and biofilm-associated cells on stainless steel surfaces were reduced by 1.83 log CFU/mL, 7.00 log CFU/cm(2), and 4.35 log CFU/cm(2) following LED treatment for 360, 120, and 120â€‰min, respectively. LED treatment damaged both DNA and cell wall of S. flexneri and changed cell morphology and cell membrane permeability. In addition, LED treatment decreased total cell protein concentration of S. flexneri. These results indicated that 405-nm LED treatment effectively controlled S. flexneri contamination of foods and food contact surfaces and that the bacterial inactivation may be the result of damage to multiple cellular components. These findings highlight the potential of LED technology in controlling S. flexneri during food processing, storage, and preparation. Stainless Steel Colony Count, Microbial;Food Handling;Food Microbiology;Humans;Shigella flexneri;Stainless Steel

Exosome therapy in hair regeneration: A literature review of the evidence, challenges, and future opportunities. BACKGROUND: Alopecia is a common chief complaintÂ and is challenging to treat. As such, regenerative treatments to promote hair growth are an emergingÂ area of research. Exosomes, which are extracellular vesicles involved in cell communication, homeostasis, differentiation, and organogenesis, have been shown to play a central role in hair morphogenesis and regeneration with potential for use as alopecia treatment. AIMS: This review summarizes and assesses the body of literature surrounding exosomes as regenerative therapeutics for alopecia and identifies areas for improvement in future research. METHODS: A review was conducted using a comprehensive list of keywords including "exosome," "alopecia," and "hair loss" on PubMed, EMBASE, and Google Scholar databases published from inception to February 2022. Reference lists of identified articles were included. 47Â studies were included. Clinical trial databases were searched using the term "exosome"; however, no trials relevant to hair growth were identified. RESULTS: Our updated and comprehensive review details the history of exosome use in medicine, postulated underlying mechanisms in treating hair loss, and current clinical studies. Preclinical studies demonstrate clear benefits of exosome therapeutics in regenerative medicine and for hair loss treatment. Clinical trials demonstrate safety of exosome use in medicine, but data showing efficacy and safety of exosome therapy for alopecia are lacking. We identified several gaps in knowledge required for effective clinical translation including safety, exosome source, and optimal treatment delivery mechanism and dosage. CONCLUSION: Exosomes are on the horizon as an exciting therapeutic for the treatment of alopecia. Further studies and clinical trials are required. Alopecia;Exosomes;Hair;Humans;Low-Level Light Therapy;Regeneration

Effects of moderate aerobic exercise, low-level laser therapy, or their combination on muscles pathology, oxidative stress and irisin levels in the mdx mouse model of Duchenne muscular dystrophy. This study aimed to investigate how the combined use of low-level laser therapy (LLLT) and exercise, to reduce the possible side effects and/or increase the benefits of exercise, would

affect oxidative stress, utrophin, irisin peptide, and skeletal, diaphragmatic, and cardiac muscle pathologies. In our study, 20 mdx mice were divided into four groups. Groups; sedentary and placebo LLLT (SC), sedentary and LLLT (SL), 30-min swimming exercise (Ex), and 30-min swimming exercise and LLLT (ExL). After 8Â weeks of swimming exercise, muscle tests, biochemically; oxidative stress index (OSI), utrophin and irisin levels were measured. Skeletal, diaphragmatic and cardiac muscle histopathological scores, skeletal and cardiac muscle myocyte diameters were determined under the light and electron microscope. While only irisin levels were increased in group SL compared to SC, it was determined that OSI, heart muscle histopathological scores decreased and irisin levels increased in both exercise groups (pâ€‰<â€‰0.05). In addition, in the ExL group, an increase in rotarod and utrophin levels, and a decrease in muscle and diaphragm muscle histopathological scores were observed (pâ€‰<â€‰0.05). It was determined that the application of swimming exercise in the mdx mouse model increased the irisin level in the skeletal muscle, while reducing the OSI, degeneration in the heart muscle, inflammation and cardiopathy. When LLLT was applied in addition to exercise, muscle strength, skeletal muscle utrophin levels increased, and skeletal and diaphragmatic muscle degeneration and inflammation decreased. In addition, it was determined that only LLLT application increased the level of skeletal muscle irisin. Fibronectins;Utrophin Animals;Disease Models, Animal;Fibronectins;Inflammation;Low-Level Light Therapy;Mice;Mice, Inbred mdx;Muscle, Skeletal;Muscular Dystrophy, Duchenne;Oxidative Stress;Swimming;Utrophin

Does low-intensity pulsed ultrasound enhance repigmentation in vitiligo? Humans;Hypopigmentation;Low-Level Light Therapy;Skin Pigmentation;Treatment Outcome;Ultrasonic Waves;Vitiligo

Combinatorial wound healing therapy using adhesive nanofibrous membrane equipped with wearable LED patches for photobiomodulation. Wound healing is the dynamic tissue regeneration process replacing devitalized and missing tissue layers. With the development of photomedicine techniques in wound healing, safe and noninvasive photobiomodulation therapy is receiving attention. Effective wound management in photobiomodulation is challenged, however, by limited control of the geometrical mismatches on the injured skin surface. Here, adhesive hyaluronic acid-based gelatin nanofibrous membranes integrated with multiple light-emitting diode (LED) arrays are developed as a skin-attachable patch. The nanofibrous wound dressing is expected to mimic the three-dimensional structure of the extracellular matrix, and its adhesiveness allows tight coupling between the wound sites and the flexible LED patch. Experimental results demonstrate that our medical device accelerates the initial wound healing process by the synergetic effects of the wound dressing and LED irradiation. Our proposed technology promises progress for wound healing management and other biomedical applications.

Low-power infrared laser modulates mRNA levels from genes of base excision repair and genomic stabilization in heart tissue from an experimental model of acute lung injury. The aim of this study was to evaluate photobiomodulation effects on mRNA relative levels from genes of base excision repair and genomic stabilization in heart tissue from an experimental model of acute lung injury by sepsis. For experimental procedure, animals were randomly assigned to six main groups: (1) control group was animals treated with intraperitoneal saline solution; (2) LASER-10 was animals treated with intraperitoneal saline solution and exposed to an infrared laser at 10Â JÂ cm(-2); (3) LASER-20 was animals treated with intraperitoneal saline solution and exposed to an infrared laser at 20Â JÂ cm(-2); (4) acute lung injury (ALI) was animals treated with intraperitoneal LPS (10Â mgÂ kg(-1)); (5) ALI-LASER10 was animals treated with intraperitoneal LPS (10Â mgÂ kg(-1)) and, after 4Â h, exposed to an infrared laser at 10Â JÂ cm(-2) and (6) ALI-LASER20 was animals treated with intraperitoneal LPS (10Â mgÂ kg(-1)) and, after 4Â h, exposed to an infrared laser at 20Â JÂ cm(-2). Irradiation was performed only once and animal euthanasias for analysis of mRNA relative levels by

RT-qPCR. Our results showed that there was a reduction of mRNA relative levels from ATM gene and an increase of mRNA relative levels from P53 gene in the heart of animals with ALI when compared to the control group. In addition, there was an increase of mRNA relative levels from OGG1 and APE1 gene in hearts from animals with ALI when compared to the control group. After irradiation, an increase of mRNA relative levels from ATM and OGG1 gene was observed at 20Â JÂ cm(-2). In conclusion, low-power laser modulates the mRNA relative levels from genes of base excision repair and genomic stabilization in the experimental model of acute lung injury evaluated.
Lipopolysaccharides;RNA, Messenger;Saline Solution Acute Lung Injury;Animals;DNA Repair;Genomics;Lasers;Lipopolysaccharides;Lung;Models, Theoretical;RNA, Messenger;Saline Solution

Laser therapy and light sources for labial lentigines in patients with Peutz-Jeghersâ€‰syndrome. Labial lentigines associated with Peutz-Jeghers syndrome are challenging and represent a cosmetic problem. Laser and intense-pulsed light sources (IPLS) can be used to treat these macules. However, there are few guidelines regarding the different types of protocols found in the literature. Thus, the purpose of this study was to review the pertinent literature on lasers and IPLS as therapy for labial lentigines in patients with Peutz-Jeghers syndrome. A detailed literature search was conducted in seven databases (Cochrane Library, Embase, Lilacs, PubMed, SciELO, Scopus and Web of Science) to November 2020. Data were extracted and analyzed from selected studies including study design, sample size, participants' skin color, age, and gender, parameters of the laser or IPLS used, interval and total sessions of laser application, results obtained, follow-up time and side effects. Thirteen out of 124 published studies met our eligibility criteria, covering 81 patients. Ten types of lasers and IPLS were used, and most of the sample (nÂ =Â 57) was treated with Q-switch Alexandrite Laser (QSAL). The total number of sessions ranged from 1 to 12 and the interval between sessions ranged from 2 to 16â€‰weeks. All studies have shown satisfactory results, with no further complications. The follow-up ranged from 2 to 97â€‰months. Laser therapy and IPLS are effective in the treatment of lentigines associated with PJS. Although QSAL was used in 70.3% of the sample, different types of lasers showed comparable satisfactory results. Humans;Laser Therapy;Lentigo;Lip Diseases;Low-Level Light Therapy;Melanosis;Peutz-Jeghers Syndrome

Australian experience and practical approach to the 308-nm excimer light therapy in dermatology. The monochromatic excimer light therapy (308-nm excimer laser and lamp) is used to treat focal dermatoses with inflammation or hypopigmentation. In Australia, despite excimer light therapy being a proven effective treatment for many cutaneous conditions, barriers such as access and affordability provide considerable limitations to patients. This study aims to retrospectively evaluate the different applications of excimer light therapy in treating dermatologic conditions within the Australian setting and provide practical information for its use.
Australia;Dermatology;Humans;Hypopigmentation;Low-Level Light Therapy;Retrospective Studies;Treatment Outcome

Photobiomodulation stimulates surrounding bone formation and increases stability of titanium alloy miniscrews in ovariectomized rats. The number of older individuals (>â€‰60Â years) treated in orthodontic dental practice is constantly growing, and osteoporosis is a common disease within this age range. Orthodontic treatment for this group tends to be challenging, often requiring the use of mini-implants. Mini-implants are important accessories in orthodontic treatment that provide solutions to complex cases. Despite the high level of success, these devices are prone to failure if insufficient bone stability is achieved. This study aimed to evaluate the effects of photobiomodulation on bone neoformation around mini-implants using fluorescence analysis in ovariectomized rats. A total of 12 female rats (Wistar) were ovariectomized and divided into three groups: two groups of low-level laser therapy irradiation in two different protocols, as follows: in the PBM1 group,

applications were performed using 2Â J, for 20Â s each for 48Â h, 6 irradiations in total, and in the PBM2 group, a single application of 4Â J was performed for 40Â s, and the third group represented the control group, and no laser therapy was applied. Each rat received two mini-implants placed immediately behind the upper incisors, and 0Â g of force was applied using a NiTi spring. All rats received two bone markers, tetracycline (days 0-4) and alizarin (days 7-10), for 5Â days each. Both markers were bound to calcium, allowing visualization of bone neoformation through fluorescence microscopy. After 12Â days, euthanasia was performed; the results revealed that both irradiated groups showed significantly greater bone neoformation compared to the control group (pâ€‰<â€‰0.05). Mini-implant stability was measured in all animals using the Periotest device on day 0 and on the day of euthanasia. A significant increase in stability was observed in the group that received more laser application (pâ€‰<â€‰0.05). Photobiomodulation had a positive effect on bone neoformation around mini-implants in ovariectomized rats, with an increase in stability when more irradiation was performed. Alloys;Dental Implants;Titanium Alloys;Animals;Dental Implants;Female;Orthodontic Anchorage Procedures;Osteogenesis;Rats;Rats, Wistar;Titanium

Effects of photobiomodulation combined with orofacial myofunctional therapy on the quality of life of individuals with temporomandibular disorder. PURPOSE: To analyze the impact of photobiomodulation combined with orofacial myofunctional therapy (OMT) on the oral health quality of life (OHQOL) of individuals with temporomandibular disorder, before and after the treatment. METHODS: Blind, controlled, randomized clinical trial with 34 volunteers randomly distributed into two groups: G1, who received OMT combined with photobiomodulation, and G2, treated with OMT combined with inactive laser. The subjects were first assessed with a visual analog scale (VAS) to classify them according to the degree of orofacial pain and with the Oral Health Impact Profile - Short Form (OHIP-14) regarding the impact on the OHQOL. The resulting data were statistically analyzed. The significance level was set at 0.05 (95%). RESULTS: "Physical pain", "psychological discomfort", "physical disability", and "psychological disability" were the aspects with the greatest impact on the OHQOL. The G1 subjects responded positively to their treatment, as well as G2 to theirs. There was a strong positive correlation between VAS and total OHIP-14 score in both groups after the treatment. However, the functional recovery in the control group individuals (G2) was the most perceived positive change in the OHQOL in comparison with the experimental group (G1). CONCLUSION: The people who received photobiomodulation combined with OMT perceived an improvement in the OHQOL, as well as those treated with placebo laser. There was a strong positive correlation in both groups in the improvement of the degree of pain and self-perception of the OHQOL. Facial Pain;Humans;Myofunctional Therapy;Pain Measurement;Quality of Life;Temporomandibular Joint Disorders

Photobiomodulation reduces inflammation but does not influence the hypoxia-inducible factor-1Î± in pulp tissue of rats after bleaching. OBJECTIVES: To evaluate the influence of photobiomodulation with infrared laser (IRL) in the rat pulp tissue after bleaching, considering the immunolabeling of interleukin (IL)-23 and hypoxia-inducible factor (HIF)-1Î±. METHODOLOGY: The right and left molars of forty rats were divided into groups: Control - with placebo gel and Bleached - with 35% hydrogen peroxide (H2O2). Half of the rats received one IRL application on both sides, establishing a split-mouth design, which resulted in 4 groups with 20 hemi-maxillae each: Control, Bleach, IRL, and Bleached-IRL. Rats (n=10) from each group were euthanized, at 2- and 30-days mark, and the pulp tissue was evaluated using inflammation and immunolabeling scores. Wilcoxon and Mann-Whitney statistical tests were performed ($p<0.05$). RESULTS: At the 2-days mark, the Bleached group had severe inflammation and necrosis in the occlusal thirds of the pulp, and moderate to severe inflammation in cervical third, whereas the Bleached-IRL had mild to moderate inflammation ($p<0.05$). At the 30-days mark, there was no inflammation, but tertiary dentine formation in the

bleached groups. Regarding IL-23, severe immunolabeling was observed in the Bleached group (p<0.05) at the 2-days mark; at the 30-days mark, there was a reduction in immunolabeling, in which the Bleached group had moderate and the Bleached-IRL group had mild immunolabeling (p>0.05). HIF-1Î± was more evident at the 2-days mark in the Bleached group, without significant difference with the Bleached-IRL (p>0.05). The difference was observed between the bleached and control groups, without immunolabeling (p<0.05); at the 30-days mark, the Bleached group had reduction in HIF-1Î± immunolabeling, while the Bleached-IRL had an increase; the difference remained between the bleached and the controls groups (p<0.05). CONCLUSION: Photobiomodulation using IRL minimized the inflammation and IL-23 immunolabeling in the pulp tissue of rats after dental bleaching, but did not influence significantly the HIF-1Î± immunolabeling. Hypoxia-Inducible Factor 1, alpha Subunit;Interleukin-23;Tooth Bleaching Agents;Hydrogen Peroxide Animals;Dental Pulp;Hydrogen Peroxide;Hypoxia-Inducible Factor 1, alpha Subunit;Inflammation;Interleukin-23;Rats;Rats, Wistar;Tooth Bleaching;Tooth Bleaching Agents

Hemorheological alterations of red blood cells induced by 450-nm and 520-nm laser radiation. Proper rheological properties of red blood cells (RBC) including flexibility and aggregability are essential for healthy blood microcirculation. Excessive RBC aggregation has been observed to be associated with many pathological conditions and is crucial in acute circulatory problems. Low-level laser radiation (LLLR) has been found to have positive effects on the rheology of human blood, however, the detailed mechanisms of blood photobiomodulation remains unclear. In this study, utilizing the single-cell technique optical tweezers (OT) and traditional light microscopy, the influence of photobiomodulation of human RBC was examined under different conditions of laser irradiation. The results revealed that high radiant exposure (over 170.5Â J/cm(2) radiant fluence) caused enhanced RBC aggregation and cell shape transformation while the aggregation force between single RBC remained unchanged. LLLR with radiant fluence below 9.5Â J/cm(2) by 450Â nm wavelength improved the RBC deformability, weakened the strength of cell-cell interaction in the RBC disaggregation process, and showed rejuvenating effects on RBC suspended in a harsh cell environment. Erythrocyte Aggregation;Erythrocyte Deformability;Erythrocytes;Humans;Lasers;Rheology

Light-emitting diode phototherapy: pain relief and underlying mechanisms. Pain is a common symptom of an illness. For decades, pain treatments such as non-steroidal anti-inflammatory drugs, opioids, and surgical nerve blocking have been widely used, but each method has its limitations. Photobiomodulation is a recently developed method for pain management, with light-emitting diodes (LEDs) being a more recent development used in pain management because of their low cost, low side effects, and high safety. Here, we reviewed the phototherapeutic effects of LEDs on different pain conditions. We also discussed possible physicochemical and neurobiological mechanisms underlying LED therapy, especially its effects on inflammatory pain. Humans;Low-Level Light Therapy;Pain;Pain Management;Pain Measurement;Phototherapy

Neurotechnological Approaches to the Diagnosis and Treatment of Alzheimer's Disease. Alzheimer's disease (AD) is the most common cause of dementia in the elderly, clinically defined by progressive cognitive decline and pathologically, by brain atrophy, neuroinflammation, and accumulation of extracellular amyloid plaques and intracellular neurofibrillary tangles. Neurotechnological approaches, including optogenetics and deep brain stimulation, have exploded as new tools for not only the study of the brain but also for application in the treatment of neurological diseases. Here, we review the current state of AD therapeutics and recent advancements in both invasive and non-invasive neurotechnologies that can be used to ameliorate AD pathology, including neurostimulation via optogenetics, photobiomodulation, electrical stimulation, ultrasound stimulation, and magnetic neurostimulation, as well as nanotechnologies employing nanovectors,

magnetic nanoparticles, and quantum dots. We also discuss the current challenges in developing these neurotechnological tools and the prospects for implementing them in the treatment of AD and other neurodegenerative diseases.

Effect of Photobiomodulation on Structure and Function of Extracellular Vesicle Secreted from Mesenchymal Stem Cells. The current study intended to evaluate the effect of photobiomodulation on the morphology and function of EVs secreted from mesenchymal stem cells (MSCs) derived from periodontal ligament (PDL) and the adipose tissue (ADSCs) (from buccal fat pad) inÂ vitro. These cells were irradiated at 660â€‰nm or kept in dark as control. EVs were then isolated from each group using ultracentrifugation. EVs were defined by flow cytometry and Western blot. Electron microscopy (SEM) was used to study the morphology of EVs. Then, MTT and wound-healing scratch assays were applied to compare the cell survival and migration of human dermal fibroblast (HDF) cells treated with the EVs obtained from the four groups. According to SEM images, isolated EV were round and cup-shaped in all groups showing no destructive effects of laser irradiation on EV morphology. MTT test results revealed a statistically significant difference between the HDF cells treated with different EV groups from hPDLSCs-Dark in comparison with control (0â€‰Î¼g/mL) (Pâ€‰<â€‰0.05) and treated with exosome from hPDLSCs-Irradiation cells compared with dark group (Pâ€‰<â€‰0.05). However, scratch wound-healing assay did not show a significant difference between various groups (P Ëƒ 0.05). Further studies with different irradiation protocols are recommended to find an optimal strategy. Humans;Mesenchymal Stem Cells;Extracellular Vesicles;Adipose Tissue;Wound Healing;Cell Survival

Photobiomodulation Therapy Affects the Elastic Modulus, Cytoskeletal Rearrangement and Migration Capability of Human Osteosarcoma Cells. Photobiomodulation (PBM) therapy utilizes low-power lasers to modulate the viability of living human cells and leads to changes in proliferation, differentiation, adhesion and gene expression, even though the rearrangement of cytoskeleton was not previously studied. The present study aims to evaluate the photobiological effects on the elastic behavior of human osteosarcoma cells (MG-63) and their morphological changes. Fluorescence staining, confocal imaging and atomic force microscopy (AFM) topography were performed to study the effects of PBM therapy with the exposure of 532Â nm-25mW, 650Â nm-3mW, 650Â nm-150mW and 780Â nm-70mW beams following the 5-min continuous irradiation. The area of each beam was 3.14cm(2) with a source-surface distance of 20Â cm. Besides the cell proliferation assessment, the migratory potential of MG-63 was determined with the wound healing technique. The results indicated an increase in stiffness and shape index of radiation-induced cells 24Â h after exposure along with the obvious F-actins changes. But, cell stiffening was not observed 72Â h after 532Â nm laser irradiation. Also, a decrease in the migration rate was seen in all of the groups after 72Â h of irradiation except cells treated with 532Â nm wavelength. However, 532Â nm laser beams increase the migratory potential 24Â h after exposure. Within 72Â h after irradiation, the cell proliferation was only affected by applying 532Â nm and 650Â nm-150mW laser beams. It was concluded that applying photobiomodulation with wavelengths of 650Â nm (at both utilized powers) and 780Â nm alters the migration capability and provides a quantitative description of cytoskeletal changes. Moreover, membrane stiffening can be considered as the biological marker of PBM treatments. Cell Proliferation;Cytoskeleton;Elastic Modulus;Humans;Low-Level Light Therapy;Osteosarcoma

Nitric oxide storage levels modulate vasodilation and the hypotensive effect induced by photobiomodulation using an aluminum gallium arsenide (AlGaAs) diode laser (660Â nm). The aim of this study was to evaluate the participation of nitric oxide (NO) in the hypotensive and vasorelaxation effect induced by PBM using an aluminum gallium arsenide (AlGaAs) diode laser (660Â nm). Male Wistar rats were treated with the inhibitor of nitric oxide synthase (L-NAME). A red laser (660Â nm; 63Â J/cm(2); 56Â s/point) was applied to the abdominal region at six different points.

Thoracic aorta was dissected for vascular reactivity study, and a laser (660Â nm; 96Â J/cm(2); 56Â s) was applied after incubation with the NO donor DETA-NO, PBS, or hydroxicobalamin. Endothelial cells (HUVEC) were treated with DETA-NO or CuSO(4), and then, PBM (63Â J/cm(2)) was applied, and the nitric oxide was detected. Hypertensive L-NAME rats did not exhibit a decrease in blood pressure after PBM. PBM promoted vasodilation in the aorta isolated from normotensive rats, and less effect in the aorta of L-NAME rats and the addition of the NO donor, DETA-NO, promoted greater vasodilation by PBM in the aorta of L-NAME rats. In endothelial cells, an increase in NO, after PBM, was detected; however, with the addition of CuSO(4), which catalyzes the decomposition of NO storage, there was no detection of NO after PBM. The results of this study demonstrate that the hypotensive and vasodilatory effect of PBM with a red laser at 660Â nm is modulated by the release of nitric oxide from the storage. Arsenicals;Nitric Oxide Donors;gallium arsenide;Nitric Oxide;Gallium;Aluminum;NG-Nitroarginine Methyl Ester Aluminum;Animals;Arsenicals;Endothelial Cells;Gallium;Hypotension;Lasers, Semiconductor;Male;NG-Nitroarginine Methyl Ester;Nitric Oxide;Nitric Oxide Donors;Rats;Rats, Wistar;Vasodilation

Comparative evaluation of the efficacy of ozone therapy and low level laser therapy on oral mucosal wound healing in rat experimental model. OBJECTIVE: The aim of the present study was to evaluate and compare the effectiveness of ozone therapy and low-level laser therapy (LLLT) on healing of oral mucosal wounds in rats through histological assessment. METHODS: Thirty male Wistar rats were employed in this study. Following a 5-mm surgical wound created on the buccal mucosa, the rats were randomly distributed into 3 groups of 10: (1) ozone group (treated with topical gaseous ozone), (2) laser group (treated with LLLT), and (3) control group (received no treatment). Following the sacrifice of rats on day 21, samples were taken from rats' buccal mucosa for histological assay and scoring. The data were analyzed using Mann-Whitney test. RESULTS: Ozone and laser groups demonstrated reduced acute inflammation scores compared to control group (p=.01), while no significant differences were observed between the ozone and laser groups (pÂ =Â 1.00). Similarly, ozone and laser groups showed higher histological tissue repair scores than the control group (p=.00), and no difference was found between ozone and laser groups (p=.76). On the other hand, no significant difference in expression of TNF-Î± (p=.33) and TGF-Î²1 (p=.13) was identified between ozone, laser and control samples. CONCLUSION: The present study demonstrated that both adjunctive ozone therapy and LLLT with a 940Â nm diode laser provided significant improvement in parameters of acute inflammation and tissue repair in surgical oral mucosal wounds in rats. Ozone Rats;Male;Humans;Animals;Low-Level Light Therapy;Mouth Mucosa;Rats, Wistar;Wound Healing;Ozone;Inflammation;Models, Theoretical

Efficacy and safety of skin-adhesive low-level light therapy for overactive bladder: a Phase III study. INTRODUCTION AND HYPOTHESIS: Overactive bladder (OAB) is a common condition that remains challenging to treat. We hypothesized that skin-adhesive low-level light therapy (LLLT) would be an effective treatment for OAB caused by bladder muscle contraction. Accordingly, we aimed to evaluate the efficacy and safety of an LLLT device for the treatment of OAB. METHODS: This prospective, randomized, double-blind, placebo-controlled, multicenter trial included patients with a clinical diagnosis of OAB who were treated at either of two university hospitals. Patients were instructed to apply an LLLT device (Color DNA-WSF) or a sham device at home three times daily for 12 weeks. The primary outcome was the change in the mean daily number of urge urinary incontinence (UUI) episodes between baseline and 12 weeks. The secondary outcomes were the mean changes in incontinence, voiding, and nocturia episodes from baseline and the likelihood of achieving a > 50% reduction in UUI and incontinence episodes after 12 weeks. All patients completed the Overactive Bladder Symptom Score (OABSS), Urogenital Distress Inventory-6 (UDI-6), and Impact Urinary

Incontinence-7 (IIQ-7) questionnaires. Safety parameters included treatment-emergent adverse events. RESULTS: Compared with those in the sham group, the numbers of UUI and urinary incontinence episodes in the LLLT group were significantly decreased at week 12 (UUI, (-1.0 Â± 1.7 vs. -0.4 Â± 2.5, P = 0.003; urinary incontinence, -1.1 Â± 1.9 vs. -0.5 Â± 2.9, P=0.002). Furthermore, the OABSS, UDI-6, and IIQ-7 scores at week 12 tended to be better in the LLLT group than in the sham group. The incidence of device-related treatment-emergent adverse events was similar between groups. CONCLUSIONS: LLLT may be clinically useful and safe for the treatment of OAB.
Adhesives Humans;Adhesives;Double-Blind Method;Low-Level Light Therapy;Prospective Studies;Treatment Outcome;Urinary Bladder, Overactive;Urinary Incontinence;Urinary Incontinence, Urge;Skin

Multiple LEDT wavelengths modulate the Akt signaling pathways and attenuate pathological events in mdx dystrophic muscle cells. This study is aimed at investigating the effects of LEDT, at multiple wavelengths, on intracellular calcium concentration; on transient receptor potential canonical channels; on calcium-binding protein; on myogenic factors; on myosin heavy chains; on Akt signaling pathway; on inflammatory markers; and on the angiogenic-inducing factor in dystrophic muscle cell culture experimental model. Dystrophic primary muscle cells were submitted to LEDT, at multiple wavelengths (420Â nm, 470Â nm, 660Â nm, and 850Â nm), and evaluated after 48Â h for cytotoxic effects and intracellular calcium content. TRPC-1, TRPC-6, Calsequestrin, MyoD, Myogenin, MHC-slow, MHC-fast, p-AKT, p-mTOR, p-FoxO1, Myostatin, NF-ÎºB, TNF-Î±, and VEGF levels were evaluated in dystrophic primary muscle cells by western blotting. The LEDT, at multiple wavelengths, treated-mdx muscle cells showed no cytotoxic effect and significant lower levels in [Ca2â€‰+]i. The mdx muscle cells treated with LEDT showed a significant reduction of TRPC-1, NF-ÎºB, TNF-Î± and MyoD levels and a significant increase of Myogenin, MHC-slow, p-AKT, p-mTOR, p-FoxO1 levels, and VEGF levels. Our findings suggest that different LEDT wavelengths modulate the Akt-signaling pathways and attenuate pathological events in dystrophic muscle cells, and a combined multiwavelength irradiation protocol may even provide a potentially therapeutic strategy for muscular dystrophies.
Myogenin;NF-kappa B;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases;Calcium Animals;Calcium;Mice;Mice, Inbred mdx;Muscle Cells;Muscle, Skeletal;Myogenin;NF-kappa B;Proto-Oncogene Proteins c-akt;Signal Transduction;TOR Serine-Threonine Kinases;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A

Interplay between epithelial and mesenchymal cells unveils essential proinflammatory and pro-resolutive mediators modulated by photobiomodulation therapy at 660â€‰nm.
Photobiomodulation therapy (PBMT) has been widely used to promote tissue repair. However, PBMT's critical roles in the epithelial and mesenchymal tissues interactions are still barely known. Herein, we investigated light parameters on challenged keratinocytes (KC)-i.e., cultivated under oxidative stress-solely or associated with fibroblasts (FB) in a co-culture system. Cells were treated with PBMT at the wavelength of 660â€‰nm, at 20â€‰mW and 0.71â€‰W/cm(2) . Three different energy densities were primarily evaluated on KC: 1 (1.4Â s), 5 (7Â s), and 50â€‰J/cm(2) (70â€‰s). Next, KC and FB were co-cultured and assessed at 5Â J/cm(2) . This energy density was also tested in ex vivo murine skin samples. Our main data suggest that PBMT can increase cellular proliferation at low doses and cell migration in a biphasic mode (1 and 50â€‰J/cm(2)), both further confirmed by the epidermal growth factor receptor ligand-amphiregulin-upregulation. IL-1RA mRNA-the IL-1Î² (interleukin-1Î²) receptor antagonist recognized to fasten wound repair-was upregulated in the co-culture system. Upon PBMT, the ex vivo findings showed a progressive increase in the epidermal thickness, although presenting qualitatively less differentiated epithelium than the control group. In conclusion, PBMT effects are dependent on the cellular interactions with the surrounding

microenvironment. Ultimately, PBMT is anti-inflammatory and contributes to the expression of critical mediators of wound repair. Animals;Fibroblasts;Keratinocytes;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice;Wound Healing

Photobiomodulation Attenuates Neurotoxic Polarization of Macrophages by Inhibiting the Notch1-HIF-1Î±/NF-ÎºB Signalling Pathway in Mice With Spinal Cord Injury. Spinal cord injury (SCI) is a catastrophic disease with a complex pathogenesis that includes inflammation, oxidative stress, and glial scar formation. Macrophages are the main mediators of the inflammatory response and are distributed in the epicentre of the SCI. Macrophages have neurotoxic and neuroprotective phenotypes (also known as classically and alternatively activated macrophages or M1 and M2 macrophages) that are associated with pro- or anti- inflammatory gene expression. Our previous study demonstrated that photobiomodulation (PBM) alters the polarization state of macrophages in the SCI region towards the M2 phenotype and promotes the recovery of motor function in rats with SCI. However, the mechanism by which PBM promotes SCI repair remains largely undefined. This study is based on the replacement of conventional percutaneous irradiation with implantable biofibre optic in vivo irradiation. The aim was to further investigate the effects of PBM on SCI in mice under new irradiation patterns and its potential mechanisms of action. PBM was administered to male mice with clamped SCI for four consecutive weeks and significantly promoted the recovery of motor function in mice. Analysis of the macrophage phenotypes in the epicentre of the SCI in mice showed that PBM mainly inhibited the neurotoxic activation of macrophages in the SCI area and reduced the secretion of inflammatory factors such as IL-1Î± and IL-6; PBM had no effect on M2 macrophages. Immediately afterwards, we constructed in vitro models of the inflammatory polarization of macrophages and PBM intervention. We found that PBM attenuated the neurotoxicity of M1 macrophages on VSC 4.1 motor neurons and dorsal root ganglion (DRG) neurons. The effects of PBM on neurotoxic macrophages and the possible mechanisms of action were analysed using RNA sequencing (RNA-seq), which confirmed that the main role of PBM was to modulate the inflammatory response and immune system processes. Analysis of the differentially expressed genes (DEGs) associated with the inflammatory response showed that PBM had the most significant regulatory effects on genes such as interleukin (IL)-1Î±, IL-6, cyclooxygenase-2 (COX-2), and inducible nitric oxide synthase (iNOS) and had obvious inhibitory effects on inflammation-related Notch1 and hypoxia-inducible factor-1Î± (HIF-1Î±) pathway genes. RNA-seq analysis of the effect of PBM on gene expression in resting-state macrophages and M2 macrophages did not show significant differences (data not shown). In conclusion, PBM promoted better motor recovery after SCI in mice by inhibiting the neurotoxic polarization of macrophages and the release of inflammatory mediators by acting on the Notch1-HIF-1Î±/NF-ÎºB Signalling Pathway. Anti-Inflammatory Agents;Interleukin-6;NF-kappa B;Notch1 protein, rat;Receptor, Notch1 Animals;Anti-Inflammatory Agents;Inflammation;Interleukin-6;Macrophages;Male;Mice;NF-kappa B;Rats;Receptor, Notch1;Spinal Cord Injuries

Photobiomodulation of Cytochrome c Oxidase by Chronic Transcranial Laser in Young and Aged Brains. In cellular bioenergetics, cytochrome c oxidase (CCO) is the enzyme responsible for oxygen consumption in the mitochondrial electron transport chain, which drives oxidative phosphorylation for adenosine triphosphate (ATP) production. CCO is also the major intracellular acceptor of photons in the light wavelengths used for photobiomodulation (PBM). Brain function is critically dependent on oxygen consumption by CCO for ATP production. Therefore, our objectives were (1) to conduct the first detailed brain mapping study of the effects of PBM on regional CCO activity, and (2) to compare the chronic effects of PBM on young and aged brains. Specifically, we used quantitative CCO histochemistry to map the differences in CCO activity of brain regions in healthy young (4 months old) and aged (20 months old) rats from control groups with sham

stimulation and from treated groups with 58 consecutive days of transcranial laser PBM (810 nm wavelength and 100 mW power). We found that aging predominantly decreased regional brain CCO activity and systems-level functional connectivity, while the chronic laser stimulation predominantly reversed these age-related effects. We concluded that chronic PBM modified the effects of aging by causing the CCO activity on brain regions in laser-treated aged rats to reach levels similar to those found in young rats. Given the crucial role of CCO in bioenergetics, PBM may be used to augment brain and behavioral functions of older individuals by improving oxidative energy metabolism.

Laser Surgery for Dermatologic Conditions in Pediatric Patients. Laser therapy is an effective treatment that can be used in a wide range of cutaneous conditions in pediatric dermatology. It is an important tool to have in one's armamentarium. The parameters within each laser can vary greatly by the make and model of the laser, making it difficult to make settings generalizable. The goal of this article is to provide some general guiding principles for laser choice, theory behind laser parameter choice, and education surrounding tissue response which will guide treatment parameter changes. Child;Dermatology;Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases

Photobiomodulation treatments drive osteogenic versus adipocytic fate of bone marrow mesenchymal stem cells reversing the effects of hyperglycemia in diabetes. Diabetes mellitus (DM) is a chronic metabolic disease that affects bone metabolism, which can be related to a reduced osteogenic potential of bone marrow mesenchymal stem cells (BM-MSCs). MSCs from diabetic rats (dBM-MSC) have shown a tendency to differentiate towards adipocytes (AD) instead of osteoblasts (OB). Since photobiomodulation (PBM) therapy is a non-invasive treatment capable of recovering the osteogenic potential of dBM-MSCs, we aimed to evaluate whether PBM can modulate MSC's differentiation under hyperglycemic conditions. BM-MSCs of healthy and diabetic rats were isolated and differentiated into osteoblasts (OB and dOB) and adipocytes (AD and dAD). dOB and dAD were treated with PBM every 3Â days (660Â nm; 5Â J/cm(2); 0.14Â J; 20 mW; 0.714Â W/cm(2)) for 17Â days. Cell morphology and viability were evaluated, and cell differentiation was confirmed by gene expression (RT-PCR) of bone (Runx2, Alp, and Opn) and adipocyte markers (PparÎ³, C/EbpÎ±, and C/EbpÎ²), production of extracellular mineralized matrix (Alizarin Red), and lipid accumulation (Oil Red). Despite no differences on cell morphology, the effect of DM on cells was confirmed by a decreased gene expression of bone markers and matrix production of dOB, and an increased expression of adipocyte and lipid accumulation of dAD, compared to heatlhy cells. On the other hand, PBM reversed the effects of dOB and dAD. The negative effect of DM on cells was confirmed, and PBM improved OB differentiation while decreasing AD differentiation, driving the fate of dBM-MSCs. These results may contribute to optimizing bone regeneration in diabetic patients. Lipids Adipocytes;Animals;Bone Marrow Cells;Cell Differentiation;Cells, Cultured;Diabetes Mellitus, Experimental;Hyperglycemia;Lipids;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis;Rats

Photobiomodulation therapy's effects on cardiac fibrosis activation after experimental myocardial infarction. INTRODUCTION: Ischemic heart disease is the leading cause of death worldwide, and interventions to reduce myocardial infarction (MI) complications are widely researched. Photobiomodulation therapy (PBMT) has altered multiple biological processes in tissues and organs, including the heart. OBJECTIVES: This study aimed to assess the temporal effects of PBMT on cardiac fibrosis activation after MI in rats. In this proof-of-concept study, we monitored the change in expression patterns over time of genes and microRNAs (miRNAs) involved in the formation of cardiac fibrosis post-MI submitted to PBMT. MATERIALS AND METHODS: Experimental MI was induced, and PBMT was applied shortly after coronary artery ligation (laser light of wavelength 660â€‰nm, 15â€‰mW of power, energy density 22.5â€‰J/cm(2) , 60â€‰seconds of application, irradiated area 0.785â€‰cm(2) , fluence 1.1â€‰J/cm(2)). Ventricular septal samples were collected at 30â€‰minutes, 3, 6, 24â€‰hours, and 3 days post-MI to determine temporal PBMT's effects on

messenger RNA (mRNA) expression associated with cardiac fibrosis activation and miRNAs expression. RESULTS: PBMT, when applied after ischemia, reversed the changes in mRNA expression of myocardial extracellular matrix genes induced by MI. Surprisingly, PBMT modified cardiac miRNAs expression related to fibrosis replacement in the myocardium. Expression correlations between myocardial mRNAs were assessed. The correlation coefficient between miRNAs and target mRNAs was also determined. A positive correlation was detected among miR-21 and transforming growth factor beta-1 mRNA. The miR-29a expression negatively correlated to Col1a1, Col3a1, and MMP-2 mRNA expressions. In addition, we observed that miR-133 and Col1a1 mRNA were negatively correlated. CONCLUSION: The results suggest that PBMT, through the modulation of gene transcription and miRNA expressions, can interfere in cardiac fibrosis activation after MI, mainly reversing the signaling pathway of profibrotic genes. MicroRNAs;RNA, Messenger;mirn21 microRNA, rat Animals;Fibrosis;Low-Level Light Therapy;MicroRNAs;Myocardial Infarction;RNA, Messenger;Rats

The use of surface EMG in neurorehabilitation following traumatic spinal cord injury: A scoping review. OBJECTIVE: Surface electromyography (sEMG) is a common electrophysiological assessment used in clinical trials in individuals with spinal cord injury (SCI). This scoping review summarizes the most common sEMG techniques used to address clinically relevant neurorehabilitation questions. We focused on the role of sEMG assessments in the clinical practice and research studies on neurorehabilitation after SCI, and how sEMG reflects the changes observed with rehabilitation. Additionally, this review emphasizes the limitations and pitfalls of the sEMG assessments in the field of neurorehabilitation after SCI. METHODS: A comprehensive search of Medline (Ovid), Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Embase, Emcare, Cumulative Index to Nursing & Allied Health Literature, and PubMed was conducted to find peer-reviewed journal articles that included individuals post-SCI that participated in neurorehabilitation interventions using sEMG assessments. This is a scoping review using a systematic search (hybrid review). RESULTS: Of 4522 references captured in the primary database searches, 100 references were selected and included in the scoping review. The main focus of the studies was on neurorehabilitation using sEMG biofeedback, brain stimulation, locomotor training, neuromuscular electrical stimulation (NMES), paired-pulse stimulation, pharmacology, posture and balance training, spinal cord stimulation, upper limb training, vibration, and photobiomodulation. CONCLUSIONS: Most studies employed sEMG amplitude to understand the effects of neurorehabilitation on muscle activation during volitional efforts or reduction of spontaneous muscle activity (e.g., spasms, spasticity, and hypertonia). Further studies are needed to understand the long-term reliability of sEMG amplitude, to circumvent normalization issues, and to provide a deeper physiological background to the different sEMG analyses. SIGNIFICANCE: This scoping review reveals the potential of sEMG in exploring promising neurorehabilitation strategies following SCI and discusses the barriers limiting its widespread use in the clinic. Electromyography;Humans;Neurological Rehabilitation;Reproducibility of Results;Spinal Cord Injuries;Systematic Reviews as Topic

Effect of Photobiomodulation Therapy on Differentiation of Mesenchymal Stem Cells Derived from Impacted Third Molar Tooth into Neuron-like Cells. Peripheral nerve damages are among the most important consequences of dental and maxillofacial procedures. Tissue engineering using mesenchymal stem cells (MSCs) is a promising method to manage such injuries. Moreover, photobiomodulation therapy (PBMT) can enhance this treatment. The present study aimed to investigate the effect of PBMT on differentiation of MSCs derived from dental follicle (DF) into neurons. MSCs were isolated from an impacted tooth follicle by digestion method. The stem cells were cultured, and differentiated into neurons. The cells received two sessions of PBMT with 810 or 980â€‰nm diode laser (100 mW, 4 Jâ€‰cm(-2)) in either DMEM or neural inductive medium.

Phenotypic characterization of the cells was determined using flow cytometry. In addition, Î²-tubulin and MAP2 genes expression level changes were analyzed using RT-PCR and western blot technique. After 14 days, flow cytometry analysis confirmed the mesenchymal nature of cells. RT-PCR and western blot affirmed the expression of Î²-tubulin and MAP2 genes and proteins respectively. PBMT with both wavelengths significantly increased Î²-tubulin and MAP2 expression in neural inductive medium with highest expression mean in 980 nm group. PBMT with 810 and 980 nm lasers could be a promising adjunctive method in differentiation of DF-originated MSCs into neural cells. Tubulin Humans;Cell Differentiation;Cells, Cultured;Low-Level Light Therapy;Mesenchymal Stem Cells;Neurons;Tooth, Impacted;Tubulin

Rare clinical case report of a contralateral effect of laser biostimulation on the bone regeneration. This paper describes a unique clinical case of peri-implantitis treated by a laser biostimulation in one side of maxilla and the effect extended to contralateral side in the maxilla. This indicates that low level laser therapy treatment may have some degree of bilateral effects within the orofacial region.

Physical, Chemical, and Mechanical Evaluation of Irradiated Xeno-Sheep Bony Implantation by Low-Level Laser Therapy of Long Bones Fractures in Rabbits. Bone grafts/implantation is widely used in veterinary medicine. The present study aimed to evaluate the physical, chemical, and mechanical prosperities of irradiated xeno-sheepÂ bony implantation(X-SBI) by low-level laser therapy (LLLT) implanted in the induced empty defect of the femoral bones in rabbits. A total of 10 adult rabbits were used to create a 1cm length of the femoral gab surgically; thereafter, the empty space was filled with X-SBI and internally fixed by intramedullary pinning with two femoral fragments. The operated rabbits were assigned to the un-irradiated control group 1 which was left without laser irradiation, and irradiated group (group 2) which was irradiated on a daily basis by a continuous diode laser, a single dose at four points at the lateral aspect of the X-SBI for 5 min at a period of 72 intervals for 14(th) days post-operation with a dosage of 850 nm, 148.4 J/cm(2). The parameters which were used for the evaluation of results after 3rd-month post-operation were physical, chemical, and mechanical examinations. The physical examination revealed high bone density and hardness at the sites of X-SBI of the irradiated group, as compared to the un-irradiated animals. Moreover, the chemical analysis demonstrated an increment in the level of bone calcium and phosphorus elements, as well as a decrease in the level of magnesium, potassium, and sodium in the irradiated group, as compared to the un-irradiated group. The mechanical and fracture tolerance results demonstrated a gradually high resistance level of fracture tolerance of irradiated animals, as compared to un-irradiated rabbits. It can be concluded that the irradiated X-SBI by LLLT could be used strongly and successfully to fill the empty space in the femoral bone, supporting body weight better and faster than the control group, with no complications or body rejection. Animals;Femur;Low-Level Light Therapy;Physical Examination;Rabbits;Sheep

Laser light sources for photobiomodulation: The role of power and beam characterization in treatment accuracy and reliability. PURPOSE: Daily clinical use of therapeutic light sources can lead to changes in light emission stability with potentially significant consequences for usage in photomedicine treatment. The aim of this study was to evaluate the average and maximum power and to describe the beam diameter of different low-power laser photobiomodulation devices in clinical use in Brazil. METHODS: The power and light-emitting beam diameter of twenty-four therapeutic devices with an average age of 11Â±5 years, with an average weekly use of fewer than thirty minutes, were measured. RESULTS: The analyzed power varied between 2% to 134% of the values declared by the manufacturers. Differences in beam diameter of between 38% and 543% of the nominal values were also observed. It is also noteworthy that even between the same brand and model, differences in diameter were obtained. Finally, differences were observed in the power output after one and three minutes of sequential emission for 830 nm and 904 nm ($p < 0.05$), but not

when comparing the difference between wavelengths in factor time. CONCLUSION: There is a need for a shared effort on the part of laser manufacturers to improve standardization and consistency of laser output power and beam diameters. At the same time, medical laser operators should also consider development of standardized protocols for maintenance and monitoring equipment performance over time to correct for fluctuations that could ultimately impact on treatment outcomes. Brazil;Lasers;Low-Level Light Therapy;Reproducibility of Results;Treatment Outcome

Photobiomodulation: Evolution and Adaptation. Photobiomodulation (PBM) can be described as the intentional use of low-power laser or light-emitting diode light in the visible and near-infrared light spectra as a medical treatment to living biological tissues. This article describes the evolution of photochemical reactions on Earth, the mitochondria, and their implications in PBM; the science of light and energy (necessary to understand the mechanisms of PBM); and the clinical science of light as therapeutic medicine. Finally, selected reviews of current treatment protocols and ongoing research regarding the possibilities for the use of PBM in the human body are examined. Humans;Lasers;Low-Level Light Therapy;Mitochondria

Effect of Photobiomodulation Therapy on Reducing Acute Pain and Inflammation Following Surgical Removal of Impacted Mandibular Third Molars: A Randomized, Split-Mouth Clinical Trial. Objective: This study aimed to compare the effects of photobiomodulation therapy (PBMT) on analgesic and inflammatory reduction with that of ibuprofen following surgical removal of impacted mandibular third molars (IMTMs). Methods: A randomized, split-mouth clinical trial was performed on patients undergoing bilateral IMTM removal. PBMT [gallium aluminum arsenide (GaAlAs) laser] with specific parameters (wavelength of 810â€‰nm, power of 0.5%â€‰Â±â€‰20% W, and energy density of 4â€‰J/cm(2)) was applied randomly on one side of the mouth immediately after surgery and 1 and 2 days after surgery. The pain level was self-rated with a Likert scale at 2, 4, 6, 24, and 48â€‰h postoperatively. Swelling and trismus were measured on the first and second day after surgery. Saliva was collected for measuring pre- and postoperative salivary immunoglobulin A (sIgA) concentrations with the sandwich ELISA test. Results: The study sample included 25 patients (average age of 22.88 years) with 50 bilateral symmetrical IMTMs. Pain level was highest at 2â€‰h after surgery in both groups and gradually decreased over time (pâ€‰<â€‰0.01). Swelling and trismus at 48â€‰h were higher than at 24â€‰h (pâ€‰<â€‰0.01). Within the first 48â€‰h postoperatively, pain level, swelling, and trismus were significantly lower in the PBMT group (pâ€‰<â€‰0.05). Postoperative sIgA was also significantly lower in the PBMT group (pâ€‰<â€‰0.05). Conclusions: In short-term and specific conditions of this study, it was found that PBMT helped promote postoperative pain relief and anti-inflammation after surgical removal of IMTMs. The results suggested that there may be a link between a decrease in salivary sIgA levels and decrease in inflammatory processes after PBMT. Trial Registration No. NCT04280809 at ClinicalTrials.gov. Immunoglobulin A, Secretory Acute Pain;Adult;Edema;Humans;Immunoglobulin A, Secretory;Inflammation;Low-Level Light Therapy;Molar, Third;Mouth;Pain, Postoperative;Tooth Extraction;Trismus;Young Adult

Similar Is Not Equal: It Is Time to Create the Perfect Photobiomodulation Storm.

Evaluation of the Functional Treatment of Patients With Skeletal Class II Malocclusion Using Low-Level Laser Therapy-Assisted Twin-Block Appliance: A Three-Arm Randomized Controlled Trial. Background Different techniques have been used to reduce functional treatment time including low-level laser therapy (LLLT), and the majority of studies have been conducted on animals. Therefore, the aim of the current study was to evaluate the effects of LLLT on improving orthodontic functional treatment using the Twin-Block (TB) appliance. Materials and methods This study was a three-arm, parallel-groupÂ randomized controlled trial. Patients were selected using the following inclusion

criteria: skeletal Class II Division 1 malocclusionÂ resulting from mandibular retrognathiaÂ (angle between the anterior cranial base and the NB plane (i.e., SNB angle): 73Â°-78Â°), the sagittal skeletal discrepancy angle (ANBÂ angle) between 4Â° and 9Â°, and overjet between 5 and 9 mm. Forty-eight patients were randomly allocated into three equal groups. In the LLLT-TB group, the low-level laser device was used with a wavelength of 808 nm and power of 250 mWÂ in addition to functional treatment with a Twin-Block appliance. The laser was applied on the skin at the bilateral temporomandibular joint (TMJ) regions, at five points, each point received 5 J of the laser for 20 seconds. The laser course was twice a week in the first month, every two weeks in the second month, and every three weeks up to the end of the treatment. The second group (the TB group) received functional treatment with a Twin-Block appliance, while patients inÂ the third group (the untreated control group (UCG)) were observed for nine months without any intervention. Results There were statistically significant differences in treatment periods between the LLLT-TB group and the TB group (129 days and 235 days, respectively, P-value<0.001). The change in the effective mandibular length (Co-Gn) was the highest in the LLLT-TB group compared with the TB and the UCG groups (4.41 mm, 3.66 mm, and 1.07 mm,Â respectively; P-value<0.001). Conclusions The application of low-level laser therapy on the condylar regions accelerated the functional treatment in skeletal Class II malocclusion patients by approximately 45% and increased the bone growth and mandibular length. The improvement in the SNB angle was similar in both interventional groups. Irradiation of low-level laser stimulated bone growth at the condyles and did not cause anterior movement of the temporomandibular joint following functional orthopedic correction.

Transcranial photobiomodulation (808Â nm) attenuates pentylenetetrazole-induced seizures by suppressing hippocampal neuroinflammation, astrogliosis, and microgliosis in peripubertal rats. Significance: Transcranial photobiomodulation (tPBM) at 808Â nm attenuates pentylenetetrazole (PTZ)-induced seizures and convulsive status epilepticus (CSE) in peripubertal rats by protecting neurons from injury and parvalbumin-positive interneurons from apoptosis, and preserving the integrity of perisomatic inhibitory networks. However, the effects of tPBM on neuroinflammation, astrogliosis, and microgliosis in epileptic rat brains are unknown. Thus, further study to unveil these aspects is needed for understanding the phenomena of tPBM on pediatric CSE prevention. Aim: To evaluate the effects of tPBM on neuroinflammation, astrogliosis, and microgliosis in peripubertal rat hippocampus with PTZ-induced seizures and SE. Approach: An 808-nm diode laser was applied transcranially to peripubertal rats prior to PTZ injection. Immunofluorescence staining of neuron-specific enolase (NSE) was used as a marker of neuroinflammation, glial fibrillary acid protein (GFAP) for astrogliosis, ionized calcium-binding adapter molecule 1 (Iba-1) for microgliosis, and mitochondrial cytochrome c oxidase subunit 1 (MT-CO1) for confirming the involvement of cytochrome c oxidase (CCO). Results: tPBM significantly reduced NSE immunoreactivity in CA3 in PTZ-treated rats, GFAP immunoreactivity in CA1, and Iba-1 immunoreactivity in CA3. Enhancement of hippocampal MT-CO1 reflected that tPBM acted in CCO-dependent manner. Conclusions: tPBM (808) attenuated PTZ-induced seizures and SE by suppressing neuroinflammation, astrogliosis, and microgliosis in peripubertal rats.

Effect of low-level laser therapy on the time needed for leveling and alignment of mandibular anterior crowding. OBJECTIVES: To assess the effect of low-level laser therapy (LLLT) on overall leveling and alignment time of mandibular anterior crowding and associated pain after initial archwire placement. MATERIALS AND METHODS: Thirty-two females (18-25 years) with mandibular anterior crowding were randomly allocated into laser and control groups. Eligibility criteria included Angle Class I molar relationship and Little's irregularity index (LII) from 4 to 10 mm. Randomization was accomplished with a computer-generated random list. A 0.014-inch copper-nickel-titanium (Cu-NiTi) wire was inserted immediately after bonding of 0.022-inch Roth brackets followed by 0.016-inch

Cu-NiTi, 0.016 Ã— 0.022-inch NiTi then 0.017 Ã— 0.025-inch stainless steel wire after completion of alignment. In-Ga-As laser was applied to the mandibular anterior segment in the laser group on days 3, 7, and 14, then at 1 month followed by every 2 weeks until completion of leveling and alignment. Visual analogue scale questionnaires were completed by each patient over 7 days from initial archwire placement. Digital models were used to monitor changes in the irregularity index. Blinding was applicable for outcome assessors only. RESULTS: The mean time for leveling and alignment was significantly lower in the laser compared to the control group (68.2 Â± 28.7 and 109.5 Â± 34.7 days, respectively). The laser group displayed a significantly higher mean alignment improvement percentage as well as lower pain scores compared to the control group. CONCLUSIONS: Within the constraints of the current study, LLLT has a potential for acceleration of anterior segment alignment as well as reduction of the pain associated with placement of initial archwires. Dental Alloys;Titanium Dental Alloys;Female;Humans;Low-Level Light Therapy;Malocclusion;Orthodontic Wires;Pain;Titanium;Tooth Movement Techniques

The relationship between urethral sphincter mechanism incompetency and lower back pain: Positing a novel treatment for urinary incontinence in dogs. BACKGROUND: In humans, multiple researchers have not only determined that there is a relationship between urinary incontinence (UI) and lower back pain (LBP), but that by treating the LBP, clinicians are able to improve or resolve the UI. Up until now, no equivalent canine research has investigated whether treatment of LBP can improve the clinical signs of acquired, non-neurologic UI in dogs. AIM: To determine if a relationship exists between LBP and urethral sphincter mechanism incompetence (USMI) in dogs. METHODS: Review of medical records of all patients that presented to Points East West Veterinary Services with a history of naturally occurring acquired UI from May 2013 to December 2019. Thirty-nine patients treated for LBP using combined acupuncture and manual therapy, and 33/39 patients that also received concurrent photobiomodulation (PBM) therapy, qualified for this study. RESULTS: Treated patients showed a statistically significant reduction in both the frequency ($p < 0.01$) and volume ($p < 0.01$) of UI episodes. Treatment responses ranged from no improvement, to complete resolution of the USMI clinical signs. CONCLUSION: The reduction of USMI clinical signs following LBP treatment suggests a relationship between these two conditions. Combined acupuncture, manual therapy, with or without PBM was shown to be an effective treatment for USMI. By corollary, USMI incontinence should be considered a potential pain symptom. Animals;Dog Diseases;Dogs;Female;Humans;Low Back Pain;Male;Treatment Outcome;Urethra;Urinary Incontinence

Advancement in therapeutic strategies for immune-mediated oral diseases. Immune-mediated diseases are a diverse group of conditions characterized by alteration of cellular homeostasis and inflammation triggered by dysregulation of the normal immune response. Several immune-mediated diseases exhibit oral signs and symptoms. Traditionally, these conditions are treated with corticosteroids or immunosuppressive agents, including azathioprine, cyclophosphamide, and thalidomide. Recent research into the developmental pathways of these diseases has led to the exploration of novel approaches in treatment. This review examines newer treatment modalities for the management of immune-mediated diseases with oral presentations. Topical calcineurin inhibitors (TCIs) such as tacrolimus and pimecrolimus have been employed successfully in managing oral lichen planus and pemphigus vulgaris. Biologic agents, comprising monoclonal antibodies, fusion proteins, and recombinant cytokines, can provide targeted therapy with fewer adverse effects. Neutraceutical agents comprising aloe vera, curcumin, and honey are commonly used in traditional medicine and offer a holistic approach. They may have a place as adjuvants to current standard therapeutic protocols. Photodynamic therapy (PDT) and low-level laser therapy (LLLT) utilize a specific wavelength of light to achieve desired cellular change. While the use of PDT in immune-mediated diseases is

contentious, LLLT has shown positive results. Newer therapeutic modalities involve kinase inhibitors, S1P(1) receptor modulators, MSCs, and iRNA providing targeted treatment of specific diseases. Calcineurin Inhibitors;Adrenal Cortex Hormones Humans;Calcineurin Inhibitors;Mouth Diseases;Lichen Planus, Oral;Adrenal Cortex Hormones;Laser Therapy;Administration, Topical

A Novel Concept of Combined High-Level-Laser Treatment and Transcutaneous Photobiomodulation Therapy Utilisation in Orthodontic Periodontal Interface Management. This case report is aimed to demonstrate the synergetic effects of Î»940 nm laser photobiomodulation (PBM) therapy in augmenting the advantages of high-level-laser treatment (HLLT)-mediated reaction orthodontic periodontal interface management. Materials and Methods: A 32-year-old female who presented with a persistent gummy smile of upper incisors and low upper midline frenum attachment post-orthodontic treatment, was seeking a better smile appearance. She had a history of delayed wound healing without underlying medical conditions; otherwise, she was fit and healthy. She underwent laser ablation of the upper midline frenum and gingivoplasty of the upper incisors region with Î»940 nm and Î»2780, respectively, as well as transcutaneous PBM therapy (Î»940 nm) to accelerate wound healing. The laser protocols were as follows: Î»2780 nm: power output-2 W, pulse width-60 Î¼s, free running pulse (FRP), spot area-0.0016 cm(2), pulse repetition rate-25 pulses per second (s), 80 mJ/pulse, 90 s, Î»940 nm: 1.2 W, continuous wave (CW) emission mode, 300 Î¼m, 60 s; whereas the adjunctive Î»940 nm induced-PBM parameters were as follows: power output-1.4 W, CW-120 s, single application, spot area-2.8 cm(2). An acceleration of the wound healing was observed on the 4th day of treatment with no immediate or post-operative complications. The results showed no functional or aesthetic relapses at a long-term follow-up of 6 months. The authors concluded that Î»940 nm laser-PBM can provide a synergetic effect to HLLT in accelerating wound healing and offering a precision smile with minimal to none post-operative complications. It is safe and justifiable to utilise dual therapy over the conventional methods, which serves our patients' needs in our daily practice and in various clinical indications. The concept and laser protocols of this clinical case report can pave the roadmap for future extensive studies. Adult;Esthetics, Dental;Female;Gingiva;Humans;Lasers;Low-Level Light Therapy;Smiling

Simulation of Gold Nanoparticle Transport during MHD Electroosmotic Flow in a Peristaltic Micro-Channel for Biomedical Treatment. The study of gold nanoparticles (AuNPs) in the blood flow has emerged as an area of interest for numerous researchers, due to its many biomedical applications, such as cancer radiotherapy, DNA and antigens, drug and gene delivery, in vitro evaluation, optical bioimaging, radio sensitization and laser phototherapy of cancer cells and tumors. Gold nanoparticles can be amalgamated in various shapes and sizes. Due to this reason, gold nanoparticles can be diffused efficiently, target the diseased cells and destroy them. The current work studies the effect of gold nanoparticles of different shapes on the electro-magneto-hydrodynamic (EMHD) peristaltic propulsion of blood in a micro-channel under various effects, such as activation energy, bioconvection, radiation and gyrotactic microorganisms. Four kinds of nanoparticle shapes, namely bricks, cylinders and platelets, are considered. The governing equations are simplified under the approximations of low Reynolds number (LRN), long wavelength (LWL) and Debye-HÃ¼ckel linearization (DHL). The numerical solutions for the non-dimensional equations are solved using the computational software MATLAB with the help of the bvp4c function. The influences of different physical parameters on the flow and thermal characteristics are computed through pictorial interpretations.

Photobiomodulation Therapy: A New Light in the Treatment of Systemic Sclerosis Skin Ulcers. INTRODUCTION: Skin ulcers (SU) represent one of the most frequent manifestations of systemic sclerosis (SSc), occurring in almost 50% of scleroderma patients. SSc-SU are often particularly difficult to treat with conventional systemic and local therapies. In this study, a preliminary evaluation of the

role and effectiveness of blue light photobiomodulation (PBM) therapy with EmoLED(Â®) in the treatment of scleroderma skin ulcers (SSc-SU) was performed. METHODS: We retrospectively analyzed 12 consecutive SSc patients with a total of 15 SU on finger hands. All patients were treated with adequate systemic therapy and local treatment for SU; after a standard skin ulcer bed preparation with debridement of all lesions, EmoLED(Â®) was performed. All patients were locally treated every week during 2Â months of follow-up; SU data were collected after 4 weeks (T4) and 8Â weeks (T8). Eight SSc patients with comparable SU were also evaluated as controls. RESULTS: The application of EmoLED(Â®) in addition to debridement apparently produced faster healing of SU. Complete healing of SU was recorded in 41.6% cases during EmoLED(Â®) treatment. Significant improvements in SU area, length, and width, wound bed, and related pain were observed in EmoLED(Â®) patients from T0 to T8. Control subjects treated with standard systemic/local therapies merely showed an amelioration of SU area and width at the end of the follow-up. No procedural or post-procedural adverse events were reported. CONCLUSIONS: The positive clinical results and the absence of side effects suggest that EmoLED(Â®) could be a promising tool in the management of SSc-SU, with an interesting role to play in the healing process in addition to conventional systemic and local treatments.

Combination treatment with photodynamic therapy and laser therapy in chronic hyperplastic candidiasis: A case report. Chronic hyperplastic candidiasis (CHC) is a rare subtype of oral candidiasis. Due to the malignant transformation potential of this disease, its treatment deserves attention. Here we report a refractory case of an 85-year-old female with chronic hyperplastic candidiasis treated with combined photodynamic therapy and laser therapy with a superior clinical result. The patient had a two-months history of thick white plaque on her upper inner lip. Conventional antifungal therapy and repeated photodynamic therapy contributed slightly improvement to the hyperkeratosis lesion, and then it was removed by laser therapy. Recurrence was found at the follow-up visit of eighth- week, and the recurrent lesion was removed again by laser therapy and prophylactic photodynamic therapy was performed. The patient is still under follow-up. Aged, 80 and over;Candidiasis, Oral;Female;Humans;Laser Therapy;Low-Level Light Therapy;Mouth Mucosa;Photochemotherapy;Stomatitis

Photobiomodulation Therapy and the Glymphatic System: Promising Applications for Augmenting the Brain Lymphatic Drainage System. The glymphatic system is a glial-dependent waste clearance pathway in the central nervous system, devoted to drain away waste metabolic products and soluble proteins such as amyloid-beta. An impaired brain glymphatic system can increase the incidence of neurovascular, neuroinflammatory, and neurodegenerative diseases. Photobiomodulation (PBM) therapy can serve as a non-invasive neuroprotective strategy for maintaining and optimizing effective brain waste clearance. In this review, we discuss the crucial role of the glymphatic drainage system in removing toxins and waste metabolites from the brain. We review recent animal research on the neurotherapeutic benefits of PBM therapy on glymphatic drainage and clearance. We also highlight cellular mechanisms of PBM on the cerebral glymphatic system. Animal research has shed light on the beneficial effects of PBM on the cerebral drainage system through the clearance of amyloid-beta via meningeal lymphatic vessels. Finally, PBM-mediated increase in the blood-brain barrier permeability with a subsequent rise in AÎ² clearance from PBM-induced relaxation of lymphatic vessels via a vasodilation process will be discussed. We conclude that PBM promotion of cranial and extracranial lymphatic system function might be a promising strategy for the treatment of brain diseases associated with cerebrospinal fluid outflow abnormality. Amyloid beta-Peptides Amyloid beta-Peptides;Animals;Brain;Glymphatic System;Low-Level Light Therapy;Lymphatic System;Neurodegenerative Diseases

Single Cell Effects of Photobiomodulation on Mitochondrial Membrane Potential and Reactive Oxygen Species Production in Human Adipose Mesenchymal Stem Cells. Photobiomodulation (PBM) has recently emerged in cellular therapy as a potent alternative in promoting cell proliferation, migration, and differentiation during tissue regeneration. Herein, a single-cell near-infrared (NIR) laser irradiation system (830 nm) and the image-based approaches were proposed for the investigation of the modulatory effects in mitochondrial membrane potential (Î”Î¨m), reactive oxygen species (ROS), and vesicle transport in single living human adipose mesenchymal stem cells (hADSCs). The irradiated-hADSCs were then stained with 2',7'-dichlorodihydrofluorescein diacetate (H(2)DCFDA) and Rhodamine 123 (Rh123) to represent the Î”Î¨m and ROS production, respectively, with irradiation in the range of 2.5-10 (J/cm(2)), where time series of bright-field images were obtained to determine the vesicle transport phenomena. Present results showed that a fluence of 5 J/cm(2) of PBM significantly enhanced the Î”Î¨m, ROS, and vesicle transport phenomena compared to the control group (0 J/cm(2)) after 30 min PBM treatment. These findings demonstrate the efficacy and use of PBM in regulating Î”Î¨m, ROS, and vesicle transport, which have potential in cell proliferation, migration, and differentiation in cell-based therapy. Reactive Oxygen Species Adipose Tissue;Cell Survival;Humans;Membrane Potential, Mitochondrial;Mesenchymal Stem Cells;Reactive Oxygen Species

Outpatient Oral Neuropathic Pain Management with Photobiomodulation Therapy: A Prospective Analgesic Pharmacotherapy-Paralleled Feasibility Trial. Neuropathic pain (NP) can be challenging to treat effectively as analgesic pharmacotherapy (MED) can reduce pain, but the majority of patients do not experience complete pain relief. Our pilot approach is to assess the feasibility and efficacy of an evidence-based photobiomodulation (PBM) intervention protocol. This would be as an alternative to paralleled standard analgesic MED for modulating NP intensity-related physical function and quality of life (QoL) prospectively in a mixed neurological primary burning mouth syndrome and oral iatrogenic neuropathy study population (n = 28). The study group assignments and outcome evaluation strategy/location depended on the individual patient preferences and convenience rather than on randomisation. Our prospective parallel study aimed to evaluate the possible pre/post-benefit of PBM and to allow for a first qualitative comparison with MED, various patient-reported outcome measures (PROMs) based on Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT-II) were used for up to a nine-month follow-up period in both intervention groups (PBM and MED). The PBM protocol applied to the PBM group was as follows: Î»810 nm, 200 mW, 0.088 cm(2), 30 s/point, 9 trigger and affected points, twice a week for five consecutive weeks, whereas the MED protocol followed the National Institute of Clinical Excellence (NICE) guidelines. Our results showed that despite the severe and persistent nature of the symptoms of 57.50 Â± 47.93 months at baseline in the PBM group, a notably rapid reduction in PIS(max) on VAS from 7.6 at baseline (T0) to 3.9 at one-month post-treatment (T3) could be achieved. On the other hand, mean PIS(max) was only reduced from 8.2 at baseline to 6.8 at T3 in the MED group. Our positive PBM findings furthermore support more patients' benefits in improving QoL and functional activities, which were considerably impaired by NP such as: eating, drinking and tasting, whereas the analgesic medication regimens did not. No adverse events were observed in both groups. To the best knowledge of the authors, our study is the first to investigate PBM efficacy as a monotherapy compared to the gold standard analgesic pharmacotherapy. Our positive data proves statistically significant improvements in patient self-reported NP, functionality, psychological profile and QoL at mid- and end-treatment, as well as throughout the follow-up time points (one, three, six and nine months) and sustained up to nine months in the PBM group, compared to the MED group. Our study, for the first time, proves the efficacy and safety of PBM as a potent analgesic in oral NP and as a valid alternative to the gold standard pharmacotherapy approach. Furthermore, we observed long-term

pain relief and functional benefits that indicate that PBM modulates NP pathology in a pro-regenerative manner, presumably via antioxidant mechanisms.

Burning Mouth Syndrome (BMS)-Treatment with Verbal and Written Information, B Vitamins, Probiotics, and Low-Level Laser Therapy: A Randomized Clinical Trial. BACKGROUND: The objective of this study was to determine the most effective treatment option for burning mouth syndrome. METHODS: Informative treatment alone, B vitamin injections, oral cavity probiotics, and low-level laser therapy were evaluated and compared. The study included new patients diagnosed with burning mouth syndrome, who were randomly allocated into one of four treatment groups. The primary outcome was improvement in patient's quality of life as determined by a self-perceived Oral Health Impact Profile-14 (OHIP-14) quality of life questionnaire before and after therapy. The secondary outcome was determination of mucosal symptom intensity according to visual analog scale (VAS) grading from 0 to 10. Data were submitted to statistical analysis. RESULTS: A total of 62 patients completed the study. Oral cavity probiotics and LLLT scores for OHIP-14 resulted in a statistically significant difference before and after therapy. Standardized effect sizes between OHIP scores before and after treatment were the greatest for patients who had received oral cavity probiotics. CONCLUSIONS: Oral cavity probiotics and LLLT were the most effective treatment for improvement in quality of life. Further investigation on a larger group of patients is required.

Comparison of salivary calprotectin levels in periodontitis associated with diabetes mellitus after low-level laser therapy as an adjunct to scaling and root planing: A randomized clinical trial. CONTEXT AND AIMS: Calprotectin is a myeloid protein, exerting pro-inflammatory effects on various cells and are shown to be elevated in inflammatory diseases. Periodontal therapy has been shown to decrease the levels of calprotectin in body fluids. Hence, the present study was aimed at assessing salivary calprotectin levels in periodontitis associated with diabetes mellitus after low-level laser therapy (LLLT) as an adjunct to scaling and root planing (SRP). MATERIALS AND METHODS: Sixty-four participants were divided into Groups A (periodontitis) and B (periodontitis associated with type 2 diabetes mellitus [T2DM]) based on probing depth of â‰¥5 mm, clinical attachment level (CAL) of >2 mm, and history of T2DM. Based on assigned treatments, the groups were subdivided into A1, A2, B1, and B2 where A1 and B1 were subjected to SRP alone and A2 and B2 received LLLT as an adjunct to SRP, respectively. The parameters assessed included probing pocket depth, CAL, bleeding on probing (BOP), plaque index (PI), and salivary calprotectin. All the values were subjected for comparison at baseline and 8 weeks. STATISTICAL ANALYSIS USED: Multiple group comparisons were done using analysis of variance; intragroup comparisons were made using t-test. The level of significance was assessed at $P < 0.05$ for all tests. RESULTS: All parameters showed a significant difference within the groups from baseline to 8 weeks. Intergroup comparison of PI, BOP, and salivary calprotectin showed a significant difference ($P < 0.05$). CONCLUSIONS: Reduction in calprotectin levels was noticed with LLLT when used as an adjunct to SRP. Calprotectin may be used as a prognostic marker for periodontitis.

Correction to: Efficacy assessment for lowâ€‘level laser therapy in the treatment of androgenetic alopecia: a realâ€‘world study on 1383 patients.

Photobiomodulation therapy and endodontic treatment of teeth with apical periodontitis using 940-nm diode laser. Report of two cases. BACKGROUND: Diode laser (DL) can be used in endodontics both for its bactericidal effect inside the root canal system (RCS) and for photobiomodulation therapy (PBMT) to accelerate the repair of periradicular bone tissue. CLINICAL CASES: This work presents two cases of pulp necrosis/asymptomatic apical periodontitis (AAP) that were treated with 940-nm DL, administered both to disinfect the root canal and to apply PBMT to the periradicular tissues. The cases were analysed by Cone-Beam Computed Tomography (CBCT). DISCUSSION: DL has become widely accepted due to its high antimicrobial effectiveness and its ability to accelerate the repair of

large apical lesions by biostimulation. Nevertheless, differences of opinion persist within the scientific community due to the lack of standardized endodontic protocols. CONCLUSIONS: The application of 940-nm DL, both for disinfection of the RCS and for PBMT, is an effective treatment in non-vital teeth with large periapical lesions. In both cases reported, bone neoformation were found at the 6-month check-up. Key words:Low-level laser therapy, photobiomodulation therapy, diode laser, endodontics.

Comparative efficacy of low-level laser therapy (LLLT) to TENS and therapeutic ultrasound in management of TMDs: a systematic review & meta-analysis. OBJECTIVE: To assess the reduction in pain, muscle tenderness, joint clicking, and improvement in mouth opening (MO) after low-level laser therapy (LLLT) compared to transcutaneous electrical nerve stimulation (TENS) and therapeutic ultrasound (US) among temporomandibular joint disorder (TMD) patients. METHODS: A systematic search of online sources of electronic databases was undertaken. The quality of the study was assessed using the Cochrane risk of bias assessment tool for randomized controlled trials (RCTs). RESULTS: Twelve RCTs were included in the systematic review, and 9 were included in the meta-analysis. For reduction in pain between LLLT and TENS, LLLT was found to be better than TENS, at 95% CI. LLLT was also proven to be better in reducing pain than therapeutic US, at 81% CI. CONCLUSION: This systematic review and meta-analysis compared the effectiveness of LLLT, TENS, and therapeutic US in TMD. LLLT provided relatively more effective pain relief and improvement in MO.

Effect of low-level laser therapy (LLLT) on cognitive impairment among patients with chronic schizophrenia: a double-blind randomized placebo-controlled clinical trial. Low-level laser therapy (LLLT) is a noninvasive technique used in different medical fields. It has been applied in different medical areas such as wound healing, traumatic brain injuries, neurological disorders, cognitive disorders, Alzheimer's disease, pain, and arthritis, with different results. We studied the effectiveness of LLLT on cognitive impairment in patients with chronic schizophrenia. A randomized controlled double-blind clinical trial was performed in a men's chronic treatment center, in Razi Psychiatric Hospital, in Tehran, Iran. We screened the cognitive impairment by Mini-Mental State Examination (MMSE). Positive And Negative Syndrome Scale (PANSS) was also used to assess the patients' positive and negative symptoms. Seventeen consenting patients were randomly allocated to the treatment arm, and 15 to the sham treatment control arm. The mean age of the control and treated patients was 49.47â€‰Â±â€‰6.99 and 50.24â€‰Â±â€‰7.69, respectively. No significant difference in PANSS and MMSE test scores was detected in both groups after the 6th session and after 2Â months of follow-up after laser therapy. The positive and negative scales and agitation and excitement levels did not change significantly in either group. Nevertheless, the depression/anxiety subscale in the PANSS test showed a significant reduction after 6 sessions but did not persist after 2Â months. No improvement in cognitive impairment or the positive and negative symptoms was detected after LLLT in patients with chronic schizophrenia. Trial registration: IRCT 20210520051349N1. Antipsychotic Agents Antipsychotic Agents;Cognitive Dysfunction;Double-Blind Method;Humans;Iran;Low-Level Light Therapy;Male;Schizophrenia;Treatment Outcome

Transcranial photobiomodulation add-on therapy to valproic acid for pentylenetetrazole-induced seizures in peripubertal rats. BACKGROUND: Convulsive status epilepticus (CSE) prevention is critical for pediatric patients with epilepsy. Immediate intervention before CSE reduce severity. Despite its wide usage as an anticonvulsant, valproic acid (VPA) results in harmful side effects such as dose-dependent hepatotoxicity. Hence, reducing VPA dosage to minimize side effects while maintaining its efficacy is necessary, and transcranial photobiomodulation (tPBM) add-on therapy could facilitate this. We recently demonstrated for the first time that tPBM at a wavelength of 808â€‰nm attenuated CSE in peripubertal rats. However, the effects of VPA with the add-on therapy of tPBM prior to seizures have not yet been explored. This study investigated whether adding tPBM

to VPA exerts synergistic effect for CSE prevention in peripubertal rats. METHODS: A gallium-aluminum-arsenide laser (wavelength of 808â€‰nm with an exposure duration of 100â€‰s and irradiance of 1.333â€‰W/cm(2) at the target) was applied transcranially 30â€‰min after VPA injection in Sprague Dawley rats. All the rats received 90â€‰mg/kg of pentylenetetrazole (PTZ). Except for the saline (nâ€‰=â€‰3), tPBM + saline (nâ€‰=â€‰3), and PTZ group (nâ€‰=â€‰6), all the rats received a PTZ injection 30â€‰min after VPA injection. The rats received add-on tPBM with PTZ immediately after tPBM. In the VPAâ€‰+â€‰PTZ group, the rats received low-dose (100â€‰mg/kg, nâ€‰=â€‰6), medium-dose (200â€‰mg/kg, nâ€‰=â€‰6), and high-dose (400â€‰mg/kg, nâ€‰=â€‰7) VPA. In the VPAâ€‰+â€‰tPBM + PTZ group, the rats received low (100â€‰mg/kg, nâ€‰=â€‰5), medium (200â€‰mg/kg, nâ€‰=â€‰6), and high (400â€‰mg/kg, nâ€‰=â€‰3) doses of VPA. Seizures were evaluated according to the revised Racine's scale in a non-blinded manner. RESULTS: Adding tPBM to low-dose VPA reduced the incidence of severe status epilepticus and significantly delayed the latency to stage 2 seizures. However, adding tPBM to high-dose VPA increased the maximum seizure stage, prolonged the duration of stage 4-7 seizures, and shortened the latency to stage 6 seizures. CONCLUSIONS: Adding tPBM to low-dose VPA exerted a synergistic prevention effect on PTZ-induced seizures, whereas adding tPBM to high-dose VPA offset the attenuation effect. Anticonvulsants;Valproic Acid;Pentylenetetrazole Animals;Anticonvulsants;Humans;Pentylenetetrazole;Rats;Rats, Sprague-Dawley;Seizures;Valproic Acid

The use of photobiomodulation therapy for the prevention of chemotherapy-induced peripheral neuropathy: a randomized, placebo-controlled pilot trial (NEUROLASER trial). PURPOSE: The purpose of this study was to investigate the effectiveness of photobiomodulation (PBM) therapy for the prevention of chemotherapy-induced peripheral neuropathy (CIPN) in breast cancer patients. METHODS: A prospective, randomized placebo-controlled pilot trial (NEUROLASER) was set up with 32 breast cancer patients who underwent chemotherapy (ClinicalTrials.gov; NCT03391271). Patients were randomized to receive PBM (nâ€‰=â€‰16) or placebo treatments (nâ€‰=â€‰16) (2â€‰Ã—â€‰/week) during their chemotherapy. The modified Total Neuropathy Score (mTNS), six-minute walk test (6MWT), Numeric pain Rating Scale (NRS), and Functional Assessment of Cancer Therapy/Gynecologic Oncology Group Taxane (FACT/GOG-Taxane) were used to evaluate the severity of CIPN and the patients' quality of life (QoL). Outcome measures were collected at the first chemotherapy session, 6Â weeks after initiation of chemotherapy, at the final chemotherapy session, and 3Â weeks after the end of chemotherapy (follow-up). RESULTS: The mTNS score increased significantly over time in both the control and the PBM group. A significantly higher score for FACT/GOG-Taxane was observed in the PBM group during chemotherapy compared to the control group. Questions of the FACT/GOG-Taxane related to sensory peripheral neuropathy symptoms showed a significant increase in severeness over time in the control group, whereas they remained constant in the PBM group. At follow-up, a (borderline) significant difference was observed between both groups for the 6MWT and patients' pain level, in benefit of the PBM group. CONCLUSIONS: This NEUROLASER trial shows promising results concerning the prevention of CIPN with PBM in breast cancer patients. Furthermore, a better QoL was observed when treated with PBM. Antineoplastic Agents;Taxoids Antineoplastic Agents;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Pain;Peripheral Nervous System Diseases;Pilot Projects;Prospective Studies;Quality of Life;Taxoids

Minimizing patient morbidity after free gingival graft harvesting:A triple-blind randomized-controlled clinical trial. OBJECTIVES: This study aimed to evaluate the effect of photobiomodulation therapy (PBMT) on patient morbidity and donor site healing after free gingival graft (FGG) harvesting. METHODS: Forty-four patients requiring FGG were selected for this trial. Individuals were randomly

assigned to test group (PBMT, nÂ =Â 22) or control group (placebo, nÂ =Â 22) applied immediately after surgery, 24 and 48Â h after. Demographic, surgical-related and psychosocial variables possibly associated with treatment response were collected. The primary outcome was postoperative pain at the donor site evaluated using Visual Analog Scale (VAS) immediately after surgery and 6, 24, 48 and 72Â h after. Secondary outcomes include medication consumption, patient-reported outcome measures (PROMs) and percentage of wound closure. RESULTS: Intragroup analysis showed no differences in VASLOG means for placebo group throughout the study (pÂ >Â .05), whereas a significant difference in PBMT group at 6Â h, 24Â h, 48Â h and 72Â h (pÂ <Â .05) were observed. Postoperative rescue analgesic requirement was significantly higher in the placebo group (pÂ =Â .004). The number needed to treat(NNT) was 2.43. PBMT group reported significant better function related to sleeping, going to work/school and daily routine activities, less restriction to mouth opening, chewing and food consumption, less swelling and bleeding (pÂ <Â .05), mainly in the first 48Â h. PBMT group presented a significantly higher palatal wound closure at 7Â days compared to placebo group (33.41 vs. 21.20 respectively, pÂ =Â .024) after adjustment for confounding. No adverse effects were reported. CONCLUSIONS: Photobiomodulation therapy accelerated the pain resolution time and palatal closure, decreased rescue medication consumption and significantly improved patient satisfaction in the postoperative period. Humans;Low-Level Light Therapy;Morbidity;Oral Surgical Procedures;Pain, Postoperative;Palate

Effect of the photobiomodulation for acceleration of the orthodontic tooth movement: a systematic review and meta-analysis. To determine whether the application of photobiomodulation (PBM), as an adjunctive treatment for patients with orthodontic fixed appliances, decreased the total treatment time compared to conventional orthodontics. Studies were collected from four electronic databases following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for systematic reviews. Eligibility criteria were full-text articles in English or Spanish with the design of randomized (RCT), non-randomized clinical trials (non-RCT), and retrospective cohort, without any restriction regarding the publication time, in which the effect of PBM using low-level laser irradiation (LLLI) and light-emitting diode (LED) for the acceleration of the orthodontic movement had been evaluated. Data collection and analysis: Two authors independently extracted data for the characteristics and outcomes of the studies selected for inclusion. The risk of bias (RoB 2 and Robins-I) and the quality assessments (GRADE) were performed. For the quantitative synthesis, the standardized mean difference was calculated for each individual study selected and then the data were combined using a random-effects meta-analysis. The total number of included studies was nâ€‰=â€‰22 (only RCT and non-RCT were found) with a total of 515 participants. The included studies exhibited high risk of bias and some concerns, though none of them presented a low risk of bias. The quality of the studies was very low. The meta-analysis showed that the means (mm) and 95% confidence intervals (95% CI) of acceleration of tooth movement at 1, 2, and 3Â months were 0.50 (-â€‰0.28, 1.28), 1.40 (0.27, 2.53), and 0.46 (-â€‰0.33, 1.24), respectively. The analysis showed that there is no evidence to support the use of LLLI to accelerate the orthodontic movement. LED for the acceleration of orthodontic movement does not have sufficient evidence to generate conclusions about it. Acceleration;Humans;Orthodontic Appliances;Orthodontics;Retrospective Studies;Tooth Movement Techniques

Oral ulcers and sarcoid-like reaction in lymph nodes after cemiplimab therapy for locally advanced cutaneous squamous cell carcinoma: a case report. Cemiplimab is a novel programmed death-1 inhibitor recently approved for advanced cutaneous squamous cell carcinoma. Immune-related adverse events derived from cemiplimab are similar to other anti-PD-1 drugs, including gastrointestinal and cutaneous toxicities. Oral immune-related adverse events were not reported with cemiplimab in previous studies; thus this case report warns of the fact that the oral cavity may

be a site of immune-related adverse events during programmed death-1 block therapy and that this can lead to significant limitations when not properly treated. The present report describes the case of a patient with locally advanced cutaneous squamous cell carcinoma metastatic to cervical lymph nodes who developed dysphagia due to large and painful oral ulcers after a single dose of cemiplimab. The patient also exhibited a sarcoid-like reaction in mediastinal lymph nodes. No immune-related adverse events were found in any other organs. The oral lesions showed significant improvement after topical and short-course systemic corticosteroids, and low-level laser therapy was also performed in the oral lesions. The patient achieved a near-complete response and treatment was discontinued. This article discusses in detail the clinical outcomes and oral toxicity management of cemiplimab therapy for cutaneous squamous cell carcinoma. Antibodies, Monoclonal, Humanized;cemiplimab Antibodies, Monoclonal, Humanized;Carcinoma, Squamous Cell;Humans;Lymph Nodes;Oral Ulcer;Skin Neoplasms

Management of oral mucositis in children. OBJECTIVE: Children undergoing chemotherapy or hematopoietic stem cell transplantation may suffer from Oral mucositis. Therefore, the aim of this systematic review was to find the protocols which are used in the management of oral mucositis (OM) in children. MATERIALS AND METHODS: A search was performed to find the related studies. After reading the searched articles, 15 studies were selected for this review. RESULTS: Good oral care, glutamine, some biological agents, and laser therapy, had a significant effect to reduce the pain sensation and occurrence of oral mucositis in children. CONCLUSIONS: It has been concluded that there are many types of management, such as oral care and laser therapy, which can be used to reduce the severity of oral mucositis. Glutamine Child;Glutamine;Hematopoietic Stem Cell Transplantation;Humans;Laser Therapy;Low-Level Light Therapy;Mucositis;Stomatitis

Clinical Study of a Q-Switched Neodymium-Doped Yttrium Aluminum Garnet Laser with Different Parameters in the Treatment of Chloasma: A Randomized-Controlled Trial. Objective: To explore the clinical efficacy of a Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser with different parameters in the treatment of chloasma. Methods: In this study, 30 patients with chloasma, symmetrically distributed on the left and right sides of the face and who were treated with a Fayton Q-switched 1064â€‰nm Nd:YAG laser, were recruited. The patients were randomly selected for the treatment of facial lesions on the left and right sides of the face using a spot diameter of 9â€‰mm and an energy density of 0.8â€‰J/cm(2) on one side, and, on the opposite side, a spot diameter of 6â€‰mm with an energy density of 1.2â€‰J/cm(2). The laser frequency was 5â€‰Hz and treatment was conducted once every 7-10 days and repeated eight times as a course of treatment. At the end of the course of treatment, as well as 1, 3, and 6 months after treatment, front-facing images and 45Â° left- and right-side images were taken, respectively. The curative effect of the treatment was evaluated using the Melasma Area Severity Index (MASI) score. Results: The results of this study showed that the total effective rate of a Fayton Q-switched 1064â€‰nm Nd:YAG laser in the treatment of chloasma was 60%. Conclusions: Using a Q-switched 1064â€‰nm Nd:YAG laser represents a safe and effective approach for the treatment of chloasma. The therapeutic effects of the parameter sets, that is, a spot diameter of 9â€‰mm and an energy density of 0.8â€‰J/cm(2), and a spot diameter of 6â€‰mm with an energy density of 1.2â€‰J/cm(2), were similar. The treatment time and average effective times of the latter were relatively shortened. Clinical Trial Registration number researchregistry6799. Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Photobiomodulation Reduces Pain-Related Symptoms Without Interfering in the Efficacy of In-Office Tooth Bleaching: A Systematic Review and Meta-Analysis of Placebo-Controlled Clinical Trials. Objective: This systematic review aimed to determine whether the use of photobiomodulation (PBM) with low-level laser therapy prevents tooth sensitivity induced by in-office tooth bleaching with

hydrogen. Methods: Placebo-controlled clinical trials were included to evaluate the efficacy of PBM with low-level laser therapy in the prevention of tooth sensitivity after in-office tooth bleaching. Searches were conducted on the Medline database via PubMed, Scopus, Web of Science, EBSCO, SciELO, LILACS, Cochrane, DOSS, and Google Scholar until July 2020, and fixed-effects meta-analysis was performed for tooth sensitivity [standardized mean differences (MDs)] and color changes (MDs). Results: Five studies were included in this systematic review and meta-analysis, with a total of 288 patients, 123 patients in the PBM group and 165 patients in the placebo group. In the meta-analysis, despite high heterogeneity, PBM significantly reduced the tooth sensitivity after the first [pâ€‰<â€‰0.001; Cohen's dâ€‰=â€‰-0.32, 95% confidence interval (CI)â€‰=â€‰-0.46 to -0.18], second (pâ€‰<â€‰0.001; Cohen's dâ€‰=â€‰-0.30, 95% CIâ€‰=â€‰-0.46 to -0.15), and third (pâ€‰<â€‰0.001; Cohen's dâ€‰=â€‰-0.82, 95% CIâ€‰=â€‰-1.06 to -0.58) sessions of in-office tooth bleaching, without impairing the Î”E (pâ€‰=â€‰0.300). Conclusions: The results of this systematic review and meta-analysis suggest that PBM significantly prevents pain-related symptoms after the first three weekly sessions of in-office tooth bleaching with hydrogen. Tooth Bleaching Agents Dentin Sensitivity;Humans;Low-Level Light Therapy;Pain;Tooth Bleaching;Tooth Bleaching Agents

The Effectiveness of Repetition or Multiplicity of Different Surgical and Non-Surgical Procedures Compared to a Single Procedure Application in Accelerating Orthodontic Tooth Movement: A Systematic Review and Meta-Analysis. In this study, we aimed toÂ assess the current scientific evidence concerning the effectiveness of combining two acceleration techniques or repeating an acceleration procedure in comparison with the single application in terms of theÂ speed of the orthodontic tooth movement (OTM). We performed a comprehensive electronic search to retrieve relevant studies on 10 databases. Randomized controlled trials (RCTs) on fixed orthodontic treatment patients who received multiple types of acceleration techniques or underwent a repeated acceleration procedure compared to a single application were included. Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2)Â was usedÂ for assessing the risk of bias of retrieved studies. A total of six RCTs were included in this review. Regarding multiple acceleration methods, it seems that the combination of low-level laser therapy (LLLT) with a surgical technique outperforms the single application of each technique separately. Additionally, the combination of two surgical interventions may have a synergistic effect leading to reduced treatment time compared to theÂ application of a single intervention. Regarding acceleration method repetition, it seems that the re-application of surgical procedures twice is more efficient than the single application. The meta-analysis showed a non-significant difference in the canine retraction rate between the four-weekly micro-osteoperforationsÂ (MOPs) (three times of applications) and both the eight-weekly MOPs (two times of applications) [mean difference (MD) = 0.24; 95% CI: -0.2-0.77; p = 0.36], as well asÂ 12-weekly MOPs (two times of applications) (MD = 0.06; 95% CI: -0.14-0.27; p = 0.55). Based on very low evidence,Â combining two acceleration techniques is superior over a single application in accelerating tooth movement. Again, very low evidence suggests that the efficacy of repetition of surgical procedures twice and three times is similar. Further high-quality RCTs are required to assess the benefit of repeating an acceleration procedure or combining two different methods. In addition, more insight is needed into the possible side effects associated with the repetition or multiplicity of procedures.

Near Infrared Laser Photobiomodulation of Periodontal Ligament Stem Cells. OBJECTIVE: To determine the effect of different energy densities of near infrared diode lasers with wavelengths of 810 or 940 nm on the proliferation and survival of periodontal ligament derived stem cells (PDLSCs). METHODS: After isolation and characterisation, PDLSCs were cultured in clear 96-well plates. Each well was irradiated by either 810 nm (L1) or 940 nm (L2) lasers, with energy densities of 0.5, 1.5 and

2.5 J/cm2 and an output power of 100 mW. A non-irradiated well was used as a control. Cellular viability was measured 24 hours after irradiation using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay and proliferation was measured 24, 48 and 72 hours after irradiation using trypan blue staining and counting. Propidium iodide (PI) staining was used to identify any pyknotic nuclei or nuclear fragmentation 72 hours after irradiation. RESULTS: An increase in viability was observed only in the group with the 940 nm laser irradiation at energy density of 2.5 J/cm2 ($P < 0.001$). The proliferation of cells was significantly increased in the group with 940 nm laser irradiation at energy density of 2.5 J/cm2 at all the time points examined in comparison to other groups ($P < 0.001$). PI staining showed no change in cell nuclei in any of the groups. CONCLUSION: Irradiation of PDLSCs with a 940 nm laser at an energy density of 2.5 J/cm2 could promote efficient cell proliferation. Cell Survival;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Ligament;Stem Cells

Efficacy of concentrated growth factor with low-level laser for the regeneration of interdental papilla defects. Gingival "black triangle" is common in clinical which due to interdental papilla recession. The cause of the loss of papilla is multi-factorial and it may be caused by the absorption of interdental alveolar bone or abnormal tooth position. Besides, it is a common complication after orthodontics and implant surgery. Recession of gingival papilla influences interdental plaque control, increasing food impaction and alveolar bone absorption, causing aesthetic and pronunciation problems. Thus, the way of reducing or eliminating the gingival "black triangle" has become one of the most essential problems for dentists. Concentrated growth factor (CGF) and low-level-laser therapy have been widely used, respectively, and CGF was considered as the only self-substance which has soft tissue regeneration function. This study aims to evaluate the efficacy of regenerating interdental papilla by Liquid phase concentrated growth factor (LPCGF) injection with low-level-laser therapy (LLLT). Intercellular Signaling Peptides and Proteins Gingiva;Intercellular Signaling Peptides and Proteins;Lasers;Light

Treatment of nail psoriasis with pulsed dye laser versus combined pulsed dye and Nd:YAG lasers-An intrapatient left-to-right study. BACKGROUND AND OBJECTIVES: There are limited treatment options for nail psoriasis. It is important to find new therapies and improve existing ones. The aim of this study was to compare the effectiveness of pulsed dye laser (PDL) versus combined PDL and Nd:YAG lasers in patients with nail psoriasis. METHODS: Fourteen patients (with a total of 126 nails affected by nail psoriasis) were treated with PDL (6â€‰J/cm2, 7â€‰mm, 0.45â€‰milliseconds) on both hands and additionally with Nd:YAG (10â€‰J/cm(2) , 6â€‰mm, 15â€‰milliseconds) on the right hand. Three treatment sessions were applied at 4-week intervals and patients were followed up for 6 months after the last session. Disease severity was assessed using the Nail Psoriasis Severity Index, both 8- and 32-point variant. Additionally, Dermatology Life Quality Index was assessed before and after treatment. RESULTS: Overall, there was a statistical difference in 8- and 32-point NAPSI score before and after treatment for both hands. However, there was no statistical difference between the score for the right and left hands based on both scale variants. Some aspects of patients' lives showed improvement due to the treatment. CONCLUSIONS: Both PDL in monotherapy and combined Nd:Yag+PDL lasers are safe and effective in treatment of nail psoriasis, although combined therapy shows no advantage over the use of a single laser. Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Nail Diseases;Psoriasis;Treatment Outcome

Low-power therapeutic lasers on mRNA levels. Gene expression evaluation in cells and biological tissues has been crucial for research in biology, medicine, biotechnology, and diagnostic. Messenger ribonucleic acid (mRNA) levels show relationship with gene expression, and they can be measured by real-time quantitative polymerase chain reaction (RT-qPCR) for the quantification of steady-state mRNA levels in cells and biological tissues. Radiations emitted from low-power lasers induce

photobiomodulation, which is the base of therapeutic protocols for disease treatment. Despite that the understanding on photobiomodulation has been improved by mRNA level evaluation, laser irradiation parameters and procedures are diversified among studies, harming the comparison of RT-qPCR data. In this systematic review, data from mRNA levels reported in photobiomodulation studies were summarized regarding the process, function, and gene. Literature search was conducted for the assessment of published reports on mRNA levels evaluated by RT-qPCR in cells and biological tissues exposed to low-power lasers. Data showed that mRNA levels have been evaluated by RT-qPCR for a variety of genes related to molecular, cellular, and systemic processes after low-power violet-orange, red, and infrared laser exposure. Results from gene expression have increased the understanding of the mechanisms involved in photobiomodulation, and they can be useful to increase the efficacy and safety of clinical applications based on low-power lasers. RNA, Messenger Lasers;Light;Low-Level Light Therapy;RNA, Messenger

Optimal Parameters of Laser Therapy to Improve Critical Calvarial Defects. Body bones play diverse pivotal roles, including the protection of vital organs. For instance, the integrative functions of the brain controlling diverse peripheral actions can be affected by a traumatic injury on the calvaria and the reparative process of a large defect is a challenge in the integrative physiology. Therefore, the development of biomaterials and approaches to improve such defects still requires substantial advances. In this regard, the most attractive approaches have been covering the cavity with inorganic bovine bone (IBB) and, more recently, also using low-level laser therapy (LT), but this issue has opened many questions. Here, it was determined the number of LT sessions required to speed up and to intensify the recovery process of two 5-mm-diameter defects promoted in the calvaria of each subgroup of six adult Wistar rats. The quantitative data showed that 30 days post-surgery, the recovery process by using blood clot-filling was not significantly influenced by the number of LT sessions. However, in the IBB-filled defects, the number of LT sessions markedly contributed to the improvement of the reparative process. Compared to the Control group (non-irradiated), the percentage of mineralization (formation of new bone into the cavities) gradually increased 25, 49, and 52% with, respectively, 4, 7, and 11 sessions of LT. In summary, combining the use of IBB with seven sessions of LT seems to be an optimal approach to greatly improve the recovery of calvarial defects. This translational research opens new avenues targeting better conditions of life for those suffering from large bone traumas and in the present field could contribute to preserve the integrative functions of the brain.

Role of Low-Level Light Therapy (LLLT) in Androgenetic Alopecia. Androgenetic alopecia (AGA) is the commonest type of alopecia affecting over half of men and women. Only two drugs have been approved so far (minoxidil and finasteride), and hair transplant is the other treatment alternative. Low-level laser therapy (LLLT) has been claimed to be a new safe devise-based modality for stimulating hair growth in men and women in AGA. Searches of PubMed and Google Scholar were carried out using keywords alopecia, hair loss, and LLLT. Fifteen studies were found to be strongly relevant and were analyzed. Studies have shown that LLLT stimulated hair growth in both men and women. Studies with largest randomized controlled trials demonstrated statistically significant hair regrowth by terminal hair count in both males and females. One study also showed that LLLT and minoxidil had similar efficacy in hair growth and that combination therapy was even more effective. LLLT represents a non-invasive, safe, and potentially effective treatment option for patients with AGA who do not respond or are not tolerant to standard treatment of AGA. Moreover, combining LLLT with topical minoxidil solution and oral finasteride may act synergistic to enhance hair regrowth. However, the level of evidence of the studies is still low and hence more controlled large studies are needed.

Activation of the AKT/GSK-3Î²/Î²-catenin pathway via photobiomodulation therapy promotes neural stem cell proliferation in neonatal rat models of hypoxic-ischemic brain damage. BACKGROUND: Hypoxic-ischemic brain damage (HIBD) significantly affects neurodevelopment in infants and is a leading cause of severe neurological morbidity and mortality in neonates. Our previous study found that photobiomodulation therapy (PBMT) improves the impaired spatial learning and memory of HIBD rat models. However, the neuroprotective mechanism conferred by PBMT in HIBD is unclear. METHODS: In the present study, HIBD model rats were treated with PBMT at 5 mW/cm(2) per day in the dark for 14 days (10 min each day), and primary neural stem cells (NSCs) after oxygen-glucose deprivation (OGD) were treated with PBMT for 10 min at 1, 5, 10, and 20 mW/cm(2) in the dark. PBMT promoted hippocampal neural stem cell (NSC) proliferation in vivo and in vitro. RESULTS: Mechanistically, PBMT upregulated phosphatidylinositol 3 kinase (PI3K), phosphorylated protein kinase B (p-AKT), phosphorylated glycogen synthase kinase 3 beta (p-GSK-3Î²), Î²-catenin, and cyclin D1 expression in vivo and in vitro, promoting NSC proliferation. Furthermore, both LY294002 (a PI3K inhibitor) and IWR-1 (a Wnt/Î²-catenin inhibitor) inhibited the PBMT promotion of NSC proliferation after OGD and suppressed Î²-catenin and cyclin D1 expression in vitro. CONCLUSIONS: PBMT improved the spatial learning and memory of HIBD rats and promoted hippocampal NSC proliferation through the AKT/GSK-3Î²/Î²-catenin pathway.

Efficacy of LED Photobiomodulation for Functional and Axonal Regeneration After Facial Nerve Section-Suture. Facial nerve damage can lead to partial or total facial nerve palsy. Photobiomodulation has been reported to improve and accelerate functional recovery following peripheral nerve lesion, depending on the type of lesion and the light exposure parameters used. The aim of this study was to investigate the effects of infrared exposure on functional and axonal regeneration after section-suture of the distal branches of the facial nerve: the buccal and marginal mandibular branches and the distal pes. The animals underwent surgery and were irradiated with infrared light at 850 nm twice daily from day 1 to day 16. The recovery of facial function was then studied at both the behavioral and morphological levels. Behavioral analyses were performed by videoscoring with a high-speed camera and using various devices to assess the recovery of whisker movement on the lesioned side from day 1 to day 30. We also assessed nasal deviation toward the intact side and the ability to close the ipsilateral eyelid completely from day 1 to day 38 and from day 1 to day 50, respectively. For morphological analyses, we assessed the re-establishment of facial motoneuron labeling with FluorogoldÂ®, an immunofluorescent retrograde marker of axonal transport injected into the vibrissae, on D10, D14 and D30. We found that whisker movements recovery was significantly faster in treated than in control mice. A complete disappearance of nasal deviation was observed at 2 weeks in infrared-treated lesioned mice and at 5 weeks in controls. Complete eyelid closure was observed 3 weeks after surgery in treated animals and 6 weeks after surgery in controls. Finally, normal fluorogold labeling of the facial nuclei complex was restored 30 days after surgery in the treated animals, but no such restoration was ever observed in control animals. In conclusion, our data show that IR treatment at a distal site has a significant positive effect on facial nerve recovery. These findings pave the way for the clinical use of infrared photobiomodulation in patients with nerve lesions.

Phototherapy and topical treatments for cutaneous graft vs. host disease in haematopoietic stem cell transplantation patients: a scoping review. Skin is usually the first and most affected organ involved in graft-versus-host disease (GvHD), and treatment is still a clinical challenge. Although the need for skin-directed treatments such as physical treatments and topical medications are generally agreed on, what the gold standard treatment strategy should be remains open to debate. The aim of this scoping review was to synthesize the current knowledge on the topical and physical treatments of cutaneous GvHD in haematopoietic stem cell transplantation patients and to highlight the best

evidence available so as to reduce the gap between 'what is known' and 'what is done' in the clinical practice. Twenty-eight studies were included in this qualitative synthesis. Photo-biomodulation with psoralen was not included in this review. Phototherapy (ultraviolet A or B or narrowband B) was the physical treatment most described in the literature in both acute GvHD and chronic GvHD. Topical calcineurin inhibitors such as tacrolimus ointment and pimecrolimus cream as well as corticosteroid creams such as clobetasol and triamcinolone are mainly used in case of chronic GvHD. In all of the studies included in the review, topical treatments were always associated with systemic therapy. None of the topical interventions identified in our review provided strong evidence supporting its use, and the topical approaches seemed to have an adjuvant role in the treatment of cutaneous GvHD. Calcineurin Inhibitors Calcineurin Inhibitors;Graft vs Host Disease;Hematopoietic Stem Cell Transplantation;Humans;Phototherapy;Skin;Skin Diseases

Comparative Effect of Photobiomodulation on Human Semen Samples Pre- and Post-Cryopreservation. The primary objective of this study is to evaluate and to compare the effects of photobiomodulation (PBM) on sperm parameters both before and after cryopreservation. In this regard, 24 freshly ejaculated semen samples from normozoospermic men were included in this study. Each semen sample was randomly divided into three groups (1Â ml aliquot for each group): the control group (group one) underwent conventional sperm cryopreservation (nâ€‰=â€‰24), group two underwent pre-freezing PBM exposure (810Â nm, diode laser, and 0.6Â J/cm(2)) (nâ€‰=â€‰24), and group three underwent post freezing and thawing PBM exposure (nâ€‰=â€‰24). Indicators of sperm quality, including total sperm motility (TSM), progressive sperm motility (PSM), DNA fragmentation, lipid peroxidation levels, apoptosis-like changes, and gene expression levels of protamine (PRM) 1, PRM2, and adducin 1 alpha (ADD1), were investigated in a blinded style. Due to the beneficial effect of pre-freezing PBM therapy, group 2 exhibited the highest TSM and PSM levels compared to groups 1 and 3. At the same time, DNA fragmentation and lipid peroxidation were significantly reduced in the group 2 compared to the group 1 (pâ€‰=â€‰0.024 pâ€‰=â€‰0.016, respectively). Evaluation of apoptotic/necrotic changes revealed that parameters including early apoptosis, dead, and necrotic cells decreased in the group 2 compared to the either groups 1 (pâ€‰=â€‰0. 008, pâ€‰=â€‰0. 032, pâ€‰=â€‰0. 02, respectively) or group 3 (pâ€‰=â€‰0.037, pâ€‰=â€‰0.108, pâ€‰=â€‰0.083). There were no significant differences in the expression levels of PRM1, PRM2, and ADD1 among the study groups. Based on our results, PBM therapy prior to cryopreservation, even in the normal semen samples, plays a significant protective role against cryo-damage by preserving the functional parameters of spermatozoa. Cryopreservation;Humans;Male;Semen;Semen Analysis;Semen Preservation;Sperm Motility;Spermatozoa

Effectiveness of Low-Level Laser Therapy in Patients with Discogenic Lumbar Radiculopathy: A Double-Blind Randomized Controlled Trial. PURPOSE: To determine the effectiveness of low-level laser therapy (LLLT) in patients with discogenic lumbar radiculopathy and correlation among pain intensity, functional disability, and lumbar range of motion (LROM). Study Design/Setting. A double-blind RCT was conducted at physical therapy departments of different hospitals of Islamabad, Pakistan. The study period was March 2020 to August 2021. Patient Sample. The study comprised 110 patients with acute LBP and unilateral discogenic lumbar radiculopathy. Outcome Measures. The outcomes of the treatment were measured on the first day and then after 18 sessions from each patient's pain intensity, functional disability, L-ROM, and straight leg raise by using visual analogue scale, Oswestry disability index, dual inclinometer, and straight leg raise test. METHODS: A total of 110 participants with a mean age of 38â€‰Â±â€‰7.4 years were randomly assigned into two groups of 55 each. The experimental group of 55 patients was treated with LLLT and conventional physical therapy. The control group of 55 patients was treated with conventional physical therapy alone. Both

groups had received 18 treatment sessions. The data were analyzed through SPSS-21.0. RESULTS: The results of the Wilcoxon signed-rank test score as well as Mann-Whitney U test indicated a statistically significant difference in values (pâ€‰<â€‰0.05 in all instances) within the groups and between the groups, respectively. CONCLUSIONS: The LLLT is proved as an efficient adjunct therapy to conventional physical therapy for discogenic lumbar radiculopathy. Adult;Humans;Low Back Pain;Low-Level Light Therapy;Lumbosacral Region;Middle Aged;Pain Measurement;Radiculopathy;Treatment Outcome

Non-invasive photobiomodulation treatment in an Alzheimer Disease-like transgenic rat model. Alzheimer's disease (AD) is the most common form of dementia in the elderly, causing neuronal degeneration and cognitive deficits that significantly impair independence and quality of life for those affected and their families. Though AD is a major neurodegenerative disease with vast avenues of investigation, there is no effective treatment to cure AD or slow disease progression. The present work evaluated the therapeutic effect of long-term photobiomodulation (PBM) treatment with continuous-wave low-level laser on AD and its underlying mechanism. Methods: PBM was implemented for 2 min, 3 times per week for 16 months in 2-month-old transgenic AD rats. A battery of behavioral tests was performed to measure the effect of PBM treatment on cognitive dysfunction in AD rats. The effects of PBM therapy on typical AD pathologies, including amyloid plaques, intracellular neurofibrillary tangles, neuronal loss, neuronal injury, neuronal apoptosis, and neurodegeneration, were then assessed. The underlying mechanisms were measured using immunofluorescence staining, western blotting analysis, mass spectrometry, primary cortical and hippocampal cell cultures, and related assay kits. Results: PBM treatment significantly improved the typical AD pathologies of memory loss, amyloid plaques, tau hyperphosphorylation, neuronal degeneration, spine damage, and synaptic loss. PBM treatment had several mechanistic effects which may explain these beneficial effects, including 1) regulation of glial cell polarization and inhibition of neuroinflammation, 2) preservation of mitochondrial dynamics by regulating fission and fusion proteins, and 3) suppression of oxidative damage to DNA, proteins, and lipids. Furthermore, PBM enhanced recruitment of microglia surrounding amyloid plaques by improving the expression of microglial IL-3RÎ± and astrocytic IL-3, which implies a potential role of PBM in improving AÎ² clearance. Finally, our results implicate neuronal hemoglobin in mediating the neuroprotective effect of PBM, as HbÎ± knockdown abolished the neuroprotective effect of PBM treatment. Conclusion: Collectively, our data supports the potential use of PBM treatment to prevent or slow the progression of AD and provides new insights into the molecular mechanisms of PBM therapy. Amyloid beta-Peptides;Neuroprotective Agents Aged;Alzheimer Disease;Amyloid beta-Peptides;Animals;Disease Models, Animal;Humans;Neurodegenerative Diseases;Neuroprotective Agents;Plaque, Amyloid;Quality of Life;Rats;Rats, Transgenic

A biocomplex to repair experimental critical size defects associated with photobiomodulation therapy. BACKGROUND: The association of scaffolds to repair extensive bone defects can contribute to their evolution and morphophysiological recomposition. The incorporation of particulate biomaterials into three-dimensional fibrin bioproducts together with photobiomodulation therapy (PBM) has potential and can improve regenerative medicine procedures. The objective of this experiment was to evaluate the effects of PBM therapy on critical size defects filled with xenogenic bone substitute associated with fibrin biopolymer. METHODS: A critical defect of 8 mm was performed in 36 Wistar male adult rats that were divided into four groups. Groups BC and BC-PBM were defined as controls with defects filled by a clot (without or with PBM, respectively) and groups XS and XS-PBM that comprised those filled with biocomplex Bio-Oss(TM) in association with fibrin biopolymer. PBM was applied immediately after the surgery and three times a week every other day, with the parameters: wavelength of 830 nm, energy density 6.2 J/cm(2), output power 30 mW, beam

area of 0.116 cm(2), irradiance 0.258,62 W/cm(2), energy/point 0.72 J, total energy 2.88 J. Fourteen and 42 days after the surgery, animals were euthanatized and subjected to microtomography, qualitative and quantitative histological analysis. RESULTS: The BC-PBM and XS-PBM groups had a similar evolution in the tissue repair process, with a higher density of the volume of new formed bone in relation to the groups without PBM ($p = 0.04086$; $p = 0.07093$, respectively). Intense vascular proliferation and bone deposition around the biomaterial particles were observed in the animals of the groups in which biocomplex was applied (XS and XS-PBM). CONCLUSION: PBM therapy allowed an improvement in the formation of new bone, with a more organized deposition of collagen fibers in the defect area. Biocomplex favored the insertion and permanence of the particulate material in bone defects, creating a favorable microenvironment for accelerate repair process.

Near-infrared photobiomodulation of blood reversibly inhibits platelet reactivity and reduces hemolysis. Photobiomodulation (PBM) in the red/near-infrared (R/NIR) spectral range has become widely recognized due to its anti-inflammatory and cytoprotective potential. We aimed to assess the effects of blood PBM on platelets function and hemolysis in an in vitro setting. Porcine blood samples were separated into four aliquots for this study, one of which served as a control, while the other three were subjected to three different NIR PBM dosages. The platelet count and functions and the plasma free haemoglobin and osmotic fragility of red blood cells were measured during the experiment. The control group had a considerable drop in platelet number, but the NIR exposed samples had more minimal and strictly dose-dependent alterations. These modifications were consistent with ADP and collagen-induced platelet aggregation. Furthermore, red blood cells that had received PBM were more resistant to osmotic stress and less prone to hemolysis, as seen by a slightly lower quantity of plasma free hemoglobin. Here we showed under well-controlled in vitro conditions that PBM reversibly inhibits platelet activation in a dose-dependent manner and reduces hemolysis. Animals;Blood Platelets;Erythrocytes;Hematologic Tests;Hemolysis;Platelet Activation;Swine

Diabetes Mellitus and Bell's Palsy. The aim of the present brief review was to discuss Bell's palsy (BP) in diabetes mellitus (DM). The risk of BP is increased in DM. DM subjects with BP are more prone to severe facial nerve degeneration. Further characteristics of BP in DM include a) infrequent taste impairment; b) more frequent and more marked facial nerve subclinical electrophysiological impairment; c) more frequent Blink reflex impairment; d) potentially concurrent distal symmetrical sensorimotor polyneuropathy; e) more frequent alternating BP with recurrent episodes affecting different sides of the face. Diagnosis of BP rests on clinical examination, along with facial nerve electromyographic and electroneurographic evaluation. Management of BP in DM includes physical therapy, corticosteroids, and antiviral agents. Finally, acupuncture, low-level laser therapy, lipoprostaglandin E1, and stellate ganglion block are new modalities with initially promising results. Antiviral Agents Humans;Bell Palsy;Diabetes Mellitus;Acupuncture Therapy;Antiviral Agents;Nerve Conduction Studies

A Study on the Effect of 850 nm Low-Level Diode Laser versus Electrical Stimulation in Facial Nerve Regeneration for Patients with Bell's Palsy. INTRODUCTION: Bell's palsy is acute facial paralysis with unclear etiology that results in weakness of facial muscles or paralysis on one side of the face. METHODS: This prospective, randomized, single-blind, controlled study was conducted on 45 patients with Bell's palsy who were randomly divided into three equal groups. Two groups received either low-level laser therapy (LLLT) or electrical stimulation (E.S.) both in conjunction to medications, massage, and facial exercise treatment. The third group (control) was treated with medication, massage, and facial exercise. RESULTS: The primary outcome was the improvement of nerve conduction velocity of facial nerve while the secondary outcome was the change of Sunnybrook facial grading system (SBGS). The outcome measures were evaluated pre- and posttreatment. There was statistically

significant difference between the three groups in favor of the LLLT group regarding the nerve action potential amplitude and latency, in addition to signs of nerve regeneration and improved SBGS. CONCLUSION: This short-term investigation revealed that LLLT proved to be more efficient than E.S. in facial nerve regeneration for patients with Bell's palsy. Bell Palsy;Electric Stimulation;Facial Nerve;Facial Paralysis;Humans;Lasers, Semiconductor;Nerve Regeneration;Prospective Studies;Single-Blind Method

Micro-CT analysis of the mandibular bone microarchitecture of rats after radiotherapy and low-power laser therapy. To investigate whether low-level laser therapy (LLLT), at different times of application (immediate and late) in the region of the parotid glands, has a distance effect on the microarchitecture of the trabecular bone in mandible of rats irradiated by volumetric modular arc therapy (VMAT). Thirty adult Wistar rats were randomly divided into placebo control groups (CG, nâ€‰=â€‰2), only radiotherapy (RG, nâ€‰=â€‰2), only LPLT (LG, nâ€‰=â€‰2), and two other groups using LLLT in the immediate time (24Â h) (ILG, nâ€‰=â€‰12) and late (120Â h) (LLG, nâ€‰=â€‰12) to radiotherapy by VMAT in a single dose of 12Â Gy. LLLT with AsGaAl laser (660Â nm, 100 mW), a spot size of 0.0028 cm(2), was applied in three points in the region of the right parotid gland, with energy of 2Â J/cm(2), 20Â s per point, for 10 consecutive days. After euthanasia, the right hemimandibles of each animal were dissected, prepared, and analyzed by computerized microtomography (micro-CT) and histomorphometry. The different groups were analyzed by the Tukey and Bonferroni multiple comparison tests. The micro-CT analysis found statistically significant differences between the groups, especially in the LLG, which had the highest average bone volume compared to the CG (pâ€‰=â€‰0.001) and ILG (pâ€‰=â€‰0.002) and a greater number of trabeculae than the CG (pâ€‰=â€‰0.000) and ILG (pâ€‰=â€‰0.031). The ILG also had a higher number of trabeculae than the CG (pâ€‰=â€‰0.005). Trabecula separation (Tb.Sp) was lower in the LLG (pâ€‰=â€‰0.000) and ILG (pâ€‰=â€‰0.002) when compared to the CG. In the histomorphometry, there was no statistical difference between the groups in relation to all the analyzed variables. Micro-CT analysis showed that the LLLT, even applied at a distance, both in the immediate and late VMAT times, has an effect on the mandibular bone microarchitecture by increasing the volume and number of trabeculae and decreasing the spaces between them. Animals;Cancellous Bone;Low-Level Light Therapy;Mandible;Rats;Rats, Wistar;X-Ray Microtomography

Photobiomodulation as a treatment for dermatitis caused by chemoradiotherapy for squamous cell anal carcinoma: case report and literature review. In-field dermatitis is a severe and common adverse effect of radiation therapy, that can cause significant pain and treatment interruptions in patients with squamous cell anal carcinoma (SCAC) being treated with radical chemoradiation protocols. There are no established therapies for the treatment of radiation induced dermatitis. Photobiomodulation (PBM) is an effective and low-cost treatment for radiation induced mucositis, but have recently been explored to treat in-field dermatitis. We present a case report of the successful use of PBM for the treatment of dermatitis in the anal area in a patient with SCAC treated with concomitant chemoradiation with curative intent and follow with a literature review of the recent advances and possibilities of the use of PBM as a promising strategy. PBM therapy proved to be efficient in the radiodermatitis treatment, both in relieving the symptoms and controlling dermatitis, in addition to improving the patient's quality of life. Anus Neoplasms;Carcinoma, Squamous Cell;Chemoradiotherapy;Dermatitis;Humans;Low-Level Light Therapy;Male;Middle Aged

Laser Decontamination and LED Photobiomodulation Promote Bone Regeneration and Wound Healing by Secondary Intention, in Alveolar Ridge Preservation-Clinical and Radiographic Evaluation: A Pilot Experience. Background: Tooth loss reduces crestal bone with important resorption of

alveolar dimensions, reducing the possibility of placing implants after wounds healing. Objective: The goal of this pilot experience was to consider, in alveolar ridge preservation, the regenerative and decontaminating potential of oxygen high-level laser therapy (OHLLT), a high-frequency and high-power diode laser combined with hydrogen peroxide 10 volumes 3%, and to evaluate wound closure during the 14-21 days after surgery. Methods: For this study we selected 15 patients (age range from 30 to 70 years old) who underwent alveolar ridge preservation (three patients were treated in the anterior maxilla, 12 in the mandibular jaw, with molars and premolars involved). A clinical and radiographic examination was performed at baseline. In this pilot experience, after the extractions, the sockets were treated with photodynamic therapy without dye (OHLLT/SiOxyL+ protocol) to decontaminate the area that was treated, combined with allografts, Osteobiol, granulometry 25, Platelet-Rich Fibrin and collagen membranes, Biogide/Geistlich. Photobiomodulation (PBM) sessions with ATP38 were made for the first 4 months every 2 weeks. Clinical evaluations were performed at 14, 21, 90, and 240 days. Radiographic evaluations with cone beam computed tomography (CBCT) were performed at 240 days, before the second surgery. Two hundred seventy days after the first surgery, a new surgical treatment was made with the same concepts adopted in the first surgery, to place implants. Results: All alveolar ridge preservation surgeries were successful, with minimal bone resorption after 9 months. Closure of gingival tissue healed by secondary intention was achieved after 14 days for all patients, except one, who showed wound closure after 21 days. Conclusions: This pilot experience showed that this technique allowed to obtain new bone and wound healing by secondary intention in treated sites and to place implants in all patients, without other bone augmentation techniques, thanks to extracellular matrix induced by photodynamic laser therapy on grafts materials and to PBM made each 2 weeks for the first 4 months postsurgery. The study was conducted according to the guidelines of the Ethics Committee of the School of Medicine and Surgery at the Milano Bicocca University (protocol n. 11/17), and derived from the approval of Italian National Institute of Health (ISS), protocol 30 July 2007-0040488. Adult;Aged;Alveolar Process;Alveolar Ridge Augmentation;Bone Regeneration;Decontamination;Humans;Intention;Lasers;Middle Aged;Tooth Extraction;Tooth Socket;Wound Healing

Treatment with Light-Emitting Diodes of Wavelength 863â€‰nm Delays DMBA/TPA-Induced Skin Tumor Formation and Decreases Proinflammatory Cytokine Levels in ICR Mice. The popularity of light/energy devices for cosmetic purposes (e.g., skin care) is increasing. However, the effects and underlying mechanisms remain poorly understood. Commencing in the 1960s, various studies have evaluated the beneficial effects of a light source on cells and tissues. The techniques evaluated include low-level light (laser) therapy and photobiomodulation (PBM). Most studies on PBM used red light sources, but, recently, many studies have employed near-infrared light sources including those of wavelength 800â€‰nm. Here, we used a light-emitting diode (LED) array with a wavelength of 863â€‰nm to treat DMBA/TPA-induced mouse skin tumors; treatment with the array delayed tumor development and reduced the levels of systemic inflammatory cytokines. These results suggest that light therapy could be beneficial. However, the effects were small. Further studies on different skin tumors using an optimized LED setup are required. Combination therapies (conventional methods and an LED array) may be useful. Cytokines Animals;Cytokines;Infrared Rays;Low-Level Light Therapy;Mice;Mice, Inbred ICR;Skin Neoplasms

Effects of photobiomodulation and deep water running in patients with chronic non-specific low back pain: a randomized controlled trial. Photobiomodulation therapy (PBM) is often used to treat musculoskeletal disorders such as chronic non-specific low back pain (NSCLBP) as it can have positive effects on biomarkers-creatine kinase (CK) and serum cortisol levels-related to stress caused by physical exercise, such as deep water running (DWR) or by pain. The aim of this study was to evaluate

the effects of the combination of PBM and aquatic exercise (DWR) on the intensity of pain, disability, 6-min walk test adapted (6WTA), and on cortisol and creatine kinase (CK) levels in a population with NSCLBP. The participants were allocated into three groups: TG(PBM) (Photobiomodulation and Training Group), TG(PLA) (Placebo Photobiomodulation and Training Group), and the G(PBM) (Photobiomodulation Group). Information regarding anthropometric data, blood pressure, and heart rate were collected, and the questionnaires were applied: IPAQ-Short Form, Oswestry Disability Index, and the Visual Analog Scale for Pain. The submaximal exercise test (6WTA) was performed. Blood was collected for analysis of cortisol and CK levels. The training sessions were performed twice a week, for 4Â weeks. In the intragroup comparisons, there were statistically significant changes in the TG(PBM) and G(PBM) groups in the outcomes pain intensity, disability (reductions in both groups), and in cortisol (increased in the TG(PBM) and reduced in the G(PBM)); in the TG(PLA) group, there was a statistically significant reduction only in the outcome of pain intensity. In the intergroup comparison, in the comparison between TG(PBM) and TG(PLA), there was a statistically significant difference in the level of cortisol, as well as in the comparison between TG(PBM) and G(PBM), in which there was a statistically significant difference for this same outcome (cortisol) and for the 6WTA outcome. The effects of the combination of PBM and aquatic exercise have positive effects on reducing pain intensity, disability, and cortisol levels, but its effects on other variables (6WTA and CK) are too small to be considered significant. Trial registration number: NCT03465228-April 3, 2019; retrospectively registered (ClinicalTrials.gov). Water;Creatine Kinase;Hydrocortisone Chronic Pain;Creatine Kinase;Exercise Therapy;Humans;Hydrocortisone;Low Back Pain;Low-Level Light Therapy;Running;Treatment Outcome;Water

Effect of low-level light therapy in patients with dry eye: a prospective, randomized, observer-masked trial. To evaluate the efficacy of low-level light therapy (LLLT) with near-infrared light-emitting diodes (LED-LLLT) for the treatment of dry eye. 40 patients were randomly assigned with a 1:1 allocation ratio to receive LED-LLLT (LLLT group, nâ€‰=â€‰20) or placebo treatment (placebo group, nâ€‰=â€‰20). Patients in the LLLT group received LLLT twice a week for 3Â weeks, for a total of 6 treatment sessions. The primary endpoint was the changes in the fluorescein corneal staining (FCS) score. The secondary endpoints were the changes in the ocular surface disease index (OSDI) score, lissamine green conjunctival staining (LGCS) scores, tear film break-up time (TBUT), Schirmer test, and the meibomian gland dysfunction (MGD) index. These were evaluated before treatment and 4Â weeks after start of treatment. The mean difference of score change in primary endpoint revealed significant improvement in the LLLT group, compared to the placebo. Among secondary endpoints, LGCS, Schirmer's test, upper meibography scores showed significant improvements, while TBUT, lid debris, lid swelling, lid telangiectasia, meibomian gland secretion and expressibility scores had slight improvement without significant differences. No serious adverse events were observed. The use of LED-LLLT for the treatment of dry eye and MGD appears to be safe and beneficial. Dry Eye Syndromes;Humans;Low-Level Light Therapy;Meibomian Gland Dysfunction;Meibomian Glands;Prospective Studies;Tears

Intranasal low-level laser therapy versus acupuncture treatment for allergic rhinitis: A randomized, noninferiority trial. INTRODUCTION: Intranasal low-level laser therapy (LLLT) has already proven its immunosuppressive effects on allergic rhinitis (AR) in experimental studies; however, there is a dearth of clinical evidence supporting its effects in treating AR. The aim of this study was to assess the safety and effectiveness of intranasal LLLT in the treatment of AR compared with acupuncture. METHODS: A total of 80 patients with AR participated and were randomly assigned to the intranasal LLLT or acupuncture treatment (AT) group. They were given each treatment for 20Â min 3 times a week for 4 weeks. RESULTS: Both groups improved the total nasal symptom score (TNSS), rhinoconjunctivitis quality of life questionnaire (RQLQ) score, and nasal endoscopy index in patients

with AR after 4 weeks of treatment, and these effects extended 4 weeks after the end of treatment. Intranasal LLLT was noninferior to AT in regard to the TNSS. The estimated outcome difference between baseline and the 5th week was -0.38 points (upper 97.5% confidence limit 1.06 points), which was within the noninferiority margin of 2 points. The effect size of the TNSS at the 5th week was 0.19, which was close to Cohen's small effect size. There were no significant differences between two groups regarding the RQLQ, nasal endoscopy index, total serum immunoglobulin E level or absolute eosinophil count. CONCLUSION: This study showed that intranasal LLLT is noninferior compared to AT in terms of the TNSS; thus, it may be used as an alternative or adjunctive treatment option for relieving symptoms of AR. TRIAL REGISTRATION: This study was registered at the Korean National Clinical Trial Registry, Clinical Research Information Service (KCT0004079). Humans;Low-Level Light Therapy;Quality of Life;Rhinitis, Allergic;Acupuncture Therapy;Surveys and Questionnaires;Treatment Outcome

Pulpal and periapical tissue response after direct pulp capping with endosequence root repair material and low-level laser application. BACKGROUND: The study aims to investigate the pulp and periapical reaction and healing after capping with EndoSequence Root Repair Material (ERRM) combined with low-level laser application. METHODS: In 6 rabbits, pulps were exposed via class V, half of the samples received a low-level diode laser at 980Â nm. Thereafter, cavities were capped with regular-set ERRM. The specimens were processed for histomorphological examination after 2 weeks and two months. RESULTS: After 2 weeks, images show mild inflammation and organized odontoblasts in lased group. The non-lased group shows more severe inflammation. The predentin thickness was thicker in the lased group with statistical significance (pâ€‰<â€‰0.05). After 2Â months, inflammatory cells were sparse in both lased and non-lased groups. In the periapical area, group one showed dilated blood vessels and thick fibrous connective tissues. In group two, there were more numerous maturations of PDL fibers with scattered inflammatory cells and congested blood vessel. CONCLUSIONS: Using low-level laser therapy in combination with ERRM for pulp capping shortens the inflammatory phase and enhances healing. Calcium Phosphates;Drug Combinations;EndoSequence root repair material;Oxides;Silicates;Calcium Hydroxide Animals;Calcium Hydroxide;Calcium Phosphates;Dental Pulp;Dental Pulp Capping;Dental Pulp Exposure;Dentin, Secondary;Drug Combinations;Humans;Lasers;Oxides;Periapical Tissue;Rabbits;Silicates

Pathogenesis and Amelioration of Radiation-Induced Oral Mucositis. Oral mucositis (OM) causes significant detriment to patient quality of life. Despite advances in RT, chemotherapy, and surgery for HNC which have led to improved local control and survival, management of certain toxicities such as OM have not kept pace. Numerous strategies have emerged with demonstrable benefit in preventing severe OM. However, ones which are not only effective, but practical and affordable to implement are rare. For example, infusion of growth factors or free radical scavengers, and daily treatment of intra-oral sites with lasers are supported by high-quality evidence but have not become widely adopted. It falls to familiarity of the physician with the available preventative measures and ultimately, patient preference in accepting which strategies for OM amelioration are used. In this review, we present a pathophysiological-based review of prevention techniques available for reducing the incidence and duration of severe OM. Head and Neck Neoplasms;Humans;Incidence;Quality of Life;Radiation Injuries;Stomatitis

The Functions and Mechanisms of Low-Level Laser Therapy in Tendon Repair (Review). Tendon injury is a common disease of the musculoskeletal system, accounting for roughly 30%-40% of sports system disorder injuries. In recent years, its incidence is increasing. Many studies have shown that low-level laser therapy (LLLT) has a significant effect on tendon repair by firstly activating cytochrome C oxidase and thus carrying out the photon absorption process, secondly acting in all the three phases

of tendon repair, and finally improving tendon recovery. The repair mechanisms of LLLT are different in the three phases of tendon repair. In the inflammatory phase, LLLT mainly activates a large number of VEGF and promotes angiogenesis under hypoxia. During the proliferation phase, LLLT increases the amount of collagen type III by promoting the proliferation of fibroblasts. Throughout the remodeling phase, LLLT mainly activates M2 macrophages and downregulates inflammatory factors, thus reducing inflammatory responses. However, it should also be noted that in the final phase of tendon repair, the use of LLLT causes excessive upregulation of some growth factors, which will lead to tendon fibrosis. In summary, we need to further investigate the functions and mechanisms of LLLT in the treatment of tendon injury and to clarify the nature of LLLT for the treatment of diverse tendon injury diseases.

Photobiomodulation reduces hippocampal apoptotic cell death and produces a Raman spectroscopic "signature". Apoptotic cell death within the brain represents a significant contributing factor to impaired post-traumatic tissue function and poor clinical outcome after traumatic brain injury. After irradiation with light in the wavelength range of 600-1200 nm (photobiomodulation), previous investigations have reported a reduction in apoptosis in various tissues. This study investigates the effect of 660 nm photobiomodulation on organotypic slice cultured hippocampal tissue of rats, examining the effect on apoptotic cell loss. Tissue optical Raman spectroscopic changes were evaluated. A significantly higher proportion of apoptotic cells 62.8Â±12.2% vs 48.6Â±13.7% ($P<0.0001$) per region were observed in the control group compared with the photobiomodulation group. After photobiomodulation, Raman spectroscopic observations demonstrated 1440/1660 cm-1 spectral shift. Photobiomodulation has the potential for therapeutic utility, reducing cell loss to apoptosis in injured neurological tissue, as demonstrated in this in vitro model. A clear Raman spectroscopic signal was observed after apparent optimal irradiation, potentially integrable into therapeutic light delivery apparatus for real-time dose metering.
Animals;Apoptosis;Brain;Brain Injuries, Traumatic;Hippocampus;Low-Level Light Therapy;Rats;Spectrum Analysis, Raman

Spotlight on the DRCR Retina Network's Photobiomodulation for Diabetic Macular Edema Trial. Ranibizumab Clinical Trials as Topic;Diabetes Mellitus;Diabetic Retinopathy;Humans;Macular Edema;Ranibizumab;Retina;Tomography, Optical Coherence

Infrared thermography as valuable tool for gynoid lipodystrophy (cellulite) diagnosis. Cellulite is a morphological alteration of the tegument tissue, directly interfering in self-esteem with etiology and pathophysiology far from being a consensus. Although the visual diagnosis of cellulitis is well known, it does not represent the real pathological condition of the subcutaneous tissue. The aim of the study was to investigate the hypothesis that the more heterogeneous tissue pattern analyzed by infrared thermography, the more severe is the cellulite grade. Forty female participants were selected and 60 thighs were analyzed by clinical anamnesis and infrared thermography. Classical visual analysis was correlated to the tissue heterogeneity measured by thermography. R Spearman's correlation between visual evaluation and thermography was 0.92. Phototype presented a negative significant correlation of 0.67 with classical visual analysis. In the present study, we presented a simple method based on infrared thermography that can be adopted in any esthetics office with a correlation of 0.92 with the visual classic evaluation, but, besides, may be very helpful to the clinician to decide which treatment will be adopted, i.e., an aggressive and inflammatory approach such as the radiofrequency of shockwave therapy or an anti-inflammatory approach such as photobiomodulation, depending on the inflammatory status of cellulite.
Cellulite;Female;Humans;Lipodystrophy;Subcutaneous Fat;Thermography;Thigh

Effects of photobiomodulation therapy with red LED on inflammatory cells during the healing of skin burns. The aim of this study was to evaluate the effects of red light emitting diode (LED)

photobiomodulation therapy protocol on inflammatory cells during the healing of third-degree skin burns. Fifty Wistar rats were randomly divided into control group (CTRL) (nâ€‰=â€‰25) and red group (RED) (nâ€‰=â€‰25), with subgroups (nâ€‰=â€‰5) for each time of euthanasia (7, 14, 21, 28, and 32Â days). Treatment animals were daily irradiated (630Â nmâ€‰Â±â€‰10Â nm, 300 mW, 9Â J/cm(2) per point, 30Â s, continuous emission mode) at the 4 angles of the wound (total: 36Â J/cm(2)). After specimen removal, histological sections were stained with hematoxylin and eosin for quantitative analysis of the inflammatory infiltrate (neutrophils and lymphocytes) under light microscopy. Greater number of inflammatory cells was observed in irradiated groups when compared to CTRL at 7, 14, 21, and 28Â days, but with statistically significant difference only at 14Â days (pâ€‰=â€‰0.02). At 32Â days, higher inflammatory cell value was observed in CTRL when compared to RED, but with no statistically significant difference (pâ€‰=â€‰0.91). The results suggest that red LED, according to the protocol used, modulates the number of inflammatory cells in the early stages of the healing of third-degree skin burns. Nevertheless, this low-intensity light therapy may not, be efficient in reducing the number of neutrophils and lymphocytes in advanced stages of the repair process of skin burns. Further studies with other therapy protocols are needed to assess the effects of this type of light on the inflammatory response of skin burns. Animals;Burns;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Wound Healing

[Laser therapy effect on endothelial dysfunction in patients after the surgery for orthognathic disorders]. OBJECTIVE: To optimize postoperative rehabilitation by applying low-intensity laser irradiation (LILI) with different wavelengths in the early postoperative period to prevent inflammatory complications. MATERIAL AND METHODS: After radiological examination and ultrasound diagnostics of the periodontal tissue vessels, surgical methods of orthognathic treatment were performed, after completion of which a course of LILI was carried out. The VEGF its receptors (sVEGF-R1; sVEGF-R2) content was measured by enzyme immunoassay using standard reagent kits. The laser therapy using 635 nm laser light was applied directly to the vestibular and oral surfaces of the gingival tissues and in the operation area, changeable by the scanning method, for 1.5 minutes (5 W power); the pulsed infrared laser therapy (PILT) with the 904 nm wavelength (light pulse duration 100 s, power 15 W, 1500 Hz) applied epicutaneously to the operation projective zones (four control points of the upper and lower jaw) through the skin of the cheek, in stable method (1.5 minutes) with a time range between red and infrared wavelength LILI not exceeding 100 s (1.5 minutes). RESULTS: Vascular and endothelial dysfunction after laser irradiation with different wavelengths is better controlled by increasing the microcapillary blood flow (66.7% gain; $p<0.05$) in arteriolar and 70.3% in venular sections of capillaries ($p<0.01$), which is associated by vasodilatation: diameter increased by 26.9% compared to that under the influence of red laser radiation (by 13.0%) and infrared laser radiation (by 7.2%); $p<0.01$). CONCLUSIONS: Early laser therapy using the low-intensity laser irradiation with different wavelengths improves vasoactive processes of hemoregulation in dental tissues associated with the elimination of vasospasm caused by operative stress, activation of arteriolodilatory effects, contributes to the prevention of development of inflammatory complications. Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Phototherapy;Skin

Plant extract incorporated into glass ionomer cement as a photosensitizing agent for antimicrobial photodynamic therapy on Streptococcus mutans. BACKGROUND: A plant extract (EB) incorporated into glass ionomer cement (GIG) could be a potential photosensitizer for Antimicrobial PDT (aPDT) against caries-microorganisms, replacing methylene blue (MB), due to the presence of chlorophyll. GICÂ +Â EBÂ +Â aPDT could be an therapeutic alternative to dentin decontamination and sealing, allowing reduction of operative time. OBJECTIVE: Evaluate Dioscorea altissima (EB) incorporated into GIC as a photosensitizer for aPDT against Streptococcus mutans. METHODS: Groups (nÂ =Â 24; ntotalÂ =Â 192): G1-GIC; G2-GICÂ +Â LASER; G3-GIC/EB; G4-GIC/EBÂ +Â LASER; G5-

GIC+MB; G6-GICÂ +Â aPDT; G7-GIC/EBÂ +Â MB; and G8 - GIC/EB+aPDT. In aPDT groups, MB was the photosensitizer. In LASER groups, MB was not used. The irradiation protocol was 660Â nm/100Â mW/5Â J/150Â J/cmÂ²/50Â s, with a 5-min pre-irradiation time for the MB groups. Antibacterial assays were carried out in 24-well microplates. The wells were completed with one milliliter of a S. mutans in BHI at 1.3Â Ã—Â 10(8)Â CFU/mL suspension. After incubation, PDT or laser was performed. After MTT bacteria viability test, the data were submitted to the Kolgomorov-Smirnoff normality test, followed by one-way ANOVA and Tukey's posterior test, Î±Â <Â 0.05. RESULTS: Group G6 showed significant inhibition (pÂ <Â 0.001), followed by groups G4, G5, G7, and G8, which did not show significant differences among them (pÂ >Â 0.05). Groups G2 and G3 also showed similar results (pÂ >Â 0.05) and were the least active compared to the others. CONCLUSIONS: EB potentiated the antimicrobial action of GIC against S. mutans and laser irradiation over GIC/EB presented better antimicrobials results. The results indicate that EB could be a potential photosensitizer for aPDT. Anti-Bacterial Agents;Anti-Infective Agents;Glass Ionomer Cements;Photosensitizing Agents;Plant Extracts;Methylene Blue Anti-Bacterial Agents;Anti-Infective Agents;Biofilms;Glass Ionomer Cements;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Plant Extracts;Streptococcus mutans

Effects of light-emitting diode therapy on cardiovascular and salivary nitrite responses in postmenopausal women submitted to a single bout of high-intensity interval training. The aim of the present study was to analyze the effects of light-emitting diode therapy (LEDT) on cardiovascular effort during a single bout of high-intensity interval training (HIIT) and on blood pressure (BP), salivary nitrite, and heart rate variability (HRV) responses after the exercise session in postmenopausal women. Sixteen postmenopausal women between 50 and 70Â years of age participated in the present study. The intervention comprised two sessions: placebo plus HIIT and LEDT plus HIIT, with a 14-day interval between sessions. The oxygen uptake (VO(2)), heart rate (HR), and rating of perceived exertion (RPE) were monitored throughout the HIIT sessions. Salivary samples were taken before, immediately post, and 30' and 60' post-HIIT sessions for nitric oxide (NO) analysis. In addition, HR and BP were checked before, 15Â min, 30Â min, 45Â min, and 60Â min post-HIIT sessions. HR data were used to calculate the HRV indices. Cardiovascular parameters during HIIT and BP, HRV, and NO responses were not different between placebo and LEDT conditions (pâ€‰>â€‰0.05). BP responses increased after compared to pre-exercise (pâ€‰<â€‰0.01). HRV was impaired post- compared to pre-exercise (pâ€‰<â€‰0.05). LEDT did not improve physiological performance during HIIT and did not accelerate the recovery of BP and autonomic modulation or change the NO release after exercise in postmenopausal women. Nitrites Female;Heart Rate;High-Intensity Interval Training;Humans;Nitrites;Oxygen Consumption;Postmenopause

The comparison of calcium hydroxideâ€‰+â€‰biostimulation, calcium hydroxide, formocresol, and MTA pulpotomies without biostimulation in primary teeth: 12-months clinical and radiographic follow-up. This study has aimed to evaluate the clinical and radiographic success rates of calcium hydroxide pulpotomy (CH) with biostimulation (PBMT) and compare them to that of CH, formocresol (FC), mineral trioxide aggregate (MTA) pulpotomies without PBMT in primary molars. A total of 172 pulpotomies were performed on primary first or second mandibular molars in 94 children who were 5-8Â years old. The pulpotomy procedure was performed with four different techniques. In the PBMT group, before the CH placement, 820-nm diode laser radiation was applied to each pulp-stump for 12Â s (10 mW, 2.5Â J/cm(2)). The clinical (lack of spontaneous pain, abscess or fistula, and pathological mobility) and radiographic success (lack of periapical/furcal lesions and internal/external resorption) were recorded at 6 and 12Â months. The data was statistically evaluated. p valueâ€‰<â€‰0.05 was considered as significant. After 12Â months, the clinical and radiographic success rate (a tooth with at least one of the findings was considered unsuccessful) was 97%/92% for

FC and 97%/95%, 87%/73%, and 71%/45% for MTA, CHâ€‰+â€‰PBMT, and CH, respectively. There was no significant difference between the CHâ€‰+â€‰PBMT and the other groups in clinical success, while a significant difference was found between CH and FC, MTA groups. In radiographic success, there was a significant difference between the CH and the other groups. No significant difference was found between the 6th- and 12th-month results in clinical success for all the groups. A decrease in success over time was seen only in the CH group for radiographic results. CH without PBMT showed the worst clinical and radiographic results among the groups. CHâ€‰+â€‰PBMT showed similar clinical success compared to the MTA and FC groups. In radiographic success, CHâ€‰+â€‰PBMT showed higher success compared to CH, but this success was not high as compared to MTA and FC. Aluminum Compounds;Calcium Compounds;Calcium Hydroxide;Drug Combinations;Formocresols;mineral trioxide aggregate;Oxides;Silicates Child;Child, Preschool;Humans;Aluminum Compounds;Calcium Compounds;Calcium Hydroxide;Drug Combinations;Follow-Up Studies;Formocresols;Oxides;Pulpotomy;Silicates;Tooth, Deciduous

Evaluation of effect of low level laser therapy with intracanal medicament on periapical healing: A randomised control trial. OBJECTIVE(S): Photobiomodulation, also commonly referred to as low level laser therapy (LLLT), uses light energy to elicit biological responses from the cell and normalise cell function. Using LLLT on bone has been demonstrated to be effective in modulating inflammation, accelerating bone cell proliferation and enhancing the healing process. The objectives of this study were to evaluate postoperative pain and periapical healing in two different groups. MATERIALS AND METHODS: 40 subjects with periapical lesion were selected and were assigned randomly into two groups. Group I: Conventional root canal therapy along with LLLT. Group II: Conventional root canal therapy only. Radiographs were obtained and assessed at baseline, 3, 6 and 9 months postoperatively. The VAS pain scale was assessed post operatively at 0, 7(th) and 14(th) day respectively. The Independent t-test was used for evaluation of the data. RESULTS: Significant differences were noted in reduction of periapicallesion at 3 and 9 months follow-up. The healing was better in Group I that received LLLT with the conventional Root Canal Treatment (RCT). Values for postoperative pain was lower in Group I than Group II, but were statistically non-significant. CONCLUSION(S): LLLT when used as an adjunct with conventional root canal treatment showed acceleration of the healing process of periapical lesions. LLLT has a positive effect on modulating the immune response for favourable healing. Humans;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative;Periapical Periodontitis;Root Canal Therapy;Wound Healing

Effect of Low-Level Er: YAG (2940 nm) laser irradiation on the photobiomodulation of mitogen-activated protein kinase cellular signaling pathway of rodent cementoblasts. BACKGROUNDS: Dental avulsion due to trauma, especially in young patients, is a worldwide problem, requiring tooth replacement. Delayed replantation could cause tooth loss when the cementum is severely damaged. A small number of studies has reported that photobiomodulation (PBM) therapy using Er: YAG laser irradiation activates cellular signaling responses in different cell types, resulting in a variety of favorable biological effects. The aim of this in vitro study was to evaluate the potential biostimulatory effect of low-level Er: YAG laser irradiation on the biological responses of cultured mouse cementoblasts (OCCM-30), including the mitogen-activated protein kinases (MAPKs). METHODS: OCCM-30 cells were exposed to 2940 nm Er: YAG laser irradiation for 15 s at 0.34 W (pulse duration of 100 or 1000 Î¼s, 17 mJ/pulse) at energy densities of 1 or 2 J/cm(2). Irradiated and non-irradiated OCCM-30 cells were tested for migration (Scratch assay), proliferation (MTS assay) and functional differentiation (Alizarin Red S assay). Lumican (Lum) and Fibromodulin (Fmod) gene expression, and activation of MAPKs, were assessed by RT-PCR and Western blotting, respectively. RESULTS: Low-level Er: YAG laser irradiation at 2 J/cm(2) and pulse duration of 1000 Î¼s resulted in the highest migration rate and proliferation. Moreover, the pulse duration irradiation of 100 Î¼s increased Lum expression.

Fmod expression was increased after 1000 Î¼s pulse duration laser stimulation. Low-level Er: YAG laser irradiation increased the mineralization of OCCM-30 cells after 7 days and activated ERK1/2, P38 and JNK signaling. CONCLUSIONS: Low-level Er: YAG laser irradiation induces OCCM-30 cell migration, proliferation and differentiation, and activates the MAPK signaling pathway. Mitogen-Activated Protein Kinases Animals;Dental Cementum;Humans;Lasers, Solid-State;Mitogen-Activated Protein Kinases;Rodentia;Signal Transduction

Review of oral mucositis treatment guidelines with an emphasis on laser therapy. Healthcare professionals require effective treatment options for managing the complications that may arise during cancer treatment. The Multinational Association of Supportive Care in Cancer (MASCC) and the International Society of Oral Oncology (ISOO) work together to reduce oral complications secondary to cancer, including difficulties associated with oral mucositis (OM). The present article is intended to summarize the MASCC/ISOO guidelines, which are updated periodically based on the most recent evidence supporting the multiple treatment options for OM caused by chemotherapy and radiotherapy used to treat head and neck tumors. The Mucositis Study Group (MSG) of MASCC/ ISOO conducted systematic reviews of the current literature pertaining to several interventions, including anti-inflammatory agents; basic oral care; vitamins, minerals, and nutritional supplements; and photobiomodulation. The MSG then categorized the effectiveness of each treatment for preventing OM or reducing the severity, duration, and reported pain of patients with OM based on the type of cancer being treated, the cancer treatment modality (chemotherapy, radiotherapy, or combination therapy), and the goals of the OM treatment (preventive or therapeutic). The present article also describes a case demonstrating the positive effects of using various laser devices to heal the symptoms of OM in a patient undergoing radiotherapy and chemotherapy for a squamous cell carcinoma at the base of the tongue. Dietary Supplements;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mucositis;Stomatitis

Induction of hair growth in hair follicle cells and organ cultures upon treatment with 30 kHz frequency inaudible sound via cell proliferation and antiapoptotic effects. Androgenic alopecia is a hair loss disease mediated by dihydrotestosterone (DHT) and is currently treated using minoxidil, finasteride, or low-level laser therapy. However, these treatments have side-effects, indicating the need for an alternative treatment. In the present study, it was demonstrated that inaudible sound at 30 kHz significantly induced proliferative and anti-apoptotic effects in human dermal papilla cells (hDPCs) and outer root sheath keratinocytes. Cell viability assay, ELISA, reverse transcription quantitative PCR and TUNEL assays were performed to evaluate the effect of inaudible sound. Inaudible sound was also demonstrated to significantly inhibit the hair loss signals induced by DHT treatment in hDPCs. Furthermore, inaudible sound significantly induced hair follicle (HF) elongation and hair matrix keratinocyte proliferation in human HF organ culture. Overall, the results suggested that inaudible sound may be effective in treating hair loss and could be used to develop a new hair loss treatment approach.

Short- and long-term effects of whole-body photobiomodulation on pain, functionality, tissue quality, central sensitisation and psychological factors in a population suffering from fibromyalgia: protocol for a triple-blinded randomised clinical trial. BACKGROUND: The development of an integral and global treatment to improve the quality of life in those with fibromyalgia syndrome (FMS) is challenging. The aim of this study is to investigate the impact of whole-body photobiomodulation (PBM) on pain perception, functionality, quality of soft tissue, central sensitisation and psychological factors in patients suffering with FMS. METHODS: This study is a randomised, placebo-controlled clinical trial. A total of 44 participants will be recruited in a private care practice and randomised to receive either a whole-body PBM therapy programme or placebo in the same care centre. The parameters of the PBM programme are as follows: wavelengths of red and near-infrared LEDs 50:50

ratio with 660-850 nanometers; fluence of 25.2 J/cm(2); treatment time of 1200â€‰s and a total power emitted of 967 W. Treatment sessions will be 3 times weekly for a period of 4â€‰weeks, totalling 12 treatment sessions. Primary outcome will be pain (Numeric Pain Rating Scale; Widespread Pain Index; Symptom Severity Score). Secondary outcomes will be functionality (Fibromyalgia Impact Questionnaire; the Leisure Time Physical Activity Instrument), quality of soft tissue (elastography), central sensitisation (pain pressure threshold and the Autonomic Symptom Profile) and psychological factors (Pain Catastrophising scale, Tampa Scale, Self-Efficacy questionnaire). Assessments will be at baseline (T1), after session 6 (T2), after treatment (T3) and 2â€‰weeks (T4), 3 (T5) and 6 (T6) month follow-up. DISCUSSION: PBM therapy has been shown to reduce pain and inflammation and to increase the rate of tissue repair for a wide range of conditions, but its potential use as a whole-body treatment in FM is yet to be explored. This trial will investigate whether whole-body PBM therapy is effective at reducing pain intensity, improving functionality, quality of soft tissue, central sensitisation symptoms and psychological measurements. Furthermore, 3- and 6-month follow-up will investigate long-term efficacy of this treatment. TRIAL REGISTRATION: NCT04248972. Registered on January 29, 2020, https://clinicaltrials.gov/ct2/show/NCT04248972?term=navarro-ledesma+santiago&draw=2&rank=2.

Noninvasive Systemic Modalities for Prevention of Head and Neck Radiation-Associated Soft Tissue Injury: A Narrative Review. BACKGROUND: â€ƒRadiation-associated soft tissue injury is a potentially devastating complication for head and neck cancer patients. The damage can range from minor sequelae such as xerostomia, which requires frequent daily maintenance, to destructive degenerative processes such as osteoradionecrosis, which can contribute to flap failure and delay or reverse oral rehabilitation. Despite the need for effective radioprotectants, the literature remains sparse, primarily focused on interventions beyond the surgeon's control, such as maintenance of good oral hygiene or modulation of radiation dose. METHODS: â€ƒThis narrative review aggregates and explores noninvasive, systemic treatment modalities for prevention or amelioration of radiation-associated soft tissue injury. RESULTS: â€ƒWe highlighted nine modalities with the most clinical potential, which include amifostine, melatonin, palifermin, hyperbaric oxygen therapy, photobiomodulation, pentoxifylline-tocopherol-clodronate, pravastatin, transforming growth factor-Î² modulators, and deferoxamine, and reviewed the benefits and limitations of each modality. Unfortunately, none of these modalities are supported by strong evidence for prophylaxis against radiation-associated soft tissue injury. CONCLUSION: â€ƒWhile we cannot endorse any of these nine modalities for immediate clinical use, they may prove fruitful areas for further investigation. Fibroblast Growth Factor 7;Transforming Growth Factors;Deferoxamine;Melatonin;Pravastatin;Amifostine Amifostine;Deferoxamine;Fibroblast Growth Factor 7;Humans;Melatonin;Pravastatin;Soft Tissue Injuries;Transforming Growth Factors

Treatment of recurrent minor aphthous stomatitis using diode laser (940 nm). BACKGROUND: The exact etiology of recurrent aphthous ulcers (RAUs) is unknown. The management of RAUs is not always straightforward. Ulcers in the mouth (recurrent aphthous stomatitis [RAS]) are very common and may vary in size from very small to very large. OBJECTIVE: To evaluate reduction in pain intensity and duration of pain relief, reduction in size of ulcer, and duration for healing of ulcer (healing time) in patients with RAS after application of Low-Level Light Amplification by Stimulated Emission of Radiation therapy (LLLT) comparing with topical Anginovag spray medication and control group. MATERIALS AND METHODS: A total of 21 individuals diagnosed as RAS were divided into three equal groups as follows: Group 1: Minor aphthous ulcer, which was treated by giving LLLT using Diode LASER; Group 2: Minor aphthous ulcer, which was treated by topical Anginovag spray medication.; Group 3: Minor aphthous ulcer, which was treated conservatively with motivation and follow-up. RESULTS: In this randomized, controlled, clinical study, LLLT using Diode LASER causes reduction in

pain intensity due to RAUs, thereby reducing morbidity. There is also reduction in the diameter and healing time of the ulcer as compared to Anginovag spray medication and the control group. CONCLUSION: Although various treatment modalities have been used and LLLT is not commonly used to treat aphthous ulcers, this study suggests that using LLLT would be a safe and effective treatment modality for RAUs patients. Humans;Lasers, Semiconductor;Stomatitis, Aphthous;Treatment Outcome;Ulcer

Photobiomodulation at Different Wavelengths Boosts Mitochondrial Redox Metabolism and Hemoglobin Oxygenation: Lasers vs. Light-Emitting Diodes In Vivo. Our group previously examined 8 min photobiomodulation (PBM) by 1064 nm laser on the human forearm in vivo to determine its significant effects on vascular hemodynamics and cytochrome c oxidase redox activity. Since PBM uses a wide array of wavelengths, in this paper, we investigated (i) whether different wavelengths of lasers induced different PBM effects, and (ii) if a light-emitting diode (LED) at a similar wavelength to a laser could induce similar PBM effects. A broadband near-infrared spectroscopy (bbNIRS) system was utilized to assess concentration changes in oxygenated hemoglobin (Î”[HbO]) and oxidized cytochrome c oxidase (Î”[oxCCO]) during and after PBM with lasers at 800 nm, 850 nm, and 1064 nm, as well as a LED at 810 nm. Two groups of 10 healthy participants were measured before, during, and after active and sham PBM on their forearms. All results were tested for significance using repeated measures ANOVA. Our results showed that (i) lasers at all three wavelengths enabled significant increases in Î”[HbO] and Î”[oxCCO] of the human forearm while the 1064 nm laser sustained the increases longer, and that (ii) the 810-nm LED with a moderate irradiance (â‰ˆ135 mW/cm(2)) induced measurable and significant rises in Î”[HbO] and Î”[oxCCO] with respect to the sham stimulation on the human forearm.

Photobiomodulation for Lowering Pain after Tonsillectomy: Low Efficacy and a Possible Unexpected Adverse Effect. BACKGROUND: Tonsillectomy is one of the most common surgical procedures performed in children as a treatment for obstructive sleep apnea due to tonsil hypertrophy or highly recurrent tonsillitis. Odynophagia, associated with food refusal for the first few days, is a common post-operative complaint. Available drugs for pain management, while efficacious, present some drawbacks, and a novel strategy would be welcome. Photobiomodulation (PBMT), in this context, can represent a possible choice, together with pharmacological therapy. The aim of this study was to evaluate PBMT effects compared to standard pain therapy on nociceptive sensation at different time points and administration of painkiller. METHODS: A registered, controlled, randomized, double-blind clinical trial was performed. Twenty-two patients were recruited and divided into laser-treated (T) or untreated (UT) groups, based on random assignment. In T group, immediately after tonsillectomy, performed with cold dissection technique, laser light was applied to the surgery site (using a Cube 4 from Eltech K-Laser s.r.l., Treviso, Italy), and then hemostasis was performed using bismuth subgallate paste. In C group, the same procedure was performed, except that laser light was switched off. The primary outcome was the difference in pain scores between subject receiving photobiomodulation (PBMT) and subjects receiving standard care after 24 h; the secondary outcomes were pain scores at awakening and at 48 h together with distress (delirium) at awakening. RESULTS: Two patients from the T group experienced a post-surgery bleeding, and one of them required revision of the hemostasis under general anesthesia. A preliminary analysis of pain sensation reported by the patients or caregivers did not show differences between treated and untreated subjects. CONCLUSION: These data suggest that PBMT could increase post-surgical bleeding.

Photobiomodulation Therapy Combined with Static Magnetic Field (PBMT-SMF) on Spatiotemporal and Kinematics Gait Parameters in Post-Stroke: A Pilot Study. BACKGROUND: Gait deficit is a major complaint in patients after stroke, restricting certain activities of daily living. Photobiomodulation therapy combined with a static magnetic field (PBMT-SMF) has been studied for

several diseases, and the two therapies are beneficia. However, their combination has not yet been evaluated in stroke. Therefore, for PBMT-SMF to be used more often and become an adjunctive tool in the rehabilitation of stroke survivors at physical therapy rehabilitation centers and clinics, some important aspects need to be clarified. PURPOSE: This study aimed to test different doses of PBMT-SMF, to identify the ideal dose to cause immediate effects on the spatiotemporal and kinematic variables of gait in post-stroke patients. METHODS: A randomized, triple-blinded, placebo-controlled crossover pilot study was performed. A total of 10 individuals with hemiparesis within 6 months to 5 years since the occurrence of stroke, aged 45-60 years, were included in the study. Participants were randomly assigned and treated with a single PBMT-SMF dose (sham, 10 J, 30 J, or 50 J) on a single application, with one dose per stage at 7-day intervals between stages. PBMT-SMF was applied with a cluster of 12 diodes (4 of 905 nm laser, 4 of 875 nm LEDs, and 4 of 640 nm LEDs, SMF of 35 mT) at 17 sites on both lower limbs after baseline evaluation: plantar flexors (2), knee extensors (9), and flexors (6). The primary outcome was self-selected walking speed, and the secondary outcomes were kinematic parameters. Gait analysis was performed using SMART-D 140(Â®) and SMART-D INTEGRATED WORKSTATION(Â®). The outcomes were measured at the end of each stage after the single application of each PBMT-SMF dose tested. RESULTS: No significant differences ($p > 0.05$) in spatiotemporal variables were observed between the different doses, compared with the baseline evaluation. However, differences ($p < 0.05$) were observed in the kinematic variable of the hip in the paretic and non-paretic limbs, specifically in the minimum flexion/extension angulation during the support phase (HMST-MIN) in doses 10 J, 30 J, and 50 J. CONCLUSIONS: A single application of PBMT-SMF at doses of 10 J, 30 J, and 50 J per site of the lower limbs did not demonstrate positive effects on the spatiotemporal variables, but it promoted immediate effects in the kinematic variables of the hip (maximum and minimum flexion/extension angulation during the support phase) in the paretic and non-paretic limbs in post-stroke people.

Blue Laser Irradiation Decreases the ATP Level in Mouse Skin and Increases the Production of Superoxide Anion and Hypochlorous Acid in Mouse Fibroblasts. Photobiomodulation studies have reported that blue light irradiation induces the production of reactive oxygen species. We investigated the effect of blue laser (405 nm) irradiation on the ATP levels in mouse skin and determined the types of reactive oxygen species and reactive nitrogen species using cultured mouse fibroblasts. Blue laser irradiation caused a decrease in the ATP level in the mouse skin and triggered the generation of superoxide anion and hypochlorous acid, whereas nitric oxide and peroxynitrite were not detected. Moreover, blue laser irradiation resulted in reduced cell viability. It is believed that the decrease in the skin ATP level due to blue light irradiation results from the increased levels of oxidative stress due to the generation of reactive oxygen species. This method of systematically measuring the levels of reactive oxygen species and reactive nitrogen species may be useful for understanding the effects of irradiation conditions.

Method to analyze effects of low-level laser therapy on biological cells with a digital holographic microscope. Low-level laser therapy (LLLT) is a therapeutic tool that uses the photobiochemical interaction between light and tissue. Its effectiveness is controversial due to a strong dependence on dosimetric parameters. In this work, we demonstrate that digital holographic microscopy is an effective label-free imaging technique to analyze the effects of LLLT on biological cells, and we propose the full methodology to create correct synthetic aperture phase maps for further extensive, highly accurate statistical analysis. The proposed methodology has been designed to provide a basis for many other biological experiments using quantitative phase imaging. We use SHSY-5Y and HaCaT cells irradiated with different doses of red light for the experiment. The analysis shows quantitative changes in cell dry mass density and the projected cell surface in response to different radiation doses. Holography;Low-Level Light Therapy

An exploration of optimal time and safety of 595-nm pulsed dye laser for the treatment of early superficial infantile hemangioma. Infantile hemangioma (IH) is the most common benign vascular tumor that occurs in infants and young children. Studies have shown laser therapy to reduce the proliferation of superficial IH and promote its regression, but the optimal timing for treatment has not been determined. Our study explores the timing and safety of 595-nm pulsed dye laser (PDL) treatment for early superficial IH. We retrospectively analyzed 180 cases of superficial IH treated with 595-nm PDL. Data was organized according to patient age at the first visit. Six months after the initial treatment, patients were evaluated using a grade IV classification method, and the clinical curative effect of each group was calculated. The number of laser treatments and the occurrence of adverse reactions were recorded simultaneously. The overall effective and cure rates were 98.3% and 84.4%, respectively, with no significant difference in rates between groups (pâ€‰>â€‰0.05). There was a statistically significant difference in the number of laser treatments among the age groups (pâ€‰<â€‰0.05). The average laser frequency: "0-2â€‰months group" < "2-4â€‰months group" < "4-6â€‰months group." The overall incidence of adverse reactions was 11.1%, and 12 (6.7%) cases had short-term adverse reactions, with no statistically significant differences between groups (p >â€‰0.05). Eight cases had long-term adverse reactions. This difference between groups was statistically significant (pâ€‰<â€‰0.05). Younger children (â‰¤2Â months of age) receiving 595-nm PDL treatment for IH require relatively fewer treatment times than other children (>2Â months of age), have a shorter course of disease, experience better curative effect, and have fewer sequelae reactions. Child;Child, Preschool;Hemangioma;Humans;Infant;Laser Therapy;Lasers, Dye;Low-Level Light Therapy;Retrospective Studies;Treatment Outcome

Photobiomodulation Therapy to Autologous Bone Marrow in Humans Significantly Increases the Concentration of Circulating Stem Cells and Macrophages: A Pilot Study. Objective: The aim of this study was to examine the effect of photobiomodulation therapy (PBMT) of the bone marrow (BM) on the concentration of stem cells and other cells in the circulating blood (CB) in humans. Background: Circulating stem cells have received increasing attention in recent years due to their potential role in regenerative medicine. Various biological processes have been shown to be affected by PBMT. Methods: The study was conducted on 15 volunteers. Ga-Al-As diode laser 808 nm wavelength was applied to both tibias of each volunteer for PBMT to the BM. The kinetics of concentration of various cells in the CB was followed by comparing blood samples relative to their baseline levels prior to application of PBMT to the BM. CD-34+ cells and macrophages were identified in CB samples using flow cytometry technology. Results: PBMT to the BM caused a significant (p < 0.01) increase in the concentration of CD-34+ cells in the CB from 7.8â€‰Â±â€‰3.0% (meanâ€‰Â±â€‰SD) of total mononucleated cell to 29.5â€‰Â±â€‰10.1% of total commencing at about 2 h post-PBMT. The levels of CD-34+ cells peaked at 2-4 days post-PBMT and then gradually returned to baseline levels. Macrophages in the CB were also significantly (pâ€‰<â€‰0.01) elevated following PBMT to the BM from 7.8â€‰Â±â€‰6.0% (meanâ€‰Â±â€‰SD) of the total mononucleated cells to 52.1â€‰Â±â€‰7.9% of total. Conclusions: Application of PBMT to the BM in humans can significantly increase the concentration of CD-34+ cells and macrophages in the CB. These cells may consequently home in on the impaired target organs and improve their function, as has been previously shown in experimental animal models. Furthermore, the results may also have clinical relevance in respect to enrichment of CB in cells that may be consequently isolated for cell therapy. Clinical Trial Registration No. is 7/14. Animals;Attention;Bone Marrow;Humans;Low-Level Light Therapy;Macrophages;Pilot Projects;Stem Cells

Lasers, lights, and compounds for hair loss in aesthetics. Hair loss is a common complaint that is often stressful for patients and a challenge for practitioners to treat. Fortunately, innovations in the field have contributed to growing evidence for several promising topical, oral, and light and energy-

based therapies. We have reviewed the current literature about the efficacy of these treatments, including topical agents (finasteride, latanoprost, spironolactone, caffeine, and metformin), oral minoxidil, nutraceuticals, platelet-rich plasma, low-level laser therapy, fractional lasers, and laser-assisted drug delivery. In addition, several debates related to these treatments have been discussed, including post-finasteride syndrome, effects of biotin supplementation on laboratory testing, standardization of platelet-rich plasma and low-level laser therapy, and combination treatment to enhance hair transplantation. Finasteride;Minoxidil
Alopecia;Esthetics;Finasteride;Humans;Lasers;Minoxidil;Treatment Outcome

Photobiomodulation Therapy Minimizes the DNA Damage in 5FU-Treated Gingival Fibroblasts. 5-Fluoroufacil (5FU) is a chemotherapeutic agent indicated for solid tumors but causes oral mucositis, which can be prevented and treated using photobiomodulation therapy (PBMT). It is unknown whether PBMT modifies DNA damage induced by 5FU in oral cells. The aim of this study was to investigate the effect of PBMT on DNA damage and repair and on oxidative stress in gingival fibroblasts exposed to 5FU. Primary gingival fibroblasts were exposed to 5FU and then treated with a laser (660â€‰nm, 100 mW, 1â€‰Wâ€‰cm(-2) , 0.09 cm(2) spot area) for three different irradiation times (6, 10 or 20 s). Six-second irradiation decreased DNA damage and lipidic peroxidation. All irradiated groups showed low H2AX levels and increased p53 expression. Ten-second irradiation showed a trend to induce high lipidic peroxidation levels and DNA damage than other irradiation groups. In conclusion, the PBMT effect on DNA damage and repair was dependent on the time irradiation: 6 s-time irradiation (6.6â€‰Jâ€‰cm(-2)) protect gingival fibroblasts from 5FU-related genotoxicity and oxidative stress, whereas 10s- and 20s-time irradiations (11.1â€‰Jâ€‰cm(-2) and 22.2â€‰Jâ€‰cm(-2) , respectively) increased the risk of DNA damage after the 5FU exposure. Tumor Suppressor Protein p53;Fluorouracil DNA Damage;Fibroblasts;Fluorouracil;Low-Level Light Therapy;Tumor Suppressor Protein p53

Systemic and local effects of doxycycline and low-intensity laser treatment on periodontitis in rats. PURPOSE: This study evaluated the systemic and local effects of doxycycline (DOX) and low-intensity laser (LIL) treatment as adjuvants to scaling and root planing (SRP) in the treatment of experimental periodontitis in rats. METHODS: The sample consisted of 180 male rats (Rattus norvegicus albinus, Wistar), of which 30 did not receive induction of periodontal disease (negative control [NC] group) and 150 received induction of periodontal disease in the lower first molar. After 7 days, the ligature was removed, and the animals were divided into the following groups: NT (no treatment), SRP (SRP), DOX (SRP and DOX irrigation), LIL (SRP and laser irradiation), and DOX+LIL (SRP, DOX, and LIL). The animals were euthanized at 7, 15, and 30 days; thereafter, biochemical, radiographic, histological, and immunohistochemical analyses were performed. RESULTS: In the intragroup analysis, lower concentrations of Î±-1-glycoprotein acid (Î±-1-Ga) and complement 3 (C3) were observed in the DOX+LIL group than in all other groups at all time points, as well as lower levels of complement 4 (C4) at 15 and 30 days (P<0.001). Less bone loss was observed in the DOX, LIL, and DOX+LIL groups than in the NC and SRP groups at all time points (P<0.001). There was a smaller number of tartrate-resistant acid phosphatase (TRAP)-positive cells in the DOX+LIL group than in the other groups at all time points (P<0.001). Positive correlations were observed between the systemic levels of Î±-1-Ga, C3, and C4 and the number of TRAP-positive cells. CONCLUSIONS: The combination of DOX with LIL as SRP adjuvants was effective both systemically and locally for the treatment of experimental periodontitis in rats.

Photobiomodulation Therapy Restores IL-10 Secretion in a Murine Model of Chronic Asthma: Relevance to the Population of CD4(+)CD25(+)Foxp3(+) Cells in Lung. It is largely known that photobiomodulation (PBM) has beneficial effects on allergic pulmonary inflammation. Our previous study showed an anti-inflammatory effect of the PBM in an acute experimental model of asthma, and

we see that this mechanism is partly dependent on IL-10. However, it remains unclear whether the activation of regulatory T cells is mediated by PBM in a chronic experimental model of asthma. In this sense, the objective of this study was to verify the anti-inflammatory role of the PBM in the pulmonary inflammatory response in a chronic experimental asthma model. The protocol used for asthma induction was the administration of OVA subcutaneously (days 0 and 14) and intranasally (3 times/week, for 5 weeks). On day 50, the animals were sacrificed for the evaluation of the different parameters. The PBM used was the diode, with a wavelength of 660 nm, a power of 100 mW, and 5 J for 50 s/point, in three different application points. Our results showed that PBM decreases macrophages, neutrophils, and lymphocytes in the bronchoalveolar lavage fluid (BALF). Moreover, PBM decreased the release of cytokines by the lung, mucus, and collagen in the airways and pulmonary mechanics. When we analyzed the percentage of Treg cells in the group irradiated with laser, we verified an increase in these cells, as well as the release of IL-10 in the BALF. Therefore, we conclude that the use of PBM therapy in chronic airway inflammation attenuated the inflammatory process, as well as the pulmonary functional and structural parameters, probably due to an increase in Treg cells. Anti-Inflammatory Agents;Forkhead Transcription Factors;Foxp3 protein, mouse;Interleukin-10;Ovalbumin Animals;Anti-Inflammatory Agents;Asthma;CD4-Positive T-Lymphocytes;Disease Models, Animal;Forkhead Transcription Factors;Inflammation;Interleukin-10;Low-Level Light Therapy;Lung;Mice;Mice, Inbred BALB C;Ovalbumin

Cone photoreceptor preservation with laser photobiomodulation in murine and human retinal dystrophy. Animals;Disease Models, Animal;Humans;Low-Level Light Therapy;Mice;Retinal Cone Photoreceptor Cells;Retinal Dystrophies

Phototherapies as an adjuvant treatment for oral paracoccidioidomycosis. Photosensitizing Agents Humans;Mouth Diseases;Paracoccidioidomycosis;Photochemotherapy;Photosensitizing Agents;Phototherapy

Physiotherapeutic Reduction of Orofacial Pain Using Extremely Low-Frequency Electromagnetic Field and Light-Emitting Diode Therapy-A Pilot Study. INTRODUCTION: Pain is a natural response of the body to injury and one of the symptoms defining an inflammatory reaction. It is almost always present after orthognathic surgeries (OGS), but its severity is subjective in each patient. Postoperative care of the patient is aimed at minimizing of postoperative pain relief orofacial region. Options of physiotherapy include extremely low-frequency electromagnetic field (ELF EMF) and high-energy light-emitting diode (LED). Aim of the Study. The aim of this study was to evaluate the effects of physiotherapy combining ELF EMF and LED to reduce pain of the orofacial region in patients after OGS. Material and Methods. The study was conducted in thirty-two patients who underwent OGS to treat morphological defects. The participants were randomly divided into two groups: Physiotherapy group (PT) and Control group (CG). In both groups, patients were prescribed Paracetamol and nonsteroidal analgesics (NSAID-ibuprofen). Patients from the PT group additionally received postoperative physiotherapy immediately after leaving the surgical clinic in the form of ELF EMF and LED therapy. Physiotherapeutic treatments were performed for 10â€‰days, three applications a day, at no cost to the patient. Pain intensity was assessed using the visual analogue scale (VAS), which is a reliable instrument for the measurement of pain intensity self-reported by the patient. RESULTS: Faster reduction of pain was the major observation made in patients who received physiotherapy treatments. In all subjects, after 5 days of therapy, the pain intensity was reduced by about 50% or resolved completely. Effects of therapy were measured with the relative changes in the pain intensity score, showing what fraction of the initial pain was eliminated at the first stage and throughout the whole therapy. The analysis of relative changes instead of absolute changes allowed us, among other things, to eliminate the bias of the higher initial pain intensity in the CG group compared to the PT group. CONCLUSIONS: The conducted research revealed that the combined use of ELF EMF and LED is

beneficial in the reduction of pain of patients after OGS. The analgesic effects of physiotherapy in the treatment after OGS are necessary to continue research in this area and analyze the possibility of extending the indications for its use in other surgically treated maxillofacial diseases. Acetaminophen;Ibuprofen Acetaminophen;Electromagnetic Fields;Facial Pain;Humans;Ibuprofen;Pilot Projects

In vivo comparative study of the effects of using the enamel matrix derivative and/or photobiomodulation on the repair of bone defects. BACKGROUND: The repair of bone defects has been the subject of many studies that have shown inconclusive results as to what is the best bone substitute. MATERIAL AND METHODS: Bone defects (Ã˜ 2 mm) were induced on the tibia of seventy-two rats, which were distributed into the following four groups/treatments (n=18 each): Control: no treatment; EMD: enamel matrix derived protein; PBM: photobiomodulation therapy (660 nm, 0,035 W, 60 s); EMD + PBM: EMD and immediate treatment with PBM (660 nm, 0,035 W, 60 s). Six animals from each group were euthanized after 10, 30 and 60 days. Histological and immunohistochemistry analyses (osteocalcin - OCN and tartrate-resistant acid phosphatase - TRAP) were performed with scores for each of the biological events. RESULTS: All performed treatments resulted in an increased filling and maturation of bone tissue, being greater in the EMD and EMD + PBM groups in the 30 day period, compared to the Control group. The immunostaining of OCN was greater at 60 days in all treated groups than in the Control over the same period. TRAP immunostaining was higher at 30 days in all treated groups, and lower in groups EMD and PBM after 60 days, compared to the Control over the same period. There was greater immunostaining in the EMD + PBM group after 10 days than in the Control and EMD groups in the same period. CONCLUSIONS: These results lead to the conclusion that treatments with EMD and PBM, both separate and in association were effective in filling and maturing bone tissue in tibial bone cavities, with greater effectiveness in the period of 30 days in the EMD and EMD + PBM groups. Key words:Enamel matrix proteins, low-level laser, bone, animal research.

A single session of antimicrobial photodynamic therapy does not influence the alveolar repair process in rats. The aim of this study was to use microscopic and molecular techniques to evaluate the effects of a single session of antimicrobial photodynamic therapy (aPDT) on the alveolar repair process after tooth extraction in rats. The study sample included 84 rats divided into four groups, as follows: a) Control - untreated socket; b) Laser - socket treated using photobiomodulation; c) TBO - socket treated with topic application of the photosensitizer agent, toluidine blue O (TBO); and d) aPDT - socket treated with TBO and laser irradiation. An additional rat was used for thermal mapping during socket irradiation. The animals were euthanatized at 6, 15, and 28 days after unilateral extraction of the upper incisor. Quantitative and qualitative analyses of the connective and bone tissues, blood clot, blood vessel, and inflammatory infiltrate were performed, and real-time polymerase chain reaction was used to study the expression of genes (collagen type I, osteocalcin, alkaline phosphatase [ALP], runt-related transcription factor 2 [RUNX2], and vascular endothelial growth factor [VEGF]) involved in the bone healing process. No statistically significant differences in microscopic and molecular outcomes were observed between the groups ($p > 0.05$). A positive correlation was seen to exist between blood clot and VEGF ($p = 0.000$), and a negative correlation was observed between bone tissue and ALP ($p = 0.028$) and blood vessel and VEGF ($p = 0.018$). A single session of aPDT in the dental extraction site did not influence the alveolar repair process in rats. Anti-Infective Agents;Vascular Endothelial Growth Factor A Alveolar Process;Animals;Anti-Infective Agents;Photochemotherapy;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket;Vascular Endothelial Growth Factor A

Investigation of oral and general health status and IL-1Î² gene polymorphism as risk factors for oral mucositis in hematopoietic stem cell transplantation patients. The aim of the present study was

to analyze the relationship of OM with possible risk factors such as oral health condition, immunological status and IL-1Î² profile in patients submitted to hematopoietic stem cell transplantation (HSCT). Fifty-four individuals submitted to HSCT were included. All patients received previous dental treatment and photobiomodulation (PBM) as the institutional OM preventive protocol. OM scores, immune status, and IL-1Î² levels were determined during the conditioning period and at D+3 and D+8 after HSC infusion. IL-1Î² gene polymorphism was also analyzed during conditioning. Possible associations of OM with risk factors were analyzed using conditional Fisher's exact test. OM was observed in 34 patients (62.9%) classified as Grade 1 (13 patients/24.1%), Grade 2 (14 patients/25.9%), Grade 3 (3 patients/5.5%), and Grade 4 (4 patients/7.4%). Allogeneic HSCT individuals exhibited a higher OM grade than autologous subjects. Moreover, an association was observed between severe OM and severe gingivitis (p = 0.01), neutropenia (p = 0.03), and leukopenia (p = 0.04). A significant association between OM and lower IL-1Î² levels was detected at three time points, i.e., conditioning (p = 0.048), D+3 (p = 0.01), and D+8 (p = 0.005). The results showed that IL-1Î² gene polymorphism was not associated with OM. Our study provided important insights into the scope of OM risk factors in the setting of HSCT. Patients submitted to HSCT with severe gingivitis prior to chemotherapy and with severe neutropenia and leukopenia exhibited a higher OM grade. Further investigation will be necessary to better understand the exact role of IL-1Î² in the context of OM pathobiology and to validate cytokine analysis in larger cohorts. Health Status;Hematopoietic Stem Cell Transplantation;Humans;Polymorphism, Genetic;Risk Factors;Stomatitis;Transplantation Conditioning

Thermodynamic basis for comparative photobiomodulation dosing with multiple wavelengths to direct odontoblast differentiation. Multiple wavelength devices are now available for photobiomodulation (PBM) treatments, but their dosimetry for individual or combinatorial use remains unclear. The present work investigated the effects of 447, 532, 658, 810, 980 and 1064â€‰nm wavelengths on odontoblast differentiation at 10Â mW/cm(2) using either equal treatment time for conventional fluence (300â€‰seconds for 3Â J/cm(2)) or varying times to adjust for individual wavelength photon fluence (4.6Â p.J/cm(2)). Both 447 and 810â€‰nm significantly increased alkaline phosphatase (ALP) activity, while 1064â€‰nm showed reduced ALP activity at 3Â J/cm(2) . However, ALP induction was significantly improved when equivalent photon fluence dosing was used. Other wavelengths did not show significant changes compared to untreated controls. The data suggest that accounting for wavelength-specific photon energy transfer during PBM dosing could improve clinical safety and efficacy. Low-Level Light Therapy;Odontoblasts;Thermodynamics

Impact of photobiomodulation for oral mucositis on body weight and BMI of patients with head and neck cancer. PURPOSE: To evaluate the impact of photobiomodulation for oral mucositis on body weight and body mass index (BMI) in head and neck cancer patients. METHODS: Patients were separated into two groups: photobiomodulation (PBM) (nâ€‰=â€‰17) and SHAM (nâ€‰=â€‰19). Participants assigned to the PBM group received the photobiomodulation therapy on alternate days at 33 different sites of the oral mucosa (1Â J for 10Â s per application point) using a low-power aluminum gallium arsenide (AsGaAl) laser device with a maximum output power of 86.7 mW and a wavelength of 660Â nm (red). The same protocol was performed in patients allocated in the SHAM group but with the device turned off. At the first and twenty-fourth radiotherapy sessions, participants from both groups underwent an intraoral examination to assess the presence or absence of mucositis using the WHO scale, and measurements of weight and height for BMI calculation were undertaken. RESULTS: All patients had significant differences in weight and BMI throughout the study period. Patients in the PBM group lost less weight (pâ€‰<â€‰0.01) and had a reduced BMI loss (pâ€‰<â€‰0.01) in comparison to patients in the SHAM group. Although PBM did not prevent oral

mucositis, it decreased its severity (pâ€‰<â€‰0.01). CONCLUSION: Photobiomodulation for oral mucositis reduced weight loss and prevented a reduction in BMI in patients who underwent chemoradiotherapy for head and neck cancer. Retrospectively registered at https://data.mendeley.com//datasets/4kd7s49wk4/1 . Body Mass Index;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mucositis;Stomatitis;Weight Loss

The efficacy of low-level diode laser versus laser acupuncture for the treatment of myofascial pain dysfunction syndrome (MPDS). BACKGROUND: Myofascial pain dysfunction syndrome (MPDS) is the most common type of temporomandibular disorder. This study compared the efficacies of low-level diode laser therapy (LLLT) and laser acupuncture therapy (LAT) in the treatment of MPDS. METHODS: This double-blind randomized controlled clinical trial included 24 patients with MPDS who were randomly divided into two equally sized groups. Patients in the LLLT group received 12 sessions of low-level diode laser irradiation applied to the trigger points of the masticatory muscles during 1 month. The same protocol was also used in the LAT group according to the specific trigger points. We measured pain intensity and maximum mouth opening in both groups at baseline, during treatment, and 2 months after treatment completion. RESULTS: The pain intensities decreased from 6.58 Â± 1.31 to 0.33 Â± 0.65 and from 7.08 Â± 1.37 to 0 in the LLLT and LAT groups, respectively. The maximum mouth openings increased from 32.25 Â± 8.78 mm to 42.58 Â± 4.75 mm and from 33 Â± 6.57 mm to 45.67 Â± 3.86 mm in the LLLT and LAT groups, respectively. Pain intensity (P = 0.839) and level of maximum mouth opening (P = 0.790) did not differ significantly between the groups. CONCLUSION: Our results showed similar efficacy between LLLT and LAT in the treatment of MPDS signs and symptoms.

Effect of the combination of photobiomodulation therapy and the intralesional administration of corticoid in the preoperative and postoperative periods of keloid surgery: A randomized, controlled, double-blind trial protocol study. Keloid scars are characterized by the excessive proliferation of fibroblasts and an imbalance between the production and degradation of collagen, leading to its buildup in the dermis. There is no "gold standard" treatment for this condition, and the recurrence is frequent after surgical procedures removal. In vitro studies have demonstrated that photobiomodulation (PBM) using the blue wavelength reduces the proliferation speed and the number of fibroblasts as well as the expression of TGF-Î². There are no protocols studied and established for the treatment of keloids with blue LED. Therefore, the purpose of this study is to determine the effects of the combination of PBM with blue light and the intralesional administration of the corticoid triamcinolone hexacetonide on the quality of the remaining scar by Vancouver Scar Scale in the postoperative period of keloid surgery. A randomized, controlled, double-blind, clinical trial will be conducted involving two groups: 1) Sham (n = 29): intralesional administration of corticoid (IAC) and sham PBM in the preoperative and postoperative periods of keloid removal surgery; and 2) active PBM combined with IAC (n = 29) in the preoperative and postoperative periods of keloid removal surgery. Transcutaneous PBM will be performed on the keloid region in the preoperative period and on the remaining scar in the postoperative period using blue LED (470 nm, 400 mW, 4J per point on 10 linear points). The patients will answer two questionnaires: one for the assessment of quality of life (Qualifibro-UNIFESP) and one for the assessment of satisfaction with the scar (PSAQ). The team of five plastic surgeons will answer the Vancouver Scar Scale (VSS). All questionnaires will be administered one, three, six, and twelve months postoperatively. The keloids will be molded in silicone prior to the onset of treatment and prior to excision to assess pre-treatment and post-treatment size. The same will be performed for the remaining scar at one, three, six, and twelve months postoperatively. The removed keloid will be submitted to histopathological analysis for the determination of the quantity of fibroblasts, the organization and distribution of collagen (picrosirius staining), and the genic expression of TGF-Î² (qPCR). All data will be submitted to statistical analysis.

Trial registration: This study is registered in ClinicalTrials.gov (ID: NCT04824612). Adrenal Cortex Hormones;Transforming Growth Factor beta;Triamcinolone Acetonide;triamcinolone hexacetonide Adrenal Cortex Hormones;Adult;Combined Modality Therapy;Double-Blind Method;Female;Humans;Injections, Intralesional;Keloid;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Postoperative Care;Preoperative Care;Prospective Studies;Quality of Life;Transforming Growth Factor beta;Treatment Outcome;Triamcinolone Acetonide;Young Adult

Comparison of the effects between lasers applied to myofascial trigger points and to classical acupoints for patients with cervical myofascial pain syndrome. BACKGROUND: To compare the immediate effectiveness of low-level laser therapy (LLLT) applied to classical acupoints versus trigger points for patients with cervical myofascial pain syndrome (MPS). METHODS: This was a single-blinded, randomized, placebo-controlled trial. This study was performed in a university-affiliated medical center. One hundred participants with cervical myofascial pain syndrome were randomly allocated to four treatment groups, including (1) acupoint therapy (AcuT), (2) acupoint control (AcuC), (3) trigger point therapy (TriT), and (4) trigger point control (TriC) groups. Low-level laser (810-nm) therapy was used in both therapy groups, while the same procedure was performed without laser in the acupoint control groups. The patients were evaluated based on visual analogue scale (VAS) pain score, pressure pain threshold, and cervical range of motion (ROM) before and after the therapy. RESULTS: Immediate pain relief was observed in the TriT group (pÂ <Â 0.01). The TriT group showed improved cervical ROM in ipsilateral bending (pÂ <Â 0.01), while the AcuT group did not. CONCLUSIONS: LLLT applied to trigger points could significantly relieve myofascial pain and was effective in relieving cervical ROM limitations. Considering the risk of pneumothorax, laser therapy at trigger points for patients with cervical MPS may be a choice when acupuncture therapy is unavailable. TRIAL REGISTRATION: ClinicalTrials.gov ID: NCT01516502. Acupuncture Points;Humans;Lasers;Myofascial Pain Syndromes;Treatment Outcome;Trigger Points

Application of Solidago chilensis and laser improved the repair of burns in diabetic rats. BACKGROUND: The repair of burns in diabetic patients is a clinical problem. It is relevant to study alternative therapies that can improve the healing process. Our aim was to investigate the effects of Solidago chilensis associated or not with laser on burns in diabetic rats. METHODS: The animals were divided in four groups (nÂ =Â 30): C- without treatment; S- S. chilensis extract; L-laser irradiated; LS-laser and S. chilensis. In 7, 14 and 21 days samples were collected after the injury to structural, morphometric and molecular analysis. RESULTS: Our results demonstrate the association of S. chilensis and laser reduced the inflammatory infiltrate and favored the angiogenesis. In the groups treated only with laser or with the plant extract showed higher levels of VEGF. The low-level laser therapy (LLLT) promoted higher collagen I and reduction of collagen III. It was also observed higher MMP-2 activation and a decreasing of the active isoform of MMP-9 in the S, L and LS groups. CONCLUSIONS: The treatments improved the repair of burns in diabetic rats, since it reduced the inflammatory infiltrate and favored the collagen organization presenting similar effects in the burn repair of the diabetics. Animals;Burns;Diabetes Mellitus, Experimental;Humans;Lasers;Rats;Rats, Wistar;Solidago;Wound Healing

A Narrative Review on Oral and Periodontal Bacteria Microbiota Photobiomodulation, through Visible and Near-Infrared Light: From the Origins to Modern Therapies. Photobiomodulation (PBM) consists of a photon energy transfer to the cell, employing non-ionizing light sources belonging to the visible and infrared spectrum. PBM acts on some intrinsic properties of molecules, energizing them through specific light wavelengths. During the evolution of life, semiconducting minerals were energized by sun radiation. The molecules that followed became photoacceptors and were expressed into the first proto-cells and prokaryote membranes. Afterward, the components of the mitochondria electron transport chain influenced the eukaryotic cell physiology. Therefore, although many

organisms have not utilized light as an energy source, many of the molecules involved in their physiology have retained their primordial photoacceptive properties. Thus, in this review, we discuss how PBM can affect the oral microbiota through photo-energization and the non-thermal effect of light on photoacceptors (i.e., cytochromes, flavins, and iron-proteins). Sometimes, the interaction of photons with pigments of an endogenous nature is followed by thermal or photodynamic-like effects. However, the preliminary data do not allow determining reliable therapies but stress the need for further knowledge on light-bacteria interactions and microbiota management in the health and illness of patients through PBM. Bacteria;Humans;Infrared Rays;Light;Low-Level Light Therapy;Microbiota;Mitochondria;Periodontal Diseases;Phototherapy;Stomatitis

Photodynamic Activity of Protoporphyrin IX-Immobilized Cellulose Monolith for Nerve Tissue Regeneration. The development of nerve conduits with a three-dimensional porous structure has attracted great attention as they closely mimic the major features of the natural extracellular matrix of the nerve tissue. As low levels of reactive oxygen species (ROS) function as signaling molecules to promote cell proliferation and growth, this study aimed to fabricate protoporphyrin IX (PpIX)-immobilized cellulose (CEPP) monoliths as a means to both guide and stimulate nerve regeneration. CEPP monoliths can be fabricated via a simple thermally induced phase separation method and surface modification. The improved nerve tissue regeneration of CEPP monoliths was achieved by the activation of mitogen-activated protein kinases, such as extracellular signal-regulated kinases (ERKs). The resulting CEPP monoliths exhibited interconnected microporous structures and uniform morphology. The results of in vitro bioactivity assays demonstrated that the CEPP monoliths with under 0.54 Â± 0.07 Î¼mol/g PpIX exhibited enhanced photodynamic activity on Schwann cells via the generation of low levels of ROS. This photodynamic activation of the CEPP monoliths is a cell-safe process to stimulate cell proliferation without cytotoxic side effects. In addition, the protein expression of phospho-ERK increased considerably after the laser irradiation on the CEPP monoliths with low content of PpIX. Therefore, the CEPP monoliths have a potential application in nerve tissue regeneration as new nerve conduits. Protoporphyrins;Reactive Oxygen Species;Cellulose;protoporphyrin IX;Extracellular Signal-Regulated MAP Kinases Animals;Cell Line;Cell Proliferation;Cellulose;Extracellular Signal-Regulated MAP Kinases;Gene Expression Regulation;Low-Level Light Therapy;Nerve Regeneration;Nerve Tissue;Phosphorylation;Protoporphyrins;Rats;Reactive Oxygen Species;Schwann Cells

Innovative Concepts and Recent Breakthrough for Engineered Graft and Constructs for Bone Regeneration: A Literature Systematic Review. BACKGROUND: For decades, regenerative medicine and dentistry have been improved with new therapies and innovative clinical protocols. The aim of the present investigation was to evaluate through a critical review the recent innovations in the field of bone regeneration with a focus on the healing potentials and clinical protocols of bone substitutes combined with engineered constructs, growth factors and photobiomodulation applications. METHODS: A Boolean systematic search was conducted by PubMed/Medline, PubMed/Central, Web of Science and Google scholar databases according to the PRISMA guidelines. RESULTS: After the initial screening, a total of 304 papers were considered eligible for the qualitative synthesis. The articles included were categorized according to the main topics: alloplastic bone substitutes, autologous teeth derived substitutes, xenografts, platelet-derived concentrates, laser therapy, microbiota and bone metabolism and mesenchymal cells construct. CONCLUSIONS: The effectiveness of the present investigation showed that the use of biocompatible and bio-resorbable bone substitutes are related to the high-predictability of the bone regeneration protocols, while the oral microbiota and systemic health of the patient produce a clinical advantage for the long-term success of the regeneration procedures and implant-supported restorations. The use of growth factors is able to reduce the co-morbidity of the regenerative procedure ameliorating the post-

operative healing phase. The LLLT is an adjuvant protocol to improve the soft and hard tissues response for bone regeneration treatment protocols.

Disorders of hyperpigmentation. Part II. Review of management and treatment options for hyperpigmentation. Key challenges in the management of pigmentary disorders such as melasma and postinflammatory hyperpigmentation are their resistance to treatment, tendency to recur after treatment, and the risk of exacerbating hyperpigmentation with many treatment modalities. The second article in this 2-part continuing medical education series on pigmentary disorders focuses on the evidence behind medical and procedural treatments of dyschromias, including photoprotection, topical lightening agents, oral agents, chemical peels, and laser therapy. Humans;Hyperpigmentation;Melanosis;Laser Therapy;Chemexfoliation;Low-Level Light Therapy;Treatment Outcome

Potential adjunct therapies for the management of temporomandibular disorders: An evidence-based review. OBJECTIVE: The aim was to review the role of adjuvant therapies that may potentially contribute toward the management of temporomandibular disorders (TMD). METHODS: The addressed focused question was, "Are there any adjuvant therapies that may contribute toward the management of TMD?". Indexed databases were searched up to June 2021. The eligibility criteria were the following: (a) original clinical studies and (b) randomized controlled clinical trials (RCTs). RESULTS: Adjuvant therapies were comprised of acupuncture, manual therapy, jaw exercises, dietary modifications, botulinum toxin therapy, and photobiomodulation. Short-term follow-up results from each of these RCTs showed beneficial effects in terms of pain reduction and improvements in jaw movement among patients with TMD. There are no long-term follow-up results in this regard. CONCLUSION: The most effective adjunct treatment for managing TMD remains unknown, primarily due to a lack of sufficient scientific evidence.

The Role of Low-Level Laser Therapy in the Treatment of Multiple Sclerosis: A Review Study. Introduction: Multiple sclerosis (MS) is an autoimmune disease. Inflammatory cells, cytokines and chemokines play a major role in the pathogenesis of the disease. Low-level laser therapy (LLLT) as a photobiostimulation approach could affect a wide range of cellular responses. LLLT inhibits the inflammatory signaling pathway, improves cell viability, inhibits apoptosis, modulates immune responses and induces the production of growth factors. Methods: In this review, we discuss the effect of LLLT on cellular responses and its application in the treatment of MS. Such keywords as "low-level laser therapy", "photobiomodulation" and "multiple sclerosis" were used to find studies related to laser therapy in MS in Google scholar, PubMed and Medline databases. Results: LLLT reduced the inflammatory immune cells and mediators. It also enhanced the regeneration of neurons. Conclusion: Investigations showed that besides current treatment strategies, LLLT could be a promising therapeutic approach for the treatment of MS.

Utilization of the 1064 nm Wavelength in Photobiomodulation: A Systematic Review and Meta-Analysis. Introduction: Photobiomodulation or low-level laser therapy (LLLT;<0.5 W) has been used as a non-invasive treatment for various medical indications. Short (visible; 635-650 nm) and longer (invisible; 810-850 nm and 915-980 nm) near-infrared wavelengths have been commonly used, but power setting deficiencies or incorrect wavelength settings can cause negative outcomes. The 1064 nm wavelength as the longest wavelength is a relative newcomer in high-powered (>0.5 W) laser photobiomodulation therapy (HPL-PBMT) with unique biophysical characteristics. Methods: A comprehensive search of 2016-2021 PubMed, Google Scholar, and Cochrane databases for "photobiomodulation" restricted to clinical trials for patients with a medical diagnosis was done. "1064 nm" content was identified and restricted to high-powered lasers (>0.5 watt). Cohen's d was calculated for the effect size and the difference was determined as a measure of relative 1064 nm HPL-PBMT efficacy. Results: The 22 independent studies meeting inclusion criteria focused on knee

arthropathies, spine, shoulder/elbow, wound, gynecological, or osteoporosis with evaluation of pain, function, quality of life, range of motion (ROM), and anatomy. Pain was reduced with statistical significance (P<0.05) in 90% of study assessments (n=20) and 100% of studies focused on the knee (n=6). Of 18 studies assessing functional outcome measures, 100% demonstrated statistically significant improvements. Follow-up assessments up to 6 months in 5 knee arthritis studies revealed long-term pain reduction after cessation of treatment. Improvements in wound healing, bone mineral density, and knee cartilage thickness were demonstrated. The largest effect sizes observed were pain reduction in knee arthritis (average Cohen's d effect size=2.46). Conclusion: These studies have established that 1064 nm HPL-PBMT can effectively reduce pain, increase ROM, increase functional scores, and increase the quality of life for knee osteoarthritis and spinal disorders, with limitations. More studies are needed for clinical validation of single-trial data detecting changes in musculoskeletal conditions, cartilage thickness and bone density.

Effect of Low-Level Laser Therapy and Sinensetin (Combination therapy) on Tumor Cells (Hela) and Normal Cells (CHO). Introduction: Cervical and ovarian cancers are well-known causes of death among women in developing countries. There are various technologies to treat cancer cells, but the polyphenolic compound is a natural one and has an anti-cancer effect. Sinensetin is one of them and is found in Orthosiphon stamineus and citrus fruits. Since combination therapy is more effective than drug treatment alone, in this study, we investigated combination therapy using sinensetin and low-level laser therapy (LLLT) to enhance treatment. Methods: The cancer cells purchased from Pasteur Institute, Iran, were cultured. The cells were treated with various concentrations of sinensetin (0.1-1-10-50,150 Âµg/mL for 24 hours), wavelengths of laser therapy (660 nm) and power density (3 J/cm2) for different times)30, 60, and 90 seconds) separately. Furthermore, sensitivity of cells to sinensetin, LLLT and combined therapy was determined by clonogenic assays. To measure DNA damage and repair at individual cell level used comet assay. To examine the intracellular generation of reactive oxygen species used 2',7'-dichlorodihydrofluorescein (DCFH) as an intracellular probe. To analyze data we used SPSS software and comparison between groups was used (ANOVA) and t test statistical analyses were performed using SPSS 17 software. Data are presented as means - standard error of mean. The level of statistical significance was set at a two-tailed P value of 0.05. All tests were performed in triplicate. Results: Our results demonstrated that the doubling time for CHO is more than Hella cells, with 20.7 and 27.7 h for each cell respectively. The pretreatments (first LLLT, then sinensetin) can decrease the viability of both cell lines more than the first treatment (sinensetin + LLLT). In the clonogenic assay, the pretreatment of cells with LLLT and Sinensetin significantly reduced the surviving fraction of both cell lines. MTT results showed that pretreatment with LLLT and Sinensetin can increase cell death compared to Sinensetin and LLLT alone. Production of ROS within the cell was enhanced with LLLT + sinensetin. Conclusion: Our result indicated that combined therapy with LLLT and Sinensetin can treat CHO and Hela cells better than the other groups. Combination treatment with sinensetin-LLLT and the other treatment means, sinensetin and LLLT alone, did not change the cell viability significantly.

Effect of Low-Level Laser Therapy on Bacterial Counts of Contaminated Traumatic Wounds in Dogs. Introduction: The clinical effect of low-level laser therapy (LLLT) on canine wounds is still under debate. The aim of this pilot study was to evaluate the potential influence of LLLT on the bacterial loads of wounds, using two different energy densities or doses of laser light as an adjuvant therapy for traumatic contaminated wound management. Methods: A prospective, randomized, blinded, placebo-controlled pilot clinical trial was used to evaluate the effect of two different doses of LLLT as an adjuvant treatment of contaminated traumatic wounds on the bacterial load and wound scoring in dogs. Fourteen dogs with traumatic bites or laceration wounds were randomly assigned to one of the three groups. Animals in groups A and B received a dose of LLLT of 6 and 2 J/cm(2) respectively. Four

wavelengths were used simultaneously: 660 nm, 800 nm, 905 nm, and 970 nm. Animals in group C received placebo LLLT. Bacterial burden and clinical wound scores were evaluated. Results: A statistically significant reduction in the average count of colony forming units was observed in group B (2 J/cm(2)) when compared to placebo group C. Group B also showed improved wound scores. No clinically adverse effects were observed in the patients treated with LLLT. Conclusion: LLLT, with the parameters used in this pilot trial, decreased bacterial loads of contaminated wounds in dogs and improved wound scores, especially when using a dose of 2 J/ cm(2). This is the first time the effect of LLLT on bacterial load has been investigated in a clinical setting using traumatic wounds in canine patients.

Low-Level Laser Irradiation Promotes Proliferation and Differentiation on Apical Papilla Stem Cells. Introduction: Low-level laser therapy (LLLT) has been reported to improve cell proliferation and differentiation. The stem cells derived from dental apical papilla (SCAPs) are a promising therapy because they are easily obtained from immature human teeth. The effect of LLLT over SCAPs is still unknown. This study aimed to evaluate the proliferation and osteogenic potential of the SCAPs stimulated with LLLT. Methods: SCAPs were isolated from the third molars of a healthy donor and characterized according to the minimum established criteria. SCAPs were cultured for 24 hours before being exposed to LLLT. Cells were exposed to different doses, energy, and wavelengths for selecting the irradiation parameters. SCAPs proliferation was evaluated with the MTT assay at 24 hours and 7-day post-laser exposure. VEGF and TGFÎ²2 expression were assessed with a specific enzyme-linked immunosorbent assay (ELISA). The osteogenic differentiation potential was analyzed with alizarin red staining, and the nodule quantification was performed by the relative optical density (ROD) analysis using ImageJ software. Results: The cells isolated from the apical papilla showed phenotype and stem cell properties. SCAPs irradiated with one dose at 6 J/m(2) and 650 nm exhibited significantly higher proliferation ($P>0.05$) than the controls nonirradiated. LLLT stimulated SCAPs' expression of factors VEGF and TGFÎ²2. Also, SCAPs irradiated showed higher osteogenic activity ($P<0.05$). Conclusion: LLLT promotes proliferation, osteogenic differentiation, and VEGF and TGFÎ²2 expression on SCAPs. LLLT is a practical approach for the preconditioning of SCAPs in vitro for future regenerative therapies. More studies are needed to determine the underlying molecular processes that determine the mechanism of the LLLT.

Clinical Effect of Non-Thermal CO2 Laser Therapy (NTCLT) on Pain Relief of Oral Aphthous Ulcers of BehÃ§et's Disease. Introduction: BehÃ§et's disease (BD) is a debilitating and chronic vasculitis which can affect multiple organs. Recurrent oral aphthosis is the most common clinical feature of BD. The remarkable pain associated with painful oral ulcers can exert a major impact on the patients' quality of life. Relieving pain of these oral ulcers is an essential approach in the management of mucocutaneous lesions of BD. Non-thermal CO2 laser therapy (NTCLT) as a novel photobiomodulative approach has recently been used for significant and immediate pain reduction of some types of painful oral lesions such as recurrent aphthous stomatitis, pemphigus vulgaris, and so on. In this procedure by some considerations, the conventional CO2 laser is used as a non-surgical, non-thermal, photobiomodulative laser without any visible thermal adverse effects. In this article, we report our experiences about the analgesic effects of NTCLT on painful oral aphthous ulcers of BD. Case Presentation: We report four cases of BD, whose painful oral aphthous ulcers were irradiated with NTCLT. Immediately after NTCLT, the pain of the lesions was significantly relieved with no visible complications. Conclusion: The results of this study suggest that NTCLT could be proposed as a hopeful procedure for significant and instant pain relief of oral aphthous ulcers of BD without any visible thermal adverse effects.

Effects of Laser Acupuncture Therapy for Patients With Inadequate Recovery From Bell's Palsy: Preliminary Results From Randomized, Double-Blind, Sham-Controlled Study. Introduction:

Inadequate recovery from Bell's palsy exists in a third of patients and results in physical and social impairments. The controversial nature of existing medical treatment options means that novel, alternative approaches are needed. In basic and clinical studies, low-level laser therapy (LLLT) has proven successful in regenerating peripheral nerves. Laser acupuncture therapy (LAT) is a rapidly growing treatment modality; however, its effectiveness for treating chronic Bell's palsy is unknown. The feasibility of this innovative approach is the focus of this pilot study. Methods: A two-armed, parallel, randomized, investigator-subject-assessor-blinded, sham-controlled pilot study was conducted, and 17 eligible subjects were randomly allocated to either LAT (n=8) or sham LAT (n=9). The LAT group received three treatments each week for six weeks (18 sessions), while the sham LAT group received the same procedure but with a sham laser device. The change from baseline to week 6 in the social subscale of the Facial Disability Index (FDI) was the primary outcome. Secondary outcomes were changes in the House-Brackmann facial paralysis scale (HB), the Sunnybrook facial grading system (SB) and a stiffness scale at weeks 3 and 6. Results: A significant difference was shown in the HB score (P=0.0438) between baseline and week 3 and borderline significance was observed in both SB and stiffness scores from baseline to week 6 (P=0.0598 and P=0.0980 respectively). There was no significant difference in the FDI score between baseline and week 6. Conclusion: To the best of our knowledge, this clinical trial is the first such investigation on this topic. Our findings suggest that using LAT may have clinical effects on long-term complications of Bell's palsy and justify further large-scale studies.

Low-Level Laser Therapy: "Western School" vs "Eastern School".

The Principal Role of Several Members of HLA and IRF Genes in Prevention of Oral Mucositis After Chemoradiotherapy. Introduction: One of the chemoradiotherapy (CRT) side effects is oral mucositis (OM). Since photobiomodulation therapy (PBMT) is a public method for the repair process, in the present study the mechanism of PBMT in the prevention of OM is investigated via the bioinformatics approach. Methods: Six validated and significant differentially expressed genes (DEGs) associated with the prevention of OM in head and neck cancer (HNC) patients who had experienced CRT were extracted from the literature. After adding 50 neighbors from STRING, the network was constructed and analyzed. The results of the action map and network analysis were compared and discussed. Results: HLA gene family were identified as central nodes of the analyzed network. Based on action map finding, activation is prominent action and IRF9 was the potent activator. The role of the IRF gene family was highlighted by action map analysis. Conclusion: Regulation of the immune system by HLA and IRF genes family is a crucial factor in the prevention of OM in the studied patients.

Light-Emitting Diode Laser Therapy for Hyperoxia-Induced Retinal Abnormalities. Introduction: Hyperoxygenation is linked to numerous effects in a variety of organ systems. It can cause tissue damage by generating reactive oxygen species (ROS), increasing oxidative stress, and inducing cell death by apoptosis. The present study aimed to evaluate the effects of low-level laser therapy on the retina in response to acute hyperoxia in animals. Methods: A total of 70 Wistar albino rats were evaluated in the present study: 10 rats were designated as a control group, and the rest were exposed to hyperoxia (O(2), 90%) for 3 days, 1 week, and 2 weeks (20 rats each). Each group was divided into two subgroups (n=10), one of which was designated as hyperoxia only. The other was treated with a 670 nm light-emitting diode laser (2 sessions/one week, ~ 9.0 J/cm(2)) in each eye. The animals were euthanized, and their retinas were dissected for analysis of protein content, sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE), total antioxidant capacity (TAC), hydrogen peroxide (H(2) O(2)), malondialdehyde (MDA), and histological examination. Results: We found that two weeks of hyperoxia induced an increase in retinal protein content (P<0.001), an alteration in the intensities and molecular weights of protein fractions, a significant decrease in the TAC level (P<0.01), and a noticeable increase in H(2) O(2) and MDA levels (P<0.001). Histological

examination revealed fragmentation of the photoreceptors and neovascularization in the outer and inner plexiform layers. Furthermore, the data showed remarkable improvement in the retinal protein contents, oxidative state, and retinal structure after light-emitting diode laser therapy. Conclusion: Light-emitting diode laser therapy was found to be a useful treatment paradigm for reducing hyperoxia-induced retinal damage.

Photobiomodulation (Î»=808nm) and Platelet-Rich Plasma (PRP) for the Treatment of Acute Rheumatoid Arthritis in Wistar Rats. Introduction: Rheumatoid arthritis (RA) causes inflammation, pain, edema, and articular degradation and its treatment can be based on anti-inflammatory drugs, photobiomodulation (PBM) and/or platelet-rich plasma (PRP) that can decrease cell flow and promote local healing. In the present study, we evaluate the effects of PBM and PRP on acute arthritis in Wistar rats through inflammatory and oxidative stress parameters. Methods: Thirty female Wistar rats were assigned to five groups (n=6, each group): Control, Sham, PRP, Laser, and PRP+Laser. For arthritis induction, all animals of groups Sham, PRP, Laser and PRP+Laser received an intraarticular injection of ZymosanÂ® (200Âµg) in the right knee. Twenty-four hours post-arthritis induction, PRP was prepared and injected (8 Ã— 10(5) of platelets) in animals of PRP and PRP+Laser groups. PBM was performed in Laser and PRP+Laser groups by single-dose therapy with the GaAlAs laser (Î»=808 nm, P=25 mW, fluence=30 J/cm(2), beam area=0.02 mm(2), t=33 seconds, E=0.825 J, punctual application). After seven days of induction, serum samples were collected and thiobarbituric acid reactive substances (TBARS), nitric oxide (NO) and catalase activity were analysed. Morphological parameters were measured for inflammation areas, cartilage thickness, and C3 protein expression in knee samples. Statistical analysis was performed with an ANOVA test and Tukey's post-hoc test with a significance level of 5% ($P<0.05$). Results: NO was lower in the treated groups compared to the Sham group, and TBARS did not show any differences, while catalase showed greater activity between PRP+Laser versus PRP ($P<0.05$). Inflammatory areas and cartilage thickness were lower in the treated groups compared to Sham ($P<0.05$), while no differences in C3 protein expression was observed. Conclusion: PBM associated with PRP is better for anti-inflammatory and joint preservation by morphological aspects and NO levels that concern a potential clinical application.

Low-Level Laser Therapy Effects on Rat Blood Hemostasis Via Significant Alteration in Fibrinogen and Plasminogen Expression Level. Introduction: There are many documents about the significant role of low-level laser therapy (LLLT) in different processes such as regenerator medicine and bone formation. The aim of this study is to assess the role of LLLT in blood hemostasis in rats via bioinformatic investigation. Methods: The differentially expressed plasma proteins of treated rats via LLLT from the literature and the added 50 first neighbors were investigated via network analysis to find the critical dysregulated proteins and biological processes by using Cytoscape software, the STRING database, and ClueGO. Results: A scale-free network including 55 nodes was constructed from queried and added first neighbor proteins. Fibrinogen gamma, fibrinogen alpha, and plasminogen were highlighted as the central genes of the analyzed network. Fibrinolysis was determined as the main group of biological processes that were affected by LLLT. Conclusion: Findings indicate that LLLT affects blood hemostasis which is an important point in approving the therapeutic application of LLLT and also in preventing its possible complication.

Treatment Parameters of Photobiomodulation in the Prevention of Non-surgical Cancer Treatment-Induced Oral Mucositis: A Review of Preclinical Studies. Introduction: The most important side effect after non-surgery cancer treatment (NSCT) is oral mucositis (OM) which degrades the quality of life. Using photobiomodulation (PBM), formerly known as low-level laser therapy (LLLT), in the prevention of NSCT-induced OM was widely studied. Hence, this review evaluates the efficacy of optical treatment parameters behind the working process of PBM in preventing NSCT-induced OM in preclinical studies. Methods: Using the PubMed, Scopus and Embase databases, the present study

systematically reviewed existing preclinical studies for optical treatment parameters of PBM in preventing NSCT-induced OM in experimental models without restriction on the year of publication. Results: In total, 51 articles were recognized during the search of the literature, and only 16 research papers were included in this review, taking into consideration the inclusion as well as exclusion benchmarks. The reviewed studies showed that a consensus has yet to be reached on the optimal PBM treatment parameters in preventing NSCT-induced OM. However, a wavelength of 660 nm, a power density of 40 mW as well as fluence which ranged between 2 and 6 J/cm(2) were mostly utilized in the included studies. Furthermore, the severity of NSCT-induced OM was reduced following PBM application with no reported severe side effects. Conclusion: The efficacy of PBM with the associated optical parameters is a promising strategy in preventing NSCT-induced OM. However, the optimal parameters of PBM need to be investigated.

The Effect of Photobiomodulation Therapy in Different Doses on Bone Repair of Critical Size Defects in Rats: A Histomorphometric Study. Introduction: Photobiomodulation therapy (PBM) appears to induce osteogenesis and stimulate fracture repair; because of its capacity, it is considered a promising treatment, but the characteristics of response to different radiation doses must be investigated through in vivo studies to establish their safety and effectiveness. Thus, this paper aims to analyze the effects of the PBM at different doses on the repair of critical bone defects through histological and histomorphometric analyses. Methods: Sixty 90-day-old adult rats (Rattus norvegicus, albinus, Wistar) weighing approximately 300 g were used. Critical bone defects of 5 mm in diameter were performed in their calvaria. The animals were randomly separated into 5 groups: C-Blood clot, L15-PBM 15J/cm(2), L30-PBM 30 J/ cm(2), L45-PBM 45 J/cm(2), L60-PBM 60 J/cm(2). Each group was subdivided according to observation periods of 30 and 60 days with 6 rats in each subgroup. Low-level gallium aluminum arsenide (GaAlAs) lasers were used at a 660 nm wavelength, 30 mW and 0.04 cm(2) in area. The PBM was applied over 5 points; 4 points of application were distributed on the edges while one point of application was located in the center of the bone defect. PBM occurred right after the procedure. In 30 and 60 days, the animals were euthanized by anesthesia overdose and the analyses were performed. The data were analyzed statistically by the ANOVA, together with the Tukey test, whose significance level was 5%. Results: As regards the treatment factor, the highest percentage of bone neoformation was achieved by group L45-60. The group with the highest closure, despite not having a statistically significant difference with the other doses, was 45 J with only 0.49 mm between edges. Conclusion: Thus, the present study allowed concluding that the highest percentage of bone neoformation area was achieved at 45 J/cm(2) in 60 days; that is, it was significantly effective in comparison with other doses.

Rapid maxillary expansion supplementary methods: A scoping review of animal studies. INTRODUCTION: Maxillary constriction is a relatively common condition. Various treatment modalities have been proposed for this condition such as rapid maxillary expansion (RME). Although RME can significantly expand the suture in a relatively short period of time, it has a number of drawbacks, mainly a lengthy retention period. The primary objective of this study was to assess the efficacy of the supplementary methods used in conjunction with RME for new bone formation (NBF) at the midpalatal suture (MPS). Relapse, bone healing, and root resorption were also studied as the secondary outcomes. MATERIALS AND METHODS: The PubMed, Embase, and Cochrane library online databases were searched according to the PRISMA-ScR guideline. Animal studies on the effects of non-surgical supplementary methods other than laser therapy on NBF in RME were included and reviewed. RESULT: Thirty-eight articles met the inclusion criteria. The supplementary methods were categorized into 6 groups: hormones, chemical agents, drugs, vitamins, proteins, and some other substances, which could not be assigned to any group. All the aforementioned substances enhanced NBF. Drugs such as bisphosphonates also increased bone resorption. The oestrogen hormone was

shown to reduce treatment relapse. Lastly, stem cell application accelerated bone healing at the expanded MPS. CONCLUSION: Administration of hormones, chemical agents, drugs, vitamins, herbs, and proteins may improve the outcomes of RME, shorten the retention period and consequently, reduce relapse in animals. However, the generalizability of these findings is limited due to the insubstantial number of studies published on each substance. Animals;Humans;Low-Level Light Therapy;Maxilla;Palatal Expansion Technique

Photobiomodulation therapy applied during an exercise-training program does not promote additional effects in trained individuals: A randomized placebo-controlled trial. BACKGROUND: Previous studies have shown positive results of photobiomodulation (PBM) for improving performance and accelerating post-exercise recovery. However, the effects of PBM in healthy individuals who underwent a neuromuscular adaptation training remain unclear. OBJECTIVE: To investigate the effects of PBM during a training program combining sprints and explosive squats exercises on clinical, functional, and systemic outcomes in trained healthy individuals compared to a placebo intervention and a control. METHODS: We conducted a randomized placebo-controlled trial. Healthy males were randomly assigned to three groups: active PBM (30â€¯J per site), placebo, or control (passive recovery). The participants performed a six-week (12 sessions) of a training program consisting of a combination of sprints and squats with recovery applied between sprints and squats. To prevent the influence of the primary neuromuscular adaptation to exercise on the results, all participants had to participate in a period of six weeks of exercise training program. Functional, clinical, and psychological outcomes and vascular endothelial growth factor (VEGF) were assessed at baseline and after six weeks. Results are expressed as mean difference (MD) and 95% confidence intervals (CI). RESULTS: Thirty-nine healthy male volunteers (aged 18-30 years; body mass index 23.9â€¯Â±â€¯3â€¯kg/mÂ²) were recruited. There was no significant time by group interaction, and no significant effect of group, but there was a significant effect of time for maximal voluntary isometric contraction (primary outcome) (MD=22 Nm/kg; 95%CI: 3.9, 40) and for squat jump (MD=1.6â€¯cm; 95CI%: 0.7, 2.5). There was no significant interaction (time*group), time, or group effect for the other outcomes. CONCLUSION: The addition of PBM to a combined training performed for six weeks in previously trained individuals did not result in additional benefits compared to placebo or no additional intervention. Vascular Endothelial Growth Factor A Exercise;Exercise Therapy;Humans;Isometric Contraction;Low-Level Light Therapy;Male;Vascular Endothelial Growth Factor A

Comparative effect of micro-osteoperforation and Photo-biomodulation on the rate of maxillary canine retraction: A split mouth randomized clinical trial. INTRODUCTION: The lengthy duration of comprehensive orthodontic treatment has always been a major concern. Various modalities have been proposed to accelerate the orthodontic tooth movement (OTM) with varying degree of success. However, there is limited literature, comparing the efficiency of two commonly used modalities which are relatively simple, safe and comfortable chair-side procedures to accelerate orthodontic tooth movement viz. Photo-biomodulation (PBM) being non-invasive and micro-osteoperforations (MOPs) being minimally invasive. The aim was to evaluate the comparative effect of PBM and MOPs on the rate of orthodontic tooth movement (OTM). METHODS: In this split mouth study, thirty patients requiring ma-xillary first premolar extraction were randomly allocated for Photo-biomodulation (PBM) on one side and for micro-osteoperforations (MOPs) on other side of maxilla. Separate canine retraction was performed and movement was measured over a three month period. RESULTS: Micro-osteoperforations (MOPs) significantly increased the rate of maxillary canine retraction by 1.1 fold when compared to the Photo-biomodulation (PBM).The MOPs can successfully reduce the comprehensive fixed orthodontic treatment time by around 9% as compared to PBM. CONCLUSIONS: Micro-osteoperforation is a more efficient modality of accelerating tooth movement

as compared to Photo-biomodulation which can be used in routine orthodontic practice. Face;Humans;Maxilla;Mouth;Time Factors;Tooth Movement Techniques

The effects of intravascular photobiomodulation on sleep disturbance caused by Guillain-BarrÃ© syndrome after Astrazeneca vaccine inoculation: Case report and literature review. RATIONALE: Sleep disturbance is commonly noted after Guillain-BarrÃ© syndrome (GBS) and is often caused by persistent discomfort after disease survival. Intravascular laser irradiation of blood (ILIB) has been shown to be effective in pain modulation owing to the influence of nociceptive signals in the peripheral nervous system. We investigated the application of ILIB on post-Oxford -AstraZeneca vaccination GBS and evaluated its effect on sleep quality. PATIENT CONCERNS: A 48-year-old woman was subsequently diagnosed with GBS after Oxford-AstraZeneca vaccination. The patient was discharged after a 5-day course of intravenous immunoglobulin administration. However, 1 week after discharge, the previously relieved symptoms flared with accompanying sleep disturbance. DIAGNOSIS AND INTERVENTIONS: The patient was diagnosed with post-vaccination GBS, and persistent pain and sleep disturbances persisted after disease survival. ILIB was performed. OUTCOMES: We used the Pittsburgh Sleep Quality Index before and after intravascular laser irradiation. There was a marked improvement in the sleep duration, efficiency, and overall sleep quality. The initial score was 12 out of 21 and the final score was 7 out of 21. LESSONS: We found that ILIB was effective in pain modulation in post-vaccination GBS and significantly improved sleep quality. COVID-19 Vaccines;Immunoglobulins, Intravenous;ChAdOx1 nCoV-19 COVID-19 Vaccines;ChAdOx1 nCoV-19;Female;Guillain-Barre Syndrome;Humans;Immunoglobulins, Intravenous;Low-Level Light Therapy;Middle Aged;Pain;Sleep;Sleep Wake Disorders;Vaccination

Far-infrared-emitting fabric improves neuromuscular performance of knee extensor. The aim of this study was to verify if exposure to the far-IR emitted by fabric (FIR) is able to improve the neuromuscular performance of the knee extensors of resistance-trained males regardless of changes of the temperature. It is a crossover, randomized, double-blind, and placebo-controlled trial. Fourteen resistance-trained males (age: 24.3 Â± 4 years; body mass: 82.8 Â± 11.3 kg; height: 176.3 Â± 4.2 cm) were randomly assigned to one of initial conditions: FIR (n = 7) or placebo (n = 7). After 4 days, the participants were submitted to neuromuscular tests in an isokinetic dynamometer (maximal isometric voluntary contraction (MVC) and fatigue test). After a week of washout, participants performed the other condition. We measured peak torque (Nm), total work (J), fatigue index (%), root mean square (mV), median frequency (Hz), and temperature (Â°C) of thigh. The FIR was worn for 82 Â± 19 h before the experimental session, totaling 317 Â± 74 kJ of energy irradiation. There was a significant increase ($p < 0.05$) for pre-MVC (318.5 Â± 68.7 Nm) and post-MVC (284.1 Â± 58.2 Nm), and a trend ($p = 0.055$) for significant increase for total work (4,122.2 Â± 699.8 J) on FIR condition regardless of none change on temperature and electromyographic (EMG) signals. FIR improved the neuromuscular performance of knee extensors in resistance-trained males regardless of changes on temperature and EMG. The present results suggest that the FIR could optimize the neuromuscular performance with 82 Â± 19 h of wear. Adult;Electromyography;Fatigue;Humans;Isometric Contraction;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Torque;Young Adult

Different application procedures of Nd:YAG laser as an adjunct to scaling and root planning in smokers with stage III grade C periodontitis: a single-blind, randomized controlled trial. BACKGROUND: The aim of the present study was to evaluate whether different Nd:YAG laser applications as an adjunct to scaling and root planning (SRP) improve the healing response to periodontal therapy in smokers with periodontitis. METHODS: This clinical trial included eighty systemically healthy smokers with periodontitis. Patients were randomly allocated to a treatment group: SRP alone (group 1), SRP+low-level laser therapy (LLLT) with Nd:YAG laser (group 2), SRP+pocket debridement with ND:YAG laser (group 3), and SRP+combined pocket debridement and

LLLT with Nd:YAG laser (group 4). Gingival index (GI), plaque index (PI), bleeding on probing (%), probing depth (PD), and clinical attachment level (CAL) were recorded, and gingival crevicular fluid (GCF) samples for metalloproteinase-8 (MMP-8) levels were collected at baseline, 1 month and 3 months after treatment. RESULTS: There were no significant differences between the treatment groups for the GI, PI, and BOP (%) parameters and MMP-8 levels at any time points (p > 0.05). For moderately deep pockets, PD and CAL reductions were significantly greater in all test groups compared to group 1 (p Ë, 0.05). For deep pockets, these reductions were significantly greater in group 2 and group 4 compared to group 1 (p Ë, 0.05). PD and CAL reductions were generally similar between test groups (p > 0.05) except PD reduction between baseline and 3 months in deep pockets (p Ë, 0.05). CONCLUSIONS: The findings of this clinical trial suggest that Nd:YAG laser applications may be beneficial on the healing response of smokers to non-surgical therapy compared to SRP alone. Matrix Metalloproteinase 8 Humans;Smokers;Lasers, Solid-State;Single-Blind Method;Matrix Metalloproteinase 8;Periodontal Pocket;Root Planing;Periodontitis;Follow-Up Studies

Photobiomodulation of human gingival fibroblasts with diode laser - A systematic review. Low-level laser therapy (LLLT) is being extensively studied in the field of periodontics as a noninvasive technique to achieve better results after nonsurgical and surgical therapy. However, there is a lack of definitive guidelines for the use of LLLT to promote gingival and periodontal wound healing. The primary objective of this systematic review was to critically analyze the studies evaluating the effect of low-level diode laser on human gingival fibroblasts in vitro and to develop wavelength-specific guidelines for photobiomodulation of human gingival fibroblasts. A thorough electronic and manual search was conducted for relevant articles published until December 2019. Nine studies were included in the review after the initial screening of 1334 articles. Our data analysis revealed that LLLT with diode laser stimulates human gingival fibroblasts as there was the increase in cell viability, proliferation, migration, and protein synthesis in irradiated cells. The diode lasers in the 600-700 nm spectrum were effective in the 10 mW to 30 mW power range. Lasers in the 700-800 nm range were effective in the 25-50 mW power range and diode lasers in the 800-900 nm range were effective at a power setting of 10 mW. It was possible to ascertain a suitable power setting for a particular wavelength spectrum, but no other parameters could be defined due to a lack of reporting of details. Hence, the authors have developed guidelines for comprehensive reporting of in-vitro studies to facilitate future research and overcome existing lacunae in knowledge.

Efficacy assessment for low-level laser therapy in the treatment of androgenetic alopecia: a real-world study on 1383 patients. Low-level laser therapy (LLLT) has been a treatment modality by many androgenetic alopecia (AGA) patients in recent years. It remained unclear as to how long the treatment regime should be maintained, and which characteristics of patients should this be recommended. A real-world study was carried out with an FDA-cleared low-level laser helmet for 1383 patients. Ordinal logistic regression analysis with propensity score matching (PSM) was used to investigate the factors related to efficacy assessment. More than 80% of users were between 18 and 40Â years old. The median use times were 133 for mild AGA patients and 142 for moderate-to-severe AGA patients, which equated to 38Â weeks and 40Â weeks, respectively. The overall clinical effectiveness was nearly 80%. PSM analysis revealed that gender (Pâ€‰=â€‰0.002), use period (Pâ€‰=â€‰0.068), scalp conditions with dandruff, rash, and itchy symptoms were associated with the grading of efficacy assessment. Male users (ordinal OR: 1.35, CI: (1.01, 1.79)); use for more than 180 times or use period for 1Â year (ordinal OR: 1.40, CI: (1.11, 1.96)); and those with scalp dandruff (ordinal OR: 1.34, CI: (1.01, 1.87)), rash (ordinal OR: 1.47, CI: (1.04, 2.07)), and itchy symptoms (ordinal OR: 1.51, CI: (1.12, 2.03)) had better efficacy assessments. The recommended treatment regime with low-level laser helmet was more than 1Â year or 180 use times. Male patients with dandruff, rash, and itchy symptoms in scalps tended to have a better efficacy assessment.

Adolescent;Adult;Alopecia;Dandruff;Exanthema;Humans;Low-Level Light Therapy;Male;Scalp;Treatment Outcome;Young Adult

Fast tattoo removal using Q-Switching ND-YAG laser technique with multi pass sessions. Laser therapy is the gold standard method to remove unwanted tattoos. It is available and widely accessible. This study was done to assess the efficacy of the R20 method (multi-time separated passes in one session for 20 min) using Q-switched ND: YAG laser for the removal of tattoos and was compared with the traditional method. Forty patients with 40 Tattoos were included. These tattoos were separated into two halves left and right. One half was treated with a single pass and the other half with R20. Both halves were treated using Q-switched ND-YAG laser with 10 J/cm2, 1.064 Âµm, 8 ns pulse width, and 3 mm spot size. The treatment regimen included three sessions at three-week intervals. Tattoo bleaching was evaluated in each session by means of using the imaging process by two dermatologists. It could be concluded that the treatment with traditional single-pass is less effective than the R20 method in the three-month period. Epidermal healing period needs more than three weeks with the R20 method. The amateur tattoos have a significantly better response than professional tattoos. The R20 method is better than the traditional method to remove a tattoo, where most tattoos can be removed in one session. Amateur tattoo is removed faster compared to professional tattoo using R20 method because amateur tattoo affects the skin surface. Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Tattooing

Photodynamic therapy in the treatment of denture stomatitis: A systematic review and meta-analysis. STATEMENT OF PROBLEM: Photodynamic therapy is widely used in dentistry, but limited evidence exists regarding its effectiveness in treating denture stomatitis. High resistance to antifungals has been reported, and photodynamic therapy could be an alternative treatment. PURPOSE: The purpose of this systematic review and meta-analysis was to evaluate whether photodynamic therapy is effective in reducing denture stomatitis. MATERIAL AND METHODS: A systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist and recorded in the prospective register of systematic reviews (PROSPERO) (CRD42020205589) to answer the population, intervention, control, outcome (PICO) question: "Is photodynamic therapy effective in the treatment of denture stomatitis when compared with the use of antifungal agents?" Electronic searches were performed in databases PubMed/MEDLINE, Cochrane library, and Web of Science for articles published until February 2021 by using the following terms: (denture stomatitis OR oral candidiasis) AND (low-level light therapy OR laser therapy OR lasers OR photodynamic therapies OR photochemotherapy) AND (antifungal drugs OR antifungal agents OR antimicrobial OR treatment). Clinical trials and randomized clinical trials, studies in the English language, and studies comparing antifungal agents with photodynamic therapy were included. RESULTS: In total, 5 articles were selected for the qualitative analysis and 3 for the meta-analysis. No significant difference was detected between antifungal therapy and photodynamic therapy in the reduction of colony-forming units on the palate. In a subgroup analysis, a significant difference was found in the reduction of colony-forming units on the palate at 15 days and at the denture surface at 30 days. CONCLUSIONS: Photodynamic therapy is effective in the treatment of denture stomatitis, but after 30 days and 15 days, the antifungals demonstrated better performance. Antifungal Agents;Anti-Infective Agents Humans;Antifungal Agents;Stomatitis, Denture;Candidiasis, Oral;Photochemotherapy;Anti-Infective Agents

Direct inactivation of SARS-CoV-2 by low level blue photobiomodulation LED at 470, 454 and 450 nm. Blue light has been already reported as able to counteract different types of microorganisms including Gram-positive and Gram-negative bacteria, fungi and viruses, especially the enveloped ones. It has been reported that both blue and visible light can efficiently impact SARS-CoV-2 by affecting its ability to replicate in in vitro cellular models of infection. In this study, blue light at 450,

454 and 470â€‰nm was tested on SARS-CoV-2 to evaluate the residual viral infectious potential on Vero E6, Caco-2 and Calu-3 cells, after the irradiation of viral particles. Following 12' of irradiation at 40â€‰mW/cm(2) , a drastic block of viral amplification was observed. Indeed, at 7â€‰days post-irradiation/infection the viral load was the same as the one measured 1Â day post-irradiation/infection, and cellular viability was maintained showing similar levels to the noninfected control cells. Taken together our results indicate that blue LED lamps can be considered as a cheap and convenient tool for SARS-CoV-2 disinfection. Anti-Bacterial Agents Anti-Bacterial Agents;COVID-19;Caco-2 Cells;Gram-Negative Bacteria;Gram-Positive Bacteria;Humans;SARS-CoV-2

Efficacy of photobiomodulation in reducing pain and improving the quality of life in patients with idiopathic burning mouth syndrome. A systematic review and meta-analysis. Burning mouth syndrome is a chronic condition, which is characterised by a burning sensation or pain in the mucosa of the oral cavity. Treatment options include antidepressants, antipsychotics, anticonvulsants, analgesics, hormone replacement therapies and more recently photobiomodulation. This study aims to perform a systematic review with meta-analysis in order to determine the effect of photobiomodulation on pain relief and the oral health-related quality of life associated with this condition. A bibliographical search of the Pubmed, Embase, Web of Science and Scopus databases was conducted. Only randomised clinical trials were included. Pain and quality of life were calculated as mean difference and pooled at different treatment points (baselineâ€‰=â€‰T0 and final time pointâ€‰=â€‰Tf) and laser modality. From a total of 103 records, 7 articles were retrieved for inclusion. PBM group had a greater decrease in pain than control group at Tf with a mean differenceâ€‰=â€‰â€‰-â€‰2.536 (IC 95%â€‰-â€‰3.662 toâ€‰-â€‰1.410; I(2)â€‰=â€‰85.33%, pâ€‰<â€‰0.001). An improvement in oral health-related quality of life was observed in both groups, although this was more significant in the photobiomodulation group mean differenceâ€‰=â€‰â€‰-â€‰5.148 (IC 95%â€‰-â€‰8.576 toâ€‰-â€‰1.719; I(2)â€‰=â€‰84.91%, pâ€‰=â€‰0.003). For the red laser, a greater improvement than infrared was observed, in pain, mean differenceâ€‰=â€‰â€‰-â€‰2.498 (IC 95%â€‰-â€‰3.942 toâ€‰-â€‰1.053; I(2)â€‰=â€‰79.93%, pâ€‰<â€‰0.001), and in quality of life, mean differenceâ€‰=â€‰â€‰-â€‰8.144 (IC 95%â€‰-â€‰12.082 toâ€‰-â€‰4.206; I(2)â€‰=â€‰64.22%, pâ€‰=â€‰0.027). Photobiomodulation, in particular, red laser protocols, resulted in improvement in pain and in quality of life of burning mouth syndrome patients. Analgesics Analgesics;Burning Mouth Syndrome;Humans;Pain;Pain Management;Quality of Life

Evaluating the Preemptive Analgesic Effect of Photo-biomodulation Therapy on Pain Perception During Local Anesthesia Injection in Children: A Split-mouth Triple-blind Randomized Controlled Clinical Trial. To evaluate the impact of photobiomodulation therapy (PBMT) on injection pain perception and compare it with a topical oral anesthetic gel. A total of 30 patients of 6 to 9Â years-old seeking pulpotomy treatment of maxillary secondary primary molars of both sides were considered for this split-mouth triple-blind randomized clinical trial. On one side of the maxilla, the low-level laser (diode laser, 808â€‰nm, 250 mW; 16.25â€‰J; 32.5â€‰Jâ€‰cm(-2)) was irradiated upon the buccal gingiva of the tooth, while a Benzocaine 20% topical anesthetic gel was applied on the other side. A gel with the same taste (strawberry) was applied for the placebo. The Wong-Baker Faces Pain Rating Scale was used to evaluate the injection pain and postoperation pain at two timestamps, 1â€‰h and 24â€‰h after treatment. Patients' heart rate was also evaluated. Paired t, Wilcoxon signed-rank test, McNemar and Friedman tests were used for statistical analyses. Results demonstrated that PBMT could significantly decrease the injection pain perception and heart rate alternations compared to the topical anesthetic gels (Pâ€‰=â€‰0.000). However, no significant differences were documented between the two methods concerning the 1-h (Pâ€‰=â€‰0.26) and 24-h (Pâ€‰=â€‰1.00) postoperation pain. PBMT can be an effective nonpharmacological technique

for controlling injection pain. Analgesics;Anesthetics, Local;Gels;Lidocaine;Benzocaine Analgesics;Anesthesia, Local;Anesthetics, Local;Benzocaine;Child;Gels;Humans;Lidocaine;Mouth;Pain;Pain Measurement;Pain Perception

Laser therapy in the treatment of melasma: a systematic review and meta-analysis. Melasma is a highly prevalent and cosmetically disfiguring pigmented skin disease. The post-treatment results are often unsatisfactory. A large number of clinical trials have tried to prove the effectiveness of the combination therapy involving laser therapy, but the results have been indeterminate. This study aimed to evaluate the effectiveness of laser treatment for melasma via a systematic review and meta-analysis. We respectively searched 4 databases and clinicaltrials.gov as of June 8, 2021. Two researchers independently searched for literature and extracted data. Study outcomes were computed by weighted mean differences (WMD). All statistical analyses were performed by the Review Manager version 5.3, STATA version 14 software at 95% confidence interval. We obtained 22 eligible studies which involved a total of 694 patients. After the heterogeneity test and sensitivity analysis, we took a subgroup meta-analysis on the before and after treatment of different laser types. We found that most lasers and laser-based combinations were associated with reduced melasma area and severity index (MASI), such as low-fluence Q-switch 1,064-nm Nd: YAG laser (QSNYL) (WMD:â€‰-â€‰2.76; 95% CI:â€‰-â€‰3.53 toâ€‰-â€‰1.99), fractional ablative CO2 laser (WMD:â€‰-â€‰9.36; 95% CI:â€‰-â€‰12.51 toâ€‰-â€‰6.21), and fractional ablative 2940-nm Er: YAG laser (WMD:â€‰-â€‰2,72; 95% CI:â€‰-â€‰3.94 toâ€‰-â€‰1.49). Significant decrease was seen in neither MASI score of non-ablative 1550-nm fractional laser (WMD:â€‰-â€‰1.29; 95% CI:â€‰-â€‰2.80 to 0.21) and picosecond laser (WMD:â€‰-â€‰0.58; 95% CI:â€‰-â€‰1.43 to 0.27), nor melanin index (MI) of low-fluence QSNYL treatment (WMD: 10.17; 95% CI:â€‰-â€‰4.11 to 24.46). When using laser to treat melasma, various adverse reactions may occur, most of which will resolve quickly without subsequent treatment, such as edema, erythema, scaling, and burning sensation after treatment. However, for patients with darker skin, there are risks of postinflammatory hyperpigmentation and hypopigmentation. The laser and laser-based combination treatment for melasma could significantly reduce the MASI score, which was showed by our systematic review and meta-analysis. Humans;Hyperpigmentation;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Treatment of post-acne erythema with 585Â nm Q-Switched Nd:YAG laser in a patient receiving isotretinoin therapy. Isotretinoin Humans;Lasers, Solid-State;Isotretinoin;Acne Vulgaris;Erythema;Treatment Outcome;Laser Therapy;Low-Level Light Therapy

Laser Photobiomodulation 808Â nm: Effects on Gene Expression in Inflammatory and Osteogenic Biomarkers in Human Dental Pulp Stem Cells. The tissue engineering of dental oral tissue is tackling significant advances and the use of stem cells promises to boost the therapeutical approaches of regenerative dentistry. Despite advances in this field, the literature is still scarce regarding the modulatory effect of laser photobiomodulation (PBM) on genes related to inflammation and osteogenesis in Postnatal Human Dental Pulp Stem cells (DPSCs). This study pointedly investigated the effect of PBM treatment in proliferation, growth and differentiation factors, mineralization, and extracellular matrix remodeling genes in DPSCs. Freshly extracted human third molars were used as a source for DPSCs isolation. The isolated DPSCs were stimulated to an inflammatory state, using a lipopolysaccharide (LPS) model, and then subjected or not to laser PBM. Each experiment was statistically evaluated according to the sample distribution. A total of 85 genes related to inflammation and osteogenesis were evaluated regarding their expression by RT-PCR. Laser PBM therapy has shown to modulate several genes expression in DPSCs. PBM suppressed the expression of inflammatory gene TNF and RANKL and downregulated the gene expression for VDR and proteolytic enzymes cathepsin K, MMP-8 and MMP-9. Modulation of gene expression for

proteinase-activated receptors (PARs) following PBM varied among different PARs. As expected, PBM blocked the odontoblastic differentiation of DPSCs when subjected to LPS model. Conversely, PBM has preserved the odontogenic potential of DPSCs by increasing the expression of TWIST-1/RUNEX-2/ALP signaling axis. PBM therapy notably played a role in the DPSCs genes expression that mediate inflammation process and tissue mineralization. The present data opens a new perspective for PBM therapy in mineralized dental tissue physiology.

Control of stem cell differentiation by using extrinsic photobiomodulation in conjunction with cell adhesion pattern. The induction and direction of stem cell differentiation into needed cell phenotypes is the central pillar of tissue engineering for repairing damaged tissues or organs. Conventionally, a special recipe of chemical factors is formulated to achieve this purpose for each specific target cell type. In this work, it is demonstrated that the combination of extrinsic photobiomodulation and collagen-covered microislands could be used to induce differentiation of Wharton's jelly mesenchymal stem cells (WJ-MSCs) with the differentiation direction dictated by the specific island topography without use of chemical factors. Both neurogenic differentiation and adipogenic differentiation could be attained with a rate surpassing that using chemical factors. Application of this method to other cell types is possible by utilizing microislands with a pattern tailored particularly for each specific cell type, rendering it a versatile modality for initiating and guiding stem cell differentiation. Collagen Adipogenesis;Cell Adhesion;Cell Culture Techniques;Cell Differentiation;Cells, Cultured;Collagen;Humans;Light;Mesenchymal Stem Cells;Neurogenesis;Tissue Engineering;Wharton Jelly

The efficacy of low-level laser therapy versus paracetamol-caffeine in controlling orthodontic separation pain and changes in the oral-health-related quality of life in Class I malocclusions: A 3-arm, randomized, placebo-controlled clinical trial. BACKGROUND: This study evaluated the analgesic effects of low-level laser therapy (LLLT) and paracetamol-caffeine in controlling orthodontic pain induced by elastomeric separators, as well as changes in oral health-related quality of life (OHRQoL). METHODS: A total of 54 patients (22 male, 32 female; mean age [standard deviation]: 21.68 [Â±2.77]) participated in the study. Elastomeric separators were placed mesially and distally to the first molars in the upper and lower dental arches. The first group (nÂ =Â 18) received a single dose of aluminum gallium arsenide (GaAlAs) laser irradiation (808 nm; 350 milliwatts; 3.5 joule/point) with a placebo medication. The laser beam was applied buccally and lingually at the center of the first molar roots and the adjacent teeth (2nd molar and 2nd premolar) in both the upper and lower dental arches bilaterally. The second group (nÂ =Â 18) received paracetamol-caffeine tablets (3 times daily for the first couple of days after separator insertion, and as needed for the rest of the week), with a placebo light-emitting diode (LED) light; patients in the third group (nÂ =Â 18) were exposed to the 2 placebo procedures. An 11-point numeric rating scale was used to assess spontaneous and chewing pain perception immediately and at 1 hour, 24 hour, 48 hours, and 1 week after separator placement. The short version of the oral health impact profile (OHIP-14) was used to evaluate OHRQoL at 48 hours and at 1 week after separator placement. RESULTS: Pain perception reached its peak at 24 hours after separator placement (median values: 3, 3, 6.5 for spontaneous pain, and 6, 6, 8 for chewing pain in the LLLT, drug, and control groups, respectively). LLLT relieved the induced pain more than did the placebo procedures (PÂ =Â 0.002 for spontaneous pain, PÂ =Â 0.012 for chewing pain). Orthodontic separators worsened patients' OHRQoL scores during the entire week, especially at 48 hours after placement (median OHIP-14 score: 21, 25, 24 in the LLLT, drug, and control groups, respectively). In comparison with the control group, LLLT slightly increased the "physical pain" domain score (PÂ =Â 0.015) and the "psychological disability" domain score of the scale (PÂ =Â 0.010) after 48 hours, as well as the "psychological disability" domain score 1 week after separator placement. CONCLUSIONS: The pain levels were similar in the laser and drug groups. The LLLT group had

decreased pain, compared with the placebo group. Paracetamol-caffeine and LLLT were unable to enhance the overall OHRQoL. Acetaminophen;Caffeine Acetaminophen;Caffeine;Female;Humans;Low-Level Light Therapy;Male;Malocclusion, Angle Class I;Pain;Pain Measurement;Quality of Life

A systematic review of evaluating the efficacy of acne scar treatment by Fractional Laser with or without using adjunctive treatments. Fractional laser (FL) resurfacing has proved its effectiveness in acne scars treatments. To evaluate the efficacy of Fractional laser systems for treatment of acne scars as a monotherapy, and as adjunctive therapy with other treatment types. A systematic literature review was performed by searching the electronic databases PubMed, Google Scholar, and Embase. Fractional laser has proven therapeutic efficacy of over 26% in treating acne scars, with minor and transient side effects, and well-tolerant pain. The application of PRP not only accelerated recovery and reduced adverse events, but also enhanced localized collagen neogenesis and redistribution. The addition of surgical treatments to Fractional Laser Systemes (FLS) therapy delivers the best treatment results for Icepick scars. Fractional laser is an effective tool for treating acne scars. The degree of effectiveness varies according to the laser parameters, the number of treatment sessions, skin photo type, the severity and the type of scars. The application of Platelet-Rich Plasma (PRP) and Fractional Radiofrequency Microneedle (FRM) in addition to the FL treatment improves the therapeutic efficacy and reduces the appearance of Post Inflammatory Hyper-Pigmentation (PIH), and is the ideal treatment for dark-skinned patients. FL therapy along with surgical methods such as subsicion and punch techniques provided the best improvements for deep scars. Acne Vulgaris;Cicatrix;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome

What conservative interventions improve bite function in those with temporomandibular disorders? A systematic review using self-reported and physical measures. BACKGROUND: Bite is an important function of the human stomatognathic system. Despite this, it is commonly impaired in temporomandibular disorder (TMD) populations. The aim of this review is to evaluate the effectiveness of conservative interventions on self-reported and physical measures of bite function in individuals with TMD. METHODS: This review was performed in compliance with PRISMA guidelines. An electronic search was performed on databases including PubMed, CINAHL, Embase, and Cochrane Central. Inclusion criteria were journal articles evaluating the effect of any non-pharmacological conservative interventions on bite function in participants diagnosed with TMD. Risk of bias for individual studies was assessed using the Cochrane risk-of-bias v2 tool, and the NIH NHLBI pre-post tool. Data was synthesised based on outcome measures of bite function, and the quality of evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation approach. RESULTS: Eleven studies were eligible for this review. Interventions included splinting, photobiomodulation, needling, exercise, manual therapy, and patient education, which were evaluated using mastication-related pain, self-reported chewing difficulty, and bite force/endurance outcome measures. Findings suggested manual therapy, needling, oral splinting, exercise, and PBM interventions may improve bite function in TMD, although confidence in cumulative evidence ranged from moderate to very low. There was no evidence that patient education improved bite function. CONCLUSION: Conservative interventions may be helpful to address bite-related impairments associated with TMD, although further research is needed to improve the quality of evidence and direct clinical guidelines. Dental Occlusion;Humans;Mastication;Range of Motion, Articular;Self Report;Temporomandibular Joint Disorders

Effects of low-level laser photobiomodulation on the masticatory function and mandibular movements in adults with temporomandibular disorder: a systematic review with meta-analysis. PURPOSE: To review the effects of low-level laser photobiomodulation on masticatory function and

mandibular movements in adults with temporomandibular disorder. RESEARCH STRATEGIES: Search in PubMed, Web of Science, Scopus, EMBASE, Cochrane, LILACS, ScienceDirect, and Google Scholar, using the following descriptors: "temporomandibular joint disorders", "low-level light therapy", "low-level laser therapy", "mastication", and "mandible". SELECTION CRITERIA: Randomized clinical trials in adults with temporomandibular disorder, using low-level laser and assessing the mastication and mandibular movements. DATA ANALYSIS: Firstly, the titles and abstracts of all retrieved studies were read. Then, only the studies selected in the first stage were read in full and assessed regarding eligibility. After the selection, the characteristics, methodological quality, and quality of evidence of the studies included in the review were analyzed. In the meta-analysis, the mean amplitude of mouth opening was considered as a measure of intervention effect. RESULTS: The 10 articles included in the review had quite different results one from the other, especially regarding the amplitude of mouth opening, while the mastication was assessed in only one of them. Most studies had a high risk of bias, demonstrating a low methodological quality. Significantly higher results for photobiomodulation were identified in the six studies included in the meta-analysis. CONCLUSION: Due to the scarcity in the literature, there is not enough evidence of the effects of low-level laser photobiomodulation on mastication. As for the mandibular movements, this intervention presented significant results, particularly in the amplitude of mouth opening. Adult;Humans;Lasers;Low-Level Light Therapy;Mandible;Mastication;Temporomandibular Joint Disorders

Efficacy of laser photobiomodulation pulpotomy in human primary teeth: A randomized controlled trial. BACKGROUND: Laser photobiomodulation (LPBM), also called Low Level Laser Therapy (LLLT), has shown potential to reduce the pulpal inflammation and to preserve the dental pulp vitality, thereby improving healing. Lasers being minimally invasive, safe, and patient friendly prompt its application in pediatric dentistry. AIM: The aim of this study was to evaluate and compare the clinical and radiographic success rates of LPBM and formocresol pulpotomy at 9 months post intervention in human primary molars. MATERIALS AND METHODS: A randomized controlled, split-mouth study design was followed involving children aged 4-7 years with at least two primary molars indicated for pulpotomy. Sixty-eight eligible primary molars were randomly allocated to two interventions - formocresol pulpotomy (Group I) and LPBM pulpotomy (Group II). STATISTICAL ANALYSES: Chi-square test was used for statistical analysis fixing significance level at P â‰¤ 0.05. RESULTS: There was no statistically significant difference in the clinical success rates between the formocresol group (97.05%) and the photobiomodulation group (94.1%) (Ï‡(2) = 0.34, P = 0.55); however, the radiographic success rate was significantly high in the laser group (94.1%) compared to the formocresol group (58.82%) (Ï‡(2) = 11.76, P = 0.001). CONCLUSION: LPBM could be a viable nonpharmaceutical alternative for formocresol pulpotomy in human primary teeth. Child;Humans;Lasers;Molar;Pulpotomy;Tooth, Deciduous

Management of orofacial lesions with antimicrobial photodynamic therapy and photobiomodulation protocols in patients with COVID-19: A multicenter case series. Several oral lesions related to COVID-19 have been described in the scientific literature. The COVID-19 pandemic highlighs importance of supportive protocols, which can reduce the inflammation and aid in tissue repair in severe cases. Photobiomodulation therapy (PBMT) alone or in combination with antimicrobial photodynamic therapy (aPDT) can be used to manage orofacial lesions in confirmed cases of COVID-19. Here, we sought to describe the clinical presentation and specificities of three cases in which aPDT and PBMT were used to manage orofacial lesions in patients with COVID-19. The laser protocols were effective with improvement of the orofacial lesions within a few days. Anti-Bacterial Agents;Anti-Infective Agents;Photosensitizing Agents Anti-Bacterial Agents;Anti-Infective Agents;COVID-19;Humans;Low-Level Light Therapy;Multicenter Studies as Topic;Pandemics;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2

The efficacy of high-intensity laser therapy in low back pain: A critical appraisal. The current narrative review was planned to identify the most likely factors that influence the diversity of the findings among clinical studies that investigate the use of high-intensity laser therapy in treating low-back pain. It also planned to provide recommendations with respect to the methodological drawbacks identified in literature. An extensive literature search of clinical and randomised, controlled trials was conducted using Embase, MEDLINE, Cinahl databases and the Cochrane Controlled Trial Register as well as a search by hand. The search yielded only six studies that could be critically reviewed. This limited number of studies exhibited different treatment approaches, parameters, blinding procedures, symptom durations, irradiated areas and testing occasions. The studies assessing the efficacy of high-intensity laser therapy in treating low-back pain showed controversial findings, which may be due to diversity in treatment parameters, approaches, symptom duration, blinding and / or randomisation procedures and testing occasions. Humans;Laser Therapy;Low Back Pain;Randomized Controlled Trials as Topic

Photobiomodulation and space closure. Humans;Low-Level Light Therapy;Wound Healing

Photobiomodulation and photodynamic therapy applied after electrocauterization for skin healing optimization in rats. Photobiomodulation-PBM and Photodynamic Therapy-PDT have been used to induce healing. However, the effects of these therapies on skin-lesions induced by electrocautery are unknown, aiming at more favorable clinical and esthetic results. Electrocauterization was done in 78-female Wistar-rats using a system that includes an electrocautery and red-LED. The groups were: No injury, Injury, Injuryâ€‰+â€‰ALA (topical 5-aminolevulinic acid application), Injuryâ€‰+â€‰LED and Injuryâ€‰+â€‰ALAâ€‰+â€‰LED (topical ALA application followed by photoactivation with LED). After 2nd, 7th and 14th days post-injury, immuno-histomorphometric analyses (inflammatory infiltrate, blood vessels, fibroblasts, eschar/epidermal thickness, IL-10 and VEGF) and biochemical assays of MPO (neutrophil), NAG (macrophage), nitrite, DCF (H(2) O(2)), carbonyl (membrane's damage), sulfhydryl (membrane's integrity), SOD, GSH, hydroxyproline and re-epithelialization area were performed. The Injuryâ€‰+â€‰LED and Injuryâ€‰+â€‰ALAâ€‰+â€‰LED groups controlled inflammation and oxidative stress, favoring angiogenesis, fibroblasts proliferation and collagen formation. Therefore, the PBM or PDT was effective in tissue formation with thinner eschar and epidermis, resulting in less scarring after electrocauterization. Aminolevulinic Acid Aminolevulinic Acid;Animals;Electrocoagulation;Female;Photochemotherapy;Rats;Rats, Wistar;Skin;Skin Diseases;Wound Healing

The Effect of Low-level Laser Therapy on VEGF, IL-6 Expression and Viability of Oral Squamous Cell Carcinoma Cells. Low-level laser therapy has shown successful results in the prevention and treatment of oral mucositis. One of the concerns about low-level lasers is their effects on remaining malignant cells in the area. Interleukin-6 is a multifunctional cytokine that plays an important role in a wide range of biological activities in increasing tumor functions, decreasing survival and resistance to chemo-radiotherapy. Vascular-endothelial growth factor increases tumor vascularization. It has been shown in the previous studies that LLLT can cause an increase of IL-6 and VEGF in some cells. The present thesis aims to study the effects of LLLT on IL-6 and VEGF expression, as well as cell viability on OSCC cells. Tumorigenic cells of an oral squamous cell carcinoma cell line were irradiated with 3 different diode lasers, and were compared to the control group (660â€‰nm-200â€‰mW-4â€‰Jâ€‰cm(-2) , 810â€‰nm-200â€‰mW-4â€‰Jâ€‰cm(-2) , 940â€‰nm-200â€‰mW-4â€‰Jâ€‰cm(-2)). MTT assay, ELISA and RT-PCR were used to measure cell viability, IL-6 and VEGF expression. Cell viability of all laser-irradiated groups was significantly lower than the control group. VEGF expression increased in laser-irradiated groups. This was only significant in the 810â€‰nm

group. IL-6 protein secretion was significantly higher in all laser-irradiated groups compared to the control group. Interleukin-6;Vascular Endothelial Growth Factor A Humans;Interleukin-6;Lasers, Semiconductor;Low-Level Light Therapy;Mouth Neoplasms;Squamous Cell Carcinoma of Head and Neck;Vascular Endothelial Growth Factor A

Benefits of Using Low-level Laser Therapy in the Rapid Maxillary Expansion: A Systematic Review. AIM AND OBJECTIVE: Determine the benefits of low-level laser therapy (LLLT) as a complement to rapid maxillary expansion (RME), through a systematic review. BACKGROUND: Transversal maxillary compression is a common skeletal problem that can be treated with different devices. This RME technique consists of the separation and regeneration of the midpalatal suture. Low-level laser therapy has been suggested to be able to accelerate bone healing after trauma or bone defects. REVIEW RESULTS: Thirty-two publications were found by electronic search during July to August of 2019 on Medline (PubMed) and Google Scholar, using the terms "Low-Level Laser", "LLLT", "Rapid Maxillary Expansion", and "Osteogenesis Distraction". Only 16 were used (2 systematic reviews, 6 articles on humans, and 8 on animals). Even though all the studies had different intervention protocols, they all revealed that LLLT has the effect of accelerating bone regeneration after RME. CONCLUSION: The use of LLLT as a complement to RME has shown promising results with cellular biostimulation, promoting angiogenesis and bone regeneration of the midpalatal suture. CLINICAL SIGNIFICANCE: This study provides scientific evidence of the benefits of using LLLT as a complement to RME during orthopedic and orthodontic treatments, accelerating bone regeneration and reducing the time of consolidation of the maxillary. HOW TO CITE THIS ARTICLE: Lai P-S, Fierro C, Bravo L, et al. Benefits of Using Low-level Laser Therapy in the Rapid Maxillary Expansion: A Systematic Review. Int J Clin Pediatr Dent 2021;14(S-1):S101-S106.

Efficacy of Laser Photobiomodulation in Accelerating Orthodontic Tooth Movement in Children: A Systematic Review with Meta-analysis. AIM AND BACKGROUND: This systematic review aimed to investigate the efficacy of laser photobiomodulation (PBM) on the acceleration of orthodontic tooth movement (OTM). REVIEW METHODS: The study protocol was registered at PROSPERO (CRD42019121465). An extensive electronic search for randomized control trials and clinical control trials via Medline (via PubMed), The Cochrane Controlled Clinical Trials Register, and Scopus up to date 24/02/2019 was done. Hand searching was performed for relevant journals. Reference articles were retrieved and exported to Mendeley Desktop 1.13.3 software. The risk of bias was assessed using the Cochrane risk of the bias assessment tool. Articles were further analyzed using Revman5.3 software. RESULTS: A total of 14 articles were considered for systematic review and 9 articles were considered for meta-analysis. The results of the meta-analysis showed a significant difference between the laser group and conventional orthodontic treatment with Forest plots showing more tooth movement in the laser group compared to the control group in 2-3 months (mean difference = 1.73; CI: 0.9-2.57; p = 0.00001; I (2) = 89 %). CONCLUSION: Although the analysis of the results shows that laser PBM favors OTM, the results are inconclusive as the heterogeneity across studies was high. CLINICAL SIGNIFICANCE: Laser PBM may be considered as novel, safe, and noninvasive adjuvant therapy for the acceleration of OTM in children. HOW TO CITE THIS ARTICLE: Yavagal CM, Matondkar SP, Yavagal PC. Efficacy of Laser Photobiomodulation in Accelerating Orthodontic Tooth Movement in Children: A Systematic Review with Meta-analysis. Int J Clin Pediatr Dent 2021;14(S-1):S94-S100.

Updates in Wound Management and Dressings. Wound healing is a complex process that traverses 4 main phases which overlap and are interdependent. Many patient-related factors can impede healing by disrupting the normal pathways from one phase to the next. Wound-related factors also determine the best techniques or dressings for each patient. Species differences between cats and dogs must be understood for the successful treatment of cats. New techniques such as fish skin graft application, photobiomodulation, and bioelectric dressings hold promise as an addition to

our armamentarium against wounds. NPWT, hyperbaric oxygen, regenerative medicine techniques, and low-level laser therapies yield mixed results and large-scale controlled studies are needed. Animals;Bandages;Cats;Dogs;Skin Transplantation;Wound Healing

Effect of the association of infra-red and red wavelength photobiomodulation therapy on the healing of post-extraction sockets of third lower molars: a split-mouth randomized clinical trial. The aim of this study was to evaluate the effect of photobiomodulation therapy (PBMT) with the association of red and infra-red laser therapy in the healing of the post-extraction sockets of third lower molars. Twenty patients were submitted to extraction of lower third molars and the post-extraction sockets were treated using two different approaches in a randomized split-mouth design: The test side received the PBMT with red (Î» 660Â nm) and infra-red laser therapy (Î» 808Â nm) and the control side was not irradiated. The PBMT was applied immediately and 3 and 7Â days after the surgical procedure. Post-extraction socket healing was assessed by the bone repair score, bone density, and fractal dimension analysis 7 and 90Â days after the surgical procedure, using cone-beam computed tomography images. Additionally, clinical analyses were performed 3, 7, 14, 30, and 90Â days after the surgical procedure, considering the occurrence of pain, edema, and bleeding, as well as the quality of the oral mucosa repair, assessed using a visual analogue scale. The clinical analysis showed that PBMT reduced edema and improved the repair of oral mucosa at 7Â days after surgery, while the tomographic analysis showed no significant differences between groups. Dual-wavelength PBMT improved the post-operative clinical course in patients undergoing lower third molar extraction, without altering bone repair. Edema;Humans;Low-Level Light Therapy;Molar, Third;Mouth;Tooth Extraction;Wound Healing

Area light source-triggered latent angiogenic molecular mechanisms intensify therapeutic efficacy of adult stem cells. Light-based therapy such as photobiomodulation (PBM) reportedly produces beneficial physiological effects in cells and tissues. However, most reports have focused on the immediate and instant effects of light. Considering the physiological effects of natural light exposure in living organisms, the latent reaction period after irradiation should be deliberated. In contrast to previous reports, we examined the latent reaction period after light exposure with optimized irradiating parameters and validated novel therapeutic molecular mechanisms for the first time. we demonstrated an organic light-emitting diode (OLED)-based PBM (OPBM) strategy that enhances the angiogenic efficacy of human adipose-derived stem cells (hADSCs) via direct irradiation with red OLEDs of optimized wavelength, voltage, current, luminance, and duration, and investigated the underlying molecular mechanisms. Our results revealed that the angiogenic paracrine effect, viability, and adhesion of hADSCs were significantly intensified by our OPBM strategy. Following OPBM treatment, significant changes were observed in HIF-1Î± expression, intracellular reactive oxygen species levels, activation of the receptor tyrosine kinase, and glycolytic pathways in hADSCs. In addition, transplantation of OLED-irradiated hADSCs resulted in significantly enhanced limb salvage ratio in a mouse model of hindlimb ischemia. Our OPBM might serve as a new paradigm for stem cell culture systems to develop cell-based therapies in the future.

The neurobiology of nutraceuticals combined with light exposure, a case report in the course of retinal degeneration. The present article presents a case report and discusses the neurobiology underlying the potential neuro-repair induced by combined administration of phytochemicals in a patient undergoing photo-bio-modulation (PBM), which improves anatomical and clinical abnormalities in the course of age-related macular degeneration (AMD). After combined treatments the patient with nutraceuticals and PBM had noticeable improvement of retinal tissue with excellent vision for her age and no worsening of corneal guttae, which was present at the time of diagnosis. The present treatment was tailored, based on translational evidence, to improve the autophagy pathway, which is a key determinant in the onset and progression of AMD. In fact, treatment with

specific patterns of light exposure combined with specific phytochemicals, may synergize in improving the microanatomy of the retina by restoring its neurobiology. The combination of light exposure, at selective wavelengths, with the effects produced by the intake of specific phytochemicals to treat AMD is reported here as "Lugano Protocol". Such a clinical protocol represents an "in progress" development backed up by translational research. In fact, recent evidence indicates that, specific phytochemicals, when administered in combination may promote anatomical and functional integrity within the retina. These in turn synergize with analogous effects produced by specific wavelengths, when administered at specific time intervals. The synergism between specific light and combined phytochemicals is discussed at molecular level, where recent data indicate how these treatments, when delivered according to specific patterns, may enhance autophagy in the retina. The improvement of retinal morphology and visual acuity, observed in this case report is thoroughly discussed in the light of the key role of autophagy in regulating the integrity of the retinal epithelium. Despite exciting, and consistent with translational evidence, the clinical report of a disease modifying effect during AMD owns the inherent limit of a case report, which requires wide validation in large number of patients. The potential effectiveness of "Lugano protocol" may apply to other types of retinal degenerations, where common alterations in the autophagy pathway do occur. Thus, such a therapeutic approach may extend to a common late stage of retinal trans-synaptic degeneration, where maladaptive plasticity during several types of retinal degenerative disorders eventually converge. Dietary Supplements;Female;Humans;Macular Degeneration;Retina;Retinal Degeneration;Visual Acuity

Benefits of a Skull-Interfaced Flexible and Implantable Multilight Emitting Diode Array for Photobiomodulation in Ischemic Stroke. Photobiomodulation (PBM) has received attention due to its potential for improving tissue function and enhancing regeneration in stroke. A lightweight, compact, and simple system of miniaturized electronic devices consisting of packaged light-emitting diodes (LEDs) that incorporates a flexible substrate for in vivo brain PBM in a mouse model is developed. Using this device platform, the preventive and therapeutic effects of PBM affixed to the exposed skull of mice in the photothrombosis and middle cerebral artery occlusion stroke model are evaluated. Among the wavelength range of 630, 850, and 940 nm LED array, the PBM with 630-nm LED array is proved to be the most effective for reducing the infarction volume and neurological impairment after ischemic stroke. Moreover, the PBM with 630 nm LED array remarkably improves the capability of spatial learning and memory in the chronic poststroke phase, attenuates AIM2 inflammasome activation and inflammasome-mediated pyroptosis, and modulates microglial polarization in the hippocampus and cortex 7 days following ischemic stroke. Thus, PBM may prevent tissue and functional damage in acute ischemic injury, thereby attenuating the development of cognitive impairment after stroke. Inflammasomes Animals;Inflammasomes;Ischemic Stroke;Low-Level Light Therapy;Mice;Skull;Stroke

Clarification: Whole-organ transdermal photobiomodulation (PBM) of COVID-19: A 50-patient case study.

Clinical and radiographic effectiveness of mineral trioxide aggregate (MTA) partial pulpotomy with low power or high power diode laser irradiation in deciduous molars: a randomized clinical trial. This study investigated the clinical and radiographic effectiveness of MTA partial pulpotomy with low power or high power diode laser irradiation in primary molars. In this randomized single-blind clinical trial, 63 mandibular second molars were assigned into three groups (nâ€‰=â€‰21). After pulp amputation and achieving hemostasis, MTA was placed over pulp stumps in group 1 (MTA). The patients in groups 2 (LLLT-MTA) and 3 (DL-MTA) underwent low level (660Â nm, 200 mW) and high power (810Â nm, 1Â W) diode laser radiation prior to MTA placement, respectively. The occurrence of clinical failure (spontaneous pain, tenderness upon percussion, swelling, fistula, mobility) and

radiographic failure (periodontal ligament widening, external or internal root resorption, periapical or furcal radiolucency) was recorded up to 18Â months after therapy.Â MTA and LLLT-MTA groups showed clinical success rate of 100% throughout the experiment. The clinical success rate of DL-MTA group was 95.2%, 95.2%, and 87.5% after 6, 9, and 18Â months. The radiographic success rates were 90.5%, 90.5%, and 87.5% in the MTA group; 100%, 95.2%, and 88.2% in the LLLT-MTA group, and 85.7%, 76.2%, and 68.7% in the DL-MTA group, at 6-, 9-, and 18-month follow-ups, respectively. No significant differences were found in the frequency of clinical or radiographic failure among the groups at any interval (pâ€‰>â€‰0.05). MTA partial pulpotomy was a suitable technique for vital pulp therapy in deciduous teeth. The addition of low power or high power diode laser radiation to the procedure did not cause a significant difference in success rate values. Aluminum Compounds;Calcium Compounds;Drug Combinations;mineral trioxide aggregate;Oxides;Silicates Humans;Aluminum Compounds;Calcium Compounds;Drug Combinations;Lasers, Semiconductor;Oxides;Pulpotomy;Silicates;Single-Blind Method;Tooth, Deciduous;Treatment Outcome

Inhibition of bacterial growth through LED (light-emitting diode) 465 and 630Â nm: in vitro. Photobiomodulation has been used to inactivate bacterial growth, in different laser or LED protocols. Thus, the aim of this study was to verify the inhibition of Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli, in ATCC strains and bacteria collected from patients with skin burns, after irradiation with LED; 300Â Î¼l of saline solution with bacterial suspension was irradiated at a concentration of 0.5-0.63, by the McFarland scale, after five serial dilutions, with evaluation of pre- and post-irradiation pH and temperature control. The cultures were placed in a bacteriological incubator at 37Â Â°C for 24Â h for later counting of colony-forming units (CFU). Data were analyzed by Shapiro-Wilk tests and single-factor ANOVA, with Tukey post hoc (pâ€‰<â€‰0.05). Both wavelengths and energy densities tested showed inhibition of bacterial growth. The comparison of the irradiated groups (ATCC) with the control group showed the following: S. aureus and P. aeruginosa 465Â nm (40Â J/cm(2)) and 630Â nm (50Â J/cm(2)) and E. coli 465Â nm (40Â J/cm(2)) and 630Â nm (30Â J/cm(2)). Among the ATCC S. aureus groups, there was a difference for 630Â nm (30Â J/cm(2)) and 465Â nm (30, 40, 50Â J/cm(2)). The bacteria from the burned patients were S. aureus (30 and 50Â J/cm(2)) and P. aeruginosa (50Â J/cm(2)). We conclude that different bacterial strains were reduced into colony-forming units after LED irradiation. Escherichia coli;Humans;Light;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus

Red and near infrared light-stimulated angiogenesis mediated via Ca(2+) influx, VEGF production and NO synthesis in endothelial cells in macrophage or malignant environments. Irradiation with red or near-infrared (NIR) light in low level light therapy (LLLT) is found to stimulate cellular processes and bioenergetics, resulting in enhanced wound healing, pain control, neurodegenerative diseases treatment, etc. During light irradiation of tissues and organs, different cells are affected, though the connection between photostimulation of cells and their environmental conditions remains poorly understood. In this report, red/NIR light-stimulated angiogenesis is investigated using endothelial cells in vitro, with a focus on the capillary-like structure (CLS) formation and the respective biochemical processes in cells under conditions proximate to a healthy or malignant environment, which strongly defines angiogenesis. To model environmental conditions for endotheliocytes in vitro, the cell culture environment was supplemented by an augmented conditioned medium from macrophages or cancer cells. The biochemical processes in endothelial cell cultures were investigated with and without irradiation by red (650Â nm) and near-infrared (808Â nm) laser diodes and under normoxia or hypoxia conditions. A light-stimulated angiogenesis has been found, with a more efficient stimulation by 650Â nm light compared to 808Â nm light. It was shown that the irradiation with light promoted extracellular Ca(2+) influx, fostered cell cycle progression, proliferation and NO

generation in endothelial cells, and caused an increase in vascular endothelial growth factor (VEGF) production by endothelial cells and M2 macrophages under hypoxia conditions. The activation of VEGF production by macrophages was found to be associated with an increase in the number of M2 macrophages after light irradiation under hypoxia conditions. Thus, a new pathway of an activation of the endothelial cell metabolism, which is related with the extracellular Ca(2+) influx after light irradiation, has been revealed. STATEMENT OF SIGNIFICANCE: Red/NIR light-stimulated angiogenesis has been studied using endothelial cells in vitro, with focus on CLS formation and the respective biochemical processes in cell models proximate to a healthy or malignant environment. A light-stimulated angiogenesis has been found, stimulated via extracellular Ca(2+) influx, cell cycle progression, proliferation and NO generation, VEGF production increase by endothelial cells under hypoxia conditions. Vascular Endothelial Growth Factor A Cells, Cultured;Endothelial Cells;Humans;Infrared Rays;Macrophages;Neovascularization, Pathologic;Neovascularization, Physiologic;Vascular Endothelial Growth Factor A

Effectiveness of sodium fluoride varnish and/or diode laser in decreasing post-bleaching hypersensitivity: A comparative study. BACKGROUND: Professional tooth whitening has gained popularity in the past several years. The most commonly active chemical agent used in bleaching is hydrogen peroxide (HP). HP is a low molecular weight unstable material that easily diffuses into the tooth structure, causing oxidative reactions with a consequent whitening effect. After bleaching, tooth sensitivity and gingival irritation are anticipated. AIM: This study aimed to compare the effectiveness of remineralization and/or diode laser therapies in reducing tooth sensitivity after bleaching. METHODOLOGY: Thirty-nine participants from Umm Al-Qura University, dental clinics, Makkah, SA. They were divided into three equal groups according to the desensitizing technique used. All participants were subjected to bleaching by 40% opalescence boost HP. Subsequently, 13 participants received 5% sodium fluoride varnish (5% NaF), 13 participants received low-level laser therapy (LLLT), and 13 participants received a combination of both desensitizing techniques. Each participant represented self-control, where tooth sensitivity was measured before and after bleaching. The cold test was used to measure tooth sensitivity before bleaching, immediately after bleaching and after application of the proposed desensitizing technique. Then, a visual analogue scale (VAS) was used for re-assessment. RESULTS: The desensitizing methods exhibited a notable reduction in tooth sensitivity post-bleaching with no significant difference among the following therapies (pÂ =Â 0.544). CONCLUSION: All the employed desensitizing methods reduced post-bleaching sensitivity, with no significant differences among them. Thus, using one technique individually is enough for effort, time and cost savings.

Chronic Leg Ulcer Associated with Cutaneous IgG4-Related Disease. Chronic leg ulcer occurs in up to 13% of the general population and leads to economic and health care burdens. Approximately 20% of chronic nonhealing wounds are related to autoimmune diseases or vasculitis. Of these, chronic wounds associated with IgG4-related disease, a group of fibroinflammatory disorders that can have cutaneous and systemic involvement, are rarely reported. This case report describes a chronic leg ulcer associated with cutaneous IgG4-related disease. In addition to disease control with anti-inflammatory agents, following the principles of wound management and providing adjuvant wound treatment (eg, debridement, dressing, photobiomodulation therapy, or hyperbaric oxygen therapy) can promote the wound healing process. Humans;Immunoglobulin G4-Related Disease;Skin;Wound Healing;Administration, Cutaneous;Leg Ulcer;Chronic Disease;Varicose Ulcer

Evaluation of the effects of preconditioned human stem cells plus a scaffold and photobiomodulation administration on stereological parameters and gene expression levels in a critical size bone defect in rats. We assessed the impact of photobiomodulation (PBM) plus adipose-derived stem cells (ASCs) during the anabolic and catabolic stages of bone healing in a rat model of a critical size femoral

defect (CSFD) that was filled with a decellularized bone matrix (DBM). Stereological analysis and gene expression levels of bone morphogenetic protein 4 (BMP4), Runt-related transcription factor 2 (RUNX2), and stromal cell-derived factor 1 (SDF1) were determined. There were six groups of rats. Group 1 was the untreated control or DBM. Study groups 2-6 were treated as follows: ASC (ASC transplanted into DBM, then implanted in the CSFD); PBM (CSFD treated with PBM); irradiated ASC (iASC) (ASCs preconditioned with PBM, then transplanted into DBM, and implanted in the CSFD); ASCâ€‰+â€‰PBM (ASCs transplanted into DBM, then implanted in the CSFD, followed by PBM administration); and iASCâ€‰+â€‰PBM (the same as iASC, except CSFDs were exposed to PBM). At the anabolic step, all treatment groups had significantly increased trabecular bone volume (TBV) (24.22%) and osteoblasts (83.2%) compared to the control group (all, pâ€‰=â€‰.000). However, TBV in group iASCâ€‰+â€‰PBM groups were superior to the other groups (97.48% for osteoblast and 58.8% for trabecular bone volume) (all, pâ€‰=â€‰.000). The numbers of osteocytes in ASC (78.2%) and iASCâ€‰+â€‰PBM (30%) groups were remarkably higher compared to group control (both, pâ€‰=â€‰.000). There were significantly higher SDF (1.5-fold), RUNX2 (1.3-fold), and BMP4 (1.9-fold) mRNA levels in the iASCâ€‰+â€‰PBM group compared to the control and some of the treatment groups. At the catabolic step of bone healing, TBV increased significantly in PBM (30.77%), ASCâ€‰+â€‰PBM (32.27%), and iASCâ€‰+â€‰PBM (35.93%) groups compared to the control group (all, pâ€‰=â€‰.000). There were significantly more osteoblasts and osteocytes in ASC (71.7%, 62.02%) (pâ€‰=â€‰.002, pâ€‰=â€‰.000); PBM (82.54%, 156%), iASC (179%, 23%), and ASCâ€‰+â€‰PBM (108%, 110%) (all, pâ€‰=â€‰.000), and iASCâ€‰+â€‰PBM (79%, 100.6%) (pâ€‰=â€‰.001, pâ€‰=â€‰.000) groups compared to control group. ASC preconditioned with PBM in vitro plus PBM in vivo significantly increased stereological parameters and SDF1, RUNX2, and BMP4 mRNA expressions during bone healing in a CSFD model in rats. Bmp4 protein, rat;Bone Morphogenetic Protein 4;CXCL12 protein, rat;Chemokine CXCL12;Core Binding Factor Alpha 1 Subunit;RNA, Messenger;Runx2 protein, rat Adipose Tissue;Animals;Bone Morphogenetic Protein 4;Bone and Bones;Chemokine CXCL12;Core Binding Factor Alpha 1 Subunit;Gene Expression;Humans;Low-Level Light Therapy;RNA, Messenger;Rats;Stem Cells

A prospective, split-face study comparing 1,064-nm picosecond Nd:YAG laser toning with 1,064-nm Q-switched Nd:YAG laser toning in the treatment of melasma. BACKGROUND: Recently, a low-fluence picosecond (ps) laser is an emerging option for removing pigmented lesions. OBJECTIVES: We aimed to evaluate the efficacy and safety of a 1,064-nm ps Nd:YAG laser as compared to a 1,064-nm Qs Nd:YAG laser for melasma treatment in an Asian. METHODS: Twenty Korean patients with facial melasma were enrolled and randomly treated with a 1,064-nm ps Nd:YAG laser on one side of the face and 1,064-nm Qs Nd:YAG on the other side at 2-week intervals for five sessions. At each visit, the modified Melasma Area Severity Index (mMASI), patient satisfaction scores, visual analogue scale (VAS) scores, and adverse events were assessed. RESULTS: Both groups showed significant clinical improvement and decreased mMASI scores compared to the baseline. No statistically significant difference was observed in the mMASI score between the two treatment techniques at any time point. The melanin index showed no statistically significant improvement in both groups, and no significant differences were observed in patient satisfaction scores and VAS scores between both modalities. CONCLUSIONS: A 1,064â€‰nm ps Nd:YAG laser is as effective and safe as a conventional 1,064â€‰nm Qs Nd:YAG laser in the treatment of melasma in Asian skin, but no superior outcome was observed. Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Prospective Studies;Treatment Outcome

Comment on "Photobiomodulation therapy for the prevention of acute radiation dermatitis (ARD) in head and neck cancer patients (DERMISHEAD trial)".

Response to the Comment on "Photobiomodulation therapy for the prevention of acute radiation dermatitis (RD) in head and neck cancer patients (DERMISHEAD trial)" by He et al.

Effect of photobiomodulation after non-surgical mechanical debridement on cortisol levels in the peri-implant sulcular fluid among patients with peri-implant mucositis. OBJECTIVE: The aim of this was to compare the efficacy of photobiomodulation after non-surgical mechanical debridement (MD) on cortisol levels (CL) in peri-implant sulcular fluid (PISF) among patients with peri-implant mucositis. METHODS: Patients with peri-implant mucositis were encompassed. All patients underwent non-surgical MD with (test group) and without (control group) a single application of photobiomodulation. Demographic data were collected and PISF was collected. Peri-implant modified plaque index (mPI), modified gingival index (mGI), probing depth and crestal bone loss were measured, and CL in PISF were recorded. All clinical parameters and PISF CL were re-assessed at 4Â months of follow-up. pÂ <Â .05Â showed statistical significance. RESULTS: Seventeen (14 males and 3 females) and 17 (15 males and 2 females) patients with peri-implant mucositis were recruited in test and control groups. The mean age of patients in the test and control groups was 46.1Â Â±Â 6.5 and 50.2Â Â±Â 2.7Â years respectively. At baseline, mPI, mGI, PD and PISF volume and CL in control and test groups were similar. At follow-up, there was a significant reduction in mPI (pÂ <Â .001), mGI (pÂ <Â .001), PD (pÂ <Â .001) and PISF volume (pÂ <Â .001) and CL (pÂ <Â .001) in both groups compared with baseline. There was no difference in mPI, mGI, PD and PISF volume and CL in test and control groups at follow-up. CONCLUSION: In short term, non-surgical MD with photobiomodulation does not offer additional benefits in terms of reducing soft-tissue inflammatory parameters and PISF CL in patients with peri-implant mucositis. Hydrocortisone Adult;Debridement;Female;Humans;Hydrocortisone;Male;Middle Aged;Mucositis;Peri-Implantitis

Pretreatment with combined low-level laser therapy and methylene blue improves learning and memory in sleep-deprived mice. Low-level laser therapy (LLLT) and methylene blue (MB) were proved to have neuroprotective effects. In this study, we evaluated the preventive effects of LLLT and MB alone and in combination to examine their efficacy against sleep deprivation (SD)-induced cognitive impairment. Sixty Balb/c male mice were randomly divided into five groups as follows: wide platform (WP), SD, LLLT, MB, LMB (treatment with both LLLT and MB). Daily MB (0.5Â mg/kg) was injected for ten consecutive days. An 810-nm, 10-Hz pulsed laser was used in LLLT every other day. We used the T-maze test, social interaction test (SIT), and shuttle box to assess learning and memory and PSD-95, GAP-43, and synaptophysin (SYN) markers to examine synaptic proteins levels in the hippocampus. Our results showed that SD decreased alternation rate in the T-maze test, sociability and social novelty in SIT, and memory index in the shuttle box. Single treatments were not able to reverse these in most of the behavioral parameters. However, behavioral tests showed a significant difference between combined therapy and the SD group. The levels of synaptic plasticity markers were also significantly reduced after SD. There was a significant difference between the MB group and SD animals in GAP-43 and SYN biomarkers. Combination treatment with LLLT and MB also increased GAP-43, PSD-95, and SYN compared to the SD group. We found that the combined use of LLLT and MB pretreatment is more effective in protecting SD-induced cognitive impairment, which may be imparted via modulation of synaptic proteins. GAP-43 Protein;Methylene Blue Animals;GAP-43 Protein;Hippocampus;Low-Level Light Therapy;Male;Methylene Blue;Mice;Mice, Inbred BALB C;Sleep

Microbiome Changes in Humans with Parkinson's Disease after Photobiomodulation Therapy: A Retrospective Study. There is a paucity of information on the effect of photobiomodulation therapy on gut microbiome composition. Parkinson's disease is a progressive neurological disorder with few management options, although the gut microbiome has been suggested as a potential avenue of treatment. We retrospectively analysed the microbiome from human stool samples from a

previously published study, which had demonstrated the efficacy of photobiomodulation to treat Parkinson's patients' symptoms. Specifically, we have observed changes in the microbiome of Parkinson's patients after a 12-week treatment regimen with photobiomodulation to the abdomen, neck, head and nose. Noted were positive changes in the Firmicutes to Bacteroidetes (F:B) ratio, which is often interpreted as a proxy for gut health.

Cellular and Molecular Targets for Non-Invasive, Non-Pharmacological Therapeutic/Rehabilitative Interventions in Acute Ischemic Stroke. BACKGROUND: Cerebral circulation delivers the blood flow to the brain through a dedicated network of sanguine vessels. A healthy human brain can regulate cerebral blood flow (CBF) according to any physiological or pathological challenges. The brain is protected by its self-regulatory mechanisms, which are dependent on neuronal and support cellular populations, including endothelial ones, as well as metabolic, and even myogenic factors. OBJECTIVES: Accumulating data suggest that "non-pharmacological" approaches might provide new opportunities for stroke therapy, such as electro-/acupuncture, hyperbaric oxygen therapy, hypothermia/cooling, photobiomodulation, therapeutic gases, transcranial direct current stimulations, or transcranial magnetic stimulations. We reviewed the recent data on the mechanisms and clinical implications of these non-pharmaceutical treatments. METHODS: To present the state-of-the-art for currently available non-invasive, non-pharmacological-related interventions in acute ischemic stroke, we accomplished this synthetic and systematic literature review based on the Preferred Reporting Items for Systematic Principles Reviews and Meta-Analyses (PRISMA). RESULTS: The initial number of obtained articles was 313. After fulfilling the five steps in the filtering/selection methodology, 54 fully eligible papers were selected for synthetic review. We enhanced our documentation with other bibliographic resources connected to our subject, identified in the literature within a non-standardized search, to fill the knowledge gaps. Fifteen clinical trials were also identified. DISCUSSION: Non-invasive, non-pharmacological therapeutic/rehabilitative interventions for acute ischemic stroke are mainly holistic therapies. Therefore, most of them are not yet routinely used in clinical practice, despite some possible beneficial effects, which have yet to be supplementarily proven in more related studies. Moreover, few of the identified clinical trials are already completed and most do not have final results. CONCLUSIONS: This review synthesizes the current findings on acute ischemic stroke therapeutic/rehabilitative interventions, described as non-invasive and non-pharmacological. Biomarkers;Cytokines;Inflammation Mediators Biomarkers;Brain;Clinical Decision-Making;Combined Modality Therapy;Cytokines;Disease Management;Disease Susceptibility;Gene Expression Regulation;Humans;Inflammation Mediators;Ischemic Stroke;Neovascularization, Pathologic;Oxidative Stress;Signal Transduction

Polyamide 6-Aluminum Assembly Enhanced by Laser Microstructuring. The presented work's aim is the application of low-power laser treatment for the enhancement of interfacial micromechanical adhesion between polyamide 6 (filled with glass fiber) and aluminum. A fiber laser beam was used to prepare micro-patterns on aluminum sheets. The micro-structuring was conducted in the regime of 50, 100, 200 and 300 mm/s laser beam speeds, for both sides. The joining process was realized in an injection molding process. Metallic inserts were surface engraved and overmolded in one-side and two-side configurations. A lap shear test was used to examine the strength of the joints. Engraved metallic surfaces and adequate imprints on polyamide side were checked by optical microscope with motorized stages, and roughness parameters were also determined. Microscopic observations made it possible to describe the grooves' shape and to conclude that a huge recast melt was formed when the lowest laser beam speed was applied; thus, the roughness parameter Ra reached the highest value of 16.8 Î¼m (compared to 3.5 Î¼m obtained for the fastest laser speed). The maximum shear force was detected for a sample prepared with the lowest scanning speed (one-

sides joints), and it was 883 N, while for two-sided joints, the ultimate force was 1410 N (for a scanning speed of 200 mm/s).

Photobiomodulation for the Treatment of Primary Headache: Systematic Review of Randomized Clinical Trials. The purpose of this study was to evaluate the efficacy and safety of photobiomodulation as an adjuvant treatment for primary headache. A systematic review of randomized clinical trials was performed. For such, electronic searches were performed in the MEDLINE, Embase, Cochrane Library, LILACS, PEDro, PsycInfo, Clinicaltrials.gov., and WHO/ICTRP databases, with no restrictions imposed regarding language or year of publication. We included studies that assessed any photobiomodulation therapy as an adjuvant treatment for primary headache compared to sham treatment, no treatment, or another intervention. The methodological assessment was conducted using the Cochrane Risk of Bias tool. The certainty of the evidence was classified using the GRADE approach. Four randomized clinical trials were included. Most of the included studies had an overall high risk of bias. Compared to sham treatment, photobiomodulation had a clinically important effect on pain in individuals with primary headache. Despite the benefits reported for other outcomes, the estimates were imprecise, and the certainty of the evidence was graded as low. These findings are considered insufficient to support the use of photobiomodulation in the treatment of primary headache. Randomized clinical trials, with higher methodological quality, are needed to enhance the reliability of the estimated effects.

Blue Laser Light Counteracts HSV-1 in the SH-SY5Y Neuronal Cell Model of Infection. Herpes simplex virus 1 (HSV-1) is wide-spread virus that triggers painful and recurrent infections, as herpes labialis, causing blister lesions on the lip. HSV-1 infection can be a lifelong condition starting from childhood due to the latency of the virus hidden in the trigeminal ganglia. Despite the use of antiviral treatments, there is not a resolutive cure for herpes. In our study, we tested blue light against HSV-1 in a neuronal cellular model, aimed at mimicking the neuronal tropism of HSV-1. Two laser protocols employing continuous wave and pulse modalities were delivered to infected cell cultures and to the virus alone. A significant reduction of viral replication was observed when the beam was directly applied to the virus, along with an increase in cell survival. Our findings, considering the limitation of the still-unknown mechanisms by which the blue light acts on the virus, suggested a potential use of photobiomodulation therapy for clinical applications against herpes labialis in pediatric patients.

Pain Reduction during Rapid Palatal Expansion Due to LED Photobiomodulation Irradiation: A Randomized Clinical Trial. Objective: The purpose of this research is to assess the analgesic efficiency of Photobiomodulation (PBM) in pain reduction in young patients during rapid maxillary expansion therapy. Materials and Methods: Thirty patients were included and allocated to an experimental group [Rapid Palatal Expansion (RPE) and PBM] and a control group (RPE only) at random. Inclusion criteria were skeletal age from CVS1 to CVS3, examined on the cephalometric lateral teleradiography, with cervical vertebra staging and completed eruption of upper first molar. Exclusion criteria were previous orthodontic treatment, bone disease, disability, or skeletal age from CVS4. Patients referred the pain they felt using a Numerical scale rate (NRS), ranging from 0 to 10, with specific intervals of time: 6 h, 12 h, 24 h, and from days 2 to 7. The Wilcoxon-Mann-Whitney test was used to evaluate differences in NRS reported values between the two groups. Results: The final sample included 30 patients, 14 males and 16 females, with a mean age of 7.8 Â± 1.2 years. The pain that was felt at each time interval and the maximum score of pain were significantly lower in the experimental group ($p < 0.05$) and decreased faster in the experimental group, with a score test near to 0 after 2/3 days. Conclusions: PBM is efficient in reducing the intensity and the time of pain felt by young patients that undergo rapid maxillary expansion.

Metabolic Connectivity and Hemodynamic-Metabolic Coherence of Human Prefrontal Cortex at Rest and Post Photobiomodulation Assessed by Dual-Channel Broadband NIRS. Billions of neurons in

the human brain form neural networks with oscillation rhythms. Infra-slow oscillation (ISO) presents three main physiological sources: endogenic, neurogenic, and myogenic vasomotions. Having an in vivo methodology for the absolute quantification of ISO from the human brain can facilitate the detection of brain abnormalities in cerebral hemodynamic and metabolic activities. In this study, we introduced a novel measurement-plus-analysis framework for the non-invasive quantification of prefrontal ISO by (1) taking dual-channel broadband near infrared spectroscopy (bbNIRS) measurements from 12 healthy humans during a 6-min rest and 4-min post transcranial photobiomodulation (tPBM) and (2) performing wavelet transform coherence (WTC) analysis on the measured time series data. The WTC indexes (IC, between 0 and 1) enabled the assessment of ipsilateral hemodynamic-metabolic coherence and bilateral functional connectivity in each ISO band of the human prefrontal cortex. At rest, bilateral hemodynamic connectivity was consistent across the three ISO bands (IC â‰… 0.66), while bilateral metabolic connectivity was relatively weaker. For post-tPBM/sham comparison, our analyses revealed three key findings: 8-min, right-forehead, 1064-nm tPBM (1) enhanced the amplitude of metabolic oscillation bilaterally, (2) promoted the bilateral metabolic connectivity of neurogenic rhythm, and (3) made the main effect on endothelial cells, causing alteration of hemodynamic-metabolic coherence on each side of the prefrontal cortex.

The Path to an Evidence-Based Treatment Protocol for Extraoral Photobiomodulation Therapy for the Prevention of Oral Mucositis. Oral mucositis is a painful complication of hematopoietic stem cell transplantation for which photobiomodulation therapy (PBMT) is a safe and effective intervention. Extraoral delivery of PBMT has clinical advantages over intraoral delivery but requires additional dosimetric considerations due to the external tissue layers through which the light must propagate before reaching the oral mucosa. Additionally, to date there has been no dose modeling study, a task essential to developing a justified treatment protocol. We review here some of the complexities surrounding extraoral photobiomodulation therapy and offer that may help guide researchers toward an evidence-based treatment protocol for the prevention of oral mucositis.

Laser-Assisted Management of a Rare Presentation of Peripheral Ossifying Fibroma in an Infant. Reactive hyperplasias are a group of lesions often seen in the oral mucosa, especially on the gingiva, in association with local irritation or trauma. Peripheral ossifying fibroma (POF) is a common reactive lesion, almost always affecting the tooth-bearing areas of the oral cavity. It is most often encountered in young adults but extremely rare in patients below 10 years of age.(Â)Here, we report a unique presentation of peripheral ossifying fibroma affecting the anterior mandible in a three-month-old infant. We also highlight the role of laser in the management of such lesions.

Effects of Photo-Biomodulation in Stargardt Disease. PURPOSE: Stargardt disease (STGD1) is the most common hereditary macular degeneration and currently no treatments have been approved to interrupt the progression of the disease. The aim of this study was to evaluate the efficacy of photo-biomodulation in patients with Stargardt disease 1 year after treatment, considering as primary outcomes improvements in best corrected visual acuity (BCVA), microperimetry, and pattern electroretinography (PERG) amplitude. MATERIALS AND METHODS: Ninety eyes of 45 patients with a diagnosis of Stargardt disease stage 1 were prospectively recruited at the University of Bologna. Selected patients were treated with photo-biomodulation therapy for 1 year for 10 minutes a day, twice a day, and 5 days per week for 12 months. A light emitting diode (LED) of 10 Hz and wavelength 650 nm was used. BCVA and microperimetry were assessed before treatment and 1 year after photo-biomodulation, whereas PERG was assessed at baseline, 1, 3, 6, and 12 months after treatment. RESULTS: BCVA improved from 0.7 [interquartile range (IQR)=0.6-0.9)] to 0.4 (IQR=0.2-0.5)] after treatment (95% CI=-0.3, -0.35; p=<0.001) and PERG negative wave at 35 ms (N35)-positive wave at 50 ms (P50) amplitude improved from 0.9 (IQR=0.74-1.21) to 2.12 (95% CI=1.11, 1.28; p<0.001). MP-1 Microperimetry improved from 26.5% (IQR=16.75-40) of median preferred retinal loci (PRL) within an

area of 2Â° of diameter to 38% (IQR=29-50.25; 95% CI=10.50, 14.50; p=<0.001); on the other hand, PRL within 4Â° of diameter raised from 72% (IQR=51.5-80) to 80% (IQR=76-87) after photo-biomodulation (95% CI=4.50, 7.50; p<0.001). Also, patients with an improvement of more than 1.205 PERG N35-P50 ratio amplitude at 3 months and more than 1.29 at 6 months tended to present an improvement of more than 0.2 logMar in BCVA at 12 months (p=0.28, AUC=0.630; p=0.30, AUC=0.636). CONCLUSION: BCVA, PERG, and MP-1 significantly improved 1 year after treatment. Also, improvement of PERG N35-P50 amplitude at 3 and 6 months was correlated to BCVA improvement at 1 year, suggesting that PERG could be useful in predicting visual outcome after photo-biomodulation.

Correction to: Photobiomodulation: The Clinical Applications of Low-Level Light Therapy.

One day at a time. In this issue of Biomedical Journal we get to know measures to prevent a nosocomial COVID-19 outbreak, a compound that is able to stall SARS-CoV-2 replication, and the connection between air pollution and COVID-19 cases. Another article allows an insight into the potential of treating HIV combining a conventional drug and low level laser therapy. Furthermore, the advantages of awake craniotomy are presented, the efficacy of IRES is examined, and plant extracts are on the one hand explored as a nociceptive agent and on the other hand as therapeutic approach against breast cancer. We learn about drug resistance in liver cancer, a mutation involved in a rare inflammatory disorder, and lung surgery related unilateral vocal fold paralysis. Finally, the success of emergency endotracheal intubations across different hospital units is compared, the importance of monitoring cerebral blood flow in asphyxiated neonates is elucidated, and resistance variants in hepatitis C virus are examined. A study about the necessity to perform quantitative cardiac MRI in Asian population is presented, and an approach is shown on how to augment the effect of platelet-rich plasma injections in chronic knee osteoarthritis. COVID-19;Humans;Infant, Newborn;SARS-CoV-2

Nestin and NG2 transgenes reveal two populations of perivascular cells stimulated by photobiomodulation. Pericytes and glial cells are known to collaborate in dental pulp tissue repair. Cell-based therapies that stimulate these stromal components may be of therapeutic relevance for partially vital dental pulp conditions. This study aimed to examine the early effect of photobiomodulation (PBM) in pericytes from experimentally injured pulp tissue. To accomplish this, we used the Nestin-GFP/NG2-DsRed mice, whichÂ could allow the identification of distinct pericyte phenotypes. We discovered the presence of two pericytes subsets within the dental pulp, the Nestin (+) NG2(+) (type-2) and Nestin(-) NG2(+) (type-1). Upon injury, PBM treatment led to a significant increase in Nestin(+) cells and pericytes. This boost was mainly conferred by the more committed pericyte subset (NestinNG2(+)). PBM also stimulated terminal blood vessels sprouting adjacent to the injury site while maintaining signs of pulp vitality. In vitro, PBM induced VEGF upregulation, improved dental pulp cells proliferation and migration, and favored their mineralization potential. Herein, different subsets of perivascular cells were unveiled in the pulp tissue. PBM enhanced not only NG2(+) cells but nestin-expressing progenitors in the injured dental pulp. Nestin Animals;Dental Pulp;Mice;Nestin;Neuroglia;Pericytes;Transgenes

A prospective study on the treatment of immediate post-operative scar with narrowband intense pulsed light under polarized dermoscopy. (a) To evaluate the efficacy and safety of narrow-band intense-pulsed light (DPL) in immediate post-operative scar. (b) To observe the process of scar formation under dermoscopy in the first 6Â months. Nine patients with postoperative scars were enrolled in the randomized, prospective, split-scar study. Patients were treated in one half of the scar with DPL for cosmetic improvement at a wavelength of 500-600Â nm and the other half was not treated as control. The laser treatments were initiated 2Â weeks after the surgery and were given 3 times over a 4-week period. All patients were followed-up for 3Â months from the last treatment.

Photographs and dermoscopy digital images were collected each time. (a) Neither DPL or control produce statistically significant improvements in Vancouver Scar Scale. Moreover, comparatively, there was no statistical difference in Vancouver Scar Scale between DPL or control. However, 6 out of 9 patients treated with DPL had reduced scores in vascularity sooner compared with control. (b) Under dermoscopy, redness, and swelling were obvious from 2Â weeks after surgery, but were gradually alleviated. The surface of the scar gradually became uneven and rough. DPL might be beneficial in early recovery of immediate post-operative scar.
Cicatrix;Dermoscopy;Erythema;Humans;Low-Level Light Therapy;Prospective Studies;Treatment Outcome

Head and neck radiotherapy leading to extensive late oral soft-tissue necrosis. Radiotherapy is generally used as an adjuvant treatment in malignant head and neck tumors, which can cause a series of toxicities to tissues involved in the radiation field. Hard tissue necrosis surrounding the tumor is widely debated and recognized; however, oral mucosa necrosis as a late effect of head and neck radiotherapy is a toxicity that has been little explored and understood in the literature. The present report describes a 53-year-old Caucasian, diabetic man with a painful yellowish mass in the buccal mucosa, remaining oral mucositis with history of radiotherapy completed 90Â days ago as adjuvant treatment for a polymorphic adenocarcinoma in the palate. Photobiomodulation was used as therapy for tissue necrosis with good therapeutic response despite discontinuation of treatment by the patient. Since there are few descriptions and illustrations of radiotherapy-related soft tissue necrosis, the current case may bring some new experience with this important topic, which directly impacts on the patient's quality of life. Head and Neck Neoplasms;Humans;Male;Middle Aged;Mouth Mucosa;Necrosis;Quality of Life;Radiation Oncology;Radiotherapy;Stomatitis

Use of photodynamic therapy and photobiomodulation as alternatives for microbial control on clinical and subclinical mastitis in sheep. Evaluate the effects of antimicrobial photodynamic therapy (aPDT) and photobiomodulation (PBM) as alternatives in the treatment of mastitis in sheep. A total of 100 sheep were evaluated, and four teats with clinical mastitis and 16 teats with subclinical mastitis were selected. Milk was collected for isolation and identification of microorganisms. They were grown on TSA, EMB, and MacConkey agar for 24Â h, and the microorganisms were identified by Gram stain and biochemical tests. The ceilings were subdivided into four groups: G1, treatment with photosensitizer; G2, treatment with PBM (diode laser Î»â€‰=â€‰660Â nm); G3, aPDT with methylene blue, and G4, control group. Milk samples were collected before, 24 and 48Â h after treatments. Cases of subclinical mastitis presented coagulase-negative Staphylococcus and Streptococcus spp, and clinical mastitis had Escherichia coli grow from the samples. The treatments decrease the total bacterial count of negative coagulase Staphylococcus, Streptococcus spp, and Escherichia coli. Comparing the treatments, aPDT stood out, as it was able to photoinactivate all bacteria. Treatment with methylene blue photosensitizer, PBM, and aPDT induced the initial microbial reduction, but aPDT was more effective 48Â h after treatment. Anti-Bacterial Agents;Anti-Infective Agents;Coagulase;Photosensitizing Agents;Methylene Blue Animals;Anti-Bacterial Agents;Anti-Infective Agents;Coagulase;Escherichia coli;Female;Humans;Mastitis;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Sheep;Streptococcus

Surgical Wound Dehiscence Treatment With Low-Level Laser Therapy and BarbatimÃ£o: A Case Report. BACKGROUND: Low-level laser therapy (LLLT) and a gel containing an extract of BarbatimÃ£o, a native Brazilian tree, have shown promising results in both preclinical and clinical wound healing studies. PURPOSE: To describe the treatment of surgical wound dehiscence with LLLT and BarbatimÃ£o gel. CASE STUDY: A 54-year-old woman without comorbidities underwent abdominoplasty at another health facility. Three (3) weeks later she presented to the authors' clinic after an episode of syncope, abrupt dyspnea, purulent exudate, and necrotic tissue in the surgical

incision. She reported that wound redness, warmth, and swelling started 8 days postoperatively. The patient was admitted; on day 3 of that hospital stay, her condition improved and surgical debridement was performed. Follow-up care of wound dehiscence was provided in the outpatient clinic. The treatment involved daily application of BarbatimÃ£o gel and weekly application of LLLT. The wound healed after 84 days. CONCLUSION: This case report suggests that LLLT may be a beneficial adjunctive therapy, together with BarbatimÃ£o gel, for the treatment of surgical wound dehiscence. Abdominoplasty;Debridement;Female;Humans;Low-Level Light Therapy;Middle Aged;Surgical Wound Dehiscence;Wound Healing

Pain and Disability of Conservatively Treated Distal Radius Fracture: A Triple-Blinded Randomized Placebo-Controlled Trial of Photobiomodulation Therapy. Objective: Many patients with distal radius fracture (DRF) experience pain and disability after removal of the cast. The aim of this study was to investigate if photobiomodulation therapy (PBMT) applied after cast removal provides an add-on effect to a home-based exercise program in rehabilitation after DRF. Methods: In this triple-blinded placebo-controlled trial, 50 patients with conservatively treated DRF were randomized to receive either active PBMT or placebo PBMT after cast removal in addition to a home-based exercise therapy program. The outcome measures were the Patient-Rated Wrist and Hand Evaluation (PRWHE) questionnaire, night pain (NP), and consumption of analgesic medication (AM) and were evaluated after cast removal at 4 (baseline), 8, 12, and 26 weeks after injury. NP and AM were also evaluated 7 weeks after injury (end of active/placebo PBMT). Results: There was a significant between-group difference in PRWHE scores in favor of active PBMT 8, 12, and 26 weeks after DRF. NP and consumption of AM were significantly lower in the active PBMT group from 7 to 26 weeks. There was a minimum clinically important improvement between the groups in favor of active PBMT in total score at 12 weeks, in pain subscore at 8, 12, and 26 weeks, and in disability subscore at 8 and 12 weeks. Conclusions: PBMT is safe and has long-term positive effect on pain and disability in DRF patients, when applied in combination with a home-based rehabilitation exercise program. Clinical Trial registration number: NCT03014024. Exercise Therapy;Humans;Low-Level Light Therapy;Pain;Physical Therapy Modalities;Radius Fractures

Photobiomodulation Literature Watch October 2021.

Vaginal stretching therapy and class IIIB vaginal laser treatment for pelvic floor myofascial pain: a randomized clinical trial. PURPOSE: Several treatment options are proposed for the management of pelvic floor myofascial pain (PFMP). Manual therapy, such as vaginal stretching (VS), is one of these options. Photobiomodulation therapy (PBMT) with a laser device is a treatment option for PFMP that has been tested on other muscles. The aim of this study was to evaluate the effect of VS combined or not with PBMT for PFMP treatment. METHODS: One hundred three women with PFMP were enrolled in a double-blind randomized trial and assigned to VS+PBMT (10 treatments over 2 weeks with 100 mw delivering 12 joules to surface intravaginally, using near-infrared light 808 nm) and VS+shamPBMT treatment groups. Pain severity was assessed by Visual Analog Scale (VAS). Pelvic floor muscle function was assessed by Oxford Scale and surface electromyography. Urinary symptoms were evaluated by ICIQ-OAB and ICIQ-SF questionnaires, and intestinal constipation was assessed by ROMA criteria. RESULTS: There was a significant improvement in pain intensity (VAS) after treatment in both groups, with no difference between groups ($p = 0.46$). More than 50% of the women complained of severe pain before treatment, and after treatments, it was reported by less than 20% of women ($p < 0.001$), with no difference between groups ($p = 0.08$). Urinary symptoms improved in both groups ($p < 0.001$) with no difference between groups ($p = 0.37$). Intestinal constipation improved in the VS+PBMT group only ($p = 0.01$). CONCLUSION: VS and VS with near-infrared vaginal laser therapy were equally effective at decreasing myofascial pelvic pain and reducing urinary symptoms TRIAL REGISTRATION: REBEC (Registro Brasileiro de Ensaios ClÃ-nicos; Brazilian Registry of

Clinical Trials) under no.RBR-2TDCQ4 (November 11, 2018).
Constipation;Female;Humans;Lasers;Myofascial Pain Syndromes;Pain;Pelvic Floor;Treatment Outcome

The influence of delivery power losses and full operating parametry on the effectiveness of diode visible-near infra-red (445-1064Â nm) laser therapy in dentistry-a multi-centre investigation. The development of protocols for laser-assisted therapy demands strict compliance with comprehensive operating parametry. The purpose of this investigation was to examine the accuracy of correlation between laser control panel and fibre emission power values in a selection of diode dental lasers. Through retrospective analysis using successive systematic review and meta-analysis, it is clear that there is inconsistency in the details, and possible inaccuracies in laser power applied and associated computed data. Through a multi-centre investigation, 38 semi-conductor ("diode") dental laser units were chosen, with emission wavelengths ranging from 445 to 1064Â nm. Each unit had been recently serviced according to manufacturer's recommendations, and delivery fibre assembly checked for patency and correct alignment with the parent laser unit. Subject to the output capacity of each laser, four average power values were chosen using the laser control panel-100 mW, 500 mW, 1.0Â W, and 2.0Â W. Using a calibrated power meter, the post-fibre emission power value was measured, and a percentage power loss calculated. For each emission, a series of six measurements were made and analysed to investigate sources of power losses along the delivery fibre, and to evaluate the precision of power loss determinations. Statistical analysis of a dataset comprising % deviations from power setting levels was performed using a factorial ANOVA model, and this demonstrated very highly significant differences between devices tested and emission power levels applied (pâ€‰<â€‰10-142 andâ€‰<â€‰10-52 respectively). The devicesâ€‰Ã—â€‰emission power interaction effect was also markedly significant (pâ€‰<â€‰10-66), and this confirmed that differences observed in these deviations for each prior power setting parameter were dependent on the device employed for delivery. Power losses were found to be negatively related to power settings applied. Significant differences have emerged to recommend the need to standardize a minimum set of parameters that should form the basis of comparative research into laser-tissue interactions, both in vitro and in vivo.
Dentistry;Laser Therapy;Lasers;Low-Level Light Therapy;Meta-Analysis as Topic;Multicenter Studies as Topic;Retrospective Studies

Laser-photobiomodulation on titanium implant bone healing in rat model: comparison between 660- and 808-nm wavelength. Laser-photobiomodulation (L-PBM) has been widely studied and its biomodulatory effects have been established on irradiated cells, increasing viability and proliferation and on damaged tissues. In addition, L-PBM may reduce and modulate the inflammatory process. The effect of 660-nm and 808-nm laser-photobiomodulation on bone repair around titanium dental implants placed in rat's femur was evaluated by histomorphometry. Twenty-seven Wistar rats were divided into 3 groups of nine animals: group C - non-irradiated control; group R - Î»=660nm irradiated; and group IR - Î»=808nm irradiated. Each group was further divided in 3 subgroups of three animals each, according to histomorphometry analysis in 3 days, 7 days, and 14 days after irradiation. Histological H.E.-stained slides were photographed, and bone matrix measured in new-formed bone area. Bone matrix histomorphometry analysis indicates that at 7 days in the irradiated groups (R and IR), a bigger area matrix was observed in relation to control group (C) (p=0.04 and p=0.048 respectively). On the other hand, at 14 days, control group (C) presented a bigger area than infrared irradiated (IR) (p=0.001) and red irradiated group (R) also showed a bigger area than infrared irradiated group (IR) (p=0.019). Histological analysis indicates that irradiated groups (R and IR) exhibited a faster bone tissue matrix production than control group. Titanium
Animals;Femur;Lasers;Low-Level Light Therapy;Rats;Rats, Wistar;Titanium

Comparative evaluation of low-level light therapy and ethinyl estradiol and desogestrel combined oral contraceptive for clinical efficacy and regulation of serum biochemical parameters in primary dysmenorrhoea: a prospective randomised multicentre trial. We aimed to compare low-level light therapy with oral contraceptive pills for pain relief and serum levels of nitric oxide and prostaglandin E(2) in patients with primary dysmenorrhoea. This was a randomised, active comparator-controlled, multicentre study. In total, 156 patients were randomised to receive either low-level light therapy with light-emitting diodes (LED) applying on two acupoints, namely, conception vessel 4 (CV4) and CV6 or conventional treatment with oral Marvelon, 30Â Âµg of ethinyl estradiol and 150Â Âµg of desogestrel (DSG/EE), for three consecutive menstrual cycles. The main outcome was the proportion of patients who achieved 33% or more decrease in pain scores measured using the visual analogue scale, which was deemed as efficient rate. Absolute changes in visual analogue scale scores, serum levels of nitric oxide (assessed by nitrites and nitrates reflecting nitric oxide metabolism) and prostaglandin E(2) (measured by enzyme-linked immunosorbent assay) were the secondary outcomes. A total of 135 patients completed the study (73 in the light therapy group and 62 in the DSG/EE group). The efficient rate at the end of treatment was comparable between the groups (73.6% vs. 85.7%, Ï‡(2)â€‰=â€‰2.994, pâ€‰=â€‰0.084). A more significant reduction in pain scores was observed in the DSG/EE group (39.25% vs. 59.52%, pâ€‰<â€‰0.001). Serum levels of prostaglandin E(2) significantly decreased from baseline but did not differ between groups (-â€‰109.57â€‰Â±â€‰3.99Â pg/mL vs.â€‰-â€‰118.11â€‰Â±â€‰12.93Â pg/mL, pâ€‰=â€‰0.51). Nitric oxide concentration remained stable in both groups. Low-level light therapy with LED-based device applied on acupuncture points CV4 and CV6 demonstrated a similar level of dysmenorrhoea pain reduction to DSG/EE combined contraceptive. Both treatment modalities achieved clinically meaningful levels of pain reduction. Registration on ClinicalTrials.gov: TRN: NCT03953716, Date: April 04, 2019. Contraceptives, Oral, Combined;Norpregnenes;Prostaglandins;Nitric Oxide;Ethinyl Estradiol;Desogestrel Contraceptives, Oral, Combined;Desogestrel;Dysmenorrhea;Ethinyl Estradiol;Female;Humans;Low-Level Light Therapy;Nitric Oxide;Norpregnenes;Prospective Studies;Prostaglandins;Treatment Outcome

Photobiomodulation of gingival lesions resulting from autoimmune diseases: systematic review and meta-analysis. OBJECTIVES: To evaluate the effects of photobiomodulation (PBM) in gingival lesions resulting from autoimmune diseases; to compare PBM and topical corticosteroid (CS) treatment; and to assess PBM outcome over time of follow-up. MATERIALS AND METHODS: A comprehensive electronic search was performed in four electronic databases. Treatment effects were measured through visual analog scale of pain (VAS) and clinical evolution of lesion (Thongprasom scale for oral lichen planus (OLP)). Meta-analysis was performed to compare PBM with topical corticosteroid treatment and to evaluate PBM effect over time of follow-up. RESULTS: Seventeen studies were included in this review, of which six were used for the meta-analysis. Meta-analysis results showed no significant differences between PBM and topical CS in pain reduction at baseline (MDâ€‰=â€‰0.20, 95% CIâ€‰=â€‰â€‰-â€‰0.92, 1.32, pâ€‰=â€‰0.72) and 60-day follow-up (MDâ€‰=â€‰0.63, 95% CIâ€‰=â€‰â€‰-â€‰3.93, 5.19, pâ€‰=â€‰0.79); however, VAS showed significant pain reduction when compared before and after PBM at 30-day (MDâ€‰=â€‰â€‰-â€‰3.52, 95% CIâ€‰=â€‰â€‰-â€‰5.40,â€‰-â€‰1.64, pâ€‰=â€‰0.0002) and 60-day (MDâ€‰=â€‰â€‰-â€‰5.04, 95% CIâ€‰=â€‰â€‰-â€‰5.86,â€‰-â€‰4.22, pâ€‰<â€‰0.00001) follow-up. Thongprasom clinical scale for OLP also showed significant improvement at 30-day follow-up (MDâ€‰=â€‰â€‰-â€‰2.50, 95% CIâ€‰=â€‰â€‰-â€‰2.92,â€‰-â€‰2.08, pâ€‰<â€‰0.00001) after PBM. CONCLUSION: PBM led to significant reduction of pain and clinical scores of the lesions, not having shown significant differences when

compared to topical CS. CLINICAL RELEVANCE: PBM has been used in the treatment of autoimmune gingival lesions, but so far there is little strong evidence to support its use. Adrenal Cortex Hormones;Glucocorticoids Adrenal Cortex Hormones;Autoimmune Diseases;Glucocorticoids;Humans;Lichen Planus, Oral;Pain

Systematic review of postoperative rehabilitation interventions after cranial cruciate ligament surgery in dogs. OBJECTIVE: To critically evaluate the evidence for rehabilitation interventions following surgery for cranial cruciate ligament disease (CCLD) in dogs. STUDY DESIGN: Systematic review. METHODS: Google Scholar and Pubmed databases were searched for studies evaluating postoperative CCLD rehabilitation interventions from 1990 until March 2020 per the international Prospective Register of Systematic Reviews (PROSPERO). Each study was assigned a level of evidence score from I to IV and a risk of bias (RoB) score by 2 reviewers, and by a third reviewer, when consensus was not reached. RESULTS: Nineteen studies met the inclusion criteria. Twelve comprised randomized, controlled trials (Level II), 6 were nonrandomized or nonblinded (Level III), and one was retrospective (Level IV). Nine studies had high RoB scores. Sixteen studies yielded positive results. Therapeutic exercise had the most studies with positive results but all had high RoB. Cold compression therapy had 3 supporting studies (2 Level II, low RoB). Extracorporeal shockwave yielded 2 positive Level II studies (low-moderate and high-moderate RoB) and photobiomodulation had 1 positive study (Level II, low RoB) with objective outcomes. A negative outcome was noted in 1 photobiomodulation study. There was 1 supporting study on electrical stimulation and there was none on low-intensity pulsed ultrasound. CONCLUSION: This systematic review supports the use of rehabilitation interventions in recovery of postoperative CCLD in dogs; however, many studies had a high risk of bias. CLINICAL SIGNIFICANCE: There is a lack of class I level evidence in veterinary rehabilitation. This study supports therapeutic exercise and cold compression therapy for postoperative CCLD rehabilitation. Existing studies on other modalities are limited and demonstrate conflicting results. Animals;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Dog Diseases;Dogs;Postoperative Care

Treatment of carpal tunnel syndrome by low-level laser therapy versus corticosteroid injection: a randomized, prospective clinical study. To compare the effects of low level laser therapy (LLLT) and corticosteroid injection in patients with moderate carpal tunnel syndrome (CTS). Eighty-seven patients (143 wrists) with moderate CTS were randomized to the corticosteroid or LLLT groups. 40Â mg of triamcinolone acetate solution was applied to carpal tunnel of 44 patients (74 wrist). LLLT was applied to 43 patients (70 wrist) five times a week, for a total of 15 sessions (fluence of 6 j/cm(2) for 1Â min per point at a wavelength of 830Â nm). Outcome measures were numbness and pain, QuickDASH questionnaire, grasping tests, Tinel and Phalen tests, electrophysiological tests and MRI evaluations, which were tested at the baseline and 1st and 6th months after the treatment. Eighty patients (133 wrists) completed the study at the end of 6Â months. VAS and Quick DASH scores were better in the corticosteroid group in the 1st month, but there were no significant differences between groups in the 6th month. Phalen and Tinel tests, strength tests, and motor distal latency improved significantly and similarly in both groups at the 1st and 6th months. Sensory distal latency and sensory nerve conduction velocity showed significant improvements in the 1st and 6th months only in the corticosteroid group. In both groups, median nerve intensity rate and palmary spring rate improved significantly after the treatment. Based on this study, corticosteroid injection and LLLT groups showed statistically significant difference at the 1st month (short-term), whereas there was no significant difference at the 6th month (intermediate-term). Adrenal Cortex Hormones Adrenal Cortex Hormones;Carpal Tunnel Syndrome;Double-Blind Method;Humans;Low-Level Light Therapy;Median Nerve;Neural Conduction;Prospective Studies;Treatment Outcome

In vivo efficacy of low-level laser therapy on bone regeneration. PURPOSE: In clinical use of low-level laser therapy for bone regeneration (LLLT), application protocol (dose, duration, and repetitions) has not been established. This study aimed to depict a reliable dosage of LLLT by evaluating the efficacy of different dosing of LLLT (diode) on the healing of rabbit cranial defects. METHODS: Critical size defects were prepared in calvarias of 26 New Zealand White Rabbits in such each animal containing both test and control groups. Test groups were irradiated with 4Â Joule/cm(2) (j/cm(2)), 6 j/cm(2), and 8 j/cm(2). The rabbits were subjected to six times of laser treatments in 10Â days. At the end of the second week, 5 rabbits were sacrificed for histopathological and immunohistochemical analyses. At the 4th and 8th weeks, 20 rabbits (10 each) were sacrificed for micro-CT and histopathological analyses. RESULTS: Micro-CT evaluation revealed improved new bone formation in all test groups compared to the control group. 6 j/cm(2) group demonstrated the highest bone formation. The highest bone morphogenic protein -2 levels were found in the 4 j/cm(2) group. Osteocalcin expression was significantly higher in 4 j/cm(2) group. CONCLUSIONS: Our findings indicate that LLLT have a positive effect on new bone formation. The high efficacy of doses of 4 j/cm(2) and 6 j/cm(2) is promising to promote early bone healing. Osteocalcin Animals;Bone Regeneration;Low-Level Light Therapy;Osteocalcin;Osteogenesis;Rabbits;Wound Healing

Immediate effects of photobiomodulation on maximum lip pressure. PURPOSE: To verify the immediate effects of different doses of photobiomodulation on maximum lip pressure. METHODS: Experimental, randomized and triple-blind study. The sample consisted of 23 women and 17 men, age between 18 and 33 years old (average 23.18 years old, SD=2.1), distributed in four groups: CG (control group), G1, G4 and G7. The maximum pressure was assessed with the Iowa Oral Performance Instrument (IOPI). The bulb was placed between the lips and the participants were instructed to press it as strong as possible. Infrared LASER (808 nm), manufactured by DMC, Therapy EC model, 100 mW of power output, was applied. The doses tested were 1 J (G1), 4 J (G4) and 7 J (G7), applied at six points of the orbicularis oris muscle. In the CG there was no intervention. The evaluation procedures were repeated after the LASER application. The results were analyzed with a significance level of 95%. RESULTS: The maximum lip pressure increased significantly only in the group irradiated with 7 J. CONCLUSION: Low level LASER therapy with 7 J dose promoted changes in the performance of the orbicularis oris muscle in the maximum pressure task. Adolescent;Adult;Clinical Protocols;Facial Muscles;Female;Humans;Lip;Low-Level Light Therapy;Male;Young Adult

Photobiomodulation effect in tumoral necrosis factor-alpha(TNF-Î±) on the viability of random skin flap in rats. The aim of this study was to investigate the effect of red laser (660 nm) photobiomodulation (PBM) with different energies on tumor necrosis factor-alpha(TNF-Î±) expression for random skin flap viability in rats. Twenty-four Wistar rats were divided into three groups: sham group (SG), PBM laser group with an energy dose of 0.29 J (0.29G), and PBM laser group with an energy dose of 7.30 J (7.30G). A cranially based dorsal skin flap measuring 10 Ã— 4 cm was raised and a plastic barrier was placed between the flap and its bed. PBM was applied in 3 timepoints: in the immediate postoperative period, in the 1(st) and in the 2(nd) postoperative days; the animals were euthanized on the 7(th) postoperative day. The assessments included: TNF-Î± expression of 3 different flap areas (proximal, medial and distal), by immunohistochemistry; percentage of skin flap necrosis area, by the paper template method. The statistical analysis was performed through the Kruskal-Wallis and Mann-Whitney tests, the level of significance adopted was 5% ($p < 0.05$). TNF-Î± expression was significantly lower for 7.30G in the proximal area, reduced for SG in the medial point, and larger for 7.30G in the distal area. The percentage of flap necrosis area was significantly reduced for 7.30G. Higher energy doses are more efficacious than lower energy doses for modulating TNF-Î± expression. PBM with an energy dose of 7.30 J was effective in reducing the expression of TNF-Î± and

increase skin flap viability. Tumor Necrosis Factor-alpha Animals;Low-Level Light Therapy;Necrosis;Rats;Rats, Wistar;Skin;Surgical Flaps;Tumor Necrosis Factor-alpha

Low-level laser therapy is effective in controlling postoperative pain in lower third molar extractions: a systematic review and meta-analysis. This systematic review aimed to evaluate the effectiveness of low-level laser therapy in controlling postoperative pain in lower third molar extractions. A search was carried out in MEDLINE/PubMed, Web of Science and Cochrane Library (CENTRAL) databases, using the "low-level laser therapy", "photobiomodulation therapy", "impacted mandibular third molar", "mandibular third molar", "third molar extraction" descriptors and 2625 studies were found, including only randomized clinical trials published until July 2020, with no restrictions on language and country of study. Selected studies were submitted to initial screening based on the reading of titles, abstracts and full article, and duplicate studies were excluded. Overall, 2562 articles were found, of which only 15 randomized clinical trials were included in this review. A total of 648 patients (16-44Â years) who received low-level laser therapy as an intervention and placebo in their control group were evaluated. The pain evaluation criterion was the Visual Analog Scale (VAS) on the second and seventh days after surgery. Photobiomodulation with low-level laser showed statistically significant reduction in postoperative pain in lower third molar extractions, both on the second (MD:â€‰-â€‰0.59; CI:â€‰-â€‰0.92,â€‰-â€‰0.27) and seventh day after surgery (MD:â€‰-â€‰0.76; CI:â€‰-â€‰1.21,â€‰-â€‰0.32). Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain Measurement;Pain, Postoperative;Randomized Controlled Trials as Topic;Tooth Extraction;Tooth, Impacted;Trismus

Most used photobiomodulation dosimetry parameters to treat oral mucositis after preconditioning for hematopoietic stem cell transplantation: systematic review and meta-analysis. Parameter reproducibility in photobiomodulation therapy (PBMT) is still scarce in literature for the management of oral mucositis (OM). This study aimed to identify the most used PBMT dosimetry parameters (DP) and their efficacy in OM management after preconditioning for hematopoietic stem cell transplantation (HSCT). This research was conducted according to the PRISMA guidelines. The search for primary studies was in PubMed/MEDLINE, Web of Science, Embase, BVS, and Cochrane Library. Gray literature was verified on BDTD-Ibict and Open Gray. A total of 1044 studies were identified. Nine met the eligibility criteria for qualitative assessment and 7 for meta-analysis. The studies involved 396 patients submitted to preconditioning for HSCT, 211 with PBMT and 185 without PBMT in the OM management. The WHO scale was the most used to assess OM degree. The most used parameters were 660-nm wavelength, 40-mw power, 0.16-J energy, 1-W/cm(2) power density, 4-J/cm(2) energy density, and 0.04-cm(2) spot size. The meta-analysis demonstrated that PBMT decreased the severity of OM, with a protection factor 20% higher than the control group (without PBMT), and when the parameters are similar to the DP mentioned, the protection factor increases to 94%. These most used DP with similarity seem to be a therapeutic strategy for the management of OM in this population. Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Reproducibility of Results;Stomatitis

Tunable NIR Absorption Property of a Dithiolene Nickel Complex: A Promising NIR-II Absorption Material for Photothermal Therapy. Exogenous photothermal agents absorbing in the second near-infrared optical window (NIR-II, 1000-1700 nm) have received much attention due to their use in noninvasive photothermal therapy. A small quantity of organic NIR-II photothermal agents have been exploited, and the development of organic NIR-II photothermal materials is an urgent need for biological applications. In this study, we designed and synthesized three dithiolene nickel(II) complexes with different ligands-bis(phenyl) dithiolene for NiBD-Ph, bis(fluorenyl) dithiolene for NiBD-Fl, and bis(carbazolyl) dithiolene for NiBD-Cz-and investigated their photophysical properties. These complexes exhibited ligand-dependent NIR absorption performance, centered at 854 nm for

NiBD-Ph, 942 nm for NiBD-Fl, and 1010 nm for NiBD-Cz, respectively. NiBD-Cz is wrapped in ethylene oxide/propylene oxide block copolymer (F-127) through a hydrophilic-hydrophobic interaction to form water-soluble NiBD-Cz/F-127 nanoparticles (NiBD-Cz NPs), and the absorption peak of NiBD-Cz NPs are red-shifted to 1036 nm. NiBD-Cz NPs exhibit good dispersibility in water, robust photostability, and a high photothermal conversion efficiency (PCE) of 63.6% under 1064 nm laser irradiation, which is the highest PCE among metal bis(dithiolene) complexes up to now. The high PCE makes it possible to achieve better photothermal treatment effects even at low concentrations and under low-power laser irradiation. Antineoplastic Agents;Biocompatible Materials;Coordination Complexes;Sulfhydryl Compounds;Nickel Antineoplastic Agents;Biocompatible Materials;Cell Proliferation;Cell Survival;Coordination Complexes;Drug Screening Assays, Antitumor;HeLa Cells;Humans;Infrared Rays;Materials Testing;Molecular Structure;Nickel;Particle Size;Photothermal Therapy;Sulfhydryl Compounds

Effect of NIR light on the permeability of the blood-brain barriers in in vitro models. The blood-brain barrier (BBB) is a dynamic barrier between the blood microcirculation system and the brain parenchyma, which plays an important role in the pathogenesis of a variety of neurological diseases. Meanwhile, a non-invasive therapeutic approach of photobiomodulation (PBM) has emerged as a promising treatment for neurological disorders through irradiation with near infrared (NIR) light. However, despite multiple encouraging results reported for PBM in vitro and in vivo, the mechanisms of its therapeutic effect on brain, especially on the BBB, remain barely known. Herein, the effect of NIR light irradiation on the in vitro BBB models was studied. 808â€…nm laser irradiation at the doses of 10 and 30 J/cm(2) was found to significantly increase the permeability of this BBB model. The results showed that NIR light affected mitochondria of cells in the in vitro BBB models, leading to an increase in the mitochondrial activity, reactive oxygen species (ROS) level and Ca(2+) influx. The activity of matrix metalloproteinases and the expression of the tight junction proteins in the endothelial cells were found to be inhibited by the NIR light, resulting in an increase in the BBB permeability. This study suggested a new strategy for drug transport across the BBB in development of treatments for brain disorders.

LED photobiomodulation effect on the bleaching-induced sensitivity with hydrogen peroxide 35%-a controlled randomized clinical trial. OBJECTIVES: The aim of this study was to evaluate the effect of a protocol of photobiomodulation (PBM) with light-emitting diodes (LED) on the clinical risk of bleaching-induced sensitivity. MATERIALS AND METHODS: Sixty-four volunteers were selected and randomly divided in two groups, placebo (PG) and LED (LG). The LG received PBM irradiation and tooth bleaching, while the PG received tooth bleaching and simulation of the irradiation. The occurrence of painful sensitivity was recorded during the dental bleaching; immediately after bleaching; and 24, 48, and 72Â h after tooth bleaching. At the same measurement times, data were collected on the intensity of sensitivity (VAS and NRS scale) and teeth affected by bleaching-induced sensitivity. A questionnaire sought to measure how the painful sensitivity influenced basic daily activities. Tooth color measures were performed using subjective and objective methods. RESULTS: LED irradiation decreased the occurrence of sensitivity at all studied evaluation times as well as its intensity, with the exception of the 72-h data when both groups presented no difference. Teeth affected by bleaching-induced sensitivity were significantly greater in the PG. Color measurements presented no differences between the groups in the recently after and later measures. CONCLUSIONS: PBM with LED decreases sensitivity risk and sensibility intensity during and after office bleaching and causes no influence on the shade degree of whitening achieved. The decrease in tooth sensitivity provided more comfort and less suffering while drinking. CLINICAL RELEVANCE: LED irradiation is a promising intervention in the control of bleaching-induced sensitivity. TRIAL REGISTRATION: RBR-7hpfwj. Sensitivity intensity measured by the VAS scale (0-10) in the first

whitening session (Graphic A) and second whitening session (Graphic B). Significance level set at â‰¤ 5%. *Mann-Whiteney U test. Columns followed by the same letter are significant different (apâ€‰<â€‰0.001; bpâ€‰<â€‰0.001; cpâ€‰<â€‰0.001; dp =0.013; epâ€‰<â€‰0.001; fpâ€‰<â€‰0.001; gpâ€‰<â€‰0.001; hp = 0.002). Tooth Bleaching Agents;Hypochlorous Acid;Hydrogen Peroxide Dentin Sensitivity;Humans;Hydrogen Peroxide;Hypochlorous Acid;Tooth Bleaching;Tooth Bleaching Agents;Treatment Outcome

Near-infrared light spectroscopy and stimulation in cognitive neuroscience: the need for an integrative view? Near-infrared spectroscopy (NIRS) has been largely used in neuroscience as an alternative non-invasive neuroimaging technique, primarily to measure the oxygenation levels of cerebral haemoglobin. Its portability and relative robustness against motion artefacts made it an ideal method to measure cerebral blood changes during physical activity. Usually referred to as 'functional' NIRS (fNIRS) when used to monitor brain changes during motor or cognitive tasks, this technique often involves the montage the probes on the forehead of the participants to gauge the neurophysiological underpinning of executive functioning. Other applications of NIRS include other aspects of cerebral hemodynamics such as cerebral pulsatility. However, there is an important aspect that fNIRS studies do not seem to have taken into account so far, which relates to the capacity of near-infrared light to modulate cognitive and psychological processes according to what is known as photobiomodulation (PBM). Hence, drawing on a selection of NIRS and PBM experiments, we argue in favour of an integrative view for NIR-based neuroimaging studies, which should embrace a control for the possible effects of light stimulation, especially when fNIRS is considered to test the effect of an intervention. Cognitive Neuroscience;Functional Neuroimaging;Humans;Low-Level Light Therapy;Research Design;Spectroscopy, Near-Infrared

Evaluation of the red & blue LED effects on cutaneous refractory wound healing in male Sprague-Dawley rat using 3 different multi-drug resistant bacteria. OBJECTIVES: Photobiomodulation (PBM) is widely used in clinical therapy, andÂ is an effective approach to resist the bacterial infection of the cutaneous wound and modulate the wound healing process. Due to the several detriments of lasers, Red & Blue LED light (RBLL) may be a more viable light source. This study is aimed to evaluate and compare the therapeutic effect of RBLL light on different multi-drug resistant (MDR) bacteria in vitro and male Sprague-Dawley (SD) rat refractory MDR infection wound model in vivo. MATERIALS AND METHODS: Methicillin-resistant Staphylococcus aureus (MRSA), Extended-spectrum Î²-lactamases -producing Escherichia coli (ESBLs-Eco), and the MDR Pseudomonas aeruginosa (MDR-Pae) were employed to evaluate the antibacterial effects of the Blue LED light in vitro. Effects of RBLL on in vivo wound healing were evaluated by analyzing time to closure, wound score, semi-quantitative test for bacterial culture, histopathological examination and Masson staining of skin tissue, immunohistochemical (IHC) staining, and western blot analysis (WB) of wound tissue. RESULTS: Blue LED light inhibited MRSA, ESBLs-Eco, and MDR-Pae in vitro study. In vivo, RBLL accelerated wound healing, reduced levels of pathogenic bacteria on the wound surface while increasing the blood supply to the wound surface and inhibiting the excessive inflammatory response. CONCLUSION: RBLL showed a great potential gain for the treatment of MDR bacterial infected wounds, suggesting PBM therapy is an inexpensive, convenient, pain-free, and safe therapeutic intervention for refractory MDR infection wounds. Anti-Bacterial Agents Animals;Anti-Bacterial Agents;Bacteria;Drug Resistance, Multiple, Bacterial;Male;Methicillin-Resistant Staphylococcus aureus;Rats;Rats, Sprague-Dawley;Wound Healing;Wound Infection

Split-face comparative study between intradermal tranexamic acid injection alone versus intradermal tranexamic acid injection combined with Q-switched Nd:YAG laser in melasma treatment: dermoscopic and clinical evaluation. Melasma is a chronic, dark brown-pigmented patches and macules commonly on the face. Many treatment modalities for melasma have been used as

hydroquinone, laser treatment, and recently tranexamic acid. Dermoscopy is used to diagnose and follow up the treatment of melasma and to detect underlying invisible vessels and their change with treatment. Melasma treatment evaluation by using combined Q-switched Nd:YAG laser with intradermal tranexamic acid injection versus tranexamic acid intradermal injection alone. This study was conducted on 40 female patients aged 35-45 years. It was a split-face study; for 12 weeks, the right side of the face was treated with low fluence Q-switched Nd:YAG laser combined with intradermal injection of tranexamic acid, while the left side was treated with an injection of tranexamic acid intradermal alone. The patients were clinically evaluated by using the modified melasma area and severity index (mMASI) score, and underwent dermoscopic evaluation before treatment, at the end of the treatment (12 weeks), and at (24 weeks) as follow-up. The efficacy, adverse effects, and recurrence after treatment were reported. There was a statistically significant decrease in mMASI score with combination treatment than with intradermal injection of tranexamic acid alone after treatment at 12 weeks and at the end of follow-up at 24 weeks. Combination of an injection of tranexamic acid intradermal and low fluence Q-switched Nd:YAG laser is an effective and safe treatment for melasma with minimal side effects more than the intradermal tranexamic acid injection alone. Tranexamic Acid Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Tranexamic Acid;Treatment Outcome

Lightwave-reinforced stem cells with enhanced wound healing efficacy. Comprehensive research has led to significant preclinical outcomes in modified human adipose-derived mesenchymal stem cells (hADSCs). Photobiomodulation (PBM), a technique to enhance the cellular capacity of stem cells, has attracted considerable attention owing to its effectiveness and safety. Here, we suggest a red organic light-emitting diode (OLED)-based PBM strategy to augment the therapeutic efficacy of hADSCs. In vitro assessments revealed that hADSCs basked in red OLED light exhibited enhanced angiogenesis, cell adhesion, and migration compared to naÃ¯ve hADSCs. We demonstrated that the enhancement of cellular capacity was due to an increased level of intracellular reactive oxygen species. Furthermore, accelerated healing and regulated inflammatory response was observed in mice transplanted with red light-basked hADSCs. Overall, our findings suggest that OLED-based PBM may be an easily accessible and attractive approach for tissue regeneration that can be applied to various clinical stem cell therapies.

Is Low-level Laser Therapy a Candidate to Be a Good Alternative in the Treatment of Mucositis in Childhood Leukemia? BACKGROUND AND AIM: Oral mucositis (OM) is a common side effect of systemic chemotherapy (CT) in cancer patients. The aim was to evaluate the effect of low-level laser therapy (LLLT) for the treatment of CT-induced OM children. PATIENTS AND METHODS: The study was carried out in 40 pediatric patients 3 to 18 years of age, who were hospitalized for the diagnosis of leukemia and underwent CT between June 1, 2019, and December 31, 2019. They were randomly divided into 2 groups with 20 cases in each group. The LLLT group was treated with GaAlAs diode laser (l): 830â€‰nm (infrared), power: 150â€‰mW, dose: 4.5â€‰J/cm2 and the control group underwent bicarbonate treatment. Patients received intervention for 3 days. The grade of OM was clinically assessed by the World Health Organization (WHO) Common Toxicity Criteria Scale. Visual Analog Scale was used on the same days with OM grade to evaluate the pain status. RESULTS: While there was no significant difference between the groups in terms of OM grade at the beginning of the treatment and on the first, second, fourth, and 11th days of the treatment, the average OM grade of the LLLT group was found to be statistically significantly lower on the third, fifth, sixth, and seventh days of the treatment. The Visual Analog Scale score of the LLLT group was statistically significantly lower compared with the control group at all examinations starting from the first day of treatment ($P<0.05$). CONCLUSION: In the treatment of oral OM that occurs in children after CT, both standard

care and LLLT treatment improve the grade and pain of OM. Adolescent;Child;Child, Preschool;Female;Humans;Leukemia;Low-Level Light Therapy;Male;Stomatitis
Reversal of Acquired Prosopagnosia Using Quantitative Electroencephalography-Guided Laser Therapy. Background: Currently treatment for prosopagnosia is limited. Methods: We report the reversal of acquired associative-type prosopagnosia (AAP) using quantitative electroencephalography (qEEG)-guided transcranial laser therapy (qGLT) in a subject with temporal lobe epilepsy (TLE) and mild cognitive impairment (MCI). Results: Objective and subjective measures of improvement in AAP, TLE, and MCI are presented. Additional improvement, measured through qEEG, was found 1-month post-treatment. Conclusions: There was no recurrence of AAP for 1 year. We conclude that further research into the utility of qGLT in the treatment of AAP is warranted. Cognitive Dysfunction;Electroencephalography;Humans;Laser Therapy;Prosopagnosia
Effects of Photobiomodulation and Split-Thickness Skin Grafting in the Prognosis of Wound Healing in Children with Deep Burn Ulcers. Background: Split-thickness skin grafting (STSG) is a standard therapeutic technique in patients with extensive and deep ulcers. Hospitalization and surgery can result in complications, especially in children. Photobiomodulation (PBM) has been applied in a variety of conditions such as healing of surgical, venous, pressure, and diabetic wounds, but no clinical trial using this method for healing of burn ulcers in children was found on searching the literature. The aim of the study was to evaluate the effect of PBM on the outcome of burn ulcers in children. Materials and methods: Informed consent and protocols were reviewed according to Shahid Beheshti University of Medical Sciences' Medical Ethics Board (IR.SBMU.REC.1394.363) and the Iranian Registry of Clinical Trials (IRCT2016011726069N1). Forty children with deep burn ulcers, who were candidates for STSG, were divided into PBM and STSG groups. A 650-nm laser (power 150â€‰mW, spot size 0.6â€‰cm(2), time 10â€‰sec, and energy point 1.5â€‰J) was used for irradiation over the burn area every other day until complete healing in the PBM group. STSG was performed in the STSG group. All other therapeutic care protocols were identical. Results: Thirty-nine children completed the study. The mean ulcer size in the two groups was similar before treatment (PBMâ€‰=â€‰60.72â€‰cm(2)â€‰Â±â€‰13.8 and STSGâ€‰=â€‰63.74â€‰Â±â€‰7.6). In the PBM group, all wounds healed within 10-12 sessions. Analysis of the burn area was performed 1, 3, and 6 months after injury. There was a significant difference (t test) in the burn area after 6 months in the PBM group compared with the STSG group (t test; pâ€‰>â€‰0.001). Conclusions: This is the first study to compare PBM and STSG in burn ulcers in children. Results indicated that PBM was an effective alternative to STSG, significantly decreasing the rate of scar and hypertrophic scar formation. Potential mechanisms of PBM that may be involved in burn tissue repair are discussed. Burns;Child;Humans;Iran;Prognosis;Skin Transplantation;Ulcer;Wound Healing
A Systematic Review and Meta-analysis of Randomized Controlled Trials of United States Food and Drug Administration-Approved, Home-use, Low-Level Light/Laser Therapy Devices for Pattern Hair Loss: Device Design and Technology. BACKGROUND: Low-level light/laser therapy (LLLT) can potentially stimulate hair growth in pattern hair loss (PHL), with many available home-use LLLT devices of different designs and technology on the market. However, not all devices are cleared by the United States (US) Food and Drug Administration (FDA), with very few studies to support their efficacy. OBJECTIVES: This systematic review and meta-analysis aimed to investigate the effectiveness of FDA-approved LLLT devices for PHL treatment. METHODS: We included articles related to FDA-approved home-use LLLT devices on PubMed and Medline, using the FDA 510(K) Premarket Notification database and the systematic search of articles up to January 2020. The standardized mean difference (SMD) for the changes of hair density treated by LLLT versus sham devices was analyzed. RESULTS: Only 32 home-use LLLT devices have been approved by the FDA as of January 2020. The meta-analysis comprised seven double-blinded, randomized, controlled trials. The overall

quantitative analysis yielded a significant increase in hair density in those treated by LLLT versus sham groups (SMD: 1.27, 95% confidence interval [CI]: 0.993-1.639). The subgroup analysis demonstrated the increased hair growth in male and female subjects with both comb- and helmet-type devices. There were significant LLLT sources in the LDs alone (SMD: 1.52, 95% CI: 1.16-1.88) and the LDs combination (SMD: 0.85, 95% CI: 0.55-1.16) (p=0.043). CONCLUSION: LLLT is potentially effective for PHL treatment. Nonetheless, the long-term follow-up study in patients with severe PHL with combined standard treatment and comparison between LLLT devices and energy sources is recommended.

Transcranial Photobiomodulation Therapy Ameliorates Perioperative Neurocognitive Disorder Through Modulation of Mitochondrial Function in Aged Mice. Perioperative neurocognitive disorder (PND) is a serious nervous system complication characterized by progressive cognitive impairment, especially in geriatric population. However, the neuropathogenesis of PND is complex, and there are no approved disease-modifying therapeutic options. Mitochondrial dysfunction has been demonstrated to contribute to the occurrence and development of PND. Transcranial near-infrared (tNIR) light treatment helps to improve mitochondrial dysfunction and enhance cognition, but its effect on PND remains unclear. Here, we evaluated the effect of tNIR light treatment on PND caused by anesthesia and surgery in aged mice. We built the PND models with 18-month C57BL/6 male mice by exploratory laparotomy under isoflurane inhalation anesthesia, and treated by tNIR light with wavelength 810Â nm for 2Â weeks. The short-term and long-term changes in cognitive function were analyzed by behavioral tests. We further explored the effects of tNIR light on mitochondria, synapses, neurons, and signaling pathways through different experimental methods. The results demonstrated that the cognitive impairment and mitochondrial dysfunction in PND mice were ameliorated after tNIR light treatment. Further experiments demonstrated that photobiomodulation therapy (PBMT) increased synapse-related protein expression, neuronal survival, and protected synapse from depletion. Moreover, downregulated sirtuin 1 (SIRT1) and peroxisome proliferator-activated receptor-Î³ coactivator-1Î± (PGC-1Î±) were increased after tNIR light treatment. Our results suggested that tNIR light was an effective treatment of PND through PBMT effect, accompanied by synaptic and neuronal improvement. The improvement of mitochondrial dysfunction mediated by SIRT1/PGC-1Î± signaling pathway might participate in this process. Those findings might provide a novel and noninvasive therapeutic target for PND. Peroxisome Proliferator-Activated Receptor Gamma Coactivator 1-alpha;Sirtuin 1 Aged;Animals;Female;Humans;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Mitochondria;Neurocognitive Disorders;Peroxisome Proliferator-Activated Receptor Gamma Coactivator 1-alpha;Sirtuin 1

Histological and biochemical effects of preventive and therapeutic vascular photobiomodulation on rat muscle injury. The intravascular or transcutaneous application of photobiomodulation (PBM) over blood vessels (vascular photobiomodulation, VPBM) has been used for the treatment of inflammatory and chronic conditions with promising systemic results. This study evaluated the VPBM effects on a model of muscle regeneration after acute injury and compared the outcomes of preventive and therapeutic VPBM. Transcutaneous VPBM was administered over the rat's main tail vein. Serum levels of creatine kinase (CK), aspartate aminotransferase (AST), and lactate were evaluated and muscles were processed for macroscopic and microscopic analysis. Preventive and therapeutic VPBM led to decreased inflammatory infiltrate, edema, and myonecrosis but with an increase in immature muscle fibers. CK, AST, and lactate levels were lower in the groups treated with VPBM (lowest concentrations in preventive VPBM application). Preventive and therapeutic VPBM were capable of exerting a positive effect on acute muscle injury repair, with more accentuated results when preventive VPBM was administered. Lactic Acid Animals;Edema;Lactic Acid;Low-Level Light Therapy;Muscles;Rats

A Practical Approach to Cosmetic Tattoo Removal with the Nd:YAG Laser. The Q-switched neodymium-yttrium aluminium garnet (Nd:YAG) laser remains the gold standard method for tattoo removal including cosmetic tattoos. Modern picosecond lasers are referenced to the Nd:YAG laser and essentially do the same job. Persons with cosmetic tattoos in the face are especially eager to achieve perfect removal or correction and from start are critical to suboptimal results. Customers mostly request complete removal; sometimes the goal is fast treatment and bleaching to prepare for a cover up tattoo. Removal or correction of eyebrows is the largest group, followed by lip tattoos and eyeliners. The article gives a systematic and stepwise introduction to routine cosmetic tattoo removal by laser in an Austrian private medical practice. Rationales and selection of customers who can benefit from treatment, preparation, performance, and aftercare is reviewed. Emphasis is given to qualified power adjustment of the laser equipment and the treatment strategy, e.g. the delicate navigation between efficient removal and the risk of short-term and long-term adverse effects. Treatment relies on a partnership between provider and customer. Over the months of treatment, customers gain more insight into the possibilities of treatment, so that they get an understanding of the realistic results that can be achieved. Therefore, customers are also satisfied even with results that are not always optimal since best treatment was given a fair chance. Humans;Lasers, Solid-State;Tattoo Removal;Tattooing;Low-Level Light Therapy;Eyebrows;Laser Therapy

Photobiomodulation laser therapy in pemphigus vulgaris oral lesions: A randomized, double-blind, controlled study. OBJECTIVE: Systemic corticosteroids are the mainstay treatment for PV oral lesions; the aim of this study is to evaluate the efficacy of PBMT with a 645 nm diode laser as a supportive topical therapy in patients with PV induced erosive-ulcerative oral lesions. MATERIALS AND METHODS: This double-blind placebo-controlled study divided patients into two groups: A, patients receiving laser therapy (Raffaello 980 Bio, Dental Medical Technologies, Italy with the following parameters: 100 mW power, 645 nm wave length, irradiation area 1 cm(2), application time 30 sec/cm(2), energy density 3 J/cm(2), scanning modality) and B, receiving sham therapy (placebo). All patients were being treated also with a systemic corticosteroid therapy i.e. prednisone 0.5 mg/Kg per day. Size of lesions, VAS and satisfaction were evaluated before the treatment (T0), after 4 weeks (T1) and after 8 weeks as a follow-up (T2). RESULTS: A total of 50 lesions were evaluated. About lesions size, there was a statistical significative difference between the two groups just at T2 (p=0.0193), though VAS significantly decreased both at T1 (p=0.0198) and at T2 (p=0.0087). In general, all patients were satisfied of the treatment received. CONCLUSION: PBMT can be considered a validate supportive therapeutic option, even if further RCTs studies with wide sample sizes and standardized management protocols are suggested. Adrenal Cortex Hormones Humans;Pemphigus;Low-Level Light Therapy;Double-Blind Method;Adrenal Cortex Hormones;Lasers, Semiconductor

Effects of Photobiomodulation Therapy with Various Laser Wavelengths on Proliferation of Human Periodontal Ligament Mesenchymal Stem Cells. Several methods have been proposed to enhance the regeneration and healing time in periodontal therapy. Photobiomodulation therapy (PBMT) is a recently suggested novel technique for this purpose. This study aimed to compare the efficacy of PBMT with various laser wavelengths and energy densities on proliferation of human periodontal ligament mesenchymal stem cells (PDLMSCs). The wells containing PDLMSCs were subjected to laser irradiation at 635, 660, 808 and 980â€‰nm wavelengths with 1, 1.5, 2.5 and 4â€‰Jâ€‰cm(-2) energy densities. Cell proliferation and viability were evaluated after 1, 3 and 5â€‰days with the methyl thiazolyl tetrazolium (MTT) assay and 4,6-diamidino-2-phenylindole (DAPI) staining. No significant difference was observed among the experimental and the control groups on day 1 (Pâ€‰>â€‰0.05). On day 3, 808â€‰nm laser at 4â€‰Jâ€‰cm(-2) energy density and 980â€‰nm laser at all densities had significant differences with control group. On day 5, the

control group had significant differences in cell proliferation with 808â€‰nm laser at 2.5 and 4â€‰Jâ€‰cm(-2) energy densities, and 980â€‰nm laser at all densities. PBMT with 635, 660, 808 and 980â€‰nm wavelengths increased the proliferation of PDLMSCs but the maximum cell viability was prominent after irradiation by 980â€‰nm laser with energy density of 4â€‰Jâ€‰cm(-2) on day 3. Cell Proliferation;Humans;Lasers;Low-Level Light Therapy;Mesenchymal Stem Cells;Periodontal Ligament

Effectiveness of low-level gallium aluminium arsenide laser therapy for temporomandibular disorder with myofascial pain: A systemic review and meta-analysis. PURPOSE: Temporomandibular disorder (TMD) causes masticatory muscle pain and mouth opening limitations and affects patients' ability to eat, practice oral health and perform other activities of daily living. Although the benefits of low-energy lasers in treating TMD have been reported, the results vary greatly depending on the equipment used and the energy output. This study systematically evaluated the efficacy of a low-level gallium aluminium arsenide (GaAlAs) laser treatment for TMD with myofascial pain and maxillary pain. METHODS: We searched the PubMed, EMBASE, Cochrane Library, Web of Science, and ClinicalTrials.gov databases for randomized controlled trials (RCTs) published since database inception to April 5, 2020, that compared low-level laser treatment to sham/placebo treatment or no intervention in patients suffering from TMD with myofascial pain. Three reviewers independently screened the literature, extracted data, and assessed the quality of the included studies according to the risk-of-bias tool recommended by the Cochrane Handbook V.5.1.0 (Cochrane Collaboration, London, UK). Then, a meta-analysis was performed using RevMan 5.3 and Stata 15.1 software. RESULTS: The data from 8 randomized controlled trials including 181 patients were analyzed. The severity of myofascial TMD pain (measured on a visual analogue scale, VAS) at the end of treatment was significantly different between the control laser therapy and the low-level GaAlAs laser therapy (weighted mean difference [WMD]â€Š=â€Š-0.76, 95% confidence interval [CI] -1.51 to 0.01, Pâ€Š=â€Š.046); at 3 to 4â€Šweeks after treatment, there was no significant difference (WMDâ€Š=â€Š1.24, 95% CI -0.04 to 2.51, Pâ€Š=â€Š.057). In addition, there was no significant improvement in maximum mouth opening (MMO) at the end of treatment (WMDâ€Š=â€Š-0.03, 95% CI -4.13 to 4.06, Pâ€Š=â€Š.987) or at 3 to 4â€Šweeks after treatment (WMDâ€Š=â€Š1.22, 95% CI -2.94 to 5.39, Pâ€Š=â€Š.565). CONCLUSIONS: The results of this study suggest that there is insufficient evidence to indicate an efficacy of low-level GaAlAs laser therapy in improving TMD pain and maximal oral opening. These results suggest that clinicians should make appropriate recommendations to inform patient decision-making. Humans;Lasers, Semiconductor;Myofascial Pain Syndromes;Pain;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders

[Transcranial photobiomodulation in therapy of neurodegenerative diseases of the brain: theoretical background and clinical effectiveness]. Transcranial photobiomodulation (tPBM) is a form of light therapy that uses monochromatic visible and infrared light from non-ionizing radiation sources (lasers, LEDs) placed on the scalp, forehead, or intranasally to project light directly to target areas of the brain. Accumulated experimental and clinical data indicate the safety and potential efficacy of tPBM in some central nervous system diseases.This article briefly reviews the general concepts of tPBM, the results of experimental and clinical studies on the efficacy of tPBM in Alzheimer's disease, Parkinson's disease, and brain stroke. The possible mechanisms of the tPBM therapeutic effect and the need to choose optimal exposure parameters are discussed. Although the evidence base regarding the efficacy of tPBM in neurodegenerative and vascular brain diseases is still insufficient, analysis of the published data justifies considering tPBM as a promising method of adjuvant therapy for some central nervous system diseases. Alzheimer Disease;Brain;Humans;Low-Level Light Therapy;Neurodegenerative Diseases;Parkinson Disease;Treatment Outcome

Evaluation of Gender Differences in Response to Photobiomodulation Therapy, Including Laser Acupuncture: A Narrative Review and Implication to Precision Medicine. Background: The influence of gender is significant in the manifestation and response to many diseases and in the treatment strategy. Photobiomodulation (PBM) therapy, including laser acupuncture, is an evidence-based treatment and disease prevention modality that has shown promising efficacy for a myriad of chronic and acute diseases. Anecdotal experience and limited clinical trials suggest gender differences exist in treatment outcomes to PBM therapy. There is preliminary evidence that gender may be as important as skin color in the individual response to PBM therapy. Purpose: To conduct a literature search of publications addressing the effects of gender differences in PBM therapy, including laser acupuncture, to provide a narrative review of the findings, and to explore potential mechanisms for the influence of gender. Methods: A narrative review of the literature on gender differences in PBM applications was conducted using key words relating to PBM therapy and gender. Results: A total of 13 articles were identified. Of these articles, 11 have direct experimental investigations into the response difference in gender for PBM, including laser acupuncture. A variety of cadaver, human, and experimental studies demonstrated results that gender effects were significant in PBM outcome responses, including differences in tendon structural and mechanical outcomes, and mitochondrial gene expression. One cadaver experiment showed that gender was more important than skin tone. The physiologic mechanisms directing gender differences are explored and postulated. Conclusions: The review suggests that to address the requirements of a proficient precision medicine-based strategy, it is important for PBM therapy to consider gender in its treatment plan and dosing prescription. Further research is warranted to determine the correct dose for optimal gender treatment, including gender-specific treatment plans to improve outcomes, taking into account wavelength, energy exposure, intensity, and parameters related to the deliverance of treatment to each anatomical location. Acupuncture Therapy;Humans;Lasers;Low-Level Light Therapy;Precision Medicine;Sex Factors

Modifying the Microbiome as a Potential Mechanism of Photobiomodulation: A Case Report. Objective: The objective of this case study was to elucidate the effect of photobiomodulation (PBM) on the microbiome. Background: The gut microbiome has been identified as a key component of health, with gut dysbiosis, characterized by decreased microbial diversity and an altered microbial composition, being recognized as instrumental in many diseases and disorders. Previous research has suggested that the gut microbiome can be favorably altered in animal models using PBM. Materials and methods: The participant had their microbiome tested on nine occasions, three times before any treatment, three times after radiotherapy and commencement of immunotherapy for breast cancer, and three times after PBM treatment. The PBM treatment consisted of infrared laser treatment (904â€‰nm; 700â€‰Hz pulse frequency, 861.3 total joules) to the abdomen three times per week for 11 weeks. Results: The microbiome of the participant showed significant changes in diversity after PBM treatment, but not after cancer therapy, with an increase in the number of known beneficial bacteria (Akkermansia, Faecalibacterium, and Roseburia) and decrease in the number of potentially pathogenic genera. Conclusions: The results suggested the possibility that PBM may alter the microbiome and thus it represents a therapeutic avenue for chronic diseases with otherwise limited treatment options. Animals;Dysbiosis;Gastrointestinal Microbiome;Humans;Low-Level Light Therapy;Microbiota

Narrative Review of Russian, Ukrainian and English-Language Publications Investigating the Effects of Photobiomodulation on Red Blood Cell Physiology. Objective: The beneficial effects of photobiomodulation (PBM) on cellular function are well characterized, principally deriving from the absorption of red to near-infrared radiation by chromophores such as cytochrome-c-oxidase. However, the effects and underlying mechanisms of PBM on non-mitochondria containing cells, such

as red blood cells (RBCs), are relatively unknown. In this review, we evaluate studies that investigated the effects of PBM on RBCs in the peripheral circulation, with particular attention on changes in the structural and functional features of RBC membrane dynamics, as well as the potential implications of PBM as an intervention for pathologies related to RBC dysfunction. Methods: A literature review was performed in concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol, using the following databases: PubMed; Ovid (OvidMedline); Scopus; Web of Science; Google Scholar; Scholar.ru; eLIBRARY.ru; Digital Library: Dissertation; and Russian State Library. Search results included publications in Russian, Ukrainian, and English languages after 1995. Eligible articles included the effects of PBM on RBC membrane morphology and function in the peripheral circulation, used either in isolation or alongside other interventions. Results: The majority of articles indicated beneficial changes in RBC structure and function following exposure to PBM, including increased osmotic resistance, normalization of membrane permeability, decreased free radical oxidation and concentration of intermediate products of lipid peroxidation, reduced phospholipase A2 membrane activity, and normalization of the viscoelastic properties of RBCs and erythrocyte deformability index. Most trials had small patient numbers with no long-term follow-up. Conclusions: The importance of RBC membrane dysfunction as a potential marker and mechanism for RBC pathologies was highlighted. PBM has shown to have membrane protective effects. Further clinical trials are recommended to provide more evidence PBM therapy to treat RBC-related diseases, which may, at the correct dose, improve RBC stability and deformability in RBC-related pathologies. Erythrocytes;Humans;Infrared Rays;Language;Low-Level Light Therapy;Russia

Effect of Vaginal Stretching and Photobiomodulation Therapy on Sexual Function in Women With Pelvic Floor Myofascial Pain - A Randomized Clinical Trial. BACKGROUND: Spasm or increased tonus of the pelvic floor muscles (PFM) can cause myofascial pain (MP), which may result in painful intercourse and sexual dysfunction. AIM: The effect of vaginal stretching (VS) with photobiomodulation therapy (PBMT) is compared to VS with sham PBMT in overall sexual function, rate and severity of painful intercourse at baseline and after treatment in women with pelvic floor MP. METHODS: A double-blind randomized clinical trial of 103 women with MP: 1 group received 10 sessions of VS with PBMT (4 Joules of near-infrared light-808 nm at 3 points), and the other group received VS with sham PBMT. OUTCOMES: Impact of treatment was measured by the number of women experiencing painful intercourse, Pain severity was measured by Visual Analog Scale and sexual function was assessed by the FSFI questionnaire. Variables were assessed at baseline and after ten sessions in the intervention groups. RESULTS: After treatment, the number of women experiencing painful intercourse was significantly lower in both the VS with PBMT group (90.2-55%, Pâ€¯=â€¯.001), and VS with sham PBMT group (86.6-46.2%, P < .001). There was a significant reduction in pain measure by Visual Analog Scale (P < .001, [VS with PBMT group: Pâ€¯=â€¯.002; VS with sham PBMT group: P < .001]). There was a significant decrease in the number of participants with sexual dysfunction (FSFI score â‰¤26.55) after the treatment in the VS with PBMT group (92.2-74.5%, Pâ€¯=â€¯.003) and in the VS with sham PBMT group (90.4-76.9%, Pâ€¯=â€¯.035). Both groups showed improvement in the FSFI pain domain after treatment (P < .001, [VS with PBMT group: Pâ€¯=â€¯.038; VS with sham PBMT group: Pâ€¯=â€¯.005]). Only the VS with sham PBMT group had a significant increase in FSFI desire and total score (P < .001) after treatment. CLINICAL IMPLICATIONS: We found that VS associated or not with PBMT may be effective in reducing complaints of painful intercourse, alleviating pain severity, and reducing the number of women with pelvic floor MP suffering from sexual dysfunction. STRENGTHS & LIMITATIONS: Strengths of this study are the randomized design and use of validated questionnaires. Limitation of the study is the lack of a long follow-up period and the lack of a usual care comparison group hampers generalizability of the results. CONCLUSION: VS only and VS with PBMT have short-term efficacy in reducing painful

intercourse and reducing a number of women with sexual dysfunction. Frederice CP, de Mira TAA, Machado HC, et al. Effect of Vaginal Stretching and Photobiomodulation Therapy on Sexual Function in Women With Pelvic Floor Myofascial Pain - A Randomized Clinical Trial. J Sex Med 2022;19:98-105. Female;Humans;Low-Level Light Therapy;Pain;Pelvic Floor;Pelvic Floor Disorders;Sexual Dysfunction, Physiological

Mechanistic approaches to the light-induced neural cell differentiation: Photobiomodulation vs Low-Dose Photodynamic Therapy. BACKGROUND: Neurodegenerative diseases are the result of irreversible damage in the neuronal cells by effecting vital functions temporarily or even permanently. The use of light for the treatment of these diseases is an emerging promising innovative method. Photobiomodulation (PBM) and Photodynamic Therapy (PDT) are the modalities that have a wide range of use in medicine and have opposite purposes, biostimulation and cell death respectively. METHODS: In this study, we aimed to compare these two modalities (PDT and PBM) at low-level intensities and create a stimulatory effect on the differentiation of PC12 cells. Three different energy densities (1, 3, and 5Â J/cm(2)) were used in PBM and Chlorin e6-mediated PDT applications upon irradiation with 655-nm laser light. The light-induced differentiation profile of PC12 cells was analyzed by morphological examinations, qRT-PCR, cell viability assay, and some mechanistic approaches such as; the analysis of intracellular ROS production, NO release, and mitochondrial membrane potential change. RESULTS: It has been observed that both of these modalities were successful at neural cell differentiation. PBM at 1Â J/cm(2) and low-dose PDT at 3Â J/cm(2) energy densities provided the best differentiation profiles which were proved by the over-expressions of SYN-1 and GAP43 genes. It was also observed that intracellular ROS production and NO release had pivotal roles in these mechanisms with more cell differentiation obtained especially in low-dose PDT application. CONCLUSION: It can be concluded that light-induced mechanisms with properly optimized light parameters have the capacity for neural cell regeneration and thus, can be a successful treatment for incurable neurodegenerative diseases. Cell Differentiation;Cell Survival;Low-Level Light Therapy;Photochemotherapy

Photobiomodulation Therapy Applied after 6 Months for the Management of a Severe Inferior Alveolar Nerve Injury. Despite its significant negative impact on the quality of life, the methods for the management of the inferior alveolar nerve (IAN) injury are still limited. In this case report, the patient did not show any improvement from the day of the iatrogenic accident until 6 months. A significant improvement of the symptoms started to appear only at 6 months when PBMT was applied. A total of 42 sessions of PBMT took place. The application zone included intraoral and extraoral areas. The parameters were: Delivery power of 0.1 W, for 40 s, continuous wave (CW), contact mode, and delivered energy of 4 J. The delivered energy density related to the fiber diameter was 1415 J/cm(2). Each treated point was considered to be 1 cm(2) of diameter. At the end of the treatment, all of the symptoms disappeared except for an abnormal sensation on touching the mucosa and gingiva of the concerned area. No side effects were noted. This case report shows that PBMT can be a very promising approach for the management of severe cases that are not improving with conventional methods.

Photobiomodulation and Sports: Results of a Narrative Review. Benefits of photobiomodulation (PBM) have been known for several decades. More recently, PBM applied in sports offers a special chance to support the modeling of the performance and recovery. Increasingly complex physical activities and fierce competition in the world of sports generate a state of psycho-emotional and physical stress that can induce chronic fatigue syndrome, failure in physical training, predisposition to muscle damage, physical and emotional exhaustion etc., for which PBM could be an excellent solution. To evaluate and identify all risk factors and the influence of PBM on health and performance in sport and for a better understanding of its effects, we did a search for "Photobiomodulation and

Sports" on PubMed, to update the PBM science applied in sports, and we retained for analysis the articles published from 2014 to date. The term "PBM" is recent, and we did not include previous studies with "low level laser therapy" or "LLLT" before 2014. In the present research, PBM has been shown to have valuable protective and ergogenic effects in 25 human studies, being the key to success for high performance and recovery, facts supported also by 22 animal studies. PBM applied creatively and targeted depending on sport and size of the level of physical effort could perfectly modulate the mitochondrial activity and thus lead to remarkable improvements in performance. PBM with no conclusive results or without effects from this review (14 studies from a total of 39 on humans) was analyzed and we found the motivations of the authors from the perspective of multiple causes related to technological limitations, participants, the protocols for physical activity, the devices, techniques and PBM parameters. In the near future, dose-response experiments on physical activity should be designed and correlated with PBM dose-response studies, so that quantification of PBM parameters to allow the energy, metabolic, immune, and neuro-endocrine modulation, perfectly coupled with the level of training. There is an urgent need to continuously improve PBM devices, delivery methods, and protocols in new ingenious future sports trials. Latest innovations and nanotechnologies applied to perform intracellular signaling analysis, while examining extracellular targets, coupled with 3D and 4D sports motion analysis and other high-tech devices, can be a challenge to learn how to maximize PBM efficiency while achieving unprecedented sports performance and thus fulfilling the dream of millions of elite athletes.

Validation of a Monte Carlo Modelling Based Dosimetry of Extraoral Photobiomodulation. An in vivo validation study was performed to confirm the accuracy of extraoral photobiomodulation therapy (PBMT) dosimetry determined by modelling. The Monte Carlo technique was utilized to calculate the fluence rate and absorbed power of light delivered through multi-layered tissue. Optical properties used during Monte Carlo simulations were taken from the literature. Morphological data of four study volunteers were acquired using magnetic resonance imaging (MRI) scans. Light emitting diode (LED) coupled to a power meter were utilized to measure transmitted power through each volunteer's cheek, in vivo. The transmitted power determined by Monte Carlo modelling was compared to the in vivo measurements to determine the accuracy of the simulations. Experimental and simulation results were in good agreement for all four subjects. The difference between the mean values of the measured transmission was within 12% from the respective transmission obtained using Monte Carlo simulations. The results of the study indicate that Monte Carlo modelling is a robust and reliable method for light dosimetry.

Synergistic Effects of Photobiomodulation Therapy with Combined Wavelength on Diabetic Wound Healing In Vitro and In Vivo. Objective: The difficulty in chronic diabetic wound healing remains the focus of clinical research. Photobiomodulation therapy (PBMT) with different wavelengths could exert different effects on wound healing, but the effects of combined red and blue light (BL) remained unclear. Methods: Diabetic rat wound model and diabetic wounded endothelial cell model were established to observe possible effects of PBMT using combined wavelengths for wound healing. Cells and animals were separated into four groups exposed to red and/or BL. Cell viability, apoptosis, and migration, as well as the expression level of nitric oxide (NO), vascular endothelial growth factor, interleukin-6, and tumor necrosis factor-Î± were measured in vitro. Diabetic rats were evaluated for wound closure rates, collagen deposition, inflammation intensity, and density of neovascularization after light irradiation. Results: PBMT using combined wavelengths significantly sped up the healing process with increasing angiogenesis density, collagen deposition, and alleviating inflammation in vivo. Moreover, combined wavelength irradiation promoted cell proliferation and migration, and NO production, as well as reduced reactive oxygen species and inflammation in vitro. Conclusions: PBMT using combined wavelengths performed a synergistic effect for promoting

diabetic wound healing and would be helpful to explore a more efficient pattern toward chronic wound healing. Vascular Endothelial Growth Factor A;Collagen Animals;Collagen;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Rats;Vascular Endothelial Growth Factor A;Wound Healing

Transcranial Photobiomodulation in Adults with High-Functioning Autism Spectrum Disorder: Positive Findings from a Proof-of-Concept Study. Objective: To assess the efficacy and safety of transcranial photobiomodulation (tPBM) in adults with autism spectrum disorder (ASD). Methods: Adults with high-functioning-ASD, between 18 and 59 years of age, were enrolled to receive twice a week tPBM for 8 weeks in an open-label single group design. ASD symptom severity was assessed at baseline, midpoint, and end-point, by clinician-, self-, and informant-rated measures. Treatment response was defined as a â‰¥30% reduction in Social Responsiveness Scale-2nd Edition (SRS-2) total score and ASD Clinical Global Impression-Improvement score â‰¤2. Any possible adverse events were recorded at each visit. Paired-samples t-test analyses were performed. Results: Eleven participants were enrolled, and 10 participants (9 males; 30.0â€‰Â±â€‰11.9 years) completed the study. One participant withdrew consent before baseline. All 10 completers were included in efficacy and safety analyses. Five participants (50%) met responder criteria at end-point. Overall, 8-week tPBM was associated with significant reduction in SRS-2 total scores at end-point (SRS-2: -30.6â€‰Â±â€‰23, pâ€‰<â€‰0.001) particularly in Social Awareness (-3.0â€‰Â±â€‰1.9, pâ€‰<â€‰0.001), Social Communication (-10.3â€‰Â±â€‰6, pâ€‰<â€‰0.001), Social Motivation (-5.0â€‰Â±â€‰2.4, pâ€‰<â€‰0.001), and Restricted/Repetitive Behaviors (-7.4â€‰Â±â€‰4.1, pâ€‰<â€‰0.001). There were statistically significant improvements at end-point in Global Assessment of Functioning scores (+12.8â€‰Â±â€‰4.2, pâ€‰<â€‰0.001) and Quality of Life Enjoyment and Satisfaction Questionnaire scores (+6.0â€‰Â±â€‰7.9, pâ€‰=â€‰0.02). Three participants experienced transient, mild side effects (insomnia, headache, and warmth at treatment application site). No adverse events required changes in tPBM protocol. Adherence rate was 98%. Conclusions: tPBM is a safe and feasible treatment approach that has the potential to treat core features of ASD. Further research is necessary and warranted. ClinicalTrials.gov Identifier: NCT03724552. Adult;Autism Spectrum Disorder;Humans;Infant;Male;Proof of Concept Study;Quality of Life

Laser Photobiomodulation of the Induratio Penis Plastica or La Peyronie's Syndrome. Background: Since 1980, laser therapy has been proposed with success in the treatment of the Induratio Penis Plastica (IPP), also called La Peyronie's Syndrome, but still few physicians use it. Objective: We would like to investigate the clinical effects of using more laser sequentially in each session, in the treatment of chronic IPP. We used high levels of energy, watts rather than milliwatts, reducing the duration of each application, and the number of the cycles in total. Materials and methods: Laser wavelengths used for photobiomodulation (PBM) were 808, 1064, and 10,600â€‰nm. Taking into account the clinical aspect of the lesion being treated, the specific dosage for each patient was determined. Penis echography established the exact localization and extension of the pathologic fibrous tissue as plaque, nodules, and ring. From 2012 to 2019, we treated 41 patients, 35-65 years old, who were selected using the same criteria: inflammatory signs present since â‰¥12 months, negative results with two other types of physical therapy, and exclusion of surgical cases. Results: Echographic test was repeated 1 month after the end of the treatment, for the evaluation of the results. Further parameters of results evaluation were presence/absence of pain, inflammation, recurvation, and functional limitation. The control was done comparing similar cases not treated with laser, selected with random criteria. Discussion and conclusions: Results were positive in a high percentage of patients, the majority after one cycle of treatment, and follow-up was positive after 2 years. The sequential use of more laser with wavelengths listed above gave better

results than the wavelengths used up until the year 2000, in our previous experience. We need fewer cycles to obtain positive results, and follow-up improved significantly.
Adult;Aged;Humans;Laser Therapy;Lasers;Male;Middle Aged;Penile Induration;Penis;Ultrasonography

Neodymium-Doped Yttrium Aluminum Garnet Laser Photobiomodulation May Improve Neurosensory Function after Surgical Injury to Cranial Nerve V: A Report of Three Consecutive Cases.
OBJECTIVE: The purpose of this report was to document clinical responses to Nd:YAG laser energy in patients with surgical injury to terminal branches of the trigeminal nerve. BACKGROUND: Limited evidence from in vitro, animal, and human studies suggests infrared laser energy may positively influence recovery after peripheral or cranial nerve injury, although clinical effects of neodymiumdoped yttrium aluminum garnet (Nd:YAG) lasers remain unstudied in this context. METHODS: We applied Nd:YAG laser energy in the treatment of three consecutive patients presenting with altered neurosensory function following various oral and maxillofacial procedures. The time interval between surgical injury and laser photobiomodulation ranged from one week to two years. RESULTS: All patients exhibited reduction in the area of diminished sensation and partial recovery of normal neurosensory function. The two patients with long-standing neurosensory deficiency experienced near complete recovery of intraoral sensation, with residual zones of diminished sensation from the perioral skin. CONCLUSIONS: Although all patients in this case series demonstrated clinical improvements compared with baseline, controlled studies are needed to determine whether Nd:YAG laser energy accelerates or enhances recovery of neurosensory function after surgical nerve injury. Studies establishing the relative efficacies of Nd:YAG and diode lasers appear warranted. Humans;Intraoperative Complications;Lasers, Semiconductor;Lasers, Solid-State;Skin;Trigeminal Nerve

Photobiomodulation Delivery Parameters in Dentistry: An Evidence-Based Approach.
Background: Dosimetry at a level of 2-8â€‰J/cm(2) at target cellular level has been accepted to represent the optimum range for the stimulatory benefits associated with photobiomodulation therapies. However, it has been proposed that a higher bracket of 10-30â€‰J/cm(2) at target tissue level may represent a good and effective range for analgesia, accompanied by at-distance regional anti-inflammatory effects. However, although this provides a useful guideline, transforming recommendations into a translatable and repeatable clinical skill have to date proven elusive. Methods: Based on prior publications of systematic reviews by the authors, key factors have been identified, associated with reported clinical and in vitro and in vivo animal studies that can support outcome success or null responses. Drawn from five recently published systematic reviews, an analysis of an extended published evidence base indicates that research methodology should embrace a mature understanding of terminology, a requirement for consistent metered energy delivery, and an appreciation of optical transport techniques. Results: Using models derived from orthodontics and oncology, evidence-based optimal delivery parameters and techniques are presented. Within the confines of the accepted inclusion criteria, a modified Cochrane risk of bias tool has been applied and the parameters extracted from the included studies were subjected to a meta-analysis. This demonstrated a low risk of bias from the studies included with a multivariate and/or univariate statistical analysis that supports the author's evidence-based determinations. The adoption of a surface optical spot size of >1â€‰cm(2) demonstrated a high degree of success in managing both superficial as well as subsurface pathologies in oral care. Also, the timing of the intervention with conditioning before or at the same time as a potentially traumatic cellular event was found to be a significant signal of outcome success. An extended commentary explores the benefits and disadvantages of scanning techniques. Conclusions: The extracted clinical data are cross-referenced to the mechanisms suggested for photobiomodulation therapies from the authors' own current in

vitro research, and proposals are made for some possible lines of approach in future research and clinical trials. Analgesia;Low-Level Light Therapy;Orthodontics;Systematic Reviews as Topic

Systemic Effects of Photobiomodulation on Blood Components in the Treatment of Community-Acquired Pneumonia. Background: The analysis of the complete blood count (CBC) of patients with community-acquired pneumonia (CAP) is an essential practice both for diagnosing the disease and for evaluating the patient's clinical evolution. It is proposed in the present study to analyze the hematological alterations resulting from photobiostimulation using near-infrared light-emitting diodes (LEDs) in patients with CAP. Methods: This was a clinical, prospective, blinded, and descriptive longitudinal study that involved 21 patients undergoing CAP treatment who were divided into two groups: LED, 11 patients who were treated with infrared LED and conventional treatment; and CON (control), 10 patients who received only conventional treatment (antibiotic therapy and physiotherapy). Physiotherapy was applied before LED irradiation in the LED group. The patients' CBCs were obtained before and after treatment, and erythrocyte counts, hemoglobin and hematocrit concentrations, and leukocyte and platelet counts were assessed. The phototherapy was performed with a vest with an array of 300 LEDs (940â€‰nm) mounted on an area of 36â€‰Ã—â€‰58â€‰cm and positioned in the patient's anterior thoracic and abdominal regions. The total power was 6 W, with 15â€‰min of irradiation time. The patients were treated daily for seven consecutive days. Statistical analyses of the intra- and intergroups of CBC data were done using Student's t-test and one-way ANOVA (analysis of variance), respectively, both at the significance level of Î±â€‰=â€‰0.05. Results: There was a statistically significant recovery difference after treatment in the LED group compared with the CON group for erythrocytes, hemoglobin, leukocytes, segmented and band neutrophils, lymphocytes, and monocytes (pâ€‰<â€‰0.05). The greatest differences between the LED and CON groups were lymphocyte count reduction (60% vs. 16%), erythrocyte increase (86% vs. 35%), and leukocyte reduction (28% vs. 15%). Conclusions: The hematologic components of CAP patients recovered their normal values faster with conventional treatment associated with infrared LED therapy, thus indicating greater treatment efficiency when compared with the conventional therapy. This study was registered with the Brazilian Registry of Clinical Trials (ReBeC) under Universal Trial Number (UTN) U1111-1229-1296 (2019/06/05). Community-Acquired Infections;Humans;Longitudinal Studies;Neutrophils;Pneumonia;Prospective Studies

A Perspective on the Potential of Opsins as an Integral Mechanism of Photobiomodulation: It's Not Just the Eyes. Objective: To investigate the potential relationship between opsins and photobiomodulation. Background: Opsins and other photoreceptors occur in all phyla and are important in light-activated signaling and organism homeostasis. In addition to the visual opsin systems of the retina (OPN1 and OPN2), there are several non-visual opsins found throughout the body tissues, including encephalopsin/panopsin (OPN3), melanopsin (OPN4), and neuropsin (OPN5), as well as other structures that have light-sensitive properties, such as enzymes, ion channels, particularly those located in cell membranes, lysosomes, and neuronal structures such as the nodes of Ranvier. The influence of these structures on exposure to light, including self-generated light within the body (autofluorescence), on circadian oscillators, and circadian and ultradian rhythms have become increasingly reported. The visual and non-visual phototransduction cascade originating from opsins and other structures has potential significant mechanistic effects on tissues and health. Methods: A PubMed and Google Scholar search was made using the search terms "photobiomodulation", "light", "neuron", "opsins", "neuropsin", "melanopsin", "encephalopsin", "rhodopsin", and "chromophore". Results: This review was examined the influence of neuropsin (also known as kallikrein 8), encephalopsin, and melanopsin specifically on ion channel function, and more broadly on the central and peripheral nervous systems. The relationship between opsins 3, 4, and 5 and photobiomodulation mechanisms was evaluated, along with a proposed role of

photobiomodulation through opsins and light-sensitive organelles as potential alleviators of symptoms and accelerators of beneficial regenerative processes. The potential clinical implications of this in musculoskeletal conditions, wounds, and in the symptomatic management of neurodegenerative disease was also examined. Conclusions: Systematic research into the pleotropic therapeutic role of photobiomodulation, mediated through its action on opsins and other light-sensitive organelles may assist in the future execution of safe, low-risk precision medicine for a variety of chronic and complex disease conditions, and for health maintenance in aging. OPN3 protein, human;Opsins;Rod Opsins Humans;Neurodegenerative Diseases;Opsins;Retina;Rod Opsins

Effect of Different Energy Densities of 915 nm Low Power Laser on the Biological Behavior of Human Gingival Fibroblast Cells In Vitro. Photobiomodulation is recognized as an effective method for adjunct therapy in periodontal treatments. Our purpose in this study was to investigate the effects of different energy densities of 915â€‰nm diode laser on the viability and viability capacity of human gingival fibroblast cells. Cell samples were examined in five groups, including four irradiation groups with low-level diode laser 915â€‰nm, 1, 2, 3, 4â€‰Jâ€‰cm(-2) and a control group (no Laser irradiation). Cell viability and viability were measured 1, 3 and 5â€‰days after irradiation by MTT and DAPI assay. Statistical differences between groups at any time were analyzed by one-way ANOVA and a post hoc Turkey's test. The cell viability and viability capacity increased on the third day at an energy density of 3â€‰Jâ€‰cm(-2) ; (P-value = 0.007) and the fifth day at energy densities of 2, 3 and 4â€‰Jâ€‰cm(-2) was recorded compared with the control group (P-value = 0.000). Also, a significant decrease in the viability and viability of irradiated cells with an energy density of 1â€‰Jâ€‰cm(-2) was found (P-value = 0.033). According to our results, Photobiomodulation with 915â€‰nm diode laser has a positive stimulating effect on the viability and viability capacity of human gingival fibroblast cells. Cell Proliferation;Cell Survival;Fibroblasts;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy

Photobiomodulation of inflamed dental pulp stem cells under different nutritional conditions. Aim: The present study aimed to investigate photobiomodulation's (PBM) effect on inflamed dental pulp stem cells (IDPSCs) under different nutritional conditions. Methods: Cell proliferation and odontogenic differentiation were evaluated using the MTT assay and real-time quantitative reverse transcription PCR, respectively after laser PBM of cells in 5 or 10% fetal bovine serum (FBS) culture conditions. Results: A significant positive effect of laser irradiation on cell proliferation under both nutritional conditions after 24 and 48Â h was observed. DMP-1 gene expression increased in the groups with laser irradiation and 5% FBS. Comparison of gene expression levels in the four groups revealed no statistically significant stimulatory effect. The highest gene expression was observed in the non-laser group with 5% FBS. Conclusion: Further studies are required to obtain an irradiation setup to ideally improve inflamed dental pulp stem cells' proliferation and differentiation. Cell Differentiation;Cell Proliferation;Cells, Cultured;Dental Pulp;Stem Cells

Light Emitting Diodes Photobiomodulation Improves Cardiac Function by Promoting ATP Synthesis in Mice With Heart Failure. Heart failure (HF) is the common consequences of various cardiovascular diseases, often leading to severe cardiac output deficits with a high morbidity and mortality. In recent years, light emitting diodes-based therapy (LEDT) has been widely used in multiple cardiac diseases, while its modulatory effects on cardiac function with HF still remain unclear. Therefore, the objective of this study was to investigate the effects of LED-Red irradiation on cardiac function in mice with HF and to reveal its mechanisms. In this study, we constructed a mouse model of HF. We found that LED-Red (630 nm) was an effective wavelength for the treatment of HF. Meanwhile, the application of LED-Red therapy to treat HF mice improved cardiac function, ameliorate heart morphology, reduced pulmonary edema, as well as inhibited collagen deposition.

Moreover, LED-Red therapy attenuated the extent of perivascular fibrosis. Besides, LED-Red irradiation promoted calcium transients in cardiomyocytes as well as upregulated ATP synthesis, which may have positive implications for contractile function in mice with HF. Collectively, we identified that LED-Red exerts beneficial effects on cardiac function in HF mice possibly by promoting the synthesis of ATP.

Low-dose tofacitinib with 308-nm excimer therapy successfully induced repigmentation in patients with refractory vitiligo. Combining low-dose tofacitinib with 308-nm excimer may be an effective treatment for patients with nonsegmental vitiligo who were refractory to conventional therapies. Piperidines;Pyrimidines;tofacitinib Humans;Low-Level Light Therapy;Piperidines;Pyrimidines;Treatment Outcome;Vitiligo

LOW-LEVEL LASER THERAPY MAY REDUCE THE RISK OF SEVERE ORAL MUCOSITIS IN PATIENTS RECEIVING CHEMOTHERAPY OR RADIOTHERAPY. ARTICLE TITLE AND BIBLIOGRAPHIC INFORMATION: Peng et al. Low-level laser therapy in the prevention and treatment of oral mucositis: a systematic review and meta-analysis. Oral Surg Oral Med Oral Pathol Oral Radiol. 2020 Oct;130(4):387-397.e9. doi: 10.1016/j.oooo.2020.05.014. Epub 2020 Jun 5. SOURCE OF FUNDING: Sichuan University Post-doctoral Research and Development Fund (grant No. 19 XJ0008) TYPE OF STUDY/DESIGN: Systematic review with meta-analysis. Humans;Low-Level Light Therapy;Stomatitis

Photobiomodulation promotes hair regeneration in injured skin by enhancing migration and exosome secretion of dermal papilla cells. The application of photobiomodulation (PBM) in regenerative medicine has expanded to the treatment of alopecia caused by various reasons. However, the mechanisms responsible for its effects are poorly understood. Here, we aimed to investigate the effects of PBM on hair regeneration in injured skin and to explore the underlying mechanisms. The scratched epidermis or dermis models were established in C57 mice aged 7-8â€‰weeks. We found that the scratched epidermis had no influence on hair regeneration, but the scratched dermis led to obvious hair follicle atrophy and significantly influenced hair regeneration. The wounds in scratched dermis models were treated with PBM (655â€‰nm, 3Â J/cm(2) [10Â min]) and the hair regeneration and cell proliferation in hair follicle were evaluated. Compared with control, the hair coverage level was significantly enhanced after PBM treatment. Sox9(+) and PCNA(+) cells in hair follicle were obviously observed in PBM-treated group, but not in control. In vitro, the effects of PBM on the function of dermal papilla cells (DPCs) were investigated. The results showed that the migration of DPCs was increased significantly by PBM (655â€‰nm, 3Â J/cm(2) [10Â min]), whereas no effect was found on proliferation. Furthermore, we found that PBM promoted exosome secretion of DPCs, accompanied by the activation of Akt/GSK-3Î²/Î²-catenin pathway. AKT inhibitor MK-2206 effectively blocked PBM-induced migration and exosome secretion of DPCs. These findings suggest that the enhanced migration and exosome secretion of DPCs mediated by the Akt/GSK-3Î²/Î²-catenin pathway were responsible for the promotion of hair regeneration in injured skin by PBM. beta Catenin;Glycogen Synthase Kinase 3 beta;Proto-Oncogene Proteins c-akt Animals;Cell Proliferation;Cells, Cultured;Dermis;Glycogen Synthase Kinase 3 beta;Hair;Hair Follicle;Mice;Proto-Oncogene Proteins c-akt;Wound Healing;beta Catenin

Long COVID Oral Cavity Symptoms Based on Selected Clinical Cases. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is characterized by variable clinical features, different durations, and several previously unheard-of late complications. Knowledge about this infection is constantly evolving.The aim of the study is to present selected cases of the most common symptoms of long COVID in the oral cavity.Among the 1,256 studied patients, 32% of them had discoloration, ulceration, and hemorrhagic changes on the oral mucosa, 29.69% had mycosis located on the tongue, 25.79% of patients had aphthous-like lesions on the hard palate, and in 12.5% atrophic cheilitis was

observed. During the anamnesis, approximately 60% of patients reported salivary secretory disorders in the initial period of infection, which is 6.68% prolonged up to 4 months after systemic symptoms disappeared. In an extreme case, an aphthous-like lesion was located on the hard palate, which persisted for 6 months. Approximately 36% of patients did not agree to the proposed treatment. As a result, they only received recommendations on the use of oral hygiene products and received weekly check-ups. In this group of patients, most pathological changes spontaneously cleared after 3 weeks. The elderly with coexisting diseases, persons with a more severe SARS-CoV-2, and hospitalized patients had more extensive and severe lesions in the oral cavity that persisted for a long time after infection.In patients after the SARS-CoV-2 infection and suspected of this infection, a detailed intraoral examination should be performed, and the patient must be obligatorily monitored for a minimum period of 6 months. Depending on the patient's clinical condition, changes in the oral cavity require observation, basic or specialist treatment. In the case of changes in the cavity without pain symptoms, observation should be made for approximately 4 weeks and wait for the spontaneous regression of the changes. However, when pain occurs, a good solution is to use laser biostimulation. In the case of complex pathological changes occurring in the oral cavity, the patient should be directed for specialist treatment.

Remote Photobiomodulation Treatment for the Clinical Signs of Parkinson's Disease: A Case Series Conducted During COVID-19. Objective: To assess whether remote application of photobiomodulation (PBM) is effective in reducing clinical signs of Parkinson's disease (PD). Background: PD is a progressive neurodegenerative disease for which there is no cure and few treatment options. There is a strong link between the microbiome-gut-brain axis and PD. PBM in animal models can reduce the signs of PD and protect the neurons from damage when applied directly to the head or to remote parts of the body. In a clinical study, PBM has been shown to improve clinical signs of PD for up to 1 year. Methods: Seven participants were treated with PBM to the abdomen and neck three times per week for 12 weeks. Participants were assessed for mobility, balance, cognition, fine motor skill, and sense of smell on enrolment, after 12 weeks of treatment in a clinic and after 33 weeks of home treatment. Results: A number of clinical signs of PD were shown to be improved by remote PBM treatment, including mobility, cognition, dynamic balance, spiral test, and sense of smell. Improvements were individual to the participant. Some improvements were lost for certain participants during at-home treatment, which coincided with a number of enforced coronavirus disease 2019 (COVID-19) pandemic lockdown periods. Conclusions: Remote application of PBM was shown to be an effective treatment for a number of clinical signs of PD, with some being maintained for 45 weeks, despite lockdown restrictions. Improvements in clinical signs were similar to those seen with the application of remote plus transcranial PBM treatment in a previous study. Clinical Trial Registration number: U1111-1205-2035. Animals;COVID-19;Communicable Disease Control;Humans;Low-Level Light Therapy;Neurodegenerative Diseases;Parkinson Disease;SARS-CoV-2

Improved healing and macrophage polarization in oral ulcers treated with photobiomodulation (PBM). OBJECTIVES: The effect of photobiomodulation (PBM) treatment on wound healing and macrophage polarization was investigated in vivo. Animal models of oral ulcers were simulated through chemically induced oral ulcers in rats. MATERIALS AND METHODS: PBM treatment using an infrared pulsed laser was used to treat oral ulcers in the animal models. Twelve Sprague-Dawley rats were randomly divided into four groups depending on set absorbed energy: Group 1 (control), Group 2 (30â€‰J), Group 3 (60â€‰J), and Group 4 (100â€‰J). Laser treatment was performed every other day for 8 days after ulcer confirmation. Parameters used were as follows: wavelength 808â€‰nm, power output 50â€‰mW, spot size 10â€‰mm, frequency 10â€‰Hz, and pulse duration 1â€‰millisecond. Ulcers were measured to determine the effect of the treatments over time.

Histology, immunostaining, and real-time polymerase chain reaction analyses were performed to evaluate the effect of PBM treatment on macrophage-related (IL-6/IL-10) and wound-healing-related (TNF-Î±/TGF-Î²/MMP-2) cytokine expression. RESULTS: Histological examinations indicate that the PBM treatment stimulated a higher level of wound recovery after 8 days of treatment at 60â€‰J absorbed energy compared to other treatment groups. Analyses of relative gene expression of proinflammatory, anti-inflammatory, and tissue remodeling cytokines indicate that the macrophages in the tissue samples were predominantly characterized as M2 subtypes (alternatively activated), which possibly accounts for the accelerated tissue repair in the animal model of oral ulcer. CONCLUSION: This preliminary study stands as a proof of concept regarding the potential use of infrared laser PBM treatment for oral ulcers which have not been previously investigated upon. PBM treatment affects macrophage polarization and enhances wound healing. Further experimentation will be conducted to expand the understanding of how PBM treatment affects the healing mechanism of ulcers. Cytokines;phytobacteriomycin;Streptothricins Animals;Cytokines;Low-Level Light Therapy;Macrophages;Oral Ulcer;Rats;Rats, Sprague-Dawley;Rats, Wistar;Streptothricins;Ulcer;Wound Healing

Low-intensity LASER and LED (photobiomodulation therapy) for pain control of the most common musculoskeletal conditions. Pain is the most common reason for physician consultations and the number one reason for missed work or school days is musculoskeletal pain. Pain management is utilized for easing the suffering and improving the Quality of Life of those living with chronic pain. Over the past several decades, physicians have become increasingly willing to prescribe opioids to manage pain. However, the opioid use can cause side effects as poor coordination, sedation, mood swings, depression, and anxiety combined with a dependence on the drugs. In the rehabilitation setting, patients benefit most when their health providers utilize a multimodal approach combining different types of therapies and when patients take on a significant role in optimal management of their own pain. The use of light as a therapeutic alternative form of medicine to manage pain and inflammation has been proposed to fill this void. Photobiomodulation therapy applied in the form of low-intensity Light Amplification by Stimulated Emission of Radiation (LASER) and light-emitting diode (LED) has been shown to reduce inflammation and swelling, promote healing, and reduce pain for an array of musculoskeletal conditions. There is evidence that photobiomodulation therapy reduces pain intensity in non-specific knee pain, osteoarthritis, pain post-total hip arthroplasty, fibromyalgia, temporomandibular diseases, neck pain, and low back pain. Therefore, the purpose of this paper was to present the up-to-dated evidence about the effects of low-intensity LASER and LED (photobiomodulation therapy) on pain control of the most common musculoskeletal conditions. We observed that the photobiomodulation therapy offers a non-invasive, safe, drug-free, and side-effect-free method for pain relief of both acute and chronic musculoskeletal conditions as well as fibromyalgia. Chronic Pain;Fibromyalgia;Humans;Inflammation;Lasers;Low-Level Light Therapy;Musculoskeletal Pain;Pain Management;Quality of Life

Influence of synthetic and natural photosensitizers activated by photodynamic therapy on extrusion bond strength of fiber post to radicular dentin. OBJECTIVE: To assess the effect of different photosensitizers activated by low-level laser therapy on EBS of glass fiber post to radicular dentin. METHODS: This study was conducted at King Saud University from January 2021 to March 202. Fifty maxillary central incisors were sanitized and decoronated. NiTi was used for mechanical instrumentation of the canal. All canals were shaped, cleaned and obturated with gutta-percha. Post space was made using peso reamers. Four Division of groups were made according to photosensitizers used (n=10). Group-1: MBP at 100mg/l, Group-2: Phycocyanin at 100mg/l, Group-3: CP at 500mg/l, and Group-4 toluidine blue photosensitizer (TB). Lasers were used for activation of photosensitizers. In Group-5 samples were irrigated using sodium hypochlorite NaOCl +17% EDTA.

Posts were cemented and teeth sectioned into apical, coronal and middle. For EBS all samples were subjected to a universal testing machine. Fracture patterns were analyzed using stereomicroscope. To compare EBS at different segments One-way analysis of variance (ANOVA) and Tukey multiple comparison tests (p=0.05) was performed. RESULTS: The maximum value of EBS was shown in Group-2 radicular canal treated with CP with 17% EDTA at all three levels cervical (8.61Â±1.32 MPa), middle (6.81Â±0.73 MPa), and apical (5.51Â±0.25 MPa). Similarly, the minimum value of EBS was displayed in Group-5 canal irrigated with 2.25% NaOCl +17% EDTA (control) coronal (6.10Â±1.77 MPa), middle (5.11Â±0.75MPa), and apical (3.60Â±0.94 MPa). Intragroup assessment disclosed a decrease in EBS from cervical one-third to apical one-third in all groups. CONCLUSION: P, CP, and TB along with EDTA have the potential to be used as canal disinfectant and favors the bonding of GFP to radicular dentin using self-etch adhesive resin.

Combined application of chondroitinase ABC and photobiomodulation with low-intensity laser on the anal sphincter repair in rabbit. BACKGROUND: Photobiomodulation with low-intensity laser (LIL) and chondroitinase ABC (ChABC) can repair damaged muscle tissue, so the aim of this study was to investigate the effect of co-administration of these two factors on anal sphincter repair in rabbits. METHODS: Male rabbits were studied in 5 groups (nâ€‰=â€‰7): Control (intact), sphincterotomy, laser, ChABC and laserâ€‰+â€‰ChABC. 90Â days after intervention were evaluated resting and maximum squeeze pressures, number of motor units, collagen amount, markers of muscle regeneration and angiogenesis. RESULTS: Resting pressure in the Laserâ€‰+â€‰ChABC group was higher than the sphincterotomy, laser and ChABC groups (pâ€‰<â€‰0.0001). Maximum squeeze pressure in the all study groups was higher than sphincterotomy group (pâ€‰<â€‰0.0001). In the laserâ€‰+â€‰ChABC and ChABC groups, motor unit numbers were more than the sphincterotomy group (pâ€‰<â€‰0.0001). Collagen content was significantly decreased in the laser (pâ€‰<â€‰0.0001) and laserâ€‰+â€‰ChABC groups. ACTA1 (pâ€‰=â€‰0.001) and MHC (pâ€‰<â€‰0.0001) gene expression in the Laserâ€‰+â€‰ChABC group were more than the laser or ChABC alone. VEGFA (pâ€‰=â€‰0.009) and Ki67 mRNA expression (pâ€‰=â€‰0.01) in the Laserâ€‰+â€‰ChABC group were more than the laser group, But vimentin mRNA expression (pâ€‰<â€‰0.0001) was less than the laser group. CONCLUSION: Co-administration of ChABCs and photobiomodulation with LIL appears to improve the tissue structure and function of the anal sphincter in rabbits more than when used alone. Collagen;Chondroitin ABC Lyase Anal Canal;Animals;Chondroitin ABC Lyase;Collagen;Lasers;Male;Rabbits

How can biophotonics help dentistry to avoid or minimize cross infection by SARS-CoV-2? Biophotonics is defined as the combination of biology and photonics (the physical science of the light). It is a general term for all techniques that deal with the interaction between biological tissues/cells and photons (light). Biophotonics offers a great variety of techniques that can facilitate the early detection of diseases and promote innovative theragnostic approaches. As the COVID-19 infection can be transmitted due to the face-to-face communication, droplets and aerosol inhalation and the exposure to saliva, blood, and other body fluids, as well as the handling of sharp instruments, dental practices are at increased risk of infection. In this paper, a literature review was performed to explore the application of Biophotonics approaches in Dentistry focusing on the COVID-19 pandemic and how they can contribute to avoid or minimize the risks of infection in a dental setting. For this, search-related papers were retrieved from PubMED, Scielo, Google Schoolar, and American Dental Association and Centers for Disease Control and Prevention databases. The body of evidence currently available showed that Biophotonics approaches can reduce microorganism load, decontaminate surfaces, air, tissues, and minimize the generation of aerosol and virus spreading by minimally invasive, time-saving, and alternative techniques in general. However, each clinical situation must be individually evaluated regarding the benefits and drawbacks of these approaches,

but always pursuing less-invasive and less aerosol-generating procedures, especially during the COVID-19 pandemic. COVID-19;Cross Infection;Dentistry;Humans;Pandemics;Photochemotherapy;SARS-CoV-2;United States

Clinical and Molecular Outcomes After Combined Intense Pulsed Light Therapy With Low-Level Light Therapy in Recalcitrant Evaporative Dry Eye Disease With Meibomian Gland Dysfunction. PURPOSE: Dry eye disease (DED) is a leading cause of ocular morbidity worldwide. This study evaluates the effects of combined light therapy [intense pulsed light (IPL) and low-level light therapy (LLLT)] on clinical and molecular outcomes in evaporative DED with meibomian gland dysfunction (MGD). METHODS: This prospective study evaluated 94 eyes (47 subjects) with chronic MGD treated with combined light therapy. Patients underwent a detailed evaluation of MGD and DED using the Ocular Surface Disease Index, dry eye tests-tear breakup time and Schirmer test, ocular surface staining, meibomian gland expressibility scoring, and meibography. Patients underwent a single session of combined light therapy (IPL + LLLT treatment) using the Eye-light device. All these tests were repeated at 3 and 6 months after treatment. Tear fluid and ocular surface wash samples were collected from a subset of patients before and after treatment for cellular and secreted immune factor profiling by flow cytometry. RESULTS: Combined light therapy (IPL + LLLT) demonstrated a marked improvement in the clinical metrics studied. Three months after treatment, Ocular Surface Disease Index showed a significant reduction in 95.6% ($P < 0.0001$), tear breakup time increased in 72.3% ($P < 0.0001$), and meibomian gland expressibility scoring increased in 80.8% ($P < 0.0001$) of the eyes. These effects were observed to be sustained during the 6-month follow-up visit. Significant ($P < 0.05$) reduction in tear fluid levels of interleukin-1Î², interleukin-17F, and MMP9; MMP9/TIMP1 ratio; and ocular surface B-cell proportions was observed. CONCLUSIONS: Combined light therapy shows promising results in patients with chronic MGD and DED, even in recalcitrant cases. Clinical and molecular factor alterations support the improved symptomatology and reduced inflammation. Matrix Metalloproteinase 9 Dry Eye Syndromes;Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Matrix Metalloproteinase 9;Meibomian Gland Dysfunction;Meibomian Glands;Prospective Studies;Tears

The Probable Protective Effect of Photobiomodulation on the Inflammation of the Airway and Lung in COVID-19 Treatment: A Preclinical and Clinical Meta-Analysis. Preliminary studies also show that many of the fatalities of COVID-19 are due to over-activity of the immune system, and photobiomodulation (PBM) therapy mainly accelerates wound healing and reduces pain and inflammation. Therefore, this systematic review and meta-analysis was conducted to evaluate the probable effect of the PBM therapy on the lung inflammation or ARDS and accelerate the regeneration of the damaged tissue. We systematically searched major indexing databases, including PubMed/Medline, ISI web of science (WOS), Scopus, Embase, and Cochrane central, using standard terms without any language, study region, or type restrictions. Of the 438 studies found through initial searches, 13 met the inclusion criteria. After applying the exclusion criteria, the main properties of 13 articles on 384 animals included in this meta-analysis with a wide range of species include rat (nÂ =Â 10) and rabbit (nÂ =Â 3). The analysis revealed that PBM therapy reduced TNFÎ± (SMD:-3.75, 95% CI: -4.49, -3.02, PÂ <Â 0.00001, I(2)Â =Â 10%), IL-1Î² (SMD:-4.65, 95% CI: -6.15, -3.16, PÂ <Â 0.00001, I(2)Â =Â 62%), and IL-6 (SMD:-4.20, 95% CI: -6.42, -1.97, PÂ =Â 0.0002, I(2)Â =Â 88%) significantly compared with the model controls. Hence, PBM therapy increased IL-10 significantly compared with the model controls (SMD:-4.65, 95% CI: -6.15, -3.16, PÂ <Â 0.00001, I(2)Â =Â 62%). PBM therapy also reduced MPO activity (SMD:-2.13, 95% CI: -3.38, -0.87, PÂ =Â 0.0009, I(2)Â =Â 64%) and vascular permeability (SMD:-2.59, 95% CI: -4.40, -0.77, PÂ =Â 0.0052, I(2)Â =Â 71%) in the lung using the Evans blue extravasation technique significantly compared with the model controls. This systematic review and meta-analysis revealed that the PBM therapy does utilize beneficial anti-

inflammatory effect, modulation of the immune system, lung permeability, or bronchoalveolar lavage on lung damage in both animal models and clinical studies. However, animal model and clinical studies appear limited considering the quality of the included evidences; therefore, large clinical trials are still required. Animals;COVID-19;Inflammation;Low-Level Light Therapy;Lung;Pneumonia;Rabbits;Rats

Photobiomodulation-Activated Latent Transforming Growth Factor-Î²1: A Critical Clinical Therapeutic Pathway and an Endogenous Optogenetic Tool for Discovery. Objective: The central role of the TGF-Î² pathway in embryonic development, immune responses, tissue healing, and malignancies is well established. Prior attempts with small molecules, peptides, and regulatory RNAs have failed mainly due to off-target effects in clinical studies. This review outlines the evidence for selectively activating the endogenous, latent transforming growth factor (TGF)-Î²1 with photobiomodulation (PBM) treatments. Background: Light treatments play a central role in current-directed energy therapeutics in medicine. Therapeutic use of low-dose light treatments has been noted since the 1960s. However, the breadth of treatments and inconsistencies with clinical outcomes have led to much skepticism. This can be primarily attributed to a lack of understanding of the fundamental light-tissue interactions and optimization of clinical treatment protocols. Methods: Recent advances in molecular mechanisms and improved biophotonic device technologies have led to a resurgence of interest in this field. Results: Over the past two decades, our work has focused on outlining a direct molecular mechanism involving PBM-generated redox-mediated activation of endogenous latent TGF-Î²1. Conclusions: Despite its critical roles in these processes, the complexity and cross talk in this potent growth factor signaling network have prevented the development of directed targeted therapeutics. PBM treatments offer a novel therapeutic and discovery tool in this aspect, especially with the growing evidence for its roles in cancer immunotherapy and stem cell biology. Transforming Growth Factor beta1 Optogenetics;Signal Transduction;Stem Cells;Transforming Growth Factor beta1;Wound Healing

The influence of low- intensity laser irradiation versus hyperbaric oxygen therapy on transcutaneous oxygen tension in chronic diabetic foot ulcers: a controlled randomized trial. BACKGROUND AND OBJECTIVE: Evaluation of the stage and severity of the chronic diabetic foot ulcer (CDFU) is vital to increase the healing rate andÂ to select the suitable treatment. We aim to assess the influence of low-intensity laser irradiation (LILI) and hyperbaric oxygenation therapy (HBOT) to accelerateÂ the CDFU healing thru the transcutaneous oxygen tension (TcPO2) measurements. MATERIALS AND METHODS: Seventy-five diabetic patients (type 2) of both genders, their ages ranged from 40-65Â years with CDFUs (duration of ulcerâ€‰<â€‰6Â weeks). All patients were randomly assigned into LILI, HBOT, and the control group. Measurement of TcPO2 using transcutaneous oximetry was performed for all patients once in the baseline and consequently in the second, fourth, and sixth-weeks duration. LILI utilized by a 33-diode cluster contact applicator with output power 1440 mW, energy density (fluency) was adjusted for 4Â J/Cm(2) at 10Â kHz, and for 8Â min per session, three times per week for a total of consecutive 6Â weeks. HBOT was pressurized up to 2.5 ATA and patients delivered 100% oxygen for 60Â min per session for 30 sessions. The Control group received conventional wound care only, twice daily, with saline and apply a new bandage after cleaning. RESULTS: MANOVA revealed a statistically insignificant difference in the control group, while statistically significant improvement in both the LILI and HBOT groups. The intergroup comparisons showed an insignificant statistical difference in the pre-test, while highly statistically significant differences for the three post-measures in favor of HBOT and LILI groups. The percentage of improvement of the HBOT group was higher than LILI. Post-hoc test using the least significant difference (LSD) revealed statistically significant differences of HBOT in favor of the LILI group.

CONCLUSION: Both LILI and HBOT may be used as adjunctive methods to improve TcPO2 that accelerate healing in CDFUs. HBOT may be favorable in the improvement of TcPO2 than LILI.

Evaluation of Picosecond 755-nm Alexandrite Laser With a Diffractive Lens Array on Pore Size Reduction. OBJECTIVES: Medications, lasers and light therapy have all been shown to transiently minimize pore size. Current research of the 755-nm Alexandrite picosecond laser (Cynosure, MA) on pore size shows differing results regarding the efficacy, with one study of Asian volunteers (Fitzpatrick skin type IV) reporting “marked” improvement of pores, yet another study reporting no significant improvement in pore size in Chinese patients (Fitzpatrick skin type III–IV), causing some contention. This study aims to rectify the discordant results through the examination of the 755-nm Alexandrite picosecond laser on pore size reduction in a sample consisting of Fitzpatrick skin type I–III. METHODS: Patients who received 755-nm Alexandrite picosecond laser treatment for photorejuvenation, (6 mm lens array) with a fluence of 0.71 J/cm2 of the face or head, with at least two treatments over four-week intervals were included in the study. A precision subject imaging system (Canfield VISIA® Complexion Analysis Generation 7, NJ) was used to assess three parameters of pore size (feature count, score, percentile rank) at each time period at right lateral, left lateral and frontal views. A Wilcoxin signed rank test was performed to compare differences between time periods and a mixed model ANOVA was utilized to account for patients who received less than three treatments. Significance level set to P=<0.05. RESULTS: 32 participants met criteria and underwent at least two picosecond laser treatments for photorejuvenation. There was an overall reduction in pore count in approximately 57% of participant data points from times 1 to 2 and 50% reduction from times 2 to 3. There was a 100% pore count reduction observed from baseline compared with the follow-up visit four weeks after the third treatment, at time 4. Further, there was a significant improvement of pores demonstrated by score from times 1 to 3 (Z= -2.197, P=0.028) as well as percentile rank between times 1 and 2 (Z= -2.070, P=0.038) and times 1 and 3 (Z= -2.201, P=0.028). CONCLUSION: Future studies should investigate the longterm effect of 755-nm Alexandrite picosecond laser on pore size reduction as continued patient recruitment and data collection is necessary to effectively discern the 755-nm Alexandrite picosecond laser debate. Thus, prolonged follow up post treatment should be evaluated in order to determine if results are maintained. Nonetheless, the 755-nm Alexandrite picosecond laser shows promising results for the improvement of skin pores thus far. J Drugs Dermatol. 2021;20(12):1302-1306. doi:10.36849/JDD.6199. alexandrite;Beryllium Beryllium;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Aging;Treatment Outcome

Phototherapies for COVID-19-associated opportunistic oral infections. Opportunistic infections are widely described in patients with novel coronavirus disease 2019 (COVID-19); however, very few studies have addressed those affecting the oral cavity. Given the lack of information on the clinical presentations and the available treatment options, the present study aimed to show a case in which a combination of antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) was used for the management of two concomitant COVID-19-associated opportunistic oral infections (oral pseudomembranous candidiasis and recurrent herpes labialis). Within 7 days and without any systemic drug administration, all the lesions resolved completely, and the patient no longer reported oral pain or discomfort. According to the current case report and taking into consideration the significant gaps in the knowledge and understanding of COVID-19, this combination of phototherapy modalities seems to be a promising tool for managing viral and fungal opportunistic oral infections. Photosensitizing Agents COVID-19;Humans;Opportunistic Infections;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2

Evaluation of the acceleration, skeletal and dentoalveolar effects of low-level laser therapy combined with fixed posterior bite blocks in children with skeletal anterior open bite: A three-arm randomised

controlled trial. OBJECTIVES: To evaluate the effectiveness of the low-level laser therapy (LLLT) in accelerating the early treatment of the skeletal anterior open bite (AOB) and to evaluate the associated skeletal and dentoalveolar changes. MATERIALS AND METHODS: A three-arm, parallel-group, randomized controlled trial was conducted on 42 patients aged 8-10 years with skeletal AOB. Patients were randomly allocated to three groups: the fixed posterior bite block+low-level laser therapy (FPBB+LLLT) group; the fixed posterior bite block (FPBB) group; and the untreated control group (UCG) in a 1:1:1 allocation ratio. The LLLT dose in the FPBB+LLLT group was applied using 808-nm wavelength Ga-Al-As semiconductor laser device with the energy of 4-joules/point and irradiation time of 16 seconds/point. LLLT was applied in the first visit; then, it was applied on day 3, 7 and 14 of the first month. Afterwards, it was applied every 15 days until the end of the treatment. Lateral cephalometric images were taken at the beginning of the treatment (T0) and at the end of the active phase (T1). The primary outcome measures were the overall time needed to correct the AOB and the skeletal and dentoalveolar changes. RESULTS: The correction of the AOB required significantly less mean time in the FPBB+LLLT group compared to the FPBB group (xl̀…=7.07, xl̀…=9.42 months, respectively; P=0.001). The mean upper first molar intrusion in the FPBB+LLLT group was 1.21mm and significantly greater than that of the FPBB group (0.82mm; P=0.018). However, there was a slight mean extrusion of the upper first molar in the UCG (0.32mm). CONCLUSIONS: The overall time needed to correct the AOB was shorter in the FPBB+LLLT group. The LLLT appeared to be effective in accelerating orthodontic tooth movement. FPBB alone or LLLT were effective in the early treatment of anterior open bite (AOB). The two interventional groups produced similar dentoalveolar and skeletal changes; most of which were dentoalveolar in the correction of the anterior open bite. Acceleration;Cephalometry;Child;Humans;Low-Level Light Therapy;Open Bite;Tooth Movement Techniques

Effectiveness of Laser Therapy and Laser Acupuncture on Treating Paraesthesia After Extraction of Lower Third Molars. Objective: This randomized clinical trial evaluated the sensitive return of the lower alveolar nerve (LAN) using two photobiomodulation therapy (PBMT) techniques, after the extraction of lower third molars or implant surgery. Materials and methods: Sixty participants with sensory impairment of LAN were randomly divided into three groups (nâ€‰=â€‰20): group C-systemic medication (control-ETNA(Â®), 01 capsule, 8/8â€‰h, 30 days); group laser therapy (LT) (808â€‰nm, 100â€‰mW, 40â€‰sec/point, 4â€‰J/point, intra/extraoral, irradiation following nerve path); group laser acupuncture (LA) (same parameters as the LT group, applied at six acupuncture points on the affected side (ST 4 [Dicang], M-HN-18 [Jiachengjiang], CV 24 [Chengjiang], ST 5 [Daying], ST 6 [Jiache], and point A1 [YNSA]). The following evaluations were performed, at predetermined times: general perception of paresthesia, thermal perception, vibratory mechanical perception, two-point discrimination, pain perception, and tactile perception. Data were analyzed by two-way analysis of variance (ANOVA), followed by the Tukey, except for the two-point discrimination, which was analyzed using the chi-square test. Results: In general and thermal perception, both PBMTs had better results than control; regarding cold perception, only the LT group was statistically superior to control. LA presented inferior results of neural regeneration for tests of perception of pain and tactile at the lip, and of tactile perception at the chin. In the other tests, there was no statistical difference among the groups. Conclusions: LT and the conventional drug treatment had the same effectiveness and both were superior to LA for the treatment of paresthesia of the LAN after oral surgeries. Acupuncture Therapy;Humans;Laser Therapy;Low-Level Light Therapy;Molar, Third;Paresthesia

Neonatal Eye Shielding during Phototherapy: What Protects the Eye Better? BACKGROUND: Phototherapy remains an important component of the management of unconjugated neonatal jaundice, a major cause of newborn morbidity. During phototherapy the toxic unconjugated form of

bilirubin is converted to nontoxic form through action of light delivered by phototherapy. An important possible complication of phototherapy is retinal damage and therefore eye protective measures are taken during therapy to prevent this from occurring. Devices currently in use for phototherapy are capable of providing intensive phototherapy with the attendant increased risk of eye injury. The materials used in providing eye protection are varied among care providers. A dearth of information exists on shielding provided by the commonly used eye protectors during phototherapy, more so during intensive phototherapy. OBJECTIVE: To evaluate the shielding provided by the different eye protectors commonly used in our setting under intensive phototherapy. MATERIALS AND METHOD: Five materials in use for eye shielding were obtained. Using an institutional built light emitting diode phototherapy device, intensive phototherapy was provided and the irradiance at varying distances of 35â€‰cm, 25â€‰cm, 15â€‰cm and 10â€‰cm was measured using an Olympic bili meterTM Natus. At the distance of each measured irradiance the different eye protective materials were then placed one after the other over the surface of the measuring sensor of the meter and the irradiance measurement was recorded. Two measurements were taken for each material at each distance and the average irradiance measurement was then recorded for each of the materials tested at that distance. RESULTS: Five eye shielding materials in use were identified: black cotton fabric, white cotton fabric, black cotton fabric with foam, white cotton fabric with foam and gauze. The black cotton fabric with or without foam at the phototherapy device irradiances of 30, 46.3, 58.7 and 75.4 Âµw/m2/nm recorded 0 irradiance. CONCLUSION: Black cotton fabric with or without foam pad provided the most shielding under intensive phototherapy. Bilirubin Bilirubin;Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Jaundice, Neonatal;Phototherapy

Retraction notice to: Does Low-Level Laser Photobiomodulation Improve Neurosensory Recovery After Orthognathic Surgery? A Clinical Trial With Blink Reflex [J Oral Maxillofacial Surg 79 (2021) 685-693].

670nm photobiomodulation modulates bioenergetics and oxidative stress, in rat MÃ¼ller cells challenged with high glucose. Diabetic retinopathy (DR), the most common complication of diabetes mellitus, is associated with oxidative stress, nuclear factor-ÎºB (NFÎºB) activation, and excess production of vascular endothelial growth factor (VEGF) and intracellular adhesion molecule-1 (ICAM-1). Muller glial cells, spanning the entirety of the retina, are involved in DR inflammation. Mitigation of DR pathology currently occurs via invasive, frequently ineffective therapies which can cause adverse effects. The application of far-red to near-infrared (NIR) light (630-1000nm) reduces oxidative stress and inflammation in vitro and in vivo. Thus, we hypothesize that 670nm light treatment will diminish oxidative stress preventing downstream inflammatory mechanisms associated with DR initiated by Muller cells. In this study, we used an in vitro model system of rat MÃ¼ller glial cells grown under normal (5 mM) or high (25 mM) glucose conditions and treated with a 670 nm light emitting diode array (LED) (4.5 J/cm2) or no light (sham) daily. We report that a single 670 nm light treatment diminished reactive oxygen species (ROS) production and preserved mitochondrial integrity in this in vitro model of early DR. Furthermore, treatment for 3 days in culture reduced NFÎºB activity to levels observed in normal glucose and prevented the subsequent increase in ICAM-1. The ability of 670nm light treatment to prevent early molecular changes in this in vitro high glucose model system suggests light treatment could mitigate early deleterious effects modulating inflammatory signaling and diminishing oxidative stress. Reactive Oxygen Species;Sweetening Agents;Glucose Animals;Cells, Cultured;Energy Metabolism;Ependymoglial Cells;Glucose;Infrared Rays;Mitochondria;Oxidative Stress;Rats;Reactive Oxygen Species;Sweetening Agents

Mammalian complex III heme dynamics studied with pump-probe spectroscopy and red light illuminations. The electronic or molecular mechanisms that initiate photobiomodulation (PBM)

in cells are not yet fully understood. The porcine complex III (C-III) of the electron transport chain was characterized with transient absorption spectroscopy (TAS). We then applied our recently developed continuous wave laser coupled TAS procedure (CW-TAS) to investigate the effect of red light irradiances on the heme dynamics of C-III in its c(1) reduced state. The time constants were found to be 3.3â€‰Â±â€‰0.3 ps for vibrational cooling of the oxidized state and 4.9â€‰Â±â€‰0.4 ps for rebinding of the photodissociated axial ligand of the c(1) reduced state. The analysis of the CW-TAS procedure yielded no significant changes in the C-III heme dynamics. We rule out the possibility of 635 nm CW light at 4.7 mW/cm(2) inducing a PBM effect on the heme dynamic of C-III, specifically with the photodissociation of its axial ligand.

Immediate effects of photobiomodulation therapy combined with a static magnetic field on the subsequent performance: a preliminary randomized crossover triple-blinded placebo-controlled trial. There is evidence about the effects of photobiomodulation therapy (PBMT) alone and combined with a static magnetic field (PBMT-sMF) on skeletal muscle fatigue, physical performance and post-exercise recovery in different types of exercise protocols and sports activity. However, the effects of PBMT-sMF to improve the subsequent performance after a first set of exercises are unknown. Therefore, the aim of this study was to investigate the effects of PBMT-sMF, applied between two sets of exercises, on the subsequent physical performance. A randomized, crossover, triple-blinded (assessors, therapist, and volunteers), placebo-controlled trial was carried out. Healthy non-athlete male volunteers were randomized and treated with a single application of PBMT-sMF and placebo between two sets of an exercise protocol performed on isokinetic dynamometer. The order of interventions was randomized. The primary outcome was fatigue index and the secondary outcomes were total work, peak work, and blood lactate levels. Twelve volunteers were randomized and analyzed to each sequence. PBMT-sMF decreased the fatigue index compared to the placebo PBMT-sMF at second set of the exercise protocol (MDâ€‰=â€‰-6.08, 95% CI -10.49 to -1.68). In addition, PBMT-sMF decreased the blood lactate levels post-intervention, and after the second set of the exercise protocol compared to placebo ($p<0.05$). There was no difference between PBMT-sMF and placebo in the remaining outcomes tested. Volunteers did not report adverse events. Our results suggest that PBMT-sMF is able to decrease skeletal muscle fatigue, accelerating post-exercise recovery and, consequently, increasing subsequent physical performance when applied between two sets of exercises.

Hair Growth Promoting Effects of 650 nm Red Light Stimulation on Human Hair Follicles and Study of Its Mechanisms via RNA Sequencing Transcriptome Analysis. BACKGROUND: Androgenetic alopecia (AGA) leads to thinning of scalp hair and affects 60%~70% of the adult population worldwide. Developing more effective treatments and studying its mechanism are of great significance. Previous clinical studies have revealed that hair growth is stimulated by 650-nm red light. OBJECTIVE: This study aimed to explore the effect and mechanism of 650-nm red light on the treatment of AGA by using ex vivo hair follicle culture. METHODS: Human hair follicles were obtained from hair transplant patients with AGA. Hair follicles were cultured in Williams E medium and treated with or without 650-nm red light. Real-time RT-PCR and immunofluorescence staining were used to detect the expression level of genes and proteins in hair follicles, respectively. RNA-sequencing analysis was carried out to reveal the distinct gene signatures upon 650 nm treatment. RESULTS: Low-level 650 nm red light promoted the proliferation of human hair follicles in the experimental cultured-tissue model. Consistently, 650 nm red light significantly delayed the transition of hair cycle from anagen to catagen in vitro. RNA-seq analysis and gene clustering for the differentially expressed genes suggests that leukocyte transendothelial migration, metabolism, adherens junction and other biological process maybe involved in stimulation of hair follicles by 650-nm red light treatment. CONCLUSION: The effect of 650-nm red light on ex vivo hair follicles and the transcriptome set which

implicates the role of red light in promoting hair growth and reversing of miniaturization process of AGA were identified.

Comparative efficacy of topical aloe vera and low-level laser therapy in the management of oral lichen planus: a randomized clinical trial. This randomized clinical trial aimed to compare the efficacy of topical aloe vera with low-level laser therapy in patients with oral lichen planus (OLP). A randomized, parallel arm, single-blind study comprising of 60 patients with OLP was randomly divided into two groups. Group A was given topical aloe vera extract gel applied thrice daily for 2Â months, and group B was given low-level laser therapy (LLLT) at 980Â nm twice weekly for 2Â months. Both groups were followed up for 9Â months. Patients were assessed for various parameters according to the Escudier scale at baseline, after treatment at 9Â months. Results were assessed using the McNemar-Bowker test and the Mann-Whitney U test. Both individual groups showed significant (pâ€‰<â€‰0.05) results at the end of the treatment period (0-2Â months) and the follow-up period (2-7Â months). Intergroup comparison showed significant results in the laser group (reduction of VAS by 44.1%, site score by 24.6%, and activity score by 50%) as compared with the aloe vera group (reduction of VAS by 26.7%, site score by 9.2%, and the activity score by 26%) in the treatment period. In the follow-up period, both groups showed insignificant differences in comparison to each other. Within the limitations of the study, LLLT was more effective as compared with topical aloe vera in managing oral lichen planus during the active treatment time, while both were equally effective during the follow-up period. The clinical study was registered under the Clinical Trials Registry India with the registration number CTRI/2018/04/013147. Aloe;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Single-Blind Method

Effect of 970Â nm low-level laser therapy on orthodontic tooth movement during Class II intermaxillary elastics treatment: a RCT. This prospective randomized clinical trial aimed to evaluate the effect of low-level laser therapy on tooth movement during Class II intermaxillary elastics treatment. Forty-two patients with Class II malocclusion were included, and their maxillary quadrants were allocated into two groups: treatment with an active diode laser and a placebo group. In each group, the time taken to obtain Class I occlusion after 6Â months, rate of movement, total displacement of the maxillary canine to Class I occlusion and pain were recorded. The time to reach Class I occlusion in the active laser group (2.46â€‰Â±â€‰2.1Â months) was not significantly different from that in the placebo group (2.48â€‰Â±â€‰2.0Â months) (pâ€‰=â€‰0.938). Interestingly, the total distance of movement on the active laser side (2.27â€‰Â±â€‰1.5Â mm) was significantly greater than that on the placebo side (1.64â€‰Â±â€‰1.3Â mm) (pâ€‰=â€‰0.009). The pain levels on days 1, 2 and 3 were not significantly different between the laser and placebo sections. The rate of distance change toward Class I occlusion in the laser group (1.1â€‰Â±â€‰0.7Â mm/month) was significantly higher than that in the placebo group (0.74â€‰Â±â€‰0.6Â mm/month) (pâ€‰=â€‰0.037). Low-level laser therapy (970Â nm) did not reduce the time needed to obtain Class I occlusion, but a significant acceleration in tooth movement was observed in the irradiated group.Trial registration: NCT02181439. Registered 04 July 2014- https://www.clinicaltrials.gov/ct2/results?term=cinelaser .
Adolescent;Child;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Malocclusion, Angle Class II;Pain;Tooth Movement Techniques;Treatment Outcome

Effect of low-level laser therapy on pain and disability in patients with plantar fasciitis: A systematic review and meta-analysis. OBJECTIVE: We performed a systematic review to investigate the effects of low-level laser therapy (LLLT) on pain and disability in patients with plantar fasciitis (PF). METHODS: We searched Pubmed, PEDro database, Scielo, and Cochrane Central for randomized controlled trials that evaluated the effects of LLLT for patients with PF. The methodological aspects of the studies included were scored using the PEDro scale. Three comparisons were made: LLLT

compared with placebo, LLLT combined with conventional rehabilitation (CR) compared with CR and LLLT compared with extracorporeal shock wave therapy. RESULTS: Fourteen studies (817 patients) met the study criteria. Compared to the placebo group, LLLT improved pain (MD, -2.3; 95% CI: 2.6 to -2, I(2)Â =Â 0%; 4 studies, NÂ =Â 234: moderate-quality evidence) in the short term (0-6 weeks). No significant difference in short-term disability was found for participants in the LLLT group compared to the placebo group. Compared to the CR group, LLLT combined with CR improved pain (MD, -2.0; 95% CI: 2.9 to -1.1, I(2)Â =Â 0%; 2 studies, NÂ =Â 90: moderate-quality evidence) in the short term (0-6 weeks). Compared to extracorporeal shock wave therapy, LLLT did not significantly reduce pain intensity in the short term (MD, 0.5; 95% CI: 2.0 to 2.9, I(2)Â =Â 96%; 4 studies, NÂ =Â 175: low-quality evidence). CONCLUSIONS: LLLT may improve pain in the short term and can be considered as a component of care of patients with PF. However, this superiority disappeared compared to extracorporeal shock wave therapy. LEVEL OF EVIDENCE: Therapeutic level I. Fasciitis, Plantar;Humans;Low-Level Light Therapy;Pain;Pain Measurement

Transvaginal Photobiomodulation for the Treatment of Chronic Pelvic Pain: A Pilot Study. Background: Chronic pelvic pain (CPP) is a common and debilitating condition that affects millions of U.S. women. Most treatments are ineffective and innovative new therapies are desperately needed. Large, controlled studies show that photobiomodulation (PBM) can reduce pain in patients with other chronic pain conditions, such as low back pain, neck pain, and fibromyalgia. The objective of this pilot study was to determine if transvaginal PBM (TV-PBM) can reduce pain in women with CPP. Methods: We conducted a before and after, observational, pilot study. Patients completed the Short Form-McGill Pain Questionnaire (SF-MPQ) at baseline, 1 week, 3 months, and 6 months after nine treatments of TV-PBM. Clinicians completed the Clinical Global Impression Scale (CGI) assessing patient illness severity at the same time. Wilcoxon rank-sum t-tests and effect size using Cohen's d coefficient (low effect size if dâ€‰<â€‰0.2, medium if 0.2 < dâ€‰>â€‰8, and high if dâ€‰>â€‰0.8) was used to measure degree of pain improvement, which was also considered clinically significant if pain reduction was >30%. Results: Thirteen women completed 9 treatments, and 10 women were successfully followed to 6 months. At baseline, the mean SF-MPQ score was 19.7 (standard deviation [SD]â€‰Â±â€‰5.9). Compared with baseline, 60% improved; the mean SF-MPQ score decreased to 10.0 (SD Â±7.5, pâ€‰=â€‰0.004, dâ€‰=â€‰1.6) at 1 week after treatment, to 9.7 (SD Â±7.9, pâ€‰=â€‰0.005, dâ€‰=â€‰1.7) at 3 months, and 8.2 (SD Â±8.1, pâ€‰=â€‰0.002, dâ€‰=â€‰1.9) at 6 months. Conclusion: Transvaginal PBM provided significant and sustained pain relief to women with CPP up to 6 months. Further controlled studies are needed to confirm these findings, however, in this initial pilot, TV-PBM shows promise.

Biophotonic Therapy with Fluorescent Light Energy Decreases Facial Erythema, Improves Signs and Symptoms of Rosacea, and Increases Patient Satisfaction: A Postmarket Study. BACKGROUND: Rosacea is a difficult-to-manage chronic inflammatory skin condition reported to have a negative psychosocial impact on patients. Novel approaches are sought to target the many signs and symptoms of the condition while also improving the quality of life of patients. OBJECTIVE: We assessed the efficacy of the Kleresca(Â®) biophotonic platform (KLOX Technologies Inc., Laval, Canada), which creates fluorescent light energy (FLE), to induce a novel form of photobiomodulation for treating rosacea. We also assessed patient satisfaction with their facial appearance and concerns about perceptions of others before and after treatment. METHODS: Nine patients were treated once a week for four weeks with FLE. Patients and the treating clinician completed questionnaires throughout and after the treatment to grade the rosacea signs and symptoms and capture patients' perceptions of the treatment and their condition. RESULTS: FLE significantly reduced the inflammatory erythematous reaction of the face, improved flushing and erythema associated with

rosacea, and had a positive impact on patients' self-perception and emotional wellbeing. CONCLUSION: Our results support FLE as an effective, noninvasive treatment modality for rosacea.

Stimulatory responses in Î±- and Î²-cells by near-infrared (810 nm) photobiomodulation. Significant efforts have been committed to better understand and regulate insulin secretion as it has direct implications on diabetes. The first phase of biphasic insulin secretion in response to glucose lasts about 10Â minutes, followed by a more sustained release persisting several hours. Attenuated insulin release in the first phase is typically associated with abnormal Î²-cells. While near-infrared photobiomodulation (PBM) demonstrates potential for multiple therapeutic applications, photostimulatory effects on Î±- and Î²-cells remain to be further elucidated. Herein, we demonstrate that 810â€‰nm PBM exposure at fluence of 9Â J/cm(2) can elevate the intracellular reactive oxygen species within 15â€‰minutes following photostimulation. In addition, calcium spiking showed an approximately 3-fold increase in both ATC1 (Î±-cells) and BTC6 (Î²-cells) and correlates with hormone secretion in response to PBM stimulation. Our findings could lay a foundation for the development of non-biologic therapeutics that can augment islet transplantation. Insulin;Reactive Oxygen Species;Glucose Glucose;Insulin;Reactive Oxygen Species

Role of Photobiomodulation Therapy in Neurological Primary Burning Mouth Syndrome. A Systematic Review and Meta-Analysis of Human Randomised Controlled Clinical Trials. Mitochondrial homeostasis is crucial for energy production and neuronal survival in neurological primary burning mouth syndrome (npBMS). Photobiomodulation therapy (PBMT) has been utilised in npBMS management, however, its role of intervention remains controversial. The aim of this systematic review and meta-analysis of CRD 42020198921 PROSPERO registration reference was to oversee and determine the efficacy of PBMT in patients with npBMS, identifying the gaps and bridge them by proposing recommendations for future studies purposes. PRISMA guidelines and Cochrane Collaboration recommendations followed. Various search engines employed to analyse a total of 351 studies of which 12 were included. A wide range of utilised PBM wavelengths was between 635-980 nm and the power output ranged between 30 mW and 4000 mW. A high risk of bias (RoB) was noted in 7 out of 12 included studies (58.3%), as results of qualitative analysis. Meta-analysis findings of 4 out of 12 studies showed statistically significant intergroup differences (SSID) for visual analogue scale (VAS) values (MD = -1.47; 95% CI = -2.40 to -0.53; Z = 3.07 (p = 0.002) whereas meta-analysis on 5 out of 12 studies revealed SSID for anxiety/depression and quality of life (MD = -1.47; 95% CI = -2.40 to -0.53; Z = 3.07 (p = 0.002), favouring PBMT group to the control treatment strategies. Despite the inconsistency and diversity in PBM parameters (wavelength, power, light source, spot size, emission mode, energy per point, total energy) and treatment protocols (exposure time, number of sessions, time interval between sessions, treatment duration)-majority of the included studies showed positive PBM results. The high RoB and meta-analytical heterogeneity in the eligible studies warrant the necessity to perform well-designed and robust RCTs after acknowledging the drawbacks of the available scientific literature and addressing our suggested recommendations highlighted in our review.

Physical Agent Modalities in Early Osteoarthritis: A Scoping Review. Early osteoarthritis (EOA) still represents a challenge for clinicians. Although there is no consensus on its definition and diagnosis, a prompt therapeutic intervention in the early stages can have a significant impact on function and quality of life. Exercise remains a core treatment for EOA; however, several physical modalities are commonly used in this population. The purpose of this paper is to investigate the role of physical agents in the treatment of EOA. A technical expert panel (TEP) of 8 medical specialists with expertise in physical agent modalities and musculoskeletal conditions performed the review following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) model. The TEP searched for evidence of the following physical modalities in the

management of EOA: "Electric Stimulation Therapy", "Pulsed Electromagnetic field", "Low-Level Light Therapy", "Laser Therapy", "Magnetic Field Therapy", "Extracorporeal Shockwave Therapy", "Hyperthermia, Induced", "Cryotherapy", "Vibration therapy", "Whole Body Vibration", "Physical Therapy Modalities". We found preclinical and clinical data on transcutaneous electrical nerve stimulation (TENS), extracorporeal shockwave therapy (ESWT), low-intensity pulsed ultrasound (LIPUS), pulsed electromagnetic fields stimulation (PEMF), and whole-body vibration (WBV) for the treatment of knee EOA. We found two clinical studies about TENS and PEMF and six preclinical studies-three about ESWT, one about WBV, one about PEMF, and one about LIPUS. The preclinical studies demonstrated several biological effects on EOA of physical modalities, suggesting potential disease-modifying effects. However, this role should be better investigated in further clinical studies, considering the limited data on the use of these interventions for EOA patients. Electric Stimulation Therapy;Humans;Magnetic Field Therapy;Osteoarthritis, Knee;Physical Therapy Modalities;Quality of Life

Multi-Wavelength Photobiomodulation Therapy Combined with Static Magnetic Field on Long-Term Pulmonary Complication after COVID-19: A Case Report. INTRODUCTION: Photobiomodulation therapy, alone (PBMT) or combined with a static magnetic field (PBMT-sMF), has been demonstrated to be effective in the regeneration of tissues, modulation of inflammatory processes, and improvement in functional capacity. However, the effects of PBMT-sMF on the pulmonary system and COVID-19 patients remain scarce. Therefore, in this case report, we demonstrated the use of PBMT-sMF for peripheral oxygen saturation, pulmonary function, massive lung damage, and fibrosis as a pulmonary complication after COVID-19. CASE REPORT: A 53-year-old Mexican man who presented with decreased peripheral oxygen saturation, massive lung damage, and fibrosis after COVID-19 received PBMT-sMF treatment once a day for 45 days. The treatment was irradiated at six sites in the lower thorax and upper abdominal cavity and two sites in the neck area. We observed that the patient was able to leave the oxygen support during the treatment, and increase his peripheral oxygen saturation. In addition, the patient showed improvements in pulmonary severity scores and radiological findings. Finally, the patient presented with normal respiratory mechanics parameters in the medium-term, indicating total pulmonary recovery. CONCLUSIONS: The use of PBMT-sMF may potentially lead to safe treatment of and recovery from pulmonary complications after COVID-19, with regard to the structural and functional aspects.

808-nm Photobiomodulation Affects the Viability of a Head and Neck Squamous Carcinoma Cellular Model, Acting on Energy Metabolism and Oxidative Stress Production. Photobiomodulation (PBM) is a form of low-dose light therapy that acts through energy delivery from non-ionizing sources. During the recent two decades, there has been tremendous progress with PBM acceptance in medicine. However, PBM effects on potential stimulation of existing malignant or pre-malignant cells remain unknown. Thus, the primary endpoint was to assess the safety of PBM treatment parameters on head and neck squamous cell carcinoma (HNSCC) proliferation or survival. The secondary endpoint was to assess any putative anti-cancer effects of PBM treatments. Cell viability, energy metabolism, oxidative stress, and pro- and anti-apoptotic markers expression were investigated on a Human Head and Neck Squamous Cell Carcinoma cellular model (OHSU-974 FAcorr cell line). PBM therapy was administered through the 810 nm diode laser (GaAlAs) device (Garda Laser, 7024 Negrar, Verona, Italy) at the powers of 0, 0.25, 0.50, 0.75, 1.00, or 1.25 W in continuous wave (CW) mode for an exposure time of 60 s with a spot-size of 1 cm(2) and with a distance of 1.86 cm from the cells. Results showed that 810-nm PBM affected oxidative phosphorylation in OHSU-971 FAcorr, causing a metabolic switch to anaerobic glycolysis. In addition, PBM reduced the catalase activity, determining an unbalance between oxidative stress production and the antioxidant defenses, which could stimulate the pro-apoptotic cellular pathways. Our data, at the parameters investigated,

suggest the safeness of PBM as a supportive cancer therapy. Pre-clinical and clinical studies are necessary to confirm the in vitro evidence.

Autophagy and Apoptosis Induced in U87 MG Glioblastoma Cells by Hypericin-Mediated Photodynamic Therapy Can Be Photobiomodulated with 808 nm Light. Glioblastoma is one of the most aggressive types of tumors. Although few treatment options are currently available, new modalities are needed to improve prognosis. In this context, photodynamic therapy (PDT) is a promising adjuvant treatment modality. In the present work, hypericin-mediated PDT (hypericin-PDT, 2 J/cm(2)) of U87 MG cells is combined with (2 min, 15 mW/cm(2) at 808 nm) photobiomodulation (PBM). We observed that PBM stimulates autophagy, which, in combination with PDT, increases the treatment efficacy and leads to apoptosis. Confocal fluorescence microscopy, cytotoxicity assays and Western blot were used to monitor apoptotic and autophagic processes in these cells. Destabilization of lysosomes, mitochondria and the Golgi apparatus led to an increase in lactate dehydrogenase activity, oxidative stress levels, LC3-II, and caspase-3, as well as a decrease of the PKCÎ± and STAT3 protein levels in response to hypericin-PDT subcellular concentration in U87 MG cells. Our results indicate that therapeutic hypericin concentrations can be reduced when PDT is combined with PBM. This will likely allow to reduce the damage induced in surrounding healthy tissues when PBM-hypericin-PDT is used for in vivo tumor treatments.

A Brazilian multicenter pilot case series on the efficacy of photobiomodulation therapy for COVID-19-related taste dysfunction. BACKGROUND AND AIM: Among the most common symptoms of COVID-19 is taste dysfunction, which has a ranging clinical presentation. As well as its pathophysiology remains to be unclear, there is not enough information about the efficacy and safety of the available treatments. This study aims to report a series of cases using PBMT for the management of COVID-19-related taste impairment. CASE SERIES: 8 female and 2 male patients sought medical help for taste impairment (either partially or completely) after COVID-19 infection. Photobiomodulation therapy (PBMT) on the tongue mucosa was then proposed but with 3 different protocols. Taste perception at baseline and before every laser session was evaluated using a visual analog scale. Irrespective of the PBMT protocol, taste recovery was noted in all cases but with varying degrees of improvement. CONCLUSION: given the high prevalence rates of taste dysfunction in COVID-19 patients and the lack of information about the available treatments, PBMT seems to be a promising therapeutic modality but not dependent on the total number of laser sessions and the interval between them. The choice of the most suitable laser protocol as well as the knowledge of the exact photonic mechanisms, however, need to be better studied. COVID-19;Female;Humans;Low-Level Light Therapy;Male;Photochemotherapy;SARS-CoV-2;Taste Disorders

Effect of Low-level Laser on LI4 Acupoint in Pain Reduction during Local Anesthesia in Children. BACKGROUND: Pain is a multidimensional construct that involves sensory, emotional, and cognitive processes. It is an essential component of child behavior guidance. The injection of a local anesthetic agent during pediatric dental treatment is one of the most painful and distressing procedures performed, stimulation of acupoint LI4 provides an analgesic effect in the orofacial region, thus decreasing the pain during injection. AIMS AND OBJECTIVES: To compare and evaluate the effect of low-level laser on LI4 acupoint and surface-acting 20% benzocaine gel during local anesthesia. MATERIALS AND METHODS: Children of age-group between 5 years and 9 years receiving bilateral local anesthesia were scheduled for dental treatment. Split-mouth cross-over study was planned and was divided into two groups, receiving low-level laser acupuncture on LI4 acupoint with placebo as a moist cotton swab in the first visit and 20% benzocaine gel with placebo as low-level laser acupuncture off mode in second visit and vice versa. Pain intensity was evaluated using the sound eye motor scale as subjective scale, Wong-Bakers pain rating scale. Pulse rate was measured before, during, and after the procedure using a pulse oximeter. RESULTS: The average heart rate, Wong-

Bakers pain rating scale, and Sound Eye Motor scale were significantly lower in the group having low-level laser when compared with the group having placebo low-level laser therapy. CONCLUSION: The low-level laser can be used to control pain during local anesthesia in children. HOW TO CITE THIS ARTICLE: Sandhyarani B, Pawar RR, Patil AT, et al. Effect of Low-level Laser on LI4 Acupoint in Pain Reduction during Local Anesthesia in Children. Int J Clin Pediatr Dent 2021;14(4):462-466.

Comparative study of royal jelly, propolis, and photobiomodulation therapies in 5-fluorouracil-related oral mucositis in rats. PURPOSE: This study aimed to evaluate the effects and mechanisms of action of royal jelly (RJ) and propolis compared to photobiomodulation therapy (PBMT) in an animal model of 5-fluorouracil-related oral mucositis (OM). METHODS: Seventy-two male Wistar rats were randomly allocated to four groups (nâ€‰=â€‰18 each): control (no treatment), PBMT (intraoral laser, 6Â J/cm(2)), RJ, and propolis. On days 0 and 2, the animals received an injection of 5-fluorouracil (5-FU). The buccal mucosa was scratched (days 3 and 4) and the treatments were initiated on day 5. Six animals of each group were euthanized on days 8, 10, and 14. Phytochemical analysis (thin-layer chromatography, TLC) and clinical, histopathological, and immunohistochemical analysis of pS6, pAKT, and NF-ÎºB were performed, and oxidative stress markers were also investigated. RESULTS: TLC revealed the presence of large amounts of sucrose (Rf 0.34) in RJ and of flavonoids in propolis. Lower clinical OM scores were observed on day 8, and improved morphological data were observed on day 10 in the PBMT, RJ, and propolis groups (pâ€‰<â€‰0.05). On day 8, immunoexpression of pS6, pAKT, and NF-ÎºB was increased compared to control. On day 14, reduced glutathione (GSH) antioxidant levels were increased in the propolis group compared to control (pâ€‰<â€‰0.05). CONCLUSIONS: Our results showed that RJ and propolis, as well as PBMT, are effective in the treatment of OM. Considering that some patients who develop OM do not have access to PBMT, the present study demonstrated that topical application of RJ and propolis may be an important alternative for the treatment of OM. Fatty Acids;Propolis;royal jelly;Fluorouracil Animals;Fatty Acids;Fluorouracil;Humans;Low-Level Light Therapy;Male;Propolis;Rats;Rats, Wistar;Stomatitis

Photobiomodulation Therapy Mechanisms Beyond Cytochrome c Oxidase. Electron Transport Complex IV Electron Transport Complex IV;Low-Level Light Therapy

The effect of photobiomodulation therapy on the management of chronic idiopathic large-bowel diarrhea in dogs. To evaluate photobiomodulation therapy's effectiveness (PBMT) in managing chronic idiopathic large-bowel diarrhea. Thirty dogs were selected and divided into a control (CG) and treatment group (TG). CG received psyllium husk at the dose of 4 tablespoons/day for 30Â days. TG received PBMT with a Class IV therapeutic laser, divided into three sessions on week 1, two sessions on week 2, and one session on week 3. A daily log of fecal characteristics was maintained, and on days 0, 8, 15, and 30, a canine inflammatory bowel disease index (CIBDAI) and body condition scores (BCS) were obtained. Results were compared using a Mann-Whitney test. Multiple regression was run to predict CIBDAI, Bristol stool scores, and diarrhea from different parameters. The Kaplan-Meier test was used to compare the occurrence rate ofâ€‰â‰¥â€‰1Â day of diarrhea andâ€‰â‰¥â€‰2Â days of diarrhea by 30Â days. Cox regression analysis to investigate interest covariates influences the same outcome. A pâ€‰<â€‰0.05 was set. The sample included 15 Belgian Malinois Shepherd Dogs, 10 German Shepherd Dogs, and 5 Dutch Shepherd Dog, with a mean age of 3.6â€‰Â±â€‰2.3Â years and a bodyweight of 24.6â€‰Â±â€‰8.0Â kg. TG showed an improvement in all scores and clinical signs, increased body weight, and BCS. An increased time of appearance of a second episode of diarrhea was observed in both groups. Activity level contributed to the prediction of defecation frequency and CIBDAI. PBMT significantly improved clinical signs and frequency of diarrhea episodes compared to psyllium husk. Animals;Diarrhea;Dog Diseases;Dogs;Feces;Inflammatory Bowel Diseases;Low-Level Light Therapy

Serum and salivary cytokines in patients with oral lichen planus treated with Photobiomodulation. OBJECTIVES: To evaluate the serum and salivary levels of IL-1Î², IL-6, IL-17A, TNF-Î±, IL-4, and IL-10 in patients with oral lichen planus (OLP) treated with Photobiomodulation (PBM) and clobetasol propionate 0.05%. MATERIAL AND METHODS: Thirty-four OLP patients were randomized into two groups: Control (clobetasol propionate 0.05%) and PBM (660Â nm, 100Â mW, 177Â J/cm(2) , 5Â s, 0.5Â J per point). Serum and saliva were collected at baseline and at the end of treatment (after 30Â days) and evaluated using ELISA. The cytokine results were correlated with pain, clinical subtypes, and clinical scores of OLP. RESULTS: IL-1Î², IL-6, IL-17A, TNF-Î±, and IL-4 levels were higher in saliva in relation to serum. IL-1Î² was the most concentrated cytokine in saliva, and a positive correlation with the severity of OLP was noticed. After treatment with corticosteroid, IL-1Î² in saliva decreased significantly. No modulation of all cytokines was observed after PBM. CONCLUSION: IL-1Î² appears to be an important cytokine involved in OLP pathogenesis. In addition, the mechanisms of action of PBM do not seem to be linked to the modulation of pro or anti-inflammatory cytokines at the end of treatment. It is possible that this events occurred early during treatment. Cytokines;Interleukin-6;Interleukin-17;Tumor Necrosis Factor-alpha;Clobetasol;Interleukin-4 Humans;Cytokines;Interleukin-6;Interleukin-17;Tumor Necrosis Factor-alpha;Clobetasol;Lichen Planus, Oral;Interleukin-4;Saliva

Effect of low-level laser therapy on the membrane induced by the Masquelet technique at an orthotopic site in rabbits. PURPOSE: To evaluate the low-level laser therapy (LLLT) on the membrane induced by the Masquelet technique in rabbits. METHODS: Twelve Norfolk rabbits at approximately 3 months of age were used. A 1-cm segmental defect was induced in both radii, which were filled with polymethylmethacrylate cylinder. LLLT was used postoperatively in the bone defect of one of the forelimbs every 48 hours for 15 days. Six rabbits were euthanatized on third and sixth postoperative weeks. RESULTS: In both forelimbs, radiographs showed new bone growth from radius cut ends on the third postoperative week and more advanced stage on the sixth postoperative week. Ultrasound showed induced membrane one week after the surgery. Histologically, there were no significant differences in the semi-quantitative score of inflammation intensity, total number of blood vessels, bone metaplasia, and collagen. The average thicknesses were 2,050.17 and 1,451.96 Î¼m for control membranes and 2,724.26 and 2,081.03 Î¼m for irradiated membranes, respectively, on third and sixth postoperative weeks. Vascular endothelial growth factor A (VEGF-A) and platelet derived growth factor (PDGF) expression were present in the induced membranes of control and irradiated forelimbs, but there was no significant difference. CONCLUSIONS: Based on assessment methods, it was not possible to demonstrate the effect of LLLT on the induced membrane. Vascular Endothelial Growth Factor A;Collagen Animals;Bone and Bones;Collagen;Low-Level Light Therapy;Rabbits;Vascular Endothelial Growth Factor A

Oral care and photobiomodulation protocol for the prevention of traumatic injuries and lip necrosis in critically ill patients with COVID-19: an observational study. It is well reported that severe cases of COVID-19 frequently need critical care in the ICU to manage respiratory complications, often requiring orotracheal intubation (OTI). Due to complex systemic conditions, the patient may remain intubated for a long period of time and be placed in prone position. This positioning and the pressure of the intubation device on the lips may lead to the development of traumatic injuries. Oral care and the use of photobiomodulation (PBM) can be successfully implemented to promote oral mucosa healing and prevent soft tissue necrosis. We describe the outcomes of the management protocol that was routinely used by the ICU oral medicine team, leading to the implementation of a preventive protocol for the OTI-related oral injuries. We retrospectively analyzed the records of 472 patients with COVID-19 in the ICU from May 2020 to February 2021. 60/472 patients developed traumatic injuries and were managed with the oral care protocol and PBM, to prevent the progress to lip

necrosis. When appropriated, in addition to oral care and PBM, other measures were taken to prevent further local trauma (lip hydration, changes in tube fixation). The proposed oral care protocol associated with PBM successfully prevented the progress of traumatic lesions, ulceration, necrosis, and loss of tissue associated with IOT. The quality of life of patients in the ICU and after their recovery was preserved.

Bioenergetics of photobiomodulated osteoblast mitochondrial cells derived from human pulp stem cells: systematic review. Dental pulp cells are a source of multipotent mesenchymal stem cells with a high proliferation rate and multilineage differentiation potential. This study investigated the photobiomodulated bioenergetic effects of mitochondria in osteoblasts that differentiated from human pulp stem cells. The systematic review followed PRISMA guidelines. The PICO question was formulated. Criteria for inclusion and exclusion were established prior to searches being performed on the PubMed/MEDLINE, Embase, and Scopus. Articles were identified and included if published in English within last 10Â years; photobiomodulation or low-level laser therapy were discussed; the delivery parameters for dose and time were included and the studies focused on bioenergetics of osteoblast mitochondria. Studies excluded were non-human dental pulp tissue and in vivo studies. A total number of 110 articles were collated, 106 were excluded leaving a total of 4 articles. These studies demonstrated that in vitro use of photobiomodulation was performed using different laser and LED types; InGaAlP; InGaN; and InGaAsP with average wavelengths of 630 to 940Â nm. Primary human osteoblastic STRO-1 and mesenchymal stem cell lineages were studied. Three out of four articles confirmed positive bioenergetic effects of photobiomodulation on mitochondria of osteoblasts derived from human pulp cells. This systematic review demonstrated a lack of adequate reporting of bioenergetics of osteoblast mitochondria after photobiomodulation treatment.
Cell Differentiation;Cell Proliferation;Dental Pulp;Energy Metabolism;Humans;Low-Level Light Therapy;Mitochondria;Osteoblasts;Stem Cells

Laser as a promising non-invasive technique to treat oral submucous fibrosis: A systematic review of the literature. BACKGROUND: Oral submucous fibrosis (OSMF) is one of the common oral potentially malignant disorders that can result in severe morbidity. Depending upon the stage of disease, multiple management therapies exist which include medicinal and surgical approaches. Although the surgical approach is preferred in severe conditions, numerous studies have reported its post-surgical deteriorating outcomes including increased fibrotic changes. To reduce these post-surgical complications, Light amplification by stimulated emission of radiation (Laser) has been introduced and studied as a non-invasive technique to treat oral submucous fibrosis. However, there exists a lack of knowledge about 'which laser shows a better post-treatment outcome'. Accordingly, this review aims to answer this question. MATERIALS AND METHODS: A systematic review of the published literature was performed using an electronic search in PubMed/Medline, Science Direct, Web of Science, Embase, J- STAGE, Google Scholar, and Scopus databases, from 1952 till 2019 using keywords like, 'Oral submucous fibrosis', 'Treatment', 'Laser', 'Trismus', ' Fibrosis', 'Surgical', 'Non-invasive', and 'Postoperative results'. RESULTS: The search strategy revealed 20 relevant published studies in which laser had been used to treat 250 patients of OSMF. Effective results were found without any complications in all the cases after follow up. CONCLUSION: Observing the current literature, it can be concluded that laser might be used as a potential non-invasive approach in the management of OSMF, however, large scale studies are required to investigate the efficacy and other effects of this technology.

Pilot study of the effect of therapeutic photobiomodulation on postoperative pain in knee arthroplasty. Nine participants undergoing primary TKA submitted to spinal anesthesia, sedation, ultrasound-guided obturator and Femoral nerve Block analgesia, and photobiomodulation Therapy (FBMT) were evaluated regarding postoperative pain and morphine consumption. FBMT sessions

were performed in the Immediate Postoperative period (IPO) and after 24 hours. Participants received 16.7Â±15 mg of morphine up to the third postoperative day. At IPO, mean pain score was 4.8Â±3.2 and 5.6Â±3.5, at rest and on movement, respectively. Photo biomodulation therapy can be considered an option for mitigating pain for patients undergoing TKA. Analgesics, Opioid;Anesthetics, Local;Morphine Analgesics, Opioid;Anesthetics, Local;Arthroplasty, Replacement, Knee;Femoral Nerve;Humans;Morphine;Nerve Block;Pain, Postoperative;Pilot Projects

Effects of photobiomodulation therapy on regulation of myogenic regulatory factor mRNA expression in vivo: A systematic review. Non-invasive promotion of myogenic regulatory factors (MRFs), through photobiomodulation therapy (PBMT), may be a viable method of facilitating skeletal muscle regeneration post-injury, given the importance of MRF in skeletal muscle regeneration. The aim of this systematic review was to collate current evidence, identifying key themes and changes in expression of MRF in in vivo models. Web of Science, PubMed, Scopus and Cochrane databases were systematically searched and identified 1459 studies, of which 10 met the inclusion criteria. Myogenic determination factor was most consistently regulated in response to PBMT treatment, and the expression of remaining MRFs was heterogenous. All studies exhibited a high risk of bias, primarily due to lack of blinding in PBMT application and MRF analysis. Our review suggests that the current evidence base for MRF expression from PBMT is highly variable. Future research should focus on developing a robust methodology for determining the effect of laser therapy on MRF expression, as well as long-term assessment of skeletal muscle regeneration. Myogenic Regulatory Factors;RNA, Messenger Low-Level Light Therapy;Muscle Development;Myogenic Regulatory Factors;RNA, Messenger

Photobiomodulation therapy prevents dysgeusia chemotherapy induced in breast cancer women treated with doxorubicin plus cyclophosphamide: a triple-blinded, randomized, placebo-controlled clinical trial. PURPOSE: To evaluate the effectiveness of photobiomodulation (PBMT) in preventing dysgeusia in breast cancer patients treated with doxorubicin-cyclophosphamide (AC). METHODS: This is a phase II, randomized, triple-blind, placebo-controlled clinical trial involving 112 breast cancer patients treated with AC. The patients were divided equally into two groups: a test group treated with 2 J red laser and 3 J infrared laser on 21 points that were symmetrically distributed on the tongue on day 0 of four cycles of AC, and an equal placebo group treated with simulated PBMT to blind the patient, evaluator, and statistician. The clinicopathological and sociodemographic data, results of taste test, and subjective taste analysis, and the QoL, ECOG performance status, body mass index, and other side effects were recorded. The data were analyzed using ANOVA-RM/Bonferroni, Friedman/Dunn, and chi-square/Fisher's exact tests. RESULTS: PBMT patients showed less objective and subjective taste loss ($p<0.05$). On the other hand, the placebo group showed a higher ECOG status ($p=0.037$) and more significant weight loss ($p<0.001$) after four cycles of AC. The QoL was significantly higher in the PBMT group ($p<0.05$) at all assessment periods, and PBMT treatment also reduced the incidence of cachexia ($p=0.020$), anorexia ($p<0.001$), diarrhea ($p=0.040$), oral mucositis ($p=0.020$), and vomiting ($p=0.008$). CONCLUSION: PBMT reduced the taste loss and improved the overall health status and QoL of patients with breast cancer treated with AC. TRIAL REGISTRATION: Brazilian Clinical Trials Registry (www.ensaiosclinicos.gov.br) approval number RBR-9qnm34y, registered on 01/05/2021. Antineoplastic Agents;Doxorubicin;Cyclophosphamide Antineoplastic Agents;Breast Neoplasms;Cyclophosphamide;Doxorubicin;Dysgeusia;Female;Humans;Low-Level Light Therapy;Quality of Life

Effectiveness of Photobiomodulation on Orthodontic Mini Screw Stability: A Systematic Review. Objective: Photobiomodulation therapy (PBMT) enhances bone regeneration and bone healing and has been suggested to improve the stability of orthodontic mini screws. This study aimed to

systematically review the clinical influence of PBMT on orthodontic mini screw stability. Methods: A comprehensive search was run in the following electronic databases: PubMed, EMBASE, Web of Science, Scopus, and Cochrane. The clinical trials reporting the effects of PBMT on mini screw stability in human subjects were included. Two reviewers independently screened and extracted data. The Cochrane Risk of Bias Assessment Tool was used to investigate the quality of the included studies. The overall quality of evidence was evaluated through the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach. The primary outcome was the stability of mini screws, and the secondary outcomes were pain, inflammation [the interleukin (IL)-1ÃŸ, IL6, and IL8], and overall success rate. Quantitative synthesis could not be performed due to heterogeneities among studies. Results: Seven articles were finally included in the present review. Moderate-quality evidence suggests that if the PBMT continues until the third or fourth week, the stability of min screws would be promoted from the third to the eighth week after insertion. Although the evidence for secondary outcomes was limited, PBMT could positively affect the inflammation. Conclusions: PBMT exerted varying effects on the stability of mini screws at different time intervals. However, despite the limitations of studies, it seems to enhance the secondary stability of orthodontic mini screws primarily. Registration: The study protocol was registered on PROSPERO (https://www.crd.york.ac.uk/PROSPERO/) with the ID#CRD42020194058. Bone Regeneration;Bone Screws;Humans;Inflammation;Low-Level Light Therapy;Pain

Impact of photobiomodulation therapy on the morphological aspects of submandibular gland submitted to excretory duct ligation and hypothyroidism: an animal study. The aim of this study was to evaluate the impact of photobiomodulation therapy (PBMT) on histomorphological aspects of submandibular gland (SMG) submitted to salivary gland duct obstruction in hypothyroid rats. Fifty-six male Wistar rats (250 to 300Â g) were divided into 4 groups (nâ€‰=â€‰14): euthyroid (EU), EUâ€‰+â€‰PBMT, hypothyroid (HYPO), and HYPOâ€‰+â€‰PBMT. Duct obstruction of the left submandibular gland (LSMG) was performed in all animals by a ligature procedure. For the induction of hypothyroidism, total thyroidectomy was performed. PBMT groups received irradiation with AlGaInP diode laser (808Â nm, 0.04Â W, 0.04cm(2) spot size, 60Â s, 2.4Â J per point, 60Â J/cm(2), 1Â W/cm(2)). Irradiation was performed immediately, 24Â h, and 48Â h after the obstruction of the salivary gland duct, in one point, extra oral and perpendicular to the gland. Animals were sacrificed after 24Â h and 72Â h after duct ligature. Our results indicated that salivary duct obstruction and hypothyroidism caused negative modifications on the salivary glands' histomorphology, especially acinar atrophy, after 24Â h and 72Â h. HYPOâ€‰+â€‰PBMT showed a significant reduction of the inflammatory infiltrate, congested blood vessels, and acinar atrophy in the SMG submandibular salivary gland in 72Â h compared to 24Â h (pâ€‰<â€‰0.05). In conclusion, obstruction of the salivary gland excretory duct and hypothyroidism causes severe sialoadenitis with expressive atrophy of the glandular parenchyma. However, PBMT was able to modulate the inflammatory process and delaying acinar atrophy. This study provided insights to better understand the role of the PBMT on the altered salivary gland by duct ligation and associate hypothyroidism. Animals;Hypothyroidism;Ligation;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Salivary Ducts;Submandibular Gland

Photobiomodulation Promotes Repair Following Spinal Cord Injury by Regulating the Transformation of A1/A2 Reactive Astrocytes. After spinal cord injury (SCI), reactive astrocytes can be classified into two distinctive phenotypes according to their different functions: neurotoxic (A1) astrocytes and neuroprotective (A2) astrocytes. Our previous studies proved that photobiomodulation (PBM) can promote motor function recovery and improve tissue repair after SCI, but little is known about the underlying mechanism. Therefore, we aimed to investigate whether PBM contributes to repair after SCI by regulating the activation of astrocytes. Male rats subjected to clip-compression SCI were

treated with PBM for two consecutive weeks, and the results showed that recovery of motor function was improved, the lesion cavity size was reduced, and the number of neurons retained was increased. We determined the time course of A1/A2 astrocyte activation after SCI by RNA sequencing (RNA-Seq) and verified that PBM inhibited A1 astrocyte activation and promoted A2 astrocyte activation at 7 days postinjury (dpi) and 14 dpi. Subsequently, potential signaling pathways related to A1/A2 astrocyte activation were identified by GO function analysis and KEGG pathway analysis and then studied in animal experiments and preliminarily analyzed in cultured astrocytes. Next, we observed that the expression of basic fibroblast growth factor (bFGF) and transforming growth factor-Î² (TGF-Î²) was upregulated by PBM and that both factors contributed to the transformation of A1/A2 astrocytes in a dose-dependent manner. Finally, we found that PBM reduced the neurotoxicity of A1 astrocytes to dorsal root ganglion (DRG) neurons. In conclusion, PBM can promote better recovery after SCI, which may be related to the transformation of A1/A2 reactive astrocytes.

Effects of low-level laser therapy on reducing pain, edema, and trismus after orthognathic surgery: a systematic review. The purpose of this study was to systematically review the scientific evidence of the effect of low-level laser therapy (LLLT) on the perception of pain, edema, and trismus after orthognathic surgery. The literature was searched in 11 databases (MedLine via PubMed, Scopus, LILACS, SciELO, Embase, Web of Science, Cochrane Library, and LIVIVO, OpenGrey, OADT, and OpenThesis), without restriction of publication year or language. This search aimed to identify randomized clinical trials comparing low-level laser therapy and placebo for controlling pain, edema, and trismus after orthognathic surgeries. Two reviewers extracted the data and assessed the individual risk of bias of the eligible studies using the Cochrane Collaboration Risk of Bias Tool (RoB, version 2.0). The initial search resulted in 808 articles, from which only five (total of 190 participants) were included in the qualitative synthesis. The studies were published from 2014 to 2020. Two presented a low risk of biasâ€‰+â€‰in the mean mouth opening of all patients subjected to bimaxillary surgery who received LLLT. However, the other study found a significant difference in maximum mouth opening in the LLLT group at 14, 30, and 60Â days after surgery. Based on limited evidence, LLLT was presented as an auxiliary tool for reducing pain and trismus after surgery. However, the reduction of edema is controversial due to the absence of measuring standardization. Edema;Humans;Low-Level Light Therapy;Orthognathic Surgery;Pain;Trismus

Photobiomodulation therapy upregulates the growth kinetics and multilineage differentiation potential of human dental pulp stem cells-an in vitro Study. This study aims to evaluate the impact of red LED irradiation on the viability, proliferation, colonogenic potential, markers expression along with osteogenic and chondrogenic differentiation of dental pulp stem cells. DPSCs were isolated from sound human permanent teeth using enzymatic digestion method and seeded with regular culture media. Cells at P4 were irradiated using red LED Light (627Â nm, 2Â J/cm(2)) and examined for growth kinetics, and multilineage differentiation using the appropriate differentiation media. The irradiated groups showed an increase in cellular growth rates, cell viability, clonogenic potential, and decrease in population doubling time compared to the control group. Cells of the irradiated groups showed enhanced differentiation towards osteogenic and chondrogenic lineages as revealed by histochemical staining using alizarin red and alcian blue stains. Photobiomodulation is an emerging promising element of tissue engineering triad besides stem cells, scaffolds, and growth factors. Cell Differentiation;Cell Proliferation;Cells, Cultured;Dental Pulp;Humans;Kinetics;Low-Level Light Therapy;Osteogenesis;Stem Cells

Efficacy of ILIB on periodontal clinical parameters and glycemic control in patients with periodontitis and type II diabetes-randomized clinical trial. Our study aimed to study the efficacy of ILIB on periodontal parameters and glycemic control in patients with periodontitis and type II diabetes. Twenty-one patients in a randomized clinical trial were divided into 2 groups: control group (CG),

conventional periodontal therapy, and test group (TG), conventional periodontal treatment associated with 10 laser applications by the ILIB-Modified (ILIB-M) technique. Fasting blood glucose levels and glycated hemoglobin (HbA1c), visible plaque index (VPI), gingival bleeding index (GBI), and periodontal clinical parameters were evaluated at baseline and after 4Â months (T(4)). Regarding periodontal parameters, the intragroup analysis showed a statistically significant reduction (pâ€‰<â€‰0.05) between baseline and T(4), for the VPI, GBI, BOP, PD, and CAL indexes. However, in the intergroup analysis, no statistically significant improvements (pâ€‰>â€‰0.05) were observed between the TG and CG for the VPI, GBI, BOP, PD, and CAL indexes. Regarding HbA1C and fasting blood glucose values, no statistically significant improvements were observed in intergroup and intragroup analyses (pâ€‰>â€‰0.05). The Modified ILIB did not improve the periodontal clinical parameters and glycemic control in patients with type II diabetes. Glycated Hemoglobin A Chronic Periodontitis;Dental Scaling;Diabetes Mellitus, Type 2;Glycated Hemoglobin;Glycemic Control;Humans;Root Planing

Clinical evaluation of single and repeated sessions of photobiomodulation with two different therapeutic wavelengths for reducing postoperative sequelae after impacted mandibular third molar surgery: a randomized, double-blind clinical study. OBJECTIVE: The effects of the number of photobiomodulation (PBM) sessions on the postoperative inflammatory process remain controversial. The current literature comparing single and repeated PBM sessions is limited. This study aimed to compare the effects of single and repeated PBM sessions, applied at two different therapeutic wavelengths within the infrared spectrum, on postoperative inflammatory response after impacted third molar tooth extraction. METHODOLOGY: This randomized, double-blind clinical study included 40 patients with bilateral impacted mandibular third molars (80 teeth). The patients were divided into two groups each including 20 subjects (40 teeth) to receive either single-session laser at 810 nm (20 teeth) and 940 nm (20 teeth) immediately after the surgery or repeated laser sessions at 810 nm (20 teeth) and 940 nm (20 teeth) (immediately after the surgery and on postoperative Day 1). Lasers at 940 nm (power density 0.5 Watt/cm2, energy density 4 J/cm2 for a time until the cumulative energy on the device screen reaches 50 J from 0 J, in continuous mode, spot size 2.8 cm2) and at 810 nm (power density 0.14 Watt/cm2, energy density 4 J/cm2, for 30 seconds, in continuous mode, spot size 2.1 cm2) were applied intra- and extra-orally. Pain, swelling, and trismus were evaluated postoperatively. RESULTS: No significant differences were determined between the groups on the evaluated parameters (p>0.05). CONCLUSION: Within the study limitations, in PBM, the effects of 810 nm and 940 nm and those of single and repeated applications were similar regarding pain, swelling and trismus. Immediate postoperative PBM could be preferred to repeated applications performed by point application within a 24-hour period. Double-Blind Method;Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Trismus

The effectiveness and safety of low-level laser therapy on breast cancer-related lymphedema: An overview and update of systematic reviews. The objective of our overview of systematic reviews was to critically analyze the evidence from existing systematic reviews investigating the effectiveness and safety of low-level laser therapy (LLLT) in patients with breast cancer-related lymphedema (BCRL). In addition, an updated and comprehensive systematic review was conducted, which aimed to provide updated evidence about this topic. PubMed, EMBASE, and Cochrane Library databases were systematically searched for systematic reviews and randomized controlled trials (RCTs) investigating the effectiveness and safety of LLLT in patients with BCRL. The methodological quality for each of included systematic reviews or RCTs was assessed using the Assessing the Methodological Quality of Systematic Reviews 2 (AMSTAR 2) tool or Cochrane risk of bias tool, respectively. The updated systematic review separately compared the effectiveness of LLLT to each of active or

negative interventions. Data were pooled with random-effects models for each outcome per comparison. The evidence quality of outcomes was assessed using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) or GRADE-Confidence in the Evidence from Reviews of Qualitative research (GRADE-CERQual) for quantitative studies and qualitative studies, respectively. Seven systematic reviews and ten RCTs met the eligibility criteria. Conflicting results regarding the effectiveness of LLLT were presented by the overview of systematic reviews. The AMSTAR 2 showed that the methodological quality of included systematic reviews was low or critically low quality due to one or more critical weaknesses. The GRADE and GRADE-CERQual showed that the evidence quality was low to very low for most outcomes. The updated systematic review showed that LLLT may offer additional benefits as compared to compression therapies (pneumatic compression or compression bandage), placebo laser, or no treatment for patients with BCRL. However, when compared to other types of active interventions, LLLT did not improve outcomes significantly. None of the treatment-related adverse event was reported. Many trials had a high or unclear risk of bias for two or more items, and our updated systematic review showed low quality of evidence per outcome using GRADE approach. Due to insufficient data and poor quality of evidence, there is uncertain to reach these conclusions that LLLT is superior to another active or negative intervention and is safe. More RCTs of high methodological quality, with large sample sizes and long-term follow-up, are needed to inform clinical guidelines and routine practice. Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Lymphedema;Systematic Reviews as Topic

Comparison of laser therapy and ozonated water on gingival inflammation in orthodontic patients with fixed appliances. BACKGROUND: There is an increased prevalence of oral ailments such as dental caries, gingivitis, and periodontitis when orthodontic therapy is administered. Poor oral hygiene in conjunction with the placement of fixed orthodontic appliances is considered a significant factor in raising accumulation of bacterial plaque and its associated inflammatory response. AIM: The present study aimed to evaluate and compare laser therapy with subgingival irrigation using ozonated water on gingivitis in patients undergoing fixed orthodontic treatment and to ascertain the presence of the inflammatory marker monocyte chemoattractant protein (MCP-1) in gingival crevicular fluid (GCF). METHODS: This study was a double-blind clinical study in which a split-mouth design was applied in 30 subjects for 28 days that received fixed orthodontic therapy. In each subject, the upper right quadrant (control side) was irrigated with 0.01 mg/L ozonated water and the upper left quadrant (experimental side) was irradiated with a diode laser on day 0 (baseline) and day 7. The patients were recalled on days 7, 14, and 28 and clinical parameters were recorded at each visit. Biochemical evaluation of gingival inflammation with MCP-1 levels in GCF was obtained at the baseline (day 0) and on day 28. RESULTS: A statistically significant ($p < 0.05$) reduction of all clinical parameters and MCP-1 activity in GCF was observed on both sides. Low-level laser irradiation showed a significant reduction of clinical parameters and MCP-1 activity compared to subgingival ozone irrigation. CONCLUSIONS: Laser therapy can be considered a more effective method than subgingival ozone irrigation in patients undergoing fixed orthodontic treatment as it showed a consistent improvement in gingival inflammation. RELEVANCE FOR PATIENTS: Fixed orthodontic appliances make oral hygiene maintenance difficult and results in gingivitis. Adjunctive oral hygiene procedures such as subgingival irrigation with ozonated water or laser irradiation are beneficial. The data from this study suggest that irrigation with ozonated water or laser irradiation reduces gingival inflammation, with laser therapy being more effective.

Conservative treatment of lymphedema: the state of the art. This article aims to discuss the possibilities of conservative and non-pharmacological treatments for lymphedema. A non-systematic review of the literature was carried out, including studies involving human subjects with different types of lymphedema. Several approaches to lymphedema treatment have been reported and

Complex Decongestive Therapy (CDT) has been considered the most effective treatment for limb lymphedema. Other conservative treatments have been proposed such as Taping, Extracorporeal Shock Wave Therapy, Acupuncture, Photobiomodulation Therapy, Endermologie, Intermittent Pneumatic Compression, and Low-frequency, Low-intensity Electrotherapy. The choice of the therapeutic approach to be employed should consider lymphedema characteristics, the therapist's experience, and the patient's wishes. In addition, since this is a chronic condition, the patient must adhere to the treatment. To this end, the therapeutic proposal may be the key to better control of limb volume.

Physiotherapy in the management of gynecological cancer patient: A systematic review. AIM: to evaluate the effectiveness of physiotherapy as an adjunct treatment in patients with gynecological cancer. METHOD: systematic review carried out in the PubMed, MEDLINE, via VHL, Cochrane and SciELO, in the last ten years. A search strategy was based on the PICO method and the PRISMA flowchart using Boolean descriptors and operators: "gynecological cancer or neoplasms of female genital organs" and "physiotherapy or physiotherapy modalities" and "rehabilitation or quality of life" in languages Portuguese, English, and Spanish. RESULTS: 405 articles were found, and after eligibility criteria, only 5 studies were selected for review. Evidence of a monitored physical exercise, photobiomodulation and pelvic floor rehabilitation program as physiotherapeutic resources in the management of gynecological cancer. CONCLUSION: Physiotherapy dominates techniques and appears to be beneficial for the main complications arising from the treatment or post-treatment of gynecological cancer and has sought to accompany the knowledge and care of the patient, through scientific research. Female;Humans;Neoplasms;Pelvic Floor;Physical Therapy Modalities;Quality of Life

Using a single dose of photobiomodulation (laserÂ + LED) to improve performance of lower limbs in functional test: Randomized clinical trial. BACKGROUND: Photobiomodulation (PBM) improves motor performance despite doubts whether it occurs immediately or late after a single dose. We evaluated the effect of a cluster PMB (laserÂ +Â LED) single dose on muscle fatigue recovery in young sedentary adults, both immediately and in the short term (period between 24 and 48Â h) after the fatiguing event. METHODS: Randomized clinical trial with 60 volunteers randomized in 5 groups (nÂ =Â 12 in each): control/(CG); placebo/(SG); PBM in knee extensor/(KE_G); plantar-flexor/(PF_G); knee extensorÂ +Â plantar-flexor/(KEÂ +Â FP_G). Before the intervention (pre) a fatiguing event (FE) was applied, which consisted in going up and down one step until exhaustion. Repetition number (RN) and time to exhaustion (TTE) were recorded. Then each group received its respective intervention and immediately after that, the FE was performed again (immediate post). In the period between 24 and 48Â h after irradiation, a new FE was performed (late post). In addition to the comparative statistics, complementary metrics (if the mean difference [Diff] between the comparison pairs was higher or lower than minimum detectable change [MDC] and effect size [ES]) were calculated. RESULTS: Through the integrated analysis of inferential statistics and complementary metrics, it was observed that although there was no time of evaluation effect, there was a group effect. PBM improved performance in KEÂ +Â FP_G (p-value<0.05; Diff>MDC; ESÂ =Â moderate) and PF_G (p-value>0.05; but DiffÂ >Â MDC; ESÂ =Â moderate) regarding CG for both RN and TTE. CONCLUSION: A PBM single dose irradiation may improve motor performance and there is specificity of the irradiated muscle group, although it does not depend on the moment. Adult;Humans;Lasers;Low-Level Light Therapy;Lower Extremity;Muscle Fatigue;Muscle, Skeletal

Effects of 445 nm, 520 nm, and 638 nm Laser Irradiation on the Dermal Cells. Background: The invention of non-ionizing emission devices revolutionized science, medicine, industry, and the military. Currently, different laser systems are commonly used, generating the potential threat of excessive radiation exposure, which can lead to adverse health effects. Skin is the organ most

exposed to laser irradiation; therefore, this study aims to evaluate the effects of 445 nm, 520 nm, and 638 nm non-ionizing irradiation on keratinocytes and fibroblasts. Methods: Keratinocytes and fibroblasts were exposed to a different fluency of 445 nm, 520 nm, and 638 nm laser irradiation. In addition, viability, type of cell death, cell cycle distribution, and proliferation rates were investigated. Results: The 445 nm irradiation was cytotoxic to BJ-5ta (â‰¥58.7 J/cm(2)) but not to Ker-CT cells. Exposure influenced the cell cycle distribution of Ker-CT (â‰¥61.2 J/cm(2)) and BJ-5ta (â‰¥27.6 J/cm(2)) cells, as well as the Bj-5ta proliferation rate (â‰¥50.5 J/cm(2)). The 520 nm irradiation was cytotoxic to BJ-5ta (â‰¥468.4 J/cm(2)) and Ker-CT (â‰¥385.7 J/cm(2)) cells. Cell cycle distribution (â‰¥27.6 J/cm(2)) of Ker-CT cells was also affected. The 638 nm irradiation was cytotoxic to BJ-5ta and Ker-CT cells (â‰¥151.5 J/cm(2)). The proliferation rate and cell cycle distribution of BJ-5ta (â‰¥192.9 J/cm(2)) and Ker-CT (13.8 and 41.3 J/cm(2)) cells were also affected. Conclusions: At high fluences, 455 nm, 520 nm, and 638 nm irradiation, representing blue, green, and red light spectra, are hazardous to keratinocytes and fibroblasts. However, laser irradiation may benefit the cells at low fluences by modulating the cell cycle and proliferation rate. Cell Cycle;Cell Death;Cell Proliferation;Cell Survival;Cells, Cultured;Fibroblasts;Humans;Lasers;Light;Low-Level Light Therapy;Skin

Association of photobiomodulation therapy and therapeutic exercises in relation to pain intensity and neck disability in individuals with chronic neck pain: a systematic review of randomized trials. Exercise is often pointed out as an effective form of treatment in the clinical management of chronic neck pain (CNP). However, due to its complex range of causal factors and great diversity of signs and symptoms, other resources such as photobiomodulation therapy (PBMT) have been routinely used for the treatment of CNP. The aim of this study was to systematically review the literature on the use of the association of PBMT and therapeutic exercises in relation to pain intensity and neck disability in individuals with CNP. PubMed, Medline (via Ovid), Embase (via Ovid), Cinahl (via Ebsco), and Central (via Cochrane library) databases were searched using the following terms: "laser," "low-level laser," "photobiomodulation," "light emitting diodes," "phototherapy," "exercise," "chronic neck pain." After verification and implementation of eligibility criteria, seven manuscripts were considered eligible for data analysis. These manuscripts had methodological quality between 5 and 8 points on the PEDro scale. Most studies used low infrared laser therapy to perform PBMT, with a wide range of parameters and energy density between 2 and 7Â J/cm(2) and a total treatment time between 2 and 6Â weeks. Four studies showed significant benefits in terms of pain intensity at short-term follow-up and one at intermediate-term follow-up. However, only one showed a minimal clinically important change. No studies have shown significant improvement in disability. This review demonstrates that the association of PBMT with therapeutic exercises in general promotes significant benefits only for the intensity of pain. However, it does not seem to promote a minimally effective clinical difference in individuals with CNP. Chronic Pain;Humans;Low-Level Light Therapy;Neck Pain;Pain Measurement;Randomized Controlled Trials as Topic

LED photobiomodulation therapy combined with biomaterial as a scaffold promotes better bone quality in the dental alveolus in an experimental extraction model. A bone scaffold added to the dental alveolus immediately after an extraction avoids bone atrophy and deformity at the tooth loss site, enabling rehabilitation with implants. Photobiomodulation accelerates bone healing by stimulating blood flow, activating osteoblasts, diminishing osteoclastic activity, and improving the integration of the biomaterial with the bone tissue. The aim of the present study was to evaluate the effect of photobiomodulation with LED at a wavelength of 850Â nm on bone quality in Wistar rats submitted to molar extraction with and without a bone graft using hydroxyapatite biomaterial (StraumannÂ® CeraboneÂ®). Forty-eight rats were distributed among five groups (nâ€‰=â€‰12): basal (no interventions); control (extraction) (basal and control were the same animal, but at

different sides); LED (extractionâ€‰+â€‰LED Î»â€‰=â€‰850Â nm); biomaterial (extractionâ€‰+â€‰biomaterial), and biomaterialâ€‰+â€‰LED (extractionâ€‰+â€‰biomaterialâ€‰+â€‰LED Î»â€‰=â€‰850Â nm). Euthanasia occurred at 15 and 30Â days after the induction of the extraction. The ALP analysis revealed an improvement in bone formation in the control and biomaterialâ€‰+â€‰LED groups at 15Â days (pâ€‰=â€‰0.0086 and pâ€‰=â€‰0.0379, Bonferroni). Moreover, the LED group had better bone formation compared to the other groups at 30Â days (pâ€‰=â€‰0.0007, Bonferroni). In the analysis of AcP, all groups had less resorption compared to the basal group. Bone volume increased in the biomaterial, biomaterialâ€‰+â€‰LED, and basal groups in comparison to the control group at 15Â days (pâ€‰<â€‰0.05, t-test). At 30Â days, the basal group had greater volume compared to the control and LED groups (pâ€‰<â€‰0.05, t-test). LED combined with the biomaterial improved bone formation in the histological analysis and diminished bone degeneration (demonstrated by the reduction in AcP), promoting an increase in bone density and volume. LED may be an important therapy to combine with biomaterials to promote bone formation, along with the other known benefits of this therapy, such as the control of pain and the inflammatory process. Biocompatible Materials;Durapatite Animals;Biocompatible Materials;Durapatite;Low-Level Light Therapy;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket

2021 August Summary of Photobiomodulation Literature.

An Efficacy of Photobiomodulation of 850â€‰nm on Pain Reduction in a Human Oral Capsaicin Pain Model. Objective: The aim of this clinical trial was to evaluate the efficacy of photobiomodulation (PBM) to reduce oral pain initiated by capsaicin. Background: PBM has been used for pain reduction in oral regions; however, its clinical efficacy to alleviate burning sensations is still unknown. Methods: This clinical study was divided into two phases. There were 10 subjects in each phase. In Phase I, the burning sensation was stimulated using 0.05% in 95% ethanol capsaicin (prepared by the Faculty of Pharmaceutical Sciences, Khon Kaen University, Thailand) on filter paper and recorded with a 10-cm horizontal visual analog scale (VAS) every 1â€‰min until the subject experienced no more pain. The area under the curve (AUC) of the graph between VAS and time was calculated. The washout period was 24â€‰h. In Phase II, a crossover clinical trial was conducted in subjects who received the pain model as stated. Four interventions were included: (1) PBM before & after pain stimulation, (2) PBM before pain stimulation, (3) PBM after pain stimulation, and (4) Placebo. For PBM intervention, a single exposure of 850â€‰nm Laser (AsGaAl; TOP 250 Soft Laser, Berkmed Medikal, distributed by Medical Innovation-MI, Istanbul, Turkey) with 0.10â€‰cm(2) spot size laser probe continuous wave at 1 W/cm(2) and 30â€‰J/cm(2) for 30â€‰sec was used. Results: In Phase I, there was no statistically significant difference (pâ€‰=â€‰0.09) between the average AUC of day 1 [55.63 (23.38)] and day 2 [48.99 (27.20)]. In phase II, there was no statistical difference (pâ€‰=â€‰0.20) of the average AUC among the interventions and the placebo; group 1 [56.24 (30.11)], group 2 [45.46 (45.46)], group 3 [64.15 (32.89)], and group 4 [58.59 (30.16)]. Conclusions: The human capsaicin model was suitable for a crossover design clinical trial. The PBM used in this study did not reduce oral burning sensations from capsaicin. Capsaicin Capsaicin;Humans;Low-Level Light Therapy;Pain;Pain Measurement;Thailand

Treating melasma with the 1064Â nm Nd:YAG laser with a 650-microsecond pulse duration: A clinical evaluation. BACKGROUND: The effective treatment of melasma remains a challenge that necessitates a multifaceted approach that includes strict sun protection, bleaching creams, chemical peels, and laser therapy. The 1064Â nm Nd:YAG laser with a 650-microsecond pulse duration provides a safe option for all skin types. METHODS: We treated 10 patients with the 1064Â nm Nd:YAG laser with a 650-microsecond pulse duration. Treatments were performed every 2-4Â weeks. RESULTS: Using a conservative treatment protocol, lightening of melasma occurred as early as

3Â weeks post-treatment, with all subjects requiring several treatment sessions to achieve adequate resolution of their melasma. The majority of subjects experienced up to 25% improvement after two treatments, and an even more noticeable improvement after the 3rd treatment session. None reported any associated pain or discomfort. CONCLUSIONS: Advantages of this laser modality include essentially no pain or downtime, lower risk of rebound, and the ability to safely treat all skin types with melasma. Therefore, the 1064Â nm Nd:YAG laser with a 650-microsecond pulse duration serves as a treatment option for melasma. Chemexfoliation;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanosis

Comparative Evaluation of Sclerostin Levels in Gingival Crevicular Fluid in the Treatment of Chronic Periodontitis Patients Using Diode Laser as an Adjunct to Scaling and Root Planing: A Clinico-biochemical Study. AIMS: Sclerostin is an inhibitor of bone formation, and laser irradiation enhances osteoblast proliferation. The objective of this study was to assess and compare the gingival crevicular fluid (GCF) sclerostin level and clinical parameters of chronic periodontitis patients following the application of diode laser (810 nm) as an adjunct to scaling and root planing (SRP). SUBJECTS AND METHODS: Fifteen systemically healthy chronic periodontitis patients (age 35-55 years) with probing pocket depth â‰¥5mm were included in this split-mouth study. SRP and pocket irradiation with diode laser were done in the test group and SRP alone in the control group at baseline. Low-level laser therapy application and saline irrigation were done in both the groups, respectively, in the 2(nd) and 3(rd) visits. Two microliters of GCF samples was collected from both the groups at baseline before treatment and on the 90(th) day for the assessment of sclerostin concentration. RESULTS: This study showed a statistically significant reduction of clinical parameters in the test and control groups at the end of 3 months. Both the groups showed a statistically significant reduction of sclerostin levels in GCF after 3 months, in which the test group (125.80 Â± 28.21 to 82.80 Â± 9.31) showed a highly significant reduction (P = 0.000). CONCLUSIONS: The adjunctive use of laser had shown a beneficial effect in terms of clinical parameters and osteoblast proliferation by the reduction in the levels of sclerostin in GCF. From the observations of this study, it can be concluded that the therapeutic effectiveness of diode laser as an adjunct to SRP is having a beneficial effect and sclerostin can be used as a potent biomarker.

Effects of laser therapy on chronic low back pain: A systematic review and meta-analysis of randomized controlled trials. Chronic Pain;Humans;Laser Therapy;Low Back Pain;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Androgenetic alopecia in transgender and gender diverse populations: A review of therapeutics. Androgenetic alopecia (AGA) management is a significant clinical and therapeutic challenge for transgender and gender-diverse (TGD) patients. Although gender-affirming hormone therapies affect hair growth, there is little research about AGA in TGD populations. After reviewing the literature on approved treatments, off-label medication usages, and procedures for treating AGA, we present treatment options for AGA in TGD patients. The first-line treatments for any TGD patient include topical minoxidil 5% applied to the scalp once or twice daily, finasteride 1Â mg oral daily, and/or low-level laser light therapy. Spironolactone 200Â mg daily is also first-line for transfeminine patients. Second-line options include daily oral minoxidil dosed at 1.25 or 2.5Â mg for transfeminine and transmasculine patients, respectively. Topical finasteride 0.25% monotherapy or in combination with minoxidil 2% solution are second-line options for transmasculine and transfeminine patients, respectively. Other second-line treatments for any TGD patient include oral dutasteride 0.5Â mg daily, platelet-rich plasma, or hair restoration procedures. After 6-12Â months of treatment, AGA severity and treatment progress should be assessed via scales not based on sex; eg, the Basic and Specific Classification or the Bouhanna scales. Dermatologists should coordinate care with the patient's primary gender-affirming clinician(s) so that shared knowledge of all medications exists

across the care team. Minoxidil;Finasteride;Dutasteride
Humans;Minoxidil;Finasteride;Transgender Persons;Alopecia;Dutasteride;Treatment Outcome

Laser in wounds: knowledge translation to an effective and innovative nursing practice.
OBJECTIVE: To describe the knowledge translation obtained through research of low-level laser therapy to wound treatment in the clinical practice. METHODS: Experience report about implementation strategies of this new technology in a university hospital, being an extension course the main one, developed between May and December 2019. RESULTS: The course was carried out by researchers in partnership with clinical nurses to 13 nurses from different areas with previous experience in wound care. Were taught 30 theoretical-practical class hours, part of them supervised in a real clinical setting, besides case studies. From that, an exclusive nursing consultation schedule of laser therapy was created at the outpatient and its use was also improved to patients admitted in several units of the hospital. FINAL CONSIDERATIONS: The knowledge translation developed about laser therapy allowed its implementation as a technology in wound treatment, qualifying the professional practice and benefiting the treatment of patients with wounds.
Humans;Lasers;Nurses;Translational Research, Biomedical

An Atypical Presentation of Sinonasal Tract Alveolar Rhabdomyosarcoma in a Young Male Patient Submitted to Multimodality Treatment. Rhabdomyosarcoma (RMS), a malignant tumor derived from the neoplastic proliferation of striated skeletal muscle cells, is the most common pediatric soft tissue sarcoma. Its treatment is mainly based on neoadjuvant chemotherapy (QT+), surgical resection, and adjuvant radiotherapy (RT+). RT+ has shown satisfactory results for locoregional control of the disease, in spite of promoting local side effects. The present case report was aimed at describing the clinical and therapeutic characteristics and the management of complications resulting from multimodal therapy in a patient with an atypical presentation of RMS in the sinonasal tract. A 20-year-old Afro-descendant man complained of an expansive tumor lesion, with left eye proptosis that reduced visual acuity and caused severe regional pain. Imaging analysis showed an extensive and infiltrative lesion in the periorbital region, sinonasal tract, left maxilla, and orbital roof. According to the histopathological analysis, the diagnosis was established corresponding to parameningeal alveolar RMS that was unresectable. Treatment was initiated with three cycles of QT+ which showed partial response and later RT+. After completing half of the RT+ sessions, the patient showed a complete response with reduction in tumor volume and improvement in pain and local conditions. Side effects such as alopecia and dermatological changes induced by radiation were observed. Moreover, painful erythematous areas were observed in the region of the hard and soft palate, uvula, and oropharynx, compatible with Grade 2 mucositis lesions. After the cytological swab test, some of them were diagnosed as herpes simplex lesions; thickening and decrease in salivary flow were also found. A local drug therapy approach was instituted, and photobiomodulation was performed to manage oral complications. RT+ was shown to be effective in locoregional control of the disease; however, the early management of its undesirable effects on the surrounding tissues was required.

Low-level light pre-conditioning promotes C2C12 myoblast differentiation under hypoxic conditions. Exercise, especially anaerobic one, can gradually increase muscle mass over time as a result of adaptive responses of muscle cells to ensure metabolic homeostasis in the tissue. Low-level light therapy (LLLT) or photobiomodulation exhibits beneficial effects on promoting muscular functions, regeneration, and recovery from exhausting exercise, although the underlying cellular mechanisms remain poorly understood. We found that hypoxia, a condition following anaerobic exercise, significantly impeded myotube differentiation from myoblasts. However, this adverse effect was blunted greatly by pre-exposure of myoblast cells to a 980â€‰nm laser at 0.1Â J/cm(2) , resulting in almost nearly normal myotube differentiation. LLL pre-treatment enhanced myotube formation by 80%, with a tubular diameter of 4.28â€‰Â±â€‰0.11â€‰Î¼m on average, representative of a 53.4%

increase over sham light treatment. The normalized myoblast differentiation concurred with 68% more mitochondrial mass and myogenin expression over controls. Moreover, LLL pre-treatment appeared to enhance glucose uptake, prevent energy metabolic switch from oxidative phosphorylation to glycolysis, and diminish lactate production under hypoxic conditions. The observation provides valuable guidance with respect to the timing of LLLT and its potential effects on muscle strengths in concert with anaerobic exercise. Cell Differentiation;Humans;Hypoxia;Low-Level Light Therapy;Muscle Fibers, Skeletal;Myoblasts

Erythema Ab Igne successfully treated with a 755-nm alexandrite picosecond laser. alexandrite;Beryllium Beryllium;Erythema;Erythema Ab Igne;Humans;Lasers, Solid-State;Low-Level Light Therapy

[PHYSICAL THERAPEUTIC FACTORS IN STAGE MEDICAL REHABILITATION OF PUERPERAS WITH PERINEAL WOUNDS AFTER FETAL VACUUM EXTRACTION]. Objective - to assess the role of physical therapeutic factors in the staged medical rehabilitation of puerperas with perineal wounds after fetal vacuum extraction. A comparative analysis of the postpartum period was carried out in 154 puerperas with perineal injuries after fetal vacuum extraction. Three groups were formed by simple randomization: patients in the control group (54 women) received standard treatment only; the experimental group (51 women) received standard treatment and low-intensity magnetic laser therapy (LLLT); the main group (49 women) underwent additional extracorporeal magnetic stimulation. Staged physiotherapy provided an increase in the strength of the pelvic floor muscles in patients of the main group by 47.9% ($p<0.01$), experimental group - by 36.2% ($p<0.01$), and control - by 24.4% ($p <0.05$); a decrease in the number of postoperative complications was by 6.5, 4.6, and 2.63 times, respectively. The use of staged physiotherapy in puerperas with perineal wounds after delivery operations provides a statistically significant improvement in clinical and functional parameters in comparison with the use of only standard treatment and its combination with NMLT. Female;Humans;Perineum;Physical Therapy Modalities;Postpartum Period;Pregnancy;Prenatal Care;Vacuum Extraction, Obstetrical

Beneficial effects of infrared light-emitting diode in corticosteroid-resistant asthma. Corticosteroid-resistant asthma (CRA) is a severe form of disease and clinically important, since patients do not respond to mainstay corticosteroid therapies. Thus, new therapies are needed. However, a big limiting factor in the understanding of CRA is the existence of different immunological and inflammatory phenotypes, a fact that makes it difficult to reproduce experimentally. Photobiomodulation (PBM) emerges as an alternative therapy based on earlier studies. This study aims to evaluate the effect of PBM using infrared light-emitting diode (ILED) on the development of corticosteroid-resistant asthma. Therefore, groups of rats were sensitized and challenged with ovalbumin plus Freund's adjuvant for the induction of CRA, and treated or not with ILED directly in the respiratory tract on the skin (wavelength 810 nm; power 100 mW; density energy 5 J/cm; total energy 15 J; time 150 s). Our experimental model was capable to induce neutrophilic asthma. Besides that, the corticosteroid treatment did not reverse the lung cell migration as well as the levels of leukotriene B4, and interleukins 17 and 6. The treatment with ILED reduced the lung cell migration; myeloperoxidase activity; mast cell degranulation; and the levels of leukotriene B4, thromboxane B2, prostaglandin E2, tumoral necrosis factor alpha, and interleukins 17 and 6. Still, ILED increased the level of interleukin 10. In conclusion, we showed promisor effects of ILED when irradiated directly in the respiratory tract as adjuvant treatment of corticosteroid-resistant asthma. Adrenal Cortex Hormones Adrenal Cortex Hormones;Animals;Asthma;Humans;Low-Level Light Therapy;Lung;Mast Cells;Rats;Skin

Tumor radiosensitization by photobiomodulation. PURPOSE: To investigate the safety of photobiomodulation therapy (PBM) in tumors and its potential as a radiosensitizer when combined

with radiotherapy. METHODS: We have performed in vitro experiments in A431 cells to assess proliferation and cell cycle after PBM, as well as clonogenic assay and H2AX-gamma immunolabeling to quantify double strand breaks after the combination of PBM and radiation. In vivo experiments in xenografts included Kaplan-Meier survival analysis, optical coherence tomography (OCT) and histological analysis. RESULTS: PBM did not induce proliferation in vitro, but increased the G2/M fraction by 27% 24h after illumination, resulting in an enhancement of 30% in radiation effect in the clonogenic assay. The median survival of the PBM-RT group increased by 4 days and the hazard ratio was 0.417 (CI 95%: 0.173-1.006) when compared to radiation alone. OCT analysis over time demonstrated that PBM increases tumor necrosis due to radiation, and histological analysis showed that illumination increased cell differentiation and angiogenesis, which may play a role in the synergetic effect of PBM and radiation. CONCLUSION: PBM technique may be one of the most appropriate approaches for radiosensitizing tumors while protecting normal tissue because of its low cost and low training requirements for staff. Radiation-Sensitizing Agents Animals;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Mice;Neoplasms;Neovascularization, Pathologic;Radiation-Sensitizing Agents

Clinical and histological evaluation of a dual sequential application of fractional 10,600Â nm and 1570Â nm lasers, compared to single applications in a porcine model. The sequential application of fractional ablative/10,600Â nm/CO(2) followed by 1570Â nm non-ablative laser treatment might produce better results than applying either laser treatment alone. However, histological data regarding the safety of this combination is lacking. This study aimed to assess and compare clinical effects, histological tissue damage, and wound healing after monochromatic and sequential fractional laser treatments. In this prospective porcine model study, three adult female pigs were each irradiated using three different wavelengths: (a) monochromatic fractional ablative CO(2) laser; (b) monochromatic fractional non-ablative 1570Â nm laser; (c) sequential fractional 10,600Â nm/CO(2) followed by 1570Â nm laser treatment. There were six power levels in the monochromatic 1570Â nm laser, five in the 10,600Â nm/CO(2), and five in the sequential treatment. The immediate skin reaction (ISR), crusting and adverse effects, was evaluated across different time points throughout the healing process. Wound biopsies were taken at immediately after (0) and at 3, 7, and 14Â days after irradiation. Depth and width of craters, and width of coagulation zone were measured and compared. Similar ISR and crusting score values were obtained following the monochromatic and sequential irradiation in a similar dose-response manner. During 14Â days of follow-up, the skin looked intact and non-infected with no signs of necrosis. The mean depth and width of craters were comparable only at the maximal energy level (240Â mJ) of CO(2) laser, with the coagulation size greater after the sequential treatment. In histology, a similar wound healing was evident. On day 3, crusts were observed above all lesions as was epithelial regeneration. The sequential irradiation with 10,600Â nm/CO(2) and 1570Â nm lasers did not pose any additional risk compared to the risk of each laser alone. Animals;Female;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Prospective Studies;Skin;Surgical Wound;Swine;Wound Healing

Treatment options for androgenetic alopecia: Efficacy, side effects, compliance, financial considerations, and ethics. BACKGROUND: Androgenetic alopecia (AGA) is the most common form of hair loss consisting of a characteristic receding frontal hairline in men and diffuse hair thinning in women, with frontal hairline retention, and can impact an individual's quality of life. The condition is primarily mediated by 5-alpha-reductase and dihydrotestosterone (DHT) which causes hair follicles to undergo miniaturization and shortening of successive anagen cycles. Although a variety of medical, surgical, light-based and nutraceutical treatment options are available to slow or reverse the progression of AGA, it can be challenging to select appropriate therapies for this chronic condition. AIMS: To highlight treatment options for androgenetic alopecia taking into consideration

the efficacy, side effect profiles, practicality of treatment (compliance), and costs to help clinicians offer ethically appropriate treatment regimens to their patients. MATERIALS AND METHODS: A literature search was conducted using electronic databases (Medline, PubMed, Embase, CINAHL, EBSCO) and textbooks, in addition to the authors' and other practitioners' clinical experiences in treating androgenetic alopecia, and the findings are presented here. RESULTS: Although topical minoxidil, oral finasteride, and low-level light therapy are the only FDA-approved therapies to treat AGA, they are just a fraction of the treatment options available, including other oral and topical modalities, hormonal therapies, nutraceuticals, PRP and exosome treatments, and hair transplantation. DISCUSSION: Androgenetic alopecia therapy remains challenging as treatment selection involves ethical, evidence-based decision-making and consideration of each individual patient's needs, compliance, budget, extent of hair loss, and aesthetic goals, independent of potential financial benefits to the practitioners. Finasteride;Minoxidil Alopecia;Alopecia Areata;Female;Finasteride;Hair Follicle;Humans;Male;Minoxidil;Quality of Life

Phototherapy and optical waveguides for the treatment of infection. With rapid emergence of multi-drug resistant microbes, it is imperative to seek alternative means for infection control. Optical waveguides are an auspicious delivery method for precise administration of phototherapy. Studies have shown that phototherapy is promising in fighting against a myriad of infectious pathogens (i.e. viruses, bacteria, fungi, and protozoa) including biofilm-forming species and drug-resistant strains while evading treatment resistance. When administered via optical waveguides, phototherapy can treat both superficial and deep-tissue infections while minimizing off-site effects that afflict conventional phototherapy and pharmacotherapy. Despite great therapeutic potential, exact mechanisms, materials, and fabrication designs to optimize this promising treatment option are underexplored. This review outlines principles and applications of phototherapy and optical waveguides for infection control. Research advances, challenges, and outlook regarding this delivery system are rigorously discussed in a hope to inspire future developments of optical waveguide-mediated phototherapy for the management of infection and beyond. Nanoparticle Drug Delivery System;Photosensitizing Agents Communicable Diseases;Humans;Low-Level Light Therapy;Nanoparticle Drug Delivery System;Photochemotherapy;Photosensitizing Agents

Photobiomodulation inhibits the activation of neurotoxic microglia and astrocytes by inhibiting Lcn2/JAK2-STAT3 crosstalk after spinal cord injury in male rats. BACKGROUND: Neurotoxic microglia and astrocytes begin to activate and participate in pathological processes after spinal cord injury (SCI), subsequently causing severe secondary damage and affecting tissue repair. We have previously reported that photobiomodulation (PBM) can promote functional recovery by reducing neuroinflammation after SCI, but little is known about the underlying mechanism. Therefore, we aimed to investigate whether PBM ameliorates neuroinflammation by modulating the activation of microglia and astrocytes after SCI. METHODS: Male Sprague-Dawley rats were randomly divided into three groups: a sham control group, an SCIâ€‰+â€‰vehicle group and an SCIâ€‰+â€‰PBM group. PBM was performed for two consecutive weeks after clip-compression SCI models were established. The activation of neurotoxic microglia and astrocytes, the level of tissue apoptosis, the number of motor neurons and the recovery of motor function were evaluated at different days post-injury (1, 3, 7, 14, and 28Â days post-injury, dpi). Lipocalin 2 (Lcn2) and Janus kinase-2 (JAK2)-signal transducer and activator of transcription-3 (STAT3) signaling were regarded as potential targets by which PBM affected neurotoxic microglia and astrocytes. In in vitro experiments, primary microglia and astrocytes were irradiated with PBM and cotreated with cucurbitacin I (a JAK2-STAT3 pathway inhibitor), an adenovirus (shRNA-Lcn2) and recombinant Lcn2 protein. RESULTS: PBM promoted the recovery of motor function, inhibited the activation of neurotoxic microglia and astrocytes, alleviated neuroinflammation and tissue apoptosis, and increased the number of neurons retained after SCI.

The upregulation of Lcn2 and the activation of the JAK2-STAT3 pathway after SCI were suppressed by PBM. In vitro experiments also showed that Lcn2 and JAK2-STAT3 were mutually promoted and that PBM interfered with this interaction, inhibiting the activation of microglia and astrocytes. CONCLUSION: Lcn2/JAK2-STAT3 crosstalk is involved in the activation of neurotoxic microglia and astrocytes after SCI, and this process can be suppressed by PBM. Lipocalin-2;STAT3 Transcription Factor;Janus Kinase 2 Animals;Astrocytes;Janus Kinase 2;Lipocalin-2;Low-Level Light Therapy;Male;Microglia;Neuroinflammatory Diseases;Rats;Rats, Sprague-Dawley;Recovery of Function;STAT3 Transcription Factor;Signal Transduction;Spinal Cord Injuries;Up-Regulation

Increased Anti-Allergic Effects of Secretome of Low-Level Light Treated Tonsil-Derived Mesenchymal Stem Cells in Allergic Rhinitis Mouse Model. BACKGROUND: Low-level light therapy (LLLT) is widely used for the photobiomodulation of cell behavior. Recent studies have shown that LLLT affects the proliferation and migration of various types of mesenchymal stem cells (MSCs). However, there is a lack of studies investigating the effect of LLT on enhancing the immunomodulatory properties of tonsil-derived MSCs (T-MSCs). OBJECTIVE: The aim of this study was to investigate the immunomodulatory effects of conditioned media from T-MSCs (T-MSCs-CM) treated with LLLT in allergic inflammation. METHODS: We isolated T-MSCs from human palatine tonsils and evaluated the ingredients of T-MSCs-CM. The effect of T-MSCs-CM treated with LLLT was evaluated in a mouse model of allergic rhinitis (AR). We randomly divided the mice into four groups (negative control, positive control, T-MSCs-CM alone, and T-MSCs-CM treated with LLLT). To elucidate the therapeutic effect, we assessed rhinitis symptoms, serum immunoglobulin (Ig), the number of inflammatory cells, and cytokine expression. RESULTS: We identified increased expression of immunomodulatory factors, such as HGF, TGF-Î², and PGE, in T-MSCs-CM treated with LLLT, compared to T-MSCs-CM without LLLT. Our animal study demonstrated reduced allergic symptoms and lower expression of total IgE and OVA-specific IgE in the LLLT-treated T-MSCs-CM group compared to the AR group and T-MSCs-CM alone. Moreover, we found that T-MSCs-CM treated with LLLT showed significantly decreased infiltration of eosinophils, neutrophils, and IL-17 cells in the nasal mucosa and reduced IL-4, IL-17, and IFN-Î³ expression in OVA-incubated splenocytes compared to the AR group. CONCLUSIONS: The present study suggests that T-MSCs-CM treated with LLLT may provide an improved therapeutic effect against nasal allergic inflammation than T-MSCs-CM alone. Anti-Allergic Agents;Cytokines;Ovalbumin Animals;Anti-Allergic Agents;Cytokines;Disease Models, Animal;Mesenchymal Stem Cells;Mice;Mice, Inbred BALB C;Nasal Mucosa;Ovalbumin;Palatine Tonsil;Rhinitis, Allergic;Secretome

Effects of low level laser therapy on injection pain and anesthesia efficacy during local anesthesia in children: AÂ randomized clinical trial. BACKGROUND: The use of low level laser therapy (LLLT) to reduce injection pain associated with dental local anesthesia is reported in a limited number of studies in adults, but research on the effects of LLLT in children is needed. AIM: This study aimed to evaluate the effects of topical anesthesiaÂ +Â LLLT on injection pain, anesthesia efficacy, and duration in local anesthesia of children who are undergoing pulpotomy treatment. DESIGN: The study was conducted as a randomized, controlled-crossover, double-blind clinical trial with 60 children aged 6-9Â years. Before local infiltration anesthesia was administered, only topical anesthesia was applied in one side (control group/CG), and topical anesthesia plus LLLT (a diode laser: 810Â nm; continuous mode; 0.3W; 20Â s; 69Â J/cm(2)) was applied in the contralateral side (LG) as pre-anesthesia. The injection pain and anesthesia efficacy were evaluated subjectively and objectively using the Wong-Baker Faces Pain Rating Scale (PRS) and the Face, Legs, Activity, Cry, Consolability (FLACC) scale respectively. Data were analyzed for statistical significance (pÂ <Â .05). RESULTS: The "no pain" and "severe pain" rates in the PRS were 41.7% and 3.3% for the LG and 21.7% and 11.7% for the CG, respectively, during injection. Similarly, in the FLACC data, the number of "no pain" responses was

higher for the LG than the CG (40%, 33.3%) and no "severe pain" rate was observed in both groups. The only statistically significant difference found for the PRS was pÂ <Â .05. The median pain score was "0" for the LG and the CG in the FLACC data for the evaluation of anesthesia efficacy, and there was no statistically significant difference between the groups in terms of pain and anesthesia duration (pÂ >Â .05). Also, most of the children preferred injection with topical anesthesiaÂ +Â LLLT (66.7%). CONCLUSIONS: It has been determined that the application of topical anesthesiaÂ +Â LLLT with an 810-nm diode laser before local infiltration anesthesia reduced injection pain and did not have an effect on anesthesia efficacy and duration in children. Anesthetics, Local Anesthesia, Dental;Anesthesia, Local;Anesthetics, Local;Child;Humans;Low-Level Light Therapy;Pain;Pain Measurement

Stimulation and homogenization of the protoporphyrin IX endogenous production by photobiomodulation to increase the potency of photodynamic therapy. Protoporphyrin IX (PpIX) is produced in the mitochondria and used as fluorescent contrast agent or photosensitizer after exogenous 5-aminolevulinic acid (ALA) delivery in cancer photodynamic detection and therapy (PDT). Although routinely used in the clinics, the stimulated production of PpIX is often insufficient and/or heterogeneous within the lesions, thereby limiting the PDT performances. Since photobiomodulation, which is based on the illumination of the tissues with sub-thermal radiometric conditions in the red or near-infrared, is known to stimulate the cell metabolism, we have optimized these conditions in vitro. Some of them lead to the homogenization and strong stimulation of the PpIX endogenous production. Interestingly, combined sequentially, PBM enhanced significantly the potency of PpIX-based PDT in vitro and in vivo in tumors grown on the chicken embryo chorioallantoic membrane. These results are in excellent agreement with other assays based on measurements of the cell survival/death, the production of reactive oxygen species, including singlet oxygen, and the mitochondrial membrane potential. Photosensitizing Agents;Protoporphyrins;Reactive Oxygen Species;protoporphyrin IX Animals;Cell Line, Tumor;Chickens;Humans;Membrane Potential, Mitochondrial;Optical Imaging;Photochemotherapy;Photosensitizing Agents;Protoporphyrins;Reactive Oxygen Species

Photobiomodulation intervention improves oxidative, inflammatory, and morphological parameters of skeletal muscle in cirrhotic Wistar rats. Photobiomodulation (PBM) might be an intervention method to mitigate sarcopenia in cirrhotic patients. Given the lack of research on this issue, the goal of this study was to evaluate possible beneficial effects of PBM on the structural and functional properties of skeletal muscle from cirrhotic rats. Cirrhosis was induced by secondary bile duct ligation (BDL). Wistar rats were randomized into four groups: sham-operated control (Sham), Shamâ€‰+â€‰PBM, BDL, and BDLâ€‰+â€‰PBM. After cirrhosis induction, a dose of PBM (1Â J; 100mW; 10Â s; 880Â nm; 6â€‰Ã—â€‰per week) was applied to each quadriceps, from the 15th to the 45th day after surgery. The locomotor ability was performed using an open-field task. The muscle structure was analyzed using histological methods. Cell damage was also evaluated assessing oxidative stress and DNA damage markers, and IL-1Î² pro-inflammatory interleukin by immunohistochemical analysis. An increase in the number of crossings was observed in the BDLâ€‰+â€‰PBM group in relation to BDL. The BDL group showed muscle atrophy and increased IL-1Î² in relation to Sham, while in the BDLâ€‰+â€‰PBM group, the fiber muscle was restructured and there was a decrease of IL-1 Î². TBARS increased in the liver and muscle tissues in the BDL group and decreased it in the BDLâ€‰+â€‰PBM group. SOD increased while CAT decreased in the BDLâ€‰+â€‰PBM group in relation to the BDL group. No genotoxic or mutagenic effect was observed for PBM treatment. PBM improved the locomotion and the morphology of the muscle fibers, decreasing oxidative stress and inflammation, without causing DNA damage in cirrhotic rats.

Animals;Rats;Disease Models, Animal;Ligation;Liver;Liver Cirrhosis;Muscle, Skeletal;Oxidative Stress;Rats, Wistar

Photobiomodulation With Blue Laser Inhibits Bladder Cancer Progression. Blue lasers are becoming more widely used in the diagnosis and treatment of bladder cancer; however, their photobiomodulation effects on bladder cancer cells remains unclear. The purpose of the current study was to explore the photobiomodulation effect of blue laser irradiation on bladder cancer progression and the associated mechanisms. The human uroepithelial cell line SV-HUC-1 and human bladder cancer cell lines T24 and EJ were exposed to blue laser irradiation (450 nm) at various energy densities, and cell proliferation, migration, invasion, epithelial-mesenchymal transition (EMT), and the levels of the proteins associated with the MAPK pathway proteins were determined. A significant decrease in cell viability was observed in a density-dependent manner after blue laser irradiation at > 4 J/cm(2) in both bladder cancer cell lines. However, the blue laser did not reduce cell viability in SV-HUC-1 cells until the energy density exceeded 16 J/cm(2). Meanwhile, Ki67 levels, reflecting cell proliferation and senescence, were also significantly decreased after blue laser irradiation at 4 J/cm(2) and 8 J/cm(2) in the absence of cell cycle arrest. Moreover, blue laser irradiation at 4 J/cm(2) and 8 J/cm(2) caused a reduction in cell migration and invasion and also reduced the expression levels of MMP-2, MMP-9, Snail, N-cadherin, phospho-MEK and phospho-ERK, and elevated the expression levels of E-cadherin. Meanwhile ERK activator(tBHQ) significantly reversed the irradiation-induced suppression of proliferation, migration and invasion in T24 and EJ cell lines. The present study showed that blue laser irradiation inhibited bladder cancer proliferation in a density-dependent manner and inhibited bladder cancer progression by suppressing migration, invasion, and the EMT process in T24 and EJ cell lines. This inhibition was possibly mediated via suppression of the MAPK/MEK/ERK pathway. Thus, the use of a low-energy blue laser in the diagnosis and treatment of bladder cancer is possibly safe and may have an anti-tumor effect.

A Systematic Review of Elective Laser Therapy during Pregnancy. Introduction: Currently, lasers are used to treat many diseases and their complications. However, the use of lasers in pregnant patients is still controversial. Methods: In this review, the application of lasers in the fields of urology, surgery, obstetrics, dermatology, and musculoskeletal disorders is evaluated. The following keywords were used to search through PubMed, Google Scholar, and Scopus: pregnancy, laser, urolithiasis, endovenous laser ablation (EVLA) or treatment, leg edema, varicose vein, venous insufficiencies, hair removal, pigmentation, telangiectasia, vascular lesions, Q switch laser, diode laser, holmium, holmium-YAG laser, erbium laser and Pulsed dye laser, low-level laser therapy, high-intensity laser therapy, pain, musculoskeletal disorders, twin to twin transfusion syndrome (TTTS), amnioreduction, and safety. Results: Totally, 147 articles were found, and their abstracts were evaluated; out of 53 articles extracted, 14 articles were about dermatology, 24 articles were about urology, 12 articles were about obstetrics and gynecology, 10 articles were about musculoskeletal disorders and three articles were related to surgery. Conclusion: Laser therapy can be used as a safe treatment for urolithiasis, skin diseases, TTTS and varicose veins of the lower extremities. However, the use of laser therapy for musculoskeletal disorders during pregnancy is not recommended due to lack of evidence, and also we cannot recommend endovenous ablation.

The Photobiomodulation Effect of 940nm Laser Irradiation on Enterococcus faecalis in Human Root Dentin Slices of Varying Thicknesses. Introduction: An increase in dentine thickness could result in an inadequate depth of laser energy penetration. This study aimed to evaluate the effect of a 940 nm laser on Enterococcus faecalis through varying thicknesses of human root dentin slices. Methods: Thirty-five dentin slices of root dentin with thicknesses ranging between 500 and 3000 Âµm were produced. Six experimental groups (500, 1000, 1500, 2000, 2500, and 3000 Âµm (n=5 each) were lased and the seventh, non-lased group served as the positive control with a dentine thickness of

2000 Âµm. The slices were inoculated with 2 ÂµL of E. faecalis suspension of 1.5 Ã— 10(8) E. faecalis cells/mL. All the lased slices were lased from the opposing side of the inoculation. A non-initiated 200 Î¼m bare end fibre at the power of 1 W, in a continuous wave was used. Four doses of laser irradiation of 5 seconds with a side to side movement with the tip held at a 5Âº angle to the dentine slice were performed. The colony-forming units of E. faecalis were determined and the bacterial photobiomodulation effect analysed using one-way ANOVA with a Bonferroni and Holm post hoc test at a significance level of $P > 0.05$. Results: There were statistical differences between the dentin slices of 500, 1000, and 1500 Î¼m treated with the laser compared to the positive control ($P < 0.01$). However, there were no statistical differences between the lased 2000 and 2500 Î¼m slices compared to the positive control. There was significantly more photobiomodulation of the E. faecalis for the dentine slices of 3000 Î¼m than the positive control ($P < 0.01$). Conclusion: Laser treatment through dentine slices of 2000 Î¼m and thinner significantly reduced bacterial growth. The photobiomodulation effects started to occur in dentine slices thicker than 2500 Î¼m compared to the positive control.

Effect of Radiotherapy and Low-Level Laser Therapy on Circulating Blood Cells of Rats. Introduction: This study aimed to investigate the effect of low-level laser therapy (LLLT) on the blood cell count when applied to parotid glands of rats irradiated by volumetric modular arc therapy (VMAT). Methods: Thirty-two adult male Wistar rats were used in this study. Samples were randomly assigned to three groups: control group (CG, n = 8), immediate laser group (24 hours) (ILG, n=12), and late laser group (120 hours) (LLG, n=12). The two laser groups were previously subjected to VMAT radiotherapy in a single dose of 12 Gy. LLLT with an AsGaAl laser (660 nm, 100 mW) was applied at three points in the region of the parotid glands, right side, with the energy of 2 J per point (20s, 70 J/cm(2)) and a spot size of 0.0028 cm(2) for 10 consecutive days. In the euthanasia, blood samples were obtained by cardiac puncture. The samples from each group were processed by an automatic method and analyzed for erythrogram, leukogram and platelet count values. The data were analyzed by ANOVA and each LLLT time point was analyzed in relation to the control group, with a significance level less than 0.05. Results: Groups using LLLT had higher red blood cell counts, being higher in the LLG ($P = 0.000$). The hematimetric indices MCV ($P = 0.002$) and MCH ($P = 0.009$) were lower than the control group, especially when compared to the group using LLLT 120h after radiotherapy (LLG). White blood cell counts were lower in the groups with radiotherapy and immediate use of LLLT (ILG) ($P = 0.011$), mainly at the expense of lymphocytes ($P = 0.002$). Conclusion: The results suggest a potential systemic effect of LLLT, especially on circulating red blood cell counts, regardless of their time of immediate or late use of radiotherapy.

A Comparison Between Low-Level Laser Therapy and Intra-articular Ozone Injection in Knee Osteoarthritis Treatment: A Randomized Clinical Trial. Introduction: Knee osteoarthritis (KOA) is a common degenerative joint disease, causing deformity, pain and a limited joint range of motion. Modification of the lifestyle and an exercise training program are the cornerstone of treatment. Alternative therapies such as laser or ozone are commonly used, but there is not any comparative study of low-level laser therapy (LLLT) versus ozone therapy. The aim of the study was to compare the efficacy and safety of the LLLT versus ozone in patients with KOA. Methods: In this single-blinded randomized clinical trial, 60 patients with KOA were assigned to LLLT or ozone groups (n=30). The First basic pain severity, the Western Ontario and McMaster Universities Arthritis Index (WOMAC) score and physical function were determined. Then in the LLLT group, the patients were provided with 12 sessions of LLLT. In the ozone group, 6 sessions of intra-articular injection of ozone were organized (in each session a mixture of 10 mL of bupivacaine 0.25% with 15 mL of ozone 30 Î¼g/mL). In the middle and at the end of the intervention period, we reassessed the joint pain and physical function and the degree of improvement compared between the two groups. Results: In the middle

and at the end of the treatment period in both groups, the joint pain decreased significantly. The same as pain, the self-administrated WOMAC score and the range of joint motion improved significantly in both groups. All of these variables exposed more improvement in the ozone group patients. Conclusion: The study showed that both LLLT and ozone are acceptable non-invasive methods in the non-surgical treatment of KOA. Compared to LLLT, the ozone was more effective. These methods must be considered in any patient who is not suitable for surgical interventions or does not experience enough improvement in symptoms following long periods of common exercise training programs.

Low-Level Laser Therapy: Potential and Complications. Introduction: Laser therapy has attracted experts' attention in medical sciences. Many benefits of laser therapy are presented besides some complications. In the present study, it is tried to present a new perspective of laser therapy in the various fields of medicine. Methods: Laser therapy-related articles which are combined with regenerative medicine, cosmetic, dentistry, neurodegenerative diseases, kidney, bone fracture, and vaginal function in the English language were searched through the google scholar search engine in the range of 2000-2021. After title screening, the abstracts were evaluated to access the full texts. Results: Basic concepts and various kinds of lasers which are applied in medicine were explained. Applications of laser therapy in various fields of medicine such as pain reduction, wound healing, regenerative medicine, dentistry, and several other body organs were highlighted and some complications were pointed. Conclusion: High potential of laser therapy for application in medicine implies a reconsideration of the laser properties and also styles of laser applications to improve the treatment and prevention of its side effects.

Simultaneous Treatment of Photobiomodulation and Demineralized Bone Matrix With Adipose-Derived Stem Cells Improve Bone Healing in an osteoporotic bone defect. Introduction: The ability of simultaneous treatment of critical-sized femoral defects (CSFDs) with photobiomodulation (PBM) and demineralized bone matrix (DBM) with or without seeded adipose-derived stem cells (ASCs) to induce bone reconstruction in ovariectomized induced osteoporotic (OVX) rats was investigated. Methods: The OVX rats with CSFD were arbitrarily separated into 6 groups: control, scaffold (S, DBM), S + PBM, S + alendronate (ALN), S + ASCs, and S + PBM + ASCs. Each group was assessed by cone beam computed tomography (CBCT) and histological examinations. Results: In the fourth week, CBCT and histological analyses revealed that the largest volume of new bone formed in the S + PBM and S + PBM + ASC groups. The S + PBM treatment relative to the S and S + ALN treatments remarkably reduced the CSFD (Mann-Whitney test, $P = 0.009$ and $P = 0.01$). Furthermore, S + PBM + ASCs treatment compared to the S and S + ALN treatments significantly decreased CSFD (Mann Whitney test, $P = 0.01$). In the eighth week, CBCT analysis showed that extremely enhanced bone regeneration occurred in the CSFD of the S + PBM group. Moreover, the CSFD in the S + PBM group was substantially smaller than S, S + ALN and S + ASCs groups (Mann Whitney test, $P = 0.01$, $P = 0.02$ and $P = 0.009$). Histological observations showed more new bone formation in the treated CSFD of S + PBM + ASCs and S + PBM groups. Conclusion: The PBM plus DBM with or without ASCs significantly enhanced bone healing in the CSFD in OVX rats compared to control, DBM alone, and ALN plus DBM groups. The PBM plus DBM with or without ASCs significantly decreased the CSFD area compared to either the solo DBM or ALN plus DBM treatments.

Combined Treatment of Photobiomodulation and Arginine on Chronic Wound Healing in an Animal Model. Introduction: Herein, the individual and combined effects of photobiomodulation (PBM) and arginine (ARG) on the wound healing course of an experimental model of a slow healing wound (ulcer) in rats were assessed. Methods: A total of 108 male rats were divided into 6 groups: control; lower energy density (low)-PBM; arginine ointment (ARG); low-PBM+ARG; high energy density (high)-PBM; and high-PBM+ARG. In each rat, one ischemic wound in the center of a bipedicle flap and one

non-ischemic wound out of the flap were created. Both wounds were treated in the experimental groups. Microbial growth, wound area, and wound strength were assessed on days 0, 5, 10, 15, and 20 after wound infliction. Results: All non-ischemic wounds closed before day 15. High-PBM+ARG and ARG significantly increased wound closure rates compared to the control group (LSD test, P = 0.000, and P = 0.001, respectively) on day 10. All slow healing wounds were open on day 15 but closed completely before day 20. Low-PBM+ARG and high-PBM significantly increased wound strength (stress high load, SHL) on day 10 compared to the control group (LSD test, P = 0.001, and P = 0.000, respectively). ARG, high-PBM, and low-PBM+ARG significantly increased wound closure rates on day 15 relative to the control group (LSD test, P = 0.000, P = 0.000, and P = 0.001, respectively). Conclusion: High-PBM and low-PBM+ARG have biostimulatory and antibacterial effects on slow-healing wounds, which were shown by significant increases in wound closure rates, wound strength, and inhibition of Staphylococcus aureus growth.

The Effect of Laser Therapy Along With Mediterranean Diet Versus Mediterranean Diet Only on Older Adults With Non-alcoholic Fatty Liver Disease: A Randomized Clinical Trial. Introduction: Obesity is the major pathogenesis of the non-alcoholic fatty liver disease (NAFLD). The combination of low-level laser therapy (LLLT) and Mediterranean diet (MD) is a new approach for improving liver function. Methods: 60 obese older adults (65-75 years old) with NAFLD were randomly assigned equally to two groups: a study group and a control group. The study group received LLLT and MD, while the control group followed MD only. These findings evaluated the changes in the level of liver enzymes, serum lipid profile, and anthropometric measurements (body mass index [BMI] and waist circumference [WC]) after 12 weeks of intervention. Results: Both study and control groups showed a significant reduction in the levels of liver enzymes, serum lipid profile, BMI, and WC ($P < 0.001$ and $P < 0.01$ respectively); however, the study group showed more significant results compared to the control group ($P < 0.01$). Conclusion: LLLT and MD may be considered as a treatment approach for NAFLD in older adults to improve their liver function, control dyslipidemia, and help in losing weight.

Low-Level Laser Therapy for Herpesvirus Infections: A Narrative Literature Review. Introduction: Herpesvirus infection has a variety of clinical forms and is extremely widespread in the world while existing treatment methods are not always quite effective. The search for new treatment modalities is a relevant problem and numerous studies show the therapeutic effect of low-level laser therapy (LLLT) on different herpesvirus types. Methods: The mechanisms of laser light action and the impact of LLLT on the pathological pathways of herpes infections are described. A narrative review of the relevant papers is conducted. Results: The reviewed studies confirm that LLLT is a potential prospective treatment method for patients infected with the herpesvirus. However, it is necessary to improve the methodology and optimize the combination of laser action with antiviral medications. Conclusion: The review shows that it is most effective to combine laser impact on skin lesions with the application of topical antiviral gels or creams, additionally using a combined procedure of laser ultraviolet blood illumination (LUVBI, 365-405 nm) + intravenous laser blood irradiation (ILBI, 525 nm).

Low Level Laser Therapy With an 810-nm Diode Laser Affects the Proliferation and Differentiation of Premature Osteoblasts and Human Gingival Fibroblasts In Vitro. Introduction: Photomodulation is a promising strategy for optimizing tissue healing, but its photomodulatory effects on the synergistic cellular metabolism of gingival and bony tissues remain largely unknown. The aim of the present study was to evaluate the photomodulatory effects of a diode laser (810 nm) on osteoblasts, HGFs and their co-cultures in vitro. Methods: Primary cultures of HGFs, cultures of immature osteoblastic cells (MG63) and their co-cultures were irradiated with a diode laser (810 nm), 15 J/cm(2). Cell cultures were examined for cellular proliferation (MTT assay), viability (FDA/PI staining) after 24, 48 and 72 hours and cell differentiation (qPCR of collagen type 1a - COL1a and alkaline

phosphatase expressions - ALP) after 7 days. Results: Photomodulation with an 810-nm diode laser increased cell proliferation at all time points. COL1a gene expression increased both in HGF and co-cultures. ALP expression was up-regulated in osteoblastic cultures, but co-cultures with fibroblasts negated this response. Conclusion: The 810-nm diode laser positively affected cell proliferation and viability in all experimental groups. The statistically significant increased COL1a gene expression at 7 days after irradiation both in the irradiated HGF and co-cultures suggests that low-level laser therapy (LLLT) stimulated extracellular matrix (ECM) formation signaling in both cell types.

Use of Blue and Blue-Violet Lasers in Dentistry: A Narrative Review. Introduction: Blue and blue-violet diode lasers (450 and 405 nm) seem to represent an interesting approach for several clinical treatments today. The aim of this narrative review is to describe and comment on the literature regarding the utilization of blue and blue-violet lasers in dentistry. Methods: A search for "blue laser AND dentistry" was conducted using the PubMed database, and all the papers referring to this topic, ranging from 1990 to April 2020, were analyzed in the review. All the original in vivo and in vitro studies using 450 nm or 405 nm lasers were included in this study. All the articles on the LED light, laser wavelengths other than 405 and 450 nm and using lasers in specialties other than dentistry, as well as case reports, guideline papers and reviews were excluded. Results: From a total of 519 results, 47 articles met the inclusion criteria and were divided into 8 groups based on their fields of application: disinfection (10), photobiomodulation (PBM) (4), bleaching (1), resin curing (20), surgery (7), periodontics (1), endodontics (1) and orthodontics (3). Conclusion: Blue and blue-violet diode lasers may represent new and effective devices to be used in a large number of applications in dentistry, even if further studies will be necessary to fully clarify the potentialities of these laser wavelengths.

Efficacy of Photobiomodulation and Vitamin D on Odontogenic Activity of Human Dental Pulp Stem Cells. Introduction: The regeneration of dental pulp tissue using human dental pulp stem cells (HDPSCs) has attracted increasing attention in recent years. Recent studies have suggested that several factors such as photobiomodulation (PBM) and vitamin D affect the proliferation and differentiation of HDPSCs. Therefore, the present study evaluated the effects of PBM and vitamin D on odontogenic differentiation of HDPSCs for dentin -like tissue formation. Methods: HDPSCs were collected, isolated, and characterized and then divided into six groups: group I, control; group II, vitamin D (10(-7) Mol); group III, irradiation at 1 J/cm(2) of 810 nm diode laser; group IV, irradiation at 1 J/cm(2) and culture with vitamin D; group V, irradiation at 2 J/cm(2), and group VI, irradiation at 2 J/cm(2) and culture with vitamin D, cell viability assay was measured through MTT. Alkaline phosphatase (ALP) enzyme activity and mRNA levels of vascular endothelial growth factor (VEGF), bone morphogenic protein-2 (BMP-2), and dentin sialophosphoprotein (DSPP) were also assessed. Results: PBM at 1 and 2 J/cm(2) combined with vitamin D significantly promoted HDPSCs proliferation through MTT assay and odontogenic differentiation through gene expression of VEGF, BMP-2, and DSPP levels ($P < 0.0001$). Conclusion: PBM at 2 J/cm(2) combined with vitamin D enhanced the HDPSCs proliferation and odontogenic differentiation and thus could be a novel strategy for dentin regeneration in dentistry.

The Effectiveness of Low-Level Laser Therapy in Pain Induced by Orthodontic Separator Placement: A Systematic Review. Introduction: This systematic review was conducted to evaluate the effectiveness of low-level laser therapy (LLLT) in orthodontic separator pain. Methods: This article was written according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist. Electronically and manually 3 databases, namely PubMed, Scopus and Google Scholar, were searched by the keywords that were selected based on population, intervention, comparison and outcome (PICO) on October 10, 2020. Studies were appraised by Cochrane version 5.2.0 with 7 domains and were checked by these inclusion criteria: 1. Randomized clinical trial (RCT)

that examined the efficacy of LLLT in separator pain, 2. Split-mouth design, 3. LLLT application in the first hours after separator placement, 4. LLLT application to both sides of the teeth, 5. Patients receiving elastomeric separators between the premolars and molars, 6. Lasers with a wavelength of 800-899 nm, 7. Studies conducted from 2010 to 2020, and 8. Participants who went through orthodontic treatment without limitation in gender, age and social-economic status. Results: 299 studies were screened. 34 full-text papers were read by 2 authors independently. In the end, 4 articles met the inclusion criteria. All 4 articles showed LLLT has a significant impact on pain reduction. Conclusion: The exact protocol for laser therapy is still not clear. Therefore, more studies with a meticulously designed method are needed.

Dosage Effects of an 810 nm Diode Laser on the Proliferation and Growth Factor Expression of Human Gingival Fibroblasts. Introduction: A substantial amount of evidence supports the positive effect of photobiomodulation on the proliferation and differentiation of various cell types. Several laser wavelengths have been used for wound healing improvement, and their actual outcome depends on the settings utilized during irradiation. However, the heterogeneous wavelengths and laser settings applied in the existing literature make it difficult to draw solid conclusions and comparison of different studies. The aim of the present study is to evaluate and compare the effects of various doses of laser energy, provided by an 810 nm diode, on human gingival fibroblasts in terms of proliferation and expression of growth factors with a pivotal role in wound healing. Methods: Human gingival fibroblasts were cultured on plastic tissue culture and irradiated with 2, 4, 6 or 12 J/cm(2). The effects of the low-level laser therapy (LLLT) using an 810 nm diode laser on growth factor expression (EGF, TGF and VEGF) were evaluated by qPCR at 72 hours and 7 days after irradiation. Cell proliferation was evaluated at 24, 48 and 72 hours after LLLT using MTT assay. Results: Energy density of 12 J/cm(2) provoked irradiated gingival fibroblasts to demonstrate significantly higher proliferation as well as higher gene expression of Col1, VEGF and EGF. LLLT positive effects were obvious up to 7 days post-irradiation. Conclusion: LLLT with 810 nm presents beneficial effects on proliferation, collagen production and growth factor expression in human gingival fibroblast cells. The application of 12 J/cm(2) can be suggested as the optimal energy density for the enhancement of the wound healing process.

The Comparison of The Efficacy of Photobiomodulation and Ultrasound in the Treatment of Chronic Non-specific Neck Pain: A Randomized Single-Blind Controlled Trial. Introduction: Chronic neck pain is a common complaint among office workers. The aim of the present study was to compare the efficacy of a high-intensity laser and physiotherapy in office workers who were diagnosed with chronic non-specific neck pain. Methods: This study was a single-blind randomized controlled trial, with parallel allocation. Sixty office workers with chronic neck pain, aged between 25 and 55 years, participated in the study. The participants were randomly divided into two groups: photobiomodulation (by a high-level laser) and physiotherapy. Visual analogue scale (VAS), Neck Disability Index (NDI), Neck Pain and Disability Scale (NPDS) and Bournemouth Questionnaire (BQN) were completed on three occasions (before, immediately and 2 weeks after the intervention) to assess and compare the efficacy of the high-intensity laser and physiotherapy in neck pain. Data were analyzed by SPSS 23 software using the chi-square test, Student's t test, multivariate tests, and Fisher's exact test. Results: The mean age of the participants was 37.53Â±9.52 and 41.16Â±7.85 years in physiotherapy and laser therapy respectively. The VAS score and NDI scores decreased after both kinds of interventions, and the effect of photobiomodulation was significantly higher than physiotherapy ($P < 0.001$). Both treatment modalities significantly affect different aspects of chronic neck pain assessed by NDPS and BQN questionnaires and the effect of photobiomodulation was more prominent than physiotherapy. Conclusion: The findings of this study showed that

photobiomodulation and physiotherapy can reduce chronic neck pain and its different aspects and the effect of laser therapy was significantly higher than physiotherapy.

Evaluation of Biological Activity of Different Wavelengths of Low-Level Laser Therapy on the Cancer Prostate Cell Line Compared With Cisplatin. Introduction: Cancer is one of the most important problems in the world. Low-level laser therapy (LLLT) has been emerged as a new approach, having both stimulation and inhibition effects on cellular function. The goal of this study was to analyze and compare the different concentrations of cisplatin and wavelengths of laser therapy on the LnCap cell lines. Methods: LnCap cells were cultured and treated with different concentrations of cisplatin (0.1, 0.4, 0.8, 1.2 and 2 Âµg/mL for 24 hours) and wavelengths of laser therapy (610, 630 and 810 nm) (0.45 J/cm(2)) separately. The viability of cells was examined by MTT assay and IC50 was also calculated. Furthermore, a combination of cisplatin IC50 (24 hours) and different wavelengths of the laser was examined. Results: The results of this study showed that 2 Âµg/mL of cisplatin has the most significant reduction effect on the cell viability of the LnCap cell line. Cisplatin decreased the viability of cells in a dose-dependent manner. Moreover, IC50 of cisplatin was 1.24 Âµg/mL. On the other hand, LLLT with wavelengths of 610, 630 and 810 nm did not show notable biological effects on cell viability. Conclusion: As known, cisplatin has the capability to reduce the viability of LnCap cell lines. However, LLLT cannot be a remarkable option for the treatment of prostate cancer. Therefore, although laser therapy showed praiseful therapeutic activity against some cancer cell lines, in this study the results indicated that defined laser wavelengths had no inhibitory effects against the prostate cancer cell line.

Effect of Light-Emitting Diode Phototherapy on Allograft Bone After Open Sinus Lift Surgery: A Randomized Clinical Trial (Concurrent Parallel). Introduction: Phototherapy with a light-emitting diode (LED) is used in medicine due to its potential bio-stimulatory effects on the human body. However, controversy still exists regarding the efficacy of low-level laser therapy (LLLT) and phototherapy with LED. This in vivo study aimed to quantitatively and qualitatively assess the newly formed bone following LED phototherapy of the human maxillary sinuses. Methods: This randomized clinical trial (concurrent parallel) was conducted on 44 patients in two groups (n=22) at the Implant Department of Tehran University of Medical Sciences. Randomization was done by a random sequence generator program. The inclusion criteria were absence of chronic sinusitis and chronic bone marrow conditions, no history of surgery at the site, absence of diabetes mellitus, no history of chemotherapy or radiotherapy, maxillary premolar edentulism, and signing informed consent forms. Group A underwent LED phototherapy with 620 Â± 2 nm wavelength for 20 minutes daily for a total of 21 days after sinus lift surgery. Group B served as the control group and did not receive phototherapy. After 6 months, the grafted sites were re-opened for implant placement, and bone biopsy samples were obtained using a trephine bur. The samples were stained with hematoxylin and eosin and inspected under a light microscope. The results were statistically analyzed using the Mann-Whitney U test. Both the surgeon and pathologist were blinded to the group allocation of patients. Results: Forty tissue specimens were analyzed. Insignificant differences existed between the two groups in terms of the degree of inflammation, bone quality, and maturity of collagen. Histological analyses revealed no significant difference in the mineralized areas of bone between the two groups ($P > 0.05$). Conclusion: The results indicated that LED phototherapy cannot significantly enhance osteogenesis after sinus lift surgery. No side effects were observed in the experimental group.

Local (but not systemic) photobiomodulation treatment reduces mast cell degranulation, eicosanoids, and Th2 cytokines in an experimental model of allergic rhinitis. Allergic rhinitis (AR) is an inflammatory disorder of the nasal mucosa, and is a worldwide health problem with a significant impact on the quality of life. The main goal of AR treatment is to relieve symptoms. However, standard treatments have considerable side effects or are not effective. Photobiomodulation (PBM)

therapy has emerged as an alternative treatment. Here, we evaluated the effects of transcutaneous systemic (tail) or local (skin over nostrils) PBM using a 660-nm light-emitting diode (LED) array. Adult rats were assigned into 4 groups: basal, as non-manipulated animals; Sham, as rats sensitized with 7 intradermal injections of ovalbumin (OVA) plus alum followed by intranasal instillation with OVA (2%) daily for 7Â days; and the LPBM and SPBM groups, in which the animals were treated with PBM (local or systemic) immediately after the last instillation of OVA (1%) daily for 3Â days. Our results showed that local PBM treatment reduced mast cell degranulation in the nasopharynx and nostrils; levels of leukotriene B4, thromboxane A2, and interleukin 4 (IL-4) in the nasopharynx; and gene expression of IL-4. Moreover, we showed higher levels and gene expression of IL-10 after local PBM treatment. Systemic PBM treatment did not change any of the evaluated parameters. In conclusion, our data showed that local (but not systemic) treatment with PBM could improve parameters related to AR in an animal model, and should be tested clinically. Cytokines;Eicosanoids;Ovalbumin Animals;Cell Degranulation;Cytokines;Disease Models, Animal;Eicosanoids;Mice;Mice, Inbred BALB C;Ovalbumin;Quality of Life;Rats;Rhinitis, Allergic

The effect of 805 nm near-infrared photobiomodulation on proliferation and differentiation of bone marrow stem cells in murine rats. OBJECTIVE: To evaluate the effect of near infra-red gallium-aluminium-arsenide (GaAlAs) diode laser (805 nm) irradiation on proliferation and differentiation of rat femoral bone marrow-derived mesenchymal stem cells (BMSCs) cultured in osteogenic medium. MATERIALS AND METHODS: BMSCs were obtained from femurs of 60 Sprague Dawley rats (200 gm). The control group comprised isolated BMSCs supplemented with an osteogenic differentiation medium. On the other hand, in the experimental group, the BMSCs were irradiated with a near-infrared laser in addition to an osteogenic differentiation medium. The experimental group was irradiated with a soft tissue laser comprising of allium-aluminium-arsenic (Ga-Al-Ar) Diode at a near-infrared wavelength of 805 nm in continuous mode. The different output powers applied were 0.5 W, 1.0 W, 1.5 W and 2.0 W respectively. Various energy levels of 1, 4, 7 and 10 J were used for irradiation. Alkaline phosphatase (ALP) assay and Alizarin staining were performed to confirm osteogenic differentiation. Statistical analysis was done using a one-way ANOVA and a p-value of <0.05 was considered significant. RESULTS: According to our findings, 1.27 J/cm2 was the optimal energy density value that significantly increased the BMSC proliferation at the output of 1.5 W with the power density of 1.27 W/cm2. On 1.27 J/cm2, there was a significant difference compared to the control group on the first day, and the osteogenic differentiation increased significantly on the 4th day compared to the 1st day. CONCLUSIONS: According to our findings, 1.27 J/cm2 was the optimal energy density value that significantly increased the BMSC proliferation at the output of 1.5 W with the power density of 1.27 W/cm2. Animals;Cell Differentiation;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Rats;Rats, Sprague-Dawley

[Dental care in health resort institutions]. Over the past decades, a small yet convincing evidence base has accumulated that demonstrates the effectiveness of dental care for patients in health-resort (HR) settings. In addition to a positive local effect, complex HR care increases nonspecific resistance and promotes desensitization. OBJECTIVE OF THE REVIEW: Addressing the HR rehabilitation in patients with various maxillofacial diseases for further consideration of the possibility of the increased use of HR care in dental practice. MATERIAL AND METHODS: Russian and English-language publications were analyzed without specifying the search timeframe. The search keywords were the following: Â«health-resort careÂ», Â«balneotherapyÂ», Â«peloid therapyÂ», Â«physiotherapyÂ», Â«magnet therapyÂ», Â«laser therapyÂ» in combination with Â«dental diseasesÂ», Â«maxillofacial diseasesÂ», Â«periodontal diseasesÂ», Â«temporomandibular joint diseasesÂ», Â«postoperative rehabilitationÂ» Â«balneotherapyÂ», Â«mud therapyÂ», Â«peloid therapyÂ», Â«spa therapyÂ»,

Â«physiotherapyÂ». A total of 21 articles were analyzed, including 10 related to periodontal disease, 5 to temporomandibular joint pathology, and 6 to rehabilitation in the postoperative period. Seventeen original studies (3855 patients) were selected, including 47.62% with evidence level C, due to lack of information on comparison group or randomization. RESULTS AND DISCUSSION: Available data from clinical studies suggest the effectiveness of natural and physiotherapeutic factors in the medical rehabilitation of patients with various dental diseases. Further randomized clinical trials and the development of clinical guidelines for various techniques in dental diseases are warranted. Balneology;Dental Care;Health Resorts;Humans;Low-Level Light Therapy;Mud Therapy

Energy-based devices for the treatment of Acne Scars: 2022 International consensus recommendations. BACKGROUND AND OBJECTIVES: Acne scars are one of the most distressing and long-term consequences of acne vulgaris, with damaging effect on a person's physical, mental, and social well-being. Numerous treatment options are available including surgical and nonsurgical techniques, depending on the clinical presentation. Although considerable advances in the development of new treatment technologies and applications have been made in the last decade, international treatment guidelines and reimbursement schemes have not yet caught up with current knowledge and practice in many centers. The authors intend to highlight the potential utility of energy-based devices (EBDs) for acne scarring, offer recommendations for safe and efficacious treatment, and provide consensus-based EBD treatment options based on varying presentations demonstrated in a series of real-life clinical photographs. STUDY DESIGN/MATERIALS AND METHODS: An international panel of 24 dermatologists and plastic surgeons from 12 different countries and a variety of practice backgrounds was self-assembled to develop updated consensus recommendations for the treatment of acne scars. A two-step modified Delphi method took place between March 2020 and February 2021 consisting of two rounds of emailed questionnaires. The panel members approved the final manuscript via email correspondence. RESULTS: The manuscript includes a comprehensive discussion and panel recommendations regarding the following topics: 1. the role of EBD in mitigating and treating acne scars in a patient with active acne, 2. the use of various EBDs for the treatment of different acne scar types with special focus on commonly used laser platform such as vascular lasers, ablative fractional lasers (AFLs) and non-AFLs (NAFLs), 3. treatment combinations, and 4. acne scar treatments in skin of color. The last part comprised of 10 photos of real-life clinical cases with the panel recommendation treatment plan to achieve best aesthetic outcome. CONCLUSION: Panel members were unanimous in their view that EBDs have a role in the management of acne scars, with AFLs, NAFLs, vascular lasers, and RF devices preferentially selected by most of the panel experts. EBDs are considered a first-line treatment for a variety of acne scar types and patients without access to these treatments may not be receiving the best available care for optimal cosmetic results. Future high-quality research and updated international treatment guidelines and reimbursement schemes should reflect this status. Acne Vulgaris;Cicatrix;Consensus;Humans;Low-Level Light Therapy;Treatment Outcome

Low-level laser therapy and static stretching exercises for patients with knee osteoarthritis: A randomised controlled trial. OBJECTIVES: To investigate the laser effect associated with stretching exercise on pain and functionality in patients with knee osteoarthritis. DESIGN: A randomised controlled trial. SETTING: Special Rehabilitation Services. SUBJECTS: We enrolled 215 knee osteoarthritis patients (430 knees were treated). INTERVENTION: Group Laserâ€‰+â€‰Stretch (nâ€‰=â€‰43), Placeboâ€‰+â€‰Stretch (nâ€‰=â€‰43), Stretch (nâ€‰=â€‰43), Laser (nâ€‰=â€‰43) and Control (nâ€‰=â€‰43) were treated with active laser and stretching exercises; placebo laser and stretching exercises; stretching exercises; active laser, and control, respectively. Interventions were conducted 3 times a week for 8 or 11 weeks. MAIN OUTCOME MEASURES: The primary outcome was the change in knee pain and disability. Secondary outcomes included severity

of osteoarthritis, mobility, knee range of motion, flexibility, activity, severity of osteoarthritis and medication intake for pain relief. RESULTS: The patients' average age was 63.52 (6.8) years. Pain scores at baseline and post treatment (pâ€‰<â€‰0.001) were 7.43 (2.10) and 2.79 (1.92) for group Laserâ€‰+â€‰Stretch, 7.39 (1.98) and 4.47 (2.82) for group Placeboâ€‰+â€‰Stretch, 6.83 (1.42) and 4.24 (2.43) for group Stretch, 6.61 (1.68) and 2.94 (2.65) for group Laser, 6.74 (1.75) and 6.47 (2.29) for group Control, respectively. Disability score at baseline and post treatment (pâ€‰=â€‰0.000237) were 12.36 (5.02) and 8.08 (4.64) for group Laserâ€‰+â€‰Stretch, 12.71 (5.12) and 9.90 (4.95) for group Placeboâ€‰+â€‰Stretch, 11.83 (2.77) and 7.20 (5.28) for group Stretch, 11.58 (5.59) and 8.21 (6.18) for group Laser, 11.23 (4.68) and 11.45 (4.83) for group Control, respectively. CONCLUSION: Laser therapy combined with stretching exercises improves pain during rest, activities of daily living, stiffness, muscle shortening and range of motion in patients with knee osteoarthritis. Activities of Daily Living;Exercise Therapy;Humans;Low-Level Light Therapy;Middle Aged;Muscle Stretching Exercises;Osteoarthritis, Knee;Range of Motion, Articular;Treatment Outcome

The effects of photobiomodulation using LED on the repair process of skin graft donor sites. The benefits of photobiomodulation (PBM) applied to wounds are well-described in the literature; however, its effects in skin graft donor sites have been poorly studied. The aim of this study is to evaluate the effects of LED PBM on re-epithelialization and wound quality of the skin donor site and on pain during repair process. This is a case series study that part of the patients received standard treatment and the others received standard treatment combined with PBM. Data collection was performed at the Burn Unit at a Public Hospital, Brazil. The study had 21 participants and 25 donor sites, 13 in the control group (conventional treatment with MembracelÂ® bandage) and 12 in the experimental group (MembracelÂ®â€‰+â€‰LED). Irradiation parameters were 1.53Â J/cm(2), 2.55Â mW/cm(2), 660Â nm, 600Â s in the immediate postoperative period as well as on the 1st, 3rd, 5th, and 7th days postoperatively. Pain was measured using the visual analog scale. The Bates-Jensen scale was used to monitor the re-epithelialization process and measurements were performed of donor skin sites in the postoperative period. Quantitative variables were expressed as meanâ€‰Â±â€‰standard deviation or median and interquartile range [p25; p75]. The comparison of the distribution of these variables between groups was performed using the Mann-Whitney test. No differences between groups were found for re-epithelialization time, area or quality of the wound. Regarding pain, a significant reduction was found on the 5(th) postoperative day in the experimental group compared to the control group. PBM did not induce changes in the re-epithelialization period, wound area or wound quality scores of the Bates-Jensen Scale but did induce a reduction in pain compared to the group treated with MembracelÂ® alone. Humans;Re-Epithelialization;Skin;Skin Transplantation;Transplant Donor Site;Wound Healing

Laser Therapy as a Preventive Approach for Oral Mucositis in Cancer Patients Undergoing Chemotherapy: The Potential Role of Superoxide Dismutase. PURPOSE: Oral mucositis is a painful condition that occurs in patients who undergo chemotherapy. Due to the worsening of oral mucositis, the patient may progress to a worse clinical condition and interrupt antineoplastic treatment. There is little literature on low-power laser therapy in chemotherapy for other solid tumors. The purpose of this study was to investigate whether low-level laser therapy (LLLT) applied before chemotherapy could prevent oral mucositis in patients with solid tumors. METHODS: Laser therapy was applied at a frequency of 630nm, with a dose of 2J / cm2, for the prevention of oral mucositis induced by chemotherapy specifically for non-hematological tumors. Epidemiological data, total neutrophils, general side effects, development of oral mucositis and degree, and the performance of low-power laser therapy to prevent oral mucositis were collected. The involvement of oxidative stress was evaluated by the enzyme superoxide dismutase (SOD) through blood samples,

before and after chemotherapy treatments. RESULTS: LLLT in the proposed protocol is efficient in reducing the development of oral mucositis (only at grade I/II) in patients under chemotherapy and able to reduce the severity of oral mucosal lesions, in patients who developed mucositis after the use of the laser for prevention. All individuals who underwent LLLT protocol did not show a significant reduction of SOD activity after the last chemotherapy cycle. CONCLUSIONS: The prophylactic laser therapy protocol proposed by the study, defined at a frequency of 630nm, a dose of 2J / cm2, demonstrated the ability to decrease the occurrence of oral mucositis in patients undergoing chemotherapy protocols to solid tumors. This effect could be related to preserved SOD activity, as it was observed that oral mucositis is related to leukopenia and reduced SOD activity and LLLT protocol prevented the decrease of SOD activity. Antineoplastic Agents;Doxorubicin;Cyclophosphamide;Carboplatin;Superoxide Dismutase;Paclitaxel;Cisplatin;Fluorouracil Adult;Aged;Aged, 80 and over;Antineoplastic Agents;Antineoplastic Combined Chemotherapy Protocols;Carboplatin;Cisplatin;Cyclophosphamide;Doxorubicin;Female;Fluorouracil;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Oxidative Stress;Paclitaxel;Stomatitis;Superoxide Dismutase

Photobiomodulation Improves the Inflammatory Response and Intracellular Signaling Proteins Linked to Vascular Function and Cell Survival in the Brain of Aged Rats. Photobiomodulation is a non-pharmacological tool widely used to reduce inflammation in many tissues. However, little is known about its effects on the inflammatory response in the aged brain. We conducted the study to examine anti-inflammatory effects of photobiomodulation in aging brains. We used aged rats (20Â months old) with control (handled, laser off) or transcranial laser (660Â nm wavelength, 100 mW power) treatments for 10 consecutive days and evaluated the level of inflammatory cytokines and chemokines, and the expression and activation of intracellular signaling proteins in the cerebral cortex and the hippocampus. Inflammatory analysis showed that aged rats submitted to transcranial laser treatment had increased levels of IL-1alpha and decreased levels of IL-5 in the cerebral cortex. In the hippocampus, the laser treatment increased the levels of IL-1alpha and decreased levels of IL-5, IL-18, and fractalkine. Regarding the intracellular signaling proteins, a reduction in the ERK and p38 expression and an increase in the STAT3 and ERK activation were observed in the cerebral cortex of aged rats from the laser group. In addition, the laser treatment increased the hippocampal expression of p70S6K, STAT3, and p38 of aged rats. Taken together, our data indicate that transcranial photobiomodulation can improve the inflammatory response and the activation of intracellular signaling proteins linked to vascular function and cell survival in the aged brain. Cytokines;Intracellular Signaling Peptides and Proteins Aging;Animals;Brain;Cell Survival;Cytokines;Intracellular Signaling Peptides and Proteins;Low-Level Light Therapy;Male;Neuroinflammatory Diseases;Rats;Rats, Wistar

Extraoral photobiomodulation for prevention of oral and oropharyngeal mucositis in head and neck cancer patients: interim analysis of a randomized, double-blind, clinical trial. PURPOSE: To assess the safety and efficacy of prophylactic extraoral photobiomodulation (PBM) for the prevention of oral and oropharyngeal mucositis (OM) on clinical outcomes and survival in patients with oral cavity and oropharyngeal squamous cell carcinoma (OOPSCC). METHODS: OOPSCC patients who received radiotherapy (RT) were prospectively randomized to two groups: prophylactic extraoral PBM and placebo. OM grade (NCI), pain (VAS), analgesia, and anti-inflammatory prescriptions were assessed weekly. Quality of life questionnaires (QoL) were performed at the first and last day of RT. Following RT, participants were evaluated quarterly for oncological outcomes follow-up. RESULTS: Fifty-five patients met the inclusion criteria. The first occurrence of OM was observed at week 1, for the placebo group (pâ€‰=â€‰0.014). Later, OM onset and severity was observed for the PBM group,

with first occurrence at week 2 (pâ€‰=â€‰0.009). No difference in severe OM incidence was observed (pâ€‰>â€‰0.05). Lower mean pain score was noted at week 7 for the PBM group (2.1) compared to placebo group (4.5) (pâ€‰=â€‰0.009). Less analgesics (week 3; pâ€‰=â€‰0.009/week 7; pâ€‰=â€‰0.02) and anti-inflammatory prescription (week 5; pâ€‰=â€‰0.0346) were observed for the PBM group. Better QoL scores were observed for the PBM group at last day of RT (pâ€‰=â€‰0.0034). No difference in overall survival among groups was observed in 1Â year of follow-up (pâ€‰=â€‰0.889). CONCLUSION: Prophylactic extraoral PBM can delay OM onset, reduce pain, and reduce analgesic and anti-inflammatory prescription requirements. Extraoral PBM was associated with better QoL. There was no evidence of PBM impact on oncological outcomes. TRIAL REGISTRATION: TRN:RBR-4w4swx (date of registration: 01/20/2020).
Double-Blind Method;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mucositis;Quality of Life;Stomatitis

Immediate effects of red (660 nm) and infrared (808 nm) photobiomodulation therapy on fatigue of the orbicularis oris muscle: a randomized clinical study. PURPOSE: To compare the immediate effects of laser photobiomodulation at wavelengths of 660 nm and 808 nm on fatigue of the orbicularis oris. METHODS: This is a randomized study with 60 women aged between 19 and 43 years. The participants were divided into four groups. Group RG received photobiomodulation with a laser wavelength of 660 nm at four points of the orbicularis oris; group IRG received photobiomodulation with a laser wavelength of 808 nm at the same points; the control group did not receive light treatment; and the placebo group underwent the same procedures as RG and IRG but with the equipment switched off. The irradiation was performed with a laser of 100 mW of power, 4 J of energy per point and 133.3 J/cm2 of fluency. An electromyography evaluation was performed before and after the irradiation, concomitantly with the exercise of lip protrusion maintained until the sensation of fatigue. Fatigue was evaluated by a median frequency using the electromyographic fatigue index. The amplitude of the signal was evaluated, examining the root mean square, and the values were normalized by the peak. The difference in amplitude between the upper and lower lips was also analyzed. All variables were compared before and after irradiation. RESULTS: No significant difference was found between the measures taken before and after irradiation. CONCLUSION: Photobiomodulation with the parameters investigated in this study had no immediate effect on orbicular oris fatigue. Adult;Facial Muscles;Female;Humans;Lip;Low-Level Light Therapy;Muscle Fatigue;Young Adult

Effect of Photobiomodulation on Periodontal Ligament Cells Under Inflamed and Nutrient-Deficient Conditions Simulating Damaged Cells of Avulsed Teeth: An In Vitro Study. Background: The prognosis of replanted teeth is depended on the vitality of periodontal ligament cells residual on the root surface. Photobiomodulation has photobiological effects that can promote cell vitality. The study aimed to explore the effect of photobiomodulation on the periodontal ligament cells under inflamed or starved conditions mimicking clinically damaged periodontal ligament cells of avulsed teeth and provide the adjuvant procedure for tooth replantation. Materials and methods: Normal, starved, or inflamed periodontal ligament cells were irradiated with an 808â€‰nm laser at densities of 0, 1, 3, 5, or 10â€‰J/cm(2). The cell counting kit-8 (CCK-8) assay and scratch test were applied to determine the effects on the proliferation and migration of cells. Anti-inflammatory effects were assessed according to the mRNA expression of tumor necrosis factor-Î± (TNF-Î±), interleukin-1Î² (IL-1Î²), and interleukin-6 (IL-6) measured by reverse-transcription polymerase chain reaction. Osteogenic capacity was evaluated by alkaline phosphatase (ALP) staining, ALP activity assay, Alizarin Red S staining, and ALP and osteocalcin (OCN) mRNA expression. Results: The CCK-8 assay and scratch test demonstrated that the 808â€‰nm laser significantly promoted proliferation and migration of normal condition periodontal ligament cells at a density of 3â€‰J/cm(2) versus 5â€‰J/cm(2) under the starved and

inflamed conditions. Moreover, the 808â€‰nm laser had anti-inflammatory effects and promoted osteogenesis of periodontal ligament cells at 3â€‰J/cm(2) under normal conditions, while photobiomodulation at 5â€‰J/cm(2) upregulated the osteogenesis of periodontal ligament cells under starved and inflamed conditions. Conclusions: The photobiomodulation of 808â€‰nm laser reduced inflammation and improved the proliferation, migration, and osteogenesis of normal, starved, and inflamed periodontal ligament cells. These effects required a higher energy density under starved or inflamed conditions compared with normal conditions. The photobiomodulation of 808â€‰nm has a potential application in root surface treatment for replanted teeth. Cell Differentiation;Cell Proliferation;Nutrients;Osteogenesis;Periodontal Ligament

A split-face comparison of fractional erbium: YAG laser plus Kligman's formula vs. Kligman's formula monotherapy for facial melasma. Melasma is a chronic hyperpigmentation disorder. Although several treatment methods are used for patients, it remains a challenging problem for physicians. Erbium-YAG laser is one of the laser treatment methods that proved its efficacy in melasma treatment. We aimed to compare the efficacy of combining the fractional Er: YAG laser and Kligman's formula with Kligman's formula alone in the treatment of melasma. Twenty female patients with bilateral melasma were randomly treated in a split-face controlled manner with a fractional Er: YAG laser followed by Kligman's formula on one side and Kligman's formula on the other side. All patients received three laser sessions with four-week intervals. The efficacy of treatments was determined through photographs, Visioface, and Melasma Area Severity Index (MASI) score, all performed at baseline and three months after the end of laser sessions. Fractional Er: YAG laser and Kligman's formula showed a significant decrease in MASI score than Kligman's formula alone (Pâ€‰=â€‰0.005). There was a significant decrease in cheek Visioface score on Er: YAG laser and Kligman's formula vs Kligman's formula (Pâ€‰=â€‰0.02). However, the Patient Global Assessment Scale of both sides was not statistically significant (Pâ€‰=â€‰0.23). The combination of Fractional Er: YAG laser with Kligman's formula is an effective treatment method for melasma. Erbium Erbium;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Clinical Evaluation of Intravascular Blood Irradiation with Laser, Photobiomodulation, and Photodynamic Therapy in Cancer Patients with Mucositis. Objective: To assess the clinical application of intravascular laser irradiation of blood (ILIB), photodynamic therapy (PDT), and photobiomodulation therapy (PBM-T) in mucositis in cancer patients. Background: PBM-T and PDT are used for the management of oral mucositis (OM) and there are no studies associating intravascular laser irradiation of blood (ILIB) for this purpose. Materials and methods: Thirty-six patients were allocated by convenience into three groups according to the established therapy: PDT+PBM-T (nâ€‰=â€‰10); PDT+PBM-T+ILIB (nâ€‰=â€‰10), and ILIB (nâ€‰=â€‰16). PDT was performed with the photosensitizer curcumin and irradiation of the oral cavity with blue light-emitting diode (LED) (power 1200â€‰mW and wavelength 468â€‰nm). PBM-T was performed using low-intensity laser (power 100â€‰mW, wavelength 660â€‰nm, and spot energy 1â€‰J) at 26 points of the oral cavity. ILIB was applied with a bracelet on the radial artery using the low-intensity laser (100â€‰mW of power, 660â€‰nm wavelength, and 30â€‰J of total energy). All therapies were performed weekly for 5 weeks. The results of the OM degrees were analyzed using the Wilcoxon test. Results: There was a significant reduction in the degrees of OM after treatment with PDT+PBM-T (pâ€‰=â€‰0.0117), PDT+PBM-T+ILIB (pâ€‰=â€‰0.0277), and ILIB (pâ€‰=â€‰0.0277). Conclusions: It was concluded that ILIB, PDT, and PBM-T reduced the severity of mucositis and prevented its onset. Clinical Trial Registration number: RBR-54XS25. Humans;Lasers;Mucositis;Neoplasms;Photochemotherapy;Stomatitis

Near-Infrared Light and Skin: Why Intensity Matters. Infrared light (760 nm-1 mm) constitutes approximately 40% of the solar radiation reaching the ground at sea level. Shortest wavelength near-infrared (NIR) photons (NIR or IR-A: 760-1,400 nm) can penetrate the epidermis, dermis, and subcutaneous tissue with numerous biological effects. NIR used to have a bad reputation on the basis of past studies using high-intensity artificial light sources (above the solar IR-A irradiance threshold) at high doses leading to detrimental effects (i.e., upregulation of matrix metalloproteinase-1). However, when looking at the other side of the coin and what we can learn from the sun, NIR intensity matters. Hence, mimicking sunlight NIR intensity (30-35 mW/cm2) will rather trigger beneficial cutaneous effects. It is likely that intensity is more important than the fluence (dose) delivered. Moreover, the law of reciprocity (i.e., the biological effect is directly proportional to the total dose irrespective of intensity) does not always apply when considering tissue response in photobiology. In fact, the biphasic dose curve (Arndt-Schulz curve) of photobiomodulation establishes that if irradiance is lower than the physiological threshold value for a given target, it does not produce beneficial effects, even when -irradiation duration is extended. Also, photo-inhibitory deleterious effects may occur at higher irradiances. Remarkably, the beneficial "sweet spot" in between corresponds to the irradiance of the sun. NIR might even precondition the skin from an evolutionary standpoint as exposure to early morning NIR wavelengths in sunlight may prepare the skin for upcoming mid-day harmful UVR. Consequently, NIR light appears to be the solution, not the problem. Humans;Infrared Rays;Photoperiod;Skin;Sunlight

Low-Intensity Laser Therapy As a Method to Reduce Stress Responses after Septoplasty. The aim of the study was to evaluate the effectiveness of the use of photobiomodulation therapy (PBMT) to minimize acute pain in the early postoperative period in patients after septoplasty. In total, 62Â patients underwent septoplasty under general anesthesia (40 men and 22 women, 18-44 years old) followed by nasal tamponade. Patients of the 1st group did not undergo PBMT, and patients of the 2nd group received PBMT 3, 6, and 24 h after septoplasty (infrared pulsed laser radiation, Î» = 0.890 Î¼m, P = 10 W, 2Â min in the projection of the wings of the nose). After 48 h, after the removal of tampons, intranasal PBMT with a nozzle in the red range, with Î» = 0.63 Î¼m, P = 8 mW, 2 min. ULF, HF, LF, and total power of heart rate variability (HRV), pain syndrome was assessed. ULF, LF, HF, total HRV power were significantly lower in group 2, compared to group 1. In the period from 6 to 24 h after septoplasty, patients of group 1 experienced higher pain than patients with PBMT ($p < 0.001$). The use of PBMT after septoplasty against the background of nasal tamponade helps to reduce the severity of pain syndrome and the inflammatory response to surgical stress and, consequently, leads to less pronounced changes in the autonomic nervous system in response to surgical stress. Low-Level Light Therapy

Effectiveness of preconditioned adipose-derived mesenchymal stem cells with photobiomodulation for the treatment of diabetic foot ulcers: a systematic review. The primary goal of this systematic review article was to provide an outline of the use of diabetic autologous adipose-derived mesenchymal stem cells (DAAD-MSCs) in the treatment of wounds and ulcers in animal models and patients with diabetes mellitus (DM). The secondary goal was to present the outcomes of pretreatment of diabetic adipose-derived mesenchymal stem cells (DAD-MSCs) with probable different agents in the treatment of diabetic foot ulcers (DFUs) and wounds. In view of possible clinical applications of AD-MSC-mediated cell therapy for DFUs, it is essential to evaluate the influence of DM on AD-MSC functions. Nevertheless, there are conflicting results about the effects of DAAD-MSCs on accelerating wound healing in animals and DM patients. Multistep research of the MEDLINE, PubMed, Embase, Clinicaltrials.gov, Scopus database, and Cochrane databases was conducted for abstracts and full-text scientific papers published between 2000 and 2020. Finally, 5 articles confirmed that the usage of allogeneic or autologous AD-MSCs had encouraging outcomes on

diabetic wound healing. One study reported that DM changes AD-MSC function and therapeutic potential, and one article recommended that the pretreatment of diabetic allogeneic adipose-derived mesenchymal stem cells (DAlD-MSCs) was more effective in accelerating diabetic wound healing. Recently, much work has concentrated on evolving innovative healing tactics for hastening the repair of DFUs. While DM alters the intrinsic properties of AD-MSCs and impairs their function, one animal study showed that the pretreatment of DAlD-MSCs in vitro significantly increased the function of DAlD-MSCs compared with DAlD-MSCs without any treatment. Preconditioning diabetic AD-MSCs with pretreatment agents like photobiomodulation (PBM) significantly hastened healing in delayed-healing wounds. It is suggested that further animal and human studies be conducted in order to provide more documentation. Hopefully, these outcomes will help the use of DAAD-MSCs plus PBM as a routine treatment protocol for healing severe DFUs in DM patients. Animals;Diabetes Mellitus;Diabetic Foot;Humans;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells

Effect of Blue Light on Acne Vulgaris: A Systematic Review. Acne is a dermatosis that affects almost 90% of the adolescent population worldwide and its treatment is performed with retinoids, antimicrobials, acids, and topical or systemic antibiotics. Side effects such as skin irritation in addition to microbial resistance to antibiotics are the main side effects found. Phototherapy with blue light is being used as an alternative treatment. Our objective was to analyze the use of blue light to treat inflammatory acne. We conducted a systematic literature review, following the recommendation PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses), including in the sample randomized clinical trial studies that compared blue light with another intervention as control. The research was carried out in the PUBMED and WEB of SCIENCE databases and the methodological quality of the studies evaluated were made by the Cochrane Collaboration Bias Risk Scale. After the exclusion of duplicates, the titles and abstracts of 81 articles were evaluated, and 50 articles were selected for full reading, including in the review at the end 8 articles. Studies have shown significant improvements in the overall picture of acne. It is concluded that despite the great potential in its use in the treatment of acne, there is a need for more detailed trials on the effect of blue light on the treatment of inflammatory acne. Anti-Bacterial Agents Acne Vulgaris;Adolescent;Anti-Bacterial Agents;Data Management;Humans;Light;Phototherapy;Randomized Controlled Trials as Topic;Treatment Outcome

Influence of photobiomodulation therapy on the treatment of pulmonary inflammatory conditions and its impact on COVID-19. We are currently facing a pandemic that continuously causes high death rates and has negative economic and psychosocial impacts. Therefore, this period requires a quick search for viable procedures that can allow us to use safe and non-invasive clinical tools as prophylactic or even adjuvant methods in the treatment of COVID-19. Some evidence shows that photobiomodulation therapy (PBMT) can attenuate the inflammatory response and reduce respiratory disorders similar to acute lung injury (ALI), complications associated with infections, such as the one caused by the new Coronavirus (SARS-CoV-2). Hence, the aim of the present study was to evaluate the influence of PBMT (infrared low-level laser therapy) on the treatment of ALI, one of the main critical complications of COVID-19 infection, in an experimental model in rats. Twenty-four male Wistar rats were randomly allocated to three experimental groups (nâ€‰=â€‰8): control group (CG), controlled ALI (ALI), and acute lung injury and PBM (ALIP). For treatment, a laser equipment was used (808Â nm; 30 mw; 1.68Â J) applied at three sites (anterior region of the trachea and in the ventral regions of the thorax, bilaterally) in the period of 1 and 24Â h after induction of ALI. For treatment evaluation, descriptive histopathological analysis, lung injury score, analysis of the number of inflammatory cells, and expression of interleukin 1 Î² (IL-1Î²) were performed. In the results, it was possible to observe that the treatment with PBMT reduced inflammatory infiltrates, thickening of the

alveolar septum, and lung injury score when compared to the ALI group. In addition, PBMT showed lower immunoexpression of IL-1Î². Therefore, based on the results observed in the present study, it can be concluded that treatment with PBMT (infrared low-level laser therapy) was able to induce an adequate tissue response capable of modulating the signs of inflammatory process in ALI, one of the main complications of COVID-19. Animals;COVID-19;Low-Level Light Therapy;Lung;Male;Rats;Rats, Wistar;SARS-CoV-2

Treatment with LEDs at a wavelength of 642â€…nm enhances skin tumor proliferation in a mouse model. Photobiomodulation (PBM) is attracting increased attention in the fields of dermatology and cosmetics. PBM with a variety of light parameters has been used widely in skin care, but can cause certain types of unwanted cells to proliferate in the skin; this can lead to skin tumors, such as papillomas and cancers. We constructed a mouse model of human skin tumors using DMBA as an initiator and TPA as a promoter, and confirmed that LEDs with a wavelength of 642 nm (red light) increased tumor size, epidermal thickness, and systemic proinflammatory cytokine levels. These results indicated that skin tumor cell proliferation may result from the use of 642 nm LEDs, suggesting the need for regulation of skin care based on LED light therapy.

Sequential PBM-Saffron Treatment in an Animal Model of Retinal Degeneration. Background and Objectives: Saffron treatment and photobiomodulation (PBM) are non-invasive therapeutic approaches able to mitigate and stabilize retinal degenerative diseases such as age-related macular degeneration (AMD). Although different, these therapies partially match their modulated pattern of genes. Recent attempts to find an additive effect by coadministration of saffron and PBM have failed. Instead, in this study, a different protocol to increase neuroprotection by providing consecutive saffron and PBM treatment administration is suggested. Materials and Methods: Albino rats, whose retinal damage was caused by light exposure (LD, light damage), were subjected to differential treatment protocols before and after LD: (1) PBM followed by saffron; and (2) single treatments of PBM. Thinning of the photoreceptor layer and neuro-inflammatory markers for gliosis and microglia were assessed via immune-histochemical techniques. Results: Results confirm that PBM and saffron alone cope with retinal neurodegenerative processes, preserving retinal thickness and gliosis and microglia invasion in a differential way. However, the synergistic effect of the combined treatment was restricted to the early neuroinflammation, even when provided sequentially. Conclusion: The broad spectra of action of both neuroprotectants require further investigation to identify other key pathways helpful in enhancing the effects of these two approaches in combination. Animals;Crocus;Disease Models, Animal;Macular Degeneration;Rats;Retina;Retinal Degeneration

Latest Innovations and Nanotechnologies with Curcumin as a Nature-Inspired Photosensitizer Applied in the Photodynamic Therapy of Cancer. In the context of the high incidence of cancer worldwide, state-of-the-art photodynamic therapy (PDT) has entered as a usual protocol of attempting to eradicate cancer as a minimally invasive procedure, along with pharmacological resources and radiation therapy. The photosensitizer (PS) excited at certain wavelengths of the applied light source, in the presence of oxygen releases several free radicals and various oxidation products with high cytotoxic potential, which will lead to cell death in irradiated cancerous tissues. Current research focuses on the potential of natural products as a superior generation of photosensitizers, which through the latest nanotechnologies target tumors better, are less toxic to neighboring tissues, but at the same time, have improved light absorption for the more aggressive and widespread forms of cancer. Curcumin incorporated into nanotechnologies has a higher intracellular absorption, a higher targeting rate, increased toxicity to tumor cells, accelerates the activity of caspases and DNA cleavage, decreases the mitochondrial activity of cancer cells, decreases their viability and proliferation, decreases angiogenesis, and finally induces apoptosis. It reduces the size of the primary tumor, reverses multidrug resistance in chemotherapy and decreases resistance to

radiation therapy in neoplasms. Current research has shown that the use of PDT and nanoformulations of curcumin has a modulating effect on ROS generation, so light or laser irradiation will lead to excessive ROS growth, while nanocurcumin will reduce the activation of ROS-producing enzymes or will determine the quick removal of ROS, seemingly opposite but synergistic phenomena by inducing neoplasm apoptosis, but at the same time, accelerating the repair of nearby tissue. The latest curcumin nanoformulations have a huge potential to optimize PDT, to overcome major side effects, resistance to chemotherapy, relapses and metastases. All the studies reviewed and presented revealed great potential for the applicability of nanoformulations of curcumin and PDT in cancer therapy.

Visible Light-Mediated Sustainable Antibacterial Activity and Osteogenic Functionality of Au and Pt Multi-Coated TiO(2) Nanotubes. The visible light reactions of noble metal-based photocatalysts have been increasingly utilized to investigate their antibacterial activities. Furthermore, the photoreactions at various visible light wavelengths for specific combinations of titania nanotubes and noble metal nanoparticles have been found to promote osteogenic functionality. In this investigation, a novel multi-coating combination of noble metals (gold and platinum) on titania nanotubes was assessed using plasmonic photocatalysis and low-level laser therapy at 470 and 600 nm. The results showed that this coating on the nanotubes promoted antibacterial activity and osteogenic functionality. The order in which the gold and platinum coatings were layered onto the titania nanotubes strongly affected the osteogenic performance of the human mesenchymal stem cells. These results have identified a new approach for the development of efficient novel combinations of noble metal nanoparticles and titania nanotubes with visible light responses, sustainable antimicrobial activity, and osteogenic functionality.

Cellular Signalling and Photobiomodulation in Chronic Wound Repair. Photobiomodulation (PBM) imparts therapeutically significant benefits in the healing of chronic wounds. Chronic wounds develop when the stages of wound healing fail to progress in a timely and orderly frame, and without an established functional and structural outcome. Therapeutic benefits associated with PBM include augmenting tissue regeneration and repair, mitigating inflammation, relieving pain, and reducing oxidative stress. PBM stimulates the mitochondria, resulting in an increase in adenosine triphosphate (ATP) production and the downstream release of growth factors. The binding of growth factors to cell surface receptors induces signalling pathways that transmit signals to the nucleus for the transcription of genes for increased cellular proliferation, viability, and migration in numerous cell types, including stem cells and fibroblasts. Over the past few years, significant advances have been made in understanding how PBM regulates numerous signalling pathways implicated in chronic wound repair. This review highlights the significant role of PBM in the activation of several cell signalling pathways involved in wound healing. Animals;Cell Proliferation;Humans;Low-Level Light Therapy;Signal Transduction;Wound Healing

The Effects of Photobiomodulation on Bone Defect Repairing in a Diabetic Rat Model. The purpose of this study is to examine the prospective therapeutic effects of photobiomodulation on the healing of bone defects in diabetic mellitus (DM) using rat models to provide basic knowledge of photobiomodulation therapy (PBMT) during bone defect repair. For in vitro study, an Alizzarin red stain assay was used to evaluate the effect of PBMT on osteogenic differentiation. For in vivo study, micro-computed tomography (microCT) scan, H&E and IHC stain analysis were used to investigate the effect of PBMT on the healing of the experimental calvarial defect (3 mm in diameter) of a diabetic rat model. For in vitro study, the high glucose groups showed lower osteogenic differentiation in both irradiated and non-irradiated with PBMT when compared to the control groups. With the PBMT, all groups (control, osmotic control and high glucose) showed higher osteogenic differentiation when compared to the non-irradiated groups. For in vivo study, the hyperglycemic group showed

significantly lower bone regeneration when compared to the control group. With the PBMT, the volume of bone regeneration was increasing and back to the similar level of the control group. The treatment of PBMT in 660 nm could improve the bone defect healing on a diabetic rat calvarial defect model. Animals;Bone Regeneration;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;X-Ray Microtomography

Photobiomodulation therapy for hypersensitivity associated with molar-incisor hypomineralization: a case report. Molar-incisor hypomineralization (MIH) is a qualitative defect of the dental enamel on permanent first molars and may be associated with permanent incisors. There is currently no defined therapeutic protocol for managing the hypersensitivity associated with this condition. The present case report describes the treatment of a patient with MIH and the impact on the patient's quality of life as assessed using the Child Perceptions Questionnaire for children aged 11 to 14 years (CPQ(11-14)). The maxillary central incisors, maxillary and mandibular first molars, and mandibular right canine of an 11-year-old girl were compromised by MIH. The long version of the CPQ(11-14) was self-administered before treatment. Initially, the patient reported hypersensitivity of her maxillary right central incisor, maxillary and mandibular left first molars, and mandibular right canine when consuming cold food and beverages. This was confirmed by applying a jet of air to the teeth and asking the patient to report the level of sensitivity using the Wong-Baker FACES Pain Rating Scale. The patient reported that hypersensitivity was present every day or almost every day. Desensitizing treatment included 4 applications of photobiomodulation therapy (infrared diode laser) and 4 applications of fluoride varnish. After desensitization, the maxillary central incisors received direct composite resin restorations, while the maxillary left first molar, which had an amalgam restoration and recurrent caries, received a resin-modified glass ionomer cement restoration. At the conclusion of the treatment, the patient completed the CPQ(11-14) again and reported less difficulty with consuming hot and cold foods and beverages, indicating that treatment had reduced hypersensitivity and its negative impact on her quality of life. Child;Dental Enamel Hypoplasia;Female;Humans;Incisor;Low-Level Light Therapy;Molar;Prevalence;Quality of Life

Laser Phototherapy: Is it the Light at the End of the Tunnel? Humans;Low-Level Light Therapy;Stellate Ganglion;Tachycardia, Ventricular

Photobiomodulation and antimicrobial photodynamic therapy for the prevention of osteonecrosis of the jaw in an oncologic patient. Anti-Infective Agents;Diphosphonates Anti-Infective Agents;Bisphosphonate-Associated Osteonecrosis of the Jaw;Diphosphonates;Humans;Photochemotherapy

Comparison between cryotherapy and photobiomodulation in muscle recovery: a systematic review and meta-analysis. The purpose of this study is to compare the effect of photobiomodulation therapy (PBMT) and cryotherapy (CRT) on muscle recovery outcomes. These searches were performed in PubMed, PEDro, CENTRAL, and VHL (which includes the Lilacs, Medline, and SciELO database) from inception to June 2021. WeÂ includedÂ randomized clinical trials involved healthy human volunteers (>â€‰18Â years) underwent an intervention of PBMT and CRT, when used in both isolated form post-exercise. Standardized mean differences (SMD) or mean difference (MD) with 95% confidence interval were calculated and pooled in a meta-analysis for synthesis. The risk of bias and quality of evidence were assessed through Cochrane risk-of-bias tool and GRADE system. Four articles (66 participants) with a high to low risk of bias were included. The certainty of evidence was classified as moderate to very low. PBMT was estimated to improve the muscle strength (SMDâ€‰=â€‰1.73, CI 95% 1.33 to 2.13, I(2)â€‰=â€‰27%, pâ€‰<â€‰0.00001), reduce delayed onset muscle soreness (MD:â€‰-â€‰25.69%, CI 95%â€‰-â€‰34.42 toâ€‰-â€‰16.97, I(2)â€‰=â€‰89%, pâ€‰<â€‰0.00001), and lower the concentration of biomarkers of muscle damage (SMDâ€‰=â€‰â€‰-â€‰1.48, CI 95%â€‰-â€‰1.93 toâ€‰-â€‰1.03, I(2)â€‰=â€‰76%,

pâ€‰<â€‰0,00,001) when compared with CRT. There was no difference in oxidative stress and inflammatory levels. Based on our findings, the use of PBMT in muscle recovery after high-intensity exercise appears to be beneficial, provides a clinically important effect, and seems to be the best option when compared to CRT. Cryotherapy;Exercise;Humans;Low-Level Light Therapy;Muscle Strength;Muscles

Effects of ozonated olive oil and photobiomodulation using diode laser on gingival depigmented wound: A randomized clinical study. OBJECTIVE: Photobiomodulation (PBM) using diode laser is regarded an effective modality for the repair of tissues and control of pain. Ozone, owing to its biocompatibility, healing, and antimicrobial properties, is used in dentistry as well. This study was carried to clinically compare and evaluate the healing of gingival depigmented wounds using ozonated oil and PBM. MATERIALS AND METHODS: A laser depigmentation procedure was conducted on seven patients exhibiting bilateral upper and lower gingival melanin hyperpigmentation, followed by the application of ozonated oil (Group 1) and laser PBM (Group 2). The clinical parameters are taken namely Visual Analog Scale and Healing Index (HI), were evaluated on the 3(rd), 7(th), and 15(th) day. RESULTS: Statistical analysis showed better HI in Group I as compared to Group II on the 3(rd) day, but it was comparable in both groups on the 7(th) and 15(th) day. CONCLUSION: The application of ozonated oil was found to be more efficacious in promoting the initial healing of wound in comparison to PBM. Both ozonated oil and PBM also showed the same capabilities in reduction of the postoperative pain.

Photobiomodulation and Oxidative/Nitrosative Stress. Antioxidants Antioxidants;Nitrosative Stress;Oxidative Stress

Bio-modulated mice epithelial endometrial organoids by low-level laser therapy serves as an invitro model for endometrial regeneration. Endometrial regeneration is a dynamic process that is not well understood. The destruction of the endometrium with the formation of intrauterine adhesions is known as Asherman's syndrome. The lesions range from minor to severe adhesions and their impact on pregnancy is well documented. Operative hysteroscopy is the mainstay of diagnosis and treatment of intrauterine adhesions. Nevertheless, the recurrence rates remain high. It was recorded that low-level laser therapy in low doses has a stimulatory effect on different tissues while the high dose produces a suppressive effect. Organoid is a three-dimensional assembly that displays architectures and functionalities similar to in vivo organs that are being developed from human or animal stem cells or organ-specific progenitors through a self-organization process. Our prospective was to study the effect of Low-Level Laser Therapy (LLLT) on mouse epithelial endometrial organoids regarding cell proliferation and endometrial regeneration as a new modality of treatment. An in vitro clinical trial to generate mouse epithelial organoid model and testing LLLT using He:Ne 632.8 nm device on organoids proliferation, function, and their response to ovarian hormones was performed. Trying endometrial regeneration by culturing organoids with decellularized uterine matrix (DUM) and studying the LLLT effect on the regeneration process. LLLT produced a proliferative effect on the epithelial mouse organoids confirmed by Ki67 and PCNA IHC. The organoids could regenerate the epithelial layer of the endometrium in vitro on DUM and LLLT could help in this process. In conclusion, organoids whether control or bio-stimulated proved a new modality to regenerate the endometrium. Animals;Cell Proliferation;Endometrium;Epithelium;Female;Gynatresia;In Vitro Techniques;Low-Level Light Therapy;Mice;Organoids;Regeneration

Evolution of compressive mechanical properties of early hypertrophic scar during laser treatment. Laser therapy has been widely used in the treatment of hypertrophic scars (HPS), but whether the mechanical properties of HPS tissue after laser treatment can be restored to those of normal skin remains unclear. In this paper, the relationship between the evolution of compressive mechanical properties and histological changes of HPS tissues following three successive combined pulsed dye

laser (PDL) and fractional CO(2) laser (CO(2)) treatments was investigated by compression tests and histological analysis. The early HPS model of rabbit ear was established by CO(2) laser ablation. The loading-unloading tests and strain creep tests under the compression forces of 1Â N, 2Â N, and 3Â N were carried out for normal skin, untreated HPS and HPS after different treatment times, respectively. The results showed that the compression ratio Î» of all tissues revealed force dependence and rose with the increasing compression force, which was similar to the trend of most biological soft tissues. The histological changes of HPSs following laser treatment have a significant influence on the compressive mechanical response. Compared with the normal skin, the toughness and anti-deformation ability of HPS reduced due to the proliferation of collagen fibers and the destruction of elastic fibers, resulting in higher energy dissipation, compression ratio Î», and stable creep rate D, and lower elastic modulus. After three successive combined PDL/ CO(2) laser treatments, the compressive mechanical properties and creep properties of HPS gradually approached that of the normal skin owing to the gradual restoration of the amount and distribution of collagen and elastic fibers in HPS. The results provide a new method for evaluating the clinical efficacy of laser therapy for treatment of HPS tissue. Animals;Cicatrix, Hypertrophic;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Rabbits;Treatment Outcome

2021 July Summary of Photobiomodulation Literature.

The Optimal Energy Density of Photobiomodulation Therapy in Decreasing Orthodontic-Related Pain: A Systematic Review and Network Meta-Analysis. Objective: The aim of this network meta-analysis (NMA) was to explore the optimal energy density (ED) for relief of orthodontic-related pain by photobiomodulation therapy. Background: Orthodontic treatment corrects the deformity of teeth, dental arch, jaw, and face using various orthodontic devices under the action of biomechanics. Materials and methods: A computerized literature search was conducted within the MEDLINE, EMBASE, Scopus, Cochrane Library, Web of Science, CNKI, Wanfang, VIP, and CBM databases to identify randomized controlled trials (RCTs) that used photobiomodulation therapy to relieve pain during orthodontic treatment. Particular inclusion and exclusion criteria were connected to recognize relevant articles. The information was extricated autonomously by two reviewers, and a quality assessment was carried out by utilizing the Cochrane Collaboration "risk of bias" tool. The RevMan 5.4 software and STATA 15.0 were utilized for data analysis. Also, the NMA was performed with mvmeta commands in Stata (StataCorp, TX). Results: Of the 1024 recognized articles, 21 RCTs were at long last included. Within the risk-of-bias assessments, 2 studies displayed a high risk, 17 an unclear risk, and 2 a low risk. The global and local inconsistency of the NMA in 1 and 2 days was not significant; however, the NMA in 3 days showed a significant inconsistency. Laser with lower ED (0-10â€‰J/cm(2)) appeared to be the most noteworthy possibility to become the optimal intervention, and it also had the highest mean rank in the rankogram and the biggest value of surface under the cumulative ranking in all three NMA structures. Conclusions: On account of the limited evidence of included trials, laser with lower ED (0-10â€‰J/cm(2)) appeared to be more valid than the remaining treatment modalities (laser with higher ED, placebo, and control) for pain reduction in 1, 2, and 3 days after orthodontic procedures were applied. In the future, more high-quality research with consistency in research design is needed for further evaluation. Humans;Low-Level Light Therapy;Network Meta-Analysis;Pain

Effect of Transcranial Near-Infrared Light 1068â€‰nm Upon Memory Performance in Aging Healthy Individuals: A Pilot Study. Background: We present a pilot study of near-infrared (NIR) 1068â€‰nm transcranial photobiomodulation therapy (PBM-T). Impact upon motor function, memory, and processing speed in healthy individuals, older than 45 years of age, was evaluated. Methods: PBM-T was performed at home using a transcranial phototherapy device, a helmet that comprised 14 air cooled light emitting diode panel arrays, with a peak wavelength of 1068â€‰nm,

full width at half maximum bandwidth of 60â€‰nm and total average optical output power of 3.8 W. The device was used for 6â€‰min twice daily on age-matched middle-aged subjects with normal intellectual function. The US Food and Drug Administration (FDA)-approved computerized assessment tool Automated Neuropsychological Assessment Metrics (ANAM) was adopted to quantify a series of cognitive and motor activities in the participating groups. Results: A significant improvement in motor function, memory performance, and processing speed was observed in healthy individuals with PBM-T compared to the placebo group. No adverse effects were reported. Conclusions: PBM-T may be a promising new approach to improve memory in healthy middle-aged individuals. ClinicalTrials.gov ID: NCT04568057. Aging;Cognition;Humans;Infrared Rays;Low-Level Light Therapy;Middle Aged;Pilot Projects;United States

Treatment of Kleine-Levin Syndrome With Intranasal Photobiomodulation and Methylene Blue. Kleine-Levin syndrome (KLS) is a rare neuropsychiatric disorder, characterized by recurrent episodes of idiopathic hypersomnia, and cognitive and behavioral abnormalities, such as memory loss and child-like language. There is no definitive etiology for KLS; however, there are hypotheses of genetic predisposition, autoimmune mechanisms, and abnormal thalamic and hypothalamic functioning. Similarly, there is no definitive treatment for KLS as one method may be beneficial for one patient and not for another. We present a case of KLS in a patient who has no clinical improvement in symptoms with a variety of treatments. The parents of the patient agreed to attempt a trial of intranasal photobiomodulation (i-PBM) with red light, in combination with methylene blue (MB). The patient showed remission of the KLS episode following treatment with no further KLS episodes reported after treatment.

The effectiveness of long Pulsed Nd:YAG Laser alone for treatment of keloids and hypertrophic scars versus its combination with bleomycin. BACKGROUND AND OBJECTIVES: Pathological scars are benign hyper-proliferative growths of dermal collagen that causes severe psychological and physical problems. This study was performed to assess and compare safety and clinical efficiency of combined pulsed Nd-YAG laser and intralesional bleomycin versus pulsed Nd-YAG laser alone to treat the hypertrophic scars and keloids. PATIENTS AND METHODS: Randomly, 40 patients with hypertrophic scars or keloids were divided into two groups A and B. Group A were handled by pulsed Nd:YAG laser and intralesional bleomycin while group B were handled by pulsed Nd:YAG laser only. Response was assessed subjectively by clinical imaging and modified Vancouver Scar Scale (mVSS). While for objective evaluation, skin biopsies were taken from volunteer patients before and after treatment, and were examined by Hematoxylin and eosin staining (H&E) and Masson trichrome staining. RESULTS: Our study demonstrated almost complete improvement in 4 (20%) patients, partial improvement in 16 (80%) patients and 0 patient with no improvement in group A. Furthermore, in group B, we demonstrated almost complete improvement in 2 (10%) patients, partial in 14 (70%) patients and no improvement in 4 (20%) patients. Modified Vancouver Scar Scale reduced from 10.15 to 3.5 in group A and from 11.05 to 4.95 in group B. Elastica Masson-Goldner staining and Hematoxylin and eosin staining showed that treatment in both groups structurally changed tissue collagen. CONCLUSION: Long-pulsed Nd-YAG laser combined with intralesional bleomycin could be a promising way for treatment of keloids or hypertrophic scars. Bleomycin Bleomycin;Cicatrix, Hypertrophic;Humans;Keloid;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Whole-organ transdermal photobiomodulation (PBM) of COVID-19: A 50-patient case study. A nonrandomized 50-person case study of COVID-19-positive patients was conducted employing (for the first time) a regimen of whole-organ deep-tissue transdermal dynamic photobiomodulation (PBM) as a primary (or exclusive) therapeutic modality in the treatment of coronavirus. Therapy sessions comprised algorithmically alternating red (650â€‰nm) and near-infrared (NIR; 850â€‰nm)

LEDs with an average irradiance of 11â€‰mW/cm(2) dynamically sequenced at multiple pulse frequencies. Delivered via 3D bendable polymeric pads maintaining orthogonal optical incidence to body contours over 1,000â€‰cm(2) , a single 84-minute session concurrently delivered 20â€‰kJ to the sinuses and 15â€‰kJ to each lung at skin temperatures below 42Â°C. Therapeutic outcomes observed include significant reductions in the duration and severity of disease symptoms. Acute conditions including fever, body aches (BA) and respiratory distress comprising paroxysmal coughing; lung congestion, dyspnea and hypoxia; sinus congestion; acute eye inflammation; and extreme malaise were eliminated in 41/50 patients within 4â€‰days of commencing PBM treatments with 50/50 patients fully recovering within 3â€‰weeks with no supplemental oxygen requirements. SpO(2) concentrations improved as much as 9 points (average 2.5 points) across the entire study population. The PBM sessions required to completely resolve COVID-19 conditions appears monotonically correlated to the time-to-treatment (TTTx)-the delay between the onset of a patient's symptoms and commencing PBM therapy. In contrast, acute inflammatory symptoms were resolved within 4â€‰days irrespective of TTTx. COVID-19;Humans;Low-Level Light Therapy;Lung;SARS-CoV-2

Photobiomodulation Therapy Improves Postoperative Pain and Edema in Third Molar Surgeries: A Randomized, Comparative, Double-Blind, and Prospective Clinical Trial. PURPOSE: Laser light has biological effects that can modulate inflammatory processes. Thus, this study aimed to evaluate the effects of photobiomodulation (PBM) therapy on pain, edema, and trismus after the extraction of retained third molars. METHODS: A split-mouth, double-blind, randomized clinical trial (RCT) was conducted in 13 patients with similar bilateral third molars who received intraoral application PBM therapy at 4 points with a diode laser at 810 nm wavelength, 6 J (100 mW, 60 seconds/point) on 1 side (the PBM side); and laser irradiation simulation on the other side (SHAM side). The pain was assessed through visual analog scale (VAS) at 0, 12, 24, 48, and 72 hours, number of analgesic-relief (NAR), and mean time of first analgesic use; edema, through VAS, and linear facial measurements at 0, 24, 48, and 72 hours; and trismus, through the mouth opening measurements at 0, 24, 48, and 72 hours. The repeated-measures analysis was applied to assess the effect of the treatment, followed by Tukey's post hoc test for multiple comparisons ($P < .05$). RESULTS: Thirteen patients (61.77% male and 38.63% female) with age of 24.16 Â± 2.06 participated in this research. VAS showed that PBM controlled pain better (7.56 Â± 6.25) than SHAM (32.25 Â± 22.78) at 24 hours ($P < .001$) and 48 hours (19.47 Â± 9.27 and 39.87 Â± 4.21, respectively) (PÂ =Â .011). VAS also showed that PBM controlled edema better (19.7 Â± 13.27) than SHAM (32.38 Â± 15.28) at 24 hours (PÂ =Â .037) and 48 hours (19.47 Â± 13.11 and 39.87 Â± 22.77, respectively) (PÂ =Â .002). CONCLUSION: The PBM therapy in this study resulted in pain and edema reduction after third molar surgery and may be considered as adjuvant therapy after the surgical procedure. Double-Blind Method;Edema;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Trismus

Effects of photobiomodulation and a physical exercise program on the expression of inflammatory and cartilage degradation biomarkers and functional capacity in women with knee osteoarthritis: a randomized blinded study. BACKGROUND: The knee osteoarthritis (OA) is a joint disease characterized by degradation of articular cartilage that leads to chronic inflammation. Exercise programs and photobiomodulation (PBM) are capable of modulating the inflammatory process of minimizing functional disability related to knee OA. However, their association on the concentration of biomarkers related to OA development has not been studied yet. The aim of the present study is to investigate the effects of PBM (via cluster) with a physical exercise program in functional capacity, serum inflammatory and cartilage degradation biomarkers in patients with knee OA. METHODS: Forty-two patients were randomly allocated in 3 groups: ESP: exerciseâ€‰+â€‰sham PBM; EAP:

exerciseâ€‰+â€‰PBM and CG: control group. Six patients were excluded before finished the experimental period. The analyzed outcomes in baseline and 8-week were: the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) and the evaluation of serum biomarkers concentration (IL-1Î², IL-6, IL-8, IL-10 e TNF-Î±, and CTX-II). RESULTS: An increase in the functional capacity was observed in the WOMAC total score for both treated groups (pâ€‰<â€‰0.001) and ESP presents a lower value compared to CG (pâ€‰<â€‰0.05) the 8-week post-treatment. In addition, there was a significant increase in IL-10 concentration of EAP (pâ€‰<â€‰0.05) and higher value compared to CG (pâ€‰<â€‰0.001) the 8-week post-treatment. Moreover, an increase in IL-1Î² concentration was observed for CG (pâ€‰<â€‰0.05). No other difference was observed comparing the other groups. CONCLUSION: Our data suggest that the physical exercise therapy could be a strategy for increasing functional capacity and in association with PBM for increasing IL-10 levels in OA knee individuals. TRIAL REGISTRATION: ReBEC (RBR-7t6nzr). Biomarkers;Interleukin-10 Biomarkers;Exercise Therapy;Female;Humans;Interleukin-10;Low-Level Light Therapy;Osteoarthritis, Knee;Physical Functional Performance;Treatment Outcome

Effects of low-level and high-intensity laser therapy as adjunctive to rehabilitation exercise on pain, stiffness and function in knee osteoarthritis: a systematic review and meta-analysis. BACKGROUND: When treating knee osteoarthritis (KOA), rehabilitation exercise is often combined with low-level (LLLT) or high-intensity laser therapy (HILT). However, the effectiveness of these combinations is still uncertain. OBJECTIVE: To examine the effects of LLLT or HILT combined with rehabilitation exercise (LLLT+E or HILT+E) on pain, stiffness and function in KOA. DATA SOURCES: Five databases (PubMed, Web of Science, CINAHL, PEDro and SPORTDiscus) were searched for relevant studies published up to 31 December 2019. STUDY SELECTION: KOA randomised controlled trials, LLLT+E or HILT+E against exercise alone with or without placebo laser, reported clinical outcomes, human studies and English language. DATA SYNTHESIS: Methodological quality was assessed by the PEDro and Cochrane risk-of-bias scales, and the meta-analysis was undertaken using RevMan 5.3. RESULTS: Of the 10 retrieved studies, six investigated LLLT+E, three on HILT+E, and one evaluated both. All the studies had high PEDro scores. However, as most of the studies employed a single type of laser therapy, only indirect comparison of LLLT+E and HILT+E was possible. This study found all treatment modalities were effective in reducing KOA symptoms. Interestingly, relative to control, the meta-analysis showed significant improvements in knee pain, stiffness and function for the HILT+E. CONCLUSION: Both LLLT and HILT are beneficial as adjuncts to rehabilitation exercise in the management of KOA. Based on an indirect comparison, the HILT+E seems to have higher efficacy in reducing knee pain and stiffness, and in increasing function. To confirm this finding, a direct comparative investigation of the two types of laser therapy may be necessary. Systematic review registration PROSPERO ID CRD42020206228. Exercise Therapy;Humans;Laser Therapy;Low-Level Light Therapy;Osteoarthritis, Knee;Pain

Defocused high-power diode laser accelerates skin repair in a murine model through REDOX state modulation and reepithelization and collagen deposition stimulation. Skin wounds represent a burden in healthcare. Our aim was to investigate for the first time the effects of defocused high-power diode laser (DHPL) on skin healing in an animal experimental model and compare it with gold standard low-level laser therapy. Male Wistar rats were divided into 5 groups: Negative control; Sham; 0.1Â W laser (L0.1Â W); DHPL Dual 1Â W (DHPLD1Â W); and DHPL Dual 2Â W (DHPLD2Â W). Rats were euthanized on days 3, 5, 10, 14 and 21. Clinical, morphological, PicroSirus, oxidative stress (MDA, SOD and GSH) and cytokines (IL-1Î², IL-10 and TNF-Î±) analyses were performed. A faster clinical repair was observed in all laser groups at D10 and D14. DHPLD1Â W exhibited lower inflammation and better reepithelization compared to other groups at D10. DHPL protocols modulated oxidative stress by decreasing MDA and increasing SOD and GSH. Collagen maturation was

triggered by all protocols tested and L0.1Â W modulated cytokines release (IL-1Î² and TNF-Î±) at D3. In conclusion, DHPL, especially DHPL1Â W protocol, accelerated skin healing by triggering reepithelization and collagen maturation and modulating inflammation and oxidative stress. Cytokines;Collagen Animals;Collagen;Cytokines;Epithelium;Inflammation;Laser Therapy;Male;Oxidation-Reduction;Oxidative Stress;Rats;Rats, Wistar;Skin;Wound Healing

Use of Blue Light in the Management of Chronic Venous Ulcer in Asian Patients: A Case Series. Chronic venous ulcers, often complicated by late diagnosis and persistent infections, presentÂ major clinical and financial challenges. Recently, photobiomodulation therapy (PBMT) has been shown to be effective in overcoming physiological impairments such as hemostasis and inflammation, accelerating the wound healing process. This case series summarises our experience in the treatment of two Asian patients with lower-extremity chronic venous ulcers using PBMT with blue light.Â Case 1 was a 71-year-old male with a history of hypertension, chronic venous insufficiency and previous deep vein thrombosis. Prior to blue light therapy, the average duration of treatment until wound closure with compression dressings used to be 10-12 weeks. Complete wound closure with the blue light therapy was eight weeks, with a total reduction of 67% of wound size by week 4. Case 2 was a 77-year-old male with a background of hypertension and ischaemic heart disease. Prior to blue light therapy, the patient had also underwent iliac venoplasty and stenting for his recurring bilateral malleolus venous ulcers. By week 4, the right malleolus wound had healed, while the left malleolus wound had a size reduction of 38%. Complete closure of both the wounds was noted at week 6. Blue light was administered to the wounds of both patients for 120 seconds per session, as an adjunct to compression therapy.Â Both patients reported no additional wound pain during the administration of blue light therapy, with an overall reduction of wound pain at three weeks. The cases demonstrated that PBMT with blue light was well-tolerated, safe, and efficacious in improving wound healing with an adjunct to standard treatment of chronic venous ulcers.

Acne scar treatment using high-energy fractional nanosecond Q-switched 1064Â nm laser. AIMS: The objective of this study was to evaluate the effectiveness and safety of high-energy ablative fractional nanosecond Q-switched 1064Â nm laser therapy for acne scars. MATERIAL AND METHODS: Forty-six patients aged from 16 to 69Â years and of Fitzpatrick skin type from 2 to 4 were included in this retrospective study. Multiple passes were delivered with a fractional 1064-nm handpiece at high energy. Results were evaluated using blinded analysis of patient before and after photographs and also by evaluating patient satisfaction. RESULTS: Most patients (75%) were improved or very improved according to blinded evaluation. Patient satisfaction was high. No hypo/hyperpigmentation, scarring, or any other side effects were reported by any of the patients. CONCLUSIONS: The study demonstrated good clinical outcomes in facial acne scar management with a high patient satisfaction rate and no adverse side effects. Acne Vulgaris;Cicatrix;Humans;Laser Therapy;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Patient Satisfaction;Retrospective Studies;Treatment Outcome

Efficacy and safety of different interventions to accelerate maxillary canine retraction following premolar extraction: A systematic review and network meta-analysis. Decreasing orthodontic treatment duration is at the forefront of innovation for clinical orthodontics. This network meta-analysis aimed to determine the relative efficacy and safety of treatments for accelerated orthodontic tooth movement (OTM) in patients undergoing extraction of maxillary first premolars followed by canine retraction in any orthodontic setting. MEDLINE, EMBASE, Cochrane CENTRAL, CINAHL and SCOPUS were searched (from inception to 20 April 2020). Study selection and data extraction were performed in duplicate. Eligible randomized controlled trials (RCTs) were meta-analysed to estimate the rate of tooth movement, 95% credible interval and surface under the cumulative ranking curve (SUCRA) in the first 3Â months following the application of the adjunctive accelerative method.

Eligible RCTs were assessed by Cochrane risk of bias tool, and quality of evidence was assessed by GRADE approach, obtained from CINeMA web application. Interventions were ranked for efficacy and reviewed for safety. Nineteen studies pertaining to eight interventions, with data from 415 patients were included. Quality of evidence was very low to moderate. Very low-to low-quality evidence suggests that corticotomy is an efficacious and safe adjunctive treatment to accelerate OTM in comparison with conventional treatment in the first 2Â months of treatment. Low-quality evidence suggests that piezocision and micro-osteoperforations (MOP) are efficacious and safe adjunctive treatments only in the first month of treatment. Frequent MOP in conjunction with low-level laser therapy appeared to be an efficacious and safe adjunctive treatment only in the first month following its initial application but not thereafter. Bicuspid;Cuspid;Humans;Low-Level Light Therapy;Network Meta-Analysis;Tooth Movement Techniques

Effects of low-level light therapy on dentin hypersensitivity: a systematic review and meta-analysis. OBJECTIVE: To investigate the treatment efficacy of low-level light therapy on dentin hypersensitivity. MATERIALS AND METHODS: Following the PRISMA guideline, six electronic databases supplemented with bibliographies were searched till December 2020. Two reviewers performed the screenings independently with a reliability assessment. Studies fulfilling the pre-registered eligibility criteria were included for risk-of-bias assessment and data synthesis. RESULTS: Thirty-five articles ultimately informed this systematic review based on the eligibility criteria and underwent risk-of-bias assessment (Ä¸â€‰=â€‰0.86). Quantitative results were deduced by meta-analysis of 20 randomised controlled trials: LLLT showed favourable outcomes compared to placebos for immediate (SMD: 1.09, 95% CI: 0.47 to 1.70), interim (SMD: 1.32, 95% CI: 0.41 to 2.23), and persistent efficacies (SMD: 2.86, 95% CI: 1.98 to 3.74). However, substantial heterogeneity existed among included studies (I(2): 64-95%). Regarding comparisons with other desensitising strategies, LLLT showed no significant benefits in DH alleviation over others except fluorides for interim efficacy (SMD: 0.31, 95% CI: 0.10 to 0.52) and persistent efficacy (SMD: 0.45, 95% CI: 0.03 to 0.86). CONCLUSIONS: This systematic review shows that LLLT has positive immediate, interim, and persistent DH-treatment efficacies compared with placebo. No superior treatment effects of LLLT were observed except fluoride agent use. Further studies are warranted-RCTs with low risk of bias, consistent technical settings, comprehensive assessments, and long follow-up periods. CLINICAL RELEVANCE: This systematic review bridges a critical research gap by analysing clinical evidence in the DH-alleviating efficacy of LLLT in comparison with placebo and other in-office desensitising strategies. Fluorides Dentin Sensitivity;Fluorides;Humans;Low-Level Light Therapy;Reproducibility of Results;Treatment Outcome

Photodynamic Therapy with Tumor Cell Discrimination through RNA-Targeting Ability of Photosensitizer. Photodynamic therapy (PDT) represents an effective treatment to cure cancer. The targeting ability of the photosensitizer is of utmost importance. Photosensitizers that discriminate cancer cells can avoid the killing of normal cells and improve PDT efficacy. However, the design and synthesis of photosensitizers conjugated with a recognition unit of cancer cell markers is complex and may not effectively target cancer. Considering that the total RNA content in cancer cells is commonly higher than in normal cells, this study has developed the photosensitizer QICY with RNA-targeting abilities for the discrimination of cancer cells. QICY was specifically located in cancer cells rather than normal cells due to their stronger electrostatic interactions with RNA, thereby further improving the PDT effects on the cancer cells. After intravenous injection into mice bearing a xenograft tumor, QICY accumulated into the tumor location through the enhanced permeability and retention effect, automatically targeted cancer cells under the control of RNA, and inhibited tumor growth under 630 nm laser irradiation without obvious side effects. This intelligent photosensitizer with RNA-targeting ability not only simplifies the design and synthesis of cancer-cell-targeting photosensitizers but also paves the way for the further development of highly efficient PDTs.

Photosensitizing Agents;RNA Animals;COS Cells;Cell Line, Tumor;Chlorocebus aethiops;Female;Humans;Injections, Intravenous;Low-Level Light Therapy;MCF-7 Cells;Mice, Inbred BALB C;Molecular Targeted Therapy;Neoplasms;Photochemotherapy;Photosensitizing Agents;RNA;Xenograft Model Antitumor Assays;Mice
Effect of Fractional Carbon Dioxide Laser vs Sham Treatment on Symptom Severity in Women With Postmenopausal Vaginal Symptoms: A Randomized Clinical Trial. IMPORTANCE: Postmenopausal vaginal symptoms are common and frequently detrimental to a woman's quality of life. Fractional carbon dioxide vaginal laser is increasingly offered as a treatment, but the efficacy remains unproven. OBJECTIVE: To determine the efficacy of fractional carbon dioxide laser for treatment of vaginal symptoms associated with menopause. DESIGN, SETTING, AND PARTICIPANTS: A double-blind, randomized, sham-controlled trial with 12-month follow-up was undertaken at a single tertiary referral hospital in Sydney, Australia. Enrollment commenced on September 19, 2016, with final follow-up on June 30, 2020. Participants were postmenopausal women with vaginal symptoms substantive enough to seek medical treatment. Of 232 participants approached, 85 were randomized. INTERVENTIONS: Three treatments using a fractional microablative carbon dioxide laser system performed 4 to 8 weeks apart, with 43 women randomized to the laser group and 42 to the sham group. MAIN OUTCOMES AND MEASURES: The co-primary outcomes were symptom severity assessed using a visual analog scale (VAS; range, 0-100; 0 indicates no symptoms and 100 indicates the most severe symptoms) and the Vulvovaginal Symptom Questionnaire (VSQ; range, 0-20; 0 indicates no symptoms and 20 indicates the most severe symptoms) at 12 months. The minimal clinically important difference was specified as a 50% decrease in both VAS and VSQ severity scores. There were 5 prespecified secondary outcomes, including quality of life (range, 0-100; higher scores indicate better quality of life), the Vaginal Health Index Score (range, 5-25; higher scores indicate better health), and vaginal histology (premenopausal or postmenopausal status). RESULTS: Of 85 randomized participants (mean [SD] age, 57 [8] years), 78 (91.7%) completed the 12-month follow-up. From baseline to 12 months, there was no significant difference between the carbon dioxide laser group and the sham group in change in symptom severity (VAS score for overall vaginal symptoms: -17.2 vs -26.6; difference, 9.4 [95% CI, -28.6 to 47.5]; VAS score for the most severe symptom: -24.5 vs -20.4; difference -4.1 [95% CI, -32.5 to 24.3]; VSQ score: -3.1 vs -1.6; difference, -1.5 [95% CI, -5.9 to 3.0]). There were no significant differences between the laser and sham group in the mean quality of life score (6.3 vs 1.4; difference, 4.8 [95% CI, -3.9 to 13.5]) and Vaginal Health Index Score (0.9 vs 1.3; difference, -0.4 [95% CI, -4.3 to 3.6]) or in histological comparisons between laser and sham treatment groups. There were 16 adverse events in the laser group and 17 in the sham group, including vaginal pain/discomfort (44% vs 68%), spotting, discharge, and lower urinary tract symptoms. No severe adverse events were reported in either group. CONCLUSIONS AND RELEVANCE: Among women with postmenopausal vaginal symptoms, treatment with fractional carbon dioxide laser vs sham treatment did not significantly improve vaginal symptoms after 12 months. TRIAL REGISTRATION: Australian and New Zealand Clinical Trials Registry: ACTRN12616001403426. Atrophy;Double-Blind Method;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Postmenopause;Quality of Life;Severity of Illness Index;Treatment Failure;Vagina;Vaginal Diseases
Replicating Cortical Signatures May Open the Possibility for "Transplanting" Brain States via Brain Entrainment. Brain states, which correlate with specific motor, cognitive, and emotional states, may be monitored with noninvasive techniques such as electroencephalography (EEG) and magnetoencephalography (MEG) that measure macroscopic cortical activity manifested as oscillatory network dynamics. These rhythmic cortical signatures provide insight into the neuronal activity used to identify pathological cortical function in numerous neurological and psychiatric conditions. Sensory

and transcranial stimulation, entraining the brain with specific brain rhythms, can effectively induce desired brain states (such as state of sleep or state of attention) correlated with such cortical rhythms. Because brain states have distinct neural correlates, it may be possible to induce a desired brain state by replicating these neural correlates through stimulation. To do so, we propose recording brain waves from a "donor" in a particular brain state using EEG/MEG to extract cortical signatures of the brain state. These cortical signatures would then be inverted and used to entrain the brain of a "recipient" via sensory or transcranial stimulation. We propose that brain states may thus be transferred between people by acquiring an associated cortical signature from a donor, which, following processing, may be applied to a recipient through sensory or transcranial stimulation. This technique may provide a novel and effective neuromodulation approach to the noninvasive, non-pharmacological treatment of a variety of psychiatric and neurological disorders for which current treatments are mostly limited to pharmacotherapeutic interventions.

Intranasal photobiomodulation therapy for COVID-19-related olfactory dysfunction: A Brazilian multicenter case series. Olfactory dysfunction is commonly seen in COVID-19 patients; however, little is known about the pathophysiology and management. The present study aimed to report a series of cases in which three protocols of intranasal photobiomodulation therapy (PBMT) were used for COVID-19-related olfactory dysfunction. Irrespective of the PBMT protocol, olfaction recovery was noted in all cases but with varying degrees of improvement. Although intranasal PBMT seems to be a promising therapeutic modality, more research is needed to better define effectiveness. Photosensitizing Agents COVID-19;Humans;Low-Level Light Therapy;Olfaction Disorders;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2;Smell

A Randomized Trial of Photobiomodulation Therapy for Center-Involved Diabetic Macular Edema with Good Visual Acuity (Protocol AE). PURPOSE: To determine if treatment with a photobiomodulation (PBM) device results in greater improvement in central subfield thickness (CST) than placebo in eyes with center-involved diabetic macular edema (CI-DME) and good vision. DESIGN: Phase 2 randomized clinical trial. PARTICIPANTS: Participants had CI-DME and visual acuity (VA) 20/25 or better in the study eye and were recruited from 23 clinical sites in the United States. METHODS: One eye of each participant was randomly assigned 1:1 to a 670-nm light-emitting PBM eye patch or an identical device emitting broad-spectrum white light at low power. Treatment was applied for 90 seconds twice daily for 4 months. MAIN OUTCOME MEASURES: Change in CST on spectral-domain OCT at 4 months. RESULTS: From April 2019 to February 2020, 135 adults were randomly assigned to either PBM (nÂ = 69) or placebo (nÂ = 66); median age was 62 years, 37% were women, and 82% were White. The median device compliance was 92% with PBM and 95% with placebo. OCT CST increased from baseline to 4 months by a mean (SD) of 13 (53) Î¼m in PBM eyes and 15 (57) Î¼m in placebo eyes, with the mean difference (95% confidence interval [CI]) beingÂ -2 (-20 to 16) Î¼m (PÂ = 0.84). CI-DME, based on DRCR Retina Network sex- and machine-based thresholds, was present in 61 (90%) PBM eyes and 57 (86%) placebo eyes at 4 months (adjusted odds ratio [95% CI]Â = 1.30 (0.44-3.83); PÂ = 0.63). VA decreased by a mean (SD) ofÂ -0.2 (5.5) letters andÂ -0.6 (4.6) letters in the PBM and placebo groups, respectively (difference [95% CI]Â = 0.4 (-1.3 to 2.0) letters; PÂ = 0.64). There were 8 adverse events possibly related to the PBM device and 2 adverse events possibly related to the placebo device. None were serious. CONCLUSIONS: PBM as given in this study, although safe and well-tolerated, was not found to be effective for the treatment of CI-DME in eyes with good vision. Angiogenesis Inhibitors Adult;Angiogenesis Inhibitors;Clinical Trials, Phase II as Topic;Diabetes Mellitus;Diabetic Retinopathy;Female;Humans;Low-Level Light Therapy;Macular Edema;Male;Middle Aged;Randomized Controlled Trials as Topic;Tomography, Optical Coherence;Visual Acuity

Aetiology, Prevention and Management of Alveolar Osteitis-A Scoping Review. BACKGROUND: Alveolar osteitis (AO) is a poorly understood, common, painful complication following exodontia. It is

sometimes managed by inappropriate prescription of antibiotics which contributes to the global threat of antimicrobial resistance. Use of intra-alveolar chlorhexidine also presents a serious risk of anaphylaxis to the patient. OBJECTIVE: This scoping review aims to investigate the aetiology, prevention and management of AO and highlight the extent of inappropriate prescribing and intra-alveolar chlorhexidine use. DESIGN: A scoping review was undertaken using the PRISMA guidelines. Medline, Ovid and Pubmed were searched between 2010 and 2020, from which 63 studies were selected for review that related to the aetiology, prevention or management of AO. Data were analysed for frequency of studies reporting information on risk factors for aetiology, prevention strategies and management including inappropriate management using antibiotic prescribing and intra-alveolar chlorhexidine. RESULTS: Impaired immune response, surgical technique and age were identified as significant factors in the development of AO, while there is conflicting evidence regarding the effects of smoking and gender. With regard to prevention, the use of prophylactic antibiotics is not supported within the literature. Saline irrigation and eugenol pastes used preventively have been shown to be cheap and effective alternatives to chlorhexidine with no adverse effects. Hyaluronic acid and low-level laser therapies showed a significant reduction in pain and soft-tissue inflammation in the management of AO compared to Alveogyl. CONCLUSIONS: Further understanding of the pathophysiology of AO is needed, in addition to large high-quality RCTs or long-term observational studies into the aetiology, prevention, and management of AO to produce up-to-date evidence-based clinical guidelines. Clinicians should also be mindful of their contribution to growing antimicrobial resistance and avoid inappropriate prescribing of antibiotics. Saline should replace chlorhexidine as the intra-alveolar irrigant of choice. Chlorhexidine Chlorhexidine;Dry Socket;Humans;Molar, Third;Smoking;Tooth Extraction

Effects of laser photobiomodulation in the management of oral lichen planus: a literature review. OBJECTIVES: This review aims to understand whether Photobio-modulation (PBM) therapy is a valid aid in the management of Oral Lichen Planus (OLP) and its symptoms. Moreover, an analysis to determine whether it is a valid replacement for conventional therapies and whether standardized protocols can be used in PBM sessions or whether these should be changed depending on the type of injury has been made. Finally, an evaluation to determine whether PBM may induce transformation of dysplastic oral keratinocytes into squamous cell carcinoma has been made. MATERIALS AND METHODS: Searches were conducted on two search databases for relevant publications released between 1992 and 2019. The databases used were: Pubmed "Medline", and Google Scholar. Forty-four articles complied with the inclusion criteria and were included for quality assessment and data extraction. RESULTS: All the studies reported positive effects of PBM; how-ever, there was wide heterogeneity in the laser parameters used in the management of the OLP. The effective dose ranges from 2 to 3 J/cm2, in order to see the desired biological effects. CONCLUSIONS: PBM is useful in controlling algal sensation and can be used in cases of OLP lesions that are not responsive to conventional therapies or when corticosteroid doses are too high for the patient, resulting in possible side effects. Standardized biostimulation protocols with further scientific insights are therefore required. Carcinoma, Squamous Cell;Humans;Lasers;Lichen Planus, Oral

Clinical use of photobiomodulation as a supportive care during radiation therapy. Humans;Low-Level Light Therapy;Radiodermatitis;Stomatitis

Effect of Light Emitting Diode Photobiomodulation on the Stability of Dental Implants in Bone Grafted Cases: a Split-Mouth Randomized Clinical Trial. Introduction: The high success rate of implants has made implant-based prostheses attractive to edentulous patients. Osseointegration lasts 4-6 months, increasing to 6-8 months in cases requiring bone grafts and guided bone regeneration. Many efforts have been made to accelerate osseointegration, including low level laser (LLL) and light emitting diode (LED) photobiomodulation. Material and methods:Twelve patients underwent

bimaxillary immediate implant surgery with particulate bone grafts between the socket wall and the implant, and the transmucosal abutment was attached on implants at the same time. The intervention side was exposed to LED radiation for 20 minutes a day one day preoperatively and 10 consecutive sessions, starting from the day of surgery. A trained operator measured and recorded the implant stability quotient (ISQ) value on both sides immediately after surgery as well as one month and three months postoperatively. Results: The ISQ value was 37.54 on the non-irradiated side immediately after surgery; it decreased to 35.09 one month postoperatively and increased to 46.45 at three months after the operation. The ISQ value was 36.73 on the irradiated side immediately after surgery and it increased to 47.36 and 71.18 at one month and three months postoperatively, respectively. There were significant differences between the ISQ values on the irradiated side at all the three time intervals, but also a significant difference on the non-irradiated side, except for two other two time intervals of immediately and one month after surgery. Although there was no significant difference between the two sides in terms of the ISQ value immediately after surgery, the ISQ value was significantly higher on the irradiated versus non-irradiated side at one month and three months postoperatively. Conclusion:Low level laser radiation resulted in a favorable increase in the ISQ value in three months. Light emitting diode has lso led to a clinically significant increase in the ISQ value after three months because implants with ISQ values >54 could be loaded.

Effect of Transcutaneous Radial Artery Photobiomodulation on Continuous Measures of Interstitial Glucose in a Single Subject: A Brief Report. Background: Intravenous blood irradiation with light is purported to reduce blood sugar levels in people with diabetes mellitus (DM). Transcutaneous light emitting devices are marketed for use in modulating glucose levels, yet evidence of effectiveness is scarce. Materials and methods: In a single subject (nondiabetic woman with significant family history of DM), transcutaneous photobiomodulation (PBM) at various wavelengths was applied to the radial artery immediately after a standardized meal, or at the peak glucose after the standardized meal. Data were compared with a "no intervention" control period. Interstitial glucose was measured every 5â€‰min until return to baseline. Results: A single transcutaneous application of PBM at wavelength and dose combinations tested and when applied immediately after a test meal or at peak glucose postprandially did not affect interstitial glucose levels in a woman without DM. Conclusions: Future studies could include testing additional subjects, using repeated PBM applications and monitoring using blood glucose. Glucose Diabetes Mellitus;Female;Glucose;Humans;Low-Level Light Therapy;Radial Artery

Effect of photobiomodulation combined with physical therapy on functional performance in children with myelomeningocele: A protocol randomized clinical blind study. INTRODUCTION: Myelomeningocele is a severe type of spina bifida, resulting from improper closure of the neural tube. This condition drastically affects the structures of the spinal cord resulting in deficiencies. The combination of these deficiencies results in an overall decrease in mobility and functional participation amongst this population. Physiotherapy plays an essential role in rehabilitating people with MMC. The current literature shows that resources such as photobiomodulation (PBM) may support the rehabilitation of neurological conditions. The aim of the proposed study is to evaluate the effects of photobiomodulation (PBM) combined with physical therapy on functional performance in children with low lumbosacral myelomeningocele. MATERIALS AND METHODS: This is a protocol randomized clinical blind study, that will include 30 individuals of both sexes, aged between 5 to 8 years, diagnosed with low and sacral lumbar myelomeningocele and capable of performing the sit-to-stand task. The participants will be randomly assigned into two treatment groups: PBM + physiotherapeutic exercises and sham PBM + physiotherapeutic exercises. Irradiation will be carried out with light emitting diode (LED) at a wavelength of 850 nm, energy of 25 J per point, 50 seconds per point and a power of 200 mW. The same device will be used in the placebo group but will not

emit light. Muscle activity will be assessed using a portable electromyograph (BTS Engineering) and the sit-to-stand task will be performed as a measure of functioning. Electrodes will be positioned on the lateral gastrocnemius, tibialis anterior and rectus femoris muscles. The Pediatric Evaluation of Disability Inventory will be used to assess functional independence. Quality of life will be assessed using the Child Health Questionnaire-Parent Form 50. Changes in participation will be assessed using the Participation and Environment Measure for Children and Youth. The data will be analyzed with the aid of GraphPad PRISM. DISCUSSION: The results of this study can contribute to a better understanding of the effectiveness of PBM on functioning and quality of life in children with myelomeningocele. CLINICAL TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT04425330. Child;Child, Preschool;Disability Evaluation;Exercise;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Meningomyelocele;Physical Functional Performance;Physical Therapy Modalities;Quadriceps Muscle;Quality of Life

Label-free photothermal disruption of cytotoxic aggregates rescues pathology in a C. elegans model of Huntington's disease. Aggregation of proteins is a prominent hallmark of virtually all neurodegenerative disorders including Alzheimer's, Parkinson's and Huntington's diseases. Little progress has been made in their treatment to slow or prevent the formation of aggregates by post-translational modification and regulation of cellular responses to misfolded proteins. Here, we introduce a label-free, laser-based photothermal treatment of polyglutamine (polyQ) aggregates in a C. elegans nematode model of huntingtin-like polyQ aggregation. As a proof of principle, we demonstrated that nanosecond laser pulse-induced local photothermal heating can directly disrupt the aggregates so as to delay their accumulation, maintain motility, and extend the lifespan of treated nematodes. These beneficial effects were validated by confocal photothermal, fluorescence, and video imaging. The results obtained demonstrate that our theranostics platform, integrating photothermal therapy without drugs or other chemicals, combined with advanced imaging to monitor photothermal ablation of aggregates, initiates systemic recovery and thus validates the concept of aggregate-disruption treatments for neurodegenerative diseases in humans. Peptides;Protein Aggregates;Recombinant Fusion Proteins;polyglutamine Animals;Caenorhabditis elegans;Disease Models, Animal;Humans;Huntington Disease;Lasers;Low-Level Light Therapy;Peptides;Photothermal Therapy;Protein Aggregates;Protein Aggregation, Pathological;Recombinant Fusion Proteins

Effectiveness of Nonpharmacologic Treatments of Burning Mouth Syndrome: A Systematic Review. AIMS: To assess the efficacy of nonpharmacologic treatments for burning mouth syndrome (BMS). METHODS: PubMed, Scopus, Web of Science, and the Cochrane Central Register of Controlled Trials were systematically searched. Reference lists from the latest systematic reviews (2015 to 2020) on BMS treatment in the PubMed, Scopus, Web of Science, and Cochrane Library databases were also scrutinized. Randomized controlled trials (RCTs) or clinical controlled trials (CCTs) in English were considered eligible. Trials on photobiomodulation were excluded to avoid redundancy with recent publications. Risk of bias was established through the Cochrane Risk of Bias tool for RCTs and the Risk of Bias in Nonrandomized Studies of Interventions (ROBINS-I) tool for CCTs. RESULTS: This review included 27 RCTs and 6 open clinical trials (OCTs) describing 14 different nonpharmacologic interventions. Eleven trials experimented with 600 to 800 mg/day of alpha-lipoic acid for 30 to 120 days, with 7 placebo-controlled studies showing significant pain relief. Four trials tested topical and systemic capsaicin for 7 to 30 days, with 2 placebo-controlled studies revealing significant efficacy. Four of the 5 trials testing acupuncture offered favorable evidence of pain relief. Two trials reported significant pain relief after a 2- to 3-month regimen with tongue protectors and showed no difference after aloe vera addition. Short-term pain relief was reported in anecdotal placebo-controlled trials deploying tocopherol, catuama, ultramicronized palmitoylethanolamide, group psychotherapy,

cognitive therapy, and repetitive transcranial magnetic stimulation of the prefrontal cortex. Most therapies were safe. CONCLUSION: Evidence was collected from highly biased, short-term, heterogenous studies mainly focused on BMS-related pain, with scarce data on quality of life, psychologic status, dysgeusia, and xerostomia. Long-term effectiveness of nonpharmacologic treatments should be further investigated, with a more rigorous, bias-proof study design. Capsaicin Acupuncture Therapy;Burning Mouth Syndrome;Capsaicin;Humans;Pain;Quality of Life

The effect of intra-oral LED device and low-level laser therapy on orthodontic tooth movement in young adults: A randomized controlled trial. INTRODUCTION: This randomized controlled clinical trial aimed to assess the effect of LED(5) and LLLT(6) in a three-arm parallel setting. METHODS: Sixty patients who needed the maxillary first premolar extraction were allocated to three groups using the stratified block randomization method. In the LED group, a custom-made device with a wavelength of 640nm and a power density of 40 mW/cm(2) was used 5min/day. In the laser group, Ga Al As(7) laser with a wavelength of 810nm and a power of 100 mW was used on days 0, 3, 30, and 60 each time for 18seconds. Patients in the control group received placebo treatment as the laser group protocol, using a coated light cure device. Models were made at baseline and monthly until the end of the retraction. The rate of canine retraction was the primary outcome, while canine rotation and pain were secondary outcomes. The final data were anonymous for the outcome assessor and statistical consultant. Data were analyzed per protocol using a linear mixed model. RESULTS: The rate of canine retraction significantly increased by 60.8% in the laser group, while it increased not significantly by 26% in the LED group compared with the control group. There was no significant difference among the groups in terms of tooth rotation and pain. CONCLUSIONS: LLLT can accelerate orthodontic tooth movement (OTM). LED with the present setting couldn't increase the rate of OTM. LLLT and LED did not affect canine rotation or pain. TRIAL REGISTRATION: IRCT20120220009086N4. On 1 June 2019 was retrospectively registered. Bicuspid;Humans;Low-Level Light Therapy;Malocclusion;Pain;Tooth Movement Techniques;Young Adult

A systematic review on the treatment of pediatric severe alopecia areata by topical immunotherapy or Anthralin (contact sensitization) or low-level light/laser therapy (LLLT): focus on efficacy, safety, treatment duration, recurrence, and follow-up based on clinical studies. INTRODUCTION: Alopecia areata (AA) in its extensive and severe forms is treatment-challenging, especially in pediatrics. METHOD: A PRISMA-compliant systematic review of seven electronic databases was searched by the terms "alopecia areata," "pediatric," "topical immunotherapy," "Anthralin," and "light therapy" from inception until March 2021. All the alternative names of the disease and therapies have been included in the search terms. 790 articles went to title abstract review by two independent reviewers. In the subsequent level, a review of the full text of studies was conducted. RESULTS: Finally, 10 relevant articles in terms of content structure, subject coverage, and purpose, were selected for further review. The highest percentages of complete hair regrowth were 79.6% and 63.61% by SADBE (topical immunotherapy) and laser therapy. By Anthralin (contact sensitization), the complete response rate was below 50% (between 30 and 35%). Regarding average response, the most effective methods were local immunotherapy (with an average effectiveness of 53.8%), laser therapy (52.55%), and the use of Anthralin-induced contact dermatitis (30.86%), respectively. However, recurrence rate-after treatment with induced contact dermatitis by topical medications like Anthralin (contact sensitization)-was lower (mean 43.53%) in comparison with local immunotherapy (57%). In topical immunotherapy, light base therapy, and contact sensitization, the highest percentage of complete hair regrowth and the average response rate were (63.61% and 52.55%), (79.6% and 53.8%) and (32% and 30.8%), respectively. These methods are considered safe in children. CONCLUSION: A high and more than 50% efficacy in hair regrowth could be expected by topical immunotherapy and light/laser therapy method. No serious side effects have been observed by these

methods that are well tolerated in children. Therefore, a combination of local immunotherapy and light/laser therapy could be suggested for the treatment of extensive AA in children. The use of Anthralin could be associated with a lower but more durable response. These points are important for patient selection in individualized situations. Immunologic Factors;Anthralin Administration, Topical;Alopecia Areata;Anthralin;Child;Dermatitis, Contact;Duration of Therapy;Follow-Up Studies;Humans;Immunologic Factors;Immunotherapy;Low-Level Light Therapy;Treatment Outcome

Effects of photobiomodulation on glucose homeostasis and morphometric parameters in pancreatic islets of diabetic mice. High-fat diets lead to accumulation of body fat that is associated with the onset of insulin resistance and type II diabetes mellitus. On the other hand, photobiomodulation (PBM) is an electrophysical resource that interacts with cells, stimulating mitochondrial respiration, increasing ATP production, reducing key inflammatory mediators, inhibiting apoptosis, and stimulating angiogenesis. However, little is known about its therapeutic effectiveness on the development of diabetes in diet-induced obese mice. Thus, our aim was to evaluate the effect of PBM applied single point over the pancreas area on glucose homeostasis, insulin expression, and pancreatic morphometric parameters of mice submitted to high-fat diet for 12Â weeks. Male mice C57BL6/J were divided into three groups: control group (C), diabetic group (D), and diabeticâ€‰+â€‰PBM (Dâ€‰+â€‰PBM). The treatment with PBM started at 9th week and ended in the 12th week, applied 3â€‰Ã—â€‰/week. Body mass, fast blood glucose, and glucose and insulin tolerance were evaluated. Immunohistochemistry to detect insulin expression and pancreatic morphometry were also performed. At the end of 12th week, both groups submitted to high-fat diet showed an increase in body mass, adiposity, disturbances on glucose homeostasis, and high insulin expression when compared to the control group. However, mice treated with PBM had more discrete impairments on glucose homeostasis during the glucose tolerance test when compared to untreated D animals. Despite modest, the results were positive and encourage future investigations to explore different doses and duration of PBM to better elucidate its role in obesity-associated type 2 diabetes development. Blood Glucose;Insulin;Glucose Animals;Blood Glucose;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Diet, High-Fat;Glucose;Homeostasis;Insulin;Islets of Langerhans;Male;Mice;Mice, Inbred C57BL

A multifunctional hydrogel coating to direct fibroblast activation and infected wound healing via simultaneously controllable photobiomodulation and photodynamic therapies. Bacterial infection treatment and subsequent tissue rebuilding are the main tasks of biomaterial research. To endow implants with antibacterial activity and biological functions, the material systems are usually very complicated and ineffective. Recently, the concept of photobiomodulation (PBM), or low-level laser therapy (LLLT), has attracted increasing attention in tissue repair applications but still has not obtained wide acceptance. Because of the same laser resource, PBM could simultaneously work with 660Â nm laser triggered photodynamic therapy (PDT), which will significantly simplify the material system and achieve the multiple functions of antibacterial activity and biological modulation effects. Herein, we attempt to validate the effectiveness of PBM and combine PBM with a PDT-based material system. A catechol motif-modified methacrylated gelatin containing photosensitizer Chlorin e6-loaded mesoporous polydopamine nanoparticles was fabricated (GelMAc/MPDA@Ce6). This hydrogel could be tightly adhered to titanium surfaces to serve as surface coating materials or directly used as dressings. Because of the 660Â nm laser-triggered ROS generation property of Ce6, GelMAc/MPDA@Ce6 exhibited a remarkable and rapid antibacterial activity when the laser power was 1Â WÂ cm(-2). After bacterial elimination, when the power was adjusted to 100Â mWÂ cm(-2), daily irradiation brought an excellent PBM effect: the fibroblast activation was realized to accelerate wound repair. According to our in vitro and in vivo results, the fabricated hydrogel coating possessed

both antibacterial activity and fibroblast activation ability only by adjusting the power of laser irradiation, which will greatly strengthen the confidence of using PBM in broader fields and give a good example to combine PBM with traditional biomaterial design. Hydrogels;Photosensitizing Agents Fibroblasts;Hydrogels;Photochemotherapy;Photosensitizing Agents;Wound Healing

Specific parameters of infrared LED irradiation promote the inhibition of oxidative stress in dental pulp cells. OBJECTIVES: The present study aimed to assess the oxidative stress and the viability of dental pulp cells stimulated by lipopolysaccharide (LPS) and submitted to photobiomodulation (PBM) with infrared light-emitting diode (LED, 850Â nm). DESIGN: Three healthy primary teeth (nÂ =Â 3) were collected and seeded in 24-well plates with 10Â Âµg/mL of LPS to induce inflammatory mediator formation. The cells were irradiated (850Â nm, 40Â mW/cm(2) and 80Â mW/cm(2)) at the proposed radiant exposures of 0 (control), 4, 15, and 30Â J/cm(2) shortly after LPS supplementation. The tests were performed 24Â h after irradiation to assess mitochondrial activity (MTT assay), the number of viable cells (Trypan Blue), cell morphology (Scanning Electron Microscopy - SEM), and the quantification of Nitric Oxide (NO) and Reactive Oxygen Species (ROS). The data were analyzed using Kruskal-Wallis and Dunn's tests (pÂ <Â 0.05). RESULTS: The irradiated groups showed larger viable cells number than the non-irradiated group with LPS (pÂ <Â 0.0001). All irradiation parameters decreased ROS concentrations after LPS application compared to the non-irradiated group (pÂ <Â 0.05). All irradiation parameters enhanced the NO values compared to those of the control group (pÂ <Â 0.05). The SEM images showed cells with regular morphology that adhered to the substrate. CONCLUSIONS: According to the parameters used in this study, the radiant exposure of 15Â J/cm(2) and irradiance of 40Â mW/cm(2) were the most effective irradiation parameters to stimulate and modulate oxidative stress in the primary teeth-derived dental pulp cells. Reactive Oxygen Species Cell Survival;Dental Pulp;Infrared Rays;Oxidative Stress;Reactive Oxygen Species

Low-energy laser therapy application on knee joints as an auxiliary treatment in patients with polyarticular juvenile idiopathic arthritis: a dual-arm randomized clinical trial. Patients with juvenile idiopathic arthritis (JIA) always experience persistent pain and stiffness which induces muscle weakness, fatigue, and functional limitations. This study evaluated whether applying low-energy laser therapy (LLT) on the knee joint could be an effective adjuvant intervention for patients with JIA. Sixty children with polyarticular JIA participated and were randomly allocated to receive either LLT (wavelength Î»â€‰=â€‰903Â nm; power output of 50 mW; and energy of 1.5Â J) plus exercises (LLT group) or exercises alone (control group). Pain, peak concentric torque of quadriceps muscles, fatigue, and functional status were measured by the visual analogue scale, isokinetic testing system, Pediatric Quality of Life Inventory Multidimensional Fatigue Scale, and Childhood Health Assessment Questionnaire, respectively pre- and post-intervention, and at 6-month follow-up. Per the mixed-model analysis of variance, the LLT group showed a statistically more favorable improvement in pain (Pâ€‰=â€‰.003, Î·(p)(2)â€‰=â€‰.014), fatigue perception (Pâ€‰=â€‰.004, Î·(p)(2)â€‰=â€‰.015), and functional status (Pâ€‰=â€‰.022, Î·(p)(2)â€‰=â€‰.09) across the three assessment occasions, as compared to the control group. However, no significant difference was demonstrated between both groups concerning peak concentric torque (all Pâ€‰>â€‰.05). Incorporation of LLT into the standard physical rehabilitation program for patients with JIA has the potential to induce more conducive improvements in pain, fatigue, and functional performance, but is not effective for improving muscle performance. Arthritis, Juvenile;Child;Exercise Therapy;Humans;Knee Joint;Laser Therapy;Quality of Life

Photobiomodulation impacts the levels of inflammatory mediators during orthodontic tooth movement? A systematic review with meta-analysis. During orthodontic tooth movement (OTM), there is the release of cytokines in the gingival crevicular fluid (GCF) that are supposed to participate in the bone remodeling. This systematic review aimed at assessing the effects of

photobiomodulation (PBM) on the levels of these cytokines during OTM. This systematic review according to Cochrane Collaboration guidelines aimed to answer the clinical question following the PICOS strategy. The broad search in the literature was performed before 05 April, 2021 in six electronic databases (Pubmed, Web of Science, Scopus, Embase, Cochrane, Biblioteca Virtual de SaÃºde) and supplemented by the grey literature. The risk of bias of randomized and non-randomized clinical trials was evaluated by two tools: RoB 2 and ROBINS-I. Mean and standard deviation of cytokine levels was extracted to meta-analysis, and the GRADE system was applied to assess the quality of the evidence. Nine studies were included in this review. Low-level laser therapy (LLLT) was the photobiomodulation type used in most of the studies (nâ€‰=â€‰8). The wavelengths used varied from 618 to 980Â nm and also differed concerning the light emission pattern. LLLT increased the levels of IL-1Î², IL-8, OPN, and PGE2, but not TNF-Î±1, TGF-Î²1. The levels of IL6, RANKL, and OPG presented conflicting results. LLLT was statistically associated with an increase of IL-1Î² levels (standard mean difference [SMD]â€‰=â€‰1.99; 95% confidence intervalâ€‰=â€‰0.66 to 3.33; pâ€‰<â€‰0.001) with low certainty of evidence. LLLT may increase the levels of IL-1Î² and other cytokines; however, the results should be interpreted with caution due to protocol variations between studies, and the few studies added in the meta-analysis. Cytokines Cytokines;Gingival Crevicular Fluid;Humans;Immunomodulation;Low-Level Light Therapy;Tooth Movement Techniques

Low-Level Laser and Antimicrobial Photodynamic Therapy Reduce Peri-implantitis-related Microorganisms Grown In Vitro. OBJECTIVE: â€ƒCurrently, dental implants are a predictable treatment option for oral rehabilitation; however, complications such as peri-implant diseases are increasing every day. Thus, the aim of this study was to verify the efficacy, in vitro, of two protocols against cultures of periodontal biofilm and Staphylococcus aureus. MATERIAL AND METHODS: â€ƒPetri dishes for each of the following groups were used: control groups (C)-plates inoculated with periodontal biofilm (C.B; n = 4) or S. aureus (C.SA; n = 4) without any treatment; laser groups-plates inoculated with periodontal biofilm (low-level laser therapy [LLLT].B; n = 4) or S. aureus (LLLT.SA; n = 4) and treated with LLLT (660 nm, 30 mW, 50 J/cm(2), and 47 seconds); antimicrobial photodynamic therapy groups (aPDT)-plates inoculated with periodontal biofilm (aPDT.B; n = 4) or S. aureus (aPDT.SA; n = 4) and treated with aPDT (red laser 660 nm, 30 mW, 50 J/cm(2), 47 seconds + toluidine blue O (TBO) 100 Âµg/mL, and 1 minute). After treatments were performed, the contents of all plates were diluted and seeded for counting colony-forming units (CFUs). STATISTICAL ANALYSIS: â€ƒResults were analyzed with one-way analysis of variance (ANOVA), Tukey's test, comparison of percentages, and independent t-tests with a 5% significance level. RESULTS: â€ƒBoth treatments, LLLT and aPDT, significantly reduced the number of CFUs for the two types of culture, LLLT.B (3.69 Ã— 10(6) Â± 0.20), aPDT.B (2.79 Ã— 10(6) Â± 0.13), LLLT.SA (4.10 Ã— 10(6) Â± 0.12), and aPDT.SA (3.23 Ã— 10(6) Â± 0.10) when compared with control groups C.B (5.18 Ã— 10(6) Â± 0.43) and C.SA (5.81 Ã— 10(6) Â± 0.16; p = 0.000). When treatment groups were compared separately, there was also a statistically significant difference (p = 0.000). None of the protocols were able to eliminate cultured microorganisms. CONCLUSION: â€ƒThe LLLT and aPDT protocols effectively reduced cultures of periodontal biofilm and S. aureus in vitro, with the superiority of aPDT.

Effects of low-level laser therapy versus soft occlusive splints on mouth opening and surface electromyography in females with temporomandibular dysfunction: A randomized-controlled study. BACKGROUND: Low level lasers have been used as an alternative pain relief therapy for muscle and joint pain, since it induces analgesic, anti-inflammatory, and biomodulation effects of the physiological cell functions. The effectiveness of low-level laser therapy in temporomandibular joint dysfunction (TMD) treatment, however, is not well established. Although Surface electromyography (sEMG) has been suggested as a complementary means in TMD diagnosis, the effect of conservative

treatments on muscle activity has not yet been thoroughly correlated with (sEMG) findings. PURPOSE: To assess the efficacy of low-level laser therapy (LLLT) as compared to occlusive splint therapy (OST) on the TMJ opening index (TOI) and sEMG of masticatory muscles. MATERIALS AND METHODS: 112 female subjects suffering from unilateral myogenous TMD, aged 21-30 years-old, were recruited and divided into three groups: LLLT; soft occlusive splint therapy OST and a waitlist group as controls. OUTCOME MEASURES: TMJ opening index (TOI), Visual analogue scale (VAS), surface electromyography (sEMG). RESULTS: A significant reduction was reported in TOI, VAS and the sEMG within the LLLT and OST groups as well as significant decrease in all outcomes between groups in favor of the LLLT group (P< 0.0001). Meanwhile, there was a weak significant difference within the control group probably attributed to the analgesic. Post-hoc pairwise comparisons between groups [control vs occlusive splints, control vs low-level laser and low-level laser vs occlusive splints] revealed significant differences in the VAS and TOI [P = 0.0001; 95% CI: 0.9-2.2, 1.61-4.01, 0.65-1.96]. CONCLUSIONS: Findings support an evident short term therapeutic effect of the LLLT on improving VAS, TOI and sEMG in females suffering from myogenous TMD.
Adult;Electromyography;Facial Pain;Female;Humans;Low-Level Light Therapy;Temporomandibular Joint Disorders;Treatment Outcome;Young Adult

Photobiomodulation for Diabetic Foot Ulcers? Show Me! Diabetes Mellitus;Diabetic Foot;Humans;Low-Level Light Therapy;Wound Healing

Effect of transcranial near-infrared photobiomodulation on cognitive outcomes in D-galactose/AlCl(3) induced brain aging in BALB/c mice. Brain photobiomodulation (PBM) therapy (PBMT) modulates various biological and cognitive processes in senescence rodent models. This study was designed to investigate the effects of transcranial near-infrared (NIR) laser treatment on D-galactose (D-gal)/aluminum chloride (AlCl(3)) induced inflammation, synaptic dysfunction, and cognitive impairment in mice. The aged mouse model was induced by subcutaneously injecting D-gal (60Â mg/kg/day) followed by intragastrically administering AlCl(3) (200Â mg/kg/day) for 2Â months. NIR PBM (810Â nm laser, 32, 16, and 8Â J/cm(2)) was administered transcranially every other day (3Â days/week) for 2Â months. Social, contextual, and spatial memories were assessed by social interaction test, passive avoidance test, and Lashley III maze, respectively. Then, tumor necrosis factor-Î± (TNF-Î±), interleukin (IL)-6, and synaptic markers including growth-associated protein 43 (GAP-43), post-synaptic density-95 (PSD-95), and synaptophysin (SYN) levels were measured in the hippocampus using western blot method. Behavioral results revealed that NIR PBM at fluencies of 16 and 8Â J/cm(2) could reduce D-gal/AlCl3 impaired social and spatial memories. Treatment with NIR attenuated neuroinflammation through down-regulation of TNF-Î± and IL-6. Additionally, NIR significantly inhibited the down-regulation of GAP-43 and SYN. The results indicate that transcranial PBM at the fluencies 16 and 8Â J/cm(2) effectively prevents cognitive impairment in mice model of aging by inhibiting the production of the inflammatory cytokines and enhancing synaptic markers.
Galactose Aging;Animals;Brain;Cognition;Galactose;Hippocampus;Mice;Mice, Inbred BALB C

Effects of photobiomodulation on wound contraction in rats undergoing doxorubicin extravasation: a histomorphometric analysis. OBJECTIVE: To analyze wound contraction and histomorphometric pattern of lesions in Wistar rats undergoing doxorubicin extravasation. METHOD: Sixty adult female rats were used, divided into four groups of fifteen animals: Group 1 (Control, without antidote); Group 2 (Hyaluronidase); Group 3 (Photobiomodulation), and Group 4 (Hyaluronidase + Photobiomodulation). Doxorubicin 1mg (0.5 ml) was applied subcutaneously on the animals' back, inducing the wound. Macroscopic and morphometric evaluation of the lesions was performed every two days for 28 days. On the 30th day, euthanasia was performed and the material was collected for histological evaluation. RESULTS: The animals in the photobiomodulation and photobiomodulation + Hyaluronidase groups presented regeneration tissue with neovascularization and acute inflammation,

with improvement in wound healing, which did not occur in the other groups. The contraction rates were better in those treated with photobiomodulation and photobiomodulation + Hyaluronidase, with healing percentages of 76.6% and 72.1%, respectively. CONCLUSION: The combination of photobiomodulation (660 nm-1 J) with topical hyaluronidase (65 UTR) proved to be effective in the process of wound healing due to extravasation of doxorubicin, and can be incorporated into the practice of clinical oncology. Doxorubicin Animals;Doxorubicin;Female;Low-Level Light Therapy;Rats;Rats, Wistar;Wound Healing

LASER in periodontal treatment: is it an effective treatment or science fiction? There are several studies that evaluate the use of lasers in periodontal treatment in non-surgical or surgical therapy. However, while several studies showed clinically beneficial effects of some lasers in periodontal treatment, there are few clinical reports of additional advantages of lasers as adjunctive treatments in periodontology. The aim of this paper is to demonstrate and critically analyze the level of scientific evidence of effects of low-level lasers and high-power lasers in periodontology. A narrative review of the studies was carried out in each topic and type of laser or periodontal treatment. In nonsurgical periodontal therapy the results showed that there is an additional clinical benefit when using a diode laser (DL) associated with scaling and root planing (SRP) in patients with moderate to severe periodontitis. The Er:YAG laser seems to be the most suitable for nonsurgical periodontal therapy and promotes the same clinical effects as conventional therapy. In periodontal surgery vaporization of the gingival or mucosal tissue can be carried out with DL, CO2, Nd:YAG, Er:YAG and Er,Cr:YSGG lasers. Photobiomodulation (PBM), mediated by low-level lasers associated with non-surgical periodontal therapy, promotes additional benefits in the short term and accelerates the bone and gingival tissue repair process and also reduces postoperative symptoms of periodontal surgery. The effect of antimicrobial Photodynamic Therapy is relevant in the initial reevaluation periods. Studies have shown controversial results of the use of lasers in periodontics, and this fact may be due to the lack of standard parameters of irradiation in each clinical application. Chronic Periodontitis;Dental Scaling;Humans;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Periodontitis;Root Planing

Effects of photobiomodulation therapy on functional recovery, angiogenesis and redox status in denervated muscle of rats. OBJECTIVE: To evaluate the effects of photobiomodulation therapy in redox status, angiogenesis marker - vascular endothelial growth factor - and in the functional recovery in denervated muscle. METHODS: A total of 32 female Wistar rats underwent a crush injury and were randomly divided into four groups: Light Emitting Diode Group 2 and Control Group 2 (muscle collected 2 days after injury), and Light Emitting Diode Group 21 and Control Group 21 (muscle collected 21 days afterinjury). Light Emitting Diode Group 2 and Light Emitting Diode Group 21 received two and ten light emitting diode applications (630Â±20nm, 9J/cm2, 300mW), respectively, and the Control Group 2 and Control Group 21 did not receive any treatment. The function was evaluated by grasping test at four moments (pre-injury, 2, 10 and 21 post-injury days). The flexor digitorum muscle was collected for analysis of immunolocalization of vascular endothelial growth factor and redox parameters. RESULTS: Functional improvement was observed at the second and tenth post-injury day in treated groups compared to control ($p<0.005$). The muscle tissue of treated groups presented higher immunohistochemical expression of vascular endothelial growth factor. Photobiomodulation therapy decreased the oxidative damage to lipid in Light Emitting Diode Group 2 compared to Control Group 2 ($p=0.023$) in the denervated muscle. CONCLUSION: Photobiomodulation therapy accelerated the functional recovery, increased angiogenesis and reduced lipid peroxidation in the denervated muscle at 2 days after injury. Vascular Endothelial Growth Factor A Animals;Female;Low-Level Light Therapy;Muscle, Skeletal;Oxidation-Reduction;Rats;Rats, Wistar;Vascular Endothelial Growth Factor A

Phototoxicity-free blue light for enhancing therapeutic angiogenic efficacy of stem cells. Low-level light therapy (LLLT) is a safe and noninvasive technique that has drawn attention as a new therapeutic method to treat various diseases. However, little is known so far about the effect of blue light for LLLT due to the generation of reactive oxygen species (ROS) that can cause cell damage. We introduced a blue organic light-emitting diode (bOLED) as a safe and effective light source that could generate a low amount of heat and luminance compared to conventional light sources (e.g., light-emitting diodes). We compared phototoxicity of bOLED light with different light fluences to human adipose-derived stem cells (hADSC). We further explored molecular mechanisms involved in the therapeutic efficacy of bOLED for enhancing angiogenic properties of hADSC, including intracellular ROS control in hADSCs. Using optimum conditions of bOLED light proposed in this study, photobiomodulation and angiogenic properties of hADSCs were enhanced. These findings might open new methods for using blue light in LLLT. Such methods can be implemented in future treatments for ischemic disease. Reactive Oxygen Species Humans;Adipose Tissue;Reactive Oxygen Species;Adipocytes;Stem Cells;Neovascularization, Physiologic

Photobiomodulation Therapy vs. Corticosteroid for the Management of Erosive/Ulcerative and Painful Oral Lichen Planus. Assessment of Success Rate during One-Year Follow-Up: A Retrospective Study. Photobiomodulation (PBM) therapy is a promising approach for the management of inflammatory conditions and autoimmune lesions, such as oral lichen planus (OLP). The aim of this retrospective study was to assess the effectiveness of PBM in the management of painful and erosive/ulcerative OLP and to compare it with the standard of care that is the topical application of corticosteroids. 96 patients were included with erosive and painful OLP. 48 patients received PBM therapy and 48 received corticosteroids. Data was collected retrospectively on pain using the visual analogue scale; clinical aspects of lesions were assessed with the REU score, and the recurrence rate was noted. One session of PBM therapy with a helium-neon red light (635 nm) was carried out every 48 h for 6 weeks. Treatments were mainly made in contact mode, using a fiber with a diameter of 600 Âµm (0.6 mm). The output power of the laser beam was calibrated by a power meter. A delivered power of 0.1 W was used for 40 s in a continuous wave (CW), corresponding to a delivered energy of 4 J. The delivered energy density related to the fiber diameter was 1415 J/cm(2). Each treated point was considered as 1 cm(2) of diameter. PBM therapy within these parameters was carried out on each point until the totality of the lesion was covered, including the non-erosive OLP area. Furthermore, healthy mucosa within 5 mm of the lesion was also irradiated with the same conditions. This PBM treatment was performed during 6 consecutive weeks. The topical corticosteroid treatment consisted of cortisone application to cover the OLP 3 times/day for 6 weeks. Follow-up was made at 6 weeks and at 3, 6 and 12 months. After 6 weeks, both groups showed complete absence of pain, and a complete disappearance of ulcerative/erosive areas. No significant difference was found for both groups concerning the recurrence rate of erosive OLP during the follow-up period; values were 0% at 6 weeks for both groups and 79% and 87.5% for the corticosteroid and PBM group, respectively, at 12 months of follow-up. PBM is effective for managing OLP and is significantly similar to topical corticosteroids without any need for the use of medication and with no reported side effects.

Thermal-sensitive lipid nanoparticles potentiate anti-PD therapy through enhancing drug penetration and T lymphocytes infiltration in metastatic tumor. The response rate of anti-PD therapy in most cancer patients remains low. Therapeutic drug and tumor-infiltrating lymphocytes (TILs) are usually obstructed by the stromal region within tumor microenvironment (TME) rather than distributed around tumor cells, thus unable to induce the immune response of cytotoxic T cells. Here, we constructed the cationic thermosensitive lipid nanoparticles IR780/DPPC/BMS by introducing cationic NIR photosensitizer IR-780 iodide (IR780) modified lipid components, thermosensitive lipid DPPC and

PD-1/PD-L1 inhibitor BMS202 (BMS). Upon laser irradiation, IR780/DPPC/BMS penetrated into deep tumor, and reduced cancer-associated fibroblasts (CAFs) around tumor cells to remodel the spatial distribution of TILs in TME. Interestingly, the cationic IR780/DPPC/BMS could capture released tumor-associated antigens (TAAs), thereby enhancing the antigen-presenting ability of DCs to activate cytotoxic T lymphocytes. Moreover, IR780/DPPC/BMS initiated gel-liquid crystal phase transition under laser irradiation, accelerating the disintegration of lipid bilayer structure and leading to the responsive release of BMS, which would reverse the tumor immunosuppression state by blocking PD-1/PD-L1 pathway for a long term. This combination treatment can synergistically exert the antitumor immune response and inhibit the tumor growth and metastasis. Acetamides;B7-H1 Antigen;BMS202;Indoles;Lipid Nanoparticles;Liposomes;Programmed Cell Death 1 Receptor;Pyridines Acetamides;B7-H1 Antigen;CD8-Positive T-Lymphocytes;Cell Line, Tumor;Cell Proliferation;Humans;Immune Tolerance;Immunotherapy;Indoles;Liposomes;Low-Level Light Therapy;Lymphocytes, Tumor-Infiltrating;Nanoparticles;Neoplasms;Programmed Cell Death 1 Receptor;Pyridines;T-Lymphocytes, Cytotoxic;Tumor Microenvironment

Macrophages Modulated by Red/NIR Light: Phagocytosis, Cytokines, Mitochondrial Activity, Ca(2+) Influx, Membrane Depolarization and Viability. Low-level light therapy (LLLT) is emerging as a promising therapeutic approach to modulate the biochemical and molecular processes within living cells. LLLT is known to produce local and systemic effects; therefore, immune cells in local tissues or in the circulation are affected by light. However, this specific effect remains weakly explored. In this study, the effect of red (650â€‰nm) and NIR (808â€‰nm) light on phagocytosis (respiratory burst), cytokine expression, mitochondrial activity, ROS generation, Ca(2+) influx and membrane depolarization in macrophages inÂ vitro is investigated. Both the phagocytic capacity and adhesion of macrophages strongly (~2.5 times) increased in the first hours after exposure to light in a dose-dependent manner. The light-evoked upregulation of phagocytosis is found to be less efficient than the maximal pharmacologically induced enhancement of ~3.2 times. Also, red/NIR light reduces the production of pro-inflammatory cytokines and activates the secretion of anti-inflammatory cytokines by several times in activated macrophages. At the same time, the viability shows a biphasic dose response: it increases after irradiation with lower doses (0.3-1â€‰Jâ€‰cm(-2)) and decreases after treatment with higher doses (18-30â€‰Jâ€‰cm(-2)), which is apparently associated with the upregulation of ROS generation, followed by an increase in the mitochondrial activity. Cytokines;Reactive Oxygen Species;Calcium Calcium;Cytokines;Low-Level Light Therapy;Macrophages;Mitochondria;Phagocytosis;Reactive Oxygen Species

Assessment of wound area reduction on chronic wounds in dogs with photobiomodulation therapy: A randomized controlled clinical trial. BACKGROUND AND AIM: Chronic wounds are a clinical problem and require intensive standard wound care. However, this is sometimes insufficient to promote healing. Photobiomodulation therapy (PBMT) can be used as an adjunctive therapy to improve wound healing. Various PBMT devices with different properties and parameter settings as well as different animal species can influence a variety of clinical outcomes. This study aims to assess the use of 830 nm PBMT or simultaneous superpulsed and multiple wavelengths (SPMW; 660, 875, and 905 nm) PBMT on chronic wounds in client-owned dogs. MATERIALS AND METHODS: This study included 21 client-owned dogs with chronic wounds allocated into three groups: (1) Control group (C) treated with irrigated saline and without PBMT (n=7); (2) L1 group treated with irrigated saline together with the radiation of 830 nm PBMT (n=7); and (3) L2 group treated with irrigated saline together with the radiation of simultaneous SPMW-PBMT (n=7). Wound healing was assessed on the basis of wound size reduction as a percentage of wound area every 2(nd) day for 15 days using image analysis software (ImageJ software(Â®), National Institutes of Health, Rockville, Maryland, USA). RESULTS: A significant difference in the percentage of wound area reduction was noted between the

C and PBMT groups (L1 and L2; p<0.05). The average percentages of wound area reduction at the end of the study (15 days) were 42.39Â±20.58, 56.98Â±24.82, and 61.81Â±27.18 in the C, L1, and L2 groups, respectively. A steady decrease in wound size was noted in both PBMT and non-PBMT groups, and coefficients were 7.77, 8.95, and 10.01 in the C, L1, and L2 groups, respectively. The percentage of wound area reduction was found to be significantly different between the PBMT and non-BPMT groups on day 7 (p<0.05). CONCLUSION: Based on the results of the current study, using either 830 nm PBMT or simultaneous SPMW-PBMT can accelerate the chronic wound healing process in dogs with a significant reduction in wound area. Therefore, it can be used as an adjunctive therapy to improve wound healing in dogs with reduced treatment duration.

Comparative study of an antimicrobial peptide and a neuropeptide conjugated with gold nanorods for the targeted photothermal killing of bacteria. There are certain disadvantages in treating bacterial infections through conventional methods. For this reason, the current study does focus on combating bacterial wound infections by photothermal therapy assisted by gold nanorod-peptide conjugates (GNR-peptide conjugates). Two peptides, the cationic antimicrobial peptide LL-37 and neuropeptide ANGIOPEP-2 both with specificity for targeted bacterial binding, were conjugated with GNR surface through electrostatic interactions. The GNR-peptide conjugates showed good biocompatibility, sufficient stability, enhanced targeting, potential photothermal killing of bacteria, and possible acceleration of wound healing. The photo-biomodulation properties of NIR improved the wound closure rates through enhanced cell migration. The multifunctional LL37-conjugated GNRs significantly enhanced photothermal therapeutic outcomes based on bacterial targeting with promising wound healing properties. Neuropeptides;Pore Forming Cytotoxic Proteins;Gold Bacteria;Gold;Nanotubes;Neuropeptides;Pore Forming Cytotoxic Proteins

Photoactivation of mitochondrial reactive oxygen species-mediated Src and protein kinase C pathway enhances MHC class II-restricted T cell immunity to tumours. High fluence low-level laser (HF-LLL), a mitochondria-targeted tumour phototherapy, results in oxidative damage and apoptosis of tumour cells, as well as damage to normal tissue. To circumvent this, the therapeutic effect of low fluence LLL (LFL), a non-invasive and drug-free therapeutic strategy, was identified for tumours and the underlying molecular mechanisms were investigated. We observed that LFL enhanced antigen-specific immune response of macrophages and dendritic cells by upregulating MHC class II, which was induced by mitochondrial reactive oxygen species (ROS)-activated signalling, suppressing tumour growth in both CD11c-DTR and C57BL/6 mice. Mechanistically, LFL upregulated MHC class II in an MHC class II transactivator (CIITA)-dependent manner. LFL-activated protein kinase C (PKC) promoted the nuclear translocation of CIITA, as inhibition of PKC attenuated the DNA-binding efficiency of CIITA to MHC class II promoter. CIITA mRNA and protein expression also improved after LFL treatment, characterised by direct binding of Src and STAT1, and subsequent activation of STAT1. Notably, scavenging of ROS downregulated LFL-induced Src and PKC activation and antagonised the effects of LFL treatment. Thus, LFL treatment altered the adaptive immune response via the mitochondrial ROS-activated signalling pathway to control the progress of neoplastic disease. Histocompatibility Antigens Class II;MHC class II transactivator protein;Nuclear Proteins;Reactive Oxygen Species;STAT1 Transcription Factor;Trans-Activators;src-Family Kinases;Protein Kinase C Active Transport, Cell Nucleus;Animals;Antigen Presentation;Dendritic Cells;Histocompatibility Antigens Class II;Low-Level Light Therapy;Macrophages;Mice;Mice, Inbred C57BL;Neoplasms, Experimental;Nuclear Proteins;Protein Kinase C;Reactive Oxygen Species;STAT1 Transcription Factor;T-Lymphocytes;Trans-Activators;src-Family Kinases

Role of auricular laser acupuncture and psychological counseling in reducing nicotine dependence due to smoking: A randomized controlled trial. BACKGROUND: Low level laser therapy is a novel noninvasive technology used to stimulate the acupoints recognized for tobacco cessation. OBJECTIVE:

To compare the effect of laser auricular acupuncture, psychological counseling, and combination of laser acupuncture and psychological counseling in reducing nicotine dependence due to smoking. METHODS: Smokers (n = 150) fulfilling the eligibility criteria were randomly allocated to three interventional groups. Evaluation of the nicotine dependence and physical effects due to smoking were done using Fagerstrom test and Visual Analog Scale, respectively, at baseline and 1 month postintervention. Person's Chi-square, Kruskal Wallis analysis of variance, and Wilcoxon signed-rank tests were used for the statistical analysis. Statistical significance was set at P â‰¤ 0.05. RESULTS: There was a statistically significant reduction in nicotine dependence (P = 0.00) and physical effects related to smoking (P < 0.05) in all the interventional groups 1 month postintervention. Reduction in Fagerstrom test scores was significantly higher (P = 0.001) in Group 3 (laser acupuncture with psychological counseling) as compared to other groups. There was significant reduction (P < 0.01) in irritability, tiredness, craving, headaches, and significant increase (P < 0.05) in the unpleasant taste due to smoking and ability to concentrate in laser acupuncture with psychological counseling group as compared to other groups. CONCLUSION: Auricular laser acupuncture with psychological counseling was effective in reducing nicotine dependence due to smoking. Acupuncture Therapy;Acupuncture, Ear;Counseling;Humans;India;Lasers;Smoking;Smoking Cessation;Tobacco Use Disorder

Effect of oral exercises and photobiomodulation therapy in the rehabilitation of patients with mandible fractures: randomized double-blind clinical trial. Mandible fractures compromise stomatognathic functions, requiring rehabilitation. Evaluate the effectiveness of photobiomodulation (PBM) associated with oral exercises for rehabilitation of patients with mandible fractures. In this randomized clinical trial, we compared PBM with PBM sham in 14 adults with mandibular fractures who underwent surgical intervention. The sessions were performed 24Â h and 48Â h after surgical procedure, and weekly for 4Â weeks after hospital discharge. Both groups performed oral exercises after each PBM session. Restriction of food consistencies, mandibular mobility, pain, and facial sensitivity measured before and after the surgical procedure were the outcomes evaluated, one and 3Â months after surgery. Maximum interincisal distances (MID), exercise pain, and restriction of food consistencies were also evaluated during each week of intervention. Both groups showed normal MID (>â€‰35Â mm) and food consistencies consumed 1Â month after the surgical procedure, with no significant differences between them. Individuals in the PBM group had less pain response to exercise during all the weeks of intervention than the sham group (pâ€‰<â€‰0.05). The patients presented a reduction in the painful response in MID and mandibular laterality movements 1Â month after surgery compared to the preoperative period. In contrast, there was an improvement in laterality in the sham group only 3Â months postoperatively and persistent pain in MID. There was no significant difference in facial sensitivity within and between groups during follow-up. The performance of oral exercises associated with PBM effectively facilitated the early rehabilitation of oral functions, with significant gains in pain management. Adult;Exercise Therapy;Humans;Low-Level Light Therapy;Mandible;Mandibular Fractures;Pain

"At-Home" Photobiomodulation: A New Approach for Bell's Palsy Treatment. OBJECTIVE: This report is the first one to describe the possibility to use "self-administered" photobiomodulation (PBM) for Bell's palsy (BP) treatment. BACKGROUND: BP is a peripheral disorder of the facial nerve causing sudden paralysis of unilateral facial muscles, and PBM has been successfully suggested for its treatment without any side effect. This is the first case report where a laser device was successfully used at home by the patient herself to treat BP opening new perspectives on the therapy of this disease. METHODS: This report describes the "at-home PBM" treatment performed on a 15-year-old girl who presented BP consisting of acute pain on the right side of her face, difficulty in biting and dripping saliva from the right side of her lips. The treatment was performed twice a day by cutaneous

applications, each of 15 minutes (total fluence 48â€‰J/cm(2)) in an area corresponding to the parotid gland by a device emitting at 808â€‰nm at 250â€‰mW output power. RESULTS: Two weeks after PBM treatment, performed at home twice a day by the patient herself without any kind of pharmacological therapy, the complete disappearing of the disease was noticed with no side effects. CONCLUSION: With the limitations due to a single case report and with the need of further clinical trials to confirm it, "at-home PBM" seems to represent a good and safe approach to the treatment of BP.

Transcranial photobiomodulation and thermal stimulation induce distinct topographies of EEG alpha and beta power changes in healthy humans. Our recent study demonstrated that prefrontal transcranial photobiomodulation (tPBM) with 1064-nm laser enables significant changes in EEG rhythms, but these changes might result from the laser-induced heat rather than tPBM. This study hypothesized that tPBM-induced and heat-induced alterations in EEG power topography were significantly distinct. We performed two sets of measurements from two separate groups of healthy humans under tPBM (nâ€‰=â€‰46) and thermal stimulation (thermo_stim; nâ€‰=â€‰11) conditions. Each group participated in the study twice under true and respective sham stimulation with concurrent recordings of 64-channel EEG before, during, and after 8-min tPBM at 1064Â nm or thermo_stim with temperature of 33-41Â Â°C, respectively. After data preprocessing, EEG power spectral densities (PSD) per channel per subject were quantified and normalized by respective baseline PSD to remove the power-law effect. At the group level for each group, percent changes of EEG powers per channel were statistically compared between (1) tPBM vs light-stimulation sham, (2) thermo_stim vs heat-stimulation sham, and (3) tPBM vs thermo_stim after sham exclusion at five frequency bands using the non-parametric permutation tests. By performing the false discovery rate correction for multi-channel comparisons, we showed by EEG power change topographies that (1) tPBM significantly increased EEG alpha and beta powers, (2) the thermal stimulation created opposite effects on EEG power topographic patterns, and (3) tPBM and thermal stimulations induced significantly different topographies of changes in EEG alpha and beta power. Overall, this study provided evidence to support our hypothesis, showing that the laser-induced heat on the human forehead is not a mechanistic source causing increases in EEG power during and after tPBM. Adolescent;Adult;Alpha Rhythm;Beta Rhythm;Brain;Cross-Over Studies;Female;Hot Temperature;Humans;Low-Level Light Therapy;Male;Young Adult

Effectiveness of low-level laser therapy and chewing gum in reducing orthodontic pain: A randomized controlled trial. OBJECTIVE: The purpose of this study was to evaluate the effects of chewing gum and low-level laser therapy in alleviating orthodontic pain induced by the initial archwire. METHODS: Patients with 3-6 mm maxillary crowding who planned to receive non-extraction orthodontic treatment were recruited for the study. Sixty-three participants (33 females and 30 males) were randomly allocated into three groups: laser, chewing gum, and control. In the laser group, a gallium aluminum arsenide (GaAlAs) diode laser with a wavelength of 820 nm was used to apply a single dose immediately after orthodontic treatment began. In the chewing gum group, sugar-free gum was chewed three times for 20 minutes- immediately after starting treatment, and at the twenty-fourth and forty-eighth hours of treatment. Pain perception was measured using a visual analog scale at the second, sixth, and twenty-fourth hours, and on the second, third, and seventh days. RESULTS: There were no statistically significant differences between the groups at any measured time point ($p > 0.05$). The highest pain scores were detected at the twenty-fourth hour of treatment in all groups. CONCLUSIONS: Within the limitations of the study, we could not detect whether low-level laser therapy and chewing gum had any clinically significant effect on orthodontic pain. Different results may be obtained with a higher number of participants or using lasers with different wavelengths and specifications. Although the study had a sufficient number of participants

according to statistical analysis, higher number of participants could have provided more definitive outcomes.

Effects of photobiomodulation therapy in chondrocyte response by in vitro experiments and experimental model of osteoarthritis in the knee of rats. The purpose of this study is to evaluate the effects of photobiomodulation (PBM) therapy in chondrocyte response by in vitro experiments and cartilage repair using an experimental model of osteoarthritis (OA) in the knee of rats. The in vitro experiment was performed with chondrocyte cells, and they were divided into two groups: non-irradiated and irradiated with PBM (808Â nm; 0.8Â J or 1.4Â J). Then, cell proliferation was evaluated after 1, 3, and 5Â days. The experimental model of osteoarthritis (OA) was performed in the knee of 64 Wistar rats, and they were assorted into control group (CG), PBM (808Â nm; 1.4Â J). The results of in vitro showed that PBM 1.4Â J increased cell proliferation, on days 1 and 5. However, after 3Â days was demonstrated a significant increase in cell proliferation in PBM 0.8Â J. The in vivo experiment results demonstrated, on histological analysis, that PBM presented less intense signs of tissue degradation with an initial surface discontinuity at the superficial zone and disorganization of the chondrocytes in the cartilage region when compared to CG, after 4 and 8Â weeks. These findings were confirmed by immunohistochemistry and qRT-PCR analysis which showed that PBM increased IL-4, IL-10, COL-2, Aggrecan, and TGF-Î² which are anabolic factors and acts on extracellular matrix. Also, PBM reduces the IL1-Î², an inflammatory marker that operates as a catabolic factor on articular cartilage. In conclusion, these results suggest that PBM may have led to a return to tissue homeostasis, promoting chondroprotective effects and stimulating the components of the articular tissue. Animals;Cartilage, Articular;Chondrocytes;Disease Models, Animal;Low-Level Light Therapy;Osteoarthritis;Osteoarthritis, Knee;Rats;Rats, Wistar

In Vitro Effect of Photodynamic Therapy with Indocyanine Green Followed by 660 nm Photobiomodulation Therapy on Fibroblast Viability. This inÂ vitro study sought to assess the effect of repetitive PBMT on the viability of fibroblasts following aPDT with indocyanine green (ICG). In this inÂ vitro experimental study, human gingival fibroblasts (HGFs) were obtained and incubated in a culture medium. After reaching 10â€‰000 cellsâ€‰cm(-2) , the cells were divided into five groups of control, aPDT with ICG and 808â€‰nm (energy density of 24â€‰Jâ€‰cm(-2)), PBMT immediately after aPDT, PBMT with 660â€‰nm (energy density of 7.2â€‰Jâ€‰cm(-2)) immediately and 24â€‰h after aPDT and PBMT immediately and 24 and 48â€‰h after aPDT in 48-well plates. Cell viability was evaluated using the methyl thiazolyl tetrazolium (MTT) assay after 1, 4 and 7â€‰days of incubation. Statistical analyses were performed using one-way ANOVA. Cell viability significantly decreased in group 2 (Pâ€‰<â€‰0.002). We observed no significant increase in cell viability at any time point in group 3 (Pâ€‰>â€‰0.05). Cell viability significantly increased in groups 4 and 5 after the first day of incubation (Pâ€‰<â€‰0.000). Emission of 660â€‰nm as PBMT for two and three times along with passage of time would increase the viability of HGFs following aPDT with ICG. Photosensitizing Agents;Indocyanine Green Fibroblasts;Humans;Indocyanine Green;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

Infrared light therapy relieves TLR-4 dependent hyper-inflammation of the type induced by COVID-19. The leading cause of mortality from COVID-19 infection is respiratory distress due to an exaggerated host immune response, resulting in hyper-inflammation and ensuing cytokine storms in the lungs. Current drug-based therapies are of limited efficacy, costly, and have potential negative side effects. By contrast, photobiomodulation therapy, which involves periodic brief exposure to red or infrared light, is a noninvasive, safe, and affordable method that is currently being used to treat a wide range of diseases with underlying inflammatory conditions. Here, we show that exposure to two 10-min, high-intensity periods per day of infrared light causes a marked reduction in the TLR-4 dependent inflammatory response pathway, which has been implicated in the onset of cytokine storms in COVID-

19 patients. Infrared light exposure resulted in a significant decline in NFkB and AP1 activity as measured by the reporter gene assay; decreased expression of inflammatory marker genes IL-6, IL-8, TNF-alpha, INF-alpha, and INF-beta as determined by qPCR gene expression assay; and an 80% decline in secreted cytokine IL6 as measured by ELISA assay in cultured human cells. All of these changes occurred after only 48Â hours of treatment. We suggest that an underlying cellular mechanism involving modulation of ROS may downregulate the host immune response after Infrared Light exposure, leading to decrease in inflammation. We further discuss technical considerations involving light sources and exposure conditions to put these observations into potential clinical use to treat COVID-19 induced mortality.

Topically applied liposome-in-hydrogels for systematically targeted tumor photothermal therapy. Transdermal drug delivery for local or systemic therapy provides a potential anticancer modality with a high patient compliance. However, the drug delivery efficiency across the skin is highly challenging due to the physiological barriers, which limit the desired therapeutic effects. In this study, we prepared liposome-in-hydrogels containing a tumor targeting photosensitizer IR780 (IR780/lipo/gels) for tumor photothermal therapy (PTT). The formulation effectively delivered IR780 to subcutaneous tumor and deep metastatic sites, while the hydrogels were applied on the skin overlying the tumor or on an area of distant normal skin. The photothermal antitumor activity of topically administered IR780/lipo/gels was evaluated following laser irradiation. We observed significant inhibition of the rate of the tumor growth without any toxicity associated with the topical administration of hydrogels. Collectively, the topical administration of IR780/lipo/gels represents a new noninvasive and safe strategy for targeted tumor PTT. Drug Carriers;Hydrogels;Indoles;Liposomes;Photosensitizing Agents Administration, Cutaneous;Animals;Body Weight;Chemistry, Pharmaceutical;Drug Carriers;Hydrogels;Indoles;Liposomes;Low-Level Light Therapy;Lung Neoplasms;Male;Mice;Mice, Inbred BALB C;Photosensitizing Agents;Photothermal Therapy;Tumor Burden;Xenograft Model Antitumor Assays

Low-level laser treatment promotes skin wound healing by activating hair follicle stem cells in female mice. The aim of the study was to explore the effect and mechanism of a low-level laser on hair follicle stem cells in full-thickness skin wound healing in mice. Full-thickness skin defects were generated by a 5-mm punch biopsy tool on the backs of depilated C57/BL6N mice, which were randomly divided thereafter into a low-dose laser treatment group (LLLT-Low), a high-dose laser treatment group (LLLT-High), and a control group (control). From the day of modeling to the day before the skin samples were taken, the wound area and wound edge of the mice in the LLLT-Low and LLLT-High groups were irradiated with a laser comb every 24Â h, and the energy density was 1Â J/cm(2) and 10Â J/cm(2), respectively. The control group was irradiated with an ordinary fluorescent lamp. At 0, 3, 5, 10, and 14Â days after modeling, pictures of each wound were taken, and the percent wound closure was analyzed. At 3, 5, 10, and 14Â days after modeling, the samples were observed by hematoxylin and eosin (HE) and immunofluorescence (IF) staining. Whole transcriptome sequencing (RNA-Seq) was performed on the samples on day 10. Gene Ontology (GO) analysis was performed, and the results were validated by Western blot analysis and enzyme-linked immunosorbent assay (ELISA). The analysis of the percent of wound closure showed that healing was accelerated (significantly from 5 to 10Â days) in the LLLT-Low group, but there was no clear change in the LLLT-High group. HE staining showed that the LLLT-Low group had an increasing number of hair follicles and a tendency to migrate to the center of the wound. There was no significant increase in the number of hair follicles and no obvious migration in the LLLT-High group. Immunofluorescence staining showed that the total number of CK15â€‰+â€‰hair follicle stem cells in the LLLT-Low group was higher than that in the control group and LLLT-High group at all time points. The number and farthest migration distance of CK15â€‰+â€‰hair follicle stem cells increased significantly with time,

and after 5Â days, they were significantly higher than those in the control group and LLLT-High group. RNA-Seq and Western blot analysis showed that the expression of related genes in hair follicle stem cells, including CK15, in the LLLT-Low group was upregulated. GO analysis and ELISA showed that the expression of many cytokines, represented by IL34, in the LLLT-Low group was upregulated. Low-level laser treatment can promote the proliferation, differentiation, and migration of CK15â€‰+â€‰hair follicle stem cells by upregulating the cytokine IL34, thereby promoting skin wound healing in mice.
Animals;Cell Differentiation;Female;Hair Follicle;Low-Level Light Therapy;Mice;Skin;Stem Cells;Wound Healing

Imaging and Pathological Characteristics of Port-Wine Stain Patients with Tissue Hypertrophy Before Laser Therapy: Retrospective Data. Background: Port-wine stain (PWS) patients may simultaneously have accompanied soft tissue hypertrophy. The outcome of laser therapy can be poor. Objective: To study the imaging and histopathological characteristics of PWS patients with facial overgrowth. Materials and methods: We retrospectively assessed the effect of therapy on a subset of PWS patients with facial overgrowth. The degree of hypertrophy and the density of enhanced signals on T1-weighted magnetic resonance imaging (MRI) were independently graded by two radiologists using a quartile scale. Biopsies/resection of tissue deep to the facial muscle was reviewed and compared with flat PWS. Results: Thirty-two PWS patients with facial hypertrophy and 15 patients with flat PWS were included. MRI revealed a statistically significant correlation between the degree of hypertrophy and the density of enhanced signals (3.02â€‰Â±â€‰0.92 vs. 2.47â€‰Â±â€‰0.69; pâ€‰<â€‰0.01). Histological features of a subset of patients showed that vascular malformations existed in the dermis and also in the subcutaneous fat and muscle with much larger vessel diameters (fat, 0.048 vs. 0.020; muscle, 0.035 vs. 0.017) and thicker vessel walls (fat, 0.014 vs. 0.006; muscle, 0.010 vs. 0.006) (both pâ€‰<â€‰0.05). Conclusions: The imaging and pathological findings indicate that capillary malformation in subcutaneous tissue might be a major cause of poor therapeutic effect of laser therapy for PWS. Clinical trial registration no.: ChiCTR1800014278.
Humans;Hypertrophy;Laser Therapy;Low-Level Light Therapy;Port-Wine Stain;Retrospective Studies

Short-Term Results of Photobiomodulation Using Light-Emitting Diode Light of 670â€‰nm in Eyes with Age-Related Macular Degeneration. Objective: To evaluate the short-term result of retinal functional behavior in patients with dry age-related macular degeneration (AMD) corrected by photobiomodulation (PBM) with 670â€‰nm light-emitting diode (LED) light. Materials and methods: Ten patients with dry AMD underwent a treatment consisting of nine PBM sessions with LED light of 670â€‰nm with two cycles of 50â€‰mW/cm(2), producing 4â€‰J/cm(2) per dose in 88â€‰sec. The studied eye was compared with the baseline (before therapy), and after nine PBM sessions, the following aspects were evaluated: best-corrected visual acuity (VA), retinal sensitivity, and characteristics of the correction area by the fundus automated perimetry using the Compass system. A functional and structural assessment of the retina was also performed using the multifocal electroretinography (ERG), optical coherence tomography (OCT), fluorescence retinography (FR), and autofluorescence (AF). All examinations were performed 1, 4, and 16 weeks after the therapy. The Chi-square and Student's t-tests were used for comparisons. The analyses followed the 95% confidence level (p-value â‰¤0.05). Results: The BCVA significantly improved, from an average of 1.1 to 0.98 LogMAR (pâ€‰=â€‰0.01). The visual field examination, according to the parameters of mean deviation, standard deviation, and index of deviation of background perimeter, showed a significant improvement of -12.6% to -10.6%, 10.54% to 9.89%, and 56% to 60%, respectively (pâ€‰=â€‰0.02, 0.03, and 0.02, respectively). No participant had an adverse effect during the follow-up period; neither did any participant experience abnormalities in OCT, ERG, FR, and AF findings. Conclusions: In this short-term study, the PBM technique in patients with dry AMD showed the potential to improve VA and macular perimetry without causing significant adverse events. A

larger number of patients and a longer follow-up will be necessary to further assess the success of this technique in these patients. Electroretinography;Humans;Macular Degeneration;Retina;Visual Acuity;Visual Field Tests

The Effectiveness of Low-Level Light/Laser Therapy on Hair Loss. Background: A systematic review on low-level light/laser therapy (LLLT) in male pattern hair loss (MPHL) and female pattern hair loss (FPHL) has been performed. Objectives: Compare the reported effectiveness of LLLT in MPHL and FPHL with any control, through randomized controlled trials (RCTs) analysis. Methods: The protocol was developed in accordance with the Preferred Reporting for Items for Systematic Reviews and Meta-Analyses-Protocols guidelines. A multistep search of the PubMed, MEDLINE, Embase, PreMEDLINE, Ebase, Clinicaltrials.gov, Scopus database, and Cochrane databases has been performed to identify articles on MPHL and/or FPHL treatment with LLLT. Results: Of the 298 articles initially identified, 136 articles focusing on MPHL and FPHL were selected and, consequently, only 36 articles focused exclusively on LLLT. Of this amount, 23 articles were clinical trials while 13 articles were systematic reviews. Systematic reviews were excluded, and only seven articles were analyzed as RCTs. Conclusions: All the articles selected and analyzed reported a positive effect of LLLT for MPHL and/or FPHL treatment without side effects. Female;Humans;Male;Alopecia;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Laterally closed tunnel technique with and without adjunctive photobiomodulation therapy for the management of isolated gingival recession-a randomized controlled assessor-blinded clinical trial. The objective of this prospective randomized controlled single-center clinical trial was to prove the efficacy of adjunctive photobiomodulation in improving selected outcomes following the use of laterally closed tunnel technique for the management of isolated gingival recession. Nineteen participants (with isolated gingival recession) each treated by laterally closed tunnel technique were randomized to either add on treatment with control (sham laser application) or test group (photobiomodulation with 660Â nm diode, 3.5Â J/cm(2) per point of application). The primary outcome variable was change in recession depth and secondary variables included recession width, width of keratinized gingiva, periodontal biotype, and VAS score for pain assessment and EHS index for early wound healing assessment. Analysis was performed using a linear mixed effects model. There were no significant differences in the gingival recession depth (pâ€‰=â€‰0.8324) and recession width (p-0.969) at 3-month follow-up. The VAS scores were significantly lower for the test (laterally closed tunnel techniqueâ€‰+â€‰photobiomodulation) group as compared to control (laterally closed tunnel techniqueâ€‰+â€‰sham laser) over time (pâ€‰=â€‰â€‰<â€‰0.0001) as well as per site (pâ€‰=â€‰0.0006) The Early Wound Healing Index scores were significantly higher in the test (laterally closed tunnel techniqueâ€‰+â€‰photobiomodulation) group as compared to control (laterally closed tunnel techniqueâ€‰+â€‰sham laser) group (pâ€‰<â€‰0.0001). The adjunctive use of photobiomodulation did not show a better outcome concerning recession depth but appears to provide faster healing of the surgical wounds and better patient comfort. The result needs further evaluation in particular with respect to long-term effect and due to limitation in sample size. Clinical Trial Registry of India: CTRI/2019/11/022012. Connective Tissue;Follow-Up Studies;Gingiva;Gingival Recession;Humans;Low-Level Light Therapy;Prospective Studies;Surgical Flaps;Tooth Root;Treatment Outcome

Investigation of the effects of therapeutic ultrasound or photobiomodulation and the role of spinal glial cells in osteoarthritis-induced nociception in mice. Pain is the most common symptom of osteoarthritis, and spinal glia is known to contribute to this symptom. Therapeutic ultrasound and laser therapy have been used to effectively treat osteoarthritis, with few adverse effects. Thus, this study aimed to investigate the effects of ultrasound and photobiomodulation on the symptoms and evaluate the participation of spinal glia in osteoarthritis-induced nociception in mice. Male Swiss mice

were subjected to osteoarthritis induction with a 0.1-mg intra-articular injection of monosodium iodoacetate. Additionally, the mice received chronic ultrasound or photobiomodulation treatment for 21Â days or a single treatment at day 14. Nociception was evaluated using von Frey filaments, and osteoarthritis symptoms were assessed by analysis of gait, joint temperature, and knee joint diameter. The role of spinal microglia and astrocytes on nociception was evaluated via an intrathecal injection of minocycline or fluorocitrate, and the spinal release of IL-1Î² and TNF-Î± was assessed by ELISA after chronic treatment with ultrasound or photobiomodulation. Our data showed that both single and chronic treatment with ultrasound or photobiomodulation attenuated the osteoarthritis-induced nociception. No differences in gait, knee joint temperature, or knee joint diameter were found. The intrathecal injection of minocycline and fluorocitrate decreased the osteoarthritis-induced nociception. There was an increase in the spinal levels of TNF-Î±, which was reverted by chronic ultrasound and laser treatments. These results suggest that osteoarthritis induces nociception and glial activation via spinal release of TNF-Î± and that the chronic treatment with ultrasound or photobiomodulation decreased nociception and TNF-Î± release. Iodoacetic Acid Animals;Disease Models, Animal;Iodoacetic Acid;Male;Mice;Neuroglia;Nociception;Osteoarthritis;Pain

Efficacy of hyaluronic acid for recurrent aphthous stomatitis: a systematic review of clinical trials. OBJECTIVES: Recurrent aphthous stomatitis (RAS) is a very common oral mucosal disease, and its management is quite challenging with no definitive cure being available so far. Many studies have tried hyaluronic acid (HA) for alleviating signs and symptoms of RAS. The present systematic review sought to assess the available evidence regarding the efficacy of HA in management of RAS. METHODS: Two reviewers independently conducted extensive search in four online databases (PubMed, Scopus, Web of Science, and Google Scholar) and the gray literature, with no restriction to date or language of the publication. All clinical trials that assessed the efficacy of HA in reducing signs and symptoms of RAS were included. Risk of bias was assessed by two reviewers independently, using the Cochrane assessment tool. Due to substantial heterogeneity, no meta-analysis was feasible. RESULTS: Out of the 75 identified articles, nine clinical trials involving 538 RAS patients (259 in HA group) were included. The risk of bias was high in five studies, low in one study, and unclear in three studies. The comparative groups varied greatly across the included studies: triamcinolone (in three studies), chlorhexidine mouthwash, lidocaine, placebo, iodine glycerin, diclofenac, and laser therapy. Overall, the results revealed a good efficacy of HA in alleviating pain and shortening the healing time of RAS, without any reported side effects. Compared to triamcinolone, HA showed superior results in one study, and comparable results in two studies. CONCLUSIONS: The available evidence suggests that HA is a promising treatment option for RAS. However, given the huge heterogeneity of the included studies and high risk of bias in some of these studies, the evidence is inconclusive. Further well-designed clinical trials with standardized methodologies and adequate sample sizes are warranted to discern the efficacy of HA for RAS. CLINICAL RELEVANCE: Hyaluronic acid might be a viable alternative therapeutic option for patients with RAS. Hyaluronic Acid Humans;Hyaluronic Acid;Low-Level Light Therapy;Mouth Diseases;Pain;Stomatitis, Aphthous

Transcranial Laser Photobiomodulation Improves Intracellular Signaling Linked to Cell Survival, Memory and Glucose Metabolism in the Aged Brain: A Preliminary Study. Aging is often accompanied by exacerbated activation of cell death-related signaling pathways and decreased energy metabolism. We hypothesized that transcranial near-infrared laser may increase intracellular signaling pathways beneficial to aging brains, such as those that regulate brain cell proliferation, apoptosis, and energy metabolism. To test this hypothesis, we investigated the expression and activation of intracellular signaling proteins in the cerebral cortex and hippocampus of aged rats (20 months old) treated with the transcranial near-infrared laser for 58 consecutive days. As compared to

sham controls, transcranial laser treatment increased intracellular signaling proteins related to cell proliferation and cell survival, such as signal transducer and activator of transcription 3 (STAT3), extracellular signal-regulated protein kinase (ERK), c-Jun N-terminal kinase (JNK), p70 ribosomal protein S6 kinase (p70S6K) and protein kinase B (PKB), also known as Akt that is linked to glucose metabolism. In addition, ERK is linked to memory, while ERK and JNK signaling pathways regulate glucose metabolism. Specifically, the laser treatment caused the activation of STAT3, ERK, and JNK signaling proteins in the cerebral cortex. In the hippocampus, the laser treatment increased the expression of p70S6K and STAT3 and the activation of Akt. Taken together, the data support the hypothesis that transcranial laser photobiomodulation improves intracellular signaling pathways linked to cell survival, memory, and glucose metabolism in the brain of aged rats.

Pulsed high-intensity laser therapy versus low level laser therapy in the management of primary dysmenorrhea. [Purpose] To determine the effect of pulsed high intensity laser therapy (HILT) versus low level laser therapy (LLLT) in the treatment of primary dysmenorrhea. [Participants and Methods] This was a randomized clinical trial that included 30 females diagnosed with primary dysmenorrhea who were assigned randomly into two groups of equal numbers. The treatment was three sessions every cycle for three consecutive cycles, where group (A) received pulsed HILT and group (B) received LLLT. All participants were evaluated before and after treatment sessions by visual analogue scale (VAS) and at the end of treatment by pain relief scale (PRS). [Results] The results showed a significant decrease in the severity of pain in the two groups. Comparison between the two groups showed a statistically non-significant difference in the severity of pain and pain alleviation at the end of the treatment course. [Conclusion] Both pulsed HILT and LLLT are effective in the treatment of primary dysmenorrhea, with no significant differences between the two modalities.

New photobiomodulation device for prevention and cure of radiotherapy-induced oral mucositis and dermatitis: results of the prospective Safe PBM study. PURPOSE: The study aims to assess the feasibility, safety, and tolerability of CareMin650, a new photobiomodulation device, in patients treated by radiotherapy (RT) and to collect preliminary data on efficacy for prevention and treatment of oral mucositis (OM) and radiation dermatitis (RD). METHODS: Safe PBM is a French, multicentric, prospective, non-comparative study which include patients with head and neck cancer (H&NC, cohort A) or breast cancer (BC, cohort B) treated in prophylactic (cohorts A1 and B1) or curative setting (cohort A2 and B2). Prophylactic treatment was administered from D1 to end of RT, at a dose of 3Â J/cm(2). Curative treatment started when a grade 1 to grade 3 lesion had occurred and was pursued until end of RT. Primary endpoint was incidence of device-related adverse events (AEs). OM and RD lesions were graded according to CTCAE V3. RESULTS: Overall, 72 patients were included (22, 9, 23, and 18 in cohorts A1, A2, B1, and B2, respectively). No device-related AE was reported after 1312 CareMin650 sessions. In cohorts A1 and B1, median time to first OM or RD lesion was 20Â days. One BC patient developed G3 RD after completion of RT and discontinuation of CareMin650. Four H&NC patients developed G3 OM. In cohorts A2 and B2, lesions improved or stabilized in 71% of patients. Rates of satisfaction were high among patients and users. CONCLUSION: CareMin650 is feasible, safe, and well tolerated for preventive or curative treatment of OM and RD in cancer patients treated with RT. Preliminary efficacy results are promising. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Prospective Studies;Radiodermatitis;Stomatitis

Light-induced nitric oxide release in the skin beyond UVA and blue light: Red & near-infrared wavelengths. Nitric oxide (NO) is omnipresent in the body and synthesized by 3 isoenzymes (nNOS, eNOS and iNOS), all detected in human skin. NO can be stored in a pool of compounds readily converted to NO following skin irradiation by UVR and blue light. This non-enzymatic (without NOS involvement) photolytic reaction mobilizes cutaneous stores of NO derivatives to the bloodstream, lowering blood pressure. However, with the likelihood of skin deleterious effects caused by UVR/blue

light, safer wavelengths in the red/near-infrared (NIR) spectrum are becoming potential contenders to release cutaneous NO, possibly via NOS temperature-dependent effects. The use of red/NIR light to mobilize NO stores from the body's largest organ (the skin) is auspicious. This review focuses on UVR, blue, red, and NIR spectra and their capacity to release NO in human skin. PubMed and Google Scholar were used as article databases to find relevant publications related to this particular field. Nitric Oxide Animals;Humans;Infrared Rays;Low-Level Light Therapy;Mice;Nitric Oxide;Skin

Photobiomodulation therapy preconditioning modifies nitric oxide pathway and oxidative stress in human-induced pluripotent stem cell-derived ventricular cardiomyocytes treated with doxorubicin. Doxorubicin (DOX) is an anthracycline antibiotic that exhibits high heart toxicity. Human-induced pluripotent stem cell-derived ventricular cardiomyocytes (hiPSC-vCMs) are important in vitro models for testing drug cardiotoxicity. Photobiomodulation therapy (PBMT) is a non-invasive therapy that stimulates cells growth and self-repair using light irradiation. This study aimed to investigate the in vitro effects of PBMT preconditioning on cardiotoxicity induced by DOX. HiPSC-vCMs were treated with PBMT for 500Â s, followed by the addition of 2Â Î¼M DOX. LED irradiation preconditioning parameters were at 660Â nm with an irradiance of 10Â mW/cm(2), performing 5Â J/cm(2), followed by 24-h DOX exposure (2Â Î¼M). Human iPSC-vCMs treated with 2Â Î¼M DOX or irradiated with PBMT composed the second and third groups, respectively. The control group did neither receive PBMT preconditioning nor DOX and was irradiated with a white standard lamp. Cells from all groups were collected to perform mRNA and miRNA expressions quantification. PBMT, when applied before the DOX challenge, restored the viability of hiPSC-vCMs and reduced ROS levels. Although downregulated by DOX, myocardial UCP2 mRNA expression presented marked upregulation after PBMT preconditioning. Expression of eNOS and UCP2 mRNA and NO production were decreased after DOX exposure, and PBMT preconditioning before the DOX challenge reversed these changes. Moreover, our data indicated that PBMT preconditioning lowered the miR-24 expression. Our data suggested that PBMT preconditioning ameliorated in vitro DOX-induced cardiotoxicity on transcription level, restoring NO levels and reducing oxidative stress. Nitric Oxide;Doxorubicin Doxorubicin;Humans;Induced Pluripotent Stem Cells;Low-Level Light Therapy;Myocytes, Cardiac;Nitric Oxide;Oxidative Stress

Triple pass laser therapy for recalcitrant facial port wine stains. Patients with recalcitrant facial port wine stains (rfPWS) can be challenging to manage, often leaving the clinician with difficult decisions for treatment options. 'Triple therapy' consists of using three different laser wavelengths at each treatment setting. The evidence on outcomes is limited as this treatment approach has not been previously reported to the best of our knowledge. Children who received triple therapy at least once for rfPWS, and for whom SIAscopy readings had been taken, were retrospectively identified. SIAscope readings were compared before the first triple therapy treatment and at final the most recent clinical follow-up. The clinical appearance was also assessed using a Visual Analogue Scale comparing clinical photographs taken before triple therapy to those taken at the most recent clinical follow-up. A total of 47 children were identified and included in our review. The SIAscope readings showed an overall significant (pâ€‰<â€‰0.001) lightening with 39 (83%) showing lightening and 8 (17%) patients showing a darkening. Scores using the VAS also showed improvement with 55% experiencing an improvement in their clinical appearance, 38% showing no visible change and 6% appearing to have worsened. Triple therapy can offer improvement of rfPWS which have failed to respond to single wavelength laser therapy. SIAscopy and VAS scores correlate well in assessing clinical response; however, the added clinical benefit of SIAscopy in vascular laser clinics remains uncertain. Child;Humans;Laser Therapy;Low-Level Light Therapy;Port-Wine Stain;Retrospective Studies;Treatment Outcome

HeaLED: Assessment of skin healing under light-emitting diode (LED) exposure-A randomized controlled study versus placebo. BACKGROUND: Light-emitting diodes (LEDs) in the visible or near-infrared spectrum have been reported to promote wound healing. However, despite being frequently proposed in daily clinical practice, the efficacy of photobiomodulation treatment after a laser procedure relies on very limited clinical data. OBJECTIVE: To compare the relative efficacy of LED versus placebo treatment in decreasing erythema and transepidermal water loss (TEWL) after a fractional CO(2) session. METHODS: We conducted an open prospective intraindividual randomized controlled study with 10 healthy volunteers. An ablative fractional laser was performed on the seven forearm areas. Three consecutive daily sessions of LED (590, 630, and 850â€‰nm [two tested irradiances each] and placebo) were applied after randomization. Physical measures (colorimetry, TEWL), photography, and clinical evaluation were performed on Days 1, 2, 3, 7, and 21. The main criterion of evaluation was the variation of parameter a* (erythema) at 72â€‰hours for each LED parameter compared to placebo treatment. RESULTS: No significant differences in the variation of the parameter a* or any of the other studied parameters were found for the different LEDs compared to the placebo area. CONCLUSION: Photobiomodulation failed to improve healing after laser ablation compared to placebo. Erythema;Humans;Prospective Studies;Wound Healing

Inflation-Adjusted Trends in Medicare Reimbursement for Common Dermatologic Procedures, 2007-2021. IMPORTANCE: Medicare enrollment, dermatologist utilization of Medicare, and dermatologic procedural volume have all increased over time. Despite this, there are limited studies evaluating changes in Medicare reimbursement within dermatology. OBJECTIVE: To identify trends in Medicare reimbursement for 46 common dermatologic procedures from 2007 to 2021. DESIGN, SETTING, AND PARTICIPANTS: In this cross-sectional study, reimbursement data were obtained from the Centers for Medicare & Medicaid Services Physician Fee Schedule for commonly used dermatologic Current Procedural Terminology (CPT) codes from 2007 to 2021. The CPT codes in several major dermatologic categories were analyzed, including skin biopsy, shave removal, benign/premalignant/malignant destruction, benign/malignant excision, Mohs micrographic surgery, simple/intermediate/complex repair, flap, graft, and laser/phototherapy. All procedure prices were adjusted for inflation to January 2021 dollar value. MAIN OUTCOMES AND MEASURES: The primary outcomes were percentage changes and cumulative annual growth rates of pricing for each dermatologic procedure. RESULTS: From 2007 to 2021, there was a mean decrease in dermatologic procedure reimbursement of -4.8% after adjusting for inflation. Mean inflation-adjusted changes in reimbursements during this time period significantly varied by procedure type, including skin biopsy (+30.3%), shave removal (+24.5%), benign/premalignant/malignant destruction (-7.5%), Mohs micrographic surgery (-14.4%), benign/malignant excision (-3.9%), simple/intermediate/complex repair (-9.9%), flap repair (-14.1%), graft repair (-12.0%), and laser/phototherapy (-6.6%; Pâ€‰<â€‰.001). Changes in reimbursement did not vary by anatomical risk categories. CONCLUSIONS AND RELEVANCE: The findings of this cross-sectional analysis suggest that changes in Medicare reimbursement can have several downstream effects, including concomitant private insurance changes and decreased patient access. Future adjustments in reimbursement should balance high-value care with sustainable pricing to optimize patient access. Aged;Cross-Sectional Studies;Current Procedural Terminology;Humans;Insurance, Health, Reimbursement;Medicare;Physicians;United States

Fluorescent light energy modulates healing in skin grafted mouse model. Skin grafting is often the only treatment for skin trauma when large areas of tissue are affected. This surgical intervention damages the deeper dermal layers of the skin with implications for wound healing and a risk of scar development. Photobiomodulation (PBM) therapy modulates biological processes in different tissues, with a positive effect on many cell types and pathways essential for wound healing. This study

investigated the effect of fluorescent light energy (FLE) therapy, a novel type of PBM, on healing after skin grafting in a dermal fibrotic mouse model. Split-thickness human skin grafts were transplanted onto full-thickness excisional wounds on nude mice.Â Treated wounds were monitored, and excised xenografts were examined to assess healing and pathophysiological processes essential for developing chronic wounds or scarring. Results demonstrated that FLE treatment initially accelerated re-epithelialization and rete ridge formation, while later reduced neovascularization, collagen deposition, myofibroblast and mast cell accumulation, and connective tissue growth factor expression. While there was no visible difference in gross morphology, we found that FLE treatment promoted a balanced collagen remodeling. Collectively, these findings suggest that FLE has a conceivable effect at balancing healing after skin grafting, which reduces the risk of infections, chronic wound development, and fibrotic scarring.

Response of Aerobic Capacity to Low-Level Laser Therapy in Burned Patients. Severe burns lead to decreased pulmonary function and impaired aerobic capacity for long periods postinjury. Low-level laser therapy is a modality used to improve aerobic capacity, enhance exercise performance, and increase the time until fatigue when used before aerobic exercises. This work aims to determine the impacts of pre-exercise low-level laser therapy on aerobic capacity in burn cases. Sixty adults burned cases of both sex, aged from 25 to 40 years, with second-degree healed thermal burns, and the total burned body surface area ranged from 20 to 40% participated in this study after complete wound healing. They were randomly categorized into two groups of equal numbers. The study group received low-level laser therapy before aerobic exercises, three sessions per week for 12 weeks, while the control group performed aerobic exercises three times weekly for 12 weeks. All cases received the routine physical treatment program. Aerobic capacity was assessed for both groups by measuring maximum oxygen consumption and time to exhaustion at baseline and 12 weeks following interventions. There was a statistically significant rise in the mean values of maximum oxygen usage and time to fatigue after 12 weeks of treatment in both groups. However, after comparison, the improvements in the study group were statistically significant than those in the control group with $P < .01$ and $P < .05$, respectively. Low-level laser therapy has a beneficial therapeutic impact on promoting aerobic capacity, improving maximum oxygen consumption, and increasing treadmill time in burned cases when preceding aerobic exercises. Adult;Burns;Exercise Therapy;Exercise Tolerance;Fatigue;Humans;Low-Level Light Therapy;Oxygen Consumption

Photobiomodulation Therapy for Age-Related Macular Degeneration and Diabetic Retinopathy: A Review. PURPOSE: Photobiomodulation therapy (PBT) has emerged as a possible treatment for age-related macular degeneration (AMD) and diabetic retinopathy (DR). This review seeks to summarize the application of PBT in AMD and DR. METHODS: The National Clinical Trial (NCT) database and PubMed were queried using a literature search strategy and reviewed by the authors. RESULTS: Fourteen studies examining the application of PBT for AMD and nine studies examining the application of PBT for diabetic macular edema (DME) were extracted from 60 candidate publications. DISCUSSION: Despite notable methodological differences between studies, PBT has been reported to treat certain DR and AMD patients. DR patients with center involving DME and VA â‰¥ 20/25 have demonstrated response to treatment. AMD patients at Age-Related Eye Disease Study Stages 2-4 with VA â‰¥20/200 have also shown response to treatment. Results of major clinical trials are pending. CONCLUSION: PBT remains an emergent therapy with possible applications in DR and AMD. Further, high powered studies monitored by a neutral party with standard devices, treatment delivery and treatment timing are needed.

Phototherapy (cluster multi-diode 630 nm and 940 nm) on the healing of pressure injury: A pilot study. The therapeutic benefits of LED in wound care have been reported since the 1990s. Nevertheless, studies directly related to the effects of LED phototherapy on the venous and arterial

circulation and the healing process of pressure injuries are scarce in literature. Thus, the aim of this study was to evaluate the efficacy of a LED phototherapy prototype in participants with pressure injuries. In this pilot study 15 participants were randomized into three therapeutic groups. The experimental groups received applications of 630 and 940 nm LED three times a week for 8 weeks, with a dose of 6 J/cm(2) in Group I. In group II, a dose of 8 J/cm(2) in addition to the standard treatment. Group III (control group) received only daily standard treatment which consisted of cleaning the lesioned area with physiological solution, followed by application of an alginate hydrogel dressing over a period of 8 weeks. Pressure injuries were photographed and the area was measured by the QuantikovÂ® image analyzer software. There was no statistically significant difference (pÂ >Â 0.05) between the three groups when assessing the initial lesion area. At the end of 2 months, the median and interquartile ranges of the injuries were 5.90 (0.79-9.5)Â cm(2) for group I, 0.54 (0.47-1.16)Â cm(2) for group II and 26.76 (17.25-41.05) for group III. There was a statistically significant difference between treatment types (I x III and II x III) for pressure injuries over the 21 sessions. However, there was no significant difference between groups I x II that received different doses of LED phototherapy. The initial hypothesis was supported given that the combination of two wavelengths in the LED phototherapy with different doses may be helpful in accelerating the healing of pressure injuries. Humans;Phototherapy;Pilot Projects;Wound Healing;Pressure Ulcer

Thermoelastic behavior of skin tissue induced by laser irradiation based on the generalized dual-phase lag model. This paper analyzes the thermoelastic responses of skin tissue during laser irradiation based on a generalized dual-phase-lag (DPL) model. The method of separation of variables is utilized to obtain the analytical solutions for thermal and mechanical responses. The influences of some crucial parameters on temperature, displacement and stress evolutions are discussed, including the phase lag of heat flux, the phase lag of temperature gradient and the phase lag of laser pulse, the coupling factor between tissue and blood, the porosity of tissue, the equivalent diameter of tissue and the diameter of blood vessels. The generalized DPL bio-heat transfer model predicts different results from those by the classical DPL model and Pennes model. The equivalent diameter of tissue affects the coupling factor between tissue and blood, while the diameter of blood vessels mainly affects the porosity of tissue. Elasticity;Humans;Low-Level Light Therapy;Microvessels;Models, Theoretical;Porosity;Skin;Skin Temperature

Novel Application of Light-Emitting Diode Therapy in the Treatment of Eyebrow Loss in Frontal Fibrosing Alopecia. BACKGROUND: Eyebrow loss in the course of frontal fibrosing alopecia (FFA) is becoming a growing issue among older females. It has a considerable negative impact on patients' quality of life. Since there is no standardized treatment, photobiomodulation with light-emitting diodes (LEDs) could be an option. Here we assess, for the first time, the efficacy of LED therapy in the treatment of eyebrow loss in females with FFA. METHODS: 16 female patients with FFA aged 60-74 years were enrolled in the study. LED therapy was performed once a week for a 10-week session. The LEDs' effectiveness was assessed at the baseline, after 10 irradiations, and 6 months after the end of treatment during a follow-up visit. RESULTS: The therapy was well tolerated. After 10 irradiations, the total eyebrow hair count increased significantly, as did the number of thick hairs and mid-thick hairs ($p = 0.002$, $p = 0.002$, and $p = 0.044$, respectively). During the follow-up visit, the total number of eyebrow hairs remained significantly higher than before treatment ($p = 0.002$). CONCLUSION: The study revealed that LED therapy seems to be a novel and promising therapeutic option for eyebrow loss in patients with FFA. It is safe and well tolerated and leads to clinically and cosmetically acceptable improvement. Alopecia;Eyebrows;Female;Humans;Lichen Planus;Quality of Life;Retrospective Studies

Effects of Photobiomodulation Therapy Combined With Exercise in Patients Who Have Chronic Low Back Pain: Protocol for a Randomized Controlled Trial. OBJECTIVE: Although commonly

prescribed, exercise therapy alone is insufficient for the treatment of low back pain (LBP). Thus, studies recommend a combination of interventions. Photobiomodulation therapy (PBMT) involving low-level laser is an effective intervention for relieving LBP; however, scientific evidence on the effects of laser therapy combined with exercise therapy is scarce and contradictory. The aim of this clinical trial is to evaluate the short-term and long-term effects of the combination of PBMT and an exercise protocol in individuals with persistent nonspecificLBP. METHODS: This 2-armed, randomized, placebo-controlled trial with blinded participants, assessors, and therapists will be conducted in the outpatient physical therapy clinic of a university in Diamantina, Brazil. Participants are 90 individuals between 18 and 65Â years of age with self-reported LBP. The participants will be randomly allocated to (1) a 6-week exercise program combined with active PBMT at a frequency of twice per week, totaling 12 sessions (nâ€‰=â€‰45), or (2) a 6-week exercise program combined with placebo PBMT (nâ€‰=â€‰45). Clinical outcomes will be measured at baseline as well as at 8 and 20Â weeks and 12Â months after randomization. The primary outcomes will be pain intensity and disability. The secondary outcomes will be mental health, mobility, disability, and strength of the trunk extensor muscles. IMPACT: The findings will help determine whether adding PBMT to a physical therapist-supervised exercise protocol is more effective than the exercise protocol alone for persistent LBP. This study has the potential to guide clinical practice toward innovative ways of providing health care.
Adult;Chronic Pain;Combined Modality Therapy;Exercise Therapy;Healthy Life Expectancy;Humans;Low Back Pain;Low-Level Light Therapy;Middle Aged;Pain Measurement;Young Adult

Effectiveness of Blue light photobiomodulation therapy in the treatment of chronic wounds. Results of the Blue Light for Ulcer Reduction (B.L.U.R.) Study. BACKGROUND: Lower limb ulcers not responding to standard treatments after 8 weeks are defined as chronic wounds, and they are a significant medical problem. Blue light (410-430 nm) proved to be effective in treating wounds, but there is a lack of data on chronic wounds in clinical practice. The aim of the study was to determine if blue light photobiomodulation with EmoLED (Emoled Srl, Sesto Fiorentino, Florence, Italy) medical device in addition to standard of care is more effective compared to standard of care alone in promoting re-epithelialization of chronic wounds of lower limbs in 10 weeks. METHODS: Ninety patients affected by multiple or large area ulcers were enrolled. To minimize all variabilities, each patient has been used as control of himself. Primary endpoint was the comparison of the re-epithelialization rate expressed as a percentage of the difference between the initial and final area. Secondary endpoints were: treatment safety, pain reduction, wound area reduction trend over time, healing rate. RESULTS: At week 10, the wounds treated with EmoLED in addition to standard care showed a smaller residual wound area compared to the wounds treated with standard of care alone: 42.1% vs. 63.4% (P=0.029). The difference is particularly evident in venous leg ulcers, 33.3% vs. 60.1% (P=0.007). 17 treated wounds and 12 controls showed complete healing at week 10. Patients showed a significant reduction in pain (P=2Ã—10(-7)). CONCLUSIONS: Blue light treatment in addition to standard of care accelerates consistently the re-epithelialization rate of chronic wounds, especially venous leg ulcers and increases the chances of total wound healing in 10 weeks.
Humans;Low-Level Light Therapy;Pain;Ulcer;Varicose Ulcer;Wound Healing

Effects of Various Physical Interventions on Reducing Neuromuscular Fatigue Assessed by Electromyography: A Systematic Review and Meta-Analysis. Introduction: Various interventions have been applied to improve recovery from muscle fatigue based on evidence from subjective outcomes, such as perceived fatigue and soreness, which may partly contribute to conflicting results of reducing muscle fatigue. There is a need to assess the effectiveness of various intervention on reducing neuromuscular fatigue assessed by a quantitative outcome, such as electromyography (EMG). The objective of this review and meta-analysis was to evaluate the effectiveness of different

interventions and intervention timing for reducing fatigue rates during exercise. Methods: The literature was searched from the earliest record to March 2021. Eighteen studies with a total of 87 data points involving 281 participants and seven types of interventions [i.e., active recovery (AR), compression, cooling, electrical stimulation (ES), light-emitting diode therapy (LEDT), massage, and stretching] were included in this meta-analysis. Results: The results showed that compression (SMD = 0.28; 95% CI = -0.00 to 0.56; p = 0.05; I (2) = 58%) and LEDT (SMD = 0.49; 95% CI = 0.11 to 0.88; p = 0.01; I (2) = 52%) have a significant recovery effect on reducing muscle fatigue. Additionally, compression, AR, and cooling have a significant effect on reducing muscle fatigue when conducted during exercise, whereas a non-effective trend when applied after exercise. Discussion: This meta-analysis suggests that compression and LEDT have a significant effect on reducing muscle fatigue. The results also suggest that there is a significant effect or an effective trend on reducing muscle fatigue when compression, AR, cooling, and ES are applied during exercise, but not after exercise.

Microglia modulation with 1070-nm light attenuates AÎ² burden and cognitive impairment in Alzheimer's disease mouse model. Photobiomodulation, by utilizing low-power light in the visible and near-infrared spectra to trigger biological responses in cells and tissues, has been considered as a possible therapeutic strategy for Alzheimer's disease (AD), while its specific mechanisms have remained elusive. Here, we demonstrate that cognitive and memory impairment in an AD mouse model can be ameliorated by 1070-nm light via reducing cerebral Î²-amyloid (AÎ²) burden, the hallmark of AD. The glial cells, including microglia and astrocytes, play important roles in AÎ² clearance. Our results show that 1070-nm light pulsed at 10â€‰Hz triggers microglia rather than astrocyte responses in AD mice. The 1070-nm light-induced microglia responses with alteration in morphology and increased colocalization with AÎ² are sufficient to reduce AÎ² load in AD mice. Moreover, 1070-nm light pulsed at 10â€‰Hz can reduce perivascular microglia and promote angiogenesis to further enhance AÎ² clearance. Our study confirms the important roles of microglia and cerebral vessels in the use of 1070-nm light for the treatment of AD mice and provides a framework for developing a novel therapeutic approach for AD.

An in-vivo study of photobiomodulation using 403Â nm and 649Â nm diode lasers for molar tooth extraction wound healing in wistar rats. PURPOSE: This study aims to examine the effects of red 649Â nm 4Â J/cm(2) and blue 403Â nm 8Â J/cm(2) diode laser treatment for post-extraction wounded healing in rats through histopathological and immunohistochemical analysis. METHODS: Samples of 54 Wistar rats were divided into six groups: C- control group without treatment; Câ€‰+â€‰wounded group without treatment; TB wound group with Povidone-iodine treatment; TD wounded group with doxycycline treatment; TLB wounded group with 403Â nm diode laser treatment; and TLR wounded group with 649Â nm diode laser treatment. Mandibular samples were observed for the number of lymphocytes and fibroblasts cells, new blood vessels formation, Interleukin 1Î², and Collagen 1Î± expression level. RESULTS: Based on the histopathological test results, red laser diode treatment significantly increased the number of lymphocyte, fibroblast cells and the formation of new blood vessels. Meanwhile, immunohistochemical tests showed an increase in the expression of the Colagen-1Î± protein which plays a role in the formation of collagen for new tissues formation after damage, as well as a decrease in Interleukin-1Î² expression level. Blue laser is also able to show a positive effect on wound healing even though its penetration level into the tissue is lower compared to red laser. CONCLUSION: The red diode laser 649Â nm has been shown to accelerate the process of proliferation in wound healing post molar extraction based on histopathological and immunohistochemical test results. Animals;Lasers, Semiconductor;Molar;Rats;Rats, Wistar;Tooth Extraction;Wound Healing

An observational cohort study of pelvic floor photobiomodulation for treatment of chronic pelvic pain. Aim: This research is the first to evaluate the effectiveness of trans-vaginal

photobiomodulation therapy (TV-PBMT) for chronic pelvic pain. Materials & methods: Observational analysis of 128 women, undergoing TV-PBMT for chronic pelvic pain. Minimal clinically important difference, defined as â‰¥2-point drop on a 0-10 numeric pain rating scale (NPRS), and effect size Cohen d coefficient, was calculated over nine treatments for overall pain, and pain with activities. Results: Compared with baseline, 64.5% of women showed improvement in overall pain, pain with bowel movement, intercourse, exercise, urination, sittingÂ and vulvar pain (minimal clinically important differenceÂ =Â -2.4, -2.0, -2.4, -2.1, -2.1, -2.0, -3.1; dÂ =Â 0.9, 0.7, 0.9, 0.7, 0.7, 0.7, 0.9) by treatment 9. Conclusion: In this cohort, TV-PBMT resulted in improvement of pelvic pain without serious adverse events.

 Lay abstract Low-level laser is a therapy that can help pain, but this type of treatment has not been available to women with chronic pelvic pain because traditional laser devices cannot access the pelvic structures. In this research we studied a novel low-laser device that can be used in the vagina, to treat pain arising from pelvic organs and muscles. Our preliminary research shows that this approach significantly reduced pelvic pain, and pain with activities such as exercise, urination, bowel movementsÂ and intercourse, in two-thirds of women who completed the therapy. Chronic Pain;Cohort Studies;Female;Humans;Pain Measurement;Pelvic Floor;Pelvic Pain

Photobiomodulation Promotes Hippocampal CA1 NSC Differentiation Toward Neurons and Facilitates Cognitive Function Recovery Involving NLRP3 Inflammasome Mitigation Following Global Cerebral Ischemia. Our recent study revealed that photobiomodulation (PBM) inhibits delayed neuronal death by preserving mitochondrial dynamics and function following global cerebral ischemia (GCI). In the current study, we clarified whether PBM exerts effective roles in endogenous neurogenesis and long-lasting neurological recovery after GCI. Adult male rats were treated with 808 nm PBM at 20 mW/cm(2) irradiance for 2 min on cerebral cortex surface (irradiance âˆ¼7.0 mW/cm(2), fluence âˆ¼0.8 J/cm(2) on the hippocampus) beginning 3 days after GCI for five consecutive days. Cognitive function was evaluated using the Morris water maze. Neural stem cell (NSC) proliferation, immature neurons, and mature neurons were examined using bromodeoxyuridine (BrdU)-, doublecortin (DCX)-, and NeuN-staining, respectively. Protein expression, such as NLRP3, cleaved IL1Î², GFAP, and Iba1 was detected using immunofluorescence staining, and ultrastructure of astrocyte and microglia was observed by transmission electron microscopy. The results revealed that PBM exerted a markedly neuroprotective role and improved spatial learning and memory ability at 58 days of ischemia/reperfusion (I/R) but not at 7 days of reperfusion. Mechanistic studies revealed that PBM suppressed reactive astrocytes and maintained astrocyte regeneration at 7 days of reperfusion, as well as elevated neurogenesis at 58 days of reperfusion, as evidenced by a significant decrease in the fluorescence intensity of GFAP (astrocyte marker) but unchanged the number of BrdU-GFAP colabeled cells at the early timepoint, and a robust elevation in the number of DCX-NeuN colabeled cells at the later timepoint in the PBM-treated group compared to the GCI group. Notably, PBM treatment protected the ultrastructure of astrocyte and microglia cells at 58 days but not 7 days of reperfusion in the hippocampal CA1 region. Furthermore, PBM treatment significantly attenuated the GCI-induced immunofluorescence intensity of NLRP3 (an inflammasome component), cleaved IL1Î² (reflecting inflammasome activation) and Iba1, as well as the colocalization of NLRP3/GFAP or cleaved IL-1Î²/GFAP, especially in animals subjected to I/R at 58 days. Taken together, PBM treatment performed postischemia exerted a long-lasting protective effect on astrocytes and promoted endogenous neurogenesis in the hippocampal CA1 region, which might contribute to neurological recovery after GCI.

Dose-response and efficacy of low-level laser therapy on diabetic foot ulcers healing: Protocol of a randomized controlled trial. BACKGROUND: Current evidence shows that low-level laser therapy (LLLT) is an effective non-invasive and non-pharmacological strategy to treat diabetic foot ulcers

(DFU). However, knowledge of parameterization efficacy remains unclear. METHODS: This randomized, double-blind, controlled trial will be conducted at the Physical Therapy University Clinic. Eighty volunteers will be randomized into four groups. The control group will receive placebo LLLT + conventional treatment. The three active groups will receive 10 (G10), 8 (G8), or 4Â J/cm(2) (G4) of GaAs 904Â nm LLLT plus conventional treatment twice a week for 20 sessions. Conventional treatment involves cleaning and dressing the ulcers. The main outcome will be the area of ulcers and Wagner classification score. Assessments will take place before treatment, after 5 and 10Â weeks of treatment, and in the third month after treatment, by a blinded evaluator. IMPLICATIONS: This trial can potentially provide important information and assist in clinical decision-making regarding DFU treatment with LLLT. TRIAL REGISTRATION: NCT04246814, registered 29th January 2020. Diabetes Mellitus;Diabetic Foot;Double-Blind Method;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Treatment Outcome;Wound Healing

Antidepressant and antioxidant effects of transcranial irradiation with 830-nm low-power laser in an animal model of depression. The present study aimed at investigating the antidepressant and antioxidant actions of near-infrared (NIR) laser at a wavelength of 830Â nm and power of 100 mW which applied transcranially on an animal model of depression induced by repeated doses of reserpine (0.2Â mg/kg). Thirty male Wistar adult rats were divided into three groups: rat model of depression; rat model of depression irradiated with laser for 14Â days after induction of depression; and the control group that was given the drug vehicle and sham-exposed to the laser. Forced swimming test (FST) was used to verify the induction of animal model of depression and to screen the effect of antidepressant effect of low-level laser at the end of the experiment. Monoamine level, oxidative stress markers, and activities of acetylcholinesterase (AchE) and monoamine oxidase (MAO) were determined in the cortex and hippocampus of the rat brain. Reserpine resulted in depletion of monoamines and elevation in the oxidative stress markers and change in the enzymatic activities measured in both brain areas. Laser irradiation has an inhibitory action on the monoamine oxidase (MAO) in the cortex and hippocampus leading to elevation of the monoamine levels and attenuation of the oxidative stress in the studied areas. FST has emphasized the antidepressant effect of the utilized laser irradiation parameters on the behavioral level. The present findings provide evidence for the antidepressant and antioxidant actions of NIR low-power laser in the rat model of depression. Accordingly, low-laser irradiation may be presented as a potential candidate modality for depression treatment. Antidepressive Agents;Antioxidants;Acetylcholinesterase Acetylcholinesterase;Animals;Antidepressive Agents;Antioxidants;Behavior, Animal;Depression;Disease Models, Animal;Lasers;Male;Rats;Rats, Wistar;Swimming

Dosimetry and Clinical Efficacy of Transcranial Photobiomodulation for Major Depression Disorder: Could they Guide Dosimetry for Alzheimer's Disease? BACKGROUND: Major depressive disorder (MDD) is prevalent and has significant impact on individuals and society. Cognitive symptoms are frequent in MDD and insufficiently treated by antidepressant medications. Transcranial photobiomodulation (t-PBM) is a novel device therapy which shows promise as an antidepressant and pro-cognitive treatment. To date, despite the encouraging results, the optimal stimulation parameters of t-PBM to treat MDD are not established, and clinical studies are very heterogeneous in terms of these parameters. While the literature provides guidance on the appropriate fluence to achieve therapeutic results, little is known on the other parameters. OBJECTIVE: To evaluate the relationship between different parameters and the antidepressant effect of t-PBM. METHODS: We reviewed clinical studies on MDD and on depressive symptoms comorbid with other diseases. We calculated the standardized effect size of the change in symptoms severity before and after t-PBM and we performed a descriptive analysis of the reviewed papers. RESULTS: The greatest effect sizes for the antidepressant effect were found in studies using pulse-wave t-PBM with high peak irradiance

(but low average irradiance) over large skin surface. One well-designed and sufficiently powered, double-blind, sham-controlled trial indicated that t-PBM with low irradiance over a small skin surface is ineffective to treat depression. CONCLUSION: The use of t-PBM for Alzheimer's disease and for dementia is still at its inception; these dosimetry lessons from the use of t-PBM for depression might serve as guidance. Alzheimer Disease;Depressive Disorder, Major;Double-Blind Method;Humans;Low-Level Light Therapy;Treatment Outcome

Wound healing process with different photobiomodulation therapy protocols to treat 5-FU-induced oral mucositis in hamsters. OBJECTIVES: The aim of this study was to analyze the effects of three different Photobiomodulation Therapy (PBMT) protocols in the treatment of 5-fluorouracil-induced oral mucositis in hamsters. DESIGN: 60 hamsters were divided into five groups: group "C", which did not receive oral mucosa scratching, 5-fluorouracil (5-FU) or PBMT; group "Ch", which received anesthesia, superficial oral mucosa scratching and 5-FU (oral mucositis induction); and three groups that received oral mucositis induction and a PBMT protocol: groups ChLI, ChLII and ChLIII that received 0.24Â J (one point), 1Â J (one point) and 1.2Â J (five points of 0.24Â J) of energy, respectively. The laser equipment used had Î»Â =Â 660Â nm and 0.04Â cm(2) of spot area (0.226Â cm diameter). The animals were euthanized on days 7 and 10 of the experiment, and their oral mucosas were removed for histological (light microscopy and collagen staining), immunohistochemical (NF-kB and TNF-Î±), and biochemical (TNF-Î±, NF-kB and hydroxyproline) analysis. RESULTS: Group ChLI (less energy), showed the most accelerated repair rates and a lower concentration of inflammatory biomarkers than group Ch. Comparing the three PBMT protocols for treatment of 5-FU-induced oral mucositis in hamsters, the one with low energy (0.24Â J) showed better results, regarding reduction of inflammatory biomarkers and tissue repair, than the ones with higher energy (1 and 1.2Â J). Fluorouracil Animals;Cricetinae;Fluorouracil;Low-Level Light Therapy;Mouth Mucosa;Mucositis;Stomatitis;Wound Healing

Photobiomodulation therapy for the prevention of acute radiation dermatitis in breast cancer patients undergoing hypofractioned whole-breast irradiation (LABRA trial). OBJECTIVES: To evaluate the efficacy of photobiomodulation therapy in breast cancer patients post-lumpectomy undergoing hypofractionated whole-breast irradiation (HF-WBI) for the prevention and management of acute radiodermatitis (ARD). MATERIALS AND METHODS: A randomized, multicentric clinical trial (LABRA trial, NCT03924011) was set up at the Limburg Oncology Center, including the Jessa Hospital (Hasselt, BE) and Ziekenhuis Oost-Limburg (Genk, BE). A total of 71 breast cancer patients planned to undergo HF-WBI were randomized to one of the two study arms: the control group (nâ€‰=â€‰32) or the PBM group (nâ€‰=â€‰39). The PBM group received the standard institutional skincare combined with PBM (2Ã—/week) during the complete radiotherapy (RT) course. Patients in the control group received the standard skincare combined with placebo treatment (2x/week). Patients' skin reactions were evaluated weekly during the RT treatment by using the modified version of the Radiation Therapy Oncology Group (RTOG) criteria. RESULTS: At week 3 of RT, one patient presented a grade 2 and one patient a grade 3 skin reaction in the control group, while in the PBM group, all patients still presented grade 1 ARD. At the final RT session 28% of the patients presenting grade 2-3 ARD, while in the PBM group 10% presented grade 2 and no grade 3 ARD. PBM reduced the incidence of severe ARD by 18%. However, the difference was not significant (pâ€‰=â€‰0.053). CONCLUSION: Based on the LABRA trial results, PBM seems not able to reduce the incidence of severe ARD in breast cancer patients undergoing HF-WBI. Research in a larger patient population is recommended. Breast;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Radiodermatitis

Impact of preconditioned diabetic stem cells and photobiomodulation on quantity and degranulation of mast cells in a delayed healing wound simulation in type one diabetic rats. Herein, we report the influence of administering different protocols of preconditioned diabetic adipose-derived

mesenchymal stem cells (ADSs) with photobiomodulation in vitro, and photobiomodulation in vivo on the number of mast cells (MCs), their degranulation, and wound strength in the maturation step of a Methicillin-resistant Staphylococcus aureus (MRSA)-infectious wound model in rats with type one diabetes. An MRSA-infectious wound model was generated on diabetic animals, and they were arbitrarily assigned into five groups (G). G1 were control rats. In G2, diabetic ADS were engrafted into the wounds. In G3, diabetic ADS were engrafted into the wound, and the wound was exposed to photobiomodulation (890Â nm, 890â€‰Â±â€‰10Â nm, 80Â Hz, 0.2Â J/cm(2)) in vivo. In G4, preconditioned diabetic ADS with photobiomodulation (630 and 810Â nm; each 3 times with 1.2Â J/cm(2)) in vitro were engrafted into the wound. In G5, preconditioned diabetic ADS with photobiomodulation were engrafted into the wound, and the wound was exposed to photobiomodulation in vivo. The results showed that, the maximum force in all treatment groups was remarkably greater compared to the control group (all, pâ€‰=â€‰0.000). Maximum force in G4 and G5 were superior than that other treated groups (both pâ€‰=â€‰0.000). Moreover, G3, G4, and G5 showed remarkable decreases in completely released MC granules and total numbers of MC compared to G1 and G2 (all, pâ€‰=â€‰0.000). We concluded that diabetic rats in group 5 showed significantly better results in terms of accelerated wound healing and MC count of an ischemic infected delayed healing wound model. Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Mast Cells;Methicillin-Resistant Staphylococcus aureus;Rats;Rats, Wistar;Stem Cells

Treatment of melasma with a low-fluence 1064â€‰nm Q-switched Nd:YAG laser: Laser toning in Caucasian women. BACKGROUND AND OBJECTIVES: Melasma is a common, therapeutically challenging, and very often relapsing disorder of hyperpigmentation most often observed in women. Low-fluence, multipass technique with Q-switched-mode laser-"laser toning" is broadly used to treat melasma, especially in Asia. The study aimed to evaluate the effects of a series of laser treatments with very short, nanosecond pulses in the treatment of melasma in Caucasian women. MATERIAL AND METHODS: Forty polish females with Fitzpatrick skin phototype II-III and melasma were treated with 1064â€‰nm Q-switched neodymium:yttrium-aluminum-garnet (QSNY) laser (pulse with 5â€‰ns; spot size, 6-8â€‰mm; fluence, 1.7-3.2â€‰J/cm(2) ; 2-8 passes; nine treatments). Melanin index (MI), erythema index (EI) by Mexameter MX18Â®, the modified Melasma Area Severity Index (mMASI), and the participant's self-assessment were used to evaluate the treatment results. Twenty-one patients were subjected to a 1-year follow-up. RESULTS: Significant improvement in melasma pigmentation was observed in the mean MI and mMASI score; both were significantly reduced (pâ€‰<â€‰0.0001). Significant erythema reduction was achieved (pâ€‰<â€‰0.001). In total, 70% of participants rated the laser as a method that met their expectations for treating melasma. Clinical follow-up after one year showed that the reduced melasma effect was still maintained. Patients also noticed improved skin conditions (radiance, smoothness, brightness, hydration, regeneration). No serious adverse effects were observed. CONCLUSIONS: Low-fluence 1064â€‰nm QSNY laser is an effective, safe, and noninvasive method with long-term results in melasma treatment. QSNY (1064â€‰nm) improves the condition of melasma patients with erythema. Erythema;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

The Anti-Acne Effect of Near-Infrared Low-Level Laser Therapy. BACKGROUND: Acne vulgaris is a skin problem affecting many people of different ages. Phototherapy is one of the acne treatment options. The aim of the study was to assess the effect of near-infrared low-level laser therapy on acne lesions. MATERIALS AND METHODS: The prospective study involved a total number of 27 women, aged 18 to 45 years, with mild to severe acne. All the participants underwent a series of six treatments with the use of a 785 nm low-level laser with the power density 80mW/cm(2), performed every two weeks. The analysis of the effectiveness of the performed procedures was based on

sebumetric examination, photographic documentation and assessment of the change in the number of acne lesions. RESULTS: Significant improvements in acne lesions (assessed as non-inflammatory and inflammatory lesion counts) and a significant decrease in skin sebum excretion were observed after the treatment. No adverse effects were reported. CONCLUSION: A series of six treatments using a near-infrared low-level laser represents a safe and effective non-invasive therapy option for acne vulgaris.

New-generation photosensitizer-anchored gold nanorods for a single near-infrared light-triggered targeted photodynamic-photothermal therapy. Traditional combined photodynamic and photothermal therapy (PDT/PTT) was limited in clinical treatment of cancer due to the exceptionally low drug delivery efficiency to tumor sites and the activation by laser excitation with different wavelengths. We have accidentally discovered that our synthesized chlorin e6-C-15-ethyl ester (HB, a new type of photosensitizer) be activated by a laser with an excitation wavelength of 660â€‰nm. Herein, we utilized Au nanorods (AuNRs) as 660â€‰nm-activated PTT carriers to be successively surface-functionalized with HB and tumor-targeting peptide cyclic RGD (cRGD) to develop HB-AuNRs@cRGD for single NIR laser-induced targeted PDT/PTT. The HB-AuNRs@cRGD could be preferentially accumulated within tumor sites and rapidly internalized by cancer cells. Thereby, the HB-AuNRs@cRGD could exhibit amplified therapeutic effects by producing both significant reactive oxygen species (ROS) and hyperthermia simultaneously under the guidance of fluorescence imaging. The tumor inhibition rate on ECA109 esophageal cancer model was approximately 77.04%, and the negligible systematic toxicity was observed. This study proposed that HB-AuNRs@cRGD might be a promising strategy for single NIR laser-induced and imaging-guided targeted bimodal phototherapy. Photosensitizing Agents;Reactive Oxygen Species;Gold Animals;Cell Line;Female;Gold;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Nanotubes;Photochemotherapy;Photosensitizing Agents;Photothermal Therapy;Reactive Oxygen Species

The Pathogenesis and Management of Acne-Induced Post-inflammatory Hyperpigmentation. Acne vulgaris is a common inflammatory disease. Among patients with darker skin phototypes (Fitzpatrick III-VI), the inflammatory processes of acne stimulate excess melanogenesis and abnormal melanin deposition, leading to pigmentary sequelae known as post-inflammatory hyperpigmentation and post-inflammatory erythema in all skin tones, although post-inflammatory hyperpigmentation is more common in darker skin and post-inflammatory erythema in lighter skin. These pigmentary alterations can be long lasting and are often more distressing to patients than the active acne lesions. This article discusses what is known about acne-related pigmentation, much of which is extrapolated from general study of nonspecific pigment deposition. Because dyspigmentation poses both a significant clinical concern to patients and a therapeutic challenge to clinicians, we formed a working group consisting of pigmentary experts with the aim of increasing awareness and education of acne-related pigmentary sequelae. Anti-Inflammatory Agents;Dermatologic Agents;Melanins Acne Vulgaris;Anti-Inflammatory Agents;Combined Modality Therapy;Dermabrasion;Dermatologic Agents;Humans;Hyperpigmentation;Low-Level Light Therapy;Melanins;Skin;Skin Pigmentation

Maintaining Photobiomodulation Research During the COVID-19 Pandemic. COVID-19;Humans;Low-Level Light Therapy;Pandemics;SARS-CoV-2

Author Correction: Accelerated burn wound healing with photobiomodulation therapy involves activation of endogenous latent TGF-Î²1.

Black phosphorus conjugation of chemotherapeutic ginsenoside Rg3: enhancing targeted multimodal nanotheranostics against lung cancer metastasis. It is a significant challenge in lung cancer chemophotothermal (CPT) therapy to develop multifunctional theranostic nanoagent (MTN) for precise targeting and successful tumor treatments, especially for lung metastasis. To overcome this problem, we effectively design and construct multifunctional black phosphorus (BP) nanoagents,

BPs/G-Rg3@PLGA. BPs quantum dots (BPsQDs) are co-loaded onto poly(lactic-co-glycolic acid) (PLGA) with subsequent conjugations of a cancer therapeutic compound, ginsenoside Rg3 (G-Rg3), in this composite nanoagent. The inÂ vivo delivery findings suggest that BPs/G-Rg3@PLGA has an excellent affinity for primary tumors and metastatic lung tumors. Furthermore, when paired with near-light irradiation, BPs/G-Rg3@PLGA shows superior controllable CPT therapy synergetic therapeutics, significantly increasing photothermal tumor ablation effectiveness. Mechanistically, heating causes rapid G-Rg3 release from the non-complex, and thermal therapy induces apoptosis, culminating in the reduction of lung cancer metastasis. Additionally, inÂ vivo and inÂ vitro findings support the biocompatibility of BPs/G-Rg3@PLGA. This thesis identifies a versatile BPs-based MTN for lung cancer metastasis control. Antineoplastic Agents, Phytogenic;Ginsenosides;Polylactic Acid-Polyglycolic Acid Copolymer;ginsenoside Rg3;Phosphorus Animals;Antineoplastic Agents, Phytogenic;Cell Line, Tumor;Chemistry, Pharmaceutical;Combined Modality Therapy;Drug Liberation;Female;Ginsenosides;Low-Level Light Therapy;Lung Neoplasms;Mice;Mice, Inbred BALB C;Neoplasm Metastasis;Phosphorus;Polylactic Acid-Polyglycolic Acid Copolymer;Surface Properties;Theranostic Nanomedicine

Photobiomodulation as an antioxidant substitute in post-thawing trauma of human stem cells from the apical papilla. Cryopreservation, the most common method of preserving stem cells, requires post-processing because it produces trauma to the cells. Post-thawing trauma typically induces cell death, elevates reactive oxygen species (ROS) concentration, and lowers mitochondrial membrane potential (MMP). Although this trauma has been solved using antioxidants, we attempted to use photobiomodulation (PBM) instead of chemical treatment. We used a 950-nm near-infrared LED to create a PBM device and chose a pulsed-wave mode of 30Â Hz and a 30% duty cycle. Near-infrared radiation (NIR) at 950Â nm was effective in reducing cell death caused by hydrogen peroxide induced-oxidative stress. Cryodamage also leads to apoptosis of cells, which can be avoided by irradiation at 950Â nm NIR. Irradiation as post-processing for cryopreservation had an antioxidant effect that reduced both cellular and mitochondrial ROS. It also increased mitochondrial mass and activated mitochondrial activity, resulting in increased MMP, ATP generation, and increased cytochrome c oxidase activity. In addition, NIR increased alkaline phosphatase (ALP) activity, a biomarker of differentiation. As a result, we identified that 950Â nm NIR PBM solves cryodamage in human stem cells from the apical papilla, indicating its potential as an alternative to antioxidants for treatment of post-thawing trauma, and further estimated its mechanism. Antioxidants;Biomarkers;Reactive Oxygen Species;Hydrogen Peroxide;Electron Transport Complex IV;Alkaline Phosphatase Alkaline Phosphatase;Antioxidants;Apoptosis;Biomarkers;Biophysics;Cell Biology;Cell Death;Cell Proliferation;Cell Survival;Cryopreservation;Electron Transport Complex IV;Equipment Design;Humans;Hydrogen Peroxide;Luminescence;Membrane Potential, Mitochondrial;Mitochondria;Oxidative Stress;Phototherapy;Reactive Oxygen Species;Spectroscopy, Near-Infrared;Stem Cells

Photobiomodulation of the Brain: Shining Light on Alzheimer's and Other Neuropathological Diseases. Alzheimer Disease;Brain;Humans;Low-Level Light Therapy;Nervous System Diseases

Effects of photobiomodulation on the redox state of healthy and cancer cells. Photobiomodulation therapy (PBMT) uses light to stimulate cells. The molecular basis of the effects of PBMT is being unveiled, but it is stated that the cytochrome-c oxidase enzyme in mitochondria, a photon acceptor of PBMT, contributes to an increase in ATP production and modulates the reduction and oxidation of electron carriers NADH and FAD. Since its effects are not fully understood, PBMT is not used on tumors. Thus, it is interesting to investigate if its effects correlate to mitochondrial metabolism and if so, how it could be linked to the optical redox ratio (ORR), defined as the ratio of

FAD/(NADH + FAD) fluorescences. To that end, fibroblasts (HDFn cell line) and oral squamous cell carcinoma (SCC-25 cell line) were irradiated with a light source of 780 nm and a total dose of 5 J/cm(2), and imaged by optical microscopy. PBMT down-regulated the SCC-25 ORR by 10%. Furthermore, PBMT led to an increase in ROS and ATP production in carcinoma cells after 4 h, while fibroblasts only had a modest ATP increase 6 h after irradiation. Cell lines did not show distinct cell cycle profiles, as both had an increase in G2/M cells. This study indicates that PBMT decreases the redox state of oral cancer by possibly increasing glycolysis and affects normal and tumor cells through distinct pathways. To our knowledge, this is the first study that investigated the effects of PBMT on mitochondrial metabolism from the initiation of the cascade to DNA replication. This is an essential step in the investigation of the mechanism of action of PBMT in an effort to avoid misinterpretations of a variety of combined protocols.

Effect of low-level gallium aluminum arsenide laser therapy on the chewing performance and pain perception of patients with systemic lupus erythematosus: A randomized controlled clinical trial. OBJECTIVE: To evaluate the effect of low-level laser therapy (LLLT) on pain intensity (PI) and chewing performance (CP) in systemic lupus erythematosus (SLE) patients with myogenic temporomandibular disorder (TMD). METHODS: Ninety-one patients were randomly allocated to three groups: Group L (intervention), Group P (placebo), and Group C (control). Outcomes were PI (assessed with visual analog scale (VAS)) and CP (assessed with the geometric mean diameter (GMD) of crushed test food). Measurements were performed at T0 (before the LLLT), T1 (immediately after the LLLT), and T2 (1-month follow-up). Data were analyzed using Generalized Linear Models, Kruskal-Wallis, and Friedman tests. RESULTS: For T1 and T2, Group L demonstrated the lowest values for both GMD (6283.7Â Â±Â 257.2Â Âµm; 6382.7Â Â±Â 303.7Â Âµm) and VAS (5;6) (p <Â 0.001). CONCLUSION: LLLT was an effective therapeutic approach in reducing pain and improving CP for one month in SLE patients with myogenic TMD.

Paired facial treatment with 755nm picosecond laser with diffractive lens array and 1060nm laser lipolysis of the submentum: An open-label prospective trial. BACKGROUND: Performing multiple cosmetic treatments in a single session to target different aspects of facial rejuvenation is an effective regimen. Picosecond lasers with a fractionated handpiece can target fine lines, which can supplement submental fat reduction procedures. However, limited data exist on the safety and efficacy of single-session treatment strategies. AIMS: To assess the safety and utility of paired facial treatment with 755Â nm picosecond laser with diffractive lens array (DLA) and 1060Â nm laser lipolysis of the submentum. PATIENTS/METHODS: A prospective clinical study investigated the utility of paired facial treatment with 755Â nm picosecond laser with DLA and 1060Â nm diode laser lipolysis of the submentum. Subjects received treatments during the same session. Subjects were enrolled to receive up to 3 picosecond laser and 2 lipolysis treatments at 2-8-week intervals. RESULTS: Eleven subjects completed the study. Mean age was 52.1Â years, and 81.8% were female. Fitzpatrick skin types II-VI were represented. For investigator global aesthetics improvement scores (GAIS), 63.6%, 81.8%, and 85.7% had improvement from baseline at 30-, 90-, and 180-day follow-up, respectively. At 180-day follow-up, 100% maintained improvement from 90-day follow-up. At 90-day follow-up, calculations for neck laxity showed a significant improvement of 11.7% from baseline (pÂ <Â 0.001) with a mean amount of lift of 42.7Â mm(2) , which was above the predetermined threshold (20Â mm(2)). No serious or unexpected treatment effects were observed. CONCLUSION: Paired facial treatment with 755Â nm picosecond laser with DLA and 1060Â nm laser lipolysis of the submentum improved clinical aesthetic outcomes. This treatment regimen was demonstrated to be safe, well-tolerated, and well-liked by subjects. Female;Humans;Lasers, Solid-State;Lipolysis;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Skin Aging;Treatment Outcome

Combination Therapy of Pulsed Dye Laser With Intense Pulsed Light in Port-Wine Stain Treatment: A Prospective Side-by-Side Comparison. BACKGROUND: Pulsed dye laser (PDL) treatment currently represents the mainstream choice for port-wine stain (PWS) treatment in accordance with selective photothermolysis. However, most PWS lesions cannot be removed despite several treatments. Intense pulsed light (IPL) is reportedly an effective alternative to PDL for PWS treatment. No studies have thus far been reported on the combination therapy of PDL with IPL in PWS treatment. OBJECTIVE: This study evaluated the efficacy and safety of PDL with IPL for PWS treatment. METHODS: A total of 33 PWS lesions underwent 3 treatment sessions. Each PWS was divided into IPL + PDL, PDL, and untreated sites. Therapeutic outcomes were evaluated by visual assessment and chromametric assessment 3 months after the final treatment. RESULTS: The overall average blanching rates were 36.2% and 32.6% at the sites treated with IPL + PDL and PDL, respectively ($p > .05$). No permanent side effects were reported. CONCLUSION: In this laser setting, although IPL + PDL is a safe and effective PWS treatment, no significant improvement in the efficacy was observed using IPL + PDL in contrast to PDL alone. Adolescent;Adult;Child;Child, Preschool;Combined Modality Therapy;Female;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Prospective Studies;Single-Blind Method

An Effective and Safe Novel Treatment of Opioid Use Disorder: Unilateral Transcranial Photobiomodulation. Background: The opioid epidemic is a global tragedy even with current treatments, and a novel, safe, and effective treatment would be welcomed. We report here our findings from our second randomized controlled trial to evaluate unilateral transcranial photobiomodulation as a treatment for opioid use disorder. Methods: We enrolled 39 participants with active opioid cravings at 2 sites, 19 received the active treatment which consisted of a 4-min twice weekly (every 3 or 4 days) application of a light-emitting diode at 810 nm with an irradiance of 250 mW/cm(2) and a fluence of 60 J/cm(2) to the forehead over either the left or right dorsolateral prefrontal cortex with a fluence to the brain of 2.1 J/cm(2). Twenty participants received a sham treatment with the same device with foil over the bulb. The side of the treatment was based on Dual-Brain Psychology, which posits that one hemisphere is more affected by past maltreatments and is more prone to anxiety and drug cravings that the other hemisphere. We treated the hemisphere with the more positive hemispheric emotional valence (HEV) by 2 tests for HEV. Results: Our primary outcome was changes in pre-treatment opioid craving scale (OCS) minus baseline, and we found using a mixed model that the active group had a highly significant treatment (*) time benefit over the sham group, $p < 0.0001$, effect size at the last follow-up of 1.5. The active treatment benefited those not on buprenorphine as well as those not on it. The TimeLine Follow Back measure of opioid use was significantly better in the actively treated group, $p = 0.0001$, with an effect size of 0.45. We observed no adverse effects. Conclusion: Active unilateral transcranial photobiomodulation to the brain hemisphere with the better HEV was better than sham in the reduction of opioid cravings and opioid use to a very significant degree in a RCT of 39 participants at 2 independent sites. In the active group those on buprenorphine and those not on it both had improvements in cravings over the study. No adverse responses were reported in either group. ClinicalTrials.gov Identifier: NCT04340622.

Red Light Irradiation In Vivo Upregulates DJ-1 in the Retinal Ganglion Cell Layer and Protects against Axotomy-Related Dendritic Pruning. Retinal ganglion cells (RGCs) undergo dendritic pruning in a variety of neurodegenerative diseases, including glaucoma and autosomal dominant optic atrophy (ADOA). Axotomising RGCs by severing the optic nerve generates an acute model of RGC dendropathy, which can be utilized to assess the therapeutic potential of treatments for RGC degeneration. Photobiomodulation (PBM) with red light provided neuroprotection to RGCs when administered ex vivo to wild-type retinal explants. In the current study, we used aged (13-15-month-old) wild-type and heterozygous B6;C3-Opa1(Q285STOP) (Opa1(+/-)) mice, a model of ADOA

exhibiting RGC dendropathy. These mice were pre-treated with 4 J/cm(2) of 670 nm light for five consecutive days before the eyes were enucleated and the retinas flat-mounted into explant cultures for 0-, 8- or 16-h ex vivo. RGCs were imaged by confocal microscopy, and their dendritic architecture was quantified by Sholl analysis. In vivo 670 nm light pretreatment inhibited the RGC dendropathy observed in untreated wild-type retinas over 16 h ex vivo and inhibited dendropathy in ON-center RGCs in wild-type but not Opa1(+/-) retinas. Immunohistochemistry revealed that aged Opa1(+/-) RGCs exhibited increased nitrosative damage alongside significantly lower activation of NF-ÎºB and upregulation of DJ-1. PBM restored NF-ÎºB activation in Opa1(+/-) RGCs and enhanced DJ-1 expression in both genotypes, indicating a potential molecular mechanism priming the retina to resist future oxidative insult. These data support the potential of PBM as a treatment for diseases involving RGC degeneration. PARK7 protein, mouse;Protein Deglycase DJ-1 Animals;Disease Models, Animal;Light;Mice;Neuroprotection;Optic Atrophy, Autosomal Dominant;Phototherapy;Protein Deglycase DJ-1;Retinal Degeneration;Retinal Ganglion Cells;Up-Regulation

The Treatment of Medication-Related Osteonecrosis of the Jaw (MRONJ): A Systematic Review with a Pooled Analysis of Only Surgery versus Combined Protocols. Medication-related osteonecrosis of the jaw (MRONJ) is a serious adverse reaction of antiresorptive and antiangiogenic agents, and it is also a potentially painful and debilitating condition. To date, no specific studies have prospectively evaluated the efficacy of its treatment and no robust standard of care has been established. Therefore, a systematic review (2007-2020) with a pooled analysis was performed in order to compare MRONJ surgical techniques (conservative or aggressive) versus combined surgical procedures (surgery plus a non-invasive procedure), where 1137 patients were included in the pooled analysis. A statistically significant difference in the 6-month improvement rate, comparing combined conservative surgery versus only aggressive (91% versus 72%, p = 0.05), was observed. No significant difference regarding any group with respect to the 6-month total resolution rate (82% versus 72%) was demonstrated. Of note, conservative surgery combined with various, adjuvant, non-invasive procedures (ozone, LLLT or blood component + Nd:YAG) was found to achieve partial or full healing in all stages, with improved results and the amelioration of many variables. In conclusion, specific adjuvant treatments associated with minimally conservative surgery can be considered effective and safe in the treatment of MRONJ, although well-controlled studies are a requisite in arriving at definitive statements. Bone Density Conservation Agents;Diphosphonates Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Humans

Neuropathic and Psychogenic Components of Burning Mouth Syndrome: A Systematic Review.
The pathophysiology of primary burning mouth syndrome (BMS) has been extensively debated but is poorly understood despite a large number of hypotheses attempting to explain its etiopathogenic mechanisms. The aim of the present work was to systematically review papers that could provide arguments in favour of the neuropathic and psychogenic components of primary BMS for a better understanding of the disease. This systematic review (SR) was registered in PROSPERO (CRD42021224160). The search was limited to articles in English or French from 1990 to 01 December 2020. A total of 113 articles were considered for data extraction. We divided them into four subgroups: pharmacological and nonpharmacological management studies (n = 23); neurophysiological studies (n = 35); biohistopathological studies (n = 25); and questionnaire-based studies (n = 30). Several of these studies have shown neuropathic involvement at various levels of the neuraxis in BMS with the contribution of quantitative sensory testing (QST), functional brain imaging, and biohistopathological or pharmacologic studies. On the other hand, the role of psychological factors in BMS has also been the focus of several studies and has shown a link with psychiatric disorders such as anxiety and/or depression symptoms. Depending on the patient, the neuropathic and psychogenic components may exist simultaneously, with a preponderance of one or the other, or

exist individually. These two components cannot be dissociated to define BMS. Consequently, BMS may be considered nociplastic pain. Cytokines;Thioctic Acid;Capsaicin Burning Mouth Syndrome;Capsaicin;Cytokines;Humans;Low-Level Light Therapy;Neuralgia;Pain;Pain Measurement;Pain Threshold;Perception;Physical Stimulation;Sensory Thresholds;Surveys and Questionnaires;Thioctic Acid

New evidence from hyperspectral imaging analysis on the effect of photobiomodulation therapy on normal skin oxygenation. The aim of this study was to assess the changes induced by photobiomodulation therapy in oxygenation of normal skin and underlying tissue using hyperspectral imaging combined with a chemometric regression approach. Eleven healthy adult volunteers were enrolled in this study. The dorsal side of the left hand of each subject was exposed to photobiomodulation therapy, while the correspondent side of the right hand was used as a control (placebo effect). Laser irradiation was performed with a laser diode system (635Â nm, 15mW, 9Â J/cm(2)) for 900Â s. Changes in skin oxygenation were assessed before and after applying the photobiomodulation therapy and placebo using the hyperspectral imaging. Hyperspectral data analysis showed that variations of oxyhemoglobin and deoxyhemoglobin concentrations had no statistical significance in both groups. In conclusion, photobiomodulation therapy does not induce changes in oxyhemoglobin and deoxyhemoglobin concentrations in the normal skin measured from hyperspectral images, at least at Î»â€‰=â€‰635Â nm and 900-s exposure time. Oxyhemoglobins Adult;Humans;Hyperspectral Imaging;Lasers, Semiconductor;Low-Level Light Therapy;Oxyhemoglobins;Skin

Synergistic effects of combined therapy with transcranial photobiomodulation and enriched environment on depressive- and anxiety-like behaviors in a mice model of noise stress. The development of anxiety and depression due to chronic exposure to noise stress has remained as an unsolved health problem so far. Despite the studies suggesting the neuroenhancement effects of transcranial photobiomodulation (tPBM) and housing in an enriched environment (EE), the combined effects of these treatments have not been elucidated yet. Also, there is no available data on the relationship between the application of tPBM and hippocampal brain-derived neurotrophic factor (BDNF) expression in animal models of stress. The present study aims to investigate the application of the tPBM and EE (alone or in combination) on depressive- and anxiety-like behaviors in a mice model of noise stress. Mice were divided into five groups: control, noise, noiseâ€‰+â€‰EE, noiseâ€‰+â€‰tPBM, and noiseâ€‰+â€‰EEâ€‰+â€‰tPBM. Except for the control group, other groups were subjected to 110 dB SPL white noise for 4Â h/day for 14 consecutive days and received their respective treatments. Forced Swimming Test (FST) was used to evaluate depressive-like behaviors. Elevated Plus Maze (EPM) and Open Field Test (OFT) were used to evaluate anxiety-like behaviors. BDNF, tyrosine receptor kinase B (TrkB), and cAMP response element-binding (CREB) protein levels in the hippocampus were determined by the Western blot method, and also serum corticosterone levels were assessed using an ELISA kit. Exposure to noise stress significantly elevated serum corticosterone level; downregulated hippocampal BDNF, TrkB, and CREB protein expressions; and resulted in depressive- and anxiety-like behaviors. While, the application of tPBM (810 nm wavelength, 8Â J/cm(2) fluence, 10Â Hz pulsed wave mode), housing in EE, and their combination lowered corticosterone levels, upregulated the BDNF/TrkB/CREB signaling pathway in the hippocampus, and improved behavioral outcomes in noise stress subjected mice. Our finding revealed the improving effects of tPBM and EE on depressive and anxiety-like behaviors induced by noise stress, possibly by augmenting the BDNF/TrkB/CREB signaling pathway. Brain-Derived Neurotrophic Factor;Cyclic AMP Response Element-Binding Protein;Corticosterone Animals;Anxiety;Behavior, Animal;Brain-Derived Neurotrophic Factor;Combined Modality

Therapy;Corticosterone;Cyclic AMP Response Element-Binding Protein;Depression;Disease Models, Animal;Hippocampus;Low-Level Light Therapy;Mice;Noise;Stress, Psychological
Effects of Low-Level Laser Therapy on Muscular Performance and Soreness Recovery in Athletes: A Meta-analysis of Randomized Controlled Trials. CONTEXT: Athletes must maintain their peak state of strength. Previous studies have investigated the effect of low-level laser therapy (LLLT) on muscular performance. A previous systematic review and meta-analysis has investigated this issue in healthy participants but not in physically active athletes. OBJECTIVE: To investigate whether LLLT can improve muscular performance and soreness recovery in athletes. DATA SOURCES: PubMed, EMBASE, and Cochrane Library. STUDY SELECTION: Published randomized controlled trials and crossover studies till December 2020. STUDY DESIGN: Systematic review and meta-analysis. LEVEL OF EVIDENCE: Level 3. DATA EXTRACTION: Assessment of study quality was rated using the risk of bias assessment method for randomized trials (Cochrane Handbook for Systematic Reviews of Interventions). RESULTS: A total of 24 studies were included. LLLT application before exercise significantly improved lower-limb muscle strength in 24-hour, 48-hour, 96-hour, and 8-week follow-up groups. Furthermore, decreased soreness index, serum creatine kinase concentrations, interleukin-6, and thiobarbituric acid reactive substance concentrations and a trend toward the improvement of contract repetition number and VO(2) kinetic outcomes were observed. CONCLUSION: Although a definite therapeutic effect of LLLT is yet to be established, the current evidence supports that LLLT use improves muscular performance in physically active athletes. Additional trials with large sample sizes and robust design should be conducted before strong recommendations are made. Athletes;Humans;Low-Level Light Therapy;Pain;Randomized Controlled Trials as Topic
The efficacy of the diode laser at 800-980 nm as an aid to non-surgical therapy in periodontitis treatment: a review of literature. The aim of this literature review is to assess the effectiveness of diode laser at a wavelength of 800-980 nm in addition to non-surgical periodontal therapy in periodontitis treatment. The authors performed an electronic research on Pubmed inserting as keywords: (laser OR laser therapy OR diode laser) and (periodontitis OR periodontal disease). The field has been narrowed to select only Randomized controlled clinical trials (RCT) performed from 2010 to 2020. The result of this research was 84 articles, of which eight were included in the review because they respect the inclusion criteria. The clinical, immunological, and microbiological parameters studied in the various clinical random trials were analysed. It has been shown that four out of eight studies have achieved greater benefits, in terms of clinical parameters, with the use of diode laser compared to Scaling and Root Planing. However, the greater increase in clinical parameters in diode laser-treated patients compared to the control group was mainly detected in the short term rather than in the long term. In terms of microbiological parameters, no improvement was detected after six months. Only one study reported six-month improvements in immunological parameters in patients treated with DL compared to the Scaling and Root Planing only group. In conclusion, considering the limitations of this review of literature, there is no evidence that the diode laser at 800-980 nm in addition to non-surgical periodontal therapy is more effective than SRP alone in the long term. Chronic Periodontitis;Humans;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Root Planing
2021 Summary of Photobiomodulation Literature.
Effects of Photobiomodulation on Changes in Cognitive Function and Regional Cerebral Blood Flow in Patients with Mild Cognitive Impairment: A Pilot Uncontrolled Trial. BACKGROUND: Photobiomodulation (PBM) affects local blood flow regulation through nitric oxide generation, and various studies have reported on its effect on improving cognitive function in neurodegenerative diseases. However, the effect of PBM in the areas of the vertebral arteries (VA) and internal carotid

arteries (ICA), which are the major blood-supplying arteries to the brain, has not been previously investigated. OBJECTIVE: We aimed to determine whether irradiating PBM in the areas of the VA and ICA, which are the major blood-supplying arteries to the brain, improved regional cerebral blood flow (rCBF) and cognitive function. METHODS: Fourteen patients with mild cognitive impairments were treated with PBM. Cognitive assessment and single-photon emission computed tomography were implemented at the baseline and at the end of PBM. RESULTS: Regarding rCBF, statistically significant trends were found in the medial prefrontal cortex, lateral prefrontal cortex, anterior cingulate cortex, and occipital lateral cortex. Based on the cognitive assessments, statistically significant trends were found in overall cognitive function, memory, and frontal/executive function. CONCLUSION: We confirmed the possibility that PBM treatment in the VA and ICA areas could positively affect cognitive function by increasing rCBF. A study with a larger sample size is needed to validate the potential of PBM. Aged;Brain;Carotid Artery, Internal;Cerebrovascular Circulation;Cognition;Cognitive Dysfunction;Executive Function;Female;Humans;Low-Level Light Therapy;Male;Memory;Middle Aged;Neuropsychological Tests;Pilot Projects;Regional Blood Flow;Tomography, Emission-Computed, Single-Photon

Photobiomodulation Therapy in Hearing Related Aspects: an Integrative Bibliometric Study. INTRODUCTION: In the last decades have been increasing cases of inner ear disorders and among them is included hearing loss, tinnitus, and vertigo, on that way the demand for new treatments is growing, with low-level laser therapy (LLLT) being a highly targeted treatment due to its non-invasive nature. OBJECTIVES: The present study aims to investigate the studies of low level laser (LLL) and audiology in recent years. MATERIALS AND METHODS: The quantitative bibliometric study was performed by searching scientific articles in the Web of Science - Clarivate Analytics database. The association of the words "low level laser therapy" and "hearing" was used to construct the sample. RESULTS: The most recurrent objectives analyzed the action of LLLT regarding its effectiveness, with predominantly positive results in the effectiveness of the treatment of hearing problems such as hearing loss, tinnitus and vertigo. CONCLUSIONS: LLL is a great tool for professionals who take care of human hearing, helping in the recovery of patients with hearing problems in a noninvasive or drug way, thus improving the functions in which the TBLI is applied.
Bibliometrics;Hearing;Humans;Low-Level Light Therapy;Tinnitus;Vertigo

Split-face clinical comparative study of fractional Er:YAG (2940nm) laser versus long pulsed Nd:YAG (1064nm) laser in treatment of atrophic acne scar. Despite various modalities used for treating acne scars, no single treatment modality was significantly satisfactory. We compare the efficacies of fractional Erbium: yttrium aluminum garnet (Er:YAG), 2940Â nm, laser versus long-pulsed Neodymium: yttrium-aluminum-garnet (Nd:YAG), 1064Â nm, laser for the treatment of acne scars. Twenty patients were treated in a randomized split-face manner. They underwent three sessions at a three-week interval. Assessment of the patient was done before each treatment and 3 months after the end of the treatment sessions. The treatment effect was evaluated objectively, according to Sharquie scores for grading scarring acne vulgaris and digital photographic assessment and subjectively, according to the patient's satisfaction. Results According to objective Sharquie scores, there were no significant differences in the response between the two types of laser used. Based on the visual analog score, there was a significantly higher score of improvement for the side irradiated with fractional Er:YAG (2940Â nm) laser. Subjectively, the patients were significantly satisfied with the results on the fractional Er: YAG than on the long pulsed Nd:YAG side. Both lasers were effective, However, the improvement in appearance of acne scars was better with fractional Er:YAG laser with fewer side effects with Long Pulsed Nd:YAG laser. Acne Vulgaris;Cicatrix;Humans;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Effects of low-level light therapy on xerostomia related to hyposalivation: a systematic review and meta-analysis of clinical trials. Hyposalivation is a condition represented by a reduced salivary flow and may include symptoms such as mouth dryness (xerostomia), loss of taste, pain, dysphagia, and dysphonia, all of which greatly affect an individual's quality of life.The aim of the present study was to systematically review the effects of low-level light therapy irradiation (photobiomodulation) on salivary gland function in patients with hyposalivation.The main question of the systematic review was: "Does low-level light irradiation therapy of the salivary glands affect salivary flow rate or indicators of salivary function (ion and protein concentrations) in patients with xerostomia or hyposalivation?" The question was based on the PICO (participant, intervention, control, outcome) principle and followed the PRISMA guidelines. Databases were explored and papers published between the years 1997 and 2020 were reviewed for the following Mesh-term keywords and their corresponding entry terms in different combinations: "Low-level light therapy," "Xerostomia," "Saliva," "Salivary glands," "Salivation."The initial sample consisted of 220 articles. Of those, 47 articles were used for full-text analysis and 18 were used for a systematic review, 14 were used in meta-analysis. According to their individual quality, most articles were classified as high quality of evidence according to the GRADE score. Meta-analysis of the evidence observed increase of unstimulated salivary flow 0.51 SMD compared to placebo (95% CI: 0.16-0.86), I(2)â€‰=â€‰50%, pâ€‰=â€‰0.005.The findings of our review revealed evidence of a beneficial effect of photobiomodulation therapy on salivary gland function. The therapy alleviates xerostomia and hyposalivation. However, these effects are reported short term only and did not induce lasting effects of photobiomodulation therapy on patients' quality of life. Humans;Low-Level Light Therapy;Quality of Life;Saliva;Salivary Glands;Xerostomia

Low-Level Laser Therapy with 670 nm Alleviates Diabetic Retinopathy in an Experimental Model. PURPOSE: To evaluate the effects of low-level laser therapy (LLLT) on the retina with diabetic retinopathy (DR). METHODS: Eight Wistar rats were used as a control group, and 64 rats were injected intraperitoneally with 55 mg/kg of streptozotocin to induce diabetes and served as a diabetic group. After the establishment of the DR, the rats were separated into (a) 32 rats with DR; did not receive any treatment, (b) 32 rats with DR were exposed to 670 nm LLLT for 6 successive weeks (2 sessions/week). The retinal protein was analyzed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis, total antioxidant capacity (TAC), hydrogen peroxide (H(2)O(2)), and histological examination. RESULTS: LLLT improved retinal proteins such as neurofilament (NF) proteins (200 KDa, 160 KDa, and 86 KDa), neuron-specific enolase (NSE) (46 KDa). Moreover, the percentage changes in TAC were 46.8% ($P < 0.001$), 14.5% ($P < 0.01$), 4.8% and 1.6% ($P > 0.05$), and in H(2)O(2,) they were 30% ($P < 0.001$), 25% ($P < 0.001$), 20% ($P < 0.01$), and 5% ($P > 0.05$) after 1, 2, 4, and 6 weeks, compared with the control. DR displayed swelling and disorganization in the retinal ganglion cells (RGCs) and photoreceptors, congestion of the capillaries in the nerve fiber layer, thickening of the endothelial cells' capillaries, and edema of the outer segment of the photoreceptors layer. The improvement of the retinal structure was achieved after LLLT. CONCLUSION: LLLT could modulate retinal proteins such as NSE and NFs, improve the RGCs, photoreceptors, and reduce the oxidative stress that originated in the retina from diabetes-induced DR.

Effect of Low-Level Laser Irradiation on Accommodation and Visual Fatigue. PURPOSE: This study used low-level laser irradiation on auricular points for the eyes of junior college teenagers with myopia to observe the changes in refractive errors and eye accommodation. According to the Sterner's study, we used the relationship between the amplitude and subjective symptoms to assess the degree of improvement in visual fatigue caused by changes in accommodation. METHODS: Participants were 49 healthy junior college teenagers, with an average age of 16.04Â±0.80 years old, and the refractive errors of both eyes were between -1.50 D and -5.00 D. All participants underwent

refractive error tests before and after class and after a 30-min break. In a 30-min break, all participants underwent two tests of with (experimental group) and without (control group) low-level laser irradiation on the auricular points. Then, refractive error tests were conducted to evaluate the participants' eye accommodation. RESULTS: The results revealed that with treatment of the auricular points with and without low-level laser irradiation, the refractive error of the participants' binocular left and right eyes decreased by -0.12 D (-0.18 D) in the experimental grou and by -0.05 D (-0.02D) in the control group. For the amplitudes of accommodation (AA) examination, the AA of the participants' binocular in the experimental group became 7.98 Â± 1.35 D (7.65 Â± 1.37 D). The AA of participants' binocular can recover to the level before the class. CONCLUSION: The results indicated that low-level laser irradiation at auricular points restored the eye accommodation faster than did natural closing of the eyes.

Laser acupuncture and intravascular laser irradiation of blood for management of pediatric dental anxiety. The aim of this study was to assess the effectiveness of laser acupuncture and intravascular laser irradiation of blood (ILIB) for managing anxiety in pediatric dentistry. Eighty-four children recruited at a university dental clinic were randomly assigned to three groups: the Sham group (n = 27) underwent sham laser irradiation of three acupuncture points, the ILIB group (n = 25) underwent 10 min of ILIB, and the laser acupuncture group (LAC, n = 32) underwent 40 s of laser acupuncture over points VG20 (Baihui), PC6 (Neiguan), and the Oppression Point. The results suggest that ILIB and laser acupuncture are feasible alternatives for managing dental anxiety in children. Acupuncture Points;Acupuncture Therapy;Child;Dental Anxiety;Humans;Lasers

Impact of photobiomodulation and low-intensity pulsed ultrasound adjunctive interventions on orthodontic treatment duration during clear aligner therapy. OBJECTIVE: To assess the efficiency of low-intensity pulsed ultrasound (LIPUS) and photobiomodulation (PBM) interventions in accelerating orthodontic tooth movement during clear aligner therapy (CAT). MATERIALS AND METHODS: This retrospective study was carried out on the records of 84 subjects who were treated using CAT. Twenty-eight patients were treated using CAT with a daily use of LIPUS for 20 minutes, 28 patients were treated using CAT with a daily use of PBM for 10 minutes, and 28 patients were treated using CAT alone. The total duration of treatment was recorded for all patients. One-way analysis of variance and post hoc Tukey test were used to assess whether there was any significant difference in total treatment duration among the three groups (P < .05). RESULTS: The mean treatment durations in days were 719 Â± 220, 533 Â± 242, and 528 Â± 323 for the control, LIPUS, and PBM groups, respectively. The LIPUS group showed a 26% reduction, on average, in treatment duration when compared with the control group, whereas the PBM group showed an average 26.6% reduction in the treatment duration when compared with the control group. The results showed that there were statistically significant differences among the groups (P = .011). Treatment durations were significantly reduced in the LIPUS and PBM groups as compared with the control (P = .027 and P = .023, respectively), with no statistically significant differences between the LIPUS and PBM groups (P = .998). CONCLUSIONS: Daily use of LIPUS or PBM as adjunctive interventions during CAT could reduce the duration of orthodontic treatment. Duration of Therapy;Humans;Low-Level Light Therapy;Orthodontic Appliances, Removable;Retrospective Studies;Ultrasonic Therapy;Ultrasonic Waves

A systematic review of treatment for patients with burning mouth syndrome. BACKGROUND: Burning mouth syndrome is a chronic idiopathic intractable intraoral dysaesthesia that remains a challenge to clinicians due to its poorly understood pathogenesis and inconsistent response to various treatments. AIM: This review aimed to study the short- (â‰¤3 months) and long-term (>3 months) effectiveness and sustainable benefit of different burning mouth syndrome treatment strategies and the associated side effects. MATERIALS AND METHODS: Randomised controlled trials

of burning mouth syndrome treatment compared with placebo or other interventions with a minimum follow up of 2 months were searched from the PubMed, Embase and Cochrane database (published to July 2020). RESULTS: Twenty-two studies were selected based on the inclusion and exclusion criteria and analysed. Nine categories of burning mouth syndrome treatment were identified: Anticonvulsant and antidepressant agents, phytomedicine and alpha lipoic acid supplements, low-level laser therapy, saliva substitute, transcranial magnetic stimulation, and cognitive behaviour therapy. Cognitive behaviour therapy, topical capsaicin and clonazepam, and laser therapy demonstrated favourable outcome in both short- and long-term assessment. Phytomedicines reported a short-term benefit in pain score reduction. The pooled effect of alpha lipoic acid (ALA) pain score improvement was low, but its positive effects increased in long term assessment. CONCLUSION: A more significant volume in terms of sample size, multi-centres, and multi-arm comparison of therapeutic agents with placebo and longitudinal follow-up studies is recommended to establish a standardised burning mouth syndrome treatment protocol. Further studies are required to assess the analgesic benefits of topical clonazepam and capsaicin, alternative medicines with neurodegenerative prevention capability and psychology support in treating burning mouth syndrome and reducing systemic adverse drug reactions.Registration International Prospective Register of Systematic Reviews (PROSPERO):Protocol ID - CRD42020160892.
Clonazepam;Thioctic Acid;Capsaicin Burning Mouth Syndrome;Capsaicin;Clonazepam;Humans;Pain;Thioctic Acid

Pulsed blue light inactivates two strains of human coronavirus. Emerging evidence suggests that blue light has the potential to inactivate viruses. Therefore, we investigated the effect of 405Â nm, 410Â nm, 425Â nm and 450Â nm pulsed blue light (PBL) on human alpha coronavirus HCoV-229 E and human beta coronavirus HCoV-OC43, using Qubit fluorometry and RT-LAMP to quantitate the amount of nucleic acid in irradiated and control samples. Like SARS-CoV-2, HCoV-229E and HCoV-OC43 are single stranded RNA viruses transmitted by air and direct contact; they have similar genomic sizes as SARS-CoV-2, and are used as surrogates for SARS-CoV-2. Irradiation was carried out either at 32.4Â JÂ cm(-2) using 3Â mWÂ cm(-2) irradiance or at 130Â JÂ cm(-2) using 12Â mWÂ cm(-2) irradiance. Results: (1) At each wavelength tested, PBL was antiviral against both coronaviruses. (2) 405Â nm light gave the best result, yielding 52.3% (2.37 log(10)) inactivation against HCoV-OC43 (pÂ <Â .0001), and a significant 1.46 log (10) (44%) inactivation of HCoV-229E (pÂ <Â .01). HCoV-OC43, which like SARS-CoV-2 is a beta coronavirus, was more susceptible to PBL irradiation than alpha coronavirus HCoV-229E. The latter finding suggests that PBL is potentially antiviral against multiple coronavirus strains, and that, while its potency may vary from one virus to another, it seems more antiviral against beta coronaviruses, such as HCoV-OC43. (3) Further, the antiviral effect of PBL was better at a higher irradiance than a lower irradiance, and this indicates that with further refinement, a protocol capable of yielding 100% inactivation of viruses is attainable.
Coronavirus 229E, Human;Coronavirus OC43, Human;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;SARS-CoV-2

Comparison of effects of low-level laser therapy and extracorporeal shock wave therapy in calcaneal spur treatment: A prospective, randomized, clinical study. OBJECTIVES: In this study, we aimed to evaluate and compare the efficacy of low-level laser therapy (LLLT) and extracorporeal shock wave therapy (ESWT) in the treatment of calcaneal spurs. PATIENTS AND METHODS: A total of 62 patients (14 males, 48 females; mean age: 47.6Â±11.7 years; range, 18 to 70 years) who were diagnosed with calcaneal spurs based on clinical examination and plain radiography between April 2019 and September 2019 were included in this study. A total of 15 sessions of plantar fascia gastroc-soleus stretching exercises and cold pack treatments were given to both groups. The LLLT (904 nm wavelength, 3,000 Hz, 8 J/cm2 dose to the painful heel area and insertion of the plantar fascia on the

medial calcaneal area, five points for a total of 5 min for three weeks) was applied to the first group (n=31), whereas ESWT (10 Hz, 2,000 shock waves with a 2.5 bar pressure into the areas of the painful heel, insertion of the plantar fascia on the medial calcaneal area) was applied the second group (n=31). All patients were evaluated using the Visual Analog Scale (VAS) and Foot Function Index (FFI) before and after treatment. RESULTS: In both groups, the median VAS and FFI scores after treatment showed a significant improvement, compared to pre-treatment scores (p=0.001). There was no significant difference between the groups in terms of the median post-treatment VAS scores (p>0.05). In the ESWT group, the median FFI pain and total scores after treatment were significantly lower than in the LLLT group (p=0.033). The change in the median FFI pain and total scores were significantly higher in the ESWT group (p=0.046). CONCLUSION: Both treatment modalities are effective and not superior to each other in terms of disability and activity limitation reduction, although a greater improvement in the FFI pain and total scores can be achieved with the ESWT. Based on these findings, we recommend both non-invasive treatment methods to be used in the treatment of calcaneal spurs in the clinical practice.

The effect of low-level red and near-infrared photobiomodulation on pain and function in tendinopathy: a systematic review and meta-analysis of randomized control trials. BACKGROUND: Tendinopathy is a common clinical condition that can significantly affect a person's physical function and quality of life. Despite exercise therapy being the mainstay of tendinopathy management, there are many potential adjunct therapies that remain under investigated, one of which is photobiomodulation (PBM). PBM uses varied wavelengths of light to create a biological effect. While PBM is used frequently in the management of tendinopathy, high quality evidence supporting its utility is lacking. METHODS: A systematic search of the Pubmed, CINAHL, SCOPUS, Cochrane Database, Web of Science and SPORTSDICUS databases was performed for eligible articles in August 2020. Randomized Control Trials that used red or near-infrared PBM to treat tendinopathy disorders that made comparisons with a sham or 'other' intervention were included. Pain and function data were extracted from the included studies. The data were synthesized using a random effects model. The meta-analysis was performed using the mean difference (MD) and standardized mean difference (SMD) statistics. RESULTS: A total of 17 trials were included (nâ€‰=â€‰835). When compared solely to other interventions PBM resulted in similar decreases in pain (MD -0.09; 95% CI -â€‰0.79 to 0.61) and a smaller improvement in function (SMD -0.52; 95% CI -â€‰0.81 to -â€‰0.23). When PBM plus exercise was compared to sham treatment plus exercise, PBM demonstrated greater decreases in pain (MD 1.06; 95% CI 0.57 to 1.55) and improved function (MD 5.65; 95% CI 0.25 to 11.04). When PBM plus exercise was compared to other interventions plus exercise, no differences were noted in pain levels (MD 0.31; 95% CI -â€‰0.07 to 0.70). Most studies were judged as low-risk of bias. The outcome measures were classified as very low to moderate evidence quality according to the Grading of Recommendation, Development and Evaluation tool. CONCLUSION: There is very-low-to-moderate quality evidence demonstrating that PBM has utility as a standalone and/or adjunctive therapy for tendinopathy disorders. TRIAL REGISTRATION: PROPERO registration number: CRD42020202508 .

Comparative study of combination therapy with non-steroidal anti inflammatory drugs and different doses of low level laser therapy in acute low back pain. According to various side effects of medication in low back pain, respecting conservative therapy, owing to the widespread use of laser therapy in recent decades, related therapeutic outcomes were different and contradictory. The current study aimed at comparing the effect of non-steroidal drugs and laser therapy with different doses in patients with acute low back pain. METHODS: The current randomized, placebo-controlled study was conducted on 65 patients randomly assigned to four groups. In group 1(NÂ =Â 20), only drug therapy and in group 2(NÂ =Â 15), laser therapy (3Â J/cm (2)) in addition to medication was

administrated to the patients. For group 3(NÂ =Â 15), a therapeutic plan similar to that of group 2 was given; however, the laser dose was 6Â J/cm (2). Finally, drug therapy plus placebo laser therapy was applied to group 4(NÂ =Â 15). Pain was compared among the groups using visual analogue scale and Oswestry low back pain disability questionnaire. RESULTS: Significant difference between baseline pain scores and those of the weeks 1, 2, 3, and 4 of laser therapy in all intervention groups. Also, the results of the intergroup analyses showed a significant difference between group 1 compared with groups 2 and 3. There was a significant ODI difference between the groups after laser therapy. CONCLUSION: Findings showed that laser therapy plus drug therapy in comparison with drug therapy alone was a more effective method to relieve pain and disability in patient with acute low back pain; however, evidence to support this finding is still inadequate. Anti-Inflammatory Agents, Non-Steroidal;Pharmaceutical Preparations Acute Pain;Anti-Inflammatory Agents, Non-Steroidal;Humans;Low Back Pain;Low-Level Light Therapy;Pharmaceutical Preparations;Treatment Outcome

Photobiomodulation and diabetic foot and lower leg ulcer healing: A narrative synthesis.
PURPOSE: To provide a comprehensive narrative review and critical appraisal of research investigating photobiomodulation (PBM), formerly known as low level laser therapy which includes lasers and light emitting diodes (LEDs), as a treatment to promote diabetic foot and lower leg ulcer (DFU) healing for humans. MATERIALS AND METHODS: Pubmed, CINAHL, Scopus, and OVID Medline databases were used to find relevant studies published between January 2000 and January 2020. Reference lists of identified articles were scanned for additional studies that might have been missed in the database searches. RESULTS: A total of 13 studies, with a total of 417 participants, were included in this review. DISCUSSION: The studies were critically appraised using the PEDro scale, which revealed weaknesses in study designs such as small sample sizes and problems with reproducibility with respect to the laser protocols. Characteristics of PBM that improved wound healing were wavelengths of 630 nm-660 nm and infrared wavelengths of 850 or 890 nm, and radiant exposure levels of 3 J/cm(2)-7 J/cm(2). PBM was beneficial for superficial and deep DFUs. Controlled blood glucose levels and adherence to best practices (pressure off-loading, optimized wound dressing changes, appropriate debridement, etc.) could have been a factor in the beneficial outcomes. CONCLUSION: Regardless of the laser characteristics chosen, in the majority of studies PBM as a treatment for DFUs improved healing rate when compared with standard wound care alone. However, weaknesses across the studies indicate that further research is required.
Diabetes Mellitus;Diabetic Foot;Humans;Low-Level Light Therapy;Reproducibility of Results;Surgical Wound Infection;Wound Healing

Photobiomodulation inhibits inflammation in the temporomandibular joint of rats.
Photobiomodulation (PBM) has been applied as a non-invasive technique for treating temporomandibular joint symptoms, especially on painful condition's relief, however the anti-inflammatory mechanism underlying the effect of PBM remains uncertain. This study aims to evaluate the mechanisms of action of PBM (808Â nm) in a carrageenan-induced inflammation on temporomandibular joint (TMJ) of rats. In this study male Wistar rats were pre-treated with irradiation of a low-power diode laser for 15Â s on TMJ (infra-red 808Â nm, 100Â mW, 50Â J/cm(2) and 1.5Â J) 15Â min prior an injection in the temporomandibular joint of carrageenan (100Â Î¼g/TMJ). 1Â h after the TMJ treatments, the rats were terminally anesthetized for joint cavity wash and periarticular tissues collect. Samples analysis demonstrated that PBM inhibit leukocytes chemotaxis in the TMJ and significantly reduces amounts of TNF-Î±, IL-1Î² and CINC-1. In addition, Western blotting analysis demonstrated that PBM significantly decreased the protein levels of P2X3 and P2X7 receptors in the periarticular tissues. On the other hand, PBM was able to increase protein level of IL-10 (anti-inflammatory cytokine). In summary, it is possible to suggest that PBM inhibit

inflammatory chemotaxis, modulation the balance of the pro- and anti-inflammatory characteristics of inflammatory cells. Receptors, Purinergic P2X3;Receptors, Purinergic P2X7;Tumor Necrosis Factor-alpha;Interleukin-10;Carrageenan Animals;Carrageenan;Cell Movement;Down-Regulation;Enzyme-Linked Immunospot Assay;Inflammation;Interleukin-10;Lasers, Semiconductor;Leukocytes;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Receptors, Purinergic P2X3;Receptors, Purinergic P2X7;Temporomandibular Joint;Tumor Necrosis Factor-alpha

Photobiomodulation Therapy in Head and Neck Cancer-Related Lymphedema: A Pilot Feasibility Study. PURPOSE: Lymphedema is a common debilitating late effect among patients post-head and neck cancer (HNC) treatment. Head and neck lymphedema was associated with symptom burden, functional impairment, and decreased quality of life. The objective of this study was to determine the feasibility and potential efficacy of the use of photobiomodulation (PBM) therapy for head and neck lymphedema, symptom burden, and neck range of motion among HNC survivors. METHODS: This was a single-arm, pre- and post-design clinical trial. Eligible patients included those with lymphedema after completion of complete decongestive therapy (CDT) and 3 to 18â€‰months after completion of cancer therapy. The intervention included PBM therapy 2 times a week for 6â€‰weeks for a total of 12 treatments. Lymphedema, symptom burden, and neck range of motion were measured at baseline, end-of-intervention, and 4-week post-intervention. RESULTS: Of the 12 patients enrolled in the study, 91.7% (nâ€‰=â€‰11) completed the study intervention and assessment visits, and no adverse events were reported. When comparing the baseline to 4-week post-intervention, we found statistically significant improvements in the severity of external lymphedema, symptom burden, and neck range of motion (all Pâ€‰<â€‰.05). CONCLUSION: PBM therapy was feasible and potentially effective for the treatment of head and neck lymphedema. Future randomized controlled trials are warranted to examine the efficacy of PBM therapy for HNC-related lymphedema. TRIAL REGISTRATION NUMBER AND DATE OF REGISTRATION: ClinicalTrials.gov Identifier: NCT03738332; date of registration: November 13, 2018. Feasibility Studies;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Lymphedema;Quality of Life

Effect of low-level laser therapy on postoperative pain after single-visit root canal retreatment of mandibular molars: A randomized controlled clinical trial. AIM: To compare the effect of low-level laser therapy (LLLT) on postoperative pain after single-visit root canal retreatment on mandibular molars. METHODOLOGY: This randomized controlled clinical trial included 36 patients referred to the Department of Endodontics, Islamic Azad University, Tehran, Iran. Healthy patients who required root canal retreatment on symptomatic first or second mandibular molars, with a PAI index score of 2 or 3, preoperative tooth and percussion pain of <56Â mm on a 170-mm visual analogue scale (VAS) were included. After local anaesthesia using inferior alveolar nerve block followed by rubber dam isolation and access cavity preparation, the D RaCe retreatment system was used to remove the existing root filling material, and after canal negotiation and gaining patency, working length was determined with an apex locator. Further canal enlargement was carried out with size 35, 0.04 taper, and size 40, 0.04 taper RaCe rotary instruments and then canals were filled using laterally compacted gutta-percha points and AH Plus sealer. The patients were randomly assigned to treatment groups: In the LLLT group, a 980-nm diode laser set at 6.89Â W/cm(2) energy density, 0.5Â W power, and a tip diameter of 10Â mm were activated from the buccal side on the mesial and distal root apices for 15Â s. In the sham group, the laser handpiece was placed inside the patient's mouth at the same location, but the laser was not activated. Then patients were instructed to record their postoperative pain levels at 4, 8, 12 and 24Â h and 2, 3 and 7Â days after treatment on separate VAS scales. For data analysis, the independent sample t and the Mann-Whitney U tests were used. Nominal variables were analysed by using the chi-square test. RESULTS: In the LLLT group, the most intense pain was reported 24 and 48Â h post-treatment [mean (SD)Â =Â 0.22 (0.54) for both],

whereas in the sham group, the most intense pain level was observed 4Â h post-treatment [mean (SD)Â =Â 0.78 (0.80)]. At the 4-h interval, pain intensity was significantly lower in the LLLT group (pÂ =Â .016). CONCLUSIONS: Low-level laser therapy reduced postoperative pain after single-visit root canal retreatment of mandibular molars only four hours following the procedure.
Dental Pulp Cavity;Humans;Iran;Low-Level Light Therapy;Molar;Pain, Postoperative;Retreatment;Root Canal Preparation

Effectiveness of low-power laser therapy in improvement of the peripheral neuropathy induced by xenobiotics in rats. BACKGROUND: Peripheral neuropathy (PN) is the damage and dysfunction of neurons of the peripheral nervous system. The present study was conducted to estimate the effectiveness of low-power laser therapy (LPLT) in the management of PN in a rats' model. METHODS: PN was induced by giving dichloroacetate (DCA) (250Â mg/kg/day) for up to 12 weeks. Four groups of rats were used: control group, PN group, PN group treated with gabapentin and PN group treated with LPLT. The study was conducted for 8 weeks. The management of PN was estimated by behavioral tests which included hot plate and Morris water maze tests. Blood biochemical analysis were carried out. RESULTS: Using of hot plate test indicated thermal hypoalgesia and using Morris water maze test showed cognitive decline in PN rats. Treatment with LPLT or gabapentin improved both the pain sensations and deteriorated memory that occurred in the PN rats. Biochemical analysis showed that LPLT significantly decreased the elevated beta-endorphin level in PN rats, while gabapentin could not reduce it. Treatment PN rats with LPLT or gabapentin shifted the high levels of TNF-Î±, IL-1Î² and IL-10 cytokines back to their normal values. Serum nitric oxide and MDA significantly increased in the PN group together with significant reduction in the rGSH level, these values were significantly improved by LPLT application while this was not the case with gabapentin treatment. Furthermore, treatment with gabapentin or LPLT significantly reduced serum ALAT and ASAT activities which are otherwise increased in the PN group. S100B, PGE2, total cholesterol, triglycerides, LDL-cholesterol, HDL-cholesterol, urea and creatinine showed insignificant changes among all groups. CONCLUSIONS: Our results showed that treatment with LPLT is more efficient than gabapentin in ameliorating the peripheral neuropathy induced by xenobiotics.

The effect of cisplatin-low-level laser therapy on cell viability and death of LNCaP prostate cancer cell line. Prostate cancer, as a common male cancer, is a serious threat to men's health. In spite of extreme developments for increasing survival rate, there are still limitations about common treatment options such as surgical procedures, radiotherapy, and chemotherapy. We hypothesized that combination of two treatments would bring better clinical outcomes. Therefore, the aim of this study was to determine the effect of conjugated cisplatin and low-level laser treatment (LLLT) on the viability of LNCaP prostate cancer cell line. LNCaP cells were harvested in DMEM containing 10% FBS and 1% antibiotic. Confluent cells were treated with different concentrations of cisplatin and different wavelengths of low-level laser (LLL) alone and in combination. The relative IC50 and cell viability was evaluated using MTT assay. Analysis of lipid peroxidation rate was performed using lipid peroxidation assay kit. LDH activity was also carried out on the treated and control cells using LDH cytotoxicity assay kit. Our results showed that combination of cisplatin and LLLT could effectively decrease cisplatin-induced cytotoxicity as well as LNCaP cell viability. Cisplatin-LLLT combination led to a significant increase in the MDA content as the product of membrane lipid peroxidation. Analyzing the LDH activity under the effect of cisplatin-LLL combined treatment showed a remarkable increase in the enzyme activity. We conclude that applying the cisplatin-LLL combination therapy is promising as an effective anti-cancer treatment. This novel combination has a potential to attenuate adverse side effects of earlier monotherapy strategies. Antineoplastic Agents;Cisplatin Antineoplastic Agents;Apoptosis;Cell Line, Tumor;Cell Survival;Cisplatin;Humans;Low-Level Light Therapy;Male;Prostatic Neoplasms

Photobiomodulation therapy does not depend on the differentiation of dental pulp cells to enhance functional activity associated with angiogenesis and mineralization. The purpose of this study is to analyze the influence of InGaAlP diode laser (660Â nm) with or without an odontogenic medium (OM) in the functional activity of OD-21 cells. Undifferentiated OD-21 pulp cells were cultivated with or without OM and divided into four groups (nâ€‰=â€‰5): nonirradiated control (Câ€‰-), nonirradiatedâ€‰+â€‰OM (Câ€‰+), irradiated (Lâ€‰-), and irradiatedâ€‰+â€‰OM (Lâ€‰+). Laser application was performed in two sessions of a 24-h interval with an irradiance of 11.3 mW/cm2, energy density of 1Â J/cm(2), and total cumulative energy/well of 4.6Â J. Cell proliferation, VEGF-164 expression, mineralization, and expression of Alp, Runx2, and Dmp1 genes, as well as immunolocalization of RUNX2 and MEPE proteins, were evaluated. Data were analyzed by statistical tests (Î±â€‰=â€‰0.05). All studied groups showed a similar increase in cell proliferation with or without OM. After 7 and 10Â days, a significatively higher concentration of VEGF-164 in Lâ€‰-â€‰group when compared to Câ€‰-â€‰group was observed. A significant increase in mineralized nodules in the Lâ€‰+â€‰was noted when compared to Câ€‰+â€‰in the same conditions. Photobiomodulation upregulated significantly Runx2 and Dmp1 expression after 10Â days in Lâ€‰-â€‰and after 7Â days in Lâ€‰+â€‰, with downregulation of Dmp1 after 10Â days in Lâ€‰+â€‰group. Immunolocalization of RUNX2 and MEPE was expressive after 7Â days of culture in the cytoplasm adjacent to the nucleus with a decrease after 10Â days, regardless of the presence of OM. Photobiomodulation enhances metabolism associated with angiogenesis, gene expression, and mineralization regardless of the odontogenic medium in OD-21 cells. Cell Differentiation;Cell Proliferation;Cells, Cultured;Dental Pulp;Low-Level Light Therapy;Odontogenesis

Diabetic Foot Wounds Treated With Human Amniotic Membrane and Low-level Laser Therapy: A Pilot Clinical Study. BACKGROUND: Low-level laser therapy (LLLT) and human amniotic membrane (HAM) application have been shown to be viable options for use in wound healing. PURPOSE: This study sought to compare LLLT and HAM to a control treatment (hydrogel, saline, and gauze) in persons with diabetes mellitus (DM) and foot ulcers. METHODS: Using a prospective pilot clinical study design, patients receiving care at a health center that specializes in the treatment of diabetic foot wounds between November 2016 and August 2017 were recruited. Eligible patients had to be 30 to 59 years of age; diagnosed with type 2 DM (postprandial capillary glucose levels between 140 and 350 mg/dL); and have uninfected, granulating stage 2 or 3 foot ulcers measuring less than 7 cm by 3 cm. Immunosuppressed and malnourished patients or those with neoplasms or in critical condition were not eligible to participate. Patients received the control treatment (2 mg hydrogel, saline, and gauze), HAM (patches of thawed HAM, applied with overlapping edges), or LLLT (phototherapy session, 2 mg hydrogel, saline, and gauze) for 28 days. Variables, wound area measurements, Pressure Ulcer Scale for Healing (PUSH) scores, and Visual Analog Scale (VAS) scores were used to assess wound improvement progress and pain on days 7, 14, 21, and 28. Descriptive statistics were used to analyze the participant anthropometric and clinical profiles. The Kolmogorov-Smirnov test was used to analyze the sample distribution. The Kruskal-Wallis test with Dunn's post-test was used to evaluate differences in PUSH and VAS scores and wound size for intergroup analysis, and the Mann-Whitney U test was used for the same outcomes in intragroup analysis. The level of significance was 5% ($P < .05$). RESULTS: Twenty-seven (27) patients participated (mean age, 51.4 years; mean body mass index, 26.5 kg/m2), with 9 patients in each treatment group. No statistically significant differences were noted in clinical or anthropometric variables among the groups, but mean baseline wound areas were different (2.6 cmÂ² for the control, 1.9 cmÂ² for the LLLT, and 5.5 cmÂ² for the HAM groups). Intragroup comparisons showed a significant reduction in PUSH score in the LLT group between days 0 and 21 (8.2 vs 4.9; $P < .01$) and days 21 to 28 (4.9 vs 3.2; $P < .001$). In all treatment groups the percent reduction was significantly different between days 7 and 28. No

outcomes were significantly different between groups. CONCLUSION: Diabetic foot ulcer wound area as well as PUSH and VAS scores showed more improvement for patients with DM receiving LLLT or HAM than for the control group, but the differences were not significant. Larger studies are needed to compare these treatment modalities. Amnion;Diabetes Mellitus;Diabetic Foot;Humans;Low-Level Light Therapy;Middle Aged;Prospective Studies;Wound Healing

Texturized P(VDF-TrFE)/BT membrane enhances bone neoformation in calvaria defects regardless of the association with photobiomodulation therapy in ovariectomized rats. OBJECTIVES: The purpose of this investigation was to evaluate in vivo the response of bone tissue to photobiomodulation when associated with texturized P(VDF-TrFE)/BT in calvaria defects of ovariectomized rats. MATERIALS AND METHODS: Wistar Hannover rats were submitted to ovariectomy/control surgery. Calvaria bone defects of 5-mm diameter were performed after 90Â days of ovariectomy. The animals were divided into OVX (without laser (L) and membrane), OVXâ€‰+â€‰P(VDF-TrFE)/BT, OVXâ€‰+â€‰P(VDF-TrFE)/BTâ€‰+â€‰L, and OVXâ€‰+â€‰PTFEâ€‰+â€‰L. It was utilized a low-intensity gallium-aluminum-arsenide laser (GaAlAs) with 780-nm wavelength and 30-J/cm(2) energy density in 12 sessions (120Â s). Thirty days after the bone defect the animals were euthanized for histological, microtomographic, and molecular evaluation. Quantitative analysis was analyzed by statistical software for pâ€‰<â€‰0.05. RESULTS: Histological parameters showed bone tissue formation at the borders of all group defects. The association of photobiomodulation and texturized P(VDF-TrFE)/BT was not synergistic and did not show significant changes in morphometric analysis and biomarkers gene expression. Nevertheless, texturized P(VDF-TrFE)/BT membrane enhanced bone repair regardless of the association with photobiomodulation therapy, with an increase of connectivity density when compared to the OVXâ€‰+â€‰PTFEâ€‰+â€‰L group. The association of photobiomodulation therapy and PTFE was synergistic, increasing the expression of Runx2, Alp, Bsp, Bglap, Sp7, and Rankl, even though not enough to reflect significance in the morphometric parameters. CONCLUSIONS: The utilization of texturized P (VDF-TrFE)/BT, regardless of the association with photobiomodulation therapy, enhanced bone repair in an experimental model of osteoporosis. Titanium Animals;Female;Low-Level Light Therapy;Osteogenesis;Rats;Rats, Wistar;Skull;Titanium

Transient absorption spectroscopy to explore cellular pathways to photobiomodulation. Photobiomodulation (PBM) describes the use of low irradiance light in the red to near-infrared wavelength range to stimulate biological effects in tissue, and many biological and spectroscopic techniques are used to study PBM. However, these techniques focus on the products or downstream effects rather than the electronic transitions that initiate the PBM processes. This study presents a novel approach to studying low irradiance light exposures on individual proteins and/or protein complexes by combining a continuous wave (CW) laser diode with femtosecond transient absorption spectroscopy (TAS), coined here as CW-TAS, and tests the system on reduced cytochrome c (Cyt c) for proof of principle. TAS was conducted using a 532-nm excitation pump beam and a 350-600Â nm supercontinuum probe. CW laser diodes with wavelengths of 450Â nm, 635Â nm, and 808Â nm were interchangeably fiber coupled into the HELIOS Fire. Samples of Cyt c were tested by TAS using a pump power of 15Â Î¼W, both with and without CW exposure. CW exposures were carried out with irradiances of 1.60 and 3.20Â mW/cm(2), except for 808Â nm, which was only tested at 1.60Â mW/cm(2). Both kinetic and global analyses were performed on the TAS data and the time constants for sets with and without CW exposures were compared. The TAS data for Cyt c with the full dosage of CW exposures did not alter the TAS data distinguishably from the control data. No new electronic transient signals were observed beyond the background when testing Cyt c with the CW exposures. Kinetic analysis confirmed that existing transients did not deviate beyond uncertainty. Global time constants for Cyt c were calculated to be 0.25Â Â±Â 0.03Â ps and 5.1Â Â±Â 0.3Â ps for

the control study, and the time constants for the CW exposed Cyt c were not significantly different. This study concludes that CW irradiation, at doses delivered, does not alter the transient absorption data of Cyt c. The CW-TAS method provides a new tool for studying PBM effects in other proteins and protein complexes that might respond to the CW wavelengths, such as Complex IV, in future studies. Cytochromes c Cytochromes c;Kinetics;Lasers, Semiconductor;Light;Oxidation-Reduction;Spectrophotometry

Synergic effects of ultrasound and laser therapies on mesentery for management of obesity and diabetes in rats. Nowadays, the mesentery as a new organ was discovered. Mesenteric events may play an important role in the pathophysiology of several diseases. The aim of our study was investigate the synergic effects of ultrasound (US) and laser therapies on mesentery in obese-hyperglycemic rats. The 25 male Wistar rats were randomized into five groups. Obese nondiabetic (OND) group: obese rats without diabetes and no treatment conditions; SHAM group: obese-hyperglycemic rats treated with placebo; US group: obese-hyperglycemic rats treated with US; LASER group: obese-hyperglycemic rats treated with laser and; US+LASER group: obese-hyperglycemic rats treated with US plus laser. An animal model of type 2 diabetes based on a hyperlipidemic diet combined with a low dose of streptozotocin was used in this study. Body mass and biochemical measurements were performed. GOT and GPT level showed a significant reduction in the treated groups than SHAM. The total cholesterol, triglycerides and very low-density lipoprotein (VLDL) levels showed significantly lower values for the US+LASER group. There was also reduced risk of cardiovascular diseases evidenced by Castelli index in the treated groups than SHAM. This study showed that the US and laser treatment on mesentery resulted to an improvement in biochemical measurements of the obese-hyperglycemic rats, especially the total cholesterol, triglycerides and VLDL levels. Blood Glucose;Triglycerides Animals;Blood Glucose;Diabetes Mellitus, Type 2;Laser Therapy;Male;Mesentery;Obesity;Rats;Rats, Wistar;Triglycerides

High-frequency near-infrared diode laser irradiation suppresses IL-1Î²-induced inflammatory cytokine expression and NF-ÎºB signaling pathways in human primary chondrocytes. Osteoarthritis (OA) and rheumatoid arthritis (RA) are common inflammation-associated cartilage degenerative diseases. Recent studies have shown that low-level diode laser treatment can reduce inflammatory cytokine expressions in cartilage. We recently reported that high-frequency low-level diode laser irradiation attenuates matrix metalloproteinases (MMPs) expression in human primary chondrocytes. However, the molecular mechanism underlying the effect of high-frequency low-level diode laser on chondrocytes remains unclear. Therefore, we aimed to elucidate the effect of high-frequency low-level diode laser irradiation on inflammatory cytokine expression in human primary chondrocytes. Normal human articular chondrocytes were treated with recombinant interleukin-1 beta (IL-1Î²) for 30Â min or 24Â h and irradiated with a high-frequency NIR diode laser at 8Â J/cm(2). The expression of IL-1Î², interleukin-6, and tumor necrosis factor-alpha was assessed using western blot analysis. To evaluate the nuclear factor-kappa B (NF-ÎºB) signaling pathway, the phosphorylation, translocation, and DNA-binding activity of NF-ÎºB were detected using western blot analysis, immunofluorescence analysis, electrophoretic mobility shift assay, and enzyme-linked immunosorbent assay analysis. High-frequency low-level diode laser irradiation decreased inflammatory cytokine expression in IL-1Î²-treated chondrocytes. Moreover, high-frequency low-level diode laser irradiation decreased the phosphorylation, nuclear translocation, and DNA-binding activity of NF-ÎºB in the IL-1Î²-treated state. However, irradiation alone did not affect NF-ÎºB activity. Thus, high-frequency low-level diode laser irradiation at 8Â J/cm(2) can reduce inflammatory cytokine expressions in normal human articular chondrocytes through NF-ÎºB regulation. These findings indicate that high-frequency low-level diode laser irradiation may reduce the expression of inflammatory cytokines in OA and RA. Cytokines;Interleukin-1beta;NF-kappa B Cells,

Cultured;Chondrocytes;Cytokines;Humans;Interleukin-1beta;Lasers, Semiconductor;NF-kappa B;Signal Transduction

Improving Consistency of Photobiomodulation Therapy: A Novel Flat-Top Beam Hand-Piece versus Standard Gaussian Probes on Mitochondrial Activity. The tremendous therapeutic potential of photobiomodulation therapy in different branches of medicine has been described in the literature. One of the molecular mechanisms for this treatment implicates the mitochondrial enzyme, cytochrome C oxidase. However, the efficacy and consistency of clinical outcomes with photobiomodulation treatments has been fiercely debated. This work was motivated by this need to improve photobiomodulation devices and delivery approaches. We designed a novel hand-piece with a flat-top beam profile of irradiation. We compared the beam profile versus a standard hand-piece and a fibre probe. We utilized isolated mitochondria and performed treatments at various spots within the beam, namely, the centre, left and right edge. We examined mitochondrial activity by assessing ATP synthesis with the luciferin/luciferase chemiluminescent method as a primary endpoint, while mitochondrial damage was assessed as the secondary endpoint. We observed a uniform distribution of the power density with the flat-top prototype compared to a wide Gaussian beam profile with the standard fibre and standard hand-piece. We noted increased production of ATP in the centre of all three beams with respect to the non-treated controls ($p < 0.05$). Both the fibre and standard hand-piece demonstrated less increase in ATP synthesis at the edges than the centre ($p < 0.05$). In contrast, ATP synthesis was increased homogenously in the flat-top handpiece, both in the centre and the edges of the beam. Fibre, standard hand-piece and the flat-top hand-piece prototype have discrete beam distribution characteristics. This significantly affected the mitochondrial activity with respect to their position within the treated areas. Flat-top hand-piece enhances the uniformity of photobiomodulation treatments and can improve the rigour and reproducibility of PBM clinical outcomes. Adenosine Triphosphate;Electron Transport Complex IV Adenosine Triphosphate;Electron Transport Complex IV;Humans;Lasers, Semiconductor;Mitochondria;Oxygen Consumption

Photobiomodulation with a 660-Nanometer Light-Emitting Diode Promotes Cell Proliferation in Astrocyte Culture. Astrocytes act as neural stem cells (NSCs) that have the potential to self-renew and differentiate into other neuronal cells. The protein expression of these astrocytes depends on the stage of differentiation, showing sequential expression of multiple proteins such as octamer-binding transcription factor 4 (Oct4), nestin, glial fibrillary acidic protein (GFAP), and aldehyde dehydrogenase 1 family member L1 (aldh1L1). Photobiomodulation (PBM) affects cell apoptosis, proliferation, migration, and adhesion. We hypothesized that astrocyte proliferation and differentiation would be modulated by PBM. We used an optimized astrocyte culture method and a 660-nanometer light-emitting diode (LED) to enhance the biological actions of many kinds of cells. We determined that the 660-nanometer LED promoted the biological actions of cultured astrocytes by increasing the reactive oxygen species levels. The overall viability of the cultured cells, which included various cells other than astrocytes, did not change after LED exposure; however, astrocyte-specific proliferation was observed by the increased co-expression of GFAP and bromodeoxyuridine (BrdU)/Ki67. Furthermore, the 660-nanometer LED provides evidence of differentiation, as shown by the decreased Oct4 and GFAP co-expression and increased nestin and aldh1L1 expression. These results demonstrate that a 660-nanometer LED can modify astrocyte proliferation, which suggests the efficacy of the therapeutic application of LED in various pathological states of the central nervous system. GFAP protein, rat;Glial Fibrillary Acidic Protein;Ki-67 Antigen;MKI67 protein, human;Nes protein, rat;Nestin;Octamer Transcription Factor-3;Pou5f1 protein, rat;Reactive Oxygen Species;Oxidoreductases Acting on CH-NH Group Donors;formyltetrahydrofolate dehydrogenase Animals;Apoptosis;Astrocytes;Brain;Cell Adhesion;Cell Differentiation;Cell Movement;Cell

Proliferation;Coculture Techniques;Embryo, Mammalian;Gene Expression;Glial Fibrillary Acidic Protein;Ki-67 Antigen;Lasers, Semiconductor;Light;Nestin;Neurons;Octamer Transcription Factor-3;Oxidoreductases Acting on CH-NH Group Donors;Primary Cell Culture;Rats;Rats, Sprague-Dawley;Reactive Oxygen Species

Biphasic Effects of Blue Light Irradiation on Human Umbilical Vein Endothelial Cells. Blue light regulates biological function in various cells, such as proliferation, oxidative stress, and cell death. We employed blue light illumination on human umbilical vein endothelial cells utilizing a LED device at 453 nm wavelength and revealed a novel biphasic response on human umbilical vein endothelial cells (HUVECs). The results showed that low fluence blue light irradiation promoted the fundamental cell activities, including cell viability, migration and angiogenesis by activating the angiogenic pathways such as the VEGF signaling pathway. In contrast, high fluence illumination caused the opposite effect on those activities by upregulating pro-apoptotic signaling cascades like ferroptosis, necroptosis and the p53 signaling pathways. Our results provide an underlying insight into photobiomodulation by blue light and may help to implement potential treatment strategies for treating angiogenesis-dependent diseases.

Efficacy and safety of pulsed dye laser for the treatment of surgical scars: a systematic review and meta-analysis. Various clinical trials have explored whether the pulsed dye laser (PDL) method is safe to treat scars, especially surgical scars. However, comprehensive evidence confirming the exact outcomes of PDL for treating surgical scars is lacking. The efficacy and safety of PDL in the treatment of surgical scars were determined through a review of several studies. The PubMed, Embase, Cochrane Library, and Web of Science databases were searched, and the main clinical outcomes were Vancouver Scar Scale (VSS) scores in terms of pigmentation, vascularity, pliability, and height. Review Manager 5.4 software was used for statistical analyses of the data; we chose a standardized mean difference (SMZ) to present the results with 95% confidence interval (CI). Overall, seven randomized controlled trials were used for this meta-analysis, all of these papers used 585Â nm or 595Â nm PDL with 7Â mm or 10Â mm spot size and a fluence of 3.5 to 10Â J/cm(2) for treating surgical scars; besides, the pulse duration ranged from 450Â Î¼s to 10Â ms. We found that PDL significantly resulted in decreased VSS scores (Pâ€‰=â€‰0.02) in four aspects: pigmentation (Pâ€‰=â€‰0.0002), vascularity (Pâ€‰<â€‰0.00001), pliability (Pâ€‰=â€‰0.0002), and height (Pâ€‰=â€‰0.0002). Moreover, scar improvement was similar when using 585Â nm and 595Â nm PDL in terms of pigmentation (Pâ€‰=â€‰0.76), vascularity (Pâ€‰=â€‰0.34), pliability (Pâ€‰=â€‰0.64), and height (Pâ€‰=â€‰0.57). Furthermore, our review indicated that PDL has no obvious adverse effects for most people, except transitory erythema and purpura. The meta-analysis showed that both 585Â nm and 595Â nm PDL therapy can effectively reduce the VSS score, suggesting that PDL can be a safe and effective method for the treatment of surgical scars.
Cicatrix;Erythema;Humans;Lasers, Dye;Low-Level Light Therapy;Treatment Outcome

Combination of two desensitizing protocols to control dentin hypersensitivity in non-carious lesions: a randomized, double-blind clinical trial. OBJECTIVES: This study evaluated the effect of photobiomodulation (PBM) combined with 8% strontium acetate (SA8%) in the treatment of dentin hypersensitivity (DH) in non-carious lesions and analyzed the risk factors with the patient's quality of life. METHODS: Eighty teeth with DH were randomly allocated into four treatment groups (nâ€‰=â€‰20): G1, PBM imitationâ€‰+â€‰toothpaste with no active ingredient; G2, PBM imitationâ€‰+â€‰toothpaste with SA8%; G3, PBMâ€‰+â€‰toothpaste without the active ingredient; and G4, PBMâ€‰+â€‰toothpaste with SA8%. Participants were provided with a questionnaire on the experience of dentin hypersensitivity (QEDH) to assess the impact of desensitizing treatment on health-related quality of life (HRQL). Friedman and Kruskal-Wallis tests were used for intra- and intergroup comparisons, and Wilcoxon and Mann-Whitney tests were used

to analyze HRQL. All analyses used significance levels of 5%. RESULTS: Intergroup comparisons revealed a significant difference (pâ€‰<â€‰0.05); G4 had the best response in terms of HD reduction in G4 compared to the other groups on the 7th day of assessment (T3). Only G4 showed a statistically significant difference (pâ€‰<â€‰0.05) in the reduction of EDH for intragroup analysis. CONCLUSION: The combination of therapies was more effective in reducing DH than the isolated use of these strategies. CLINICAL RELEVANCE: The combination of therapies is effective in the treatment of DH. Dentin Desensitizing Agents;Toothpastes;Fluorides Dentin Desensitizing Agents;Dentin Sensitivity;Double-Blind Method;Fluorides;Humans;Quality of Life;Toothpastes;Treatment Outcome

The Facts and Myths for the Use of Lasers in Orthopedic Surgery. For the past three decades, laser use has been investigated, mainly on implant applications, as well as hard and soft tissue processing on orthopedics. However, despite significant technological advances and achievements in Biophotonics, lasers have yet to emerge as a successful tool for hard-tissue manipulation (e.g., osseous tissue). Indeed, a careful search in relevant literature reveals a limited number of laser-based clinical applications in orthopedics, except for the low-level laser therapy applications. In this review article, we give a brief overview of the biophysical mechanisms of bone tissue and biocompatible implants laser surgery and, in parallel, we summarize some specific pre-clinical and clinical laser applications in orthopedics. Taking into consideration the complexity of laser-based applications in inhomogeneous musculoskeletal biostructures and/or implants, it is justified to state that applying laser radiation is still an open field of multidisciplinary research before performing interventions in clinical praxis. The evidence from this study indicates the need for more experimental and theoretical studies regarding light transport on soft and hard tissues, in order to further enhance safe and efficient laser applications in orthopedics. This undoubtedly implies the need for developing modern light delivery devices for laser surgery, by means of implementing robotic guidance, specialized for medical procedures on various anatomic structures. The aforementioned studies could eventually revolutionize the clinical applications of laser technology in orthopedics. Humans;Laser Therapy;Lasers;Orthopedic Procedures;Orthopedics

Optical and thermal fields induced in the bone marrow by external laser irradiation. In regenerative medicine, the problem of growing mesenchymal stem cells from the bone marrow often arises. In such cases is important that the number of initial cells was large enough and their proliferative activity was high. We believe that this problem can be solved by short-term heating of local areas of the bone marrow in vivo with laser radiation. In this regard, it is of interest to study the optical and temperature fields induced inside the tubular bone under external laser irradiation. In this work, we obtained experimental data on the spatial distribution of temperature in the bone marrow of the rat femur in vitro under external exposure to laser radiation with wavelengths of 970 and 1940Â nm. Radiation delivery was carried out using an optical fiber which tip contacted the surface of the femur bone. A thin thermocouple was used to measure the temperature in a local area of the bone marrow. By moving the optical fiber tip discretely along the longitudinal axis of the bone, and the thermocouple in the perpendicular direction, the spatial temperature distributions in dynamics were measured. Similarly, the spatial distributions of the laser radiation intensity were measured by replacing thermocouple with optical fiber probe. A thermal camera was used to control the temperature of the bone surface near the tip of the fiber. It was shown that the marrow could be heated from the outside by about 5-10Â Â°C during 10Â s without significant overheating of the bone tissue. The data obtained make it possible to estimate the volume of the bone marrow heated by the laser to a predetermined temperature and to make a reasonable choice of laser exposure modes to stimulate the proliferative activity of bone marrow mesenchymal stem cells in vivo. Animals;Bone Marrow;Laser Therapy;Lasers;Optical Fibers;Rats;Temperature

Low level laser therapy promotes bone regeneration by coupling angiogenesis and osteogenesis. BACKGROUND: Bone tissue engineering is a new concept bringing hope for the repair of large bone defects, which remains a major clinical challenge. The formation of vascularized bone is key for bone tissue engineering. Growth of specialized blood vessels termed type H is associated with bone formation. In vivo and in vitro studies have shown that low level laser therapy (LLLT) promotes angiogenesis, fracture healing, and osteogenic differentiation of stem cells by increasing reactive oxygen species (ROS). However, whether LLLT can couple angiogenesis and osteogenesis, and the underlying mechanisms during bone formation, remains largely unknown. METHODS: Mouse bone marrow mesenchymal stem cells (BMSCs) combined with biphasic calcium phosphate (BCP) grafts were implanted into C57BL/6 mice to evaluate the effects of LLLT on the specialized vessel subtypes and bone regeneration in vivo. Furthermore, human BMSCs and human umbilical vein endothelial cells (HUVECs) were co-cultured in vitro. The effects of LLLT on cell proliferation, angiogenesis, and osteogenesis were assessed. RESULTS: LLLT promoted the formation of blood vessels, collagen fibers, and bone tissue and also increased CD31(hi)EMCN(hi)-expressing type H vessels in mBMSC/BCP grafts implanted in mice. LLLT significantly increased both osteogenesis and angiogenesis, as well as related gene expression (HIF-1Î±, VEGF, TGF-Î²) of grafts in vivo and of co-cultured BMSCs/HUVECs in vitro. An increase or decrease of ROS induced by H(2)O(2) or Vitamin C, respectively, resulted in an increase or decrease of HIF-1Î±, and a subsequent increase and decrease of VEGF and TGF-Î² in the co-culture system. The ROS accumulation induced by LLLT in the co-culture system was significantly decreased when HIF-1Î± was inhibited with DMBPA and was followed by decreased expression of VEGF and TGF-Î². CONCLUSIONS: LLLT enhanced vascularized bone regeneration by coupling angiogenesis and osteogenesis. ROS/HIF-1Î± was necessary for these effects of LLLT. LLLT triggered a ROS-dependent increase of HIF-1Î±, VEGF, and TGF-Î² and resulted in subsequent formation of type H vessels and osteogenic differentiation of mesenchymal stem cells. As ROS also was a target of HIF-1Î±, there may be a positive feedback loop between ROS and HIF-1Î±, which further amplified HIF-1Î± induction via the LLLT-mediated ROS increase. This study provided new insight into the effects of LLLT on vascularization and bone regeneration in bone tissue engineering. Hypoxia-Inducible Factor 1, alpha Subunit;Hydrogen Peroxide Animals;Bone Regeneration;Human Umbilical Vein Endothelial Cells;Humans;Hydrogen Peroxide;Hypoxia-Inducible Factor 1, alpha Subunit;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Neovascularization, Physiologic;Osteogenesis

Photobiomodulation therapy improved functional recovery and overexpression of interleukins-10 after contusion spinal cord injury in rats. Following severe Spinal Cord Injury (SCI), regeneration is inadequate, and functional recovery is incomplete. The occurrence of oxidative stress and the spread of inflammation play a crucial role in the failure to regenerate the injury site. In this way, we explored the neuroprotective effects of PhotoBioModulation (PBM), as the main factor in controlling these two destructive factors, on SCI. fifty-four female adult Wistar rats divided into three groups: sham group (just eliminate vertebra lamina, n = 18), SCI group (n = 18), and SCI-PBM group which exposed to PBM (150 MW, 50 min/day, 14 days, n = 18). After SCI induction at the endpoint of the study (the end of 8 week), we took tissue samples from the spinal cord for evaluating the biochemical profiles that include Catalase (CAT), Malondialdehyde (MDA), Superoxide Dismutase (SOD), Glutathione Peroxidase (GSH-PX) levels, immunohistochemistry for Caspase-3, gene expressions of Interleukin-1Î² (IL-1Î²), Tumor Necrosis Factor-alpha (TNF-Î±), and Interleukin (IL-10). Also, stereological assessments evaluated the spinal cord, central cavity volumes, and numerical density of the glial and neural cells in the traumatic area. The open-field test, rotarod test, Narrow Beam Test (NBT), Electromyography recording (EMG) test and the Basso-Beattie-Bresnehan (BBB) evaluated the neurological functions. Our results showed that the stereological parameters, biochemical profiles (except MDA), and neurological functions were markedly greater in the SCI-PBM group in comparison

with SCI group. The transcript for the IL-10 gene was seriously upregulated in the SCI-PBM group compared to the SCI group. This is while gene expression of TNF-Î± and IL-1Î², also density of apoptosis cells in Caspase-3 evaluation decreased significantly more in the SCI-PBM group compared to the SCI group. Overall, using PBM treatment immediately after SCI has neuroprotective effects by controlling oxidative stress and inflammation and preventing the spread of damage. Interleukin-10 Animals;Female;Gene Expression;Interleukin-10;Locomotion;Low-Level Light Therapy;Psychomotor Performance;Rats;Rats, Wistar;Recovery of Function;Spinal Cord Injuries;Thoracic Vertebrae

Efficacy of near infrared dental lasers on dentinal hypersensitivity: a meta-analysis of randomized controlled clinical trials. Conventional therapies have aimed to try to help individuals suffering with dentine hypersensitivity (DH/DHS). A relatively new approach, laser therapy claims to be beneficial while having immediate and long-lasting effect. Therefore, our analysis aims to explore the immediate and 1-month efficacy of near-infrared laser (NIR) therapy in treating dentinal hypersensitivity. A systematic literature search conducted in databases, and analysis was undertaken utilizing a meta-analysis approach. Randomized controlled clinical trials comparing near-infrared lasers and placebo/no treatment in patients (>â€‰18Â years) were included. The risk of bias for included studies was assessed using Cochrane RoB tool (for randomized studies). Random effects meta-analyses model of standardized mean differences and 95% confidence intervals were performed using RevMan 5.4 software. A comprehensive electronic and manual search yielded a total of 1081 potential articles. Following the implementation of the inclusion and exclusion criteria, a total of 6 studies were included in the analysis. Near-infrared laser therapy led to statistical significant reduction in immediate and 1-month follow-up VAS (visual analog scale) scores compared to placebo/no treatment (pâ€‰<â€‰0.05). Statistical heterogeneity across the studies was high (I(2)-96%). The findings suggest that near-infrared laser therapy does have a significant immediate effect in reducing dentine hypersensitivity compared to placebo/no treatment. Furthermore, this effect is not diminished and endured at 1-month follow-up. Dentin Sensitivity;Humans;Laser Therapy;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Benefits of Sebastiania hispida (Euphorbiaceae) extract and photobiomodulation therapy as potentially adjunctive strategies to be explored against snake envenoming. The purpose of this study was to assess the topic use of Sebastiania hispida extract and low-level gallium-arsenide laser irradiation (GaAs, 904Â nm) to reduce the local myonecrosis and edema of Bothrops moojeni snake venom-injected gastrocnemius. Wistar rats receiving intramuscular venom injection (VBm) were compared with saline control (S) and envenomed rats receiving local exposure to plant extract (VExt) or laser irradiation (VL). The phytochemistry and thin-layer chromatography of S. hispida extract indicated the presence of phenolic compounds like gallic acid and flavonoids including quercetin. Gastrocnemius of VExt and VL groups had a significant reduction of edema and creatine kinase (CK) activities and a greater Myogenin (MyoG) expression compared to VBm group, with the plant extract efficacy better than laser exposure. Reduction of edema and serum CK activities reflects a lessening of muscle damage, whereas the increase of MyoG indicates myoblast differentiation and acceleration of muscle repair. The S. hispida richness in phenolic compounds and flavonoids, such as the light modulatory ability to triggering a multitude of cell signalings likely underlie the positive outcomes. Our findings suggest both treatments as potential auxiliary tools to be explored in clinical trials in combination with anti-venom therapy after Bothropic snakebites. Antivenins;Snake Venoms Animals;Antivenins;Low-Level Light Therapy;Rats;Rats, Wistar;Snake Bites;Snake Venoms

Corticospinal Motor Circuit Plasticity After Spinal Cord Injury: Harnessing Neuroplasticity to Improve Functional Outcomes. Spinal cord injury (SCI) is a devastating condition that affects approximately 294,000 people in the USA and several millions worldwide. The corticospinal motor

circuitry plays a major role in controlling skilled movements and in planning and coordinating movements in mammals and can be damaged by SCI. While axonal regeneration of injured fibers over long distances is scarce in the adult CNS, substantial spontaneous neural reorganization and plasticity in the spared corticospinal motor circuitry has been shown in experimental SCI models, associated with functional recovery. Beneficially harnessing this neuroplasticity of the corticospinal motor circuitry represents a highly promising therapeutic approach for improving locomotor outcomes after SCI. Several different strategies have been used to date for this purpose including neuromodulation (spinal cord/brain stimulation strategies and brain-machine interfaces), rehabilitative training (targeting activity-dependent plasticity), stem cells and biological scaffolds, neuroregenerative/neuroprotective pharmacotherapies, and light-based therapies like photodynamic therapy (PDT) and photobiomodulation (PMBT). This review provides an overview of the spontaneous reorganization and neuroplasticity in the corticospinal motor circuitry after SCI and summarizes the various therapeutic approaches used to beneficially harness this neuroplasticity for functional recovery after SCI in preclinical animal model and clinical human patients' studies. Neuroprotective Agents;Riluzole Animals;Brain-Computer Interfaces;Combined Modality Therapy;Electric Stimulation Therapy;Humans;Locomotion;Low-Level Light Therapy;Motor Cortex;Nerve Regeneration;Neuronal Outgrowth;Neuronal Plasticity;Neuroprotective Agents;Photochemotherapy;Pyramidal Tracts;Quality of Life;Recovery of Function;Riluzole;Spinal Cord;Spinal Cord Diseases;Spinal Cord Injuries;Stem Cell Transplantation;Transcranial Direct Current Stimulation;Transcutaneous Electric Nerve Stimulation

Optimal Fluence and Duration of Low-Level Laser Therapy for Efficient Wound Healing in Mice. BACKGROUND: Low-level laser (light) therapy is a promising technology that stimulates healing, relieves pain and inflammation, and restores function in injured body parts. However, few studies have compared the effects of light-emitting diodes of different fluence levels or different treatment durations. OBJECTIVE: Here, we investigated the effects of various fluence levels and treatment durations on wound closure in mice. METHODS: Full-thickness wounds were created on the dorsal skin using an 8-mm diameter punch, and the wounds were irradiated at 1, 4, or 40 J/cm(2) for 5 consecutive days starting on day 1. To determine the optimal irradiation duration, wounds were irradiated at the most potent fluence of previous study for 5, 10, or 15 days. Photographic documentation, skin biopsies, and wound measurements were performed to compare the effects of different treatment parameters. RESULTS: The most effective fluence level was 40 J/cm(2) at day 5, as determined by monitoring wound closure. There were no statistically significant differences in wound healing with different durations. CONCLUSION: We have shown that repeated exposure to low levels of light significantly stimulates wound healing in mice and demonstrated more efficient wound closure with certain fluences of 830 nm irradiation.

Low-Level Erbium-Doped Yttrium Aluminum Garnet Laser Irradiation Induced Alteration of Gene Expression in Osteogenic Cells from Rat Calvariae. Objective: The aim of this study was to investigate the effect of low-level erbium-doped yttrium aluminum garnet (Er:YAG) laser irradiation on gene expression in osteogenic cells from rat calvariae. Background: Previous studies showed beneficial effects of laser irradiation on bone-related cells. However, few studies have examined the gene expression alteration by laser irradiation on osteogenic cells in a calcified condition. Materials and methods: Osteogenic cells were prepared by culturing rat calvarial osteoblast-like cells in osteoinductive medium for 21 days. The cells at the bottom of the culture dish were irradiated with Er:YAG laser (wavelength: 2.94â€‰Î¼m, energy density: 3.1 and 8.2â€‰J/cm(2)) positioned at distance of 25â€‰cm. Lactate dehydrogenase (LDH) assay of the irradiated cells was performed. After screening for genes related to bone formation, mechanotransduction, and thermal effect by quantitative polymerase chain reaction (qPCR), gene expression at 3â€‰h after 3.1â€‰J/cm(2)

irradiation was comprehensively analyzed using microarray. Results: No dramatical increase in surface temperature and LDH activities after laser irradiation were observed. Sost expression was significantly reduced at 3â€‰h after 3.1â€‰J/cm(2) irradiation. Bcar1 and Hspa1a expression was significantly increased following 8.2â€‰J/cm(2) irradiation. Microarray analysis identified 116 differentially expressed genes. Gene set enrichment analysis showed enrichment of histone H3-K9 methylation and modification gene sets. Conclusions: Er:YAG laser irradiation, especially at 3.1â€‰J/cm(2), showed positive effect on the expression of genes related to bone formation in osteogenic cells, without inducing significant cell damage. These findings may represent critical mechanisms of early bone formation after Er:YAG laser irradiation. Animals;Gene Expression;Lasers, Solid-State;Mechanotransduction, Cellular;Osteogenesis;Rats;Skull

Photobiomodulation Regulation as One Promising Therapeutic Approach for Myocardial Infarction. Myocardial infarction refers to myocardial necrosis caused by acute or persistent coronary ischemia and hypoxia. It is considered to be one of the significant crises threatening human health in the world. Following myocardial infarction, collagen gradually replaces the original tissue due to the loss of many cardiomyocytes, myocardial contractile function decreases, and myocardial fibrosis eventually leads to heart failure. Phototherapy is a new treatment which has shown superior efficacy on the nerve, skeletal muscle, skin, and other tissues. Likewise, there is growing evidence that phototherapy also has many positive effects on the heart. Therefore, this article introduces the progress of research on phototherapy as a new therapeutic strategy in the treatment of myocardial infarction. The wavelength of photobiomodulation in the treatment of myocardial infarction is specific, and the influence of light source power and light duration on the tissue presents a bell-shaped distribution. Under these conditions, phototherapy can promote ATP synthesis and angiogenesis, inhibit the inflammatory response, improve heart function, reduce infarct size, and protect myocardium. In addition, we summarized the molecular mechanisms of phototherapy. According to the location of photoreceptors, they can be divided into mitochondrial and nonmitochondrial parts. Animals;Humans;Low-Level Light Therapy;Myocardial Infarction

Effects of Photobiomodulation Therapy Combined with Static Magnetic Field in Severe COVID-19 Patients Requiring Intubation: A Pragmatic Randomized Placebo-Controlled Trial. PURPOSE: We aimed to investigate the effects of photobiomodulation therapy combined with static magnetic field (PBMT-sMF) on the length of intensive care unit (ICU) stay and mortality rate of severe COVID-19 patients requiring invasive mechanical ventilation and assess its role in preserving respiratory muscles and modulating inflammatory processes. PATIENTS AND METHODS: We conducted a prospectively registered, triple-blinded, randomized, placebo-controlled trial of PBMT-sMF in severe COVID-19 ICU patients requiring invasive mechanical ventilation. Patients were randomly assigned to receive either PBMT-sMF or a placebo daily throughout their ICU stay. The primary outcome was length of ICU stay, defined by either discharge or death. The secondary outcomes were survival rate, diaphragm muscle function, and the changes in blood parameters, ventilatory parameters, and arterial blood gases. RESULTS: Thirty patients were included and equally randomized into the two groups. There were no significant differences in the length of ICU stay (mean difference, MD = -6.80; 95% CI = -18.71 to 5.11) between the groups. Among the secondary outcomes, significant differences were observed in diaphragm thickness, fraction of inspired oxygen, partial pressure of oxygen/fraction of inspired oxygen ratio, C-reactive protein levels, lymphocyte count, and hemoglobin ($p < 0.05$). CONCLUSION: Among severe COVID-19 patients requiring invasive mechanical ventilation, the length of ICU stay was not significantly different between the PBMT-sMF and placebo groups. In contrast, PBMT-sMF was significantly associated with reduced diaphragm atrophy, improved ventilatory parameters and lymphocyte count, and decreased C-reactive protein levels and hemoglobin count. TRIAL REGISTRATION NUMBER CLINICAL TRIALSGOV: NCT04386694.

Combining Low-Power Fractional Diode Laser With Injectable Neurotoxin and Filler: Safety of Treatment Regimen Over 6 Years. Dermal Fillers;Botulinum Toxins, Type A Adult;Aged;Aged, 80 and over;Botulinum Toxins, Type A;Combined Modality Therapy;Cosmetic Techniques;Dermal Fillers;Face;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Treatment Outcome;Young Adult

Fractionated low-level laser irradiation on breast cancer (MCF 7 cells) treatment. Breast cancer is responsible for one of the top leading causes of cancer deaths among women. Radiotherapy (RT) uses high energy radiation to kill cancer cells, but this method has been reportedly linked to risks of toxicity. Post-therapeutic relapse from RT believed to be caused by its toxicity is one of the challenges encountered during tumour therapy. Therefore, further attention should be devoted to developing novel anti-tumour therapeutic approaches. The role of low-level laser therapy (LLLT) in breast cancer management is to alleviate the side effects arising from RT, instead of acting against the tumour cells directly. This study investigated the effects of low-level laser (532Â nm), as well as single and fractionated irradiation, on breast cancer MCF 7 cell line. Additionally, this study assessed the most effective laser parameter for fractionated irradiation. The MCF 7 cells were irradiated with green laser power at 1.5, 45.0, and 100.0 mW with a spot size diameter of 0.7Â mm for 1, 5, 10, and 15Â min. The irradiation was carried out in single, double, and triple fractionation separated by 5- and 10-min intervals in between the fractional regimes. The laser output of 100 mW showed a promising potential in killing cells with single fractionation. However, as the irradiation was fractionated into two, power of 1.5 mW appeared to be more effective in cell death, which contributed to the lowest percentage cells viable of 31.4% recorded in the study. It was proven that fractionated regime was more successful in tumour cell death. Breast Neoplasms;Female;Humans;Lasers;Low-Level Light Therapy;MCF-7 Cells;Neoplasm Recurrence, Local

Effect of Photobiomodulation Therapy on Oxidative Stress Markers in Healing Dynamics of Diabetic Neuropathic Wounds in Wistar Rats. BACKGROUND: Prolonged and overlapping phases of wound healing in diabetes are mainly due to the redox imbalance resulting in the chronicity of the wound. Photobiomodulation therapy works on the principle of absorption of photon energy and its transduction into a biological response in the living tissue. It alleviates the cellular responses, thereby improving the mechanism of wound healing in diabetes. OBJECTIVE: To find out the effect of photobiomodulation therapy of dosage 4â€‰J/cm(2) in the healing dynamics of diabetic neuropathic wounds in Wistar rats and its relation with oxidative stress markers. METHODOLOGY: Diabetes was induced using Streptozotocin of 60â€‰mg/kg of body weight to eighteen female Wistar rats. Neuropathy was induced by the sciatic nerve crush injury followed by an excisional wound of 2â€‰cm(2) on the back of the animal. Experimental group animals were treated with dosage 4â€‰J/cm(2) of wavelength 655 and 808â€‰nm, and control group animals were kept unirradiated. The biomechanical, histopathological, and biochemical changes were analysed in both groups. RESULTS: There was a reduction in mean wound healing time and an increased rate of wound contraction in the experimental group animals compared to its control group. The experimental group showed improved redox status, and histopathological findings revealed better proliferative cells, keratinisation, and epithelialization than un-irradiated controls. CONCLUSIONS: Photobiomodulation therapy of dosage 4â€‰J/cm(2) enhanced the overall wound healing dynamics of the diabetes-induced neuropathic wound and optimised the oxidative status of the wound, thereby facilitating a faster healing process. Animals;Diabetes Mellitus, Experimental;Female;Low-Level Light Therapy;Oxidative Stress;Rats;Rats, Wistar;Wound Healing

Synergistic effect of photobiomodulation and phthalocyanine photosensitizer on fibroblast signaling responses in an in vitro three-dimensional microenvironment. Photobiomodulation (PBM) is a promising medical treatment modality in the area of photodynamic therapy (PDT). In this study, we

investigated the effect of combined therapy in a 3D microenvironment using aluminum chloride phthalocyanines (AlClPc) as the photosensitizing agent. Normal human fibroblast-containing collagen biomatrix was prepared and treated with an oil-in-water (o/a) AlClPc-loaded nanoemulsion (from 0.5 to 3.0Â Î¼M) and irradiated at a range of fluences (from 0.1 to 3.0Â J/cm(2)) using a continuous-wave light-emitting diode (LED) irradiation system (660Â nm). PBM at 1.2Â J/cm(2) and AlClPc/NE at 0.5Â Î¼M modified the fibroblast signaling response under 3D conditions, promoting collagen synthesis, ROS production, MMP-9 secretion, proliferation of the actin network, and facile myofibroblastic differentiation. PBM alone (at 1.2Â J/cm(2) and 0.3Â J/cm(2)) had no significant effect on any of these parameters. The combined therapy affected myofibroblastic differentiation, inflammatory response, and extracellular matrix pliability, and should thus be examined further in subsequent studies considering that no side effects of PBM have been reported. Even though significant progress has been made in the field of phototherapy in recent years, it is necessary to further elucidate the detailed mechanisms underlying its effects already shown in 2D conditions to increase the acceptance of this beneficial and non-invasive therapeutic approach.
Indoles;Organometallic Compounds;Photosensitizing Agents;Reactive Oxygen Species;aluminum chloride phthalocyanine;Aluminum Chloride;Collagen;Matrix Metalloproteinase 9 Aluminum Chloride;Cell Culture Techniques;Cell Survival;Cells, Cultured;Collagen;Fibroblasts;Humans;Indoles;Light;Matrix Metalloproteinase 9;Organometallic Compounds;Photosensitizing Agents;Reactive Oxygen Species

Viability of Photobiomodulaton Therapy in Decreasing Orthodontic-Related Pain: A Systematic Review and Meta-Analysis. Objective: To assess the viability of photobiomodulation therapy (PBMT) in decreasing orthodontic-related pain after different orthodontic procedures. Methods: A computerized literature search was conducted within the MEDLINE, EMBASE, Scopus, Cochrane Library, Web of Science, CNKI, WanFang, VIP, and CBM databases to identify randomized controlled trials (RCTs), which used PBMT to relieve pain during orthodontic treatment. Particular inclusion and exclusion criteria were connected to recognize relevant articles. The information was extricated autonomously by two reviewers, and a quality assessment was carried out by utilizing the Cochrane Collaboration "risk of bias" tool. Meta-analysis was conducted with fixed- or random-effects models as suitable. Statistical heterogeneity was also examined. The RevMan 5.4 software was utilized for data analysis. Results: Of 1024 recognized articles, 25 RCT were at long last included. Within the risk-of-bias assessments, 1 study displayed a high risk, 22 an unclear risk, and 2 a low risk. The meta-analysis appeared that in patients treated with photobiomodulation (PBM) versus control there was a distinction in support of PBMT in placement of elastomeric separators, canine retraction, and archwire placement during 1 week. Conclusions: PBMT demonstrated to be effective in advancing a reduction pain after elastomeric separators placement, canine retraction, and archwire placement within 1 week. In the future, more high-quality research with consistency in research design is needed for further evaluation. Humans;Low-Level Light Therapy;Pain

Effects of Photobiomodulation on the Upper First Molar Intrusion Movement Using Mini-Screws Anchorage: A Randomized Controlled Trial. Objective: The aim of this study was to quantify the changes obtained when the molar intrusion movement is complemented by photobiomodulation (PBM). Background: A common problem in adult patients is the super-eruption of maxillary molars caused by the loss of the antagonist tooth. Super-erupted molars impair oral rehabilitation and can cause both occlusal and functional problems. There is increasing research confirming the benefits of adjunctive PBM during orthodontic treatment. Methods: Twenty patients with indication of a maxillary first molar intrusion for oral rehabilitation were selected. Patients were randomized into two groups to receive orthodontic intrusion (control group) or the same treatment complemented by PBM (PBM group) in repeated doses (days 0, 1, 2, 3, 4, and 7 from the start of the intrusion and in

each monthly follow-up) by using a low-power red laser diode (670â€‰nm, 150â€‰mW, 12â€‰min around the molar). Plaque index (PI), probing depth (PD), and bleeding of probing (BOP) were assessed at 0, 1, 2, 3, and 6 months. Stereolithography models generated from an intraoral scanner were taken at 0, 3, and 6 months and cone beam computed tomography (CBCT) records were taken at 0 and 6 months. Mean intrusion distance, mean intrusion velocity, and volumetric resorption were calculated. Results: Periodontal clinical assessments (PI, PD, and BOP) and mean intrusion distance or mean intrusion velocity yielded no differences (pâ€‰>â€‰0.05) between groups. However, PBM group showed lower values of all these scores during the first 3 months. Intraoral scanner and CBCT were equally effective in accurately monitoring the intrusion distance (pâ€‰>â€‰0.05). CBCT records allowed volumetric evaluation of the root resorption process, being lesser in the PBM group, but not significantly (pâ€‰>â€‰0.05). Conclusions: During orthodontic intrusion process, the adjunctive application of PBM may provide better periodontal records and lower progression of root resorption at the expense of a little lower intrusion distance and velocity. Adult;Bone Screws;Humans;Molar;Orthodontic Anchorage Procedures;Root Resorption;Tooth Movement Techniques

Effectiveness of Pre-cooling the Injection Site, Laser Biostimulation, and Topical Local Anesthetic Gel in Reduction of Local Anesthesia Injection Pain in Children. AIM AND OBJECTIVE: Evaluation of the effectiveness of laser biostimulation (LBS), ice, and local anesthetic (LA) gel in reducing the injection pain during administration of local anesthesia in children. MATERIALS AND METHODS: A 3-arm, crossover randomized controlled trial included 30 children of age 9-12 years requiring extraction of primary maxillary posterior teeth. Children were randomly allocated to 3 groups of 10 each. After proper isolation and drying of the buccal mucosa, one of the three techniques, i.e., either LBS or ice or LA gel was applied for 1 minute followed by administration of the LA solution. The pain response was assessed using Wong-Baker Faces Pain Rating Scale and the Sound Eyes Motor scale (SEM). Kruskal-Wallis ANOVA and Mann-Whitney U tests were performed for intragroup and intergroup comparisons, respectively. RESULTS: Lower pain score of zero suggesting no hurt was given by more children in the ice group, followed by LA gel and LBS groups in both the scales. The differences in pain scores recorded were found to be statistically significant. CONCLUSION: Ice is found to be equally effective as LA gel, whereas low-level laser therapy is less effective compared to the other two techniques in reducing the injection pain during administration of maxillary posterior buccal infiltration in children. CLINICAL SIGNIFICANCE: Pain management during LA injection is a critical step in gaining initial trust and during the subsequent treatment visits. The present study suggests that simple methods like pre-cooling the injection site with ice can be used as an effective non-pharmacological technique to reduce injection pain. HOW TO CITE THIS ARTICLE: AmruthaVarshini I, Vinay C, Uloopi KS, et al. Effectiveness of Pre-cooling the Injection Site, Laser Biostimulation, and Topical Local Anesthetic Gel in Reduction of Local Anesthesia Injection Pain in Children. Int J Clin Pediatr Dent 2021;14(1):81-83.

Photobiomodulation for the aging brain. Longevity is one of the great triumphs of humanity. Worldwide, the elderly is the fastest growing segment of the population. As a consequence, the number of cases of age-related cognitive decline and neurological diseases associated with aging, such as Alzheimer's and Parkinson's, has been increasing. Among the non-pharmacological interventions studied for the treatment or prevention of age-related neurocognitive impairment, photobiomodulation (PBM) has gained prominence for its beneficial effects on brain functions relevant to aging brains. In animal models, the neuroprotective and neuromodulatory capacity of PBM has been observed. Studies using both animals and humans have shown promising metabolic and hemodynamic effects of PBM on the brain, such as improved mitochondrial and vascular functions. Studies in humans have shown that PBM can improve electrophysiological activity and

cognitive functions such as attention, learning, memory and mood in older people. In this paper we will review the main brain effects of PBM during aging, discuss its mechanisms of action relevant to the aging brain, and call for more controlled studies in older populations.
Aged;Aging;Animals;Brain;Cognition;Cognitive Dysfunction;Humans;Low-Level Light Therapy

Single and consecutive application of near-infrared and green irradiation modulates adipose derived stem cell proliferation and affect differentiation factors. Regenerative medicine uses undifferentiated adipose-derived mesenchymal stem cells (ADMSCs) to differentiate into multiple cell types. Photobiomodulation (PBM) is a rapidly growing treatment for pain and inflammation reduction, as well as tissue healing. PBM's efficacy is dependent on wavelength and energy dosage. Red (600-700Â nm) and near-infrared (780-1100Â nm) wavelengths have been shown to promote cell proliferation. Light wavelengths such as green (495Â nm-570 nm) have been found to influence ADMSC differentiation. The initiation of ADMSC proliferation and differentiation requires physiologically relevant levels of reactive oxygen species (ROS), while increased levels inhibit self-renewal. Stem cell differentiation is guided by mitochondrial metabolism, where an increased mitochondrial membrane potential (MMP) is associated with higher inÂ vitro differentiation capacity. ADMSCs must home to and accumulate at the sites of injury in regenerative medicine, so cell homing is critical. The aim of this inÂ vitro study was to compare consecutive NIR (825Â nm) and green (525Â nm) applications on ADMSC morphology and physiology with the possibility that multiple wavelengths could lead to a combination of the two effects. The results showed that concurrent use of NIR-green irradiation significantly stimulated ADMSC proliferation, increasing population density and cellular ATP. Furthermore, NIR-green showed a time dependent increase in ROS production and was significantly higher at 7 days. Consecutive NIR-green irradiation significantly increased MMP and was most effective at facilitating ADMSC migration over time. Findings suggest that with consecutive NIR and green irradiation, the ADMSCs can rapidly proliferate, but can also be modulated for regenerative purposes. Reactive Oxygen Species Adipose Tissue;Cell Differentiation;Cell Proliferation;Reactive Oxygen Species

NIR Laser Photobiomodulation Induces Neuroprotection in an In Vitro Model of Cerebral Hypoxia/Ischemia. Brain photobiomodulation (PBM) is an innovative treatment for a variety of neurological conditions, including cerebral ischemia. However, the capability of PBM for ischemic stroke needs to be further explored and its mechanisms of action remain currently unclear. The aim of the present research was to identify a treatment protocol capable of inducing neuroprotection and to investigate the molecular mechanisms activated by a dual-wavelength near infrared (NIR) laser source in an organotypic hippocampal slice model of hypoxia/ischemia. Hippocampal slices were exposed to oxygen and glucose deprivation (OGD) for 30Â min followed by NIR laser light (fluence 3.71, 7.42, or 14.84Â J/cm(2); wavelengths 808Â nm and 905Â nm) delivered immediately or 30Â min or 60Â min after OGD, in order to establish a therapeutic window. Neuronal injury was assessed by propidium iodide fluorescence 24Â h later. Our results show that NIR laser irradiation attenuates OGD neurotoxicity once applied immediately or 30Â min after OGD. Western blot analysis of proteins involved in neuroinflammation (iNOS, COX-2, NFkB subunit p65, and Bcl-2) and in glutamatergic-mediated synaptic activity (vGluT1, EAAT2, GluN1, and PSD95) showed that the protein modifications induced by OGD were reverted by NIR laser application. Moreover, CA1 confocal microscopy revealed that the profound morphological changes induced by OGD were reverted by NIR laser radiation. In conclusion, NIR laser radiation attenuates OGD neurotoxicity in organotypic hippocampal slices through attenuation of inflammatory mechanisms. These findings shed light on molecular definition of NIR neuroprotective mechanisms, thus underlining the potential benefit of this technique for the treatment of cerebral ischemia. Animals;Female;Hippocampus;Hypoxia-Ischemia,

Brain;Laser Therapy;Low-Level Light Therapy;Male;Microscopy, Fluorescence;Neuroprotection;Organ Culture Techniques;Rats;Rats, Wistar

Multidrug-resistant protein inhibitor and phosphodiesterase inhibitor potentiate the vasodilator effect induced by photobiomodulation in isolated aortic rings. A previous work indicates that the red LASER (660Â nm) induces vascular relaxation by nitric oxide (NO)-dependent mechanism. NO activates soluble guanylate cyclase (sGC) which produces cGMP, the main effector in the vasodilation pathway. An interesting pharmacological strategy is to control the levels of intracellular cGMP, preventing its efflux (with multidrug-resistant protein blockers, such as MK-571), or preventing its degradation (such as sildenafil, which inhibits the enzyme responsible for cGMP degradation, the phosphodiesterase-5 PDE5). This study aimed to look for pharmacological strategies to improve vasodilation LASER effect in normotensive and hypertensive rats (L-NAME model). The vascular reactivity study was performed in isolated aortic rings from normotensive and hypertensive rats, with a single LASER application and sodium nitroprusside (SNP) treatment. In aortic rings from normotensive rats, MK-571 and sildenafil potentiated the relaxation induced by LASER, compared to control. The vasodilation induced by SNP was potentiated by MK-571 and sildenafil, compared to control. In aortic rings from hypertensive rats, vasodilation effect induced by LASER and by SNP was potentiated just by MK-571, compared to control, with no potentiation by sildenafil. In addition, it was seen that the withdrawal of nitric oxide stocks carried out by L-cysteine is capable of being reversed with the use of the SNP. The results support the evidence that the vasodilation induced by red LASER is potentiated by MK-571 and sildenafil in aortic rings from normotensive rats. However, in aortic rings from L-NAME hypertensive rats, the potentiation in vasodilation was induced just by MK-571. Phosphodiesterase Inhibitors;Vasodilator Agents;Nitroprusside;Nitric Oxide;Sildenafil Citrate Animals;Nitric Oxide;Nitroprusside;Phosphodiesterase Inhibitors;Rats;Sildenafil Citrate;Vasodilation;Vasodilator Agents

Photobiomodulation and myofascial temporomandibular disorder: Systematic review and meta-analysis followed by cost-effectiveness analysis. BACKGROUND: Photobiomodulation (PBM) is a non-invasive and non-pharmacological treatment, which, has shown beneficial results in the treatment of temporomandibular disorders (TMD) related pain. This systematic review and meta-analysis study aimed to evaluate the efficacy of photobiomodulation in the treatment of myofascial pain associated with (TMD by analyzing randomized clinical trials published from 2007 to February 2019. The secondary objective of the study was to perform a cost-effectiveness analysis of TMD treatment with photobiomodulation in patients with myofascial pain. MATERIAL AND METHODS: International databases were used: Pubmed, Medline and Web of Science; the initial search raised 316 papers, and only 17 papers met the inclusion criteria for the systematic review (SR). Of these, only 04 papers met the inclusion criteria for meta-analysis: VAS data represented by numerical scores and placebo control group. RESULTS: As for the wavelength, the most used value was 780nm (followed by 830nm. The most used treatment time was 4 offered treatments for 4 weeks; followed by 10 sessions. Regarding periodicity, 9 studies used 2 times a week. The meta-analysis showed that laser-treated groups had painful symptoms improvement that was superior to the control group (mean difference 1.49;95% CI = -1.67; -1.32). Laser therapy showed a cost-effectiveness of $1,464.28 by controlled pain intensity and placebo showed $2,866.20 by controlled pain intensity. CONCLUSIONS: The studies were considered to have moderate quality of evidence. Laser-treated groups had painful symptoms improvement that was superior to the control group and photobiomodulation was more cost-effective than placebo in patients with TMD and myofascial pain. Key words:Temporomandibular disorder, Myofascial pain, Photobiomodulation, Placebo, Cost-effectiveness.

[Research advances on the application of pulsed dye laser in the early treatment of post-traumatic scars]. Recent studies have shown that intervention in the early post-traumatic period can inhibit scar hyperplasia and promote scar maturation. Because of its definite therapeutic efficacy and few adverse reactions, it has become an important auxiliary method to prevent scar formation after trauma. This article reviews the research advances on the mechanism of pulsed dye laser in inhibiting the formation of early hypertrophic scar after trauma, the timing of intervention, and its complications and treatment methods, in order to provide a basis for the early prevention and treatment of clinical post-traumatic scars. Cicatrix, Hypertrophic;Humans;Hyperplasia;Lasers, Dye;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation enhances facial nerve regeneration via activation of PI3K/Akt signaling pathway-mediated antioxidant response. Facial nerve dysfunction is a common clinical condition that leads to disfigurement and emotional distress in the affected individuals. This study aimed to evaluate whether photobiomodulation can enhance regeneration of crushed facial nerves and attempt to investigate the possible underlying mechanism of neuroprotective function and therapeutic target. Various parameters of photobiomodulation were assigned to the facial nerves and Schwann cells (SCs) separately during crushed injury in rats. Axonal regeneration, functional outcomes, and SC apoptosis, proliferation, and underlying mechanisms of action were evaluated by morphological, histopathological, and functional assessments, flow cytometry, western blotting, real-time PCR, and IncuCyte. The results showed that photobiomodulation improved axonal regeneration and functional recovery, and also promoted proliferation, and inhibited apoptosis of SCs, both of these were considered as the most effective parameters in 250mW group. In addition, the neuroprotective effects of photobiomodulation (500mW) were likely associated with oxidative stress-induced SC apoptosis via activation of the PI3K/Akt signaling pathway. Our results revealed that photobiomodulation significantly promoted axonal regeneration, functional recovery, and regeneration of the facial nucleus, and its mechanism was related to the up-regulation of the PI3K/Akt signaling pathway. These findings provide clear experimental evidence of photobiomodulation as an alternative therapeutic strategy for peripheral nerve damage. Antioxidants;Proto-Oncogene Proteins c-akt Animals;Antioxidants;Facial Nerve;Nerve Regeneration;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;Rats;Signal Transduction

Efficacy of Photobiomodulation in the Treatment of Cancer Chemotherapy-Induced Oral Mucositis: A Meta-Analysis with Trial Sequential Analysis. Oral mucositis is a debilitating complication of chemotherapy, characterized by erythema, ulcers and oedema of the oral mucosa. This review aimed to evaluate the efficacy of Photobiomodulation in the treatment of oral mucositis using meta-analysis and trial sequential analysis, and also to assess the quality of the results by Grading of Recommendations, Assessment, Development and Evaluation (GRADE). A comprehensive search of three databases, including Embase, Medline and Central, was performed to identify randomized controlled trials studying the efficacy of Photobiomodulation in the treatment of cancer chemotherapy-induced oral mucositis. The primary outcome was reduction in the severity of oral mucositis. Secondary outcomes were pain relief, duration of oral mucositis and adverse effects. The meta-analysis was performed using the random-effects model, and random errors of the meta-analyses were detected by trial sequential analysis. A total of 6 randomized controlled trials with 398 participants were included in our analysis. Photobiomodulation significantly reduced the severity of oral mucositis when compared to sham radiation (RR 0.43, 95% CI 0.20 to 0.93; $p < 0.05$). Sensitivity analysis by excluding trials with high risk of bias reiterated the robustness of our results (RR 0.28, 95% CI 0.16 to 0.48). Trial sequential analysis illustrated that the evidence from the meta-analysis was conclusive. The result of the meta-analyses with trial sequential analysis illustrated that Photobiomodulation is an effective therapeutic intervention for the treatment of oral mucositis, and

the evidence gathered can be considered conclusive with a moderate level of certainty according to GRADE. Further trials are recommended to standardize the laser parameters required for the optimal effect. Antineoplastic Agents Antineoplastic Agents;Humans;Mouth Mucosa;Neoplasms;Pain Management;Randomized Controlled Trials as Topic;Stomatitis

Photobiomodulation by Near-Infrared 980-nm Wavelengths Regulates Pre-Osteoblast Proliferation and Viability through the PI3K/Akt/Bcl-2 Pathway. BACKGROUND: bone tissue regeneration remains a current challenge. A growing body of evidence shows that mitochondrial dysfunction impairs osteogenesis and that this organelle may be the target for new therapeutic options. Current literature illustrates that red and near-infrared light can affect the key cellular pathways of all life forms through interactions with photoacceptors within the cells' mitochondria. The current study aims to provide an understanding of the mechanisms by which photobiomodulation (PBM) by 900-nm wavelengths can induce in vitro molecular changes in pre-osteoblasts. METHODS: The PubMed, Scopus, Cochrane, and Scholar databases were used. The manuscripts included in the narrative review were selected according to inclusion and exclusion criteria. The new experimental set-up was based on irradiation with a 980-nm laser and a hand-piece with a standard Gaussian and flat-top beam profile. MC3T3-E1 pre-osteoblasts were irradiated at 0.75, 0.45, and 0.20 W in continuous-wave emission mode for 60 s (spot-size 1 cm(2)) and allowed to generate a power density of 0.75, 0.45, and 0.20 W/cm(2) and a fluence of 45, 27, and 12 J/cm(2), respectively. The frequency of irradiation was once, three times (alternate days), or five times (every day) per week for two consecutive weeks. Differentiation, proliferation, and cell viability and their markers were investigated by immunoblotting, immunolabelling, fluorescein-FragELTM-DNA, Hoechst staining, and metabolic activity assays. RESULTS AND CONCLUSIONS: The 980-nm wavelength can photobiomodulate the pre-osteoblasts, regulating their metabolic schedule. The cellular signal activated by 45 J/cm(2), 0.75 W and 0.75 W/cm(2) consist of the PI3K/Akt/Bcl-2 pathway; differentiation markers were not affected, nor do other parameters seem to stimulate the cells. Our previous and present data consistently support the window effect of 980 nm, which has also been described in extracted mitochondria, through activation of signalling PI3K/Akt/Bcl-2 and cyclin family, while the Wnt and Smads 2/3-Î²-catenin pathway was induced by 55 J/cm(2), 0.9 W and 0.9 W/cm(2). Proto-Oncogene Proteins c-bcl-2;Proto-Oncogene Proteins c-akt Animals;Cell Differentiation;Cell Proliferation;Cell Survival;Lasers;Low-Level Light Therapy;Mice;Osteoblasts;Osteogenesis;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;Proto-Oncogene Proteins c-bcl-2;Signal Transduction;Skull

Identification of the fate and regenerative mechanism of zebrafish melanocyte progenitor cells and melanocytes after laser-induced pigment ablation. BACKGROUND AND OBJECTIVES: Lasers are known to be the most effective treatment modality for pigmentary skin diseases. However, melanocytes and melanin pigment often recur or leave post-inflammatory hyperpigmentation after the laser procedure. Studies have reported on the role of progenitor cells in pigment cell regeneration, which can be constantly replenished through mitosis. However, the response of unpigmented melanocyte progenitor cells to laser treatment is poorly understood. In this study, we used adult zebrafish skin as the melanocyte regenerative system and examined the response of melanocyte progenitor cells to laser photothermolysis. MATERIALS AND METHODS: The two groups of adult zebrafish were irradiated with 1064â€‰nm wavelength laser system of Q-switched neodymium:yttrium-aluminum-garnet (Nd:YAG) laser with 0.3 or 0.7â€‰JÂ·cm(-2) . We compared the regeneration of pigment at different energy levels by measuring new melanocyte counts and pigment area. We traced and quantitatively compared the melanocyte lineage cells by immunohistochemical staining using specific markers such as sox10, mitfa, and dct during the regeneration process. Three repetitive laser ablations were also held to test the postinflammatory

hyperpigmentation. RESULTS: After the laser ablation of melanocytes, most of the new melanocytes appeared between Days 5 and 10. In high-energy irradiation of 0.7â€‰JÂ·cm(-2) , the unpigmented mitfa-expressing cells showed significant decrease (pâ€‰<â€‰0.05) and showed delay in the differentiation process of melanocyte lineage cells. After repeated laser irradiation, hyperpigmentation did not appear and the final recovery ratio of the pigmented area was 87.5% and 75.3% at the 0.3 and 0.7â€‰JÂ·cm(-2) energy levels, respectively. CONCLUSION: We suggest that laser treatment overcoming the recurrence should be planned based on the adequate energy level targeting the melanocyte progenitor cells. High-energy irradiation may induce apoptosis of progenitor cells and delay their process of differentiation. Short-term repetitive sessions of laser therapy can reduce the pigmentation in the long-term observation. Animals;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanocytes;Pigmentation;Stem Cells;Zebrafish

Evaluation of lipolysis and toxicological parameters of low-level laser therapy at different wavelengths and doses in the abdominal subcutaneous tissue. Investigate the effects of low-level lasers therapy (LLLT) aiming abdominal lipolysis. Female Wistar rats received applications of LLLT directly in the abdominal skin twice a week (5Â weeks). Except the control group (nâ€‰=â€‰5), animals received treatments with red wavelength 660Â nm being (I) R3.3 group (nâ€‰=â€‰5): 3.3Â J/cm(2), and (II) R5 group (nâ€‰=â€‰5): 5Â J/cm(2), or infrared wavelength 808Â nm being (III) IR3.3 group (nâ€‰=â€‰5): 3.3Â J/cm(2), and (IV) IR5 group (nâ€‰=â€‰5): 5Â J/cm(2). Abdominal subcutaneous and liver tissues were evaluated histologically. Levels of thiobarbituric acid reactive substances (TBARS) and catalase (CAT) activity were analyzed in liver tissue. In the peripheral blood aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, and total cholesterol were investigated. Micronucleus assay was performed in the bone marrow. Except for the IR3.3 group, all treated groups reduced the body weight (pâ€‰<â€‰0.001). The R5 group reduced the abdominal subcutaneous tissue weight and thickness (pâ€‰<â€‰0.05), even though all treated groups reduced the number of adipocytes and its size (pâ€‰<â€‰0.001). No histological changes in the liver. There were no alterations in the triglycerides and LDL levels. The IR5 group increased the total cholesterol levels and decreased the HDL, ALT (both pâ€‰<â€‰0.05), and AST levels (pâ€‰<â€‰0.001). The group IR3.3 showed higher levels of ALP (pâ€‰<â€‰0.01). The R3.3 group increased the TBARS and CAT activity (pâ€‰<â€‰0.05). No mutagenic effects were found. The red laser treatment at 5Â J/cm(2) led to lipolysis and did not alter the liver's parameters. Aspartate Aminotransferases Animals;Aspartate Aminotransferases;Female;Lipolysis;Liver;Low-Level Light Therapy;Rats;Rats, Wistar;Subcutaneous Tissue

Efficacy of low-level laser therapy in nerve injury repair-a new era in therapeutic agents and regenerative treatments. BACKGROUND: Traumatic nerve injuries may result in severe motor dysfunctions. Although the microenvironment of peripheral axons favors their regeneration, regenerative process is not always successful. PURPOSE: We reviewed and discussed the main findings obtained with low-level laser therapy (LLLT), a therapeutic intervention that has been employed in order to achieve an optimized regeneration process in peripheral axons. SCOPE: Disseminating the best available evidence for the effectiveness of this therapeutic strategy can potentially improve the statistics of success in the clinical treatment of nerve injuries. We found evidence that LLLT optimizes the regeneration of peripheral axons, improving motor function, especially in animal models. Nonetheless, further clinical evidence is still needed before LLLT can be strongly recommended. Although the results are promising, the elucidation of the mechanisms of action and safety assessment are necessary to support highquality clinical studies. CONCLUSION: The present careful compilation of findings with consistent pro-regenerative evidence and published in respected scientific journals can be valuable for health professionals and researchers in the field,

possibly contributing to achieve more promising results in future randomized controlled trials and interventions, providing better prognosis for clinical practice. Animals;Axons;Humans;Low-Level Light Therapy;Models, Animal;Nerve Regeneration;Peripheral Nerve Injuries

Pulsed dye laser versus intense pulsed light for facial erythema of rosacea: a systematic review and meta-analysis. Erythema;Humans;Lasers, Dye;Low-Level Light Therapy;Rosacea;Treatment Outcome

Photobiomodulation associated with sclerotherapy for treatment of hemangioma in the hard palate. Vascular changes frequently involve the head and neck region and hemagioma is the most common. A 61-year-old female patient complained of severe pain in the hard palate. A purple lesion was found, measuring 1.5 cm, sensitive to palpation, and with a history of hemorrhage. The patient was fully edentulous and her upper denture compressed the lesion site. Diascopy confirmed the lesion's vascular origin. A diagnostic hypothesis of hemangioma was raised. In the first session, red laser light (660nm) was applied at 4 points around the lesion, with 0.5 J at each point, in order to obtain analgesia and trigger the repair process. The upper denture was also relined. In the second session, 2 mL of 5% monoethanolamine oleate was applied. After 14 days, total regression of the lesion was observed. Dental surgeons must be able to recognize, diagnose and treat vascular lesions in the oral cavity.

Photobiomodulation with polychromatic light (600-1200â€‰nm) improves fat graft survival by increasing adipocyte viability, neovascularization, and reducing inflammation in a rat model. OBJECTIVES: Unpredictability with the final volume and viability of the graft are the major concerns in fat grafting. An experimental study was conducted to increase graft retention using photobiomodulation (PBM) with polychromatic light in near-infrared region (600-1200â€‰nm) by utilizing its stimulatory effects on angiogenesis, neovascularization, adipocyte viability, and anti-inflammatory properties. METHODS: A total of 24 rats were divided into four groups (nâ€‰=â€‰6) according to the applied polychromatic light protocol to the recipient site (none, before fat transfer, after fat transfer, and combined). In all groups, inguinal fat pad was excised, measured for volume and weight, and transferred to the dorsum of the rat. At the end of the experiment, fat grafts were harvested from the recipient site for volume and weight measurements, histological, and immunohistochemical evaluation. RESULTS: Intergroup comparison revealed that fat graft retention regarding weight and volume, was significantly superior in Group IV (pâ€‰=â€‰0.049 and pâ€‰=â€‰0.043, respectively), which polychromatic light was applied both before and after transfer of the graft. Hematoxylin-eosin and Masson's trichrome stained sections showed absence of necrosis, fibrosis, inflammation, cyst formation, and increased vascularization of both inner and outer zones of the grafts in Group IV. Also, immunohistochemical staining scores for perilipin (indicator for adipocyte viability), CD31 and VEGF (indicators for angiogenesis and neovascularization) were significantly higher (pâ€‰<â€‰0.001). Ki67 scores were significantly lower in this group because of anti-inflammatory environment (pâ€‰<â€‰0.001). CONCLUSIONS: Application of PBM to the recipient site before and after fat transfer improved outcomes in rats at 56 day after fat grafting by means of volume retention, increased neovascularization and adipocyte viability and reduced necrosis, fibrosis and inflammation. Adipocytes;Adipose Tissue;Animals;Graft Survival;Inflammation;Necrosis;Neovascularization, Physiologic;Rats

Comparative effectiveness of low-level laser therapy with different wavelengths and transcutaneous electric nerve stimulation in the treatment of pain caused by temporomandibular disorders: A systematic review and network meta-analysis. OBJECTIVE: To assess the efficacy of low-level laser therapy (LLLT) with different wavelengths and transcutaneous electric nerve stimulation (TENS) and explore the optimal wavelength range of laser application in the treatment of pain caused by temporomandibular disorders (TMD). METHODS: An electronic search on PubMed, Cochrane Library,

Embase, Scopus and Web of Science was undertaken to identify the randomised clinical trials (RCTs) published from database inception to 16 April 2021, aiming to compare the effects of LLLT with different wavelengths (632.8-672Â nm, 780-904Â nm, and 910-1100Â nm) or TENS or placebo group on TMD patients pain reduction. In addition, manual search of the studies was performed. The reviewers assessed the risk of bias of individual studies with the Cochrane risk of bias tool and excluded the RCTs with a high risk of bias in any field. Meanwhile, the reviewers, after performing the network meta-analysis, assessed the quality of evidence, which contributed to network estimate via the GRADE framework. RESULTS: Twenty-seven RCTs with 969 patients with TMD were included. In the meta-analysis, all treatment groups showed an overall improvement in pain scores, when compared with the placebo group. LLLT with wavelength ranging from 910Â nm to 1100Â nm produced more pain relief in the visual analogue scale (VAS) immediately after treatment [mean difference (MD)Â =Â 4.68, 95% confidence interval (CI):(3.08,6.28)]. After one-month follow-up, LLLT with wavelength ranging from 910Â nm to 1100Â nm also showed superior pain-relieving effects [MDÂ =Â 3.61, 95% CI: (-1.77, 8.99)]. However, no significant difference was observed. Based on the SUCRA ranking, L3 ranked first immediately after treatment and 1Â month later. CONCLUSION: The results of the meta-analysis showed the LLLT had better short-term efficacy than TENS in the treatment of pain caused by TMD. Better results can be achieved with higher wavelengths. Therefore, we recommended to treat TMD using LLLT with wavelength ranging from 910Â nm to 1100Â nm. Humans;Low-Level Light Therapy;Network Meta-Analysis;Pain;Temporomandibular Joint Disorders;Transcutaneous Electric Nerve Stimulation

The Use of Lasers and Light Devices in Acne Management: An Update. Acne vulgaris is a disease of the pilosebaceous unit and the most common inflammatory dermatosis worldwide. It is also associated with significant economic burden. Limitations of conventional topical and systemic treatments include long treatment course, intolerable adverse effects, antibiotic resistance, and patient compliance. Therefore, laser and light-based interventions present as alternative options over the past decade and have been used in combination with conventional pharmacological therapies and other physical modalities. An updated overview on the use of lasers and light-based devices in acne management is presented to help clinicians understand the safety and efficacy of these treatment options. The effectiveness of neodymium:yttrium aluminum garnet (Nd:YAG) for treating acne is supported by more high-level studies compared with other laser devices. There is limited evidence to support the use of CO(2) lasers, potassium titanyl phosphate lasers, and 1565-nm non-ablative fractional lasers for treating acne. Among light devices, photodynamic therapy is the most studied, showing higher efficacies than some of the conventional topical and oral acne therapies. Intense-pulsed light and blue light therapies also show favorable outcomes. A limitation is that most studies are non-randomized and lack a control group, and report on a variety of device settings, treatment regimens, and outcome measures, making it challenging to summarize and generalize findings. Although the use of laser and light devices to treat acne is promising, further work with randomized controlled study designs and larger sample sizes will provide improved guidance on the application of these modalities. Acne Vulgaris;Clinical Trials as Topic;Humans;Intense Pulsed Light Therapy;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Photochemotherapy;Severity of Illness Index;Treatment Outcome

Venous ulcer healing treated with conventional therapy and adjuvant laser: is there a difference? OBJECTIVES: to evaluate the effects of venous ulcer healing in patients after six months of conventional treatment and adjuvant low-power laser therapy. METHODS: prospective cohort study nested in a randomized clinical trial with 38 patients, allocated into an intervention group (conventional treatment and adjuvant laser therapy) and a control group (conventional treatment). Patients were followed up as outpatients, sociodemographic and clinical variables were collected, and

indicators of the outcomes Wound healing: secondary intention (1103) and Tissue integrity: skin and mucous membranes(1101) of the Nursing Outcomes Classification. Generalized estimating equations, Kaplan-Meier tests, and robust Poisson regression were used in the analysis. RESULTS: the clinical indicators Decreased wound size and Scar formation showed a statistically significant difference in the intervention group, higher number of healed wounds, lower rate, longer time to relapse. CONCLUSIONS: laser therapy adjuvant to conventional treatment returned better results in healing and lower recurrence rates after six months of intervention. Chronic Disease;Humans;Lasers;Prospective Studies;Varicose Ulcer;Wound Healing

Efficacy and safety of laser combination therapy and laser alone therapy for keloid: a systematic review and meta-analysis. To evaluate the efficacy and safety of laser alone therapy and laser combination therapy (mainly combined with other kinds of laser or steroids) for keloid.PubMed, Embase and Web of Science were searched for relevant articles from inception to June 2020. Comprehensive Meta-Analysis software 2.0 (CMA) was used to perform the meta-analysis.A total of 29 articles were included in this meta-analysis. During the mean follow-up of 14 (1-84) months, the overall improvement rates of baseline Vancouver scar scale (VSS) score and itch were 0.454 (95%CI 0.351-0.561, I(2)â€‰=â€‰0) and 0.786 (95%CI 0.613-0.895, I(2)â€‰=â€‰0) in the laser combination therapy group. The improvement rates of scar height and flexibility in the laser combination therapy group were 0.629 (95%CI 0.519-0.727, I(2)â€‰=â€‰52.089) and 0.784 (95%CI 0.251-0.975, I(2)â€‰=â€‰89.420). The average improvement rate of the scar score in laser combination therapy was 0.338 (0.201-0.510); however, there were insufficient data for laser alone therapy comparison. The laser combination therapy had a greater pain improvement rate, 0.580 (0.389-0.750) versus 0.420 (0.224-0.645), compared to laser alone therapy, and a greater degree of good or excellent (>â€‰50%) improvement in the overall scar, 0.636 (95%CI 0.347-0.852) versus 0.149 (95%CI 0.032-0.482), with laser alone therapy. Moreover, a lower regrowth rate of 0.187 (0.129-0.263) versus 0.249 (0.060-0.631), a lower post-treatment pigmentation rate of 0.125 (0.091-0.169) versus 0.135 (0.058-0.282), and a lower infection rate of 0.047 (0.009-0.209) versus 0.076 (0.012-0.351) were observed in the laser combination therapy compared with those rates in the laser alone therapy.The overall effect of laser combination therapy was better than that of laser alone therapy, and the incidence of adverse reactions was lower in laser combination therapy than in laser alone therapy. Cicatrix, Hypertrophic;Humans;Keloid;Laser Therapy;Lasers;Low-Level Light Therapy

Efficacy of Photobiomodulation and Metformin on Diabetic Cell Line of Human Periodontal Ligament Stem Cells through Keap1/Nrf2/Ho-1 Pathway. BACKGROUND: Diabetes mellitus (DM) is a metabolic disorder resulting from hyperglycemia. Hyperglycemia contributes to oxidative stress, and the release of advanced glycation end products (AGEs) further promotes disease pathogenesis. Uncontrolled diabetes reflects great oral complications and affects human oral health. So, the present study aimed to assess the effects of photobiomodulation therapy (PBMT) and Metformin on proliferation and viability of human periodontal ligament stem cells (HPDLSCs) cultured in high glucose medium. METHODS: HPDLSCs were collected, isolated, and characterized and then divided into eight groups. Addition of extra glucose to diabetic groups 24 hours before cell irradiations. Metformin was added to half of the diabetic groups. Cells were irradiated with 808 nm diode laser 24, 48 hours. Cell viability was analyzed with MTT assay 24 hours post-irradiation to detect cell viability in each group. Real-time (PCR) was used to evaluate gene expression of Nrf2, Keap1, PIK3, and HO-1 and the effect of PBMT on Keap1/Nrf2/Ho-1 Pathway. ELISA reader was used to evaluating cell viability through (ROS, TNF-Î±, IL-10) protein levels after cell irradiation. RESULTS: Photobiomodulation at 1, 2, and 3 J/cm2 combined with metformin significantly promoted diabetic cell lines of HPDLSCs viability (in MTT assay and ELISA reader of ROS, TNF-Î±, IL-10 results) and gene expression of Nrf2, Keap1,

PIK3, and HO-1 levels (p< 0.05). CONCLUSION: photobiomodulation with 3 J/cm(2) combined with metformin enhanced proliferation and viability of diabetic cell lines of HPDLSCs and thus could improve differentiation and function of diabetic cell lines of HPDLSCs with minimum side effects.

Photobiomodulation in the treatment of xerostomia associated with hyposalivation in a pediatric patient with systemic scleroderma. Scleroderma is a rare autoimmune disease characterized by excessive collagen production. The oral manifestations of the patient with scleroderma can include microstomia, xerostomia, and changes in the resorption teeth. We report the case of a 7-year-old female patient diagnosed with systemic scleroderma where photobiomodulation therapy was used to treat xerostomia associated with hyposalivation. She attended a pediatric clinic and presented with dry and rigid facial skin, trismus, xerostomia, malocclusion, and difficulty swallowing. Stimulated salivary flow was assessed before, during, and after treatment. Photobiomodulation therapy was conducted at four points at the sublingual glands with 660 nm, 100 mW, and 0.8 J/cm(2) to each point; eight points at the parotid glands; and six points at the submandibular glands with 808 nm, 100 mW, and 0.8 J/cm(2) for 8 seconds at each point. After this therapy, an increase in salivary flow, remission of the xerostomia, and an improvement in mastication and swallowing were observed. Photobiomodulation therapy was effective in controlling xerostomia in this pediatric patient, resulting in increased salivary flow and an improvement in her quality of life.

A smart LED therapy device with an automatic facial acne vulgaris diagnosis based on deep learning and internet of things application. In low-level laser therapy, providing an optimal dosage and proposing a proper diagnosis before dermatological treatment are essential to reduce the side effects and potential dangers. In this article, a smart LED therapy system for automatic facial acne vulgaris diagnosis based on deep learning and Internet of Things application is proposed. The main goals of this study were to (1) develop an LED therapy device with different power densities and LED grid control; (2) propose a deep learning model based on modified ResNet50 and YOLOv2 for an automatic acne diagnosis; and (3) develop a smartphone application for facial photography image capture and LED therapy parameter configuration. Furthermore, a healthcare Internet of Things (H-IoT) platform for the connectivity between smartphone apps, the cloud server, and the LED therapy device is proposed to improve the efficiency of the treatment process. Experiments were conducted on test data sets divided by a cross-validation method to verify the feasibility of the proposed LED therapy system with automatic facial acne detection. The obtained results evidenced the practical application of the proposed LED therapy system for automatic acne diagnosis and H-IoT-based solutions. Acne Vulgaris;Deep Learning;Humans;Internet of Things;Research Design

Response to the Comment on "Photobiomodulation therapy for the prevention of acute radiation dermatitis (RD) in head and neck cancer patients (DERMISHEAD trial)" by Baiocchi et al.
Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiodermatitis

Comment on "Photobiomodulation therapy for the prevention of acute radiation dermatitis (RD) in head and neck cancer patients (DERMISHEAD trial)". Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiodermatitis

The effectiveness of topical forms of dexamethasone in the treatment of oral lichen planus- A systematic review. The goal of this systematic review was to assess the efficacy of dexamethasone compared to other treatments in oral lichen planus (OLP). The literature search used the following inclusion criteria: randomized controlled trials (RCT) comparing dexamethasone and other treatment strategies in patients with OLP. The outcome measures included relief of symptoms, decrement of erosive area size, and changes in quality of life. A computer and manual search was performed in Pubmed, Web of Science, and Cochrane Library up to January 31, 2021. The risk of bias was measured with the Revised Cochrane risk-of-bias tool for randomized trials. Eight trials with 131 study participants and 132 controls were identified. The following interventions were compared

dexamethasone mouthwash, and 5% methylene blue-mediated photodynamic therapy, low-level laser therapy, amlexanox, clobetasol mouthwash, ketoconazole with amitriptyline, and thalidomide 1% paste. The therapeutic outcomes were more advantageous for dexamethasone in comparison with photodynamic therapy (PDT) (2 RCT) and low-level laser therapy (LLLT). Comparable effects were observed for dexamethasone, amlexanox, thalidomide, and PDT (1 RCT). Clobetasol showed more effective action than dexamethasone. Given the small sample sizes, heterogeneity and the few studies included, there is limited evidence to support the selection of treatment for OLP.
Aminopyridines;Mouthwashes;Amitriptyline;Thalidomide;Dexamethasone;Clobetasol;amlexanox;Ketoconazole;Methylene Blue Administration, Topical;Aminopyridines;Amitriptyline;Clobetasol;Dexamethasone;Humans;Ketoconazole;Lichen Planus, Oral;Methylene Blue;Mouthwashes;Thalidomide

Impact of photobiomodulation in a patient-derived xenograft model of oral squamous cell carcinoma. BACKGROUND: Photobiomodulation therapy (PBMT) is an effective method for the prevention of oral mucositis. However, the effects of PBMT on oral squamous cell carcinoma (OSCC) have not yet been fully elucidated. This study aimed to evaluate the impact of PBMT in an OSCC-patient-derived xenograft (OSCC-PDX) model. METHODS: BALB/c nude mice with OSCC-PDX models were divided into Control, without PBMT (nÂ =Â 8); Immediate irradiation, PBMT since one week after tumor implantation (nÂ =Â 6); and Late irradiation, PBMT after tumors reached 200Â mm(3) (nÂ =Â 6). OSCC-PDX were daily irradiated (660Â nm; 100Â mW; 6Â J/cm(2) ; 0,2Â J/point) for 12Â weeks. The tumors were collected and submitted to volumetric, histological, immunohistochemistry, and cell cycle analysis. RESULTS: No significant differences in the volumetric measurements (pÂ =Â 0.89) and in the histopathological grade (pÂ >Â 0.05) were detected between the groups. The immunohistochemical analysis of Ki-67 (pÂ =Â 0.9661); H3K9ac (pÂ =Â 0.3794); and BMI1 (pÂ =Â 0.5182), and the evaluation of the cell cycle phases (pÂ >Â 0.05) by flow cytometry also did not demonstrate significant differences between the irradiated and non-irradiated groups. CONCLUSION: In this study, PBMT did not impact the behavior of OSCC-PDX models. This is an important preclinical outcome regarding safety concerns of the use of PBMT in cancer patients.
Animals;Mice;Humans;Carcinoma, Squamous Cell;Squamous Cell Carcinoma of Head and Neck;Mouth Neoplasms;Heterografts;Mice, Nude;Disease Models, Animal;Low-Level Light Therapy;Head and Neck Neoplasms

[State of art of photobiomodulation in the management of radiotherapy adverse events: Indications and level of evidence]. PURPOSE: To evaluate the current and potential indications of photobiomodulation (PBM) and their level of evidence in the prevention or management of radiation therapy-related side effects. MATERIALS AND METHODS: The Embase, Medline/PubMed, Cochrane, EBSCO, Scopus, and LILACS databases were systematically reviewed to include and analyze publications of clinical studies that have assessed PBM in the prevention or management of radiotherapy-related side effects. The keywords used were "photobiomodulation"; "low level laser therapy"; "acute oral mucositis"; "acute dysphagia"; "acute radiation dermatitis"; "lymphedema"; "xerostomia"; "hyposalivation"; "trismus"; "bone necrosis"; "osteoradionecrosis"; and "radiation induced fibrosis". Prospective studies were included, whereas retrospective cohorts and non-original articles were excluded from the analysis. RESULTS: PBM in the red or infrared spectrum has demonstrated efficacy in randomized controlled trials in the prevention and management of radiotherapy-related side effects, especially acute oral mucositis, acute radiation dermatitis, and upper extremity lymphedema. The level of evidence associated with PBM was heterogeneous, but overall was still moderate. The main shortcomings were the diversity and lack of detail in treatment protocols, which could have compromised efficiency and reproducibility of PBM results. CONCLUSION: The published data suggest that PBM may be considered as a full-fledged supportive

care for patients treated with radiotherapy, or at least in the setting of a therapeutic clinical trial. However, until strong evidence has been published on its long-term safety, the use of PBM should be considered with caution, specifically when applied near areas with proven or potential tumors. The patient should be informed of the theoretical benefits and risks of PBM in order to obtain his informed consent before treatment. Acute Disease;Clinical Protocols;Deglutition Disorders;Fibrosis;Humans;Low-Level Light Therapy;Lymphedema;Osteoradionecrosis;Prospective Studies;Radiation Injuries;Radiodermatitis;Radiotherapy;Randomized Controlled Trials as Topic;Reproducibility of Results;Stomatitis;Trismus;Xerostomia

The effect of photobiomodulation therapy on antioxidants and oxidative stress profiles of adipose derived mesenchymal stem cells in diabetic rats. We studied the effects of photobiomodulation therapy (PBMT) on adipose-derived mesenchymal stem cells (ADSCs) which were extracted from streptozotocin (STZ) induced diabetic rats. Adipose tissue was extracted from the hypodermis of diabetic rats, and diabetic ADSCs were extracted, characterized, and cultured. There were two in vitro groups: control-diabetic ADSCs, and PBMT-diabeticADSCs. We used 630Â nm and 810Â nm laser at 1.2Â J/cm(2) with 3 applications 48Â h apart. We measured cell viability, apoptosis, population doubling time (PDT), and reactive oxygen species (ROS) by flow cytometry. Gene expression of antioxidants, including cytosolic copper-zinc superoxide dismutase (SOD1), catalase (CAT), total antioxidant capacity (TAC), and oxidative stress biomarkers (NADPH oxidase 1 and 4) by quantitative real time (qRT) - PCR. In this study, data were analyzed using t-test. Viability of PBMT-diabetic- ADSC group was higher than control- diabetic-ADSC (pÂ =Â 0.000). PDT and apoptosis of PBMT- diabetic-ADSC group were lower than control-diabetic -ADSC (pÂ =Â 0.001, pÂ =Â 0.02). SOD1 expression and TAC of PBMT- diabetic-ADSC group were higher than control -diabetic -ADSC (pÂ =Â 0.018, pÂ =Â 0.005). CAT of PBMT -diabetic-ADSC group was higher than control-diabetic -ADSC. ROS, NOX1, and NOX4 of PBMT- diabetic -ADSC group were lower than control-diabetic-ADSC (pÂ =Â 0.002, pÂ =Â 0.021, pÂ =Â 0.017). PBMT may improve diabetic- ADSC function in vitro by increasing levels of cell viability, and gene expression of antioxidant agents (SOD1, CAT, and TAC), and significantly decreasing of levels of PDT, apoptosis, ROS, and gene expression of oxidative stress biomarkers (NOX1 and NOX4). Antioxidants Animals;Antioxidants;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Mesenchymal Stem Cells;Oxidative Stress;Rats

Photobiomodulation Therapy to Promote Angiogenesis in Diabetic Mice with Hindlimb Ischemia. Objective: To assess whether photobiomodulation therapy (PBMT) induces angiogenesis in diabetic mice with hindlimb ischemia (HLI). Background: Patients with diabetes mellitus (DM) are at high risk of developing peripheral arterial disease (PAD) in the lower extremities. PBMT has been shown to promote angiogenesis both in vitro and in vivo and could be a treatment for DM patients with PAD. Methods: Femoral artery ligation/excision in mice was performed to induce HLI as an animal model of PAD. PBMT at a dose of 660â€‰nm and 1.91â€‰J/cm(2) was delivered for 10â€‰min on 5 consecutive days after the HLI surgery. Control mice received HLI only. Mice in the DM group were injected with streptozocin to induce diabetes before HLI surgery. Mice in the laser and DM+ laser groups received both HLI and PBMT, and the latter group had induced DM. After the laser treatment, lower limb blood flow was evaluated by laser Doppler. The capillary density and CD31 were analyzed by immunofluorescence staining, and protein levels of vascular endothelial growth factor (VEGF)-A, hypoxia-inducible factor-1Î± (HIF-1Î±), inducible nitric oxide synthase (iNOS), endothelial nitric oxide synthase (eNOS), and extracellular signal-regulated kinases (ERK) were measured by Western blotting of tissue samples. Results: Compared with the control and DM mice, the laser and DM+ laser groups had more than double the capillary density and blood perfusion rate. Levels of CD31 and VEGF-A proteins in groups that received laser were increased by 1.9- to 3.2-fold compared with groups that did not undergo laser treatment. Animals treated with PBMT exhibited significantly increased HIF-1Î±

expression and ERK phosphorylation compared with animals that did not receive this treatment, and the amount of phospho-eNOS and iNOS increased and decreased, respectively. Conclusions: PBMT can induce therapeutic angiogenesis, indicating that low intensity laser could be a novel treatment for PAD patients. Animals;Diabetes Mellitus, Experimental;Disease Models, Animal;Hindlimb;Ischemia;Low-Level Light Therapy;Mice

Photobiomodulation Therapy in Burn Wound Healing: Systematic Review and Meta-Analysis of Preclinical Studies. Background and objective: To determine the effectiveness of photobiomodulation therapy (PBMT) in the burn wound healing compared with the control or with the use of antibiotics, in animal models. Materials and methods: A systematic search was conducted in EMBASE, MEDLINE, and LILACS databases. Preclinical studies were included that analyzed the effectiveness of PBMT in the burn wound healing, which assessed wound contraction, angiogenesis, proliferation of fibroblasts, and collagen deposition. SYRCLE risk of bias tool was used. Random effects models were used to estimate the pooled effect. Results: Thirty-eight studies were included. PBMT favored wound contraction (mean differenceâ€‰=â€‰-11.47, 95% confidence interval -19.87 to -3.08, I(2)â€‰=â€‰0%; moderate certainty of evidence). PBMT also favored angiogenesis at doses between 11 and 20â€‰J/cm(2), and increased the collagenization rate. Conclusions: In animal models, PBMT favored wound contraction, angiogenesis, and collagen deposition in second- and third-degree burn wounds. Animals;Burns;Low-Level Light Therapy;Wound Healing

Protective Effect of Photobiomodulation on Denervated and Crushed Muscle. Low-Level Light Therapy;Muscles

Gender Differences of Dementia in Response to Intensive Self-Administered Transcranial and Intraocular Near-Infrared Stimulation. Background Transcranial near-infrared (tNIR) stimulation was proven to be a safe, reliable, and effective treatment for cognitive and behavioral symptoms of dementia. Dementia patients of different genders differ in terms of gross anatomy, biochemistry, genetic profile, clinical presentations, and socio-psychological status. Studies of the tNIR effect on dementia have thus far been gender-neutral, with dementia subjects being grouped based on diagnoses or dementia severity. This trial hereby investigated how dementia subjects of different sex respond to tNIR treatment. Methods A total of 60 patient-caregiver dyads were enrolled and randomized to this double-blind, sham-controlled clinical trial. The tNIR light has a wavelength of 1,060 nm to 1,080 nm and was delivered via a photobiomodulation (PBM) unit. The active PBM unit emits near-infrared (NIR) light while the sham unit does not. The treatment consists of a six-minute tNIR light stimulation session twice daily for eight weeks. Neuropsychological assessments conducted at baseline (week 0) and endline (week 8) were compared within the female and male group and between different sex, respectively. Results Over the course of treatment, active-arm female subjects had a 20.2% improvement in Mini-Mental State Exam (MMSE) (mean 4.8 points increase, $p < 0.001$) and active-arm male cohort had 19.3% improvement ($p < 0.001$). Control-arm female subjects had a 6.5% improvement in MMSEÂ (mean 1.5 points increase, $p < 0.03$) and control-arm male subjects had 5.9% improvement ($p = 0.35$) with no significant differences in the mean MMSE between female and male subjects in both arms respectively. Other comparison of assessments including Clock Copying and Drawing Test, Logical Memory Test - immediate and delayed recall yielded nominal but not statistically significant differences. No significant differences were observed in the mean MMSE between female and male subjects in both arms respectively before treatment implementation (active arm, $p = 0.12$; control arm, $p = 0.50$) at week 0, or after treatment completion (active arm, $p = 0.11$; control arm, $p = 0.74$) at week 8. Conclusion Despite differences between female and male dementia subjects, the response to tNIR light stimulation does not demonstrate gender-based differences. Further studies are warranted to refine the tNIR treatment protocol for subjects suffering from dementia or dementia-related symptoms.

Antimicrobial photodynamic and photobiomodulation adjuvant therapies for the treatment of perianal abscess. Although the treatment and management options for perianal abscess vary considerably, most cases require incision and drainage. Whatever the clinical approach selected, it is imperative to monitor patients to identify postoperative signs and symptoms which suggest treatment failure or further complications, such as sepsis, recurrent abscess, and fistula formation. Considering the debate on the role of postoperative antibiotic therapy for patients with perianal abscess and the significant discomfort caused by the infection, the present study aimed to report a clinical case in which antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) were used after incision and drainage of a simple perianal abscess. Within 5 days, there was no sign or symptom of both infection and inflammation, and after 3 months, no fistulous pathways or perianal collections were present. According to the current case report, the combination of aPDT and PBMT following incision and drainage of perianal abscess may be a smart strategy for infection resolution and prevention of late complications. Anti-Bacterial Agents;Anti-Infective Agents;Photosensitizing Agents Abscess;Anti-Bacterial Agents;Anti-Infective Agents;Anus Diseases;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Rectal Fistula

Comparison of 2940 nm Er: YAG laser treatment in the microlaser peel, fractional ablative laser, or combined modes for the treatment of concave acne scars. OBJECTIVE: To compare and analyze the effects of Er:YAG laser treatment in the microlaser peeling, fractional ablative laser, or combined modes for the treatment of concave acne scars. METHOD: Ninety patients of concavity acne scar were randomly assigned to three different groups:microlaserpeeling mode group (MM group), fractional ablative mode group (FM group) and combined mode group (CM group). MM group received microlaserpeeling mode with depth of 60â€ŠÎ¼m and a repetition rate of 20%, FM group received fractional ablative mode with depth of 300â€ŠÎ¼m and a fractional density of 8%, and CM group received a fractional depth of 200â€ŠÎ¼m, density of 8%, and a peeling depth of 30â€ŠÎ¼m, repetition rate of 20%. All patients were evaluated for their treatment effects and side effects 30â€Šdays after treatment, including the treatment satisfaction, the ECCA grading scale, pain score and pigmentation level. RESULTS: According to the effect satisfaction of patients' self-assessment, the difference among the three groups was statistically significant (Pâ€Š<â€Š.05), the CM group was better than the other two groups, but there was no significant difference between the FM group and the MM group (Pâ€Š>â€Š.05). About the ECCA grading scale 30â€Šdays after treatment, the statistical result among the three groups was significant (Pâ€Š<â€Š.05), the CM group is much lower than the FM group which is approximately equal to the MM group. There was statistical difference in pain score among the three groups and every two groups (Pâ€Š<â€Š.05), the CM group had the highest pain score, while FM group had the lowest. About the pigmentation level, there was statistical difference among the three groups (Pâ€Š<â€Š.05), FM group had the lightest pigmentation, while the CM group had the heaviest. CONCLUSIONS: Three treatment modes are all effective in treating the concavity acne scar. Among the three modes, CM group is best effective, also accompanied with the most severe side effect; FM group achieves the best balance between treatment effect and side effect. The treatment practices indicate that when the Er:YAG laser with a wavelength of 2940â€Šnm is used to treat concavity acne scars, the right treatment mode should be subject to the severity of the scar. Acne Vulgaris;Adolescent;Adult;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Young Adult

Effect of S53P4 bioactive glass and low-level laser therapy on calvarial bone repair in rats submitted to zoledronic acid therapy. PURPOSE: To evaluate the influence of bioactive glass and photobiomodulation therapy (PBMT) in calvarial bone repair process in rats submitted to zoledronic acid therapy. METHODS: Twenty-four rats were selected and treated with the dose of 0.035 mg/kg of zoledronic acid every two weeks, totalizing eight weeks, to induce osteonecrosis. After the drug

therapy, surgical procedure was performed to create 5-mm diameter parietal bone defects in the calvarial region. The rats were then randomly assigned to groups according to the following treatments: AZC: control group, treated with blood clot; AZBIO: bone defect filled with bioactive glass; AZL: treated with blood clot and submitted to PBMT; and AZBIOL: treated with bioactive glass S53P4 and submitted to PBMT. Tissue samples were collected and submitted to histomorphometric analysis after 14 and 28 days. RESULTS: At 14 days, bone neoformation in the AZBIO (52.15 Â± 9.77) and AZBIOL (49.77 Â± 13.58) groups presented higher values (p â‰¤ 0.001) compared to the AZC (23.35 Â± 10.15) and AZL groups (23.32 Â± 8.75). At 28 days, AZBIO (80.24 Â± 5.41)still presented significant higher bone recovery values when compared to AZC (59.59 Â± 16.92)and AZL (45.25 Â± 5.41) groups (p = 0.048). In the 28-day period, the AZBIOL group didn't show statistically significant difference with the other groups (71.79 Â± 29.38). CONCLUSIONS: The bioactive glass is an effective protocol to stimulate bone neoformation in critical defects surgically created in rats with drug induced osteonecrosis, in the studied periods of 14 and 28 days. Zoledronic Acid Animals;Rats;Bone Regeneration;Glass;Low-Level Light Therapy;Zoledronic Acid

The use of LED therapy to treat synovial joints disorders: scoping review. The aim of this scoping review was to assess the extent of the literature on the use of LED therapy to treat synovial joint disorders. The JBI methodology for scoping reviews was followed. The databases used were PUBMED, EMBASE, Scopus, Web of Science, LILACS, PEDro, Cochrane Database, Google Scholar and ProQuest. To be included, studies should have used LED as therapy, and include at least one measure related to the structures of any synovial joint. The search strategy included all keywords and indexed terms identified in the articles. Studies in any language and in any year, whether published or not, were included. The analysis of the studies was carried out by two independent reviewers. Data were extracted from articles using a data extraction tool developed by the reviewers. After carrying out the definitive search and selection, 47 publications were included: 15 clinical trials, 8 clinical protocols, 12 animal studies, 4 in vitro studies and 8 reviews on the topic. Studies have shown great variability from the device and number of diodes used, to the parameters and dosimetry chosen. Some positive effects were observed: on cell proliferation (in vitro); on anti-inflammatory biomarkers (murine models) and on pain scale (clinical trials - TMD). Although, the cause of non-significant results in clinical trials was rarely discussed: depth of penetration, dosimetry, follow-up time? Thus, future studies should focus on answering more elementary aspects about the LED effect when used alone in different synovial joints. Animals;Humans;Joint Diseases;Lighting;Mice;Research Design

Short-pulsed and Q-switched ND-YAG laser with topical carbon versus fractional CO(2) laser in the treatment of enlarged facial pores: A split-face comparative study. OBJECTIVES: To assess and compare the efficacy and safety of topical carbon plus short-pulsed and Q-switched Nd-YAG laser to fractional carbon dioxide (CO(2)) laser in improving the appearance of wide facial pores. MATERIALS AND METHODS: Thirty Egyptian patients with wide facial pores were treated in a split-face manner with two sessions of fractional CO(2) laser on one side of the face and topical carbon followed by short-pulsed and Q-switched Nd-YAG laser on the other side at 4-week intervals. Clinical evaluation by Investigator Global Assessment (IGA), patient satisfaction level, and photography before treatment and 1 month after the second laser session was performed and adverse effects were monitored. Dermoscopic evaluation by dermoscopy pore score and optical coherence tomography (OCT) evaluation by surface irregularities score were performed at baseline and 1-month posttreatment. RESULTS: One month after treatment, both modalities produced significant reduction in IGA score, dermoscopy pore score, and surface irregularities by OCT (pâ€‰<â€‰0.001, pâ€‰<â€‰0.001). Both procedures were well-tolerated. There was no significant difference in IGA, dermoscopy pore score, surface irregularities score by OCT, adverse effects or patient satisfaction level between both treated sides. CONCLUSION: Fractional CO(2) laser and topical carbon application followed by short-

pulsed and Q-switched Nd-YAG laser can be safely and effectively used to improve the appearance of wide facial pores. Carbon Dioxide Carbon Dioxide;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Patient Satisfaction;Treatment Outcome

The influence of photobiomodulation on the temperature of the brachial biceps during muscle fatigue protocol. Physical activity raises body temperature. However, the literature does not contain studies about whether the employment of hotobiomodulation (PMB) could significantly influence body temperature during a muscle fatigue (MF) protocol. Thus, the aim of this study was to evaluate the effects of PMB on the temperature of the biceps brachii muscle during the performance of a muscle fatigue protocol. The study consisted of 14 volunteers who were divided into two groups (placebo group and laser group) and all individuals rotated into all groups (crossover study). To induce muscle fatigue, three maximum voluntary isometric contractions (MVIC) were performed for 50Â s with a 50-s interval. During the MVIC, the muscle strength was assessed using surface electromyography and infrared temperature at 0, 5, 10, and 15Â min after the tests. The laser group presented a less accentuated decrease in muscle strength, evidencing a lower rate of muscle fatigue (pâ€‰>â€‰0.05) in relation to the other groups. In the temperature analysis, the control group exhibited the highest average temperature, with a significant difference only for the placebo. The results indicate that the control displayed the greatest physical degeneration and the PMB group had a positive effect on MF attenuation and body thermoregulation. Cross-Over Studies;Electromyography;Humans;Isometric Contraction;Muscle Fatigue;Muscle, Skeletal;Temperature

Insurance coverage gap for treatment of melasma compared with rosacea: it pays to be light. Humans;Insurance Coverage;Low-Level Light Therapy;Melanosis;Rosacea

Clinical practice guideline for the prevention of oral and oropharyngeal mucositis in pediatric cancer and hematopoietic stem cell transplant patients: 2021 update. PURPOSE: To update the 2015 clinical practice guideline for the prevention of oral mucositis in pediatric cancer or hematopoietic stem cell transplant (HSCT) patients. METHODS: We performed seven systematic reviews of mucositis prevention. Three reviews included randomized controlled trials (RCTs) conducted in pediatric and adult patients evaluating cryotherapy, keratinocyte growth factor (KGF) or photobiomodulation therapy with a focus on efficacy. Three reviews included studies of any design conducted in pediatric patients evaluating these same interventions with a focus on adverse events and feasibility. One review included all RCTs of any intervention for mucositis prevention in pediatric patients. Primary outcome was severe oral mucositis. RESULTS: We included 107 unique studies of cryotherapy (22 RCTs and 4 pediatric studies); KGF (15 RCTs and 12 pediatric studies); photobiomodulation therapy (29 RCTs and 8 pediatric studies)Â and any intervention (31 pediatric RCTs). Effects on severe mucositis reduction from RCTs wereÂ cryotherapy risk ratio (RR) 0.49 and 95% confidence interval (CI) 0.31-0.76; palifermin RR 0.81 and 95% CI 0.69-0.95Â and photobiomodulation therapy RR 0.40 and 95% CI 0.27-0.60. Cryotherapy was not feasible in young children while photobiomodulation therapy was feasible across age groups. Palifermin was associated with adverse effects. CONCLUSIONS: Cryotherapy should be used for older cooperative pediatric patients who will receive short infusions of melphalan or 5-fluorouracil. Intraoral photobiomodulation therapy (620-750Â nm spectrum) should be used in pediatric patients undergoing autologous or allogeneic HSCTÂ and for pediatric head and neck carcinoma patients undergoing radiotherapy. Palifermin should not be used routinely in pediatric cancer or HSCT patients. Adult;Child;Cryotherapy;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Neoplasms;Oropharynx;Practice Guidelines as Topic;Radiotherapy;Stomatitis

Analysis of the psychopathological profile, quality of life, and cost-effectiveness of oral lichen planus patients treated with photobiomodulation. OBJECTIVES: To evaluate the effect of PBM on the

psychological profile and quality of life of patients with oral lichen planus (OLP) in comparison to corticoid and to investigate the cost-effectiveness of both treatments. MATERIALS AND METHODS: Patients were randomized into two groups: Control (clobetasol propionate 0.05%) and Photobiomodulation (660Â nm, 100mW, 177Â J/cm(2), 5Â s, 0.5Â J) twice a week for 30Â days. The Hospital Anxiety and Depression Scale (HADS) and OHIP-14 were used in different treatment time points and at follow-up. The cost-effectiveness was calculated using the improvement in OHIP-14 after treatment. RESULTS: OLP patients showed detected levels of anxiety, depression, and poor quality of life at baseline. No improvement in anxiety and depression was noticed after treatments. However, PBM and corticoid significantly improved the quality of life of OLP patients, considering the OHIP-14-T and the physical pain domain. The treatment with corticoid was more cost-effective than PBM. CONCLUSIONS: Psychological distress was not improved after both treatments and PBM is as effective as corticoids in promoting a better quality of life in OLP patients, despite its higher cost. CLINICAL RELEVANCE: This study highlights the need for additional therapeutic interventions in OLP patients, to early recognize and to manage the alterations in their psychological profile. Moreover, PBM is an effective therapy in OLP patient's quality of live and although it was a more expensive, the advantage of being a minimally invasive therapy associated with no side effects must be considered in clinical practice, especially in those patients with refractory disease. TRIAL REGISTRATION: This study is registered at ClinicalTrials.gov; the registration number is NCT03320460, registered in 17/10/2017. Anxiety;Cost-Benefit Analysis;Humans;Lichen Planus, Oral;Mental Disorders;Quality of Life

Photobiomodulation at a wavelength of 633â€‰nm leads to faster functional recovery than 804â€‰nm after facial nerve injury. We analyzed the effects of photobiomodulation (PBM) of various wavelengths on regeneration of the facial nerve using in vitro and in vivo experimental models. We assessed the antioxidative effect of PBM in geniculate ganglion neurons irradiated with a diode laser at 633â€‰nm, 780â€‰nm and 804â€‰nm. Wavelengths of 633 and 780â€‰nm but not 804â€‰nm inhibited cell death by oxidative stress. We assessed the effects of PBM on functional and morphologic recovery in rats divided into control, facial nerve damage (FND) and FND irradiated with a 633â€‰nm or 804â€‰nm lasers. Injured rats treated with 633-nm light had better facial palsy scores, larger axon diameter and higher expression of Schwann cells compared with the FND group. No positive results were observed in rats irradiated at 804-nm light. These findings indicate that 633-nm PBM promotes accelerated nerve regeneration and improved functional recovery in an injured facial nerve. Animals;Facial Nerve Injuries;Lasers, Semiconductor;Low-Level Light Therapy;Nerve Regeneration;Rats;Recovery of Function

Comparison of photobiomodulation and photodynamic therapy as adjuncts to mechanical debridement for the treatment of peri-implantitis. BACKGROUND AND OBJECTIVE: The aim of this study was to compare the efficacy of photobiomodulation therapy (PBMT) and photodynamic therapy (PDT) as adjuncts to mechanical debridement (MD) for the treatment of peri-implantitis. The present study is based on the null hypothesis that there is no difference in the peri-implant inflammatory parameters (modified plaque index [mPI], modified gingival index [mGI], probing depth [PD]) and crestal bone loss (CBL) following MD either with PBMT or PDT in patients with peri-implantitis. METHODS: Forty-nine patients with peri-implantitis were randomly categorized into three groups. In Groups 1 and 2, patients underwent MD with adjunct PBMT and PDT, respectively. In Group 3, patients underwent MD alone (controls). Peri-implant inflammatory parameters were measured at baseline and 3-months follow-up. P-values < 0.01 were considered statistically significant. RESULTS: At baseline, peri-implant clinicoradiographic parameters were comparable in all groups. Compared with baseline, there was a significant reduction in mPI (P< 0.001), mGI (P< 0.001) and PD (P< 0.001) in Groups 1 and 2 at 3-months follow-up. In Group 3, there was no difference in the

scores of mPI, mGI and PD at follow-up. At 3-months follow-up, there was no difference in mPI, mGI and PD among patients in Groups 1 and 2. The mPI (P< 0.001), mGI (P< 0.001) and PD (P< 0.001) were significantly higher in Group 3 than Groups 1 and 2. The CBL was comparable in all groups at follow-up. CONCLUSION: PBMT and PDT seem to be useful adjuncts to MD for the treatment of peri-implant soft-tissue inflammation among patients with peri-implantitis. Combined Modality Therapy;Debridement;Humans;Low-Level Light Therapy;Peri-Implantitis;Photochemotherapy

LONG-PULSED ND:YAG LASER TO TREAT TELANGIECTASIA OF THE NOSE: A COMPREHENSIVE 5-YEAR SINGLE CENTER STUDY. Telangiectases of the nose are of esthetic concern and treatment is warranted. The study provides the results of 5 years of treatment of telangiectases of the nose region with the long-pulsed Nd:YAG 1,064 nm laser. A retrospective analysis was conducted in patients of Fitzpatrick skin type II-V. Exclusion criteria were patients with a previous history of treatment of the nose region, pregnant or lactating patients or patients with unrealistic expectations regarding the treatment risks, limitations and results. Standardized photographs were obtained before each session and at least 2 months after the last treatment session. A long-pulsed Nd:YAG 1,064 nm laser was used with a spot size of 2.5mm, fluence of 100 - 175 J/cm2, pulse duration of up to 135ms and repetition rate of 2-4 Hz. The follow-up ranged from 2 months to 5 years. The number of laser sessions varied from 1 to 5 monthly. Assessment was made by comparing pre-treatment and post-treatment photographs by two independent specialists and also by the patients' own assessment. All patients presented improvement of the vascular alterations. Evaluation of independent specialists as well as the evaluation of the patients themselves showed a high degree of satisfaction with the treatment. The treatment presented only few transitory side effects. Treatment of telangiectasia on the nose skin with the long-pulsed Nd:YAG 1,064 nm laser demonstrated to be safe and effective even in darker pigmented skin. The major limitation of this study is its retrospective nature. Female;Humans;Lactation;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Retrospective Studies;Telangiectasis;Treatment Outcome

Low-level laser irradiation enhances the proliferation and osteogenic differentiation of PDLSCs via BMP signaling. The aim of this in vitro study was to evaluate the effects of low-level laser therapy (LLLT) at different energy intensities on proliferation and osteogenesis of periodontal ligament stem cells (PDLSCs). We designed one control group, without irradiation and four testing groups, treated with LLLT (Nd:YAG;1064Â nm) at 2, 4, 6, and 8Â J/cm(2) for human PDLSCs. Cell proliferation was measured using colony-forming unit fibroblast assay and 3-(4,5-dimethylthiazol-2yl)-2,5-diphenyltetrazolium bromide assay. Osteogenic capacity of cells was determined by alkaline phosphatase (ALP) staining, ALP activity assay, Alizarin Red S staining, and the gene levels of runt-related transcription factor 2 (Runx2), ALP, osteocalcin, and bone morphogenetic protein 2 (BMP2). The effects of LLLT on secretion of TNF-Î± and IL-1Î² in PDLSCs were measured by enzyme-linked immunosorbent assay. BMP/Smad pathway was measured through the expression of Smad1/5/8 phosphorylation (P-Smad1/5/8). LDN-193189, an inhibitor of the BMP/Smad pathway, was used to explore the underlying effects of BMP/Smad signaling on the process of LLLT regulating the proliferation and osteogenesis of PDLSCs. Our results demonstrated LLLT could promote the proliferation and osteogenesis of PDLSCs at 2-6Â J/cm(2) and LLLT at 8Â J/cm(2) significantly suppress osteogenic differentiation of PDLSCs. Moreover, LLLT stimulated the secretion of TNFÎ± and IL-Î²1. Finally, we found the irradiation positively modulates the P-Smad1/5/8 level. When the cells were treated with LDN-193189, the proliferation and osteogenic effects of LLLT on PDLSCs were attenuated. In conclusion, LLLT may upregulate the proliferation and bone formation ability of PDLSCs via the BMP/Smad signaling. Cell Differentiation;Cell Proliferation;Cells, Cultured;Humans;Lasers;Osteogenesis;Periodontal Ligament;Stem Cells

The effect of low-level laser therapy on the success rate of inferior alveolar nerve blocks in mandibular molars with symptomatic irreversible pulpitis: A randomized clinical trial. AIM: To evaluate the effect of low-level laser therapy (LLLT) on the success rate of inferior alveolar nerve blocks (IANB) in mandibular molar teeth with symptomatic irreversible pulpitis (SIP). METHODOLOGY: Eighty-eight patients who were diagnosed with SIP were randomly divided into two groups: the group in which only IANB was applied and the group in which IANBÂ +Â LLLT was applied. IANB was applied to patients in the control group with 4% articaine. LLLT was applied to the patients in the experimental group in addition to IANB. The pain experienced during the operation was evaluated using a visual analog scale. If the patients reported moderate or severe pain during the treatment, the IANB was defined as unsuccessful. Pearson's chi-square test was used to analyse anaesthetic success rates. RESULTS: Whilst the anaesthesia success rate was 34% in the group where only IANB was applied, it was 57% in the group in which LLLT was applied in addition to IANB. There was a significant difference between the groups (pÂ =Â .032). CONCLUSIONS: The application of LLLT to support IANB in mandibular molar teeth with SIP increased the success of anaesthesia. However, it was insufficient for a complete pulpal anaesthesia. Anesthetics, Local;Lidocaine Anesthesia, Dental;Anesthetics, Local;Double-Blind Method;Humans;Lidocaine;Low-Level Light Therapy;Mandibular Nerve;Molar;Nerve Block;Pulpitis

Does the use of low-level light therapy postoperatively reduce pain, oedema, and neurosensory disorders following orthognathic surgery? A systematic review. The aim of this study was to evaluate the efficacy of low-level light therapy (LLLT) in improving pain, oedema, and neurosensory disorders of the inferior alveolar nerve (IAN) after orthognathic surgery. This systematic review was performed in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines. Searches were conducted in the PubMed, Embase, and Web of Science databases for randomized clinical trials (RCTs) published up to September 2020. After evaluating eligibility, 15 RCTs were selected. None of the studies reported an evaluation of all of the outcomes within the same publication. It was possible to determine the effect of LLLT in controlling pain following orthognathic surgery. Of the three studies evaluating this outcome, all observed a positive effect. Of the four studies that evaluated oedema, two found a positive effect. Of the 11 studies that evaluated neurosensory disorders of the IAN, all of them observed a positive effect, at least in one of the sensory evaluation tests. A meta-analysis was not possible due to the heterogeneity across studies. Considering the limitations of this review, but given the fact that LLLT is a minimally invasive intervention, its use merits consideration in immediate postoperative orthognathic surgery. Edema;Humans;Low-Level Light Therapy;Orthognathic Surgery;Pain;Pain Management

Intense Pulsed Plus Low-Level Light Therapy in Meibomian Gland Dysfunction. PURPOSE: To analyse the clinical outcome in patients with meibomian gland dysfunction (MGD) who underwent intense pulsed light (IPL) plus low-level light therapy (LLL). MATERIALS AND METHODS: The prospective non-comparative study included identified by MGD patients with altered interferometry and lower loss area of the meibomian glands (LAMG), who underwent IPL plus LLL, between July 2020 and August 2020. A multimodal assessment was performed before, 2-3 weeks, and 6 months after treatment. The main outcome was lipid layer thickness (LLT) and the secondary outcomes were the ocular surface disease index (OSDI) score, presence of corneal fluorescein staining (CFS), blink rate (BR), Schirmer test (ST), tear meniscus height (TMH), tear osmolarity (OSM), non-invasive break-up time (NIBUT) and LAMG. RESULTS: This study included 62 eyes of 31 patients, 61.3% female, with a mean age of 66.94Â±9.08 years at the time of IPL plus LLL treatment. LLT (<0.001) grades improved 6 months after treatment. The mean OSDI score improved (p<0.001) from 45.02Â±21.17 (severe symptoms) to 22.35Â±17.68 (moderate symptoms) at 2-3 weeks and 8.24Â±17.9.91 (normal) at 6 months after treatment. CFS was identified in 51.6% (32/62) before and in 45.2% (28/62) 6 months

(p=0.293) after treatment. ST (p=0.014) grades improved; OSM grades mild worsened (p<0.001); TMH, NIBUT and LAMG grades did not modify 6 months after treatment. No patient suffered any adverse effects. CONCLUSION: IPL combined with LLL was effective and safe, improving the lipid layer thickness in MGD and decreasing the level of symptoms.

Influence of photobiomodulation and vitamin D on osteoblastic differentiation of human periodontal ligament stem cells and bone-like tissue formation through enzymatic activity and gene expression. BACKGROUND: (1)Human periodontal ligament stem cells (HPDLSCs) are a unique population of mesenchymal stem cells (MSCs). Recently, the positive effects of photobiomodulation on the regulation of MSCs proliferation and osteogenic differentiation have gained significant attention. This study aimed to assess the effects of photobiomodulation and vitamin D (as an anabolic factor) on HPDLSCs for bone regeneration. METHODS: (2)HPDLSCs were collected, isolated, and characterized and then divided into six groups: groups I and II, control and (10(-7) Mol) vitamin D, respectively; group III, irradiation at 1 J/cm(2) of 808-nm diode laser; group IV, irradiation at 1 J/cm(2) and culture with vitamin D; group V, irradiation at 2 J/cm(2), and group VI, irradiation at 2 J/cm(2) and culture with vitamin D. Cell viability assay was measured through MTT assay and cell growth curve. Alkaline phosphatase (ALP) enzyme activity and mRNA levels of RUNX2, collagen 1 (Col-1), ALP, and osteonectin were also assessed. RESULTS: (3)Photobiomodulation at 1 and 2 J/cm(2) combined with vitamin D significantly promoted HPDLSC proliferation (in MTT assay and cell growth curve results) and osteogenic differentiation (through the gene expression of RUNX2, Col-1, ALP, and osteonectin levels ($p < 0.05$). CONCLUSION: (4)Laser irradiation at 2 J/cm(2) combined with vitamin D3 enhanced osteoblast differentiation and proliferation of cultured HPDLSCs and thus could further substitute bone grafting. Calcium-Binding Proteins;Cell Adhesion Molecules;Core Binding Factor Alpha 1 Subunit;NID2 protein, human;Peptide Fragments;RUNX2 protein, human;Vitamin D;Alkaline Phosphatase;Col-1 peptide, human;Matrix Metalloproteinase 2 Alkaline Phosphatase;Bone Regeneration;Calcium-Binding Proteins;Cell Adhesion Molecules;Cell Differentiation;Cells, Cultured;Core Binding Factor Alpha 1 Subunit;Gene Expression Profiling;Humans;Lasers;Matrix Metalloproteinase 2;Osteogenesis;Peptide Fragments;Periodontal Ligament;Stem Cells;Vitamin D

Integrated Treatment of Breast Cancer-related Lymphedema: A Descriptive Review of the State of the Art. BACKGROUND/AIM: Upper limb breast cancer-related lymphedema (BCRL) is a chronic and severe condition affecting a significant percentage of breast cancer survivors. Even though its physiopathology is well-known, there is no worldwide consensus on BCRL evaluation and a gold-standard treatment. This narrative review aims at providing a brief descriptive overview with regard to BCRL treatment modalities. MATERIALS AND METHODS: We conducted a literature search within the PubMed database, and 33 articles out of 56 were selected, including reviews, systematic reviews, and meta-analyses aiming find the most updated evidence regarding BCRL treatment modalities. RESULTS: Physical exercise (aerobic exercise, resistance exercise, aquatic therapy), bandages, and intermittent pneumatic compression were shown to be most effective in BCRL patients, in terms of swelling reduction in the acute-intensive phase. Furthermore, physical exercise was beneficial also as a maintenance tool. Manual lymphatic drainage demonstrated efficacy in preventing secondary lymphedema if applied immediately after breast cancer surgery or in early phases of BCRL or as a maintenance tool. Complementary procedures such as acupuncture, reflexology, yoga and photo-biomodulation therapy did not show conclusive results in BCRL treatment. Surgery was shown effective in managing symptoms (liposuction), preventing (lymphaticovenular anastomosis) and treating BCRL (vascularized lymph node transfer). CONCLUSION: BCRL is still a challenging condition either for breast cancer survivors and clinicians, deeply impacting patient functioning and quality of life. Due to the lack of globally accepted criteria in evaluating BCRL, to date a gold standard treatment

for this widespread issue is still needed. Breast Cancer Lymphedema;Breast Neoplasms;Complementary Therapies;Exercise;Female;Humans;Survivors

Low-level laser therapy for oral mucositis in children with cancer. OBJECTIVE: To assess the efficacy of oral low-level laser therapy (LLLT) - also known as photobiomodulation - in the reduction of oral mucositis experienced by children and young people with cancer undergoing chemotherapy. DESIGN: A systematic review to evaluate the efficacy of oral LLLT for oral mucositis in children with cancer and the safety of oral LLLT in any age with cancer (International Prospective Register of Systematic Reviews/PROSPERO registration: CRD42018099772). Multiple databases and grey literature were screened. Randomised controlled trials were considered for assessing efficacy, and all studies were considered for assessing safety. Primary outcomes included severity of oral mucositis, oral pain and adverse events. Where results were compatible, meta-analysis was performed using a random-effects model. A narrative synthesis considered other outcome measures. RESULTS: 14 studies (n>416 children) were included in the narrative synthesis of LLLT efficacy. 5 studies (n=380 children and young people) were included in the meta-analyses. Results demonstrate that LLLT may reduce the severity of oral mucositis and the level of oral pain, but further randomised controlled trials are needed to confirm or deny this. There is vast variation in different trial protocols. Insufficient blinding between LLLT or sham therapy/control led to a strong risk of performance bias. 75 studies (encompassing 2712 patients of all ages who had undergone LLLT) demonstrated minor and infrequent adverse reactions, but most studies had significant areas of weakness in quality. CONCLUSION: LLLT appears to be a safe therapy, but further evidence is needed to assess its efficacy as a prevention or treatment tool for oral mucositis in children with cancer. Antineoplastic Agents Antineoplastic Agents;Child;Humans;Low-Level Light Therapy;Neoplasms;Stomatitis;Treatment Outcome

Transcranial Near Infrared Light Stimulations Improve Cognition in Patients with Dementia. Dementia is a complex syndrome with various presentations depending on the underlying pathologies. Low emission of transcranial near-infrared (tNIR) light can reach human brain parenchyma and be beneficial to a number of neurological and neurodegenerative disorders. We hereby examined the safety and potential therapeutic benefits of tNIR light stimulations in the treatment of dementia. Patients of mild to moderate dementia were randomized into active and sham treatment groups at 2:1 ratio. Active treatment consisted of low power tNIR light stimulations with an active photobiomodulation for 6 min twice daily during 8 consequent weeks. Sham treatment consisted of same treatment routine with a sham device. Neuropsychological battery was obtained before and after treatment. Analysis of variance (ANOVA) was used to analyze outcomes. Sixty subjects were enrolled. Fifty-seven subjects completed the study and had not reported health or adverse side effects during or after the treatment. Three subjects dropped out from trial for health issues unrelated to use of tNIR light treatment. Treatment with active device resulted in improvements of cognitive functions and changes were: an average increase of MMSE by 4.8 points; Logical Memory Tests I and II by ~3.0 points; Trail Making Tests A and B by ~24%; Boston Naming Test by ~9%; improvement of both Auditory Verbal Learning Tests in all subtest categories and overall time of performance. Many patients reported improved sleep after ~7 days of treatment. Caregivers noted that patients had less anxiety, improved mood, energy, and positive daily routine after ~14-21 days of treatment. The tNIR light treatments demonstrated safety and positive cognitive improvements in patients with dementia. Developed treatment protocol can be conveniently used at home. This study suggests that additional dementia treatment trials are warranted with a focus on mitigating caregivers' burden with tNIR light treatment of dementia patients.

Combined Low-Level Light Therapy and Intense Pulsed Light Therapy for the Treatment of Dry Eye in Patients with SjÃ¶gren's Syndrome. PURPOSE: To evaluate the effects of combined intense

pulsed light therapy (IPL) and low-level light therapy (LLLT) in dry eye disease (DED) in patients affected by SjÃ¶gren's syndrome. Patients and Methods. This is a monocentric, prospective, interventional study. At baseline, all the study patients (nâ€‰=â€‰20) were on tear substitute therapy and underwent Schirmer type-1 test and breakup time (BUT) test. After baseline measurements, tear substitute therapy was suspended, and patients underwent IPL and LLLT. The same investigations were carried out at one (T1) and at three (T3) months after treatment. The Ocular Surface Disease Index (OSDI) survey was used to measure the severity of DED. RESULTS: BUT test showed an increase in tear film breakup time in patients with DED 1 month after the beginning of the treatment (T0 vs T1: p=0,01). This increase was even more statistically significant after 3 months of the IPL and LLLT treatment (T0 vs T3: $p < 0.0001$). Schirmer test values increased too, but there was not statistically significance between values at T0 and T1 or T3. The patients perceived an improvement in their condition, which resulted in a lower score on the OSDI survey. The OSDI score was lower at T1 than T0 (T0 vs T1: p=0.0003), while it tended to increase again after 3 months although it was still lower than baseline (T0 vs T3: p=0.02). No facial or ocular side effects were reported. CONCLUSIONS: The use of combined IPL/LLLT for the treatment of DED in patients affected by SjÃ¶gren's syndrome appears to be beneficial.

Photobiomodulation Therapy Attenuates Anxious-Depressive-Like Behavior in the TgF344 Rat Model. BACKGROUND: Anxious-depressive-like behavior has been recognized as an early endophenotype in Alzheimer's disease (AD). Recent studies support early treatment of anxious-depressive-like behavior as a potential target to alleviate memory loss and reduce the risk of developing dementia. We hypothesize that photobiomodulation (PBM) could be an effective method to alleviate depression and anxiety at the early stage of AD pathogenesis. OBJECTIVE: To analyze the effect of PBM treatment on anxious-depressive-like behavior at the early stage of AD. METHODS: Using a novel transgenic AD rat model, animals were divided into wild-type, AD+sham PBM, and AD+PBM groups. Two-minute daily PBM (irradiance: 25 mW/cm2 and fluence: 3 J/cm2 at the cortical level) was applied transcranially to the brain of AD animals from 2 months of age to 10 months of age. After completing PBM treatment at 10 months of age, behavioral tests were performed to measure learning, memory, and anxious-depressive-like behavior. Neuronal apoptosis, neuronal degeneration, neuronal damage, mitochondrial function, neuroinflammation, and oxidative stress were measured to test the effects of PBM on AD animals. RESULTS: Behavioral tests showed that: 1) no spatial memory deficits were detected in TgF344 rats at 10 months of age; 2) PBM alleviated anxious-depressive-like behavior in TgF344 rats; 3) PBM attenuated neuronal damage, degeneration, and apoptosis; and 4) PBM suppresses neuroinflammation and oxidative stress. CONCLUSION: Our findings support our hypothesis that PBM could be an effective method to alleviate depression and anxiety during the early stage of AD development. The mechanism underlying these beneficial effects may be due to the improvement of mitochondria function and integrity and the inhibition of neuroinflammation and oxidative stress. Alzheimer Disease;Animals;Anxiety;Apoptosis;Depression;Disease Models, Animal;Humans;Low-Level Light Therapy;Male;Maze Learning;Mitochondria;Neurons;Oxidative Stress;Rats;Rats, Transgenic

Use of low-level laser therapy to reduce postoperative pain, edema, and trismus following third molar surgery: A systematic review and meta-analysis. This Systematic Review and Meta-analysis was conducted with the following PICOS question: patients undergoing third molar surgery (P) can benefit from low-intensity laser therapy (I) as compared to other postoperative management (C) to reduce pain, edema, and trismus (O), evaluated in previous randomized clinical trials (S). Databases used were PubMed, SCOPUS, Web of Science, and Biblioteca Virtual em SaÃºde, screening for studies published between 2015 and 2020. The meta-analysis was based on the standardized mean difference (SMD), under a 95% confidence interval (CI). 246 studies were initially included, and after

the screening of data, 10 studies were selected for the final sample. The qualitative analysis resulted in favorable results for pain and edema management in most studies, whereas trismus remained controversial. Meta-analysis resulted in (SMD,Â -0.53; 95% CI,Â -0.82,-0.24), (SMD,Â -0.60; 95% CI,Â -0.81,-0.39), and (SMD,Â -0.62; 95% CI,Â -2.63, 1.39) for pain, edema, and trismus, respectively, indicating statistical success on pain and edema reduction, but not for trismus. LLLT can act on reducing postoperative pain and edema following third molar surgery, whereas, trismus remains not significantly changed. Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Trismus

The impact of photobiomodulation on the chondrogenic potential of adipose-derived stromal/stem cells. Due to their capacity to differentiate into the chondrogenic lineage, adipose-derived stromal/stem cells (ASC) are a promising source of therapeutically relevant cells for cartilage tissue regeneration. Their differentiation potential, however, varies between patients. In our study, we aim to stimulate ASC towards a more reliable chondrogenic phenotype using photobiomodulation (PBM). LED devices of either blue (475Â nm), green (516Â nm) or red (635Â nm) light were used to treat human ASC from donors of varying chondrogenic potential. The treatment was applied either once during the 2D expansion phase or repeatedly during the 3D differentiation phase. Chondrogenic differentiation was assessed via pellet size, GAG/DNA content, histology and gene expression analysis. Reactions to PBM were found to be wavelength-dependent and more pronounced when the treatment was applied during expansion. Donors were assigned to responder categories according to their response to the treatment during expansion, whereby good responders were mainly donors with low intrinsic chondrogenic potential. Exposed to light, they revealed a particularly high relative increase in pellet size (more than twice the size of untreated controls after red light PBM), intense collagen type II immunostaining (low/absent in untreated controls) and activation of otherwise absent COL2A1 expression. Conversely, on a donor with high intrinsic chondrogenic potential, light had adverse effects. When applied with shorter wavelengths (blue, green), it led to reduced pellet size, GAG/DNA content and collagen type II immunostaining. However, when PBM was applied in 3D, the same donor was the only one to react with increased differentiation to all three wavelengths. We were able to demonstrate that PBM can be used to enhance or hamper chondrogenesis of ASC, and that success depends on treatment parameters and intrinsic cellular potential. The improvement of chondrogenesis in donors with low intrinsic potential highlights PBM as potent tool for cell-based cartilage regeneration. Its cost-effectiveness and ease of use make for an attractive treatment option to enhance the performance of ASC in cartilage tissue engineering. COL2A1 protein, human;Collagen Type II;Interleukin-1beta Adipose Tissue;Cell Culture Techniques;Cell Differentiation;Cells, Cultured;Chondrogenesis;Collagen Type II;Down-Regulation;Humans;Interleukin-1beta;Light;Mesenchymal Stem Cells;Up-Regulation

Improvements in clinical signs of Parkinson's disease using photobiomodulation: a prospective proof-of-concept study. BACKGROUND: Parkinson's disease (PD) is a progressive neurodegenerative disease with no cure and few treatment options. Its incidence is increasing due to aging populations, longer disease duration and potentially as a COVID-19 sequela. Photobiomodulation (PBM) has been successfully used in animal models to reduce the signs of PD and to protect dopaminergic neurons. OBJECTIVE: To assess the effectiveness of PBM to mitigate clinical signs of PD in a prospective proof-of-concept study, using a combination of transcranial and remote treatment, in order to inform on best practice for a larger randomized placebo-controlled trial (RCT). METHODS: Twelve participants with idiopathic PD were recruited. Six were randomly chosen to begin 12â€‰weeks of transcranial, intranasal, neck and abdominal PBM. The remaining 6 were waitlisted for 14â€‰weeks before commencing the sameÂ treatment. After the 12-week treatment period, all participants were supplied with PBM devices to continue home treatment. Participants were assessed for mobility, fine

motor skills, balance and cognition before treatment began, after 4â€‰weeks of treatment, after 12â€‰weeks of treatment and the end of the home treatment period. A Wilcoxon Signed Ranks test was used to assess treatment effectiveness at a significance level of 5%. RESULTS: Measures of mobility, cognition, dynamic balance and fine motor skill were significantly improved (pâ€‰<â€‰0.05) with PBM treatment for 12â€‰weeks and up to one year. Many individual improvements were above the minimal clinically important difference, the threshold judged to be meaningful for participants. Individual improvements varied but many continued for up to one year with sustained home treatment. There was a demonstrable Hawthorne Effect that was below the treatment effect. No side effects of the treatment were observed. CONCLUSIONS: PBM was shown to be a safe and potentially effective treatment for a range of clinical signs and symptoms of PD. Improvements were maintained for as long as treatment continued, for up to one year in a neurodegenerative disease where decline is typically expected. Home treatment of PD by the person themselves or with the help of a carer might be an effective therapy option. The results of this study indicate that a large RCT is warranted. TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry, registration number: ACTRN12618000038291p , registered on 12/01/2018.
COVID-19;Humans;Low-Level Light Therapy;Parkinson Disease;Prospective Studies;SARS-CoV-2

Evaluation of diode laser versus topical corticosteroid in management of Behcet's disease-associated oral ulcers: a randomized clinical trial. OBJECTIVES: The current trial was conducted to assess the effect of diode laser therapy compared to topical corticosteroid in management of oral ulcers of BD. MATERIALS AND METHODS: Fifty patients were divided randomly into two parallel groups. The first group received 980Â nm diode laser; the second group received topical corticosteroid (0.1% triamcinolone acetonide). The outcome measures included oral ulcer activity index (composite index), pain (VAS), number of oral ulcers, healing time, and oral health-related quality of life (OHIP-14). The collected data were analyzed for any statistical significance. RESULTS: A statistically significant difference was detected between laser and corticosteroid groups favoring laser on comparing composite index and VAS scores on the first and third days and on comparing number of ulcers on the third and fifth days. A statistically significant difference was detected between laser and corticosteroid groups on comparing scores of the questions assessing discomfort with eating food, irritability with other people, taste worsening, unsatisfactory diet, and painful aching on the first and/or third days. No adverse effects were reported by participants of both groups. CONCLUSIONS: Diode laser is efficient safe treatment modality for management of BD-associated oral ulcers. Diode laser was more efficient than triamcinolone acetonide in controlling pain and reducing oral ulcer activity. CLINICAL RELEVANCE: Laser therapy is efficient safe modality that could spare BD patient from adding a new medication to their long list, being just one visit compared to other regular daily regimen medications. TRIAL REGISTRATION: ClinicalTrials.gov registration number: NCT03771768.
Adrenal Cortex Hormones Adrenal Cortex Hormones;Behcet Syndrome;Humans;Lasers, Semiconductor;Oral Ulcer;Quality of Life;Stomatitis, Aphthous

The Search for Natural and Synthetic Inhibitors That Would Complement Antivenoms as Therapeutics for Snakebite Envenoming. A global strategy, under the coordination of the World Health Organization, is being unfolded to reduce the impact of snakebite envenoming. One of the pillars of this strategy is to ensure safe and effective treatments. The mainstay in the therapy of snakebite envenoming is the administration of animal-derived antivenoms. In addition, new therapeutic options are being explored, including recombinant antibodies and natural and synthetic toxin inhibitors. In this review, snake venom toxins are classified in terms of their abundance and toxicity, and priority actions are being proposed in the search for snake venom metalloproteinase (SVMP), phospholipase A(2) (PLA(2)), three-finger toxin (3FTx), and serine proteinase (SVSP) inhibitors. Natural inhibitors include compounds isolated from plants, animal sera, and mast cells, whereas synthetic inhibitors

comprise a wide range of molecules of a variable chemical nature. Some of the most promising inhibitors, especially SVMP and PLA(2) inhibitors, have been developed for other diseases and are being repurposed for snakebite envenoming. In addition, the search for drugs aimed at controlling endogenous processes generated in the course of envenoming is being pursued. The present review summarizes some of the most promising developments in this field and discusses issues that need to be considered for the effective translation of this knowledge to improve therapies for tackling snakebite envenoming. Antivenins;Snake Venoms Animals;Antivenins;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Research Design;Snake Bites;Snake Venoms

Photobiomodulation Therapy as a Possible New Approach in COVID-19: A Systematic Review.
COVID-19 is a viral disease characterized as a pandemic by the World Health Organization in March 2020. Since then, researchers from all over the world have been looking for ways to fight this disease. Many cases of complications arise from insufficient immune responses due to low immunity, with intense release of pro-inflammatory cytokines that can damage the structure of organs such as the lung. Thus, the hypothesis arises that photobiomodulation therapy (PBMT) with the use of a low-level laser (LLLT) may be an ally approach to patients with COVID-19 since it is effective for increasing immunity, helping tissue repair, and reducing pro-inflammatory cytokines. This systematic review was performed with the use of PubMed/MEDLINE, Web of Science, Scopus and Google Scholar databases with the following keywords: "low-level laser therapy OR photobiomodulation therapy AND COVID-19". The inclusion criteria were complete articles published from January 2020 to January 2021 in English. The exclusion criteria were other languages, editorials, reviews, brief communications, letters to the editor, comments, conference abstracts, and articles that did not provide the full text. The bibliographic search found 18 articles in the Pubmed/MEDLINE database, 118 articles on the Web of Science, 23 articles on Scopus, and 853 articles on Google Scholar. Ten articles were included for qualitative synthesis, of which four commentary articles discussed the pathogenesis and the effect of PBMT in COVID-19. Two in vitro and lab experiments showed the effect of PBMT on prevention of thrombosis and positive results in wound healing during viral infection, using the intravascular irradiation (ILIB) associated with Phthalomethyl D. Two case reports showed PBMT improved the respiratory indexes, radiological findings, and inflammatory markers in severe COVID-19 patients. One case series reported the clinical improvement after PBMT on 14 acute COVID-19 patients, rehabilitation on 24 patients, and as a preventive treatment on 70 people. One clinical trial of 30 patients with severe COVID-19 who require invasive mechanical ventilation, showed PBMT-static magnetic field was not statistically different from placebo for the length of stay in the Intensive Care Unit, but improved diaphragm muscle function and ventilation and decreased the inflammatory markers. This review suggests that PBMT may have a positive role in treatment of COVID-19. Still, the necessity for more clinical trials remains in this field and there is not sufficient research evidence regarding the effects of PBMT and COVID-19 disease, and there is a large gap.

Photobiomodulation with Red and Near-Infrared Light Improves Viability and Modulates Expression of Mesenchymal and Apoptotic-Related Markers in Human Gingival Fibroblasts.
Photobiomodulation (PBM), also called low-level laser treatment (LLLT), has been considered a promising tool in periodontal treatment due to its anti-inflammatory and wound healing properties. However, photobiomodulation's effectiveness depends on a combination of parameters, such as energy density, the duration and frequency of the irradiation sessions, and wavelength, which has been shown to play a key role in laser-tissue interaction. The objective of the study was to compare the in vitro effects of two different wavelengths-635 nm and 808 nm-on the human primary gingival fibroblasts in terms of viability, oxidative stress, inflammation markers, and specific gene expression during the four treatment sessions at power and energy density widely used in dental practice (100 mW, 4 J/cm(2)). PBM with both 635 and 808 nm at 4 J/cm(2) increased the cell number, modulated

extracellular oxidative stress and inflammation markers and decreased the susceptibility of human primary gingival fibroblasts to apoptosis through the downregulation of apoptotic-related genes (P53, CASP9, BAX). Moreover, modulation of mesenchymal markers expression (CD90, CD105) can reflect the possible changes in the differentiation status of irradiated fibroblasts. The most pronounced results were observed following the third irradiation session. They should be considered for the possible optimization of existing low-level laser irradiation protocols used in periodontal therapies.

Sinking Our Teeth in Getting Dental Stem Cells to Clinics for Bone Regeneration. Dental stem cells have been isolated from the medical waste of various dental tissues. They have been characterized by numerous markers, which are evaluated herein and differentiated into multiple cell types. They can also be used to generate cell lines and iPSCs for long-term in vitro research. Methods for utilizing these stem cells including cellular systems such as organoids or cell sheets, cell-free systems such as exosomes, and scaffold-based approaches with and without drug release concepts are reported in this review and presented with new pictures for clarification. These in vitro applications can be deployed in disease modeling and subsequent pharmaceutical research and also pave the way for tissue regeneration. The main focus herein is on the potential of dental stem cells for hard tissue regeneration, especially bone, by evaluating their potential for osteogenesis and angiogenesis, and the regulation of these two processes by growth factors and environmental stimulators. Current in vitro and in vivo publications show numerous benefits of using dental stem cells for research purposes and hard tissue regeneration. However, only a few clinical trials currently exist. The goal of this review is to pinpoint this imbalance and encourage scientists to pick up this research and proceed one step further to translation. Biomarkers Animals;Biomarkers;Bone Regeneration;Humans;Organoids;Osteogenesis;Stem Cells;Tooth

Role of Photobiomodulation Therapy in Modulating Oxidative Stress in Temporomandibular Disorders. A Systematic Review and Meta-Analysis of Human Randomised Controlled Trials. This systematic review and meta-analysis (PROSPERO registration; ref CRD 42020198921) aimed to govern photobiomodulation therapy (PBMT) efficacy in temporomandibular disorder (TMD). PRISMA guidelines and Cochrane Collaboration recommendations were followed. Differences in pain reduction assessment by qualitative measurement with visual analogue scale pain (VAS), pressure threshold (PPT) and maximum mouth opening (MMO) were calculated with 95% confidence intervals and pooled in a random effects model with a subgroup analysis, evaluating the role of follow-up duration. Heterogeneity was analysed using Q and I(2) tests. Publication bias was assessed by visual examination of funnel plot symmetry. Qualitative analysis revealed 46% of the 44 included studies showed a high risk of bias. Meta-analysis on 32 out of 44 studies revealed statistically significant intergroup differences (SSID) for VAS (SMD = -0.55; 95% CI = -0.82 to -0.27; Z = 3.90 ($p < 0.001$)), PPT (SMD = -0.45; 95% CI = -0.89 to 0.00; Z = 1.97 ($p = 0.05$)) and MMO (SMD = -0.45; 95% CI = -0.89 to 0.00; Z = 1.97 ($p = 0.05$)), favouring PBMT compared to control treatment strategies. Sensitivity analysis revealed SSID (SMD = -0.53; 95% CI = -0.73 to -0.32; Z = 5.02 ($p < 0.0001$)) with low heterogeneity (Î¤(2) = 0.02; Ï‡(2) = 16.03 ($p = 0.31$); I(2) = 13%). Hence, this review, for first time, proposed suggested recommendations for PBMT protocols and methodology for future extensive TMD research.

Meibomian Gland Dysfunction: Intense Pulsed Light Therapy in Combination with Low-Level Light Therapy as Rescue Treatment. Background and Objectives: Evaporative dry eye disease is frequently associated with meibomian gland dysfunction. Patients are often unhappy because of daily drops, care burden, and suboptimal conventional treatments. In this study, we assessed the efficacy of a novel device, the Eye-light(Â®), a combination of intense pulsed light therapy and low-level light therapy, as a novel treatment for meibomian gland dysfunction and dry eye disease. Materials and Methods: This was a retrospective, single-center study carried out over a 6-week period, in which 22

eyes from 11 patients were included. Each patient received four combined light therapy treatment sessions, once weekly over 4 weeks. Patients underwent a clinical examination and filled out a standardized questionnaire to evaluate symptoms one week prior to treatment, and one week after the fourth session. Results: Combined light therapy improved several ocular surface outcome measures in our patients. This study demonstrates that this adjunctive treatment significantly improves the ocular surface and quality of life of patients with dry eye disease and meibomian gland dysfunction. Conclusions: Combined light therapy may be included in meibomian gland dysfunction treatment protocols as an adjunctive rescue treatment. Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Meibomian Gland Dysfunction;Meibomian Glands;Quality of Life;Retrospective Studies;Tears

Two dimensional automatic active shape model of degenerative disc repaired by low-intensity laser. OBJECTIVE: Intervertebral disc degeneration is the main factor causing low back pain, and the related long-term treatment can improve the situation of degeneration. This study aimed to investigate the effect of low-intensity laser irradiation on the repair of degenerative intervertebral disc by two dimensional automatic active shape model (2D-AASM). METHODS: Nine Bama miniature pigs were randomly divided into three groups: control group (Con), model group (Mod) and laser treatment group (Las). After one month, the discs were treated with low-energy laser for another month. MRI was performed for one month, and the statistical shape model and 2D-AASM of intervertebral disc were established based on the minimum description length method. RESULTS: The model established by the proposed method is more accurate and the segmentation result is more accurate. From the segmented T2-weighted image, the signal intensity of the Mod group decreased significantly, and the signal intensity in the Las group was moderate and high compared with the Mod group. The HE staining display the structure of Con group was damaged, and the construction of Las group was restored compared with Mod group. CONCLUSIONS: The 2D-AASM method effectively improves the accuracy of intervertebral disc segmentation. The low-intensity laser has a protective effect on the repair of the degenerative intervertebral disc. Animals;Intervertebral Disc;Intervertebral Disc Degeneration;Lasers;Magnetic Resonance Imaging;Swine

The addition of topical calcipotriol to phototherapy enhance the efficacy of treatment in patients with vitiligo: A systematic review and meta-analysis. BACKGROUND: Treatment of vitiligo has several challenges. Phototherapy and topical calcipotriol have been reported to be effective in combination with other therapies, but there is no consensus on the combination use. OBJECTIVE: To perform a systematic review and meta-analysis that elucidates the efficacy of the combination of phototherapy and topical calcipotriol. METHODS: This systematic review was performed by searching PubMed, EMBASE, Web of Science, Cochrane Library databases, Chinese National Knowledge Infrastructure (CNKI), WanFang and VIP databases for relevant publications till February 28, 2021. Relative risk (RR) and its 95% confidence interval (CI) were used to evaluate the data. Bias assessment, heterogeneity and sensitivity analysis were conducted in this meta-analysis. RESULTS: After screening, nine studies with 700 participants were included. The meta-analysis indicated that the combination of phototherapy and topical calcipotriol showed significantly higher effective rate (RR 1.11, 95% CI 1.02-1.22;Â pÂ <Â 0.05) and apparent effective rate (RR 1.35, 95% CI 1.15-1.59;Â pÂ < 0.01) than phototherapy monotherapy in the treatment of vitiligo. In addition, the side effects were minor, transient and tolerable. CONCLUSIONS: This meta-analysis provides evidence supporting phototherapy combined with topical calcipotriol as a valuable treatment modality for patients with vitiligo, which has better efficacy than monotherapy. Dermatologic Agents;calcipotriene;Calcitriol Administration, Cutaneous;Calcitriol;Combined Modality Therapy;Dermatologic Agents;Humans;Lasers, Excimer;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Severity of Illness Index;Skin Pigmentation;Treatment Outcome;Vitiligo

Cross-modality imaging of bisphosphonate-treated murine jawbones. In this proof-of-principle study, we established and implemented a cross-modality imaging (CMI) pipeline to characterize and compare bisphosphonate (BIS)-treated jawbones of Sprague-Dawley rats after tooth extraction after physical therapies (photobiomodulation and extracorporeal shockwave therapy (PBMT and ESWT)). We showcase the feasibility of such a CMI approach and its compatibility across imaging modalities to probe the same region of interest (ROI) of the same jawbone. Jawbones were imaged in toto in 3D using micro-Computed Tomography to identify ROIs for subsequent sequential 2D analysis using well-established technologies such as Atomic Force Microscopy and Scanning Electron Microscopy, and recent imaging approaches in biomedical settings, such as micro-X-Ray Fluorescence Spectroscopy. By combining these four modalities, multiscale information on the morphology, topography, mechanical stiffness (Young's modulus), and calcium, zinc and phosphorus concentrations of the bone was collected. Based on the CMI pipeline, we characterized and compared the jawbones of a previously published clinically relevant rat model of BIS-related osteonecrosis of the jawbone (BRONJ) before and after treatment with BISs, PBMT and ESWT. While we did not find that physical therapies altered the mechanical and elemental jawbone parameters with significance (probably due to the small sample size of only up to 5 samples per group), both ESWT and PBMT reduced pore thicknesses and bone-to-enamel distances significantly compared to the controls. Although focused on BIS-treated jawbones, the established CMI platform can be beneficial in the study of bone-related diseases in general (such as osteoarthritis or -porosis) to acquire complementary hallmarks and better characterize disease status and alleviation potentials. Diphosphonates Animals;Diphosphonates;Extracorporeal Shockwave Therapy;Mice;Osteoarthritis;Rats;Rats, Sprague-Dawley;X-Ray Microtomography

Effects of photobiomodulation on different application points and different phases of complex regional pain syndrome type I in the experimental model. BACKGROUND: Complex regional pain syndrome type I (CRPS-I) consists of disorders caused by spontaneous pain or induced by some stimulus. The objective was to verify the effects of photobiomodulation (PBM) using 830 nm wavelength light at the affected paw and involved spinal cord segments during the warm or acute phase. METHODS: Fifty-six mice were randomized into seven groups. Group (G) 1 was the placebo group; G2 and G3 were treated with PBM on the paw in the warm and acute phase, respectively; G4 and G5 treated with PBM on involved spinal cord segments in the warm and acute phase, respectively; G6 and G7 treated with PBM on paw and involved spinal cord segments in the warm and acute phase, respectively. Edema degree, thermal and mechanical hyperalgesia, skin temperature, and functional quality of gait (Sciatic Static Index [SSI] and Sciatic Functional Index [SFI]) were evaluated. RESULTS: Edema was lower in G3 and G7, and these were the only groups to return to baseline values at the end of treatment. For thermal hyperalgesia only G3 and G5 returned to baseline values. Regarding mechanical hyperalgesia, the groups did not show significant differences. Thermography showed increased temperature in all groups on the seventh day. In SSI and SFI assessment, G3 and G7 showed lower values when compared to G1, respectively. CONCLUSIONS: PBM irradiation in the acute phase and in the affected paw showed better results in reducing edema, thermal and mechanical hyperalgesia, and in improving gait quality, demonstrating efficacy in treatment of CRPS-I symptoms.

Combination effect of red light irradiation and Traychspermum ammi essential oil on colorectal cancer cells (SW480). Colon cancer is the third significant reason for death related to cancers in the world. There are various treatments for colon cancer, which have several side effects. Polyphenol agents are a type of antioxidant in plants that have diverse biological properties, such as anti-cancer effects. Here, we investigate the effect of Trachyspermum ammi essential oil (TEO) and red light irradiation on the colorectal cancer cell line (SW 480). The colorectal cancer cell lines were irradiated

at 660Â nm for 90Â s and then the cells were incubated with different TEO concentrations. In another study, cells initially were treated with various TEO concentrations and then irradiation for 90Â s. Effect of TEO and the red light irradiation on viability of the cell, ROS generation, and cell cycle was assessed by MTT and flow cytometry, respectively. The findings demonstrated that early incubation with TEO and then irradiation decreased the SW 480 cells survival more than the early irradiation at 660Â nm and then essential oil. In addition, TEO treatment at IC(50) concentration in combination with low-level laser irradiation induces ROS generation in SW 480 cells as compared to the dark group. In addition, TEO treatment at IC(50) in combination with low-level laser irradiation induces G0/G1 arrest of the cell cycle in SW 480 cells in comparison to the dark group. This study revealed that the Trachyspermum ammi essential oil in combination with low-level laser results in more reduction in survival which leads to ROS generation and cell cycle arrest in SW 480 colorectal cancer cells. Antioxidants;Oils, Volatile Ammi;Antioxidants;Cell Survival;Colonic Neoplasms;Humans;Oils, Volatile

Photobiomodulation laser therapy in a Lenvatinib-related osteonecrosis of the jaw: A case report. BACKGROUND: Medication-related osteonecrosis of the jaw (MRONJ) is a serious adverse drug reaction often presenting as a post-surgery complication that may interfere in the quality of the patient's life. In the last decade, additionally to bisphosphonates, other drugs have been associated with MRONJ including other antiresorptive, antiangiogenic or multitarget drugs such as levantinib. The data on MRONJ associated to lenvatinib is scarce with no guidelines for best management option. Our aim is to report a case of MRONJ associated with lenvatinib and the useful of a non-invasive management using local photobiomodulation (PBM) therapy with a 635nm diode laser. MATERIAL AND METHODS: A 61-year-old female patient with a follicular thyroid carcinoma (stage IV) and taking lenvatinib presented to our Oral Medicine Unit with a painful non-healing ulcer with bone exposure, in the posterior right maxilla, after an extraction of a molar tooth which occurred 4 months previously. Bone rarefaction was detected in CT scan in the same affected area. We diagnosis a lenvatinib-related osteonecrosis of the Jaw (LRONJ). We performed 5 sessions of PBM treatment using a 635 nm diode laser, delivering 10J/ cm2 in affected area. RESULTS: At the end of the first session, a relief in the pain was already refereed by the patient. One month after, the oral mucosa was completely healed and tissue integrity was confirmed clinically and on panoramic radiograph and the patient referred an increase in her quality of life. On the last follow up after 6 months the patient was without any recurrence. CONCLUSIONS: A lenvatinib-related osteonecrosis of the maxilla in a female patient is reported here for the first time. Moreover, a non-invasive management using PBM laser therapy has shown a successful healing of involved tissues and immediate symptoms relief improving the quality of life of the patient. Key words:Lenvatinib, MRONJ, osteonecrosis of the jaw, tyrosine kinase inhibitors, photobiomodulation.

Accelerated burn wound healing with photobiomodulation therapy involves activation of endogenous latent TGF-Î²1. The severity of tissue injury in burn wounds from associated inflammatory and immune sequelae presents a significant clinical management challenge. Among various biophysical wound management approaches, low dose biophotonics treatments, termed Photobiomodulation (PBM) therapy, has gained recent attention. One of the PBM molecular mechanisms of PBM treatments involves photoactivation of latent TGF-Î²1 that is capable of promoting tissue healing and regeneration. This work examined the efficacy of PBM treatments in a full-thickness burn wound healing in C57BL/6 mice. We first optimized the PBM protocol by monitoring tissue surface temperature and histology. We noted this dynamic irradiance surface temperature-monitored PBMÂ protocol improved burn wound healing in mice with elevated TGF-Î² signaling (phospho-Smad2) and reduced inflammation-associated gene expression. Next, we investigated the roles of individual cell types involved in burn wound healing following PBM treatments and noted discrete

effects on epithelieum, fibroblasts, and macrophage functions. These responses appear to be mediated via both TGF-Î² dependent and independent signaling pathways. Finally, to investigate specific contributions of TGF-Î²1 signaling in these PBM-burn wound healing, we utilized a chimeric TGF-Î²1/Î²3 knock-in (TGF-Î²1(LÎ²3/LÎ²3)) mice. PBM treatments failed to activate the chimeric TGF-Î²1(LÎ²3/LÎ²3) complex and failed to improve burn wound healing in these mice. These results suggest activation of endogenous latent TGF-Î²1 following PBM treatments plays a key role in burn wound healing. These mechanistic insights can improve the safety and efficacy of clinical translation of PBM treatments for tissue healing and regeneration. Tgfb1 protein, mouse;Transforming Growth Factor beta1 Animals;Burns;Cell Line;Inflammation;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;RAW 264.7 Cells;Signal Transduction;Transforming Growth Factor beta1;Wound Healing

Effectiveness of low-level laser therapy compared with other conventional therapies on wound healing and pain reduction in patients with median sternotomy: a systematic review protocol. OBJECTIVE: The objective of this review is to evaluate the effect of low-level laser therapy, used alone or in combination with conventional therapies, on wound healing and pain reduction in patients with median sternotomy. INTRODUCTION: In the previous two decades, the incidence of postsurgical complications following median sternotomy has remained reasonably unchanged. Owing to the shortcomings of conventional therapies in wound healing, alternative solutions are sought. Photobiomodulation with low-level laser therapy has become a preferred therapy for augmenting tissue repair and stimulating immediate analgesia by releasing local neurotransmitters and endorphins, or through anti-inflammatory effects. INCLUSION CRITERIA: This review will include only randomized controlled trials that studied the effects of low-level laser therapy used as a monotherapy or in combination with other conventional therapies in promoting wound healing and reducing pain in adult patients with median sternotomy. Comparators may include other forms of photobiomodulation therapy/phototherapy, other conventional therapies, control, or placebo/sham interventions. METHODS: Cochrane Central Register of Controlled Trials, MEDLINE (PubMed), CINAHL (EBSCO), AMED (EBSCO), Physiotherapy Evidence Database (PEDro), and Scopus will be searched from database inception to the present date. Two reviewers will independently screen, extract data, and examine methodological quality of the eligible studies using the JBI critical appraisal checklist for randomized controlled trials. A meta-analysis will be done if adequate data with homogeneous population, interventions, and outcomes are available. The overall level of evidence will be synthesized using the Grading of Recommendations, Assessment, Development and Evaluation criteria. SYSTEMATIC REVIEW REGISTRATION NUMBER: PROSPERO CRD42020203011. Adult;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Pain;Pain Management;Sternotomy;Systematic Reviews as Topic;Wound Healing

Clinical research: low-level laser therapy in accelerating orthodontic tooth movement. BACKGROUND: The present study aimed to investigate the effects of low-level laser therapy (LLLT) on orthodontic tooth movement and its correlation with the levels of interleukin-1Î² (IL-1Î²), receptor activator of nuclear factor kappa B ligand (RANKL) and osteoprotegerin (OPG) in gingival crevicular fluid (GCF). METHODS: This split-mouth design study included 12 patients scheduled for the extraction of both upper first premolars. Patients were randomly selected for experimental group that received left- or right-side radiation with a diode laser (810Â nm wavelength, 100 mW power output, 6.29Â J/cm(2) energy density). Laser treatment was applied on days 0, 7, 14, and 21, after loading the canine retraction forces. GCF concentrations of IL-1Î², RANKL, and OPG were analyzed. The upper arch of each patient was scanned with an intraoral scanner to assess tooth movement. RESULTS: The cumulative tooth movement over 28Â days was significantly higher in the laser group than in the control group. We observed significant reductions in OPG levels and increases in IL-1Î² and

RANKL levels in GCF samples on the experimental sides. CONCLUSION: With the parameter settings used in this study, LLLT could, to some extent, lead to changes in bone metabolism, which could accelerate orthodontic tooth movement. TRIAL REGISTRATION: Chinese Clinical Trial Registry, ChiCTR2000039594. Registered 2 November 2020-Retrospectively registered, www.chictr.org.cn/edit.aspx?pid=62465&htm=4 . Bicuspid;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Tooth Movement Techniques

Autophagy upregulation may explain inhibition of oral carcinoma in situ by photobiomodulation in vitro. There is currently no clear understanding on the pathways involved in the process of cell inhibition by photobiomodulation (PBM). The present study evaluated the influence of PBM on the expression of autophagy markers in vitro in an in situ model of oral carcinoma. Oral squamous cell carcinoma (Cal27) and stromal fibroblasts (FG) cultures were used. The independent variables were 'cell type' (FG and CAL27) 'culture condition' (monocultures or co-cultures) and PBM (placebo and 36Â J/cm(2)). The cultures were irradiated from a red LED source for mRNA expression and protein expression analyses. The autophagy markers evaluated were Beclin-1, LC3B and p62 as well as adjuvant markers (BAX Bcl-2, VEGF, CD105, CD34, PRDX1, PRDX4 and GRP78). The Cal27 cells upregulated the autophagy markers upon exposure to PBM both at the mRNA and protein expression levels, providing evidence to explain malignant cell inhibition by PBM. Beclin-1;Endoplasmic Reticulum Chaperone BiP;HSPA5 protein, human;Microtubule-Associated Proteins;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger Autophagy;Beclin-1;Carcinoma, Squamous Cell;Cell Line;Coculture Techniques;Endoplasmic Reticulum Chaperone BiP;Humans;Light;Microtubule-Associated Proteins;Mouth Neoplasms;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;Up-Regulation

The review of the light parameters and mechanisms of Photobiomodulation on melanoma cells. Photobiomodulation (PBM) uses low-intensity visible or near-infrared light to produce beneficial effects on cells or tissues, such as brain therapy, wound healing. Still there is no consistent recommendation on the parameters (dose, light mode, wavelength, irradiance) and protocols (repetition, treatment duration) for its clinical application. Herein, we summarize the current PBM parameters for the treatment of melanoma, and we also discuss the potential photoreceptors and downstream signaling mechanisms in the PBM treatment of melanoma cells. It is hypothesized that PBM may inhibit the melanoma cells by activating mitochondria, OPNs, and other receptors. Regardless of the underlying mechanisms, PBM has been shown to be beneficial in treating melanoma. Through further in-depth studies of the underlying potential mechanisms, it can strengthen the applications of PBM for the therapy of melanoma. Humans;Infrared Rays;Low-Level Light Therapy;Melanoma;Signal Transduction;Wound Healing

Photobiomodulation Therapy at 808 nm Does Not Improve Biceps Brachii Performance to Exhaustion and Delayed-Onset Muscle Soreness in Young Adult Women: A Randomized, Controlled, Crossover Trial. OBJECTIVE: This study aims to investigate the effects of laser photobiomodulation (PBM) at 808 nm on biceps brachii performance to exhaustion, rating of perceived exertion (RPE), and delayed onset muscle soreness (DOMS) in untrained young women. METHODS: Thirteen young women (20.1 Â± 2.9 years) participated in a crossover study in which they received, in a counterbalanced manner, active and placebo laser PBM on two occasions (T1 and T2), separated by a 7-day washout period. During T1 and T2, participants received active (100 mW output power, irradiance of 35.7 W cm(-2), and total energy of 28 J/arm) or placebo laser irradiation on the biceps brachii muscle at 20 min before the repetitions-to-failure test [six sets at 60% of one-repetition maximum (1RM) until failure] for elbow flexion exercise. The number of repetitions performed and RPE over the six sets, as well as DOMS from basal up to 72 h after the repetitions-to-failure test, were recorded. RESULTS: There was a significant (time, $p < 0.05$) reduction in the number of repetitions performed and an increase in RPE

over six sets, with no statistical differences between placebo and active laser conditions (treatment Ã— time, p > 0.05). DOMS increased at 24 h postexercise and progressively returned to baseline after 72 h in both conditions (time, p < 0.05; treatment Ã— time, p > 0.05). CONCLUSION: Our results indicate that acute laser PBM at 808 nm does not improve biceps brachii performance to exhaustion, RPE, and DOMS in untrained women.

Effect of photobiomodulation on post-operative symptoms in teeth with asymptomatic apical periodontitis treated with foraminal enlargement: A randomized clinical trial. AIM: To assess the efficacy of photobiomodulation in reducing post-operative symptoms and use of analgesics in teeth with asymptomatic apical periodontitis treated with foraminal enlargement in a single visit. METHODOLOGY: This prospective double-blind, controlled, superiority, randomized clinical trial enrolled 70 patients requiring root canal treatment of one single-rooted tooth with asymptomatic apical periodontitis. The participants were randomized into one of the following two groups: 35 patients in the control group (C.G) - root canal treatment with foraminal enlargement, without any additional treatment and 35 patients in the photobiomodulation group (PBM.G) - root canal treatment with foraminal enlargement associated with photobiomodulation (antimicrobial photodynamic therapy and low-level laser therapy). The outcome variables were post-operative pain, tenderness, oedema and the use of analgesics. Pain intensity was measured using a visual analogue scale (recorded every day for 7Â days, then the 14th and 30th days after root canal treatment). Facial oedema was assessed subjectively by two independent evaluators using photographs taken by one of the researchers at 48Â h, 72Â h and 7Â days after the procedures. Data were tabulated and analysed using the Mann-Whitney U, Chi-Square, Fisher`s Exact, Student T and Ordinal Logistic Regression by Generalized Estimating Equations tests in SPSS software. RESULTS: There were no significant differences in post-operative pain and tenderness between the groups at any observation period (pÂ >Â .05). Photobiomodulation (betaÂ =Â -0.77 / pÂ =Â .01), time (betaÂ =Â -0.23 / pÂ <Â .01), and male gender (betaÂ =Â -1.20 / pÂ <Â .01) were associated with decreased post-operative pain. Only time (beta: -0.10; pÂ <Â .01) and male gender (beta: -1.04; pÂ <Â .01) were associated with decreased tenderness. For oedema and use of analgesics, there was no difference between the groups (pÂ >Â .05). CONCLUSIONS: Photobiomodulation had no significant effect on post-operative pain, tenderness, oedema and the use of analgesics after root canal treatment with foraminal enlargement, in single-rooted teeth treated in a single visit. Register of Clinical Trials: NCT03704857. Research Ethics Committee: no 2.353.996 / CAAE 74185417.9.0000.5626.
Female;Humans;Male;Pain, Postoperative;Periapical Periodontitis;Prospective Studies;Root Canal Preparation;Root Canal Therapy

Could the oral cavity be a target organ in SARS-CoV-2 infection? Data sources A series of eight patients with active COVID-19 who also presented with associated oral lesions seen at a hospital in Sao Paulo, Brazil provided the information in this report.Study selection The authors reported a case series with eight COVID-19 patients.Data extraction and synthesis Demographic information, hospitalisation details including signs, symptoms and severity of COVID-19, along with presence of anosmia, dysgeusia, ageusia and oral lesions from all eight patients were documented and reported by the authors.Results All eight patients in this report presented for medical care with well-established respiratory symptoms of COVID-19. These patients also presented with oral ulcers that resembled aphthous ulcers, of which some also had necrosis and haemorrhagic ulcerations. The time to onset ranged between two to ten days and duration lasted between 5-15 days. The painful ulcers were empirically managed using daily photobiomodulation (PBMT) therapy using a PBMT device (Twin Flex, MMOptics, Sao Carlos, Brazil).Conclusions Oral lesions may precede COVID-19 and progressively worse oral lesions are seen in severe COVID-19 patients. Some of these oral lesions also tend to occur early along with loss of taste and smell in some patients. Taken together, these oral

manifestations could serve as early indication of COVID-19 and prompt referral for further testing is recommended. Ageusia;Brazil;COVID-19;Humans;Mouth;SARS-CoV-2

[Combined Intense Pulsed Light and low-level light therapy in the treatment of Meibomian gland dysfunction]. INTRODUCTION: Meibomian gland dysfunction (MGD) is the most common cause of dry eye syndrome. The goal of this study was to evaluate the efficacy of combined intense pulsed light (IPL) and low-level light therapy (LLLT) in symptomatic MGD. MATERIALS AND METHODS: This retrospective study analyzed data from 30 patients with MGD causing dry eye symptoms not relieved by medical therapy and managed with combined IPL and LLLT. The primary endpoint was the Ocular Score Disease Index (OSDI) score at 1 month and 1 year. Secondary endpoints were visual acuity, intraocular pressure, tear film break-up time, Schirmer's test, Oxford score, and infrared meibographic score at 1 month after the conclusion of treatment. RESULTS: The mean OSDI score decreased from 43Â±19 to 17Â±12 (1 month; p<0.0001) and then to 29Â±11 (12 months; p=0.013); 63% of patients were meibographic grade 2 before versus 7% after treatment (range, 1-4) (p=0.009); 75% of patients were Oxford grade 1 before versus 41% after treatment (p=0.004) (range, 1-3). No significant difference in the other secondary endpoints was noted. CONCLUSION: Over time, IPL therapy in combination with LLLT appears to improve patients with symptomatic MGD resistant to medical therapy. Humans;Low-Level Light Therapy;Meibomian Gland Dysfunction;Meibomian Glands;Retrospective Studies;Tears

Combining Low Power Fractional CO(2) With QS-NdYAG Toning in the Treatment of Melasma Reduces the Incidence of Punctate Leukoderma. BACKGROUND AND OBJECTIVES: Q-switched Nd:YAG (QS-Nd:YAG) toning (low fluence, large spot size, and high frequency) has been used successfully for the treatment of melasma, especially in dark skin phototypes. Punctate leukoderma was found to be a frequent complication that reduced the safety of this procedure. Combining low power fractional CO(2) laser, which is another effective melasma laser therapy, might improve the efficacy and safety of this procedure. The aim of this study was to evaluate Â the effect of combining low power fractional CO(2) laser with QS-Nd:YAG toning in the treatment of melasma. STUDY DESIGN/MATERIALS AND METHODS: A randomized comparative split-face study included a total of 30 patients with bilateral, symmetrical melasma. All patients received QS-Nd:YAG toning on one randomly selected side of the face, while the other side randomly received either low power fractional CO(2) alone (group A) or combined QS-Nd:YAG toning with low power fractional CO(2) (group B). QS-Nd:YAG toning sessions were scheduled every two weeks for nine consecutive sessions, and low power fractional CO(2) sessions were received every 4 weeks for three consecutive sessions. The assessment was done using the modified melasma area and severity index (mMASI) score, spectrophotometry (melanin index [MI] and erythema index [EI]), photography, blinded physician assessment, and patient satisfaction (at baseline, 1 week and 8-12 weeks after the last treatment sessions). RESULTS: A significant reduction in the mMASI score and MI was obtained with all treatment regimens. On comparing different modalities, group A reduction in mMASI and MI was significantly greater on the side receiving QS-ND:YAG toning (64.03%Â andÂ 8.27%, respectively), than the side receiving low power fractional CO(2) laser alone (36.02%. 2.64%, respectively). On the other hand, reduction of mMASI score and MI showed no statistical significance between the side receiving QS-Nd:YAG toning alone and the combined modality. Punctate leukoderma occurred in four cases (13%) on the side receiving QS-Nd:YAG toning. CONCLUSION: QS-Nd:YAG toning is significantly more effective than low power fractional CO(2) in the treatment of melasma when used separately. Although combining low power fractional CO(2) with QS-Nd:YAG toning does not increase its efficacy, it minimizes the incidence of the undesirable punctate leukoderma complication and achieves lower recurrence. This combination can thus be recommended as a safe and effective measure for the treatment of melasma.Â Â© 2021 Wiley Periodicals LLC. Carbon Dioxide Carbon

Dioxide;Humans;Incidence;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Analysis of referrals to the stomatology service in a Southern Brazilian hospital: a retrospective study. This paper intends to describe the demand for referrals to the stomatology service requested by the medical teams for inpatients in a reference hospital in the south of Brazil. This research is a retrospective cross-sectional descriptive study focusing on data collection and assessment of information about referrals to the stomatology unit carried out from January 2008 to December 2018. All information was obtained from the hospital management software database, then transferred and analyzed individually for descriptive statistics. A total of 4433 cases were referred to the stomatology team, with an average of 403 cases by year. Hematology/hemato-oncology (37.3%) was the specialty asking for the majority of the referrals, followed by Oncology (20.4%) and Pneumology (8.2%). The mean patients' profile was males (55.5%), receiving a diagnosis of oral mucositis (43.5%), and with the first and second decades of life being the most prevalent ones (34.9%), with a mean age of 34.8Â±22.3 years. The most common treatment performed by the stomatology team was the photobiomodulation therapy (44.8%). This retrospective study demonstrated the important profile of the stomatological care in hospitalized patients from a specific hospital, especially referred by the hematology/hemato-oncology team. These results evidenced the importance of the stomatology specialty in the hospital environment.
Adolescent;Adult;Brazil;Child;Cross-Sectional Studies;Hospitals;Humans;Male;Middle Aged;Oral Medicine;Referral and Consultation;Retrospective Studies;Young Adult

Photobiomodulation has rejuvenating effects on aged bone marrow mesenchymal stem cells.
The plasticity and proliferative capacity of stem cells decrease with aging, compromising their tissue regenerative potential and therapeutic applications. This decline is directly linked to mitochondrial dysfunction. Here, we present an effective strategy to reverse aging of mouse bone marrow mesenchymal stem cells (BM-MSCs) by restoring their mitochondrial functionality using photobiomodulation (PBM) therapy. Following the characterization of young and aged MSCs, our results show that a near-infrared PBM treatment delivering 3Â J/cm(2) is the most effective modality for improving mitochondrial functionality and aging markers. Furthermore, our results unveil that young and aged MSCs respond differently to the same modality of PBM: whereas the beneficial effect of a single PBM treatment dissipates within 7 h in aged stem cells, it is lasting in young ones. Nevertheless, by applying three consecutive treatments at 24-h intervals, we were able to obtain a lasting rejuvenating effect on aged MSCs. Our findings are of particular significance for improving autologous stem cell transplantation in older individuals who need such therapies most.
Biomarkers Aging;Animals;Biomarkers;Cell Differentiation;Cell Lineage;Cell Proliferation;Cellular Senescence;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice, Inbred C57BL;Mitochondria;Mice

Treatment of atrophic acne scars: Topical or intralesional plasma gel? BACKGROUND: Atrophic post-acne scarring is considered to be a therapeutic challenge. OBJECTIVES: The aim was to compare the safety and efficacy of (A) FCL combined with intradermal injection of plasma gel, (B) FCL combined with topical application of plasma gel, and (C) FCL monotherapy in the treatment of atrophic post-acne scars. METHODS: Thirty patients with facial atrophic post-acne scars were enrolled in this study and randomly assigned into one of three groups. All of them underwent four treatment sessions at 4-weeks intervals. They were assessed objectively by the quantitative global scarring grading system (GSGS). This system was applied at baseline, and after 1- and 6-month follow-up (FU). Subjective assessments were performed through the global esthetic improvement scale (GAIS) and level of patient satisfaction. The DLQI questionnaire was employed at the baseline and 6-month FU. RESULTS: According to the quantitative GSGS scores, the reductions in group A (68.4%) and group B

(63%) scores were comparable, and both were significantly higher than that in group C (41.2%) in all steps of evaluation. At 6-month FU, both groups A and B showed further significant improvement, while group C did not. Based on the GAIS and patients' satisfaction, there were no significant differences between all groups. The reductions in DLQI scores in groups A and B were comparable; however, both were significantly higher than group C (PÂ <Â .001). CONCLUSIONS: The combination of plasma gel and FCL resurfacing was noticeably outstanding in their efficacy and impact on the patients' quality of life. Acne Vulgaris;Atrophy;Cicatrix;Humans;Low-Level Light Therapy;Quality of Life;Treatment Outcome

Comparison of the effects of low level laser and insoles on pain, functioning, and muscle strength in subjects with stage 2 posterior tibial tendon dysfunction: A randomized study. BACKGROUND: Low level laser therapy (LLLT) is known to be effective in tendinopathies. No study yet investigated the effect of LLLT on posterior tibial tendon dysfunction (PTTD) in comparison to orthotic treatment. OBJECTIVE: The aim was to compare the effects of LLLT and insole application on pain, function and muscle strength in subjects with stage 2 PTTD. METHODS: Fifty-two subjects with stage 2 PTTD were randomly assigned to the LLLT and insole groups. The foot pain, function and strength of invertor and evertor muscles of the subjects was evaluated before and after treatment, and after 9 months. RESULTS: Significant improvement was observed in the foot function and pain ($p< 0.05$) in both groups after treatment, but in the 9-month follow-up, the insole group had better values. The increase in 180âˆ˜.sec-1 concentric invertor muscle strength was found significant after the treatment and in month-9 as compared to the initial values ($p< 0.05$). CONCLUSIONS: Both treatments are effective in reducing treating foot pain, as well as improving the function in subjects with stage 2 PTTD. However, at the end of the 9-month follow-up, it was seen that insoles were more effective. Neither method had a clinically important effect on muscle strength. Foot;Humans;Lasers;Muscle Strength;Pain;Posterior Tibial Tendon Dysfunction

Sensitivity of Four Various Candida Species to Photodynamic Therapy Mediated by Indocyanine Green, an in vitro Study. STATEMENT OF THE PROBLEM: Various species of candida contribute to oral candidiasis. It is the time to shift from conventional rigid antimicrobial therapies to more patient specific and safer ones. PURPOSE: The present study aimed to investigate antifungal effects of photodynamic therapy (PDT) using Indocyanine green as photosensitizer and low-power laser irradiation on the viability of candida albicans, candida tropicalis, candida glabrata and candida krusei, and to compare it with Nystatin as the conventional treatment. MATERIALS AND METHOD: In this in vitro study, 0.5 McFarland suspensions of candida's species were prepared (n=50, each). Each strain was then divided into five groups of 10 samples each, according to the following experimental interventions: (1) Nystatin, (2) photodynamic therapy: laser irradiation (wavelength= 808 nm, power= 100 mW, energy density= 10 J/cm(2), exposure duration= 100 s) in the presence of the photosensitizer, (3) laser irradiation alone, (4) treatment with the PS alone and (5-control: no exposure to laser light or photosensitizer. Next, serial dilutions were prepared and seeded onto Sabouraud dextrose agar. The colonies were counted, and the values of log (CFU/ml) were analyzed by variance and the Tamhan test ($p< 0.05$). RESULTS: Photodynamic therapy mediated indocyanine green is significantly effective in reducing the number of CFU/ml of all species of candida tested, compared to control group ($p< .001$). Nystatin, laser irradiation and photodynamic therapy, with respectively decreasing potency, have considerably reduced the number of candida's colonies in all four bacterial strains ($p<. 05$). Photosensitizer alone, showed impressive antimicrobial potency against all species of candida except candida albicans, in comparison to control group. CONCLUSION: It seems that laser therapy alone is more powerful than photodynamic therapy mediated indocyanine green; however, conventional treatment has still the top antimicrobial efficacy towards all candida species.

Transcutaneous systemic photobiomodulation reduced lung inflammation in experimental model of asthma by altering the mast cell degranulation and interleukin 10 level. Asthma is a chronic inflammatory disease characterized by recurrent and reversible episodes of wheezing, dyspnea, chest stiffness, and cough. Its treatment includes several drugs, high cost, and considerable side effects. Photobiomodulation (PBM) emerges as an alternative treatment, showing good results, and it can be applied locally or systemically. Here, we aim to evaluate the effect of transcutaneous systemic photobiomodulation (TSPBM) by red diode light. Therefore, adult rats were sensitized and challenged with ovalbumin (OVA) plus alum for induction of asthma and irradiated or not with TSPBM in the caudal vein (wavelength 660â€‰Â±â€‰10Â nm; total radiant emission 15Â J; area 2.8 cm(2); energy density 5.35Â J/cm(2); irradiance 33.3 mW/cm(2); exposure time 150Â s). Our investigations prioritized the cell migration into the alveolar space and lung, tracheal responsiveness, release and gene expression of cytokines, mast cell degranulation, and anaphylactic antibodies. Our results showed that TSPBM reduced the cell migration and mast cell degranulation without altering the tracheal responsiveness and ovalbumin antibody titers. Indeed, TSPBM increased the levels of interleukin 10 (IL-10) in the BAL fluid without altering the gene expression of cytokines in the lung tissue. Thus, this study showed that transcutaneous systemic irradiation reduced lung inflammation by altering mast cells degranulation and IL-10 level. Considering that this study is a pioneer in the used of light by the systemic route to treat asthma, the data are interesting and instigate future investigations, mainly in relation to the mechanisms involved and in dosimetry.
Cytokines;Interleukin-10;Ovalbumin Animals;Asthma;Cell Degranulation;Cytokines;Disease Models, Animal;Interleukin-10;Lung;Mast Cells;Mice;Mice, Inbred BALB C;Models, Theoretical;Ovalbumin;Pneumonia;Rats

Letter to the editor regarding the article "Photobiomodulation therapy for the prevention of acute radiation dermatitis in head and neck cancer patients (DERMISHEAD trial)" by Robijns et al. Radiat Oncol. 2021. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiodermatitis

Effects of photobiomodulation on bone remodeling in an osteoblast-osteoclast co-culture system. The general bone anabolic effect of photobiomodulation (PBM) is largely accepted. As a result, PBM therapy is expected to be beneficial in the medical fields of dentistry and bone healing. However, most of the previous in vitro studies on PBM and bone metabolism were performed with single-cell cultures of osteoclast-lineage cells or osteoblast-lineage cells. In the present study, the bone-modulating effects of PBM were evaluated in an in vitro osteoblast/osteoclast co-culture system. Mouse bone marrow-derived macrophages (BMMs) and mouse calvarial pre-osteoblasts cells were purified and used as precursor cells for osteoclasts and osteoblasts, respectively. The PBM effects on single-cell culture of osteoclasts or osteoblasts as well as co-culture were examined by 1.2Â J/cm(2) low-level Ga-Al-As laser (Î»â€‰â€‰=â€‰808â€‰Â±â€‰3Â nm, 80 mW, and 80Â mA; spot size, 1cm(2); NDLux, Seoul, Korea) irradiation for 30Â s at daily intervals throughout culture period. At the end of culture, the osteoclast differentiation and osteoblast differentiation were assessed by TRAP staining and ALP staining, respectively. The expressions of osteoclastogenic cytokines were evaluated by RT-PCR and Western blot analyses. Under the single-cell culture condition, PBM enhanced osteoblast differentiation but had minor effects on osteoclast differentiation. However, in the co-culture condition, its osteoblastogenic effect was maintained, and osteoclast differentiation was substantially reduced. Subsequent RT-PCR analyses and western blot results revealed marked reduction in receptor activator of NF-ÎºB ligand (RANKL) expression and elevation in osteoprotegerin (OPG) expression by PBM in co-cultured cells. More importantly, these alterations in RANKL/OPG levels were not observed under the single-cell culture conditions. Our results highlight the different effects of PBM on bone cells based on culture conditions. Further, our findings suggest the indirect

anti-osteoclastogenic effect of PBM, which is accompanied by a decrease in RANKL expression and an increase in OPG expression. Osteoprotegerin;RANK Ligand Animals;Bone Remodeling;Cell Differentiation;Coculture Techniques;Mice;Osteoblasts;Osteoclasts;Osteoprotegerin;RANK Ligand

Transcranial photobiomodulation in the management of brain disorders. Transcranial photobiomodulation (tPBM) is the process of delivering light photons through the skull to benefit from its modifying effect. Brain disorders are important health problems. The aim of this review was to determine the existing evidence of effectiveness, useful parameters, and safety of tPBM in the management of traumatic brain injury, stroke, Parkinson, and Alzheimer's disease as the common brain disorders. Four online databases, including Cochrane, Pub Med, Embase, and Google scholar were searched according to the Preferred Reporting Items for Systematic Reviews and meta-analyses (PRISMA) guidelines. 4728 articles were obtained in the initial search. Only those articles that were published until September 2020 and designed as randomized clinical trials (RCTs) or animal-controlled studies were included. 6 RCTs, 2 related supplementary articles, and 38 controlled animal studies met the inclusion criteria of this study. No RCTs were performed in the fields of Alzheimer's and Parkinson's diseases. The human RCTs and animal studies reported no adverse events resulted from the use of tPBM. Useful parameters of tPBM were identified according to the controlled animal studies. Since the investigated RCTs had no homogenous results, making an evidence-based decision for definite therapeutic application of tPBM is still unattainable. Altogether, these data support the need for large confirmatory well-designed RCTs for using tPBM as a novel, safe, and easy-to-administer treatment of brain disorders. EVIDENCE BEFORE THIS STUDY: High prevalence and complications of brain disorders and also side effects of neuropsychiatric medications have encouraged researchers to find alternative therapeutic techniques which tPBM can be one of them. In present review we tried to determine the existing evidence of effectiveness, useful parameters, and safety of tPBM in the management of traumatic brain injury, stroke, Alzheimer, and Parkinson's disease as common brain disorders. Four online databases, including "Cochrane", "Pub Med", "Embase", and "Google scholar" were searched. Only those articles that were published until September 2020 and designed as RCTs or animal-controlled studies were included. Search keywords were the followings: transcranial photobiomodulation" OR "transcranial low-level laser therapy" AND "stroke" OR "traumatic brain injury" OR "Alzheimer" OR "Parkinson". Several studies have confirmed effectiveness of tPBM in treatment of different brain disorders but the level of evidence of its effectiveness remain to be determined. ADDED VALUE OF THIS STUDY: In this study we systematically reviewed human RCTs to determine the existing evidence of tPBM effectiveness in management of four mentioned brain disorders. Since the outcomes of the reviewed RCTs were not homogeneous, further well-designed RCTs are required to decide more definitively on the evidence of this noninvasive and probably safe therapeutic intervention. We hypothesized that non-homogeneous outcomes could be due to inefficiency of PBM parameters. Controlled animal studies have the advantage of using objective tests to evaluate the results and compare them with the control group. We determined useful tPBM parameters based on these studies. IMPLICATIONS OF ALL THE AVAILABLE EVIDENCE: This research is part of our main project of tinnitus treatment using photobiomodulation (PBM). Evidence of central nervous system involvement in tinnitus led us to believe that treatment protocol of tinnitus should also include transcranial PBM. The determined useful parameters can be helpful in designing more efficient tPBM protocols in the management of brain disorders and tinnitus as a common debilitating symptom that can be associated with these disorders. Alzheimer Disease;Animals;Brain Diseases;Brain Injuries, Traumatic;Disease Models, Animal;Humans;Low-Level Light Therapy;Parkinson Disease;Randomized Controlled Trials as Topic

Response to the Letter to the editor by Donnelly et al. regarding the article "Photobiomodulation therapy for the prevention of acute radiation dermatitis in head and neck cancer patients (DERMISHEAD trial)". Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiodermatitis

Oxygen-generating glycol chitosan-manganese dioxide nanoparticles enhance the photodynamic effects of chlorin e6 on activated macrophages in hypoxic conditions. This study aimed to investigate the use of glycol chitosan (GC) for the synthesis of MnO(2) nanoparticles (NPs) and to evaluate whether the prepared GC-MnO(2) NPs enhance the light-triggered photodynamic effects of chlorin e6 (Ce6) via the generation of oxygen and alleviation of hypoxia in lipopolysaccharide (LPS)-activated macrophages (RAW 264.7), which produce excessive amounts of reactive oxygen species (ROS). GC-MnO(2) NPs were synthesized by a simple reaction between GC and KMnO(4) in water. The prepared GC-MnO(2) NPs were spherical in shape, with a mean diameter of approximately 60Â nm. The particles effectively generated oxygen via H(2)O(2)-induced degradation under hypoxic conditions, which led to an increase in the singlet oxygen levels upon laser irradiation. Furthermore, GC-MnO(2) NPs significantly enhanced the light-triggered photodynamic effects of Ce6 on activated macrophages under hypoxic conditions, as shown by the increased levels of cell death and cell membrane damage in activated macrophages. Therefore, these results suggest that GC can be used as an alternative natural polymer for the synthesis of MnO(2) NPs and that oxygen-generating GC-MnO(2) NPs enhance the light-triggered photodynamic effects of Ce6 on activated macrophages by alleviating hypoxia. Chlorophyllides;Lipopolysaccharides;Manganese Compounds;Oxides;Porphyrins;glycol-chitosan;Water;phytochlorin;Chitosan;Hydrogen Peroxide;Oxygen;manganese dioxide Animals;Cell Death;Cell Hypoxia;Chitosan;Chlorophyllides;Hydrogen Peroxide;Lipopolysaccharides;Low-Level Light Therapy;Macrophage Activation;Manganese Compounds;Mice;Nanoparticles;Oxides;Oxygen;Particle Size;Photochemotherapy;Porphyrins;RAW 264.7 Cells;Water

Photoactivation of TGFÎ²/SMAD signaling pathway ameliorates adult hippocampal neurogenesis in Alzheimer's disease model. BACKGROUND: Adult hippocampal neurogenesis (AHN) is restricted under the pathological conditions of neurodegenerative diseases, especially in Alzheimer's disease (AD). The drop of AHN reduces neural circuit plasticity, resulting in the decrease of the generation of newborn neurons in dentate gyrus (DG), which makes it difficult to recover from learning/memory dysfunction in AD, therefore, it is imperative to find a therapeutic strategy to promote neurogenesis and clarify its underlying mechanism involved. METHODS: Amyloid precursor protein/presenilin 1 (APP/PS1) mice were treated with photobiomodulation therapy (PBMT) for 0.1â€‰mW/mm(2) per day in the dark for 1 month (10â€‰min for each day). The neural stem cells (NSCs) were isolated from hippocampus of APP/PS1 transgenic mice at E14, and the cells were treated with PBMT for 0.667â€‰mW/mm(2) in the dark (5â€‰min for each time). RESULTS: In this study, photobiomodulation therapy (PBMT) is found to promote AHN in APP/PS1 mice. The latent transforming growth factor-Î²1 (LTGFÎ²1) was activated in vitro and in vivo during PBMT-induced AHN, which promoted the differentiation of hippocampal APP/PS1 NSCs into newborn neurons. In particular, behavioral experiments showed that PBMT enhanced the spatial learning/memory ability of APP/PS1 mice. Mechanistically, PBMT-stimulated reactive oxygen species (ROS) activates TGFÎ²/Smad signaling pathway to increase the interaction of the transcription factors Smad2/3 with Smad4 and competitively reduce the association of Smad1/5/9 with Smad4, thereby significantly upregulating the expression of doublecortin (Dcx)/neuronal class-III Î²-tubulin (Tuj1) and downregulating the expression of glial fibrillary acidic protein (GFAP). These in vitro effects were abrogated when eliminating ROS. Furthermore, specific inhibition of TGFÎ² receptor I (TGFÎ²R I) attenuates the DNA-binding efficiency of Smad2/3 to the Dcx promotor triggered by PBMT.

CONCLUSION: Our study demonstrates that PBMT, as a viable therapeutic strategy, directs the adult hippocampal APP/PS1 NSCs differentiate towards neurons, which has great potential value for ameliorating the drop of AHN in Alzheimer's disease mice. Amyloid beta-Protein Precursor;Dcx protein, mouse;Doublecortin Protein;Presenilin-1;Smad Proteins;Transforming Growth Factor beta Alzheimer Disease;Amyloid beta-Protein Precursor;Animals;Disease Models, Animal;Doublecortin Protein;Hippocampus;Mice;Mice, Transgenic;Neurogenesis;Presenilin-1;Signal Transduction;Smad Proteins;Transforming Growth Factor beta

Effect of Red-to-Near Infrared Light and a Nitric Oxide Donor on the Oxygen Consumption of Isolated Cytochrome c Oxidase. Objective: To study the effects of 670 and 830â€‰nm irradiation on oxygen consumption by cytochrome c oxidase (CCO) in a Clark electrode type reaction chamber. To explore the effect of irradiation on the nitric oxide (NO) donor-induced inhibition of oxygen consumption. Background: Most theories of photobiomodulation (PBM) involve the enzyme CCO as a cellular target for red-to-near infrared light (R-NIR) irradiation. Attempts to measure the effect of irradiation on the kinetics of CCO have failed to demonstrate a significant effect. It remains to explore the effects of irradiation on the consumption of oxygen. NO has been proposed as a possible mediator for PBM due to its inhibitory effects on CCO. Studying the effect of R-NIR on NO-induced inhibition of oxygen consumption is needed to explore this thesis. Methods: Oxygen consumption assays at 22Â°C were performed in a Mitocell MT200A system equipped with a 1302 oxygen electrode. R-NIR irradiation at 670â€‰nm (41â€‰mW/cm(2)) or 830â€‰nm (31â€‰mW/cm(2)) was provided to the reaction mixture. Calculated second-order rate constants were compared with control runs at four cytochrome c concentrations. Assays were also performed with or without NO donor and/or light for two substrate concentrations. Results: Kinetics constants for oxygen consumption with or without R-NIR showed no significant differences with either wavelength at any substrate concentration. The NO donor showed significant inhibition that was not relieved by irradiation. Conclusions: This lack of effect by R-NIR calls into question both the CCO activity model and the NO inhibition relief model of PBM. Nitric Oxide Donors;Electron Transport Complex IV Electron Transport Complex IV;Infrared Rays;Low-Level Light Therapy;Nitric Oxide Donors;Oxygen Consumption

Oral mucositis in paediatric cancer patients undergoing allogeneic hematopoietic stem cell transplantation preventively treated with professional dental care and photobiomodulation: Incidence and risk factors. BACKGROUND: Oral mucositis (OM) is an important side effect related to allogeneic hematopoietic stem cell transplantation (allo-HSCT), and it has been associated with a significative reduction of quality of life. A negative impact of OM in paediatric patients could result in increased use of parenteral feeding and opioids, longer periods of hospitalization, and a higher risk of systemic infection. AIM: To investigate the clinical features and clinical outcomes associated with OM development and severity in hematological cancer paediatric patients undergoing allo-HSCT who underwent professional dental care (PDC) and photobiomodulation (PBM) as prophylactic treatment. DESIGN: Medical data and OM presentation were retrieved retrospectively from all patients younger than 18Â years who received allo-HSCT between 2013 and 2016. The incidence of OM was assessed and graded by two oral medicine specialists following the WHO guidelines, and it was correlated with clinical parameters. RESULTS: Forty-nine consecutive paediatric patients were included. OM was diagnosed in 73.5% of patients, and in 36.1% of patients, OM was classified as severe. Acute lymphoblastic leukemia as a primary diagnosis and the use of a myeloablative regimen were associated with OM development. The primary diagnosis and use of total body irradiation (TBI) were associated with aggressive OM. Neither the incidence nor the severity of OM affected the overall survival, whereas only the use of a myeloablative regimen and a high body mass index (BMI) were determinants of lower OM-free survival rates. CONCLUSIONS: A myeloablative conditioning and a

high BMI were observed to be independent prognostic determinants of a lower OMFS rate. The cluster analysis allowed us to outline patient profiles with greater susceptibility to the development and severity of oral mucositis, which seems to be a useful tool to determine the risk of OM in paediatric patients. Child;Dental Care;Hematopoietic Stem Cell Transplantation;Humans;Incidence;Neoplasms;Quality of Life;Retrospective Studies;Risk Factors;Stomatitis

Influence of low-level-laser therapy on the stability of orthodontic mini-screw implants. A systematic review and meta-analysis. BACKGROUND: The influence of low-level-laser therapy (LLLT) on the stability of orthodontic mini-screw implants (MSIs) has not been systematically reviewed. OBJECTIVES: The aim was to assess the influence of LLLT on the stability of orthodontic MSIs. METHODS: An unrestricted search of indexed databases was performed. SELECTION CRITERIA: Randomized controlled clinical trials (RCTs) investigating the influence of LLLT on orthodontic MSI stability. DATA COLLECTION AND ANALYSIS: Two authors independently performed study retrieval and selection, and data extraction. The risk of bias (RoB) of individual studies was assessed using the Cochrane RoB Tool for RCTs. Meta-analyses were performed separately for RCTs using periotest and resonance frequency analysis (RFA) to measure MSI stability; and a random effects model was applied. Subgroup analyses were performed based on the time-points of MSI stability evaluation. The quality of available evidence was evaluated using the Grades of Recommendation, Assessment, Development, and Evaluation approach. RESULTS: Initially, 1332 articles were screened. Six RCTs with a split-mouth design were included. The periotest was used in 4 RCTs and 2 RCTs used RFA to measure MSI stability. All RCTs had a low RoB. Subgroup analyses based on periotest indicated that MSIs treated with LLLT had significantly higher stability than untreated MSIs at 21 and 30 days [weighted mean difference (MD) = -2.76, confidence interval (CI): [-4.17, -1.36], P-value = 0.0001) and at 60 days (weighted MD = -3.47, CI: [-4.58, -2.36], P < 0.00001); and the level of certainty was high. Subgroup analyses based on RFA showed higher stability of MSIs treated with than without LLLT at 56 and 60 days (standardized MD = 0.82, CI: [0.32, 1.32], P = 0.001), and at 70 and 90 days (standardized MD = 0.86, CI: [0.36, 1.36], P = 0.0007); and the level of certainty was moderate. LIMITATIONS: Due to limited number of relevant studies, it was not possible to perform sensitivity analysis, subgroup analyses for patient and intervention-related characteristics, and reporting biases assessment. CONCLUSIONS: The role of LLLT on the secondary stability of MSIs placed in patients undergoing OT remains debatable. CLINICAL TRIAL REGISTRATION: PROSPERO (CRD42021230291). Dental Implants Bone Screws;Dental Implants;Humans;Laser Therapy;Low-Level Light Therapy

Dependence of laser-induced optical breakdown on skin type during 1064â€‰nm picosecond laser treatment. The current study aims to evaluate the dependence of laser-induced optical breakdown (LIOB) on skin types by using 1064â€‰nm picosecond laser with micro-lens arrays (MLA) and diffractive optical elements (DOE). Both black and white skin tissues were examined to comparatively assess the LIOB effects in the skin in terms of laser-induced vacuolization. The black skin irradiated at 3.0Â J/cm(2) demonstrated that MLA yielded a deeper distribution (180-400â€‰Î¼m) of laser-induced vacuoles with a size of 67â€‰Î¼m, compared to DOE (180-280â€‰Î¼m; 40â€‰Î¼m in size). However, the white skin presented that MLA created larger vacuoles (134â€‰Î¼m in size) in a smaller number at deeper distributions (125-700â€‰Î¼m) than MLA with the black skin. DOE generated no laser-induced vacuolization in the white skin. The white skin tissue with inherent higher scattering could be responsible for deeper vacuolization after the picosecond laser treatment. Further investigations are expected to determine the optimal treatment conditions for various skin types. Lasers, Solid-State;Lenses;Light;Low-Level Light Therapy;Skin

Photobiomodulation Effect of Different Diode Wavelengths on the Proliferation of Human Gingival Fibroblast Cells. This study is focused on comparing the effect of various energy densities and wavelengths of diode lasers on the proliferation of human gingival fibroblast (HGF) cells inÂ vitro. In this study, 204 sample cells were examined in 4 test groups (laser radiation) and 1 control group (non-laser radiation). The proliferation rate of radiated cells with wavelengths of 635, 660, 808 and 980Â nm and the densities of 1, 1.5, 2.5 and 4Â JÂ cm(-2) was measured after 1, 3 and 5Â days using the MTT assay. The proliferation rate of human gingival fibroblast (HGF) cells in test groups was increased on day 1 at wavelengths of 635, 808 and 980Â nm and on day 3 at the wavelength of 980Â nm compared with the control group. Our findings denoted that the photobiomodulation therapy increased the proliferation rate of HGF. The most desirable laser radiation setting, which led to the highest proliferation rate of the cells, included 980Â nm wavelength with 1, 1.5 and 4Â JÂ cm(-2) energy densities and 635Â nm wavelength with 4Â JÂ cm(-2) energy density. Cell Proliferation;Fibroblasts;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy

Effects of photobiomodulation associated with orofacial myofactional therapy on temporomandibular joint dysfunction. PURPOSE: To investigate the influence of photobiomodulation associated with orofacial myofunctional therapy (OMT) in patients with temporomandibular muscle disorders (TMD). METHODS: Randomized, blinded trial clinical study with a sample of eleven women with muscle TMD divided into two groups. The experimental group (EG) consisted of five women submitted to orofacial myofunctional therapy associated with photobiomodulation, and the control group (CG) consisted of six women submitted to orofacial myofunctional therapy associated with inactive photobiomodulation (placebo). The intervention was performed in the following twelve sessions: one evaluation, ten speech therapy sessions associated with photobiomodulation, and one reevaluation. For outcomes, investigation on pain perception using the visual analogue scale (VAS), investigation of palpation sensitivity with the research diagnostic criteria for temporomandibular disorders (RDC/TMD), and quality of life (QOL) verification through oral health impact profile - short form (OHIP-14) were considered. RESULTS: The EG increased measurements of mandibular movements of opening and protrusion and improved in the evaluation of QOL. CONCLUSION: Orofacial myofunctional therapy, when associated with photobiomodulation, contributed to increase the range of mandibular movements, with important improvements in the perception of quality of life and with significant improvement in the painful conditions of volunteers with TMD. Female;Humans;Mandible;Myofunctional Therapy;Quality of Life;Temporomandibular Joint;Temporomandibular Joint Disorders

Low-level laser therapy in temporomandibular joint disorders: a systematic review. Temporomandibular joint disorders (TMDs) encompass a wide array of ailments affecting the temporomandibular joint (TMJ), muscles of mastication, and the allied structural framework. Myofascial pain, internal derangement of the joint, and degenerative joint diseases constitute the majority of TMDs. TMDs usually have a multifactorial etiology, and treatment modalities range from conservative therapies to surgical interventions. Low-level laser therapy (LLLT) has evolved as an efficient non-invasive therapeutic modality in TMDs. Previously conducted systematic reviews and meta-analyses have shown variable results regarding the efficiency of LLLT in TMJ disorder patients. Hence, this systematic review was carried out as an attempt to evaluate the efficacy of LLLT in the treatment of temporomandibular joint disorder patients. Humans;Low-Level Light Therapy;Publication Bias;Risk;Software;Temporomandibular Joint Disorders

Photobiomodulation as an Adjunctive Treatment to Physiotherapy for Reduction of Anterior Knee Pain in Combat Soldiers: A Prospective, Double-Blind, Randomized, Pragmatic, Sham-Controlled Trial. BACKGROUND AND OBJECTIVES: Anterior knee pain (AKP) is the most common knee pathology in athletes and occurs in 15% of army recruits of elite units during basic training. Of these, 50% are

symptomatic 6 years later. Photobiomodulation (PBM) is a nonthermal red-to-near-infrared irradiation used for pain reduction of a variety of etiologies. This study was designed to determine whether addition of PBM to physiotherapy (PT) for AKP in combat soldiers is superior to PT alone. STUDY DESIGN/MATERIALS AND METHODS: In this prospective, double-blind, sham-controlled, randomized clinical trial (NCT02845869), 26 combat soldiers/policemen (male:female, 15:11; body mass index [BMI]â€‰=â€‰24.2â€‰Â±â€‰3.9, nâ€‰=â€‰46 knees), with AKP due to overuse/load, received 4 weeks of PT + sham (PTâ€‰+â€‰Sham) or active PBM (wavelengthâ€‰=â€‰660 and 850â€‰nm, pulsingâ€‰=â€‰2.5â€‰Hz, LED powerâ€‰=â€‰50â€‰mW/cm(2) [local tissue/regional lymph nodes]; 810â€‰nm continuous beam, laser cluster 6â€‰W/cm(2) [analgesia] and laser pointer 4.75â€‰W/cm(2) [trigger points]) (PTâ€‰+â€‰PBM). The main outcome measures were subjective pain by visual analog scale (VAS) (0 [none]-100 [intolerable]) and functional disability by Kujala score (0 [worst]-100 [best]). Evaluations were carried out at baseline, end of treatments, and 3-month follow-up. RESULTS: All participants completed the treatment protocol without any reported adverse device effects. Post-treatment pain was significantly reduced in the PT+PBM group, compared with baseline and sham (Î”pain, VAS, meanâ€‰Â±â€‰SD: PTâ€‰+â€‰PBMâ€‰=â€‰-19â€‰Â±â€‰23, Pâ€‰=â€‰0.002; PTâ€‰+â€‰Shamâ€‰=â€‰-6â€‰Â±â€‰21, Pâ€‰=â€‰0.16; between groups, Pâ€‰=â€‰0.032). At 3-month follow-up, pain reduction was similar between groups; however, the Kujala score was significantly improved only in the PBM-treated group (Î”Kujala: PTâ€‰+â€‰PBMâ€‰=â€‰11â€‰Â±â€‰10, Pâ€‰=â€‰0.003; PTâ€‰+â€‰Shamâ€‰=â€‰5â€‰Â±â€‰7, Pâ€‰=â€‰0.059). CONCLUSIONS: Addition of PBM to PT for AKP resulted in earlier reduction in pain and improved functionality, compared with PT alone. This noninvasive, nonpharmacologic, adjunctive therapeutic modality can be easily incorporated into team healthcare frameworks or end units and may lead to earlier return to competition or combat-level service. Lasers Surg. Med. Â© 2021 Wiley Periodicals LLC. Female;Humans;Low-Level Light Therapy;Male;Military Personnel;Pain;Physical Therapy Modalities;Prospective Studies

Efficacy and Safety of Topical Silymarin Versus Low Fluence 1064-nm Q Switched Nd:YAG Laser in the Treatment of Melasma: A Comparative Randomized Trial. BACKGROUND AND OBJECTIVES: The management of melasma is challenging and requires multiple uses of available therapeutic options. To compare the short-term efficacy and safety of topical silymarin and low fluence 1064-nm Q-switched ND:YAG laser for treatment of melasma with dermoscopic follow-up. STUDY DESIGN/MATERIALS AND METHODS: Fifty female patients with melasma were included in this study. They were randomly divided into two groups. Group A: 25 patients were treated with six sessions of low fluence Q switched ND:YAG 1064-nm laser, and group B: 25 patients were treated with topical silymarin cream 1.4% with a 3-monthÂ treatment duration. Patients were evaluated clinically by the modified melasma area and severity index (mMASI) score. Dermoscopic examinations were performed before and after the treatment sessions. RESULTS: The severity of melasma, as evaluated dermoscopically and clinically by mMASI score, was significantly reduced after treatment in all patients with no recorded side effects. There was no statistically significant difference between both studied groups regarding the change in mMASI score and dermoscopic assessment of the patients after the treatment sessions. CONCLUSION: Both low fluence Q switched ND:YAG 1064-nm laser and topical silymarin cream appear to be safe and effective modalities in the treatment of melasma. Â© 2021 Wiley Periodicals LLC. Silymarin Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Silymarin;Treatment Outcome

On-Site Laser Photobiomodulation Treatment of Crushed Muscle Due to Prolonged Pressure in Rats. BACKGROUND AND OBJECTIVES: Crush injuries and prolonged pressure on musclesÂ lead to bruises and sprains and, in most of the cases, cause distraction of the muscle and release of particles into the

blood stream, causing renal and systemic complications in severe cases. Laser photobiomodulation treatment (i.e., laser phototherapy) is a method suggested to decrease the pressure damage in the first 24-48â€‰hours after muscle injury, allowing a faster and more complete physical rehabilitation. We studied the efficacy of non-invasive laser photobiomodulation treatment as an on-site treatment for crush-injured gastrocnemius muscles, developing a moderate muscle crush injury model and aiming at decreasing damage extent while regaining physical competence faster. STUDY DESIGN/MATERIALS AND METHODS: Muscle crush injury was performed on 30 female Wistar rats using direct pressure for 10 minutes on the gastrocnemius muscle in both left and right hindlimbs. Immediately after the injury, only the left hindlimb were irradiated for 16 minutesÂ (with 780â€‰nm laser with a power of 250â€‰mW, the energy at the target was 240â€‰J, and the fluence was 1019â€‰J/cm(2)) for 1, 3, or 7 consecutive days, and sacrificed accordingly. During the follow-up period, 1, 3, or 7 days, both gastrocnemius muscles (of the treated and untreated hindlimbs) were evaluated for electrophysiology and functionality. RESULTS: The laser photobiomodulation treatment showed a significant electrophysiological and functional recovery of the gastrocnemius muscle during the first 3 days after injury, in comparison with the untreated hindlimb. CONCLUSIONS: These preliminary results are promising, showing a significant effect of the laser photobiomodulation treatment during the first 3 days after the induction of the muscle crush injury, which is the most critical period in the clinical aspect. These findings suggest a therapeutic approach, which may help restore the muscle after crush injury. Animals;Crush Injuries;Female;Lasers;Low-Level Light Therapy;Muscle, Skeletal;Rats;Rats, Wistar

Blue light-emitting diodes in hair regrowth: the first prospective study. Different studies highlight photo-receptors' presence on the hair follicle that seems to be capable of eliciting hair growth. This study aims to demonstrate blue light's effectiveness on hair growth in patients affected by androgenetic alopecia. Twenty patients enrolled at Magna Graecia University Unit of Dermatology, affected by androgenetic alopecia, were treated with a blue LED light device at 417â€‰Â±â€‰10Â nm, fluence of 120Â J/cm(2), and power intensity of 60 mW/cm(2)â€‰Â±â€‰20%. The treatments were performed twice a week for ten consecutive weeks. Patients were evaluated before and 1Â month after the end of therapy clinically using standardized global photographs and dermoscopically estimating hair density and hair shaft width. An increase in hair density and hair shaft width was recorded in 90% of patients after 10Â weeks. Photographic improvement was noted in 80% of the patients. No serious adverse events have been reported. The only side effect consisted in a darkening of the hair, perhaps due to melanic stimulation due to blue light in 2 patients. Blue light therapy is a promising therapy for patients affected by androgenetic alopecia and other diseases characterized by hair loss. Further studies will be necessary to confirm the findings of this preliminary study. Alopecia;Hair;Hair Follicle;Humans;Low-Level Light Therapy;Prospective Studies

Photobiomodulation for non-exudative age-related macular degeneration. BACKGROUND: Age-related macular degeneration (AMD) is one of the leading causes of blindness in high-income countries. The majority of cases of AMD are of the non-exudative type. Experts have proposed photobiomodulation (PBM) therapy as a non-invasive procedure to restore mitochondrial function, upregulate cytoprotective factors and prevent apoptotic cell death in retinal tissue affected by AMD. OBJECTIVES: To assess the effectiveness and safety of PBM compared to standard care, no treatment or sham treatment for people with non-exudative AMD. SEARCH METHODS: We searched CENTRAL (which contains the Cochrane Eyes and Vision Trials Register) (Issue 5, 2020), Ovid MEDLINE, Embase, ISRCTN, ClinicalTrials.gov and the WHO ICTRP to 11 May 2020 with no language restrictions. SELECTION CRITERIA: The review included randomised controlled trials (RCTs) on participants receiving any type of PBM therapy for non-exudative AMD compared to standard care, sham

treatment or no treatment. DATA COLLECTION AND ANALYSIS: We used standard methodological procedures expected by Cochrane. We considered the following outcome measures at 12 months: best-corrected visual acuity (BCVA) ; contrast sensitivity; near vision; low luminance density score; reading speed; vision-related quality of life score; and adverse events such as progression of AMD and conversion to exudative AMD. We graded the certainty of the evidence using GRADE. MAIN RESULTS: We included two published RCTs from single centres in the UK and Canada, which recruited 60 participants (60 eyes) and 30 participants (46 eyes) respectively. Participants in these trials were people with non-exudative AMD with Age-Related Eye Disease Study (AREDS) categories 2 to 4. One study compared single wavelength PBM with no treatment. This study was at risk of performance bias because the study was not masked, and there was attrition bias. One study compared multi-wavelength PBM with sham treatment and conflicts of interest were reported by study investigators. We also identified three eligible ongoing RCTs from searching the clinical trials database. When comparing PBM with sham treatment or no treatment for non-exudative AMD, there was no evidence of any meaningful clinical difference in BCVA at 12 months (mean difference (MD) 0.02 logMAR, 95% confidence interval (CI) -0.02 to 0.05; 2 RCTs, 90 eyes; low-certainty evidence). One study comparing multi-wavelength PBM with sham treatment showed an improvement in contrast sensitivity at Level E (18 cycles/degree) at 12 months (MD 0.29 LogCS, 95% CI 0.23 to 0.35; 1 RCT, 46 eyes; low-certainty evidence). Visual function and health-related quality of life scores were comparable between single wavelength PBM and no treatment groups at 12 months (VFQ-48 score MD 0.43, 95% CI -0.17 to 1.03; P = 0.16; 1 RCT, 47 eyes; low-certainty evidence). When comparing PBM with sham treatment or no treatment for non-exudative AMD, there was no evidence of any meaningful clinical difference in conversion to exudative AMD (risk ratio (RR) 0.97, 95% CI 0.17 to 5.44; 2 RCTs, 96 eyes; very low-certainty evidence) at 12 months. There was inconclusive evidence that single wavelength PBM prevents the progression of AMD (RR 0.79, 95% CI 0.41 to 1.53; P = 0.48; 1 RCT, 50 eyes; low-certainty evidence). Disease progression was defined as the development of advanced AMD or significant increase in drusen volume. No included study reported near vision, low luminance vision or reading speed outcomes. AUTHORS' CONCLUSIONS: Currently there remains uncertainty whether PBM treatment is beneficial in slowing progression of non-exudative macular degeneration. There is a need for further well-designed controlled trials assessing dosimetry, powered for both effectiveness and safety outcomes. Consideration should be given to the adoption of agreed clinical outcome measures and patient-based outcome measures for AMD. Placebos Bias;Confidence Intervals;Contrast Sensitivity;Disease Progression;Humans;Low-Level Light Therapy;Macular Degeneration;Outcome Assessment, Health Care;Placebos;Quality of Life;Randomized Controlled Trials as Topic;Treatment Outcome;Visual Acuity

Exploring the Effect of Combined Transcranial and Intra-Oral Photobiomodulation Therapy Over a Four-Week Period on Physical and Cognitive Outcome Measures for People with Parkinson's Disease: A Randomized Double-Blind Placebo-Controlled Pilot Study. BACKGROUND: Neuroprotection against Parkinson's disease degeneration by photobiomodulation has been reported in animal models but no true placebo-controlled human studies have been published. OBJECTIVE: To understand if photobiomodulation therapy can produce clinically significant differences in physical performance measures in people with Parkinson's disease; and what frequency of treatment is necessary to initiate clinical change. METHODS: In a participant and assessor-blinded, randomized, placebo-controlled pilot study, 22 participants received either sham and/or active laser photobiomodulation (904â€Šnm, 60â€ŠmW/diode, 50â€ŠHz) for 33 s to each of 21 points at the cranium and intra-orally, on one, two or three times/week for 4 weeks. Two treatment phases were separated by a 4-week wash-out (Phase 2). Upper and lower limb physical outcome measures were assessed before and after each treatment phase. The Montreal Cognitive Assessment was evaluated prior to treatment Phase 1, and

at the end of treatment Phase 3. RESULTS: Montreal Cognitive Assessment remained stable between start and end of study. No measures demonstrated statistically significant changes. With regular treatment, the spiral (writing) test and the dynamic step test were most sensitive to change in a positive direction; and the 9-hole peg test demonstrated a minimum clinically important difference worthy of further investigation in a larger, adequately powered clinical trial. A placebo effect was noted. CONCLUSION: The results support the notion that combined transcranial and intra-oral photobiomodulation therapy needs to be applied at least 2 to 3 times per week for at least four weeks before some improvement in outcome measures becomes evident. Longer courses of treatment may be required. Aged;Double-Blind Method;Exercise Test;Female;Humans;Low-Level Light Therapy;Lower Extremity;Male;Mental Status and Dementia Tests;Mouth;Outcome Assessment, Health Care;Parkinson Disease;Physical Functional Performance;Pilot Projects;Time Factors;Upper Extremity

Pilot Study on Dose-Dependent Effects of Transcranial Photobiomodulation on Brain Electrical Oscillations: A Potential Therapeutic Target in Alzheimer's Disease. BACKGROUND: Transcranial photobiomodulation (tPBM) has recently emerged as a potential cognitive enhancement technique and clinical treatment for various neuropsychiatric and neurodegenerative disorders by delivering invisible near-infrared light to the scalp and increasing energy metabolism in the brain. OBJECTIVE: We assessed whether transcranial photobiomodulation with near-infrared light modulates cerebral electrical activity through electroencephalogram (EEG) and cerebral blood flow (CBF). METHODS: We conducted a single-blind, sham-controlled pilot study to test the effect of continuous (c-tPBM), pulse (p-tPBM), and sham (s-tPBM) transcranial photobiomodulation on EEG oscillations and CBF using diffuse correlation spectroscopy (DCS) in a sample of ten healthy subjects [6F/4 M; mean age 28.6Â±12.9 years]. c-tPBM near-infrared radiation (NIR) (830â€Šnm; 54.8â€ŠmW/cm2; 65.8 J/cm2; 2.3 kJ) and p-tPBM (830â€Šnm; 10â€ŠHz; 54.8â€ŠmW/cm2; 33%; 21.7 J/cm2; 0.8 kJ) were delivered concurrently to the frontal areas by four LED clusters. EEG and DCS recordings were performed weekly before, during, and after each tPBM session. RESULTS: c-tPBM significantly boosted gamma (tâ€Š=â€Š3.02, dfâ€Š=â€Š7, pâ€Š<â€Š0.02) and beta (tâ€Š=â€Š2.91, dfâ€Š=â€Š7, pâ€Š<â€Š0.03) EEG spectral powers in eyes-open recordings and gamma power (tâ€Š=â€Š3.61, dfâ€Š=â€Š6, pâ€Š<â€Š0.015) in eyes-closed recordings, with a widespread increase over frontal-central scalp regions. There was no significant effect of tPBM on CBF compared to sham. CONCLUSION: Our data suggest a dose-dependent effect of tPBM with NIR on cerebral gamma and beta neuronal activity. Altogether, our findings support the neuromodulatory effect of transcranial NIR. Adult;Alzheimer Disease;Brain;Cerebrovascular Circulation;Electroencephalography;Female;Healthy Volunteers;Humans;Male;Neuropsychological Tests;Pilot Projects;Single-Blind Method;Spectrum Analysis

Light-based therapies in the management of rosacea: a systematic review with meta-analysis. BACKGROUND: The current scenario and position of laser and light-based therapies (LLBT) in the therapeutic rosacea scheme are lacking evidence-based recommendations and comparisons on efficacy and tolerability among different devices. This article aimed to systematically compare the efficacy, acceptability, and tolerability of the pulsed dye laser (PDL) versus other devices. METHOD: A literature search was conducted in March 2020. Four domains were analyzed throughout the following six outcomes: Spectrophotometer erythema index and percentage of reduction for background erythema, telangiectasia grading scale for telangiectasias, visual analog scale for pain, and physician's assessment and patient's satisfaction for treatment success. RESULTS: Our search yielded 423 potentially relevant studies. After removing the excluded and duplicated records, 12 records were assessed for eligibility in the meta-analysis. Erythema (RR:0.38 95%CI: -0.20-0.95), telangiectasias (RR:0.54 95%CI: -0.87-1.94), and the treatment success throughout the physician's

assessment (RR:1.23 95%CI: 0.74-2.04) and the patient's satisfaction (RR:1.15 95%CI: 0.73-1.82) were not significantly different between pulsed dye laser and other LLBT. In the pain domain, PDL was as painful as other LLBT (RR:-0.23 95%CI: -0.96-0.49) but more painful than neodymium: yttrium-aluminum-garnet laser (RR:0.84 95%CI: 0.53-1.14) and less than intense pulsed light (RR:-1.18 95%CI: -1.56-0.80). CONCLUSION: This work based on previously published literature demonstrates that the quality of evidence to support any recommendation on LLBT in rosacea is low-to-moderate. Among all the available devices, PDL holds the most robust evidence, although in the meta-analysis the effectiveness was comparable to other LLBT, such as neodymium: yttrium-aluminum-garnet laser (Nd-YAG) or IPL. Erythema;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Rosacea

Photodynamic Therapy as an adjunct in the Treatment of Medication-Related Osteonecrosis of the Jaw: A Case Report. Introduction: Medication-related osteonecrosis of the jaw (MRONJ) corresponds to an adverse effect of the use of drugs such as bisphosphonates and denosumab. This condition is often associated with pain, infection, purulent secretion, paraesthesia, tooth mobility and halitosis, decreasing the patient's quality of life. The management of MRONJ tends to be conservative, through the guidance of oral hygiene, antibiotic therapy and mouthwashes. However, the use of antimicrobial photodynamic therapy (aPDT) has shown promise in the treatment of these injuries. The purpose of this article is to report a case of MRONJ treatment associated with aPDT. Case Report: A 75-year-old patient, with a history of breast cancer and use of intravenous Zoledronic Acid, presented with bilateral MRONJ lesions in tuberosity on the right and left sides. Treatment was conservatively instituted with the use of aPDT as an adjuvant. After 12 aPDT sessions, complete regression of the lesion was observed. However, after two weeks, the presence of a new lesion was noted, this time in the anterior region of the maxilla. The same protocol previously established was followed and after two aPDT sessions, the patient returned with complete lesion regression. Conclusion: The use of aPDT may represent an important adjuvant within a set of clinical protocols in the treatment of MRONJ.

Infrared Thermography in the Evaluation of Dental Socket Healing After Photobiomodulation Therapy: A Case Report. Introduction: The aim of this article was to evaluate the efficacy of photobiomodulation therapy (PBMT) in the alveolar tissue healing process post-extraction using infrared thermography (IT). Case Presentation: A 36-year-old male patient had teeth extractions (18 and 28). Four PBMT sessions (660 nm; 2 J per tooth) were performed in the region of tooth 28 and recorded with thermographic images to compare the healing process, bilaterally. In the first two postoperative sessions, the temperature was higher (hyperradiant) on the left side (treated). After the third laser application, the left side was hyporradiant. In later session, the treated side became hyperradiant compared to the control side. The alveolus of tooth 28 showed more rapid healing than tooth 18 over a period of 60 days. Conclusion: IT can be used to detect the favorable effect of PBMT on accelerating the healing process in the alveolus within 60 days after the tooth extraction.

The Combined Effect of Photobiomodulation and Curcumin on Acute Skin Wound Healing in Rats. Introduction: Abnormal wound repair is a cause for considerable expense, as well as patient morbidity and mortality. Here, we investigated the combined impact of photobiomodulation (PBM) and curcumin on a rat experimental model of an acute skin wound. Methods: A round full-thickness wound was created on the back of each rat. We divided the rats into the following four groups. Group one was the control group. Group two received pulse wave (PW) PBM at a dose of 890 nm, 80 Hz, and 0.2 J/cm(2). Group 3 received 40 mg/kg curcumin by gastric gavage and group 4 were treated with PWPBM + curcumin. We measured the wound area on days 4, 7, and 15, and performed microbiological and tensiometric examinations. Results: There was markedly improved wound contraction in the curcumin (7.5 Â± 0.57; P =0.000), PBM (8.5 Â± 1.2; P =0.000), and PBM + curcumin

(14.5 Â± 4.3; P =0.002) groups relative to the control group (25 Â± 6). PBM (100 Â± 7.3; P =0.005), and PBM + curcumin (98 Â± 6; P =0.005) groups meaningfully improved tensile strength relative to the control group (61 Â± 8.2). On day 15, the PBM (10 Â± 5; P =0.000), curcumin (14 Â± 4.5, P =0.000), and PBM + curcumin (27.3 Â± 8.3; P =0.000) groups meaningfully decreased microbial flora relative to the control group (95 Â± 6). Conclusion: We concluded that the PBM and PBM + curcumin groups meaningfully accelerated wound healing of the acute skin wound in the rats. The results of the PBM group were statistically more effective than the curcumin alone and PBM + curcumin-treated groups.

Efficacy of Photobiomodulation Therapy for Orthodontic Pain Control Following the Placement of Elastomeric Separators: A Randomized Clinical Trial. Introduction: Controlling pain in orthodontic patients has gained special attention. This study assessed the efficacy of photobiomodulation therapy (PBMT) for pain control following the placement of elastomeric separators. Methods: This split-mouth single-blind randomized clinical trial evaluated 30 orthodontic patients who required posterior elastomeric separators. The two maxillary quadrants were randomized into the laser and control groups. In the laser quadrant, an 808 nm diode laser (400 mW, 15.60 J/cm(2) , 11 seconds, continuous-wave, contact mode) was irradiated to the cervical third of the maxillary first molar roots 24 hours prior to the placement of separators. The control quadrant received placebo radiation by a light-curing unit. The patients received the second laser cycle right before the placement of separators 24 hours later. The level of self-perceived pain was recorded at 0, 2, 6, 24, and 72 hours and 5 days after the intervention in the laser and control quadrants using a visual analog scale (VAS). Data were analyzed using the analysis of variance (ANOVA) and paired-samples t test. Results: The trend of change in the pain score was similar in both groups. The pain score was significantly lower in the laser group than the control group at all-time points (P <0.05) except at time 0. The pain score increased in the first 6 hours and reached its maximum level in 24 hours in both groups. Conclusion: PBMT by an 808 nm diode laser can effectively decrease pain following the placement of elastomeric separators.

The Efficacy and Safety of Fractional 1064 nm Nd:YAG Picosecond Laser Combined With Intense Pulsed Light in the Treatment of Atrophic Acne Scar: A Split-Face Study. BACKGROUND AND OBJECTIVES: To evaluate the efficacy and safety of fractional 1064â€‰nm Nd:YAG picosecond laser combined with intense pulsed light (IPL) in the treatment of atrophic acne scar with post-inflammatory erythema (PIE). Â© 2021 Wiley Periodicals LLC. STUDY DESIGN/MATERIALS AND METHODS: Seventeen patients received five sessions of treatment at weeks 0, 4, 8, 12, 16 and were followed up at week 28. One half of the face was randomly treated by fractional 1064â€‰nm Nd:YAG picosecond laser combined with IPL (FxPicoâ€‰+â€‰IPL), and the other by IPL alone as a control. RESULTS: For the 15 patients who completed the study, the FxPicoâ€‰+â€‰IPL side demonstrated significant median Ã‰chelle D'Ã©valuation clinique des cicatrices D'acnÃ© (ECCA) score improvement (Pâ€‰<â€‰0.01), while IPL alone side did not (Pâ€‰=â€‰0.1250). The pore counts for both sides decreased but more pore count reduction was seen on the FxPicoâ€‰+â€‰IPL side (Pâ€‰<â€‰0.05). Better scar improvement was observed on the FxPicoâ€‰+â€‰IPL-treated side (Pâ€‰<â€‰0.05) while no difference in erythema improvement was seen between the two sides. There was no difference between the two treatments in terms of overall satisfaction. Pain, erythema, edema, petechiae, crusting, reactive acneiform eruptions, and pruritus were common adverse effects and were mild to moderate. CONCLUSION: FxPicoâ€‰+â€‰IPL is an effective, efficient, and safe treatment regimen for atrophic acne scars complicated by PIE. Acne Vulgaris;Cicatrix;Humans;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Probiotics, Photobiomodulation, and Disease Management: Controversies and Challenges. In recent decades, researchers around the world have been studying intensively how micro-organisms that are present inside living organisms could affect the main processes of life, namely health and

pathological conditions of mind or body. They discovered a relationship between the whole microbial colonization and the initiation and development of different medical disorders. Besides already known probiotics, novel products such as postbiotics and paraprobiotics have been developed in recent years to create new non-viable micro-organisms or bacterial-free extracts, which can provide benefits to the host with additional bioactivity to probiotics, but without the risk of side effects. The best alternatives in the use of probiotics and postbiotics to maintain the health of the intestinal microbiota and to prevent the attachment of pathogens to children and adults are highlighted and discussed as controversies and challenges. Updated knowledge of the molecular and cellular mechanisms involved in the balance between microbiota and immune system for the introspection on the gut-lung-brain axis could reveal the latest benefits and perspectives of applied photobiomics for health. Multiple interconditioning between photobiomodulation (PBM), probiotics, and the human microbiota, their effects on the human body, and their implications for the management of viral infectious diseases is essential. Coupled complex PBM and probiotic interventions can control the microbiome, improve the activity of the immune system, and save the lives of people with immune imbalances. There is an urgent need to seek and develop innovative treatments to successfully interact with the microbiota and the human immune system in the coronavirus crisis. In the near future, photobiomics and metabolomics should be applied innovatively in the SARS-CoV-2 crisis (to study and design new therapies for COVID-19 immediately), to discover how bacteria can help us through adequate energy biostimulation to combat this pandemic, so that we can find the key to the hidden code of communication between RNA viruses, bacteria, and our body.
Brain;COVID-19;Cytokine Release Syndrome;Gastrointestinal Microbiome;Humans;Low-Level Light Therapy;Lung;Metabolomics;Phototherapy;Probiotics;SARS-CoV-2

Phototherapy and Tailored Brushing Method. Personalized Oral Care in Patients with Facial and Dental Trauma. A Report of a Case. (1) Background: Traumatic dental injuries are frequent in children and young adults. The facial structures involved in dental trauma may include soft tissues of the face and mouth, bone and dental structures. Dental trauma often results in augmented dental anxiety. Phototherapy can improve stress and pain control thereby improving compliance in young patients with the necessary dental treatments, after dental trauma has occurred. (2) Methods: Phototherapy was performed to enable soft tissue healing. The Tailored Brushing Method (TBM), a personalized approach for at-home oral hygiene procedures, was also utilized, with the aim of improving biofilm control in traumatized patients. (3) Results: The approach hereafter presented made it possible to obtain subjective control of anxiety and pain documented on a visual analog scale (VAS) due to the innovative use of photo-biomodulation. In addition, for the first time, the TBM was adapted to the needs of a patient with facial trauma and illustrated. (4) Conclusions: Phototherapy and TBM were found to be effective in the combined treatment of soft tissue wounds and in the oral care of the traumatized patient.

Chronological Gene Expression of Human Gingival Fibroblasts with Low Reactive Level Laser (LLL) Irradiation. Though previously studies have reported that Low reactive Level Laser Therapy (LLLT) promotes wound healing, molecular level evidence was uncleared. The purpose of this study is to examine the temporal molecular processes of human immortalized gingival fibroblasts (HGF) by LLLT by the comprehensive analysis of gene expression. HGF was seeded, cultured for 24 h, and then irradiated with a Nd: YAG laser at 0.5 W for 30 s. After that, gene differential expression analysis and functional analysis were performed with DNA microarray at 1, 3, 6 and 12 h after the irradiation. The number of genes with up- and downregulated differentially expression genes (DEGs) compared to the nonirradiated group was large at 6 and 12 h after the irradiation. From the functional analysis results of DEGs, Biological Process (BP) based Gene Ontology (GO), BP 'the defense response' is considered to be an important process with DAVID. Additionally, the results of PPI analysis of DEGs involved in

the defense response with STRING, we found that the upregulated DEGs such as CXCL8 and NFKB1, and the downregulated DEGs such as NFKBIA and STAT1 were correlated with multiple genes. We estimate that these genes are key genes on the defense response after LLLT.

Influence of low-level laser therapy on implant stability in implants placed in healed sites: a randomized controlled trial. BACKGROUND: The present study aims to assess the influence of low-level laser therapy (LLLT) on stability in implants placed in healed sites. MATERIAL AND METHODS: The present study followed the SPIRIT statement and is reported according to CONSORT. Patients were randomly allocated to LLLT or control groups. LLLT consisted in the application of 808-nm GaAlA laser applied before the preparation of the implant bed and after suturing (80 seconds; 11J/cm(2)). Implant stability quotient (ISQ) and the distance between the implant platform to the alveolar bone crest (millimeters) were assessed at implant placement (T(0)) and the abutment selection phase (4-6 months, T(a)). RESULTS: A total of 64 implants were placed in 33 patients. The insertion torque ranged from 10 to 70 N.cm (mean 43.23; SD Â±16.82). The T(0) ISQ ranged from 18 to 95.5 (mean 61.7; SD Â±18.23) and the crestal bone radiographic distance was 2.03 mm (SDÂ±1.27). At T(a), the ISQ ranged from 39 to 90 (mean 64.2; SDÂ±9.84), and the mean crestal bone radiographic loss was 1.70mm (SDÂ±1.65). However, no differences were observed when LLLT and control groups were compared with ISQ difference (T(a)-T(0); p=0.598) or radiographical peri-implant alterations (p=0.531). CONCLUSION: LLLT did not influence the implant stability in implants placed in healed sites compared to a control group. TRIAL REGISTRATION: ReBEC, RBR-35TNJ7 . Registered May 23, 2018. Alveolar Process;Humans;Low-Level Light Therapy;Prostheses and Implants;Radiography;Torque

Paradoxical Hypertrichosis Associated with Laser and Light Therapy for Hair Removal: A Systematic Review and Meta-analysis. BACKGROUND: Paradoxical hypertrichosis (PH) is an uncommon, poorly understood adverse effect associated with laser or intense pulsed light treatment for hair removal. OBJECTIVE: The objective of this study was to conduct a systematic review and meta-analysis to determine PH prevalence and associated risk factors. METHODS: We conducted a systematic review and meta-analysis of studies evaluating hair removal with lasers or intense pulsed light. Primary outcome was PH prevalence. Meta-regression and subgroup analysis were used to investigate associations among treatment modality, patients' characteristics, and PH. RESULTS: Included were 9733 patients in two randomized controlled trials and 20 cohort studies (three prospective and 17 retrospective). Pooled PH prevalence was 3% (95% confidence interval 1-6; I(2) = 97%). Paradoxical hypertrichosis was associated with a face or neck anatomic location, and occurred in only 0.08% of non-facial/neck cases. Treatment modality and interval between treatments had no effect on the PH rate. There were insufficient data to determine the association between sex and skin type to PH. In three out of four studies, PH gradually improved with continued therapy. CONCLUSIONS: Based primarily on cohort studies, PH occurs in 3% of patients undergoing hair removal with lasers or intense pulsed light, yet rarely outside the facial/neck areas. Treatment modality does not seem to be a contributing factor. Continuation of treatment in areas with PH may be the most appropriate treatment. Hair Follicle;Hair Removal;Humans;Hypertrichosis;Laser Therapy;Low-Level Light Therapy;Phototherapy;Risk Assessment;Risk Factors;Severity of Illness Index

Photobiostimulatory Effect of a Single Dose of Low-Level Laser on Orthodontic Tooth Movement and Pain. OBJECTIVE: To assess the effect of low-level laser applied at 3 weeks intervals on orthodontic tooth movement (OTM) and pain using conventional brackets (CB). MATERIALS AND METHODS: Twenty patients with Angle's class II div 1 (10 males and 10 females; aged 20.25â€‰Â±â€‰3.88 years) needing bilateral extractions of maxillary first bicuspids were recruited. Conventional brackets MBT of 0.022 in slot (McLaughlin Bennett Trevisi) prescription braces (Ortho Organizers, Carlsbad, Calif) were bonded. After alignment and levelling phase, cuspid retraction

began with nitinol closed coil spring on 19â€‰Ã—â€‰25 stainless steel archwire, wielding 150 gram force. 7.5â€‰J/cm(2) energy was applied on 10 points (5 buccal and 5 palatal) on the canine roots on the investigational side using gallium-aluminum-arsenic diode laser (940â€‰nm wavelength, iLaseâ„¢ Biolase, Irvine, USA) in a continuous mode. Target tissues were irradiated once in three weeks for 9 weeks at a stretch (T0, T1, and T2). Patients were given a feedback form based on the numeric rating scale (NRS) to record the pain intensity for a week. Silicon impressions preceded the coil activation at each visit (T0, T1, T2, and T3), and the casts obtained were scanned with the Planmeca CAD/CAMâ„¢ (Helsinki, Finland) scanner. RESULTS: The regimen effectively accelerated (1.55â€‰Â±â€‰0.25â€‰mm) tooth movement with a significant reduction in distress on the investigational side as compared to the placebo side (94â€‰Â±â€‰0.25â€‰mm) ($p < 0.05$). CONCLUSIONS: This study reveals that the thrice-weekly LLLT application can accelerate OTM and reduce the associated pain. Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Pakistan;Tooth Movement Techniques;Toothache;Young Adult

Effects of Photobiomodulation/Laser Therapy Combined With Resistance Training on Quadriceps Hypertrophy and Strength, and Postural Balance in Older Women: A Randomized, Triple-Blinded, Placebo-Controlled Study. BACKGROUND AND PURPOSE: Physical and therapeutic strategies to maintain and rehabilitate skeletal muscle mass, strength, and postural balance are clinically relevant to improve the health, well-being, and quality of life of older adults. The purpose of this study was to investigate the effects of photobiomodulation (PBM)/laser therapy combined with a resistance training (RT) program on quadriceps hypertrophy and strength, and postural balance in older women. METHODS: In a randomized, triple-blinded, placebo-controlled design, twenty-two older women (age 66.6 Â± 5.2 years) were engaged in a supervised 10-wk RT program (2 times per week) involving unilateral leg extension exercise, in which each leg of the same participant was randomly assigned to receive active (Î» = 808 nm, optical output = 100 mW, total energy = 42 J) or placebo laser PBM immediately before the RT sessions. Maximal dynamic strength by unilateral knee extension 1-repetition maximum (1RM), muscle hypertrophy by vastus lateralis muscle thickness, and postural balance by one-legged stance test on a force platform were assessed before and after the training program. RESULTS: Significance statistical analysis revealed a similar improvement (time $P = .003$) from pre- to posttraining for muscle hypertrophy and strength, and postural balance between active and placebo laser conditions. However, clinical interpretation for muscle hypertrophy showed a moderate effect (effect size [ES] = 0.58) for the active laser and a small effect (ES = 0.38) for the placebo laser. Clinical difference was not noticed between conditions for other analyzed variables. CONCLUSIONS: These findings indicate that RT alone can be clinically important for counteracting the deleterious effects of aging on muscle size, strength, and balance, and that applying laser PBM therapy before the RT sessions may further improve gains in muscle hypertrophy. Aged;Double-Blind Method;Female;Humans;Hypertrophy;Laser Therapy;Lasers;Low-Level Light Therapy;Middle Aged;Muscle Strength;Postural Balance;Quadriceps Muscle;Quality of Life;Resistance Training

Energy-based Devices for Hair Loss. Treatment options for hair loss have traditionally been limited to topical and systemic therapies. Systemic therapies for inflammatory hair disorders are often immunosuppressive, and systemic treatment of androgenetic hair loss can cause undesired effects on sexual and reproductive health. Topical agents have a favorable side effect profile compared with systemic therapies, but many topicals have poor transcutaneous absorption, limiting their concentration and action at follicular targets in the dermis. Alopecia;Hair;Humans

Modulatory effects of photobiomodulation in the anterior cingulate cortex of diabetic rats. Anterior Cingulate Cortex (ACC) has a crucial contribution to higher order pain processing. Photobiomodulation (PBM) has being used as integrative medicine for pain treatment and for a

variety of nervous system disorders. This study evaluated the effects of PBM in the ACC of diabetic rats. Type 1 diabetes was induced by a single dose of streptozotocin (85Â mg/Kg). A total of ten sessions of PBM (pulsed gallium-arsenide laser, 904Â nm, 9500Â Hz, 6.23Â J/cm(2)) was applied to the rat peripheral nervous system. Glial fibrillary acidic protein (GFAP), mu-opioid receptor (MOR), glutamate receptor 1 (GluR1), and glutamic acid decarboxylase (GAD65/67) protein level expression were analyzed in the ACC of diabetic rats treated with PBM. Our data revealed that PBM decreased 79.5% of GFAP protein levels in the ACC of STZ rats. Moreover, STZâ€‰+â€‰PBM rats had protein levels of MOR increased 14.7% in the ACC. Interestingly, STZâ€‰+â€‰PBM rats had a decrease in 70.7% of GluR1 protein level in the ACC. Additionally, PBM decreased 45.5% of GAD65/67 protein levels in the ACC of STZ rats. Streptozocin Animals;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Disease Models, Animal;Gyrus Cinguli;Lasers;Photochemical Processes;Rats;Streptozocin

Effect of photobiomodulation therapy on trunk flexor performance after incisional hernia repair: a randomized controlled trial. To investigate the effect of two photobiomodulation approaches on trunk flexor performance after incisional hernia repairÂ and to compare the effects of both wavelengths. Forty-five patients were randomly distributed after isokinetic trunk flexor assessments into infrared laser, red laser, and placebo groups. Each patient received laser treatment followed by a traditional physical therapy program. In laser treatment, 24 points in both recti were irradiated by infrared or red laser light with the following parameters; 0.6Â J per point, 214.28Â J/cm(2) as energy density, and 17.85Â W/cm(2) as intensity, while the control group received a placebo approach. All groups received clinical treatments at a rate of 3 sessions per week for 4Â weeks; in addition, the physical therapy program was continued on other days for all groups. Isokinetic trunk flexor strength was measured before treatment and 4Â weeks after treatment as in each measurement, fatigue protocol was designed, and the trunk flexor strength was measured before fatigue test while the trunk flexor resistance to fatigue was measured after fatigue test. After 4Â weeks, pre-and post-fatigue trunk flexor strengths in both laser groups were significantly increased compared to pre-and post-fatigue trunk flexor strength in the placebo group, respectively, and there was no significant difference between the two laser groups.Â Photobiomodulation approaches enhance trunk flexor response to exercise after incisional hernia repair. This enhancement leads to greater strength and more fatigue resistance for the trunk flexors in photobiomodulation groups compared to the placebo groupÂ and no difference between the two photobiomodulation effects. Lactic Acid Exercise;Humans;Incisional Hernia;Lactic Acid;Low-Level Light Therapy;Muscle Fatigue

Treatment of diabetic foot ulcers in a frail population with severe co-morbidities using at-home photobiomodulation laser therapy: a double-blind, randomized, sham-controlled pilot clinical study. PURPOSE: To evaluate the safety and efficacy of an at-home photobiomodulation (PBM) device for the treatment of diabetic foot ulcers (DFUs) in a frail population with severe comorbidities. METHODS: Prospective, randomized, double-blind, sham-controlled pilot study. Patients (ageâ€‰=â€‰63â€‰Â±â€‰11Â years, male:female 13:7) with insulin-dependent diabetes type 2, neuropathy, peripheral artery disease, significant co-morbidities, and large osteomyelitis-associated DFUs (University of Texas gradeâ€‰â‰¥â€‰III) were randomized to receive active (nâ€‰=â€‰10) or sham (nâ€‰=â€‰10) at-home daily PBM treatments (pulsed near-infrared 808Â nmÂ Ga-Al-As laser, 250Â mW, 8.8Â J/cm(2)) for up to 12Â weeks in addition to standard care. The primary outcome was the %wound size reduction. The secondary was adverse events. RESULTS: With the numbers available, PBM-treated group had significantly greater %reduction compared to sham (area [cm(2)], baseline vs endpoint: PBM 10[20.3]Â cm(2) vs 0.2[2.4]Â cm(2); sham, 7.9 [12.0]Â cm(2) vs 4.6 [13.8]Â cm(2), pâ€‰=â€‰0.018 by Mann-Whitney U test). Wound closureâ€‰>â€‰90% occurred in 7 of 10 PBM-treated patients but in only 1 of 10 sham patients (pâ€‰=â€‰0.006). No adverse

device effects were observed. CONCLUSIONS: Photobiomodulation at home, in addition to standard care, may be effective for the treatment of severe DFUs in frail patients with co-morbidities and is particularly relevant at these times of social distancing. Our preliminary results justify the conduction of a larger clinical trial. CLINICALTRIALS: gov: NCT01493895. Aged;Diabetes Mellitus;Diabetic Foot;Double-Blind Method;Female;Frail Elderly;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged;Morbidity;Pilot Projects;Prospective Studies;Wound Healing

Effects of infrared light laser therapy on in vivo and in vitro periodontitis models. BACKGROUND: This study evaluated the effects of infrared light laser therapy (ILLT) on ligature-induced periodontitis in rats using micro-computed tomography (micro-CT), histology, fibroblast migration, and viability analysis. METHODS: Forty-eight rats were randomly distributed into three groups: control (no periodontitis), PDC (periodontitis without laser therapy), and PD+L (periodontitis with laser therapy). Periodontitis was induced by ligature placement for 4 weeks. The 12-week-old rats (baseline) were subjected to laser treatment and euthanized 30 days after. After treatment, the mandibular first molars were prepared for micro-CT scanning, and histological sections were assessed as to the cementoenamel junction, alveolar bone crest, and polymorphonuclear (PMN) cell infiltration. In vitro assays were carried out to examine NIH/3T3 fibroblast viability after laser therapy. RESULTS: Migration and cell viability assays revealed that the ILLT maintained fibroblast cell viability with 4 J/cm(2) , reaching 100% healing. The control group (at baseline and 30 days) presented a statistically significant difference from the PDC group at 30 days in terms of distance from the cementoenamel junction to the alveolar bone crest (CEJ-ABC). The PD+L group showed a statistically substantial difference from the PDC group at 30 days in terms of trabecular thickness (Tb.Th), degree of anisotropy (DA), and closed porosity percentage (Po%). CONCLUSION: ILLT seemed to preserve the bone structure in the in vivo periodontitis induction model at 30 days and did not reduce cell viability or increase fibroblast migration in vitro. The ILLT provides positive effects on mandibular bone microstructure. Alveolar Bone Loss;Animals;Lasers;Low-Level Light Therapy;Periodontitis;Rats;X-Ray Microtomography

Red light stimulates vasodilation through extracellular vesicle trafficking. Red light (670Â nm) promotes ex vivo dilation of blood vessels in a nitric oxide (NO) dependent, but eNOS independent manner by secreting a quasi-stable and transferable vasoactive substance with the characteristics of S-nitrosothiols (RSNO) from the endothelium. In the present work we establish that 670Â nm light mediated vasodilation occurs in vivo and is physiologically stable. Light exposure depletes intracellular S-nitroso protein while concomitantly increasing extracellular RNSO, suggesting vesicular pathways are involved. Furthermore, we demonstrate this RSNO vasodilator is embedded in extracellular vesicles (EV). The action of red light on vesicular trafficking appears to increase expression of endosome associated membrane protein CD63 in bovine aortic endothelial cells, enhance endosome localization in the endothelium, and induce exit of RSNO containing EVs from murine facialis arteries. We suggest a mechanism by which the concerted actions of 670Â nm light initiate formation of RSNO containing EVs which exit the endothelium and trigger relaxation of smooth muscle cells. Nitroso Compounds;Sulfhydryl Compounds Animals;Cattle;Cells, Cultured;Endothelium, Vascular;Extracellular Vesicles;Light;Mice;Mice, Inbred C57BL;Nitroso Compounds;Sulfhydryl Compounds;Vasodilation

Effect of Photobiomodulation on the Incidence of Alveolar Osteitis and Postoperative Pain following Mandibular Third Molar Surgery: A Double-Blind Randomized Clinical Trial. The current study aimed to evaluate the effectiveness of photobiomodulation therapy for the prevention of incidence of alveolar osteitis (AO) and postoperative pain following third molar surgery. In this double-blind clinical trial, the impacted teeth of patients having bilateral impacted mandibular third molars were surgically extracted; for each participant, one socket was randomly assigned to receive

photobiomodulation treatment, the other received sham treatment. 660Â nm 200Â mW CW was applied at a distance of ~1cm to 4 points onÂ the occlusal area of extraction socket (beam area at the tissue ~0.64 cm(2) , 312.5Â mWÂ cm(-2) , 1J, 1.6Â JÂ cm(-2)). Also, 810Â nm 200Â mW CW was applied at tissue surface at three points on the buccal and three points on the lingual gingiva, for 15Â s (400Â mWÂ cm(-2) , 3Â J, 6Â JÂ cm(-2)). There was a statistically meaningful difference in AO frequency between the two groups, and the photobiomodulation group showed lower AO frequency compared with the sham PBM treatment (P-valueÂ =Â 0.035). According to the findings of this study, photobiomodulation therapy reduced the incidence of AO following surgical removal of impacted mandibular third molars. The incidence of AO typically occurs 3-7Â days post-extraction, and our results suggest that PBM treatment within the 7Â days could help reduce the risk of AO development. Double-Blind Method;Dry Socket;Humans;Incidence;Molar, Third;Pain, Postoperative;Tooth Extraction

An injectable photothermally active antibacterial composite hydroxypropyl chitin hydrogel for promoting the wound healing process through photobiomodulation. Prevention of bacterial infection, acceleration of wound closure and promotion of skin regeneration are crucial in the wound healing process. In this work, the photothermal activity of an injectable thermosensitive composite hydrogel based on hydroxypropyl chitin (HPCH), tannic acid (TA) and ferric ions (Fe3+) was studied. It was found that the photothermal efficiency was enhanced when the molar ratio of Fe3+/TA increased up to 20. The composite hydrogel possessed good cytocompatibility and hemocompatibility with a low dosage of the antibacterial agent TA. In vitro and in vivo antibacterial tests showed that the HPCH/TA/Fe hydrogel possessed an effective and rapid bactericidal effect with 10 minutes of near-infrared laser irradiation. Furthermore, the combination of a low-level laser therapy with the hydrogel is conducive to the acceleration of wound closure and promotion of skin tissue repair. Thus, the injectable photothermally active antibacterial composite hydrogel has great potential for the infected skin wound regeneration in clinical applications. Anti-Bacterial Agents;Hydrogels;Chitin Anti-Bacterial Agents;Chitin;Hydrogels;Low-Level Light Therapy;Wound Healing

Effects of Diode Low-Level Laser Therapy of 810 Nm on Pulpal Anesthesia of Maxillary Premolars: A Double-Blind Randomized Clinical Trial. OBJECTIVE: The purpose of this study was to investigate the pulpal effect of diode low-level laser therapy (LLLT) of 810 nm on the alleviation of pain in patients requiring dental procedures. METHODS: The current study was a double-blind randomized clinical trial carried out on twenty participants. The electric pulp testing (EPT) was recorded at baseline. Patients were randomly divided into sham laser and laser group respectively receiving low-level laser with placebo and active probes. Low-level laser at 810 nm, 200 MW constant power, 30s irradiation time and energy dose of 6 J was used. The electric pulp testing (EPT) method was again adopted to assess the rate of induced anesthesia. Laser and sham laser treatments were carried out in two different sessions with a one-week interval to ensure avoiding the potential false placebo results. Data were analyzed in SSPS-24 using Chi-square test and t-test. The p-value was set at 0.05. RESULTS: A low-level laser at 810 nm significantly alleviate EPT-induced pain compared to the pain before laser irradiation (Pâ‰¤0.001). While the difference of EPT-induced pain before and after sham laser irradiation was not significant in control group (P>0.05). There was no correlation between the anesthetic effects of a laser application at 810 nm and other variables including age and gender (P>0.05). CONCLUSION: An 810 nm low-level laser is a powerful device for induced anesthesia applications in patients requiring dental procedures. It also lessens the patients' fear of dental procedures.

Combined Intense Pulsed Light and Low-Level Light Therapy for the Treatment of Dry Eye: A Retrospective Before-After Study with One-Year Follow-Up. PURPOSE: To assess the effectiveness of a combination of intense pulsed light and low-level light therapy (IPL/LLLT) for the

treatment of dry eye. STUDY DESIGN: Retrospective before-after single-center clinical study. MATERIALS AND METHODS: Patients diagnosed with dry eye, refractory to conventional treatment, underwent four sessions of combined IPL/LLLT over 3 months. The Ocular Surface Disease Index (OSDI) questionnaire, non-invasive breakup time (NIBUT), tear film osmolarity and meniscus height were measured 6 months before intervention, at baseline, post-intervention (3 months), 9 and 15 months. RESULTS: NIBUT, osmolarity and meniscus height significantly worsened during the 6 months before treatment, whereas symptoms did not change. OSDI scores significantly improved at post-intervention (MD = -44.0, 95% CI -38.1, -50.0), and then increased again until the at last follow-up, but still significantly different from baseline (MD = -30.0, 95% CI -23.4, -36.8). The three clinical signs showed a similar pattern, with one-year improvements of 3.6 seconds for the NIBUT (95% CI 3.1, 4.2, p <0.001), 28 mOsm/L for osmolarity (95% CI 23.6, 32.4, p <0.001) and 0.03 mm for meniscus height (95% CI 0.02, 0.04, p <0.001). No adverse effects were observed. CONCLUSION: IPL/LLLT is safe and produces an important reduction in symptoms and signs of dry eye disease, still relevant one year after the end of treatment in a sample with high symptoms' severity. Therefore, it represents a promising treatment option for patients who do not improve with conventional treatment. Randomized trials are needed to determine the added benefit provided by LLLT.

Locoregional Treatments for Digital Ulcers in Systemic Sclerosis: A Systematic Review. The management of digital ulcers in systemic sclerosis is difficult. While the 2017 European League Against Rheumatism (EULAR) guidelines clearly defined the use of systemic therapies for digital ulcers, little is known about the efficacy of locoregional treatments. The aim of this review is to systematically assess the spectrum of published locoregional therapies for digital ulcers. A total of 58 studies were included. Among the different locoregional treatment strategies described, injections of fat-derived cells and botulinum toxin showed promising results in the reduction of pain and the number of digital ulcers. By contrast, this review found that sympathectomy yielded disappointing results, with low rates of effectiveness and frequent recurrence. For other treatments, such as hyperbaric oxygen therapy, phototherapy (ultraviolet A), low-level light therapy, intermittent compression, Waon therapy, extracorporeal shockwave, vitamin E gel, and topical dimethyl sulphoxide, the conflicting results or limited published data reflected the low level of evidence. Larger randomized clinical trials are required to confirm the validity of promising techniques. Humans;Pain;Scleroderma, Systemic;Skin Ulcer;Ulcer

Protective effect of low-level laser irradiation on lipopolysaccharide-mediated inflammatory injury of human periodontal ligament fibroblasts. OBJECTIVES: To study the effect and mechanism of low-level laser irradiation (LLLI) on lipopolysaccharide (LPS)-induced inflammatory injury of human periodontal ligament fibroblasts (hPDLFs). METHODS: hPDLFs were inoculated into well plates and randomly divided into the normal group, LPS group, and LPS+LLLI group. The cells in the normal group were cultured in conventional medium. The hPDLFs in the LPS and LPS+LLLI groups were cultured in RPMI1640 medium containing 1 mgÂ·L(-1) LPS. The three subgroups of the LPS+LLLI group were exposed to different LLLI. After 4 days, the cell apoptosis, viability, and intracellular free Ca(2+) concentration of each group were measured. The contents of tumor necrosis factor-Î± (TNF-Î±), interleukin (IL)-8, IL-1Î², and IL-6 were measured by enzyme linked immunosorbent assay (ELISA). Reverse transcription-polymerase chain reaction (RT-PCR) and Western blot were used to detect the expression of matrix metalloproteinase (MMP)-2, MMP-3, and MMP-9 genes and proteins of hPDLFs in each group. RESULTS: Compared with the normal group, the LPS group showed increased apoptosis rate of hPDLFs and intracellular free Ca(2+)concentration and decreased cell viability (P<0.05). The TNF-Î±, IL-8, IL-1Î², and IL-6 levels were higher in the cell supernatant (P<0.05), and the expression of MMP-2, MMP-3, and MMP-9 genes and proteins of hPDLFs was significantly increased (P<0.05). Compared with the LPS group, the LPS+LLLI group showed significantly decreased apoptosis rate and

intracellular free Ca(2+) concentration and significantly increased cell viability (P<0.05). The TNF-Î±, IL-8, IL-1Î², and IL-6 levels in the supernatant of cells and the expression of MMP-2, MMP-3, and MMP-9 genes and proteins of hPDLFs were significantly decreased (P<0.05). CONCLUSIONS: LLLI has a protective effect on the inflammatory injury of hPDLFs induced by LPS, and the effect is most obvious when the irradiation intensity is 4 JÂ·cm(-2).

 OBJECTIVE: To study the effect and mechanism of low-level laser irradiation (LLLI) on lipopolysaccharide (LPS)-induced inflammatory injury of human periodontal ligament fibroblasts (hPDLFs). METHODS: hPDLFs were inoculated into well plates and randomly divided into the normal group, LPS group, and LPS+LLLI group. The cells in the normal group were cultured in conventional medium. The hPDLFs in the LPS and LPS+LLLI groups were cultured in RPMI1640 medium containing 1 mgÂ·L(âˆ’1) LPS. The three subgroups of the LPS+LLLI group were exposed to different LLLI. After 4 days, the cell apoptosis, viability, and intracellular free Ca(2+) concentration of each group were measured. The contents of tumor necrosis factor-Î± (TNF-Î±), interleukin (IL)-8, IL-1Î², and IL-6 were measured by enzyme linked immunosorbent assay (ELISA). Reverse transcription-polymerase chain reaction (RT-PCR) and Western blot were used to detect the expression of matrix metalloproteinase (MMP)-2, MMP-3, and MMP-9 genes and proteins of hPDLFs in each group. RESULTS: Compared with the normal group, the LPS group showed increased apoptosis rate of hPDLFs and intracellular free Ca(2+) concentration and decreased cell viability (P<0.05). The TNF-Î±, IL-8, IL-1Î², and IL-6 levels were higher in the cell supernatant (P<0.05), and the expression of MMP-2, MMP-3, and MMP-9 genes and proteins of hPDLFs was significantly increased (P<0.05). Compared with the LPS group, the LPS+LLLI group showed significantly decreased apoptosis rate and intracellular free Ca(2+) concentration and significantly increased cell viability (P<0.05). The TNF-Î±, IL-8, IL-1Î², and IL-6 levels in the supernatant of cells and the expression of MMP-2, MMP-3, and MMP-9 genes and proteins of hPDLFs were significantly decreased (P<0.05). CONCLUSION: LLLI has a protective effect on the inflammatory injury of hPDLFs induced by LPS, and the effect is most obvious when the irradiation intensity is 4 JÂ·cm(âˆ’2). Interleukin-1beta;Lipopolysaccharides;Tumor Necrosis Factor-alpha Cells, Cultured;Fibroblasts;Humans;Interleukin-1beta;Lasers;Lipopolysaccharides;Periodontal Ligament;Tumor Necrosis Factor-alpha

Study of autologous platelet-rich-plasma versus its combination with intense pulsed light in treatment of melasma. Melasma is a common acquired hypermelanosis of variably successful therapies with frequent relapse. Platelet-rich-plasma (PRP) is a promising treatment in melasma, alone or combined with other treatments. We evaluated efficacy of autologous PRP in melasma treatment and the effect of combined intense pulsed light (IPL). Study included 20 Egyptian female melasma patients. PRP was injected in all melasma area and IPL was used on the right hemi-face. Melasma Area and Scoring Index (MASI) of melasma area, modified-MASI (mMASI) of PRP-IPL side and of PRP side significantly decreased after treatments (p-valueâ€‰<â€‰0.05). There was no statistically significant difference between both sides regarding mMASI score or patient and physician satisfaction (p-valueâ€‰>â€‰0.05). Our study provides the first comparison between PRP versus its combination with IPL in melasma treatment. We think the improvement of melasma with regression of melasma scores after PRP treatment is an important finding. Female;Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Melanosis;Platelet-Rich Plasma;Treatment Outcome

Treatment of partial injury of the calcaneus tendon with heterologous fibrin biopolymer and/or photobiomodulation in rats. The present study aimed to evaluate the new heterologous fibrin biopolymer associated, or not, with photobiomodulation therapy for application in tendon injuries, considered a serious and common orthopedic problem. Thus, 84 Rattus norvegicus had partial transection of the calcaneus tendon (PTCT) and were randomly divided into: control (CG); heterologous fibrin biopolymer (HFB); photobiomodulation (PBM); heterologous fibrin

biopolymerâ€‰+â€‰photobiomodulation (HFBâ€‰+â€‰PBM). The animals received HFB immediately after PTCT, while PBM (660Â nm, 40 mW, 0.23Â J) started 24Â h post injury and followed every 24Â h for 7, 14, and 21Â days. The results of the edema volume showed that after 24Â h of PTCT, there was no statistical difference among the groups. After 7, 14, and 21Â days, it was observed that the treatment groups were effective in reducing edema when compared to the control. The HFB had the highest edema volume reduction after 21Â days of treatment. The treatment groups did not induce tissue necrosis or infections on the histopathological analysis. Tenocyte proliferation, granulation tissue, and collagen formation were observed in the PTCT area in the HFB and HFBâ€‰+â€‰PBM groups, which culminated a better repair process when compared to the CG in the 3 experimental periods. Interestingly, the PBM group revealed, in histological analysis, major tendon injury after 7Â days; however, in the periods of 14 and 21Â days, the PBM had a better repair process compared to the CG. In the quantification of collagen, there was no statistical difference between the groups in the 3 experimental periods. The findings suggest that the HFB and PBM treatments, isolated or associated, were effective in reducing the volume of the edema, stimulating the repair process. However, the use of HFB alone was more effective in promoting the tendon repair process. Thus, the present study consolidates previous studies of tendon repair with this new HFB. Future clinical trials will be needed to validate this proposal. Biopolymers;Fibrin Animals;Rats;Achilles Tendon;Biopolymers;Calcaneus;Fibrin;Low-Level Light Therapy;Rats, Wistar

Photobiomodulation therapy combined with radiotherapy in the treatment of triple-negative breast cancer-bearing mice. This work investigated the effect of photobiomodulation therapy (PBM) combined with radiotherapy (RT) on triple-negative breast cancer (TNBC)-bearing mice. Female BALB/c mice received 4Â T1 cells into a mammary fat pad. Local RT was performed with a total dose of 60Â Gy divided into 4 consecutive sessions of 15Â Gy. For PBM, a red laser was used in three different protocols: i-) single exposure delivering 150Â J.cm(-2) (24Â h after the last RT session), and ii-) radiant exposure of 150Â J.cm(-2) or iii-) fractionated radiant exposure of 37.5Â J.cm(-2) (after each RT session). Tumor volume, complete blood cell count, clinical condition, metastasis, and survival of animals were monitored during 3Â weeks post-RT. Our results demonstrated that regardless of the protocol, PBM arrested the tumor growth, improved the clinical condition, and prevented hemolytic anemia. Besides, although PBM groups have exhibited a high neutrophil:lymphocyte ratio (NLR), they decreased the number of lung metastases and enhanced mouse survival. Worthy of note, PBM should be used along with the RT sessions in higher radiant exposures, since PBM at 150Â J.cm(-2) per session significantly extended the survival rate. Together, these data suggest PBM could be a potential ally to RT to fight TNBC. Animals;Female;Heterografts;Humans;Low-Level Light Therapy;Lung Neoplasms;Mice;Mice, Inbred BALB C;Triple Negative Breast Neoplasms

Photobiomodulation induces murine macrophages polarization toward M2 phenotype. Photobiomodulation using light-emitting diode (LED) treatment has analgesic and anti-inflammatory effects which can be an effective therapeutic associated with serum therapy for local treatment of snakebites. Here we explored the effects of LED treatment on isolated macrophage under Bothrops jararacussu venom. Results showed that LED induced IL-6 and TNF-Î± genes down-regulation and, TGF and ARG1 genes up-regulation which indicates a polarization of macrophages to an M2 phenotype contributing to both tissue repair and resolution of inflammation. Crotalid Venoms Animals;Bothrops;Crotalid Venoms;Low-Level Light Therapy;Macrophages;Mice;Phenotype

Combined approach to treatment of advanced stages of medication-related osteonecrosis of the jaw patients. INTRODUCTION: Increased incidence of localized osteonecrosis in the jaw bones caused by bisphosphanate use and reduced quality of life of the patients led researchers to diagnose the disease in the early period and to investigate the effective treatment modality. OBJECTIVE:

Treatment of medication-related osteonecrosis of the jaw patients is based on individual protocols from clinical experience, as there are no definitive treatment guidelines. In view of the lack of consensus on the effectiveness of medication-related osteonecrosis of the jaw treatments in the literature, the aim of this study was to evaluate the surgical technique described in the treatment of advanced stages of medication-related osteonecrosis of the jaw patients. METHODS: Twenty-one patients affected by Stage 2-3 medication-related osteonecrosis of the jaw were treated with ultrasonic piezoelectric bone surgery for necrotic bone removing, leukocyte and platelet-rich fibrin concentrate obtained from the patient's peripheral blood and Nd:YAG laser for biostimulation. Success was assessed as the maintenance of full mucosal coverage without signs of residual infection at 1-month (T1), 3-months (T2), 6-months (T3) and 1-year (T4) after surgery. Logistic regressions were used to evaluate the association between the different independent variables and treatment outcomes. RESULTS: Two Stage 3 patients had delayed healing at 1 month after the operation. Complete mucosal healing was achieved in all patients at the third month. Multivariate analysis demonstrated that different variables were not significantly correlated with delayed healing (pâ€¯>â€¯0.05). CONCLUSION: The surgical protocol presented in this study shows promising results for surgical management of advanced stages of medication-related osteonecrosis of the jaw patients. Bisphosphonate-Associated Osteonecrosis of the Jaw;Humans;Quality of Life;Treatment Outcome;Wound Healing

Long-term safety of photobiomodulation therapy for oral mucositis in hematopoietic cell transplantation patients: a 15-year retrospective study. Photobiomodulation therapy (PBMT) has demonstrated efficacy in the prevention and treatment of oral mucositis (OM) in hematopoietic cell transplantation (HCT). However, based on the cell stimulation properties, its long-term safety has been questioned, mainly in relation to risk for secondary malignancies in the oral cavity. The aim of this study was to investigate if different PBMT protocols for OM control have association with immediate and late adverse effects in HCT patients. Data on autologous and allogeneic transplantation, conditioning regimen, PBMT protocols, and OM severity were retrospectively collected from medical and dental records. Presence of secondary malignancies in the oral cavity was surveyed during a 15-year follow-up. Impact of OM on overall survival was also analyzed. Different PBMT protocols for prevention and treatment of OM were recorded over the years. Severe OM (grades 3 and 4) was infrequently observed. When present, we observed a significant decrease of the overall survival. No immediate adverse effect and secondary malignancy was associated to PBMT. In conclusion, the PBMT protocols used in the study were considered safe. The low frequency of severe OM observed encourages the implementation of this technique, with a special emphasis on the dosimetry adjustments focused on the HCT context. Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Retrospective Studies;Stomatitis;Transplantation Conditioning;Transplantation, Homologous

Photobiomodulation therapy for hair regeneration: A synergetic activation of Î²-CATENIN in hair follicle stem cells by ROS and paracrine WNTs. Photobiomodulation therapy (PBMT) has shown encouraging results in the treatment of hair loss. However, the mechanism by which PBMT controls cell behavior to coordinate hair cycle is unclear. Here, PBMT is found to drive quiescent hair follicle stem cell (HFSC) activation and alleviate hair follicle atrophy. Mechanistically, PBMT triggers a new hair cycle by upregulating Î²-CATENIN expression in HFSCs. Loss of Î²-Catenin (Ctnnb1) in HFSCs blocked PBMT-induced hair regeneration. Additionally, we show PBMT-induced reactive oxygen species (ROS) activate the PI3K/AKT/GSK-3Î² signaling pathway to inhibit proteasome degradation of Î²-CATENIN in HFSCs. Furthermore, PBMT promotes the expression and secretion of WNTs in skin-derived precursors (SKPs) to further activate the Î²-CATENIN signal in HFSCs. By contrast, eliminating ROS or inhibiting WNT secretion attenuates the activation of HFSCs triggered by PBMT. Collectively,

our work suggests that PBMT promotes hair regeneration through synergetic activation of Î²-CATENIN in HFSCs by ROS and paracrine WNTs by SKPs. Reactive Oxygen Species;beta Catenin;Glycogen Synthase Kinase 3 beta Alopecia;Animals;Female;Gene Expression Regulation;Gene Knockout Techniques;Glycogen Synthase Kinase 3 beta;Hair Follicle;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Phosphatidylinositol 3-Kinases;Reactive Oxygen Species;Regeneration;Stem Cells;Wnt Signaling Pathway;beta Catenin

Letter regarding "Photobiomodulation alters the viability of HUVEC cells". Cell Proliferation;Cell Survival;Human Umbilical Vein Endothelial Cells;Humans

Interventions for Trismus in Head and Neck Cancer Patients: A Systematic Review of Randomized Controlled Trials. BACKGROUND: Current treatment for head and neck cancers (HNCs) have led to an improved survival. However, the sequelae of cancer treatment often result in trismus, or reduced mouth opening. The purpose of this report is to identify interventional studies for trismus management in HNC patients. METHODS: A search of PubMed, Embase, Cumulated Index to Nursing and Allied Health Literature, and the Cochrane Library was conducted in March 2020 for randomized controlled trials (RCTs) involving interventions for trismus for head and neck cancer within 10â€‰years. Intervention could involve the use of an exercise regime, jaw rehabilitation device, technological device, medication or massage therapy. The primary outcome was the measurement of mouth opening. RESULTS: Eleven RCTs involving a total of 685 patients with HNC were included. Six RCTs evaluated the effectiveness of a jaw mobilization device with exercises; there was no significant benefit of an exercise regime with a jaw mobilization device either initiated before, during or after treatment compared to no exercise. Two RCTs compared 2 intervention groups that involved exercises only, with 1 study assessing the benefit of weekly supervised physical therapy with gum chewing and another evaluating the benefit of immediate (1-2â€‰days) versus delayed (7-10 days) initiation of exercise post-surgery; there was no significant difference between groups in either study. One RCT that recruited only patients with trismus demonstrated that an exercise regime in combination with low-level laser therapy or low-intensity ultrasound had superior results in mouth opening measurements compared to exercise alone. Two RCTs compared intervention groups with and without follow-up reminders; both studies showed a significant improvement in mouth opening measurements in groups with follow-up reminders. CONCLUSION: This systematic review did not convey a clear consensus as to optimal intervention for trismus in HNC patients. A variety of exercise regimens and jaw rehabilitation devices appear to have comparable effectiveness. However, efforts focused on increasing adherence to a particular intervention protocol may positively impact mouth opening measures in head and neck cancer patients. Also, low-level laser therapy and low-intensity ultrasound coupled with exercise may be beneficial for patients with trismus. Exercise Therapy;Head and Neck Neoplasms;Humans;Quality of Life;Randomized Controlled Trials as Topic;Trismus

Effects of Low Level Laser Therapy (LLLT) on Serum Values of Interleukin 6 (IL-6) in Patients with Periodontitis and Type 2 Diabetes Mellitus (T2DM). BACKGROUND: In patients with T2DM, the therapeutic effects of conservative treatment are quite limited, and there is a need for additional therapeutic procedures to achieve the desired satisfactory and solid effect. Low-level laser therapy (LLLT) has an anti-inflammatory effect, and is used to heal lesions. This mechanism is realized through inhibition of lipopolysaccharides (LPS), so it can be used in the treatment of periodontal disease in patients with diabetes. OBJECTIVE: The aim of this study is to assess the effect of level laser therapy (LLLT) on serum IL-6 values in patients with periodontitis and T2DM. METHODS: Patients at age between 35-60 years old, with chronic periodontitis (CH) where the clinical loss of attachment (CAL) was â‰¥4 mm therefore covering at least 50 % of affected teeth. In this study we included 80 patients, divided into two groups: 40 patients with type 2 diabetes mellitus (2TDM) treated with

conservative periodontal treatment supplemented with laser therapy (LLLT), group A, and 40 patients with 2TDM, conservatively treated without LLLT. therapy i.e. group B. The laser light was applied to the gingiva in separate quadrants in 5 sessions for the next five days in a row. Blood samples were taken from all subjects at the first treatment, then in 6 weeks and 3 months after treatment, and interleukin 6 (IL-6) levels were measured. The blood samples in the test tubes remained for about 30 minutes and were then distributed in a biochemical laboratory, where they were centrifuged at 6,000 rpm for 10 minutes. The serum was separated from the test tube and transferred to the eppendorph. All serum samples were stored at -80 Â° C until complete analysis and determination of IL-6, according to the standardized methodology. RESULTS: In group A, on the first examination serum IL-6 levels varies in the interval 11.54 Â± 1.11 pg / mL, after 6 weeks of therapy the values range between 11.26 Â± 0.77 pg / mL, and after 3 months of therapy levels oscillate at intervals of 11.02 Â± 0.67 pg / mL. In group B the findings are similar. At the first examination, the serum IL-6 values were 11.56 Â± 0.81 pg / mL, after 6 weeks of therapy ranged from 11.59 Â± 0.71 pg / mL, and after 3 months of therapy levels were recorded at intervals. 11.41 Â± 0.78 pg /mL. The serum IL-6 value after 6 weeks of therapy in patients in group B for $Z = -2.04$ and $p < 0.05$ ($p = 0.04$) was significantly higher than in patients in group A, while after 3 months of therapy in patients in group B for $Z = -2.42$ and $p < 0.05$ ($p = 0.02$) is significantly higher than the value in patients in group A. CONCLUSION: LLLT resulted in significantly reduced serum IL-6 values in patients with periodontitis and T2DM after 6 weeks and 3 months of therapy in which conservative treatment was supplemented with LLLT.

Low-power infrared laser modulates telomere length in heart tissue from an experimental model of acute lung injury. Acute lung injury and acute respiratory distress syndrome can occur as a result of sepsis. Cardiac dysfunction is a serious component of multi-organ failure caused by severe sepsis. Telomere shortening is related to several heart diseases. Telomeres are associated with the shelterin protein complex, which contributes to the maintenance of telomere length. Low-power infrared lasers modulate mRNA levels of shelterin complex genes. This study aimed to evaluate effects of a low-power infrared laser on mRNA relative levels of genes involved in telomere stabilization and telomere length in heart tissue of an experimental model of acute lung injury caused by sepsis. Animals were divided into six groups, treated with intraperitoneal saline solution, saline solution and exposed to a low-power infrared laser at 10 J cm(-2) and 20 J cm(-2), lipopolysaccharide (LPS), and LPS and, after 4 h, exposed to a low-power infrared laser at 10 J cm(-2) and 20 J cm(-2). The laser exposure was performed only once. Analysis of mRNA relative levels and telomere length by RT-qPCR was performed. Telomere shortening and reduction in mRNA relative levels of TRF1 mRNA in heart tissues of LPS-induced ALI animals were observed. In addition, laser exposure increased the telomere length at 10 J cm(-2) and modulated the TRF1 mRNA relative levels of at 20 J cm(-2) in healthy animals. Although the telomeres were shortened and mRNA levels of TRF1 gene were increased in nontreated controls, the low-power infrared laser irradiation increased the telomere length at 10 J cm(-2) in cardiac tissue of animals affected by LPS-induced acute lung injury, which suggests that telomere maintenance is a part of the photobiomodulation effect induced by infrared radiation. Lipopolysaccharides;RNA, Messenger Acute Lung Injury;Animals;Heart;Lasers;Lipopolysaccharides;RNA, Messenger;Sepsis;Telomere

Three-dimensional imaging and molecular analysis of the effects of photobiomodulation and mechanical vibration on orthodontic retention treatment in rats : Effects of photobiomodulation and mechanical vibration on orthodontic retention treatment. PURPOSE: We aimed to evaluate and compare effects of photobiomodulation (PBM) and low-magnitude high-frequency mechanical vibration (HFMV) on orthodontic retention. METHODS: Sixty-four female Wistar albino rats were divided into 9Â groups (2Â negative and positive controls each, 3Â PBM and 2Â HFMV groups) and studied for 25Â days. In the experimental groups, closed nickel-titanium closed coil springs with

aÂ 50â€¯cN force were placed for 10Â days between the maxillary incisor and molar. PBM and HFMV were applied daily over long- (15Â days) and short-term (7Â days) retention periods. The PBM groups received PBM with aÂ single wavelength (650â€¯nm) or higher wavelengths (532, 650, 940â€¯nm) for 9â€¯min per day. HFMV groups received HFMV of 10, 20, and 30â€¯Hz for 10â€¯min per day. Right and left maxilla were assessed using micro-computed tomography imaging and real-time polymerase chain reaction. The amount of tooth movement during the retention period, expression levels of cyclooxygenaseâ€‘2 (COX-2), osteoprotegerin (OPG), and receptor activator of nuclear factor-kappaÂ B ligand (RANKL) mRNA gene expression levels, OPG/RANKL ratios, alveolar bone trabecular thickness (Tb.Th), trabecular number (Tb.N), and structure model index were analyzed. Kruskal-Wallis and Mann-WhitneyÂ U tests were used for multiple comparisons of the nonparametric distributed data and binary comparisons, respectively. RESULTS: When using the long-term retention protocol, PBM and HFMV treatment increased Tb.N (pâ€¯<â€‰0.05) and decreased COXâ€‘2 mRNA gene expression levels (pâ€¯<â€‰0.05) and Tb.Th (pâ€¯<â€‰0.05) compared to controls. For short-term retention, PBM and HFMV decreased the amount of relapse tooth movement compared to controls. In addition, Tb.Th (pâ€¯<â€‰0.05) and the mRNA gene expression levels of COXâ€‘2 and RANKL (pâ€¯<â€‰0.05) were decreased. CONCLUSION: PBM and HFMV might be able to support retention after orthodontic tooth movement by reducing bone resorption and increasing bone quality. Osteoprotegerin;RANK Ligand;RNA, Messenger;Nickel;Titanium;Cyclooxygenase 2 Animals;Cyclooxygenase 2;Female;Imaging, Three-Dimensional;Nickel;Orthodontic Retainers;Osteoclasts;Osteoprotegerin;RANK Ligand;RNA, Messenger;Rats;Rats, Wistar;Titanium;Tooth Movement Techniques;Vibration;X-Ray Microtomography

Photodynamic Therapy and Photobiomodulation on Oral Lesion in Patient with Coronavirus Disease 2019: A Case Report. Objective: This article reports the case of a patient with oral manifestation of coronavirus disease 2019 (COVID-19) treated with photobiomodulation (PBM) and photodynamic therapy (PDT). Background: Some dermatological and oral mucosal lesions have recently been linked to severe acute respiratory syndrome coronavirus 2 infection. Methods: A 65-year-old female patient with a confirmed real-time reverse transcriptase-polymerase chain reaction diagnosis of COVID-19 presented with dry edematous lips, edema with mucosal desquamation, ulceration and blood crust on the inner aspect of the lips, gingival petechiae and erythematous and pseudomembranous lesions on the dorsum of the tongue. The treatment protocol was three sessions of antimicrobial PDT (aPDT) (660â€‰nm diode laser + methylene blue) to the lips and tongue, every 24â€‰h to control contamination, followed by PBM (low-power laser, 100â€‰mW, 2â€‰J/point) to the lips, tongue, and oral mucosa for additional four sessions every 24â€‰h. Results: Therapy association promoted pain control and healing of oral mucosal lesions in 7 days of treatment. Conclusions: PBM and aPDT could be an interesting approach to manage COVID-19 patients. Photosensitizing Agents;Methylene Blue Aged;COVID-19;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Methylene Blue;Mouth Diseases;Photochemotherapy;Photosensitizing Agents

Evaluating outcomes of pulsed dye laser therapy combined with intralesional triamcinolone injection after surgical removal of hypertrophic cesarean section scars. BACKGROUND: Recently, pulsed dye laser (PDL) combined with triamcinolone intralesional injection (TAILI) has been introduced for surgical scar prevention. However, little is known about this procedure's effectiveness in preventing hypertrophic scar following surgical scar removal. OBJECTIVES: This study aimed to evaluate the outcome of early intervention using PDL combined with TAILI after surgical removal of hypertrophic cesarean section (CS) scars. METHODS: The medical records of 35 patients who underwent early intervention using PDL and TAILI after removal of hypertrophic CS scars were retrospectively reviewed. The scars' average Vancouver Scar Scale (VSS) scores before scar removal and 3Â months after the final treatment were compared. RESULTS: The patients received 4.23 treatments on average

and were followed up for a mean period of 7.74Â months. The mean final VSS was 3.11Â Â±Â 1.52 and was significantly lower than that of the previous VSS (9.29Â Â±Â 1.74, pÂ =Â 0.000). VSS of the previous CS scar, and the presence or absence of keloid formation in other areas, was associated with treatment outcome (pÂ =Â 0.003 and 0.008, respectively). CONCLUSIONS: Early intervention using PDL combined with TAILI could prevent the recurrence or progression of hypertrophic CS scarring after surgical scar removal. Triamcinolone Cesarean Section;Cicatrix, Hypertrophic;Female;Humans;Injections, Intralesional;Keloid;Lasers, Dye;Low-Level Light Therapy;Pregnancy;Retrospective Studies;Treatment Outcome;Triamcinolone

EFFICACY OF LOW-LEVEL LASER THERAPY ON FISTULA-IN-ANO TREATMENT. BACKGROUND: Fistulous area being A control and B laser group: Arrows indicate fistulous tract much thinner in B. Treating anal fistulae is still a great challenge due to the possibility of fecal incontinence after surgery and that the use of laser has been gaining space in medicine, including as an inducing method of healing. AIM: To evaluate the efficacy of low-level laser therapy on fistula-in-ano treatment in rats. METHODS: Fifteen male Wistar rats weighing approximately 250-300g were used, which were subjected to the anal fistula induction procedure and after 30 days were distributed into two groups: control group (CG, n=5) and laser group (LG, n=10) observed for another 30 days. In the CG no treatment was performed and, in the LG, low-level laser therapy was applied in fistulous tracts daily. The closure of the fistulous tract, the area of the remaining tract, the inflammatory infiltrate and vascular congestion were evaluated. RESULTS: There was no complete closure of the tract in any of the animals. The mean area of the remaining tract was 847.2 Âµm2 in the CG and 248.5 Âµm2 in the LG (p=0.001). The mean inflammatory infiltrate score was 2.4 in the CG and 1.3 in the LG (p=0.0285), while in the evaluation of vascular congestion, 1.6 was observed in the CG and 0.6 in the LG (p=0.031). CONCLUSIONS: Low-level laser therapy was able to reduce the area of the fistulous tracts as well as decrease the inflammatory process and local vascular congestion. Anal Canal;Animals;Fecal Incontinence;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Rectal Fistula;Treatment Outcome;Wound Healing

Electromagnetic Dosimetry for Isolated Mitochondria Exposed to Near-Infrared Continuous-Wave Illumination in Photobiomodulation Experiments. This paper presents results on the electromagnetic field computed inside isolated mitochondria when they are exposed to near-infrared illuminations with reference to photobiomodulation experiments. The accurate calculation of the electromagnetic dose is considered to be important for a better understanding of the mechanism of interaction of light with these organelles and to improve the reliability and repeatability of the experiments. ToÂ get such results, we introduce several models. Even though they refer to a well-defined experimental setup, different models are necessary to take into accountÂ the possible different dispositions of the mitochondria, and of the differences in their dimensions and in their constitutive parameters. Different wavelengths and polarizations are considered as well. The effects of all parameters on the electromagnetic field inside mitochondria are discussed. Â© 2021 Bioelectromagnetics Society. Electromagnetic Fields;Infrared Rays;Lighting;Mitochondria;Radiometry;Reproducibility of Results

Clinical Practice Guideline for Physical Therapist Management of People With Rheumatoid Arthritis. OBJECTIVE: This guideline revises the 2008 Royal Dutch Society for Physical Therapy guideline for physical therapy for patients with rheumatoid arthritis (RA). METHOD: This revised guideline was developed according to the Appraisal of Guidelines for Research and Evaluation tool and the Guidelines International Network standards. A multidisciplinary guideline panel formulated clinical questions based on perceived barriers in current care. For every clinical question, a narrative or systematic literature review was undertaken, where appropriate. The guideline panel formulated recommendations based on the results of the literature reviews, the values and preferences of

patients and clinicians, and the acceptability, feasibility, and costs, as described in the Grading of Recommendations Assessment, Development and Evaluation evidence-to-decision framework. RESULTS: The eventual guideline describes a comprehensive assessment based on the International Classification of Functioning, Disability and Health Core Set for RA. It also includes a description of yellow and red flags to support direct access. Based on the assessment, 3 treatment profiles are distinguished: (1) education and exercise instructions with limited supervision, (2) education and short-term supervised exercise therapy, and (3) education and intensified supervised exercise therapy. Education includes RA-related information, advice, and self-management support. Exercises are based on recommendations concerning the desired frequency, intensity, type, and time-related characteristics of the exercises (FITT factors). Their interpretation is compliant with the individual patient's situation and with public health recommendations for health-enhancing physical activity. Recommended measurement instruments for monitoring and evaluation include the Patient-Specific Complaint instrument, Numeric Rating Scales for pain and fatigue, the Health Assessment Questionnaire Disability Index, and the 6-minute walk test. CONCLUSION: An evidence-based physical therapy guideline was delivered, providing ready-to-use recommendations on the assessment and treatment of patients with RA. An active implementation strategy to enhance its use in daily practice is advised. IMPACT: This evidence-based practice guideline guides the physical therapist in the treatment of patients with RA. The cornerstones of physical therapist treatment for patients with RA are active exercise therapy in combination with education. Passive interventions such as massage, electrotherapy, thermotherapy, low-level laser therapy, ultrasound, and medical taping play a subordinate role. Arthritis, Rheumatoid;Disability Evaluation;Humans;Pain Measurement;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Walk Test

Low-level laser therapy (LLLT) improves alveolar bone healing in rats. The main objective of the present study was to evaluate the effect of low-level laser therapy (LLLT) in enhancing bone healing in irradiated alveolus post-tooth extraction. Sixty male Wistar rats (180â€‰Â±â€‰10Â g) were used in the present study. The left maxillary first molars were extracted, and the alveolar region was irradiated by diode laser device (GaAlAs) immediately after extraction and for more 3-day daily applications. The animals were randomly assigned into two groups: control group (nâ€‰=â€‰30, with left maxillary molar extraction-CG) and experimental group (nâ€‰=â€‰30, with tooth extraction and low-level laser therapy applied to the dental alveolus for 42Â s-EG). These groups were divided into subgroups (five rats per subgroup) according to the observation time point-1, 2, 3, 5, 7, and 10Â days-post-tooth extraction. The maxillary bone was separated, and the specimens were stained with hematoxylin and eosin, Masson's trichrome, and picrosirius red and immunohistochemistry for RUNX-2. Parametric and nonparametric tests were used with a significance level of 5%. LLLT accelerated bone healing with mature collagen fiber bundles and early new bone formation. Histomorphometric analysis revealed an increase of osteoblast (RUNX-2) and osteoclast (TRAP) activity and in the area percentage of cancellous bone in the lased alveolus compared to the control group. This increase was statistically significant (pâ€‰<â€‰0.05). Application of LLLT with a GaAlAs diode laser device enhanced bone healing and mineralization on alveolar region. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tooth Extraction;Wound Healing

Photobiomodulation Enhances Memory Processing in Older Adults with Mild Cognitive Impairment: A Functional Near-Infrared Spectroscopy Study. BACKGROUND: Recent studies of photobiomodulation (PBM) in patients with cognitive or psychological disorders (including traumatic brain injury, stroke, and dementia) have yielded some encouraging results. OBJECTIVE: In this study, we aimed to investigate the effect of a single stimulation on memory in older adults with mild cognitive impairment (MCI). METHODS: After PBM, hemodynamic changes, as a measure of

functional brain activity, were evaluated using functional near-infrared spectroscopy (fNIRS). Eighteen subjects who met the criteria of MCI were randomly assigned to control and experimental groups. A single real or sham PBM session was administered to the forehead of each patient in the experimental and control groups, respectively. All subjects performed a visual memory span test before and after the stimulation, and their hemodynamic responses during the tasks were measured using fNIRS. RESULTS: The results showed that among the MCI subjects, only those who received PBM, but not those who received the sham stimulation, demonstrated significant improvement in the visual memory performance and a reduction in the hemodynamic response during the tasks. CONCLUSION: These findings suggest that PBM may reduce the cognitive efforts needed to complete tasks that require high memory loads, and thus improve the cognitive performance of individuals with MCI. Aged;Cognition;Cognitive Dysfunction;Female;Hemodynamics;Humans;Low-Level Light Therapy;Male;Memory, Short-Term;Neuropsychological Tests;Spectroscopy, Near-Infrared

Photobiomodulation Response From 660â€‰nm is Different and More Durable Than That From 980â€‰nm. BACKGROUND AND OBJECTIVES: Photobiomodulation (PBM) therapy uses light at various wavelengths to stimulate wound healing, grow hair, relieve pain, and more-but there is no consensus about optimal wavelengths or dosimetry. PBM therapy works through putative, wavelength-dependent mechanisms including direct stimulation of mitochondrial respiration, and/or activation of transmembrane signaling channels by changes in water activity. A common wavelength used in the visible red spectrum is ~660â€‰nm, whereas recently ~980â€‰nm is being explored and both have been proposed to work via different mechanisms. We aimed to gain more insight into identifying treatment parameters and the putative mechanisms involved. STUDY DESIGN/MATERIALS AND METHODS: Fluence-response curves were measured in cultured keratinocytes and fibroblasts exposed to 660 or 980â€‰nm from LED sources. Metabolic activity was assessed using the MTT assay for reductases. ATP production, a major event triggered by PBM therapy, was assessed using a luminescence assay. To measure the role of mitochondria, we used an ELISA to measure COX-1 and SDH-A protein levels. The respective contributions of cytochrome c oxidase and ATP synthase to the PBM effects were gauged using specific inhibitors. RESULTS: Keratinocytes and fibroblasts responded differently to exposures at 660â€‰nm (red) and 980â€‰nm (NIR). Although 980â€‰nm required much lower fluence for cell stimulation, the resulting increase in ATP levels was short-term, whereas 660â€‰nm stimulation elevated ATP levels for at least 24 hours. COX-1 protein levels were increased following 660â€‰nm treatment but were unaffected by 980â€‰nm. In fibroblasts, SDH-A levels were affected by both wavelengths, whereas in keratinocytes only 660â€‰nm light impacted SDH-A levels. Inhibition of ATP synthase nearly completely abolished the effects of both wavelengths on ATP synthesis. Interestingly, inhibiting cytochrome c oxidase did not prevent the rise in ATP levels in response to PBM treatment. CONCLUSION: To the best of our knowledge, this is the first demonstration of differing kinetics in response to PBM therapy at red versus NIR wavelength. We also found cell-type-specific differences in PBM therapy response to the two wavelengths studied. These findings confirm that different response pathways are involved after 660 and 980â€‰nm exposures and suggest that 660â€‰nm causes a more durable response.Â Â© 2021 Wiley Periodicals LLC. Electron Transport Complex IV Electron Transport Complex IV;Fibroblasts;Low-Level Light Therapy;Mitochondria;Wound Healing

Efficacy of Minoxidil Combined With Photobiomodulation for the Treatment of Male Androgenetic Alopecia. A Double-Blind Half-Head Controlled Trial. BACKGROUND: Androgenetic alopecia (AGA) is a hair loss disorder that frequently affects the male population. Conventional treatment modalities are limited to minoxidil, 5Î± reductase inhibitors, and hair transplantation procedures. The efficacy of low-level laser therapy (LLLT), also known as photobiomodulation, in the treatment of AGA has been reported, yet little is known about the outcomes of combining photobiomodulation with

other conventional therapies. OBJECTIVE: To evaluate hair growth improvement in males with AGA, during the administration of minoxidil with and without photobiomodulation, using a half-head model. STUDY DESIGN/MATERIALS AND METHODS: Twenty-one men with AGA agreed to undergo 12 minutes of low-level laser irradiation (using a modified CapelluxÂ®), followed by topical minoxidil application (1â€‰mlÂ of 5% solution), to the affected scalp two times per day for 6 months. The photobiomodulation devices were modified such that the left half emitted light, and the right half did not. Efficacy was assessed by blinded analyses of clinical photos and automated phototrichograms (TrichoscanÂ®) taken before treatment and after 3 and 6 months of therapy. RESULTS: None of the study participants experienced any adverse events. All patients showed improvements in hair coverage on both sides of the scalp at 3 and 6 months. On the side with combined treatments, the number of total hairs was significantly increased after 3 (Pâ€‰<â€‰0.001) and 6 months (Pâ€‰=â€‰0.001). A similar increase was also observed on theÂ minoxidil-only side, at both 3 (Pâ€‰<â€‰0.001) and 6 months (Pâ€‰<â€‰0.001). No statistically significant differences were detected between sides (Pâ€‰>â€‰0.05). CONCLUSION: Additional improvement was not observed with the association of photobiomodulation to topical minoxidil in male AGA. Differences from previous studies that might have influenced our result includeÂ non-collimated light source, higher dosimetry, and a cohort with darker skin phototype and more severe alopecia. Lasers Surg. Med. 2021. Â© 2021 Wiley Periodicals LLC. Minoxidil Alopecia;Double-Blind Method;Hair;Humans;Male;Minoxidil;Scalp;Treatment Outcome

Photobiomodulation Therapy for the Management of Patients With Inferior Alveolar Neurosensory Disturbance Associated With Oral Surgical Procedures: An Interventional Case Series Study. Introduction: Inferior alveolar nerve (IAN) injury is a serious complication during intraoral surgeries. We aimed to evaluate the outcome of photobiomodulation (PBM) therapy in patients with IAN injury associated with third molar or implant procedures. Methods: Eight patients with an alteration of sensory function of the IAN after third molar or implant surgeries were enrolled in this case series study. The patients received 10 sessions of PBM therapy (810 nm diode laser, 200 mW, 10 J/cm(2) per point, three times a week). Pinprick (PP) and visual analogue scale (VAS) neurosensory tests were recorded at each treatment session and 14 days after the last treatment. The association between explanatory variables and the outcome of interest was analyzed using generalized estimating equations. Results: The median percentage change of outcomes from the first to the last visit was as follows: VAS score: +125.00% (range: 50.00 to 166.67); PP score: +350% (range: 150 to 800). The duration of paresthesia was inversely correlated with changes in VAS and PP scores. No significant association was found between patients' gender or age and changes in VAS and PP scores. Conclusion: Considering the limitations of this study, PBM with the parameters used in this study presented positive effects on neurosensory recovery in patients suffering from IAN injury associated with routine intraoral procedures. Patients with shorter duration of paresthesia tended to respond more favorably to PBM therapy.

The Effect of High-Power and Low-Power Lasers on Symptoms and the Nerve Conduction Study in Patients With Carpal Tunnel Syndrome. A Prospective Randomized Single-Blind Clinical Trial. Introduction: Carpal tunnel syndrome (CTS) is the most common peripheral nerve entrapment. Various treatments have been suggested for CTS and there is no consensus on their superiority and the order of their use. Laser therapy is a non-invasive treatment method for many musculoskeletal diseases, including CTS. This study aimed to determine and compare the effect of high-power lasers (HPLs) and low-power lasers (LPLs) on pain severity, function, pinch strength, and nerve conduction study findings in patients aged 30-50 years with mild or moderate CTS. Methods: This is a prospective, randomized, single-blind clinical trial. The study population included 45 patients aged 30-50 years who came to the physical medicine and rehabilitation clinic of Shohada-e-Tajrish hospital

and mild or moderate CTS was confirmed for them. Patients were randomly assigned to control, LPL therapy, and HPL therapy groups. Pain, function, pinch strength, and nerve conduction study findings were recorded in all groups before, immediately and 12 weeks after the treatment. All data were compared using SPSS version 21. Results: All groups showed improvement regarding pain, function, and pinch strength. Laser therapy showed significantly better results compared to a wrist splint, but no significant difference was seen between high-power and LPL therapy groups. Nerve conduction evaluation findings did not reveal any significant difference. Conclusion: Both the wrist splint and laser therapy can improve the symptoms of carpal tunnel syndrome. HPL therapy showed better results, although not significantly different from LPL therapy.

Central Proteins of Plasma in Response to Low-Level Laser Therapy Involve in Body Hemostasis and Wound Repair. Introduction: Low-level laser therapy (LLLT) is accompanied by protein expression change in the body. There are many efforts to find a clear relationship between the differentially expressed proteins. This study aims to find the central differentiated expressed proteins of plasma after LLLT. Methods: Six proteins are extracted from a proteomics study and the network including these query proteins plus 100 first neighbors was constructed. The central proteins were determined based on degree value, betweenness centrality, closeness centrality (CC), and stress (The centrality parameters). Results: Among 106 nodes of the network, 10 proteins were characterized with the most values of degree, betweenness centrality, CC, and stress. These proteins were determined as central proteins in response to LLLT in plasma. Conclusion: Three query proteins, AHSG, FGG, and SERPINA1, plus 7 first neighbors, namely FGA, ALB, KNG1, FN1, APP, TIMP1, and F5, were identified as central proteins which were dysregulated.

Comparison of Single and Multiple Low-Level Laser Applications After Rapid Palatal Expansion on Bone Regeneration in Rats. Introduction: This study was performed to compare the effects of single and multiple irradiations of low-level laser therapy (LLLT) on bone regeneration in a mid-palatal suture following rapid palatal expansion (RPE). Methods: In this animal study, 40 male Wistar rats underwent RPE for 7 days and were divided into 4 groups including A: single LLLT on day 7, B: Multiple LLLT on days 7, 9, 11, 13 and 15, C: control (no LLLT), and D: sacrificed on day 7. Animals in group D were used to determine the amount of suture expansion. LLLT was done by a diode laser set at an 808 nm wavelength with a useful power output of 100 mW and duration of 0.1 ms. LLLT was applied to three points. After three weeks of retention, the rats were sacrificed and beheaded and the maxilla was evaluated by occlusal radiography, Âμ-CT, and histomorphometric analyses. A comparison of the mean measurements between the groups was performed using ANOVA and the Tukey post hoc test. Results: Based on occlusal radiography and ÂμCT, bone density in group B was significantly higher than group A and group C ($P<0.05$). There was no significant difference in bone density between group A and group C ($P>0.05$). Mean suture width (MSW) in group B was significantly lesser than the control group ($P=0.027$) while there was no significant difference between MSWnin groups A and B ($P=0.116$) and groups A and C ($P=0.317$). Conclusion: It may be concluded that multiple low-power laser irradiation improves bone regeneration after RPE while single irradiation does not have a positive effect.

The Effectiveness of Photobiomudulation Therapy (PBMT) in COVID-19 Infection. Introduction: Currently, the COVID-19 pandemic is an important health challenge worldwide. Due to the cytokine storm, the mortality rate in acute respiratory distress syndrome (ARDS) is high, but until now no therapy for these patients was approved. The aim of this review was to discuss the possible anti-inflammatory effect of photobiomodulation therapy (PBMT) on ARSD patients and present the potential role of low-level laser therapy (LLLT) in the improvement of respiratory symptoms associated with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Methods: Studies about PBMT in inflammation and ARSD patients were examined. A primary search with reviewing

English-language citations between 2005 and 2020 using the keywords COVID-19, ADRS, cytokine storm, low-level laser therapy, anti-inflammatory, and photobiomodulation was performed. The initial search yielded 818 articles; however, 60 articles were selected and discussed in the present study. Results: The results of the selected studies showed the usefulness of PBMT in the treatment of inflammation and ARSD in patients with COVID-19 infection. This therapy is non-invasive and safe to modulate the immune responses in ARSD patients. Conclusion: PBMT can potentially reduce the viral load and bacterial super-infections in patients with COVID-19 infection and control the inflammatory response. Therefore, the use of PBMT could be an efficient strategy for preventing severe and critical illness in SARS-COV2 infection.

Therapeutic Potential of Photobiomodulation In Alzheimer's Disease: A Systematic Review. Introduction: Alzheimer disease (AD) is characterized by the decline of cognitive functions such as learning and memory. Scientific society has proposed some non-pharmacological interventions, among which photobiomodulation has gained prominence for its beneficial effects. Therefore, we investigated, through systematic review, the therapeutic potential of photobiomodulation in AD. Methods: This systematic review was registered under the number CRD42019128416 in the International Prospective Record of Systematic Reviews (PROSPERO). A systematic search was conducted on the bibliographic databases (PubMed and ScienceDirect) with the keywords based on MeSH terms: "photobiomodulation therapy" or "low-level laser therapy" or "LLLT" or "light emitting diode" and "amyloid" or "Alzheimer". The data search was conducted from 2008 to 2019. We follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. The search strategy included experimental in vivo and in vitro studies in the English language and photobiomodulation as a non-pharmacological intervention. We included 10 studies, being 5 in vivo studies, 4 in vitro studies and 1 study using in vivo and in vitro. To evaluate the quality of the studies, we used the Rob tool of the Systematic Review Center for Laboratory Animal Experimentation (SYRLE). Results: The studies showed that photobiomodulation is able to reduce inflammatory response, oxidative stress and apoptotic effects generated by amyloid beta (AÎ²) and restore mitochondrial function and cognitive behavior. Conclusion: Taken together, these results indicate that photobiomodulation may be a useful tool for treating AD.

Therapeutic application of light and electromagnetic fields to reduce hyper-inflammation triggered by COVID-19. COVID-19 - related morbidity is associated with exaggerated inflammation and cytokine production in the lungs, leading to acute respiratory failure. The cellular mechanisms underlying these so-called 'cytokine storms' are regulated through the Toll-like receptor 4 (TLR4) signaling pathway and by ROS (Reactive Oxygen Species). Both light (Photobiomodulation) and magnetic fields (e.g., Pulsed Electro Magnetic Field) stimulation are noninvasive therapies known to confer anti-inflammatory effects and regulate ROS signaling pathways. Here we show that daily exposure to two 10-minute intervals of moderate intensity infra-red light significantly lowered the inflammatory response induced via the TLR4 receptor signaling pathway in human cell cultures. Anti-inflammatory effects were likewise achieved by electromagnetic field exposure of cells to daily 10-minute intervals of either Pulsed Electromagnetic Fields (PEMF), or to Low-Level static magnetic fields. Because current illumination and electromagnetic field therapies have no known side effects, and are already approved for some medical uses, we have here developed protocols for verification in clinical trials of COVID-19 infection. These treatments are affordable, simple to implement, and may help to resolve the acute respiratory distress of COVID-19 patients both in the home and in the hospital.

Effect of photobiomodulation in the patellofemoral pain syndrome; randomized clinical trial in young women. OBJECTIVE: patellofemoral pain syndrome (PFPS) is one of the most frequent musculoskeletal disorders in the knee joint, affecting mainly physically active adolescents and young

adults; its main symptom is pain. Physiotherapy has several therapeutic modalities aimed at pain relief, among which are photobiomodulation (PBM). The aim of the study was to analyze the effects of using PBM in cluster form (LaserÂ +Â LED) in patients with PFPS. PATIENTS AND METHODS: This study is characterized as quantitative, experimental, randomized, composed of 30 women with PFPS, randomized into two groups: Control Group (CG) and PBM Group (PBMG). Both groups underwent three evaluations: pre-intervention, post-intervention, and after one month of follow-up. Participants of the PBMG were presented to the application of the cluster device, three times a week, for four weeks. The intensity of spontaneous pain and movement were evaluated, knee function tests and function questionnaires. The results showed a reduction in pain only for the landing of the jump. As for the other variables there was no interaction of factors; the questionnaires used showed larger effect sizes for PBMG when compared to CG. It is possible to conclude that the use of PBM showed benefit in reducing pain at the time of landing of the jump and functional assessment questionnaires. Adolescent;Exercise Therapy;Female;Humans;Knee Joint;Pain Measurement;Patellofemoral Pain Syndrome;Physical Therapy Modalities;Young Adult

Effects of the infrared laser on classical ballerinas' feet: Analysis of plantar foot and static balance. BACKGROUND AND PURPOSE: Overuse injuries and painful symptoms in athletes and dancers (especially classical ballerinas) may lead to reduced functional performance. However, laser application may reduce pain and increase physical conditioning. The aim of the current study was to evaluate the immediate and long-term effects of infrared laser on classical ballerinas' feet. METHODS: Eight female adults who perform classical ballet training and feel pain in their foot, but report no injuries in the last 6 months participated in the study. Infrared laser (808Â nm) was applied on ballerina's feet twice a week during three months. The laser parameters utilized were 100Â mW average optical power and spot size of 0.04Â cm(2) applied during 1Â min, leading to 6Â J and 125Â J/cm(2) per point. Thermography, algometry and unipodal static standing balance test were performed. RESULTS: There was a significant increase in plantar arch temperature (1.6Â Â°C for center and 2.3Â Â°C for border, pÂ <Â 0.05) immediately after laser treatment for all ballerinas. The pressure pain thresholds (PPT) were significantly increased for 5 of 7 analyzed sites (pÂ <Â 0.05). Regarding to the static standing balance, the time on one-foot showed a significant increases (from 23Â Â±Â 12Â s to 34Â Â±Â 13Â s, pÂ <Â 0.05) only when the test was performed on the left foot (support foot). CONCLUSION: Then, there were pain relief and improvement of functional performance in ballerinas. The possible mechanism of laser action in reducing pain and thus enhancing performance, like higher blood flow of foot due to an increase of cutaneous temperature, will be discussed. Adult;Female;Foot;Humans;Pain;Pain Management;Postural Balance;Thermography

Photobiomodulation of oral fibroblasts stimulated with periodontal pathogens. Photobiomodulation (PBM) utilises light energy to treat oral disease, periodontitis. However, there remains inconsistency in the reporting of treatment parameters and a lack of knowledge as to how PBM elicits its molecular effects in vitro. Therefore, this study aimed to establish the potential immunomodulatory effects of blue and near infra-red light irradiation on gingival fibroblasts (GFs), a key cell involved in the pathogenesis of periodontitis. GFs were seeded in 96-well plates in mediaâ€‰+â€‰/â€‰-â€‰Escherichia coli lipopolysaccharide (LPS 1Â Î¼g/ml), or heat-killed Fusobacterium nucleatum (F. nucleatum, 100:1MOI) or Porphyromonas gingivalis (P. gingivalis, 500:1MOI). Cultures were incubated overnight and subsequently irradiated using a bespoke radiometrically calibrated LED array (400-830Â nm, irradiance: 24 mW/cm(2) dose: 5.76Â J/cm(2)). Effects of PBM on mitochondrial activity (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) and adenosine triphosphate (ATP) assays, total reactive oxygen species production (ROS assay) and pro-inflammatory/cytokine response (interleukin-8 (IL-8) and tumour growth factor-

Î²1 (TGFÎ²1)) were assessed 24Â h post-irradiation. Data were analysed using one-way ANOVA followed by the Tukey test. Irradiation of untreated (no inflammatory stimulus) cultures at 400Â nm induced 15%, 27% and 13% increases in MTT, ROS and IL-8 levels, respectively (pâ€‰<â€‰0.05). Exposure with 450Â nm light following application of P. gingivalis, F. nucleatum or LPS induced significant decreases in TGFÎ²1 secretion relative to their bacterially stimulated controls (pâ€‰<â€‰0.001). Following stimulation with P. gingivalis, 400Â nm irradiation induced 14% increases in MTT, respectively, relative to bacteria-stimulated controls (pâ€‰<â€‰0.05). These findings could identify important irradiation parameters to enable management of the hyper-inflammatory response characteristic of periodontitis. Lipopolysaccharides Cells, Cultured;Fibroblasts;Fusobacterium nucleatum;Gingiva;Humans;Lipopolysaccharides;Periodontitis;Porphyromonas gingivalis

Effectiveness of photobiomodulation therapy in radiation dermatitis: A systematic review and meta-analysis. PURPOSE: To evaluate the effectiveness of photobiomodulation therapy (PBMT) in the prevention and treatment of radiation dermatitis (RD). METHODS: A systematic review was conducted using seven databases and the gray literature. We performed a meta-analysis to summarize the effect sizes of response rates (RRs). RESULTS: We included seven clinical trials. Breast cancer patients receiving PBMT developed more grade 1 RD than the control group (RR 1.55, 95 % CI 1.14-2.10, I(2)â€¯=â€¯51 %). PBMT appears to prevent RD grade 2 (RR 0.33, 95 % CI 0.09-1.23, I(2)â€¯=â€¯85 %) and RD grade 3 (RR 0.21, 95 % CI 0.05-0.94, I(2)â€¯=â€¯0%) with very low certainty of evidence. CONCLUSIONS: There is very low certainty of evidence that PBMT was effective in the prevention of RD. However, PBMT showed a significant effect to prevent grade 3 RD in breast cancer patients. Thus, further randomized clinical trials are required to confirm the promising effect of PBMT in RD. Breast;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Radiodermatitis

Local application of low level laser therapy in mice ameliorates ovarian damage induced by cyclophosphamide. The aim of the present study is to assess whether low level laser therapy (LLLT) can protect ovaries from chemotherapy-induced gonadotoxicity using a mice model of premature ovarian failure induced by cyclophosphamide (CTX). LLLT (64Â J/cm(2)) increased the number of antral follicles whilst decreasing the number of atretic follicles compared to CTX alone. LLLT increased the number of primordial follicles compared with those in the CTX group but they did not differ from those in the control group. LLLT treatment increased the number of AMH-positive follicles compared to CTX alone. LLLT application increased ovarian weight, serum progesterone concentration and P450scc protein levels compared to CTX alone. LLLT reduced the apoptosis in antral follicles and the BAX/BCL-2 ratio compared to CTX alone. Vascular morphology, analysed by CD31 and Î±-SMA immunostaining, was restored in LLLT-treated ovaries compared to CTX alone. In conclusion, application of LLLT prior to CTX might serve as a promising and novel protocol to preserve female fertility in cancer survivors. Progesterone;Cyclophosphamide;Cytochrome P-450 Enzyme System Animals;Cyclophosphamide;Cytochrome P-450 Enzyme System;Disease Models, Animal;Female;Humans;Low-Level Light Therapy;Mice;Organ Size;Ovary;Primary Ovarian Insufficiency;Progesterone

Photo-crosslinking of hyaluronic acid with low-level laser therapy device: a new combined and innovative approach. Hyaluronic Acid Hyaluronic Acid;Low-Level Light Therapy

Role of Visible Light on Skin Melanocytes: A Systematic Review. In the last few years, the focus of phototherapy has shifted toward the visible (400-700Â nm) part of the electromagnetic spectrum of light. Lately, it has been demonstrated that visible light (VL) can have both beneficial and detrimental effects, especially on the skin. Previously and until now, the most harmful effects on the skin are associated with ultraviolet radiation (UVR). After exposure to natural light, the most evident and immediate change is observed on skin pigmentation. Various wavelengths within the visible spectrum

have been reported to alter skin pigmentation. However, the underlying mechanisms are incompletely understood so far. The article aims to shed light on the progress made in the photobiology field (photobiomodulation, PBM) to study the role of visible light on skin melanocytes. Melanocytes;Photobiology;Skin;Skin Pigmentation;Ultraviolet Rays

Effect of photobiomodulation in secondary intention gingival wound healing-a systematic review and meta-analysis. BACKGROUND: Photobiomodulation is widely being used to improve the wound healing process in dentistry and a vast majority of studies have proven its benefits. But there are plenty of knowledge gaps according to the optimal laser characteristics which should be used to maximize the healing effects of lasers. The goal of this systematic review and meta-analysis was to determine the effect of photobiomodulation (PBM) as an adjunctive treatment to periodontal therapies to evaluate secondary intention gingival wound healing and post-operative pain. METHODS: Five databases (PubMed, Embase, Scopus, ProQuest, and Web of Sciences) were searched up to November 30, 2020, for clinical trials that reported the result of the application of PBM on secondary gingival healing wounds and post-operative pain and discomfort after periodontal surgeries. Two independent reviewers selected the eligible studies and the outcomes of interest were extracted. The quality of eligible studies was assessed using the Cochrane Handbook for Systematic Reviews of Interventions. RESULTS: Ultimately, twelve studies were included in this review. The application of PBM as an adjunct to periodontal surgeries resulted in a significant improvement in wound healing indices. The Landry wound healing index at the 7th post-operative day was significantly improved (SMDâ€‰=â€‰1.044 [95% CI 0.62-1.46]; pâ€‰<â€‰0.01) in PBMâ€‰+â€‰surgery groups compared to the control groups. There was also a statistically significant increase in the complete wound epithelialization (RRâ€‰=â€‰3.23 [95% CI 1.66-6.31]; pâ€‰<â€‰0.01) at the 14th post-operative day compared to the control groups. The methods used to assess the post-operative pain were heterogeneous, and therefore the results were limited which made the meta-analysis for post-operative pain assessment not possible. CONCLUSION: Based on the results of this review, PBM can be effectively used as a method to improve secondary intention wound healing. High-quality randomized clinical trials, however, are needed in the future to identify the optimal PBM irradiation parameters and the effect of PBM on post-operative pain. Gingiva;Humans;Intention;Pain, Postoperative;Wound Healing

Photobiomodulation as an Adjunct Therapy in Wound Healing. "Light amplification by stimulated emission of radiation" or more commonly known as Laser has become very popular in the field of dermatology and aesthetic medicine over the past decades. For the treatment of wound healing, a combination of different wavelengths for laser therapy has been introduced which includes 660, 800, and 970â€…nm. The aim of this study was to note wound healing utilizing photobiomodulation as an adjunct therapy by measuring the wound size in terms of length and width (area measurement). Study participants were selected randomly from a pool of patients who were attending for their routine follow-up visits in the Wound Care Unit in Hospital Kuala Lumpur. Eleven patients with chronic wounds of different etiologies, ie, diabetic foot ulcer and nonhealing ulcer, were recruited for this study . Wound assessment was done prior to cleansing using distilled water and followed by debridement if necessary. Subsequently, the laser technician and patients used protective goggles before applying a super intense continuous flow of laser with 3 wavelengths, ie, 660, 800, and 970â€…nm with 30â€…kJ of energy with the handpiece over a 3â€…min period whereby it is focused on the wound milieu and then rotated around the periwound area. There were 9 diabetic foot ulcers and 2 nonhealing ulcers treated with photobiomodulation as an adjunct therapy. All wounds were managed with the standard of care. Three wounds ie, 3 diabetic foot ulcers and 1 nonhealing ulcer were closed completely. Meanwhile, the other 7 ulcers are at 68.2% to 99% in terms of wound area reduction and new granulomatous tissue was present indicating high healing potential. Therefore, the

photobiomodulation was effective as an adjunct in the management of diabetic foot and nonhealing ulcers in this case series. A larger sample size would be able to show the significance of this finding. Humans;Diabetic Foot;Wound Healing

Low-Level Light Therapy Downregulates Scalp Inflammatory Biomarkers in Men With Androgenetic Alopecia and Boosts Minoxidil 2% to Bring a Sustainable Hair Regrowth Activity. BACKGROUND AND OBJECTIVES: Low-level light therapies using visible to infrared light are known to activate several cellular functions, such as adenosine triphosphate and nitric oxide synthesis. However, few clinical observations report its biological consequences for skin and scalp homeostasis. Since scalp inflammation was recognized as a potential physiological obstacle to the efficacy of the reference hair regrowth drug Minoxidil in vivo and since perifollicular inflammation is the hallmark of about 50%-70% follicular units in androgenetic alopecia, we decided to investigate whether the anti-inflammatory activity of LLLT/GentleWavesÂ® device were assigned to L'OrÃ©al by Light BioScience L.L.C., Virginia Beach, VA (US) could enhance hair regrowth activity of Minoxidil. STUDY DESIGN/MATERIALS AND METHODS: We conducted a first experimental clinical study on 64 men with androgenetic alopecia using LLLT/GentleWavesÂ®, 590-nm predominant wavelength 70 seconds, specifically pulsed once per day, for 3 days, and we performed a whole-genome analysis of treated scalp biopsies. In a second clinical study, including 135 alopecic volunteers, we evaluated the hair regrowth activity in response to the upgraded LLLT/GentleWavesÂ® device and Minoxidil. RESULTS: In the first clinical study, whole-genome analysis of treated scalp biopsies showed downregulation of scalp inflammatory biomarkers, such as AP1/FOSB messenger RNA (mRNA) and mir21, together with the disappearance of CD69 mRNA, specific to scalp-infiltrating T cells of about 50% of the studied volunteers prior to the LLLT/GentleWavesÂ® treatment. In the second clinical study, we observed that LLLT/GentleWavesÂ® was able to boost the hair regrowth activity of a Minoxidil 2% lotion to the extent of the highest concentration (5%) in terms of efficacy, number of responders, and perceived performance. CONCLUSIONS: Altogether, these observations suggest the potential benefit of LLLT/GentleWavesÂ® as a noninvasive adjunctive technology for skin and scalp conditions, where a mild perifollicular inflammation is involved. Lasers Surg. Med. 2021. Copyright Â© 2021 Wiley Periodicals LLC. Biomarkers;MIRN21 microRNA, human;MicroRNAs;Minoxidil Alopecia;Biomarkers;Humans;Low-Level Light Therapy;Male;MicroRNAs;Minoxidil;Scalp;Treatment Outcome

Photobiomodulation and Antiviral Photodynamic Therapy in COVID-19 Management. Coronavirus disease 2019 (COVID-19) has shocked the world by its spread and contagiousness. There is no approved vaccine and no proven treatment for this infection. Some potential treatments that have already been associated with antiviral and anti-inflammatory effects are under investigation. Photobiomodulation therapy (PBMT) is a photon-based therapy that uses light to mediate a variety of metabolic, analgesic, anti-inflammatory, and immunomodulatory effects. Antiviral photodynamic therapy (aPDT) is a branch of photodynamic therapy based on the reaction between a photosensitizing agent and a light source in the presence of oxygen, which can produce oxidative and free radical agents to damage the viral structures such as proteins and nucleic acids. This chapter aims to discuss the potential therapeutic benefit of PBMT and aPDT in the context of the novel coronavirus. Studies indicate that PBMT and aPDT could be useful in many viral and bacterial pulmonary complications like influenza, SARS-CoV, and MERS, but we found no direct study on SARS-CoV-2. With a combination of PBMT and aPDT, we may be able to combat COVID-19 with minimal interference with pharmaceutical agents. It might improve the efficacy of PBMT and aPDT by using monoclonal antibodies and preparing new photosensitizers at the nanoscale that target the lung tissue specifically. More animal and human studies would need to take place to reach an effective protocol. This chapter would encourage other scientists to work on this new platform. Antiviral

Agents;Photosensitizing Agents Animals;Antiviral Agents;COVID-19;Humans;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2

Effects of intravascular laser phototherapy on delayed neurological sequelae after carbon monoxide intoxication as evaluated by brain perfusion imaging: A case report and review of the literature. BACKGROUND: Delayed neurological sequelae (DNS) caused by carbon monoxide (CO) intoxication poses considerable treatment challenges for clinical practitioners. In this report, we used nuclear medicine imaging and the Mini-Mental State Examination (MMSE) to evaluate the effectiveness of intravascular laser irradiation of blood (ILIB) therapy for the management of DNS. CASE SUMMARY: A 51-year-old woman presented to our medical center experiencing progressive bradykinesia, rigidity of limbs, gait disturbance, and cognitive impairment. Based on her neurological deficits, laboratory tests and imaging findings, the patient was diagnosed with delayed neurological sequelae of CO intoxication. She received intensive rehabilitation and ILIB therapy during 30 sessions over 2 mo after diagnosis. Brain single-photon emission computed tomography was performed both prior to and after ILIB therapy. The original hypoperfusion area in bilateral striata, bilateral frontal lobe, right parietal lobe, and bilateral cerebellum showed considerable improvement after completion of therapy. The patient's MMSE score also increased markedly from 6/30 to 25/30. Symptoms of DNS became barely detectable, and the woman was able to carry out her daily living activities independently. CONCLUSION: ILIB therapy could facilitate recovery from delayed neurological sequelae in patients with CO intoxication, as demonstrated by improved cerebral blood flow and functional outcomes in our patient.

Transcranial Photobiomodulation of Clearance of Beta-Amyloid from the Mouse Brain: Effects on the Meningeal Lymphatic Drainage and Blood Oxygen Saturation of the Brain. Here, we demonstrate the therapeutic effects of transcranial photobiomodulation (tPBM, 1267Â nm, 32Â J/cm(2), a 9-day course) in mice with the injected model of Alzheimer's disease (AD) associated with accumulation of beta-amyloid (AÎ²) in the brain resulting in neurocognitive deficit vs. the control group (CG) (the neurological severity score (NNS), AD 3.67Â Â±Â 0.58 vs. CG 1.00Â Â±Â 0.26%, pÂ <Â 0.05) and mild cerebral hypoxia (AD 72Â Â±Â 6% vs. CG 97Â Â±Â 2%, pÂ <Â 0.001). The course of tPBM improved neurocognitive status of mice with AD (NNS, AD 2.03Â Â±Â 0.14 vs. CG 1.00Â Â±Â 0.26, vs. 2.03Â Â±Â 0.14, pÂ <Â 0.05) due to stimulation of clearance of AÎ² from the brain via the meningeal lymphatic vessels (the immunohistochemical and confocal data) and an increase in blood oxygen saturation of the brain tissues (the pulse oximetry data) till 85Â Â±Â 2%, pÂ <Â 0.05. These results open breakthrough strategies for non-pharmacological therapy of AD and clearly demonstrate that tPBM might be a promising therapeutic target for preventing or delaying AD based on stimulation of oxygenation of the brain tissues and activation of clearance of toxic molecules via the cerebral lymphatics. Amyloid beta-Peptides;Oxygen Alzheimer Disease;Amyloid beta-Peptides;Animals;Brain;Mice;Mice, Transgenic;Oximetry;Oxygen

Assessment of the tongue frenulum in Beckwith-Wiedemann syndrome: Pre- and post-frenectomy findings. AIM: To report the pre- and post-frenectomy findings of a patient with Beckwith-Wiedemann syndrome. METHODS AND RESULTS: Clinical case report of a patient with a confirmed genetic-molecular diagnosis of the referred syndrome. The minor was evaluated and reassessed by the protocol for the evaluation of the tongue's frenulum for babies in two moments: pre-surgical and 2 months after the frenectomy. The surgical procedure was performed using the traditional technique and, after the procedure, the minor was breastfed and received photobiomodulation with a red laser. The minor obtained 16 points in the neonatal tongue screening test, indicating the need for a frenectomy. Thus, she was referred to a dentist for surgery. After the surgical procedure, macroglossia was observed as a maternal complaint (previously not mentioned). The wound healing was satisfactory, and the total score obtained in the reapplication of the protocol (five points)

showed functional results of improvements in sucking and tongue mobility, justifying the importance of the frenectomy. CONCLUSION: Frenectomy, despite showing macroglossia related to the Beckwith-Wiedemann syndrome, allowed anatomical and functional advances of the tongue in the present clinical case. Beckwith-Wiedemann Syndrome;Female;Glossectomy;Humans;Infant;Infant, Newborn;Macroglossia;Tongue;Tongue Diseases

Early cases of acute infectious respiratory syndrome treated with photobiomodulation, diagnosis and intervention: Two case reports. PBMT using 630Â +Â 660Â nm wavelengths transcutaneously at 7Â cm above chest area irradiating lungs and heart regions of patients with acute, infectious respiratory syndrome alleviated their respiratory symptoms, mitigated pulmonary inflammation and hypoxia. PBMT could prevent more severe respiratory distress requiring emergency care and reduce the strain on healthcare. This case report's clinical experience can be the basis of future research evaluating oxygen saturation levels pre- and post-PBMT.

Combination treatment of dendrosomal nanocurcumin and low-level laser therapy develops proliferation and migration of mouse embryonic fibroblasts and alter TGF-Î², VEGF, TNF-Î± and IL-6 expressions involved in wound healing process. INTRODUCTION: Pressure ulcer (PU) is known as the third most costly disorder usually caused by prolonged pressure and stagnation in various parts of the body. Although several therapeutic approaches are employing, obstacles in appropriate healing for skin lesions still exist which necessitates new practical alternative or adjunctive treatments. Low level laser therapy (LLLT) as one of the mentioned new strategies have gained attention. Besides, curcumin is an herbal medicine extracted from turmeric with anti-inflammatory and antioxidative properties with promising beneficial therapeutic effects in wound healing. Employing dendrosomal nanoparticles, we overcome the hydrophobicity of curcumin in the present study. We hypothesized that combination treatment of DNC+LLLT (450 nm) simultaneously may promote the wound healing process. MATERIAL AND METHODS: MTT assay, PI staining followed by flowcytometry, scratch assay and intracellular ROS measurement were used to investigate the effects caused by DNC and LLLT (450 nm) alone and in combination, on proliferation, cell cycle, migration and oxidative stress mouse embryonic fibroblast cells, respectively. The levels of growth factors and pro-inflammatory cytokines were evaluated by qRT-PCR and ELISA. RESULTS: Our results indicated that combination exposure with DNC and LLLT leads to increased proliferation and migration of MEFs as well as being more efficient in significantly upregulating growth factors (TGF-Î², VEGF) and decline in inflammatory cytokines (TNF-Î±, IL-6). Moreover, findings of this research provide persuasive support for the notion that DNC could reduce the LLLT-induced enhancement in intracellular ROS in mouse embryonic fibroblasts. CONCLUSION: Concurrent exposure to anti-oxidant concentrations of DNC and LLLT enriched S phase entry and therefor increased proliferation as well as migration on MEFs through regulating the expression levels growth factors and shortening the inflammatory phase by modulating of cytokines. It should be noted that DNC were able to reduce the laser-induced oxidative stress, during wound healing, representing an informative accompaniment with LLLT. Dendrimers;Interleukin-6;Transforming Growth Factor alpha;Transforming Growth Factor beta;Vascular Endothelial Growth Factor A;Curcumin Animals;Apoptosis;Cell Line, Tumor;Cell Movement;Cell Proliferation;Curcumin;Dendrimers;Fibroblasts;Gene Expression Regulation, Neoplastic;Interleukin-6;Low-Level Light Therapy;Mice;Nanoparticles;Transforming Growth Factor alpha;Transforming Growth Factor beta;Vascular Endothelial Growth Factor A

Transcranial photobiomodulation prevents PTSD-like comorbidities in rats experiencing underwater trauma. Maladaptive fear memory processing after a traumatic event is a major contributor to the development of the comorbidities related to posttraumatic stress disorder (PTSD). An intervention to normalize this process could be a first-line treatment to prevent PTSD development. However, little progress has been made in identifying interventions that can prevent trauma survivors

from developing PTSD. A treatment that could help trauma survivors cope with traumatic memories and decrease the prevalence of PTSD is thus in high demand. This study was designed to investigate the potential beneficial effects of early photobiomodulation (PBM) interventions to prevent PTSD-like comorbidities in animals. PTSD-like comorbidities in rats were induced by an underwater trauma (UWT) procedure, followed by multiple swimming sessions on later days for memory recall. Immediately after UWT and swimming, rats were restrained with or without PBM treatment (808â€‰nm, 25â€‰mW/cm(2), 3â€‰J/day). PTSD-like commodities, such as anxiety-like behavior, depression-like behavior, and cognitive dysfunction, were reproduced in UWT-rats. These comorbidities, however, could be prevented by early PBM interventions. By measuring the expression of immediate early genes (IEGs) as neuronal activity markers, we found that PBM treatment differentially regulated Arc and c-fos expression in the hippocampus and amygdala, two PTSD-related brain regions. Additionally, PBM boosted ATP production and regulated protein expression in the hippocampus following stress. Our results demonstrate that PBM can modulate brain activity in response to traumatic and stressful events and that early PBM intervention can prevent the occurrence of PTSD-like comorbidities in rats.
Animals;Anxiety;Comorbidity;Fear;Memory;Rats;Stress Disorders, Post-Traumatic

Photobiomodulation therapy promotes the ATP-binding cassette transporter A1-dependent cholesterol efflux in macrophage to ameliorate atherosclerosis. Atherosclerosis is a chronic inflammatory disease related to a massive accumulation of cholesterol in the artery wall. Photobiomodulation therapy (PBMT) has been reported to possess cardioprotective effects but has no consensus on the underlying mechanisms. Here, we aimed to investigate whether PBMT could ameliorate atherosclerosis and explore the potential molecular mechanisms. The Apolipoprotein E (ApoE)(-/-) mice were fed with western diet (WD) for 18Â weeks and treated with PBMT once a day in the last 10Â weeks. Quantification based on Oil red O-stained aortas showed that the average plaque area decreased 8.306Â Â±Â 2.012% after PBMT (PÂ <Â .05). Meanwhile, we observed that high-density lipoprotein cholesterol level in WDÂ +Â PBMT mice increased from 0.309Â Â±Â 0.037 to 0.472Â Â±Â 0.038Â nmol/L (PÂ <Â .05) compared with WD mice. The further results suggested that PBMT could promote cholesterol efflux from lipid-loaded primary peritoneal macrophages and inhibit foam cells formation via up-regulating the ATP-binding cassette transporters A1 expression. A contributing mechanism involved in activating the phosphatidylinositol 3-kinases/protein kinase C zeta/specificity protein 1 signalling cascade. Our study outlines that PBMT has a protective role on atherosclerosis by promoting macrophages cholesterol efflux and provides a new strategy for treating atherosclerosis. ABCA1 protein, mouse;ATP Binding Cassette Transporter 1;Cholesterol ATP Binding Cassette Transporter 1;Animals;Atherosclerosis;Cholesterol;Low-Level Light Therapy;Macrophages;Male;Mice;Mice, Inbred C57BL;Mice, Knockout, ApoE

Photobiomodulation of mineralisation in mesenchymal stem cells. Mesenchymal stem cells (MSCs) and photobiomodulation (PBM) both offer significant therapeutic potential in regenerative medicine. MSCs have the ability to self-renew and differentiate; giving rise to multiple cellular and tissue lineages that are utilised in repair and regeneration of damaged tissues. PBM utilises light energy delivered at a range of wavelengths to promote wound healing. The positive effects of light on MSC proliferation are well documented; and recently, several studies have determined the outcomes of PBM on mineralised tissue differentiation in MSC populations. As PBM effects are biphasic, it is important to understand the underlying cellular regulatory mechanisms, as well as, provide accurate details of the irradiation conditions, to optimise and standardise outcomes. This review article focuses on the use of red, near-infra-red (R/NIR) and blue wavelengths to promote the mineralisation potential of MSCs; and also reports on the possible molecular mechanisms which underpin transduction of these effects. A variety of potential photon absorbers have been identified which are

reported to mediate the signalling mechanisms, including respiratory chain enzymes, flavins, and cryptochromes. Studies report that R/NIR and blue light stimulate MSC differentiation by enhancing respiratory chain activity and increasing reactive oxygen species levels; however, currently, there are considerable variations between irradiation parameters reported. We conclude that due to its non-invasive properties, PBM may, following optimisation, provide an efficient therapeutic approach to clinically support MSC-mediated hard tissue repair. However, to optimise application, further studies are required to identify appropriate light delivery parameters, as well as elucidate the photo-signalling mechanisms involved. Humans;Infrared Rays;Low-Level Light Therapy;Mesenchymal Stem Cells

Noninvasive management of soft tissue disorders of the shoulder: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. OBJECTIVES: Objective of this study is to develop an evidence-based guideline for the noninvasive management of soft tissue disorders of the shoulder (shoulder pain), excluding major pathology. METHODS: This guideline is based on high-quality evidence from seven systematic reviews. Multidisciplinary experts considered the evidence of effectiveness, safety, cost-effectiveness, societal and ethical values, and patient experiences when formulating recommendations. Target audience is clinicians; target population is adults with shoulder pain. RESULTS: When managing patients with shoulder pain, clinicians should (a) rule out major structural or other pathologies as the cause of shoulder pain and reassure patients about the benign and self-limited nature of most soft tissue shoulder pain; (b) develop a care plan in partnership with the patient; (c) for shoulder pain of any duration, consider low-level laser therapy; multimodal care (heat/cold, joint mobilization, and range of motion exercise); cervicothoracic spine manipulation and mobilization for shoulder pain when associated pain or restricted movement of the cervicothoracic spine; or thoracic spine manipulation; (d) for shoulder pain >3-month duration, consider stretching and/or strengthening exercises; laser acupuncture; or general physician care (information, advice, and pharmacological pain management if necessary); (e) for shoulder pain with calcific tendinitis on imaging, consider shock-wave therapy; (f) for shoulder pain of any duration, do not offer ultrasound; taping; interferential current therapy; diacutaneous fibrolysis; soft tissue massage; or cervicothoracic spine manipulation and mobilization as an adjunct to exercise (i.e., range of motion, strengthening and stretching exercise) for pain between the neck and the elbow at rest or during movement of the arm; (g) for shoulder pain >3-month duration, do not offer shock-wave therapy; and (h) should reassess the patient's status at each visit for worsening of symptoms or new physical, mental, or psychological symptoms, or satisfactory recovery. CONCLUSIONS: Our evidence-based guideline provides recommendations for non-invasive management of shoulder pain. The impact of the guideline in clinical practice requires further evaluation. SIGNIFICANCE: Shoulder pain of any duration can be effectively treated with laser therapy, multimodal care (i.e., heat/cold, joint mobilization, range of motion exercise), or cervicothoracic manipulation and mobilization. Shoulder pain (>3Â months) can be effectively treated with exercises, laser acupuncture, or general physician care (information, advice, and pharmacological pain management if necessary). Adult;Exercise Therapy;Humans;Ontario;Range of Motion, Articular;Shoulder;Shoulder Pain

The Pendulum Should Swing Back: Combination Full-Field Erbium Doped Yttrium Aluminum Garnet and Fractional Ablative Lasers for Photoaging. yttrium-aluminum-garnet;Yttrium;Aluminum Aged;Aluminum;Cosmetic Techniques;Dose Fractionation, Radiation;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Aging;Yttrium

A systematic review and meta-analysis of the effect of photodynamic therapy for the treatment of oral mucositis. BACKGROUND: Oral mucositis is a significant reaction to antineoplastic treatment characterized with pain, nutritional compromise, impact on the quality of life, interruption in cancer

therapy and risk for infection. There is no effective standard protocol for the treatment of oral mucositis. This study aims to synthesize the scientific evidence available about the effects of photodynamic therapy on treatment of oral mucositis. METHODS: PubMed, Scopus, Web of Science, Science Direct, Scielo, Embase and Cochrane libraries were searched. Two independent and calibrated researchers (kappa = 0.92) performed all systematic steps according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). To access the risk of bias, RoB 2 and Delphi list criteria for clinical trials were used. Meta-analysis was conducted using the R software with "META" package. RESULTS: Clinical and randomized clinical trials were included with a total of five articles. Meta-analysis, level of evidence, and risk of bias assessment were performed showing that photodynamic therapy was effective in reducing healing time in association with low-power laser therapy when compared to low-power laser therapy alone (p = 0.0005). CONCLUSION: Photodynamic therapy presents promising results for the treatment of oral mucositis. It may be an effective therapeutic option, contributing to the healing of injured tissues especially in the time needed for repair. Antineoplastic Agents;Photosensitizing Agents Antineoplastic Agents;Humans;Photochemotherapy;Photosensitizing Agents;Quality of Life;Stomatitis

Fluorescent light energy combined with systemic isotretinoin: A 52-week follow-up evaluating efficacy and safety in treatment of moderate-severe acne. Fluorescent light energy therapy combined with low-dose isotretinoin or tetracycline show remarkable clinical effect on 12 cases of moderate-to-severe acne. Treatment was considered safe, well-tolerated, and highly efficacious.

Photobiomodulation Therapy for Dementia: A Systematic Review of Pre-Clinical and Clinical Studies. BACKGROUND: Photobiomodulation (PBM) involves the use of red and/or near-infrared light from lasers or LEDs to improve a wide range of medical disorders. Transcranial PBM, sometimes accompanied by intranasal PBM, has been tested to improve many brain disorders, including dementia. OBJECTIVE: To conduct a systematic review according to PRISMA guidelines of pre-clinical and clinical studies reporting the use of PBM, which were considered relevant to dementia. METHODS: Literature was searched between 1967 and 2020 using a range of keywords relevant to PBM and dementia. The light source and wavelength(s), output power, irradiance, irradiation time, fluence or total energy (dose), operation mode (continuous or pulsed) irradiation, approach and site, number of treatment sessions, as well as study outcome(s) were extracted. RESULTS: Out of 10,473 initial articles, 36 studies met the inclusion criteria. Nine articles reported in vitro studies, 17 articles reported studies in animal models of dementia, and 10 studies were conducted in dementia patients. All of the included studies reported positive results. The clinical studies were limited by the small number of patients, lack of placebo controls in some instances, and only a few used objective neuroimaging methods. CONCLUSION: The preliminary evidence of clinical benefit, the lack of any adverse effects, and the remarkable ease of use, suggest larger clinical trials should be conducted as soon as possible. Animals;Clinical Studies as Topic;Dementia;Humans;Low-Level Light Therapy;Models, Animal

Comparative assessment of low-level laser therapy (LLLT) vs. topical application of amlexanox + lidocaine to treat recurrent aphthous ulcers (RAUs): A randomized controlled trial. Background. The present study aimed to assess and compare the pain perception and ulcer sizes before and after applying low-level laser therapy (LLLT) and Amlexanox + lidocaine. Methods. Twenty-six patients referring to the out-patient department of the institution and diagnosed with recurrent aphthous ulcers (RAU) were assigned to two groups to receive either LLLT or Amlexanox + lidocaine. In group 1, the patients were provided with amlexanox + lidocaine to apply topically four times daily. In group 2, the patients underwent LLLT with no tissue contact in inward circular motions for two cycles for 30 seconds. This study was registered in "the Clinical Trials Registry- India" (CTRI), with the registration number CTRI/2019/09/028222. The data were analyzed with SPSS 16. Results. The intergroup

comparison was performed using Mann-Whitney U test, and intragroup comparisons were made using Wilcoxon's signed-rank test. The level of significance was set at P <0.05. The results showed that pain perception and ulcer size were significantly lower in group 2 subjects than group 1 subjects (P <0.05). Conclusion. LLLT was more effective than amlexanox + lidocaine in the management of RAU. It is a cost-effective therapy for treating RAU.

Mechanisms of PhotoBioModulation (PBM) focused on oral mucositis prevention and treatment: a scoping review. BACKGROUND: Oral mucositis (OM) is a severe complication cancer patients undergo when treated with chemoradiotherapy. Photobiomodulation (PBM) therapy also known as low-level laser therapy has been increasingly used for the treatment of such oral toxicity. The aim of this review is to discuss the mechanisms of photobiomodulation (PBM) regarding OM prevention and treatment, and more precisely to focus on the effect of PBM on tumor and healthy cells. METHODS: MEDLINE/PubMed, and google scholar were searched electronically. Selected studies were focusing on PBM effects on tumor and healthy cells. RESULTS: PBM interactions with the tissue and additional mechanism in OM therapy were detailed in this review. Moreover, this review highlighted a controversy about the carcinogenic effect of PBM. Indeed, Many studies reported that PBM could enhance malignant cell proliferation; suggesting that PBM would have no protective effect. In addition to acting on cancer cells, PBM may damage healthy cells. CONCLUSION: More prospective studies are needed to assess the effect of PBM on cancer cells in order to improve its use for OM prevention and treatment. Chemoradiotherapy;Humans;Low-Level Light Therapy;Neoplasms;Prospective Studies;Stomatitis

The Use of a Light-Emitting Diode Device for Neck Rejuvenation and Its Safety on Thyroid Glands. Home-use light-emitting diodes (LEDs) are attracting growing attention regarding their anti-aging effects. Although most previous studies on the use of LED devices as a form of low-level laser therapy reported no significant adverse events, questions regarding the safety of using a light source on secretory tissues have been raised. This study aimed to assess the safety and efficacy of a home-use LED device for neck skin rejuvenation, particularly regarding its effect on thyroid gland morphology and function. Thyroid function tests and ultrasonographic analyses showed no significant changes after 16 weeks of LED use. Evaluation using the Lemperle wrinkle scale and global improvement scales by both investigators and subjects showed significant improvement after 16 weeks of daily application, as well as 8 weeks after discontinuation. Biophysical parameters, such as hydration, elasticity, and density, also showed significant improvements. Hence, the long-term use of the LED device was safe and effective for neck rejuvenation, and showed no significant side effects on the adjacent thyroid and parathyroid glands.

Mitochondrial Bioenergetic, Photobiomodulation and Trigeminal Branches Nerve Damage, What's the Connection? A Review. BACKGROUND: Injury of the trigeminal nerve in oral and maxillofacial surgery can occur. Schwann cell mitochondria are regulators in the development, maintenance and regeneration of peripheral nerve axons. Evidence shows that after the nerve injury, mitochondrial bioenergetic dysfunction occurs and is associated with pain, neuropathy and nerve regeneration deficit. A challenge for research is to individuate new therapies able to normalise mitochondrial and energetic metabolism to aid nerve recovery after damage. Photobiomodulation therapy can be an interesting candidate, because it is a technique involving cell manipulation through the photonic energy of a non-ionising light source (visible and NIR light), which produces a nonthermal therapeutic effect on the stressed tissue. METHODS: The review was based on the following questions: (1) Can photo-biomodulation by red and NIR light affect mitochondrial bioenergetics? (2) Can photobiomodulation support damage to the trigeminal nerve branches? (preclinical and clinical studies), and, if yes, (3) What is the best photobiomodulatory therapy for the recovery of the trigeminal nerve branches? The papers were searched using the PubMed, Scopus and Cochrane

databases. This review followed the ARRIVE-2.0, PRISMA and Cochrane RoB-2 guidelines. RESULTS AND CONCLUSIONS: The reliability of photobiomodulatory event strongly bases on biological and physical-chemical evidence. Its principal player is the mitochondrion, whether its cytochromes are directly involved as a photoacceptor or indirectly through a vibrational and energetic variation of bound water: water as the photoacceptor. The 808-nm and 100 J/cm(2) (0.07 W; 2.5 W/cm(2); pulsed 50 Hz; 27 J per point; 80 s) on rats and 800-nm and 0.2 W/cm(2) (0.2 W; 12 J/cm(2); 12 J per point; 60 s, CW) on humans resulted as trustworthy therapies, which could be supported by extensive studies. Animals;Energy Metabolism;Humans;Low-Level Light Therapy;Mitochondria;Nerve Regeneration;Recovery of Function;Trigeminal Nerve Injuries

Correction to: Impact of pandemic COVID-19 outbreak on oral mucositis preventive and treatment protocols: new perspectives for extraoral photobiomodulation therapy.

Oxidative stress is involved in LLLT mechanism of action on skin healing in rats. The skin injury healing process involves the main phases of homoeostasis, inflammation, proliferation, and remodeling. The present study aimed to analyze the effects of low-level laser therapy (LLLT) on hematological dynamics, oxidative stress markers, and its relation with tissue healing following skin injury. Wistar rats were divided into control, sham, skin injury, and skin injury LLLT. The biochemical and morphological analyses were performed in the inflammatory (1 and 3 days) and regenerative phases (7, 14, and 21 days) following injury. The skin injury was performed in the dorsal region, between the intrascapular lines, using a surgical punch. LLLT (Al-Ga-In-P, Î»=660 nm, energy density of 20 J/cm2, 30 mW power, and a time of 40 s) was applied at the area immediately after injury and on every following day according to the experimental subgroups. LLLT maintained hematocrit and hemoglobin levels until the 3rd day of treatment. Surprisingly, LLLT increased total leukocytes levels compared to control until the 3rd day. The effects of LLLT on mitochondrial activity were demonstrated by the significant increase in MTT levels in both inflammatory and regenerative phases (from the 1st to the 7th day), but only when associated with skin injury. The results indicated that LLLT modulated the inflammatory response intensity and accelerated skin tissue healing by a mechanism that involved oxidative damage reduction mostly at early stages of skin healing (inflammatory phase). Animals;Laser Therapy;Low-Level Light Therapy;Oxidative Stress;Rats;Rats, Wistar;Wound Healing

Outcomes of Mandibular Overdentures Supported by Four Short Implants Combined with Photobiomodulation Therapy. PURPOSE: The aim of this study was to clinically and radiographically evaluate mandibular overdentures supported by four short implants combined with two different doses of photobiomodulation (PBM). MATERIALS AND METHODS: A split-mouth design was applied; six completely edentulous male subjects received four short implants in the canine and second premolar area. Short implants were inserted via a digital fully guided approach with a stereolithographic surgical guide. All patients received five PBM sessions immediately after surgery and every 48 hours. Group A (n = 6) implants on the right side received a dose of 3.75 J/cm(2), and group B (n = 6) implants on the left side received a dose of 7.5 J/cm(2). Evaluation of peri-implant probing depth (PIPD), modified Gingival Index (MGI), and vertical bone loss was performed at the time of prosthetic loading and 6 and 12 months later. The implant stability quotient (ISQ) was also assessed 6 and 12 months after loading. RESULTS: There was no significant difference between both groups regarding PIPD values. However, a minor but significant increase from the baseline ($P < .001$) was observed in PIPD values in both groups after 12 months. The MGI scores at the different time intervals were very low for both groups. The mean vertical bone loss after 12 months was minimal for both groups but statistically significant from the baseline ($P < .001$). ISQ values for both groups after 12 months revealed a significant increase from the baseline, and group B values were significantly higher than those of group A. CONCLUSION: Within the limitations of this study, a mandibular

overdenture supported by four short implants is a valid treatment modality for atrophic mandibles, and a PBM dose of 7.5 J/cm(2) has a potential positive influence on implant healing and osseointegration. Dental Implants Alveolar Bone Loss;Dental Implants;Dental Prosthesis, Implant-Supported;Denture, Overlay;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Mandible;Treatment Outcome

Combination of strontium chloride and photobiomodulation in the control of tooth sensitivity post-bleaching: A split-mouth randomized clinical trial. OBJECTIVE: This split-mouth randomized controlled clinical trial assessed the effect of 10% strontium chloride in combination with photobiomodulation (PBM) for the control of tooth sensitivity (TS) post-bleaching. METHODS: The upper/lower, right and left quadrants of fifty volunteers were randomized and allocated to four groups (n = 25): PLACEBO-placebo gel + simulation of PBM; Placebo + PBM; STRONTIUM-10% strontium chloride + simulation of PBM; and PBM + STRONTIUM-10% strontium chloride + PBM. All groups received tooth bleaching treatment with 35% hydrogen peroxide. For the PBM treatment, the laser tip was positioned in the apical and cervical regions of the teeth bleached in the respective hemi-arch. The laser system was operated in continuous mode, using 1.7 J of energy. A dose of 60 J/cm2 was applied to each point for 16 seconds under 808 nm near-infrared light (100mW of power), with a point area of 0.028 cm2. TS was assessed during a 21-day follow-up, using the modified visual analogue scale. RESULTS: In the intragroup assessment, the Friedman test indicated that PBM + STRONTIUM promoted the greatest reduction in TS after the second week of treatment (p â‰¤ 0.05). The Wilcoxon-Mann-Whitney test indicated that the groups Placebo + PBM, STRONTIUM, and STRONTIUM + PBM did not differ statistically (p â‰¥ 0.05) in the first and third weeks of treatment The group PLACEBO exhibited the greatest TS in the first three days after each bleaching session. CONCLUSION: The combination of 10% strontium chloride with PBM was effective in reducing post-bleaching TS; however, the combination of 10% strontium chloride with PBM was effective in reducing post-bleaching TS; however, it did not differ from the individual use of Placebo + PBM or STRONTIUM groups assessed after 21 days of follow-up. Placebos;strontium chloride;Strontium Adult;Brazil;Dentin;Dentin Sensitivity;Female;Humans;Lasers;Low-Level Light Therapy;Male;Pain;Placebos;Strontium;Tooth;Tooth Bleaching;Young Adult

Photobiomodulation therapy for management of inferior alveolar nerve injury post-extraction of impacted lower third molars. PURPOSE: Inferior alveolar nerve (IAN) injury is one of the most serious complications after extraction of impacted lower third molars. Photobiomodulation (PBM) therapy has been noted to reduce pain and inflammation while promoting tissue healing. This study examined the efficacy of PBM therapy tested in a case series of patients with postoperative IAN injury. MATERIAL AND METHODS: 20 patients with post-extraction IAN injury were involved in this study and divided into two groups. In the study group, PBM therapy (808-nm laser, 16 mW, 3 J/cm(2)) was used every other day for 2 weeks solely on post-extraction sockets in 10 patients diagnosed with IAN injury. In the control group, mecobalamine was prescribed to 10 patients with IAN injury. Objective and subjective recovery of IAN paresthesia was evaluated using clinical neurosensory testing and visual analog score. RESULTS: All patients showed improvement in both objective and subjective examination. Notably, the visual analog score was significantly improved after PBM treatment compared to the mecobalamine treatment ($p < 0.05$). CONCLUSION: PBM therapy with 808-nm laser appears to be an effective approach to manage paresthesia post-IAN injury following impacted third molar surgery. Given the limited sample size in this study, large-scale, placebo-controlled, multi-center randomized controlled trials are needed for further validation of this innovative treatment.

Effect of photobiomodulation therapy on painful temporomandibular disorders. To evaluate the effect of photobiomodulation therapy (PBMT) on painful temporomandibular disorders (TMD)

patients in a randomized, double-blinded, placebo-controlled manner. Participants were divided into a masseter myalgia group (nâ€‰=â€‰88) and a temporomandibular joint (TMJ) arthralgia group (nâ€‰=â€‰87) according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). Both groups randomly received PBMT or placebo treatment once a day for 7 consecutive days, one session. The PBMT was applied with a gallium-aluminum-arsenide (GaAlAs) laser (wavelengthâ€‰=â€‰810Â nm) at pre-determined points in the masseter muscle (6Â J/cm(2), 3 regions, 60Â s) or TMJ region (6Â J/cm(2), 5 points, 30Â s) according to their most painful site. Pain intensity was rated on a 0-10 numerical rating scale (NRS) and pressure pain thresholds (PPT) and mechanical sensitivity mapping were recorded before and after the treatment on day 1 and day 7. Jaw function was assessed by pain free jaw opening, maximum unassisted jaw opening, maximum assisted jaw opening, maximum protrusion and right and left excursion. Data were analyzed with a mixed model analysis of variance (ANOVA). Pain intensity in arthralgia patients decreased over time (Pâ€‰<â€‰0.001) for both types of interventions, however, PBMT caused greater reduction in pain scores than placebo (Pâ€‰=â€‰0.014). For myalgia patients, pain intensity decreased over time (Pâ€‰<â€‰0.001) but without difference between interventions (Pâ€‰=â€‰0.074). PPTs increased in both myalgia (Pâ€‰<â€‰0.001) and TMJ arthralgia patients over time (Pâ€‰<â€‰0.001) but without difference between interventions (Pâ€‰â‰¥â€‰0.614). Overall, PBMT was associated with marginally better improvements in range of motion compared to placebo in both myalgia and arthralgia patients. Pain intensity, sensory function and jaw movements improve after both PBMT and placebo treatments in myalgia and arthralgia patients indicating a substantial non-specific effect of PBMT. Adolescent;Adult;Double-Blind Method;Facial Pain;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Myalgia;Pain Measurement;Temporomandibular Joint Disorders;Young Adult

Intraoral versus extraoral photobiomodulation therapy in the prevention of oral mucositis in HSCT patients: a randomized, single-blind, controlled clinical trial. To compare the efficacy of intraoral and extraoral photobiomodulation (PBM) protocols for the prevention of oral mucositis (OM) in hematopoietic stem cell transplantation (HSCT) patients. A total of 60 patients was randomized into intraoral PBM (IOPBM) and extraoral PBM (EOPBM) groups. Both PBM protocols were well tolerated and no side effects were observed. EOPBM session times were one fourth of IOPBM durations. Of 60 patients, 35 (58.3%) developed ulcerated OM between day +3 and day +12. No intergroup difference was observed in OM healing times (pâ€‰=â€‰0.424). The lateral border of the tongue was the most common site affected in both groups. However, the incidence of mucositis on buccal mucosa was significantly reduced in the EOPBM group (pâ€‰=â€‰0.021). Young patients (OR.5.35, 95%CI 0.94-30.4, pâ€‰=â€‰0.058) and those who had received myeloablative conditioning (OR.55.1, 95%CI 2.69-1129.3, pâ€‰=â€‰0.009) were more likely to develop ulcerated OM, whereas autologous HSCT recipients (OR 0.079, 95% CI 0.009-0.67, pâ€‰=â€‰0.021) had a lower probability of developing ulcerated OM independent of PBM protocol. EOPBM protocol was as effective as IOPBM in the management of OM in HSCT patients, with the advantage of shorter treatment sessions. Trial registration number: RBR-7nww56. Date of trial registration submission: 30th September 2019. Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Single-Blind Method;Stomatitis;Transplantation Conditioning

Interferential current and photobiomodulation in knee osteoarthritis: A randomized, placebo-controlled, double-blind clinical trial. OBJECTIVES: To evaluate the effects of interferential current and photobiomodulation in patients with knee osteoarthritis. DESIGN: A randomized, placebo-controlled, double-blind clinical trial. SETTING: Physiotherapy Clinic of City University of SÃ£o Paulo. SUBJECTS: A total of 184 patients with knee osteoarthritis were recruited and, of these, 168 were included and randomized into four groups with 42 each: interferential current,

photobiomodulation, interferential current plus photobiomodulation or placebo groups. One hundred and sixty-four patients completed the study. INTERVENTION: Patients received 12 sessions (three times a week) of treatment: 30â€‰minutes of interferential current (active or placebo) followed by photobiomodulation (active or placebo). MAIN MEASURES: Primary outcome: pain intensity at rest and during movement (numeric rating scale) after 12 sessions. Secondary outcomes: functional capacity (Timed Up & Go and Sit and Lift tests and Lequesne and WOMAC questionnaires), pressure pain threshold, conditioned pain modulation, and muscle strength production (isokinetic evaluation). Patients were assessed at baseline, after 12 sessions, and three and six months after the end of the treatment. RESULTS: Interferential current plus photobiomodulation reduced pain intensity at rest and during movement compared to placebo and interferential current at all time points (Pâ€‰<â€‰0.05). Photobiomodulation reduced pain intensity at rest compared to placebo at all time points (Pâ€‰<â€‰0.05) and compared to interferential current at six months follow-up (Pâ€‰<â€‰0.05). Photobiomodulation reduced pain intensity during movement compared to placebo at six months follow-up (Pâ€‰<â€‰0.05). CONCLUSION: Interferential current plus photobiomodulation or isolated photobiomodulation improve pain intensity in knee osteoarthritis. Double-Blind Method;Humans;Osteoarthritis, Knee;Pain;Pain Measurement;Pain Threshold

Treatment of permanent post-inflammatory hyperpigmentation with medium-fluence medium-spot-size setting in Q-switched Nd: YAG 1064Â nm laser: A novel treatment parameters setting strategy. Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Exploring the ability of low-level laser irradiation to reduce myonecrosis and increase Myogenin transcription after Bothrops jararacussu envenomation. Envenoming caused by snakebites is a very important neglected tropical disease worldwide. The myotoxic phospholipases present in the bothropic venom disrupt the sarcolemma and compromise the mechanisms of energy production, leading to myonecrosis. Photobiomodulation therapy (PBMT) has been used as an effective tool to treat diverse cases of injuries, such as snake venom-induced myonecrosis. Based on that, the aim of this study was to analyze the effects of PBMT through low-level laser irradiation (904Â nm) on the muscle regeneration after the myonecrosis induced by Bothrops jararacussu snake venom (Bjssu) injection, focusing on myogenic regulatory factors expression, such as Pax7, MyoD, and Myogenin (MyoG). Male Swiss mice (Mus musculus), 6-8-week-old, weighing 22â€‰Â±â€‰3Â g were used. Single sub-lethal Bjssu dose or saline was injected into the right mice gastrocnemius muscle. At 3, 24, 48, and 72Â h after injections, mice were submitted to PBMT treatment. When finished the periods of 48 and 72Â h, mice were euthanized and the right gastrocnemius were collected for analyses. We observed extensive inflammatory infiltrate in all the groups submitted to Bjssu injections. PBMT was able to reduce the myonecrotic area at 48 and 72Â h after envenomation. There was a significant increase of MyoG mRNA expression at 72Â h after venom injection. The data suggest that beyond the protective effect promoted by PBMT against Bjssu-induced myonecrosis, the low-level laser irradiation was able to stimulate the satellite cells, thus enhancing the muscle repair by improving myogenic differentiation. Crotalid Venoms;Myogenin Animals;Bothrops;Cell Differentiation;Crotalid Venoms;Gene Expression Regulation;Laser Therapy;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Myogenin;Necrosis

Low-level laser or LED photobiomodulation on oral mucositis in pediatric patients under high doses of methotrexate: prospective, randomized, controlled trial. PURPOSE: The objective of the present study was to compare the efficacy of photobiomodulation with low-level laser therapy (LLLT) or light-emitting diode therapy (LEDT) devices for the prevention and treatment of oral mucositis in pediatric patients diagnosed with acute lymphoblastic leukemia undergoing chemotherapy with high doses of methotrexate (MTX). METHODS: Eighty patients were randomly divided into two groups: LLLT and LEDT. Both protocols were applied with the same energy and radiant exposure. The protocols started

in the beginning of high doses MTX and finished when the patients were discharged from the hospital or there was oral mucositis resolution. The oral mucositis was assessed during each session in accordance to the World Health Organization (WHO) score. The patients' self-assessed pain was scored on a visual analog scale (VAS). RESULTS: The incidence of oral mucositis was similar to LLLT and LEDT, 10% and 12.5%, respectively. Both groups required the same number of days to reach score of zero for mucositis and pain (p > 0. 05), and there was no significant difference in mean VAS between the groups. CONCLUSIONS: These findings suggest that LEDT has similar effects to LLLT to avoid and treat oral mucositis. Brazilian Clinical Trial Registry with #U1111-1221-5943. Methotrexate Child;Humans;Lasers;Low-Level Light Therapy;Methotrexate;Mucositis;Prospective Studies;Stomatitis

Central involvement of 5-HT1A receptors in antinociception induced by photobiomodulation in animal model of neuropathic pain. This study aimed to investigate the central involvement of 5-HT1A receptors in the nociceptive behavior of mice submitted to the chronic constriction injury (CCI) of sciatic nerve and the subsequent application of photobiomodulation (PBM). Male mice (Swiss-albino) were submitted to CCI and subsequently received an infusion of WAY100635 (5-HT1A receptor antagonist) or intracerebroventricular saline (ICV), followed by infrared laser irradiation (808Â nm), in continuous mode, with the power of 100Â mW and a dose of 0Â J/cm(2) (control group) or 50Â J/cm(2). The thermal hyperalgesia was evaluated by hot plate test, while mechanical allodynia was evaluated by von Frey filaments. After CCI, animals showed a reduction in the nociceptive threshold (p<0.001) when compared to the sham group. In von Frey test, the CCI + saline + PBM 50Â J/cm(2) group showed an increase in nociceptive threshold (p<0.001) in all measurement moments in comparison with groups CCI + SALINE + PBM 0Â J/cm(2), CCI + WAY100635 + PBM 50Â J/cm(2), and CCI + WAY100635 + PBM 0Â J/cm(2). Similarly, in hot plate test, CCI + SALINE + PBM 50Â J/cm(2) group showed an increase in nociceptive threshold after application of PBM at 120 and 180Â min. Because of the results found, it can be suggested the involvement of 5-HT1A receptors in the central nervous system, since WAY100635 was able to reverse the antinociceptive effect provided by PBM in animals submitted to CCI. Receptor, Serotonin, 5-HT1A Animals;Disease Models, Animal;Hyperalgesia;Male;Mice;Neuralgia;Receptor, Serotonin, 5-HT1A;Sciatic Nerve

The effect of LED photobiomodulation on the proliferation and osteoblastic differentiation of periodontal ligament stem cells: in vitro. BACKGROUND: The aim of this study was to investigate the influence of three different light-emitting diode (LED) wavelengths on the proliferation and osteoblastic differentiation of periodontal ligament stem cells (PDLSCs) in vitro. METHODS: PDLSCs seeded on 96- and 24-well plates, for proliferation and osteoblastic differentiation, respectively, were irradiated daily by LED light with peak emission wavelengths of 630, 680, and 830 nm at constant energy densities of 3.5 J/cm(2). Cultures were grown for 8 days for the proliferation assay, 10 days for the alkaline phosphatase (ALP) assay, and 28 days for Alizarin red staining. Mitochondrial activity, ALP enzyme level, and the ability to form calcium phosphate deposits were measured and compared across cultures. RESULTS: Results obtained from statistical analysis of the experimental data indicated that the rate of proliferation (P < 0.05) in 830-nm irradiated cultures were significantly higher than the control samples at day 6 and 8; whereas, for the 630- and 680-nm groups, test results showed lower proliferation rates at day 8. For osteoblastic differentiation, significantly greater mineralization than the control samples was detected in the red-light groups (630 and 680 nm) during the late differentiation period (P < 0.001), which was supported by a higher ALP activity of the 630- and 680-nm groups in the early stage (P < 0.01). CONCLUSION: The results of this study demonstrate that the PDLSCs responded differently to specific LED wavelengths. For enhancing cellular proliferation, 830-nm LED irradiation was more effective. On the other hand, the wavelengths of 630 and 680 nm were

better for stimulating osteoblastic differentiation. Cell Differentiation;Cell Proliferation;Cells, Cultured;Osteogenesis;Periodontal Ligament;Stem Cells
Effect of different low-level intensity laser therapy (LLLT) irradiation protocols on the osseointegration of implants placed in grafted areas. OBJECTIVE: To evaluate the effect of different protocols of low-level intensity laser therapy (LLLT) irradiation on the osseointegration of implants placed in grafted areas. METHODOLOGY: 84 rats were randomly allocated into six groups: DBB: defect filled with deproteinized bovine bone; HA/TCP: defect filled with biphasic ceramic of hydroxyapatite/Î²-tricalcium phosphate ; DBB-LI: defect filled with DBB and treated with LLLT after implant placement; HA/TCP-LI: defect filled with HA/TCP and treated with LLLT after implant placement; DBB-LIB: defect filled with DBB and treated with LLLT after graft procedure and implant placement; and HA/TCP-LIB: defect filled HA/TCP and treated with LLLT after graft procedure and implant placement. The bone defects were made in the tibia and they were grafted. After 60 days, the implants were placed. The rats were subsequently subjected to euthanasia 15 and 45 days after implant placement. The pattern of osseointegration and bone repair in the grafted area was evaluated by biomechanical, microtomographic, and histometric analyses. Furthermore, the expression of bone biomarker proteins was assessed. RESULTS: The LLLT groups presented higher removal torque, mineralized tissue volume, and a greater degree of osseointegration, especially when LLLT was performed only after implant placement, and these findings were associated with higher expression of BMP2 and alkaline phosphatase. CONCLUSION: LLLT performed on implants placed in grafted areas enhances the osseointegration process. Dental Implants Animals;Cattle;Ceramics;Dental Implants;Low-Level Light Therapy;Osseointegration;Rats;Tibia
Digital Transformation of Photobiomodulation Therapy: A Step Forward to Become Mainstream? Low-Level Light Therapy
Acceleration of Dental Movement by Photobiomodulation: How Does It Happen? Acceleration;Low-Level Light Therapy;Tooth Movement Techniques
LLLI promotes BMSC proliferation through circRNA_0001052/miR-124-3p. Osteoporosis (OP) is a multifactorial bone disease that occurs worldwide. The treatment of OP is still unsatisfactory. Bone mesenchymal stem cell (BMSC) differentiation is a key process in OP pathogenesis. Low-level laser irradiation (LLLI) has been reported to regulate BMSC proliferation, but the role of circRNAs in the LLLI-based promotion of BMSC proliferation remains unclear. CircRNAs are essential molecular regulators that participate in numerous biological processes and have therapeutic potential. miR-124-3p is an essential microRNA (miRNA), and its expression changes are related to BMSC proliferation ability. In the present study, gain-loss function of experiments demonstrated that circRNA_0001052 could regulate the proliferation of BMSCs by acting as a miR-124-3p sponge through the Wnt4/Î²-catenin pathway. The results of this study strongly suggest that circRNA_0001052 plays an essential role in BMSC proliferation in response to LLLI treatment, which is a potential therapeutic manipulation with clinical applications. MicroRNAs;RNA, Circular Biological Phenomena;Cell Proliferation;Mesenchymal Stem Cells;MicroRNAs;Osteogenesis;RNA, Circular
Low level laser therapy, Er,Cr:YSGG laser and fluoride varnish for treatment of dentin hypersensitivity after periodontal surgery: A randomized clinical trial. This clinical trial aimed to compare the effects of low-level laser therapy (LLLT), Er,Cr;YSGG laser, and fluoride varnish, as compared to the placebo laser on decreasing dentin hypersensitivity (DH). This randomized, double-blinded clinical trial included 60 jaw quadrants in 24 patients who underwent periodontal surgery. The quadrants were randomly assigned to 4 groups and received treatments as follows. Group 1: LLLT with a combination of red and infrared wavelengths, group 2: Er,Cr:YSGG laser (0.25 W and 0.5 W), group 3: fluoride varnish, and group 4: placebo laser. The sensitivity response to the cold spray was recorded using visual analogue scale (VAS) at baseline, immediately, and 1 week post-treatment. The data were

analyzed by repeated measures analysis at the significance level of P<0.05. There was a significant reduction in DH after treatment by low-level lasers, Er,Cr:YSGG laser, or fluoride varnish compared to the baseline data (P<0.05), but the placebo group displayed no significant alteration in DH (P=0.069). At 1 week, the VAS score in the Er,Cr:YSGG laser group was significantly lower than that of the LLLT (P= 0.043) and placebo (P<0.001) groups. Furthermore, the subjects who received fluoride varnish exhibited significantly lower DH compared with the placebo group (P = 0.023). Er,Cr:YSGG laser was the most effective strategy in dealing with DH, as it caused the greatest pain reduction over the study period and showed a significant superiority over LLLT and placebo groups. Alternatively, the application of fluoride varnish could be recommended for attenuating DH following periodontal surgery. Fluorides, Topical;Fluorides Dentin Sensitivity;Fluorides;Fluorides, Topical;Humans;Lasers, Solid-State;Low-Level Light Therapy

Photodynamic Therapy for Biomodulation and Disinfection in Implant Dentistry: Is It Feasible and Effective? Dental implants are the most common rehabilitation and restorative treatment used to replace missing teeth. Biofilms adhere to implant surfaces to trigger implant-associated infection and inflammatory response. Clinically, the biofilm induces a local host response with the infiltration of phagocytic immune cells. The pro-inflammatory surroundings set off osteoclastogenesis, which leads to the septic loosening of the implant. The standard of dental care for implant-associated infection relies on a combination of surgery and antimicrobial therapy. Antimicrobial photodynamic therapy is a noninvasive and photochemistry-based approach capable of reducing bacterial load and modulating inflammatory responses. In this review, we explore the photobiomodulation and disinfection outcomes promoted by photodynamic therapy for implant infections, highlighting the quality of evidence on the most up-to-date studies, and discuss the major challenges on the advance of these therapeutic strategies. Anti-Infective Agents Anti-Infective Agents;Biofilms;Dentistry;Disinfection;Photochemotherapy

Transcranial photobiomodulation changes topology, synchronizability, and complexity of resting state brain networks. Objective. Transcranial photobiomodulation (tPBM) is a recently proposed non-invasive brain stimulation approach with various effects on the nervous system from the cells to the whole brain networks. Specially in the neural network level, tPBM can alter the topology and synchronizability of functional brain networks. However, the functional properties of the neural networks after tPBM are still poorly clarified.Approach. Here, we employed electroencephalography and different methods (conventional and spectral) in the graph theory analysis to track the significant effects of tPBM on the resting state brain networks. The non-parametric statistical analysis showed that just one short-term tPBM session over right medial frontal pole can significantly change both topological (i.e. clustering coefficient, global efficiency, local efficiency, eigenvector centrality) and dynamical (i.e. energy, largest eigenvalue, and entropy) features of resting state brain networks.Main results. The topological results revealed that tPBM can reduce local processing, centrality, and laterality. Furthermore, the increased centrality of central electrode was observed.Significance. These results suggested that tPBM can alter topology of resting state brain network to facilitate the neural information processing. On the other hand, the dynamical results showed that tPBM reduced stability of synchronizability and increased complexity in the resting state brain networks. These effects can be considered in association with the increased complexity of connectivity patterns among brain regions and the enhanced information propagation in the resting state brain networks. Overall, both topological and dynamical features of brain networks suggest that although tPBM decreases local processing (especially in the right hemisphere) and disrupts synchronizability of network, but it can increase the level of information transferring and processing in the brain network. Brain;Brain Mapping;Electroencephalography;Magnetic Resonance Imaging;Nerve Net

Carbon Arc Lamp Therapy Enhances the Repair Potential of Chronic Soft Tissue Injury in Rats Compared with the Ability of Photobiomodulation Therapy. Objective: The effects of photobiomodulation therapy (PBMT) and carbon arc lamp therapy (CALT) on the repair of chronic soft tissue injury were compared. Background data: PBMT improves soft tissue repair of chronic injury. However, there has been no research on the effect of CALT. Methods: Human umbilical vein endothelial cells (HUVECs) were irradiated using PBMT and CALT at 2â€‰J/cm(2) to observe their effects on cell proliferation and migration. The effects of PBMT and CALT on soft tissue injury repair were assessed using a chronic gastrocnemius injury model of the posterior limb in rats. The malondialdehyde (MDA), superoxide dismutase (SOD), and prostaglandin E2 (PGE2) were examined by biochemical analyses. The degree of tissue damage repair was evaluated by the immunohistochemical method [CD45, CD34, vascular endothelial growth factor (VEGF), and actin] and the terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) method. Results: Treatment by PBMT and CALT significantly accelerated the proliferation and migration of HUVECs. Moreover, significant decreases in the contents of MDA and PGE2 were observed in the PBMT and CALT groups, while SOD activity was increased. The histological assessment shows that the content of inflammatory cells and apoptotic cells significantly decreased in the CALT group. However, the microvascular density, VEGF content, and actin content were increased in the CALT group. Conclusions: The results demonstrate that CALT has a stronger effect on promoting chronic soft tissue injury repair in comparison with PBMT. Vascular Endothelial Growth Factor A;Carbon Animals;Carbon;Endothelial Cells;Low-Level Light Therapy;Rats;Rats, Wistar;Soft Tissue Injuries;Vascular Endothelial Growth Factor A

Photobiomodulation in diabetic wound healing: A review of red and near-infrared wavelength applications. The development of a painless, non-invasive, and faster way to diabetic wound healing is at the forefront of research. The complexity associated with diabetic wounds makes it a cause for concern amongst diabetic patients and the world at large. Irradiation of cells generates a photobiomodulatory response on cells and tissues, directly causing alteration of cellular processes and inducing diabetic wound repair. Photobiomodulation therapy (PBMT) using red and near-infrared (NIR) wavelengths is being considered as a promising technique for speeding up the rate of diabetic wound healing, eradication of pain and reduction of inflammation through the alteration of diverse cellular and molecular processes. This review presents the extent to which the potential of red and NIR wavelengths have been harnessed in PBMT for diabetic wound healing. Important research challenges and gaps are identified and discussed, and future directions mapped out. This review thus provides useful insights and strategies into improvement of PBMT, including its acceptance within the global medical research community. Animals;Diabetes Mellitus;Humans;Infrared Rays;Low-Level Light Therapy;Wound Healing

Safe and Effective Use of a Novel Large Spot Size 595-nm Pulsed Dye Laser With High Energies for Rapid Improvement of Adult and Pediatric Port-Wine Birthmarks. Adolescent;Adult;Child;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Retrospective Studies;Time Factors;Treatment Outcome;Young Adult

Post-resistance exercise photobiomodulation therapy has a more effective antioxidant effect than pre-application on muscle oxidative stress. This study evaluated the effect of photobiomodulation therapy (PBMt) before or after a high-intensity resistance exercise (RE) session on muscle oxidative stress. Female Wistar rats were assigned to one of the following groups: Sham (non-exercised, undergoing placebo-PBMt); NLRE (exercised, undergoing placebo-PBMt); PBMtâ€‰+â€‰RE (pre-exercise PBMt); REâ€‰+â€‰PBMt (post-exercise PBMt). The RE comprised four climbs bearing the maximum load with a 2Â min rest between each climb. An 830-nm aluminum gallium arsenide diode laser (100 mW; 0.028 cm(2); 3.57 mW/cm(2); 142.8Â J/cm(2); 4Â J; Photon

Laser III, DMC, SÃ£o Paulo, Brazil) was applied 60Â s before or after RE in gastrocnemius muscles. Analyses were performed at 24Â h after RE: lipoperoxidation using malondialdehyde (MDA) and protein oxidation (OP) on Western blot. Superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx) activity were spectrophotometrically assessed. Nitric oxide (NO) level was determined by the Griess reaction. The MDA and OP levels were significantly higher in the NLRE group. Increased OP was prevented in all PBMt groups; however, increased MDA was prevented only in the REâ€‰+â€‰PBMT group. The REâ€‰+â€‰PBMt group had higher SOD activity compared to all other groups. A higher GPx activity was observed only in the PBMTâ€‰+â€‰RE compared to Sham group, and CAT activity was reduced by RE, without PBMt effect. NO levels were unchanged with RE or PBMt. Therefore, PBMt application after a RE section has a more potent antioxidant effect than previous PBMt. Rats submitted to post-RE PBMt illustrated prevention of increased lipoperoxidation and protein oxidation as well as increased SOD activity. The photobiomodulation can attenuate oxidative stress induced by resistance exercise. A more evident benefit shows to be obtained with the application after exercise, in which it has increased the activity of superoxide dismustase. Antioxidants;Thiobarbituric Acid Reactive Substances;Malondialdehyde Animals;Antioxidants;Female;Lipid Peroxidation;Low-Level Light Therapy;Malondialdehyde;Muscle, Skeletal;Oxidation-Reduction;Oxidative Stress;Physical Conditioning, Animal;Rats;Rats, Wistar;Resistance Training;Thiobarbituric Acid Reactive Substances

Effects of Buprenorphine, Chlorhexidine, and Low-level Laser Therapy on Wound Healing in Mice. Systemic buprenorphine and topical antiseptics such as chlorhexidine are frequently used in research animals to aid in pain control and to reduce infection, respectively. These therapeutics are controversial, especially when used in wound healing studies, due to conflicting data suggesting that they delay wound healing. Low-level laser therapy (LLLT) has been used to aid in wound healing without exerting the systemic effects of therapies such as buprenorphine. We conducted 2 studies to investigate the effects of these common treatment modalities on the rate of wound healing in mice. The first study used models of punch biopsy and dermal abrasion to assess whether buprenorphine HCl or 0.12% chlorhexidine delayed wound healing. The second study investigated the effects of sustained-released buprenorphine, 0.05% chlorhexidine, and LLLT on excisional wound healing. The rate of wound healing was assessed by obtaining photographs on days 0, 2, 4, 7, and 9 for the punch biopsy model in study 1, days 0, 1, 2, 4, 6, 8, 11, and 13 for the dermal abrasion model in study 1, and days 0, 3, 6, and 10 for the mice in study 2. Image J software was used to analyze the photographed wounds to determine the wound area. When comparing the wound area on the above days to the original wound area, no significant differences in healing were observed for any of the treatment groups at any time period for either study. Given the results of these studies, we believe that systemic buprenorphine, topical chlorhexidine, and LLLT can be used without impairing or delaying wound healing in mice. Anti-Infective Agents, Local;Buprenorphine;Chlorhexidine Animals;Anti-Infective Agents, Local;Buprenorphine;Chlorhexidine;Laser Therapy;Low-Level Light Therapy;Mice;Wound Healing

Photobiomodulation Therapy Ameliorates Glutamatergic Dysfunction in Mice with Chronic Unpredictable Mild Stress-Induced Depression. Accumulating evidence indicates that dysfunction of the glutamatergic neurotransmission has been widely involved in the pathophysiology and treatment of depression. Photobiomodulation therapy (PBMT) has been demonstrated to regulate neuronal function both in vitro and in vivo. Herein, we aim to investigate whether the antidepressant phenotype of PBMT is associated with the improvement of glutamatergic dysfunction and to explore the mechanisms involved. Results showed that PBMT decreased extracellular glutamate levels via upregulation of glutamate transporter-1 (GLT-1) and rescued astrocyte loss in the cerebral cortex and hippocampus, which also alleviated dendritic atrophy and upregulated the

expression of AMPA receptors on the postsynaptic membrane, ultimately exhibiting behaviorally significant antidepressant effects in mice exposed to chronic unpredictable mild stress (CUMS). Notably, PBMT also obtained similar antidepressant effects in a depressive mouse model subcutaneously injected with corticosterone (CORT). Evidence from in vitro mechanistic experiments demonstrated that PBMT treatment significantly increased both the GLT-1 mRNA and protein levels via the Akt/NF-ÎºB signaling pathway. NF-ÎºB-regulated transcription was in an Akt-dependent manner, while inhibition of Akt attenuated the DNA-binding efficiency of NF-ÎºB to the GLT-1 promoter. Importantly, in vitro, we further found that PKA activation was responsible for phosphorylation and surface levels of AMPA receptors induced by PBMT, which is likely to rescue excitatory synaptic transmission. Taken together, our research suggests that PBMT as a feasible therapeutic approach has great potential value to control the progression of depression.
Glutamic Acid Animals;Depressive Disorder;Disease Models, Animal;Glutamic Acid;Low-Level Light Therapy;Male;Mice

Photobiomodulation prevents PTSD-like memory impairments in rats. A precise fear memory encoding a traumatic event enables an individual to avoid danger and identify safety. An impaired fear memory (contextual amnesia), however, puts the individual at risk of developing posttraumatic stress disorder (PTSD) due to the inability to identify a safe context when encountering trauma-associated cues later in life. Although it is gaining attention that contextual amnesia is a critical etiologic factor for PTSD, there is no treatment currently available that can reverse contextual amnesia, and whether such treatment can prevent the development of PTSD is unknown. Here, we report that (I) a single dose of transcranial photobiomodulation (PBM) applied immediately after tone fear conditioning can reverse contextual amnesia. PBM treatment preserved an appropriately high level of contextual fear memory in rats revisiting the "dangerous" context, while control rats displayed memory impairment. (II) A single dose of PBM applied after memory recall can reduce contextual fear during both contextual and cued memory testing. (III) In a model of complex PTSD with repeated trauma, rats given early PBM interventions efficiently discriminated safety from danger during cued memory testing and, importantly, these rats did not develop PTSD-like symptoms and comorbidities. (IV) Finally, we report that fear extinction was facilitated when PBM was applied in the early intervention window of memory consolidation. Our results demonstrate that PBM treatment applied immediately after a traumatic event or its memory recall can protect contextual fear memory and prevent the development of PTSD-like psychopathological fear in rats.
Animals;Extinction, Psychological;Fear;Memory;Memory Disorders;Rats;Stress Disorders, Post-Traumatic

Follow-up of pressure ulcer treatment with photodynamic therapy, low level laser therapy and cellulose membrane. OBJECTIVE: A pressure ulcer (PU) is an area of tissue trauma caused by continuous and prolonged pressure, often associated with hospitalised patients immobilised due to neurological problems, negatively affecting their quality of life, and burdening the public budget. The aim of this study was to report the follow-up, for 45 weeks, of three patients with neurological lesions due to trauma who subsequently developed PUs, and who were treated with a combination of photodynamic therapy (PDT), low level laser therapy (LLLT) and cellulose membrane (CM). METHOD: PDT was mediated by the photosensitiser curcumin on a 1.5% emulsion base. Blue LED light at 450 nm was delivered continuously for 12 minutes at an irradiance of 30mW/cm(2) and total energy delivered to the tissue was 22J/cm(2). LLLT was performed with 660 nm laser, punctuated and continuous, twice a week with parameters: spot size 0.04cm(2), power of 40mW, 10 seconds per point, fluence of 10J/cm(2) and irradiance of 1000mW/cm(2). RESULTS: All PUs had a significant reduction (range: 95.2-100%) of their area after 45 weeks of follow-up and two PUs had complete healing at 20 weeks and 30 weeks. All of the PUs showed a reduction in contamination with the PDT

treatments in different proportions. CONCLUSION: From the results obtained, we conclude that the combination of PDT, LLLT and CM is a promising treatment for PU healing. Cellulose Adult;Cellulose;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Photochemotherapy;Pressure Ulcer;Quality of Life

Evaluation of a novel deep tissue transvaginal near-infrared laser and applicator in an ovine model. Photobiomodulation therapy (PBMT) is an effective means of treating muscle spasm and pain. A novel near-infrared laser system has been commercialized for the treatment of myofascial pelvic pain in women (SoLÃ¡ Therapy, UroShape, LLC). This study was undertaken to determine if this device is capable of delivering therapeutic levels of irradiance to the pelvic muscles and to identify the surface irradiance required to achieve this goal. This novel class IV near-infrared laser and transvaginal applicator were used to deliver near-infrared light energy through the vaginal mucosa of an adult Suffolk/Dorset Ewe. Irradiance was measured on the surface of the levator ani muscle, inside the levator ani muscle, and inside the bladder. Measurements were taken at powers of 5 W and 0.5 W. 3.0% of vaginal surface irradiance was measured inside of the levator ani muscle. 4.4% of vaginal surface irradiance was measured inside the bladder. At 5 W, the novel laser system provided a surface irradiance of 738 mW/cm(2). At 0.5 W, the system provided a surface irradiance of 74 mW/cm(2). A novel class IV near-infrared laser and transvaginal applicator delivered therapeutic irradiance to the levator ani muscle and bladder of an anesthetized ewe at a power setting of 5 W. A power setting of 0.5 W failed to deliver therapeutic energy into either the levator ani muscle or bladder. Clinical applications targeting deeper tissues such as the pelvic muscles and or bladder should consider power settings that exceed 0.5 W and or irradiance of â‰¥ 75 mW/cm(2). Adult;Animals;Female;Humans;Lasers;Low-Level Light Therapy;Muscle, Skeletal;Myofascial Pain Syndromes;Pelvic Floor;Sheep

Methods of effective low-level laser therapy in the treatment of patients with bronchial asthma (literature review). Bronchial asthma is an autoimmune disease, one of the most common and practically non-treatable by standard methods. At present, the used drugs only maintain a state of temporary remission, simultaneously having a negative effect on various organs and structures and causing side effects. At the same time, the experts have ignored more than 50 years of successful experience of low-level laser therapy, the results of hundreds of studies proving the effectiveness of the method in treating patients with all forms of bronchial asthma. It is proved that therapeutic and periodic (2-4 per year) courses of low-level laser therapy can significantly decrease the frequency and severity of attacks, reduce or cancel the reception of medicines, as well as negative consequences. In this brief review, only some part of studies is given as an example; pediatrics issues are almost not discussed. However, the review clearly demonstrates that various methods of laser illumination (specific techniques are given) make it possible to influence almost all the known pathogenesis of the disease, and low-level laser therapy is a truly effective method of treatment. We note that there are very few publications published on the topic outside of Russia. Russian scientists, as always, are ahead of world science and low-level laser therapy practice.

A Systematic Review on the Treatment of Dermatosis Papulosa Nigra. Dermatosis papulosa nigra (DPN) is a benign skin condition that is primarily reported in skin of color patients. While prevalent, treatment options are limited and the benign course of DPNs may cause them to be overlooked by clinicians. However, large and multiple lesions in cosmetically sensitive areas may be emotionally and socially distressful to patients. There are few literature reviews examining treatment options for this condition. A literature search was performed using PubMed, Medline, Embase, and Web of Science databases. 67 articles were identified and 15 studies met the inclusion criteria. Our findings demonstrate that laser therapy is becoming increasingly utilized as a safe and efficacious treatment for DPNs in skin of color patients. J Drugs Dermatol. 20(4):467-472. doi:10.36849/JDD.2021.5555.

Curettage;Dose Fractionation, Radiation;Electrosurgery;Humans;Lasers, Dye;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Quality of Life;Skin;Skin Diseases, Papulosquamous;Skin Pigmentation;Treatment Outcome

The stability of implants and microbiological effects following photobiomodulation therapy with one-stage placement: A randomized, controlled, single-blinded, and split-mouth clinical study. BACKGROUND: Studies have reported a positive effect on bone healing and the elimination of microorganisms placed on the titanium implants, while others have not confirmed the positive photobiomodulation therapy (PBMT) effects on bone regeneration and bone structure around the implants. PURPOSE: The aim of the present study was to address the following questions: Does PBMT improve implant stability and affect microbiota around dental implants in the early stage of osseointegration? MATERIALS AND METHODS: This study was designed as randomized-controlled prospective, split mouth, single-blinded clinical trial. Implants were randomly divided into two groups and implants placed in the test group were treated with Gallium-aluminum-arsenide (GaAlAs) diode laser with PBMT immediately after surgery and for 15â€‰days (nÂ =Â 47). In the control group, implants were not irradiated(nÂ =Â 46). The primary stability of the implants was measured by the Resonance frequency analysis (RFA) after insertion and the secondary stability values were recorded at 30th, 60th, and 90th days after surgery as implant stability quotient (ISQ). The hand-held RFA was held perpendicular to the jaw line as indicated by the manufacturer for buccal-lingual (BL), mesial-distal (MD), and lingual-buccal (LB) measurement and different measurements were analyzed as separately. RESULTS: Significantly higher magnetic RFA values were achieved on the 90th day in all measurement sides for both groups. ISQ levels in groups at baseline and the day-30, 60, and 90. ISQ readings were not statistically significant between test and control groups for each time point. A statistically significant increase in ISQ reading for BL, MD, and LB dimensions in both groups was noted from baseline to the day-90 (Pâ€‰<â€‰.05). CONCLUSION: It was concluded that PBMT did not have a clinically significant effect on implant stabilization, especially in terms of ISQ values at early alveolar bone healing term. Clinical trial number is NCT04495335. Dental Implants Dental Implantation, Endosseous;Dental Implants;Humans;Low-Level Light Therapy;Mouth;Osseointegration;Prospective Studies

Bond Integrity of Resin-modified Glass Ionomer to Dentin Conditioned Using Photodynamic Therapy and Low-level Laser Therapy: An In Vitro Study. AIM: The aim of the study was to assess the conditioning efficacy of photodynamic therapy (PDT) and Er,Cr:YSGG laser (ECYL) to dentin compared with conventional regime bonded to resin-modified glass ionomer (RMGIC). MATERIALS AND METHODS: Forty mandibular teeth were cleaned, disinfected, and mounted vertically within the segments of polyvinyl pipes up to cementoenamel junction. The occlusal surfaces were flattened, and samples were divided into four groups according to conditioning protocols. Samples in groups I and II underwent PDT, samples in group III were conditioned with low-level laser therapy (LLLT) using Er,Cr:YSGG laser (ECYL), and samples in group IV were conditioned using polyacrylic acid (PAA). Fuji II LC was applied incrementally and light cured for 20 seconds. All samples were placed in universal testing machine for shear bond strength (SBS) testing. The fracture surface was analyzed using stereomicroscope at 50Ã— magnification to determine mode of failure. Among different investigational groups Tukey test was used as post hoc along with analysis of variance (ANOVA). Significance level was established at $p < 0.05$. RESULTS: Maximum SBS values were observed in group IV dentin conditioned with PAA (19.55 Â± 1.84 MPa), whereas minimum SBS values were shown by group I (methylene blue photosensitizer, MBP) activated by PDT (13.52 Â± 1.22 MPa). In group III, dentin conditioned with ECYL (18.22 Â± 2.07 MPa) and group IV (19.55 Â± 1.84 MPa) surface treated with PAA exhibited comparable SBS values ($p > 0.05$). Fracture analysis revealed that in PDT group adhesive failure type was in majority. However, admixed failure type was commonly presented in

groups III and IV. CONCLUSION: PDT of dentin using photosensitizers MBP and CP deteriorates bond values when bonded to RMGIC. The use of LLLT to condition dentin has the potential to improve SBS. CLINICAL SIGNIFICANCE: Dentin conditioning with LLLT using ECYL may improve, is of utmost importance for better treatment outcome, predictable prognosis, and improved bond integrity to RMGIC. Acrylic Resins;Glass Ionomer Cements;glass ionomer;Silicon Dioxide Acrylic Resins;Dental Bonding;Dentin;Glass Ionomer Cements;Low-Level Light Therapy;Materials Testing;Photochemotherapy;Silicon Dioxide

Photobiomodulation Therapy on Myocardial Infarction in Rats: Transcriptional and Posttranscriptional Implications to Cardiac Remodeling. BACKGROUND AND OBJECTIVES: Induction of myocardial infarction (MI) in rats by occlusion of the left anterior descending coronary artery is an experimental model used in research to elucidate functional, structural, and molecular modifications associated with ischemic heart disease. Photobiomodulation therapy (PBMT) has become a therapeutic alternative by modulating various biological processes eliciting several effects, including anti-inflammatory and pro-proliferative actions. The main objective of this work was to evaluate the effect of PBMT in the modulation of transcriptional and post-transcriptional changes that occurred in myocardium signal transduction pathways after MI. STUDY DESIGN/MATERIALS AND METHODS: Continuous wave (CW) non-thermal laser parameters were: 660 nm wavelength, power 15 mW, with a total energy of 0.9 J, fluence of 1.15 J/cm(2) , spot size of 0.785 cm(2) , and time of 60 seconds. Using in silico analysis, we selected and then, quantified the expression of messenger RNA (mRNA) of 47 genes of 9 signaling pathways associated with MI (angiogenesis, cell survival, hypertrophy, oxidative stress, apoptosis, extracellular matrix, calcium kinetics, cell metabolism, and inflammation). Messenger RNA expression quantification was performed in myocardial samples by polymerase chain reaction real-time array using TaqMan customized plates. RESULTS: Our results evidenced that MI modified mRNA expression of several well-known biomarkers related to detrimental cardiac activity in almost all signaling pathways analyzed. However, PBMT reverted most of these transcriptional changes. More expressively, PBMT provoked a robust decrease in mRNA expression of molecules that participate in post-MI inflammation and ECM composition, such as IL-6, TNF receptor, TGFb1, and collagen I and III. Global microRNA (miRNA) expression analysis revealed that PBMT decreased miR-221, miR-34c, and miR-93 expressions post-MI, which are related to deleterious effects in cardiac remodeling. CONCLUSION: Thus, the identification of transcriptional and post-transcriptional changes induced by PBMT may be used to interfere in the molecular dynamics of cardiac remodeling post-MI. MicroRNAs;Mirn93 microRNA, rat Animals;Apoptosis;Disease Models, Animal;Low-Level Light Therapy;MicroRNAs;Myocardial Infarction;Myocardium;Rats;Ventricular Remodeling

Incidence and risk factors for oral mucositis in pediatric patients receiving chemotherapy. PURPOSE: To investigate the incidence and risk factors for oral mucositis (OM) in patients with childhood cancer undergoing chemotherapy. METHODS: Eight hundred and twenty-nine cycles of chemotherapy were evaluated in 112 patients with childhood cancer undergoing chemotherapy. Chemotherapy protocol, hematological, hepatic, and renal function parameters were collected and compared to presence and severity of OM, as graded by the World Health Organization (WHO) scale. Patients received counseling on oral hygiene and those who presented with OM (grade â‰¥1) received photobiomodulation therapy (PBMT). RESULTS: Age ranged from 0 to 17 years (mean/SD, 8.58 Â± 5.05) and fifty-one patients (45.54%) were females. The most common baseline diseases were leukemia (51%) followed by sarcomas (23%) and lymphomas (18%). Eight hundred and twenty-nine cycles of chemotherapy were evaluated, and OM was diagnosed in 527 cycles (63.57%). Higher incidence and severity of OM was observed in protocols using high-dose methotrexate (MTX-HD), MTX-HD cyclophosphamide/doxorubicin combination, and MTX-HD combined with cyclophosphamide ($p < 0.001$). Patients with severe OM had lower levels of leukocytes ($p = 0.003$),

hemoglobin (p = 0.005), platelets (p = 0.034), and higher levels of total bilirubin (p = 0.027), alanine aminotransferase (ALT) (p = 0.001), and creatinine (p = 0.007). CONCLUSION: The study contributes to the elucidation of the risk factors for OM in pediatric cancer patients. Chemotherapy protocols using MTX-HD, MTX-HD associated with doxorubicin and cyclophosphamide, and MTX-HD and cyclophosphamide a have higher incidence of severe grades of OM. Other toxicities such as hematological, hepatic, and renal also developed in patients with OM. Methotrexate Adolescent;Antineoplastic Combined Chemotherapy Protocols;Child;Child, Preschool;Female;Humans;Incidence;Infant;Infant, Newborn;Methotrexate;Risk Factors;Stomatitis

Blue laser-induced selective vasorelaxation by the activation of NOSs. Phototherapy has been tried for treating cardiovascular diseases. In particular, ultraviolet and blue visible lights were suggested to be useful due to their nitric oxide (NO)-production ability in the skin. However, the effects of blue light on the arterial contractility are controversial. Here, we hypothesized that appropriate protocol of blue laser can induce selective vasorelaxation by activating vasodilating signaling molecules in arteries. Using organ chamber arterial mechanics, NO assay, Matrigel assay, and microarray, we showed that a 200-Hz, 300-Î¼s, 445-nm pulsed-laser (total energy of 600â€¯mJ; spot size 4â€¯mm) induced selective vasorelaxation, without vasocontraction in rat mesenteric arteries. The laser stimulation increased NO production in the cord blood-endothelial progenitor cells (CB-EPCs). Both the laser-induced vasorelaxation and NO production were inhibited by a non-selective, pan-NO synthase inhibitor, L-N(G)-Nitro arginine methyl ester. Microarray study in CB-EPCs suggested up-regulation of cryptochrome (CRY)2 as well as NO synthase (NOS)1 and NOSTRIN (NOS trafficking) by the laser. In conclusion, this study suggests that the 445-nm blue puled-laser can induce vasorelaxation possibly via the CRY photoreceptors and NOSs activation. The blue laser-therapy would be useful for treating systemic hypertension as well as improving local blood flow depending on the area of irradiation. Nitric Oxide;Nitric Oxide Synthase Animals;Cells, Cultured;Endothelial Progenitor Cells;Enzyme Activation;Fetal Blood;Gene Expression Regulation;Humans;Lasers;Low-Level Light Therapy;Male;Mesenteric Arteries;Nitric Oxide;Nitric Oxide Synthase;Rats, Sprague-Dawley;Signal Transduction;Vasodilation;Rats

Acute Photobiomodulation by LED Does Not Alter Muscle Fatigue and Cycling Performance-Corrigendum.

Effect of Photobiomodulation on Restoration of Ionization Radiation-Induced Thyroid Dysfunction Through p53 and Retinoblastoma Signaling. Objective: This study aimed to investigate whether photobiomodulation (PBM) restores normal thyroid follicular cells affected by ionizing radiation, and to determine the mechanism of PBM on thyroid function. Background: Despite diverse applications of PBM to medical therapy, there has been no evidence of its involvement with thyroid function. Methods: A light emission diode (850â€‰nm) array was used at 2, 5, and 10â€‰J/cm(2) for in vitro analysis in human thyroid N-Thy-3.1 cells, and at 120â€‰J/cm(2) for in vivo analysis in C58BL6 mice. Cell survival and proliferation were evaluated through clonogenic and MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide] assays. Cell cycle was measured using flow cytometry. Cell cycle markers, such as p53, retinoblastoma (Rb), and E2F1, were investigated by western blot analysis. In vitro levels of cyclic adenosine monophosphate (cAMP) and thyroglobulin (TG) and in vivo levels of cAMP, TG, thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4) were measured using enzyme-linked immunosorbent assay. Results: A lethal dose for N-Thy-3.1 cells was 6 Gy. PBM at 2â€‰J/cm(2) was the most effective for causing cell cycle arrest by ionizing radiation. PBM regulated p53, Rb, and cAMP expression levels in vitro. PBM restored proliferation by regulating Rb and p53 in ionizing radiated thyroid follicular tissues. PBM also recovered cAMP, TG, and thyroid function marker expression (TSH, T3, and T4) by ionizing radiation in vivo. Conclusions: PBM restored ionizing radiation-induced thyroid follicular cell dysfunction by increasing cAMP proliferation and

expression. PBM is effective for ionizing radiation-induced hypothyroidism by complementing cell proliferation and cAMP, presenting a novel method for clinical application. Tumor Suppressor Protein p53 Animals;Cell Survival;Mice;Retinal Neoplasms;Retinoblastoma;Thyroid Gland;Tumor Suppressor Protein p53

Photobiomodulation using LLLT and LED of cells involved in osseointegration and peri-implant soft tissue healing. This study evaluated the influence of photobiomodulation (PBM) using low-level laser therapy (PBM/LLLT) or light-emitting diode (PBM/LED) therapy on peri-implant tissue healing. A laboratory model was used to assess the adhesion and metabolism of osteoblasts (SaOs-2), human gingival fibroblasts (HGF), and normal oral keratinocytes (NOK) seeded on a titanium (Ti) surface. After seeding the cells on disks of Ti placed in wells of 24-well plates, three irradiations were performed every 24 h at energy density of 3 J/cm(2). For PBM/LLLT, a LaserTABLE device was used with a wavelength of 780 nm and 25 mW, while for PBM/LED irradiation, a LEDTABLE device was used at 810 nm, 20 mW, at a density of 3 J/cm(2). After irradiations, the number of cells (NC) attached and spread on the Ti surface, cell viability (CV), total protein (TP), and collagen (Col) synthesis were assessed. Alkaline phosphate activity (ALP) was evaluated only for SaOs-2. Data were submitted to ANOVA complemented by Turkey statistical tests at a 5% significance level. PBM significantly increased adherence of NOK to the Ti surface, while no significant effect was observed for SaOs-2 and HGF. PBM positively affected CV, as well as Col and TP synthesis, in distinct patterns according to the cell line. Increased ALP activity was observed only in those cells exposed to PBM/LLLT. Considering cell specificity, this investigation reports that photobiomodulation with low-power laser and LED at determined parameters enhances cellular functions related to peri-implant tissue healing in a laboratory model. Cell Proliferation;Gingiva;Humans;Low-Level Light Therapy;Osseointegration;Osteoblasts

Exploring the Use of Intracranial and Extracranial (Remote) Photobiomodulation Devices in Parkinson's Disease: A Comparison of Direct and Indirect Systemic Stimulations. In recent times, photobiomodulation has been shown to be beneficial in animal models of Parkinson's disease, improving locomotive behavior and being neuroprotective. Early observations in people with Parkinson's disease have been positive also, with improvements in the non-motor symptoms of the disease being evident most consistently. Although the precise mechanisms behind these improvements are not clear, two have been proposed: direct stimulation, where light reaches and acts directly on the distressed neurons, and remote stimulation, where light influences cells and/or molecules that provide systemic protection, thereby acting indirectly on distressed neurons. In relation to Parkinson's disease, given that the major zone of pathology lies deep in the brain and that light from an extracranial or external photobiomodulation device would not reach these vulnerable regions, stimulating the distressed neurons directly would require intracranial delivery of light using a device implanted close to the vulnerable regions. For indirect systemic stimulation, photobiomodulation could be applied to either the head and scalp, using a transcranial helmet, or to a more remote body part (e.g., abdomen, leg). In this review, we discuss the evidence for both the direct and indirect neuroprotective effects of photobiomodulation in Parkinson's disease and propose that both types of treatment modality, when working together using both intracranial and extracranial devices, provide the best therapeutic option. Neuroprotective Agents Brain;Dopaminergic Neurons;Humans;Low-Level Light Therapy;Mitochondria;Neuroprotective Agents;Parkinson Disease

Effects of Morning Blue-Green 500â€Šnm Light Therapy on Cognition and Biomarkers in Middle-Aged and Older Adults with Subjective Cognitive Decline and Mild Cognitive Impairment: Study Protocol for a Randomized Controlled Trial. BACKGROUND: Given that there is no specific drug to treat Alzheimer's disease, non-pharmacologic interventions in people with subjective cognitive decline

(SCD) and amnestic mild cognitive impairment (aMCI) are one of the most important treatment strategies. OBJECTIVE: To clarify the efficacy of blue-green (500â€Šnm) light therapy on sleep, mood, and physiological parameters in patients with SCD and aMCI is an interesting avenue to explore. METHODS: This is a monocentric, randomized, and controlled trial that will last for 4 weeks. We will recruit 150 individuals aged 45 years or older from memory clinics and divide them into 5 groups: SCD treatment (nâ€Š=â€Š30), SCD control (nâ€Š=â€Š30), aMCI treatment (nâ€Š=â€Š30), aMCI control (nâ€Š=â€Š30), and a group of healthy adult subjects (nâ€Š=â€Š30) as a normal control (NC). RESULTS: The primary outcome is the change in subjective and objective cognitive performance between baseline and postintervention visits (4 weeks after baseline). Secondary outcomes include changes in performance assessing from baseline, postintervention to follow-up (3 months after the intervention), as well as sleep, mood, and physiological parameters (including blood, urine, electrophysiology, and neuroimaging biomarkers). CONCLUSION: This study aims to provide evidence of the impact of light therapy on subjective and objective cognitive performance in middle-aged and older adults with SCD or aMCI. In addition, we will identify possible neurophysiological mechanisms of action underlying light therapy. Overall, this trial will contribute to the establishment of light therapy in the prevention of Alzheimer's disease. Biomarkers Affect;Aged;Biomarkers;Cognition;Cognitive Dysfunction;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neuroimaging;Neuropsychological Tests;Sleep

Effect of light-emitting diode-mediated photobiomodulation on extraction space closure in adolescents and young adults: A split-mouth, randomized controlled trial. INTRODUCTION: This split-mouth trial aimed to examine the effects of light-emitting diode (LED)-mediated photobiomodulation compared with no photobiomodulation on maxillary canine distalization. METHODS: Twenty participants (10 males and 10 females; aged 11-20Â years) requiringÂ bilateral extraction of maxillary first premolars were included from the Sydney Dental Hospital waiting list. After premolar extractions, leveling, and alignment, canines were retracted on 0.020-in stainless steel wires with coil springs delivering 150Â g of force to each side. Each patient's right side was randomly assigned to experimental or control using www.randomisation.com, and allocation concealment was performed with sequentially numbered, opaque, sealed envelopes. The experimental side received 850Â nm wavelength, 60Â mW/cm(2) power, continuous LED with OrthoPulse device (Biolux Research Ltd, Vancouver, British Columbia, Canada) for 5Â min/d. For the control side, the device was blocked with opaque black film. Patients were reviewed at 4-week intervals for force reactivation and intraoral scanning over 12Â weeks. The primary outcome was the amount of tooth movement, and secondary outcomes were anchorage loss and canine rotation, all measured digitally. Blinding for study participants and the treating clinician was not possible; however, blinding was done for the measurements by deidentifying the digital scans. Linear mixed models were implemented for the data analysis. RESULTS: Nineteen participants concluded the study. Data analysis showed that the treatmentÂ Ã—Â time interaction was not significant, suggesting no difference in space closure (unstandardized regression coefficient [b], 0.12; 95% confidence interval [CI], -0.05 to 0.29; PÂ =Â 0.17), canine rotation (b, 0.21; 95% CI, -0.82 to 1.25; PÂ =Â 0.69), and anchorage loss (b, -0.01, 95% CI, -0.28 to 0.26, PÂ =Â 0.94). No harms were noted. CONCLUSIONS: Daily 5-minute application of LED did not result in clinically meaningful differences during extraction space closure compared with no LED application. REGISTRATION: Australian New Zealand Clinical Trials Registry (ACTRN12616000652471). PROTOCOL: The protocol was not published before trial commencement. FUNDING: This research was funded by the Australian Society of Orthodontists Foundation for Research and Education. Adolescent;Australia;British Columbia;Cuspid;Female;Humans;Low-Level Light Therapy;Male;Mouth;Tooth Movement Techniques;Young Adult

Photobiomodulation combined with adipose-derived stem cells encapsulated in methacrylated gelatin hydrogels enhances in vivo bone regeneration. Reconstruction of bone defects is still a significant challenge. The aim of this study was to evaluate the effect of application of photobiomodulation (PBM) to enhance in vivo bone regeneration and osteogenic differentiation potential of adipose-derived stem cells (ADSCs) encapsulated in methacrylated gelatin (GEL-MA) hydrogels. Thirty-six Sprague-Dawley rats were randomly separated into 3 experimental groups (n = 12 each). The groups were control/blank defect (I), GEL-MA hydrogel (II), and ADSC-loaded GEL-MA (GEL-MA+ADSC) hydrogel (III). Biparietal critical sized bone defects (6 mm in size) are created in each animal. Half of the animals from each group (n = 6 each) were randomly selected for PBM application using polychromatic light in the near infrared region, 600-1200 nm. PBM was administered from 10 cm distance cranially in 48 h interval. The calvaria were harvested at the 20th week, and macroscopic, microtomographic, and histologic evaluation were performed for further analysis. Microtomographic evaluation demonstrated the highest result for mineralized matrix formation (MMF) in group III. PBM receiving samples of group III showed mean MMF of 79.93Â±3.41%, whereas the non-PBM receiving samples revealed mean MMF of 60.62Â±6.34 % (p=0.002). In terms of histologic evaluation of bone defect repair, the higher scores were obtained in the groups II and III when compared to the control group (2.0 for both PBM receiving and non-receiving specimens; p<0.001). ADSC-loaded microwave-induced GEL-MA hydrogels and periodic application of photobiomodulation with polychromatic light appear to have beneficial effect on bone regeneration and can stimulate ADSCs for osteogenic differentiation. Hydrogels;Gelatin Adipose Tissue;Animals;Bone Regeneration;Gelatin;Hydrogels;Osteogenesis;Rats;Rats, Sprague-Dawley;Stem Cells

Use of 1064 nm Nd:YAG Laser Biostimulation for Immediate Reversal of a Long-Standing Paresthesia of the Superior Labial Branch of the Infraorbital Nerve Following a Root Coverage Procedure: A Case Report. INTRODUCTION: Paresthesia is a common cause of dental malpractice litigation. Symptoms range from minimal to severely affecting the quality of life. Effective treatments of post-traumatic paresthesias are scarce. This case report documents the first reported use of laser biostimulation to reverse a long-standing paresthesia of the infraorbital nerve, resulting from a root coverage procedure of the maxillary right canine. CASE PRESENTATION: A coronally repositioned flap with enamel matrix derivative was used to treat gingival recession on the buccal surface of tooth #6 of a 35-year-old Caucasian female. One week later the patient reported lip numbness. The patient declined further treatment, and the paresthesia remained unchanged for the next 13 months. The patient then consented to laser biostimulation with a 1064 nm neodymium:yttrium aluminum garnet laser. A single laser biostimulation treatment resulted in an immediate and dramatic improvement of lip sensation. The patient's symptoms improved over the next 2Â½ years without further treatment. CONCLUSION: The cause of the paresthesia and the exact mechanism of its reversal remain unknown, although speculated causes and the possible mechanisms of action of low-level laser therapy are discussed. Laser biostimulation for treatment of peripheral nerve injury is noninvasive and may eliminate the need for corticosteroids or other more invasive treatment modalities. It may not be effective in all paresthesia cases, but when used properly, laser therapy offers a safe treatment alternative for an often troubling problem. Adult;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Paresthesia;Quality of Life

Photobiomodulation: An Effective Approach to Enhance Proliferation and Differentiation of Adipose-Derived Stem Cells into Osteoblasts. Osteoporosis is regarded as the most common chronic metabolic bone condition in humans. In osteoporosis, bone mesenchymal stem cells (MSCs) have reduced cellular function. Regenerative medicine using adipose-derived stem cell (ADSC) transplantation can promote the growth and strength of new bones, improve bone stability, and reduce the risk of fractures. Various methods have been attempted to differentiate ADSCs to

functioning specialized cells for prospective clinical application. However, commonly used therapies have resulted in damage to the donor site and morbidity, immune reactions, carcinogenic generation, and postoperative difficulties. Photobiomodulation (PBM) improves ADSC differentiation and proliferation along with reducing clinical difficulties such as treatment failures to common drug therapies and late initiation of treatment. PBM is a noninvasive, nonthermal treatment that encourages cells to produce more energy and to undergo self-repair by using visible green and red and invisible near-infrared (NIR) radiation. The use of PBM for ADSC proliferation and differentiation has been widely studied with multiple outcomes observed due to laser fluence and wavelength dependence. In this article, the potential for differentiating ADSCs into osteoblasts and the various methods used, including biological induction, chemical induction, and PBM, will be addressed. Likewise, the optimal laser parameters that could improve the proliferation and differentiation of ADSC, translating into clinical success, will be commented on.

Effect of Low-Level Laser Therapy on Peri-Miniscrew Fluid Prostaglandin E2 and Substance P Levels: A Controlled Clinical Trial. OBJECTIVE: This study aims to evaluate the effect of low-level laser therapy on peri-miniscrew fluid prostaglandin E2 (PGE2) and substance P (SP) levels during orthodontic treatment. METHODS: A total of 15 individuals were included in this study. Miniscrews were inserted to the inter-radicular region of the maxillary right and left second premolar and the first molar teeth, and diode lasers were randomly applied to the right or left side. Irradiation was performed at 940 nm wavelength using a gallium-aluminum-arsenide diode laser with 100 mW power output, 0.125 cm2 spectral area, 8 J/cm2 energy density, and 10 seconds of exposure time. Peri-miniscrew fluid samples were collected on the 1st, 3rd, and 7th days, and PGE2 and SP levels were assessed. For statistical comparison, two-way (factors) analysis of variance with repeated measurements on one-factor levels was used at statistical significance (p) of <0.05. RESULTS: PGE2 levels on the 1st, 3rd, and 7th days were 160.64Â±10.05, 135.17Â±37.18, and 98.57Â±22.94, respectively, in the control group and 150.75Â±9.08, 87.17Â±40.67, and 78.10Â±16.50, respectively, in the laser group. SP levels on the 1st, 3rd, and 7th days were 79.90Â±12.05, 64.61Â±10.05, and 70.05Â±9.10, respectively, in the control group and 76.32Â±11.39, 60.25Â±9.08, and 65.71Â±5.59, respectively, in the laser group. The differences in PGE2 and SP levels between the laser and control groups were not statistically significant at all time intervals. CONCLUSION: Low-level laser therapy cannot be recommended as a clinical adjunct therapy to reduce inflammation and pain around the miniscrews.

Effect of Photobiomodulation Therapy following Direct Pulp Capping on Postoperative Sensitivity by Thermal Stimulus: A Retrospective Study. OBJECTIVE: The aim of this study was to investigate the effect of photobiomodulation therapy (PBMT) on postoperative pain provoked by thermal stimulation in direct pulp capping (DPC). SUBJECTS AND METHODS: A retrospective study was performed using the records of patients who received DPC using mineral trioxide aggregate. Teeth irradiated with a laser were assigned as the PBMT group, and nonirradiated teeth were considered as the control group. Before treatment and 6 h, 1 day, and 7 days after treatment, tooth sensitivity to a cold stimulus was recorded using a visual analog scale. RESULTS: From a total of 123 documented DPC procedures, only 72 directly capped permanent teeth met the inclusion criteria. Age, gender, and tooth location were comparable between the groups. A statistically significant difference was found in sensitivity to cold stimulus between groups on day 7 ($p = 0.007$), but no difference was found at the preoperative, 6 h, and day 1 time points ($p = 0.055$, $p = 0.132$, and $p = 0.100$, respectively). In the intragroup evaluation, a significantly greater decrease in sensitivity to cold stimulus was detected in the PBMT group than that in the control group, although both groups showed a reduction in discomfort throughout the follow-up period ($p = 0.000$). CONCLUSION: PBMT is an effective method for enhancing patient comfort by reducing thermal sensitivity following DPC procedures.

Adult;Dental Pulp Capping;Female;Humans;Low-Level Light Therapy;Male;Pain, Postoperative;Retrospective Studies

Long-Term Effectiveness of Combined Intermittent Pneumatic Compression Plus Low-Level Laser Therapy in Patients with Postmastectomy Lymphedema: A Randomized Controlled Trial. Background: Upper limb lymphedema may be revealed after breast cancer and its treatment. Among different treatment approaches, intermittent pneumatic compression (IPC) therapy and low-level laser therapy (LLLT) are reported as effective modalities in the treatment of postmastectomy upper limb lymphedema (PML). The aim of the current study is to investigate the long-term effectiveness of combined IPC plus LLLT versus IPC therapy alone in patients with PML. Methods and Results: The patients were allocated into two groups in this single-blinded, controlled clinical trial. Group I received combined treatment with IPC plus LLLT (nâ€‰=â€‰21) and group II received only IPC (nâ€‰=â€‰21). IPC treatment was given 5 sessions per week for 4 weeks (20 sessions). LLLT was also performed 5 sessions per week for 4 weeks (20 sessions). Clinical evaluations were performed before and after the treatment at the 3, 6, and 12-month follow-up visits. According to within-group analysis, statistically significant improvements in the circumference difference (C(diff)) and grip strength were observed in both groups (for C(diff), pâ€‰=â€‰0.018 and pâ€‰=â€‰0.032, respectively; for grip strength, pâ€‰=â€‰0.001 and pâ€‰=â€‰0.046, respectively). Visual analog scale values for arm pain and shoulder pain during motion were decreased only in group I. Conclusion: Both interventions have positive effects on lymphedema, grip strength, and pain. Long-term effects of combined therapy, especially on pain, are slightly superior to the pneumatic compression alone. Breast Cancer Lymphedema;Breast Neoplasms;Female;Humans;Intermittent Pneumatic Compression Devices;Low-Level Light Therapy;Lymphedema;Mastectomy;Pain

Photobiomodulation induces microvesicle release in human keratinocytes: PI3 kinase-dependent pathway role. Microvesicles (MVs, 100-1000 nm diameter) are released into the extracellular environment by mammalian cells. MVs interact with near or remote cells through different mechanisms; in particular, MVs from human keratinocytes accelerate wound healing. Photobiomodulation by laser improves wound healing, but no information is available about its effects on MV release from human keratinocyte. Human-immortalized keratinocytes (human adult low-calcium high-temperature, HaCaT) were starved for 24 h and then irradiated using a 980-nm energy density of 0, 16.2, 32.5, and 48.7 J/cm(2). After 24 h, MVs released in the conditioned medium were isolated, stained, and quantified using flow cytometry. MVs were distinguished from exosomes on the basis of their volume (forward scatter signals). In some experiments, phosphatidylinositol 3-kinase (PI-3K) activity, involved in MV release and stimulated by laser light, was inhibited by pre-treating cells with Wortmannin (WRT, 10 Î¼g/mL). MVs were observed in HaCaT-conditioned medium both in basal- and laser-stimulated conditions. Photobiomodulation therapy, also known as PBMT, was able to increase MV release from human keratinocytes reaching a maximum effect at 32.5 J/cm(2) with a stimulation of (148.6 Â±15.1)% of basal (p<0.001). PI-3K activity inhibition strongly reduced both basal- and laser-induced MV release; but PBMT by laser still increased MV release, compared to basal values in the presence of WRT. In vitro near infrared photobiomodulation increased the releasing of MVs from human keratinocytes, while Wortmannin, a PI-3K inhibitor, negatively affects both basal- and laser-induced releasing. Laser-induced MV release could be a new effect of biostimulation on the wound healing process.
Animals;Humans;Keratinocytes;Low-Level Light Therapy;Phosphatidylinositol 3-Kinases;Phosphorylation;Wound Healing

Photobiomodulation effect of red LED (630 nm) on the free radical levels produced by pulp cells under stress conditions. The aim of this study was to assess the ability of red light emitting

diodes (LED) to modulate oxidative stress in human dental pulp fibroblasts (HDPFs) when different irradiation parameters are employed. Cells from primary teeth were seeded (100,000 cells/well) in 24-well plates in culture medium (DMEM). At 24 h after incubation, the culture medium was replaced with DMEM containing 10 Î¼g/mL lipopolysaccharide (LPS). Thereafter, the cells were irradiated (LED 630 nm, 0.04 W/cm(2) and 0.08 W/cm(2)) at 0 J/cm(2) (control group), 4 J/cm(2), 15 J/cm(2), and 30 J/cm(2); and their viability (MTT assay), number (Trypan Blue), synthesis of nitric oxide (NO) (Griess reagent), and reactive oxygen species (ROS) (fluorescence probe, DCFH-DA) were assessed. The Kruskal-Wallis and Mann-Whitney statistical tests using Bonferroni correction were employed (significance level of 5%). Compared to that in control fibroblasts, increased viability was observed in HDPFs exposed to LPS and irradiated with 15 J/cm(2) and 30 J/cm(2) at 0.04 W/cm(2) and 4 J/cm(2) and 15 J/cm(2) at 0.08 W/cm(2) ($p < 0.05$). Exposure to 4 J/cm(2) at 0.04 W/cm(2) and 15 J/cm(2) and 30 J/cm(2) at 0.08 W/cm(2) modulated the oxidative stress in cells relative to that observed in non-irradiated LPS-treated pulp cells ($p < 0.05$). It was concluded that the irradiation strategies of using red LED with radiant exposures of 15 J/cm(2) and 30 J/cm(2) at 0.04 W/cm(2) and 15 J/cm(2) at 0.08 W/cm(2) were the best parameters to decrease NO and ROS concentration and to stimulate viability of HDPFs exposed to LPS challenge. Reactive Oxygen Species Cell Survival;Fibroblasts;Humans;Odontoblasts;Oxidative Stress;Reactive Oxygen Species

Photobiomodulation Therapy Improves Spermatogenesis in Busulfan-Induced Infertile Mouse. About 50% of infertility is caused by men. This study aimed to investigate the efficiency of photobiomodulation on spermatogenesis in a busulfan-induced infertile mouse as a testicular degeneration treatment. Thirty-two adult NMRI male mice were divided into 4 groups: control, busulfan, PBMT 0.03 J/cm(2), and laser 0.2 J/cm(2). In the study, azoospermia was induced by busulfan as a testicular degeneration, and then, they were treated using photobiomodulation therapy at 0.03 J/cm2 and 0.2 J/cm(2) energy densities. Sperm parameters, stereological analysis, serum testosterone levels, together with SDH activity, MDA production oxidized as a marker for lipid peroxidation, glutathione (GSSG) and glutathione (GSH), mitochondrial membrane permeability (MMP), reactive oxygen species (ROS) production, and ATP production as well as TUNEL assay were assessed. Photobiomodulation therapy with 0.03 J/cm(2) energy densities group revealed a significant increase the testosterone hormone level and spermatogenic cells with the reduction of apoptotic cells and marked increase in GSH, ATP, and SDH levels and decrease the levels of MDA and ROS production in the busulfan-induced mice when compared with the control and sham groups. In conclusion, the photobiomodulation therapy (0.03 J/cm(2) energy density) may provide benefits on the spermatogenesis following busulfan injection and might be an alternative treatment to the patients with oligospermia and azoospermia in a dose-dependent manner. Alkylating Agents;Busulfan Alkylating Agents;Animals;Busulfan;Infertility, Male;Low-Level Light Therapy;Male;Mice;Spermatogenesis

Mandibular Advancement in Adult Skeletal Class II Patients Using Clear Aligners and Photobiomodulation. Adult;Cephalometry;Humans;Malocclusion, Angle Class II;Mandible;Mandibular Advancement;Orthodontic Appliances, Removable

Combination photobiomodulation/N-acetyl-L-cysteine treatment appears to mitigate hair cell loss associated with noise-induced hearing loss in rats. Sensorineural hearing loss is an intractable disease. Acoustic overstimulation creates hearing loss; many patients exhibit social and emotional dysfunctions. In a model of noise-induced hearing loss (NIHL), low-level laser photobiomodulation (PBM) at a near-infrared wavelength significantly improved auditory brainstem response (ABR) thresholds. In addition, both N-acetyl-L-cysteine (NAC) and acetyl-L-carnitine (ALCAR) attenuated NIHL, reducing the effects of noise trauma in the cochlea and the central auditory system. Here, we combined PBM with antioxidants to explore hearing threshold recovery and morphological hair cell

changes after rats were exposed to noise. The average auditory brainstem response thresholds after PBM/NAC combination treatment were reduced from the apex to the basal turn at all of 8, 16, and 32 kHz compared to the noise-only group. The PBM/NAC combination treated group exhibited intact outer hair cells in all turns, and significantly greater hair cell numbers in the middle and basal cochlear turns, than did controls. Thus, PBM/NAC treatment may prevent hearing dysfunction caused by NIHL. Acetylcysteine Acetylcysteine;Animals;Auditory Threshold;Cochlea;Evoked Potentials, Auditory, Brain Stem;Hair Cells, Auditory;Hearing Loss, Noise-Induced;Humans;Rats

Bactericidal effect of Er,Cr:YSGG laser irradiation on endodontic biofilm: An ex vivo study. AIM: This ex vivo study aimed to evaluate the of Er,Cr:YSGG laser effectiveness in the decontamination of an endodontic biofilm. MATERIALS AND METHODS: Seventy-three single rooted human teeth, freshly were chosen. Each tooth was exposed to four associated species in an endodontic biofilm (Enterococcus faecalis, Streptococcus salivarius, Porphyromonas gingivalis, and Prevotella intermedia) and randomly allocated to one of the seven experimental groups. The group 1 (7 teeth) was used to finalize the reliable biofilm-forming technique. The groups 2 and 3 (15 teeth each group) were irradiated with two different Er;Cr:YSGG laser settings (0,75Â W - 40Â Hz and 4Â W - 40Â Hz, respectively). The groups 4 and 5 (15 teeth each group) were irrigated with two different solutions and laser irradiated with the same settings (1,5Â W - 15Â Hz). The group 6 (6 teeth) was the control group treated only with 4Â ml 2,5% NaOCl irrigation during 60Â s. RESULTS: The observations of group 2 and 3 specimens showed the ripeness of the biofilm with the presence of Enterococcus faecalis and Streptococcus salivarius in chains but in group 3 thermal edge effects produced by the optic fiber in the canal walls were present. The group 4 specimens observation showed an average cleaning of the root canal walls while on the canal walls of group 5 samples the apical third presented several debris and smear layer and in the centre cracks and melting dentin of the radicular wall were observed. CONCLUSION: In those experimental conditions, this study, demonstrated that Er,Cr:YSGG laser has a canals decontamination ability when associated to NaOCl irrigation. Anti-Bacterial Agents;Chromium;Erbium Anti-Bacterial Agents;Biofilms;Chromium;Enterococcus faecalis;Erbium;Humans;Lasers, Solid-State;Low-Level Light Therapy;Porphyromonas gingivalis;Prevotella intermedia;Streptococcus salivarius;Tooth Root

Efficacy of different combinations of physiotherapy techniques compared to exercise and patient education in temporomandibular disorders: A randomized controlled study. OBJECTIVE: This study aims to investigate the efficacy of different types of physiotherapy approaches in individuals with cervical myofascial painful temporomandibular disorders (TMDs). METHODS: Seventy-five participants with myofascial pain of jaw muscles and cervical myofascial pain were randomized into three groups: exercise group (E), low-level laser therapy group (LLLT), and manual pressure release group (MPR). All patients were assessed before treatment and after 12 sessions of treatment. RESULTS: Significant improvement was seen in all groups' pressure pain threshold (PPT) values ($p <$ Â 0.01). Some masticatory and neck muscles' PPT changes in MRP and LLLT groups were significantly higher than the exercise group ($p <$ Â 0.05). CONCLUSION: Exercise therapy is an effective approach for treatment of TMDs. Additionally, LLLT combined with exercise and MPR combined with exercise have better effects than only exercise therapy. Multimodal treatment approaches should include exercise to achieve better results in clinical practice. Humans;Patient Education as Topic;Temporomandibular Joint Disorders;Pain Threshold;Physical Therapy Modalities;Myofascial Pain Syndromes;Treatment Outcome

Photobiomodulation therapy and antimicrobial photodynamic therapy for orofacial lesions in patients with COVID-19: A case series. Oral lesions related to the novel Coronavirus Disease 2019 (COVID-19) have been increasingly described; however, clinical and epidemiological information is still scant. Although a diversity of therapeutic strategies for the management of these lesions are present in the

literature, one can note a lack of standardization and doubtful effectiveness. Thus, the present study aimed to report a series of cases in which a combination of antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) was used for orofacial lesions in patients suffering from COVID-19. It was noted, in all cases, a marked improvement in tissue repair and pain relief within a few days; moreover, the patients recovered their orofacial functions satisfactorily. Based on the present series of cases and having in mind the conspicuous lack of information on the different aspects of COVID-19, the protocol which combined aPDT with PMBT seemed to be effective in the management of COVID-19-related orofacial lesions. Anti-Infective Agents;Photosensitizing Agents Anti-Infective Agents;COVID-19;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2

Effectiveness and safety of low-level laser therapy in diabetic peripheral neuropathy: a protocol for a systematic review and meta-analysis. BACKGROUND: Diabetic peripheral neuropathy (DPN) is one of the most common chronic complications of diabetes mellitus. The main symptoms of DPN include numbness or pain in both extremities and paresthesia (such as formication or burning sensations), which greatly affect patients' quality of life. Pharmacological treatments for DPN are associated with both uncertain therapeutic effects and adverse effects, as well as with high costs. Some clinical studies have reported that low-level laser therapy (LLLT) relieves clinical symptoms and improves nerve function in patients with DPN. We intend to conduct a systematic review and meta-analysis to further evaluate the effectiveness and safety of LLLT for DPN. METHODS: The following electronic databases will be searched to retrieve literature from their inception until December 2020: MEDLINE (PubMed), Embase, Cochrane Central Register of Controlled Trials, Web of Science (the Science and Social Science Citation Index), CNKI, VIP, WanFang, and SinoMed. Simultaneously, clinical registration tests and gray literature will also be retrieved. Randomized controlled trials (RCTs) comparing LLLT with either sham LLLT, no (specific) treatment, or active conventional medical treatments will be included. The primary outcomes will be nerve conduction velocity as well as clinical scores that assess neurological function and related symptoms. The risk of bias of each study and quality of evidence will be assessed using the updated Cochrane Risk of Bias 2.0 tool and GRADE approach, respectively. A meta-analysis will then be conducted using Review Manager software version 5.3. DISCUSSION: This study will integrate RCTs and analyze data to provide a detailed summary of the evidence relating to the effects and safety of LLLT in patients with DPN. LLLT will be compared with sham LLLT, no (specific) treatment, or active conventional medical treatments, especially in terms of neurological function, quality of life, and adverse events. In conclusion, this systematic review will generate evidence regarding the use of LLLT to treat DPN, in terms of both its efficacy and safety. SYSTEMATIC REVIEW REGISTRATION: This protocol was registered with the International Prospective Register of Systematic Reviews on April 2020 (registration number: CRD42020170625). Diabetes Mellitus;Diabetic Neuropathies;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Systematic Reviews as Topic

Effect of NIR Laser Therapy by MLS-MiS Source on Fibroblast Activation by Inflammatory Cytokines in Relation to Wound Healing. The fine control of inflammation following injury avoids fibrotic scars or impaired wounds. Due to side effects by anti-inflammatory drugs, the research is continuously active to define alternative therapies. Among them, physical countermeasures such as photobiomodulation therapy (PBMT) are considered effective and safe. To study the cellular and molecular events associated with the anti-inflammatory activity of PBMT by a dual-wavelength NIR laser source, human dermal fibroblasts were exposed to a mix of inflammatory cytokines (IL-1Î² and TNF-Î±) followed by laser treatment once a day for three days. Inducible inflammatory key enzymatic pathways, as iNOS and COX-2/mPGES-1/PGE2, were upregulated by the cytokine mix while PBMT reverted their levels and activities. The same behavior was observed with the proangiogenic factor

vascular endothelial growth factor (VEGF), involved in neovascularization of granulation tissue. From a molecular point of view, PBMT retained NF-kB cytoplasmatic localization. According to a change in cell morphology, differences in expression and distribution of fundamental cytoskeletal proteins were observed following treatments. Tubulin, F-actin, and Î±-SMA changed their organization upon cytokine stimulation, while PBMT reestablished the basal localization. Cytoskeletal rearrangements occurring after inflammatory stimuli were correlated with reorganization of membrane Î±5Î²1 and fibronectin network as well as with their upregulation, while PBMT induced significant downregulation. Similar changes were observed for collagen I and the gelatinolytic enzyme MMP-1. In conclusion, the present study demonstrates that the proposed NIR laser therapy is effective in controlling fibroblast activation induced by IL-1Î² and TNF-Î±, likely responsible for a deleterious effect of persistent inflammation.

Proof-of-Concept Study of Multifunctional Hybrid Nanoparticle System Combined with NIR Laser Irradiation for the Treatment of Melanoma. The global impact of cancer emphasizes the importance of developing innovative, effective and minimally invasive therapies. In the context of superficial cancers, the development of a multifunctional nanoparticle-based system and its in vitro and in vivo safety and efficacy characterization are, herein, proposed as a proof-of-concept. This multifunctional system consists of gold nanoparticles coated with hyaluronic and oleic acids, and functionalized with epidermal growth factor for greater specificity towards cutaneous melanoma cells. This nanoparticle system is activated by a near-infrared laser. The characterization of this nanoparticle system included several phases, with in vitro assays being firstly performed to assess the safety of gold nanoparticles without laser irradiation. Then, hairless immunocompromised mice were selected for a xenograft model upon inoculation of A375 human melanoma cells. Treatment with near-infrared laser irradiation for five minutes combined with in situ administration of the nanoparticles showed a tumor volume reduction of approximately 80% and, in some cases, led to the formation of several necrotic foci, observed histologically. No significant skin erythema at the irradiation zone was verified, nor other harmful effects on the excised organs. In conclusion, these assays suggest that this system is safe and shows promising results for the treatment of superficial melanoma. Oleic Acid;Epidermal Growth Factor;Gold Animals;Cell Line, Tumor;Epidermal Growth Factor;Gold;Humans;Low-Level Light Therapy;Male;Melanoma;Metal Nanoparticles;Mice, SCID;Multifunctional Nanoparticles;Oleic Acid;Proof of Concept Study;Skin Neoplasms;Xenograft Model Antitumor Assays;Mice

Effectiveness of Low-Level Laser Therapy Associated with Strength Training in Knee Osteoarthritis: Protocol for a Randomized Placebo-Controlled Trial. Physical activity and low-level laser therapy (LLLT) can reduce knee osteoarthritis (KOA) inflammation. We are conducting a randomized placebo-controlled trial to investigate the long-term effectiveness of LLLT combined with strength training (ST) in persons with KOA, since it, to our knowledge, has not been investigated before. Fifty participants were enrolled. LLLT and ST was performed 3 times per week over 3 and 8 weeks, respectively. In the LLLT group, 3 Joules of 904 nm wavelength laser was applied to 15 spots per knee (45 Joules/knee/session). The primary outcomes are pain during movement, at night and at rest (Visual Analogue Scale) and global pain (Knee injury and Osteoarthritis Outcome Score, KOOS) pain subscale. The secondary outcomes are KOOS disability and quality-of-life, analgesic usage, global health change, knee active range of motion, 30 s chair stand, maximum painless isometric knee extension strength, knee pain pressure threshold and real-time ultrasonography-assessed suprapatellar effusion, meniscal neovascularization and femur cartilage thickness. All the outcomes are assessed 0, 3, 8, 26 and 52 weeks post-randomization, except for global health change, which is only evaluated at completed ST. This study features the blinding of participants, assessors and therapists, and will improve our understanding of what occurs with the local pathophysiology, tissue morphology and

clinical status of persons with KOA up to a year after the initiation of ST and a higher 904 nm LLLT dose than in any published trial on this topic.

Experimental and Clinical Applications of Red and Near-Infrared Photobiomodulation on Endothelial Dysfunction: A Review. BACKGROUND: Under physiological conditions, endothelial cells are the main regulator of arterial tone homeostasis and vascular growth, sensing and transducing signals between tissue and blood. Disease risk factors can lead to their unbalanced homeostasis, known as endothelial dysfunction. Red and near-infrared light can interact with animal cells and modulate their metabolism upon interaction with mitochondria's cytochromes, which leads to increased oxygen consumption, ATP production and ROS, as well as to regulate NO release and intracellular Ca(2+) concentration. This medical subject is known as photobiomodulation (PBM). We present a review of the literature on the in vitro and in vivo effects of PBM on endothelial dysfunction. METHODS: A search strategy was developed consistent with the PRISMA statement. The PubMed, Scopus, Cochrane, and Scholar electronic databases were consulted to search for in vitro and in vivo studies. RESULTS: Fifty out of >12,000 articles were selected. CONCLUSIONS: The PBM can modulate endothelial dysfunction, improving inflammation, angiogenesis, and vasodilatation. Among the studies, 808 nm and 18 J (0.2 W, 2.05 cm(2)) intracoronary irradiation can prevent restenosis as well as 645 nm and 20 J (0.25 W, 2 cm(2)) can stimulate angiogenesis. PBM can also support hypertension cure. However, more extensive randomised controlled trials are necessary.

Efficacy and safety of a novel combined 1060-nm and 635-nm laser device for non-invasive reduction of abdominal and submental fat. The aim of this study was to evaluate the safety and efficacy of combined 1060-nm diode laser and 635-nm low-level laser therapy (LLLT) device for non-invasive reduction of the abdominal and submental fat. Forty-two healthy subjects received single laser treatment on both the abdomen and submental area. Ultrasound images measuring the thickness of abdominal and submental fat were taken at baseline, follow-up at 4, 8, and 12 weeks after treatment. Waist circumference and body weight were also measured at all visits. Adverse events were recorded at all visits. Subjects completed a satisfaction questionnaire at the end of the trial. Twelve weeks after a single treatment with the investigational device, ultrasound images showed statistically significant ($P < 0.0001$) reductions in abdominal and submental fat by 18.62 and 26.4%, respectively. In addition, significant ($P < 0.0001$) reduction in waist circumference was observed. Ninety-six percent of subjects rated that they were satisfied. Noted side effects were transient mild to moderate tenderness which subsided within 1 to 3 weeks. No serious treatment-related adverse events were reported. The dual wavelength device combining 1060-nm diode laser with 635-nm LLLT was safe and effective for non-invasive reduction of both abdominal and submental fat. Combined Modality Therapy;Humans;Lasers, Semiconductor;Lipectomy;Low-Level Light Therapy;Subcutaneous Fat;Subcutaneous Fat, Abdominal;Treatment Outcome;Ultrasonography

Efficacy of compound topical anesthesia combined with photobiomodulation therapy in pain control for placement of orthodontic miniscrew: a double-blind, randomized clinical trial. This study aims to investigate the effect of compound topical anesthetic (CTA) application combined with photobiomodulation therapy (PBMT) on the level of pain perceived during placement of miniscrews and 24 h post the procedure in the buccal side of the maxillary bone. This randomized, prospective, single-center, split-mouth, double-blinded study included 25 subjects (12 males and 13 females, aged 16 to 35). Two anesthetic techniques before implantation were performed including Profound gel +PBM with 980 nm diode laser and local anesthesia with 2% lidocaine hydrochloride. Then, the miniscrews with the size of 1.6 mm in diameter and 8 mm in length were placed with a hand driver in the buccal side of the maxillary bone. The pain immediately after miniscrew placement (T1), also 12 h (T2), and 24 h (T3) post the procedure were collected by visual analog scale (VAS). Data were analyzed by SPSS version 22. There were no statistically significant differences in mean VAS scores

within or between CTA combined with PBMT or injection applications, immediately after miniscrew placement (P = 0.75), 12 h after miniscrew placement (P = 0.4), and 24 h after miniscrew placement (P = 1.0). Compound topical anesthetic combined with PBMT provided adequate local anesthesia for the placement of miniscrews in the buccal side of the maxillary bone. Anesthetics, Local;Lidocaine Anesthesia, Local;Anesthetics, Local;Double-Blind Method;Female;Humans;Lidocaine;Low-Level Light Therapy;Male;Pain;Prospective Studies

Could the photobiomodulation therapy induce angiogenic growth factors expression from dental pulp cells? This study aimed to evaluate the effect of different photobiomodulation (PBM) radiant exposures on the viability, proliferation, and gene expression of pulp fibroblasts from human primary teeth (HPF) involved in the pulp tissue repair. HPF were irradiated with Laser InGaAlP (Twin Flex Evolution, MMOpticsÂ®) at 660-nm wavelength (red); single time, continuous mode, 0.04-cm(2) laser tip area, and 0.225-cm laser tip diameter, keeping the distance of 1 mm between the laser beam and the cell culture. The doses used were between 1.2 and 6.2 J/cm(2) and were evaluated at the 6 h, 12 h, and 24 h after PBM. MTT and crystal violet assays evaluated the cell viability and proliferation. RT-PCR verified VEGF and FGF-2 mRNA expression. A blinded examiner analyzed the data through two-way ANOVA followed by Tukey test ($p < 0.05$). The groups with higher powers (10 mW, 15 mW, 20 mW, and 25 mW), shortest application periods (10 s), and radiant exposures between 2.5 and 6.2 J/cm(2) exhibited statistically higher viability than that of the groups with small power (5 mW), longer application period (50 s), and radiant exposure of 6.2 J/cm(2) ($p < 0.05$). VEGF and FGF-2 mRNA expression were observed at the three evaluated periods (6 h, 12 h, and 24 h) and the highest expression was in the shortest period ($p < 0.05$). All radiant exposures maintained HPF viable. The period of 6 h after irradiation showed statistically greater gene expression for both growth factors than other periods. VEGF mRNA had no differences among the dosimetries studied. The best radiant exposures for FGF-2 gene expression were 2.5 J/cm(2) and 3.7 J/cm(2). Cell Proliferation;Cell Survival;Dental Pulp;Humans;Low-Level Light Therapy;Tooth, Deciduous

Androgenetic Alopecia in a Patient with Klinefelter Syndrome: Case Report and Literature Review. INTRODUCTION: Klinefelter syndrome (KS) is defined as (a chromosomal disorder in which males have an extra X chromosome). KS presents clinically with signs of androgen deficiency including low testosterone. Androgenetic alopecia (AGA) develops as a response of the hair follicle cells to androgens in individuals with genetic predisposition. CASE PRESENTATION: We describe a 17-year-old male patient with KS who developed AGA with a Ludwig pattern. CONCLUSION: Our patient had a good response to oral minoxidil, finasteride, and low-level light therapy.

Transcriptome analysis of human dermal fibroblasts following red light phototherapy. Fibrosis occurs when collagen deposition and fibroblast proliferation replace healthy tissue. Red light (RL) may improve skin fibrosis via photobiomodulation, the process by which photosensitive chromophores in cells absorb visible or near-infrared light and undergo photophysical reactions. Our previous research demonstrated that high fluence RL reduces fibroblast proliferation, collagen deposition, and migration. Despite the identification of several cellular mechanisms underpinning RL phototherapy, little is known about the transcriptional changes that lead to anti-fibrotic cellular responses. Herein, RNA sequencing was performed on human dermal fibroblasts treated with RL phototherapy. Pathway enrichment and transcription factor analysis revealed regulation of extracellular matrices, proliferation, and cellular responses to oxygen-containing compounds following RL phototherapy. Specifically, RL phototherapy increased the expression of MMP1, which codes for matrix metalloproteinase-1 (MMP-1) and is responsible for remodeling extracellular collagen. Differential regulation of MMP1 was confirmed with RT-qPCR and ELISA. Additionally, RL upregulated PRSS35, which has not been previously associated with skin activity, but has known anti-fibrotic functions. Our results suggest that RL may benefit patients by altering fibrotic gene expression. Reactive

Oxygen Species;Transcription Factors;Collagen;MMP1 protein, human;Matrix Metalloproteinase 1;Oxygen Adult;Cell Movement;Cell Proliferation;Collagen;Female;Fibroblasts;Fibrosis;Gene Expression Profiling;Humans;Male;Matrix Metalloproteinase 1;Middle Aged;Oxidative Stress;Oxygen;Phototherapy;RNA-Seq;Reactive Oxygen Species;Skin;Skin Diseases;Time Factors;Transcription Factors;Transcriptome
Laser Speckle Contrast Imaging for the Objective Assessment of Blood Perfusion in Keloids Treated With Dual-Wavelength Laser Therapy. BACKGROUND: Most of the widely used methods for the assessment of keloid treatment are subjective grading scales based on the opinion of an individual clinician or patient. There is a growing need for objective methods to evaluate keloid treatment. OBJECTIVE: This study aimed to evaluate the value of laser speckle contrast imaging (LSCI) as an objective method for the assessment of dual-wavelength laser therapy for keloids. METHODS: This prospective study included 21 patients with 54 keloids. All patients were treated with a combined 585-nm pulsed dye laser and 1,064 nm neodymium-doped yttrium aluminum garnet dual-wavelength laser at 4 weeks to 6 weeks intervals. Keloids were assessed using the Vancouver Scar Scale (VSS) and LSCI. RESULTS: The total VSS score significantly decreased after 4 sessions of treatment ($p < .05$). Blood perfusion in keloids as measured by LSCI was significantly reduced after treatment ($p < .05$). The improvement of chest keloids in terms of the total VSS score and blood perfusion was significantly greater than that of scapular keloids ($p < .05$). There was a positive correlation between decreased perfusion and reduced total VSS score ($R2 = 0.84$). CONCLUSION: Blood perfusion in keloids significantly decreased after dual-wavelength laser therapy. Laser speckle contrast imaging is a promising objective method for assessing the improvement of keloids treated with laser therapy. Adolescent;Adult;Female;Humans;Keloid;Laser Speckle Contrast Imaging;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Regional Blood Flow;Treatment Outcome;Young Adult
Photobiomodulation therapy ameliorates hyperglycemia and insulin resistance by activating cytochrome c oxidase-mediated protein kinase B in muscle. Ameliorating hyperglycemia and insulin resistance are major therapeutic strategies for type 2 diabetes. Previous studies have indicated that photobiomodulation therapy (PBMT) attenuates metabolic abnormalities in insulin-resistant adipose cells and tissues. However, it remains unclear whether PBMT ameliorates glucose metabolism in skeletal muscle in type 2 diabetes models. Here we showed that PBMT reduced blood glucose and insulin resistance, and reversed metabolic abnormalities in skeletal muscle in two diabetic mouse models. PBMT accelerated adenosine triphosphate (ATP) and reactive oxygen species (ROS) generation by elevating cytochrome c oxidase (CcO) activity. ROS-induced activation of phosphatase and tensin homolog (PTEN)/ protein kinase B (AKT) signaling after PBMT promoted glucose transporter GLUT4 translocation and glycogen synthase (GS) activation, accelerating glucose uptake and glycogen synthesis in skeletal muscle. CcO subunit III deficiency, ROS elimination, and AKT inhibition suppressed the PBMT effects of glucose metabolism in skeletal muscle. This study indicated amelioration of glucose metabolism after PBMT in diabetic mouse models and revealed the metabolic regulatory effects and mechanisms of PBMT on skeletal muscle. Reactive Oxygen Species;Adenosine Triphosphate;Electron Transport Complex IV;Proto-Oncogene Proteins c-akt;PTEN Phosphohydrolase;Glucose Adenosine Triphosphate;Animals;Cell Line;Diabetes Mellitus, Type 2;Electron Transport Complex IV;Glucose;Hyperglycemia;Insulin Resistance;Low-Level Light Therapy;Mice;Muscle, Skeletal;PTEN Phosphohydrolase;Proto-Oncogene Proteins c-akt;Reactive Oxygen Species;Signal Transduction;Treatment Outcome
Low-level laser therapy. Face;Humans;Low-Level Light Therapy;Mouth;Tooth Movement Techniques

Authors' response. Humans;Low-Level Light Therapy;Mouth;Tooth Movement Techniques

A review of combined treatments for melasma involving energy-based devices and proposed pathogenesis-oriented combinations. BACKGROUND: Melasma is an acquired disorder of hyperpigmentation, affecting a million individuals worldwide. Energy-based devices (EBDs) employed to treat melasma include various types of lasers, intense pulsed light (IPL), and radiofrequency (RF). Recent studies have attempted to address recalcitrant and recurring melasma by combining energy-based devices with topical or oral medications. OBJECTIVE: This article reviews EBDs-based augmented treatment for melasma and suggests practical pathogenesis-oriented treatment regimens. Treatment algorithms are proposed to address various components of melasma. METHODS: A systematic PubMed search was conducted acquiring information from various studies on combination treatments of melasma involving EBDs. RESULTS: The 286 retrieved articles were filtered by title to contain at least one type of energy-based modality such as laser, IPL, or RF along with at least one other treatment method. Based on their subject matter, combinations were further categorized into the subheadings: laser plus medication, laser plus laser, and IPL- and RF-containing treatment methods. CONCLUSION: There are many energy-based combination treatments that have been explored for mitigation of melasma including laser therapy with medication, multi-laser therapies, IPL, RF, and microneedling devices. Melasma is an exceedingly difficult condition to treat, however, choosing the appropriate tailor-made treatment combination can improve the final outcome. Combined Modality Therapy;Humans;Hyperpigmentation;Laser Therapy;Low-Level Light Therapy;Melanosis;Treatment Outcome

Effects of Pulsed-Wave Photobiomodulation Therapy on Human Spermatozoa. BACKGROUND AND OBJECTIVES: Previous studies reported that photobiomodulation (PBM) positively affects the mitochondrial respiratory chain in sperm, resulting in improved motility and velocity. As laser settings are not yet fully established, the present study aimed at optimizing PBM on human sperm. In addition, possible side-effects of PBM on sperm DNA fragmentation level and acrosomal integrity have been analyzed. STUDY DESIGN/MATERIALS AND METHODS: A pulsed laser-probe (wavelength 655â€‰nm, output power 25â€‰mW/cmÂ², impulse duration 200 nanoseconds) was used. Native fresh liquefied semen samples underwent radiation with energy doses of 0 (control), 4, 6, and 10â€‰J/cmÂ². Sperm parameters were assessed at 0, 30, 60, 90, and 120 minutes after radiation using a computer-assisted sperm analysis system. Motility and velocity of sperm from asthenozoospermic patients (nâ€‰=â€‰42) and normozoospermic controls (nâ€‰=â€‰22) were measured. The amount of DNA strand breaks was analyzed using ligation-mediated quantitative polymerase chain reaction in patients with asthenozoospermia (nâ€‰=â€‰18) and normozoospermia (nâ€‰=â€‰13). Post-irradiance acrosomal integrity was investigated using flow cytometry based on CD46 protein expression (nâ€‰=â€‰7). RESULTS: Exposure to laser energy-doses of 4Â and 6â€‰J/cmÂ² improved sperm motility and velocity in asthenozoospermic patients. PBM exhibited no significant effect on DNA fragmentation level and expression of CD46 serving as a biomarker for acrosome integrity. CONCLUSION: PBM improves sperm motility parameters by maintaining DNA and acrosome integrity and, therefore, represents a promising new tool for assisted reproductive therapy. In particular, improving sperm motility in asthenozoospermic patients by PBMÂ in futureÂ may contribute to increasingÂ the chance for successful intrauterine insemination. The present trial has no clinical registration number, as only in vitro studies were performed. The study was approved by the local ethics committee and performed according to the Declaration of Helsinki. Lasers Surg. Med. Â© 2021 The Authors. Lasers in Surgery and Medicine published by Wiley Periodicals LLC. Asthenozoospermia;Flow Cytometry;Humans;Low-Level Light Therapy;Male;Sperm Motility;Spermatozoa

The effect of low-level laser therapy on pathophysiology and locomotor recovery after traumatic spinal cord injuries: a systematic review and meta-analysis. This study was designed to determine the effective therapeutic parameters and evaluate the regenerative potential of low-level laser therapy (LLLT) after traumatic spinal cord injuries (TSCIs) in animal studies. The EMBASE and MEDLINE databases were searched on October 5, 2019, and followed with an update on January 2, 2021. All animal studies discussing the effect of LLLT on main pathophysiological events after TSCI, including inflammation, axon growth, remyelination, glial scar formation, cavity size, and locomotor recovery, were included. For statistical analysis, we used mean difference with 95% confidence intervals for locomotor recovery. In total, 19 articles were included based on our criteria. The results showed that regardless of laser type, laser beams with a wavelength between 600 and 850 nm significantly suppress inflammation and led inflammatory cells to M2 polarization and wound healing. Also, laser therapy using these wavelengths for more than 2 weeks significantly improved axon regeneration and remyelination. Improvement of locomotor recovery was more efficient using wavelengths less than 700 nm (SMD = 1.21; 95%CI: 0.09, 2.33; p = 0.03), lasers with energy densities less than 100 J/cm(2) (SMD = 1.72; 95%CI: 0.84, 2.59; p = 0.0001) and treatment duration between 1 and 2 weeks (SMD = 2.21; 95%CI: 1.24, 3.19; p < 0.00001). The LLLT showed promising potential to modulate pathophysiological events and recovery after TSCI, although there was heterogeneity in study design and reporting methods, which should be considered in future studies. Animals;Axons;Inflammation;Low-Level Light Therapy;Nerve Regeneration;Spinal Cord Injuries

Electrical physical modalities of treatment have been used therapeutically for many centuries. Reports of their use have been found in ancient writings, and include techniques still in use today, such as use of heat, cold and electricity. Contemporary electrical physical modalities are diverse and include treatments regularly used for pain management and self-management. The list below is not exhaustive: Thermal modalities, often in the form of reusable hot or cold packs applied to the skin. Therapeutic ultrasound, using a probe that generates ultrasonic waves from electricity and delivers them into the tissues. Interferential therapy, using medium frequency electrical currents delivered with multiple electrodes over the affected areas. Pulsed Shortwave Diathermy, using high frequency electromagnetic energy delivered using electrical coils, to heat the tissues. Low level laser therapy (LLLT), involving the non-invasive application of a single wavelength of light to the skin over the injured area using a probe. Neuromuscular Electrical Stimulation (NMES), using superficial electrodes to target motor fibres. For many of these techniques, a mechanism of action is currently unclear. Mechanisms may include activation of pain gate mechanisms, stimulation of cellular activity related to healing and repair, delivery of mechanical forces to alter the physical properties of tissues, alteration of blood flow and reduction of inflammation. While many of these interventions are popular choices for the self-management of painful conditions, their role in clinical practice is much less clear. This evidence review therefore intends to explore the effectiveness of these interventions for chronic primary pain.

Light emitting diode-red light for reduction of post-surgical scarring: Results from a dose-ranging, split-face, randomized controlled trial. Scarring has significant esthetic and functional consequences for patients. A need exists for anti-scarring therapeutics. Light emitting diode-red light (LED-RL) has been shown to modulate skin fibrosis. The aim of this study is to evaluate the safety and efficacy of LED-RL to reduce post-operative scarring. Cutaneous Understanding of Red-light Efficacy on Scarring was a randomized, mock-controlled, single-blind, dose-ranging, split-face phase II clinical trial. Starting 1â€‰week post-surgery, patients received LED-RL irradiation and temperature-controlled mock therapy to incision sites at fluences of 160, 320 or 480â€‰J/cm(2) , triweekly for 3â€‰weeks. Efficacy was assessed at 1, 3 and 6-12â€‰months. The primary endpoint was difference in scar pliability between LED-RL-treated and control sites. Secondary outcomes included

Patient and Observer Scar Assessment Scale, collagen and water concentration, and adverse events. There were no significant differences in scar pliability between treated and control scars. At certain fluences, treated scars showed greater improvements in observer rating and scar pliability, reflected by greater reductions in induration, from baseline to 6Â months compared to control scars. Treatment-site adverse events included blistering (nÂ =Â 2) and swelling (nÂ =Â 1), which were mild and resolved without sequelae. LED-RL phototherapy is safe in the early postoperative period and may reduce scarring. Cicatrix;Humans;Light;Phototherapy;Single-Blind Method;Skin;Treatment Outcome

470 nm LED Irradiation Inhibits the Invasiveness of CD133-positive Human Colorectal Cancer Stem Cells by Suppressing the Cyclooxygenase-2/prostaglandin E2 Pathway. BACKGROUND/AIM: Recurrence and metastasis of cancer caused by cancer stem cells (CSCs) is a challenge to overcome. Low level laser therapy is a new treatment strategy to suppress their invasiveness. We have assessed the inhibitory effects of 470 nm blue LED on the invasiveness of them to determine the molecular mechanisms of anti-invasiveness. MATERIALS AND METHODS: The effects of blue LEDs on their viability, proliferation and invasion were analyzed using MTT and transwell methods. In addition, the anti-invasiveness effect of blue LED on them was evaluated by zymography, semi-quantitative RT-PCR and western blot analysis. RESULTS: Irradiation with blue LED at 3 J/cm(2) resulted in inhibition of their viability, proliferation and invasiveness. Their matrix metalloproteinase 2 (MMP-2) and MMP-9 activities were reduced by blue LED irradiation. Semi-quantitative RT-PCR also showed similar results. In addition, western blotting analyses showed that cyclooxygenase-2 (COX-2) and prostaglandin E2 (PGE2) synthesis were significantly inhibited by LED irradiation in CD133(+) colorectal CSCs. CONCLUSION: Down-regulation of the COX-2/PGE2 signaling pathway by blue LED irradiation led to reduce expression of MMP-2 and MMP-9, inhibiting the invasiveness of CD133(+) colorectal CSC. AC133 Antigen;Cyclooxygenase 2;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Dinoprostone AC133 Antigen;Cell Proliferation;Cell Survival;Colorectal Neoplasms;Cyclooxygenase 2;Dinoprostone;Down-Regulation;Gene Expression Regulation, Neoplastic;Humans;Lasers, Semiconductor;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Neoplasm Invasiveness;Neoplastic Stem Cells;Signal Transduction;Tumor Cells, Cultured

Photobiomodulation exerts anti-inflammatory effects on the vascular and cellular phases of experimental inflammatory models. Photobiomodulation therapy (PBMT) is a non-thermal therapeutic procedure widely used in clinical practice. It is considered an effective modality of treatment for the control of various inflammatory conditions with fewer adverse effects as compared to conventional therapy. However, despite the clinical effects, the mechanisms of action and dosimetric parameters of PBMT are not fully understood. This study was performed to describe the effects of two different doses of PBMT on experimental models of inflammation. Male Swiss mice were administered with 0.9% of saline or phlogistic agents (carrageenan, dextran, serotonin, histamine, or bradykinin) by intra-plantar injection and were treated with PBMT at a dose of 1 or 5 J/cm(2); right after, the variation of the paw volume was made, and histopathological analysis and myeloperoxidase assay of the carrageenan-induced edematous paw tissues were performed. The action of PBMT on carrageenan-induced vascular permeability was further evaluated. Our results showed that PBMT (1 J/cm(2)) led to an improvement in paw edema induced by the phlogistic agents and further reduced the histological scores. Inhibition of neutrophil migration was observed following the administration of 1 and 5 J/cm(2) of PBMT. However, only 1 J/cm(2) of PBMT showed beneficial effects on carrageenan-induced edema. Laser at a dose of 1 J/cm(2) showed cellular and vascular effects since it was able to reverse all the inflammatory parameters, and laser at a dose of 5 J/cm(2) probably has only cellular effects in the presence of acute inflammation. Anti-Inflammatory

Agents Animals;Anti-Inflammatory Agents;Edema;Inflammation;Low-Level Light Therapy;Male;Mice;Models, Theoretical;Rats;Rats, Wistar
Clinical Features, Prognostic Factors, and Treatment Interventions for Ulceration in Patients With Infantile Hemangioma. IMPORTANCE: Ulceration is a common complication of infantile hemangioma (IH), which leads to substantial morbidity. Ulceration in IH has not been systematically studied since the advent of Î²-blocker therapy for IH. OBJECTIVES: To examine treatment interventions used for ulceration in IH and identify clinical prognostic indicators of healing time. DESIGN, SETTING, AND PARTICIPANTS: A retrospective, multicenter cohort study was conducted on 436 consecutive patients with a clinical diagnosis of ulcerated IH and available clinical photographs. Patients receiving care at tertiary referral centers evaluated between 2012 and 2016 were included; statistical and data analysis were performed from February 7 to April 27, 2020. EXPOSURES: Clinical characteristics, treatment interventions, course, complications, and resource use were analyzed. Treatment interventions for ulceration in IH included local (wound care, topical), systemic (Î²-blocker, corticosteroids), and procedural (pulsed-dye laser). MAIN OUTCOMES AND MEASURES: The primary end point was time to complete or nearly complete ulceration healing. Clinical characteristics were analyzed to determine the responses to most common interventions and prognostic factors for healing of ulceration. RESULTS: Of the 436 patients included in the study, 327 were girls (75.0%); median age at ulceration was 13.7 weeks (interquartile range, 8.86-21.30 weeks). The median heal time was 4.79 weeks (95% CI, 3.71-5.86 weeks) with wound care alone, 5.14 weeks (95% CI, 4.57-6.00 weeks) with timolol, 6.36 weeks (95% CI, 5.57-8.00 weeks) with a systemic Î²-blocker, and 7.71 weeks (95% CI, 6.71-10.14 weeks) with multimodal therapy. After adjusting for IH size, a dose of propranolol less than or equal to 1 mg/kg/d was associated with shorter healing time compared with higher propranolol doses (hazard ratio, 2.04; 95% CI, 1.11 to 3.73; Pâ€‰=â€‰.02). Size of the IH was identified as a significant prognostic factor for healing time in multivariable analysis. Increasing size of IH portends a proportionately longer time to heal of the ulceration. CONCLUSIONS AND RELEVANCE: Despite the use of Î²-blockers, this cohort study found that a subset of patients with IH ulceration continued to experience prolonged IH healing times. Larger IH size appears to be a poor prognostic factor for time to heal. For patients requiring systemic therapy, initiation of propranolol at lower doses (â‰¤1 mg/kg/d) should be considered. Adrenergic beta-Antagonists;Timolol Adrenergic beta-Antagonists;Age Factors;Bandages;Combined Modality Therapy;Female;Hemangioma, Capillary;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Prognosis;Retrospective Studies;Skin Neoplasms;Skin Ulcer;Timolol;Treatment Outcome;Wound Healing
In Reply. Humans;Low-Level Light Therapy
Low-Level Laser Therapy. Humans;Low-Level Light Therapy
Evaluation of Adjunctive Photobiomodulation (PBMT) for COVID-19 Pneumonia via Clinical Status and Pulmonary Severity Indices in a Preliminary Trial. PURPOSE: Evidence-based and effective treatments for COVID-19 are limited, and a new wave of infections and deaths calls for novel, easily implemented treatment strategies. Photobiomodulation therapy (PBMT) is a well-known adjunctive treatment for pain management, wound healing, lymphedema, and cellulitis. PBMT uses light to start a cascade of photochemical reactions that lead to local and systemic anti-inflammatory effects at multiple levels and that stimulate healing. Numerous empirical studies of PBMT for patients with pulmonary disease such as pneumonia, COPD and asthma suggest that PBMT is a safe and effective adjunctive treatment. Recent systematic reviews suggest that PBMT may be applied to target lung tissue in COVID-19 patients. In this preliminary study, we evaluated the effect of adjunctive PBMT on COVID-19 pneumonia and patient clinical status. PATIENTS AND METHODS: We present a small-scale clinical trial with 10 patients randomized to standard medical care or standard medical care plus

adjunctive PBMT. The PBMT group received four daily sessions of near-infrared light treatment targeting the lung tissue via a Multiwave Locked System (MLS) laser. Patient outcomes were measured via blood work, chest x-rays, pulse oximetry and validated scoring tools for pneumonia. RESULTS: PBMT patients showed improvement on pulmonary indices such as SMART-COP, BCRSS, RALE, and CAP (Community-Acquired Pneumonia questionnaire). PBMT-treated patients showed rapid recovery, did not require ICU admission or mechanical ventilation, and reported no long-term sequelae at 5 months after treatment. In the control group, 60% of patients were admitted to the ICU for mechanical ventilation. The control group had an overall mortality of 40%. At a 5-month follow-up, 40% of the control group experienced long-term sequelae. CONCLUSION: PBMT is a safe and effective potential treatment for COVID-19 pneumonia and improves clinical status in COVID-19 pneumonia.

Paradoxical darkening following picosecond laser and successful treatment. Adult;Dose-Response Relationship, Radiation;Eyebrows;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Radiation Dosage;Tattooing

Successful treatment of oral pigmented spots in Chinese subjects with Peutz-Jeghers syndrome using a 755-nm picosecond laser. Adolescent;Asian People;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Peutz-Jeghers Syndrome;Pigmentation Disorders;Treatment Outcome

Photobiomodulation and Oxidative Stress: 980â€‰nm Diode Laser Light Regulates Mitochondrial Activity and Reactive Oxygen Species Production. Photobiomodulation with 808â€‰nm laser light electively stimulates Complexes III and IV of the mitochondrial respiratory chain, while Complexes I and II are not affected. At the wavelength of 1064â€‰nm, Complexes I, III, and IV are excited, while Complex II and some mitochondrial matrix enzymes seem to be not receptive to photons at that wavelength. Complex IV was also activated by 633â€‰nm. The mechanism of action of wavelengths in the range 900-1000â€‰nm on mitochondria is less understood or not described. Oxidative stress from reactive oxygen species (ROS) generated by mitochondrial activity is an inescapable consequence of aerobic metabolism. The antioxidant enzyme system for ROS scavenging can keep them under control. However, alterations in mitochondrial activity can cause an increment of ROS production. ROS and ATP can play a role in cell death, cell proliferation, and cell cycle arrest. In our work, bovine liver isolated mitochondria were irradiated for 60â€‰sec, in continuous wave mode with 980â€‰nm and powers from 0.1 to 1.4â€‰W (0.1â€‰W increment at every step) to generate energies from 6 to 84â€‰J, fluences from 7.7 to 107.7â€‰J/cm(2), power densities from 0.13 to 1.79â€‰W/cm(2), and spot size 0.78â€‰cm(2). The control was equal to 0â€‰W. The activity of the mitochondria's complexes, Krebs cycle enzymes, ATP production, oxygen consumption, generation of ROS, and oxidative stress were detected. Lower powers (0.1-0.2â€‰W) showed an inhibitory effect; those that were intermediate (0.3-0.7â€‰W) did not display an effect, and the higher powers (0.8-1.1â€‰W) induced an increment of ATP synthesis. Increasing the power (1.2-1.4â€‰W) recovered the ATP production to the control level. The interaction occurred on Complexes III and IV, as well as ATP production and oxygen consumption. Results showed that 0.1â€‰W uncoupled the respiratory chain and induced higher oxidative stress and drastic inhibition of ATP production. Conversely, 0.8â€‰W kept mitochondria coupled and induced an increase of ATP production by increments of Complex III and IV activities. An augmentation of oxidative stress was also observed, probably as a consequence of the increased oxygen consumption and mitochondrial isolation experimental conditions. No effect was observed using 0.5â€‰W, and no effect was observed on the enzymes of the Krebs cycle. Reactive Oxygen Species;Superoxides;Malate Dehydrogenase;Isocitrate Dehydrogenase;Electron Transport Complex IV;Proton-Translocating ATPases;Electron Transport Complex III Animals;Cattle;Cell Respiration;Electron Transport

Complex III;Electron Transport Complex IV;Female;Isocitrate Dehydrogenase;Lasers, Semiconductor;Lipid Peroxidation;Low-Level Light Therapy;Malate Dehydrogenase;Male;Mitochondria;Oxidative Phosphorylation;Oxidative Stress;Proton-Translocating ATPases;Reactive Oxygen Species;Superoxides;Temperature

The Use of Technology in the Management of Orthodontic Treatment-Related Pain. Orthodontic pain is one of the negatives associated with fixed orthodontic treatment that cannot be avoided. This pain usually comes around the wire placement period and gradually decreases once the endogenous analgesic mechanisms start functioning. Over the years, several treatment modalities have been utilized for relief from orthodontic pain, and these include mechanical, behavior modification, and pharmacological methods. However, in the last decade, there are several newer methods employing the use of technology that have come up and are being used for alleviating pain. From computerized indirect bonding to virtual treatment planning, technology has slowly become a vital part of an orthodontist's repertoire. The digital age is here, and orthodontics must embrace the use of technology to help improve the quality of life of patients. Female;Humans;Low-Level Light Therapy;Male;Orthodontics;Pain Management;Quality of Life;Technology

Effect of Photobiomodulation on Critical Swimming Velocity: A Randomized, Crossover, Double-Blind, and Placebo-Controlled Study. PURPOSE: To analyze the acute effect of photobiomodulation (PBM) on swimming critical velocity (CV). METHODS: A total of 15 male federated swimmers (20.9 [2.4]Â y old) participated in this study. Three sets of front crawl were performed at distances of 100, 200, and 400Â m to determine the CV under 3 experimental conditions: PBM (420Â J), placebo (PLA), and control (C) in this randomized, crossover, double-blind, and placebo-controlled study. One-way analysis of variance for repeated measurements was used for statistical analyses. RESULTS: The results showed that the prior application of PBM did not have ergogenic effects on CV and front crawl swimming performance: CV (PBM = 1.15 [0.15]; PLA = 1.20 [0.25]; C = 1.15 [0.14]Â mÂ·s-1), swim time (ST) 100Â m (PBM = 65.5 [6.3]; PLA = 65.2 [5.6]; C = 66.0 [5.9]Â s), ST 200Â m (PBM = 148.5 [17.9]; PLA = 149.4 [16.4]; C = 150.1 [17.9]Â s), and ST 400Â m (PBM = 327.7 [38.2]; PLA = 321.6 [47.7]; C = 329.5 [41.2]Â s). CONCLUSIONS: A PBM application prior to front crawl swimming test did not significantly modify the CV, ST, physiological factors of metabolic fatigue, perceptual, and front crawl stroke efficiency parameters in competition swimmers covering distances of 100, 200, and 400Â m. Performance-Enhancing Substances Biomechanical Phenomena;Cross-Over Studies;Double-Blind Method;Humans;Male;Performance-Enhancing Substances;Swimming

The Effect of Photobiomodulation on Analgesia During Childbirth: A Controlled and Randomized Clinical Trial. Background: Pain during labor can be a barrier when choosing vaginal delivery. In an attempt to relief pain during labor, several pharmacological and nonpharmacological methods are proposed. Objective: To assess the effect of light-emitting diode (LED) photobiomodulation on analgesia during labor. Methods: A clinical trial was conducted with 29 women who were divided into two groups: G1 (experimental group-LED) and G2 (control group-hot shower). In the experimental group, an LED plate with red and infrared merged [red 660â€‰Â±â€‰20â€‰nm, 5â€‰mW/cm(2), 3â€‰J per LED (108â€‰J) and infrared 850â€‰Â±â€‰20â€‰nm, 5â€‰mW/cm(2), 3â€‰J per LED (108â€‰J), total energyâ€‰=â€‰216â€‰J] was placed on the subjects' dorsal region, at the level of T10 to S4, for 10â€‰min, with the plate automatically turning off. Hot shower at controlled temperature was offered for 30â€‰min. To verify the effect of LED on analgesia during labor, the following variables were assessed: (1) perception of pain, (2) fetal well-being assessed by cardiotocography or intermittent auscultation of fetal heart rate, (3) Apgar score at minutes 1 and 5 after birth, and (4) labor duration. Results: There was a statistically significant difference (pâ€‰<â€‰0.05) in pain reduction evidenced by a millimetric visual scale, before and after application on G1-LED (7.92â€‰Â±â€‰1.78). Regarding the other variables, there was no statistical

difference between the groups when comparing fetal well-being, Apgar score and labor duration. Conclusions: It is concluded that LED can be considered an alternative, since it caused pain reduction without changing other parameters during labor, compared with hot shower, a method included in hospital protocols, proving to be safe. Clinical Trial Registration number: NCT03496857.
Analgesia;Delivery, Obstetric;Female;Humans;Pain;Pain Measurement;Pregnancy

[Management of vulvovaginal atrophy: Physical therapies. Postmenopausal women management: CNGOF and GEMVi clinical practice guidelines]. INTRODUCTION: For some patients, local hormonal or non-hormonal treatments for genitourinary syndrome of menopause (SGUM) are contraindicated or insufficiently effective. Different physical therapies such as vaginal laser therapy, radiofrequency therapy, photobiomodulation therapy and local injection of hyaluronic acid, autologous fat (lipofilling) and platelet rich plasma (PRP) have been proposed as alternatives. OBJECTIVE: The objective of this review was to elaborate guidelines for clinical practice regarding the physical therapies proposed for management of vulvovaginal atrophy (AVV). METHODS: A systematic review of the literature on AVV management with physical therapies was conducted on Medline between January 2014 and December 2020. RESULTS: Regarding vaginal laser therapy, there are few randomized controlled trials and no formal conclusions can be drawn. The fractional CO2 laser did not demonstrate its superiority over local estrogen therapy. The ERBIUM:YAG laser has not been studied in randomized controlled trials. The lack of follow-up on the vaginal laser and the series of cases reporting risks of vaginal stenosis or chronic pain do not encourage recommending it as a first-line treatment. The literature concerning other physical treatments of AVV is weak concerning the genital area. CONCLUSION: CO2 or ERBIUM:YAG vaginal lasers are not the first-line treatment for AVV (grade C). In patients with a contraindication to local hormonal treatments, treatment with vaginal CO2 laser or ERBIUM:YAG may be considered after information about the risks (burn, stenosis, pain) (expert opinion). The other physical treatments of SGUM have to be evaluated.
Atrophy;Constriction, Pathologic;Female;Humans;Physical Therapy Modalities;Postmenopause;Vagina

Photobiomodulation therapy increases collagen II after tendon experimental injury. A tendon is a mechanosensitive tissue that transmits muscle-derived forces to bones. Photobiomodulation (PBM), also known as low-level laser therapy (LLLT), has been used in therapeutic approaches in tendon lesions, but uncertainties regarding its mechanisms of action have prevented its widespread use. We investigated the response of PBM therapy in experimental lesions of the Achilles tendon in rats. Thirty adult male Wistar rats weighing 250 to 300 g were surgically submitted to bilateral partial transverse section of the Achilles tendon. The right tendon was treated with PBM, whereas the left tendon served as a control. On the third postoperative day, the rats were divided into three experimental groups consisting of ten rats each, which were treated with PBM (Konf, Aculas - HB 750), 780 nm and 80 mW for 20 seconds, three times/week for 7, 14 and 28 days. The rats were sacrificed at the end of the therapeutic time period. The Sca-1 was examined by immunohistochemistry and histomorphometry, and COLA1, COLA2 and COLA3 gene expression was examined by qRT-PCR. COLA2 gene expression was higher in PBM treated tendons than in the control group. The histomorphometric analysis coincided with increased number of mesenchymal cells, characterized by Sca-1 expression in the lesion region ($p<0.001$). PBM effectively interferes in tendon tissue repair after injury by stimulating mesenchymal cell proliferation and the synthesis of collagen type II, which is suggested to provide structural support to the interstitial tissues during the healing process of the Achilles tendon. Further studies are needed to confirm the role of PBM in tendon healing. Collagen Achilles Tendon;Animals;Collagen;Disease Models, Animal;Low-Level Light Therapy;Rats;Rats, Wistar;Tendon Injuries;Wound Healing

Evaluation of the bond strengths of restorative materials to primary tooth dentin treated with different pulpotomy techniques. The aim of this study was to investigate the changes of different pulpotomy techniques on the primary tooth dentin and to evaluate the effects of these pulpotomy methods on the shear bond strength of restorative materials to primary tooth dentin. Two hundred and forty dentin specimens were distributed randomly to the study groups as; control, ferric sulphate, Biodentine(Â®) , Nd:YAG laser, photobiomodulation, and atmospheric pressure cold plasma (APCP). After the application of pulpotomy methods, samples were again randomly divided to two restorative materials (glass hybrid and composite resin) (nÂ =Â 20) and shear bond strength (SBS) test was performed. Then, 12 new dentin specimens were prepared for all groups for surface analysis. Surface examination (nÂ =Â 12) and fracture analyses (nÂ =Â 240) were carried out with scanning electron microscope (SEM). Statistical significance range was accepted as Î± <.05 for all data. A statistically significant difference was obtained among all study groups for glass hybrid material as well as composite material (p <.05). While the highest mean SBS value was obtained with Nd:YAG laser (7.58â€‰Â±â€‰0.60â€‰MPa), the lowest value was observed with Biodentine(Â®) (6.70â€‰Â±â€‰0.91â€‰MPa; pÂ =Â .001) for glass hybrid material. For composite material, the highest mean SBS value was calculated for Nd:YAG laser (13.79â€‰Â±â€‰1.24â€‰MPa), while the lowest value was obtained with ferric sulphate (10.17â€‰Â±â€‰1.45â€‰MPa; pÂ =Â .001). Fracture modes were mainly adhesive and mixed type according to SEM analysis. Moreover, morphological changes were observed with SEM on the dentin surfaces of ferric sulphate, Biodentine(Â®) and Nd:YAG laser. Within the limitations of this study, Nd:YAG laser increased the shear bond strength values in groups of composite resin. RESEARCH HIGHLIGHTS: In this article, we report the results of the shear bonding strength test of two restorative materials (glass-hybrid vs. composite resin) to primary tooth dentin following the application of five different pulpotomy techniques (ferric sulfate, Biodentine(Â®) , Nd:YAG laser, photobiomodulation, and atmospheric pressure cold plasma) were reported. This article will contribute to the literature that there are considerably limited researches concerning the bond strength of glass hybrid to primary dentin and also atmospheric pressure cold plasma in pulpotomies. The SEM examination was performed in two stages in this study; the morphological changes in both treated dentin surfaces and the surfaces of the samples subjected to the shear bond strength test. Composite Resins;Dentin-Bonding Agents;Resin Cements Humans;Composite Resins;Dental Bonding;Dentin;Dentin-Bonding Agents;Materials Testing;Pulpotomy;Resin Cements;Shear Strength;Tooth, Deciduous

Treatment of Distal Radius Fracture During Immobilization with an Orthopedic Cast: A Double-Blinded Randomized Controlled Trial of Photobiomodulation Therapy. Objective: With distal radius fracture (DRF) many patients experience stiffness and pain after removal of the cast. The aim of this study was to investigate possible effects of photobiomodulation therapy (PBMT) in DRF during immobilization with semicircular orthopedic cast. Methods: In this double-blinded, placebo-controlled trial, 53 patients with DRF were randomized to receive nine treatments of either PBMT or placebo-PBMT. The fractures were irradiated through openings in the cast. Patient-Rated Wrist and Hand Evaluation (PRWHE) questionnaire and clinical outcomes were measured at baseline, 4, 8, 12, and 26 weeks after the trauma. Results: No significant differences were found for PRWHE scores, although PBMT was significantly superior to placebo regarding active range of motion [AROM; 95% (confidence interval) CI: -65.25Â° to -20.42Â° and -25.57Â° to -0.73Â°, respectively] and grip strength at week 4 (95% CI: -12.10 to -1.67â€‰kg). Side-to-side differences between injured and noninjured wrists were significantly smaller in the PBMT group regarding grip and pinch strength at week 4 (95% CI: 0.89 to 8.87â€‰kg and 0.55 to 3.79â€‰kg, respectively). Significantly less patients in the PBMT group reported night pain at week 3. Conclusions: PBMT administered during the immobilization period of DRF had no effect on perceived pain and function measured through PRWHE. Night pain

was significantly reduced after 3 weeks by PBMT. PBMT significantly improved pinch and grip strength and AROM, but these findings did not translate to the subjective experience of pain and function. Trial registration number: Clinical.trials.gov number NCT02749929. The study was approved by the Regional ethics committee (REK-Vest) in Norway (App. No: 2015/330). Informed consent was obtained from all patients. Humans;Low-Level Light Therapy;Radius Fractures;Research Design

The effect of low-level laser therapy on diabetic foot ulcers: A meta-analysis of randomised controlled trials. Our purpose was to perform a meta-analysis to evaluate the effect of Low-level laser therapy (LLLT) on diabetic foot ulcers (DFUs). The PubMed, Cochrane, Embase, Web of Science, Chinese BioMedical Literature Database (CBM), China National Knowledge Infrastructure (CNKI), VIP and Wanfang databases were searched systematically up to August 27, 2020. Studies that met the inclusion criteria were included in the analysis. A total of 13 randomised controlled trials (RCTs) and 413 patients were analysed. Compared with the control group, LLLT significantly increased the complete healing rate (risk ratio [RR]Â =Â 2.10, 95% confidence interval [CI] 1.56-2.83, Pâ€‰<â€‰.00001), reduced the ulcer area (standardised mean difference [SMD]Â =Â 3.52, 95% CI 1.65-5.38, PÂ =Â .0002), and shortened the mean healing time (SMDÂ =Â -1.40, 95% CI -1.90 to -0.91, Pâ€‰<â€‰.00001) of patients with DFUs. The quality of the evidence was very low according to the GRADE system. LLLT is a promising and effective adjuvant treatment to accelerate the healing of DFUs. Further evidence from larger samples and higher quality RCTs is needed to prove the effect of LLLT and to determine the most appropriate parameters for the healing of DFUs. China;Diabetes Mellitus;Diabetic Foot;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Treatment Outcome;Wound Healing

Successful GaAlAs low-level laser therapy of self-inflicted thermal burns of the palate. Thermal burns of the oral cavity usually arise from ingestion of hot foods or beverages. A 38-year-old female patient presented with two painful ulcerative erythematous patches of the palate. The patient was consulted on the same day lesions appeared. Medical history was unremarkable. Clinically significant self-inflicted injuries may result in wide ulcers in the mouth and usually do not take less than 2 weeks to heal, whereas our patient, treated with low-level laser therapy, had a complete response in day 4, after 2 days of treatment. The fact that multiple lesions were present signaled against the World Health Organization exclusion diagnosis of erythroplakia for red patches. A traumatic ulcer, regardless of its cause of origin, usually heals within 2 weeks, after the source of injury is resolved. A thermal burn in the oral cavity usually takes longer than that to heal, but whenever this time frame is not respected, the suspicion of a potentially malignant disorder should always arise, and a biopsy should be performed. The present case showed two painful thermal burns with great results in terms of speeding up the relieve of symptoms and healing time with soft laser as opposed to the traditional treatment with oral topical corticosteroid.

Effects of photobiomodulation in salivary glands of chronic kidney disease patients on hemodialysis. This randomized placebo-controlled trial evaluates the impact of photobiomodulation (PBMT) on the salivary flow and biochemistry of patients with chronic kidney disease (CKD) on hemodialysis. Forty-four patients on hemodialysis self-responded two questionnaires for oral health and salivary gland function perception. The subjects were evaluated for function of salivary glands and randomly allocated to two groups: PBMT group (three irradiations at 808 nm, 100 mW, 142 J/cm(2), and 4 J per site); and placebo group. Patients were submitted to non-stimulated and stimulated sialometry and after the treatment at baseline and 14 days. Salivary volume and biochemical of the saliva were analyzed. At baseline, most subjects had self-perception of poor oral health (52.6%) and salivary dysfunction (63.1%). Clinical exam revealed that 47.3% of subjects presented dry mucosa. PBMT promoted increase of the non-stimulated (p = 0.027) and stimulated saliva (p = 0.014) and decrease

of urea levels in both non-stimulated (p = 0.0001) and stimulated saliva (p = 0.0001). No alteration was detected in total proteins and calcium analysis. Patients with kidney disease can present alteration in flow, concentrations, and composition of saliva, affecting oral health, but our findings suggest that PBMT is effective to improve hyposalivation and urea levels in saliva of patients with CKD. Humans;Low-Level Light Therapy;Renal Dialysis;Renal Insufficiency, Chronic;Salivary Glands

Photobiomodulation-blue and red LED: protection or cellular toxicity? In vitro study with human fibroblasts. Photobiomodulation is widely used in clinical practice, and there is increasing interest in using this tool to treat numerous dysfunctions in living organisms. Therefore, this study aimed to verify the action of blue and red light-emitting diode light in cells. Human fibroblast cell line (HFF-1) were irradiated by blue (470 nm) or red (658 nm) light at doses of 4 and 18 J/cm(2), respectively. Laboratory analyses were carried out to check for viability, proliferation, cell death, and the formation of reactive oxygen and nitric oxide species. The blue light demonstrated cell protection potential by reducing free radical formation and protecting the cell membrane by decreasing double-stranded DNA strands. On the other hand, the red light showed less potential for cell protection due to the risk of associating more significant nitric oxide formation with increased reactive oxygen species formation, in addition to having a greater amount of extracellular DNA. Cell damage prevention is a potential beneficial effect of blue light at 18 J/cm(2). Despite the consolidated effects of red light in treating wounds, there was a potential toxic effect of this wavelength in the doses studied. Given the above, new studies relating these parameters with pathological cells or aggressors that simulate damage may offer results that can better support clinical practice. Cell Line;Cell Proliferation;Fibroblasts;Humans;Light;Skin Diseases

Near-infrared 940-nm diode laser photobiomodulation of inflamed periodontal ligament stem cells. Photobiomodulation (PBM) is an acceptable method of stimulating stem cells through its non-invasive absorption by the cell photoreceptors and the induction of cellular response. The current research was aimed at evaluating the effect of near-infrared PBM on proliferation and osteogenic differentiation in inflamed periodontal ligament stem cells (I-PDLSCs). I-PDLSCs were isolated and characterized. Third passage cells were irradiated with 940-nm laser at an output power of 100 mW in a continuous wave. A fluence of 4 J/cm(2) in three sessions at 48-h intervals was applied and compared with non-irradiated controls. Cell viability and proliferation were evaluated by MTT assay. Alkaline phosphatase activity, quantitative Alizarin red staining test, and q-RT-PCR were used to evaluate the osteogenic properties of the I-PDLSCs in four groups of (a) osteogenic differentiation medium + laser (ODM + L), (b) osteogenic differentiation medium without laser (ODM), (c) non-osteogenic differentiation medium + laser (L), and (d) non-osteogenic differentiation medium (control). There was a non-significant increase in the viability of cells at 48- and 72-h post last laser irradiation. Alizarin red staining revealed no significant stimulatory effect of PBM at 14 and 21 days. However, alkaline phosphatase activity was significantly higher in the L + ODM group. Expression of osteogenic-related genes had a statistically significant increase at 21-day post irradiation. The irradiation used in the present study showed no significant increase in the proliferation of I-PDLSCs by PBM. However, expression levels of osteogenic-related genes and alkaline phosphatase activity were significantly increased in irradiated groups. Alkaline Phosphatase Alkaline Phosphatase;Cell Differentiation;Cell Proliferation;Cells, Cultured;Lasers, Semiconductor;Osteogenesis;Periodontal Ligament;Stem Cells

Photobiomodulation therapy was more effective than photobiomodulation plus arginine on accelerating wound healing in an animal model of delayed healing wound. The combined and individual influences of photobiomodulation therapy (PBMT) and arginine on wound strength, stereological parameters, and gene expressions of some related growth factors in ischemic and

delayed healing wounds in rats were analyzed. We divided 108 rats into six groups: control, lower energy density (LOW)-PBMT, 2% arginine ointment (Arg 2%), LOW-PBMT + Arg 2%, high energy density (HIGH)-PBMT, and HIGH-PBMT + Arg 2%. First, we generated an ischemic and delayed healing wound model in each rat. We examined wound strength, stereological parameters, and gene expressions of basic fibroblast growth factor (bFGF), vascular endothelial growth factor A (VEGF-A), and stromal cell-derived factor 1 (SDF-1) by quantitative real-time polymerase chain reaction (qRT-PCR). PBMT alone and PBMT + Arg 2% considerably increased wound strength compared to the control and Arg 2% groups during the inflammatory and proliferative steps of wound healing ($p < 0.05$). In these steps, PBMT alone significantly induced an anti-inflammatory effect and increased fibroblast counts; Arg 2% alone induced an inflammatory response ($p < 0.05$). Concurrently, PBMT and PBMT + Arg 2% significantly increased keratinocyte counts and volume of the new dermis ($p < 0.05$). At the remodeling step, the Arg 2% groups had significantly better wound strength than the other groups ($p < 0.05$). In this step, PBMT and PBMT + Arg 2% significantly decreased inflammation, and increased fibroblast counts, vascular length, and the volume of new epidermis and dermis compared to the control and Arg 2% groups ($p < 0.05$). In all cases of gene analysis, there were statistically better results in the PBMT and PBMT + Arg 2% groups compared with the Arg 2% and control groups ($p < 0.05$). The anti-inflammatory and repairing effects of PBMT on an ischemic and delayed healing wound model in rats were shown by significant improvements in wound strength, stereological parameters, and gene expressions of bFGF, VEGF-A, and SDF-1Î±. Vascular Endothelial Growth Factor A;Arginine Animals;Arginine;Disease Models, Animal;Low-Level Light Therapy;Rats;Vascular Endothelial Growth Factor A;Wound Healing

Violet LED induces vasodilation in rat aortic rings by soluble guanylate cyclase-dependent mechanism and increases SOD activity. We found several studies that have used the aortic rings as an experimental model, mainly for the testing of new drugs or new therapies that try to reverse or prevent endothelial dysfunction or characterize its mechanism of action in a biological system, creating the knowledge necessary to obtain the treatment of those several diseases, where many of these treatments involve photobiomodulation therapies. We also found numerous wavelengths represented by different colors of LASER or LED in which frequently, the mechanism of action in biological systems is unknown. This study has as main objective to investigate the effects of the Violet LED Light (405 nm) by using isolated aortic rings, looking for nitric oxide (NO) release, and evaluating if Violet LED Light can modulate the superoxide dismutase (SOD) activity. We performed a vascular reactivity study in isolated aortic rings from normotensive rats with a single LED application. Besides it, the rings were pre-incubated with soluble guanylate cyclase (sGC) inhibitor or endothelial NO synthase inhibitor and subsequently underwent the application of the Violet LED. The cell viability and nitric oxide release in cell culture of human umbilical codon vein cells (HUVEC) were analyzed. In the vascular reactivity experiment, we observed a peak of vasodilation when applying light to the aortic rings. The soluble guanylate cyclase inhibitor abolished the relaxation induced by the Violet LED Light. However, the NO synthase inhibitor did not modify the Violet LED effect. In an isolated system, we verified that the Violet LED Light can increase SOD activity. Our results suggest that Violet LED Light induces vasodilation by a mechanism dependent on sGC activation, and not by NOS activation, and part of this effect could be due to the increase of SOD activity. Nitric Oxide;Superoxide Dismutase;Guanylate Cyclase;Soluble Guanylyl Cyclase Animals;Endothelium, Vascular;Guanylate Cyclase;Nitric Oxide;Rats;Soluble Guanylyl Cyclase;Superoxide Dismutase;Vasodilation

Effectiveness of electrophysical modalities in the sensorimotor rehabilitation of radial, ulnar, and median neuropathies: A meta-analysis. INTRODUCTION: People with ulnar, radial or median nerve injuries can present significant impairment of their sensory and motor functions. The

prescribed treatment for these conditions often includes electrophysical therapies, whose effectiveness in improving symptoms and function is a source of debate. Therefore, this systematic review aims to provide an integrative overview of the efficacy of these modalities in sensorimotor rehabilitation compared to placebo, manual therapy, or between them. METHODS: We conducted a systematic review according to PRISMA guidelines. We perform a literature review in the following databases: Biomed Central, Ebscohost, Lilacs, Ovid, PEDro, Sage, Scopus, Science Direct, Semantic Scholar, Taylor & Francis, and Web of Science, for the period 1980-2020. We include studies that discussed the sensorimotor rehabilitation of people with non-degenerative ulnar, radial, or median nerve injury. We assessed the quality of the included studies using the Risk of Bias Tool described in the Cochrane Handbook of Systematic Reviews of Interventions and the risk of bias across studies with the GRADE approach described in the GRADE Handbook. RESULTS: Thirty-eight studies were included in the systematic review and 34 in the meta-analysis. The overall quality of evidence was rated as low or very low according to GRADE criteria. Low-level laser therapy and ultrasound showed favourable results in improving symptom severity and functional status compared to manual therapy. In addition, the low level laser showed improvements in pinch strength compared to placebo and pain (VAS) compared to manual therapy. Splints showed superior results to electrophysical modalities. The clinical significance of the results was assessed by effect size estimation and comparison with the minimum clinically important difference (MCID). CONCLUSIONS: We found favourable results in pain relief, improvement of symptoms, functional status, and neurophysiological parameters for some electrophysical modalities, mainly when applied with a splint. Our results coincide with those obtained in some meta-analyses. However, none of these can be considered clinically significant. TRIAL REGISTRATION: PROSPERO registration number CRD42020168792; https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=168792. Combined Modality Therapy;Electric Stimulation Therapy;Humans;Median Neuropathy;Neuralgia;Pain Measurement;Radial Neuropathy;Splints;Treatment Outcome;Ulnar Neuropathies

The Effectiveness of Photobiomodulation on Accelerating Tooth Movement in Orthodontics: A Systematic Review and Meta-Analysis. Objective: This meta-analysis evaluated the effectiveness of photobiomodulation therapy (PBMT) on accelerating orthodontic tooth movement (OTM) in clinical practice. Methods: Data from bilingual journals across seven different databases were compiled and analyzed. Randomized controlled trials (RCTs) and quasi-RCTs regarding the effect of PBMT on OTM in cases with four first premolar extractions in split-mouth design were selected. This study was conducted after approval from the IRB. The outcome variables were the cumulative tooth movement distances in 1, 2, and 3 months. Data extraction was performed by two authors independently and in duplicate. Risk of bias was assessed. Results: Eight RCTs and one quasi-RCT were ultimately included and analyzed in meta-analysis. This study revealed that the pooled mean difference (MD) among these trials was 0.30 [95% confidence interval (CI): -0.02 to 0.62], 0.69 (95% CI: 0.08 to 1.29), and 0.64 (95% CI: -0.01 to 1.29) for 1, 2, and 3 months, respectively. The results remained consistent after sensitivity analysis assessment. Conclusions: There is insufficient evidence to support that photobiomodulation accelerates tooth movement in orthodontic treatments. Our results suggest that the optimal parameters of PBMT on OTM in human might be about 20â€‰mW, 5-8â€‰J/cm(2), 0.5 W/cm(2), 0.2â€‰J/point, and 2-10â€‰J/tooth. More large-sample multicenter clinical trials carried out in similar settings are required to confirm and pinpoint treatment efficiency and optimal parameters. Registration: The review protocol was not registered prior to the study. Humans;Low-Level Light Therapy;Multicenter Studies as Topic;Orthodontics;Tooth Movement Techniques

Bone substitutes and photobiomodulation in bone regeneration: A systematic review in animal experimental studies. In general, bone fractures are able of healing by itself. However, in critical

situations such as large bone defects, poor blood supply or even infections, the biological capacity of repair can be impaired, resulting in a delay of the consolidation process or even in non-union fractures. Thus, technologies able of improving the process of bone regeneration are of high demand. In this context, ceramic biomaterials-based bone substitutes and photobiomodulation (PBM) have been emerging as promising alternatives. Thus, the present study performed a systematic review targeting to analyze studies in the literature which investigated the effects of the association of ceramic based bone substitutes and PBM in the process of bone healing using animal models of bone defects. The search was conducted from March and April of 2019 in PubMed, Web of Science and Scopus databases. After the eligibility analyses, 16 studies were included in this review. The results showed that the most common material used was hydroxyapatite (HA) followed by Biosilicate associated with infrared PBM. Furthermore, 75% of the studies demonstrated positive effects to stimulate bone regeneration from association of ceramic biomaterials and PBM. All studies used low-level laser therapy (LLLT) device and the most studies used LLLT infrared. The evidence synthesis was moderate for all experimental studies for the variable histological analysis demonstrating the efficacy of techniques on the process of bone repair stimulation. In conclusion, this review demonstrates that the association of ceramic biomaterials and PBM presented positive effects for bone repair in experimental models of bone defects. Biocompatible Materials;Bone Substitutes Animals;Biocompatible Materials;Bone Regeneration;Bone Substitutes;Low-Level Light Therapy

Efficacy of single versus multiple exposure by electromagnetic modalities on gram-negative and positive bacterial strains in an in-vitro model. OBJECTIVES: The primary purpose of the recent experiment was to scrutinize the dissimilarity between single and multiple exposures by electrotherapeutic modalities to determine the development of Gram-positive and Gram negative bacteria spectrum. MATERIAL AND METHODS: Bacterial strains employed in this study were Gram-negative bacteria such as Pseudomonas aeruginosa, Escherichia coli, and Klebsiella pneumonae and Gram-positive bacteria such as Staphylococcus aureus, Staphylococcus saprophyticus and Streptococcus pyogenes. Fluence for Low level laser therapy (LLLT) (810Â nm) was 40Â J/cm(2) for 80Â s, for microwave (MWD) a dosage of 100-Watt with duration of 5Â min and for magnetic field therapy (MT) duration of 30Â min with 100% intensity was used. RESULTS: Repeated Measures of analysis of variances (RANOVA) for within-subject effects was used to detect a global significant change within the means at dissimilar time points. The experiments of within-subjects revealed a significant difference within groups, df of (3, 40), F value of 39.38 and a p value less than 0.001, representing a significant variation between the three groups between pre and post exposures. There was a significant variation between single exposure and multiple exposures in the experimental sample's pre-post between the four groups with df (1, 40) f value of 2943.69 and p value less than 0.001. Scanning and Transmission electron microscopy images were also taken into account to determine the extent of damage caused to the bacterial cells surface topography in Gram negative and Gram positive spectrums. CONCLUSION: The study demonstrated that single high exposure with the LLLT appears to have the most emphatic effect followed by exposure by MWD and MT.

The MAPKinase Signaling and the Stimulatory Protein-1 (Sp1) Transcription Factor Are Involved in the Phototherapy Effect on Cytokines Secretion from Human Bronchial Epithelial Cells Stimulated with Cigarette Smoke Extract. The present study was aimed to investigate the phototherapy effect with low-level laser on human bronchial epithelial cells activated by cigarette smoke extract (CSE). Phototherapy has been reported to actuate positively for controlling the generation/release of anti-inflammatory and pro-inflammatory mediators from different cellular type activated by distinct stimuli. It is not known whether the IL-8 and IL-10 release from CSE-stimulated human bronchial epithelium (BEAS) cells can be influenced by phototherapy. Human bronchial epithelial cell (BEAS) line was cultured in a medium with CSE and irradiated (660 nm) at 9 J. Apoptosis index was

standardized with Annexin V and the cellular viability was evaluated by MTT. IL-8, IL-10, cAMP, and NF-ÎºB were measured by ELISA as well as the Sp1, JNK, ERK1/2, and p38MAPK. Phototherapy effect was studied in the presence of mithramycin or the inhibitors of JNK or ERK. The IL-8, cAMP, NF-ÎºB, JNK, p38, and ERK1/2 were downregulated by phototherapy. Both the JNK and the ERK inhibitors potentiated the phototherapy effect on IL-8 as well as on cAMP secretion from BEAS. On the contrary, IL-10 and Sp1 were upregulated by phototherapy. The mithramycin blocked the phototherapy effect on IL-10. The results suggest that phototherapy has a dual effect on BEAS cells because it downregulates the IL-8 secretion by interfering with CSE-mediated signaling pathways, and oppositely upregulates the IL-10 secretion through of Sp1 transcription factor. The manuscript provides evidence that the phototherapy can interfere with MAPK signaling via cAMP in order to attenuate the IL-8 secretion from CSE-stimulated BEAS. In addition, the present study showed that phototherapy effect is driven to downregulation of the both the IL-8 and the ROS secretion and at the same time the upregulation of IL-10 secretion. Besides it, the increase of Sp-1 transcription factor was crucial for laser effect in upregulating the IL-10 secretion. The dexamethasone corticoid produces a significant inhibitory effect on IL-8 as well as ROS secretion, but on the other hand, the corticoid blocked the IL-10 secretion. Taking it into consideration, it is reasonable to suggest that the beneficial effect of laser therapy on lung diseases involves its action on unbalance between pro-inflammatory and anti-inflammatory mediators secreted by human bronchial epithelial cells through different signaling pathway. Cytokines;Smoke;Sp1 Transcription Factor;SP1 protein, human;Mitogen-Activated Protein Kinase Kinases Bronchi;Cell Line;Cigarette Smoking;Cytokines;Humans;Mitogen-Activated Protein Kinase Kinases;Phototherapy;Respiratory Mucosa;Smoke;Sp1 Transcription Factor;Nicotiana

Comparing QS Nd:YAG laser alone with its combination with fractional ablative Er:YAG in tattoo removal. Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Tattooing;Treatment Outcome

Preliminary evaluation of the utility of optical coherence tomography in detecting structural changes during photobiomodulation treatment in patients with atrophic-erosive oral lichen planus. INTRODUCTION: Oral lichen planus (OLP) is a common oral inflammatory condition. Against symptomatic atrophic-erosive OLP, topical steroids, or photobiomodulation (PBM) are deployed. Optical coherence tomography (OCT) provides a real-time, non-invasive, tissue investigation. Aim of this study was to evaluate modifications of OCT pattern in patients with painful atrophic-erosive OLP, before and after treatment with PBM, comparing those results with patients treated with topical steroid. METHODS: Two groups of 20 OLP patients were evaluated. Group A underwent two daily application of 0.05 % clobetasol propionate for 8 weeks; group B was treated with eight weekly PBM sessions using a 980/645 nm diode laser. OCT scans were performed before and after treatment, and six months after end of the proposed protocol. Changes of width of stratified epithelium (EP) and lamina propria (LP) were quantified. RESULTS: After 8-weeks, both groups experienced a significant increase of EP width ($p < 0.05$), and a significant decrease of LP width ($p < 0.05$), with Î”-EP in Group A significantly higher than Group B ($p = 0.0015$); conversely, Î”-LP was not significantly different ($p > 0.05$). After six months, significant increase of EP width remained only in group B ($p = 0.01$), with no significant decrease of LP mean width in both groups ($p > 0.05$). CONCLUSIONS: Increase of EP and decrease of LP might be explained as consequence of clobetasol and PBM ability to promote epithelial healing, and to reduce interface inflammation. When investigated with OCT, clobetasol appears to provide more significant short-term structural changes, whereas PBM might guarantee long-term alterations. Anti-Inflammatory Agents;Glucocorticoids;Photosensitizing Agents Administration, Topical;Anti-Inflammatory Agents;Glucocorticoids;Humans;Lichen Planus, Oral;Photochemotherapy;Photosensitizing Agents;Tomography, Optical Coherence

The synergistic effects of applying low-level laser therapy plus ultrasound on pain and muscle function in patients with knee osteoarthritis: A protocol of a randomized double-blind study. BACKGROUND: To our knowledge, only 1 study with limited sample size tried to evaluate the synergistic effects of ultrasound and low-level laser therapy (LLLT) in patients with knee osteoarthritis. Further research is needed to confirm this synergy with larger numbers and better design. Therefore, we will conduct this present randomized double-blind study to evaluate the synergistic effects of simultaneously applying ultrasound plus LLLT on pain and muscle function in patients with knee osteoarthritis. METHODS: The study protocol is a randomized, controlled, double-blind design. The study will be conducted at our academic hospital from February 2021 to January 2022. The study protocol was approved through Institutional Review Board in the Hunan Provincial People's Hospital. Patients will be assigned at random to the ultrasound + LLLT group, LLLT group, or the ultrasound group. After baseline examination, all patients will be given a full explanation of the treatment protocol and will be required to sign a written informed consent for study participation and for publication of the results. All the data collectors, surgeons, statistical analysts, as well as result assessors are not aware of grouping assignment. The primary outcome is weekly change in pain intensity relative to baseline through 6â€Šweeks of therapy. RESULTS: This protocol will provide a reliable theoretical basis for the following research. CONCLUSION: It is assumed that there will be a remarkable difference in postoperative outcomes between the intervention and control groups. TRIAL REGISTRATION: This study protocol was registered in Research Registry (researchregistry6470). Combined Modality Therapy;Double-Blind Method;Humans;Low-Level Light Therapy;Muscle, Skeletal;Osteoarthritis, Knee;Pain Management;Ultrasonic Therapy;Randomized Controlled Trials as Topic

Viability of transverse rectus abdominis musculocutaneous flap treated with photobiomodulation and therapeutic ultrasound: an experimental model. Report the effects of photobiomodulation (PBM) and therapeutic ultrasound (TUS) on the viability of TRAM in mice. MATERIALS AND METHODS: Fifty-five mice Swiss were subjected to treatment for 5 days. Group 1, treatment was performed with the agents switched off. Groups 2 to 5 were treated with different wavelengths 660 and 830 nanometers (nm) and groups 6 to 11 with TUS of 1 and 3 MHz frequency. Macrometric analyses were performed using a specific camera and analyzed by the ImageJÂ® software. Thermographic analyses were performed with the Flir C2 and analyzed using the FLIR Tools software. RESULTS: Group 9 obtained 95% of viable area on the 3rd day and 85% on the 5th day, showing the effectiveness of the TUS in the flap viability. Regarding skin temperature, there was a difference only in the immediate postoperative period in group 1, which had a lower temperature than the other groups. CONCLUSIONS: TUS demonstrated greater efficiency in maintaining the viability of TRAM. PBM 830 nm also demonstrated good results in the viability of TRAM. Animals;Graft Survival;Mammaplasty;Mice;Models, Theoretical;Myocutaneous Flap;Rectus Abdominis;Ultrasonic Therapy

Comprehensive Effects of Photobiomodulation Therapy as an Adjunct to Post-orthodontic Treatment Care: A Systematic Review. PURPOSE: To evaluate the comprehensive effects of photobiomodulation (PBM) therapy on teeth after active orthodontic treatment. MATERIALS AND METHODS: This systematic review was conducted according to the PRISMA guidelines. Six databases were electronically searched and screened for eligible human and animal studies published up to August 2020. The risk of bias was assessed based on the Cochrane Handbook for Systematic Reviews of Interventions and Systematic Review Centre for Laboratory Experiment Tool. Two independent reviewers performed all procedures in duplicate. Any disagreement was resolved by discussion or consultation with a third reviewer. RESULTS: A total of 395 records were identified from the initial search up to August 2020. Following screening, 16 full-text articles were reviewed for eligibility (Îº >

0.90), and ultimately 9 studies (3 clinical studies and 6 animal studies) were included in this review. The key outcomes observed were 'tooth position maintenance' and 'root resorption rehabilitation'. Two controlled clinical trials and two animal studies supported the preventive effects of PBM therapy on the relapse of post-orthodontic tooth positions, while the other two animal studies reported opposing findings. Regarding root resorption, all evidence supported the rehabilitation potential using PBM therapy for teeth that had undergone orthodontic tooth movement. There was a high risk of bias among studies, except for one randomised controlled trial. Due to the substantial heterogeneity among studies in terms of their types, participants, designs, PBM therapy settings and variables of interest, it was not possible to conduct a meta-analysis; therefore, a qualitative synthesis is presented. CONCLUSION: The quality of evidence for PBM therapy contributing to the maintenance of tooth position or improved dental health after orthodontic treatment remains low. There is considerable controversy over the effects of PBM therapy on orthodontic relapse. However, the use of PBM therapy after orthodontic treatment has promising effects for root resorption rehabilitation and is generally recommended. Animals;Dental Care;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Root Resorption;Tooth Movement Techniques

Effect of photobiomodulation on mitochondrial dynamics in peripheral nervous system in streptozotocin-induced type 1 diabetes in rats. There is no effective treatment to halt peripheral nervous system damage in diabetic peripheral neuropathy. Mitochondria have been at the center of discussions as important factors in the development of neuropathy in diabetes. Photobiomodulation has been gaining clinical acceptance as it shows beneficial effects on a variety of nervous system disorders. In this study, the effects of photobiomodulation (904Â nm, 45 mW, 6.23Â J/cm(2), 0.13 cm(2), 60Â ns pulsed time) on mitochondrial dynamics were evaluated in an adult male rat experimental model of streptozotocin-induced type 1 diabetes. Results presented here indicate that photobiomodulation could have an important role in preventing or reversing mitochondrial dynamics dysfunction in the course of peripheral nervous system damage in diabetic peripheral neuropathy. Photobiomodulation showed its effects on modulating the protein expression of mitofusin 2 and dynamin-related protein 1 in the sciatic nerve and in the dorsal root ganglia neurons of streptozotocin-induced type 1 diabetes in rats. Blood Glucose;Streptozocin Animals;Blood Glucose;Diabetes Mellitus, Experimental;Ganglia, Spinal;Lasers, Semiconductor;Male;Mitochondrial Dynamics;Rats;Rats, Wistar;Sciatic Nerve;Streptozocin

Combined pulsed-dye laser and medical therapy for treatment of cutaneous sarcoidosis lesions: a case report. Sarcoidosis is a systemic granulomatous disease of unknown etiology that most frequently occurs in the lungs. However, cutaneous lesions are often the primary sign. Cutaneous sarcoidosis is difficult to treat, although different therapies have been applied. We herein report a case in which cutaneous sarcoidosis was treated with pulsed-dye laser (PDL) therapy along with oral administration of acitretin and hydroxychloroquine; no topical medications were applied. All patient details are de-identified. The treatment areas gradually improved after several courses of PDL therapy. This case illustrates that PDL therapy can serve as an auxiliary treatment for cutaneous sarcoidosis. Combined Modality Therapy;Humans;Lasers, Dye;Low-Level Light Therapy;Sarcoidosis

Biological role of postoperative low level laser therapy in preventing hydroxyapatite orbital implantation exposure: A case report. Conjunctival sac stenosis is the contraction of the conjunctival sac as a result of trauma or disease. The aim of the present study was to observe the clinical effects of low-level laser therapy (LLLT) combined with hydroxyapatite (HA) orbital implantation as a treatment strategy for conjunctival sac stenosis. A total of 10 patients with conjunctival sac stenosis were treated with scleral graft transplantation in conjunction with HA implantation and postoperative LLLT. In addition, a rabbit model was used to investigate the

biological mechanism underlying the effects of LLLT with the aim of preventing and treating orbital implantation exposure. The right eyeball was removed, orbital implantation performed and LLLT applied to experimental groups. (99m)Tc-Methyl diphosphonate scanning methods were performed at different timepoints to compare the average radioactivity count of the region of interest between surgical (right) and control (left) eyes (R/L). Histopathological examination was performed 8 weeks post-surgery, followed by analysis of fiber vascularization. Following LLLT, moderate conjunctival wounds were completely healed within 2 weeks and severe stenosis wounds healed within 3 weeks. Following prosthesis implantation in the rabbit model, a significantly elevated R/L ratio was observed after 4 weeks, whereas no significant difference was observed compared with the control group at 6 and 8 weeks postoperatively. Histopathological examination revealed that all implants were fibrotic. Overall, the present study demonstrated that LLLT promoted the survival of conjunctival grafts, stimulated conjunctival incision healing and promoted early vascularization of HA implants. Clinical trial registration no: ChiCTR-DDT-12002660 (www.chictr.org/cn/).

Effectiveness of low level laser therapy versus cryotherapy in cancer patients with oral mucositis: Systematic review and network meta-analysis. OBJECTIVE: The purpose of this network meta-analysis was to analyze the relative effects of low level laser therapy (LLLT) and/or cryotherapy in cancer patients with oral mucositis (OM). METHODS: This literature search followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials (CENTRAL), and the Physiotherapy Evidence Database (PEDro) up to 2020. Only randomized control trials which involved comparisons of groups receiving the interventions of combined cryotherapy and LLLT, LLLT, cryotherapy and usual care (the control group) in patients with cancer were eligible for inclusion. The effect sizes are presented as odds ratios for the occurrence of severe, moderate and none/mild OM. The mixed treatment comparison was conducted using generalized linear mixed models to analyze the direct and indirect comparisons of interventions. The critical appraisal was assessed using Cochrane Collaboration's tool. Heterogeneity between studies was assessed using I(2) statistics, and publication bias was evaluated by constructing a funnel plot. RESULTS: Twenty-six randomized controlled trials with a total enrollment of 1830 cancer patients with OM were included. The outcome of none/mild OM is desirable, and odds ratios of more than 1 favor the intervention group. Moderate and severe OM are defined as adverse outcomes, and ORs less than 1 favor the intervention group. The treatment effects of the combined cryotherapy and LLLT were better than those of usual care for none/mild and severe OM (ORs = 106.23 [95% CI = 12.15 to 929.17] and 0.01 [95% CI = 0 to 0.57], respectively). Treatment effects with cryotherapy alone and LLLT alone were better than those with usual care for none/mild and severe OM (ORs = 3.13 [95%CI = 1.56 to 6.27]; ORs = 7.56 [95%CI = 3.84 to 14.88] and 0.25 [95%CI = 0.11 to 0.54]; ORs = 0.13 [95%CI = 0.07 to 0.24], respectively). Nevertheless, for patients with none/mild OM, treatment effects with combined use of cryotherapy and LLLT were better than those with only LLT or cryotherapy (ORs = 14.06 [95%CI = 1.79 to 110.30] and 33.95 [95%CI = 3.50 to 329.65], respectively). For patients with moderate OM, treatment effect did not reach statistical significance among comparisons. The limitations include the wide variability in treatment protocols and the non-uniform outcome measurements across the studies examined. CONCLUSION: Compared with no intervention, the treatment effects of combined cryotherapy and LLLT, laser alone, and cryotherapy alone are beneficial for the reduction of severe OM. There is no difference in treatment effects among cryotherapy and/or LLLT intervention in cancer patients with moderate OM. Results of this study provide an implicative basis for LLLT and cryotherapy as viable interventions that can significantly improve severe OM. Cryotherapy;Humans;Low-Level Light Therapy;Neoplasms;Network Meta-Analysis;Stomatitis

Effects of Photobiomodulation Therapy (LED 630Â nm) on Muscle and Nerve Histomorphometry after Axonotmesis. Peripheral injuries constitute a substantial clinical problem with unsatisfactory treatment. The study's objective was to analyze the effects of photobiomodulation therapy (PBMT) on median nerve regeneration and muscle recovery after axonotmesis. Twenty-four rats were randomized into three groups: control (CG), injury (IG), and LED therapy (LEDG). A 630Â Â±Â 20Â nm (300-mW) LED was placed in contact with the skin. One point over the injury site was irradiated for 30Â s, delivering 9Â J (9Â JÂ cm(-2)). PBMT irradiation was performed once daily for 5Â days followed by two-day interval and then more five consecutive days of treatment. Proximal and distal segments of the nerve and flexors muscles were removed for histomorphometric analysis using H&E staining for muscles and osmium tetroxide for nerves. The myelinated fiber and axon diameter and the myelin sheath thickness were greater in the proximal and distal nerve segments in the LEDG compared to the IG (PÂ â‰¤Â 0.05). The number of myelinated fibers was greater in the distal segment of the LEDG (PÂ â‰¤Â 0.05). The area, circumference, and diameter of the muscle fibers were larger in the LEDG than in the IG (PÂ â‰¤Â 0.05). The PBMT protocol used favored axonal regeneration and muscle recovery. Animals;Low-Level Light Therapy;Muscle, Skeletal;Nerve Regeneration;Rats;Trauma, Nervous System

Results of low-level laser therapy in the treatment of hair growth: An Egyptian experience. Recently, low level laser therapy was evaluated as an effective stimulating hair growth. Hair loss is the most common complaint in dermatology (specially females). It causes a significant psychosocial distress and decreased quality of life in affected patients and exists in different types, but the most common types are androgenetic alopecia and telogen effluvium (TE). Although there are many treatments with highest levels of medical evidence, but patients who exhibit intolerance or poor response to these treatments need additional treatment modalities. To evaluate the efficacy and safety low level laser therapy for female pattern hair loss (FPHL) and TE. A prospective interventional study included 20 female patients, 13 were diagnosed as FPHL, and 7 were diagnosed TE. Patients received two sessions per week with Hair Growth System (TOPHAT655) a bicycle-helmet type device. Treatment session of 20â€‰minutes for 16 successive weeks (total of 32 treatments) with follow-up. Patients were evaluated by software-analyzed trichoscopic images, as the primary endpoint was the percent increase in hair counts from baseline to post-treatment. Global photography and patient satisfaction were determined as a secondary end point. Twenty patients completed the study (13 FPHL, 7 TE). FPHL patients baseline hair counts were 222.3 Â±â€‰33.5 (N = 13), in TE patients baseline hair counts were 271.2â€‰Â±â€‰39.0 (N = 7). Post-treatment hair counts were 255.3â€‰Â±â€‰30.4 (N = 13) In FPHL patients (P = .007), and 294.2 Â±â€‰38.1 (N = 7) in TE patients (P = .143). Low level laser therapy of the scalp at 655â€‰nm significantly improved hair counts in FPHL, and there is no significance difference in TE patients with no serious adverse events. Additional studies should be considered to determine the long-term effects of low-level laser therapy treatment on hair growth and maintenance, and to optimize laser modality. Alopecia;Egypt;Female;Hair;Humans;Low-Level Light Therapy;Prospective Studies;Quality of Life

Antimicrobial photodynamic therapy using optical fiber for oral fistula resulting from mandibular osteoradionecrosis. Osteoradionecrosis (ORN) is considered one of the most severe complications of radiotherapy (RT). Treatment modalities for ORN may vary considerably, including conservative or surgical procedures. Recently, alternative managements such as the combination of photobiomodulation therapy (PBMT) and antimicrobial photodynamic therapy (aPDT) have also yielded promising results in patients presenting ORN or delayed healing post-RT. Herein, it is reported a case of ORN manifested as an oral fistula on the mandibular alveolar mucosa in which a combination of PBMT and aPDT was used every 15 days for six weeks. A laser device with an optical fiber was introduced into the fistula for light delivery. Seven days after the first laser session, it was

noted complete resolution of both edema and erythema; after six weeks, the ORN fistula was no longer present. According to the current case, the combination of PBMT and aPDT with an optical fiber to deliver the laser light seems to be a suitable alternative for restricted areas such as fistula paths. Anti-Infective Agents;Photosensitizing Agents Anti-Infective Agents;Humans;Optical Fibers;Oral Fistula;Osteoradionecrosis;Photochemotherapy;Photosensitizing Agents;Retrospective Studies

Photobiomodulation therapy for the prevention of acute radiation dermatitis in head and neck cancer patients (DERMISHEAD trial). BACKGROUND AND PURPOSE: The purpose of this study was to investigate the effectiveness of photobiomodulation therapy (PBMT) for the prevention of acute radiation dermatitis (ARD) in head and neck cancer (HNC) patients. MATERIALS AND METHODS: A randomised, placebo-controlled trial (RCT) with 46 HNC patients who underwent radiotherapy (RT) with or without concomitant chemotherapy was set up (DERMISHEAD trial). Patients were randomised to receive PBM or placebo treatments from the first day of RT (2Ã—/week) alongside the institutional skincare. The severity of skin reactions was assessed by the National Cancer Institute-Common Terminology Criteria for Adverse Events version 4.03 (NCI-CTCAE v4.03) and the Radiotherapy-Induced Skin Reaction Assessment Scale (RISRAS). Quality of life (QoL) was evaluated using the Skindex-16 questionnaire. RESULTS: PBMT significantly reduced NCI-CTCAE grade 2-3 ARD with 49% at the end of RT. CONCLUSION: The results of the first RCT in HNC patients showed that PBMT is an effective method to prevent the development of severe ARD. These results support the implementation of PBM in the clinical oncology - radiotherapy practice. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiodermatitis

Improved Spatial Memory And Neuroinflammatory Profile Changes in Aged Rats Submitted to Photobiomodulation Therapy. Recent evidences have shown the therapeutic potential of transcranial photobiomodulation on traumatic brain injury and Alzheimer's disease. Despite the promising benefits in the brain, little is known about the laser's effects in the absence of pathological conditions. We submitted young (4Â months old) and aged (20Â months old) rats to transcranial low-level laser and evaluated their exploratory activity and habituation in open field, anxiety in elevated plus maze, spatial memory in Barnes maze, and aversive memory in a step-down inhibitory avoidance task. Additionally, the levels of a panel of inflammatory cytokines and chemokines were quantified in two different brain regions: the cerebral cortex and the hippocampus. Young and aged rats submitted to transcranial laser exhibited better cognitive performance in Barnes maze than did control rats. Transcranial laser therapy decreased cortical levels of GM-CSF, IL-10, MCP-1, LIX, and TNFÎ± in young rats and IL-5 in aged rats. High levels of IL-6, IL-10, and TNF-alpha were found in the cerebral cortex of aged rats submitted to transcranial laser. In the hippocampus, a decrease in IP-10 and fractalkine levels was observed in the aged rats from the laser group when compared to the aged rats from the control group. Our data indicate that transcranial photobiomodulation improves spatial learning and memory and alters the neuroinflammatory profile of young and aged rats' brains. Interleukin-10 Animals;Anxiety;Hippocampus;Interleukin-10;Low-Level Light Therapy;Maze Learning;Rats;Spatial Memory

High-level laser therapy versus scalpel surgery in the treatment of oral lichen planus: a randomized control trial. OBJECTIVE: To compare the clinical effectiveness of various types of high-level laser therapy (HLLT) toward scalpel excision for the surgical treatment of erosive oral lichen planus (OLP). MATERIALS AND METHODS: The total number of 128 individuals were enrolled in the study. The 35 did not meet the inclusion criteria due to malignancy signs and presence of diabetes mellitus. In total, 8 were lost to follow-up, and 10 were excluded from the analysis, due to analgesics intake. This way 75 patients with the erosive form of OLP were analyzed in three intervention groups (Er:YAG, n = 19; Nd:YAG, n = 15; Er:YAG + Nd:YAG combination, n = 20) and one control group with scalpel excision (n

= 21). The therapy effectiveness has been assessed based on the comparison of salivary interleukin (IL)-1Î², IL-6 and interferon (IFN)-Î³ preoperative levels to 14, 30 days, and 2 years postoperation, as well as pain level and time of epithelization. RESULTS: All HLLT groups demonstrated a significantly (p > 0.05) higher IL-1Î², IL-6, IFNÎ³ and pain level reduction and quicker epithelization toward the control group on the 30th day, except Nd:YAG in case of IFNÎ³ level. The highest IL-1Î², IFNÎ³ and pain level reduction and quicker epithelization on the 30th day was observed in Er:YAG group, followed by Er:YAG + Nd:YAG combination, Nd:YAG respectively. However no significant difference was observed between the HLLT groups with regard to IL-6 level reduction. After a 2-year follow-up, no significant difference was observed between all study groups with regard to all variables. CONCLUSION: HLLT yields a superior clinical outcome compared to the scalpel excision for the surgical treatment of oral lichen planus, whereby the Er:YAG has been proposed as the most effective laser type at the end of the first postoperative month. CLINICAL RELEVANCE: For the surgical treatment of erosive OLP the Er:YAG laser may be a preferable treatment option compared to Nd:YAG and scalpel surgery. TRIAL REGISTRATION: The present trial was registered retrospectively in the German Clinical Trials Register, as a member of WHO international clinical trials registry platform, on the 18.03.2020 with the following number: DRKS00020986. Humans;Laser Therapy;Lasers, Solid-State;Lichen Planus, Oral;Low-Level Light Therapy;Retrospective Studies

Photobiomodulation (low-level light therapy) and dry eye disease. Dry eye disease is one of the most common, chief-complaints presenting in clinical practice, with a prevalence of up to 50%. Evaporative dry eye, as a result of meibomian gland dysfunction, is thought to be the biggest component factor. Treatments for meibomian gland dysfunction aim to restore tear film homoeostasis and include warm compress therapy, eyelid hygiene, in-office meibomian gland expression and lipid-containing, artificial tears. A recent introduction to the in-office treatments available for meibomian gland dysfunction has been low-level light therapy, also known as photobiomodulation. The technique involves applying red, or near infra-red, radiation using low-power light sources and is suggested to promote tissue repair, decrease inflammation, and relieve pain. This work aims to review the available literature on the efficacy and safety of photobiomodulation in meibomian gland dysfunction and dry eye disease, as well as what is currently known about its mechanism of action. Dry Eye Syndromes;Eyelid Diseases;Humans;Low-Level Light Therapy;Meibomian Gland Dysfunction;Meibomian Glands;Tears

The multi-faceted approach to dry eye disease. Dry Eye Syndromes;Humans

The effect of post-extraction socket preservation laser treatment on bone density 4â€‰months after extraction: Randomized controlled trial. BACKGROUND: Post-extraction bone resorption may affect the outcome of ensuing restorations. PURPOSE: This study aimed to evaluate a comprehensive laser post-extraction protocol by comparing resulting alveolar bone regeneration with that obtained after standard extraction procedure. MATERIALS AND METHODS: About 53 simple extractions were randomized to either laser or control group. In the laser group, erbium (Er:YAG; 2940â€‰nm) and neodymium (Nd:YAG; 1064â€‰nm) lasers were used for degranulation, disinfection, de-epithelialization of the surrounding gingiva, clot stabilization, and photobiomodulation. The primary outcome measure was change in bone density in the extraction area between day 1 and 4â€‰months after extraction. Patients were monitored for potential side effects. RESULTS: Increase in bone density at the follow-up CBCT was significantly higher in laser than in control group (pâ€‰<â€‰0.001). No post-operative pain, bleeding, or swelling was present in the laser group. In the control group, one patient had bleeding 3-5â€‰days after extraction, two patients had swelling and three patients reported post-operative pain rated 3-5 on a 0-10 pain scale up to 3â€‰days after extraction. CONCLUSIONS: The proposed laser post-extraction procedure is a safe and effective

method to improve post-extraction bone healing. Bone Density;Bone Regeneration;Dental Care;Humans;Tooth Extraction;Tooth Socket
The Signalling Effects of Photobiomodulation on Osteoblast Proliferation, Maturation and Differentiation: A Review. Proliferation of osteoblasts is essential for maturation and mineralization of bone matrix. Ossification, the natural phase of bone-forming and hardening is a carefully regulated phase where deregulation of this process may result in insufficient or excessive bone mineralization or ectopic calcification. Osteoblasts can also be differentiated into osteocytes, populating short interconnecting passages within the bone matrix. Over the past few decades, we have seen a significant improvement in awareness and techniques using photobiomodulation (PBM) to stimulate cell function. One of the applications of PBM is the promotion of osteoblast proliferation and maturation. PBM research results on osteoblasts showed increased mitochondrial ATP production, increased osteoblast activity and proliferation, increased and pro-osteoblast expression in the presence of red and NIR radiation. Osteocyte differentiation was also accomplished using blue and green light, showing that different light parameters have various signalling effects. The current review addresses osteoblast function and control, a new understanding of PBM on osteoblasts and its therapeutic impact using various parameters to optimize osteoblast function that may be clinically important. Graphical Abstract. Cell Differentiation;Cell Proliferation;Osteoblasts;Osteocytes;Signal Transduction
Hypertrophic Scar Outcomes in Fractional Laser Monotherapy Versus Fractional Laser-Assisted Topical Corticosteroid Delivery: A Randomized Clinical Trial. Topical corticosteroid delivery following fractional laser treatment is an effective means of treating hypertrophic scars. However, the relative efficacy of adjuvant corticosteroid treatment vs fractional laser mono-therapy alone is unclear. The aim of this study was to compare the efficacy and safety of fractional laser-assisted topical corticosteroid delivery with fractional laser monotherapy in the treatment of hyper-trophic scars. In this randomized, comparative, split-scar trial of 19 subjects, a borderline significant reduction in scar thickness was observed at 3-month follow-up in the laser+steroid group compared with laser+petrolatum (pâ€‰=â€‰0.049). However, no significant long-term difference in scar flattening was observed between the 2 groups. Patient and Observer Scar Assessment Scale scores showed significant improvement in scar appearance from baseline without significant differences between treatment groups. In conclusion, fractional laser monotherapy is an effective treatment for hypertrophic scars, and the application of topical corticosteroid provides no long-term synergistic effect to fractional laser monotherapy. Cicatrix, Hypertrophic;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome
Efficacy of photobiomodulation in the management of tinnitus: A systematic review of randomized control trials. There is a controversy in regards to the efficacy of photobiomodulation (PBM) in the management of tinnitus. The aim was to systematically review randomized controlled trials (RCTs) that assessed the efficacy of PBM (low-level laser therapy) in the management of tinnitus. The focused question was "Is PBM effective in the management of tinnitus?". Indexed databases were searched up to and including June 2020 using different combinations of the following key words: (a) laser; (b) diode; (c) low-level laser therapy; (d) photobiomodulation; (e) tinnitus; (f) medium-level laser; (g) photo-biomodulation; and (h) low-power laser; and RCTs performed on humans were included. Letters to the editor; case reports/series; commentaries; experimental studies and historic reviews were excluded. The risk of bias was assessed using the modified cochrane collaboration tool. The format of the current systematic review was personalized to summarize the appropriate information. Ten RCTs (2 single-blinded and 8 double-blinded) were included. One study reported 30% and 100% resolution of tinnitus using diode and Neodymium-doped Yttrium Aluminum Garnet lasers; respectively. One study reported that PBM was effective in relieving tinnitus for up to 3

months. Eight studies reported that PBM was ineffective in the management of chronic tinnitus. The risk of bias was high; medium and low in 4; 5 and 1 studies; respectively. The effectiveness of PBM in the management of tinnitus remains debatable. Further power-adjusted and well-designed RCTs with long-term follow-up are needed. Humans;Low-Level Light Therapy;Tinnitus

Antenatal management and neonatal outcomes of monochorionic twin pregnancies in a tertiary teaching hospital: a 10-year review. Monochorionic (MC) pregnancy is a high risk pregnancy with well-defined specific complications, such as twin-to-twin transfusion syndrome (TTTS) and twin anaemia-polycythaemia sequence (TAPS). Laser photocoagulation (LPC) is an effective treatment for both complications. In the current retrospective study, we determined the incidence of MC pregnancy complications in a tertiary care centre during a 10-year period. Single foetal death (FD) beyond 14 weeks' gestation was significantly higher when complicated by either TTTS, TAPS or selective foetal growth restriction (21.4%, 16.7% and 9.1% versus 1.6%, p<.001, p=.02 and p=.04, respectively). We also demonstrated that twins' weight discordance >20% is an independent risk factor for single or double FD after LPC. Consequently, prior to LPC, patients should be counselled that early diagnosis of TTTS, advanced Quintero stages and weight discordances >20% are potential risk factors for FD. Further studies are needed to identify additional risk factors for TTTS and TAPS outcome after LPC.Impact StatementWhat is already known on this subject? Monochorionic (MC) pregnancy is a high risk pregnancy with well-defined specific complications, such as twin-twin transfusion syndrome (TTTS) and twin anaemia-polycythaemia sequence (TAPS). Laser photocoagulation (LPC) is an effective treatment for both complications.What the results of this study add? The results of the current study determined the incidence of MC pregnancy complications in a tertiary care centre in Brussels, and identified that twins' weight discordance >20% is an independent risk factor for single or double foetal death after LPC.What the implications are of these findings for clinical practice and/or further research? Prior to laser coagulation, patients should be counselled that early diagnosis of TTTS, Quintero stages 3 or 4 and weight discordances >20% are potential risk factors for foetal demise. Further studies are needed to identify additional risk factors for TTTS and TAPS outcome after LPC. Adult;Anemia, Neonatal;Diseases in Twins;Female;Fetal Death;Fetal Growth Retardation;Fetofetal Transfusion;Gestational Age;Hospitals, Teaching;Humans;Low-Level Light Therapy;Polycythemia;Pregnancy;Pregnancy Outcome;Pregnancy, Twin;Retrospective Studies;Tertiary Care Centers;Treatment Outcome;Twins, Monozygotic

The Application of Laser Acupuncture in Animal Experiments: A Narrative Review of Biological Aspects. Experimental studies on animals are conducted in almost all areas of medical research. The experiments offer insights into diseases and expand biomedical knowledge. Animal experiments are also imperative for studying acupuncture treatment mechanisms and the exploration of innovative acupuncture techniques. Laser acupuncture (LA), as a promising alternative to traditional manual acupuncture (MA), has the characteristics of painless and controllable stimulation. Today, society is more aware of animal welfare than previous generations. The use of noninvasive LA as a substitute for invasive MA in basic experimental research of acupuncture should be encouraged. Thus, we conducted an overview of animal experiments in the research field of LA from January 1978 to April 2020. After careful research, 52 studies were included in the work. Among these studies, both single-point and multipoint LA studies have been reported. To make noninvasive LA better in replacing invasive MA in experimental animal research of acupuncture, further experiments should focus on exploring uniform criteria for selecting laser parameters and revealing the extent to which the curative effect of LA depends on the property of acupuncture points rather than the characteristics of photobiomodulation.

The history of light therapy in hospital physiotherapy and medicine with emphasis on Australia: Evolution into novel areas of practice. Objective: The objective of this narrative review was to

investigate the history of light therapy in hospital settings, with reference to physiotherapy and particularly in an Australian context.Types of articles and search method:a review of available literature was conducted on PubMed, Medline and Google Scholar using keywords light therapy, photobiomodulation, physiotherapy, low-level laser, heliotherapy. Physiotherapy textbooks from Sydney University Library were searched. Historical records were accessed from the San Hospital library. Interviews were conducted with the San Hospital Chief Librarian and a retired former Head Physiotherapist from Royal Prince Alfred Hospital.Summary: Historically, light treatment has been used in both medical and physiotherapy practice. From its roots in ancient Egypt, India, and Greece, through to medieval times, the modern renaissance in 'light as therapy ' was begun by Florence Nightingale who, in the 1850s, advocated the use of clean air and an abundance of sunlight to restore health. Modern light therapy (phototherapy) had a marked uptake in use in medicine in Scandinavia, America, and Australia from 1903, following the pioneering work of Niels Finsen in the late 19th century, which culminated in Dr Finsen receiving the Nobel Prize for Medicine for the treatment of tuberculosis scarring with ultraviolet (UV) light, and treatment of smallpox scarring with red light. Treatment with light, especially UVB light, has been widely applied by physiotherapists in hospitals for dermatological conditions since the 1950s, particularly in Australia, Scandinavia, USA, England and Canada. In parallel, light treatment in hospitals for hyperbilirubinemia was used for neonatal jaundice. Since the 1980s light was also used in the medical specialties of ophthalmology, dermatology, and cardiology. In more recent years in physiotherapy, light was mostly used as an adjunct to the management of orthopedic/rheumatological conditions. Since the 1990s, there has been global use of light, in the form of photobiomodulation for the management of lymphedema, including in supportive cancer care. Photobiomodulation in the form of low-level laser has been used by physiotherapists and pain doctors since the 1990s in the management of chronic pain. The use of light as therapy is exemplified by its use in the San Hospital in Sydney, where light therapy was introduced in 1903 (after Dr. John Harvey Kellogg visited Niels Finsen in Denmark) and is practiced by nurses, physiotherapists and doctors until the present day. The use of light has expanded into new and exciting practices including supportive cancer care, and treatment of depression, oral mucositis, retinopathy of prematurity, and cardiac surgery complications. Light is also being used in the treatment of neurological diseases, such as Parkinson's disease, traumatic brain injury, and multiple sclerosis. The innovative uses of light in physiotherapy treatment would not be possible without the previous experience of successful application of light treatment.Conclusion: Light therapy has had a long tradition in medicine and physiotherapy. Although it has fallen somewhat out of favour over the past decades, there has been a renewed interest using modern techniques in recent times. There has been continuous use of light as a therapy in hospitals in Australia, most particularly the San Hospital in Sydney where it has been in use for almost 120 years. Australia;History, 19th Century;History, 20th Century;History, 21st Century;Hospitals;Humans;Phototherapy;Physical Therapy Modalities

A randomised controlled trial of laser acupuncture improves early outcomes of osteoarthritis patients' physical functional ability after total knee replacement. BACKGROUND AND PURPOSE: Total knee replacement is the most effective intervention for late-stage osteoarthritis; however, a major concern is postoperative recovery of physical function. This randomised controlled trial evaluated the effects of acupuncture with low-level laser therapy (ALLLT) on early outcomes of physical function after total knee replacement. MATERIALS AND METHODS: Eighty-two osteoarthritis patients were recruited and randomly assigned to the experimental group receiving ALLLT or the control group receiving sham ALLLT without laser beam output. Physical function was evaluated by assessing knee joint flexion and stiffness on days 1, 2, and 3 after total knee replacement. RESULTS: Generalised estimating equations revealed a significant difference between the two groups in joint

flexion. The experimental group displayed better joint flexion and less stiffness on days 2 and 3 than did the control group. CONCLUSION: ALLLT can facilitate the recovery of physical function, as evidenced by knee joint flexion and stiffness, in patients receiving total knee replacement. Acupuncture Therapy;Arthroplasty, Replacement, Knee;Humans;Lasers;Osteoarthritis, Knee;Range of Motion, Articular;Treatment Outcome

Photobiomodulation effects on photodynamic therapy in HNSCC cell lines. A combination of metabolic modifications by light stimulus and photodynamic action is very attractive. Photobiomodulation therapy (PBMT) comprehends a vast range of applications and has been shown to be suitable to ease morbidities caused by chemotherapy and radiation, such as mucositis and dermatitis. The current study investigates the effects of near-infrared PBMT combined with porphyrin-based photodynamic therapy (PDT) in squamous cell carcinoma cell lines SCC-25 and SCC-4. The aim is to evaluate the potential of this combination to improve PDT outcome by increasing cell toxicity. Many techniques were used to verify the combined effect. Photobiomodulation (PBM) enhanced PDT action in SCC-25 cells by increasing photosensitizer (PS) uptake and production of reactive oxygen species (ROS). The equivalent was not seen in SCC-4 cells compared to the PDT only group. We believe these effects are strongly related to the interval of application between PBMT, PS incubation and PDT. Additionally, the effect of ascorbic acid on preventing PBM effects in PDT shows that ROS play an important role in the early mechanisms of PBM-PDT. Therefore, we believe PBM-PDT combination is worth exploring, for its benefit-cost ratio and simple protocols, along with the possibility of improvement in treatment resuts. Antioxidants;Photosensitizing Agents;Reactive Oxygen Species;Ascorbic Acid Antioxidants;Ascorbic Acid;Carcinoma, Squamous Cell;Cell Line, Tumor;Cell Proliferation;Cell Survival;Humans;Light;Photochemotherapy;Photosensitizing Agents;Reactive Oxygen Species;Squamous Cell Carcinoma of Head and Neck

Clinical Efficacy and Safety of Low-Level Laser Therapy in Patients with Perennial Allergic Rhinitis: A Randomized, Double-Blind, Placebo-Controlled Trial. Allergic rhinitis (AR) is a common disease that interferes with the daily activities and reduces the quality of life. Conventional treatments often do not provide complete resolution of the symptoms, and many new treatment modalities have been tried. This study aimed to evaluate the efficacy and safety of low-level laser therapy (LLLT) for AR in a randomized, double-blind, placebo-controlled trial. Patients diagnosed with AR were randomly allocated to receive LLLT or sham treatment. The primary outcome was a change in the reflective total nasal symptom score (TNSS). The secondary outcome was quality of life scores assessed using the Rhinoconjunctivitis Quality of Life Questionnaire. Incidences of adverse events were also recorded. Among 67 randomized subjects, 41 subjects (22 in LLLT group and 19 in sham treatment group) were included for efficacy analysis. The LLLT group showed a significantly improved TNSS score compared to the sham treatment group for decreasing AR symptom severity ($p = 0.011$) and improving quality of life regarding nasal symptoms ($p = 0.036$) at the end of treatment. Throughout the treatment period, no severe adverse events occurred. This clinical trial showed that LLLT is an effective and safe option for the management of AR regarding symptom relief and quality of life improvement.

Is an anodizing coating associated to the photobiomodulation able to optimize bone healing in ovariectomized animal model? This in vivo study investigated whether the bioactivity of anodizing coating, produced by plasma electrolytic oxidation (PEO), on mini-plate in femur fracture could be improved with the association of photobiomodulation (PBM) therapy. From the 20 ovariectomized Wistar female rats, 8 were used for model characterization, and the remaining 12 were divided into four groups according to the use of PBM therapy by diode laser (808Â nm; power: 100Â mW; energy: 6.0Â J; energy density: 212Â J/cm(2); power density: 3.5Â W/cm(2)) and the type of mini-plate surface (commercially pure titanium mini-plate -cpTi- and PEO-treated mini-plate) as

follow: cpTi; PEO; cpTi/PBM; and PEO/PBM. After 60Â days of surgery, fracture healing underwent microstructural, bone turnover, histometric, and histologic adjacent muscle analysis. Animals of groups with PEO and PBM showed greater fracture healing than cpTi control group under histometric and microstructural analysis (PÂ <Â 0.05); however, bone turnover was just improved in PBM's groups (PÂ <Â 0.05). there was no difference between cpTi and PEO without PBM (PÂ >Â 0.05). Adjacent muscle analysis showed no metallic particles or muscle alterations in all groups. PEO and PBM are effective strategies for bone repair in fractures, however their association does not provide additional advantages. Estrogens Animals;Disease Models, Animal;Estrogens;Female;Femoral Fractures;Femur;Fracture Healing;Lasers, Semiconductor;Low-Level Light Therapy;Ovariectomy;Rats;Rats, Wistar;X-Ray Microtomography

The efficacy of energy-based devices combination therapy for melasma. Melasma is a recalcitrant pigmentary disease with a complex pathogenesis. Monotherapy often results in unsatisfactory results with high recurrence rate. In this review article, we evaluate efficacy of energy-based devices combination therapy for melasma. We reviewed published literature since 2010 up to November 2020 regarding adjuvant therapy of energy-based devices with other treatment modalities in the treatment of melasma. After final selection, we assessed 49 articles. Energy-based devices include lasers, non-coherent lights, radiofrequency, iontophoresis, sonophoresis, microneedling, and microdermabrasion. Adjuvant therapies other than energy-based devices were lightening agents, chemical peels, platelet rich plasma (PRP) and mesotherapy. Combination of Q-switched neodymium-doped: yttrium, aluminum, and garnet (QSNY) with either intense pulsed light therapy (IPL) or pulsed-dye laser (PDL) are recommended in recalcitrant melasma in patients with light skin photo types and with dilated skin vessels (especially with PDL). Combination of fractional microneedling radiofrequency or microneedling with QSNY leads to promising results and is a safe treatment modality, especially in darker skin types. Application of topical lightening agents in combination with laser therapy leads to higher efficacy with less adverse effects (post-inflammatory hyperpigmentation) and rebound of melasma. Combination of ablative techniques with QSNY is not recommended, due to the high risk of permanent adverse effects such as guttate hypopigmentation and exacerbation of melasma. Combined Modality Therapy;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

An Investigation Into the Short-Term Effects of Photobiomodulation on the Mechanical Nociceptive Thresholds of M.Â Longissimus and M.Â Gluteus Medius, in Relation to Muscle Firing Rate in Horses at Three Different Gaits. Back pain is a common condition in horses, yet despite this, quantitative assessments of the efficacy of treatment are scarce. Mechanical nociceptive thresholds (MNTs) and acoustic myography (AMG) recordings were obtained, both preinterventionand postintervention, from the left and right epaxial muscles in eight healthy general riding horses (mean age 17 Â± 6 yrs). Using an algometer, MNT readings were taken at each of the 6 preselected points along the thoracolumbar M.Â longissimus and M.Â gluteus medius region. AMG recordings of the M.Â longissimus and M.Â gluteus medius were taken while walking, trotting, and cantering on a left or right hand 20m circle on a longe, on a waxed sand surface in an indoor arena. Horses were then treated using a class 1 laser. Therapy was applied for 1Â minute at 1000Â Hz to the same preselected points from which MNT measurements had previously been taken. Measurements were subsequently taken 1Â hour and 24Â hours post-treatment for MNT reading, and only 24Â hours after for AMG measurements. No significant effect of treatment was noted for the MNTs. The AMG results were analyzed in terms of their temporal summation (T-score), where statistically significant improvements in the T-scores for M.Â longissimus and M.Â gluteus medius were noted for the different gaits. It is concluded that cold laser therapy has a positive effect on horse muscles that reveals a change in their

firing frequency that is commensurate with changes seen with analgesia in subjects experiencing pain. Animals;Back Pain;Buttocks;Gait;Horses;Muscles;Nociception
Effect of photobiomodulation therapy on mini-implant stability: a systematic review and meta-analysis. The study aimed to assess trials investigating the effect of PBMT on mini-implant stability. Electronic searches of seven databases and manual search were conducted up to May 2020. Randomized controlled trials and controlled clinical trials evaluating the effect of PBMT on mini-implant stability were included. The risks of bias of individual studies were performed using ROB 2.0 and ROBINS-I-tool based on different study design. Meta-analysis was conducted to compare mini-implant stability exposed to PBMT with control ones at different time points after implantation. Among the 518 records initially identified, seven studies were included in this study. Six studies investigated low-level laser therapy (LLLT) and one study evaluated light-emitting diode (LED) therapy. Two studies were eligible for meta-analysis, which showed that LLLT significantly improved mini-implant stability 60 days after initial implantation (MD - 3.01, 95% CI range [- 4.68, - 1.35], p = 0.0004). High energy density of LLLT began to show beneficial effect on mini-implant stability as early as 3 days after implantation, while the significant effect of low energy density displayed later than 30 days after insertion. LED therapy could improve mini-implant stability after 2 months post-insertion. In conclusion, PBMT appears to be beneficial in ameliorating mini-implant stability. High energy density of LLLT might exert more rapid effect than low energy density. More high-quality clinical trials are needed to further demonstrate PBMT' effects on orthodontic mini-implants. Dental Implants Dental Implants;Laser Therapy;Low-Level Light Therapy;Orthodontic Anchorage Procedures
Commentary on: Photobiomodulation: The Clinical Applications of Low Level Light Therapy. Humans;Low-Level Light Therapy
Effects of diode low-level laser therapy on healing of tooth extraction sockets: a histopathological study in diabetic rats. Diabetes mellitus is mostly interrelated to deficiency in wound healing. Low-level laser therapy has been shown to exert reliable effects on the acceleration of wound healing process. This study aimed to determine the potential influence of low-level laser therapy (LLLT) on the healing of extraction sockets in diabetic rats. A total of 24 healthy male Wistar rats were selected for this study. After diabetes induction, the maxillary first molars of all rats were extracted bilaterally. Then, the animals were subjected either to Ga-Al-As laser at 808 nm or to Al-Ga-In-P laser at 660 nm at the right extracted socket every day for the next 14 days. The left sockets served as controls. Rats were sacrificed on the 3rd, 5th, 7th, and 14th days after tooth extraction. The samples were examined by a pathologist. LLLT at 808 nm was able to significantly repress inflammation, improve osteoid formation, and promote vascularization in comparison to the non-treated sockets. LLLT at 660 nm significantly suppressed inflammation and developed vascularization in comparison to the non-treated sockets, but failed to improve osteoid formation in the treated sockets. This study suggests that LLLT could be considered asÂ a reliable treatment for wound healing in diabetic experimental rats. Animals;Diabetes Mellitus, Experimental;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket;Wound Healing
The effect of delayed photobiomodulation on neurosensory disturbance recovery after zygomatic trauma: A parallel controlled clinical trial. INTRODUCTION: Zygomatic fractures are usually accompanied with neural complications, which are routinely treated by surgery or medication. However, photobiomodulation has been proven as a non-invasive method with better results in nerve's regeneration and repair. Therefore, in this study, we aimed to investigate the healing effect of photobiomodulation on neurosensory defect after facial trauma. PATIENTS AND METHODS: In this parallel controlled clinical trial, 35 control cases and 36 patients with zygomaticomaxillary complex (ZMC) fractures as well as the sustained infraorbital nerve paresthesia were included. Afterward, Laser irradiation was applied using a GaAlAs diode laser (810Â nm, 27Â J/cm(2), 200Â mW) on 12

points on malar area of paresthesia during 12 sessions within six weeks. Neurosensory evaluations were performed in four sessions as follows: at baseline, the end of treatment, one month, and three months after the last session of irradiation, which were achieved through three tests including visual analogue scales (VAS) for general sensitivity, two-point discrimination, and pain discrimination. Repeated measure ANOVA, independent t-test, and Chi-square test were used for comparing time trends, each time point, and gender, respectively. P-values less than 0.05 were considered to be statistically significant. RESULTS: The patients and controls were matched in both terms of age and gender. Baseline results showed non-significant differences between the two groups based on the VAS, pain, and two-point discrimination. Moreover, for VAS scale, some significant differences were observed between the groups by passing "one month and three months from therapy". Pain and two-point discriminations showed a significant difference between the intervention and control groups in "one month after therapy" and "at the end of the therapy, one month after therapy, and three months after therapy", respectively. CONCLUSION: Photobiomodulation could be considered as an effective treatment option for post-traumatic neurosensory disturbance of facial area in terms of VAS, pain and two-point discrimination, even if not performed early after trauma. Adolescent;Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Nerve;Pain;Radiation Dosage;Treatment Outcome;Young Adult;Zygomatic Fractures

Visible light. Part I: Properties and cutaneous effects of visible light. Approximately 50% of the sunlight reaching the Earth's surface is visible light (400-700Â nm). Other sources of visible light include lasers, light-emitting diodes, and flash lamps. Photons from visible light are absorbed by photoreceptive chromophores (e.g., melanin, heme, and opsins), altering skin function by activating and imparting energy to chromophores. Additionally, visible light can penetrate the full thickness of the skin and induce pigmentation and erythema. Clinically, lasers and light devices are used to treat skin conditions by utilizing specific wavelengths and treatment parameters. Red and blue light from light-emitting diodes and intense pulsed light have been studied as antimicrobial and anti-inflammatory treatments for acne. Pulsed dye lasers are used to treat vascular lesions in adults and infants. Further research is necessary to determine the functional significance of visible light on skin health without confounding the influence of ultraviolet and infrared wavelengths. Acne Vulgaris;Humans;Light;Low-Level Light Therapy;Skin;Skin Pigmentation;Treatment Outcome

Effects of the phenotypic polarization state of human leukocytes on the optical absorbance spectrum. This study evaluated the optical absorbance spectrum of human monocytes, neutrophils and lymphocytes polarized, or not, to the inflammatory or immunoregulatory phenotypes. Peripheral human blood leukocytes were isolated and polarized (10Â ng/mL) with LPS or IL-4Â +â€‰LPS for 2Â hours. After polarization, cells were washed and incubated for an additional 24â€‰hours (monocytes and lymphocytes) or 12â€‰hours (neutrophils). Next, cells were collected to evaluate the optical absorbance spectrum. The three types of leukocytes exhibited absorbance in the region from 450 to 900â€‰nm, with greater absorbance at wavelengths lower than 570â€‰nm. Lymphocytes had a second region of greater absorbance between 770 and 900â€‰nm. Inflammatory monocytes and lymphocytes showed increased absorbance of blue, green and yellow wavelengths (monocytes), as well as red and infrared wavelengths (monocytes and lymphocytes). Immunoregulatory polarization altered the absorbance of monocytes and lymphocytes very little. Neutrophils treated with LPS or LPSâ€‰+â€‰IL-4 exhibited lower absorbance at wavelengths higher than 575â€‰nm compared to untreated cells. The present findings showed that leukocytes exhibit greater absorbance in regions of the spectrum that have not been much used in photobiomodulation (PBM), and the polarization of these cells can affect their capacity to absorb light. Taken together, these results suggest new perspectives in the use of PBM in the clinical setting depending on the

wavelengths and the stage of the inflammatory process.
Humans;Leukocytes;Lymphocytes;Monocytes;Neutrophils;Phenotype

Transcranial laser stimulation: Mitochondrial and cerebrovascular effects in younger and older healthy adults. BACKGROUND: Transcranial laser stimulation is a novel method of noninvasive brain stimulation found safe and effective for improving prefrontal cortex neurocognitive functions in healthy young adults. This method is different from electric and magnetic stimulation because it causes the photonic oxidation of cytochrome-c-oxidase, the rate-limiting enzyme for oxygen consumption and the major intracellular acceptor of photons from near-infrared light. This photobiomodulation effect promotes mitochondrial respiration, cerebrovascular oxygenation and neurocognitive function. Pilot studies suggest that transcranial photobiomodulation may also induce beneficial effects in aging individuals. OBJECTIVES: Randomized, sham-controlled study to test photobiomodulation effects caused by laser stimulation on cytochrome-c-oxidase oxidation and hemoglobin oxygenation in the prefrontal cortex of 68 healthy younger and older adults, ages 18-85. METHODS: Broadband near-infrared spectroscopy was used for the noninvasive quantification of bilateral cortical changes in oxidized cytochrome-c-oxidase and hemoglobin oxygenation before, during and after 1064-nm wavelength laser (IR-A laser, area: 13.6Â cm(2), power density: 250Â mW/cm(2)) or sham stimulation of the right anterior prefrontal cortex (Brodmann Area 10). RESULTS: As compared to sham control, there was a significant laser-induced increase in oxidized cytochrome-c-oxidase during laser stimulation, followed by a significant post-stimulation increase in oxygenated hemoglobin and a decrease in deoxygenated hemoglobin. Furthermore, there was a greater laser-induced effect on cytochrome-c-oxidase with increasing age, while laser-induced effects on cerebral hemodynamics decreased with increasing age. No adverse laser effects were found. CONCLUSION: The findings support the use of transcranial photobiomodulation for cerebral oxygenation and alleviation of age-related decline in mitochondrial respiration. They justify further research on its therapeutic potential in neurologic and psychiatric diseases.
Adolescent;Adult;Aged;Aged, 80 and over;Aging;Cerebral Cortex;Humans;Lasers;Middle Aged;Prefrontal Cortex;Spectroscopy, Near-Infrared;Young Adult

Mechanisms and Pathways of Pain Photobiomodulation: A Narrative Review. A growing body of evidence supports the modulation of pain by light exposure. As such, phototherapy is being increasingly utilized for the management of a variety of pain conditions. The modes of delivery, and hence applications of phototherapy, vary by wavelength, intensity, and route of exposure. As such, differing mechanisms of action exist depending upon those parameters. Cutaneous application of red light (660 nm) has been shown to reduce pain in neuropathies and complex regional pain syndrome-I, whereas visual application of the same wavelength of red light has been reported to exacerbate migraine headache in patients and lead to the development of functional pain in animal models. Interestingly visual exposure to green light can result in reduction in pain in variety of pain conditions such as migraine and fibromyalgia. Cutaneous application typically requires exposure on the order of minutes, whereas visual application requires exposure on the order of hours. Both routes of exposure elicit changes centrally in the brainstem and spinal cord, and peripherally in the dorsal root ganglia and nociceptors. The mechanisms of photobiomodulation of pain presented in this review provide a foundation in furtherance of exploration of the utility of phototherapy as a tool in the management of pain. PERSPECTIVE: This review synopsizes the pathways and mechanisms through which light modulates pain and the therapeutic utility of different colors and exposure modalities of light on pain. Recent advances in photobiomodulation provide a foundation for understanding this novel treatment for pain on which future translational and clinical studies can build upon.
Humans;Light Signal Transduction;Neural Pathways;Pain;Pain Management;Phototherapy

Laser dentistry in daily practice during the COVID-19 pandemic: Benefits, risks and recommendations for safe treatments. The COVID-19 pandemic forced dental professionals to cope with an unexpected challenge and caused an abrupt cessation of conventional care practices. The high degree of contagiousness as well as the diffusion of the virus through the air and droplets via respiratory transmission placed dental professionals at top-level risk of contracting and spreading the disease. General recommendations were announced in different countries, including patient distancing, air ventilation, surface and instrument sanitization, and the wearing of suitable masks and shields. However, many dental treatments are performed using lasers, and some specific precautions must be added to conventional procedures to ensure the advantages of this technology to patients because of the particular tissueâ€“matter interaction effects of laser wavelengths. Based on the literature, the authors evaluated all of using laser wavelengths to analyze the risk and the benefits of using lasers in daily dental practice, and to provide safety recommendations during pandemic. An unrestricted search of indexed databases was performed. Laser use effects were categorized into: 1) explosive processes that produce tissue ablation and aerosol formation; 2) thermal actions that create vaporization and smoke plume; 3) photobiomodulation of the cells; and 4) enhanced chemical activity. Knowledge of the device functions and choice of adequate parameters will reduce aerosol and plume formation, and the application of suction systems with high flow volume and good filtration close to the surgical site will avoid virus dissemination during laser use. In the categories that involve low energy, the beneficial effects of lasers are available and sometimes preferable during this pandemic because only conventional precautions are required. Lasers maintain the potential to add benefits to dental practice even in the COVID-19 era, but it is necessary to know how lasers work to utilize these advantages. The great potential of laser light, with undiscovered limits, may provide a different path to face the severe health challenges of this pandemic. COVID-19;Dental Care;Dentistry;Humans;Infection Control;Infectious Disease Transmission, Patient-to-Professional;Laser Therapy;Pandemics;Personal Protective Equipment;Practice Guidelines as Topic;SARS-CoV-2;Safety Management

Low-intensity photobiomodulation at 632.8 nm increases tgfÎ²3, col2a1, and sox9 gene expression in rat bone marrow mesenchymal stem cells in vitro. The high incidence of cartilage destructions, as well as the social and economic importance of this pathology attracted great interest to the problem. At the present time, some data are available about the 632.8 nm low-intensity laser photobiomodulation positive effect on the cartilage tissue proliferation. The effect of this wavelength laser irradiation on the mesenchimal stem cell (MSC) differentiation in the chondrogenic direction was studied. The main aim of this work was to assess the low-intensity photobiomodulation effect on chondrogenesis. In this experiment, the cell model was used to compare the photobiomodulation and cytokine TgfÎ²3 (transforming growth factor Î² 3) effects. Bone marrow MSCs were isolated from Wistar rats and cultured for the third passage. Chondrogenic effects of low-intensity He-Ne laser photobiomodulation and cytokine TgfÎ²3 (10 ng/Î¼L) were analyzed and compared after 21 days. The radiation source was the standard LGN-208 helium-neon (He-Ne) laser (632.8 nm, 1.7 mWt). Irradiation was performed cyclically for 15 min with 45-min pauses. The increase of the responsible for chondrogenesis (col2a1, tgfÎ²3, and sox9) main gene expression under the photobiomodulation at 632.8 nm was evaluated in comparison with TgfÎ²3 effect. The tgfÎ²3, col2a1, and sox9 gene expression increase was obtained in two experimental groups: using the laser photobiomodulation and cytokine TgfÎ²3 effect. Gene expression levels of tgfÎ²3, col2a1, and sox9 were measured using real-time polymerase chain reaction (RT-PCR) according to the -Î”Î”Ct method. It was found that the responsible for chondrogenesis genes expression (tgfÎ²3, col2a1, sox9) increased under the action of specific laser photobiomodulation during the observation period (from 0 to 21 days). The chondrogenic differentiation effect under the laser irradiation is less significant than TgfÎ²3 cytokine

effect. COL2A1 protein, rat;Collagen Type II Animals;Bone Marrow Cells;Cell Differentiation;Cells, Cultured;Chondrocytes;Chondrogenesis;Collagen Type II;Gene Expression;Mesenchymal Stem Cells;Rats;Rats, Wistar

Enhancement of Wound Healing by Conditioned Medium of Adipose-Derived Stromal Cell with Photobiomodulation in Skin Wound. BACKGROUND AND OBJECTIVES: The objective of this study was to investigate whether conditioned medium from photobiomodulation (PBM) irradiated adipose-derived stromal cell (ASC) spheroids prior to implanting could stimulate angiogenesis and tissue regeneration to improve functional recovery of skin tissue in an animal skin wound model. METHODS AND RESULTS: ASC were split and seeded on chitosan-coated 24 well plate at a density of 7.5Ã—10(4) cells/cm(2), and allowed to adhere at 37Â°C. Within 3 days of culture, ASC formed spheroids by PBM irradiation. Conditioned medium (CM) fractions were collected from the PBM-ASC to yield nor adipose-derived stromal cell spheroid (spheroid) and PBM-spheroid, respectively, centrifuged at 13,000 g at 4â„ƒ for 10 min, and stored prior to use for ELISA, protein assay, or in vivo wound-healing assays. Phosphate-buffered saline, cultured CM from ASCs, PBM irradiation prior to implanting conditioned medium from ASC, cultured CM from ASC spheroid, and PBM-spheroid-CM (PSC) were transplanted into a wound bed in athymic mice to evaluate therapeutic effects of PSC in vivo. PSC enhanced wound closure in a skin injury model compared to PBS, CM, PBM-CM, and spheroid-CM. The density of vascular formations increased as a result of angiogenic factors released by the wound bed and enhanced tissue regeneration at the lesion site. CONCLUSIONS: These results indicate that implant of PSC can significantly improve functional recovery compared to PBS, CM, PBM-CM, or spheroid-CM treatment. Implant of PSC may be an effective form of paracrine mediated therapy for treating a wound bed.

Histological and immunohistochemical changes in facial skin treated with combined ablative and non-ablative laser therapy. BACKGROUND: Facial skin rejuvenation is a highly sought after procedure. Different materials, energy-based devices and techniques have been shown to offer good results in facial rejuvenation. AIMS: The aim of this study was to evaluate the macroscopic and histological and immunohistochemical changes in facial skin treated with a combined laser therapy. PATIENTS/METHODS: Fourteen patients aged from 38 to 59 years were included in the study. Two different wavelengths (2940 and 1064 nm) were used in this four-step procedure. RESULTS: Significant improvement according to classification for age-related changes in all areas of the face was achieved. There were also significant structural changes in the epidermis and dermis, confirmed with histology and immunohistochemistry. CONCLUSION: The dual-wavelength protocol has been found to provide excellent results for facial rejuvenation. Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Rejuvenation;Skin Aging

Levels of Cyclooxygenase 2, Interleukin-6, and Tumour Necrosis Factor-Î± in Fibroblast Cell Culture Models after Photobiomodulation at 660â€‰nm. Chemicals and signaling molecules released by injured cells at the beginning of wound healing prompt inflammation. In diabetes, prolonged inflammation is one of the probable causes for delayed wound healing. Increased levels of cyclooxygenase-2 (cox-2), interleukin-6 (IL-6), and tumour necrosis factor-alpha (TNF-Î±) are associated with the inflammatory response and in diabetes, and increased levels of these contribute to chronic wounds that do not heal. Rising levels of cox-2, IL-6, and TNF-Î± have also been associated with increased oxidative stress. Photobiomodulation (PBM) may impact wound healing processes by affecting the signaling pathways and molecules pertinent to tissue repair. In the present study, the effect of PBM (wavelength: 660â€‰nm; energy density: 5â€‰J/cm(2)) on levels of cox-2, IL-6, and TNF-Î± was determined in fibroblast cell culture models. Four WS1 models (normal, normal wounded, diabetic, and diabetic wounded) were irradiated at 660â€‰nm, and the culture media was collected at 0, 24, and 48â€‰h postirradiation. Cells that were not irradiated (0â€‰J/cm(2)) served as the

controls. The following parameters were determined postirradiation: cell morphology using light microscopy, cell viability using the Trypan Blue exclusion assay, and levels of the inflammatory markers cox-2, IL-6, and TNF-Î± were measured using ELISA. Cell migration increased in the wounded groups over the 48â€‰h interval after PBM; viability improved postirradiation in the diabetic wounded groups at 0 and 24â€‰h (P â‰¤ 0.05 and P â‰¤ 0.01, respectively); levels of cox-2 decreased in normal and diabetic wounded groups at 0â€‰h (P â‰¤ 0.001) and increased in the diabetic and diabetic wounded groups at 48â€‰h postirradiation (P â‰¤ 0.05 and P â‰¤ 0.01, respectively), while levels of IL-6 decreased in the normal (P â‰¤ 0.01), diabetic (P â‰¤ 0.05), and diabetic wounded (P â‰¤ 0.001) groups at 24â€‰h and in the diabetic and diabetic wounded groups at 48â€‰h (P â‰¤ 0.05) postirradiation. TNF-Î± was decreased in the normal wounded groups (P â‰¤ 0.05) at 48â€‰h. Through its effect on decreased IL-6 levels in diabetic cell models, PBM at 660â€‰nm may be successful at decreasing oxidative stress; however, the present study also found an increase in cox-2 levels at 48â€‰h postirradiation. Interleukin-6;Tumor Necrosis Factor-alpha;Cyclooxygenase 2 Cell Culture Techniques;Cell Shape;Cell Survival;Cyclooxygenase 2;Fibroblasts;Humans;Interleukin-6;Low-Level Light Therapy;Tumor Necrosis Factor-alpha

Mechanistic aspects of photobiomodulation therapy in the nervous system. Photobiomodulation therapy (PBMT) previously known as low-level laser therapy (LLLT) has been used for over 30 years, to treat neurological diseases. Low-powered lasers are commonly used for clinical applications, although recently LEDs have become popular. Due to the growing application of this type of laser in brain and neural-related diseases, this review focuses on the mechanisms of laser action. The most important points to consider include the photon absorption by intracellular structures; the effect on the oxidative state of cells; and the effect on the expression of proteins involved in oxidative stress, inflammation, pain, and neuronal growth. Brain;Humans;Inflammation;Low-Level Light Therapy;Oxidation-Reduction;Oxidative Stress

Enhancing the Therapeutic Potential of Mesenchymal Stem Cells with Light-Emitting Diode: Implications and Molecular Mechanisms. This study evaluated the effects of light-emitting diode (LED) on mesenchymal stem cells (MSCs). An electronic search was conducted in PubMed/MEDLINE, Scopus, and Web of Science database for articles published from 1980 to February 2020. Ten articles met the search criteria and were included in this review. The risk of bias was evaluated to report quality, safety, and environmental standards. MSCs were derived from adipose tissue, bone marrow, dental pulp, gingiva, and umbilical cord. Protocols for cellular irradiation used red and blue light spectrum with variations of the parameters. The LED has been shown to induce greater cellular viability, proliferation, differentiation, and secretion of growth factors. The set of information available leads to proposing a complex signaling cascade for the action of photobiomodulation, including angiogenic factors, singlet oxygen, mitogen-activated protein kinase/extracellular signal-regulated protein kinase, Janus kinase/signal transducer, and reactive oxygen species. In conclusion, although our results suggest that LED can boost MSCs, a nonuniformity in the experimental protocol, bias, and the limited number of studies reduces the power of systematic review. Further research is essential to find the optimal LED irradiation parameters to boost MSCs function and evaluate its impact in the clinical setting. Humans;Light;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Publication Bias;Risk

Effects of photobiomodulation on sport performance in swimming para-athletes - a case series. This study evaluates photobiomodulation (PBM) on cardio-respiratory function and swimming performance in parathletes. Ten swimming parathletes were tested before PBM, after PBM and placebo irradiation applied on upper musculature. After warmup, the parathletes rested for 1Â min, and heart rate was recorded. Three sessions of 50 m free style swimming at maximum effort, with 5-min interval were performed and time, peak and recovery heart rate were recorded. After 1 week,

biceps, deltoid, and trapezius received 108Â J of energy from an LED array or sham-irradiation in a crossover study. After another week, the same protocol was repeated. All athletes improved time in 50Â ms swimming. On average, time decreased 4Â s after PBM and 1.5 s after placebo. Also, the peak heartbeat was 10% lower after PBM. A muscular pre-conditioning using PBM with an infrared LED could modulate upper musculature and cardio-respiratory function, leading tobetter swimming performance in parathletes. Athletes;Cross-Over Studies;Humans;Muscle, Skeletal;Para-Athletes;Swimming

Blue photobiomodulation LED therapy impacts SARS-CoV-2 by limiting its replication in Vero cells. The study of any intervention able to counteract SARS-CoV-2 pandemic is considerably envisaged. It was previously shown, in in vitro models of infections, that the LED blue light is able to decrease the viral load of HSV-1 and ZIKV. In our study, LED photobiomodulation therapy (PBMT) at blue wavelengths (450, 454 and 470â€‰nm) was tested in an in vitro model of SARS-CoV-2 infection, employing three experimental settings: SARS-CoV-2 was irradiated and then transferred to cells; already infected cells were irradiated; cells were irradiated prior to infection. A decrement of the viral load was observed when previously infected cells were irradiated with all three tested wavelengths and relevant effects were registered especially at 48â€‰hours post-infection, possibly suggesting that the blue light could interfere with the intracellular viral replication machinery. Our in vitro findings could represent the starting point for translational applications of PBMT as a supportive approach to fight SARS-CoV-2. Animals;COVID-19;Chlorocebus aethiops;Low-Level Light Therapy;SARS-CoV-2;Vero Cells;Viral Load

Orofacial evaluation of individuals with temporomandibular disorder after LED therapy associated or not of occlusal splint: a randomized double-blind controlled clinical study. This study compared the effects of LED therapy associated with occlusal splint (OS) on the signs and symptoms of temporomandibular disorder (TMD). In this randomized, double-blind clinical trial, 70 TMD patients were randomly divided into six groups. The volunteers received the following treatments: Group 1 (G1) was the control and received only conventional therapy with OS; Group 2 (G2) was the placebo and received treatment with OS and therapy with LED (device turned off); Group 3 (G3) LED therapy (infrared,) once a week; Group 4 (G4) LED therapy (infrared) twice a week; Group 5 (G5) OS associated with LED (infrared) therapy (once a week); Group 6 (G6) received OS therapy plus infrared LED (two sessions per week). The patients were evaluated before, after, and 30 days after treatment. The pain intensity in masticatory system was recorded at each interval. The evaluation of the electromyographic signals (EMG) of the muscles (masseter and temporal) and blood lactate was performed before and after treatment. The associated groups presented better clinical results in relation to the control. The associated groups showed significant differences ($p < 0.05$) from control in the analysis of pain intensity and in decrease of the RMS value (EMG analysis). In the intragroup analysis, the volunteers in G6 exhibited a significant reduction ($p < 0.05$) in blood lactate. In conclusion, the association of LED therapy and OS presented superior results in relation to the isolated therapies, especially the protocol with two weekly sessions. Double-Blind Method;Humans;Occlusal Splints;Pain Measurement;Temporomandibular Joint Disorders;Treatment Outcome

The Effect of Photobiomodulation on Human Mesenchymal Cells: A Literature Review. BACKGROUND: Mesenchymal stem cell-based therapy is known to have the potential to induce angiogenesis. However, there are still some limitations regarding their clinical application. Photomodulation/photobiomodulation is non-invasive and non-toxic phototherapy able to stimulate cell viability, proliferation, differentiation, and migration, when the right irradiation parameters are applied. A review of the published articles on human conditioned-by-photobiomodulation mesenchymal cells in an in vitro set up was carried out. Our aim was to describe the studies' results

and identify any possible tendency that might highlight the most suitable procedures. METHODS: A search in English of the PubMed database was carried out with the search criteria: photobiomodulation or photoactivation or photomodulation, and mesenchymal cells. All irradiations applied in vitro, on human mesenchymal cells, with wavelengths ranged from 600 to 1000Â nm. RESULTS: The search yielded 42 original articles and five reviews. Finally, 37 articles were selected with a total of 43 procedures. Three procedures (7.0%) from 620 to 625 nm; 26 procedures (60.5%) from 625 to 740 nm; 13 procedures (30.2%) from 740 to 1000 nm; and one procedure (2.3%) with combinations of wavelengths. Of the 43 procedures, 14 assessed cell viability (n = 14/43, 32.6%); 34 cell proliferation (n = 34/43, 79.1%); 19 cell differentiation (n = 19/43, 44.2%); and three cell migration (n = 3/43, 7.0%). CONCLUSIONS: Photobiomodulation is a promising technology that can impact on cell viability, differentiation, proliferation, or migration, leading to enhance its regenerative capacity. NO LEVEL ASSIGNED: This journal requires that authors assign a level of evidence to each submission to which Evidence-Based Medicine rankings are applicable. This excludes Review Articles, Book Reviews, and manuscripts that concern Basic Science, Animal Studies, Cadaver Studies, and Experimental Studies. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Animals;Cell Proliferation;Cell Survival;Humans;Phototherapy;Stem Cell Transplantation

Adherence of head and neck cancer patients to laser photobiomodulation in a public health service: Pilot study. OBJECTIVE: The aim of this study was to evaluate the adherence of patients with head and neck cancer who underwent radiotherapy or radio-chemotherapy combined to the preventive laser photobiomodulation protocol in a public health service. MATERIALS AND METHODS: This was a cross-sectional study, whose population sample included patients with malignant head and neck neoplasms. Thirty head and neck cancer patients undergoing cancer treatment, were examined and interviewed through a record of signs and symptoms of oral mucositis (OM) and adherence to the preventive laser photobiomodulation protocol, that began in the first session of radiotherapy, and included the laser application three times a week during the 3-week period. The collected data were documented, and the descriptive and inferential statistics were performed with a significance level of $p < 0.05$. RESULTS: It was observed that 66.6% of patients developed OM. There was a predominance of degrees I and II, with 36.8% and 31.6%, respectively. A total of fifteen patients (50%) missed one or more laser photobiomodulation sessions. A positive association was found between patients who missed at least two laser photobiomodulation sessions with the development of OM degrees III ($p < 0.05$). CONCLUSIONS: There was moderate adherence of patients with head and neck cancer to the laser photobiomodulation protocol and the development of more severe degrees of OM was related to individuals that didn't attend scheduled sessions. Cross-Sectional Studies;Head and Neck Neoplasms;Health Services;Humans;Lasers;Low-Level Light Therapy;Pilot Projects;Stomatitis

Effect of photobiomodulation on external root resorption during orthodontic tooth movementÂ -Â a randomized controlled trial. OBJECTIVE: The objective of the study was to compare external root resorption during orthodontic tooth movement between patients who were subjected to photobiomodulation and those who were not. MATERIALS AND METHODS: The study was designed as a split-mouth, single-blind randomized controlled trial conducted on twenty-two orthodontic patients requiring extraction of maxillary first premolars (age group 13-30years). A buccal force was applied to all the premolars using a 0.019â€³Ã—0.025â€³ beta-titanium cantilever spring for 28days. The test group premolars were irradiated by indium-gallium-arsenide (InGaAs) diode laser (980nm, 100mW) 0, 3, 7, 11, 15 and 28days after force application. Each premolar was irradiated at ten locations on the buccal and palatal gingiva resulting in a total energy of 10J delivered per tooth. After 28days, the root surface of all the premolars were studied for the number and volume of resorption

craters using three-dimensional optical profilometry by a blinded assessor. One-sample Kolmogorov-Smirnov test was used to ascertain normality and Mann-Whitney U test was applied for data analysis. RESULTS: All twenty-two patients enrolled completed the study. The root surface analysis showed formation of 32.78% less number of resorption craters (P<0.05) and 39.49% less volume of resorption craters (P<0.05) in the test group premolars relative to the control group premolars. CONCLUSIONS: The results of the present study, therefore, suggest that photobiomodulation reduces external root resorption during orthodontic tooth movement. TRIAL REGISTRATION/REGISTRATION NUMBER: CTRI/2018/04/013520. Adolescent;Adult;Dental Cementum;Humans;Root Resorption;Single-Blind Method;Tooth Movement Techniques;Tooth Root;X-Ray Microtomography;Young Adult

Gut flora-targeted photobiomodulation therapy improves senile dementia in an AÃŸ-induced Alzheimer's disease animal model. BACKGROUND: Emerging evidence suggests that the gut microbiota plays an important role in the pathological progression of Alzheimer's disease (AD). Photobiomodulation (PBM) therapy is believed to have a positive regulatory effect on the imbalance of certain body functions, including inflammation, immunity, wound healing, nerve repair, and pain. Previous studies have found that the intestinal flora of patients with AD is in an unbalanced state. Therefore, we have proposed the use of gut flora-targeted PBM (gf-targeted PBM) as a method to improve AD in an AÃŸ-induced AD mouse model. METHODS: PBM was performed on the abdomen of the mice at the wavelengths of 630Â nm, 730Â nm, and 850Â nm at 100Â J/cm(2) for 8Â weeks. Morris water maze test, immunofluorescence and proteomic of hippocampus, and intestinal flora detection of fecal were used to evaluate the treatment effects of gf-targeted PBM on AD rats. RESULTS: PBM at all three wavelengths (especially 630Â nm and 730Â nm) significantly improved learning retention as measured by the Morris water maze. In addition, we found reduced amyloidosis and tau phosphorylation in the hippocampus by immunofluorescence in AD mice. By using a quantitative proteomic analysis of the hippocampus, we found that gf-targeted PBM significantly altered the expression levels of 509 proteins (the same differentially expressed proteins in all three wavelengths of PBM), which involved the pathways of hormone synthesis, phagocytosis, and metabolism. The 16Â s rRNA gene sequencing of fecal contents showed that PBM significantly altered the diversity and abundance of intestinal flora. Specifically, PBM treatment reversed the typical increase of Helicobacter and uncultured Bacteroidales and the decrease of Rikenella seen in AD mice. CONCLUSIONS: Our data indicate that gf-targeted PBM regulates the diversity of intestinal flora, which may improve damage caused by AD. Gf-targeted PBM has the potential to be a noninvasive microflora regulation method for AD patients. tau Proteins Animals;Humans;Male;Mice;Rats;Alzheimer Disease;Amyloidosis;Disease Models, Animal;Gastrointestinal Microbiome;Hippocampus;Low-Level Light Therapy;Morris Water Maze Test;Phosphorylation;Proteomics;tau Proteins

Efficacy of the laser at low intensity on primary burning oral syndrome: a systematic review. BACKGROUND: Primary burning mouth syndrome (BMS) is a chronic clinical condition of idiopathic mainly characterized by pain and a burning sensation in the oral cavity. The application of laser at low intensity therapy is a treatment option. This systematic review evaluated the efficacy of laser therapy in treating symptoms of burning mouth syndrome. MATERIAL AND METHODS: The study was formulated according to the PRISMA and Cochrane guidelines. Seven databases were used as primary sources of research. Only randomized controlled clinical trials were included. The efficacy of the therapy was estimated comparing the values of the visual and numerical scales of pain before and after laser treatment, through qualitative analysis. RESULTS: The search resulted in 348 records and only eight filled the eligibility criteria and were included. All studies evaluated pain and / or a burning sensation considering a time interval of two to ten weeks. The total sample consisted of 314 patients

submitted to treatment: 123 from the control group, who participated with laser off or with the tip blocked, and 191 from the intervention group, treated with low-level laser therapy. The female gender stood out and the average age of the participants was 60.89 years. The main symptoms reported were pain and a burning sensation in the oral mucosa and tongue. The parameters adopted by the authors for laser treatment were diverse and the variables were not fully described in the published studies. Visual analog and numerical scales were used to assess symptoms and only three studies showed statistical significance. CONCLUSIONS: It is suggested that laser therapy may be an effective alternative in the treatment of BMS. New randomized clinical trials should consider well-established protocols to better understand the efficacy of laser therapy without confounding the effects. Burning Mouth Syndrome;Female;Humans;Lasers;Low-Level Light Therapy;Middle Aged;Pain;Tongue Diseases

Photobiomodulation therapy in age-related macular degeneration. PURPOSE OF REVIEW: To review the available data supporting the use of photobiomodulation therapy (PBT) in the treatment of age-related macular degeneration (AMD). RECENT FINDINGS: PBT might be used in treating nonexudative AMD. Limited evidence suggests that exudative AMD may also benefit from PBT. SUMMARY: The optimal device would deliver doses of 60â€ŠJ/cm2 or more with a multiwavelength composition through the pupil over short treatment intervals. Safe upper limits have not been established. More studies are needed to evaluate the efficacy of PBT in treating exudative and nonexudative AMD. Geographic Atrophy;Humans;Low-Level Light Therapy;Wet Macular Degeneration

Photobiomodulation with a wavelength > 800 nm induces morphological changes in stem cells within otic organoids and scala media of the cochlea. Photobiomodulation (PBM) is a therapeutic approach to certain diseases based on light energy. Currently, stem cells (SCs) are being considered as putative treatments for previously untreatable diseases. One medical condition that could be treated using SCs is sensorineural hearing loss. Theoretically, if properly delivered and differentiated, SCs could replace lost hair cells in the cochlea. However, this is not currently possible due to the structural complexity and limited survival of SCs within the cochlea. PBM facilitates SC differentiation into other target cells in multiple lineages. Using light with a wavelength > 800 nm, which can penetrate the inner ear through the tympanic membrane, we assessed morphological changes of mouse embryonic stem cells (mESCs) during "otic organoid" generation, and within the scala media (SM) of the cochlea, after light energy stimulation. We observed enhanced differentiation, which was confirmed by an increased number of otic vesicles and increased cell attachment inside the SM. These results suggest that > 800-nm light affected the morphology of mESCs within otic organoids and SM of the cochlea. Based on our results, light energy could be used to enhance otic sensory differentiation, despite the structural complexity of the inner ear and limited survival time of SCs within the cochleae. Additional studies to refine the light energy delivery technology and maximize the effect on otic differentiation are required. Animals;Cell Differentiation;Cochlea;Cochlear Duct;Ear, Inner;Mice;Organoids;Stem Cells

Low-level laser therapy using laser diode 940 nm in the mandibular impacted third molar surgery: double-blind randomized clinical trial. BACKGROUND: The effect of low-level laser therapy (LLLT) on pain mitigation following the third molar surgery is still controversial. The absence of a standard method for using laser among the studies is related to the types of sample selection, sample size, control, and LLLT parameters, which make pain mitigation following surgery more controversial. Therefore, this study aimed to determine the effect of LLLT on reducing pain, swelling, and trismus following the mandibular impacted third molar surgery. METHODS: This study was performed on 25 healthy subjects. After the surgery, amoxicillin 500Â mg was prescribed every 8Â h for a 7-day period besides oral Ibuprofen (Gelofen) 400Â mg every 12Â h for a 3-day period. The intraoral Laser diode

940 nm was applied immediately after suture on the tested side, while on the placebo side, a fiber tip was used with no laser radiation following surgery. Eventually, the pain score was evaluated by VAS index from the 1st to the 7th-day post-surgery and then analyzed by SPSS 24. RESULTS: The results indicate that the mean swelling and trismus before, during, 2Â days after, and 7Â days after the intervention did not differ significantly between the two studied groups. However, the results show that on the sixth and seventh days, the pain was significantly lower in the intervention group compared to the control group. CONCLUSIONS: The results suggest that although the pain, swelling, and trismus following surgery were lower on the radiated side, only pain was found to be significant on the radiated side (pâ€‰<â€‰0.05). The registration number of the clinical trial in a Primary Registry in the WHO Registry Network is IRCT20141209020258N110 and the date of retrospective registration is 04/05/2019. The related URL is https://www.irct.ir/trial/36321 . Double-Blind Method;Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Retrospective Studies;Tooth Extraction;Tooth, Impacted;Trismus

Photobiomodulation Therapy/Photodynamic Therapy Versus Steroid Therapy for Oral Lichen Planus: A Systematic Review and Meta-Analysis. Objective: To evaluate the efficiency of photobiomodulation therapy (PBMT) or photodynamic therapy (PDT) in treating oral lichen planus (OLP) as well as identifiy the side effects when compared with steroid therapy. Background: Nowadays, PBMT and PDT are increasingly applied for treating OLP with minimal adverse effects. Methods: The electronic databases of PubMed, Cochrane Central Register of Controlled Trial, Web of Science, and Embase were searched until March 13, 2020. Randomized controlled trials (RCTs) with 1 month of follow-up period were selected. Two reviewers extracted data from selected studies independently. Cochrane collaboration's tool for assessing risk of bias was used for assessing the quality of the RCTs. The random-effects model was employed for meta-analysis. Results: One thousand fifteen studies were initially identified. Finally, nine RCTs were included for quality assessment and seven studies for meta-analysis. Four RCTs were of unclear risk of bias and five were assessed as high risk of bias. The comparison showed no significant differences for pain scores [visual analog scale (VAS)] [mean differences (MD)â€‰=â€‰0.38, confidence interval (CI)â€‰=â€‰95% -0.64 to 1.40] and severity scores (reticular-atrophic-erosive scores) (MDâ€‰=â€‰1.67, CIâ€‰=â€‰95% -1.13 to 4.46) between topical corticosteroid therapy and PBMT after 1 month. For PDT, no significant differences were observed for sign scores (Thongprasm sign scoring) (MDâ€‰=â€‰-0.31, CIâ€‰=â€‰95% -1.52 to 0.91) and pain scores (VAS) (MDâ€‰=â€‰-2.30, CIâ€‰=â€‰95% -5.88 to 1.28) of the lesions when compared with topical corticosteroid therapy after 1 month of follow-up period. One study reported the discomfort of the affected area in patients of the PDT group when probe tip was moved. Conclusions: PBMT and PDT could be reliable alternatives to topical corticosteroids for OLP with no or less severe complications in a short-term period. However, further well-designed RCTs with long-term period are recommended to consolidate the conclusions in this regard. Steroids Humans;Lichen Planus, Oral;Low-Level Light Therapy;Pain Measurement;Photochemotherapy;Steroids

The Effect of Laser Bio-modulation on Dysplastic Lesions, an Animal Study. Potentially malignant disorders are one of the clinical challenges. Dysplasia in these lesions can be a predictor of more potential for malignant changes. Photo-bio-modulation in benign lesions has advantages, but there is doubt on its safety in potentially malignant lesions. This study aims to assess if low-level laser can promote dysplastic changes while the method can play an important role in management of dysplastic lesions. Dysplasia was induced on anterior wall of the buccal pouch of 80 young Syrian male hamsters. Then, hamsters were divided to four groups to receive 4 and 12 sessions irradiation of 660 and 810 nanometers low-level lasers. For histopathologic study of the tissue, we used light microscopes. Using SPSS, data were analyzed via Wilcoxon signed rank test and Mann-Whitney U-

test. In all of our four groups, the severity of dysplasia had no statistical difference in study sides comparing with their own controls. Wavelength and numbers of laser irradiation sessions had no statistically meaningful effect on the severity of dysplasia either. Low-level lasers appear to show no relevant or significant effect over the aggravation of the dysplasia's severity. Neither the wavelength nor the number of sessions appear to have any impact in the results. Animals;Cheek;Cricetinae;Hyperplasia;Lasers;Light;Male

Role of Photo-Biomodulation Therapy in Facial Rejuvenation and Facial Plastic Surgery. Photo-biomodulation (PBM) also known as low-level laser therapy is a rising technology with multiple potential uses in medicine and recently in the cosmetic field for the treatment of skin conditions and skin rejuvenation. Due to its wound healing and anti-inflammatory properties, there is an increase in popularity in its use as adjunctive treatment before and after surgical procedures in the face and neck. Cosmetic Techniques;Face;Humans;Plastic Surgery Procedures;Rejuvenation;Skin Aging;Surgery, Plastic

Kaposi's Sarcoma-Related Lymphedema Treated by a Nd:YAG Laser. Humans;Lasers, Solid-State;Low-Level Light Therapy;Lymphedema;Sarcoma, Kaposi;Skin Neoplasms;Treatment Outcome

Effects of low-level laser therapy on the orthodontic mini-implants stability: a systematic review and meta-analysis. OBJECTIVES: The aim of this systematic review and meta-analysis was to assess the effects of low-level laser therapy (LLLT) on the orthodontic mini-implants (OMI) stability. MATERIALS AND METHODS: An unrestricted electronic database search in PubMed, Science Direct, Embase, Scopus, Web of Science, Cochrane Library, LILACS, Google Scholar, and ClinicalTrials.gov and a hand search were performed up to December 2020. Randomized clinical trials (RCTs) or non-randomized clinical trials (Non-RCTs) that assessed the effects of LLLT on the OMI stability were included. Data regarding the general information, LLLT characteristics, and outcomes were extracted. The authors performed risk of bias assessment with Cochrane Collaboration's or ROBINS-I tool. Meta-analysis was also conducted. RESULTS: Five RCTs and one Non-RCT were included and 108 patients were evaluated. The LLLT characteristics presented different wavelength, power, energy density, irradiation time, and protocol duration. Five RCTs had a low risk of selection bias. Two RCTs had a low risk of performance and detection bias. All RCTs had a low risk of attrition bias, reporting bias and other bias. The Non-RCT presented a low risk of bias for all criteria, except for the bias in selection of participants. The meta-analysis revealed that LLLT significantly increased the OMI stability ($p < 0.001$, Cohen's $d = 0.67$) and the highest clinical benefit was showed after 1 ($p < 0.001$, Cohen's $d = 0.75$), 2 ($p < 0.001$, Cohen's $d = 1.21$), and 3 ($p < 0.001$, Cohen's $d = 1.51$) months of OMI placement. CONCLUSIONS: LLLT shows positive effects on the OMI stability. Dental Implants Dental Implants;Humans;Low-Level Light Therapy

Our experience in the treatment of hemangioma with intense pulsed light laser: A 10 year study in Albania. Laser treatment brought an innovation in the treatment of hemangiomas and vascular anomalies. The range of superficial vascular lesions that can be treated with laser continues to expand. In our country laser device date relatively late, since then these technologies have facilitated the treatment of many skin condition. The goal of laser therapy is to maximize vascular destruction while minimizing injury to surrounding healthy epidermis and dermal tissues. We present our experience with IPL as a first line therapy in the treatment of superficial hemangiomas. After institutional review, board approval we analyzed the medical records of 202 patients diagnosed with hemangioma and treated with the IPL laser during January 2009 to January 2019. The performed procedure consists of using impulses of light with wave length that varies from 590 to 595â€‰nm, duration 1.5 ms, and fluency by 11 to 12â€‰J/cm(2) . For each patient, four PDL sessions have been performed. We aim to evidence the efficacy and the good safety profile of (IPL) laser but with small

adverse events that this treatment represent. The importance of proper patient selection, use of appropriate equipment settings, skin cooling mechanisms, and other safety measures minimize the occurrence of adverse events due to IPL treatment. Albania;Hemangioma;Humans;Laser Therapy;Lasers, Dye;Low-Level Light Therapy

Diabetic macular edema. Diabetic retinopathy (DR) is a leading cause of preventable blindness world-wide. Diabetic macular edema (DME) is the most common cause of moderate vision loss in patients with diabetes. Although treatments for DME have improved significantly over the past decades, the burden of this disease remains high for patients and the healthcare system alike. The role of the primary care provider is critical in the prevention and prompt referral for management of DME. Adrenal Cortex Hormones;Angiogenesis Inhibitors;VEGFA protein, human;Vascular Endothelial Growth Factor A Adrenal Cortex Hormones;Angiogenesis Inhibitors;Diabetes Complications;Humans;Intravitreal Injections;Low-Level Light Therapy;Macular Edema;Vascular Endothelial Growth Factor A;Vision Disorders

Transcranial low-level laser therapy in an in vivo model of stroke: Relevance to the brain infarct, microglia activation and neuroinflammation. Stroke is the main cause of death and functional disability. The available therapy affects only 5% of patients, and new therapeutic approaches have been constantly tested. Transcranial photobiomodulation (PBM) is promising for its neuroprotective effect on brain injuries. Thus, the present study investigated the PBM effects in an in vivo model of ischemic stroke induced by photothrombosis (PT). Five different groups of Wistar rats were submitted or not to a daily dose of fish oil or/and laser sessions for 2â€‰months. The ischemia volume was evaluated by stereology; GFAP, Iba and NeuN by immunohistochemistry; TNF-Î±, IL-1Î², IL-6, IL-10 and TGF-Î² by ELISA assay. PBM influenced both the lesion volume and the GFAP. Furthermore, PBM and Î©-3 or both reduced Iba RNAm. PBM reduced TNF-Î±, IL-1Î², IL-6, brain damage, neuroinflammation and microglial activation, and it increased astroglial activity in peri-lesioned region after stroke. Animals;Brain Infarction;Humans;Low-Level Light Therapy;Microglia;Rats;Rats, Wistar;Stroke

Blue light absorbing pigment in Streptococcus agalactiae does not potentiate the antimicrobial effect of pulsed 450Â nm light. INTRODUCTION: Recently, it was shown that Group B Streptococcus (GBS) COH1 strain, which has granadaene-an endogenous chromophore known to absorb blue light-is not susceptible to 450Â nm pulsed blue light (PBL) inactivation unless the bacterium is co-cultured with exogenous porphyrin. PURPOSE: To confirm or refute the finding, we studied the effect of blue light on NCTC, another strain of GBS with more granadaene than COH1, to determine if the abundance of granadaene-and by implication more absorption of blue light-fosters GBS susceptibility to PBL. METHODS: We irradiated cultures of the bacterium with or without protoporphyrin, coproporphyrin, flavin mononucleotide (FMN), flavin adenine dinucleotide (FAD), nicotinamide adenine dinucleotide (NAD) or NADH. After 24-h incubation, bacterial colonies were enumerated, log(10) CFU/mL computed, and descriptive and inferential data analyzed and compared. RESULTS: (1) The rich amount of granadaene in NCTC did not enhance its susceptibility to antimicrobial pulsed blue light (PBL). (2) Adding exogenous porphyrin fostered NCTC susceptibility to irradiation, resulting in 100% bacterial suppression. (3) Exogenous FMN or FAD, which strongly absorb 450Â nm light, did not promote the antimicrobial effect of PBL, neither did exogenous NAD or NADH, two weak blue light-absorbing photosensitizers. CONCLUSION: These results strengthen our previous assertion that an endogenous chromophore with the capacity to absorb and transform light energy into a biochemical process that engenders bacterial cell death, is essential for 450Â nm PBL to suppress GBS. Photosensitizing Agents;Porphyrins;NAD;Flavin-Adenine Dinucleotide;Flavin Mononucleotide Apoptosis;Cell Culture Techniques;Dose-Response Relationship, Radiation;Flavin Mononucleotide;Flavin-Adenine Dinucleotide;Light;NAD;Photosensitizing Agents;Porphyrins;Streptococcus agalactiae;Time Factors

Structural membrane changes induced by pulsed blue light on methicillin-resistant Staphylococcus aureus (MRSA). BACKGROUND: In a recent study we showed that blue light inactivates methicillin-resistant Staphylococcus aureus (MRSA) by perturbing, depolarizing, and disrupting its cell membrane. PURPOSE: The current study presents visual evidence that the observed biochemical changes also result in cell metabolic changes and structural alteration of the cell membrane. METHODS: Cultures of MRSA were treated with 450Â nm pulsed blue light (PBL) at 3Â mW/cm(2) irradiance, using a sub lethal dose of 2.7Â J/cm(2) radiant exposure three times at 30-min intervals. Following 24Â h incubation at 37Â Â°C, irradiated colonies and control non-irradiated colonies were processed for light and transmission electron microscopy. RESULTS: The images obtained revealed three major effects of PBL; (1) disruption of MRSA cell membrane, (2) alteration of membrane structure, and (3) disruption of cell replication. CONCLUSION: These signs of bacterial inactivation at a dose deliberately selected to be sub-lethal supports our previous finding that rapid depolarization of bacterial cell membrane and disruption of cellular function comprise another mechanism underlying photo-inactivation of bacteria. Further, it affirms the potency of PBL. Cell Culture Techniques;Cell Membrane;Colony Count, Microbial;Dose-Response Relationship, Radiation;Light;Methicillin-Resistant Staphylococcus aureus;Microbial Viability

Vascular Photobiomodulation. Low-Level Light Therapy

Orthokeratology and Low-Intensity Laser Therapy for Slowing the Progression of Myopia in Children. Orthokeratology (OK) is widely used to slow the progression of myopia. Low-level laser therapy (LLLT) provides sufficient low energy to change the cellular function. This research is aimed at verifying the hypothesis that LLLT treatment could control myopia progression and comparing the abilities of OK lenses and LLLT to control the refractive error of myopia. Eighty-one children (81 eyes) who wore OK lenses, 74 children (74 eyes) who underwent LLLT treatment, and 74 children (74 eyes) who wore single-vision distance spectacles for 6 months were included. Changes in axial length (AL) were 0.23 Â± 0.06â€‰mm for children wearing spectacles, 0.06 Â± 0.15â€‰mm for children wearing OK lens, and -0.06 Â± 0.15â€‰mm for children treated with LLLT for 6 months. Changes in subfoveal choroidal thickness (SFChT) observed at the 6-month examination were -16.84 Â± 7.85â€‰Î¼m, 14.98 Â± 22.50â€‰Î¼m, and 35.30 Â± 31.75â€‰Î¼m for the control group, OK group, and LLLT group, respectively. Increases in AL at 1 month and 6 months were significantly associated with age at LLLT treatment. Changes in AL were significantly correlated with the baseline spherical equivalent refraction (SER) and baseline AL in the OK and LLLT groups. Increases in SFChT at 1 month and 6 months were positively associated with age at enrolment for children wearing OK lens. At 6 months, axial elongation had decelerated in OK lens-wearers and LLLT-treated children. Slightly better myopia control was observed with LLLT treatment than with overnight OK lens-wearing. Evaluations of age, SER, and AL can enhance screening for high-risk myopia, improve the myopia prognosis, and help determine suitable control methods yielding the most benefits. Axial Length, Eye;Child;Disease Progression;Female;Humans;Low-Level Light Therapy;Male;Myopia;Orthokeratologic Procedures;Refraction, Ocular;Treatment Outcome

Physical and Biological Properties of a Chitosan Hydrogel Scaffold Associated to Photobiomodulation Therapy for Dental Pulp Regeneration: An In Vitro and In Vivo Study. BACKGROUND: The regeneration of dental pulp, especially in cases of pulp death of immature teeth, is the goal of the regenerative endodontic procedures (REPs) that are based on tissue engineering principles, consisting of stem cells, growth factors, and scaffolds. Photobiomodulation therapy (PBMT) showed to improve dental pulp regeneration through cell homing approaches in preclinical studies and has been proposed as the fourth element of tissue engineering. However, when a blood clot was used as a scaffold in one of these previous studies, only 30% of success was achieved. The authors pointed out the instability of the blood clot as the regeneration shortcoming. Then, to circumvent this problem, a

new scaffold was developed to be applied with the blood clot. The hypothesis of the present study was that an experimental injectable chitosan hydrogel would facilitate the three-dimensional spatial organization of endogenous stem cells in dental pulp regeneration with no interference on the positive influence of PBMT. METHODS: For the in vitro analysis, stem cells from the apical papilla (SCAPs) were characterized by flow cytometry and applied in the chitosan scaffold for evaluating adhesion, migration, and proliferation. For the in vivo analysis, the chitosan scaffold was applied in a rodent orthotopic dental pulp regeneration model under the influence of PBMT (660â€‰nm; power output of 20â€‰mW, beam area of 0.028â€‰cm(2), and energy density of 5â€‰J/cm(2)). RESULTS: The scaffold tested in this study allowed significantly higher viability, proliferation, and migration of SCAPs in vitro when PBMT was applied, especially with the energy density of 5â€‰J/cm(2). These results were in consonance to those of the in vivo data, where pulp-like tissue formation was observed inside the root canal. CONCLUSION: Chitosan hydrogel when applied with a blood clot and PBMT could in the future improve previous results of dental pulp regeneration through cell homing approaches. Hydrogels;Chitosan Animals;Cells, Cultured;Chitosan;Dental Pulp;Humans;Hydrogels;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Regeneration;Stem Cells;Tissue Engineering;Tissue Scaffolds

Antibiotic Therapy in Dentistry. Dental caries, pulpal necrosis, trauma, and periodontal diseases can result in dental infections which could have severe consequences that affect both soft and hard tissues of the oral cavity. Dental infections commonly present with symptoms of pain, fever, and swelling. Surgical and endodontic treatments are the early management of infected teeth, followed by antibiotic therapy. Some alternative methods also exist for treating infection such as low-level laser therapy and photodynamic therapy. Antibiotics are generally used in dental procedures to treat odontogenic infections, nonodontogenic infections, local infection, focal infection, and prophylaxis. Antibiotic prophylaxis is prescribed for patients with immunosuppressed conditions, infective endocarditis, metabolic disorders, and patients with prosthetic joints. To reduce the complications of unnecessary antibiotic prescriptions especially bacterial resistance, comprehensive guidelines should be established. It has been noted that only about 12% of dentists adequately and correctly prescribe antibiotics, which shows the importance of comprehensive guidelines. Antibiotics prescription may result in some adverse effects such as hypersensitivity reactions and dermatological and allergic disorders. Furthermore, unnecessary prescription of antibiotics could result in several serious sequelae, for example, bacterial resistance, gastric and hematological problems, and diversion of bacterial microbiota. The present review attempts to summarize the indications of antibiotic therapy in dentistry and discuss the common types of antibiotics that are routinely used in dental practice based on pharmacologic classes. Moreover, types of antibiotics that are considered safe during pregnancy and childhood are also reviewed.

Laser Photobiomodulation (PBM)-A Possible New Frontier for the Treatment of Oral Cancer: A Review of In Vitro and In Vivo Studies. The treatment of oral squamous cell carcinoma (OSCC) is particularly complex due to its aggressive behavior, location, the patient's age, and its spread at diagnosis. In recent years, photobiomodulation (PBM) has been introduced in different medical fields; however, its application, in patients suffering from OSCC for palliative support or to induce analgesia, has been hotly debated due to the possibility that the cell growth stimuli induced by PBM could lead to a worsening of the lesions. The aim of this study is to review the literature to observe the available data investigating the effect of PBM on cancer cells in vitro and in vivo. A review was conducted on the PubMed and Scopus databases. A total of twelve studies met the inclusion criteria and were therefore included for quality assessment and data extraction. The analysis showed that the clinical use of PBM is still only partially understood and is, therefore, controversial. Some authors stated that it could be contraindicated for clinical use in patients suffering from SCC, while others noted that it

could have beneficial effects. According to the data that emerged from this review, it is possible to hypothesize that there are possibilities for PBM to play a beneficial role in treating cancer patients, but further evidence about its clinical efficacy and the identification of protocols and correct dosages is still needed.

A preclinical research platform to evaluate photosensitizers for transbronchial localization and phototherapy of lung cancer using an orthotopic mouse model. BACKGROUND: Establishing the efficacy of novel photosensitizers (PSs) for phototherapy of lung cancer requires in vivo study prior to clinical evaluation. However, previously described animal models are not ideal for assessing transbronchial approaches with such PSs. METHODS: An ultra-small parallel-type composite optical fiberscope (COF) with a 0.97 mm outer diameter tip. The integration of illumination and laser irradiation fibers inside the COF allows simultaneous white-light and fluorescence imaging, as well as real-time monitoring of tip position during laser phototherapy. An orthotopic lung cancer mouse model was created with three human lung cancer cell lines transbronchially inoculated into athymic nude mice. The COF was inserted transbronchially into a total of 15 mice for tumor observation. For in vivo fluorescence imaging, an organic nanoparticle, porphysome, was used as a PS. Laser excitation through the COF was performed at 50 mW using a 671 nm source. RESULTS: The overall success rate for creating orthotopic lung tumors was 71%. Transbronchial white light images were successfully captured by COF. Access to the left main bronchus was successful in 87% of mice (13/15), the right main bronchus to the cranial lobe bronchus level in 100% (15/15), and to the right basal trifurcation of the middle lobe, caudal lobe and accessory lobe in 93% (14/15). For transbronchial tumor localization of orthotopic lung cancer tumors, PS-laden tumor with the strong signal was clearly contrasted from the normal bronchial wall. CONCLUSIONS: The ultra-small COF enabled reliable transbronchial access to orthotopic human lung cancer xenografts in vivo. This method could serve as a versatile preclinical research platform for PS evaluation in lung cancer, enabling transbronchial approaches in in vivo survival models inoculated with human lung cancer cells.

Impact of intraoral non-pharmacological non-surgical adjunctive interventions on orthodontically induced inflammatory root resorption in humans: A systematic review. BACKGROUND: The current systematic review aimed to assess the impact of intraoral non-surgical non-pharmacological adjunctive interventions on orthodontically induced inflammatory root resorption (OIIRR). SEARCH METHODS: Search without restrictions was performed up to November 2020 in three electronic databases (Cochrane Central Register of Controlled Trials, MEDLINE and EMBASE) for randomized controlled trials (RCTs), prospective and retrospective non-randomized studies. The ROB 2.0 tool was used to assess the quality of the included RCTs, and the ROBINS-I tool was applied to non-randomized clinical studies. The strength of evidence was ranked using GRADE. RESULTS: Three hundred and sixteen records were initially retrieved. A total of 10 studies, with 236 patients, were finally considered. These studies assessed the effects of mechanical vibration (low-frequency and high-frequency), low-intensity pulsed ultrasound (LIPUS), low-level laser therapy (LLLT) and photobiomodulation (light-emitting devices (LED). While the low-frequency vibration and LED do not seem to affect OIIRR, OIIRR has been reported to be reduced in high-frequency vibration, and LIPUS-treated teeth (differences may not likely be considered clinically relevant). The potential positive effect of LLLT on OIIRR is still debatable. Overall, the existing evidence suggests that the amount of OIIRR observed while using these interventions with traditional orthodontic treatment was not more than that was observed without it. CONCLUSIONS: Based on a very low level of confidence, it seems that intraoral non-pharmacological non-surgical adjunctive interventions do not affect the amount of OIIRR either positively or negatively to a clinically relevant degree when compared to what is seen with conventional orthodontic treatment alone. Humans;Low-Level Light Therapy;Retrospective Studies;Root Resorption;Vibration

Photobiomodulation Therapy on the Guided Bone Regeneration Process in Defects Filled by Biphasic Calcium Phosphate Associated with Fibrin Biopolymer. The aim is to evaluate the effects of photobiomodulation therapy (PBMT) on the guided bone regeneration process (GBR) in defects in the calvaria of rats filled with biphasic calcium phosphate associated with fibrin biopolymer. Thirty male Wistar rats were randomly separated: BMG (n = 10), defects filled with biomaterial and covered by membrane; BFMG (n = 10), biomaterial and fibrin biopolymer covered by membrane; and BFMLG (n = 10), biomaterial and fibrin biopolymer covered by membrane and biostimulated with PBMT. The animals were euthanized at 14 and 42 days postoperatively. Microtomographically, in 42 days, there was more evident bone growth in the BFMLG, limited to the margins of the defect with permanence of the particles. Histomorphologically, an inflammatory infiltrate was observed, which regressed with the formation of mineralized bone tissue. In the quantification of bone tissue, all groups had a progressive increase in new bone tissue with a significant difference in which the BFMLG showed greater bone formation in both periods (10.12 Â± 0.67 and 13.85 Â± 0.54), followed by BFMG (7.35 Â± 0.66 and 9.41 Â± 0.84) and BMG (4.51 Â± 0.44 and 7.11 Â± 0.44). Picrosirius-red staining showed greater birefringence of collagen fibers in yellow-green color in the BFMLG, showing more advanced bone maturation. PBMT showed positive effects capable of improving and accelerating the guided bone regeneration process when associated with biphasic calcium phosphate and fibrin biopolymer. Calcium Phosphates;Fibrin;calcium phosphate Animals;Bone Regeneration;Calcium Phosphates;Fibrin;Guided Tissue Regeneration;Low-Level Light Therapy;Rats;Skull

Complementarity of Photo-Biomodulation, Surgical Treatment, and Antibiotherapy for Medication-Related Osteonecrosis of the Jaws (MRONJ). Background and Objectives: Antiresorptive or anti-angiogenic agents may induce medication-related osteonecrosis of the jaws (MRONJ), which represents a challenge for clinicians. The aim of this study is to design and apply a composed and stage-approach therapy combining antibiotherapy, surgical treatment, and photo-biomodulation (PBM) for the prevention or treatment of MRONJ lesions. Materials and Methods: The proposed treatment protocol was carried out in the Department of Oral & Maxillofacial Surgery of the "Victor Babes" University of Medicine and Farmacy of Timisoara, in 2018-2020. A total of 241 patients who were previously exposed to antiresorptive or anti-angiogenic therapy, as well as patients already diagnosed with MRONJ at different stages of the disease were treated. A preventive protocol was applied for patients in an "at risk" stage. Patients in more advanced stages received a complex treatment. Results: The healing proved to be complete, with spontaneous bone coverage in all the n = 84 cases placed in an "at risk" stage. For the n = 49 patients belonging to stage 0, pain reductions and decreases of mucosal inflammations were also obtained in all cases. For the n = 108 patients proposed for surgery (i.e., in stages 1, 2, or 3 of MRONJ), a total healing rate of 91.66% was obtained after the first surgery, while considering the downscaling to stage 1 as a treatment "success", only one "failure" was reported. This brings the overall "success" rate to 96.68% for a complete healing, and to 99.59% when downscaling to stage 1 is included in the healing rate. Conclusions: Therefore, the clinical outcome of the present study indicates that patients with MRONJ in almost all stages of the disease can benefit from such a proposed association of methods, with superior clinical results compared to classical therapies. Angiogenesis Inhibitors;Bone Density Conservation Agents Angiogenesis Inhibitors;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Humans;Jaw;Treatment Outcome

Patient Centeredness in Orthognathic Surgery. Patient centeredness in planning treatment and research has become paramount. The goal of this report was to describe a complex case in which untreated chronic pain was not properly addressed to reflect on the need to establish alternative protocols for controlling chronic orofacial pain. When a female underwent orthognathic surgery to correct her occlusion, she not only ended up with a worse occlusion, she developed chronic orofacial

pain that could not be treated by opioids and only improved after the use of neuropathic medication, and finally disappeared after the use of low-level laser therapy. There is a need to incorporate alternative nonpharmacological approaches to manage chronic pain. Further, what the patient's goals are for their treatments should be given priority in case of elective procedures.

Rehabilitation of the Canine Forelimb. The goal of rehabilitation is to restore function and mobility and reduce pain associated with chronic disease. In human medicine, physical therapy is standard of care for acute and chronic injuries and an integral component of postoperative recovery. Although there is a dearth of evidence-based veterinary medical studies in rehabilitation therapy and modalities for forelimb injuries in dogs, some extrapolation from human medicine can be made and applied. When developing a rehabilitation and therapeutic plan, the biomechanics of the affected limb and timeline of tissue healing of the target tissue and/or joint are important to consider. Animals;Dog Diseases;Dogs;Forelimb;Physical Therapy Modalities

Assessment of Human Gingival Fibroblast Proliferation after Laser Stimulation In Vitro Using Different Laser Types and Wavelengths (1064, 980, 635, 450, and 405 nm)-Preliminary Report. PURPOSE: to assess the effect of photobiomodulation (PBM) on human gingival fibroblast proliferation. METHODS: The study was conducted using the primary cell cultures of human fibroblasts collected from systemically healthy donors. Three different laser types, Nd:YAG (1064 nm), infrared diode laser (980 nm), and prototype led laser emitting 405, 450, and 635 nm were used to irradiate the fibroblasts. Due to the patented structure of that laser, it was possible to irradiate fibroblasts with a beam combining two or three wavelengths. The energy density was 3 J/cm(2), 25 J/cm(2), 64 J/cm(2). The viability and proliferation of cells were determined using the (Thiazolyl Blue Tetrazolium Blue) (MTT) test conducted 24, 48, and 72 h after laser irradiation. RESULTS: The highest percentage of mitochondrial activity (MA = 122.1%) was observed in the group irradiated with the 635 nm laser, with an energy density of 64 J/cm(2) after 48 h. The lowest percentage of MA (94.0%) was observed in the group simultaneously irradiated with three wavelengths (405 + 450 + 635 nm). The use of the 405 nm laser at 25 J/cm(2) gave similar results to the 635 nm laser. CONCLUSIONS: The application of the 635 nm and 405 nm irradiation caused a statistically significant increase in the proliferation of gingival fibroblasts.

Red laser-mediated alterations in seed germination, growth, pigments and withanolide content of Ashwagandha [Withania somnifera (L.) Dunal]. Withania somnifera (L.) Dunal, generally well-known as Ashwagandha, is part of Indian traditional medicinal systems like Ayurveda, Siddha, and Unani for over 3000Â years for treating an array of disorders. The chief bioactive component of this plant is the withanolides, a group of C(28)-steroidal lactone triterpenoids. These compounds are present in very low concentrations and hence cell culture methods have been used to enhance their production. Low-level laser irradiation has been reported to have elicited the seed germination, agronomical characters, biosynthesis of bioactive compounds in some plants. Therefore, the objective of the study was to investigate the effect of red (He-Ne) laser irradiation on seed germination, growth characters, pigment contents and withanolide content in W. somnifera. The seeds were inoculated onto two different combinations of Murashige and Skoog (MS) media and incubated for germination. The highest germination percentage was observed in Â½ MS with pHÂ 6.5 and GA(3) presoaking followed by Â½ MS with different pH. Four different doses of Helium-Neon (He-Ne) laser (10, 15, 20 and 25Â J/cm(2)) were used to irradiate the seeds at 632.8Â nm and germinated in vitro on Â½ MS with pHÂ 6.5. The maximum germination percentage, 63.88% was noted from seeds irradiated with 25Â J/cm(2) (PÂ =Â 0.04). The highest total length of 13.33Â cm was observed in the seedlings irradiated with 25Â J/cm(2) groups (PÂ =Â 0.008). The highest total chlorophyll content of 329.5Â Î¼g/g fresh weight (FW) was observed for seedlings irradiated with 15Â J/cm(2) (PÂ =Â 0.02) and the highest carotenoid content of 49.6Â Î¼g/g FW was observed for 25Â J/cm(2) treated

seedlings. Further, primary root length was measured and found to be highest (11.14Â cm) in seedlings irradiated with 10Â J/cm(2) and the highest number of lateral roots were observed for 15 and 25Â J/cm(2) groups. The significant amount of Withanolide A (WA) 0.52Â Î¼g/g dry weight (DW) and 0.60Â Î¼g/g DW was noted in 15 (PÂ =Â 0.01) and 20Â J/cm(2) (PÂ =Â 0.002) groups, respectively than control. The present investigation thus reveals the positive impact of red laser on the germination of seeds, growth characters and withanolide contents under in vitro environment. Plant Extracts;Withanolides;Chlorophyll;Carotenoids;Ashwagandha Carotenoids;Cell Culture Techniques;Chlorophyll;Dose-Response Relationship, Radiation;Germination;Lasers;Plant Extracts;Plant Roots;Radiation Dosage;Seedlings;Seeds;Withania;Withanolides

Comparison of low power laser and kinesio taping for the treatment of carpal tunnel syndrome: A prospective randomized study. BACKGROUND: Although carpal tunnel syndrome (CTS) is a common neuromuscular disorder, studies on its conservative treatment are inadequate and contradictory. OBJECTIVES: This study aimed to investigate and compare the effectiveness of low power laser therapy (LPLT) and Kinesio taping (KT) for the treatment of CTS. METHODS: Sixty patients with CTS were included in this study. One group received 15 sessions of KT, and the second group underwent 15 sessions of LPLT within three weeks. All patients were assessed with hand grip strength (HGS), Visual Analogue Scale (VAS)-pain, Douleur Neuropathique-4 (DN4) score, Boston Questionnaire (BQ), and electroneuromyography before and after treatment. RESULTS: Before treatment, all clinical and neurophysiological parameters were similar between the groups. After treatment, both groups significantly improved in terms of HGS, VAS-pain, DN4, and BQ. However, the LPLT group had significantly better HGS, VAS-pain, DN4, and BQ than the KT group. In addition, while median nerve motor distal latency and median nerve sensory conduction velocity improved significantly with treatment in both groups, the LPLT group's improvement was significantly better than that of the KT group. CONCLUSIONS: In patients with CTS, both LPLT and KT were effective treatments. However, the LPLT group had significantly better improvements than the KT group. Adult;Athletic Tape;Carpal Tunnel Syndrome;Female;Hand Strength;Humans;Lasers;Low-Level Light Therapy;Male;Pain Measurement;Physical Therapy Modalities;Prospective Studies;Treatment Outcome

Transcranial Photobiomodulation to Improve Cognition in Gulf War Illness. Introduction: Approximately 25-30% of veterans deployed to Kuwait, 1990-91, report persistent multi-symptom Gulf War Illness (GWI) likely from neurotoxicant exposures. Photobiomodulation (PBM) in red/near-infrared (NIR) wavelengths is a safe, non-invasive modality shown to help repair hypoxic/stressed cells. Red/NIR wavelengths are absorbed by cytochrome C oxidase in mitochondria, releasing nitric oxide (increasing local vasodilation), and increasing adenosine tri-phosphate production. We investigated whether PBM applied transcranially could improve cognition, and health symptoms in GWI. Materials and Methods: Forty-eight (40 M) participants completed this blinded, randomized, sham-controlled trial using Sham or Real, red/NIR light-emitting diodes (LED) applied transcranially. Fifteen, half-hour transcranial LED (tLED) treatments were twice a week (7.5 weeks, in-office). Goggles worn by participant and assistant maintained blinding for visible red. Pre-/Post- testing was at Entry, 1 week and 1 month post- 15th treatment. Primary outcome measures were neuropsychological (NP) tests; secondary outcomes, Psychosocial Questionnaires, including PTSD. Results: Primary Analyses (all participants), showed improvement for Real vs. Sham, for Digit Span Forwards ($p < 0.01$); and a trend for Trails 4, Number/Letter Sequencing ($p < 0.10$). For secondary outcomes, Real group reported more improvement on the SF-36V Plus, Physical Component Score ($p < 0.08$). Secondary Analyses included only subjects scoring below norm (50%ile) at Entry, on specific NP test/s. Real and Sham improved at 1 week after 15th treatment; however, at 1 month, only those receiving Real improved further: Digit Span Total, Forwards and Backwards; Trails 4, Number/Letter

Sequencing; California Verbal Learning Test-II, long delay free recall; Continuous Performance Test-II, False Alarm Rate; and Color-Word Interference, Stroop, Trial 3, Inhibition; Sham group worsened, toward Entry values. Only those with more post-traumatic stress disorder (PTSD) symptomatology at Entry, receiving Real, continued to have additional PTSD reduction at 1 month; Sham regressed. Conclusion: This study was underpowered (n = 48), with large heterogeneity at Entry. This likely contributed to significance or trend to significance, for only two of the NP tests (Digit Span Forwards; Trails 4, Number/Letter Sequencing) and only one general health measure, the SF-36V Plus, Physical Component Score. More subjects receiving Real, self-reported increased concentration, relaxation and sleep. Controlled studies with newer, transcranial LED home treatment devices are warranted; this is expected to increase enrollment. Clinical Trial Registration: www.ClinicalTrials.gov, identifier: NCT01782378.

Methylene blue and photobiomodulation recover cognitive impairment in hepatic encephalopathy through different effects on cytochrome c-oxidase. Mitochondrial dysfunction plays a central role in hepatic encephalopathy (HE), due to changes in enzyme cytochrome c-oxidase (CCO), causing a decline in brain metabolism. We used an HE animal model and applied intracranial administration of methylene blue (MB) and transcranial photobiomodulation (PBM), both targeting CCO, to determine their differential effects on recovering cognition. Five groups of rats were used: sham-operated group + saline (SHAM + SAL, n = 6), hepatic encephalopathy + SAL (HE + SAL, n = 7), SHAM + methylene blue (SHAM + MB, n = 7), HE + MB (n = 7), HE + PBM (n = 7). PBM animals were exposed transcranially to 670 +/- 10 nm LED light at a dose of 9 J/cm(2) once a day for 7 days, and the MB and SAL groups were injected with 2.2 Î¼g/0.5 Î¼L in the accumbens. Cognitive dysfunction was evaluated on a striatal stimulus-response task using the Morris water maze. Our results showed cognitive improvement in the HE group when treated with MB. This improvement was accompanied by a decrease in CCO activity in the prefrontal cortex, dorsal striatum, and dorsal hippocampus. When comparing MB and PBM, we found that, although both treatments effectively improved the HE-memory deficit, there was a differential effect on CCO. A general decrease in CCO activity was found in the prefrontal and entorhinal cortices, dorsal striatum, and hippocampus when PBM, compared to MB, was applied. Our results suggest that mitochondrial dysfunction and brain metabolic decline in HE might involve CCO alteration and can be improved by administering MB and PBM. Enzyme Inhibitors;Electron Transport Complex IV;Methylene Blue Animals;Cognitive Dysfunction;Disease Models, Animal;Electron Transport Complex IV;Enzyme Inhibitors;Hepatic Encephalopathy;Hippocampus;Low-Level Light Therapy;Male;Methylene Blue;Neostriatum;Prefrontal Cortex;Rats, Wistar;Rats

Photobiomodulation Therapy by 820 nm Diode Laser on Nonsurgical Periodontal Treatment of Smoker and Nonsmoker Patients: A Single-Blind Parallel Randomized Clinical Trial. The effect of smoking on nonsurgical periodontal treatment (SRP) is known, but the adjunct use of photobiomodulation (PBMT) to SRP has not been fully investigated in smokers. This study aimed to assess the effect of 820Â nm diode laser on SRP in smoker/nonsmoker. Sixty patients (smokers/nÂ =Â 30, nonsmokers/nÂ =Â 30) were enrolled in this parallel-arm clinical study. All patients were divided into two main groups: SRP and PBMTÂ +Â SRP. In PMBTÂ +Â SRP groups, 7.96Â JÂ cm(-2) energy was applied by 820nm diode laser at baseline and first, second and third weeks after SRP. Periodontal pocket depth (PPD), gingival index (GI), plaque index (PI) and clinical attachment level (CAL) were recorded, and also gingival crevicular fluid (GCF) samples were collected at baseline and 6w after SRP. Total antioxidant capacity (TAOC) and total oxidative status (TOS) in GCF were analyzed. PBMTÂ +Â SRP groups showed a statistically significant decrease in PPD and CAL, not in GI and PI compared with SRP alone. There were no statistically significant differences between smokers and nonsmokers in clinical data at six weeks after treatment. Although TAOC levels were

increased in PMBT groups, TOS levels were decreased in all groups at the comparison of baseline and 6w after SRP. Adjunct use of 820Â nm diode laser on SRP may improve the clinical parameters in smoker or nonsmoker patient with periodontitis. Chronic Periodontitis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Non-Smokers;Periodontal Pocket;Root Planing;Single-Blind Method;Smokers;Smoking

Low-Level Laser Therapy in Prevention of the Development of Endothelial Dysfunction and Clinical Experience of Treatment and Rehabilitation of COVID-19 Patients. OBJECTIVES: The aim of the article is to justify the application of low-level laser therapy (LLLT) to prevent the development of endothelial dysfunction in COVID-19 patients. The results of treating and rehabilitating patients with COVID-19 and prevention of the disease using low-level laser therapy (LLLT) are evaluated. METHODS: A literature review is conducted on mechanisms of vascular homeostasis regulation, biomodulating effect of laser light, and LLLT methods for preventing endothelial dysfunction. A total of 106 patients were treated in two COVID-19 healthcare centers in Russia. 22 patients with SARS (+) pneumonia at the stage of resolving the pathological lesion were admitted to rehabilitation using pulsed IR laser. 14 patients with acute forms of COVID-19 were treated using LASMIK device: wavelength 904â€‰nm, pulsed mode, externally and ILBI-525 (intravenous laser blood illumination) + LUVBI (ultraviolet laser blood illumination). 70 persons underwent preventive courses of noninvasive LLLT. RESULTS: It was shown that LLLT is effective in preventing the development of endothelial dysfunction. Clinical experience demonstrated good tolerability of the treatment, improvement in sputum discharge, and an improvement in overall health. The severity of general hypoxia decreased by the 5th procedure. The procedures for prevention of the disease were well tolerated; there were no cases of COVID-19. CONCLUSION: Low-level laser therapy is a justified treatment method that promotes lung tissue regeneration and mitigates the consequences of the disease. The obtained results confirm that LLLT can be used for the effective prevention and treatment of COVID-19 patients.

Intense pulsed light versus cryotherapy in the treatment of hypertrophic scars: A clinical and histopathological study. BACKGROUND: Different therapeutic modalities have been tried for hypertrophic scar treatment. To our knowledge, intense pulsed light (IPL) has not been previously evaluated in comparison with cryotherapy as a stand-alone treatment for hypertrophic scars. OBJECTIVE: We aimed to evaluate the efficacy of IPL as a monotherapy for hypertrophic scar treatment as compared with cryotherapy both clinically and histopathologically. METHODS: This study included 28 patients with hypertrophic scars. Patients were divided randomly and equally into two groups; group I patients received cryotherapy while group II patients received IPL. All patients received treatments for a total of six sessions or until resolution of the lesion whichever was nearer. The outcome was evaluated clinically and histopathologically. RESULTS: Scar height showed a significant decrease and scar color and pliability showed a significant improvement in group I. No significant changes were detected in group II except in scar pliability. Vancouver scar scale (VSS) mean decreased by -53.7% in group I versus -11.5% decrease in group II. Histopathologically, group I showed a significantly increased epidermal thickness and decreased dermal and collagen bundle thickness, while group II showed insignificant histopathological changes. Group I exhibited a statistically significant clinical and histopathological improvement compared to group II, yet with more complications. CONCLUSION: Cryotherapy is more effective than IPL in the treatment of hypertrophic scars both on clinical and histopathological level yet with more complications. Cicatrix, Hypertrophic;Cryotherapy;Humans;Low-Level Light Therapy;Treatment Outcome

Effects of concomitant use of hydrogen water and photobiomodulation on Parkinson disease: A pilot study. BACKGROUND: Parkinson disease (PD), the second most common neurodegenerative disease, has no cure or applicable disease-modifying approach, only symptomatic therapy. Oxidative

stress and mitochondrial dysfunction play key roles in PD pathophysiology. Animal studies have demonstrated that photobiomodulation (PBM) may enhance mitochondrial function and boost adenosine triphosphate production, thus alleviating PD symptoms; however, this process can cause increased reactive oxygen species (ROS) production. Molecular hydrogen (H2) is a potent and possibly therapeutic antioxidant that can mitigate the effect of ROS. PBM targeting the brainstem may facilitate neuronal activity, and the concomitant H2 may clear additional ROS produced by PBM. Therefore, this study aimed to determine the safety and effectiveness of PBM + H2 in patients with PD. METHODS: We included 18 patients with PD (age 30-80â€Šyears) who were at Hoehn and Yahr stages II-III. All the participants received daily PBM + H2 therapy for 2â€Šweeks. The adverse event and the Unified Parkinson Disease Rating Scale (UPDRS) scores were recorded. RESULTS: We noted that the UPDRS scores began significantly decreasing from the first week, and this improvement persisted until the end of therapy. Moreover, no adverse event was recorded. After 1â€Šweek of therapy cessation, UPDRS scores slightly increased but the improvement remained significant compared with the baseline. CONCLUSION: This novel, proof-of-concept study demonstrated that PBM+H2 therapy is safe and reduces disease severity. A larger-scaled clinical trial is warranted to completely investigate the effects of PBM + H2 therapy on PD. Antioxidants;Water;Hydrogen Adult;Aged;Aged, 80 and over;Antioxidants;Combined Modality Therapy;Double-Blind Method;Female;Humans;Hydrogen;Low-Level Light Therapy;Male;Middle Aged;Oxidative Stress;Parkinson Disease;Pilot Projects;Severity of Illness Index;Water

Transcranial Infrared Laser Stimulation Improves Cognition in Older Bipolar Patients: Proof of Concept Study. This is the first study to examine if transcranial infrared laser stimulation (TILS) improves cognition in older euthymic bipolar patients, who exhibit greater cognitive decline than is expected for age-matched controls. TILS is a non-invasive novel form of photobiomodulation that augments prefrontal oxygenation and improves cognition in young adults by upregulating the mitochondrial respiratory enzyme cytochrome-c-oxidase. We used a crossover sham-controlled design to examine if TILS to bilateral prefrontal cortex produces beneficial effects on cognition in 5 euthymic bipolar patients (ages 60-85). We measured cognitive flexibility, verbal fluency, working memory, sustained attention and impulsivity with tasks that have been shown to differentiate between healthy older adults and older bipolar adults. We found TILS-induced improvements in cognitive performance on the tasks that measure cognitive flexibility and impulsivity, after 5 weekly sessions of TILS. We concluded that TILS appeared both safe and effective in helping alleviate the accelerated cognitive decline present in older bipolar patients. Aged;Aged, 80 and over;Bipolar Disorder;Cognition;Cross-Over Studies;Humans;Lasers;Prefrontal Cortex;Proof of Concept Study

Enhancing room-temperature NO(2) gas sensing performance based on a metal phthalocyanine/graphene quantum dot hybrid material. Metal phthalocyanine (MPc) has a great saturation response value, but its low conductivity and slow response speed limit its practical application. A novel hybrid material composed of graphene quantum dots (GQDs) and metal phthalocyanine derivatives has been obtained. GQDs can be anchored onto the surface of MPc nanofibers through Ï€-Ï€ stacking. The response to NO(2) can be significantly enhanced under certain component proportion matching, which is much better than their respective response to NO(2). The introduction of GQDs greatly increases the conductivity of phthalocyanine fibers, leading to a faster response of the hybrid material. In addition, the reproducibility, selectivity and stability of the hybrid materials are excellent, and the minimum response concentration can reach 50 ppb. Ultra-low-power laser irradiation was used to solve the problem of slow recovery of metal phthalocyanine. Overall, we present the advantages of combining MPc nanofibers with GQDs and pave a new avenue for the application of MPc-GQD hybrids in the gas sensing field.

Effect of continuous wave, quasi-continuous wave and pulsed laser radiation on functional characteristics of fish spermatozoa. For the first time, using sturgeon sperm as a model system, sensitive to optical radiation, the comparative studies of biological effect of continuous wave, quasi-continuous wave, nano- and picosecond laser radiation under conditions with equal average irradiance (3Â mW/cm(2)) and wavelength (532Â nm) have been carried out. Analyzing the parameters of spermatozoa motion it has been shown that, depending on the energy dose and mode of laser operation, the radiation may have both stimulatory and inhibitory effect on the velocity of motion and spermatozoa motility duration as well as on sustaining of functional characteristics of cold-stored sperm. The possibility of increasing the fertilization rate due to use of the sperm preliminary treated with laser radiation is demonstrated. For the first time, the possibility of enhancement of biological effect going from continuous wave to quasi-continuous wave laser radiation at equal irradiance and wavelength has experimentally been proven. It is shown that the difference in biological effect of continuous wave, quasi-continuous wave, nano- and picosecond laser radiation is due to amplitude (peak) values of intensity. Using fluorescence analysis and luminol-dependent chemiluminescence assay, evidence for the participation of endogenous flavins and metal-free porphyrins in sensitized ROS formation (singlet oxygen, hydrogen peroxide, and hydroxyl radicals) in sturgeon sperm was obtained. Mechanisms of photochemical and photothermal reactions explaining the difference in efficacy of action of laser radiation in above modes are discussed. Flavins;Photosensitizing Agents;Porphyrins;Reactive Oxygen Species;Hydroxyl Radical;Hydrogen Peroxide Animals;Chordata;Dose-Response Relationship, Radiation;Fertilization;Flavins;Hydrogen Peroxide;Hydroxyl Radical;Lasers;Luminescent Measurements;Male;Photochemical Processes;Photosensitizing Agents;Porphyrins;Reactive Oxygen Species;Sperm Motility;Spermatozoa;Theranostic Nanomedicine

Comparative evaluation of improvement in periodontal and glycemic health status of type 2 diabetes mellitus patients after scaling and root planing with or without adjunctive use of diode laser. BACKGROUND: Periodontal treatment in diabetic patients reduces systemic inflammatory burden and hence should be closely coordinated with the patient's overall clinical diabetic management. OBJECTIVE: To evaluate the effectiveness of diode laser (DL) (Biolase Epic(TM), 940 nm, Irvine, CA, USA) as an adjunct to scaling root and planing (SRP) on periodontal health and glycated hemoglobin (HbA1c) level of type 2 diabetes mellitus (T2DM) patients suffering from generalized chronic periodontitis (CP), currently, stage II or above/grade B or C periodontitis. MATERIALS AND METHODOLOGY: After initial screening of 55 T2DM patients, a total of 44 T2DM-CP patients (between the age group of 30 and 65 years) were selected and randomly assigned into two groups. The groups were divided into control group (n=22), treated with scaling and root planing alone (SRP alone), and experimental group (n=22), treated with scaling and root planing along with laser therapy (SRP + DL). Laser irradiation was accomplished at perio pocket setting of 0.8 W (average) in a pulse interval of 1.0 ms and pulse length of 1.0 ms delivering 24 J of energy using a 300-Î¼m fiber optic delivery system. RESULTS: Thirty-seven out of 44 enrolled T2DM-CP patients completed the study. Both treatment modalities, i.e., SRP alone and SRP+DL resulted in mean significant ($p < 0.001$) improvement in periodontal health parameters (plaque index (PI), gingival index (GI), probing pocket depth (PPD) and clinical attachment loss (CAL)) and glycemic level (RBS, FBS, and HbA1c) in T2DM-CP patients after 6 months, and was higher in SRP+DL group in comparison to SRP alone. Among the periodontal health parameters, the mean PPD reduction and CAL gain were 51.78% and 48.26% in control as compared to 61.56% and 62.54% in experimental group respectively, whereas the mean significant reduction in HbA1c was 13.8% in SRP alone and 22.52% in SRP+DL group after 6 months ($p < 0.05$). CONCLUSION: Periodontal treatment involving SRP+DL contributes to improved periodontal health parameters and HbA1c level in T2DM-CP patients. Glycated Hemoglobin A Adult;Aged;Chronic

Periodontitis;Dental Scaling;Diabetes Mellitus, Type 2;Glycated Hemoglobin;Health Status;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Root Planing

Comparison of the effects of two laser photobiomodulation techniques on bio-physical properties of Zea mays L. seeds. BACKGROUND: Laser applications in agriculture have recently gained much interest due to improved plant characteristics following laser treatment before the sowing of seeds. In this study, maize seeds were exposed to different levels of laser treatment prior to sowing to improve their field performance. The aim of this study is to evaluate the impact of pre-sowing laser photobiomodulation on the field emergence and growth of treated maize seeds. METHODS: The maize seeds were first photobiomodulated with two lasers: 1) a helium-neon (He-Ne) red laser (632.8 nm), and 2) a neodymium-doped yttrium aluminum garnet (Nd:YAG) green laser (532 nm). Following three replications of randomized complete block design (RCBD), four irradiation treatments were applied (45 s, 65 s, 85 s, and 105 s) at two power intensities (2 mW/cm(2) and 4 mW/cm(2)). RESULTS: Based on the results, maize seeds pretreated with a green laser and 2 mW/cm(2) power intensity for 105 s exhibited the highest rate of seed emergence (96%) compared to the untreated control seeds with a lower seed emergence rate (62.5%). Furthermore, maize seeds treated with a red laser for 45 s showed an increased vigor index compared to the other treatment options and the control (PÂ <Â 0.01). The treatment groups also showed statistically significant differences in seedling growth characteristics compared to the control group pÂ <Â 0.01. The green laser produced a significant enhancement of about 24.20 cm in seedling length, 8.2 leaves/plant, and 3.4 cm in stem diameter compared to the untreated seeds. Moreover, the green laser treatment showed 57.4 days to anthesis, which was earlier than the untreated seeds (61.4 days). The results showed that the protein, oil, and starch contents of the seeds irradiated with the green laser were 17.54%, 6.18%, and 73.32%, respectively, compared to the seeds irradiated by the red laser with 16.51%, 6.33%, and 71.05%, respectively. CONCLUSIONS: The photo biomodulation of maize seeds using a green laser light can improve the field emergence, seedling growth, and seed quality of the treated seed compared to the red laser treatment.

Photobiomodulation 30 min or 6 h Prior to Cycling Does Not Alter Resting Blood Flow Velocity, Exercise-Induced Physiological Responses or Time to Exhaustion in Healthy Men. PURPOSE: The aim of the current study was to investigate the effects of photobiomodulation therapy (PBMT) applied 30 min or 6 h prior to cycling on blood flow velocity and plasma nitrite concentrations at rest, time to exhaustion, cardiorespiratory responses, blood acid-base balance, and K(+) and lactate concentrations during exercise. METHODS: In a randomized, crossover design, 13 healthy untrained men randomly completed four cycling bouts until exhaustion at the severe-intensity domain (i.e., above respiratory compensation point). Thirty minutes or 6 h prior to the cycling trials, participants were treated with PBMT on the quadriceps, hamstrings, and gastrocnemius muscles of both limbs using a multi-diode array (11 cm Ã— 30 cm with 264 diodes) at doses of 152 J or a sham irradiation (with device turned off, placebo). Blood samples were collected before and 30 min or 6 h after treatments to measure plasmatic nitrite concentrations. Doppler ultrasound exams of the femoral artery were also performed at the same time points. Cardiorespiratory responses, blood acid-base balance, and K(+) and lactate concentrations were monitored during exercise sessions. RESULTS: PBMT did not improve the time to exhaustion ($p = 0.30$). At rest, no differences were found in the peak systolic velocity ($p = 0.97$) or pulsatility index ($p = 0.83$) in the femoral artery, and in plasma nitrite concentrations ($p = 0.47$). During exercise, there were no differences for any cardiorespiratory response monitored (heart rate, $p = 0.15$; oxygen uptake, $p = 0.15$; pulmonary ventilation, $p = 0.67$; carbon dioxide output, $p = 0.93$; and respiratory exchange ratio, $p = 0.32$), any blood acid-base balance indicator (pH, $p = 0.74$; base excess, $p = 0.33$; bicarbonate concentration, $p = 0.54$), or K(+) (p

= 0.22) and lactate (p = 0.55) concentrations. CONCLUSIONS: PBMT at 152 J applied 30 min or 6 h before cycling at severe-intensity did not alter resting plasma nitrite and blood flow velocity in the femoral artery, exercise-induced physiological responses, or time to exhaustion in healthy untrained men.

Effects of different wavelengths of low-level laser therapy on orthodontically induced inflammatory root resorption in rats investigated with micro-computerized tomography. INTRODUCTION: The objective of this research was to investigate the effects of different wavelengths low-level laser therapies on orthodontically induced inflammatory root resorption (OIIRR) during orthodontic tooth movement in rats by micro-computerized tomography. METHODS: Forty Wistar albino rats were divided into 5 groups: control group (A), 405-nm laser group (B), 532-nm laser group (C), 650-nm laser group (D), and 940-nm laser group (E). The left side of group A was used as a positive control (A-PC), and the right side of group A was used as a negative control (A-NC) group. In all groups, the maxillary left first molars were moved mesially by 50Â g of force for 14Â days. The lasers were performed for 9Â minutes on the maxillary left first molar tooth. At the end of the experimental period, OIIRR measurements were performed at the mesial and the distal sides along the mesial root of the maxillary first molars. RESULTS: The root resorption volume was significantly lower in group A-NC than in groups A-PC, B, and D. The percentage of root resorption was significantly lower in group A-NC than in all other groups. The root resorption volume and the percentage of root resorption in groups C, D, and E were significantly lower than group A-PC. The depth and the width of the lacuna and even the number of mesial lacunae were similar between groups. The distal and the total lacunae were significantly lower in group A-NC than in all other groups except group C. CONCLUSIONS: The 532-nm, 650-nm, and 940-nm lasers significantly reduced the volume of OIIRR. In addition, the 532-nm laser reduced the number of lacunae both distally and totally than all the other groups. Animals;Low-Level Light Therapy;Rats;Rats, Wistar;Root Resorption;Tomography;Tooth Movement Techniques

Use of Lasers and Piezoelectric in Intraoral Surgery. Laser therapy has been delivering good results for more than 30Â years. Therapeutic effects are seen due to its ability to stimulate cell proliferation, revascularization, cell regeneration, local microcirculation, and vascular permeability; leading to edema reduction and analgesic effects. The piezoelectric system has been used in several surgeries recently, following the trend of minimally invasive surgery. The system consists of crystals undergoing deformation when exposed to electric current, resulting in an oscillating movement with ultrasound frequency. In oral surgery it is used in orthognathic and temporomandibular joint procedures, alveolar corticotomies, tumor excision, bone grafts, third molars, and dental implants. Humans;Lasers;Minimally Invasive Surgical Procedures;Molar, Third;Piezosurgery;Temporomandibular Joint

Supportive care of cancer patients with a self-applied photobiomodulation device: a case series. PURPOSE: Oral mucositis (OM) and prolonged wound healing are common side-effects of cancer treatments. Photobiomodulation (PBM), previously called low-level laser, is currently part of the official guideline for OM prevention. However, all the PBM protocols relate to office-based devices, operated by professional health caregivers, requiring frequent applications. In the following case series, we present our experience with a self-applied consumer home-use PBM device for supportive care. METHODS: Five patients receiving cancer treatment presented at the clinic (female:male 3:2, 55-76 years old) with OM grade 3/4 (n=2), post-surgical non-healing wounds (n=3), and dermatitis (n=1). The PBM treatment (808 nm, 250 mW peak power, 15KHz, 5 J/min, ray size 4.5Ã—1.0cm(2)) was self-applied by the patients. The protocol included extra/intra-oral applications, over the wound bed/margins and adjacent lymph nodes. RESULTS: The treatment was found effective for resolving OM with rapid pain relief and accelerated healing in post-operative wounds and dermatitis, without

reported adverse events. Patients found routine easy to follow and painless, and the protocol was easily integrated as an adjuvant treatment to standard care at the clinic or home while not requiring additional time from the staff. CONCLUSIONS: Side-effects induced by cancer therapy have a detrimental effect on the patient's well-being and may delay or even prevent the patients from completing treatment regimens. PBM is already an established tool for supportive treatment in cancer patients. The advent of a self-applied personal PBM treatment with easy-to-apply protocols for a variety of side-effects makes this technology an important accessible and safe supportive care option. Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Palliative Care;Stomatitis

Comparative transcriptome analysis of gene expression patterns on B16F10 melanoma cells under Photobiomodulation of different light modes. Cutaneous melanoma is one of the aggressive cancers. Recent studies have shown that Photobiomodulation (PBM) can inhibit the proliferation of melanoma cells. However, it is not clear that the effect of PBM light mode on the inhibition of melanoma cells. Herein, we investigated the difference of influence between continuous wave (CW) and Pulse PBM on B16F10 melanoma cells. Our results suggested that Pulse mode had a more significant inhibition on the viability of B16F10 melanoma cells than CW mode under the PBM light parameter of wavelength, dose, and average irradiance at 457Â nm, 1.14Â J/cm(2), and 0.19Â mW/cm(2). Besides, we revealed the differentially expressed genes of B16F10 melanoma cells under the various treatments of PBM light mode (not PBM treatment, CW mode, and Pulse mode) by RNA sequencing. Together, our data suggested that Pulse-PBM can improve the effect of PBM on cells significantly and there may be different molecular mechanisms between Pulse and CW mode including anti-proliferative and cell necrosis. The study shed new light on investigating the molecular mechanisms of various PBM light modes on B16F10 melanoma cells. Immunologic Factors Apoptosis;Cell Line, Tumor;Dose-Response Relationship, Radiation;Gene Expression Profiling;Gene Expression Regulation, Neoplastic;Humans;Immunologic Factors;Light;Low-Level Light Therapy;Melanoma;Skin Neoplasms;Transcriptome;Melanoma, Cutaneous Malignant

A combination of phototherapy modalities for extensive lip lesions in a patient with SARS-CoV-2 infection. Many oral signs and symptoms related to the novel coronavirus disease (COVID-19) have been reported; however, both prevalence and etiology are still undetermined. Since the clinical features of the oral lesions seen in COVID-19 are highly heterogeneous and the treatments differ considerably in the literature, the present study aimed to report a clinical case in which a combination of antimicrobial photodynamic therapy (aPDT) and photobiomodulation therapy (PBMT) was used for extensive lip lesions in a patient suffering from COVID-19. Within 4 days and without any systemic drug administration, after two sessions of aPDT and one session of PBMT, the lip lesions were completely healed, and the patient recovered her orofacial functions satisfactorily. According to the current case report and taking into consideration the evident lack of information about many aspects of COVID-19 infection, this combination of phototherapy modalities seems to be a promising tool for managing COVID-19-related lip lesions; however, more studies are necessary. Photosensitizing Agents;Methylene Blue COVID-19;Female;Humans;Lip;Low-Level Light Therapy;Methylene Blue;Middle Aged;Photochemotherapy;Photosensitizing Agents;SARS-CoV-2

Emerging Therapies in Nonexudative Age-Related Macular Degeneration in 2020. Age-related macular degeneration (AMD) is one of the most common causes of severe vision loss in the developed world. Advanced forms of AMD are seen in primarily 2 types, exudative AMD involving the presence of choroidal neovascularization and nonexudative or dry AMD with geographic atrophy. For the latter, the combination of vitamins and minerals known as the Age-Related Eye Disease Study-2 formulation has been shown to decrease the rate of progression of nonexudative to exudative AMD, as no other treatments are currently approved for nonexudative AMD. This review will highlight

upcoming treatments for nonexudative AMD. Six upcoming agents have shown results at least in the 2A phase. This includes intravitreal agents that are inhibitors of integrin (Risuteganib), intravitreal agents that disrupt the complement pathway (Zimura, APL-2), neuroprotective implants (Brimonidine DDS), a subcutaneous injectable (Elamipretide), and photobiomodulation (Valeda Light Delivery System). Angiogenesis Inhibitors Angiogenesis Inhibitors;Choroidal Neovascularization;Geographic Atrophy;Humans;Vision Disorders

Will Repeated Low-Energy 1064-nm Q-Switched Nd:YAG Laser Treatment Sessions Affect Facial Skin Sensitivity? Results of a 12-Month, Prospective, Randomized Split-Face Study. BACKGROUND AND OBJECTIVE: To compare changes in skin sensitivity before and after treatment with a 1064-nm Q-switched Nd:YAG laser in healthy individuals, and to provide a reference for clinicians to use this laser reasonably. STUDY DESIGN/MATERIALS AND METHODS: Nineteen healthy female volunteers underwent 10 random unilateral 1064-nm Q-switched Nd:YAG laser treatments. The skin transepidermal water loss rate (TEWL), skin glossiness, epidermal and dermal thickness and density, current perception threshold (CPT) value, facial blood perfusion were determined before and after treatment at different time points. Moreover, the changes in skin barrier function, blood vessels, and sensory nerve reaction in the treated and untreated sides of the face were recorded before and after treatment. RESULTS: Seventeen volunteers completed the 12-month follow-up study after 1064-nm Q-switched Nd:YAG laser treatment. At D3, M3, and M6, skin TEWL was decreased on the treated side of the face. Skin glossiness was significantly improved in the early post-treatment period (D1-D7) and M3, M6, and M12 compared with the untreated side of the face. There was no significant change in dermal and epidermal thickness or density at all time points before and after treatment. There were no significant differences in sensory nerve CPT values and local blood flow volume or velocity between the treated side of the face and the untreated side before and after treatment. CONCLUSION: Multiple low-energy 1064-nm Q-switched Nd:YAG laser treatments will not affect the barrier function of facial skin, skin nerve sensitivity, or local microcirculation of healthy skin over the long term. Therefore, 1064-nm Q-switched Nd:YAG laser treatment is safe, and does not alter skin sensitivity. Lasers Surg. Med. Â© 2021 Wiley Periodicals LLC. Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Skin;Treatment Outcome

In Vitro Wound Healing Potential of Photobiomodulation Is Possibly Mediated by Its Stimulatory Effect on AKT Expression in Adipose-Derived Stem Cells. Increasing evidence suggests that adipose-derived stem cells (ADSCs) serve as a therapeutic approach for wound healing. The aim of this study was to determine the effect of photobiomodulation (PBM) on antioxidant enzymes in ADSCs. Four ADSC cell models, namely, normal, wounded, diabetic, and diabetic wounded, were irradiated with 660â€‰nm (fluence of 5â€‰J/cm(2) and power density of 11.2â€‰mW/cm(2)) or 830â€‰nm (fluence of 5â€‰J/cm(2) and power density of 10.3â€‰mW/cm(2)). Nonirradiated cells served as controls. Cell morphology and wound migration were determined using light microscopy. Cell viability was determined by the trypan blue exclusion assay. The enzyme-linked immunosorbent assay (ELISA) was used to measure the levels of antioxidants (superoxide dismutase (SOD), catalase (CAT), and heme oxygenase (HMOX1)). AKT activation and FOXO1 levels were determined by immunofluorescence and western blotting. The gaps (wound) in PBM-treated wounded and diabetic wounded cell models closed faster than the controls. PBM treatment significantly increased antioxidant levels in all cell models. This reflects that oxidative stress is reduced on the counterpart of increased antioxidant levels. This might be due to the activation of the AKT signaling pathway as evidenced by the increased AKT signals via western blotting and immunofluorescence. This data suggests that PBM promotes wound healing by increasing antioxidant levels by activating AKT signaling. Proto-Oncogene Proteins c-akt Cell Movement;Cell Proliferation;Cell

Survival;Diabetes Mellitus;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Proto-Oncogene Proteins c-akt;Signal Transduction;Wound Healing

Current Applications and Future Perspectives of Fluorescence Light Energy Biomodulation in Veterinary Medicine. The purpose of this review is to determine the state of the art of the mode of action and potential applications of fluorescence photobiomodulation in veterinary medicine. After a summary of the assets that have led the translation of such light-based therapies from bench side into clinical use, recent advances in canine dermatology using this brand-new approach are presented, and future scenarios where this type of care may provide benefits over the current standard care are highlighted.

Evaluation of the effects of diode laser application on experimental orthodontic tooth movements in rats. Histopathological analysis. PURPOSE: To evaluate the effect of diode laser use on experimental orthodontic tooth movements. METHODS: Thirty Rattus norvegicus albinus Wistar were divided into three equal groups (n = 10), two experimentals and one control. Applying 20 g orthodontic force were attached to the maxillary incisors of the rats in all groups. Low dose laser was applied to the surrounding tissues of the maxillary incisors of the rats in the experimental groups. Two exposure times for laser irradiation were used for seven days: t = 12 min (energy dose = 72 J) and t = 9 min (energy dose = 54 J) by a 0.1 W DEKA brand diode laser with wavelength of 980 nm. RESULTS: Osteoclastic activation increased in the 72 J group when compared to control group and decreased in comparison to the 54 J group. Osteoblastic activation was decreased in the 72 J group when compared to the control group and increased in comparison to the 54 J group. CONCLUSIONS: Applying 54 J laser energy has been found effective to accelerate the orthodontic tooth movement. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Osteoclasts;Rats;Rats, Wistar;Tooth Movement Techniques

Photobiomodulation therapy for thrombocytopenia by upregulating thrombopoietin expression via the ROS-dependent Src/ERK/STAT3 signaling pathway. BACKGROUND: Chemotherapy-induced thrombocytopenia (CIT) can increase the risk of bleeding, which may delay or prevent the administration of anticancer treatment schedules. Photobiomodulation therapy (PBMT), a non-invasive physical treatment, has been proposed to improve thrombocytopenia; however, its underlying regulatory mechanism is not fully understood. OBJECTIVE: To further investigate the mechanism of thrombopoietin (TPO) in megakaryocytopoiesis and thrombopoiesis. METHODS: Multiple approaches such as western blotting, cell transfection, flow cytometry, and animal studies were utilized to explore the effect and mechanism of PBMT on thrombopoiesis. RESULTS: PBMT prevented a severe drop in platelet count by increasing platelet production, and then ameliorated CIT. Mechanistically, PBMT significantly upregulated hepatic TPO expression in a thrombocytopenic mouse model, which promoted megakaryocytopoiesis and thrombopoiesis. The levels of TPO mRNA and protein increased by PBMT via the Src/ERK/STAT3 signaling pathway in hepatic cells. Furthermore, the generation of the reactive oxygen species was responsible for PBMT-induced activation of Src and its downstream target effects. CONCLUSIONS: Our research suggests that PBMT is a promising therapeutic strategy for the treatment of CIT. Reactive Oxygen Species;Thrombopoietin Animals;Blood Platelets;Low-Level Light Therapy;Megakaryocytes;Mice;Reactive Oxygen Species;Signal Transduction;Thrombocytopenia;Thrombopoiesis;Thrombopoietin

Usefulness of high-frequency ultrasound to assess the healing progress of shin ulcers. INTRODUCTION: As the average lifespan becomes longer, the number of cases of chronic shin ulcers is rising, which is slowly becoming a societal problem. Currently, there no methods for objective evaluation of ulcer healing process. AIM OF THE STUDY: The aim of the study was to assess the use of high-frequency ultrasound to monitor the healing of shin ulcers subjected to laser biostimulation.

MATERIAL AND METHODS: The study included 8 patients (4 men and 4 women) aged from 46 to 81 years with 9 shin ulcers in whom the healing process did not progress within 8 weeks despite effective causal treatment. The ulcers were subjected to laser biostimulation. The induced changes were monitored using high-frequency ultrasound and photographic records. Ultrasound examination was used to assess the depth of ulceration and the thickness of granulation tissue, migrating epidermis, subepidermal low-echogenic band (SLEB) and epidermis in the immediate vicinity. The wound severity index and ulcer vascularity were also assessed. RESULTS: As a result of laser therapy, in 7 out of 9 cases the ulcers healed completely and in the remaining 2 cases ulcer size was reduced. During the ulcer healing process induced by laser therapy, ultrasound examination revealed decreasing ulcer depth, wound severity index and SLEB thickness. Granulation tissue increased in thickness and there was an epidermal formation effect (newly formed epidermis was much thicker than the one surrounding the wound and became thicker as a result of laser therapy sessions). During the healing of ulcers induced by laser therapy no significant changes were observed in ulcer vascularity and thickness of the surrounding epidermis. CONCLUSIONS: High-frequency ultrasound is a useful technique for the imaging of leg ulcers. It allows one to monitor their healing process induced by laser biostimulation. Further research on the subject needs to be pursued.

[A prospective randomized controlled clinical study on the optimal treatment interval of pulsed dye laser in treating hypertrophic scar after burn]. Objective: To observe the influence of different treatment intervals of pulsed dye laser (PDL) in treating hypertrophic scar after burn, and to explore the optimal treatment interval. Methods: From May 2018 to March 2019, 20 burn patients who met the inclusion criteria and were admitted to the First Affiliated Hospital of Air Force Medical University were included in this prospective randomized controlled study. Patients were divided into 1 week group (4 patients, 2 males and 2 females, aged 27 (4, 67) years, 19 scars), 2 weeks group (5 patients, 2 males and 3 females, aged 9 (3, 55) years, 15 scars), 3 weeks group (5 patients, 4 males and 1 female, aged 26 (19, 45) years, 15 scars), and 4 weeks group (6 patients, 4 males and 2 females, aged 31 (14, 48) years, 13 scars), according to the random number table, and treated with PDL with the treatment intervals of 1 week, 2 weeks, 3 weeks, and 4 weeks, respectively, with total treatment cycle of 3 months. Before the first treatment and three months after the first treatment, the Vancouver Scar Scale (VSS) was conducted and the decreased value of VSS score was calculated; the laser Doppler blood flow meter was used to measure scar blood perfusion and the proportion of change in blood perfusion volume was calculated. Data were statistically analyzed with Kruskal-Wallis test, Wilcoxon rank sum test, Wilcoxon symbolic rank sum test, Bonferroni correction, and Fisher's exact probability test. Results: The VSS scores of patients in 1 week group, 2 weeks group, 3 weeks group, and 4 weeks group in three months after the first treatment were significantly lower than those before the first treatment ($Z=-3.74, -3.47, -2.69, -3.25$, $P<0.01$). There were no statistically significant differences in the decreased values of VSS scores in three months after the first treatment among the patients in 4 groups ($H=2.35$, $P>0.05$). Three months after the first treatment, the blood perfusion volumes of patients in 2 weeks group and 3 weeks group were significantly lower than those before the first treatment ($Z=-2.95, -2.50$, $P<0.05$ or $P<0.01$). The proportions of changes in blood perfusion volume of patients in 1 week group, 2 weeks group, 3 weeks group, and 4 weeks group were respectively -0.02 (-1.05, 0.69), -0.29 (-0.75, 0.18), -0.11 (-0.55, 0.23), 0.05 (-0.61, 0.75). There were statistically significant differences among the 4 groups ($H=9.39$, $P<0.05$). The proportions of changes in blood perfusion volume of patients in 2 weeks group was statistically higher than that of 1 week group ($Z=2.76$, $P<0.01$). Conclusions: PDL treatment can reduce the VSS score and blood perfusion volume of scar. One treatment every two weeks or three weeks improve the scar blood perfusion volume more significantly, and can be recommended as the appropriate treatment interval of PDL for

hypertrophic scar after burn. Aged;Burns;Cicatrix, Hypertrophic;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome

Evaluation of Fluorescent Light Energy for the Treatment of Acute Second-degree Burns. INTRODUCTION: The use of photobiomodulation has been proposed to improve wound healing for the last two decades. Recent development in photobiomodulation has led to the development of a novel biophotonic platform that utilizes fluorescent light energy (FLE) within the visible spectrum of light for healing of skin inflammation and wounds. MATERIALS AND METHODS: In this article, FLE was used in preliminary analysis on 18 case studies of acute second-degree burns and in a pilot study using an ex vivo human skin model. Efficacy of FLE on wound healing and tissue remodeling was evaluated by monitoring improvements in the treated tissues, assessing pain for the patients, and by performing human genome microarray analysis of FLE-treated human skin samples. RESULTS: Healing was reported for all 18 patients treated with FLE for acute second-degree burns without reported adverse effects or development of infections. Furthermore, preliminary ex vivo skin model data suggest that FLE impacts different cellular pathways including essential immune-modulatory mechanisms. CONCLUSIONS: The results presented in this article are encouraging and suggest that FLE balances different stages of wound healing, which opens the door to initiating randomized controlled clinical trials for establishing the efficacy of FLE treatment in different phases of wound healing of second-degree burns. Burns;Humans;Pilot Projects;Skin;Soft Tissue Injuries;Wound Healing

Efficacy of photodynamic therapy, photobiomodulation and antimicrobial agent on the shear bond strength of composite restorations to hypomineralized teeth. PURPOSE: The aim of this study was to investigate the adhesive bond strength and fracture analysis of resin based restorations to carious dentin of hypomineralized molars (HMs) after disinfecting with photodynamic therapy (PDT), Nd:YAG and chlorhexidine (CHX). MATERIALS AND METHODS: Sixty carious HM molars were investigated. After removal of all carious infected tissue, the cavities were condition with methylene blue initiated PDT, a 1064 nm wavelength Nd:YAG laser or 2.0% CHX gel. Non-carious dentin from HM was used as a control without performing any disinfection or conditioning technique. All samples were bonded using a one-step one-coat adhesive bond over the dentin surface, packed with composite and light cured. All specimens were subjected to thermocycling at 5Â°C and 60Â°C with a dwell time of 30 s for 10,000 cycles. Bonded specimens were placed on a universal testing machine with a flat loading head. The debonded surface were viewed under light optical microscope to estimate the type of failure including adhesive, cohesive, and admixed. RESULTS: The highest mean SBS was seen in the non-carious HM (control group). The mean score for control group was 17.64 Â± 2.96 MPa. The lowest bond strength value was displayed for Group-PDT (11.37 Â± 3.66 MPa) and Group-Nd:YAG (12.69 Â± 2.45 MPa). Affected dentin disinfected with the Group-CHX (15.71 Â± 3.04 MPa) bonded with composite showed statistically significantly higher SBS values compared to the laser groups ($p < 0.05$). No statistically significant difference was noted with specimens disinfected with PDT and Nd:YAG laser showed comparable SBS scores ($p > 0.05$). Fracture analysis showed equal incidence of adhesive and cohesive failures in control group and Group-CHX. Moreover, a significant number of failures in group-PDT were related to adhesive. Whereas in group 4, admixed type failures were common. CONCLUSION: Caries infected hypomineralized teeth demonstrated lower bond strength values compared to non-carious hypomineralized teeth. Adhesive bond strength of hypomineralized teeth was highest with chlorhexidine compared to other laser treatment strategies. Anti-Infective Agents;Composite Resins;Photosensitizing Agents Anti-Infective Agents;Composite Resins;Dentin;Low-Level Light Therapy;Materials Testing;Photochemotherapy;Photosensitizing Agents

The Potential Role of Photobiomodulation in Long COVID-19 Patients Rehabilitation. COVID-19;Humans;Low-Level Light Therapy;Pneumonia, Viral;SARS-CoV-2

Photobiomodulation Therapy (Light-Emitting Diode 630â€‰nm) Favored the Oxidative Stress and the Preservation of Articular Cartilage in an Induced Knee Osteoarthritis Model. Objective: To evaluate the effects of photobiomodulation (PBM) therapy on oxidative stress and histological aspects of knee osteoarthritis (OA) induced by sodium monoiodoacetate in Wistar rats. Background: OA is a chronic degenerative disease. In addition to the inflammatory role, other factors, such as redox balance, appear to contribute to changes in the articular cartilage, the main articular structure affected. PBM therapy using light-emitting diode (LED) has been proposed to treat the disease by favoring anti-inflammatory effects and modulating markers of oxidative stress, acting on the degenerative process of cartilage. Methods: Twenty-seven male rats were separated into three groups: control (CG), OA (OAG), and LED treatment (LEDG). In the LED group, PBM (LED 630â€‰nm, 300â€‰mW, 9â€‰J/cm(2), 0.3 W/cm(2), 30â€‰sec) was applied, starting 24â€‰h after induction, three times per week, for 8 weeks. Cartilage thickness, number of chondrocytes, enzymatic antioxidant defenses [superoxide dismutase (SOD) and catalase (CAT)], oxidative damage [thiobarbituric acid reactive substances (TBARS)], and nonenzymatic defense (ferric reducing antioxidant power) were analyzed. Results: The LEDG had higher average cartilage thickness compared with the OAG and had similar thickness to the CG. Also, the number of chondrocytes was similar to the CG. In the oxidative stress analysis, the LEDG presented antioxidant enzymatic activity (SOD and CAT) higher than the CG, and presented concentration of TBARS lower than the CG and OAG groups. Conclusions: PBM therapy was effective in recovering oxidative stress and preserving the articular cartilage aspects in a knee OA animal model. Animals;Cartilage, Articular;Low-Level Light Therapy;Male;Osteoarthritis, Knee;Oxidative Stress;Rats;Rats, Wistar

Comparison of photobiomodulation in the treatment of skin injury with an open wound in mice. This study aimed to investigate the effects of photobiomodulation at a wavelength of 660 and 830Â nm at different numbers of application points in the healing of open wounds in mice. In total, 120 mice were divided into 10 groups. The animals were submitted to cutaneous lesion of the open wound type (1.5â€‰Ã—â€‰1.5Â cm). Photobiomodulation at a wavelength of 660 and 830Â nm and total energy of 3.6Â J were used, applied at 1, 4, 5, and 9 points, for 14Â days. The animals were subjected to analysis of the lesion area, skin temperature, and histological analysis. Macroscopic analysis results showed a difference (pâ€‰<â€‰0.05) between the irradiated groups and the sham group at 14Â days PO. There was no statistical difference in skin temperature. Histological analysis findings showed better results for the epidermis thickness. Regarding the number of blood vessels, a difference was found between the 1- and 5-point 830-nm photobiomodulation groups and between the 4-point 660-nm group and the naive group. A significant difference in the number of fibroblasts was observed between the 830- and 660-nm photobiomodulation groups and the naive and sham groups. When comparing photobiomodulation wavelength, the 830-nm groups were more effective, and we emphasize the groups irradiated at 5 points, which showed an improvement in macroscopic analysis and epidermis thickness, an increase in the number of vessels, and a lower number of fibroblasts on the 14th day after skin injury. Animals;Fibroblasts;Low-Level Light Therapy;Mice;Rats;Rats, Wistar;Skin;Skin Diseases;Wound Healing

Orthodontic Treatment of Periodontally Compromised Teeth After Laser Periodontal Therapy: A Case Report. Objective: To assess stability of laser periodontal therapy (LPT) results after orthodontic tooth movement. Background: Periodontitis and malocclusion each exhibit high global prevalence. Thus, dentists inevitably face increasing demand for orthodontic treatment in patients with reduced periodontal support. Many of these patients benefit from orthodontic treatment, provided that periodontal inflammation is controlled. Materials and methods: We present a case demonstrating

successful orthodontic treatment of periodontally compromised teeth after LPT. A patient with severe attachment and alveolar bone loss received orthodontic treatment 13 months after neodymium-doped: yttrium aluminum garnet LPT (1064â€‰nm). We utilized three laser parameter sets for various purposes during the procedure-ablation of the periodontal pocket epithelium (2.8 W, 20â€‰Hz, 100â€‰Î¼s), clot stabilization (2.8 W, 20â€‰Hz, 550â€‰Î¼s), and photobiomodulation (2.8 W, 20â€‰Hz, 100â€‰Î¼s, noncontact). Results: Treatment resulted in improved radiographic bone levels, clinical parameters consistent with periodontal health, and favorable occlusal relationships. Conclusions: In the presented case, we successfully treated a patient presenting with malocclusion and reduced periodontal support while avoiding the risk and morbidity of conventional periodontal surgery. Controlled clinical research to establish the predictability of the described approach appears warranted. Alveolar Bone Loss;Humans;Malocclusion;Periodontal Pocket;Tooth Movement Techniques

Effect of mesenchymal stem cells injection and low-level laser therapy on bone formation after rapid maxillary expansion: an animal study. INTRODUCTION: One of the most common orthodontic problems is maxillary constriction, which is mostly treated by rapid palatal expansion (RPE). However, its high rate of relapse and prolonged retention period have led to some challenges for orthodontists. To encounter these issues, accelerating bone regeneration can provide long-term stability of expanded maxilla. The present study aimed to evaluate the effect of low-level laser therapy (LLLT), bone marrow-derived mesenchymal stem cells (BMSCs) and their combination on promoting bone regeneration of the inter-maxillary suture after RPE in rats. MATERIALS AND METHOD: Total of 60 rats went under RPE treatment. After 7 days, retention period started and interventions (group A, Control (saline); group B, LLLT; group C, BMSCs; group D, LLLT + BMSCs) were performed in the sutural area. After 21 days, radiographic and histological analyses were done. Histological analyses were conducted to evaluate the following criteria of the newly formed bone: the number of osteoblasts, new bone formation, vascularization, connective tissue. Moreover, sutural width was assessed in histologic images. To evaluate bone density at suture area, gray scale and Hounsfield Unit values were measured based on the occlusal radiographic and Micro-Computed topography images respectively. RESULTS: Only in group C and D, osteoblasts and new bone formation were observed in all of the samples. There were no significant differences among the study groups regarding the post-treatment sutural width ($P > 0.05$). In the radiographic analysis, only group D showed more bone density compared to the control group ($P = 0.022$). Similarly, in micro-CT analysis, the most bone density was observed in group D which was significantly more than the control group ($P = 0.013$). CONCLUSION: Our findings suggest that the application of LLLT and BMSCs is the most beneficial approach in accelerating bone regeneration in the inter-maxillary suture.

A retrospective study to identify the optimal parameters for pulsed dye laser in the treatment of hypertrophic burn scars in Chinese children with Fitzpatrick skin types III and IV. For over several decades, 595-nm pulsed dye laser (PDL) has been used effectively, reducing erythema and improving the pliability and texture of burn scars. Children usually tolerate PDL treatment as it is non-invasive and causes only mild pain compared to other laser treatments. However, currently, there are limited data on scar management in children who underwent PDL treatment, especially for Fitzpatrick skin types III and IV. The objective of the study was to identify the optimal parameters for the PDL treatment that induce inhibitory effects on scar tissue in children with Fitzpatrick skin types III and IV. Besides, the study assessed the usefulness of high-frequency ultrasound (20 MHz) and laser Doppler flowmetry in assessing these lesions. A total of 165 (79 males and 86 females) children with hypertrophic scars treated by PDL were assessed by the Vancouver scar scale (VSS), high-frequency ultrasound (20 MHz), and laser Doppler flowmetry. The parameters used for the 595-nm PDL treatment were pulse duration of 0.45 ms, fluence between 5 and 9 J/cm(2), a spot size of 7 mm, and

treatment intervals from 3 to 8 weeks. There were no significant differences between pretreatment and post-treatment in terms of the distribution of sex, type of skin color, and low and high fluences. While the mean scores of all scar parameters based on VSS, except thickness and pliability between pre and post-treatment, showed significant differences in â‰¤3-year-old children vs. to >3-year-old children, except for the subscore, a significant improvement was observed when PDL was initiated within 4 to 6 months of the scar age. In Chinese children with Fitzpatrick skin types III and IV, early intervention, appropriate treatment intervals, and low fluence of PDL were optimal parameters in treating hypertrophic burn scars. The combined high-frequency ultrasound and laser Doppler flowmetry assessment of scars helped assess these lesions and compare the efficacy of different treatment modalities. Burns;Child, Preschool;China;Cicatrix, Hypertrophic;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome

Low-power lasers on bacteria: stimulation, inhibition, or effectless? Clinical protocols based on low-power lasers have been widely used for inflammation process resolution improvement, pain relief, wound healing, and nerve regeneration. However, there are concerns if exposure to such lasers could have negative effects on infected organs and tissues. There are experimental data suggesting exposure to radiations emitted by low-power lasers either induces stimulation, inhibition, or it is effectless on bacterial cultures. Thus, this review aimed to carry out a review of studies and to propose a hypothesis to explain why exposure to low-power lasers could stimulate, inhibit, or have no effect on bacteria. A literature search was carried out for assessment of published reports on effect of low-power lasers on bacteria. The experimental data suggest that keys for determining laser-induced effects on bacteria are specific physical laser and biological parameters. Final consequence on bacterial cells could depend on exposure to low-power laser which could either cause more stimulation of endogenous photoacceptors, more excitation of endogenous photosensitizers, or a balance between such effects. Bacteria;Lasers;Wound Healing

The viability of human cells irradiated with 470-nm light at various radiant energies in vitro. Blue light is known to be antimicrobial, but its effect on normal cutaneous and subcutaneous cells remains unclear. Therefore, we studied the effect of 470-nm light on the viability of adult and neonatal human dermal fibroblasts, Jurkat T-cells, and THP-1 monocytes in vitro. Each culture was irradiated with 0, 3, 55, or 110 J/cm(2) of 470-nm light and subjected to trypan blue assay to ascertain viability. Further, MTT, neutral red, and fluorescence assays of fibroblasts were performed, and cell morphology visualized using bright field and fluorescence microscopy. At each dose and in each of the four cellÂ lines, there was no significant difference in cell concentration between irradiated and non-irradiated cultures, even though irradiation with 55 J/cm(2) or 110 J/cm(2) slightly decreased cell count. Light microscopy showed progressive morphological changes in the fibroblasts as energy fluence increased from 55 to 110 J/cm(2). Irradiation at 3 J/cm(2) produced a slight but non-significant increase in the viability of Jurkat T-cells and THP-1 monocytes. In contrast, at 110 J/cm(2) radiant exposure, irradiation slightly decreased the viability of all four cells. While 3 J/cm(2) appears stimulatory, our finding that 110 J/cm(2) produces a slight decrease in viability and engenders morphological changes in fibroblasts, suggesting that such high doses should be avoided in blue light treatments. Cell Proliferation;Cell Survival;Fibroblasts;Humans;Light;Low-Level Light Therapy

Low-fluence laser-facilitated platelet-rich plasma permeation for treating MRSA-infected wound and photoaging of the skin. Platelet-rich plasma (PRP) is rich in cytokines and growth factors and is a novel approach for tissue regeneration. It can be used for skin rejuvenation but the large molecular size of the actives limits its topical application. In this study, low-fluence laser-facilitated PRP was delivered to evaluate its effect on absorption through the skin, infection-induced wound, and

photoaging. The PRP permeation enhancement was compared for two ablative lasers: fractional (CO(2)) laser and fully-ablative (Er:YAG) laser. In the Franz cell experiment, pig skin was treated with lasers with superficial ablation followed by the application of recombinant cytokines, growth factors, or PRP. The transport of interferon (IFN)-Î³ and tumor necrosis factor (TNF)-Î± was negligible in intact skin and stratum corneum (SC)-stripped skin. Both lasers significantly elevated skin deposition of IFN-Î³ and TNF-Î± from PRP, and fully-ablative laser showed a higher penetration enhancement. A similar tendency was found for vascular endothelial growth factor and epidermal growth factor. Er:YAG laser-exposed skin displayed 1.8- and 3.9-fold higher skin deposition of platelet-derived growth factor (PDGF)-BB and transforming growth factor (TGF)-Î²1 from PRP, respectively. According to the confocal images, both laser interventions led to an extensive and deep distribution of IFN-Î³ and PDGF-BB in the skin. In the in vivo methicillin-resistant Staphylococcus aureus (MRSA) infection model, CO(2) laser- and Er:YAG laser-assisted PRP delivery reduced bacterial load from 1.8Â Ã—Â 10(6) to 5.9Â Ã—Â 10(5) and 1.4Â Ã—Â 10(4) colony-forming units, respectively. The open wound induced by MRSA was closed by the laser-assisted PRP penetration. In the mouse photoaging model, elastin and collagen deposition were fully restored by combined PRP and full-ablative laser but not by PRP alone and PRP combined with fractional laser. Laser-facilitated PRP delivery even with a low fluence setting can be considered a promising strategy for treating some dermatological disorders. Cytokines;Intercellular Signaling Peptides and Proteins Administration, Cutaneous;Animals;Combined Modality Therapy;Cytokines;Humans;Intercellular Signaling Peptides and Proteins;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Mice;Mice, Inbred BALB C;Mice, Nude;Platelet-Rich Plasma;Skin;Skin Absorption;Skin Aging;Skin Diseases;Staphylococcal Skin Infections;Swine;Wound Healing

Layered 1927-nm Laser for Prevention of Postprocedural Bruising. Aged;Contusions;Cosmetic Techniques;Dry Needling;Humans;Low-Level Light Therapy;Middle Aged;Retrospective Studies;Treatment Outcome

Effects of laser therapy on periorbital hyperpigmentation: a systematic review on current studies. Periorbital hyperpigmentation is a problem with complex multifactorial etiology, with early knowledge expanding. The purpose of the present study was to review studies on the efficacy of laser on periorbital hyperpigmentation. A systematic review of the data banks of scientific and research articles including PubMed, Web of Knowledge, Google Scholar, SCOPUS, and Iranian databases including SID and Magiran is performed. The following keywords were used to evaluate existing articles: Periorbital Hyperpigmentation, Periorbital Darkening, Dark Eye Circle, Eye Dark Circle, Infraorbital Hyperpigmentation, Infraorbital Dark Circle, and Laser (1990-2018). Finally, 10 clinical trial articles were included. A total of 2.76% of patients responded poor, 11.4% responded fair to different types of lasers, 45.3% responded good, and 35.9% excellent responded to have been cured. As a long-term effect, less than 1% of patients received a poor score after their laser treatment. Twenty-five percent of the patients showed a fair result. In total, 26.27% of patients achieved good and 43.35% of patients received excellent response from laser treatment on periorbital hyperpigmentation after 4-6Â months of laser therapy. A large percentage of patients (76.4%) were satisfied with the effect of lasers on the reduction of moderate to high periorbital hyperpigmentation rates in the studies. Laser therapy is an effective and satisfactory therapeutic choice for treatment of periorbital hyperpigmentation. Also, it is safe overall with favorable sustainable results, although the follow-up periods usually last about several months. Face;Humans;Hyperpigmentation;Iran;Laser Therapy;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation (low-level laser) therapy for immediate pain relief of persistent oral ulcers in chronic graft-versus-host disease. PURPOSE: To determine the immediate pain-relieving effect of photobiomodulation therapy (PBMt) in patients with oral ulcers of chronic graft-versus-host disease

(cGVHD) refractory to first line therapy with topical corticosteroids. METHODS: This retrospective study included all patients who underwent PBMt for pain relief of refractory oral cGVHD lesions. PBMt was applied using an intraoral approach to all sites with mucosal lesions, using a 940 nm InGaAsP diode laser device, with the following parameters: pulsed modulation (duty cycle of 50%), power 0.7 W, illuminated spot size 7.1 cm(2), irradiance 98.6 mW/cm(2), and irradiation time 90 s per point. Pain was self-assessed using a 0-to-10 scale immediately before and after PBMt. RESULTS: Data from eleven patients with a total of 56 PBMt sessions were analyzed. In 48 (85.7%) sessions, the patients reported less pain immediately after treatment, with a reduction of â‰¥ 50% of the initial pain level in 43 (76.8%) sessions. Mean pre- and post-treatment pain levels were 5.20 Â±2.7 and 1.38 Â±2.1, respectively ($p < 0.001$), i.e., a post-treatment reduction of 73.4% of the initial pain level. The benefits of the treatment remained for a mean of 6.50 Â±5.4 days (range of 2 to 14 days). No adverse effects were reported. CONCLUSIONS: PBMt seems to be a promising treatment modality for refractory oral cGVHD lesions as a rapid pain reliever with relatively long-lasting effects. Adolescent;Adult;Aged;Child;Child, Preschool;Chronic Disease;Chronic Pain;Female;Graft vs Host Disease;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Oral Ulcer;Pain Management;Retrospective Studies;Treatment Outcome;Young Adult

Photobiomodulation with a 645â€‰nm Diode Laser of Saos-2 Cells and Platelet-Rich Plasma: The Potential for a New Mechanism of Action. Objective: The main focus of this in vitro study was to highlight possible differences between outcomes of photobiomodulation performed in the presence or absence of growth factors derived from platelet-rich plasma. Background: Photobiomodulation has garnered increasing attention, thanks to a large number of controlled clinical trials that have proven its efficacy in various oral pathologies. Nevertheless, the mechanism of action is still a matter of debate. Materials and methods: The cell model used was Saos-2ATTC HTB-85, a human osteosarcoma cell line that retains an osteogenic potential matching that of osteoblastic cells. Photobiomodulation was performed with a 645â€‰nm diode laser; we investigated three different fluence values (2, 5, and 10â€‰J/cm(2)) delivered with 3 different irradiation times (1, 2, and 4â€‰min). The design of the study included a case-control structure. Cell viability was assessed by resazurin reduction assay before laser irradiation. We assessed cell differentiation by Alizarin-red Sigma Aldrich assay 48â€‰h after the last laser irradiation. Results: Results show that the combination of photobiomodulation and platelet-rich plasma can lead to a statistically significant increase in both proliferation and differentiation rates. Conclusions: Only a defined amount of energy, that is, a fluence of 5â€‰J/cm(2) delivered in 2â€‰min and of 10â€‰J/cm(2) in 4â€‰min, was proven to be the most effective in the presence of platelet-rich plasma to induce cell proliferation and calcium deposition. Cell Differentiation;Cell Survival;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Platelet-Rich Plasma

Is low-level laser therapy useful as an adjunctive treatment for canine acral lick dermatitis? A randomized, double-blinded, sham-controlled study. BACKGROUND: Conventional therapy for canine acral lick dermatitis (ALD) consists of systemic antibiotics and anti-anxiety medications. Low-level laser therapy (LLLT) is a noninvasive therapy used to treat inflammatory and painful conditions. HYPOTHESIS/OBJECTIVES: The primary objective was to determine whether LLLT with conventional therapy would be beneficial as an adjunct treatment for ALD. We hypothesized that LLLT and conventional therapy combined would result in a greater reduction in licking Visual Analog Score (LVAS) compared to conventional therapy alone. Secondary objectives were to assess change in lesion/ulcer size, thickness and hair growth. ANIMALS: Thirteen dogs with a skin lesion consistent with ALD. METHODS AND MATERIALS: Dogs were randomly assigned to two groups. All dogs received systemic antibiotics and trazodone. The treatment group (TG) received LLLT by laser (130Â mW, 2Â min) with blue and red light-emitting diodes (LEDs), while the control group (CG) had sham

therapy (laser/LEDs off). Treatments were administered three times weekly for two weeks, then twice weekly for two weeks for a total of 10 visits. Descriptive statistics were performed (mean, median); primary and secondary objectives were assessed with nonparametric ANOVA (Kruskal-Wallis test), with significance set at PÂ <Â 0.05. RESULTS: Thirteen dogs (six CG, seven TG) were enrolled. There were no significant differences in median LVAS, lesion/ulcer size or thickness of the ALD lesion between TG and CG. There was a significantly greater increase (24%) in hair growth in TG (PÂ =Â 0.0081) compared to CG. CONCLUSIONS AND CLINICAL RELEVANCE: Treatment of ALD requires multimodal therapy. Although combining LLLT with conventional therapy did not result in a significantly greater reduction in LVAS, there was a significant increase in hair growth compared to conventional therapy alone. Animals;Dermatitis;Dog Diseases;Dogs;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation: The Clinical Applications of Low-Level Light Therapy. BACKGROUND: Low-level light therapy (LLLT) is a recent addition to the pantheon of light-based therapeutic interventions. The absorption of red/near-infrared light energy, a process termed "photobiomodulation," enhances mitochondrial ATP production, cell signaling, and growth factor synthesis, and attenuates oxidative stress. Photobiomodulation is now highly commercialized with devices marketed directly to the consumer. In the gray area between the commercial and therapeutic sectors, harnessing the clinical potential in reproducible and scientifically measurable ways remains challenging. OBJECTIVES: The aim of this article was to summarize the clinical evidence for photobiomodulation and discuss the regulatory framework for this therapy. METHODS: A review of the clinical literature pertaining to the use of LLLT for skin rejuvenation (facial rhytids and dyschromias), acne vulgaris, wound healing, body contouring, and androgenic alopecia was performed. RESULTS: A reasonable body of clinical trial evidence exists to support the role of low-energy red/near-infrared light as a safe and effective method of skin rejuvenation, treatment of acne vulgaris and alopecia, and, especially, body contouring. Methodologic flaws, small patient cohorts, and industry funding mean there is ample scope to improve the quality of evidence. It remains unclear if light-emitting diode sources induce physiologic effects of compararable nature and magnitude to those of the laser-based systems used in most of the higher-quality studies. CONCLUSIONS: LLLT is here to stay. However, its ubiquity and commercial success have outpaced empirical approaches on which solid clinical evidence is established. Thus, the challenge is to prove its therapeutic utility in retrospect. Well-designed, adequately powered, independent clinical trials will help us answer some of the unresolved questions and enable the potential of this therapy to be realized. Alopecia;Humans;Low-Level Light Therapy;Rejuvenation;Skin;Wound Healing

Targeting Mitochondrial Impairment in Parkinson's Disease: Challenges and Opportunities. The underlying pathophysiology of Parkinson's disease is complex, but mitochondrial dysfunction has an established and prominent role. This is supported by an already large and rapidly growing body of evidence showing that the role of mitochondrial (dys)function is central and multifaceted. However, there are clear gaps in knowledge, including the dilemma of explaining why inherited mitochondriopathies do not usually present with parkinsonian symptoms. Many aspects of mitochondrial function are potential therapeutic targets, including reactive oxygen species production, mitophagy, mitochondrial biogenesis, mitochondrial dynamics and trafficking, mitochondrial metal ion homeostasis, sirtuins, and endoplasmic reticulum links with mitochondria. Potential therapeutic strategies may also incorporate exercise, microRNAs, mitochondrial transplantation, stem cell therapies, and photobiomodulation. Despite multiple studies adopting numerous treatment strategies, clinical trials to date have generally failed to show benefit. To overcome this hurdle, more accurate biomarkers of mitochondrial dysfunction are required to detect subtle beneficial effects. Furthermore, selecting study participants early in the disease course,

studying them for suitable durations, and stratifying them according to genetic and neuroimaging findings may increase the likelihood of successful clinical trials. Moreover, treatments involving combined approaches will likely better address the complexity of mitochondrial dysfunction in Parkinson's disease. Therefore, selecting the right patients, at the right time, and using targeted combination treatments, may offer the best chance for development of an effective novel therapy targeting mitochondrial dysfunction in Parkinson's disease.

Impact of Combined Photo-Biomodulation and Aerobic Exercise on Cognitive Function and Quality-of-Life in Elderly Alzheimer Patients with Anemia: A Randomized Clinical Trial. PURPOSE: Few data are available on the positive impact of photo-biomodulation (PBM) using low-level laser therapy as a complementary treatment for improving the cognitive function and optimizing the hemoglobin (Hb) level and oxygen carrying capacity in anemic elderly patients and consequently improving the quality-of-life. The present study aimed to evaluate a new, safe, and easy therapeutic approach to improve Alzheimer's disease-related symptoms that interfere with the whole life activities and social interaction of elderly patients. PATIENTS AND METHODS: In this placebo-controlled clinical trial, 60 elderly patients suffering from anemia and mild cognitive dysfunction were randomly assigned into two equal groups to receive active or placebo low-level laser in addition to a moderate-intensity aerobic exercise over a 12-week period. Hb level as well as cognitive and functional tests were reassessed for any change after 12 weeks of intervention. RESULTS: By the end of this study, both groups showed significant improvements in Hb level, Montreal Cognitive Assessment Scale (MoCa - B basic), Quality-of-Life for Alzheimer's Disease scale, and Berg Balance scale scores along with significant reduction in body mass index (BMI) and waist-hip ratio (WHR) ($P<0.0001$). The experimental group which received active low-level laser in addition to moderate-intensity aerobic exercise showed more significant results compared to the control group which received placebo low-level laser in addition to moderate-intensity aerobic exercise in all the measured outcomes ($P<0.001$). CONCLUSION: Combined low-level laser therapy and moderate-intensity aerobic exercises are more effective in improving the cognitive function and quality-of-life of Alzheimer's disease patients. CLINICAL TRIAL REGISTRATION: www.ClinicalTrials.gov, identifier NCT04496778.

Photobiomodulation of Human Fibroblasts and Keratinocytes with Blue Light: Implications in Wound Healing. In recent years, photobiomodulation (PBM) has been recognized as a physical therapy in wound management. Despite several published research papers, the mechanism underlying photobiomodulation is still not completely understood. The investigation about application of blue light to improve wound healing is a relatively new research area. Tests in selected patients evidenced a stimulation of the healing process in superficial and chronic wounds treated with a blue LED light emitting at 420 nm; a study in animal model pointed out a faster healing process in superficial wound, with an important role of fibroblasts and myofibroblasts. Here, we present a study aiming at evidencing the effects of blue light on the proliferation and metabolism in fibroblasts from healthy skin and keratinocytes. Different light doses (3.43, 6.87, 13.7, 20.6, 30.9 and 41.2 J/cm2) were used to treat the cells, evidencing inhibitory and stimulatory effects following a biphasic dose behavior. Electrophysiology was used to investigate the effects on membrane currents: healthy fibroblasts and keratinocytes showed no significant differences between treated and not treated cells. Raman spectroscopy revealed the mitochondrial Cytochrome C (Cyt C) oxidase dependence on blue light irradiation: a significant decrease in peak intensity of healthy fibroblast was evidenced, while it is less pronounced in keratinocytes. In conclusion, we observed that the blue LED light can be used to modulate metabolism and proliferation of human fibroblasts, and the effects in wound healing are particularly evident when studying the fibroblasts and keratinocytes co-cultures.

Photobiomodulation to Treat Necrotizing Fasciitis. The spread of odontogenic infections associated with comorbidities, such as diabetes mellitus, can result in a potentially lethal

complication, with rapid necrosis of the superficial fascia, necrotizing fasciitis. In this case report, a female patient, 52 years old, fasting blood glucose of 303â€Šmg/dL with necrotizing fasciitis associated with type 2 diabetes mellitus in the left cervical-thoracic region. She was treated with antibiotics, cervicotomy, abscess drainage, and underwent 10 photobiomodulation sessions with 2 weekly applications of the red wavelength laser to correct tissue loss in the left cervical region. With the development of tissue healing, the formation of granulation tissue increased, absence of necrotic areas, contraction of the edges, and total wound repair. This case emphasizes the effectiveness of photobiomodulation to optimize healing and modulate the inflammatory pattern in the treatment of necrotizing fasciitis sequelae. Anti-Bacterial Agents Anti-Bacterial Agents;Diabetes Mellitus, Type 2;Drainage;Fasciitis;Fasciitis, Necrotizing;Female;Humans;Middle Aged;Neck

Effect of photobiomodulation therapy on performance and running economy in runners: A randomized double-blinded placebo-controlled trial. The objective of this study was to evaluate effects of photobiomodulation therapy (PBMT) on the 3000 m running performance (primary outcome), running economy (RE), metabolic cost and ratings of perceived exertion during running (secondary outcomes). Twenty male endurance athletes performed 4-min treadmill rectangular test at 12 km.h-1 monitored by a gas analyser. After that, PBMT or placebo in each lower limb was applied, followed performed a maximum test of 3000 m. Immediately after 3000 m test, the athletes repeated the treadmill test. Another application of PBMT/placebo was done after the treadmill test, and athletes went back to the laboratory 24Â h later to repeat the treadmill test. After a 72Â h interval, athletes repeated all procedures with another treatment intervention (PBMT/placebo). Athletes performed the 3000 m running test ~7s faster when treated with PBMT with similar effort score compared placebo condition. The RE remains unchanged immediately post 3000 m running test, nonetheless RE measured post-24Â h improved by 5% with PBMT application without changes in metabolic cost. The PBMT pre- and post-conditioning enhanced the 3000 m running performance and improved RE 24Â h following the 3000 m test. However, no changes on ratings of perceived exertion and metabolic cost with the application of PBMT. Adult;Cross-Over Studies;Double-Blind Method;Energy Metabolism;Exercise Test;Humans;Low-Level Light Therapy;Male;Oxygen Consumption;Perception;Physical Endurance;Physical Exertion;Running

Effects of the Association between Photobiomodulation and Hyaluronic Acid Linked Gold Nanoparticles in Wound Healing. Healing is the process responsible for restoring the integrity of the body's internal or external structures when they rupture. Photobiomodulation (PBM) stands out as one of the most efficient resources in the treatment of epithelial lesions, as well as hyaluronic acid (HA), which has been emerging as a new molecule for the treatment of dermal and epidermal lesions. The biological application of gold nanoparticles (GNPs) shows promising results. This study aimed to investigate the possible anti-inflammatory and antioxidant effects of the association between PBM and GNPs-linked HA in an epithelial lesion model. Fifty Wistar rats were randomly distributed in the Control Group (CG); (PBM); (PBM + HA); (PBM + GNPs); (PBM + GNPs-HA). The animals were anesthetized, trichotomized, and induced to a surgical incision in the dorsal region. Topical treatment with HA (0.9%) and/or GNPs (30 mg/kg) occurred daily associated with 904 nm laser irradiation, dose of 5 J/cm(2), which started 24 h after the lesion and was performed daily until the seventh day. The levels of proinflammatory (IL1 and TNFÎ±), anti-inflammatory (IL10 and IL4) and growth factors (FGF and TGFÎ²) cytokines and oxidative stress parameters were evaluated, besides histological analysis through inflammatory infiltrate, fibroblasts, new vessels, and collagen production area. Finally, for the analysis of wound size reduction, digital images were performed and subsequently analyzed by the IMAGEJ software. The treated groups showed a decrease in proinflammatory cytokine levels and an increase in anti-inflammatory cytokines. TGFÎ² and FGF levels also increased in the treated groups, especially in the combination therapy group (PBM + GNPs-HA). Regarding the oxidative stress

parameters, MPO, DCF, and Nitrite levels decreased in the treated groups, as well as the oxidative damage (Carbonyl and Thiol groups). In contrast, antioxidant defense increased in the groups with the appropriate therapies proposed compared to the control group. Histological sections were analyzed where the inflammatory infiltrate was lower in the PBM + GNPs-HA group. The number of fibroblasts was higher in the PBM and PBM + HA treated groups, whereas collagen production was higher in all treated groups. Finally, in the analysis of the wound area contraction, the injury group presented a larger area in cm(2) compared to the other groups. Taken together, these results allow us to observe that the combination of PBM + GNPs-HA optimized the secretion of anti-inflammatory cytokines, proliferation and cell differentiation growth factors, and made an earlier transition to the chronic phase, contributing to the repair process. Gold;Hyaluronic Acid
Animals;Gold;Hyaluronic Acid;Low-Level Light Therapy;Metal Nanoparticles;Rats;Rats, Wistar;Wound Healing

Involvement of substance P, osteopontin and satellite glial cells on photobiomodulation-induced antinociceptive effect in an experimental model of dentin hypersensitivity. The aim of this work was to investigate the involvement of substance P (SP), osteopontin (OPN), and satellite glial cells (SGC) on photobiomodulation-induced (PBM) antinociceptive effect in an experimental model of dentin hypersensitivity (DH). Rats ingested isotonic drink (ID, pH 2.87) for 45 consecutive days and after this period received PBM irradiation at Î»660 nm or Î»808 nm (1 J, 3.5 J/cm(2), 100 mW, 10 s, 0.028 cm(2), continuous wave, 3 consecutive daily sessions), and were evaluated for nociceptive behavior 24, 48, 72 h, and 14 days after laser treatments. ID ingestion induced an increase on thermal sensitivity of DH characteristics in rats that was completely reversed by PBM treatment at both 660 and 808 nm. Immunohistochemical analysis revealed increased SP expression at both dentin-pulp complex (DPC) and trigeminal ganglia (TG) of DH-rats which did not occur in PBM groups by PBM treatment. Also, the increase of glial fibrillary acidic protein (GFAP) observed in the TG of DH-rats was also reversed by PBM treatment. Finally, PBM at both 660 and 808 nm increased OPN expression in the dentin-pulp complex of DH-rats after 14 days of PBM treatment. All in all, this data demonstrates that PBM reverses nociception in a DH experimental model by inhibiting neurogenic inflammation and inducing a regenerative response. Analgesics;Osteopontin;Substance P
Analgesics;Animals;Dentin Sensitivity;Low-Level Light Therapy;Male;Models, Theoretical;Neuroglia;Nociception;Osteopontin;Rats;Substance P;Trigeminal Ganglion

Assessing the Outcomes of Focused Heating of the Skin by a Long-Pulsed 1064â€‰nm Laser with an Integrated Scanner, Infrared Thermal Guidance, and Optical Coherence Tomography.
BACKGROUND ANDÂ OBJECTIVE: Long-term benefits can be predicted by the incorporation of more intelligent systems in lasers and other devices. Such systems can produce more reliable zones of thermal injury when used in association with non-invasive monitoring and precise laser energy delivery. The more classical endpoint of tumor destruction with radiofrequency or long-pulsed (LP) 1064â€‰nm laser is the non-specific appearance of tissue graying and tissue contraction.Â Herein we discuss combining non-invasive LP 1064â€‰nm Nd:YAG treatment with the assistance of optical coherence tomography (OCT) and the forward-looking infrared (FLIR) thermal camera while testing literature-based formulaeÂ for thermal destruction. STUDY DESIGN/MATERIALS AND METHODS: The skin on the forearm and back of two consenting volunteers was marked and anesthetized with lidocaine with epinephrine. The parameters of a scanner-equipped LP 1064â€‰nm Nd:YAG laser were adjusted to achieve an epidermal/superficial dermal heating of between 50Â°C and 60Â°C over a specified time course. Experimental single treatments examined various adjusted parameters including, fluence, pulse overlap, pulse duration, scan size, and pulse rate. A FLIR camera was used to record skin temperature. Outcome measures included skin temperature, post-treatment appearance, and OCT assessment of skin and vascular damage. The clinical response of each treatment was

followed daily for 4 weeks. RESULTS: Optimal protocols initially raised the skin temperature to between 55Â°C and 60Â°C, which was carefully maintained using subsequent laser passes over a 60-second time course. Immediately post laser, clinical responses included erythema, edema, and blistering. Immediate OCT revealed increased vascularity with intact, dilated blood vessels. Prolonged exposure above 60Â°C resulted in sub-epidermal blistering and an absence of blood flow in the treatment area with prolonged healing. CONCLUSION: The LP 1064â€‰nm laser can be used to achieve heat-related tissue injury, though the narrow parameters necessary for the desired endpoint require the assistance of IR thermal regulation to avoid unacceptable outcomes. The use of the laser scanner ensures precise energy delivery over a defined treatment area. Future studies might explore this as a selective hyperthermic method for the treatment of non-melanoma skin cancer. Lasers Surg. Med. Â© 2021 Wiley Periodicals LLC. Heating;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Skin;Tomography, Optical Coherence

Photobiomodulation therapy is not better than placebo in patients with chronic nonspecific low back pain: a randomised placebo-controlled trial. Photobiomodulation therapy (PBMT) has been used in several musculoskeletal disorders to reduce pain, inflammation, and promoting tissue regeneration. The current evidence about the effects of PBMT on low back pain (LBP) is still conflicting. We aimed to evaluate the effects of PBMT against placebo on pain intensity and disability in patients with chronic nonspecific LBP. This was a prospectively registered, randomised placebo-controlled trial, with blinded patients, therapists, and assessors. The study was conducted on an outpatient physical therapy clinic in Brazil, between April 2017 and May 2019. A total of 148 patients with chronic nonspecific LBP were randomised to either active PBMT (n = 74) or placebo (n = 74). Patients from both groups received 12 treatment sessions, 3 times a week, for 4 weeks. Patients from both groups also received an educational booklet based on "The Back Book." Clinical outcomes were measured at baseline and at follow-up appointments at 4 weeks, 3, 6, and 12 months after randomisation. The primary outcomes were pain intensity and disability measured at 4 weeks. We estimated the treatment effects using linear mixed models following the principles of intention-to-treat. There was no clinical important between-group differences in terms of pain intensity (mean difference = 0.01 point; 95% confidence interval = -0.94 to 0.96) and disability (mean difference = -0.63 points; 95% confidence interval = -2.23 to 0.97) at 4 weeks. Patients did not report any adverse events. Photobiomodulation therapy was not better than placebo to reduce pain and disability in patients with chronic nonspecific LBP. Brazil;Chronic Pain;Humans;Low Back Pain;Low-Level Light Therapy;Treatment Outcome

Photobiomodulation therapy for chronic low back pain: time to move on. Chronic Pain;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement

Effect of photobiomodulation with 810 and 940 nm diode lasers on human gingival fibroblasts. BACKGROUND: The growth and proliferation of gingival fibroblasts are important in the process of oral wound healing, and photobiomodulation (PBM) might be able to modify this process. OBJECTIVES: The aim of the current study was to evaluate the biomodulatory effect of a single session of laser PBM by means of 810 nm and 940 nm diode lasers alone and their combined application with different fluencies on human gingival fibroblasts (HGFs). MATERIAL AND METHODS: Cells were provided by the Pasteur Institute, the National Cell Bank of Iran (NCBI) (C-165). Laser irradiation was carried out using 810 nm, 940 nm and 810 nm + 940 nm in the continuous wave (CW) mode, 100 mW, and energy densities of 0.5, 1.5 and 2.5 J/cm2. Cell viability was evaluated at 24 h with the MTT assay. Trypan blue staining was used to evaluate proliferation 24, 48 and 72 h after laser therapy. Propidium iodine was used to stain DNA and the cell nucleus. RESULTS: Laser irradiation (810 nm, 0.5 J/cm2) increased the viability of gingival fibroblasts, while this dose had an inhibitory effect with 940 nm. No positive effect on cell viability was found with other settings at 24 h.

The viability results were not statistically different from those of the control in the dual wavelength group. At all single-laser irradiation doses, the cell proliferation results were lower as compared to the control at 48 and 72 h. The dual wavelength group results were significantly better than those of the control for the 1.5 J/cm2 and 2.5 J/cm2 energy densities ($p < 0.001$). Propidium iodine staining showed no negative effect of laser irradiation on the cell nucleus in any of the groups. CONCLUSIONS: Although a single irradiation dose of 810 nm, 0.5 J/cm2, resulted in a positive effect on cell viability at 24 h, no statistically significant stimulatory effect on viability and proliferation was observed for the other single wavelength group. When a combination of the 2 wavelengths was used, better results were observed as compared to the control, which needs to be further investigated in future studies. Fibroblasts;Gingiva;Humans;Iran;Lasers, Semiconductor;Low-Level Light Therapy

Understanding COVID-19 Pandemic: Molecular Mechanisms and Potential Therapeutic Strategies. An Evidence-Based Review. Initially, the SARS-CoV-2 virus was considered as a pneumonia virus; however, a series of peer reviewed medical papers published in the last eight months suggest that this virus attacks the brain, heart, intestine, nervous and vascular systems, as well the blood stream. Although many facts remain unknown, an objective appraisal of the current scientific literature addressing the latest progress on COVID-19 is required. The aim of the present study was to conduct a critical review of the literature, focusing on the current molecular structure of SARS-CoV-2 and prospective treatment modalities of COVID-19. The main objectives were to collect, scrutinize and objectively evaluate the current scientific evidence-based information, as well to provide an updated overview of the topic that is ongoing. The authors underlined potential prospective therapies, including vaccine and phototherapy, as a monotherapy or combined with current treatment modalities. The authors concluded that this review has produced high quality evidence, which can be utilized by the clinical scientific community for future reference, as the knowledge and understanding of the SARS-CoV-2 virus are evolving, in terms of its epidemiological, pathogenicity, and clinical manifestations, which ultimately map the strategic path, towards an effective and safe treatment and production of a reliable and potent vaccine.

Comparison of the efficacy and safety between a low-fluence 1064-nm Q-switched neodymium-doped yttrium aluminum garnet laser and a conventional Q-switched 532-nm laser for the treatment of cafe-au-lait macules in 40 Chinese children: a prospective, randomized, parallel-controlled, evaluator-blinded trial. Cafe-au-lait macules (CALMs) affect the appearance of patients and can result in serious psychological problems. Successful treatments without adverse effects remain challenging. We designed a prospective, randomized, controlled, evaluator-blinded trial on 40 pediatric patients to compare the efficacy between a low-fluence 1064-nm Q-switched Nd:YAG laser and a Q-switched Nd:YAG 532-nm laser for the treatment of solitary CALMs in children. We randomly assigned participants into 2 groups. We treated those in the first group with 3 sessions of 532-nm QS laser at 1-month intervals, and those in the second group with 6 sessions of 1064-nm LFQS laser at 2-week intervals. We found no significant differences in treatment efficacy ($p = 0.14$). The 1064-nm laser group referred significantly less pain than the 532-nm laser group ($p = 0.0001$). Side effects were detected in 5 patients in the 532-nm laser group. The difference of the side effects was statistically significant ($p = 0.04$). Two patients in 532-nm laser group were recurred and none in 1064-nm laser group. On a univariate logistic regression analysis, lesions with brown color, small size, and irregular edges were significantly associated with better outcomes (> 50% clearance). Multivariate logistic regression analysis found that brown lesions and lesions with irregular edges had higher odds of getting > 50% clearance ($p < 0.05$). In conclusion, the 1064-nm LFQS laser produced fewer side effects, less pain, and shorter recovery time than the 532-nm laser. Irregular-bordered, smaller, brown lesions improved better than smooth-bordered, larger, light brown lesions. Moreover, the 1064-nm laser may be a better choice for treating large size CALMs. However, no significant

differences were found in terms of the treatment efficacy and recurrence. Cafe-au-Lait Spots;Child;China;Humans;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Treatment Outcome

LASMIK laser biorevitalization: mechanisms and therapeutic experience. LASMIK laser biorevitalization is a well-known technology developed in Russia that is based on laser phoresis as a method to enhance percutaneous penetration of substances. The article describes the mechanisms that act here and factors that determine the optimal parameters of the technique. The research conducted for 2 years allowed to optimize the parameters of the laser phoresis technique, testing the LASMIK laser biorevitalization technology. Our findings indicate the stimulation of facial skin blood microcirculation and, consequently, an increase in the oxygen tension in the skin, oxygenation of the facial skin blood, and an increase in the trophic support to tissues. The skin becomes 5-15 years younger, a noticeable reduction of facial wrinkles is demonstrated. The studies enabled to optimize the parameters of gels and laser exposure for the maximum efficiency of procedures that are in great demand both by cosmetologists and customers, due to non-invasiveness, simplicity and good results.

Photobiomodulation: A review of the molecular evidence for low level light therapy. Light energy is harnessed for therapeutic use in a number of ways, most recently by way of photobiomodulation (PBM). This phenomenon is a cascade of physiological events induced by the nonthermal exposure of tissue to light at the near infrared end of the visible spectrum. Therapeutic PBM has become a highly commercialized interest, marketed for everything from facial rejuvenation to fat loss, and diode-based devices are popular in both the clinic setting and for use at home. The lack of regulatory standards makes it difficult to draw clear conclusions about efficacy and safety but it is crucial that we understand the theoretical basis for PBM, so that we can engage in an honest dialogue with our patients and design better clinical studies to put claims of efficacy to the test. This article presents a summary of the science of PBM and examines the differences between laser light, on which much of the preclinical evidence is based and light from diodes, which are typically used in a clinical setting. Animals;Cell Proliferation;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Oxidative Stress;Rejuvenation

Neglect of relevant treatment recommendations in the conduct and reporting of a laser therapy knee osteoarthritis trial: letter to the editor. We read with interest the article by Gomes et al. entitled: "Exercise program combined with electrophysical modalities in subjects with knee osteoarthritis: A randomised, placebo-controlled clinical trial". Gomes et al. concluded that the low-level laser therapy (LLLT) did not reduce knee osteoarthritis pain when applied as an adjunct to exercise therapy. We argue that Gomes et al. neglected relevant laser treatment recommendations in the conduct and reporting of the trial.Gomes et al. did not state the Joules per treatment spot applied. We calculated the Joules applied from other laser information in the report and found that it is too low of a dose according to the World Association for Laser Therapy (WALT) guidelines. Furthermore, we have published a meta-analysis of 22 placebo-controlled trials demonstrating a significant difference in pain-relieving effect between doses in adherence and non-adherence to the WALT guidelines. However, neither the WALT guidelines, nor our meta-analysis was mentioned by Gomes et al.Moreover, Gomes et al. did not state whether the output power of the laser device was measured, and this is concerning because in the city of SÃ£o Paulo, where the trial was conducted, most laser devices have been found to deliver less of a dose than specified by the manufacturers.In summary, we found that the best available evidence regarding effective and ineffective LLLT dosing from systematic reviews was neglected in the conduct and reporting of the trial, and that the laser device may not have been calibrated. Brazil;Exercise Therapy;Humans;Lasers;Low-Level Light Therapy;Osteoarthritis, Knee;Randomized Controlled Trials as Topic

The Effects of Photobiomodulation on Leukocyte and Platelet-Rich Fibrin as Barrier Membrane on Bone Regeneration: An Experimental Animal Study. Objective: To compare the effects of leukocyte and platelet-rich fibrin (L-PRF) and photobiomodulation therapy (PBMT)-applied L-PRF (PBMT/L-PRF) as barrier membranes on new bone formation (BV/TV) for the treatment of critical-sized bone defects. Materials and methods: The right iliac crests of five sheep were used in this experimental animal study. Eight critical-sized defects were surgically created in each sheep and a total of 40 defects were obtained. A deproteinized bovine bone graft was placed in all defects, and the defects were divided into four groups to be covered with L-PRF membrane, PBMT/L-PRF membrane, collagen membrane, or left uncovered as controls. Animals were sacrificed at 1 month. The sections obtained were histomorphometrically analyzed. Results: The results showed that the collagen group presented significantly higher values for main bone healing parameters (BV/TV, bone volume, and bone surface; pâ€‰<â€‰0.05). The PBMT/L-PRF group presented higher values than the L-PRF group and controls for these parameters though not statistically significant (pâ€‰>â€‰0.05). Conclusions: The findings show that PBMT may provide additional regenerative properties to L-PRF when used as barrier membranes. However, these results did not reach the collagen membranes, which warrants further studies for adapting the laser parameters to increase regenerative capacity of L-PRF. Fibrin Animals;Bone Regeneration;Bone Transplantation;Cattle;Fibrin;Leukocytes;Platelet-Rich Fibrin;Sheep

Shining a (blue) light on hair follicle chronobiology and photobiomodulation.
Alopecia;Hair Follicle;Humans;Light;Low-Level Light Therapy

Efficacy of photobiomodulation therapy on neurosensory recovery in patients with inferior alveolar nerve injury following oral surgical procedures: a systematic review. OBJECTIVE: The present systematic review aimed to assess the efficacy of photobiomodulation (PBM) therapy on neurosensory recovery of patients with inferior alveolar nerve injury following third molar surgery or dental implant placement. METHOD AND MATERIALS: An electronic search was carried out in Scopus, Embase, Medline, PubMed, Web of Science, Cochrane Library, and Google Scholar databases. Among 1,122 identified papers, seven articles (three RCTs, one observational study, and three case series) met the inclusion criteria.
Results: Time lapse from nerve injury to the onset of PBM therapy varied widely from 2Â days to 4Â years. The number of patients in each study ranged between 4 and 74. In the majority of the studies, PBM was done using a diode laser at wavelengths ?in the range of 808 to 830Â nm with power of 5 to 500Â mW and radiation dose of 3 to 244 J/cm2. Two out of three RCTs found significant neurosensory recovery in the patients who received PBM therapy compared to the controls. The observational study and all case series reported significant improvement in the neurosensory status following PBM therapy. The degree of neurosensory recovery was found to be greater in younger patients and those who received the treatment within 6Â months following the injury.
Conclusions: Due to the limited number of well-designed RCTs and small number of patients in each study, it is not possible to make a clear conclusion about the efficacy of PBM therapy on neurosensory recovery in patients with inferior alveolar nerve injury following third molar or implant procedures. Considering the possibility of spontaneous inferior alveolar nerve recovery during this period, the conclusion based on the studies with no control group should be interpreted with caution. (Quintessence Int 2021;52:140-153; doi:Â 10.3290/j.qi.a45430).
Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mandibular Nerve

Synergistic effect of three-dimensionalÂ coculture and photobiomodulation therapy on vascularized liver spheroid formation by stem cells. Despite studies reporting functional differentiation of liver cells, a three-dimensional, vascularized liver organ has yet to be developed from mesenchymal stem cells. We investigated whether treatment with photobiomodulation (PBM) before three-dimensional liver spheroid transplantation improved the recovery of liver function via stimulation of

angiogenesis and hepatocyte differentiation. Liver spheroids composed of hepatic, endothelial,Â and mesenchymal cells were subjected to PBM therapy. To evaluate the in vivo therapeutic effect of the liver spheroids treated with PBM, phosphate-buffered saline, liver spheroid, and PBM-treated liver spheroid were transplanted into a damaged host liver using conventional chimeric mouse models. To further characterize the maturation of transplanted PBM-liver spheroid compared with the newly generated non-PBM-liver spheroid or human liver tissues, the expression profiles of mature liver signature genes were analyzed. Liver spheroids expressed hepatocyte growth factors, including vascular endothelial growth factor and angiogenic factors. The cells in liver spheroid compensated for the low viability and improved the function of hepatocytes. Here, we demonstrate the formation of vascularized and functional human liver spheroid from human adipose-derived stem cellsÂ by transplantation of liver tissue created in vitro. Albumin secretion by PBM-treated liver spheroid was higher on Day 28 compared with liver spheroid-seeded transplant group. PBM-liver spheroids serve as individual vascularization units, promoting the simultaneous development of new microvascular networks at different locations inside the implanted tissue constructs. The vasculature in the liver spheroid transplants became functional by connecting to the host vessels within 48â€‰h. These PBM-liver spheroids may be useful in designing artificial three-dimensional hepatic tissue constructs and in cell therapy with limited numbers of human hepatocytes. Adipocytes;Adipose Tissue;Cell Differentiation;Coculture Techniques;Hepatocytes;Humans;Liver;Low-Level Light Therapy;Mesenchymal Stem Cells;Neovascularization, Physiologic;Spheroids, Cellular;Stem Cells

Medication-Related Osteonecrosis of the Jaw and Low-Level Laser Therapy as Adjuvant Treatment: A Case Report. Introduction: Medication-related osteonecrosis of the jaw (MRONJ) occurs by the use of a drug that has osteonecrosis as one of its side effects. Case Report: We describe a case of a 48-year-old oncological patient who had brain and bone metastasis due to breast cancer and was medicated with bisphosphonates (BPs). She presented cavities, and after an incorrect exodontia, the lesion evolved into a jaw osteonecrosis. Then she did a sequestrectomy and was treated using laser therapy. Radiological and clinical features are also described. Conclusion: In a case like this, we notice how necessary is a complete evaluation of the oncological patient before some procedures and laser therapy as an effective ally in the management.

Assessment of the Photobiomodulation Effect of a Blue Diode Laser on the Proliferation and Migration of Cultured Human Gingival Fibroblast Cells: A Preliminary In Vitro Study. Introduction: Photobiomodulation therapy (PBM) is emerging as an effective strategy for the management of wound healing. The application of red and near infra-red light sources in laser therapy has been the subject of most researches in recent literature. Considering the lack of sufficient evidence in assessing the blue light in PBM, we aimed to investigate the photobiomodulation effect of a blue diode laser on the proliferation and migration of cultured human gingival fibroblast cells as a preliminary in vitro study. Methods: Human gingival fibroblast cells were irradiated with a blue diode laser at a 445 nm wavelength. Irradiation was done using three different powers of 200 mW (irradiation times of 5, 10,15, and 20 seconds); 300 mW (irradiation times of 5, 10, and 15 seconds); and 400 mW (irradiation times of 5 and 10 seconds). The fibroblast cells without laser exposure were considered as control. After 24 hours of incubation, the MTT assay and the wound scratch test were performed on the cells to investigate the biomodulation effect of the blue laser on the proliferation and migration of the cells respectively. The results were analyzed by one-way ANOVA and a post-hoc Tukey test with a P value <0.05 as a statistical significance level. Results: PBM with blue diode laser at power densities of 400 mW/cm(2) with irradiation times of 10 and 15 seconds corresponding to energy densities of 4 and 6 J/cm(2) exerted the statistically significant positive effect on both proliferation and migration of gingival fibroblast cells. Conclusion: Considering the encouraging findings of this study, PBM with blue

diode laser can promote proliferation and migration of human gingival fibroblasts, the key cells involved in the process of oral wound healing.

Low-Level Laser Therapy for Diabetic Dermopathy in Patients With Type 2 Diabetes: A Placebo-Controlled Pilot Study. Introduction: Diabetic dermopathy (DD) is the most common cutaneous diabetes marker. Few studies have targeted DD using low-level laser therapy (LLLT). This pilot study aimed to evaluate the effect of LLLT on DD in patients with type 2 diabetes (T2D). Methods: 12 patients with T2D (9 men, 3 women) and bilateral DD were enrolled in this placebo controlled pilot study, and their ages ranged 50-65 years. One side was subjected to LLLT, three sessions weekly for one month (LLLT side), while the other side received the same treatment protocol with a laser device switched off as a placebo (placebo side). All patients were instructed to receive skincare for both sides, such as debridement, antibiotic creams, and dressings with betadine solution. The diameter of DD lesion and the cutaneous blood flow of the knees and ankles sites were assessed before and after one month at the end of the intervention. Results: At the baseline, no significant differences existed between LLLT and placebo sides in the DD and skin blood flow at the knee and ankle sites ($P > 0.05$). Post-intervention, a significant improvement occurred in DD diameter and the skin blood flow of the knee and ankle sites in the LLLT side ($P < 0.05$), while the placebo side showed a significant improvement only in DD diameter ($P < 0.05$) and non-significant changes in skin blood flow ($P > 0.05$). Comparing both sides, all measures significantly favored LLLT. Conclusion: The findings of this study indicate that LLLT has beneficial effects on decreasing DD in T2D patients. Also, it was approved that the short term of LLLT is a safe modality to control DD in T2D patients.

Photobiomodulation Therapy in the Proliferation and Differentiation of Human Umbilical Cord Mesenchymal Stem Cells: An In Vitro Study. Introduction: Since photobiomodulation therapy (PBMT) favors in vitro mesenchymal stem cell (MSC) preconditioning before MSC transplantation, increasing the proliferation of these cells without molecular injuries by conserving their characteristics, in the present in vitro study we analyzed the effect of PBMT on the proliferation and osteogenic differentiation of human umbilical cord mesenchymal stem cells (hUCMSCs). Methods: Irradiation with an InGaAlP Laser (660 nm, 10 mW, 2.5 J/cm(2) , 0.08 cm(2) spot size, and 10 s) was carried out. The cells were divided into four groups: CONTROL [cells grown in Dulbecco's Modified Eagle Medium (DMEM)], OSTEO (cells grown in an osteogenic medium); PBMT (cells grown in DMEM+PBMT), and OSTEO+PBMT (cells grown in an osteogenic medium plus PBMT). The cell proliferation curve was obtained over periods of 24, 48 and 72 hours using the 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. Osteogenic differentiation was analyzed by the formation of calcium nodules over periods of 7, 14 and 21 days. Morphometric analysis was performed to quantify the total area of nodular calcification. Results: The highest cell proliferation and cell differentiation occurred in the OSTEO+PBMT group, followed by the PBMT, OSTEO and CONTROL groups respectively, at the observed times ($P < 0.05$). Conclusion: PBMT enhanced the osteogenic proliferation and the differentiation of hUCMSCs during the periods tested, without causing damage to the cells and preserving their specific characteristics, a fact that may represent an innovative pretreatment in the application of stem cells.

Effect of Low-Level Laser Therapy and Platelet-Rich Fibrin on the Treatment of Intra-bony Defects. Introduction: Attempts to regenerate the periodontal osseous defect, which is lost as a result of periodontal disease, require the tapping of the innate healing potential of periodontium through appropriately designed therapeutic strategies. A multitude of grafted and non-grafted approaches have been used in the management of Intra-bony defects. However, they do not provide predictable periodontal regeneration. The aim of this study was to evaluate the combined effect of low-level laser therapy (LLLT) and platelet-rich fibrin (PRF), in site modulated intra-bony defects (decortication), which were accessed using a simplified papilla preservation flap (SPPF), on the clinical and

radiographic outcomes of periodontal disease. Methods: A total of 30 patients with intra-bony defects were recruited for the study and randomly distributed in two groups (n=15). Test group sites were accessed with SPPF and the defects received intra-marrow Penetration (IMP) following debridement and were irradiated with a low-level laser followed by PRF grafting and suturing done. The control group defects were accessed with SPPF and grafted with PRF before being secured by sutures. The plaque and bleeding score, PPD, CAL, and the position of the gingival margin with radiographic defect depth were recorded and analyzed at baseline and six months post-intervention using the student's t test and Wilcoxon signed rank test. Results: The test group showed a clinically relevant increase in mean PPD reduction, CAL gain, and radiographic bone fill (3.6 Â± 1.35 mm, 3.26 Â± 1.16 mm and 2.44 Â± 1.24 mm) compared to the control group (2.93 Â±1.1 mm, 2.267 Â± 1.33 mm and 1.26 Â± 0.99 mm) six months post-intervention. However, intergroup comparison between the test and control groups did not show any statistically significant difference. Conclusion: These results highlights that test protocol had greater amelioration of the effects of periodontal disease and all the investigated clinical and radiographic parameters showed considerable improvement from baseline to 6 months within test and control group, but intergroup comparison between the test and control groups did not show any statistically significant difference, indicating statistical equivalence between the test and control protocol.

Laser Acupuncture: 35 Years of Successful Application in Russia (Narrative Review). Introduction: Laser acupuncture is one of the low-level laser therapy (LLLT) methods, replacing the traditional technique of Chinese needle acupuncture. This article describes the main principles and parameters of laser acupuncture based on the analysis of 35 years of successful experience in applying the method in Russia. Methods: The search of the literature on laser acupuncture was made in the Russian Medical Library and the Russian State Library (1498 publications in Russian), and PubMed/Medline (117 publications in English). 96 studies on laser acupuncture techniques were selected and a narrative review was conducted. Results: The optimal parameters of the technique were worked out by Russian specialists in the 1970s, and are perfectly confirmed by the wide practice of clinical application. The literature review showed that the most optimal parameters of laser acupuncture are wavelength - 635 nm (red spectrum), power - no more than 2-3 mW, the diameter of special nozzle attachment - not more than 1-1.5 mm, and exposure - 20-40 s (for corporal points) or 5-10 s (for auricular points). The impact on acupuncture points (APs) is carried out consistently in accordance with the recipe (protocol), with no more than 10-12 daily procedures. Conclusion: Laser acupuncture is a very effective and reproducible technique to treat patients with different diseases. Any specialist can apply this method because of its simplicity, but using the most effective parameters.

Evaluation of Efficacy of Low-Level Laser Therapy. Introduction: Given the inconsistencies in the literature regarding laser performance in non-surgical treatments, this study investigated the available literature to determine the advantages and disadvantages of low-power lasers in treating non-surgical complications and diseases. Methods: Authentic information from articles was extracted and evaluated to assess low-power laser performance for non-surgical treatments. A systematic search of studies on low-level laser therapy (LLLT) for non-surgical treatments was conducted mainly in PubMed and google scholar articles. Results: Four categories of diseases, including brain-related diseases, skin-related diseases, cancers, and bone-related disorders, which were treated by LLLT were identified and introduced. The various types of LLLT regarding the studied diseases were discussed. Conclusion: Positive aspects of LLLT versus a few disadvantages of its application imply more investigation to find better and efficient new methods.

A Review of Low-Level Laser Therapy for Spinal Cord Injury: Challenges And Safety. Introduction: Damage to the spinal cord is a central nervous system disorder that results in direct damage to neural

cells (axons, cell bodies) and glia, followed by autonomic, motor and sensory impairments. Inflammatory response after this injury can contribute to secondary tissue damage that leads to further behavioral and functional disorders. Inflammation is a complex process, which occurs after an injury. If this progressive process is not well controlled can lead to additional damage to the spinal cord which is preventing neural improvement and regeneration and, which ultimately will not provide good clinical consequences. Inflammation in the injured spinal cord is a physiological response that causes the death of glial and neuronal cells. The reduction of the initial inflammatory process after damage to the spinal cord is one of the important therapeutic strategies. It has been proposed that low-level laser (LLL) therapy, as a noninvasive manner, can modulate inflammatory processes, which leads to a significant improvement in neurological symptoms after spinal cord injury (SCI). Methods: A comprehensive review was performed on SCI, the etiologies, and treatment methods using the keywords spinal cord injury, low-level laser, and inflammation in valid medical databases such as Google Scholar, PubMed, and Elsevier (76 articles). Among the collected papers, articles that were most relevant to the purposes of the study were selected and studied. Results: LLL therapy was able to reduce inflammation and also attenuate neuronal damage after spinal cord damage. Conclusion: The present study illustrates that LLL therapy has positive effects on improving functional recovery and regulating the inflammatory function in the SCI.

Comparison of low level laser therapy and extracorporeal shock wave in treatment of chronic lateral epicondylitis. OBJECTIVE: The aim of this study was to compare the efficacy of extracorporeal shock wave therapy (ESWT) ver-sus low-level laser therapy (LLLT) in treating chronic lateral epicondylitis (CLE). METHODS: In this prospective study, 52 patients (24 males, 28 females; mean age=48 years; age range=30-70 years) with a diagnosis of CLE were included and randomized into two groups (26 in each group): ESWT group (14 males, 12 females; mean age=48Â±10 years) or LLLT group (10 males, 16 females; mean age=48Â±11 years). ESWT was applied for 5 weeks with one session per week, while LLLT was applied with 15 sessions on consecutive days. All patients were evaluated using Disability of the Arm, Shoulder and Hand Questionnaire (DASH), Patient-Related Lateral Epicondy-litis Evaluation (PRTEE), and the 36-Item Short-Form Health Survey (SF-36) before and after the treatments. RESULTS: In the comparison of baseline data between treatment groups, significant differences were observed only in SF-Physical functioning and SF-Energy/fatigue scores (p=0.035 and p=0.038, re-spectively), which were 77.1Â±17.2 and 56.3Â±17.2 in ESWT group and 66.5Â±18.0 and 44.8Â±21.5 in LLLT group, respectively. In the comparison of post-treatment data between groups, there were sig-nificant differences in all scores (p<0.05) except two subscales of SF-36, which were SF-role limita-tions due to emotional problems (p=0.092) and physical health (p=0.147), respectively. The other subscales of SF-36, PRTEE and DASH scores obtained after the treatments were better in ESWT group than in LLLT group. The comparison of pre-and post-treatment scores in each group revealed significant improvements in all scores (p<0.05), except SF-36 subscales, including energy/fatigue, emotional well-being, social functioning, and general health scores (p>0.05). CONCLUSION: Evidence from this study revealed that although both treatment modalities were effective in the treatment of CLE, ESWT seemed to more effective in pain relief and functional recovery than LLLT. LEVEL OF EVIDENCE: Level II, Therapeutic study. Extracorporeal Shockwave Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Management;Prospective Studies;Recovery of Function;Tennis Elbow;Treatment Outcome

Photobiomodulation therapy and the clinical reality in Brazil: response to the letter to the editor. Brazil;Double-Blind Method;Humans;Low-Level Light Therapy

Correction to: Photobiomodulation effect on children's scars.

Impact of photobiomodulation using four diode laser wavelengths of on cationic liposome gene transfection into pre-osteoblast cells. Gene therapy can be an effective treatment modality for

some severe genetic diseases. Despite efforts to improve their performance, non-viral gene delivery methods remain inefficient and costly. As an alternative to viral vectors, cationic liposomes have a good safety profile and low immunogenicity, but relatively low transfection efficiency. They may also be toxic to cells at high concentrations. Given these challenges, the present study explored the impact of photobiomodulation (PBM) on cationic liposome plasmid DNA transfection in terms of its efficiency and toxicity, using Lipofectamine 2000 to carry green fluorescent protein (GFP) encoding plasmid DNA, with the pre-osteoblast MC3T3-E1 cell line as the target. Cultures were irradiated using diode lasers (445, 685, 810, or 970Â nm) at 200Â mW using pulsed mode (50Â Hz), with a power density of 104.64Â mW/cm(2), and irradiance from 6 to 18 joules. To determine transfection efficiency, expression of GFP was assessed using confocal laser scanning microscopy and flow cytometry. Cell viability was evaluated using the MTT assay. PBM using 810Â nm and 970Â nm lasers significantly enhanced transfection efficiency for GFP, indicating more efficient uptake of plasmid DNA. Conversely, laser irradiation at 445Â nm and 685Â nm wavelengths reduced the GFP transfection efficiency. Treatment using 685, 810, and 970Â nm lasers at 12Â J maintained cell viability and prevented toxicity of cationic liposomes. Overall, these findings support the concept that PBM using near infrared laser wavelengths can enhance transfection efficiency and support cell viability when cationic liposomes are used as the vector in gene therapy. Liposomes 3T3 Cells;Animals;Cell Survival;Lasers;Liposomes;Low-Level Light Therapy;Mice;Osteoblasts;Semiconductors;Transfection

Effects of Chronic Photobiomodulation with Transcranial Near-Infrared Laser on Brain Metabolomics of Young and Aged Rats. Since laser photobiomodulation has been found to enhance brain energy metabolism and cognition, we conducted the first metabolomics study to systematically analyze the metabolites modified by brain photobiomodulation. Aging is often accompanied by cognitive decline and susceptibility to neurodegeneration, including deficits in brain energy metabolism and increased susceptibility of nerve cells to oxidative stress. Changes in oxidative stress and energetic homeostasis increase neuronal vulnerability, as observed in diseases related to brain aging. We evaluated and compared the cortical and hippocampal metabolic pathways of young (4Â months old) and aged (20Â months old) control rats with those of rats exposed to transcranial near-infrared laser over 58 consecutive days. Statistical analyses of the brain metabolomics data indicated that chronic transcranial photobiomodulation (1) significantly enhances the metabolic pathways of young rats, particularly for excitatory neurotransmission and oxidative metabolism, and (2) restores the altered metabolic pathways of aged rats towards levels found in younger rats, mainly in the cerebral cortex. These novel metabolomics findings may help complement other laser-induced neurocognitive, neuroprotective, anti-inflammatory, and antioxidant effects described in the literature. Aging;Animals;Brain;Energy Metabolism;Homeostasis;Lasers;Low-Level Light Therapy;Male;Metabolome;Metabolomics;Neurons;Oxidative Stress;Rats;Rats, Wistar

Photobiomodulation Promotes Neuronal Axon Regeneration After Oxidative Stress and Induces a Change in Polarization from M1 to M2 in Macrophages via Stimulation of CCL2 in Neurons: Relevance to Spinal Cord Injury. To study the effect of photobiomodulation (PBM) on axon regeneration and secretion change of dorsal root ganglion (DRG) under oxidative stress after spinal cord injury (SCI), and further explore the effect of changes in DRG secretion caused by PBM on the polarization of macrophages. The PBM-DRG model was constructed to perform PBM on neurons under oxidative stress simulated in vitro. And the irradiation conditions were as follows: wavelength, 810Â nm; power density, 2Â mW/cm(2); irradiation area, 4.5Â cm(2); and irradiation time, 440Â s. Then resulted in an energy of 4Â J (2Â mW/cm(2)Â Ã—Â 4.5Â cm(2)Â Ã—Â 440Â s). About 100Â Î¼M H(2)0(2) was added to the culture medium to simulate oxidative stress after SCI. An ROS (reactive oxygen species) assay kit was used to measure ROS contend in the DRG. The survival level of the neurons was measured

using the CCK-8 method, and the axon regeneration of neurons was observed by using immunofluorescence. The secretion level of CCL2 from DRG was determined by RT-qPCR and ELISA. Further culturing macrophages of DRG-conditioned medium culture, the expression level of iNOS and Arg-1 in macrophages was assessed using Western blot analysis. The expression level of TNF-Î± and IL-1Î² was determined by ELISA. After adding the neutralizing antibody of CCL2 to the DRG neuron-conditioned medium following PBM irradiation to culture macrophages to observe the effects on macrophage polarization and secretion. PBM could reduce ROS levels in neurons, increase neuronal survival under oxidative stress, and promote neuronal axon regeneration. In addition, PBM could also promote CCL2 secretion by DRG under oxidative stress. By constructing a DRG supernatant-M1 macrophage adoptive culture model, we found that the supernatant of DRG after PBM intervention could reduce the expression level of iNOS and the secretion of TNF-Î± and IL-1Î² in M1 macrophages; at the same time, it could also up-regulate the expression ofÂ Arg-1, one of the markers of M2 macrophages. Furthermore, these effects could be prevented by the addition of neutralizing antibodies of CCL2. PBM could promote survival and axonal regeneration of DRG under SCI oxidative stress, increase the secretion level of CCL2 by DRG, and this change can reduce the polarization of macrophages to M1, further indicating that PBM could promote spinal cord injury repair. Ccl2 protein, mouse;Chemokine CCL2;Interleukin-1beta;Tumor Necrosis Factor-alpha Animals;Axons;Cell Differentiation;Cells, Cultured;Chemokine CCL2;Female;Ganglia, Spinal;Interleukin-1beta;Light;Macrophages;Male;Mice;Mice, Inbred BALB C;Oxidative Stress;Phototherapy;Spinal Cord Injuries;Spinal Cord Regeneration;Tumor Necrosis Factor-alpha

Photobiomodulation and Sida tuberculata combination declines the inflammation's markers in knee-induced osteoarthritis. The aim of this study was to assess potential combination effects of photobiomodulation therapy (PBMT) with Sida tuberculata extracts on the oxidative stress and antioxidant activity, as well as on the inflammatory process. Rats with knee osteoarthritis (OA) were treated with S. tuberculata extracts and PBMT (904Â nm, 18Â J/cm(2)). The animals were evaluated for nociception and edema. The blood, knee lavage and structures, spinal cord, and brainstem were collected for biochemical analyses (lipid peroxidation, protein carbonyl content, superoxide dismutase activity, non-protein thiol levels, and measurement of nitrite/nitrate). The knee structures were also used to measure cytokine levels. PBMT lowered the damage due to oxidative stress in the knee and at distant sites from the lesion. PBMT also reduced the levels of nitric oxide and cytokines, which could explain the nociception reduction mechanism. Similarly, S. tuberculata decreased the damage by oxidative stress, levels of nitrite/nitrate, and cytokines. The therapy combination reduced levels of cytokines and nitrite/nitrate. PBMT and S. tuberculata extracts reduced the oxidative stress and inflammation. It is noteworthy that PBMT increased the antioxidant activity in the knee and at sites distant from the lesion, contributing to a more significant decrease in nociception. The combination of therapies did not present significant effects on the analyzed parameters. Therefore, it is suggested that PBM is sufficient to minimize the signs and symptoms of the knee OA in our rat model. Animals;Inflammation;Knee Joint;Low-Level Light Therapy;Osteoarthritis, Knee;Protein Carbonylation;Rats;Rats, Wistar

Efficacy and safety of different low fluences of Q-switched Nd:YAG laser in treatment of melasma: a split-face clinical and dermoscopic comparative study. Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Effect of low-level laser irradiation on cytotoxicity of benzene in human normal fibroblast cells. Benzene is volatile organic hydrocarbon which is widely used in a wide range of industries. Studies have shown that exposure to benzene consequences serious health risks for human. Understanding the effect and risks of environmental hazard materials in the laser therapy of skin is interesting which can show useful or harmful role of these effects in therapies. In this study, the effect of low-level laser

therapy was investigated on benzene-induced cytotoxicity on human skin fibroblast cells (HU02). Human skin fibroblast cells (HU02) were exposed to various concentrations of benzene (0-100Â Î¼g/mL) and incubated for 2Â h. Then the effect of low-level laser therapy (LLLT) at 660-nm wavelength with 3Â J/cm(2) energy for 90Â s was investigated on the viability of the cells exposed to benzene using MTT assay and inverted light microscope. The effect of low-level laser therapy on the viability of the cells was positive at concentrations 0-15Â Î¼g/mL but negative at higher concentrations than 15Â Î¼g/mL. Low-level laser therapy in low concentrations of benzene decreases the cytotoxicity caused by benzene and maintains cell viability. At high concentrations and in the presence of low-level laser therapy, the cell viability decreased compared to dark experiment. The morphology study of the cells using inverted light microscopy has confirmed the MTT results.
Benzene Benzene;Cell Proliferation;Cell Survival;Fibroblasts;Humans;Lasers;Low-Level Light Therapy

Higher pulse frequency of near-infrared laser irradiation increases penetration depth for novel biomedical applications. BACKGROUND: The clinical efficiency of laser treatments is limited by the low penetration of visible light used in certain procedures like photodynamic therapy (PDT). Second Harmonic Generation (SHG) PDT is an innovative technique to overcome this limitation that enables the use of Near Infrared (NIR) light instead of visible light. NIR frequency bands present an optical window for deeper penetration into biological tissue. In this research, we compare the penetration depths of 405 and 808 nm continuous wave (CW) lasers and 808 nm pulsed wave (PW) laser in two different modes (high and low frequency). METHODS: Increasing thicknesses of beef and chicken tissue samples were irradiated under CW and PW lasers to determine penetration depths. RESULTS: The 808 nm CW laser penetrates 2.3 and 2.4 times deeper than the 405 nm CW laser in beef and chicken samples, respectively. 808 nm PW (pulse frequency-500 Hz) penetrates deeper than CW laser at the same wavelength. Further, increasing the pulse frequency achieves higher penetration depths. High frequency 808 nm PW (pulse frequency-71.4 MHz) penetrates 7.4- and 6.0-times deeper than 405 nm CW laser in chicken and beef, respectively. CONCLUSIONS: The results demonstrate the higher penetration depths of high frequency PW laser compared to low frequency PW laser, CW laser of the same wavelength and CW laser with half the wavelength. The results indicate that integrating SHG in the PDT process along with pulsed NIR light may allow the treatment of 6-7 times bigger tumours than conventional PDT using blue light.
Animals;Cattle;Chickens;Equipment Design;Humans;Infrared Rays;Lasers;Low-Level Light Therapy

Cost-effectiveness of photobiomodulation therapy for the prevention and management of cancer treatment toxicities: a systematic review. PURPOSE: To identify and summarize the evidence on the cost-effectiveness of photobiomodulation (PBM) therapy for the prevention and treatment of cancer treatment-related toxicities. METHODS: This systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA) and Meta-analysis Of Observational Studies in Epidemiology (MOOSE). Scopus, MEDLINE/PubMed, and Embase were searched electronically. RESULTS: A total of 1490 studies were identified, and after a two-step review, 4 articles met the inclusion criteria. The included studies analyzed the cost-effectiveness of PBM therapy used in the context of lymphedema for breast cancer and oral mucositis (OM) induced by chemotherapy and radiotherapy. Better outcomes were associated with PBM therapy. The incremental cost-effectiveness ratio ranged from 3050.75 USD to 5592.10 USD per grade 3-4 OM case prevented. PBM therapy cost 21.47 USD per percentage point reduction in lymphedema in comparison with 80.51 USD for manual lymph drainage and physical therapy. CONCLUSION: There is limited evidence that PBM therapy is cost-effective in the prevention and treatment of specific cancer treatment-related toxicities, namely, OM and breast cancer-related lymphedema. Studies may have underreported the benefits due to a lack of a comprehensive cost evaluation. This suggests a

wider acceptance of PBM therapy at cancer treatment centers, which has thus far been limited by the number of robust clinical studies that demonstrate cost-effectiveness for the prevention and treatment of toxicities. Cost-Benefit Analysis;Humans;Low-Level Light Therapy;Neoplasms

Relationship between salivary alpha-amylase activity and pain relief scale score after low level laser therapy: a prospective interventional pilot study. Salivary alpha-Amylases Humans;Low-Level Light Therapy;Pain;Pilot Projects;Prospective Studies;Saliva;Salivary alpha-Amylases

Bone repair assessment of critical size defects in rats treated with mineralized bovine bone (Bio-OssÂ®) and photobiomodulation therapy: a histomorphometric and immunohistochemical study. This study aimed to investigate the effects of administering photobiomodulation therapy (PBM) with bovine bone matrix on critical size defects in rats. Seventy-two adult male rats (albinus, Wistar), 90Â days old, were used. Defect of 5Â mm in diameter was made in their calvaria. The animals were divided into 4 groups: C-blood clot, B-Bio-OssÂ®, L-PBM, B+L-Bio-OssÂ®+PBM. Each group has been subdivided into 07, 30, and 60Â days of observation. For PBM, a low GaAlAs energy of 660Â nm was irradiated, total energy density of 45Â J/cm(2) . PBM was conducted in a trans-surgical form once only. For immunohistochemistry, a semi-quantitative analysis was made of expression of osteoprotegerin (OPG), nuclear kappa B-factor ligand receptor activator (RANKL), and tartrate-resistant acid phosphatase (TRAP). All histomorphometric data were statistically analyzed by ANOVA and Tukey test, significance level of 5%. The groups that showed the highest proportion of neoformation were L (0.39%â€‰Â±â€‰0.13) and C (0.37%â€‰Â±â€‰0.97), but groups B and B+L had larger defect size (C-1.75Â mm(2)Â Â±â€‰0.40, B-3.02Â mm(2)Â Â±â€‰0.63, L-2.45Â mm(2)Â Â±â€‰0.53, B+L-3.23Â mm(2)Â Â±â€‰1.01). In immunohistochemistry, groups B and B+L had higher immunostaining scores for OPG and RANKL at 60Â days, and TRAP immunostaining increased in all groups at 30Â days, but group L was the only one to present specimens with score 0. Although, at 60Â days, groups L and C presented the highest proportion of bone neoformation, at 30Â days group B+L had more than twice as much bone neoformation as group B, the choice of treatment application should depend on the aim of the treatment. Bio-Oss;Minerals;Osteoprotegerin Animals;Cattle;Low-Level Light Therapy;Male;Minerals;Osteoprotegerin;Rats;Rats, Wistar;Skull

Effects of intravenous and transdermal photobiomodulation on the postoperative complications of coronary artery bypass grafting surgery: a randomized, controlled clinical trial. Although coronary artery bypass graft (CABG) surgery is one of the most worldwide commonly performed cardiac surgeries to enhance myocardial perfusion in high-grade myocardial occlusion, it remains a high-risk procedure. Photobiomodulation (PBM) is one of the methods which have been shown to have positive effects on the healing process after CABG and postoperative complications. The aim of this study was to evaluate the efficacy of PBM in patients who underwent a coronary artery bypass graft (CABG). Ths study was conducted with 192 volunteers who electively submitted to CABG. The volunteers were randomly allocated into two groups: laser-treated (transdermal: 980Â nm, 200Â mW, continuous, average energy fluency of 6Â J/cm(2) and intravenous: 405Â nm, 1.5Â mW, continuous for 30Â min) and standard treatment and control group (standard treatment only). Intravenous laser was illuminated the day before the surgery, immediately after transferring the patient to CCU post-operation and IV laser in addition to transdermal laser was applied every day after surgery for 6Â days. A total of 170 out of 192 participants completed the study, 82 (48.2%) in the PBM group and 88 (51.8%) in the control group. Level of LDH and CPK was significantly lower in the PBM group ($P < 0.05$) in the 4th day postoperatively. The PBM group also showed significantly lower post-surgery complications, including pericardial effusion, ejection fraction, pathologic ST changes, pathologic Q, rehospitalization, heart failure, and mediastinitis ($P < 0.05$). Likewise, the VAS

pain score after surgery was significantly lower in patients in the laser group (P < 0.05). PBM seems a promising, safe, cost-benefit therapeutic modality to reduce postoperative complications of CABG. Trial registration number: IRCT2016052926069N4 . Coronary Artery Bypass;Heart Failure;Humans;Postoperative Complications;Treatment Outcome;Wound Healing

Combination Tripeptide/Hexapeptide Serum with 1540 nm Nonablative Fractional Laser for the Treatment of Striae Distensae: A Pilot Study. Striae distensae (SD) are associated with negative psychosocial effects. Improvements have been shown with non-ablative fractional lasers (NAFL). Topical peptides have also been effective in cutaneous rejuvenation; however, no studies have examined combination therapy for striae. Our study evaluated the efficacy and safety of a peri-procedural tripeptide/hexapeptide serum as an adjunct to 1540 nm NAFL for the treatment of SD in 10 patients. All patients reported subjective improvement. The addition of tripeptide/hexapep-tide serum increased the objective improvement, reduced the incidence of post-inflammatory hyperpigmentation, and increased patient satisfaction. Dermatologic Agents;Oligopeptides;glycyl-histidyl-lysine;acetyl-glutamyl-glutamyl-methionyl-glutaminyl-arginyl-argininamide Adult;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Low-Level Light Therapy;Male;Oligopeptides;Patient Satisfaction;Pilot Projects;Striae Distensae;Treatment Outcome

Correction to: MicroRNA-193 Pro-Proliferation Effects for Bone Mesenchymal Stem Cells After Low-Level Laser Irradiation Treatment Through Inhibitor of Growth Family, Member by Wang J, et al. Stem Cells Dev 2011;21;13;2508-2519 DOI:10.1089/scd.2011.0695.

Evaluation of the Significance of Constant Laser Therapy, 532 nm, in Various Exposure Times on the Healing Process of Wounds Infected by Acinetobacter baumannii. Many considerable investigations focused on the stimulation of therapeutic manners of infected injuries in mice. The exaggerated pathogens that induced wounds were gram-positive like staphylococcal and gram-negative, for example, Pseudomonas aeuroginosa and Acinetobacter baumannii. Acinetobacter can generate a scale range of an infection that may be received in a hospital or any wellness concern facility. In order to know the significance of laser 532 nm with a constant irradiance at various exposure times on the healing process of wounds infected by Acinetobacter baumannii, this study was performed on the BALB/C mice. An elliptical full-thickness skin injury was made on the backside of 45 adult female (BALB/C) mice. Injuries were affected via Acinetobacter baumannii and were randomly assigned into 3 groups. Semiconductor diode continuous wave laser, Î» = 532 nm, with output power 40 mW was used. The power density was 5.71 mW/cm(2), while the fluencies were 1.7 J/cm(2) and 5.14 J/cm(2). Fifteen mice were classified according to the times of irradiation. The first group was infected and presented as control, without irradiation. The second group was infected and irradiated for 5 minutes. The third group, likewise, was infected but irradiated for 15 minutes. All groups were subdivided according to the following period, 3, 5, and 10 days, after irradiation and the animals were killed after the treatment. Wound healing was made by measuring the rate of wound closure and histopathological evaluation. The study determined that 532 nm laser therapy had an obvious and positive influence on the healing of infected wounds with fluence (5.14 J/cm(2)). Female;Mice;Animals;Acinetobacter baumannii;Mice, Inbred BALB C;Wound Healing;Low-Level Light Therapy;Wound Infection;Laser Therapy

Association of photobiomodulation therapy (PBMT) and exercises programs in pain and functional capacity of patients with knee osteoarthritis (KOA): a systematic review of randomized trials. Knee osteoarthritis (KOA) is a common degenerative disease in which several treatments and treatment associations have been investigated. This review analyzed the efficacy of the association of photobiomodulation therapy (PBMT) and exercises for people with KOA in randomized controlled clinical trials. PubMed, Scopus, and EMBASE databases were searched using the following terms:

"knee osteoarthritis," "laser," "low-level laser," "photobiomodulation," "phototherapy," and "exercise." Seven RCT studies involving humans that examined PBMT treatment in association with were found. Most studies used mainly near-infrared PBMT irradiation, with a fluence ranging from 610Â mJ/cm(2) to 200Â J/cm(2), 23.55Â J to 2400Â J total energy per knee, and number of treatment sessions from 10 to 24. In addition, all the protocols included exercises to increase lower limb muscle strength that were performed alone or in association with other types of exercises. However, only 2 studies, considered as a high quality, showed the additional effect of PBMT (lower doses) on an exercise program (involving warming-up, motor learning, balance coordination and strengthening exercises, and stretching) for improvement of pain and functional capacity in people with KOA. This review demonstrates that there is a controversy on the effects PBMT associated with exercises for pain and functional capacity improvement for people with KOA, because there is a heterogeneity between studies in related to PBMT parameters, as dose, number of therapy sessions and the type of PBMT (either LLLT and HILT), and the exercise protocols proposed. Exercise Therapy;Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Pain;Randomized Controlled Trials as Topic

670 nm photobiomodulation improves the mitochondrial redox state of diabetic wounds. BACKGROUND: Photobiomodulation (PBM) by far-red (FR) to near-infrared (NIR) light has been demonstrated to accelerate diabetic wound healing in preclinical and clinical studies. Mitochondrial dysfunction and oxidative stress play key roles in impaired diabetic wound healing, and the effect of PBM on the metabolic state of diabetic wounds remains to be elucidated. METHODS: In this study, a custom-designed in vivo fluorescence imaging technique was used to quantitatively assess the effect of FR-PBM on the mitochondrial bioenergetics of diabetic wounds. The intrinsic fluorescence of two mitochondrial co-enzymes, nicotinamide adenine dinucleotide (NADH) and oxidized flavin adenine dinucleotide (FAD), was monitored to quantify the redox ratio (RR) (NADH/FAD) of wounds over time. RESULTS: Using an excisional model of wound healing, we demonstrated that 670 nm (FR) PBM improved mitochondrial bioenergetics and stimulated the rate of wound healing in diabetic db/db mice. Wound closure and the RR of diabetic wounds in response to 670 nm PBM (4.5 J/cm(2), 60 mW/cm(2) for 90 s per day, 5 days/week) were compared to the sham-treated group. At day 9 of post-wounding, we observed a 43% decrease in the wound area and a 75% increase in RR in FR-treated diabetic mice compared to sham-treated diabetic mice. CONCLUSIONS: We conclude that the increase in mitochondrial RR and the related decrease in oxidative stress may be an important factor in FR-PBM mediated acceleration of wound healing in diabetic mice.

Effects of prenatal photobiomodulation treatment on neonatal hypoxic ischemia in rat offspring. Neonatal hypoxic-ischemic (HI) injury is a severe complication often leading to neonatal death and long-term neurobehavioral deficits in children. Currently, the only treatment option available for neonatal HI injury is therapeutic hypothermia. However, the necessary specialized equipment, possible adverse side effects, and limited effectiveness of this therapy creates an urgent need for the development of new HI treatment methods. Photobiomodulation (PBM) has been shown to be neuroprotective against multiple brain disorders in animal models, as well as limited human studies. However, the effects of PBM treatment on neonatal HI injury remain unclear. Methods: Two-minutes PBM (808 nm continuous wave laser, 8 mW/cm(2) on neonatal brain) was applied three times weekly on the abdomen of pregnant rats from gestation day 1 (GD1) to GD21. After neonatal right common carotid artery ligation, cortex- and hippocampus-related behavioral deficits due to HI insult were measured using a battery of behavioral tests. The effects of HI insult and PBM pretreatment on infarct size; synaptic, dendritic, and white matter damage; neuronal degeneration; apoptosis; mitochondrial function; mitochondrial fragmentation; oxidative stress; and gliosis were then assessed. Results: Prenatal PBM treatment significantly improved the survival rate of neonatal rats

and decreased infarct size after HI insult. Behavioral tests revealed that prenatal PBM treatment significantly alleviated cortex-related motor deficits and hippocampus-related memory and learning dysfunction. In addition, mitochondrial function and integrity were protected in HI animals treated with PBM. Additional studies revealed that prenatal PBM treatment significantly alleviated HI-induced neuroinflammation, oxidative stress, and myeloid cell/astrocyte activation. Conclusion: Prenatal PBM treatment exerts neuroprotective effects on neonatal HI rats. Underlying mechanisms for this neuroprotection may include preservation of mitochondrial function, reduction of inflammation, and decreased oxidative stress. Our findings support the possible use of PBM treatment in high-risk pregnancies to alleviate or prevent HI-induced brain injury in the perinatal period. Neuroprotective Agents Animals;Animals, Newborn;Apoptosis;Astrocytes;Cerebral Cortex;Disease Models, Animal;Female;Hippocampus;Hypoxia;Hypoxia-Ischemia, Brain;Ischemia;Low-Level Light Therapy;Male;Mitochondria;Neurons;Neuroprotective Agents;Oxidative Stress;Pregnancy;Rats;Rats, Sprague-Dawley

Tumor cell-activated "Sustainable ROS Generator" with homogeneous intratumoral distribution property for improved anti-tumor therapy. Photodynamic therapy (PDT) holds a number of advantages for tumor therapy. However, its therapeutic efficiency is limited by non-sustainable reactive oxygen species (ROS) generation and heterogeneous distribution of photosensitizer (PS) in tumor. Herein, a "Sustainable ROS Generator" (SRG) is developed for efficient antitumor therapy. Methods: SRG was prepared by encapsulating small-sized Mn(3)O(4)-Ce6 nanoparticles (MC) into dendritic mesoporous silica nanoparticles (DMSNs) and then enveloped with hyaluronic acid (HA). Due to the high concentration of HAase in tumor tissue, the small-sized MC could be released from DMSNs and homogeneously distributed in whole tumor. Then, the released MC would be uptaken by tumor cells and degraded by high levels of intracellular glutathione (GSH), disrupting intracellular redox homeostasis. More importantly, the released Ce6 could efficiently generate singlet oxygen ((1)O(2)) under laser irradiation until the tissue oxygen was exhausted, and the manganese ion (Mn(2+)) generated by degraded MC would then convert the low toxic by-product (H(2)O(2)) of PDT to the most harmful ROS (Â·OH) for sustainable and recyclable ROS generation. Results: MC could be homogeneously distributed in whole tumor and significantly reduced the level of intracellular GSH. At 2 h after PDT, obvious intracellular ROS production was still observed. Moreover, during oxygen recovery in tumor tissue, Â·OH could be continuously produced, and the nanosystem could induce 82% of cell death comparing with 30% of cell death induced by free Ce6. For in vivo PDT, SRG achieved a complete inhibition on tumor growth. Conclusion: Based on these findings, we conclude that the designed SRG could induce sustainable ROS generation, homogeneous intratumoral distribution and intracellular redox homeostasis disruption, presenting an efficient strategy for enhanced ROS-mediated anti-tumor therapy. Chlorophyllides;Drug Carriers;Manganese Compounds;Oxides;Porphyrins;Radiation-Sensitizing Agents;Reactive Oxygen Species;Singlet Oxygen;Hydroxyl Radical;phytochlorin;manganese oxide;Silicon Dioxide;Hyaluronic Acid;Hydrogen Peroxide;Glutathione;Glutathione Disulfide Animals;Apoptosis;Breast Neoplasms;Cell Line, Tumor;Chlorophyllides;Drug Carriers;Glutathione;Glutathione Disulfide;Humans;Hyaluronic Acid;Hydrogen Peroxide;Hydroxyl Radical;Low-Level Light Therapy;Manganese Compounds;Mice;Nanoparticles;Oxides;Photochemotherapy;Porphyrins;Radiation-Sensitizing Agents;Reactive Oxygen Species;Silicon Dioxide;Singlet Oxygen;Tissue Distribution

Near Infrared (NIR) Light Therapy of Eye Diseases: A Review. Near infrared (NIR) light therapy, or photobiomodulation therapy (PBMT), has gained persistent worldwide attention in recent years as a new novel scientific approach for therapeutic applications in ophthalmology. This ongoing therapeutic adoption of NIR therapy is largely propelled by significant advances in the fields of photobiology and bioenergetics, such as the discovery of photoneuromodulation by cytochrome c

oxidase and the elucidation of therapeutic biochemical processes. Upon transcranial delivery, NIR light has been shown to significantly increase cytochrome oxidase and superoxide dismutase activities which suggests its role in inducing metabolic and antioxidant beneficial effects. Furthermore, NIR light may also boost cerebral blood flow and cognitive functions in humans without adverse effects. In this review, we highlight the value of NIR therapy as a novel paradigm for treatment of visual and neurological conditions, and provide scientific evidence to support the use of NIR therapy with emphasis on molecular and cellular mechanisms in eye diseases. Superoxide Dismutase;Electron Transport Complex IV Apoptosis;Electron Transport Complex IV;Eye Diseases;Humans;Low-Level Light Therapy;Mitochondria;Photoreceptor Cells, Vertebrate;Superoxide Dismutase;Treatment Outcome

Photobiomodulation and diffusing optical fiber on spinal cord's impact on nerve cells from normal spinal cord tissue in piglets. Experts have proven that photobiological regulation therapy for spinal cord injury promotes the spinal repair following injury. The traditional irradiation therapy mode is indirect (percutaneous irradiation), which could significantly lower the effective use of light energy. In earlier studies, we developed an implantable optical fiber that one can embed above the spinal cord lamina, and the light directly is cast onto the surface of the spinal cord in a way that can dramatically improve energy use. Nonetheless, it remains to be seen whether near-infrared light diffused by embedded optical fiber can have side effects on the surrounding nerve cells. Given this, we implanted optical fiber on the lamina of a normal spinal cord to observe the structural integrity of the tissue using morphological staining; we also used immunohistochemistry to detect inflammatory factors. Considering the existing studies, we meant to determine that the light energy diffused by embedded optical fiber has no side effect on the normal tissue. The results of this study will lay a foundation for the clinical application of the treatment of spinal cord injury by near-infrared light irradiation. Animals;Neurons;Optical Fibers;Spinal Cord;Spinal Cord Injuries;Swine

Effect of low power lasers on prokaryotic and eukaryotic cells under different stress condition: a review of the literature. Radiations emitted by low power radiation sources have been applied for therapeutic proposals due to their capacity of inactivating bacteria and cancer cells in photodynamic therapy and stimulating tissue cells in photobiomodulation. Exposure to these radiations could increase cell proliferation in bacterial cultures under stressful conditions. Cells in infected or not infected tissue injuries are also under stressful conditions and photobiomodulation-induced regenerative effect on tissue injuries could be related to effects on stressed cells. The understanding of the effects on cells under stressful conditions could render therapies based on photobiomodulation more efficient as well as expand them. Thus, the objective of this review was to update the studies reporting photobiomodulation on prokaryotic and eukaryotic cells under stress conditions. Exposure to radiations emitted by low power radiation sources could induce adaptive responses enabling cells to survive in stressful conditions, such as those experienced by bacteria in their host and by eukaryotic cells in injured tissues. Adaptive responses could be the basis for clinical photobiomodulation applications, either considering their contraindication for treatment of infected injuries or indication for treatment of injuries, inflammatory process resolution, or tissue regeneration. Bacteria;Eukaryotic Cells;Humans;Low-Level Light Therapy;Stress, Physiological

Photobiomodulation for the management of hair loss. Photobiomodulation, otherwise known as low-level laser (or light) therapy, is an emerging modality for the management of hair loss. Several randomized trials have demonstrated that it is safe and potentially effective on its own or in combination with standard therapies. These devices come in many forms including wearable caps or helmets that afford hands-free and discreet use. Models with light-emitting diodes (LEDs) are less expensive compared to laser-based devices and do not require laser safety considerations, thus

facilitating ease of home use. Limitations include cost of the unit, risk of information bias, and lack of standardized protocols. Finally, as with any hair loss treatment, patients' expectations with regards to therapeutic outcomes must be managed. Alopecia;Humans;Low-Level Light Therapy
Effects of Low-Level Laser Therapy as a Therapeutic Strategy for Patients With Tinnitus: A Systematic Review. Purpose This systematic review aimed to analyze the effects of low-level laser therapy (LLLT) on the severity of tinnitus when compared to no therapy or other modalities of therapies. Method A systematic review protocol was registered at the International Prospective Register of Systematic Reviews (PROSPERO) under the Registration Number CRD42019119376. A search was performed in each of the following databases: EMBASE, LILACS, PubMed, Science Direct, Scopus, Web of Science, Google Scholar, and ProQuest. The inclusion criteria consisted of studies in adults over 16 years of age, randomized clinical trials in which subjects presented chronic (â‰¥ 6 months) and subjective tinnitus (unilateral or bilateral) as well as with or without bilateral sensorineural hearing loss, and studies that used only LLLT for treatment of tinnitus compared to no-therapy group or other modalities of therapy. No language or time restrictions were stipulated. The references were managed by Endnote Web and Rayyan QCRI. Results After the screening process, seven studies remained that attained the eligibility criteria. Regarding the risk of bias, only one study was categorized as low risk of bias; the six remaining studies were classified as moderate risk of bias. The seven included studies mainly assessed the LLLT effects on tinnitus by Visual Analogue Scale, Tinnitus Handicap Inventory, pitch and loudness matching, minimum masking level, and pure-tone audiometry. All the seven selected studies found different degrees of significant results regarding tinnitus severity; however, there was no consensus among the results. Conclusion Even though the LLLT showed positive effects in the tinnitus severity in some studies, it is not possible yet to make any recommendation over its uses for the treatment of tinnitus severity. Adult;Humans;Infant;Audiometry, Pure-Tone;Low-Level Light Therapy;Research Design;Tinnitus
Effect of photobiomodulation therapy on inflammatory cytokines in healing dynamics of diabetic wounds: a systematic review of preclinical studies. CONTEXT: Delayed wound healing in diabetes mellitus (DM) is due to the overlapping phases of the healing process. The prolonged inflammation and altered levels of inflammatory cytokines lead to deformed cell proliferation. Photobiomodulation alleviates the expression of inflammatory cytokines and promotes tissue repair, thereby restoring the wound healing process. OBJECTIVE: To find out the effect of photobiomodulation therapy (PBMT) in the healing dynamics of diabetic wounds with particular emphasis on interleukin-6, interleukin-1Î², and tumour necrosis factor-Î±. METHODS: Scientific databases searched using keywords of the population: DM, intervention: PBMT, and outcomes: inflammatory cytokines. RESULTS: We have included five preclinical studies in the present systematic review for qualitative analysis. These studies evaluated the effect of PBMT at different wavelengths, dosage, and time on wound healing in DM. CONCLUSIONS: The systematic review concludes that PBMT regulates inflammatory cytokines levels, enhances cell proliferation, and migration, thereby improving the wound healing properties. Cytokines Rats;Animals;Humans;Cytokines;Rats, Wistar;Low-Level Light Therapy;Wound Healing;Inflammation;Diabetes Mellitus
Association between type of phototherapy management and hospital and patient-related outcomes in neonates with non-haemolytic jaundice at an Australian community hospital. AIM: To evaluate the associations between type of light-emitting diode phototherapy intervention and hospital and patient related outcomes in term neonates with non-haemolytic jaundice. METHODS: A retrospective observational study in a community hospital within a disadvantaged area in Australia was conducted. Data was extracted from hospital systems and medical records regarding the use of three types of phototherapy surface-area exposure for term neonates â‰¤28â€‰days with non-haemolytic neonatal jaundice. Associations between type of phototherapy management and length of stay (LOS),

rate of serum bilirubin (SBR) decline and duration of phototherapy were estimated using the general linear mixed model or linear regression. RESULTS: Of 102 neonates diagnosed with non-haemolytic jaundice between 1 June 2016 and 31 August 2017, 82 were included in final analyses. Neonates treated for jaundice during their first (birth) admission had a median LOS of 118â€‰h for single-sided and 125â€‰h for maximal double-sided phototherapy. Differences by phototherapy type were not statistically significant (PÂ =â€‰0.06). SBR rate of decline increased as surface-area of phototherapy increased (PÂ <â€‰0.001) with the fastest decline seen in maximal double-sided phototherapy. Estimated duration of phototherapy did not vary by phototherapy type but did vary by age at initiation of phototherapy (PÂ =â€‰0.006), with 16 fewer hours of phototherapy if commenced at â‰¥72 to <96â€‰h versus â‰¥24 to 48â€‰h of age (difference -16.4Â h, 95% confidence interval -29.1 to -3.7Â h). CONCLUSIONS: LOS and phototherapy duration were not associated with phototherapy type. Older neonates with neonatal jaundice required shorter phototherapy duration. Double-sided phototherapy was associated with faster reduction in SBR.
Australia;Hospitals, Community;Humans;Infant, Newborn;Jaundice;Jaundice, Neonatal;Phototherapy

Light-based treatment of pediatric port-wine birthmarks. Port-wine birthmarks (PWBs) are progressive vascular malformations with significant disfigurement and psychosocial morbidity; early light-based treatment has shown improved outcomes in the pediatric population. Somatic mosaic mutations underly the progressive nature of PWBs and explain the significant differences in response and heterogeneity of vessel architecture in the pediatric population when compared to the adult cohort. Here, we summarize a review of pediatric specific literature on the various light-based treatment modalities, including pulsed dye laser, near-infrared lasers, and intense pulsed light, providing the various indications, tips, advantages, and disadvantages for the pediatric dermatologist.
Adult;Child;Cohort Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Treatment Outcome

Dental infection associated with exuberant gingival necrosis in a patient with paroxysmal nocturnal hemoglobinuria: A case report. Paroxysmal nocturnal hemoglobinuria (PNH) is a hematological disorder that affects hematopoietic stem cells. An association with other hematological diseases, such as hemolytic anemia and neutropenia, is observed with a high occurrence of aplastic anemia. The aim of the present study is to report a case of dental infection in a patient with PNH exhibiting exuberant gingival involvement. A 45-year-old male patient sought the Federal University of Ceara reporting severe toothache associated with tooth 24. Clinical examination revealed that the tooth was associated with an apparent fistula and a yellowish lesion with smooth surface located in the palate. The patient had interrupted the medication to control PNH. Blood transfusion was requested due to deficient hematological parameters. Tooth extraction and excisional biopsy were performed under antibiotic coverage. In the postoperative period, low-level laser therapy (LLLT) was performed. Histopathological examination revealed connective tissue showing extensive necrotic areas, accumulation of basophilic material, numerous cyst-like cavities, and degenerated cells. Histopathological findings were compatible with the initial clinical diagnosis of gingival necrosis. The patient evolved with febrile neutropenia, requiring hospitalization for 1 month. Improvement in the overall health was observed after the administration of antibiotics, eculizumab, and weekly LLLT at the biopsy site. Anemia, Aplastic;Diagnosis, Oral;Hemoglobinuria, Paroxysmal;Humans;Male;Middle Aged;Necrosis

ET-(B) receptors involvement in peripheral opioid analgesia induced by light-emitting diode photobiomodulation in male and female mice. Currently, photobiomodulation therapy (PBMT) is gaining space in the scientific and clinical environment. To help elucidate the importance of irradiance, this study evaluated the effect of two different PBMT irradiances (3.5 and 90Â mW/cm(2)), given a fixed wavelength of 630Â nm and a dose of 2Â J/cm(2), on mechanical

hyperalgesia following Complete Freund's Adjuvant (CFA) intraplantar (i.pl.) injection in mice. Additionally, we investigated the role of peripheral opioid and endothelin-B receptors (ET(B)-R), as well as sex differences in treatment outcome. Different groups of male or female mice were evaluated 6 and 96Â h after CFA. Mechanical hyperalgesia was evaluated 30Â min after treatments. Naloxone or Bq-788 administration, fifteen minutes before PBMT or Sarafotoxin S6c, helped determine the involvement of peripheral opioid and ET(B)-Rs on PBMT. Lastly, ET(B)-Rs skin immunocontent in both sexes was quantified after PBMT consecutive daily treatments. PBMT at an irradiance of 90Â mW/cm(2), was more effective than 3.5Â mW/cm(2). Bq-788 and naloxone administration prevented the effects of PBMT and SRTX S6c; however, PBMT did not influence peripheral ET(B)-Rs immunocontent. The results suggest that irradiance influences PMBT effect; and that activation of ET(B)-R play a role in peripheral PBMT opioid induced analgesia. Lastly, PMBT effects do not appear to be sex-dependent. Analgesics, Opioid;Oligopeptides;Piperidines;Receptor, Endothelin B;Viper Venoms;sarafotoxins s6;Naloxone;BQ 788 Analgesics, Opioid;Animals;Dose-Response Relationship, Radiation;Female;Hyperalgesia;Low-Level Light Therapy;Male;Mice;Naloxone;Oligopeptides;Piperidines;Radiation Exposure;Receptor, Endothelin B;Sex Factors;Time Factors;Viper Venoms

RETRACTED: Does Low-Level Laser Photobiomodulation Improve Neurosensory Recovery After Orthognathic Surgery? A Clinical Trial With Blink Reflex. This article has been retracted: please see Elsevier Policy on Article Withdrawal (http://www.elsevier.com/locate/withdrawalpolicy). This article has been retracted at the request of the Editor-in-Chief. The article includes material that had already appeared in de Oliveira RF, da Silva AC, Simoes A, Youssef MN, de Freitas PM. Laser Therapy in the Treatment of Paresthesia: A Retrospective Study of 125 Clinical Cases. Photomed Laser Surg. 2015 Aug; 33(8)415-23. doi: 10.1089/pho.2015.38888. PMID:26226172 in the journal Photomedicine and Laser Surgery by Mary Ann Liebert Publishing. Any re-use of any material should be appropriately cited and published with permission of any relevant copyright owner. As such this article represents a misuse of the scientific publishing system. Apologies are offered to readers of the journal that this was not detected during the submission process. Adolescent;Adult;Blinking;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Mandibular Nerve;Orthognathic Surgery;Orthognathic Surgical Procedures;Trigeminal Nerve Injuries;Young Adult

Platelet-rich plasma in alopecia areata: intradermal injection versus topical application with transepidermal delivery via either fractional carbon dioxide laser or microneedling. INTRODUCTION: Alopecia areata (AA) is a common cause of non-scarring alopecia with variable response to treatment. Platelet-rich plasma (PRP) stimulates proliferation and differentiation of stem cells in the hair-follicle bulge via multiple mechanisms. Although beneficial, pain during injection in addition to unequal delivery and coverage is a major drawback of intralesional PRP in alopecia, particularly for extensive lesions and in patients with a low pain threshold. This study evaluates intradermal injection of PRP versus its topical use with enhanced transepidermal delivery through either fractional CO2 laser (FCL) or microneedling in treatment of AA. METHODS: Sixty AA patients were randomized into three equal groups to receive monthly sessions of either PRP intradermal injection, FCL followed by topical PRP, or microneedling followed by topical PRP for 3 consecutive months. Assessment was done through the Severity of Alopecia Tool (SALT) score and patient satisfaction at the end of sessions (2 weeks after the last session) and after 3 additional months of follow-up. RESULTS: Patients in all groups showed satisfactory results of PRP treatment, with statistically insignificant differences in the degree of improvement among patients of the three groups studied according to the two assessment parameters. Intralesional PRP injection was

associated with significantly higher pain scores. CONCLUSIONS: PRP is potentially effective and safe for treatment of AA. FCL and microneedling could facilitate topical PRP delivery and considerably decrease pain associated with intradermal injection while preserving PRP efficacy. These methods could be helpful for extensive lesions and in children. Dermatologic Agents Alopecia Areata;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Platelet-Rich Plasma;Treatment Outcome

Near-infrared photoimmunotherapy (NIR-PIT) on cholangiocarcinoma using a novel catheter device with light emitting diodes. Near-infrared photoimmunotherapy (NIR-PIT) is a novel therapy for cancers that uses NIR light and antibody-photosensitizer (IR700) conjugates. However, it is difficult to deliver NIR light into the bile duct for cholangiocarcinoma (CCA) from the conventional extracorporeal apparatus. Thus, in this study, we developed a dedicated catheter with light emitting diodes (LEDs) that supersedes conventional external irradiation devices; we investigated the therapeutic effect of NIR-PIT for CCA using the novel catheter. The new catheter was designed to be placed in the bile duct and a temperature sensor was attached to the tip of the catheter to avoid thermal burn. An anti-epidermal growth factor receptor (EGFR) antibody, Panitumumab-IR700 conjugate or anti-human epidermal growth factor receptor type 2 (HER2) antibody, Trastuzumab-IR700 conjugate, was used with EGFR- or HER2-expressing cell lines, respectively. The in vitro efficacy of NIR-PIT was confirmed in cultured cells; the capability of the new catheter for NIR-PIT was then tested in a mouse tumor model. NIR-PIT via the developed catheter treated CCA xenografts in mice. NIR-PIT had an effect in Panitumumab-IR700 conjugate- and Trastuzumab-IR700 conjugate-treated CCA cells that depended on the receptor expression level. Tumor growth was significantly suppressed in mice treated with NIR-PIT using the novel catheter compared with controls (PÂ <Â .01). NIR-PIT was an effective treatment for EGFR- and HER2-expressing CCA cells, and the novel catheter with mounted LEDs was useful for NIR-PIT of CCA. Photosensitizing Agents;Panitumumab;Trastuzumab Animals;Bile Duct Neoplasms;Catheters;Cell Line, Tumor;Cholangiocarcinoma;Female;Humans;Immunotherapy;Infrared Rays;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Mice, Nude;Panitumumab;Photosensitizing Agents;Trastuzumab;Xenograft Model Antitumor Assays

The Effects of Whole-Body Photobiomodulation Light-Bed Therapy on Creatine Kinase and Salivary Interleukin-6 in a Sample of Trained Males: A Randomized, Crossover Study. Photobiomodulation therapy (PBMT) can be applied to the whole body as compared to the application of using single hand-held devices that isolate a smaller muscle area. The purpose of this study was to examine the effects of an acute dose of whole-body PBMT pre- and post-high-intensity resistance training on creatine kinase (CK) and salivary interleukin-6 (IL-6) in a sample of trained males. Twelve males (31 Â± 8.3 years, 177.2 Â± 5.4 cm, and 86.0 Â± 7.5 kg) were part of a randomized, counterbalanced, cross-over design, whereby each participant performed a high-intensity resistance training session that consisted of the bench press, chin-up, and repeated sprints on two separate occasions. Each participant was assigned to either the PBMT or control condition on two separate weeks, with a 10-days washout period between the weeks. Creatine kinase was measured at baseline, 24, 48, and 72 h post-exercise. Salivary IL-6 was measured at baseline, 60, 90, and 120 min. A paired t-test showed no significant difference ($p = 0.669$) in the area under the curve (AUC) for CK during the PBMT (191.7 Â± 48.3) and control conditions (200.2 Â± 68.0). A Wilcoxon signed-rank test also showed no significant median difference ($p = 0.155$) in the AUC for salivary IL-6 during the PBMT (Mdn = 347.7) and control conditions (Mdn = 305.8). An additional Wilcoxon signed-rank test for CK percentage change from 24 to 72 h showed the PBMT condition (Mdn = -45%) to have a -18% median difference as compared to the control condition (Mdn = -41%). As such, whole-

body PBMT does not significantly reduce the activity of salivary IL-6 or CK concentration during the 24 to 72-h recovery post-high-intensity resistance training.

A Review of Biological Interventions in Chronic Aphasia. Aphasia is a common and debilitating condition following stroke. While the gold standard for aphasia treatment is behavioral speech-language therapy, benefits remain modest in chronic stages of recovery. This limitation motivates the pursuit of novel interventions for chronic aphasia. Here, we review biological approaches that have been used (or proposed for use, in the case of regenerative and genetic therapies) to treat chronic aphasia. These techniques aim to ameliorate the deficits of aphasia by directly manipulating brain function, rather than training lost or compensatory functions, although many have been used to augment effects of behavioral therapy. Specifically, we explore the most robust designs of transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), and pharmacotherapy that have been applied in chronic (â‰¥6 months) post-stroke aphasia. We also consider less investigated approaches including epidural cortical stimulation and photobiomodulation. All methods are currently in nascent phases and restricted to experimental studies and clinical trials. Although the evidence base remains limited, such interventions may ultimately improve language function and quality of life for those living with chronic aphasia. However, it is crucial that application of these methods consider the effects of concomitant speech-language therapy, as biological interventions combined with behaviorally induced experience-dependent plasticity will likely yield the most beneficial and durable outcomes.

Unilateral transcranial photobiomodulation for opioid addiction in a clinical practice: A clinical overview and case series. INTRODUCTION: Opioid Use Disorders (OUD) cause great disfunction and pain to individuals, families, and societies. There are few good treatments. This paper presents a novel, easily applied, painless, therapy that can be applied as an adjunct to psychotherapies and medications. METHODS: The author presents a retrospective overview and 4 brief case reports. Two are typical of very positively responsive patients, one is of a positively but not remarkably responsive patient, and one of a non-responsive patient. The author used unilateral transcranial photobiomodulation (UtPBM), near infrared mode, applied to the hemisphere with the more positive hemispheric emotional valence (HEV) as a treatment to augment the patients' usual treatment. RESULTS: The case reports are from 42 consecutive patients in his practice with OUD where he has given 382 treatments over 18 months, as needed. The author's subjective clinical observations were that of the 42 patients, 26 (62%) consistently had responses to the UtPBM (as described in the case reports) that were easily observable to the patient and the author as strikingly beneficial, 8 (19%) had helpful, but not remarkable responses, and 8 (19%) had no noticeable response. These 3 characterizations will be illustrated with clinical examples. There were no side-effects reported or observed aside from 2 women who experienced anxiety which resolved with psychotherapy. CONCLUSIONS: Using UtPBM as an adjunctive treatment to the author's usual in-depth psychotherapy and medication management, he found subjectively that for the majority of his patients, this treatment was a valuable, safe benefit to their treatment for OUD. Female;Humans;Male;Opioid-Related Disorders;Pain;Psychotherapy;Retrospective Studies

Photobiomodulation therapy reduces postoperative pain after third molar extractions: A randomized clinical trial. BACKGROUND: To assess the efficacy of PBMT on reducing postoperative pain scores in patients submitted to third molar extractions. MATERIAL AND METHODS: A randomized controlled trial (ReBEC:RBR-94BCKZ) was designed according to the SPIRIT and followed the CONSORT. Patients were randomly allocated according to control or PBMT groups. PBMT consisted of the application of GaAlAs laser (808nm;50mW) applied in six points (1.23 min;11 J/cm2) after extraction. Pain scores were assessed using the Visual Analogue Scale (VAS) in millimeters evaluated after 6 (T6), 24 (T24), and 48 (T48) hours. The Wilcoxon Mann-Whitney test was used to check for

possible associations between VAS scores and treatment groups. RESULTS: A total of 101 third molar extractions were performed in 44 patients. The mean age was 28 years old(SDÂ±11.54). Comparing control and intervention, PBMT group showed a significant effect on the reduction of postoperative pain at T6(mean VAS=0.9; C.I:0.63-1.16) compared to control (mean VAS=2.5;C.I:2.1-2.88)(p<0.001). The same statistically significant effect on the reduction of postoperative pain was observed at T24 (PBMT mean VAS=0.72;C.I:0.51-0.93; control mean VAS=2.86;C.I:2.40-3.31;p<0.001) and T48 (PBMT mean VAS=0.64;C.I:0.36-0.92; control mean VAS=2.86;C.I:2.37-3.34;p<0.001). CONCLUSIONS: PBMT significantly reduce the postoperative pain scores when assessed 6, 24, and 48 hours after third molar extractions. Adult;Humans;Low-Level Light Therapy;Molar, Third;Pain Measurement;Pain, Postoperative;Tooth Extraction

Photobiomodulation effects on active brain networks during a spatial memory task. Photobiomodulation (PBM) or the use of red to near-infrared irradiation spectrum, is a non-invasive intervention that produces neurostimulatory effects and reaches benefits in several pathologies as well as in healthy subjects. The main objective of this study was to evaluate and compare the effects of PBM in a rat brain network on basal state and functional activity during the execution of a reversal task. Twenty-eight rats were divided into four groups: control group (nÂ =Â 7), control photobiomodulation group (nÂ =Â 8), behavioural group (nÂ =Â 6) and behavioural photobiomodulation group (nÂ =Â 7). Reversal memory was assessed using a Morris water maze and cytochrome c oxidase (CCO) was used as a brain metabolic activity marker. After five days of PBM, the control photobiomodulation group showed a decrease of CCO levels in the striatum, medial septum, entorhinal, hippocampus, amygdala, thalamus, mammillary nuclei and VTA. Both behavioural groups performed the task correctly, however, the behavioural photobiomodulation group displayed CCO reduction in some regions involved in the execution of the reversal task: septum, entorhinal, CA1, CA3, central amygdala and supramammilar, along with higher levels in accumbens. These results could show the effect of PBM on active brain networks. Further studies will be necessary to elucidate its effects in different brain networks that are involved in the execution of other memory tasks. Animals;Brain;Hippocampus;Maze Learning;Rats;Rats, Wistar;Spatial Memory

Evaluation of the Preventive Effect of Photobiomodulation on Orofacial Discomfort in Dental Procedures: A Randomized-Controlled, Crossover Study and Clinical Trial. Background: Orofacial pain has been a prevalent symptom in the worldwide population, which may cause restrictions in daily activities and, consequently, have a great impact on the well-being of affected individuals. Photobiomodulation using light sources, such as low-level laser or light emitting diodes, with different wavelengths, has been widely used in the last years, in addition to being a noninvasive, low-cost resource and reducing pain. Objective: This study aimed at evaluating the effect of photobiomodulation as a protocol treatment to prevent facial muscle discomfort after long-term clinical procedures. Methods: The volunteers were randomized and allocated as follows: laser (nâ€‰=â€‰16) and placebo (nâ€‰=â€‰16) groups, following a crossover study design. The laser parameters were as following: 786â€‰nm wavelength, 9â€‰J per point, and 100â€‰mW power of 2.393 W/cm(2) irradiance. The discomfort was induced by simulating a 50-min dental procedure (with bilateral mouth open), and the pain scale (assessed bilaterally), tiredness, and temperature measurement through thermography were used for analysis. Results: The results showed a significant lower pain and tiredness in the laser group. Also, the results showed a statistically significant valid temperature change between the groups at times: T1, T40, and T50. Conclusions: According to our results, photobiomodulation showed a positive effect on the face musculature in patients submitted to the treatments, reducing pain and improving the subjective perception of exertion. Cross-Over Studies;Facial Pain;Humans;Low-Level Light Therapy;Pain Measurement

Photobiomodulation suppresses JNK3 by activation of ERK/MKP7 to attenuate AMPA receptor endocytosis in Alzheimer's disease. Alzheimer's disease (AD), a severe age-related neurodegenerative disorder, lacks effective therapeutic methods at present. Physical approaches such as gamma frequency light flicker that can effectively reduce amyloid load have been reported recently. Our previous research showed that a physical method named photobiomodulation (PBM) therapy rescues AÎ²-induced dendritic atrophy in vitro. However, it remains to be further investigated the mechanism by which PBM affects AD-related multiple pathological features to improve learning and memory deficits. Here, we found that PBM attenuated AÎ²-induced synaptic dysfunction and neuronal death through MKP7-dependent suppression of JNK3, a brain-specific JNK isoform related to neurodegeneration. The results showed PBM-attenuated amyloid load, AMPA receptor endocytosis, dendrite injury, and inflammatory responses, thereby rescuing memory deficits in APP/PS1 mice. We noted JNK3 phosphorylation was dramatically decreased after PBM treatment in vivo and in vitro. Mechanistically, PBM activated ERK, which subsequently phosphorylated and stabilized MKP7, resulting in JNK3 inactivation. Furthermore, activation of ERK/MKP7 signaling by PBM increased the level of AMPA receptor subunit GluR 1 phosphorylation and attenuated AMPA receptor endocytosis in an AD pathological model. Collectively, these data demonstrated that PBM has potential therapeutic value in reducing multiple pathological features associated with AD, which is achieved by regulating JNK3, thus providing a noninvasive, and drug-free therapeutic strategy to impede AD progression. Receptors, AMPA;Mitogen-Activated Protein Kinase 10 Alzheimer Disease;Animals;Disease Models, Animal;Endocytosis;Humans;Low-Level Light Therapy;Male;Mice;Mitogen-Activated Protein Kinase 10;Receptors, AMPA

Comparative analysis of the light parameters of red and near-infrared diode lasers to induce photobiomodulation on fibroblasts and keratinocytes: An in vitro study. BACKGROUND: Photobiomodulation (PBM) depends on the use of non-ionizing light energy to trigger photochemical changes, particularly in light-sensitive mitochondrial structures. It triggers proliferation and the metabolic activity of the cells, primarily by utilizing the energy from the near-infrared to the red wavelength of the light. PURPOSE: This in vitro study has analyzed comparatively the most appropriate energy doses and wavelengths to induce PBM on keratinocytes and fibroblasts for the accelerated wound healing process. METHODS: 1, 3, and 5Â J/cm(2) energy densities of 655 and 808-nm diode lasers were used to promote cell proliferation and wound healing process. Scratch assay and MTT analysis were performed on keratinocytes and fibroblasts for wound closure and cell proliferation after the triple light applications, respectively. RESULTS: 655-nm of wavelength was more successful on keratinocytes to induce wound healing and cell proliferation, whereas 808-nm of wavelength was so effective on fibroblasts to heal the wounds totally and it induced cell proliferation almost 3 times compared to the untreated control group. CONCLUSION: This study revealed that PBM with 655 and 808Â nm of wavelengths was effective to speed up the wound healing process at specific energy densities. In general 808-nm of wavelength was more successful. However, the proper wavelength and the energy density may differ according to the cell type. Thus, every light parameter should be chosen properly to obtain better outcomes during PBM applications. Fibroblasts;Keratinocytes;Lasers, Semiconductor;Low-Level Light Therapy;Wound Healing

Acute Photobiomodulation Effects Through a Cluster Device on Skeletal Muscle Fatigue of Biceps Brachii in Young and Healthy Males: A Randomized Double-Blind Session. Objective: The aim of this study was to investigate and compare the acute effects of red and infrared photobiomodulation (PBM) using a cluster device on biceps brachii muscle fatigue in young and healthy males. Background: Vigorous physical activity could lead to muscle fatigue, which compromises motor control and muscle strength and consequently impairs performance. The positive effects of PBM in reducing fatigue onset have been highlighted. However, the better wavelength with cluster devices is

not yet established. Methods: A randomized double-blind session was used. Thirty-two young and healthy males were randomized into the control group (CG), red PBM group (RPG), and infrared PBM group (IPG). A PBM cluster device [7 visible diodes (630â€‰nm), 7 infrared diodes (850â€‰nm), 100â€‰mW/diode, 2 W/cm(2) power density, 91â€‰J/cm(2) energy density, 4â€‰J per point, 28â€‰J total energy, and 40â€‰sec] was applied after muscle fatigue. Muscle fatigue was analyzed by surface electromyography (EMG) recorded from the long head of biceps brachii, blood lactate concentration, and evaluation of the rate of perceived exertion (RPE) using the Borg Scale. The fatigue protocol consisted of a maximum voluntary isotonic contraction of elbow flexion-extension with 75% of one-repetition maximum until exhaustion. The Borg Scale was applied before and at the end of the experiment to measure the RPE. The electromyography fatigue index (EMGFI) was calculated by windows of median frequency from EMG data. Results: EMGFI, blood lactate concentration, and RPE showed no intergroup statistical difference, except the EMGFI delta value that showed a difference between IPG and CG, with a greater value in the CG. However, intragroup comparisons showed that EMGFI decreased in the CG and RPE and lactate concentration increased significantly in all groups. Conclusions: There was no difference between red and infrared PBM in reduction of biceps brachii fatigue. However, the EMGFI delta value was greater in the IPG compared with the CG, suggesting that infrared can be more effective in reducing biceps brachii fatigue. Electromyography;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle Strength;Muscle, Skeletal

Photobiomodulation Before Eccentric Fatigue Protocol in the Control of Pain and Muscle Damage Markers: A Double-Blind, Randomized Controlled Study. Background: Several strategies are used in the management of delayed-onset muscle soreness (DOMS), but there is not always evidence to justify its use. Photobiomodulation (PBM) is a noninvasive means, with promising previous results of its use in this outcome. Objective: This study aimed to identify the effects of PBM in the femoral quadriceps region to reduce DOMS in men undergoing a fatigue protocol. Methods: This is a double-blind, randomized controlled study. The sample consisted of 35 physically active men. The volunteers were divided into two groups: pre-fatigue PBM [Group 1 (G1)] and post-fatigue PMB [Group 2 (G2)]. The fatigue test was conducted at the same time of day. Given this was a crossover study of volunteers, we used at least a 1-week washout to avoid any residual interference from the previous intervention. PBM (active/placebo) was performed 5â€‰min before the start of the fatigue protocol in G1 and immediately after the fatigue protocol in G2. PBM was applied at six points on the femoral quadriceps muscle (cluster laser/light emitting diodes 13, 415â€‰mW, 30.2â€‰J per point, 73â€‰sec per application, and total dose of 181.2â€‰J). In the data analysis, the primary endpoint was DOMS measured using a Numerical Pain Scale, and the secondary outcome was examined on the effects of PMB muscle damage, muscle contraction, and isometric horizontal jump. Results: There were significant differences to PBM compared with the placebo group for DOMS, with no differences between the times of application. For muscle damage, there was significant difference (pâ€‰>â€‰0.05) when PBM was applied in pre-fatigue. G1 led to an increase of 14.9% in the creatine kinase level when active since the application of placebo PBM increased by 65% (pâ€‰=â€‰0.04). Conclusions: The PBM applied before eccentric fatigue protocol showed no significant results on DOMS, although there was a positive effect to control muscle damage. Brazilian Registry of Clinical Trials (RBR-7qhddz). Cross-Over Studies;Fatigue;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Pain;Randomized Controlled Trials as Topic

Full Body Photobiomodulation Therapy to Induce Faster Muscle Recovery in Water Polo Athletes: Preliminary Results. Objective: To investigate the recovery of male water polo athletes applying full body photobiomodulation therapy (PBMT) regarding inflammation and muscle damage markers, testosterone and cortisol hormonal responses, heart rate variability (HRV), maximal voluntary

contraction, and squat jump (SJ) after official water polo matches. Background: PBMT has been applied locally on specific muscle groups to induce faster recovery and improve the performance of athletes and nonathletes. However, many sports modalities require movement of the whole body, and a full body PBMT could be more adequate to irradiate large muscle areas homogeneously and faster. Methods: In a randomized, parallel, and double-blinded design, 13 athletes (whole team) aged 18 years attended the study and were allocated into two groups: PBMT (dose of 6.9â€‰J/cm(2), irradiance of 46.17â€‰mW/cm(2), 5â€‰min irradiation) and placebo treatment. The study was conducted during the 2019 Brazilian under 20 water polo championship. All athletes were assessed by blood samples and neuromuscular evaluation. Immediately after each match, all athletes received PBMT (effective or placebo). Results: No significant interactions (raw values and percentage related to baseline) were observed for testosterone and cortisol, tumor necrosis factor-alpha, interleukin-6, creatine kinase concentration, maximal isometric voluntary contraction, SJ test, and HRV. Only an isolated interaction (decrease) was found for lactate dehydrogenase (LDH) response after the first match (pâ€‰=â€‰0.004, post-hoc pâ€‰=â€‰0.038). Conclusions: The parameters of the full body PBMT of this study did not induce faster recovery of inflammatory, muscle damage (excepting LDH), testosterone, cortisol, HRV, and neuromuscular responses during repeated days of water polo matches. Athletes;Double-Blind Method;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Water Sports

Effect of Photobiomodulation in Lipopolysaccharide-Treated Myoblasts. Objective: To evaluate the effect of photobiomodulation (PBM) on cell viability, synthesis of nitric oxide (NO), and interleukin (IL)-6 inflammatory cytokine production in myoblasts cultured in the presence of lipopolysaccharides (LPSs). Methods: C2C12 myoblasts were treated with LPS and PBM using different parameters (wavelength: 780â€‰nm; beam spot: 0.04â€‰cm(2); power output: 10 or 40â€‰mW; energy density: 5 or 20â€‰J/cm(2); and 20-sec exposure time). Nonirradiated cells were used to the control group. Results: An increase in cell viability was found in both LPS groups in comparison with the control. PBM with the higher power output (40â€‰mW) induced a reduction in cell viability. PBM also modulated the synthesis of NO in the myoblasts, but did not alter the expression of IL-6. Conclusions: Based on these findings, PBM is capable of modulating the cell viability and the production of NO in LPS-treated myoblasts and it is, therefore, a possible tool for the treatment of muscle injury caused by infection. Lipopolysaccharides Cell Survival;Gene Expression;Lipopolysaccharides;Low-Level Light Therapy;Myoblasts

Effectiveness of low-level laser therapy on recovery from neurosensory disturbance after sagittal split ramusÂ osteotomy: a systematic review and meta-analysis. BACKGROUND: Orthognathic surgery such as bilateral sagittal split ramusÂ osteotomy (BSSRO) for the treatment of mandibular deformities is one of the most common procedures in maxillofacial operations that may lead to neurosensory disturbance. In this study, we aimed to evaluate the effectiveness of low-level laser therapy (LLLT) on augmenting recovery of neurosensory disturbance of inferior alveolar nerve (IAN) in patients who underwent BSSRO surgery. METHODS: A comprehensive literature search was conducted by two independent authors in PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, Embase, and Google Scholar electronic databases. Besides, a manual search of all textbooks and relevant articles were conducted. Searches took place in August 2020 and were limited to published and peer-reviewed articles from 2000 to 2020. All analysis was performed using the comprehensive meta-analysis (CMA) and the STATA MP (version:16) software. The weighted mean difference (WMD) using the inverse variance method and the standard mean difference (SMD) was considered for continuous variables. RESULTS: Seventy-four papers were retrieved after removing duplicate studies and finally, eight studies were assessed for qualitative synthesis and five for meta-analysis. Totally, 94 patients were included in the meta-analysis. Based on the meta-analysis, it was shown that LLLT was

not effective in a short interval (0 to 48â€‰h) after surgery, but in a period of more than 1â€‰month after surgery, the positive results of treatment can be observed strikingly. Also, LLLT side/group showed no significant difference in some aspects of neurosensory recovery such as thermal sensation compared to the placebo side/group. CONCLUSIONS: The meta-analysis of randomized controlled trials revealed that LLLT generally improves IAN sensory disturbance caused by BSSRO. Further high-quality clinical trials with longer follow-up periods and larger sample sizes are recommended.

Update on dermatologic laser therapy II - advances in photodynamic therapy using laser-assisted drug delivery. Technical advances in recent years have led to the development of new dermatologic laser systems, light sources, and treatment concepts. With the introduction of ablative fractional lasers (using common wavelengths) in the field of dermatology, it is now possible to more effectively and efficiently treat a variety of skin disorders. One important example of these advances is laser-assisted drug delivery (LADD). A type of LADD, laser-assisted photodynamic therapy has been successfully employed in the treatment of non-melanoma skin cancer including field cancerization. This treatment concept has been continually modified and today includes the use of daylight as well as artificial daylight systems. This update is based as cited, shortened and updated according to "Paasch,U. 2019. Laser-assistierte photodynamische Therapie. p. 226-239. In G.Kautz (ed.) Energie fÃ¼r die Haut. Springer Nature, Springer Nature". Pharmaceutical Preparations Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Pharmaceutical Preparations;Photochemotherapy

Comparison of Fractional Micro-Plasma Radiofrequency and Fractional Microneedle Radiofrequency for the Treatment of Atrophic Acne Scars: A Pilot Randomized Split-Face Clinical Study in China. BACKGROUND AND OBJECTIVE: Both fractional micro-plasma radiofrequency (RF) and fractional microneedle RF are novel devices that can be applied for the treatment of atrophic acne scars, and they have both been proved to be effective. To compare the clinical effectiveness and adverse reactions of fractional micro-plasma RF and fractional microneedle RF for the therapy of facial atrophic acne scars in a randomized split-face study. STUDY DESIGN/MATERIALS AND METHODS: Sixty patients with facial atrophic acne scars received three applications at 2-month intervals in a randomized split-face study using fractional micro-plasma RF and fractional microneedle RF on different sides of the face. Three independent dermatologists evaluated the improvement in acne scars using the ECCA grading scale (Echelle d'Evaluation Clinique des Cicatrices d'AcnÃ©) by comparing the digital images and graded the improvement in the acne scars. Patients were asked to provide a self-evaluation of satisfaction for efficacy and safety. Adverse effects were also recorded after each treatment. RESULTS: In total sixty patients completed the entire study. A significant improvement was observed in the appearance of acne scars, and the mean ECCA scores improved significantly after both modalities. The mean decrease in ECCA scores from the baseline was significantly more pronounced in fractional micro-plasma RF as compared with fractional microneedle RF (41.33â€‰Â±â€‰20.19 vs 32.17â€‰Â±â€‰17.35; Pâ€‰<â€‰0.05). The degree of clinical improvement was also significantly better for fractional micro-plasma RF. Pain, erythema, and swelling were observed in all patients after both treatments. The pain was more intense during micro-plasma RF treatment (Pâ€‰=â€‰0.000), and the duration of pain and erythema were longer than with fractional microneedle RF (Pâ€‰=â€‰0.000). Postinflammatory hyperpigmentation (PIH) was observed in one patient on the fractional micro-plasma RF side while no PIH was observed on the fractional microneedle RF side. No infections or worsening of scarring was observed with either treatment. No subject was dissatisfied with the efficacy of either device. Rolling scars tended to respond better to fractional micro-plasma RF treatment compared with fractional microneedle RF (Pâ€‰=â€‰0.000). CONCLUSIONS: Both fractional micro-plasma RF and fractional microneedle RF

are effective and safe methods for improving atrophic acne scars. Fractional micro-plasma RF is significantly more effective for atrophic acne scars, especially for rolling scars. However, fractional microneedle RF has fewer side effects plus shorter downtime, and patients are more comfortable after the treatment. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Acne Vulgaris;Atrophy;Cicatrix;Humans;Low-Level Light Therapy;Pilot Projects;Treatment Outcome

Skin surface infrared thermography in pressure ulcer outcome prognosis. OBJECTIVE: To assess the usefulness of skin surface infrared thermography (SSIT) as a prognostic tool in the treatment of stages III and IV pressure ulcers (PU), with hydrocolloid/hydrogel dressings plus 20 exposures to low-level laser therapy (LLLT), compared with hydrocolloid dressings alone, in a group of long-term bedbound care patients. METHOD: In this comparative study, participants were randomly assigned to group I: PUs treated with specialist wound dressings and laser therapy, or to group II: PUs treated with specialist wound dressings without laser therapy. Thermal imaging sessions were carried out at the beginning of the study, and after two and four weeks of treatment. Thermal imaging processing was applied to compare percentage differences in the temperature distribution between the groups within selected regions of interest (ROIs). The correlation between the temperature distribution and PU healing was evaluated. RESULTS: A total of 43 patients took part. In the study, three variants of PU healing were observed: pure healing (H) with minimal granulation; healing with hypergranulation (H+G); and non-healing (NH). Analyses of SSIT-related thermographic patterns revealed their dependence on the course of healing. The percentage of successful PU healing reached 79.2% in group I compared with 73.7% in group II ($p<0.05$) The dominant variant of healing in Group I was H, while in group II the variants H and H+G were present with equal frequency. CONCLUSION: Thermal imaging processing allowed comparison of differences in the temperature distribution between the groups within ROIs. Application of LLLT significantly improved the healing process ($p<0.05$). The clinical significance of this finding should be confirmed with larger studies; however, SSIT may be useful as a prognostic tool during the treatment of PUs, with the ability to predict the course of healing initially, that is independent of LLLT treatment. Bandages, Hydrocolloid;Humans;Pressure Ulcer;Prognosis;Thermography;Wound Healing

Low-Level Laser Light Therapy Dosage Variables vs Treatment Efficacy of Neuromusculoskeletal Conditions: A Scoping Review. OBJECTIVE: The purpose of this scoping review was to identify and synthesize literature on dosage variables on the efficacy of low-level laser therapy (LLLT) for neuromusculoskeletal conditions. METHODS: A scoping literature review was conducted by searching the following databases: the Cochrane Library, the Cumulative Index to Nursing and Allied Health Literature, Medline, the Physiotherapy Evidence Database, the Index to Chiropractic Literature, manufacturer websites, and online guidelines. The search was modeled after STARLITE criteria. The reporting used Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews (PRISMA-ScR). Articles were included if LLLT was used in any treatment group for a neuromusculoskeletal complaint with dosage and effectiveness reported. This was tabulated by source, dosage variables, conditions, outcome measures, and conclusions. Data were charted in Excel format. Frequency counts were performed on ordinal data. Descriptive statistics were computed for the continuous data. RESULTS: A total of 86 articles were included in the review. They revealed a broad range of musculoskeletal conditions and diverse dosage parameters. Seven individual parameters were found that would alter the dosage. Although duration of application is an independent clinical factor, the negative-outcome studies were inconsistent in duration. There was lack of statistical difference between the studies with improved vs unimproved outcomes. No statistical differences were noted between the dosage parameters and efficacy. CONCLUSION: Although many articles were found on LLLT for neuromusculoskeletal conditions, the studies had amorphous parameters. A heterogeneity of reported doses precluded the synthesis of sufficient

evidence to correlate dosage variables with improved or unimproved outcomes. Therefore, based on the current literature, dosage variables for the efficacy of LLLT for neuromusculoskeletal conditions are uncertain at this time.

The effects of photobiomodulation on human dermal fibroblasts in vitro: A systematic review. Photobiomodulation (PBM) is reported to impart a range of clinical benefits, from the healing of chronic wounds to athletic performance enhancement. The increasing prevalence of this therapy conflicts with the lack of understanding concerning specific cellular mechanisms induced by PBM. Herein, we systematically explore the literature base, specifically related to PBM (within the range 600-1070Â nm) and its influence on dermal fibroblasts. The existing research in this field is appraised through five areas: cellular proliferation and viability; cellular migration; ATP production and mitochondrial membrane potential; cellular protein expression and synthesis; and gene expression. This review demonstrates that when fibroblasts are irradiated in vitro within a set range of intensities, they exhibit a multitude of positive effects related to the wound healing process. However, the development of an optimal in vitro framework is paramount to improve the reliability and validity of research in this field. Proteins Cell Line;Cell Movement;Cell Proliferation;Cell Survival;Fibroblasts;Gene Expression Regulation;Humans;In Vitro Techniques;Low-Level Light Therapy;Proteins;Skin;Wound Healing

The effectiveness of low-level laser therapy combined with facial expression exercises in patients with moderate-to-severe Bell's palsy: A study protocol for a randomised controlled trial. BACKGROUND: Even though corticosteroid therapy and facial expression exercises were found to be effective, still 30% of participants with bell's palsy achieve incomplete recovery from the facial paralysis. The study objective was to evaluate the effectiveness of low-level laser therapy (LLLT) combined with progressive facial expression exercises in participants with moderate to severe bell's palsy. METHODOLOGY: A total of 120 participants with idiopathic bell's palsy to be equally allocated in three groups. LLLT, electrical stimulation and corticosteroid/antiviral therapy will be performed respectively in the group I, group II and Group III and facial expression exercises as a common intervention. First two groups to be treated with respective interventions weekly 3Â days for 6 consecutive weeks and third group will receive prescribed doses of medications and facial expression exercise for 6Â weeks. The functional recovery will be assessed at baseline, 3Â weeks, 6Â weeks, and 12Â weeks using the Facial Disability Index and House-Brackmann Scale. The overall within and between group differences in the clinical outcomes to be reported based on the Friedman Repeated Measures ANOVA and Kruskal-Wallis test. Whereas Wilcoxon Signed Rank and Mann-Whitney-U tests will be performed to report the within and between groups timeline differences. DISCUSSION: Based on the dearth of evidence for the effective treatment of moderate to severe bell's palsy, we framed a most appropriate LLLT dosage along with facial expression exercises. Our study's intervention protocol designed with equal duration and number of interventions for all three groups. Even the comparator groups such as electrical muscle stimulation and Corticosteroids therapy will be receiving similar facial expression exercises. We believe that this intervention protocol would benefit by promoting the complete facial function recovery in patients with moderate to severe bell's palsy. DISSEMINATION: We plan to publish this review in a peer-reviewed journal. We may also present this review at local and/or national conferences.

Differential effects of photobiomodulation interval schedules on brain cytochrome c-oxidase and proto-oncogene expression. Significance: Transcranial photobiomodulation (PBM) is a noninvasive neuromodulation technique capable of producing changes in the mitochondrial cytochrome c-oxidase (CCO) activity of neurons. Although the application of PBM in clinical practice and as a neurophysiological tool is increasing, less is known about how different treatment time intervals may result in different outcomes. Aim: We evaluated the effects of different PBM treatment

intervals on brain metabolic activity through the CCO and proto-oncogene expression (c-Fos). Approach: We studied PBM effects on brain CCO and c-Fos expression in three groups of animals: Control (CN, n =Â 8), long interval PBM treatment (LI, n =Â 5), and short interval PBM treatment (SI, n =Â 5). Results: Increased CCO activity in the LI group, compared to the SI and CN groups, was found in the prefrontal cortices, dorsal and ventral striatum, and hippocampus. Regarding c-Fos expression, we found a significant increase in the SI group compared to LI and CN, whereas LI showed increased c-Fos expression compared to CN in the cingulate and infralimbic cortices. Conclusions: We show the effectiveness of different PBM interval schedules in increasing brain metabolic activity or proto-oncogene expression.

Efficacy of low-level laser therapy combined with exercise for subacromial impingement syndrome: A randomised controlled trial. OBJECTIVE: To investigate the effect of low-level laser therapy (LLLT) combined with exercise on shoulder pain and disability in patients with subacromial impingement syndrome (SIS). DESIGN: Randomised controlled trial. SETTING: Pontifical Catholic University. SUBJECTS: We enrolled 120 subacromial impingement syndrome patients. INTERVENTION: Groups I (nâ€‰=â€‰42), II (nâ€‰=â€‰42) and III (nâ€‰=â€‰36) were treated with Low-level laser therapy and exercise, exercise only and Low-level laser therapy only, respectively. Interventions were conducted three times a week for 8â€‰weeks. MAIN OUTCOME MEASURES: The primary outcome was the change in shoulder pain and disability index (SPADI). Secondary outcomes included changes in the numeric pain rating scale and medication intake. RESULTS: Average ages of patients in groups I, II and III were 51.9â€‰Â±â€‰8.7â€‰years, 56.0â€‰Â±â€‰10.4â€‰years and 54.2â€‰Â±â€‰7.1â€‰years, respectively. Pain scores at baseline (Pâ€‰=â€‰0.829), 2â€‰months (Pâ€‰=â€‰0.057) and 3â€‰months follow-ups (pâ€‰=â€‰0.004) were 6.8 (4.7-7.7), 0.2 (0.0-0.5) and 0.3 (0.0-1.0) for group I; 6.6 (5.7-8.0), 0.5 (0.2-2.0) and 0.2 (0.0-3.3) for group II; and 6.5 (5.1-7.4), 2.4 (0.1-6.7) and 4.0 (2.0-5.0) for group III, respectively. SPADI scores at baseline (Pâ€‰=â€‰0.029), 2â€‰months (Pâ€‰<â€‰0.001) and 3â€‰months follow-ups (Pâ€‰=â€‰0.001) were 60.8 (37.7-70.8), 3.8 (0.0-10.8) and 2.3 (0.8-10.8) for group I; 61.5 (41.5-71.5), 9.2 (3.8-29.2) and 14.2 (1.5-38.0) for the group II; and 73.3 (59.2-80.8), 34.2 (16.9-54.6) and 33.1 (22.3-49.2) for the group III, respectively. CONCLUSION: Low-level laser therapy combined with exercises reduce pain intensity, improve shoulder function and reduces pain intensity and medication intake over 3â€‰months. CLINICAL TRIAL REGISTRATION NUMBER: NCT02725749.
Aged;Combined Modality Therapy;Exercise;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Range of Motion, Articular;Shoulder Impingement Syndrome;Shoulder Pain

Effect of low-level laser therapy on postoperative endodontic pain: An updated systematic review. OBJECTIVE: To evaluate the influence of low-level laser therapy (LLLT) on postoperative pain after endodontic treatment. METHODS: The PICOS strategy was used to identify randomized clinical trials comparing low-level laser therapy and mock laser therapy to manage postoperative pain after endodontic treatment, retreatment, and endodontic surgery. An electronic search was performed in MEDLINE through PubMed, Web of Science, LILACS, Scopus and Cochrane Library, OpenGrey and Google Scholar. Quality assessment was performed using the Cochrane Collaboration's tool for assessing the risk of bias. The quality of evidence was rated on the basis of the GRADE approach. RESULTS: Twelve studies were included in the qualitative synthesis. Within the 12 studies, 7 articles were classified as "low risk of bias," 4 studies were considered "unclear risk of bias" and 1 study was considered "high risk of bias." Six studies evaluated the postoperative pain after primary root canal treatment, two studies after root canal retreatment and four after periapical surgery. Most of the studies reported significantly less postoperative pain after LLLT in different time periods; two studies found no differences. The certainty of evidence was classified as low and very low to treatment / retreatment and endodontic surgery, respectively. CONCLUSIONS: Based on the limited quality

evidence, most of the included studies reported significantly less postoperative pain after LLLT. However, the lack of standardization in laser parameters, use of medications and the certainty of evidence classified as low and very low indicate the need for further studies. Humans;Low-Level Light Therapy;Pain, Postoperative;Root Canal Therapy

The Effect of Laser Photobiomodulation on Periodontal Ligament Stem Cells. Photobiomodulation (PBM) is considered as a noninvasive procedure with the potential of inducing favorable changes in cellular behavior. In this study, we aimed to evaluate the effects of near-infrared low-intensity laser PBM on proliferation, viability and osteogenic differentiation of stem cells isolated from human periodontal ligament. A 940-nm diode laser with an energy density of 4Â JÂ cm(-2) in a 100-mW continuous wave was used for irradiation in 3 sessions every 48h. Cell viability was measured 24, 48 and 72Â h after irradiation. The effects of laser on mineralized tissue deposition were evaluated by using Alizarin red staining after dividing cells into three groups of nonosteogenic medium (C-), an osteogenic medium without laser (C+), and an osteogenic medium with laser irradiation (L+). Gene expression levels were also evaluated by real-time PCR. Our results showed no significant difference between MTT levels of the study and control groups. After 14 and 21Â days, both L+ and C+ groups showed an increase in mineralized tissue formation compared to the C- group. There was an increase in VEGF and BMP expressions compared to C-. In conclusion, the irradiation setting used in this study may be able to improve mineralized tissue deposition. Cell Differentiation;Cell Proliferation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Periodontal Ligament;Stem Cells

Healing Process of Rat Skin Wounds Treated With Vitamin C and Low-Intensity Laser Therapy. INTRODUCTION: This study evaluated, from a histological point of view, the process of repairing skin wounds caused in the dorsal region of rats when subjected to treatment with vitamin C, low-intensity laser, and association of both. METHODS: Forty-eight adult male rats (Rattus norvegicus, albinus, Wistar), weighing between 250 and 300 g were used in this study. The rats were anesthetized with sodium pentobarbital (10 mg/kg) intraperitoneally (IP) and a circular area of â€‹â€‹skin of approximately 8 mm in diameter was removed from the dorsal region of their back by a punch. The animals were randomly divided into four groups of 12 individuals: Group I, control group, was treated with saline solution; Group II was treated with topical application of vitamin C; Group III was treated with low-intensity laser; and Group IV was treated with both low-intensity laser and topical application of vitamin C. Samples were histologically analyzed through optical microscopy with hematoxylin and eosin staining and collagen I and III concentrations were quantified using the picrosirius-hematoxylin histochemical method and further submitted to statistical analysis. RESULTS: Whilst the control and vitamin C groups admittedly showed slight epithelial proliferation at the wound edges, the group irradiated with low-intensity laser and the group treated with both laser and vitamin C had already partially formed epidermis, with a more organized underlying connective tissue and less evident inflammatory process. The group treated with laser alone obtained a higher concentration of type I collagen fibers and the group with the highest amount of type III collagen fibers was the one treated with the association of vitamin C and laser. CONCLUSION: The present findings suggest that in spite of all treatments being effective in the repair of skin wounds compared to the control group, the isolated use of low-intensity therapy laser and its combined use with topical vitamin C showed the most favorable results, indicating that those could be further used for the treatment of skin wounds.

The Molecular Mechanisms of Action of Photobiomodulation Against Neurodegenerative Diseases: A Systematic Review. Neurodegenerative diseases might be slow but relentless, as we continue to fail in treating or delaying their progression. Given the complexity in the pathogenesis of these diseases, a broad-acting approach like photobiomodulation can prove promising.

Photobiomodulation (PBM) uses red and infrared light for therapeutic benefits, working by stimulating growth and proliferation. The implications of photobiomodulation have been studied in several neurodegenerative disease models. It has been shown to improve cell survival, decrease apoptosis, alleviate oxidative stress, suppress inflammation, and rescue mitochondrial function. In in vivo models, it has reportedly preserved motor and cognitive skills. Beyond mitochondrial stimulation, the molecular mechanisms by which photobiomodulation protects against neurodegeneration have not been very well studied. This review has systematically been undertaken to study the effects of photobiomodulation at a molecular level and identify the different biochemical pathways and molecular changes in the process. The data showed the involvement of pathways like extracellular signal-regulated kinase (ERK), mitogen-activated protein kinase (MAPK), and protein kinase B (Akt). In addition, the expression of several genes and proteins playing different roles in the disease mechanisms was found to be influenced by PBM, such as neurotrophic factors and secretases. Studying the literature indicated that PBM can be translated to a potential therapeutic tool, acting through a spectrum of mechanisms that work together to decelerate disease progression in the organism, which is difficult to achieve through pharmacological interventions. Mitogen-Activated Protein Kinases Cell Survival;Humans;Low-Level Light Therapy;Mitochondria;Mitogen-Activated Protein Kinases;Neurodegenerative Diseases

Effect of Photobiomodulation on Relapse in an Experimental Rapid Maxillary Expansion Model in Rat. Rapid maxillary expansion (RME) is performed on transversely deficient maxilla. As all orthodontic treatments, retention is important in maintaining therapeutic outcomes. Fixed /removable retainers are used post-RME causing hygiene and compliance problems. Given photobiomodulation's positive effects on the quantity and quality of bone regeneration, its effect on post-RME relapse was studied. Thirty Sprague Dawley rats were randomly divided into group R, non-irradiated RME-treated (nÂ =Â 12), group P, irradiated RME-treated (nÂ =Â 12) and group C, non-RME non-irradiated (nÂ =Â 6). A 1.5Â mm metal ring inserted between maxillary incisors at days 0 and 15 was expanded until 1.5Â mm space was obtained at day 30. In group P, Ga-Al-As diode laser (810Â nm, 100Â mW, 4J/cm(2) , 30Â secs) was applied on days 0, 2, 4, 6, 8, 10, 12 and 14 as predictor variable. The relapse was measured as the space lost between incisors for 30Â days after appliance removal (primary outcome variable) and compared with t-test. In week 2, space loss in group P was significantly lower (PÂ <Â 0.05) than all other groups. The relapse during weeks 2 and 3 was significantly lower in group P than group R. However, no significant difference in relapse amount was found between groups during first and fourth week. There was a significant difference (PÂ <Â 0.05) between groups in relapse rates (secondary outcome variable) but not in total relapse after 4Â weeks. Photobiomodulation proved beneficial in resisting relapse in our study, and it is suggested to be continued until the end of expansion. Animals;Maxilla;Palatal Expansion Technique;Rats;Rats, Sprague-Dawley;Recurrence

Treatment criteria for infants with hyperbilirubinemia in Japan. With the availability of blue light-emitting diode phototherapy devices capable of delivering high-intensity irradiance, neonatologists in Japan are requesting revisions of the 1992 Kobe University treatment criteria for hyperbilirubinemia using total serum/plasma bilirubin (TB) and serum unbound bilirubin (UB) threshold values, especially for indications for exchange transfusion (ET). Retrospective data analysis of 1,184 infants born between January 2012 and November 2014 when the 1992 criteria were followed, we applied revised criteria proposed in 2017 to these infants to assess consequent changes in treatment recommendations. We found that the estimated number of infants with ET indications decreases from 48 to 20, with intensive phototherapy recommended for the remaining 28. Also, the estimated number of infants with phototherapy indications decreases from 446 to 195. We conclude that use of the revised criteria will lead to judicious use and reduction of phototherapy and ET in infants with

hyperbilirubinemia. Bilirubin Bilirubin;Exchange Transfusion, Whole Blood;Humans;Hyperbilirubinemia, Neonatal;Infant;Infant, Newborn;Japan;Retrospective Studies
Experimental Study on Blue Light Interaction with Human Keloid-Derived Fibroblasts. Keloids are an exuberant response to wound healing, characterized by an exaggerated synthesis of collagen, probably due to the increase of fibroblasts activity and to the reduction of their apoptosis rate: currently no standard treatments or pharmacological therapies are able to prevent keloid recurrence. To reach this goal, in recent years some physical treatments have been proposed, and among them the PhotoBioModulation therapy (PBM). This work analyses the effects of a blue LED light irradiation (410-430 nm, 0.69 W/cm(2) power density) on human fibroblasts, isolated from both keloids and perilesional tissues. Different light doses (3.43-6.87-13.7-20.6-30.9 and 41.2 J/cm(2)) were tested. Biochemical assays and specific staining were used to assess cell metabolism, proliferation and viability. Micro-Raman spectroscopy was used to explore direct effects of the blue LED light on the Cytochrome C (Cyt C) oxidase. We also investigated the effects of the irradiation on ionic membrane currents by patch-clamp recordings. Our results showed that the blue LED light can modulate cell metabolism and proliferation, with a dose-dependent behavior and that these effects persist at least till 48 h after treatment. Furthermore, we demonstrated that the highest fluence value can reduce cell viability 24 h after irradiation in keloid-derived fibroblasts, while the same effect is observed 48 h after treatment in perilesional fibroblasts. Electrophysiological recordings showed that the medium dose (20.6 J/cm(2)) of blue LED light induces an enhancement of voltage-dependent outward currents elicited by a depolarizing ramp protocol. Overall, these data demonstrate the potentials that PBM shows as an innovative and minimally-invasive approach in the management of hypertrophic scars and keloids, in association with current treatments.
Effects of photobiomodulation on auriculotherapy points for sleep disorders, anxiety, and temporomandibular dysfunctions. OBJECTIVE: The purpose of this study was to evaluatephotobiomodulation applied at auriculotherapy points forsleep disorder (SD) and anxiety related to temporomandibulardysfunction (TMD). METHODS: The study consisted of two groups of 20 participants: Auriculotherapy group (A) and Control Group(C). The participants responded to the RDC/TMD, Fletcher & Luckett questionnaires, and the Beck Anxiety Inventory to analyze TMD, SD, and anxiety before and after the treatment. RESULTS: The participants presented scores corresponding to mild to moderateanxiety (MDN = 17; CI = [13.16;22.31]) and after treatment, normalor non-existent anxiety (MDN = 9; CI = [8.76; 17.12]) ($p = 0.005$). There was no significant difference ($p > 0.05$) between the controland 20 auriculotherapy groups for TMD and SD. DISCUSSION: The results suggest that auriculotherapy was effective in the treatment of anxiety. However, it did not prove effective with the results of the SD and symptoms of TMD. Humans;Temporomandibular Joint Disorders;Anxiety;Anxiety Disorders;Auriculotherapy;Sleep Wake Disorders;Sleep
Effects of arthrocentesis and low-level laser therapy on patients with osteoarthritis of the temporomandibular joint. This retrospective study examined whether arthrocentesis combined with 10 sessions of low-level laser therapy (LLLT) improved the clinical outcomes of patients with temporomandibular joint osteoarthritis (TMJ-OA) compared with arthrocentesis alone. Data from two groups of patients (total: n=36) with unilateral TMJ-OA were evaluated. The groups were established according to their treatment regimens: Group 1 (arthrocentesis alone; n=19) and Group 2 (arthrocentesis plus LLLT; n=17). All patients had been diagnosed in accordance with the Research Diagnostic Criteria for Temporomandibular Joint Disorders (RDC/TMD) (Axis I Group IIIb) protocol. They all underwent the same arthrocentesis protocol, but those in Group 2 also received 10 sessions of LLLT immediately afterwards. The outcome variables were the visual analogue scale scores (VAS 1, VAS 2) for various treatment outcomes and millimetric measurements of mandibular movements

over both the short and long term. Intra-group comparisons showed significant short and long-term improvements for both groups, but outcomes were better over the long term than the short term in both. In addition, greater improvements in muscle palpation scores and mandibular movements were achieved in Group 2 than in Group 1. In conclusion, although both techniques improved joint pain and function, a combination with LLLT seemed to have an additional benefit for myofascial components. Arthrocentesis;Humans;Injections, Intra-Articular;Low-Level Light Therapy;Osteoarthritis;Range of Motion, Articular;Retrospective Studies;Temporomandibular Joint;Treatment Outcome

Red and near-infrared light evokes Ca(2+) influx, endoplasmic reticulum release and membrane depolarization in neurons and cancer cells. Low level light therapy uses light of specific wavelengths in red and near-infrared spectral range to treat various pathological conditions. This light is able to modulate biochemical cascade reactions in cells that can have important health implications. In this study, the effect of low intensity light at 650, 808 and 1064Â nm on neurons and two types of cancer cells (neuroblastoma and HeLa) is reported, with focus on the photoinduced change of intracellular level of Ca(2+) ions and corresponding signaling pathways. The obtained results show that 650 and 808Â nm light promotes intracellular Ca(2+) elevation regardless of cell type, but with different dynamics due to the specificities of Ca(2+) regulation in neurons and cancer cells. Two origins responsible for Ca(2+) elevation are determined to be: influx of exogenous Ca(2+) ions into cells and Ca(2+) release from endoplasmic reticulum. Our investigation of the related cellular processes shows that light-induced membrane depolarization is distinctly involved in the mechanism of Ca(2+) influx. Ca(2+) release from endoplasmic reticulum activated by reactive oxygen species generation is considered as a possible light-dependent signaling pathway. In contrast to the irradiation with 650 and 808Â nm light, no effects are observed under 1064Â nm irradiation. We believe that the obtained insights are of high significance and can be useful for the development of drug-free phototherapy. Fluorescent Dyes;Reactive Oxygen Species;Calcium Calcium;Calcium Signaling;Cell Membrane;Electrophysiology;Endoplasmic Reticulum;Fluorescent Dyes;HeLa Cells;Humans;Infrared Rays;Low-Level Light Therapy;Neurons;Optical Imaging;Reactive Oxygen Species

Efficacy of Low-Level Laser Therapy for Tinnitus: A Systematic Review with Meta-Analysis and Trial Sequential Analysis. STUDY OBJECTIVE: Tinnitus is a common disorder characterized by sound in the ear in the absence of external or internal stimuli. Low-level laser therapy (LLLT) was discovered enhancing tissue repair via increasing the blood microcirculation and cell proliferation in 1960s. In the last two decades, LLLT delivered to the cochlea has frequently been used to reduce the severity of tinnitus. However, whether LLLT effectively attenuates the severity of tinnitus remains controversial. We aimed to evaluate the efficacy of low-level laser therapy on adult patients with complaints of tinnitus. DESIGN: Systematic review and meta-analysis with trial sequential analysis. INTERVENTIONS: Low-level laser therapy (LLLT). MEASUREMENTS: Tinnitus Handicap Inventory (THI) score; improvement rates of the visual analog scale (VAS), verbal rating scale (VRS) and numeric rating scale (NRS) scores. METHODS: We searched PubMed, Embase, Scopus, Web of Science, and the Cochrane Library from inception through 17 September 2020. Randomized control trials that involved adult patients with complaints of tinnitus, compared LLLT to a placebo and provided sufficient information for meta-analysis were considered eligible. MAIN RESULTS: Overall, 11 studies involving 670 patients were included. No significant difference in the overall effect according to the THI score (mean difference (MD), -2.85; 95% CI, -8.99 to 3.28; p = 0.362; I(2) = 0%) and the rating scale score improvement rate (risk ratio (RR), 1.35; 95% CI, 0.81 to 2.27; p = 0.250; I(2) = 67%) was demonstrated between patients receiving LLLT and those receiving a placebo. None of the subgroup analyses showed significant differences, regardless of underlying sensorineural hearing loss, the number of irradiation sessions or the wavelength used. CONCLUSIONS: Our meta-analysis suggests that the

value of LLLT in controlling the severity of tinnitus remains unclear, in part due to the relatively small number of patients and underlying heterogeneity. More large-scale investigations of LLLT for tinnitus related to inner ear disease are required to further elucidate the therapeutic effects.

Immunomodulatory effects of Nd:YAG (1064 nm) and diode laser (810 nm) wavelengths to LPS-challenged human gingival fibroblasts. OBJECTIVE: Human gingival fibroblasts (hGFs) are involved in inflammatory responses to bacteria by recognizing pathogen-associated molecular patterns. In search of host modulation strategies to increase LPS tolerance, Low level laser therapy (LLLT) has been suggested as an alternative treatment that reduces periodontal tissue inflammation. In this study, we investigate whether 810 nm (diode) and 1064 nm (Nd:YAG) laser wavelengths, modulate pro-inflammatory responses to LPS challenges in hGFs. DESIGN: Primary hGFs were challenged with Porphyromonas gingivalis LPS and irradiated with either Diode (810 nm) or with Nd:YAG (1064 nm) lasers. Cell cultures were examined for cell proliferation by MTT assay and IL-6 and IL-8 expression by qPCR at 24, 48 and 72 h. IL-6 and IL-8 protein levels were detected via ELISA. RESULTS: NaÃ¯ve hGF populations irradiated with both Diode 810 nm and Nd:YAG 1064 nm lasers demonstrated cellular proliferation ($p < 0.05$), but LLLT did not affect cellular viability in LPS-challenged cells. IL-6 and IL-8 gene expression levels revealed significant anti-inflammatory effects of irradiation with both examined wavelengths on hGFs challenged with P. gingivalis LPS. Protein levels of these cytokines were increased by LPS challenge. Treatment with LLLT inhibited this increase for both wavelengths evaluated in the study at a statistically significant level particularly for the first 48 h. CONCLUSIONS: The present study demonstrates a modulatory effect of LLLT using both 810 nm diode and Nd:YAG 1064 nm lasers in gingival fibroblasts by decreasing the production of IL-6, IL-8 in response to LPS. Lipopolysaccharides Cells, Cultured;Fibroblasts;Gingiva;Humans;Immunomodulation;Lasers, Semiconductor;Lipopolysaccharides;Porphyromonas gingivalis

Phototherapy Improves Muscle Recovery and Does Not Impair Repeated Bout Effect in Plyometric Exercise. Padoin, S, Zeffa, AC, Molina CorrÃªa, JC, de Angelis, TR, Moreira, TB, Barazetti, LK, and de Paula Ramos, S. Phototherapy improves muscle recovery and does not impair repeated bout effect in plyometric exercise. J Strength Cond Res 36(12): 3301-3310, 2022-The effects of photobiomodulation with red (630 nm) and near-infrared (940 nm) light wavelengths were investigated on the inhibition of exercise-induced muscle damage (EIMD) and adaptation to the repeated bout effect (RBE). Twenty-eight healthy men were randomized to receive light-emitting diode therapy (LEDT) at 630 nm (4.6 JÂ·cm -2 , 97 J energy), LEDT at 940 nm (4.6 JÂ·cm -2 , 114 J), or placebo. After LEDT or placebo treatment, subjects performed 100 drop-jumps (5 sets of 20 repetitions). Creatine kinase, delayed-onset muscle soreness (DOMS), countermovement jump (CMJ), and squat jump (SJ) were assessed before, immediately after, and 24, 48, and 72 hours after the bout. After 14 days, the subjects were submitted to the same plyometric exercise, without LEDT, and were evaluated again. Creatine kinase levels increased significantly 72 hours after the first bout in the placebo group in relation to the LEDT 940-nm group ($P < 0.01$). The LEDT 630-nm group showed a significant increase in SJ at 24 hours ($P < 0.05$), whereas, at 48 hours, the LEDT 940 nm showed a significant increase compared with the placebo group ($P < 0.05$). The 2-way analysis of variance revealed an effect for treatment in the SJ ($F = 7.12$; $P = 0.001$). No differences were found between groups for DOMS and CMJ after the first bout. After the second bout of exercise, there was no effect of treatment. The results suggest that treatment with LEDT 630 nm and LEDT 940 nm before eccentric exercise attenuates EIMD without impairing RBE. Creatine Kinase Male;Humans;Plyometric Exercise;Muscle, Skeletal;Myalgia;Creatine Kinase;Phototherapy

Effects of nitrite and far-red light on coagulation. Nitric oxide, NO, has been explored as a therapeutic agent to treat thrombosis. In particular, NO has potential in treating mechanical device-

associated thrombosis due to its ability to reduce platelet activation and due to the central role of platelet activation and adhesion in device thrombosis. Nitrite is a unique NO donor that reduces platelet activation in that it's activity requires the presence of red blood cells whereas NO activity of other NO donors is blunted by red blood cells. Interestingly, we have previously shown that red blood cell mediated inhibition of platelet activation by adenosine diphosophate (ADP) is dramatically enhanced by illumination with far-red light that is likely due to photolysis of red cell surface bound NO congeners. We now report the effects of nitrite, far-red light, and their combination on several measure of blood coagulation using a variety of agonists. We employed turbidity assays in platelet rich plasma, platelet activation using flow cytometry analysis of a fluorescently labeled antibody to the activated platelet fibrinogen binding site, multiplate impedance-based platelet aggregometry, and assessment of platelet adhesion to collagen coated flow-through microslides. In all cases, the combination of far-red light and nitrite treatment decreased measures of coagulation, but in some cases mono-treatment with nitrite or light alone had no effect. Perhaps most relevant to device thrombosis, we observed that platelet adhesions was inhibited by the combination of nitrite and light treatment while nitrite alone and far-red light alone trended to decrease adhesion, but the results were mixed. These results support the potential of combined far-red light and nitrite treatment for preventing thrombosis in extra-corporeal or shallow-tissue depth devices where the far-red light can penetrate. Such a combined treatment could be advantageous due to the localized treatment afforded by far-red light illumination with minimal systemic effects. Given the role of thrombosis in COVID 19, application to treatment of patients infected with SARS Cov-2 might also be considered.
Nitric Oxide Donors;Nitrites;Nitric Oxide Blood Coagulation;Blood Platelets;COVID-19;Humans;Light;Nitric Oxide;Nitric Oxide Donors;Nitrites;Platelet Activation;Platelet Adhesiveness;Platelet Aggregation;SARS-CoV-2;COVID-19 Drug Treatment

Repair strength and surface topography of lithium disilicate and hybrid resin ceramics with LLLT and photodynamic therapy in comparison to hydrofluoric acid. AIM: The aim was to compare the repair bond strength and surface topography of lithium disilicate ceramics (LDC) and hybrid resin ceramics (HRC) using different surface conditioning treatments [low level laser therapy (LLLT), photodynamic therapy (PDT), hydrofluoric acid (HF) with silane and air abrasion (AA) and silane]. MATERIAL AND METHOD: Sixty specimens each of LDC and HRC were used. Discs were prepared for each group (6â€‰Ã—â€‰2â€‰mm), conditioned using different regimes. Specimens in group 1 and 5 were laser irradiated using Er,Cr:YSGG (ECYL), group 2 and 6 were conditioned using methylene blue photosensitizer (PDT), group 3 and 7 surface was treated with hydrofluoric acid and silane (HFA-S), group 4 and 8 conditioned with Al(2)O(3) air abrasion and silane (AA-S). A Porcelain Repair Kit was used according to manufacturer recommendation in all samples. Peak universal bond adhesive was rubbed on ceramic surface and then bonded with composite resin. For shear bond strength testing the specimens were placed in a universal testing machine. A stereomicroscope at 40x magnification was used to analyse failure pattern. Five specimens in each group after surface treatment were evaluated for surface changes and topography using scanning electron microscopy. The mean repair bond strength was calculated using ANOVA and Tukey's post hoc test at a significance level of (pâ€‰<â€‰0.05). RESULT: The highest repair bond strength was observed in group 3 (LDC) (20.57â€‰Â±â€‰3.58â€‰MPa) (HFA-S), whereas, the lowest score was displayed in Group 2 (LDC) using methylene blue photosensitizer (MBPS) (12.18â€‰Â±â€‰1.08â€‰MPa). Similarly, in HRC the highest repair SBS was presented in group 8 (AA-S) (20.52â€‰Â±â€‰2.51â€‰MPa) and the lowest SBS values were exhibited by PDT treated group 6 (13.22â€‰Â±â€‰0.62â€‰MPa). CONCLUSION: A combination of mechanical and chemical surface treatments should be used in order to achieve adequate repair bond strength between resin composites and ceramic interface of LDC and HRC.
Resin Cements;lithia disilicate;Dental Porcelain;Hydrofluoric Acid Ceramics;Dental

Bonding;Dental Porcelain;Hydrofluoric Acid;Low-Level Light Therapy;Materials Testing;Photochemotherapy;Resin Cements;Shear Strength;Surface Properties

Current application and future directions of photobiomodulation in central nervous diseases. Photobiomodulation using light in the red or near-infrared region is an innovative treatment strategy for a wide range of neurological and psychological conditions. Photobiomodulation can promote neurogenesis and elicit anti-apoptotic, anti-inflammatory and antioxidative responses. Its therapeutic effects have been demonstrated in studies on neurological diseases, peripheral nerve injuries, pain relief and wound healing. We conducted a comprehensive literature review of the application of photobiomodulation in patients with central nervous system diseases in February 2019. The NCBI PubMed database, EMBASE database, Cochrane Library and ScienceDirect database were searched. We reviewed 95 papers and analyzed. Photobiomodulation has wide applicability in the treatment of stroke, traumatic brain injury, Parkinson's disease, Alzheimer's disease, major depressive disorder, and other diseases. Our analysis provides preliminary evidence that PBM is an effective therapeutic tool for the treatment of central nervous system diseases. However, additional studies with adequate sample size are needed to optimize treatment parameters.

A Potential Role for Photobiomodulation Therapy in Disease Treatment and Prevention in the Era of COVID-19. COVID-19 is an evolving pandemic that has far reaching global effects, with a combination of factors that makes the virus difficult to contain. The symptoms of infection can be devastating or at the least very debilitating for vulnerable individuals. It is clear that the elderly are at most risk of the adverse impacts of the virus, including hospitalization and death. Others at risk are those with comorbidities such as cardiovascular disease and metabolic conditions and those with a hyper-excitable immune response. Treatment options for those with acute responses to the virus are limited and there is an urgent need for potential strategies that can mitigate these severe effects. One potential avenue for treatment that has not been explored is the microbiome gut/lung axis. In addition to those severely affected by their acute reaction to the virus, there is also a need for treatment options for those that are slow to recover from the effects of the infection and also those who have been adversely affected by the measures put in place to arrest the spread of the virus. One potential treatment option is photobiomodulation (PBM) therapy. PBM has been shown over many years to be a safe, effective, non-invasive and easily deployed adjunctive treatment option for inflammatory conditions, pain, tissue healing and cellular energy. We have also recently demonstrated the effectiveness of PBM to alter the gut microbiome. PBM therapy is worthy of consideration as a potential treatment for those most vulnerable to COVID-19, such as the elderly and those with comorbidities. The treatment may potentially be advantageous for those infected with the virus, those who have a slow recovery from the effects of the virus and those who have been denied their normal exercise/rehabilitation programs due to the isolation restrictions that have been imposed to control the COVID-19 pandemic.

Effect of light emitting diode photobiomodulation on murine macrophage function after Bothrops envenomation. Several reports have suggested that photobiomodulation, owing to its analgesic, anti-inflammatory, and healing effects, may be an effective therapeutic option for local effects of snakebites when the availability and accessibility of conventional serum therapy are inefficient and far from medical care centers. Although there have been studies that demonstrate the application of photobiomodulation in the treatment of local adverse events due to snakebites from snakes of the genus Bothrops, its role in the activation of leukocytes, particularly macrophages, has not been evaluated. Here, we assessed the effect of light-emitting diode (LED) treatment on macrophage activation induced by B. jararacussu venom (BjV). LED treatment caused an increase in the viability of macrophages incubated with BjV. This treatment reduced reactive oxygen species (ROS) and nitric oxide (NO) production by macrophages after incubation with BjV. However, LED treatment did not

interfere with IL-1Î² and IL-10 production by macrophages after incubation with BjV. In conclusion, this study showed that LED treatment has the potential to be used in combination with conventional serum therapy to prevent or minimize the progression of local to severe symptoms after Bothrops envenomation. Crotalid Venoms;Interleukin-1beta;Reactive Oxygen Species;Superoxides;Interleukin-10;Nitric Oxide Animals;Bothrops;Cell Survival;Crotalid Venoms;Interleukin-10;Interleukin-1beta;Intracellular Space;Low-Level Light Therapy;Macrophages;Male;Mice;Nitric Oxide;Reactive Oxygen Species;Semiconductors;Snake Bites;Superoxides

Can Photons Pass through Primary Coatings Used to Treat Cutaneous Wounds? OBJECTIVE: To determine the transmittance spectrum of primary dressings commonly used in the treatment of cutaneous wounds to verify if there is a real need to remove them during photobiomodulation. METHODS: Spectroscopic analysis was performed on 17 dressings using a spectrophotometer (USB 2000+; OceanOptics, Delray Beach, Florida). A piece of each dressing was inserted into a quartz cuvette; the reflection from the slide walls was corrected for using a 0.9% saline solution to completely fill the cuvette (baseline). The transmittance of each dressing was measured between 350 and 950 nm, and a transmittance table was created based on the main wavelengths used in photobiomodulation. RESULTS: Six dressings (Supriderme, Membracel, Cuticell Contact, UrgoTul, Tegaderm, and Opsite Flexigrid) have a transmittance greater than 50% in most of the spectral range and therefore may remain on wounds during irradiation. CONCLUSIONS: It may not always be necessary to remove a primary dressing when lasers or LED lights are used to treat wounds. It is the authors' hope that the results of this article will increase the effectiveness of both photobiomodulation and primary dressings and reduce patient discomfort as well as the cost of primary dressings via a reduction in unnecessary dressing changes. Absorption, Radiation;Bandages;Low-Level Light Therapy;Materials Testing;Photons;Porosity;Spectrophotometry

Effects of 405-, 532-, 650-, and 940-nm wavelengths of low-level laser therapies on orthodontic tooth movement in rats. BACKGROUND: Investigating the effects of 405-nm, 532-nm, 650-nm, and 950-nm wavelengths of LLLTs (low-level laser therapies) on the orthodontic tooth movement in rats by using histological and immunohistochemical methods. Forty-five Wistar albino rats were randomly divided into 5 groups: control group (positive control: the left maxillary 1st molar side; negative control: the right maxillary 1st molar side), 405â€‰nm LLLT group (Realpoo), 532â€‰nm LLLT group (Realpoo), 650â€‰nm LLLT group (Realpoo), and 940â€‰nm LLLT group (Biolase). The left maxillary 1st molar teeth of all rats were applied mesially 50-g force. Starting from the 1st day, 48â€‰h intervals, LLLT was applied in continuous wave mode and in contact with the tissue. The application area was approximately 1â€‰cm(2). The lasers were performed for 3â€‰min on each surface (buccal, palatal, mesial), totally 9â€‰min (total dose 54â€‰J/cm(2)). The amount of the molar mesialization, the bone area between the roots, PDL (periodontal ligament) measurements, TRAP (tartrate-resistant acid phosphatase), and ALP (alkaline phosphatase) immunoreactivity intensity were calculated. RESULTS: The amount of the molar mesialization was significantly higher in the 650â€‰nm LLLT group (mean 0.878 Â± 0.201â€‰mm; 95% CI (confidence interval) 0.724 and 1.032) than in the groups of positive control (mean 0.467 Â± 0.357â€‰mm; 95% CI 0.192 and 0.741) and 405â€‰nm LLLT (mean 0.644 Â± 0.261â€‰mm; 95% CI 0.443 and 0.845) ($p < 0.001$). There were significant differences in the PDL-mesial ($p = 0.042$) and PDL-distal ($p = 0.007$) regions between the groups. The immunoreactivity intensity for TRAP-mesial was significantly higher in the positive control group (mean 109,420.33 Â± 8769.17; 95% CI 100,217.65 and 118,623.02) than in the 405â€‰nm (mean 91,678.83 Â± 7313.39; 95% CI 84,003.9 and 99,353.77) and the 650â€‰nm LLLT (mean 87,169.17 Â± 4934.65; 95% CI 81,990.56 and 92,347.77) groups ($p = 0.002$). There was no statistically significant difference between the groups on immunoreactivity intensity with ALP

staining. CONCLUSIONS: The results of this study show that LLLT with 650-nm wavelength increases orthodontic tooth movement more than 405-nm, 532-nm, and 940-nm LLLTs. The 940-nm and 650-nm LLLTs also increase the bone area between the roots by more than 405-nm and 532-nm wavelengths. Animals;Low-Level Light Therapy;Molar;Periodontal Ligament;Rats;Rats, Wistar;Tooth Movement Techniques

In Vitro Cytological Responses against Laser Photobiomodulation for Periodontal Regeneration. Periodontal disease is a chronic inflammatory disease caused by periodontal bacteria. Recently, periodontal phototherapy, treatment using various types of lasers, has attracted attention. Photobiomodulation, the biological effect of low-power laser irradiation, has been widely studied. Although many types of lasers are applied in periodontal phototherapy, molecular biological effects of laser irradiation on cells in periodontal tissues are unclear. Here, we have summarized the molecular biological effects of diode, Nd:YAG, Er:YAG, Er,Cr:YSGG, and CO(2) lasers irradiation on cells in periodontal tissues. Photobiomodulation by laser irradiation enhanced cell proliferation and calcification in osteoblasts with altering gene expression. Positive effects were observed in fibroblasts on the proliferation, migration, and secretion of chemokines/cytokines. Laser irradiation suppressed gene expression related to inflammation in osteoblasts, fibroblasts, human periodontal ligament cells (hPDLCs), and endothelial cells. Furthermore, recent studies have revealed that laser irradiation affects cell differentiation in hPDLCs and stem cells. Additionally, some studies have also investigated the effects of laser irradiation on endothelial cells, cementoblasts, epithelial cells, osteoclasts, and osteocytes. The appropriate irradiation power was different for each laser apparatus and targeted cells. Thus, through this review, we tried to shed light on basic research that would ultimately lead to clinical application of periodontal phototherapy in the future. Animals;Humans;Low-Level Light Therapy;Models, Biological;Periodontal Ligament;Regeneration

The Vascular Component of Melasma: A Systematic Review of Laboratory, Diagnostic, and Therapeutic Evidence. BACKGROUND: Melasma is a common acquired disorder of hyperpigmentation, classically manifesting as symmetric brown patches on the face. Although the exact pathogenesis is not fully understood, vascular abnormalities have been implicated in melasma. OBJECTIVE: To evaluate the laboratory and clinical evidence regarding the safety and efficacy of antivascular agents for the treatment of melasma. METHODS: A systematic review of PubMed, EMBASE, and Cochrane was conducted on May 13, 2020, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Original research articles investigating the role of vascularity and/or evaluating the use of antivascular therapeutics in melasma were included. Clinical recommendations were based on the American College of Physicians guidelines. RESULTS: A total of 34 original research articles as follows were identified: 4 laboratory studies, 15 diagnostic studies, and 15 therapeutic studies. CONCLUSION: There is promising evidence supporting the use of tranexamic acid and laser/light therapies to treat the vascular component of melasma, and more rigorous clinical trials are needed to validate their efficacy. Clinicians may consider treatment with one or more antivascular therapeutics in patients with melasma. Further research is warranted to characterize the role of cutaneous vascularization in melasma and may provide insights for novel therapies. Angiogenesis Inhibitors;Melanins;Tranexamic Acid Administration, Cutaneous;Administration, Oral;Angiogenesis Inhibitors;Dermoscopy;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Melanocytes;Melanosis;Neovascularization, Pathologic;Randomized Controlled Trials as Topic;Skin;Tranexamic Acid;Treatment Outcome

Treatment Modalities for Cherry Angiomas: A Systematic Review. BACKGROUND: Cherry angiomas are benign vascular proliferations of endothelial cells associated with aging. Currently, no mainstay of treatment for these vascular anomalies exists. OBJECTIVE: To review existing evidence-based therapies for the treatment of cherry angiomas. METHODS: A literature search in May 2019

was performed with PubMed Database and Cochrane Library using the following terms: "cherry angioma," "senile hemangioma," "senile angioma," "cherry hemangioma," and "Campbell de Morgan spots." RESULTS: Ten studies included in this systematic review reported laser therapy and nonlaser therapy as efficacious treatments for cherry angiomas. Among the laser therapies, pulsed dye laser (PDL) was preferred over potassium-titanyl-phosphate (KTP) and electrodessication (ED), based on decreased procedure-related pain. The neodymium-doped yttrium aluminum garnet (Nd:YAG) laser 1064 nm produced less pigmentary complications, whereas KTP and PDL risked pigmentary changes in darker-skinned individuals. Nonlaser therapies included cryotherapy, sclerotherapy, electrosurgery (i.e., ED, electrocoagulation), and radiofrequency ablation. No therapy proved to be superior. CONCLUSION: A variety of therapeutic modalities exist for the treatment of cherry angiomas. However, a limited number of high-quality studies explored the efficacy of treatments and compared treatment modalities. Light-based methods such as argon, KTP, Nd:YAG, intense pulsed light, and PDL, along with non-light-based interventions such as cryotherapy, electrosurgery, and sclerotherapy effectively treated cherry angiomas.
Aging;Cryotherapy;Dermatology;Electrosurgery;Endothelial Cells;Evidence-Based Medicine;Hemangioma;Humans;Low-Level Light Therapy;Sclerotherapy;Skin;Skin Neoplasms;Treatment Outcome

Dry Needling and Photobiomodulation Decreases Myofascial Pain in Trapezius of Women: Randomized Blind Clinical Trial. OBJECTIVE: The purpose of this study was to assess whether dry needling (DN) added to photobiomodulation (PBM) has effects on the treatment of active myofascial trigger points in the upper trapezius. METHODS: This study was a randomized clinical trial, with 43 participants divided into 3 groups: DN and PBM (DNP), DN, and DN outside of the trigger point (DNout). Each group received 1 session of DN followed by PBM therapy with the machine turned on or off. Pain, disability, pain pressure threshold, and muscle activity were assessed before the intervention and afterward at intervals of 10 minutes, 30 minutes, 1 week, and 1 month. RESULTS: Pain decreased after intervention in the DNP and DNout groups, with mean differences, respectively, of 1.33 cm (95% confidence interval [CI], 0.019-2.647) and 2.78 cm (95% CI, 1.170-2.973). Scores for the disability questionnaire decreased in all groups after intervention (Fâ€¯=â€¯36.53, P < .0001) after the intervention, with mean differences of 3.8 points in the DNP group (95% CI, 1.082-5.518), 3.57 in the DN group (95% CI, 0.994-6.149), and 5.43 in the DNout group (95% CI, 3.101-7.756). There were no significant differences between or within groups in pain pressure threshold (Fâ€¯=â€¯2.14, Pâ€¯=â€¯.139), with mean differences after 30 minutes of 0.139 kgf for the DNP group (95% CI, -0.343 to 0.622), 0.273 for the DN group (95% CI, -0.661 to 1.209), and -0.07 for the DNout group (95% CI, -0.465 to 0.324). Muscle activation for the DN group increased 8.49% after the intervention, where for the DNP group it decreased 11.5%, with a significant difference between groups. CONCLUSION: DN added to PBM presented similar results compared to DNout and DN. In this sample, the effects of the application of DN outside of the trigger point had better effects on pain and disability scores than DN applied directly on the trigger point. Adult;Dry Needling;Female;Humans;Low-Level Light Therapy;Middle Aged;Myofascial Pain Syndromes;Pain Threshold;Superficial Back Muscles;Surveys and Questionnaires;Trigger Points

Evaluation of the salivary function of patients in treatment with radiotherapy for head and neck cancer submitted to photobiomodulation. BACKGROUND: Head and neck radiotherapy is typically associated with toxicities that can have profound effects on the patient's quality of life. Xerostomia, which may or may not be related to hypofunction of the salivary gland, leading to negative consequences, mainly in quality of life, leaving patients more susceptible to the development of oral mucositis, dental caries, oral infection and difficulties in speech is one of the most common side effects of such treatment. The aim of the present study was to evaluate salivary

function of patients in treatment with radiotherapy for head and neck cancer submitted to photobiomodulation. MATERIAL AND METHODS: A cross-sectional study with a quantitative approach was carried out in the Dentistry Department of the Hospital de CÃ¢ncer de Pernambuco between February and September 2019. RESULTS: The study sample comprised 23 patients of both genders, treated with radiotherapy for cancer in the head and neck region. The patients were submitted to photobiomodulation with infrared laser, as intraoral applications in order to prevent mucositis and extraoral applications to stimulate salivary glands. The applications were undertaken three times a week on alternate days throughout the radiotherapy period. The following parameters were used: Intraoral 15mW, 12J / cm2, 10s / point, 2.4 J / point, and extraoral 30mW, 7.5J / cm2, 10s / point, 0.3J / point, both with a wavelength of 830nm and area of 0.028cmÂ². Subjective and objective symptoms were evaluated by measuring the unstimulated salivary flow (USF) using the spitting technique before, during and after radiotherapy treatment. For statistical analysis, a significance level of 5% was adopted. Most patients were male (70%) with 60 years of age on average. At the beginning of treatment, 22 patients had USF > 0.2 ml / min (grade 1), at the end of which 15 patients remained unchanged and only 3 patients progressed to grade 3. As for the subjective classification, most (52%) remained in grade 1 (absence of disability) throughout the treatment. CONCLUSION: Based upon the results of this study it was possible to conclude that the use of photobiomodulation did not significantly interfere with the xerostomia complaint of patients in treatment with radiotherapy, however, it does seem to prevent patients from reaching higher degrees of xerostomia taking into account salivary flow measures. Cross-Sectional Studies;Dental Caries;Female;Head and Neck Neoplasms;Humans;Male;Middle Aged;Quality of Life;Xerostomia

Photobiomodulation invigorating collagen deposition, proliferating cell nuclear antigen and Ki67 expression during dermal wound repair in mice. The present investigation focuses on understanding the role of photobiomodulation in enhancing tissue proliferation. Circular excision wounds of diameter 1.5Â cm were created on Swiss albino mice and treated immediately with 2Â J/cm(2) and 10Â J/cm(2) single exposures of the Helium-Neon laser along with sham-irradiated controls. During different days of healing progression (day 5, day 10, and day 15), the tissue samples upon euthanization of the animals were taken for assessing collagen deposition by Picrosirius red staining and cell proliferation (day 10) by proliferating cell nuclear antigen (PCNA) and Ki67. The positive influence of red light on collagen synthesis was found to be statistically significant on day 10 (Pâ€‰<â€‰0.01) and day 15 (Pâ€‰<â€‰0.05) post-wounding when compared to sham irradiation, as evident from the image analysis of collagen birefringence. Furthermore, a significant rise in PCNA (Pâ€‰<â€‰0.01) and Ki67 (Pâ€‰<â€‰0.05) expression was also recorded in animals exposed to 2Â J/cm(2) when compared to sham irradiation and (Pâ€‰<â€‰0.01) compared to the 10Â J/cm(2) treated group as evidenced by the microscopy study. The findings of the current investigation have distinctly exhibited the assenting influence of red laser light on excisional wound healing in Swiss albino mice by augmenting cell proliferation and collagen deposition. Ki-67 Antigen;Proliferating Cell Nuclear Antigen;Collagen Animals;Collagen;Ki-67 Antigen;Lasers, Gas;Low-Level Light Therapy;Mice;Proliferating Cell Nuclear Antigen;Wound Healing

Treatment of recurrent herpes of the lower lip skin region with photodynamic therapy and photobiomodulation: case report. The aim of the present study is to describe a case report on the treatment of recurrent herpes using Photodynamic therapy (PDT) and Photobiomodulation as the treatments of choice. A 21-year-old white man checked in in the clinic for evaluation of vesicles arranged in the lower lip skin region. The clinical diagnosis was recurrent herpes and, for treatment, PDT was chosen, using 0.1% methylene blue as a photosensitizer and a pre-irradiation time of five minutes. The Therapy XT laser was used, with a wavelength of 660 nm, power of 100 mW, in a spot area of 0.028 cmÂ², using 4 J energy per point, having been applied on 4 points, one in the center of

the lesion and three on its laterals, so that it involved the entire extension of the lesion, totaling 16 J. After 24 hours after the application of the PDT, the patient returned for photobiomodulation with a low-power laser with a wavelength of 660 nm, power of 100 mW, using energy of 1 J per point, for 10 s, being applied on 4 points, totaling 4 J. It was possible to observe complete healing after 10 days of treatment, and the patient remains in follow-up for eight months without any recurrences. Photosensitizing Agents;Methylene Blue Adult;Humans;Lip;Low-Level Light Therapy;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Young Adult

Photobiomodulation therapy as a high potential treatment modality for COVID-19. COVID-19 is now a worldwide concern, causing an unprecedented pandemic. The infected cases show different symptoms based on the severity of the disease. In asymptomatic and non-severe symptomatic cases, the host immune system can successfully eliminate the virus and its effects. In severe cases, however, immune system impairment causes cytokine release syndrome which eventually leads to acute respiratory distress syndrome (ARDS). In recent years, photobiomodulation (PBM) has shown promising results in reducing acute pulmonary inflammation. Considering the high potential impact of PBM on immune responses, we hypothesized that using PBM could be an effective treatment modality for ARDS management in COVID-19 patients. Anti-Inflammatory Agents Anti-Inflammatory Agents;COVID-19;Humans;Low-Level Light Therapy;Pneumonia;SARS-CoV-2

Low-Level Laser Therapy and Topical Medications for Treating Aphthous Ulcers: A Systematic Review. OBJECTIVE: The study compares low-level laser therapy with topical medications for treating aphthous ulcers. METHODS: A search of articles in this systematic review was completed in six databases. Treatment and comparative groups comprised of patients subjected to laser therapy and topical medications, respectively. Two different treatment outcomes were considered; pain and size of the lesion. Risk of bias was assessed using the Revised Cochrane risk-of-bias tool for randomized trials. RESULTS: From 109 articles, five randomized control trials fulfilled the selection criteria. The overall sample comprised of 98 males and 232 females, with a mean age of 32.4 years. The laser therapies in each included study had different active media and varying wavelengths. Topical medication used in the comparative group were triamcinolone acetonide, amlexanox, granofurin, and solcoseryl. Findings showed that patients who reported lower pain and decreased aphthous ulcer lesions were more in the laser therapy group than in the topical medication group. CONCLUSION: Low-level laser therapy was better in treating aphthous ulcer lesions in comparison to topical medications, and all laser wavelengths in the included reports were seen to be effective. However, the results should be interpreted with caution, because no study demonstrated low-risk of bias in all the assessed domains.

Transplantation of photobiomodulation-preconditioned diabetic stem cells accelerates ischemic wound healing in diabetic rats. BACKGROUND: Diabetic foot ulcer is the most costly and complex challenge for patients with diabetes. We hereby assessed the effectiveness of different preconditioned adipose-derived mesenchymal stem cells (AD-MSCs) and photobiomodulation protocols on treating an infected ischemic wound in type 1 diabetic rats. METHODS: There were five groups of rats: (1) control, (2) control AD-MSCs [diabetic AD-MSCs were transplanted (grafted) into the wound bed], (3) AD-MSC + photobiomodulation in vivo (diabetic AD-MSCs were grafted into the wound, followed by in vivo PBM treatment), (4) AD-MSCs + photobiomodulation in vitro, and (5) AD-MSCs + photobiomodulation in vitro + in vivo. RESULTS: Diabetic AD-MSCs preconditioned with photobiomodulation had significantly risen cell function compared to diabetic AD-MSC. Groups 3 and 5 had significantly decreased microbial flora correlated to groups 1 and 2 (all, pâ€‰=â€‰0.000). Groups 2, 3, 4, and 5 had significantly improved wound closure rate (0.4, 0.4, 0.4, and 0.8, respectively) compared to group 1 (0.2). Groups 2-5 had significantly increased wound strength compared to group 1 (all pâ€‰=â€‰0.000). In most cases, group 5 had significantly better results

than groups 2, 3, and 4. CONCLUSIONS: Preconditioning diabetic AD-MSCs with photobiomodulation in vitro plus photobiomodulation in vivo significantly hastened healing in the diabetic rat model of an ischemic infected delayed healing wound. Animals;Diabetes Mellitus, Experimental;Humans;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Rats;Rats, Wistar;Stem Cells;Wound Healing

Interaction between Laser Light and Osteoblasts: Photobiomodulation as a Trend in the Management of Socket Bone Preservation-A Review. Bone defects are the main reason for aesthetic and functional disability, which negatively affect patient's quality of life. Particularly, after tooth extraction, the bone of the alveolar process resorbs, limiting the optimal prosthetic implant placement. One of the major pathophysiological events in slowly- or non-healing tissues is a blood supply deficiency, followed by a significant decrease in cellular energy amount. The literature shows that photons at the red and infrared wavelengths can interact with specific photoacceptors located within the cell. Through this mechanism, photobiomodulation (PBM) can modify cellular metabolism, by increasing mitochondrial ATP production. Here, we present a review of the literature on the effect of PBM on bone healing, for the management of socket preservation. A search strategy was developed in line with the PRISMA statement. The PubMed and Scholar electronic databases were consulted to search for in vivo studies, with restrictions on the year (<50 years-old), language (English), bone socket preservation, and PBM. Following the search strategy, we identified 269 records, which became 14, after duplicates were removed and titles, abstract and inclusion-, exclusion-criteria were screened. Additional articles identified were 3. Therefore, 17 articles were included in the synthesis. We highlight the osteoblast-light interaction, and the in vivo therapeutic tool of PBM is discussed.

Analysis of the Curative Effect of Alexandrite Laser in the Treatment of Venous Lake of Lips. BACKGROUND AND OBJECTIVES: Laser is being widely used in clinical treatment nowadays, including 755â€‰nm Alexandrite laser [1,2]. This study was conducted to examine the clinical outcome of long-pulse 755â€‰nm Alexandrite laser in the treatment of venous lake of the lip. STUDY DESIGN/MATERIALS AND METHODS: Forty-one patients (2015-2019) were reviewed. The clinical outcomes were assessed 1 month after the treatment. The efficacy of the treatment was classified into four categories: basic recovery (most optimal outcome), effective, improvement, and ineffective (least favorable outcome). Adverse reactions were also recorded. RESULTS: Thirty-three (80.49%) patients achieved basic recovery and 8 (19.51%) were effective; 29 (70.73%) recovered after receiving one treatment, 3 (7.32%) recovered after receiving two treatments, and 1 (2.44%) recovered after three treatments. CONCLUSION: Long-pulse 755â€‰nm Alexandrite laser is an effective treatment for the venous lake of the lip. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Hair Removal;Humans;Lasers, Solid-State;Lip;Low-Level Light Therapy;Treatment Outcome

Treatment of Pain in Keloids Using Only a Long-Pulsed 1064â€‰nm Nd:YAG Laser. BACKGROUND AND OBJECTIVE: Keloids are benign lesions arising from overproduction of the extracellular matrix and abnormal collagen deposition by dermal fibroblasts. This altered wound healing typically occurs in response to dermal trauma. Keloid treatment poses a challenge due to the variable nature of treatment response, which can be affected by the size, appearance, and associated symptoms of erythema, pruritus, and pain. Recently, successful treatment of keloids has been reported using the Nd:YAG laser in conjunction with 5-fluorouracil and intralesional corticosteroids. We present a series of patients with symptomatic keloids, who we treated with only a 1064â€‰nm Nd:YAG laser. STUDY DESIGN/MATERIALS AND METHODS: Eight patients of Fitzpatrick skin types I-VI presented for treatment of keloids with associated symptoms of pain. The keloids were most commonly located on the trunk, and seven patients had intralesional steroid injections prior to presentation with persistence of symptoms. Patient treatment consisted of two passes under a long-

pulsed 1064â€‰nm Nd:YAG laser with a 10â€‰mm spot size, a fluence of 18-19â€‰J/cm(2) , and 60â€‰ms pulse duration every 3-8 weeks. Patient-reported pain scores were collected before and after treatment. RESULTS: Following treatment, transient erythema and mild edema were noted at the treatment site. All patients reported improvement in the symptoms of pain, with an average of a 5-point reduction using a 10-point scale (R: 2-10). Five out of eight patients had total resolution of their pain. An average of 3.25 treatments (R:1-5) were needed for patients to first notice an improvement in the pain. A Wilcoxon signed-rank test showed that treatment with a 1064â€‰nm laser elicited a statistically significant improvement in pain in individuals with keloids (Zâ€‰=â€‰2.46, Pâ€‰=â€‰0.01). No patients in our study suffered any scarring or pigment changes as a result of these treatments. CONCLUSION: Keloids are a common condition with variable rates of treatment satisfaction. Lasers have been used in an attempt to improve clinical appearance and associated symptoms. We report a significant reduction in pain for patients treated exclusively with a 1064â€‰nm Nd:YAG laser. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Humans;Keloid;Lasers, Solid-State;Low-Level Light Therapy;Pain;Treatment Outcome

Effects of photobiomodulation therapy on the local experimental envenoming by Bothrops leucurus snake. Bothrops leucurus is the major causative agent of snakebites in Brazil's Northeast. The systemic effects of its venom are effectively neutralized by antivenom therapy, preventing bitten patients' death. However, antivenom fails in neutralizing local effects that include intense pain, edema, bleeding, and myonecrosis. Such effects can lead to irreversible sequels, representing a clinically relevant issue for which there is no current effective treatment. Herein, the effects of photobiomodulation therapy (PBMT) were tested in the local actions induced by B. leucurus venom (BLV) in mice (nÂ =Â 123 animals in 20 experimental groups). A continuous emission AlGaAs semiconductor diode laser was used in two wavelengths (660 or 780Â nm). Mechanical nociceptive thresholds were assessed with the electronic von Frey apparatus. Local edema was determined by measuring the increase in paw thickness. Hemorrhage was quantified by digital measurement of the bleeding area. Myotoxicity was evaluated by serum creatine kinase (CK) activity and histopathological analysis. PBMT promoted anti-hypernociception in BLV-injected mice; irradiation with the 660Â nm laser resulted in faster effect onset than the 780Â nm laser. Both laser protocols reduced paw edema formation, whether irradiation was performed immediately or half an hour after venom injection. BLV-induced hemorrhage was not altered by PBMT. Laser irradiation delayed, but did not prevent myotoxicity caused by BLV, as shown by a late increase in CK activity and histopathological alterations. PBMT was effective in the control of some of the major local effects of BLV refractory to antivenom. It is a potential complementary therapy that could be used in bothropic envenoming, minimizing the morbidity of these snakebite accidents. Antivenins;Creatine Kinase Animals;Antivenins;Bothrops;Creatine Kinase;Edema;Hemorrhage;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Necrosis;Snake Bites

Dose-Response Effect of Photobiomodulation Therapy on Muscle Performance and Fatigue During a Multiple-Set Knee Extension Exercise: A Randomized, Crossover, Double-Blind Placebo-Controlled Trial. Objective: The aim of this study was to identify the best energy dose of photobiomodulation therapy (PBMT) able to improve muscle performance and reduce fatigue during multiple-set knee extension exercise. Methods: Eighteen physically active men participated in this study. Each participant performed an isokinetic exercise protocol (5 sets of 10 knee extension repetitions, maximum contractions at 60Â°Â·s(-1)) in 6 sessions, 1 week apart. Control condition (no PBMT/placebo treatments) was applied at the first and sixth sessions. Placebo or PBMT with 135, 270, or 540â€‰J/quadriceps was randomly applied from the second to fifth sessions. Placebo/PBMT treatments were always applied at two moments: 6â€‰h before and immediately before exercise. The isometric and isokinetic concentric peak torques were assessed before and after the exercise

protocol. Results: The knee extension exercise performance (total work performed during exercise) was not affected by PBMT (135, 270, and 540â€‰J) compared with placebo treatment. However, all PBMT treatments (135, 270, and 540â€‰J) led to lower percentage drop compared with placebo and control conditions on isometric peak torque (IPT), concentric peak torque (CPT), and concentric work (W). All PBMT doses led to possibly positive or likely positive effects on IPT, CPT, and W compared with placebo. Conclusions: Our findings demonstrate that PBMT with 135, 270, and 540â€‰J applied at two moments (6â€‰h before and immediately before exercise) was able to produce the same total work with lower fatigue, which may facilitate the performance of additional sets (i.e., higher training volume). Double-Blind Method;Exercise;Fatigue;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal

Efficacy of 308-nm excimer laser treatment for refractory vitiligo: a case series of treatment based on the minimal blistering dose. Humans;Hypopigmentation;Lasers, Excimer;Low-Level Light Therapy;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo

Effects of different energy density low-level laser therapies for temporomandibular joint disorders patients: a systematic review and network meta-analysis of parallel randomized controlled trials. PURPOSE: To compare the effects of different energy density LLLT onÂ TMD patients' pain reduction. METHODS: ReviewersÂ searched RCTs published in Embase, PubMed and The Cochrane Library before 1 April 2020. Reviewers included parallelRCTs that compared the effects of LLLT with placebo or different energy density LLLT for TMD patients' pain reduction. Reviewers did network meta-analysis and evaluated the quality of evidence using the GRADE process. RESULTS: From 352 studies, reviewers included 16 RCTs. Immediately after treatment, the d1 laser therapy (energy density ranging from 0 to 10Â J/cm(2)) rankedÂ first. The d1 laser therapy showed more pain reduction than placebo (Â MDâ€‰=â€‰2.49, 95% CI ranging from 1.28 to 3.71). The quality of "d1 vs p" comparison was assessed as "moderate" quality. A month after treatment, the d1 laser therapy also performed better than placebo (MDâ€‰=â€‰1.69, 95%CIâ€‰=â€‰[-0.78, 4.16]). The quality of secondary outcome was assessed as "low" quality. CONCLUSIONS: For clinical application, d1 laser therapy (energy density ranging from 0 to 10Â J/cm(2)) is recommended for short-term pain management of TMD patients (moderate quality evidence). A month after treatment, the d1 laser therapy also performed better than placebo and other laser groups but the result didn't reach the point of statistical significance (low quality evidence). TRIAL REGISTRATION: PROSPERO-CRD42018118313. Humans;Low-Level Light Therapy;Pain Management;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders

Photobiomodulation preserves mitochondrial redox state and is retinoprotective in a rodent model of retinitis pigmentosa. Photobiomodulation (PBM) by far-red (FR) to near-infrared (NIR) light has been demonstrated to restore the function of damaged mitochondria, increase the production of cytoprotective factors and prevent cell death. Our laboratory has shown that FR PBM improves functional and structural outcomes in animal models of retinal injury and retinal degenerative disease. The current study tested the hypothesis that a brief course of NIR (830Â nm) PBM would preserve mitochondrial metabolic state and attenuate photoreceptor loss in a model of retinitis pigmentosa, the P23H transgenic rat. P23H rat pups were treated with 830Â nm light (180Â s; 25 mW/cm(2); 4.5Â J/cm(2)) using a light-emitting diode array (Quantum Devices, Barneveld, WI) from postnatal day (p) 10 to p25. Sham-treated rats were restrained, but not treated with 830Â nm light. Retinal metabolic state, function and morphology were assessed at p30 by measurement of mitochondrial redox (NADH/FAD) state by 3D optical cryo-imaging, electroretinography (ERG), spectral-domain optical coherence tomography (SD-OCT), and histomorphometry. PBM preserved retinal metabolic state, retinal function, and retinal morphology in PBM-treated animals compared to the sham-treated group. PBM protected against the disruption of the oxidation state of the

mitochondrial respiratory chain observed in sham-treated animals. Scotopic ERG responses over a range of flash intensities were significantly greater in PBM-treated rats compared to sham controls. SD-OCT studies and histological assessment showed that PBM preserved the structural integrity of the retina. These findings demonstrate for the first time a direct effect of NIR PBM on retinal mitochondrial redox status in a well-established model of retinal disease. They show that chronic proteotoxic stress disrupts retinal bioenergetics resulting in mitochondrial dysfunction, and retinal degeneration and that therapies normalizing mitochondrial metabolism have considerable potential for the treatment of retinal degenerative disease. NAD;Flavin-Adenine Dinucleotide Animals;Disease Models, Animal;Electroretinography;Energy Metabolism;Flavin-Adenine Dinucleotide;Infrared Rays;Low-Level Light Therapy;Mitochondria;NAD;Oxidation-Reduction;Rats;Rats, Transgenic;Retinal Degeneration;Retinal Rod Photoreceptor Cells;Retinitis Pigmentosa;Tomography, Optical Coherence;Treatment Outcome

Effect of Photobiomodulation Therapy in the 1500â€‰m Run: An Analysis of Performance and Individual Responsiveness. Objective: The aims of this study were to verify the effects of photobiomodulation therapy (PBMT) on time trial run performance over 1500â€‰m, as well as on individual responsiveness of recreative runners. Materials and methods: Nineteen recreationally trained runners participated in a randomized, crossover, double-blind placebo-controlled trial. The study was divided in four sessions: (1) incremental maximal running test; (2) 1500â€‰m run control (without placebo or PBMT); and (3, 4) PBMT or placebo before 1500â€‰m run. PBMT or placebo was applied over 14 sites per lower limb immediately before time trial run using a mixed wavelength device (33 diodes: 5 LASERs of 850â€‰nm, 12 LEDs of 670â€‰nm, 8 LEDs of 880â€‰nm, and 8 LEDs with 950â€‰nm). PBMT delivered 30â€‰J per site, with a total energy dose of 840â€‰J. Physiological variables [maximal oxygen uptake (VO(2MAX)), velocity associated to VO(2MAX) (vVO(2MAX)), peak of velocity, and respiratory compensation point (RCP)] were assessed during incremental maximal test. During 1500â€‰m races we accessed the following: time, heart rate, and lower limb rate perception exertion per lap, total time, and blood lactate concentration ([Lac]). Results: PBMT had no significant difference and likely trivial effect for performance in the total time trial run over 1500â€‰m compared to placebo. In the responsiveness analyses, 10 participants positively responded to PBMT, whereas total time reduced for responders (-10.6â€‰sec; -3.18%) and increased for nonresponders (+6.0â€‰sec; +1.73%). Responders presented higher aerobic parameters (VO(2MAX) and RCP) than nonresponders. Moreover, responders had lower time per lap and [Lac] (1 and 3â€‰min) when PBMT was applied. Conclusions: PBMT applied immediately before running in noncontrolled environment was not able to improve the 1500â€‰m performance of recreationally trained runners. However, responders to PBMT presented higher aerobic capacity than nonresponders. Cross-Over Studies;Double-Blind Method;Humans;Low-Level Light Therapy;Running

Time-Response of Photobiomodulation Therapy by Light-Emitting Diodes on Muscle Torque and Fatigue Resistance in Young Men: Randomized, Double-Blind, Crossover and Placebo-Controlled Study. Background: Photobiomodulation therapy (PBMT) by lasers or light-emitting diodes (LEDs) has been used in the last two decades to increase muscle performance in humans. The main findings of PBMT on muscle performance are increment in torque and number of muscle contractions, and fatigue resistance in high-intensity exercises. Although there are suggested light energies to be followed, the literature has also pointed out to a possible time-response of PBMT to increase exercise performance and recovery in humans. Objective: To investigate the possible time-response of PBMT by LEDs to increase muscle performance in young men regarding peak torque (PT), rate of torque development (RTD), fatigue resistance, and subjective perception of effort in maximal voluntary isometric contractions (MVIC) of elbow flexion. Methods: This randomized, double-blind,

placebo-controlled, crossover trial with two arms enrolled 34 healthy and physically active young men, but 30 (21.10â€‰Â±â€‰2.25 years old) completed all procedures. All volunteers were allocated into two equal arms (groups): PBMT (60â€‰J; 1152â€‰mW; 52â€‰sec; and 166.75â€‰cm(2)) applied on biceps brachii by a flexible array of LEDs, and placebo treatment. Each arm (nâ€‰=â€‰15) investigated the time-response (5â€‰min, 1â€‰h, 3â€‰h, and 6â€‰h) of PBMT in a randomized, double-blind, and crossover manner on the PT, RTD, fatigue resistance, and subjective perception of effort. Results: There were no significant results (pâ€‰>â€‰0.05) for all comparisons within and between groups regarding PT, RTD, fatigue resistance, and subjective perception of effort in MVIC of the elbow flexion in all time-response tested (5â€‰min, 1â€‰h, 3â€‰h, and 6â€‰h) before or after fatigue test. Only RTD did not decay significantly after fatigue test at all time-responses for PBMT group. Conclusions: PBMT was not effective to increase muscle performance and decrease fatigue to demonstrate the possible time-response in humans. Adolescent;Adult;Cross-Over Studies;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Range of Motion, Articular;Torque;Young Adult

The comparative study of efficacy between 1064-nm long-pulsed Nd:YAG laser and 595-nm pulsed dye laser for the treatment of acne vulgaris. BACKGROUND: The popularity of laser therapy in acne treatment has been increasing recently due to its safety, effectiveness, and convenience. Both 595-nm pulsed dye laser (PDL) and 1064-nm long-pulsed neodymium:yttrium-aluminum-garnet laser (Nd:YAG) have been successful in treating inflammatory acne lesions. However, clinical data from controlled comparative studies are still lacking. AIMS: To compare the clinical efficacy of 1064-nm Nd:YAG with 595-nm PDL for the treatment of acne vulgaris. METHODS: Thirty-four participants with mild to moderate facial acne were enrolled and then randomized to receive three, 2-week interval treatments with 1064-nm Nd:YAG on one side of the face and 595-nm PDL on the other side. Clinical assessments including acne lesion counts, acne erythema grading, and erythema index were performed at baseline, 2nd, 4th, and 8th week. Participants' satisfaction, preference, and adverse effects were recorded. RESULTS: As compared with baseline, the significant reduction of mean inflammatory acne lesion counts, acne erythema grading, and erythema index was demonstrated on 595-nm PDL-treated sides and 1064-nm Nd:YAG-treated sides. However, there were no significant differences between both sides. The participants were satisfied with both laser treatments, but the participants preferred 1064-nm Nd:YAG over 595-nm PDL treatment. The adverse effects were less on 1064Â nm Nd: YAG-treated sides. CONCLUSIONS: 1064-nm Nd:YAG and 595-nm PDL treatments are equally effective in reducing inflammatory acne lesions and acne erythema in mild to moderate facial acne vulgaris. Acne Vulgaris;Erythema;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Role of Onco rehabilitation in head and neck cancer. Adult;Chemoradiotherapy;Deglutition Disorders;Exercise Therapy;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Stomatitis

Photobiomodulation preconditioned human semen protects sperm cells against detrimental effects of cryopreservation. The biological consequences of semen samples preconditioning with photobiomodulation (PBM) were studied on human sperm cells post cryopreservation. Donated semen samples were collected from 22 married men with normal sperm parameters according to World Health Organization (WHO) criteria. Included samples were divided into control and PBM-preconditioning (one session, 810Â nm, diode laser, and 0.6Â J/cm(2)) groups before cryopreservation procedure. Progressive sperm motility (PSM), morphology, viability, sperm mitochondrial membrane potential(MMP), intracellular reactive oxygen species (ROS) and lipid peroxidation of sperm cells were assessed post thawing. PBM preconditioning of cryopreserved semen samples most prominently increased the PSM percentage 30Â min post thawing

(pÂ =Â 0.000).Application of PBM before cryopreservation significantly increased the number of viable spermatozoa (p = 0.000), increased significantly the number of spermatozoa with high MMP (p = 0.004) and decreased significantly the number of spermatozoa with low MMP post-thawing(P = 0. 007)compared to control group. Cryopreserved human sperm cells with PBM preconditioning showed significant decrease in the levels of intracellular ROS (47.66 Â± 2.14 versus 60.42 Â± 3.16, p = 0.002) and lipid peroxidation (3.06 Â± 0.13 versus 3.68 Â± 0.27, p = 0.05)compared to control group. Our findings, as the first evidence, indicated that PBM-preconditioning of human semen before cryopreservation provides a real and substantial advantage. This might lead to a novel strategy in improving PBM application in the procedures of assisted reproductive technologies. Cryopreservation;Humans;Male;Semen;Semen Preservation;Sperm Motility;Spermatozoa

The bioenergetics of COVID-19 immunopathology and the therapeutic potential of biophysical radiances. In developing an effective clinical tool against COVID-19, we need to consider why SARS-CoV-2 infections develop along remarkably different trajectories: from completely asymptomatic to a severe course of disease. In this paper we hypothesize that the progressive exhaustion and loss of lymphocytes associated with severe stages of COVID-19 result from an intracellular energy deficit in an organism which has already been depleted by preexisting chronic diseases, acute psychological stress and the aging process. A bioenergetics view of COVID-19 immunopathology opens a new biophysical opportunity to enhance impaired immune function via proposed pathways of photomagnetic catalysis of ATP synthesis, regenerative photobiomodulation and the ultrasonic acceleration of cell restructuring. Moreover, we suggest that a coherent application of multiple biophysical radiances (coMra) may synergistically enhance energy-matter-information kinetics of basal self-regeneration of cells and thus improve immune function and accelerate recovery. Biophysical Phenomena;COVID-19;Energy Metabolism;Humans;Low-Level Light Therapy;Ultrasonic Therapy

Immunomodulatory activity seen as a result of photobiomodulation therapy in stimulated primary human fibroblasts. OBJECTIVE: Oral biofilms burden host responses by induction of inflammatory mediators, exacerbating periodontal inflammation. Photobiomodulation Therapy (PBMT) has been shown to decrease levels of pro-inflammatory cytokines and chemokines. However, optimal wavelengths and exposure doses have not been established. This study investigated the effects of PBMT on human periodontal ligament fibroblasts (hPDLFs) stimulated with inflammatory mediators (LPS, TNF-Î±, and IL-1Î²). METHODS: Cytotoxic effects of laser wavelengths 660 nm and 810 nm were assessed by measuring their effects on cellular dehydrogenase activity. The study was expanded to include 980 nm, 660 nm + 810 nm, and 810 nm + 980 nm. P.g. LPS, TNF-Î±, and/or IL-1Î² were added one hour before irradiation, then exposed to laser irradiation to determine the most appropriate stimulus. The levels of INF-Î³, IL-6, IL-8, IL-17A/F, and MCP-1 production in stimulated hPDLFs were measured and analyzed. RESULTS: P.g. LPS was a poor stimulus for hPDLFs, while TNF-Î± and IL-1Î² significantly elevated the analytes. The 660 nm laser treatment induced pro-inflammatory cytokines when stimulated, while 810 nm exhibited significant suppression. IL-1Î² was the stimulus of choice and the 810 nm wavelength alone exhibited anti-inflammatory effects for all analytes except IL-8, while the 810 nm in combination with 660 nm and/or 980 nm exhibited effects similar to 810 nm alone. CONCLUSIONS: The downregulation of inflammatory mediators by the combination or individual treatment with 810 nm wavelength shows promise for the management of periodontal inflammation. PBMT may lead to the development of a novel approach in the management of periodontal disease. Cytokines;Interleukin-1beta;Lipopolysaccharides;Tumor Necrosis Factor-alpha Cells, Cultured;Cytokines;Fibroblasts;Humans;Immunomodulation;Interleukin-1beta;Lipopolysaccharides;Low-Level Light Therapy;Periodontal Ligament;Tumor Necrosis Factor-alpha

Photobiomodulation on trigeminal neuralgia: systematic review. Trigeminal neuralgia is a recurrent episode of facial pain, that may be associated with other conditions such as multiple sclerosis, neoplasms, and nerve compromises or may occur due to an unknown cause. The available treatments are pharmacotherapy or surgery; however, both are susceptible to develop side effects. Photobiomodulation could be a promising alternative therapy for trigeminal neuralgia. A systematic review of literature was carried out using the PRISMA protocol, in the PubMed/MEDLINE, Embase, and Web of Science databases. Risk of bias by ROB 2.0 protocol was performed in included studies. Initially, 20 identified articles were collected varying between the years of 1983-2018, from which 6 were included. A total of 193 patients were evaluated; photobiomodulation was compared to conventional therapies, TENS, and therapy combinations with pharmacotherapy. The overall risk of bias was low, with some concerns in the randomization and double-blinding process; moreover, there are few reports in the literature. Photobiomodulation appears to be as effective as conventional therapies, being a coadjutant therapeutic opportunity for the treatment of trigeminal neuralgia. Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Trigeminal Neuralgia

Use of Photobiomodulation Therapy in Exercise Performance Enhancement and Postexercise Recovery: True or Myth? Exercise;Low-Level Light Therapy;Recovery of Function

Neuromuscular electrical stimulation but not photobiomodulation therapy improves cardiovascular parameters of rats with heart failure. The aim of the present study was to analyze the effect of neuromuscular electrical stimulation (NMES) and photobiomodulation (PBMT) on the cardiovascular parameters, hemodynamic function, arterial baroreflex sensitivity (BRS), and autonomic balance (ANS) of rats with heart failure (HF). Male Wistar rats (220-290 g) were organized into five groups: Sham (n = 6), Control-HF (n = 5), NMES-HF (n = 6), PBMT-HF (n = 6), and NMES + PBMT-HF (n = 6). Myocardial infarction (MI) was induced by left coronary artery ligation. Animals were subjected to an eight-week NMES and PBMT protocol. Statistical analysis included the General Linear Model (GLM) followed by a Bonferroni post-hoc test. Rats of the NMES-HF group showed a higher MI area than the Control-HF (P = 0.003), PBMT-HF (P = 0.002), and NMES + PBMT-HF (P = 0.012) groups. NMES-HF and NMES + PBMT-HF showed higher pulmonary congestion (P = 0.004 and P = 0.02) and lower systolic pressure (P = 0.019 and P = 0.002) than the Sham group. NMES + PBMT-HF showed lower mean arterial pressure (P = 0.02) than the Sham group. Control-HF showed a higher heart rate than the NMES-HF and NMES + PBMT-HF (P = 0.017 and P = 0.013) groups. There was no difference in the BRS and ANS variables between groups. In conclusion, eight-week NMES isolated or associated with PBMT protocol reduced basal heart rate, systolic and mean arterial pressure, without influence on baroreflex sensibility and autonomic control, and no effect of PBMT was seen in rats with HF. Animals;Baroreflex;Heart Failure;Heart Rate;Hemodynamics;Male;Rats;Rats, Wistar

Does photobiomodulation influence the resting-state brain networks in young human subjects? Using fMRI (functional magnetic resonance imaging), we explored the effect of transcranial photobiomodulation on four major resting-state brain networks, namely the sensorimotor, salience, default mode and central executive networks, in normal young subjects. We used a vielight transcranial device (810Â nm) and compared the scans in 20 subjects (mean age 30.0â€‰Â±â€‰2.8Â years) after active- and sham-photobiomodulation sessions. Four sets of analysis-independent components, network connectivity, infra-slow oscillatory power and arterial spin labelling-were undertaken. Our results showed that when comparing pre- with post-active and pre- with post-sham photobiomodulation scans, there were no substantial differences in activity across any of the four resting-state networks examined, indicating no clear photobiomodulation effect. When taken together with previous findings, we suggest that the impact of photobiomodulation becomes much clearer only after brain circuitry is altered, for example, after a neurone undergoes some change in its equilibrium or homeostasis, either during pathology or ageing,

or during a change in functional activity when individuals are engaged in a specific task (e.g. evoked brain activity). Adult;Aging;Brain;Brain Mapping;Humans;Magnetic Resonance Imaging;Nerve Net;Neural Pathways;Research Subjects
Photobiomodulation promotes neural regeneration when compared to simvastatin treatment in a sciatic nerve crush model. To determine whether the effects of photobiomodulation (PBM) were associated with the use of Simvastatin in the functional recovery from sciatic nerve in mice submitted to crush injury. Fifty Swiss mice (approximately 3Â months old; average weight 40Â g) were randomly divided into six groups: naive, sham, control, PBM (660Â nm, 10Â J/cm(2); 30Â mW; 0.6Â J per day for 28Â days; 0.06Â cm(2); 16.8Â J total and 20Â s), Simvastatin (20Â mg/kg), and PBM/Simv (association of the two protocols). The sciatic functional index (SFI), thermal heat hyperalgesia, mechanical hyperalgesia, and thermographic evaluation were used as analyses. The evaluations were performed preoperatively and 7, 14, 21, and 28Â days after the initial injury analyzed by two-way analysis of variance (ANOVA) for mixed models followed by the Bonferroni post-test. All groups except sham and naive presented an SFI compatible with severe peripheral nerve injury on the 7th day of evaluation. The PBM group presented better results in the SFI analysis (pâ€‰<â€‰0.001) on the 21st postoperative day compared to the control group. This benefit was maintained when compared to the Simvastatin (pâ€‰<â€‰0.001) and PBM/Simv groups (pâ€‰<â€‰0.01). The results of the thermal and mechanical hyperalgesia and thermography analyses were not significant (pâ€‰>â€‰0.05). The obtained results showed that PBM alone was more effective compared to Simvastatin alone or PBM combined with Simvastatin for sciatic nerve injury in mice. Simvastatin Animals;Mice;Nerve Crush;Nerve Regeneration;Peripheral Nerve Injuries;Sciatic Nerve;Sciatic Neuropathy;Simvastatin
Emerging and Adjunctive Therapies for Spinal Cord Injury Following Acute Canine Intervertebral Disc Herniation. Some dogs do not make a full recovery following medical or surgical management of acute canine intervertebral disc herniation (IVDH), highlighting the limits of currently available treatment options. The multitude of difficulties in treating severe spinal cord injury are well-recognized, and they have spurred intense laboratory research, resulting in a broad range of strategies that might have value in treating spinal cord-injured dogs. These include interventions that aim to directly repair the spinal cord lesion, promote axonal sparing or regeneration, mitigate secondary injury through neuroprotective mechanisms, or facilitate functional compensation. Despite initial promise in experimental models, many of these techniques have failed or shown mild efficacy in clinical trials in humans and dogs, although high quality evidence is lacking for many of these interventions. However, the continued introduction of new options to the veterinary clinic remains important for expanding our understanding of the mechanisms of injury and repair and for development of novel and combined strategies for severely affected dogs. This review outlines adjunctive or emerging therapies that have been proposed as treatment options for dogs with acute IVDH, including discussion of local or lesion-based approaches as well as systemically applied treatments in both acute and subacute-to-chronic settings. These interventions include low-level laser therapy, electromagnetic fields or oscillating electrical fields, adjunctive surgical techniques (myelotomy or durotomy), systemically or locally-applied hypothermia, neuroprotective chemicals, physical rehabilitation, hyperbaric oxygen therapy, electroacupuncture, electrical stimulation of the spinal cord or specific peripheral nerves, nerve grafting strategies, 4-aminopyridine, chondroitinase ABC, and cell transplantation.
Efficacy of Flat-Top Hand-Piece Using 980 nm Diode Laser Photobiomodulation on Socket Healing after Extraction: Split-Mouth Experimental Model in Dogs. The objective was to evaluate the effect of photobiomodulation (PBM) using 980Â nm diode laser therapy (0.60Â W, 0.77Â WÂ cm(-2) , 36Â J, 46Â JÂ cm(-2) , 60Â s) irradiated in continuous wave mode by flat-top hand-piece on socket

healing in the maxilla and mandible. A split-mouth experimental design was performed on 6 dogs. The 3(rd) premolar tooth was extracted from the maxilla and mandibles for both sides. The right-sided sockets were irradiated (PBM group), and the left-sided sockets were kept as control. Irradiation was done after extraction and at 48-h interval for 14Â days. Both the buccal and lingual sides were irradiated to reach a total irradiation time of 120Â s. Bone density was evaluated at 3, 4 and 5Â weeks using cone beam computed tomography. We showed that maxillary sockets in the PBM group had higher bone density compared to control one at 3, 4, 5Â weeks (PÂ =Â 0.029, <0.001, <0.001), respectively. Mandibular sockets revealed no significant difference between PBM and control at 3Â weeks (PÂ =Â 0.347), while at 4 and 5Â weeks PBM group showed higher bone density (PÂ =Â 0.004, <0.001). In both groups, there was a significant increase (PÂ <Â 0.001) in bone density by time which was higher in the PBM group. We concluded that PBM using a flat-top hand-piece of 980-nm improved the bone density of extraction sockets. Animals;Dogs;Lasers, Semiconductor;Low-Level Light Therapy;Models, Theoretical;Tooth Socket;Wound Healing

Photobiomodulation: systematic review and meta-analysis of the most used parameters in the resolution diabetic foot ulcers. The most common photobiomodulation parameters used to aid in the treatment of diabetic foot ulcers were investigatedÂ in this paper. The databases MEDLINE, LILACS, MEDCARIB, PAHO-IRIS, and WHOLIS were searched with the following descriptors: diabetic foot ulcers AND low-level laser therapy OR low-level therapy AND wound healing; this search was conducted from January of 2014 to December of 2019. Inclusion criteriaÂ wereÂ randomized clinical trials on humans. Exclusion criteria wereÂ systematic reviews, literature reviews, studies with animals, studies lacking photobiomodulation parameters, and studies with non-diabetic individuals. The Jadad scale was used in order to analyze the methodological quality of the matching papers. There were seventeen studies found on PubMed and four on LILACS. Among these, seven were selected, according to the inclusion and exclusion criteria. Two out of the seven matching studies obtained a high score, and five obtained a low score, on the Jadad scale. The studies settled on the use of 600-nm and 800-nm wavelength spectrum. Most of the analyzed papers on photobiomodulation on diabetic foot ulcers did not describe the detailed parameters in their methodology. None of the studies featured the maximum score with regard to the Jadad scale for methodological quality. The relations of energy versus wavelength and power versus wavelength were divergent among the parameters on the papers. Therefore, it is necessary to analyze the parameters for an optimized power value in order to improve the results of the treatment. Diabetic Foot;Humans;Low-Level Light Therapy;Wound Healing

Fractional CO(2) laser therapy for cesarean scar under the guidance of multiple evaluation methods: A retrospective study. AIMS: To introduce the treatment experience of fractional CO(2) laser for cesarean scar under the guidance of multiple evaluation methods. METHODS: Cesarean scar patients receiving fractional CO(2) laser therapy between January 2016 and January 2020 were retrospectively analyzed in this study. The demographic characteristics and treatment protocols, the Vancouver Scar Scale (VSS), the University of North Carolina "4P" Scar Scale (UNC4P), and the Antera3D score of all the enrolled patients were recorded. RESULTS: Altogether, 79 cesarean scar patients were involved in this study, with the average age of 28.1Â years, the average scar age and length of 26.5 (range, 24-30)Â months and 8.5 (range, 7-11)Â cm, respectively. Significant improvements were observed in VSS (tÂ =Â 16.75, PÂ <Â .05), UNC4P (tÂ =Â 15.63, PÂ <Â .05), and Antera3D score (color:tÂ =Â 13.19, PÂ <Â .05; texture: tÂ =Â 13.12, PÂ <Â .05; melanin: tÂ =Â 3.89, PÂ <Â .05; hemoglobin: tÂ =Â 2.28, PÂ <Â .05). No long-term complication was reported during the follow-up visits. CONCLUSIONS: Fractional CO(2) laser therapy is an effective treatment for cesarean scar. The multiple evaluation methods, including the combined application of VSS, UNC4P, and Antera3D score, can be potentially used for guiding treatment protocols and evaluating efficacy. Meanwhile, rhGM-CSF hydrogel

provides another choice for laser wound management. Carbon Dioxide Adult;Carbon Dioxide;Cicatrix;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Retrospective Studies;Treatment Outcome

Recovering the osteoblastic differentiation potential of mesenchymal stem cells derived from diabetic rats by photobiomodulation therapy. Autologous cell-based therapy for bone regeneration might be impaired by diabetes mellitus (DM) due to the negative effects on mesenchymal stem cells (MSCs) differentiation. Strategies to recover their osteogenic potential could optimize the results. We aimed to evaluate the effect of photobiomodulation (PBM) therapy on osteoblast differentiation of rats with induced DM. Bone marrow MSCs of healthy and diabetic rats were isolated and differentiated into osteoblasts (OB and dOB, respectively). dOB were treated with PBM therapy every 72â€‰hour (660â€‰nm; 0.14â€‰J; 20â€‰mW; 0.714â€‰W/cm(2) , and 5 J/cm(2)). Cell morphology, viability, gene and protein expression of osteoblastic markers, alkaline phosphatase (ALP) activity, and the mineralized matrix production of dOB-PBM were compared to dOB. PBM therapy improved viability of dOB, increased the gene and protein expression of bone markers, the ALP activity and the mineralized matrix production. PBM therapy represents an innovative therapeutic approach to optimize the treatment of bone defects in diabetic patients. Animals;Cell Differentiation;Cells, Cultured;Diabetes Mellitus, Experimental;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis;Rats

830Â nm photobiomodulation therapy promotes engraftment of human umbilical cord blood-derived hematopoietic stem cells. Human umbilical cord blood (hUCB)-derived hematopoietic stem cells (HSCs) are an important source for HSCs in allogeneic HSC transplantation, but a limited number and a low efficacy of engraftment greatly restrict their clinical use. Here, we report the ability of photobiomodulation therapy (PBMT) to significantly enhance the engraftment efficacy of hUCB HSCs and progenitor cells (HSPCs). hUCB CD34(+) cells were illuminated at a fluence of 2Â J/cm(2) with a near-infrared light (830Â nm) transmitted by an array of light-emitting diodes (LED) prior to infusion of NOD/SCID-IL2RÎ³(-/-) mice. The pre-treatment resulted in a threefold higher of the mean percentage of human CD45(+) cells in the periphery of the mice compared to sham-treated CD34(+) cells. The enhanced engraftment may result from a PBMT-mediated increase of intracellular reactive oxygen species (ROS) levels and Src protein phosphorylation in CD34(+) cells. The two events were causally related as suggested by the finding that elevation of ROS by hydrogen peroxide increased Src phosphorylation, while ROS reduction by N-acetyl cysteine partially reversed the phosphorylation. The investigation demonstrates that PBMT can promote engraftment of hUCB HPSCs, at least in part, via ROS-mediated Src signaling pathway. PBMT can be potentially a safe, convenient, and cost-effective modality to improve hematological reconstitution in patients. Leukocyte Common Antigens;PTPRC protein, human Animals;Fetal Blood;Graft Survival;Hematopoietic Stem Cell Transplantation;Humans;Leukocyte Common Antigens;Low-Level Light Therapy;Mice;Mice, Inbred NOD;Mice, SCID

Biological non-ablative repair of lumbar discs by transforaminal intradiscal laser irradiation: MRI quantitative analysis of the effects-preliminary report. Degenerative disc disease is a significant reason for low back pain. Low-level laser irradiation (LLLI) of cartilage results in its reshaping and combines with regenerative reaction. A certain pattern of lumbar disc irradiation induces healing reaction and formation of new cartilage. Quantitative MRI analysis of regenerative response of the cartilage is the subject of this investigation. Fifty-one lumbar discs of 28 patients with discogenic low back pain underwent irradiation with 1.56-Î¼m Er fiber laser (1.2Â W). Quantitative MRI analysis is performed in STIR regime within 0.93-14.80Â months. Signal intensity is estimated from irradiated discs and control measured from adjacent non-irradiated discs and vertebral bones. T2 WI follow-up is performed within a long period (up to 5Â years) in selected cases. The mean value of MRI signal

intensity from the irradiated discs increased by 14% (pâ€‰<<<â€‰0.001). The control bone measurement revealed no difference in signal intensity (pâ€‰=â€‰0.83). The adjacent non-irradiated discs slightly increased their signal (pâ€‰<â€‰0.05). T2 WI follow-up within 5Â years revealed a steady increase of the signal and the irradiated discs healing. LLLI of degenerated intervertebral discs by 1.56-Î¼m Er fiber laser produces increase of MRI disc signal within the first year after treatment that confirms regenerative response of the disc and could lay in the basis of clinical improvement. Further assessment on the effect is mandatory.
Humans;Intervertebral Disc;Intervertebral Disc Degeneration;Intervertebral Disc Displacement;Low Back Pain;Lumbar Vertebrae;Magnetic Resonance Imaging

Response to: Optimization of Photobiomodulation Protocol for Chemotherapy-Induced Mucositis in Pediatric Patients (re: DOI: 10.1089/photob.2019.4794). Antineoplastic Agents
Antineoplastic Agents;Child;Humans;Low-Level Light Therapy;Mucositis;Stomatitis

A Randomized Comparative Study between High-Intensity and Low-Level Laser Therapy in the Treatment of Chronic Nonspecific Low Back Pain. OBJECTIVES: Chronic nonspecific low back pain (chronic nsLBP) is one of the most common musculoskeletal disorders leading to disabilities and physical inactivity. Laser therapy was used in chronic nsLBP treatment; however, no previous studies have assessed the impacts of high-intensity laser therapy (HILT) versus low-level laser therapy (LLLT) on chronic nsLBP. This study compared the effects of HILT versus LLLT on individuals suffering from chronic nsLBP. METHODS: The study was a randomized control trial. Sixty individuals with chronic nsLBP were enrolled in this study between May and November 2019. All participants were clinically diagnosed with chronic nsLBP. They were assigned randomly into three groups, 20 in each group. The first group received a program of LLLT, the second group received a program of HILT, and the third did not receive laser therapy (control group). Pain severity, disability, lumbar mobility, and quality of life were assessed before and after 12-week intervention. RESULTS: Both LLLT and HILT groups showed a significant improvement of the Oswestry Disability Index (ODI), visual analogue scale (VAS), lumbar range of motion (ROM), and European Quality of Life (EuroQol) scores ($p > 0.05$), while the control group did not show significant changes ($p > 0.05$). Comparison among the three study groups postintervention showed significant differences in the outcome measures ($p > 0.05$), while comparison between the LLLT and HILT groups showed nonsignificant differences ($p > 0.05$). CONCLUSION: There are no different influences of LLLT versus HILT on chronic nsLBP patients. Both LLLT and HILT reduce pain and disability and improve lumbar mobility and quality of life in chronic nsLBP patients.

Consensus Statement for the Management and Treatment of Port-Wine Birthmarks in Sturge-Weber Syndrome. IMPORTANCE: Sturge-Weber syndrome (SWS) is a neurocutaneous syndrome involving the skin, brain, and eyes. Consensus recommendations for management are lacking. OBJECTIVE: To consolidate the current literature with expert opinion to make recommendations that will guide treatment and referral for patients with port-wine birthmarks (PWBs). EVIDENCE REVIEW: In this consensus statement, 12 nationally peer-recognized experts in dermatology with experience treating patients with SWS were assembled. Key topics and questions were formulated for each group and included risk stratification, optimum treatment strategies, and recommendations regarding light-based therapies. A systematic PubMed search was performed of English-language articles published between December 1, 2008, and December 1, 2018, as well as other pertinent studies identified by the expert panel. Clinical practice guidelines were recommended. FINDINGS: Treatment of PWBs is indicated to minimize the psychosocial impact and diminish nodularity and potentially tissue hypertrophy. Better outcomes may be attained if treatments are started at an earlier age. In the US, pulsed dye laser is the standard for all PWBs regardless of the lesion size, location, or color. When performed by experienced physicians, laser treatment can be safe for

patients of all ages. The choice of using general anesthesia in young patients is a complex decision that must be considered on a case-by-case basis. CONCLUSIONS AND RELEVANCE: These recommendations are intended to help guide clinical practice and decision-making for patients with SWS and those with isolated PWBs and may improve patient outcomes. Clinical Decision-Making;Consensus;Dermatology;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Practice Guidelines as Topic;Sturge-Weber Syndrome;Treatment Outcome

Efficacy of laser monotherapy or non-surgical mechanical instrumentation in the management of untreated periodontitis patients. A systematic review and meta-analysis. OBJECTIVE: To evaluate and compare the effects of laser monotherapy with non-surgical mechanical instrumentation alone in untreated periodontitis patients. MATERIALS AND METHODS: A focused question was formulated based on the Population, Intervention, Comparison, Outcome, and Study design criteria (PICOS): in patients with untreated periodontitis, does laser mono-therapy provide adjunctive effects on pocket probing depth (PPD) changes compared with non-surgical instrumentation alone? Both randomized controlled clinical trials (RCTs) and controlled clinical trials (CCTs) were included. The results of the meta-analyses are expressed as weighted mean differences (WMD) and reported according to the PRISMA guidelines. RESULTS: The search yielded 1268 records, out of which 8 articles could be included. With respect to PPD changes, a meta-analysis including 5 articles (n = 148) failed to identify statistically significant differences in favor of laser monotherapy for PPDÂ change (WMD = 0.14 mm; 95% CI: - 0.04/0.32; z = 1.51; p = 0.132) nor for clinical attachment level (CAL)Â (WMD = 0.04 mm; 95% CI: - 0.35/0.42; z = 0.19; p = 0.850). Data on cost-effectiveness are lacking. One study reported patient-related outcome measures (PROMS). CONCLUSIONS: In untreated periodontitis patients, laser monotherapy does not yield superior clinical benefits compared with non-surgical mechanical instrumentation alone. CLINICAL RELEVANCE: In untreated periodontitis patients, mechanical instrumentation with hand and/or ultrasonic instruments remains the standard of care. Dental Scaling;Humans;Lasers;Low-Level Light Therapy;Periodontitis;Treatment Outcome

Photobiomodulation by a new optical fiber device: analysis of the in vitro impact on proliferation/migration of keratinocytes and squamous cell carcinomas cells stressed by X-rays. Photobiomodulation-based (PBM-based) therapies show promising results in mucositis and dermatitis treatment by stimulating wound healing mechanisms such as cell proliferation and migration. The aim of the present study is to investigate the in vitro effects of CareMin650 on the proliferation and migration of two different types of cells, namely cancer and non-cancer cells, with or without X-ray radiation. Study design used PBM through a combination of 0-3-6 J/cm(2) doses-with or without X-ray radiation-on the proliferation and migration capabilities of a keratinocyte cell line (HaCaT) and a squamous cell carcinoma line (SCC61). PBM is delivered by a new woven optical fiber device, namely CareMin650 prototype (light emission by LEDs (light-emitting diodes), peak at 660 nm, irradiance of 21.6 mW/cm(2)). The effectiveness of PBM to increase HaCaT proliferation and migration (with or without X-ray radiation) supports the capability of PBM to favor wound healing. It also highlights that PBM does not provide any anti-radiation effect to previously X-rays radiated SCC ($p < 0.001$). Such data supports the beneficial effect of PBM delivered by an optical fiber device to heal wounds, without promoting cancer development. Carcinoma, Squamous Cell;Cell Proliferation;Humans;Keratinocytes;Low-Level Light Therapy;Optical Fibers;X-Rays

Wound Phototherapy. Researchers have tested the effects of low-level light therapy (LLLT) using low-power lasers or non-coherent, non-collimated light therapy from light-emitting diodes (LEDs) on wounds for decades, exploring the efficacy of phototherapy treatments for chronic1 and acute2 wounds. Low-level light therapy has received device clearance in the United States for cosmetic improvement of aging or sun-damaged skin, acne, actinic keratoses, non-melanoma skin cancer, improving circulation, and decreasing pain as well as stiffness and muscle spasm. 3 It has been used

for dental, dermatologic, neurologic, and chiropractic conditions in Canada, Europe, and Asia for several years.4 There are few adequately powered, double-blind randomized clinical trials (RCTs) carefully evaluating energy dose-response of each color or wavelength of LLLT. Typical ranges of LLLT include infrared light waves (800-1200 nm, penetrating 5-10 mm of tissue), red (630-700 nm, penetrating 2-3 mm), yellow (570-590 nm, penetrating 0.5-2 mm), and blue to ultraviolet (400-170 nm, penetrating âŸ¨ 1 mm).3 Low-level light therapy is delivered at various power densities (W/cm2), time durations, and duty cycles, accumulating as energy absorbed over time, called fluence (J/cm2). The variety of wound outcomes in response to differing LLLT parameters used to stimulate various aspects, depths, and types of tissue injury can be confusing. In this installment of Evidence Corner, a systematic review5 of LED effects on dermatologic conditions and wounds and a second on LLLT effects on diabetic foot ulcers (DFUs)1 add clarity to LLLT effects on some aspects of wound management.

Effect of 808-nm Laser Photobiomodulation Treatment in Blepharitis Rat Model. PURPOSE: Blepharitis, simply defined as eyelid inflammation, is one of the common ocular conditions associated with discomfort and irritation. Because blepharitis causes meibomian gland dysfunction and dry eye, this study aimed to confirm the effect of photobiomodulation (PBM) on blepharitis. METHODS: A total of 20 rats were randomly assigned to 4 equal groups, including control, blepharitis, PBM, and eye drop. Blepharitis was induced in rats by injecting complete Freund's adjuvant in the eyelid margins. PBM intervention was given every 3 days after blepharitis induction. Clinical signs including tear volume, tear breakup time (TBUT), meibomian gland swelling, fluorescein, telangiectasia, and meibomian gland secretion scores were measured every week, and the rats were killed for histological analysis after 4 weeks. Immunohistochemistry was performed to compare the level of inflammatory cytokines, interleukin-1Î² and tumor necrosis factor-Î±, and terminal deoxynucleotidyl transferase dUTP nick end labeling staining on retina was performed to observe any retinal damage. RESULTS: Tear volume and TBUT increased with PBM intervention, and with improved eyelid swelling, corneal staining, telangiectasia, and meibomian gland secretion scores increased. Hematoxylin and eosin staining showed no structural abnormalities of meibomian gland caused by blepharitis induction. Immunohistochemistry revealed that the levels of inflammatory cytokines interleukin-1Î² and tumor necrosis factor-Î± were lowered with PBM treatment in both eyelid and conjunctiva. Terminal deoxynucleotidyl transferase dUTP nick end labeling staining showed no retinal damage. CONCLUSIONS: Laser PBM at 808 nm was effective in alleviating ocular signs and controlling inflammation in blepharitis rat model. The in vivo results suggest that PBM has the potential to be used in treating blepharitis patients. Interleukin-1beta;Tumor Necrosis Factor-alpha Animals;Blepharitis;Disease Models, Animal;Immunohistochemistry;In Situ Nick-End Labeling;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Tears;Telangiectasis;Tumor Necrosis Factor-alpha

Neuromodulation in the Treatment of Alzheimer's Disease: Current and Emerging Approaches. Neuromodulation as a treatment strategy for psychiatric and neurological diseases has grown in popularity in recent years, with the approval of repetitive transcranial magnetic stimulation (rTMS) for the treatment of depression being one such example. These approaches offer new hope in the treatment of diseases that have proven largely intractable to traditional pharmacological approaches. For this reason, neuromodulation is increasingly being explored for the treatment of Alzheimer's disease. However, such approaches have variable, and, in many cases, very limited evidence for safety and efficacy, with most human evidence obtained in small clinical trials. Here we review work in animal models and humans with Alzheimer's disease exploring emerging neuromodulation modalities. Approaches reviewed include deep brain stimulation, transcranial magnetic stimulation, transcranial electrical stimulation, ultrasound stimulation, photobiomodulation, and visual or

auditory stimulation. In doing so, we clarify the current evidence for these approaches in treating Alzheimer's disease and identify specific areas where additional work is needed to facilitate their clinical translation. Acoustic Stimulation;Alzheimer Disease;Deep Brain Stimulation;Humans;Low-Level Light Therapy;Photic Stimulation;Transcranial Direct Current Stimulation;Transcranial Magnetic Stimulation;Ultrasonic Therapy

The effects of 808-nm near-infrared laser light irradiation on actin cytoskeleton reorganization in bone marrow mesenchymal stem cells. Tailoring the cell organelles and thus changing cell homeostatic behavior has permitted the discovery of fascinating metabolic features enabling enhanced viability, differentiation, or quenching inflammation. Recently, photobiomodulation (PBM) has been accredited as an effective cell manipulation technique with promising therapeutic potential. In this prospective, in vitro results revealed that 808-nm laser light emitted by a hand-piece with a flat-top profile at an irradiation set up of 60Â J/cm2 (1Â W, 1Â W/cm(2); 60Â s, continuous wave) regulates bone marrow stromal cell (BMSC) differentiation toward osteogenesis. Considering the importance ofÂ actin cytoskeleton reorganization, which controls a range of cell metabolic activities, comprising shape change, proliferation and differentiation, the aim of the current work is to assess whether PBM therapy, using a flat-top hand-piece at higher-fluence irradiation on BMSCs, is able to switch photon signals into the stimulation of biochemical/differentiating pathways involving key activators that regulate de novo actin polymerization. Namely, for the first time, we unearthed the role of the flat-top hand-piece at higher-fluence irradiation on cytoskeletal characteristics of BMSCs. These novel findings meet the needs of novel therapeutically protocols provided by laser treatment and the manipulation of BMSCs as anti-inflammatory, osteo-inductive platforms. Actin Cytoskeleton;Animals;Cell Differentiation;Cell Proliferation;Cells, Cultured;Female;Mesenchymal Stem Cells;Mice;Mice, Inbred BALB C;Prospective Studies

Photobiomodulation drives pericyte mobilization towards skin regeneration.
Photobiomodulation is being widely applied for improving dermal or mucosal wound healing. However, the underlying cellular and molecular processes that directly contribute to its effects remain poorly understood. Pericytes are relevant cells involved in the wound microenvironment and could be one of the main targets of photobiomodulation due to their plasticity and perivascular localization. Herein, we investigate tissue repair under the photobiomodulation stimulus using a pericyte labeled (or reporter) transgenic mice. Using a model of two contralateral back wounds, one the control and the other photoactivated daily (660Â nm, 20 mW, 0.71Â W/cm(2), 5Â J/cm(2), 7Â s, 0.14Â J), we showed an overall influx of immune and undifferentiated cells and higher mobilization of a potent pericyte subpopulation (Type-2 pericytes) in the photoactivated wounds in comparison to the controls. Doppler analysis showed a significant increase in the blood flow in the photoactivated wounds, while marked vascular supply was observed histologically. Histochemical analysis has indicated more advanced stages of tissue repair after photoactivation. These data suggest that photobiomodulation significantly accelerates tissue repair through its vascular effects with direct recruitment of pericytes to the injury site. Animals;Low-Level Light Therapy;Mice;Mice, Transgenic;Pericytes;Skin;Wound Healing

Effect of photobiomodulation therapy on the proliferation phase and wound healing in rats fed with an experimental hypoproteic diet. Photobiomodulation therapy (PBMT) has been indicated for enforcement on healing skin wounds. This study evaluated the effects of PBMT on the healing of skin wounds during the proliferation phase in rats with a hypoproteic diet. Rats were randomized to one of the following groups (n = 10 per group): (i) injured normoproteic (25% protein) not subjected to PBMT; (ii) injured normoproteic who received PBMT; (iii) injured hypoproteic (8% protein) not subjected to PBMT; and (iv) injured hypoproteic who received PBMT. Rats were submitted to skin wounds and then treated with PBMT (low-level laser therapy: 660 nm, 50 mW, 1.07 W/cm(2), 0.028

cm(2), 72 J/cm(2), 2 J). Analyses were performed at 7 and 14 days of follow-up: semi-quantitative histopathologic analysis, collagen type I and III expressions, immunohistochemical marking for matrix metalloproteinases-3 (MMP-3) and (matrix metalloproteinases-9) MMP-9, and mechanical resistance test. There were significant differences between the normoproteic groups and their respective treated groups ($p < 0.05$), as well as to treated and untreated hypoproteic groups in histopathologic analysis semi-quantitatively and immunohistochemistry for MMP-3 and 9, in which PBMT was able to decrease immunostaining. Moreover, there was a decrease in collagen deposition with the statistical difference ($p < 0.05$) for both collagen types III and I. In conclusion, PBMT application was proved effective in the treatment of cutaneous wounds in rats submitted to a hypoproteic diet. These alterations were more salient in the proliferation stage with the reduction of metalloproteinases providing better mechanical resistance of the injured area in the remodeling phase with an intensification of type I collagen. Animals;Cell Proliferation;Diet;Diet, Protein-Restricted;Low-Level Light Therapy;Rats;Rats, Wistar;Wound Healing

MASCC/ISOO clinical practice guidelines for the management of mucositis: sub-analysis of current interventions for the management of oral mucositis in pediatric cancer patients. OBJECTIVE: The aim of this sub-analysis was to highlight the MASCC/ISOO clinical practice guidelines for the management of oral mucositis (OM) in pediatric patients and to present unique considerations in this patient population. METHODS: This sub-analysis of the pediatric patient population is based on the systematic review conducted by the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISSO) published in 2019/2020. Studies were scored and assigned a level of evidence based on previously published criteria. Data regarding adverse effects and compliance was collected from the original publications. RESULTS: A total of 45 papers were included and assessed in this sub-analysis, including 21 randomized controlled trials (RCTs). Chewing gum was demonstrated to be not effective in preventing OM in pediatric cancer patients in 2 RCTs. The efficacy of all other interventions could not be determined based on the available literature. CONCLUSION: There is limited or conflicting evidence about interventions for the management of OM in pediatric cancer patients, except for chewing gum which was ineffective for prevention. Therefore, currently, data from adult studies may need to be extrapolated for the management of pediatric patients. Honey and photobiomodulation therapy in this patient population had encouraging potential. Implementation of a basic oral care protocol is advised amid lack of high level of evidence studies. Adolescent;Child;Guidelines as Topic;Humans;Stomatitis

Photobiomodulation enhances the Th1 immune response of human monocytes. This study aims to evaluate the effects of photobiomodulation (PBM) on human monocytes, assessing the oxidative burst and ultimate fungicidal potential of these cells, as well as the gene expression at the mRNA level of CD68, CD80, CD163, CD204, IL-6, TNF-Î± and IL-10 in derived macrophages. Primary cultures of human monocytes were irradiated with an InGaAlP (660Â nm)/GaAlAs (780Â nm) diode laser (parameters: 40Â mW, 0.04Â cm(2), 1Â W/cm(2); doses: 200, 400 and 600Â J/cm(2)). Cells were submitted to the chemiluminescence assay, and a microbicidal activity assay against Candida albicans was performed. Reactive oxygen species (ROS) and nitric oxide (NO) production were measured, and cell viability was assessed by the exclusion method using 0.2% Trypan blue reagent. Irradiated monocytes were cultured for 72Â h towards differentiation into macrophages. Total RNA was extracted, submitted to reverse transcription and real-time PCR. The results were analysed by ANOVA and the Tukey test (Î±â€‰=â€‰0.05). Irradiated monocytes revealed a significant increase in their intracellular and extracellular ROS (Pâ€‰<â€‰0.001). The 660Â nm wavelength and 400Â J/cm(2) dose were the most relevant parameters (Pâ€‰<â€‰0.001). The fungicidal capacity of the monocytes was shown to be greatly increased after PBM (Pâ€‰<â€‰0.001). PBM increased the expression of TNF-Î± (Pâ€‰=â€‰0.0302) and the production of NO (Pâ€‰<â€‰0.05) and did not

impair monocyte viability. PBM induces a pro-inflammatory Th1-driven response in monocytes and macrophages. Cell Survival;Humans;Immunity;Lasers, Semiconductor;Macrophages;Monocytes

Effects of photobiomodulation therapy on neuropathic pain in rats: evaluation of nociceptive mediators and infrared thermography. Nerve injury induces release of peptides and upregulation of receptors such as substance P and transient receptor potential receptor V1 (TRPV1), which contribute to the development and maintenance of chronic pain. Photobiomodulation therapy (PBMT) is a nonpharmacological strategy that promotes tissue repair and reduces pain and inflammation. However, the molecular basis for PBMT effects on neuropathic pain is still unclear. We investigated the effects of PBMT on substance P, TRPV1, and superficial temperature change in a rodent model of neuropathic pain. We evaluated substance P and TRPV1 in dorsal root ganglia (DRG L4 to L6) at baseline, 14 days after chronic constriction injury (CCI) and after PBMT. We also assessed the superficial temperature of tarsal, metatarsal, tibia, and fibula regions before and after PBMT using infrared thermography. Substance P and TRPV1 levels increased in DRG of CCI rats compared to naive and sham rats and decreased after PBMT. Infrared thermography showed increased temperature of tarsal, metatarsal, tibia, and fibula regions in CCI rats, which was decreased after PBMT. There were no statistical differences between CCI rats with PBMT, sham, and naive rats in any assay. PBMT reduces nociceptive mediators and hind paw and leg's temperature in a rodent model of neuropathic pain, suggesting that PBMT may play a modulatory role in thermoregulation, neurogenic inflammation, and thermal sensitivity in peripheral nerve injuries. Therefore, PBMT appears to be a valuable strategy for neuropathic pain treatment in clinical settings. Animals;Ganglia, Spinal;Hyperalgesia;Low-Level Light Therapy;Neuralgia;Nociception;Rats;Rats, Sprague-Dawley;Thermography

Photobiomodulation reduces hepatic lipogenesis and enhances insulin sensitivity through activation of CaMKKÎ²/AMPK signaling pathway. Photobiomodulation (PBM) could improve systemic blood glucose and insulin resistance in diet-induced diabetic mice. A few possible molecular mechanisms for the beneficial effects of PBM on diabetes have been proposed, but there is still an urgent need to explore the underlying mechanisms that support the application of PBM in the treatment of diabetes. Our study aimed to evaluate the effects of PBM on lipid metabolism in the liver of high-fat diet (HFD)-induced mice and explore the potential mechanisms of PBM on obesity and type 2 diabetes. Here, we administered PBM therapy (wavelength: 635Â nm, energy density: 8Â J/cm(2)) daily for eight weeks to HFD-induced mice. We detected that eight-week daily administration of PBM ameliorated HFD-induced gain weight, hyperlipidemia, and hyperglycemia, but also protected against diet-induced hepatic steatosis and insulin resistance. Furthermore, PBM increased AMP-activated protein kinase (AMPK) activation, lowered nuclear translocation of sterol regulatory element binding protein 1 (SREBP1), decreased aberrant lipogenesis, and enhanced insulin sensitive in HFD-induced mice livers. We also observed that Ca(2+)/calmodulin-dependent protein kinase kinase Î² (CaMKKÎ²) activation was responsible for AMPK activation in insulin-resistant HepG2 cells exposed to PBM. In summary, PBM at 635Â nm and 8Â J/cm(2) improved hepatic lipid metabolism and inhibited the development of HFD-induced obesity and type 2 diabetes. Moreover, increased intracellular Ca(2+) content and CaMKKÎ²-dependent AMPK activation were possible molecular mechanisms underlying the PBM-induced improvement on obesity and type 2 diabetes. Blood Glucose;Calmodulin;Insulin;Triglycerides;Calcium-Calmodulin-Dependent Protein Kinase Kinase;AMP-Activated Protein Kinases AMP-Activated Protein Kinases;Animals;Blood Glucose;Calcium-Calmodulin-Dependent Protein Kinase Kinase;Calmodulin;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Diet, High-Fat;Hep G2 Cells;Humans;Insulin;Insulin Resistance;Lipid

Metabolism;Lipogenesis;Liver;Luminescence;Male;Mice, Inbred C57BL;Phosphorylation;Signal Transduction;Triglycerides

Influence of root debridement with adjunct photodynamic therapy on periodontal parameters and gingival crevicular fluid cortisol levels among patients with and without type-2 diabetes mellitus. OBJECTIVE: The aim of the present study was to assess the influence of scaling and root planing (SRP) with adjunct antimicrobial photodynamic therapy (aPDT) on periodontal parameters and gingival crevicular fluid (GCF) cortisol levels in type-2 diabetic and non-diabetic patients with periodontitis. METHODS: One hundred and twenty-eight patients with periodontitis (64 with and 64 without type-2 diabetes mellitus, respectively) were included. In the test- and control-groups, patients underwent SRP with and without aPDT, respectivey. In both groups, plaque and gingival indices (PI and GI), probing depth (PD), clinical attachment loss (CAL), marginal bone loss (MBL) and GCF volume and cortisol levels were assessed at baseline and three and six-months after SRP with or without aPDT. The aPDT was performed at baseline using methylene blue and photobiomodulation. The Kruskall-Wallis test was used to assess data normality; and group-comparisons were done. P-values, which were below 0.01 indicated statistical significance. RESULTS: Sixty-four type-2 diabetic patients with and 64 non-diabetic patients with periodontitis were included. All individuals had Stage-III/Grade-C periodontitis. Among patients with type-2 diabetes mellitus (DM), there was no statistically significant difference in hemoblobin A1c, PI, GI, PD, CAL and MBL at baseline and at 3- and 6-months intervals. Amongst diabetic patietns, there was no difference in the GCF volume and cortisol levels in the test- and control-groups at all time intervals. In non-diabetic patients, there was a significqnt reductionin GCF volume and cortisol levels when SRP was done with aPDT than when SRP was carried out as the sole treatment strategy CONCLUSION: Among non-diabetic patients, SRP with aPDT helps reduce periodontal inflammation and GCF cortisol levels for up to 6-months; however poorly-controlled DM compromises the beneficial effects of this treatment strategy. Photosensitizing Agents;Hydrocortisone Chronic Periodontitis;Debridement;Dental Scaling;Diabetes Mellitus, Type 2;Gingival Crevicular Fluid;Humans;Hydrocortisone;Photochemotherapy;Photosensitizing Agents;Root Planing

Transcranial photobiomodulation-induced changes in human brain functional connectivity and network metrics mapped by whole-head functional near-infrared spectroscopy in vivo. Transcranial photobiomodulation (tPBM) with near-infrared light on the human head has been shown to enhance human cognition. In this study, tPBM-induced effects on resting state brain networks were investigated using 111-channel functional near-infrared spectroscopy over the whole head. Measurements were collected with and without 8-minute tPBM in 19 adults. Functional connectivity (FC) and brain network metrics were quantified using Pearson's correlation coefficients and graph theory analysis (GTA), respectively, for the periods of pre-, during, and post-tPBM. Our results revealed that tPBM (1) enhanced information processing speed and efficiency of the brain network, and (2) increased FC significantly in the frontal-parietal network, shedding light on a better understanding of tPBM effects on brain networks.

Effects of photo-stimulation with laser or LED on the composition of Xanthan gum produced in media containing distilled water or dialyzed or not produced water by means of Raman spectroscopy. Oil is expected to continue to be one of the most important sources of energy in the world and world's energy matrix for the foreseeable future. However, high demand for energy and the decline of the production of oil fields makes oil recovery a challenge. Most techniques used for the recovery process are expensive, non-sustainable and technically difficult to implement. In this context, microbial enhanced oil recovery (MEOR) represents an attractive alternative. It employs products derived from the metabolism of microorganisms that produce biopolymers. Certain bacteria species (e.g., Xanthomonas campestris) produce polysaccharides (exopolysaccharides - EPS) such as the well-

known Xanthan gum (XG). We hypothesized that the use of produced water (PW) water in combination photo-stimulation with laser/LED could influence the production and composition of XG. Raman spectroscopy has been used for qualitative and quantitative evaluation of the biochemical composition of XG biopolymer under light stimulation. X. campestris cultures in either distilled water or dialysis-produced water were studied under the absence or presence of laser irradiation (Î»Â =Â 660Â nm, CW, spot size 0.040Â cm(2), 40Â mW, 444Â s, 8.0Â J/cm(2)) or LED (Î»Â =Â 630Â nmÂ Â±Â 2Â nm, CW, spot size 0.50Â cm(2), 140Â mW, 500Â s, 12Â J/cm(2)). XG produced by these cultures was analyzed by Raman spectroscopy at 1064Â nm excitation and subjected to principal component analysis (PCA). Results of the exploratory analysis and ANOVA general linear model (GLM) suggested that the extent of XG and pyruvate (pyruvyl mannose) production was affected differentially in X. campestris when cultured in distilled water plus LED photo-stimulation versus dialysis-produced water plus LED photo-stimulation. XG production increased in the distilled water culture. In contrast, both pyruvate acetyl mannose content went up in the dialysis-water culture. These results open a wide field of opportunities in the use of metal-enriched cultures in combination with photo-biomodulation to direct and optimize bacterial production of compounds (i.e., XG) that may be of great benefit in the implementation of sustainable practices for oil extraction. Complex Mixtures;Culture Media;Polysaccharides, Bacterial;Water;xanthan gum Complex Mixtures;Culture Media;Lasers;Polysaccharides, Bacterial;Principal Component Analysis;Spectrum Analysis, Raman;Viscosity;Water;Xanthomonas campestris

Photobiomodulation as adjunctive therapy for guided bone regeneration. A microCT study in osteoporotic rat model. Regeneration of diseased bone is challenging. Guided bone regeneration (GBR) has been applied to favor the bone repair. Photobiomodulation (PBM) is also a recognized therapy able to improve bone repair in healthy and diseased individuals. Thus, with the hypothesis that PBM therapy could improve the GBR of diseased bone, this study evaluated the effect of PBM as adjunctive therapy to GBR in osteoporotic rats. Osteoporosis was induced in rats using the oophorectomy model. Then, 5-mm calvaria bone defects were created and treated according to the experimental groups, as follows: with no further treatment (Control); conventional GBR (Membrane), GBR and PBM applied with 3Â s, 4Â J/cm(2) and 0.12Â J per point (PBM-1) and GBR and PBM applied with 10s, 14Â J/cm(2), 0.4Â J per point (PBM-2). PBM therapy (808Â nm, 40Â mW, 1.42Â W/cm(2)) was applied immediately, 48 and 96Â h postoperatively. Four and eight weeks later, the samples were harvested and processed for micro-computerized tomography (Micro CT). Data were statistically compared (pÂ <Â 0.05). From 4 to 8Â weeks mostly significant changes were observed in the PBM groups. The bone volume fraction and number of trabeculae of the PBM groups, especially the PBM-1, were significantly higher than those of Control (pÂ <Â 0.0001). The values of thickness and separation of the trabeculae and structural model index of the PBM groups were significantly smaller than Control (pÂ <Â 0.0001). The connectivity density was significantly higher on Membrane and PBM groups than Control (pÂ <Â 0.0004). The application of PBM as adjunctive therapy to GBR results in enhanced bone formation and maturation in comparison to the conventional GBR in the regeneration of lesions of osteoporotic bone in rats. Overviewing the challenges that face bone regeneration in patients with osteoporosis, our findings open new perspectives on the treatment of bone defects under osteoporotic conditions. Animals;Bone Regeneration;Female;Lasers;Low-Level Light Therapy;Models, Animal;Osteogenesis;Osteoporosis;Ovariectomy;Rats;Rats, Wistar;Skull;Time Factors;Treatment Outcome;X-Ray Microtomography

A Systematic Review of Nonsurgical Vulvovaginal Restoration Devices: An Evidence-Based Examination of Safety and Efficacy. BACKGROUND: The efficacy and safety of vulvovaginal

restoration devices were called into question in a U.S. Food and Drug Administration statement on July 30, 2018, claiming that women are being harmed by laser and other energy-based devices. The goal of this systematic literature review was to assess existing data, determine gaps in evidence, and propose opportunities for continued investigation pertaining to laser and energy-based vaginal restoration techniques. METHODS: A review of literature using PubMed, Cochrane Library databases, Embase, MEDLINE, and the Cumulative Index to Nursing and Allied Health Literature was conducted on January 9, 2019, and articles up to this point were considered. For inclusion, studies had to be available or translated in English and relate to clinical medicine, direct patient care, and nonsurgical energy-based vulvovaginal procedures. RESULTS: The authors found five level I studies, 19 level II studies, four level III studies, and 46 level IV studies that used 15 different devices. Various degrees of improvement of symptoms were reported in all studies. Adverse events/side effects were noted in two of the 13 radiofrequency device studies, 15 of the 23 erbium:yttrium-aluminum-garnet device studies, and 17 of the 37 carbon dioxide device studies. The majority of adverse events were considered mild. CONCLUSIONS: The majority of studies resulted in mild to no adverse side effects. However, there is a large gap in level I evidence. As a result, the authors emphasize the necessity of supplemental data surrounding this subject and suggest that additional randomized sham-controlled studies be conducted to further investigate vulvovaginal restoration devices in an effort to address women's health issues. Device Approval;Evidence-Based Medicine;Female;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Menopause;Radiofrequency Ablation;Treatment Outcome;United States;United States Food and Drug Administration;Vagina;Vaginal Diseases;Vulva;Vulvar Diseases

Cryptochrome 1 is modulated by blue light in human keratinocytes and exerts positive impact on human hair growth. Photoactivation of cryptochrome-family proteins by blue light is a well-established reaction regulating physiology of plants, fungi, bacteria, insects and birds, while impact of blue light on cryptochrome synthesis and/or activity in human non-visual cells remains unknown. Here, we show that 453Â nm blue light induces cryptochrome 1 (CRY1) accumulation in human keratinocytes and the hair follicle. CRY1 is prominently expressed in the human anagen hair follicle, including epithelial stem cells. Specific silencing of CRY1 promotes catagen, while stimulation of CRY1 by KL001 prolongs anagen ex vivo by altering the expression of genes involved in apoptosis and proliferation. Together, our study identifies a role for CRY1 in sustaining human hair growth. Previously, we demonstrated positive effects of 453Â nm blue light on hair growth ex vivo. Taken all together, our study suggests that CRY1 might mediate blue light-dependent positive effects on hair growth. CRY1 protein, human;Carbazoles;Cryptochromes;KL001;Sulfonamides Apoptosis;Carbazoles;Color;Cryptochromes;Gene Expression;Gene Silencing;Hair;Hair Follicle;Humans;Keratinocytes;Sulfonamides

Effect of different treatments on recurrent aphthous stomatitis: laser versus medication. Recurrent aphthous stomatitis (RAS) is a common disease with ulcers in oral cavity which may trigger chewing, speaking, and swallowing difficulties to patients. Treatment of RAS is primarily aimed at pain relief and the promotion of wound healing. However, few agents have been found to have definite effect in the management of RAS and most of the medicinal products may cause adverse reactions or other disadvantages, which makes their clinical usage questionable. The purpose of this randomized controlled clinical trial (RCT) was to assess the clinical effect of diode laser and traditional medication treatment on RAS. In this study, 56 patients were randomly assigned to two groups (n = 28). Laser group was treated using diode laser (810 nm, 1.0 W, CW, irradiation time 20 s for 3 applications) once daily for continuous 3 days. Medication group was treated with triamcinolone acetonide 0.1% three times a day until the lesion was healed. Spontaneous and functional pain level on the third day of treatment was significantly less in the laser group. Significant difference was observed with respect to

healing time; however, the order of difference is small albeit of statistical significance. Diode laser with the chosen parameters had better effects on pain relief and no distinct advantage on wound healing comparing with medication. Trial registration number: ChiCTR2000030298; date of registration: 26 February 2020 (retrospectively registered). Adult;Humans;Low-Level Light Therapy;Male;Pain Management;Recurrence;Stomatitis, Aphthous;Treatment Outcome;Wound Healing

Management of Medication-Related Osteonecrosis of the Jaw (MRONJ) Using Leukocyte- and Platelet-Rich Fibrin (L-PRF) and Photobiomodulation: A Retrospective Study. BACKGROUND: The aim of this study was to compare retrospectively the effect of three different treatment protocols on the healing outcome in patients with established medication-related osteonecrosis of the jaw (MRONJ). METHODS: A total of 34 MRONJ patients were recruited from the Department database and were divided according to the treatment protocols in a study group (G1) and two control groups (G2 and G3). G1 was treated with antibiotic therapy, surgery, leukocyte- and platelet-rich fibrin (L-PRF), and photobiomodulation; G2 was treated with antibiotic therapy and surgery; G3 was treated with antibiotic therapy and photobiomodulation. Various clinical variables and treatment protocols were analyzed to determine their correlation with the healing outcome at three and six months of follow-up. RESULTS: There was a significant association between the different treatment protocols and the outcomes at both three and six months follow-up ($p = 0.001$ and $p = 0.002$, respectively). No significant association was observed between the outcomes and MRONJ localization, MRONJ stage, duration of drug treatment, gender, diabetes, corticosteroid therapy, smoking habits, underlying disease, and history of chemotherapy at both three and six months follow-up. CONCLUSIONS: Our results show that the combination of antibiotic therapy, surgery, L-PRF, and photobiomodulation may effectively contribute to MRONJ management.

Low-Level Laser Therapy for Androgenetic Alopecia. Minoxidil Alopecia;Humans;Low-Level Light Therapy;Minoxidil

Probable positive effects of the photobiomodulation as an adjunctive treatment in COVID-19: A systematic review. BACKGROUND: COVID-19, as a newly-emerged viral infection has now spread all over the world after originating in Wuhan, China. Pneumonia is the hallmark of the disease, with dyspnea in half of the patients and acute respiratory distress syndrome (ARDS) in up to one -third of the cases. Pulmonary edema, neutrophilic infiltration, and inflammatory cytokine release are the pathologic signs of this disease. The anti-inflammatory effect of the photobiomodulation (PBM) has been confirmed in many previous studies. Therefore, this review study was conducted to evaluate the direct effect of PBM on the acute lung inflammation or ARDS and also accelerating the regeneration of the damaged tissues. The indirect effects of PBM on modulation of the immune system, increasing the blood flow and oxygenation in other tissues were also considered. METHODOLOGY: The databases of PubMed, Cochrane library, and Google Scholar were searched to find the relevant studies. Keywords included the PBM and related terms, lung inflammation, and COVID-19 -related signs. Studies were categorized with respect to the target tissue, laser parameters, and their results. RESULTS: Seventeen related papers were included in this review. All of them were in animal models. They showed that the PBM could significantly decrease the pulmonary edema, neutrophil influx, and generation of pro-inflammatory cytokines (tumor necrosis factor-Î± (TNF-Î±), interleukin 1 beta (IL-1Î²), interleukin 6 (IL-6), intracellular adhesion molecule (ICAM), reactive oxygen species (ROS), isoform of nitric oxide synthase (iNOS), and macrophage inflammatory protein 2 (MIP-2)). CONCLUSION: Our findings revealed that the PBM could be helpful in reducing the lung inflammation and promoting the regeneration of the damaged tissue. PBM can increase the oxygenation indirectly in order to rehabilitate the affected organs. Thus, the infra-red lasers or light-emitting diodes (LEDs) are recommended in this regard. Cytokines;Reactive Oxygen Species COVID-

19;Cytokines;Humans;Low-Level Light Therapy;Lung;Macrophages;Neutrophils;Pneumonia;PubMed;Pulmonary Edema;Reactive Oxygen Species;Respiratory Distress Syndrome

In vitro effects of photobiomodulation therapy on 50B11 sensory neurons: evaluation of cell metabolism, oxidative stress, mitochondrial membrane potential (MMP), and capsaicin-induced calcium flow. The analgesic properties of photobiomodulation therapy (PBMT) have been raising increasing interest in the clinical community due to the positive effects observed on patients, nevertheless the mechanistic basis of its action on peripheral sensory neurons remains still elusive. In this study, the effect of near-infrared (NIR) PBMT at 800 and 970â€‰nm of wavelength was investigated on the 50B11 immortalized nociceptive sensory neuronal cell line by evaluating capsaicin-induced calcium flow and different markers correlated to mitochondria, that is, ATP, reactive oxygen species (ROS), and mitochondrial membrane potential (MMP). Calcium peak stimulated by capsaicin, the ligand of TRPV1 channel, was decreased in neurons pre-irradiated with the combination of the two wavelengths. Furthermore, delivering the 800 and 970â€‰nm separately an increment of ATP, as well as MMP hyperpolarization were detected; notably, the 800â€‰nm wavelength also increased ROS and O(2)(-) levels. Our findings, obtained on an in vitro model of nociception, show the positive effect of PBMT on two potential photo-targets of NIR light, namely the TRPV1 channel and the mitochondria. Capsaicin;Calcium Calcium;Capsaicin;Ganglia, Spinal;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Oxidative Stress;Sensory Receptor Cells

Photobiomodulation of the Visual System and Human Health. Humans express an expansive and detailed response to wavelength differences within the electromagnetic (EM) spectrum. This is most clearly manifest, and most studied, with respect to a relatively small range of electromagnetic radiation that includes the visible wavelengths with abutting ultraviolet and infrared, and mostly with respect to the visual system. Many aspects of our biology, however, respond to wavelength differences over a wide range of the EM spectrum. Further, humans are now exposed to a variety of modern lighting situations that has, effectively, increased our exposure to wavelengths that were once likely minimal (e.g., "blue" light from devices at night). This paper reviews some of those biological effects with a focus on visual function and to a lesser extent, other body systems. Animals;Cell Proliferation;Humans;Low-Level Light Therapy;Visual Pathways

Laser therapy in the treatment of cicatricial ectropion. INTRODUCTION: The objective of this study was to investigate the clinical effects of laser therapy in treating cicatricial ectropion. METHODS: Seven patients with cicatricial ectropion were entered into this clinical study. The ectropions were pretreated with the 595-nm pulsed dye laser if the scar color was red. If there was no red, the UltraPulse fractional CO(2) laser was used and parameters were adapted according to the height of scar. MEBT/MEBO was used after laser treatment for wound healing. The degree of ectropion was measured for changes before and after treatment, and the scars were evaluated for changes in melanin, height, vascularity, and pliability using the Vancouver Scar Scale (VSS) before and after treatment. RESULTS: All seven patients with cicatricial ectropion entered into this protocol were completely corrected after 1-2 treatment sessions. The total VSS score, as well as the score for melanin and pliability in 7 patients, showed a decrease following the treatments, and this was statistically significant (PÂ <Â 0.05). The scores for height and vascularity showed a decrease following the treatments, but there was no significant difference by statistical analysis (PÂ â‰¥Â 0.05). There were no adverse reactions reported. CONCLUSIONS: The treatment of cicatricial ectropion with laser therapy can not only correct the ectropion, but also improve the scars in the treatment area. Compared with the traditional repair of cicatricial ectropion, the use of fractional CO(2) laser provides surgical precision and the advantage of a timely treatment without the

need to wait for the scar to stabilize. Cicatrix;Ectropion;Humans;Laser Therapy;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome

Effect of Multiradiance Low-Level Laser Therapy and Topical Silver Sulfadiazine on Healing Characteristics of Dermal Wounds in Marine Toads (Rhinella marina). Current recommendations for wound management in amphibians are based primarily on clinical experience and on extrapolation from other taxa, whereas controlled clinical studies are lacking. Low-level laser therapy, also termed photobiomodulation, has gained popularity in veterinary medicine and may represent a valuable adjunct therapy for wound care in amphibians, though dosing and safety evaluations have not been previously reported. Silver sulfadiazine (SSD), a topical antimicrobial, is commonly utilized in amphibian medicine but little is known about its effects on wound healing in this class of animals. This pilot study evaluated the effects of repeated treatments of low-level laser therapy or topical SSD on second-intention healing characteristics of surgically induced full-thickness dermal wounds in 33 adult wild-caught marine toads. Toads were anesthetized, and a 6â€‰mm cutaneous biopsy was performed over the right dorsum. They were then randomly assigned to one of three groups: laser therapy (LT) at 5â€‰Hz (905â€‰nm wavelength on a super pulsed sequence), topical SSD (SD), or control sham treatment (CT). Treatments were administered at 24â€‰hrs after biopsy and then every 72â€‰hrs thereafter, concurrent with a visual assessment of the wound. Toads were euthanized at one of five timepoints (day 4, 7, 13, 19, or 28) to permit scoring of histologic criteria, including lymphocytic inflammation, granulomatous inflammation, heterophilic inflammation, granulation tissue, fibrosis, and reepithelialization. Visual assessments and histologic scoring did not identify a benefit of laser therapy or SSD as compared to controls. Laser therapy and SSD, at the doses and dosing schedule utilized in this pilot study, appear to be safe and well-tolerated treatments in marine toads, but may not be warranted for uncomplicated skin wounds in this species.

Effects of 660 nm and 810 nm Low-Power Diode Laser on Proliferation and Invasion of Oral Cancer Cells in Cell Culture Media. In the present study, the effects of 660 and 810Â nm diode laser on the proliferation and invasion of cancer cells were investigated. Sixteen plates of oral cancer cells originated from tongue SCC were irradiated with diode laser at 660Â nm (40 and 80Â mW) and 810Â nm (100 and 200Â mW) with the energy density of 4Â JÂ cm(-2) . One plate received no irradiation (the control). Irradiation was performed at four times (0, 24, 72 and 168Â h). Cell proliferation was measured by MTT assay. The Ki67 and vascular endothelial growth factor (VEGF) markers were examined by real-time polymerase chain reaction (RT-PCR). Cyclin D1, E-cadherin, Î²-catenin and matrix metalloproteinase-9 (MMP-9; flow cytometry) were also evaluated. Proliferation was lower in the irradiated groups. This result was significant for all groups at 24Â h. The percentages of cyclin D1 and MMP-9 were higher in 810Â nm groups, Î²-catenin and E-cadherin were higher in 660Â nm groups, VEGF marker was significantly lower in 810Â nm/200Â mW group, and Ki67 marker has no difference between the groups. According to the results of this study, laser irradiation at 0 and 24Â h resulted in a significant inhibitory effect on cell proliferation especially in 660Â nm/80Â mW and 810Â nm/200Â mW. Further studies are needed in this respect. Cadherins;Ki-67 Antigen;Vascular Endothelial Growth Factor A;beta Catenin;Cyclin D1;Matrix Metalloproteinase 9 Cadherins;Cell Culture Techniques;Cell Proliferation;Cyclin D1;Humans;Ki-67 Antigen;Lasers, Semiconductor;Low-Level Light Therapy;Matrix Metalloproteinase 9;Mouth Neoplasms;Vascular Endothelial Growth Factor A;beta Catenin

Combined isobutylamido thiazolyl resorcinol and low-fluence Q-switched Nd: YAG laser for the treatment of facial hyperpigmentation: A randomized, split-face study. BACKGROUND: Isobutylamido thiazolyl resorcinol (ITR) is a novel anti-tyrosinase recently shown to be effective in the treatment of hyperpigmentation. Low-fluence Q-switched Nd:YAG 1064-nm laser (LFQS) has proven to be effective for various hyperpigmentary conditions. However, there is no study on the efficacy

and safety of combined ITR and LFQS treatment. OBJECTIVES: To compare the efficacy and safety of combined ITR and LFQS with LFQS monotherapy for facial hyperpigmentation. MATERIALS AND METHODS: Patients with symmetrical facial hyperpigmentation were treated with five sessions of once weekly LFQS on the whole face. One side was randomly treated with ITR and the other side received a placebo cream for 12Â weeks. Patients were followed for 8Â weeks after the last laser treatment. Relative lightness index (RL*I), Facial Hyperpigmentation Severity Score on the malar area (FHSS(m)), patient satisfaction, recurrence, and adverse events were recorded. RESULTS: Twenty-four patients completed the study. Both sides demonstrated significant reductions of mean RL*I and mean FHSS(m) from baseline (PÂ <Â .01). At the 4th week, the ITR-treated side showed more improvement of mean RL*I than the placebo-treated side (62.5% vs 47.3% improvement, PÂ <Â .05). The mean FHSS(m) on the ITR-treated was reduced at a significantly higher percentage than the placebo-treated side (54.4% vs 40.2% reduction, PÂ <Â .05). Partial recurrence was observed on both sides. No serious side effects were noted. CONCLUSION: Combined ITR and LFQS therapy was more superior than LFQS monotherapy in the treatment of facial hyperpigmentation. ITR may serve as adjuvant for patients with such condition. Resorcinols Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Resorcinols;Treatment Outcome

Pharmacological and non-pharmacological management of burning mouth syndrome: A systematic review. Burning mouth syndrome (BMS) is idiopathic chronic oral pain, associated with depression, anxiety and pain symptoms. The BMS symptoms include a burning sensation in the tongue and/or other oral mucosa with no underlying medical or dental reasons. As many BMS patients suffer from psychiatric comorbidities, several psychotropic drugs are included in the management of BMS, reducing the complaint, while managing anxiety, depression and pain disorders. In this review, a search of the published literature regarding the management of BMS was conducted. We discuss the BMS etiology, clinically associated symptoms and available treatment options. The current evidence supports some BMS interventions, including alpha-lipoic acid (ALA), clonazepam, capsaicin, and low-level laser therapy (LLLT); however, there is a lack of robust scientific evidence, and large-scale clinical trials with long follow-up periods are needed to establish the role of these BMS management options. This knowledge could raise the awareness of dentists, psychiatrists and general practitioners about these challenges and the available kinds of treatment to improve multidisciplinary management for better health outcomes. Clonazepam;Capsaicin Burning Mouth Syndrome;Capsaicin;Clonazepam;Humans;Low-Level Light Therapy;Pain

Photobiomodulation reduces the impact of radiotherapy on oral health-related quality of life due to mucositis-related symptoms in head and neck cancer patients. To assess the effectiveness of photobiomodulation therapy (PBMT) in the oral health-related quality of life (OHRQoL) of patients with head and neck cancer undergoing radiotherapy (RT), using the Oral Health Impact Profile-14 (OHIP-14) and the Patient-Reported Oral Mucositis (OM) Symptoms Scale (PROMS), and to correlate OM degree with the PROMS and OHIP-14 scores. Forty-eight patients undergoing RT for head and neck cancer were randomly assigned into two groups: PBMT group (n = 25)-daily PBMT associated with a preventive oral care program (POCP); and control group (n = 23)-receiving POCP exclusively. OHRQoL was assessed using the PROMS and OHIP-14 questionnaires. OM degrees were classified according to the World Health Organization and the National Cancer Institute scales. Assessments were performed at the 1st, 7th, 14th, 21st, and 30th RT sessions. PBMT was effective in preventing and treating severe OM. Both groups showed increased OHRQoL impacts throughout the RT sessions; however, higher impacts were observed in the control group, mainly at the final stage of treatment (21st and 30th RT sessions). Significant correlations were found between the severity of OM and PROMS scores in the total sample and the control group at all RT periods. PROMS and OM scores were positive correlated at 14th, 21st, and 30th RT sessions in the control group, suggesting that this

instrument is useful in classifying OM. PBMT was effective in treating and preventing severe OM and OM-related symptoms, and with consequent positive impacts in OHRQoL in head and neck patients undergoing RT. The PROMS scale was helpful instrument for assessment of the severity of OM. Brazilian Clinical Trials database (ReBEC - RBR-5h4y4n), registered in Aug, 24th 2017. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Quality of Life;Stomatitis;Surveys and Questionnaires
Proposed mechanisms of low-level light therapy in the treatment of androgenetic alopecia. Androgenetic alopecia (AGA) is a global challenge, affecting a large number of people worldwide. Efficacy of the existed treatments can barely meet the demands of patients. Patients who are poorly responding to those treatments are seeking for a more effective and suitable technique to treat their disease. Low-level light therapy (LLLT) is a newly developed technique, which has been proved to stimulate hair growth. Based on the function principle of LLLT in other domains and refer to the published literatures, we write this review to neaten and elucidate the possible mechanism of LLLT in the treatment of AGA. A review of published literature which is associated with keywords LLLT, photobiomodulation, AGA, treatment, hair growth, and mechanism was performed to elucidate the proposed mechanism of LLLT in the treatment of AGA. The present study shows that LLLT can accelerate hair growth in AGA patients. The proposed mechanism of LLLT in treating AGA may vary among different specialists. But we can summarize the consensual mechanisms as follows; low-level light absorbed by chromophores can lead to the production of nitric oxide (NO) and the modulation of reactive oxygen species (ROS). These mobilized molecules subsequently activate redox-related signaling pathways in hair follicle cells and perifollicular cells. Finally, these activated cells participate in the regrowth of hair follicle. Even though the efficacy of LLLT in the treatment of AGA in both men and women has already been confirmed, the present studies focusing on discovering LLLT are still inadequate and unsystematic. More studies are needed to standardize the optimum treatment parameters applied in promoting hair growth and determine the long-term safety and efficacy of LLLT. Current recognitions about the mechanisms of LLLT, mainly focused on the molecules that may take effect, neglected different cellular components that are functional in the hair follicle macro-environment. Reactive Oxygen Species Alopecia;Female;Humans;Low-Level Light Therapy;Ovarian Follicle;Reactive Oxygen Species;Treatment Outcome
Safety and efficacy of photobiomodulation therapy in oncology: A systematic review. We performed a systematic review of the current literature addressing the safety and efficacy of photobiomodulation therapy (PBMT) in cancer patients. In this systematic review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used. In vitro, in vivo, and clinical studies, which investigated the effect of PBMT on cell proliferation/differentiation, tumor growth, recurrence rate, and/or overall survival were included. The Medline/PubMed, EMBASE, and Scopus databases were searched through April 2020. A total of 67 studies met the inclusion criteria with 43 in vitro, 15 in vivo, and 9 clinical studies identified. In vitro studies investigating the effect of PBMT on a diverse range of cancer cell lines demonstrated conflicting results. This could be due to the differences in used parameters and the frequency of PBM applications. In vivo studies and clinical trials with a follow-up period demonstrated that PBMT is safe with regards to tumor growth and patient advantage in the prevention and treatment of specific cancer therapy-related complications. Current human studies, supported by most animal studies, show safety with PBMT using currently recommended clinical parameters, including in Head & Neck cancer (HNC) in the area of PBMT exposure. A significant and growing literature indicates that PBMT is safe and effective, and may even offer a benefit in patient overall survival. Nevertheless, continuing research is indicated to improve understanding and provide further elucidation of remaining

questions regarding PBM use in oncology. Animals;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Neoplasms;Treatment Outcome;Tumor Burden

Effects of photobiomodulation and swimming on gene expression in rats with the tibialis anterior muscle injury. The aim of the present study was to evaluate the effects of photobiomodulation (low-level laser therapy (LLLT)) and aquatic exercise on the expression of genes related to muscle regeneration in rats. Wistar rats were divided into five groups: control group (n = 15), non-treated injury group (n = 15), injury+LLLT group (n = 15), injury+aquatic exercise group (n = 15), and injury+LLLT+aquatic exercise group (n = 15). Cryoinjury was performed on the belly of the tibialis anterior (TA) muscle. LLLT was performed daily with an AlGaAs laser (830 nm; beam spot of 0.0324 cm(2), output power of 100 mW, energy density of 180 J/cm(2), and 58-s exposure time). Animals were euthanized at 7, 14, and 21 days. The TA muscles were removed for gene expression analysis of TGF-Î², Myogenin, and MyoD. The results were statistically analyzed at a significance level of 5%. The cryoinjury increased the expression of genes related to muscle regeneration-MyoD, Myogenin, and TGF-Î²-compared to the control group ($p < 0.05$); the photobiomodulation increased the expression of these genes at day 7 ($p < 0.05$), decreasing until day 21; and the aquatic exercise increases the expression of the three genes over time. When the two treatments were combined, the expression of the analyzed genes also increased over time. In summary, the results of our study suggest that photobiomodulation (LLLT), when applied alone in cryoinjury, is able to increase the gene expression of MyoD, Myogenin, and TGF-Î² at the acute phase, while when combined with aquatic exercises, there is an increase in expression of these genes specially at the long-term treatment. Animals;Gene Expression;Low-Level Light Therapy;Muscle, Skeletal;Rats;Rats, Wistar;Swimming

Ablative laser surgery for allergic tattoo reactions: a retrospective study. Patients with allergic tattoo reactions are burdened with itch and have a reduced quality of life. Conservative treatment is often insufficient and little is known about treatment options to remove the responsible allergen. We aimed to address the effectiveness and safety of ablative laser therapy including measurement of patient's satisfaction, in patients with allergic reactions to tattoos. A retrospective study was conducted including patients with allergic tattoo reactions who were treated with a 10,600Â nm ablative CO(2) laser, either by full-surface ablation or fractional ablation. Clinical information originated from medical files and a 25-item questionnaire. Sixteen tattoo allergy patients were treated with a CO(2) laser between January 2010 and January 2018. Fourteen patients completed the questionnaire. Ten patients were satisfied with laser treatment. On a visual analogue scale, pruritus and burning improved with a median of 5.5 and 4 points in the full surface ablation group and 3 points on both parameters in the fractional ablation group. Despite the relatively small group of patients, our results suggest that CO(2) laser ablation improves itching, burning and impact on daily life in tattoo allergy. Adult;Humans;Hypersensitivity;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Pruritus;Quality of Life;Retrospective Studies;Tattooing;Visual Analog Scale

In Vitro Biostimulation of Low-Power Diode Pumping Solid State Laser Irradiation on Human Serum Proteins. Objective: This research is conducted to clarify whether the action of low-power diode pumping solid state (DPSS) laser doses modify proteins of normal human blood serum in vitro. Background data: Low-power laser light is considered to act through biostimulation rather than through thermal effects. It was found that low-power laser light biostimulates various biological processes, such as increasing the blood flow within the microcirculation. Methods: Human blood serum samples were carefully collected and divided into five equal aliquots. One of them served as a control (nonirradiated serum) and the other four aliquots were irradiated by DPSS laser at a wavelength of 589â€‰nm with different doses (50, 70, 90, and 110â€‰J/cm(2)). The electrophoretic migration speeds of each specific protein were measured immediately after irradiation using protein

electrophoresis. A paired Student's t-test was used between variables. Results: The protein concentrations were not significantly (pâ€‰>â€‰0.05) changed by the various doses of DPSS laser comparing with the nonirradiated counterpart. The electrophoretic migration speed of serum proteins was significantly decreased in almost all tested doses relative to the nonirradiated counterpart. Moreover, the irradiation of serum proteins (albumin, alpha1, alpha 2, beta, and globulin) with a laser dose of 70â€‰J/cm(2) was associated with a significant decrease (pâ€‰<â€‰0.003, 0.02, 0.002, 0.02 and 0.001, respectively) in protein migration speed compared with the protein migration speed of the control nonirradiated counterpart. Conclusions: Laser light at a wavelength of 589â€‰nm induces processes that lead to decreases in serum protein migration speeds. Globulin protein was found to have the lowest migration speed among the other plasma proteins. Blood Proteins Blood Proteins;Humans;Lasers, Solid-State;Low-Level Light Therapy;Serum

Effects of Irradiation Parameters and Position on Photobiomodulation Therapy for Spinal Cord Injury Rat Phantom Model: A Dosimetry Simulation Study. Objective: To optimize photobiomodulation therapy (PBMT) for spinal cord injury (SCI) by studying the effect(s) of irradiation parameters and position of PBMT on injury site using Monte Carlo simulation and a three-dimensional voxelated SCI rat phantom model. Background: Several studies used a range of irradiation parameters and surface irradiances to calculate the fluence delivered to the SCI site. However, most have ignored factors such as the optical properties of tissues, irradiation parameters, and position. Therefore, although such studies present a broad range of treatment outcomes, a comparison of the treatment efficacy concerning the applied fluence using these studies presents certain challenges Methods: In this study, an 810â€‰nm top-hat beam was simulated for 5 numerical apertures (NAs; 0.0, 0.2, 0.4, 0.6, and 0.8), 10 beam radii (0.001, 0.01, 0.1, 0.25, 0.5, 1, 2.5, 5, 10, and 25â€‰mm), and 17 different irradiation positions relative to the SCI site. Results: The beam radius and position strongly affect the accumulated fluence within the injury site, whereas the NA appears to have a smaller effect on the accumulated fluence within the injury site. A large probe beam produces a uniform fluence distribution reaching the injury site, minimizing the effect of misplacing the probe at the center of the injury. Conclusions: Our findings will be beneficial to understanding the effects of irradiation parameters on tissues and organs, which will help reduce variability in the fluence applied to injury sites and will help optimize PBMT outcomes. Animals;Computer Simulation;Low-Level Light Therapy;Radiometry;Rats;Spinal Cord Injuries

Beneficial Effects of Near-Infrared Light Photobiomodulation in Linear Morphea: A Case Report. Background: Linear morphea is a variant of scleroderma limited to the skin and underlying tissues secondary to an autoimmune inflammation leading to excess collagen deposition and fibrosis. Apart from topical or oral medications, successful light-based treatments have been reported using phototherapy including Psoralen plus ultraviolet A, photodynamic therapy, carbon dioxide laser, pulsed dye laser, and visible/infrared light. Methods: We report a patient with biopsy-proven infraorbital linear morphea responding to 940â€‰nm near-infrared light photobiomodulation treatments. Results: The patient had excellent cosmesis without textural changes or hypopigmentation despite her darker skin complexion (Fitzpatrick phototype III) after tri-weekly treatments for 8 months. Conclusions: Linear morphea, therefore, may be potentially amenable to home use light-based therapy by using nonthermal nonablative 940â€‰nm photons. To our knowledge, this home-based treatment approach has not been previously reported. Female;Humans;Infrared Rays;Lasers, Gas;Phototherapy;Scleroderma, Localized;Skin

Photobiomodulation and Miescher's cheilitis granulomatosa: case report. BACKGROUND: Miescher's cheilitis granulomatosa (MCG) is a rare chronic inflammatory disease and is known as the monosymptomatic clinical form of Melkersson-Rosenthal syndrome (MRS). It is characterised by

swelling of one or both lips and more frequently affects the upper lip. Histopathological findings show the presence of numerous inflammatory infiltrates and granuloma formations. Pharmacological treatments and surgery have provided results that are positive yet insufficiently stable in the long term. The clinical case described is of a 68-year-old female patient with a diagnosis of MCG of the upper lip. CASE PRESENTATION: The patient was diagnosed and treated at the Oral Medicine and Oral Pathology outpatient clinic of Maxillofacial and Odontostomatology Unit, Fondazione CÃ Granda IRCCS Ospedale Maggiore Policlinico. The patient was recommended localised treatments of photobiomodulation (PBM) using a diode laser with a 635 nm and 980 nm dual-wavelength (Î») approach, a 600-micron fibre, and a handpiece with a 1-cm-diameter lens at 300 mW. Three treatments a week were administered for four weeks for a total of 12 treatment sessions (T (1)-T (12)). After that, the patient had a long follow-up period of about 2 years. The therapeutic results were clear from the initial stages of treatment. There was an immediate, gradual, and consistent reduction in labial swelling. A reduction in the size of the lip by about 35% at T (10)-T (12) was observed, returning the size and volume of the upper lip within the normal clinical range. The painful symptoms subsided after the seventh treatment (T (7)). The histopathological check at 3 months and the follow-up in particular confirmed the disease was in remission with satisfactorily stable treatment results. Moreover, the patient did not use any other treatments on the area from the early laser treatments through to the end of the follow-up period. CONCLUSIONS: Our experience describes a clinical case of MCG treated with PBM and effectively resolved with a reduction of the lip swelling. The real success of the treatment emerged over time, showing that the tissue healing was stable. In absence of any collateral phenomena, this confirms the effective and documented therapeutic potential of PBM for chronic inflammatory infiltrates.

Association of antimicrobial photodynamic therapy and photobiomodulation for herpes simplex labialis resolution: Case series. Antimicrobial Photodynamic Therapy (aPDT) with photobiomodulation therapy (PBT) can be used in herpes simplex and may have a role in improving modulation of inflammatory process, pain relief and acceleration of tissue repair. This article reports through a case series, a proposal for an efficient resolution in clinical manifestations of herpes simplex labialis using aPDT associated with PBT. Anti-Infective Agents;Photosensitizing Agents;Methylene Blue Anti-Infective Agents;Herpes Labialis;Herpes Simplex;Humans;Methylene Blue;Photochemotherapy;Photosensitizing Agents

Effectiveness of Photobiomodulation as an Adjunct to Nonsurgical Periodontal Therapy in the Management of Periodontitis- A Systematic Review of in vivo Human Studies. Photobiomodulation therapy (PBMT) has anti-inflammatory, analgesic and regenerative properties. This systematic review aimed to critically appraise the published data of in vivo human randomized clinical trials (RCTs), and present a comprehensive overview of the efficacy of PBMT, as an adjunct to the nonsurgical periodontal therapy (NSPT) in the management of periodontitis. The systematic review protocol is registered in the Prospective Register Of Systematic Reviews (PROSPERO) (www.crd.york.ac.uk/PROSPERO/; ref CRD 42020169108). With the help of the appropriate key words, structured electronic and manual search strategies were applied to gather the relevant published data on in vivo human RCTs based on this topic. Seventeen papers that met the eligibility criteria were included in this review and subjected to a qualitative assessment. Current evidence lacks adequate information regarding the photobiomodulation (PBM) dosimetry, which is fundamental in establishing a standardized and replicable protocol for future researches. Furthermore, substantial discrepancies in the study methodology and a high risk of bias, arising from the majority of the included papers, abet to the inferior quality of these studies. Ultimately, there is an urgent necessity to conduct further well-designed RCTs in order to determine the effectiveness of PBMT, if any, by

taking into consideration the abovementioned confounding factors. Combined Modality Therapy;Humans;Low-Level Light Therapy;Periodontitis;Randomized Controlled Trials as Topic

Effects of ibuprofen and low-level laser therapy on orthodontic pain by means of the analysis of interleukin 1-beta and substanceÂ P levels in the gingival crevicular fluid. OBJECTIVE: The goal of this study was to compare the effects of ibuprofen and low-level laser therapy in alleviating orthodontic pain observed after elastomeric separator placement (ESP) by means of the analysis of interleukin 1â€'beta (IL-1Î²) and substance P (SP) levels in gingival crevicular fluid (GCF) and visual analog scale (VAS). MATERIALS AND METHODS: A total of 60Â subjects requiring ESP for the banding of maxillary first molars were randomly assigned to the ibuprofen, laser, and control groups. The ibuprofen and control groups received, respectively, 400â€¯mg ibuprofen and placebo lactose tablets orally 1â€¯h before ESP; the laser group received aÂ single low-level laser irradiation session immediately after ESP. GCF samples were collected immediately after ESP (dayÂ 0) and on daysÂ 1, 3, andÂ 7. Pain intensity was evaluated using the VAS immediately after ESP (baseline) and at hoursÂ 2 andÂ 6, as well as on daysÂ 1, 3, andÂ 7. RESULTS: Although IL-1Î² levels increased significantly on daysÂ 1, 3, andÂ 7 compared to dayÂ 0, intergroup comparison results revealed insignificant differences. SP levels indicated insignificant within-group differences. Only the SP levels of the ibuprofen group showed aÂ significant decrease on daysÂ 0 andÂ 1 compared to the laser and control groups. In all groups, VAS scores increased from baseline to aÂ peak level on dayÂ 1, followed by aÂ significant decrease on daysÂ 3 andÂ 7. Intergroup comparison results of VAS scores indicated less pain intensity in the ibuprofen group compared to the control group at baseline. CONCLUSIONS: Only the ibuprofen group exhibited significant decreases in SP levels on daysÂ 0 andÂ 1, as well as in VAS scores at baseline. IL1B protein, human;Interleukin-1beta;Substance P;Ibuprofen Gingival Crevicular Fluid;Humans;Ibuprofen;Interleukin-1beta;Low-Level Light Therapy;Pain;Pain Management;Substance P

Photobiomodulation Therapy and Dexamethasone in the Management of Oral Acute Graft-Versus-Host Disease: Case Report. Background: Acute graft-versus-host disease (GVHD) in the oral cavity is a rare complication of hematopoietic stem cell transplantation (HSCT) and treatment has a varying length of time for wound healing. Objective: This case report present a 63-year-old female patient with a diagnosis of acute lymphoid leukemia, submitted a related allogeneic HSCT, which after 6 months evolved with oral acute GVHD, presenting odynophagia, dysphagia, and difficulty of hygiene. Methods: We started the mouthwash dexamethasone and nystatin oral suspension and five sessions of photobiomodulation therapy (PBMT) (660â€‰nm, 100â€‰mW, 0.028â€‰cm(2), 2â€‰J, 70â€‰J/cm(2), 20â€‰sec/point) has been used with daily applications in the oral cavity (at the lesion sites and in healthy areas). Results: Complete healing of the oral lesions was observed in 5 days although the patient had acute skin and gastrointestinal GVHD. Conclusions: The treatment of oral acute GVHD with PBMT is still rare in the literature, but due to a good result in wound healing with PBMT, we have used this therapeutic option in combination with dexamethasone and have been successful in healing and reducing pain. Dexamethasone Dexamethasone;Female;Graft vs Host Disease;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Middle Aged;Wound Healing

Photobiomodulation Therapy Reduces the Inflammatory Process without Inhibiting Bone Deposition in Rats in an Extraction Model. Objective: We evaluated the influence of photobiomodulation therapy (PBMT) application during bone healing postexodontia in rats. Methods: We divided 84 male Wistar rats into a control group (CG), which received placebo treatment without PBMT, and a test group (TG), which was treated with PBMT. After exodontia, the animals were subjected to PBMT (TG) with an AsGaAI diode laser at 810â€‰nm, 100â€‰mW, 2â€‰J, and 70â€‰J/cm(2) or placebo treatment (CG) every 72â€‰h. After 1, 3, 7, 14, 21, and 28 days, the animals were weighed and

euthanized to remove the left hemimandibles for radiographic (alveolar filling) and histomorphometric (inflammatory polymorphonuclear cell (PMN), mononuclear cell (MN), osteoclast (OC), and blood vessels counting) analysis. Statistic approach used two-way variance analysis followed by Bonferroni post hoc (pâ€‰<â€‰0.05, GraphPad Prism 5.0). Results: There was no significant difference in body mass variation (pâ€‰=â€‰0.828) and bone neoformation (pâ€‰=â€‰0.365) between the two groups, but the TG presented lower PMN (pâ€‰<â€‰0.001), MN (pâ€‰<â€‰0.001), and OC counts (pâ€‰<â€‰0.001) and higher blood vessels count (pâ€‰<â€‰0.001) throughout the repair process. Conclusions: PBMT attenuated the inflammatory process after exodontia without interfering with bone neoformation. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Evidence-based post exercise recovery in combat sports: a narrative review. INTRODUCTION: Some methods such as ergo nutritional aids, cooling or massage among others could improve recovery in combat sports (CS). The effects, doses, duration, and timing of these methods remains unknown. Nowadays, there is no clear consensus regarding the recovery strategies and it is necessary to understand the type of fatigue induced in CS and its underlying mechanisms. The main aim of this article is to review the update literature related to recovery strategies in CS. EVIDENCE ACQUISITION: A literature search was conducted following preferred reporting items for review statement on the topic of: "combat sports," "recovery," "nutrition," "fatigue," "ergogenic aids," "weight cutting" and "hydration." EVIDENCE SYNTHESIS: The initial search of the literature detected 369 articles about CS. Later, 307 were excluded after being determined unrelated to recovery or after failure to fulfill the inclusion criteria. Of the 80 included articles, 19 satisfied the final inclusion criteria. CONCLUSIONS: To optimize CS performance, adequate recovery is required during training and competition processes. Traditional ergo nutritional supplementation of carbohydrates and proteins combined. Besides, the consumption of evidence supported supplementation (green tea, beetroot gels, creatine or alkaline water) improve recovery processes. Further methods of recovery including physical (cold water immersion, massage or photobiomodulation) and physiological (types of active recovery, sleep and rest) therapies have also been shown useful. This narrative review elucidates the important role of recovery techniques in CS. Athletic Performance;Dietary Supplements;Humans;Martial Arts;Massage;Rest;Sleep

Photobiomodulation with 590â€‰nm Wavelength Delays the Telomere Shortening and Replicative Senescence of Human Dermal Fibroblasts In Vitro. Background: Cellular senescence is one of the major factors contributing to the aging process. Photobiomodulation (PBM) is known to trigger an array of cellular responses, but there are no data on how it affects the process of cellular senescence. In this study, we analyze the effect of PBM on the cellular senescence and telomere dynamics. Methods: Human dermal fibroblasts were irradiated by a panel of light-emitting diodes with 590â€‰nm and dose 30â€‰J/cm(2) accumulated over 1200â€‰sec repeated in 4-day cycle within 40 days. After the last cycle of PBM treatment, the difference in number of senescent cells between PBM treated groups end nontreated control groups was measured by senescent sensitive Î²-galactosidase assay, and the difference in average telomere length between the experimental end control groups was analyzed using relative human telomere length quantitative Polymerase Chain Reaction (qPCR) assay. Results: After 10 cycles of irradiation, the percentage of senescent cells in PBM-treated cultures was 19.7%â€‰Â±â€‰4.5%, pâ€‰<â€‰0.05 smaller than the percentage of senescent cells in the control group, and their relative telomere length was 1.19â€‰Â±â€‰0.09-fold, pâ€‰<â€‰0.05 greater than nontreated controls. Conclusions: Our study demonstrates for the first time that PBM with appropriate parameters can delay the attrition of the telomeres and the entry of cells into senescence, suggesting a potential involvement of telomerase reactivation. A

hypothetical mechanism for this light-induced antiaging effect is discussed. Telomerase Cellular Senescence;Fibroblasts;Humans;Telomerase;Telomere;Telomere Shortening

Examining the Safety and Efficacy of Low-Level Laser Therapy for Male and Female Pattern Hair Loss: A Review of the Literature. PURPOSE: Pattern hair loss is the most common type of alopecia. Standard of care involves long-term use of topical medications with limited effectiveness. Low-level laser therapy (LLLT) has become a popular alternative treatment. Here, we examine published clinical trials to establish whether the breadth of evidence supports LLLT for pattern hair loss. METHODS: A literature search was conducted within the PubMed, Embase, Scopus, and Cochrane Trials databases to identify original articles evaluating hair regrowth following LLLT. Articles were selected based on use of 600-1,100 nm wavelengths, treatment time â‰¥16 weeks, and objective evaluation for hair regrowth. RESULTS: Ten randomized controlled trials were included, of which 8 compared LLLT to sham device and 1 to no treatment. The study populations varied, with 3 studies evaluating only women. All sham-device controlled studies demonstrated statistically significant increase in hair diameter or density ($p < 0.01$) following LLLT. DISCUSSION: Based on our review of the literature, LLLT appears to be effective for treating pattern hair loss in both men and women. These laser devices have good safety profiles, with only minor adverse effects reported. However, physicians should be cautious when drawing conclusions as some studies included have a relationship with industry.

What is the optimal time-response window for the use of photobiomodulation therapy combined with static magnetic field (PBMT-sMF) for the improvement of exercise performance and recovery, and for how long the effects last? A randomized, triple-blinded, placebo-controlled trial. BACKGROUND: The optimal time-response window for photobiomodulation therapy (PBMT) using low-level laser therapy (LLLT) and/or light emitting diodes therapy (LEDT) combined with static magnetic fields (sMF) before physical activity still was not fully investigated. The aim of the present study was to investigate the better of four time-response windows for PBMT combined with sMF (PBMT-sMF) use before exercise in humans. METHODS: A prospectively registered, randomized, triple-blinded (volunteers, therapists and assessors) placebo-controlled trial was carried out. Sixty healthy untrained male subjects were randomly allocated to six experimental groups (nâ€‰=â€‰10 per group): PBMT-sMF 5 mins, PBMT-sMF 3â€‰h, PBMT-sMF 6â€‰h, PBMT-sMF 1-day, placebo, and control. The control group performed all procedures, however did not receive any kind of intervention. PBMT-sMF active or PBMT-sMF placebo was applied precisely in different time points after baseline MVC test to ensure that both MVC tests and eccentric exercise protocol would occur at the same hour of the day in all groups. Then, after five minutes, 3â€‰h, 6â€‰h or 1-day (24â€‰h) of PBMT-sMF treatment (active or placebo) the eccentric exercise protocol was performed. The primary outcome was peak torque obtained from maximum voluntary contraction (MVC). The secondary outcomes were creatine kinase (CK), and delayed onset muscle soreness (DOMS). The primary and secondary outcomes were measured at baseline, immediately after, 1â€‰h, 24â€‰h and 48â€‰h after the eccentric exercise protocol. RESULTS: Sixty patients were randomized and analyzed to each sequence. The outcomes in absolute values show that all activeÂ PBMT-sMF groups increased (pâ€‰<â€‰0.05) MVC from immediately after to 1â€‰h after eccentric exercise, and decreased (pâ€‰<â€‰0.05) CK activity at all time points. However, PBMT-sMF 5 mins, 3â€‰h and 6â€‰h groups showed better results in MVC and CK analysis from 24â€‰h to 48â€‰h, and also to DOMS (pâ€‰<â€‰0.05) at all time points. Participants did not report any adverse events. CONCLUSIONS: PBMT-sMF can be used from 5â€‰min to 6â€‰h before exercise, and the effects can last up to 54â€‰h after treatment. However, the effects start to decrease when a 1-day (24â€‰h) time-response window is used. TRIAL REGISTRATION: NCT03420391. Registered 05 February 2018.

Clinical and Radiographic Success of Low-Level Laser Therapy Compared with Formocresol Pulpotomy Treatment in Primary Molars. Purpose: The purpose of this study was to assess and compare the clinical and radiographic success rates of low-level laser therapy (LLLT) and formocresol (FC) for pulpotomy in primary teeth. Methods: Utilizing a split-mouth technique, 106 primary molars of 36 five- to eight-year-olds were included. The teeth were selected according to specific clinical and radiographic inclusion criteria and randomly assigned to the LLLT group and FC group. A pulpotomy was performed on each molar; 53 teeth were treated with LLLT, and 53 teeth were treated using FC. Children were followed at six and 12 months for clinical and radiographic evaluation. Results: At six months, the clinical success rate was 98 percent for each group. Radiographic success was 100 percent for the LLLT group and 98 percent for the FC group. At 12 months, both groups showed a clinical success of 96.1 percent. Radiographic success at 12 months was 100 percent and 98 percent for LLLT and FC, respectively. Conclusions: Both low-level laser therapy and formocresol pulpotomy techniques showed favorable clinical and radiographic outcomes in human primary molar teeth over 12 months. Further longitudinal studies with longer follow-up periods and larger sample sizes are encouraged. Formocresols Child;Formocresols;Humans;Low-Level Light Therapy;Molar;Pulpotomy;Tooth, Deciduous

[Transscleral laser therapy in the treatment of glaucoma]. Nowadays glaucoma is one of the leading causes of irreversible blindness worldwide. The main goal in preservation of vision in glaucoma patients is reducing intraocular pressure (IOP), which is considered the main controlled risk factor for progression of glaucomatous optic neuropathy. The article discusses the effectiveness and safety of various transscleral laser technologies in the treatment of glaucoma. Modern transscleral laser technologies that affect the uveoscleral drainage and scleral hydro-permeability are less traumatic and more gentle making them promising in the treatment of patients with early stages of glaucoma, and not only in terminal glaucoma with pain syndrome resistant to conventional treatment ("last resort surgery"). Glaucoma;Humans;Intraocular Pressure;Laser Therapy;Low-Level Light Therapy;Tonometry, Ocular

Acne fulminans. Acne fulminans (AF) is a rare and severe form of inflammatory acne presenting clinically with an abrupt outburst of painful, hemorrhagic pustules and ulceration, that may or may not be associated with systemic symptoms, such as fever, polyarthritis, and laboratory abnormalities. It typically affects male teenagers with a pre-existing acne. Although the pathogenetic mechanism has not been established yet, a role of genetic, abnormal immunologic response, drugs intake, hormonal imbalance and viral infection, as causal factors, has been identified. AF may occur as a single disease or may be associated with other disorders. Traditionally, AF has been classified, on the basis of the presence of systemic involvement, in "acne fulminans" and acne fulminans "sine fulminans," when no systemic involvement is present. Recently, four clinical variants have been proposed: acne fulminans with systemic symptoms (AF-SS), acne fulminans without systemic symptoms (AF-WOSS), isotretinoin-induced acne fulminans with systemic symptoms (IIAF-SS), isotretinoin-induced acne fulminans without systemic symptoms (IIAF-WOSS). The diagnosis of AF is usually based on clinical history and physical examination. No specific laboratory abnormalities are generally found. In selected cases, biopsy and/or radiologic imaging are helpful for a correct diagnosis. The treatment significantly differs from severe acne according to severity of clinical presentation and possible systemic involvement. Currently, systemic corticosteroids (prednisolone) and retinoids (isotretinoin) represent the first choice of treatment. Dapsone, cyclosporine A, methotrexate, azathioprine, levamisole, and biological agents such as anakinra, infliximab, adalimumab may be considered as alternative therapies in selected cases. Adjunctive topical and physical therapies may also be considered. Adrenal Cortex Hormones;Androgens;Anti-Inflammatory Agents;Dermatologic Agents;Immunosuppressive Agents;Retinoids;Isotretinoin Acne Vulgaris;Acquired Hyperostosis

Syndrome;Adolescent;Adrenal Cortex Hormones;Adult;Androgens;Anti-Inflammatory Agents;Arthralgia;Combined Modality Therapy;Debridement;Dermatologic Agents;Diagnosis, Differential;Disease Progression;Female;Humans;Immunosuppressive Agents;Inflammation;Isotretinoin;Lasers, Dye;Low-Level Light Therapy;Male;Photochemotherapy;Propionibacteriaceae;Retinoids;Symptom Assessment;Young Adult

Antimicrobial photodynamic therapy against Propionibacterium acnes biofilms using hypericin (Hypericum perforatum) photosensitizer: in vitro study. Acne vulgaris is the most recurring skin condition in the world, causing great harm to the physical and psychological well-being of many patients. Antimicrobial photodynamic therapy (aPDT) has broad therapeutic applicability. The purpose was to evaluate in vitro the photodynamic inactivation against Propionibacterium acnes (P. acnes) biofilms by using different concentrations of hypericin (Hypericum perforatum) photosensitizer associated with different energies of low-level laser. The biofilms were placed in 96-well microplates with a 6.4-mm diameter surface, by using standard suspensions (2â€‰Ã—â€‰10(7)Â CFU/mL) and grown in brain heart infusion broth (BHI) for 48Â h in anaerobic chamber. Subsequently, the control group received application of 0.9% sterile saline solution for 3Â min; the photosensitising groups received hypericin at concentrations of 5 and 15Â Î¼g/mL for 3Â min; the laser groups received irradiation of energies of 3 and 5Â J (660Â nm, continuous output, 100Â mW, 30 and 50Â s and 100Â J/cm(2) and 166Â J/cm(2), respectively); the aPDT groups received 5 and 15Â Î¼g/mL concentrations of hypericin associated with energies of 3 and 5Â J of low-level laser irradiation. After the biofilms were broken up and seeded for CFU counting. The results showed a reduction in P. acnes biofilms after aPDT emphasising that 15Â Î¼g/mL hypericin associated with 3 and 5Â J laser irradiation reduced biofilms by 14.1 and 27.9%, respectively. In addition, all groups of aPDT demostrated statistically significant reductions. In vitro photodynamic inactivation against P. acnes biofilms using different concentration of hypericin photosensitizer associated with different energies of low-level laser promoted effective antimicrobial action. Anthracenes;Anti-Bacterial Agents;Anti-Infective Agents;Photosensitizing Agents;Perylene;hypericin Acne Vulgaris;Anthracenes;Anti-Bacterial Agents;Anti-Infective Agents;Biofilms;Humans;Hypericum;Lasers;Light;Perylene;Photochemotherapy;Photosensitizing Agents;Propionibacterium acnes

Efficacy of low-level light therapy for improving healing of diabetic foot ulcers: A systematic review and meta-analysis of randomized controlled trials. Diabetic foot ulcers are prevalent among patients with diabetes and negatively affect mortality and life expectancy. This study aimed to synthesize and systematically review the best evidence to assess the efficacy of low-level light therapy in improving healing of diabetic foot ulcers. We search CINAHL, Cochrane Library, EMBASE, ProQuest, PubMed, Scopus, and Web of Science from inception until September 30, 2019. Meta-analysis was performed using the Comprehensive Meta-analysis 3.0 software. Overall effect was measured using Hedges' g and determined using the Z-statistic at a significance level of P <â€‰.05. Heterogeneity was assessed using Ï‡(2) and I(2) statistics. Twelve randomized controlled trials were included. Meta-analysis revealed that 30.90% of the ulcer area was significantly reduced in the therapy group compared with the control group (Z =â€‰3.95, P <â€‰.001) with a very large effect (g =â€‰2.81). A 4.2 cm(2) reduction of the ulcer area was observed in the therapy group compared with the control group (Z =â€‰2.17, P =â€‰.03) with a very large effect (g =â€‰1.37). In addition, diabetic foot ulcers in the therapy group was 4.65 times more likely to heal completely than those in the control group (Z =â€‰3.02, P =â€‰.003). Low-level light therapy accelerates wound healing and reduces the size of diabetic foot ulcers. However, our review does not allow any recommendation for the best treatment parameters required to achieve improved healing. Future trials need to include a

good design and large sample size in defining the optimal treatment parameters for ulcers of different sizes. Diabetic Foot;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Wound Healing

Light Energy Dose and Photosensitizer Concentration Are Determinants of Effective Photo-Killing against Caries-Related Biofilms. Caries-related biofilms and associated complications are significant threats in dentistry, especially when biofilms grow over dental restorations. The inhibition of cariogenic biofilm associated with the onset of carious lesions is crucial for preventing disease recurrence after treatment. This in vitro study defined optimized parameters for using a photosensitizer, toluidine blue O (TBO), activated via a red light-emitting diode (LED)-based wireless device to control the growth of cariogenic biofilms. The effect of TBO concentrations (50, 100, 150, and 200 Î¼g/mL) exposed to light or incubated in the dark was investigated in successive cytotoxicity assays. Then, a mature Streptococcus mutans biofilm model under sucrose challenge was treated with different TBO concentrations (50, 100, and 150 Î¼g/mL), different light energy doses (36, 108, and 180 J/cm(2)), and different incubation times before irradiation (1, 3, and 5 min). The untreated biofilm, irradiation with no TBO, and TBO incubation with no activation represented the controls. After treatments, biofilms were analyzed via S. mutans colony-forming units (CFUs) and live/dead assay. The percentage of cell viability was within the normal range compared to the control when 50 and 100 Î¼g/mL of TBO were used. Increasing the TBO concentration and energy dose was associated with biofilm inhibition ($p < 0.001$), while increasing incubation time did not contribute to bacterial elimination ($p > 0.05$). Irradiating the S. mutans biofilm via 100 Î¼g/mL of TBO and â‰ˆ180 J/cm(2) energy dose resulted in â‰ˆ3-log reduction and a higher amount of dead/compromised S. mutans colonies in live/dead assay compared to the control ($p < 0.001$). The light energy dose and TBO concentration optimized the bacterial elimination of S. mutans biofilms. These results provide a perspective on the determining parameters for highly effective photo-killing of caries-related biofilms and display the limitations imposed by the toxicity of the antibacterial photodynamic therapy's chemical components. Future studies should support investigations on new approaches to improve or overcome the constraints of opportunities offered by photodynamic inactivation of caries-related biofilms. Photosensitizing Agents;Tolonium Chloride Animals;Biofilms;Colony Count, Microbial;Curing Lights, Dental;Dental Caries;Dose-Response Relationship, Radiation;Mice;Photosensitizing Agents;RAW 264.7 Cells;Streptococcus mutans;Tolonium Chloride

Combination Treatment with Human Adipose Tissue Stem Cell-derived Exosomes and Fractional CO2 Laser for Acne Scars: A 12-week Prospective, Double-blind, Randomized, Split-face Study. A variety of applications of human adipose tissue stem cell-derived exosomes have been suggested as novel cell-free therapeutic strategies in the regenerative and aesthetic medical fields. This study evaluated the clinical efficacy and safety of adipose tissue stem cell-derived exosomes as an adjuvant therapy after application of fractional CO2 laser for acne scars. A 12-week prospective, double-blind, randomized, split-face trial was performed. A total of 25 patients received 3 consecutive treatment sessions of fractional CO2 laser to the whole face, with a follow-up evaluation. Post-laser treatment regimens were applied; for each patient, one side of the face was treated with adipose tissue stem cell-derived exosomes gel and the other side was treated with control gel. Adipose tissue stem cell-derived exosomes-treated sides had achieved a significantly greater improvement than the control sides at the final follow-up visit (percentage reduction in Ã©chelle d'Ã©valuation clinique des cicatrices d'acnÃ© scores: 32.5 vs 19.9%, pâ€‰<â€‰0.01). Treatment-related erythema was milder, and post-treatment downtime was shorter on the applications of human adipose tissue stem cell-derived exosomes-treated side. In conclusion, the combined use of this novel material with resurfacing devices would provide synergistic effects on both the efficacy and safety of atrophic acne scar treatments. Acne Vulgaris;Adipose Tissue;Cicatrix;Double-Blind

Method;Exosomes;Humans;Lasers, Gas;Low-Level Light Therapy;Prospective Studies;Stem Cells;Treatment Outcome

Photobiomodulation as a promising new tool in the management of psychological disorders: A systematic review. Photobiomodulation is a brain modulation technique that has become a promising treatment for multiple pathologies. This systematic review collects studies up to 2019 about the beneficial effects of photobiomodulation as a therapy for treating psychological disorders and a tool for modulating cognitive processes. This technique is mostly used for the treatment of depression and stress, as well as to study its effects on psychological variables in healthy subjects. Despite the lack of parameters used, photobiomodulation seems to achieve enough brain penetration to produce beneficial effects in healthy subjects and patients with multiple pathologies. The best parameters are the wavelengths of 810 nm for the treatment of depression and 1064 nm for cognitive enhancement, along with a scalp irradiance of 250 mW/cm(2) and a scalp yield of 60 J/cm(2). It weekly application on the bilateral prefrontal area and the default mode network seems to be ideal for the maintenance of the effects. Photobiomodulation could be used as an effective and safe therapy for the treatment of multiple psychological pathologies. Brain;Humans;Low-Level Light Therapy;Mental Disorders

Comparison of low-level light therapy and combination therapy of 5% minoxidil in the treatment of female pattern hair loss. This study was conducted in order to compare the safety and efficacy of LLLT, 5% minoxidil, and combination therapy in the treatment of FPHL. A randomized controlled trial was developed to study the effect of LLLT on FPHL using a device called iHelmetÂ®, which is equipped with 200 5mW laser diode source (650Â nm) arrays. Ninety Ludwig's types II-III FPHL patients were randomly divided into 3 groups: LLLT group (A), 5% minoxidil group (B), and combination group(C). Hair density, hair diameter, and scalp oil-secretion were detected to evaluate the treatment effect. Significant improvement of hair density and hair diameter was observed in all stages of FPHL after treatment. Oil-secretion of the three groups was decreased after treatment. The effectiveness of reducing oil-secretion in LLLT group and combination group was higher than minoxidil group (PÂ <â€‰0.05). For improving hair diameter and hair density, combination group was better than LLLT and minoxidil groups. No side effects were reported. Our study illustrated that LLLT is a safe and effective treatment for FPHL. Besides, LLLT can significantly improve its efficacy when used in combination with 5% minoxidil. Minoxidil Adult;Alopecia;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Minoxidil;Treatment Outcome

Physical modalities for the conservative treatment of wrist and hand's tenosynovitis: A systematic review. OBJECTIVES: The management of wrist and hand's tenosynovitis remains challenging and needs to be individualized. Physical modalities are accepted among conservative treatments, but there is currently no systematic assessment of their role and efficacy. The aim of this review is to analyze the literature including studies dealing with the use of physical modalities in De Quervain disease, Dupuytren disease and trigger finger, in order to obtain indications for everyday clinical practice. METHODS: A systematic literature search of the following databases was conducted: MEDLINE (through PubMed), Cochrane Library, PEDro and Scopus. All kind of papers, except for case reports and case series, were included, due to the small amount of scientific evidence in literature about this topic. The inclusion criteria were papers regarding the effectiveness of conservative treatment with physical modalities of adult humans affected by De Quervain disease, Dupuytren disease and trigger finger. The review included articles in English language published before 10 May 2020. The exclusion criteria were papers whose topic were surgery or conservative treatment with therapeutic tools different from physical modalities for hand and wrist's tenosynovitis. RESULTS: The literature search identified 2422 papers, but only 15 were included in this review. While 10 of the 15 studies (66.6%) were RCTs, only 2 had a lower risk of bias according to the Cochrane library

assessment tool. For the conservative treatment of De Quervain disease 7 papers were found, studying ultrasound therapy, low level laser therapy, phonoporesis, and anodyne therapy, alone or associated. For Dupuytren disease 3 papers were found, studying extracorporeal shock wave therapy (ESWT), temperature controlled high energy adjustable multi-mode emission laser, electron beam therapy and radiofrequency. For trigger finger 5 papers were found, studying ESWT and ultrasound therapy. CONCLUSIONS: Laser therapy and therapeutic ultrasound were the most used and effective physical therapies for De Quervain tenosynovitis. ESWT was found the most efficient and safe therapy for Dupuytren disease; radiotherapy, electron beam therapy, targeted radiofrequency and laser therapy could be promising therapeutic options at Dupuytren's onset. ESWT turned out to be the most frequent physical mean used for functional improvement and pain control in trigger finger. However, more high-quality studies are still needed to further define evidence-based practice for patients with trigger finger, Dupuytren disease, and De Quervain disease.
Adult;Conservative Treatment;Humans;Physical Therapy Modalities;Tenosynovitis;Wrist;Wrist Joint

Chronic Musculoskeletal Pain: Nonpharmacologic, Noninvasive Treatments. Chronic low back pain, neck pain, hip and knee osteoarthritis, and fibromyalgia are the most common types of chronic musculoskeletal pain. Because no individual therapy has consistent benefit, a multimodal treatment approach to chronic musculoskeletal pain is recommended. Many nonpharmacologic, noninvasive treatment approaches yield small to moderate improvement and can be used with pharmacologic or more invasive modalities. Systematic reviews and guidelines support the effectiveness of various forms of exercise in improving pain and function in patients with chronic pain. Cognitive behavior therapy and mindfulness techniques appear to be effective for small to moderate short- and long-term improvement of chronic low back pain. Cognitive behavior therapy may also be effective for small short- and intermediate-term improvement of fibromyalgia. Spinal manipulation leads to a small benefit for chronic neck and low back pain. Acupuncture has a small to moderate benefit for low back pain and small benefit for nonpain fibromyalgia symptoms. Massage or myofascial release yields a small improvement in low back pain, hip and knee osteoarthritis, and fibromyalgia. Low reactive level laser therapy may provide short-term relief of chronic neck and low back pain, and ultrasound may provide short-term pain relief for knee osteoarthritis. Multidisciplinary rehabilitation may be effective for short- and at least intermediate-term improvement in pain and function for chronic low back pain and fibromyalgia. Patients should be encouraged to engage in a variety of therapies aligned with their preferences and motivation. Acupuncture Therapy;Chronic Pain;Cognitive Behavioral Therapy;Exercise;Fibromyalgia;Humans;Low Back Pain;Low-Level Light Therapy;Manipulation, Spinal;Massage;Mindfulness;Muscle Relaxation;Musculoskeletal Pain;Neck Pain;Osteoarthritis, Hip;Osteoarthritis, Knee;Pain Clinics;Patient Education as Topic;Ultrasonic Therapy

Effect of low level laser therapy on crestal bone levels around dental implants-A pilot study. BACKGROUND: Implant success is affected by initial bone resorption at the implant surface. Continuous efforts have been made to reduce the peri-implant crestal bone loss. Limited information is available regarding the influence of low level laser therapy (LLLT) on interaction between the bone and implant surface. PURPOSE: The aim of this pilot study was to assess the effect of LLLT on peri-implant crestal bone levels. MATERIALS AND METHODS: Twenty implants were placed in 20 patients who were randomly assigned to two groups. Group I patients' received no adjunctive treatment and group II patients' were administered LLLT using 980â€‰nm diode laser at 0.1 W output power following implant placement. The energy density of 4 J/cm(2) was delivered at six sites for a duration of 10 seconds per site. Crestal bone levels were evaluated primarily using digital intraoral periapical (IOPA) radiograph. The measurements were made immediately (T0) and 6â€‰weeks (T1) post implant placement; and 6 months (T2) and 1 year (T3) post prosthetic loading time intervals and

compared using repeated measures ANOVA test. RESULTS: Crestal bone levels at baseline were statistically not significant between groups (P = .880). At T3 time interval, the mean change in crestal bone levels around all anatomical implant sites measured was 0.81 (SE 0.04) mm for irradiated group and 0.97 (SE 0.04) mm for nonirradiated group. Intergroup analysis revealed statistically significant (P = .020) less crestal bone loss in group that received LLLT. CONCLUSION: Under the conditions of this study, LLLT reduced the crestal bone resorption surrounding dental implants. TRIAL REGISTRATION: The present clinical trial was not registered. Dental Implants Alveolar Bone Loss;Dental Implantation, Endosseous;Dental Implants;Dental Prosthesis Design;Humans;Low-Level Light Therapy;Pilot Projects

A systematic review of the effective laser wavelength range in delivering photobiomodulation for pain relief in active orthodontic treatment. OBJECTIVE: This systematic review aimed to establish an effective wavelength range for PhotoBioModulation (PBM) to relieve pain in orthodontic treatments. MATERIAL AND METHODS: The electronic literature search was carried out in the following databases: PubMed, ISI Web of Science, Scopus, and Cochrane. In the initial search, 255 papers were obtained. Deleting duplicates in the search left 180 items. One manually searched study was included for a total of 181 studies. According to PRISMA guidelines and a thorough analysis of their methodology, the final sample was composed of 13 RCTs. The final statistical analysis was performed in 11 studies. The statistical analysis sought to strengthen the collected data, determining the correlation coefficient (r) for the same time interval (24h) using a scale equivalent to the standard value (0-10cm). Aiming to reduce the effect of heterogeneity, the difference in cm between control group (GC) and experimental group (EG) averages was considered the outcome. This difference was correlated with the wavelength in nm, calculating the Pearson linear correlation coefficient, and calculating a logarithmic correlation. RESULTS: The dispersion of the data obtained in the experimental groups at each given wavelength showed that the most significant number of studies were in the ranges of 780-830nm. The correlation between the wavelength and the difference between the control and experimental group averages, either linear (R2=0.0564, r=0.237) or logarithmic (R2=0.0688, r=0.262) was not significant (P>0.90). Therefore, pain reduction after 24h is not significantly dependent of wavelength. CONCLUSION: The majority of RCTs related to pain relief in orthodontic treatment showed 780-830nm as the most effective photobiomodulation wavelength range for orthodontic pain relief. However, pain reduction after 24h is not significantly dependent of wavelength. The protocol was registered in PROSPERO (CRD42019119799). Databases, Factual;Humans;Laser Therapy;Lasers;Orthodontics;Pain;Pain Measurement;Tooth Movement Techniques

Cytotoxic, Migration, and Angiogenic Effects of Photodynamic Therapy and Photobiomodulation Associated with a Revascularization Protocol. INTRODUCTION: This study evaluated photodynamic therapy (PDT) and photobiomodulation therapy (PBM) as adjuncts to pulp revascularization using cultures of apical papilla cells (APCs) and endothelial cells (HUVECs). METHODS: The root canal and apical foramen of 2 mandibular first premolars were enlarged to simulate immature teeth. The canal of 1 tooth was filled with 1 mL 0.005% methylene blue (MB). After that, the canals of both teeth were irrigated with 20 mL 1.5% sodium hypochlorite (NaOCl) and 20 mL 17% EDTA. The resulting solutions were diluted in cell culture media at a concentration of 0.5% (0.5% MB + NaOCl + EDTA and 0.5% NaOCl + EDTA). After PDT (0.5% MB + NaOCl + EDTA + PDT) and PBM (0.5% NaOCl + EDTA + PBM) applications, the effects were evaluated to determine cytotoxicity, polarity index, APC migration, and HUVEC sprouting, and results were compared with those of their controls (solutions without laser application). Cell culture media (CT) was also used as a control. Data were analyzed using 1-way analysis of variance and the Tukey post hoc test (P â‰¤ .05). RESULTS: PDT and PBM promoted greater APC viability than their controls, and PDT had greater cell viability

than CT (P < .05). All protocols reduced APC migration when compared with CT (P < .05). HUVEC sprouts grown out of spheroids in PBM had a greater ratio area than their control (P â‰¤ .01), and the PDT ratio of the spheroid area was similar to that of its control (P > .05). CONCLUSIONS: PBM and PDT seem to be potentially effective adjuncts to revascularization in nonvital immature teeth. Photosensitizing Agents;Root Canal Irrigants;Edetic Acid;Sodium Hypochlorite Dental Pulp Cavity;Edetic Acid;Endothelial Cells;Photochemotherapy;Photosensitizing Agents;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite

The Use of Low-Level Laser Therapy to Reduce Postoperative Morbidity After Third Molar Surgery: A Systematic Review and Meta-Analysis. PURPOSE: Surgical removal of third molars carries morbidity and significantly affects patients' quality-of-life. This study aims to investigate whether administration of low-level laser therapy (LLLT) is effective in reducing postoperative morbidity in patients undergoing surgical removal of mandibular third molars compared with placebo. MATERIAL AND METHODS: A systematic review and meta-analysis involving a comprehensive search strategy implemented across 5 electronic databases. This was supplemented by hand searching and contacting international experts and grey literature. Titles, abstracts, and full articles were scrutinized for studies meeting the inclusion criteria. All randomized controlled trials comparing treatment group of LLLT with a placebo control group were eligible for inclusion. The outcomes variables were postoperative pain, swelling, and trismus. Risk of bias and methodological quality assessment was carried out. We pooled data statistically, and meta-analyses were carried out using a random-effects model. RESULTS: Seventeen randomized controlled trials were included in this systematic review, all of which were considered to have a low risk of bias. Participants, aged 13 to 70 years, and 35% women, totaled 1064. Meta-analyses found significant reductions in standardized mean differences (SMDs) in swelling at day 2 and day 7 postoperatively (SMD, -0.611; 95% confidence interval, -0.968, -0.234 and SMD, -0.532; 95% confidence interval, -0.795, -0.269). There were nonsignificant reductions in SMD in pain and trismus at day 2 and day 7 postoperatively. CONCLUSIONS: LLLT significantly reduces swelling after extraction of mandibular third molars compared with placebo. LLLT has not shown to reduce postoperative pain and trismus. LLLT does not cause adverse effects. There is currently insufficient evidence available, to promote the investment in LLLT vs the net clinical benefit. Randomized controlled trials with larger sample size and standardized study design and outcome measures are required, to make definitive recommendations to clinicians on its use on patients. Adolescent;Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Molar, Third;Morbidity;Pain, Postoperative;Tooth, Impacted;Trismus;Young Adult

Photobiomodulation Enhances the Healing of Postextraction Alveolar Sockets: A Randomized Clinical Trial With Histomorphometric Analysis and Immunohistochemistry. PURPOSE: Wound healing of postextraction sockets is a complex process that permits to reach the bone reformation in about 3 months, and that could be characterized by the presence of some complications, mainly dependent on the duration of the surgery. The aim of this study is to evaluate the impact of photobiomodulation (PBMT) on the healing processes of mucosa overlying postextraction alveolus and on related complications. METHODS: Twenty systemically healthy patients who needed to extract both lower third molars were selected in a private clinic and included in this prospective split-mouth randomized clinical trial. Inclusion criteria were no smokers subjects with the necessity to extract both lower third molars with surgeries overlapping for duration and difficulty. A computer-based randomization procedure was permitted to choose the side, subject to PBMT, by means of a neodymium-doped YAG (Nd: YAG) laser (test) and controls. Both surgeries were performed by the same operator with a gap of 40Â days. Twenty-two days after each surgery, a biopsy in correspondence to the alveolar mucosa of the socket was obtained from both sites and observed with an optical microscope and analyzed with histomorphometric analysis and immunohistochemistry. RESULTS: Each of the 20 participants

included in this study (11 women and 9 men, nonsmokers, mean age 16Â years in the range of 15 to 17 years) were subjected to the extraction of both lower third molars, and a side was treated as control, the other, as the test. The histomorphometric analysis and immunohistochemistry showed that the tested sites, contrary to controls, were characterized by a lower presence of inflammatory cells, a more mature epithelium and myofibroblasts incorporated in a network of fibers parallel to the basal membrane, with little positivity to alpha-SMA antibodies and anti-myosin but positivity to anti-desmin. CONCLUSIONS: In conclusion, PBMT accelerates the healing process of postextraction alveolus after third molar extraction.
Adolescent;Female;Humans;Immunohistochemistry;Male;Prospective Studies;Tooth Extraction;Tooth Socket;Wound Healing

Infrared neuromodulation:a neuroengineering perspective. Infrared neuromodulation (INM) is a branch of photobiomodulation that offers direct or indirect control of cellular activity through elevation of temperature in a spatially confined region of the target tissue. Research on INM started about 15 ago and is gradually attracting the attention of the neuroscience community, as numerous experimental studies have provided firm evidence on the safe and reproducible excitation and inhibition of neuronal firing in both in vitro and in vivo conditions. However, its biophysical mechanism is not fully understood and several engineered interfaces have been created to investigate infrared stimulation in both the peripheral and central nervous system. In this review, recent applications and present knowledge on the effects of INM on cellular activity are summarized, and an overview of the technical approaches to deliver infrared light to cells and to interrogate the optically evoked response is provided. The micro- and nanoengineered interfaces used to investigate the influence of INM are described in detail. Biophysics;Central Nervous System;Infrared Rays;Neurons;Neurosciences

[The combined use of kinesio- and laser therapy in the regional hemodynamic disorders correction in dilated cardiomyopathy]. The search for new methods of symptomatic therapy of dilated cardiomyopathy (DCM) remains a relevant objective of modern cardiology. This is due to the low and short-term existing methods effectiveness of conservative and surgical treatment, including drug therapy. PURPOSE OF THE STUDY: Efficacy evaluation of the combined use of kinesio- and laser therapy for the correction of regional hemodynamics in patients with DCM against the background of maintenance drug therapy. MATERIAL AND METHODS: 100 patients with DCM were examined. All patients received differential maintenance drug therapy (beta-blockers, ACE inhibitors, with intolerance to the latter - angiotensin II receptor blockers, aldosterone receptor antagonists, diuretics, cardiac glycosides, antiarrhythmic drugs). Patients were divided into 2 groups at least 3 months after the selection of drug therapy. Intravenous laser blood irradiation (ILBI) and the selection of unloading therapeutic exercises were performed for patients of the main group during therapy. Patients in the control group received only drug therapy. The main research method was venous occlusion plethysmography. It was used to assess regional hemodynamics with the determination of recirculating blood flow (Qr) and regional vascular resistance (Rr) at rest, venous tone (Vt), reserve blood flow (QH) and regional vascular resistance (RH) against a functional stress test. RESULTS: Data obtained in the dynamic observation process (after 1, 3, 6, 9 and 12 months) in the main group indicate a significant increase in Qr and QH, a decrease in Rr and RH, Vt. Significant positive dynamics in the control group was not observed. The regional hemodynamics indices after 9 and 12 months of observation significantly worsened. CONCLUSION: Thus, according to venous-occlusal plethysmography, the use of unloading therapeutic exercises in combination with ILBI against the background of rationally selected differentiated drug therapy in patients with DCM significantly improves the regional hemodynamics. The developed symptomatic therapy methods can be applied in the practice of cardiologists, general practitioners, therapeutists, rehabilitation physicians to

optimize the treatment of patients with DCM. Adrenergic beta-Antagonists Adrenergic beta-Antagonists;Cardiomyopathy, Dilated;Hemodynamics;Humans;Laser Therapy;Low-Level Light Therapy

Photobiomodulation reduces oxidative stress in diabetic wounded fibroblast cells by inhibiting the FOXO1 signaling pathway. This study aimed to elucidate the underlying molecular mechanism of photobiomodulation (PBM) in attenuating oxidative stress in diabetic wounded fibroblast cells. Cell models were exposed to PBM at a wavelength of 660Â nm (fluence of 5Â J/cm(2), and power density of 11.2Â mW/cm(2)) or 830Â nm (fluence of 5Â J/cm(2), and power density of 10.3Â mW/cm(2)). Non-irradiated cell models were used as controls. Cellular migration was determined at regular time intervals (0, 12, 24 and 48Â h) using inverted light microscopy. Cell viability was determined by the Trypan blue exclusion assay. The levels of enzymic antioxidants superoxide dismutase (SOD), catalase (CAT), and heme oxygenase (HMOX1) were determined by the enzyme linked immunosorbent assay (ELISA). The alteration in the levels of AKT and FOXO1 was determined by immunofluorescence and western blotting. Upon PBM treatment, elevated oxidative stress was reversed in diabetic and diabetic wounded fibroblast cells. The reduced oxidative stress was represented by decreased FOXO1 levels and increased levels of SOD, CAT and HMOX1. This might be due to the activation of the AKT signaling pathway. This study concluded that treatment with PBM progressed diabetic wound healing by attenuating oxidative stress through inhibition of the FOXO1 signaling pathway.

NIR light-assisted phototherapies for bone-related diseases and bone tissue regeneration: A systematic review. Recently, the rapid development of biomaterials has induced great interest in the precisely targeted treatment of bone-related diseases, including bone cancers, infections, and inflammation. Realizing noninvasive therapeutic effects, as well as improving bone tissue regeneration, is essential for the success of boneâ€‘related disease therapies. In recent years, researchers have focused on the development of stimuli-responsive strategies to treat bone-related diseases and to realize bone regeneration. Among the various external stimuli for targeted therapy, near infrared (NIR) light has attracted considerable interests due to its high tissue penetration capacity, minimal damage toward normal tissues, and easy remote control properties. The main objective of this systematic review was to reveal the current applications of NIR light-assisted phototherapy for bone-related disease treatment and bone tissue regeneration. Database collection was completed by June 1, 2020, and a total of 81 relevant studies were finally included. We outlined the various therapeutic applications of photothermal, photodynamic and photobiomodulation effects under NIR light irradiation for boneâ€‘related disease treatment and bone regeneration, based on the retrieved literatures. In addition, the advantages and promising applications of NIR light-responsive drug delivery systems for spatiotemporal-controlled therapy were summarized. These findings have revealed that NIR light-assisted phototherapy plays an important role in bone-related disease treatment and bone tissue regeneration, with significant promise for further biomedical and clinical applications. Animals;Bone Diseases;Bone Regeneration;Bone and Bones;Clinical Trials as Topic;Disease Models, Animal;Drug Delivery Systems;Humans;Infrared Rays;Low-Level Light Therapy;Nanoparticles;Photochemotherapy;Photothermal Therapy;Treatment Outcome

Is it safe to use visible blue light-emitting diode phototherapy for neonatal jaundice in infants who are also treated with amiodarone? Amiodarone is a useful treatment for neonatal cardiac arrhythmias. A minority of neonates with arrhythmias treated with amiodarone may also develop neonatal jaundice. Phototherapy is recommended to treat neonatal jaundice. However, amiodarone is known to cause skin reactions when patients are exposed to light. Therefore phototherapy may not be administered due to concerns about this interaction. Exchange transfusions are used as an alternative to phototherapy to avoid the interaction. However, exchange transfusions are associated with serious complications such as the transmission of bloodborne disease, seizures and

haemodynamic instability. We report a literature review and outcome of a premature infant treated with amiodarone and visible blue light-emitting diode (LED) phototherapy. Phototherapy was used for 54â€‰hours and no skin reactions were observed. This is because visible blue LED phototherapy lamps emit predominantly visible light. Therefore exposure to ultraviolet light that is known to cause amiodarone phototoxicity is minimised. Amiodarone Amiodarone;Humans;Infant, Newborn;Infant, Premature;Jaundice, Neonatal;Light;Phototherapy

Three-Dimensional Assessment of Mandibular Condylar Volume and Position Subsequent to Twin Block Functional Therapy of Skeletal Class II Malocclusion Accompanied by Low-Level Laser Therapy. This study aimed to evaluate and compare the effect of low-level laser therapy (LLLT) on mandibular condylar volume and position following treatment of a Class II malocclusion with a twin block (TB) appliance employing cone beam computed tomography (CBCT). Twenty-four growing patients, aged 9-12 years, were randomly allocated into control and laser groups. All patients were treated with a TB appliance. The patients in the laser group were treated weekly with a gallium-aluminum-arsenide (GaAlAs) diode laser around the temporomandibular joint (TMJ) region for three months. CBCT images were obtained before and after TB therapy and the changes in TMJ and skeletal variables were evaluated and compared among and between the groups. In the laser group, the condylar volume of the right and left sides significantly increased by 213.3 mm(3) and 231.2 mm(3), respectively ($p < 0.05$), whereas in the control group it significantly increased by 225.2 mm(3), and 244.2 mm(3), respectively ($p < 0.05$), with forward and lateral positioning of both sides. Furthermore, effective mandibular, ramus, and corpus lengths were increased, which were not significant between the groups. Low-Level Laser therapy accomplished no considerable effect on mandibular condylar volume and position following the functional orthopedic treatment of skeletal Class II malocclusions using a TB appliance.

Performance Improvement of Near-Infrared Spectroscopy-Based Brain-Computer Interfaces Using Transcranial Near-Infrared Photobiomodulation With the Same Device. Transcranial near-infrared photobiomodulation (tNIR-PBM) can modulate physiological characteristics of the human brain, such as the cerebral blood flow and oxidative metabolism. Here, we investigated whether the performance of near-infrared spectroscopy (NIRS)-based brain-computer interfaces (BCIs) can be improved by tNIR-PBM applied to the prefrontal cortex with the same NIRS device. A total of 14 healthy individuals participated in the NIRS-based BCI study where the aim was to distinguish the mental arithmetic task from the idle state (IS) task either after tNIR-PBM or after sham stimulation, with the two experiments being conducted at least two days apart. The tNIR-PBM was applied by simply turning on the NIRS recording equipment for 20 min. To evaluate the degree of performance improvement obtained after tNIR-PBM, the average BCI classification accuracy obtained under the tNIR-PBM condition was compared with that obtained under the sham stimulation condition. The classification accuracy of NIRS-based BCI was significantly improved upon conduction of tNIR-PBM (82.74%) as compared to that in the sham stimulation condition (76.07%, $p < 0.005$). Thus, our results suggest that simply turning on the NIRS recording equipment before the BCI experiment can improve the performance of the NIRS-based BCI system. Brain-Computer Interfaces;Humans;Mathematics;Prefrontal Cortex;Psychomotor Performance;Spectroscopy, Near-Infrared

Photobiomodulation reduces nociception and edema in a CFA-induced muscle pain model: effects of LLLT and LEDT. Photobiomodulation therapy (PBMT) is an effective therapeutic strategy and a noninvasive method to improve the regulation of inflammation and pain. Our aim was to examine the effects of different doses of PBMT on improvement of edematogenic and nociceptive responses in a myositis model in rats. We administered complete Freund's adjuvant (CFA) into the gastrocnemius muscle (GS) of rats to induce myositis and observe the effect of PBMT using different doses of energy

and two types of light sources, a low-level laser (LLL) and light emitting diodes (LED). For this, we evaluated the effects of these different energies to improve nociceptive and edematogenic responses using behavioural tests. In addition, we analysed histological images in animals with myositis induced by CFA. The administration of CFA to the GS induced increased cellular infiltrates, edema and a nociceptive response when compared to animals without myositis. When we treated the CFA-induced myositis animals with PBMT (LLLT or LEDT), we observed a decrease in nociception and edema formation. Our results demonstrated that only the major energy for both the LED and LLL was able to remain in a homogeneous form throughout the period analyzed. Based on our results, we suggest that both LLLT and LEDT using the highest dose (3 J) could be an alternative treatment for myositis in rats. Freund's Adjuvant Animals;Behavior, Animal;Disease Models, Animal;Edema;Freund's Adjuvant;Lasers;Light;Low-Level Light Therapy;Male;Myositis;Nociception;Rats;Rats, Wistar

Effect of one session of aerobic exercise associated with abdominal laser therapy in lipolytic activity, lipid profile, and inflammatory markers. BACKGROUND: Increased abdominal fat and sedentary lifestyles contribute to cardiovascular disease risk. The combination of exercise and low-level laser therapy (LLLT) appears to be an innovative method to increase the lipolytic rate of abdominal adipocytes, in order to reduce abdominal fat. OBJECTIVES: To evaluate the effect of one session of aerobic exercise associated with abdominal laser therapy in lipolytic activity, profile lipid, and inflammatory markers (C-reactive protein-CRP). METHODS: Experimental randomized controlled study in 36 participants of female sex divided into three groups: placebo group (PG) (nÂ =Â 12), experimental group 1 (EG1) (nÂ =Â 11), and experimental group 2 (EG2) (nÂ =Â 13). The EG1 and EG2 performed the laser therapy protocol followed by 50Â minutes of aerobic exercise on cycle ergometer, of 45%-55% of reserve heart rate; however, in EG2 the laser therapy was applied without power. The PG only performed the laser therapy protocol without power. The anthropometric measures were evaluated, and all participants were subject to blood samples at the beginning and at the end of the intervention for measure glycerol, lipid profile (total cholesterol, triglycerides, HDL, and LDL), and CRP. One-way ANOVA was used to compare the groups in the quantitative variables and Fisher's test to compare the groups in the qualitative variables. To compare the variables between moments (M0 and M1), we used the t test for paired samples. RESULTS: In the group that performed physical exercise and lipolytic laser and in the group that performs only physical exercise, there was a significant increase in glycerol mobilization between M0 and M1 (PÂ <Â .001). The same did not occur in the placebo group. Regarding the CRP levels and lipidic profile, no significant differences were observed between moments in the experimental groups. CONCLUSION: It is concluded that one session of aerobic exercise associated with LLLT and one session of aerobic exercise appears to be able to increase the lipolytic activity. However, it appears that LLLT does not provide increased value to the aerobic physical exercise by itself in lipolysis process. Lipids;Triglycerides Exercise;Female;Humans;Lipids;Lipolysis;Low-Level Light Therapy;Triglycerides

Effect of low-level laser therapy on osseointegration of titanium dental implants in ovariectomized rabbits: biomechanics and micro-CT analysis. PURPOSE: The primary aim of this study is to assess, in an animal model, whether biostimulation of osteoporotic bone with low-level laser therapy improves the osseointegration of dental implants. MATERIAL AND METHODS: Twenty-two female rabbits were randomly divided into two groups: sham-ovariectomy and bilateral-ovariectomy. Laser therapy was applied to the implants placed in the right tibial bones and was not applied to implants placed in the left tibial bones. The periotest device was used for the stability test. Periotest values were recorded after the implantation (T0) and when the animals were euthanized (T1). The removal torque test and micro-computed tomography examination were evaluated. RESULTS: As a result of removal torque, the mean of ovariectomy-laser group (56.1 Â± 5.1 Ncm) was higher than sham-

ovariectomy group (55.4 Â± 18.5 Ncm) (p = 0.9). In periotest analysis, a significant difference was found between the values of T1 and T0 in all groups, except sham-ovariectomy group ($p < 0.05$); and the highest difference was found in the ovariectomy-laser group. Micro-CT examination demonstrated that ovariectomy-laser group showed an increase of implant-bone contact when compared with ovariectomy ($p < 0.05$). CONCLUSIONS: The values obtained from biomechanical tests and micro-CT in the ovariectomy-laser group were significantly higher than the ovariectomy group and achieved the values in the healthy bone.

Adjunct low level laser therapy (LLLT) in a morbidly obese patient with severe COVID-19 pneumonia: A case report. INTRODUCTION: COVID-19 poses a higher risk of complications in obese patients due to low respiratory system compliance, increased inflammatory cytokines, and an activated immune system secondary to excess adiposity. Low level laser therapy (LLLT) has significant anti-inflammatory effects and reduces inflammatory cytokines. It is noninvasive and approved for pain management and musculoskeletal injuries. Data from human and experimental animal models of respiratory tract disease suggests that LLLT reduces inflammation and promotes lung healing. CASE AND OUTCOMES: A morbidly obese 32-year-old Asian female with severe COVID-19 received four consecutive once-daily LLLT sessions via a laser scanner. Pulsed 808 nm and 905 nm laser beams were delivered over the posterior chest for 28 min. The patient was evaluated before and after LLLT by radiological assessment of lung edema (RALE) on chest X-ray, oxygen requirements and saturation, pneumonia severity indices (SMART-COP and Brescia-COVID), blood inflammatory markers (interleukin-6, ferritin, and C-Reactive protein (CRP)). Prior to treatment, oxygen saturation (SpO(2)) via pulse oximetry was 88%-93% on 5-6 L oxygen. Following LLLT, SpO(2) increased to 97%-99% on 1-3 L oxygen. Reductions in RALE score from 8 to 3, Brescia-COVID from 4 to 0, and SMART-COP from 5 to 0 were observed. Interleukin-6 decreased from 45.89 to 11.7 pg/mL, ferritin from 359 to 175 ng/mL, and CRP from 3.04 to 1.43 mg/dL. Post-treatment, the patient noted appreciable improvement in respiratory symptoms. CONCLUSION: Following LLLT our patient showed improvement over a few days in respiratory indices, radiological findings, inflammatory markers, and patient outcomes. This report suggests that adjunct LLLT can be safely combined with conventional treatment in patients with severe COVID-19 and morbid obesity.

Applications of Lasers in Refractory Periodontitis: A Narrative Review. OBJECTIVE: The purpose of the study is to evaluate the various lasers in dentistry and to investigate if it can be used for treatment of refractory periodontitis. METHODS: The study followed partially the PRISMA guidelines as it is a narrative review. A number of articles were selected from a period of 1980 to 2020 from databases, PubMed, PubMed central, Cochrane and Scopus. Articles related to the effects of lasers on periodontitis both refractory and aggressive were investigated. RESULTS: After reviewing the literature, 70 articles were found, related to application of lasers in periodontal diseases. Out of the 70, 11 articles pertained to the effect of laser for the treatment of Refractory and inflammatory periodontitis. 5 articles related to experimental animal models, one pertaining to in-vitro and six studies related to in-vivo in human cohorts. DISCUSSION: It was found that lasers if used in controlled parameters by incorporating laser assisted treatment such as Photodynamic therapy and low level laser therapy can be of use as an adjunct therapy for treatment of refractory periodontitis. The use of different wavelengths in the initial and maintenance phase of periodontal disease plays a positive role. The presence of in-vitro and animal model studies is one of the limitation to this study. The available studies have shown marked reduction in inflammation and better clinical and microbiological parameters. The drawback of this study is the limited literature involving laser management for refractory periodontitis in human cohorts. CONCLUSION: Different wavelengths of laser and choice of laser assisted periodontal treatment plays an important role in the overall progress and prognosis of periodontal disease activity.

ZnO-based multifunctional nanocomposites to inhibit progression and metastasis of melanoma by eliciting antitumor immunity via immunogenic cell death. Rationale: The development of a highly effective and tumor-specific therapeutic strategy, which can act against the primary tumor and also condition the host immune system to eliminate distant tumors, remains a clinical challenge. Methods: Herein, we demonstrate a facile yet versatile ZnO-capping and Doxorubicin (DOX)-loaded multifunctional nanocomposite (AuNP@mSiO(2)@DOX-ZnO) that integrates photothermal properties of gold nanoparticles (NPs), pH-responsive properties and preferential selectivity to tumor cells of ZnO QDs and chemotherapeutic agent into a single NP. The photothermal performance, pH-triggered release and preferential phagocytic ability were assessed. The induced anti-tumor immunity was determined by analyzing immune cell profile in tumor in vivo and molecular mechanism were identified by detecting expression of immunogenic cell death (ICD) markers in vitro. Moreover, mice models of unilateral and bilateral subcutaneous melanoma and lung metastasis were established to evaluate the antitumor effects. Results: As an efficient drug carrier, ZnO-capped NPs guarantee a high DOX payload and an in vitro, efficient release of at pH 5.0. In murine melanoma models, the nanocomposite can significantly inhibit tumor growth for a short period upon low-power laser irradiation. Importantly, ZnO NPs not only demonstrate preferential selectivity for melanoma cells but can also induce ICD. Meanwhile, AuNP@mSiO(2)-based photothermal therapy (PTT) and DOX are directly cytotoxic towards cancer cells and demonstrate an elevated ICD effect. The induced ICD promotes maturation of dendritic cells, further stimulating the infiltration of effector T cells into tumor sites, preventing tumor growth and distant lung metastases. Conclusions: This study highlights the novel mechanism of ZnO-triggered anti-tumor immunity via inducing ICD. Additionally, we shed light on the multifunctionality of nanocomposites in delivering localized skin tumor therapy as well as inhibiting metastatic growth, which holds great promise in clinical applications. Antineoplastic Agents;Drug Carriers;Gold;Silicon Dioxide;Doxorubicin;Zinc Oxide Animals;Antineoplastic Agents;Cell Line, Tumor;Doxorubicin;Drug Carriers;Female;Gold;Humans;Immunogenic Cell Death;Lasers;Melanoma, Experimental;Metal Nanoparticles;Mice;Nanocomposites;Photochemotherapy;Photothermal Therapy;Porosity;Silicon Dioxide;Skin Neoplasms;Zinc Oxide

The Effect of Low-Level Light Therapy on Capsaicin-Induced Peripheral and Central Sensitization in Healthy Volunteers: A Double-Blinded, Randomized, Sham-Controlled Trial. INTRODUCTION: Several clinical trials have demonstrated that low-level light therapy (LLLT), a method of photobiomodulation, is an effective analgetic treatment. However, the mechanism of action has not yet been finally clarified. In particular, unanswered questions include whether it only affects peripheral or whether it also affects the spinal or supraspinal level. This study aimed to evaluate the effect of low-level light therapy on primary and secondary hyperalgesia in a human pain model. METHODS: This study was planned as a randomized, sham-controlled, and double-blinded trial with repeated measures within subject design. Capsaicin was applied on both forearms of ten healthy volunteers to induce peripheral and central sensitization. One forearm was treated with low-level light therapy; the other served as sham control. RESULTS: Low-level light therapy significantly increased the mechanical pain threshold, heat pain threshold, and decreased pain intensity. CONCLUSIONS: Our data indicate that low-level light therapy is effective at reducing the heat and mechanical pain threshold in a human pain model, pointing to a significant modulating effect on peripheral and central sensitization. These effects-especially in the absence of reported side effects-make low-level light therapy a promising tool in pain management. The application of low-level light therapy to treat chronic pain should be considered for further clinical trials.

Does laser photobiomodulation prevent hyposalivation in patients undergoing head and neck radiotherapy? A systematic review and meta-analysis of controlled trials. INTRODUCTION: Head

and neck radiotherapy can cause hypofunction of the salivary glands. Many studies report that laser photobiomodulation (PBM) is able to minimize radiation-induced hyposalivation, yet there is no consensus about its effects. OBJECTIVE: To carry out a meta-analysis of controlled clinical trials that used PBM to prevent radiation-induced hyposalivation. METHODS: A systematic search was performed through Embase, Medline/PubMed, Cochrane, EBSCO, Scopus, LILACS and Web of Science databases. The strategy included comparisons of the effect of PBM with placebo/clinical follow-up on unstimulated and/or stimulated salivary flow in patients undergoing head and neck radiotherapy. RESULTS: Six clinical trials were included, five of which were used for meta-analysis. Evidence was observed between the use of PBM and increased unstimulated salivary flow (MD 0.20 mL/min, 95 % CI 0.10-0.30, IÂ² = 96 %, p < 0.00001) and in stimulated salivary flow (MD 0.27 mL/min, 95 % CI 0.08-0.46, IÂ² = 95 %, p < 0.00001). CONCLUSION: PBM appears to minimize radiation-induced hyposalivation. Humans;Head and Neck Neoplasms;Salivary Glands;Xerostomia;Low-Level Light Therapy;Radiation Injuries;Clinical Trials as Topic

High-fluence light emitting diode-red light inhibits cell cycle progression in human dermal fibroblasts. Skin fibrosis is a debilitating feature of several systemic and dermatologic diseases. While current treatment options carry significant risk of side effects and recurrence, high-fluence light emitting diode-generated red light (LED-RL) is an alternative therapeutic that is safe, non-invasive, and accessible. We previously demonstrated LED-RL decreases fibroblast proliferation, a key pathogenic component of fibrosis. However, the cellular mechanism by which high fluence LED-RL modulates fibroblast proliferation is unclear. Herein, we explored the effects of high fluence LED-RL on human dermal fibroblast cell cycle progression. We demonstrate that LED-RL at 640â€‰J/cm(2) induced significant arrest of cells in G(0) /G(1) compared to temperature-matched control. This was accompanied by a corresponding increase in expression of checkpoint regulator p53 in irradiated cells. These data demonstrate high fluence LED-RL may exert its anti-proliferative effect on fibroblasts by inducing G(0) /G(1) arrest. Further, this study provides insight into the molecular mechanism underlying LED-RL as an anti-fibrotic therapeutic. Cell Division;Cell Proliferation;Fibroblasts;Fibrosis;Humans;Light;Skin

Therapeutic alternatives in the management of osteoradionecrosis of the jaws. Systematic review. BACKGROUND: to systematically review the literature, comparing the healing of osteoradionecrosis (ORN) among the therapeutic alternatives: surgical, pharmacological and combined. MATERIAL AND METHODS: The review was organized according to the PRISMA protocol with regards to the following PICO question: patients with ORN of the jaws (P=Patient); all interventions reported (I = intervention); between all therapies (C=Comparison); healing of lesions (O=outcome). RESULTS: Surgical treatment was the most common choice (46.3%) followed by pharmacological treatment, exclusively (25.9%) or combined (26.9%). Treatment exclusively by surgical intervention seems to be most effective option, with 51.2% of the lesions healed, OR for healing of 5.7 (CI95% 1.9-16.9, p=0.002). Only 1 case (0.9%) corresponded to low level laser therapy. CONCLUSIONS: It seems clear that early intervention with conservative surgical combined with pharmacological methods improves the prognosis of ORN. Head and Neck Neoplasms;Humans;Jaw;Jaw Diseases;Osteoradionecrosis;Prognosis

Photobiomodulation therapy on expression of HSP70 protein and tissue repair in experimental acute Achilles tendinitis. The aim of the present study was to investigate the effects of photobiomodulation (PBM) therapy on the expression of heat shock protein 70 (HSP70) and tissue repair in an experimental model of collagenase-induced Achilles tendinitis. Thirty Wistar rats (aged 12Â weeks) were randomly distributed among control group (nâ€‰=â€‰8), tendinitis group (nâ€‰=â€‰11), and LED group (nâ€‰=â€‰11). Tendinitis was induced in the tendinitis and LED groups through a peritendinous injection of collagenase (100Â Î¼l). The LED group animals received the first irradiation 1Â h after injury. A 630â€‰Â±â€‰20Â nm, 300-mW continuous wave light-

emitting diode (LED), spot size 1Â cm(2), was placed in contact with the skin. One point over the tendon was irradiated for 30Â s, delivering 9Â J (9Â J/cm(2)). LED irradiation was performed once daily for 7Â days, with the total energy delivered being 63Â J. The tendons were surgically removed and expression of the HSP70 protein was calculated using semi-quantitative analyses of immunohistochemistry (HSCORE). Number of fibroblasts and amount of collagen were measured using histological and histochemical analyses. An increase in the mean HSCORE for HSP70, in the number of fibroblasts, and in the amount of collagen were found in the LED group compared with those in the tendinitis and control group (PÂ â‰¤â€‰0.05). PBM therapy increased the expression of the HSP70, number of fibroblasts, and amount of collagen in the acute Achilles tendinitis in rats. HSP70 Heat-Shock Proteins Achilles Tendon;Animals;Disease Models, Animal;Fibroblasts;Gene Expression Regulation;HSP70 Heat-Shock Proteins;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tendinopathy

Photobiomodulation Dose Parameters in Dentistry: A Systematic Review and Meta-Analysis. OBJECTIVE: This systematic review and meta-analysis of published randomized controlled trials examines a possible relationship between optical spot size at surface tissue, irradiance, radiant exposure, total energy delivered, operator technique and reported clinical outcomes. BACKGROUND: Clinical photobiomodulation (PBM) therapy has achieved a high level of evidence-based acceptance in the mitigation of oral mucositis associated with cancer radiotherapy and chemotherapy, and supportive clinical research in relation to orthodontic tooth movement, oral medical conditions, including burning mouth syndrome, xerostomia and lichen planus. Inconsistent outcomes have been reported not withstanding a substantial body of primary supportive research from clinical, in vitro and animal studies. MATERIALS AND METHODS: PubMed, Cochrane Database of Reviews and Google Scholar search engines were applied to identify human clinical trials of PBM therapy in clinical dentistry. A total of 766 articles between February 2009 and June 2020 were identified and following a full text evaluation, 38 papers with sufficient data to permit analyses are included in this investigation. RESULTS: Following a detailed assessment of potential factors that may have an influence in clinical outcome, a clear trend is apparent associating optical spot size to a positive or negative effect. Furthermore, there is a clear difference in the reported results in relation to total energy applied, delivery techniques and optical parameters, which merits further investigation. Factorial statistical analyses identified an association between smaller optical surface applications and an overall lower level of reported clinical success in treating superficial and deeper targets, and correspondingly sub-surface larger target tissues were found to be more responsive to therapy by use of a larger optical surface spot size. Moreover, use of multiple small diameter probe applications was found to provide inconsistent results. CONCLUSIONS: Many factors can confound clinical success including variations in anatomy, site location, clinical condition and subject individuality. To achieve higher levels of predictable outcome, a mature appreciation of these factors, plus an expanded understanding of laser parametry, tissue volume and target depth to deliver an adequate dose within current recommended guidelines, is essential.

Laser-Induced Differentiation of Human Adipose-Derived Stem Cells to Temporomandibular Joint Disc Cells. BACKGROUND AND OBJECTIVES: Temporomandibular disorder (TMD) is an incapacitating disease with temporomandibular joint (TMJ) disc degenerative changes in patients. Despite several research attempts to find a definitive treatment, there is no evidence of a permanent solution. The objective of the current study was to observe the role of 660â€‰nm diode laser in the differentiation of human adipose-derived stem cells (ADSCs) to fibroblasts and chondrocytes. STUDY DESIGN/MATERIALS AND METHODS: After irradiation, the morphology, viability, and adenosine triphosphate (ATP) proliferation of the ADSCs were analyzed at different time intervals. The differentiation of ADSCs toward fibroblastic and chondrogenic phenotypes was supported using flow

cytometry and immunofluorescence at 1- and 2-week post-irradiation. RESULTS: More than 90% of viable cells were observed in all experimental groups, with an increase in ATP proliferation. Flow cytometry analyses and immunofluorescence demonstrated the presence of chondrogenic and fibroblastic cell surface markers at 1- and 2-week post-irradiation. CONCLUSION: This study has demonstrated methods to induce the differentiation of ADSCs toward fibroblastic and chondrogenic phenotypes with a 660â€‰nm diode laser. The study also proposes a future alternative method of treatment for patients with degenerative TMJ disc disorders and presents a positive prospect in the application of photobiomodulation and ADSCs in the treatment of degenerative TMJ disc. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Cell Differentiation;Cells, Cultured;Humans;Lasers;Stem Cells;Temporomandibular Joint Disc

Efficacy of Acupoints Dual-Frequency Low-Level Laser Therapy on Knee Osteoarthritis. BACKGROUND: Knee osteoarthritis (OA) presented with knee pain and limitation of mobility is common, and it may become a chronic problem resulting in major loss of function, with related impaired activity of daily living. Current traditional therapy for knee OA includes pharmacological treatment and physiotherapy, but the efficacies are limited. An alternative noninvasive treatment low-level laser therapy (LLLT) applied to acupoints is still contradictory and the efficacy needs to be assessed. METHODS AND MATERIALS: We conduct the randomized double-blind control study to investigate the efficacy of a dual-frequency LLLT (combines red light (780â€‰nm) and near-infrared light (830â€‰nm)) in patients suffering knee OA. Participates were randomly assigned into active laser therapy (ALT) and placebo laser therapy (PLT) groups. Subjects in the ALT group were separately treated by laser apparatus at the three acupoints (SP9, SP10, and EX-LE2) on their knee joints under continuous radiation for 15â€‰min at the maximum intensity, three times per week for four weeks. The PLT group used laser apparatus of the same model according to similar procedures without laser light emission. Outcome Measurements including visual analog scale (VAS), pain pressure threshold (PPT), and Lequesne index were used. RESULTS: A total of 30 subjects with two-sided knee OA in both groups completed the experiment. Statistically significant decreases were observed in the Lequesne index (5.27â€‰Â±â€‰3.26 vs. 10.83â€‰Â±â€‰3.83), conscious VAS 4 weeks after treatment (moving: 2.87â€‰Â±â€‰1.13 vs. 5.67â€‰Â±â€‰1.72; resting: 0.33â€‰Â±â€‰0.62 vs. 2.67â€‰Â±â€‰1.29), and the increase was noted in PPT (21.23â€‰Â±â€‰1.82â€‰kg vs. 13.02â€‰Â±â€‰1.46â€‰kg) in the ALT group compared with the PLT group. CONCLUSION: It appears that the knee OA pain and disability can be decreased after a dual-frequency LLLT applied to acupoints (SP9, SP10, and EX-LE2). The clinical efficacy of LLLT is highly related to the therapeutic settings of the laser apparatus; hence, more clinical trials with diffident parameter settings are needed to be further clarified.

A Clinical Trial of Photobiomodulation Effect on Orthodontic Microscrews Stability Using a 635â€‰nm Red Laser Light. Background: One of the procedures enhancing implants stability can be photobiomodulation. Objective: To assess the effect of a 635â€‰nm wavelength on orthodontic microscrews stability, survival rate, and an individual patient's pain score. Materials and methods: The study was done with 15 subjects, 30 orthodontic microscrews with a length of 10â€‰mm and diameter 1.4â€‰mm. Implants inserted on the right and left side of the maxilla. The implants in the test group (G1) were irradiated with the laser at palatal and buccal part of peri-implant area (two points). The diode laser (SmartM PRO; Lasotronix, Warsaw, Poland) was used with the following settings: power: 100â€‰mW, spot size: 0.5â€‰cm(2), mean power density (irradiance): 200â€‰mW/cm(2), in continuous wave (CW) mode, energy per point: 4â€‰J, radiant exposure: 8â€‰J/cm(2), time per point: 40â€‰sec, the total energy dose (radiant energy) per session: 8â€‰J in contact mode, handpiece diameter: 8â€‰mm. Laser sessions: day of surgery and 3, 6, 9, 12, 15, 30 days later. Cumulative radiant energy was 59â€‰J. Periotest appliance was used to

assess the microscrews stability at day of surgery and 3, 6, 9, 12, 15, 30, 60 days later. Each patient received a survey for individual pain assessment (NRS-11) promptly after the implantation. Results: The analysis after 60 days revealed significantly higher secondary stability for the laser-irradiated microscrews group in comparison with control implants (G2 group) (pâ€‰=â€‰0.0037). We observed significantly higher stability in the experimental group compared with the control after 30 days (pâ€‰=â€‰0.0218). Moreover, we noted significantly higher microimplants stability for the control group in comparison with the test group, 9 days after implantation (pâ€‰=â€‰0.0374). Laser application had no effect on pain reduction noted in the first day in comparison with the control sites (pâ€‰=â€‰0.6690). No microscrews were lost in the study. Conclusions: Application of a 635â€‰nm laser on peri-implant soft tissue increased the microscrews stability after 30 and 60 days. Humans;Lasers, Semiconductor;Pain;Pain Measurement

Systematic Review of Post-Surgical Laser-Assisted Oral Soft Tissue Outcomes Using Surgical Wavelengths Outside the 650-1350â€‰nm Optical Window. Objective: To explore via systematic review the validation of uneventful post-surgical healing, associated with shorter and longer laser wavelength applications in minor oral surgery procedures. Methods: From April 28 to May 11, 2020, PubMed, Cochrane Database of Systemic Reviews, and Google Scholar search engines were applied to identify human clinical trials of photobiomodulation (PBM) therapy in clinical dentistry. The searches were carried out with reference to (1) dental laser wavelengths shorter than 650â€‰nm; (2) wavelengths localized within the 2780-2940â€‰nm; and (3) the 9300-10,600â€‰nm range. Selected articles were further assessed by three independent reviewers for strict compliance with PRISMA guidelines and modified Cochrane Risk of Bias to determine eligibility. Results: Using selection filters of randomized clinical trials, moderate/low risk of bias, and the applied period, and following PRISMA guidelines, 25 articles were selected and examined. A risk of bias was completed, where 11 out of 25 publications were classified as low risk of bias, and 14 out of 25 were classified as medium risk status. In total, 6 out of 13 (46% of) studies comparing the examined laser wavelengths with scalpel-based treatment showed positive results, whereas 6 out of 13 (46%) showed no difference, and only 1 out of 13 (7.7%) presented a negative outcome. In addition, 5 out of 6 (83% of) studies comparing the examined laser wavelengths with other diodes (808-980â€‰nm) showed positive results, whereas 1 out of 6 (17%) had negative outcomes. Conclusions: A detailed and blinded examination of published studies has been undertaken, applying strict criteria to demonstrate research outcome data, which suggests positive or at worst neutral comparatives when a given laser wavelength system is used against an alternative control therapy. As such, substantiated evidence for laser surgery in delivering uneventful healing and analgesic effects, as an expression of a PBM-like (quasi-PBM) influence, has been shown. Humans;Low-Level Light Therapy;Wound Healing

Effect of Diode Low-level Laser Irradiation Time on Socket Healing. AIM: The purpose of this research was to survey the effect of low-level laser irradiation time on socket healing in rats. MATERIALS AND METHODS: This randomized nonblinded animal study was done on 24 male rats that were divided into four groups. First maxillary molars of rats were extracted through general anesthesia, and laser was used in all four groups: first group with zero radiation time, second group with 3 minutes, third group with 5 minutes, and fourth group with 10 minutes of radiation by the diode laser (power: 100 mW, wavelength: 980 nm). Half of the rats (three rats) were sacrificed on the 3rd day and another half of rats were sacrificed on the 7th day. Then, the presence of angiogenesis, bone trabeculae, fibroblasts, neutrophil cells, macrophage cells, and lymphocyte cells was assessed. Data were analyzed by SPSS (version 21) using parametric tests. RESULTS: Among 24 rats, on the 3rd day, the percentage of macrophage and bone trabecula increased significantly in the 5 minute group ($p = 0.041$ and $p < 0.01$, respectively). Other changes in days 3 and 7 were not statistically significant

(p > 0.05). CONCLUSION: Low-level laser radiation can accelerate the process of tooth socket healing, which was particularly noticeable in the 5 minute radiation over 3 days. CLINICAL SIGNIFICANCE: Using a low-level laser can be helpful in accelerating the healing of the tooth socket and reduce the complications after tooth extraction. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Tooth Extraction;Tooth Socket;Wound Healing

Photobiomodulation therapy drives massive epigenetic histone modifications, stem cells mobilization and accelerated epithelial healing. Emerging evidence indicates the clinical benefits of photobiomodulation therapy (PBMT) in the management of skin and mucosal wounds. Here, we decided to explore the effects of different regiments of PBMT on epithelial cells and stem cells, and the potential implications over the epigenetic circuitry during healing. Scratch-wound migration, immunofluorescence (anti-acetyl-Histone H3, anti-acetyl-CBP/p300 and anti-BMI1), nuclear morphometry and western blotting (anti-Phospho-S6, anti-methyl-CpG binding domain protein 2 [MBD2]) were performed. Epithelial stem cells were identified by the aldehyde dehydrogenase enzymatic levels and sphere-forming assay. We observed that PBMT-induced accelerated epithelial migration and chromatin relaxation along with increased levels of histones acetylation, the transcription cofactors CBP/p300 and mammalian target of rapamycin. We further observed a reduction of the transcription repression-associated protein MBD2 and a reduced number of epithelial stem cells and spheres. In this study, we showed that PBMT could induce epigenetic modifications of epithelial cells and control stem cell fate, leading to an accelerated healing phenotype. Acetylation;Epigenesis, Genetic;Histone Code;Low-Level Light Therapy;Stem Cells;Wound Healing

Acute Photobiomodulation Does Not Influence Specific High-Intensity and Intermittent Performance in Female Futsal Players. The acute improvement of performance after photobiomodulation therapy (PBMT) has been reported in different types of exercise. However, the effect on high-intensity and intermittent exercises that are relevant for team sports is unknown. Thus, we evaluated the effect of prior acute application of PBMT on high-intensity and intermittent exercise performance, muscle oxygenation, and physiological/perceptual indicators in amateur female futsal players. Thirteen players (24.1 Â± 3.7 years) performed a testing battery (countermovement jump (CMJ), Illinois agility and YoYo intermittent recovery test level 1 (YYIR1)) preceded by 15 min of PBMT (1 min 30 s each muscular point; five muscular points in each lower limbs) or 15 min of placebo (SHAM), in a counterbalanced randomized cross-over design (one-week in-between PBMT/SHAM). All test performance did not differ (p > 0.05) between PBMT and SHAM, as well as blood lactate, rating of perceived exertion, heart rate, and muscle oxygenation (via near infrared spectroscopy) responses. The acute application of PBMT prior to a physical testing battery does not influence high-intensity and intermittent exercises performance, neither physiological nor perceptual responses in amateur female futsal players. Athletes;Athletic Performance;Cross-Over Studies;Exercise;Female;Humans;Illinois;Low-Level Light Therapy;Running;Soccer;Sports;Task Performance and Analysis

Vaginal Er:YAG laser application in the menopausal ewe model: a randomised estrogen and sham-controlled trial. OBJECTIVE: To describe effects of non-ablative erbium-doped:yttrium-aluminium-garnet (Er:YAG) laser on vaginal atrophy induced by iatrogenic menopause in the ewe. DESIGN: Animal experimental, randomised, sham and estrogen-treatment controlled study with blinding for primary outcome. SETTING: KU Leuven, Belgium. SAMPLE: Twenty-four ewes. METHODS: Menopause was surgically induced, after which the ewes were randomised to three groups receiving vaginal Er:YAG laser application three times, with a 1-month interval; three sham manipulations with a 1-month interval; or estrogen replacement and sham manipulations. At given intervals, ewes were clinically examined and vaginal wall biopsies were taken. Vaginal compliance was determined by

passive biomechanical testing from explants taken at autopsy. MAIN OUTCOME MEASURES: Vaginal epithelial thickness (primary), composition of the lamina propria (collagen, elastin, glycogen and vessel content), vaginal compliance, clinical signs. RESULTS: Animals exposed to Er:YAG laser application and sham manipulation, but not to estrogens, displayed a significant and comparable increase in vaginal epithelial thickness between baseline and 7Â days after the third application (69% and 67%, respectively, both PÂ <Â 0.0008). In laser-treated ewes, temporary vaginal discharge and limited thermal injury were observed. Estrogen-substituted ewes displayed a more prominent increase in epithelial thickness (202%; PÂ <Â 0.0001) and higher vaginal compliance (PÂ <Â 0.05). None of the interventions induced changes in the lamina propria. CONCLUSIONS: Vaginal Er:YAG laser has comparable effect to sham manipulation in menopausal ewes. TWEETABLE ABSTRACT: Vaginal Er:YAG laser has comparable effect to sham manipulation in menopausal ewes #LASER #GSM #RCT. Estrogens Animals;Atrophy;Biopsy;Disease Models, Animal;Estrogen Replacement Therapy;Estrogens;Female;Lasers, Solid-State;Low-Level Light Therapy;Menopause;Sheep;Treatment Outcome;Vagina;Vaginal Diseases

Dose Analysis of Photobiomodulation Therapy in Stomatology. The penetration depth and the power density of photobiomodulation (PBM) in human tissue under real conditions remain unclear to date. A novel quantitative measurement method was proposed in this study. This study aimed to design a noninvasive measurement system for the quantitative calculation of PBM dose on the attached gingiva. A flexible facial fixture appliance (FFFA) and nine piece detectors were mounted on the retainer to detect the real dose of 660 and 830â€‰nm lasers on the attached gingiva. In addition, the angular distribution of light scattering and the light propagation in the biotissue were obtained. Two cases (a female and a male) are presented in this study. Experimental results demonstrated that the real power density of laser in the target tissue can be measured exactly after the laser light penetrates the orbicularis oris. Simulation results match with real conditions. Conversely, slight differences in power density are observed in the tissue radiated with collimated and uncollimated laser. The proposed method can be used to calculate the real dose in the target tissue for stomatology and deep acupoint stimulation.

Changes in Brain Function and Structure After Self-Administered Home Photobiomodulation Treatment in a Concussion Case. Traumatic brain injury (TBI) is a common neurological disorder among athletes. Although there are no widely accepted treatments for TBI, new investigational approaches, such as photobiomodulation (PBM), are being tested. PBM is a light therapy that uses red to near-infrared (NIR) light to stimulate, heal, and protect tissue that has been injured or is at risk of dying. Benefits following transcranial PBM treatments in animal models of acute TBI and a small number of chronic TBI patients have been reported. However, the human PBM TBI studies published to date have been based on behavioral assessments. This report describes changes in behavioral and neuroimaging measures after 8 weeks of PBM treatments. The subject was a 23-year professional hockey player with a history of concussions, presumed to have caused his symptoms of headaches, mild anxiety, and difficulty concentrating. He treated himself at home with commercially available, low-risk PBM devices that used light-emitting diodes (LEDs) to emit 810-nm light pulsing at 10 or 40 Hz delivered by an intranasal and four transcranial modules that targeted nodes of the default mode network (DMN) with a maximum power density of 100 mW/cm(2). After 8 weeks of PBM treatments, increased brain volumes, improved functional connectivity, and increased cerebral perfusion and improvements on neuropsychological test scores were observed. Although this is a single, sport-related case with a history of concussions, these positive findings encourage replication studies that could provide further validation for this non-invasive, non-pharmacological modality as a viable treatment option for TBI.

Photobiomodulation is effective in oral lichen planus: A randomized, controlled, double-blind study. OBJECTIVES: To compare the efficacy of photobiomodulation to that of topical clobetasol 0.05% in patients with symptomatic oral lichen planus (OLP). SUBJECTS: Thirty-four patients with symptomatic OLP were randomly allocated into two groups: (a) the Control group (nÂ =Â 17), application of topical clobetasol propionate 0.05% three times a day for 30 consecutive days with laser placebo applied twice a week to mask the treatment, and (b) the photobiomodulation group (nÂ =Â 17), laser application twice a week, totalling 8 sessions, and gel placebo for 30 consecutive days to mask the treatment. Evaluations were performed once a week during treatment and 30, 60 and 90Â days after treatment. The following parameters were evaluated: pain, clinical scores, clinical resolution and recurrence rate. RESULTS: Photobiomodulation and propionate clobetasol 0.05% were able to significantly decrease pain in oral lichen planus patients and improve clinical scores during treatment and follow-up. Both the Control and photobiomodulation groups presented similar clinical resolution and recurrence rates. Most importantly, no difference was observed between treatments during treatment and follow-up. CONCLUSIONS: These findings indicate that photobiomodulation twice a week is as effective as corticoid therapy in treating oral lichen planus. Moreover, photobiomodulation is a safe and non-invasive therapy with the remarkable advantage of no adverse effects. Glucocorticoids;Clobetasol Administration, Topical;Clobetasol;Double-Blind Method;Glucocorticoids;Humans;Lichen Planus, Oral;Treatment Outcome

Safety and Clinical Impact of a Single Red Light Irradiation on Breast Tumor-Bearing Mice. Low-level light therapy has been used in health care as a therapeutic strategy for different diseases. However, its effects on cancer are controversial. This work evaluated the effects of three energies on breast cancer-bearing mice after a single red light-emitting diode (LED) irradiation. 4T1 cells were inoculated into the mammary fat pad of female BALB/c mice. When tumor volume reached 100 mm(3) , animals were irradiated by a LED irradiator (660Â Â±Â 11Â nm) with energies of 1.2, 3.6, and 6.0Â J. Control without irradiation and healthy animals were also evaluated. Mice were monitored regarding tumor volume and total blood count. After euthanasia, their organs were examined. We observed that a single irradiation does not increase tumor volume. All irradiated groups exhibited better clinical conditions than control, which presented a significant decrease in platelet and red blood cell levels compared with healthy mice. The energy of 3.6Â J arrested neutrophil-lymphocyte rate besides promoting longer survival and a lower number of metastatic nodules in the lungs. These findings suggest that a single red LED irradiation causes no impact on the course of the disease. Besides, the intermediary dose-effect should be further investigated since it seems to promote better outcomes on breast cancer-bearing mice. Animals;Breast Neoplasms;Female;Mice;Xenograft Model Antitumor Assays

Photobiomodulation of avian embryos by red laser. The current research focuses on the effect of variable doses of red laser on the chick embryonic development. He-Ne laser of 632-nm wavelength was used as an irradiation source in the first 48 h post-laying of chicken eggs. We have used five different doses: 2, 1, 0.3, 0.2, and 0.1 mJ/cm(2) that needed a time range for about 400-20 s. Those irradiated embryos were left for additional 11 days for incubation in normal conditions, where they are blindly studied after the 11(th) day. Light microscopy was used in this study to investigate the histological and pathological features of the different experimental groups compared to the control one. However, electron microcopy was utilized to trace the apoptotic distribution in the developmental embryos. Minor abnormalities that are dependent on the laser dose have been shown in the irradiated embryos when compared to the sham group, where the highest laser dose showed about 12% embryonic development anomalies when related to the other irradiated groups. Irradiated embryos were found to express more INF-Î³ and IL-2 as circulating cytokines relative to the unexposed group, where the levels of IL-2 were highly significantly increased by all laser doses (0.3

mJ/cm(2) light dose recipient group showed significant increase only when compared to the control group). IFN-Î³ levels were significantly increased as well by light doses above 0.2 mJ/cm(2). This IFN-Î³ increase trend seemed to be laser dose-dependent. Simultaneously, these combined results propose the ability of high laser doses in inducing incurable changes in the embryonic development and consequently such alterations can have potential therapeutic applications through what is known as photobiomodulation. Animals;Chick Embryo;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Time Factors

Effectiveness of single versus multiple sessions of photodynamic therapy as adjunct to scaling and root planing on periodontopathogenic bacteria in patients with periodontitis. OBJECTIVE: The aim of the present 6-months' follow-up study was to assess the influence of single versus multiple sessions of photodynamic therapy (PDT) as adjunct to scaling and root planning (SRP) on periodontopathogenic bacteria in patients with periodontitis. METHODS: Forty-five patients with periodontitis were included. The patients were randomly divided into 3 groups. In groups 1 (n = 15), 2 (n = 15) and 3 (n = 15), the patients under went SRP with PDT at (a) baseline; (b) baseline and after 1-month; and (c) baseline and after 1- and 3-months. Peri-implant plaque index (PI), bleeding on probing (BOP), probing depth (PD), clinical attachment loss (CAL) and marginal bone loss (MBL) were measured at baseline and 6-months follow-up. Counts of Porphyromonas gingivalis, Treponema denticola, Prevotella intermedia, Fusobacterium nucleatum and Aggregatibacter Actinomycetemcomitans were determined before SRP and at 4- and 6-months follow-up. RESULTS: All patients had grade-B periodontitis. There was no statistically significant difference in age and gender in all groups. At- 6-months' follow-up, patients that underwent SRP once showed significantly higher counts of periodontopathogenic bacteria in the oral biofilm compared with patients that received photobiomodulation twice or three times ($P < 0.05$). There was no significant difference in the periodontal parameters and counts of gram-negative bacteria in patients that received photobiomodulation 2 or 3 times. CONCLUSION: At least 2 sessions of PDT following baseline SRP is essential to achieve a significant reduction in the counts of subgingival bacteria in periodontitis patients over a 6-month follow-up period. Photosensitizing Agents Dental Scaling;Follow-Up Studies;Humans;Periodontal Attachment Loss;Periodontal Pocket;Periodontitis;Photochemotherapy;Photosensitizing Agents;Porphyromonas gingivalis;Root Planing

Laser therapy increases the proliferation of preosteoblastic MC3T3-E1 cells cultured on poly(lactic acid) films. This study aimed to verify the efficacy of low-level laser irradiation (LLLI) on the proliferation of MC3T3-E1 preosteoblasts cultured on poly(lactic acid) (PLA) films. The produced films were characterized by contact angle tests, scanning electron microscopy (SEM), atomic force microscopy, differential scanning calorimetry, and X-ray diffraction. The MC3T3-E1 cells were cultured as three different groups: Control-cultured on polystyrene plastic surfaces; PLA-cultured on PLA films; and PLA + Laser-cultured on PLA films and submitted to laser irradiation (660 nm; 30 mW; 4 J/cm(2)). Cell proliferation was analyzed by Trypan blue and Alamar blue assays at 24, 48, and 72 h after irradiation. Cell viability was assessed by Live/Dead assay, apoptosis-related events were evaluated by Annexin V/propidium iodide (PI) expression, and cell cycle events were analyzed by flow cytometry. Cell morphology on the surface of films was assessed by SEM. Cell counting and biochemical assay results indicate that the PLA + Laser group exhibited higher proliferation ($p < 0.01$) when compared with the Control and PLA groups. The Live/Dead and Annexin/PI assays indicate increased cell viability in the PLA + Laser group that also presented a higher percentage of cells in the proliferative cell cycle phases (S and G2/M). These findings were also confirmed by the higher cell density observed in the irradiated group through SEM images. The evidence from this study supports the idea that LLLI increases the proliferation of MC3T3-E1 cells on PLA surfaces, suggesting that it can

be potentially applied in bone tissue engineering. Polyesters Animals;Apoptosis;Cell Cycle;Cell Proliferation;Cell Shape;Cells, Cultured;Crystallization;Low-Level Light Therapy;Mice;Microscopy, Atomic Force;Osteoblasts;Polyesters;X-Ray Diffraction
Salivary alpha-1-antitrypsin and macrophage migration inhibitory factor may be potential prognostic biomarkers for oncologic treatment-induced severe oral mucositis. AIMS: Evaluate the abundance of the selected targets, alpha-1-antitrypsin (A1AT) and macrophage migration inhibitory factor (MIF), and correlate these findings with the risk of developing severe oral mucositis (OM). MATERIALS AND METHODS: Head and neck squamous cell carcinoma (HNSCC) patients submitted to radiotherapy (RT) or chemoradiotherapy (CRT) were assessed. OM grade and pain were evaluated daily during treatment. Two protein targets, A1AT and MIF, were evaluated, using selected reaction monitoring-mass spectrometry (SRM-MS), in whole saliva, collected prior to oncologic treatment. The results obtained from the targeted proteomic analysis were correlated with OM clinical outcomes. RESULTS: A total of 27 patients were included, of whom 21 (77.8%) had locally advanced disease (clinical stage III or IV). Most patients (70.4%) received CRT. OM grades 2 (40.8%) and 3 (33.3%) were the most prevalent during RT with a mean highest reported OM-related pain of 3.22 through the visual analogue scale (VAS). The abundance of A1AT and MIF correlated significantly with severe (grades 3 or 4, pâ€‰<â€‰0.02) compared with moderate-low (grades 1 or 2, pâ€‰<â€‰0.04) OM grade. CONCLUSIONS: There is a correlation between the abundance of salivary A1AT and MIF and oncologic treatment-induced OM. The correlation of MIF expression with severe OM appears to be compatible with its physiological pro-inflammatory role. These results open up great possibilities for the use of salivary MIF and A1AT levels as prognostic markers for effective therapeutic interventions, such as photobiomodulation therapy, patient-controlled analgesia, or personalized medicaments. Biomarkers;Macrophage Migration-Inhibitory Factors;alpha 1-Antitrypsin Adult;Aged;Aged, 80 and over;Biomarkers;Cohort Studies;Female;Head and Neck Neoplasms;Humans;Macrophage Migration-Inhibitory Factors;Male;Middle Aged;Prognosis;Quality of Life;Saliva;Stomatitis;Young Adult;alpha 1-Antitrypsin
Effectiveness of the Laser Application in Temporomandibular Joint Disorder: A Systematic Review of 1172 Patients. OBJECTIVE: The aim of this systematic review was to evaluate the effectiveness of laser application in temporomandibular joint disorder. METHODS: PubMed, SCOPUS, Science Direct, Web of Science, and Google Scholar electronic databases were searched systematically with restricting the languages to only English and year (January 2001 to March 2020), and studies were selected based on the inclusion criteria. Study quality and publication bias were assessed by using the Robvis, a software package of R statistical software. RESULTS: This systematic review included 32 studies (1172 patients) based on the inclusion and exclusion criteria. Most of the studies reported significant reduction of pain by the use of the laser during TMD treatment. Two-thirds of the study (78.13%) found a better outcome comparing with conventional one. According to Robvis, 84.4% of the studies were high methodological studies with low risk of bias. CONCLUSION: TMD patients suffer with continuous pain for long time even after conventional treatment. Laser therapy shows a promising outcome of pain reduction for TMD patients. Therefore, laser therapy can be recommended for the TMD patients' better outcome. This trial is registered with PROSPERO (CRD42020177562). Adult;Female;Humans;Lasers;Low-Level Light Therapy;Pain;Pain Management;Temporomandibular Joint Disorders
Bidirectional myofiber transition through altering the photobiomodulation condition. Despite remarkable advancements in modern medicine, muscular atrophy remains as an unsolved problem. It is well known that pathological characteristics of different atrophy types could vary according to the pathophysiological causes. In fact, the lesion of atrophy is not always homogenously distributed but often predominantly evident in either fast or slow myofibers. As the focalization of the atrophic

lesions, the existence and the functional impairment of each fast and slow progenitor/satellite cell (SC) are suspected though there are still controversies about this hypothesis. In this study, we isolated Pax7 positive (Pax7(+ve)) SCs from the tibia anterior (fast) and soleus (slow) muscles respectively and successfully demonstrated, for the first time, the difference between optimal exposure durations of photobiomodulation (PBM) which was known as low level laser irradiation (LLLI) in promoting proliferation of Pax7(+ve) SC which were acquired from fast and slow muscles respectively. Moreover, a hypertrophy-accompanied bidirectional change in myofiber composition with neuromuscular junction alteration, either from slow to fast or fast to slow, were achieved by applying different PBM durations. Simultaneously, PBM exhibited a synergistic effect with muscle exercise on the increase in myofiber size. Our data suggested the existence of at least two different populations of Pax7(+ve) SC which possess distinct sensitivities towards PBM. As our data revealed the capability of PBM in bidirectional changes of skeletal muscle composition and neuromuscular junction constitution thereby strengthen its contractility through altering the irradiation condition, we believe PBM showed the potential to be as a promising clinical treatment for muscular atrophy.
Animals;Cell Proliferation;Kinetics;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Sprague-Dawley

Curcumin and Photobiomodulation in Chronic Viral Hepatitis and Hepatocellular Carcinoma.
Immune modulation is a very modern medical field for targeting viral infections. In the race to develop the best immune modulator against viruses, curcumin, as a natural product, is inexpensive, without side effects, and can stimulate very well certain areas of the human immune system. As a bright yellow component of turmeric spice, curcumin has been the subject of thousands of scientific and clinical studies in recent decades to prove its powerful antioxidant properties and anticancer effects. Curcumin has been shown to influence inter- and intracellular signaling pathways, with direct effects on gene expression of the antioxidant proteins and those that regulate the immunity. Experimental studies have shown that curcumin modulates several enzyme systems, reduces nitrosative stress, increases the antioxidant capacity, and decreases the lipid peroxidation, protecting against fatty liver pathogenesis and fibrotic changes. Hepatitis B virus (HBV) affects millions of people worldwide, having sometimes a dramatic evolution to chronic aggressive infection, cirrhosis, and hepatocellular carcinoma. All up-to-date treatments are limited, there is still a gap in the scientific knowledge, and a sterilization cure may not yet be possible with the removal of both covalently closed circular DNA (cccDNA) and the embedded HBV DNA. With a maximum light absorption at 420 nm, the cytotoxicity of curcumin as photosensitizer could be expanded by the intravenous blue laser blood irradiation (IVBLBI) or photobiomodulation in patients with chronic hepatitis B infection, Hepatitis B e-antigen (HBeAg)-positive, noncirrhotic, but nonresponsive to classical therapy. Photobiomodulation increases DNA repair by the biosynthesis of complex molecules with antioxidant properties, the outset of repairing enzyme systems and new phospholipids for regenerating the cell membranes. UltraBioavailable Curcumin and blue laser photobiomodulation could suppress the virus and control better the disease by reducing inflammation/fibrosis and stopping the progression of chronic hepatitis, reversing fibrosis, and diminishing the progression of cirrhosis, and decreasing the incidence of hepatocellular carcinoma. Photodynamic therapy with blue light and curcumin opens new avenues for the effective prevention and cure of chronic liver infections and hepatocellular carcinoma. Blue laser light and UltraBioavailable Curcumin could be a new valuable alternative for medical applications in chronic B viral hepatitis and hepatocarcinoma, saving millions of lives.
Antineoplastic Agents, Phytogenic;Antioxidants;DNA, Circular;DNA, Viral;Hepatitis B e Antigens;Immunologic Factors;Photosensitizing Agents;Curcumin Antineoplastic Agents, Phytogenic;Antioxidants;Carcinoma, Hepatocellular;Curcumin;DNA Repair;DNA, Circular;DNA,

Viral;Hepatitis B e Antigens;Hepatitis B virus;Hepatitis B, Chronic;Humans;Immunologic Factors;Liver;Liver Cirrhosis;Liver Neoplasms;Low-Level Light Therapy;Photosensitizing Agents

The Effect of Photobiomodulation on Nitrite and Inflammatory Activity in Radiotherapy-Induced Oral Mucositis: A Randomized Clinical Trial. BACKGROUND AND OBJECTIVES: To investigate pro- and anti-inflammatory cytokines and nitrite salivary levels in patients with head and neck cancer receiving photobiomodulation therapy (PBMT) associated with a Preventive Oral Care Program (POCP), for prevention and control of oral mucositis (OM) during radiotherapy (RT) associated or not with chemotherapy protocol. STUDY DESIGN/MATERIALS AND METHODS: In this randomized double-blinded clinical trial, 48 patients were randomly assigned to two groups: PBMT (nâ€‰=â€‰25) and Control (nâ€‰=â€‰23). In the PBMT group, patients were submitted to PBMT associated with the POCP. In the Control group, patients were submitted only to the POCP. Saliva samples were collected in the 1st (baseline), 7th, 14th, 21st, and 30th sessions of RT, and the levels of interleukin-6 (IL-6), IL-8, IL-10, IL-12p70, IL-1Î², and tumoral necrosis factor-Î± (TNF-Î±) were measured using the cytometric bead array. Nitrite levels were measured by colorimetric method. OM was assessed using the World Health Organization and the National Cancer Institute scales. RESULTS: Patients in the PBMT group presented less severe OM. PBMT tended to stabilize nitrite concentration levels during the RT regimen. The IL-1Î² concentration was associated with higher OM scores. PBMT promoted an increase in IL-12p70, TNF-Î±, and IL-10 concentration. CONCLUSION: PBMT was effective in the prevention and control of severe OM, and its mechanism of action may be related to a better balance of inflammatory response that may favor injury control. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Nitrites Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Nitrites;Saliva;Stomatitis

Low-level laser therapy in the treatment of recurrent aphthous stomatitis and oral lichen planus: a literature review. Recurrent aphthous stomatitis (RAS) and oral lichen planus (OLP) present inflammatory, recurrent diseases of the oral mucosa with not fully understood aetiology. Despite numerous attempts to discover an effective treatment for RAS and OLP, the current main treatment strategies are largely confined to the reduction of symptoms. Low-level laser therapy (LLLT) is of interest as a novel treatment modality. The aim of the paper was to discuss the mechanism of action and the biological effects of LLLT and to critically review and summarize recent clinical reports on the management of RAS and OLP. Most of the studies demonstrated the beneficial effect of LLLT in accelerating the healing process and pain reduction. However, the results should be interpreted with caution due to the limited number of studies available and empirical design using various irradiation parameters.

Which method is more effective for accelerating canine distalization short term, low-level laser therapy or piezocision? AÂ split-mouth study. OBJECTIVES: This study evaluated and compared the effects of low-level laser therapy (LLLT) and piezocision on the amount of orthodontic tooth movement. MATERIALS AND METHODS: Forty maxillary canines from 20Â patients (mean age, 16.35â€¯Â±â€‰1.14Â years) were evaluated in aÂ split-mouth design study. Miniscrew-supported canine distalization was performed. Piezocision was applied in the right maxillary canine region, and the left maxillary canines were irradiated with aÂ diode laser (940â€¯nm, 5â€¯J/cm(2)). LLLT was performed on dayÂ 0 and days 3, 7, 14, 21, and 28 after the start of canine distalization in the first 4â€‘week period. Data were evaluated at baseline (T0) and after 4 (T1), 8 (T2), and 12 (T3) weeks. The amount of canine movement was determined from three-dimensional models, and the angulation of canines and first molars was analyzed based on lateral cephalograms. RESULTS: Intragroup and intergroup comparisons of canine distalization were performed for four different time intervals (T0-T1, T1-T2, T2-T3, T0-T3). The canine tooth movement in the T0-T1 period was significantly greater in the LLLT group compared to the piezocision group. No statistically significant differences were

observed between the groups for the T1-T2, T2-T3, and T0-T3 periods. The amount of canine distalization in the T0-T1 period was significantly greater than that in the T1-T2 and T2-T3 periods in both groups. Tooth movement during the T1-T2 period was higher than that in the T2-T3 period in the LLLT group. Cephalometric evaluation revealed no statistically significant difference between the groups with respect to canine and first molar angulation. CONCLUSION: Although laser application seems more effective during the first 4â€‘week period, considering the 12-week period, the effects of LLLT and piezocision on orthodontic tooth movement during canine distalization were similar.
Adolescent;Cuspid;Humans;Low-Level Light Therapy;Maxilla;Molar;Mouth;Tooth Movement Techniques

Photobiomodulation Therapy Modulates Muscle Gene Expression and Improves Performance of Rats Subjected to a Chronic Resistance Exercise Protocol. Objective: In professional sports activities, the search for increased performance is constant. Electrophysical agents, including photobiomodulation (PBM), have been used in the sports context to accelerate postworkout recovery, prevent injuries, and even to improve performance. This study aims to investigate the effects of infrared laser (904â€‰nm) on skeletal muscle gene expression of performance-related proteins of rats submitted to a chronic resistance training protocol. Materials and methods: Male Wistar rats (nâ€‰=â€‰40), weighing Â±300â€‰g were divided into four groups: sedentary control (CT, nâ€‰=â€‰10); irradiated control (CTL, nâ€‰=â€‰10); exercised not irradiated (EX, nâ€‰=â€‰10); exercised irradiated (EXL, nâ€‰=â€‰10). To assess the performance, the maximum carrying test was adapted and applied 72â€‰h prior the training and 72â€‰h after the last exercise session. The vertical weight climbing protocol was adapted for resistance training 3â€‰Ã—â€‰per week with 48â€‰h interval between each session: first week adaptation, second week 25% of body weight (BW), third week 50% BW, fourth week 75% BW, and fifth week 100% BW. Animals were irradiated before exercise on hind paws 50â€‰sec each, with infrared laser 904â€‰nm 5 days per week, during 4 weeks, 9â€‰J per leg in a total of 18â€‰J energy per day. Results: The EXL performed more climbing (7.1â€‰Â±â€‰0.91) compared to EX (4.4â€‰Â±â€‰0.63). PBM promoted increased expression of lactate dehydrogenase enzyme, mammalian target of rapamycin protein, and androgen receptor (pâ€‰<â€‰0.05) but not the myosin heavy chain (pâ€‰=â€‰0.43). Conclusions: PBM therapy increases the expression of performance-related muscle mass gain genes besides improving the resistance training performance.
Animals;Gene Expression;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Resistance Training

Effect of Photobiomodulation on Salivary Cortisol, Masticatory Muscle Strength, and Clinical Signs in Children with Sleep Bruxism: A Randomized Controlled Trial. Background: The diagnosis of sleep bruxism (SB) in children is difficult due to the lack of a polysomnographic protocol for this population. Moreover, the gold standard treatment [occlusal splint (OS) therapy] has limitations, as adequate use depends on the child's cooperation. The etiology of SB may include stress factors. Salivary cortisol is a biomarker used as a noninvasive method to evaluate the response to stress. Besides physiological aspects, it is also important to investigate morphological aspects, such as masticatory muscle strength. The aim of the present study was to determine the occurrence of bite marks on the buccal mucosa in children as a complementary sign for the diagnosis of SB and investigate and the effectiveness of photobiomodulation as an alternative treatment for this condition. Methods: Seventy-six children 6-12 years of age were divided into four groups: G1-with SB and submitted to laser therapy over acupuncture points (Î»â€‰=â€‰786.94â€‰nm, 20â€‰sec per point, fluencyâ€‰=â€‰33.5 Jcm(2), energyâ€‰=â€‰1â€‰J, number of pointsâ€‰=â€‰12); G2-with SB, use of OS, G3-with SB and submitted to sham laser therapy; and G4-control group without SB. Clinical signs (bite marks on buccal mucosa and headaches), bite force (BF), and salivary cortisol (biomarker

of stress) were evaluated before and after treatment. Statistical analysis involved the Kolmogorov-Smirnov, Shapiro-Wilk, and analysis of variance (ANOVA) tests. Results: Bite marks on the buccal mucosa were significantly associated with SB (pâ€‰<â€‰0.001). A statistically significant difference was found between the frequency of children with headache before and after treatment in G1 (pâ€‰=â€‰0.0005) and G2 (pâ€‰=â€‰0.0001), with no significant differences between the two groups (G1 and G2). The children in G1 had lower BF on both sides compared to the other groups. In the intragroup analysis after treatment, all groups exhibited an increase in salivary cortisol levels. Conclusions: Bite marks on the buccal mucosa can be used as a complementary sign for the clinical diagnosis of SB. Children with SB responded well to photobiomodulation therapy, as evidenced by the reduction in BF and reports of headache. Hydrocortisone Bite Force;Child;Humans;Hydrocortisone;Low-Level Light Therapy;Masticatory Muscles;Sleep Bruxism

Selective Laser Efficiency of Green-Synthesized Silver Nanoparticles by Aloe arborescens and Its Wound Healing Activities in Normal Wounded and Diabetic Wounded Fibroblast Cells: In vitro Studies. INTRODUCTION: Silver nanoparticles (AgNPs) have been extensively used in wound healing applications owing to their valuable physicochemical and biological properties. The main objective of this study was to evaluate the combined effects of green-synthesized silver nanoparticles (G-AgNPs) and photobiomodulation (PBM; laser irradiation at 830 nm with 5 J/cm(2)) in normal wounded and diabetic wounded fibroblast cells (WS1). METHODS: The combined effect of G-AgNPs and PBM was studied by various in vitro wound healing studies including cell morphology, cell migration rate and percentage wound closure, cell viability, cell proliferation, and filamentous (F)-actin and nuclear morphology staining. RESULTS: Cell viability results revealed good cellular compatibility of G-AgNPs to WS1 cells. The combined therapy of G-AgNPs and PBM demonstrated promising results to achieve progressive migration and wound closure in both normal wounded and diabetic wounded cell models. G-AgNPs alone and in combination with PBM had no negative effect on cell viability and proliferation, and there was an increase in cell migration. CONCLUSION: Overall, these findings demonstrate that the combined treatment of G-AgNPs and PBM does not display any adverse effects on wound healing processes in both normal wounded and diabetic wounded cell models. Silver Aloe;Cell Movement;Cell Proliferation;Cell Survival;Cells, Cultured;Diabetes Mellitus;Fibroblasts;Green Chemistry Technology;Humans;Lasers;Metal Nanoparticles;Silver;Wound Healing

Blue light: Friend or foe ? BACKGROUND: The purpose of this study was to elucidate why some potentially damaging and beneficial effects were obtained following blue light exposures on skin. MATERIALS AND METHODS: Light-emitting diode (LED) devices containing 415 and 470Â nm bulbs were used on normal human keratinocytes, skin biopsies and subjects with acne. Reactive oxygen species (ROS) evaluation was performed after a course of blue LED light exposures. A comparison between very small bandwidth centered at 415Â nm and a combination of (415Â +Â 470Â nm) wavelengths was also carried out regarding the effects on ROS production. The effects on other targets such as opsin1 short wavelength (OPN1 SW) photoreceptor, fibrillin-1 dermal component, LL37 antimicrobial peptide and interleukin-8 (IL-8) proinflammatory cytokine were then explored. Finally, clinical pictures of acne signs were also investigated after blue LED exposures. RESULTS: Dose dependent increases of ROS production were obtained on keratinocytes exposed to increasing 415Â nm LED exposures. However, a ROS decreasing first phase was observed on keratinocytes exposed to 415Â +Â 470Â nm LED exposures. Moreover, comparing the same doses of 415Â nm wavelength and (415Â +Â 470Â nm) wavelength combination, 415Â nm alone is more damaging than the 415Â +Â 470Â nm exposures. In case of increase in ROS, decrease in OPN1 SW photoreceptor and fragmentation of fibrillin-1 dermal fiber were observed. When conditions of ROS decrease were experienced, an increase in LL37 antimicrobial peptide and a modulation of IL-8 inflammatory

response were noted, suggesting improvement in acne signs. Clinical results confirmed the benefits on inflammatory lesions on subjects with acne. CONCLUSION: Blue lights can induce beneficial and adverse effects, depending on the dose and on the spectrum width of the exposure. Interleukin-8;Reactive Oxygen Species Color;Dose-Response Relationship, Radiation;Humans;Interleukin-8;Keratinocytes;Light;Reactive Oxygen Species;Skin;Time Factors

Laser Rejuvenation of Nonfacial Skin: A Review and a Personal Approach. BACKGROUND: Laser skin rejuvenation historically has emphasized facial photodamage. In this review, we examine energy-based rejuvenation for nonfacial skin. OBJECTIVE: The purpose of this review is to summarize past and current energy-based rejuvenation off the face. RESULTS: Many energy-based interventions can address pigment, tone, and texture irregularities of nonfacial skin. CONCLUSION: With conservative settings, current devices can be applied safely for nonfacial skin rejuvenation.
Arm;Cosmetic Techniques;Humans;Lasers, Gas;Lasers, Solid-State;Leg;Low-Level Light Therapy;Neck;Rejuvenation;Skin;Skin Aging;Skin Pigmentation;Thorax;Treatment Outcome

A Novel Treatment of Opioid Cravings With an Effect Size of .73 for Unilateral Transcranial Photobiomodulation Over Sham. BACKGROUND: Opioid use disorders (OUDs) are an epidemic causing catastrophic consequences to individuals, families, and society despite treatments including psychotherapy, substitution therapy or receptor blockers, and psychoeducation. We have developed a novel treatment that combines unilateral transcranial photobiomodulation (t-PBM) to the hemisphere with a more positive valence by Dual Brain Psychology (DBP). METHODS: We used a randomized, double blind, placebo-controlled protocol in which 22 patients with significant opioid cravings and a history of recent or current OUD attended three 1-h weekly sessions. After baseline measures of opioid craving and other psychometrics, subjects received two unilateral t-PBM applications (810 nm CW LED, 250 mW/cm(2), 60 J/cm(2), 4Â min) or a sham (foil-covered LED) at F3 or F4. Prior to any treatment we used two tests to determine which hemisphere was more associated with a negative outlook and cravings and treated that side before the more positive hemisphere. Primary outcome measure was an opioid craving scale (OCS). Secondary outcomes were weekly Hamilton Depression (HDRS) and Anxiety (HARS) Rating Scales prior to treatments and at follow-up. RESULTS: Immediately after treatment the OCS improved significantly for both the sham and active treatments, but one week later the active treatment showed a 51.0% (SD 33.7) decrease in OCS while a week after the sham treatments there was a decrease of only 15.8% (SD 35.0) (by Wilcoxon Sign Rank Test, $p = 0.004$) and by a mixed model it was $p = 0.0071$. The effect size for the differences between active and sham was 0.73. For the active treatment from before and after treatment the effect size was 1.51 and for the sham, 0.45. The HDRS improved from a baseline of 15.1 to 8.8 (SD 10.3) a week after the active treatment and to 13.3 (SD 12.9) after the sham ($p = 0.0071$). HARS improved from 14.7 to 8.0 (SD 13.2) after the active treatments and to 14.3 (SD 16.0) after the sham, $p = 0.08$. Active treatment of the positive hemisphere after the negative hemisphere significantly improved the OCS, but there was no significant difference after the sham treatment. One patient complained of 2Â h of abdominal bloating and dropped out; no other adverse effects were observed. DISCUSSION: Unilateral t-PBM to the hemisphere with a more positive hemispheric emotional valence was an effective and safe treatment for opioid cravings as well as for depression and anxiety. Our results also lend support to the underlying premises of DBP.

Assessment of Vein Diameter and Body Surface Temperature after High-Intensity Laser Therapy (HILT) on the Tarsal Joint in Healthy Horses. The aim of the study was to assess the influence of high-intensity laser therapy (HILT) on vein diameter and on body surface temperature changes in the tarsal joint area in a group of clinically healthy racehorses. The hypothesis of the study was that HILT increases vein diameter and body surface temperature in healthy tissue. The study involved 16 Thoroughbreds being subjected to ultrasonographic examination to assess changes of diameter of the

cranial branch of the medial saphenous vein and thermographic examination to indicate temperature change of the dorsal surface of the tarsal joint, just before and immediately after HILT treatment. Vein diameter and mean surface temperature of the tarsal joint significantly increased after HILT treatment. In addition, the study was the first to describe the photothermal effect of HILT in healthy horses. More studies are necessary to specify the parameters of the procedure, that is, wavelength, energy density, or time of the procedure, depending on the patient's individual characteristics and type of tissue. Animals;Body Temperature;Horses;Laser Therapy;Low-Level Light Therapy;Tarsal Joints;Temperature

Advance in Functional Restoration of Injured Nerve with Low Level Laser and its Utilization in the Dental and Maxillofacial Region. The inferior alveolar nerve and facial nerve are the two most important nerves in the dental and maxillofacial region. The injury to them is one of the major postoperative complications after alveolar surgery and orthognathic surgery. However, recovering the nerve function after injury takes a long time and the recovery effect tends to be unsatisfactory. In recent years, an intensively investigated technique, low level laser which has been applying in assisting the recovery of nerve function, has been gradually proved to be effective in clinically treating postoperative nerve injury. In this article we review in terms of the mechanisms involved in low level laser-assisted functional restoration of nerve injury and its clinical application in the recovery of nerve function in the dental and maxillofacial area as well. Face;Facial Nerve;Humans;Low-Level Light Therapy;Mandibular Nerve;Maxilla;Recovery of Function;Tooth

Acute and cumulative benefits of Photobiomodulation for xerostomia: A systematic review and meta-analysis. The objective was to explore the effectiveness of photobiomodulation therapy for treating patients who suffer xerostomia and/or hyposalivation due to the most prevalent clinical diagnoses. We searched PubMed, Scopus, Web of Science, CINAHL and Cochrane Library for randomized or clinical controlled trials published until 31 October 2019. Risk of bias assessment and meta-analysis were conducted using the Cochrane tools. A total of 274 records were retrieved, and 11 met the inclusion criteria. Interventions whose parameters ranged between wavelengths of 790-830Â nm (infrared), 30-120Â mW of power and an energy density below 30Â J/cm-2 were associated with improvements in xerostomia/hyposalivation. As for the assessment of methodological quality, 10 of the 11 articles included had a high risk of overall bias. Only 3 articles provided sufficient information to conduct a meta-analysis for quality of life, compared with placebo in patients with burning mouth syndrome, showing a standardized mean difference between groups from baseline of -0.90 (-1.48; -0.32). The present review and meta-analysis suggest that photobiomodulation therapy is an effective, non-invasive and safe approach in patients with xerostomia. However, despite the potential, it is not possible to reach a reliable consensus on the parameters to be used, and future studies should be conducted by standardizing intervention protocols. Burning Mouth Syndrome;Humans;Low-Level Light Therapy;Quality of Life;Xerostomia

Light Emitting Diode Therapy Protects against Myocardial Ischemia/Reperfusion Injury through Mitigating Neuroinflammation. BACKGROUND: Neuroinflammation plays a key role in myocardial ischemia-reperfusion (I/R) injury. Previous studies showed that light-emitting diode (LED) therapy might improve M2 microglia activation and brain-derived neurotrophic factor (BDNF) expression, thereby exerting anti-inflammatory effects. Therefore, we hypothesized that LED therapy might reduce myocardial I/R injury by neuroinflammation modulation. OBJECTIVE: To explore the effect of LED therapy on myocardial I/R-induced injury and seek the underlying mechanism. METHODS: Thirty rats were randomly divided into three groups: Control group (without LED treatment or myocardial I/R, n = 6), I/R group (with myocardial I/R only, n = 12), and LED+I/R group (with myocardial I/R and LED therapy, n = 12). Electrocardiogram was recorded continuously during the procedure. In addition, brain tissue was extracted for BDNF, Iba1, and CD206 analyses, and heart

tissue for myocardial injury (ischemic size and infarct size), IL-4 and IL-10 mRNA analysis. RESULTS: In comparison with the I/R group, the ischemia size and the infarct size were significantly attenuated by LED therapy in the LED+I/R group. Meanwhile, the microglia activation induced by I/R injury was prominently attenuated by LED treatment either. And it is apparent that there was also an increase in the beneficial neuroinflammation markers (BDNF and CD206) in the paraventricular nucleus (PVN) in the LED+I/R group. Furthermore, the anti-inflammatory cytokines, IL-4 and IL-10, were greatly decreased by I/R while improved by LED treatment in myocardium. CONCLUSION: LED therapy might reduce neuroinflammation in PVN and decrease myocardium injury by elevating BDNF and M2 microglia. Brain-Derived Neurotrophic Factor;RNA, Messenger;Interleukin-10;Interleukin-4 Animals;Brain;Brain-Derived Neurotrophic Factor;Gene Expression Regulation;Inflammation;Interleukin-10;Interleukin-4;Microglia;Myocardial Reperfusion Injury;Myocardium;Phototherapy;RNA, Messenger;Rats, Sprague-Dawley

Wound Healing and Cell Dynamics Including Mesenchymal and Dental Pulp Stem Cells Induced by Photobiomodulation Therapy: An Example of Socket-Preserving Effects after Tooth Extraction in Rats and a Literature Review. High-intensity laser therapy (HILT) and photobiomodulation therapy (PBMT) are two types of laser treatment. According to recent clinical reports, PBMT promotes wound healing after trauma or surgery. In addition, basic research has revealed that cell differentiation, proliferation, and activity and subsequent tissue activation and wound healing can be promoted. However, many points remain unclear regarding the mechanisms for wound healing induced by PBMT. Therefore, in this review, we present an example from our study of HILT and PBMT irradiation of tooth extraction wounds using two types of lasers with different characteristics (diode laser and carbon dioxide laser). Then, the effects of PBMT on the wound healing of bone tissues are reviewed from histological, biochemical, and cytological perspectives on the basis of our own study of the extraction socket as well as studies by other researchers. Furthermore, we consider the feasibility of treatment in which PBMT irradiation is applied to stem cells including dental pulp stem cells, the theme of this Special Issue, and we discuss research that has been reported on its effect. Animals;Bone and Bones;Cell Differentiation;Dental Pulp;Laser Therapy;Lasers, Gas;Lasers, Semiconductor;Male;Periodontal Ligament;Rats;Rats, Wistar;Stem Cells;Tooth Extraction;Wound Healing

Local management of neutropenic ulcer in a patient under breast cancer treatment. Neutropenic ulcers are characterized by regular margins with a yellowish membrane, and are usually associated with severe pain and signs of inflammation due to opportunistic infections. Considering the immunosuppressed condition of these patients, local management of these lesions is a challenge. Antimicrobial photodynamic therapy (aPDT) is the association of light, which can be a low-power laser, with a photosensitizing agent and oxygen, whose synergy produces reactive oxygen species capable of reducing non-specific microbial contamination without causing side effects. The aim of this paper is to report a case of oral neutropenic ulcer treated with aPDT. A 50-year-old diabetic woman undergoing breast cancer treatment, presented with a malodorous malodorous and painful ulcer, which limited her basic oral functions. It was located in the maxillary alveolar ridge in the left first upper molar region and did not present bone involvement. Blood tests showed grade 2 of neutropenia. Thus, conservative treatment with aPDT technique was proposed. After one week, the lesion showed an improvement and pain had halved. The region was totally healed after three weeks. Local and non-invasive management of these lesions is of utmost importance for immunosuppressed patients, because it avoids systemic side effects and bacterial resistance resulting from overuse of antibiotics. Photosensitizing Agents Bacterial Infections;Breast Neoplasms;Female;Humans;Middle Aged;Photochemotherapy;Photosensitizing Agents;Ulcer

Photobiomodulation modulates inflammation and oral microbiome: aÂ pilot study. INTRODUCTION: Oral mucositis (OM) is a severe side effect in patients undergoing anticancer therapies, which negatively impacts on their quality of life often leading to either the interruption ofÂ the therapy. Photobiomodulation (PBM) is emerging as an effective strategy allowing a faster wound healing. OBJECTIVES: This pilot study aims at verifying whether PBM modulates the inflammatory response in patients and its effect on the oral microbiome composition. MATERIALS AND METHODS: Buccal swabs were collected from four patients affected by OM, both on ulcerated and clinically healthy areas, before and on the last day of PBM therapy, as well as on the first day after treatment discontinuation. The concentration of 38 cytokines and the composition of oral microbiome were measured. RESULTS: Most of the pro-inflammatory cytokines were reduced, whereas anti-inflammatory cytokines resulted up-regulated by PBM. In addition, PBM influenced the composition of oral microbiome, by decreasing the amount of pathogenic species and promoting the growth of commensal bacteria. These changes were even more evident when separately analysing patients who clinically responded to PBM and the only patient who did not respond. CONCLUSIONS: PBM reduces inflammatory burden in patients affected by OM and positively influences the composition of the oral microbiome. Cytokines;Inflammation Mediators Bacteria;Cytokines;Dysbiosis;Humans;Inflammation Mediators;Low-Level Light Therapy;Microbiota;Mouth Mucosa;Pilot Projects;Stomatitis;Treatment Outcome

Potential of Photobiomodulation to Induce Differentiation of Adipose- Derived Mesenchymal Stem Cells into Neural Cells. BACKGROUND: Given the minimal capacity and sometimes the failure of the mammalian nervous system to regenerate and repair itself after damage, strategies are required to help enhance this regenerative process. Adipose-derived Mesenchymal Stem Cells (ADMSCs) are likely candidates to assist in the recovery process due to their ability to differentiate into neural cells. Successful implementation of this intervention in a clinical setting would increase the rate of recovery following traumatic brain injury. REVIEW: Various strategies have been attempted to differentiate ADMSCs into neural cells for clinical use. Such methods have not been entirely successful in the development of functioning specialized cells for subsequent practical use. Therefore, the implementations of this differentiation technique in the clinical trial have not been effective. In this article, the potential of differentiating ADMSCs into neural cells and the various methods employed, including biological induction, chemical induction and photobiomodulation (PBM) will be discussed, where the combined use of transducers and PBM for neural differentiation of ADMSCs is also deliberated. CONCLUSION: PBM shows promise as an avenue for effective ADMSCs differentiation into neural cells and their proliferation. Applying PBM with optimized biological factors and chemical inducers may prove to be an effective tool for clinical application. Adipose Tissue;Animals;Cell Differentiation;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Neurons

Red light-emitting diode treatment improves tissue recovery in DSS-induced colitis in mice. Inflammatory bowel diseases are debilitating illnesses characterized by severe inflammation of the gastrointestinal tract. Treatments currently available are expensive and ineffective. We here investigated the role of red-light emitting diode (LED) on dextran sodium sulfate (DSS)-induced colitis. DSS was added to the drinking water of male mice at days 0, 2, 4 and withdrawn at day 6. LED irradiation was performed daily for 90s from day 6 to 9 on the right and left sides of the ventral surface and beside the external anal region. LED treatment decreased the amount of crypt dysplasia/edema, inflammatory infiltrates and ulcers, attenuated apoptosis and increased proliferation of crypt cells. Also, LED treatment induced expression of annexin A1 in the damaged epithelium, preserved the organization of claudin-1 and skewed cytokine profiling towards a more anti-inflammatory status. Thus, LED treatment promotes structural protection and modulates the

inflammatory response, constituting a potential non-invasive and low-cost combined therapy to help patients achieve disease remission. Dextran Sulfate Animals;Colitis;Dextran Sulfate;Intestinal Mucosa;Male;Mice;Mice, Inbred C57BL;Phototherapy;Semiconductors;Treatment Outcome

Effects of ultraviolet-C light-emitting diodes at 275â€‰nm on inactivation of Alicyclobacillusacidoterrestris vegetative cells and its spores as well as the quality attributes of orange juice. Alicyclobacillus acidoterrestris is a thermoacidophilic, spore-forming bacillus. A. acidoterrestris and its spores can survive in pasteurized juices and cause microbial spoilage. In this work, the effects of ultraviolet-C light-emitting diodes at 275â€‰nm on the inactivation of A. acidoterrestris vegetative cells and its spores in commercial pasteurized orange juice were studied. Meanwhile, the effects of ultraviolet-C light-emitting diodes on the quality attributes of the orange juice were also investigated. The quantities of A. acidoterrestris vegetative cells and its spores inoculated in orange juice were reduced by 6.04 and 2.49 log(10) CFU/mL after ultraviolet-C light-emitting diode treatment at 220 mJ/cm(2), respectively. The Weibull and Weibull plus tail models were satisfactorily fitted to estimate the reductions of A. acidoterrestris vegetative cells and its spores in orange juice, respectively. Physicochemical properties (pH, titratable acidity, total soluble solids, and clarity) of orange juice did not change significantly after exposure to ultraviolet-C light-emitting diodes. However, the total phenolic content of orange juice decreased with increasing fluence. In addition, ultraviolet-C light-emitting diode treatment at a higher fluence led to a noticeable color difference. These results indicate that ultraviolet-C light-emitting diode treatment has a potential application in the juice processing industry.
Alicyclobacillus;Beverages;Citrus sinensis;Food Microbiology;Spores;Spores, Bacterial

Safety and efficacy of a novel home-use device for light-potentiated (LED) skin treatment. Skin structure and function results from a dynamic interplay between dermal and epidermal cell types. Optimizing skin health through an effective and long-lasting skin care regime therefore requires a global approach, encompassing various mechanisms to stimulate this interplay beyond the action scope of a classical topical solution. This study evaluates the impact of a novel home-use device combining a topical serum, light-emitting diodes and massage on the clinical signs of extrinsic skin aging. The innovative principle relies on potentiating the effect of active ingredients contained in the topical serum with visible and near infra-red photons to prevent extracellular matrix degradation and promote its reconstruction. After in vitro and ex vivo investigations, a clinical study assessed the safety and efficacy of a daily treatment with the home-use device for 28â€‰days. A significant increases in skin density and radiance while reducing the wrinkles was obtained with no side effects.
Administration, Cutaneous;Rejuvenation;Skin;Skin Aging

Phototherapy as a Rational Antioxidant Treatment Modality in COVID-19 Management; New Concept and Strategic Approach: Critical Review. The COVID-19 pandemic has taken the entire globe by storm. The pathogenesis of this virus has shown a cytokine storm release, which contributes to critical or severe multi-organ failure. Currently the ultimate treatment is palliative; however, many modalities have been introduced with effective or minimal outcomes. Meanwhile, enormous efforts are ongoing to produce safe vaccines and therapies. Phototherapy has a wide range of clinical applications against various maladies. This necessitates the exploration of the role of phototherapy, if any, for COVID-19. This critical review was conducted to understand COVID-19 disease and highlights the prevailing facts that link phototherapy utilisation as a potential treatment modality for SARS-CoV-2 viral infection. The results demonstrated phototherapy's efficacy in regulating cytokines and inflammatory mediators, increasing angiogenesis and enhancing healing in chronic pulmonary inflammatory diseases. In conclusion, this review answered the following research question. Which molecular and cellular mechanisms of action of phototherapy have demonstrated great potential in

enhancing the immune response and reducing host-viral interaction in COVID-19 patients? Therefore, phototherapy is a promising treatment modality, which needs to be validated further for COVID-19 by robust and rigorous randomised, double blind, placebo-controlled, clinical trials to evaluate its impartial outcomes and safety.

Patient-reported outcomes of laser-assisted pain control following non-surgical and surgical periodontal therapy: A systematic review and meta-analysis. Adjunctive use of laser devices as high reactive-level laser/light therapy (HLLT) or photobiomodulation therapy (PBMT) for periodontal therapy is known to be more effective on suppressing pain than conventional therapy, however, there are no systematic reviews addressed its effectiveness. This systematic review and meta-analysis aim to investigate the following clinical question (CQ): does adjunctive use of lasers with conventional therapy suppress the pain associated with periodontal treatment? A systematic and extensive literature search was performed to summarize the currently available knowledge to answer the CQ using the PubMed, Cochrane Library, and Web of Science databases for randomized controlled trials (RCTs) conducted before June 2020. Bias risk was assessed using the Cochrane tool for the risk of bias evaluation. A meta-analysis was performed on quantitative evaluation of pain control based on patient-reported outcomes. After an independent screening of 165 initial records, ten RCTs were included. Six of them focused on surgical procedures and the others on non-surgical periodontal pocket therapy. The protocols of HLLT, PBMT, and combination with HLLT and PBMT were employed in five, four and one RCTs, respectively. Following the assessment of bias risk, it is revealed that all RCTs had methodological weaknesses regarding the blinding of key personnel, although other bias risk factors were not evident. Meta-analysis showed that HLLT using erbium lasers significantly reduced the patient-reported pain immediately after treatment (two RCTs, $p < 0.0001$), while PBMT using diode lasers significantly reduced pain 2-7 days after treatment (two RCTs, $p < 0.0001$ to $p = 0.03$). The presented systematic review and meta-analysis suggest that the alternative use of HLLT using erbium lasers to conventional instrumentation can significantly suppress postoperative pain and that intraoperative or postoperative PBMT using diode lasers combined with periodontal surgery can significantly reduce postoperative pain. However, the evidence is still insufficient and more well-designed RCTs are required. Humans;Judgment;Laser Therapy;Low-Level Light Therapy;Pain Management;Patient Reported Outcome Measures;Periodontium;Publication Bias;Risk;Visual Analog Scale

Treatment of Refractory Melasma in Asians With the Picosecond Alexandrite Laser. BACKGROUND/OBJECTIVES: The picosecond Alexandrite laser was studied in our practice with the diffractive lens array and the flat optic to treat melasma. METHODS AND MATERIALS: Sixty patients with melasma were treated in a prospective investigation with the picosecond Alexandrite laser. Nineteen patients were treated with the flat optic and 41 patients were treated with the diffractive lens array. Treatments were performed with 1 pass at 2-week intervals for 6 treatments. The Melasma Severity Index (MSI) was used to evaluate the patients before treatment and 3 and 6 months after the final treatment session. RESULTS: At 6 months after the last treatment, there was an 18.5% difference between the groups with a 75.7% improvement in the MSI in patients with the diffractive lens array and a 57.2% improvement in the MSI score in patients with the flat optic. At 6 months, there was recurrence of melasma in 5% of the cases with no hyperpigmentation with the diffractive optic in contrast to recurrence in 16% of the cases in the flat optic group and a transient macular hyperpigmentation in 21% of the cases. CONCLUSION: This investigation highlights the utility of a picosecond Alexandrite laser with a flat and diffractive lens to successfully treat a large percentage of Asian patients in a sunny climate. Asian People;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Patient

Satisfaction;Prospective Studies;Recurrence;Secondary Prevention;Severity of Illness Index;Skin;Skin Pigmentation;Sunlight;Thailand;Treatment Outcome

Laser-assisted nucleic acid delivery: A systematic review. Gene therapy has become an effective treatment modality for some conditions. Laser light may augment or enhance gene therapy through photomechanical, photothermal, and photochemical. This review examined the evidence base for laser therapy to enhance nucleic acid transfection in mammalian cells. An electronic search of MEDLINE, Scopus, EMBASE, Web of Science, and Google Scholar was performed, covering all available years. The preferred reporting items for systematic reviews and meta-analyses guideline for systematic reviews was used for designing the study and analyzing the results. In total, 49 studies of laser irradiation for nucleic acid delivery were included. Key approaches were optoporation, photomechanical gene transfection, and photochemical internalization. Optoporation is better suited to cells in culture, photomechanical and photochemical approaches appear well suited to in vivo use. Additional studies explored the impact of photothermal for enhancing gene transfection. Each approach has merits and limitations. Augmenting nucleic acid delivery using laser irradiation is a promising method for improving gene therapy. Laser protocols can be non-invasive because of the penetration of desirable wavelengths of light, but it depends on various parameters such as power density, treatment duration, irradiation mode, etc. The current protocols show low efficiency, and there is a need for further work to optimize irradiation parameters. Nucleic Acids Animals;Laser Therapy;Lasers;Low-Level Light Therapy;Nucleic Acids;Transfection

Effect of Transcranial Low-Level Light Therapy vs Sham Therapy Among Patients With Moderate Traumatic Brain Injury: A Randomized Clinical Trial. IMPORTANCE: Preclinical studies have shown that transcranial near-infrared low-level light therapy (LLLT) administered after traumatic brain injury (TBI) confers a neuroprotective response. OBJECTIVES: To assess the feasibility and safety of LLLT administered acutely after a moderate TBI and the neuroreactivity to LLLT through quantitative magnetic resonance imaging metrics and neurocognitive assessment. DESIGN, SETTING, AND PARTICIPANTS: A randomized, single-center, prospective, double-blind, placebo-controlled parallel-group trial was conducted from November 27, 2015, through July 11, 2019. Participants included 68 men and women with acute, nonpenetrating, moderate TBI who were randomized to LLLT or sham treatment. Analysis of the response-evaluable population was conducted. INTERVENTIONS: Transcranial LLLT was administered using a custom-built helmet starting within 72 hours after the trauma. Magnetic resonance imaging was performed in the acute (within 72 hours), early subacute (2-3 weeks), and late subacute (approximately 3 months) stages of recovery. Clinical assessments were performed concomitantly and at 6 months via the Rivermead Post-Concussion Questionnaire (RPQ), a 16-item questionnaire with each item assessed on a 5-point scale ranging from 0 (no problem) to 4 (severe problem). MAIN OUTCOMES AND MEASURES: The number of participants to successfully and safely complete LLLT without any adverse events within the first 7 days after the therapy was the primary outcome measure. Secondary outcomes were the differential effect of LLLT on MR brain diffusion parameters and RPQ scores compared with the sham group. RESULTS: Of the 68 patients who were randomized (33 to LLLT and 35 to sham therapy), 28 completed at least 1 LLLT session. No adverse events referable to LLLT were reported. Forty-three patients (22 men [51.2%]; mean [SD] age, 50.49 [17.44] years]) completed the study with at least 1 magnetic resonance imaging scan: 19 individuals in the LLLT group and 24 in the sham treatment group. Radial diffusivity (RD), mean diffusivity (MD), and fractional anisotropy (FA) showed significant time and treatment interaction at 3-month time point (RD: 0.013; 95% CI, 0.006 to 0.019; Pâ€‰<â€‰.001; MD: 0.008; 95% CI, 0.001 to 0.015; Pâ€‰=â€‰.03; FA: -0.018; 95% CI, -0.026 to -0.010; Pâ€‰<â€‰.001).The LLLT group had lower RPQ scores, but this effect did not reach statistical significance (time effect Pâ€‰=â€‰.39, treatment effect Pâ€‰=â€‰.61, and timeâ€‰Ã—â€‰treatment effect

Pâ€‰=â€‰.91). CONCLUSIONS AND RELEVANCE: In this randomized clinical trial, LLLT was feasible in all patients and did not exhibit any adverse events. Light therapy altered multiple diffusion tensor parameters in a statistically significant manner in the late subacute stage. This study provides the first human evidence to date that light therapy engages neural substrates that play a role in the pathophysiologic factors of moderate TBI and also suggests diffusion imaging as the biomarker of therapeutic response. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT02233413. Placebos Adult;Aged;Anisotropy;Brain Injuries, Traumatic;Diffusion Tensor Imaging;Double-Blind Method;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Neural Pathways;Placebos;Post-Concussion Syndrome;Severity of Illness Index;Surveys and Questionnaires;Treatment Outcome;White Matter

Transcranial Low-Level Light Therapy: A New Hope for Preventing Cognitive Consequences of Traumatic Brain Injuries? Brain Injuries, Traumatic;Cognition;Cognition Disorders;Humans;Low-Level Light Therapy

Concussions in Ice Hockey - Moving Toward Objective Diagnoses and Point-of-care Treatment: A Review. The incidence of sport-related concussion coupled with a doubling of the participation rate in youth hockey over the past two decades provides impetus for the review of the most promising concussion treatment options. This narrative review summarizes the future treatment options for sport-related concussions in ice hockey, while acknowledging their generalizability to concussion in all sports. Symptom assessment, sign observation, as well as cognitive and balance testing, have historically been used to diagnose a concussion. These methods continue to improve, but the need for effective treatments is clear. Pharmacologic, transcranial light, and nutritional supplement treatment options for concussion warranting further investigation have been identified. Dimethyl fumarate is an immunomodulatory compound thought to trigger antioxidant gene expression. Memantine reduces apoptosis and astrogliosis by inhibiting the calcium influx into cells normally caused by glutamate's activation of N-methyl-D-aspartate receptors. Thioredoxin-mimetic peptides and transcranial photobiomodulation temper the effects of the energy crisis by acting as free radical scavengers. In addition, seven neuroprotective nutritional supplements have been identified: berberine, creatine, curcumin, melatonin, omega-3 fatty acids, resveratrol, and vitamins. An estimated US $1.1 billion has been spent on unsuccessful traumatic brain injury clinical trials. As our ability to accurately diagnose concussion improves, dimethyl fumarate, memantine, thioredoxin-mimetic peptides, transcranial photobiomodulation, and nutritional supplements (berberine, creatine, curcumin, melatonin, omega-3 fatty acids, resveratrol, and vitamins) warrant further preclinical and clinical examination in advancing the treatment of sport-related concussions. Animals;Athletic Injuries;Brain Concussion;Hockey;Humans;Neuropsychological Tests;Point-of-Care Systems

Effect of diode laser biostimulation compared to Teriparatide on induced osteoporosis in rats: an animal study from Egypt. Our aim in this study was to evaluate the effect of low-level laser therapy (LLLT) by means of diode laser bio-stimulation compared to Teriparatide in induced osteoporosis in rats. A total of 45 adult female Egyptian albino rats were used. Rats were divided into five groups: normal control, osteoporotic control, Teriparatide (TPTD) group (T), laser group (L), and laser and teriparatide (T+L) combination group. Osteoporosis was induced by performing double ovariectomy in rats. Lower jaws and left femurs were dissected. The specimens were tested using a Computed tomography unit, scanning EM (SEM) equipped with Energy Dispersive X-Ray Analyzer, and Rat PINP ELISA Kit. The histopathologic examination of experimental rat jaws and femurs revealed changes in bone architecture among the various groups throughout the experiment. CT examination showed a noticeable difference in radiodensity between jaw and femur bones. By SEM, bones of the Normal Control (NC) group showed normal bone porosity. However, bones of the Osteoporotic

Control (OC) group showed a great difference as bone pores were large and numerous with irregular outlines. The ELISA test for PINP concentration showed a steady rise in the PINP concentrations in OC, T, L and T+L groups. We concluded that TPTD has osteogenic potential and is capable to enhance bone architecture by inducing the formation of new well-organized bone with narrower bone pore diameter. LLLT can be used as a good alternative local treatment strategy with minimal side effects and superior outcomes.

No Clear Evidence for the Effect of Low-Level Laser Treatment on Orthodontically Induced Inflammatory Root Resorption: More Human Clinical Studies Are Needed. ARTICLE TITLE AND BIBLIOGRAPHIC INFORMATION: Influence of low-level laser therapy on orthodontically induced inflammatory root resorption. A systematic review. Michelogiannakis D, l-Shammery D, Akram Z, Rossouw PE, Javed F, Romanos GE. Arch Oral Biol 2019;100:1-13. SOURCE OF FUNDING: The authors reported that this article did not receive any specific grants from funding agencies in the public, commercial, or nonprofit sectors. TYPE OF STUDY/DESIGN: Systematic review. Humans;Low-Level Light Therapy;Root Resorption;Tooth Movement Techniques

Therapeutic effects of andiroba (Carapa guianensis Aubl) oil, compared to low power laser, on oral mucositis in children underwent chemotherapy: A clinical study. ETHNO-PHARMACOLOGICAL RELEVANCE: The Carapa guianensis Aubl, popularly known as andiroba, is a large tree of the Meliaceae family, commonly found in the Amazon region. The oil extracted from its seeds is recognized in traditional medicine and has high anti-inflammatory and analgesic potential, which are the basic prerequisites for a therapeutic agent that can be used in the treatment of oral mucositis (OM). Moreover, the aforementioned oil has antimicrobial, antiallergic, and parasiticidal actions and is effective in the management of cutaneous and muscular dysfunctions. AIM OF THE STUDY: To evaluate the therapeutic effects of andiroba gel (Carapa guianensis Aubl) on the symptomatology and evolution of OM in children with leukemia who underwent chemotherapy and to compare it to the effects of low power laser. MATERIALS AND METHODS: This randomized, double-blind clinical trial involved 60 patients of both genders with leukemia, with age ranging from six to twelve years. The patients were divided into two study groups: the andiroba group (nÂ =Â 30) and the laser group (nÂ =Â 30). The level of pain experienced by the patients was assessed using the Wong-Baker visual analog scale and the degree of severity of OM was assessed using a table, recommended by the World Health Organization, that depicts the degrees of severity of OM. The data obtained were analyzed using the Mann-Whitney test, with statistical significance indicated by a P value less than or equal to 0.05. RESULTS: A statistically significant reduction in the degree of OM was observed on the fourth, fifth, and sixth days and in the pain scores on the second, third, and fourth days in the andiroba group after the manifestation of OM, compared to the laser group. CONCLUSIONS: The use of andiroba oil effectively reduced the severity of OM and relieved pain, which resulted in a decrease in the severity of signs and symptoms in the patients in the andiroba group, compared to the laser group. Antineoplastic Agents;Plant Oils Antineoplastic Agents;Child;Child, Preschool;Double-Blind Method;Female;Humans;Leukemia, Myelomonocytic, Juvenile;Low-Level Light Therapy;Male;Meliaceae;Pain Measurement;Plant Oils;Stomatitis;Treatment Outcome

The effects of photobiomodulation therapy for treatment of alveolar osteitis (Dry Socket): Systematic review and meta-analysis. INTRODUCTION: Dry socket (alveolar osteitis) is one of the most common complications that occur after the extraction of permanent teeth. The aim of this review was to evaluate and compare the effectiveness of photobiomodulation (PBT) with other treatment methods on alveolar osteitis. METHODS AND MATERIALS: MEDLINE, Web of Science, EMBASE, Scopus and Cochrane's CENTRAL online databases were searched based on the search strategy. Also, the prominent laser journals and the references of relevant studies were hand searched for eligible studies and then the data were extracted from the retrieved studies were extracted using piloted

custom forms. The data were combined and analyzed using inverse-variance random-effect meta-analysis. RESULTS: For the treatment of dry socket, pain perception based on the VAS score, PBT on average has a 3.41 higher pain level reduction compared to alveogyl which seems to be both statistically and clinically significant. In addition, based on the GRADE score, the evidence seems to be of moderate quality. Also, in the individual studies which were included in this systematic review, PBT seems to be more effective than other methods (Salicept, zinc-oxide eugenol, ozone, and photodynamic therapy) in pain reduction of patients with alveolar osteitis. CONCLUSIONS: PBT, in general, has a higher ability in decreasing pain levels for patients with alveolar osteitis (dry socket) compared to alveogyl. Therefore, PBT could be used as an appropriate method for treatment and controlling the signs of dry socket. Photosensitizing Agents Dry Socket;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Tooth Extraction

Prevention of medication related osteonecrosis of the jaw after dentoalveolar surgery: An institution's experience. BACKGROUND: Dentoalveolar surgery is a predisposing factor for medication related osteonecrosis of the jaw (MRONJ). The aim of our study was to evaluate the described surgical procedures to prevent the development of MRONJ after dentoalveolar surgery in patients receiving bisphosphonates. MATERIAL AND METHODS: In this retrospective study, sixty-three dentoalveolar surgeries were performed on 44 patients taking bisphosphonate in accordance with the treatment procedures we described. The following procedures were applied to patients 1) use of antibiotics 2) performed dentoalveolar surgical procedures 3) fill the socket with leukocyte- and platelet-rich fibrin (L-PRF) 4) post-operative application of low level laser therapy through Nd: YAG laser 5) sutures were removed on post-op 14th day 6) long-term results were evaluated. RESULTS: Healing of all patients was uneventful. Complete mucosal healing was achieved in all patients at 1 month. There is no failure was observed in long-term follow-up. CONCLUSIONS: Because of the pathophysiology of MRONJ is not fully understood and has many risk factors, definitive protocols on prevention and treatment have not been established yet. Personal risk assessment is required for the prevention and treatment of MRONJ. The described surgical protocol may be considered to reduce the risk of developing MRONJ after dentoalveolar surgery due to its high success rate. Key words:Tooth extraction, medication related osteonecrosis of the jaw, preventive dentistry, L-PRF, low level laser therapy.

Molecular and Cellular Mechanisms of Arthritis in Children and Adults: New Perspectives on Applied Photobiomodulation. Juvenile idiopathic arthritis and adult rheumatoid arthritis are two major groups with chronic joint pain and inflammation, extra-articular manifestations, and high risk of comorbidities, which can cause physical and ocular disability, as well as create great socio-economic pressure worldwide. The pathogenesis of arthritis manifested in childhood and adulthood is multifactorial, unclear, and overly complex, in which immunity plays an important role. Although there are more and more biological agents with different mechanisms of action for the treatment of arthritis, the results are not as expected, because there are partial responses or non-responsive patients to these compounds, high therapeutic costs, side effects, and so on; therefore, we must turn our attention to other therapeutic modalities. Updating knowledge on molecular and cellular mechanisms in the comparative pathogenesis of chronic arthritis in both children and adults is necessary in the early and correct approach to treatment. Photobiomodulation (PBM) represents a good option, offering cost-effective advantages over drug therapy, with a quicker, more positive response to treatment and no side effects. The successful management of PBM in arthritis is based on the clinician's ability to evaluate correctly the inflammatory status of the patient, to seek the optimal solution, to choose the best technology with the best physical parameters, and to select the mode of action to target very precisely the immune system and the molecular signaling pathways at the molecular level with the exact amount of quantum light energy in order to obtain the desired

immune modulation and the remission of the disease. Light is a very powerful tool in medicine because it can simultaneously target many cascades of immune system activation in comparison with drugs, so PBM can perform very delicate tasks inside our cells to modulate cellular dysfunctions, helping to initiate self-organization phenomena and finally, healing the disease. Interdisciplinary teams should work diligently to meet these needs by also using single-cell imaging devices for multispectral laser photobiomodulation on immune cells.
Adolescent;Adult;Aged;Arthritis;Arthritis, Juvenile;Arthritis, Rheumatoid;Child;Female;Humans;Inflammation;Low-Level Light Therapy;Male;Middle Aged

Evaluation Effects of Laser Therapy and Extracorporeal Shock Wave Therapy with Clinical Parameters and Magnetic Resonance Imaging for Treatment of Plantar Fasciitis in Patients with Spondyloarthritis: A Randomized Controlled Trial. OBJECTIVE: Low-level laser therapy (LLLT) and extracorporeal shock wave therapy (ESWT) is applied in the conservative treatment of inflammatory plantar fasciitis, which is also a characteristic feature of spondyloarthritis (SpA) (Gill, 1997 and Roxas, 2005). We determined and compared the effectiveness of LLLT and ESWT using magnetic resonance imaging (MRI). METHODS: This study is a prospective, randomized, comparative, single-blind clinical study. Voluntarily followed 40 patients with the diagnosis of SpA and having pain at the heels at least for 6 months. Patients were divided randomly into two treatment groups. One group undertook 14 sessions of infrared Ga-Al-As LLLT, and the other group undertook 3 sessions ESWT. Feet functions of the patients were evaluated by American Orthopaedic Foot and Ankle Society (AOFAS) and Roles and Maudsley Scoring; VAS was evaluated for foot pain and function. In clinical assessment, disease activity was carried out by applying the BASDAI, the functional assessment was evaluated through the BASFI, and the patient quality of life was evaluated through the ASQoL; enthesitis was scored according to MASES assessment, performed before and at 1 month after treatment. The thickness of the plantar fascia was measured with MRI before and 1 month after treatment. RESULTS: Compared with the pretherapy, progress in the feet function by AOFAS and Roles-Maudsley scoring and decrease in VAS levels were statistically significant in both groups ($p < 0.001$). Only the VAS exercise score was superior to LLLT ($p < 0.05$). The thickness of the plantar fascia had decreased significantly on MRI in all two groups. CONCLUSION: The treatment of plantar fasciitis with LLLT and ESWT was more successful in pain improvement and functional outcomes with the dose, frequency, and duration used in our study.

At-Home Photobiomodulation Treatments for Supportive Cancer Care During the COVID-19 Pandemic. COVID-19;China;Humans;Neoplasms;Pandemics;SARS-CoV-2

UC-USP collaborative exercise on photobiomodulation therapy in neurological orofacial disturbances. BACKGROUND: Neurosensory peripheral disorders are one of the most common risks associated with iatrogenic and/or post-traumatic injuries. It is often related to disability. Photobiomodulation therapy (PBMT) is a nonsurgical and safe procedure which can accelerate and improve the regeneration of injured biological tissue. This study aims to analyze the impact of PBMT, in the quality of life and impairment of individuals with orofacial neurological peripheral disturbance. MATERIAL AND METHODS: A retrospective analysis in the database of the dental traumatology clinic of the Hospital Centre of the University of Coimbra/Faculty of Medicine of the University of Coimbra was performed.5 out of 50 individuals were selected, according to the selection criteria. The neurosensory activity was assessed by a pinprick nociceptive test and the EQ-5D-5L self-report questionnaire was used to analyse the quality of life. The study was performed in two phases:1) inactive laser or placebo phase, for one month and 2) active laser or treatment phase. A diode low-level laser device (SIROLaserBlue;Sirona,Germany) was used, according to our protocol. A collaborative protocol in the PBMT influence in individuals with neurosensory peripheral disturbances was studied. RESULTS: There was no improvement in the neurosensory activity nor in the quality of life, in the placebo

phase. After the treatment phase, the EQ-5D-5L final results reported no problems in all of the five dimensions, except for anxiety/depression in individuals with long-standing neurosensory peripheral disturbances. The EQ-VAS scores increased in all the individuals. CONCLUSIONS: Our results supported the improvement of quality of life and impairment reduction in the individuals submitted to PBMT. Key words:Low-level light therapy, peripheral nerve injuries, sensation disorders, quality of life, forensic medicine.

The Effect on Muscle Hardness of Acupuncture Stimulation Using Low-reactive Level Laser Therapy and Silver Spike Point Therapy, along with Stretching. BACKGROUND AND AIMS: Muscle hardness causes lower activity in athletic practice or sport competition. Increase in muscle hardness often cause injury and muscle fatigue. The aim of this study is to investigate the effect on muscle hardness of acupuncture stimulation using low-reactive level laser therapy (LLLT) and silver spike point (SSP) therapy, along with stimulation by stretching. MATERIALS SUBJECTS AND METHODS: Muscle fatigue was created experimentally, and the effect of LLLT was examined with the indices of muscle hardness and the pennation angle, using ultrasound diagnostic equipment with real-time tissue elastography (RTE) functionality. RESULTS: As a result, a combined use of stretching and SSP therapy was effective on muscle hardness, while LLLT alone had no immediate lowering of muscle hardness. In addition, only the laser stretching group demonstrated a significant decrease in the pennation angle. CONCLUSIONS: This is because an improved local blood flow due to SSP therapy is considered to have relaxed muscle tonus, which boosted metabolism and removed algogenic substances. This became more effective through a combined use of stretching and low-power laser irradiation. Moreover, it was suggested that stimulation of the acupuncture points in the crus could have a further effect on muscle hardness and the pennation angle.

Evaluation of green light exposure on headache frequency and quality of life in migraine patients: A preliminary one-way cross-over clinical trial. BACKGROUND: Pharmacological management of migraine can be ineffective for some patients. We previously demonstrated that exposure to green light resulted in antinociception and reversal of thermal and mechanical hypersensitivity in rodent pain models. Given the safety of green light emitting diodes, we evaluated green light as a potential therapy in patients with episodic or chronic migraine. MATERIAL AND METHODS: We recruited (29 total) patients, of whom seven had episodic migraine and 22 had chronic migraine. We used a one-way cross-over design consisting of exposure for 1-2 hours daily to white light emitting diodes for 10 weeks, followed by a 2-week washout period followed by exposure for 1-2 hours daily to green light emitting diodes for 10 weeks. Patients were allowed to continue current therapies and to initiate new treatments as directed by their physicians. Outcomes consisted of patient-reported surveys. The primary outcome measure was the number of headache days per month. Secondary outcome measures included patient-reported changes in the intensity and frequency of the headaches over a two-week period and other quality of life measures including ability to fall and stay asleep, and ability to perform work. Changes in pain medications were obtained to assess potential reduction. RESULTS: When seven episodic migraine and 22 chronic migraine patients were analyzed as separate cohorts, white light emitting diodes produced no significant change in headache days in either episodic migraine or chronic migraine patients. Combining data from the episodic migraine and chronic migraine groups showed that white light emitting diodes produced a small, but statistically significant reduction in headache days from (daysâ€‰Â±â€‰SEM) 18.2â€‰Â±â€‰1.8 to 16.5â€‰Â±â€‰2.01 days. Green light emitting diodes resulted in a significant decrease in headache days from 7.9â€‰Â±â€‰1.6 to 2.4â€‰Â±â€‰1.1 and from 22.3â€‰Â±â€‰1.2 to 9.4â€‰Â±â€‰1.6 in episodic migraine and chronic migraine patients, respectively. While some improvement in secondary outcomes was observed with white light emitting diodes, more secondary outcomes with significantly greater magnitude including assessments of quality of life, Short-Form McGill Pain Questionnaire,

Headache Impact Test-6, and Five-level version of the EuroQol five-dimensional survey without reported side effects were observed with green light emitting diodes. Conclusions regarding pain medications reduction with green light emitting diode exposure were not possible. No side effects of light therapy were reported. None of the patients in the study reported initiation of new therapies. DISCUSSION: Green light emitting diodes significantly reduced the number of headache days in people with episodic migraine or chronic migraine. Additionally, green light emitting diodes significantly improved multiple secondary outcome measures including quality of life and intensity and duration of the headache attacks. As no adverse events were reported, green light emitting diodes may provide a treatment option for those patients who prefer non-pharmacological therapies or may be considered in complementing other treatment strategies. Limitations of this study are the small number of patients evaluated. The positive data obtained support implementation of larger clinical trials to determine possible effects of green light emitting diode therapy.This study is registered with clinicaltrials.gov under NCT03677206. Cross-Over Studies;Headache;Humans;Light;Migraine Disorders;Pain;Quality of Life;Treatment Outcome

Evaluation of photobiomodulation therapy to accelerate bone formation in the mid palatal suture after rapid palatal expansion: a randomized clinical trial. To evaluate the efficiency of photobiomodulation therapy (PBMT) in the midpalatal suture (MPS) and pain sensation in patients undergoing rapid palatal expansion (RPE). Thirty-four individuals with the diagnosis of skeletal maxillary hypoplasia were divided in two groups: laser (nâ€‰=â€‰18) and control (nâ€‰=â€‰16). Treatment plan consisted of the use of the Hyrax expander in all patients. Subjects in the laser group were irradiated with diode laser (980Â nm, 0.3Â W) in six spots bilaterally distributed along the MPS for 10Â s during the active phase of treatment and after overcorrection (passive phase of RPE). Control group received sham irradiations with the laser in standby mode to characterize the placebo effect. Digital occlusal radiographs were performed at different time-points for bone formation evaluation in both groups. The effects of laser irradiation on pain were assessed by the visual analog scale (Wong-Baker Faces Pain Scale). Bone formation between groups was not significantly different (pâ€‰=â€‰0.2273). At 3Â months, bone formation was not yet complete in both groups. Pain sensation was similar between groups (pâ€‰=â€‰0.3940). However, pain was significantly higher for the first 7Â days of treatment compared with the 14th day. PBMT did not accelerate bone regeneration in the MPS and pain sensation was similar. Bone Regeneration;Humans;Low-Level Light Therapy;Male;Osteogenesis;Palatal Expansion Technique;Palate;Sutures

Short-term clinical efficacy of the pulsed Nd: YAG laser therapy on chronic nonspecific low back pain: A randomized controlled study. BACKGROUND: Chronic non-specific low back pain (LBP) is gradually increasing among populations worldwide and affects their activities. Recently, the Nd:YAG laser has been presented in the rehabilitation field. OBJECTIVES: This study aims to explore the short-term effects of the Nd:YAG laser on chronic non-specific LBP individuals. METHODS: Thirty-five individuals with chronic nonspecific LBP were included in the study from December 2019 to March 2020. Randomly, they were categorized to Nd:YAG group (nâ€Š=â€Š18) and sham laser as a control (nâ€Š=â€Š17) thrice weekly for a 6-week intervention. Modified Oswestry disability index (MODI), pain disability index (PDI), visual analogue scale (VAS), and lumbar flexion range of motion (ROM) have been assessed pre and post-6 weeks of the intervention. RESULTS: Significant improvements were observed in the Nd:YAG group (MODI, Pâ€Š<â€Š.001; PDI, Pâ€Š=â€Š.007; VAS, Pâ€Š<â€Š.001; lumbar ROM, Pâ€Š=â€Š.002), whereas the sham group showed no significant changes (MODI, Pâ€Š=â€Š.451; PDI, Pâ€Š=â€Š.339; VAS, Pâ€Š=â€Š.107; lumbar ROM, Pâ€Š=â€Š.296) after 6-week intervention. Between-group comparisons showed significant differences in tending toward the Nd:YAG group (MODI, Pâ€Š<â€Š.001; PDI, Pâ€Š=â€Š.046; VAS, Pâ€Š<â€Š.001; lumbar ROM, Pâ€Š=â€Š.003). CONCLUSIONS: Regarding the present study outcomes, short-term pulsed Nd:YAG

laser (6 weeks) may reduce functional disabilities and pain intensity, and improve the lumbar flexion ROM in patients with chronic nonspecific LBP. Further well-designed randomized controlled studies with large sample sizes should be conducted regarding laser treatment. Adult;Chronic Disease;Disability Evaluation;Humans;Lasers, Solid-State;Low Back Pain;Low-Level Light Therapy;Middle Aged;Pain Measurement;Physical Functional Performance;Prospective Studies;Range of Motion, Articular;Single-Blind Method

Use of Intense Pulsed Light Versus Pulsed-Dye Laser in the Treatment of Truncal Telangiectasia. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Skin;Telangiectasis;Tomography, Optical Coherence;Torso;Treatment Outcome

Comparative Effectiveness of 755-nm Picosecond Laser, 755- and 532-nm Nanosecond Lasers for Treatment of CafÃ©-au-Lait Macules (CALMs): A Randomized, Split-Lesion Clinical Trial. BACKGROUND AND OBJECTIVES: Many types of lasers have been used to treat cafÃ©-au-lait macules (CALMs) since the introduction of the selective photothermolysis theory. However, the efficacy and safety of picosecond lasers, compared with those of nanosecond lasers, have not been researched. To compare the efficacy and safety of 755â€‰nm picosecond laser (PS-755â€‰nm), Q-switched (QS) Alexandrite 755â€‰nm nanosecond laser (QS-755â€‰nm), and QS Nd:YAG 532â€‰nm nanosecond laser (QS-532â€‰nm) for treating CALMs. STUDY DESIGN/MATERIALS AND METHODS: Forty-one patients received several treatments at 3-month intervals. Lesions were divided into two or three approximately equal parts, which were randomly treated with PS-755â€‰nm, QS-755â€‰nm, and QS-532â€‰nm. The safety and efficacy of three lasers were determined based on blinded visual assessments and self-reports of patients three months after the comparative trial. RESULTS: Visual assessment 3 months after the comparative trial revealed that there was no statistically significant difference among the sites treated by QS-755â€‰nm (2.84â€‰Â±â€‰1.11), QS-532â€‰nm (2.63â€‰Â±â€‰1.06), and PS-755â€‰nm (2.74â€‰Â±â€‰1.05) lasers. Five (26.32%) of 19 patients showed lesion recurrence. Adverse effects included acneiform miliaris, hypopigmentation, and hyperpigmentation, which were resolved within 12 months. Five (26.32%) of 19 patients who showed lesion recurrence 1-5 months after laser treatment had lightened or cleared at least 50% of the lesion. 46.67% of patients were satisfied or very satisfied with the outcome of the overall treatment. CONCLUSIONS: PS-755â€‰nm, QS-755â€‰nm, and QS-532â€‰nm laser treatments were equally effective in treating and improving CALMs. PS-755â€‰nm caused fewer adverse effects. Individuals can react differently to different types of lasers. Patch tests should be conducted before the treatment. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Cafe-au-Lait Spots;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Recurrence;Treatment Outcome

Low-Level Laser Therapy in Different Wavelengths on the Tibialis Anterior Muscle of Wistar Rats After Nerve Compression Injury. OBJECTIVE: Traumatic injuries are common and may promote disruption of neuromuscular communication, triggering phenomena that lead to nerve degeneration and affect muscle function. A laser accelerates tissue recovery; however, the parameters used are varied, making it difficult to compare studies. The purpose of this study was to evaluate the effect of low-level laser therapy, at 660- and 830-nm wavelengths, on the tibialis anterior muscle of Wistar rats after sciatic nerve compression. METHODS: Twenty animals were separated into 4 groups: control, sciatic nerve injury, lesionâ€¯+â€¯660-nm laser, and lesionâ€¯+â€¯830-nm laser. In the lesion groups, the right sciatic nerve was surgically exposed and compressed with hemostatic forceps for 30 seconds. After the third postoperative day, the groups with laser therapy were submitted to treatment for 2 weeks totaling 10 applications, performed directly on the surgical scar of the nerve injury. Grip strength was analyzed before and after the nerve injury and during the treatment period. The tibialis anterior muscle was processed for light microscopy, area measurement, smaller diameter,

number of fibers, nuclei, and connective tissue. RESULTS: The animals submitted to the injury experienced muscular atrophy and morphological changes in the number of muscle fibers and nuclei. In the connective tissue morphometry, there was a decrease in the treated groups compared with the untreated groups. CONCLUSION: The laser treatment at different wavelengths showed no improvement in the tibialis anterior muscle of Wistar rats within the morphological and functional aspects evaluated. Animals;Connective Tissue;Low-Level Light Therapy;Muscle, Skeletal;Peripheral Nerve Injuries;Rats;Rats, Wistar;Sciatic Nerve;Sciatic Neuropathy

The shifting preferences of patients and physicians in nonsurgical hair loss treatment. BACKGROUND: There are multiple etiologies for hair thinning and loss, including genetic, hormonal, immune, scaring, and infectious. Hair loss treatment involves both surgical intervention and nonsurgical therapies such as pharmaceuticals, haircare products, vitamins, and low-level laser therapy (LLLT). While pharmaceuticals have been extensively researched, the efficacy of other therapies remains inconclusive. With so many available treatments, consumers often research their options using search engines such as Google and/or seek help from hair restoration physicians. AIMS: To identify and analyze changing trends in international consumer and physician interest in nonsurgical hair loss therapies. METHODS: Worldwide trends in Google searches of hair loss products (2004-2020) were compared with product prescription frequency surveys from members of the International Society of Hair Restoration Surgery (2004-2019, ~29% response rate). RESULTS: Minoxidil and finasteride were the most prescribed hair loss treatments, while "minoxidil" was the most "Googled" term. Generic products were searched more often than their brand counterparts. Nutritionals and haircare prescriptions increased over time. LLLT was also increasingly prescribed, with Internet searches increasing following government regulation announcements. The COVID-19 pandemic initially negatively affected hair loss treatment searches, which have since returned to, and surpassed, pre-pandemic levels. CONCLUSION: Regulations and social media have influence on consumer interest in hair loss products. A weak economy and coronavirus fears may persuade consumers to turn to cheaper hair loss treatment alternatives. Hair restoration specialists need to keep abreast of online trends to communicate effectively with their patients. Patients should be cognizant of the safety and efficacy of hair restoration treatments. Alopecia;Attitude of Health Personnel;Humans;Internet;Patient Acceptance of Health Care;Patient Preference;Physicians

Do Antimicrobial Photodynamic Therapy and Low-Level Laser Therapy Minimize Postoperative Pain and Edema After Molar Extraction? PURPOSE: This study was designed to examine the efficacy of antimicrobial photodynamic therapy (aPDT) and low-level laser therapy (LLLT) in reducing postoperative pain and edema after molar extractions. METHODS: The investigators designed a single-blind randomized controlled study and enrolled subjects requiring extraction of at least one of the first or secondÂ molars. They were randomized to one of the following four groups: control group, aPDT group, LLLT group, and aPDT and LLLT group. Patients were blinded to the group assigned. The outcome variables were postoperative pain and edema. Pain intensity was measured on a visual analog scale (recorded every day for 7Â days after tooth extraction). Facial edema was assessed by measuring the perimeter between the tragus, base of the jaw, and labial commissure, which was recorded once before surgery and then on the third and seventh days after surgery. Other variables were age, sex, ethnicity, decayed/missing/filled teeth, and tooth types. Appropriate univariate and bivariate statistics were computed and statistical significance was set at a value of PÂ <Â .05. RESULTS: The sample was composed of 40 patients with a mean age of 41.25Â Â±Â 13.97 years and 25 (62.5%) of them were women. There were 10 subjects in each treatment group. The mean of postoperative pain within the groups was associated with a significant continuous decrease over time (PÂ <Â .05). Postoperative pain was lowest in the aPDTÂ +Â LLLT group in the 1st, 2nd, 3rd, 5th, 6th, and 7th day after tooth extraction (PÂ <Â .05). There were no significant differences in

edema among the groups (PÂ >Â .05). CONCLUSION: The combined use of aPDT and LLLT was effective in reducing postoperative pain. These procedures can be applied in everyday surgical practice. Adult;Double-Blind Method;Edema;Female;Humans;Low-Level Light Therapy;Middle Aged;Molar;Molar, Third;Pain, Postoperative;Photochemotherapy;Single-Blind Method;Tooth Extraction;Tooth, Impacted

Repetitive transcranial photobiomodulation but not long-term omega-3 intake reduces epileptiform discharges in rats with stroke-induced epilepsy. Epilepsy is a yet under-recognized consequence after a stroke and nearly 30% of cases are pharmacoresistant. There is an unmet need for therapeutic interventions during epileptogenesis for better long-term disease outcomes. Transcranial photobiomodulation (PBM) and omega-3 (Î©-3) dietary supplementation are two approaches that have been shown promising neuroprotective effects after brain injuries. Here, we studied the PBM treatment or Î©-3 diet during epileptogenesis in long-term recurrent spontaneous abnormal electrical discharges after stroke. Wistar rats received repetitive 780â€‰nm-laser in the scalp or oral diet with Î©-3 for 2-months after photothrombotic stroke. EEG recordings were performed 60â€‰days after treatment end. PBM but not Î©-3 reduced both electrographic seizure duration and spikes number in the ipsilateral and contralateral cortices and ventral posteromedial thalamic nucleus. Conclusively, PBM reduced epileptiform discharges in stroke-induced epilepsy. Our results suggest the PBM as a therapeutic approach for stroke-induced epileptogenesis to minimize long-term disease outcomes. Animals;Brain Injuries;Epilepsy;Rats;Rats, Wistar;Stroke

Photobiomodulation and estrogen stabilize mitochondrial membrane potential in angiotensin-II challenged porcine aortic smooth muscle cells. Rupture of Abdominal aortic aneurysm (AAA) is among the 15 leading causes of death after age 65. Using high frequency ultrasound, we showed that photobiomodulation (PBM) prevents formation and progression of AAA in the angiotensin-II (Ang-II)-infused, apolipoprotein-e-deficient mouse model. In the current study we report that while challenge of porcine aortic Smooth Muscle Cells (SMCs) with Ang-II (1 Î¼M) resulted in a marked decay in mitochondrial membrane potential (MitMP) vs non-challenged cells, treatment with PBM (continuous diode laser, 780â€‰nm, 6.7 mW/cm(2) , 5 minutes, 2 J/cm(2)) or pre-incubation with estrogen (50â€‰nM, 1 hour) significantly attenuated this deterioration in MitMP. We also report that PBM and estrogen markedly affected porcine aortic SMC contraction and modified mitochondrial dispersion reflecting important influence on SMC function. These studies provide strong evidence of the important underlying role of mitochondria in the preventive effect of PBM on formation and progression of AAA and its reduced incidence and delayed onset in women. Apolipoproteins E;Estrogens;Angiotensin II Angiotensin II;Animals;Aortic Aneurysm, Abdominal;Apolipoproteins E;Disease Models, Animal;Estrogens;Membrane Potential, Mitochondrial;Mice;Mice, Inbred C57BL;Mice, Knockout;Myocytes, Smooth Muscle;Swine

Treatment of keratosis pilaris and its variants: a systematic review. INTRODUCTION: Keratosis pilaris (KP) is a common, benign skin condition of follicular hyperkeratosis. Although KP is asymptomatic, the cosmetic appearance of KP can lead to psychosocial distress among patients. New emerging treatments are increasingly being utilized. Yet, there is little to no summative data on the treatments of KP and its subtypes. OBJECTIVE: To summarize existing literature on treatments for KP and its subtypes. METHODS: A comprehensive search was performed using Pubmed/MEDLINE, Embase and Web of Science databases. The search identified 1150 non-duplicated articles, and 47 articles were included in the review. The primary outcomes measured were KP treatment type and the degree of improvement following therapy. FINDINGS: Our findings demonstrate that the most supported form of treatment for KP is laser therapy, particularly the QS:Nd YAG laser. Topical treatments - including Mineral Oil-Hydrophil Petrolat, tacrolimus, azelaic acid, and salicylic acid - are also effective at least for improving the appearance of KP. CONCLUSION: While the measured

treatment outcomes varied among studies, laser therapy appears to be the most effective form of treatment. Use of topicals also improved KP lesions. Abnormalities, Multiple;Darier Disease;Eyebrows;Humans;Low-Level Light Therapy

Photobiomodulation Therapy in the Management of Burning Mouth Syndrome: Morphological Variations in the Capillary Bed. Burning mouth syndrome (BMS) is an idiopathic condition that manifests itself primarily with the onset of a burning sensation. The aim of this research was to perform photobiomodulation therapy (PBM) using a diode laser on the oral mucosa of BMS patients, followed by an objective evaluation of the morphological changes in the vascular bed underlying the mucosa using polarized light videocapillaroscopy. A group of 40 patients were included in the study. The patients were randomly divided into two groups (using simple randomization) as follows: 20 patients were assigned to the laser group and 20 patients were assigned to the placebo group. Each patient of the laser group received eight irradiations (with 4 Watt of power, wavelength 800 nm, energy 1200 Joules, irradiation time of 300 s, energy density 50 J/cm(2), 60 mW continuous wave laser, and irradiance 180 mW/cm(2)), twice a week, blinded to the type of irradiation administered, for four consecutive weeks. The patients in the placebo group underwent the same sessions as the other patients, the only difference was the non-emission of the laser. An initial check of the vascular bed was performed with a polarized light videocapillaroscope. This was followed by treatment with a therapeutic diode laser and a subsequent check with a videocapillaroscope. We observed that in the group of patients who underwent laser therapy, there was a lasting improvement in symptoms. The capillary oral bed of patients in the placebo group did not show any statistically significant difference ($p > 0.05$). In the laser group we observed the following: in the buccal mucosa the diameter of the capillary had a reduction of 3 Î¼m; in the upper lip mucosa, there was a reduction of 3 Î¼m; in the lower lip mucosa, there was a reduction of 3 Î¼m; and in the dorsal lingual surface, there was a reduction of 2 Î¼m. An increase in capillary length was also obtained in all irradiated regions in the laser group patients ($p < 0.05$). PBM induces microcirculatory changes that are still present over a long period of time, such as an improvement in the clinical picture. The improvement in the symptoms has been correlated to the reduction of the capillary diameter. The placebo effect only led to a temporary improvement in symptoms that were unrelated to changes in the microcirculatory pattern.

Micro needling: A novel therapeutic approach for androgenetic alopecia, A Review of Literature. Androgenetic alopecia (AGA) is an androgen-dependent hereditary trait resulting in hair miniaturization. It is the most common type of alopecia in men and women. During the last years, multiple treatment modalities have been studied, but only topical minoxidil and finasteride have been approved by the US Food and Drug Administration. Microneedling (MN) is a minimally invasive technique that induces collagen formation, as well as growth factors production and neovascularization. Even though not many studies of MN in alopecia have been performed, it remains a favorable treatment modality; however, no standardized protocol for MN in hair loss has been proposed yet. Current evidence is not sufficient to allow a direct comparison with other therapies, but it shows promises to increase hair density, thickness, and quality of hair, especially when combined with other treatments or when used as a drug delivery system. This article aims to summarize the available literature regarding the use of MN alone or associated with other therapies for the treatment of androgenetic alopecia. Finasteride;Minoxidil Alopecia;Finasteride;Hair;Humans;Low-Level Light Therapy;Minoxidil

History of Laser Acupuncture: A Narrative Review of Scientific Literature. Background: Laser acupuncture is a relatively young modality in the field of acupuncture, used successfully for the treatment of various conditions since the early 1970s. It has, despite its âˆ¼50 years of existence, already a comprehensive history behind it. This review deals with facts of this history and summarizes

the most-important milestones. Materials and Methods: Scientific articles from the PubMed, Google Scholar, and China National Knowledge Infrastructure databases served as research documents. In addition, the research on laser acupuncture history included material published in scientific books. Results: A total of 38 listed articles were identified, 7 of which were considered relevant. In addition to a generally recognized definition of laser acupuncture, the beginnings of laser acupuncture and the first clinical applications worldwide, this review also shows the most-important milestones in the development of this discipline. The latter are, of course, the development of laser acupuncture systems, the first clinical studies, the implementation of multichannel laser acupuncture devices with laser-needle technology, and, ultimately, the combination of laser acupuncture with methods from research on photobiomodulation. Conclusions: Although considerable progress has been made in evaluating this innovative method of laser acupuncture, further research is needed in the coming years and decades.

Physical therapy for tendinopathy: An umbrella review of systematic reviews and meta-analyses. OBJECTIVE: To summarize evidence in the last decade regarding the efficacy of physical therapy interventions to treat tendinopathy, as a single disease entity, as determined in systematic reviews (SRs) and/or meta-analyses (MAs). METHODS: Electronic search of PubMed, PEDro, and Scopus database was performed from year 2010 to January 2020. The methodological quality of the identified studies was assessed using the AMSTAR 2 tool. Studies scoring 9 points or higher were further analyzed using GRADE principles. RESULTS: 40 SRs and/or MAs were included in qualitative synthesis, whereas only 5Â MAs were included in quantitative synthesis. Low-level laser therapy (LLLT) intervention showed a pooled improvement in pain reduction of 1.53Â cm; 95% CI, [1.14, 1.91] (I(2)Â =Â 1.9%, pÂ =Â 0.361) on visual analogue scale, and grip strength of 9.59Â kg; 95% CI, [5.90, 13.27]. CONCLUSIONS: Moderate-quality evidence may support these following interventions: LLLT revealed a statistically and potentially clinically significant improvement in pain and function on the short-term. Extracorporeal shockwave therapy showed a statistically significant enhancement in pain and function at all follow-up durations; however, its clinical significance was undetermined. Eccentric exercise was supported by qualitative evidence only. Caution is advised when interpreting results due to possible pathological differences in tendinopathy at each region. Exercise;Exercise Therapy;Extracorporeal Shockwave Therapy;Humans;Iontophoresis;Low-Level Light Therapy;Meta-Analysis as Topic;Musculoskeletal Manipulations;Orthotic Devices;Pain;Pain Measurement;Physical Therapy Modalities;Systematic Reviews as Topic;Tendinopathy;Transcutaneous Electric Nerve Stimulation;Ultrasonography

Effect of photobiomodulation therapy on radiodermatitis in a mouse model: an experimental animal study. This study aimed to evaluate the effect of photobiomodulation (PBM) for prevention of radiodermatitis in an irradiated mouse model and compare the efficacy of PBM using 633- or 830-nm wavelengths. Irradiated mice were randomly distributed into three groups: A (633Â nm), B (830Â nm), and C (without PBM). On post-irradiation days 7 and 21, we compared acute damage and recovery in treated skin samples to non-irradiated skin using H&E, Masson's trichrome, anti-CD45 and PCNA immunohistochemistry, and a TUNEL assay. Grade 3 radiodermatitis was evident only in group C. Compared with that in group C, the skin in groups A and B had significantly less epidermal hyperplasia, inflammatory cell infiltration, and thinner dermis on day 7 and less inflammatory cell infiltration, fewer apoptotic cells, and thinner dermis on day 21. However, there was no significant difference between groups A and B. This study indicates PBM could prevent severe radiodermatitis by reducing epidermal and dermal damage, inflammation, and apoptosis. There was no difference in PBM efficacy between the 633- and 830-nm wavelengths. Animals;Apoptosis;Disease Models, Animal;Low-Level Light Therapy;Mice;Radiodermatitis;Skin

Laser and anti-vascular endothelial growth factor treatment for drusenoid pigment epithelial detachment in age-related macular degeneration. This study aims to report the 12Â months results of efficacy and safety of laser photocoagulation and anti-vascular endothelial growth factor (VEGF) injections for drusenoid pigment epithelial detachment (dPED). In this prospective study, patients with treatment naÃ¨ve bilateral intermediate age-related macular degeneration, featuring dPED, with visual acuityâ€‰â‰¤â€‰83 letters were enrolled. The study group received PASCAL laser (532Â nm) along the periphery of the dPED, and the fellow eye served as a control group. To prevent complications of choroidal neovascularization, intravitreal anti-VEGF injections to laser treated eye were performed on a 3-month interval up to 1 year. Primary outcomes-drusen area, PED height-and secondary outcomes-best-corrected visual acuity (BCVA), contrast sensitivity, degree of metamorphopsia, NEI-VFQ 25, and fundus autofluorescence-were analyzed. Among 21 patients, a total of 20 patients satisfied the 12Â months follow-up. Drusen area and PED height decreased significantly in the laser group, while no significant change appeared in the control group (74.1% vs.â€‰-Â 3.5%, Pâ€‰<â€‰0.001; 76.6% vs. 0.1%, Pâ€‰<â€‰0.001). Mean BCVA improved 4.6 letters in the laser group (vs. 1.1 letters in the control group, Pâ€‰=â€‰0.019). As for safety, one study eye developed retinal pigment epithelial tear, and one control eye developed retinal angiomatous proliferation. Low energy laser photocoagulation and anti-VEGF injection in eyes with dPED showed some improvement in visual acuity. dPED regressed without developing center involving GA in the study eye, but a longer term follow-up is necessary to reveal the efficacy and safety of these treatments. The 2-year results of this study will be followed to reveal long term efficacy and safety of the treatment for dPED. Angiogenesis Inhibitors;Vascular Endothelial Growth Factor A;Bevacizumab Aged;Aged, 80 and over;Angiogenesis Inhibitors;Bevacizumab;Choroidal Neovascularization;Female;Follow-Up Studies;Geographic Atrophy;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Pilot Projects;Prospective Studies;Retinal Detachment;Retinal Perforations;Treatment Outcome;Vascular Endothelial Growth Factor A;Visual Acuity

Efficacy of light therapy for a college student sample with non-seasonal subthreshold depression: An RCT study. BACKGROUND: Light therapy has been successfully used to treat seasonal and non-seasonal depression, but there is limited evidence for its efficacy in subthreshold depression. This study examines the efficacy of light therapy for symptoms of depression and anxiety in non-seasonal subthreshold depression. METHODS: College students with non-seasonal subthreshold depression were recruited. The participants were randomly allocated to one of the three conditions: high- (LT-5000 lux) and low-intensity (LT-500 lux) light therapy conditions and a waiting-list control condition (WLC). The primary outcome was Hamilton Depression Rating Scale (HAMD), and secondary outcomes were Beck Depression Inventory-II (BDI-II) and state anxiety inventory (SAI), which were assessed at baseline (Week 0), during the trial (Week 4), and after completion of the light therapy (Week 8). RESULTS: A total of 142 participants completed the trial. The LT-5000 (effect size [d]Â =Â 1.56, 95% CI: 1.15 to 1.98) and LT-500 conditions (dÂ =Â 0.84, 95% CI: 0.43 to 1.26) were significantly superior to the WLC condition. For the LT-5000, LT-500, and WLC conditions by the end of the 8-week trial, a response on the HAMD was achieved by 70.0%, 42.0% and 19.0% of the participants, and remission was achieved by 76.0%, 54.0%, and 19.0%, respectively. LIMITATIONS: The subjects were not followed up regularly after completion of the trial. CONCLUSION: Light therapy, both at high- and low-intensity, was efficacious in the treatment of college students with non-seasonal subthreshold depression. High-intensity light therapy was superior to low-intensity light therapy by the end of an 8-week trial.
Anxiety;Depression;Humans;Phototherapy;Students;Treatment Outcome

Effectiveness of photobiomodulation therapy for nipple pain or nipple trauma in lactating women: a systematic review protocol. OBJECTIVE: The objective of this protocol is to evaluate the effectiveness of photobiomodulation therapy for the treatment of nipple pain or nipple trauma in women during the breastfeeding period. INTRODUCTION: One approach that has been reported on the management of nipple pain or nipple trauma in lactating women is the use photobiomodulation therapy to heal the injury or to decrease pain intensity. However, studies have achieved different results, due to variations in the treatment protocol, such as the source of light used, the application mode, the irradiation, or the light dose parameters, leading to varying outcomes. INCLUSION CRITERIA: This review will consider studies that evaluate photobiomodulation therapy for the treatment of nipple pain or nipple trauma in lactating women in the postpartum period that compare the intervention to standard care, placebo, or other type of treatment. The following outcomes will be considered: intensity of nipple pain, healing of nipple trauma, exclusive breastfeeding rate, quality of life, and satisfaction of the women with treatment. There will be no publication time limit, and studies published in any language will be considered for inclusion. METHODS: This review will be conducted in accordance with JBI methodology for systematic reviews of effectiveness. The search strategy will search both published and unpublished studies, and the process of study selection, critical appraisal, data extraction, and data synthesis will be performed in accordance to the JBI approach. SYSTEMATIC REVIEW REGISTRATION NUMBER: PROSPERO CRD42019147401. Female;Humans;Lactation;Low-Level Light Therapy;Nipples;Quality of Life;Review Literature as Topic;Systematic Reviews as Topic

A Prospective, Split-Face, Randomized Study Comparing a 755-nm Picosecond Laser With and Without Diffractive Lens Array in the Treatment of Melasma in Asians. BACKGROUND AND OBJECTIVES: Treatment of melasma with lasers remains a challenge due to its limited clinical efficacy in addition to high rates of recurrence and side effects. Recently, picosecond lasers have shown favorable results in treatment of benign pigmented lesions. To compare the efficacy and safety of using a 755-nm picosecond laser for the treatment of melasma in a split-face manner, having one side treated with a fractionated beam (diffractive lens array [DLA] coupling) and with a full-beam (flat optics) on the other side. STUDY DESIGN/MATERIALS AND METHODS: Eighteen subjects presenting with mixed-type melasma were enrolled. Each patient was randomly treated with a 755-nm picosecond laser coupled with DLA on one side of the face and without DLA (flat optics) on the other side. The laser was delivered through an 8-mm spot size with an average fluence of 0.4â€‰J/cm(2) at 2.5â€‰Hz for a total of two passes without pulse overlapping. All subjects received five monthly treatments. Subjective (clinical evaluation) and objective (color readings) assessments on the degree of pigment clearance and adverse effects were obtained at 1-, 3-, and 6-month after the final treatment. RESULTS: At 6 months after the last treatment, physician-rating scores were 1.50â€‰Â±â€‰0.76 and 1.50â€‰Â±â€‰0.65 of the DLA and flat-optics sides, respectively. Pigment clearance significantly improved from 1 to 6 months after the treatment on each side (Pâ€‰=â€‰0.019 on DLA and Pâ€‰=â€‰0.023 on flat-optics sides). No statistically significant differences in physician-rating scores between the two treatment techniques were observed at all follow-up visits. Objective assessments of melasma clearance corresponded to the clinical evaluation. However, the full-beam (flat optics) provided lower incidence of pos-tinflammatory hyperpigmentation than the fractioned one. CONCLUSIONS: A 755-nm picosecond laser is safe and effective for the treatment of melasma in dark-skinned individuals. The use of DLA does not provide additional benefit over the flat optics in clearing pigmentation. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Asian People;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Prospective Studies;Treatment Outcome

A 57-Year-Old African American Man with Severe COVID-19 Pneumonia Who Responded to Supportive Photobiomodulation Therapy (PBMT): First Use of PBMT in COVID-19. BACKGROUND Coronavirus disease 2019 (COVID-19) is associated with lung inflammation and cytokine storm. Photobiomodulation therapy (PBMT) is a safe, non-invasive therapy with significant anti-inflammatory effects. Adjunct PBMT has been employed in treating patients with lung conditions. Human studies and experimental models of respiratory disease suggest PBMT reduces inflammation and promotes lung healing. This is the first time supportive PBMT was used in a severe case of COVID-19 pneumonia. CASE REPORT A 57-year-old African American man with severe COVID-19 received 4 once-daily PBMT sessions by a laser scanner with pulsed 808 nm and super-pulsed 905 nm modes for 28 min. The patient was evaluated before and after treatment via radiological assessment of lung edema (RALE) by CXR, pulmonary severity indices, blood tests, oxygen requirements, and patient questionnaires. Oxygen saturation (SpOâ,,) increased from 93-94% to 97-100%, while the oxygen requirement decreased from 2-4 L/min to 1 L/min. The RALE score improved from 8 to 5. The Pneumonia Severity Index improved from Class V (142) to Class II (67). Additional pulmonary indices (Brescia-COVID and SMART-COP) both decreased from 4 to 0. CRP normalized from 15.1 to 1.23. The patient reported substantial improvement in the Community-Acquired Pneumonia assessment tool. CONCLUSIONS This report has presented supportive PBMT in a patient with severe COVID-19 pneumonia. Respiratory indices, radiological findings, oxygen requirements, and patient outcomes improved over several days and without need for a ventilator. Future controlled clinical trials are required to evaluate the effects of PBMT on clinical outcomes in patients with COVID-19 pneumonia. Black or African American;Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Low-Level Light Therapy;Male;Middle Aged;Pandemics;Pneumonia, Viral;SARS-CoV-2;Tomography, X-Ray Computed;United States

Does Previous Application of Photobiomodulation Using Light-Emitting Diodes at Different Energy Doses Modify the Peak Running Velocity and Physiological Parameters? A Randomized, Crossover, Double-Blind, and Placebo-Controlled Study. Objective: This study aimed to verify the acute effects of photobiomodulation (PBM) using different doses of LED on peak running velocity (V(peak)) and physiological parameters. Materials and methods: The study had a randomized, crossover, double-blind, and placebo-controlled format, in which 15 physically active males were submitted, besides the control (CON), to four conditions performed 5â€‰min before the maximal incremental treadmill tests for the determination of V(peak): placebo (PLA) and three conditions of PBM application at different doses: PBM applied with 30â€‰J per area (PBM(1)), PBM applied with 120â€‰J per area (PBM(2)), and PBM applied with 180â€‰J per area (PBM(3)). The LED was applied using an equipment with 56 diodes of red light (660â€‰nm; 50â€‰mW/cm(2) and 1.5â€‰J/cm(2) each diode) and 48 diodes of infrared light (850â€‰nm; 150â€‰mW/cm(2) and 4.5â€‰J/cm(2) each diode). The PBM was applied in two regions of the quadriceps muscle, two regions of the femoral biceps muscle, and one region of the gastrocnemius muscle in both legs. Results: There was no difference among the outcomes from PBM irradiations and PLA condition for the variables, V(peak) (CONâ€‰=â€‰13.4â€‰Â±â€‰1.6; PLAâ€‰=â€‰13.4â€‰Â±â€‰1.6; PBM(1)â€‰=â€‰13.5â€‰Â±â€‰1.7; PBM(2)â€‰=â€‰13.4â€‰Â±â€‰1.6; PBM(3)â€‰=â€‰13.4â€‰Â±â€‰1.7â€‰km/h), similar to other variables associated with aerobic running performance analyzed during the maximal incremental treadmill tests for V(peak) determination: lactate peak, heart rate, and rating of perceived exertion. Conclusions: We concluded that the application of different doses of PBM using LEDs did not modify V(peak) and physiological and perceptual parameters. Cross-Over Studies;Double-Blind Method;Humans;Male;Muscle, Skeletal;Running

Does photobiomodulation therapy combined to static magnetic field (PBMT-sMF) promote ergogenic effects even when the exercised muscle group is not irradiated? A randomized, triple-blind, placebo-controlled trial. BACKGROUND: The direct application of photobiomodulation therapy (PBMT) using low-level laser therapy (LLLT) and light emitting diodes (LEDs) combined with a static magnetic field (sMF) (PBMT-sMF) to target tissues is shown to improve muscle performance and recovery. Studies have reported possible PBMT effects when a local distant to the target tissue is irradiated. Notably, the extent of these effects on musculoskeletal performance and the optimal site of irradiation remain unclear, although this information is clinically important since these aspects could directly affect the magnitude of the effect. Therefore, we investigated the effects of local and non-local PBMT-sMF irradiations on musculoskeletal performance and post-exercise recovery before an eccentric exercise protocol. METHODS: This randomized, triple-blind (participants, therapists and assessors), placebo-controlled trial included 30 healthy male volunteers randomly assigned to the placebo, local, and non-local groups. Active or placebo PBMT-sMF was applied to 6 sites of the quadriceps muscle of both legs. An eccentric exercise protocol was used to induce fatigue. The primary outcome was peak torque assessed by maximal voluntary contraction (MVC). The secondary outcomes were delayed onset muscle soreness (DOMS) measured by visual analogue scale (VAS), muscle injury assessed by serum creatine kinase activity (CK), and blood lactate levels. Evaluations were performed before the eccentric exercise protocol (baseline), as well as immediately after and 1, 24, 48, and 72â€‰h upon protocol completion. RESULTS: Ten volunteers were randomized per group and analysed for all outcomes. Compared to the placebo and non-local groups, irradiation with PBMT-SMF led to statistically significant improvement (pâ€‰<â€‰0.05) with regard to all variables in the local group. The outcomes observed in the non-local group were similar to those in the placebo group with regard to all variables.The volunteers did not report any adverse effects. CONCLUSION: Our results support the current evidence that local irradiation of all exercised muscles promotes ergogenic effects. PBMT-sMF improved performance and reduced muscle fatigue only when applied locally to muscles involved in physical activity. TRIAL REGISTRATION: NCT03695458. Registered October 04th 2018.

The importance of porphyrins in blue light suppression of Streptococcus agalactiae. It is well documented that blue light absorption by bacterial chromophores triggers downstream production of reactive oxygen species (ROS), which in turn results in bacterial cell death. To elucidate the importance of chromophores in the bactericidal effect of blue light, and to determine whether blue light absorption per se or the presence of porphyrins known to engender ROS is crucial in blue light treatment, we studied the effect of 450Â nm pulsed light on Streptococcus agalactiae, also known as Group B Streptococcus (GBS) strain COH1. GBS does not synthesize porphyrins but has a blue light-absorbing chromophore, granadaene. We irradiated planktonic cultures of GBS with or without exogenous chromophore supplementation using either protoporphyrin IX (PPIX), coproporphyrin III (CPIII), Nicotinamide adenine dinucleotide (NAD), reduced nicotinamide adenine dinucleotide (NADH), Flavin adenine dinucleotide (FAD), or Flavin mononucleotide (FMN). Quantification of surviving bacterial colonies, presented as percent survival and CFU/mL (log(10)), showed that (1) 450Â nm blue light does not suppress the growth of GBS, even though its endogenous chromophore, granadaene, absorbs light in the 450Â nm spectrum. (2) The addition of either of the two exogenous porphyrins, PPIX or CPIII, significantly suppressed GBS, indicating the importance of porphyrins in the antimicrobial action of blue light. (3) Adding exogenous FMN or FAD, two known absorbers of 450Â nm light, minimally potentiated the bactericidal effect of blue light, again confirming that mere absorption of blue light by chromophores does not necessarily result in bacterial suppression. (4) Irradiation of GBS with or without NAD+ or NADH supplementation-two weak absorbers of 450Â nm light-minimally suppressed GBS, indicating that a blue light-absorbing chromophore is essential for

the bactericidal action of blue light. (5) Collectively, these findings show that in addition to the presence of a blue light-absorbing chromophore in bacteria, a chromophore with the right metabolic machinery and biochemical structure, capable of producing ROS, is necessary for 450Â nm blue light to suppress GBS. Porphyrins;NAD;Flavin-Adenine Dinucleotide Drug Interactions;Flavin-Adenine Dinucleotide;Light;Microbial Viability;NAD;Porphyrins;Streptococcus agalactiae

Acute application of photobiomodulation does not bring important gains for the muscular performance and functionality of diabetic individuals. Photobiomodulation therapy (PBMT) has been used to improve the physical performance of individuals with advanced age; however, there are no studies in the literature that support the application of light-emitting diode (LED) therapy for the muscular performance of individuals with diabetes mellitus who show a decline in functionality. The aim of the study was to analyze the acute effects of PBMT on strength and functional performance in type 2 diabetic individuals. Sixty-three volunteers were recruited and randomized into five groups: control (C), sham (S), red LED (R), infrared LED (IR), and red LED + infrared LED (R + IR). On the first day, the volunteers were evaluated using the time up and go (TUG), the 6-min walk test (6MWT), and isokinetic dynamometer of the ankle. In the following 3Â days, groups R, IR, R + IR, and S returned for application of PBMT bilaterally, with 180Â J of energy on each leg. On the fifth day, a reassessment was performed. There was no statistical difference between groups for the variables of the isokinetic dynamometer, TUG, and 6MWT. Analysis of the size of the clinical effect for the isokinetic variables showed that there was no pattern among the effects observed. There is a moderate effect in favor of R, IR, and R + IR in relation to C for the TUG and a moderate effect of R + IR in relation to C for the 6MWT. The PBMT applied for a short period does not bring important gains for the muscular performance and functionality of diabetic individuals. Diabetes Mellitus;Female;Humans;Low-Level Light Therapy;Male;Muscles;Walk Test

Effects of photobiomodulation on bone defects grafted with bone substitutes: A systematic review of in vivo animal studies. A present, photobiomodulation therapy (PBMT) effectiveness in enhancing bone regeneration in bone defects grafted with or without biomaterials is unclear. This systematic review (PROSPERO, ref. CRD 42019148959) aimed to critically appraise animal in vivo published data and present the efficacy of PBMT and its potential synergistic effects on grafted bone defects. MEDLINE, CCCT, Scopus, Science Direct, Google Scholar, EMBASE, EBSCO were searched, utilizing the following keywords: bone repair; low-level laser therapy; LLLT; light emitting diode; LEDs; photobiomodulation therapy; in vivo animal studies, bone substitutes, to identify studies between 1994 and 2019. After applying the eligibility criteria, 38 papers included where the results reported according to "PRISMA." The results revealed insufficient and incomplete PBM parameters, however, the outcomes with or without biomaterials have positive effects on bone healing. In conclusion, in vivo animal studies with a standardized protocol to elucidate the effects of PBMT on biomaterials are required initially prior to clinical studies. Bone Substitutes Animals;Bone Regeneration;Bone Substitutes;Low-Level Light Therapy

Light-based technologies for management of COVID-19 pandemic crisis. The global dissemination of the novel coronavirus disease (COVID-19) has accelerated the need for the implementation of effective antimicrobial strategies to target the causative agent SARS-CoV-2. Light-based technologies have a demonstrable broad range of activity over standard chemotherapeutic antimicrobials and conventional disinfectants, negligible emergence of resistance, and the capability to modulate the host immune response. This perspective article identifies the benefits, challenges, and pitfalls of repurposing light-based strategies to combat the emergence of COVID-19 pandemic. Photosensitizing Agents Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Infrared Rays;Lasers, Solid-State;Light;Low-Level Light Therapy;Pandemics;Photosensitizing Agents;Pneumonia, Viral;SARS-CoV-2;Ultraviolet Rays

Low-level laser therapy for the treatment of early stage cutaneous leishmaniasis: A pilot study. Low-Level Laser Therapy (LLLT) has been investigated for the treatment of various dermatological disorders. Here, we investigate the efficacy of LLLT for the treatment of cutaneous leishmaniasis (CL). This study comprised of 53 patients (total 123 lesions) with a confirmed diagnosis of CL via positive smear of LD-bodies. The CL lesions were classified in Grade I (ie, papule of size â‰¤1 cm) to Grade V (ie, vesicle formation, ulceration, and superadded infection of size >4 cm). All the patients were divided into group 1 with low grade (ie, Grade I and II) CL lesions and group 2 with high-grade disease (ie, Grade III-V). Red laser light (wavelength = 635â€‰nm) was used for the lesion irradiation, with a light dose of 75â€‰J/cm(2) and at a low power of 300â€‰mW. The treatment was divided into four sessions, one session per week. Disease assessment at 10 months follow-up revealed complete response in 91% and partial response in 9% patients of group 1, while no response was observed in patients of group 2. LLLT offers a promising treatment modality for patients presenting with early-stage (ie, Grade I and II) CL lesions.

Penetration depth study of 830 nm low-intensity laser therapy on living dog tissue. BACKGROUND AND AIM: Recent studies have shown that low-intensity laser therapy (LILT) enhances chronic wound healing, reduces pain, reduces inflammation, and improves post-operative rehabilitation. However, clinical outcomes in the veterinary use of LILT vary between different experimental studies. This is explained by improper laser parameter settings and limits of its penetration depth. This study aimed to investigate the penetration depth of 830 nm LILT on living dog tissue in different operating modes. This entailed continuous wave (CW) versus pulse wave (PW) and with contact versus non-contact techniques of the laser probe at different tissue-laser probe distances. The results can be applied for use in clinical practice. MATERIALS AND METHODS: Twenty-four dogs that had undergone abdominal surgery were included in this study. The laser parameters were set at 200 mW, fluence of 4 J/cm(2) and the laser power output denoted as mean output power (MOP) was measured by a power meter. RESULTS: The MOP of the 830 nm CW laser was significantly higher than the PW laser ($p<0.05$). The MOP of the contact technique was significantly greater than that of the non-contact technique in both CW and PW modes ($p<0.05$). The MOP through the skin tissue was between 16.09 and 18.60 mW (8.05-9.30%) for the contact technique and 8.73 and 19.36 mW (4.37-9.68%) for the non-contact technique. In the muscle-skin layer, the MOP was between 0.50 and 1.56 mW (0.25-0.78%) and the MOP was not detected using the non-contact technique with a 5 cm tissue-laser probe distance. CONCLUSION: Our study indicates that 830 nm LILT (with laser parameter setting at 200 mW, fluence of 4 J/cm(2) for both contact and non-contact techniques, and tissue-laser probe distance up to 5 cm) was appropriate for treatments within 14 mm of depth. However, the use of 830 nm LILT for an application in which the target tissue is deeper than 14 mm may limit its positive effect.

Post-Inflammatory Hyperpigmentation: A Review of Treatment Strategies. Post-inflammatory hyperpigmentation (PIH) is a reactive process resulting from increased melanin or abnormal distribution of melanin secondary to inflammatory skin conditions, dermatologic therapies, and external stimuli. Because PIH is a common condition that has a substantial effect on the quality of life, an understanding of its treatment modalities is essential. Though there are many therapeutic strategies for hyperpigmentary conditions such as melasma that are described in the literature, fewer studies focus on PIH. This article aims to provide a comprehensive literature review of therapies specifically used to treat PIH, such as topical combinations, chemical peels, and lasers. J Drugs Dermatol. 2020;19(8): doi:10.36849/JDD.2020.4887. Keratolytic Agents;Skin Lightening Preparations Administration, Cutaneous;Clinical Trials as Topic;Dermatitis;Drug Therapy, Combination;Humans;Keratolytic Agents;Low-Level Light Therapy;Melanosis;Observational Studies as Topic;Quality of Life;Skin;Skin Lightening Preparations;Skin Pigmentation;Treatment Outcome

Low level laser therapy as a modality to attenuate cytokine storm at multiple levels, enhance recovery, and reduce the use of ventilators in COVID-19. The global pandemic COVID-19 is a contagious disease and its mortality rates ranging from 1% to 5% are likely due to acute respiratory distress syndrome (ARDS), and cytokine storm. A significant proportion of patients who require intubation succumb to the disease, despite the availability of ventilators and the best treatment practices. Researchers worldwide are in search of anti-inflammatory medicines in the hope of finding a cure for COVID-19. Low-level laser therapy (LLLT) has strong, anti-inflammatory effects confirmed by meta-analyses, and it may be therapeutic to ARDS. LLLT has been used for pain management, wound healing, and other health conditions by physicians, physiotherapists, and nurses worldwide for decades. In addition, it has been used in veterinary medicine for respiratory tract disease such as pneumonia. Laser light with low-power intensity is applied to the surface of the skin to produce local and systemic effects. Based on the clinical experience, peer-reviewed studies, and solid laboratory data in experimental animal models, LLLT attenuates cytokine storm at multiple levels and reduces the major inflammatory metabolites. LLLT is a safe, effective, low-cost modality without any side-effects that may be combined with conventional treatment of ARDS. We summarize the effects of LLLT on pulmonary inflammation and we provide a protocol for augmenting medical treatment in COVID-19 patients. LLLT combined with conventional medical therapy has the potential to prevent the progression of COVID-19, minimize the length of time needed on a ventilator, enhance the healing process, and shorten recovery time.

Visible Light-Enhanced Antibacterial and Osteogenic Functionality of Au and Pt Nanoparticles Deposited on TiO(2) Nanotubes. This study aimed at evaluating the visible light mediated antimicrobial and osteogenic applications of noble metal, such as gold (Au) and platinum (Pt) coated titania (TiO(2)) nanotubes (NTs). In this study, the Au and Pt nanoparticles (NPs) were deposited on anodized 100 nm TiO(2) NTs by ion plasma sputtering. The Au and Pt NPs were mainly deposited on the top surface layer of TiO(2) NTs and showed light absorbance peaks around the 470 and 600 nm visible light region used in this study, as seen from the surface characterization. From the results of antibacterial activity test, Au and Pt NPs that were deposited on TiO(2) NTs showed excellent antibacterial activity under 470 nm visible light irradiation due to the plasmonic photocatalysis based on the localized surface plasmon resonance effect of the Au and Pt NPs. In addition, alkaline phosphate activity test and quantitative real-time PCR assay of osteogenic related genes resulted that these NPs promoted the osteogenic functionality of human mesenchymal stem cells (hMSCs) under 600 nm visible light irradiation, because of the synergic effect of the photothermal scattering of noble metal nanoparticles and visible light low-level laser therapy (LLLT). Therefore, the combination of noble metal coated TiO(2) NTs and visible light irradiation would be expected to perform permanent antibacterial activity without the need of an antibacterial agent besides promoting osteogenic functionality.

[LOW-ENERGY LASER TECHNOLOGY IN THE COMPLEX TREATMENT OF PRESSURE SORES IN PATIENTS WITH SEVERE BRAIN DAMAGE]. Aim - to improve the results of treatment of pressure sores using low-energy laser technology. The authors performed a comparative analysis of the effectiveness of the use of low-energy laser irradiation in the complex treatment of pressure ulcers of 2-3 degrees in 35 patients with severe brain damage for the period from 2017-2019. The contact laser was used with the following parameters: wave length - 904 nm, frequency - 5000 Hz, irradiation mode - pulsed, power - 13.5mWt/cm2, exposure - on average 2 minutes per zone. The results were compared with those in 41 people treated according to the traditional methodology. The demographic criteria, localization and length of the process did not have significant intergroup differences. The use of low-energy laser technology in combination with other conservative methods made it possible to accelerate the healing of pressure sores by 1.3-1.4 times, and to reduce the

degree of microbial contamination of the focus in earlier periods (p<0.05). At the same time, both the duration of the inpatient rehabilitation phase and the overall treatment costs are reduced. An integrated approach using low-energy laser technology as an additional physical factor can significantly improve the results of the treatment of pressure sores in people with severe brain damage. Brain;Humans;Lasers;Light;Pressure Ulcer;Wound Healing

Efficacy of Scaling and Root Planing with Photobiomodulation for Treating Periodontitis in Gutka Chewers: A Randomized Controlled Trial. Objective: To explore the influence of photobiomodulation (PBMT) as an adjuvant to scaling and root planing (SRP) for treating periodontitis among gutka chewers. Materials and methods: Self-reported smokeless-tobacco (gutka) users were enrolled; and underwent SRP with (test group) and without (control group) PBMT. Full-mouth plaque index (P-I), bleeding upon probing (BUP), probing depth (P-D) clinical attachment loss (CAL), marginal bone loss (MBL) (on mesial and distal surfaces of the teeth), and number of missing teeth were recorded before treatment and at 3 and 6 months. Group comparisons were performed and pâ€‰<â€‰0.05 was referred significant. Results: In the control group, P-I (pâ€‰<â€‰0.013), BUP (pâ€‰<â€‰0.001), and P-D (pâ€‰<â€‰0.012) were high at baseline compared with 3 months follow-up. P-I, BUP, and P-D were higher in the test group, at baseline in comparison with the 3-month (pâ€‰<â€‰0.001) and 6-month (pâ€‰<â€‰0.01) follow-up. At 3 and 6 months, scores of P-I, BUP, and P-D were high in the control compared with the test group. No difference in CAL, and mesial and distal MBL was found among patients of both groups at 3 and 6 months. Conclusions: Among gutka chewers, SRP with PBMT is more efficient than SRP alone in the management of periodontitis. Dental Scaling;Humans;Periodontal Index;Periodontitis;Root Planing;Tobacco, Smokeless

A New 675â€‰nm Laser Device in the Treatment of Melasma: Results of a Prospective Observational Study. Objective: This study evaluates the efficacy and safety of a new 675â€‰nm laser source system on melasma. Background: Melasma is an acquired circumscribed hyperpigmented disorder that has a negative impact on patients' life quality. Different treatments are currently available. This study evaluates this new 675â€‰nm laser source system, on melasma with the use of established parameters that guarantee minimum pain, the absence of side effects, and simplifying posttreatment management. Materials and methods: A total of 25 subjects (all women, 21-50 years old), with facial melasma and Fitzpatrick skin types I-III, were treated with three sessions of a new 675â€‰nm laser system. Efficacy of treatment was evaluated using Melasma Severity Index (MSI) score before and 3 months after the last session. The appearance of side effects has also been monitored to evaluate safety. A preclinical study was executed to evaluate laser effectiveness on sheep skin. Results: All 25 subjects treated with the 675â€‰nm laser had significant improvement in melasma according to MSI score (mean baseline MSI 26.4â€‰Â±â€‰19.2; mean 3-month follow-up MSI 17.3â€‰Â±â€‰15, p: 0.003). Histology in preclinical study showed selective damage of melanin-rich areas. No side effects have been observed except some minor erythematous reactions in two patients. Conclusions: Due to its high affinity with melanin, and its minimal interaction with the vascular component, novel 675â€‰nm laser may be considered promising when treating benign pigmented lesions with a low risk of side effects and simple posttreatment management. Erythema;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Prospective Studies

Does low level laser therapy has effects on inflammatory biomarkers IL-1Î², IL-6, TNF-Î±, and MMP-13 in osteoarthritis of rat models-a systemic review and meta-analysis. Osteoarthritis (OA) is a chronic degenerative joint disease and is considered as the most common cause of pain and disability. To the best of our knowledge, it is generally observed that there is a lack of evidence on the effects of low-level laser therapy (LLLT) on inflammatory cytokines in OA. The present review aims to appraise the current evidence of efffects of LLLT on inflammatory cytokines in OA of the knee.

Medical databases such as Medline, PubMed, EMBASE, PEDro CINAHL, Web of Science, Cochrane register, and Google reference were searched from its inception to June 2019. Articles that meet the inclusion criteria: subjects (animals-Wistar rats) induced with OA; rats with age group of 50-90 days; weight of 150-300 g; finding the effects of LLLT; reporting inflammatory cytokines; and articles written in English were included. The reviewers assessed the methodological quality of the primary studies. Data of inflammatory cytokines IL-1Î², IL-6, TNF-Î±, and MMP-13 were extracted for analysis. The Q (x(2)) test and I(2) statistics analysis were performed to find the heterogeneity evaluation. Standard mean difference (SMD) and its 95% confidence interval (CI) were used to synthesize the data. Two hundred eleven potential articles were identified and 186 articles were excluded based on the selection criteria. The rest of the 25 articles were read and 8 articles were selected for further study. From the study, it is observed that the laser therapy group had mild to moderate improvement than control group in IL-1Î², TNF-Î±, and MMP-13 (IL-1Î²; SMD 1.21 [95% CI - 0.278, 2.704], TNF-Î±; SMD 5.19 [95% CI 2.413, 7.961], and MMP-13 SMD - 1.45 [95% CI - 5.121, 2.211]), while IL-6 [SMD 3.11 (95% CI 0.662, 5.549] did not show any considerable improvement after laser therapy. The present review provides the evidence of LLLT-dependent reduction of IL-1Î², TNF-Î±, and MMP-13, and its ability to modulate proliferation of inflammatory cells, which makes LLLT a suitable treatment for OA. Though the included studies showed a high heterogeneity in treatment parameter, the beneficial effect of LLLT on changes in inflammatory cytokines, such as IL-6, seems to be unaffected. Biomarkers;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Matrix Metalloproteinase 13 Animals;Biomarkers;Disease Models, Animal;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Osteoarthritis;Publication Bias;Rats, Wistar;Tumor Necrosis Factor-alpha;Rats

Combined therapy of adipose-derived stem cells and photobiomodulation on accelerated bone healing of a critical size defect in an osteoporotic rat model. We investigated the impact of human demineralized bone matrix (hDBM) plus adipose-derived stem cells (hADS) plus photobiomodulation (PBM) on a critical-sized femoral defect (CSFD) in ovariectomy induced osteoporosis in rats. There were 6 groups as follows. In group 1 (control, C), only CSFDs were created. Groups 2-6 were implanted with DBM into the CSFD (DBM-CSFD). In group 2 (S), only DBM was transplanted into the CSFD. In group 3 (SÂ +Â PBM), the DBM-CSFDs were treated with PBM. In group 4, the DBM-CSFDs were treated with alendronate (SÂ +Â ALN). In group 5, ADSs were seeded into DBM-CSFD (SÂ +Â ADS). In group 6, ADSs were seeded into DBM-CSFD and the CSFDs were treated with PBM (SÂ +Â PBMÂ +Â ADS). At week eight (catabolic phase of bone repair), the SÂ +Â ALN, SÂ +Â PBMÂ +Â ADS, SÂ +Â PBM, and SÂ +Â ADS groups all had significantly increased bone strength than the S group (ANOVA, pÂ =Â 0.000). The SÂ +Â PBM, SÂ +Â PBMÂ +Â ADS, and SÂ +Â ADS groups had significantly increased Hounsfield unit than the S group (ANOVA, pÂ =Â 0.000). ALN, ADS, and PBM significantly increased healed bone strength in an experimental model of DBM-treated CSFD in the catabolic phase of bone healing in osteoporotic rats. However, ALN alone and PBM plus ADS were superior to the other protocols. Animals;Bone Matrix;Cell Line;Disease Models, Animal;Female;Femur;Humans;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Osteoporosis;Rats;Rats, Wistar

Lycium barbarum polysaccharide fraction associated with photobiomodulation protects from epithelium thickness and collagen fragmentation in a model of cutaneous photodamage. Ultraviolet radiation (UVR) is the major etiologic agent of cutaneous photoaging, and different strategies are used to prevent and treat this condition. The polysaccharide fraction (LBPF) isolated from Lycium Barbarum fruits (goji berry) contains several active ingredients with antioxidant, immune system modulation, and antitumor effects. In addition, the photobiomodulation (PBM) is widely applied in photoaging treatment. This study investigated the effects of LBPF and PBM against the

UVR-induced photodamage in the skin of hairless mice. The mice were photoaged for 6 weeks in a chronic and cumulative exposure regimen using a 300-W incandescent lamp that simulates the UVR effects. From the third to the sixth week of photoaging induction, the animals received topical applications of LBPF and PBM, singly or combined, in different orders (first LBPF and then PBM and inversely), three times per week after each session of photoaging. After completion of experiments, the dorsal region skin was collected for the analysis of thickness, collagen content, and metalloproteinases (MMP) levels. A photoprotective potential against the increase of the epithelium thickness and the fragmentation of the collagen fibers was achieved in the skin ofÂ mice treated with LBPF or PBM singly, as well as their combination. All treatments maintained the skin collagen composition, except when PBM was applied after the LBPF. However, no treatment protected against the UVR-induced MMP increase. Taken together, we have shown that the LBPF and PBM promote a photoprotective effect in hairless mice skin against epidermal thickening and low collagen density. Both strategies, singly and combined, can be used to reduce the UVR-induced cutaneous photoaging. Drugs, Chinese Herbal;lycium barbarum polysaccharide;Collagen Animals;Collagen;Drugs, Chinese Herbal;Epithelium;Low-Level Light Therapy;Mice;Mice, Hairless;Skin;Skin Aging;Ultraviolet Rays

Do Lasers Have an Adjunctive Role in Initial Non-Surgical Periodontal Therapy? A Systematic Review. (1) Background: dental lasers have numerous applications for periodontal therapy which include surgical procedures of soft tissue and osseous structures, and non-surgical treatments such as pathogen reduction, removal of surface accretions, and photobiomodulation. The aim of this review was to evaluate the scientific literature to ascertain whether lasers have a beneficial role when used adjunctively in initial non-surgical periodontal therapy. (2) Methods: A PubMed search was performed specifically for randomized clinical trials where a dental laser was used adjunctively for initial periodontal therapy on human patients published from January 2010-April 2020. The first search identified 1294 eligible studies. After additional criteria and filters were applied, 20 manuscripts were included in this review. (3) Results: The chosen manuscripts reported on investigations into initial therapy for patients diagnosed with chronic periodontitis. After periodontal charting, conventional instrumentation such as hand and ultrasonic scaling was performed on all patients in the studies, and then a test group or groups of patients were treated adjunctively with a laser. That adjunctive laser group's periodontal findings showed various degrees of improved health compared to the group treated with only conventional methods. (4) Conclusion: This systematic review found that 70% of the included studies reported significantly better outcomes in certain clinical parameters, but no improvement in others. The remaining 30% of the manuscripts reported no significant difference in any of the measurements. With consideration to correct parametry, lasers have an adjunctive role in initial non-surgical periodontal therapy.

Photobiomodulation and antimicrobial photodynamic therapy as adjunct in the treatment and prevention of osteoradionecrosis of the jaws: A case report. We report on a patient with a history of radiotherapy to the head and neck region exhibiting necrotic bone exposure associated with fistula and purulent exudation in the mandible, with the diagnosis of stage 3 osteoradionecrosis, in addition to a periapical cyst in the maxillary anterior region and multiple root remnants. An antibiotic coverage protocol with amoxicillin and metronidazole was prescribed for subsequent necrotic bone removal. The surgical procedure was performed along with the aPDT using methylene blue and red light, followed by coaptation of the edges of the surgical wound and the healing protocol with LLLT. The extraction of non-rehabilitated teeth was performed two per session using antibiotic coverage, aPDT, and LLLT and mouthwash with 0.12 % chlorhexidine was prescribed until the complete closure of the surgical wound was achieved. Additionally, two aPDT sessions and four LLLT protocols were performed for complete healing of the surgical sites. Extra and intraoral

examinations and panoramic and periapical radiographs were performed. No emergence or recurrence of osteonecrosis was observed after 12 months of follow-up. Anti-Bacterial Agents;Anti-Infective Agents;Photosensitizing Agents Anti-Bacterial Agents;Anti-Infective Agents;Humans;Jaw;Osteoradionecrosis;Photochemotherapy;Photosensitizing Agents

The effect of chondroitinase ABC and photobiomodulation therapy on neuropathic pain after spinal cord injury in adult male rats. INTRODUCTION: . The goal of the study was to test the effects of photobiomodulation therapy (PBMT) and intra-spinal injection of chondroitinase ABC (chABC) both alone and combined on pain induced by spinal cord injury (SCI) in rats. MATERIAL AND METHODS: SCI was induced by compression using an aneurysm clip. PBMT used a 660 nm laser starting at 30 minutes after SCI and then daily for 2 week, and at the end of 1-week ChABC was injected into the spinal cord. Allodynia (mechanical and cold), hyperalgesia (mechanical and thermal) and functional recovery were measured. Molecular levels of IL6, BDNF, GDNF and Gad65 were evaluated. RESULTS: . Both ChABC, PBMT and the combination reduced allodynia and thermal hyperalgesia and improved functional recovery, but did not reduce mechanical hyperalgesia. Pain-related factors (BDNF and IL6) were decreased and anti-nociceptive factors (Gad65 and GDNF) were increased. CONCLUSION: . Treatment of SCI by PBM is a non-invasive technique, and could be improved by ChABC injection to reduce neuropathic pain and improve movement. Chondroitin ABC Lyase Animals;Chondroitin ABC Lyase;Low-Level Light Therapy;Male;Neuralgia;Rats;Recovery of Function;Spinal Cord;Spinal Cord Injuries

Safety Profile of Slit-Lamp-Delivered Retinal Laser Photobiomodulation. PURPOSE: Photobiomodulation (PBM) refers to therapeutic irradiation of tissue with low-energy, 630- to 1000-nm wavelength light. An increasing body of evidence supports a beneficial effect of PBM in retinal disorders. To date, most studies have utilized light-emitting diode irradiation sources. Slit-lamp-mounted retinal lasers produce a coherent beam that can be delivered with precisely defined dosages and predetermined target area; however, the use of retinal lasers raises safety concerns that warrant investigation prior to clinical application. In this study, we determined safe dosages of laser-delivered PBM to the retina. METHODS: A custom-designed, slit-lamp-delivered, 670-nm, red/near-infrared laser was used to administer a range of irradiances to healthy pigmented and non-pigmented rat retinas. The effects of PBM on various functional and structural parameters of the retina were evaluated utilizing a combination of electroretinography, Spectral Domain Optical Coherence (SD-OCT), fluorescein angiography, histology and immunohistochemistry. RESULTS: In non-pigmented rats, no adverse events were identified at any irradiances up to 500 mW/cm(2). In pigmented rats, no adverse events were identified at irradiances of 25 or 100 mW/cm(2); however, approximately one-third of rats that received 500 mW/cm(2) displayed very localized photoreceptor damage in the peripapillary region, typically adjacent to the optic nerve head. CONCLUSIONS: A safety threshold exists for laser-delivered PBM in pigmented retinas and was identified as 500 mW/cm(2) irradiance; therefore, caution should be exercised in the dosage of laser-delivered PBM administered to pigmented retinas. TRANSLATIONAL RELEVANCE: This study provides important data necessary for clinical translation of laser-delivered PBM for retinal diseases. Animals;Electroretinography;Lasers;Light;Low-Level Light Therapy;Rats;Retina

Bone marrow coagulated and low-level laser therapy accelerate bone healing by enhancing angiogenesis, cell proliferation, osteoblast differentiation, and mineralization. The present study evaluated bone marrow aspirate (BMA) and low-level laser therapy (LLLT) on bone healing. It was created critical-size defects (CSD) of 5â€‰mm diameter in rat calvaria of 64 rats. Animals were randomly divided into four groups: Control (blood clot), BMA (coagulated BMA), LLLT (laser irradiation and blood clot), and BMA/LLLT (laser irradiation and coagulated BMA). Euthanasia was performed at 15 or 30â€‰days postoperative. Immunohistochemical reactions were performed to

identify vascular endothelial growth factor (VEGF), proliferating cell nuclear antigen (PCNA), runt-related transcription factor-2 (Runx2), bone morphogenetic protein-2 (BMP-2), osteocalcin (OCN), and osteopontin (OPN). The markers were quantified, and data were statistically analyzed. Groups BMA/LLLT and LLLT presented significantly higher VEGF expression than group control. Group BMA/LLLT presented a significantly higher expression of PCNA than all experimental groups. Groups BMA and BMA/LLLT presented significantly higher expression of BMP-2 than all experimental groups. Groups LLLT and BMA/LLLT presented significantly higher expression of OPN than groups control and BMA. Groups LLLT, BMA, and BMA/LLLT presented a significantly higher expression of OCN than group control. It can be concluded that the association of BMA and LLLT enhanced bone healing by improving expression of VEGF, PCNA, Runx2, BMP-2, OPN, and OCN. Biomarkers Animals;Biomarkers;Blood Coagulation;Bone Marrow;Bone Regeneration;Calcification, Physiologic;Cell Differentiation;Cell Proliferation;Fracture Healing;Laser Therapy;Male;Neovascularization, Physiologic;Osteoblasts;Rats;Rats, Wistar

Effect of low-level laser therapy on seminiferous epithelium: a systematic review of in vivo studies. Laser therapy has proved effective in the treatment of different tissue injuries but little is known about its effect on the testis. The aim of this review was to synthesize research on the in vivo effect of low-level laser therapy on the seminiferous epithelium. A search was performed in the PubMed/Medline, Scopus, Web of Science, and LILACS databases. The initial search retrieved 354 references, and five articles that met the eligibility criteria were selected. In general, the studies showed that laser therapy exerted a positive effect on the germ cell population; however, there was considerable variation in the laser parameters, as well as in the experimental models and methods of tissue analysis used. In conclusion, further studies determining the biostimulation parameters of laser therapy in the testis are necessary in order to provide a basis for the possible application of this technique to the restoration of the human seminiferous epithelium and consequent treatment of some male reproductive disorders. Animals;Low-Level Light Therapy;Male;Models, Animal;Publication Bias;Risk;Seminiferous Epithelium;Treatment Outcome

Effects of photobiomodulation on cellular viability and cancer stem cell phenotype in oral squamous cell carcinoma. Oral squamous cell carcinoma (OSCC) is the most common head and neck malignancy; it has been shown that cancer stem cells (CSC) are present in OSCC and associated with tumor growth, invasion, metastasis, and therapeutic resistance. Photobiomodulation (PBM) is an alternative tool for oncologic treatment adverse effects such as oral mucositis (OM); however, controversy exists regarding the undesirable effects of PBM on tumor or CSC. This study aimed to evaluate in vitro, the effects of PBM, with the same dosimetric parameters as those used in the clinic for OM prevention and treatment, on OSCC cellular viability, as well as PBM's effect on CSC properties and its phenotype. OSCC cell lines were submitted to single or daily PBM with 3 J/cm(2) and 6 J/cm(2) and then the cellular viability was evaluated by MTT, NRU (neutral red uptake), and CVS (crystal violet staining). The CSC populations were evaluated by clonogenic formation assay, flow cytometry, and RT-qPCR. The single PBM with the 3 J/cm(2) group was associated with increased cellular viability. Daily PBM with 3 J/cm(2) and 6 J/cm(2) was associated with a significant decrease in cellular viability. Additionally, daily PBM was not able to promote CSC self-renewal or the CD44(high)/ESA(low) and CD44(high)/ESA(high) cellular phenotypes. Moreover, a decrease in the number of spheres and in the expression of the CSC related gene BMI1 was observed after daily PBM with 6 J/cm(2). Daily PBM with 3 J/cm(2) and 6 J/cm(2) showed an inhibitory effect on cellular viability and was not able to promote the CSC self-renewal or phenotype. Carcinoma, Squamous Cell;Cell Line, Tumor;Cell Survival;Colony-Forming Units Assay;Humans;Low-Level Light Therapy;Mouth Neoplasms;Neoplastic Stem Cells;Phenotype

Effect of systemic photobiomodulation in the course of acute lung injury in rats. Acute lung injury (ALI) is a severe, multifactorial lung pathology characterized by diffuse alveolar injury, inflammatory cell infiltration, alveolar epithelial barrier rupture, alveolar edema, and impaired pulmonary gas exchange, with a high rate of mortality; and sepsis is its most common cause. The mechanisms underlying ALI due to systemic inflammation were investigated experimentally by systemic lipopolysaccharide (LPS) administration. Photobiomodulation (PBM) has been showing good results for several inflammatory diseases, but there are not enough studies to support the real benefits of its use, especially systemically. Considering that ALI is a pathology with high morbidity and mortality, we studied the effect of systemic PBM with red light-emitting diode (LED) (wavelength 660Â nm; potency 100Â mW; energy density 5Â J/cm; total energy 15Â J; time 150Â s) in the management of inflammatory parameters of this disease. For this, 54 male Wistar rats were submitted to ALI by LPS injection (IP) and treated or not with PBM systemically in the tail 2 and 6Â h after LPS injection. Data were analyzed by one-way ANOVA followed by Student's Newman-Keuls. Our results point to the beneficial effects of systemic PBM on the LPS-induced ALI, as it reduced the number of neutrophils recruited into the bronchoalveolar lavage, myeloperoxidase activity, and also reduced interleukins (IL) 1Î², IL-6, and IL-17 in the lung. Even considering the promising results, we highlight the importance of further studies to understand the mechanisms involved, and especially the dosimetry, so that in near future, we can apply this knowledge in clinical practice.
Interleukins Acute Lung Injury;Animals;Bronchoalveolar Lavage;Disease Progression;Interleukins;Low-Level Light Therapy;Lung;Male;Rats;Rats, Wistar;Treatment Outcome

Efficacy of high-intensity laser therapy in patients with adhesive capsulitis: a sham-controlled randomized controlled trial. Adhesive capsulitis is an idiopathic condition characterized by painful shoulder stiffness, impairs quality of life, and causes disability. The purpose of the study is to evaluate the effects of high-intensity laser therapy (HILT) on pain, disability, and quality of life in patients with adhesive capsulitis. The study was designed as a prospective, double-blinded, and sham-controlled randomized trial. Thirty-six patients diagnosed with adhesive capsulitis were randomized into HILT plus therapeutic exercises, sham-laser plus therapeutic exercises, and control-therapeutic exercises only groups. All groups received 25Â min of exercises to the shoulder joint supervised by a physiotherapist. Patients in both the HILT and the sham-laser group were blinded to their group randomization. The interventions were performed five times a week for 3Â weeks (a total of 15 sessions). The primary outcome measure was the visual analogue scale for pain (Visual Analog Scale for pain (VAS)-pain). The secondary outcome measures were shoulder pain and disability index (SPADI), short-form health survey-36 (SF-36), and range of motion (ROM) of the shoulder joint. Assessments were performed at pre-intervention, post-intervention, and 12-week follow-up by an investigator who was blinded. Thirty-one participants completed the study. HILT plus therapeutic exercises showed significant differences in VAS-pain, SPADI-pain, and SF-36 (subgroups of energy/fatigue, pain, and general health) scores (all Pâ€‰<â€‰0.05). All groups provided comparable improvements in SPADI-disability and ROM of shoulder joint after the interventions and during the follow-up (all Pâ€‰<â€‰0.05). Fifteen sessions of HILT are superior to improve pain and quality of life but not superior in terms of disability or function in patients with adhesive capsulitis. Clinical trial registration number: The study was registered at the US National Institutes of Health (ClinicalTrials.gov) (NCT03929276) and available at https://clinicaltrials.gov/ct2/show/NCT03929276?term=tu%C4%9Fba+atan&draw=2&rank=3.
Bursitis;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Quality of Life;Shoulder Joint;Shoulder Pain;Surveys and Questionnaires;Treatment Outcome;United States;Visual Analog Scale

Treatment of Cutaneous Lupus Erythematosus With 1064-nm Neodymium-Doped Yttrium Aluminum Garnet Laser Verses Topical Corticosteroid Alone. Glucocorticoids Administration, Cutaneous;Adult;Chemoradiotherapy;Female;Glucocorticoids;Humans;Lasers, Solid-State;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Middle Aged;Patient Satisfaction;Severity of Illness Index;Visual Analog Scale

A Prospective, Split-Face, Comparative Study of Combined Treatment With Fractional Microneedle Radiofrequency and Nonablative 1927-nm Fractional Thulium Fiber Laser for Wrinkle Treatment. BACKGROUND: Fractional microneedle radiofrequency (FMR) and nonablative 1927-nm fractional thulium fiber laser (TFL) are widely used for skin rejuvenation treatment. OBJECTIVES: To investigate the efficacy and safety of combined treatment with both devices for wrinkles. PATIENTS AND METHODS: Twenty-five patients with wrinkles were enrolled. One side of the face was treated with FMR alone, while the other side was treated with a combination of FMR and TFL. Each treatment consisted of 3 sessions at four-week intervals and patients were followed up 12 weeks after the last treatment. Overall improvement was assessed by patient global assessment (PGA) and investigator global assessment (IGA). Depression scores for the evaluation of wrinkles were objectively assessed by Antera 3D system. RESULTS: Both sides of the face led to clinical improvement in both mean PGA and IGA. Combination treatment demonstrated a greater improvement in both mean PGA and IGA compared with FMR alone. In addition, wrinkle grading scales and depression scores showed greater improvement in the combination group than in FMR alone. CONCLUSION: This study demonstrated that FMR and TFL comprise a good combination treatment for the treatment of wrinkles because both treatments have a synergistic effect on wrinkle improvement. Thulium Combined Modality Therapy;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Needles;Prospective Studies;Radiofrequency Ablation;Rejuvenation;Skin Aging;Thulium

Light and Laser Treatments for Keratosis Pilaris: A Systematic Review. BACKGROUND: Keratosis pilaris (KP) is a common hereditary keratinization disorder. Keratosis pilaris rubra and KP atrophicans faciei are less frequent variants of the disease. Topical treatments often yield ineffective and temporary results. OBJECTIVE: The objective of this article is to review and assess all the studies that used light and laser devices to treat KP and its variants. MATERIAL AND METHODS: On January 15, 2017, an online search of the MEDLINE, Embase, and Cochrane databases was performed using the following combination of keywords: "keratosis pilaris" and "treatment." RESULTS: Seventeen studies related to light and laser treatments were retained for analysis. The total number of treated patients was 175. Of which, 22 patients had KP atrophicans faciei, 17 patients had KP rubra, and 136 patients had KP. CONCLUSION: Light and laser devices have been emerging as promising therapeutic options for a disfiguring disease that still lacks, until today, an effective long-term treatment. Abnormalities, Multiple;Clinical Trials as Topic;Darier Disease;Eyebrows;Humans;Intense Pulsed Light Therapy;Lasers, Dye;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Severity of Illness Index;Treatment Outcome

The 1440 nm and 1927 nm Nonablative Fractional Diode Laser: Current Trends and Future Directions. Clinical characteristics of skin exposed to ultraviolet and infrared radiation include dryness, dyschromia, laxity, roughness, sallowness, scaling, telangiectasia, and wrinkles. Fractional photothermolysis promotes skin remodeling by formation of new dermal collagen. The nonablative fractional diode laser (NFDL) system employs fractional photothermolysis to rejuvenate the skin, using 2 distinct handpieces for wavelengths of 1440 nm and 1927 nm. Fractional photothermolysis from nonablative fractional diode lasers facilitates delivery of small molecular-weight compounds, such as L-ascorbic acid, through the skin without compromising barrier function of the stratum corneum. Both handpieces of the NFDL system are effective for rejuvenation of photodamaged facial

skin, providing clinical improvement in skin tone, skin texture, fine lines, and dyschromia and reducing the number of detectable skin pores. Application of the 1927 nm wavelength handpiece has shown clinical improvement of hyperpigmentation, melasma, and postinflammatory hyperpigmentation, which have been challenging to treat effectively with other laser devices. With a target chromophore of water, the infrared energy of the 1440 nm and 1927 nm NFDL system is appropriate for skin rejuvenation and treatment of dyschromia in skin of color, with a reduced risk of the adverse events observed with other nonablative and ablative fractional lasers. Clinical data have demonstrated that both the 1440 nm and 1927 nm wavelengths are effective, with high levels of patient satisfaction, transient side effects, and minimal patient downtime. Cosmetic Techniques;Dose Fractionation, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Melanosis;Patient Satisfaction;Rejuvenation;Skin Aging;Skin Pigmentation;Treatment Outcome

Low-Level Laser Therapy Approach of Bilateral Necrotizing Sialometaplasia of the Hard and Soft Palates. Introduction: Necrotizing sialometaplasia (NS) is a rare locally destructive inflammatory benign disease that commonly affects the minor salivary glands. It is frequently associated with the glands located in the posterior portion of the hard and soft palates. Low-level laser therapy (LLLT), also called photobiomodulation therapy (PBMT), has been deemed a substantial method for the regenerative wound process. Case Presentation: A 32-year-old male patient was referred with a chief complaint of two asymptomatic crater-like ulcers measuring approximately 1.5 cm wide on the right side of the hard and soft palates, and another measuring 0.3 cm wide on the left side of the hard palate. The lesion had two weeks of evolution followed by a previous infectious "sore throat" event that kept the patient hospitalized for 4 days. A clinical diagnosis of NS was made. LLLT was applied during 2 sessions per week, favoring the total wound healing within 2 weeks. At 3 months of clinical followup, the patient did not present any complication or relapse and was thus released. Conclusion: This is, to our knowledge, the first clinical report of LLLT applied for the management of NS. Large palatal ulcers caused by NS usually have long healing periods. The shortened healing period observed in this case encourages the inclusion of LLLT in any treatment protocol for similar lesions.

Photobiomodulation in Sciatic Nerve Crush Injuries in Rodents: A Systematic Review of the Literature and Perspectives for Clinical Treatment. Objective : The aim of the study was to perform a literature review to analyze the effect of photobiomodulation in experimental studies on peripheral nerve regeneration after sciatic nerve crush injury in rodents. Methods: A bibliographic search was performed in the electronic databases, including MEDLINE (PubMed), SCOPUS, and SciELO, from 2008 to 2018. Results: A total of 1912 articles were identified in the search, and only 19 fulfilled all the inclusion criteria. Along with the parameters most found in the manuscripts, the most used wavelengths were 660 nm and 830 nm, power of 30 and 40 mW, and energy density of 4 and 10 J/cm(2) . For total energy throughout the intervention period, the lowest energy found with positive effects was 0.70 J, and the highest 1.141 J. Seventeen studies reported positive effects on nerve regeneration. The variables selected to analyze the effect were: Sciatic Functional Index (SFI), Static Sciatic Index (SSI), morphometric, morphological, histological, zymographic, electrophysiological, resistance mechanics and range of motion (ROM). The variety of parameters used in the studies demonstrated that there is yet no pre-determined protocol for treating peripheral nerve regeneration. Only two studies by different authors used the same power, energy density, beam area, and power density. Conclusion: It was concluded that the therapeutic window of the photobiomodulation presents a high variability of parameters with the wavelength (632.8 to 940 nm), power (5 to 170 mW) and energy density (3 to 280 J /cm(2)), promoting nerve regeneration through the expression of cytokines and growth factors that aid in modulating the inflammatory process, improving morphological aspects, restoring the functionality to the animals in a brief period.

The Efficacy of Low-Level Laser Therapy in the Treatment of Bell's Palsy in Diabetic Patients. Introduction: The most common causes of the abrupt onset of unilateral facial weakness are stroke and Bell's palsy. The drug regimen together with electrical stimulation was more effective in treating Bell's palsy than conventional drug treatment alone. We aimed to evaluate more effective and safe therapies for the treatment of Bell's palsy. Methods: This clinical interventional study was conducted on 30 diabetic patients with Bell's palsy who referred to a pain clinic for 1 year and were treated by low-level laser (LLL). The system of House-Brackmann was used for assessing the severity of nerve damage and patients were evaluated by electromyography and nerve conduction study (NCS) before and after treatment with low-level laser. These patients had not consumed any other medication for facial nerve palsy. Results: In the present study, 30 cases with poorly controlled diabetes mellitus (18 females and 12 males) were studied. After 12 sessions of low-level laser therapy (LLLT), we could observe complete recovery in 18 patients and partial recovery in 6 patients after 3 months. Conclusion: The recovery rate showed that LLLT is a safe, reliable and proper alternative approach for the treatment of facial nerve palsy, especially in the presence of underlying conditions such as diabetes mellitus.

The Effect of Low-Level Laser Therapy and Curcumin on the Expression of LC3, ATG10 and BAX/BCL2 Ratio in PC12 Cells Induced by 6-Hydroxide Dopamine. Introduction: Parkinson's disease (PD) is one of the most common neurodegenerative disorders. The neuroinflammation in the brain of PD patients is one of the critical processes in the immune pathogenesis of PD leading to the neural loss in the substantia nigra. Due to the anti-inflammatory effects of curcumin (CU) and low-level laser therapy (LLLT), we examined the protective effect of CU and LLLT on PC12 cells treated with 6-hydroxydopamine (6-OHDA) as a Parkinson model. Methods: PC12 cells were pretreated using various concentrations of 6-OHDA for 24 hours to induce oxidative and cellular damages. PC12-6-OHDA cells were co-treated with CU and LLLT. The effects of CU and LLLT on Bax/Bcl2 and LC3/ATG10 expression were analyzed by real-time PCR and cell viability was assessed by MTT assay. Cell A Software was used to calculate the length of the Neurite and cell body areas. Results: The results of this study show that the combination of CU dose-dependently and LLLT has a significant neuroprotective effect on cells and cellular death significantly decreases by increasing CU concentration. CU+LLLT decreases Bax/Bcl2 ratio which is an indicator of apoptosis and it also rescued a decrease in LC3 and ATG10 expression in comparison with 6-OHDA group. Conclusion: This study shows that the combination of 5 Î¼M CU and LLLT has the best neuroprotective effect on PC12 cells against 6-OHDA by decreasing the BAX/BCL2 ratio.

Neuroprotective Properties of Photobiomodulation in Retinal Regeneration in Rats: Perspectives From Interaction Levels. Introduction: Photobiomodulation (PBM) is known as low-level laser (or light) therapy and is applied in different fields of medicine. However, it is required that its molecular and cellular mechanism be investigated. This study aims to assess the neuroprotective properties of PBM in the rat retina. Methods: GSE22818 was downloaded from Gene Expression Omnibus (GEO) and the regulation of the significant differentially expressed genes (DEGs) which are produced by light damage in the rat retina by the pretreatment of PBM application was assessed via network analysis and gene ontology enrichment. Results: The 78 produced DEGs by light-damage in the rat retina were protected via PBM pretreatment action. Among these determined DEGs, 53 individuals were included in the main connected component of the constructed protein-protein interaction (PPI) network. Ccl2, Icam1, Cxcl10, Timp1, and Fos were determined as hub nodes. Eight clusters including 26 regulated biochemical pathways by PBM pretreatment were identified. The critical DEGs based on the action maps were introduced. Conclusion: The finding indicates that PBM treatment protects rat retina against light damage via the prevention of Fos, Ccl2, Icam1, Cxcl10, and Myc dysregulation.

Effectiveness of Low-Level Laser Irradiation in Reducing Pain and Accelerating Socket Healing After Undisturbed Tooth Extraction. Introduction: This study aimed to determine the effect of low-level laser therapy (LLLT) on reducing complications following tooth extraction. Methods: This randomized clinical trial consisted of 40 subjects who underwent lower molar extraction. The patients were randomly assigned to 4 groups. Group 1 was irradiated with a 660 nm laser (200 mW, 30 seconds radiation to lingual, buccal and occlusal surfaces of the socket, 6 J/area). In group 2, an 810 nm laser was applied similar to group 1. In group 3, a combination of 660 and 810 nm lasers was used. The patients in group 4 served as a placebo group. LLLT was performed after 0.5-1 hour of extraction and 2 days later. The participants were asked to record pain degree using a visual analogue scale (VAS) over 7 days. The amount of wound healing was evaluated on the third and seventh days. Results: There was no significant difference in pain scores among the groups at any of the assessment intervals (P >0.05). The between-group differences in wound healing scores were small and insignificant (P >0.05). Conclusion: LLLT with 660 nm or 810 nm lasers or their combination had no greater effect than the placebo laser for reducing the complications of tooth extraction.

Evaluation of Aquaporins 1 and 5 Expression in Rat Parotid Glands After Volumetric Modulated Arc Radiotherapy and Use of Low-Level Laser Therapy at Different Times. Introduction: This experimental study investigated the mRNA expression of aquaporins (AQPs) 1 and 5 in the parotid glands of rats irradiated with volumetric modulated arc therapy (VMAT) and subjected to low-level laser therapy (LLLT) at different time points. Methods: The sample consisted of 30 Wistar rats (Rattus norvegicus) divided into the following groups: control, LLLT alone (LG), radiotherapy alone (RG), and experimental groups that received LLLT at 24 hours (early experimental group [EEG], n=12) and 120 hours (late experimental group [LEG], n=12) after radiotherapy. VMAT was delivered at a single dose (12 Gy) and LLLT was performed with an aluminium-gallium-arsenide diode laser (660 nm, 100 mW), spot area of 0.0028 cm2, energy of 2 J/cm(2) applied to 3 spots in the region corresponding to the right parotid gland, for 10 consecutive days. The right parotid gland was resected and prepared for RNA extraction. The gene expression of AQPs was evaluated by quantitative polymerase chain reaction (qPCR) using specific TaqMan probes, with the HPRT gene as an internal control. Results: The lowest AQP1 gene expression was 0.83 (0.27) with the use of LLLT 24 hours after radiotherapy (EEG), and the highest was 1.56 (0.80) with the use of LLLT alone (LG). Likewise, the lowest AQP5 gene expression was found in the EEG (mean = 0.88; SD = 0.49) and the highest in the LG (mean = 1.29; SD = 0.33). Conclusion: The use of LLLT after radiotherapy may contribute to the maintenance and an increase of these proteins, even when used at a later time point after radiotherapy.

Effect of Low-level Laser Therapy With Different Locations of Irradiation on Postoperative Endodontic Pain in Patients With Symptomatic Irreversible Pulpitis: A Double-Blind Randomized Controlled Trial. Introduction: This double-blind, placebo-controlled, clinical trial aimed to investigate the analgesic efficacy of low-level laser therapy (LLLT) with two different locations, and their comparison, in postoperative endodontic pain (PEP) levels in molars diagnosed with symptomatic irreversible pulpitis. Methods: Seventy-five patients with a molar tooth, diagnosed with symptomatic irreversible pulpitis, were divided into three groups of placebo, buccal only irradiation (BI), and buccal and lingual irradiation (BLI), with 25 cases being in each group. The participants received similar single-visit nonsurgical endodontic treatments. Then, a sham laser was used in the control group instead of LLLT. Individuals in BI and BLI groups received 80-second irradiation on the buccal surface and 80-second irradiation on each of the buccal and lingual surfaces respectively. A laser with an 808 nm wavelength, power of 100 mW, and a fiber diameter of 600 Î¼m was used. PEP was assessed using a 0-100 mm VAS 4, 8, 24, and 48 hours after the treatment. Results: BLI showed a significantly higher reduction of PEP compared to placebo in all time intervals of this study. BLI was significantly more effective than BI 8 hours after the treatment. However, intragroup differences between BLI and BI

groups at other time intervals and between BI and placebo groups in all time intervals were not significant. The number of taken analgesics in the BLI group was significantly lower than the placebo group and was on a statistical borderline compared to the BI group. Conclusion: LLLT with BLI was an effective measure as a supplement to oral analgesics in the reduction of PEP compared to the placebo.

Erratum to "Effect of low intensity laser therapy (LILT) on MMP-9 expression in gingival crevicular fluid and rate of orthodontic tooth movement in patients undergoing canine retraction: A randomized controlled trial" [Int. Orthod. 18 (2020) 330-9].

Ergogenic Effects of Photobiomodulation on Performance in the 30-Second Wingate Test: A Randomized, Double-Blind, Placebo-Controlled, Crossover Study. Molina Correa, JC, Padoin, S, Varoni, PR, Demarchi, MC, Flores, LJ, Nampo, FK, and de Paula Ramos, S. Ergogenic effects of photobiomodulation on performance in the 30-second Wingate test: A randomized, double-blind, placebo-controlled, crossover study. J Strength Cond Res 36(7): 1901-1908, 2022-The purpose of this study was to evaluate the ergogenic effects of red light (630 nm) photobiomodulation on anaerobic capacity in the Wingate test. Sixteen healthy and physically active male volunteers (21.71 Â± 2.49 years of age, body mass index between 18.5 and 24.9 kg/m2) participated in this randomized, double-blind, placebo-controlled, crossover study. The subjects performed 3 Wingate test sessions, with a 48-hour interval between tests. In the first session (baseline session, BS), a Wingate test was performed to evaluate the initial performance. Subjects were paired by performance in the BS and allocated through a draw to receive either the phototherapy (630 nm, 4.6 J/cm2, 6 J per point, 16 points, light-emitting diode [LED] session) or placebo intervention (PLA session) in the second test session. In the third test session, a crossover intervention was performed. The repeated-measures analysis of variance test, followed by Bonferroni post hoc test or Friedman test with Dunn's post hoc test ($p < 0.05$) and Cohen's d statistic were used for comparisons. The LED session with phototherapy promoted an increase in performance in peak power ($p < 0.05$), relative power ($p < 0.05$), RPMpeak ($p < 0.05$), and peak velocity ($p < 0.05$), as well as total displacement ($p < 0.01$) compared with PLA. The mean power ($p < 0.05$), relative power ($p < 0.05$), RPMmean ($p < 0.01$), and mean velocity ($p < 0.01$) were higher in the LED session than those of BS. We concluded that phototherapy improves performance in Wingate anaerobic exercise, possibly due to large effects on the anaerobic alactic metabolism. Performance-Enhancing Substances;Polyesters Cross-Over Studies;Double-Blind Method;Humans;Male;Performance-Enhancing Substances;Polyesters;Young Adult

Review on the Cellular Mechanisms of Low-Level Laser Therapy Use in Oncology. Photobiomodulation (PBM) using low-level laser therapy (LLLT) is a treatment that is increasingly used in oncology. Studies reported enhancement of wound healing with reduction in pain, tissue swelling and inflammatory conditions such as radiation dermatitis, oral mucositis, and lymphedema. However, factors such as wavelength, energy density and irradiation frequency influence the cellular mechanisms of LLLT. Moreover, the effects of LLLT vary according to cell types. Thus, controversy arose as a result of poor clinical response reported in some studies that may have used inadequately planned treatment protocols. Since LLLT may enhance tumor cell proliferation, these will also need to be considered before clinical use. This review aims to summarize the current knowledge of the cellular mechanisms of LLLT by considering its effects on cell proliferation, metabolism, angiogenesis, apoptosis and inflammation. With a better understanding of the cellular mechanisms, bridging findings from laboratory studies to clinical application can be improved.

Effects and safety of intranasal phototherapy for allergic rhinitis: Study protocol for a single-center, randomized, parallel (acupuncture-controlled), open-label, investigator-initiated, pilot study. INTRODUCTION: Allergic rhinitis (AR) is an immunoglobulin E (Ig E)-mediated inflammatory disease. Intranasal phototherapy is a promising treatment modality because it has a profound

immunosuppressive effect, but the evidence of its use for AR is insufficient. Therefore, rigorously designed randomized controlled trials (RCTs) are needed. Our objective is to describe the protocol for an RCT to assess the effects and safety of intranasal phototherapy for the treatment of AR. METHODS AND ANALYSIS: This is a study protocol for a single-center, randomized, parallel (acupuncture-controlled), open-label, investigator-initiated, pilot study. A total of 80 patients with AR will be randomly assigned to the intranasal phototherapy or acupuncture group at a 1:1 ratio. The participants will receive intranasal phototherapy with medical or acupuncture treatment for 20â€Šminutes, 3 times a week for 4 weeks. The primary outcome will be the mean change in the total nasal symptom score (TNSS) from baseline to 4 weeks. The secondary outcomes will include the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) score, Nasal Endoscopy Index, total serum immunoglobulin E (Ig E) level and eosinophil count. DISCUSSION: The findings of this study will provide the basis for the design and implementation of RCTs investigating the effects and safety of intranasal phototherapy for AR. Additionally, it will provide preliminary evidence of intranasal phototherapy for use in AR. TRIAL REGISTRATION: This study was registered at the Korean National Clinical Trial Registry, Clinical Research Information Service (KCT0004079). Immunoglobulin E Acupuncture Therapy;Eosinophils;Humans;Immunoglobulin E;Leukocyte Count;Low-Level Light Therapy;Nasal Cavity;Pilot Projects;Quality of Life;Randomized Controlled Trials as Topic;Rhinitis, Allergic;Severity of Illness Index;Single-Blind Method

Wavelength- and irradiance-dependent changes in intracellular nitric oxide level. SIGNIFICANCE: Photobiomodulation (PBM) refers to the beneficial effects of low-energy light absorption. Although there is a large body of literature describing downstream physiological benefits of PBM, there is a limited understanding of the molecular mechanisms underlying these effects. At present, the most popular hypothesis is that light absorption induces release of nitric oxide (NO) from the active site of cytochrome c oxidase (COX), allowing it to bind O2 instead. This is believed to increase mitochondrial respiration, and result in greater overall health of the cell due to increased adenosine triphosphate production. AIM: Although NO itself is a powerful signaling molecule involved in a host of biological responses, less attention has been devoted to NO mechanisms in the context of PBM. The purpose of our work is to investigate wavelength-specific effects on intracellular NO release in living cells. APPROACH: We have conducted in-depth dosimetry analyses of NO production and function in an in vitro retinal model in response to low-energy exposure to one or more wavelengths of laser light. RESULTS: We found statistically significant wavelength-dependent elevations (10% to 30%) in intracellular NO levels following laser exposures at 447, 532, 635, or 808Â nm. Sequential or simultaneous exposures to light at two different wavelengths enhanced the NO modulation up to 50% of unexposed controls. Additionally, the immediate increases in cellular NO levels were independent of the function of NO synthase, depended greatly on the substrate source of electrons entering the electron transport chain, and did not result in increased levels of cyclic guanosine monophosphate. CONCLUSIONS: Our study concludes the simple model of light-mediated release of NO from COX is unlikely to explain the wide variety of PBM effects reported in the literature. Our multiwavelength method provides a novel tool for studying immediate and early mechanisms of PBM as well as exploring intracellular NO signaling networks. Nitric Oxide;Electron Transport Complex IV Electron Transport Complex IV;Low-Level Light Therapy;Mitochondria;Nitric Oxide;Oxidation-Reduction

Factors influencing the effect of photobiomodulation in the treatment of androgenetic alopecia: A systematic review and analyses of summary-level data. Low-level laser therapy (LLLT) is used to treat androgenetic alopecia (AGA). The therapeutic effect of LLLT on AGA has been evaluated; however, there is a paucity of studies that investigated device- and usage-related factors that may influence the effect of LLLT on hair regrowth. The literature was systematically searched to identify

eligible studies; PubMed, Scopus, EMBASE and clinicaltrials.gov databases were searched on 30 April 2020. Eligible studies were randomized trials that investigated the effect of LLLT on hair density in AGA. Robust linear regressions were used to make comparisons. An increase in the per-session energy fluence by 1â€‰J/cm(2) is significantly associated with an increase in hair density by 0.23 hairs/cm(2) (95% CI: 0.21 hairs/cm(2) , 0.25 hairs/cm(2)). The number of laser or light-emitting diodes is not significantly associated with change in hair density. Increasing the total duration of exposure to treatment is associated with a significant increase in hair density (Î² = .53, Pâ€‰<â€‰.05). Switching from continuous to pulse irradiation was associated with a significant increase in hair density (Î² = 10.11, Pâ€‰<â€‰.01). Energy fluence, irradiation session duration, and light pulsing have a significant therapeutic effect on AGA, while the number of diodes does not. Alopecia;Hair;Humans;Light;Low-Level Light Therapy;Treatment Outcome

Can photobiomodulation therapy be an alternative to pharmacological therapies in decreasing the progression of skeletal muscle impairments of mdx mice? OBJECTIVE: To compare the effects of photobiomodulation therapy (PBMT) and pharmacological therapy (glucocorticoids and non-steroidal anti-inflammatory drugs) applied alone and in different combinations in mdx mice. METHODS: The animals were randomized and divided into seven experimental groups treated with placebo, PBMT, prednisone, non-steroidal anti-inflammatory drug (NSAIDs), PBMT plus prednisone and PBMT plus NSAID. Wild type animals were used as control. All treatments were performed during 14 consecutive weeks. Muscular morphology, protein expression of dystrophin and functional performance were assessed at the end of the last treatment. RESULTS: Both treatments with prednisone and PBMT applied alone or combined, were effective in preserving muscular morphology. In addition, the treatments with PBMT ($p = 0.0005$), PBMT plus prednisone ($p = 0.0048$) and PBMT plus NSAID ($p = 0.0021$) increased dystrophin gene expression compared to placebo-control group. However, in the functional performance the PBMT presented better results compared to glucocorticoids ($p<0.0001$). In contrast, the use of NSAIDs did not appear to add benefits to skeletal muscle tissue in mdx mice. CONCLUSION: We believe that the promising and optimistic results about the PBMT in skeletal muscle of mdx mice may in the future contribute to this therapy to be considered a safe alternative for patients with Duchenne Muscular Dystrophy (DMD) in a washout period (between treatment periods with glucocorticoids), allowing them to remain receiving effective and safe treatment in this period, avoiding at this way periods without administration of any treatment. Anti-Inflammatory Agents, Non-Steroidal;Dystrophin;Glucocorticoids;Prednisone Animals;Anti-Inflammatory Agents, Non-Steroidal;Combined Modality Therapy;Disease Models, Animal;Disease Progression;Dystrophin;Gene Expression Regulation;Glucocorticoids;Humans;Low-Level Light Therapy;Mice;Mice, Inbred mdx;Muscle, Skeletal;Muscular Dystrophy, Duchenne;Prednisone

Study protocol for the use of photobiomodulation with red or infrared LED on waist circumference reduction: a randomised, double-blind clinical trial. INTRODUCTION: The search for non-invasive procedures to reduce localised adiposity in aesthetics clinics has recently been increasing. In this context, procedures, such as cryolipolysis, ultracavitation, photobiomodulation (PBM) and other techniques have been proposed. Some studies have shown that PBM can be used in body contouring. However, there is no standardisation of the protocol. More than that, as in other techniques for reducing adipose tissue, the availability of triacylglycerol may affect the lipid profile in the blood, bringing consequences to the general health of an individual. This work will aim to compare the light wavelengths when using PBM as a technique for reducing the abdominal waist circumference, while also evaluating the efficacy of the method. Changes in the lipid profile in the blood, with a long-term follow-up, will also be appraised. METHODS AND ANALYSIS: This will be a controlled, randomised, double-blind, single-centred clinical trial. 174 patients will be recruited at the Nove de Julho University, Brazil, and then divided into three groups: Group A-RED PBM; Group B-INFRARED PBM;

Group C-PLACEBO (Sham) treatment. The treatments will consist of eight sessions, two times a week, for 4 weeks. At each session, the participants will receive 30 minutes PBM (using a radiant exposure of 127 J/cm(2)), with an abdominal strap containing 4 LED clusters, with 72 devices each, following the indication of randomisation. All of the groups will receive 30 min of Aussie Current, at 4 kHz, modulated at 10 Hz, 40-60 mA. The main outcome of this study will be waist circumference reduction. The secondary variables will be anthropometric data, lipid profile, liver function and adipose tissue thickness, changes in the local microcirculation, and the quality of life and self-esteem. The analyses will be performed at four stages of the research, D0, end of the eighth session (D30), 15 days after the last session (FU15), 90 days after the last session (FU90) and 180 days after the last session (FU180). ETHICS AND DISSEMINATION: The Ethics Committee of the Nove de Julho University, Brazil, approved the modified version of this project under No. 3414146 on 26 June 2019. This study is not yet recruiting. The results obtained will be published in a peer-reviewed journal in the related field. TRIAL REGISTRATION NUMBER: Brazilian Registry of Clinical Trials-ReBec (RBR-9bwxcx). Brazil;Double-Blind Method;Humans;Low-Level Light Therapy;Quality of Life;Randomized Controlled Trials as Topic;Waist Circumference

Role of E2F1/SPHK1 and HSP27 During Irradiation in a PMA-Induced Inflammatory Model. Background: Sphingosine kinase 1 (SPHK1) and heat shock protein 27 (HSP27) are important for antioxidant and anti-inflammatory effects after red light irradiation in an inflammatory model. Objective: The purpose of the present study was to evaluate whether SPHK1 and HSP27 work independently or are dependent on some other regulator after 625â€‰nm light-emitting diode irradiation in the human keratinocyte (HaCaT) cell line. Methods: Differentially expressed genes (DEGs) were identified between groups with or without 625â€‰nm photobiomodulation (PBM) in the inflammatory model. Potential transcription factors (TFs) of key DEGs were predicted using the iRegulon plugin. The mechanism was investigated by analyzing mRNA and protein expression levels, prostaglandin E2 levels, and intracellular reactive oxygen species (ROS) in phorbol 12-myristate 13-acetate (PMA)-induced HaCaT cells after 625â€‰nm PBM. Results: A total of 6 TFs (e.g., E2F1) and 51 key DEGs (e.g., SPHK1) were identified after 625â€‰nm PBM in PMA-stimulated HaCaT cells. E2F1 worked as a regulator of SPHK1; however, it did not affect HSP27. E2F1 knockdown drastically decreased the SPHK1 expression level and increased the intracellular ROS, as well as the expression levels of inflammation-related proteins in PMA-induced HaCaT cells. In addition, the inhibition of HSP27 decreased the anti-inflammatory effect of 625â€‰nm PBM. Conclusions: E2F1 worked as a TF of SPHK1 and exhibited anti-inflammatory and antioxidative effects through SPHK1 in PMA-induced HaCaT cells after 625â€‰nm PBM. HSP27 is essential for the 625â€‰nm PBM-induced anti-inflammatory function. Therefore, E2F1/SPHK1 and HSP27 could be used as potential biomarkers for anti-inflammatory therapy with 625â€‰nm PBM. Antioxidants;E2F1 Transcription Factor;E2F1 protein, human;HSPB1 protein, human;Heat-Shock Proteins;Molecular Chaperones;Reactive Oxygen Species;sphingosine kinase Antioxidants;E2F1 Transcription Factor;Gene Expression;HaCaT Cells;Heat-Shock Proteins;Humans;Inflammation;Low-Level Light Therapy;Molecular Chaperones;Phosphotransferases (Alcohol Group Acceptor);Reactive Oxygen Species

Preconditioning adipose-derived stem cells with photobiomodulation significantly increased bone healing in a critical size femoral defect in rats. We assessed the combined impacts of human demineralized bone matrix (hDBM) scaffold, adipose-derived stem cells (hADS), and photobiomodulation (PBM) on bone repair of a critical size femoral defect (CSFD) in 72 rats. The rats were divided into six groups: control (group 1); ADS (group 2 - ADS transplanted into hDBM); PBM (group 3 - PBM-treated CSFDs); ADSÂ +Â PBM inÂ vivo (group 4 - ADS transplanted into hDBM and the CSFDs were treated with PBM inÂ vivo); ADSÂ +Â PBM inÂ vitro (group 5 - ADS were treated with PBM inÂ vitro, then seeded into hDBM); and ADSÂ +Â PBM inÂ vitro+inÂ vivo (group 6 - PBM-treated

ADS were seeded into hDBM, and the CSFDs were treated with PBM inÂ vivo. At the anabolic phase (2 weeks after surgery), bone strength parameters of the groups 5, 6, and 4 were statistically greater than the control, ADS, and PBM inÂ vivo groups (all, pÂ =Â 0.000). Computed tomography (CT) scans during the catabolic phase (6 weeks after surgery) of bone healing revealed that the Hounsfield unit (HU) of CSFD in the groups 2 (pÂ =Â 0.000) and 5 (pÂ =Â 0.019) groups were statistically greater than the control group. The groups 5, 4, and 6 had significantly increased bone strength parameters compared with the PBM inÂ vivo, control, and ADS groups (all, pÂ =Â 0.000). The group 5 was statistically better than the groups 4, and 6 (both, pÂ =Â 0.000). InÂ vitro preconditioned of hADS with PBM significantly increased bone repair in a rat model of CSFD inÂ vivo. Biomarkers Adipose Tissue;Animals;Biomarkers;Biomechanical Phenomena;Bone Matrix;Cell Survival;Elastic Modulus;Femur;Humans;Low-Level Light Therapy;Male;Rats, Wistar;Stem Cells;Wound Healing

Geriatric Freshwater and Marine Fish. As pain management finally becomes accepted for this last of the vertebrate taxa, fish medicine is finally reaching the sophistication of other vertebrates. The diseases of aging fish in captivity therefore need to be addressed. The degenerative organ/tissue changes and neoplasias of fish deserve the same diagnosis and treatments of their terrestrial counterparts including pain relief, anti-inflammatory medications, chemotherapy, surgery, joint supplements, regenerative cell therapy, and photobiomodulation. Besides the challenges of an aquatic environment, recognizing normal changes in older fish will be addressed in this article. Clinicians can appreciate the diversity of fishes and their unique anatomies, physiologies, and behaviors which translate to creative medicine. Aging;Animals;Biodiversity;Fish Diseases;Fishes;Fresh Water;Pain Management;Seawater;Veterinary Medicine

A Comparative Clinical Study between Concentrated Growth Factor and Low-Level Laser Therapy in the Management of Dry Socket. OBJECTIVE: â€ƒA dry socket is a well-recognized complication of wound healing following tooth extraction. Its etiology is poorly understood and commonly occur among healthy patients. As such, management strategies for dry socket has always been empirical rather than scientific with varying outcome. The aim of this study is to investigate the efficacy of concentrated growth factor (CGF) and low-level laser therapy (LLLT) and compared them to the conventional treatment in the management of dry socket. MATERIALS AND METHODS: â€ƒSixty patients with one dry socket each, at University Dental Hospital Sharjah, were divided into three treatment groups based on their choice. In group I (n = 30), conventional treatment comprising of gentle socket curettage and saline irrigation was done. Group II (n = 15) dry sockets were treated with CGF and group III (n = 15) sockets were lased with LLLT. All dry socket patients were seen at day 0 for treatment and subsequently followed-up at 4, 7, 14, and 21 days. Pain score, perisocket inflammation, perisocket tenderness, and amount of granulation tissue formation were noted. STATISTICAL ANALYSIS: â€ƒData were analyzed as mean values for each treatment group. Comparisons were made for statistical analysis within the group and among the three groups to rank the efficacy of treatment using one-way analysis of variance (ANOVA). Statistically significant difference is kept at $p < 0.05$. RESULTS: â€ƒConventional treatment group I took more than 7 days to match the healing phase of group II CGF treated socket and group III LLLT irradiated socket ($p = 0.001$). When healing rate between CGF and LLLT are compared, LLLT group III showed a delay of 4 days compared with CGF in granulation tissue formation and pain control. CONCLUSION: â€ƒCGF treated socket was superior to LLLT in its ability to generate 75% granulation tissue and eliminate pain symptom by day 7 ($p = 0.001$).

Effects of 660-nm and 780-nm Laser Therapy on ST88-14 Schwann Cells. The aim of the present study was to evaluate the comparative effects of red (660-nm) and near-infrared (780-nm) low-level laser therapy (LLLT) on viability, mitochondrial activity, morphology and gene expression of growth factors on Schwann cells (SC). ST88-14 cells were grown in RPMI 1640 with 10Â mM of HEPES, 2Â mM

of glutamine, 10% fetal bovine serum and 1% antibiotic-antimycotic solution at 37Â°C in humidified atmosphere of 5% CO(2) . Cells were detached with trypsin and centrifugated at 231Â g for 5Â min at 10Â°C, and the pellet (8Â Ã—Â 10(4) Â cells/tube) was irradiated at the bottom of 50Â ml polypropylene tube with a Twin-Laser system (660 and 780Â nm, 40Â mW, 1Â mWÂ cm(-2) , 3.2 and 6.4Â J, 80 and 160Â JÂ cm(-2) with 80 and 160Â s). After 1, 3 and 7Â days, the analysis was performed. After irradiation, the SC increase mitochondrial activity, gene expression of the neural growth factors NGF and BDNF, and cell migration and increase the G2/M cells. SC showed neuronal morphology, normal F-actin cytoskeleton organization and positive labeling for S100. PBM increased metabolic activity, mitosis and gene expression when irradiated with red and infrared LLLT. An increase in cell migration was obtained when irradiated with infrared LLLT. Cell Cycle;Cell Line;Cell Survival;Gene Expression Regulation;Humans;Laser Therapy;Mitochondria;Schwann Cells;Time Factors

The effect of laser irradiation and doxycycline application on the production of matrix metalloproteinase-8 and collagen I from cultured human periodontal ligament cells. BACKGROUND: Periodontal ligament fibroblasts (PDLF) play a key role in periodontal wound healing and tooth-supporting structures. Various approaches have been tried to enhance the fibroblastic activity such as laser irradiation or doxycycline application. The current study explored the influence of laser irradiation and doxycycline application on human PDLF. The aim of the study was the effect of low-level laser treatment and doxycycline application on the expression of collagen I and matrix metalloproteinase-8 (MMP8) from cultured human periodontal ligament cells. MATERIALS AND METHODS: In this experimental study After preparation of human PDLF in three replications, they were divided into five treatment groups. The first group was day 0, which was used for standardization. The second group was the control group, which received no treatment within 4 days of the study. The third group was treated with doxycycline 30, daily for 4 consecutive days. The fourth group was treated with diode laser 2 daily for 4 consecutive days. The fifth group was treated with both doxycycline and laser irradiation pertaining to the third and fourth groups. After 4 days of treatment, cells were tested for collagen I and MMP-8 secretion through real-time-polymerase chain reaction and ELISA reader. The data were analyzed using the ANOVA and least significant difference pair tests ($P < 0.05$). RESULTS: Treatment of human PDLF either with diode laser or doxycycline reduced the secretion of MMP-8 significantly. The maximum reduction was related to doxycycline application. Regarding collagen, I, only doxycycline application significantly increased collagen I secretion. Other groups showed no significant increase in collagen I secretion. CONCLUSION: This study showed that treatment of human PDLF either with diode laser or doxycycline significantly reduced MMP-8. Treatment with doxycycline significantly increased the secretion of collagen I.

Does Photobiomodulation Therapy Enhance Maximal Muscle Strength and Muscle Recovery? Photobiomodulation has been shown to improve tissue and cell functions. We evaluated the influence of photobiomodulation, using a B-Cure laser, on: 1) maximal performance, and 2) muscle recovery after resistance exercise. Two separate crossover randomized double-blinded placebo-controlled trials were conducted. Sixty healthy physical education students (28 men, 32 women), aged 20-35, were recruited (30 participants for each trial). Participants performed two interventions for each experiment, with real lasers (GaAlAs, 808 nm) on three quadricep locations in parallel (overall treatment energy of ~150J) or sham (placebo) treatment. In the first experiment muscle total work (TW) and peak torque (PT) were measured by an isokinetic dynamometer in five repetitions of knee extension, and in the second experiment muscle recovery was measured after the induction of muscle fatigue by evaluating TW and PT in five repetitions of knee extension. There were no differences between treatments (real or sham) regarding the TW ($F(1,28) = 1.09$, $p = .31$), or PT ($F(1,29) = .056$, $p = .814$). In addition, there was no effect of photobiomodulation on muscle recovery

as measured by the TW (F(1,27) = .16, p = .69) or PT (F(1,29) = .056, p = .814). Applying photobiomodulation for 10 min immediately before exercise did not improve muscle function or muscle recovery after fatigue.

Deja UV all over again: Theoretical risks of the unregulated direct-to-consumer infrared technologies. Direct-to-Consumer Advertising;Government Regulation;Humans;Infrared Rays;Low-Level Light Therapy;Risk Factors

Guidelines versus evidence: what we can learn from the Australian guideline for low-level laser therapy in knee osteoarthritis? A narrative review. This narrative review analyses the Australian Guideline (2018) for the treatment of knee osteoarthritis (KOA) developed using Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology. The Guideline recommended against the use low-level laser therapy (LLLT). Why this conclusion was reached is discussed in this review in the context of evidence provided in other systematic reviews, the latest of which was published in 2019 and which provided strong support for LLLT for knee OA. We evaluated the reference list cited for the recommendation "against" LLLT and compared this with reference lists of systematic reviews and studies published before and after the publication date of the Guideline. Eight randomised controlled trials (RCTs) of LLLT were cited in the Guideline the latest of which was published in 2012. There were seventeen additional RCTs, five of which together with one systematic review were located in the year of publication, 2018. The most recent systematic review in 2019 included 22 RCTs in its analysis. Discordance with the levels of evidence and recommendations was identified. Although GRADE methodology is said to be robust for systematically evaluating evidence and developing recommendations, many studies were not identified in the Guideline. In contrast, the latest systematic review and meta-analysis provides robust evidence for supporting the use of LLLT in knee OA. The conflict between guidelines based on opinion and evidence based on meta-analysis is highlighted. Given the totality of the evidence, we recommend that the Australian Guideline should be updated immediately to reflect a "for" recommendation. Australia;Humans;Low-Level Light Therapy;Meta-Analysis as Topic;Osteoarthritis, Knee;Practice Guidelines as Topic;Randomized Controlled Trials as Topic;Systematic Reviews as Topic

Light-emitting diode photobiomodulation therapy for non-specific low back pain in working nurses: A single-center, double-blind, prospective, randomized controlled trial. BACKGROUND: Low back pain (LBP) affects approximately 51% to 57% of hospital nurses and nurses' aides in Europe. New high-risk groups include home- and long-term-care nurses and physiotherapists. A number of European countries are experiencing a shortage of healthcare workers. Light therapy has been shown to be an effective treatment for various musculoskeletal disorders, including lateral epicondylitis, temporomandibular joint pain, carpal tunnel syndrome, and delayed-onset muscle soreness. A systematic review and meta-analysis demonstrated that low-level laser therapy is an effective method for relieving non-specific chronic low back pain (NSCLBP). However, the efficacy of light-emitting diode (LED) therapy for NSCLBP is disputed. This study aims to evaluate the effect of LED therapy on NSCLBP. METHODS AND ANALYSIS: We conducted a prospective, double-blind, randomized placebo-controlled trial of 148 patients with NSCLBP. The patients were randomly assigned to 2 groups: intervention group, where patients received LED photobiomodulation therapy 3 times a week for 2 weeks, and the sham group, where patients had sham therapy 3 times a week for 2 weeks. Primary outcome measures included the visual analog scale for pain, lumbar active range of motion assessments, and chair-rising times. Secondary outcome measures included a multidimensional fatigue inventory, fear-avoidance beliefs questionnaire, and the Oswestry disability index. The outcome measures were assessed before therapy and 2weeks, 4 weeks, 8 weeks, 12 weeks, and 6 months after the first interventions were completed. DISCUSSION: This study is a prospective, single-center, double-blind, randomized, controlled study. This study aims to research

the efficacy of a 2-week LED program for NSCLBP working nurse. Our results will be useful for patients, working nurses, nurses' aides, and other healthcare workers with chronic low back pain. TRIAL REGISTRATION NUMBER: NCT04424823. Adolescent;Adult;Aged;Chronic Pain;Clinical Protocols;Double-Blind Method;Humans;Low Back Pain;Low-Level Light Therapy;Middle Aged;Nurses;Pain Management;Pain Measurement;Prospective Studies;Surveys and Questionnaires;Visual Analog Scale

The Effect of Conditioned Media From Human Adipocyte-Derived Mesenchymal Stem Cells on Androgenetic Alopecia After Nonablative Fractional Laser Treatment. BACKGROUND: The conditioned media from adipocyte-derived mesenchymal stem cells-conditioned media (ADSC-CM) contains cytokines and growth factors that stimulate hair regeneration. OBJECTIVE: We evaluated the efficacy and safety of human ADSC-CM treatment on patients who underwent nonablative fractional laser for the treatment of androgenetic alopecia (AGA). MATERIALS AND METHODS: Thirty patients who underwent nonablative fractional laser treatment were topically administered either ADSC-CM or placebo solution. As a primary outcome, phototrichograms were taken to measure changes in hair density at each visit. In addition, global improvement scores (GISs) were compared by clinical digital photographs, which were taken at the initial and final visits, and assessed by 2 independent dermatologists. Finally, the investigator's improvement score was measured by questionnaire response during the final visit. RESULTS: Hair density comparisons during the treatment period revealed that the ADSC-CM group had significantly higher final densities compared with the placebo group. The GIS of the ADSC-CM group was also significantly higher than the placebo group. Finally, no adverse effects associated with the application of ADSC-CM were noted during the study. CONCLUSION: The application of ADSC-CM after nonablative fractional laser treatment accelerated increases in hair density and volume in AGA patients. Culture Media, Conditioned;Placebos Adipose Tissue;Administration, Topical;Adult;Alopecia;Combined Modality Therapy;Culture Media, Conditioned;Double-Blind Method;Female;Hair;Humans;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Middle Aged;Photography;Placebos;Treatment Outcome;Young Adult

Effects of Dexamethasone and Photobiomodulation on Pain, Swelling, and Quality of Life After Buccal Fat Pad Removal: A Clinical Trial. PURPOSE: In this study we aimed to compare the effects of photobiomodulation (PBM) and dexamethasone (DXM) on pain, swelling, and the quality-of-life (QOL) of patients submitted to buccal fat pad removal. PATIENTS AND METHODS: A total of 20 patients with pseudoherniation of buccal fat pad were included in the present study. The patients were divided randomly into 2 groups: the PBM group (660Â nm, 100Â mW, 6Â seconds, 2Â J/cm(2)) and the DXM group (4Â mg every 8Â hours for 3Â days after the procedure). Pain levels were evaluated using a visual analog scale at days 2 and 4 after surgery, whereas the edema was evaluated by measuring the distance between 6 reference points: tragus, pogonion of the soft tissue, lateral eye commissure, the gonial angle, nose wing, and mouth commissure at days 2, 4, 7, 15, 30, 60, and 90. The QOL was evaluated using the Oral Health Impact Profile 14 questionnaire at days 2 and 4 after surgery. RESULTS: There were no differences between the PBM and DXM groups in pain or edema. In terms of the QOL, the PBM group was significantly more comfortable when chewing than the DXM group (PÂ <Â .05) CONCLUSION: The use of PBM at a power of 100Â mW and 2Â J/cm(2) per point had similar effects to oral DXM for the control of pain and edema, as well as in the QOL, except for masticatory function, which was significantly better in the PBM group. Dexamethasone Adipose Tissue;Dexamethasone;Edema;Humans;Low-Level Light Therapy;Mouth;Pain;Quality of Life

Combined effects of a topical fluoride treatment and 445 nm laser irradiation of enamel against a demineralization challenge: A light and electron microscopic ex vivo study. This study investigated the caries-preventive effect of 445 nm laser radiation in combination with fluoride on the prevention of white spot lesions. Previously, several studies have indicated the ability of 488 nm

argon ion laser irradiation to reduce early enamel demineralization. A diode laser (445 nm) could be an alternative technology for possible caries-preventive potential. Each sample of a group of seventeen caries-free bovine teeth was treated in four different ways on four different zones of the labial surface: control/no treatment (C), laser irradiation only (L) (0.3 W, 60 s and applied dose of 90 J/cm2), amine fluoride application only (10,000 ppm and pH 3.9) (F), and amine fluoride application followed by laser irradiation (FL). After treatment, the teeth were subjected to a demineralization solution (pH 4.3 for 48 h at 37 Â°C) to induce subsurface lesions. After sectioning, the teeth were examined by light microscopy. Three teeth were analyzed by scanning electron microscopy (SEM). The depths of the subsurface lesions in the C, L, F, and FL groups were 103.01 (Â± 13.04), 96.99 (Â± 14.51), 42.59 (Â± 17.13), and 24.35 (Â± 11.38) Î¼m, respectively. The pairwise group comparison showed the following results: $p < 0.001$ for FL versus C, FL versus L, F versus C, and F versus L, $p = 0.019$ for FL versus F and $p = 0.930$ for L versus C. The SEM micrographs support the light-microscopic examination. The results of the current study have shown that using relatively low irradiation settings of 445 nm laser on fluoridated enamel may be effective for prevention of white spot lesions. Fluorides, Topical;amine fluoride solution Animals;Cattle;Combined Modality Therapy;Dental Caries;Dental Enamel;Fluorides, Topical;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Tooth Demineralization

Photobiomodulation and Oral Mucositis: A Systematic Review. Oral mucositis (OM) is a debilitating complication of chemotherapy, and head and neck radiotherapy. In an effort to offer the best possible advice within the limitations of published research, a systematic review with an extended discussion and commentary on dosimetry and dose delivery is presented. Using keywords as listed, Pubmed, Google Scholar and Cochrane databases were searched during a period extending from 1995 to 2019. A total of 782 abstracts were identified. A total of 50 papers were analysed, and of these, 29 satisfied criteria required for systematic review in accordance with an optimized PRISMA statement. Clinical outcome as reported was subject to analysis with respect to time of intervention, incidence and severity of oral mucositis, and pain amelioration, and a comprehensive combined univariate and multivariate statistical analysis of the methods employed was performed. Recommendations are made with respect to the timing of the intervention. Moreover, there is an extended discussion available on the treatment care rationale of photobiomodulation (PBM), and its adjunctive association with OM. In conclusion, early prophylactic application offers clear advantages in clinical management. The many studies and associated variables and covariables assessed here revealed a choice of delivery techniques, associated wavelengths and many further indices to consider with regard to the accomplishment of optical parameters. It is therefore our recommendation that clinicians use PBM as a therapy with a full and proper understanding and training in order to optimise the clinical effects achievable.

Laser-assisted regenerative surgical therapy for peri-implantitis: A randomized controlled clinical trial. BACKGROUND: Different surgical approaches have been proposed to treat peri-implantitis defects with limited effectiveness and predictability. Laser has been proposed as an effective tool to assist in bacterial decontamination and modulating peri-implant tissue inflammation. The aim of this pilot clinical trial was to evaluate the adjunctive benefits of Er:YAG laser irradiation for regenerative surgical therapy of peri-implantitis-associated osseous defects. METHODS: Twenty-four patients diagnosed with peri-implantitis with a radiographic infrabony defect were randomized into two groups. Both test and control groups received the following treatment: open flap mechanical debridement, supracrestal implantoplasty, bone grafting using a mixture of human allograft with demineralized bone matrix human allograft putty, and then covered with acellular dermal matrix membrane. The only difference in the test group was the adjunctive use of Er:YAG laser to modulate and remove inflammatory tissue as well as to decontaminate the implant surface. Clinical

assessments, including pocket depth (PD), clinical attachment level (CAL), and gingival index (GI) were performed by calibrated masked examiners for up to 6 months following surgery. Standardized radiographs were also taken to evaluate linear bone gain and defect bone fill. Student t-tests were used to analyze those clinical parameters. RESULTS: Both groups showed significant reductions in PD, GI, and CAL gain overtime. The test group demonstrated significantly higher PD reductions at the site level compared to the control group (2.65 Â± 2.14 versus 1.85 Â± 1.71 mm; test versus control, P = 0.014). There were no statistical differences found in CAL gain (1.90 Â± 2.28 versus 1.47 Â± 1.76 mm; test versus control), GI reduction (-1.14 Â± 1.15 versus -1.04 Â± 0.89; test versus control), radiographic linear bone gain (1.27 Â± 1.14 versus 1.08 Â± 1.04 mm; test versus control) or proportional defect size reduction (- 24.46 Â± 19.00% versus -15.19 Â± 23.56%; test versus control). There was a positive trend for test patients on PD reduction and CAL gain found in narrow infrabony defects. Major membrane exposure negatively impaired the overall treatment outcome of CAL gain (2.47 Â± 1.84 versus 1.03 Â± 1.48 mm; no/minor versus major exposure, P = 0.051) and PD reduction in the test group (-3.63 Â± 2.11 versus -1.66 Â± 1.26 mm, P = 0.049). CONCLUSION: This pilot study indicated using laser irradiation during peri-implantitis regenerative therapy may aid in better probing PD reduction. Nonetheless, a larger sample size and longer follow-up is needed to confirm if Er:YAG laser irradiation provides additional clinical benefits for peri-implantitis regenerative therapy (Clinicaltrials.gov: NCT03127228). Humans;Laser Therapy;Low-Level Light Therapy;Peri-Implantitis;Periodontal Index;Pilot Projects;Treatment Outcome

Effect of low-level laser therapy on the inflammatory response in an experimental model of ventilator-induced lung injury. The effect of low-level laser therapy (LLLT) on an experimental model of ventilator-induced lung injury (VILI) was evaluated in this study. 24 adult Wistar rats were randomized into four groups: protective mechanical ventilation (PMV), PMV + laser, VILI and VILI + laser. The animals of the PMV and VILI groups were ventilated with tidal volumes of 6 and 35 ml kg-1, respectively, for 90 minutes. After the first 60 minutes of ventilation, the animals in the laser groups were irradiated (808 nm, 100 mW power density, 20 J cm-2 energy density, continuous emission mode, and exposure time of 5 s) and after 30 minutes of irradiation, the animals were euthanized. Lung samples were removed for morphological analysis, bronchoalveolar lavage (BAL) and real time quantitative polynucleotide chain reaction (RT-qPCR). The VILI group showed a greater acute lung injury (ALI) score with an increase in neutrophil infiltration, higher neutrophil count in the BAL fluid and greater cytokine mRNA expression compared to the PMV groups ($p < 0.05$). The VILI + laser group when compared to the VILI group showed a lower ALI score (0.35 Â± 0.08 vs. 0.54 Â± 0.13, $p < 0.05$), alveolar neutrophil infiltration (7.00 Â± 5.73 vs. 21.50 Â± 9.52, $p < 0.05$), total cell count (1.90 Â± 0.71 vs. 4.09 Â± 0.96 Ã— 105, $p < 0.05$) and neutrophil count in the BAL fluid (0.60 Â± 0.37 vs. 2.28 Â± 0.48 Ã— 105, $p < 0.05$). Moreover, LLLT induced a decrease in pro-inflammatory and an increase of anti-inflammatory mRNA levels compared to the VILI group ($p < 0.05$). In conclusion, LLLT was found to reduce the inflammatory response in an experimental model of VILI. Animals;Disease Models, Animal;Inflammation;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Ventilator-Induced Lung Injury

Kinesio taping and low-level laser therapy in breast cancer-related lymphedema in an arm with arteriovenous fistula for hemodialysis. Secondary lymphedema mainly occurs as a result of impairment or obstruction of the lymphatic system. Although complex decongestive therapy is recognized as the best management technique of lymphedema, we encounter various patient profiles in our clinical practice and may need to apply alternative treatment options. In this article, we report a 57-year-old female patient with breast cancer-related lymphedema and arteriovenous (AV) fistula for hemodialysis in the same arm. We performed low-level laser therapy treatment for 12 sessions, kinesio taping, and remedial exercises to the patient as the compression part of complex

decongestive therapy was contraindicated in the AV fistula. Self-manual lymphatic drainage training and skin care education were also given. The arm volume difference was decreased from 691 mL to 454 mL after the treatments. Low-level laser therapy and kinesio taping should be kept in mind as alternative techniques for appropriate cases in the treatment of lymphedema.

Photobiomodulation Therapy Effects on Resistance Training Volume and Discomfort in Well-Trained Adults: A Randomized, Double-Blind, Placebo-Controlled Trial. Objective: To investigate the effects of photobiomodulation therapy (PBMT) on resistance training volume and discomfort of well-trained adults. Background: PBMT has been used to attenuate fatigue in several physical exercise topics. However, it is unclear if PBMT can increase volume and reduce discomfort in resistance training well-trained individuals. Methods: Fourteen participants (womenâ€‰=â€‰7, 27.7â€‰Â±â€‰6.0 years and menâ€‰=â€‰7, 28.3â€‰Â±â€‰5.7 years) visited the laboratory three times, 7 days apart. In the first visit, 12-repetition maximum (12-RM) test was performed unilaterally on the standing calf raise machine. In the second and third visits, subjects were randomly submitted to a PBMT (60â€‰J per site, 6 sites per limb, total doseâ€‰=â€‰360â€‰J) or placebo treatment on the gastrocnemius and soleus muscles with a randomized crossover design. Five minutes after the treatment, subjects began the resistance training session, performed unilaterally with six sets of repetitions to concentric failure. In addition, the rate of perceived exertion for discomfort (RPE-D) was asked after each set. Results: After the training session, it was observed a similar force reduction of 10.0â€‰Â±â€‰13.6% for placebo and 7.7â€‰Â±â€‰7.3% for PBMT (pâ€‰=â€‰0.815). No differences between PBMT and placebo was observed for the repetitions fatigue index (53.4â€‰Â±â€‰11.7% and 50.0â€‰Â±â€‰11.6%; pâ€‰=â€‰0.325) and total repetitions volume (55.4â€‰Â±â€‰10.9 and 54.8â€‰Â±â€‰13.0 reps; pâ€‰=â€‰0.764), respectively. RPE-D presented large means for all sets representing a large discomfort during resistance training to concentric failure for both PBMT (7.3â€‰Â±â€‰2.3) and placebo (7.5â€‰Â±â€‰2.5). Conclusions: The PBMT was not effective for increasing volume and reducing discomfort during resistance training performed to concentric failure by well-trained men and women. Adult;Double-Blind Method;Exercise;Female;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Resistance Training

"In Loco" Gingival Papilla Regeneration with Photobiomodulation: Is Blood a Natural Biomaterial? Biocompatible Materials Biocompatible Materials;Gingiva;Regeneration

Effect of Photobiomodulation (Diode 810â€‰nm) on Long-Standing Neurosensory Alterations of the Inferior Alveolar Nerve: A Case Series Study. Objective: To evaluate and describe the results of photobiomodulation (PBM) therapy on the treatment of long-standing neurosensory inferior alveolar nerve (IAN) alterations after third molar extraction. Background: The use of PBM is an acceptable alternative method to improve the therapeutic outcomes of neural lesions. Materials and methods: Longitudinal case study research. Patients with >6 months of inferior alveolar neurosensory disturbance after third molar extraction were included. Fifteen laser sessions were done, irradiating intra- and extraoral points along the distribution of this nerve area. A semiconductor Ga,Al,As diode laser (Thor laser(Â®)) was used. Before and after the treatment, variables such as Zuniga-Essick score, British Medical Research Council (BRC) scale, visual analog scale (VAS), and mapping of the affected area were described. Gender, age, and duration of the lesion were analyzed. Descriptive statistical study was carried out with SPSS 19.0. Results: Eleven patients with a mean age of 38.5 years [standard deviation (SD) Â±15.22]. Average duration of the lesion was 13.2 (SD Â±4) months. The results obtained with the Zuniga-Essick scale before treatment showed mild alteration in 36.3% (4), moderate in 18.2% (2), and severe in 45.4% (5). After treatment, the percentage score improved, obtaining normality in 54.5% (6) of the patients and mild degree in 27.2% (3). In the BRC score, before the treatment, 45.4% (5) of grade S2+ and 27% (3) of S3 and S3+ were obtained. The final percentage

after treatment reached an improvement of S4 in a total of 36% (4) of cases and a recovery of S3+ in 54.5% (6). Reduction of the mapped altered area and an upturn of VAS were noted. Conclusions: The laser parameters and application protocol used result in subjective and objective improvement in mechanical sensory perception in long-standing neurosensory deficit in the IAN. Adult;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mandibular Nerve;Tooth Extraction;Treatment Outcome

Long-Term Follow-Up for Q-Switched Nd:YAG Treatment of Nevus of Ota: Are High Number of Treatments Really Required? A Case Report. Objective: Q-switched laser is considered a gold standard treatment for Nevus of Ota (NO). We report how few laser sessions in long intervals of time may achieve satisfying outcomes reducing the rate of possible procedure-linked side effects such as burning, cornea injuries, or hyperpigmentation. Background: NO represents a congenital dermal melanocytosis in the trigeminal distribution majorly occurring in Asian individuals. Multiple reports have shown efficacy and safety of Q-switched laser for the treatment of this condition, but they were based on an empiric regimen, often leading to unnecessary overtreatments. At the best of our knowledge, no long-term follow-up observations of single laser sessions have been conducted to assess the proper intervals and number of treatments. Materials and methods: A 36-year-old Asian woman, Fitzpatrick skin type IV with clinical diagnosis of NO, was treated with 1064â€‰nm 6 ns Q-switched laser one session per year for a total of two sessions. Clinical result was valued by two physicians independently using standardized and polarized light. No use of general anesthesia or sedation was needed in our experience. Corneal shields have been used. Results: After only two sessions of the Q-switched laser performed 1 year apart, the result was excellent with a 95% of clinical response. No side effect was observed. Conclusions: In our experience, Q-switched Nd:YAG laser is an effective treatment for NO with no necessity of high number of treatments. A larger population is needed to confirm this preliminary result. Adult;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus of Ota;Skin Neoplasms

Postconditioning With Red-Blue Light Therapy Improves Survival of Random Skin Flaps in a Rat Model. BACKGROUND: Random skin flap ischemic necrosis is a serious challenge in reconstructive surgery. Photobiomodulation is a noninvasive effective technique to improve microcirculation and neovascularization. Photobiomodulation with red or blue light has been separately proven to partially prevent skin flap necrosis, but the synergistic effect of red and blue light not been elucidated. Our experiment evaluated the impact of postconditioning with red-blue light therapy on the viability of random flaps. METHODS: Thirty Sprague-Dawley male rats (male, 12 weeks) with a cranially based random pattern skin flap (3 Ã— 8 cm) were divided into 3 groups: control group, red light group, and red-blue light group. On postoperative day 7, flap survival was observed and recorded using transparent graph paper, flaps were obtained and stained with hematoxylin and eosin, and microvessel density was measured. Micro-computed tomography was used to measure vascular volume and vascular length. On days 0, 3, and 7 after surgery, blood flow was measured by laser Doppler. To investigate the underlying mechanisms, the amount of nitric oxide (NO) metabolites in the flap tissue was assessed on days 3, 5, and 7 after surgery. RESULTS: The mean percentage of skin flap survival was 59 Â± 10% for the control group, 69 Â± 7% for the red light group, and 79 Â± 9% for the red-blue light group ($P < 0.01$). The microvessel density was 12.3 Â± 1.2/mm2 for the control group, 31.3 Â± 1.3/mm2 for the red light group, and 36.5 Â± 1.4/mm2 for the red-blue light group ($P < 0.01$). Both vascular volume and total length in the red-blue light group showed significantly increased compared with the red light and control group ($P < 0.01$). Blood flow in the red-blue light treated flap showed significantly increased at postsurgery days 3 and 7 compared with the red light and control group ($P < 0.01$). The level of the NO metabolites was significantly increased in flap tissues belonging to the red-blue light group compared with the other 2 groups ($P < 0.01$).

CONCLUSIONS: This study showed that postconditioning with red-blue light therapy can enhance the survival of random skin flap by improving angiogenesis and NO releasing. Animals;Graft Survival;Male;Necrosis;Phototherapy;Rats;Rats, Sprague-Dawley;Skin;X-Ray Microtomography

Effects of Mulligan Mobilization and Low-Level Laser Therapy on Physical Disability, Pain, and Range of Motion in Patients with Chronic Low Back Pain: A Pilot Randomized Controlled Trial. This study aimed to determine the combined treatment effects of Mulligan sustained natural apophyseal glides (SNAGs) and low-level laser therapy (LLLT) on function, pain, and range of motion (ROM) in patients with chronic low back pain. A total of 49 adults participated in this study and were randomly divided into three groups (SNAGs with LLLT group, SNAGs group, and control group). The participants in the SNAGs with LLLT group received SNAGs for 10 min, LLLT for 10 min, and electrotherapy for 10 min. The SNAGs group received SNAGs for 10 min and electrotherapy for 20 min. The control group received electrotherapy for 30 min. All participants received the assigned treatment for 30 min a day, 3 times a week, for 4 weeks. We used the visual analogue scale (VAS) to measure pain, the modified-modified Schober test (MMST) to measure ROM, and the Roland Morris disability questionnaire (RMDQ) to measure physical disability. Compared to the pre-intervention values, the VAS and MMST scores significantly increased after the intervention in the SNAGs with LLLT group ($p = 0.000$) and the SNAGs group ($p = 0.000$). The RMDQ score significantly improved in the SNAGs with LLLT ($p = 0.000$), SNAGs ($p = 0.000$) and control ($p = 0.025$) group after the intervention. The inter-group differences were greater for the SNAGs with LLLT and SNAGs groups than for the control group ($p = 0.001$), and the difference was greater for the SNAGs with LLLT than for the SNAGs ($p = 0.001$) with respect to the VAS, MMST, and RMDQ scores. These results indicate that significant improvement in pain, function, and ROM may be achieved by a combination of SNAGs and LLLT to treat chronic low back pain.

Early effect of laser irradiation in signaling pathways of diabetic rat submandibular salivary glands. Low-power laser irradiation (LPLI) is clinically used to modulate inflammation, proliferation and apoptosis. However, its molecular mechanisms are still not fully understood. This study aimed to describe the effects of LPLI upon inflammatory, apoptotic and proliferation markers in submandibular salivary glands (SMGs) in an experimental model of chronic disorder, 24h after one time irradiation. Diabetes was induced in rats by the injection of streptozotocin. After 29 days, these animals were treated with LPLI in the SMG area, and euthanized 24h after this irradiation. Treatment with LPLI significantly decreased diabetes-induced high mobility group box 1 (HMGB1) and tumor necrosis factor alpha (TNF-Î±) expression, while enhancing the activation of the transcriptional factor cAMP response element binding (CREB) protein. LPLI also reduced the expression of bax, a mitochondrial apoptotic marker, favoring the cell survival. These findings suggest that LPLI can hamper the state of chronic inflammation and favor homeostasis in diabetic rats SMGs. Creb1 protein, rat;Cyclic AMP Response Element-Binding Protein;HMGB1 Protein;Hbp1 protein, rat;NF-kappa B;RNA, Messenger;Tumor Necrosis Factor-alpha;Cyclic AMP;Mitogen-Activated Protein Kinases Animals;Apoptosis;Cyclic AMP;Cyclic AMP Response Element-Binding Protein;Diabetes Mellitus, Experimental;Female;HMGB1 Protein;Low-Level Light Therapy;Mitogen-Activated Protein Kinases;NF-kappa B;Phosphorylation;RNA, Messenger;Rats;Rats, Wistar;Signal Transduction;Submandibular Gland;Tumor Necrosis Factor-alpha

Q-switched 532â€‰nm Nd:YAG laser therapy for physiological lip hyperpigmentation: novel classification, efficacy, and safety. BACKGROUND: Physiological lip hyperpigmentation (PLH) is a common cosmetic concern in the Middle East and Asia. It is characterized by homogeneous symmetric diffuse hyperpigmentation affecting both lips. There is no satisfactory treatment for this condition. The aim of this study is to evaluate the efficacy and safety of Q-switched (QS) 532â€‰nm Nd:YAG laser for PLH. METHODS: A total of 30 patients with clinical diagnosis of PLH were retrospectively reviewed and included in the study. Patients underwent at least one laser treatment

using QS 532â€‰nm with a minimum follow up of six months. Laser parameters were as follows: spot size 2-3â€‰mm, pulse duration 20â€‰ns, fluence 2-4â€‰J/cm(2). One to three sessions were performed depending on clinical response. Two methods were used for assessment: patient satisfaction and independent physician assessment. PLH was classified as grade 1 (upper lip fully affected plus only border of lower lip), grade 2 (upper lip fully affected plus most of lower lip), and grade 3 (majority of both lips hyperpigmented). RESULTS: Excellent (>75% improvement) response was achieved in 30% of patients. Good (51-75% improvement) response was seen in 37% and 43% of patients according to patient satisfaction and independent physician assessment, respectively. Majority of patients required only one treatment session. Reactivation of herpes labialis occurred in two patients, and mottled hypopigmentation in three patients. None of the patients developed persistent hyperpigmentation or scarring. CONCLUSIONS: PLH can be effectively treated with QS 532â€‰nm Nd:YAG laser and is well tolerated by patients.
Humans;Hyperpigmentation;Laser Therapy;Lasers, Solid-State;Lip;Low-Level Light Therapy;Retrospective Studies;Treatment Outcome

Excimer laser/light treatment of alopecia areata: A systematic review and meta-analyses. BACKGROUND: The excimer laser/light (EL) has been reported to be effective for alopecia areata (AA), but its treatment response has not been systematically reviewed. OBJECTIVE: To determine the treatment response and safety of EL treatment of AA. METHODS: A comprehensive search of the Medline, EMBASE, Cochrane library, and Web of Science (from inception to December 31, 2018) was conducted to identify prospective clinical studies assessing the treatment response of EL for AA. The primary outcome was cosmetically acceptable hair regrowth (hair regrowth â‰¥75%); random-effects meta-analyses using generic inverse variance weighting were performed to estimate treatment responses. The study was registered with PROSPERO (CRD42019121092). RESULTS: Of 52 records initially identified, 13 full-text articles were finally assessed in terms of eligibility. A total of 9 prospective clinical studies (129 AA patients) including 5 controlled clinical trials were identified. Cosmetically acceptable hair regrowth was achieved in 50.2% (95% confidence interval 31.5%-68.9%; 8 studies). EL treatment significantly improved hair regrowth compared with untreated controls (relative risk 7.83; 95% confidence interval 2.11-29.11; 5 controlled clinical trials). No serious adverse effect was noted. CONCLUSIONS: EL treatment appeared to produce a favorable therapeutic response in AA patients. The use of EL should be encouraged for AA patients with the advantages of the non-invasiveness and no systemic effect. Alopecia Areata;Hair;Humans;Lasers, Excimer;Low-Level Light Therapy;Treatment Outcome

Effects of Photobiomodulation Therapy and Restriction of Wrist Extensor Blood Flow on Grip: Randomized Clinical Trial. Objective: To evaluate the influence of two different photobiomodulation therapy (PBMT) protocols (red 660â€‰nm vs. infrared 830â€‰nm) combined with a blood flow restriction (BFR) training protocol in wrist extensor muscles on handgrip, wrist extension force, and electromyographic behavior [root mean square (RMS)]. Background: PBMT has been widely used to increase muscle performance and recovery in recent clinical trials. However, there is no evidence whether PBMT (red and/or infrared) can promote better results when combined with BFR, a known method to induce better strength gains. Methods: This study was a randomized controlled trial including 58 volunteers allocated into four groups: (1) control (conventional strengthening), (2) BFR (strengthening with BFR), (3) 660â€‰nm (BFR strengthening with 660â€‰nm PBMT-35â€‰mW; 0.05â€‰cm(2); 2.10â€‰J, total energy 18.9â€‰J), and (4) 830â€‰nm (BFR strengthening with 830â€‰nm PBMT-32â€‰mW; 0.101â€‰cm(2); 1.92â€‰J, total energy 17.2â€‰J). Data were analyzed by using a mixed-effects model, with a 5% significance index. Results: A statistically significant increase was obtained for handgrip strength for the 660â€‰nm group [27.36â€‰Â±â€‰2.61 kilogram force (kgF)] compared with the 830â€‰nm

group (23.04â€‰Â±â€‰3.06 kgF) (pâ€‰=â€‰0.010) and for wrist extensor strength in the 660â€‰nm (7.77â€‰Â±â€‰0.58 kgF) and BFR (7.54â€‰Â±â€‰0.92 kgF) groups compared with the control group (5.33â€‰Â±â€‰0.61 kgF) (pâ€‰=â€‰0.001 and pâ€‰=â€‰0.004, respectively). The RMS value for the 660â€‰nm group was significantly higher than control (pâ€‰<â€‰0.0001), BFR (pâ€‰<â€‰0.0001), and the 830â€‰nm group (pâ€‰=â€‰0.0009). Conclusions: The association of PBMT (660â€‰nm) and BFR was effective for increasing handgrip strength of the wrist extensors, associated with an increase in RMS. Hand Strength;Humans;Low-Level Light Therapy;Muscle, Skeletal;Regional Blood Flow;Wrist

Neurite growth of trigeminal ganglion neurons in vitro with near-infrared light irradiation. Trigeminal ganglion (TG) neurons play an essential role in the sensory nerves of the face. Damaged TG neurons resulting from the accidental and non-intentional nerve lesions, commonly identified as neuropathic pain, which is known to cause intense pain and sensory abnormalities. For the treatment, surgical methods are conducted when the pharmacological treatment fails to provide satisfactory recovery. However, the process of surgery or drug intake can burden the patient or cause side effects. One of the logical choices of study becomes photobiomodulation (PBM) referred to as therapeutic approaches based on the interactions of visible or near-infrared (NIR) photons with biomolecules inside cells or tissues. In this study, we constructed a PBM illumination setup to stimulate the cultured primary TG neurons and compared the growth morphology between the non-irradiated control group and irradiation group with NIR laser of 808Â nm wavelength. In addition, we applied various radiant exposures of 1, 2, and 10Â J/cm(2) with different pulse frequencies of 1, 10, and 100Â Hz. We found that PBM could promote neurite growth of TG neurons, and it works at relatively low energy densities at 1 and 2Â J/cm(2). The irradiation group in the pulsed wave mode with the frequency of 10Â Hz was found to be the most effective when compared to other frequencies. Thus, PBM on TG neurons facilitated neuronal growth in vitro in a dose and frequency-dependent fashion. PBM may provide a potential therapeutic approach to treat damaged peripheral nerves. Animals;Cells, Cultured;Infrared Rays;Mice;Neurites;Neurons;Optical Imaging;Trigeminal Ganglion

Laser-photobiomodulation on experimental cancer pain model in Walker Tumor-256. CONTEXT: Cancer Pain is considered a common and significant clinical problem in malignant neoplasms, comprising 20% to 50% of all patients with tumor progression. Laser photobiomodulation (L-PBM) has been used in a multitude of pain events, ranging from acute trauma to chronic articular. However, L-PBM has never been tested in cancer pain. OBJECTIVES: Evaluate hyperalgesia, edema, COX-1, COX-2, IL-10, and Bdkrb1 mRNA in low-level laser irradiated Walker-256 tumor-bearing rats. METHODS: Rat hind paw injected with Walker Tumor-256 (W-256) and divided into six groups of 6 rats: G1 (control) - W-256 injected, G2- W-256â€¯+â€¯Nimesulide, G3- W-256â€¯+â€¯1â€¯J, G4- W-256â€¯+â€¯3â€¯Jand G5- W256â€¯+â€¯6â€¯J. Laser parameters: Î»â€¯=â€¯660â€¯nm, 3.57â€¯W/cm(2), Ã˜â€¯=â€¯0.028â€¯cm(2). Mechanical hyperalgesia was evaluated by Randall-Selitto test. Plethysmography measured edema; mRNA levels of COX-1, COX-2, IL-10, and Bdkrb1were analyzed. RESULTS: It was found that the W-256â€¯+â€¯1â€¯J group showed a decrease in paw edema, a significant reduction in pain threshold. Higher levels of IL-10 and lower levels of COX-2 and Bdkrb1 were observed. CONCLUSION: Results suggest that 1â€¯Jâ€¯L-PBM reduced the expression of COX-2 and Bdkrb1 and increasing IL-10 gene expression, promoting analgesia to close levels to nimesulide. Interleukin-10;Cyclooxygenase 1;Cyclooxygenase 2 Animals;Carcinoma 256, Walker;Cell Line, Tumor;Cyclooxygenase 1;Cyclooxygenase 2;Edema;Humans;Hyperalgesia;Interleukin-10;Lasers, Semiconductor;Low-Level Light Therapy;Male;Plethysmography;Rats;Rats, Wistar;Transplantation, Heterologous

Case series of corneal eye shield application for laser treatment of periocular port-wine stains in infancy. Corneal Injuries;Eye;Eye Protective Devices;Female;Humans;Infant;Infant, Newborn;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Radiation Injuries;Retrospective Studies

Taste and smell disturbances in cancer patients: a scoping review of available treatments. PURPOSE: Taste and smell disturbances in patients affected by cancer are very common, but often under-recognized symptoms. If not addressed properly, they may impact nutritional status, food enjoyment, and quality of life. Treatment tools available for clinicians to manage chemosensory alterations are limited and are often based on personal clinical experiences. The aim of this study was to assess current oncological and palliative care literature through a scoping review, in order to identify available treatments for taste and smell alterations in cancer patients. METHODS: Medline, Embase, CINAHL, ProQuest Dissertations and Theses, and Google Scholar were searched from inception until January 2020, with subject headings relevant to the domains of chemosensory alterations, palliative, and cancer care. A total of 10,718 English and French language publications were reviewed, yielding 43 articles on the researched topic. RESULTS: The heterogeneity of selected articles led to difficulties in interpretation and analysis of the available evidence. Included publications differed in study design, population sample, anticancer treatments, and measures of assessment for taste and smell disturbances. A broad variety of treatment options were described including zinc and polaprezinc, radio-protectors, vitamins and supplements, anti-xerostomia agents, active swallowing exercises, nutritional interventions, delta-9-tetrahydrocannabinol, and photobiomodulation. CONCLUSION: This scoping review identifies the current state of knowledge regarding chemosensory alterations within supportive cancer care. Despite not reaching firm conclusions, this article offers therapeutic venues to further explore in larger and more methodologically sound studies. Organometallic Compounds;Zinc Compounds;polaprezinc;Dronabinol;Carnosine;Selenium;Amifostine Adult;Amifostine;Carnosine;Dronabinol;Humans;Neoplasms;Nutritional Status;Olfaction Disorders;Organometallic Compounds;Palliative Care;Quality of Life;Selenium;Smell;Taste;Taste Disorders;Zinc Compounds

Synchrotron radiation soft X-ray microscopy and low energy X-ray fluorescence to reveal elemental changes in spermatozoa treated with photobiomodulation therapy. Male infertility is a worldwide clinical issue that increases the number of couples resorting to assisted reproductive technologies (ARTs) to achieve pregnancy. Photobiomodulation therapy (PBMT) is a promising technique that can biostimulate cells and tissues and it is currently successfully employed to enhance the sperm motility in vitro. Nevertheless, its use has been so far restricted to the research field. In the present work, we exploited two PBMT protocols at an 800 nm wavelength on sperm derived from infertile individuals, detecting an increase in sperm motility 1 hour after irradiation. Moreover, in order to add new information about the molecular effect of PBMT, the content of some light elements was evaluated using high resolution X-ray fluorescence imaging. Interestingly, an increase in Na content was detected in the irradiated samples, possibly suggesting a role of this element in sperm motility; indeed, a low Na content was previously correlated with a poor sperm quality, low semen volume, and modest fertilization rate. Amplifying the knowledge of PBMT in the ART field will expedite the translational potentiality of the PBMT use in clinical settings. Female;Humans;Low-Level Light Therapy;Male;Microscopy;Pregnancy;Sperm Motility;Spermatozoa;Synchrotrons;X-Rays

Effectiveness of photobiomodulation in the treatment of primary burning mouth syndrome-a systematic review and meta-analysis. To evaluate the effectiveness of photobiomodulation (PBM) on primary burning mouth syndrome (pBMS). We searched Chinese and English studies

published before February 10, 2020. The databases used include PubMed, EMBASE, the Cochrane Library, Web of Science, Wanfang Database, and China National Knowledge Infrastructure (CNKI). Randomized controlled clinical trials (RCTs) that used the PBM to treat pBMS and reported specific treatment outcomes were considered for inclusion. We eventually included 12 RCTs, and 574 samples were included in these studies. The primary outcomes investigated were pain reduction and life quality improvement. A meta-analysis performed on 9 groups in 5 trials showed that PBM was effective in reducing pain compared with placebo (MD -â€‰1.86, 95% CI -â€‰2.59 to -â€‰1.13, Zâ€‰=â€‰4.99, Pâ€‰<â€‰0.00001). Meta-analysis was also performed on 7 groups in 4 trials and showed that PBM was effective in improving life quality compared with placebo (MD -â€‰3.43, 95% CI -â€‰5.11 to -â€‰1.75, Zâ€‰=â€‰4.00, Pâ€‰<â€‰0.0001). Qualitative analysis of the included RCTs found that PBM might also play a role in the decrease of TNF-Î± and IL-6 in saliva. Three studies that compared PBM with medications were evaluated by descriptive analysis. None of the treatment-related adverse event was reported. Up to date, PBM appears to have an effect on pain reduction and life quality improvement in pBMS patients. However, more evidence is still required to warrant its efficacy and safety in treating pBMS. Placebos Burning Mouth Syndrome;China;Humans;Low-Level Light Therapy;Pain Management;Placebos;Publication Bias;Quality of Life;Randomized Controlled Trials as Topic;Risk;Treatment Outcome

Cutaneous Photoaging: A Notable Pattern of Distribution of Lentigines on the Face. Importance: Facial lentigines are a common patient complaint encountered in general and cosmetic dermatology practices. Lentigines are a marker of photoaging and understanding their distribution will provide insight into the aging process in order to better counsel patients. Objectives: To compare the relative distribution of lentigines in facial cosmetic subunits. Methods: We reviewed clinical photographs of patients receiving Alexandrite laser treatment for facial lentigines during the time period 11/1/2017-12/1/2018. Individual lentigines were plotted for each patient into one of 21 aesthetic units. A "heat map" was created to compare the relative density of these lesions. Results: Grouped peripheral cosmetic subunits contained more lentigines compared to grouped central cosmetic units. The mean number of lentigines in the central units was 0.60 and in the peripheral units was 0.85. This finding was statistically significant with a p value of 0.0001. J Drugs Dermatol. 2020;19(7): doi:10.36849/JDD.2020.5193. Adult;Aged;Aged, 80 and over;Cosmetic Techniques;Facial Dermatoses;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Skin Aging

Hypothalamic Hamartomas: A Comprehensive Review of Literature - Part 3: Updates on Radiotherapy Management. Hypothalamic hamartomas (HH) are rare, non-neoplastic heterotopic tissues which contains normal neurons and glia including oligodendrocytes and fibrillary astrocytes but in an abnormal distribution. They arise from the floor of the third ventricle, tuber cinereum, or mammillary bodies. Estimated incidence ranges from 1 in 50,000 to 1 in 1,000,000. Hypothalamic hamartomas are associated with different clinical presentations including various types of seizures, most characteristically; the gelastic seizures, precocious puberty, cognitive impairment and behavioral changes. In this review, the authors discuss the recent advancements in different modalities of radiotherapy and their application in hypothalamic hamartomas management. Brachytherapy;Hamartoma;Humans;Hypothalamic Diseases;Low-Level Light Therapy;Radiosurgery;Treatment Outcome

Photobiomodulation Therapy to Treat Facial Paralysis of 8 Years: Case Report. Background: Paralysis of the facial muscles produces functional and aesthetic disturbance that has a negative impact for the patient's quality of life. Objective: To evaluate the effects of a photobiomodulation (PBM) with low-level laser (LLL) on the treatment of a patient with 8 years of facial paralysis. Methods: PBM with two different wavelengths of LLL (660 and 808â€‰nm), applied only on the

affected side, three times a week for 8 consecutive weeks. Evaluations were performed before starting treatments, after the 12th session of treatment and after the 24th session, using the House-Brackmann scale and electroneuromyography. Results: The House-Brackmann and electroneuromyography tests showed improvements in the movement of the facial muscles when tested in the middle and at the end of the treatment with LLL. Conclusions: PBM with LLL at the wavelength of 660 and 808â€‰nm with the parameters used in this case report was an effective and noninvasive treatment for facial paralysis in this long-standing, chronic case of 8 years.
Adult;Chronic Disease;Electromyography;Facial Muscles;Facial Nerve;Facial Paralysis;Female;Humans;Low-Level Light Therapy;Movement;Time Factors

What Lies at the Heart of Photobiomodulation: Light, Cytochrome C Oxidase, and Nitric Oxide-Review of the Evidence. Objective: The underlying mechanisms of photobiomodulation (PBM) remain elusive. The most attractive hypotheses revolve around the role of cytochrome c oxidase (CCO) and cellular energetics. Background: No reliable demonstration of any PBM-related light-induced mechanistic effect on CCO has been reported. Studies on PBM have proven to be either nonreproducible, of questionable relevance, or involve wavelengths unlikely to be operative in vivo. The literature reveals very few demonstrable mechanistic light effects of any sort on CCO. Nitric oxide (NO) is involved in a number of the reported light effects on CCO. NO inhibits CCO at high reductive pressures by binding to the heme a(3) moiety. This complex is white light labile. Methods: The reported photolability of the heme-NO complex seems to be a prime target for PBM studies, as removal of inhibiting NO from the active site of CCO could restore normal activity to inhibited CCO. Another aspect of CCO-NO chemistry has been revealed that shows intriguing possibilities. Results: A novel nitrite reductase activity of solubilized mitochondria has been demonstrated attributable to CCO. NO production was optimal under hypoxic conditions. It was also found that 590â€‰nm irradiation increased NO production by enhancing NO release. The presence of cellular NO has usually been considered metabolically detrimental, but current thinking has expanded the importance and the physiological roles of NO. Evidence shows that NO production is likely to play a role in cardioprotection and defenses against hypoxic damage. Conclusions: Studies combining PBM and hypoxia also point to a connection between light irradiation, hypoxia protection, and NO production. This leads the authors to the possibility that the intrinsic nature of PBM involves the production of NO. The combination of CCO and hemoglobin/myoglobin NO production with photorelease of NO may constitute the heart of PBM.

Photobiomodulation therapy improves the growth factor and cytokine secretory profile in human type 2 diabetic fibroblasts. Impaired wound healing is a common complication of diabetes mellitus (DM) and the underlying mechanism of this impairment is still unclear. Fibroblast, as the main reconstructing cell, secretes some critical growth factors and cytokine contributing to wound healing. It is well known that DM alters the behavior of these cells and photobiomodulation therapy (PBMT) compensates some impairments in diabetic fibroblasts. Therefore, the aim of the present study was to demonstrate the impact of diabetes and the role of PBMT through low level laser irradiation on secretory profile of human diabetic fibroblasts. Primary human dermal fibroblasts from normal (HDFs) and diabetic (DHDFs) donors were harvested. For PBMT, the DHDFs were irradiated with a Helium-Neon laser at 632.8Â nm wavelength and energy density of 0.5Â J/cm(2), as laser treated group (LT-DHDFs). Next, some cellular behaviors and secretory profiling array for 60 growth factors/cytokines were investigated in LT-DHDFs and then compared with those of controls. The data showed that the PBMT could compensate such impairments occurred in DHDFs in terms of viability, proliferation, and migration. Furthermore, considering our novel findings, out of those 20 growth factors/cytokines involved in cell proliferation, immune system regulation, and cell-cell communication pathways, which significantly decreased in DHDF as compared with HDFs, the PBMT

could compensate seven in LT-DHDFs as compared with DHDFs. The seven growth factor/cytokines, which are mainly involved in cell-cell communication, positive regulation of cell proliferation, and chemokine mediated pathway included BDNF, Eotaxin-3, FGF6, FGF7, Fractalkine, fit-3ligand, and GCP-2. Therefore, it is suggested that scrutinizing these differentially secreted molecules and the impaired pathways in DHDFs, in combination with those compensated in LT-DHDFs, could raise our knowledge to manage diabetic ulcer through a feasible and cost effective intervention, specifically PBMT. Cytokines;Intercellular Signaling Peptides and Proteins Case-Control Studies;Cell Movement;Cell Proliferation;Cell Survival;Cells, Cultured;Cytokines;Diabetes Mellitus, Type 2;Fibroblasts;Humans;Intercellular Signaling Peptides and Proteins;Lasers, Gas;Male;Middle Aged

Photobiomodulation Therapy in Oral Mucositis and Potentially Malignant Oral Lesions: A Therapy Towards the Future. Photobiomodulation therapy (PBMT) is an effective treatment modality, which has the significant advantage of enhancing a patient's quality of life (QoL) by minimising the side effects of oral cancer treatments, as well as assisting in the management of potentially cancerous lesions. It is important to note that the major evidence-based documentation neither considers, nor tackles, the issues related to the impact of PBMT on tumour progression and on the downregulation of cellular proliferation improvement, by identifying the dose- and time-dependency. Moreover, little is known about the risk of this therapy and its safety when it is applied to the tumour, or the impact on the factor of QoL. The review aimed to address the benefits and limitations of PBMT in premalignant oral lesions, as well as the conflicting evidence concerning the relationship between tumour cell proliferation and the applied dose of photonic energy (fluence) in treating oral mucositis induced by head and neck cancer (H&N) treatments. The objective was to appraise the current concept of PBMT safety in the long-term, along with its latent impact on tumour reaction. This review highlighted the gap in the literature and broaden the knowledge of the current clinical evidence-based practice, and effectiveness, of PBMT in H&N oncology patients. As a result, the authors concluded that PBMT is a promising treatment modality. However, due to the heterogeneity of our data, it needs to undergo further testing in well-designed, long-term and randomised controlled trial studies, to evaluate it with diligent and impartial outcomes, and ensure laser irradiation's safety at the tumour site.

Postoperative Analgesic Effects of Laserpuncture and Meloxicam in Bitches Submitted to Ovariohysterectomy. BACKGROUND: This prospective, randomised and blind study investigated the efficacy of laserpuncture for postoperative pain management in dogs. METHOD: Sixteen bitches were sedated with acepromazine and randomly treated before ovariohysterectomy with meloxicam 0.2 mgÂ·kg(-1) intramuscular or laserpuncture (wavelength 904 mm, frequency 124 Hz, potency 10 Joules, 100 s in each acupoint). Anaesthesia was performed with propofol, isoflurane/O(2), and fentanyl. The Glasgow Composite Measure Pain Scale (GCMPS) and Dynamic Interactive Visual Analog Scale (DIVAS) were used to evaluate postoperative pain before and for 24 h after surgery. Morphine was administrated as rescue analgesia when pain scores were â‰¥3.33 (GCMPS). Differences between treatments, time points, and amount of rescue analgesia between groups were investigated by the Mann-Whitney test and the area under the curve (AUC) for GCMPS, Friedman, and Chi-squared tests, respectively ($p < 0.05$). RESULTS: Dogs treated with laserpuncture presented lower GCMPS AUC for 24 h and lower GCMPS scores at 2 and 4 h postoperatively ($p = 0.04$). Three dogs treated with meloxicam required postoperatively rescue analgesia against none treated with laserpuncture. CONCLUSIONS: In this preliminary study, laserpuncture mitigated postoperative pain in dogs following ovariohysterectomy, and the technique is a promising adjunct to perioperative pain management in dogs undergoing soft tissue surgery.

Laser irradiation activates spinal adenosine A1 receptor to alleviate osteoarthritis pain in monosodium iodoacetate injected rats. The analgesic role of the adenosine A1 receptor is

thought to involve the modulation of the spinal N-methyl D-aspartate receptor-mediated nociceptive pathway, which is suggested to be an underlying mechanism in chronic pain. Knee osteoarthritis is a degenerative condition accompanied by chronic pain. We have demonstrated that 10.6-Î¼m laser irradiation has an antinociceptive effect in the monosodium iodoacetate -induced knee osteoarthritis in rats. However, its mechanism of action has yet to be explored. In the present work, we investigate the mechanism of 10.6-Î¼m laser irradiation mediated antinociception in the monosodium iodoacetate -induced knee osteoarthritis. Results showed that the 10.6-Î¼m laser significantly reversed the monosodium iodoacetate -induced nociceptive behaviors for up to 28 days. Moreover, the up-regulation of the A1 receptor and the down-regulated phosphorylation of the N-methyl D-aspartate receptor 1 subunit of the N-methyl D-aspartate receptor were observed in the spinal cord dorsal horn in the monosodium iodoacetate injected rats treated by laser irradiation. Intrathecal injection of 8-cyclopentyl-1,3-dipropylxanthine markedly reversed the effects of laser irradiation, as evidenced both by behavioral pain tests and by levels of spinal phosphorylation of N-methyl D-aspartate receptor 1. These results suggest that the spinal A1 receptor contributes to the antinociceptive effects of 10.6-Î¼m laser, at least in part by inhibiting phosphorylation of N-methyl D-aspartate receptor 1 in the monosodium iodoacetate -induced knee osteoarthritis pain. Alkylating Agents;NR1 NMDA receptor;Receptor, Adenosine A1;Receptors, N-Methyl-D-Aspartate;Iodoacetic Acid Alkylating Agents;Analgesia;Animals;Behavior, Animal;Disease Models, Animal;Gene Expression Regulation;Iodoacetic Acid;Low-Level Light Therapy;Male;Musculoskeletal Pain;Nociception;Osteoarthritis, Knee;Rats;Rats, Sprague-Dawley;Receptor, Adenosine A1;Receptors, N-Methyl-D-Aspartate;Spinal Cord Dorsal Horn

Low-level light therapy using a helmet-type device for the treatment of androgenetic alopecia: A 16-week, multicenter, randomized, double-blind, sham device-controlled trial. INTRODUCTION: Androgenetic alopecia is the most common form of hair loss in both sexes. In recent studies, low-level light therapy (LLLT) has been established as an effective treatment for alopecia. The purpose of this study was to evaluate the safety and efficacy of LLLT using a new helmet-type device for the treatment of androgenetic alopecia. METHOD: A randomized, sham device-controlled, double-blind clinical trial was conducted at 2 institutions. Sixty participants diagnosed with androgenetic alopecia aged from 19 to 65 years were recruited. LLLT was performed through a helmet-type device that emitted light with a mean output power of 2.36â€ŠmW/cm at a wavelength of 655â€Šnm. Participants were divided into 2 groups, which respectively used the experimental device and a sham device. After tattooing at the central point of the vertex, phototrichograms at that point were obtained at 0, 8, and 16 weeks. The primary endpoint of the study was the difference in the rate of change of hair density between the test group and the control group. RESULTS: Comparing the results at baseline and week 16, the experimental group showed an increase in hair density of 41.90â€Šhairs/cm and an increase in hair thickness of 7.50â€Šμm, whereas the control group showed an increase of 0.72â€Šhairs/cm and a decrease of 15.03â€Šμm, respectively (Pâ€Š<â€Š.001). No adverse events or side effects occurred. CONCLUSION: LLLT showed a significant effect on increasing hair density in patients with androgenetic alopecia. LLLT could be a safe and effective treatment for androgenetic alopecia in both sexes. Placebos Adult;Aged;Alopecia;Double-Blind Method;Equipment Design;Female;Head Protective Devices;Humans;Low-Level Light Therapy;Male;Middle Aged;Placebos;Treatment Outcome

Female pattern hair loss: A comprehensive review. Female pattern hair loss is a common form of hair loss in women that increases in incidence with age. The etiology is unknown with numerous factors identified that influence its onset. Female pattern hair loss may be viewed as a marker for an increased risk of cardiovascular and metabolic disease. New treatments include microneedling, low-level laser therapy, and autologous fat transfer. This article focuses on the pathophysiology,

diagnosis, systemic associations, and current treatments for female pattern hair loss, which is the most common cause of alopecia in women. Alopecia;Female;Humans;Low-Level Light Therapy;Transplantation, Autologous
Combined effects of photobiomodulation and curcumin on mast cells and wound strength in wound healing of streptozotocin-induced diabetes in rats. We investigated the probable involvement of mast cell degranulation and their numbers in the remodeling step of wound healing in a diabetic ischemic skin wound model treated with photobiomodulation plus curcumin. A total of 108 adult male Wistar rats were randomized into one healthy control and five diabetic groups. Type I diabetes was inflicted in 90 of the 108 rats. After 1 month, an excisional wound was generated in each of the 108 rats. There were one healthy group (group 1) and five diabetic groups as follows: group 2 was the untreated diabetic control group and group 3 rats were treated with sesame oil. Rats in group 4 were treated with photobiomodulation (890 nm, 890 Â± 10 nm, 80 Hz, 0.2 J/cm(2)) and those in group 5 received curcumin dissolved in sesame oil. Group 6 rats were treated with photobiomodulation and curcumin. We conducted stereological and tensiometric tests on days 4, 7, and 15 after treatment. The results indicated that photobiomodulation significantly improved wound strength in the diabetic rats and significantly decreased the total numbers of mast cells. The diabetic control group had significantly reduced tensiometric properties of the healing wounds and a significant increase in the total numbers of mast cells. Photobiomodulation significantly improved the healing process in diabetic animals and significantly decreased the total number of mast cells. The increased numbers of mast cells in the diabetic control group negatively affected tensiometric properties of the ischemic skin wound. Curcumin Animals;Biomechanical Phenomena;Cell Count;Cell Degranulation;Curcumin;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Mast Cells;Rats, Wistar;Stress, Mechanical;Wound Healing;Rats
Impact of pandemic COVID-19 outbreak on oral mucositis preventive and treatment protocols: new perspectives for extraoral photobiomodulation therapy. This communication discusses the current challenges of oral mucositis (OM) management during the pandemic COVID-19 outbreak and reflects about an extraoral photobiomodulation protocol as an optimal alternative for preventing and treating OM in advanced cancer patients while minimizing the risk of infection by avoiding intraoral manipulation. Antineoplastic Agents Antineoplastic Agents;Betacoronavirus;COVID-19;Clinical Protocols;Coronavirus Infections;Disease Outbreaks;Humans;Low-Level Light Therapy;Neoplasms;Pandemics;Pneumonia, Viral;SARS-CoV-2;Stomatitis
Comparative Effect of Low-intensity Laser Radiation in Green and Red Spectral Regions on Functional Characteristics of Sturgeon Sperm. A comparative study of the effect of low-intensity laser radiation in green (Î»Â =Â 532Â nm) and red (Î»Â =Â 632.8Â nm) spectral regions at equal average irradiance (3Â mWÂ cm(-2)) on functional characteristics of Siberian sturgeon spermatozoa is carried out. Confirmation of the photobiomodulation effect of the radiation is obtained by analyzing spermatozoa motility, percentage of motile spermatozoa and fertilization rate. It is shown that, depending on the energy dose, the laser radiation in red and green spectral regions can have both stimulatory and inhibitory effects on spermatozoa motility. Contrary to popular belief that the short-wavelength radiation has great prospects in reproductive biotechnologies (due to more efficient absorption of radiation by cellular chromophores and increased generation of ROS), convincing evidence of a more pronounced stimulatory effect of radiation in the red spectral region was obtained. For the first time, metal-free porphyrins capable of acting as endogenous photosensitizers generating ROS were detected and identified in animal sperm. Using luminol-dependent chemiluminescence, it is shown that the increased production of ROS capable of exerting an inhibitory effect on biological systems at high concentrations is among the possible reasons for reduction in the stimulatory effect of radiation when moving from red to green spectral region.

Reactive Oxygen Species Animals;Dose-Response Relationship, Radiation;Fishes;Lasers;Male;Reactive Oxygen Species;Spectrum Analysis;Spermatozoa

Low-level laser therapy effectiveness in reducing initial orthodontic archwire placement pain in premolars extraction cases: a single-blind, placebo-controlled, randomized clinical trial. BACKGROUND: The objective of this randomized clinical trial was to evaluate Low-Level Laser Therapy (LLLT) effectiveness in spontaneous and chewing pain reduction following initial orthodontic archwire placement. METHODS: 26 patients (mean age 20.07â€‰Â±â€‰3.13â€‰years) with maxillary Little's Irregularity Index (LII) of 7â€‰mm or more that indicates first maxillary premolars extraction and no medications intake were eligible for this trial. Patients were randomly assigned with 1:1 ratio using simple randomization technique to receive either LLL or placebo treatment. Blinding was applicable for patients only. In the laser group, patients received a single LLL dose (wavelength 830â€‰nm, energy 2â€‰J/point) in four points (2 buccal, 2 palatal) for each maxillary anterior tooth root. Patients in the placebo group had the same laser application procedure without emitting the laser beam. Patients were asked to score spontaneous and chewing pain intensity by filling out a questionnaire with a 100-mm Visual Analogue Scale (VAS) after 1, 6, 24, 48, and 72â€‰h of treatment application. Independent t-test was used to compare the mean pain scores between the laser and placebo groups for both spontaneous and chewing pain at each studied time point. RESULTS: No dropout occurred so the results of the 26 patients were statistically analyzed. Despite some clinical differences observed between the two groups, no statistical significance was found for each studied time point (pÂ >â€‰0.05) for both spontaneous and chewing pain except after 72â€‰h for chewing pain with a VAS score of (18.84â€‰Â±â€‰13.44) mm for the laser group compared to (38.15â€‰Â±â€‰27.06) mm for the placebo group. CONCLUSIONS: LLLT, with the suggested parameters, is not effective in pain reduction following initial orthodontic archwire placement. TRIAL REGISTRATION: Name of the registry: Clinicaltrials.gov Trial registration number: NCT02568436. Date of registration: 26 September 2015 'Retrospectively registered'.
Adolescent;Adult;Bicuspid;Humans;Low-Level Light Therapy;Orthodontic Wires;Pain;Retrospective Studies;Single-Blind Method;Young Adult

Photobiomodulation therapy does not decrease pain and disability in people with non-specific low back pain: a systematic review. QUESTION: In people with non-specific low back pain (LBP), what are the effects of photobiomodulation therapy (PBMT) on pain, disability and other outcomes when compared with no intervention, sham PBMT and other treatments, and when used as an adjunct to other treatments? DESIGN: Systematic review of randomised trials with meta-analysis. PARTICIPANTS: People with acute/subacute or chronic non-specific LBP. INTERVENTIONS: Any type of PBMT (laser class I, II and III and light-emitting diodes) compared with no treatment, sham PBMT and other types of treatment, or used as an adjunct to another treatment. OUTCOME MEASURES: Pain intensity, disability, overall improvement, quality of life, work absence and adverse effects. RESULTS: Twelve randomised controlled trials were included (pooled nÂ = 1,046). Most trials had low risk of bias. Compared with sham PBMT, the effect of PBMT on pain and disability was clinically unimportant in people with acute/subacute or chronic LBP. In people with chronic LBP, there was no clinically important difference between the effect of PBMT and the effect of exercise on pain or disability. Although benefits were observed on some other outcomes, these estimates were imprecise and/or based on low-quality evidence. PBMT was estimated to reduce pain (MDÂ -11.20, 95% CIÂ -20.92 toÂ -1.48) and disability (MDÂ -11.90, 95% CIÂ -17.37 toÂ -6.43) more than ultrasound, but these confidence intervals showed important uncertainty about whether the differences in effect were worthwhile or trivial. Conversely, PBMT was estimated to reduce pain (MD 19.00, 95% CI 9.49 to 28.51) and disability (MD 17.40, 95% CI 8.60 to 26.20) less than Tecar (Energy Transfer Capacitive and Resistive) therapy, with marginal uncertainty that these differences in effect were worthwhile.

CONCLUSION: Current evidence does not support the use of PBMT to decrease pain and disability in people with non-specific LBP. REGISTRATION: CRD42018088242. Disability Evaluation;Humans;Low Back Pain;Pain Management;Pain Measurement;Phototherapy;Quality of Life;Randomized Controlled Trials as Topic

A randomized blinded retrospective study: the combined use of micro-needling technique, low-level laser therapy and autologous non-activated platelet-rich plasma improves hair re-growth in patients with androgenic alopecia. INTRODUCTION: Mini-invasive therapies based on autologous non-activated Platelet-Rich Plasma (ANA-PRP), Low-Level Laser Therapy (LLL-T), and Micro-Needling Technique (MN-T) used in combining for hair re-growth need to be standardized. OBJECTIVES: The work aims to show in vivo outcomes resulted from retrospective case-series study in which ANA-PRP + MN-T +Â LLL-T were used in combined in patients affected by Androgenic alopecia. METHODS: 23 patients were treated, of which 13 males were classified in stage I-V by the Norwood-Hamilton scale, and 10 females were classified in stage I-III by the Ludwig scale. Assessment of hair re-growth was evaluated with photography, physician's and patient's global assessment scale, and standardized phototrichograms during a follow-up: T0 - baseline, T1 - 12Â weeks, T2 - 23Â weeks, T3 - 44Â weeks, T4 - 58Â weeks. RESULTS: Interesting outcomes represented by a hair density increase of 81Â Â±Â 5 hairs/cm(2) and 57Â Â±Â 7 hairs/cm(2) respectively at T1 and T2 compared with baseline (173Â Â±Â 5 hairs/cm(2) at T1 and 149Â Â±Â 9 hairs/cm(2) at T2 versus 92Â Â±Â 2 hairs/cm(2) at baseline) were observed using computerized trichograms. EXPERT OPINION: The main limitation in the autologous regenerative therapies and biotechnologies in hair-regrowth is the extreme variability of PRP products used, in the absence of standardized protocols and widely shared. Appropriate PRP preparations have to be pick after carefully thinking about their bio-molecular specifications and intended indications for use in patients. This approach will aid in matching the optimal PRP product to specific patient factors, leading to improved outcomes and the elucidation of the cost-effectiveness of this treatment. The combined use of biotechnologies as the association of PRP with micro-needling and low-level laser therapy may improve the results in terms of hair count and hair density compared with those obtained by alone PRP. All the procedures must be performed in the full respect of international and local rules. CONCLUSIONS: The effect of the combined use of MN-T, LLL-T, and ANA-PRP has been demonstrated. Adult;Aged;Alopecia;Female;Hair;Humans;Light;Low-Level Light Therapy;Male;Middle Aged;Platelet-Rich Plasma;Randomized Controlled Trials as Topic;Regenerative Medicine;Retrospective Studies;Severity of Illness Index;Transplantation, Autologous;Young Adult

Optimization of Photobiomodulation Protocol for Chemotherapy-Induced Mucositis in Pediatric Patients. Objective: To determine optimal settings of a specific diode laser for reducing the severity of oral mucositis (OM) in pediatric patients. Background: Photobiomodulation (PBM) has been reported to reduce the severity of chemotherapy-induced OM. Treatment parameters for PBM are difficult to determine due to different reports in the literature. Materials and methods: Patients with OM graded WHO 3 or 4 were randomly assigned to three groups with different laser settings (group A: power 250â€‰mW, the energy density 8.8 and 15.5â€‰J/cm(2) for WHO grade 3 and 4, respectively; group B: power 500â€‰mW, energy density as in group A; group C: power 250â€‰mW, energy density was half of groups A and B). PBM was performed on all lesion areas. The mean number of PBM sessions to a decrease from WHO 3 or 4 to WHO 2, 1, or 0 was calculated for each patient. Multiple linear regression was used to determine whether the test groups differed in the mean number of sessions to a decrease of OM. Results: The mean number of PBM sessions to reduce from severe mucositis to mild or no mucositis was 3.8 [standard deviation (SD)â€‰=â€‰3.5] in group A, 4.4 (SDâ€‰=â€‰2.3) in group B, and 4.0 (SDâ€‰=â€‰2.7) in group C. The differences in the number of PBM sessions for OM severity decrease were not statistically significantly different

among the three study groups. Conclusions: Because of the lack of statistically significant differences between the groups, more patient practical laser parameters could be applied, that is, a shorter irradiation time. Antineoplastic Agents Adolescent;Antineoplastic Agents;Child;Child, Preschool;Clinical Protocols;Female;Humans;Low-Level Light Therapy;Male;Neoplasms;Stomatitis

Comparison of the Effects of Photobiomodulation with Different Lasers on Orthodontic Movement and Reduction of the Treatment Time with Fixed Appliances in Novel Scientific Reports: A Systematic Review with Meta-Analysis. Background: The duration of orthodontic treatment is one of the most important aspects considered by patients. Photobiomodulation (PBM) depends upon the exposure of the tissue to particular, therapeutic wavelengths of light in the "therapeutic window" (from 600 to 1200â€‰nm). PBM increases cell metabolism, which leads to higher ATP production. Increasing the amount of ATP in well-vascularized bone cells promotes cell proliferation and differentiation, creating a favorable environment for tooth movement. Objective: The aim of the study is to discuss and compare the use of PBM in accelerating the orthodontic movement and reducing the time of treatment. Materials and methods: A systematic review was conducted. Literature searches were performed using Medline (PubMed), Web of Science, and Scopus (from September 13 to September 20, 2019). The quality assessment was performed using the Jadad scale for reporting randomized controlled trials for randomized clinical trial and randomized control clinical trial studies, and the Newcastle/Ottawa Quality Assessment Form for case/control studies. Results: Thirty-three articles from PubMed, 46 from Scopus, 5 from Web of Science were selected. After removal of duplicates, 82 articles were analyzed. Subsequently, 74 articles were excluded because they did not meet the inclusion criteria. The remaining eight articles were included in the qualitative synthesis. Conclusions and summary: PBM is an efficient, effective, and noninvasive method to accelerate orthodontic tooth movement. PBM should be introduced into the daily practice of treating various malocclusions as an additional procedure. Intraoral application gives better results and its introduction to treatment seems more reasonable. Humans;Laser Therapy;Low-Level Light Therapy;Orthodontic Appliances, Fixed;Time Factors;Tooth Movement Techniques

Corrigendum: Photobiomodulation preconditioning prevents cognitive impairment in a neonatal rat model of hypoxia-ischemia.

Fluid Movement in the Apical Area Beyond the Ledge During Er:YAG Laser-Activated Irrigation: A Particle Image Velocimetry Analysis. Objective: This study aimed to examine the irrigant flow generated by laser-activated irrigation (LAI), in comparison with ultrasonic-activated irrigation (UAI) and syringe irrigation (SI), in the area beyond the ledge using particle image velocimetry (PIV). Background data: There was no reported study about cleaning efficacy of LAI beyond the ledge. Materials and methods: Forty-nine J-shaped root canal models (40Â° curvature) were instrumented to no. 35/0.06, and a ledge, 2.5â€‰mm deep, was created with no. 60/0.08 instrument at 5â€‰mm from the apical foramen in each canal. The samples were irrigated with LAI [30â€‰mJ/5 pulse per second (pps), 30â€‰mJ/10 pps, 30â€‰mJ/20 pps, 50â€‰mJ/10 pps, 70â€‰mJ/10 pps], UAI, and SI with a tip/needle insertion depth of 5â€‰mm from the apical foramen (nâ€‰=â€‰7). PIV was performed with glass beads and a high-speed camera. Velocities were compared in the coronal and apical areas to the ledge, respectively. Results: In the apical area, all LAI groups and UAI produced a higher velocity than that of SI, and LAI at 30â€‰mJ/20 pps and 70â€‰mJ/10 pps showed significantly higher velocity than that of UAI (pâ€‰<â€‰0.05). In the coronal area, LAI at 30â€‰mJ/20 pps generated a significantly higher velocity than that of UAI and SI (pâ€‰<â€‰0.05). Velocity was significantly slower in the apical area than in the coronal area in UAI and SI (pâ€‰<â€‰0.05), but was similar between both areas in LAI except at 30â€‰mJ/20 pps. Conclusions: Among tested laser settings, higher velocity was significantly achieved by LAI at 30â€‰mJ/20 pps and 70â€‰mJ/10 pps compared with UAI in the canal area beyond the ledge. SI

generated lower fluid movement than LAI and UAI in both canal regions. Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Rheology;Root Canal Preparation;Therapeutic Irrigation;Tooth Apex

Systemic Effects of Photobiomodulation on the Morphology of the Thyroid and Sublingual Glands: A Study in Rabbits. Objective: To investigate whether photobiomodulation (PBM) applied in a clinical situation with the purpose of improving the healing process of implants placed in the rabbit mandible would cause any morphological change in the thyroid and sublingual glands as a systemic effect of laser irradiation. Methods: Thirty-two New Zealand rabbits were randomly divided into four groups of eight animals each, one control group (CI, nonirradiated animals) and three experimental groups (EI, EII, and EIII) that received PBM postoperatively with an aluminum/gallium/arsenide laser diode (Theralase(Â®)) at a wavelength of 830â€‰nm (infrared) and 50â€‰mW output power applied to two irradiation fields per session, for a total of seven sessions. All rabbits underwent surgical extraction of the mandibular left incisor, followed by immediate placement of an osseointegrated implant in the fresh socket. The experimental groups EI, EII, and EIII received PBM at an energy density of 5, 2.5, and 10â€‰J/cm(2), respectively, per irradiation field. Results: There was no histomorphometric change in any of the groups. Conclusions: PBM, based on the irradiation protocol used in this study, does not cause morphological changes in the thyroid and sublingual glands when used to stimulate peri-implant bone healing in the rabbit mandible. Dental Implants Animals;Bone-Implant Interface;Dental Implantation;Dental Implants;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Rabbits;Sublingual Gland;Thyroid Gland;Wound Healing

Photobiomodulation in oral mucositis in patients with head and neck cancer: a systematic review and meta-analysis followed by a cost-effectiveness analysis. BACKGROUND: Oral mucositis (OM) is an oral toxicity caused by cancer treatment, found often in patients with head and neck cancer. Low-intensity laser therapy for OM has anti-inflammatory, analgesic, and tissue reparative properties. OBJECTIVE: The objective of this work is to perform a systematic review and meta-analysis of the randomized clinical trials of OM laser therapy in patients undergoing treatment for head and neck cancers, followed by a cost-effectiveness analysis of the therapy. METHOD: The search terms, mucositis and phototherapy, laser therapy and mucositis, photobiomodulation and mucositis, and low-level laser therapy and mucositis, were used to search the databases of PubMed, Web of Science, and MEDLINE. Randomized clinical trials were divided into two groups: one treated with laser therapy and the other given a placebo. Only 13 studies were included in the systematic review, and 6 studies in the meta-analysis. RESULTS: The results of the systematic review and meta-analysis show that the laser therapy presented good results in clinical improvement and pain reduction, decreasing the patients' likelihood of developing OM, with degrees of debilitating lesions, to 64% (RRâ€‰=â€‰0.36 [95% CIâ€‰=â€‰0.29-0.44]). The cost-effectiveness analysis revealed an incremental cost of R$ 3687.53 for the laser group, with an incremental effectiveness of 132.2. The incremental cost-effectiveness ratio (ICER) was 27.89, for the severe OM cases that were avoided. CONCLUSION: It was concluded, therefore, that photobiomodulation for OM in patients receiving head and neck cancer treatment was clinically effective and cost-effective. Cost-Benefit Analysis;Head and Neck Neoplasms;Humans;Laser Therapy;Phototherapy;Radiation Injuries;Randomized Controlled Trials as Topic;Stomatitis

Chronic oral graft-versus-host disease: induction and maintenance therapy with photobiomodulation therapy. This study presents follow-up of a prior study of patients with chronic symptomatic oral chronic graft-versus-host-disease (cGVHD) managed with photobiomodulation therapy (PBM therapy for 1Â month. Here, we report long-term follow-up of a series of patients where PBM therapy in patients with oral cGVHD for maintenance follows the initial period of PBM therapy for continuing

management. PATIENTS AND METHODS: We report continuing follow-up of 7 cases of oral cGVHD that were treated with PBM therapy. PBM therapy was continued in these patients with the goal of determining the best management schedule of PBM to maintain or improve control of each patient's symptoms and signs of oral cGVHD. RESULTS: Oral sensitivity and mucosal changes of cGVHD were controlled with a continuing schedule of PBM therapy of up to 6-8-week treatment intervals in patients with continuing GVHD. These findings suggest that PBM therapy represents an additional approach for continuing management of oral cGVHD and that the frequency of treatment should be individualized for each patient to provide best control of oral findings. In one case weekly PBM treatment was continued, while in others, management on a monthly or bimonthly basis was associated with control of the oral condition. PBM may be individualized and provided based upon best control of the symptoms and signs of oral GVHD. Adolescent;Adult;Aged;Chronic Disease;Female;Graft vs Host Disease;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases

Laser therapy as treatment for oral paresthesia arising from mandibular third molar extraction. Oral paresthesia is a localized condition of sensory abnormality that occurs in the presence of injury in one of the nerves in the region after certain dental procedures. The aim of this study was to present a case report of a patient who received low-level laser therapy as treatment for inferior alveolar nerve paresthesia due to mandibular third molar extraction surgery. A 25-year-old female patient reported lack of sensitivity for 6 months in various regions of the bucomaxillofacial complex after surgery. Laser therapy (808 Â± 10nm, 100 mW, 3J per point and 30 seconds per point) was indicated twice a week. The degree of sensitivity was evaluated using a Visual Analog Scale (VAS) and with the aid of a microbrush. Prior to laser therapy, the patient reported VAS = 10, i.e., total lack of sensitivity. After 72 hours of the first session, the patient reported improvement of sensitivity in the chin (VAS = 5) and oral regions (VAS = 5), reporting recovery of sensitivity and that the area of paresthesia decreased. After 8 sessions, the patient reported total recovery of sensitivity in the chin, oral and gum regions (VAS = 0), with paresthesia being limited only to the left lower lip region and below it. After 26 sessions, the patient reported recovery of sensitivity in all affected regions (VAS = 0), with positive responses to the brush touch. Within the parameters used, laser therapy was effective in the treatment of inferior alveolar nerve paresthesia after third molar tooth extraction. Key words:Lasers, paresthesia, oral surgery, low-level laser therapy.

Assessment of the Healing of Dental Implant Surgical Site Following Low-Level Laser Therapy Using Bioclinical Parameters: An Exploratory Study. The purpose of this study was to evaluate whether low-level laser therapy improves healing of the implant surgical site with clinical and biochemical parameters. Thirty patients with an edentulous space spanning a single tooth were selected. The patients were randomly allocated to 1 of 2 groups: control group and test group. The test group received laser energy at a power of 2 J/cm2 with a total of 4-6 J energy over each implant. Clinical parameters (implant stability quotient, probing index, modified sulcus bleeding index) and osteoprotegerin were assessed at baseline and follow-up intervals (2 weeks, 6 weeks, and 3 months). The test group showed significantly higher implant stability quotient than the control group at 2 weeks (57.93 Â± 3.95 vs 35.67 Â± 3.08; P < . 01) and 3 months (58.86 Â± 3.75 vs 67.06 Â± 3.78; P < . 01). A significant rise in osteoprotegerin levels of the test group (686.30 Â± 125.36 pg/mL at baseline and 784.25 Â± 108.30 pg/mL at 3 months; P < . 01) was seen contrary to significant decline in the control group (839.50 Â± 249.08 pg/mL at baseline vs 415.30 Â± 78.39 pg/mL at 3 months; P < . 01). Within the limitations of the study, the findings suggest that the healing of peri-implant hard and soft tissues may be enhanced with the use of low-level laser therapy as an explicit modality during the postoperative period. Dental Implants Dental Implantation, Endosseous;Dental Implants;Humans;Low-Level Light Therapy;Mouth, Edentulous;Wound Healing

Preclinical and clinical studies of photobiomodulation therapy for macular oedema. AIMS/HYPOTHESIS: Diabetic macular oedema (DME) is the leading cause of visual impairment in people with diabetes. Intravitreal injections of vascular endothelial growth factor inhibitors or corticosteroids prevent loss of vision by reducing DME, but the injections must be given frequently and usually for years. Here we report laboratory and clinical studies on the safety and efficacy of 670Â nm photobiomodulation (PBM) for treatment of centre-involving DME. METHODS: The therapeutic effect of PBM delivered via a light-emitting diode (LED) device was tested in transgenic mice in which induced MÃ¼ller cell disruption led to photoreceptor degeneration and retinal vascular leakage. We also developed a purpose-built 670Â nm retinal laser for PBM to treat DME in humans. The effect of laser-delivered PBM on improving mitochondrial function and protecting against oxidative stress was studied in cultured rat MÃ¼ller cells and its safety was studied in pigmented and non-pigmented rat eyes. We then used the retinal laser to perform PBM in an open-label, dose-escalation Phase IIa clinical trial involving 21 patients with centre-involving DME. Patients received 12 sessions of PBM over 5Â weeks for 90Â s per treatment at a setting of 25, 100 or 200Â mW/cm(2) for the three sequential cohorts of 6-8 patients each. Patients were recruited from the Sydney Eye Hospital, over the age of 18 and had centre-involving DME with central macular thickness (CMT) of >300Â Î¼m with visual acuity of 75-35 Log minimum angle of resolution (logMAR) letters (Snellen visual acuity equivalent of 20/30-20/200). The objective of this trial was to assess the safety and efficacy of laser-delivered PBM at 2 and 6Â months. The primary efficacy outcome was change in CMT at 2 and 6Â months. RESULTS: LED-delivered PBM enhanced photoreceptor mitochondrial membrane potential, protected MÃ¼ller cells and photoreceptors from damage and reduced retinal vascular leakage resulting from induced MÃ¼ller cell disruption in transgenic mice. PBM delivered via the retinal laser enhanced mitochondrial function and protected against oxidative stress in cultured MÃ¼ller cells. Laser-delivered PBM did not damage the retina in pigmented rat eyes at 100Â mW/cm(2). The completed clinical trial found a significant reduction in CMT at 2Â months by 59â€‰Â±â€‰46Â Î¼m (pâ€‰=â€‰0.03 at 200Â mW/cm(2)) and significant reduction at all three settings at 6Â months (25Â mW/cm(2): 53â€‰Â±â€‰24Â Î¼m, pâ€‰=â€‰0.04; 100Â mW/cm(2): 129â€‰Â±â€‰51Â Î¼m, pâ€‰<â€‰0.01; 200Â mW/cm(2): 114â€‰Â±â€‰60Â Î¼m, pâ€‰<â€‰0.01). Laser-delivered PBM was well tolerated in humans at settings up to 200Â mW/cm(2) with no significant side effects. CONCLUSIONS/INTERPRETATION: PBM results in anatomical improvement of DME over 6Â months and may represent a safe and non-invasive treatment. Further testing is warranted in randomised clinical trials. TRIAL REGISTRATION: ClinicalTrials.gov NCT02181400 Graphical abstract. Aged;Animals;Diabetic Retinopathy;Ependymoglial Cells;Female;Humans;Low-Level Light Therapy;Macular Edema;Male;Mice;Mice, Transgenic;Middle Aged;Mitochondria;Oxidative Stress;Rats;Tomography, Optical Coherence

ILIB (intravascular laser irradiation of blood) as an adjuvant therapy in the treatment of patients with chronic systemic diseases-an integrative literature review. To perform an integrative review of the literature on the effectiveness of intravascular laser irradiation of blood (ILIB) as an adjunct therapy in the treatment of chronic systemic diseases. This is an integrative literature review that included non-randomized and randomized controlled clinical trials that specifically evaluated the therapeutic effect of ILIB on chronic systemic diseases, without restriction of time, and written in English. The Medical Publications (PubMed)/MEDLINE database was used. MeSH (Medical Subject Headings) was used to select search descriptors with the Boolean operators "AND/OR." After applying the inclusion and exclusion criteria, 13 articles were selected. Coronary diseases were the most prevalent, followed by type 2 diabetes mellitus, with the coronary artery being the most widely used access route for ILIB application. Despite the varied parameters and protocols for using this kind of

therapy, all studies have shown satisfactory results in the patients' clinical condition. ILIB proved to be effective in all organic systems, showing some positive result. However, studies on the effect of this therapy on various diseases are still scarce in the literature, and there is a need for more well-designed clinical trials to better understand the role of ILIB in various systemic diseases. Adult;Aged;Child;Chronic Disease;Diabetes Mellitus, Type 2;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

Effects of Low-Level Er:YAG Laser Irradiation on Proliferation and Calcification of Primary Osteoblast-Like Cells Isolated From Rat Calvaria. Several reports have shown that the photo-bio-modulation of cells by various lasers has favorable biological effects. However, the effects of low-level Er:YAG laser irradiation on osteoblasts remain unclear. The purpose of this study was to evaluate the effects of low-level Er:YAG laser irradiation on proliferation and osteogenic differentiation of primary osteoblast-like cells isolated from the calvariae of 3-5-day-old Wistar rats. Cells were irradiated by Er:YAG laser at energy fluences of 2.2, 3.3, and 4.3 J/cm(2), respectively. After irradiation, cell surface temperatures were measured and cell proliferation was evaluated by flow cytometry and CCK-8. Calcification was evaluated by measuring areas of Alizarin red S staining after 7, 14, and 21 days culture in osteoinductive medium. Gene expression in non-irradiated and laser-irradiated cells was evaluated by qPCR at 3, 6, and 12 h, as well as 1, 3, 7, and 14 days after irradiation. Microarray analysis was performed to comprehensively evaluate the gene expression of non-irradiated and irradiated cells at 3.3 J/cm(2) at 6 h after irradiation. No pronounced increase of cell surface temperature was induced by irradiation. Irradiation did not affect osteoblast-like cell proliferation. Osteoblast-like cell calcification was significantly increased 7 days after Er:YAG laser irradiation at 3.3 J/cm(2). Bglap expression was significantly increased in cells irradiated at 3.3 J/cm(2) 6 h post-irradiation. Microarray analysis showed that irradiation at 3.3 J/cm(2) caused an upregulation of inflammation-related genes and downregulation of Wisp2. Gene set enrichment analysis also clarified enrichment of inflammation-related and Notch signaling gene sets. In conclusion, low-level Er:YAG laser irradiation at 3.3 J/cm(2) enhanced calcification of primary osteoblast-like cells via enhanced Bglap expression and enriched Notch signaling.

Topical sodium alendronate combined or not with photodynamic therapy as an adjunct to scaling and root planing: Histochemical and immunohistochemical study in rats. OBJECTIVE: The purpose of this study was to evaluate influence of topical sodium alendronate (ALN), photodynamic therapy (aPDT), or a combination thereof as adjuvant to scaling and root planing (SRP) in the treatment of experimental periodontitis in rats. BACKGROUND: Therapeutic protocols to control periodontitis progression that aim to equalize bacterial action and load with tissue immune response are well addressed in current scientific research. METHODS: Experimental periodontitis was induced in 96 rats with a ligature around the mandibular left first molar. After 7Â days, ligature was removed and animals were treated according to the following experimental groups (nÂ =Â 8): control-SRP plus saline solution; ALN-SRP plus ALN; aPDT-SRP plus methylene blue irrigation, followed by low-level laser therapy (LLLT); and ALN/aPDT-SRP plus ALN and methylene blue irrigation followed by LLLT. The animals were euthanized at 7, 15, and 30Â days after treatments. Collagen maturation (picrosirius red staining) and immunohistochemical analyses (TRAP, RANKL and osteoprotegerin [OPG]) were performed. Data were submitted to statistical analysis (PÂ <Â .05). RESULTS: At 7Â days, group ALN presented a significantly higher number of TRAP-positive cells and percentage of immature collagen fibers than group ALN/aPDT, while group ALN/aPDT presented a significantly higher percentage of mature collagen fibers than group ALN. At 30Â days, group ALN presented significantly lower percentage of immature collagen fibers and higher percentage of mature collagen fibers than control. CONCLUSION: It can be concluded that topical use of ALN coadjutant to SRP, alone or combined with aPDT, enhanced collagen maturation and reduced osteoclastogenesis during the healing of

experimental periodontitis. Sodium;Alendronate Alendronate;Animals;Combined Modality Therapy;Dental Scaling;Photochemotherapy;Rats;Rats, Wistar;Root Planing;Sodium
Impact of 970Â nm photobiomodulation therapy on wound healing in cellular models of hidradenitis suppurativa.
NIR multiphoton ablation of cancer cells, fluorescence quenching and cellular uptake of dansyl-glutathione-coated gold nanoparticles. Theranostics based on two-photon excitation of therapeutics in the NIR region is an emerging and powerful tool in cancer therapy since this radiation deeply penetrates healthy biological tissues and produces selective cell death. Aggregates of gold nanoparticles coated with glutathione corona functionalized with the dansyl chromophore (a-DG-AuNPs) were synthesized and found efficient nanodevice for applications in photothermal therapy (PTT). Actually the nanoparticle aggregation enhances the quenching of radiative excitation and the consequent conversion into heat. The a-DG-AuNPs are readily internalized in Hep G2 where the chromophore acts as both antenna and transducer of the NIR radiation under two-photons excitation, determining efficient cell ablation via photothermal effect. Phosphatidylcholines;Gold;Glutathione Animals;Cell Line, Tumor;Combined Modality Therapy;Fluorescence;Glutathione;Gold;Humans;Infrared Rays;Lasers;Low-Level Light Therapy;Metal Nanoparticles;Mice;Neoplasms;Phosphatidylcholines;Photons;Photothermal Therapy;Theranostic Nanomedicine
Effect of photobiomodulation on serum neuron specific enolase (NSE) among patients with diabetic peripheral neuropathy - A pilot study. BACKGROUND AND AIM: Photobiomodulation is an emerging therapy for Diabetic peripheral neuropathy (DPN) of which the management is still a dilemma for clinicians. Elevated Neuron Specific Enolase (NSE) is associated with neuropathy. We aimed this study to assess the effect of Low Level Laser Therapy (LLLT) on Serum Neuron Specific Enolase in Type II Diabetes Mellitus patients with DPN. METHODOLOGY: Pre post interventional study was done on 50 patients with DPN. DPN was confirmed using 10g Monofilament test, Vibration perception threshold (VPT) and Michigan Neuropathy Screening Instrument. All patients were provided with LLLT for 9Â min on dorsal and plantar of foot with a dosage of 3.1Â J/cm (2) for 10 days. A blood sample was collected at baseline and 4 weeks after LLLT for NSE estimation. RESULT: A significant reduction in serum NSE levels (0.006) after 4 weeks of laser therapy was observed in 42 patients when compared with baseline. A significant reduction in the vibration perception threshold (pÂ =Â 0.003) and Numeric pain rating scale (pÂ =Â 0.004) were observed. CONCLUSION: In this pilot study, we have assessed the effect of LLLT on serum NSE levels among patients with DPN and showed improved quality of life and decrease in serum NSE levels. These findings should be investigated in larger trials. Biomarkers;Blood Glucose;Phosphopyruvate Hydratase Adult;Aged;Biomarkers;Blood Glucose;Diabetes Mellitus, Type 2;Diabetic Neuropathies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Phosphopyruvate Hydratase;Pilot Projects;Prognosis;Quality of Life
Effect of photobiomodulation on CCC-ESF reactive oxygen species steady-state in high glucose mediums. Delayed wound healing is one of the most challenging complications of diabetes mellitus (DM) in clinical medicine, and it is related to the excessive generation of reactive oxygen species (ROS). Photobiomodulation (PBM) can promote wound healing in many ways, so it can be used as a method for the treatment of delayed healing of DM wounds. In this study, we investigated the effect of PBM on ROS homeostasis in human embryonic skin fibroblast cells (CCC-ESFs) cultured in high glucose concentrations. The CCC-ESFs were cultured in vitro and divided into two groups, including the control group and the 635 nm laser irradiation group. After 2 days of high glucose treatment, the experimental group was irradiated with different doses of laser for 3 days. First, we measured the cellular proliferation, and the results showed that laser irradiation could promote

cellular proliferation. Then, we measured the generation of ROS, the activities of total superoxide dismutase (SOD), and total antioxidant capacity (TAC) of the cells; the results showed that high glucose destroyed cells by inducing high concentration of ROS, the balance of oxidation, and antioxidation cause oxidative stress damage to cells. PBM can increase the antioxidant capacity of cells, reducing the high concentration of ROS induced by high glucose. Finally, we measured the levels of mitochondrial membrane potential (âˆ†Ïˆ(m)) and the secretion of nuclear factor kappa-B (NF-ÎºB), tumor necrosis factor-Î± (TNF-Î±), and interleukin-1Î² (IL-1Î²); the results showed that PBM can reduce apoptosis and regulate the inflammatory state. We conclude that PBM can maintain the ROS homeostasis, increase the TAC of cells, and trigger the cellular proliferation, and the response of CCC-ESFs to PBM was dose-dependent. Antioxidants;Culture Media;Interleukin-1beta;NF-kappa B;Reactive Oxygen Species;Tumor Necrosis Factor-alpha;Superoxide Dismutase;Glucose Animals;Antioxidants;Cell Proliferation;Cell Survival;Culture Media;Dose-Response Relationship, Radiation;Embryo, Mammalian;Fibroblasts;Glucose;Humans;Interleukin-1beta;Low-Level Light Therapy;Membrane Potential, Mitochondrial;NF-kappa B;Oxidative Stress;Reactive Oxygen Species;Skin;Superoxide Dismutase;Tumor Necrosis Factor-alpha;Wound Healing

Photobiomodulation for mucosal repair in patients submitted to dental extraction after head and neck radiation therapy: a double-blind randomized pilot study. OBJECTIVE: The aim of this study was to evaluate the efficacy of photobiomodulation therapy (PBMT) on the mucosal healing of patients submitted to simple dental extractions after head and neck radiation therapy (HNRT). METHODS: Forty surgical procedures were randomly assigned into two groups: G1: dental extraction + PBMT (nâ€‰=â€‰19) and G2: dental extraction + sham-PBMT (nâ€‰=â€‰21). All patients received antibiotic therapy and the surgical alveolotomy to promote primary closure of the surgical site. Group 1 was submitted to PMBT according to the following parameters: 808Â nm, 40Â mW, 100Â J/cm(2), 70Â s, 2.8Â J/point, 14Â J/session, and area of 0.028cm(2). The primary outcome was complete mucosal lining at 14Â days, and the secondary outcomes were the presence of infection, postoperative pain, and analgesics intake at 7Â days. The patients were evaluated every 7Â days until 28Â days. RESULTS: Alveolar mucosal lining was faster in G1, and at 14 postoperative days, 94.7% patients evolved with complete alveolar mucosal lining compared to no patient from G2 (pâ€‰<â€‰0.001). Patients from G1 reported postoperative pain less frequently (G1â€‰=â€‰4, 21.1%â€‰Ã—â€‰G2â€‰=â€‰14, 66.7%, pâ€‰=â€‰0.005), and also reported lower intake of analgesic pills at D7 (21.1% Ã— 66.7%, pâ€‰=â€‰0.005%). PBMT had a significant positive impact on both postoperative pain (NNTâ€‰=â€‰2.192, CI95%â€‰=â€‰1.372-5.445) and mucosal healing (NNTâ€‰=â€‰1.056, CI95%â€‰=â€‰0.954-1.181). CONCLUSIONS: This preliminary study strongly supports the use of PMBT to promote surgical alveolar mucosal lining in a shorter time and with less postoperative pain. Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Tooth Extraction

Photobiomodulation modulates the expression of inflammatory cytokines during the compensatory hypertrophy process in skeletal muscle. Compensatory hypertrophy (CH) occurs due to excessive mechanical load on a muscle, promoting an increase in the size of muscle fibers. In clinical practice, situations such as partial nerve injuries, denervation, and muscle imbalance caused by trauma to muscles and nerves or diseases that promote the loss of nerve conduction can induce CH in muscle fibers. Photobiomodulation (PBM) has demonstrated beneficial effects on muscle tissue during CH. The aim of the present study was to evaluate the effect of PBM on the inflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor alpha (TNF-Î±) as well as type 2 metalloproteinases (MMP-2) during the process of CH due to excessive load on the plantaris muscle in rats. Forty-five Wistar rats weighing 250Â g were divided into three groups: control group (nâ€‰=â€‰10), hypertrophy (H) group (nâ€‰=â€‰40), and H + PBM group (nâ€‰=â€‰40). CH was induced

through the ablation of synergist muscles of the plantaris muscle. The tendons of the gastrocnemius and soleus muscles were isolated and sectioned to enable the partial removal of each of muscle. The preserved plantaris muscle below the removed muscles was submitted to excessive functional load. PBM was performed with low-level laser (AsGaAl, Î»â€‰=â€‰780Â nm; 40Â mW; energy density: 10Â J/cm(2); 10Â s on each point, 8 points; 3.2Â J). Animals from each group were euthanized after 7 and 14Â days. The plantaris muscles were carefully removed and sent for analysis of the gene and protein expression of IL-6 and TNF-Î± using qPCR and ELISA, respectively. MMP-2 activity was analyzed using zymography. The results were submitted to statistical analysis (ANOVA + Tukey's test, pâ€‰<â€‰0.05). The protein expression analysis revealed an increase in IL-6 levels in the H + PBM group compared to the H group and a reduction in the H group compared to the control group. A reduction in TNF-Î± was found in the H and H + PBM groups compared to the control group at 7Â days. The gene expression analysis revealed an increase in IL-6 in the H + PBM group compared to the H group at 14Â days as well as an increase in TNF-Î± in the H + PBM group compared to the H group at 7Â days. Increases in MMP-2 were found in the H and H + PBM groups compared to the control group at both 7 and 14Â days. Based on findings in the present study, it is concluded that PBM was able to modulate pro-inflammatory cytokines that are essential for the compensatory hypertrophy process. However, it has not shown a modulation effect directly in MMP-2 activity during the same period evaluated. Cytokines;Interleukin-6;Tumor Necrosis Factor-alpha;Matrix Metalloproteinase 2 Animals;Cytokines;Gene Expression Regulation;Hypertrophy;Interleukin-6;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Muscle, Skeletal;Rats;Rats, Wistar;Tendons;Tumor Necrosis Factor-alpha

Comparison of low-level laser treatment and extracorporeal shock wave therapy in subacromial impingement syndrome: a randomized, prospective clinical study. The aim of this study was to compare the efficacy of low-level laser treatment (LLLT) and extracorporeal shock wave therapy (ESWT) in the treatment of subacromial impingement syndrome (SIS). Seventy-one patients with subacromial impingement were randomly assigned to LLLT (nâ€‰=â€‰37) and ESWT (nâ€‰=â€‰34) groups. The patients received a total of 15 sessions of LLLT or once a week for 3 sessions of ESWT. All patients, before treatment, at the end of treatment, and 3 months after treatment, were evaluated with range of motion (ROM), visual analogue pain scale (VAS pain), Shoulder Pain and Disability Index (SPADI), Beck Depression and Anxiety Inventories, the Short Form Health Survey (SF-36), and Pittsburgh Sleep Quality Index (PSQI). In both groups, there was a significant improvement in all outcome measures (pâ€‰<â€‰0.05) except the mental health score in the LLLT group. ESWT group showed more improvements in terms of SPADI disability and total scores, PSQI, and physical-mental health scores at the end of treatment (pâ€‰<â€‰0.05). The improvement in VAS pain day and SPADI scores at the third month was significantly more evident in the ESWT group (pâ€‰<â€‰0.05). Both LLLT and ESWT treatments are effective in the treatment of SIS in the short-medium term and can be used in clinical practice. Future larger prospective clinical trials are needed to investigate the long-term efficacy and optimal treatment protocol of LLLT and ESWT in SIS. Adult;Extracorporeal Shockwave Therapy;Humans;Low-Level Light Therapy;Male;Middle Aged;Outcome Assessment, Health Care;Prospective Studies;Range of Motion, Articular;Shoulder Impingement Syndrome;Treatment Outcome

Systematic Review on the Role of Lasers in Endodontic Therapy: Valuable Adjunct Treatment? (1) Background: Adjunctive instruments, such as lasers have been investigated to address the risk of failure of endodontic therapy due to the complexity of the root canal system. Lasers have been used therapeutically, in direct irradiation of the root canals or adjunct to irrigants placed into the canals, in combination with a photosensitizer (antimicrobial photodynamic therapy) and in pain management (photobiomodulation). The purpose of this systematic review was to evaluate the evidence in clinical

use within these three areas of therapy. (2) Methods: PubMed, Cochrane and Scopus search engines were used to identify human clinical trials regarding the use of lasers in endodontic therapy. (3) Results: After applying the keywords and additional filters, inclusion and exclusion criteria, the initial number of 1486 articles was reduced to 17. It was revealed that almost all studies (14/17) presented a statistically significant improved outcome in laser-assisted endodontic therapy, with the remaining three not showing any adverse effects. (4) Conclusions: The use of laser photonic energy of appropriate delivered parameters can be proposed as useful adjunctive when considering optimal treatment modalities in orthograde endodontics. Additionally, a tendency of research towards pain modulation in this field is developing.

Patterns of oral mucositis in advanced oral squamous cell carcinoma patients managed with prophylactic photobiomodulation therapy-insights for future protocol development. To characterize oral sites affected by radiation-induced oral mucositis (OM) and related clinical outcomes in oral cancer patients subjected to prophylactic photobiomodulation therapy (PBMT). This study included advanced oral squamous cell carcinoma (OSCC) patients treated with prophylactic PBMT for OM. The site distribution of OM, OM grading (CTCAE NCI, Version 4.0, 2010), OM-related pain (VAS), analgesic protocol (WHO Analgesic Ladder), and use of enteral nutrition were evaluated weekly during treatment. Data analysis was performed using descriptive statistics expressed as median values and percentages. A total of 145 OSCC patients were included. OM most frequently affected the lateral border of the tongue (44.1%), buccal mucosa (37.2%), and labial mucosa (33.8%). Keratinized oral mucosa sites, including the tongue dorsum (6.21%), retromolar trigone (8.3%), and hard palate (2.76%), were less frequently affected. Peak OM scores were observed at weeks 5, 6, and 7, with severe OM (NCI grades 3 and 4) rates of 11%, 20%, and 25%, respectively. The cumulative occurrence of severe OM was 23%, which developed as early as week 3 and as late as week 7. The highest mean value of OM-related pain (2.7) was observed at the sixth week, and 13.8% of the patients required feeding support. This study showed, compared with studies that did not provide PBMT, reduced severity of mucositis, reduced pain and analgesic use, and reduced tube feeding in patients treated with PBMT. OM involving keratinized and non-keratinized surfaces should be included in the prophylactic PBMT to reduce severe OM in future studies.
Adult;Aged;Aged, 80 and over;Analgesia;Carcinoma, Squamous Cell;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Neoplasms;Severity of Illness Index;Stomatitis

Use of Intense Pulsed Light to Mitigate Meibomian Gland Dysfunction for Dry Eye Disease. Dry Eye Disease (DED) is a common ocular condition that needs prompt diagnosis and careful treatment interventions. If left untreated, it can lead to numerous sight-threatening complications, including ulceration of the cornea, blepharitis, alterations of the tear film, conjunctivitis, and in severe cases, may lead to scarring, thinning, and even perforation of the cornea. Intense pulsed light (IPL) is a non-laser high-intensity light source that has shown to play a valuable role in dry eye disease. Recent evidence from various research works has shown that IPL modifies the mechanism of meibomian gland dysfunction (MGD), which helps to relieve the symptoms of DED. In this review, we demonstrated the mechanism of action of IPL, including its benefits on DED. The emerging evidence shows that the role of IPL in DED is novel and therapeutic. These results direct us to conclude that IPL is a potentially beneficial tool and essential future therapy for dry eye disease. Advances in the treatment of DED will lead to a better quality of life. However, tools to recognize potentially severe side effects of DED earlier in order to treat or prevent them must be developed. Dry Eye Syndromes;Female;Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Male;Meibomian Gland Dysfunction

Low-level laser therapy in the prevention and treatment of oral mucositis: a systematic review and meta-analysis. OBJECTIVE: The aim of this study was to determine whether prophylactic and

therapeutic low-level laser therapy (LLLT), compared with placebo or no therapy, reduced the risk of severe oral mucositis (OM) in patients receiving chemotherapy or radiotherapy. STUDY DESIGN: We searched for articles published on randomized controlled trials (RCTs) in the databases MEDLINE, EMBASE, Cochrane Library, Cochrane Central Register of Controlled Trials, Web of Science, and Clinical Trials, until December 2018. RCTs were filtered on the basis of eligibility criteria, and data were analyzed by using R software 3.5.2. RESULTS: Overall, 30 studies were included in the meta-analysis. Prophylactic LLLT reduced the overall risk of severe OM (relative risk [RR]Â =Â 0.40; 95% confidence interval [CI]: 0.28-0.57; P < .01). Therapeutic LLLT substantially reduced the duration of severe OM (P < .01). LLLT also reduced the overall mean grade of OM, overall incidence of severe pain, mean score of pain, and incidence of severe OM, at the most anticipated time. CONCLUSIONS: Prophylactic and therapeutic LLLT can reduce the risk of severe OM in patients receiving chemotherapy or radiotherapy. Databases, Factual;Humans;Low-Level Light Therapy;Stomatitis

In vitro effects of 635Â nm photobiomodulation under hypoxia/reoxygenation culture conditions. Photobiomodulation (PBM), especially in the red wavelength range, has been demonstrated to be an effective treatment option for superficial and chronic wounds. However, ischemia and subsequent reperfusion can further challenge wound healing. Therefore, we investigated the effect of pulsed red LED light at 635Â nm on cellular function in an in-vitro model of hypoxia/reoxygenation (H/R) challenge. Mouse myoblasts and fibroblasts were incubated in oxygen-deprived starvation medium (hypoxia) for 3Â h after which the media was changed to oxygenated, fully supplemented media to simulate reperfusion. Cells were then treated with pulsed red LED light at a wavelength of 635Â nm at 40Â mW/cm(2). Mitochondrial respiratory activity, ATP production and ROS levels were analysed immediately post-illumination. The effects on cellular metabolic activity and proliferation were measured at 6Â h and 24Â h and apoptosis/necrosis was measured at 24Â h post-illumination. Our results show that both cell types reacted differently to H/R challenge and PBM. PBM of H/R-challenged cells enhanced mitochondrial activity and rescued decreased ATP levels, with significant effects in fibroblasts. This was associated with increased cell proliferation rates in both cell types. The increase was again more pronounced in fibroblasts. Our study concluded that PBM with red LED light significantly restored ATP levels during H/R and effectively promoted cell growth under both normoxic and H/R conditions. In clinical applications, PBM has been repeatedly reported to resolve difficult clinical situations in which ischemia/reperfusion injuries are a major issue. Our study confirms the beneficial effects of PBM especially in H/R-challenged cells. Reactive Oxygen Species;Adenosine Triphosphate;Oxygen Adenosine Triphosphate;Animals;Apoptosis;Cell Line;Cell Proliferation;Hypoxia;In Vitro Techniques;Low-Level Light Therapy;Mice;Mitochondria;Oxygen;Reactive Oxygen Species

Laser hair reduction for hidradenitis suppurativa warrants insurance coverage. Hidradenitis suppurativa is a chronic, painful disease that significantly reduces quality of life. Laser hair reduction is one modality that can be used in combination with other treatments to ameliorate the condition. We argue that insurance should provide coverage for this necessary service. Hair;Hair Removal;Hidradenitis Suppurativa;Humans;Insurance Coverage;Insurance, Health;Low-Level Light Therapy;United States

Crescent-Shaped Hyperpigmentation Following Laser Hair Removal: Case Series of Fifteen Patients. BACKGROUND AND OBJECTIVES: Post-inflammatory hyperpigmentation (PIH) is a common adverse effect of laser hair removal procedures. This case series emphasizes the under-reported crescent-shaped form of PIH that may occur following laser therapy. This case series sought to assess the potential causes of the distinct, crescent-shaped form of PIH that may arise following laser hair removal procedures, and to examine the concept of thermal versus cryogenic damage, which was

discovered accidentally due misalignments between laser-cryogen spurts. STUDY DESIGN/MATERIALS AND METHODS: A retrospective, multicentre case recruitment was undertaken, involving three laser centers and presented in the form of a case series. The included patients were individuals with crescent-shaped PIH following laser hair removal. RESULTS: Fifteen patients were recruited over 12 months. All patients were treated with the GentleLase system (Candella) with built-in cryogen spurt. Prior to the study, only one patient had suffered from PIH following laser hair removal. Most patients improved partially or completely both with and without the use of bleaching compounds. After testing one machine, it was found that the cryogen spurt was misaligned. It was not located in the circle of the laser beam, thereby leaving a crescent shape of uncooled but laser-treated skin. A trial on one patient with cryogen alone did not cause PIH, whereas a trial with the laser alone caused PIH. CONCLUSION: The appearance of crescent-shaped marks following PIH is a distinct and uncommon adverse effect associated with laser hair removal procedures. This case series suggests that it arises due to the malfunctioning of the built-in cryogen spurt device, leading to a deficit in cooling a portion of the treated skin, urging checking the built-in cryogen spurt device. Lasers Surg. Med. Â© 2020 Wiley Periodicals, LLC. Hair Removal;Humans;Hyperpigmentation;Laser Therapy;Low-Level Light Therapy;Retrospective Studies

Low Level Laser Therapy in Knee Osteoarthritis: A Narrative Review. Knee osteoarthritis (KOA) is the most common musculoskeletal disorder, especially in middle up to old age. KOA also results in many complications like changes in gait. Nowadays, changes in lifestyle and the reduced physical activity make people more vulnerable to KOA. Therefore, considering the increasing prevalence of KOA in many societies and the costs imposed on the afflicted people and their governments, providing conservative management approaches with a view to saving time and money is important. There are an assortment of conservative strategies in the management of KOA including low level laser therapy (LLLT). Since the introduction of lasers in the medical field in 1960, various types of lasers with widespread administration programs are used for medical conditions from cosmetics to surgery. However, there are conflicting findings on the application of lasers in osteoarthritis. To discuss the basis of the highest level of evidence, only systematic reviews with or without meta-analyses published up to January 2019 were included in the present work. In this regard, Scopus, PEDro, Medline, ISI Web of Science, Cochrane, PubMed, Irandoc, Iran Medex, Magiran, and SID were searched to retrieve articles in English or Persian. A total of 22 systematic reviews and meta-analyses were found, 14 of which were included in this study. The accepted articles were published between 1991 and up to 2019. The purpose of this narrative review was to investigate the effect of LLLT on pain and function in subjects with KOA. The result of the present review may help clinicians in making evidence-based decisions on optimal care in relation to administering LLLT.
Adult;Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Management

Cost-effectiveness randomized clinical trial on the effect of photobiomodulation therapy for prevention of radiotherapy-induced severe oral mucositis in a Brazilian cancer hospital setting. OBJECTIVES: This study aimed to assess the cost-effectiveness of photobiomodulation therapy (PBMT) in association with a Preventive Oral Care Program (POCP) compared with POCP alone in the treatment of radiotherapy (RT)-induced oral mucositis (OM). METHODS: The cost-effectiveness was evaluated from the health provider perspective and conducted alongside a randomized, double-blind clinical trial. Participants were randomly assigned to either PBMT (nâ€‰=â€‰25) or control (nâ€‰=â€‰23) group. The PBMT group participants received PBMT associated with POCP. In the control group, patients were submitted to POCP alone. Costs were identified, quantified, and valued through observation and consultation of the hospital's financial sector database and estimated in Brazilian real and converted to international dollars using the purchasing power parity exchange rate.

The incremental cost-effectiveness ratio (ICER) was estimated by considering the prevention of severe OM, interruption of RT, and oral health-related quality of life (OHRQoL) scores, measured by the OHIP-14 and patient-reported OM symptoms scale (PROMS). RESULTS: The incremental cost of PBMT was $857.35, and the cost per session was $25.69. The ICER was $ 2867.39 to avoid one case of severe OM and $ 2756.75 to prevent one interruption in RT due to OM. ICER to reduce 1 point in OHIP-14 and PROMS scores were $170.79 and $31.75, respectively. CONCLUSION: PBMT is more cost-effective than POCP alone in preventing severe OM, worsening of the OHRQoL, and RT interruptions. PBMT is a promising therapy, especially to avoid interruptions in oncological treatment. TRIAL REGISTRATION: ReBEC-RBR-5h4y4n. Brazil;Cancer Care Facilities;Chemoradiotherapy;Cost-Benefit Analysis;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Quality of Life;Stomatitis

Effects of green light photobiomodulation on Dental Pulp Stem Cells: enhanced proliferation and improved wound healing by cytoskeleton reorganization and cell softening. Photobiomodulation (PBM) has been shown to improve cell proliferation and cell migration. Many cell types have been investigated, with most studies using deep penetrating red light irradiation. Considering the interest of surface biostimulation of oral mesenchymal cells after surgical wound, the present study aimed to assess green light irradiation effects on Dental Pulp Stem Cells' (DPSC) proliferation and migration. To understand the mechanisms underlying these effects, we investigated cytoskeleton organization and subsequent cell shape and stiffness. A 532-nm wavelength Nd:YAG laser (30Â mW) was applied between 30 and 600Â s on DPSC in vitro. Cell proliferation was analyzed at 24, 48, and 72Â h after irradiation, by cell counting and enzymatic activity quantification (paranitrophenylphosphate phosphatase (pNPP) test). A wound healing assay was used to study cell migration after irradiation. Effects of PBM on cytoskeleton organization and cell shape were assessed by actin filaments staining. Elasticity changes after irradiation were quantified in terms of Young's modulus measured using Atomic Force Microscopy (AFM) force spectroscopy. Green light significantly improved DPSC proliferation with a maximal effect obtained after 300-s irradiation (energy fluence 5Â J/cm(2)). This irradiation had a significant impact on cell migration, improving wound healing after 24Â h. These results were concomitant with a decrease of cells' Young's modulus after irradiation. This cell softening was explained by actin cytoskeleton reorganization, with diminution of cell circularity and more abundant pseudopodia. This study highlights the interest of green laser PMB for the proliferation and migration of mesenchymal stem cells, with encouraging results for clinical application, especially for surgical wound healing procedures.
Adolescent;Adult;Biomechanical Phenomena;Cell Movement;Cell Proliferation;Cell Shape;Cells, Cultured;Cytoskeleton;Dental Pulp;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Wound Healing;Young Adult

Three photobiomodulation protocols in the prevention/treatment of radiotherapy-induced oral mucositis. PURPOSE: To compare three Photobiomodulation protocols to prevent/treat oral mucositis associated to radiotherapy. METHODS: Seventy-three patients with cancer in oral cavity, oropharynx, and nasopharynx, who underwent RT with dose in facial fields equal or higher than 6000 cGy were randomized into three groups (mean RT dose = 66 cGy Â±4.9). Protocols of Group 1 was 660 nm, 15 mW, 3.8 J/cm2, Group 2 660 nm, 25 mW, 6.3 J/cm2 both starting on the first day of radiotherapy, and group 3 660 nm, 15 mW, 3.8 J/cm2 for therapeutic purpose. The patients of group 1 and 2 were irradiated at 40 points daily covering non-keratinizing oral mucosa. The spot size (probe's tip surface size) was 0.040 cm2 for all groups. Oral mucositis was evaluated according to both WHO and NCI scales, and pain related to oral mucositis was scored using the VAS. RESULTS: Patients from group 1 presented with grade II oral mucositis later than groups 2 and 3 ($p < 0.001$). Moreover, groups 2 and 3 also presented with a mean higher of oral mucositis grade than group 1, p

< 0.001. Pain scores were lower in group 1 (p = 0.002). CONCLUSIONS: The Photobiomodulation used in Group 1 was more effective than the protocols used in groups 2 and 3 in controlling the grade II oral mucositis intensity, and mean pain scores. Photosensitizing Agents Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Randomized Controlled Trials as Topic;Stomatitis

Human Oral Motion-Powered Smart Dental Implant (SDI) for In Situ Ambulatory Photo-biomodulation Therapy. Peri-implant disease is an inflammatory condition affecting the soft and hard tissues surrounding a dental implant. However, current preventative methods are insufficient due to the limited bioactivity on the dental implant and poor patient compliance. Recently, photo-biomodulation (PBM) therapy that can recover and regenerate peri-implant soft tissue has attracted considerable attention in dentistry. In this paper, a seamless human oral motion-powered dental implant system (called Smart Dental Implant or SDI) is presented as an ambulatory PBM therapy modality. SDI allows the in situ light delivery, which is enabled by the energy harvesting from dynamic human oral motions (chewing and brushing) via an engineered piezoelectric dental crown, an associated circuit, and micro light emitting diodes (LEDs). The SDI also offers adequate mechanical strength as the clinical standards. Using primary human gingival keratinocytes (HGKs) as a model host organism and Pseudomonas aeruginosa lipopolysaccharides (LPS) as a model inflammatory stimulus, effective SDI-mediated PBM therapy is demonstrated. A new class of dental implants could be an ambulatory PBM therapy platform for the prevention of peri-implant disease without patient dependency, warranting long-lasting dental implants. Dental Implants Dental Implants;Gingiva;Humans

Comparative evaluation of low-level laser therapy on proliferation of long-term cryopreserved human dental pulp cells isolated from deciduous and permanent teeth. The aim of the current study was to evaluate the proliferative effect of low-level laser therapy on long-term cryopreserved dental pulp stem cells (DPSC(S)) and stem cells from human exfoliated deciduous teeth (SHED(S)). The DPSC(S) and SHED(S) were divided into 2 main groups according to gallium aluminum arsenide (GaAIAs) diode laser irradiation densities as 5Â J/cm(2) and 7Â J/cm(2). Each main group was further divided into 4 groups according to laser irradiation periods as 0, 24, 48, 72Â h groups. During the incubation periods, cells received laser irradiation in every 24Â h according to their groups and were put into incubator after irradiation. Cell groups that were not subjected to laser irradiation were served as control groups. Viabilities of cells were determined via MTT assay at the end of all incubation periods, and data were statistically analyzed. Laser irradiation demonstrated significant effects on proliferation rate of DPSCs and SHEDs in comparison with control. Intragroup comparison data of DPSC(S) revealed that repetitive laser irradiation for long term (72Â h) increased the cellular viability significantly in comparison with all other treatment groups; however, no significant differences were found when energy densities were compared within each time interval, except for 48Â h group at which irradiation with 7Â J/cm(2) provided significantly higher cell viability rates of SHED(S). DPSCs showed significantly higher cellular viability than SHEDs only for the 7Â J/cm(2) energy density in 72Â h. Longer term (72Â h) repetitive laser irradiation with energy densities of 5 and 7Â J/cm(2) (wavelength of 980Â nm) may be recommended to induce the proliferative effect on long-term cryopreserved DPSC(S) and SHED(S). Cell Proliferation;Cell Separation;Cell Survival;Cells, Cultured;Cryopreservation;Dental Pulp;Dentition, Permanent;Humans;Low-Level Light Therapy;Stem Cells;Tooth, Deciduous

The effect of low-level laser therapy as an adjunct to periodontal surgery in the management of postoperative pain and wound healing: a systematic review and meta-analysis. The meta-analysis and systematic review aimed to evaluate the effect of low-level laser therapy (LLLT) as an adjunct to periodontal surgery in the management of postoperative pain and wound healing. An

electronic search in 4 databases (PubMed, Embase, Cochrane, and OpenGrey) was conducted for randomized clinical trials reporting the effectiveness of LLLT used as an adjunct to periodontal surgery to alleviate pain and accelerate wound healing compared with surgery alone. Finally, 13 studies were eligible and included. The results showed a significant difference of pain relief between groups at day 3 post-surgery, whereas no difference was found at day 7. Moreover, a significant reduction was observed in the mean analgesic intake during the first week in the LLLT group. On day 14, the adjunctive use of LLLT showed significantly faster re-epithelialization and better wound healing in palatal donor sites following free gingival graft procedures. Based on the results, LLLT used as an adjunct to periodontal surgery positively influenced postsurgical pain control. Low power (â‰¤â€‰500Â mW) combined with energy density â‰¥â€‰5Â J/cm(2) might be more appropriate for postoperative pain relief. Moreover, adjunctive LLLT to free gingival grafts could significantly accelerate wound healing of palate sites at early healing phase. Multicenter studies using different LLL parameters without postsurgical analgesics are needed to determine optimal laser settings. Analgesics Analgesics;Combined Modality Therapy;Edema;Humans;Low-Level Light Therapy;Pain, Postoperative;Periodontium;Publication Bias;Re-Epithelialization;Risk;Treatment Outcome;Wound Healing

Severe chronic nonlichenoid oral mucositis in pembrolizumab-treated patients: new cases and a review of the literature. Aim: To report of severe chronic oral mucositis (OM) in two pembrolizumab-treated cancer patients. Materials & methods: A retrospective chart review was performed. Inclusion/exclusion criteria detected patients that developed OM duringÂ pembrolizumab immunotherapy. In addition, we searched the literature for nonlichenoid OM in immunotherapy-treated cancer patients. Results: Two male patients treated for anaplastic astrocytoma and lung adenocarcinoma were included. Extensive painful OM (grade 4) developed in both patients during the course of immunotherapy and the ulcerations remained >30Â weeks (>16Â weeks after stopping immunotherapy). Superficial mucocele appeared in one patient. In one patient, pain relief was achieved with photobiomodulation (low-level laser) therapy. Conclusion: OM induced by immunotherapy may be a major cause of suffering and eating difficulties. In most cases, the OM lasted for months even after the drug was stopped. There is a controversy regarding the beneficial effect of corticosteroids on OM in these patients. Antibodies, Monoclonal, Humanized;Antineoplastic Agents, Immunological;pembrolizumab Adenocarcinoma;Adolescent;Aged, 80 and over;Antibodies, Monoclonal, Humanized;Antineoplastic Agents, Immunological;Astrocytoma;Brain Neoplasms;Chronic Disease;Drug-Related Side Effects and Adverse Reactions;Humans;Immunotherapy;Low-Level Light Therapy;Lung Neoplasms;Male;Severity of Illness Index;Stomatitis;Withholding Treatment

Effective Wavelength Range in Photobiomodulation for Tooth Movement Acceleration in Orthodontics: A Systematic Review. Objective: The present systematic review aims to establish an effective range of low-level laser therapy wavelengths to accelerate tooth movement in orthodontic treatments. Materials and methods: The electronic literature search was carried out in the following databases: PubMed, ISI Web of Science, Scopus, and Cochrane randomized controlled trials (RCTs). The protocol (CRD42019117648) was registered in PROSPERO. Results: According to PRISMA guidelines and after applying the inclusion criteria, nine RCTs were included. Three blind reviewers independently assessed the methodological quality and evidence level of selected articles. Evidence level classification was established according to the recommendations of SIGN 50 (Scottish Intercollegiate Guidelines Network 2012) and was high quality being ++, acceptable +, low quality -, unacceptable -, reject 0. Conclusions: The majority of RCTs related to accelerating the tooth movement in orthodontic treatments are ideally between 780 and 830â€‰nm wavelengths. The average increase in speed movement calculated as a percentage of the control group in nine studies

is 24%. Further studies are necessary to establish the exact dosimeter in photobiomodulation during orthodontic movement. Acceleration;Low-Level Light Therapy;Orthodontics;Tooth Movement Techniques
Photobiomodulation: Inhibition or Resolution of the Inflammatory Process? Low-Level Light Therapy
Current Concepts of Laser-Oral Tissue Interaction. Abstract: Fundamental to the adjunctive use of laser photonic energy for delivering therapy and tissue management, is the ability of the incident energy to be absorbed by target tissues. The aim of this review is to examine the differential performance of the separate components of oral hard and soft tissues when exposed to laser photonic irradiance of variable wavelengths and power values. Through an examination of peer-reviewed published data and materials, the interaction of laser photonic energy and target tissues are explored in detail. Varying laser wavelength emissions relative to anatomical structures explores the ability to optimise laser-tissue interactions, and also identifies possible risk scenarios as they apply to adjacent non-target structures. The concepts and practical aspects of laser photonic energy interactions with target oral tissues are clearly demonstrated. Emphasis was placed on optimising the minimum level of laser power delivery in order to achieve a desired tissue effect, whilst minimising the risk or outcome of collateral tissue damage.
A Prospective, Split-Face, Randomized Study Comparing Picosecond to Q-Switched Nd: YAG Laser for Treatment of Epidermal and Dermal Pigmented Lesions in Asians. BACKGROUND: Whether picosecond lasers outperform Q-switched lasers in treating pigmented lesions has not been clearly evaluated. OBJECTIVE: To compare the efficacy and safety of picosecond and Q-switched lasers in treating epidermal and dermal pigmented lesions in Asians. METHODS: Eight subjects with lentigines and 6 subjects with acquired bilateral nevus of Ota-like macules were enrolled. Subjects was randomly treated with a picosecond laser on one side of the face and a Q-switched laser on the other side. Subjective assessments on pigment clearance, and adverse effect were obtained at Weeks 0, 4, 12, and 24 after the final treatment. RESULTS: Clinical improvement differed between the 2 laser systems at Week 4 ($p = .034$), Week 12 ($p = .039$), and Week 24 ($p = .027$), with 85.7% of picosecond and 57.2% of Q-switched laser sites showing >50% improvement at 6 months. There was no significant difference in the incidence of side effect and healing time, but picosecond laser was significantly associated with a lower treatment discomfort ($p = .05$). CONCLUSION: The picosecond laser seems to be more effective and better tolerated than Q-switched laser for the treatment of pigmented lesions in Asians. Adolescent;Adult;Aged;Aged, 80 and over;Asian People;Dermis;Epidermis;Face;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Patient Satisfaction;Prospective Studies;Skin Neoplasms;Treatment Outcome;Young Adult
Commentary on Efficacy and Safety of the 532-nm KTP and Long-Pulsed 1,064-nm Nd: YAG Laser for Treatment of Vascular Malformations. Humans;Lasers, Solid-State;Low-Level Light Therapy;Vascular Malformations
Deciphering Alzheimer's disease: predicting new therapeutic strategies via improved understanding of biology and pathogenesis. INTRODUCTION: There is no cure for Alzheimer's disease (AD). One explanation may pertain to the need to intervene as early as possible upstream from the accumulation of Î²-amyloid plaques and tau tangles. AREAS COVERED: A PUBMED literature search was completed to review the biological or pathological changes at the basis of disease initiation; this includes neuroinflammation, oxidative stress, microbiome changes and glymphatic system dysfunction. Innovative therapeutic strategies based on these mechanisms are also discussed. EXPERT OPINION: Improved understanding of the pathophysiological mechanisms that underly AD would assist in the identification of drug targets for clinical trials. Furthermore, pharmacokinetic and

pharmacodynamic studies are key for the characterization of the properties of disease-modifying drugs and the improvement of their penetration of the blood-brain barrier. Drug targets can be examined at different stages of the disease, hence the importance of selecting and recruiting the appropriate participants, preferably at the earliest stage of AD. New trial designs should be established which primarily involve combination therapies that can work synergistically on common pathways. Going forward, innovative treatment strategies involving nanotechnology, young blood products transfusion and photobiomodulation also offer promise for the future. Amyloid beta-Peptides;tau Proteins Alzheimer Disease;Amyloid beta-Peptides;Animals;Humans;Molecular Targeted Therapy;Neurofibrillary Tangles;Oxidative Stress;Patient Selection;Research Design;tau Proteins

Effect of 12 Weeks of Endurance Training Combined with Creatine Supplement, Photobiomodulation Therapy, or Both on Performance and Muscle Damage in Rats. Background: Photobiomodulation therapy (PBMT) and creatine (Cr) intake have been used in conjunction with heavy training, but little is known about their possible effects during a long-term training program. Objective: We assessed long-term use of PBMT and Cr in an exercise training program. Methods: Twenty-five male Wistar rats weighing â^¼300â€‰g were randomly allocated to one of five groups: a nontraining control group, a training group, a training group receiving Cr, a training group receiving PBMT, and a training group receiving both PBMT and Cr. The training program consisted of 12 weeks of daily swimming training. PBMT was delivered in six points with a laser device (808â€‰nm, 100â€‰mW, 30â€‰sec per point of irradiation, 3â€‰J, 75â€‰J/cm(2)). Results: All training groups showed significantly higher peak force and longer time to 50% decay of force, and lower creatine kinase (CK) levels than the nontraining control group, thus confirming the benefit of the training program. In all outcomes related to muscle performance, the groups receiving PBMT with or without Cr supplement performed significantly better (pâ€‰<â€‰0.05) peak force and time of force decay during an electrical stimulation protocol than all the other groups. In addition, CK levels were also significantly lower for the PBMT groups than for the other groups. Conclusions: We conclude that PBMT alone or in conjunction with Cr supplement during a 12-week training program resulted in significantly better muscle performance and lower levels of CK, a biochemical marker of muscle damage. Creatine Animals;Creatine;Endurance Training;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar

Optically Improved Mitochondrial Function Redeems Aged Human Visual Decline. The age spectrum of human populations is shifting toward the older with larger proportions suffering physical decline. Mitochondria influence the pace of aging as the energy they provide for cellular function in the form of adenosine triphosphate (ATP) declines with age. Mitochondrial density is greatest in photoreceptors, particularly cones that have high energy demands and mediate color vision. Hence, the retina ages faster than other organs, with a 70% ATP reduction over life and a significant decline in photoreceptor function. Mitochondria have specific light absorbance characteristics influencing their performance. Longer wavelengths spanning 650->1,000 nm improve mitochondrial complex activity, membrane potential, and ATP production. Here, we use 670-nm light to improve photoreceptor performance and measure this psychophysically in those aged 28-72 years. Rod and cone performance declined significantly after approximately 40 years of age. 670-nm light had no impact in younger individuals, but in those around 40 years and older, significant improvements were obtained in color contrast sensitivity for the blue visual axis (tritan) known to display mitochondrial vulnerability. The red visual axis (protan) improved but not significantly. Rod thresholds also improved significantly in those >40 years. Using specific wavelengths to enhance mitochondrial performance will be significant in moderating the aging process in this metabolically demanding

tissue. Adult;Aged;Aging;Female;Humans;Male;Middle Aged;Mitochondria;Photoreceptor Cells, Vertebrate;Vision Disorders

Photobiomodulation and Pain Reduction in Patients Requiring Orthodontic Band Application: Randomized Clinical Trial. PURPOSE: The aim of this study was to investigate the effect of Photobiomodulation (PBM) in managing orthodontic pain intensity over time in patients requiring band application on upper first molars. METHODS: Maxillary first molars were banded. In the trial group, each molar received single-session PBM on two buccal and two palatal points (Î» = 830 Â± 10â€‰nm; 150â€‰mW, 7.5â€‰J/cm(2); spot of 0.1â€‰cm(2); 5â€‰sec per point), while the control group received a placebo treatment. All patients were asked to answer five pain rating scales to assess pain intensity at 5 minutes and 1, 12, 24, and 72 hours and completed a survey describing the type of pain and its temporal course in the next 7 days. RESULTS: 26 patients (mean age 11.8 years) were randomly assigned to a control or a trial group. The trial group showed significantly lower pain intensities ($p < 0.05$) at 5â€‰min (M = 0.92, SD = 1.32), 1â€‰h (M = 0.77, SD = 1.01), and 12â€‰h (M = 0.77, SD = 1.54) after band application compared to the control group (5â€‰min: M = 1.62, SD = 1.26; 1â€‰h: M = 1.77, SD = 1.92; and 12â€‰h: M = 1.77, SD = 2.17), whereas no difference between groups ($p > 0.05$) was found at 24â€‰h (trial: M = 0.62, SD = 1.71; control: M = 1.08, SD = 1.75) and 72â€‰h (trial: M = 0.31, SD = 0.75; control: M = 0.15, SD = 0.55). Patients in the control group reported more frequently the presence of "compressive pain" (58.8%, $p < 0.05$) from the appliance during the week after the application, while the trial group showed higher frequency of "no pain" (46.2%, $p < 0.05$). However, PBM did not affect the pain onset (trial: M = 10.86, SD = 26.97; control: M = 5.25, SD = 7.86), peak (trial: M = 15.86, SD = 26.29; control: 6.17, SD = 7.96), and end time (trial: 39.57, SD = 31.33; control: M = 22.02, SD = 25.42) reported by the two groups ($p > 0.05$). CONCLUSIONS: PBM might be considered a promising alternative to decrease general pain intensity, although not affecting the typical pain cycle, in terms of the onset, peak, and ending times. Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Molar;Orthodontic Appliances;Pain Management;Pain Measurement;Young Adult

Optimization of the incubator air temperature during LED phototherapy treatment for the preterm infant. Light-emitting diode phototherapy treatment for jaundice of the preterm infant presents adverse effects, such as discomfort, changes in metabolism, and overheating. This study quantified the body heat exchanges between the environment and a simulated preterm infant requiring phototherapy treatment in a closed incubator. Phototherapy treatment increased the mean incubator roof temperature by 2.9Â Â°C (pâ€‰<â€‰0.001) and the incubator air temperature by 1Â Â°C (pâ€‰<â€‰0.001). Analytical calorimetry was used to calculate the additional energy received during phototherapy and thus deduce the optimal incubator air temperature for ensuring thermoneutrality and preventing hyperthermia. The optimal air temperature settings inside the incubator during phototherapy were -â€‰0.51 to -â€‰1.25Â Â°C lower than references, for preterm infant weighing 500 to 2000Â g.Conclusion: Phototherapy treatment for jaundice of the preterm infant increased the incubator air temperature. To prevent overheating in the preterm during phototherapy, new curves for optimal air temperature settings inside the incubator were calculated with analytic calorimetry. What is Known â€¢Phototherapy treatment is the first-line treatment for jaundice in the preterm infant. â€¢Phototherapy treatment increases the risk of overheating. What is New â€¢The heat transfers and risk of overheating were quantified using a thermal manikin during phototherapy treatment. â€¢Phototherapy treatment increased the incubator roof temperature and heat transfers. â€¢New incubator's air temperature settings during phototherapy treatment were calculated with analytical calorimetry for preterm infant weighing 500-2000Â g. Humans;Incubators;Incubators, Infant;Infant;Infant, Newborn;Infant, Premature;Phototherapy;Temperature

How and why does photobiomodulation change brain activity?

Polysaccharide-rich hydrogel formulation combined with photobiomodulation repairs UV-induced photodamage in mice skin. Prolonged skin exposure to ultraviolet radiation (UVR) induces premature aging in both the epidermis and the dermis. Chronic exposure to UVR induces the activation of mitogen-activated protein kinase (MAPK) signaling pathway, activating c-Jun, c-Fos expression, and transcription factor of AP-1 activating protein. AP-1 activation results in the positive induction of matrix metalloproteinase (MMP) synthesis, which degrade skin collagen fibers. Polysaccharides from the fruit of Lycium barbarum (LBP fraction) have a range of activities and have been demonstrate to repair the photodamage. In different approaches, laser application aims to recover the aged skin without destroying the epidermis, promoting a modulation, called photobiomodulation (PBM), which leads to protein synthesis and cell proliferation, favoring tissue repair. Here we developed a topical hydrogel formulation from a polysaccharide-rich fraction of Lycium barbarum fruits (LBP). This formulation was associated with PBM (red laser) to evaluate whether the isolated and combined treatments would reduce the UVR-mediated photodamage in mice skin. Hairless mice were photoaged for 6â€‰weeks and then treated singly or in combination with LBP and PBM. Histological, immunohistochemistry, and immunofluorescence analyses were used to investigate the levels of c-Fos, c-Jun, MMP-1, -2, and -9, collagen I, III, and FGF2. The combined regimen inhibited UVR-induced skin thickening, decreased the expression of c-Fos and c-Jun, as well as MMP-1, -2, and -9 and concomitantly increased the levels of collagen I, III, and FGF2. The PBM in combination with LBP treatment is a promising strategy for the repair of photodamaged skin, presenting potential clinical application in skin rejuvenation. Drugs, Chinese Herbal;Hydrogels;Proto-Oncogene Proteins c-fos;Transcription Factor AP-1;lycium barbarum polysaccharide;JNK Mitogen-Activated Protein Kinases;Mitogen-Activated Protein Kinases;Matrix Metalloproteinase 1 Animals;Disease Models, Animal;Drugs, Chinese Herbal;Female;Hydrogels;JNK Mitogen-Activated Protein Kinases;Low-Level Light Therapy;Matrix Metalloproteinase 1;Mice;Mice, Hairless;Mitogen-Activated Protein Kinases;Proto-Oncogene Proteins c-fos;Signal Transduction;Skin;Transcription Factor AP-1;Ultraviolet Rays;Wound Healing

Effects of photobiomodulation in relation to HeLa Kyoto tumor cells exposed to ionizing radiation. The aim of the work was studying the effects of photobiomodulation of a red spectrum in doses of less than 1Â J/cm(2) in combination with gamma-irradiation to Hela Kyoto cells. Tumor cells were irradiated with 640Â nm LED at different energy densities before and after to gamma-irradiation. Cells viability was determined 24Â h after exposure for each gamma-irradiation dose and each PBM mode. There was a statistically significant decrease in a number of viable tumor cells for the samples that were exposed to low-intensity red light prior to gamma-irradiation and a statistically significant increase in a number of viable tumor cells for the samples that were exposed to low-intensity red light after gamma-irradiation. An increase in the number of viable tumor cells exposed to PBM after gamma irradiation correlates with a decrease in the number of cells with a depolarized mitochondrial membrane. The results of a current study need to take into consideration at further studies of PBM effects on tumor cells in vitro as far as clinical studies and clinical application of PBM during radiation therapy. HeLa Cells;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Radiation, Ionizing

Weak evidence for the management of medication-related osteonecrosis of the jaw: An overview of systematic reviews and meta-analyses. BACKGROUND: Although several therapies are proposed for medication-related osteonecrosis of the jaw (MRONJ), to date there is no consensus or treatment protocol for MRONJ. This overview aims to summarize the available evidence on the management and outcomes of MRONJ. METHODS: An electronic search without language or date restrictions occurred in five databases and gray literature for articles published until March 2020. This overview

was performed according to the PICO format. The eligibility criteria comprised systematic reviews (RS) with or without meta-analyses that analyzed treatments outcomes for MRONJ. The methodological quality of each SR was evaluated using AMSTAR 2. RESULTS: Fifteen studies published between 2014 and 2020 were included in this overview. The summary of the evidence showed that conservative treatment and low level laser therapy can yield favorable results for early stages of MRONJ whereas surgical treatment seems to be better for advanced stages. However, qualitative assessment of the SRs highlighted a global low level of quality. CONCLUSIONS: There is weak evidence to support treatment protocols for MRONJ. Because of the low quality of the SRs, highlighted by this overview, no insightful therapeutic recommendations can be issued for any intervention for MRONJ. Bone Density Conservation Agents Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Conservative Treatment;Humans;Meta-Analysis as Topic;Systematic Reviews as Topic;Treatment Outcome

Irradiation by high-intensity red light-emitting diode enhances human bone marrow mesenchymal stem cells osteogenic differentiation and mineralization through Wnt/Î²-catenin signaling pathway. Photobiomodulation therapy (PBMT) using a light-emitting diode (LED) has been employed for various photomedicine studies. The aim of this study was to determine the effects of a high-intensity red LED on the proliferation and osteogenic differentiation of human bone marrow mesenchymal stem cells (BMSCs) and the related mechanism. BMSCs were subjected to high-intensity red LED (LZ1-00R205 Deep Red LED) irradiations for 0 to 40Â s with energy densities ranging from 0 to 8Â J/cm(2). The distance from the LED to the cell layer was 40Â mm. The spot size on the target was 4Â cm(2). Cell proliferation was measured at 3, 24, 48, and 72Â h. The effects of LED irradiation on osteogenic differentiation and mineralization were examined with a particular focus on the Wnt/Î²-catenin signaling pathway. The high-intensity red LED irradiations did not alter BMSC proliferation after 72Â h. LED exposure of 6Â J/cm(2) (30Â s) led to significant enhancements of osteogenic differentiation and mineralization. Additionally, the high-intensity LED irradiation induced activation of Wnt/Î²-catenin. The effects of the high-intensity LED irradiation on BMSC osteogenic differentiation and mineralization were suppressed by treatment with the Wnt/Î²-catenin inhibitor XAV939. Pâ€‰<â€‰0.05 was considered significant. The results indicate that high-intensity red LED irradiation increases BMSC osteogenic differentiation and mineralization via Wnt/Î²-catenin activation. Therefore, short duration irradiation with a portable high-intensity LED may be used as a potential approach in hard tissue regeneration therapy. Calcification, Physiologic;Cell Differentiation;Cell Proliferation;Cells, Cultured;Humans;Light;Mesenchymal Stem Cells;Osteogenesis;Wnt Signaling Pathway

Clinical Efficacy of Photobiomodulation on Dental Implant Osseointegration: A Systematic Review. BACKGROUND: Photobiomodulation (PBM) has been shown to have a positive effect on dental implant osseointegration and stability in in vitro and animal studies; however, its usefulness in dental implant clinical practice is yet unclear. OBJECTIVE: The objective was to assess the clinical effectiveness of PBM on dental implants' osseointegration. METHODS: Two reviewers independently conducted a comprehensive electronic search of articles published from inception up to January 10, 2020, in PubMed, Cochrane Library and Embase databases following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Randomized clinical trials (RCTs) and nonrandomized clinical studies that compared the effect of PBM on dental implant stability with control groups were included. Animals and in vitro studies studies as well as studies with confounders such as application of orthodontic were excluded. Risk of bias (using Cochrane Risk of Bias tool for RCTs and Risk of Bias in Non-Randomized Studies of Interventions tool for nonrandomized studies) was assessed by both authors. Owing to substantial heterogeneity, only a narrative synthesis of the included studies is presented. RESULTS: Seven relevant clinical studies were included, and they used a

variety of PBM parameters and devices. The posterior region of the jaw was found to be more frequently evaluated. For assessing the effect of PBM on implant stability, five studies used resonance frequency analysis and two used periotest; three studies additionally used biomarkers for assessment. Four studies found that PBM has a potential positive effect on the outcome of dental implant stability, whereas three studies reported that PBM has no effect on implant stability. CONCLUSION: The findings of this systematic review suggest that postoperative application of PBM may potentially have some positive effect on dental implant's osseointegration and stability. However, additional studies are required with uniformity in methods to provide a more robust assessment of this effect.

Low-Intensity Laser Light Projection for Improved Reading Abilities in Low-Vision Patients. PURPOSE: To evaluate the efficacy of a new laser imaging device that projects images onto functioning macular areas, to improve visual acuity (VA) in low-vision patients with macular diseases. METHODS: An interventional case series of consecutive patients with low vision in their right eyes (RE). RE VA was measured by showing the patients digits of various standard sizes and measuring their best-corrected VA (BCVA). Then, using the I.C.INSIDE device to project the same standard digits onto functioning macular areas. Patient's ability to recognize the digits with the I.C.INSIDE device was correlated with patient's performance using telescopic low-vision aids. The main outcome measure was change in VA with the different visual aids. RESULTS: Eleven patients (6 males and 5 females) with an average age of 75Â Â±Â 6.7Â years and low vision in their RE due to macular diseases were included in the study. Baseline BCVA was 1.554Â Â±Â 0.50 logMAR. Low-vision aids improved mean VA in 10 patients to 0.64Â Â±Â 0.40 logMAR (p <Â .0001), further improvement was noticed in 8 patients to 0.35Â Â±Â 0.16 logMAR (p <Â .0001) using the laser device, but, three patients did not recognize any digit using the laser device. CONCLUSIONS: The I.C.INSIDE device significantly improved baseline VA in low-vision patients with macular diseases, using extra-foveal fixation. Aged;Aged, 80 and over;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Pilot Projects;Reading;Treatment Outcome;Vision, Low;Visual Acuity

Photobiomodulation Effect of Low-level Laser Therapy as a Palliative Treatment of Symptomatic Geographic Tongue (A Double-blinded Randomized Clinical Trial). AIM: To evaluate the effectiveness of photobiomodulation (PBM) of low-level laser therapy (LLLT) as a palliative treatment of symptomatic geographic tongue. MATERIALS AND METHODS: This randomized double-blinded controlled clinical trial was performed on 50 patients with symptomatic geographic tongue (GT). Participants were allocated randomly into study and control groups. A 660-nm diode laser was applied on randomly selected patients of the study group (n = 25) over the complained site for 2 minutes with continuous laser beam application. For the control group (n = 25), no application of 660-nm diode laser was performed. None of the participants were aware if they received the LLLT or placebo treatment. Patients were assessed for the level of pain, burning sensation, and size of the lesion before starting LLLT "T0" and during recall visit "T1, T2, and T3." RESULTS: The study group showed a low level of pain, burning sensation, and better healing with statistically significant differences at T2 and T3 of the follow-up period, with a level of significance was set at $p < 0.05$. CONCLUSION: Low-level laser therapy can be used to adequately relieve significant discomforts associated with GT and accelerate healing and restoring of the patient's quality of life. CLINICAL SIGNIFICANCE: To develop a framework based on the results regarding the photobiomodulation effect of a 660-nm diode laser to relieve pain and burning sensation associated with symptomatic GT, which increases patients' perception toward the services provided to them. Double-Blind Method;Glossitis, Benign Migratory;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Palliative Care;Quality of Life

Effects of photobiomodulation combined with MSCs transplantation on the repair of spinal cord injury in rat. Stem cell transplantation has shown promising regenerative effects against neural injury, and photobiomodulation (PBM) can aid tissue recovery. This study aims to evaluate the therapeutic effect of human umbilical cord mesenchymal stem cells (hUCMSCs) and laser alone or combined on spinal cord injury (SCI). The animals were divided into SCI, hUCMSCs, laser treatment (LASER) and combination treatment (hUCMSCsâ€‰+â€‰LASER) groups. Cell-enriched grafts of hUCMSCs (1â€‰Ã—â€‰10(6) cells/ml) were injected at the site of antecedent trauma in SCI model rats. A 2â€‰cm(2) damaged area was irradiated with 630â€‰nm laser at 100â€‰mW/cm(2) power for 20â€‰min. Locomotion was evaluated using Basso-Beattie-Bresnahan (BBB) scores, and neurofilament repair were monitored by histological staining and diffusion tensor imaging (DTI). First, after SCI, the motor function of each group was restored with different degrees, the combination treatment significantly increased the BBB scores compared to either monotherapy. In addition, Nissl bodies were more numerous, and the nerve fibers were longer and thicker in the combination treatment group. Consistent with this, the in situ expression of NF-200 and glial fibrillary acidic protein in the damaged area was the highest in the combination treatment group. Finally, DTI showed that the combination therapy optimally improved neurofilament structure and arrangement. These results may show that the combination of PBM and hUCMSCs transplantation is a feasible strategy for reducing secondary damage and promoting functional recovery following SCI. Animals;Cell Differentiation;Cells, Cultured;Diffusion Tensor Imaging;Humans;Intermediate Filaments;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Motor Activity;Rats;Rats, Sprague-Dawley;Recovery of Function;Spinal Cord;Spinal Cord Injuries;Umbilical Cord

Does low-level laser therapy affect the survival of patients with head and neck cancer? Low-level laser therapy (LLLT) is used in patients with head and neck cancer (HNC) for treatment-related mucositis. There is conflicting evidence as to whether LLLT leads to the proliferation of tumor cells and whether it interferes with the tumoricidal effect of radiotherapy or chemoradiotherapy, if the tumor lies within the LLLT field. Using fuzzy matching, 126 HNC patients who had received LLLT including the tumor region and 126 matching HNC patients without LLLT (controls) treated at the Department of Otorhinolaryngology, Head & Neck Surgery, Medical University of Innsbruck, were identified. The overall survival was compared using the Kaplan-Meier analysis. Fuzzy matching yielded 2 patient samples well comparable in terms of risk of death. The survival did not significantly differ between patients with and without LLLT (pâ€‰=â€‰0.18). An increased risk of death in HNC patients who received LLLT covering the tumor region was not observed in our study. Dose-Response Relationship, Radiation;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Mucositis

The use of photobiomodulation therapy or LED and mineral trioxide aggregate improves the repair of complete tibial fractures treated with wire osteosynthesis in rodents. The repair of large bone defects is lengthy and complex. Both biomaterials and phototherapy have been used to improve bone repair. We aimed to describe histologically the repair of tibial fractures treated by wiring (W), irradiated or not, with laser (Î»780Â nm, 70Â mW, CW, spot area of 0.5Â cm(2), 20.4Â J/cm(2) (4â€‰Ã—â€‰5.1Â J/cm(2), Twin Flex EvolutionÂ®, MM Optics, Sao Carlos, SP, Brazil) per session, 300Â s, 142.8Â J/cm(2) per treatment) or LED (Î»850â€‰Â±â€‰10Â nm, 150Â mW, spot area of 0.5Â cm(2), 20.4Â J/cm(2) per session, 64Â s, 142.8Â J/cm(2) per treatment, FisioledÂ®(,) MM Optics, Sao Carlos, Sao Paulo, Brazil) and associated or not to the use of mineral trioxide aggregate (MTA, AngelusÂ®, Londrina, PR, Brazil). Inflammation was discrete on groups W and Wâ€‰+â€‰LEDPT and absent on the others. Phototherapy protocols started immediately before suturing and repeated at every other day for 15Â days. Collagen deposition intense on groups Wâ€‰+â€‰LEDPT,

Wâ€‰+â€‰BIO-MTAâ€‰+â€‰LaserPT and Wâ€‰+â€‰BIO-MTAâ€‰+â€‰LEDPT and discrete or moderate on the other groups. Reabsorption was discrete on groups W and Wâ€‰+â€‰LEDPT and absent on the other groups. Neoformation varied greatly between groups. Most groups were partial and moderately filed with new-formed bone (W, Wâ€‰+â€‰LaserPT, Wâ€‰+â€‰LEDPT, Wâ€‰+â€‰BIO-MTAâ€‰+â€‰LEDPT). On groups Wâ€‰+â€‰BIO-MTA and Wâ€‰+â€‰BIO-MTAâ€‰+â€‰LaserPT bone, neoformation was intense and complete. Our results are indicative that the association of MTA and PBMT (Î»â€‰=â€‰780Â nm) improves the repair of complete tibial fracture treated with wire osteosynthesis in a rodent model more efficiently than LED (Î»â€‰=â€‰850â€‰Â±â€‰10Â nm). Aluminum Compounds;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate Aluminum Compounds;Animals;Bone Wires;Calcium Compounds;Drug Combinations;Low-Level Light Therapy;Oxides;Rodentia;Silicates;Tibial Fractures

Different Therapeutic Effects of CO(2) and Diode Laser Irradiation on Tooth Movement-Related Pain. Although orthodontic treatment is common, orthodontic force often induced pain. Low-level laser therapy (LLLT) has been investigated to improve therapeutic comfort. In dentistry, LLLT is mainly applied using two types of lasers, CO(2) and diode lasers, whose biological actions are thought to be associated with wavelength (CO(2): 10,600 nm; diode: 808 nm). The analgesic effect of LLLT on orthodontic treatment-related pain is widely reported but inconsistent. This study aimed to (1) determine whether irradiation with a CO(2) or diode laser attenuates orthodontic treatment-related pain using the jaw-opening reflex model, (2) elucidate the optimal irradiation protocol for both lasers to obtain the maximal analgesic effect, (3) evaluate the effects of laser irradiation on other biological features [e.g., tooth movement, glial fibrillary acidic protein (GFAP) expression, and temperature alterations] and (4) investigate the mechanism underlying the analgesic effect of laser irradiation. In this animal model, orthodontic treatment-induced pain manifested as a significantly reduced the threshold for inducing the jaw-opening reflex on the orthodontically treated side compared with the contralateral side. GFAP expression in the bilateral trigeminal ganglia (TGs) was significantly increased by the application of orthodontic force. CO(2) laser irradiation of the orthodontically treated region significantly increased the threshold for inducing the jaw-opening reflex and the peripheral temperature. Similar reductions in jaw-opening reflex excitability were induced by surface anesthesia and thermal stimulation but not, the diode laser. Neither CO(2) nor diode laser irradiation altered GFAP expression in the TGs. Infiltration anesthesia also significantly increased the threshold for inducing the jaw-opening reflex on each anesthetized side. Irradiation (30 s) by either laser immediately after orthodontic force application (preirradiation) significantly decreased jaw-opening reflex excitability and GFAP expression in the bilateral TGs the next day. However, thermal stimulation immediately after orthodontic force application failed to alter jaw-opening reflex excitability the next day. Laser irradiation did not alter tooth movement; however, an optimized irradiation protocol for aiding tooth movement is suggested. In conclusion, both CO(2) and diode lasers are able to prevent orthodontic treatment-related pain. Furthermore, the involvement of temperature alterations and surface anesthesia in the analgesic effect induced by CO(2) laser irradiation is suggested.

Response to: Can Transdermal Photobiomodulation Help Us at the Time of COVID-19? Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Pandemics;Pneumonia, Viral;SARS-CoV-2

Author's Response to Ferreira: Can Transdermal Photobiomodulation Help Us at the Time of COVID-19? An Update. Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Pandemics;Pneumonia, Viral;SARS-CoV-2

Photobiomodulation: Shining Light on COVID-19. Objective: To evaluate the hypothesis that light could reduce the lethality of COVID-19. Methods: Most models for projections of the spread and

lethality of COVID-19 take into account the ambient temperature, neglecting light. Recent advances in understanding the mechanism of action of COVID-19 have shown that it causes a systemic infection that significantly affects the hematopoietic system and hemostasis, factors extremely dependent of light, mainly in the region of visible and infrared radiation. Results: In the COVID-19 patients hemoglobin is decreasing and protoporphyrin is increasing, generating an extremely harmful accumulation of iron ions in the bloodstream, which are able to induce an intense inflammatory process in the body with a consequent increase in C-reactive protein and albumin. Observing the unsaturation characteristics of the cyclic porphyrin ring allows it to absorb and emit radiation mainly in the visible region. This characteristic can represent an important differential to change this process in the event of an imbalance in this system, through the photobiomodulation to increase the production of adenosine triphosphate (ATP) using red and near-infrared radiation (R-NIR) and vitamin D using ultraviolet B (UVB) radiation. These two compounds have the primary role of activating the defense mechanisms of the immune system, enabling greater resistance of the individual against the attack by the virus. According to the theory of electron excitation in photosensitive molecules, similar to hemoglobin heme, after the photon absorption there would be an increase in the stability of the iron ion bond with the center of the pyrrole ring, preventing the losses of heme function oxygen transport (HbO(2)). The light is also absorbed by cytochrome c oxidase in the R-NIR region, with a consequent increase in electron transport, regulating enzyme activity and resulting in a significant increase of oxygen rate consumption by mitochondria, increasing ATP production. Conclusions: The most favorable range of optical radiation to operate in this system is between R-NIR region, in which cytochrome c oxidase and porphyrin present absorption peaks centered at 640â€‰nm and HbO(2) with absorption peak centered at 900â€‰nm. Based on the mechanisms described earlier, our hypothesis is that light could reduce the lethality of COVID-19. Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Infrared Rays;Low-Level Light Therapy;Pandemics;Pneumonia, Viral;SARS-CoV-2;Ultraviolet Rays;Ultraviolet Therapy

Cytotoxicity studies of an optoacoustic stimulation strategy for the development of laser-based hearing aids. SIGNIFICANCE: Worldwide, â˜¼460â€‰â€‰million people suffer from disabling hearing impairment. Many of these patients are still not sufficiently supplied with currently available auditory technologies. Optical stimulation of the hearing organ offers a promising alternative for a new generation of auditory prostheses. AIM: To assess the biocompatibility margins of our laser pulse amplitude strategy in vitro, we designed a protocol and present the effects on normal human dermal fibroblasts, human chondrocytes, and human osteoblasts. APPROACH: Laser pulses of 532Â nm were applied over 120Â s using our laser pulse amplitude modulation strategy. We then assessed cell viability and cytotoxicity through fluorescence staining and quantitative polymerase chain reaction-analysis regarding 84 key player-genes for cytotoxicity and stress response. RESULTS: The first in vitro biocompatibility margins for our stimulation parameters applied to cells of the peripheral hearing organ were between 200 and 223Â mW (3348â€‰â€‰J/cm2). After irradiation with a subphototoxic laser power of 199Â mW (2988â€‰â€‰J/cm2), only the fibroblasts showed a significant upregulation of GADD45G. CONCLUSION: Further studies are underway to optimize parameters for the optoacoustic stimulation of the auditory system. Our protocol and results on laser-tissue interactions can be useful for translational laser applications in various other irradiated biological tissues. Cell Survival;Hearing Aids;Humans;Lasers;Light;Low-Level Light Therapy

Photo biostimulatory effect of low dose photodynamic therapy on human mesenchymal stem cells. BACKGROUND: Tissue engineering is one treatment to regenerate bone . Stem cell proliferation or differentiation can be stimulated by adjunctive approaches like photobiomodulation. Some studies suggested that, photodynamic therapy with low concentration of photosensitizers can stimulate cell differentiation as a photobiomodulation approach. METHODS: Human bone marrow mesenchymal

stem cell was isolated and then cultured in sterile medium. Two photosensitizer drugs as 5-aminolevulenic acid (1 mM) (5-ALA) and Methylene blue (1Î¼M) (MB) were used in incubation culture media. In order to activate the photosensitizers, 630 and 660 nm wavelengths were irradiated with 1 J/cm2 energy density, respectively. Cell viability was assessed using MTT assay before and after laser irradiation, and also Alizarin red histologic test was used for calcium nodule formation. RESULTS: performing the MTT test before irradiation showed that, the optimum concentrations were 1 mM for 5-ALA and 1Î¼M for MB that were optimized. After laser irradiation, ALA group showed no osseous differentiation. In contrast, there was a significant calcium nodule formation in MB group compared with the control one. CONCLUSIONS: Photodynamic therapy with low photosensitizer concentration and low doses of laser energy density may improve osteogenic differentiation. Accordingly, MB had stimulatory effect on bone marrow derived mesenchymal stem cells. However, 5-ALA did not show this effect. Photosensitizing Agents;Aminolevulinic Acid Aminolevulinic Acid;Humans;Mesenchymal Stem Cells;Osteogenesis;Photochemotherapy;Photosensitizing Agents

The effect of photobiomodulation on human dental pulp-derived stem cells: systematic review. This systematic review assessed if photobiomodulation of human dental pulp tissue improved cell viability, proliferation, and/or differentiation compared with a placebo. This systematic review was conducted in line with PRISMA. PICO question was established; inclusion and exclusion criteria were established before a search had begun. A literature search was conducted through PubMed, Scopus, and Cochrane. Studies were included if published within the last 20Â years in English language, or where translation was available; laser parameters were mentioned; human dental pulp tissue was studied in vitro. Studies were excluded if non-human dental pulp tissue was studied and where the study was an in vivo study. Out of the total 121 studies found, 109 were excluded. Of the twelve included studies, three full-text articles were not available despite attempts made to contact the respective authors, leaving nine studies. Four of the included studies reported the use of stem cells derived from human deciduous teeth (SHEDs), and five used those from human permanent teeth (DPSCs). Most included studies utilized InGaAlP laser with wavelengths 660Â nm, and one study with 610Â nm. Other types of lasers included LED InGaN, and GaAlAs. Out of all included studies, two had a moderate risk of bias, and the rest had a low risk of bias. All studies confirmed positive effects on proliferation. One study also found improved osteogenic differentiation of the stem cells derived from stem cells of deciduous teeth. After assessing SHEDs and DPSCs separately, it is found that photobiomodulation improved cell proliferation in both subgroups. Due to heterogeneity in design protocols and laser parameters, it was not possible to compare the studies together. However, this study indicated that cell viability and proliferation did improve with photobiomodulation.
Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Dental Pulp;Humans;Low-Level Light Therapy;Outcome Assessment, Health Care;Publication Bias;Risk;Stem Cells;Tooth, Deciduous

Comparison of rate of orthodontic tooth movement in adolescent patients undergoing treatment by first bicuspid extraction and en-mass retraction, associated with low level laser therapy in passive self-ligating and conventional brackets: A randomized controlled trial. BACKGROUND: Low Level Laser Therapy (LLLT) is one of the various interventions to accelerate the rate of Orthodontic Tooth Movement (OTM) in adolescent patients who are undergoing en-mass retraction after all first bicuspid extractions. OBJECTIVES: To assess the efficacy of LLLT in increasing the rate of OTM. MATERIALS AND METHODS: Setting and sample population: Institutional Department of Orthodontics and Dentofacial Orthopaedics. Participants, study design and methods: 65 Patients requiring all first premolar extractions were randomly allocated to three groups. Two groups (Comprising of passive self-ligating brackets and conventional brackets) were treated with LLLT and one group served as the control (conventional brackets). The allocation ratio was 1:1:1.32. Eligibility criteria: adolescent patients with sound and healthy permanent dentition with Little's Irregularity Index<5mm. MAIN

OUTCOME: rate of tooth movement in mm/month. Randomization and blinding: computer-generated random allocation sequence; only the data analyser was blinded by coding the digital models. Patients were reviewed once every month till the completion of space closure. STATISTICS: data normality was checked using Shapiro-Wilks test and Q-Q Plot. Parametric tests were applied for the inferential statistics (ANCOVA) with Dunnett's t test being used for post hoc analysis. RESULTS: There was a statistically significant enhancement in the rate of OTM in the 2 experimental groups (0.68/0.67mm/month in the right and left side of the maxilla and 0.66/0.65mm/month in the right and left side of the mandible) when compared with the control group (0.48mm/month in the maxilla and 0.48mm/month in the mandible) (P<0.05), but when the 2 experimental groups were compared no difference was observed (P>0.05). No serious harms were reported. CONCLUSION: A significant increase in the rate of OTM was observed with the application of LLLT. No difference was observed in the rate of OTM when comparing different ligation methods treated with LLLT. REGISTRATION: National Trial Registry (CTRI No- CTRI/2018/04/013156). Protocol was not published before trial commencement. Adolescent;Bicuspid;Female;Humans;Low-Level Light Therapy;Male;Mandible;Maxilla;Orthodontic Appliance Design;Orthodontic Brackets;Orthodontic Wires;Prospective Studies;Tooth Extraction;Tooth Movement Techniques;Young Adult

Effect of photobiomodulation on salivary flow and composition, xerostomia and quality of life of patients during head and neck radiotherapy in short term follow-up: A randomized controlled clinical trial. Xerostomia and hyposalivation are frequent conditions in patients undergoing head and neck radiotherapy, which usually lead to a worsening of quality of life. This study aimed to assess whether photobiomodulation (PBM) can minimize hyposalivation, xerostomia and qualitative changes on saliva and improve quality of life in patients undergoing radiotherapy in short-term follow-up. Twenty-one patients were randomly divided into two groups: sham group (SG) and laser group (LG). A diode laser was used for intra- (660Â nm, 10Â J/cm(2), 0.28Â J per point, 40Â mW) and extra-oral (810Â nm, 25Â J/cm(2), 0.7Â J per point, 40Â mW) applications over the salivary glands, three times a week, during the entire radiotherapy period. In SG, the tip of the instrument was sealed with blue rubber to prevent the passage of light. Xerostomia and pH were evaluated and unstimulated and stimulated salivary flow was determined before the start of radiotherapy (T1), after the 15th session (T2), after the end of radiotherapy (T3) and 60Â days after radiotherapy (T4). Concentrations of calcium, total proteins, chloride, sodium, potassium and amylase and catalase activities were evaluated in stimulated saliva samples. Quality of life was assessed at times T1 and T4. Generalized estimating equations were used to assess differences in the outcome between times and groups. All patients showed worsening in unstimulated (pÂ =Â .003) and stimulated (pÂ <Â .001) salivary flow, xerostomia (pÂ <Â .05) and quality of life during radiotherapy (pÂ =Â .001). An increase in chloride concentrations was observed at times T3 and T4 (pÂ <Â 0,05), and a reduction in amylase activity at T3 (pÂ <Â .05). Unstimulated saliva pH was higher in LG than SG at T3 (pÂ =Â .037). No difference between groups was noted in relation to salivary flow and composition, xerostomia or quality of life. Our results suggest that PBM may help in preserving salivary pH during radiotherapy. Amylases Amylases;Follow-Up Studies;Head and Neck Neoplasms;Humans;Quality of Life;Saliva;Xerostomia

The impact of photobiomodulation therapy on the biology and behavior of head and neck squamous cell carcinomas cell lines. Photobiomodulation therapy (PBMT) is an emerging therapeutic modality designed to prevent and treat chemotherapy-driven oral mucositis (OM). However, the response of tumor cells to the effects of PBMT remains poorly understood. Our study explores the effects of PBMT in head and neck squamous cell carcinoma (HNSCC) based on cellular proliferation, migration, and survival of tumor cells and its population of cancer stem cells (CSC). We explored the behavior of two HNSCC cell lines (HN6 and HN13) under two distinct conditions, a physiological

growing condition (10% FBS), and under stress growing condition (2% FBS) prior to irradiation using diode laser (InGaAlP; MM Optics, SÃ£o Carlos, SP, Brazil). Diode laser (660Â nm) was applied with a power of 100Â mW delivering a total energy per point of 0.24Â J. MTT and wound healing test (scratch assay) were performed to evaluate, respectively, proliferation and migration of tumor cells. Clonogenic and spheres formation assays were also performed to evaluate the survival and percentage of CSC upon irradiation. Overall, we observed that PBMT does not exacerbate the behavior of HNSCC. We could only observe a decrease in cellular proliferation of one cell line (HN6) when cultured under nutritional stress conditions (pÂ <Â .05). There were no significant differences between the control and the PBMT groups regarding cell migration, survival and the percentage of CSC. Collectively, our results suggest that in vitro administration of PBMT to HNSCC does not modify the behavior of tumor cells. Cell Line, Tumor;Cell Movement;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Squamous Cell Carcinoma of Head and Neck

Perspectives on using laser fluorescence spectroscopy in chronological skin ageing assessment. INTRODUCTION: Laser fluorescence spectroscopy (LFS) is a potential tool for diagnosing pathological skin processes such as fibrosis, hypoxia, and inflammation. This article describes the results of the non-invasive assessment of skin autofluorescence for animals of different ages. METHODS: The study was performed on outbred white male mice (n = 14). Fluorescence spectra were measured using the multifunctional device LAKK-M (SPE Lazma, Moscow, Russia), which implements LFS in vivo. The method is to record the fluorescence spectrum of a tissue after laser irradiation at a wavelength of Î»e excites its fluorescence. The wavelength Î»e is selected corresponding to specific fluorophore properties. To excite the fluorescence, the wavelength Î»e = 535 nm was used, which made it possible to estimate the fluorescence intensity of the lipofuscin. RESULTS: Increased autofluorescence of lipofuscin in the green waveband was detected in animals in the older age group compared to the younger group using LFS. It is important to note that the autofluorescence spectra of lipofuscin are in superposition with the spectra of other fluorophores and that the autofluorescence spectra of lipofuscin overlap the spectra of other fluorophores such as porphyrins. This may affect the interpretation of LFS data. CONCLUSIONS: Adjustment of animal age is necessary for the optical assessment of pathological processes using LFS. Lipofuscin Animals;Lipofuscin;Low-Level Light Therapy;Male;Mice;Optical Imaging;Skin Aging;Spectrometry, Fluorescence

Micro-needling versus fractional carbon dioxide laser for delivery of tranexamic acid in the treatment of melasma: A split-face study. BACKGROUND: Tranexamic acid (TXA) in oral, topical, and intra-dermal injection routes showed efficacy in melasma treatment. Micro-needling and fractional carbon dioxide (CO(2)) laser were reported to enhance the drug delivery of TXA. AIMS: This study aimed at comparing the use of micro-needling and fractional CO(2) laser for drug delivery of TXA in the treatment of facial melasma. PATIENTS/METHODS: Thirty female patients with bilateral symmetrical facial melasma were subjected to micro-needling, for one side of the face, and fractional CO(2) laser, for the other, followed by an immediate topical application of TXA solution 4Â mg/mL. Patients received six biweekly sessions. RESULTS: Two weeks after the last session, a significant reduction in baseline modified melasma area and severity index (mMASI) score was observed on both sides. The meanÂ Â±Â SD baseline mMASI dropped from 3.43Â Â±Â 1.84 to 1.59Â Â±Â 1.51 (mean reduction 57.73%,Â PÂ <Â .001) and from 3.51Â Â±Â 1.84 to 1.78Â Â±Â 1.51 (mean reduction 55.82%,Â PÂ <Â .001) in the micro-needling-treated side and in the fractional CO(2) laser-treated side, respectively. However, no statistically significant differences were found between the two sides (PÂ =Â .81). CONCLUSIONS: Micro-needling and fractional CO(2) laser are equally safe and effective for the delivery of TXA in the treatment of facial melasma. Tranexamic Acid Combined Modality Therapy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Melanosis;Tranexamic Acid

Management of dry socket with low-level laser therapy. OBJECTIVE: The aim of this study is to investigate the efficacy of delivering low-level laser therapy (LLLT) in the management of dry socket at University Dental Hospital Sharjah. MATERIALS AND METHOD: Forty-five patients with dry socket were divided into two treatment groups. Group I dry socket patients (nâ€‰=â€‰30) received conventional treatment while group II patients (nâ€‰=â€‰15) were irradiated with LLLT at a setting of 200-mW, 6-J, continuous-wave mode using an R02 tipless handpiece (Fotona Er:YAG, Europe), on the buccal, lingual, and middle surfaces of the socket for 30Â s from a delivery distance of 1Â cm. Pain score and quantification of granulation tissue in the socket were recorded at 0, 4, and 7Â days post-dry socket treatment. RESULTS: Results showed that the LLLT-irradiated group II sockets showed a much lower VAS pain score of 1-2 as early as day 4, and a richer amount of granulation tissue compared to the conventional treated group I socket. The amount and rate of granulation tissue formation in the dry socket are inversely proportional to the pain score showing significant clinical effectiveness of LLLT on promoting the healing of the dry socket, with improvement in symptoms (Pâ€‰=â€‰.001). Conventionally treated dry sockets take at least 7Â days to match the effective healing of an LLLT-irradiated dry socket. CONCLUSION: LLLT irradiation influences biomodulation of dry socket healing by dampening inflammation, promoting vascularization, stimulating granulation, and controlling pain symptoms. CLINICAL RELEVANCE: LLLT may be an additional effective tool for managing dry sockets in general dental practice. Dry Socket;Europe;Humans;Low-Level Light Therapy;Tooth Socket;Wound Healing

Low-level laser therapy seems to reduce pain, swelling, and analgesic consumption after implant placement surgery. Analgesics;Dental Implants Analgesics;Dental Implants;Edema;Humans;Low-Level Light Therapy;Pain;Pain, Postoperative

Accelerated extraction treatment with the Invisalign system and photobiomodulation. Orthodontic Appliances, Removable;Tooth Movement Techniques;Treatment Outcome

Photobiomodulation and pain. Humans;Low-Level Light Therapy;Pain

Effect of photobiomodulation on pain perception among orthodontic patients: a randomized clinical trial. Humans;Low-Level Light Therapy;Pain;Pain Perception

Red-Light (670â€‰nm) Therapy Reduces Mechanical Sensitivity and Neuronal Cell Death, and Alters Glial Responses after Spinal Cord Injury in Rats. Individuals with spinal cord injury (SCI) often develop debilitating neuropathic pain, which may be driven by neuronal damage and neuroinflammation. We have previously demonstrated that treatment using 670â€‰nm (red) light irradiation alters microglia/macrophage responses and alleviates mechanical hypersensitivity at 7 days post-injury (dpi). Here, we investigated the effect of red light on the development of mechanical hypersensitivity, neuronal markers, and glial response in the subacute stage (days 1-7) following SCI. Wistar rats were subjected to a mild hemi-contusion SCI at vertebra T10 or to sham surgery followed by daily red-light treatment (30â€‰min/day; 670â€‰nm LED; 35â€‰mW/cm(2)) or sham treatment. Mechanical sensitivity of the rat dorsum was assessed from 1â€‰dpi and repeated every second day. Spinal cords were collected at 1, 3, 5, and 7â€‰dpi for analysis of myelination, neurofilament protein NF200 expression, neuronal cell death, reactive astrocytes (glial fibrillary acidic protein [GFAP](+) cells), interleukin 1 Î² (IL-1Î²) expression, and inducible nitric oxide synthase (iNOS) production in IBA1(+) microglia/macrophages. Red-light treatment significantly reduced the cumulative mechanical sensitivity and the hypersensitivity incidence following SCI. This effect was accompanied by significantly reduced neuronal cell death, reduced astrocyte activation, and reduced iNOS expression in IBA1(+) cells at the level of the injury. However, myelin and NF200 immunoreactivity and IL-1Î² expression in GFAP(+) and IBA1(+) cells were not altered by red-light treatment. Thus, red-light therapy may represent a useful non-pharmacological approach for treating pain during the subacute period after SCI by decreasing neuronal loss and modulating the

inflammatory glial response. Animals;Cell Death;Disease Models, Animal;Hyperalgesia;Light;Low-Level Light Therapy;Male;Neuralgia;Neuroglia;Neurons;Rats;Rats, Wistar;Spinal Cord Injuries

Promoted Viability and Differentiated Phenotype of Cultured Chondrocytes With Low Level Laser Irradiation Potentiate Efficacious Cells for Therapeutics. Effective clinical treatments of cartilage lesions in affected joints require large numbers of viable chondrogenic cells generated through in vivo stimulation or ex vivo expansion of chondrocytes isolated from small biopsy specimens. Conventional passaging of chondrocytes in culture provides sufficient cells for treatments but these cells usually lose their differentiated phenotype. This leads to the formation of fibrocartilaginous tissue due to a malfunctioning repair process. Biostimulation of passaging chondrocytes with low level laser irradiation (LLLI) may theoretically produce more functional chondrocytes for cell-based repair of cartilage defects. Molecular and cellular analyses, cytochemistry, cell cultivation, and microscopy showed that LLLI treatments were found to (1) increase chondrocyte viability, (2) promote secretion of matrix proteins, (3) upregulate expression of chondrogenic genes, and (4) downregulate gene expression of cell destructive proteases and genes coding for mediators involved in the extrinsic apoptosis signaling pathway. Furthermore, LLLI attenuated induction of genes associated with cell death and matrix breakdown induced by IL-1Î², some of which was seen at the protein level, with verification of effects on gene expression in the C28/I2 human chondrocyte line. LLLI treatments during culture generated larger numbers of viable chondrocytes compared to untreated cultures. Moreover, LLLI-treated chondrocytes in culture also rectified and simultaneously maintained their differentiated phenotype. Cultured chondrocytes treated with LLLI are a promising cell source for repairing cartilage lesions in vivo and restoration of articular function using tissue engineering strategies.

Effect of photobiomodulation on pain level during local anesthesia injection: a randomized clinical trial. The aim of this study was to investigate the effect of photobiomodulation therapy (PBMT) as pre-treatment on pain level during injection in the anterior maxillary region. 56 Patients were randomly divided into 3 groups, Group 1:980Â nm diode laser (nÂ =Â 22) (experimental), Group 2:980Â nm diode laser probe placed in vestibule without radiation (placebo) (nÂ =Â 22), Group3: no pre-treatment before injection (nÂ =Â 12) (control). Pain level during injection was evaluated by visual analog scale (VAS). The severity of pain in Group 1(experimental) and Group 2 (placebo) was significantly lower than Group 3 (control). Group 1 had a lesser pain level than Group 2, but the difference in pain level between them was not significant. PBMT with 980Â nm wavelength decreased pain level during local anesthesia injection without superiority over placebo. Anesthesia, Local;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain;Pain Measurement

Evaluation of preventive laser photobiomodulation in patients with head and neck cancer undergoing radiochemotherapy: Laser in patients with head and neck cancer. AIMS: This study aimed to evaluate the effect of laser photobiomodulation in the prevention of oral mucositis (OM), salivary hypofunction and referred pain in patients with head and neck cancer. METHODS AND RESULTS: This randomized clinical study divided patients into two groups: the laser group (LG, nÂ =Â 30) and the control group (CG, nÂ =Â 24). The LG (InGaAlP, 660Â nm, 86.7Â mW, 2 J/cm(2)) participated in the preventive protocol, while the CG underwent a simulated procedure without light emission. The degree of OM, salivary flow, and referred pain were evaluated at five different periods of radiotherapy. Both groups showed a significant increase in the degree of OM (PÂ <Â .01). Regarding OM, salivary flow, and oral pain, there were no significant differences between the groups. CONCLUSIONS: The laser photobiomodulation protocol used in this study was not effective in preventing radiochemotherapy-induced OM, salivary hypofunction, and referred pain in patients with head and neck cancer. Notably, although the development of OM did not differ significantly according

to the use of laser therapy, the severity of oral mucositis was reduced in patients who underwent laser therapy compared to that in patients who did not. Chemoradiotherapy;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Stomatitis

Effects of photobiomodulation on annulus fibrosus cells derived from degenerative disc disease patients exposed to microvascular endothelial cells conditioned medium. Intervertebral disc (IVD) degeneration with chronic low back pain is associated with neo-vascularisation into the deeper IVD regions. During this process, endothelial cells (ECs), which are primarily responsible for angiogenesis, interact with the adjacent annulus fibrosus (AF) cells, which are the first line of defence against the invasion of vascular structures into deeper IVD regions. However, the accumulation of inflammatory and catabolic enzymes that results from this interaction promotes matrix degradation and an inflammatory response. Thus, regulating the production of these mediators and catabolic enzymes could ameliorate IVD degeneration. Photobiomodulation (PBM) therapy is a non-invasive stimulation known to have biologically beneficial effects on wound healing, tissue repair, and inflammation. Here, we examined the effects of PBM, administered at various wavelengths (645, 525, and 465â€‰nm) and doses (16, 32, and 64â€‰J/cm(2)), on EC-stimulated human AF cells. Our results show that PBM selectively inhibited the EC-mediated production of inflammatory mediators, catabolic enzymes, and neurotrophins by human AF cells in a dose- and wavelength-dependent manner. These results suggest that PBM could be a superior and advanced treatment strategy for IVD degeneration. CXCL8 protein, human;Culture Media, Conditioned;IL6 protein, human;Interleukin-6;Interleukin-8;Matrix Metalloproteinases Adult;Annulus Fibrosus;Cells, Cultured;Culture Media, Conditioned;Dose-Response Relationship, Radiation;Endothelial Cells;Extracellular Matrix;Female;Gene Expression Regulation;Humans;Interleukin-6;Interleukin-8;Intervertebral Disc Degeneration;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Middle Aged;Models, Biological;Neovascularization, Pathologic

Photochemical Retinopathy induced by blue light emitted from a light-emitting diode Face Mask: A case report and literature review. RATIONALE: Skin photobiomodulation involves the use of low doses of light of a specific wavelength to reduce skin inflammation and promote tissue repair. Recently, a face mask using a light-emitting diode (LED) to induce photobiomodulation has been widely introduced in the market. However, a short wavelength of high-energy blue light can cause retinal damage. We would like to report a rare case of photochemical retinopathy after using a blue LED face mask. PATIENT CONCERNS: A 37-year-old woman presented with complaints of distorted vision. The patient was exposed to blue light from an LED face mask 1 month before presentation. DIAGNOSIS: Color fundus photography revealed a yellowish chorioretinal lesion and optical coherence tomography revealed retinal pigment epithelium destruction in the parafoveal area. Fluorescein angiography revealed leakage from the lesion at the parafovea. The patient was diagnosed with blue LED-induced photochemical retinopathy. INTERVENTIONS: Intravitreal bevacizumab was injected in the right eye. OUTCOMES: After 4 weeks, dysmorphopsia was improved. LESSONS: This case report demonstrates that retinal damage can occur in humans due to prolonged exposure to blue light. Therefore, it is important to be wary of eye exposure and ensure the eyes are covered during LED face mask use. Adult;Female;Humans;Light;Low-Level Light Therapy;Retinal Diseases

Prophylactic photobiomodulation therapy using 660 nm diode laser for oral mucositis in paediatric patients under chemotherapy: 5-year experience from a Brazilian referral service. The use of photobiomodulation therapy (PBMT) in the prevention of oral mucositis (OM) in paediatric care has increased. In this article, we report data of paediatric oncology/haematopoietic stem cell transplantation (HSCT) patients treated with PBMT to prevent chemotherapy-induced OM. A retrospective study was conducted at a Brazilian referral service. Prophylactic PBMT was used in

children and adolescents (â‰¤ 17 years) following the protocol: InGaAlP, 660 nm, 100 mW, 2 J, 3.33 W/cm(2), and 20 s per point. Demographic data and OM severity scores were assessed. A regression model tested the association between OM with prophylactic PBMT and antineoplastic therapy. A total of 148 individuals who had undergone 358 chemotherapy cycles were analysed. A higher occurrence of OM was observed in HSCT and osteosarcoma (OS) patients. Except for HSCT, OM was associated with methotrexate (MTX) use in all disease groups. PBMT significantly reduced OM severity in acute lymphoblastic leukaemia (ALL) and OS patients. OM grade was 3.16 and 5.45 times higher among individuals with ALL and OS, who had not undergone prophylactic PBMT compared with those who had undergone prophylactic PBMT ($p < 0.001$). PBMT prevented chemotherapy-induced OM. Individuals who used MTX and did not undergo prophylactic PBMT were at increased risk of OM. Antineoplastic Agents Adolescent;Antineoplastic Agents;Child;Child, Preschool;Female;Hematopoietic Stem Cell Transplantation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Referral and Consultation;Retrospective Studies;Stomatitis

Effect of Low- Level Laser Therapy on Bone Regeneration of Critical-Size Bone Defects: A Systematic Review of In Vivo Studies and Meta-Analysis. OBJECTIVE: Low-level laser therapy is a method for osteogenesis since it stimulates cell proliferation, vascularization and osteoblastic activity. Various protocols applying low-level laser with different outcomes exist. The aim of the present study was to review the result of different methods on bone formation in critical-size defects of in vivo studies. DESIGN: According to PRISMA statement, electronic search of PubMed, google scholar, Scopus and Web of Science and a hand search limited to in vivo English language studies until December 2019. Studies used low-level laser therapy in bone regeneration of critical-size defects met the inclusion criteria and which used high power lasers or a defect size smaller than 5 mm, were excluded. RESULTS: Finally, 18 studies were included. Fourteen studies utilized low-level laser with a wavelength ranging from 606 to 980 nm and 53 % of studies applied low-level laser in a single session. Ten studies utilized continuous wave mode of laser. Highest and lowest values of power density were 1.5 W/cm(2) and 0.1 W/cm(2) in order. Eleven studies evaluated low-lever laser therapy on defects of 5 mm in calvaria. Meta-analysis showed the positive effect of low-level laser therapy on osteogenesis after 30 days compared to control group and no significant difference after 60 days. CONCLUSIONS: New bone formation can be increased in early stage by applying low-level laser therapy through stimulating osteoblasts and fibroblasts' proliferation. This effect would be more remarkable by combining with bone substitutes. Hence, for each case, protocol selection should be performed according defect's properties, attentively. Animals;Bone Regeneration;Low-Level Light Therapy;Osteogenesis;Skull

In vitro effects of photobiomodulation applied to gingival fibroblasts cultured on titanium and zirconia surfaces and exposed to LPS from Escherichia coli. Photobiomodulation (PBM) therapy is used to stimulate cell proliferation and metabolism, as well as reduce inflammatory cytokine synthesis, which plays a main role in the long-term stability of implants. This study assessed the response of gingival fibroblasts cultured on titanium (Ti) and zirconia (ZrO(2)), submitted to PBM and exposed to lipopolysaccharide (LPS). Cells seeded on Ti and ZrO(2) were irradiated (InGaAsP; 780Â nm, 25Â mW) 3 times, using 0.5, 1.5, and 3.0Â J/cm(2) doses, and exposed to Escherichia coli LPS (1Â Î¼g/mL). After 24Â h, cell viability (alamarBlue, nâ€‰=â€‰8), interleukin 6 (IL-6) and 8 (IL-8) synthesis (ELISA, nâ€‰=â€‰6), and IL-6 and vascular endothelial growth factor (VEGF) gene expression (qPCR, nâ€‰=â€‰5) were assessed and statistically analyzed (one-way ANOVA, Î±â€‰=â€‰0.05). Cell morphology was evaluated by fluorescence microscopy. Increased cell viability occurred in all groups cultured on Ti compared with that of the control, except for cells exposed to LPS. Fibroblasts cultured on ZrO(2) and LPS-exposed exhibited reduced viability. PBM at 3.0Â J/cm(2) and 1.5Â J/cm(2) downregulated the IL-6 synthesis by fibroblasts seeded on Ti and

ZrO(2), as well as IL-8 synthesis by cells seeded on ZrO(2). Fibroblasts seeded on both surfaces and LPS-exposed showed increased IL-6 gene expression; however, this activity was downregulated when fibroblasts were irradiated at 3.0Â J/cm(2). Enhanced VEGF gene expression by cells seeded on Ti and laser-irradiated (3.0Â J/cm(2)). Distinct patterns of cytoskeleton occurred in laser-irradiated cells exposed to LPS. Specific parameters of PBM can biomodulate the inflammatory response of fibroblasts seeded on Ti or ZrO(2) and exposed to LPS. Interleukin-6;Lipopolysaccharides;Zirconium;Titanium;zirconium oxide Cell Proliferation;Cell Survival;Cells, Cultured;Escherichia coli;Fibroblasts;Gene Expression Regulation;Gingiva;Humans;Interleukin-6;Lipopolysaccharides;Low-Level Light Therapy;Titanium;Young Adult;Zirconium

Photobiomodulation-Induced Differentiation of Immortalized Adipose Stem Cells to Neuronal Cells. BACKGROUND AND OBJECTIVES: Transdermal differentiation of human adipose stem cells (ASCs) to other cell types is still a challenge in regenerative medicine. Studies using primary ASCs are also limited as they may undergo replicative senescence during repeated passages in vitro. However, ASCs immortalized (iASCs) with human telomerase enzyme expressing plasmid exhibits a uniform population suitable for differentiation in vitro. A right combination of biological and physical stimuli may induce transdermal differentiation of iASCs into neurons in vitro. STUDY DESIGN/MATERIALS AND METHODS: iASCs were differentiated to free-floating neural stem cell aggregates (neurospheres) using a combination of growth inducers. Cells in these spheres were induced to differentiate into neurons using low-intensity lasers by a process called photobiomodulation (PBM). RESULTS: Laser at the near infrared (NIR) wavelength 825â€‰nm and fluences 5, 10, and 15â€‰J/cm(2) was capable of increasing the differentiation of neurospheres to neurons. Precisely, there was a statistically significant increase in the early neuronal marker at 5â€‰J/cm(2) and a much appreciable increase at 15â€‰J/cm(2) in correlation with the biphasic dose response of PBM. However, these differentiated cells failed to express late neuronal markers in vitro. Comparison of these differentiating iASCs with the primary ASCs revealed a sharp distinction between the metabolic processes of the primary ASCs, neurospheres, and newly differentiated neurons. CONCLUSION: We found that PBM increased the yield of neurons and effected stem cell differentiation through modulation of cellular metabolism and redox status. Our study also identifies that iASCs are an excellent model for analysis of stem cell biology and for performing transdermal differentiation. SIGNIFICANCE: This study demonstrates that a combination of biological and physical inducers can advance the differentiation of adipose stem cells to neurons. We were able to establish the optimal energy for the neuronal differentiation of iASCs in vitro. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Adipose Tissue;Cell Differentiation;Humans;Low-Level Light Therapy;Neurons;Stem Cells

The effectiveness and safety of electrotherapy in the management of fibromyalgia. Treating fibromyalgia is a challenging task for physicians. With its multifaceted features, fibromyalgia requires a comprehensive management strategy focusing on both the pharmacological and non-pharmacological treatment options. During the last decades, there has been growing evidence regarding the role of electrotherapy in fibromyalgia treatment. In this regard, the present article aimed to review the recent literature on the effectiveness and safety of the electrotherapy in the treatment of fibromyalgia. A literature search was conducted through PubMed/MEDLINE and Scopus databases. Transcutaneous electrical nerve stimulation (TENS), non-invasive brain stimulation (transcranial direct current/magnetic stimulation), and light amplification by stimulated emission of radiation (LASER) emerged as the most commonly examined electrotherapy techniques in fibromyalgia. Currently, there is growing data regarding the effectiveness of electrotherapy in the management of fibromyalgia-related pain. Besides, non-invasive electrotherapy techniques are related to no/minor side effects. Further studies are warranted to identify the optimal treatment protocols for each electrotherapy modality. Fibromyalgia;Humans;Low-Level Light

Therapy;Pain Management;Transcranial Direct Current Stimulation;Transcutaneous Electric Nerve Stimulation

Salivary Cortisol Levels and Burning Symptoms in Patients with Burning Mouth Syndrome before and after Low Level Laser Therapy: a Double Blind Controlled Randomized Clinical Trial. OBJECTIVES: Burning mouth syndrome (BMS) is a disorder which is described as burning sensation of the oral mucosa without pathological changes. Most of the patients have some underlying stressful conditions. Stress induces an increase in secretion of different endocrine glands resulting in higher levels of glucocorticoids. One of the options for treatment of BMS includes low level laser therapy (LLLT). The aim of this research was to determine salivary cortisol levels and intensity of burning symptoms in BMS patients before and after LLLT. MATERIALS AND METHODS: Twenty-three participants were allocated by randomization in two groups: 12 patients in the study group and 11 patients in the placebo group. Cortisol levels in all patients were analyzed from the sample of saliva collected without stimulation. In both groups, the LLLT was performed once a day for ten consecutive days (excluding weekend) with Ga-Al-As light-emitting diode type of laser, with a wavelength of 685nm. In the control group, LLLT was done with inactive laser probe which was only emitting audio signal. The intensity of burning symptoms was measured by a visual analogue scale (VAS). The VAS and unstimulated saliva were measured at baseline and on the last day of the LLLT. A quantitative analysis of saliva was performed using competitive commercial ELISA-kit. RESULTS: VAS scores and salivary cortisol levels were significantly lower in both groups after LLLT. CONCLUSIONS: LLLT can be useful in patients with BMS for reducing burning symptoms and salivary cortisol level. Future studies on a larger number of patients should clarify whether the positive results are an outcome of laser effectiveness or of placebo effect.

Auto-Administered Photobiomodulation on Diabetic Leg Ulcers Treatment: A New Way to Manage It? BACKGROUND: Peripheral arterial disease is a dramatic consequence of an uncontrolled diabetic condition causing an increase of morbidity and mortality and its treatment is currently medical or surgical, finally requiring, in the 7-20% of cases, major or minor amputation. Photobiomodulation therapy (PBM) is a laser treatment used in medicine, thanks to its ability to stimulate the wound healing, the acceleration of inflammatory process, and the modulation of pain. Recently, the self-administration of the treatment has been suggested for different purposes in medicine and dentistry with a great number of advantages and no side effects. METHODS: A 84-year-old woman affected by diabetes type 2 and positive for diabetes complications had diagnosis for an ulcerative lesion of 1â€‰cm diameter on her right leg and started a treatment of the lesion applying the B-Cure Laser Pro (Erika Carmel, Haifa, Israel) on her own with a fluence per minute of 3.2â€‰J/cm(2) for 2 sessions of 15 minutes by cutaneous application. RESULTS: After a week of treatment, the ulcer dried and crusted, finally providing complete healing after 30 days of treatment. CONCLUSION: With this short case report, we think to add a further contribution by suggesting this kind of treatment for successful management of the leg ulcers in diabetic patients.

Analysis of low-level laser transmission at wavelengths 660, 830 and 904Â nm in biological tissue samples. BACKGROUND: In recent decades, low-level laser therapy (LLLT) has occupied a prominent position and has been studied in various fields of knowledge, and your effects have been widely observed in studies about numerous tissues, such as tendons, peripheral nerves, cutaneous tissue, bone, and muscle, in different fields of knowledge. PURPOSE: To analyze the power transmitted by low-level laser therapy (LLLT) to different tissue samples by using distinct wavelengths. METHODS: Skin samples of rat (nÂ =Â 7, 1.17-1.63Â mm) and pig (nÂ =Â 10; 1.20-2.30Â mm); pig fat (nÂ =Â 10; 2.71-14.01Â mm) and pig muscle (nÂ =Â 10; 1.91-8.91Â mm) were analyzed and interposed between the emitter and the power analyzer sensor. All the samples were irradiated sequentially three times, at five equidistant points and average power levels of

35.34(Â±1.03), 32.40(Â±0.70), and 42.32(Â±0.82) mW, for the wavelengths 660, 830, and 904Â nm, respectively. Transmitted radiation was measured with a power analyzer connected to a laser emitter. Statistical analysis was performed with a Shapiro-Wilk test followed by ANOVA with Tukey's post hoc test, with a significance level of 5%. RESULTS: The transmitted power of LLLT on skin, fat, and muscle of tissues decreases with the increase of thicknesses, presenting minor attenuation on rat skin, pig fat, and pig muscle for 904Â nm. The pig skin has the slight attenuation for 830Â nm. CONCLUSION: The LLLT should be applied after considering the transmission loss taking place in different anatomical structures, following the Beer-Lambert law and attenuation coefficient presented for more practical application in many fields. Adipose Tissue;Animals;Low-Level Light Therapy;Muscle, Skeletal;Rats;Skin;Swine

Laser and LED photobiomodulation effects in osteogenic or regular medium on rat calvaria osteoblasts obtained by newly forming bone technique. The purposes of this study are to evaluate the effects of photobiomodulation (PBM) with laser and LED on rat calvaria osteoblasts (rGO lineage), cultured in osteogenic (OST) or regular (REG) medium, after induction of a quiescent state and to test if PBM is capable of osteogenic induction and if there is a sum of effects when combining OST medium with PBM. Before irradiation, the cells were put in a quiescent state (1% FBS) 24Â h, when red (AlGaInP-660Â nm) and infrared laser (GaAlAs-808Â nm) and LED (637â€‰Â±â€‰15Â nm) were applied. The groups were as follows: red laser (RL3-5Â J/cm(2), 3Â s and RL5-8.3Â J/cm(2), 5Â s, 1.66Â W/cm(2)); infrared laser (IrL3-5Â J/cm(2), 3Â s and IrL5-8.3Â J/cm(2), 5Â s); LED (LED3-3Â s and LED5-5Â s, 0.02Â J/cm(2), 0.885Â W/cm(2)); positive (C+, 10% FBS) and negative control (C-, 1% FBS). For alkaline phosphatase (ALP) and mineralization assays, the cells were cultured in REG (DMEM 10% FBS) and OST medium (DMEM 10% FBS, 50Â Î¼g/mL ascorbic acid, 10Â mM Î²-glycerophosphate). Statistical analysis was performed using ANOVA and Tukey's tests (pâ€‰<â€‰0.05). RL5 and LED5 increased proliferation, in vitro wound closure, ALP, and mineralization in rGO cells (pâ€‰<â€‰0.05). PBM with red laser and LED induced mineralization by itself, without osteogenic medium, not observed for infrared laser (pâ€‰<â€‰0.05). A sum of effects was observed in osteogenic medium and PBM by infrared, red laser, and LED (5Â s). Red laser and LED increased proliferation, migration, and secretory phases in rGO cells in a dose-dependent manner. PBM with red laser and LED promotes osteogenic induction by itself. PBM with infrared laser and osteogenic medium potentializes mineralization. Alkaline Phosphatase Alkaline Phosphatase;Animals;Calcification, Physiologic;Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Lasers;Low-Level Light Therapy;Osteoblasts;Osteogenesis;Rats;Skull

Invited Discussion on: Effect of Photobiomodulation on Ecchymosis After Rhinoplasty-A Randomized Single-Blind Controlled Trial. Double-Blind Method;Ecchymosis;Edema;Humans;Rhinoplasty;Single-Blind Method

The effect of high-intensity versus low-level laser therapy in the management of plantar fasciitis: randomized participant blind controlled trial. OBJECTIVES: To evaluate and compare the efficacy of high-intensity laser therapy (HILT) and low-level laser therapy (LLLT) for plantar fasciitis. DESIGN: A participant blind randomized controlled trial with parallel group design and an active comparator with follow-up at fourâ€‰weeks. SETTINGS: Outpatient, University hospital. SUBJECTS: Unilateral plantar fasciitis participants (nâ€‰=â€‰102) were randomly assigned into two groups. Recruitment period was from January 2017 to April 2019. INTERVENTIONS: Interventions included eight sessions of laser therapy over threeâ€‰weeks and single session of patient education. The HILT group (nâ€‰=â€‰51) received HILT and the LLLT group (nâ€‰=â€‰51) received LLLT. MAIN MEASURES: Primary outcomes: visual analogue scale; secondary outcomes: pressure algometry, sonography of plantar fascia thickness (time frame: baseline to three-week and four-week follow-up) and numeric rating scale (0%-100%) for opinion of participants on effect of treatment (time frame:

threeâ€‰weeks). Data presented: mean (SD) or n (%). RESULTS: There was no statistically significant difference between the groups according to visual analogue scale (pain in general reduction in threeâ€‰weeks: 2.57(3.45) vs. 2.88(3.28)â€‰cm), pressure algometry (pain threshold difference between healthy and affected heel reduction in threeâ€‰weeks: 1.80(6.39) vs. 1.77(2.85)â€‰kg) and sonography measurements (plantar fascia thickness difference between healthy and affected heel reduction in threeâ€‰weeks: 0.19(0.56) vs. 0.30(0.57)â€‰mm). There was a statistically significant difference between the groups in participants' opinion in favor to HILT group (efficacy of treatment better than 50%: 26(51%) vs. 37(73%)). CONCLUSION: No statistically significant difference between groups was observed. Adult;Aged;Fasciitis, Plantar;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Patient Outcome Assessment;Treatment Outcome;Ultrasonography;Visual Analog Scale

Fox Fordyce disease: a side effect of laser therapy. Fox-Fordyce disease (FFD) is an uncommon apocrine disorder. We reported a 26-year-old woman with bilateral axillary pruritic papular lesions following 2 sessions of treatment with Diode (800Â nm) laser for axillary hair removal. No lesions were developed in the other treated areas. Topical 0.1% tacrolimus gel was used for her treatment. Adult;Axilla;Female;Fox-Fordyce Disease;Hair Removal;Humans;Laser Therapy;Low-Level Light Therapy

Photobiomodulation for spinal cord injury: A systematic review and meta-analysis. In recent years, photobiomodulation therapy (PBMT) has found many applications in various medical fields. Studies of PBMT on spinal cord injury (SCI) have mostly used laser sources in experimental animal models. The purpose of this study was to summarize studies that have employed PBMT for various kinds of SCI in animals. A thorough search in databases including MEDLINE, EMBASE, SCOPUS, and Web of Science, with the removal of unrelated articles, yielded 16 relevant articles. The meta-analysis showed that PBMT was effective in improving post-SCI movement in the first 14 days (MDÂ =Â 1.593 (95% CI: 1.110 to 2.075; p <0.001, I(2)Â =Â 51.9%) and this improvement became even greater thereafter (MDÂ =Â 2.086 (95% CI: 1.570 to 2.603; pÂ =Â <0.001. I(2)= 90.3%). Time of irradiation (<300 sec or >300 sec), gender (male or female), injury model (contusion or compression, radiation protocol (<14 days or â‰¥14days), laser wavelength (<800nm or >800nm) and injury severity (moderate or severe) were found to be factors that can affect PBM efficacy for SCI treatment. PBMT has an anti-inflammatory effect, is effective in reducing the size of spinal cord lesions and helps to absorb administrated proteins and stem cells to the lesion site. Animals;Female;Low-Level Light Therapy;Male;Spinal Cord Injuries

Photobiomodulation-Underlying Mechanism and Clinical Applications. The purpose of this study is to explore the possibilities for the application of laser therapy in medicine and dentistry by analyzing lasers' underlying mechanism of action on different cells, with a special focus on stem cells and mechanisms of repair. The interest in the application of laser therapy in medicine and dentistry has remarkably increased in the last decade. There are different types of lasers available and their usage is well defined by different parameters, such as: wavelength, energy density, power output, and duration of radiation. Laser irradiation can induce a photobiomodulatory (PBM) effect on cells and tissues, contributing to a directed modulation of cell behaviors, enhancing the processes of tissue repair. Photobiomodulation (PBM), also known as low-level laser therapy (LLLT), can induce cell proliferation and enhance stem cell differentiation. Laser therapy is a non-invasive method that contributes to pain relief and reduces inflammation, parallel to the enhanced healing and tissue repair processes. The application of these properties was employed and observed in the treatment of various diseases and conditions, such as diabetes, brain injury, spinal cord damage, dermatological conditions, oral irritation, and in different areas of dentistry.

Photobiomodulation and antimicrobial photodynamic therapy for oral cytomegalovirus reactivation following acute graft-versus-host disease. The relationship between cytomegalovirus (CMV), a severe complication in immunocompromised patients, and graft-versus-host disease (GVHD) has already been reported but remains without complete elucidation, especially concerning oral lesions. Considering that antimicrobial photodynamic therapy (aPDT) has an antimicrobial effect and photobiomodulation therapy (PBM) provides analgesia and modulation of inflammatory processes, the present study aimed to report a clinical case in which oral CMV reactivation following acute GVHD was treated by a combination of aPDT and PBMT concomitantly with conventional drug treatment. Intense and uninterrupted oral pain and consequent impairment of the patient's oral functions were present due to ulcerated lesions in the tongue, soft palate, and labial mucosa. After 72 hours from the first laser session, a marked decrease in the severity of the lesions and pain relief was observed. All oral lesions were repaired within 30 days. Based on this case report, when used concomitantly with conventional drug treatment, the combination of aPDT and PBMT seems to play a crucial role in treating CMV associated with GVHD. Anti-Infective Agents;Photosensitizing Agents Anti-Infective Agents;Cytomegalovirus;Cytomegalovirus Infections;Graft vs Host Disease;Humans;Photochemotherapy;Photosensitizing Agents

Manipulation of living cells with 450Â nm laser photobiomodulation. Increasing studies demonstrated that photobiomodulation (PBM) influenced specific biological effects in cells, tissues and organs, and these effects rely on the production of light irradiation. In this study, we aimed to precisely manipulate the spatial arrangement of adhesion cells in a traditional culture condition with 450Â nm low intensity laser. Through 450Â nm laser PBM, the adhesion of the cultured cells was significantly improved and resisted the digestion of 0.1% trypsin. Combined with a computer aided design system (CAD) and computer numerical control (CNC) system, the designed laser irradiation pattern induced the specific cell micropattern in the culture dish. RNA sequencing and biochemical experiments confirmed that the 450Â nm laser prompted low-density lipoprotein (LDL) bonding to the cell surface and induced lipid peroxidation, which crosslinked and modified the protein molecules on the irradiated cell surface. In this way, the peroxidation product-modified proteins resisted trypsin proteolysis, ultimately leading to a differential detachment between the irradiated and non-irradiated cells under trypsin treatment. This convenient method did not require special biomaterial processing, has no impact on cell viability and functions, and required no changes to the conventional cell culture conditions. The photo-induced cell capturing is a great complement to existing tools by providing spatial resolution. Animals;Cell Adhesion;Cell Proliferation;Gene Expression Profiling;Lipid Peroxidation;Low-Level Light Therapy;Mice;NIH 3T3 Cells;Proteolysis

Evidence-Based Review of Antibiofilm Agents for Wound Care. Significance: Biofilms in vivo are small densely packed aggregations of microbes that are highly resistant to host immune responses and treatment. They attach to each other and to nearby surfaces. Biofilms are difficult to study and identify in a clinical setting as their quantification necessitates the use of advanced microscopy techniques such as confocal laser scanning microscopy. Nonetheless, it is likely that biofilms contribute to the pathophysiology of chronic skin wounds. Reducing, removing, or preventing biofilms is thus a logical approach to help clinicians heal chronic wounds. Recent Advances: Wound care products have demonstrated varying degrees of efficacy in destroying biofilms in in vitro and preclinical models, as well as in some clinical studies. Critical Issues: Controlled studies exploring the beneficial role of biofilm eradication and its relationship to healing in patients with chronic wounds are limited. This review aims to discuss the mode of action and clinical significance of currently available antibiofilm products, including surfactants, dressings, and others, with a focus on levels of evidence for efficacy in disrupting biofilms and ability to improve wound healing outcomes. Future Directions: Few available products have good evidence to support antibiofilm activity and wound

healing benefits. Novel therapeutic strategies are on the horizon. More high-quality clinical studies are needed. The development of noninvasive techniques to quantify biofilms will facilitate increased ease of research about biofilms in wounds and how to combat them. Anti-Infective Agents, Local;Benzalkonium Compounds;Biguanides;Disinfectants;Iodophors;Surface-Active Agents;polihexanide;Hypochlorous Acid;cadexomer iodine Animals;Anti-Infective Agents, Local;Bandages;Benzalkonium Compounds;Biguanides;Biofilms;Disinfectants;Honey;Humans;Hypochlorous Acid;Iodophors;Low-Level Light Therapy;Surface-Active Agents;Ultrasonic Therapy;Wound Healing;Wound Infection

Alterted Adipogenesis of Human Mesenchymal Stem Cells by Photobiomodulation Using 1064â€‰nm Laser Light. BACKGROUND AND OBJECTIVES: Photobiomodulation (PBM) describes the influence of light irradiation on biological tissues. Laser light in the near-infrared (NIR) spectrum has been shown to mitigate pain, reduce inflammation, and promote wound healing. The cellular mechanism that mediates PBM's effects is generally accepted to be at the site of the mitochondria, leading to an increased flux through the electron transport chain and adenosine triphosphate (ATP) production. Moreover, PBM has been demonstrated to reduce oxidative stress through an increased production of reactive oxygen species (ROS)-sequestering enzymes. The aim of the study is to determine whether these PBM-induced effects expedite or interfere with the intended stem cell differentiation to the adipogenic lineage. STUDY DESIGN/MATERIALS AND METHODS: To determine the effects of 1064â€‰nm laser irradiation (fluence of 8.8-26.4â€‰J/cm(2)) on human mesenchymal stem cells (hMSCs) undergoing adipogenic differentiation, the ATP and ROS levels, and adipogenic markers were quantitatively measured. RESULTS: At a low fluence (8.8â€‰J/cm(2)) the ATP increase was essentially negligible, whereas a higher fluence induced a significant increase. In the laser-stimulated cells, PBM over time decreased the ROS level compared with the non-treated control group and significantly reduced the extent of adipogenesis. A reduction in the ROS level was correlated with a diminished lipid accumulation, reduced production of adipose-specific genetic markers, and delayed the chemically intended adipogenesis. CONCLUSION: We characterized the use of NIR light exposure to modulate adipogenesis. Both the ATP and ROS levels in hMSCs responded to different energy densities. The current study is expected to contribute significantly to the growing field of PBM as well as stem cell tissue engineering by demonstrating the wavelength-dependent responses of hMSC differentiation. Lasers Surg. Med. Â© 2020 Wiley Periodicals LLC. Reactive Oxygen Species Adipogenesis;Humans;Lasers;Mesenchymal Stem Cells;Reactive Oxygen Species;Stem Cells

Treatment of myofascial pain with a rapid laser therapy protocol compared to occlusal splint: A double-blind, randomized clinical trial. OBJECTIVE: To compare the effect of a rapid low-level laser therapy (LLLT) protocol to Michigan occlusal splint in the treatment of myofascial pain, as well as to evaluate their impact on Oral Health-Related Quality of Life (OHRQoL). METHODS: Thirty participants were randomly allocated into three groups: G1: occlusal splint (nÂ =Â 11), G2: LLLT (nÂ =Â 10), and G3: LLLT placebo (nÂ =Â 9). LLLT and placebo were applied in the points of pain upon palpation. RESULTS: G1 presented improvement in pain (p =Â 0.014) and in the diagnosis of myofascial pain (p =Â 0.008), while G2 and G3 did not. Regarding OHRQoL, G1 and G2 presented significant improvement (p =Â 0.005, in both), whereas, G3 did not. CONCLUSION: Michigan occlusal splint was effective in reducing pain and improving OHRQoL. Treatment with the rapid LLLT protocol only provided an improvement in OHRQoL. Humans;Laser Therapy;Low-Level Light Therapy;Myofascial Pain Syndromes;Occlusal Splints;Pain;Quality of Life;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Treatment Outcome

Rapid LLLT protocol for myofascial pain and mouth opening limitation treatment in the clinical practice: An RCT. OBJECTIVE: To evaluate the effect of a rapid treatment protocol of low-level

laser therapy (LLLT) in patients with myofascial pain and mouth opening limitation. METHODS: Twenty patients were randomly allocated into the laser group (LG) (nÂ =Â 10) and the placebo group (PG) (nÂ =Â 10). Two LLLT sessions or placebo were performed. They were applied to the pain points upon palpation, with a 48-hr interval. Patients were evaluated for spontaneous pain sensitivity during mandibular movements and for oral health-related quality of life, which was assessed using the Oral Health Impact Profile for Temporomandibular Disorders (OHIP/TMD) questionnaire. RESULTS: Two patients from the placebo group were lost during the study. A significant increase in the maximum mouth opening (p =Â 0.04) and improvement in OHIP/TMD scores (p =Â 0.003) were observed in the LG after 30Â days. CONCLUSION: Spontaneous pain was reduced in both groups with low-level laser therapy. Humans;Low-Level Light Therapy;Myofascial Pain Syndromes;Pain;Quality of Life;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Treatment Outcome

Effect of low intensity photobiomodulation associated with norbixin-based poly (hydroxybutyrate) membrane on post-tenotomy tendon repair. In vivo study. PURPOSE: To evaluate the in vivo response of photobiomodulation therapy associated with norbixin-based poly(hydroxybutyrate) membrane (PHB) in tenotomized calcaneal tendon. METHODS: Thirty rats were randomly allocated to six groups (n=5 each): LED groups (L1, L2 and L3) and membrane + LED groups (ML1, ML2 and ML3). The right calcaneal tendons of all animals were sectioned transversely and were irradiated with LED daily, one hour after surgery every 24 hours, until the day of euthanasia. At the end of the experiments the tendons were removed for histological analysis. RESULTS: The histological analysis showed a significant reduction in inflammatory cells in the ML1, ML2 and ML3 groups (p=0.0056, p=0.0018 and p<0.0001, respectively) compared to those in the LED group. There was greater proliferation of fibroblasts in the ML1 (p<0.0001) and L3 (p<0.0001) groups. A higher concentration of type I collagen was also observed in the ML1 group (p=0.0043) replacing type III collagen. CONCLUSION: Photobiomodulation in association with norbixin-based PHB membrane led to control of the inflammatory process. However, it did not favor fibroblast proliferation and did not optimize type I collagen formation in the expected stage of the repair process. Collagen Type I;Collagen Type III;Hydroxybutyrates;Phb protein, rat;Prohibitins;Carotenoids;Collagen;norbixin Achilles Tendon;Animals;Carotenoids;Collagen;Collagen Type I;Collagen Type III;Drug Evaluation, Preclinical;Fibroblasts;Hydroxybutyrates;Low-Level Light Therapy;Male;Prohibitins;Random Allocation;Rats;Rats, Wistar;Tendinopathy;Tenotomy;Wound Healing

Photobiomodulation and Stem Cell Therapy for Temporomandibular Joint Disc Disorders. Background: Temporomandibular disorder (TMD) refers to a group of disorders affecting the temporomandibular joint (TMJ) and its related muscles. The two commonly used treatment modalities for TMD are occlusal splint therapy and relaxation therapy. Neither comprises definitive treatment. Objective: The objective of this review was to report updated information on photobiomodulation and stem cells, as an alternative treatment for the degenerative TMJ disc as a part of TMJ disorders. Materials and methods: With only a few research studies reported till date, this review also proposes the mechanism of laser irradiation on inflammatory mediators to treat TMD. Results: Photobiomodulation of stem cells with and without scaffolds could be used indirectly or directly as modulation of degenerative changes of the TMJ disc. Conclusions: The need for a distinct shift of the research margin in this field of dentistry is evident, specifically regarding the application of photobiomodulation and stem cells for tissue engineering of the TMJ disc. Humans;Low-Level Light Therapy;Stem Cell Transplantation;Temporomandibular Joint Disorders

Clinical management of tendinopathy: A systematic review of systematic reviews evaluating the effectiveness of tendinopathy treatments. While the pathoetiology is disputed, a wide array of treatments is available to treat tendinopathy. The most common treatments found in the literature include therapeutic modalities, exercise protocols, and surgical interventions; however, their

effectiveness remains ambiguous. The purpose of this study was to perform a systematic review of systematic reviews to determine the ability of therapeutic interventions to improve pain and dysfunction in patients with tendinopathy regardless of type or location. Five databases were searched for systematic reviews containing only randomized control trials to determine the effectiveness of treatments for tendinopathies based on pain and patient-reported outcomes. Systematic reviews were assessed via the Assessment of Multiple Systematic Reviews (AMSTAR) for methodological quality. From the database search, 3,295 articles were found, 107 passed the initial inclusion criteria. After further review, 25 systematic reviews were included in the final qualitative analysis. The AMSTAR scores were relatively high (8.8Â Â±Â 1.0) across the 25 systematic reviews. Eccentric exercises were the most common and consistently effective treatment for tendinopathy across systematic reviews. Low-level laser therapy and extracorporeal shockwave therapy demonstrated moderate effectiveness, while platelet-rich plasma injections demonstrated inconclusive evidence on their ability to decrease tendinopathy-related pain and improve function. Corticosteroids also showed some effectiveness for short-term pain, but for the long-term use deemed ineffective and at times contraindicated. Regarding surgical options, minimally invasive procedures were more effective compared to open surgical interventions. When treating tendinopathy regardless of location, eccentric exercises were the best treatment option to improve tendinopathy-related pain and improve self-reported function. Adrenal Cortex Hormones Adrenal Cortex Hormones;Combined Modality Therapy;Databases, Factual;Dry Needling;Exercise Therapy;Extracorporeal Shockwave Therapy;Humans;Laser Therapy;Low-Level Light Therapy;Minimally Invasive Surgical Procedures;Pain Management;Pain Measurement;Patient Reported Outcome Measures;Platelet-Rich Plasma;Randomized Controlled Trials as Topic;Systematic Reviews as Topic;Tendinopathy

Effect of photobiomodulation on cellular migration and survival in diabetic and hypoxic diabetic wounded fibroblast cells. A disrupted wound repair process often leads to the development of chronic wounds, and pose a major physical, social and economic inconvenience on patients and the public health sector. Chronic wounds are a common complication seen in diabetes mellitus (DM), and often the severity necessitates amputation of the lower limbs. Recently, there has been increasing evidence that photobiomodulation (PBM) initiates wound healing, including increased protein transcription for cell proliferation, viability, migration and tissue reepithelialisation. Here, the hypothesis that PBM at a wavelength of 660Â nm and energy density of 5Â J/cm(2) regulates wound repair in diabetic wounded and hypoxic diabetic wounded fibroblasts by enhancing cell migration and survival was investigated. PBM increased migration and survival in diabetic wounded and hypoxic diabetic wounded fibroblasts. Our findings suggest that PBM enhances migration and survival in diabetic wounded and hypoxic diabetic wounded fibroblasts, indicating that this therapeutic method may be beneficial against chronic wounds in diabetic patients. Animals;Apoptosis;Cell Movement;Cell Proliferation;Cell Survival;Diabetes Mellitus;Fibroblasts;Humans;Hypoxia;Low-Level Light Therapy;Wound Healing

Photobiomodulation therapy for male infertility. Male infertility is a worldwide critical condition that affects about the 7.5% of males in Europe leading to an increment of the couples referring to reproductive medicine units to achieve pregnancy. Moreover, in the recent years, an increased number of patients have required to freeze their gametes in order to preserve their fertility. Photobiomodulation (PBM) therapy is a potential treatment that has been used for different clinical application basically aimed at biostimulating cells and tissues. Here, we report a deep overview of the published studies, focusing on PBM mechanism of action, with the aim of expanding the knowledge in the field of laser light for a rational utilization of irradiation in the clinical practice. In the field of reproductive science, PBM was employed to increment spermatozoa's metabolism, motility, and

viability, due to its beneficial action on mitochondria, leading to an activation of the mitochondrial respiratory chain and to the ATP production. This treatment can be particularly useful to avoid the use of chemicals in the spermatozoa culture medium as well as to promote the spermatozoa survival and movement especially after thawing or in largely immotile sperm samples. DNA DNA;Humans;Infertility, Male;Low-Level Light Therapy;Male;Sperm Motility;Spermatozoa

Photobiomodulation can prevent apoptosis in cells from mouse periodontal ligament. Photobiomodulation (PBM) has been used to modulate the inflammatory and immune responses, pain relief, and to promote wound healing. PBM is widely used in dental practice and its cellular effects should be investigated. The aim was to evaluate if PBM changes proteins cell death-related, such as caspase-6 and Bcl-2, in periodontal ligament cells. Eighteen mice were divided in three groups (n = 6), i.e., (I) control, (II) 3 J cm(-2), and (III) 30 J cm(-2). Low power infrared laser (830 nm) parameters were power at 10 mW, energy densities at 3 and 30 J cm(-2) in continuous emission mode, exposure time of 15 and 150 s, respectively for 4 days in a row. Twenty-four hours after last irradiation, the animals were euthanized, and their jaws were fixed and decalcified. Caspase-6 and Bcl-2 were analyzed by real-time polymerase chain reaction and immunocytochemical techniques, and DNA fragmentation was evaluated by TUNEL. Statistical differences were not significant to caspase-6 mRNA relative levels in tissues from jaws at both energy densities, but a significant increase of Bcl-2 mRNA relative levels was obtained at 30 J cm(-2) group. Also, 30 J cm(-2) group showed caspase-6 positive-labeled cells decreased and Bcl-2 positive-labeled cells significantly increased. TUNEL-labeled cells demonstrated DNA fragmentation decreased at 30 J cm(-2). PBM can alter Bcl-2 mRNA relative level and both caspase-6 and Bcl-2 protein, modulating cell survival, as well as to reduce DNA fragmentation. More studies must be performed in order to obtain conclusive results about photobiostimulation effects using infrared low-level laser in apoptosis process as to achieve the optimum dosage. BCL2 protein, human;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger Animals;Apoptosis;Cell Survival;DNA Fragmentation;Gene Expression Regulation;Low-Level Light Therapy;Mice;Periodontal Ligament;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;Wound Healing

Diethyldithiocarbamate-copper nanocomplex reinforces disulfiram chemotherapeutic efficacy through light-triggered nuclear targeting. To circumvent the huge cost, long R&D time and the difficulty to identify the targets of new drugs, repurposing the ones that have been clinically approved has been considered as a viable strategy to treat different diseases. In the current study, we outlined the rationale for repurposing disulfiram (DSF, an old alcohol-aversion drug) to treat primary breast cancer and its metastases. Methods: To overcome a few shortcomings of the individual administration of DSF, such as the dependence on copper ions (Cu(2+)) and limited capability in selective targeting, we here artificially synthesized the active form of DSF, diethyldithiocarbamate (DTC)-Cu complex (CuET) for cancer therapeutics. To achieve a greater efficacy in vivo, smart nanomedicines were devised through a one-step self-assembly of three functional components including a chemically stable and biocompatible phase-change material (PCM), the robust anticancer drug (CuET) and a near-infrared (NIR) dye (DIR), namely CuET/DIR NPs. A number of in vitro assays were performed including the photothermal efficacy, light-triggered drug release behavior, nuclear localization, DNA damage and induction of apoptosis of CuET/DIR NPs and molecular mechanisms underlying CuET-induced repression on cancer metastatic behaviors. Meanwhile, the mice bearing 4T1-LG12-drived orthotopic tumors were employed to evaluate in vivo biodistribution and anti-tumor effect of CuET/DIR NPs. The intravenous injection model was employed to reflect the changes of the intrinsic metastatic propensity of 4T1-LG12 cells responding to CuET/DIR NPs. Results: The rationally designed nanomedicines have self-traceability for bioimaging, long blood circulation time for enhanced drug accumulation in the tumor site and photo-responsive release of the anticancer drugs.

Moreover, our data unearthed that CuET/DIR nanomedicines behave like "Trojan horse" to transport CuET into the cytoplasm, realizing substantial intracellular accumulation. Upon NIR laser irradiation, massive CuET would be triggered to release from the nanomedicines and reach a high local concentration towards the nucleus, where the pro-apoptotic effects were conducted. Importantly, our CuET/DIR nanomedicines revealed a pronounced capability to leash breast cancer metastases through inhibition on EMT. Additionally, these nanomedicines showed great biocompatibility in animals. Conclusion: These combined data unearthed a remarkably enhanced tumor-killing efficacy of our CuET nanomedicines through nuclear targeting. This work may open a new research area of repurposing DSF as innovative therapeutic agents to treat breast cancer and its metastases. Antineoplastic Agents;Copper;Ditiocarb;Disulfiram Animals;Antineoplastic Agents;Breast Neoplasms;Cell Line, Tumor;Cell Nucleus;Copper;Disulfiram;Ditiocarb;Drug Delivery Systems;Drug Liberation;Drug Repositioning;Female;Humans;Low-Level Light Therapy;Mice;Nanomedicine;Nanoparticles;Neoplasm Metastasis;Neoplasms;Theranostic Nanomedicine

Photobiomodulation therapy associated with supervised therapeutic exercises for people with knee osteoarthritis: a randomised controlled trial protocol. BACKGROUND: Physical exercise, a cornerstone of the conservative management of knee osteoarthritis (KOA), is exhaustively recommended by important clinical guidelines. A strength therapeutic exercise program (STEP) relieves pain, improves physical function and ultimately ameliorates quality of life (QoL). Furthermore, photobiomodulation (PBM) has been used as an adjunct treatment for people with KOA; however, there are still controversial recommendations regarding its use on this population. Thus, we hypothesised that PBM, when associated with a STEP protocol on patients with KOA, could induce better clinical outcomes than a STEP protocol alone. METHODS AND ANALYSIS: The study is a 6-month triple-blind placebo-controlled randomised clinical trial with intention-to-treat analysis. The trial will include 120 people with clinic and radiographic signs of KOA. The intervention consists of a supervised STEP and PBM protocols conducted over an 8-week intervention period. Assessments are performed at baseline, right after treatment, and 3-month and 6-month follow-up periods. The primary clinical outcome is pain intensity according to a 10â€‰cm Visual Analogue Scale. Secondary outcomes are the global Western Ontario & McMaster Universities Osteoarthritis Index; QoL assessed by the 36-item Short-Form health survey questionnaire; and performance-based physical parameters assessed by the 30 s chair stand test; the stair climb test; and the 40â€‰m fast-paced walk test. ETHICS AND DISSEMINATION: The trial was approved by the Human Research Ethics Committee of the Federal University of SÃ£o Carlos, SÃ£o Paulo, Brazil (REC no 2.016.122). Results will be published in peer-reviewed journals. TRIAL REGISTRATION NUMBER: Brazilian Clinical Trials Registry (U1111-1215-6510). Brazil;Exercise Therapy;Humans;Knee Joint;Low-Level Light Therapy;Ontario;Osteoarthritis, Knee;Quality of Life;Randomized Controlled Trials as Topic;Treatment Outcome

Elucidating the time course of the transcriptomic response to photobiomodulation through gene co-expression analysis. Photobiomodulation (PBM) with low-intensity red to near infrared light elicits neuroprotection in various pre-clinical models and in some clinical contexts, yet the intracellular mechanisms triggered by PBM, and their temporal sequence of modulation, remain unclear. We aimed to address this uncertainty by mapping the temporal transcriptomic response to PBM. Human SH-SY5Y neuroblastoma cells were treated with 670Â nm PBM and RNA collected a various time points over 24Â h. The transcriptome was screened by RNA microarray, and gene co-expression analysis by hierarchical clustering was coupled with bioinformatics analysis to reveal the molecular systems modulated by PBM and their expression patterns over the time course. The findings suggest that PBM induces distinct early phase (up to 8Â h post-PBM) and late phase (24Â h

post-PBM) intracellular responses. The early intracellular response features enrichment of pathways relating to transcriptional regulation and cellular stress responses, while the late intracellular response demonstrates a physiological shift to enrichment of downstream pathways such as cell death and DNA damage. These findings provide support for the hypothesis that PBM acts as a transient stressful stimulus, activating endogenous stress response pathways that in turn enhance cellular resilience. Further, the study introduces a novel method for retaining the richness of the temporal component when analysing transcriptomic time course data sets. RNA, Neoplasm Apoptosis;Cell Line, Tumor;Cluster Analysis;Computational Biology;DNA Damage;Humans;Infrared Rays;Low-Level Light Therapy;Oligonucleotide Array Sequence Analysis;RNA, Neoplasm;Time Factors;Transcriptome

The effectiveness of combination therapies for androgenetic alopecia: A systematic review and meta-analysis. Androgenetic alopecia (AGA) is the most common type of baldness affecting both men and women. Studies investigating combination therapies for AGA reported greater efficacy than monotherapy but without rigorous examination. The authors performed a meta-analysis and systemic review to further verify the evidence. To evaluate the effectiveness of three common combination therapies of minoxidil with finasteride, low-level laser light therapy (LLLT) or microneedling versus minoxidil monotherapy. We conducted a systematic review of randomized controlled trials (RCTs) of combination therapies consisting of topical minoxidil for AGA through April 2020. Quality assessment and data analysis were performed by Review Manager 5.3. Fifteen studies met the inclusion criteria involving a total of 1172 AGA patients. We conducted meta-analysis for three groups of combined treatment separately, and all were superior to monotherapy in terms of global photographic assessment (Pâ€‰<â€‰.05). Combination of LLLT or microneedling with minoxidil also showed significant increase in hair count (Pâ€‰<â€‰.05) compared to monotherapy. The present study suggests that combination therapy could be an effective, safe and promising option for the treatment of AGA. However, more RCTs are needed to further investigate and confirm the efficacy of combined treatment. Finasteride;Minoxidil Alopecia;Female;Finasteride;Hair;Humans;Male;Minoxidil;Treatment Outcome

Mitochondria as a target for neuroprotection: role of methylene blue and photobiomodulation. Mitochondrial dysfunction plays a central role in the formation of neuroinflammation and oxidative stress, which are important factors contributing to the development of brain disease. Ample evidence suggests mitochondria are a promising target for neuroprotection. Recently, methods targeting mitochondria have been considered as potential approaches for treatment of brain disease through the inhibition of inflammation and oxidative injury. This review will discuss two widely studied approaches for the improvement of brain mitochondrial respiration, methylene blue (MB) and photobiomodulation (PBM). MB is a widely studied drug with potential beneficial effects in animal models of brain disease, as well as limited human studies. Similarly, PBM is a non-invasive treatment that promotes energy production and reduces both oxidative stress and inflammation, and has garnered increasing attention in recent years. MB and PBM have similar beneficial effects on mitochondrial function, oxidative damage, inflammation, and subsequent behavioral symptoms. However, the mechanisms underlying the energy enhancing, antioxidant, and anti-inflammatory effects of MB and PBM differ. This review will focus on mitochondrial dysfunction in several different brain diseases and the pathological improvements following MB and PBM treatment. Methylene Blue Animals;Brain Diseases;Humans;Low-Level Light Therapy;Methylene Blue;Mitochondria;Neuroprotection

Effect of nanohydroxyapatite associated with photobiomodulation in the control of dentin hypersensitivity: A randomized, double-blind, placebo-controlled clinical trial. PURPOSE: To evaluate the effect of nanohydroxyapatite (nHAP) associated with photobiomodulation (PBM) in the

control of dentin hypersensitivity (DH). (C-Shape It). METHODS: 32 subjects with 83 hypersensitive teeth were randomized into four groups (N =8) : GPlacebo - simulated PBM (without light emission) followed by the application of nHAP-free toothpaste; GLaser - PBM followed by the application of nHAP-free toothpaste; GnHAP - simulated PBM followed by the application of nHAP; GLasernHAP - PBM followed by the application of nHAP. A visual analogue scale (VAS) was used to measure DH after a tactile and evaporative stimulus. DH evaluations were performed at four times: baseline, 1st, and 2nd treatment sessions, and 1 month. A questionnaire was used to evaluate the risk factors associated with DH intensity. Mixed-design ANOVA followed by Tukey test and logistic regression were used. RESULTS: The mechanical stimulus showed a significant reduction in DH in all experimental groups (P< 0.05) at the 2nd treatment session. For the evaporative stimulus, the GLasernHAP group presented a significant reduction in DH at the 1st treatment session (P< 0.05). Intragroup analysis showed that only the GnHAP group showed regression of DH at 1 month for the two applied stimuli. The variables of parafunctional habits, diets rich in acidic drinks and anxiety had significant relationships with the intensity of DH (P< 0.05). CLINICAL SIGNIFICANCE: The use of nHAP and application of PBM to laser are effective in the control of dentin hypersensitivity. However, their association did not enhance the desensitizing effect. Dentin Desensitizing Agents;Toothpastes Dentin Desensitizing Agents;Dentin Sensitivity;Double-Blind Method;Humans;Toothpastes;Treatment Outcome

Effect of Photobiomodulation Therapy (660â€‰nm) on Wound Healing of Rat Skin Infected by Staphylococcus. Objective: To assess the impact of photobiomodulation (PBM) therapy on healing of infected wounds and document the microscopic findings throughout the recovery process. Background: Previous studies have suggested that PBM accelerates wound healing and reduces inflammation and pain. However, the ideal protocol and ultimate value of PBM treatment for infected wounds are controversial. Materials and methods: Eight-month-old male rats were randomly divided into the control group, the nonirradiation group, or the irradiation group. A 1â€‰cm diameter skin excision was made. The wounds of the nonirradiated and irradiated rats were inoculated with a suspension of Staphylococcus aureus. We then performed 7 days of PBM therapy at a wavelength of 660â€‰nm for 35â€‰min/day. On day 8, the rats were sacrificed for histological assessment. Sections were stained with hematoxylin and eosin, Masson trichrome, and a proliferating cell nuclear antigen (PCNA) kit. Defect diameter was calculated using the Visus Image Analysis System. Results: The irradiated group had more epithelial cells and richer granulation tissue compared to those in the other groups. The irradiation group had a significantly smaller defect size than the nonirradiation group (pâ€‰<â€‰0.01) and the control group (pâ€‰<â€‰0.05). The amount of collagen was highest in the irradiation group and was graded as 3, 2, and 3+ in the control, nonirradiation, and irradiation groups, respectively. The percentage of PCNA in the control group was significantly lower than that in the other two groups (pâ€‰<â€‰0.05). Conclusions: PBM therapy (660â€‰nm) promoted cell proliferation and collagen synthesis, thereby improving the wound healing response to an S. aureus infection. Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Staphylococcal Skin Infections;Wound Healing;Wound Infection

Successful application of antimicrobial photodynamic and photobiomodulation therapies for controlling osteoradionecrosis and xerostomia after laryngeal carcinoma treatment: A case report of full oral rehabilitation. We present a clinical case where a conservative treatment based on photonics [antimicrobial Photodynamic Therapy (aPDT) associated to Photobiomodulation therapy (PBMT)] of a patient with osteoradionecrosis (ORN) due to radiotherapy treatment of a laryngeal cancer. As a result of this combined treatment the ORN was controlled (e.g. the necrosis, infection and suppuration disappeared). Moreover, the symptoms reported by the patient (pain and xerostomia) also diminished along with the repair of oral mucosa. In future cases this combined

therapy (e.g. PBM therapy and the aPDT) will be further examined. Anti-Infective Agents;Photosensitizing Agents Anti-Infective Agents;Carcinoma;Head and Neck Neoplasms;Humans;Laryngeal Neoplasms;Low-Level Light Therapy;Osteoradionecrosis;Photochemotherapy;Photosensitizing Agents;Xerostomia
Sunlight and health: shifting the focus from vitamin D3 to photobiomodulation by red and near-infrared light. Both sun exposure and serum vitamin D levels have been associated with lower risks of all-cause mortality and chronic age-related diseases, e.g., cancer, diabetes and cardiovascular disease, in epidemiological studies. These associations have mainly been ascribed to beneficial effects of vitamin D. However, a vast body of randomized controlled trials (RCTs) and Mendelian randomization studies have failed to confirm any major health benefits from vitamin D supplementation. In this review, we present tentative evidence showing that red and near-infrared light, both being present in sunlight, could explain the associations between sunlight exposure and better health status. Body irradiation with red and near-infrared light, usually termed as photobiomodulation (PBM), has demonstrated beneficial effects in animal models of chronic diseases. Beyond this, preliminary evidence from RCTs suggest potential clinical benefit from PBM for chronic diseases. PBM is currently being investigated in many pre-registered clinical trials, results of which will eventually clarify the role of red and near-infrared light in the prevention and treatment of common age-related chronic diseases. Vitamin D;Cholecalciferol Aging;Animals;Cardiovascular Diseases;Cholecalciferol;Humans;Infrared Rays;Sunlight;Vitamin D;Vitamin D Deficiency
In vitro anti-tumor effect of high-fluence low-power laser light on apoptosis of human colorectal cancer cells. Colorectal cancer is the third most common malignancy all over the world, along with high morbidity and mortality. As a treatment, high-fluence low-power laser irradiation (HF-LPLI) has reported that its biostimulatory activity can suppress or even destruct tumor growth in neoplastic diseases. The aim of the present study is to examine a therapeutic capacity of HF-LPLI for colorectal cancer treatment by using human colon cancer cell (HT29) model. The in vitro cancer cell model was used to analyze the underlying mechanism of laser-induced apoptosis. Laser irradiation was performed five times (once a day for five consecutive days) with 635Â nm laser light for 8 and 16Â min (fluenceâ€‰=â€‰128 and 256Â J/cm(2)), respectively. The efficiency of the HF-LPLI treatment was evaluated by MTT, fluorescence staining, cell wound healing, and western blot test during the 5-day period. Experiment data showed that HF-LPLI had a dose-dependent stimulating effect on cell viability, migration, and apoptosis of HT29 cells. The inhibition effect of laser treatment at 256Â J/cm(2) on cell viability was statistically significant. Meanwhile, the wound healing and western blot tests also confirmed that HF-LPLI could inhibit cell migration and induce cell apoptosis. The current research results demonstrate that 635Â nm HF-LPLI can be an alternative treatment option for colorectal cancer by increasing the expression of caspase-3 and inducing HT29 tumor cell apoptosis through activation of the mitochondrial pathway. CASP3 protein, human;Caspase 3;Caspase 9 Apoptosis;Caspase 3;Caspase 9;Cell Death;Cell Movement;Cell Survival;Colorectal Neoplasms;Fluorescence;HT29 Cells;Humans;Low-Level Light Therapy;Mitochondria;Wound Healing
Photobiomodulation Therapy for the Management of Chemotherapy-Induced Peripheral Neuropathy: An Overview. Background: Chemotherapy-induced peripheral neuropathy (CIPN) is a common side effect of chemotherapy (CT), affecting 68% of patients. Current treatment strategies are based on pharmacological symptom management, but have limited results. Photobiomodulation therapy (PBMT) is a new and emerging therapeutic tool in the supportive care of cancer patients. In this overview, we explore the usability of PBMT for management of CIPN. Objective: To provide a comprehensive overview of management of CIPN with PBMT. Methods: Specific terms, including "Photobiomodulation Therapy," "Drug Therapy," and "Peripheral Nervous System Diseases," were

identified for the literature research in PubMed. Results: Three articles were considered eligible for this review. Primary outcome measures were highly variable across the included studies. Conclusions: PBMT might be an effective treatment strategy to manage CIPN, with very encouraging reports from renowned teams, but evidence is limited. More methodologically uniform research (mainly regarding the parameters of PBMT) is needed to support the use of PBMT for this indication. Antineoplastic Agents Antineoplastic Agents;Humans;Low-Level Light Therapy;Neoplasms;Peripheral Nervous System Diseases

Photobiomodulation Therapy to Mitigate Radiation Fibrosis Syndrome. Objective: We evaluated the role of photobiomodulation (PBM) in radiation fibrosis syndrome (RFS). Background: Radiation therapy (RT) is an important treatment utilized in over half of newly diagnosed cancers. Despite its benefits, patients treated with RT may experience acute and chronic significant side effects depending on both treatment- and patient-related factors. RFS is an important long-term side effect of RT, which can adversely impact patient's quality of life and organ function. With improved oncologic outcomes and survival for cancer patients after radiation, there is an unmet need to address long-term side effects of RT, particularly RFS. Results: Photobiomodulation (PBM) using low energy, nonionizing light primarily in the visible (especially red) or near-infrared spectrum has been demonstrated to decrease acute side effects of radiation in rigorously conducted phase III randomized studies; however, its potential benefit in ameliorating chronic radiation side effects, particularly RFS remains to be investigated. Conclusions: This review summarizes the in vitro data, preclinical animal studies and clinical reports, which showcase the potential benefits of PBM treatments in preventing and reversing RFS. Humans;Low-Level Light Therapy;Neoplasms;Radiation Pneumonitis;Radiotherapy

A Narrative Review on the Use of Photobiomodulation Therapy for the Prevention and Management of Acute Radiodermatitis: Proposed Mechanisms, Current Clinical Outcomes, and Preliminary Guidance for Clinical Studies. Objective: A narrative review of the available scientific evidence to identify the current proposals relating the use of photobiomodulation (PBM) to treat acute radiodermatitis (ARD), to guide future research. Background data: A devastating side effect of radiotherapy (RT) is ARD, defined as an inflammatory skin reaction induced by RT. Currently, there is still no standard of care for ARD. PBM is a non-invasive light therapy that is a growing modality in the field of supportive cancer care. There is a need for identifying the therapeutic irradiation windows in this field, based on the available literature. Methods: An electronic search of original articles in the PubMed database was performed with the following keywords: "photobiomodulation therapy," "low-level light therapy," "low-level laser therapy," "acute radiodermatitis," and "radiotherapy" until December 2019. Randomized controlled trials, prospective non-randomized, case report, cohort, cross-over, and retrospective studies were selected for this review. Results: Nine clinical trials that investigated the use of photobiomodulation therapy (PBMT) in ARD were available for evaluation. Results demonstrate that PBMT could significantly reduce the severity of ARD and the accompanying discomfort and pain in patients with cancer. Conclusions: Based on the available evidence of the narrative review, PBM might be an effective therapy for the prevention and management of ARD in patients with cancer. More research is needed to confirm this finding. Acute Disease;Humans;Low-Level Light Therapy;Neoplasms;Radiodermatitis;Radiotherapy

Approach Behavior Induced by 10.6-Î¼m Laser Stimulation at Acupoint ST36 in a Rat Model of Incisional Pain. Objective: Laser stimulation (LS) at both the injury site and specific acupoints may induce analgesic effects. The purpose of this study is to investigate the effects of LS at injury site or acupoint on analgesic-associated approach behavior and determine whether opioid receptors in the anterior cingulate cortex (ACC) were involved. Methods: The left hindpaw incision was established in rats. LS (10.6â€‰Î¼m) was performed at the ipsilateral (left) acupoint ST36 (Zusanli) or

locally to the incision site. Characteristic guarding pain behavior was measured to assess incision-induced pain. A two-chamber conditioned place preference (CPP) paradigm was used to measure approach behavior induced by pain relief. To inhibit opioid receptors, naloxone was microinjected into the ACC before LS. Results: A delayed analgesic effect (24â€‰h after treatment) was induced in both the LS groups (ST36 and incision site) as compared with the sham control or model groups (pâ€‰<â€‰0.05). An immediate (30â€‰min after the end of the LS) decrease in guarding pain (pâ€‰<â€‰0.001) and CPP for the LS chamber (pâ€‰<â€‰0.001) were observed only in the ST36 LS group. The administration of naloxone in ACC inhibited the LS-induced analgesic effect and CPP (pâ€‰<â€‰0.05). Conclusions: Our results highlight the novel approach behavior of pain relief induced by 10.6-Î¼m LS at ST36 in a rat model of incisional pain, and implicate ACC opioid receptor signaling in these actions. Acupuncture Points;Animals;Avoidance Learning;Choice Behavior;Conditioning, Psychological;Disease Models, Animal;Low-Level Light Therapy;Male;Pain, Procedural;Rats;Rats, Sprague-Dawley;Surgical Wound

Effects of photobiomodulation with low-level laser therapy in burning mouth syndrome: A randomized clinical trial. BACKGROUND: Photobiomodulation (PBM) has proven to be effective in different painful conditions. OBJECTIVES: To assess the effect of photobiomodulation for pain management in burning mouth syndrome (BMS) patients, besides analysing the impact on different aspects of quality of life. METHODS: A randomized, single-blind, clinical trial was performed among 20 patients with BMS. Photobiomodulation was applied in the study group (nÂ =Â 10) with a dose of 12Â J/cm(2) during 10 sessions, comparing with a placebo group (nÂ =Â 10) with the laser turned off. Pain was assessed using the visual analogue scale (VAS) before starting each treatment session, and at the 1-month and 4-month follow-up appointments. Some validated questionnaires for general health were also complete: SF-36, OHIP-14, Epworth, SCL 90-R and McGill. RESULTS: All patients (nÂ =Â 10) in the study group improved their pain ending treatment and remaining among 90% (nÂ =Â 9) in the 4-month follow-up. Significant improvement was found in the study group in some sections of McGill questionnaire, Epworth scale, and SCL 90-R at the end of the treatment and in the 1-month and 4-month follow-ups. CONCLUSIONS: Photobiomodulation seems to be effective in reducing pain in patients with BMS, as well as, having a positive impact on the psychological state of these patients. Burning Mouth Syndrome;Humans;Low-Level Light Therapy;Pain Measurement;Quality of Life;Single-Blind Method

Photobiomodulation with 808-nm diode laser enhances gingival wound healing by promoting migration of human gingival mesenchymal stem cells via ROS/JNK/NF-ÎºB/MMP-1 pathway. Photobiomodulation (PBM) has been shown to improve wound healing by promoting mesenchymal stem cell migration and proliferation. However, it remains unknown whether an 808-nm diode laser can influence human gingival mesenchymal stem cells (HGMSCs), and which dose this works well. In the present study, it was found that PBM could promote the migration of HGMSCs but not the proliferation. Furthermore, PBM could activate mitochondrial ROS, which could elevate the phosphorylation levels of JNK and IKB in HGMSCs, and further activate NF-ÎºB as the nuclear translocation of p65 is elevated. Taken together, these present results indicate that PBM might promote cell migration via the ROS/JNK/NF-ÎºB pathway. NF-kappa B;Reactive Oxygen Species;JNK Mitogen-Activated Protein Kinases;Matrix Metalloproteinase 1 Cell Movement;Gingiva;Humans;JNK Mitogen-Activated Protein Kinases;Lasers, Semiconductor;MAP Kinase Signaling System;Matrix Metalloproteinase 1;Mesenchymal Stem Cells;Mitochondria;NF-kappa B;Phosphorylation;Reactive Oxygen Species;Wound Healing

Treatment of periocular and temporal reticular veins with 1064-nm Nd:YAG Laser. BACKGROUND: The periocular and temporal regions are important aspects of beauty. The presence of reticular veins in these areas is undesirable and can also interfere with injection of neurotoxins to

treat squint lines. 1064-nm Nd:YAG laser shows promise as an effective treatment modality with long-lasting effects. AIM: The aim of the study is to show that the long-pulsed, contact-cooled, variable spot-sized 1064-nm Nd:YAG laser is effective and safe, with good patient satisfaction and tolerability, and is able to achieve long-term results. METHODS: A retrospective study of 35 consecutive patients seen over a 3-year period in a private cosmetic clinic affiliated to the University of Toronto for periocular and temporal reticular veins was conducted. They were all treated with 1064-nm Nd:YAG laser. RESULTS: A total of 35 patients with an average age of 45.8Â years old received treatment. 13 had lower eyelids treated, 9 had temples treated, 12 had both lower eyelids and temples treated, and 1 had both upper and lower eyelids treated. The first case of upper eyelid vein being treated with the 1064-nm Nd:YAG laser with great success after only 1 treatment is reported. 80% of the patients required only 1-2 treatment sessions. The average satisfaction score was 7.9 out of 10. The average pain score was 5.0 out of 10. 91% perceived the treatment outcome as excellent or good with the longest result lasting 33Â months. There were 4 complications: 1 scabbing, 1 small burn, 1 skin darkening, and 1 teary eye. CONCLUSION: The study showed that the use of the long-pulsed, contact-cooled, variable spot-sized 1064-nm Nd:YAG laser is effective and safe, with good patient satisfaction and tolerability, and is able to achieve long-term results. Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Retrospective Studies;Treatment Outcome;Veins

Photobiomodulation Therapy on Orthodontic Movement: Analysis of Preliminary Studies with a New Protocol. This study aimed to investigate the effectiveness of photobiomodulation therapy (PBMT) on the acceleration of orthodontic movements, deriving from its biostimulating and regenerative capacity on soft tissues, consequent to the increase in differentiation, proliferation, and activity of cells that are involved with alveolar bone remodeling. The present randomized controlled trial was conducted on six patients who required extractive orthodontic therapy because their ectopic canines had erupted. A total of eight canines were analyzed, four of which received laser irradiation (i.e., experimental group). Two weeks after the extractions, all canines of the experimental and placebo groups were distalized simultaneously and symmetrically with the laceback retraction technique. The PBMT protocol consisted of four cycles of laser applications, one each on days 0, 3, 7, and 14 of the study, with session treatment durations of 2-4 min. The results of the descriptive analysis on the distal displacement speed of the canines after 1 month of follow-up indicate an average displacement of 1.35 mm for the non-irradiated group and 1.98 mm for the irradiated group. Through inferential analysis, a statistically significant difference ($p < 0.05$) was found between the average speed of the irradiated canines and the control canines. The low energy density laser used in this study, with the parameters set, was found to be a tool capable of statistically significantly accelerating the distal displacement of canines. Acceleration;Bone Remodeling;Cuspid;Humans;Low-Level Light Therapy;Movement;Tooth Movement Techniques

Low-level laser therapy for management of large periapical lesions associated with open apex cases. CONTEXT: Low-level laser therapy (LLLT) is an established method to accelerate wound healing through the phenomenon of biostimulation. AIMS: This case study presents a novel approach for management of open apex cases associated with large peripapical lesions using 980-nm diode laser for biostimulation. SETTINGS AND DESIGN: Case report. MATERIALS AND METHODS: Two patients presenting with open apex associated with periapical lesion were selected. After access opening, canal disinfection was carried out with sodium hypochlorite and 980-nm diode laser. Calcium hydroxide was given as intracanal medicament for 1 week. When patient was asymptomatic, apical plug of 4-5 mm MTA was placed. In addition, seven sessions of LLLT were administered transcutaneously around the apices of involved teeth every alternate day for 15 days. RESULTS: One year follow-up radiograph revealed remarkable healing of the lesion. CONCLUSION: The combination

of increased cellular proliferation with laser biostimulation and meticulous canal disinfection with lasers has the potential of accelerating healing of the periapical lesions. Drug Combinations;Root Canal Filling Materials;Sodium Hypochlorite;Calcium Hydroxide Calcium Hydroxide;Drug Combinations;Humans;Low-Level Light Therapy;Root Canal Filling Materials;Sodium Hypochlorite;Tooth Apex

A comparative study of low-level laser efficacy on autologous activity of PRP injected in knee arthritis, in vivo study. There were many studies that attempt to measure the effect of growth factors of platelets through platelet-rich plasma (PRP) techniques on repairing of different human tissues and their efficiency either by platelets account or measuring the concentrations of growth factors secreted from platelets at various experimental conditions, to get the optimal parameters for platelets functions in healing processes. There were little trails dealing with laser and PRP for accelerating healing process that generally takes two methods, either by studding the stimulation effect of LLLT (low-level laser therapy), by subjecting laser irradiation on injured part and left for a period of time that is necessary for photobiostimulation of cell proliferations, then PRP treatment followed, or by studding the direct effects of laser on PRP factors activity. The objectives of this study are to investigate the indirect and prolonged influence of laser irradiation (650Â nm with 100Â mW output power) on healing processes of knee joints with induced osteoarthritis (OA), by comparison of radiated and non-radiated PRP on repairing of joint cartilage. In material and methods, we used 9 rats divided in to four groups: C1, control without any treatment, for positive comparisons of healing; C2 and C3, controls with induced OA, left for 14Â days, then sacrificed for histological analysis of negative comparisons; and P and L groups that had induced with OA for 14Â days and then treated with non-irradiated and radiated PRP, respectively. Preparation of PRP (condensed platelets account with high concentration of growth factors) in order to accelerate repairing processes on induced-osteoarthritis cartilage in rats groups. To estimate the efficacy of photobiostimulation or photobioinhibition on platelets' granules, we determine the absorbance of PRP by spectrophotometer. The technique was based on PRP, as a feature of platelets quantity, that compares the quality of PRP on healing of induced osteoarthritis with and without irradiation of laser, using Wistar rats as a model. The quality of platelets was measured by time required for healing according to histopathological observations and grades of OA. Finally, the results were analyzed statistically using ANOVA test (Pâ€‰=â€‰0.05). Our conclusion was emphasizing the idea of inhibiting the effect of LLLT on growth factors of PRP that is responsible of speed up healing of OA. Animals;Cartilage, Articular;Humans;Injections;Knee Joint;Low-Level Light Therapy;Male;Osteoarthritis, Knee;Platelet-Rich Plasma;Rats, Wistar;Rats

Evaluation of the effects of photobiomodulation therapy and ozone applications after gingivectomy and gingivoplasty on postoperative pain and patients' oral health-related quality of life. The aim of this study was to evaluate the effects of photobiomodulation therapy (PBM) and ozone applications on patients' quality of life after gingivectomy and gingivoplasty. In this study, 36 patients with chronic inflammatory gingival enlargement underwent gingivectomy and gingivoplasty. The groups were randomly divided into control (nâ€‰=â€‰12), PBM (nâ€‰=â€‰12) and ozone (nâ€‰=â€‰12) groups. GaAlAs diode laser 810Â nm wavelength at a non-contact and continuous mode with a power of 0.3Â W and a density of 4Â J/cm(2) used for PBM for 1Â min. Ozone was applied for 1Â min for every 5Â mm(2) in contact mode at power level 9 using probe number 3. PBM and ozone applications were performed immediately after the operation, on the 3rd and 7th days. Pain assessment was performed at 3rd, 7th, 14th and 28th days after gingivectomy and gingivoplasty by using visual analogue scale (VAS). Oral Health Impact Profile (OHIP-14) records were obtained from the patients before gingivectomy and gingivoplasty and postoperative 7th and 14th days. OHIP-14 questions were also evaluated individually. VAS pain levels of the control group measured on the 3rd

day were higher than the PBM group and on the 7th day were found to be significantly higher than both groups (pâ€‰<â€‰0.05). The total OHIP-14 score of the control group on the 7th postoperative day was found to be higher than the PBM group (pâ€‰<â€‰0.05). The mean score obtained from the third question of OHIP-14 at 7th and 14th day of the PBM group was found to be lower than the control and ozone groups (pâ€‰<â€‰0.05). The PBM and ozone applications after gingivectomy and gingivoplasty reduce the pain levels of patients and have a positive effect on patients' quality of life. Ozone Adolescent;Adult;Female;Gingivectomy;Gingivoplasty;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oral Health;Ozone;Pain Measurement;Pain, Postoperative;Quality of Life;Surveys and Questionnaires;Wound Healing;Young Adult

The expression of opsins in the human skin and its implications for photobiomodulation: A Systematic Review. BACKGROUND: Skin is the organ most extensively exposed to light of a broad range of wavelengths. Several studies have reported that skin expresses photoreceptive molecules called opsins. However, the identity and functional role of opsins in the human skin remain elusive. We aim to summarize current scientific evidence on the types of opsins expressed in the skin and their biological functions. METHODS: A primary literature search was conducted using PubMed to identify articles on dermal opsins found in nonhuman animals and humans. RESULTS: Twenty-two articles, representing, however, a non-exhaustive selection of the scientific papers published in this specific field, met the inclusion criteria. In nonhuman animals, opsins and opsin-like structures have been detected in the skin of fruit fly, zebrafish, frog, octopus, sea urchin, hogfish, and mouse, and they mediate skin color change, light avoidance, shadow reflex, and circadian photoentrainment. In humans, opsins are present in various skin cell types, including keratinocytes, melanocytes, dermal fibroblasts, and hair follicle cells. They have been shown to mediate wound healing, melanogenesis, hair growth, and skin photoaging. CONCLUSION: Dermal opsins have been identified across many nonhuman animals and humans. Current evidence suggests that opsins have biological significance beyond light reception. In nonhuman animals, opsins are involved in behaviors that are critical for survival. In humans, opsins are involved in various functions of the skin although the underlying molecular mechanisms remain unclear. Future investigation on elucidating the mechanism of dermal opsins will be crucial to expand the therapeutic benefits of photobiomodulation for various skin disorders. Opsins Animals;Humans;Opsins;Skin

Dermoscopy as a useful tool for evaluating melasma and assessing the response to 1064-nm Q-switched Nd:YAG laser. Melasma is a hard-to-manage disorder with considerable relapsing behavior. Dermoscopy emerged to help in comprehensive evaluation of pigmentary disorders and melasma. The aim of the study was to evaluate the potential role of dermoscopy in assessing melasma and monitoring the efficacy of 1064-nm low-fluence Q-switched neodymium:yttrium-aluminum-garnet (QS Nd:YAG) laser. A total of 31 patients with facial melasma were included. A total of five laser sessions were performed with 2-week intervals. Patients were evaluated at baseline and 2â€‰weeks after the last session (at the 10th week) by using digital photography, modified melasma area and severity index (mMASI), and colorimetry, as well as dermoscopic score for pigment and vascular elements. Adverse effects were reported. Postlaser sessions, mMASI scores as well as the colorimetric melanin and erythema indices had showed significant improvement. The "dermoscopic score of pigmentary and vascular elements" displayed significant change and confirmed the improvement. Side effects were tolerable. mMASI, colorimetry, and dermoscopy had ascertained the efficacy of low-fluence 1064-nm QS Nd:YAG laser in melasma; however, dermoscopy is superior to other assessments as it can help in the diagnosis of melasma besides the follow-up assessment and can precisely detect the detailed changes in response to treatment.

Dermoscopy;Erythema;Face;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Clinical and Immunological Effects of Er,Cr:YSGG Laser in Nonsurgical Periodontal Treatment: A Randomized Clinical Trial. Objective: The aim of this study was to compare the clinical and immunological results of nonsurgical periodontal treatment with or without the erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser. Background data: As lasers have begun to be used in dentistry, the Er,Cr:YSGG laser has started to attract attention in the field of periodontology. Materials and methods: Fifty-nine nonsmoking patients with advanced chronic periodontitis were randomly allocated to a test group (full-mouth ultrasonic supra- and subgingival debridement+Er,Cr:YSGG laser application) and a control group (full-mouth ultrasonic supra- and subgingival debridement+root planing with Gracey curettes). The laser parameters were set as follows: 1.5 W output power, pulse mode H (pulse duration of 140â€‰Î¼s), pulse frequency of 20â€‰Hz, and an air-water spray ratio of 10% air and 15% water. The instrumentation was performed until the operator felt that the root surfaces were adequately debrided. Probing depth (PD), clinical attachment level (CAL), bleeding on probing (BOP), plaque index, interleukin-1 beta (IL-1Î²), matrix metalloproteinase-8 (MMP-8), tissue inhibitor metalloproteinase-1 (TIMP-1), and MMP-8/TIMP-1 levels in gingival crevicular fluid were evaluated at baseline, 6 weeks, and 3 months postoperatively. Results: There were statistically significant differences in PD, which was our primary outcome, and BOP between the groups at both examinations [pâ€‰<â€‰0.001 and pâ€‰<â€‰0.001 (for PD) and pâ€‰=â€‰0.048 and pâ€‰<â€‰0.001 (for BOP), respectively], in favor of the laser group. However, there were no significant differences among groups at any time for CAL gain (pâ€‰=â€‰563 and pâ€‰=â€‰369, respectively). No significant differences in MMP-8, TIMP-1, and MMP-8/TIMP-1 levels were detected among groups. There was a statistically significant difference for IL-1Î² levels among groups at 3-month evaluations in favor of the laser group. Conclusions: Using the Er,Cr:YSGG laser instead of hand instruments in nonsurgical periodontal treatment has shown additional improvements in terms of pocket reduction and gingival bleeding compared with traditional nonsurgical therapy. IL1B protein, human;Interleukin-1beta;TIMP1 protein, human;Tissue Inhibitor of Metalloproteinase-1;MMP8 protein, human;Matrix Metalloproteinase 8 Adult;Chronic Periodontitis;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Lasers, Solid-State;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Tissue Inhibitor of Metalloproteinase-1

Effect of Er,Cr:YSGG Laser on the Prevention of Primary and Permanent Teeth Enamel Demineralization: SEM and EDS Evaluation. Objective: To evaluate in vitro the effect of the erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser on resistance of primary and permanent human enamel to demineralization using water cooling and fluoride coapplication as variable parameters. Methods: Enamel specimens were prepared from extracted primary and permanent teeth (nâ€‰=â€‰225 each). The specimens were separated into 15 subgroups (nâ€‰=â€‰15/group) based on laser application at three different power settings (0.25, 0.50, and 0.75 W), laser application with and without water cooling, and application of acidulated phosphate fluoride (APF) gel before laser treatment. Morphological changes were assessed with scanning electron microscopy (SEM), and the specimens' chemical contents were determined with energy-dispersive X-ray spectroscopy. Results: In both the primary and permanent teeth, the highest Ca and P content was observed in the noncooled 0.75 W laser group (pâ€‰<â€‰0.05), irrespective of APF pretreatment (pâ€‰>â€‰0.05). The Ca and P content for the noncooled APF +0.75 W laser group was lower than that for the APF group and the noncooled 0.75 W laser group. For both dentitions, the F mass content for the APF+laser groups was significantly higher than laser-only groups (pâ€‰<â€‰0.05). Under SEM, both the primary and permanent enamel exhibited cracks, craters,

and surface roughness without water cooling, consistent with increased power output. Conclusions: Er,Cr:YSGG laser application at 0.75 W without water cooling increased enamel resistance to demineralization. Compared with topical APF application, Er,Cr:YSGG laser application barely improved enamel resistance against demineralization, and coapplication did not result in a synergistic effect. Dental Enamel;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Tissue Culture Techniques;Tooth Demineralization;X-Ray Absorption Spectroscopy

Effectiveness of Photobiomodulation in Temporomandibular Disorder-Related Pain Using a 635â€‰nm Diode Laser: A Randomized, Blinded, and Placebo-Controlled Clinical Trial. Objective: We aimed to evaluate the efficacy of photobiomodulation (PBM), using an 635â€‰nm diode laser, to provide pain relief for temporomandibular disorder (TMD). Background data: TMD involves a set of multiple clinical manifestations where pain is prevalent. Treatment ideally should be noninvasive and innocuous such as PBM. Methods: A randomized, placebo-controlled, clinically blinded trial was performed on 42 patients with painful TMD diagnosed according the Research Diagnostic Criteria for Temporomandibular Disorders. They were randomly placed into two groups: an intervention group (nâ€‰=â€‰22) subjected to the application of a 635â€‰nm wavelength diode laser (using a 8-mm diameter handpiece in contact mode, delivering 8â€‰J/cm(2) over a period of 20â€‰sec applied over the sensitive points where the pain was reported by the participants) and a placebo group (nâ€‰=â€‰20) following the same protocol but without laser activation. All patients received four sessions of treatment over 4 weeks. Personal pain perception, nonassisted pain-free maximum mouth opening and tenderness elicited during palpation of muscles were used as primary outcomes, evaluated at baseline and at follow-up 1 month later by blinded, calibrated evaluators. Results: There was a significant reduction in the degree of pain recorded in the laser group after treatment (0.63â€‰Â±â€‰0.36) compared with the baseline evaluation (4.59â€‰Â±â€‰2.36; pâ€‰<â€‰0.001), which was not observed in the placebo group. Reduction of pain during palpation of most masticatory muscles was significant following treatment in the intervention group. A significant increase in the nonassisted painless mouth opening was observed after treatment (42.14â€‰Â±â€‰5.8â€‰mm) compared with baseline values (36.73â€‰Â±â€‰9.91â€‰mm) only among the laser group (pâ€‰=â€‰0.007). There were no reported adverse events or side effects among the patients in the intervention group. Conclusions: Our results suggest that PBM using a 635â€‰nm laser was effective on the remission of painful TMD, without complications. Adolescent;Adult;Facial Pain;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain Measurement;Patient Satisfaction;Single-Blind Method;Temporomandibular Joint Disorders;Treatment Outcome;Young Adult

Caries Prevention Effects of Silver Diamine Fluoride with 10,600â€‰nm Carbon Dioxide Laser Irradiation on Dentin. Objective: To investigate the caries prevention effect of silver diamine fluoride (SDF) with a carbon dioxide (CO(2)) laser (Î»â€‰=â€‰10,600â€‰nm) on dentin. Method: Human dentin slices (nâ€‰=â€‰10) were prepared and allocated to the following treatments: Group 1 (SDF)-slices received an SDF application. Group 2 (laser)-slices were irradiated with a CO(2) laser. Group 3 (laser + SDF)-slices were irradiated with a CO(2) laser, followed by an SDF application. Group 4 (negative control)-slices had no treatment. All of the slices were subjected to pH cycling for cariogenic challenge. Lesion depth, nanohardness, and chemical and morphological changes were assessed by microcomputed tomography (micro-CT), nanoindentation, and scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS), respectively. Results: micro-CT determined lesion depths for groups 1-4 were 27â€‰Â±â€‰6, 138â€‰Â±â€‰32, 17â€‰Â±â€‰5, and 182â€‰Â±â€‰49â€‰Î¼m, respectively (pâ€‰<â€‰0.001; group 3 < group 1 < groups 2 and 4). The nanohardness values for groups 1-4 were 456â€‰Â±â€‰109, 288â€‰Â±â€‰5, 444â€‰Â±â€‰142, and 258â€‰Â±â€‰76â€‰MPa, respectively (pâ€‰=â€‰0.003; groups 2 and

4 < groups 1 and 3). EDS determined that the calcium-to-phosphorus molar ratio for groups 1-4 were 1.26â€‰Â±â€‰0.12, 1.07â€‰Â±â€‰0.19, 1.37â€‰Â±â€‰0.08, and 0.80â€‰Â±â€‰0.17, respectively (pâ€‰<â€‰0.001; group 4 < group 2 < groups 1 and 3). SEM evidenced no ablation or cracking on the lased dentin surfaces. The treated dentin showed a relatively more intact and smoother surface morphology compared with the untreated dentin. Conclusions: SDF can reduce dentin demineralization against cariogenic challenge, and the caries preventive effect of SDF is further enhanced through CO(2) laser irradiation. Fluorides, Topical;Quaternary Ammonium Compounds;Silver Compounds;silver diamine fluoride Dental Caries;Dentin;Fluorides, Topical;Humans;Lasers, Gas;Low-Level Light Therapy;Microscopy, Electron, Scanning;Quaternary Ammonium Compounds;Silver Compounds;Tissue Culture Techniques

Progress in Photobiomodulation for Bone Fractures: A Narrative Review. Objective: The aim of this article is to examine current concepts and the future direction of implementing photobiomodulation (PBM) for fracture treatment. Background data: The effectiveness of PBM for bone regeneration has been demonstrated throughout in vitro studies and animal models. Yet, insufficient clinical trials have been reported on treating fractures with PBM. Materials and methods: A narrative review was composed on the basis of a literary search. Inclusion criteria consisted of studies between 2000 and 2019 using animal or human fracture models. Exclusion criteria consisted of studies that did not pertain to complete fractures or used other forms of intervention. Results: Ten animal studies on rats and rabbits and four clinical trials were found on using PBM for complete fractures. Conclusions: Based on positive outcomes in animal trials, parameter optimization of PBM for human fractures still requires extensive research on factors such as dosage, wavelength, penetration depth, treatment frequency, and the use of pulsed waves. Animals;Bone Regeneration;Fracture Healing;Fractures, Bone;Humans;Low-Level Light Therapy

Method for Accurately Preparing Cavities on Cortical Bones Using Picosecond Laser. Objective: This study was conducted to (1) evaluate a new method for accurately and automatically preparing dental implant cavities; (2) investigate the quantitative relationships between the number of focal-plane additive pulse layers (n) in two-dimensional ablation, the Z-axis feed rate, and the ablation depth (d) during cortical-bone ablation using a numerically controlled three-axis picosecond laser; and (3) establish appropriate methods for precise ablation control. Materials and methods: Two-dimensional ablation was performed on swine-rib blocks in the focal plane on a preset circular path using a picosecond laser device and an in-house-developed three-axis numerically controlled micro-laser galvanometer scanner. The maximum two-dimensional d and the quantitative relationship between n and d within the maximum d were consequently obtained. The measured and theoretical values of the ablated cavities were then compared to obtain n and d values corresponding to the minimum difference, and to evaluate the error in d, resulting in a higher-accuracy d value (i.e., single-step ablation depth) being obtained. Results: The diameter and deep errors between the measured and design data for 24 cavities were 2.76â€‰Â±â€‰1.51 and 10.23â€‰Â±â€‰4.82â€‰Î¼m, respectively. Thus, high-quality cortical-bone cavities preparation was achieved using a picosecond laser with the parameters employed in this study. Conclusions: Precise control of cortical-bone ablation using a picosecond laser can be attained by optimizing the single-step ablation parameters. Animals;Cortical Bone;Dental Cavity Preparation;Low-Level Light Therapy;Models, Animal;Swine;Tissue Culture Techniques

Preliminary clinical experience of low-level laser therapy for the treatment of canine osteoarthritis-associated pain: A retrospective investigation on 17 dogs. BACKGROUND: Osteoarthritis (OA) is common in dogs and causes chronic pain that affects the quality of life and may not respond to analgesics. OBJECTIVE: The objective of this study was to determine whether low-level laser therapy (LLLT) would improve the quality of life and help reducing systemic analgesics, in dogs with OA.

METHODS: Seventeen client-owned dogs diagnosed with OA and associated pain were included. The diagnosis of OA was confirmed by orthopedic and radiographic examination. Pain was evaluated in each dog with the canine brief pain inventory (CBPI), compiled by the dog owners, as well as with a visual analog scale (VAS) and the colorado state canine chronic pain scale, used by the clinician. The LLLT was performed weekly in each study dog, for a total period of 6 weeks. The CBPI was then repeated at 2, 4, 6, and 8 weeks after the first laser session, whereas the VAS was reassessed at weeks 2 and 6. The dogs were observed for the occurrence of laser-related side effects. RESULTS: Both CBPI and VAS were significantly reduced after the first laser session (9.2 Â± 3.8 and 5.2 Â± 1.1, respectively) compared to pretreatment values (11.8 Â± 3.6 and 7.6 Â± 0.9, respectively; and $p = 0.018$ and $p < 0.001$, respectively) and continued to decrease over time until the end of the therapy. Based on these results and improved function, as assessed by the orthopedic surgeon, the pharmacological analgesic therapy was reduced by the clinician at week 2 in 13 of 17 dogs. Laser-related side effects were not observed. CONCLUSION: This retrospective report provides a basis for future investigations, needed to clarify whether laser therapy may be beneficial to treat canine OA-associated pain. The preliminary findings are promising and suggest that LLLT may help reducing the analgesic administration and improving client satisfaction and the quality of life of dogs with OA.
Animals;Chronic Pain;Dog Diseases;Dogs;Female;Low-Level Light Therapy;Male;Osteoarthritis;Pain Measurement;Retrospective Studies;Treatment Outcome

Absorption and diffusion of a 645 nm diode laser beam in the bone. An ex vivo study. The present preliminary ex vivo study aims to assess the possible interaction between complex biological systems and laser light, through irradiation of different hard tissue samples. A 645 nm wavelength diode laser was adopted to perform the present evaluation. Due to known similarities to human tissues, swine tissue samples were used. Two samples of cortical bone measuring 4.4 mm and 4.7 mm of thickness and 2 samples of spongeous bone measuring 2.45 mm and 2.9 mm were harvested for the analysis of hard tissues. Mean absorption values were as follows: 128.82 mW standard deviation 8.74 for 2.45 mm spongeous bone sample; 132.34 mW standard deviation 7.66 for 2.9 mm spongeous bone sample; 140.59 mW standard deviation 5.97 for 4.4 mm cortical bone sample and 152.20 mW standard deviation 3.36 for 4.7 mm mucosa and cortical bone sample. Red-light laser with 645nm wavelength has the ability to reach cells in each layer of measured tissues.
Animals;Bone and Bones;Humans;Lasers, Semiconductor;Light;Swine

Effect of 808 nm Semiconductor Laser on the Stability of Orthodontic Micro-Implants: A Split-Mouth Study. BACKGROUND: To evaluate the effect of photobiomodulation (PBM) on orthodontic micro-implants (n = 44; 14 women, 8 men). METHODS: PBM with 808 nm diode laser was applied immediately, 3, 6, 9, 12, 15, and 30 days post the implantation. Results were assessed within same time frames and additionally after 60 days to check for implants stability using the Periotest device. Patients pain experiences following the first day post-treatment and potential loss of micro-implants after 60 days were recorded. The procedure involved insertion of mini-implants in the maxilla for the laser group (L, n = 22) and negative control group (C, n = 22). Irradiation was carried buccally and palatally with respect to the maxillary ridge (2 points). The energy per point was 4 J (8 J/cm(2)), total dose was 56 J. RESULTS: Patients did not report significant differences in terms of pain experiences comparing the L and C groups ($p = 0.499$). At 30 days post-treatment, higher secondary stability of implants was observed in the laser group (Periotest Test Value, PTV 6.32 Â± 3.62), in contrast to the controls (PTV 11.34 Â± 5.76) ($p = 0.004$). At 60 days post-treatment, significantly higher stability was recorded in the laser group (PTV 6.55 Â± 4.66) compared with the controls, PTV (10.95 Â± 4.77) ($p = 0.009$). Conclusions: Application of the 808 nm diode laser increased secondary micro-implant stability.

Non-Amyloid Approaches to Disease Modification for Alzheimer's Disease: An EU/US CTAD Task Force Report. While amyloid-targeting therapies continue to predominate in the Alzheimer's disease (AD) drug development pipeline, there is increasing recognition that to effectively treat the disease it may be necessary to target other mechanisms and pathways as well. In December 2019, The EU/US CTAD Task Force discussed these alternative approaches to disease modification in AD, focusing on tau-targeting therapies, neurotrophin receptor modulation, anti-microbial strategies, and the innate immune response; as well as vascular approaches, aging, and non-pharmacological approaches such as lifestyle intervention strategies, photobiomodulation and neurostimulation. The Task Force proposed a general strategy to accelerate the development of alternative treatment approaches, which would include increased partnerships and collaborations, improved trial designs, and further exploration of combination therapy strategies.

Effect of Photobiomodulation on Ecchymosis after Rhinoplasty: A Randomized Single-Blind Controlled Trial. BACKGROUND: This study was conducted to compare the effect of photobiomodulation therapy (low-level laser therapy) on ecchymosis after rhinoplasty. SUBJECTS AND METHODS: Sixty rhinoplasty candidates were randomly divided into two groups. Photobiomodulation, including red light (660Â nm), infrared light (840Â nm), and infrared laser, was used in the first group on the first postoperative day, and its effect on periorbital ecchymosis was evaluated. RESULTS: The findings showed that low-power laser reduced ecchymosis significantly (pâ€‰=â€‰0.005(*)). CONCLUSION: Photobiomodulation may be effectively used for reducing ecchymosis after rhinoplasty. LEVEL OF EVIDENCE II: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . RCT registration number is IRCT20080820001056N3. Ecchymosis;Humans;Rhinoplasty;Single-Blind Method;Treatment Outcome

Success of surgical interventions for direct dental implant-related injuries to the mandibular nerve: a review. To the best of our knowledge there are no guidelines regarding the surgical management of dental implant-related injuries to the mandibular nerve. This review aims to investigate the success of different surgical interventions. Neurosensory injury to the mandibular branch of the trigeminal nerve can occur during administration of local anaesthetic, elevation of the flap, preparation for osteotomy, and placement of the implant. Surgical interventions include extraction of the implant, external decompression, internal neurolysis, excision of a neuroma, neurorrhaphy, nerve grafting, and low-level laser therapy. The following electronic databases were searched: MEDLINE, EMBASE, and the Cochrane Library. Primary outcome measures included patient-reported outcomes such as pain and altered sensation. A total of 185 publications were obtained, of which 21 were included in the qualitative synthesis (2 randomised controlled trials (RCT), 9 controlled cohort studies, and 10 case reports/series). They were all screened in consideration of the exclusion criteria and appraised using the Cochrane risk of bias tool, the Newcastle Ottawa scale, and the modified Newcastle Ottawa scale. Results were triangulated to evaluate their level of agreement. The extraction of dental implants less than 36hours after injury to the mandibular nerve results in the most successful resolution of neurosensory dysfunction. Various microsurgical techniques have shown less success in obtaining neurosensory recovery than extraction of the implant. However, microsurgery is worthwhile, as it improves neurosensory dysfunction and reduces dysaesthesia in the majority of patients. Direct suturing and external decompression can result in good neurosensory recovery, and nerve grafts are also successful whenever tension-free direct suturing is not possible. Low-level laser therapy has been shown to achieve some neurosensory improvement. Dental Implants Dental Implants;Humans;Mandible;Mandibular Nerve;Neurosurgical Procedures;Trigeminal Nerve;Trigeminal Nerve Injuries

Photobiomodulation restores spermatogenesis in the transient scrotal hyperthermia-induced mice. OBJECTIVE: Heat stress shock affects the generation of free radicals and can have a harmful effect on spermatogenesis. Photobiomodulation (PBM) is very effective in andrology for treating male infertility. This research aimed at the evaluation of the impacts of PBM on spermatogenesis on the transient scrotal hyperthermia-induced oligospermia mouse model. MATERIALS AND METHODS: This experimental research divided 24 mice into the following four groups: (1) Control, (2) Scrotal hyperthermia, (3) Scrotal hyperthermia receiving laser 0.03Â J/cm(2) for 30Â s for each testis, 35Â days after induction of scrotal hyperthermia every other day for 35Â days, and (4) Scrotal hyperthermia receiving laser 0.03Â J/cm(2) for 30Â s for each testis, immediately after induction of scrotal hyperthermia every other day for 35Â days. Scrotal hyperthermia was induced by water bath with 43Â Â°C for 30Â min. Then, the mice were euthanized, and their sperm samples were collected for sperm parameters analysis. Then, we took the testis samples for histopathological experimentations, serum testosterone level, reactive oxygen species (ROS), RNA extraction for the examination of IL1-Î±, IL6 and TNF-Î± genes expression as well as production and glutathione disulfide (GSH) activity. KEY FINDINGS: Our outputs indicated that PBM could largely improve the sperms parameters and stereological parameters, like spermatogonia, primary spermatocyte, round spermatid and Leydig cells together with an increasing level of the serum testosterone and GSH activity compared to the scrotal hyperthermia induced mice. In addition, it was found that the diameter of seminiferous tubules, ROS production, as well as the expression of IL1-Î±, IL6, and TNF-Î± genes significantly decreased in the treatment groups by PBM compared to the scrotal hyperthermia induced mice, but there was not a significant difference in terms of testis weight and Sertoli cells between the studied groups. SIGNIFICANCE: It could be concluded that PBM may be regarded as an alternative treatment for improving the spermatogenesis process in the scrotal hyperthermia induced mice. Animals;Fever;Heat-Shock Response;Hot Temperature;Hyperthermia, Induced;Infertility, Male;Leydig Cells;Low-Level Light Therapy;Male;Mice;Oxidative Stress;Scrotum;Sertoli Cells;Spermatogenesis;Spermatozoa;Testis

Low-dose photodynamic therapy-induced increase in the metastatic potential of pancreatic tumor cells and its blockade by simvastatin. Pancreatic tumor are a deadly malignancy with high aggressiveness, and photodynamic therapy (PDT) is a prospective remedy. Nevertheless, the cells in the peripheral tissues of large tumors are often subjected to low-dose illumination and tend to survive after sublethal PDT exposure. Thus, it is of critical importance to determine the metastatic influence of PDT on pancreatic neoplasms. (17R, 18R)-2-(1-Hexyloxyethyl)-2-devinyl chlorine E6 trisodium salt (YLG-1) is a novel chlorine derivative photosensitizer, and we previously demonstrated potent growth inhibition of pancreatic neoplasms by YLG-1-mediated PDT (YLG-1-PDT). In this study, we assessed the metastatic effect of low-dose PDT with YLG-1 on pancreatic tumors and its combination with simvastatin. We found that sublethal YLG-1-PDT promoted MMP-2/9 expression in residual pancreatic tumor cells as well as tumor cell motility/invasion and liver metastasis. Since simvastatin was reported to improve the survival of patients with pancreatic tumors at an early stage and suppress the metastasis of most cancers, we utilized it during YLG-1-PDT and discovered alleviated migration/invasion, metastasis and MMP-2/9 expression. Collectively, our study results raise the concern that PDT could also be a Janus-like treatment owing to its prometastatic potential provoked by a low dosage. Concomitant use of simvastatin during PDT might be an effective method to attenuate such adverse reactions. Antineoplastic Agents;Chlorophyllides;Photosensitizing Agents;Porphyrins;Reactive Oxygen Species;phytochlorin;Simvastatin;Collagenases Animals;Antineoplastic Agents;Apoptosis;Cell Line, Tumor;Cell Movement;Chlorophyllides;Collagenases;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Mice, Inbred BALB C;Mice, Nude;Pancreatic

Neoplasms;Photochemotherapy;Photosensitizing Agents;Porphyrins;Reactive Oxygen Species;Simvastatin;Treatment Outcome

Effects of photobiomodulation at different wavelengths on orthodontically induced root resorption in orthodontic retention period: a micro-CT and RT-PCR study. The aim of this study was to evaluate and compare the reparative and inhibitory effects of single wavelength photobiomodulation (SW-PBM) and of cumulative increased wavelength photobiomodulation (CW-PBM) on orthodontically induced inflammatory root resorption (OIIRR). Thirty-three Wistar albino rats were divided into five groups: untreated group (negative control), only relapse group (positive control-1), only retention group (positive control-2), SW-PBM group (650Â nm, 100Â mW/cm(2)), and CW-PBM group (532-650-940Â nm, 100Â mW/cm(2)). Orthodontic tooth movement was induced experimentally in rats for 10Â days with an applied force of 50 cN; retention and therapeutic approaches were performed concurrently. At the end of the experiment, maxillary quadrants were prepared for micro-CT analysis and real-time polymerase chain reaction (RT-PCR) analysis. After the Shapiro-Wilk normality test, Kruskal-Wallis test followed post hoc Bonferroni test and paired samples t test was used for statistical evaluation of the data. Resorption lacunae volume (pâ€‰<â€‰0.001), number of resorption lacunae (pâ€‰<â€‰0.05), and percentage of the resorption (PR) lacunae (pâ€‰<â€‰0.001) decreased with PBM applications when compared with the positive control groups, and the mean PR was similar in the negative control group when compared with SW-PBM group. Receptor activator of nuclear factor kappa B ligand (RANKL) levels of the PBM groups were lower (pâ€‰<â€‰0.05) than those of the positive control groups. Cyclooxygenase-2 (COX-2) expression levels significantly decreased with PBM administration (pâ€‰<â€‰0.05). No significant change was found in osteoprotegerin (OPG) expression levels and OPG/RANKL ratios (pâ€‰>â€‰0.05). PBM applications showed marked inhibitory and reparative effects on OIIRR by modulating the RANKL and COX-2 expression levels. However, the effects of the different wavelengths were similar to each other.Graphical abstract. Osteoprotegerin;RANK Ligand;Cyclooxygenase 2 Animals;Cyclooxygenase 2;Dental Prosthesis Retention;Light;Low-Level Light Therapy;Male;Orthodontics;Osteoprotegerin;RANK Ligand;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Root Resorption;Tooth Movement Techniques;X-Ray Microtomography

Successful Treatment of Iatrogenic Cutaneous Siderosis with Pigment Lasers: A Retrospective Study in 15 Consecutive Patients. Intravenous ferric carboxymaltose is increasingly used to treat iron deficiency. However, a common side-effect is paravenous extravasation of iron preparations, resulting in cutaneous siderosis. Quality-switched (QS) lasers and, recently, picosecond (PS) lasers have been used to treat these hyperpigmentations with variable success. The optimal treatment protocol remains unclear. The aims of this study were to assess the response of cutaneous siderosis to treatment with pigment lasers and to determine the optimal wavelength, number of treatment sessions and pulse duration. Fifteen patients with cutaneous siderosis on the arms were included. The effectiveness of laser treatment was evaluated using a 5-point standard Physician Global Assessment (PGA) grading system. Differences in continuous variables between distinct groups of patients were assessed with a Mann-Whitney U test. In all 15 patients clearance of at least 50% was obtained. In 12 patients, at least 75% of pigment was removed. In conclusion, pigment lasers are an effective and safe method to treat cutaneous siderosis. Ferric Compounds;Hematinics;ferric carboxymaltose;Maltose Administration, Intravenous;Adolescent;Adult;Aged;Extravasation of Diagnostic and Therapeutic Materials;Female;Ferric Compounds;Hematinics;Humans;Iatrogenic Disease;Lasers, Solid-State;Low-Level Light Therapy;Maltose;Middle Aged;Retrospective Studies;Siderosis;Skin Diseases;Treatment Outcome;Young Adult

Quantum biology in low level light therapy: death of a dogma. BACKGROUND: It is shown that despite exponential increase in the number of clinically exciting results in low level light therapy

(LLLT), scientific progress in the field is retarded by a wrong fundamental model employed to explain the photon-cell interaction as well as by an inadequate terminology. This is reflected by a methodological stagnation in LLLT, persisting since 1985. The choice of the topics is, by necessity, somewhat arbitrary. Obviously, we are writing more about the fields we know more about. In some cases, there are obvious objective reasons for the choice. Progress in LLLT is currently realized by a trial and error process, as opposed to a systematic approach based on a valid photon-cell interaction model. METHODS: The strategy to overcome the current problem consists in a comprehensive analysis of the theoretical foundation of LLLT, and if necessary, by introducing new interaction models and checking their validity on the basis of the two pillars of scientific advance (I) agreement with experiment and (II) predictive capability. The list of references used in this work, does contain a representative part of what has been done in the photon-cell interaction theory in recent years, considered as ascertained by the scientific community. RESULTS: Despite the immense literature on the involvement of cytochrome c oxidase (COX) in LLLT, the assumption that COX is the main mitochondrial photoacceptor for R-NIR photons no longer can be counted as part of the theoretical framework proper, at least not after we have addressed the misleading points in the literature. Here, we report the discovery of a coupled system in mitochondria whose working principle corresponds to that of field-effect transistor (FET). The functional interplay of cytochrome c (emitter) and COX (drain) with a nanoscopic interfacial water layer (gate) between the two enzymes forms a biological FET in which the gate is controlled by R-NIR photons. By reducing the viscosity of the nanoscopic interfacial water layers within and around the mitochondrial rotary motor in oxidatively stressed cells R-NIR light promotes the synthesis of extra adenosine triphosphate (ATP). CONCLUSIONS: Based on the results of our own work and a review of the published literature, we present the effect of R-NIR photons on nanoscopic interfacial water layers in mitochondria and cells as a novel understanding of the biomedical effects R-NIR light. The novel paradigm is in radical contrast to the theory that COX is the main absorber for R-NIR photons and responsible for the increase in ATP synthesis, a dogma propagated for more than 20 years.

A Systematic Review and Meta-Analysis of the Effects of Low-Level Laser Therapy in the Treatment of Diabetic Foot Ulcers. Diabetic foot ulcers (DFUs) are considered one of the most aggressive and expensive complications of diabetes. Low-level laser therapy (LLLT) has been highlighted as a potential modality of treatment to accelerate the healing of ulcers. This systematic review and meta-analysis aimed to investigate the efficacy of LLLT in the treatment of DFU and identify the LLLT application parameters recommended for the treatment of DFU over the past 10 years. A systematic search was conducted in PubMed, BVS, PEDro, Scopus, Web of Science, and CINAHL up to March 31, 2019. Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines, randomized controlled trials (RCTs) that assessed the effect of LLLT on the treatment of DFU were included. Thirteen RCTs with a total of 361 participants were included in this review. Three RCTs reported a reduction in the percentage size of the ulcers and were included in the meta-analysis. The meta-analysis of the percentage size difference demonstrated a significant reduction in ulcer size in the LLLT group compared with controls (22.96 [95% confidence interval = 18.22-27.69; z = 9.51, P < .0001]). Treatment with 632.8 to 685 nm, 50 mW/cm(2), 3 to 6 J/cm(2), and irradiation for 30 to 80 seconds, 3 times weekly for a month is of benefit to patients with DFU. LLLT is effective and safe for the treatment of DFU. Additionally, well-designed, high-quality studies are needed to allow its ideal parameterization for clinical practice. Humans;Diabetic Foot;Low-Level Light Therapy;Wound Healing;Treatment Outcome

Photobiomodulation of human osteoblast-like cells inÂ vitro by low-intensity-pulsed LED light. Visible light irradiation is an emerging area in regenerative medicine research. We hypothesized that low-intensity-pulsed LED light irradiance may exert photobiomodulatory effects on cultured

osteoblast-like cells. To test this hypothesis, we investigated cell proliferation and markers of cell maturation and metabolic activity following pulsed LED irradiance. Monolayer explant cultures of human osteoblast-like cells were exposed four times in 24-h intervals to 2Â min of pulsed white LED irradiance of 2.4-2.5 mWÂ·cm(-2) and its different spectra of 0.2-0.5 mWÂ·cm(-2) (frequency range of 10-40Â Hz). Cell proliferation was estimated from microscopic cell counting and cell death by lactate dehydrogenase activity in culture media (measured by a colorimetric method). The early markers of osteoblast maturation and metabolic activity, that is, cellular alkaline phosphatase activity and osteocalcin content, were measured using a colorimetric method and ELISA, respectively. Irradiance of 40Â Hz caused the highest increase in cell number (PÂ <Â 0.01). Osteocalcin content in cells decreased following 40Â Hz and 10Â Hz irradiance (PÂ <Â 0.05). The 40Â Hz blue range irradiance (diffuse transmittance 420-580Â nm, maximal cell irradiance 0.5 mWÂ·cm(-2)) caused a decrease in alkaline phosphatase cellular activity (PÂ <Â 0.001) and an increase in media osteocalcin content (PÂ <Â 0.05). The 40Â Hz green range (diffuse transmittance 560-650Â nm, maximal cell irradiance 0.4 mWÂ·cm(-2)) irradiance caused an increase in the number of cells and in cell death. In summary, pulsed (40Â Hz) white light irradiance has photomodulatory effects, with its green range spectrum affecting cell proliferation and cell death, and its blue range spectrum affecting cellular maturation and metabolism. The results indicate a low-intensity threshold of photobiomodulation of osteoblast-like cells inÂ vitro. Cell Death;Cell Proliferation;Cells, Cultured;Humans;Light;Osteoblasts;Photochemical Processes

Photobiomodulation therapy inhibits oral submucous fibrosis in mice. OBJECTIVES: Oral submucous fibrosis (OSMF) is a chronic inflammatory disease and a potentially malignant oral disorder. However, the best therapeutic treatment for OSMF remains uncertain. Our previous study showed that photobiomodulation (PBM) therapy and forskolin could reduce arecoline-induced fibrosis reactions via the cAMP pathway. The present study aimed to establish an animal model of areca nut extract (ANE)-induced OSMF and to evaluate the therapeutic potential of PBM and forskolin for ANE-induced OSMF. SUBJECTS AND METHODS: The mice were divided into five groups. The buccal tissues were harvested for histomorphological analysis and immunoblotting. RESULTS: Our results showed that PBM significantly reduced the development of ANE-induced OSMF, quantified by changes in submucosal layer thickness and collagen deposition. Additionally, PBM could extensively reduce the protein expression of the fibrotic marker genes alpha-smooth muscle actin (Î±-SMA) and connective tissue growth factor (CTGF) in buccal submucous lesions. However, forskolin treatment significantly decreased the protein expression of fibrotic marker genes but slightly decreased the observed histomorphological changes. CONCLUSIONS: We established an ANE-induced OSMF mouse model, which also provided a model for the development of a therapeutic treatment for OSMF. The anti-fibrotic effects of PBM and forskolin may be useful for clinical interventions.
Arecoline;Collagen Animals;Areca;Arecoline;Collagen;Low-Level Light Therapy;Mice;Oral Submucous Fibrosis

Photobiomodulation for Alzheimer's Disease: Translating Basic Research to Clinical Application.
One of the challenges in translating new therapeutic approaches to the patient bedside lies in bridging the gap between scientists who are conducting basic laboratory research and medical practitioners who are not exposed to highly specialized journals. This review covers the literature on photobiomodulation therapy as a novel approach to prevent and treat Alzheimer's disease, aiming to bridge that gap by gathering together the terms and technical specifications into a single concise suggestion for a treatment protocol. In light of the predicted doubling in the number of people affected by dementia and Alzheimer's disease within the next 30 years, a treatment option which has already shown promising results in cell culture studies and animal models, and whose safety has already been proven in humans, must not be left in the dark. This review covers the mechanistic

action of photobiomodulation therapy against Alzheimer's disease at a cellular level. Safe and effective doses have been found in animal models, and the first human case studies have provided reasons to undertake large-scale clinical trials. A brief discussion of the minimally effective and maximum tolerated dose concludes this review, and provides the basis for a successful translation from bench to bedside. Alzheimer Disease;Animals;Brain;Disease Models, Animal;Humans;Phototherapy;Translational Research, Biomedical

Photobiomodulation therapy for the management of recurrent aphthous stomatitis in children: clinical effectiveness and parental satisfaction. BACKGROUND: This study aims to evaluate the effectiveness of the photobiomodulation therapy (PBMT) in the treatment of minor recurrent aphthous stomatitis (MiRAS) in children, in terms of pain relief, lesion size reduction and the parental satisfaction of the therapy. MATERIAL AND METHODS: This randomized controlled study was carried out on 60 children with clinical diagnosis of MiRAS. Patients were randomized into two groups: group A receiving laser therapy and group B receiving sham therapy (placebo). Laser therapy (diode laser, Î»: 645 nm) was administered on day 1 (T0) for three consecutive days. Patients were evaluated also on day 4 (T1), on day 7 (T2) and on day 10 (T3). Oral aphthous lesions size was assessed through a periodontal probe to measure the diameter length (mm); pain was evaluated through the Visual Analogue Scale (VAS); parental satisfaction was assessed through a questionnaire. RESULTS: The difference in the reduction of ulcers diameters between the two groups resulted statistically significant at T1 and at T2 ($p<0.05$). A statistically significant difference in pain reduction between two groups was found at T1 ($p<0.05$). No statistically significant difference between the two groups of parents was found as concerns the parental acceptance of the procedure and the discomfort for the need of multiple appointments. CONCLUSIONS: PBMT is to be considered effective in the treatment of MiRAS in children and well- accepted by the parents of the children themselves. Child;Humans;Low-Level Light Therapy;Pain Measurement;Personal Satisfaction;Stomatitis, Aphthous;Treatment Outcome

Light as a potential treatment for pandemic coronavirus infections: A perspective. The recent outbreak of COVID-19, which continues to ravage communities with high death tolls and untold psychosocial and catastrophic economic consequences, is a vivid reminder of nature's capacity to defy contemporary healthcare. The pandemic calls for rapid mobilization of every potential clinical tool, including phototherapy-one of the most effective treatments used to reduce the impact of the 1918 "Spanish influenza" pandemic. This paper cites several studies showing that phototherapy has immense potential to reduce the impact of coronavirus diseases, and offers suggested ways that the healthcare industry can integrate modern light technologies in the fight against COVID-19 and other infections. The evidence shows that violet/blue (400-470Â nm) light is antimicrobial against numerous bacteria, and that it accounts for Niels Ryberg Finsen's Nobel-winning treatment of tuberculosis. Further evidence shows that blue light inactivates several viruses, including the common flu coronavirus, and that in experimental animals, red and near infrared light reduce respiratory disorders, similar to those complications associated with coronavirus infection. Moreover, in patients, red light has been shown to alleviate chronic obstructive lung disease and bronchial asthma. These findings call for urgent efforts to further explore the clinical value of light, and not wait for another pandemic to serve as a reminder. The ubiquity of inexpensive light emitting lasers and light emitting diodes (LEDs), makes it relatively easy to develop safe low-cost light-based devices with the potential to reduce infections, sanitize equipment, hospital facilities, emergency care vehicles, homes, and the general environment as pilot studies have shown. COVID-19;Coronavirus Infections;Heliotherapy;Humans;Infrared Rays;Light;Low-Level Light Therapy;Lung Diseases;Pandemics;Phototherapy;Pneumonia, Viral

Efficiency of using the diode laser in the treatment of periodontal inflammatory diseases. OBJECTIVE: The aim: To study clinical efficiency of using the diode laser in the treatment of chronic catarrhal and hypertrophic gingivitis. PATIENTS AND METHODS: Materials and methods: Treatment of 32 patients with chronic catarrhal gingivitis and 30 patients with hypertrophic gingivitis by basic therapy according to the protocols of dental care was carried out. The patients of the main groups were additionally subjected to laser irradiation of the affected areas of the gums with a diode laser. RESULTS: Results: The use of laser therapy in the treatment of chronic catarrhal gingivitis contributed to the pain relief, reducing of bleeding and edema of the gums in 68.8% of patients on the 3rd day of observation. On the 7th day, 93.8% of the examined patients had no inflammation in periodontal tissues. During treatment of hypertrophic gingivitis, anti-inflammatory and decongestant effects, improvements in the aesthetic appearance of the gums were revealed in 33.3% patients on the 3rd day of the examination; absence of inflammation, gingival bleeding and gum hypertrophy was diagnosed in 53.3% on the 7th day and in 80.0% patients on 14th day of follow-up. In the control group, similar changes were revealed only in 68.8% patients with catarrhal gingivitis and in 46.7% patients with hypertrophic gingivitis after complete course of drug treatment in 14 days of observation. CONCLUSION: Conclusions: The use of a diode laser in patients with chronic gingivitis has provided a reduction in the term required for the complete elimination of the inflammatory process and suspended its further progression. Dental Plaque Index;Gingivitis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontitis;Periodontium

The efficacy and safety of a 577-nm high-power optically pumped semiconductor laser in the treatment of postacne erythema. BACKGROUND: Postacne erythema (PAE) is a common sequela of inflammatory acne vulgaris, treatment of which has been challenging due to limited options available and the variability of results for each modality. Recently, a 577-nm high-power optically pumped semiconductor laser (HOPSL) initially developed for vascular lesions has shown promising results for the treatment of PAE. AIMS: To evaluate the efficacy and safety of 577-nm HOPSL in the treatment of postacne erythema. METHODS: This was a split-face, randomized controlled trial pilot study. Twenty-one patients with PAE on both sides of their face were enrolled. Each subject's face sides were randomly assigned to either receive 577-nm HOPSL treatment (QuadroStar PROâ„¢, Asclepion Laser Technologies) using the scanner handpiece, 1mm spot size, 80% coverage, 12-15Â J/cm(2) , 30Â ms, 2 passes for 3 sessions at 1-month intervals, or no treatment at all. Outcome measures such as overall improvement, the Erythema Index (EI), and Melanin Index (MI) from 3 different areas on both treatment and control sides were assessed at baseline, and 1-month follow-up after each treatment session. Side effects including pain, erythema, swelling, and crusting were also recorded. RESULTS: Upon completion of the treatment period, the mean EI was significantly decreased in both treated and nontreated sides of the face (PÂ <Â .001 and PÂ =Â .001, respectively). The laser-treated sides already demonstrated significant reduction in the mean EI compared with nontreated sides at 1Â month after the 2nd treatment (PÂ =Â .007). The mean MI of both sides, however, did not show any statistically significant differences from baseline, and likewise when comparing between sides. Patients reported more improvement on laser-treated sides compared with nontreated sides. Reported side effects were limited to mild discomfort during treatment and transient facial erythema lasting approximately 30Â minutes. CONCLUSION: Patients who received treatment with the 577-nm HOPSL had better outcomes with minimal side effects at 1Â month after 2 treatments as compared to those who did not receive any treatment. Therefore, the 577-nm HOPSL may be considered as an effective adjuvant treatment for PAE and early erythematous atrophic scars. Acne Vulgaris;Erythema;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pilot Projects;Treatment Outcome

Low-power laser and potassium oxalate gel in the treatment of cervical dentin hypersensitivity-a randomized clinical trial. OBJECTIVE: To evaluate the effectiveness of different protocols for the treatment of cervical dentin hypersensitivity (CDH) in non-carious cervical lesions (NCCLs). MATERIALS AND METHODS: The CONSORT checklist was used to design this study. The sample with nâ€‰=â€‰74 participants (389 NCCLs) was randomly allocated into three groups: G1, potassium oxalate (Oxa-Gel BF); G2, GaAlAs (gallium-aluminum-arsenate) low-power laser (100Â mW, 808nn, 60Â J/cm(2)); and G3, potassium oxalate (Oxa-Gel BF) associated with the GaAlAs low-power laser. The CDH was triggered by the evaporative stimulus test (EST) and by the tactile stimulus test (TST). The visual analog scale (VAS) was used to quantify the degree of CDH. Changes in sensitivity were assessed from baseline over 3Â weeks. Data were analyzed for NCCLs using mixed-effects models with unstructured direct product covariance structure (Î±â€‰=â€‰0.05). RESULTS: After the first application, participants from G1 and G3 had a reduction in CDH (pâ€‰<â€‰0.05) compared with group G2 for TST. After the second application, G3 participants had a reduction in CDH (pâ€‰<â€‰0.05) in relation to G2 for both stimuli. Reduction in CDH (pâ€‰<â€‰0.05) occurred over 3Â weeks for EST and TST for all groups; however, there was no difference between groups at the end of the therapies. CONCLUSION: Potassium oxalate was more effective in reducing immediate CDH. After four applications, all groups showed similar results for the reduction of CDH. CLINICAL RELEVANCE: GaAlAS laser irradiation and oxalate potassium gel could reduce the symptoms of CDH; thus, they are viable alternatives for the treatment of this condition. Chemical occlusion of dental tubules showed effective results after a shorter time interval. TRIAL REGISTRATION: Brazilian Clinical Trials Registration Platform under protocol number RBR-4ybjmt. http://www.braziliantrials.com/?keywords=RBR-4ybjmt&order=%7Ensaios.patrocinador_primario. Oxalic Acid Brazil;Dentin Sensitivity;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Oxalic Acid

Consequences of 660 nm Diode Laser Following Postsurgical Exodontia in Patients under Contraceptive Pills: A Randomized Double-blinded Clinical Trial. AIM: The photobiomodulation (PBM) effect of 660 nm diode laser in reducing pain, edema, trismus and promote healing subsequently to the transalveolar extraction of mandibular third molars in female patients taking contraceptive pills were evaluated. MATERIALS AND METHODS: Fifty female patients participated in our study. The 660 nm diode laser was applied immediately on randomly selected patients of the study group (n = 25) over the surgical site for 1 minute with continuous laser beam application. For the control group (n = 25), the same extraction procedure was performed without the application of 660 nm diode laser. Pain intensity, swelling, trismus, and healing was evaluated before extraction and during recall visits 24 hours, 48 hours, and 7 days postoperatively. RESULTS: The values of pain, swelling, and trismus were significantly inferior in the study group compared to the control group ($p < 0.05$) at T2 and T3; while the values of the healing index were significantly superior in the study group compared to the control group ($p < 0.001$) at T1, T2, and T3. CONCLUSION: Using 660 nm diode laser reduced the postsurgical discomforts (pain, edema, and trismus) and promote healing associated following transalveolar extraction of the lower third molar. CLINICAL SIGNIFICANCE: To develop a framework based on the results regarding the PBM effect of 660 nm diode laser following transalveolar extraction of lower third molar in a female patient taking oral contraceptive pills, which may help to improve the treatment services provided to the community. Contraceptive Agents Contraceptive Agents;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain, Postoperative;Tooth, Impacted

A Dynamically Cooled, Variable Spot-Sized 1,064 nm Neodymium-doped Yttrium Aluminum Garnet Laser as a Treatment Option for Facial Reticular Veins. BACKGROUND: Facial reticular veins can be treated with laser therapy, sclerotherapy, or surgical removal. The use of a 1,064 nm neodymium-

doped yttrium aluminum garnet (Nd:YAG) laser has been reported to be successful in the treatment of facial reticular veins. OBJECTIVE: To report a large retrospective study examining the efficacy, side effects, and satisfaction of a dynamically cooled, variable spot-sized 1,064 nm Nd:YAG laser for the treatment of facial reticular veins in the periorbital and temporal area. PATIENTS AND METHODS: Contact was made with 100 patients from 2006 to 2019 who underwent treatment with a 1,064 nm Nd:YAG laser for facial reticular veins through office follow-up or telephone interviews. Percent resolution of veins, satisfaction, and adverse effects were evaluated. RESULTS: Eighty-nine of the 100 patients ranked their satisfaction with the treatment as 3 or very satisfied. Most patients reported 75% to 100% improvement. The most commonly reported adverse event seen after treatment was mild edema. Sixty-eight percent of patients reported no adverse effects at all. CONCLUSION: The dynamically cooled, variable spot-sized 1,064 nm Nd:YAG laser is a safe and effective treatment for facial reticular veins with minimal side effects. The results are usually immediate and, based on the long-term follow-up, tend to be long lasting. Adult;Aged;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Retrospective Studies;Telangiectasis

Extracorporeal Shock-Wave Therapy or Low-Level Laser Therapy: Which is More Effective in Bone Healing in Bisphosphonate Treatment? OBJECTIVES: Bisphosphonate-related osteonecrosis of the jaw is potential side effect of long-term bisphosphonate therapy. Different treatment modalities have been used in this and investigate the effects of low-level laser therapy (LLLT) and extracorporeal shockwave therapy (ESWT) on socket healing after tooth extraction in rats given long-term bisphosphonates. METHODS: Forty male Wistar-Albino rats were used in this experimental study. About 0.1â€Šmg/kg zoledronic acid was administered intraperitoneally to all animals 3 times per week for 8 weeks. Four groups were made which were control, LLLT, ESWT, and ESWT+LLLT. Upper right first molar teeth extraction was performed in all groups; no treatment was given to the control group after molar tooth extraction. About 810â€Šnm wavelength GaAlAs laser was used in LLLT group. In ESWT group, 1000 pulses, 0.21â€ŠmJ/mm ESWT was applied, and the 2 treatment methods were applied to the last ESWT+LLLT group at the same time. All the 4 groups were divided into 2 subgroups according to sacrification time 4 and 8 weeks. Steorologic, histologic, and immunohistochemical examinations were performed. RESULTS: The highest new bone volume was observed in the early LLLT+ESWT. New vessel volume and CD31 expression were found to be high in the LLLT group. matrixmetalloproteinaze (MMP)-2 expression was found increased by the application of LLLT and ESWT. CONCLUSION: The LLLT and ESWT have similar effect on socket healing in the early period and that co-use is more effective upon healing. The LLLT has been shown to increase CD31 expression and increase vascularization and soft-tissue healing. Diphosphonates Animals;Diphosphonates;Extracorporeal Shockwave Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar;Periodontal Ligament;Rats;Rats, Wistar;Tooth Extraction;Wound Healing

Does Low-Level Laser Therapy Decrease Muscle-Damaging Mediators After Performance in Soccer Athletes Versus Sham Laser Treatment? A Critically Appraised Topic. Clinical Scenario: Low-level laser therapy (LLLT) is a controversial topic for its use in athletic recovery, mainly due to inconsistency in research regarding the application of LLLT. Articles on LLLT have assessed its effectiveness in untrained humans through pain scales, functional scales, and blood draws, and it has been found capable in nonathletic rehabilitative use. The controversy lies with LLLT in the recovering athlete. Not only do athletes need to perform at high levels, but each sport is unique in the metabolic demands placed on the athletes' bodies. This modality can alter chemical mediators of the inflammatory process, specifically blood lactate (BL) and creatine kinase (CK). During soccer contests, it is a common problem for athletes to have an average CK level of 800Â U/L and BL of 8Â mmolÂ·L, increasing delayed-onset muscle soreness and fatigue. Micro-CK level elevation is associated with

cellular membrane damage, localized hypoxia, and electrolyte imbalances, hindering the recovery process. Clinical Question: Does LLLT decrease muscle-damaging mediators effecting player fatigue and delayed-onset muscle soreness after performance in soccer athletes versus sham treatment? Summary of Key Findings: In 3 studies, preperformance, postperformance, or preperformance and postperformance LLLT was performed and evaluated BL (2 of 3) and CK (2 of 3). In each article, BL and CK showed a significant decrease ($P < .05$) when performed either preperformance or postperformance versus the control group. The greatest decrease in these mediators was noticed when postperformance laser therapy was performed. Clinical Bottom Line: LLLT at 10, 30, or 50Â J performed at a minimum of 2 locations on the rectus femoris, vastus lateralis, and vastus medialis bilaterally for 10Â seconds each is significant in decreasing blood serum levels of BL and CK when performed postexercise. Strength of Recommendations: All 3 articles obtained a Physiotherapy Evidence Database score of â‰¥8/10. Biomarkers;Lactic Acid;Creatine Kinase Biomarkers;Creatine Kinase;Humans;Lactic Acid;Low-Level Light Therapy;Muscle Fatigue;Myalgia;Quadriceps Muscle;Soccer

Efficacy of Nonsurgical Mechanical Debridement With and Without Adjunct Low-Level Laser Therapy in the Treatment of Peri-Implantitis: A Randomized Controlled Trial. We hypothesized that in the long term (6-month follow-up), nonsurgical mechanical debridement (NSMD) with adjunct low-level laser therapy (LLLT) is more effective for the treatment of peri-implantitis than NSMD alone. The aim of the present 6-month follow-up convenience-sample cohort study was to assess the efficacy of LLLT as an adjunct to NSMD in the treatment of peri-implantitis. A questionnaire was used to collect demographic information. Patients with peri-implantitis in the test and control groups underwent NSMD with and without adjunct LLLT, respectively. Randomization was done by tossing a coin. In the test group, the laser was applied perpendicular to the periodontal pocket for 20 seconds at a constant distance of 15 mm and with a continuous wavelength (3.41 J/cm2 delivery with a 1.76 cm2 spot and average output of 0.3 W). In both groups, peri-implant probing depth, bleeding upon probing, and crestal bone resorption were assessed at baseline and at the 3-month and 6-month follow-up. Group comparisons were performed, and $P < .05$ was considered statistically significant. Sixty-seven individuals with peri-implantitis were included. The mean age of participants who underwent NSMD with adjunct LLLT and NSMD alone was 46.5 Â± 3.4 and 45.3 Â± 1.1 years, respectively. At the 3- and 6-month follow-up, peri-implant ($P < .05$), bleeding upon probing ($P < .05$), and probing depth ($P < .05$) were significantly higher among patients who underwent NSMD alone compared with patients who underwent NSMD with adjunct LLLT. There was no significant difference in crestal bone resorption in all patients up to the 6-month follow-up. In the short term, NSMD with adjunct LLLT was a useful treatment protocol for the treatment of peri-implant soft-tissue inflammation. Adult;Cohort Studies;Debridement;Humans;Low-Level Light Therapy;Middle Aged;Peri-Implantitis;Periodontal Pocket

Acute Photobiomodulation by LED Does Not Alter Muscle Fatigue and Cycling Performance. PURPOSE: The purpose of the present study was to investigate the ergogenic effects of two doses of photobiomodulation therapy (PBMT) in comparison to placebo on markers of respiratory and muscle activity, blood acid-base, ion and lactate concentrations, indicators of muscle fatigue (global, central, and peripheral), and time to exhaustion in severe-intensity cycling. METHODS: Two separate studies were performed, both in a pseudorandomized and balanced, crossover design. In study 1, 14 male recreational cyclists completed three constant-load, severe-intensity cycling bouts that were duration matched. The PBMT (18 Ã— 38 cm array with 200 diodes) treatments occurred before bouts at 260, 130, or 0 J (placebo) doses. EMG activity of selected lower limb musculature was assessed during each bout. Maximal voluntary contractions of knee extension with peripheral nerve stimulations and EMG activity evaluation of vastus lateralis was also performed before and after cycling. In study 2, 13

recreational cyclists performed three bouts of constant-load, severe-intensity cycling until exhaustion, preceded by PBMT as detailed previously. Blood lactate concentrations, respiratory responses, EMG activity, and capillary gasometry aspects were monitored. RESULTS: In both studies, there were no interactions effects (time-condition) on the EMG activity, which was displayed as root mean square (P â‰¥ 0.168) and median frequency (P â‰¥ 0.055) during cycling. In study 1, there were no interaction effects on the indicators of muscle fatigue after exercise (P â‰¥ 0.130). In study 2, there were no differences on time to exhaustion (P = 0.353) and no interaction effects among the physiological responses monitored (P â‰¥ 0.082). CONCLUSIONS: Based on our findings, the PBMT at 260- and 130-J doses does not have a beneficial effect on muscle fatigue, cycling performance, metabolic parameters, and muscle activity in male recreational cyclists. Biomarkers Adult;Athletic Performance;Bicycling;Biomarkers;Cross-Over Studies;Electromyography;Exercise Test;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Oxygen Consumption

Effect of Pulse Energy, Pulse Frequency, and Tip Diameter on Intracanal Vaporized Bubble Kinetics and Apical Pressure During Laser-Activated Irrigation Using Er:YAG Laser. Objective: Er:YAG laser-activated irrigation (LAI) is an effective method of root canal cleaning, but irrigant extrusion from the apical foramen has been a concern. We aimed to analyze the effects of pulse energy, pulse frequency, and laser tip diameter on intracanal vapor bubble kinetics and periapical pressure generation during LAI with Er:YAG laser. Background: Irrigant vapor bubble kinetics are one of indices of root canal cleaning efficacy. However, few studies have compared laser pulse conditions to vapor bubble kinetics, in relation to periapical pressure. Methods: A plastic root canal model (apical diameter 0.50â€‰mm, 6% taper, 20â€‰mm long) was filled with distilled water, and LAI with Er:YAG laser (Erwin AdvErl Unit; 30, 50, or 70â€‰mJ; 10, or 20 pulses per second; laser tip R200T or R600T) was performed with the end of the tip fixed at 15â€‰mm from the root apex. The number, maximum diameter, and velocity of vapor bubbles were analyzed by high-speed video imaging. Pressure generated outside the apical foramen was measured with a pressure sensor. Results: Vapor bubble count and maximum diameter increased significantly with pulse energy, pulse frequency, and tip diameter. Vapor bubble velocity increased significantly with pulse frequency, but not with pulse energy or tip diameter. Periapical pressure increased significantly with pulse energy, pulse frequency, and tip diameter. Conclusions: The pulse frequency was the single factor that significantly affected all the examined parameters (the number, diameter, and velocity) of vapor bubble kinetics together with the periapical pressure. Dose-Response Relationship, Radiation;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Root Canal Preparation;Therapeutic Irrigation;Volatilization

Photobiomodulation for Side Effects of Cancer Therapy. Drug-Related Side Effects and Adverse Reactions;Humans;Low-Level Light Therapy;Neoplasms;Postoperative Complications;Radiation Injuries;Radiotherapy

Transcranial photobiomodulation attenuates pentylenetetrazole-induced status epilepticus in peripubertal rats. Convulsive status epilepticus is the most common neurological emergency in children. Transcranial photobiomodulation (tPBM) reverses elevated rodent neurotransmitters after status epilepticus (SE) yet whether tPBM can attenuate seizure behaviors remains unknown. Here, we applied near-infrared laser at wavelength 808â€‰nm transcranially to peripubertal Sprague-Dawley rats prior to pentylenetetrazole (PTZ) injection. Hematoxylin-eosin, immunofluorescence (IF) staining with anti-parvalbumin (PV) and terminal deoxynucleotidyl transferase dUTP nick-end labeling (TUNEL) assay after IF staining was performed. Behaviorally, tPBM attenuated the mean seizure score and reduced the incidence of SE and mortality. Histochemically, tPBM reduced dark neurons in the cortex, hippocampus, thalamus and hypothalamus, lessened the apoptotic ratio of parvalbumin-positive interneurons (PV-INs) and alleviated the aberrant extent of PV-positive unstained somata of PCs in

the hippocampus. Conclusively, tPBM attenuated PTZ-induced seizures, SE and mortality in peripubertal rats and reduced PTZ-induced neuronal injury, apoptosis of PV-INs and preserved PV positive perisomatic inhibitory network in the hippocampus. Pentylenetetrazole Animals;Hippocampus;Pentylenetetrazole;Rats;Rats, Sprague-Dawley;Seizures;Status Epilepticus

Evaluation of the effect of 5-aminolevulinic acid hexyl ester (H-ALA) PDT on EBV LMP1 protein expression in human nasopharyngeal cells. Nasopharyngeal carcinoma (NPC) is of high prevalence in Hong Kong and southern China. The pathogenesis of NPC is closely associated with Epstein-Barr virus (EBV) infection via regulation of viral oncoprotein latent membrane protein 1 (LMP1). The conventional treatment for NPC is chemo-radiotherapy, but the prognosis remains poor for advanced stage, recurrent and metastatic NPC. Photodynamic therapy (PDT) is a therapeutic approach to combat tumors. PDT effectiveness depends on the interaction of photosensitizers, light and molecular oxygen. 5- aminolevulinic acid hexyl derivative (H-ALA) is one of the photosensitizers derived from 5-ALA. H-ALA with improved lipophilic properties by adding a long lipophilic chain (hexyl group) to 5-ALA, resulted in better penetration into cell cytoplasm. In this study, the effect of H-ALA-PDT on NPC cells (EBV positive C666-1 and EBV negative CNE2) was investigated. The H-ALA mediated cellular uptake and cytotoxicity was revealed via flow cytometry analysis and MTT assay respectively. H-ALA PDT mediated protein modulation was analysed by western blot analysis. Our finding reported that the cellular uptake of H-ALA in C666-1 and CNE2 cells was in a time dependent manner. H-ALA PDT was effective to C666-1 and CNE2 cells. EBV LMP1 proteins was expressed in C666-1 cells only and its expression was responsive to H-ALA PDT in a dose dependent manner. This work revealed the potential of H-ALA PDT as a treatment regiment for EBV positive NPC cells. Understanding the mechanism of H-ALA mediated PDT could develop improved strategies for the treatment of NPC. EBV-associated membrane antigen, Epstein-Barr virus;Photosensitizing Agents;Protoporphyrins;Viral Matrix Proteins;Aminolevulinic Acid;protoporphyrin IX;5-aminolevulinic acid hexyl ester Aminolevulinic Acid;Cell Line, Tumor;Cell Survival;Herpesvirus 4, Human;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Nasopharyngeal Neoplasms;Photochemotherapy;Photosensitizing Agents;Protoporphyrins;Viral Matrix Proteins

LLLT enhance cyclophosphamide induced TRPM2 channel activation in human colon cancer cells. AIM: Transient receptor potential (TRP) channels expression is enhanced significantly in colon cancer cells andÂ Low Lever Laser Treatment (LLLT), is known to have effects and is used clinically in the treatment ofmany diseases, including colon cancer. We aimed to reveal the effects of (LLLT) on apoptosis of colon cancer and on the efficacy of cyclophosphamide via Transient receptor potential melastatin 2 (TRPM2) channels. METHOD: Human colon cancer cells (Caco-2) were cultured and cells were divided into seven main groups. Cells were incubated with cyclophosphamide, TRPM2 channel inhibitor, stimulator and low level laser exposure separately and together. The effects of cyclophosphamide and low level laser were investigated on apoptosis. RESULTS: It was found that the levels of apoptosis in cyclophosphamide group were significantly increased in cancer cells compared to the control group. TRPM2 channel stimulator administration resulted in significantly increased apoptosis levels compared to the control group, in cyclophosphamide + low level laser group the apoptosis level was significantly increased compared to the cyclophosphamide-only group. CONCLUSIONS: It has been shown that apoptotic effects of cyclophosphamide on colon cancer cells were directly related to TRPM2 channels, low level laser increased apoptosis in colon cancer cells through TRPM2 channels and induced apoptotic effect of cyclophosphamide (Fig. 5, Ref. 26). TRPM Cation Channels;TRPM2 protein, human;Cyclophosphamide Apoptosis;Caco-2 Cells;Colonic Neoplasms;Cyclophosphamide;Humans;Low-Level Light Therapy;TRPM Cation Channels

Beyond 2D: effects of photobiomodulation in 3D tissue-like systems. SIGNIFICANCE: Currently, various scaffolds with immobilized cells are widely used in tissue engineering and regenerative

medicine. However, the physiological activity and cell viability in such constructs might be impaired due to a lack of oxygen and nutrients. Photobiomodulation (PBM) is a promising method of preconditioning cells to increase their metabolic activity and to activate proliferation or differentiation. AIM: Investigation of the potential of PBM for stimulation of cell activities in hydrogels. APPROACH: Mesenchymal stromal cells (MSCs) isolated from human gingival mucosa were encapsulated in modified fibrin hydrogels with different thicknesses and concentrations. Constructs with cells were subjected to a single-time exposure to red (630Â nm) and near-infrared (IR) (840Â nm) low-intensity irradiation. After 3 days of cultivation, the viability and physiological activity of the cells were analyzed using confocal microscopy and a set of classical tests for cytotoxicity. RESULTS: The cell viability in fibrin hydrogels depended both on the thickness of the hydrogels and the concentration of gel-forming proteins. The PBM was able to improve cell viability in hydrogels. The most pronounced effect was achieved with near-IR irradiation at the 840-nm wavelength. CONCLUSIONS: PBM using near-IR light can be applied for stimulation of MSCs metabolism and proliferation in hydrogel-based constructs with thicknesses up to 3Â mm. Hydrogels Cell Differentiation;Cell Survival;Humans;Hydrogels;Mesenchymal Stem Cells;Tissue Engineering

Can Low-Level Laser and Light-Emitting Diode Enhance the Stability of Dental Implants? PURPOSE: Stability of dental implants is an important factor for evaluation of osseointegration. The aim of this study was to evaluate the effect of combined use of low-level laser (LLL) and light-emitting diode (LED) therapy on the stability of dental implants during the healing phase. MATERIALS AND METHODS: This was a randomized clinical trial. Patients were assigned to two groups: In group 1, patients received LLL and LED 20Â min/day for 10Â days after implant insertion. Patients in group 2 (controls) did not undergo LLL and LED. The implant stability quotient (ISQ) was measured at 0 (time 0), 10 (time 1), 21 (time 2), 42 (time 3) and 63Â days (time 4) after implant placement. Independent t test was used to compare the ISQs between the two groups. RESULTS: Fifty-eight patients were studied in two groups (nâ€‰=â€‰28). The mean ISQ did not differ immediately after insertion (Pâ€‰>â€‰0.05). The mean ISQ differed significantly between the two groups on days 10, 21, 42 and 63 (Pâ€‰<â€‰0.05). Results demonstrated an increase in the amount of ISQ in group 1 (intervention) at times 1, 2, 3 and 4. In the control group, the amount of ISQ decreased on days 10 and 21 following implant insertion, but increased afterward on days 42 and 63. CONCLUSION: The results of this study showed that simultaneous use of LLL and LED increased the stability of the implants after 9Â weeks of follow-up.

Effect of 532nm photodynamic therapy with hemoporfin on the expression of vascular endothelial growth factor in cultured human vascular endothelial cells. BACKGROUND: Photodynamic therapy (PDT) with hemoporfin (hematoporphyrinmonomethyl ether, HMME) and 532 nm continuous-wave lasers is effective for port-wine stains (PWS) and is considered as a promising treatment modality. The vascular endothelial growth factor (VEGF) is involved in the development of PWS. This study aimed to investigate the effect of 532 nm-HMME-PDT on the in vitro expression of VEGF in human umbilical vein endothelial cells (HUVECs) exposed to different power levels of 532 nm laser and different concentrations of HMME. METHOD: The CCK-8 assay was performed to assess cell viability. Enzyme-linked immunosorbent assay (ELISA) was performed to measure VEGF secretion. VEGF and VEGF receptor (VEGFR) mRNA expression levels were detected by quantitative reverse transcription-polymerase chain reaction (qRT-PCR). RESULTS: Within 72 h after HMME-PDT, cell viability was inhibited, secretion and expression of VEGF was decreased, and expression of VEGFR mRNA was significantly decreased with the increase of HMME concentration. CONCLUSION: 532 nm-HMME-PDT can downregulate the expression of VEGF and VEGFR mRNA. Future studies are necessary to examine the HMME doses to achieve better efficacy with fewer adverse effects. Hematoporphyrins;RNA, Messenger;Vascular Endothelial Growth Factors;hematoporphyrin

monomethyl ether;Receptors, Vascular Endothelial Growth Factor Cell Survival;Dose-Response Relationship, Drug;Enzyme-Linked Immunosorbent Assay;Hematoporphyrins;Human Umbilical Vein Endothelial Cells;Humans;Lasers, Dye;Low-Level Light Therapy;Photochemotherapy;RNA, Messenger;Real-Time Polymerase Chain Reaction;Receptors, Vascular Endothelial Growth Factor;Vascular Endothelial Growth Factors

A Comparative Study of Low-Level Laser Therapy and Transcutaneous Electrical Nerve Stimulation as an Adjunct to Pharmaceutical Therapy for Myofascial Pain Dysfunction Syndrome: A Randomized Clinical Trial. OBJECTIVES: Myofascial pain dysfunction syndrome (MPDS) is the most common form of temporomandibular disorders. Because of the multifactorial nature of the problem, its management usually involves several treatment modalities to maximize their synergistic effects. This randomized clinical trial aimed to assess the efficacy of low-level laser therapy (LLLT) and transcutaneous electrical nerve stimulation (TENS) as an adjunct to pharmaceutical therapy for treatment of MPDS. MATERIALS AND METHODS: This clinical trial evaluated 108 MPDS patients. First, the initial pain intensity of patients was determined using a visual analogue scale (VAS). The first phase of the study included education, awareness, self-care, behavior and relaxation therapy. After 1 month, the pain score was measured again using VAS. Patients who acquired a pain score >1 were divided into three groups of LLLT with diode (GAAlAr) laser with 0.2 W power, TENS, and control, using block randomization. All groups received 10 mg fluoxetine once daily, 0.25 mg clonazepam once daily and 10 mg baclofen three times a day. ANOVA was used to compare the recovery rate of the three groups. RESULTS: Pain in the trapezius muscle and pain on mouth opening resolved faster in the laser + medication group. The recovery rate was faster in the mean muscle pain, general pain reported by patients, pain in the masseter and pterygoid muscles and pain and limitation in lateral movements in both laser + medication and TENS groups. CONCLUSION: Combination of LLLT and TENS with medication accelerated pain relief and resolved movement restrictions in MPDS patients.(IRCT registration number: IRCT201411113144N4).

Sensory and motor responses after photobiomodulation associated with physiotherapy in patients with incomplete spinal cord injury: clinical, randomized trial. Complete or incomplete spinal cord injury (SCI) results in permanent neurological deficits due to the interruption of nerve impulses, causing the loss of motor and sensory function, which leads to a reduction in quality of life. The focus of rehabilitation for such individuals is to improve quality of life and promote functional recovery. Photobiomodulation (PBM) has proved to be promising complementary treatment in cases of SCI. The aim of the present study was to investigate the effects of PBM combined with physiotherapy on sensory-motor responses below the level of the injury and quality of life in individuals with SCI. Thirty participants were randomized for allocation to the PBM group (active PBM + physiotherapy) or sham group (sham PBM + physiotherapy). Physiotherapy was administered three times a week. Sensitivity and motor skills were evaluated using the ASIA impairment scale. Quality of life was assessed using the WHOQOL-BREF questionnaire. The data were analyzed with the level of significance set to 5%. Improvements in sensitivity and an increase in the perception of muscle contraction were found in the active PBM group 30Â days after treatment compared with the sham group. The results of the WHOQOL-BREF questionnaire revealed a significant difference in general quality of life favoring the active PBM group over the sham group after treatment. Physiotherapy combined with PBM leads to better sensory-motor recovery in patients with SCI as well as a better perception of health and quality of life. Trial registration identifier: NCT03031223. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Motor Activity;Muscle Contraction;Physical Therapy Modalities;Quality of Life;Recovery of Function;Sensation;Spinal Cord Injuries;Young Adult

Perilesional photobiomodulation therapy and physical rehabilitation in post-operative recovery of dogs surgically treated for thoracolumbar disk extrusion. BACKGROUND: Recent studies have

reported contrasting results of the effects of laser therapy on post-operative intervertebral disk herniation, with a lack of evidence-based advantages of this modality within a rehabilitation protocol. The aim of this study was to report the clinical effects of photobiomodulation therapy within a post-operative rehabilitation protocol in dogs submitted to surgery for thoracolumbar disk extrusion. Twenty-four dogs were included in the study (12 dogs treated with laser therapy and rehabilitation protocol and 12 dogs treated with same rehabilitation protocol but without laser therapy). RESULTS: All dogs treated with laser therapy showed improved neurological status (Modified Frankel Score more than 3 within 30â€‰days of physiotherapy starting) if deep nociception on admission was maintained (Pâ€‰=â€‰0.04). However, Kaplan-Meier analysis did not show any statistical difference in time to regain ambulatory ability, although there was a tendency for a shorter mean time of 14.2â€‰Â±â€‰8.55â€‰days in the laser group versus 24â€‰Â±â€‰18.49â€‰days in the no laser group. CONCLUSIONS: The use of laser therapy in the post-operative rehabilitation of dogs affected by intervertebral disc extrusion and submitted to surgery for spinal decompression could help improve their neurological status. Animals;Decompression, Surgical;Dog Diseases;Dogs;Female;Intervertebral Disc Degeneration;Intervertebral Disc Displacement;Laser Therapy;Low-Level Light Therapy;Lumbar Vertebrae;Male;Postoperative Period;Thoracic Vertebrae

Photobiomodulation therapy increases functional capacity of patients with chronic kidney failure: randomized controlled trial. Photobiomodulation (PBM) has been used in different populations as a strategy to attenuate muscle fatigue and improve exercise performance. Recent findings demonstrated that a single session with specific PBM doses during hemodialysis (HD) increased the upper limb muscle strength of chronic kidney failure (CKF) patients. Now, the primary objective of this study was to evaluate the chronic effect of PBM on the functional capacity of this population. Secondarily, we aimed at investigating the effects of PBM on the patients' strength, muscle thickness and echogenicity, perception of pain, fatigue, and quality of life. A randomized controlled trial was conducted in which the intervention group (IG, nâ€‰=â€‰14) received 24 sessions of PBM (810Â nm, 5 diodesâ€‰Ã—â€‰200Â mW, 30Â J/application site) on lower limb during HD. The control group (CG, nÂ =â€‰14) did not receive any physical therapy intervention, it only underwent HD sessions. As a result, there was an increase in the functional capacity (assessed through the six-minute walk test) for the IG compared with the CG [50.7Â m (CI95% 15.63; 85.72), pâ€‰=â€‰0.01, large effect size, dâ€‰=â€‰1.12], as well as an improvement on lower limb muscle strength (assessed through the sit-and-stand test) [-â€‰7.4Â s (CI95% -â€‰4.54; -â€‰10.37), pâ€‰=â€‰0.00, large effect size, dâ€‰=â€‰1.99]. For other outcomes evaluated, no significant difference between-group was observed. Finally, PBM applied as monotherapy for 8Â weeks in the lower limb improves functional capacity and muscle strength of CKF patients. Female;Humans;Kidney Failure, Chronic;Low-Level Light Therapy;Male;Middle Aged;Muscle Fatigue;Muscle Strength;Physical Therapy Modalities;Quality of Life

Photobiomodulation effect on angiogenic proteins produced and released by dental pulp cells. OBJECTIVE: To verify the photobiomodulation effect on angiogenic proteins produced and released by dental human pulpal fibroblasts (HPFs). MATERIAL AND METHODS: HPFs were irradiated with 660-nm low-level laser at fluences of 2.5Â J/cm(2) and 3.7Â J/cm(2). The control group was not irradiated. MTT, crystal violet, and ELISA assays respectively verified viability, proliferation, and angiogenic protein (supernatant/lysate) at 6Â h, 12Â h, and 24Â h after photobiomodulation. Capillary-like structure formation assay verified functional role. Two-way ANOVA/Tukey's test and ANOVA/Bonferroni's multiple comparisons test respectively verified cell viability/proliferation and intragroup and intergroup comparisons of protein synthesis (pâ€‰<â€‰0.05). RESULTS: Irradiated and non-irradiated HPFs showed statistically similar cell viability and proliferation pattern. Intragroup comparisons showed similar patterns of protein synthesis for all groups: VEGF-A, VEGF-C, and

vascular endothelial growth factor receptor 1 (VEGFR1) increased significantly in the supernatant, while FGF-2 and VEGF-A increased significantly in the lysate. The lower fluence significantly increased BMP-9 (6Â h) in the supernatant and VEGFR1 (6Â h and 12Â h) and VEGF-D (24Â h) in the lysate, while the higher fluence significantly increased BMP-9 (6Â h) in the supernatant and VEGFR1 (12Â h) in the lysate. Regardless of the time, both fluences statistically downregulated placental growth factor (PLGF) and PDGF secretion. Both fluences statistically decreased VEGF-A secretion (24Â h) and PLGF production (6Â h). CONCLUSION: Photobiomodulation produced stimulatory effects on angiogenic protein secretion by pulp fibroblasts. In terms of photobiomodulation, over time, both fluences significantly increased the secretion of VEGF-A, VEGF-C, and VEGFR1 and significantly upregulated BMP-9 (6Â h) in the supernatant; for capillary-like structure formation, the fluence of 2.5Â J/cm(2) was better than the fluence of 3.7Â J/cm(2). CLINICAL RELEVANCE: This study results addressed effective photobiomodulation parameters tailored for pulp angiogenesis. Angiogenic Proteins;Vascular Endothelial Growth Factor A;Placenta Growth Factor Angiogenic Proteins;Cells, Cultured;Dental Pulp;Female;Humans;Placenta Growth Factor;Vascular Endothelial Growth Factor A

Effects of Photobiomodulation in Children with Down Syndrome and Possible Sleep Bruxism: Protocol For A Randomized, Controlled, Blind, Clinical Trial: Study protocol clinical trial (SPIRIT compliant). Hypotonia, particularly of the masticatory and oropharyngeal muscles, is 1 of the main characteristics of Down Syndrome (DS), resulting in impaired speech, chewing and swallowing. Moreover, the complete or partial obstruction of the airways during sleep may occur due to hypotonia of the tongue, leading to snoring and sleep disorders, such as obstructive apnea and sleep bruxism. OBJECTIVE:: Analyze salivary levels of dopamine and cortisol and muscle activity before and after treatment with low-level laser therapy administered to acupoints in children with DS. METHODS:: A randomized, controlled, clinical trial will be conducted. Individuals 4 to 17 years of age with a diagnosis of DS and possible sleep bruxism will be screened at the Integrated Health Clinic of Nove de Julho University. We will evaluate orofacial dysfunction (Nordic Orofacial Test - Screening questionnaire), Masseter muscle activity during sleep will be assessed by BiteStrip and the masticatory muscles will be evaluated by electromyography (BTS TMJOINT) head posture as well as salivary cortisol and dopamine. After the evaluations, the participants will be randomized into 2 groups: Grupo 1 - treatment with low-level laser therapy at a wavelength of 808â€Šnm; Group 2 - sham treatment (simulated laser therapy). Treatment will be conducted twice per week for a total of 12 sessions. The data will be tabulated and treated using GraphPad Prism version 7.0. The Kolmogorov-Smirnov test will be used to determine the normality of the data. Variables that fit the Gaussian curve will be expressed as mean and standard deviation. The ANOVA 2-way will be used for comparisons between the groups, with the significance level set to 5% (Pâ€Š<â€Š.05).ClinicalTrials registration number: NCT04211870. Acupuncture Points;Adolescent;Child;Child, Preschool;Clinical Protocols;Disabled Children;Down Syndrome;Female;Humans;Low-Level Light Therapy;Male;Randomized Controlled Trials as Topic;Sleep Bruxism;Surveys and Questionnaires

Can Transdermal Photobiomodulation Help Us at the Time of COVID-19? Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Low-Level Light Therapy;Pandemics;Pneumonia, Viral;SARS-CoV-2

Photobiomodulation Therapy is Able to Modulate PGE(2) Levels in Patients With Chronic Non-Specific Low Back Pain: A Randomized Placebo-Controlled Trial. BACKGROUND AND OBJECTIVES: Non-specific low back pain (LBP) is responsible for triggering increased biomarkers levels. In this way, photobiomodulation therapy (PBMT) may be an interesting alternative to treat these patients. One of the possible biological mechanisms of PBMT involved to decrease pain intensity in patients with musculoskeletal disorders is modulation of the inflammatory mediators' levels. The aim of this study was to evaluate the effects of PBMT compared with placebo on inflammatory mediators' levels and

pain intensity in patients with chronic non-specific LBP. STUDY DESIGN/MATERIALS AND METHODS: A prospectively registered, randomized triple-blinded (volunteers, therapists, and assessors), placebo-controlled trial was performed. Eighteen patients with chronic non-specific LBP were recruited and treated with a single session of active PBMT or placebo PBMT. The primary outcome of the study was serum prostaglandin E(2) levels and the secondary outcomes were tumor necrosis factor-Î±, interleukin-6 levels, and pain intensity. All outcomes were measured before and after 15â€‰minutes of treatment session. RESULTS: PBMT was able to decrease prostaglandin E(2) levels at post-treatment compared with placebo, with a mean difference of -1470â€‰pg/ml, 95% confidence interval -2906 to -33.67 in patients with LBP. There was no difference between groups in the other measured outcomes. Patients did not report any adverse events. CONCLUSION: Our results suggest that PBMT was able to modulate prostaglandin E(2) levels, indicating that this may be one of the mechanisms involved in the analgesic effects of PBMT in patients with LBP. Trial registration number (ClinicalTrials.gov): NCT03859505. Lasers Surg. Med. Â© 2020 The Authors. Lasers in Surgery and Medicine published by Wiley Periodicals, Inc. Interleukin-6;Tumor Necrosis Factor-alpha;Dinoprostone Dinoprostone;Humans;Interleukin-6;Low Back Pain;Low-Level Light Therapy;Tumor Necrosis Factor-alpha

Influence of low-level laser therapy on implant stability in implants placed in fresh extraction sockets: A randomized clinical trial. BACKGROUND: Low-level laser therapy (LLLT) has been suggested to improve primary stability at the early stages of osseointegration in animal models. However, there is still scarce evidence about its influence on implant stability in humans. PURPOSE: To assess the influence of LLLT on implant stability in implants placed in fresh extraction sockets. MATERIAL AND METHODS: A randomized controlled trial was designed according to the SPIRIT guidelines and is reported following the CONSORT. Patients were randomly allocated according to control or LLLT groups. LLLT consisted in the application of GaAlAs laser (808â€‰nm, avg. power density: 50â€‰mW, circular spot diameter and area: 0.71â€‰cm/0.4cm(2)) applied in six points in contact mode with peri-implant soft tissue (1.23â€‰minutes in each point of application; dose per point 11â€‰J) before bone perforation and after suturing. The total dose resulted in 66â€‰J per application moment. This LLLT protocol was applied only in the dental implant placement session. Implant stability was by ISQ at implant placement (T(0)) and the abutment selection (T(a)). Digital radiographs for T(0) and T(a) were used to assess the distance between the implant platform and alveolar bone crest, in millimeters. T-test and Shapiro-Wilk test were used to analyze data between groups using the implant as a unit of analysis. RESULTS: Fifty implants were placed in 44 patients. The insertion torque ranged from 15 to 60â€‰N.cm (mean 35.64â€‰Â±â€‰13.34). Two implants of the LLLT and one of the control groups were lost to follow-up and one implant of the control group failed to osseointegrate (4.3%). ISQ at T(0) ranged from 17 to 79 (mean 59.33â€‰Â±â€‰13.05) and from 40 to 89 (mean 66.46 SDâ€‰Â±â€‰11.56) at T(a) . No differences were observed when comparing the groups with ISQ difference (P = .433) or radiographical peri-implant alterations (P = .261). CONCLUSIONS: LLLT did not influence implant stability in implants placed in fresh extraction sockets when assessed at healing abutment installation. Dental Implants Alveolar Process;Animals;Dental Implantation, Endosseous;Dental Implants;Humans;Low-Level Light Therapy;Osseointegration;Tooth Socket

Photobiomodulation and Antiviral Photodynamic Therapy as a Possible Novel Approach in COVID-19 Management. Antiviral Agents Antiviral Agents;Betacoronavirus;COVID-19;Coronavirus Infections;Humans;Laser Therapy;Pandemics;Photochemotherapy;Photons;Pneumonia, Viral;SARS-CoV-2;COVID-19 Drug Treatment

Photobiomodulation for Parkinson's Disease in Animal Models: A Systematic Review. Photobiomodulation (PBM) might be an effective treatment for Parkinson's disease (PD) in human patients. PBM of the brain uses red or near infrared light delivered from a laser or an LED at relatively low power densities, onto the head (or other body parts) to stimulate the brain and prevent degeneration of neurons. PD is a progressive neurodegenerative disease involving the loss of dopamine-producing neurons in the substantia nigra deep within the brain. PD is a movement disorder that also shows various other symptoms affecting the brain and other organs. Treatment involves dopamine replacement therapy or electrical deep brain stimulation. The present systematic review covers reports describing the use of PBM to treat laboratory animal models of PD, in an attempt to draw conclusions about the best choice of parameters and irradiation techniques. There have already been clinical trials of PBM reported in patients, and more are expected in the coming years. PBM is particularly attractive as it is a non-pharmacological treatment, without any major adverse effects (and very few minor ones). Animals;Disease Models, Animal;Humans;Low-Level Light Therapy;Parkinson Disease;Publications

Efficacy of low-level laser therapy on management of Bell's palsy: a systematic review. The aim of this study is to evaluate the efficacy of low-level laser therapy (LLLT) in patients with Bell's palsy (BP) through a systematic review method. We systematically searched international databases including PubMed, Scopus, and Web of Science to find eligible articles without language limitation. All relevant randomized controlled trials (RCTs) that compared the efficacy of the LLLT with placebo laser, exercise, massage, or no intervention on BP patients were included. Four studies (out of 259) had met our inclusion criteria involving 171 patients and were entered to the systematic review. Full texts of the selected studies were retrieved and critically appraised using Physiotherapy Evidence Database (PEDro) scale. The patients of all trials were in sub-acute (less than 1Â week) stage. Both of LLLT and control groups showed significant improvement after trials. Two authors reported significant differences between the groups after 6Â weeks of laser application (830Â nm, 100Â mW). In converse, two other authors did not identify any effectiveness following 4Â weeks and 15Â days of LLLT application with 670 and 830Â nm wavelength, sequentially. There is clear lack of information lead to get and evidence-based suggestion for the LLLT application on Bells' palsy; however, the LLLT irradiation with 830Â nm and 100Â mW power for a period of 6Â weeks might be beneficial on recovery for the patients with sub-acute Bell's palsy. There were no reported adverse effects during treatment and/or follow-up sessions. Bell Palsy;Humans;Lasers;Low-Level Light Therapy;Physical Therapy Modalities;Treatment Outcome

Acute physiological responses to combined blood flow restriction and low-level laser. PURPOSE: Blood flow restriction (BFR) is an innovation in fitness to train muscles with low loads at low oxygen levels. Low-level laser therapy (LLLT) is a bio-energetic approach to alleviate muscle fatigue during resistance training. This study investigated the immediate effect of LLLT pre-conditioning on BFR that accelerates muscle fatigue due to ischemia. METHODS: Fifteen young adults participated in this study of a crossover randomized design. They completed a low-load contraction with various pre-conditioning (blood flow restriction with low-level laser therapy (LLLTâ€‰+â€‰BFR), blood flow restriction with sham low-level laser therapy (BFR), and control). Force fluctuation dynamics, muscle oxygen saturation of hemoglobin and myoglobin (SmO(2)), and discharge patterns of motor units (MU) were compared. RESULTS: Normalized SmO(2) during low-load contractions significantly varied with the pre-contraction protocols (Control (83.6â€‰Â±â€‰3.0%)â€‰>â€‰LLLTâ€‰+â€‰BFR (70.3â€‰Â±â€‰2.8%)â€‰>â€‰BFR (55.4â€‰Â±â€‰2.4%). Also, force fluctuations and MU discharge varied with the pre-contraction protocols. Multi-scale entropy and mean frequency of force fluctuations were greater in the LLLTâ€‰+â€‰BFR condition (31.95â€‰Â±â€‰0.67) than in the BFR condition (29.47â€‰Â±â€‰0.73). The mean inter-spike interval of MUs was greater in the

LLLTâ€‰+â€‰BFR condition (53.32â€‰Â±â€‰2.70Â ms) than in the BFR condition (45.04â€‰Â±â€‰1.08Â ms). In particular, MUs with higher recruitment thresholds exhibited greater LLLT-related discharge complexity (LLLTâ€‰+â€‰BFR (0.201â€‰Â±â€‰0.012)â€‰>â€‰BFR (0.154â€‰Â±â€‰0.006)). CONCLUSIONS: LLLT pre-conditioning can minimize the BFR-related decline in muscle oxygen saturation, leading to force gradation and MU discharge in a cost-effective and complex manner. Adult;Electromyography;Female;Hemodynamics;Humans;Isometric Contraction;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Regional Blood Flow;Resistance Training;Young Adult

Evaluation the effects of low-level laser therapy on disc displacement with reduction. OBJECTIVES: This study aims to evaluate the effects of additional low-level laser therapy (940 nm GaAlAs) to the routine occlusal splint therapy on maximal mouth opening (MMO), visual analog scale (VAS) scores, and passive mouth opening (PMO). PATIENTS AND METHODS: Between January 2016 and March 2018, a total of 40 patients (10 males, 30 females; mean age 22.35 years; range, 18 to 60 years) with disc displacement with reduction of the temporomandibular joint were included. The patients were divided into two groups. Group 1 (control group, n=20) received routine non-steroidal anti-inflammatory drug (NSAID) therapy and occlusal splint therapy for eight hours per day for a total of three months. Group 2 (laser group, n=20) received NSAID, occlusal splint therapy and 940 nm wavelength diode laser therapy for two sessions per week for a total of four weeks. The MMO, PMO, and VAS scores were recorded before and at one, two, three, four, and 12 weeks after treatment. The joint and muscle examinations were performed. RESULTS: A constant decrease was found in the VAS scores in both groups. At four (p=0.008) and 12 weeks (p=0.003), a statistically significant difference in the VAS scores was observed. At all time points, PMO and MMO scores increased in both groups. The MMO scores were statistically higher in the laser group at all time points (p<0.005). CONCLUSION: Our study results suggest that short-term low-level laser therapy additional to conventional treatment may yield satisfactory outcomes.

Photobiomodulation and photodynamic therapy for the management of oral graft-versus-host disease: A case report. Photosensitizing Agents Graft vs Host Disease;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

Raman spectroscopic study of the effect of the use of laser/LED phototherapy on the repair of complete tibial fracture treated with internal rigid fixation. This study aimed to assess the repair of complete surgical tibial fractures fixed with internal rigid fixation (IRF) associated or not to the use of mineral trioxide aggregate (MTA) cement and treated or not with laser (Î»â€¯=â€¯780â€¯nm, infrared) or LED (Î»â€¯=â€¯850â€¯Â±â€¯10â€¯nm, infrared) lights, 142.8â€¯J/cm(2) per treatment, by means of Raman spectroscopy. Open surgical tibial fractures were created on 18 rabbits (6 groups of 3 animals per group, â¼8 months old) and fractures were fixed with IRF. Three groups were grafted with MTA. The groups of IRF and IRFâ€¯+â€¯MTA that received laser or LED were irradiated every other day during 15 days. Animals were sacrificed after 30 days, being the tibia surgically removed. Raman spectra were collected via the probe at the defect site in five points, resulting in 15 spectra per group (90 spectra in the dataset). Spectra were collected at the same day to avoid changes in laser power and experimental setup. The ANOVA general linear model showed that the laser irradiation of tibial bone fractures fixed with IRF and grafted with MTA had significant influence in the content of phosphate (peak â¼960 cm(-1)) and carbonated (peak â¼1,070â€¯cm(-1)) hydroxyapatites as well as collagen (peak 1,452â€¯cm(-1)). Also, peaks of calcium carbonate (1,088â€¯cm(-1)) were found in the groups grafted with MTA. Based on the Raman spectroscopic data collected in this study, MTA has been shown to improve the repair of complete tibial fractures treated with IRF, with an evident increase of collagen matrix synthesis, and development of a scaffold of hydroxyapatite-like calcium carbonate with subsequent deposition of phosphate hydroxyapatite.

Aluminum Compounds;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate;Durapatite;Calcium Carbonate Aluminum Compounds;Animals;Calcium Carbonate;Calcium Compounds;Drug Combinations;Durapatite;Fracture Fixation, Internal;Low-Level Light Therapy;Male;Oxides;Photochemotherapy;Rabbits;Silicates;Spectrum Analysis, Raman;Tibia;Tibial Fractures

Effectiveness of low-level laser therapy in accelerating the orthodontic tooth movement: A systematic review and meta-analysis. OBJECTIVES: The aim of the paper was to appraise the current evidence of the effectiveness of low-level laser therapy (LLLT) in accelerating the tooth movement. METHODS: A comprehensive search was performed in 9 databases up to June 2019. Only randomized controlled trials (RCTs) were included. The risk of bias was assessed using the Cochrane Collaboration tool. The quantitative data synthesis was attainable only for the studies evaluating the effect of laser on canine retraction; the qualitative description was used for the rest of the studies. The overall quality of evidence was rated using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria. RESULTS: A total of 25 RCTs were included in this review. The radiated upper canines showed a greater retraction â€“ 0.50 mm and 0.49 mm at months 2 and 3, respectively. The radiated lower canines showed a greater retraction â€“ 0.28 mm and 0.52 mm at months 2 and 3, respectively. No statistically significant differences were observed among the upper and lower canines after the 1st month of retraction. When the GRADE approach was utilized, the overall quality of evidence limited confidence in the estimates. The qualitative description revealed enhanced tooth movement when LLLT was applied. The attrition bias was the main risk factor affecting the methodology of the studies. CONCLUSION: Low-level laser therapy can speed up the rate of the tooth movement. However, the overall quality of evidence ranged from low to very low and the clinical significance of the obtained statistically significant differences is questionable. Hence, more precise studies are needed. As discussed in this review, it is highly recommended to express and compare the laser dosage with the total number of joules applied per month rather than the previously used J/cm2. Moreover, the previous recommendation indicating that lower energy densities (2.5, 5 and 8 J/cm2) are more effective than 20 and 25 J/cm2 is misleading. Databases, Factual;Low-Level Light Therapy;Mental Processes;Social Behavior;Tooth Movement Techniques

Method for Investigation of Photobiological Effects of Light on Human Skin Cells Mediated by Low Doses of Light. Driven by evolution, human skin cells have developed an extraordinary ability both to sense and to respond to the photons of sunlight through a plethora of photobiological interactions, activating intracellular signalling cascades and regulating skin cells homeostasis. It has recently been reported that some of these photobiological responses triggered by low levels of light (or the so-called photobiomodulation) could initiateÂ beneficial therapeutic effects. Identification of these effective light-based therapeutic solutions requires in-depth understanding of the parameter space. The physical, biological, and chemical conditions that need to be fulfilled to facilitate such positive photobiological effects areÂ to be carefully deciphered. Here, we provide the protocols that were specifically developed to investigate multidimensional parameter space driving photobiological interactions triggered by light (photobiomodulation) in the skin cells. The approach is based on the so-called design of experiment (DoE), a statistical method, which allows for the investigation of multidimensional parameters landscapes. This goes hand in hand with sharing practical tips for the design of light-based devices inducing these effects. To exemplify practical applications of the developed methods and light-based devices, we disclose experimental data sets and emphasize robustness and reproducibility of the results. Cell Culture Techniques;Cells, Cultured;Epidermal Cells;Humans;Light;Photobiology;Skin;Temperature

Physiology and Medical Treatments for Alopecia. Androgenetic alopecia (AGA) is the most common hair loss disorder in men and women. The characteristic and reproducible balding pattern in AGA negatively affects self-image and the external perceptions of the balding patient. The phenotypical changes are driven by dihydrotestosterone (DHT) and its precursor testosterone. DHT induces follicle miniaturization and hair cycle changes until resulting hairs no longer extrude through the skin surface. AGA is inherited in a polygenetic pattern and is susceptible to epigenetic and environmental factors. Currently, minoxidil, finasteride, and photolaser therapy are the only Food and Drug Administration-approved medical treatments for AGA. Hair Preparations;Dihydrotestosterone;Finasteride;Minoxidil;Dutasteride Alopecia;Dihydrotestosterone;Dutasteride;Finasteride;Hair Preparations;Humans;Low-Level Light Therapy;Minoxidil

Exercise program combined with electrophysical modalities in subjects with knee osteoarthritis: a randomised, placebo-controlled clinical trial. BACKGROUND: It is not yet clear which of the various electrophysical modalities used in clinical practice is the one that contributes most positively when added to an exercise program in patients with knee osteoarthritis (OA). The aim of the present study was to analyze the clinical effects of the inclusion of interferential current therapy (ICT), shortwave diathermy therapy (SDT) and photobiomodulation (PHOTO) into an exercise program in patients with knee OA. METHODS: This prospective, five-arm, randomised, placebo-controlled trial was carried out with blinded participants and examiners. We recruited 100 volunteers aged 40 to 80â€‰years with knee OA. Participants were allocated into five groups: exercise, exercise + placebo, exercise + ICT, exercise + SDT, and exercise + PHOTO. The outcome measures included Western Ontario and McMaster Universities (WOMAC), numerical rating pain scale (NRPS), pressure pain threshold (PPT), self-perceived fatigue and sit-to-stand test (STST), which were evaluated before and after 24 treatment sessions at a frequency of three sessions per week. RESULTS: In all groups, there was a significant improvement (pâ€‰<â€‰0.05) in all variables over time,Â except pressure pain threshold. We observed significant differences (pâ€‰<â€‰0.05) between the groups for WOMAC function (exercise vs. exercise + placebo, mean difference [MD]â€‰=â€‰5.55, 95% confidence interval [CI]â€‰=â€‰3.63 to 7.46; exercise vs. exercise + ICT, MDâ€‰=â€‰3.40, 95% CIâ€‰=â€‰1.46 to 5.33; exercise vs. exercise + SDT, MDâ€‰=â€‰4.75, 95% CIâ€‰=â€‰1.85 to 7.64; exercise vs. exercise + PHOTO, MDâ€‰=â€‰5.45, 95% CIâ€‰=â€‰3.12 to 7.77) and WOMAC pain, with better scores achieved by the exercise group. However, these differences were not clinically relevant when considering the minimum clinically important difference. CONCLUSION: The addition of ICT, SDT or PHOTO into an exercise program for individuals with knee OA is not superior to exercise performed in isolation in terms of clinical benefit. clinicaltrials.gov: NCT02636764, registered on March 29, 2014. Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Electric Stimulation Therapy;Exercise;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Management;Pain Threshold;Prospective Studies;Quality of Life;Short-Wave Therapy;Treatment Outcome

Evaluation of photobiomodulation in salivary production of patients with xerostomy induced by anti-hypertensive drugs: Study protocol clinical trial (SPIRIT compliant). INTRODUCTION: Hypertension (systemic arterial hypertension [SAH]) is a systemic condition that affects about 30% of the world population, according to data from the World Health Organization (WHO). Drugs used to control this disease have the potential to induce xerostomia, an oral condition in which the decrease of the salivary flow is observed and whose presence leads to the increase of the index of caries, periodontal disease, loss of the teeth, dysgeusia, difficulty of mastication, dysphagia, bad breath and oral burning and impairment of prothesis installed in the buccal cavity, including retention of removable and total dentures. METHODS: This is a randomized, placebo-controlled, blind clinical

protocol that aims to analyze the impact of phobiomodulation (PBM) on salivary glands of patients with antihypertensive drug induced xerostomia. Patients will be divided into 2 groups: G1: older adults with xerostomia induced by antihypertensive drugs and treatment with PBM (nâ€Š=â€Š30); G2: placebo PBM (nâ€Š=â€Š30). The irradiation will be made using a diode laser emitting at 808â€Šnm with 100â€ŠmW and 40â€Šseconds of exposure per site at the salivary glands. Twenty sites will be irradiated weekly for 4 weeks. Non-stimulated and stimulated salivary flow will be analyzed before and after the treatment. RESULTS: This protocol will determine the effectiveness of photodynamic therapy regarding the reduction of xerostomia in older adults using antihypertensive drugs. CONCLUSION: This protocol will determine the effectiveness of photodynamic therapy regarding the reduction of xerostomia in older adults using antihypertensive drugs. TRIAL REGISTRATION: Clinicaltrials.gov - NCT03632096. Antihypertensive Agents Antihypertensive Agents;Double-Blind Method;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Saliva;Salivation;Xerostomia

Does the combination of photobiomodulation therapy (PBMT) and static magnetic fields (sMF) potentiate the effects of aerobic endurance training and decrease the loss of performance during detraining? A randomised, triple-blinded,Â placebo-controlled trial. BACKGROUND: Photobiomodulation (PBMT) is a therapy that uses non-ionising forms of light, including low-level lasers and light-emitting diodes (LEDs) that may be capable of modulating cellular activity. Some biological processes may also interact with static magnetic fields (sMF), leading to modulatory effects on cells. Previous studies have verified that the combination of PBMT and sMF (PBMT/sMF) enhances the performance of individuals during aerobic training programs. The detraining period can cause losses in aerobic capacity. However, there is no evidence of the existence of any recourse that can decrease the effects of detraining. We aimed to investigate the effects of PBMT/sMF application during training and detraining to assess the effectiveness of this treatment in reducing the effects of detraining. METHODS: Sixty male volunteers were randomly allocated into four groups- participants who received PBMT/sMF during the training and detraining (PBMT/sMFâ€‰+â€‰PBMT/sMF); participants who received PBMT/sMF during the training and a placebo in the detraining (PBMT/sMFâ€‰+â€‰Placebo); participants who received a placebo during the training and PBMT/sMF in the detraining (Placebo+PBMT/sMF); and participants who received a placebo during the training and detraining (Placebo+Placebo). Participants performed treadmill training over 12â€‰weeks (3 sessions/week), followed by 4â€‰weeks of detraining. PBMT/sMF was applied using a 12-diode emitter (four 905â€‰nm super-pulsed lasers, four 875â€‰nm light-emitting diodes (LEDs), four 640â€‰nm LEDs, and a 35 mT magnetic field) at 17 sites on each lower limb (dosage: 30â€‰J per site). The data were analysed by two-way repeated measures analysis of variance (ANOVA, time vs experimental group) with post-hoc Bonferroni correction. RESULTS: The percentage of change in time until exhaustion and in maximum oxygen consumption was higher in the PBMT/sMFâ€‰+â€‰PBMT/sMF group than in the Placebo+Placebo group at all time-points (pâ€‰<â€‰0.05). Moreover, the percentage of decrease in body fat at the 16th week was higher in the PBMT/sMFâ€‰+â€‰PBMT/sMF group than in the Placebo+Placebo group (pâ€‰<â€‰0.05). CONCLUSIONS: PBMT/sMF can potentiate the effects of aerobic endurance training and decrease performance loss after a 4-week detraining period. Thus, it may prove to be an important tool for both amateur and high-performance athletes as well as people undergoing rehabilitation. TRIAL REGISTRATION: NCT03879226. Trial registered on 18 March 2019.

Mitochondrial Dysfunction and Parkinson's Disease-Near-Infrared Photobiomodulation as a Potential Therapeutic Strategy. As the main driver of energy production in eukaryotes, mitochondria are invariably implicated in disorders of cellular bioenergetics. Given that dopaminergic neurons affected in Parkinson's disease (PD) are particularly susceptible to energy fluctuations by their high basal

energy demand, it is not surprising to note that mitochondrial dysfunction has emerged as a compelling candidate underlying PD. A recent approach towards forestalling dopaminergic neurodegeneration in PD involves near-infrared (NIR) photobiomodulation (PBM), which is thought to enhance mitochondrial function of stimulated cells through augmenting the activity of cytochrome C oxidase. Notwithstanding this, our understanding of the neuroprotective mechanism of PBM remains far from complete. For example, studies focusing on the effects of PBM on gene transcription are limited, and the mechanism through which PBM exerts its effects on distant sites (i.e., its "abscopal effect") remains unclear. Also, the clinical application of NIR in PD proves to be challenging. Efficacious delivery of NIR light to the substantia nigra pars compacta (SNpc), the primary site of disease pathology in PD, is fraught with technical challenges. Concerted efforts focused on understanding the biological effects of PBM and improving the efficiency of intracranial NIR delivery are therefore essential for its successful clinical translation. Nonetheless, PBM represents a potential novel therapy for PD. In this review, we provide an update on the role of mitochondrial dysfunction in PD and how PBM may help mitigate the neurodegenerative process. We also discussed clinical translation aspects of this treatment modality using intracranially implanted NIR delivery devices.

Assessment of a single versus double application of low-level laser therapy in pain reduction following orthodontic elastomeric separation: A randomized controlled trial. BACKGROUND: Periodontal ligament (PDL) pain, associated with the insertion of elastomeric separators, is one of the most annoying experiences at the beginning of orthodontic treatment. Low-level laser therapy (LLLT) has recently been suggested as a method of controlling this pain. OBJECTIVES: The aim of this study was to evaluate the effectiveness of LLLT on reducing the pain associated with elastomeric separation and to compare a single dose of LLLT (1 h before the insertion of elastomeric separators) vs 2 doses of LLLT (1 h before and immediately after the insertion). MATERIAL AND METHODS: This randomized controlled trial was conducted at the Department of Orthodontics, Faculty of Dentistry of University of Damascus and at the Department of Orthodontics of Adib-Allaham Center in Damascus, Syria. The sample population was comprised of 36 patients, aged between 12 and 25 years (mean age: 17 Â±3.7 years), and the patients were randomly divided into 2 groups. A split-mouth design was employed. One group received 1 dose of laser therapy 1 h before the insertion of elastomeric separators, whereas the other one received 2 doses of laser therapy - 1 h before and immediately after the insertion of elastomeric separators. A GaAlAs laser with a wavelength of 830 nm and a power of 100 mW was used. The pain levels were recorded using the Visual Analog Scale (VAS) after 1, 6, 24, 48, and 96 h. Student's t-test and the repeated measures analysis of variance (ANOVA) were employed to detect significant differences. RESULTS: Low-level laser therapy significantly reduced post-separation pain when the experimental side was compared to the placebo side in the single-irradiation group ($p < 0.05$). Low-level laser therapy significantly reduced separation pain with no statistical difference between single and double irradiation protocols ($p > 0.05$). CONCLUSIONS: Low-level laser therapy had a positive effect on reducing the pain associated with elastomeric separation, whether it was applied as a single dose before elastomeric separation or as a double dose before and after this procedure. Adolescent;Adult;Child;Humans;Low-Level Light Therapy;Mouth;Pain;Pain Measurement;Syria;Young Adult

Nutritional Ketosis and photobiomodulation remediate mitochondria warding off Alzheimer's disease in a diabetic, ApoE4+ patient with mild cognitive impairment: A case report. Alzheimer's Disease (AD) is a neurodegenerative progressive disorder for which there is currently no cure. Recent research demonstrates a robust correlation between type-2 diabetes mellitus (T2DM) and the development of MCI and AD, now referred to as type-3 diabetes. Both AD and T2DM, as metabolic pathologies, can be traced to the level of mitochondrial function. The metabolic hypothesis suggests that the cause of AD might be rooted in mitochondrial dysfunction accompanied by fuel shortage in

the brain. Although glucose is known to be the deferred source of fuel for cells, ketone bodies have been observed to provide metabolically compromised brain cells with an alternative fuel source, bypassing deficiencies in GLUT transport due to increased insulin resistance. By keeping glucose and insulin levels low to allow for the production of ketones, there is evidence that mitochondrial function will be restored and cognition/memory improved. Further, visible red or near-infrared (NIR) light has been shown to heal and stimulate damaged tissue by interacting with the mitochondria to restore function. This case study evaluates the effects of a 10-week clinically prescribed ketogenic nutrition protocol combined with transcranial photobiomodulation (PBM) with a 59-year-old male, heterozygous ApoE4 carrier, with a dual diagnosis of mild AD and an 11 year history of insulin dependent type 2 diabetes (T2DM). Statistically significant results reflect an 83% reduction in HOMA-IR; 64% decrease in the triglyceride/HDL ratio; HgA1c reduction from 9.44% to 6.4%; 57% decrease in VLDL and triglycerides; and normalized cognition as measured via the MoCA (Montreal Cognitive Assessment), 26/30 post intervention. Apolipoprotein E4;Blood Glucose;Glycated Hemoglobin A;Lipids Alzheimer Disease;Apolipoprotein E4;Blood Glucose;Cognitive Dysfunction;Diabetes Mellitus, Type 2;Diet, Ketogenic;Glycated Hemoglobin;Humans;Ketosis;Lipids;Low-Level Light Therapy;Male;Mental Status and Dementia Tests;Middle Aged

Photobiomodulation alters the viability of HUVECs cells. The aim of the present study was to investigate the influence of low-level red (660Â nm) and infrared (780Â nm) laser with four different radiance exposures on human umbilical vein endothelial cells (HUVECs) in vitro. HUVECs (1.5â€‰Ã—â€‰10(4)) were incubated in 96-well culture plates. The cells were maintained in M199 medium supplemented with 20% fetal bovine serum, 1% antibiotic (penicillin), 1% anti-mycotic (Fungizone), and 1% endothelial cell growth supplement. After centrifugation, irradiations (660/780Â nm, 40Â mW, 1, 5, 10, and 20Â J/cm(2), 1Â s, 5Â s, 10Â s, and 20Â s, respectively, total energy 0.4Â J, 2Â J, 4Â J, and 8Â J, and beam spot size at target 0.04Â cm(2)) were performed at the bottom of Falcon tubes such that the laser beam directly reached the cell without passing through the culture medium. The cells were divided into groups based on radiant exposures. Cell viability and protein concentration were verified after 1, 2, 3, 6, 8, and 10Â days. Red laser increased the cell viability and protein concentration in all groups (three-way ANOVA, pâ€‰<â€‰0.05) beginning on the second day. The greatest peak compared with the control was found when the radiant exposure was 5Â J/cm(2) and 10Â J/cm(2). Infrared laser inhibited cell viability and modulated the protein concentration in the cells, with the highest peak protein concentration found on the second day in the group with radiant exposure of 1Â J/cm(2) and 10Â J/cm(2) (three-way ANOVA, pâ€‰<â€‰0.05). Red laser increased the viability and concentration of total proteins in HUVECs, whereas infrared laser had an inhibitory effect on cell viability, while maintaining the total protein concentration similar to that found in the control group. Culture Media Cell Cycle;Cell Proliferation;Cell Survival;Cells, Cultured;Culture Media;Human Umbilical Vein Endothelial Cells;Humans;Lasers;Low-Level Light Therapy

Marine collagen scaffolds and photobiomodulation on bone healing process in a model of calvaria defects. INTRODUCTION: Collagen from marine esponges has been used as a promising material for tissue engineering proposals. Similarly, photobiomodulation (PBM) is able of modulating inflammatory processes after an injury, accelerating soft and hard tissue healing and stimulating neoangiogenesis. However, the effects of the associated treatments on bone tissue healing have not been studied yet. In this context, the present study aimed to evaluate the biological temporal modifications (using two experimental periods) of marine sponge collagen or sponging (SPG) based scaffold and PBM on newly formed bone using a calvaria bone defect model. MATERIAL AND METHODS: Wistar rats were distributed into two groups: SPG or SPG/PBM and euthanized into two different experimental periods (15 and 45 days post-surgery). A cranial critical bone defect was used

to evaluate the effects of the treatments. Histology, histomorfometry and immunohistological analysis were performed. RESULTS: Histological findings demonstrated that SPG/PBM-treated animals, 45 days post-surgery, demonstrated a higher amount of connective and newly formed bone tissue at the region of the defect compared to CG. Notwithstanding, no difference among groups were observed in the histomorphometry. Interestingly, for both anti-transforming growth factor-beta (TGF-Î²) and anti-vascular endothelial growth factor (VEGF) immunostaining, higher values for SPG/PBM, at 45 days post-surgery could be observed. CONCLUSION: It can be concluded that the associated treatment can be considered as a promising therapeutical intervention. Transforming Growth Factor beta;Vascular Endothelial Growth Factor A;Collagen Animals;Aquatic Organisms;Collagen;Disease Models, Animal;Low-Level Light Therapy;Male;Rats, Wistar;Skull;Tissue Scaffolds;Transforming Growth Factor beta;Vascular Endothelial Growth Factor A;Wound Healing

Comparison between Antimicrobial Photodynamic Therapy and Low-level laser therapy on non-surgical periodontal treatment: A Clinical Study. BACKGROUND: Alternative antibacterial therapeutic modalities, such as antimicrobial photodynamic therapy (aPDT) and low-level laser therapy (LLLT), have been proposed to improve the effectiveness of periodontal treatment. However, clinical studies evaluating the efficiency of these treatments have been inconclusive, partly due to contradictory results regarding their clinical and microbiological effects. The aim of this study was to evaluate the clinical effects of aPDT and LLLT after a one-stage full-mouth disinfection (OSFMD) protocol during periodontitis treatment. METHODS: A split-mouth clinical trial was conducted in 20 patients presenting at least two contralateral teeth with a probing pocket depth (PD) â‰¥â€¯5â€¯mm and bleeding on probing (BOP) on both sides of the mouth. All patients were submitted to an OSFMD protocol. The selected sites randomly received either (1) aPDT (methylene blue as a photosensitizer activated by red and infrared diode laser) or (2) LLLT (red and infrared diode laser). Clinical parameters were assessed at baseline and at 4 and 12 weeks post-treatment. RESULTS: Both treatment protocols promoted significant reductions in PD, number of deep pockets and BOP and an increase in clinical attachment level (CAL) after 4 and 12 weeks, but there were no differences between the two groups. There was no change in the gingival level (GL) of either group for all periods of analysis. A decrease in the number of moderate pockets (4-5â€¯mm) was found in the LLLT group (5.15â€¯Â±â€¯4.20) when compared to the aPDT group (7.10â€¯Â±â€¯5.24), but only after 4 weeks. CONCLUSIONS: In conclusion, both the aPDT and LLLT therapies promoted improvements in periodontal clinical parameters after the OSFMD protocol; however, in general, there were no distinct differences between the two treatment modalities evaluated in this study. Anti-Bacterial Agents;Anti-Infective Agents;Photosensitizing Agents Anti-Bacterial Agents;Anti-Infective Agents;Chronic Periodontitis;Dental Scaling;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Root Planing

Antimicrobial Photodynamic Therapy Used as First Choice to Treat Herpes Zoster Virus Infection in Younger Patient: A Case Report. Background: Herpes zoster virus infection is commonly described as reactivation of the varicella zoster virus (VZV), which involves the trigeminal nerve branches and ganglia in the maxillofacial region. The ophthalmic branch is the most involved, whereas the maxillary (V2) and mandibular (V3) dermatomes are less commonly affected. Objective: This report describes the positive clinical results of photodynamaic therapy (PDT), used as first choice treatment modality, in a younger female patient who showed a diagnosis of recurrent infection of VZV in the right cheek after five applications and without having undergone medical approach. Methods: PDT has been used to treat several infectious processes and pre-oncological intraoral and extra-oral lesions. Our first-choice treatment protocol, taking into account her medical record, was PDT until we obtained completely regression and recovery. Results: On the third and fourth days after light irradiation, the energy was reduced to 4 J. At fifth day of light irradiation, complete recovery was

clinically observed. Conclusions: The treatment with low-intensity laser, for both aPDT and light irradiation, was effective and safe, resulting in decontamination and healing of the area of the affected lesion, and improvement in the signs and symptoms of herpes zoster virus. Anti-Infective Agents Adult;Anti-Infective Agents;Female;Herpes Zoster;Humans;Low-Level Light Therapy;Photochemotherapy

Is Photobiomodulation Therapy Cost Effective? Cost-Benefit Analysis;Humans;Low-Level Light Therapy

Photobiomodulation with 810â€‰nm Wavelengths Improves Human Sperms' Motility and Viability In Vitro. Background: Enhanced sperm motility is necessary for the successful journey of sperm inside the female genital tract, successful fertilization, and the increased chance of pregnancy. Objective: We investigated the impact of red and near-infrared (NIR) ranges of photobiomodulation (PBM) alone and together on fresh human sperm to validate an optimized PBM protocol that would maximize sperm motility and viability in vitro. Methods: We randomly divided 30 normal human semen samples into 3 different PBM protocols (red, NIR, and red+NIR lasers). Each sample was divided into four subparts, one control group sample and three experimental group samples. Each experimental group received one of the PBM protocols (red, NIR, or red+NIR). Each protocol was adjusted to three energy densities (0.6, 1.2, and 2.4â€‰J/cm(2)). After exposure to the selected protocol, we determined the percentage of either viable or progressive sperm motility (PSM) and measured the DNA Fragmentation Index (DFI). Results: The NIR and red+NIR lasers at 2.4â€‰J/cm(2) energy density significantly increased PSM after 60â€‰min compared with the control groups [least significant difference (LSD) test, pâ€‰=â€‰0.023 and pâ€‰=â€‰0.04, respectively]. Samples treated with the red laser at 0.6â€‰J/cm(2) had significantly decreased viability compared with the control group (LSD test, pâ€‰=â€‰0.003). Samples treated with the red+NIR lasers had significantly decreased viability at 0.6â€‰J/cm(2) (pâ€‰=â€‰0.003), 1.2â€‰J/cm(2) (pâ€‰=â€‰0.001), and 2.4â€‰J/cm(2) (pâ€‰=â€‰0.04) energy densities when compared with the control groups. The NIR laser resulted in no significant difference in sperm viability between the control and experimental groups. At 120â€‰min after exposure, treatment with the red+NIR and red lasers at 2.4â€‰J/cm(2) density significantly increased DFI compared to the control groups (LSD test, pâ€‰=â€‰0.000, pâ€‰=â€‰0.007). Conclusions: In this study, sperm motility, viability, and DFI data confirmed the superiority of the NIR laser at 0.6â€‰J/cm(2) energy density compared with the red and red+NIR PBM protocols. Adult;Cell Culture Techniques;Cell Survival;DNA Fragmentation;Humans;Iran;Low-Level Light Therapy;Male;Sperm Motility;Spermatozoa

Retrospective Observational Study and Analysis of Two Different Photobiomodulation Therapy Protocols Combined with Rehabilitation Therapy as Therapeutic Interventions for Canine Degenerative Myelopathy. Objective: The objective of this retrospective review was to examine the impact that adding photobiomodulation therapy (PBMt) to rehabilitation therapy had on the pathology of degenerative myelopathy (DM) in canine patients. Background: Canine DM is a progressive, fatal neurodegenerative disease for which there exists a dearth of effective treatments, limiting clinicians to pursue symptom palliation. Methods: Clinical records of dogs referred for presumed DM to a specialty rehabilitation facility were screened for patients meeting study criteria. Qualifying patients were divided into two groups: Protocol A (PTCL-A) and Protocol B (PTCL-B) group, based on the PBMt protocol used. Data related to demographics, diagnostics, rehabilitation protocols, and progression of clinical signs were collected. Data were analyzed to determine differences in outcomes between the two treated groups and historical data expectations, as given by a previously published study. Results: The times between symptom onset and euthanasia of dogs in the PTCL-B group: 38.2â€‰Â±â€‰14.67 months (meanâ€‰Â±â€‰SD), were significantly longer than those of dogs in the PTCL-A group: 11.09â€‰Â±â€‰2.68 months. Similarly, the times between

symptom onset and nonambulatory paresis (NAP) or paralysis of dogs in the PTCL-B group: 31.76â€‰Â±â€‰12.53 months, were significantly longer than those of dogs in the PTCL-A group: 8.79â€‰Â±â€‰1.60 months. Further, Kaplan-Meier survival analysis showed that the times from symptom onset to NAP of dogs in the PTCL-B group were significantly longer than those of dogs in the PTCL-A group (Mantel-Cox Log Rank statisticâ€‰=â€‰20.434, pâ€‰<â€‰0.05) or the historical data group (Mantel-Cox Log Rank statisticâ€‰=â€‰16.334, pâ€‰<â€‰0.05). Conclusions: The data reviewed show significantly slower disease progression-longer survival times-for patients in the PTCL-B group than those in the PTCL-A group or published historical data. Further studies are warranted.
Animals;Clinical Protocols;Combined Modality Therapy;Dog Diseases;Dogs;Female;Male;Neurodegenerative Diseases;Retrospective Studies

Photobiomodulation After Neurotization (Oberlin Procedure) in Brachial Plexus Injury: A Randomized Control Trial. Objective: To investigate effect of photobiomodulation (PBM) on nerve regeneration after neurotization with the Oberlin Procedure (ulnar fascicle to motor branch to biceps) to restore elbow flexion in patients with brachial plexus injury. Materials and methods: This prospective randomized controlled trial was conducted with 14 patients with high brachial plexus injury who underwent neurotization with the Oberlin Procedure to restore elbow flexion. The patients were randomly allocated to two groups of equal numbers: control group and PBM group. In this study, the PBM used has a wavelength of 808â€‰nm, 50â€‰mW power, continuous mode emission, 4â€‰J/cm(2) dosimetry, administered daily for 10 consecutive days, with an interval of 2 days (weekends). The outcome of surgery was assessed after 1, 2, 3, and 6 months. The nonparametric Mann-Whitney U-test and chi-square test were utilized to compare the results between both groups. Results: After 3 months postoperatively, more patients in the PBM group had demonstrated signs of reinnervation and the mean muscle power was significantly higher in the PBM group. No adverse effects resulted from the administration of PBM. Conclusions: PBM is a treatment modality that can improve nerve regeneration after neurotization with the Oberlin Procedure.
Adult;Brachial Plexus;Brachial Plexus Neuropathies;Elbow Joint;Female;Humans;Low-Level Light Therapy;Malaysia;Male;Muscle Strength;Nerve Regeneration;Nerve Transfer;Prospective Studies;Range of Motion, Articular;Treatment Outcome;Young Adult

Can photobiomodulation therapy (PBMT) control blood glucose levels and alter muscle glycogen synthesis? Photobiomodulation therapy (PBMT) has many effects on the energy metabolism of musculoskeletal tissue, such as increased glycogen and adenosine triphosphate synthesis. In addition, these effects may be due to a systemic blood glucose control. Twenty-four Wistar rats were randomly and equally allocated into four groups: sham, PBMT 10Â J/cm(2), PBMT 30Â J/cm(2) and PBMT 60Â J/cm(2). The animals were fasting for 6Â h for blood glucose evaluations during pre-irradiation period, 1Â h, 3Â h and 6Â h after PBMT. Muscle glycogen synthesis was measured 24Â h after PBMT. This PBMT used a cluster of 69 LEDs (light-emitting diodes) with 35 red (630Â Â±Â 10Â nm) and 34 infrared (850Â Â±Â 20Â nm); 114Â mW/cm(2) for 90s (10Â J/cm(2)), 270Â s (30Â J/cm(2)), 540Â s (60Â J/cm(2)) applied on large muscle areas (back and hind legs) of the animals. The 10Â J/cm(2) group showed lower blood glucose levels and glucose variability over 6Â h (5.92Â mg/dL) compared to the sham (13.03Â mg/dL), 30Â J/cm(2) (7.77Â mg/dL) and 60Â J/cm(2) (9.07Â mg/dL) groups. The PBMT groups had the greatest increase in muscle glycogen (10Â J/cm(2)Â >Â 60Â J/cm(2)Â >Â 30Â J/cm(2)Â >Â sham), characterizing a triphasic dose-response of PBMT. There was a strong negative correlation between blood glucose variability over 6Â h and muscle glycogen concentration for 10Â J/cm(2) group (rÂ =Â -0.94; pÂ <Â .001) followed by 30Â J/cm(2) group (rÂ =Â -0.84; pÂ <Â .001) and 60Â J/cm(2) group(rÂ =Â -0.73; pÂ <Â .006). These results suggest that PBMT can play a very important role in the control of blood glucose levels, and its possible mechanism of action is the induction of greater muscle glycogen synthesis independently of

physical exercise. Blood Glucose;Glycogen Animals;Blood Glucose;Cell Survival;Diabetes Mellitus;Dose-Response Relationship, Radiation;Glycogen;Humans;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;Muscles;Rats, Wistar

A Comprehensive Analysis of Near-Contact Photobiomodulation Therapy in the Host-Bacteria Interaction Model Using 3D-Printed Modular LED Platform. One well-studied bacterial factor recognized by the host immune system is lipopolysaccharides (LPS) that stimulate host cells, resulting in cell inflammation. Although photobiomodulation (PBM) therapy demonstrates its potency on anti-inflammatory activity, the complete mechanism of action in the host-bacteria interaction model is still elusive. In addition, many studies were performed regarding a distance between the light source and biological sample (non-contact therapy) that may result in disparate reports on the efficacy of PBM therapy. Thus, it is critical to clearly understand the effect of this approach to maximize efficacy and minimize side effects. Here, a custom-built light-emitting diode (LED) platform that mimics near-contact therapy is developed. The effect and mechanism of PBM therapy on epithelial cells in response to LPS is systematically investigated under various conditions (wavelength, irradiation-time, pulse-frequency). The data show that the irradiation of near-infrared (NIR-LED) significantly improves the viability of inflamed cells. It reveals that NIR-LED inhibits the production of reactive oxygen species by regulating the Nox4-NF-ÎºB pathway. Interestingly, however, high-pulse frequency stimulus causes the collapse of the mitochondrial membrane potential (Î”Î¨m) of cells, resulting in cell death. These results suggest that the optimized "PBM condition" is critical to assist the healthy immune system of the host against bacterial invasion. Lipopolysaccharides;Reactive Oxygen Species A549 Cells;Cell Death;Equipment Design;Host-Pathogen Interactions;Humans;Inflammation;Infrared Rays;Lipopolysaccharides;Low-Level Light Therapy;Models, Biological;Printing, Three-Dimensional;Reactive Oxygen Species

Is low level laser therapy or ozone therapy more effective for bone healing? Understanding the mechanisms of HIF-1Î±, RANKL and OPG. Periodontitis is a common chronic infection of dental tissues. Ozone therapy (OT) and low level laser therapy (LLLT) are useful treatments for periodontitis. We investigated the effects of OT and LLLT on periodontal disease-induced bone destruction in rats with experimentally induced periodontitis (EP). We used 30 male Wistar rats divided into three groups: control, OT and LLLT. EP was induced by placing a 3.0 silk suture around the cervix of the left mandibular first molar tooth. OT was performed using an ozone generator at 80% concentration. LLLT was applied using a diode laser. Both OT and LLLT were performed for two weeks at two day intervals. Histomorphometric and immunohistochemical analyses also were performed. Alveolar bone loss was significantly less in the LLLT group compared to the control group. The number of HIF-1Î± positive cells was significantly less in the LLLT group compared to the control group. We found significantly fewer RANKL-positive cells in the OT group compared to the control group. The number of osteoprotegerin (OPG) positive cells was significantly greater for the LLLT group than for the control group. Although both treatments produced positive effects, LLLT appears to be more effective for increasing alveolar bone formation. Oxidants, Photochemical;Ozone Alveolar Bone Loss;Animals;Low-Level Light Therapy;Male;Oxidants, Photochemical;Ozone;Periodontitis;Rats;Rats, Wistar

Effect of infrared and red monochromatic light on equine wound healing. BACKGROUND: Light-emitting diodes (LEDs) are commonly used for treating a variety of disorders in horses, including wounds. Despite its claim to shorten healing times, there is a lack of scientific documentation regarding its effects. OBJECTIVES: To investigate if treatment with pulsating visible red light (Î»Â â‰ˆÂ 637Â nm) and near-infrared (NIR) light (Î»Â â‰ˆÂ 956Â nm) affects wound healing. STUDY DESIGN: Randomised blinded controlled experimental study. METHODS: A circular skin wound (Ã˜Â =Â 2Â cm) was created on each side of the neck in eight healthy horses. One randomly chosen

wound received light treatment and the other served as an untreated control. Treatment duration was 4Â minutes and 40Â seconds (red light 95Â seconds, 2.3Â mW/cm(2) ; NIR light 185Â seconds, 6.4Â mW/cm(2)) and was performed once daily on day 0-4, 7-11, 14-18 and 21-25. The wounds were photographed and evaluated using digital photoplanimetry on day 0, 1, 2, 3, 4, 7, 14, 21, 28 and 35. The degree of swelling was assessed with diagnostic ultrasound on the same days except the last recording was performed on day 36 instead of 35. Days to total healing was recorded. ANOVA was used for statistical analysis (PÂ <Â .05). RESULTS: The wound area (PÂ =Â .2-.9) and degree of swelling (PÂ =Â .2-1.0) did not differ between treated and control groups on any day. There was a significant difference (PÂ =Â .03) in healing time between control (49.0, 95% CIÂ =Â 35.4-62.6Â days) and treated wounds (51.8, 95% CIÂ =Â 38.7-64.8Â days). MAIN LIMITATIONS: The wounds were treated until day 25 and this study does not investigate the effect of a longer treatment period than 25Â days. CONCLUSIONS: The results of this study do not indicate any clinically relevant positive effect of pulsating visible red light and NIR light on the healing of experimental skin wounds in horses, compared with no treatment. Animals;Horses;Light;Phototherapy;Skin;Wound Healing

Combined effects of calcium hydroxide and photobiomodulation therapy on apexogenesis of immature permanent teeth in dogs. Treatment of high-risk traumatic immature teeth due to incomplete root development is challenging. Apexogenesis is currently the ideal treatment option that allows normal root development. The purpose of this study was to evaluate the apexogenesis process of immature permanent teeth of dogs when co-administered with calcium hydroxide and photobiomodulation therapy (PBMT). A total of 36 immature permanent anterior and premolar teeth were selected from three 4-6-month-old dogs of Iranian mixed generation. The teeth were categorized into two groups, calcium hydroxide with laser irradiation (CHL) and calcium hydroxide without laser irradiation (CH). All the selected teeth received calcium hydroxide pulpotomy. After restoring teeth with amalgam, the CHL group received galliumâ€‘aluminum-arsenide (GaAlAs) diode laser (810Â nm, 4.2Â J/cm(2), 0.3Â W, 9Â s,CW) on apical one-third of both buccal and lingual roots. The irradiation was repeated every 48Â h for fourteen days. Intravenous tetracycline was used to observe newly formed dentin in the first, third, seventh, and fourteenth days. The distance between tetracycline lines (DTL) was examined by Fluorescence microscopy. Generalized estimating equations (GEE) were used for data analysis. In all assessments, the mean DTL were greater in the CHL group. However, the two groups had no significant differences in the amount of deposited dentin between the first and third, third and seventh, and first and seventh lines. Meanwhile, there was a significant difference between the two groups in terms of the distances between lines 7 and 14, 1 and 14 and also 3 to 14 (PÂ <Â .001). In other words, from the 7th day onwards, there was a significant difference between the two groups. Within the limitation of this study, the combination therapy of PBMT and pulpotomy with calcium hydroxide accelerated apexogenesis in immature permanent dogs' teeth. Root Canal Filling Materials;Tetracycline;Calcium Hydroxide Animals;Apexification;Calcium Hydroxide;Dentin;Dogs;Lasers, Semiconductor;Low-Level Light Therapy;Occupational Exposure;Pulpotomy;Risk Assessment;Root Canal Filling Materials;Tetracycline;Time Factors;Tooth Root

Ophthalmoplegia with skin necrosis after a hyaluronic acid filler injection. Hyaluronic acid filler injection is commonly used for aesthetic purposes. However, many clinicians neglect the possibility of developing vascular occlusion and its devastating sequelae. Besides visual loss after iatrogenic ophthalmic artery occlusion, ophthalmoplegia without blindness is rare but may occur. Here, we report a 23-year-old woman with ptosis, lateral deviation of the right eye, and skin necrosis after hyaluronic acid filler injection. After hyaluronidase injection and steroid pulse therapy, ptosis and eye movement were completely restored. Skin necrosis was treated with a human epithelial growth factor ointment, followed by Nd:YAG laser. Complete healing with minimal scar was achieved.

Dermal Fillers;Hyaluronic Acid Cosmetic Techniques;Dermal Fillers;Diffusion Magnetic Resonance Imaging;Face;Female;Humans;Hyaluronic Acid;Lasers, Solid-State;Low-Level Light Therapy;Necrosis;Oculomotor Muscles;Ophthalmoplegia;Skin;Treatment Outcome;Young Adult

Efficacy of Postbiotics in a PRP-Like Cosmetic Product for the Treatment of Alopecia Area Celsi: A Randomized Double-Blinded Parallel-Group Study. INTRODUCTION: Alopecia areata (AA), also known as 'area Celsi', is the second most common form of hair loss affecting the scalp. Newly proposed treatments for AA include low-level light therapy, biologics such as Janus kinase inhibitors and autologous platelet-rich plasma (PRP), which is a well-known "elixir" for hair growth. Bioactive peptides developed through biotechnological applications have been used to overcome the limitations of PRP. More recently, the involvement of microbiota in hair growth disorders, in AA in particular, has been reported, and the usefulness of microbial metabolites, i.e. postbiotics, has been suggested. METHODS: This study was a randomized double-blinded parallel-group study in which 160 persons of both sexes affected by AA and aged between 18 and 60Â years were enrolled. The subjects were randomly assigned to a treatment group (group 1), receiving the TR-PRP plus-Celsi cosmetic product, and a placebo group (group 2). The SALT (Severity of Alopecia Tool) score was determined in both groups at baseline and after 2 and 3Â months of treatment, and the results compared between groups. RESULTS: The subjects in group 1 showed a significant change from baseline in SALT score at 2Â months of treatment (61.04%â€‰Â±â€‰3.45%; pâ€‰<â€‰0.0001), with a further improvement at the end of treatment (3 months) (69.56%â€‰Â±â€‰4.32%; pâ€‰<â€‰0.0001). No significant changes from baseline were reported for the subjects in group 2 (T1: 26.45%â€‰Â±â€‰3.64%; T3: 27.63%â€‰Â±â€‰7.61%). CONCLUSIONS: The results of this study provide further proof of the efficacy of bioactive peptides that mimick the growth factors present in PRP in subjects affected by AA. They also add to our knowledge of the link between microbiota and hair growth disorders, emphasizing the importance of studies on the microbial community and microbial metabolites as a novel therapeutic approach.

585 nm light-emitting diodes inhibit melanogenesis through upregulating H19/miR-675 axis in LEDs-irradiated keratinocytes by paracrine effect. BACKGROUND: 585 nm light-emitting diodes have been proven to suppress melanogenesis in melanocytes. However, whether LEDs will influence normal human epidermal keratinocytes (NHEKs) and paracrine effect of LEDs-irradiated NHEKs in melanogenesis remains unknown. OBJECTIVE: To elucidate the possible mechanisms in vitro of anti-melanogenic activity of 585 nm LEDs on paracrine effect of NHEKs and its exosomes. METHODS: NHEKs irradiated with different fluences of 585 nm LEDs were evaluated the cell viability by CCK8 assay. Irradiated medium of NHEKs was co-cultured with melanocytes. Melanin content, tyrosinase activity and melanogenic enzymes activities were detected. Exosomes from NHEKs medium were isolated and characterized by electron microscopy and nanoparticle tracking analysis. The expression changes of H19 and its encoded exosomal miR-675 were analyzed. RESULTS: Irradiation with 585 nm LEDs from 0 J/cm(2) to 20 J/cm(2) had no cytotoxic effect on NHEKs. After co-cultured with irradiated medium of NHEKs, melanin content and tyrosinase activity were reduced and the melanogenic activities were downregulated on both mRNA and protein levels of microphthalmia-associated transcription factor (MITF), tyrosinase (TYR) and tyrosinase-related protein 1 (TRP-1). H19 and its derived exosomal miR-675 from NHEKs, which has been proven relevant to melanogenesis, were significantly upregulated after irradiation. Furthermore, H19 knockdown and miR-675 inhibition in NHEKs could attenuate the inhibition effect of 585 nm LEDs on melanogenesis. CONCLUSIONS: This study demonstrated that 585 nm LEDs could inhibit melanogenesis via the up-regulation of H19 and its derived exosomal miR-675 from NHEKs, which was considered as a novel paracrine factor in regulating melanogenesis. H19 long non-coding RNA;MIRN675 microRNA, human;MITF protein, human;Melanins;Membrane Glycoproteins;MicroRNAs;Microphthalmia-Associated Transcription

Factor;RNA, Long Noncoding;Oxidoreductases;TYRP1 protein, human;Monophenol Monooxygenase Cells, Cultured;Coculture Techniques;Exosomes;Gene Knockdown Techniques;Humans;Hyperpigmentation;Keratinocytes;Low-Level Light Therapy;Melanins;Melanocytes;Membrane Glycoproteins;MicroRNAs;Microphthalmia-Associated Transcription Factor;Monophenol Monooxygenase;Oxidoreductases;Paracrine Communication;Primary Cell Culture;RNA, Long Noncoding;Semiconductors;Up-Regulation

Sialolithiasis: Application parameters for an optimal laser therapy. In-vitro experimental parametric studies of laser ablation using natural sialoliths and artificial stones have been performed toward an efficient laser treatment of sialolithiasis. Surface microstructure and water adsorption become critical for coupling high power pulsed Ho:YAG laser radiation (Î» = 2080â€‰nm, Ï„ âˆ¼250â€‰Îœsec), inducing ablative interactions and stone fragmentation. Results reveal a generic trend, with single pulse laser energy density threshold for sialolith ablative erosion at âˆ¼200â€‰Jâ€‰cm(-2) (corresponding to intensity âˆ¼800â€‰kWâ€‰cm(-2)) and fragmentation rates reaching âˆ¼1â€‰mm/pulse at âˆ¼2400â€‰Jâ€‰cm(-2) . This process shows no saturation, suggesting that very high energy density irradiation at low pulse repetition rate is an efficient approach. Such operation facilitates rapid cooling and minimal thermal loading of the oral and maxillofacial area, thus causing negligible adverse effects. The method is expected to contribute to the establishment of an easy and optimal therapeutic protocol for sialolithiasis pathology. Humans;Laser Therapy;Lasers, Solid-State;Lithotripsy, Laser;Low-Level Light Therapy;Salivary Gland Calculi

[Effect of single low level laser therapy on initial pain during fixed orthodontic treatment]. PURPOSE: To investigate the effect of single low level laser therapy on initial pain during fixed orthodontic treatment. METHODS: Sixty patients who underwent fixed orthodontic treatment in our hospital from January 2015 to December 2017 were enrolled.Patients were divided into 2 groups by random number table method, 30 in each group. Patients in the experimental group were treated with a single low level laser therapy ,while patients in the control group were treated with a placebo.The results of the 2 groups were compared in regard to spontaneous pain and chewing pain during the day and night using SPSS 22.0 software package. RESULTS: Spontaneous pain during day and night with 0.012, 0.014 inch superelastic nickel-titanium (NiTi) line was significantly lower in the experimental group than in the control group($P<0.05$), and there was no significant difference with 0.016 and 0.018 inch NiTi ($P>0.05$).Chewing pain with 0.012, 0.014, 0.016, and 0.018 inch NiTi lines in the experimental group was significantly lower than that in the control group($P<0.05$). CONCLUSIONS: Single low level laser therapy significantly reduced postoperative pain while placing a superelastic NiTi wire for initial alignment and correction. Dental Alloys;Titanium Dental Alloys;Dental Care;Humans;Low-Level Light Therapy;Orthodontic Wires;Pain Management;Titanium;Tooth Movement Techniques

The Combination of Antimicrobial Photodynamic Therapy and Photobiomodulation Therapy for the Treatment of Palatal Ulcers: A Case Report. Introduction: One of the unexpected side effects of the Haas type palatal expander is ulcers progressing to necrotic lesions in the palatal area due to poor hygiene. The use of antibiotic therapy is mandatory. However, long periods of healing/pain and the need for a systemic host response with the aid of metabolization, especially in children, are issues that should be taken into account in the management of this type of injury. Since phototherapy modalities (antimicrobial photodynamic therapy [aPDT] and photobiomodulation therapy [PBMT]) are able to enhance and accelerate the healing process and reduce the bacterial load, this case report aimed to describe the use of the above-mentioned therapies to treat palatal ulcers occurring during orthodontic expansion. Case Report: The patient, a 10-year-old boy, with a chief complaint of bleeding and continuous pain in the region of his expander was verified on a follow-up visit. After a

dental examination, the expander was removed and two necrotic lesions which were in contact with the acrylic part of the tooth-tissue expander were found in the palatal region. The proposal was to use one aPDT session with methylene blue followed by 4 sessions of PBMT with a red laser diode. On the 5th day, reorganized tissue was verified, with the absence of bleeding, swelling, and pain. On the 20th day of follow-up, the area showed no signs of inflammation, healthy tissue without any pathological clinical symptoms, and complete wound healing. Conclusion: The concomitant use of PBMT and aPDT therapies may be considered feasible as an adjunct treatment to manage palatal ulcers resulting from the incorrect use of tooth-tissue types of expanders.

The Effect of Low-Power Laser Therapy on the TGF/Î² Signaling Pathway in Chronic Kidney Disease: A Review. Objective: The purpose of this study is to investigate the effects of low-power lasers on kidney disease by investigating several studies. Methods: A number of articles from 1998 to 2019 were chosen from the sources of PubMed, Scopus, and only the articles studying the effect of low-power lasers on kidney disease were investigated. Results: After reviewing the literature, 21 articles examining only the effects of low-power lasers on kidney disease were found. The results of these studies showed that the parameter of the lowpower laser would result in different outcomes. So, a low-power laser with various parameters can be effective in the treatment of kidney diseases such as acute kidney disease, diabetes, glomerulonephritis, nephrectomy, metabolic syndrome, and kidney fibrosis. Most studies have shown that low-power lasers can affect TGFÎ²1 signaling which is the most important signaling in the treatment of renal fibrosis. Conclusion: Lasers can be effective in reducing or enhancing inflammatory responses, reducing fibrosis factors, and decreasing reactive oxygen species (ROS) levels in kidney disease and glomerular cell proliferation.

Assessment of Laser Effects on Skin Rejuvenation. Laser skin resurfacing has changed the approach of facial skin rejuvenation over the past decade. This article evaluates the laser effects on skin rejuvenation by the assessment of laser characteristics and histological and molecular changes, accompanied by the expression of proteins during and after laser-assisted rejuvenation of skin. It is important to note that different layers of skin with different cells are normally exposed to the sun's UV radiation which is the most likely factor in aging and damaging healthy skin. To identify the expression of proteins, using validated databases and reviewing existing data could reveal altered proteins which could be analyzed and mapped to investigate their expression and their different effects on cell biological responses. In this regard, proteomics data can be used for better investigation of the changes in the proteomic profile of the treated skin. Different assessments have revealed the survival and activation of fibroblasts and new keratinocytes with an increase of collagen and elastin fibers in the dermis and the reduction of matrix metalloproteinases (MMPs) and heat shock proteins (HSPs) as a result of different low-power laser therapies of skin. There are a wide range of biological effects associated with laser application in skin rejuvenation; therefore, more safety considerations should be regarded in the application of lasers in skin rejuvenation.

The Effect of Low-Level Laser Therapy on the Acceleration of Orthodontic Tooth Movement. In clinical practice, low-level laser therapy (LLLT) is widely used. The main aim of this review is to assess the effectiveness of LLLT in accelerating tooth movement in human subjects. The PRISMA checklist was utilized as a guideline to carry out this systematic review. The electronic databases were searched from Google Scholar (2014-2018) and PubMed, and comprehensive research on this topic was also manually conducted. Therefore, 77 articles randomized clinical trials (RCTs) or controlled clinical trials (CCTs) were selected. After screening studies, consequently, eleven trials met the inclusion criteria. Eight out of 11 studies showed LLLT has a significant impact on the acceleration of orthodontic tooth movement, and there was no statistically significant difference in the rate of tooth movement between the laser group and the control group in the two remaining studies. Furthermore, five out of 11 articles showed that LLLT has no adverse effects. Although we have some

degree of understanding from a cellular point of view to LLLT effects, we still do not know whether these cellular level changes have any effect on the clinical acceleration of orthodontic tooth movement. The results are inconclusive and cannot be generalized to the public community; therefore, well-structured studies are required.

Low-Level Laser Irradiation Modulated Viability of Normal and Tumor Human Lymphocytes In Vitro. Introduction: Laser radiation is a promising strategy against various malignancies. Recent studies have shown that the application of low-power laser therapy (LPLT) at different doses and exposure times could modulate the growth dynamic of tumor cells. Based on the type of laser, LPLT could potentially trigger cell proliferation, differentiation, and apoptosis in different cell lines. Methods: In this study, MTT assay was used to monitor the effect of low and high laser intensities on the viability of normal and cancer lymphocytes. The protein levels of Ki-67 (a proliferation marker) and Caspase-3 (an apoptosis factor) were measured in human peripheral mononuclear cells (PBMCs) and the B-lymphoblastic cell line (Nalm-6) using flow cytometry after being-exposed to 630-nm LPLT at low (2, 4, 6, and 10 J/cm(2)) and high (15, 30, 60, and 120 J/cm(2)) energy densities in a continuous mode for 48 and 72 hours. Results: By using higher energy densities, 60 and 120 J/cm(2) , a significant decrease was shown in the viability of Nalm-6 cells, which reached 6.6 and 10.1% after 48 hours compared to the control cells ($P<0.05$). Notably, Cell exposure to doses 30, 60, and 120 J/cm(2) yielded 7.5, 12.9, and 21.6 cell viability reduction after 72 hours. The collected data showed that the high-intensity parameters of LPLT (15 to 120 J/cm(2)) promoted significant apoptotic changes in the exposed cells coincided with the activation of Caspase-3 compared to the none-treated control cells ($P<0.05$). The data further showed the stimulation of the Ki-67 factor both in primary PBMCs and the lymphoblastic cell line treated with LPLT at energy densities of 4 and 6 J/cm(2) ($P<0.05$), indicating enhanced cell proliferation. Similar to Nalm-6 cells, primary PBMCs showed apoptosis after 48 hours of being exposed to doses 60, and 120 J/cm(2) , indicated by increased Caspase-3 levels ($P<0.05$). As expected, the Nalm-6 cells were resistant to cytotoxic effects of laser irradiation in the first 48 hours ($P>0.05$) compared to normal PBMCs. The exposure of Nalm-6 cells to low-intensity laser intensities increased a proliferation rate compared to the PBMCs treated with the same doses. Conclusion: We showed the potency of LPLT in the induction of apoptosis and proliferation in human primary PBMCs and Nalm-6 cells in a dose and time-dependent manner after 72 hours.

Evaluation of the Therapeutic Effect of Low Level Laser in Controlling Low Back Pain: A Randomized Controlled Trial. Introduction: Low back pain (LBP) is a very common musculoskeletal disorder. The big burden of disease necessitates investigating a more effective modality of treatments with more persistence and also fewer side effects. Low power laser has been proved as a pain reducing modality, but there is a lack of studies comparing it with other treatments and also among the Iranian race and society. The purpose of this study was to evaluate the effect of low-level laser on patients with LBP. Methods: Our study was a single-blind, randomized controlled trial. Forty subjects, aged between 20 to 70 with LBP participated in the study. Their pain severity scale was 3-10 according to the visual analogue scale of pain (VAS). They were randomly assigned to two groups, a case group (true laser) and a control group (sham laser). Naproxen was prescribed with a free dose (250-1000 mg/ daily) to both groups. We evaluated patients' subjective pain, functional status (using the Roland Morris disability questionnaire), spinal range of motion (ROM) and spinal tenderness at the basic time, one month and 3 months after treatment. The true laser group received 12 sessions of laser (160 mW) and the control group took 12 sessions of sham laser (the same laser instrument in off status). An infrared laser GaAlAs, wavelength 808 nm, power 160 mw and spot size 1 cm2 and power density 0.16 J/cm(2) in continuous mode was used in treatment. We applied the laser to articular spaces of vertebral column, adjacent paravertebral points, pain radiating areas, tender points and also pain-controlling acupuncture points. Results: Of the 40 participants in the study, 6 persons were

excluded and thus the data obtained from 34 participants were statistically analyzed. There was significant improvement in pain (P<0.001 for both groups), functional status (Case group: P <0.001; control group: P=0.004) and spinal ROM (Case group: P <0.001; control group: P =0.007) in both groups at the end of the first month, but these gains persisted for 3 months only in the case group (P <0.001). Regarding spinal tenderness, it was disappeared in 89.47% of the patients in the true laser group at the end of one month but remained unchanged in 73.33% of the subjects of the sham laser group. Conclusion: We concluded that laser therapy (in combination with NSAIDs) is an effective and long-lasting therapeutic strategy in bringing relief from LBP without any significant side effect.

Light Emitting Diode Phototherapy for Skin Aging. Skin aging is associated with changes that include atrophy, pigmentation, decreased ability for wound healing, and rhytides. Recently, there has been growing research interest and consumer demand for minimally invasive cosmetic procedures involving light and energy-based devices, particularly for facial skin rejuvenation. Light emitting diode (LED) phototherapy is a promising treatment modality for photorejuvenation as it is safe, noninvasive, accessible, and can be easily combined with other treatment options. LED irradiation alters intrinsic cellular activity via absorption by chromophores located in the skin and may result in desirable photorejuvenation effects. In this review, we discuss the physiologic process of cutaneous aging, how visible light phototherapy with LEDs may be used to treat aging skin, and the importance of photoprotection. J Drugs Dermatol. 2020;19(4):359-364. doi:10.36849/JDD.2020.4711. Humans;Lasers, Semiconductor;Phototherapy;Rejuvenation;Skin Aging

Photoaging Reversibility in Asian Patients With Melasma Treated Using Picosecond Lasers With a Diffractive Lens Array: A 1-Year Prospective Observational Cohort Study. BACKGROUND: Picosecond lasers appear to be effective and safe in treating pigmentation and photoaging disorders through laser-induced optical breakdown. OBJECTIVE: To analyze the feasibility of photorejuvenation using picosecond lasers with diffractive lens array (DLA) in patients with melasma. METHODS: Ten Asian (N = 10) women with melasma and Fitzpatrick skin Type IV were enrolled and treated using 755-nm picosecond alexandrite lasers with DLA. All individuals were assessed before treatment, and at 12, 20 weeks, and 1 year by post-hoc test on melasma area and severity index (MASI) and with VISIA Complexion Analysis System using percentile rank for measurement. RESULTS: The median participant age was 46.5 years. The average MASI continually and significantly ($p < .05$) decreased until the 1-year follow-up, with the photoaging characteristics, such as wrinkles and red areas improving simultaneously ($p < .05$). Spots, texture, pores, ultraviolet (UV) spots, brown spots, and porphyrins exhibited alleviation, but this improvement relapsed by the 1-year follow-up. No postinflammatory hyperpigmentation or hypopigmentation occurred. CONCLUSION: In patients with melasma, picosecond laser treatment with DLA may alleviate pigmentation disorder and the related photoaging characteristics (e.g., wrinkled skin and increased vascularity), and the effects may be maintained for a long time. Nevertheless, post-treatment clinical visits every 3 to 6 months are recommended. Asian People;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Prospective Studies;Skin Aging

Blue LED phototherapy in preterm infants: effects on an oxidative marker of DNA damage. BACKGROUND: Phototherapy is used on the majority of preterm infants with unconjugated hyperbilirubinaemia. The use of fluorescent tube phototherapy is known to induce oxidative DNA damage in infants and has largely been replaced by blue light-emitting diode phototherapy (BLP). To date, it is unknown whether BLP also induces oxidative DNA damage in preterm infants. OBJECTIVE: To determine whether BLP in preterm infants induces oxidative DNA damage as indicated by 8-hydroxy-2'deoxyguanosine (8-OHdG). DESIGN: Observational cohort study. METHODS: Urine samples (n=481) were collected in a cohort of 40 preterm infants (24-32 weeks' gestational age) during the first week after birth. Urine was analysed for the oxidative marker of DNA damage 8-OHdG and for

creatinine, and the 8-OHdG/creatinine ratio was calculated. Durations of phototherapy and levels of irradiance were monitored as well as total serum bilirubin concentrations. RESULTS: BLP did not alter urinary 8-OHdG/creatinine ratios (B=0.2, 95% CI -6.2â€‰to 6.6) at either low (10-30 ÂµW/cm(2)/nm) or high (>30 ÂµW/cm(2)/nm) irradiance: (B=2.3, 95% CI -5.7â€‰to 10.2 and B=-3.0, 95% CI -11.7â€‰to 5.6, respectively). Also, the 8-OHdG/creatinine ratios were independent on phototherapy duration (B=-0.1, 95% CI -0.3â€‰to 0.1). CONCLUSIONS: BLP at irradiances up to 35 ÂµW/cm(2)/nm given to preterm infants â‰¤32 weeks' gestation does not affect 8-OHdG, an oxidative marker of DNA damage. Biomarkers;8-Hydroxy-2'-Deoxyguanosine;Creatinine 8-Hydroxy-2'-Deoxyguanosine;Biomarkers;Creatinine;DNA Damage;Gestational Age;Humans;Infant, Extremely Low Birth Weight;Infant, Newborn;Infant, Premature;Infant, Premature, Diseases;Jaundice, Neonatal;Longitudinal Studies;Oxidative Stress;Phototherapy;Prospective Studies

Oncological-Therapy Related Oral Mucositis as an Interdisciplinary Problem-Literature Review. Oral mucositis is a toxic side effect of non-surgical cancer treatments: chemotherapy and radiotherapy, which strongly impair quality of life and can not only cause strong pain, but also lead to problems with basic physiological needs as eating and swallowing. Development of oral mucositis is associated with type, dosage, and schedule of radiation or chemotherapy and other factors related to patients. Management of oral mucositis is a valid problem, requiring topical application of anesthetics, coating agents, cryotherapy, low level laser therapy, pharmacological methods as usage of keratinocyte growth factors, supplementation of vitamins, and a proper diet. Another approach to oral mucositis measurement includesphotobiomodulation, which brings analgesic and anti-inflammatory effects.Although oral mucositis is a general health issues, the role of proper dental care is essential. It should include elimination of all potential sources of mucosal injury and microorganisms inhabiting theoral cavity through oral hygiene education,professional management ofdental plaque,and treatment of the caries and periodontium, which are necessary to reduce the risk of inflammation in the oral cavity. This paper describes the possibilities of monitoring oral mucositis,taking into account the latest therapeutic achievements. Antineoplastic Agents Antineoplastic Agents;Humans;Neoplasms;Quality of Life;Stomatitis

Enhanced Inner-Ear Organoid Formation from Mouse Embryonic Stem Cells by Photobiomodulation. Photobiomodulation (PBM) stimulates different types of stem cells to migrate, proliferate, and differentiate inÂ vitro and inÂ vivo. However, little is known about the effects of PBM on the differentiation of embryonic stem cells (ESCs) toward the otic lineage. Only a few reports have documented the inÂ vitro differentiation of ESCs into inner-ear hair cells (HCs) due to the complexity of HCs compared with other target cell types. In this study, we determined the optimal condition to differentiate the ESCs into the otic organoid using different culture techniques and PBM parameters. The efficiency of organoid formation within the embryoid body (EB) was dependent on the cell density of the hanging drop. PBM, using 630Â nm wavelength light-emitting diodes (LEDs), further improved the differentiation of inner-ear hair cell-like cells coupled with reactive oxygen species (ROS) overexpression. Transcriptome analysis showed the factors that are responsible for the effect of PBM in the formation of otic organoids, notably, the downregulation of neural development-associated genes and the hairy and enhancer of split 5 (Hes5) gene, which inhibits the differentiation of prosensory cells to hair cells. These data enrich the current differentiation protocols for generating inner-ear hair cells.

Treatment of Male-Pattern Alopecia with Platelet-Rich Plasma. BACKGROUND: Androgenetic alopecia (AGA) affects up to 80% of men and 50% of women throughout their lifetime, causing significant discomfort. Minoxidil, finasteride, and low-level laser light therapy are the only Food and Drug Administration-approved treatments for AGA, and they have shown positive results in randomized controlled trials and meta-analyses. However, their efficacy is limited, and new therapies

are needed. Injection of platelet-rich plasma (PRP), a minimally invasive technique, has been described by several authors as a promising treatment for AGA. Although many studies report beneficial effects of PRP on AGA, there is no standardized practice for PRP preparation and administration or a standard method to evaluate results. OBJECTIVE: The aim of this study was to evaluate the efficacy of manually prepared PRP in the treatment of male AGA. MATERIALS AND METHODS: We treated 20 male patients with AGA with 3 monthly injections of PRP and analyzed results by TrichoScanÂ®. RESULTS: In this study, there was no statistically significant improvement in hair count or proportion of anagen hairs. CONCLUSIONS: This lack of response could be related to any of the variables during PRP preparation described above and also to the limited number of patients in the study.

An improvement in acute wound healing in rats by the synergistic effect of photobiomodulation and arginine. In this probe, at first we examined the best route and dosage of arginine administration on wound healing in an excisional wound model in rats. Next, we intend to assess the impact of photobiomodulation (PBM) and arginine, individually and together, on the wound healing. In the pilot study, an excisional wound was made in each of 24 rats. There were 4 groups. Group 1 was the control group. In groups 2 and 3, wounds were topically treated with arginine ointments (ARG.) 2% and 5%, respectively. In group 4, arginine was injected (ARG. INJ.,i.p.). In the main phase, in 24 new rats, an excisional wound was made. There were 4 groups: group 5 served as the control. Wounds in group 6 were topically treated with ARG 2%. Wounds in group 7 were subjected to PBM. Wounds in group 8 were treated with PBM+ARG. 2%. On day 15, wound area measurement, wound strength, and stereological examination were performed. In the pilot study, we found that the ARG 2% ointment significantly decreased wound area than ARG. 5%, ARG. INJ. and control groups, and significantly increased wound strength compared to the control and ARG.5% groups. In the main phase, a significant decrease of wound area in all treatment regimens was induced. PBMâ€‰+â€‰ARG. 2% and PBM treatment regimens significantly improved wound strength and almost all stereological parameters, compared to the control and ARG. 2% groups. PBMâ€‰+â€‰ARG. 2% induced anti-inflammatory and angiogenic activities, and hastened the wound healing process in an excisional wound model in rats.

The effect of combined corticotomy and low level laser therapy on the rate of orthodontic tooth movement: split mouth randomized clinical trial. PURPOSE: The aim of this study was to evaluate the combined effect of corticotomy and Low-Level Laser Therapy(LLLT) on the rate of orthodontic tooth movement. METHODS: A randomized split-mouth design for 16 female patients compared the rate of maxillary canine retraction using corticotomy combined with LLLT versus corticotomy only. The device used in the present study was an In-Ga-As semiconductor diode laser emitting at 940 nm (IR) with these parameters: 0.5 W/ cm(2) power density, 5 J/cm(2) Fluence, CW, 240 sec time irradiation, weekly for the first month and twice monthly for the next three months. Assessment of the rate of canine retraction was carried out via a series of dental models. RESULTS: A non-significant statistical rate of canine retraction was achieved by LLLT combined to corticotomy compared with the corticotomy technique alone. CONCLUSION: Low-Level Laser Therapy combined to corticotomy could not achieve a higher rate of canine retraction compared to the golden standard corticotomy technique alone. No long-term adverse effects on the alveolar mucosa were detected following both techniques.

Intravenous Laser Wavelength Irradiation Effect on Interleukins: IL-1Î±, IL-1Î², IL6 in Diabetic Rats. BACKGROUND AND AIMS: The main purpose of this investigation in Low-Level Laser Therapy (LLLT) on diabetic rats is laser wavelength effect on interleukins: IL-1Î±, IL-1Î², IL6. MATERIALS SUBJECTS AND METHODS: At first, diabetes was induced in Wistar rats by streptozotocin (STZ) injection. Then, by intravenous laser therapy, the rats were irradiated by four continuous wave lasers: IR (Î» = 808

nm), Red (Î» = 638 nm), Green (Î» = 532 nm) and Blue (Î»= 450 nm) to compare the related laser wavelength effect on different interleukins. The inflammatory parameters were measured 2,6 and 24 hours after laser therapy from blood samples and plotted for different laser wavelengths. RESULTS: The results show a decrease in all the above parameters by different laser irradiation in comparison to non-radiated diabetic control ones. More importantly with constant laser energy as the laser wavelength decreases, it affects more efficiently on lowering the above parameters. CONCLUSIONS: we can conclude from our data on diabetic rats that in intravenous LLLT, with constant laser energy, shorter wavelengths like Blue (Î»= 450 nm) is more effective than longer wavelengths such as Red (Î» = 638 nm) and IR (Î» = 808 nm) lasers to lower the level of interleukins toward non-diabetic ones.

Effects of 830 nm low-power laser irradiation on body weight gain and inflammatory cytokines in experimental diabetes in different animal models. BACKGROUND AND AIMS: The present investigation was carried out to determine the levels of blood serum components and inflammatory cytokines in diabetic rat models [Goto-Kakizaki (GK), Zucker, and streptozotocin (STZ)-induced Sprague Dawley (SD) rats] which underwent abdominal Low-Power Laser Irradiation (LPLI) and compare them with non-irradiated controls. METHODS: The animals were subdivided into the following groups: diabetic control rats (GK, Zucker, STZ) and diabetic rats treated with LPLI (GK + LPLI, Zucker + LPLI, and STZ + LPLI) (n = 7). The animals were irradiated three times weekly for 12 weeks in LPLI (830 nm) at a dose of 5 J/cm(2) for 500 s. RESULTS: Body weight was significantly lowered in the Zucker- LPLI group compared to control at 10 weeks and this pattern was maintained until 12 weeks of age. TNF-Î±, IL-1I and IL-6 levels were significantly decreased (5.1 Â± 1.1 vs 3.3 Â± 0.5, $p < 0.01$; 43.6 Â± 8.8 vs 27.1 Â± 3.8, $p < 0.01$; 98.3 Â± 15.8 vs 62.2 Â± 12.1, $p < 0.01$) in the Zucker- LPLI group compared with the control rats. The small intestinal transit rates of charcoal meals were significantly decreased (58.1 Â± 10.1 vs 73.4 Â± 13.3, $p < 0.05$) in the Zucker-LPLI group compared with the control rats. Similarly, the serum levels of glucose, cholesterol and triglycerides of LPLI groups were decreased in comparison with that of diabetic control rats. CONCLUSIONS: We suggest that abdominal LPLI can reduce body weight and LPLI could be applicable for use against diabetic-induced inflammatory factors.

Effects of laser power, wavelength, coat length, and coat color on tissue penetration using photobiomodulation in healthy dogs. Photobiomodulation is an accepted regenerative medicine treatment modality used to stimulate tissue repair, mediate inflammation, and improve mobility in humans and animals. The objective of this study was to assess the influence of laser power and wavelength, coat length and color, and shaving on in-vivo photon delivery by therapeutic laser in dogs. Forty-seven dogs of various breeds and coat colors (17 black, 15 brown, and 15 white) and with varying coat lengths were assessed with 2 commercially available veterinary lasers. Photons were delivered to the lateral aspect of the inguinal fold and calcaneal tendon, with direct penetration through the dermis, as well as dermis and tendon, as measured with a thermopile laser sensor. Significant impacts on laser transmission were noted for laser power ($P = 0.001$), wavelength ($P < 0.002$), coat color ($P < 0.001$), and shaved coat ($P < 0.001$). Percent transmission was higher for a class IV 810/980 nm wavelength laser at 0.5 W than for a class IIIb 904 nm laser ($P < 0.001$). There was a significant difference between transmission of photons among white, brown, and black coats, with less transmission noted with increasing coat pigment ($P < 0.001$). Transmission was greater at higher power levels (3 W, 5 W) Results showed significant differences in laser transmission for all variables assessed, with the exception of coat length, which was not a significant predictor of laser transmission. As transmission was significantly reduced in darker and unshaved areas, higher power lasers may be necessary for darker pigmented dogs and shaving of hair is recommended before laser therapy. Animals;Dogs;Hair;Lasers;Low-Level Light Therapy;Pigmentation

Effects of photobiomodulation on interleukin-10 and nitrites in individuals with relapsing-remitting multiple sclerosis - Randomized clinical trial. OBJECTIVE: Investigate the effects of photobiomodulation (PBM) on the expression of IL-10 and nitrites in individuals with Relapsing-Remitting multiple sclerosis (MS), as these biomarkers play a fundamental role in the physiopathology of the disease. The modulation of IL-10 and nitrites through treatment with PBM may be a novel treatment modality for MS. METHODS: A randomized, uncontrolled, clinical trial was conducted involving 14 individuals with a diagnosis of Relapsing-Remitting MS and a score of up to 6.0 on the Expanded Disability Status Scale (EDSS). THE PARTICIPANTS WERE RANDOMIZED TO TWO GROUPS: Group 1 -PBM in the sublingual region; Group 2 -PBM over the radial artery. Irradiation was administered with a wavelength of 808 nm and output power of 100 mW for 360 seconds twice a week, totaling 24 sessions. Peripheral blood was analyzed for the determination of serum levels of IL-10 and nitrites. RESULTS: After treatment with PBM, the expression of IL-10 increased in both the sublingual group (pre-treatment: 2.8 Â± 1.4 pg/ml; post-treatment: 8.3 Â± 2.4 pg/ml) and the radial artery group (pre-treatment: 2.7 pg/ml Â± 1.4; post-treatment: 11.7 Â± 3.8 pg/ml). In contrast, nitrite levels were not modulated in the sublingual group (pre-treatment: 65 Â± 50 nmol/mg protein; post-treatment: 51 Â± 42 nmol/mg protein) or the radial artery group (pre-treatment: 51 Â± 16 nmol/mg protein; post-treatment: 42 Â± 7 nmol/mg protein). CONCLUSION: Treatment with PBM positively modulated the expression of IL-10 but had no effect on nitrite levels. Further studies should be conducted with a larger sample and a control group, as PBM may be a promising complementary treatment for the management of MS. This trial is registered at ClinicalTrials.gov. Identifier: NCT03360487. Nitrites;Interleukin-10 Adult;Female;Humans;Interleukin-10;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Multiple Sclerosis, Relapsing-Remitting;Nitrites;Physical Therapy Modalities;Radial Artery;Young Adult

A Pilot Study Evaluating the Effects of 670 nm Photobiomodulation in Healthy Ageing and Age-Related Macular Degeneration. Limited evidence suggests that the application of 670 nm of red light alters the course of aged decline. A previous report on 18 patients showed regression of drusen and improvement in visual functions in patients with intermediate age-related macular degeneration (AMD) by 12 months. We evaluated the functional and structural effects of applying 670 nm light to 31 patients with intermediate AMD and 11 people aged 55 years or above with normal retina. The study eyes were treated daily in the morning with a 670 nm hand-held light source housed in a torch-like tube that emitted energy equivalent to 40 mW/cm(2) or 4.8J/ cm(2) for 2 min at the viewing aperture. Visual function in terms of best-corrected visual acuity, low luminance visual acuity, scotopic thresholds and rod-intercept time were compared between baseline and 1, 3, 6 and 12 months. Structural changes on optical coherence tomography OCT and colour photographs were also assessed. Five withdrew consent voluntarily due to the intensity of the study visit assessments and two developed neovascular AMD and were excluded from further treatment and the analysis. In normal ageing, there was an improvement in scotopic thresholds in the group with no AMD by 1.77dB ($p = 0.03$) and no other parameters showed any clinically significant change. In eyes with intermediate AMD, there was no significant improvement in any functional or structural changes at any time point up to 12 months although the compliance was good. This pilot study shows that photobiomodulation with 670 nm has no effect in patients who have already progressed to intermediate AMD.

Efficacy of non-surgical treatments for androgenetic alopecia in men and women: a systematic review with network meta-analyses, and an assessment of evidence quality. BACKGROUND AND OBJECTIVE: Various treatments exist for androgenetic alopecia (AGA); we determined the relative efficacies of non-surgical AGA monotherapies separately for men and women. METHODS: Randomized controlled trials (RCTs) were systematically searched in PubMed, EMBASE, Scopus and

clinicaltrials.gov. Separate networks were used for men and women; for each network, a Bayesian network meta-analysis (NMA) of mean change in hair count from baseline (in units of hairs per square centimeter) was performed using a random effects model. RESULTS: The networks for male and female AGA included 30 and 10 RCTs, respectively. We identified the following treatments for male AGA in decreasing rank of efficacy: platelet-rich plasma (PRP), low-level laser therapy (LLLT), 0.5â€‰mg dutasteride, 1â€‰mg finasteride, 5% minoxidil, 2% minoxidil, and bimatoprost. For female AGA the following were identified in decreasing rank of efficacy: LLLT, 5% minoxidil, and 2% minoxidil. The evidence quality of the highest ranked therapies, for male and female AGA, was judged to be low. CONCLUSIONS: While newer treatments like LLLT may be more efficacious than more traditional therapies like 5% minoxidil, the efficacy of the more recent treatment modalities needs to be further validated by future RCTs. Finasteride;Minoxidil Alopecia;Female;Finasteride;Humans;Male;Minoxidil;Network Meta-Analysis;Treatment Outcome

Effect of Infrared Low-Intensity Laser Irradiation on Lipid Peroxidation under Conditions of Experimental Circulatory Hypoxia of Visual Analyzer. The physiological stress modeled by circulatory hypoxia activates LPO processes in various tissues. In posthypoxic period, the infrared low-intensity laser irradiation significantly decreased the chemiluminescence parameters in blood plasma, normalized the retinal levels of diene and triene conjugates, and decreased MDA in the rat brain attesting to the correcting effect of this irradiation during various types of physiological stresses. Antioxidants;Free Radicals Animals;Antioxidants;Free Radicals;Hypoxia;Infrared Rays;Laser Therapy;Lasers;Lipid Peroxidation;Male;Oxidative Stress;Phototherapy;Rats;Retina

Comparative efficacy of low-Level laser and TENS in the symptomatic relief of temporomandibular joint disorders: A randomized clinical trial. AIM: Temporomandibular disorders (TMDs) comprise a number of signs and symptoms affecting the masticatory muscles, temporomandibular joint (TMJ), or both. Because of the multifactorial etiology of such problems, the treatment usually involves more than one modality. OBJECTIVES: Therefore, the aim of this study was to compare the effectiveness of transcutaneous electric nerve stimulation (TENS) and low-level laser therapy for the treatment of patients with TMD. Materials and Methods: The clinical trial was performed with 60 patients diagnosed with TMD of multiple causes. All the patients received both methods of treatment in 6 consecutive weeks. A paired t-test was applied to verify the significance of the results. Results: A significant improvement in the range of motion and pain relief for both the therapies was observed. CONCLUSIONS: Comparatively after analyzing the two methods, the values obtained after LLLT were significantly higher than those obtained after TENS therapy ($P < 0.01$). Humans;Low-Level Light Therapy;Masticatory Muscles;Temporomandibular Joint;Temporomandibular Joint Disorders;Transcutaneous Electric Nerve Stimulation;Treatment Outcome

At-Home Self-Applied Photobiomodulation Device for the Treatment of Diabetic Foot Ulcers in Adults With Type 2 Diabetes: Report of 4Â Cases. Diabetic foot ulcers (DFUs) incidence is increasing with the rising global prevalence of diabetes. In spite of following best practice standard of care, most DFUs are slow to heal. Photobiomodulation (PBM), previously known as low-level laser therapy, has been shown to accelerate healing of acute or chronic wounds, and specifically DFUs. However, the frequent applications required translates to frequent visits at the clinic, which are difficult for patients with DFU. In the following case series, we present our preliminary experience with a recently approved (Health Canada) consumer home-use PBM device as an adjuvant to standard treatment. Four men presented at the clinic (67 to 84 years of age) with DFUs/diabetic leg ulcers. The PBM treatment (808 nm, 250-mW peak power, 15 KHz, 5 J/min, ray sizeÂ 4.5Ã—1.0Â cm(2)) was applied by the patients themselves at the clinic or at home. In the cases presented, all wounds closed within 1 to 3 weeks with no reported adverse events. Patients found the routine easy to follow and painless. In wounds that involved pain, patients reported pain reduction after 1 to 3Â treatments. Based on

our previous experience with these patients, self-applied PBM as an adjunct therapy led to accelerated healing and rapid pain alleviation compared with standard care alone. In summary, hard-to-heal diabetic wounds are a burden for patients, a burden for caregivers and costly for the health-care system. These observations support the view that the home-use device can be easily integrated as an adjuvant treatment to standard care at the clinic or home and, most importantly, encourage patient involvement in his or her own care. Anti-Bacterial Agents Aged;Aged, 80 and over;Anti-Bacterial Agents;Debridement;Diabetes Mellitus, Type 2;Diabetic Foot;Humans;Low-Level Light Therapy;Male;Osteomyelitis;Pain Measurement;Self Care;Wound Healing

The effects of a clinically feasible application of low-level laser therapy on the rate of orthodontic tooth movement: A triple-blind, split-mouth, randomized controlled trial. INTRODUCTION: This split-mouth trial aimed to investigate the effect of low-level laser therapy (LLLT) on the amount of maxillary canine distalization when applied every 4Â weeks over 12Â weeks. METHODS: Twenty-two adolescents and young adults (15 female, 7 male; aged 13-25Â years; nÂ =Â 22) requiring bilateral maxillary first premolar extractions were recruited. After extractions and leveling-alignment, canines were retracted using closed-coil nickel-titanium springs delivering 150Â g of force. LLLT was applied to 8 intraoral points on the buccal and palatal sides around the canine root for 10Â seconds per point, on day 0, 28, and 56 with the control side receiving sham application. Alginate impressions were taken every 4Â weeks on day 0, 28, 56, and 84. The amount of tooth movement, anchorage loss, and canine rotation were measured digitally. Randomization was generated using www.randomisation.com and allocation concealment through sequentially numbered, opaque, sealed envelopes. Participants, operator, and statistic assessor were blinded. Linear regression modeling accounting for clustering within each patient was used to identify differences between LLLT and control sides. RESULTS: Twenty-one patients completed the study. The total amount of tooth movement was similar in the LLLT (2.55Â Â±Â 0.73Â mm) and control group (2.30Â Â±Â 0.86Â mm), whereas 0.25Â mm (95% confidence interval, -0.21, 0.71Â mm) of difference was insignificant (PÂ =Â 0.27). No significant differences were found for anchorage loss (PÂ =Â 0.22) or canine rotation (PÂ =Â 0.25). No harms were reported. CONCLUSIONS: Application of LLLT every 4Â weeks did not result in differences in the amount of tooth movement, anchorage loss, and canine rotation during extraction space closure. Adolescent;Adult;Bicuspid;Cuspid;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Orthodontic Wires;Tooth Movement Techniques;Young Adult

Photobiomodulation Mediates Neuroprotection against Blue Light Induced Retinal Photoreceptor Degeneration. Potent neuroprotective effects of photobiomodulation with 670 nm red light (RL) have been demonstrated in several models of retinal disease. RL improves mitochondrial metabolism, reduces retinal inflammation and oxidative cell stress, showing its ability to enhance visual function. However, the current knowledge is limited to the main hypothesis that the respiratory chain complex IV, cytochrome c oxidase, serves as the primary target of RL. Here, we demonstrate a comprehensive cellular, molecular, and functional characterization of neuroprotective effects of 670 nm RL and 810 nm near-infrared light (NIRL) on blue light damaged murine primary photoreceptors. We show that respiratory chain complexes I and II are additional PBM targets, besides complex IV, leading to enhanced mitochondrial energy metabolism. Accordingly, our study identified mitochondria related RL- and NIRL-triggered defense mechanisms promoting photoreceptor neuroprotection. The observed improvement of mitochondrial and extramitochondrial respiration in both inner and outer segments is linked with reduced oxidative stress including its cellular consequences and reduced mitochondria-induced apoptosis. Analysis of regulatory mechanisms using gene expression analysis identified upregulation Î±-crystallins that indicate enhanced production of proteins with protective functions that point to the rescued mitochondrial function. The results support the hypothesis that energy metabolism is a major target for retinal light therapy. alpha-Crystallins

Animals;Female;Infrared Rays;Low-Level Light Therapy;Male;Mice, Inbred C57BL;Neuroprotection;Photoreceptor Cells, Vertebrate;Retinal Degeneration;Up-Regulation;alpha-Crystallins

Subthreshold Micropulse Yellow Laser (577 nm) for Idiopathic Macular Telangiectasia Type 1 Resistant to Intravitreal Injection. Angiogenesis Inhibitors;Bevacizumab;Receptors, Vascular Endothelial Growth Factor Angiogenesis Inhibitors;Bevacizumab;Drug Resistance;Fluorescein Angiography;Fundus Oculi;Humans;Intravitreal Injections;Low-Level Light Therapy;Macula Lutea;Male;Middle Aged;Receptors, Vascular Endothelial Growth Factor;Retinal Telangiectasis;Tomography, Optical Coherence

Complete and Fast Recovery from Idiopathic Facial Paralysis Using Laser-Photobiomodulation. Idiopathic facial paralysis, also known as Bell's palsy, exerts a negative effect on the quality of life. Although the prognosis is good in the majority of cases, a significant percentage of affected individuals may have sequelae that can negatively affect their lives. The use of therapeutic measures as early as possible can improve the prognosis. This article describes the successful use of laser-photobiomodulation as a single therapy in a patient with Bell's palsy and confirms the possibility of using this therapeutic modality as a good choice, since it is a therapy that is painless, comfortable, and without systemic side effects. The findings demonstrate that the adequate use of laser-photobiomodulation can be an effective therapeutic option for patients with Bell's palsy, regardless of the age, shortening the recovery time obtained with conventional therapies and avoiding sequelae. Further studies are needed for the establishment of adequate protocols.

OBJECTIVES: We updated the evidence from our 2018 report assessing persistent improvement in outcomes following completion of therapy for noninvasive nonpharmacological treatment for selected chronic pain conditions. DATA SOURCES: Electronic databases (Ovid MEDLINE(Â®), Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews) through November 2017 (for prior report) and from September 2017 through September 2019 (for this update report), reference lists, ClinicalTrials.gov, and our previous report. REVIEW METHODS: Using predefined criteria, we selected randomized controlled trials (RCTs) of noninvasive nonpharmacological treatments for five common chronic pain conditions (chronic low back pain; chronic neck pain; osteoarthritis of the knee, hip, or hand; fibromyalgia; and tension headache) that reported results for a at least 1 month postintervention. We analyzed effects and assessed strength of evidence (SOE) at short term (1 to <6 months following treatment completion), intermediate term (â‰¥6 to <12 months), and long term (â‰¥12 months). RESULTS: We included 233 RCTs (31 new to this update). Many were small (N<70), and evidence beyond 12 months after treatment completion was sparse. The most common comparison was with usual care. Evidence on harms was limited, with no evidence suggesting increased risk for serious treatment-related harms for any intervention. Effect sizes were generally small for function and pain. CHRONIC LOW BACK PAIN: Psychological therapies were associated with small improvements compared with usual care or an attention control for both function and pain at short-term, intermediate-term, and long-term followup (SOE: moderate). Function improved over short and/or intermediate term for exercise, low-level laser therapy, spinal manipulation, massage, yoga, acupuncture, and multidisciplinary rehabilitation (SOE moderate at short term for exercise, massage, and yoga; low for all others). Improvements in pain at short term were seen for massage, mindfulness-based stress reduction, acupuncture, and multidisciplinary rehabilitation (SOE: moderate), and exercise, low-level laser therapy, and yoga (SOE: low). At intermediate term, spinal manipulation, yoga, multidisciplinary rehabilitation (SOE: moderate) and exercise and mindfulness-based stress reduction (SOE: low) were associated with improved pain. Compared with exercise, multidisciplinary rehabilitation improved both function and pain at short and intermediate terms (small effects, SOE: moderate.) CHRONIC NECK PAIN: In the short term, low-

level laser therapy (SOE: moderate) and massage (SOE: low) improved function and pain. Exercise in general improved function long term, and combination exercise improved function and pain both short and long term compared with usual care (SOE: low). Acupuncture improved function short and intermediate term, but there was no pain improvement compared with sham acupuncture (SOE: low). Compared with acetaminophen, Pilates improved both function and pain (SOE: low). OSTEOARTHRITIS PAIN: Exercise resulted in small improvements in function and pain at short-term (SOE: moderate) and long-term (SOE: low), and moderate improvement at intermediate-term (SOE: low) followup for knee osteoarthritis versus nonactive comparators. Small improvements in function and pain with exercise were seen for hip osteoarthritis short term (SOE: low). Functional improvement persisted into intermediate term, but pain improvement did not (SOE: low). FIBROMYALGIA: Functional improvements were seen with exercise, mind-body practices, multidisciplinary rehabilitation (SOE: low) and acupuncture (SOE: moderate) short term compared with usual care, attention control, or sham treatment. At intermediate term, there was functional improvement with exercise and acupuncture (SOE: moderate), cognitive-behavioral therapy (CBT), mindfulness-based stress reduction, myofascial release, and multidisciplinary rehabilitation (SOE: low). Long term, functional improvements persisted for multidisciplinary rehabilitation without improvement in pain (SOE: low). Compared with exercise, tai chi conferred improvement in function short and intermediate term (SOE: low). Pain was improved with exercise (short and intermediate term, SOE moderate), and for CBT (short term), mindfulness practices, and multidisciplinary rehabilitation (intermediate term) (SOE low). CHRONIC TENSION HEADACHE: Evidence was sparse and the majority of trials were of poor quality. Spinal manipulation resulted in moderate improvement in pain short term. CONCLUSIONS: Trials identified subsequent to the earlier report largely support previous findingsâ€”namely that exercise, multidisciplinary rehabilitation, acupuncture, CBT, mindfulness practices, massage, and mind-body practices most consistently improve function and/or pain beyond the course of therapy for specific chronic pain conditions. Additional research, including comparisons with pharmacological and other active controls, on effects beyond the immediate post-treatment period is needed, particularly for conditions other than low back pain.

Nrf2 played an important role in radiation protection effect of low-level laser exposed on umbilical cord mesenchymal stem cell. To investigate the protective function of low-level laser irradiation (LLLI) against ionizing irradiation and explore the molecular mechanism of photomodulation of Nrf2 protein, the impact of LLLI (635 nm, 5.7 J/cm(2)) before 2 Gy gamma ray radiation of radio-sensitive tissue hematopoietic stem cells was evaluated. As a result, reduced levels of reactive oxygen species and increased expression of antioxidant enzymes were detected. Moreover, increased expression of Nrf2 was observed after LLLI, whereas brusatol pretreatment before LLLI abolished this effect. In vivo, transplantation of human umbilical cord mesenchymal stem cells (hUC-MSCs) was employed for therapy of hematopoietic function in an acute radiation sickness (H-ARS) mouse model, which was induced by 6-Gy ionizing irradiation; different hUC-MSC pretreatments including LLLI and Nrf2 RNAi were accounted for during experimental grouping. LLLI treatment of cells significantly increased the erythrocyte count and number of myelopoiesis clones ($P < 0.05$), but such improvements were reduced by Nrf2 RNAi pretreatment compared with cells transplanted without intervention. Therefore, LLLI may improve the radiation protection effect through molecular mechanisms related to the Nrf2 antioxidant pathway. Antioxidants;NF-E2-Related Factor 2;NFE2L2 protein, human;Nfe2l2 protein, mouse Animals;Antioxidants;Cell Differentiation;Cell Line;Cell Proliferation;Gene Expression Regulation;Humans;Lasers;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;NF-E2-Related Factor 2;Radiation Protection;Umbilical Cord

The effect of low-level laser radiation and doxycycline on the levels of osteoprotegerin and receptor activator of nuclear factor kappa-B ligand. The present in vitro study was conducted to investigate the effect of low-level laser (LLL) radiation and doxycycline on the levels of osteoprotegerin (OPG) and receptor activator of nuclear factor kappa-B ligand (RANKL) derived from MG-63 osteosarcoma cell line. MG-63 cells were divided into four groups. In the first group, 2Â mg/mL of doxycycline was injected into the cell culture medium. Diode laser (810Â nm, 100Â mw, 75Â s) was radiated to the culture medium of the second group. The third group received both doxycycline and laser radiation. In the fourth group (control), the culture medium was replaced daily, similar to the above three groups. Mentioned interventions were performed once a day for 4 consecutive days. Then, on the sixth day, the levels of OPG and RANKL mediators were measured using real-time polymerase chain reaction by isolating the cells from the samples. OPG expression had the highest to lowest levels in the laser + doxycycline, doxycycline, laser, and control groups, respectively. The level of OPG was significantly different between all the study groups (pâ€‰<â€‰0.05) except in the doxycycline + laser and doxycycline groups (pâ€‰=â€‰0.061). The highest to lowest levels of RANKL was observed in the doxycycline, laser + doxycycline, control, and laser groups, respectively. The RANKL expression was not significantly different between all the study groups (pâ€‰>â€‰0.05). The results of this study revealed that LLL and doxycycline reduced the RANKL/OPG ratio derived from the MG-63 osteosarcoma cell line, which may result in the diminished activity of osteoclasts and osteoclastogenesis. Osteoprotegerin;RANK Ligand;Doxycycline Cell Line, Tumor;Doxycycline;Gene Expression Regulation;Humans;Low-Level Light Therapy;Osteoclasts;Osteoprotegerin;RANK Ligand

Evaluation of the effects of photobiomodulation on orthodontic movement of molar verticalization with mini-implant: A randomized double-blind protocol study. INTRODUCTION: Loss of a dental element can generate several repercussions in the stomatognathic system. According to the latest survey by the Ministry of Health, in 2010, Brazilian adults had, on average, 7 missing teeth. This loss may lead to movement of the adjacent teeth and the antagonist, which would make prosthetic rehabilitation harder to do. Anchoring systems, such as mini-implants, have been increasingly used as a treatment option because they act with heavy but controlled forces and without side effects. Recent studies have shown that photobiomodulation (PBM) can accelerate orthodontic movement in molar intrusion. The objective of this study will be to evaluate the effect of PBM on the acceleration of the orthodontic movement of molar verticalization and its effect on pain and inflammation of the periodontal tissues. PATIENT CONCERNS:: the concerns assessments will be done over the study using anamnesis interviews and specific questionnaire. DIAGNOSIS: verticalization will be evaluated by clinical and radiographic analysis. INTERVENTIONS: Thirty four healthy patients aged 30 to 60 years, who need to recover the prosthetic space for oral rehabilitation after loss of the posterior inferior dental elements and inclination of the adjacent element, will be randomly divided into 2 groups: G1 (control group) - verticalization by mini-implant + PBM simulation (placebo); G2 (experimental group) - verticalization by mini-implant + PBM. The movements will occur with the aid of mini-implants and elastomeric chains ligatures. The PBM will occur with diode laser application, 808â€Šnm, 100 mW, receiving 1J per point, 10â€Šseconds, 10 points (5 per buccal and 5 per lingual) and radiant exposure of 25â€ŠJ/cm. The orthodontic forces of verticalization (corresponding to any exchange of elastomeric ligation) will be applied every 30 days and the PBM will be applied immediately, 3 and 7 days of each month, for a period of 3 months. The crevicular gingival fluid (CGF) will be collected on the 1st, 3rd, and 7th days after the first activation, and then on the 3rd day of the following 2 months. OUTCOMES: Interleukins IL1Î², IL-6, IL-8, IL-10, and TNF-Î± will be analyzed by ELISA. Panoramic radiography will be performed at baseline and 90 afterwards to ascertain the amount (in degrees) of verticalization. To evaluate the pain, the Visual Analog Scale (VAS) will be used in all the

consultations, and to evaluate the quality of life, the Oral Health Impact Profile (OHIP-14) questionnaire will be applied. Analgesics will be given and the quantity of drugs will be counted. If the data are normal, they will be submitted to Student t test. The data will be presented as means Â± SD and the value of p will be defined as <0.05. DISCUSSION: This protocol will determine the effectiveness of photobiomoduation regarding the orthodontic movement of molar verticalization. ETHICS AND DISSEMINATION: This protocol received approval from the Human Research Ethics Committee of Universidade Nove de Julho (certificate number: 3 533 219). The data will be published in a peer-reviewed periodical. Interleukins;Tumor Necrosis Factor-alpha Adult;Brazil;Double-Blind Method;Female;Gingival Crevicular Fluid;Humans;Interleukins;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Molar;Pain;Pain Measurement;Quality of Life;Tooth Movement Techniques;Tumor Necrosis Factor-alpha;Randomized Controlled Trials as Topic

Efficacy of 577 nm pro-yellow laser in the treatment of melasma: a prospective split-face study.
We aimed toÂ studyÂ the effectiveness of 577Â nm pro-yellowÂ laser in the treatment of melasma. AÂ total of 82 patients with melasma were included in this comparative study. AÂ detailed medical history, examination, and calculation of Melasma Area and Severity Index were done for all patients. All participants were treated with topical sunscreen and hydroquinone 4% cream on both sides of the face. In addition, the left side of the face was subjected to aÂ single pass of 577-nmÂ pro-yellowÂ laser at aÂ monthly interval for three sessions. Follow up was done by comparing the Melasma area and severity index at 0, 3 and 6Â months. At baseline, there is no significant difference in the Melasma area and severity index score between both sides of the face. At 3Â months, MASI score was statistically significantly decreased on both sides of the face compared to pretreatment (PÂ <Â .05). At 6Â months, the mean MASI score at the laser-treatedÂ side was statistically significantly decreased compared to the non-laser-treatedÂ side (PÂ <Â .05). we concluded that the addition of 577Â nm pro-yellowÂ laser in the treatment of melasma leads to maintain the improvement and reduction of the recurrence rate. Hydroquinones;Sunscreening Agents;hydroquinone Adolescent;Adult;Combined Modality Therapy;Female;Humans;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Prospective Studies;Severity of Illness Index;Sunscreening Agents;Young Adult

New strategies for ischemic stroke: internal photobiomodulation therapy.

Biphasic Dose/Response of Photobiomodulation Therapy on Culture of Human Fibroblasts.
Objective: The objective of this study was to evaluate the effects of application of different fluences and energies of laser in the 24-, 48-, and 72-h periods in fibroblasts originating from human skin (HFF-1). Methods: The cell used as a template for cell proliferation was HFF-1. For the photobiomodulation (PBM) application, a 660â€‰nm laser with a power of 40â€‰mW and energies of 0.84, 1.40, 5.88, and 6.72â€‰J was used. Five experimental groups were studied: one control group (CG) with simulated PBM and four groups that received PBM in different doses. The changes observed after laser irradiation were evaluated by cell viability (trypan blue) and proliferation [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT)] tests. Intergroup comparisons were performed using two-way analysis of variance and the Tukey post hoc test (software GraphPad Prism 7.0). Results: In the trypan blue test, the total number of cells was significantly different between the irradiated groups and the CG at all times studied. The total number of cells increased in laser group (LG)1 (0.84â€‰J) and LG2 (1.40â€‰J) and decreased in LG4 (6.72â€‰J). The mitochondrial activity increased significantly in LG1 and LG2 at 48 and 72â€‰h and decreased in LG3 (5.88â€‰J) and LG4 (6.72â€‰J) compared with CG. Conclusions: The results indicate that the lower doses (0.45 and 0.75â€‰J/cm(2)) of PBM induce the highest mitochondrial activity and cellular viability.

Cell Culture Techniques;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Fibroblasts;Humans;Low-Level Light Therapy;Skin

Photobiomodulation of lymphatic drainage and clearance: perspective strategy for augmentation of meningeal lymphatic functions. There is a hypothesis that augmentation of the drainage and clearing function of the meningeal lymphatic vessels (MLVs) might be a promising therapeutic target for preventing neurological diseases. Here we investigate mechanisms of photobiomodulation (PBM, 1267â€…nm) of lymphatic drainage and clearance. Our results obtained at optical coherence tomography (OCT) give strong evidence that low PBM doses (5 and 10 J/cm(2)) stimulate drainage function of the lymphatic vessels via vasodilation (OCT data on the mesenteric lymphatics) and stimulation of lymphatic clearance (OCT data on clearance of gold nanorods from the brain) that was supported by confocal imaging of clearance of FITC-dextran from the cortex via MLVs. We assume that PBM-mediated relaxation of the lymphatic vessels can be possible mechanisms underlying increasing the permeability of the lymphatic endothelium that allows molecules transported by the lymphatic vessels and explain PBM stimulation of lymphatic drainage and clearance. These findings open new strategies for the stimulation of MLVs functions and non-pharmacological therapy of brain diseases.

Factors Affecting Depth of Penetration in Microneedling- and Laser-Assisted Drug Delivery: The Importance of Timing of Topical Application. BACKGROUND: Microneedling- and laser-assisted drug delivery are emerging techniques used to treat various conditions. However, key parameters affecting drug penetration remain unknown. OBJECTIVE: This study aims to investigate the importance of timing of topical application, needle length, and device type for drug delivery. MATERIALS AND METHODS: Skin harvested from cosmetic surgeries was treated with black ink applied before or after treatment with a microneedling pen (MP), roller, or fractional ablative CO2 laser, and incubated for different time intervals. Ink penetration was additionally tested using different needle lengths. Sandwich estimator was used for statistical analysis. RESULTS: Ink applied before MP penetrated deeper compared to ink applied afterward at 1 and 3 hours, and roller microneedling in both the ink-before and -after scenarios at 1, 3, and 6 hours ($p < .05$). Microneedling demonstrated lateral extension of ink beyond microchannels with increased ink penetration over time. CO2 laser demonstrated ink localization within microthermal zones without time-dependent increases in depth after 30 minutes. Ink penetration increases by 0.06 mm per 1 mm increase in needle length. CONCLUSION: Ink applied before MP results in the deepest penetration of ink. Microneedling offers unique advantages in transdermal delivery as its channels exhibit increasing penetration over time and lateral extension of product. Administration, Cutaneous;Drug Delivery Systems;Dry Needling;Humans;Ink;Low-Level Light Therapy;Permeability;Skin

Photobiomodulation with low-level laser therapy for treating Achilles tendinopathy: a systematic review and meta-analysis. OBJECTIVE: The purpose of this study was to determine the benefits and harms of low-level laser therapy for Achilles tendinopathy. DATA SOURCES: Search strategies were conducted (from inception to February 2020) in Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Literatura Latino Americana em CiÃªncias da SaÃºde e do Caribe (LILACS), Physiotherapy Evidence Database (PEDro), SPORTDiscus, ClinicalTrials.gov, World Health Organization (WHO)-ICTRP and OpenGrey databases, to retrieve all randomized controlled trials that compared laser therapy with inactive/active interventions. REVIEW METHODS: This study was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The risk of bias was assessed using the Cochrane Risk of bias table. Meta-analyses were performed on dependence of homogeneity, otherwise results were reported narratively. The certainty of evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

RESULTS: Four trials (119 participants) were analyzed. Laser therapy associated to eccentric exercises when compared to eccentric exercises and sham had very low to low certainty of evidence in pain and function assessment. Despite one trial favored laser therapy at two months (mean difference (MD) -2.55, 95% confidence interval (95% CI) -3.87 to -1.23), the CIs did not include important differences between groups at 3 and 13â€‰months. The function assessment showed an improvement favoring the placebo group at one month (MD 9.19, 95% CI -16.16 to -2.23) and non-significant difference between groups at 3 and 13â€‰months. Adverse events were poorly reported but restricted to minor events related to the exercises. CONCLUSION: The certainty of evidence was low to very low, and the results are insufficient to support the routine use laser therapy for Achilles tendinopathy. Achilles Tendon;Humans;Low-Level Light Therapy;Tendinopathy

Improvement of full-thickness rat skin wounds by photobiomodulation therapy (PBMT): A dosimetric study. Basic dosimetric studies are necessary to support the use of photobiomodulation therapy (PBMT), since the great variety of laser parameters that are reported in the literature have created an obstacle to identifying reproducible results. Thus, the present study evaluates the process of tissue repair after the photobiomodulation therapy, taking into consideration the dose, frequency and the mode of energy delivery used. For this, 6Â mm diameter wounds were created on dorsal skin of Wistar rats, and the animals were divided in control and irradiated groups, where L1 and L4 (irradiated with 1 point of 10Â J/cm(2)), L2 and L5 (5 points of 10Â J/cm(2)), L3 and L6 (1 point of 50Â J/cm(2)), respectively for one or multiple days of irradiations. A diode laser, Î» 660Â nm, 40Â mW of power and 0.028Â cm(2) of spot area was used. Our data showed that the group receiving multiple treatments over the first week post wounding, applied at 10Â J/cm2 at each of 5 points on and around the wound (group L5) presented the best improvement of wound closure, higher cytokeratin 10, lower macrophage infiltration, and greater tissue resistance to rupture. We conclude that PBMT improves the skin wound healing process, and the outcomes were directly related to the chosen laser parameters and irradiation mode.

Achilles Tendinopathy: Pathophysiology, Epidemiology, Diagnosis, Treatment, Prevention, and Screening. Achilles tendinopathy (AT) is a clinical term describing a nonrupture injury of the Achilles tendon where the patient presents with pain, swelling, and reduced performance and symptoms exacerbated by physical activity. About 52% of runners experience AT in their lifetime and in the United States military the rate of clinically diagnosed AT cases was 5/1000 person-yr in 2015. The pathophysiology can be viewed on a continuum proceeding from reactive tendinopathy where tenocytes proliferate, protein production increases, and the tendon thickens; to tendon disrepair in which tenocytes and protein production increase further and there is focal collagen fiber disruption; to degenerative tendinopathy involving cell death, large areas of collagen disorganization, and areas filled with vessels and nerves. Inflammation may be present, especially in the early phases. Some evidence suggests AT pain may be due to neovascularization and the ingrowth of new nerve fibers in association with this process. Prospective studies indicate that risk factors include female sex, black race, higher body mass index, prior tendinopathy or fracture, higher alcohol consumption, lower plantar flexion strength, greater weekly volume of running, more years of running, use of spiked or shock absorbing shoes, training in cold weather, use of oral contraceptives and/ or hormone replacement therapy, reduced or excessive ankle dorsiflexion range of motion, and consumption of antibiotics in the fluoroquinolone class. At least 10 simple clinical tests are available for the diagnosis of AT, but based on accuracy and reproducibility, patient self-reports of morning stiffness and/or pain in the tendon area, pain on palpation of the tendon, and detection of Achilles tendon thickening appear to be the most useful. Both ultrasound and magnetic resonance imaging (MRI) are useful in assisting in diagnosis with MRI providing slightly better sensitivity and specificity. Conservative treatments that have been researched include: (1) nonsteroidal anti-inflammatory medication, (2)

eccentric exercise, (3) stretching, (4) orthotics, (5) bracing, (6) glyceryl trinitrate patches, (7) injection therapies (corticosteroids, hyaluronic acid, platelet-rich plasma injections), (8) shock wave therapy, and (9) low-level laser therapy. Nonsteroidal anti-inflammatory medication and corticosteroid injections may provide short-term relief but do not appear effective in the longer term. Eccentric exercise and shock wave therapies are treatments with the highest evidence- based effectiveness. Prevention strategies have not been well researched, but in specific populations balance training (soccer players) and shock-absorbing insoles (military recruits) may be effective. Ultrasound scans might be useful in predicting future AT occurrences. Achilles Tendon;Humans;Mass Screening;Tendinopathy

Photobiomodulation Decreases Hyperalgesia in Complex Regional Pain Syndrome: An Experimental Mouse Model Subjected to Nicotine. BACKGROUND AND OBJECTIVES: Complex regional pain syndrome (CRPS) is defined as an extreme and chronic pain condition, and photobiomodulation has relevance as a complementary treatment for CRPS. The objective of this study was to verify the effects of photobiomodulation (PBMT) therapy protocols at two wavelengths 660 and 830â€‰nm, associated or not to nicotine in complex regional pain syndrome type I (CRPS-I). STUDY DESIGN/MATERIALS AND METHODS: Sixty-four Swiss mice were divided into the following groups: (i) Naive, (ii) Sham, (iii) Control, (iv) 660â€‰nm, (v) 830â€‰nm, (vii) Nicotine, (vii) Nicotine/660â€‰nm, and (viii) Nicotine/830â€‰nm. CRPS-I was induced in an experimental ischemia/reperfusion model by affixing an elastic ring, proximal to the ankle joint of the right hind mouse paw, for 3â€‰hours. Nicotine, in the respective groups was administered for 28 days prior to the induction of CRPS-I. PBMT was applied immediately after the procedure and for 20 consecutive days. The animals were evaluated for mechanical hyperalgesia, thermal hyperalgesia, paw edema at baseline and for 7, 14, and 21 days. Statistical analyses comprised a mixed-effects model, using the Tukey post hoc test (Pâ€‰<â€‰0.05). RESULTS: The PBMT wavelengths in 660 and 830â€‰nm groups had beneficial effects (Pâ€‰<â€‰0.05) in reducing mechanical and thermal hyperalgesia, but the effects at 660â€‰nm were significantly better than 830â€‰nm. At reducing edema, both wavelengths had significantÂ effects statistically, absolutely no difference between them. CONCLUSIONS: The use of PBMT (660 and 830â€‰nm) was effective in reducing mechanical hyperalgesia and thermal hyperalgesia; however, PBMT at 660â€‰nm generated significant results. In reducing edema, both wavelengths had similar effects, which were significant statistically. The deleterious effects of nicotine were evident statistically and were softened when treated with PBMT (Pâ€‰<â€‰0.05). Lasers Surg. Med. Â© 2020 Wiley Periodicals, Inc. Nicotine Animals;Chronic Pain;Complex Regional Pain Syndromes;Disease Models, Animal;Hyperalgesia;Mice;Nicotine

Reply. Laser Therapy;Low-Level Light Therapy

Re: Rosenfeld etÂ al.: Warning: do not treat intermediate AMD with laser therapy (Ophthalmology. 2019;126:839-840). Laser Therapy;Low-Level Light Therapy

Influence of low-level laser therapy on inflammation, collagen fiber maturation, and tertiary dentin deposition in the pulp of bleached teeth. OBJECTIVES: We evaluated the effects of low-level laser therapy (LLLT) using an infrared laser (IRL) and a red laser (RL) on the pulp of molar teeth in rats after dental bleaching to assess inflammation, collagen fiber maturation, and tertiary dentin formation. MATERIALS AND METHODS: Eighty Wistar rats (Rattus norvegicus, albinus) were randomly divided into eight groups with 10 hemimaxillae in each of the following: control; bleached (Ble, 35% hydrogen peroxide [H(2)O(2)]); Ble-1IRL and Ble-1RL (one IRL [808Â nm, 30Â s, 3Â J] or RL [660Â nm, 15Â s, 1.5Â J] application immediately after H(2)O(2)); Ble-3IRL and Ble-3RL (three [immediately, 24Â h, and 48Â h] IRL or RL applications after H(2)O(2)); and 3IRL and 3RL (three IRL or RL applications without bleaching). The rats were euthanized after 2 and 30Â days for histological evaluation of

inflammation (hematoxylin-eosin) and maturation of collagen fibers (picrosirius red). Additionally, the dentin deposition in the specimens obtained at 30Â days was quantified via microtomography of the pulp chamber volume. Statistical analyses were performed (Pâ€‰<â€‰0.05). RESULTS: Initially, severe damages to the pulp were observed in the Ble and Ble-1RL groups. Ble-1IRL and Ble-3RL groups showed lower inflammation. The bleached groups had a greater amount of mature collagen fibers than the control group. The Ble-3IRL group had a greater number of immature fibers than the Ble group. At 30Â days, there was an absence of inflammation and equal proportion of mature and immature collagen fibers. All bleached groups showed a reduction in the volume of the pulp chamber. CONCLUSION: Three consecutive applications of RL and one IRL application can minimize damage to the pulp of bleached teeth, whereas three IRL applications can minimize pulp fibrosis. However, LLLT did not prevent deposition of tertiary dentin. CLINICAL RELEVANCE: This study describes LLLT protocols capable of minimizing inflammation and maturation of collagen fibers in pulp tissue after dental bleaching. However, the protocols proved insufficient for reducing the formation of tertiary dentin in bleached teeth. Tooth Bleaching Agents;Collagen;Hydrogen Peroxide Animals;Collagen;Dental Pulp;Dentin;Hydrogen Peroxide;Inflammation;Low-Level Light Therapy;Rats;Rats, Wistar;Tooth Bleaching;Tooth Bleaching Agents

Invited Discussion on: A Meta-analysis-Based Assessment of Intense Pulsed Light for Treatment of Melasma. Humans;Low-Level Light Therapy;Melanosis

Photobiomodulation safety in cancer patients: in vivo data : (in response to S. Sonis' commentary "Could the impact of photobiomodulation on tumor response to radiation be affected by tumor heterogeneity?", Support Care Cancer 2019 (in press)).

Photobiomodulation by low-level laser therapy in patients with obstructive sleep apnea: Study protocol clinical trial (SPIRIT compliant). Obstructive sleep apnea (OSA) increases morbidity and mortality and it is associated with an increased cardiovascular risk. The gold standard treatment for OSA is positive airway pressure therapy (CPAP). However, it is an expensive treatment and several patients do not adapt to CPAP. GOAL: The researchers will verify the effects of low-level laser therapy (LLLT) on OSA, when applied to the soft palate and on the tongue base. METHODS: The researchers will select individuals of both sexes aged 30 to 60 years old who are sedentary and that present a high risk of OSA by the Berlin questionnaire. The evaluations pre and post interventions will be polysomnography; anthropometric and body composition measurements (Bioimpedance); metabolic syndrome risk factors (International Diabetes Federation); physical capacity (VO2 peak at the cardiopulmonary exercise test, CPET); endothelial function (flow-mediated dilatation, FMD); autonomic control (heart rate variability and sympathovagal balance). Those diagnosed with moderate and severe OSA (apnea/hypopnea index, AHI â‰¥15â€Ševents/h) will be invited to participate in the study and they will be randomized into 2 groups: LLLT treatment or placebo (C). The LLLT group will receive applications at 8 points on the soft palate and on the base of the tongue for 8â€Šseconds for each point. The applications of LLLT will occur twice a week, with a minimum interval of 2 days between the applications for 2 months, when using a Therapy Plus NS 13678 Laser. The C group will have similar applications, but with the device turned off. EXPECTED RESULTS: In the individuals with OSA, photobiomodulation through LLLT will decrease the AHI. Additionally, when LLLT is applied in the oral cavity, a highly vascularized region, this may cause improvements in the vascular function and in the autonomic and hemodynamic control. ETHICS AND DISSEMINATION: This protocol was approved by the Research Ethics Committee of the Nove de Julho University, SÃ£o Paulo, Brazil, on the date of March 11, 2019 (CAAE: 06025618.2.0000.5511 - Acceptance Number: 3.191.077). This trial has been registered with the Brazilian Registry of Clinical Trials (REBEC TRIAL RBR-42v548). This study is not yet recruiting. Issue date: November 4, 2019.

Adult;Brazil;Exercise Test;Female;Humans;Low-Level Light Therapy;Male;Metabolic Syndrome;Middle Aged;Mouth;Palate, Soft;Polysomnography;Risk Factors;Sleep Apnea, Obstructive;Tongue

Combined effect of laser acupuncture and electroacupuncture in knee osteoarthritis patients: A protocol for a randomized controlled trial. BACKGROUND: Knee osteoarthritis (KOA) is a common degenerative joint disorder that affects 250 million people globally. KOA can lead to disability and is often associated with cardiovascular disease, poor quality of life, and mortality. The most common treatment for KOA is non-steroidal anti-inflammatory drug administration. However, the analgesic effect is limited and often accompanied by multiple side effects. Hence, many KOA patients opt for complementary and alternative medicine. Acupuncture is one of the most popular complementary treatments with great analgesic effect and minimal side effect. Electroacupuncture (EA) and laser acupuncture (LA) have been known to reduce pain in KOA patients. However, to date, no study has assessed the benefits of combining these two therapies. METHODS: Fifty participants diagnosed with KOA, aged 50 years or older, and with consistent knee pain for more than 3 months were recruited and randomly assigned to the treatment group (EA plus LA) or control group (EA plus sham LA without laser output). All subjects in the treatment group will undergo a combined EA and LA treatment thrice a week for 4 weeks. The acupuncture will be performed on GB33, GB34, SP9, SP10, and ST36 sites. The treatment group will receive acupuncture with a transcutaneous electrical nerve stimulator at GB33, GB34, SP9, and SP10 sites and with LA at EX-LE5, ST35, and BL40 sites. The subjects in the control group will undergo the same treatment modality as the treatment group, except these subjects will not be exposed to laser output. Outcome measurements will include visual analog scale, Western Ontario McMaster Universities Osteoarthritis Index, Knee injury and osteoarthritis outcome, body composition analysis, knee range of motion, quadriceps muscle stiffness, one-leg standing with eyes open test, and the 30-s chair stand test before and after 4 weeks of intervention. OBJECTIVES: This protocol aims to investigate the combined effect of EA and LA in KOA patients. Acupuncture Therapy;Aged;Aged, 80 and over;Combined Modality Therapy;Electroacupuncture;Humans;Knee;Laser Therapy;Low-Level Light Therapy;Middle Aged;Osteoarthritis, Knee;Outcome Assessment, Health Care;Pain;Pain Management;Range of Motion, Articular;Taiwan;Transcutaneous Electric Nerve Stimulation;Visual Analog Scale

Effect of Modified Laser Transcutaneous Irradiation on Pain and Quality of Life in Patients with Diabetic Neuropathy. Background: Diabetic neuropathy (DN) is one of the major complications developed by individuals with diabetes mellitus. DN is responsible for a high morbidity and mortality rate and impacts the public health and medical assistance resources. Intradermic laser irradiation on blood (ILIB) consists of the application of light beams on the radial arterial, providing anti-inflammatory and vasodilator effects, antiarrhythmic action, reduction of glucose, and stabilization of the hormonal and immunological systems. These effects help to maintain the physiological dynamics of the body. Objective: The goal of this research was to evaluate the effects of ILIB to relieve pain and improve the quality of life in DN patients. The sample comprised 30 diabetic volunteers with DN, randomly distributed into 3 groups: Control-conventional treatment; ILIB-100â€‰mW, 660â€‰Â±â€‰10â€‰nm, 30 applications in total, divided into 3 stages of 10 applications, 30â€‰min each, daily, with a 20-day interval between each stage; SILIB-same protocol described for ILIB, with the equipment switched off. Before and after the application of the therapeutic protocols, all volunteers were evaluated by the following instruments: Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), visual analog scale, Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), and PAIN DETECT scale. Collected data were statistically analyzed with a 95% confidence interval, pâ€‰<â€‰0.05. Results: The ILIB group presented significantly lower pain levels and a better quality of life compared with the control and SILIB groups. Conclusions: This study demonstrated that ILIB therapy was effective in reducing pain and improving quality of life in patients

with DN. Aged;Diabetic Neuropathies;Female;Humans;Low-Level Light Therapy;Male;Neuralgia;Pain Management;Pain Measurement;Prospective Studies;Quality of Life

Evidence from systematic reviews on photobiomodulation of human bone and stromal cells: Where do we stand? This study summarizes the available evidence from systematic reviews on the in vitro effects of photobiomodulation on the proliferation and differentiation of human bone and stromal cells by appraising their methodological quality. Improvements for future studies are also highlighted, with particular emphasis on in vitro protocols and cell-related characteristics. Six reviews using explicit eligibility criteria and methods selected in order to minimize bias were included. There was no compelling evidence on the cellular mechanisms of action or treatment parameters of photobiomodulation; compliance with quality assessment was poor. A rigorous description of laser parameters (wavelength, power, beam spot size, power density, energy density, repetition rate, pulse duration or duty cycle, exposure duration, frequency of treatments, and total radiant energy), exposure conditions (methods to ensure a uniform irradiation and to avoid cross-irradiation, laser-cell culture surface distance, lid presence during irradiation) and cell-related characteristics (cell type or line, isolation and culture conditions, donor-related factors where applicable, tissue source, cell phenotype, cell density, number of cell passages in culture) should be included among eligibility criteria for study inclusion. These methodological improvements will maximize the contribution of in vitro studies on the effects of photobiomodulation on human bone and stromal cells to evidence-based translational research. Animals;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Osteocytes;Stromal Cells;Systematic Reviews as Topic

High-throughput single-cell live imaging of photobiomodulation with multispectral near-infrared lasers in cultured T cells. SIGNIFICANCE: Photobiomodulation is a well-established therapeutic modality. However, the mechanism of action is poorly understood, due to lack of research in the causal relationship between the near-infrared (NIR) light irradiation and its specific biological effects, hindering broader applications of this technology. AIM: Since biological chromophores typically show several absorption peaks, we determined whether specific effects of photobiomodulation are induced with a combination of two wavelengths at a certain range of irradiance only, rather than a single wavelength of NIR light. APPROACH: In order to analyze a wide array of combinations of multispectral NIR light at various irradiances efficiently, we developed a new optical platform equipped with two distinct wavelengths of NIR lasers by high-throughput multiple dosing for single-cell live imaging. Two wavelengths of 1064 and 1270Â nm were selected based on their photobiomodulatory effects reported in the literature. RESULTS: A specific combination of wavelengths at low irradiances (250 to 400â€‰â€‰mWâ€‰â€‰/â€‰â€‰cm2 for 1064Â nm and 55 to 65â€‰â€‰mWâ€‰â€‰/â€‰â€‰cm2 for 1270Â nm) modulates mitochondrial retrograde signaling, including intracellular calcium and reactive oxygen species in T cells. The time-dependent density functional theory computation of binding of nitric oxide (NO) to cytochrome c oxidase indicates that the illumination with NIR light could result in the NO release, which might be involved in these changes. CONCLUSIONS: This optical platform is a powerful tool to study causal relationship between a specific parameter of NIR light and its biological effects. Such a platform is useful for a further mechanistic study on not only photobiomodulation but also other modalities in photomedicine. Reactive Oxygen Species;Nitric Oxide;Electron Transport Complex IV;Calcium Animals;Calcium;Cell Proliferation;Cell Separation;Cells, Cultured;Electron Transport Complex IV;Female;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Nitric Oxide;Optical Imaging;Reactive Oxygen Species;T-Lymphocytes

Management of otitis externa with an led-illuminated gel: a randomized controlled clinical trial in dogs. BACKGROUND: Canine otitis externa is a painful condition which can be challenging to treat due to difficulties in the administration of otic medication. This can be due to lack of owner

compliance in the application of ear drops or due to the resentment that some dogs demonstrate when attempts are made to administer topical medication into a sensitive ear canal. The aim of the study was to assess the efficacy of a topical LED-illuminated gel (LIG) in canine otitis externa in comparison to standard of care therapy. Dogs with spontaneous otitis externa were randomly allocated in three groups: groups QW received LIG once weekly; BW received LIG twice weekly; group C received enrofloxacin and silver sulfadiazine twice daily. LIG consists of a topical application of a gel containing chromophores that, when illuminated by a LED lamp, re-emit fluorescent light which can stimulate physiological responses, promoting healing and controlling bacteria. The evaluation protocol (T(0) to T(5)) considered clinical assessment (OTIS-3-index-scoring-system; pruritus-severity-scale; pain-severity-score; aural temperature), cytological scoring system, quali-quantitative bacteriologic assessment. RESULTS: All groups (QW, nÂ =â€‰21; BW, nÂ =â€‰23; C, nÂ =â€‰20) showed improvement during the study (QW: PÂ <â€‰0.02 for cytological and pain scores, PÂ <â€‰0.003 for bacteriologic assessment, PÂ <â€‰10(-â€‰4) for pruritus, total OTIS-3 and temperature assessments; BW: PÂ <â€‰10(-â€‰4) for all clinical, cytological and bacteriologic assessments; C: PÂ <â€‰0.02 for all clinical and cytological assessments, PÂ <â€‰10(-â€‰4) for bacteriologic assessment). The highest clinical score reduction occurred in Group BW (PÂ <â€‰0.014 in T(3); PÂ <â€‰0.001 in T(4) and PÂ <â€‰10(-â€‰4) in T(5)). BW reached the clinically relevant effect level at T(3) (-â€‰3.26â€‰Â±â€‰1.21 levels), QW reached it at T(4) (-â€‰3.24â€‰Â±â€‰0.99), C did not reach it. No differences between groups were seen in the reduction of CFU/mL (T(0)-T(5)). CONCLUSIONS: All treatment groups showed a positive clinical effect. LIG administered twice-a-week was the most favourable protocol of the study. LIG may be considered beneficial in the management of canine otitis externa; it seems to be effective in controlling the clinical condition, including the signs of inflammation and local pain, the bacterial growth, and it may help increasing treatment compliance. Anti-Bacterial Agents;Anti-Infective Agents, Local;Gels;Enrofloxacin;Silver Sulfadiazine Animals;Anti-Bacterial Agents;Anti-Infective Agents, Local;Dog Diseases;Dogs;Enrofloxacin;Female;Fluorescence;Gels;Male;Otitis Externa;Pain;Silver Sulfadiazine

Systematic Review of Photobiomodulation Therapy (PBMT) on the Experimental Calcaneal Tendon Injury in Rats. This systematic review analyzed the light parameters and the effects of photobiomodulation therapy (PBMT) through low-level laser therapy (LLLT) and/or LED (light-emitting diode) on tendon repair of rats submitted to calcaneal injury. This study was conducted in accordance with the guidelines of the Preferred Reporting Items for Meta-Analysis, and PubMed and MEDLINE databases were accessed to search eligible studies published in English. The search terms were as follows: "Achilles tendon" or "Calcaneal tendon" or "tendon injuries" or "soft tissue injuries" and "tendinopathy" or "tendinitis" and "low-level light therapy" or "low-level laser therapy" or "low intensity power therapy" or "light-emitting diode" or photobiomodulation." The SYRCLE (SYstematic Review Center for Laboratory animal Experimentation) risks of bias was used to assess the risk of bias for selected studies. A total of 225 studies were found based on the descriptors used, and only 33 studies were eligible. Light parameters identified per point of irradiation were approximately 60 mW (continuous mode at infrared spectra), 2Â WÂ cm(-2) , 2Â J and 45Â JÂ cm(-2) . Light parameters at red spectra, continuous versus pulsed mode, and PBMT combined or compared with other therapies such as ultrasound, and studies using unhealthy rats (ovariectomized and/or diabetic models) were also identified and grouped according to these similarities. The main effects found were decreased inflammatory markers and signs of inflammatory process. PBMT (laser/LED) has positive effects in reducing the inflammatory and time for tissue repair in animal models of tendon injury and/or tendinitis using parameters identified. Achilles Tendon;Animals;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Rats;Rats, Wistar;Tendon Injuries

Novel Chemo-Photothermal Therapy in Breast Cancer Using Methotrexate-Loaded Folic Acid Conjugated Au@SiO(2) Nanoparticles. Low level laser therapy (LLLT) is known as a safe type of phototherapy to target tumor tissue/cells. Besides, using targeted nanoparticles increases the successfulness of cancer therapy. This study was designed for investigating the combined effect of folate (FA)/Methotrexate (MTX) loaded silica coated gold (Au@SiO(2)) nanoparticles (NPs) and LLLT on the fight against breast cancer.NPs were synthesized and characterized using FTIR, TEM and DLS-Zeta. The NPs had spherical morphology with mean diameter of around 25 nm and positive charge (+13.3 mV) while after conjugation with FA and MTX their net charge reduced to around -19.7 mV.Our findings in cell uptake studies clearly showed enhanced cellular uptake of NPs after FA and MTX loaded NPs in both breast cancer cell lines especially on MDA-MB-231 due to high expression of folate receptors. The results indicated that LLLT had a proliferative effect on both breast cancer cell lines but in the presence of engineered breast cancer targeted nanoparticle, the efficacy of combination chemo-photothermal therapy was significantly increased using MTT assay ($p<0.05$), DAPI staining, and cell cycle findings. The highest apoptotic effect on breast cancer cell lines was observed in the cells exposed to a combination of MTX-FA loaded Au@SiO(2) NP and LLLT proved by DAPI staining and cell cycle(by increasing the cell arrest in subG0/G1). Taken together a combination of chemotherapy and LLLT improves the potential of breast cancer therapy with minimum side effects.

Near-Infrared Light Increases Functional Connectivity with a Non-thermal Mechanism. Although techniques for noninvasive brain stimulation are under intense investigation, an approach that has received limited attention is transcranial photobiomodulation (tPBM), the delivery of near-infrared light to the brain with a laser or light-emitting diode directed at the scalp. Here we employed functional magnetic resonance imaging to measure the blood-oxygenation-level-dependent signal in nÂ =â€‰20 healthy human participants while concurrently stimulating their right frontal pole with a near-infrared laser. Functional connectivity with the illuminated region increased by up to 15% during stimulation, with a quarter of all connections experiencing a significant increase. The time course of connectivity exhibited a sharp rise approximately 1Â min after illumination onset. Brain-wide connectivity increases were also observed, with connections involving the stimulated hemisphere showing a significantly larger increase than those in the contralateral hemisphere. We subsequently employed magnetic resonance thermometry to measure brain temperature during tPBM (separate cohort, nÂ =â€‰20) and found no significant temperature differences between active and sham stimulation. Our findings suggest that near-infrared light synchronizes brain activity with a nonthermal mechanism, underscoring the promise of tPBM as a new technique for stimulating brain function.

RNA-Seq analysis revealed the molecular mechanisms of photobiomodulation effect on human fibroblasts. BACKGROUND: The photobiomodulation (PBM) effect has been applied to various clinical therapy for a long time. However, the mechanism related to the PBM effect in terms of wavelengths has been lack of in-depth study, except that ultraviolet radiation has attracted much attention due to its strong cell-killing effect. PURPOSE: To clarify the principle behind PBM and the main mechanism of improvement. METHODS: To carry on this study, we created light equipment using three LED chips, which emit 390Â nm ultraviolet radiation, 415Â nm blue light and 660Â nm red light, respectively. We choose human fibroblasts (HF) to be irradiated by three different wavelengths for PBM test. In this study, we used cell counting kit (CCK-8) test to show the cell proliferation roughly and reported on a systematic RNA sequencing (RNA-seq) analysis at transcriptional expression levels from HF, which accepted PBM of different wavelengths of light. RESULTS: We found that 415Â nm blue light inhibited cell proliferation and 660Â nm red light stimulated cell proliferation while 390Â nm ultraviolet radiation has little influence on cell proliferation. Furthermore, RNA-seq results showed that CSF1R, PPP3CC, ITGAL, ITGAM, IL2RB, and several other differentially expressed genes

(DEGs) are involved in the cell proliferation. Relative DEGs values for matrix metalloproteinases (MMPs) gene family have shown a great difference in blue and red light radiation especially on MMP25, MMP9, MMP21, and MMP13. CONCLUSION: Taken together, the results provide a valuable resource to describe the variation of HFs under PBM of different light at gene level. Matrix Metalloproteinases Cell Proliferation;Color;Fibroblasts;Humans;Low-Level Light Therapy;Matrix Metalloproteinases;Sequence Analysis, RNA;Signal Transduction;Transcriptome;Ultraviolet Rays

Impact of Photobiomodulation on T3/T4 Ratio and Quality of Life in Hashimoto Thyroiditis. Objective and background: Hashimoto's thyroiditis (HT) is both a B cell- and T cell-mediated, organ-specific autoimmune disease. No current treatment for underlying pathological mechanisms is available for HT and once diagnosed it requires long-term levothyroxine (LT(4)) treatment in most patients. The aim of our study was to evaluate the effects of photobiomodulation (PBM) on HT patients regarding thyroid functions, thyroid autoantibody levels, and decrease in hormone replacement needs. Methods: A total of 350 patients, who were diagnosed with Hashimoto`s thyroiditis, were included in our study. Patients were classified into two groups. Group 1 (nâ€‰=â€‰210) received PBM and dietary supplementation such as vitamin D, iron, and selenium. Group 2 (nâ€‰=â€‰140) received dietary supplements only. Patients' needs for LT(4) replacement levels, triiodothyronine (T3), thyroxine (T4), and TSH levels, T3/T4 ratio, and thyroid autoantibody levels were evaluated. Results: As we compare both groups, the increase in T3 levels and T3/T4 ratio was markedly superior in Group 1 (pâ€‰=â€‰0.0001). The decrease in thyroid peroxidase antibody (TPO Ab) levels was also significantly different between both groups (pâ€‰=â€‰0.0001). Hormone replacement needs were also significantly decreased in Group 1 compared with Group 2 (pâ€‰=â€‰0.03). Low-level laser therapy (LLLT) is 70 times more effective in increasing T3/T4 ratio (pâ€‰=â€‰0.001) and 15 times more effective in decreasing levothyroxine dosage. Conclusions: Our results are encouraging and PBM seems to be very effective in increasing T3/T4 ratio and decreasing TPO Ab levels and weekly dosages of LT(4) replacement therapy. Anti-inflammatory properties of PBM are greatly responsible for these changes and PBM causes major improvements in HT-related symptoms of the patient. Triiodothyronine;Thyrotropin;Thyroxine Adult;Cohort Studies;Dietary Supplements;Female;Hashimoto Disease;Humans;Low-Level Light Therapy;Male;Middle Aged;Quality of Life;Thyrotropin;Thyroxine;Triiodothyronine

Pre-Conditioning and Post-Operative Photobiomodulation Therapy by a Novel Light Patch System for Knee Arthroplasty: A Protocol for a Phase 1 Study. Objective: To determine the potential efficacy and feasibility of photobiomodulation therapy (PBMT) before and after knee arthroplasty (KA) surgery. Background: Total knee replacements (total knee arthroplasty, TKA) are one of the most common and successful surgical interventions for osteoarthritis. Up to 20,000 knee replacement arthroplasties are performed in Australia annually. Although TKA aims to restore knee alignment and relieve pain in the long term, the initial post-operative period is difficult and rehabilitation is often hindered by persistent pain and swelling. A promising therapeutic approach, PBMT using a novel self-adhesive light patch system, may be feasible for reducing post-operative pain and swelling and aiding recovery. Materials and methods: This is an interventional clinical feasibility study protocol. Patients from a surgical waitlist will be invited to take part. PBMT will be applied for 30â€‰min daily for 7 days pre-operatively using a novel light patch system (CareWear(Â®)) with both 450â€‰nm (6.75â€‰mW/cm(2)) and 640â€‰nm (2.25â€‰mW/cm(2)) microdiodes. Post-operative treatment will utilize the same device second daily for 1 week after removal of compression bandages. Results: Outcomes will be evaluated at seven time points: baseline at week 1 pre-operatively, 1 day before surgery, day 4 after surgery, weekly for a further 2 weeks, and fortnightly until 6 weeks post-hospital discharge. Outcome measures include the following: Numeric Pain Rating Scale, stair climb test, 30-sec chair stand test, timed up and go test, 40-m fast-paced walk test, modified Iowa Level of

Assistance Scale, muscle strength, knee range of motion, Knee Injury and Osteoarthritis Outcome Score, and Lower Limb Functional Index. Conclusions: This study will provide an assessment of feasibility of using PBMT applied using a novel light patch system for management of pain symptoms and swelling, and aiding recovery of patients undergoing TKA. The results of this feasibility study will contribute to planning of the design and methods of a large clinical trial. Arthroplasty, Replacement, Knee;Feasibility Studies;Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Postoperative Care;Postoperative Complications;Preoperative Care

Low-Level Laser Therapy for Osteoarthritis Treatment in Dogs at Missouri Veterinary Practice. A qualitative survey was electronically distributed to practicing veterinarians in the state of Missouri to evaluate the frequency of use and economic impact of low-level laser therapy (LLLT) for the treatment of osteoarthritis (OA) in dogs in Missouri. The survey response rate was 10% (89/867). Approximately half (43%) of respondents had LLLT units, of which all used LLLT for OA treatment in dogs. In respondents without LLLT units, 20% referred patients for LLLT OA treatment. Training was most often obtained in-house by a representative of the LLLT unit manufacturer (76%). Treatment dose was largely unknown and chosen by predetermined settings on the LLLT unit (65%). In the majority of patients (84%), no treatment site preparation was performed. An average of four patients with OA were treated per wk with an average cost per treated joint of $28 (range: $15-45). This study provides insight into the current clinical use and estimated annual economic impact ($6.2 million per year) of treating a single OA joint in dogs with LLLT by Missouri veterinarians. The frequency with which LLLT is used in the treatment of OA combined with the variation in training and treatment protocols supports the need for further research regarding the application and efficacy of LLLT in dogs with OA. Animals;Dog Diseases;Dogs;Female;Humans;Low-Level Light Therapy;Male;Missouri;Osteoarthritis;Practice Patterns, Physicians';Surveys and Questionnaires;Veterinarians

Low-level laser therapy for neurosensory recovery after sagittal ramus osteotomy. BACKGROUND: Dento-skeletal deformities are treated combining orthodontic treatment with orthognathic surgery. One of the techniques most used in this type of surgery is the sagittal osteotomy of the mandible. This technique offers many advantages, but within its disadvantages is the inferior alveolar nerve paresthesia. There are various treatments that aim to recovery of the nerve bundle, and one of them is low intensity laser treatment. The aim of this study was to evaluate the effectiveness of low intensity laser therapy in the recovery of neurosensorial tissues after mandibular sagittal osteotomy during orthognathic surgery. METHODS: Twelve patients submitted to surgery, using mandibular sagittal osteotomy, were treated unilaterally with low intensity infrared (808 nm, GaAlAs active medium) laser, following the inferior alveolar nerve path. The other part of the mandible was treated by placebo. The parameters used were 100 mW of power, irradiancy of 3.6 W/cm2, 2.8J energy per point, an energy density of 100 J/cm2, 28 seconds at each point with a distance of 1.0 cm between points, two sessions per week with a minimum of 10 sessions, starting 48 hours after surgery. Mechanical evaluation was performed in first, fourth, seventh and tenth session. RESULTS: Significant improvement on the treated side was observed. Comparing the behavior among the variables between the treatment (T) group and the control (C) group in the General Recovery was showed a tendency to better results in the T group when compared to the C group, with statistical difference (Pâ‰¤0.05) after the 10th laser therapy session. CONCLUSIONS: The treatment of neurosensorial disorders with infrared low intensity laser could be effective in accelerating recovery, providing greater comfort to the patient, and it presents advantages over other existing methods. Humans;Low-Level Light Therapy;Mandible;Mandibular Nerve;Orthognathic Surgical Procedures;Osteotomy, Sagittal Split Ramus

Minocycline-induced hyperpigmentation: rapid resolution after 755nm alexandrite picosecond laser treatment. Minocycline-induced pigmentation (MIP) is an infrequent complication of minocycline therapy, with four subtypes each with distinct clinical features and histologic staining patterns. MIP may resolve following discontinuation of minocycline therapy or it may persist indefinitely. A 64-year-old Caucasian male presented with a 6Â month history of progressive blue-gray facial pigmentation distributed symmetrically over his face. One session utilizing a 755Â nm picosecond Alexandrite laser resulted in immediate and significant clearance of the pigment in all treated areas. Long-term follow-up at 2Â years revealed no recurrence of the MIP. Anti-Bacterial Agents;Minocycline Anti-Bacterial Agents;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Minocycline

The photobiomodulation therapy together with the use of cord blood platelet gel could be safely suggested as primary treatment for oral lesions in patients with inherited epidermolysis bullosa. Gels Adolescent;Adult;Blood Platelets;Child;Child, Preschool;Combined Modality Therapy;Epidermolysis Bullosa;Female;Fetal Blood;Gels;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Pain;Treatment Outcome;Wound Healing;Young Adult

Transcranial Photobiomodulation (tPBM) With 1,064-nm Laser to Improve Cerebral Metabolism of the Human Brain In Vivo. BACKGROUND AND OBJECTIVES: In our previous proof-of-principle study, transcranial photobiomodulation (tPBM) with 1,064-nm laser was reported to significantly increase concentration changes of oxygenated hemoglobin (âˆ†[HbO]) and oxidized-state cytochrome c oxidase (âˆ†[oxi-CCO]) in the human brain. This paper further investigated (i) its validity in two different subsets of young human subjects at two study sites over a period of 3 years and (ii) age-related effects of tPBM by comparing sham-controlled increases of âˆ†[HbO] and âˆ†[oxi-CCO] between young and older adults. STUDY DESIGN/MATERIALS AND METHODS: We measured sham-controlled âˆ†[HbO] and âˆ†[oxi-CCO] using broadband near-infrared spectroscopy (bb-NIRS) in 15 young (26.7â€‰Â±â€‰2.7 years of age) and 5 older (68.2â€‰Â±â€‰4.8 years of age) healthy normal subjects before, during, and after right-forehead tPBM/sham stimulation with 1,064-nm laser. Student t tests were used to test statistical differences in tPBM-induced âˆ†[HbO] and âˆ†[oxi-CCO] (i) between the 15 young subjects and those of 11 reported previously and (ii) between the two age groups measured in this study. RESULTS: Statistical analysis showed that no significant difference existed in âˆ†[HbO] and âˆ†[oxi-CCO] during and post tPBM between the two subsets of young subjects at two study sites over a period of 3 years. Furthermore, the two age groups showed statistically identical net increases in sham-controlled âˆ†[HbO] and âˆ†[oxi-CCO]. CONCLUSIONS: This study provided strong evidence to validate/confirm our previous findings that tPBM with 1,064-nm laser enables to increase cerebral âˆ†[HbO] and âˆ†[oxi-CCO] in the human brain, as measured by bb-NIRS. Overall, it demonstrated the robust reproducibility of tPBM being able to improve cerebral hemodynamics and metabolism of the human brain in vivo in both young and older adults. Lasers Surg. Med. Â© 2020 The Authors. Lasers in Surgery and Medicine published by Wiley Periodicals, Inc. Aged;Brain;Child, Preschool;Hemodynamics;Humans;Lasers;Reproducibility of Results;Spectroscopy, Near-Infrared

Bond strength of root canal filling with radicular dentin previously treated with either photobiomodulation or photodynamic therapy: Effect of disinfection protocols. PURPOSE: The aim of the present study was to establish an assessment regarding the efficacy of final disinfection protocols and sealers on the bond strength (BS) of root canal (RC) filling materials on root dentin which has already been treated with photobiomodulation (PBT) or photodynamic therapy (PBT) respectively. METHODS: One-hundred and twenty root canals were included in the present study. The selected teeth were cleaned and shaped to accept the obturation. The prepared specimens were

subjected to laser therapy (PBT and PDT) and were randomized into three groups (n = 20/group) on the basis of irrigation technique: Group 1: distilled water (DW) + ultrasonic irrigation (UI); Group 2: 17 % EDTA; Group 3: 0.2 % Chlorhexidine digluconate (CHx) respectively. Each specific group was further divided into two subgroups (n = 10), based on endodontic sealing agent incorporated during obturation: AH Plus or MTA Fillapex. The push-out test was used to gauge the BS, whereas the evaluation was done with the help of two-way ANOVA which was followed by a subsequent Tukey post-hoc test. The chi-square test was used to calculate the mode of failure in the selected specimens (Î± = 5%). RESULTS: The final irrigation protocols of 17 % EDTA and CHX helped to enhance the BS of RC filling material with either sealer agent used ($p < 0.05$), whereas, AH Plus reported an increase in the values of BS as compared to its counterpart, MTA Fillapex ($p < 0.05$). Increased values of cohesive failure were associated with all the groups, irrespective of the tested final irrigation protocols and RC sealer agents ($p < 0.05$). There was no significant difference between the laser therapies among all the groups ($p < 0.05$). CONCLUSIONS: The use of 17 % EDTA and CHX and sealing material AH Plus increased the BS of the obturation on radicular dentin previously subjected to either of the mentioned laser therapies. Furthermore, no significant effect on the BS was observed with the use of lasers in the study. Epoxy Resins;Photosensitizing Agents;Root Canal Irrigants Dental Pulp Cavity;Dentin;Disinfection;Epoxy Resins;Materials Testing;Photochemotherapy;Photosensitizing Agents;Root Canal Irrigants;Root Canal Preparation

There does not seem to be any benefit from using low-level laser therapy to treat temporomandibular pain after 1Â year. Facial Pain;Humans;Low-Level Light Therapy

Effectiveness of Led Photobiomodulation Therapy on Treatment With Knee Osteoarthritis: A Rat Study. OBJECTIVE: The present study aimed to evaluate the effectiveness of photobiomodulation therapy by light-emitting diode on osteoarthritis treatment in the knees of rats. DESIGN: Twenty male Wistar rats were randomly assigned into two experimental groups: OAC: animals subjected to induction of osteoarthritis, without therapeutic intervention and the group OAL: animals subjected to induction of osteoarthritis treated with light-emitting diode photobiomodulation therapy (850 nm, 200 mW, 6 J). RESULTS: The results of gait analysis showed no statistical difference between the groups. The histological findings showed that the OAL group presented abnormal chondrocyte orientation, yet with less irregularities along fibrillation and the joint tissue. Thus, it presented a lower degenerative process when evaluated by the Osteoarthritis Research Society International. Likewise, in the immunohistochemical analysis, the OAL group showed higher collagen 2 and transforming growth factor Î² immunoexpression when compared with the OAC group. CONCLUSIONS: Given the above, it is possible to suggest that the photobiomodulation therapy by light-emitting diode had positive effects on the expression of extracellular matrix proteins responsible for synthesis of articular tissue. Collagen Type II;Transforming Growth Factor beta Animals;Chondrocytes;Collagen Type II;Disease Models, Animal;Gait Analysis;Immunohistochemistry;Low-Level Light Therapy;Osteoarthritis, Knee;Rats, Wistar;Stifle;Transforming Growth Factor beta

Measurement of Physical Parameters and Development of a Light Emitting Diodes Device for Therapeutic Use. Effectiveness of light-emitting diode (LED) in biological tissue is due to the correct application of physical parameters. However, most studies found do not provide complete information on the physical characteristics of the diodes. It is necessary to carefully evaluate the diode parameters so that the results of research with this feature can be reproduced. The objective of this study was to develop a light-emitting device using LED, with proper measurements for application in clinical research. It was used 267 LEDs, powered with 12-V voltage and fixed on a plate of ethylene-vinyl acetate (25â€‰Ã—â€‰42 cm), equidistant at 1.0Â cm. For the calculation of red and infrared irradiation, a spectrometer was used, and the data were processed in routines

implemented in the OriginPro 8.5.0 SR1 Software. The irradiance was determined by the integration of the spectral irradiation in the LED emission region. The red LED has a wavelength of 620â€‰Â±â€‰10Â nm, a power density of 52.86Â mW/cm(2), power of 6.6Â mW, and total power of 1.76Â W on the device. The infrared LED has a wavelength of 940â€‰Â±â€‰10Â nm, power density 33.7Â mW/cm(2), power of 6Â mW, and total power of 1.6Â W on the device. The LED characterization enables the generation and application of energy with greater precision and reproducibility. Besides, it is a light source, a device capable of framing large areas, reducing the time and cost of the application in different clinical conditions related to neuromuscular performance or rehabilitation. Equipment Design;Humans;Infrared Rays;Phototherapy;Reproducibility of Results

Oral management of pemphigus vulgaris in the intensive care unit. Pemphigus vulgaris (PV) is a rare and potentially lethal autoimmune disease that affects the skin and mucous membranes. Injuries caused by the disease cause pain, risk of infection, and other complications that result in a high mortality rate. Frequently, management of the PV requires intensive care and a multidisciplinary approach. Oral lesions of PV are usually the first clinical signs of the disease and the last lesions to heal, requiring treatment by a specialized dental team. The aim of this study was to report two clinical cases of PV with involvement of the oral mucosa. The patients were admitted to an intensive care unit, and underwent multidisciplinary management of their condition along with low-level laser therapy. Both cases demonstrated the importance of specialized dental care in improving the quality of life of patients with PV. Administration, Oral;Humans;Intensive Care Units;Mouth Mucosa;Pemphigus;Quality of Life

Low-level laser therapy and narrative review of other treatment modalities in androgenetic alopecia. Androgenetic alopecia (AGA), also termed as androgenic alopecia or common baldness, is a condition where there is androgen mediated conversion of susceptible terminal hair into vellus hair. Although it is reported more commonly in males, it also affects females but the incidence is relatively unknown. AGA tremendously affects the psychology of the patient due to its chronicity of treatment and cosmetic implications. There are numerous treatment options available for AGA but the choice of treatment has to often be tailored according to the patient's needs, affordability, and compliance. This review focusses on the various treatment options available, with special emphasis on the role of low-level laser therapy (LLLT) in the management of AGA. The literature research considered published journal articles (clinical trials or scientific reviews). Studies were identified by searching electronic databases (MEDLINE and PubMed) and reference lists of respective articles. Only articles available in English were considered for this review. Androgen Antagonists;Minoxidil Alopecia;Androgen Antagonists;Hair;Humans;Low-Level Light Therapy;Minoxidil;Platelet-Rich Plasma

Photobiomodulation with 630-nm LED radiation inhibits the proliferation of human synoviocyte MH7A cells possibly via TRPV4/PI3K/AKT/mTOR signaling pathway. Phototherapy has been used to treat postoperative pain and inflammatory response in rheumatoid arthritis. Confidence in this approach, however, is impaired by lack of understanding of the light-triggered cellular and molecular mechanisms. The purpose of this study was to characterize the response of human synoviocyte MH7A cells to visible LED red light in an attempt to elucidate the associated action mechanism. Human synoviocyte MH7A cells were treated with 630-nm LED light after stimulation of tumor necrosis factor-Î± (TNF-Î±). The effects of light radiation on cell proliferation and migration were detected by MTT assay and scratch test. The expressions of inflammatory cytokines were measured using RT-qPCR. This was followed by detection of the levels of extracellular proteins IL-6 and IL-8 after differential radiation. Furthermore, the expression levels and activation of proteins on PI3K/AKT/mTOR signaling pathway were examined with Western blot. In terms of the proliferation and migration, repeated radiation with LED red light (630Â nm, 26 and 39Â J/cm(2)) exerted an

inhibitory effect on synoviocyte MH7A cells. Expression of inflammatory factors (IL-6, IL-1Î², IL-8, and MMP-3) was reduced; meanwhile, the expression of anti-inflammatory factor IL-10 was promoted. At the protein level, treatment with 39Â J/cm(2) of LED red light could decrease the level of extracellular protein (IL-6 and IL-8) and affect the expression and phosphorylation of proteins on TRPV4/PI3K/AKT/mTOR signaling pathway induced by TNF-Î±. These results demonstrated that LED red light (630Â nm) inhibits proliferation and migration of MH7A cells. The growth-inhibiting effects of LED red light on human synoviocyte MH7A cells appear to be associated with regulation of the TRPV4/PI3K/AKT/mTOR signaling pathway. Cytokines;Inflammation Mediators;RNA, Messenger;TRPV Cation Channels;TRPV4 protein, human;MTOR protein, human;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases Cell Line;Cell Movement;Cell Proliferation;Cell Survival;Cytokines;Dose-Response Relationship, Radiation;Gene Expression Regulation;Humans;Inflammation Mediators;Low-Level Light Therapy;Models, Biological;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;RNA, Messenger;Signal Transduction;Synoviocytes;TOR Serine-Threonine Kinases;TRPV Cation Channels

Successful and quick treatment of nevus of Ota with 755nm picosecond laser in Chinese. Nevus of Ota, also known as nevus fusco-caeruleus ophthalmo-maxillaris, is a benign dermal melanocytosis. In the past, this disease was usually treated by Q-switched laser therapy, but the course of treatment was relatively long. In recent years, it has been reported that 755nm picosecond laser, which was firstly reported to treat tattoos, is also effective in the treatment of nevus of Ota. Here, we report six cases of nevus of Ota which were treated with 755nm picosecond laser in Chinese people. We find amazingly that these lesions almost disappeared after only one or two sessions of treatment. Adolescent;Child, Preschool;China;Female;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Nevus of Ota;Skin Neoplasms;Young Adult

The Effect of Cigarette Smoking And Low-Level Laser Irradiation in RANK/RANKL/OPG Expression. The objective of this study was to investigate the effects of low-level laser therapy (LLLT) and cigarette smoke on alveolar socket osteoclastogenesis signaling after tooth extraction, in rats. Sixty male Wistar rats were randomly assigned to four groups with 15 animals each: Control Group (with right maxillary molar extraction - ME), Experimental I (with ME and LLLT), Experimental II (with ME and cigarette smoke) and Experimental III group (with ME, LLLT and cigarette smoke). Euthanasia was performed at 3, 7 and 14 days postoperative. qRT-PCR was used to evaluate expression of Tnfrsf11a (RANK), Tnfsf11 (RankI) and Tnfrsf11b (OPG). Data were submitted to statistical analysis using two-way ANOVA followed by Bonferroni test (Î±=0.05). There was an upregulation of RANK, RANKL and OPG genes over all the time of healing in Exp I group compared to control group. Exp II group showed a decreased expression of all genes over time, whereas Exp III genes expression were higher than Exp II values but lower than Control and Exp I values over time. The results of this study concluded that the LLLT had a positive effect, whereas cigarette smoke had a negative effect on RANK, RANKL and OPG gene expression in bone remodeling process. Animals;Cigarette Smoking;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tooth Extraction;Wound Healing

What do Cochrane Systematic Reviews say about conservative and surgical therapeutic interventions for treating rotator cuff disease? Synthesis of evidence. BACKGROUND: Shoulder pain is considered to be the third largest cause of musculoskeletal functional alterations in individuals presenting pain during movement. OBJECTIVE: The purpose of this synthesis of evidence was to identify the clinical effectiveness of conservative and surgical treatments reported in Cochrane systematic reviews among individuals diagnosed with rotator cuff disease. DESIGNAND SETTING: Review of systematic reviews, conducted in the Federal University of SÃ£o Paulo (Universidade Federal de SÃ£o Paulo, UNIFESP). METHODS: This synthesis of evidence included systematic reviews that had been published in the Cochrane database. The inclusion criteria were that these systematic

reviews should involve individuals aged â‰¥ 16 years with rotator cuff disease, comparing surgical procedures with or without associated nonsurgical procedures versus placebo, no treatment or other nonsurgical interventions. RESULTS: Thirty-one systematic reviews were included, involving comparisons between surgical procedures and conservative treatment; procedures either combined or not combined with drugs, versus other procedures; and procedures involving exercises, manual therapy and electrothermal or phototherapeutic resources. CONCLUSIONS: The findings suggest that strengthening exercises, with or without associated manual therapy techniques and other resources, were the interventions with greatest power of treatment over the medium and long terms, for individuals with shoulder pain. These had greater therapeutic power than surgical procedures, electrotherapy or photobiomodulation.Protocol registration number in the PROSPERO database: ID - CRD42018096578. Conservative Treatment;Evidence-Based Medicine;Exercise;Humans;Pain Management;Phototherapy;Rotator Cuff Injuries;Shoulder Pain;Systematic Reviews as Topic;Treatment Outcome

Level of pain, muscle strength and posture: effects of PBM on an exercise program in women with knee osteoarthritis - a randomized controlled trial. To evaluate the effectiveness of an exercise program associated to photobiomodulation (PBM) on pain, postural changes, functionally, and muscular strength in women, one of the risk factors, with knee osteoarthritis (OA). A randomized controlled trial, with a blinded assessor and intention-to-treat analysis and placebo control. Sixty-two participants with knee OA (with confirmed radiological diagnosis) were evaluated for this study. However, 34 were considered eligible and were randomized into two groups: EPPG - exercise and PBM placebo group (nâ€‰=â€‰17) and EPAG - exercise and PBM active group (nâ€‰=â€‰16), but one participant was excluded of EPAG. The exercise program and PBM (808Â nm, 100Â mW/point, 4Â J/point, 56Â J total, 91Â J/cm(2)) were realized twice a week, during 8Â weeks. West Ontario and the McMaster University Osteoarthritis Index (WOMAC) and Lequesne questionnaires, 1-repetition maximum test (1-RM) and posture evaluation software (SAPO) were used to analyze the effects of the therapies. In intragroup analysis, a significant improvement in pain WOMAC (pâ€‰<â€‰0.001), stiffness (pâ€‰<â€‰0.001), function (pâ€‰<â€‰0.001), Lequesne (pâ€‰<â€‰0.001), and 1-RM (all muscle groups) (pâ€‰<â€‰0.001)Â were observed. In this study, the exercise program improved pain, function, and muscle strength of all the participants. However, PBM, in the parameters used, did not optimize the effects of the exercise program in women with knee OA. Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Osteoarthritis, Knee;Pain;Pain Measurement;Posture;Surveys and Questionnaires

The influence of educational measures and low-level laser phototherapy on temporomandibular disorders: Study protocol clinical trial (SPIRIT Compliant). Photobiomodulation therapy (PBMT) with low-power laser is used for pain relief in several clinical conditions, including temporomandibular disorders (TMD). As musculoskeletal pain often produces changes in motor behavior, it is common for patients with TMD to present limited mandibular movements. To the date, there is no consensus about the optimal dosimetric parameters of PMBT for TMD. This randomized, controlled, double-blind clinical trial aims to evaluate pain relief and mandibular mobility in patients with TMD following treatments with 2 laser wavelengths, red (660â€Šnm) and infrared (808â€Šnm) individually and in combination as compared to a placebo treatment. One-hundred participants presenting myalgia and arthralgia, with disk displacement or not, will be selected based on the Research Diagnostic Criteria for Temporomandibular Disorders. All participants will be instructed about the etiology, prognosis, and self-care techniques for pain control on TMD, and followed up for 2 weeks. After this period, those who still present pain score over 4 in a visual analog scale (VAS) will be included in the study. Participants will be randomly assigned to 4 treatment groups: G1 = placebo (SHAM); G2 = PBMT with red laser (660â€Šnm, 0.034â€Šcm, 88â€ŠJ/cm, 100 mW, 3â€ŠJ/point); G3 =

PBMT with infrared laser (808â€Šnm, 0.034â€Šcm, 88â€ŠJ/cm, 100 mW, 3â€ŠJ/point); and G4 = PBMT with red and infrared laser alternated between sessions. The treatment consists of 8 sessions, 2 times a week. The effect of the proposed therapies will be measured by: pain reduction in VAS; pressure pain threshold on TMJ, masseter and temporal muscles; and the amplitude of mandibular movements (opening, protrusion, and right and left lateral movements). The data will be collected at the following times: initial (T1), after the 1st treatment session (T2), at the end of treatment (T3), and 30 days after the last PBMT session (T4). For statistical analysis will be used 2-way repeated measures analysis of variance test, complemented by a post hoc Tukey test (Pâ€Š<â€Š.05). Double-Blind Method;Humans;Low-Level Light Therapy;Pain Measurement;Patient Education as Topic;Randomized Controlled Trials as Topic;Research Design;Temporomandibular Joint Disorders

Study of transcranial photobiomodulation at 945-nm wavelength: anxiety and depression. Transcranial photobiomodulation is an innovative method for the stimulation of neural activity which consists of the exposure of neural tissue to low-level light irradiance. In the present study, light-emitting diodes (LEDs) were used as light source due to their practicality and low cost. The objective was to analyze the effects of transcranial photobiomodulation using 945-nm LED in university students with anxiety and depression. Sample was composed of 22 individuals (17-25Â years of age) divided into 2 groups of 11. LED group was treated with 945-nm LEDs for 1Â min and 25Â s (9.35Â J/cm(2)), while in the placebo group, the device was off when placed in contact with the frontal bone for the same amount of time as in treatment group. Participants were evaluated at baseline and after 30Â days with the hospital anxiety and depression scale (HADS), the faces test, the designs test, and the grip strength test. On the HADS for anxiety, the mean PAB, PAA, PhAB, and PhAA were 13.89â€‰Â±â€‰3.55, 12.82â€‰Â±â€‰3.18, 10.75â€‰Â±â€‰2.49, and 6.66â€‰Â±â€‰2.50 points, respectively. In the HADS for depression, the mean for the PDB group was 13.89â€‰Â±â€‰3.55 points, in the PhDB group 12.82â€‰Â±â€‰3.18 points, in the PDA group 10.75â€‰Â±â€‰2.49 points, and in the PhDA group 6.66â€‰Â±â€‰2.50 points. In the PA and PD groups, mean values of 8.0â€‰Â±â€‰1.5 and 8.9â€‰Â±â€‰1.26 scores were obtained, but did not reach significance; however, between PA and PhD analysis, a significance level of pâ€‰=â€‰0.0003 was obtained. The 945-nm LED transcranial photobiomodulation improves brain activity and may clinically decrease anxiety and depression.
Adolescent;Adult;Anxiety;Depression;Female;Hand Strength;Humans;Low-Level Light Therapy;Male;Memory;Young Adult

A Comparative Assessment of Pain Caused by the Placement of Banded Orthodontic Appliances with and without Low-Level Laser Therapy: A Randomized Controlled Prospective Study. Patients still refuse or discontinue orthodontic treatment due to related pain and discomfort. In this study, we investigate if low-level laser therapy (LLLT) can reduce pain caused by orthodontic bands. Sixty subjects who needed bands placed on the upper permanent first molars were assigned randomly to the LLLT group, placebo, and control groups. Inclusion criteria were: age range 10-14 years, fully erupted upper first molars in healthy condition, presence of tight mesial proximal contact. Exclusion criteria were: systemic or metabolic diseases, chronic pain or neurological or psychiatric disorders, use of pharmacological agents interfering with pain perception, previous orthodontic treatment or the simultaneous presence of other devices in the patient's mouth. The assessment of pain was performed by using a numeric rating scale (NRS) considering different time intervals, i.e., immediately after bands placement, 6 h, 24 h, and from day 2 to day 5. Differences in the maximum pain and in pain experienced at each time-point, among the three groups, was assessed by using the Kruskal-Wallis H. The final sample included 56 patients, 29 males, and 27 females, with a mean age of 12.03 Â± 1.3 years. Patients were randomly allocated into three groups (tested, control, and placebo group) with each group consisting respectively of 19, 20, and 17 individuals. Subjects in the LLLT experienced

less pain at each time interval as well as the maximum pain score being lower in the LLLT compared to control and placebo groups. These findings were all statistically significant ($p < 0.05$). LLLT can alleviate the intensity of pain after the placement of orthodontic bands.

Organic Light-Emitting Diodes: Pushing Toward the Limits and Beyond. Organic light-emitting diodes (OLEDs) are established as a mainstream light source for display applications and can now be found in a plethora of consumer electronic devices used daily. This success can be attributed to the rich luminescent properties of organic materials, but efficiency enhancement made over the last few decades has also played a significant role in making OLEDs a practically viable technology. This report summarizes the efforts made so far to improve the external quantum efficiency (EQE) of OLEDs and discusses what should further be done to push toward the ultimate efficiency that can be offered by OLEDs. The study indicates that EQE close to 58% and 80% can be within reach without and with additional light extraction structures, respectively, with an optimal combination of cavity engineering, low-index transport layers, and horizontal dipole orientation. In addition, recent endeavors to identify possible applications of OLEDs beyond displays are presented with emphasis on their potential in wearable healthcare, such as OLED-based pulse oximetry as well as phototherapeutic applications based on body-attachable flexible OLED patches. OLEDs with fabric-like form factors and washable encapsulation strategies are also introduced as technologies essential to the success of OLED-based wearable electronics.

A Randomized, Controlled Trial on the Effectiveness of Photobiomodulation Therapy and Non-Contact Selective-Field Radiofrequency on Abdominal Adiposity in Adolescents With Obesity. BACKGROUND AND OBJECTIVES: Structured physical activities and dietary control have traditionally been used with the aim of controlling obesity. However, effective auxiliary modalities still needed to reduce local obesity, specifically abdominal obesity. This study examined the adjunct effect of photobiomodulation therapy (PBMT), and non-contact selective-field radiofrequency (NcRF) on abdominal adiposity in adolescents with obesity. STUDY DESIGN/MATERIALS AND METHODS: Fifty-four adolescents with obesity (33 females and 21 males) took part in this study and were distributed randomly into three treatment-based groups. Control group (nâ€‰=â€‰18, age; 14.61â€‰Â±â€‰1.14 years), PBMT group (nâ€‰=â€‰18, age; 14.22â€‰Â±â€‰0.88 years), and NcRF group (nâ€‰=â€‰18, age; 15.11â€‰Â±â€‰0.96 years). A dietary control plan of 1,000-1,200â€‰kcal/day, and a 60-minute aerobic exercise program conducted day-by-day over 4 weeks were provided for all participants. Additionally, the PBMT group received 12 20-minute PBMT on the abdominal area (energy/session ~4.08â€‰J/cm(2)) thrice/week, and the NcRF group underwent four 30-minute treatments with NcRF on the abdominal area once/week. Waist/hip ratio (W-to-H ratio), intra-abdominal fat thickness (IAFT), and the subcutaneous-abdominal fat thickness (SAFT) were observed at the baseline and after 4 weeks. RESULTS: The W-to-H ratio and SAFT reduced significantly in the PBMT group compared with either the control group (Pâ€‰=â€‰0.001 and 0.001, respectively) or the NcRF group (Pâ€‰<â€‰0.001 and Pâ€‰=â€‰0.046, respectively) post-intervention. However, the IAFT and IAFT/SAFT ratio did not differ significantly among the study groups (Pâ€‰>â€‰0.05). CONCLUSION: Our analysis shows that PBMT is more efficient than NcRF for the reduction of W-to-H ratio and SAFT in adolescents with obesity. Lasers Surg. Med. Â© 2020 Wiley Periodicals, Inc. Adiposity;Adolescent;Exercise;Female;Humans;Low-Level Light Therapy;Male;Obesity, Abdominal;Pediatric Obesity

Medication association and immunomodulation: An approach in fungal diseases and in particular in the treatment of paracoccidioidomycosis. Fungal infections have been increasing in recent decades, mainly affecting immunocompromised individuals, although certain mycoses, such as paracoccidioidomycosis (PCM), infect immunologically competent individuals. The major problems observed regarding fungal diseases are inadequate diagnosis, prolonged treatment time, the reduced

number of drugs available for treatment, in addition to the fact that there are no vaccines for clinical use. Drug combination in order to immunomodulate the immune response is a new strategy used for the treatment of mycoses, since it is difficult to develop new antifungal drugs. The aim of this study is to present and analyze strategies recently suggested for the treatment of fungi of medical interest, in particular for PCM, such as the utilization of combinations of protein fractions or dead microorganisms, as vaccinal antigens, and cellular immunotherapy. We will also propose new therapeutic alternatives, such as lipids, vitamins, synthetic or natural products as well as the use of low intensity LASER therapy (LLLT) to modulate the immune response of the host, enhancing the efficiency of the existing treatments of mycoses of medical interest and in particular of PCM. Antifungal Agents Antifungal Agents;Humans;Immunomodulation;Immunotherapy;Paracoccidioidomycosis

Epiderm-Abrasion-Assisted Intensive Pulsed Light and Radiofrequency in Aesthetic Treatment Extensive Facial Freckles. BACKGROUND: Freckles are typical epidermal pigmented disorders that occur at sun-exposed areas, presenting with dark-brown or light-brown circular hyperpigmentation. A lot of treatment modalities have been used for treatment of freckles like chemicals, electrosurgery and cryotherapy. These treatments may cause undesirable side effects such as scaring (Sarkar et al. in Indian J Dermatol 62(6):578-584, 2017). Microdermabrasion has been used in treatment of freckles; however, the results are not satisfactory, as it removes the outermost layer of the epidermis only (El-Domyati et al. in J Cosmet Dermatol 15(4):503-513, 2016). Also ablative lasers and non-ablative lasers have been used but have not proved to be completely satisfactory and share a common risk of post-inflammatory hyperpigmentation (Jang et al. in Dermatol Surg 26:231-234, 2000). In our study, we have used epiderm-abrasion-assisted intensive pulsed light (IPL) and radiofrequency (RF) to study their effect in treatment of freckles. PATIENTS AND METHODS: this prospective controlled clinical trial was carried out on 48 patients, who presented with extensive facial freckles, in the period between March 2015 and April 2018. The epiderm-abrasion procedure was performed first, and then, electro-photobiomodulation sessions were started two weeks later. RESULTS: This study was carried out on 48 patients, 39 female and 9 males. Their age ranged between 12 and 58Â years old. According to Fitzpatrick classification, four patients were type II, 30 patients were type III, and 14 patients were type IV. The results were excellent in 32 cases, good in 12 cases, fair in four cases, and we have no poor results. Side effects like hyperpigmentation were reported in three patients (6.3%), one case grade III and two cases grade IV Fitzpatrick skin type. No cases with hypopigmentation, or scars, were reported. CONCLUSIONS: Epiderm-abrasion and electro-photobiomodulation (IPL&RF) are effective methods in treatment of facial freckles. Some complications may occur post-procedure such as hyperpigmentation, hypopigmentation and abnormal scarring. LEVEL OF EVIDENCE IV: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Adolescent;Adult;Child;Dermabrasion;Epidermis;Esthetics;Female;Humans;Male;Melanosis;Middle Aged;Prospective Studies;Treatment Outcome;Young Adult

Effects of Photobiomodulation with Low-level Laser Therapy on Muscle Repair Following a Peripheral Nerve Injury in Wistar Rats. Peripheral nerve injury (PNI) can lead to sensory and/or motor impairment. As a treatment photobiomodulation (PBM) has demonstrated positive effects in terms of the maintenance of muscle activation and trophism. Wistar rats were divided into five groups: control, injury, injuryÂ +Â PBMn (irradiation over injured nerve), injuryÂ +Â PBMm (irradiation over affected muscle) and injuryÂ +Â PBMnm (irradiation over nerve and muscle). The left sciatic nerve was submitted to a crushing injury. Treatment was administered with low-level laser (780Â nm, 0.04Â cm(2) , 1Â WÂ cm(-2) , 3.2Â J) over the injured nerve and/or the tibialis anterior muscle. The

effects of PBM were favorable on muscle morphology and gene expression of calcineurin, myogenin and acetylcholine receptors. PBM led to an acceleration on muscle repair process, and effects were more evident in 2Â weeks after PNI. Thus, PBM is indicated for the area over both the injured nerve and the affected muscle. Animals;Low-Level Light Therapy;Peripheral Nerve Injuries;Rats;Rats, Wistar;Sciatic Nerve

Comparative evaluation of Low Level Laser Therapy and cryotherapy in pain control and wound healing following orthodontic tooth extraction: A double blind study. PURPOSE: To compare and evaluate pain and healing following orthodontic tooth extraction using Low Level Laser Therapy [LLLT] and Cryotherapy. MATERIALS AND METHODS: 62 patients referred for orthodontic extraction of bilateral bicuspids were included. Subjects were alternatively divided into two groups with 31 patients each. One of the bilateral extraction sites was subjected to either intervention, LLLT or Cryotherapy, while the other site was kept as control. Pain was assessed for 7 consecutive days by Visual Analogue Scale and Wound healing on 4(th), 7(th) and 14(th) days using a modified wound healing scale. RESULTS: Pain scores were generally better for Group I [LLLT] when compared to Group II [Cryotherapy] on all days. The highest mean score for pain observed on the 1(st) post-extraction day was 4.00Â Â±Â 0.93 and 4.16Â Â±Â 0.93 for Group I and Group II respectively [pÂ =Â 0.42]. It was also observed that LLLT helped in better wound healing as compared to cryotherapy with a significant difference in wound healing on 7(th) [mean score for Group I and Group II- 1.16Â Â±Â 0.52 and 1.6Â Â±Â 0.62 respectively: pÂ =Â 0.01] and 14(th) [mean score Group I and Group II- 0.23Â Â±Â 0.43 and 1.0Â Â±Â 0.58 respectively: pÂ =Â 0.00] post-extraction days. CONCLUSION: LLLT has better analgesic and wound healing properties as compared to Cryotherapy, suggesting that LLLT should be preferred over cryotherapy whenever possible. Cryotherapy;Humans;Low-Level Light Therapy;Pain;Pain Management;Tooth Extraction;Wound Healing

Effect of photobiomodulation on recovery from neurosensory disturbances after sagittal split ramus osteotomy: a triple-blind randomised controlled trial. We have investigated the effect of photobiomodulation on the recovery of neurosensory function of the lip and chin after bilateral sagittal split osteotomy (BSSO). Laser irradiation was applied with a GaAs diode laser (continuous wave 980nm wavelength, power 100mW, and energy density 12J/cm(2)). It was maintained within a 0.5cm(2) area in a total of 12 points for 60seconds at each visit on each point. Unilateral extraoral contact photobiomodulation treatment was applied the day before operation and then on days 1, 3, 7, 14, 21, and 28 postoperatively. One side of the mandible was the intervention side and the other the control side. On the control side, the laser probe was turned off and placed on the chosen area. Neurosensory evaluations were made before and immediately after operation, and 30 days and 60 days postoperatively. Twenty-five patients were screened, and 18 who met the inclusion criteria were included in the study; 14 were women and the mean (SD) age was 23 (5) years. Analysis of the visual analogue scales for general sensibility, pain discrimination, directional discrimination, and 2-point discrimination showed a significant difference between the intervention and control sides after 30 days (p=0.0011, 0.0034, 0.0023, and 0.0160, respectively). The difference was also significant after 60 days (p=0.0001, 0.0002, 0.0003, and 0.0010, respectively). The thermal discrimination rate was significantly higher in the laser group than the control group 30 days after surgery (p=0.002), but after 60 days the difference was not significant (p=1.000). We found no side effects from the laser radiation during the two-month follow up. The results suggest that photobiomodulation accelerated the patients' improvement from neurosensory disturbance after BSSO. Chin;Female;Humans;Lasers, Semiconductor;Mandible;Mandibular Nerve;Osteotomy, Sagittal Split Ramus;Postoperative Complications;Trigeminal Nerve Injuries

Photobiomodulation Therapy Associated with Heterologous Fibrin Biopolymer and Bovine Bone Matrix Helps to Reconstruct Long Bones. Bone defects cause aesthetic and functional changes

that affect the social, economic and especially the emotional life of human beings. This complication stimulates the scientific community to investigate strategies aimed at improving bone reconstruction processes using complementary therapies. Photobiomodulation therapy (PBMT) and the use of new biomaterials, including heterologous fibrin biopolymer (HFB), are included in this challenge. The objective of the present study was to evaluate the influence of photobiomodulation therapy on bone tibial reconstruction of rats with biomaterial consisting of lyophilized bovine bone matrix (BM) associated or not with heterologous fibrin biopolymer. Thirty male rats were randomly separated into three groups of 10 animals. In all animals, after the anesthetic procedure, a noncritical tibial defect of 2 mm was performed. The groups received the following treatments: Group 1: BM + PBMT, Group 2: BM + HFB and Group 3: BM + HFB + PBMT. The animals from Groups 1 and 3 were submitted to PBMT in the immediate postoperative period and every 48 h until the day of euthanasia that occurred at 14 and 42 days. Analyses by computed microtomography (ÂµCT) and histomorphometry showed statistical difference in the percentage of bone formation between Groups 3 (BM + HB + PBMT) and 2 (BM + HFB) (26.4% Â± 1.03% and 20.0% Â± 1.87%, respectively) at 14 days and at 42 days (38.2% Â± 1.59% and 31.6% Â± 1.33%, respectively), and at 42 days there was presence of bone with mature characteristics and organized connective tissue. The ÂµCT demonstrated BM particles filling the defect and the deposition of new bone in the superficial region, especially in the ruptured cortical. It was concluded that the association of PBMT with HFB and BM has the potential to assist in the process of reconstructing bone defects in the tibia of rats. Biocompatible Materials;Fibrin Animals;Biocompatible Materials;Bone Matrix;Bone Regeneration;Cattle;Fibrin;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibia

Proton Nuclear Magnetic Resonance Spectroscopy Analysis of Mixtures of Chlorhexidine with Different Oxidizing Agents Activated by Photon-Induced Photoacoustic Streaming for Root Canal Irrigation. Objective: The aim of this in vitro study was to investigate the possible interactions between photon-induced photoacoustic streaming (PIPSâ„¢)-activated oxidizing agents and 2% chlorhexidine digluconate. Background data: There is no information about the safety of laser-activated oxidizing agents in combination usage with chlorhexidine gluconate. Materials and methods: Groups were designed as follows G1: 98% para-chloroaniline (PCA); G2: 2% chlorhexidine (CHX); G3: 5.25% sodium hypochlorite (NaOCl) +2% CHX; G4: 5.25% NaOCl (30â€‰sec PIPS activated) +2% CHX; G5: 5.25% NaOCl (60â€‰sec PIPS activated) +2% CHX; G6: 3.5% chlorine dioxide (ClO(2)) + 2% CHX; G7: 3.5% (ClO(2)) (30â€‰sec PIPS activated) +2% CHX; G8: 3.5% (ClO(2)) (60â€‰sec PIPS activated) +2% CHX. The laser-irrigation protocol was performed with an erbium:yttrium-aluminum-garnet laser with a wavelength of 2940â€‰nm equipped with a 140â€‰mm long endodontic fiber tip (PIPS) using 10â€‰mJ at 15â€‰Hz (0.15 W), per pulse operating outputs. Groups were analyzed with proton nuclear magnetic resonance spectroscopy, using PCA as an internal standard. Results: No free PCA was formed in any groups of mixtures or after PIPS activation. Conclusions: Mixing of 3.5% ClO(2) and 2% CHX does not form bulky precipitates, unlike the mixture NaOCl + CHX. PIPS activation does not cause changes in reactions of oxidizing agents. Aniline Compounds;Anti-Infective Agents, Local;Oxidants;Root Canal Irrigants;Sodium Hypochlorite;chlorhexidine gluconate;Chlorhexidine;4-chloroaniline Aniline Compounds;Anti-Infective Agents, Local;Chlorhexidine;Lasers, Solid-State;Low-Level Light Therapy;Oxidants;Photoacoustic Techniques;Proton Magnetic Resonance Spectroscopy;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite

Effects of Photobiomodulation on Daphnia magna Straus and their Sensitivity to Toxicant. This paper deals with the effect of photobiomodulation (PBM) on Daphnia magna S. and their sensitivity to cadmium sulfate, a known high toxic pollutant. In a first series of experiments, the effect of different He-Ne laser fluences irradiation (range 0.9-4300Â mJÂ cm(-2)) on the fertility of both parent

and filial generations (F1-F3) of the crustacean was studied. It was found that PBM in some cases significantly influenced the fertility of both irradiated crustaceans and their nonirradiated offspring. By selecting two fluences (9Â Â±Â 2Â mJÂ cm(-2) reducing fertility and 4.3Â Â±Â 0.9Â JÂ cm(-2) increasing it), the effect of these on toxicity of cadmium sulfate was evaluated. These experiments have shown that prior irradiation with low-intensity light of a helium-neon laser with 632.8Â nm wavelength can change the sensitivity of aquatic organisms to toxin cadmium sulfate. The degree and direction of changes depend on the toxicant concentration and the irradiation dose. Cadmium Compounds;Sulfates;cadmium sulfate Animals;Cadmium Compounds;Daphnia;Low-Level Light Therapy;Sulfates

Chemotherapy-Induced Peripheral Neuropathy: Causative Agents, Preventative Strategies, and Treatment Approaches. Chemotherapy-induced peripheral neuropathy (CIPN) is a chronic symptom associated with chemotherapy treatment. Symptoms and severity vary based on chemotherapeutic agent used and dose. At present, effective options for the prevention and treatment of CIPN are inadequate and clinical guidance is limited. Unknown mechanism of action, lack of efficacy in many traditional neuropathic pain medications, and inconsistent evidence in regard to drug therapy have further complicated evaluation of therapeutic options. Twenty-five studies were identified and evaluated for CIPN prevention and treatment potential. Findings for CIPN pharmacological prevention were inconclusive as literature was largely conflicting. Exercise may be an effective non-pharmacological CIPN prevention method with limited adverse effects, however additional supporting data is still required. For treatment of CIPN, pharmacological agents duloxetine and topical combination product containing baclofen, amitriptyline, and ketamine have data supporting use. Early stage trials have shown initial promise for non-pharmacological therapies Scrambler Therapy and Photobiomodulation. Significant research is required as CIPN symptoms can lead to decreased quality of life, chemotherapy dose reduction, and discontinuation of drug therapy. Antineoplastic Agents Antineoplastic Agents;Clinical Trials as Topic;Drug-Related Side Effects and Adverse Reactions;Humans;Neuralgia;Pain Management;Peripheral Nervous System Diseases;Quality of Life

Proteomic analysis of plasma proteins after low-level laser therapy in rats. The laser radiation absorbed by cells induces production of reactive oxygen species (ROS), followed by the development of oxidative stress. Proteins are major targets for ROS due to their abundance in biological systems. The aim of the present pilot study was to examine the effects of transcutaneous laser blood irradiation (TLBI), i.e., low-level laser therapy (LLLT) at 830 nm on plasma proteome in Wistar rats. Rats were irradiated in the heart area (i.e. coronary arteries) daily (i.e., for 9-day period), by commercially available GaAsAl diode laser (Maestro/CCM, Medicom Prague, Czech Republic, lambda=830 nm, power density 450mW/cm(2), daily dose 60,3 J/ cm(2), irradiation time 134 sec). The comparison of blood plasma proteome from irradiated and non-irradiated rats was performed utilizing 2D electrophoresis followed by MALDI TOF/TOF mass spectrometry. LLLT led to a quantitative change in the acute phase proteins with antioxidant protection i.e., haptoglobin (log(2) fold change (FC)=3.5), hemopexin (log(2) FC=0.5), fibrinogen gamma (log2 FC=1.4), alpha-1-antitrypsin (log(2) FC=-2.2), fetuin A (log2 FC=-0.6) and fetuin B (log2 FC=-2.3). In comparison to conventional biochemical methods, the changes in protein levels in blood plasma induced by LLLT offer a deeper insight into the oxidative stress response. Acute-Phase Proteins;Fetuins;Proteome Acute-Phase Proteins;Animals;Blood;Fetuins;Low-Level Light Therapy;Male;Pilot Projects;Proteome;Rats, Wistar

Transcranial photobiomodulation with near-infrared light from childhood to elderliness: simulation of dosimetry. Significance: Major depressive disorder (MDD) affects over 40 million U.S. adults in their lifetime. Transcranial photobiomodulation (t-PBM) has been shown to be effective in treating

MDD, but the current treatment dosage does not account for head and brain anatomical changes due to aging. Aim: We study effective t-PBM dosage and its variations across age groups using state-of-the-art Monte Carlo simulations and age-dependent brain atlases ranging between 5 and 85 years of age. Approach: Age-dependent brain models are derived from 18 MRI brain atlases. Two extracranial source positions, F3-F4 and Fp1-Fpz-Fp2 in the EEG 10-20 system, are simulated at five selected wavelengths and energy depositions at two MDD-relevant cortical regions-dorsolateral prefrontal cortex (dlPFC) and ventromedial prefrontal cortex (vmPFC)-are quantified. Results: An overall decrease of energy deposition was found with increasing age. A strong negative correlation between the thickness of extracerebral tissues (ECT) and energy deposition was observed, suggesting that increasing ECT thickness over age is primarily responsible for reduced energy delivery. The F3-F4 position appears to be more efficient in reaching dlPFC compared to treating vmPFC via the Fp1-Fpz-Fp2 position. Conclusions: Quantitative simulations revealed age-dependent light delivery across the lifespan of human brains, suggesting the need for personalized and age-adaptive t-PBM treatment planning.

Nonablative fractional laser therapy for treatment of actinic keratosis with 3-months follow-up. BACKGROUND: Actinic keratosis (AK) is a common skin disorder that is treated with different treatment modalities. AIMS: The aim of this study was to assess the therapeutic effect of a 1540-nm nonablative fractional laser on the AK. METHODS: Ten patients with 31 AK were included in the study according to the inclusion and exclusion criteria. Treatment with nonablative fractional laser (1540Â nm) 3 times at 4Â weeks intervals in a noncontact mode was applied. Clinical severity was assessed at each session and 3Â months after the last session. It is pertinent to mention that the patients were also involved in the assessment of improvement. RESULTS: The results of present study showed that in comparison to the baseline, 3-session AK therapy with nonablative fractional laser significantly not only improved the AK severity by 79%, but also reduced the AK counts (from 31 to 17). On the other hand, the patients consented to the therapeutic effect. CONCLUSION: According to the obtained results and available studies, it seems that therapy with a 1540-nm nonablative fractional laser could be considered as a safe and effective alternative therapeutic option for the treatment of AK. Follow-Up Studies;Humans;Keratosis, Actinic;Laser Therapy;Low-Level Light Therapy;Treatment Outcome

Androgenetic Alopecia in Gender Minority Patients. Androgenetic alopecia (AGA) is the most common type of hair loss in adults and may be particularly distressing for gender minority patients, given the close relation between hair and gender expression. Furthermore, use of gender affirming hormones such as testosterone in transmen and estrogen/antiandrogens in transwomen has a direct effect on hair growth distribution and density. Clinicians should thus be knowledgeable about the effects of sex hormones on the hair growth cycle to comfortably diagnose and treat AGA in gender minority patients. 5-alpha Reductase Inhibitors;Androgens;Dermatologic Agents;Estrogens;Finasteride;Minoxidil 5-alpha Reductase Inhibitors;Alopecia;Androgens;Dermatologic Agents;Estrogens;Finasteride;Hair Follicle;Humans;Low-Level Light Therapy;Minoxidil;Sex Reassignment Procedures;Sexual and Gender Minorities;Tissue Transplantation;Transgender Persons;Transplantation, Autologous

Methodological comments on: Efficacy of photodynamic therapy and low-level laser therapy against steroid therapy in the treatment of erosive-atrophic oral lichen planus. Photosensitizing Agents Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

Photobiomodulation Therapy for Cancer Treatment-Related Salivary Gland Dysfunction: A Systematic Review. Objective: Symptoms and clinical signs of decreased saliva secretion are a common after cancer therapy. The goal of this research is to systematically review the evidence about the efficacy of

photobiomodulation therapy (PBMT) for the management of cancer treatment-related xerostomia or salivary hypofunction. Methods: PubMed was searched for articles investigating the clinical effects of PBMT on cancer therapy-related xerostomia or hyposalivation. The publications that met the eligibility criteria were evaluated for the quality of the study design, physical parameter setting reproducibility, specifics of the treatment protocol, clinical outcomes, and adverse effects. The strongest evidence was given a heavier weight in the overall conclusions. Results: A total of 314 articles were identified, and 5 controlled trials were included in this systematic review. Most of the studies were in head and neck cancer patients treated with radiotherapy (RT) or radiochemotherapy (RT-CT), and one study was in dry mouth associated with hematopoietic stem cell transplantation (HSCT). Data showed conflicting results for either prevention or treatment of RT- or RT-CT-induced dry mouth or hyposalivation. The data for HSCT-related dry mouth were positive. Conclusions: Despite positive preliminary outcomes in most of the trials, it is too early to confidently determine the efficacy of PBM for cancer therapy-related hyposalivation or xerostomia. Antineoplastic Agents Antineoplastic Agents;Humans;Low-Level Light Therapy;Neoplasms;Radiotherapy;Salivary Gland Diseases

The Nd:YAG Laser or Combined with Er:YAG Laser Therapy for Oral Venous Lakes. Objective: The aim of the present study was to investigate the clinical treatment effect on oral venous lakes (OVL) treated with neodymium-doped yttrium aluminum garnet (Nd:YAG) laser or a combination of erbium-yttrium aluminum garnet (Er:YAG) laser. Patients and methods: Between June 2015 and March 2017, nine patients, suffering from OVL in the mandibular regions, were treated with Nd:YAG laser or combination of Nd:YAG laser and Er:YAG laser in our department. The Nd:YAG laser was mainly performed for the treatment of nine initial lesions. The preset parameters were as follows: average power of 5 W, frequency of 100â€‰Hz, microshort pulse (MSP), tip size of 300â€‰Î¼m, spot size of 3â€‰mm, irradiation distance of 3-4â€‰mm, and speed of 1-2â€‰mm/sec, sequential treatment. The power density at work was 57 W/cm(2). If postoperative scars occurred after the Nd:YAG treatment, the Er:YAG laser was used. The parameters were set as follows: power of 3.75 W, energy of 150â€‰mJ, frequency of 25â€‰Hz, very long pulse (VLP), tip size of 0.6â€‰mm, 40% water, and 60% gas. The patients were followed up for 4-8 weeks. The therapeutic results were graded on a 4-point scale system. Adverse effects after laser treatment were evaluated and managed accordingly. Results: With single Nd:YAG laser, the therapeutic outcome was excellent in seven patients (77.8%) and good in two patients (22.2%). Scar tissue was encountered in two patients 2 weeks after Nd:YAG laser therapy, and then Er:YAG laser was used for the scar removal. No mucosal necrosis was found in any of the patients. Conclusions: The Nd:YAG laser or combined with Er:YAG laser was an effective and safe treatment for patients with OVL in the mandibular region. Aged;Cohort Studies;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Mouth;Treatment Outcome;Varicose Veins

Does Low-level Laser Therapy Provide Additional Benefits to Exercise in Patients with Shoulder Musculoskeletal Disorders? A Meta-analysis of Randomised Controlled Trials. BACKGROUND: Low-level laser therapy as an adjunct to exercise is common in clinical practice; however, existing evidence for its recommendation is low. To determine whether low-level laser therapy provides additional benefits to exercise in patients with various shoulder musculoskeletal disorders. MATERIAL AND METHODS: An electronic search was conducted on seven databases, including The Cochrane Library, MEDLINE, and CINAH as well as grey literatures, for randomised controlled trials published in English from 1996 to 2018. Selected studies were independently screened and assessed for quality according to the Cochrane Grade of Recommendations, Assessment, Development and Evaluation. RESULTS: Eleven studies met the inclusion criteria for this review. Moderate evidence indicates that low-level laser therapy provides additional short-term benefit to exercise in improving overall pain

(10cm-VAS) (6 RCTs, GRADE quality moderate) (WMD: 1.75; 95% CI: 1.43 to 2.07). However, low evidence indicates that low-level laser therapy provides no additional benefit to exercise for shoulder function [5 RCTs; SWMD: -0.14; 95% CI: -0.79 to 0.25] and range of motions. CONCLUSIONS: 1. Physiotherapists may consider the use of low-laser therapy as an adjunct to exercise in the short run to improve pain in patients with shoulder musculoskeletal disorders. 2. However, low-laser therapy with exercise in the short-term is no more effective than exercise alone in improving shoulder function and range of motions. Adult;Aged;Aged, 80 and over;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Musculoskeletal Diseases;Randomized Controlled Trials as Topic

Use of a High-Power Laser for Wound Healing: A Case Report. Introduction: The use of low-level laser therapy to treat wounds and accelerate tissue healing has extensively been studied in recent years. The aim of this article is to describe a clinical case using an unfocused high-power laser instead of a low-power laser for therapy. Case Report: In the present article, we present the use of a high-power diode laser to treat an extensive knee injury that occurred after surgical treatment for total prosthesis due to border ischemia resulting from prolonged use of autostatic retractors. Conclusion: It is possible to use an unfocused high-power laser at a decreased intensity to accelerate healing as an adjuvant in the treatment of complicated wounds. This procedure results in reduced application time and cost and an excellent tissue response pattern similar to that reported in the literature with low-power lasers.

The Immediate Pain-Relieving Effects of Non-Thermal CO(2) Laser Therapy on Genital Ulcers of Behcet's Disease: A Case Report. BehÃ§et's disease (BD) is a chronic, relapsing, systemic vasculitis of unknown etiology. Oral and genital aphthous ulcers are considered as the hallmarks of BD. The genital ulcers of BD may be extremely painful and often refractory to multiple treatments. In addition, they exert a negative impact on the patient's quality of life. Some investigations have demonstrated the significant and immediate pain-relieving effects of NTCLT (non-thermal CO(2) laser therapy) on some oral lesions with no visible adverse effects. In this paper, we report a case of BD whose painful genital ulcers were irradiated with NTCLT and the patient's pain caused by the ulcers relieved immediately and significantly with no visible complications.

The Beneficial Effects of High-Intensity Laser Therapy and Co-Interventions on Musculoskeletal Pain Management: A Systematic Review. Introduction: High-intensity laser therapy (HILT) has been used more recently in the therapeutic protocols of pain managements. Adding therapeutic interventions to laser therapy is usual in clinical practice. This study aimed to evaluate the efficacy of HILT and beneficial effects of adding cointerventions to HILT in musculoskeletal pain management. Methods: The following databases were searched up to August 2018: Medline, PubMed, EMBASE, Cochrane, Google Scholar, Springer and ISI. The keywords of pain, HILT, high power laser therapy, laser therapy, photobiomodulation, physical therapy and rehabilitation were searched. The quality of the articles was assessed using the PEDro scale. The primary measure was pain severity expected to be reported in all studies. Effect size was calculated as standardized mean differences divided by the standard deviation of either the treatment or other group. Results: Initially 52 potential studies were found. Eighteen of these studies were excluded based on title and abstract. The full text of 34 remaining articles was screened and 15 of the studies were excluded. All included studies had high quality (PEDro â‰¥7). Approximately, 94% of included articles (n=18) revealed positive effects of HILT on pain. The effect sizes for HILT and placebo/comparator groups were 0.9-9.11 and 0.21-11.22 respectively. Also, the differences of effect size between two groups were between 0.03 to 5.85. Conclusion: It is early to determine that HILT may be an effective non-invasive agent in the management of musculoskeletal pain, as few studies have shown its clinical efficacy. Adding related co-interventions to HILT may enhance the beneficial effects of laser therapy. The variability of the

study methods and outcomes suggests that further long-term follow-up, randomized controlled clinical trials with appropriate methodological design are needed regarding the effectiveness of HILT on pain.

The Effectiveness of the Polarized Low-Level Laser in the Treatment of Patients With Myofascial Trigger Points in the Trapezius Muscles. Introduction: This study assessed the effect of polarized low-level laser therapy (PLLLT) on the treatment of myofascial trigger points (MTrPs) in the trapezius muscles. Its effectiveness in pain reduction was compared to low-level laser therapy (LLLT). Methods: Sixty-four patients with MTrPs were randomly divided into 2 groups, namely PLLLT and LLLT. Each patient received treatment for a period of 2 weeks, 5 sessions a week. The intensity of laser irradiation to the skin surface was 6 J/cm(2) . The system exit power was 160 mw at a 755 nm wavelength. The visual analog scale (VAS) for the 1st, 5th and 10th sessions was analyzed through two-way repeated measures ANOVA. Results: Increasing the number of treatment sessions was effective in reducing pain intensity (P>0.05). The effect of LLLT on pain reduction was significantly greater than that of PLLLT (P>0.05). Referred pain (RP), the limitation of neck movement (LNM), the presence of muscular taut band (PMTB) and the sensitivity of muscular taut band (SMTB) were reduced significantly by the end of the 10th session, compared with participants' condition at the beginning of the 1st session in both groups. Conclusion: PLLLT and LLLT can effectively treat MTrPs in the trapezius muscles and they reduce RP, LNM, PMTB, and SMTB in particular. However, the effect of the LLLT was significantly greater than that of PLLLT. In accordance with the observed results, LLLT is recommended as an effective method for treating MTrPs.

Combined therapy of photobiomodulation and adipose-derived stem cells synergistically improve healing in an ischemic, infected and delayed healing wound model in rats with type 1 diabetes mellitus. OBJECTIVE: We assessed the therapeutic effects of photobiomodulation (PBM) and adipose-derived stem cell (ADS) treatments individually and together on the maturation step of repairing of a delayed healing wound model in rats with type 1 diabetes mellitus (DM1). RESEARCH DESIGN AND METHODS: We randomly assigned 24 rats with DM1 to four groups (n=6 per group). Group 1 was the control (placebo) group. In group 2, allograft human ADSs were transplanted. Group 3 was subjected to PBM (wavelength: 890â€‰nm, peak power output: 80 W, pulse frequency: 80â€‰Hz, pulsed duration: 180 ns, duration of exposure for each point: 200â€‰s, power density: 0.001â€‰W/cm(2), energy density: 0.2â€‰J/cm(2)) immediately after surgery, which continued for 6 days per week for 16 days. Group 4 received both the human ADS and PBM. In addition, we inflicted an ischemic, delayed healing, and infected wound simulation in all of the rats. The wounds were infected with methicillin-resistant Staphylococcus aureus (MRSA). RESULTS: All three treatment regimens significantly decreased the amount of microbial flora, significantly increased wound strength and significantly modulated inflammatory response and significantly increased angiogenesis on day 16. Microbiological analysis showed that PBM+ADS was significantly better than PBM and ADS alone. In terms of wound closure rate and angiogenesis, PBM+ADS was significantly better than the PBM, ADS and control groups. CONCLUSIONS: Combination therapy of PBM+ADS is more effective that either PBM or ADS in stimulating skin injury repair, and modulating inflammatory response in an MRSA-infected wound model of rats with DM1. Adipose Tissue;Adult;Allografts;Animals;Combined Modality Therapy;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Female;Healthy Volunteers;Humans;Ischemia;Low-Level Light Therapy;Male;Methicillin-Resistant Staphylococcus aureus;Rats;Rats, Wistar;Skin;Stem Cell Transplantation;Treatment Outcome;Wound Healing;Wound Infection

Effect of photobiomodulation associated with cell therapy in the process of cutaneous regeneration in third degree burns in rats. Due to the complexity involved in the healing process of full thickness burns, the literature looks for alternatives to optimize tissue reconstruction. The objective

of this study was to explore the action of photobiomodulation therapy associated with MSCs in the healing process of third degree burns. A total of 96 male Wistar rats were used, distributed in four groups with 24 animals each: Control Group, Laser Group, Cell Therapy Group, and Laser Group and Cell Therapy. The burn was performed with aluminum plate (150â€‰Â°C). We performed analysis of wound contraction, histology, immunohistochemistry, birefringence analysis, and immunoenzymatic assay to evaluate tissue quality. Our results demonstrate that the association of the techniques is able to accelerate the repair process, modulating the inflammatory process, presenting a cutaneous tissue with better quality. Thus, we conclude that the use of photobiomodulation therapy associated with cell therapy is a promising treatment in the repair of total thickness burns.
Animals;Burns;Cell- and Tissue-Based Therapy;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Wound Healing

Photobiomodulation therapy improves human dental pulp stem cell viability and migration in vitro associated to upregulation of histone acetylation. This in vitro study evaluated the role of photobiomodulation therapy (PBMT) on viability and migration of human dental pulp stem cells (hDPSCs) and its association to epigenetic mechanisms such as histone acetylation. The hDPSCs were characterized and assigned into control and PBMT groups. For the PBMT, five laser irradiations at 6-h intervals were performed using a continuous-wave InGaAlP diode laser. Viability (MTT), migration (scratch), and histone acetylation H3 (H3K9ac immunofluorescence) were evaluated immediately after the last irradiation. PBMT significantly increased the viability (Pâ€‰=â€‰0.004). Also, PBMT group showed significantly increased migration of cells in the wound compared to the control in 6Â h (Pâ€‰=â€‰0.002), 12Â h (Pâ€‰=â€‰0.014) and 18Â h (Pâ€‰=â€‰0.083) being faster than the control, which only finished the process at 24Â h. PBMT induced epigenetic modifications in hDPSC due to increased histone acetylation (Pâ€‰=â€‰0.001). PBMT increased viability and migration of hDPSCs, which are related with the upregulation of histone acetylation and could be considered a promising adjuvant therapy for regenerative endodontic treatment. Histones Acetylation;Cell Movement;Cell Survival;Dental Pulp;Histones;Humans;Low-Level Light Therapy;Stem Cells;Up-Regulation

Treatment of refractory vitiligo with the 308-nm excimer lamp - An Australian prospective analysis of clinical efficacy and safety. Adult;Australia;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Prospective Studies;Treatment Outcome;Vitiligo

Effect of Low Intensity Laser Therapy (LILT) on MMP-9 expression in gingival crevicular fluid and rate of orthodontic tooth movement in patients undergoing canine retraction: A randomized controlled trial. INTRODUCTION: Low Intensity Laser Therapy (LILT) has been shown to increase the rate of tooth movement. Since its use in orthodontics as a method of acceleration there has been a variety of views regarding its mode of action. MMP-9 is a known bone resorption factor studied in Bone remodelling. The aim of this study was to know the effect of LILT on rate of tooth movement and expression of MMP-9 in GCF. MATERIALS AND METHODS: Ten patients (3 males and 7 females) who required maxillary first premolar extraction for routine orthodontic treatment were recruited. The individual canine retraction was studied, and the side of the experimental canine was randomly selected. The laser regimen was followed on the 1st, 3rd, 5th, 7th, 14th and then 15th days consecutively. GCF was collected at baseline, 14th day, 3 months and at the end of canine retraction on experimental side and MMP-9 was estimated quantitatively using a standard ELISA kit. RESULTS: The average increase in rate of tooth movement on experimental side at 3 months was 44% and MMP-9 concentration was also high. At the end of canine retraction (4.5 months) in the experimental group the average rate increase was 38% with MMP-9 concentrations similar in both the experimental and control group. CONCLUSIONS: LILT increases the rate of tooth movement. LILT also has an effect of bio-stimulation as depicted by rise in MMP-9 concentrations in GCF. However, this

bio-stimulatory effect is restricted to the initial part of the tooth movement. Matrix Metalloproteinase 9 Analysis of Variance;Cuspid;Female;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Matrix Metalloproteinase 9;Tooth Mobility;Tooth Movement Techniques

Laser therapy versus topical desensitising agents in the management of dentine hypersensitivity: A meta-analysis. OBJECTIVES: To compare the effectiveness of lasers and topical desensitising agent treatments for dentine hypersensitivity. METHODS: PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE and ISI Web of Knowledge were electronically searched without restrictions. Study search, selection, data extraction and assessment of risk of bias were conducted independently by two reviewer authors. All analyses were performed using Review Manager 5.3 (Cochrane Collaboration). RESULTS: This meta-analysis included 13 eligible studies that compared topical desensitising agents and Nd:YAG or diode laser. Four, six and three studies were considered to have low, moderate and high risks of bias, respectively. The follow-up period varied from immediate to 9Â months. All comparisons except the 3-month Nd:YAG laser parallel group and 6-month diode laser group showed that the clinical efficacy of lasers for dentine hypersensitivity was not significantly different with topical desensitising agents. CONCLUSION: We found low-quality evidence that was insufficient to draw any conclusions regarding the superiority of lasers or conventional topical desensitising agents in the treatment of DH. Further well-designed RCTs on this topic are needed to draw definitive conclusions. Dentin Sensitivity;Humans;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy

Photobiomodulation therapy and transcutaneous electrical nerve stimulation on chronic neck pain patients: Study protocol clinical trial (SPIRIT Compliant). INTRODUCTION: Chronic neck pain is a common musculoskeletal disorder that is associated with functional disability and decreased of quality of life. Electrophysical agents are commonly used to relieve pain, however the effects of combined use of these agents are little studied. The objective is to investigate the efficacy of photobiomodulation and electrical stimulation to relieve pain, both in isolation and combined. MATERIALS AND METHODS: This a 4-arm randomized placebo-controlled trial with patient and evaluator blinded. This study will be performed in Department of Physical Therapy at Federal University of SÃ£o Carlos, SÃ£o Carlos/SP, Brazil. One hundred and forty-four patients with chronic neck pain will be randomized into 4 groups: active photobiomodulation therapy with active electrical stimulation, active photobiomodulation therapy, active electrical stimulation, or placebo treatment. They will receive 10 sessions of treatment. PRIMARY OUTCOME: pain intensity (measured by pain numerical rating scale) posttreatment. SECONDARY OUTCOMES: pain during movement, neck disability, range of motion, pressure pain threshold, temporal summation, conditioned pain modulation, depressive symptoms, pain catastrophizing, quality of life, analgesic intake, and global perceived effect at posttreatment (10 sessions). Pain intensity and global perceived effect will also be measured after 6 weeks randomization. DISCUSSION: The findings of this study might clarify the importance of using the photobiomodulation therapy and transcutaneous electrical nerve stimulation for patients with chronic neck pain. TRIAL REGISTRATION: NCT04020861. https://clinicaltrials.gov/ct2/show/NCT04020861?term=NCT04020861&draw=2&rank=1. Analgesics Adolescent;Adult;Aged;Analgesics;Chronic Pain;Combined Modality Therapy;Depression;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck Pain;Pain Measurement;Physical Therapy Modalities;Quality of Life;Range of Motion, Articular;Transcutaneous Electric Nerve Stimulation;Young Adult;Randomized Controlled Trials as Topic

Retrospective Analysis of Primary Suturing of the Internal Orifice of Perianal Fistula During FiLaC Procedure. PURPOSE: We aimed to evaluate the results of the fistula-tract laser closure associated with primary closure of internal orifice. MATERIALS AND METHODS: The surgical objective

was to seal the fistula tract using laser energy and closing internal orifice with purse-string suture. Between January 2017 and December 2018, 35 consecutive patients who underwent the laser closure plus internal orifice suturing included. In all 35 patients, the laser procedure was applied then internal orifice was primarily closed with 2-0 polyglactin suture after the debridement of necrotic tissue. RESULTS: Among 35 patients (11 female, 24 male), mean age was 43.9Â±12.9 years. Median follow-up was 11 months (6.0 to 17.6â€‰mo). According to the Park classification; 21 patients (60%) had intersphincteric fistula, 12 (34%) had transsphincteric fistula, 2 (6%) had suprasphincteric or extrasphincteric fistula. There were low/simple and high/complex fistula in 21 (60%) and 14 patients (40%), respectively. Overall, 15/35 (42.9%) patients showed complete healing, 12/35 (34%) had slight drainage with minimal symptoms, 8/35 (22%) patients had persistent symptomatic drainage, and there was no patient with painful symptomatic drainage. On the basis of the Jorge-Wexner continence score, there was no significant difference in patients before and after the procedure. The perfect continence rate was achieved in 32 patients (91%). CONCLUSION: Although the absence of major and minor complications after Fistula Laser Closure (FiLaC) procedure seemed to be a major advantage, we thought that closure of the internal opening by primary suturing has no positive effect on the healing of the perianal fistula. Adult;Endoscopy;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Rectal Fistula;Retrospective Studies;Severity of Illness Index;Sutures;Treatment Outcome;Wound Closure Techniques;Wound Healing

Stimulation of collagen and elastin production in-vivo using 1,540Â nm Er:Glass laser: assessment of safety and efficacy. Introduction: Induction of collagen and elastin remodeling in the human skin can be achieved by non-ablative fractional laser (NAFXL) and ablative fractional laser (AFXL). Our objective was to compare the safety, efficacy, tolerability, and ability to induce collagen and elastin remodeling of NAFXL versus AFXL in a series of treatments over time.Materials and Methods: In this prospective, proof of principle, single-case study, the safety, tolerability and efficacy of the laser systems were assessed via histopathology and clinical evaluations including photographs. Optical biopsies by means of multiphoton tomography (MPT) were used to evaluate the induction of collagen and elastin remodeling.Results: Treatments by both NAFXL and AFXL were well tolerated. The NAFXL system was found to be less painful and resulted in a shorter down- and healing times. MPT findings showed the superior capability of the AFXL procedure to induce collagen; on the other hand, elastin induction was more pronounced after NAFXL treatments.Conclusions: While NAFXL is as effective and safe as the traditional AFXL, it is better tolerated and has a shorter downtime. Serial optical biopsies over time over time can be a useful tool to assess the induction of collagen and elastin remodeling in the human skin. Collagen;Elastin Collagen;Elastin;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Rejuvenation;Skin Aging

Photobiomodulation by light emitting diode applied sequentially does not alter performance in cycling athletes. Analyze the effects of sequential application of photobiomodulation therapy (PBMT) at different wavelengths on the performance of cycling athletes. Cyclists (48 male, mean age 33.77Â years) underwent a performance evaluation through an incremental test, VO2max, blood lactate analysis, perception of effort, infrared thermography, and isokinetic evaluations. Photobiomodulation (180Â J) with infrared (IR 940â€‰Â±â€‰10Â nm), red (RED 620â€‰Â±â€‰10Â nm), mixed Red, and IR (RED/IR 620â€‰+â€‰940Â nm) or Sham (disabled device) intervention occurred on three consecutive days and was applied to the quadriceps femoris bilaterally. Reevaluations were performed 24Â h after the last application, with 1Â week of follow-up. A significance level of 5% was adopted, and the effect size (ES) was calculated by Cohen's d. Results: There were no significant differences in the analyzed variables under any experimental condition (pâ€‰>â€‰0.005), but a moderate effect size was observed for torque peak at 60Â°/s on left lower

limb (LLL) (ESâ€‰=â€‰0.67), average power at 60Â°/s of the right lower limb (RLL) (0.73), and LLL (ESâ€‰=â€‰0.65) and a considerable effect size in torque peak at 60Â°/s of the RLL (ESâ€‰=â€‰0.98) in the IR/RED group compared with sham 24Â h after the last application. Moreover, a large effect size was observed for total time to exhaustion (ESâ€‰=â€‰1.98) and for VO2max (ESâ€‰=â€‰6.96), and a moderate effect size was seen for anaerobic threshold (ESâ€‰=â€‰0.62) in the IR/RED group compared with sham. Photobiomodulation, when not associated with training, was not able to produce a cumulative effect on the performance of cycling athletes. However, the association of two wavelengths seems to be better for increased performance. ClinicalTrials.gov Identifier: NCT03225976. Lactic Acid Adult;Athletic Performance;Bicycling;Humans;Lactic Acid;Low-Level Light Therapy;Lower Extremity;Male;Oxygen Consumption;Torque

Good, better, best? The effects of polarization on photobiomodulation therapy. Photobiomodulation therapy (PBMT) is a widely adopted form of phototherapy used to treat many chronic conditions that effect the population at large. The exact physiological mechanisms of PBMT remain unsolved; however, the prevailing theory centres on changes in mitochondrial function. There are many irradiation parameters to consider when investigating PBMT, one of which is the state of polarization. There is some evidence to show that polarization of red and near-infrared light may promote different and/or increased biological activity when compared to otherwise identical non-polarized light. These enhanced cellular effects may also be present when the polarized light is applied linear to the tissue direction. Herein, we synthesize the current experimental and clinical evidence pertaining to polarized photobiomodulation therapy; ultimately, to better inform future research into this area of phototherapy. Low-Level Light Therapy;Mitochondria;Phototherapy

A Randomized Controlled Trial Comparing Platelet-Rich Plasma, Low-Level Laser Therapy, and Complex Decongestive Physiotherapy in Patients with Lower Limb Lymphedema. Background: Platelet-rich plasma (PRP) is an autologous concentrated preparation of platelets characterized by lymphangiogenetic and tissue-repairing effects. Although PRP has been safely used in many different fields, there is no clinical study regarding the use of PRP in lymphedema treatment in humans. We assessed the clinical outcomes of PRP in patients with lower extremity lymphedema (LEL) in a randomized controlled trial. Methods and Results: Patients with secondary LEL were randomly allocated to one of three groups consisting of treatment with PRP with complex decongestive physiotherapy (PRP+CDP group), low-level laser therapy with CDP (LLLT+CDP group), and only CDP (CDP group). Assessment of Lymphedema Quality of-Life Questionnaire (LYMQOL) for health-related quality of life, lower-extremity-circumference (LEC) for edema, tissue dielectric constant (TDC) for extremity volume, 6-minute walking test (6MWT) for functional capacity, and numeric rating scale (NRS) scoring for extremity fullness were evaluated both before and after treatment. Forty-five patients (68.8% female) with mean age 40.84â€‰Â±â€‰15.81 years were included in the study. Significant differences in LYMQOL, LEC, NRS, and TDC values both before and after treatment were found in all groups; however, there were no statistically significant difference in values between the three groups. In the PRP+CDP group, LYMQOL values had a larger effect size than the other two groups. Significant differences in 6MWT values both before and after treatment were found in PRP+CDP and LLLT+CDP groups; however, there was no statistically significant difference in the CDP group. Conclusion: This is the first clinical study to evaluate the usage of PRP in patients with secondary LEL. PRP might be an additional treatment option of lymphedema management; however, more clinical trials in humans are needed to yield more evidence in the usage of PRP in patients with lymphedema. Adult;Female;Humans;Low-Level Light Therapy;Lower

Extremity;Lymphedema;Male;Middle Aged;Physical Therapy Modalities;Platelet-Rich Plasma;Quality of Life;Treatment Outcome

Protocol for Low-level laser therapy in traumatic ulcer after troncular anesthesia: Case report in pediatric dentistry. The aim of this study was to report a protocol of use for low-level laser therapy (LLLT) in traumatic ulcer in the lower lip after inferior alveolar nerve block anesthesia (IANBA). A 3-year-old patient, male, undergoing treatment of carious lesions was submitted to an indirect pulp capping in tooth 74 under IANBA. The procedure was completed without intercurrences, but on next day, the child presented extensive traumatic ulcer in the left lower lip, with complaint of pain. Two sequential applications with LLLT were applied in punctual mode under pressure around the lesion. After 1 week, the mother reported significant improvement. After 30 days, the lesion was fully healed. In conclusion, LLLT promoted rapid analgesia and healing, being a good treatment alternative for traumatic ulcer after troncular anesthesia. Key words:Local anesthesia, soft tissue injuries, laser therapy, children.

Effect of laser photobiomodulation associated with a bioceramic cement on the repair of bone tissue in the femur of rats. This study aimed to evaluate in vivo the effect of laser photobiomodulation associated with a repair cement (MTA Repair HPâ„¢) on the process of bone repair in the femur of rats, through histological and histomorphometric assays. Forty Wistar albino rats were randomly divided into four groups, with two periods of euthanasia - 15 and 21Â days (nÂ =Â 5 per period). Under general anesthesia, a bone defect was made in the left femur of each animal. In the LS (Laser) group, the defect was irradiated following the parameters: Î»Â =Â 808Â nm, PÂ =Â 100Â mW, EDÂ =Â 80Â J/cm(2) per point, 22Â s per point, EÂ =Â 2.2Â J per point. In the LM (MTA Repair HPâ„¢Â +Â Laser) group, the defect was filled with MTA Repair HPâ„¢ and irradiated with laser in the same protocol of the LS group. In the MH (MTA Repair HPâ„¢) group, the defect was filled with MTA Repair HPâ„¢ without irradiation. In the CTR (Control) group, the bone defect received no treatment. At 15Â days, the mean index of bone neoformation in the defect area was significantly lower in the CTR group as compared to the MH, LS, and LM groups. At 21Â days, the LM group presented significantly greater bone neoformation than the MH group, without significant difference between LS and LM. Laser photobiomodulation therapy is promising as an adjuvant in the bone repair process, especially when associated with the use of biomaterials. Biocompatible Materials;Bone Cements Animals;Biocompatible Materials;Bone Cements;Bone Regeneration;Ceramics;Femur;Lasers;Male;Rats, Wistar

Treatment of Laser-Responsive Dermal Pigmentary Conditions in Type III-IV Asian Skin With a 755-nm Picosecond Pulse Duration Laser: A Retrospective Review of Its Efficacy and Safety. BACKGROUND: Picosecond lasers have become very popular in the treatment of hyperpigmentation. OBJECTIVE: Evaluating the efficacy and safety of picosecond 755-nm laser in treatment of nevi of Ota (NO) and Hori's nevi (HN) in Asians with Fitzpatrick skin Types III/IV. METHODS: A retrospective review of patient records at the National Skin Center, Singapore, from 2015 to 2017. Three independent blinded dermatologists assessed pre-and-post treatment photographs using the physician's global assessment (PGA) score (0-clear, 1-almost clear, 2-mild, 3-moderate, and 4-severe). RESULTS: There were 18 cases of NO and 11 cases of HN. Mean treatment sessions were 2.22 (NO; range 1-6) and 3.82 (HN; range 1-6). In the NO group, mean pre-and-post treatment PGA scores were 3.1 and 1.3, respectively (1.8 point change, p-value 0.0002), and average fluence used was 2.02 J/cm (range: 1.02-2.38). In the HN group, mean pre-and-post treatment PGA scores were 2.6 and 1.1, respectively (1.5 point change, p-value 0.004), and average fluence was 2.08 J/cm (range: 1.98-3.40). Eleven patients (37.9%) experienced postlaser erythema, and 1 (3.4%) patient developed transient postlaser hypopigmentation. No permanent hyper/hypopigmentation was seen. CONCLUSION: The picosecond 755-nm laser is effective in the treatment of dermal pigmentary conditions in Asians with

Fitzpatrick skin Types III/IV, with minimal risk of postlaser complications, and compared with the center's past experience with the Q-switched nanosecond 1064-nm laser, results in faster and more effective pigment clearance. Adult;Asian People;Erythema;Female;Humans;Hyperpigmentation;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Retrospective Studies;Singapore;Skin;Skin Neoplasms;Treatment Outcome;Young Adult

Management of Primary Injuries of the Medial Collateral Ligament of the Carpus in Two Horses. This case report describes the successful management of two horses with medial carpal collateral ligament injury. This is a rare cause of forelimb lameness and existing reports indicate a poor prognosis for return to athletic function with conservative management. Both horses were treated with a combination of box rest with controlled exercise and high-intensity laser therapy (HILT). Both horses returned to previous athletic function, one at Grand Prix level dressage and one at Novice level eventing. With appropriate management, the prognosis for carpal collateral ligament injury may be good. From this report, it is unclear whether a rehabilitation program including HILT offers improved prognosis compared with a rehabilitation program alone. Animals;Collateral Ligaments;Horse Diseases;Horses;Joint Diseases;Lameness, Animal;Physical Conditioning, Animal

Effects of Low-Level Laser Therapy and Chiropractic Care on Back Pain in Quarter Horses. Low-level laser therapy has been used clinically to treat musculoskeletal pain; however, there is limited evidence available to support its use in treating back pain in horses. The objective of this study was to evaluate the clinical effectiveness of low-level laser therapy and chiropractic care in treating thoracolumbar pain in competitive western performance horses. The subjects included 61 Quarter Horses actively involved in national western performance competitions judged to have back pain. A randomized, clinical trial was conducted by assigning affected horses to either laser therapy, chiropractic, or combined laser and chiropractic treatment groups. Outcome parameters included a visual analog scale (VAS) of perceived back pain and dysfunction and detailed spinal examinations evaluating pain, muscle tone, and stiffness. Mechanical nociceptive thresholds were measured along the dorsal trunk and values were compared before and after treatment. Repeated measures with post-hoc analysis were used to assess treatment group differences. Low-level laser therapy, as applied in this study, produced significant reductions in back pain, epaxial muscle hypertonicity, and trunk stiffness. Combined laser therapy and chiropractic care produced similar reductions, with additional significant decreases in the severity of epaxial muscle hypertonicity and trunk stiffness. Chiropractic treatment by itself did not produce any significant changes in back pain, muscle hypertonicity, or trunk stiffness; however, there were improvements in trunk and pelvic flexion reflexes. The combination of laser therapy and chiropractic care seemed to provide additive effects in treating back pain and trunk stiffness that were not present with chiropractic treatment alone. The results of this study support the concept that a multimodal approach of laser therapy and chiropractic care is beneficial in treating back pain in horses involved in active competition. Animals;Back Pain;Chiropractic;Horse Diseases;Horses;Low Back Pain;Low-Level Light Therapy;Manipulation, Chiropractic

A review of the treatment of male pattern hair loss. Introduction: Androgenetic alopecia is a common hair loss disorder affecting up to 80% of males by the age of 80. It is characterized by androgen related progressive thinning of hair in a defined pattern. It results in diminished self-esteem, reduced confidence and distress in affected men, irrespective of age or stage of baldness. An effective treatment for hair baldness is needed.Areas covered: In androgenetic alopecia, hair follicles undergo progressive miniaturization. Genetic factors and androgens are key role-players in disease pathogenesis. Herein the authors review the pharmacologic treatment of androgenetic alopecia, which involves 5 alpha reductase inhibitors, minoxidil and prostaglandins. Non-pharmacologic

approaches are also explored.Expert opinion: Androgenetic alopecia progresses over time and although the current available medical treatments like finasteride and minoxidil are effective in arresting the progression of the disease, they allow only partial regrowth of hair at its best. Early treatment achieves a more optimal outcome. Non-pharmacologic treatments like PRP can be considered in patients refractory to medical treatment.Abbreviations: MPHL: male pattern hair loss; AGA: androgenetic alopecia; DHT: dihydrotestosterone; 5AR: 5-alpha-reductase; VEGF: vascular endothelial growth factor; PG's: prostaglandins (PG's); PGD2R: prostaglandin D2 receptor; VPA: valproic aid; SR: Serenoa Repens; PRP: platelet-rich plasma; PDGF: platelet derived growth factor; TGF: transforming growth factor; ERK: extracellular signal-regulated kinase; PKB: protein kinase B; LLLT: low-level laser therapy; ROS: reactive oxygen species; RCT: randomized control trial; SFRP1: secreted frizzled related protein 1; DP: dermal papilla; PDE5: phosphodiesterase 5. Prostaglandins;Finasteride;Minoxidil Administration, Oral;Administration, Topical;Alopecia;Dry Needling;Finasteride;Hair;Humans;Low-Level Light Therapy;Male;Minoxidil;Prostaglandins;Randomized Controlled Trials as Topic;Treatment Outcome

Attenuation of the inflammatory response and polarization of macrophages by photobiomodulation. In spinal cord injury (SCI), inflammation is a major mediator of damage and loss of function and is regulated primarily by the bone marrow-derived macrophages (BMDMs). Photobiomodulation (PBM) or low-level light stimulation is known to have anti-inflammatory effects and has previously been used in the treatment of SCI, although its precise cellular mechanisms remain unclear. In the present study, the effect of PBM at 810Â nm on classically activated BMDMs was evaluated to investigate the mechanisms underlying its anti-inflammatory effects. BMDMs were cultured and irradiated (810Â nm, 2Â mW/cm(2)) following stimulation with lipopolysaccharide and interferon-Î³. CCK-8 assay, 2',7'-dichlorofluorescein diacetate assay, and ELISA and western blot analysis were performed to measure cell viability, reactive oxygen species production, and inflammatory marker production, respectively. PBM irradiation of classically activated macrophages significantly increased the cell viability and inhibited reactive oxygen species generation. PBM suppressed the expression of a marker of classically activated macrophages, inducible nitric oxide synthase; decreased the mRNA expression and secretion of pro-inflammatory cytokines, tumor necrosis factor alpha, and interleukin-1 beta; and increased the secretion of monocyte chemotactic protein 1. Exposure to PBM likewise significantly reduced the expression and phosphorylation of NF-ÎºB p65 in classically activated BMDMs. Taken together, these results suggest that PBM can successfully modulate inflammation and polarization in classically activated BMDMs. The present study provides a theoretical basis to support wider clinical application of PBM in the treatment of SCI. Chemokines;RNA, Messenger;Reactive Oxygen Species;Transcription Factor RelA Animals;Cell Polarity;Cell Survival;Chemokines;Gene Expression Regulation;Inflammation;Macrophage Activation;Macrophages;Mice, Inbred BALB C;Phosphorylation;RNA, Messenger;Reactive Oxygen Species;Transcription Factor RelA

Microcirculatory Response to Photobiomodulation-Why Some Respond and Others Do Not: A Randomized Controlled Study. BACKGROUND AND OBJECTIVES: Photobiomodulation (PBM), a non-ionizing, non-thermal irradiation, used clinically to accelerate wound healing and inhibit pain, was previously shown to increase blood flow. However, some individuals respond to PBM, but others do not. The purpose of this study was to investigate factors affecting this patient-specific response using advanced, noninvasive methods for monitoring microcirculatory activity. STUDY DESIGN/MATERIALS AND METHODS: In this prospective, randomized controlled clinical trial (NCT03357523), 20 healthy non-smoking volunteers (10:10 males:females, 30â€‰Â±â€‰8 years old) were randomized to receive either red- (633â€‰nm and 70â€‰W/cm(2)) or near-infrared light (830â€‰nm and 55â€‰mW/cm(2)) over the wrist for 5â€‰minutes. Photoplethysmography, laser Doppler flowmetry, and thermal imaging were used to monitor palm microcirculatory blood volume,

blood flow, and skin temperature, respectively, before, during, and 20â€‰minutes after irradiation. Participants with skin temperature change â‰¥0.5Â°C from baseline were considered "responders". RESULTS: Near-infrared PBM was found to induce a 27% increase in microcirculatory flow that increased to 54% during the 20-minute follow-up period (Pâ€‰=â€‰0.049 and Pâ€‰=â€‰0.004, respectively), but red light PBM did not increase the median flow. Only 10 of 20 participants were responders by thermal imaging (i.e., â‰¥0.5Â°C from baseline), and their initial skin temperature was between 33 and 37.5Â°C. The non-responders had either "hot" hands (â‰¥37.5Â°C) or "cold" hands (â‰¤33Â°C). In responders, the meantime to 20% increase in microcirculatory blood volume and blood flow was less than 2.5â€‰minutes after initiation of PBM irradiation. CONCLUSIONS: We demonstrated that PBM induces arteriolar vasodilatation that results in both immediate and long-lasting increased capillary flow and tissue perfusion in healthy individuals. This response was wavelength-dependent and modified by skin temperature. These findings regarding physiological parameters associated with sensitivity or resistance to PBM provide information of direct relevance for patient-specific therapy. Lasers Surg. Med. Â© 2020 Wiley Periodicals, Inc. Adult;Female;Humans;Infrared Rays;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Prospective Studies;Young Adult

The efficiency of ozone therapy and low-level laser therapy in rat facial nerve injury. PURPOSE: Comparison of low-level laser therapy (LLLT) and ozone therapy (OT) methods for the treatment of facial nerve injury (FNI) in rats, evaluated by histomorphometric measurement analysis. MATERIALS AND METHODS: Thirty rats were randomly divided into control (C), LLLT, and OT groups.Â The left facial nerves (FNs) of all rats (nÂ =Â 30) were used in this study. These were held in a surgical clamp for 30Â s to create neuropathic damage. The non-injured right FNs of the rats in the control group formed the fourth, sham (S) group in this study (nÂ =Â 10). Therefore the total number of evaluated samples was 40. The injured FNs of rats in the control group were left to heal spontaneously, whereas LLLT was applied for 21 consecutive days (output 100Â mW/cm(2) and wavelength 850Â nm) and OT (2Â ml; 80Â Î¼m/ml) once every 2 days for 21 days. RESULTS: After histomorphological evaluation, the OT group revealed statistically significant outcomes following FNI compared with the OT and control groups in terms of branching of nerve fibers (pÂ =Â 0.003), nerve fiber diameters (pÂ =Â 0.0398), nerve fiber areas (pÂ =Â 0.042), and axon numbers (pÂ =Â 0.0327). Although the LLLT group revealed a better healing process than the control group, the outcome was not statistically significant in terms of branching of nerve fibers (pÂ =Â 0.6804), nerve fiber diameters (pÂ =Â 0.7424), nerve fiber areas (pÂ =Â 0.7048), and axon numbers (pÂ =Â 0.7588). CONCLUSIONS: OT resulted in statistically significant differences in outcome when compared with the LLLT and control groups, and provided a safe and effective treatment for FNI in rats. OT could therefore be considered as an alternative treatment of FNI. Clinical studies should now be performed to establish whether comparable results can be achieved in humans. Ozone Animals;Facial Nerve;Facial Nerve Injuries;Humans;Low-Level Light Therapy;Ozone;Rats;Rats, Wistar

Current and Future Therapies for Psoriasis with a Focus on Serotonergic Drugs. Psoriasis is a chronic immune-mediated skin disease, with a pathogenesis resulting from a combination of genetic and environmental factors. The pathogenesis of psoriasis is driven by the interaction between innate and adaptive immune cells and keratinocytes, in a complex process mediated by cytokines and other signaling molecules. This leads to an inflammatory process with increased proliferation of epidermal cells, neo-angiogenesis, and infiltration of white cells in the skin, which cause the characteristic psoriasis plaques. Several studies have suggested that the neurotransmitter serotonin, a key mediator between the skin and the neuroendocrine system, also plays an important role in the pathogenesis of psoriasis. Psoriasis often needs long-term treatment, which can be a burden. Thus, the choice of the treatment is crucial to increase the patients' adherence and quality of life. This

review addresses the currently available systemic and topical treatments for psoriasis, used by themselves or combined with phototherapy. It particularly focuses on the importance of advanced drug delivery systems as a way to increase the drug penetration and retention in the skin, while also enhancing its solubility and stability. Finally, we discuss the role of the serotonin system in psoriasis, and summarize what is known about the effects of antidepressants, in particular specific serotonin reuptake inhibitors, on the physical symptoms of this disease. Anti-Inflammatory Agents;Antidepressive Agents;Biological Products;Biosimilar Pharmaceuticals;Dermatologic Agents;Dosage Forms;Emulsions;Immunologic Factors;Immunosuppressive Agents;Liposomes;Serotonin Agents;Serotonin Uptake Inhibitors;Serotonin Administration, Oral;Administration, Topical;Anti-Inflammatory Agents;Antidepressive Agents;Biological Products;Biosimilar Pharmaceuticals;Clinical Trials as Topic;Dermatologic Agents;Dosage Forms;Drug Delivery Systems;Emulsions;Forecasting;Genetic Therapy;Humans;Immunologic Factors;Immunosuppressive Agents;Liposomes;Low-Level Light Therapy;Nanoparticles;Phototherapy;Psoriasis;Serotonin;Serotonin Agents;Selective Serotonin Reuptake Inhibitors
Evaluation of angiogenesis, inflammation, and healing on irradiated skin graft with low-level laser therapy in rats (Rattus norvegicus albinus wistar). The reconstructive techniques have been widely used in Veterinary Medicine. The post-operative adjuvants therapies like the low-level laser therapy (LLLT) are used to decrease inherent complications to reconstructive surgeries. This article purposed to define the LLLT effects on the healing, inflammation, and vascularization of the skin grafts in applicable time intervals to veterinary surgical routine. Forty rats (Rattus norvegicus albinus wistar) were used and each one was submitted to autogenous cutaneous mesh grafting in the interescapular region. The rats were randomly distributed in five groups (G1, G2, G3, G4, and G5) in accordance with the 6 J/cm(2) or 10 J/cm(2) dose every 3 or 5 days. These treatments were applied on the skin graft for 15 days. The histochemical evaluation with Picrosirius showed greater expression of collagen type 1 - red in grafts of G5 ($p < 0.05$), while in G1 did not; the expression of collagen type III - green was not induced by LLLT. The histochemical evaluation with hematoxylin-eosin showed greater numbers of fibroblasts in grafts of G4 ($p < 0.05$) and less hemorrhage in grafts of G5 ($p < 0.05$). There was modulation of the inflammatory response in irradiated skin grafts. It is concluded the exhibition of the skin grafts to 6 J/cm(2) or 10 J/cm(2) dose every 5 days improved the healing and the modulation of the local inflammation. Collagen Type I;Collagen Type III Animals;Collagen Type I;Collagen Type III;Image Processing, Computer-Assisted;Inflammation;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Rats, Wistar;Skin;Skin Transplantation;Wound Healing
Effectiveness of low-level laser therapy for oral mucositis prevention in patients undergoing chemoradiotherapy for the treatment of head and neck cancer: A systematic review and meta-analysis. Oral Mucositis is a frequent and debilitating inflammatory complication in patients with head and neck malignancies and may lead to unplanned treatment interruptions due to intense pain and dysphagia. This systematic review with meta-analysis was performed to determine the effectiveness of low-level laser therapy in preventing oral mucositis in this context. The following databases were searched through September 2018, with last search performed on May 2019, for clinical trials: MEDLINE via PubMed, Cochrane Central, Scopus, Lilacs, ISI Web of Science and SIGLE via Open Grey. From 14,525 records, 4 studies were included in the review and 3 studies were included in meta-analysis. Data from 500 patients (mean age of 53.595 and 54.14 for intervention and control groups, respectively) were analysed. Meta-analysis showed that laser therapy prevents oral mucositis incidence in 28% and 23% of cases during the third and fourth follow-up week, respectively, in comparison to a placebo-treated control group. There was no statistically significant difference the

prevention of pain; dysphagia and quality of life were not analysed due to missing. Laser therapy was effective in preventing oral mucositis from the 15th to the 45th days of chemoradiotherapy. However, new primary studies with low risk of bias are needed so a higher scientific evidence can be obtained. Bias;Chemoradiotherapy;Data Analysis;Deglutition Disorders;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Stomatitis;Treatment Outcome

Lichen Planopilaris and Low-Level Light Therapy: Four Case Reports and Review of the Literature About Low-Level Light Therapy and Lichenoid Dermatosis. Lichen planopilaris (LPP) is a cell-mediated scarring alopecia that causes inflammation of the scalp and the eventual destruction of hair follicles in affected areas. Current literature on treatment of LPP remains limited with no definitive treatment approach being recognized, although a combination of topical/intralesional steroids and orally administered hydroxychloroquine remains the most utilized option. Low-level light therapy (LLLT) is an expanding technology shown to be effective in a variety of dermatologic conditions. We report here four patients with LPP who show a dramatic response to LLLT, including a reduction of inflammation, disappearance of symptoms, and evident hair regrowth with no side effects. We review the possible role of LLLT in LPP and other lichenoid conditions.

Corrigendum to "Preemptive treatment with photobiomodulation therapy in skin flap viability" [Journal of Photochemistry and Photobiology B: Biology; (2019) 111634].

Need for Caution When Applying Photobiomodulation Therapy for Hereditary Diseases. Animals;Genetic Diseases, Inborn;Humans;Low-Level Light Therapy

Therapeutic advances in wound healing. Wound healing is a complex physiological process that occurs in the human body involving the sequential activation of multiple cell types and signaling pathways in a coordinated manner. Chronic wounds and burns clearly decrease quality of life of the patients since they are associated with an increase in physical pain and socio-economical complications. Furthermore, incidence and prevalence of chronic wounds (unlike burns) have been increasing mainly due to population aging resulting in increased costs for national health systems. Thus, the development of new and more cost-effective technologies/therapies is not only of huge interest but also necessary to improve the long-term sustainability of national health systems. This review covers the current knowledge on recent technologies/therapies for skin regeneration, such as: wound dressings; skin substitutes; exogenous growth factor based therapy and systemic therapy; external tissue expanders; negative pressure; oxygen; shock wave, and photobiomodulation wound therapies. Associated benefits and risks as well as the clinical use and availability are all addressed for each therapy. Moreover, future trends in wound care including novel formulations using metallic nanoparticles and topical insulin are herein presented. These novel formulations have shown to be promising therapeutic options in the near future that may change the wound care paradigm. Bandages;Burns;Humans;Quality of Life;Skin, Artificial;Wound Healing

Angiogenic protein synthesis after photobiomodulation therapy on SHED: a preliminary study. This study evaluated the viability, proliferation, and protein expression after photobiomodulation (PBM) of stem cell from human exfoliated deciduous teeth (SHED). The groups were the following: G1 (2.5Â J/cm2), G2 (3.7Â J/cm2), and control (not irradiated). According to the groups, cells were irradiated with InGaAlP diode laser at 660Â nm wavelength, continuous mode, and single time application. After 6Â h, 12Â h, and 24Â h from irradiation, the cell viability and proliferation, and the protein expression were analyzed by MTT, crystal violet, and ELISA multiplex assay, respectively. Twenty-four hours after PBM, SHED showed better proliferation. Over time in the supernatant, all groups had an increase at the levels of VEGF-C, VEGF-A, and PLGF. In the lysate, the control and G2 exhibited a decrease of the VEGF-A, PECAM-1, and PLGF expression, while control and G3 decreased VEGF-C, VEGF-A, and PDGF expression. The dosimetries of 2.5Â J/cm2 and 3.7Â J/cm2 maintained

viability, improved proliferation, and synthesis of the angiogenic proteins in the supernatant in the studied periods on SHED. Angiogenic Proteins;Biomarkers Angiogenic Proteins;Biomarkers;Cell Proliferation;Cell Survival;Cells, Cultured;Child;Child, Preschool;Dental Pulp;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Stem Cells;Tooth, Deciduous

Laser surgery in management of medication-related osteonecrosis of the jaws: a meta-analysis. PURPOSE: The aim of this study was to perform a systematic review and meta-analysis to evaluate the efficacy of laser therapy on medication-related osteonecrosis of the jaw (MRONJ) treatment. METHODS: This study followed PRISMA standards, and an electronic search was performed on the PubMed/MEDLINE, Scopus, and Cochrane databases. Eighty-nine articles were found. After reading the manuscripts, 15 articles remained for the review. Three of them were selected for meta-analysis. RESULTS: Female gender was predominant (72.5%), and mean age was 66.5Â years. Follow-up varied between 3 and 80Â months, and the most used bisphosphonate was zoledronic acid (71.6%). Stage II of MRONJ was the most prevalent (68.9%), and the mandible was the most affected site (64.5%). Qualitative data showed that treatment with laser surgery (Er:YAG) was most effective regarding complete healing of the lesion (90%) compared with other treatments. Meta-analysis data showed that low-level laser therapy (LLLT) was more effective than medical treatment (Pâ€‰=â€‰0.006), and surgical treatment was more effective than LLLT (Pâ€‰=â€‰0.008). CONCLUSION: Laser surgery was significantly superior to LLLT (pâ€‰<â€‰0.00001). Therefore, laser surgical therapy seems to be a great management strategy for MRONJ treatment from stage II. LLLT was shown to improve conservative management in earlier MRONJ stages. Bone Density Conservation Agents;Diphosphonates Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Female;Humans;Jaw;Laser Therapy;Osteonecrosis

The effect of low-level light therapy on orthodontic tooth movement rate, heat shock protein 70, and matrix metallopreteinase 8 expression: Animal study. BACKGROUND: The aim of this study was to determine the effect of low-level light therapy (LLLT) on orthodontic tooth movement (OTM) rate, heat shock protein 70 (HSP-70) expression, and matrix metalloproteinase 8 (MMP-8) expression. MATERIALS AND METHODS: In this experimental study twenty-four male guinea pigs were randomly divided into three groups (n = 8): control group (K) without orthodontic force and LLLT; treatment group 1 (T1) with orthodontic force, and treatment group 2 (T2) with orthodontic force and LLLT. The labial surfaces of both maxillary central incisors in treatments groups were installed with single-wing bracket before being inserted with close coil spring to give 10 g/cm(2) orthodontic force. For the T2 group, 4 J/cm(2) of LLLT was administered in the mesial-distal and labial-palatal regions for 3 min every day. On day 14, the gap between teeth was measured and immunohistochemistry staining was done to determine HSP-70 and MMP-8 expression. Data were analyzed using (IBM, New York, (ANOVA), followed by Turkey's HSD test to determine the differences between groups. Nonnormal distributed data would be analyzed using Kruskal-Wallis test, followed by Mann-Whitney test with $P < 0.05$ being performed. RESULTS: The gap between teeth in the T2 group was greater compared to T1 group ($P = 0.00$). However, there was a significant decrease of HSP-70 and MMP-8 expression in T2 group compared to T1 group in the tensile and compressive sides. CONCLUSION: LLLT intervention during orthodontic treatment could accelerate OTM rate and decreased HSP-70 and MMP-8 expression both in tension and in compressive side. Thus, LLLT interventions can be used as adjuvant therapy to shorten orthodontic treatment duration.

810 nm diode laser for hair reduction with Chill-tip technology: prospective observational analysis of 55 patients of Fitzpatrick skin types III, IV,V. Background: Various light based technologies like Diode, long pulsed Nd:Yag and Intense Pulsed Light are used commonly for long-term hair reduction. The commonest indication is hirsutism.Aim: 1. To evaluate efficacy and safety of 810 nm Diode laser in Fitzpatrick skin types III, IV and V.2. To assess percentage of cases on the basis of indications,

average number of sessions, fluence required, the long-term results and complications using diode laser in darker skin types.Methods: A prospective observational study of 55 consecutive patients who came for laser hair reduction by 810 nm Light Sheer Diode laser with Chill tip technology was carried out. The sessions were conducted at an interval of 4-6Â weeks and the patients were followed up over a period of 2Â years. Data was analyzed using software SPSS (Statistical Package for Social Science. Ver.12, Inc. Chicago, USA).Results: Fifty-five patients (51 females and 4 males) were studied. 67.3% (n =Â 37) had skin type IV. The most common area treated was chin (n =Â 23). The average growth reduction of terminal hair at the end of three sessions was 61.25%. Only 8% (n =Â 4) had short-term side effects.Conclusion: Diode laser is highly effective for long-term hair reduction of terminal hair growth in Fitzpatrick skin type III, IV and V with no permanent side effects.Abbreviations: LHR (Laser Hair Reduction). Adolescent;Adult;Female;Hair Removal;Hirsutism;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Young Adult

Face and neck rejuvenation using an improved non-ablative fractional high power 1064-nm Q-switched Nd:YAG Laser: clinical results in 16 women. OBJECTIVE: To evaluate the safety and efficacy of a specific treatment protocol using a new and improved non-ablative fractional high-power 1064-nm Q-switched Nd:YAG laser for face and neck rejuvenation. METHODS: Sixteen women, aged 30 to 60Â years old, were selected to undergo three consecutive treatment sessions with this new laser at maximum energy (2,400 mJ/pulse, Clear Lift laserÂ®-Harmony XL-Pro, Alma Lasers Ltd.). Face and neck were treated in eight patients, respectively. Each treatment used the same protocol. The efficacy was evaluated by the therapist (TS), the patient (PS), and two separate independent experts who were blind to the study (E1 and E2). RESULTS: According to E1 and E2, the mean reduction in signs of skin aging on a Global Esthetic Improvement Scale was 30-40%. Using a 0-10 points scale, TS and PS mean (range) satisfaction rates were 9.0 (8-10); 9.2 (6-10) for the face and 8.7 (8-10); 8.0 (3-10), for the neck, respectively. The procedure was practically painless, no significant adverse effects were observed, and the patients returned to their daily and work activities without downtime. CONCLUSION: This laser was safe and effective for face and neck minimally invasive rejuvenation, with excellent results using our usual routine use conditions. Adult;Cosmetic Techniques;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Neck;Patient Satisfaction;Rejuvenation;Skin Aging

Successful Treatment of Cutaneous Rosai-Dorfman Disease With Pulsed Dye Laser. Aged;Biopsy;Female;Histiocytosis, Sinus;Humans;Lasers, Dye;Lip;Low-Level Light Therapy;Skin;Treatment Outcome

Retrospective photographic review of nontattoo indications treated by picosecond laser. BACKGROUND: Picosecond (PS) lasers were approved by the US FDA in 2012 after being shown to remove tattoos with more success and fewer treatments compared with traditional methods. PS lasers were shown to be versatile, indicated for the treatment of lentigines, cafÃ©-au-lait macules (CALMs), and acne scars and skin rejuvenation. OBJECTIVE: We report our experience treating our patients for different indications using a PS laser. METHODS: We performed a retrospective chart and photographic review of all patients seen between 2016 and 2018 that were treated in our centers with a PS laser for nontattoo indications. Clinical outcomes were evaluated using side-by-side comparisons of the clinical photographs by two blinded, independent physicians using a visual analog scale consisting of six levels of treatment response. RESULTS: A total of 233 patients were studied. Most sought treatment for solar lentigo (27%) and skin rejuvenation (14%). Epidermal nevi exhibited the greatest improvement with treatment, while acne scarring demonstrated the least. Only 24% of patients experienced noteworthy, transient adverse effects. CONCLUSION: Picosecond lasers were efficacious and safe for a variety of indications. They were effective in treating epidermal nevi and

pigmented lesions, such as Lentigines and CALMs. Acne Vulgaris;Adolescent;Adult;Aged;Aged, 80 and over;Cafe-au-Lait Spots;Child;Cicatrix;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Nevus;Photography;Rejuvenation;Retrospective Studies;Skin;Skin Aging;Skin Neoplasms;Skin Pigmentation;Treatment Outcome;Young Adult

Short pulse intense pulsed light versus pulsed dye laser for the treatment of facial redness. Treating diffuse facial redness with an intense pulsed light (IPL) source usually requires multiple sessions and may not achieve complete clearance. The 595Â nm pulsed dye laser (PDL) enjoys a good reputation for reducing facial redness with non-purpuric settings. The objective of this study was to compare facial redness reduction using these two devices. After establishing the lowest light dose able to achieve transient purpura for the same pulse width of 1,5Â ms with each technology, right and left sides of the face were randomly assigned for each type of treatment. There were two treatment sessions 4Â weeks apart and the final evaluation was performed 8Â weeks after thesecond treatment. Four blinded experienced dermatologists analyzed pre and post-treatment photographs, which demonstrated an average of 60% improvement on the segment treated with the IPL as opposed to 45% on the other segment. Pain level was described as mild and the procedure was well tolerated for both types of treatment. In this study we showed that short-pulsed intense pulsed light and PDL are similar in decreasing facial redness when non-purpuric low fluence settings are used. The IPL was faster and did not have consumables. Cosmetic Techniques;Face;Female;Humans;Intense Pulsed Light Therapy;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pain;Rosacea

Light Modulation of Brain and Development of Relevant Equipment. Light modulation plays an important role in understanding the pathology of brain disorders and improving brain function. Optogenetic techniques can activate or silence targeted neurons with high temporal and spatial accuracy and provide precise control, and have recently become a method for quick manipulation of genetically identified types of neurons. Photobiomodulation (PBM) is light therapy that utilizes non-ionizing light sources, including lasers, light emitting diodes, or broadband light. It provides a safe means of modulating brain activity without any irreversible damage and has established optimal treatment parameters in clinical practice. This manuscript reviews 1) how optogenetic approaches have been used to dissect neural circuits in animal models of Alzheimer's disease, Parkinson's disease, and depression, and 2) how low level transcranial lasers and LED stimulation in humans improves brain activity patterns in these diseases. State-of-the-art brain machine interfaces that can record neural activity and stimulate neurons with light have good prospects in the future. Aged;Aged, 80 and over;Alzheimer Disease;Animals;Brain;Humans;Laser Therapy;Light;Optogenetics;Phototherapy

Photobiomodulation of inflammatory-cytokine-related effects in a 3-D culture model with gingival fibroblasts. The aim of this study was to assess the effects of IL-6 and IL-8 cytokines on human gingival fibroblasts (HGF) cultured in a 3-D model and the possible photobiomodulation (PBM) of such effects by low-level laser therapy. In complete culture medium (DMEM), HGF from a healthy patient were seeded in a type I collagen matrix inserted into 24-well plates. After 5Â days of incubation, the cytokines were added or not to serum-free DMEM, which was applied to the cell-enriched matrices. Then, PBM was performed: three consecutive irradiations using LaserTable diode device (780Â nm, 0.025Â W) at 0.5Â J/cm(2) were delivered or not to the cells. Twenty-four hours after the last irradiation, cell viability and morphology, gene expression, and synthesis of inflammatory cytokines and growth factors were assessed. The histological evaluation demonstrated that, for all groups, matrices presented homogeneous distribution of cells with elongated morphology. However, numerous cytokine-exposed cells were rounded. IL-6 and IL-8 decreased cell viability, synthesis of

VEGF, and gene expression of collagen type I. PBM enhanced cell density in the matrices and stimulated VEGF expression, even after IL-6 challenge. Reduced TNF-Î± synthesis occurred in those cells subjected to PBM. In conclusion, PBM can penetrate collagen matrix and stimulate HGF, highlighting the relevance of this research model for further phototherapy studies and in vitro biomodulation of the healing process. Collagen Type I;Cytokines;Interleukin-1beta;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A Cell Culture Techniques;Cell Survival;Collagen Type I;Cytokines;Fibroblasts;Gene Expression Regulation;Gingiva;Humans;Inflammation;Interleukin-1beta;Low-Level Light Therapy;Models, Biological;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A;Wound Healing

Laser acupuncture for refractory coccydynia after traumatic coccyx fracture: A case report. RATIONALE: Coccyx fracture is an injury usually caused by trauma. In most cases, the fractures recover after conservative therapy. For refractory cases that exhibit coccydynia after more than 2 months of conservative treatment, coccygectomy is indicated. However, limited information about the efficacy of this procedure is available, and it is known to have a high complication rate. As such, other therapeutic approaches are needed. Here, we report our experience using another conservative treatment option, low-level laser therapy, to successfully reduce refractory coccydynia in a patient with coccyx fracture. PATIENT CONCERNS: A 23-year-old woman had refractory coccydynia and increased pain after a traffic accident-induced coccyx fracture. DIAGNOSES: Initially, the patient reported transient improvement after conservative treatment with non-steroidal anti-inflammatory drugs. However, the pain increased in severity (numerical rating scale score of 8) soon after she resumed work in her office, and progressed in the following 2 months. Surgical intervention was suggested owing to the prolonged coccydynia following the failure of conservative treatment and difficulties in performing daily life activities. However, she sought other conservative therapy options, because she was concerned about the risks associated with the coccygectomy surgery. INTERVENTIONS: The patient received low-level laser therapy once a week, for 24 weeks. OUTCOMES: After 11 weeks of treatment, the patient reported significant improvements in her symptoms; her pain was reduced to a numerical rating scale score of 2 and bone healing was noted on radiographs. The patient could eventually perform her daily activities satisfactorily, without coccydynia, after 24 weeks of treatment. LESSONS: Laser acupuncture produced analgesic effects in this patient with refractory coccydynia after traumatic coccyx fracture. This is the first case report to apply laser acupuncture for refractory coccydynia after traumatic coccyx fracture. Our findings imply that laser acupuncture may be a good conservative therapy option for coccyx fracture. Acupuncture Therapy;Coccyx;Female;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement;Spinal Fractures;Treatment Outcome;Young Adult

Role of 904Â nm superpulsed laser-mediated photobiomodulation on nitroxidative stress and redox homeostasis in burn wound healing. BACKGROUND: Burn wound healing is delayed due to several critical factors such as sustained inflammation, vascular disorder, neuropathy, enhanced proteolysis, infection, and oxidative stress. Burn wounds have limited oxygen supply owing to compromised blood circulation. Hypoxic burn milieu leads to free radicals overproduction incurring oxidative injury, which impedes repair process causing damage to cell membranes, proteins, lipids, and DNA. Photobiomodulation (PBM) with 904Â nm superpulsed laser had shown potent healing efficacy via attenuating inflammation while enhancing proliferation, angiogenesis, collagen accumulation, and bioenergetic activation in burn wounds. METHODS: This study investigated the effects of 904Â nm superpulsed laser at 0.4Â mW/cm(2) average power density, 0.2Â J/cm(2) total energy density, 100Â Hz frequency, and 200Â ns pulse width for 10Â min daily for seven days postburn injury on nitroxidative stress, endogenous antioxidants status, and redox homeostasis. RESULTS: Photobiomodulation treatment significantly decreased reactive oxygen species, nitric oxide,

and lipid peroxidation levels as compared to non-irradiated control. Further, protective action of PBM against protein oxidative damage was evidenced by reduced protein carbonylation and advanced oxidation protein product levels along with significantly enhanced endogenous antioxidants levels of SOD, catalase, GPx, GST, reduced glutathione, and thiol (T-SH, Np-SH, P-SH). Biochemical changes aid in reduction of oxidative stress and maintenance of redox homeostasis, which further well corroborated by significantly up-regulated protein expression of Nrf 2, hemeoxygenase (HO-1), and thioredoxin reductase 2 (Txnrd2). CONCLUSION: Photobiomodulation with 904Â nm superpulsed laser led to reduction of nitroxidative stress, induction of endogenous antioxidants, and maintenance of redox homeostasis that could play a vital role in augmentation of burn wound healing. Advanced Oxidation Protein Products;NF-E2-Related Factor 2;Nfe2l2 protein, rat;Reactive Oxygen Species;Sulfhydryl Compounds;Nitric Oxide;Malondialdehyde;Catalase;Glutathione Peroxidase;Hmox1 protein, rat;Superoxide Dismutase;Thioredoxin Reductase 2;Txnrd2 protein, rat;Glutathione Transferase;Glutathione Advanced Oxidation Protein Products;Animals;Burns;Catalase;Glutathione;Glutathione Peroxidase;Glutathione Transferase;Heme Oxygenase (Decyclizing);Homeostasis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Malondialdehyde;NF-E2-Related Factor 2;Nitric Oxide;Oxidation-Reduction;Oxidative Stress;Protein Carbonylation;Rats;Rats, Sprague-Dawley;Reactive Oxygen Species;Sulfhydryl Compounds;Superoxide Dismutase;Thioredoxin Reductase 2;Wound Healing

Low-level laser therapy for carpal tunnel syndrome: systematic review and network meta-analysis. BACKGROUND: Splinting is recommended by various organisations as a non-surgical first-line treatment for carpal tunnel syndrome (CTS), despite the limited evidence supporting its effectiveness. Previous studies on the effectiveness of low-level laser therapy (LLLT) have reported mixed results, and this systematic review aimed to resolve this controversy. OBJECTIVE: To perform a network meta-analysis (NMA) for evaluating the effectiveness of LLLT compared with other conservative treatments for CTS. METHODS: Eighteen electronic databases were searched for potential randomised controlled trials (RCTs). RCTs evaluating LLLT or other non-surgical treatments as an add-on to splinting were included. Included RCTs measured at least one of the following three outcomes with validated instruments: pain, symptom severity and functional status. RESULTS: Six RCTs (418 patients) were included. NMA suggested that LLLT plus splinting has the highest probability (75%) of pain reduction, compared with sham laser plus splinting (61%), ultrasound plus splinting (57%) and splinting alone (8%). However, while LLLT plus splinting is significantly more effective than sham laser plus splinting for pain reduction, the magnitude is not clinically significant (Visual Analogue Scale mean difference -0.53cm, 95% confidence interval -1.01 to -0.05cm; P=0.03, I(2)=25%). The effect of LLLT plus splinting on symptom severity and functional status was not superior to splinting alone. CONCLUSION: The use of LLLT in addition to splinting for the management of CTS is not recommended, as LLLT offers limited additional benefits over splining alone in terms of pain reduction, reduction of symptom severity or improved functional status. PROSPERO for systematic reviews and meta-analyses registration number CRD42017082650. Carpal Tunnel Syndrome;Humans;Low-Level Light Therapy;Network Meta-Analysis

Low-level laser therapy prevents muscle apoptosis induced by a high-intensity resistance exercise in a dose-dependent manner.

Low-level laser therapy (LLLT) in sites grafted with osteoconductive bone substitutes improves osseointegration. The aim of this study was to evaluate the osseointegration of implants placed in areas grafted with different osteoconductive bone substitutes irradiated with infrared low-level laser therapy (LLLT). Fifty-six rats were randomly allocated into 4 groups: DBB, bone defects filled with deproteinized bovine bone graft (DBB); HA/TCP, bone defects filled with biphasic ceramic made of hydroxyapatite and Î²-tricalcium phosphate (HA/TCP); DBB-L, bone defects filled with DBB and

treated by LLLT; HA/TCP-L, bone defects filled with HA/TCP and treated by LLLT. Bone defects were performed in the tibia of each animal and filled with the different biomaterials. The grafted areas were treated with LLLT (Î» 808Â nm, 100Â mW, Ï•â€‰âˆ¼â€‰0.60Â mm) in 7 sessions with 48Â h between the irradiations. After the 60-day period, the implants were placed, and the animals were euthanized after 15 and 45Â days. The osseointegration and bone repair in the grafted area were evaluated by biomechanical, microtomographic and histometric analyses, and the expression of some bone biomarkers was evaluated by immunohistochemistry analysis. LLLT induced higher degree of osseointegration, which was associated with the greater expression of BMP2 and OCN. LLLT performed in areas grafted with osteoconductive bone substitutes prior to implant placement improves osseointegration. Bone Morphogenetic Protein 2;Bone Substitutes;Hydroxyapatites;hydroxyapatite-beta tricalcium phosphate Animals;Biomechanical Phenomena;Bone Morphogenetic Protein 2;Bone Regeneration;Bone Substitutes;Cattle;Hydroxyapatites;Image Processing, Computer-Assisted;Low-Level Light Therapy;Male;Osseointegration;Rats

Correction to: Could the impact of photobiomodulation on tumor response to radiation be effected by tumor heterogeneity? The Editor wishes to clarify that the author of the above named Commentary provided an ICMJE Conflict of Interest form at the time of submission.

Biomineralization-inspired nanozyme for single-wavelength laser activated photothermal-photodynamic synergistic treatment against hypoxic tumors. Hypoxia, one of the features of most solid tumors, can severely impede the efficiency of oxygen-dependent treatments such as chemotherapy, radiotherapy and type-II photodynamic therapy. Herein, a catalase-like nanozyme RuO(2)@BSA (RB) was first prepared through a biomineralization strategy, and a high efficiency near-infrared photosensitizer (IR-808-Br(2)) was further loaded into the protein shell to generate the safe and versatile RuO(2)@BSA@IR-808-Br(2) (RBIR) for the imaging-guided enhanced phototherapy against hypoxic tumors. RB not only acts like a catalase, but also serves as a photothermal agent that speeds up the oxygen supply under near-infrared irradiation (808 nm). The loaded NIR photosensitizer could immediately convert molecular oxygen (O(2)) to cytotoxic singlet oxygen ((1)O(2)) upon the same laser irradiation. Results indicated that RBIR achieved enhanced therapeutic outcomes with negligible side effects. Features such as a simple synthetic route and imaging-guided and single-wavelength-excited phototherapy make the nanozyme a promising agent for clinical applications. Antineoplastic Agents Animals;Antineoplastic Agents;Biomineralization;Cell Hypoxia;Low-Level Light Therapy;Mice;Nanostructures;Neoplasms, Experimental;Photochemotherapy;Theranostic Nanomedicine

The Effect of Photobiomodulation Therapy on the Differentiation, Proliferation, and Migration of the Mesenchymal Stem Cell: A Review. Introduction: The purpose of this study is to investigate the effect of a low-power laser on the proliferation, migration, differentiation of different types of mesenchymal stem cells (MSCs) in different studies. Methods: The relevant articles that were published from 2004 to 2019 were collected from the sources of PubMed, Scopus, and only the articles specifically examining the effect of a lowpower laser on the proliferation, differentiation, and migration of the MSCs were investigated. Results: After reviewing the literature, only 42 articles were found relevant. Generally, most of the studies demonstrated that different laser parameters increased the proliferation, migration, and differentiation of the MSCs, except the results of two studies which were contradictory. In fact, changing the parameters of a low-power laser would affect the results. On the other hand, the source of the stem cells was reported as a key factor. In addition, the combination of lasers with other therapeutic approaches was found to be more effective. Conclusion: The different parameters of lasers has been found to be effective in the proliferation,

differentiation, and migration of the MSCs and in general, a low-power laser has a positive effect on the MSCs, helping to improve different disease models.

Effectiveness of Low-Level Laser Therapy compared to Ultrasound in Patients With Carpal Tunnel Syndrome: A Systematic Review and Meta-analysis. Introduction: Carpal tunnel syndrome (CTS) is the most common type of peripheral entrapment neuropathy that occurs in the wrist area in a space called the carpal tunnel. Low-level laser therapy (LLLT) and ultrasound are among the most common methods of physical modalities for treating CTS; the effectiveness of these 2 methods and the superiority of one over the other are not agreed among experts. Methods: In the present systematic review and meta-analysis study, the most important databases including PubMed, Cochrane Library, Scopus, Centre for Reviews and Dissemination, Science Direct, Trip medical database and Google Scholar were searched using appropriate keywords and specific strategies without time limitation to collect data. The collected data was analyzed using the meta-analytic method and the random-effects model. The heterogeneity among studies was examined using I(2) . The data were analyzed using Review Manager Software. Results: From among 108 related studies, 49 cases were entered for the first stage. After the final examination, 6 studies were selected for meta-analysis. The total number of patients in these 6 studies was 403; 204 subjects were in the LLLT group and 199 subjects were in the ultrasound group. The results of the meta-analyses showed that there was no significant difference between these 2 therapeutic methods in terms of pain relief, symptom severity scale (SSS), functional status scale (FSS), motor latency, sensory latency, hand grip strength, and motor amplitude. Conclusion: Based on the meta-analyses, there was no significant difference between the 2 LLLT and ultrasound methods; in other words, they had similar effectiveness in improving the condition of patients with CTS. However, the authors believe that arriving at conclusions in this area requires high-quality and large size studies.

The Temporal Confounding Effects of Extra-cerebral Contamination Factors on the Hemodynamic Signal Measured by Functional Near-Infrared Spectroscopy. Introduction: Functional near-infrared spectroscopy (fNIRS) has been broadly applied for optical brain imaging. This method is hemodynamic-based functional brain imaging relying on the measurement of the neurovascular coupling to detect changes in cerebral neuronal activities. The extra-cerebral hemodynamic changes are important contaminating factors in fNIRS measurements. This error signal can be misinterpreted as cerebral activities during fNIRS studies. Recently, it was assumed that temporal changes in deoxygenated hemoglobin concentration [HHb] was hardly affected by superficial blood flow, and it was proposed that the activation maps could be determined from [HHb] at large source-detector separation. Methods: In the current study, we measured the temporal changes in [HHb] using a continueswave fNIRS device at large source-detector separation, while superficial blood flow was stimulated by infrared lasers. A mesh-based Monte Carlo code was applied to estimate fNIRS sensitivity to superficial hemodynamic changes in a realistic 3D MRI-based brain phantom. Results: First, we simulated photon migration in a four-layered human-head slab model to calculate PPLs and fNIRS sensitivity. Then, the localization of the infrared laser inside a realistic brain model was studied using the Monte Carlo method. Finally, the changes in [HHb] over the prefrontal cortex of six adult males were measured by fNIRS at a source-detector separation of 3 cm. The results demonstrated that the relation between fNIRS sensitivity and an increase in S-D separation was nonlinear and a correlation between shallow and deep signals was observed. Conclusion: The presented results demonstrated that the temporal changes in the superficial blood flow could strongly affect HHb measurement at large source-detector separation. Hence, the cerebral activity map extracted from the [HHb] signal was mainly contaminated by superficial blood flow.

Cerebrospinal Fluid and Photobiomodulation Effects on Neural Gene Expression in Dental Pulp Stem Cells. Introduction: Dental pulp cells, a unique source of ectomesenchymal pluripotent stem

cells, are originated from the skull neural crest. They are considered as one ideal source of cells for the regenerative medicine applications. Cerebrospinal fluid (CSF), a transparent fluid found in the brain and spinal cord, is enriched with electrolytes, proteins, and growth factors such as EGF, bFGF, BDNF, GDNF, and neuropeptides and can be utilized as a trigger in order to induce the neural differentiation. On the other hand, photobiomodulation (PBM), with the ability to prevent cell apoptosis, can induce cell proliferation by means of increasing the ATP synthesis in mitochondria and facilitating the secretion of the growth factors. In this research, we first aimed to isolate and culture the dental pulp stem cells (DPSCs) and subsequently to investigate their potential for neural differentiation. Methods: Human dental pulp stem cells (hDPSCs) were isolated from the pulp tissues using an outgrowth method and subsequently cultured. In order to access the cells' differentiation potential, cells were firstly classified into four groups which were treated with CSF, gallium aluminum arsenide diode laser irradiation (808 nm; 30 mW power output) and a combination of both, while the fourth group was considered as the control. MTT assay was then used to examine the viability of cells following the treatments. After 4, 7, and 14 days the cell morphology in the treated groups was evaluated while RT-PCR was used in order to evaluate the Nestin and Î²-tubulinIII neural gene marker expressions. Results: It was shown that PBM has the ability to elevate the proliferation of DPSCs. Also, the differentiated morphology was obvious in the CSF treated group, especially on day 14 with the formation of three-dimensional (3D) structures. The results of gene expression analysis showed that on the fourth day of post-treatment, Nestin and Î²-tubulinIII gene expressions were reduced in all groups while a rising trend in their expression was observed subsequently on days 7 and 14. Conclusion: In accordance with previous studies, including functional and protein base researches, it has been demonstrated that CSF has a direct role in neural induction. Although past works have been significant, none of them shows a 3D structure. In this article, we investigated the dual effect of PBM and CSF. Initial results confirmed the upregulation of neural-related transcription factors. The 3D organization of the formed tissue could imply the initiation of organogenesis which has not been reported before. In sum, the dual effect of CSF and PBM has been shown to have the potential for contributing to the initiation of neurogenesis and organogenesis.

An Open-Label Study of Low-Level Laser Therapy Followed by Autologous Fibroblast Transplantation for Healing Grade 3 Burn Wounds in Diabetic Patients. Introduction: Low-level laser therapy (LLLT) has been used as an effective therapeutic modality since the mid-1960s. Although there have been several clinical studies using LLLT in wound healing, especially diabetic, pressure and venous ulcers, there are few reports of using this technique in burn ulcers. Autologous fibroblast transplantation is a novel treatment for patients with burns or venous ulcers. In this study for the first time, we used LLLT along with autologous fibroblast skin transplantation to treat grade 3 burn ulcers in diabetic patients. This case series describes the successful management of grade 3 burn ulcers in 10 diabetic patients using autologous fibroblast transplantation along with LLLT. Methods: After the approval of the Tehran University Ethics Committee (IR.TUMS.REC.1394.1683) and the Iran Registry of Clinical Trials (IRCT2016050226069N3), 10 diabetic patients with 10 grade 3 burn ulcers, who were a candidate for skin graft surgery, entered the study. Donor skin was biopsied using a 3 mm punch. Fibroblasts were extracted and cultured in vitro in the GMP Technique laboratory. The patients were treated using LLLT in 3-4 weeks during the time that fibroblast cultures became ready to use. Laser irradiation was done using red light, 650 nm, 150 mW, 1 J/cm(2) for the bed of the ulcer and infra-red light 808 nm, 200 mW, 6 J/cm(2) for the margins every other day for 10 sessions. Results: The mean wound size before treatment was 16.28 cm(2) . All patients' burn wounds healed completely after 10-12 weeks. Conclusion: We conclude that this method can be used as an effective method for treating large wounds, especially in complicated patients including the diabetics.

Photobiomodulation effects on osteogenic differentiation of adipose-derived stem cells. Increasing interest has been observed in the use of photobiomodulation (PBM) to enhance the proliferation of stem cells and induce their differentiation. The effects of PBM at two different wavelengths (635 and 809Â nm) with three different energy densities (0.5, 1 and 2Â J/cm(2)) on the osteogenic differentiation of adipose-derived stem cells (ADSC) were investigated. Cell viability and proliferation were evaluated by MTT and Alamar Blue assays. Osteoblast differentiation were assessed by alkaline phosphatase (ALP) activity, Alizarin red staining and reverse-transcription polymerase chain reaction (RT-PCR) for the expression of collagen type I (COL1A), ALP and osteocalcin. 635Â nm and 809Â nm laser irradiation had no effect on the cell viability on daysÂ 7 and 14, except for 0.5Â J/cm(2) group at 14thÂ day after 635Â nm irradiation (pâ€‰<â€‰0.05). Cell proliferation was not changed significantly. Mineralization was increased significantly in 809Â nm laser groups but no enhancement was detected in the osteogenic differentiation by ALP activity and gene expression results. In 0.5 and 1Â J/cm(2) groups, ALP and COL1A expressions were down regulated at dayÂ 7 after 809Â nm laser exposure. These results suggest that PBM may alter osteogenic differentiation of ADSC and increase mineralization but further investigation is needed to define adequate parameters.

Photobiomodulation (450Â nm) alters the infection of periodontitis bacteria via the ROS/MAPK/mTOR signaling pathway. We aimed to investigate the effects of photobiomodulation (PBM) on periodontitis. A periodontitis model was established via Porphyromonas gingivalis infection in beagles. Mandibular second and third premolars were removed, and implants were positioned immediately after tooth extraction. Left gingiva was irradiated with PBM (450Â nm) as the LG group, and right side without irradiation was regarded as the CG (control) group. PBM treatment increased oxidative stress by increasing the levels of reactive oxygen species (ROS) and reactive nitrogen species (RNS). The elevated levels of H(2)O(2) (a biomarker of oxidative stress) and the free radicals (NO(â€¢) and O(2)(â€¢-)) reduced the concentration of dominant pathogens and regulated ROS/RNS/AMP-activated protein kinase (AMPK)/mTOR pathway by affecting p-AMPK, Runt-related transcription factor 2 (RUNX2), p-c-Jun N-terminal kinase (JNK)/mammalian target of rapamycin (mTOR), and acetyl-CoA carboxylase 1 (ACC1). PBM therapy increased salivary levels of interleukin-1 receptor antagonist (IL-1ra), interleukin (IL)-10, total antioxidant capacity (TAC) and catalase (CAT), and reduced the levels of tumor necrosis factor (TNF)Î± and interleukin (IL)-1Î², malondialdehyde (MDA) and 8-hydroxydeoxyguanosine (8-OHdG) (pÂ <Â 0.05). All the results contributed to preventing periodontitis infection. PBM therapy improved bone mineral density and implant osseointegration by controlling dominant pathogens invasion via the upregulation of salivary anti-inflammatory and antioxidant defense by affecting ROS/RNS/AMPK/mTOR signaling pathway. Reactive Oxygen Species;Hydrogen Peroxide;TOR Serine-Threonine Kinases Animals;Bacteria;Dogs;Hydrogen Peroxide;Periodontitis;Reactive Oxygen Species;Signal Transduction;TOR Serine-Threonine Kinases

Biological Responses of Stem Cells to Photobiomodulation Therapy. BACKGROUND: Stem cells have attracted the researchers interest, due to their applications in regenerative medicine. Their self-renewal capacity for multipotent differentiation, and immunomodulatory properties make them unique to significantly contribute to tissue repair and regeneration applications. Recently, stem cells have shown increased proliferation when irradiated with low-level laser therapy or Photobiomodulation Therapy (PBMT), which induces the activation of intracellular and extracellular chromophores and the initiation of cellular signaling. The purpose of this study was to evaluate this phenomenon in the literature. METHODS: The literature investigated the articles written in English in four electronic databases of PubMed, Scopus, Google Scholar and Cochrane up to April 2019. Stem cell was searched by combining the search keyword of "low-level laser therapy" OR "low power laser

therapy" OR "low-intensity laser therapy" OR "photobiomodulation therapy" OR "photo biostimulation therapy" OR "LED". In total, 46 articles were eligible for evaluation. RESULTS: Studies demonstrated that red to near-infrared light is absorbed by the mitochondrial respiratory chain. Mitochondria are significant sources of reactive oxygen species (ROS). Mitochondria play an important role in metabolism, energy generation, and are also involved in mediating the effects induced by PBMT. PBMT may result in the increased production of (ROS), nitric oxide (NO), adenosine triphosphate (ATP), and cyclic adenosine monophosphate (cAMP). These changes, in turn, initiate cell proliferation and induce the signal cascade effect. CONCLUSION: The findings of this review suggest that PBMT-based regenerative medicine could be a useful tool for future advances in tissue engineering and cell therapy. Animals;Humans;Low-Level Light Therapy;Regenerative Medicine;Signal Transduction;Stem Cells

Retrospective study of photodynamic therapy for pulsed dye laser-resistant port-wine stains. Pulsed dye laser-resistant port-wine stains present a therapeutic challenge. The aim of this study was to evaluate the efficacy and safety of photodynamic therapy for treating these lesions. A total of 67 patients with pulsed dye laser-resistant cervicofacial port-wine stains were retrospectively assessed after undergoing photodynamic therapy mediated with a combination of hemoporfin and 532-nm light. For objective evaluation of photodynamic therapy efficacy, first, the colorimetric changes in the port-wine stain lesions were evaluated according to the L*a*b* color coordinate system, then the values of color changes (Î”E) and blanching rate were calculated. For subjective evaluation of improvement, photographs taken before and after photodynamic therapy were evaluated by three independent assessors blindly. Patient satisfaction was also used as a factor in the subjective evaluation. Adverse events were recorded after treatment. The median Î”E decreased significantly from the pretreatment value of 13.42 to 9.90 at the 2-month follow up (PÂ <Â 0.001). The median blanching rate of port-wine stains was 28.04% after an average of 1.21 sessions of photodynamic therapy. Based on the overall visual assessment, 46.2% patients showed excellent or good levels of improvement (>50% color blanching). Adverse events were minimal, transient and self-limiting. In conclusion, photodynamic therapy serves as an alternative means to treat pulsed dye laser-resistant port-wine stains. Hematoporphyrins;hematoporphyrin monomethyl ether Adolescent;Adult;Child;Child, Preschool;Disease Resistance;Face;Female;Hematoporphyrins;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Neck;Patient Satisfaction;Photochemotherapy;Port-Wine Stain;Retrospective Studies;Treatment Outcome;Young Adult

Alveolar bone histological necrosis observed prior to extractions in patients, who received bone-targeting agents. OBJECTIVE: We reported the alveolar bone histology prior to dental extractions in cancer patients, who received bone-targeting agents (BTA). SUBJECTS AND METHODS: Fifty-four patients were included. Patients underwent extractions, and bone biopsies were taken. RESULTS: Extractions were performed due to pain, swelling, purulence, fistula, and numbness, not responding to treatment, in 40 patients (group A); extractions due to asymptomatic, non-restorable teeth, were performed in 14 patients (group B). Complete alveolar jaw bone histological necrosis was observed in 28 of 40 (70%) patients of group A and none of group B (pÂ <Â .001). The development of clinical osteonecrosis (MRON) was assessed in 44 patients; 10 patients, who were also treated with Low Level Laser Treatments-LLLT, were excluded from this analysis, as the alternative therapies were a confounding factor. Twelve patients, with alveolar bone histological necrosis prior to extraction, developed medication-related osteonecrosis of the jaw (MRONJ) compared with two patients with vital or mixed vital/non-vital bone (pÂ <Â .0007). BTAs >1Â year and concurrent targeted therapy were also significantly associated with MRONJ (pÂ =Â .016 and pÂ =Â .050). CONCLUSION: Pain, swelling, purulence, fistula, and numbness were significantly associated with complete bone

histological necrosis prior to extractions and increased MRONJ development. Research is justified to explore whether histological necrosis represents an early stage of osteonecrosis. Bone Density Conservation Agents;Diphosphonates Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Humans;Neoplasms;Tooth Extraction

Irradiance plays a significant role in photobiomodulation of B16F10 melanoma cells by increasing reactive oxygen species and inhibiting mitochondrial function. Melanoma is a type of aggressive cancer. Recent studies have indicated that blue light has an inhibition effect on melanoma cells, but the effect of photobiomodulation (PBM) parameters on the treatment of melanoma remains unknown. Thus, this study was aimed to investigate B16F10 melanoma cells responses to PBM with varying irradiance and doses, and further explored the molecular mechanism of PBM. Our results suggested that the responses of B16F10 melanoma cells to PBM with varying irradiance and dose were different and the inhibition of blue light on cells under high irradiance was better than low irradiance at a constant total dose (0.04, 0.07, 0.15, 0.22, 0.30, 0.37, 0.45, 0.56 or 1.12 J/cm(2)), presumably due to that high irradiance can produce more ROS, thus disrupting mitochondrial function.

The effectiveness of home-use photobiomodulation toothbrush for treating dentin hypersensitivity: A pilot study. BACKGROUND AND AIMS: Dentin hypersensitivity is a frequent oral condition among patients suffering from gingival recession. Recent studies have suggested that photobiomodulation has the potential to reduce inflammation and relieve pain. The present study aims to assess the effectiveness of a new design of photobiomodulation toothbrush with specific irradiation parameters as a homecare device in treating dentin hypersensitivity and to compare its therapeutic effect with that of fluoride varnish. MATERIALS AND METHODS: Thirty patients with gingival recession and dentin hypersensitivity were selected and randomly assigned to three groups of equal size: fluoride varnish, photobiomodulation, and the combination. Dentin pain and hypersensitivity were measured using visual analog scale (VAS) by two distinct tests: the contact test with a periodontal probe and the air blast test on the areas of gingival recession and denuded root; once at baseline and again one month after the initial application of treatments. Laser irradiation was carried out at the wavelength of 660 nm in CW with an output power of 40 mW for 30 seconds per spot (1.2 J per spot, 6 J/cm(2) energy density, and 200 mW/cm(2) power density), perpendicularly to denuded root surfaces in non-contact mode. RESULTS: A significant reduction in dentin pain and hypersensitivity was observed in all three groups. However, the reduction was significantly greater in the combination group. CONCLUSION: At-home treatment of dentin hypersensitivity with photobiomodulation toothbrush is a convenient, safe, and effective method for the management of dentin hypersensitivity.

Photobiomodulation guided healing in a sub-critical bone defect in calvarias of rats. BACKGROUND: Photobiomodulation presents stimulatory effects on tissue metabolism, constituting a promising strategy to produce bone tissue healing. OBJECTIVE: the aim of the present study was to investigate the in vivo performance of PBM using an experimental model of cranial bone defect in rats. MATERIAL AND METHODS: rats were distributed in 2 different groups (control group and PBM group). After the surgical procedure to induce cranial bone defects, PBM treatment initiated using a 808 nm laser (100 mW, 30 J/cm(2), 3 times/week). After 2 and 6 weeks, animals were euthanized and the samples were retrieved for the histopathological, histomorphometric, picrosirius red staining and immunohistochemistry analysis. RESULTS: Histology analysis demonstrated that for PBM most of the bone defect was filled with newly formed bone (with a more mature aspect when compared to CG). Histomorphomeric analysis also demonstrated a higher amount of newly formed bone deposition in the irradiated animals, 2 weeks post-surgery. Furthermore, there was a more intense deposition of collagen for PBM, with ticker fibers. Results from Runx-2 immunohistochemistry demonstrated that a higher immunostaining for CG 2 week's post-surgery and no other difference was observed for Rank-L

immunostaining. CONCLUSION: This current study concluded that the use of PBM was effective in stimulating newly formed bone and collagen fiber deposition in the sub-critical bone defect, being a promising strategy for bone tissue engineering.

Role of low-level laser therapy in post-herpetic neuralgia: a pilot study. The aim of the present study was to investigate the influence of low-level laser radiation at a wavelength of 650Â nm for treating post-herpetic neuralgia, an extremely painful condition which frequently occurs severely in old age and may persist for years with no predictable course. In total, fifteen patients were included in the present study, out of which 8 were females and 7 were males aged between 42 and 82Â years. All patients were treated through 16 sessions for 8Â weeks, and pain scoring was done on a visual analogue scale and statistical analysis was made for comparison before and after treatments. The final pain score was 0 in 11 patients although their initial pain score was severe in 8 and moderate in 3 patients. In three patients, pain reduced to mild intensity (2-3), and in one, the final pain score was 4 on the visual analogue scale. Patients treated during the present study have not complained for recurrence of pain or any other abnormality even after many months since completion of the therapy. Overall, low-level laser therapy (LLLT) proved itself an excellent therapeutic modality for the relief of pain in post-herpetic neuralgia patients, which may replace pain management medicines in future. Adult;Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neuralgia, Postherpetic;Pain;Pilot Projects;Visual Analog Scale

Rehabilitation of companion animals following orthopaedic surgery. Physical therapy and rehabilitation following orthopaedic surgery in companion animals have become more common and new advancements in this field have been made in recent years. Surgery alone may not return the animal to its previous physical activity or work-related tasks, whether due to concurrent soft tissue trauma, arthrogenic muscle inhibition or osteoarthritis. Rehabilitation therapies following surgery can restore function as well as strength, coordination and balance. Many simple techniques such as cryotherapy and passive range of motion exercises have been shown to improve outcomes following musculoskeletal procedures and may help restore function as well as reduce pain and facilitate healing. Some techniques are more useful during different stages in order to achieve optimum tissue healing and recovery of function. During the first 72 hours, rehabilitation should focus on reduction of inflammation and pain, maintaining joint nutrition and range of motion, and stimulating vascularisation and healing; and may include cryotherapy, passive range of motion exercises, massage and therapeutic exercises. Following the initial recovery period, the goals of rehabilitation also include restoring strength, balance and normal gait patterns, as well as recovery of function. During this period the focus of therapy may shift toward therapeutic exercises, aquatic therapy and increasing activity in the animal. Therapeutic modalities such as neuromuscular electrical stimulation, photobiomodulation (laser therapy), therapeutic ultrasound and extracorporeal shock wave therapy have been reported to reduce pain and inflammation, enhance healing and reduce recovery time in the early and late stages following orthopaedic surgery.
Animals;Cats;Cryotherapy;Dogs;Exercise Therapy;Orthopedic Procedures;Pets;Physical Therapy Modalities

Efficacy of Low-level Laser Therapy, Hyaluronic Acid Gel, and Herbal Gel as Adjunctive Tools in Gingivectomy Wound Healing: A Randomized Comparative Clinical and Histological Study. Introduction Gingival overgrowth is usually an inflammatory response to plaque present on tooth surfaces. The other causes could be drugs and other systemic conditions. When the local factors are responsibleÂ and subgingival scaling does not help, gingivectomy is performed. The gingivectomy wound is raw and heals slowly. Low-level laser therapy (LLLT), hyaluronic acid, and herbal gels aid in healing after a gingivectomy. This study compared the efficacy of LLLT, hyaluronic acid, and herbal gel when used topically after a gingivectomy. This was a single-arm, interventional trial wherein 30

patients aged between 18 and 40 years with moderate gingival overgrowth participated. The study was approved by the institutional ethical committee. (DN/0109-16). The participants signed the consent form and the study was also registeredÂ (NCT03569683). Materials and methods The samples were equally divided into three groups. Group A received LLLT immediately postop, and on the first, third, and seventh days after surgery. Group B received hyaluronic acid (Gengigel) while Group C received an herbal gel (Hiora SG) for the same time periods after surgery, respectively. Analysis of variance (ANOVA) followed by a post-hoc Bonferroni test was used to evaluate differences within groups. Intergroup comparison was performed using the independent t-test. A p-value of <0.05 was considered statistically significant. Results The plaque index (PI), gingival index (GI), and gingival enlargement index (GEI) showed good improvement postoperativelyÂ within the groups, which was statistically significant. However, on an intergroup comparison, the GEI pertaining only to the laser group showed significant changes. Also, the pain perception analyzed by the visual analogÂ score (VAS) was the least, and histologically, the amount of mature collagen fibers laid down were more in the laser group. Conclusion Patients irradiated with laser after gingivectomy (Group A) showed superior results in the clinical, histological variables as compared to Groups B and C.

Coupled blue and red light-emitting diodes therapy efficacy in patients with rosacea: two case reports. BACKGROUND: Rosacea is a common inflammatory skin condition affecting approximately 5% of the world population. Therapeutic approaches to rosacea are focused on symptom suppression by means of anti-inflammatory agents. More recently, photodynamic therapy, especially light-emitting diodes, has been introduced as a valid alternative to conventional therapy. CASE PRESENTATION: In the present work, we reported the efficacy and safety of light-emitting diodes therapy combining blue (480â€‰nm) and red (650â€‰nm) light for the treatment of two patients with papulopustular rosacea: a 22-year-old Caucasian woman and a 68-year-old Caucasian man. CONCLUSIONS: This kind of treatment could represent an effective, safer, and well-tolerated approach for the treatment of such conditions.
Aged;Female;Humans;Male;Photochemotherapy;Rosacea;Treatment Outcome;Visual Analog Scale;Young Adult

Osteogenic Potential of Bovine Bone Graft in Combination with Laser Photobiomodulation: An Ex Vivo Demonstrative Study in Wistar Rats by Cross-Linked Studies Based on Synchrotron Microtomography and Histology. BACKGROUND: Alveolar bone defects are usually the main concern when planning implant treatments for the appropriate oral rehabilitation of patients. To improve local conditions and achieve implant treatments, there are several methods used for increasing bone volume, among which one of the most successful, versatile, and effective is considered to be guided bone regeneration. The aim of this demonstrative study was to propose an innovative analysis protocol for the evaluation of the effect of photobiomodulation on the bone regeneration process, using rat calvarial defects of 5 mm in diameter, filled with xenograft, covered with collagen membrane, and then exposed to laser radiation. METHODS: The animals were sacrificed at different points in time (i.e., after 14, 21, and 30 days). Samples of identical dimensions were harvested in order to compare the results obtained after different periods of healing. The analysis was performed by cross-linking the information obtained using histology and high-resolution synchrotron-based tomography on the same samples. A comparison was made with both the negative control (NC) group (with a bone defect which was left for spontaneous healing), and the positive control (PC) group (in which the bone defects were filled with xenografts and collagen membrane without receiving laser treatment). RESULTS: We demonstrated that using photobiomodulation provides a better healing effect than when receiving only the support of the biomaterial. This effect has been evident for short times treatments, i.e., during the first 14 days after surgery. CONCLUSION: The proposed analysis protocol was effective in detecting the presence of higher quantities of bone volumes under

remodeling after photobiomodulation with respect to the exclusive bone regeneration guided by the xenograft. Collagen Animals;Biopsy;Bone Transplantation;Cattle;Collagen;Guided Tissue Regeneration;Heterografts;Immunohistochemistry;Lasers;Low-Level Light Therapy;Osteogenesis;Rats;Synchrotrons;X-Ray Microtomography

Effects of low-level laser therapy on hamstring strain injury rehabilitation: A randomized controlled trial. OBJECTIVES: To evaluate the effects of low-level laser therapy (LLLT) on functional rehabilitation following hamstring strain injury (HSI) in amateur athletes treated with an exercise-based rehabilitation program. DESIGN: Randomized controlled trial. METHODS: Male athletes (18-40 years old) who sustained HSI were randomized in LLLT or placebo groups. All patients were engaged in the same exercise-based rehabilitation program until they met specific criteria to return to sport. Hamstring muscles were treated with LLLT or placebo immediately after each rehabilitation session. The primary outcome was time-to-return to sport. Secondary outcomes were the number of rehabilitation sessions, hamstring flexibility, hamstring strength, and re-injury rate. RESULTS: Twenty-four athletes began rehabilitation, and 22 (11 per group) completed the study schedule. Participants of LLLT and placebo groups had similar age, body size, injury characteristics, and baseline levels of hamstring flexibility and strength. The two groups increased flexibility and strength similarly throughout the rehabilitation program. Time-to-return to sport was the same for athletes treated with LLLT (23Â Â±Â 9 days) and placebo (24Â Â±Â 13 days). There were no re-injuries within 6 months after return to sport. CONCLUSION: LLLT, as used in this study, did not optimize functional rehabilitation following HSI in amateur athletes treated with an exercise-based rehabilitation program. Adolescent;Adult;Athletic Injuries;Combined Modality Therapy;Double-Blind Method;Hamstring Muscles;Humans;Low-Level Light Therapy;Male;Physical Therapy Modalities;Return to Sport;Young Adult

Optical Vaginal Biopsy Using Optical Coherence Tomography. OBJECTIVE: Optical coherence tomography is a noninvasive technology that visualizes tissue microstructure with high spatial resolution. We designed a novel vaginal system that demonstrates a clear distinction between vaginal tissues planes. In this study, we sought to compare vaginal tomographic images of premenopausal, perimenopausal, and postmenopausal women, demonstrate feasibility of tracking vaginal tissue changes after treatment with fractional-pixel CO2 laser therapy, and obtain a histologic correlation of these findings. METHODS: Enrolled subjects underwent imaging and were divided into 3 groups based on menopausal status. Women with genitourinary syndrome of menopause who received fractional-pixel CO2 laser therapy were assessed before and after treatment. A cadaveric vagina was used to obtain tomographic and histologic images to assess for accuracy. Our primary outcome was mean vaginal epithelial thickness. Statistical analysis was performed using analysis of variance and t tests, respectively. RESULTS: Among 6 women, the mean vaginal epithelial thickness decreased with menopause ($P < 0.01$). Although change in epithelial thickness after fractional-pixel CO2 laser treatment varied between the 2 subjects evaluated, it increased significantly for the subject who reported improvement of vaginal symptoms ($P < 0.01$). Using a cadaveric specimen, optical biopsy was correlated to an hematoxylin and eosin-stained biopsy of the same vaginal site. CONCLUSIONS: This study establishes feasibility of optical coherence tomography in providing an optical biopsy of the vaginal epithelium and lamina propria. In addition, it demonstrates vaginal changes as women enter menopause. This report is the initial phase of a longitudinal cohort study to evaluate changes in vaginal microstructure after energy-based treatment. Adult;Aged;Feasibility Studies;Female;Humans;Image-Guided Biopsy;Lasers, Gas;Longitudinal Studies;Low-Level Light Therapy;Middle Aged;Perimenopause;Postmenopause;Premenopause;Tomography, Optical Coherence;Treatment Outcome;Vagina;Vaginal Diseases

Photobiomodulation Therapy for Myofascial Pain in Temporomandibular Joint Dysfunction: A Double-Blinded Randomized Clinical Trial. AIMS: Temporomandibular disorder (TMD) is a complex process that affects the temporomandibular joint (TMJ). The multifactorial process is of unknown etiology and has many manifestations and thus many management options. Photobiomodulation therapy has been suggested for management of TMD, despite the lack of understanding of its exact mechanism. The aim of this study is to examine the effectiveness of photobiomodulation in the treatment of myofascial type TMD. METHODS: Patients with unilateral TMJ and masticatory muscles pain during function were recruited and divided into two groups: a control group that received a sham laser treatment every 48Â h for 10Â days and a test group that received the same frequency of treatment to deliver a dose of 257Â J per treatment and a total dose of 1285Â J for the entire treatment. Pain was assessed using the visual analog scale (VAS). RESULTS: There was a significant difference in VAS scores between the test and control groups with the test group scoring lower. CONCLUSION: Photobiomodulation therapy proved to be an effective short-term therapeutic modality for myofascial TMD pain. It is non-invasive, easy to apply with no systemic side effects. Its long-term effect and its effect on different subtypes of TMD need further investigation.

Photobiomodulation plus Adipose-derived Stem Cells Improve Healing of Ischemic Infected Wounds in Type 2 Diabetic Rats. In this study, we sought to investigate the impact of photobiomodulation and adipose-derived stem cells (ADS), alone and in combination, on the maturation step of wound healing in an ischemic infected delayed healing wound model in rats with type 2 diabetes mellitus (DM2). We randomly divided 24 adult male rats into 4 groups (nâ€‰=â€‰6 per group). DM2 plus an ischemic delayed healing wound were induced in all rats. The wounds were infected with methicillin-resistant Staphylococcus aureus. Group 1 was the control (placebo) group. Group 2 received only photobiomodulation (890â€‰nm, 80â€‰Hz, 0.324â€‰J/cm(2), and 0.001â€‰W/cm(2)). Group 3 received only the allograft ADS. Group 4 received allograft ADS followed by photobiomodulation. On days 0, 4, 8, 12, and 16, we performed microbiological examination (colony forming units, [CFU]), wound area measurement, wound closure rate, wound strength, and histological and stereological examinations. The results indicated that at day 16, there was significantly decreased CFU (Analysis of variance, pâ€‰=â€‰0.001) in the photobiomodulationâ€‰+â€‰ADS (0.0â€‰Â±â€‰0.0), ADS (1350â€‰Â±â€‰212), and photobiomodulation (0.0â€‰Â±â€‰0.0) groups compared with the control group (27250â€‰Â±â€‰1284). There was significantly decreased wound area (Analysis of variance, pâ€‰=â€‰0.000) in the photobiomodulationâ€‰+â€‰ADS (7.4â€‰Â±â€‰1.4 mm(2)), ADS (11â€‰Â±â€‰2.2 mm(2)), and photobiomodulation (11.4â€‰Â±â€‰1.4 mm(2)) groups compared with the control group (25.2â€‰Â±â€‰1.7). There was a significantly increased tensiometeric property (stress maximal load, Analysis of variance, pâ€‰=â€‰0.000) in the photobiomodulationâ€‰+â€‰ADS (0.99â€‰Â±â€‰0.06â€‰N/cm(2)), ADS (0.51â€‰Â±â€‰0.12â€‰N/cm(2)), and photobiomodulation (0.35â€‰Â±â€‰0.15â€‰N/cm(2)) groups compared with the control group (0.18â€‰Â±â€‰0.04). There was a significantly modulated inflammatory response in (Analysis of variance, pâ€‰=â€‰0.049) in the photobiomodulationâ€‰+â€‰ADS (337â€‰Â±â€‰96), ADS (1175â€‰Â±â€‰640), and photobiomodulation (69â€‰Â±â€‰54) treatments compared to control group (7321â€‰Â±â€‰4099). Photobiomodulationâ€‰+â€‰ADS gave significantly better improvements in CFU, wound area, and wound strength compared to photobiomodulation or ADS alone. Photobiomodulation, ADS, and their combination significantly hastened healing in ischemic methicillin-resistant Staphylococcus aureus infected delayed healing wounds in rats with DM2. Combined application of photobiomodulation plus ADS demonstrated an additive effect. Streptozocin Adipose Tissue;Allografts;Animals;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Ischemia;Low-Level Light Therapy;Male;Methicillin-Resistant Staphylococcus

aureus;Random Allocation;Rats;Rats, Wistar;Staphylococcal Infections;Stem Cell Transplantation;Streptozocin;Surgical Wound Infection;Treatment Outcome;Wound Healing

Cellulose nanocrystals/nanofibrils loaded astaxanthin nanoemulsion for the induction of apoptosis via ROS-dependent mitochondrial dysfunction in cancer cells under photobiomodulation. The present study investigated effects of low-level laser therapy with cellulose nanocrystals/cellulose nanofibrils loaded in nanoemulsion (NE) against skin cancer cells on apoptosis. The nanoemulsion was fabricated and characterized by the standard methods. The toxicity level by cytotoxicity assays, generation of reactive singlet oxygen (ROS) and antioxidant potential, cell proliferation and migration were confirmed by using standard assays. The cellular uptake efficacy was evaluated by differential staining. The protein levels of EGFR, PI3K, AKT, ERK, GAPDH, and Î²-actin were detected by western blot. The samples showed a spherical shaped structure with the average size confirmed strong and stable hydrogen bonding forces with high degradation temperature and endothermic transition peaks. The fabricated samples showed no toxicity and high cell proliferation by generating more singlet oxygen levels and antioxidants. The intracellular signaling pathways was regulated with high protein expression levels, which was stimulated by specific molecules for cell proliferation, migration, and differentiation in cancer cells. The results proved that combined treatment regulated the intracellular signaling pathways in cancer cells. The current study showed a novel strategy for improving therapeutic efficacy of nanoemulsion by using low-level laser therapy. Further, the current favorable outcomes will be evaluated in in vivo animal models. Emulsions;Reactive Oxygen Species;Xanthophylls;astaxanthine;Cellulose
Animals;Apoptosis;Cellulose;Emulsions;Mice;Mitochondria;NIH 3T3 Cells;Nanoparticles;Reactive Oxygen Species;Skin Neoplasms;Xanthophylls

Synergistic Effects of the 308-nm Excimer Light and Topical Calcipotriol for the Treatment of Chronic Hand Eczema: A Randomized Controlled Study. BACKGROUND: Though topical corticosteroid is a standard treatment for chronic hand eczema (CHE), it can cause many adverse effects. Topical calcipotriol and monochromatic 308-nm excimer light (MEL) are new alternative therapies for several dermatoses, including CHE. OBJECTIVE: This study aims to compare the efficacy of the combination of MEL and topical calcipotriol versus topical calcipotriol alone. METHODS: One hand of the participants was randomly assigned to be irradiated with MEL twice weekly and topical calcipotriol applied twice daily while the other hand was assigned to receive only topical calcipotriol twice daily for 8 weeks. Then, only petrolatum ointment was applied during the 4-week follow-up period. Hand Eczema Severity Index (HECSI) and modified Total Lesion Symptom Score were assessed by a blinded investigator, and a visual analogue scale score of itching symptoms was graded by the participants. RESULTS: In total, 36 hands from 18 subjects completed the protocol. On the combination-treated sides, the mean HECSI score was significantly reduced by 25% ($p = 0.015$) from the 4th week. Then, it was gradually decreased to 57 and 65% ($p < 0.001$) at the 8th week and at the follow-up visit, respectively. For the monotherapy-treated sides, the mean HECSI score was reduced to 41% ($p = 0.001$) and 49% ($p < 0.001$) at the 8th and 12th week, accordingly. At the end of the treatment period, itching scores were significantly decreased by around 64% ($p < 0.001$) and 51% ($p = 0.002$) on the combination-treated and the monotherapy-treated sides. No serious and persistent adverse reactions were found. CONCLUSION: The combined MEL and topical calcipotriol may be considered as an alternatively effective treatment for CHE. Dermatologic Agents;calcipotriene;Calcitriol
Administration, Topical;Adult;Aged;Calcitriol;Chronic Disease;Dermatologic Agents;Eczema;Female;Hand Dermatoses;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Dopaminergic induction of human dental pulp stem cells by photobiomodulation: comparison of 660nm laser light and polychromatic light in the nir. Human dental pulp stem cells (hDPSCs) are

able to differentiate into dopaminergic neurons and help the maintenance of partially degenerated neurons, which makes them as an alternative cell source for treatment of Parkinsons' disease (PD) patients. Here, the effect of photobiomodulation with polychromatic light source in the near infrared (NIR) range (600-1200â€¯nm) or low level 660â€¯nm diode laser light on hDPSCs during dopaminergic induction was investigated. Real time RT-qPCR analysis indicated that expressions of brain derived neurotrophic factor (BDNF), glial cell line derived neurotropic factor (GNDF), matrix associated protein 2 (MAP2), nuclear receptor related 1 protein (NURR1) and dopamine transporter (DAT) were increased, especially in the first 7â€¯days of dopaminergic induction when 660â€¯nm laser light was applied with a total energy density of 1.6â€¯J/cm(2). The activity of polychromatic light on hDPSCs depended on the differentiation media and protein type. BDNF, GDNF, NURR-1 and MAP2 expressions were increased in the presence of pre-induction factors, and decreased when the post-induction factors were added into the culture medium. In contrast with all these promising results, the dopaminergically induced hDPSCs did not show any functional characteristics of dopaminergic neurons and died after they were transferred to a new laminin coated culture plates. In conclusion, the expression of dopaminergic neuron protective protein mRNAs in hDPSCs was increased by photobiomodulation in defined conditions. However, the cells were not able to differentiate into functional dopaminergic neurons either in control or in photobiomodulated groups that are prone to cell death and exhibit immature dopaminergic neuron characteristics. Brain-Derived Neurotrophic Factor;Dopamine Plasma Membrane Transport Proteins;MAP2 protein, human;Microtubule-Associated Proteins;Reactive Oxygen Species;BDNF protein, human Brain-Derived Neurotrophic Factor;Cell Survival;Cells, Cultured;Dental Pulp;Dopamine Plasma Membrane Transport Proteins;Humans;Immunophenotyping;Infrared Rays;Lasers, Semiconductor;Mesenchymal Stem Cells;Microtubule-Associated Proteins;Reactive Oxygen Species;Transcriptome

Photobiomodulation and B vitamins administration produces antinociception in an orofacial pain model through the modulation of glial cells and cytokines expression. Chronic constriction injury (CCI) of infraorbital nerve (IoN) results in whisker pad mechanical allodynia in rats and activation glial cells contributing to the development of orofacial pain. Whisker pad mechanical allodynia (von Frey stimuli) was tested pre and postoperatively and conducted during the treatment time. Photobiomodulation (PBM) and vitamins B complex (VBC) has been demonstrated therapeutic efficacy in ameliorate neuropathic pain. The aim of this study was to evaluate the antinociceptive effect of PBM, VBC or the combined treatment VBCÂ â€‹+Â â€‹PBM on orofacial pain due to CCI-IoN. Behavioral and molecular approaches were used to analyses nociception, cellular and neurochemical alterations. CCI-IoN caused mechanical allodynia and cellular alterations including increased expression of glial fibrillary acid protein (GFAP) and ionized calcium binding adaptor molecule 1 (Iba-1), administration of VBC (B1/B6/B12 at 180/180/1.8Â â€‹mg/kg, s.c., 5 times all long 10 sessions) and PBM therapy (904Â â€‹nm, power of 75Wpico, average power of 0.0434Â â€‹W, pulse frequency of 9500Â â€‹Hz, area of the beam 0.13Â â€‹cm(2), 18Â â€‹s duration, energy density 6Â â€‹J/cm(2), with an energy per point of 0.78Â â€‹J for 10 sessions) or their combination presented improvement of the nociceptive behavior and decreased expression of GFAP and Iba-1. Additionally, CCI-IoN rats exhibited an upregulation of IL1Î², IL6 and TNF-Î± expression and all treatments prevented this upregulation and also increased IL10 expression. Overall, the present results highlight the pain reliever effect of VBC or PBM alone or in combination, through the modulation of glial cells and cytokines expression in the spinal trigeminal nucleus of rats.

Photobiomodulation and the expression of genes related to the JAK/STAT signalling pathway in wounded and diabetic wounded cells. Photobiomodulation therapy (PBMT) is a curative technique that uses low intensity light to relegate pain and inflammation, and accelerate tissue repair. At a molecular level, the effects of photobiomodulation (PBM) are not fully established. The

present study aimed to assess the impact of PBM on the alteration of genes linked to Janus kinase-Signal transducer and activator of transcription (JAK-STAT) signalling in wounded and diabetic wounded cells in vitro. Cells were irradiated using a diode laser at a wavelength of 660Â nm and an energy density of 5Â J/cm(2). RNA was extracted from cells 48Â h post-irradiation, and was used to synthesise complementary deoxyribonucleic acid (cDNA) that was used in PCR arrays to profile for 84 JAK/STAT signalling related genes. Irradiation at a wavelength of 660Â nm and an energy density of 5Â J/cm(2) significantly regulated genes related to the JAK/STAT signalling pathway in wounded and diabetic wounded cells. In irradiated wounded cells, 19 genes were significantly regulated, of which two were up-regulated and 17 were down-regulated, while 73 genes were significantly regulated in irradiated diabetic wounded cells of which 46 were up-regulated and 27 were down-regulated. This data suggests that PBM modulates gene transcription for protein synthesis and activates cellular signalling, and may indeed be helpful in enhancing diabetic wound repair. STAT Transcription Factors;Janus Kinases Cell Line;Diabetes Mellitus;Fibroblasts;Gene Expression;Humans;Janus Kinases;Lasers, Semiconductor;STAT Transcription Factors;Signal Transduction

Laser Moxibustion Alleviates Knee Osteoarthritis Pain by Inhibiting Spinal Microglial Activation-Mediated Neuroinflammation in Rats. Background: Central sensitization driven by glial activation-mediated neuroinflammation is recognized as a key mechanism in pain processing. Laser moxibustion using low-intensity laser irradiation of corresponding acupoints significantly relieves knee osteoarthritis (KOA) pain. However, the underlying mechanism of its effects on KOA pain is still not completely understood. Objective: In this study, we aimed to investigate whether laser moxibustion could alleviate KOA pain by inhibiting spinal glial activation and proinflammatory cytokines upregulation in monosodium iodoacetate (MIA)-induced KOA pain in rats. Materials and methods: Sprague-Dawley rats were divided randomly into three groups: Saline + Sham Laser, MIA + Laser, and MIA + Sham Laser. A 10.6â€‰Î¼m laser was used to irradiate ST35 (Dubi) for 10â€‰min once every 2 days for a total of seven applications. The paw withdrawal mechanical threshold and weight-bearing distribution were performed to evaluate the nociceptive behaviors. Spinal expressions of microglial marker, ionized calcium binding adaptor molecule-1 (Iba-1); astrocyte marker, glial fibrillary acidic protein (GFAP); pro-inflammatory cytokines, tumor necrosis factor-Î± (TNF-Î±), interleukin-1Î² (IL-1Î²), and interleukin-6 (IL-6) were measured 14 days after MIA injection. Results: The results showed that laser moxibustion significantly reversed the MIA-induced mechanical hyperalgesia and weight-bearing difference up to 14 days compared with MIA + Sham Laser group (pâ€‰<â€‰0.05 or pâ€‰<â€‰0.01). Moreover, both the protein level and immunofluorescence intensity of Iba-1 in the ipsilateral spinal cord dorsal horn were markedly decreased in the MIA + Laser group than those in the MIA + Sham Laser group (pâ€‰<â€‰0.01). However, there was no significant difference in the expression of GFAP between groups (pâ€‰>â€‰0.05). In addition, laser moxibustion decreased the upregulation of TNF-Î±, IL-1Î², and IL-6 compared with the MIA + Sham Laser group (pâ€‰<â€‰0.01). Conclusions: This study demonstrated that laser moxibustion at ST35 significantly alleviated MIA-induced KOA pain through inhibition of the microglial activation-mediated neuroinflammation, at least partially, by suppressing the production of proinflammatory cytokines, which may provide a potential analgesic target for KOA pain relief. Cytokines;Iodoacetic Acid Animals;Cytokines;Disease Models, Animal;Iodoacetic Acid;Low-Level Light Therapy;Male;Microglia;Moxibustion;Osteoarthritis, Knee;Pain;Rats;Rats, Sprague-Dawley

Clinical effect of diode laser on peri-implant tissues during non-surgical peri-implant mucositis therapy: Randomized controlled clinical study. BACKGROUND: The aim of this study is to evaluate the response to the non-surgical treatment of peri-implant mucositis using the diode laser as an adjuvant therapy in patients with implant-supported restorations, in terms of clinical variables, with respect to those patients in whom conventional non-surgical therapy is used. MATERIAL AND

METHODS: Randomized controlled clinical trial with simple blind 3 months follow-up. Two groups of patients were established, the non-surgical mechanical debridement of the affected implants was performed in the control group (n = 34) and the diode laser therapy was also performed in the test group (n = 34). The implant was considered the study subject; the variables considered were plaque index, bleeding on probing depth, depth of probing and recession of the peri-implant mucosa. The t-Student test was used to establish the intergroup statistical differences and the analysis of variance (ANOVA) was used to measures intragroup differences over time. RESULTS: In the revaluation at 6 weeks, we observed statistically significant differences ($p<0.05$) between the variables of plaque index and depth of probing between both groups. The test group obtained an average of 0.248 Â± 0.3155 in plaque index and 0.833 Â± 0.374mm in the depth of probing compared to the results obtained in the control group that was 0.558 Â± 0.526 and 1,137 Â± 0.222mm respectively. In the 3-month reevaluation, was also obtained great statistical significance between both groups for bleeding on probing ($p<0.001$), with values of 0.568 Â± 0.282 for the control group and 0.480 Â± 0.336 for the test group. CONCLUSIONS: The use of diode laser as an adjunctive therapy to the conventional treatment of peri-implant mucositis showed promising results, being more effective reducing the inflammation of the peri-implant tissue, positioning itself as a valuable tool for the treatment of peri-implant pathologies. Key words:Peri-implant diseases, peri-implant mucositis, laser therapy, diode laser, biostimulation.

Photobiomodulation as an adjunctive therapy for alveolar socket preservation: a preliminary study in humans. Bone remodeling results in loss of alveolar bone height and thickness. Photobiomodulation (PBM) based on photochemical stimulation by low-intensity lasers emerges as an adjunctive therapy for alveolar socket preservation. Our study aimed to evaluate the effects of PBM therapy on alveolar bone repair. Twenty healthy patients in need of bilateral extraction of lower molars were enrolled in this split-mouth randomized and blind clinical trial. The extraction sites were randomly selected to receive either the PBM therapy with a CW GaAlAs diode laser (808Â nm; 0.028Â mm(2); 0.1Â W; 3.6Â W/cm(2); 89Â J/cm(2); 2.5Â J/point) or no treatment (Control). Bone biopsies were harvested 45Â days after the dental extraction and evaluated using micro-computerized tomography (Î¼CT), morphometric, and histological analysis. Data were compared using the paired t test, and the level of significance was set at 5%. Bone surface (pâ€‰=â€‰0.029), bone surface/total volume (pâ€‰=â€‰0.028), trabecular number (pâ€‰=â€‰0.025), and connectivity density (pâ€‰=â€‰0.029) were higher at the PBM group compared with Control. The histological observations confirmed the Î¼CT findings. PBM samples exhibited higher number of organized and connected bone trabeculae along with higher density of blood vessels than Control. Control samples displayed a dense and highly cellular connective tissue at the central area accompanied by the presence of immature bone trabeculae at the periphery. Our results indicated that the PBM therapy improved the newly bone trabeculae formation and their connectivity which increased bone surface, indicating the positive effect of the laser on alveolar human socket repair. Adult;Aged;Biopsy;Female;Humans;Imaging, Three-Dimensional;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Tooth Socket;Treatment Outcome;Young Adult

Photobiomodulation does not influence maturation and mildly improves functional healing of mouse achilles tendons. Tendon rupture can occur at any age and is commonly treated nonoperatively, yet can result in persisting symptoms. Thus, a need exists to improve nonoperative treatments of injured tendons. Photobiomodulation (PBM) therapy has shown promise in the clinic and is hypothesized to stimulate mitochondrial-related metabolism and improve healing. However, the effect of PBM therapy on mitochondrial function during tendon maturation and healing are unknown, and its effect on tendon structure and function remain unclear. In this study, near-infrared light (980:810â€‰nm blend, 2.5â€‰J/cm(2)) was applied at low (30â€‰mW/cm(2)) or high

(300â€‰mW/cm(2)) irradiance to unilateral Achilles tendons of CD-1 mice during postnatal growth (maturation) as well as adult mice with bilateral Achilles tenotomy (healing). The chronic effect of PBM therapy on tendon structure and function was determined using histology and mechanics, and the acute effect of PBM therapy on mitochondrial-related gene expression was assessed. During maturation and healing, collagen alignment, cell number, and nuclear shape were unaffected by chronic PBM therapy. We found a sex-dependent effect of PBM therapy during healing on mechanical outcomes (eg, increased stiffness and Young's modulus for PBM-treated females, and increased strain at ultimate stress for PBM-treated males). Mitochondria-related gene expression was marginally influenced by PBM therapy for both maturation and healing studies. This study was the first to implement PBM therapy during both growth and healing of the murine tendon. PBM therapy resulted in marginal and sex-dependent effects on the murine tendon. Clinical significance: PBM may be beneficial for tendon healing because functional remodeling improves without adverse effects.
Achilles Tendon;Animals;Female;Gene Expression;Low-Level Light Therapy;Male;Mice;Mitochondria;Tendon Injuries

Anti-cancer effect of gallic acid in presence of low level laser irradiation: ROS production and induction of apoptosis and ferroptosis. BACKGROUND: There are different treatments for breast cancer and melanoma that mostly have some side effects. One of the therapeutic strategies is the use of natural components. Phenol components are a class of antioxidants in plants that have many biological functions like anticancer effects. Gallic acid (GA) is a natural polyhydroxy phenolic compound and commonly found in various foods. In the present study, GA effects alone and in combination with low-level laser irradiation on human dermal fibroblast cell line (HDF), human non-tumorigenic breast epithelial cell line (MCF10A), breast cancer cell line (MDA-MB-231) and melanoma cancer cell line (A375) was under the investigation. METHODS: The normal and cancerous cell lines were exposed to 660Â nm low-level laser with 3Â J/cm(2) for 90Â s. Then, the cells were treated with different concentrations of GA for 24Â h. In another study, the cell lines firstly were treated with GA and then exposed to low-level laser irradiation. The effects of GA and low-level laser on cell survival and apoptosis were examined using MTT assay, light microscopy, ROS production assay, fluorescence microscopy (AO/EB double staining) and flow cytometry. RESULTS: The results showed that pre-treatment with low-level laser and then GA reduced the survival of breast cancer cells and melanoma more than the first treatment with GA and then low-level laser irradiation. Our findings showed that ROS production in cells treated with both low-level laser and GA was more than the cells treated with GA alone. The apoptosis and ferroptosis assays confirmed the MTT results which combination treatment with low-level laser and then GA increase the cell death probably via apoptosis and ferroptosis cell death mechanisms compared to GA alone. CONCLUSIONS: This study suggests that low-level laser irradiation alone is not able to cause death in human normal and cancerous cells. Preirradiation followed by GA treatment did not change the cell viability in human normal significantly but reduces the cell survival of cancer cells more than GA alone.

Effect of photobiomodulation therapy as an adjunct to scaling and root planing in a rat model of ligature-induced periodontitis: a histological and radiographic study. This study aimed to histologically and radiographically evaluate the effectiveness of low-intensity laser irradiation of different wavelengths (660 or 808Â nm) as an adjunct to scaling and root planing in the treatment of experimental periodontitis in rats. Periodontitis was induced by placing a ligature around the mandibular first molar of the rats. In total, 40 Wistar rats were randomly divided into five groups (nâ€‰=â€‰8 each): control (CG), periodontal disease (PD), scaling and root planing (SRP), SRPâ€‰+â€‰660Â nm laser (GL660) and SRPâ€‰+â€‰808Â nm laser (GL808). Groups with laser use received radiation at 6 points in the first molar. The animals were euthanized at baseline and at 7 and 14Â days after the interventions. Mandibles were surgically removed for histomorphometric and

radiographic assessment of periodontal tissues. The GL660 group showed lesser bone loss than the PD group (Pâ€‰<â€‰0.05) and greater alveolar bone margin after 14Â days, indicating a better long-term treatment response (Pâ€‰<â€‰0.05). These findings suggest that SRP with the 660Â nm laser as an adjunct results in more favorable radiographic and histological responses than the 808Â nm laser. Animals;Combined Modality Therapy;Dental Scaling;Disease Models, Animal;Ligation;Low-Level Light Therapy;Male;Periodontal Ligament;Periodontitis;Photochemotherapy;Rats, Wistar;Root Planing

Does photobiomodulation change the synthesis and secretion of angiogenic proteins by different pulp cell lineages? This study aimed to compare the synthesis and secretion of VEGF-A, VEGF-C, VEGF-D, VEGFR1, VEGFR2, and FGF-2 between pulp fibroblasts from human primary teeth (HPF) and stem cell from human deciduous teeth (SHED) before and after photobiomodulation. HPF were obtained from explant technique and characterized by immunohistochemistry, while SHED were obtained from digestion technique and characterized by flow cytometry. HPF (control group) and SHED were plated, let to adhere, and put on serum starvation to synchronize the cell cycles prior to photobiomodulation. Then, both cell lineages were irradiated with 660-nm laser according to the following groups: 2.5 and 3.7Â J/cm(2). MTT and crystal violet assays respectively verified viability and proliferation. ELISA Multiplex Assay assessed the following proteins: VEGF-A, VEGF-C, VEGF-D, VEGFR1, VEGFR2, FGF-2, at 6, 12, and 24Â h after photobiomodulation, in supernatant and lysate. Two-way ANOVA/Tukey test evaluated cell viability and proliferation, while angiogenic production and secretion values were analyzed by one-way ANOVA (PÂ <Â .05). Statistically similar HPF and SHED viability and proliferation patterns occurred before and after photobiomodulation (PÂ >Â .05). HPF exhibited statistically greater values of all angiogenic proteins than did SHED, at all study periods, except for FGF-2 (supernatant; 12Â h); VEGFR1 (lysate; non-irradiated; 12Â h); and VEGFR1 (lysate; non-irradiated; 24Â h). Photobiomodulation changed the synthesis and secretion of angiogenic proteins by HPF. HPF produced and secreted greater values of all tested angiogenic proteins than did SHED before and after irradiation with both energy densities of 2.5 and 3.7Â J/cm(2). Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2 Cell Lineage;Cell Proliferation;Cell Survival;Cells, Cultured;Fibroblasts;Humans;Lasers;Stem Cells;Tooth, Deciduous;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2

Recovery of inferior alveolar nerve by photobiomodulation therapy using two laser wavelengths: A behavioral and immunological study in rat. Postoperative sensory disturbances of inferior alveolar nerve (IAN) are major challenges in dental procedures. We aimed to investigate the effect of photobiomodulation therapy (PBMT) with 810Â nm and 980Â nm diode lasers on behavioral and immunological factors in a rat IAN crush model. Seventy-two rats were randomly assigned to the four groups of 810Â nm laser (crush injury+810Â nm laser; 6Â J/cm(2), 15 sessions, every 48Â h), 980Â nm laser (crush injury+980Â nm laser; same protocol), control (crush injury without irradiation), and sham surgery (no crush injury and no irradiation). The neurosensory response of IAN was evaluated by Von Frey behavioral test before (baseline) and post-surgery in a period of one month. Changes of nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), nuclear factor-kappa B (NF-ÎºB), TNF-Î±, and IL-1Î², were assessed on days 2 and 30 post injury. Data were analyzed for significant differences by repeated measures and one-way ANOVA (pÂ <Â .05). One day after surgery, all rats subjected to nerve injury showed significant increase in the withdrawal threshold of von Frey test compared to the baseline (pÂ =Â .02 for control and pÂ =Â .03 for laser groups). The threshold gradually returned to the baseline scores in 810Â nm, 980Â nm, and control groups from days 11, 17, and 29, respectively. There was a significant lower withdrawal threshold in 810Â nm and 980Â nm laser groups compared to the control group in days 11 to 19 and 9 to 23, respectively. At both time

points, the levels of NGF and BDNF were significantly higher in 810Â nm laser group compared to the control group. There was a significant difference between laser and control groups regarding NF-ÎºB expression (all p values<.001). TNF-Î± and IL-1Î² were significantly lower in laser groups compared to the control group (all p valuesÂ <Â .001). PBMT with 810 and 980Â nm diode laser protocol used in this study, promoted the neurosensory recovery of IAN after crush injury in rats. In addition, application of 810Â nm diode laser was associated with more improvement in immunological responses compared to that of 980Â nm laser. Brain-Derived Neurotrophic Factor;Interleukin-1beta;NF-kappa B;Tumor Necrosis Factor-alpha;Nerve Growth Factor Animals;Behavior, Animal;Brain-Derived Neurotrophic Factor;Disease Models, Animal;Down-Regulation;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Nerve;Mandibular Nerve Injuries;NF-kappa B;Nerve Growth Factor;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha;Up-Regulation

Penetration Profiles of a Class IV Therapeutic Laser and a Photobiomodulation Therapy Device in Equine Skin. Photobiomodulation therapy (PBMT) effects depend on the energy settings and laser penetration. We investigated the penetration time profiles of two different light therapy devices, at the dark and light skin regions in horses. Six light skin and six dark skin adult clinically healthy Arab and Quarter horses were used. A cutometer was used to measure the width of the skin fold from both sides of the cervical area, followed by three measurements of the thickness of the same skin fold by transversal and longitudinal ultrasonography (US). The depth of light penetration was compared based on the percentage of penetration versus power, between a portable PBMT device versus a class IV laser device. The laser mean power output was measured with an optical power meter system for 120Â seconds after penetrating the skin. Skin width and laser penetration were compared among equipment by paired "t" test. There was no difference in the width of the skin fold between measurements acquired by the cutometer against either longitudinal or transversal US or between the US measurements at cervical versus metacarpus area. Light penetration was greater in both kinds of skins in the PBMT (0.01303 Â± 0.00778) versus class IV laser (0.00122 Â± SD 0.00070) ($P < .001$). The PBMT device provided a greater energy penetration than the class IV laser in unclipped light and dark skin, suggesting that the former may produce a better therapeutic effect. The color of the skin changes penetration profiles of PBMT. Animals;Horses;Lasers;Low-Level Light Therapy;Skin

Successful Treatment of Riehl's Melanosis With Mid-Fluence Q-Switched Nd:YAG 1064-nm Laser. BACKGROUND AND OBJECTIVES: Riehl's melanosis is a chronic acquired hyperpigmentation disorder that causes significant cosmetic problems for patients with this condition. Several treatment options, including low-fluence Q-switched Nd:YAG (QSNY) 1064-nm laser treatment, have been attempted with inconsistent results. We aimed to investigate the beneficial effect of mid-fluence QSNY 1064-nm laser in the treatment of Riehl's melanosis. STUDY DESIGN/MATERIALS AND METHODS: A retrospective review was conducted on patients repetitively treated with mid-fluence (3.5-5â€‰J/cm(2) with a spot size of 5â€‰mm and a pulse rate of 10â€‰Hz) QSNY 1064-nm laser. Twenty-one patients with Riehl's melanosis were involved. Clinical photographs, treatment parameters, and side effects were reviewed to assess the safety and efficacy of the modality. RESULTS: The mean age of the patients was 57.00â€‰Â±8.2 years, and there were 20 female patients and 1 male patient. The mean number of treatment sessions was 5.95â€‰Â±â€‰3.6, and the mean interval between each session was 39.12â€‰Â±â€‰13.4 days. After treatment, the mean melasma area and severity index score decreased from 12.53â€‰Â±â€‰10.2 to 5.98â€‰Â±â€‰5.3. At the final visit, 16 of the 21 (76.1%) patients were considered to have moderately or very much improved. No severe side effects were observed. CONCLUSIONS: Repetitive mid-fluence QSNY 1064-nm laser treatment may be an effective and safe optional modality for Riehl's

melanosis. Lasers Surg. Med. Â© 2020 Wiley Periodicals, Inc.
Aged;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Retrospective Studies;Treatment Outcome

Efficacy of antimicrobial photodynamic and photobiomodulation therapy against Treponema denticola, fusobacterium nucleatum and human beta defensin-2 levels in patients with gingivitis undergoing fixed orthodontic treatment: A clinic-laboratory study. BACKGROUND: Evidence suggests that molecular pathways are involved in human Î²-defensin (hBD)-2 mRNA regulation in human gingival epithelial cells stimulated with periodontal bacteria. This clinical and laboratory study evaluated the efficacy of two laser therapies including antimicrobial photodynamic therapy (aPDT) and photobiomodulation (PBM) therapy as an adjunct to ultrasonic scaling (US) on the gingival crevicular fluid (GCF) levels of hBD-2 and subgingival Treponema denticola (T. denticola) and Fusobacterium nucleatum (F. nucleatum) spp., in patients undergoing fixed orthodontic therapy and gingivitis. MATERIALS AND METHODS: Forty-five patients undergoing fixed orthodontic treatment were randomly divided into three groups based on the type of treatment rendered: Group-I: aPDT as an adjunct to US, Group-II: PBM as an adjunct to US and, Group-III: US alone. Full-mouth plaque scores (FMPS), bleeding on probing (FMBOP) and probing depth (PD) were assessed. GCF was collected for estimation of hBD-1 using enzyme-linked immunosorbent assay. Plaque samples were used to quantify T. denticola and F. nucleatum spp by quantitative polymerase chain reaction. All clinical and laboratory investigations were carried out at baseline (T(0)), day 30 (T(30)) and day 60 (T(60)). RESULTS: FMPS and FMBOP showed statistically significant reduction in all groups at T(30) and T(60) from T(0). No inter-group differences were observed between any groups at follow-up. Mean PD remained stable for Group-II and Group-III, while Group-I showed progressive reduction at T(60). The GCF levels of hBD-2 progressively decreased in Group-I (aPDT) while the levels increased slightly at T60 in Group-III. The levels in Group-II (PBM) remained stable from T(30) to T(60). Statistically significant reduction was seen for Group-I when compared with Group-II and Group-III at T60 (pâ€¯=â€¯0.045). A significant reduction was observed for T. denticola in only Group-I patients at T(30) (pâ€¯=â€¯0.031) and T(60) (pâ€¯=â€¯0.047). A significant reduction was seen in both Group-I and Group-II patients at T(30) and T(60). The number of sites with BOP was correlated with both bacterial species (Table 4). Only T. denticola showed positive correlation to mean BOP after correcting for multiple testing. CONCLUSION: aPDT and PBM showed similar improvement in gingival inflammatory and microbiological parameters compared to US. aPDT assisted in modest reduction of hBD-2 in patients undergoing fixed orthodontic treatment. Photosensitizing Agents;beta-Defensins;Methylene Blue Adolescent;Dental Plaque Index;Female;Fusobacterium nucleatum;Gingivitis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Methylene Blue;Orthodontics, Corrective;Photochemotherapy;Photosensitizing Agents;Treponema denticola;beta-Defensins

A Comparative Assessment of the Efficiency of Orthodontic Treatment With and Without Photobiomodulation During Mandibular Decrowding in Young Subjects: A Single-Center, Single-Blind Randomized Controlled Trial. Objective: To assess if photobiomodulation (PBM) improves the efficiency of orthodontic treatment with fixed appliance during the alignment stage. Methods: Eighty-nine subjects were included in this trial and randomly assigned for treatment with fixed appliance and PBM group or with fixed appliance only (control group). Inclusion criteria were as follows: (1) age between 13 and 30 years, (2) permanent dentition, (3) class I malocclusion, (4) lower 6-6 mild crowding measured on dental cast, (5) no spaces or diastema in the lower arch, (6) no ectopic teeth, (7) nonextractive treatment plan, and (8) no previous orthodontic treatment. PBM was administered in the PBM group every 14 days using the ATP38(Â®) (Biotech Dental, AllÃ©e de Craponne, Salon de Provence, France) (72â€‰J/cm(2) of fluency for each session). Dental alignment was assessed by

visual inspection, and treatment time was defined in days as T2 (date of assessment of complete dental alignment)-T1 (date of brackets bonding). The number of monthly scheduled appointments was also recorded. All the data underwent statistical analysis for comparison between groups. Results: Treatment time was significantly shorter (pâ€‰<â€‰0.001) in the PBM group (203 days) compared with the control (260 days). Consequently, control visits (pâ€‰<â€‰0.001) were lower in the PBM group (7) compared with the control group (9). Conclusions: The present findings would confirm that PBM can be used to enhance the efficiency of orthodontic treatment during dental decrowding. Adolescent;Adult;Combined Modality Therapy;Female;Humans;Italy;Low-Level Light Therapy;Male;Malocclusion;Orthodontic Appliances;Single-Blind Method;Tooth Movement Techniques;Young Adult

Effect of Er:YAG Laser Etching on the Shear Bond Strength and Microleakage of Self-Glazed Zirconia Ceramics. Objective: To investigate the effect of Er:YAG laser irradiation on the shear bond strength (SBS) and microleakage of self-glazed zirconia (SZ) ceramics. Background: SZ is a novel type ceramic; laser irradiation has started to be used in the surface treatment of different ceramics, while SZ has been rarely studied to improve the bond quality. Methods: One hundred twenty blocks (5â€‰mmâ€‰Ã—â€‰5â€‰mmâ€‰Ã—â€‰5â€‰mm) of SZ ceramics were produced and split into eight groups following different surface treatments (nâ€‰=â€‰15): Group A: no treatment; Group B: standard grid processing; and Group C-H: different Er:YAG laser power settings (100, 200, 300, 400, 500, and 600â€‰mJ). Ten blocks of each group received the measurement of SBS and fracture mode analysis, three blocks underwent the evaluation of the microleakage depths, and the other two blocks were observed under the scanning electronic microscopy (SEM). Results: Group F obtained the highest SBS and the lowest microleakage depth without damaging the ceramic surface structure, which was statistically significant compared with the control group and gridding group (pâ€‰<â€‰0.05), whereas the difference was not statistically significant (pâ€‰>â€‰0.05) between group E and group F. The results of bonding performance were consistent with failure types and observation of surface characterizations in SEM images. Conclusions: According to the results here, Er:YAG irradiation had effect on surface treatment. In addition, 400â€‰mJ Er:YAG could increase the SBS and decrease the microleakage depth on SZ ceramics without damaging the surface structure. Dental Materials;Resin Cements;Zirconium;zirconium oxide Dental Bonding;Dental Materials;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Resin Cements;Shear Strength;Zirconium

Good response to pulsed dye laser in patients with capillary malformation-arteriovenous malformationÂ syndrome (CM-AVM). Capillary malformation-arteriovenous malformation syndrome (CM-AVM) is an autosomal dominant disorder caused by heterozygous mutations in RASA1 and EPHB4. Capillary stains in CM-AVM are compatible with SchÃ¶binger's phase I AVMs. Vascular laser has been classically contraindicated for the treatment of AVMs, as there is a fear of accelerating their progression. In this study, we have treated capillary stains in five CM-AVM patients with pulsed dye laser, with improvement and without worsening or recurrence of the lesions after 1Â year of clinical and ultrasound follow-up. Adolescent;Arteriovenous Malformations;Capillaries;Child, Preschool;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Young Adult

Low-level laser therapy attenuates lung inflammation and airway remodeling in a murine model of idiopathic pulmonary fibrosis: Relevance to cytokines secretion from lung structural cells. Idiopathic pulmonary fibrosis (IPF) is a progressive and chronic inflammatory disease with a poor prognosis and very few available treatment options. Low-level laser therapy (LLLT) has been gaining prominence as a new and effective anti-inflammatory and immunomodulatory agent. Can lung inflammation and the airway remodeling be regulated by LLLT in an experimental model of IPF in

C57Bl/6 mice? The present study investigated if laser attenuates cellular migration to the lungs, the airway remodeling as well as pro-fibrotic cytokines secretion from type II pneumocytes and fibroblasts. Mice were irradiated (780Â nm and 30Â mW) and then euthanized fifteen days after bleomycin-induced lung fibrosis. Lung inflammation and airway remodeling were evaluated through leukocyte counting in bronchoalveolar lavage fluid (BALF) and analysis of collagen in lung, respectively. Inflammatory cells in blood were also measured. For in vitro assays, bleomycin-activated fibroblasts and type II pneumocytes were irradiated with laser. The pro- and anti-inflammatory cytokines level in BALF as well as cells supernatant were measured by ELISA, and the TGFÎ² in lung was evaluated by flow cytometry. Lung histology was used to analyze collagen fibers around the airways. LLLT reduced both migration of inflammatory cells and deposition of collagen fibers in the lungs. In addition, LLLT downregulated pro-inflammatory cytokines and upregulated the IL-10 secretion from fibroblasts and pneumocytes. Laser therapy greatly reduced total lung TGFÎ². Systemically, LLLT also reduced the inflammatory cells counted in blood. There is no statistical difference in inflammatory parameters studied between mice of the basal group and the laser-treated mice. Data obtained indicate that laser effectively attenuates the lung inflammation, and the airway remodeling in experimental pulmonary fibrosis is driven to restore the balance between the pro- and anti-inflammatory cytokines in lung and inhibit the pro-fibrotic cytokines secretion from fibroblasts. Cytokines Airway Remodeling;Animals;Bronchoalveolar Lavage Fluid;Cells, Cultured;Cytokines;Disease Models, Animal;Down-Regulation;Epithelial Cells;Fibroblasts;Idiopathic Pulmonary Fibrosis;Laser Therapy;Lasers;Male;Mice;Mice, Inbred C57BL;Up-Regulation

Laser irradiation pretreatment improves endometrial preparation of frozen-thawed embryo transfer in recurrent implantation failure patients. Recurrent implantation failure (RIF) remains a clinical dilemma. Helium-Neon (He-Ne) laser irradiation has recently become more popular under certain clinical conditions. Given the unique therapeutic effects, we were interested in determining whether pretreatment with He-Ne laser irradiation prior to frozen-thawed embryo transfer (FET) would improve the microcirculation and cause the release of growth factors and cytokines, thus improving endometrial receptivity and the clinical pregnancy rates. Patients chose for themselves whether to proceed with (nâ€‰=â€‰29) or without (nâ€‰=â€‰31) pretreatment with He-Ne laser irradiation prior to FET. The clinical pregnancy rate (37.9%) and implantation rate (20.3%) were higher in the laser-treatment group than in the control group (35.5% and 15.9%, respectively, pâ€‰=â€‰.844 and .518, respectively). The live birth rate was higher in the laser-treatment group (27.6% vs. 25.8%, respectively, pâ€‰=â€‰.876) and the miscarriage rate was lower in the laser-treatment group (18.2% and 27.3%, respectively, pâ€‰=â€‰.611). No side effects or complications from laser irradiation were encountered in patients who received the laser treatment. We concluded that pretreatment with He-Ne laser prior to FET may be an alternative choice for RIF-affected women; however, additional well-designed prospective studies are necessary to determine the precise clinical value of this treatment. Abortion, Habitual;Adult;Blastocyst;Combined Modality Therapy;Embryo Implantation;Embryo Transfer;Endometrium;Female;Freezing;Humans;Infertility, Female;Lasers, Gas;Low-Level Light Therapy;Pregnancy;Pregnancy Rate;Treatment Outcome

Effectiveness of laser-assisted treatments for medication-related osteonecrosis of the jaw: a systematic review. The feasibility of laser-assisted treatments of medication-related osteonecrosis of the jaw (MRONJ) remains poorly understood, so we have therefore systematically evaluated their effectiveness. We made a comprehensive search of MEDLINE, Pubmed, and Embase to find randomised controlled trials, case-control studies, and prospective cohort studies that assessed them. We assessed the eligible studies in duplicate, and if possible conducted a meta-analysis. Ten studies with a low to high risk of bias met the inclusion criteria. We found that a comparison of pain scores before and after using visible and infrared GaAs laser in the low-level laser

treatment based on the Numerical Pain Rating Scale (mean difference 4.28; 95% CI 3.62 to 4.93; p<0.00001), showed that there were significant differences in the amount of pain. The effectiveness of other laser-assisted treatments on the reduction of pain - for example, Er:YAG laser surgical treatment, and laser-assisted treatment plus platelet-rich plasma, and the effect of other techniques on wound healing of laser-assisted treatments, are uncertain. We found that the results of the studies that were deemed to be high-to-low quality and to have high-to-low statistical power suggested that there may be considerable clinical improvement in MRONJ by using laser-assisted treatment; we cautiously consider that low-level laser treatment may manage pain and symptoms in these patients. More randomised studies of good quality and with a low risk of bias are needed to test whether laser-assisted treatment should be a routine part of management of patients with MRONJ. Bisphosphonate-Associated Osteonecrosis of the Jaw;Case-Control Studies;Humans;Laser Therapy;Lasers, Solid-State;Platelet-Rich Plasma;Prospective Studies

Low-level laser therapy prevents muscle oxidative stress in rats subjected to high-intensity resistance exercise in a dose-dependent manner. High-intensity resistance exercise (RE) increases oxidative stress leading to deleterious effects on muscle performance and recovery. The aim of this study was to assess the effect of applying low-level laser therapy (LLLT) prior to a RE session on muscle oxidative stress and to determine the possible influence of the dosimetric parameters. Female Wistar rats were assigned to non-LLLT (Ctr: non-exercised control; RNI: RE) or LLLT groups subjected to RE (radiant energy: 4Â J, 8Â J, and 12Â J, respectively). RE consisted of four maximum load climbs. An 830-nm DMC Lase Photon III was used to irradiate three points in gastrocnemius muscles (two limbs) before exercise. Animals were euthanized after 60Â min after the end of the exercise, and muscle tissue was removed for analysis of oxidative stress markers. All doses resulted in the prevention of increased lipoperoxidation; however, LLLT prevented protein oxidation only in rats that were pretreated with 8Â J and 12Â J of energy by LLLT. RE and LLLT did not change catalase activity. However, RE resulted in lower superoxide dismutase activity, and the opposite was observed in the LLLT group. These data indicate that LLLT prior to RE can prevent muscle oxidative stress. This study is the first to evaluate the impact of dosimetric LLLT parameters on the oxidative stress induced by RE, wherein both 8Â J and 12Â J of energy afforded significant protection. Catalase;Superoxide Dismutase Animals;Catalase;Female;Lipid Peroxidation;Low-Level Light Therapy;Muscle, Skeletal;Oxidation-Reduction;Oxidative Stress;Physical Conditioning, Animal;Rats, Wistar;Resistance Training;Superoxide Dismutase

Antimicrobial photodynamic and photobiomodulation adjuvant therapies for prevention and treatment of medication-related osteonecrosis of the jaws: Case series and long-term follow-up. BACKGROUND: Medication-Related Osteonecrosis of the Jaws (MRONJ) incidence are increasing among elderly. Treatment can be challenging. Prevent or treatment protocols that control evolution of the lesion are warranted. OBJECTIVE: To observe long-term outcomes of two protocols based on photonics [antimicrobial photodynamic therapy (aPDT) and photobiomodulation (PBM)] for prevention and treatment of MRONJ lesions. METHODS: In a prospective study, patients who needed oral surgery and had been exposed to antiresorptive drugs were long-term followed-up. For MRONJ prevention, immediately after tooth extraction aPDT was applied. For aPDT a 0.01 % methylene blue solution was applied inside socket for 5â€¯min followed by irradiation with a diode laser [660â€¯nm, 0.028cm(2), 0.1â€¯W, 3.57â€¯W/cm(2), 90â€¯s and 9â€¯J per point, 321â€¯J/cm(2), at least at in 3 points (laser probe was placed at central, and two equidistant points) and total energy of 27J]. Irradiation was repeated weekly until total tissue repair. MRONJ treatment included preoperative aPDT sessions until signs and symptoms of infection had reduced. Then, after necrotic bone removal, aPDT was applied inside surgical wounds and re-applied weekly until healing. Antibiotics were administered pre or postoperatively for no longer than 7 days. PBM therapy was applied with

808â€¯nm diode laser, 0.028cm(2), 0.1â€¯W, 3.57â€¯W/cm(2), 30â€¯s, 107â€¯J/cmÂ², 3â€¯J and total energy of 12â€¯J until evidence of remission. RESULTS: Eighteen patients underwent preventive protocol, and none presented signs of MRONJ after a follow-up of at least 6 months. Seventeen patients presented with MRONJ underwent aPDT protocol and sixteen of them showed total regression of lesions. PRACTICAL IMPLICATIONS: aPDT and PBM therapy protocols appear to be effective as adjuvant approach not only for preventing MRONJ development due to tooth extraction but for treating MRONJ lesions at early stages with no adverse effects. Anti-Bacterial Agents;Photosensitizing Agents;Methylene Blue Aged;Anti-Bacterial Agents;Bisphosphonate-Associated Osteonecrosis of the Jaw;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Prospective Studies

Evaluation of the effect of photodynamic therapy on chemotherapy induced oral mucositis. BACKGROUND: In this study the effect of photodynamic therapy on chemotherapy induced mucositis was evaluated. METHODS: This randomized single blind clinical pilot evaluation evaluated the effect of PDT with methylene blue on 15 patients with chemotherapy induced bilateral oral mucositis. They were divided into 2 groups (control side and intervention side). Methylene blue was applied on the lesions of both sides, after 10 min the lesion of intervention side was irradiated by a 660 nm diode laser InGaAlP(Azor-2 K) for 10 min (power: 25 mW, dose:19.23 J/CM2, probe diameter: 0.78 cm2) for three sessions (day1,3,5) and followed on day 12. In control side only sham laser was used. Data were analyzed by Wilcoxon and Mann-Whitney test using SPSS version 22. RESULTS: Comparing the WCCNR and NCI difference in different sessions between intervention and control group, represented significant improvement in oral mucositis in photodynamic therapy group for sessions 1-0, 2-0, 3-0 (P.value<0.05). CONCLUSION: Photodynamic therapy can improve chemotherapy induced oral mucositis. Antineoplastic Agents;Photosensitizing Agents Antineoplastic Agents;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Single-Blind Method;Stomatitis

Combined effects of metformin and photobiomodulation improve the proliferation phase of wound healing in type 2 diabetic rats. We determined the impact of Photobiomodulation (PBM) and metformin administration alone and combined on the inflammation and proliferation steps of wound healing of incisions in type two diabetes mellitus (T2DM) rats. 40 rats were divided into 4 groups (nâ€¯=â€¯10 each group). A non-genetic model of T2DM was induced in all rats, and an incision was made on each rat. There were 4 groups as follows: Group 1 was control group. Group 2 received PBM alone (890â€¯nm, 80â€¯Hz, 0.324â€¯J/cm(2), daily). Group 3 received metformin alone (50â€¯mg/kg, i.p., daily) and the fourth group received combination of PBMâ€¯+â€¯metformin. At inflammation (day 4) and proliferation (day 7) steps, tensiometerical, stereological, and immunohistochemical examinations were performed. PBM and PBMâ€¯+â€¯metformin treatments significantly increased wound strength at inflammation and proliferation steps of wound healing respectively. PBM, metformin, and PBMâ€¯+â€¯metformin groups significantly decreased inflammatory cells at inflammation and proliferation steps of wound healing. PBM, metformin, and PBMâ€¯+â€¯metformin groups significantly improved granulation tissue formation by increasing fibroblasts, and new blood vessel formation at inflammation and proliferation steps of wound healing. Metformin significantly increased M2 macrophages than other treatment groups at inflammation and proliferation steps of wound healing. Simultaneously, PBM significantly decreased M2 macrophages than control group. We concluded PBM and PBMâ€¯+â€¯metformin treatments significantly hastened repair at the inflammation and proliferation steps of repairing skin injury in a non-genetic model of T2 DM. PBMâ€¯+â€¯metformin showed a synergistic impact. There were not a positive relation between M2 macrophage number and wound strength in the studied groups. The details of the molecular

mechanisms of PBM, and PBMâ€¯+â€¯metformin treatments of repairing wounds in animals, and treatment of DFUs of patients with T2 DM should be elucidated by further research. Blood Glucose;Metformin Animals;Blood Glucose;Cell Proliferation;Combined Modality Therapy;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Granulation Tissue;Inflammation;Low-Level Light Therapy;Macrophages;Male;Metformin;Rats, Wistar;Wound Healing

Effect of Photobiomodulation on C2C12 Myoblasts Cultivated in M1 Macrophage-conditioned Media. Moderate levels of a proinflammatory macrophages phenotype are indispensable and play an important role in the skeletal muscle repair process since this response depends on their secreted products concentration to influence and modulate muscle inflammation as well as the differentiation of myoblasts. This study investigated the effects of photobiomodulation (PBM) on undifferentiated and differentiation-induced C2C12 myoblasts cultivated in different concentrations of M1 phenotype macrophage-conditioned media of J774 cells (MCM1) also submitted to PBM using the same irradiation parameters. Irradiation was performed once with low-level laser (780Â nm, 70Â mW, 1Â J) and was evaluated cell viability, proliferation and differentiation, nitric oxide (NO) synthesis and IL-6 and TNF-Î± protein levels 24 and 48Â h after C2C12 irradiation. PBM treatment in undifferentiated myoblasts exhibited lower IL-6 levels in the presence of nonirradiated MCM1 at both concentrations. Myoblasts in proliferation condition cultivated with irradiated MCM1 showed lower IL-6 and TNF-Î± levels after 48Â h in the presence of both concentrations evaluated. PBM induced a decrease in the synthesis of NO on undifferentiated and differentiation-induced myoblasts. PBM was able to reduce the level of proinflammatory protein and markers, which are important to allow the differentiation of myoblasts during the muscle repair process. Culture Media, Conditioned;Nitric Oxide Animals;Cell Line;Cell Proliferation;Culture Media, Conditioned;Light;Macrophage Activation;Macrophages;Mice;Myoblasts;Nitric Oxide

Low-Level Laser Therapy with a 635 nm Diode Laser Affects Orthodontic Mini-Implants Stability: A Randomized Clinical Split-Mouth Trial. BACKGROUND: The study aimed to clinically estimate an influence of a 635 nm diode laser on the stability of orthodontic mini-implants, to assess mini-implants loss, and to evaluate a pain level after the treatment. MATERIALS AND METHODS: The randomized clinical split-mouth trial included 20 subjects (13 women and 7 men; age: 32.5 Â± 6.1 years), 40 implants (RMO, West Colfax Ave., Denver, CO, USA) with a diameter 1.4 mm and length of 10 mm. Mini-implants were placed in the area of the attached gingiva between the second premolar and first molar teeth, 2 mm below the mucogingival junction of both sides of the maxilla. Each implant on the right side (G1, n = 20) of the maxilla was irradiated with a diode laser, and the implants on the opposite side (left, G2, n = 20) were a control group (without laser irradiation). The 635-nm laser parameters; dose: 10 J per point (20 J/cm(2)), time: 100 s per point, two points (irradiation on a buccal, and a palatal side of the alveolus/implant), the total energy per session 20 J. Laser application protocol: immediately and 3, 6, 9, 12, 15, and 30 days after surgery. The total energy after all therapeutic sessions was 140 J. The implants' stability was measured employing a Periotest device (Periotest Test Value-PTV) immediately and 3, 6, 9, 12, 15, 30, and 60 days after the insertion of the mini-implants. RESULTS: We found significantly higher secondary stability, lower mean PTV (6.18 Â± 5.30) and (1.51 Â± 2.25), for self-drilling mini-implants (G1, test group) in contrast to the control, G2 group (9.17 Â± 8.25) and (5.00 Â± 3.24), after 30 (p = 0.0003) and 60 days (p = 0.0000). Moreover, the analysis of the mini-implants stability after 635-nm diode laser application revealed significant higher stability in comparison with none irradiated implants (G2 group) after 3 days. (p = 0.0000) There was no significant difference in pain level measured on the NRS-11 scale on both sides of the maxilla. (p = 0.3665) An important finding was that all inserted mini-implants

survived during a two-month observation period. CONCLUSIONS: 635-nm diode laser at laser irradiation increases the secondary stability of orthodontic mini-implants.

Blue light therapy to treat candida vaginitis with comparisons of three wavelengths: an in vitro study. Anti-fungal blue light (ABL) therapies have been widely studied to treat various microbial infections in the literature. The blue light with wavelengths ranging from 400 to 470 nm has been reported to be effective to inhibit various kinds of bacteria and fungi. The existing studies usually report the viability rates of the pathogens under the irradiation of the blue light with different dosage parameters. However, to the best of our knowledge, there is still no work especially focusing on studying the effect of ABL therapies on treating candida vaginitis, where it is important to study the viability of both the Candida albicans (C. albicans) and the human vaginal epithelial cells. It is the purpose of this work to conduct ABL experiments on both of these two cells, analyze the effects, and determine the best ABL wavelength out of three candidates, i.e., 405-nm, 415-nm, and 450-nm wavelength. The viability rates of the C. albicans and the human vaginal epithelial cells irradiated by the three blue LED light sources were measured, whose irradiance (power density) were all set to 50 mW/cm(2). The dynamic viability models of the C. albicans and the epithelial cells were built based on the experimental data. Moreover, in this work, we also built a functional relationship between the viability of these two types of cells, by which we further compared the effects of the blue light irradiation on both the C. albicans and vaginal epithelial cells. The experimental data showed that when an approximately 80% inhibiting rate of the C. albicans was achieved, the survival rates of the epithelial cells were 0.6700, 0.7748, and 0.6027, respectively for the treatment by the 405-nm, 415-nm, and 450-nm wavelength light. On the other hand, by simulating the functional relationship between the viability of the two types of cells, the survival rates of the epithelial cells became 0.5783, 0.6898, and 0.1918 respectively using the 405-nm, 415-nm and 450-nm wavelength light, when the C. albicans was completely inhibited. Therefore, both the experimental data and the model simulation results have demonstrated that the 415-nm light has a more effective anti-fungal result with less damage to the epithelial cells than the 405-nm and 450-nm light. Candida albicans;Candidiasis, Vulvovaginal;Cell Survival;Color;Epithelial Cells;Female;Humans;Light;Microbial Viability;Models, Biological;Phototherapy

A prospective study on oral adverse effects in head and neck cancer patients submitted to a preventive oral care protocol. OBJECTIVE: To evaluate the occurrence and severity of oral complications, number of radiotherapy (RT) interruptions and quality of life (QoL) in a population of head and neck cancer patients receiving a preventive oral care program (POCP) and photobiomodulation therapy (PBMT). METHODS: Prospective cohort of 61 head and neck cancer patients undergoing radiochemotherapy were monitored and submitted to a POCP that included oral hygiene and plaque control, removal of infection foci, dental restorations, periodontal therapy, fluorotherapy, oral hydration, and denture removal at night, combined with daily PBMT. Outcomes included occurrence of adverse effects such as severity of oral mucositis (OM) and oral symptoms (pain, solid and fluid dysphagia, odynophagia, dysgeusia), quality of life impacts, and interruptions of radiotherapy (RT) due to symptoms. Disease-free and overall survival rates were evaluated. RESULTS: There was a significant improvement in oral health conditions between initial assessment and the two longitudinal assessments (pâ€‰<â€‰0.05), which indicates that the POCP was effective for plaque control and reduction of gingival inflammation. All participants were free of OM at the beginning of the RT regimen and only 45.9% after the 7th session, and few patients ranked the highest score of OM. For all symptoms related to OM, there was a progressive increase of severity until the 14th RT session, which remained stable until the completion of the RT regimen. The same effect was observed for the quality of life measures. Discontinued RT due to OM occurred in only three patients (5%), and the maximum duration was 10Â days. The overall survival rate was 77% and

disease-free survival was 73.8%. Lower survival time was observed for patients with no response to RT (pâ€‰<â€‰0.01). CONCLUSIONS: The findings of this study suggest a positive effect of an oral preventive care program for head and neck cancer patients submitted to RT. The PBMT associated with a rigorous POCP resulted in satisfactory control of oral adverse effects, reduction of quality of life impacts, and interruption of RT regimen due to severe OM.
Adult;Aged;Chemoradiotherapy;Cohort Studies;Female;Head and Neck Neoplasms;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases;Oral Health;Oral Hygiene;Prospective Studies;Quality of Life;Radiation Injuries

Histology of ex vivo skin after treatment with fractionated picosecond Nd:YAG laser in high and low-energy settings. Background: The fractionated picosecond laser produces microscopic lesions in the epidermis and dermis, which are known as laser-induced optical breakdown (LIOB) and intra-dermal laser-induced cavitation (LIC). There have been multiple histological reports on these phenomena, although some have been challenged on the grounds of similarity to artifacts. Asian skins, with a higher melanin content, may react differently to this treatment, and present literature is also lacking in this area.Purpose: To observe and report the histological effect of different energy levels and parameters of the fractional 532 nm/1064 nm picosecond laser on Asian skin ex vivo.Methods: Six skin samples were taken from clinically normal-looking perilesional areas and treated with different energy levels and parameters of the fractional 532 nm/1064 nm picosecond laser. The specimens were then sent to the lab for H&E staining, and the slides were reviewed by a dermatopathologist.Results: Superficial, intra-epidermal LIOBs were seen in skin treating at higher laser energies; deep, intra-dermal LICs were seen in skin treated at lower energies. Lesion sizes and depths were consistent with previously reported values on Caucasian skins, and lesions were spaced in 600-Î¼m intervals or its multiple.Conclusions: The histological findings are consistent with results from other ethnicities, and the spacing of lesions is a strong indication of their validity as LIOBs or LICs. Dermatologic Surgical Procedures;Epidermis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Skin;Skin Aging;Skin Physiological Phenomena

Comparative Study of Effects of LASER, TENS, and Anesthetic Gel for Controlling Pain after Placement of Elastomeric Separators: A Clinical Trial. AIM: This study aimed to study the intensity and duration of patients' pain perception after placement of elastomeric separators and the effects of various methods to reduce the pain. MATERIALS AND METHODS: Elastomeric separators were placed on either side of first molars in 120 patients which were divided into 4 groups. Patients in group I were control group, group II underwent low-level LASER therapy, group III were subjected to topical anesthetic gel, and group IV underwent TENS (transcutaneous electric nerve stimulation). And then they were asked to measure pain using a visual analog scale (VAS) at 5 intervals of time, i.e., immediately after separator placement, after day 1, day 2, day 3, and day 4. RESULTS: Turkey's post hoc test showed that pain score after immediate placement of separators was found to be the least in the anesthetic gel than that in other groups and pain score was least in the LASER group out of all four groups on day 1, 2, 3, and 4. CONCLUSION: It was found that low-level LASER therapy was more effective in reducing pain after placement of elastomeric separators. HOW TO CITE THIS ARTICLE: Oza MJ, Desai H, Iyengar SS, et al. Comparative Study of Effects of LASER, TENS, and Anesthetic Gel for Controlling Pain after Placement of Elastomeric Separators: A Clinical Trial. Int J Clin Pediatr Dent 2020;13(S-1):S82-S86.

Severe refractory Hailey-Hailey disease Treated with electron beam radiotherapy and low-level laser therapy. Electrons;Humans;Laser Therapy;Low-Level Light Therapy;Pemphigus, Benign Familial

The effect of low level laser irradiation on oxidative stress, muscle damage and function following neuromuscular electrical stimulation. A double blind, randomised, crossover trial.

BACKGROUND: Low level laser therapy (LLLT) is among novel methods for preventing and treating muscle damage and soreness induced by volitional exercise, but little is known about using LLLT before neuromuscular electrical stimulation. The aim of this first randomised, double blind, crossover trial addressing this issue was to evaluate effects of LLLT on muscle damage and oxidative stress, as well as recovery of muscle function after a single session of isometric neuromuscular electrical stimulation(NMES). METHODS: Twenty four moderately active, healthy men aged 21-22â€‰years received 45 electrically evoked tetanic, isometric contractions of the quadriceps femoris, preceded by LLLT or sham-LLLT. Maximal isometric voluntary muscle torques, perceived soreness, and blood samples were analysed from baseline to 96â€‰h post intervention. We measured plasma markers of muscle damage (the activity of creatine kinase), and inflammation (C-reactive protein), and evaluated redox state parameters. RESULTS: NMES-evoked contractions induced oxidative stress, demonstrated by an increase in lipid peroxidation and impairments in enzymatic antioxidant system. LLLT irradiations had a protective effect on NMES-induced decrease in enzymatic antioxidant defence and shortened the duration of inflammation. This effect of irradiations on redox state and inflammation did not affect lipid peroxidation, muscle damage, and muscle torque. CONCLUSIONS: LLLT may protect from impairments in enzymatic antioxidant system and may shorten inflammation induced by a single NMES session in moderately active, healthy men. However, the effects of LLLT on redox state and inflammatory processes do not seem to affect muscle damage and recovery of muscle function after NMES. TRIAL REGISTRATION: The study was retrospectively registered in the Australian New Zealand Clinical Trials Registry (ANZCTR); The trial registration number: ACTRN12619000678190; date of registration: 6 May 2019.

Comparison of the efficiency of alveolar decortication and low level laser therapy on orthodontic tooth movement and alveolar metabolism in rats. BACKGROUND/PURPOSE: Reducing orthodontic treatment duration has many advantages for both clinicians and patients. This study was designed to compare the effects of alveolar decortication and low level laser therapy methods on tooth movement rate and alveolar bone metabolism. MATERIALS AND METHODS: A total of 42 Wistar albino rats were divided into three main groups as: Alveolar decortication (AD), low level laser therapy (LLLT) and only orthodontic force (F). The groups were evaluated at 7 and 14 day time points. Tooth movement rates were calculated by measuring the space between the contact points of the first and second molars. Comparisons regarding the alveolar bone metabolism were accomplished by evaluating osteoclast counts and RANKL - OPG expressions. RESULTS: The rate of tooth movement, at all time points, was significantly higher for the AD group than the other groups and was significantly higher in the LLLT group than the F group. At both time points, the RANKL and OPG expression in the AD group was significantly higher than the other groups and these parameters in the LLLT group was significantly higher than the F group. The osteoclast count values in the AD and LLLT groups were significantly higher than the F group and there were no significant differences between these two groups at all time points. CONCLUSION: This study shows that, to be more effective at AD, both AD and LLLT therapy significantly increases the level of tooth movement in the early period through their stimulating effects on the alveolar bone metabolism.

Persistent Erythema Ab Igne Occurring After Low-Level Laser Therapy for Lipolysis. Adult;Arm;Chronic Disease;Cosmetic Techniques;Erythema;Female;Humans;Low-Level Light Therapy

The Clinical Evaluation of the Effects of Low-Level Laser Therapy on the Donor and Recipient Sites of the Free Gingival Graft: A Case Series. Introduction: Free gingival grafting is among the most foreseeing procedures for increasing the zone of keratinized attached gingiva and enhancing soft tissue around the teeth and dental implants. Nowadays low-level laser therapy (LLLT) is a promising approach in providing patients with more pleasing results in terms of esthetics and comfort. This study aims to investigate the effects of LLLT on gingival recessions treated with free gingival graft

(FGG). Methods: This case series was conducted on 12 individuals requiring a bilateral gingival graft in the mandibular region. There was a 30-day interval between the two operations. The test side was selected randomly and irradiated by a low-level laser (LLL) just before surgery. The patients did not know which side was irradiated. LLLT was applied to the donors' as well as recipients' site immediately after the operation and 48 hours later. The patients were instructed to record their post-operative pain in a visual analogue scale (VAS) 3 and 24 hours and 7 days after the surgical procedure. The clinical photographs were taken immediately and 30 days after surgical treatment were graded by three experienced periodontists for color matching to adjacent tissues. Results: Ten individuals could finish the study. The test group presented significantly better shade matching and wound healing at the palatal donor site on days 7, 14 and 21. There was a significant reduction in post-operative pain after 24 hours (P = 0.007). No statistically significant difference was found between both groups in terms of clinical periodontal indices. Conclusion: LLLT could reduce post-operative pain 24 hours after surgical treatment. Furthermore, the application of LLLT could improve the donors' site healing and the recipients' site color matching.

Low-Level Laser Therapy in the Treatment of Inferior Alveolar Nerve Paresthesia After Surgical Exeresis of a Complex Odontoma. Introduction: Orofacial paresthesia is due to trauma to the neural structure of a particular nerve. In dentistry alterations caused by nerve damage in most cases are presented with transient symptomatology. However, it has been agreed by several authors that persistent inferior alveolar sensory aberrations for more than 6 months leave some degree of disability or are considered permanent. The objective of the present study is to report the clinical case of a young patient submitted to low-level laser therapy for the treatment of paresthesia of the inferior alveolar nerve after removal of a complex odontoma in the posterior region of the mandible. Methods: Twenty-four hours after the surgical procedure the patient started the low-level laser therapy with the following parameters: 100 mW of potency, 140 J/cm(2) of energy density, 4 J of energy per application point, 40 seconds of application per point and 0.028 cm(2) of spot area. For this particular case, the technique of alternation of laser wavelengths was used, in the first session of which visible red of 660 nm was applied, followed by near-infrared of 808 nm and so on. Results: In the first session, the score on the visual analog scale (VAS) was "3". In the tenth and last sessions, the patient reported a VAS "9". Conclusions: It seems that the early initiation of the low-level laser therapy favors a better outcome in cases like the one presented in this paper. The technique of alternation of laser wavelengths between sessions seems to have some role in the outcome possibly because of the constant stimulation of different chromophores along the treatment course. These two factors need further confirmation and validation through randomized clinical trials.

The Efficacy of Carbone Dioxide Laser Debridement Along With Low-Level Laser Therapy in Treatment of a Grade 3 Necrotic Burn Ulcer in a Paraplegic Patient (A Case Report). Introduction: A deep burn ulcer, especially in areas with sensory-motor dysfunction, is hard to cure. Case Report: The patient was a 20-year-old paraplegic girl with a grade 3 necrotic burn ulcer for 3 weeks. We used a fractional Co(2) laser along with chemical debridement with trichloroacetic acid (TCA 80%) and low-level laser therapy (LLLT) with a 808 nm infrared laser, 6 J/cm(2) for the necrotic area, and a 650 nm red laser, 2 J/cm(2) for the open wound area. Complete healing occurred after 25 sessions without surgery. Conclusion: Laser debridement along with LLLT and TCA administration may be useful to treat necrotic ulcers without surgery.

The Effect of Photobiomodulation on Distraction Osteogenesis. Distraction osteogenesis (DO) is a surgical procedure to increase bone height in different body parts. DO includes a surgical incision, wherein the bone is cut and a device is installed for further separation of the two ends by gradual unscrewing of the device screw. New bone gradually forms and fills the gap, and the bone height increases as such. Photobiomodulation (PBM) or low-level laser therapy (LLLT) enhances the

formation of soft and hard tissue such as bone and can, therefore, accelerate the process of DO and shorten the duration of different surgical phases of DO such as latency, activation, and consolidation. Different laser types with variable exposure settings and protocols have been used for this purpose. The gallium-aluminum-arsenide (GaAlAs) diode laser is the most commonly used laser type for LLLT. This study reviews 18 published articles on the effects of LLLT on DO and summarizes their findings to further elucidate this topic.

Short-term Effects of Transcranial Near-Infrared Photobiomodulation on Motor Performance in Healthy Human Subjects: An Experimental SingleBlind Randomized Clinical Trial. Introduction: Transcranial near-infrared photobiomodulation (NIR-PBM) is a new noninvasive procedure which transcranially applies a near-infrared wavelength to the scalp with a laser or a light-emitting diode (LED) source. Improvement in the neurological or psychological symptoms has been reported following light irradiation. However, to our knowledge, there is no study to investigate the effects of transcranial NIR-PBM on motor performance directly. Therefore, the objective of this study was to investigate the short-term effects of transcranial NIR-PBM on motor performance in healthy human subjects. Methods: In this experimental single-blind randomized clinical trial study, 56 right-handed healthy participants, whose ages ranged from 18 to 30, were randomly assigned to (1) Real transcranial NIR-PBMC3 group (n=14), (2) Sham transcranial NIR-PBMC3 group (n=14), (3) Real transcranial NIR-PBMC4 group (n=14), and (4) Sham transcranial NIR-PBMC4 group (n=14). We applied the 808 nm laser with irradiation energy density of 60 J/cm(2) and power density of 200 mw/cm(2) to the C3 or C4 points of the scalp. The number of finger taps as an indicator of motor performance was assessed by the finger-tapping test (FTT) before and after irradiation of transcranial NIR-PBM on the corresponding points of the scalp for 5 minutes. Results: The results showed that the number of finger taps in both right and left hands following the use of transcranial NIR-PBM in the real transcranial NIR-PBMC3 group significantly increased ($P<0.05$). Conclusion: We concluded that using transcranial NIR-PBM with a laser source on C3 point of the motor cortex in right-handed healthy people can increase the number of finger taps in both hands as an indicator of motor performance improvement.

Participation of the Immune System and Hedgehog Signaling in Neoangiogenesis Under Laser Photobiomodulation. Introduction: This study aimed to characterize immune and endothelial cells, myofibroblasts and pericytes, and positive cells for hedgehog proteins in late tissue repair of rats skin wounds treated with 670 nm photobiomodulation therapy (PBMT). Methods: A blind experimental study was conducted, in order to assess the effect of PBMT in later stages of healing, with emphasis on neoangiogenesis, immune cells and Hedgehog signaling. Forty Wistar rats were allocated randomly in two groups; control and treated with a diode GaAlAs laser (9 mW, 670 nm, 0.031 W/cm(2), spot size of 0.28 cm(2), fluence of 4 J/ cm(2) applied every other day, until a total dose of 16 J/cm(2) was achieved). Standardized skin wounds were performed and the animals were euthanized at 14, 21, 28 and 35 days. Tissue sections were subjected to hematoxylin-eosin and immunohistochemistry for CD31, NG2, smooth muscle alpha actin, CD8, CD68, Ptch, Gli-2 and Ihh. All histomorphometric data were statistically analyzed and significance level was at $P<0.05$. Results: At late stages of wound healing, neoangiogenesis persisted as revealed for the number of CD31+ cells ($P = 0.016$) and NG2+ and smooth muscle alpha actin positive pericytes ($P = 0.025$), for both experimental groups. By day 21, laser-treated group had decreased CD68+ cells ($P = 0.032$) and increased CD8+ ($P = 0.038$). At remodeling stage, there were positive cells for the hedgehog signaling pathway family which seemed to be activated. Conclusion: These data suggest that photobiomodulation therapy was able to modulate extracellular matrix remodelling even at the later stages of wound healing.

Photobiomodulation in Oral Medicine. Objective: To provide a review of the literature about the photobiomodulation therapy (PBMT) dental treatment protocols in oral medicine based on validated clinical studies that have been published so far. Background data: The lack of effective therapies for the treatment of various types of oral diseases or the presence of invasive therapeutic methods along with the use of a wide range of medications has had a significant impact on the quality of life of these patients. PBMT as a noninvasive and nondrug method can play an influential role in the treatment of oral diseases. Methods: In this study, published clinical studies up to April 2019 were reviewed from library sources, Google Scholar, PubMed and Medline, Elsevier, Embase, Cochrane, Scopus, and Web of science (ISI). Results: In general, the findings of this study showed that PBMT has had a positive effect on the treatment of oral lichen planus, recurrent aphthous stomatitis, hyposalivation, pemphigus vulgaris, recurrent herpes simplex, burning mouth syndrome, bisphosphonate-related osteonecrosis of the jaw, trigeminal neuralgia, facial nerve paralysis, geographic tongue, and chronic sinusitis. Conclusions: PBMT can be effective (as an alternative treatment or in combination with other therapies) in improving symptoms or in the complete treatment of oral diseases. However, further clinical studies are still necessary to achieve more robust results. Humans;Low-Level Light Therapy;Oral Medicine

Photobiomodulation in Endodontic, Restorative, and Prosthetic Dentistry: A Review of the Literature. Objective: To provide a review of the literature about the photobiomodulation therapy (PBMT) dental treatment protocols in endodontic, restorative, and prosthetic dentistry based on validated clinical studies published so far. More specifically, this study was carried out to carefully review therapeutic protocol of PBMT in clinical studies and their conclusions. Background data: The importance of using low-power lasers and photobiomodulation (PBM) is increasing in dentistry mainly due to their painless and noninvasive function. However, lack of sufficient clinical studies has led to unclear results regarding PBMT in dentistry, and also lack of an available precise protocol for clinicians. Moreover, scarcity of clinical studies in this area has made conduction of a precise systematic review study difficult. Methods: In our study, published clinical studies up to April 2019 were reviewed from library sources, Google Scholar, PubMed and Medline, Elsevier, Embase, Cochrane, Scopus, and Web of science (ISI). Inclusion criteria included those presented in clinical trials and case report/case series, language (English), and studies available in full text. Exclusion criterion was in vitro studies. Results: In general, findings of clinical studies have shown that PBMT can have a significant role in reducing postoperative dental pain, increasing depth of anesthesia, improving tooth hypersensitivity, reducing inflammation of the tissue, and helping wound healing. Conclusions: A review of clinical studies showed that the use of alternative or adjunctive PBMT is of great importance in controlling postoperative pain after endodontic treatments. In addition, evidence suggests that different parameters of light can be efficient in the treatment of tooth hypersensitivity. Nevertheless, lack of sufficient clinical studies and reliable results do not allow introducing a precise treatment protocol. Endodontics;Humans;Low-Level Light Therapy;Prosthodontics

Photobiomodulation in Pediatric Dentistry: A Current State-of-the-Art. Objective: Given the tremendous progress in biophotonics applications in biology and engineering, we sought to examine the evidence for the use of low-dose biophotonics treatments, termed photobiomodulation (PBM) therapy, in pediatric dentistry. Background: PBM therapy has been noted to alleviate pain and inflammation while promoting tissue healing and regeneration. These basic processes contribute to the fundamental etiopathogenesis of various oral diseases, and hence, there is now a growing list of potential clinical applications with PBM therapy in children. Materials and methods: An exhaustive literature search was conducted for PBM studies in pediatric dentistry that includes patients up to 21 years of age. An analysis of the quality of the included studies was also performed to evaluate the rigor of the evidence. Specific emphasis was placed on the treatment efficacy on the relevant

specified outcomes for individual applications. Results: From a total of over 420 initial hits, 19 studies were deemed suitable for inclusion in this review. Among them, PBM therapy has been used in pediatric dentistry for prevention and treatment of oral mucositis associated with oncotherapy (chemotherapy, radiation, and transplants), for postsurgical oral pain and for pulpotomies. Overall, all studies reported therapeutic benefits, and no adverse effects were reported. Conclusions: This review noted that PBM therapy is a safe and effective treatment modality for various clinical applications in pediatric dentistry. Despite potential positive publication bias, there appears to be clear evidence of clinical benefit with this treatment, and we recommend well-designed randomized, placebo-controlled human clinical trial be pursued. Child;Humans;Low-Level Light Therapy;Pediatric Dentistry

Influence of photobio-modulation with an Er,Cr: YSGG laser on dentin adhesion bonded with bioactive and resin-modified glass ionomer cement. METHODS: One hundred and twenty extracted human molars were allocated in eight groups (n = 15) based on surface conditioning and cement type. Specimens of groups 2 and 6 were conditioned with ECL whereas, groups 3 and 7 were treated with ECL + ethylenediamine tetra acetic acid (EDTA). Specimens in groups 4 and 8 were surface conditioned by ECL + EDTA + Tetric-N-Bond, and groups 1 and 5 were considered as control (non-surface treated). Cement build-ups were performed on the surface-treated dentin with BAC (groups 1-4) and RMGIC (groups 5-8). A universal testing machine was used to measure the SBS and the mode of failure was evaluated using a stereomicroscope. Statistical analysis was performed using an analysis of variance and Tukey's post hoc test, at a significance level of $p < 0.001$. RESULTS: The highest SBS values were observed in group 8, ECL + EDTA + Tetric-N-Bond + RMGIC (21.54 Â± 3.524 MPa) and the lowest SBS values were displayed by group 1, with no surface treatment and BAC application (11.99 Â± 0.821 MPa). The majority of failures were found to be mixed in lased dentin-treated dentin surfaces. BAC when bonded to dentin surfaces conditioned with ECL showed lower SBS in comparison to RMGIC. CONCLUSION: Conditioning of dentin with ECL and a bonding agent (Tetric-N-bond) improved bond strength scores for BAC and RMGIC. Use of EDTA improved bond strength values when bonded to BAC and RMGIC; however, this improvement was not statistically significant. Glass Ionomer Cements Dentin;Glass Ionomer Cements;Humans;Lasers, Solid-State;Materials Testing;Molar;Shear Strength;Stress, Mechanical

Non-ablative radio frequency for the treatment of androgenetic alopecia. INTRODUCTION: Medical treatment of androgenetic alopecia (AGA) is mainly limited to pharmacological and surgical interventions. Patients' desire for noninvasive and non-systemic treatments has accelerated research into medical devices that can promote hair growth. Low-level laser therapy (LLLT) was the first such device. However, its success has been limited by contradictory and often controversial efficacy claims. Work previously performed in animal models of AGA has demonstrated the viability of the wound repair mechanism as a potential treatment modality. This study therefore explores the use of a non-ablative radio frequency (RF) device in the treatment of AGA. METHODS: A single blindedstudy compared a non-ablative RF device versus a sham device in 24 men with AGA. Each subject received four treatments over the 12-week study. RESULTS: In this preliminary study of 24 AGA patients treated with a novel RF device, we demonstrated that 54% showed a clinical response. Furthermore, among patients that underwent four or more treatment sessions, 40% experienced a 30% or more increase in hair counts compared to baseline. CONCLUSIONS: If validated in a larger cohort, non-ablative RF may prove to be an important clinical tool in the treatment of AGA. Adult;Alopecia;Humans;Male;Middle Aged;Radiofrequency Therapy;Single-Blind Method;Treatment Outcome;Young Adult

Photobiomodulation and Mandibular Advancement Modulates Cartilage Thickness and Matrix Deposition in the Mandibular Condyle. Objective: We evaluated the effects of

photobiomodulation (PBM), mandibular advancement (MA), and the combination of both treatments (PBM+MA) on condylar growth, by the analysis of cartilage and bone formation, fibrillar collagen deposition, proteoglycan content, cell proliferation, and clastic cell index (CCI). Methods: Forty male Wistar rats were randomly assigned to CONTROL, PBM, positive control-MA, and PBM+MA groups. The appliance was worn 10â€‰h/day. Laser was irradiated bilaterally on mandibular condyles in 8 alternate days (1 irradiation point per condyle) using the following parameters: 780â€‰nm, 10â€‰J/cm(2), 40â€‰mW, 1â€‰W/cm(2), 10â€‰sec/point, 0.4â€‰J/point, and cumulative dose per point: 3.2â€‰J. PBM+MA received both treatments simultaneously. After 15 days, the animals were euthanized and the condyles dissected and embedded in paraffin. Histological sections from the intermediate portion of the condyle were used for morphometric analysis. The relative frequency (%) of fibrillar collagens was determined in sections stained with picrosirius red-hematoxylin under polarized light or GÃ¶mÃ¶ri's method for reticular fibers. Proteoglycan content was evaluated by computerized photocolorimetric analysis. CCI was determined by tartrate-resistant acid phosphatase (TRAP), and proliferating cell nuclear antigen (PCNA) was detected by immunohistochemistry. Results: PBM and MA influenced condylar cartilage thickeness and matrix deposition, but none of the treatments affected significantly the area of the condyle. CCI were not influenced by the treatments, but clastic cells distribution was influenced by MA and PBM+MA treatments. There was no significant difference in proliferating cells among the groups. Conclusions: This study demonstrated that PBM and MA stimulates matrix deposition and cartilage thickening in the mandibular condyle, but was not able to demonstrate a synergistic effect between the treatments. Additional studies should be conducted to evaluate the possible synergistic effect between PBM and MA.
Animals;Cartilage, Articular;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Advancement;Mandibular Condyle;Rats;Rats, Wistar

Effects of photoelectric therapy on proliferation and apoptosis of scar cells by regulating the expression of microRNA-206 and its related mechanisms. Human skin fibroblast (HSF) cells were irradiated with different energy lasers to detect cell proliferation, apoptosis, and expression of microRNA-206 and protein, and to further summarise the therapeutic effect of laser on scar cells. Human scar cell line HSF cells were cultured in three groups. The control group was not irradiated by laser, the low-energy group was irradiated by 10 J/cm(2) laser, and the high-energy group was irradiated by 20â€‰J/cm(2) laser. After irradiation, HSF cells were cultured for 20â€‰hours. Cell proliferation was detected by MTT assay. Cell cycle and apoptosis were detected by flow cytometry. Transwell migration assay was used to detect cell migratory ability. Reverse transcription polymerase chain reaction (RT-PCR) was used to detect miR-206 and mTOR gene levels. The levels of MMP-9, Bax, Bcl-2, cyclin D1, and mTOR signalling pathway proteins were detected by Western blotting assays. The results showed that after laser irradiation, the proliferation of cells decreased, and the difference between the control group and the experimental group was significant (Pâ€‰<â€‰.05). The higher the energy was, the greater the upregulation of apoptosis was. Apoptosis and cell migration increased (Pâ€‰<â€‰.05). The expressions of microRNA-206, MMP-9, and Bax were upregulated, while the expressions of mTOR, Bcl-2, and cyclin D1 were downregulated. To sum up, laser irradiation can significantly inhibit the proliferation of HSF cells, affect cell cycle, and increase cell apoptosis and migratory ability. MIRN206 microRNA, human;MicroRNAs Apoptosis;Cell Movement;Cell Proliferation;Cells, Cultured;Cicatrix;Fibroblasts;Gene Expression Regulation;Humans;Low-Level Light Therapy;MicroRNAs;Signal Transduction

Enhanced mitochondrial membrane potential and ATP synthesis by photobiomodulation increases viability of the auditory cell line after gentamicin-induced intrinsic apoptosis.
Photobiomodulation (PBM) has been suggested to have a therapeutic effect on irreversible hearing loss induced by aminoglycosides, including gentamicin (GM). However, its intracellular mechanism(s)

in GM-induced ototoxicity remain poorly understood. In the present study, we investigated the effect of PBM in GM-induced ototoxicity in auditory cells. We tried to characterize the downstream process by PBM, and the process that triggered the increased cell viability of auditory cells. As a result, the effects of PBM against GM-induced ototoxicity by increasing ATP levels and mitochondrial membrane potential was confirmed. These results suggest a theory to explain the therapeutic effects and support the use of PBM for aminoglycoside-induced hearing loss. Gentamicins;Adenosine Triphosphate Adenosine Triphosphate;Animals;Cell Line;Gentamicins;Hair Cells, Auditory;Hearing Loss;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice

Comparison of the effects of low-level laser and pulsed and continuous ultrasound on pain and physical disability in chronic non-specific low back pain: a randomized controlled clinical trial. OBJECTIVE: To compare the short-term effects of pulsed laser and pulsed and continuous ultrasound on pain and functional disability in women with chronic non-specific low back pain. METHODS: The sample was composed of 100 volunteers randomly allocated into four groups: The Pulsed Laser Group (nâ€‰=â€‰26) was treated with 3â€‰J/cm(2); the Pulsed Ultrasound Group (nâ€‰=â€‰24; 3â€‰MHz) was treated with 1â€‰W/cm(2); the Continuous Ultrasound Group (nâ€‰=â€‰26; 1â€‰MHz) was treated with 1â€‰W/cm(2); and a Control Group (nâ€‰=â€‰24), where the patients were still waiting for treatment. Before and after 10 sessions of treatment, the intensity of pain was assessed using the visual analogue scale (VAS), the quality of pain was evaluated using the McGill pain questionnaire and functional disability was investigated using the Roland-Morris questionnaire. RESULTS: The three treated groups exhibited a decrease in pain (pâ€‰<â€‰0.001); the Pulsed Laser Group showed the greater relative gain (91.2%), Meanwhile, the Control Group exhibited a worsening of -â€‰5.8%. The three treated groups demonstrated improvement in the quality of pain (McGill) in the total, sensory and affective dimensions (pâ€‰<â€‰0.005; pâ€‰<â€‰0.002; pâ€‰<â€‰0.013, respectively). All treated groups showed a decrease in functional disability (pâ€‰<â€‰0.001), but the Pulsed Ultrasound Group showed the highest relative gain (83.3%). CONCLUSIONS: The three modalities have significant effects to decreasing low back pain and improving functional disability in women with non-specific chronic low back pain, but the pulsed low-level laser had the best results on pain while the pulsed ultrasound had the best results on improve the functional disability. TRIAL REGISTRATION: ClinicalTrials.gov: NCT02150096. Chronic Pain;Female;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement;Ultrasonic Therapy;Young Adult

904â€‰nm Low-Level Laser Irradiation Decreases Expression of Catabolism-Related Genes in White Adipose Tissue of Wistar Rats: Possible Roles of Laser on Metabolism. Background: Adipose tissue is the main energy storage tissue in the body. Its catabolic and anabolic responses depend on several factors, such as nutritional status, metabolic profile, and hormonal signaling. There are few studies addressing the effects of laser photobiomodulation (PBM) on adipose tissue and results are controversial. Objective: Our purpose was to investigate the metabolic effects of PBM on adipose tissue from Wistar rats supplemented or not with caffeine. Materials and methods: Wistar rats were divided into four groups: control (CTL), laser-treated [CTL (L)], caffeine (CAF), and caffeine+PBM [CAF (L)]. Blood was extracted for quantification of triglyceride and cholesterol levels and white adipose tissues were collected for analysis. We evaluated gene expression in the adipose tissue for the leptin receptor, lipase-sensitive hormone, tumor necrosis factor alpha, and beta adrenergic receptor. Results: We demonstrated that the low-level laser irradiation was able to increase the feed intake of the animals and the relative mass of the adipose tissue in the CTL (L) group compared with CTL. Laser treatment also increases serum triglycerides [CTLâ€‰=â€‰46.99â€‰Â±â€‰5.87; CTL (L)â€‰=â€‰57.46â€‰Â±â€‰14.38; CAFâ€‰=â€‰43.98â€‰Â±â€‰5.17; and CAF (L)â€‰=â€‰56.9â€‰Â±â€‰6.12; pâ€‰=â€‰0.007] and total cholesterol

(CTLâ€‰=â€‰70.62â€‰Â±â€‰6.80; CTL (L)â€‰=â€‰79.41â€‰Â±â€‰13.07; CAFâ€‰=â€‰71.01â€‰Â±â€‰5.52; and CAF (L)â€‰=â€‰79.23â€‰Â±â€‰6.881; pâ€‰=â€‰0.003). Conclusions: Laser PBM decreased gene expression of the studied genes in the adipose tissue, indicating that PBM is able to block the catabolic responses of this tissue. Interestingly, the CAF (L) and CAF animals presented the same CLT (L) phenotype, however, without increasing the feed intake and the relative weight of the adipose tissue. The description of these phenomena opens a new perspective for the study of the action of low-level laser in adipose tissue. Caffeine Adipose Tissue, White;Animals;Caffeine;Gene Expression;Lasers, Semiconductor;Lipid Metabolism;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Utility of High-Intensity Laser Therapy Combined with Photobiomodulation Therapy for Socket Preservation After Tooth Extraction. Objective: High-intensity laser therapy (HILT) combined with photobiomodulation therapy (PBMT) using a diode or CO(2) laser was administered after extraction of the left first molar in rats. Effects on socket preservation (preservation of the alveolar bone and healing time after extraction) were evaluated histopathologically. Background: Irradiation using a diode or CO(2) laser has been shown to hasten wound healing, but the effects remain controversial. Methods: Five-week-old male Wistar rats that underwent extraction of the left maxillary first molar were divided into three groups: diode laser irradiation (diode group), CO(2) laser irradiation (CO(2) group), and no laser irradiation (control group). HILT (27â€‰J) was performed immediately after tooth extraction to enhance blood coagulation, followed by PBMT (0.7â€‰J) 1 day later to enhance healing. Tissues, including the extraction socket, were removed en bloc 3, 5, 7, 10, and 21 days postextraction to determine the morphological characteristics of wound healing and the distribution of myofibroblasts involved in scar formation. Results: In the diode and CO(2) groups, new bone formation and cancellous bone maturation were observed at an early stage of wound healing. The number of myofibroblasts was significantly lower in the laser treatment groups than the control (pâ€‰<â€‰0.001), and both treatment groups had a significantly higher alveolar crest height (pâ€‰<â€‰0.01), with almost no concavity in the mucosa of the extraction wound. Conclusions: Combined HILT and PBMT following tooth extraction hastened wound healing and preserved alveolar crest height, suggesting a role in socket preservation. Animals;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar;Osteogenesis;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket;Wound Healing

Laser photobiomodulation for cartilage defect in animal models of knee osteoarthritis: a systematic review and meta-analysis. To review and assess the efficacy of laser photobiomodulation for cartilage defect in animal models of knee osteoarthritis (KOA). Medline, Web of Science, and EMBASE were searched. Studies were considered if the global quality score of cartilage were parallelly reported between laser and untreated control groups. The methodological quality of each study was assessed using a modified 10-item checklist. The effect size was estimated by standardized mean difference (SMD) and pooled based on the random-effects model. Stratified analysis and regression analysis were conducted to partition potential heterogeneity. An adjusted significant level of 0.01 was acceptable. Five hundred eight initial search recordings were identified, of which 14 studies (including 274 animals) were included for quantitative analysis. The global quality scores mostly weighted by the structural integrity and chondrocyte distribution were measured by different four scales including Histologic Histochemical Grading System (HHGS), Osteoarthritis Research Society International (OARSI), Pineda, and Huang. There were considerable variances on laser parameters and irradiation time among those included studies. Overall, a moderate level of methodological qualities was determined. The synthesis results indicated that the SMD effect size was significantly larger in HHGS (zâ€‰=â€‰2.61, Pâ€‰=â€‰0.01) and Huang (zâ€‰=â€‰4.90, Pâ€‰<â€‰0.01) groups. Stratified by irradiance, SMD of low (<â€‰1Â W/cm(2)) but not high (â‰¥â€‰1Â W/cm(2)) level estimated

significant difference (zâ€‰=â€‰5.62, Pâ€‰<â€‰0.01). Meta-regression identified a significant association for SMDs and irradiation time (Pâ€‰<â€‰0.01). Yet, Egger's test detected small study effect (Pâ€‰<â€‰0.01). No individual study with significant variance was found in homogeneity tests. The results demonstrated the positive effect of laser photobiomodulation for cartilage defect in animal models of KOA under proper irradiance and adequate irradiation time.
Animals;Cartilage, Articular;Disease Models, Animal;Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Publication Bias;Regression Analysis

The Influence of Light on Reactive Oxygen Species and NF-ÐºB in Disease Progression. Reactive oxygen species (ROS) are important secondary metabolites that play major roles in signaling pathways, with their levels often used as analytical tools to investigate various cellular scenarios. They potentially damage genetic material and facilitate tumorigenesis by inhibiting certain tumor suppressors. In diabetic conditions, substantial levels of ROS stimulate oxidative stress through specialized precursors and enzymatic activity, while minimum levels are required for proper wound healing. Photobiomodulation (PBM) uses light to stimulate cellular mechanisms and facilitate the removal of oxidative stress. Photodynamic therapy (PDT) generates ROS to induce selective tumor destruction. The regulatory roles of PBM via crosstalk between ROS and nuclear factor kappa-light-chain-enhancer of activated B cells (NF-ÐºB) are substantial for the appropriate management of various conditions.

Photobiomodulation and photodynamic therapy for the treatment of oral mucositis in patients with cancer. BACKGROUND: Photobiomodulation therapy (PBM-T) can penetrate soft tissues and exert analgesic and healing effects, and is thus a promising alternative for prevention and treatment of oral mucositis (OM). The aim of this study was to evaluate the efficacy of PBM-T, alone or combined with photodynamic therapy (PDT), for treatment of OM in cancer patients. METHODS: Fifty-six patients were recruited from the Oncology Department of a teaching hospital. Patients underwent grading of OM and were divided into two groups (nâ€¯=â€¯28 each): PBM-T and PBM-Tâ€¯+â€¯PDT. In the PBM-T group, low-level laser was applied to 61 points in the oral cavity, once weekly for 4 weeks (wavelength 660â€¯nm, power 100â€¯mW, energy density 142â€¯J/cmÂ², spot energy 4â€¯J, irradiation time 40â€¯s). In the PBM-Tâ€¯+â€¯PDT group, in addition to PBM-T as described above, patients rinsed with 20â€¯ml of photosensitizing mouthwash (curcumin 1.5â€¯g/L) and the oral cavity was irradiated with a blue (468â€¯nm) LED for 5â€¯min. RESULTS: Significant reductions in OM grade were observed after application of PBM-T or PBM-Tâ€¯+â€¯PDT (pâ€¯<â€¯0.0001). PBM-Tâ€¯+â€¯PDT resulted in a shorter time to resolution of lesions compared to PBM-T alone (pâ€¯=â€¯0.0005). CONCLUSIONS: PBM-T, alone or combined with PDT, can be used for the treatment of OM. PDTâ€¯+â€¯PBM-T in particular accelerated the OM healing process, reducing time to lesion remission from 15 to 11 days. Photosensitizing Agents;Curcumin
Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Curcumin;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Photochemotherapy;Photosensitizing Agents;Stomatitis

Pre-/postprocedure measures for laser/energy treatments: A survey. BACKGROUND: Laser and energy-based devices may be used for many cutaneous indications, including facial resurfacing, improving skin conditions, and reducing signs of photoaging. Currently, no consensus papers or guidelines exist concerning peri-operative agents and specifically their use for laser skin resurfacing and their potential/possible role in prevention or treatment of side effects. AIM: To explore current practice using laser and energy devices, a survey was developed to identify the trends in pre- and postprocedural treatment measures. METHODS: The survey was sent out digitally to 300 randomly selected US dermatologist and plastic surgeon physicians practicing medical esthetics using laser and other energy devices treatment for facial rejuvenation. The survey gathered information on demographics, types of devices used in the clinic and pre-/postprocedural measures for facial laser,

and other energy-based devices treatment. RESULTS: The survey was active from June 15, to July 15, 2018, and fifty-eight dermatologists and plastic surgeons completed the survey (19.3% response rate, 58/300). The results showed inconsistency in skin preparation strategies and postprocedure wound care. The majority of survey participants (55/58 [96%]) reported prophylactic oral antiviral use pre- and post-treatment; however, there was inconsistency about when to start and when to stop the use. A similar inconsistency existed in the recommended period of post-treatment sun protection before and after treatment. CONCLUSION: The results of the survey confirmed the lack of consistency in the types and duration of pre- and postprocedural measures-emphasizing the need for evidence-based recommendations to optimize outcomes, prevent infection, enhance comfort, and reduce downtime. Consensus;Dermatologists;Face;Humans;Low-Level Light Therapy;Plasma Skin Regeneration;Postoperative Care;Postoperative Complications;Practice Guidelines as Topic;Preoperative Care;Radiofrequency Therapy;Rejuvenation;Skin;Skin Aging;Surgeons;Surveys and Questionnaires;Treatment Outcome;Wound Healing

Modulatory effect of laser irradiation on mastoparan-7-induced contraction. Mastoparan-7 activates guanine nucleotide-binding proteins (G-proteins) and stimulates both apoptosis and increases in cytoplasmic calcium concentration and may induce smooth muscle contraction. The primary aim of the present study was to evaluate the modulatory effect of laser stimulation on vascular smooth muscle contraction induced by direct stimulation of G-protein with mastoparan-7. Experiments were performed on isolated and perfused tail arteries of Wistar rats. Contraction force in the model was measured by increased levels of perfusion pressure with a constant flow. Irradiation treatment was applied directly to the blood vessels. The laser was applied in increasing doses of 10 mW (E=1.8 J), 30 mW (E=5.5 J) and 110 mW (E=19.8 J). Time of exposure was 3 min for each irradiation. In the laser-stimulated arteries, a significant and dose-dependent decrease was observed. The half maximal effective concentration values were 4.43Â±2.2x10(-8), 2.4Â±0.56x10(-7), 3.2Â±0.72x10(-7) and 7.7Â±0.3x10(-7) M/l in the control and 10, 30 and 110 mW laser irradiation groups, respectively. Significant ($P<0.001$) changes were identified for all laser treatment groups in comparison with the control. When analyzing the function of calcium ion (Ca(2+)) stores was analyzed, a significant inhibition of influx from both intra- and extracellular Ca(2+) stores was observed. The results from the present study suggested that contraction induced by direct activation of G-protein with mastoparan-7 may by effectively inhibited by laser radiation, and that the effect was associated with an inhibition of Ca(2+) influx from both intracellular and extracellular Ca(2+) stores.

Photobiostimulation activity of different low-level laser dosage on masticatory muscles and temporomandibular joint in an induced arthritis rat model. This study aimed to investigate the anti-inflammatory effects of different dosage of low-level laser therapy (LLLT) in an experimental model of temporomandibular joint (TMJ) arthritis. One hundred male Wistar rats were used and divided into the following groups: CG, control group; AG, animals group with left TMJ arthritis induced by intra-articular injection of Complete Freund's adjuvant - CFA; LG5, LG10 and LG20 - animals with arthritis and treated with LLLT at doses 5, 10, and 20Â J/cm(2), respectively. Morphological analysis was performed by TMJ histological sections stained with hematoxylin-eosin (HE), picrosirius (PSR), and toluidine blue (TB), as well as histomorphometric evaluation of cartilage, articular disc, and masticatory muscles. The amount of feed consumed within 3Â weeks was evaluated, and biochemical analysis of TMJ tissues included measurement of sulfated glycosaminoglycans (GAGs), matrix metalloproteinases (MMPs) 2 and 9 zymography, and ELISA for cytokines IL-6, TNF-Î±, and IL-1Î². Only the 20Â J/cm(2) dose promoted higher feed intake compared to AG. On the other hand, all LLLT doses promoted better organization of articular disc collagen fibers, greater number of proteoglycans in articular cartilage, increased area and diameter of left

lateral pterygoid fibers, reduced latent and active MMP 9 and 2 activity, and lower IL-1Î² concentration compared to AG. Considering the study limitations, it was observed that LLLT treatments were effective in protecting and tissue cleansing joint structures, accelerating tissue repair, especially at lower doses. Glycosaminoglycans;Interleukin-1beta;Interleukin-6;Proteoglycans;Tumor Necrosis Factor-alpha;Freund's Adjuvant Animals;Arthritis;Cartilage, Articular;Disease Models, Animal;Freund's Adjuvant;Glycosaminoglycans;Injections, Intra-Articular;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Masticatory Muscles;Proteoglycans;Rats, Wistar;Temporomandibular Joint;Tumor Necrosis Factor-alpha

Early tongue carcinomas (clinical stage I and II): echo-guided three-dimensional diode laser mini-invasive surgery with evaluation of histological prognostic parameters. A study of 85 cases with prolonged follow-up. The management of patients with early stage (cT1-T2) tongue squamous cell carcinoma without clinicoradiologic evidence of neck node metastasis (cN0) has been widely debated over the last 3 decades and still remains controversial. Nevertheless, the identification of patients with low-stage tumours at high-risk for occult cervical metastases is imperative before planning treatments of primary tumours, as well as that of prognostic markers which may possibly select those patients who may benefit of additional workup after surgery in view of the high metastatic potential of the primary tumour. The pre-surgical evaluation of tongue malignant primary tumour (for assessing lateral and deep margins) along with diode laser surgery (with accurate incision, bleeding-free and with reduced/absent post-surgical complications) may lead to a more conservative but equally decisive surgical treatment, also with a greater patient compliance. We studied 85 consecutive cases of cT1-T2 N0 tongue squamous cell carcinoma who had been managed by the following diagnostic/therapeutic protocol: pre-operative high definition ultrasound examination for the evaluation of size and depth, followed by three-dimensional surgical excision by diode laser (wavelength of 800â€‰Â±â€‰10Â nm, output power of 8Â W in continuous wave, flexible optic fibre of 320Â Î¼m in contact mode) and detailed histological analyses of well-established prognostic parameters (tumour grade, thickness, depth, front of infiltration and surgical margins) with statistical analysis. No post-surgical photobiomodulation was performed. Overall, 58.82% of patients were stage I, 18% stage II, and the most frequent histotype was squamous cell carcinoma (97.64%). Large nests invasion pattern was observed in 64 cases, expansive pattern in 9, invasion in single cells in 12; front of invasion involved the muscle in 62 cases, vessels in 6, nerves in 15; peritumoural vascular invasion was assessed in 6 patients and perineural invasion in 15. Selective neck lymphadenectomy was performed in 9 cases, and clinically occult node metastases were detected in two cases. At follow-up, 78 patients (98.73%) were alive and free of disease, one patient experienced tumour-related death, while the remaining 6 died for non-disease-related causes. All the histological prognostic parameters were statistically significant (Ï‡(2) test; pâ€‰=â€‰0.05), thus leading to a prognostic weight classification with a three-tiered stratification. On the bases of these results, the authors maintain that the reported diagnostic/therapeutic protocol, including the pre-operative echo-guided three-dimensional evaluation, the following diode laser mini-invasive surgery for tumour excision and the histological examination along with the proposed three-tiered stratification of histological prognostic parameters may allow proper management of clinical stage I and II early tongue carcinomas. Aged;Carcinoma, Squamous Cell;Female;Follow-Up Studies;Humans;Laser Therapy;Lasers, Semiconductor;Lymphatic Metastasis;Male;Middle Aged;Minimally Invasive Surgical Procedures;Neoplasm Staging;Prognosis;Tongue Neoplasms

Effects of photobiomodulation therapy in the integration of skin graft in rats. Skin graft is one of the most common techniques used in plastic surgery and repair. However, there are some complications that can lead to loss of the skin graft. Thus, several features have been studied with the aim of promoting the integration of skin grafts. Among these resources, the use of laser

photobiomodulation (laser PBM) has been highlighted. The present study aimed to investigate the effects of laser PBM on the viability and integration of skin grafts in rats. Twenty male Wistar rats (Â± 250 g) were randomly assigned into two experimental groups with 10 animals each: control group, animals submitted to skin graft and simulation of laser PBM; laser PBM group, submitted to the skin graft and submitted to laser PBM at 660 nm, 40 mW, 60 s, 2.4 J. The animals were submitted to laser photobiomodulation immediately after the surgical procedure and each 24 h. Animal euthanasia occurred on the 7th day after surgery, 24 h after the last treatment session. The histopathological analysis revealed that the laser PBM showed better adhesion of the graft when compared to the control group. Likewise, the morphometric analysis of mast cells, blood vessels, and collagen showed a statistically significant increase in the animals irradiated with the laser PBM when compared to the control group. In addition, immunohistochemical analysis demonstrated that the laser PBM showed statistically higher immunoexpression of FGF when compared to the CG. However, IL-4 immunoexpression did not show statistical difference between the experimental groups. From the results obtained in the present study, it can be suggested that laser photobiomodulation was effective in promoting the integration and viability of total skin grafts in rats. Interleukin-4;Collagen Animals;Cell Count;Collagen;Interleukin-4;Low-Level Light Therapy;Male;Mast Cells;Rats, Wistar;Skin;Skin Transplantation

Low-level laser-aided orthodontic treatment of periodontally compromised patients: a randomised controlled trial. Low-level laser irradiation (LLLI) shows effects in orthodontic pain relief and periodontal inflammation control. The aim of this article is to investigate the analgesic and inflammation-modulatory effects of low-level laser irradiation among orthodontic patients with compromised periodontium. A randomised controlled trial with split-mouth design was conducted in 27 adults with treated and controlled chronic periodontitis over 6 months. One side of the dental arch underwent repeated treatment under a 940-nm diode laser (EZlase; Biolase Technology Inc.) with a beam size of 2.8 cm(2) for 60 seconds at 8.6 J/cm(2), whilst the other side received pseudo-laser treatment. Laser irradiation was applied repeatedly for 8 times during the first 6 weeks after bracket bonding and monthly thereafter until the end of orthodontic treatment. Subjective pain (assessed by visual analogue scale in pain diary and by chairside archwire activation), periodontal status (assessed by periodontal clinical parameters), cytokines in gingival crevicular fluid (interleukin 1Î², prostaglandin E(2), substance P) and periodontopathic bacteria (Porphyromonas gingivalis and Treponema denticola) in supragingival plaque were assessed. The intensity of pain was lower on the laser-irradiated side at multiple follow-up visits ($P < 0.05$). The pain subsided 1 day earlier on the laser side, with a lower peak value during the first week after initial archwire placement ($P < 0.05$). The laser side exhibited a smaller reduction in bite force during the first month (mean difference = 3.17, 95% CI: 2.36-3.98, $P < 0.05$ at 1-week interval; mean difference = 3.09, 95% CI: 1.87-4.32, $P < 0.05$ at 1-month interval). A smaller increase was observed in the plaque index scores on the laser side at 1-month (mean difference = 0.19, 95% CI: 0.13-0.24, $P < 0.05$) and in the gingival index scores at the 3-month follow-up visit (mean difference = 0.18, 95% CI: 0.14-0.21, $P < 0.05$). Laser irradiation inhibited the elevation of interleukin-1Î², prostaglandin E(2) and substance P levels during the first month ($P < 0.05$). However, no intergroup difference was detected in the bacteria levels. Low-level laser irradiation exhibits benefits in pain relief and inflammation control during the early stage of adjunctive orthodontic treatment in periodontally compromised individuals. Biomarkers Adult;Bacterial Load;Biomarkers;Chronic Periodontitis;Female;Gingiva;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Perception;Periodontal Index;Porphyromonas gingivalis;Visual Analog Scale

Mid infrared light treatment attenuates cognitive decline and alters the gut microbiota community in APP/PS1 mouse model. Alzheimer's disease (AD) as the first most neurodegenerative disease in

the elderly still has no effective therapy, suggesting that the intervention toolbox for AD should be expanded. One newly developed strategy involves the use of photobiomodulation, such as near infrared or far infrared light, which has proven to attenuate AD-associated pathology. However, the efficacy of mid infrared light (MIR) in treating AD is under investigated. With this in mind, we assessed the benefits of MIR light of peak wavelength 7.7-10Â Î¼m treatment on APP/PS1 transgenic mice. We found that APP/PS1 mice treated with MIR light had improved learning and memory abilities and reduced amyloid-Î² (AÎ²) plaque load in the brain. We also surprisingly found that the gut microbiota composition in APP/PS1 mice treated with MIR light returned to normal (wild type mice) levels. Together, these findings suggested a novel non-invasive and promising avenue for AD treatment via photobiomodulation, and also proposed that future target for AD might be the gut microbiota via the brain-gut-skin axis. Amyloid beta-Protein Precursor;Presenilin-1 Alzheimer Disease;Amyloid beta-Protein Precursor;Animals;Cognitive Dysfunction;Disease Models, Animal;Gastrointestinal Microbiome;Infrared Rays;Mice;Mice, Transgenic;Presenilin-1

Low-level laser therapy protocols in dental movement acceleration and in pain management during orthodontic treatment. In recent years various studies about the biostimulatory effects of the laser therapy in orthodontics have been carried out. This study investigates the potential advantages obtainable using the Low-level Laser Therapy during orthodontic treatment and the most efficient clinical protocols. Recently published randomized controlled trials (RCTs) have been obtained through a search on electronic databases (Cochrane Library and Pubmed). Clinical studies in humans in which Low-level Laser Therapy was applied during orthodontic treatment were included. In conclusion, 14 relevant clinical studies were identified. This study shows the possibility to obtain an increase in tooth movement between 31% and 100% depending on the laser therapy considered and the time interval for measuring the value. In addition, there is a potential impact in reducing orthodontic pain limited to the day following the application of laser therapy when orthodontic therapy includes canine retraction, and during a period not exceeding five days from the placement of fixed orthodontic appliances in the others clinical cases.Low-level Laser Therapy is considered effective both to increase the movement of the dental elements and to reduce pain during orthodontic therapy. Different clinical protocols have been identified depending on the orthodontic cases considered. Both an LED device and an AlGaAs diode device can be used. In the future paying more attention to the therapeutic possibilities offered by laser devices with greater power is recommended. A greater energy density directed to the target tissues has been proven to provoke more significant therapeutic effects.

Infrared Low-Level Laser Therapy (Photobiomodulation Therapy) before Intense Progressive Running Test of High-Level Soccer Players: Effects on Functional, Muscle Damage, Inflammatory, and Oxidative Stress Markers-A Randomized Controlled Trial. The effects of preexercise photobiomodulation therapy (PBMT) to enhance performance, accelerate recovery, and attenuate exercise-induced oxidative stress were still not fully investigated, especially in high-level athletes. The aim of this study was to evaluate the effects of PBMT (using infrared low-level laser therapy) applied before a progressive running test on functional aspects, muscle damage, and inflammatory and oxidative stress markers in high-level soccer players. A randomized, triple-blind, placebo-controlled crossover trial was performed. Twenty-two high-level male soccer players from the same team were recruited and treated with active PBMT and placebo. The order of interventions was randomized. Immediately after the application of active PBMT or placebo, the volunteers performed a standardized high-intensity progressive running test (ergospirometry test) until exhaustion. We analyzed rates of oxygen uptake (VO(2 max)), time until exhaustion, and aerobic and anaerobic threshold during the intense progressive running test. Creatine kinase (CK) and lactate dehydrogenase (LDH) activities, levels of interleukin-1Î² (IL-1-Î²), interleukin-6 (IL-6), and tumor necrosis factor alpha (TNF-Î±), levels of

thiobarbituric acid (TBARS) and carbonylated proteins, and catalase (CAT) and superoxide dismutase (SOD) activities were measured before and five minutes after the end of the test. PBMT increased the VO(2 max) (both relative and absolute values-$p < 0.0467$ and $p < 0.0013$, respectively), time until exhaustion ($p < 0.0043$), time ($p < 0.0007$) and volume ($p < 0.0355$) in which anaerobic threshold happened, and volume in which aerobic threshold happened ($p < 0.0068$). Moreover, PBMT decreased CK ($p < 0.0001$) and LDH ($p < 0.0001$) activities. Regarding the cytokines, PBMT decreased only IL-6 ($p < 0.0001$). Finally, PBMT decreased TBARS ($p < 0.0001$) and carbonylated protein levels ($p < 0.01$) and increased SOD ($p < 0.0001$)and CAT ($p < 0.0001$) activities. The findings of this study demonstrate that preexercise PBMT acts on different functional aspects and biochemical markers. Moreover, preexercise PBMT seems to play an important antioxidant effect, decreasing exercise-induced oxidative stress and consequently enhancing athletic performance and improving postexercise recovery. This trial is registered with Clinicaltrials.gov NCT03803956. Biomarkers Adolescent;Adult;Athletes;Biomarkers;Cross-Over Studies;Exercise;Humans;Inflammation;Low-Level Light Therapy;Male;Muscle Fatigue;Oxidation-Reduction;Oxidative Stress;Running;Soccer;Young Adult

Low-level Laser Therapy in Combination with Desensitising Agent Reduces Dentin Hypersensitivity in Fluorotic and Non-fluorotic Teeth - A Randomised, Controlled, Double-blind Clinical Trial. PURPOSE: Dentin hypersensitivity (DH) is a prevalent painful condition of the teeth, the management of which lies in the obliteration of patent dentinal tubules. The purpose of this study was to compare the efficacy of 5% potassium nitrate (PN), low-level laser therapy (LLLT), and combination of low-level laser therapy and 5% potassium nitrate (LLLT+PN) in patients with fluorotic and non-fluorotic hypersensitive teeth. MATERIALS AND METHODS: Ninety self reporting patients with DH completed the randomised, double-blind study. Patients were equally divided into fluorosis group (FG), with moderate to moderately severe fluorosis and the non-fluorosis group (NFG) and subdivided into 3 groups to receive PN, LLLT (810 nm, 1 W) alone and LLLT+PN. Each participant had at least one tooth eliciting a response of â‰¥ 3 on a visual analog scale (VAS) to evaporative, thermal and electric tactile stimulus (digital scratch-o-meter). The teeth were evaluated at baseline, 30 min post treatment, 1 week, 4 weeks and 12 weeks. The magnitude of pressure applied by the scratch-o-meter was also assessed for all three interventions. RESULTS: Statistically, LLLT+PN was more effective in alleviating DH at all time intervals compared to baseline. However, statistically significant results (p Ë, 0.05) were seen with LLLT+PN at 12 weeks in FG. Magnitude of pressure applied showed statistically significant differences with LLLT+PN at 30 min post treatment. CONCLUSION: LLLT+PN alleviated DH at all time intervals, with a greater effect in the fluorotic group. However, LLLT+PN was more efficacious in reducing DH at 12 weeks post treatment in the fluorotic group. Dentin Desensitizing Agents Dentin Desensitizing Agents;Dentin Sensitivity;Double-Blind Method;Fluorosis, Dental;Humans;Low-Level Light Therapy;Treatment Outcome

Correction to: Effect of 650-nm low-level laser irradiation on c-Jun, c-Fos, ICAM-1, and CCL2 expression in experimental periodontitis. After publication of our article [1] we realized that we had not acknowledged that some of the text overlaps with a previous publication [2]. We apologize to readers for this error.

Long-term analyses of spastic muscle behavior in chronic poststroke patients after near-infrared low-level laser therapy (808 nm): a double-blinded placebo-controlled clinical trial. Stroke results in impairment of basic motor functions, such as muscle weakness in limbs affected by spasticity, leading to peripheral fatigue and impaired functionality. The clinical use of photobiomodulation therapy (PBMT) has provided major advances in the treatment of muscular disorders and prevention of muscle fatigue. The aim of this study was to analyze the effects of two distinct therapies in biceps spasticity of chronic hemiparetic patients. We analyzed range of elbow motion, torque,

electromyography, and mean spectral frequency after 10 sessions of PBMT (Laser 100 mW, 808 nm, 159.24 J/cm(2)/point, 5 J/point); PBMT active or placebo was associated with exoskeleton-assisted functional treatment. A double-blind placebo-controlled sequential clinical trial was conducted with 12 healthy volunteers and 15 poststroke patients who presented upper-limb spasticity. The healthy volunteers performed only the evaluation protocol, and the poststroke volunteers participated in three consecutive phases (PBMT, PBMT + exoskeleton, placebo + PBMT) with a washout period of 4 weeks between each phase. We could observe significant increases in range of elbow motion after PBMT from 57.7 Â± 14 to 84.3 Â± 27.6 degrees ($p < 0.001$). The root mean square (RMS) values also increased after PBMT + exoskeleton from 23.2 Â± 15 to 34.9 Â± 21 Î¼V ($p = 0.0178$). Our results suggest that the application of PBMT may contribute to an increased range of elbow motion and muscle fiber recruitment, increases in muscle strength, and, hence, to increase signal conduction on spastic muscle fibers in spastic patients. Placebos Adult;Double-Blind Method;Electromyography;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Muscle Spasticity;Placebos;Range of Motion, Articular;Signal Processing, Computer-Assisted;Stroke

The qualification and training of laser/intense pulse light hair removal operators within South Africa. BACKGROUND: Lasers and intense pulse light (IPL) sources are powerful devices that can cause skin burns, pigmentary changes, and scarring if used incorrectly. Adequate training is essential, and regulations are required to limit complications. AIMS: The purpose was to investigate the qualifications and training obtained by laser hair removal operators in South Africa. METHODS: Questionnaires were distributed and information gathered from owners/managers of laser clinics, suppliers of laser devices in South Africa, individuals in the workplace performing laser hair removal procedures, and accredited tertiary institutions. RESULTS: A majority of clinic owners/managers (94.45%) felt that more emphasis should be placed on laser hair removal training at a tertiary level, and 66.67% outsource additional training provided by the manufacturer of laser devices. Based on the survey to manufacturers, 50% did not require any formal qualification as a minimum requirement, while 33.33% indicated laser hair removal training is incorporated at a NQF level 4 (National/Senior Certificate). The majority of individuals (68.89%) received training from tertiary institutions; however, they did not receive any practical training, and 60.87% felt the amount of training was insufficient. According to the survey sent to tertiary institutions in South Africa, only 27.78% offer laser hair removal training, and of these, 20% offer no practical training and 50% indicated that no practical examination is provided. CONCLUSIONS: There is a clear lack of training in laser hair removal in South Africa. The industry should have standard requirements in terms of minimum practical and theoretical hours with regards to the therapy. Hair Removal;Humans;Laser Therapy;Lasers;Light;Low-Level Light Therapy;South Africa

Photobiomodulation at 660â€‰nm Stimulates Fibroblast Differentiation. BACKGROUND AND OBJECTIVES: Among many of the different complications that diabetic patients suffer, foot ulcers are the most challenging, and in many cases result in non-traumatic lower limb amputation and permanent disability. To alleviate this burden, new interventions such as photobiomodulation (PBM) have been utilized. However, the cellular pathways affected by PBM have not yet been fully recognized. The differentiation of fibroblasts into myofibroblasts forms a vital part of wound healing and is often impaired under diabetic conditions. Therefore, this study sought to investigate the effects of PBM at 660â€‰nm on the transforming growth factor-Î²1 (TGF-Î²1)/Smad pathway and the differentiation of fibroblasts into myofibroblasts. STUDY DESIGN/MATERIALS AND METHODS: WS1 fibroblasts were treated with PBM using a wavelength of 660â€‰nm at a fluence of 5â€‰J/cm(2) in normal, normal wounded, diabetic, and diabetic wounded models. Post-irradiation cellular responses were observed at 24, 48, and 72â€‰hours to ascertain morphological changes and cell viability, and

the expression of fibroblast differentiation markers (Thy-1 or CD90, extra domain A fibronectin or EDA-FN and Î±-smooth muscle actin or Î±-SMA), TGF-Î²1, phosphorylated (p)TGF-Î² receptor 1 (R1), and p-Smad2/3. RESULTS: There was a significant increase in cell viability in all irradiated cell models, and no real significant changes in TGF-Î²1, pTGF-Î²1R1, and p-Smad2/3. As incubation time post-irradiation increased, Thy-1 (CD90) decreased, while EDA-FN and Î±-SMA increased in wounded models. CONCLUSIONS: PBM at 660â€‰nm with 5â€‰J/cm(2) was successful in stimulating the differentiation of fibroblasts into myofibroblasts in diabetic wounded cells, which was independent of the TGF-Î²1/Smad pathway. Fibroblast transition into myofibroblasts is vital to wound healing, failure of which results in impaired healing; PBM is able to foster such a transition. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Cell Differentiation;Cell Survival;Cells, Cultured;Fibroblasts;Humans;Myofibroblasts;Wound Healing

Transoral Low-Level Laser Therapy Via a Cylindrical Device to Treat Oral Ulcers in a Rodent Model. BACKGROUND AND OBJECTIVE: Various clinical and animal studies have applied low-level laser therapy (LLLT) to treat oral ulcers. However, most previous studies applied lasers with small pinpoint irradiation, which required multiple laser irradiations to cover the complete extent of the ulcer. The objective of this study was to evaluate the effect of LLLT using a 635â€‰nm diode laser via a transoral device to cover the whole lesion on oral ulcers in an animal model. STUDY DESIGN/MATERIALS AND METHODS: An animal model of oral ulcers was developed with a 6â€‰mm skin punch in the right buccal mucosa of Wistar rats (males, body weight 200-250â€‰g). Three days after the mucosal injury, LLLT (spot size 2â€‰cm(2)) was conducted once a day for 5 days. Twenty-eight rats were randomly assigned into four groups according to energy density (control group, 5, 20, 75â€‰J/cm(2)). The size of the ulcers was measured and histologic analysis were performed ten days after the initial mucosal injury. RESULTS: The mean size of the oral ulcers was significantly smaller in rats treated with an energy density of 20â€‰J/cm(2) than that of any other group (control group or energy densities of 5 or 75â€‰J/cm(2)). The irradiation of oral ulcers with an energy density of 20â€‰J/cm(2) accelerated the oral mucosa wound healing process and decreased inflammation and granulation tissue, resulting in good reepithelization. However, the histologic outcomes of rats irradiated with energy densities of 5 or 75â€‰J/cm(2) were comparable with those of the control group. CONCLUSION: LLLT using a 635â€‰nm diode laser for oral ulcers with a transoral cylindrical device for wide light distribution may accelerate the wound healing process. LLLT with large-surface irradiation may be a substitute for previous LLLT for oral mucosal lesions conducted in a punctuate manner. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oral Ulcer;Rats;Rats, Wistar;Rodentia

The effects of laser diode treatment on liver dysfunction of Mus musculus due to carbofuran exposure: An in vivo study. OBJECTIVE: The aim of this study is to determine the effect of laser diode as an alternative treatment on liver dysfunction (in vivo study) that is caused by carbofuran using male mice (Mus musculus) strain Balb/C. MATERIALS AND METHODS: The samples were divided into three groups, namely, Group C-L- (control group, no treatment), Group C+L- (only treated by carbofuran treatment), and Group C+L+ (treatment group, treated by carbofuran and laser-puncture) with five replications each. After being treated, each liver slice of samples was observed using microscope to get the histology result and then scored. RESULTS: Carbofuran contamination can lead to inflammation of cells and necrosis. The histology results and the scoring test showed that the liver cells repair with the energy dose of laser diode at 0.5 and 1.0 Joule. CONCLUSION: The optimum energy dose in this study was 1.0 Joule which had the closest score of inflammatory cells and necrosis to normal liver cells.

Transcranial Photobiomodulation For The Management Of Depression: Current Perspectives. Major depressive disorder (MDD) is a prevalent condition associated with high rates of disability, as

well as suicidal ideation and behavior. Current treatments for MDD have significant limitations in efficacy and side effect burden. FDA-approved devices for MDD are burdensome (due to repeated in-office procedures) and are most suitable for severely ill subjects. There is a critical need for device-based treatments in MDD that are efficacious, well-tolerated, and easy to use. In this paper, we review a novel neuromodulation strategy, transcranial photobiomodulation (t-PBM) with near-infrared light (NIR). The scope of our review includes the known biological mechanisms of t-PBM, as well as its efficacy in animal models of depression and in patients with MDD. Theoretically, t-PBM penetrates into the cerebral cortex, stimulating the mitochondrial respiratory chain, and also significantly increases cerebral blood flow. Animal and human studies, using a variety of t-PBM settings and experimental models, suggest that t-PBM may have significant efficacy and good tolerability in MDD. In aggregate, these data support the need for large confirmatory studies for t-PBM as a novel, likely safe, and easy-to-administer antidepressant treatment.

Influence of Pulsed He-Ne Laser Irradiation on the Red Blood Cell Interaction Studied by Optical Tweezers. Optical Tweezers (OT), as a revolutionary innovation in laser physics, has been extremely useful in studying cell interaction dynamics at a single-cell level. The reversible aggregation process of red blood cells (RBCs) has an important influence on blood rheological properties, but the underlying mechanism has not been fully understood. The regulating effects of low-level laser irradiation on blood rheological properties have been reported. However, the influence of pulsed laser irradiation, and the origin of laser irradiation effects on the interaction between RBCs remain unclear. In this study, RBC interaction was assessed in detail with OT. The effects of both continuous and pulsed low-level He-Ne laser irradiation on RBC aggregation was investigated within a short irradiation period (up to 300 s). The results indicate stronger intercellular interaction between RBCs in the enforced disaggregation process, and both the cell contact time and the initial contact area between two RBCs showed an impact on the measured disaggregation force. Meanwhile, the RBC aggregation force that was independent to measurement conditions decreased after a short time of pulsed He-Ne laser irradiation. These results provide new insights into the understanding of the RBC interaction mechanism and laser irradiation effects on blood properties.

Photobiomodulation Therapy (PBMT) Applied in Bone Reconstructive Surgery Using Bovine Bone Grafts: A Systematic Review. The use of low-level laser therapy (LLLT) with biomodulatory effects on biological tissues, currently called photobiomodulation therapy (PBMT), assists in healing and reduces inflammation. The application of biomaterials has emerged in bone reconstructive surgery, especially the use of bovine bone due to its biocompatibility. Due to the many benefits related to the use of PBMT and bovine bones, the aim of this research was to review the literature to verify the relationship between PBMT and the application of bovine bone in bone reconstruction surgeries. We chose the PubMed/MEDLINE, Web of Science, and Scopus databases for the search by matching the keywords: "Bovine bone AND low-level laser therapy", "Bovine bone AND photobiomodulation therapy", "Xenograft AND low-level laser therapy", and "Xenograft AND photobiomodulation therapy". The initial search of the three databases retrieved 240 articles, 18 of which met all inclusion criteria. In the studies concerning animals (17 in total), there was evidence of PBMT assisting in biomaterial-related conduction, formation of new bone, bone healing, immunomarker expression, increasing collagen fibers, and local inflammation reduction. However, the results disagreed with regard to the resorption of biomaterial particles. The only human study showed that PBMT with bovine bone was effective for periodontal regeneration. It was concluded that PBMT assists the process in bone reconstruction when associated with bovine bone, despite divergences between applied protocols.

Therapeutic potential of intranasal photobiomodulation therapy for neurological and neuropsychiatric disorders: a narrative review. The application of photobiomodulation therapy

(PBMT) for neuronal stimulation is studied in different animal models and in humans, and has shown to improve cerebral metabolic activity and blood flow, and provide neuroprotection via anti-inflammatory and antioxidant pathways. Recently, intranasal PBMT (i-PBMT) has become an attractive and potential method for the treatment of brain conditions. Herein, we provide a summary of different intranasal light delivery approaches including a nostril-based portable method and implanted deep-nasal methods for the effective systemic or direct irradiation of the brain. Nostril-based i-PBMT devices are available, using either lasers or light emitting diodes (LEDs), and can be applied either alone or in combination to transcranial devices (the latter applied directly to the scalp) to treat a wide range of brain conditions such as mild cognitive impairment, Alzheimer's disease, Parkinson's disease, cerebrovascular diseases, depression and anxiety as well as insomnia. Evidence shows that nostril-based i-PBMT improves blood rheology and cerebral blood flow, so that, without needing to puncture blood vessels, i-PBMT may have equivalent results to a peripheral intravenous laser irradiation procedure. Up to now, no studies were conducted to implant PBMT light sources deep within the nose in a clinical setting, but simulation studies suggest that deep-nasal PBMT via cribriform plate and sphenoid sinus might be an effective method to deliver light to the ventromedial part of the prefrontal and orbitofrontal cortex. Home-based i-PBMT, using inexpensive LED applicators, has potential as a novel approach for neurorehabilitation; comparative studies also testing sham, and transcranial PBMT are warranted. Cerebrovascular Circulation;Humans;Low-Level Light Therapy;Mental Disorders;Neurodegenerative Diseases;Nose

Sustained release of growth factors from photoactivated platelet rich plasma (PRP). The goal of this study is to specify the ability of polychromatic light source (PAC), providing effective wavelengths in the range of 600-1200Â nm (near-infrared region, NIR), to activate human platelets in platelet-rich plasma (PRP) and to achieve sustained and controlled release of growth factors from photoactivated platelets. PRP was isolated from human blood and treated with PAC in different time intervals during 1, 5 and 10Â min from 10Â cm distance to the platelets. ATP secretion and then, calcium release from platelets significantly increased after light application. Photostimulation of platelets triggered lamellipodia extension, numerous filopodia formation, and platelet agglomeration as activation indicators. P-selectin expression was significantly increased after the application of PAC. In conclusion, PRP was successfully activated with PAC for 10Â min and realized activation-dependent sustained growth factor release during 28Â days. We proved that PAC which has a great potential of activation of PRP enables sustained growth factor release from PRP with a periodic use for therapeutic applications of PRP. Intercellular Signaling Peptides and Proteins;P-Selectin;SELP protein, human;Calcium Adult;Blood Platelets;Calcium;Humans;Intercellular Signaling Peptides and Proteins;Light;Male;P-Selectin;Platelet-Rich Plasma;Time Factors;Young Adult

Application of oxytocin with low-level laser irradiation suppresses the facilitation of cortical excitability by partial ligation of the infraorbital nerve in rats: An optical imaging study. The effects of current treatments for neuropathic pain are limited. Oxytocin is a novel candidate substance to relieve neuropathic pain, as demonstrated in various animal models with nerve injury. Low-level laser therapy (LLLT) is another option for the treatment of neuropathic pain. In this study, we quantified the effects of oxytocin or LLLT alone and the combination of oxytocin and LLLT on cortical excitation induced by electrical stimulation of the dental pulp using optical imaging with a voltage-sensitive dye in the neuropathic pain model with partial ligation of the infraorbital nerve (pl-ION). We applied oxytocin (OXT, 0.5Â Î¼mol) to the rat once on the day of pl-ION locally to the injured nerve. LLLT using a diode laser (810Â nm, 0.1Â W, 500Â s, continuous mode) was performed daily via the skin to the injured nerve from the day of pl-ION to 2Â days after pl-ION. Cortical responses to electrical stimulation of the mandibular molar pulp under urethane anesthesia were recorded 3Â days after pl-ION. Both the amplitude and area of excitation in the primary and

secondary somatosensory and insular cortices in pl-ION rats were larger than those in sham rats. The larger amplitude of cortical excitation caused by pl-ION was suppressed by OXT or LLLT. The expanded area of cortical excitation caused by pl-ION was suppressed by OXT with LLLT but not by OXT or LLLT alone. These results suggest that the combined application of OXT and LLLT is effective in relieving the neuropathic pain induced by trigeminal nerve injury. Oxytocin Animals;Cortical Excitability;Dental Pulp;Electric Stimulation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxillary Nerve;Neuralgia;Optical Imaging;Oxytocin;Rats;Rats, Sprague-Dawley

Feasibility of photobiomodulation therapy for the prevention of radiodermatitis: a single-institution pilot study. Acute radiodermatitis is one of the major complications when radiation therapy (RT) is delivered to the head and neck region in cases of head and neck cancers or lung cancers with supraclavicular lymph node metastasis. In these cases, high dose of RT is generally used so that acute radiodermatitis is observed in more than 90% of patients, and it negatively affects patients' quality of life. In this pilot study, we evaluated the clinical feasibility of photobiomodulation (PBM) therapy before conducting a randomized trial based on the hypothesis that PBM therapy may reduce the severity of radiodermatitis in participants receiving 60Â Gy or higher dose. Patients who were to receive 60Â Gy or higher dose in the neck were included in the study. Thirty-three patients received PBM therapy three times a week during RT. The severity of radiodermatitis was evaluated by two dermatologists and a radiation oncologist using the modified Common Terminology Criteria for Adverse Events (CTCAE). Patients were followed up until a week after RT. In all patients, 90.6% of planned PBM schedule was completed. There was no significant side effect of PBM therapy. Thirteen (39%) patients showed wet desquamation (CTCAE grade 2b or higher). Only three (9%) of them showed grade 3 toxicity, which is a favorable result compared with previous studies. This pilot study showed that PBM therapy is safe and feasible in the clinic, and it might reduce the severity of radiodermatitis. A randomized trial should be warranted to prove the efficacy of PBM therapy. Adult;Aged;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Quality of Life;Radiodermatitis;Severity of Illness Index;Young Adult

Comparison of the effect of photobiomodulation therapy and Ibuprofen on postoperative pain after endodontic treatment: randomized, controlled, clinical study. The aim of the study was to compare the effect of Ibuprofen and the application of photobiomodulation therapy protocol on the reduction of postoperative pain in endodontically treated teeth using a randomized clinical trial design. Seventy patients, diagnosed with symptomatic irreversible pulpitis, were selected. Treatment was performed by a single operator; a reciprocal system was used to prepare the canals; they were obturated using the Tagger's hybrid technique and coronally sealed with glass-ionomer cement. After treatment, patients were randomly divided into 2 groups. In the active control group, two Ibuprofen 600Â mg tablets were administered within a 12-h interval. In the photobiomodulation therapy group, the irradiation was applied after treatment. The evaluation of postoperative pain was performed by another researcher blinded to the groups at 6, 12, 24, and 72Â h intervals after treatment. To measure the outcome, two pain scales were used: numerical rate scale (NRS) and verbal rate scale (VRS). Data were analyzed using the chi-square, Mann-Whitney, and Wilcoxon paired tests. Outcome was superior with photobiomodulation therapy at 6Â h (pÂ <â€‰0.001), 12Â h (pÂ =â€‰0.005), and 24Â h (pÂ <â€‰0.001) intervals compared with Ibuprofen. The results for the 72Â h (pÂ =â€‰0.317) interval were similar, both in the VRS and NRS scales. It may be concluded that the use of photobiomodulation therapy was effective in reducing pain within the first 24Â h when compared with the administration of Ibuprofen 600Â mg. Ibuprofen Adult;Endodontics;Female;Humans;Ibuprofen;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Treatment Outcome

Photobiomodulation therapy decreases free fatty acid generation and release in adipocytes to ameliorate insulin resistance in type 2 diabetes. Excessive circulating free fatty acids (FFA) cause insulin resistance in peripheral tissues by inhibiting the proximal insulin signaling pathway. White adipose tissue (WAT) is a primary source of FFA generation and release through triglyceride (TG) hydrolysis. Thus, reducing excessive lipolysis in adipocytes ameliorates whole-body insulin resistance in type 2 diabetes. Here, we found that a noninvasive photobiomodulation therapy (PBMT), decreased FFA generation and release in WATs from high-fat diet (HFD)-fed mice and diabetic db/db mice. Meanwhile, plasma FFA and TG levels were reduced in two mouse models after PBMT. PBMT promoted mitochondrial reactive oxygen species (ROS) generation, which inhibited phosphatase and tensin homologue (PTEN) and promoted protein kinase B (AKT) activation. Photoactivation of AKT inhibited the transcriptional activity of Forkhead box transcription factor O1 (FoxO1), reducing expression of lipolytic enzymes and FFA generation and release. Eliminating ROS elimination or inhibiting AKT blocked the effects of the laser therapy in vivo and in vitro. Taken together, PBMT suppresses FFA generation and release in insulin-resistant adipocytes, contributing to improvement of insulin resistance in mouse models of type 2 diabetes. Fatty Acids, Nonesterified;Forkhead Box Protein O1;Foxo1 protein, mouse;Reactive Oxygen Species;Proto-Oncogene Proteins c-akt;PTEN Phosphohydrolase Adipocytes;Adipose Tissue;Animals;Diabetes Mellitus, Type 2;Fatty Acids, Nonesterified;Forkhead Box Protein O1;HEK293 Cells;Humans;Insulin Resistance;Lipolysis;Low-Level Light Therapy;Male;Mice, Inbred C57BL;Models, Biological;PTEN Phosphohydrolase;Proto-Oncogene Proteins c-akt;Reactive Oxygen Species;Signal Transduction

Diode laser for the treatment of lingual venous malformations. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Tongue;Vascular Malformations;Veins

Intense pulsed light for improving dry eye disease in rosacea. Dry Eye Syndromes;Humans;Lasers, Dye;Low-Level Light Therapy;Meibomian Glands;Rosacea;Treatment Outcome

Efficacy of low-level laser therapy associated with fluoride therapy for the desensitisation of molar-incisor hypomineralisation: Randomised clinical trial. BACKGROUND: Molar-incisor hypomineralisation (MIH) is a qualitative enamel defect. AIM: To investigate the low-level laser therapy (LLLT) associated with fluoride varnish for the desensitisation of teeth with MIH. DESIGN: A randomised clinical trial was conducted with 66 children, randomly allocated to the treatments: laser (L); fluoride varnish (FV); and laserÂ +Â fluoride varnish (LÂ +Â FV). The participants in the L group underwent two sessions of LLLT (48-hour interval). The FV group received four applications of varnish at one-week intervals. The LÂ +Â FV underwent two sessions of LLLT and four applications of varnish. Prior to each session and one month after the onset of treatment, tooth sensitivity and its magnitude were evaluated. Intra- and inter-group comparisons were performed (Î±Â =Â 5%). RESULTS: A significant reduction in the mean sensitivity score was found over time in all groups. After the final treatment, a significant difference was found between the L and LÂ +Â FV groups (PÂ =Â .011), with a lower score in the LÂ +Â FV group (0.09), whereas no difference was found between the FV and LÂ +Â FV groups (PÂ =Â .095). CONCLUSIONS: Fluoride varnish and the combination of treatments (LÂ +Â FV) had greater desensitising action on teeth with MIH. Laser therapy demonstrated an immediate desensitising effect, whereas fluoride varnish had a late-onset effect. Cariostatic Agents;Fluorides, Topical;Fluorides Cariostatic Agents;Child;Fluorides;Fluorides, Topical;Humans;Incisor;Low-Level Light Therapy;Molar

The light-oxygen effect in biological cells enhanced by highly localized surface plasmon-polaritons. Here at the first time we suggested that the surface plasmon-polariton phenomenon which it is well described in metallic nanostructures could also be used for explanation of the unexpectedly strong oxidative effects of the low-intensity laser irradiation in living matters (cells, tissues, organism). We

demonstrated that the narrow-band laser emitting at 1265â€‰nm could generate significant amount of the reactive oxygen species (ROS) in both HCT116 and CHO-K1 cell cultures. Such cellular ROS effects could be explained through the generation of highly localized plasmon-polaritons on the surface of mitochondrial crista. Our experimental conditions, the low-intensity irradiation, the narrow spectrum band (<4â€‰nm) of the laser and comparably small size bio-structures (~10â€‰Î¼m) were shown to be sufficient for the plasmon-polariton generation and strong laser field confinement enabling the oxidative stress observed. Reactive Oxygen Species;Oxygen Animals;CHO Cells;Cricetulus;HCT116 Cells;Humans;Lasers;Light;Mitochondria;Oxidation-Reduction;Oxidative Stress;Oxygen;Reactive Oxygen Species;Surface Plasmon Resonance

Rehabilitation strategies in maxillofacial trauma: systematic review and meta-analysis. PURPOSE: This study aims to investigate rehabilitation strategies to reduce trismus, pain, and edema in patients with maxillofacial trauma. METHODS: An electronic search in main databases was performed, including studies published until November 2017. Clinical trials aiming to investigate therapeutic techniques to improve mandibular range of motion and to reduce pain and edema compared to other treatments were included. RESULTS: Nine studies were included in the review with different therapy modalities: photobiomodulation, kinesiologic tape, hilotherapy, jaw exercises, and TENS. Only five studies had available data to be included in a meta-analysis. There were no differences between any of the proposed strategies and its controls to prevent trismus. Individuals treated with hilotherapy presented less pain compared to controls. Kinesiologic tape or hilotherapy reduced edema when compared to controls daily until postoperative day 3. CONCLUSIONS: There is diversity among the proposed rehabilitation techniques, and types of fractures and there are few numbers of included participants in each study. The results obtained in this review do not promote evidence to guide the use of non-drug rehabilitation techniques in patients with maxillofacial trauma after surgical intervention. Edema;Fractures, Bone;Humans;Maxillofacial Injuries;Pain Measurement;Trismus

Dental treatment needs in hospitalized cancer patients: a retrospective cohort study. PURPOSE: The objectives of this study were to describe the distribution and the clinicopathological features of the most common causes for dental treatment needs during the hospitalization of cancer patients. METHODS: A retrospective cohort study of 2664 hospitalized cancer patients that analyzed the main dental treatment needs and dental procedures performed from January 2010 to December 2017. RESULTS: A total of 2664 medical patients were included in this study. Non-Hodgkin lymphoma (17.2%) was the most common cancer type, followed by leukemia (14.8%), and oral and oropharyngeal squamous cell carcinoma (10.5%). The most common reasons for patients' hospitalization were chemotherapy protocols (18.8%), monitoring head and neck surgeries (9.7%), and febrile neutropenia (9.6%). The main motivation for the medical team to request dental evaluation was oral mucositis (22.8%) followed by oral pain or toothache (10.8%) and fungal, viral oral infections or traumatic oral lesions (9.9%). The dental treatment needs most observed were pain due to oral mucositis (17%), dental treatment prior to radiotherapy (RT), chemotherapy (CT) or bisphosphonate therapy (BP) (10.8%), teeth extractions (6.5%), and prophylactic photobiomodulation therapy (6.3%), whereas the most common dental treatments performed were oral hygiene protocols (30.2%), photobiomodulation therapy (prophylactic and curative) (21.7%), and dental treatment prior to cancer treatment initiation (RT, CT, and BP) (9.5%). CONCLUSION: This study can be considered original in the oncologic context, providing new information about the most frequent dental treatment needs among a large population of hospitalized cancer patients. Adolescent;Adult;Aged;Aged, 80 and over;Cancer Care Facilities;Dental Care;Female;Humans;Male;Middle Aged;Neoplasms;Retrospective Studies;Young Adult

Comparison of Nd: YAG Laser and Combined Intense Pulsed Light and Radiofrequency in the Treatment of Hypertrophic Scars: A Prospective Clinico-Histopathological Study. INTRODUCTION: Hypertrophic scars are fibroproliferative disorders, seen after burn, trauma, and/or surgery. We aimed to compare the clinical and histopathological results of 1064-nm Nd:YAG laser and combined intense pulsed light and radiofrequency in the treatment of hypertrophic scars. METHODS: Fifty patients with hypertrophic scars were included in this prospective, randomized study. Twenty-five patients were treated with Nd:YAG laser and 25 patients with combined intense pulsed light and radiofrequency (E-light). The scars were evaluated at baseline, during and at 3 months after the final treatment session using the Vancouver scar scale. Biopsy specimens from scars were obtained before, during, and 3 months after the final treatment session and were stained with hematoxylin and eosin stain, Masson's trichrome stain, and immunostaining procedures for collagen I, collagen III, and TGF-Î²1. RESULTS: Significant improvements in the total Vancouver scar scale scores before and after the treatment in both groups ($P < 0.001$); however, a significant difference between both groups ($P < 0.001$), regarding the E-light, which showed better response than Nd:YAG laser. Hematoxylin and eosin and Masson's trichrome staining showed arrangement and thinning of collagen bundles and reduction in collagen density by in both groups, but the collagen bundles thinning and parallelism were more obvious in the E-light group. Significant decrease in the concentration of collagen I, collagen III, and TGF-Î²1 in the E-light group as compared with the laser group ($P = 0.005$, $P = 0.003$ and $P < 0.001$, respectively). CONCLUSIONS: Both modalities were successful in the treatment of hypertrophic scars; however, a significant improvement in the clinical and histopathological findings was detected with the E-light method. Burns;Cicatrix, Hypertrophic;Humans;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Treatment Outcome

Neurite regrowth stimulation by a red-light spot focused on the neuronal cell soma following blue light-induced retraction. The interaction of light with biological tissues has been considered for various therapeutic applications. Light-induced neurite growth has the potential to be a clinically useful technique for neuron repair. However, most previous studies used either a large illumination area to accelerate overall neurite growth or employed a light spot to guide a growing neurite. It is not clear if optical stimulation can induce the regrowth of a retracted neurite. In the present work, we used blue light (wavelength: 473â€‰nm) to cause neurite retraction, and we proved that using a red-light (wavelength: 650â€‰nm) spot to illuminate the soma near the junction of the retracted neurite could induce neurite regrowth. As a comparison, we found that green light (wavelength 550â€‰nm) had a 62% probability of inducing neurite regrowth, while red light had a 75% probability of inducing neurite regrowth at the same power level. Furthermore, the neurite regrowth length induced by red light was increased by the pre-treatment with inhibitors of myosin functions. We also observed actin propagation from the soma to the tip of the re-growing neurite following red-light stimulation of the soma. The red light-induced extension and regrowth were abrogated in the calcium-free medium. These results suggest that illumination with a red-light spot on the soma may trigger the regrowth of aÂ neurite after theÂ retraction caused by blue-light illumination. Actins;Culture Media;Heterocyclic Compounds, 4 or More Rings;blebbistatin;Myosin Type II;Calcium Actins;Animals;Calcium;Cell Line, Tumor;Color;Culture Media;Heterocyclic Compounds, 4 or More Rings;Hippocampus;Light;Low-Level Light Therapy;Mice;Myosin Type II;Nerve Regeneration;Neurites;Primary Cell Culture;Rats

Effect of laser acupuncture in the treatment of facial paresthesia post orthognathic surgery: a case report. Acupuncture Therapy;Adult;Combined Modality Therapy;Face;Female;Humans;Low-Level Light Therapy;Orthognathic Surgical Procedures;Paresthesia;Postoperative Complications

Combination of laser and human adipose-derived stem cells in repair of rabbit anal sphincter injury: a new therapeutic approach. BACKGROUND: Anal sphincter injury leads to fecal incontinence. Based on the regenerative capability of laser and human adipose-derived stem cells (hADSCs), this study was designed to assess the effects of co-application of these therapies on anal sphincter recovery after injury. DESIGN: Male rabbits were assigned to equal groups (nâ€‰=â€‰7) including control, sphincterotomy, sphincterotomy treated with laser (660â€‰nm, 90Â s, immediately after sphincterotomy, daily, 14â€‰days), hADSCs (2â€‰Ã—â€‰10(6) hADSCs injected into injured area of the sphincter immediately after sphincterotomy), and laserâ€‰+â€‰hADSCs. Ninetyâ€‰days after sphincterotomy, manometry and electromyography were performed, sphincter collagen content was evaluated, and Ki67, myosin heavy chain (MHC), skeletal muscle alpha-actin (ACTA1), vascular endothelial growth factor A (VEGFA), and vimentin mRNA gene expression were assessed. RESULTS: The laserâ€‰+â€‰hADSCs group had a higher resting pressure compared with the sphincterotomy (pâ€‰<â€‰0.0001), laser (pâ€‰<â€‰0.0001), and hADSCs (pâ€‰=â€‰0.04) groups. Maximum squeeze pressure was improved in all treated animals compared with the sphincterotomized animals (pâ€‰<â€‰0.0001), without a significant difference between treatments (pâ€‰>â€‰0.05). In the laserâ€‰+â€‰hADSCs group, motor unit numbers were higher than those in the laser group (pâ€‰<â€‰0.0001) but did not differ from the hADSCs group (pâ€‰=â€‰0.075). Sphincterotomy increased collagen content, but the muscle content (pâ€‰=â€‰0.36) and collagen content (pâ€‰=â€‰0.37) were not significantly different between the laserâ€‰+â€‰hADSCs and control groups. Laserâ€‰+â€‰hADSCs increased ACTA1 (pâ€‰=â€‰0.001) and MHC (pâ€‰<â€‰0.0001) gene expression compared with laser or hADSCs alone and was associated with increased VEGFA (pâ€‰=â€‰0.009) and Ki67 mRNA expression (pâ€‰=â€‰0.01) and decreased vimentin mRNA expression (pâ€‰<â€‰0.0001) compared with laser. CONCLUSION: The combination of laser and hADSCs appears more effective than either treatment alone for promoting myogenesis, angiogenesis, and functional recovery after anal sphincterotomy. Actins;Ki-67 Antigen;Collagen Actins;Adipocytes;Anal Canal;Animals;Collagen;Colonic Diseases;Electromyography;Gene Expression Regulation;Humans;Ki-67 Antigen;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rabbits;Sphincterotomy;Stem Cell Transplantation;Stem Cells

Effect of the casein phosphopeptide-amorphous calcium phosphate fluoride (CPP-ACPF) and photobiomodulation (PBM) on dental hypersensitivity: A randomized controlled clinical trial. OBJECTIVE: This randomized controlled clinical trial aimed to evaluate the effect of the casein phosphopeptide-amorphous calcium phosphate fluoride (CPP-ACPF) and photobiomodulation (PBM) in the treatment of dentin hypersensitivity (DH), and the impact of this on the health-related quality of life (HRQL). METHODS: Eighty teeth with DH were randomized into four groups and received three treatment sessions: PLACEBO = placebo + LASER application mimicking; CPP-ACPF = CPP-ACPF + LASER application mimicking; PBM = placebo + LASER active application; CPP-ACPF+PBM = CPP-ACPF + LASER active application. Tactile (exploratory probe) and evaporative (triple syringe) stimuli were used to measure DH and were recorded with the aid of a visual analogue scale (VAS) after the 1st, 2nd and 3rd treatment sessions and one-month follow-up. The HRQL was recorded in the DH experience questionnaire (DHEQ). RESULTS: The intragroup comparison showed a significant reduction in DH ($p < 0.05$) with both stimuli after one-month follow-up. The intergroup comparison with the evaporative stimulus showed that CPP-ACPF+PBM significantly reduced DH when compared to the rest of treatments, after one-month follow-up. CPP-ACPF+PBM group statistically differed from the other treatment groups in the DHEQ evaluation after one-month follow-up. CONCLUSION: After one-month follow-up, the association of CPP-ACPF with PBM was effective in the reduction of DH and promoted a positive impact on the HRQL of the participants of this study. Cariostatic

Agents;Caseins;Drug Combinations;Fluorides, Topical;Placebos;casein phosphopeptide-amorphous calcium phosphate nanocomplex Adolescent;Adult;Cariostatic Agents;Caseins;Combined Modality Therapy;Dentin Sensitivity;Drug Combinations;Female;Fluorides, Topical;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Placebos;Quality of Life;Treatment Outcome;Young Adult

Evaluation of bradykinin, VEGF, and EGF biomarkers in gingival crevicular fluid and comparison of PhotoBioModulation with conventional techniques in periodontitis: a split-mouth randomized clinical trial. Periodontal disease is a chronic progressive inflammatory process leading to damage of tooth-supporting tissues. This comparative study assessed the effect of PhotoBioModulation (PBM) versus conventional therapy, and investigated biomarkers involved in the healing process. The test group comprised twenty systemically-healthy non-smoking subjects with chronic periodontitis with the presence of two matched contro-lateral premolar sites (probing depth > 5 mm); twenty subjects without chronic periodontitis (CP) served as control group. Patients were treated at baseline, either with scaling and root planing (SRP group) or with a procedure entailing SRP supported by PBM (PBM group). The laser used was a diode laser operating at 645 nm wavelength, 10 J/cm2, and 0.5 W/cm2 with a 600 Î¼m fiber optic. Crevicular fluid levels of bradykinin (BK), vascular endothelial growth factor (VEGF), and epidermal growth factor z (EGF) were determined at both sites. Crevicular fluid specimens from both groups were analyzed with the ELISA TEST. Clinical differences in analyzed outcomes were observed in favor of PBM treatment. Taking average values as 100%, the reduction in BK concentration was 47.68% with SRP and 68.43% with PBM on day 3; the VEGF concentration decreased by 35.73% with SRP and 48.59% with PBM on day 7; the EGF concentration increased by 55.58% with SRP and by 58.11% with PBM on day 21.Clinical parameters improved significantly in both groups (pooled mean values of probing depth decreased from 5.6 to 4.5 mm; gingival index from 1.92 to 1.1; and bleeding on probing from 49.67 to 23.23) but did not vary significantly between the PBM and the SRP group. The results confirmed that PBM have beneficial effects in the early phases of the healing process playing a role in modulation of BK, EGF, and VEGF in gingival crevicular fluid levels; both groups had significant clinical improvement over control but there was no significant difference between them, only a trend for PBM group. The overall results of the study suggest a potential benefit of PBM in conjunction with SRP in treating chronic periodontitis. Biomarkers;Vascular Endothelial Growth Factor A;Epidermal Growth Factor;Bradykinin Adult;Biomarkers;Bradykinin;Epidermal Growth Factor;Female;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontitis;Vascular Endothelial Growth Factor A

Low-Intensity Photobiomodulation Decreases Neuropathic Pain in Paw Ischemia-Reperfusion and Spared Nervus Ischiadicus Injury Experimental Models. BACKGROUND: There is a wide range of animal models available today for studying chronic pain associated with a variety of etiologies and an extensive list of clinical manifestations of peripheral neuropathies. Photobiomodulation is a new tool for the treatment of pain in a convenient, noninvasive way. OBJECTIVE: The aim of this work is to elucidate the effects of infrared light-emitting diodes (LEDs) on behavioral responses to nociceptive stimuli in chronic pain models. METHODS: Forty-eight Swiss male mice weighing 25 to 35 g were used. Two chronic pain models, ischemia-reperfusion (IR) and spared spinal nerve injury, were performed and then treated with infrared LED irradiation (390 mW, 890 nm, 17.3 mW/cm(2) , 20.8 J/cm(2) , for 20 minutes). The behavioral tests used were a mechanical hypersensitivity test von Frey test) and a cold allodynia test (acetone test). RESULTS: The results showed that, in the IR model, the infrared LED had a significant effect on mechanical stimulation and cold allodynia on every day of treatment. In the spared nerve injury model, an analgesic effect was observed on every treatment day (when started on the 3rd and 7th days after the surgery). In both models, the effect was abolished when the treatment was interrupted. CONCLUSIONS: These findings suggest that

photobiomodulation therapy may be a useful adjunct treatment for chronic pain. Animals;Chronic Pain;Disease Models, Animal;Hyperalgesia;Infrared Rays;Male;Mice;Neuralgia;Peripheral Nerve Injuries;Peripheral Nerves;Reperfusion Injury

Acute effects of photobiomodulation therapy and magnetic field on functional mobility in stroke survivors: a randomized, sham-controlled, triple-blind, crossover, clinical trial. Identify the optimalÂ energy delivered with a single application of the combination of photobiomodulation therapy (PBMT) combining different light sources (low-level laser therapy-LLLT and light emitting diode therapy-LEDT) and static magnetic field (sMF) in order to determine the acute effects on functional mobility of stroke survivors. Was conducted a randomized, placebo-controlled, crossover, triple-blind, clinical trial (RCT). Twelve patients were recruited, however ten concluded the study, they were randomly treated with four PBMT/sMF energies (sham-0 J, 10 J, 30 J, and 50 J per site irradiated), with 1-week interval washout between treatments. PBMT/sMF were administered after the pre-intervention (baseline) evaluation and the total energy delivered per site at each treatment was determined based on the results of the randomization procedure. PBMT/sMF were administered in direct contact with the skin and applied with slight pressure to nine sites on the knee extensors, six sites on the knee flexors, and two sites on the plantar flexors' muscles in both lower limbs (bilaterally). The primary outcome measure was the 6-min walk test (6MWT) and the secondary outcome was the Timed Up and Go (TUG) test. Significant improvements were found in the 6MWT test using a total energy of 30 J per site compared with sham (0 J) ($p < 0.05$) and compared with the baseline evaluation ($p < 0.01$). And in the TUG test significant improvements were also found using a total energy per site of 30 J per site compared to sham (0 J)Â and baseline ($p < 0.05$). PBMT with different light sources (laser and LEDs) and wavelengths in combination with sMF with a total energy per site of 30 J has positive acute effects on functional mobility in stroke survivors. Cross-Over Studies;Female;Humans;Low-Level Light Therapy;Magnetic Fields;Male;Middle Aged;Movement;Stroke;Survivors;Walk Test

Correction to: Low-level laser irradiation at a high power intensity increased human endothelial cell exosome secretion via Wnt signaling. After publication of this paper, the authors determined an error in Fig.Â 4. Below is the correct Fig.Â 4.

Artificial Caries Resistance in Enamel after Topical Fluoride Treatment and 445â€‰nm Laser Irradiation. OBJECTIVE: This in vitro study is aimed at investigating the caries preventive effectiveness of 445â€‰nm diode laser in combination with topical fluoridation. MATERIALS AND METHODS: A total of 30 caries-free bovine teeth were used in this study. Eighteen teeth were covered with nail varnish except four windows on the labial surface. The windows were assigned to no treatment/control (C), laser (L) (0.3â€‰W, 60â€‰s, and 90â€‰J/cm(2)), fluoride (F), and fluoride followed by laser (FL) treatment groups. Artificial caries lesions were created, and the teeth were sectioned and investigated under polarized light microscopy for quantitative measurement of the resulted lesion depth. Ten teeth were used for surface temperature measurement and two teeth for scanning electron microscopy (SEM). Extra twelve human molars were used for the intrapulpal temperature measurement. The absorbance of fluoride at 445â€‰nm was measured. RESULTS: The means of lesion depth for the C, L, F, and FL groups were 123.48 (Â±21.93), 112.33 (Â±20.42), 99.58 (Â±30.68), and 89.03 (Â±30.38) Î¼m, respectively. The pairwise differences of the L, F, and FL groups compared with the C group were significant ($p < 0.05$). The differences between groups were tested: FL versus L $p=0.02$, F versus L $p=0.16$, and FL versus F $p=0.91$, and the difference of the F versus FL was not significant ($p=0.91$). Temperature increment at the enamel surface and pulp roof were âˆ†Tâ€‰=â€‰16.67 (Â±4.11) and 2.12 (Â±0.66)Â°C, respectively. The topical fluoride absorbance at 445â€‰nm is five orders higher than that at 810â€‰nm. SEM shows that after laser irradiation the enamel surface was intact and without thermal damage. CONCLUSIONS: The 445â€‰nm laser

irradiation may be useful for caries prevention, and its effectiveness is lower than those previously achieved using the argon ion laser. Fluorides, Topical Animals;Cattle;Dental Caries;Dental Caries Susceptibility;Dental Enamel;Dental Pulp;Fluorides, Topical;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Microscopy, Polarization;Molar;Temperature;Tooth

Effects of photobiomodualtion therapy on breast cancer-related lymphoedema: A systematic review and meta-analysis of randomised controlled trials. OBJECTIVE: Lymphoedema characterised by the persistent accumulation of the interstitial fluid in peripheral tissues post breast cancer treatments. Photobiomodualtion therapy (PBMT) is widely used as supportive care in patients with breast cancer or breast cancer-related lymphoedema (BCRL). This systematic review and meta-analysis analysed the effectiveness and safety of PBMT for the treatment of BCRL. METHOD: PubMed, EMBASE, PEDro, SCOPUS, CINAHL, and Cochrane Central Register of Controlled Trials were searched for RCTs on PBMT published before July 2019. Randomised controlled trials (RCTs) that evaluated the efficacy of PBMT on BCRL were included. The primary outcome was the arm circumference or volume, and secondary outcomes were grip strength and pain scores. This study is registered with PROSPERO (number CRD 42018102107). RESULTS: We reviewed nine RCTs that included 316 patients and six studies for mata-analysis. We found no significant difference in the reduction of the arm circumference or arm volume after treatment, one month, and three month follow-up between the PBMT and control groups. Studies revealed no significant differences in the reduction in grip strength and pain scores at 0, 1, 2, and 3 month between the PBMT and control groups. CONCLUSIONS: Although PBMT demonstrated a slight improvement in reducing arm circumference and arm volume, the results of our meta-analysis did not show significant benefits in relieving of lymphoedema. Further trials are needed to recruit more participants, and to evaluate the long-term efficacy and safety of PBMT in management of breast cancer-related lymphoedema. Breast Neoplasms;Female;Hand Strength;Humans;Low-Level Light Therapy;Lymphedema;Pain Measurement;Randomized Controlled Trials as Topic

Photobiomodulation in acceleration of orthodontic tooth movement: A systematic review and meta analysis. BACKGROUND: Photobiomodulation therapy, a non invasive method with no adverse effects, has been used to accelerate tooth movement in orthodontia. However, the specific characteristics of laser settings used in studies documented have reported varied inconsistent conflicting results. OBJECTIVES: We decided to undertake a systematic review to eliminate this inconsistency by quantifying the literature studies that indicated the link between photobiomodulation and acceleration of tooth movement and to assess if there is any association of photobiomodulation therapy in accelerating tooth movement. SEARCH STRATEGY: We systematically searched for articles of existing literatures on Photobiomodulation therapy and acceleration of tooth movement over Cochrane library, Pubmed central, EMBASE, Scopus and Web of sciences from 2000 to 2017. Mesh search terms using various descriptors were used to identify the studies. SEARCH CRITERIA: We included randomized control trial and clinical control trail studies that used Ga-Al-As diode laser and Oseeopulse laser with specific characteristics and company specifications, addressing relevant efficiency and safety outcomes. DATA COLLECTION AND ANALYSIS: Eligible studies were reviewed and data was extracted on a standard from. We used Cochrane review manager software (Revman version 5.3) to assess the qualities of each included trials. Data were analyzed using an inverse variance method with random effects model effect. RESULTS: We observed a statistical significant difference between the photobiomodulation therapy compared to non laser group in the acceleration of tooth movement (Mean difference 0.59 (95%CI- 0.24 to 0.95) I(2) 95%). However, these results need caution while generalizing in clinical practice due to the large amount of heterogeneity across the studies. CONCLUSION: Findings of the current systematic review suggest a

possible benefit with photobiomodulation therapy and tooth movement in orthodontia. However these findings need to be further validated in larger trials using specific standardized characteristics of laser settings to uniform the methodological design that can be used in routine clinical practice. Acceleration;Humans;Low-Level Light Therapy;Pain;Pain Management;Tooth Movement Techniques

Broad Band Light and Skin Rejuvenation. Pulsed light has proven its usefulness, effectiveness, and versatility in treating a multitude of skin problems, delaying skin aging, maintaining healthy skin, and as an adjunct to a cosmetic surgical practice in the treatment of postsurgical scars. Practitioners contemplating adding a pulsed light device to their practice should choose a device that has at least 4 important features: a large spot size, variable-sized smaller spot adaptors, pulse rates of at least 1 pulse per second, a wide range of cutoff filters, including 515Â nm, 560Â nm, 590Â nm, 640Â nm, and 695Â nm, to treat most skin types. Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

Effect of laser treatment on postural control parameters in patients with chronic nonspecific low back pain: a randomized placebo-controlled trial. The management of nonspecific lumbar pain (NSLP) using laser irradiation remains controversial. A systematic review of recently published studies indicates that the effects of laser therapy are commonly assessed using only imperfect methods in terms of measurement error. The main objective of this study was to assess static postural stability using an objective tool in patients with chronic NSLP after laser irradiation at different doses and wavelengths. In total, 68 patients were included in the laser sessions and were randomly assigned into four groups: high-intensity laser therapy at 1064 nm and 60 J/cm2 for 10 min (HILT), sham (HILT placebo), low-level laser therapy at 785 nm and 8 J/cm2 for 8 min (LLLT), and sham (LLLT placebo). In addition, all patients were supplemented with physical exercises (standard stabilization training). To assess postural stability, a double-plate stabilometric platform was used. All measurements were performed pre- and post-laser sessions (three weeks) and at follow-up time points (one and three months). Laser procedures led to more balanced posture stability in patients, although these positive changes were significant mainly for short-term observation (after 4-week therapy). In the follow-up analysis, the parameters were gradually impaired. Kruskal-Wallis analysis of variance (ANOVA) for independent variables did not show any difference between the studied groups. Low- and high-intensity laser therapy does not lead to a significant improvement in postural sway in patients with NSLP compared with standard stabilization training based on short- and long-term observations. Adult;Chronic Disease;Female;Follow-Up Studies;Humans;Laser Therapy;Low Back Pain;Male;Middle Aged;Pain Measurement;Postural Balance;Treatment Outcome

Effect of Compound Laser Acupuncture-Moxibustion on Blood Glucose, Fasting Insulin and Blood Lipids Levels in Type 2 Diabetic Rats. OBJECTIVE: To investigate the effect of compound laser acupuncture-moxibustion on blood glucose, fasting insulin and blood lipids levels in type 2 diabetes mellitus (T2DM) rats. METHODS: Forty male Wistar rats were randomly divided into 4 groups, including the normal group, model control group, laser group and sham laser group (n=10 per group). The rats in the normal group were fed with a standard diet. Rats in other groups were fed with a high-sugar and high-fat diet for 4 weeks, then intraperitoneally injected with 1% streptozotocin to induce T2DM model. The laser group was irradiated by 10.6 Âμm and 650 nm compound laser on bilateral Pishu (BL 20), Shenshu (BL 23) and Sanyinjiao (SP 6) for 5 min, 6 times a week for 5 weeks. The sham laser group received the same treatment as the laser group, but without laser output. The model control group and normal group were not treated. Blood glucose levels were measured before and after 1, 2, 3, 4 and 5 weeks of treatment. The serum levels of fasting insulin, total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) were analyzed after the last treatment. RESULTS: The blood glucose levels in the model control group increased during the 5 weeks of treatment compared with the normal group ($P<0.05$), while those in the laser

group were significantly lower than the model control group after weekly treatment (P<0.01 or P<0.05). After 1, 2 and 3 weeks of treatment, the blood glucose levels in the laser group decreased obviously compared with the sham laser group (P<0.01 or P<0.05). Compared with the normal group, the levels of fasting insulin, TC and LDL in the model control group notably increased (P<0.01 or P<0.05), while their levels in the laser group were significantly lower than the model control group after 5 weeks of treatment (P<0.05 or P<0.01). However, no statistically significant differences were observed in TG or HDL levels among the 4 groups (P>0.05). CONCLUSION: The compound laser acupuncture-moxibustion of 10.6 Âμm and 650 nm had positive effects on the regulation of hyperglycemia and insulin resistance in T2DM rats, which may be a potential treatment for T2DM, and also provide an alternative to the traditional acupuncture and moxibustion therapy. Blood Glucose;Insulin;Lipids Acupuncture Points;Animals;Blood Glucose;Diabetes Mellitus, Experimental;Insulin;Lipids;Low-Level Light Therapy;Male;Moxibustion;Rats;Rats, Wistar

Effect of photobiomodulation therapies on the root resorption associated with orthodontic forces: a pilot study using micro computed tomography. OBJECTIVES: The aim of this study is to investigate the effect of photobiomodulation therapies on root resorption compared with the placebo group. MATERIALS AND METHODS: Thirty patients who were admitted to the GaziantepÂ University Faculty of Dentistry Orthodontics Department for treatment, with an indication of upper right first premolar tooth extraction were included. Before the individuals' orthodontic treatment, 0.022 slot MBT brackets and tubes were placed on the maxillary first premolar and molar. A 150-g buccal tipping force was applied to the first premolar. Cantilever spring with 0.017â€‰Ã—â€‰0.025 Beta Titanium wire was used for force application. Individuals were then randomly divided into three groups. For the first group, laser application was performed with an 810-nm GaAlAs laser device at 0, 3, 7, 14, 21, and 28Â days to 8Â J/cm(2). For the second group, an LED application according to the manufacturer's instructions with an 850-nm wavelength and 20Â mW/cm(2) output power for 10Â min per day during the experiment. For the third group, a placebo therapy was completed whereby a laser device that did not make active pulses was used. At the end of 4Â weeks, the amount of root surface resorption was compared using micro-CT imaging after the extraction of the teeth. RESULTS: No significant difference was found between the groups in terms of regional and total crater volumes. It was observed that photobiomodulation therapies were not different from the control group in terms of forming root resorption. CONCLUSIONS: It is seen that laser and LED photobiomodulation therapies used for accelerate orthodontic tooth movement do not differ from the control group in terms of forming root resorption. CLINICAL RELEVANCE: According to the results of this pilot study on this subject, which needs to be clarified with new findings in the future, LED and laser applications may not increase the risk for root resorption. Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Pilot Projects;Root Resorption;Tooth Movement Techniques;X-Ray Microtomography

An untargeted metabolomic approach reveals significant postharvest alterations in vitamin metabolism in response to LED irradiation in pak-choi (Brassica campestris L. ssp. chinensis (L.) Makino var. communis Tsen et Lee). The main objective of this study was to investigate the effect of low-level light emitting diode (LED) irradiation on the metabolite profile of pak-choi. A total of 633 different molecular features (MFs) were identified among sample groups (initial, dark-treated, light-treated) using an untargeted metabolomic approach. The identified metabolites were associated with 24 different metabolic pathways. Four of the pathways including carbon pool by folate, folate biosynthesis, thiamine metabolism, and glutathione metabolism, all of which are associated with vitamin biosynthesis, changed significantly. Metabolites in four of the pathways exhibited significant differences from the control in response to LED irradiation. Additionally, porphyrin and chlorophyll metabolism, as well as glucosinolate biosynthesis, riboflavin metabolism, and carotenoid biosynthesis

were positively induced by LED irradiation. These results indicate that postharvest LED illumination represents a potential tool for modifying the metabolic profile of pak-choi to maintain quality and nutritional levels. Vitamins Brassica;Low-Level Light Therapy;Metabolomics;Vitamins

Laser-Assisted Orthodontic Tooth Movement in Saudi Population: A Prospective Clinical Intervention of Low-Level Laser Therapy in the 1st Week of Pain Perception in Four Treatment Modalities. BACKGROUND: This first-in-human study in Saudi orthodontic patients has evaluated the role of low-level laser therapy (LLLT) in pain perception (PP). The outcome of single application of LLLT with 4 different treatment modalities (TM) on PP are evaluated following orthodontic bracket bonding on maxilla. MATERIALS AND METHODS: A prospective clinical intervention with implementation of parallel technique in each group, 32 orthodontic patients with ectopic canine requiring fixed orthodontic appliance were enrolled and randomly allocated to the 4 groups: LLLTâ€‰+â€‰self-ligating (SL) bracket, LLLTâ€‰+â€‰conventional (Conv.) bracket, non-LLLTâ€‰+â€‰SL bracket, and non-LLLTâ€‰+â€‰Conv. bracket. Orthodontic bracket bonding from 1st molar to 1st molar and superelastic 0.012 inch NiTi were applied for the maxilla. For each patient, maxillary 1st molar to molar received a single application of LLLT using a 940â€‰nm Ga-Al-As laser device on 5 different points labially/buccally and palatally. Main outcome measure was the degree of PP score during the 1st week of orthodontic tooth movement (OTM) after 4 hours, 24 hours, 3 days, and 7 days of both LLLT and non-LLLT treatment applications. A questionnaire with an 11-point numeric rating scale (NRS) was used for PP. RESULTS: Meanâ€‰Â±â€‰SD of PP in the LLLTâ€‰+â€‰SL group was 3.33â€‰Â±â€‰1.4, 3.58â€‰Â±â€‰1.06, 2.31â€‰Â±â€‰0.67, and 1.89â€‰Â±â€‰0.54 in 4 hours, 24 hours, 3 days, and 7 days, respectively. Compared to all 4â€‰TM groups, LLLT groups showed better PP. More statistically significant differences were found in LLLT groups. No harms were encountered. LIMITATIONS: The intervention provider and the patient were not blinded to the intervention. CONCLUSION: The LLLTâ€‰+â€‰SL group revealed significantly promising benefits on PP during OTM. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Brackets;Pain;Pain Management;Pain Measurement;Pain Perception;Prospective Studies;Saudi Arabia;Surveys and Questionnaires;Tooth Movement Techniques;Young Adult

Laser treatment for onychomycosis: A systematic review and meta-analysis. BACKGROUND: Laser systems are a common treatment choice for onychomycosis. They exert their effects on inhibiting the growth of the fungus by selective photothermolysis but efficacy is dependent on the specific type of apparatus used. To systematically review the available published literature on the curative effects and safety of laser treatment for onychomycosis. METHODS: Databases including PubMed, web of science, China National Knowledge Internet (CNKI), WanFang Database and VIP were searched systematically to identify relevant articles published up to July 2018. Potentially relevant articles were sourced, assessed against eligibility criteria by 2 researchers independently and data were extracted from included studies. A meta-analysis was performed using R software. RESULTS: Thirty-five articles involving 1723 patients and 4278 infected nails were included. Meta-analysis of data extracted from these studies revealed that: the overall mycological cure rate was 63.0% (95%CI 0.53-0.73); the mycological cure rate associated with the 1064-nm Nd: YAG laser was 63.0% (95%CI 0.51-0.74); and that of CO2 lasers was 74.0% (95%CI 0.37-0.98). The published data indicate that laser treatment is relatively safe, but can cause tolerable pain and occasionally lead to bleeding after treatment. CONCLUSION: Laser treatment of onychomycosis is effective and safe. The cumulative cure rate of laser treatment was significantly higher for CO2 lasers than other types of laser. Laser practitioners should be made aware of potential adverse effects such as pain and bleeding. Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Nails;Onychomycosis;Randomized Controlled Trials as Topic;Treatment Outcome

Evaluation of photobiomodulation effects on pain, edema, paresthesia, and bone regeneration after surgically assisted rapid maxillary expansion: Study protocol for a randomized, controlled, and double blind clinical trial. BACKGROUND: Surgically assisted rapid maxillary expansion (SARME) generates an uncomfortable postoperative period accompanied by pain, edema, and paresthesia. There are few studies on the effect of photobiomodulation (PBM) after SARME and it was not possible to find studies on the efficacy of light emitted by diode (LED) after this type of intervention. The main objective of the study will be to evaluate the efficacy of PBM with LED in the control of pain, facial edema, paresthesia, and bone repair after SARME. METHODS: A randomized, double-blind, placebo-controlled clinical trial involving 72 participants aged from 18 to 45 years, who search the Department of Buccomaxillofacial Surgery and Traumatology of Mandaqui Hospital Complex, will be conducted. Immediately after surgeries, the participant will be inserted into the placebo or LED group. In the LED group, the participants will receive PBM with an extraoral device (660 and 850â€Šnm with 6 J per point) and an intraoral device (660â€Šnm with 2 J per point) and in the control group the person in charge of the application will simulate the irradiation with the devices kept off. The applications will be in the immediate postoperative period, 1, 2, 7, 14, 30, 60, 90, and 120 days after the end of the surgeries, when the evaluations will also be performed. Facial measurements, extra and intraoral sensitivity, pain and bone repair will be evaluated. Secondarily, data regarding the occurrence of headache; otalgia; nausea; bruising; nasolacrimation; epistaxis; dysphagia; systemic and superficial temperature in the operated region; use of analgesics and anti-inflammatories; anxiety and impact of oral health on the participants' quality of life will be computed. DISCUSSION: Since PBM has shown positive effects on postoperative complications of other types of oral surgery and also has a positive effect on bone repair after maxillary disjunction, surgically assisted or not, it seems clear the need to evaluate its performance regarding pain, edema, and paresthesia after these surgeries. TRIAL REGISTRATION: This protocol was registered in Clinical Trials platform (https://clinicaltrials.gov/) with the number NCT03814525, first published and last updated on January 24, 2019. Adolescent;Adult;Bone Regeneration;Double-Blind Method;Edema;Female;Humans;Low-Level Light Therapy;Male;Maxilla;Maxillary Diseases;Middle Aged;Pain, Postoperative;Palatal Expansion Technique;Paresthesia;Postoperative Complications;Randomized Controlled Trials as Topic;Treatment Outcome;Young Adult

Photobiomodulation in Temporomandibular Disorders. Objective: This systematic review aimed to comprehensively review all available documents regarding photobiomodulation therapy (PBMT) application in temporomandibular disorder (TMD) patients and to suggest an evidence-based protocol for therapeutic PBM administration for these patients. Background data: The existence of temporomandibular joint and/or pain and dysfunction in masticatory muscles is characterized in TMDs. PBMT is, due to its impact on biological processes, especially inflammation, considered as an adjuvant treatment modality in TMD cases. Materials and methods: All original articles related to PBMT for TMDs in EMBASE, MEDLINE (NCBI PubMed and PMC), Cochrane library, Scopus, Web of Science, and Google Scholar were reviewed until December 2018. Results: The energy density ranging from 0.75 to 112.5â€‰J/cm(2) with 0.9-500â€‰mW power was found to be a window protocol for light application. The best results for pain relief and mandibular movement enhancement were reported after application of GaAlAs diode laser, 800-900â€‰nm, 100-500â€‰mW, and <10â€‰J/cm(2), twice a week for 30 days on trigger points. The session of light applications varied from 1 to 20. Conclusions: Although most articles showed that PBMT is effective in reducing pain and contributed to functional enhancement in TMD patients, the heterogenic parameters that have been reported in various studies made the standardization of PBMT complicated. However, such evidence-based consensus can be beneficial for both future research and for clinical applications. Humans;Low-Level Light Therapy;Temporomandibular Joint Disorders

Picosecond laser as a promising treatment option for longitudinal melanonychia caused by melanocytic activation: Report of two cases. Adult;Humans;Low-Level Light Therapy;Male;Melanocytes;Nail Diseases

Photobiomodulation and salivary glands: a systematic review. To date, there is no compilation of evidence-based information associating photobiomodulation effect and salivary glands. This systematic review aims to assess photobiomodulation effect of low intensity laser on salivary glands in the presence of systemic diseases. MEDLINE databases were searched in duplicate through December 2018. In vivo studies and clinical trials were included if photobiomodulation was performed in salivary glands of animal (rat or mice) or human in the presence of systemic disease. The methodological quality was assessed in duplicate using the modified Newcastle-Ottawa scale (NOS). Search strategy identified 483 potentially eligible articles, and 449 were included. The Boolean search naturally leads to a high amount of works the majority of which were excluded because the analysis of the title and abstract demonstrated it was not focusing on PBM. Only 34 studies were selected for the full-text analysis, of which 5 were excluded due to non-use of photobiomodulation, 4 due to lack of control group, 2 because they were studies of cell cultures and 1 because they did not have the total of animals used. Thus, 21 papers were included for the critical evaluation of the impact of photobiomodulation on the major salivary glands; the studies used rats (n = 10) and humans (n = 11). Although studies reported an increase in the salivary rate, decrease in pain, and increase in quality of life after the PBM, the lack of standards for the application of light and reporting of the parameters, make it hard to reproduce the results. This topic is still in need for further research. Animals;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Mice;Pain;Quality of Life;Rats;Salivary Glands

Photobiomodulation in Periodontology and Implant Dentistry: Part 2. (Part 1 of this article can be located at www.liebertpub.com/doi/10.1089/photob.2019.4710.) Objective: Finding evidence-based treatment strategies for low-level light therapy and the correct incorporation of these treatment methods in the clinical practice of periodontics. Background: Photobiomodulation has been shown to have biostimulatory, anti-inflammatory, and analgesic effects that can be beneficial in periodontal and dental implant treatment procedures. Methods: In this review, we have addressed some clinical questions regarding the potential clinical application of low-level light irradiation and its photobobiomodulatory effects in periodontology and implantology. The literature was searched for in vivo (animal or clinical) articles written in English in four electronic databases of PubMed, Scopus, Google Scholar, and Cochrane Library until April 2019. Only studies with low irradiation doses without any thermal effects used only for their photobiomodulatory purposes were included. Results: We were able to find relevant studies for all of our questions, and positive effects for the application of light therapy were reported in most of the studies. However, there is still a great deal of heterogeneity in terms of study designs and most importantly in light irradiation devices and the parameters used. Due to this issue, it was not possible to reach specific evidence-based irradiation protocols for the questions addressed in this review. Conclusions: Based on our search results, an obvious positive effect of low-level light therapy on stimulation of healing of periodontal soft and hard tissues and reduction of inflammation can be seen. Future well-designed randomized control studies with the same irradiation settings and systematic reviews evaluating the studies found on the questions mentioned are necessary to reach evidence-based recommendations. Dental Implantation;Humans;Low-Level Light Therapy;Periodontics

Microvascular Effects of Pulsed Dye Laser in Combination With Oxymetazoline. BACKGROUND AND OBJECTIVE: Oxymetazoline, an Î±-1A agonist, is approved by the United States Food and Drug Administration (FDA) for treatment of persistent facial erythema associated with rosacea and induces vasoconstriction by interacting with Î± receptors. The objective of our study was to study the

microvascular effects of oxymetazoline and pulsed dye laser (PDL). MATERIALS AND METHODS: A dorsal window chamber was surgically installed on 20 mice. Each animal was assigned to one of four experimental groups: saline alone, oxymetazoline alone (10â€‰Î¼l applied once dailyâ€‰Ã—â€‰7 days), salineâ€‰+â€‰PDL (saline applied 5 minutes before PDL irradiation [10â€‰mm spot, 1.5â€‰ms pulse duration, 7â€‰J/cm(2) delivered to epidermis]), or oxymetazolineâ€‰+â€‰PDL (10â€‰Î¼l oxymetazoline applied 5 minutes before PDL and then once dailyâ€‰Ã—â€‰7 days). Brightfield and laser speckle imaging were performed for 7 days to monitor vascular architectural and functional changes. RESULTS: We observed persistent blood flow in all of the saline-only and oxymetazoline-only experiments. A higher rate of vascular shutdown was observed with oxymetazolineâ€‰+â€‰PDL (66.7%) compared with salineâ€‰+â€‰PDL alone (16.7%). Oxymetazoline application increased venule diameter at 5 minutes post-application and decreased both arteriole and venule diameters at 60 minutes post-application. CONCLUSION: The combination protocol of oxymetazolineâ€‰+â€‰PDL induces persistent vascular shutdown observed 7 days after irradiation. This result may be associated with the acute vascular effects of oxymetazoline. Oxymetazolineâ€‰+â€‰PDL should be evaluated as a treatment for cutaneous vascular disease, including rosacea and port wine birthmarks. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adrenergic alpha-Agonists;Oxymetazoline Adrenergic alpha-Agonists;Animals;Lasers, Dye;Low-Level Light Therapy;Mice;Mice, Inbred C3H;Microcirculation;Oxymetazoline;Skin

Revolving doors of tendinopathy: definition, pathogenesis and treatment. The ultimate cure for the tendon pathology continues to elude current science. Despite great steps in technology, the causation and treatment is still not clear. The number of different theories and treatment modalities in the literature may confuse clinicians and patients. In this paper we outline the definitions, evolution of pathogenesis and treatment for tendinopathy. By highlighting these, the aim of this paper is to guide the practitioner in counselling and treating their patients. Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal;Intercellular Signaling Peptides and Proteins Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal;Conservative Treatment;Debridement;Decompression, Surgical;Dry Needling;Exercise Therapy;Extracorporeal Shockwave Therapy;Hot Temperature;Humans;Injections;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Massage;Mesenchymal Stem Cell Transplantation;Platelet-Rich Plasma;Prolotherapy;Rest;Sclerotherapy;Tendinopathy;Ultrasonic Therapy

Systematic Review of Orthodontic Treatment Management with Photobiomodulation Therapy. Objective: This systematic review of published research evaluates the parameters and reported outcomes in photobiomodulation therapies (PBMTs) used in management of pain and accelerated tooth movement during orthodontic treatment. Background: Consequent to positive in vitro and animal studies, there has been considerable interest in the potential applications of PBMT to ameliorate pain and to accelerate orthodontic tooth movement. Due to the lack of consistency of wavelengths and parameters applied, there is as yet no consensus in respect of guidance for clinical use. Within the limitations of the reported literature, a digest of key outcomes and parameters is presented here to assist researchers and interested clinicians. Materials and methods: Search engines, PubMed, Google Scholar, and Cochrane, were applied to identify clinical investigations into the potential benefits of PBMTs in orthodontic management. Keywords used were "low-level laser therapy," "low-level light therapy," "photobiomodulation," "orthodontics," "pain," "tooth movement," and "randomized clinical trial â‰¥5 years." A total of 35 articles were identified, covering the 5-year period January 2013 to December 2018. Only human clinical trials were considered. Seventeen articles were included in this investigation and the reported parameters and outcomes were assessed and presented for comparison. Results: Seven of nine studies supported the effectiveness of PBMT to reduce or prevent pain. There was no consensus on choice of wavelength

and a range of parameters were found beneficial. Of the seven tooth movement studies included, four of the seven were positive, of which two used a home-use light-emitting diode (LED) device, as opposed to a clinician-applied laser. A variety of wavelengths and parameters were found to be effective in accelerating tooth movement in the range of 20-40% compared with control. Conclusions: Due to a lack of consistency in approach, further studies are required to achieve a high level of acceptance. The clinical logistics associated with frequent applications supports the concept of patient home delivery use of LED devices, although there are insufficient studies at present to make an evidence-based determination of this type of appliance. To gain more general professional acceptance of the use of PBMT in orthodontics, a continued effort to extend the number of quality human clinical trials is required. Based on the current evidence base, further positive onward progression can be regarded as inevitable. Humans;Low-Level Light Therapy;Orthodontics

Photobiomodulation reduces cell death and cytokine production in C2C12 cells exposed to Bothrops venoms. Snakebites caused by the genus Bothrops are often associated with severe and complex local manifestations such as edema, pain, hemorrhage, and myonecrosis. Conventional treatment minimizes the systemic effects of venom; however, their local action is not neutralized. The purpose of this study was to evaluate the effect of photobiomodulation (PBM) on C2C12 muscle cells exposed to B. jararaca, B. jararacussu, and B. moojeni venoms on events involved in cell death and the release of inflammatory mediators. Cells were exposed to venoms and immediately irradiated with low-level laser (LLL) application in continuous wave at the wavelength of 660Â nm, energy density of 4.4Â J/cm(2), power of 10Â mW, area of 0.045Â cm(2), and time of 20Â s. Cell integrity was analyzed by phase contrast microscope and cell death was performed by flow cytometry. In addition, interleukin IL1-Î², IL-6, and IL-10 levels were measured in the supernatant. Our results showed that the application of PBM increases cell viability and decreases cell death by apoptosis and necrosis. Moreover, the release of pro-inflammatory interleukins was also reduced. The data reported here indicate that PBM resulted in cytoprotection on myoblast C2C12 cells after venom exposure. This protection involves the modulation of cell death mechanism and decreased pro-inflammatory cytokine release. Crotalid Venoms;Cytokines Animals;Apoptosis;Bothrops;Cell Line;Cell Shape;Crotalid Venoms;Cytokines;Low-Level Light Therapy;Mice;Muscle Cells

Use of low-level laser therapy (LLLT) or photobiomodulation (PBM) for the management of the hand-foot syndrome (HSF) or palmo-plantar erythrodysesthesia (PPED) associated with cancer therapy. The purpose of this pilot study was to determine whether photobiomodulation (PBM) might be effective for chemotherapy-induced palmo-plantar erythrodyesthesia (PPED), as it is for mucositis or radio dermatitis; no standard therapy exists for PPED. Patients were allocated to PBM or sham irradiation and were blindly assessed after 2 weeks. Pain and satisfaction with treatment were also evaluated. We found a significant benefit from PBM in comparison with sham treatment ($p < 0.03$) and a decrease of pain in 49% of the patients. No adverse reactions were observed. We concluded that PBM might represent a useful approach for the management of PPED. Female;Hand-Foot Syndrome;Humans;Low-Level Light Therapy;Male;Neoplasms;Pilot Projects

JQ1-Loaded Polydopamine Nanoplatform Inhibits c-MYC/Programmed Cell Death Ligand 1 to Enhance Photothermal Therapy for Triple-Negative Breast Cancer. Programmed cell death ligand 1 (PD-L1) blockade has achieved great success in cancer immunotherapy; however, the response of triple-negative breast cancer (TNBC) to PD-L1 antibodies is limited. To address this challenge, we use the bromodomain and extra-terminal inhibitor JQ1 to down-regulate the expression of PD-L1 and thus elicit the immune response to TNBC instead of using antibodies to block PD-L1. JQ1 also inhibits the growth of TNBC as a targeted therapeutic agent by inhibiting the BRD4-c-MYC axis. The polydopamine nanoparticles (PDMNs) are introduced as a biodegradable and adaptable platform to load JQ1 and induce photothermal therapy (PTT) as another synergistic therapeutic modality. Because the JQ1-

loaded PDMNs (PDMN-JQ1) are self-degradable and release JQ1 continuously, this synergistic treatment can lead to remarkable activation of cytotoxic T lymphocytes and induce a strong immune-memory effect to protect mice from tumor re-challenge. Taken together, our study demonstrates a compact and simple nanoplatform for triple therapy, including targeted therapy, PTT, and immunotherapy, for TNBC treatment. Antibodies;Azepines;B7-H1 Antigen;BRD4 protein, human;CD274 protein, human;Cell Cycle Proteins;Indoles;MYC protein, human;Polymers;Proto-Oncogene Proteins c-myc;Transcription Factors;Triazoles;polydopamine
Animals;Antibodies;Apoptosis;Azepines;B7-H1 Antigen;Cell Cycle Proteins;Cell Line, Tumor;Cell Proliferation;Female;Gene Expression Regulation, Neoplastic;Heterografts;Humans;Indoles;Low-Level Light Therapy;Mice;Nanoparticles;Phototherapy;Polymers;Proto-Oncogene Proteins c-myc;Transcription Factors;Triazoles;Triple Negative Breast Neoplasms

Photobiomodulation in Oral Surgery: A Review. Objective: This article presents a review of current data on the applications of photobiomodulation (PBM) in the field of oral and maxillofacial surgery (OMFS), to guide future research. Background data: Photobiomodulation therapy (PBMT) has been reported to be effective for various postoperative conditions, including pain relief, improvement of mastication, neurosensory recovery, and wound healing. There is a need for identifying the therapeutic irradiation windows for these conditions, based upon the available literature. Materials and methods: All original articles related to PBM for oral surgery in MEDLINE (NCBI PubMed and PMC), EMBASE, Scopus, Cochrane library, Web of Science, and Google Scholar were reviewed until December 2018. Results: Forty-six clinical trials were included in this study. These trials were categorized into three different types of PBM applications. After reviewing all these studies, the most effective physical properties for PBM pain reduction after tooth extraction were as follows: wavelength 650-980â€‰nm; power 4-300â€‰mW; and energy density 3-85.7â€‰J/cm(2). PBMT at 660-910â€‰nm with 4-500â€‰mW power and 2-480â€‰J/cm(2) energy density was effective for decreasing facial swelling. At the same wavelength and power range with 4-106â€‰J/cm(2) energy density, PBM was effective for alleviating trismus after tooth extraction. Conclusions: Most papers suggested that PBM seemed to be effective in reducing pain, swelling, and trismus after third molar tooth extraction, neurosensory and nerve recovery after mandibular ramus osteotomy. The heterogeneity of the standardization regarding the parameters of laser calls for caution in interpretation of these results. However, this evidence-based review regarding the best protocols for OMFS applications can be beneficial for both future research and clinical applications.
Humans;Low-Level Light Therapy;Surgery, Oral

Photobiomodulation in Periodontology and Implant Dentistry: Part 1. (Part 2 of this article can be located at www.liebertpub.com/doi/10.1089/photob.2019.4731.) Objective: Finding evidence-based treatment strategies for low-level light therapy (LLLT) and the correct incorporation of these treatment methods in the clinical practice of periodontics. Background: Photobiomodulation has been shown to have biostimulatory, anti-inflammatory and analgesic effects that can be beneficial in periodontal and dental implant treatment procedures. Methods: In this review we have addressed some clinical questions regarding the potential clinical application of low-level light irradiation and its photobiomodulatory effects in periodontology and implantology. The literature was searched for in vivo (animal or clinical) articles written in English in four electronic databases of PubMed, Scopus, Google Scholar, and Cochrane Library until April 2019. Only studies with low irradiation doses without any thermal effects used only for their photobiomodulatory purposes were included. Results: We were able to find relevant studies for all of our questions, and positive effects for the application of light therapy were reported in most of the studies. However, there is still great deal of heterogeneity in terms of study designs and most importantly in light irradiation devices and the parameters used. Owing to this issue it was not possible to reach specific evidence-based irradiation protocols for the

questions addressed in this review. Conclusions: Based on our search results, an obvious positive effect of LLLT on stimulation of healing of periodontal soft and hard tissues and reduction of inflammation can be seen. Future well-designed randomized control studies with the same irradiation settings and systematic reviews evaluating the studies found on the questions mentioned are necessary to reach evidence-based recommendations. Dental Implantation;Humans;Low-Level Light Therapy;Periodontics

Photobiomodulation Therapy in Clinical Dentistry. Dentistry;Humans;Low-Level Light Therapy

Successful Treatment of Digital Ischemia Following a Carbon Dioxide Laser and Tourniquet for a Digital Procedure With Adjuvant Low-Level Laser Therapy. A digital tourniquet with/without epinephrine is commonly used in local anesthetics when operating on digits. However, such a complication as digital ischemia could occur following tourniquet application. We reported an elderly patient with atherosclerotic risk factors and she subsequently underwent a digital tourniquet, partial nail plate removal, and a carbon dioxide laser treatment for subungual wart with digital gangrene development. The successful treatment consisted of wound-dressing, medication, and adjuvant low-level light therapy (LLLT) to enhance the wound healing process, thereby resulting in almost complete recovery of skin color and function of the digit in 3 months. In conclusion, the digital tourniquet should be cautiously applied, especially in elderly patients with atherothrombosis, under minimal pressure and appropriate length of time. Moreover, LLLT could be an effective adjuvant treatment to prevent the vascular complications of the digit.

Laser Therapy Versus Electromagnetic Field on Mucosal Membrane Thickening in Children With Chronic Rhinosinusitis. Introduction: Rhinosinusitis is a frequent disease in children but may be underdiagnosed, that is to say, several causes of the disease are missed in children. Therefore, it seems essential to provide other modalities to treat chronic health conditions like such cases. This controlled clinical study was conducted to compare the effect of two non-pharmacological, painless, safe modalities; low-level laser therapy (LLLT), with pulsed electromagnetic field (PEMF) on mucosal membrane thickening in children with chronic rhinosinusitis. Methods: Thirty children with chronic sinusitis participated in this study, their ages ranged from 6 to 13 years old, recruited from the outpatients ENT clinic, Kasr Al Aini teaching hospital. They were classified into 2 groups of equal number; study group A (PEMF group) and study group B (LLLT group). These children were evaluated before the starting and after the end of the study through CT scan full examination (coronal and axial) for all children. Results: This study showed that there were statistically significant improvements in mucosal membrane thickness in both groups ($P<0.05$), while there was no statistically significant difference between groups ($P>0.05$). Conclusion: From the obtained outcomes it can be concluded that both the laser and electromagnetic field can be used effectively in the management of symptoms in children with chronic rhinosinusitis, while no significant difference between these modalities obtained.

Maxillary Orthodontic Expansion Assisted by Unilateral Alveolar Corticotomy and Low-Level Laser Therapy: A Novel Approach for Correction of a Posterior Unilateral Cross-Bite in Adults. Introduction: The treatment of a true unilateral posterior crossbite often requires asymmetric maxillary expansion; however, this is challenging to achieve with conventional expansion methods because of several biomechanical limitations. In this paper, we introduce a new protocol for the treatment of a unilateral posterior crossbite in adults based on maxillary orthodontic expansion assisted by corticotomy and low-level laser therapy (LLLT) performed on the crossbite side. Methods: The study sample included 15 adults (8 females, 7 males) affected by a true unilateral posterior crossbite, with a mean age of 21.6 Â± 3.1 years at the at the beginning of treatment. After the application of orthodontic appliances (palatal expander and self-ligating brackets), corticomy was

performed at the buccal aspect of the crossbite side while LLLT was monthly administered up to the correction of the crossbite. The efficacy of the technique was evaluated through measurements performed on maxillary digital models. Results: All subjects reported successful correction of the posterior unilateral crossbite, and functional occlusion was achieved as well. The average expansion was greater at the crossbite side compared to the unaffected side and such difference was significant at the levels of first premolars ($P < 0.05$), second premolars ($P < 0.05$) and first molars ($P < 0.05$). Conclusion: Orthodontic maxillary expansion assisted by unilateral corticotomy and LLLT was effective in the treatment of the true unilateral crossbite.

Gene Expression Analysis of Chondrogenic Markers in Hair Follicle Dermal Papillae Cells Under the Effect of Laser Photobiomodulation and the Synovial Fluid. Introduction: Regarding the limited ability of the damaged cartilage cells to self-renew, which is due to their specific tissue structure, subtle damages can usually cause diseases such as osteoarthritis. In this work, using laser photobiomodulation and an interesting source of growth factors cocktail called the synovial fluid, we analyzed the chondrogenic marker genes in treated hair follicle dermal papilla cells as an accessible source of cells with relatively high differentiation potential. Methods: Dermal papilla cells were isolated from rat whisker hair follicle (Rattus norvegicus) and established cell cultures were treated with a laser (gallium aluminum arsenide diode Laser (Î»=780 nm, 30 mW) at 5 J/cm(2)), the synovial fluid, and a combination of both. After 1, 4, 7, and 14 days, the morphological changes were evaluated and the expression levels of four chondrocyte marker genes (Col2a1, Sox-9, Col10a1, and Runx-2) were assessed by the quantitative real-time polymerase chain reaction. Results: It was monitored that treating cells with laser irradiation can accelerate the rate of proliferation of cells. The morphology of the cells treated with the synovial fluid altered considerably as in the fourth day they surprisingly looked like cultured articular chondrocytes. The gene expression analysis showed that all genes were up-regulated until the day 14 following the treatments although not equally in all the cell groups. Moreover, the cell groups treated with both irradiation and the synovial fluid had a significantly augmented expression in gene markers. Conclusion: Based on the gene expression levels and the morphological changes, we concluded that the synovial fluid can have the potential to make the dermal papilla cells to most likely mimic the chondrogenic and/or osteogenic differentiation, although this process seems to be augmented by the irradiation of the low-level laser.

Protective effect of Photobiomodulation Therapy and Bone Marrow Stromal Stem Cells Conditioned Media on Pheochromocytoma Cell Line 12 Against Oxidative Stress Induced by Hydrogen Peroxide. Introduction: Bone marrow stromal stem cells (BMSCs), a type of adult stem cells, secrete bioactive molecules such as trophic factors, growth factors, chemokine and cytokines that may be effective against oxidative stress in neurodegenerative diseases. In this study, we examined the protective effect of BMSCs conditioned media (CM) and photobiomodulation therapy (PBMT) on PC12 cells exposed to H_2O_2 as an oxidative injury model. Methods: BMSCs were cultured and confirmed by flow cytometry analysis and underwent osteogenic and adipogenic differentiation. Then, PC12-H_2O_2 cells were co-treated with BMSCs-CM and PBMT. The effect of BMSCs-CM and PBMT (He-Ne laser, 632.8nm, 3mW, 1.2J/ cm(2) , 378s) on Bax/Bcl2 expression, cell viability, was assessed by real-time PCR and MTT assay. The length of the Neurite and cell body areas were assessed by Cell A software. Results: Flowcytometry analysis, as well as osteogenic and adipogenic staining, confirmed the BMSCs. The length of the Neurite was the highest in the group which received CM+PBMT and cell body areas were significant in CM+PBMT compared to other groups. Based on our results, elevating H_2O_2 concentration increased cell death significantly and using concentrations of 250 ÂµM resulted in a dramatic increase in the mortality compared to the other groups. Conclusion: Our result demonstrated that the combination of CM +PBMT has a protective effect on PC12 cells against oxidative stress.

Effectiveness of a new cosmetic treatment for melasma. BACKGROUND: Melasma treatment is difficult due to extended treatment periods, suboptimal adherence, inconsistent results, and frequent relapses. Kojic acid has been shown to be effective in reducing melasma severity and is now increasingly used in cosmetic treatments. AIMS: The purpose of the present study was to evaluate the effectiveness of a new cosmetic treatment for melasma at 45 and 90Â days. METHODS: Multicenter prospective study across 20 dermatology clinics/ambulatories. One hundred patients with mild-to-moderate melasma were evaluated. The primary endpoints were changes in mean modified melasma area and severity index (mMASI) score and patient-reported satisfaction at 45 and 90Â days. RESULTS: The mean age of patients was 45.19Â Â±Â 11.5Â years. Most patients were female and Caucasian. Patients presented mixed (65%), epidermal (26%), and dermal (4%) types of melasma. Triggering factors were hormonal contraception (33%), pregnancy (31%), and pharmacological treatment (11%); mean disease duration was 6.7Â Â±Â 6.8Â years. Overall, a statistically significant decrease in mean mMASI scores was seen at 45 (2.19Â Â±Â 0.182 vs 3.29Â Â±Â 0.267, PÂ <Â .0001) and 90Â days (1.27Â Â±Â 0.128 vs 3.29Â Â±Â 0.267, PÂ <Â .00001). The highest reduction in mMASI scores was observed in patients with dermal melasma. IGA scores showed a statistically significant improvement in pigmentation at 90Â days (PÂ <Â .00001). CONCLUSION: The novel cosmetic treatment was associated with the improvement of melasma, as assessed by mMASI. Adult;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Prospective Studies;Severity of Illness Index;Treatment Outcome

Meta-analysis of photobiomodulation for the treatment of androgenetic alopecia. BACKGROUND: Androgenetic alopecia (AGA) is a condition that affects most people at some point in their life, yet few treatments are available. Use of photobiomodulation is ideal due to the safety profile and lack of serious adverse effects. Therefore, the efficacy of photobiomodulation for AGA therapy was investigated. METHODS: A meta-analysis was used to elucidate treatment efficacy. Additionally, a sub-analysis was performed to determine if the type of device used or if use of lasers versus light emitting diodes (LEDs) significantly impacted results. RESULTS: Using hair density (hairs/cm(2)) as a measure of efficacy, the standardized mean difference (SMD) was 1.02 (95% CI: 0.68, 1.36) in favor of treatment over control (15 studies, pooled Nâ€‰=â€‰795, pâ€‰<â€‰.00001). Subgroup analysis comparing comb-style devices versus helmet/hat-style devices did not reveal a significant difference (pâ€‰=â€‰.08). A second subgroup analysis suggested that laser treatment was significantly more effective (pâ€‰=â€‰.009) than a combination of laser/LED treatment although the combination treatment was still significantly better than control treatment. DISCUSSION: Meta-analysis results suggest that photobiomodulation could be used to effectively treat AGA. Specific device recommendations should be based on use of lasers versus LEDs and not the style (comb/hat/helmet) of the device. Alopecia;Drug-Related Side Effects and Adverse Reactions;Hair;Humans;Low-Level Light Therapy;Treatment Outcome

The Effects of Photobiomodulation on MC3T3-E1 Cells via 630 nm and 810 nm Light-Emitting Diode. BACKGROUND Photobiomodulation (PBM) has been explored as a promising therapeutic strategy to regulate bone cell growth; however, the effects of PBM on osteoblast cell lines remains poorly understood. In addition, as a light source of PBM, the light uniformity of light-emitting diode (LED) devices has not been given enough attention. MATERIAL AND METHODS Here, we sought to investigate the effects of PBM on MC3T3-E1 cells via 630 nm and 810 nm light from a newly designed LED with high uniformity of light. Cell proliferation, flow cytometric analysis, alkaline phosphatase (ALP) staining, ALP activity, Alizarin Red S staining, and quantitative real-time polymerase chain reaction (qRT-PCR) were carried out to assess treatment response. MC3T3-E1 cells were irradiated with LED devices (630Â±5 nm and 810Â±10 nm, continuous wave) for 200 seconds at a power density of 5 mW/cmÂ² once daily. RESULTS Increases in cell proliferation and decreases in cell apoptosis were

evident following irradiation. ALP staining intensity and activity were also significantly increased following irradiation. Level of mineralization was obviously enhanced in irradiated groups compared with non-irradiated controls. qRT-PCR also showed significant increases in mRNA expression of osteocalcin (OCN) and osteoprotegerin (OPG) in the irradiated groups. CONCLUSIONS Our results showed that LED PBM could promote the proliferation, ALP staining intensity and activity, level of mineralization, gene expression of OCN and OPG of MC3T3-E1 cells, with no significant difference between the 630 nm- and 810 nm-irradiated groups. Osteocalcin;Osteopontin 3T3 Cells;Animals;Calcification, Physiologic;Cell Differentiation;Cell Line;Cell Proliferation;Cell Survival;Gene Expression;Low-Level Light Therapy;Mice;Osteoblasts;Osteocalcin;Osteogenesis;Osteopontin;Osteoporosis

A comparative study of the dose-dependent effects of low level and high intensity photobiomodulation (laser) therapy on pain and electrophysiological parameters in patients with carpal tunnel syndrome. BACKGROUND: Carpal tunnel syndrome (CTS) is a common peripheral nerve disorder of the wrist. Nonsurgical treatments e.g. laser therapy may cause potential beneficial effects. AIM: To compare the dose dependent effects of low level laser therapy (LLLT) and high intensity laser therapy (HILT) on pain and electrophysiology studies in patients with CTS. DESIGN: Double-blind randomized controlled trial. SETTING: Outpatient physiotherapy clinic. POPULATION: Ninety-eight participants with CTS, aged between 20 to 60 years, were randomly assigned to five groups. METHODS: All participants undertook four standard exercises, with one group serving as exercise-only controls. Patients were randomly allocated to either high or low fluence LLLT or high or low fluence HILT received over 5 sessions. All patients were assessed by visual analogue scale, median compound muscle action potential (CMAP) and sensory nerve conduction studies before and 3 weeks after the interventions. RESULTS: VAS was significantly lower in all groups after 3 weeks (P<0.05). CMAP latency decreased in all groups. The interaction of group and time (5Ã—2) was significant for pain (P<0.001), the latency of CMAP (P=0.001) and CMAP amplitude (P=0.02). The interaction of group and time was not significant for the CMAP conduction velocity, sensory nerve latency and amplitude (P>0.05). CONCLUSIONS: HILT with a power of 1.6 W and low fluence of 8 J/cm(2) was superior in reduction of pain and improvement of the median motor nerve electrophysiological studies compared to LLLT and exercise-only control groups. CLINICAL REHABILITATION IMPACT: LLLT and HILT in conjunction with exercise program are effective in reducing pain and improving median motor nerve conduction studies of the patients with CTS. It seems that high power and low fluence laser therapy is better than LLLT and exercise interventions to treat these patients. Adult;Carpal Tunnel Syndrome;Combined Modality Therapy;Double-Blind Method;Exercise Therapy;Female;Humans;Laser Therapy;Male;Middle Aged;Neural Conduction;Pain Measurement;Young Adult

Immediate effect of photobiomodulation therapy on Achilles tendon morphology and mechanical properties: an exploratory study. OBJECTIVES: Evaluate the immediate (within 4 hours) effects of laser-induced photobiomodulation (PBM) therapy on Achilles tendon morphology and mechanical properties in healthy and pathologic tendons. MATERIALS AND METHODS: Twenty people with healthy Achilles tendons and twelve people with Achilles tendinopathy participated. One Achilles tendon received PBM treatment following an established protocol and the contralateral side received a placebo treatment. Achilles tendon morphology and mechanical properties were evaluated bilaterally with ultrasound imaging and continuous shear wave elastography immediately before treatment, immediately after treatment, then 2- and 4-hours after treatment. RESULTS: There were no immediate effects of PBM on tendon morphology or mechanical properties when comparing the PBM-treated side and placebo-treated side within each cohort. Additionally, the effects of PBM did not differ between healthy and pathologic Achilles tendons. CONCLUSION: When treated with a laser-

induced PBM treatment, healthy and pathologic Achilles tendons do not have immediate (within 4 hours) changes in tendon morphology or mechanical properties. These findings suggest that PBM therapy can be administered before other clinical treatments or high-load activities.

Successful Treatment of Lower Extremity Telangiectasias Using 585-nm Pulsed-Dye Laser at Low Fluence Combined With Optical Coherence Tomography: A Case Report. Background: Significant advances have been made in using lasers and intense pulse light sources to treat common vascular lesions such as telangiectasias. However, the treatment of leg telangiectasia, specifically, is more challenging because it involves the clearing of smaller veins as well as the larger feeding veins. The latest guidelines recommend use of short wavelength pulse-dyed lasers (PDL) as an option to treat telangiectasia cases that are unresponsive to sclerotherapy. Methods: A 29-year-old white woman presented with persistent telangiectasia, with multiple telangiectasias ranging from 1 cm to 20 cm in size involving the dorsal feet and both ankles and legs, which developed 10 years prior, associated with paresthesia. Test spots were treated with a 585-nm pulsed dye laser with various energy settings, and treatment was performed at 5.5 J/cm2 with spot size 10 mm and 0.5ms pulse duration. Results: Near complete clearance was achieved 1 month after the single treatment without adverse effects. Optical coherence tomography (OCT) imaging demonstrated a reduction of cutaneous blood flow after treatment. Discussion: We report successful treatment despite using settings that were previously reported to lack efficacy. This treatment resulted in considerable improvement in aesthetics and symptomatology. Also, OCT confirmed decreased vascular flow and bulging. Conclusion: Our results suggest there is still much to learn about the use of PDL in treating telangiectasias of the lower extremities, and that the ideal parameters warrant further investigation. Moreover, the novel use of OCT in auxiliary imaging for identification of treatment spots, as well as monitoring response at a microvascular level, holds great potential for wider application. J Drugs Dermatol. 2019;18(11):1180-1182. Adult;Blood Flow Velocity;Female;Humans;Lasers, Dye;Leg;Low-Level Light Therapy;Telangiectasis;Tomography, Optical Coherence

Correction to: Photobiomodulation by dual-wavelength low-power laser effects on infected pressure ulcers. The author name Maria Maria CÃ´rtes ThomÃ© Lima was incorrectly captured in the original article. The correct author name should be Andrezza Maria CÃ´rtes ThomÃ© Lima. The original article has been corrected.

Single Ablative Fractional Resurfacing Laser Treatment For Forearm Actinic Keratoses: 6-Month Follow-Up Data From An Intrapatient Comparison Between Treated and Untreated Sites. BACKGROUND AND OBJECTIVES: Actinic keratoses (AK) are common pre-cancerous lesions, which are associated with ultraviolet light exposure and aging. Wounding therapies such as fractionated laser resurfacing (FLR) have been previously demonstrated to effectively treat facial AK. However, the effectiveness of FLR on other sites commonly afflicted with AK has not been studied in detail. Previously, our group has reported that treatment of aged skin with wounding therapies including dermabrasion and ablative fractionated resurfacing results in the removal of senescent fibroblasts and normalizing the pro-carcinogenic acute ultraviolet B radiation responses associated with aged skin. The current studies were designed to test the effectiveness of FLR of the forearm skin of subjects aged 60 and older to remove AKs. STUDY DESIGN/MATERIALS AND METHODS: Between February 2018 and March 2019, 30 subjects were enrolled in a study, in which they underwent a single FLR treatment of one extremity including the dorsal forearm, wrist, and dorsal hand. The number of AKs was recorded on both extremities at baseline, 3 and 6 months in a blinded fashion. Side effects of the FLR were documented. RESULTS: A single FLR treatment resulted in a 62% reduction in the absolute number of AK in the treated arm at 6 months post-treatment. The laser treatment was well-tolerated without major complications. CONCLUSIONS: These studies demonstrate that FLR using settings, which have demonstrated to remove senescent fibroblasts and

normalize the pro-carcinogenic UVB-response of aged skin is a potentially effective and safe field therapy treatment that should be studied for long-term efficacy for use in treating upper extremity AKs. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Age Factors;Aged;Follow-Up Studies;Forearm;Humans;Keratosis, Actinic;Low-Level Light Therapy;Male;Middle Aged;Time Factors;Treatment Outcome

Fox-Fordyce disease: Insights from cases induced by laser hair removal. Adult;Female;Fox-Fordyce Disease;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy

Low-level laser therapy induces human umbilical vascular endothelial cell proliferation, migration and tube formation through activating the PI3K/Akt signaling pathway. Low-level laser therapy (LLLT) has been recognized as a light therapy that may be used for tissue regeneration, inflammation reduction, and pain relief. We intended to evaluate the effects of LLLT on the proliferation, migration, and tube formation of HUVECs as well as their related mechanisms. HUVECs were exposed to laser irradiation under different laser parameters (irradiation dose, interval and power intensity) in order to choose the optimal parameters, which were determined by the increase in proliferation of HUVECs as follows: irradiation dose of 4.0Â J/m(2), interval time of 12Â h and 6 times in total. The HUVEC proliferation, migration, and tube formation, and levels of angiogenesis-related genes (HIF-1Î±, eNOS and VEGFA) were examined following LLLT. As suggested by the obtained data, LLLT (1.0, 2.0 and 4.0Â J/m(2)) increased the HUVEC proliferation, migration, and tube formation in dose-and time-dependent manner, accompanied with increases in the levels of HIF-1Î±, eNOS, and VEGFA. Furthermore, the regulatory mechanism regarding the phosphatidylinositol 3-kinase/protein kinase B (PI3K/Akt) signaling pathway was explored, phosphorylation levels of PI3K and Akt proteins were assessed by Western blot assay, which showed the enhancement of phosphorylation of PI3K, Akt, and mTOR by LLLT. The inhibitor for the PI3K/Akt axis was used to verify the involvement of PI3K/Akt signaling pathway. The obtained results suggested that the inhibition of the PI3K/Akt signaling pathway attenuated the effects of LLLT on proliferation, migration, and angiogenesis of HUVECs. In conclusion, LLLT promotes the proliferation, migration, and angiogenesis of HUVECs via activation of the PI3K/Akt signaling pathway. HIF1A protein, human;Hypoxia-Inducible Factor 1, alpha Subunit;VEGFA protein, human;Vascular Endothelial Growth Factor A;NOS3 protein, human;Nitric Oxide Synthase Type III;MTOR protein, human;Phosphatidylinositol 3-Kinase;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases Cell Movement;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Enzyme Activation;Human Umbilical Vein Endothelial Cells;Humans;Hypoxia-Inducible Factor 1, alpha Subunit;Low-Level Light Therapy;Neovascularization, Physiologic;Nitric Oxide Synthase Type III;Phosphatidylinositol 3-Kinase;Phosphorylation;Proto-Oncogene Proteins c-akt;Signal Transduction;TOR Serine-Threonine Kinases;Time Factors;Vascular Endothelial Growth Factor A

Photobiomodulation Therapy for Attenuating the Dystrophic Phenotype of Mdx Mice. This study analyzed photobiomodulation therapy (PBMT) effects on regenerative, antioxidative, anti-inflammatory and angiogenic markers in the dystrophic skeletal muscle of mdx mice, the experimental model of Duchenne muscular dystrophy (DMD), during the acute phase of dystrophy disease. The following groups were set up: Ctrl (control group of normal wild-type mice; C57BL/10); mdx (untreated mdx mice); mdxPred (mdx mice treated with prednisolone) and mdxLA (mdx mice treated with PBMT). The PBMT was carried out using an Aluminum Gallium Arsenide (AIGaAs; IBRAMEDÂ® laserpulse) diode, 830Â nm wavelength, applied on the dystrophic quadriceps muscle. The mdxLA group showed a degenerative and regenerative area reduction simultaneously with a MyoD level increase, ROS production and inflammatory marker reduction and up-regulation in the VEGF factor. In addition, PBMT presented similar effects to prednisolone treatment in most of the parameters analyzed. In conclusion, our results indicate that PBMT in the parameters selected

attenuated the dystrophic phenotype of mdx mice, improving skeletal muscle regeneration; reducing the oxidative stress and inflammatory process; and up-regulating the angiogenic marker. Transforming Growth Factor beta;Vascular Endothelial Growth Factor A Animals;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Mice, Inbred mdx;Muscular Dystrophy, Animal;Muscular Dystrophy, Duchenne;Phenotype;Transforming Growth Factor beta;Vascular Endothelial Growth Factor A

Photobiomodulation Therapy in the Treatment of Oral Mucositis, Dysphagia, Oral Dryness, Taste Alteration, and Burning Mouth Sensation Due to Cancer Therapy: A Case Series. Oral complications of cancer therapy, such as oral dryness, dysphagia, and taste alteration, are associated with a negative impact in the quality of life of the patients. Few supportive care measures are available for such complications. This case series reveals the effectiveness of the photobiomodulation (PBM) therapy when used in a specific protocol and parameters, in the management of oral complications related to cancer therapy. Dysphagia was measured using the functional outcome swallowing scale for staging oropharyngeal dysphagia (FOSS). Oral mucositis was measured according to the National Cancer Institute scale. The quantity of the whole resting and stimulated saliva was measured in order to assess the oral dryness. In addition, the taste alteration was measured according to a protocol suggested by the International Standards organization (ISO). Sensation of burning mouth was measured using a visual analogue scale. These measurements were made before treatment, during, and at the end of the treatment. Diode laser 635 nm was used in 3 J/cm(2). Five sessions interleaved with 24 h breaks were conducted for the dysphagia and oral dryness, and 10 sessions were conducted for the taste alteration and burning mouth sensation. Regardless of the limitations of this case series, PBM can be considered safe, time saving, and a promising approach for the management of the oral complications due to cancer therapy and the quality of life of cancer patients. Adult;Deglutition Disorders;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Quality of Life;Saliva;Stomatitis;Taste;Xerostomia

Physical exercise and low-level laser therapy on the nociception and leukocyte migration of Wistar rats submitted to a model of rheumatoid arthritis. Rheumatoid arthritis denotes hyperplasia and intense inflammatory process. Treatment involves exercise protocols and use of resources such as low-level laser therapy (LLLT) to modulate the inflammatory process and maintain physical capacity. The objective was to investigate whether treatment with LLLT and exercise modulates the inflammatory process and peripheral functionality. Sample is composed of 128 male rats, separated into three groups, control, treated and untreated, in the acute and chronic period of the disease with 64 animals in each group, divided into 8 subgroups with n = 8. The animals were immunized with injection at the base of the tail and 7 days after intra-articular injection with complete Freund adjuvant (CFA) for lesion groups, and saline solution for the controls. Joint disability was evaluated by PET (paw elevation time) and joint edema and treated with LLLT and/or resisted stair climbing exercise. Normality Shapiro-Wilk test, ANOVA mixed for the functional analyses, and ANOVA one-way for the variables of cellular differentiation, with Bonferroni post hoc, p = 5% were used. For the evaluations of joint disability and nociception, there was a significant difference between the evaluations, the groups, and the interaction groups-evaluations. The treated groups showed recovery of functionality; it is still verified that laser therapy increased the nociceptive threshold of the chronic inflammatory period, and the exercise reflected in significant functional improvement and modulation of the inflammatory process both in the acute and chronic periods. LLLT, resistance exercise, or a combination of treatments had a positive effect on the modulation of the inflammatory process, reducing the migration of leukocytes, in addition to helping the return of peripheral functionality by reducing joint disability in a model of rheumatoid arthritis induced by CFA in rats. Animals;Arthritis, Rheumatoid;Cell Movement;Edema;Inflammation;Leukocytes;Low-Level Light

Therapy;Male;Nociception;Physical Conditioning, Animal;Positron-Emission Tomography;Rats, Wistar;Synovial Fluid

Combination of Dual Wavelength Picosecond and Nanosecond Pulse Width Neodymium-Doped Yttrium-Aluminum-Garnet Lasers for Tattoo Removal. BACKGROUND AND OBJECTIVES: Tattoo removal by laser has been mostly performed using Q-switched laser, which has nanosecond pulse width. In recent years, the efficacy of treatment with picosecond pulse width laser has also been reported. STUDY DESIGN/MATERIALS AND METHODS: Using a picosecond-domain, neodymium-doped yttrium-aluminum-garnet laser with a potassium-titanyl-phosphate frequency-doubling crystal, we performed a retrospective clinical study with combination treatment using pulse widths of 750â€‰ps and 2â€‰ns. The number of treatments was compared with the Kirby-Desai score. Tissue changes immediately after laser irradiation at 2â€‰ns and 750â€‰ps were compared using an electron microscope. RESULTS: The combination treatment using pulse widths of 2â€‰ns and 750â€‰ps was safe and more effective than the Q-switched neodymium-doped yttrium-aluminum-garnet laser treatment. Tattoo removal was possible with significantly fewer treatment numbers than the Kirby-Desai score, without adverse events. The results from the scanning electron microscope revealed that ink particles irradiated by 750â€‰ps were more dispersed than those by 2â€‰ns. CONCLUSIONS: The combination treatment with pulse widths of 2â€‰ns and 750â€‰ps and 1064â€‰nm and 532â€‰nm wavelengths using the neodymium-doped yttrium-aluminum-garnet laser was safe and effective and can be a useful option for tattoo removal. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adult;Female;Humans;Ink;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Tattooing;Young Adult

Split-Sided Chest Study of Skin Rejuvenation Comparing Low-Energy, 1,927-nm Thulium Fractional Laser Treatment Prior to Photodynamic Therapy Versus Photodynamic Therapy Alone. BACKGROUND AND OBJECTIVES: Treatment of photoaging and intrinsic aging of the chest, with the associated concerns of skin roughness, uneven pigmentation, laxity, atrophy, and telangiectasias, can be problematic because of the potential for worsened esthetic outcomes with existing treatments. This study assessed the efficacy and safety of using nonablative fractional laser therapy (FLT) pretreatment with photodynamic therapy (PDT) versus PDT alone for chest rejuvenation. STUDY DESIGN/MATERIALS AND METHODS: In a randomized, evaluator-blinded, split-sided study, adult female patients with photodamage to the chest received three treatment courses over an 8-week period with follow-up visits at Weeks 12 and 20. FLT was applied to one side of the chest, randomly assigned at baseline, followed by aminolevulinic acid-based PDT, delivered using a thermal, short incubation, broad area technique, to both sides of the chest. In-person and photographic assessments were conducted using five-point scales to evaluate outcomes including rhytides, pigmentation, skin texture, and telangiectasias. RESULTS: Eleven adults completed the study, of whom 11 had improved scores for rhytides and 10 had improved scores for skin texture at Week 20. There was no significant difference in any efficacy outcome between FLT and PDT and standard PDT alone. The severity of adverse events was rated significantly greater with the combined FLT-PDT treatment vs PDT alone. CONCLUSIONS: Significant improvements were observed vs baseline for both sides of the chest treated with FLT-PDT or standard PDT following three treatment sessions. No significant difference in efficacy was observed between treatment approaches, although adverse events were more severe on the FLT-pretreated side. This study was not registered as it qualified as a nonsignificant risk study. Lasers Surg. Med. Â© 2019 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Photosensitizing Agents;Aminolevulinic Acid;Thulium Aged;Aminolevulinic Acid;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Photochemotherapy;Photosensitizing Agents;Skin Aging;Thorax;Thulium;Treatment Outcome

Comparative evaluation of low-level laser therapy and ultrasound heat therapy in reducing temporomandibular joint disorder pain. BACKGROUND: Pain, limitations in opening, asymmetrical jaw movements, and temporomandibular joint (TMJ) sounds are the most common findings in temporomandibular joint disorders (TMDs), which causes excruciating pain, inflammation of the surrounding muscles, posterior fibers, and synovial fluid. This study aimed to evaluate and compare the effects of ultrasound heat therapy and low-level laser therapy (LLLT) in reducing TMD-related pain. METHODS: This prospective study included 42 patients (age range, 25-45 years), who were divided into two groups of 21 patients each. All patients were prescribed a non-steroidal anti-inflammatory drug (NSAID) twice a day for 5 days for temporary relief of pain prior to the commencement of treatment. Patients were kept on a soft diet and asked to restrict mouth opening during the same period. Fifteen sessions of LLLT (Group A) or ultrasound therapy (Group B) were administered to the affected side. RESULTS: Post-therapy, the mean visual analog scale score for group A and group B was 4.81 (2.01) and 6.19 (1.20), respectively; the difference was statistically significant and favoring the LLLT group. Similarly, the mean mouth opening for group A and group B was 3.99 (0.40) and 3.65 (0.41), respectively; the difference was statistically significant and favoring the LLLT group. CONCLUSION: Our study recommends LLLT for treating TMD-related pain with no underlying bony pathology.

Biomodulation induced by fluorescent light energy versus standard of care in venous leg ulcers: a retrospective study. OBJECTIVE: The recently completed EUREKA study confirmed the efficacy and safety profile of fluorescent light energy (FLE) in treating hard-to-heal wounds. To supplement the EUREKA prospective, observational, uncontrolled trial results, researchers selected one of the EUREKA clinical centres to conduct a retrospective analysis of matching wound care data for 46 venous leg ulcers (VLU) patients who had received standard wound care over a five-year period, compared with 10 EUREKA VLU subjects. METHOD: The study centre selected 46 patients with VLUs based on the matching criteria (wound age and size, patient's age and gender). They compared the healing rates of these matching VLUs with 10 VLU patients treated at the same centre during the EUREKA study. RESULTS: The EUREKA patients had larger and significantly older wounds ($p<0.05$) and significantly more risk factors ($p<0.05$) than the matching wounds. However, they had better outcomes (EUREKA: 40% versus matching group: 7% for full wound closure by 16 weeks). No wound breakdown was observed at 16 weeks in the EUREKA group, compared with 25% in the matching group. No EUREKA patient developed infections requiring antibiotics, compared with 37% in the matching group. EUREKA wounds had a mean relative wound area regression (RWAR) of 32% at week six and 50% at week 16, compared with -3% at week six and -6% at week 16 for the matching group. CONCLUSION: These findings show that the system based on FLE was well-tolerated and efficacious, with better clinical outcome results compared with the wounds analysed in this retrospective matching study and treated with standard of care alone. Aged;Aged, 80 and over;Female;Fluorescence;Humans;Leg Ulcer;Male;Middle Aged;Retrospective Studies;Varicose Ulcer;Wound Healing

Laser therapy for recurrent aphthous stomatitis: an overview. OBJECTIVES: To evaluate therapeutic effects of laser therapy on patients with recurrent aphthous stomatitis assessing evidences from previously published systematic reviews. MATERIALS AND METHODS: An overview of systematic reviews was conducted based on PRISMA checklist. Search strategies were developed and adapted for six different electronic databases and a gray literature search was also performed. The methodology quality of the included systematic reviews was assessed by the Measurement Tool to Assess the Methodological Quality of Systematic Reviews 2 (AMSTAR 2). RESULTS: After a two-step selection, five systematic reviews were included. Methodology quality was considered as a high risk of bias in two systematic reviews, while in the other three were graded as moderate. The systematic

reviews' conclusions demonstrated that all included systematics reviews showed positive effects of laser therapy for pain relief, and most of them demonstrated healing improvement. A meta-analysis was not feasible due to heterogeneity in treatments parameters. CONCLUSIONS: Evidence suggested that laser therapy is an effective tool to treat recurrent aphthous stomatitis; nevertheless, more randomized clinical trials should be conducted to compare different lasers parameters. CLINICAL RELEVANCE: The present overview evaluated recent evidence about laser therapy for recurrent aphthous stomatitis management in order to contribute for evidence-based dentistry and decision-making. This overview suggests that laser therapy is a safe and promising alternative to treat recurrent aphthous stomatitis, since it promotes wound healing and pain relief. Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Pain;Stomatitis, Aphthous

Could the impact of photobiomodulation on tumor response to radiation be effected by tumor heterogeneity?

Preemptive treatment with photobiomodulation therapy in skin flap viability. Skin Flap is used in reconstructive plastic surgery. However, complications such as ischemia followed by local necrosis may occur, requiring a new surgical procedure. It is well known that photobiomodulation therapy (PBMT) is an effective technique for improving microcirculation and neoangiogenesis, which contributes positively to the blood supply in the pre and post surgical period. Thus, the objective of the present study was to investigate the effects of preemptive treatment with laser PBMT with different energies on the viability in skin flaps in rats. Sixty-three Wistar rats, male, were randomized into five groups: Control Group (CG) (nâ€¯=â€¯15): PBMT simulation; Preemptive group 1.1â€¯J laser (GP1) (nâ€¯=â€¯15): preemptive laser PBMT with 1.1â€¯J of energy per point; Preemptive group 4â€¯J laser (GP4) (nâ€¯=â€¯15): preemptive PBMT with 4â€¯J of energy per point; Laser group 11â€¯J (G1) (nâ€¯=â€¯9): PBMT immediately after surgery with 1.1â€¯J of energy per point; Laser group 4â€¯J (G4) (nâ€¯=â€¯9): TFMB immediately after surgery with 4â€¯J of energy per point. The CG, GP1 and GP4 groups started treatment 72â€¯h prior to surgery and were subdivided into two experimental periods, one of them on the day of the flap and the other along with the other groups on the seventh postoperative day. Three days after the randomization, the animals underwent random skin flap surgery. PBMT was performed with a 660â€¯nm laser at three points. In the first experimental period, a greater number of vessels were found, as well as mast cells in GP1 compared to the CG and greater expression of fibroblast growth factor and vascular endothelial growth factor in the GP1 and GP4 groups compared to the CG. In the second experimental period, GP1 presented a lower percentage of necrotic tissue, a higher number of vessels and a percentage of cells labeled with both VEGF and hypoxia indicible factor alpha (HIF-1Î±) compared to the CG, FGF in GP1, GP4 and G4 when compared to the CG. Thus, it was concluded that preemptive treatment with PBMT with the application of 1.1â€¯J of energy per point is effective in improving the viability of the skin flap. Hypoxia-Inducible Factor 1, alpha Subunit;Vascular Endothelial Growth Factor A Animals;Male;Rats;Blood Vessels;Hypoxia-Inducible Factor 1, alpha Subunit;Lasers, Semiconductor;Mast Cells;Necrosis;Random Allocation;Rats, Wistar;Surgical Flaps;Vascular Endothelial Growth Factor A

Use of Lasers for Iron-Induced Accidental Tattoos: Experience at a Tertiary Referral Center. BACKGROUND: Awareness of accidental tattoos after iron injections with paravenous leakage is low. No larger patient cohorts have been analyzed. The lesions are a burden to the patients. The only known treatment is laser therapy. OBJECTIVE: To characterize the clinical appearance and development of iron-induced tattoos and to demonstrate safe and efficient removal with quality-switched (QS) and picosecond lasers. MATERIALS AND METHODS: The authors conducted a retrospective systematic analysis on patients who presented at the Dermatology Department of the University Hospital of Zurich between Year 2008 and 2017 with accidental hyperpigmentations after iron injections. From 29 collected patients, 13 received laser treatment and were analyzed with

reference to the lasers used, including wavelength, fluence, spot size, intervals, number of sessions, and overall success. The authors defined the latter as a complete removal or as patients' satisfaction. RESULTS: The authors treated 13 patients and completed the treatment in 8 patients, with an average of 5.6 sessions. No complications occurred. CONCLUSION: Spontaneous regression of iron-induced tattoos is possible within 1 to 2 years, but not guaranteed. Removal with QS ruby, Nd:YAG, and picosecond lasers can be achieved within a mean number of 5.6 sessions. Assuring a valid indication before intravenous iron administration is important. Iron Administration, Intravenous;Adolescent;Adult;Aged;Extravasation of Diagnostic and Therapeutic Materials;Female;Humans;Hyperpigmentation;Iron;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Retrospective Studies;Tertiary Care Centers;Treatment Outcome;Young Adult

Learning Hemodynamic Effect of Transcranial Infrared Laser Stimulation Using Longitudinal Data Analysis. Transcranial infrared laser stimulation (TILS) is a promising noninvasive intervention for neurological diseases. Though some experimental work has been done to understand the mechanism of TILS, the reported statistical analysis of data is quite simple and could not provide a comprehensive picture on the effect of TILS. This study learns the effect of TILS on hemodynamics of the human brain from experimental data using longitudinal data analysis methods. Specifically, repeated measures analysis of variance (ANOVA) is first applied to confirm the significance of the TILS effect and its characteristics. Based on that, two parametric mixed-effect models and non-parametric functional mixed-effect model are proposed to model the population-level performance and individual variation of this effect. Interpretations on the fitted models are provided, and comparison of the three proposed models in terms of fitting and prediction performance is made to select the best model. According to the selected model, TILS increases the concentration of oxygenated hemoglobin in the brain and this effect sustains even after the treatment stops. Also, there is considerable variation among individual responses to TILS. Oxyhemoglobins Brain;Cerebrovascular Circulation;Hemodynamics;Humans;Infrared Rays;Low-Level Light Therapy;Models, Statistical;Oxyhemoglobins

Innovative 1064-nm Nd:YAG Laser Significantly Improves Keratosis Pilaris, A Randomized, Double-Blind, Sham-Irradiation-Controlled Trial. BACKGROUND AND OBJECTIVE: Keratosis pilaris (KP) isÂ a commonÂ follicular disorder for which various topical agents and energy-based devices have been used with some efficacy. To evaluate the efficacy of a novel 1064-nm Nd:YAG laser for the reduction of skin roughness, erythema, and hyperpigmentation in KP subjects. STUDY DESIGN/MATERIALS AND METHODS: Twenty-three subjects with untreated KP on the upper outer arms participated in a randomized, single-blind fashion. One arm of each subject was divided into upper and lower parts. One part was randomized to be treated with an innovative 1064-nm Nd:YAG laser, while the other part received sham irradiation. Subjects received four consecutive treatments at 4-week intervals. Antera3D was used to measure skin roughness, erythema, and hyperpigmentation at baseline and 4 weeks after the last treatment. Moreover, clinical outcomes were also evaluated by subjects' Global Improvement Score (GIS) and subjects' satisfaction grading scores. RESULTS: Twenty-three subjects completed the study. There was statistically significant reduction of skin roughness measured by Antera3D compared with control group (Pâ€‰<â€‰0.001). There were statistically significant improvements of skin roughness, erythema, hyperpigmentation, and overall appearances graded by subjects' Global Improvement Score (Pâ€‰<â€‰0.001 all). Subjects' satisfaction scores were graded significantly better in treatment parts (Pâ€‰<â€‰0.001). No adverse events including burning, bulla, erosion, post-inflammatory hyper/hypopigmentation, and scar formation developed in any subjects throughout the study period. CONCLUSION: This innovative 1064-nm Nd:YAG laser has proved to significantly and safely reduce

skin roughness in Thai KP subjects compared with control after four sessions. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Abnormalities, Multiple;Adult;Darier Disease;Double-Blind Method;Eyebrows;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Treatment Outcome;Young Adult

Histologic and Biomechanical Evaluation of Osseointegrated Miniscrew Implants Treated with Ozone Therapy and Photobiomodulation at Different Loading Times. PURPOSE: The aim of this study was to evaluate how continuous heavy orthopedic forces affect the stability of sandblasted, large-grit, acid-etched (SLA)-surfaced miniscrew implants and surrounding bone tissue healing at three different loading periods with treatment of photobiomodulation and ozone therapy. MATERIALS AND METHODS: Miniscrew implants were applied on the tibias of 9-month-old rabbits (n = 18). The animals were randomly divided into three groups: control, photobiomodulation, and ozone therapy. In all groups, miniscrew implants were loaded with 500 gf at 0, 4, and 8 weeks, respectively (G1, G2, and G3). Several biomechanical and histologic analyses were performed in different centers to measure the implant stability quotient level, bone volume, and bone-to-implant contact. RESULTS: According to the results of the Infinite Focus Microscopy, the ozone therapy group revealed significantly higher scores than the control group and photobiomodulation group at the 4-week loading time, whereas the photobiomodulation and ozone therapy groups revealed significantly higher scores than the control group at the 8-week loading time in terms of bone volume measurements in mm(3) ($P < .05$). According to the histologic analysis, the ozone therapy and photobiomodulation groups revealed significantly higher scores than the control group at the 4-week loading time, whereas the photobiomodulation group showed the highest scores among the 8-week loading groups ($P < .05$). CONCLUSION: This is the first study in the literature that reveals a better osseointegration process in miniscrew implants when treated with photobiomodulation and ozone therapy compared with control groups. Although the photobiomodulation and ozone therapy groups did not reveal significantly higher scores in immediately loaded miniscrew implants (G1), these treatments were significantly more effective when loaded after 4 or 8 weeks of osseointegration (G2 and G3). SLA-surfaced miniscrew implants are successful in the orthopedic forces (500 gf) and can be removed without complications. Dental Implants;Ozone;Titanium Animals;Biomechanical Phenomena;Dental Implants;Mandible;Osseointegration;Ozone;Rabbits;Surface Properties;Titanium

Photobiomodulation with 630 plus 810â€¯nm wavelengths induce more in vitro cell viability of human adipose stem cells than human bone marrow-derived stem cells. The goal of the current experiment is to explore the influence of combined and/or single applications of red and near infrared (NIR) photobiomodulation (PBM) at different wavelengths, energy densities and times on cell viability, population doubling time (PDT), and apoptosis of in vitro cultures of human bone marrow-derived mesenchymal stem cells (hBM-MSCs) and h adipose-derived stem cells (hASCs). Both in vitro hBM-MSCs and hASCs were irradiated with 36 protocols using two different laser types (heliumâ€‘neon [He-Ne] and diodes), four different laser wavelengths (HeNe laser, 630â€¯nm, 810â€¯nm, 630â€¯+â€¯810â€¯nm); three different energy densities (0.6â€¯J/cm(2), 1.2â€¯J/cm(2), 2.4â€¯J/cm(2)); and three different PBM times (1, 2, and 3). One-way ANOVA analysis showed that PBM with the 630â€¯nm red laser significantly stimulated cellular viability of both hBM-MSCs and hASCs. The 630â€¯nm red laser significantly decreased PDT of hBM-MSCs. One-way ANOVA demonstrated that the 630â€¯+â€¯810 laser significantly stimulated cellular viability, and significantly decreased PDT and apoptosis of hBM-MSCs and hASCs. Two-way ANOVA analysis showed that PBM with the 630â€¯nm red laser and 630â€¯+â€¯810â€¯nm laser significantly stimulated cellular viability of hASCs compared to the control hASCs, and experimental and control hBM-MSCs. Our study demonstrated that PBM with the combined 630â€¯+â€¯810â€¯nm lasers significantly stimulated cell viability, and significantly decreased PDT and apoptosis of hBM-MSCs and hASCs in vitro. We reported

new in vitro evidence where PBM administered at 630â€¯nm (one and two times, 0.6 and 1.2â€¯J/cm(2)) and 630â€¯+â€¯810â€¯nm (three times, 2.4â€¯J/cm(2)) significantly increased hASC cell viability compared to its control and the PBM-treated hBM-MSC groups. Adipose Tissue;Apoptosis;Bone Marrow Cells;Cell Survival;Cells, Cultured;Humans;Lasers, Gas;Low-Level Light Therapy;Mesenchymal Stem Cells;Stem Cells

Evaluation of the Safety and Efficacy of a Picosecond Alexandrite Laser With DLA for Acne Scars in Chinese Patients. BACKGROUND AND OBJECTIVES: Recently, picosecond laser treatment has been used as an effective treatment for acne scars. To evaluate the efficacy and safety of a picosecond alexandrite laser with a diffractive lens array in the treatment of acne scars in Chinese patients. STUDY DESIGN/MATERIALS AND METHODS: Patients with facial acne scars were treated with a picosecond alexandrite laser in three sessions at 4- to 6-week intervals and followed up for 2 months. Primary outcomes were measured by physicians' blinded evaluation of the acne scar using the ECCA (Ã©chelle d'Ã©va physicians'luation clinique des cicatrices d'acnÃ©) grading scale. The secondary outcomes included the investigator global assessment (IGA) on the improvement of post-inflammatory erythema (PIE), patients' assessment of improvement on a 4-point scale and of satisfaction on a 5-point scale. Pain scores and adverse effects were also evaluated. RESULT: Twenty patients with Fitzpatrick skin types III and IV were enrolled in the study and completed all treatment and follow-up visits. The mean ECCA scores fell from 197.75â€‰Â±â€‰35.26 to 142.00â€‰Â±â€‰35.92 (a 28% improvement), and the change was significant (Pâ€‰=â€‰0.000). The mean IGA score of PIE improvement was 3.03â€‰Â±â€‰0.75 (0â€‰=â€‰no improvement and 4â€‰=â€‰76-100% improvement). On the basis of the patients' self-assessment, the average improvement scores were 2.30â€‰Â±â€‰0.98 (0 indicating 0-25% improvement and 3 indicating >75% improvement). In total, 50% and 30% of the patients were "satisfied" and "very satisfied," respectively, with the treatment. The mean pain score was 3.20â€‰Â±â€‰0.50 (0â€‰=â€‰no pain, 10â€‰=â€‰maximum pain) with topical anesthesia. The adverse effects included transient and mild erythema, edema, and scabbing. CONCLUSIONS: Treatment with a picosecond alexandrite laser with a diffractive lens array is effective and safe for acne scars in Chinese patients. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. alexandrite;Beryllium Acne Vulgaris;Adult;Beryllium;China;Cicatrix;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain Measurement;Patient Satisfaction

Treatment of Erythematotelangiectatic Rosacea With Pulsed-Dye Laser and Oxymetazoline 1.0% Cream: A Retrospective Study. BACKGROUND AND OBJECTIVES: Pulsed-dye laser (PDL) and oxymetazoline 1.0% cream are each used for the treatment of erythematotelangiectatic (ET) rosacea. PDL targets oxyhemoglobin and can reduce facial erythema and telangiectasias. Oxymetazoline 1.0% cream is an Î± adrenergic agonist, which has shown to reduce facial erythema. The aim of this study was to determine the degree of erythema improvement and telangiectasia clearance after combination treatment with PDL plus oxymetazoline 1.0% cream. STUDY DESIGN/MATERIALS AND METHODS: This retrospective study was conducted at two sites. Pre- and post-treatment cross-polarized images from subjects on combination treatment with PDL and oxymetazoline 1.0% cream were graded by a board-certified dermatologist at each practice. Blinded images were analyzed using the Clinical Erythema Assessment (CEA) Scale (0â€‰=â€‰clear and 4â€‰=â€‰severe). Unblinded images were analyzed using the five-point Telangiectasia Scale to determine the degree of improvement post-treatment compared with baseline (1â€‰=â€‰<5% clearance and 5â€‰=â€‰75-100% clearance). RESULTS: Thirty-one subjects (20 females, 11 males) of age 51â€‰Â±â€‰13 years (meanâ€‰Â±â€‰standard deviation) were included in the study after an average of 4 months (range: 1-13) of daily oxymetazoline 1.0% cream and two (range: 1-4) PDL treatments. At baseline, 87% of subjects had CEA Grade 2 (mild erythema) or higher. For erythema,

55% of subjects improved by at least one CEA grade and 13% achieved two grades of improvement post-treatment. For telangiectasias, 90% of subjects achieved at least a two-point clearance (5-25%), 62% at least a three-point clearance (25-50%), and 41% at least a four-point clearance (50-75%) post-treatment. Compared with subjects with baseline CEA Grade 1-2 (almost clear to mild erythema), significantly more subjects with baseline CEA Grade 3-4 (moderate to severe erythema) achieved at least one CEA grade of improvement (Pâ€‰=â€‰0.021) and two grades of CEA improvement (Pâ€‰=â€‰0.041). A higher percentage of baseline CEA Grade 3-4 subjects achieved at least a two-point clearance in telangiectasias (Pâ€‰=â€‰0.055). CONCLUSIONS: Combination treatment with PDL and daily oxymetazoline 1.0% cream can safely and effectively reduce erythema and telangiectasias. Limitations include the retrospective design of the study, small sample size, and lack of a control group. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adrenergic alpha-Agonists;Oxymetazoline Adrenergic alpha-Agonists;Adult;Combined Modality Therapy;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Oxymetazoline;Retrospective Studies;Rosacea;Treatment Outcome

Insulin resistance is improved in high-fat fed mice by photobiomodulation therapy at 630â€‰nm. Photobiomodulation therapy (PBMT) in the infrared spectrum exerts positive effects on glucose metabolism, but the use of PBMT at the red spectrum has not been assessed. Male Swiss albino mice were divided into low-fat control and high-fat diet (HFD) for 12â€‰weeks and were treated with red (630â€‰nm) PBMT or no treatment (Sham) during weeks 9 to 12. PBMT was delivered at 31.19â€‰J/cm(2) , 60â€‰J total dose per day for 20â€‰days. In HFD-fed mice, PBMT improved glucose tolerance, insulin resistance and fasting hyperinsulinemia. PBMT also reduced adiposity and inflammatory infiltrate in adipose tissue. Phosphorylation of Akt in epididymal adipose tissue and rectus femoralis muscle was improved by PBMT. In epididymal fat PBMT reversed the reduced phosphorylation of AS160 and the reduced Glut4 content. In addition, PBMT reversed the alterations caused by HFD in rectus femoralis muscle on proteins involved in mitochondrial dynamics and Î²-oxidation. In conclusion, PBMT at red spectrum improved insulin resistance and glucose metabolism in HFD-fed mice. Insulin Adipose Tissue;Animals;Diet, High-Fat;Insulin;Insulin Resistance;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Obesity

Photobiomodulation effects on head and neck squamous cell carcinoma (HNSCC) in an orthotopic animal model. BACKGROUND: Photobiomodulation (PBM) has shown efficacy in preventing and treating cancer therapy-induced mucositis and dermatitis. However, there is contradictory information regarding the effect of PBM on (pre)malignant cells, which has led to questions regarding the safety of this technique. We address this issue using an orthotopic mouse model (Cal-33) with human squamous cell carcinoma of the oral cavity. METHODS: Mice with actively growing orthotopic Cal-33 head and neck carcinoma tumors were divided into 4 groups: control, PBM only, radiation therapy (RT) only, and PBM + RT. We performed three experiments: (1) PBM at 660Â nm, 18.4Â J/cm(2), and 5 RTâ€‰Ã—â€‰4Â Gy doses delivered daily; (2) PBM at 660Â nm, 18.4Â J/cm(2), and 1â€‰Ã—â€‰15Â Gy RT; and (3) PBM at 660Â nmâ€‰+â€‰850Â nm, 45Â mW/cm(2), 3.4Â J/cm(2), and 1â€‰Ã—â€‰15Â Gy RT. Mice were weighed daily and tumor volumes were evaluated by IVIS. Survival time was also evaluated. RESULTS: Animals treated with RT survived significantly longer and had significantly smaller tumor volume when compared with the control and PBM-only treatment groups. No significant differences were noted between the RT alone and PBM + RT groups in any of the experiments. CONCLUSION: Our results suggest that PBM at the utilized parameters does not provide protection to the tumor from the killing effects of RT. Animals;Cell Line, Tumor;Dermatitis;Disease Models, Animal;Humans;Low-Level Light Therapy;Mice;Mice, Nude;Mice, SCID;Mucositis;Neoplasm Transplantation;Radiotherapy;Squamous Cell Carcinoma of Head and Neck;Stomatitis;Transplantation, Heterologous

Can mild cognitive impairment be stabilized by showering brain mitochondria with laser photons? There is now substantial evidence that cerebral blood flow (CBF) declines with age. From age 20 to 60, CBF is estimated to dip about 16% and continues to drop at a rate of 0.4%/year. This CBF dip will slowly reduce oxygen/glucose delivery to brain thus lowering ATP energy production needed by brain cells to perform normal activities. Reduced ATP production from mitochondrial loss or damage in the wear-and-tear of aging worsens when vascular risk factors (VRF) to Alzheimer's disease develop that can accelerate both age-decline CBF and mitochondrial deficiency to a level where mild cognitive impairment (MCI) develops. To date, no pharmacological or any other treatment has been successful in reversing, stabilizing or delaying MCI. For the first time in medical interventions, a non-pharmacological, non-invasive, well-tolerated, easy to perform, free of significant side effects and cost-effective treatment may achieve what virtually all AD treatments in the past have been unable to accomplish. This intervention uses transcranial infrared brain stimulation (TIBS), a form of photobiomodulation (PBM). PBM is a bioenergetic non-ionizing, therapeutic approach using low level light emission from laser or light emitting diodes. PBM has been used in a number of neurological conditions including Parkinson's disease, depression, traumatic brain injury, and stroke with diverse reported benefits. This brief review examines the impact of reduced energy supply stemming from chronic brain hypoperfusion in the aging brain. In this context, the use of TIBS is planned in a randomized, placebo-controlled study of MCI patients to be done at our University Clinic. This article is part of the special issue entitled 'The Quest for Disease-Modifying Therapies for Neurodegenerative Disorders'. Brain;Cognitive Dysfunction;Humans;Laser Therapy;Mitochondria;Photons

Topical anesthetics for pediatric laser treatment. Topical anesthetic agent causes transient insensibility to pain in a limited area of skin, and provides effective anesthesia in a short onset time, short duration, with seldom local or systemic side effects on intact skin and is simple to use. Topical formulations may offer significant benefits for prevention of procedural pain. Currently, they are considered to be the most effective anesthesia for laser treatments. Unfortunately, there is no standard anesthetic technique for this procedure. Lasers are being widely used in numerous dermatological and esthetics treatments in childhood. The advancement of new knowledge in laser technology have contributed to the development of new lasers that are commonly used in a pediatric population, such as Pulsed Dye, Carbon-dioxide and Nd:YAG laser. The most commonly used topical anesthetics in young patients for minimally or moderately painful laser cutaneous procedures are Lidocaine, Prilocaine, Tetracaine gel and combinations thereof. Anesthetics, Local;Drug Combinations;Prilocaine;Lidocaine Anesthetics, Local;Drug Combinations;Drug Therapy, Combination;Humans;Lidocaine;Low-Level Light Therapy;Pain;Pediatrics;Prilocaine

Effects of Photobiomodulation and Ultrasound Applications on Orthodontically Induced Inflammatory Root Resorption; Transcriptional Alterations in OPG, RANKL, Cox-2: An Experimental Study in Rats. Objective: The aim of this study was to evaluate and compare the reparative and inhibitory effects of a light-emitting diode-mediated photobiomodulation (PBM) and of a low-intensity pulsed ultrasound (LIPUS) on orthodontically induced inflammatory root resorption (OIIRR). Materials and methods: Forty-nine Wistar rats were divided into four groups: untreated group (negative control), group treated with orthodontic appliances (positive control), PBM-treated group (wavelength: 618â€‰nm, output power density: 20â€‰mW/cm(2)), and LIPUS-treated group (frequency: 1.5%â€‰Â±â€‰5% MHz, pulse repetition ratio: 1.0%â€‰Â±â€‰10% kHz, effect area: 3.88%â€‰Â±â€‰1% cm(2) and intensity: 30%â€‰Â±â€‰30% mW/cm(2)). OIIRR was induced experimentally in rats for 14 days with an applied force of 100g, and therapeutic approaches were performed concurrently. At the end of the experiment, upper first molar teeth of rats were prepared for genetic analysis, scanning electron microscopy, hematoxylin and eosin staining, and tartrate-resistant acid phosphatase staining. Kruskal-Wallis and post hoc Dunn's tests were performed. Results: Number of osteoclasts (pâ€‰<â€‰0.01),

number of resorption lacunae and resorption area ratio (pâ€‰<â€‰0.001) decreased and number of total cells (pâ€‰<â€‰0.001) increased with the PBM and LIPUS applications when compared with the positive control group. Receptor activator of nuclear factor kappa B ligand (RANKL) levels of PBM and LIPUS groups were lower (pâ€‰<â€‰0.001), and osteoprotegerin (OPG) levels were higher (pâ€‰<â€‰0.001) than the positive control group. Cyclooxygenase-2 (Cox-2) expression significantly decreased with LIPUS and PBM administrations (pâ€‰<â€‰0.05). No significant difference was observed among PBM and LIPUS groups. Conclusions: PBM and LIPUS applications showed marked inhibitory and reparative effects on OIIRR by modulating the OPG/RANKL ratio, Cox-2 expression, and cell differentiation of osteoblasts and osteoclasts. Osteoprotegerin;RANK Ligand;Cyclooxygenase 2 Animals;Cyclooxygenase 2;Low-Level Light Therapy;Microscopy, Electron, Scanning;Molar;Osteoclasts;Osteoprotegerin;RANK Ligand;Rats;Rats, Wistar;Root Resorption;Tooth Resorption;Ultrasonic Waves

Laser Photobiomodulation Over Teeth Subjected to Orthodontic Movement. Background: Orthodontics of the 21st century requires aesthetic, painless, predictable, and quick treatments. This demand for faster results generated orthodontic movement acceleration protocols (OMAPs); among other OMAPs we present low-level laser (LLL) as a candidate. Objective: To evaluate levels of interleukin (IL)-1, IL-10, and type 1 collagen in the periodontal ligament of first molars of rats subjected to orthodontic traction with and without LLL irradiation, compared with untreated controls (CO), and to evaluate whether the dose of LLL used in this work is eligible as an OMAP. Materials and methods: A total of 35 male Wistar rats were distributed into three groups: group 1 NI (nonirradiated) nâ€‰=â€‰15, group 2 IR (laser irradiated using 5â€‰J, 177â€‰J/cm(2), and 100â€‰mW applied in contact to the vestibular mesial, vestibular distal, and palatal faces of gum tissue around molar region for 50â€‰sec each point, for 3 consecutive days, immediately 24 and 48â€‰h after orthodontic device placement.) nâ€‰=â€‰15, and group 3 CO nâ€‰=â€‰5; groups 1 and 2 were subjected to orthodontic force and each group was divided into three subgroups that were sacrificed after 3, 5, and 7 days, IL-1/10 and COL-1 levels were analyzed. Results: In the IR group, levels of IL-1/10 and COL-1 showed peak anticipation after LLL irradiation compared with those in the NI and CO groups. Conclusions: These results can also infer that this dose of LLL can be used as an OMAP. Collagen Type I;Interleukins Animals;Collagen Type I;Interleukins;Laser Therapy;Low-Level Light Therapy;Male;Molar;Periodontal Ligament;Rats;Rats, Wistar;Tooth Movement Techniques

Fractional CO(2) laser is as effective as pulsed dye laser for the treatment of hypertrophic scars. BACKGROUND: Both pulsed dye laser (PDL) and fractional CO(2) laser (FCO(2)L) are used commonly for the treatment of hypertrophic scars. OBJECTIVE: To compare the efficacy of PDL and FCO(2)L on hypertrophic scars. PATIENTS AND METHODS: One part of each scar, or one of the two similar scars in 35 patients was treated with PDL and the other parts, or scars were treated with FCO(2)L. The parameters used for FCO(2)L were: power = 30Â W, pulse energy = 50â€‰mJ, density = 200Â spots/cm(2). The parameters used for 585â€‰nm PDL were 9Â J/cm(2) with 5â€‰mm spot size. The FCO(2)L side was treated for three passes to debulk the scar. The coagulated tissue was wiped out before the next pass. The PDL side was treated with two superimposed passes. The procedures were repeated every month for 4Â months. RESULTS: After four sessions of laser therapy, both sides showed remarkable improvement but no meaningful difference was detected between two areas that were treated with PDL and FCO(2)Ls (pâ€‰>â€‰.05). The mean Vancouver Scar Scale was 7.31â€‰Â±â€‰1.93 in the beginning and 4.26â€‰Â±â€‰1.48 for FCO(2)L and 4.33â€‰Â±â€‰1.70 for PDL one months after the final session. CONCLUSIONS: Both PDL and FCO(2)Ls were equally effective on hypertrophic scars. Carbon Dioxide Carbon

Dioxide;Cicatrix, Hypertrophic;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome

Light emitting diode (LED) photobiomodulation therapy on murine macrophage exposed to Bothropstoxin-I and Bothropstoxin-II myotoxins. The light-emitting diode (LED) is considered a therapeutic tool due to its anti-inflammatory, analgesic, and wound-healing effects, which occur through angiogenesis, decrease in IL-1Î² and IL-6 secretion, and acceleration of the cicatricial process. Snakebites are an important public health problem in tropical regions of the world. LED treatment is a therapeutic tool associated with serum therapy used to minimize the local effects of snakebites, including decrease in creatine kinase (CK) and lactate dehydrogenase (LDH) concentrations, myonecrosis, and inflammatory and haemorrhagic responses. In this study, we analysed the photobiomodulation effect of LED on the activation of murine macrophages induced by BthTX-I or BthTX-II isolated from Bothrops jararacussu venom. Photobiomodulation caused an increase in mitochondrial metabolism and a considerable decrease in cytotoxicity in murine macrophages. Moreover, it induced a decrease in reactive oxygen species and nitrogen liberation. However, photobiomodulation caused an increase in macrophage phagocytic capacity and lipid droplet formation. The results of this study corroborated with those of others in an unprecedented way and provide a better understanding of the mechanism of action of photobiomodulation, besides offering a coadjuvant action treatment for the local effects of snakebites, not achieved with serum therapy alone. Crotalid Venoms;Reactive Oxygen Species;bothropstoxin;Group II Phospholipases A2;bothropstoxin II;Nitrogen Animals;Bothrops;Crotalid Venoms;Group II Phospholipases A2;Low-Level Light Therapy;Macrophages;Male;Mice;Mitochondria;Nitrogen;Reactive Oxygen Species

Effect of ozone and diode laser (635 nm) in reducing orthodontic pain in the maxillary arch-a randomized clinical controlled trial. The effect of ozone, diode laser irradiation, and presence of teeth crowding/spacing on pain perception in orthodontic patient was tested. Overall, 76 patients [55 women and 21 men; age 35.1(6.4) years] who met the inclusion criteria participated in the study. Immediately after fixed orthodontic appliance placement, the patients were exposed to a pain relief treatment (one single session) using either 635-nm diode laser (SmartM, Lasotronix, Warsaw, Poland) or ozone therapy (OzoneDTA, Apoza, New Taipei City, Taiwan) by placing the handpieces in the area of each teeth apex and interdental papillae, from the maxillary right first molar to the maxillary left first molar. Subjects were divided into three groups: control group (G1, n = 26), ozone (G2, n = 26, exposed to ozone therapy, generator probe type 3, working time per point 5 s, 23 points, application time 1 min and 55 s), and laser group (G3, n = 25, exposed to continuous mode diode laser, 400 mW, handpiece diameter 8 mm, spot area 0.5024 cm(2), power density per second 1.59 W/cm(2), dose 2 J per point, time: 5 s per point, 23 points, total energy per session 46 J, application time 1 min and 55 s). The level of teeth crowding was assessed using the Lundstrom indicator. The patients received a questionnaire for pain assessment (the Numeric Rating Scale, NRS-11, grade level 0-10) and recorded at 7 time points (1 h, 6 h, and 1, 2, 3, 4, and 5 days) after the fixed orthodontic appliance placement. The mean pain values for the diode laser, ozone, and control group were 3.6 (1.31) (95% CI, 2.95-4.25), 5.25 (3.37) (95% CI, 3.52-6.98), and 5.75 (2.40) (95% CI, 4.69-6.81), respectively. We observed lower pain values in the diode laser group compared to the control group ($p = 0.0237$). The use of ozone in this study did not result in significant pain reduction in comparison to control ($p = 0.8040$) and laser groups ($p = 0.1029$). There were no differences in pain perception between patients with crowded teeth and non-crowded teeth in each group (G1, $p = 0.66$, G2, $p = 0.86$, G3, $p = 0.24$). The use of 635-nm diode laser led to decreased pain perception; however, ozone and presence of teeth crowding/spacing did not affect the pain perception in orthodontic patients during the first 5 days after the fixed orthodontic appliance placement. Ozone Adult;Female;Humans;Lasers,

Semiconductor;Low-Level Light Therapy;Male;Malocclusion;Maxilla;Orthodontic Appliances, Fixed;Ozone;Pain;Pain Management;Pain Measurement;Pain Perception;Surveys and Questionnaires

Efficacy and safety of 1927 nm fractional Thulium fiber laser for the treatment of melasma: a retrospective study of 100 patients. Background: Melasma is an acquired hyperpigmentation of the skin that mostly affects areas exposed to the sun. The treatment of melasma can be challenging as it is prone to relapse. Recently, new laser and light-based treatment options have been used; one of these treatment modalities is the 1927Â nm fractional Thulium fiber laser.Objective: This study aimed to retrospectively evaluate the efficacy and safety of a 1927Â nm fractional Thulium fiber laser for the treatment of melasma.Materials and methods: This study retrospectively evaluated patients who were admitted to the dermatology outpatient clinic between September 2015 and March 2018 and treated with a 1927Â nm fractional Thulium fiber laser. The MASI score was used to assess improvements of the lesions.Results: The current study included a total of 100 patients who received 1927Â nm fractional Thulium fiber laser treatment. Each patient received two treatments at one month intervals. The mean baseline MASI score was 11.8Â Â±Â 6.3, the mean MASI score after the first session was 6.7Â Â±Â 4.1, and the mean MASI score after the second session was 3.4Â Â±Â 3.8. The differences between these three MASI scores were significant, and the laser treatment had no major side effects.Conclusion: Results of this study indicate that the 1927Â nm fractional Thulium fiber laser is a safe and effective treatment option for melasma. Thulium
Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Retrospective Studies;Thulium;Young Adult

Clinical and microbiological outcomes of photodynamic and systemic antimicrobial therapy in smokers with peri-implant inflammation. AIM: To compare the effectiveness of two protocols in the treatment of peri-implant mucositis (p-iM) among cigarette smokers. MATERIALS AND METHODS: Three groups were randomized into (i) single session of antimicrobial photodynamic therapy (aPDT) with mechanical debridement (MD) (Group-A), (ii) systemic AB with MD (Group-B), and (iii) MD alone (Group-C). Clinical peri-implant parameters including plaque scores (PS), bleeding on probing (BOP) and probing depth (PD) were measured at baseline, 6 weeks and 12 weeks. Microbiological parameters included the assessment of percentage level of Pseudomonas aeruginosa and Staphylococcus aureus at baseline and 12 weeks. All parameters were analyzed using Friedman test and multiple comparisons performed using Bonferroni tests. P-value less than 0.05 were considered statistically significant. RESULTS: At 6 weeks of follow-up, there was a statistically significant reduction in PS (pâ€¯<â€¯0.001), BOP (pâ€¯<â€¯0.01), and PD (pâ€¯<â€¯0.05) among patients in groups A and B on intragroup comparison. At 12 weeks of follow-up, there was a further significant reduction in PS (pâ€¯<â€¯0.001) and BOP (pâ€¯<â€¯0.01) among patients in groups A and B on intragroup comparison but this reduction was comparable with 6-week follow-up. On inter-group comparison, only Group-A showed statistically significant reduction in BOP compared to Group-B and C at 6 weeks (pâ€¯<â€¯0.05). The levels of both P. aeruginosa and S. aureus in Group-A and Group-B showed statistically significant reductions at 12 weeks compared with baseline (pâ€¯<â€¯0.01). On inter-group comparison, Group-A and B showed no significant differences at follow-up (pâ€¯>â€¯0.05). CONCLUSION: This short term clinical study suggests that aPDT as an adjunct to MD is as efficacious as adjunctive antibiotic therapy. However, additional benefits in the reduction of bleeding scores were observed for aPDT in peri-implant inflammation among cigarette smokers. Anti-Bacterial Agents;Photosensitizing Agents;Azithromycin Anti-Bacterial Agents;Azithromycin;Combined Modality Therapy;Debridement;Dental Health Surveys;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Peri-Implantitis;Photochemotherapy;Photosensitizing Agents;Pseudomonas aeruginosa;Smokers;Staphylococcus aureus

Photobiomodulation for the management of alopecia: mechanisms of action, patient selection and perspectives. Photobiomodulation (PBM) or low-level laser therapy was discovered over 50Â years ago, when Mester in Hungary observed regrowth of hair in mice when irradiated with a ruby laser. At the present time, several different PBM devices are marketed to assist with hair regrowth in alopecia patients. This review covers the three main types of alopecia (androgenetic, areata, and chemotherapy-induced), and discusses the mechanism of action of PBM for each disease. The different devices used (mostly low powered red laser diodes), dosimetry, animal models, and clinical trials are summarized. Criteria for patient selection are outlined. Finally a perspectives section looks forward to the future.

Exploring the Effects of Near Infrared Light on Resting and Evoked Brain Activity in Humans Using Magnetic Resonance Imaging. We explore whether near infrared light can change patterns of resting (task-negative) and/or evoked (task-positive; eg finger-tapping) brain activity in normal, young human subjects using fMRI (functional magnetic resonance imaging). To this end, we used a vielight transcranial device (810â€¯nm) and compared the scans in subjects after active- and sham-light sessions. Our fMRI results showed that, while light had no effect on cerebral blood flow and global resting state brain activity (task-negative), there were clear differences between the active- and sham-light sessions in the patterns of evoked brain activity after finger-tapping (task-positive). The evoked brain regions included the putamen, primary somatosensory and parietal association cortex, and the overall effect of the light was to suppress or reduce their activity. We also found that while light had no effect on the resting functional connectivity of the putamen and primary somatosensory cortex and the rest of the brain, it did have an effect on the functional connectivity of parietal association cortex. In summary, our fMRI findings indicated that transcranially applied light did have a major impact on brain activity in normal subjects, but only when the brain region was itself functionally active, when undertaking a particular task. We suggest that these light-induced changes, particularly those in parietal association cortex, were associated with attention and novelty, and served to deactivate the so-called default mode network. Our results lay the template for our planned fMRI explorations into the effects of light in both Alzheimer's and Parkinson's disease patients. Adult;Brain;Cerebrovascular Circulation;Evoked Potentials;Female;Humans;Infrared Rays;Male;Neural Pathways;Rest

Cognitive Enhancement by Transcranial Photobiomodulation Is Associated With Cerebrovascular Oxygenation of the Prefrontal Cortex. Transcranial infrared laser stimulation (TILS) is a novel, safe, non-invasive method of brain photobiomodulation. Laser stimulation of the human prefrontal cortex causes cognitive enhancement. To investigate the hemodynamic effects in prefrontal cortex by which this cognitive enhancement occurs, we used functional near-infrared spectroscopy (fNIRS), which is a safe, non-invasive method of monitoring hemodynamics. We measured concentration changes in oxygenated and deoxygenated hemoglobin, total hemoglobin and differential effects in 18 healthy adults during sustained attention and working memory performance, before and after laser of the right prefrontal cortex. We also measured 16 sham controls without photobiomodulation. fNIRS revealed large effects on prefrontal oxygenation during cognitive enhancement post-laser and provided the first demonstration that cognitive enhancement by transcranial photobiomodulation is associated with cerebrovascular oxygenation of the prefrontal cortex. Sham control data served to rule out that the laser effects were due to pre-post task repetition or other non-specific effects. A laser-fNIRS combination may be useful to stimulate and monitor cerebrovascular oxygenation associated with neurocognitive enhancement in healthy individuals and in those with prefrontal hypometabolism, such as in cognitive aging, dementia and many neuropsychiatric disorders.

Erbium: Yttrium Aluminum Garnet Laser Accelerates Healing in Indolent Diabetic Foot Ulcers. The objective of the study was to evaluate the effect of the erbium:yttrium aluminum garnet (YAG)

laser on diabetic foot ulcers (DFUs) that had not responded to standard care. We retrospectively evaluated 22 nonhealing DFUs that received at least 4 weeks of standard wound care, demonstrated poor healing response, and subsequently were treated with an erbium:YAG laser. We measured the percent wound area reduction (PWAR) for the 4 weeks before initiating laser therapy and the PWAR for 4 weeks after the initiation of laser therapy. Erbium:YAG laser treatment consisted of 2 components: debridement and resurfacing. The laser settings were the same for all treatments. We used the paired t test to compare pretreatment with posttreatment wound area reduction. During the 4-week period before the initiation of laser therapy, the average PWAR was -33.6%. Four weeks after initiating treatment with the erbium:YAG laser, the average PWAR was 63.4% (pâ€¯=â€¯.002) and 72.7% of wounds had â‰¥50% PWAR. By 12 weeks, 50% of wounds had healed. Erbium:YAG laser therapy accelerated DFU healing in a cohort of patients with ulcers that had been unresponsive to standard of care therapy. yttrium-aluminum-garnet;Yttrium;Aluminum Aluminum;Diabetic Foot;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Treatment Outcome;Wound Healing;Yttrium

Photobiomodulation as oedema adjuvant in post-orthognathic surgery patients: A randomized clinical trial. OBJECTIVE: Photobiomodulation therapy (PBMT) has been used in multiple applications in general medicine as powerful anti-inflammatory, analgesic and reducing oedema in different parts of the body. The aim of this study is to compare the effect on post-surgical oedema after mandibular orthognathic surgery, between two different laser power densities and oral medication with non-steroidal anti-inflammatory. MATERIALS AND METHODS: In a randomized clinical trial, on 60 patients who were subject to mandibular orthognathic surgery were divided into three groups. All groups received sodium naproxen 250mg every 8hours for 6days. Two groups were irradiated with two different laser application protocols and the other was a control group. In G1 group the irradiation parameters three times per week for two weeks were: 940nm, in continuous mode, 2.5W, 120s, 85.71J/cm(2), 0.89W/cm(2), over the right and left side with a distance from the skin surface of 1mm with the whitening handpiece (spot size of 2.8cm(2)). In G2, the irradiation parameters three times a week for two weeks were: 940nm, in continuous mode, 4.1W, 120s, 68.33J/cm(2), 0.58W/cm(2) over the right and left side with a distance from the skin surface of 15mm, with the deep tissue handpiece (spot size of 7.1cm(2)). In all the groups, millimetric facial measurements were taken from tragus to lateral commissure, and from lateral commissure to gonion in both sides. RESULTS: All differences between T1 and T6 were significant for the three groups, (paired T, $P<0.05$). The differences between the groups were generally not significant ($P>0.05$) except for commissureÂ -Â right and left gonion when compared G1 vs CG ($P<0.05$) and G2 vs CG ($P<0.05$). Initial changes (T1-T2) between groups were significantly different except for the measurement from commissure to right tragus G1 vs CG ($P=0.411$) and from commissure to left tragus G2 vs CG ($P=0.94$). The faster resolution of the oedema occurred in G2 group. PTBM with an energy density of 68.33J/cm(2) was the most effective adjuvant to oral medication with non-steroidal anti-inflammatory, to decrease post-surgical oedema after mandibular orthognathic surgery. Anti-Inflammatory Agents, Non-Steroidal;Naproxen Adolescent;Adult;Anti-Inflammatory Agents, Non-Steroidal;Edema;Female;Humans;Low-Level Light Therapy;Male;Mandible;Naproxen;Orthognathic Surgical Procedures;Pain, Postoperative;Postoperative Complications;Radiotherapy, Adjuvant;Young Adult

Photobiomodulation by diffusing optical fiber on spinal cord: A feasibility study in piglet model. Previous studies on spinal cord injury (SCI) have confirmed that percutaneous photobiomodulation (PBM) therapy can ameliorate immunoinflammatory responses at sites of injury, accelerate nerve regeneration, suppress glial scar formation and promote the subsequent recovery of locomotor function. The current study was performed to evaluate a large-animal model employing implanted optical fibers to accurately irradiate targeted spinal segments. The method's feasibility and irradiation

parameters that do not cause phototoxic reaction were determined, and the methodology of irradiating the spinal cord with near-infrared light was investigated in detail. A diffusing optical fiber was implanted above the T9 spinal cord of Bama miniature pigs and used to transfer near-infrared light (810â€‰nm) onto the spinal cord surface. After daily irradiation with 200, 300, 500 or 1000â€‰mW for 14â€‰days, both sides of the irradiated area of the spinal cord were assessed for temperature changes. The condition of the spinal cord and the position of optical fiber were investigated by magnetic resonance imaging (MRI), and different parameters indicating temperature increases or phototoxicity were measured on the normal spinal cord surface due to light irradiation (ie, heat shock responses, inflammatory reactions and neuronal apoptosis), and the animals' lower-limb neurological function and gait were assessed during the irradiation process. The implanted device was stable inside the freely moving animals, and light energy could be directly projected onto the spinal cord surface. The screening of different irradiation parameters preliminary showed that direct irradiation onto the spinal cord surface at 200 and 300â€‰mW did not significantly increase the temperature, stress responses, inflammatory reactions and neural apoptosis, whereas irradiation at 500â€‰mW slightly increased these parameters, and irradiation at 1000â€‰mW induced a significant temperature increase, heat shock, inflammation and apoptosis responses. HE staining of spinal cord tissue sections did not reveal any significant structural changes of the tissues compared to the control group, and the neurological function and gait of all irradiated animals were normal. In this study, we established an in-vivo optical fiber implantation method, which might be safe and stable and could be used to directly project light energy onto the spinal cord surface. This study might provide a new perspective for clinical applications of PBM in acute SCI. Animals;Disease Models, Animal;Feasibility Studies;Optical Fibers;Recovery of Function;Spinal Cord;Spinal Cord Injuries;Swine

Low-level laser therapy 810-nm up-regulates macrophage secretion of neurotrophic factors via PKA-CREB and promotes neuronal axon regeneration in vitro. Macrophages play key roles in the secondary injury stage of spinal cord injury (SCI). M1 macrophages occupy the lesion area and secrete high levels of inflammatory factors that hinder lesion repair, and M2 macrophages can secrete neurotrophic factors and promote axonal regeneration. The regulation of macrophage secretion after SCI is critical for injury repair. Low-level laser therapy (810-nm) (LLLT) can boost functional rehabilitation in rats after SCI; however, the mechanisms remain unclear. To explore this issue, we established an in vitro model of low-level laser irradiation of M1 macrophages, and the effects of LLLT on M1 macrophage polarization and neurotrophic factor secretion and the related mechanisms were investigated. The results showed that LLLT irradiation decreased the expression of M1 macrophage-specific markers, and increased the expression of M2 macrophage-specific markers. Through forward and reverse experiments, we verified that LLLT can promote the secretion of various neurotrophic factors by activating the PKA-CREB pathway in macrophages and finally promote the regeneration of axons. Accordingly, LLLT may be an effective therapeutic approach for SCI with clinical application prospects. Culture Media, Conditioned;Cyclic AMP Response Element-Binding Protein;Isoquinolines;Nerve Growth Factors;Protein Kinase Inhibitors;RNA, Messenger;Sulfonamides;Cyclic AMP-Dependent Protein Kinases Animals;Axons;Culture Media, Conditioned;Cyclic AMP Response Element-Binding Protein;Cyclic AMP-Dependent Protein Kinases;Female;Ganglia, Spinal;Isoquinolines;Low-Level Light Therapy;Macrophages;Male;Mice, Inbred BALB C;Nerve Growth Factors;Nerve Regeneration;Protein Kinase Inhibitors;RNA, Messenger;Sulfonamides

Effect of Combined Application of Growth Factors and Diode Laser Bio-Stimulation on the Osseo Integration of Dental Implants. BACKGROUND: The success of implants is associated first with their osseointegration, and later on with their survival rate. In recent years, many efforts have been

exerted to develop implant design, geometry, materials and techniques to enhance the osseointegration process and also to increase the success rate of implant procedures. New techniques, like leukocyte and platelet-rich fibrin (L-PRF) and low-level laser treatment (LLLT), have been developed to enhance the osseointegration around dental implants. AIM: This study aims at accelerating bone osseointegration process around dental implant using new techniques to increase the success rate, to allow immediate or early loading of a dental implant, and to make a comparison between the various new techniques in dental implant procedures to figure out which technique will achieve the best results. METHODS: The study was conducted on a random sample of 40 male patients. Dental implants were placed in the posterior areas of the lower jaw. Patients were divided randomly into 4 groups; control group, LLLT group, L-PRF group and L-PRF plus LLLT group. They were assessed using cone-beam computed tomography (CBCT). RESULTS: The results showed significant differences between all groups over different measured times. All the groups showed improvement in comparison with Normal group, where L-PRF group showed the best result followed by (L-PRF+LLLT) group, while the LLLT group showed the least improvement in comparison with bothL-PRF group and (L-PRF+LLLT) group. CONCLUSION: The study demonstrates that L-PRF gives a better performance in the osseointegration around dental implants than LLLT.

Energy-dependent effect trial of photobiomodulation on blood pressure in hypertensive rats. The main purpose of this work was to construct an energy-dependent response curve of photobiomodulation on arterial pressure in hypertension animal model. To reach this objective, we have used a two-kidney one clip (2K-1C) rat model. Animals received acute laser light irradiation (660Â nm) on abdominal region using different energy (0.6, 1.8, 3.6, 7.2, 13.8, 28.2, 55.8, and 111.6Â J), the direct arterial pressure was measured by femoral cannulation, and systolic arterial pressure (SAP), diastolic arterial pressure (DAP), heart rate (HR), and time of effect were obtained. Our results indicated that 660Â nm laser light presents an energy-dependent hypotensive effect, and 28.2Â J energy irradiation reached the maximum hypotensive effect, inducing a decreased SAP, DAP, and HR (decrease in SAP: -â€‰19.23â€‰Â±â€‰1.82Â mmHg, nâ€‰=â€‰11; DAP: -â€‰9.57â€‰Â±â€‰2.23Â mmHg, nâ€‰=â€‰11; HR: -â€‰39.15â€‰Â±â€‰5.10Â bpm, nâ€‰=â€‰11; and time of hypotensive effect: 3068.00â€‰Â±â€‰719.00Â s, nâ€‰=â€‰11). The higher energy irradiation evaluated (111.6Â J) did not induce a hypotensive effect and induced an increase in HR (21.69â€‰Â±â€‰7.89Â bpm, nâ€‰=â€‰7). Taken together, our results indicate that red laser energy irradiation from 7.2 to 55.8Â J is the effective therapeutic window to reduce SAP, DAP, MAP, and HR and induce a long-lasting hypotensive effect in rats, with effect loss at higher energy irradiation (111.6Â J). Animals;Blood Pressure;Diastole;Heart Rate;Hypertension;Hypotension;Low-Level Light Therapy;Male;Rats, Wistar;Systole

Activation of PKA/SIRT1 signaling pathway by photobiomodulation therapy reduces AÎ² levels in Alzheimer's disease models. A hallmark of Alzheimer's disease (AD) is the accumulation of amyloid-Î² (AÎ²), which correlates significantly with progressive cognitive deficits. Although photobiomodulation therapy (PBMT), as a novel noninvasive physiotherapy strategy, has been proposed to improve neuronal survival, decrease neuron loss, ameliorate dendritic atrophy, and provide overall AD improvement, it remains unknown whether and how this neuroprotective process affects AÎ² levels. Here, we report that PBMT reduced AÎ² production and plaque formation by shifting amyloid precursor protein (APP) processing toward the nonamyloidogenic pathway, thereby improving memory and cognitive ability in a mouse model of AD. More importantly, a pivotal protein, SIRT1, was involved in this process by specifically up-regulating ADAM10 and down-regulating BACE1, which is dependent on the cAMP/PKA pathway in APP/PS1 primary neurons and SH-SY5Y cells stably expressing human APP Swedish mutation (APPswe). We further found that the activity of the mitochondrial photoacceptor cytochrome c oxidase (CcO) was responsible for PBMT-induced

activation of PKA and SIRT1. Together, our research suggests that PBMT as a viable therapeutic strategy has great potential value in improving cognitive ability and combatting AD. Amyloid beta-Peptides;Sirt1 protein, mouse;Sirtuin 1 Alzheimer Disease;Amyloid beta-Peptides;Animals;Disease Models, Animal;Humans;Low-Level Light Therapy;Mice;Mice, Transgenic;Sirtuin 1

Treatment of Post-Inflammatory Hyperpigmentation in Patients With Darker Skin Types Using a Low Energy 1,927â€‰nm Non-Ablative Fractional Laser: A Retrospective Photographic Review Analysis. BACKGROUND AND OBJECTIVES: Post inflammatory hyperpigmentation (PIH) can be difficult to treat especially in patients with darker skin types as darker skin carries increased epidermal melanin content. Various treatments available to improve the appearance of PIH may incite further pigmentation thus making treatment extremely difficult and frustrating. The purpose of this study was to perform a retrospective chart and photographic review to evaluate the efficacy and safety profile of a low energy low density non-ablative fractional1927 nm wavelength laser treatment for PIH in patients with Fitzpatrick skin types IV-VI. STUDY DESIGN: A retrospective evaluation of 61 patients with PIH treated with a 1927 nm laser was conducted at a single center. Inclusion criteria required at least 2 treatment sessions so that before and after treatment photographs would be available for comparison and study purposes. Two blinded physician-evaluators using a visual analog scale for percentage of pigmentary clearance in standard photographs assessed treatment efficacy. RESULTS: The mean percent improvement after treatment, evaluated by two dermatologists was 43.24%. The correlation between raters was statistically significant (Pearson's correlation coefficienct of râ€‰=â€‰0.59, pâ€‰<â€‰0.0001). No side effects were observed in the patients treated with the 1927 nm laser. CONCLUSION: The low energy low density non-ablative fractional 1927 nm wavelength laser is a safe and effective modality for improving post inflammatory hyperpigmentation in patients with darker skin types. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adult;Aged;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Photography;Retrospective Studies;Skin Pigmentation;Treatment Outcome

Efficacy of low-level laser therapy on pain and disability in knee osteoarthritis: systematic review and meta-analysis of randomised placebo-controlled trials. OBJECTIVES: Low-level laser therapy (LLLT) is not recommended in major knee osteoarthritis (KOA) treatment guidelines. We investigated whether a LLLT dose-response relationship exists in KOA. DESIGN: Systematic review and meta-analysis. DATA SOURCES: Eligible articles were identified through PubMed, Embase, Cumulative Index to Nursing and Allied Health Literature, Physiotherapy Evidence Database and Cochrane Central Register of Controlled Trials on 18 February 2019, reference lists, a book, citations and experts in the field. ELIGIBILITY CRITERIA FOR SELECTING STUDIES: We solely included randomised placebo-controlled trials involving participants with KOA according to the American College of Rheumatology and/or Kellgren/Lawrence criteria, in which LLLT was applied to participants' knee(s). There were no language restrictions. DATA EXTRACTION AND SYNTHESIS: The included trials were synthesised with random effects meta-analyses and subgrouped by dose using the World Association for Laser Therapy treatment recommendations. Cochrane's risk-of-bias tool was used. RESULTS: 22 trials (n=1063) were meta-analysed. Risk of bias was insignificant. Overall, pain was significantly reduced by LLLT compared with placebo at the end of therapy (14.23 mm Visual Analogue Scale (VAS; 95% CI 7.31 to 21.14)) and during follow-ups 1-12 weeks later (15.92 mm VAS (95% CI 6.47 to 25.37)). The subgroup analysis revealed that pain was significantly reduced by the recommended LLLT doses compared with placebo at the end of therapy (18.71 mm (95% CI 9.42 to 27.99)) and during follow-ups 2-12 weeks after the end of therapy (23.23 mm VAS (95% CI 10.60 to 35.86)). The pain reduction from the recommended LLLT doses peaked during follow-ups 2-4 weeks after the end of therapy (31.87 mm VAS significantly beyond placebo (95% CI 18.18 to 45.56)). Disability was also statistically significantly

reduced by LLLT. No adverse events were reported. CONCLUSION: LLLT reduces pain and disability in KOA at 4-8 J with 785-860 nm wavelength and at 1-3 J with 904 nm wavelength per treatment spot. PROSPERO REGISTRATION NUMBER: CRD42016035587. Arthralgia;Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Randomized Controlled Trials as Topic;Treatment Outcome

Effects of photobiomodulation therapy combined to static magnetic field in strength training and detraining in humans: protocol for a randomised placebo-controlled trial. INTRODUCTION: In recent years, it has been demonstrated that photobiomodulation therapy (PBMT) using low-level laser therapy and/or light-emitting diode therapy combined to static magnetic field (sMF) has ergogenic effects, improving muscular performance and accelerating postexercise recovery. However, many aspects related to these effects and its clinical applicability remain unknown. Therefore, the aim of this project is to evaluate the ergogenic effects of PBMT/sMF in detraining after a strength-training protocol. METHODS AND ANALYSIS: The study will be a randomised, triple-blind, placebo-controlled clinical trial. Healthy male volunteers will be randomly distributed into four experimental groups: PBMT/sMF before training sessions + PBMT/sMF during detraining, PBMT/sMF before training sessions + placebo during detraining, placebo before training sessions + PBMT/sMF during detraining and placebo before training sessions + placebo during detraining. Strength-training sessions will be carried out over 12 weeks, and the detraining period will occur during the 4 weeks after. The muscular strength and the structural properties of quadriceps will be analysed. ETHICS AND DISSEMINATION: This study was approved by the Research Ethics Committee of Nove de Julho University. The results from this study will be disseminated through scientific publications in international peer-reviewed journals and presented at national and international scientific meetings. TRIAL REGISTRATION NUMBER: NCT03858179. Adult;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Magnetic Fields;Male;Muscle Strength;Quadriceps Muscle;Resistance Training;Young Adult;Randomized Controlled Trials as Topic

Conservative treatment of Achilles tendon partial tear in a futsal player: A case report. Background and purpose: Achilles tendon is the most commonly injured part in the lower limb, especially in athletes. Treatment options for Achilles tendinopathy and total rupture are well described; however, there is a lack of information regarding treatment protocols for partial tears. Thus, the purpose of this case report was to describe the examination, intervention and outcomes of patient who suffered an acute Achilles tendon partial tear. Case description: A case is described here, in which the diagnosis of Achilles tendon partial tear was based on both magnetic resonance imaging and physical evaluation. Both the patient and the physical therapy team opted for non-surgical treatment. A 12-week course of conservative treatment including exercise, tendon loading, electrical stimulation, and photobiomodulation is described. Outcomes: Ankle dorsiflexion range of motion and hop tests. Discussion: This case report demonstrated that non-surgical treatment for Achilles tendon partial tear was effective for this patient and enabled the athlete to return to pre-injury levels of activity 6 months following the injury. Achilles Tendon;Conservative Treatment;Humans;Range of Motion, Articular;Rupture;Tendinopathy

Low-level laser therapy improves pain in postcesarean section: a randomized clinical trial. This study aimed to evaluate the effect of low-level laser therapy (LLLT) on immediate postpartum pain relief during cesarean section. A randomized, parallel controlled trial was carried out. In total, 88 women with immediate postpartum were divided into 4 groups: control group (n = 22), placebo group (n = 22), experimental group I (n = 22, dose of 4 J/cm(2)), and experimental group II (n = 22, dose of 2 J/cm(2)). The pain measured by Numeric Rating Scale (NRS), algometry, and Global Change Perception Scale (GCPS) was assessed at 12, 20-24, and 44-48 h postpartum. Two LLLT sessions were performed at 12 and 24 h postpartum. A significant interaction was observed between time versus group for NRS $F(2.40) = 36.80$, $p < 0.001$ and algometry $F(1.70) = 27.18$, $p < 0.001$. GCPS revealed a

significant difference between the groups during second (p = 0.04) and third evaluation (p = 0.04). The NRS and algometry presented a large effect size for the experimental groups. LLLT is an efficient method to reduce pain and enhance the GCP in postcesarean section. No significant clinical differences were found between the laser doses. Adolescent;Adult;Cesarean Section;Female;Humans;Low-Level Light Therapy;Pain, Postoperative;Pregnancy;Young Adult

Clinical factors affecting the efficacy of melasma treatment using the Q-switched 1064 Nd: YAG laser mode in a group of Venezuelan female patients. The influence of melasma risk factors on the effectiveness of laser toning treatment in Venezuelan females was investigated. Clinical evaluation was performed (n = 64) including ultrasound and thyroid hormone profile. All patients underwent face exposure with laser toning, eight sessions weekly. VISIA percentiles corresponding to dark brown spots determined before and after treatment were compared by ANOVA. Differences between percentile values before and after treatment for each patient were calculated and expressed as percentages. An improvement of â‰¥30% was considered as significant. Spearman rank correlations between improvement and clinical parameters were determined. A significant increase (p > .005) of the median of the percentiles in the overall group was observed. However, only 62.5% of the patients exhibited an improvement of â‰¥30% at the right malar, 73.4% at the frontal and 71.8% at the left malar areas. Hormonal contraception during treatment (right malar: p < .0001 left malar: p = .0035), thyroid disorders (right malar: p < .0001; frontal: p = .011; left malar: p < .0001) and photoaging (right malar: p = .0235; frontal: p = .0237; left malar: p = .0137) were inversely associated to melasma improvement after treatment. Prolonged use of sunscreen improved significantly (right malar: p < .001; frontal: p = .016 and left malar: p = .025) treatment effectiveness. Adult;Female;Hormonal Contraception;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Skin Aging;Thyroid Diseases;Venezuela

Safety of Combination Laser or Intense Pulsed Light Therapies and Doxycycline for the Treatment of Rosacea. BACKGROUND: Current treatment options for rosacea include topical agents, oral therapies, phototherapy using lasers, or intense pulsed light (IPL). Combination therapy for rosacea often yields better results than monotherapy. The safety of laser/light treatments in combination with systemic doxycycline has been questioned because of the theoretical risk of photosensitivity. OBJECTIVE: The purpose of this study was to assess the incidence of phototoxicity or photosensitivity in rosacea patients receiving concomitant laser or light treatments and systemic doxycycline. METHODS: Treatment records of 36 patients receiving laser/light treatments while also being treated with standard dose or anti-inflammatory dose of doxycycline were retrospectively reviewed. RESULTS: No adverse reactions related to doxycycline combined with laser/light therapy were reported. Specifically, no photosensitivity or sensitivity to wavelengths in the pulsed dye laser (PDL), or IPL range was observed in this cohort. All patients achieved some degree of clearance. CONCLUSION: The results of this retrospective study demonstrate that doxycycline used in conjunction with laser or nonlaser light therapy is a valid combination therapy for improving signs and symptoms of rosacea. No photosensitivity reactions were observed to commonly used IPL or PDL devices. Anti-Bacterial Agents;Delayed-Action Preparations;Doxycycline Administration, Cutaneous;Adolescent;Adult;Aged;Anti-Bacterial Agents;Combined Modality Therapy;Delayed-Action Preparations;Doxycycline;Female;Humans;Intense Pulsed Light Therapy;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Photosensitivity Disorders;Retrospective Studies;Rosacea;Skin;Treatment Outcome;Young Adult

Evaluation of subject response following treatment for pigmentation or wrinkles using a diode laser. BACKGROUND: Pulsed diode array laser systems are utilized extensively for various aesthetic indications such as removal of unwanted hair, treatment of vascular and pigmented lesions, and wrinkle reduction. OBJECTIVE: The purpose of this study was to report and assess the experience of

using a diode laser system delivering pulsed infrared laser light at the near-infrared (NIR) spectrum at wavelengths of 805 and 1060Â nm. METHODS: The study was a retrospective analysis of treatment outcomes in adult subjects treated at the clinic between January 2017 and April 2018 for wrinkles and pigmentation with a noninvasive aesthetic diode laser system. Subjects were treated at nominal wavelengths of 805Â nm for pigmentation and 1060Â nm for wrinkles reduction. Improvement in pigmentation and wrinkles, adverse events, and patient tolerability to treatment and satisfaction were evaluated. RESULTS: Of 44 subjects with Fitzpatrick skin types II-IV, eight were treated for pigmentation and 36 for wrinkles. For both treatments, subjects reported tolerable pain levels. All immediate responses resolved within 48Â hours post-treatment. Evaluation of treatment outcomes by two blinded evaluators demonstrated significant pigmentation clearance mean of 2.50Â Â±Â 0.15, (PÂ <Â .05) in subjects treated for pigmentation, as well as significant improvement mean of 0.46Â Â±Â 0.12 (PÂ =Â .005) in wrinkles in 13 subjects (41%) whose "before" and "after treatment" photographs were correctly identified by both blinded evaluators. Subjects were satisfied with the treatments. CONCLUSIONS: Use of the Diode laser effectively resulted in improvement in pigmentation and wrinkles, while maintaining a high safety profile with limited downtime. Adult;Esthetics;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pigmentation Disorders;Retrospective Studies;Rhytidoplasty;Skin Aging;Skin Pigmentation;Treatment Outcome

Photobiomodulation therapy for repeated closed head injury in rats. Repeated traumatic brain injury, leads to cumulative neuronal injury and neurological impairments. There are currently no effective treatments to prevent these consequences. Growing interest is building in the use of transcranial photobiomodulation (PBM) therapy to treat traumatic brain injury. Here, we examined PBM in a repeated closed head injury (rCHI) rat model. Rats were administered a total of three closed head injuries, with each injury separated by 5â€‰days. PBM treatment was initiated 2 hours after the first injury and administered daily for a total of 15â€‰days. We found that PBM-treated rCHI rats had a significant reduction in motor ability, anxiety and cognitive deficits compared to CHI group. PBM group showed an increase of synaptic proteins and surviving neurons, along with a reduction in reactive gliosis and neuronal injury. These findings highlight the complexity of gliosis and neuronal injury following rCHI and suggest that PBM may be a viable treatment option to mitigate these effects and their detrimental consequences. Animals;Brain Injuries, Traumatic;Cognitive Dysfunction;Head Injuries, Closed;Low-Level Light Therapy;Neurons;Rats

Efficacy of the photobiomodulation therapy in the treatment of the burning mouth syndrome. BACKGROUND: This study aims to evaluate the efficacy of the photobiomodulation therapy (PBMT) - in terms of pain and of quality of life- in patients affected by burning mouth syndrome (BMS). MATERIAL AND METHODS: This study was designed as a randomised double-blinded prospective study. Patients diagnosed with BMS in the period from June 2015 to June 2018 were recruited. The patients were randomised into two groups and each received treatment once a week for ten weeks: group A received laser therapy (K Laser Cube 3) while group B was given sham therapy (placebo). Pain was evaluated through the Visual Analogue Scale (VAS) and quality of life was assessed with the short form of the Oral Health Impact Profile (OHIP-14). Assessment was done at baseline and after every therapy session. The researchers were blind to the randomised allocations. RESULTS: A total of 85 patients were analysed. Group A (laser treatment) was composed of 43 patients while group B (sham therapy) of 42 patients. Patients treated with PBMT showed a significant decrease in symptoms (p=0.0008) and improved quality of life related to oral health (p=0.0002). CONCLUSIONS: PBMT has demonstrated to have a positive effect in relieving BMS symptoms and in improving a patient's overall quality of life. Burning Mouth Syndrome;Humans;Low-Level Light Therapy;Prospective Studies;Quality of Life;Surveys and Questionnaires

Acute effects of photobiomodulation therapy applied to respiratory muscles of chronic obstructive pulmonary disease patients: a double-blind, randomized, placebo-controlled crossover trial. To investigate the effects of photobiomodulation applied to respiratory muscles on lung function, thoracoabdominal mobility, respiratory muscle strength, and functional capacity in COPD patients. This is a randomized double-blind crossover clinical trial. Twelve male COPD patients participated in the study. Participants were randomly allocated to receive two photobiomodulation sessions, 1Â week apart: (1) an effective photobiomodulation session applied at the main respiratory muscles by means of a cluster with 69 light-emitting diodes (LEDs), containing 35 red (630â€‰Â±â€‰10Â nm; 10Â mW; 0.2Â cm(2)) and 34 near-infrared (830â€‰Â±â€‰20Â nm; 10Â mW; 0.2Â cm(2)) LEDs and (2) a sham photobiomodulation session, following the same procedures without emitting light. The primary outcomes were pulmonary function (spirometric indexes); thoracoabdominal mobility (cirtometry); respiratory muscle strength (maximal respiratory pressures), assessed at three moments: (1) baseline, (2) 1Â h after intervention, and (3) 24Â h after intervention; and the functional capacity, assessed by the 6-min walk test (6MWT) at baseline and 24Â h after intervention. No significant interactions were found for spirometric variables, maximal respiratory pressures, and cirtometry. However, there was a Time Ã— Condition interaction (Fâ€‰=â€‰18.63; pâ€‰=â€‰0.001; Î·(2)(p)â€‰=â€‰0.62) in the walked distance on the 6MWT, with a significant increase after photobiomodulation intervention (pâ€‰<â€‰0.01) compared with the baseline. Photobiomodulation applied to respiratory muscles was effective in improving acute functional capacity in COPD patients. To the best of our knowledge, this is the first study assessing the effects of photobiomodulation applied to respiratory muscles in patients with COPD. Placebos Aged;Cross-Over Studies;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Placebos;Pulmonary Disease, Chronic Obstructive;Respiratory Muscles;Spirometry;Walk Test

Blinded, Randomized, Controlled Trial Evaluating the Effects of Light-Emitting Diode Photomodulation on Lower Extremity Wounds Left to Heal by Secondary Intention. BACKGROUND: Light-emitting diode (LED) has been used for wound healing because of its stimulatory effects on fibroblast proliferation, matrix synthesis, angiogenesis, and downmodulation of inflammatory reactions. OBJECTIVE: The aim of the authors' study was to investigate the effects of red LED (wavelength 633 nm) photomodulation on lower extremity surgical defects left to heal by secondary intention. MATERIALS AND METHODS: Fourteen subjects with surgical defects of the lower leg were irradiated with a 633 Â± 3-nm light source for 20 minutes (105 mW/cm, 126 J/cm) at 4 weekly sessions. RESULTS: The number of days required for wounds to heal was greater in the treatment group (63.2 Â± 12.2 days) than in the control group (48.67 Â± 11.1 days), although this difference was not statistically significant (p = .07). The percentage of the original wound remaining was not statistically different between treatment and control groups between Weeks 1 and 2 (p = .71) and Weeks 3 and 4 (p = .56). It was significant between Weeks 2 and 3 (p = .01). CONCLUSION: This study revealed that red LED photomodulation at a wavelength of 633 nm did not result in clinical improvement in wound healing of surgical defects on the lower extremities. Aged;Aged, 80 and over;Female;Florida;Humans;Low-Level Light Therapy;Lower Extremity;Male;Middle Aged;Time Factors;Wound Healing

Evaluation of the use of photobiomodulation following the placement of elastomeric separators: Protocol for a randomized controlled clinical trial. BACKGROUND: Pain stemming from the placement of elastomeric separators and the exchanging of wires and accessories is the greatest reason for abandoning orthodontic treatment. Indeed, discomfort related to treatment exerts a negative impact on quality of life due to the difficulty chewing and biting. This paper proposes a study to evaluate the analgesic effects of photomiobodulation (PBM) on individuals undergoing orthodontic

treatment. METHODS: The sample will be composed of 72 individuals who receiving elastomeric separators on the mesial and distal faces of the maxillary first molars. The patients will be randomly allocated to 2 groups: an experimental group irradiated with low-level laser and a sham group submitted to simulated laser irradiation. Upon the placement of the separators, the experimental group will receive a single application of PBM on the mesial and distal cervical portion and apical third of the molars. Perceived pain will be analyzed after one hour using the visual analog scale in both groups. Samples will be taken of the gingival crevice with absorbent paper for 30â€Šseconds for the analysis of cytokines using ELISA and the results of the 2 groups will be compared. The patients will sign a statement of informed consent. Statistical analysis will be performed with the Student's t test and analysis of variance (ANOVA). DISCUSSION: The expectation is that the patients in the irradiated group will have a lower perception of pain and lower quantity of cytokines compared to those in the sham group. The purpose of the study is to establish an effective method for PBM with the use of low-level infrared laser (Ga-Al-As with a wavelength of 808â€Šnm and output power of 100 mW) for reductions in pain and inflammatory cytokines related to orthodontic treatment. TRIAL REGISTRATION: This protocol was registered in ClinicalTrial.gov, under number NCT03939988. It was first posted and last updated in May 6, 2019. Elastomers Adolescent;Adult;Analysis of Variance;Elastomers;Female;Humans;Low-Level Light Therapy;Male;Molar;Orthodontic Appliances;Pain Measurement;Pain, Procedural;Quality of Life;Randomized Controlled Trials as Topic;Tooth Movement Techniques;Treatment Outcome;Young Adult

Photobiomodulation for the palliation of oral mucositis in cancer patients: the future is here. Diffusion of Innovation;Humans;Low-Level Light Therapy;Neoplasms;Palliative Care;Practice Guidelines as Topic;Safety;Stomatitis

Use of laser therapy in the treatment of severe rhinophyma: a report of two cases. Rhinophyma is a rare manifestation of rosacea. It is clinically characterized by sebaceous hypertrophy, fibrosis, and telangiectasia. Usually, it is considered as a cosmetic defect; however, in some cases, it might cause problems with nasal breathing and food consumption which forces the need for treatment. The following article presents the effectiveness of laser treatment with the neodymium-yttrium-aluminum garnet (Nd:YAG), carbon dioxide laser (CO(2)), and fractional CO(2) laser. yttrium-aluminum-garnet;Yttrium;Aluminum Aged;Aluminum;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Rhinophyma;Yttrium

"Efficacy of photodynamic therapy on the treatment of herpes labialis: A systematic review". OBJECTIVE: We conducted a systematic review to evaluate the efficacy of PDT in the management of recurrent herpes labialis (RHL). STUDY DESIGN: systematic review. METHODS: This study was reported according to the PRISMA checklist and we performed a literature search on five databases. RESULTS: The search revealed that there are no published clinical trials addressing PDT on RHL, therefore we conducted a review of case reports and five studies were included for qualitative review. The number of treated patients varied from 2 to 6 in each article. Most studies used methylene blue as a photosensitizer, while one used 5-aminolevulinic acid. For light irradiation, most studies used laser and one used a red light from halogen lamp. Patients' follow-up varied from 24â€¯h to 12 months. All articles reported good outcomes with resolution of disease and no recurrences. Only one study reported adverse effects during treatment (burning and pain). CONCLUSION: The results of this review suggest that PDT could be an effective treatment for herpes labialis. However, due to very few case reports and heterogeneity among protocols, there is a call for well-designed randomized clinical trials to confirm the efficacy of this therapy and to establish standardized protocols. The review protocol was registered at the International Prospective Register of Systematic Reviews (PROSPERO) under number CRD CRD42018108973. Photosensitizing

Agents Herpes Labialis;Humans;Low-Level Light Therapy;Patient Satisfaction;Photochemotherapy;Photosensitizing Agents;Recurrence
Transcranial Photobiomodulation Therapy in the Cognitive Rehabilitation of Patients with Cranioencephalic Trauma. Objective: This research evaluated the hemodynamic conditions before and after the transcranial photobiomodulation therapy (PBMT) and investigated neurocognitive changes before and after treatment. Background: Traumatic brain injury (TBI) is the major cause of morbidity and mortality among individuals 21-60 years old and causes âˆ¼500,000 people to be hospitalized in Brazil annually. Some survivors develop an irreversible decrease in neurological function, and the mortality rate is as high as 70% in severe cases. PBMT is an alternative to treat secondary injuries due to TBI. Methods: This multidisciplinary clinical study was carried out on 10 chronic adult patients with severe TBI, who were treated with PBMT with an optical device containing 13 sets of 4 light emitting diodes, and underwent hemodynamic transcranial Doppler and neuropsychological evaluation at three different times: pre-PBMT, post-PBMT (after a week), and late-PBMT, which occurred 3 months after the last session. The patients received PBMTs three times a week, for 6 weeks. PBMTs were performed for 18 sessions for 6 weeks and 30â€‰min per session. Results: The results found an alteration in the cerebral blood flow (CBF) as well as a consequent increase of the cerebral oxygenation that helped to improve the cerebral function. Conclusions: The PBMT contributed to increased CBF, evidenced mainly by the increased left peak systolic velocity, which consequently increased the hemodynamic response after the PBMT and impacts on the peripheral cerebral perfusion contributing to improved cerebral function. Adult;Brain Injuries, Traumatic;Brazil;Cerebrovascular Circulation;Chronic Disease;Cognition;Cohort Studies;Disability Evaluation;Female;Follow-Up Studies;Humans;Injury Severity Score;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Neuropsychological Tests;Retrospective Studies;Time Factors;Treatment Outcome;Ultrasonography, Doppler;Young Adult
Treatment of Neurodegeneration: Integrating Photobiomodulation and Neurofeedback in Alzheimer's Dementia and Parkinson's: A Review. Objective: A review of photobiomodulation (PBM) in Alzheimer's dementia is submitted. The addition of PBM in neurodegenerative diseases is a dual modality that is at present gaining traction as it is safe, antiviral, and anti-inflammatory for treating neurodegeneration with photons that stimulate mitochondria increasing adenosine triphosphate and proteasomes increasing misfolded protein removal. Neurofeedback provides neural plasticity with an increase in brain-derived nerve factor mRNA and an increase in dendrite production and density in the hippocampus coupled with overall growth in dendrites, density, and neuronal survival. Background: Alzheimer's disease pathophysiology is the accumulation of hyperphosphorylated tau protein neurofibrillary tangles and subsequently amyloid-beta (AÎ²) plaques. PBM and neurobiofeedback (NBF)address the multiple gene expression and upregulation of multiple pathogenic pathway inflammation, reactive oxidative stress, mitochondrial disorders, insulin resistance, methylation defects, regulation of neuroprotective factors, and regional hypoperfusion of the brain. There is no human evidence to suggest a clinical therapeutic benefit from using consistent light sources while significantly increasing safety concerns. Methods: A PBM test with early- to mid-Alzheimer's was reported in 2017, consisting of a double-blind, placebo-controlled trial in a small pilot group of early- to mid-dementia subjects under Institutional Review Board (IRB)-approved Food and Drug Administration (FDA) Clinical Trial. Results: PBM-treated subjects showed that active treatment subjects tended to show greater improvement in the functioning of the executive: clock drawing, immediate recall, practical memory, and visual attention and task switching (Trails A&B). A larger study using the CerebroLite helmet in Temple Texas again of subjects in a double-blind, placebo-controlled IRB-approved FDA Clinical Trial demonstrated gain in memory and cognition by increased clock drawing. Conclusions: Next-generation trials with the Cognitolite for Parkinson's disease

subjects will incorporate the insights regarding significant bilateral occipital hypocoherence deficits gained from the quantitative EEG analyses. Future applications will integrate noninvasive stimulation delivery, including full-body and transcranial and infrared light with pulsed electromagnetic frequencies. Age Factors;Aged;Aged, 80 and over;Alzheimer Disease;Combined Modality Therapy;Dementia;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neurodegenerative Diseases;Neurofeedback;Parkinson Disease;Risk Assessment;Severity of Illness Index;Sex Factors;Treatment Outcome

Transcranial Photobiomodulation with Near-Infrared Light for Generalized Anxiety Disorder: A Pilot Study. Objective: Our aim was to test the anxiolytic effect of transcranial photobiomodulation (t-PBM) with near-infrared light (NIR) in subjects suffering from generalized anxiety disorder (GAD). Background: t-PBM with NIR is an experimental, noninvasive treatment for mood and anxiety disorders. Preliminary evidence indicates a potential anxiolytic effect of transcranial NIR. Methods: Fifteen subjects suffering from GAD were recruited in an open-label 8-week study. Each participant self-administered t-PBM daily, for 20â€‰min (continuous wave; 830â€‰nm peak wavelength; average irradiance 30â€‰mW/cm(2); average fluence 36â€‰J/cm(2); total energy delivered per session 2.9â€‰kJ: total output power 2.4 W) broadly on the forehead (total area 80â€‰cm(2)) with an LED-cluster headband (Cerebral Sciences). Outcome measures were the reduction in total scores of the Hamilton Anxiety Scale (SIGH-A), the Clinical Global Impressions-Severity (CGI-S) subscale and the Pittsburgh Sleep Quality Index (PSQI) subscales from baseline to last observation carried forward. Results: Of the 15 recruited subjects (mean age 30â€‰Â±â€‰14 years; 67% women), 12 (80%) completed the open trial. Results show a significant reduction in the total scores of SIGH-A (from 17.27â€‰Â±â€‰4.89 to 8.47â€‰Â±â€‰4.87; pâ€‰<â€‰0.001; Cohen's d effect sizeâ€‰=â€‰1.47), in the CGI-S subscale (from 4.53â€‰Â±â€‰0.52 to 2.87â€‰Â±â€‰0.83; pâ€‰<â€‰0.001; Cohen's d effect sizeâ€‰=â€‰2.04), as well as significant improvements in sleep at the PSQI. t-PBM was well tolerated with no serious adverse events. Conclusions: Based on our pilot study, t-PBM with NIR is a promising alternative treatment for GAD. Larger, randomized, double-blind, sham-controlled studies are needed. Adolescent;Adult;Age Factors;Anxiety Disorders;Brain;Female;Follow-Up Studies;Humans;Infrared Rays;Low-Level Light Therapy;Male;Patient Safety;Pilot Projects;Prospective Studies;Risk Assessment;Severity of Illness Index;Sex Factors;Skull;Treatment Outcome;Young Adult

Reported Side Effects, Weight and Blood Pressure, After Repeated Sessions of Transcranial Photobiomodulation. Background: Transcranial photobiomodulation (t-PBM) consists in the delivery of near-infrared light (NIR) to the scalp, directed to cortical areas of the brain. NIR t-PBM recently emerged as a potential therapy for depression, although safety of repeated treatments has not been adequately explored. Objective: This study assessed incidence of side effects, including weight and blood pressure changes, during repeated sessions of NIR t-PBM using a light-emitting diode source. Methods: We performed a secondary analysis of a double-blind clinical trial on t-PBM for major depressive disorder. Eighteen individuals received NIR t-PBM (nâ€‰=â€‰9) or sham (nâ€‰=â€‰9) twice weekly for 8 weeks. Side effects were assessed using the Systematic Assessment for Treatment-Emergent Effects-Specific Inquiry. In 14 individuals (n(NIR)â€‰=â€‰6 vs. n(sham)â€‰=â€‰8), body weight and systemic blood pressure were recorded at baseline and end-point. Results: More subjects in the NIR t-PBM group experienced side effects compared to sham, but only a trend for statistical significance was observed (Ï‡(2)â€‰=â€‰3.60; dfâ€‰=â€‰1; pâ€‰=â€‰0.058). The rate of side effects described by participants as "severe" in intensity was low and similar between the treatment groups (Ï‡(2)â€‰=â€‰0.4; dfâ€‰=â€‰1; pâ€‰=â€‰0.53), with no serious adverse events. Most side effects resolved during the study and treatment interruption were not required. Changes in weight and systolic blood pressure across groups were

neither significant nor approached significance. In the NIR t-PBM group, diastolic blood pressure increased and reached statistical-however not clinical-significance (5.67â€‰Â±â€‰7.26 vs. -6.13â€‰Â±â€‰6.88; zâ€‰=â€‰-2.40, pâ€‰=â€‰0.016). Conclusions: This small-sample, exploratory study indicates repeated sessions of NIR t-PBM might be associated with treatment-emergent side effects. The systemic metabolic and hemodynamic profile of repeated t-PBM appeared benign. Future studies with larger samples and longer follow-up are needed to more accurately determine the side-effect profile and safety of NIR t-PBM. Adult;Blood Pressure Determination;Body Weight;Boston;Brain;Chi-Square Distribution;Depressive Disorder, Major;Double-Blind Method;Female;Hospitals, General;Humans;Hypertension;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Pregnancy;Severity of Illness Index;Statistics, Nonparametric

The effect of photobiomodulation therapy on nonsurgical periodontal treatment in patients with type 2 diabetes mellitus: a randomized controlled, single-blind, split-mouth clinical trial. Photobiomodulation therapy (PBMT) is a method currently used in the treatment of hard and soft tissue injuries due to its accelerating and enhancing effects on healing. In this study, we aimed to evaluate the possible additional benefits of applying PBMT with nonsurgical periodontal treatment in type 2 diabetes mellitus (DM) patients with chronic periodontitis (CP). Twenty-two type 2 DM patients with CP were enrolled in this clinical split-mouth study. Probing pocket depth (PPD), gingival index (GI), plaque index (PI), and clinical attachment level (CAL) were measured by intracaliber clinician (H.G.) at baseline and at 1 m, 3 m, and 6 m after treatment. Gingival crevicular fluid (GCF) samples were collected at baseline and at 1 week and 1 m, 3 m, and 6 m after treatment. According to split-mouth design, one randomly selected quadrant was treated with PBMT + nonsurgical periodontal treatment (NSPT) and the other quadrant was treated only non-surgical periodontal treatment. PBMT was applied the test quadrant on NSPT day and first, third, and seventh day after treatment at an energy density of 7.64 J/cm(2). Repeated measures analysis of variance test was used for the intragroup comparison and a "paired t test" in the intergroup comparison of the clinical and laboratory findings. Comparing the test and control quadrant after treatment, the test quadrant showed significant decrease in PPD at 1 month, 3 months, and 6 months; in GI at 3 months and 6 months; in CAL at month 6; in GCF at 1 week, 1 month, 3 months, and 6 months; and in IL-1Î² data at 3 months in comparison to the control quadrant. In contrast, there was no statistically significant difference in PI data at all times. Within the limitation of this study, adjunct use of PBMT on NSPT in patient with DM may positively affect the clinical and biochemical parameters. IL1B protein, human;Interleukin-1beta Adult;Chronic Periodontitis;Dental Plaque Index;Diabetes Mellitus, Type 2;Female;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Single-Blind Method

Combined Adipose-Derived Mesenchymal Stem Cells and Photobiomodulation Could Modulate the Inflammatory Response and Treat Infected Diabetic Foot Ulcers. Adipose Tissue;Diabetic Foot;Humans;Mesenchymal Stem Cell Transplantation;Photochemotherapy;Wound Healing

A retrospective analysis for facial telangiectasia treatment using pulsed dye laser and intense pulsed light configured with different wavelength bands. BACKGROUND: Facial telangiectasia is one of the common skin vascular lesions characterized by dilated cutaneous vasculatures. The variety of diameters and difference in depths of lesional blood vessels are the major challenges for effective treatments for Facial telangiectasia. AIMS: To compare the efficacy and safety profiles of pulsed dye laser (PDL, 595Â nm) with intense pulsed light (IPL) configured by three different wavelength bands inÂ the treatment forÂ facial telangiectasia in Asian populations. PATIENTS/METHODS: A retrospective analysis of hospital records and review on photographs were performed for those subjects with facial telangiectasia (nÂ =Â 160) who were treated in our department from January

2017 to January 2019. Patients were received two sessions of one of the four following laser treatments: PDL (595Â nm, nÂ =Â 38), IPL with M22 vascular filter (530-650Â nm and 900-1200Â nm, nÂ =Â 39), M22 560 (560-1200Â nm, nÂ =Â 42), and M22 590 (590-1200Â nm, nÂ =Â 41). RESULTS: The patients in all the four groups showed an overall and significant improvement of indexes of lesional severity and subjective discomfort as well as improvement score of facial telangiectasia after treatment as compared to baseline. In addition, PDL (595Â nm) and IPL with vascular filter (530-650Â nm and 900-1200Â nm) treatments showed significantly better indexes of lesional severity, subjective discomfort, and improvement score of facial telangiectasia as compared with other two treatments. CONCLUSION: Light devices with various wavelength ranges showed different efficaciesÂ of treatmentÂ for facial telangiectasia, among which PDL (595Â nm) and IPL with M22 vascular filter (530-650Â nm and 900-1200Â nm) had similar and the best clinical efficacy as compared to IPL with other wavelength bands.
Adolescent;Adult;Face;Female;Humans;Intense Pulsed Light Therapy;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Telangiectasis;Treatment Outcome;Young Adult

Increased Functional Connectivity Within Intrinsic Neural Networks in Chronic Stroke Following Treatment with Red/Near-Infrared Transcranial Photobiomodulation: Case Series with Improved Naming in Aphasia. Objective: To examine effects of four different transcranial, red/near-infrared (NIR), light-emitting diode (tLED) protocols on naming ability in persons with aphasia (PWA) due to left hemisphere (LH) stroke. This is the first study to report beneficial effects from tLED therapy in chronic stroke, and parallel changes on functional magnetic resonance imaging (fMRI). Materials and methods: Six PWA, 2-18 years poststroke, in whom 18 tLED treatments were applied (3â€‰Ã—â€‰/week, 6 weeks) using LED cluster heads: 500â€‰mW, red (633â€‰nm) and NIR (870â€‰nm), 22.48â€‰cm(2), 22.2â€‰mW/cm(2). Results: After Protocol A with bilateral LED placements, including midline, at scalp vertex over left and right supplementary motor areas (L and R SMAs), picture naming was not improved. P1 underwent pre-/postovert, picture-naming task-fMRI scans; P2 could not. After Protocol A, P1 showed increased activation in LH and right hemisphere, including L and R SMAs. After Protocol B with LEDs only on ipsilesional, LH side, naming ability significantly improved for P1 and P2; the fMRI scans for P1 then showed activation only on the ipsilesional LH side. After Protocol C with LED placements on ipsilesional LH side, plus one midline placement over mesial prefrontal cortex (mPFC) at front hairline, a cortical node of the default mode network (DMN), P3 and P4 had only moderate/poor response, and no increase in functional connectivity on resting-state functional-connectivity MRI. After Protocol D, however, with LED placements on ipsilesional LH side, plus over two midline nodes of DMN, mPFC, and precuneus (high parietal) simultaneously, P5 and P6 each had good response with significant increase in functional connectivity within DMN, pâ€‰<â€‰0.0005; salience network, pâ€‰<â€‰0.0005; and central executive network, pâ€‰<â€‰0.05. Conclusions: NIR photons can affect surface brain cortex areas subjacent to where LEDs are applied on the scalp. Improved naming ability was present with optimal Protocol D. Transcranial photobiomodulation may be an additional noninvasive therapy for stroke.
Aged;Aphasia;Brain Damage, Chronic;Connectome;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Stroke;Verbal Behavior

A case of recurrent pigmented macules in Laugier-Hunziker syndrome treated using a Q-switched Nd-YAG laser. Laugier-hunziker syndrome (LHS) is a sporadic and acquired melanotic pigmentation of lips and oral mucosa which is not associated with gastrointestinal hamartomas in contrast to Peutz-Jeghers syndrome. Treatment using Q-switched neodymium: yttrium-aluminum-garnet (QS-ND:YAG) laser, Q-switched alexandrite laser and, cryotherapy have been reported. However, to the best of our knowledge, there is no report regarding long-term follow-up for recurrence. Herein we report the clinical features and the treatment of recurrent pigmented lesions in LHS patients. A patient

diagnosed with LHS seven years ago presented with recurrent labial macules. She had undergone QS-ND:YAG laser 7Â years ago and the labial macules have been gone several years. A physical examination revealed the macules were mainly on new locations and the spots on the site where the laser was previously done rarely recur. The untreated pigmented macules on gum were maintained in the same shape for seven years. Recurrent lesions of the lips and previously untreated macules on the gums were successfully treated again with the QS-ND:YAG laser as done in 7Â years ago. Our case shows a long-term clinical course of laser-treated labial macules in LHS and treatment response of recurred lesions. yttrium-aluminum-garnet;Yttrium;Aluminum Aluminum;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Lip Diseases;Low-Level Light Therapy;Middle Aged;Mouth Diseases;Yttrium

Therapeutic Effect of Garcinia cambogia Extract and Hydroxycitric Acid Inhibiting Hypoxia-Inducible Factor in a Murine Model of Age-Related Macular Degeneration. BACKGROUND: Age-related macular degeneration (AMD) is the leading cause of blindness and can be classified into two types called atrophic AMD (dry AMD) and neovascular AMD (wet AMD). Dry AMD is characterized by cellular degeneration of the retinal pigment epithelium, choriocapillaris, and photoreceptors. Wet AMD is characterized by the invasion of abnormal vessels from the choroid. Although anti-vascular endothelial growth factor (VEGF) therapy has a potent therapeutic effect against the disease, there is a possibility of chorio-retinal atrophy and adverse systemic events due to long-term robust VEGF antagonism. We focused on hypoxia-inducible factor (HIF) regulation of VEGF transcription, and report the suppressive effects of HIF inhibition against ocular phenotypes in animal models. Many of the known HIF inhibitors are categorized as anti-cancer drugs, and their systemic side effects are cause for concern in clinical use. In this study, we explored food ingredients that have HIF inhibitory effects and verified their effects in an animal model of AMD. METHODS: Food ingredients were screened using a luciferase assay. C57BL6/J mice were administered the Garcinia cambogia extract (Garcinia extract) and hydroxycitric acid (HCA). Choroidal neovascularization (CNV) was induced by laser irradiation. RESULTS: Garcinia extract and HCA showed inhibitory effects on HIF in the luciferase assay. The laser CNV model mice showed significant reduction of CNV volume by administering Garcinia extract and HCA. Conclusions: Garcinia extract and HCA showed therapeutic effects in a murine AMD model. Citrates;Hif1a protein, mouse;Hypoxia-Inducible Factor 1, alpha Subunit;Plant Extracts;hydroxycitric acid Animals;Citrates;Disease Models, Animal;Down-Regulation;Garcinia cambogia;Gene Expression Regulation;Humans;Hypoxia-Inducible Factor 1, alpha Subunit;Low-Level Light Therapy;Macular Degeneration;Male;Mice;Plant Extracts;Treatment Outcome

Effectiveness of Adjunctive Use of Low-Level Laser Therapy and Photodynamic Therapy After Scaling and Root Planing in Patients with Chronic Periodontitis. The aim of this split-mouth, randomized controlled clinical trial was to evaluate the efficacy of low-level laser therapy (LLLT) and photodynamic therapy (PDT) as an adjunct to scaling and root planing (SRP) in treatment of chronic periodontitis. Each quadrant was categorized into control group (SRP alone; two quadrants per patient), test group 1 (SRP + PDT), and test group 2 (SRP + LLLT. The test groups showed significantly higher reductions in Gingival Index, probing depth, and clinical attachment level as well as reductions in Porphyromonas gingivalis and Aggregatibacter actinomycetemcomitans counts at 1-, 3-, 6-, and 9-month follow-ups when compared with the control group. Chronic Periodontitis;Dental Scaling;Humans;Low-Level Light Therapy;Photochemotherapy;Root Planing;Treatment Outcome

Low-level laser therapy in dentistry: Extra-oral applications. Low-level laser therapy (LLLT) is considered as a recent technique in the dental field. Nowadays, it is used by many clinicians in dentistry. The stimulation of the healing process and pain relief are among its most popular uses. The purpose of this paper is to discuss and review the latest extra-oral applications of LLLT in the dental

field. An electronic search of English scientific papers from 2000 to 2018 was accomplished using PubMed and Google Scholar search engines. The following key words were used extra-oral, applications, LLLT, and dental field. This review demonstrates the marked effectiveness of LLLT in the management of many conditions and how it could improve the quality of life of many patients. However, LLLT is still considered a recent alternative and requires more understanding of its mechanism of action by conducting more high-quality randomized clinical trials with larger sample sizes and longer follow-up periods. Dentistry;Humans;Low-Level Light Therapy;Pain Management;Quality of Life;Wound Healing

Is Low-Level Laser Therapy Effective for Pain Control After the Surgical Removal of Unerupted Third Molars? A Randomized Trial. PURPOSE: One of the main challenges after extraction of unerupted third molars is pain control, and one of the treatments for pain control is low-level laser therapy (LLLT).Â Thus, this study aimed to assess the effectiveness of LLLT for pain control after extraction of lower third molars. MATERIALS AND METHODS: This randomized, double-blind, split-mouth study included patients who required bilateral extraction of unerupted lower third molars. Patients received LLLT on 1 side (laser group) but not on the opposite side (control group). On the experimental side, each patient received a laser application at 5 intraoral points for 30Â seconds per point. This procedure was simulated on the control side. The pain control response was assessed with a modified pain visual analog scale at the following times: immediately after surgery (T0), after laser application (T1), 24Â hours after surgery (T2), 48Â hours after surgery (T3), and 72Â hours after surgery (T4). RESULTS: Thirty-two patients, 56.25% of whom were women, underwent extraction; the average age was 22.2Â years. At the times analyzed, the laser group presented better results than the control group. As for the times, there were differences in pain scores between T0 (8.03Â Â±Â 14.87) and T3 (2.66Â Â±Â 4.23), as well as T4 (3.36Â Â±Â 7.83), in the laser group and differences between T0 (19.76Â Â±Â 26.66) and T3 (7.11Â Â±Â 10.76), as well as T4 (6.26Â Â±Â 13.14), in the control group. CONCLUSION: LLLT was effective in reducing pain after surgical removal of unerupted third molars. At T3 and T4, pain reduction in relation to T0 was noted in both groups. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Molar, Third;Pain;Pain Management;Pain, Postoperative;Tooth Extraction;Young Adult

Treating Acute Cervical Radiodermatitis with Photobiomodulation Therapy: A Report of Two Cases. Objective: The objective of this study was to report the application of photobiomodulation therapy (PBMT) in the treatment of two patients diagnosed with acute cervical radiodermatitis (RD) induced by radiotherapy. Background data: An undesirable effect of radiotherapy, RD often poses a limitation to the continuity of treatment that can negatively affect the control and prognosis of the disease. RD is frequently associated with pain and aesthetic impairment and can significantly influence quality of life. Many agents used to prevent and treat RD do not have sufficient scientific evidence to support its use. Materials and methods: In both clinical cases, the patients presented RD degree 3 and were in drug treatment, with no satisfactory response, and PBMT was started. Two diode lasers were used, with a dose of 35.71â€‰J/cm(2), 10â€‰sec/point, 100â€‰mW of power, and a beam area of 0.028â€‰cm(2) and dose of 27.77â€‰J/cm(2), 25â€‰sec/point, 40â€‰mW, and 0.036â€‰cm(2) beam area. Both lasers were applied at the wavelength of red, daily, in contact and perpendicular to the skin, to deliver 1â€‰J/point/1.5â€‰cm, which covered the entire area affected with RD. Results: The PBMT made possible an expressive improvement in the healing process and reduction of painful symptoms associated with RD. Conclusions: Although PBMT facilitated healing and reduced pain experienced with RD, randomized controlled trials are needed to evaluate all of its possible benefits. Adult;Aged;Humans;Laryngeal Neoplasms;Lasers, Semiconductor;Low-Level Light Therapy;Male;Neck;Radiodermatitis;Tongue Neoplasms;Wound Healing

Melasma: A critical analysis of clinical trials investigating treatment modalities published in the past 10Â years. BACKGROUND: Melasma is an acquired disorder of facial pigmentation which is a treatment challenge. AIMS: The aim of this article is to critically appraise the clinical trial evidence for different treatment modalities for melasma, published in peer-reviewed journals in the past 10Â years. PATIENTS/METHODS: The literature review was conducted using PubMed and MEDLINE. The search was performed in July 2019, and search parameters were limited to all English language articles published in the past 10Â years only. RESULTS: Eighty-nine clinical trials were found. Four clinical trials investigated topical hydroquinone, supporting its safety and efficacy as first-line treatment. Twelve studies showed tranexamic acid as very promising. Nineteen studies assessed various novel oral, injectable, and topical treatments and highlight some new potential future treatments. Forty-two studies investigated laser and light treatment in melasma: LFQS laser is still one of the best options, especially in darker skin types. However, the picosecond laser has shown excellent results. Finally, 11 studies looked at peels. Overall, peels have not been shown to be superior to the use of topical therapy alone. CONCLUSION: Topical therapy with a HQ and retinoid-based product should be first line for a minimum of 3Â months with the addition of oral tranexamic acid at 250Â mg BD if no contraindication. Second-line treatment with lasers includes the LFQS Nd:YAG, picosecond laser, and the pulsed dye laser in lighter skin types. Third-line therapy would be the addition of chemical peels to the above treatments, with GA or TCA peels having the most evidence for effectiveness. Hydroquinones;Keratolytic Agents;Retinoids;Skin Lightening Preparations;Tranexamic Acid;hydroquinone Administration, Cutaneous;Administration, Oral;Chemexfoliation;Clinical Trials as Topic;Combined Modality Therapy;Humans;Hydroquinones;Keratolytic Agents;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Retinoids;Skin Lightening Preparations;Tranexamic Acid;Treatment Outcome

Blue laser light inhibits biofilm formation in vitro and in vivo by inducing oxidative stress. Resolution of bacterial infections is often hampered by both resistance to conventional antibiotic therapy and hiding of bacterial cells inside biofilms, warranting the development of innovative therapeutic strategies. Here, we report the efficacy of blue laser light in eradicating Pseudomonas aeruginosa cells, grown in planktonic state, agar plates and mature biofilms, both in vitro and in vivo, with minimal toxicity to mammalian cells and tissues. Results obtained using knock-out mutants point to oxidative stress as a relevant mechanism by which blue laser light exerts its anti-microbial effect. Finally, the therapeutic potential is confirmed in a mouse model of skin wound infection. Collectively, these data set blue laser phototherapy as an innovative approach to inhibit bacterial growth and biofilm formation, and thus as a realistic treatment option for superinfected wounds. Culture Media Animals;Biofilms;Cell Line;Culture Media;Disease Models, Animal;Humans;Lasers;Light;Mice, Inbred C57BL;Models, Biological;Oxidative Stress;Pseudomonas Infections;Pseudomonas aeruginosa;Radiotherapy;Treatment Outcome;Wound Infection

The effect of low intensity laser irradiation of inflamed udders on the efficacy of antibiotic treatment of clinical mastitis in dairy cows. The aim of the study was to evaluate the effect of STP-99 laser irradiation applied locally to inflamed cow udders on the efficacy of clinical mastitis treatment with either intramammary infusions of antibiotic products or systemic injections of antibiotics. Examinations were carried out on 124 milking dairy cows suffering from clinical, bacterial mastitis. Cows with signs of local acute inflammation were treated with approved intramammary antibiotic products at labeled doses as control. The exposed cows received the same antibiotic treatment but were also subjected to irradiation of the inflamed udders with a laser for 5 consecutive days (2 minutes a day). Cows with local and systemic signs of mastitis were treated with either intramuscular injections of approved antibiotics in label doses alone (controls), or with the same intramuscular treatment protocol and laser irradiation of inflamed glands for 5 consecutive days (2 minutes a day).

The recovery rate after intramammary treatment with antibiotics was 43.7%. Irradiation with laser significantly (P < 0.05%) increased the recovery rate by 31.2%. The recovery rate in the cow cohort receiving systemic treatment with antibiotics was 46.7%. The laser irradiation resulted in a 16.6% increase in recovery. Supportive treatment with laser irradiation increased recovery rates by 24.2%. Anti-Bacterial Agents Animals;Anti-Bacterial Agents;Cattle;Female;Laser Therapy;Mammary Glands, Animal;Mastitis, Bovine

"Photobiomics": Can Light, Including Photobiomodulation, Alter the Microbiome? Objective: The objective of this review is to consider the dual effects of microbiome and photobiomodulation (PBM) on human health and to suggest a relationship between these two as a novel mechanism. Background: PBM describes the use of low levels of visible or near-infrared (NIR) light to heal and stimulate tissue, and to relieve pain and inflammation. In recent years, PBM has been applied to the head as an investigative approach to treat diverse brain diseases such as stroke, traumatic brain injury (TBI), Alzheimer's and Parkinson's diseases, and psychiatric disorders. Also, in recent years, increasing attention has been paid to the total microbial population that colonizes the human body, chiefly in the gut and the mouth, called the microbiome. It is known that the composition and health of the gut microbiome affects many diseases related to metabolism, obesity, cardiovascular disorders, autoimmunity, and even brain disorders. Materials and methods: A literature search was conducted for published reports on the effect of light on the microbiome. Results: Recent work by our research group has demonstrated that PBM (red and NIR light) delivered to the abdomen in mice, can alter the gut microbiome in a potentially beneficial way. This has also now been demonstrated in human subjects. Conclusions: In consideration of the known effects of PBM on metabolomics, and the now demonstrated effects of PBM on the microbiome, as well as other effects of light on the microbiome, including modulating circadian rhythms, the present perspective introduces a new term "photobiomics" and looks forward to the application of PBM to influence the microbiome in humans. Some mechanisms by which this phenomenon might occur are considered. Animals;Dysbiosis;Humans;Low-Level Light Therapy;Microbiota

Photobiomodulation Mitigates Cerebrovascular Leakage Induced by the Parkinsonian Neurotoxin MPTP. The neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) is commonly used to model Parkinson's disease (PD) as it specifically damages the nigrostriatal dopaminergic pathway. Recent studies in mice have, however, provided evidence that MPTP also compromises the integrity of the brain's vasculature. Photobiomodulation (PBM), the irradiation of tissue with low-intensity red light, mitigates MPTP-induced loss of dopaminergic neurons in the midbrain, but whether PBM also mitigates MPTP-induced damage to the cerebrovasculature has not been investigated. This study aimed to characterize the time course of cerebrovascular disruption following MPTP exposure and to determine whether PBM can mitigate this disruption. Young adult male C57BL/6 mice were injected with 80 mg/kg MPTP or isotonic saline and perfused with fluorescein isothiocyanate FITC-labelled albumin at various time points post-injection. By 7 days post-injection, there was substantial and significant leakage of FITC-labelled albumin into both the substantia nigra pars compacta (SNc; p < 0.0001) and the caudate-putamen complex (CPu; p â‰¤ 0.0003); this leakage partly subsided by 14 days post-injection. Mice that were injected with MPTP and treated with daily transcranial PBM (670 nm, 50 mW/cm(2), 3 min/day), commencing 24 hours after MPTP injection, showed significantly less leakage of FITC-labelled albumin in both the SNc (p < 0.0001) and CPu (p = 0.0003) than sham-treated MPTP mice, with levels of leakage that were not significantly different from saline-injected controls. In summary, this study confirms that MPTP damages the brain's vasculature, delineates the time course of leakage induced by MPTP out to 14 days post-injection, and provides the first direct evidence that PBM can mitigate this leakage. These findings provide new understanding of the use of the MPTP mouse model as an experimental tool and highlight the potential of PBM as a therapeutic

tool for reducing vascular dysfunction in neurological conditions. FITC-albumin;Serum Albumin;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Fluorescein-5-isothiocyanate 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Animals;Brain;Cerebrovascular Circulation;Disease Models, Animal;Fluorescein-5-isothiocyanate;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Parkinson Disease;Random Allocation;Serum Albumin

Photobiomodulation Therapy in Oral Medicine: A Guide for the Practitioner with Focus on New Possible Protocols. Photobiomodulation (PBM) is the term to define the wide range of laser applications using low-energy densities and based on photochemical mechanisms where the energy is transferred to the intracellular mitochondrial chromophores and respiratory chain components. In literature, a great number of works are reported showing the advantages of PBM use in many oral diseases such as recurrent aphthous stomatitis, herpes infections, mucositis, and burning mouth syndrome. Different factors may explain the increasing reported use of PBM in oral medicine: the absence of side effects, the possibility of safely treating compromised patients such as oncologic patients, the possibility of a noninvasive approach not associated with pain or discomfort, and the possibility of performing short sessions. The review's aim is to describe the possible applications of PBM in oral medicine, giving practitioners simple guide for practice together with the information of a new treatment possibility "at home" performed by the patient himself under supervision. Contraindications, Procedure;Herpes Simplex;Humans;Inflammation;Low-Level Light Therapy;Mouth Diseases;Oral Surgical Procedures;Pain;Pain, Postoperative;Wound Healing

Increased Oral Health-Related Quality of Life Postsynergistic Treatment with Ultrasound and Photobiomodulation Therapy in Patients with Temporomandibular Disorders. Background and objective: The object of this study was to analyze the oral health-related quality of life (OHRQoL) of patients with temporomandibular disorders (TMDs) who were treated simultaneously with ultrasound (US) and photobiomodulation therapy (PBMT). Materials and methods: This study included 13 patients of both genders, with diagnosis of TMD according to the Research Diagnostic Criteria for Temporomandibular Disorders. The patients were treated with equipment consisting of US and PBMT in the same system. The treatment was applied to the left and right sides of the face in the masseter muscle, anterior temporalis muscle, and temporomandibular joint, two sessions per week for a total of eight sessions. The OHRQoL was assessed by the Oral Health Impact Profile (OHIP-14) at three moments: pretreatment (T(0)), after the eight treatment sessions (T(1)), and 30 days after termination of treatment (T(2)). The Wilcoxon, Mann-Whitney U, Kruskall-Wallis, and Spearman's correlation coefficient tests were applied, with a significance threshold of 5%. Results: Psychological discomfort, physical pain, and psychological limitation were the domains where the highest scores were obtained at T(0). The total OHIP-14 scores at T(1) and T(2) were significantly lower than at T(0). No statistical differences were observed between T(1) and T(2). Conclusions: We conclude that synergistic treatment was effective in improving the OHRQoL of patients with TMDs, and that its beneficial effects persisted at 1 month after termination of treatment. Adult;Age Factors;Aged;Chronic Pain;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Oral Health;Quality of Life;Temporomandibular Joint Disorders;Ultrasonic Therapy;Young Adult

Can Photobiomodulation Therapy Be an Alternative to Methylprednisolone in Reducing Pain, Swelling, and Trismus After Removal of Impacted Third Molars? Background and objective: Studies investigating an alternative to corticosteroids in terms of potential side effects after surgical removal of impacted third molars are still ongoing. Accordingly, the present randomized single-blind study aimed to compare the efficacy of photobiomodulation therapy (PBMT) and methylprednisolone on pain, edema, and trismus after surgical removal of impacted third molars. Methods: The study included 30 healthy patients with bilaterally impacted lower third molars. The side (right or left

molar) that would be extracted at first and the treatment (PBMT or corticosteroid) that would be applied to this side were decided by tossing a coin. The time interval between two surgical operations was at least 3 weeks. In the laser group, immediately after the surgical procedure, PBMT was applied extraorally to the insertion point of the masseter muscle for 60â€‰sec with an output power of 0.3 W and an energy density of 6â€‰J/cm(2) and then repeated on postoperative days 1 and 2. In the corticosteroid group, 40â€‰mg/2â€‰mL methylprednisolone sodium succinate was injected postoperatively into the masseter muscle with the intrabuccal approach. On postoperative day 1, methylprednisolone injection (20â€‰mg/1â€‰mL) was repeated. Pain was evaluated using the visual analog scale on postoperative days 1, 2, and 7. Edema (in mm) and trismus (in mm) were evaluated preoperatively and on postoperative days 2 and 7. Results: There were no significant differences between the PBMT and methylprednisolone administration in terms of postoperative pain, edema, and trismus. Conclusions: Within the limits of the present study, PBMT was considered an alternative and a useful method for controlling inflammatory complications following impacted wisdom tooth surgery as it exhibited similar clinical efficacy to that of methylprednisolone. Glucocorticoids;Methylprednisolone Hemisuccinate
Adolescent;Adult;Edema;Female;Glucocorticoids;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Methylprednisolone Hemisuccinate;Molar, Third;Pain, Postoperative;Postoperative Complications;Single-Blind Method;Tooth Extraction;Tooth, Impacted;Trismus;Visual Analog Scale;Young Adult

Impact of Photobiomodulation and Condition Medium on Mast Cell Counts, Degranulation, and Wound Strength in Infected Skin Wound Healing of Diabetic Rats. Background: Numerous people suffer from diabetes mellitus (DM) and resultant diabetic foot ulcers (DFU), which lack effective treatment. Photobiomodulation (PBM) has accelerated wound healing in diabetic animals and patients in some studies. However, there is scant information on the number and activation state of skin mast cells (MCs) in PBM-treated diabetic wounds. Objective: We intend to assess the influence of the number of MCs and degranulation in the remodeling step of an infected wound model on wound strength and its microbial flora in a type 1 DM (T1DM) rat model by administration of PBM, condition medium (CM) derived from human bone marrow mesenchymal stem cells (hBMMSCs), and the combination of PBM+CM. Methods: We prepared CM by culturing hBMMSCs. T1DM was induced in 72 rats and, after 1 month, we created one excisional wound in each rat. All wounds were infected with methicillin-resistant Staphylococcus aureus (MRSA). We divided the rats into four groups: (nâ€‰=â€‰18): (i) control; (ii) PBM; (iii) CM, and (iv) PBM+CM. On days 4, 7, and 15, we conducted microbiological, tensiometrical, and stereological analyses. The type of MCs (T1MCs, T2MCs, or T3MCs) and total number of MCs (TOMCs) were counted by light microscopy. Results: On day 15, the PBM+CM, PBM, and CM groups had significantly increased wound strength compared with the control group. There was a significant decrease in colony-forming units (CFU) at all time points in the PBM+CM and PBM groups. The PBM+CM and PBM groups had more stable MCs (T1MCs), less significant degranulated MCs (T2MCs), less significant disintegrated MCs (T3MCs), and less significant TOMCs compared with the control group at all time points. Conclusions: PBM+CM and PBM treatments significantly increased the healing process in an ischemic and MRSA-infected wound model of T1DM rats. PBM+CM and PBM significantly decreased both TOMCs and their degranulation, and significantly decreased CFU. Culture Media, Conditioned Animals;Cell Count;Cell Degranulation;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Disease Models, Animal;Humans;Low-Level Light Therapy;Mast Cells;Mesenchymal Stem Cell Transplantation;Methicillin-Resistant Staphylococcus aureus;Microscopy;Rats, Wistar;Staphylococcal Infections;Wound Healing;Wound Infection

Lasers for reduction of unwanted hair in skin of colour: a systematic review and meta-analysis. Light-based therapies are one of the most effective and widely used strategies for removal of undesired hair, with a broadly favourable safety profile. However, subjects with pigmented skin are found to be more prone to laser-related adverse events. While prolonged pulse-width and longer treatment duration were proposed to minimize adverse events, the optimal treatment option among available phototherapy modalities - long-pulsed (Nd:YAG), pulsed diode and alexandrite lasers as well as intense pulsed light (IPL) - remains unclear, particularly for skin of colour. To determine superiority in terms of effectiveness and tolerability, we conducted a systematic review of literature on different types of in-office laser and IPL for hair removal in subjects with Fitzpatrick skin types III-VI. The meta-analysis was performed using Review Manager (RevMan) version 5.3 and included 12 eligible comparative trials (nine randomized controlled trials and three quasi-randomized). In terms of hair count reduction, pooled effect estimates for long-pulsed ND:YAG laser [OR: 0.26, 95% CI (0.1, 0.78)] and diode laser [standardized mean difference (SMD): -0.11, 95% CI (-0.62, 0.39)] were not statistically significant from those of IPL; in contrast, alexandrite laser was found to be superior to IPL in reducing hair count [SMD: -1.7, 95% CI (-2.6, -0.78)]. In terms of adverse events, the pooled effect estimates favoured long-pulsed Nd:YAG laser to IPL with respect to postinflammatory hyperpigmentation [OR: 0.26, 95% CI: (0.1, 0.78)]. However, both pulsed diode and alexandrite lasers exhibited a comparable safety profile to IPL, despite higher pain scores with lasers. In conclusion, this systematic review suggests that treatment outcomes for different in-office laser devices and IPL in subjects with skin type III-VI are broadly similar; nevertheless, we observed a trend towards greater hair reduction following laser therapy compared with IPL. Hair Removal;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Skin Pigmentation;Treatment Outcome

The more the better? An appraisal of combination therapies for actinic keratosis. Actinic keratoses (AK) are common precancerous lesions of the skin. Numerous interventions exist for the treatment of AK, including lesion- and field-directed approaches. In daily practice, different treatment modalities are often combined to maximize clearance rates. However, whether a combination therapy is preferable to monotherapy in terms of efficacy and safety has been subject of intense debate. In this review, we summarize the current knowledge on the efficacy and safety of local combination therapies for the treatment of patients with AK. Combination approaches of cryosurgery followed by photodynamic therapy (PDT), laser-assisted PDT, PDT in combination with topical interventions and microneedling-assisted PDT have shown slightly better efficacy results with similar tolerability compared to the respective monotherapy. However, the individual usage of combination therapies should be checked on a case-by-case basis and take into account individual patient- and lesion-specific aspects as more resources are needed and because the individual monotherapies are already highly effective. Dermatologic Agents Administration, Topical;Combined Modality Therapy;Cryosurgery;Dermatologic Agents;Humans;Keratosis, Actinic;Low-Level Light Therapy;Needles;Photochemotherapy

The effectiveness of photodynamic therapy as a complementary therapy to mechanical instrumentation on residual periodontal pocket clinical parameters: A clinical split-mouth test. The purpose of this study was to evaluate the effectiveness of photodynamic therapy as complementary therapy to mechanical instrumentation on periodontal residual pockets. This longitudinal, prospective, double-blind and controlled split-mouth clinical trial included one hundred and fourteen residual periodontal sites with probing depth â‰¥ 4â€¯mm and bleeding on probing, which were distributed into two groups: 57 in the test group (SRPâ€¯+â€¯aPDT) - using a low power laser application Therapy XT (DMC Equipamentos Ltda, SÃ£o Carlos, SÃ£o Paulo, Brazil) with operational parameters of 660â€¯nm and 110â€¯mW for 15s, and 57 in the control group (SRP). Oral hygiene conditions were evaluated, through the Visible Plaque Index (VPI) and Gingival Bleeding

Index (GBI), as well as periodontal clinical outcomes, comprising the Bleeding on Probing (BOP), Probing Depth (PD) and Clinical Attachment Level (CAL) at baseline and after 3 months. Decrease of 17.74% was observed for the VPI after 3 months of follow-up, while the GBI was reduced by 19.91%, thus indicating statistically significant decreases for both parameters (pâ€¯<â€¯0.001). Decreases in VPI per site, BOP and PD and CAL gain between T(0) and T(3) in both treatment groups (pâ€¯<â€¯0.001) were observed, but no statistically significant intergroup differences were found (pâ€¯>â€¯0.05). Within the parameters used in this study, adjuvant aPDT to SRP did not lead additional benefits regarding the assessed clinical parameters after three months. Photosensitizing Agents Adult;Aged;Brazil;Combined Modality Therapy;Dental Health Surveys;Dental Scaling;Double-Blind Method;Female;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Periodontal Pocket;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Root Planing

Photobiomodulation therapy (PBMT) in bone repair: A systematic review. BACKGROUND: Photobiomodulation therapy (PBMT) using low-level laser influences the release of several growth factors involved in the formation of epithelial cells, fibroblasts, collagen and vascular proliferation, besides accelerating the synthesis of bone matrix due to the increased vascularization and lower inflammatory response, with significant increase of osteocytes in the irradiated bone. Considering its properties, beneficial effects and clinical relevance, the aim of this review was to analyze the scientific literature regarding the use of PBMT in the process of bone defect repair. METHODS: Electronic search was carried out in PubMed/MEDLINE(â“‡) and Web of Science databases with combination of the descriptors low-level laser therapy AND bone repair, considering the period of publication until the year 2018. RESULTS: The literature search identified 254 references in PubMed/MEDLINE and 204 in Web of Science, of which 33 and 4 were selected, respectively, in accordance with the eligibility requirements. The analysis of researches showed articles using PBMT in several places of experimentation in the subjects, different types of associated biomaterials, stimulatory effects on cell proliferation, besides variations in the parameters of use of laser therapy, mainly in relation to the wavelength and density of energy. Only four articles reported that the laser did not improve the osteogenic properties of a biomaterial. CONCLUSIONS: Many studies have shown that PBMT has positive photobiostimulatory effects on bone regeneration, accelerating its process regardless of parameters and the use of biomaterials. However, standardization of its use is still imperfect and should be better studied to allow correct application concerning the utilization protocols. Collagen Bone Regeneration;Cell Proliferation;Collagen;Fibroblasts;Fracture Healing;Fractures, Bone;Humans;Low-Level Light Therapy;Osteogenesis

Follow-up results of a randomized clinical trial for low-level laser therapy in painful TMD of muscular origins. Objective: To characterize short- and long-term assessment of the low-intensity laser therapy (LLLT) effectiveness in women with TMD of muscular origins and to evaluate whether the information about the treatment received (active or placebo) modifies the pain intensity.Methods: Forty-one women with painful TMD (31.7Â Â±Â 5.2Â years) were divided into laser (nÂ =Â 20) and placebo (nÂ =Â 21) groups. The pain intensity was measured at the baseline, after the LLLT (T8), 6 and 12Â months. At the 6-month follow-up, the groups received information about the active or placebo treatment.Results: At T8 and 6-month, both active and placebo LLLT were effective in reducing pain (p <Â .05). After one year, the groups showed similar pain. Active LLLT was more effective in reducing pain palpation (p =Â .001) and referred pain (p =Â .04) in the region of the TMJs. The information about the treatment modified the perceived pain intensity.Conclusion: Active and placebo LLLT are effective for painful TMD of muscular origins in the short-term. Information about the treatment impairs the subjective perception of pain. Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Pain;Temporomandibular Joint Disorders;Treatment Outcome

Is There a Role for Photobiomodulation in Treating Damaged Articular Cartilage Due to Injury or Degeneration? Animals;Cartilage Diseases;Cartilage, Articular;Humans;Lasers, Solid-State;Low-Level Light Therapy;Regeneration
Light-induced modulation of the mitochondrial respiratory chain activity: possibilities and limitations. Biological effects of high fluence low-power (HFLP) lasers have been reported for some time, yet the molecular mechanisms procuring cellular responses remain obscure. A better understanding of the effects of HFLP lasers on living cells will be instrumental for the development of new experimental and therapeutic strategies. Therefore, we investigated sub-cellular mechanisms involved in the laser interaction with human hepatic cell lines. We show that mitochondria serve as sub-cellular "sensor" and "effector" of laser light non-specific interactions with cells. We demonstrated that despite blue and red laser irradiation results in similar apoptotic death, cellular signaling and kinetic of biochemical responses are distinct. Based on our data, we concluded that blue laser irradiation inhibited cytochrome c oxidase activity in electron transport chain of mitochondria. Contrary, red laser triggered cytochrome c oxidase excessive activation. Moreover, we showed that Bcl-2 protein inhibited laser-induced toxicity by stabilizing mitochondria membrane potential. Thus, cells that either overexpress or have elevated levels of Bcl-2 are protected from laser-induced cytotoxicity. Our findings reveal the mechanism how HFLP laser irradiation interfere with cell homeostasis and underscore that such laser irradiation permits remote control of mitochondrial function in the absence of chemical or biological agents. Reactive Oxygen Species;Electron Transport Complex IV Apoptosis;Cell Survival;Electron Transport;Electron Transport Complex IV;Gene Expression Regulation;Hep G2 Cells;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mitochondria;Mitochondrial Membranes;Oxidation-Reduction;Phototherapy;Reactive Oxygen Species
Evaluation of Safety and Efficacy of Laser Hair Removal With the Long-Pulsed 755â€‰nm Wavelength Laser: A Two-Center Study With 948 Patients. BACKGROUND AND OBJECTIVES: Laser hair removal is the most common laser therapy and the third most commonly performed procedure with more than one million treatments in United States in 2016. This retrospective study was conducted to assess long-term efficacy and safety of the 755â€‰nm laser for hair removal. STUDY DESIGN/MATERIALS AND METHODS: Nearly, 3,606 laser treatments were performed with the long-pulsed 755â€‰nm wavelength laser equipped with an epidermal cooling device between 1997 and 2005 and were followed till 2013. Standardized assessments were conducted by two treating physicians and patients at two follow-up intervals. At first follow-up, clearance was assessed by two physicians and clearance and satisfaction by patients. At the second follow-up, patients were assessed if hair clearance sustained compared with the first follow-up. RESULTS: Nine hundred and forty-eight patients with Fitzpatrick skin types I-IV were treated with a total of 3,606 laser treatments in this study. The mean age at the beginning of the study was 35 years (Â±11), 95.1% of patients were female (nâ€‰=â€‰902) and 4.9% male (nâ€‰=â€‰46). Five hundred and seventy-four patients received a minimum of three treatments and an average of 5.31 (3-16) treatments on axilla, back, bikini, breast, abdomen, face, lower extremity, or upper extremity region. First, follow-up was conducted 3.9 (Â±1.5) years after the final laser treatment. Seventy-four percent of these patients received 75-100% clearance as reported by the physician and 48% clearance as reported by the patient. Fifty-two percent of patients reported slower hair growth and 42% change in hair texture. Ninety percent of patients treated on axilla, 82% treated on the bikini area, and 79% treated on lower extremities experienced 75% or more clearance after three treatments. Facial, as well as breast and abdomen treatments, only showed a 66% and 62%, respectively, after three treatments. For these locations, five and more treatments were needed to achieve a quote of 79% (face) or 80% (breast and abdomen) for a 75-100% clearance. Upper extremity and back treatments did not have enough

physician ratings to draw conclusions. Long-term adverse events were minimal and were all located on the face (one patient scar, four patients herpes infection). Second follow-up of 173 patients was conducted after 11.5 years (Â±2.0) and 87.9% of patients reported that their improvement sustained. CONCLUSIONS: The long-pulsed 755â€‰nm alexandrite laser is a safe and efficacious treatment for the reduction of unwanted body hair with permanent results and high patient satisfaction. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adult;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Retrospective Studies;Treatment Outcome

Peripheral osteoma of the nasal bone after laser treatment: A case report. INTRODUCTION: Peripheral osteoma, which arises from the periosteum, commonly develops in the head and neck region and is found frequently in the mandible, maxilla, and paranasal sinuses. However, osteoma of the face, especially from the nasal bone, is quite rare. PATIENT CONCERNS: A 34-year-old female visited our outpatient department with a small mass on the nose. She had n laser treatment of nevus at the same spot 14 years before, and it had enlarged slowly since 10 years before. DIAGOSIS: Computed tomography scan revealed a 0.7â€ŠÃ—â€Š0.5â€Šcm sized radio-opaque tumor of the nasal bone. INTERVENTIONS: Under general anesthesia, surgical excision was performed through a transcolumellar and infracartilaginous incision. The excised tumor was a 0.7â€ŠÃ—â€Š0.5â€Šcm sized hard mass. OUTCOMES: Biopsy confirmed it as a peripheral osteoma. After tumor removal, structural stability of nasal framework including bone and cartilage was maintained, and symmetry of the nasal dorsum was acquired. CONCLUSION: Chronic osteoma can compress the abutting structures. In the case of the nose, either structural instability or asymmetry can occur. By applying open rhinoplasty techniques, postoperative scars could be hidden and additional correction of the affected structure could be carried out if necessary. As a result, the surgeon can achieve the functional and esthetic outcomes simultaneously. Adult;Female;Humans;Low-Level Light Therapy;Nasal Bone;Nevus;Osteoma;Rhinoplasty

Low-level laser therapy (LLLT) in the treatment of recurrent aphthous stomatitis (RAS) - a promising treatment option: A report of two cases. Recurrent aphthous stomatitis (RAS) is a chronic, ulcerative condition of the oral mucosa that affects 10-25% of the population. The etiopathogenesis of the disease is not fully understood, although a polygenic mode of inheritance and immunological dysregulation have been suggested in several studies. The contribution of numerous predisposing factors, such as a deficiency of iron, vitamin B12 or folic acid, trauma, emotional stress, endocrine disturbances, or allergy, have also been considered. So far, no causative treatment for RAS has been developed; instead, topical and systemic drugs are used to reduce pain and inflammation, and to lengthen the period of remission. Low-level laser therapy (LLLT) is a non-invasive and atraumatic therapeutic method that involves the local application of a high-density, monochromatic, narrow-band light source. With the use of the appropriate power and wavelength, the therapy brings anti-inflammatory and analgesic results, and wound healing is promoted. Several reports on the beneficial effects of LLLT in RAS have been presented recently. This report describes 2 cases of adult patients with RAS treated with LLLT to relieve pain and promote the healing of the ulcers. The clinical presentations with the signs and symptoms are discussed and illustrated, along with the treatment algorithms and outcomes. Folic Acid;Vitamin B 12 Adult;Folic Acid;Humans;Low-Level Light Therapy;Stomatitis, Aphthous;Vitamin B 12

Advances in phototherapy for psoriasis and atopic dermatitis. Introduction: Phototherapy has long been used for the treatment of inflammatory skin diseases, such as psoriasis and atopic dermatitis. The most frequent treatment approach utilizes ultraviolet (UV) light, however, recently, different lasers and low-level light therapies (LLLT) emitting wavelengths in the spectrum of the visible light have also been tried for the treatment of inflammatory skin diseases with variable

success.Areas covered: This review provides an update on the different forms of phototherapy used for the treatment of psoriasis and atopic dermatitis. The proposed mechanism of action of the different phototherapeutical approaches are covered, including the immunosuppressive effect of UV light, the anti-inflammatory effect of vascular lasers and the LLLT induced photobiomodulation. The clinical efficacy of the different treatment options is also discussed.Expert opinion: Based on the efficacy and safety, NB-UVB represents the gold standard for treating psoriasis and atopic dermatitis. The UVB excimer laser and excimer lamp might be the best option for clearing localized therapy-resistant lesions. Home UV phototherapy systems might promote treatment adherence and better compliance of the patients. Vascular lasers, IPLs and LLLT, however, can not currently be recommended for the treatment of inflammatory skin diseases because of the lack of well-controlled studies. Dermatitis, Atopic;Humans;Psoriasis;Ultraviolet Rays;Ultraviolet Therapy

Analysis of the effects of low-level laser therapy on muscle fatigue of the biceps brachii muscle of healthy individuals and spastic individuals: Study protocol for a single-center, randomized, double-blind, and controlled clinical trial. BACKGROUND: Muscular fatigue is caused by biochemical alterations that modify the mechanics of muscle contraction, resulting in negative changes in the performance of the contraction. Several resources are studied to mitigate this situation among which we can cite low-level laser therapy (LLLT). The effects of LLLT are being studied in healthy subjects with fibromyalgia and who are athletes, and currently the studies are being performed in spastic muscles with poststroke individuals. The aim will be to evaluate the effects of LLLT on the fatigue of the biceps brachii muscle of healthy individuals and individuals with spastic hemiparesis. METHODS: A cross-sectional, comparative, randomized, placebo, double-blind clinical trial will be divided into 2 phases: phase I shall consist of 30 healthy subjects and phase II of 30 poststroke individuals. The study will consist of 3 groups (control group, placebo group, and LLLT group), and all individuals will pass through all groups, following the randomization criteria. The protocol consists of the application of LLLT in the biceps brachii muscle on the dominant side in healthy individuals and in the hemiparetic side of poststroke individuals, and, subsequently, 3 maximal isometric voluntary contractions (MIVCs) will be performed for 50â€Šseconds in the dynamometer, with an interval of 50â€Šseconds between them. Pain intensity will be evaluated by means of the visual analog scale, and the myoelectric activity by means of surface electromyography associated with the evaluation of muscular strength by means of the dynamometer. The local temperature will be evaluated by infrared thermography and blood lactate concentration through the lactimeter, which will be measured at 4 different times, before the application of the laser (basal), and 3, 15, and 25 minutes after the MIVC. Adult;Aged;Aged, 80 and over;Arm;Cross-Sectional Studies;Double-Blind Method;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Fatigue;Muscle Spasticity;Muscle, Skeletal;Randomized Controlled Trials as Topic;Treatment Outcome;Young Adult

Systematic Review of Delivery Parameters Used in Dental Photobiomodulation Therapy.
Objective: This systematic review of published data critically appraises the consistency in the reported delivery parameters used in photobiomodulation (PBM) therapies research within clinical dentistry and makes reporting recommendations for future clinical protocols. Background: Key to the standardization of randomized clinical trials and associated peer-reviewed articles is the disclosure of all laser and light-emitting diode operating parameters. The current status shows a lack of full parameters and significantly impacts on the ability to integrate published data with current and future investigation into clinical PBM therapy. Materials and methods: Search engines, PubMed, Google Scholar, and Cochrane, were scanned for investigation into the effects of PBM therapy research within clinical dentistry. Key words "Low-Level-Laser," "PBM," "Photobiomodulation," "Oral" and "Therapy" were used and a total of 754 articles identified, spanning a period of 9 years and 1 month between February 2009 and March 2018. Only human clinical trials were considered. Fifty-two

articles were included in this investigation and the reported basic delivery parameters used in PBM therapies research were considered for each clinical trial. Results: The overall reported basic delivery parameters used in PBM therapies research were too inadequate to be able to be replicated in further studies. These included parameters related to the power meter, beam cross-sectional dynamics, fluence, and wider aspects of dosimetry. Conclusions: The delivery parameters used in PBM therapy research within clinical dentistry, investigated in this study, presented a wide variation in their recording or nonrecording of all significant elements needed to have scientific validity. A constant inconsistency in delivering valid, reliable, PBM therapy doses, to target tissues was also identified. The lack of consensus in delivering a sound protocol for PBM therapy, is partly due to the lack of adequate reported materials and methods, which are essential for replication of individual studies. One way to resolve this problem is for Journals to insist on all comprehensive parameter records, used in PBM therapies, to be part of author guidelines in submitting articles of studies on PBM therapy in clinical dentistry. Clinical Protocols;Dentistry;Humans;Low-Level Light Therapy

Photobiomodulation Therapy Partially Restores Cartilage Integrity and Reduces Chronic Pain Behavior in a Rat Model of Osteoarthritis: Involvement of Spinal Glial Modulation. OBJECTIVE: Chronic pain associated with osteoarthritis (OA) often leads to reduced function and engagement in activities of daily living. Current pharmacological treatments remain relatively ineffective. This study investigated the efficacy of photobiomodulation therapy (PBMT) on cartilage integrity and central pain biomarkers in adult male Wistar rats. DESIGN: We evaluated the cartilage degradation and spinal cord sensitization using the monoiodoacetate (MIA) model of OA following 2 weeks of delayed PBMT treatment (i.e., 15 days post-MIA). Multiple behavioral tests and knee joint histology were used to assess deficits related to OA. Immunohistochemistry was performed to assess chronic pain sensitization in spinal cord dorsal horn regions. Furthermore, we analyzed the principal components related to pain-like behavior and cartilage integrity. RESULTS: MIA induced chronic pain-like behavior with respective cartilage degradation. PBMT had no effects on overall locomotor activity, but positive effects on weight support (P = 0.001; effect size [ES] = 1.01) and mechanical allodynia (P = 0.032; ES = 0.51). Greater optical densitometry of PBMT-treated cartilage was evident in superficial layers (P = 0.020; ES = 1.34), likely reflecting the increase of proteoglycan and chondrocyte contents. In addition, PBMT effects were associated to decreased contribution of spinal glial cells to pain-like behavior (P = 0.001; ES = 0.38). CONCLUSION: PBMT during the chronic phase of MIA-induced OA promoted cartilage recovery and reduced the progression or maintenance of spinal cord sensitization. Our data suggest a potential role of PBMT in reducing cartilage degradation and long-term central sensitization associated with chronic OA. Activities of Daily Living;Animals;Cartilage, Articular;Chronic Pain;Humans;Low-Level Light Therapy;Male;Neuroglia;Osteoarthritis;Rats;Rats, Wistar

Photobiomodulation therapy in knee osteoarthritis reduces oxidative stress and inflammatory cytokines in rats. Knee osteoarthritis (OA) is a chronic disease that causes pain and gradual degeneration of the articular cartilage. In this study, MIA-induced OA knee model was used in rats to test the effects of the photobiomodulation therapy (PBM). We analyzed the inflammatory process (pain and cytokine levels), and its influence on the oxidative stress and antioxidant capacity. Knee OA was induced by monosodium iodoacetate (MIA) intra-articular injection (1.5 mg/50 Î¼L) and the rats were treated with eight sessions of PBM 3â€‰days/week (904â€‰nm, 6 or 18â€‰J/cm(2)). For each animal, mechanical and cold hyperalgesia and spontaneous pain were evaluated; biological analyses were performed in blood serum, intra-articular lavage, knee structures, spinal cord and brainstem. Cytokine assays were performed in knee, spinal cord and brainstem samples. The effects of the 18â€‰J/cm(2) dose of PBM were promising in reducing pain and neutrophil activity in knee samples, together with reducing oxidative stress damage in blood serum and spinal cord samples.

PBM improved the antioxidant capacity in blood serum and brainstem, and decreased the knee pro-inflammatory cytokine levels. Our study demonstrated that PBM decreased oxidative damage, inflammation and pain. Therefore, this therapy could be an important tool in the treatment of knee OA. Cytokines Animals;Cartilage, Articular;Cytokines;Disease Models, Animal;Low-Level Light Therapy;Osteoarthritis, Knee;Oxidative Stress;Rats

Evaluation of the effectiveness of infrared light-emitting diode photobiomodulation in children with sleep bruxism: Study protocol for randomized clinical trial. BACKGROUND: Sleep bruxism is a masticatory muscle activity characterized as rhythmic (phasic) or nonrhythmic (tonic). In children and adolescents, etiological factors, such as breathing pattern and sleep quality, have recently been addressed in studies investigating sleep bruxism. New therapies for adults, such as botulinum toxin, have been investigated, but such techniques are not applicable for individuals in the growth and development phase. METHODS: The participants will be 76 children, which will be randomly allocated to a control group, that is group 1, absence of bruxism; group 2, children with bruxism treated with infrared light-emitting diode (LED); and group 3, bruxism treated with occlusal splint. All participants will be submitted to a clinical evaluation to evaluate muscle activity and salivary biomarkers, before and after treatments. Muscle activity will be verified by electromyography of muscles mastication, masseter and temporal, and salivary biomarkers observed will be cortisol and dopamine levels. DISCUSSION: Photobiomodulation therapy has piqued the interest of researchers, as this noninvasive method has demonstrated positive results in problems related to muscle tissues. This document describes the protocol for a proposed study to evaluate morphological and psychosocial aspects in children and adolescents with awake bruxism and their responses to photobiomodulation therapy with infrared LED. CLINICAL TRIALS:. Child;Clinical Protocols;Humans;Infrared Rays;Low-Level Light Therapy;Masticatory Muscles;Occlusal Splints;Sleep Bruxism

Low level light therapy for the treatment of recalcitrant chalazia: a sample case summary. PURPOSE: To evaluate the effects of low-level light therapy (LLLT) on the resolution of recalcitrant chalazia. PATIENTS AND METHODS: This was a single-site retrospective chart review of patients with chalazia, all of whom were unresponsive to previous pharmaceutical therapy or surgical intervention, who received a 15Â min LLLT treatment in conjunction with a standard pharmaceutical regimen. A second treatment was applied 24Â hrs to as late as 2Â months if there was no evidence of progression of resolution in appearance. RESULTS: A total of 26 eyes of 22 patients with relevant history and treatment were reviewed, all with a history of prior pharmaceutical treatment for their chalazia. After a single 15Â min LLLT treatment, followed by a standard pharmaceutical regimen, 46% of eyes (12/26) showed resolution of their chalazia. Resolution was noted from 3Â days to one-month post-treatment. With a second treatment, the chalazia resolved in 92% of eyes (24/26). Only two eyes of the 26 (8%) required incision and curettage after LLLT treatment. CONCLUSION: The use of LLLT for the treatment of recalcitrant chalazia appears to be beneficial in patients who have failed topical and/or systemic therapy, significantly reducing the likelihood of requiring surgical intervention.

The Diabetic Retinopathy Clinical Research Network (DRCR.net) and Its Contributions to the Treatment of Diabetic Retinopathy. Over the past two decades, the Diabetic Retinopathy Clinical Research Network (now known as the DRCR Retina Network) has contributed to multiple and substantial advances in the clinical care of diabetic eye disease. Network studies helped establish anti-vascular endothelial growth factor (VEGF) agents as an effective alternative to panretinal photocoagulation for eyes with proliferative diabetic retinopathy (PDR) and as first-line therapy for eyes with visual impairment for diabetic macular edema (DME), defined treatment algorithms for the use of intravitreal medications in these conditions, and provided critical data to understand how to better evaluate the diabetic eye using optical coherence tomography and other imaging modalities. Ongoing DRCR.net studies will address whether anti-VEGF therapy is effective at preventing vision-

threatening complications in eyes with severe non-proliferative diabetic retinopathy, if photobiomodulation has a beneficial effect in eyes with DME, and whether initiation of DME treatment with bevacizumab and rescue with aflibercept can provide visual outcomes as good as those achieved with aflibercept alone. Future plans for the Network also include the expansion into non-diabetic eye disease in areas such as age-related macular degeneration. Angiogenesis Inhibitors Angiogenesis Inhibitors;Clinical Protocols;Diabetic Retinopathy;Humans;Intravitreal Injections;Laser Coagulation;Retina;Tomography, Optical Coherence;Visual Acuity

Penetration Profiles of Visible and Near-Infrared Lasers and Light-Emitting Diode Light Through the Head Tissues in Animal and Human Species: A Review of Literature. Background and objective: Photobiomodulation (PBM) therapy is a promising and noninvasive approach to stimulate neuronal function and improve brain repair. The optimization of PBM parameters is important to maximize effectiveness and tolerability. Several studies have reported on the penetration of visible-to-near-infrared (NIR) light through various animal and human tissues. Scientific findings on the penetration of PBM light vary, likely due to use of different irradiation parameters and to different characteristics of the subject such as species, age, and gender. Materials and methods: In this article, we review published data on PBM penetration through the tissues of the head in both animal and human species. The patterns of visible-to-NIR light penetration are summarized based on the following study specifications: wavelength, coherence, operation mode, beam type and size, irradiation site, species, age, and gender. Results: The average penetration of transcranial red/NIR (630-810â€‰nm) light ranged 60-70% in C57BL/6 mouse (skull), 1-10% in BALB/c mouse (skull), 10-40% in Sprague-Dawley rats (scalp plus skull), 20% in Oryctolagus cuniculus rabbit (skull), 0.11% in pig (scalp plus skull), and 0.2-10% in humans (scalp plus skull). The observed variation in the reported values is due to the difference in factors (e.g., wavelengths, light coherence, tissue thickness, and anatomic irradiation site) used by researchers. It seems that these data challenge the applicability of the animal model data on transcranial PBM to humans. Nevertheless, two animal models seem particularly promising, as they approximate penetration in humans: (I) Penetration of 808â€‰nm laser through the scalp plus skull was 0.11% in the pig head; (II) Penetration of 810â€‰nm laser through intact skull was 1.75% in BALB/c mouse. Conclusions: In conclusion, it is worthwhile mentioning that since the effectiveness of brain PBM is closely dependent on the amount of light energy reaching the target neurons, further quantitative estimation of light penetration depth should be performed to validate the current findings. Animals;Brain;Cohort Studies;Dose-Response Relationship, Radiation;Female;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Mice, Inbred C57BL;Models, Animal;Rabbits;Rats;Rats, Sprague-Dawley;Sensitivity and Specificity;Skull

Effect of Photobiomodulation on Repairing Pressure Ulcers in Adult and ElderlyÂ Patients: A Systematic Review. Evaluation of photobiomodulation therapy (PBMT) in the treatment of pressure ulcers in adults and the elderly. Systematic review, based on the recommendations of the handbook, proposed by Cochrane. The search was carried out in databases, records of randomized clinical trials, list of references cited in the selected articles, as well as a manual search in meetings and specialized journals. A total of 1342 studies were identified, 18 were preselected and 5 were included in this review. Clinical heterogeneity of the participants was observed, in addition to variation in the laser parameters and predominance of studies of low methodological quality. PBMT with the use of laser (658Â nm; 4Â JÂ cm(-2) ;50Â mw) showed complete wound healing (PÂ <Â 0.001) when compared to lasers (990Â nm and 808Â nm). However, there was no statistically significant difference in relation to time to complete wound healing and in area reduction compared to standard care. PBMT in the infrared wavelength showed efficacy in the healing of the pressure ulcer, similar to the standard care presented in the different studies. PBMT (658Â nm) was effective

in promoting healing when compared to standard care. Laser can be a therapy of choice in the treatment of pressure ulcers, since no evidence has been found to refute its clinical application. Adult;Aged;Humans;Low-Level Light Therapy;Middle Aged;Pressure Ulcer;Wound Healing

The Effects of Laser Moxibustion on Knee Osteoarthritis Pain in Rats. Background: Although chronic pain affects the quality of life of patients with osteoarthritis, current medical treatments are either ineffective or have long-term side effects. Recently, low-intensity laser irradiation of corresponding acupoints was demonstrated to alleviate pain. Objective: The aim of the present study was to investigate the effects of 10.6â€‰Î¼m laser moxibustion on a monosodium iodoacetate (MIA)-induced knee osteoarthritis pain model. Methods: Thirty-two rats were randomly assigned to four groups: Saline, MIA, MIA+Laser, and MIA+Sham Laser. The 10.6â€‰Î¼m laser was used to irradiate the ST35 for 10â€‰min once a day for a total of seven applications. The paw withdrawal mechanical threshold and weight-bearing difference were performed to evaluate the analgesic effects of laser moxibustion. At the end of the experiment on days 28, the joint histology, the levels of metalloproteinases-13 (MMP-13) in the cartilage, and TNF-Î±, IL-1Î², and IL-6 in the synovial membrane were measured to determine the chondroprotection and anti-inflammatory effect of laser moxibustion. Results: Early laser moxibustion significantly reversed the MIA-induced mechanical hyperalgesia and weight-bearing difference, especially on the 28th day (pâ€‰<â€‰0.001). Moreover, laser moxibustion prevented the articular pathological lesions and cartilage destruction on days 28 (pâ€‰<â€‰0.01). Remarkably, the levels of cartilage MMP-13, and synovial TNF-Î±, IL-1Î², and IL-6 also decreased on day 28 (pâ€‰<â€‰0.05) after the early treatment of laser moxibustion. Conclusions: 10.6â€‰Î¼m laser moxibustion may have long-lasting analgesic, anti-inflammatory, and chondroprotection effects, suggesting that it may emerge as a potential therapeutic strategy for the chronic pain treatment of osteoarthritis. Biomarkers;Iodoacetic Acid Animals;Male;Rats;Acupuncture Points;Biomarkers;Iodoacetic Acid;Laser Therapy;Moxibustion;Osteoarthritis, Knee;Pain Measurement;Rats, Sprague-Dawley

Transcranial Photobiomodulation Improves Cognitive Performance in Young Healthy Adults: A Systematic Review and Meta-Analysis. Background: Transcranial photobiomodulation (t-PBM) is a noninvasive modality that may improve cognitive function in both healthy and diseased subjects. Objective: This systematic review and meta-analysis addresses the question of whether t-PBM improves cognitive function in healthy adults. Methods: We searched MEDLINE using PubMed, EMBASE, SCOPUS, Web of Science, and Cochrane Library up to March 2019. We also searched ProQuest and Google Scholar databases for unpublished material. The search was limited to articles on the procognitive effects of t-PBM in healthy adults. The initial search resulted in 871 studies, of which nine publications met our criteria for inclusion and exclusion. Seven studies were performed on young, healthy subjects (17-35 years), and two studies were conducted on older (â‰¥49 years), normal subjects. A meta-analysis was performed on six full-text publications whose subjects were young adults. Results: t-PBM administration improved cognition-related outcomes by an 0.833 standardized mean difference (SMD; 95% confidence interval (CI): 0.458-1.209, 14 comparisons) in young, healthy participants. Funnel plotting revealed asymmetry, which was validated using Egger's (pâ€‰=â€‰0.030) and Begg's regression (pâ€‰=â€‰0.006) tests. However after reanalysis, this asymmetry disappeared in the attention subgroup, but not in the memory subgroup. The trim-and-fill analysis indicated two studies were lacking required data. Thus, the effect size was adjusted from an SMD of 0.761 (95% CI: 0.573-0.949) to 0.949 (0.779-1.120). The overall quality score of the studies was modest. Conclusions: We demonstrated a significant, beneficial effect of t-PBM on cognitive performance of young, healthy individuals; however, the heterogeneity of the data was high. This could be due to the modest quality or to the low number of included studies, or to the differences between the various subdomains assessed. These shortcomings should be meticulously addressed

before concluding that t-PBM is a cognitive-enhancing intervention in healthy individuals. Brain;Cognition;Cohort Studies;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Quality Improvement;Reference Values;Retrospective Studies;Skull;Young Adult

Evaluation of the efficacy of different treatment modalities for painful temporomandibular disorders. The purpose of this study was to clinically evaluate the efficacies of three treatment methods and to compare their outcomes in patients with painful disc displacement. The study group comprised 45 patients with unilateral temporomandibular disorders who fell into Axis I group II (with limited mouth opening) of the Research Diagnostic Criteria for Temporomandibular Disorders. Magnetic resonance imaging was used for definitive diagnosis. The patients were divided randomly into three groups according to the treatment method: splint therapy, splint therapy with ultrasound-guided arthrocentesis, and splint therapy with low-level laser therapy. Patients were followed up after treatment for 6 months. The groups were compared in terms of pain and functional jaw movements (unassisted mouth opening without pain, maximum unassisted mouth opening, and contralateral movements). At the end of treatment, functional jaw movements were significantly increased while pain values were significantly decreased in all groups ($P<0.05$). Group 2 had a quicker improvement in terms of mouth opening scores at the end of the first month, and unassisted mouth opening without pain was found to be more than 35 millimetres in all groups at the end of 6 months. All treatment modalities showed effective results on pain and functional jaw movements in the treatment of temporomandibular disorders. Arthrocentesis;Humans;Pain;Pain Measurement;Periodontal Splints;Range of Motion, Articular;Temporomandibular Joint Disorders;Treatment Outcome

Application of superluminescent diodes (sLED) in the treatment of scarring alopecia - A pilot study. INTRODUCTION: Photobiomodulation therapy with the use of light-emitting diodes (LEDs) is a fast growing therapeutic technique with a wide range of dermatologic indications. Recently it has been suggested that LED therapy could be beneficial in scarring alopecia. AIM: Assessment of the efficacy of novel superluminescent diodes (sLED) with a "soft- start" as an adjuvant treatment in selected types of scarring alopecia. METHODS: This pilot study included 16 female patients: 8 with frontal fibrosing alopecia (FFA) and 8 with lichen planopilaris (LPP), aged 41-76 years with a stable treatment, either topical or systemic. In all patients, sLED irradiations were performed once a week for a 10-week period. The sLEDs' effectiveness was assessed clinically and using trichoscopy. RESULTS: The therapy was well tolerated. Both Lichen Planopilaris Activity Index (LPPAI) and Frontal Fibrosing Alopecia Severity Score (FFASS) were significantly reduced after the therapy (pâ€¯=â€¯0.012, pâ€¯=â€¯0.017 respectively). Within the treated area, the number of thick hairs significantly increased after the therapy (pâ€¯=â€¯0.009), whereas the number of medium-sized hairs and thin hairs did not change significantly (pâ€¯=â€¯0.836, pâ€¯=â€¯0.675 respectively). CONCLUSIONS: Irradiations with sLEDs were demonstrated to be safe and well tolerated. This noninvasive therapy leads to the reduction of subjective symptoms, and improve the outcome both in FFA and in LPP. This effective novel light source can be used as an adjuvant therapy in patients with chronic LPP or FFA. However, further studies including a larger study group and a control group are needed to evaluate the long-term effects of the therapy. Adult;Aged;Alopecia;Female;Humans;Lichen Planus;Low-Level Light Therapy;Middle Aged;Pilot Projects

From perinuclear to intranuclear localization: A cell-penetrating peptide modification strategy to modulate cancer cell migration under mild laser irradiation and improve photothermal therapeutic performance. Tumor metastasis is a key cause that leads to the failure of cancer treatment. Inhibition of metastasis, rather than the simple removal of the primary tumor, is critical to the survival improvement. Here, we report a cell-penetrating peptide-modification strategy to realize substantial perinuclear accumulation and subsequent near-infrared (NIR) laser-triggered nuclear

entry of palladium nanosheets (Pd NSs) for inhibition of cancer cell metastasis and photothermal cancer therapy. Specifically, it was found that the cell-penetrating peptide TAT-modified Pd NSs (abbreviated as Pd-TAT) mainly accumulated in the perinuclear region and showed the enhanced endocytosis and reduced efflux compared with the counterpart without TAT modification. On the one hand, Pd-TAT could inhibit cell migration and invasion. It was proposed that Pd-TAT located in the perinuclear region could promote the overexpression of lamin A/C proteins (related with nuclear stiffness) and increase the mechanical stiffness of the nucleus. More importantly, the introduction of NIR laser irradiation with a laser density of 0.3â€¯W/cm(2) (below the permitted value 0.329â€¯W/cm(2) for skin exposure) significantly enhanced the inhibitory effect of Pd-TAT on cancer cell migration, which might be due to the increased nuclear stiffness caused by the enhanced nuclear entry of Pd-TAT under the effect of mild laser-induced local hyperthermia in the perinuclear region. On the other hand, the increased nuclear entry of Pd-TAT under NIR laser irradiation greatly enhanced their photothermal therapeutic efficacy due to the susceptibility of the nucleus to hyperthermia. Taken together, the Pd-TAT-based and laser-promoted perinuclear-to-intranuclear localization strategy allows us to not only destroy the primary tumor more effectively, but also inhibit cancer metastasis more persistently. Cell-Penetrating Peptides;Palladium Animals;Body Weight;Cell Line, Tumor;Cell Movement;Cell-Penetrating Peptides;Humans;Hyperthermia, Induced;Infrared Rays;Lasers;MCF-7 Cells;Mice;Mice, Nude;Nanoparticles;Neoplasm Invasiveness;Neoplasm Metastasis;Neoplasms;Palladium;Phototherapy

Evaluation of combined excimer laser and platelet-rich plasma for the treatment of nonsegmental vitiligo: A prospective comparative study. BACKGROUND: Excimer laser therapy of vitiligo generally takes months to years to achieve excellent outcomes. Platelet-rich plasma is an autologous preparation with a focus on various growth factors that can help with vitiligo repigmentation. OBJECTIVES: To assess the additive effect of PRP in the therapy of vitiligo on the results of the excimer laser. PATIENTS AND METHODS: A comparative study included 52 patients (8 males and 44 females) in two groups with stable (no new lesion for 6Â months), nonsegmental and symmetrical vitiligo. Group I (26 patients): The patient was treated by intradermal PRP injection and the excimer laser, while group II (26 patients) was treated with the excimer laser only. The PRP injection was repeated every 3Â weeks for 4Â months and excimer laser two times a week and for 16Â weeks till complete response. VAS for patient's satisfaction assessment, safety assessment for complications, and follow-up for 3Â months was done. Clinical (repigmentation response) and histopathological assessment was done. RESULTS: There was a higher statistically significant treatment response in group I compared with group II. In addition, a statistically significant correlation between the treatment response and the lesion site in group I (PÂ <Â .000). A significant difference in VAS between both groups (PÂ <Â .000). Few the side effects were reported. CONCLUSION: The combination of PRP and excimer laser phototherapy is an efficient vitiligo treatment as PRP increases the excimer laser impact and also improves the result. Adolescent;Adult;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Injections, Intradermal;Lasers, Excimer;Low-Level Light Therapy;Male;Patient Satisfaction;Platelet-Rich Plasma;Prospective Studies;Treatment Outcome;Visual Analog Scale;Vitiligo;Young Adult

The 808â€¯nm and 980â€¯nm infrared laser irradiation affects spore germination and stored calcium homeostasis: A comparative study using delivery hand-pieces with standard (Gaussian) or flat-top profile. Photobiomodulation relies on the transfer of energy from incident photons to a cell photoacceptor. For many years the concept of photobiomodulation and its outcome has been based upon a belief that the sole receptor within the cell was the mitochondrion. Recently, it has become apparent that there are other photoacceptors operating in different regions of the electromagnetic spectrum. Alternative photoacceptors would appear to be water and mechanisms regulating calcium

homeostasis, despite a direct effect of laser photonic energy on intracellular calcium concentration outwith mitochondrial activity or influence, have not been clearly demonstrated. Therefore, to increase the knowledge of intracellularâ€‘calcium and laser photon interaction, as well as to demonstrate differences in irradiation profiles with modern hand-pieces, we tested and compared the photobiomodulatory effect of 808â€¯nm and 980â€¯nm diode laser light by low- and higher-energy (60s, 100â€¯mW/cm(2), 100â€¯mW/cm(2), 500â€¯mW/cm(2), 1000â€¯mW/cm(2), 1500â€¯mW/cm(2), 2000â€¯mW/cm(2)) irradiated with a "standard" (Gaussian fluence distribution) hand-piece or with a "flat-top" (uniform fluence) hand-piece. For this purpose, we used the eukaryote unicellular-model Dictyostelium discoideum. The 808â€¯nm and 980â€¯nm infrared laser light, at the energy tested directly affect the stored Ca(2+) homeostasis, independent of the mitochondrial respiratory chain activities. From an organism perspective, the effect on Ca(2+)-dependent signal transduction as the regulator of spore germination in Dictyostelium, demonstrates how a cell can respond quickly to the correct laser photonic stimulus through a different cellular pathway than the known light-chromophore(mitochondria) interaction. Additionally, both hand-piece designs tested were able to photobiomodulate the D. discoideum cell; however, the hand-piece with a flat-top profile, through uniform fluence levels allows more effective and reproducible effects. Calcium Calcium;Dictyostelium;Germination;Homeostasis;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Mitochondria;Spores;Temperature;Time Factors

Transcranial Photobiomodulation for Down Syndrome. Brain;Child;Dose-Response Relationship, Radiation;Down Syndrome;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Prognosis;Sampling Studies;Time Factors

"Buckets": Early Observations on the Use of Red and Infrared Light Helmets in Parkinson's Disease Patients. Background: Parkinson's disease is a well-known neurological disorder with distinct motor signs and non-motor symptoms. Objective: We report on six patients with Parkinson's disease that used in-house built photobiomodulation (PBM) helmets. Methods: We used "buckets" lined with light-emitting diodes (LEDs) of wavelengths across the red to near-infrared range (i.e., 670, 810, and 850â€‰nm; nâ€‰=â€‰5) or an homemade intranasal LED device (660â€‰nm; nâ€‰=â€‰1). Progress was assessed by the patients themselves, their spouse, or their attending medical practitioners. Results: We found that 55% of the initial signs and symptoms of the six patients showed overall improvement, whereas 43% stayed the same and only 2% got worse. We also found that PBM did not target a specific sign or symptom, with both motor and nonmotor ones being affected, depending on the patient. Conclusions: In summary, our early observations are the first to note the impact of PBM on patients' signs and symptoms over an extended period, up to 24 months, and lays the groundwork for further development to clinical trial. Aged;Brain;Equipment Design;Follow-Up Studies;Head Protective Devices;Humans;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neuropsychological Tests;Parkinson Disease;Risk Assessment;Sampling Studies;Severity of Illness Index;Time Factors;Treatment Outcome

Increased Tattoo Fading in a Single Laser Tattoo Removal Session Enabled by a Rapid Acoustic Pulse Device: A Prospective Clinical Trial. BACKGROUND AND OBJECTIVES: The ability to provide improved tattoo fading using multiple laser passes in a single office laser tattoo removal session is limited. In part, this is due to the loss of laser effectiveness caused by epidermal and dermal vacuoleÂ "whitening" generated during the initial laser pass at the tattoo site. The Rapid Acoustic Pulse (RAP) device generates acoustic shock wave pulses that clear epidermal and dermal vacuoles to enable multiple laser passes in a single office laser tattoo removal session. The objectives of this study were to determine if the RAP device, when used as an accessory to the 1064â€‰nm Nd:YAG Q-switched (QS) laser can enable delivery of multiple laser passes in a single office laser tattoo removal session, and therefore resultÂ in increased tattoo fading compared to the clinical standard single-pass

QS laser tattoo removal session. STUDY DESIGN/MATERIALS AND METHODS: The RAP device was evaluated in a single-center (SkinCare Physicians), prospective, IRB approved study. A total of 32 black ink tattoos, from 21 participants, were divided into three zones and treated with either multiple QS laser passes, each followed by 1 minute of RAP device application (Laserâ€‰+â€‰RAP) in zone one andÂ single-pass QS laser treatment (Laser-Only) in zone two, separated by an untreated control zone. The treatment sites were assessed for the number of laser passes and adverse events immediately, 6 weeks, and 12 weeks following the treatment session. Photographs of the treatment sites were assessed for percent fading at 12 weeks post-treatment by three blinded reviewers. RESULTS: When the RAP device was applied as an accessory to the QS laser in a multi-pass laser tattoo removal treatment, an average of 4.2 laser passes were delivered in a single session, with no unexpected or serious RAP device-related adverse events. At the 12-week follow-up, tattoos treated with Laserâ€‰+â€‰RAP showed a statistically significant increase in average fading (44.2%) compared with tattoos treated with Laser-Only (24.8%) (Pâ€‰<â€‰0.01). Additionally, a significantly higher overall proportion of tattoos treated with Laserâ€‰+â€‰RAP (37.5%) had a response of >50% fading compared with tattoos treated with QS Laser-Only (9.4%) (Pâ€‰<â€‰0.01)Â as well as a response of >75% fading from Laserâ€‰+â€‰RAP treatment (21.9%) compared with Laser-Only treatment (3.1%) (Pâ€‰<â€‰0.05). CONCLUSIONS: The RAP device, applied as an accessory to the 1064â€‰nm Nd:YAG QS laser, safely enables multiple QS laser treatments in a single office laser tattoo removal session by clearing the whitening caused by the previous QS laser pass. Enabling multiple QS laser passes results in a statistically significant increase in tattoo fading in a single office laser tattoo removal session compared to the clinical standard single-pass QS laser tattoo removal session. Â© 2019 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Sound;Tattooing;Young Adult

Localized argyria from silver nasal piercing unresponsive to Q-switched laser successfully treated with a 1064 picoseconds laser. Silver Argyria;Body Piercing;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nose;Silver;Treatment Outcome;Young Adult

A model for sustainable laser tattoo removal services for adult probationers. PURPOSE: The purpose of this paper is to describe a sustainable free laser tattoo removal clinic for economically disadvantaged adult probationers. DESIGN/METHODOLOGY/APPROACH: This paper describes the partnerships, methods and challenges/lessons learned from the implementation of a free monthly laser tattoo removal program for adult probationers within a medical school setting in California. FINDINGS: Possible patients are identified via a collaboration with the county's Probation Department. Founded in 2016, this monthly program has provided tattoo removal services to >37 adult patient probationers, many of whom receive follow-up treatments. Clients seek to remove about four blue/black ink tattoos. Since its inception, 23 dermatology residents have volunteered in the program. Challenges to patients' ongoing participation primarily pertain to scheduling issues; strategies for overcoming barriers to participation are provided. No safety concerns have emerged. SOCIAL IMPLICATIONS: Programs such as this public-private partnership may benefit probationers by eliminating financial barriers associated with tattoo removal. This model supports the training of cohorts of dermatologists seeking community service opportunities related to laser medicine. Others seeking to implement a similar program may also consider expanding treatment days/times to facilitate access for working probationers, providing enrollment options for other health and social services (e.g. public insurance, food stamp programs) and hosting a mobile onsite clinic to address clients' physical and mental health needs. ORIGINALITY/VALUE: This paper describes a unique collaboration between law enforcement and a medical school and it may assist other jurisdictions in establishing free tattoo removal programs for the benefit of probationers. The methods described

overcome challenges regarding the implementation of this specialized clinical service. California;Humans;Interinstitutional Relations;Internship and Residency;Lasers;Longitudinal Studies;Low-Level Light Therapy;Poverty;Prisons;Schools, Medical;Tattooing

Transcranial Photobiomodulation to Augment Lithium in Bipolar-I Disorder. Antimanic Agents;Lithium Adult;Antimanic Agents;Bipolar Disorder;Electroencephalography;Female;Follow-Up Studies;Humans;Lithium;Low-Level Light Therapy;Male;Photochemotherapy;Sampling Studies;Skull;Treatment Outcome;Young Adult

Kinetic analysis of bioorthogonal reaction mechanisms using Raman microscopy. Raman spectroscopy is well-suited to the study of bioorthogonal reaction processes because it is a non-destructive technique, which employs relatively low energy laser irradiation, and water is only very weakly scattered in the Raman spectrum enabling live cell imaging. In addition, Raman spectroscopy allows species-specific label-free visualisation; chemical contrast may be achieved when imaging a cell in its native environment without fixatives or stains. Combined with the rapid advances in the field of Raman imaging over the last decade, particularly in stimulated Raman spectroscopy (SRS), this technique has the potential to revolutionise our mechanistic understanding of the biochemical and medicinal chemistry applications of bioorthogonal reactions. Current approaches to the kinetic analysis of bioorthogonal reactions (including heat flow calorimetry, UV-vis spectroscopy, fluorescence, IR, NMR and MS) have a number of practical shortcomings for intracellular applications. We highlight the advantages offered by Raman microscopy for reaction analysis in the context of both established and emerging bioorthogonal reactions, including the copper(i) catalysed azide-alkyne cycloaddition (CuAAC) click reaction and Glaser-Hay coupling. Alkynes;Azides;Copper Alkynes;Azides;Catalysis;Copper;Cycloaddition Reaction;Kinetics;Molecular Structure;Spectrum Analysis, Raman

Radiotherapy mucositis in head and neck cancer: prevention by low-energy surface laser. BACKGROUND: Modern radiotherapy (RT) planning techniques and the use of oral supportive care have reduced the occurrence of acute radiation-induced toxicities. Oral mucositis remains a major concern in patients with head and neck cancer as it can compromise treatment compliance and outcome. OBJECTIVE: To report the rate of mucositis with the preventive use of surface low-level laser therapy in patients with head and neck cancer. METHODS: Forty patients treated with definitive (n=27) or adjuvant (n=13) RT using volumetric arc therapy between August 2014 and October 2015 for squamous cell carcinoma of the head and neck were included. All patients were treated using photobiomodulation using surface low-level laser therapy (Heltschl kind FL 3500, 350â€‰mW), 3 times a week during the whole treatment course. The grade of mucositis was obtained from week 1 to week 7 and at 1â€‰month. RESULTS: The median RT dose was 70â€‰Gy (64-70). Concomitant chemotherapy was administered in 29 patients. According to the Common Terminology Criteria for Adverse Events (CTCAE) v. 3, grade 0, 1, 2 and 3 mucositis was observed in 9 (22.5%), 9 (22.5%), 16 (40%) and 6 (15%) patients at week 7, and 32 (80%), 2 (5%), 3 (7.5%) and 3 (7.5%) patients at 1â€‰month following treatment. No grade 4 occurred. Median average and maximum dose to the oral mucosa was 42â€‰Gy (12.9-66.3) and 66.6â€‰Gy (39-76), respectively. CONCLUSION: Despite a substantial dose to the oral mucosa, the rate of acute radiation-induced mucositis of grade â‰¥3 remains low in patients receiving extraoral low-energy laser during RT. Humans;Mucositis;Head and Neck Neoplasms;Stomatitis;Carcinoma, Squamous Cell;Radiation Injuries;Lasers

The effect of 1540-nm fractional erbium-glass laser in the treatment of androgenic alopecia. BACKGROUND: Androgenic alopecia is common, chronic dermatologic disorder. A variety of lasers and light sources appear to be safe and effective in the treatment of AGA. AIMS: To evaluate the efficacy and safety of 1540-nm fractional erbium glass laser in the treatment of AGA.

PATIENTS/METHODS: This was an interventional therapeutic study for the treatment of patients with AGA. The patients received 10 sessions with 1540-nm fractional erbium glass laser at 2-week intervals. The assessment of the response was done before and at the end of follow-up period, both objectively (the change in the density of terminal hair and the diameter of the hair shaft) and subjectively (patient satisfaction). Any adverse effects were documented during the study. RESULTS: Forty-seven out of 51 patients completed the study. After 5Â months of laser treatment, the density of hair and hair thickness was significantly increased in both males and females (P value .001). CONCLUSION: The 1540-nm fractional erbium-glass laser seems to be an effective and safe option for treatment of patients with AGA. The improvement was accomplished in a short period. Adult;Alopecia;Dose Fractionation, Radiation;Female;Follow-Up Studies;Hair;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Photography;Severity of Illness Index;Sex Factors;Treatment Outcome;Young Adult

Treatment of port wine stains with 595-nm pulsed dye laser in 27 pediatric patients: A prospective study in the Iranian population. Port wine stain (PWS) is a congenital vascular malformation, which is visible at the birth as the red patches, mostly on the face and neck. Previous studies have shown good efficacy and safety of 595-nm pulsed dye laser (PDL). Here, we have conducted a prospective study to assess the efficacy and safety profile of pediatrics with PWS, treated with 595-nm PDL. Twenty-seven patients (10 males and 17 females) with the mean age of 5.7Â Â±Â 2.8 (range 1-13) years old were included in the study. Following 6.2 (range 4-10) sessions of treatment, 70.74Â Â±Â 18.5% of improvement was detected three months after the final session. Fourteen (51.8%) patients achieved a higher than 75% of improvement; nine (33.4%) patients experienced 50%-75% improvement; four (14.8%) patients experienced a less than 50% improvement. V1 involvement and a marked improvement within the first five sessions found to be good prognostic factors. Regarding age, sex, skin type, color and size of the PWS, no significant association with therapeutic response were detected. Blister and crust, atrophic macules, and hyperpigmentation were noted in six (22.2%), one (3.7%), and one (3.7%), respectively. In conclusion, 595-nm PDL looks an effective and relatively safe therapeutic approach in the treatment of Iranian pediatric PWS patients. Adolescent;Age Factors;Child;Child, Preschool;Humans;Infant;Iran;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Prospective Studies;Sex Factors

Photobiomodulation via multiple-wavelength radiations. Photobiomodulation via a combination of different radiations can produce different effects on biological tissues, such as cell proliferation and differentiation, when compared to those produced via a single radiation. The present study aims to conduct a review of the literature addressing the results and applications of photobiomodulation induced by a combination of two or more radiations as well as their possible effects. PubMed was used to search for studies with restrictions on the year (<â€‰50Â years old) and language (English), including studies using human and animal models, either under healthy or pathologic conditions. Several studies have been conducted to evaluate the combination of different radiation effects on cells and biological tissues. Positive effects resulting from multiple-wavelength radiations could be attributed to different absorption levels because superficial and deep tissues could absorb different levels of radiations. Multiple-wavelength radiations from devices combining radiations emitted by low power lasers and light-emitting diodes could be a new approach for promoting photobiomodulation-induced beneficial effects. Absorption, Radiation;Animals;Bacteria;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Radiation

Evaluation of Adjunctive Use of Low-Level Diode Laser Biostimulation with Combined Orthodontic Regenerative Therapy. BACKGROUND: The combined orthodontic regenerative therapy approach can greatly enhance periodontal conditions and dentofacial aesthetics in many situations.

The purpose of this study was to evaluate the effectiveness of 940nm low-level diode laser biostimulation in enhancement of intrabony wound healing with combined orthodontic/regenerative therapy in chronic periodontitis subjects suffering from malocclusion. METHODS: Fifteen chronic periodontitis adult patients with at least two intrabony defects and requiring orthodontic treatment for abnormalities in occlusion were included. A total of 30 defects were divided into two groups and treated in a split mouth design. The defects were treated with combined orthodontic regenerative therapy with laser irradiation (Group I: test group) or with combined orthodontic regenerative therapy alone (Group II: control group). The following hard and soft tissue measurements were recorded at baseline (prior to surgery) and after six and nine months postoperatively: probing depth (PD), clinical attachment level (CAL) by periodontal calibrated probe and bone density (BD) using the DBS-Win software. RESULTS: Probing depth reduction was 64.57%Â±9.37 and 64.95%Â±10.07 with no statistically significant difference between Group I and Group II. Percent change in clinical attachment level gain were 59.77%Â±12.107and 38.83%Â±7.56 in Group I and II respectively, with a statistically signifi cant difference (P-value =0.005considered signifi cant). Moreover, defects treated with combined orthodontic regenerative therapy with laser irradiation showed signifi cant preservation of bone density with a percent decrease of 4.14%Â±3.17 at the end of the study period. CONCLUSION: Improvements in clinical and radiographic parameters were observed following the adjunctive use of low-level diode laser therapy and orthodontic regenerative therapy for the management of intrabony defects in chronic periodontitis patients. Adult;Alveolar Bone Loss;Esthetics, Dental;Follow-Up Studies;Guided Tissue Regeneration, Periodontal;Humans;Low-Level Light Therapy;Periodontal Attachment Loss;Periodontal Pocket;Treatment Outcome

The mechanistic basis of chromotherapy: Current knowledge and future perspectives. Chromotherapy is a method of treatment that uses wavelengths in the visible region for curing different diseases and medical conditions. Recent advances in photobiology and the speciality of Photobiomodulation are uncovering the cellular and molecular effects of visible range electromagnetic radiation. We discuss the reported effects of visible range radiation on cells (in vitro and in vivo) and the attempted explanations of the underlying processes with regard to therapeutic effects. Some of the important advances in this area are reviewed, especially the effects of visible light on bacteria, enzymes and the use of visible light for wound healing and treatment of psychiatric diseases for the purpose of explaining the therapeutic implications of chromotherapy. We highlight the correlation of wavelengths used between recently uncovered mechanisms of photobiology and conventional chromotherapy. The elucidation of mechanisms of the cellular and molecular interaction of light will help in deciphering the scientific background of chromotherapy and will help in the application of this alternative therapeutic treatment to many other diseases. Animals;Color Therapy;Humans;Light;Mental Disorders;Radiotherapy;Wound Healing

Vascular and Pigmented Lesions of Phacomatosis Pigmentovascularis Treated With a Combination of Long-Pulsed, Q-Switched Laser, and Picosecond Lasers. Combined Modality Therapy;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Neurocutaneous Syndromes;Treatment Outcome

Electron Microscopy of Argyria Treated With Picosecond Alexandrite Laser. colloidal silver;Silver Adult;Argyria;Biopsy;Face;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron;Neck;Silver;Skin;Treatment Outcome

Botulinum Toxin Type A for Painful Temporomandibular Disorders: Systematic Review and Meta-Analysis. This systematic review investigated the effectiveness and safety of botulinum toxin type A (BTX-A) for painful temporomandibular disorders. We searched for randomized controlled trials (RCTs) in 10 databases, from inception to February 12, 2019 (MEDLINE, EMBASE, CENTRAL, LILACS, BBO, Web of Science, Scopus, ClinicalTrials.gov, WHO and OpenGrey). We included 12 RCTs

that compared BTX-A versus inactive or active interventions. BTX-A was slightly more effective than placebo for pain reduction at 1 month: mean difference -1.74 points (0-10 scale), 95% confidence interval -2.94 to -.54, 3 RCTs, 60 participants, I-square (I(2))â€¯=â€¯0%. However, there were no significant differences at 3 and 6 months. BTX-A was similar to no treatment for pain reduction at 3 and 6 months. BTX-A was more effective than conventional treatment and low-level laser therapy for pain reduction at 1, 6, and 12 months, but less effective than facial manipulation for pain reduction at 3 months. BTX-A was not associated with a significant increase in the risk of adverse events. The quality of the evidence was low, and results are insufficient to support the use of BTX-A for painful temporomandibular disorders. High-quality RCTs are needed to increase confidence in effect estimates. PERSPECTIVE: BTX-A for painful temporomandibular disorders appears to be well tolerated. For pain reduction, BTX-A is slightly more effective than placebo only at 1 month; conventional treatment and low-level laser at 1, 6, and 12 months. Low-quality evidence limits the applicability of these findings and precludes recommendations for practice. Neuromuscular Agents;Botulinum Toxins, Type A Botulinum Toxins, Type A;Facial Pain;Humans;Neuromuscular Agents;Temporomandibular Joint Disorders

Light-Emitting Diode Photobiomodulation After Cerebral Ischemia. Photobiomodulation (PBM) therapy is a promising therapeutic approach for several pathologies, including stroke. The biological effects of PBM for the treatment of cerebral ischemia have previously been explored as a neuroprotective strategy using different light sources, wavelengths, and incident light powers. However, the capability of PBM as a novel alternative therapy to stimulate the recovery of the injured neuronal tissue after ischemic stroke has been poorly explored. The aim of this study was to investigate the low-level light irradiation therapy by using Light Emitting Diodes (LEDs) as potential therapeutic strategy for stroke. The LED photobiomodulation (continuous wave, 830 nm, 0.2-0.6 J/cm(2)) was firstly evaluated at different energy densities in C17.2 immortalized mouse neural progenitor cell lines, in order to observe if this treatment had any effect on cells, in terms of proliferation and viability. Then, the PBM-LED effect (continuous wave, 830 nm, 0.28 J/cm(2) at brain cortex) on long-term recovery (12 weeks) was analyzed in ischemic animal model by means lesion reduction, behavioral deficits, and functional magnetic resonance imaging (fMRI). Analysis of cellular proliferation after PBM was significantly increased (1 mW) in all different exposure times used; however, this effect could not be replicated in vivo experimental conditions, as PBM did not show an infarct reduction or functional recovery. Despite the promising therapeutic effect described for PBM, further preclinical studies are necessary to optimize the therapeutic window of this novel therapy, in terms of the mechanism associated to neurorecovery and to reduce the risk of failure in futures clinical trials.

The Effects of Photobiomodulation on Vocal Fold Wound Healing: In Vivo and In Vitro Studies. Background: Photobiomodulation (PBM) is increasingly used in dermatology and dentistry due to its benefit of promoting wound healing and relieving pain; however, there is no corresponding research report on the application of PBM to vocal fold wound healing. Objective: To assess the potential wound-healing effects of PBM on the vocal folds via in vivo and in vitro experiments. Materials and methods: In in vitro study, vocal fold fibroblasts (VFFs) were irradiated under a diode laser with wavelength of 635â€‰nm at energy density of 8â€‰J/cm(2). The Cell Counting Kit-8 (CCK-8) assay was used to study the viability of VFFs, and the gene expressions of COL1A2, COL3A1, IL-6, HAS2, and COX-2 were investigated by real-time polymerase chain reaction (RT-PCR). In in vivo study, 15 rabbits were used. Lamina propria of the left vocal folds of 12 rabbits was unilaterally stripped, and 6 of them were treated with PBM. The remaining three rabbits served as normal controls. After 3 months, all animals were sacrificed to obtain histological results. We used laryngoscope to record images of the healing phase. Results: Irradiation with energy density of 8â€‰J/cm(2) resulted in a 2.8% increase in

cell proliferation (pâ€‰<â€‰0.05). However, the difference between the experimental and the control group became larger after 48 and 72â€‰h of subsequent irradiation. RT-PCR results showed that the expression of COL1A2, COL3A1, and HAS2 was higher, and the expression of IL-6 and COX-2 was lower. Histological examination showed that, compared with the injury group, hyaluronic acid (HA) increased significantly, collagen deposition decreased, and the configuration of collagen was more organized after PBM treatment. Conclusions: PBM can inhibit inflammatory reaction and promote the secretion of HA to decrease the deposition of collagen and regenerate vocal fold tissue without scar. Hyaluronic Acid;Collagen Animals;Cell Proliferation;Collagen;Gene Expression;Humans;Hyaluronic Acid;Laryngoscopy;Low-Level Light Therapy;Male;Rabbits;Vocal Cords;Wound Healing

Photobiomodulation Therapy: A Possible Answer to the Opioid Crisis. Facial Pain;Humans;Low-Level Light Therapy;Opioid Epidemic;Oral Surgical Procedures;Pain, Postoperative

Laser Acupuncture for Carpal Tunnel Syndrome: A Single-Blinded Controlled Study. Objectives: This study aimed to compare the efficacy of laser acupuncture (LA) treatment with that of placebo LA treatment in patients with idiopathic, mild-to-moderate carpal tunnel syndrome (CTS), as measured by subjective symptom assessments and objective changes in nerve conduction studies (NCSs). Design: A randomized, single-blinded, controlled study. Settings: A Teaching Hospital in the Taichung, Taiwan between March 2013 and November 2013. Subjects: 84 consecutive treatment-naive patients with CTS. Interventions: Participants were randomly divided into two treatment arms: (1) LA, administered at traditional Chinese acu-points on the affected side, once a day, 5 times a week, for 4 weeks (Nâ€‰=â€‰43); and (2) placebo LA, administered using the same device and protocol, with the LA device switched off (Nâ€‰=â€‰41). Outcome measures: Patients completed the Global symptom score (GSS) at baseline and two and four weeks later. The primary outcome was changes in GSS. NCSs were performed at baseline and repeated at the end of the study as a secondary outcome. Results: There was a significantly greater reduction in GSS in the LA group than in the placebo group at week 2 (-9.30â€‰Â±â€‰4.94 vs. -2.29â€‰Â±â€‰4.27, respectively, Pâ€‰<â€‰0.01) and at week 4 (-10.67â€‰Â±â€‰5.98 vs. -2.90â€‰Â±â€‰5.61, respectively, P < 0.01). However, NCSs did not show significant difference between the two groups. Conclusions: LA may be more effective than placebo LA in the treatment of mild-to-moderate idiopathic CTS in terms of subjective measurement. For patients who fear needle-based treatment, such as acupuncture or local injections, or those who do not opt for early surgical decompression, LA treatment can be considered as an effective and alternative form of acu-points stimulation therapy. Acupuncture Therapy;Adult;Carpal Tunnel Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Retrospective evaluation of the safety of low-level laser therapy/photobiomodulation in patients with head/neck cancer. BACKGROUND: The standard therapeutic approach for locally advanced head and neck cancer is optimal use of radiation therapy with or without concomitant chemotherapy. The most common and distressing acute complication of such therapies is oral/pharyngeal mucositis that may be associated with severe morbidity and can interfere with the planned administration of therapy. METHODS: We have identified all patients diagnosed with head/neck cancer between 2005 and 2009, having received radiotherapy with or without cisplatin-based chemotherapy. Radiotherapy consisted of intensity-modulated radiation therapy (IMRT) in all patients. In patients with grade >â€‰2 mucositis, photobiomodulation (PBM) consisted of three sessions of low-level laser irradiation weekly, in accordance with recently published recommendations for PBM. Patients who did not receive PBM were those for whom that approach was not requested by the radiotherapists and those who declined it. RESULTS: Two hundred twenty-two patients (62%) received PBM and 139 did not (39%). The patient's characteristics were equally distributed between the two groups. For overall survival, time to local recurrence, and progression-free survival, there was no statistical

evidence for a difference in prognosis between patients with and without PBM. In a multivariate analysis, after adjusting for known prognostic factors, we found no statistical evidence that PBM was related to overall survival, progression-free survival, or local recurrence. CONCLUSIONS: Our results show evidence of no effect of PBM upon overall survival, time to local recurrences, and disease-free survival of patients with head and neck cancer treated with radiotherapy with/without chemotherapy. Antineoplastic Agents;Cisplatin Antineoplastic Agents;Chemoradiotherapy;Cisplatin;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Mucositis;Neoplasm Recurrence, Local;Progression-Free Survival;Radiotherapy, Intensity-Modulated;Retrospective Studies

Modulatory effect of photobiomodulation on stem cell epigenetic memory: a highlight on differentiation capacity. Differentiation potential of stem cells into various lineages makes these cells as promising sources to treat multiple diseases. In this regard, the use of different strategies and protocols to increase differentiation capacity is highly demanded. Low-level laser therapy, a relatively noninvasive technique, has the capacity to accelerate the healing of numerous injuries and a portion of restorative capacity could be correlated with the stem cell activation and differentiation. Several mechanisms have been diagnosed to participate in orientation of stem cells to functional mature cells. Among them, the status of DNA methylation orchestrates the maintenance of tissue-specific gene expression during the differentiation procedure. DNA methylation is a momentous event in embryogenesis and functional maturation. This review article highlighted the potency of laser irradiation (low-level intensities) in the differentiation of stem cells by modulation of methylation. The analysis of these modalities could help us to understand the underlying mechanisms participating in the therapeutic effects of photobiomodulation. Animals;Cell Differentiation;DNA Methylation;Demethylation;Epigenesis, Genetic;Humans;Low-Level Light Therapy;Stem Cells

Bioglass/PLGA associated to photobiomodulation: effects on the healing process in an experimental model of calvarial bone defect. Bioactive glasses (BG) are known for their ability to bond to bone tissue. However, in critical situations, even the osteogenic properties of BG may be not enough to induce bone consolidation. Thus, the enrichment of BG with polymers such as Poly (D, L-lactic-co-glycolic) acid (PLGA) and associated to photobiomodulation (PBM) may be a promising strategy to promote bone tissue healing. The aim of the present study was to investigate the in vivo performance of PLGA supplemented BG, associated to PBM therapy, using an experimental model of cranial bone defect in rats. Rats were distributed in 4 different groups (Bioglass, Bioglass/PBM, Bioglas/PLGA and BG/PLGA/PBM). After the surgical procedure to induce cranial bone defects, the pre-set samples were implanted and PBM treatment (low-level laser therapy) started (808â€‰nm, 100â€‰mW, 30â€‰J/cm(2)). After 2 and 6 weeks, animals were euthanized, and the samples were retrieved for the histopathological, histomorphometric, picrosirius red staining and immunohistochemistry analysis. At 2 weeks post-surgery, it was observed granulation tissue and areas of newly formed bone in all experimental groups. At 6 weeks post-surgery, BG/PLGA (with or without PBM) more mature tissue around the biomaterial particles. Furthermore, there was a higher deposition of collagen for BG/PLGA in comparison with BG/PLGA/PBM, at second time-point. Histomorphometric analysis demonstrated higher values of BM.V/TV for BG compared to BG/PLGA (2 weeks post-surgery) and N.Ob/T.Ar for BG/PLGA compared to BG and BG/PBM (6 weeks post-surgery). This current study concluded that the use of BG/PLGA composites, associated or not to PBM, is a promising strategy for bone tissue engineering. Bioglass;Bone Substitutes;Polyglycolic Acid Animals;Bone Substitutes;Bone Transplantation;Cementation;Ceramics;Combined Modality Therapy;Fractures, Bone;Light;Male;Materials Testing;Osteogenesis;Phototherapy;Polyglycolic Acid;Rats;Rats, Wistar;Skull;Tissue Engineering;Wound Healing

Photobiomodulation Increases Viability in Full-Thickness Grafts in Rats Submitted to Nicotine. BACKGROUND AND OBJECTIVES: Photobiomodulation (PBM) therapy with 830â€‰nm wavelength or 660 wavelength to compare the effects with parameters of 30â€‰mW, 0.028â€‰cm(2) , 9.34â€‰seconds, and 3.64â€‰J on the total integration of total skin grafts in rats submitted to nicotine. STUDY DESIGN/MATERIALS AND METHODS: Sixty male Wistar rats were divided in six groups: Sham-skin-grafting surgery; 830â€‰nm-skin-grafting followed by 830â€‰nm irradiation; 660â€‰nm-skin grafting followed by 660â€‰nm irradiation; Nicotine-subjected to subcutaneous nicotine injection (2â€‰mg/kg twice a day for 4 weeks), followed by skin grafting; Group Nicotine/830â€‰nm-similar to Group Nicotine, followed by 830â€‰nm irradiation; Group Nicotine/660â€‰nm-similar to Group Nicotine, followed by 660â€‰nm irradiation. The percentage contraction of the grafting tissue was evaluated through ImageJÂ®. The thickness of the epidermis, inflammatory infiltrates, and the space between the implanted tissue and receptor bed were determined by histology; and the expression of vascular growth factor and blood vessel density (factor VIII) were evaluated by immunohistochemistry. RESULTS: The PBM at both wavelengths promoted a facilitating effect on the integration of the skin graft under nicotine and had a more significant effect on the thickness of the epidermis and expression of angiogenesis without nicotine at a wavelength of 830â€‰nm. Different wavelengths influence responses related to the viability of cutaneous grafts in rats submitted to nicotine. CONCLUSIONS: The PBM with 830â€‰nm and 660â€‰nm promoted beneficial results in skin grafts submitted to the deleterious action of nicotine. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Ganglionic Stimulants;Nicotine Animals;Disease Models, Animal;Ganglionic Stimulants;Graft Survival;Low-Level Light Therapy;Male;Nicotine;Rats;Rats, Wistar;Skin Transplantation;Wound Healing

Nonsurgical hair restoration treatment. Patterned hair loss is common and can negatively impact quality of life. Patients often seek nonsurgical treatment options as a first-line measure to avoid undue risks and expense associated with surgery. This article discusses these noninvasive treatment options, with a focus on minoxidil, finasteride, dutasteride, spironolactone, low-level laser therapy (LLLT), platelet-rich plasma (PRP), microneedling, and oral supplements. Alopecia;Hair;Humans;Low-Level Light Therapy;Needles;Platelet-Rich Plasma;Quality of Life

Fetal and Neonatal Circulatory Disorders in Twin to Twin Transfusion Syndrome (The Secondary Publication). Twin to twin transfusion syndrome (TTTS) is a major complication of monochorionic diamniotic (MD) twins, and its onset is known to be associated with placental vascular anastomoses and blood flow imbalance. In a typical case of TTTS, the recipient develops polyhydramnios, weight gain, cardiomegaly and hydrops fetalis in the uterus. In contrast, the donor develops oligohydramnios and intrauterine growth restriction. Recently, the significance of the renin-angiotensin-aldosterone system (RAAS) that transfers from the donor to the recipient has attracted interest in the fetal circulation of TTTS. The donor has decreased renal blood flow due to decreased circulating blood volume. For this reason, the secretion of RAAS hormones is augmented in the fetal kidneys of the donor. In TTTS, these RAAS hormones from the donor transfer to the recipient through the anastomosed vessels. In addition to excess preload, the recipient heart is exposed to excess afterload due to systemic vasoconstriction through RAAS hormones. Commonly occurring complications in the recipient include myocardial hypertrophy, atrioventricular valve regurgitation, and pulmonary valve stenosis or pulmonary atresia. Fetoscopic laser photocoagulation (FLP) has been introduced recently because neither mortality nor neurological morbidity have been satisfactorily improved with conventional treatment. FLP is a curative method that may improve the prognosis of TTTS. In Japan, this procedure has been performed frequently, and positive neurological outcomes have been achieved. Blood Volume;Cardiomegaly;Female;Fetal Diseases;Fetal Growth Retardation;Fetofetal Transfusion;Fetoscopy;Fetus;Humans;Low-Level Light

Therapy;Polyhydramnios;Pregnancy;Prognosis;Pulmonary Valve Stenosis;Renal Circulation;Renin-Angiotensin System

Safety of light emitting diode-red light on human skin: Two randomized controlled trials. Therapeutic applications of light emitting diode-red light (LED-RL) are expanding, yet data on its clinical effects are lacking. Our goal was to evaluate the safety of high fluence LED-RL (â‰¥160â€‰J/cm(2)). In two phase I, single-blind, dose escalation, randomized controlled trials, healthy subjects received LED-RL or mock irradiation to the forearm thrice weekly for 3â€‰weeks at fluences of 160-640â€‰J/cm(2) for all skin types (STARS 1, n = 60) and at 480-640â€‰J/cm(2) for non-Hispanic Caucasians (STARS 2, n = 55). The primary outcome was the incidence of adverse events (AEs). The maximum tolerated dose was the highest fluence that did not elicit predefined AEs. Dose-limiting AEs, including blistering and prolonged erythema, occurred at 480â€‰J/cm(2) in STARS 1 (n = 1) and 640â€‰J/cm(2) in STARS 2 (n = 2). AEs of transient erythema and hyperpigmentation were mild. No serious AEs occurred. We determined that LED-RL is safe up to 320â€‰J/cm(2) for skin of color and 480â€‰J/cm(2) for non-Hispanic Caucasian individuals. LED-RL may exert differential cutaneous effects depending on race and ethnicity, with darker skin being more photosensitive. These findings may guide future studies to evaluate the efficacy of LED-RL for the treatment of various diseases. Humans;Light;Low-Level Light Therapy;Single-Blind Method;Skin

Effects of Pulsed 810â€‰nm Al-Ga-As Diode Laser on Wound Healing Under Immunosuppression: A Molecular Insight. BACKGROUND AND OBJECTIVES: Dysregulated inflammation is one of the major contributing factors for the prevalence of non-healing chronic wound in immunosuppressed subjects. Photobiomodulation (PBM) has emerged as a potential non-thermal, light-based therapeutic healing intervention for the treatment of impaired wounds. STUDY DESIGN/MATERIALS AND METHODS: The present study delineates the underlying molecular mechanisms of PBM 810â€‰nm laser-induced full-thickness cutaneous wound repair in immunosuppressed rats at continuous and pulsed wave-mode with power-density of 40â€‰mW/cm (2) , fluence 22.6â€‰J/cm (2) for 10â€‰minutes daily for 7 post-wounding days. Molecular markers were assessed using biochemical, enzyme-linked immunosorbent assay quantification, enzyme kinetics and immunoblots analyses pertaining to inflammation, oxidative stress, cell survival, calcium signaling, and proliferation cascades. RESULTS: Results distinctly revealed that pulsed 810â€‰nm (10â€‰Hz) PBM potentially influenced the cell survival and proliferation signaling pathway by significantly upregulated phospho-protein kinase B(phospho-Akt), phospho-extracellular-signal-regulated kinase 1 (ERK1), transient receptor potential vanilloid-3 (TRPV3), Ca(2+) , calmodulin, transforming growth factor-Î²1 (TGF-Î²1), TGF-Î²R3, and Na (+) /K (+) -ATPase pump levels. PBM treatment resulted in reduction of exaggerated inflammatory responses evident by significantly repressed levels of interleukin-1Î² (IL-1Î²), IL-6, cyclooxygenase 2 (COX-2), and substance-P receptor (SPR), as well as inhibited apoptotic cell death by decreasing p53, cytochrome C, and caspase 3 levels (Pâ€‰<â€‰0.05), which, in turn, effectively augment the wound repair in immunosuppressed rats. PBM treatment also lowered 4-hydroxynoneal (HNE) adduct level and NADP/NADPH ratio and upregulated the GRP78 expression, which might culminate into reduced oxidative stress and maintained the redox homeostasis. CONCLUSIONS: Taken together, these findings would be helpful in better understanding of the molecular aspects involved in pulsed 810â€‰nm laser-mediated dermal wound healing in immunosuppressed rats through regulation of cell survival and proliferation via Ca(2+) -calmodulin, Akt, ERK, and redox signaling. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Animals;Cell Proliferation;Cell Survival;Dermis;Disease Models, Animal;Immunosuppression Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oxidative Stress;Rats;Rats, Sprague-Dawley;Signal Transduction;Wound Healing

High energy density LED-based photobiomodulation inhibits squamous cell carcinoma progression in co-cultures in vitro. Current management of oral potentially malignant disorders is careful monitoring. Unfortunately, the 'watch and wait' approach only generates anxiety and a feeling of powerlessness, especially to those caring for patients. Photobiomodulation (PBM) has emerged as a potential strategy to inhibit possible transforming cells. The aim of this study was to investigate the effect of LED-based PBM on the progression of malignant invasion into a fibroblast-based stroma. An in vitro model of carcinoma in situ (CIS) containing stromal fibroblasts and carcinoma cells in co-culture was used to study the effect of PBM on the expansion of CIS colonies. A second model of co-culture (cells separated by membrane), was used to study cell counts, viability and apoptosis following PBM at high doses (36â€¯J/cm(2)). The data was analyzed using Kruskal-Wallis, Dunn's test and non-linear regression, wherever appropriate. PBM was able to inhibit the expansion of CIS colonies as well as the total number of colonies after 72â€¯h of treatment (pâ€¯<â€¯0.05). Cell viability, apoptosis and death assays revealed an overall advantage of stromal fibroblasts over carcinoma cells after high-dose PBM. In conclusion, LED-based PBM at high doses inhibited the progression and number of oral squamous cell carcinoma colonies without affecting the surrounding stromal fibroblasts in vitro. Immunologic Factors Apoptosis;Carcinoma, Squamous Cell;Cell Line, Tumor;Cell Proliferation;Cell Survival;Coculture Techniques;Fibroblasts;Humans;Immunologic Factors;Light;Low-Level Light Therapy;Mouth Neoplasms;Photochemical Processes

Comparison of the effect of photodynamic therapy and topical corticosteroid on oral lichen planus lesions. OBJECTIVE: In this study, the effect of photodynamic therapy with topical corticosteroid in oral lichen planus patients was compared. MATERIAL AND METHODS: In this randomized, double-blind clinical trial, eight patients with bilateral oral OLP lesions were recruited. Toluidine blue was applied on the lesions of both sides; a 660-nm diode laser InGaAlP was irradiated for 10Â min (power: 25Â mW, fluence: 19.23Â J/cm(2) , probe cross section: 0.78Â cm(2)) for three sessions. In the control side of the oral mucosa, only sham laser was used. Follow-up sessions were held on weeks 3 and 7. In week 3, oral paste triamcinolone acetonide 0.1% was prescribed. Response rates were assessed clinically by VAS, Thongprasom sign scoring, clinical severity index, efficacy indices, and the amount of reduction in the size of the lesions. The Mann-Whitney test was used to evaluate the treatment outcomes. RESULTS: In spite of the control side, all scores improved significantly between sessions 0 and 4 for the intervention side. The differences between the changes in almost all scores between sessions 0 and 4 in both the intervention and control sides were significantly considerable (p valueÂ <Â .05). CONCLUSION: Photodynamic therapy can be used as an alternative therapy alongside standard methods or as a new modality for refractory OLP. Adrenal Cortex Hormones;Photosensitizing Agents;Tolonium Chloride Administration, Topical;Adrenal Cortex Hormones;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Tolonium Chloride;Treatment Outcome

Network meta-analysis of the desensitizing effects of lasers in patients with dentine hypersensitivity. OBJECTIVES: This network meta-analysis compares different lasers, placebo, and no treatment in terms of their effects on dentine hypersensitivity (DH) immediately after treatment and over the long term (1Â month). METHODS: A systematic electronic literature search of four databases and a manual search were performed to identify randomized controlled trials (RCTs) examining different laser treatments for the treatment of DH. Pairwise and network meta-analyses were performed to analyze the desensitization effect immediately after treatment and over the long term. The risk of bias was assessed based on the Cochrane guidelines and funnel plots. The quality of the evidence, statistical heterogeneity, inconsistencies, and ranking probability were also evaluated. RESULTS: A total of 11 RCTs were included in the network meta-analysis; 11 and 9 of these studies analyzed immediate and

long-term effects, respectively. All four types of laser had a better desensitizing effect than controls immediately after treatment and over the long term, but there were no significant differences among the four different lasers. There was a significant placebo effect immediately after treatment. The laser with the highest probability of being the most effective treatment for DH was Er,Cr:YSGG immediately after treatment and over the long term (73% and 47%, respectively). CONCLUSIONS: All four types of laser had significantly better effects than no treatment on DH immediately after treatment and in the long term, but there were no significant differences among the four lasers. In addition, there was a significant placebo effect, supporting the importance of including a placebo group in future studies. Furthermore, Er,Cr:YSGG may be the most effective laser for the treatment of DH immediately and over the long term. CLINICAL RELEVANCE: This study used network meta-analyses to compare different lasers, placebo, and no treatment over different time periods, which is to provide guidance for selecting an appropriate laser treatment in patients with DH. Dentin Sensitivity;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Network Meta-Analysis;Treatment Outcome

Laugier-Hunziker syndrome: complete clearance of mucosal lentigines with a single session of Q-Switched Nd:YAG laser. Background: Laugier-Hunziker (LH) syndrome is a rare condition in which melanocyte overactivity produces lentiginous lesions of the lips and buccal mucosa. Objective: Given the paucity of reports on therapeutic options in LH syndrome, this case is herein reported to show the response to treatment with the Q-Switched Nd:YAG laser in a 32-year-old man with LH Syndrome. Methods: The Q-Switched Nd:YAG laser was used to treat the lentiginous lesions on the mucosal surface of the lower lips using a single pass at 532 nm. Results: There was complete clearance of the mucosal lentiginous lesions with a single laser session, and recurrence was not observed after 12 months. Conclusion: The Q-Switched Nd:YAG laser is an effective treatment option for cosmetic benefit in LH Syndrome. Adult;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Male;Mouth Mucosa

Photobiomodulation by dual-wavelength low-power laser effects on infected pressure ulcers.
The aim of this study was to evaluate the effects of photobiomodulation (PBM) by dual-wavelength low-power lasers on the healing and bacterial bioburden of pressure ulcer (PU) models. Twenty-five male Swiss mice were divided into five equal groups. Ischemia reperfusion cycles were employed to cause PU formation by the external application of magnetic plates. Immediately after wounding, a suspension of Pantoea agglomerans was applied at the base of all the wounds of the infected groups, using a calibrated pipette. PBM (simultaneous emission at 660 and 808Â nm, 142.8Â J/cm(2), in continuous wave emission mode) was applied to the PUs for 14 sessions. The animals were euthanized 14Â days after PU induction, and their tissues were analyzed for wound contraction and reepithelialization, epidermis thickness, bacterial survival, and IL-1Î² and IL-10 mRNA level evaluations. The PU areas appeared larger in the mice from the infected groups than in those in the laser group 4Â days after PU induction and presented incomplete reepithelialization 14Â days after PU induction. However, the PBM accelerated the wound healing in the infected + laser group compared with the infected group 11 and 14Â days following the PU induction. The infected and irradiated PUs exhibited a thinner neo-epidermis than those in the infected group, and the bacterial survival decreased in the laser group; the relative expression IL-1Î² mRNA levels demonstrated an increasing tendency while the relative expression IL-10 mRNA levels demonstrated a decreasing tendency in the infected + laser and laser groups. These results suggest that PBM improves healing by killing or inhibiting bacteria in PUs as well as by accelerating the wound healing, resulting in tissue repair. Interleukin-1beta;Interleukin-10 Animals;Bacteria;Interleukin-10;Interleukin-1beta;Lasers;Low-Level Light Therapy;Male;Mice;Pressure Ulcer;Wound Healing

Low-level laser therapy for weight reduction: a randomized pilot study. Obesity and overweight is a global health crisis and novel methods of treatment are needed to address it. Low-level laser therapy (LLLT) is a currently available non-invasive procedure for lysing excess fat, but there is a lack of consensus exists on LLLT frequency and limited research from studies of LLLT. The purpose of this pilot study is to compare the effect of three of the most common LLLT frequencies on weight, waist circumference, body fat percentage, and quality of life. Sixty overweight (body mass index (BMI) 25-29.9Â kg/m(2)) adult participants were randomized to 12 LLLT treatments: (1) three times weekly for 4Â weeks, (2) twice weekly for 6Â weeks, or (3) once weekly for 12Â weeks. All participants attended an in-person visit at baseline and at weeks 4, 6, 12, and 26. Participants were recruited September 30, 2016 through to August 27, 2017. The majority of the 60 participants were female (90%) with an average age of 43.7Â years (Â±â€‰9.2Â years). Most participants (98%) completed 10 or more of the 12 LLLT treatments. When comparing across treatment groups, the greatest reductions from baseline were observed in those assigned to twice weekly for 6Â weeks in weight (1â€‰Â±â€‰1.7 (Â±SD) kg by week 6), waist circumference (-â€‰2.0â€‰Â±â€‰3.2Â in. by week 6 and -â€‰1.5â€‰Â±â€‰3.2Â in. by week 26), body mass index (-â€‰0.4â€‰Â±â€‰0.6Â kg/m(2)), and body fat mass (-â€‰1.1â€‰Â±â€‰1.6Â kg). This group also had the most significant improvement from baseline in quality of life (+â€‰0.5â€‰Â±â€‰0.8 by week 6), body satisfaction (+â€‰0.2â€‰Â±â€‰0.4 by week 6 and week 26), and body appreciation (+â€‰0.2â€‰Â±â€‰0.3 by week 6 and +â€‰0.3â€‰Â±â€‰0.3 by week 26). LLLT twice weekly for 6Â weeks could be proposed as the optimal frequency and duration for the management of body weight. Trial registration: https://clinicaltrials.gov/ct2/show/NCT02877004. Registered August 24, 2016. Adult;Body Mass Index;Body Weight;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Quality of Life;Waist Circumference;Weight Loss

Feasibility of transgingival laser irradiation for antimicrobial photodynamic therapy. AIM: Diode lasers are commonly used for antimicrobial photodynamic therapy (aPDT). This study aimed to assess the feasibility of transgingival laser irradiation during aPDT and evaluate whether the photosensitizer can be activated. MATERIALS AND METHODS: Four diode laser settings were assessed for transgingival irradiation: 120â€¯mW, 80â€¯mW, 60â€¯mW, and 40â€¯mW. Fifteen soft-tissue pieces from a pig's lower jaw were prepared. The specimens' thickness was measured and transgingival laser irradiation was performed. A digital power meter measured laser power on the other side of the tissue. The power outcome after staining of the nonbuccal aspect of the tissue with photosensitizer dye was assessed similarly. RESULTS: Transgingival laser irradiation (average soft-tissue thickness: 0.84â€¯Â±â€¯0.06â€¯mm) resulted in different power transmission depending on the power settings and photosensitizer. The lowest values were observed with the 40â€¯mW setting and photosensitizer (median 3.3â€¯mW, max. 5.0â€¯mW, min. 2.3â€¯mW, interquartile range 1.2), and the highest at 120â€¯mW without photosensitizer (median 41.3â€¯mW, max. 42.7â€¯mW, min. 38.0â€¯mW; interquartile range 1.5). CONCLUSIONS: This study indicates that transgingival irradiation may be suitable for aPDT, since power transmission through the gingival tissue was observed in all specimens. However, the decrease in laser power caused by both the soft tissue and the photosensitizer has to be taken into account. Phenothiazines;Photosensitizing Agents;phenothiazine
Animals;Gingiva;In Vitro Techniques;Lasers, Semiconductor;Phenothiazines;Photochemotherapy;Photosensitizing Agents;Swine

Fractional Ablative Laser Therapy is an Effective Treatment for Hypertrophic Burn Scars: A Prospective Study of Objective and Subjective Outcomes. OBJECTIVE: The aim of this study is to determine objective and subjective changes in mature hypertrophic burn scars treated with a fractional ablative carbon dioxide (CO2) laser. BACKGROUND: Fractional CO2 laser treatment has been reported to improve burn scars, with increasing clinical use despite a paucity of controlled, prospective clinical

studies using objective measures of improvement. METHODS: A multicenter, site-controlled, prospective open-label study was conducted from 2013 to 2016. Objective and patient-reported outcome measures were documented at baseline, at each monthly laser treatment, and 6â€Šmonths after treatment. Objective measurements employed were: mechanical skin torque to measure viscoelastic properties; ultrasonic imaging to measure scar thickness; and reflectometry to measure erythema and pigmentation. Subjective measures included health-related quality of life, patient and investigator scar assessment scales, and blinded scoring of before and after photographs. Subjects aged 11â€Šyears or older with hypertrophic burn scars were recruited. Each subject received 3 monthly treatment sessions with an ablative fractionated CO2 laser. RESULTS: Twenty-nine subjects were enrolled, of whom 26 received at least 1 fractional CO2 laser treatment and 22 received 3 treatments. Mean age of those completing all 3 treatments was 28â€Šyears. Statistically significant objective improvements in elastic stretch ($P < 0.01$), elastic recovery ($P < 0.01$), extensibility ($P < 0.01$), and thickness ($P < 0.01$) were noted. Patient- and physician-reported scar appearance and pain/pruritus were significantly improved ($P < 0.01$). There was no regression of improvement for at least 6â€Šmonths after treatment. CONCLUSIONS: Fractional ablative laser treatment provides significant, sustained improvement of elasticity, thickness, appearance, and symptoms of mature hypertrophic burn scars. Adolescent;Adult;Burns;Child;Cicatrix, Hypertrophic;Elasticity;Erythema;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Quality of Life;Skin Pigmentation;Treatment Outcome;Ultrasonography

A preliminary study on the efficacy and safety of low level light therapy in the management of cochlear tinnitus: A single blind randomized clinical trial. OBJECTIVES: To evaluate the efficacy and safety of low-level light therapy (LLLT) using new irradiation parameters for chronic unilateral tinnitus with cochlear dysfunction. DESIGN: A single-blind, randomized clinical trial. SETTING: Tertiary-care hospital center. PARTICIPANTS: Participants who had a history of chronic unilateral tinnitus (â‰¥ 3 months) and pure-tone thresholds greater than 15dB (averaged for 3k, 4k, and 6k Hz). MAIN OUTCOME MEASURES: Numerical rating scales (NRS) measuring loudness, duration, and annoyance, the tinnitus handicap inventory (THI), and psychoacoustical matches of tinnitus loudness and minimum masking levels (MML). RESULTS: Thirty-eight participants were received either a 100-mW diode laser at 830-nm (TINI group; n=19) or placebo (sham group; n=19) irradiation through the tympanic membrane. No adverse events were reported during 2 weeks of 10-interventions (20 minutes/day, five days/week). The NRS measuring duration of tinnitus and psychoacoustical matches of tinnitus loudness significantly decreased over times in the TINI group ($p<0.05$). However, post-hoc analysis revealed that there was no significant decrease of tinnitus among different time points (baseline, during LLLT, immediately after LLLT, and two weeks after LLLT). There was no placebo effect in the Sham group. Participants who improved the duration by at least one point or improved the loudness matches by more than 5 dB SL two weeks after LLLT tended to have worse pure-tone thresholds. It may suggest that further study is needed in patients with worse pure-tone thresholds to evaluate the therapeutic efficacy of LLLT. CONCLUSION: Although this preliminary result is insufficient to support the therapeutic efficacy of new laser device for chronic tinnitus, further study is needed in a large number of selected patients. Audiometry, Pure-Tone;Chronic Disease;Disability Evaluation;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Patient Safety;Quality of Life;Reference Values;Risk Assessment;Single-Blind Method;Tinnitus;Treatment Outcome

Wound Photobiomodulation Treatment Outcomes in Animal Models. The possibilities that photobiomodulation has brought on to the medical field are ever expanding and the scope it has reached is infinite. Determining how this relatively new treatment technique can be incorporated into the veterinary medical field is of interest to many medical professionals. In this review, we examine the treatment outcomes of low-level-laser therapy (LLLT) in different animal models to pinpoint any

similarities between the studies. A search was conducted to identify LLLT studies using different animal models with an open or closed wound. The studies were compared to identify the laser parameters that resulted in positive treatment outcomes. The overall result of the studies examined indicated that daily laser exposure at a wavelength of a 600 or 800â€‰nm range was the most beneficial across the rodent studies regardless of health status or wound type. More studies on rabbit, canine, and equine models are needed to explain the inconsistent results reviewed and find the correct treatment parameters for these species. Further research involving LLLT studies that focus on different factors including health status, treatment interval, wavelength, and energy density is needed to help validate our knowledge about the efficacy of using photobiomodulation in the veterinary medical field.

Recommended technology to relieve oral mucositis not yet available for children or young people in England or Wales. Adolescent;Child;Child Health;England;Humans;Pediatrics;State Medicine;Stomatitis;Wales

Effects of the combination of low-level laser therapy and anionic polymer membranes on bone repair. In view of the limitations of bone reconstruction surgeries using autologous grafts as a gold standard, tissue engineering is emerging as an alternative, which permits the fabrication and improvement of scaffolds to stimulate osteogenesis and angiogenesis, processes that are essential for bone repair. Polymers are used to mimic the extracellular bone matrix and support cell growth. In addition, bone neoformation can be induced by external factors such as laser irradiation, which stimulates bone metabolism. The objective of this study was to evaluate the regeneration of bone defects using collagen and elastin membranes derived from intestinal serosa and bovine auricular cartilage combined with low-level laser application. Thirty-six Wistar rats were operated to create a 3-mm defect in the distal metaphysis of the left femur and divided into six groups: G1 (control, no treatment); G2 (laser); G3 (elastin graft), G4 (elastin+laser); G5 (collagen graft); G6 (collagen+laser). The animals were sacrificed 6Â weeks after surgery and the femurs were removed for analysis of bone repair. Macroscopic and radiological results showed the absence of an infectious process in the surgical area. This was confirmed by histological analysis, which revealed no inflammatory infiltrate. Histomorphometry showed that the formation of new bone started from the margins of the bone defect and its volume was greater in elastin+laser and collagen+laser. We conclude that newly formed bone in the graft area was higher in the groups that received the biomaterials and laser. The collagen and elastin matrices showed biocompatibility. Membranes, Artificial;Polymers Animals;Bone Regeneration;Bone and Bones;Cattle;Combined Modality Therapy;Low-Level Light Therapy;Male;Membranes, Artificial;Organ Size;Polymers;Rats, Wistar;Swine

The effectiveness of a 595 nm pulsed-dye-laser in the treatment of surgical scars following a knee arthroplasty. Background: A knee arthroplasty results in a long vertical scar on the knee and has a high risk for the development of hypertrophic or keloid scarring. The purpose of this study is to determine the efficacy and safety of the use of a 595Â nm pulsed-dye-laser (PDL) for this type of scar. Methods: This randomized, controlled study was conducted in 40 patients (41 scars) with postoperative knee arthroplasties. Each scar was divided at the midline into two sections and randomized into a laser treated half and a controlled half. The treated half has received three treatments with a 595Â nm PDL (10 mm spot size, 0.45Â ms, 6Â J/cm(2)). The scar appearances had been evaluated at 6Â months using the Vancouver scar scale (VSS). Results: At 6Â months postoperative, the laser treated sections had demonstrated significantly better scores in the overall parameters of the VSS. Furthermore, as for the individual parameters, there were significant differences between the treatment sections and control sections with the exception of pigmentation. There were no serious complications. Conclusion: The 595Â nm PDL is an effective and safe therapeutic option for the treatment of surgical scars following a knee arthroplasty.

Adult;Aged;Aged, 80 and over;Arthroplasty, Replacement, Knee;Cicatrix;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged

Influence of photobiomodulation therapy on root development of rat molars with open apex and pulp necrosis. This study aimed to evaluate the role of photobiomodulation (PBM) in apexification and apexogenesis of necrotic rat molars with an open apex. Rat molars were exposed to the oral environment for 3 weeks. Canals were rinsed with 2.5% NaOCl and 17% EDTA, filled with antibiotic paste and sealed. After 7 days, canals were rinsed and divided into six groups (n=6): mineral trioxide aggregate (MTA); blood clot (BC); human dental pulp stem cells (hDPSC); MTA+PBM; BC+PBM; and hDPSC+PBM. In hDPSC groups, a 1% agarose gel scaffold was used. Two groups were not exposed: healthy tooth+PBM (n = 6), healthy tooth (n = 3); and one was exposed throughout the experiment: necrotic tooth (n = 3). In PBM groups, irradiation was performed with aluminum gallium indium phosphide (InGaAlP) diode laser for 30 days within 24-h intervals. After that, the specimens were processed for histological and immunohistochemical analyses. Necrotic tooth showed greater neutrophil infiltrate ($p < 0.05$). Necrotic tooth, healthy tooth, and healthy tooth+PBM groups showed absence of a thin layer of fibrous condensation in the periapical area. All the other groups stimulated the formation of a thicker layer of fibers ($p < 0.05$). All groups formed more mineralized tissue than necrotic tooth ($p < 0.05$). PBM associated with MTA, BC, or hDPSC formed more mineralized tissue ($p < 0.05$). MTA+PBM induced apexification ($p < 0.05$). Rabbit polyclonal anti-bone sialoprotein (BSP) antibody confirmed the histological findings of mineralized tissue formation, and hDPSC groups exhibited higher percentage of BSP-positive cells. It can be concluded that PBM improved apexification and favored apexogenesis in necrotic rat molars with an open apex. Aluminum Compounds;Calcium Compounds;Drug Combinations;Integrin-Binding Sialoprotein;Oxides;Silicates;mineral trioxide aggregate Aluminum Compounds;Animals;Apexification;Calcium Compounds;Dental Pulp;Dental Pulp Cavity;Dental Pulp Necrosis;Drug Combinations;Immunohistochemistry;Integrin-Binding Sialoprotein;Lasers, Semiconductor;Low-Level Light Therapy;Oxides;Random Allocation;Rats, Wistar;Reproducibility of Results;Silicates;Stem Cells;Tooth Apex;Tooth Diseases;Treatment Outcome

Photobiomodulation as a treatment for neurodegenerative disorders: current and future trends. Photobiomodulation (PBM) is a rapidly growing as an innovative therapeutic modality for various types of diseases in recent years. Neuronal degeneration is irreversible process and it is proven to be difficult to slow down or stop the progression. Pharmacologic approaches to slow neuronal degeneration have been studied, but are limited due to concerns about the side effects. Therefore, it is necessary to develop a new therapeutic approach to stabilize neuronal degeneration and achieve neuronal protection against several neurodegenerative diseases. In this review, we have introduced several previous studies showing the positive effect of PBM over neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease and different types of epilepsy. Despite excellent outcomes of animal researches, not many clinical studies are conducted or showed positive outcome of PBM against neurodegenerative disease. To achieve clinical application of PBM against neurodegenerative disorder, determination of exact mechanism and establishment of effective clinical protocol seems to be necessary.

Applications of photobiomodulation in hearing research: from bench to clinic. Hearing loss is very common and economically burdensome. No accepted therapeutic modality for sensorineural hearing loss is yet available; most clinicians emphasize rehabilitation, placing hearing aids and cochlear implants. Photobiomodulation (PBM) employs light energy to enhance or modulate the activities of specific organs, and is a popular non-invasive therapy used to treat skin lesions and neurodegenerative disorders. Efforts to use PBM to improve hearing have been ongoing for several decades. Initial in vitro studies using cell lines and ex vivo culture techniques have now been

supplanted by in vivo studies in animals; PBM protects the sensory epithelium and triggers neural regeneration. Many reports have used PBM to treat tinnitus. In this brief review, we introduce PBM applications in hearing research, helpful protocols, and relevant background literature.

Controlled nanofabrication of metal-free SERS substrate on few layered black phosphorus by low power focused laser irradiation. Black Phosphorous (BP) has intrinsic in-plane ferroelectric properties that may have the inherent capability of SERS response and can be considered as a replacement of metal nanoparticle-based SERS substrates. A simple one-step process has been demonstrated for the controlled nano-structuring and rapid prototyping on a BP flake to develop a metal-free SERS substrate by low power focused laser irradiation. The effect of focused laser irradiation on the surface morphology of the pristine BP flakes has been thoroughly investigated by real time Raman spectroscopy measurements and corresponding AFM height profiling, which confirms that the proposed laser irradiation technique has more advantages over the conventional lithography and is free from undesired contamination. For a 532 nm laser line, the minimum laser power needed to create a nano-void on the BP flake is 25 mW (Power density = âˆ¼15.62 Ã— 10(5) W cm(-2)) with 5 s exposure time, where the etching rate is controlled by the laser power and exposure time. By analyzing the geometrical shape of the nano-void created due to laser irradiation, it is possible to identify the armchair and zigzag directions of the BP flake. The experimental results revealed that by controlling the exposure time and laser power, it was possible to perform layer by layer thinning of BP flakes. The proposed thinning process of the BP flake did not alter the pristine quality and no signature of oxidation was found in the Raman spectra, which signified the reliability of this low power laser irradiation technique towards the future nano-fabrication of BP-based devices. The controlled formation of the nano-void array on a few layered BP flake enhanced the local electric field (hot spots) in the vicinity of the nano-voids, resulting in âˆ¼30% Raman intensity enhancement. Such nano-void induced hotspots on the BP flake open up a new species of metal-free SERS substrate, demonstrating pronounced enhancement in the Raman signal of Rhodamine B as high as âˆ¼10(6) and a limit of detection (LOD) up to âˆ¼10 nM.

Comparison of effects of low-level laser therapy and extracorporeal shock wave therapy in plantar fasciitis treatment: A randomized, prospective, single-blind clinical study. OBJECTIVES: The aim of this study is to compare the efficacy of extracorporeal shock wave therapy (ESWT) and low-level laser therapy (LLLT) in terms of fascia thickness, heel pain, and foot functions in patients with plantar fasciitis (PF). PATIENTS AND METHODS: Between April 2015 and October 2015, a total of 34 patients (5 males, 29 females; mean age 51.5Â±10.8 years; range, 18 to 65 years) with PF were randomized into two treatment groups to receive either ESWT or LLLT using closed envelope method. The patients were evaluated before and after treatment and one month after treatment using the visual analog scale (VAS)-pain, Foot Function Index (FFI), and plantar fascia thickness measured by ultrasonography. RESULTS: A significant improvement in the VAS-pain and FFI scores and plantar fascia thickness was observed in both groups after treatment and one month after treatment, compared to pre-treatment values ($p<0.05$). Changes over time in these outcome parameters were not different between study groups ($p>0.05$). CONCLUSION: Our study results suggest that both ESWT and LLLT seem to be effective on pain, foot functions, and fascia thickness in the treatment of PF.Presented at the 26th National Congress of Physical Medicine and Rehabilitation, April 25-29, 2017 Antalya, Turkey.

Anti-inflammatory and cell proliferative effect of the 1270 nm laser irradiation on the BALB/c nude mouse model involves activation of the cell antioxidant system. Recently, many interdisciplinary community researchers have focused their efforts on study of the low-level light irradiation effects (photobiomodulation, PBM) as a promising therapeutic technology. Among the priorities, a search of new wavelength ranges of laser radiation to enhance the laser prospects in treatment of autoimmune

and cancer diseases commonly accompanied by disorders in the antioxidant system of the body. The laser wavelengths within 1265-1270 nm corresponds to the maximum oxygen absorption band. Therefore, PBM effects on a model organism within this spectrum range are of particular interest for preclinical research. Here, we report comprehensive biomolecular studies of the changes in the BALB/c nude mice skin after an exposure to the continuous laser radiation at the 1270 nm wavelength and energy densities of 0.12 and 1.2 J/cm(2). Such regime induces both local and systemic PBM effects, presumably due to the short-term increase in ROS levels, which in turn activate the cell antioxidative system.

Pilot study of transcranial photobiomodulation of lymphatic clearance of beta-amyloid from the mouse brain: breakthrough strategies for non-pharmacologic therapy of Alzheimer's disease. In this pilot study, we analyzed effects of transcranial photobiomodulation (tPBM, 1267 nm, 32 J/cm(2)) on clearance of beta-amyloid (AÎ²) from the mouse brain. The immunohistochemical and confocal data clearly demonstrate the significant reduction of deposition of AÎ² plaques in mice after tPBM vs. untreated animals. The behavior tests showed that tPBM improved the cognitive, memory and neurological status of mice with Alzheimer's disease (AD). Using of our original method based on optical coherence tomography (OCT) analysis of clearance of gold nanorods (GNRs) from the brain, we proposed possible mechanism underlying tPBM-stimulating effects on clearance of AÎ² via the lymphatic system of the brain and the neck. These results open breakthrough strategies for a non-pharmacological therapy of Alzheimer's disease and clearly demonstrate that tPBM might be a promising therapeutic target for preventing or delaying Alzheimer's disease.

Different Postharvest Responses of Fresh-Cut Sweet Peppers Related to Quality and Antioxidant and Phenylalanine Ammonia Lyase Activities during Exposure to Light-Emitting Diode Treatments.
The influence of emitting diode (LED) treatments for 8 h per day on functional quality of three types of fresh-cut sweet peppers (yellow, red, and green) were investigated after 3, 7, 11, and 14 days postharvest storage on the market shelf at 7 Â°C. Red LED light (660 nm, 150 Î¼mol m(-2) s(-1)) reduced weight loss to commercially acceptable level levels (â‰¤2.0%) in fresh-cuts of yellow and green sweet peppers at 7 and 11 d, respectively. Blue LED light (450 nm, 100 Î¼mol m(-2) s(-1)) maintained weight loss acceptable for marketing in red fresh-cut sweet peppers up to 11 d. Highest marketability with minimum changes in color difference (âˆ†E) and functional compounds (total phenols, ascorbic acid content, and antioxidant activity) were obtained in yellow and green sweet pepper fresh-cuts exposed to red LED light up to 7 and 11 d, respectively, and for red sweet pepper fresh-cuts exposed to blue LED light for 11 d. Red LED light maintained the highest concentrations of Î² carotene, chlorophyll, and lycopene in yellow, green, and red sweet pepper fresh-cuts up to 7 d. Similarly, blue LED light showed the highest increase in lycopene concentrations for red sweet pepper fresh-cuts up to 7 d. Red LED (yellow and green sweet peppers) and blue LED (red sweet pepper) lights maintained phenolic compounds by increasing phenylalanine ammonia lyase activity. Thus, the results indicate a new approach to improve functional compounds of different types of fresh-cut sweet pepper.

Low-dose photodynamic therapy promotes angiogenic potential and increases immunogenicity of human mesenchymal stromal cells. Photodynamic therapy (PDT) is a non-invasive FDA and EMA-approved anticancer treatment modality. Initially developed for elimination of malignant cells, PDT affects all cells in the tumor bed including stromal cells. Stroma represents not only an important component of tumor microenvironment, but has a significant impact on tumor susceptibility to PDT and other anticancer therapies. However, the effects of PDT on stromal cells are poorly investigated. During PDT the tumor stroma can receive low-dose irradiation as a result of chosen regimen or limited depth of light penetration. Here, we characterized response of human mesenchymal stromal cells (MSCs) to low-dose PDT. In an in vitro model we demonstrated that low-dose PDT resulted in

activation of Erk1/2 and inhibition of GSK-3 signaling in MSCs. PDT-mediated induction of intracellular reactive oxygen species (ROS) resulted in reorganization of MSC cytoskeleton and decreased cell motility. More importantly, low-dose PDT dramatically upregulated secretion of various proangiogenic factors (VEGF-A, IL-8, PAI-1, MMP-9, etc.) by MSCs and improved MSC ability to promote angiogenesis suggesting an increase in the pro-tumorigenic potential of MSCs. In contrast, co-cultivation of PDT-treated MSCs with lymphocytes resulted in significant decrease of MSC viability and potential increase in MSC immunogenicity, which may lead to increased anti-tumor immunity. Low-dose PDT in MSCs significantly inhibited secretion of CCL2 (MCP-1) potentially limiting infiltration of pro-tumorigenic macrophages. Altogether, our findings demonstrate that low-dose PDT significantly modifies functional properties of MSCs improving their pro-tumorigenic potential while simultaneously increasing potential immune stimulation suggesting possible mechanisms of stromal cell contribution to PDT efficacy. Chemokine CCL2;Photosensitizing Agents;Reactive Oxygen Species;Mitogen-Activated Protein Kinase 1;Glycogen Synthase Kinase 3 Adipose Tissue;Animals;Cell Movement;Cell Survival;Chemokine CCL2;Coculture Techniques;Glycogen Synthase Kinase 3;Humans;Leukocytes, Mononuclear;Light;Low-Level Light Therapy;Mesenchymal Stem Cells;Mitogen-Activated Protein Kinase 1;Photochemotherapy;Photosensitizing Agents;Quail;Reactive Oxygen Species;Signal Transduction;Tumor Microenvironment;Wound Healing

Treatment of Necrobiosis Lipoidica With Pulsed Dye Laser. Female;Humans;Lasers, Dye;Low-Level Light Therapy;Necrobiosis Lipoidica;Treatment Outcome;Young Adult

In vitro anti-tumor effect of low-power laser irradiation (LPLI) on gastroenterological carcinoma cells. Primary hepatocellular carcinoma (HCC) and colon carcinoma are two of the most common clinical malignancies along with high morbidity and mortality. As low-power laser irradiation (LPLI) can induce cytotoxicity or cell apoptosis on several types of hyperplasia, LPLI may be a potential alternative treatment for gastroenterological cancers. The current in vitro study focused on LPLI-induced apoptosis and mechanism after 532-nm laser irradiation on two different carcinoma cells. Squamous cell carcinoma (VX2) and murine colon carcinoma (CT26) cells were cultured to test the feasibility of LPLI. The applied fluence varied from 0 to 600Â J/cm(2). 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide analysis, fluorescence imaging, wound healing assay, and cell apoptosis tests were performed 24Â h post-irradiation to monitor cellular responses. The current results demonstrated a dose-dependent stimulatory effect of LPLI on the cell viability, migration, and apoptosis of VX2 and CT26 cells. The therapeutic fluence of 600Â J/cm(2) induced statistically significant inhibition in cell viability. Both the wound healing assay and the cell apoptosis tests confirmed that LPLI with high fluences could inhibit cell migration as well as induce cell apoptosis. The current findings demonstrate that LPLI might be a potential treatment for the carcinoma cells. Further studies will be performed to evaluate the feasibility of LPLI in in vivo tumor models. Animals;Apoptosis;Cell Line, Tumor;Cell Survival;Gastrointestinal Neoplasms;Humans;Low-Level Light Therapy;Mice;Wound Healing

Photobiomodulation Therapy Inhibit the Activation and Secretory of Astrocytes by Altering Macrophage Polarization. Spinal cord injury (SCI) stimulates reactive astrogliosis and the infiltration of macrophages, which interact with each other at the injured area. We previously found Photobiomodulation (PBM) significantly decreases the number of M1 macrophages at the injured area of SCI. But the exact nature of the astrocyte response following PBM and relationship with the macrophage have not been explored in detail. In this study, a BALB/c mice model with standardized bilateral spinal cord compression and a macrophage-astrocyte co-culture model were applied to study effects of PBM on astrocytes. Results showed that PBM inhibit the expression of the astrocyte markers glial fibrillary acidic protein (GFAP) and the secretion of chondroitin sulfate proteoglycans (CSPG) in the para-epicenter area, decrease the number of M1 macrophage in vivo. The in vitro

experiments indicated M1 macrophages promote the cell viability of astrocytes and the expression of CSPG. However, PBM significantly inhibited the expression of GFAP, decreased activation of astrocyte, and downregulated the expression of CSPG by regulating M1 macrophages. These results demonstrate that PBM may regulate the interaction between macrophages and astrocytes after spinal cord injury, which inhibited the formation of glial scar. Chondroitin Sulfate Proteoglycans;Culture Media, Conditioned;Glial Fibrillary Acidic Protein;STAT3 Transcription Factor Animals;Astrocytes;Cell Polarity;Cell Proliferation;Chondroitin Sulfate Proteoglycans;Culture Media, Conditioned;Female;Glial Fibrillary Acidic Protein;Low-Level Light Therapy;Macrophages;Mice, Inbred BALB C;Motor Activity;Phosphorylation;Recovery of Function;STAT3 Transcription Factor;Spinal Cord Injuries

Photobiomodulation therapy is able to decrease IL1B gene expression in an in vitro cellular model of hidradenitis suppurativa.

The Efficacy of Pulsed Dye Laser Pretreated With or Without Local Anesthetic on Patients Presenting With Erythema of Face, Neck, Chest, and Extremities. BACKGROUND AND OBJECTIVES: Erythema is one of the most common cosmetic concerns and usually responds well to pulsed dye laser (PDL) treatment. As this laser can cause significant discomfort, topical anesthesia is sometimes offered. However, it is still uncertain whether topical anesthetics can affect the outcome of the laser therapy. We performed a retrospective single site study to compare the efficacy of PDL for the treatment of erythema in patients with and without pretreatment with topical anesthetic. STUDY DESIGN/MATERIALS AND METHODS: A chart review was performed and patients who presented with erythema of face, neck, chest, and extremities pretreated with topical anesthesia (23% lidocaine/7% tetracaine ointment or 7% lidocaine/7% tetracaine ointment) undergoing PDL were reviewed and compared with another group without anesthesia. Two blinded dermatologists evaluated the postlaser procedure photographs and gave an assessment compared with baseline. RESULTS: A total of 69 patient charts were reviewed. The erythema resulted from various skin conditions including telangiectasia, cherry angioma, striae, and rosacea. The mean improvement was 2.2581 in the anesthesia group and 2.2632 in the nonanesthesia group. There was no significant difference between both groups as confirmed by a noninferiority test. CONCLUSIONS: Topical anesthesia with lidocaine and tetracaine ointment do not interfere with the efficacy of the PDL. Since pain management is essential for any cosmetic procedure, the application of a local anesthetic will enhance patient comfort and satisfaction during treatment with PDL. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Anesthetics, Local;Tetracaine;Lidocaine Adult;Anesthetics, Local;Erythema;Female;Humans;Lasers, Dye;Lidocaine;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Tetracaine;Treatment Outcome

Using Bee Products for the Prevention and Treatment of Oral Mucositis Induced by Cancer Treatment. Oral mucositis is one of the most frequent complications after chemotherapy or radiotherapy or a combination of both. There is no standard therapy for its prevention or treatment. Considering that some bee products have been found to be of value in this situation, we decided to analyze the scientific literature on the subject. Scientific publications on bee products were identified by a literature search on Pubmed, Scopus and Google Scholar. There is a lot of evidence regarding the use of honey for oral mucositis due to chemotherapy or radiotherapy or a combination of both. Unfortunately, the quality of several meta-analyses on the topic is very low. There is some evidence on propolis, a little on royal jelly and none whatsoever on pollen and other bee products like apilarnil or bee venom. Bee products such as honey, propolis and royal jelly may be well suited to be integrated into a general concept for the prevention and treatment of oral mucositis which should also include other established concepts like oral care, oral cryotherapy, topical vitamin E and low-level-laser therapy. Bee products could become an integral part in the treatment of chemotherapy,

radiotherapy and radio chemotherapy. High-quality meta-analyses and further studies, especially on the combinations of various strategies, are needed. Fatty Acids;Vitamin E;Propolis;royal jelly Administration, Topical;Animals;Bees;Fatty Acids;Honey;Humans;Neoplasms;Propolis;Stomatitis;Vitamin E

Effect of Photobiomodulation in Rescuing Lipopolysaccharide-Induced Dopaminergic Cell Loss in the Male Sprague-Dawley Rat. Photobiomodulation (PBM) provides neuroprotection against dopaminergic cell death and associated motor deficits in rodent and primate models of Parkinson's disease (PD). However, it has not yet been tested in the lipopolysaccharide (LPS) model of PD, which leads to dopaminergic cell death through microglia-evoked neuroinflammation. We investigated whether transcranial PBM could protect against dopaminergic cell death within the substantia nigra in male Sprague-Dawley rats following supranigral LPS injection. PBM fully protected rats from 10 Âµg LPS which would have otherwise caused 15% cell loss, but there was no significant neuroprotection at a 20 Âµg dose that led to a 50% lesion. Cell loss at this dose varied according to the precise site of injection and correlated with increased local numbers of highly inflammatory amoeboid microglia. Twenty microgram LPS caused motor deficits in the cylinder, adjusted stepping and rotarod tests that correlated with dopaminergic cell loss. While PBM caused no significant improvement at the group level, motor performance on all three tests no longer correlated with the lesion size caused by 20 Âµg LPS in PBM-treated rats, suggesting extranigral motor improvements in some animals. These results provide support for PBM as a successful neuroprotective therapy against the inflammatory component of early PD, provided inflammation has not reached a devastating level, as well as potential benefits in other motor circuitries. Lipopolysaccharides;Neuroprotective Agents Animals;Behavior, Animal;Cell Death;Dopaminergic Neurons;Lipopolysaccharides;Male;Neuroprotective Agents;Parkinson Disease;Photochemical Processes;Rats;Rats, Sprague-Dawley

A pilot randomised clinical trial of 670â€‰nm red light for reducing retinopathy of prematurity. BACKGROUND: Photobiomodulation by 670â€‰nm red light in animal models reduced severity of ROP and improved survival. This pilot randomised controlled trial aimed to provide data on 670â€‰nm red light exposure for prevention of ROP and survival for a larger randomised trial. METHODS: Neonates <30 weeks gestation or <1150â€‰g at birth were randomised to receive 670â€‰nm for 15â€‰min (9â€‰J/cm(2)) daily until 34 weeks corrected age. DATA COLLECTED: placental pathology, growth, days of respiratory support and oxygen, bronchopulmonary dysplasia, patent ductus arteriosus, necrotising enterocolitis, sepsis, worst stage of ROP, need for laser treatment, and survival. RESULTS: Eighty-six neonates enrolled-45 no red light; 41 red light. There was no difference in severity of ROP (<27 weeks-pâ€‰=â€‰0.463; â‰¥27 weeks-pâ€‰=â€‰0.558) or requirement for laser treatment (<27 weeks-pâ€‰=â€‰1.00; â‰¥27 weeks-no laser treatment in either group). Survival in 670â€‰nm red light treatment group was 100% (41/41) vs 89% (40/45) in untreated infants (pâ€‰=â€‰0.057). CONCLUSION: Randomisation to receive 670â€‰nm red light within 24-48â€‰h after birth is feasible. Although no improvement in ROP or survivability was observed, further testing into the dosage and delivery for this potential therapy are required. Australian Capital Territory;Birth Weight;Female;Gestational Age;Humans;Infant, Extremely Premature;Infant, Low Birth Weight;Infant, Newborn;Low-Level Light Therapy;Male;Pilot Projects;Prospective Studies;Retinopathy of Prematurity;Severity of Illness Index;Time Factors;Treatment Outcome

Combined pulsed dye laser and Q-switched Nd:YAG laser intraumatic facial tattoo removal: A case series. Traumatic tattoos can be treated with several methods, including mechanical and chemical devices. However, they are rarely used due to the high risk of permanent side effects such as scarring and depigmentation. Recently, laser devices, especially the Q-switched (QS) laser and the

pulsed dye laser (PDL), applied in combination, have achieved complete clearance of the lesions without any risk of side effects. Herein, we reported three cases of traumatic facial tattoos successfully treated with combined PDL and QS Nd:YAG laser. Adult;Child;Combined Modality Therapy;Esthetics;Facial Injuries;Follow-Up Studies;Humans;Hyperpigmentation;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Sampling Studies;Tattooing;Treatment Outcome

Human Fibroblast Gene Expression Modulation Using 940 NM Diode Laser. Low-Level Laser Therapy is used as regenerative therapy in different clinical fields. This is due to its photobiomodulation effect via cell signaling on different cell populations, Including fibroblasts, cells involved in tissue regeneration and healing. The aim was to analyze the effect of 940â€‰nm diode laser on the gene expression of different markers involved in fibroblast growth, differentiation, and migration. Real-time polymerase chain reaction (q-RT-PCR) was used to quantify the expression of fibroblast growth factor (FGF), connective tissue growth factor (CTGF), vascular-endothelial growth factor (VEGF), transforming growth factor Î²1 (TGF-Î²1), TGFÎ²-receptors (TGFÎ²R1, TGFÎ²R2, and TGFÎ²R3), discoidin-domain receptor-2 (DDR2), matrix metalloproteinase-2 (MMP2), Î±-actin, fibronectin, decorin, and elastin on human fibroblast, treated with single dose (T1) or two doses (T2) of diode laser at 0.5 Watts and 4â€‰J/cm(2). A significant increase in the expression of FGF, TGF-Î²1, TGFÎ²R1, TGFÎ²R2, Î±-actin, fibronectin, decorin, DDR2 and MMP2 was observed after both treatments. A decrease was observed in expression of elastin (T1 and T2), and CTGF (T2). These changes underlie the biostimulatory effect of laser on fibroblasts, which translates into an increase in short-term proliferation and in long-term differentiation to myofibroblasts. These data support the therapeutic potential of diode laser for wound repair. Biomarkers Biomarkers;Cells, Cultured;Dose-Response Relationship, Radiation;Fibroblasts;Gene Expression Regulation;Humans;Lasers, Semiconductor

Therapeutic Insights in Melasma and Hyperpigmentation Management. Melasma and postinflammatory hyperpigmentation (PIH) are the most common forms of dyschromia in patients with skin of color. Both are associated with a high psychological burden of disease. To exacerbate this burden, the need for treatment is chronic, and the results are often suboptimal in the eyes of the patient. Successful treatment is therefore contingent upon a correct diagnosis, patient education, and a carefully considered therapeutic approach. The latter is often multimodal in its design, incorporating sun protection, topical and systemic medications, and in some cases, procedural intervention. Although topical hydroquinone is a mainstay of treatment for melasma and PIH, there are alternatives that have emerged as of late that have shown varying degrees of promise, both in terms of safety and efficacy. In this article, we review the epidemiological, clinical, and histologic features of melasma and postinflammatory hyperpigmentation, and discuss important considerations for both established and emerging treatments for these vexingly common and difficult to treat conditions. Dermatologic Agents;Melanins;Skin Lightening Preparations;Sunscreening Agents Administration, Cutaneous;Administration, Oral;Chemexfoliation;Dermatitis;Dermatologic Agents;Humans;Hyperpigmentation;Low-Level Light Therapy;Melanins;Melanosis;Prevalence;Skin;Skin Lightening Preparations;Skin Pigmentation;Sunlight;Sunscreening Agents

Photobiomodulation Enhances Cisplatin Cytotoxicity in a Culture Model with Oral Cell Lineages. Cisplatin plays a central role in cancer chemotherapy, but resistance to this drug remains a major obstacle in treatment. Drawbacks related to cisplatin failure may be associated with cell energy metabolism. This study investigated whether photobiomodulation (PBM) can potentiate the effects of cisplatin on keratinocytes (HaCat) and cancer cells (SCC25 and HN12). Cells were treated with laser (GaAlAs; 660Â nm; 60Â mW; 0.33Â J; 2.14Â WÂ cm(-2) ; 11.7Â JÂ cm(-2) and 6Â s) and cisplatin

(7.8Â Î¼gÂ mL(-1)) to evaluate cell viability, Ki-67, VEGF, TGF-Î²1, EGF expression and ROS production. Observations were validated in the SCC25 cell lineage, where the type of cell death (necrosis/apoptosis) and the amount of ATP were assessed. Cell lineages showed increased sensitivity to cisplatin associated with PBM (Cis-PBM). Ki-67 was augmented in all cell lineages treated with Cis-PBM when compared to cisplatin alone (Cis). Cis or Cis-PBM significantly decreased VEGF expression in cancer cells, while no changes were seen in the expression of TGF-Î²1 or EGF compared to control. ROS levels were similar in the Cis and Cis-PBM groups. Cells treated with Cis-PBM died by apoptosis, leading to greater consumption of ATP. These observations suggest that PBM may potentiate the effects of cisplatin, leading to increased drug cytotoxicity and enhanced cell death. Antineoplastic Agents;Cisplatin Antineoplastic Agents;Cell Line, Tumor;Cisplatin;Combined Modality Therapy;Humans;Low-Level Light Therapy;Mouth Neoplasms

Evaluation of metalloproteinases-2, -9, and -13 post photobiomodulation in mice talocrural joint. The extracellular matrix (ECM) is the main constituent of connective tissue with structural and regulatory functions, stimulating cell differentiation and proliferation. Moreover, ECM is a dynamic structure in the constant remodeling process, which is controlled by a balance between metalloproteinases (MMPs) and their inhibitors (TIMPs). Photobiomodulation (PBM) is widely described in the literature and applied in clinical practices, although its effects on ECM have not yet been elucidated. Therefore, it was evaluated if PBM could alter ECM components, such as MMP-2, -9, -13, and TIMP-2 from mice talocrural joints. Mice were divided into 3 groups (nâ€‰=â€‰6): control, PBM 3Â JÂ cm(-2), and PBM 30Â JÂ cm(-2). A low-level laser (830Â nm, 10Â mW, 0.05 irradiated area, energy densities 3Â JÂ cm(-2) and 30Â JÂ cm(-2), the irradiation time of 15 and 150Â s, respectively, continuous wave) was applied on the joint for 4 consecutive days. mRNA levels of metalloproteinases genes (MMP-2, MMP-9, and MMP-13), their regulator (TIMP-2), and protein expressions of MMP-13 and TIMP-2 were quantified. PBM can alter only mRNA relative levels of MMP-2 at 30Â JÂ cm(-2) (pâ€‰<â€‰0.05), while MMP-9, MMP-13, and TIMP-2 mRNA relative levels did not demonstrate statistical differences for any of the groups (pâ€‰>â€‰0.05). Regarding protein expressions, MMP-13 demonstrated positive-labeled cells, only in articular cartilage, although the cell quantification did not demonstrate statistical differences when compared with the control group (pâ€‰>â€‰0.05). TIMP-2 did not present positive-labeled cells for any tissues evaluated. Our results indicate that PBM can alter MMP-2 mRNA relative level but cannot alter MMP-9, MMP-13, and TIMP mRNA relative levels. Moreover, both MMP-13 and TIMP-2 proteins were also unaltered after PBM. RNA, Messenger;Tissue Inhibitor of Metalloproteinase-2;Matrix Metalloproteinase 13;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Animals;Cartilage, Articular;Extracellular Matrix;Joints;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Mice, Inbred C57BL;RNA, Messenger;Tissue Inhibitor of Metalloproteinase-2

Photobiomodulation effect on local hemoglobin concentration assessed by near-infrared spectroscopy in humans. Exposure of biological tissue to photobiomodulation therapy (PBMT) seems to increase the oxygen availability and mitochondrial electrochemical activity. With the advancement of new technologies, such as near-infrared spectroscopy (NIRS), information can be obtained about the balance between oxygen utilization and delivery by assessing local oxy- ([O(2)Hb]) and deoxy-myohemoglobin ([HHb]) concentrations, both measured in micromolars (Î¼M). Consequently, NIRS can be used to study ("in vivo") PBMT effects on the oxidative system, including oxygen availability. Thus, the main objective of the present study was to use NIRS to investigate the acute effects of PBMT by light-emitting diode (LED) on the oxygen delivery and utilization in humans. Twelve healthy young participants were treated with a LED device (850Â nm, 50Â mW, 2Â J) and placebo applied over the proximal third of the flexor carpi ulnaris muscle of the left or right forearm

selected in a random order. The LED was applied in direct contact with skin and the device was switched on for 40Â s in 4 different interventions (I(1), I(2), I(3) and I(4)) with a 3-min interval between interventions. The placebo condition was considered as the period before the first PBMT. The NIRS device was used to evaluate the relative changes in [O(2)Hb] and [HHb] before and after placebo and interventions. We found that PBMT statistically increased the [O(2)Hb] in 0.39Â Î¼M. These results demonstrate the potential of PBMT to increase oxygen availability. Hemoglobins;Oxyhemoglobins;Placebos Adult;Hemoglobins;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxyhemoglobins;Placebos;Spectroscopy, Near-Infrared

Adhesive bond integrity of dentin conditioned by photobiomodulation and bonded to bioactive restorative material. AIM: The aim of this in-vitro study is to investigate the shear bond strength (SBS) of Bioactive bulk fill restorative material (BARM) (Activa) by surface pre-treatment using Er,Cr:YSGG (ECL) on dentin in comparison to conventional dentin conditioning techniques. MATERIAL AND METHODS: Sixty extracted non-carious, non-fractured, restoration free human molars were collected and mounted vertically in acrylic resin. The buccal surface of all molars were ground and polished with abrasive paper. The specimens were randomly allocated into four groups (nâ€¯=â€¯15) according to the type of surface treatment. Group 1 ECLâ€¯+â€¯BARM, Group 2 ECLâ€¯+â€¯Ketacâ€¯+â€¯BARM, Group 3 Conventional Etch and Rinseâ€¯+â€¯BARM, Group 4 Self-etchâ€¯+â€¯BARM. The specimens from each group were positioned in a universal testing machine for SBS testing. Ten samples from each group were assessed for modes of failure. Means and standard deviations were compared using analysis of variance (ANOVA) and Tukey's post hoc test at a significance level of pâ€¯<â€¯0.05. RESULTS: BARM bonded to dentin surface etched with conventional etch and rinse technique (group 3) exhibited SBS value of 18.45â€¯Â±â€¯1.34. Similarly, the lowest bond strength was observed by group 4 (self-etch regime) bonded to BARM (16.09â€¯Â±â€¯0.81). The bond strength among groups 1 (ECLâ€¯+â€¯BARM), 2 (ECLâ€¯+â€¯Ketacâ€¯+â€¯BARM) and 3 (etch and rinseâ€¯+â€¯BARM) were found to be comparable (pâ€¯>â€¯0.05). CONCLUSION: Conditioning of dentin with photobiomodulation for the adhesive bonding of BARM showed comparable bond strength outcomes to conventional conditioning techniques. ACTIVA BioACTIVE-RESTORATIVE;Composite Resins;Glass Ionomer Cements Acid Etching, Dental;Composite Resins;Dental Bonding;Dental Stress Analysis;Glass Ionomer Cements;Humans;In Vitro Techniques;Lasers, Solid-State;Materials Testing;Molar;Shear Strength;Surface Properties

Comparing the efficacy of pulsed dye laser, Q-Switched Nd-YAG, CO2, and combined CO(2) and Q-Switched Nd-YAG lasers for the treatment of cutaneous macular amyloidosis. BACKGROUND: No topical and systemic treatment is proven to be effective on Cutaneous Macular Amyloidosis (CMA). The physical removal of the deposited protein by lasers may be a better choice. OBJECTIVE: To compare the efficacy of different lasers including Pulsed dye laser (PDL), 1064 mode of Q-Switched Nd-YAG, CO(2), and combined CO(2) and Q-Switched Nd:YAG lasers for the treatment of CMA. PATIENTS AND METHOD: 17 adult female patients with clinical CMA and histopathological confirmation were included in this study. Four close 1 by 1 cm(2) areas were treated simultaneously with PDL, Q-Switched Nd-YAG, CO(2) and combined CO(2) and Nd-YAG Lasers. The energy used for 585â€‰nm PDL were 9Â J/cm(2) with the spot size of 5â€‰mm. The energy used for 1064â€‰nm mode of Nd-YAG laser was 5 Joules/cm(2), with the spot size of 4â€‰mm, and the frequency of 10â€‰hertz. The energies used for CO(2) laser were 4 and 3.5 Micro Joules for the first and second Passes. RESULTS: No desirable result obtained after PDL therapy. The Q-Switched Nd-YAG was effective in only 3 patients. All areas treated with CO(2) laser were cleared. CONCLUSION: The CO(2) laser is seems to be the most effective laser treatment of CMA.

Adult;Amyloidosis;Cicatrix;Female;Humans;Hyperpigmentation;Lasers, Dye;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Efficacy and Safety Evaluation of Picosecond Alexandrite Laser with a Diffractive Lens Array for Treatment of Melasma in Asian Patients by VISIA Imaging System. Objective: To evaluate the efficacy and safety of picosecond (ps) 755-nm alexandrite laser with a diffractive lens array (DLA) generating laser-induced optical breakdown, which may be beneficial for melasma treatment. Background: Melasma is notorious for difficult to treat with any modality setting. Recently, picosecond alexandrite laser with DLA seems promising for dealing with it without intolerable complications. Methods: Twenty (Nâ€‰=â€‰20) Asian female melasma patients with Fitzpatrick skin type IV were recruited for 3 treatment sessions of picosecond 755-nm alexandrite laser with DLA at a 4- to 6-week interval. The pulse duration was 750 ps. An 8-mm spot size and the fluence of 0.4â€‰J/cm(2) was used over the target area with 2 passes per treatment area and around 2000-2500 passes in total. The repetition rate was 10â€‰Hz. Melasma Area and Severity Index (MASI) score and VISIA(Â®) imaging system analysis were utilized for evaluation before treatment and 4 weeks after the completion of the third treatment session. The clinical improvement and adverse events were assessed by the physicians and patients, respectively. Results: The median age of the patients was 45 years (from 27 to 55 years). In the physicians' evaluation, 40% (nâ€‰=â€‰8) of patients showed good improvement and 40% (nâ€‰=â€‰8) of patients showed moderate improvement. The mean MASI score before and after laser therapy showed significant improvement from 9.0â€‰Â±â€‰4.8 to 6.5â€‰Â±â€‰3.7 (pâ€‰<â€‰0.001). VISIA analysis of the forehead presented significant improvement in spots (pâ€‰=â€‰0.007) and porphyrins (pâ€‰=â€‰0.032). Some patients experienced erythema (25%), pruritus (20%), and scaling (20%) but subsided within few days of using emollients and sunscreen. Only 5% (nâ€‰=â€‰1) of patients developed mild postinflammatory hyperpigmentation, which also subsided in 3 weeks. Conclusions: Three sessions of picosecond 755-nm alexandrite laser with a DLA were effective for melasma treatment in Asian patients with minimal side effects. Adult;Asian People;Facial Dermatoses;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged

Combined Effectiveness of Î²-Cyclodextrin Nanoparticles in Photodynamic Antimicrobial Chemotherapy on In Vitro Oral Biofilms. Objective: This study aimed to investigate if Î²-cyclodextrin nanoparticles potentiate the photodynamic antimicrobial chemotherapy (PACT) effects in single and microcosm oral biofilms using methylene blue (MB) and a red laser. Background data: Studies of PACT have demonstrated promising effects; however, the association of nanoparticles with photosensitizers could enhance the antimicrobial result. Materials and methods: Biofilms were grown on enamel blocks either with Streptococcus mutans or in a microcosm model (salivary microorganisms) supplemented with sucrose. PACT using 50â€‰Î¼M MB associated or not with 32â€‰Î¼M encapsulated Î²-cyclodextrin with MB for 5â€‰min, followed by irradiation with red laser (Î»â€‰=â€‰660â€‰nm, 320â€‰J/cm(2)), was conducted and the counts of viable microorganisms in proper selective media were determined. Data were analyzed by one-factor ANOVA, followed by Tukey's test, or Kruskal-Wallis test, followed by Dunn's post hoc test, all with a significance level of 5%. Results: In the single-species biofilm model, a significant reduction in S. mutans counts was found for all groups when light was present. In the microcosm biofilm model, no significant difference was found among the groups for total streptococci, but a significant reduction of S. mutans was observed for the PACT group of encapsulated Î²-cyclodextrin+MB. However, no statistically significant difference was observed among the PACT groups. Conclusions: PACT with Î²-cyclodextrin mediated with MB associated with a red laser reduced S. mutans in microcosm biofilms. However, the presence of Î²-cyclodextrin nanoparticles did not potentiate the PACT effects in single or microcosm oral biofilms. Photosensitizing Agents;beta-Cyclodextrins;Methylene Blue Biofilms;Methylene

Blue;Microbial Viability;Nanoparticles;Photochemotherapy;Photosensitizing Agents;Streptococcus mutans;beta-Cyclodextrins

The application of antimicrobial photodynamic therapy (aPDT, 670Â nm) and diode laser (940Â nm) as adjunctive approach in the conventional cause-related treatment of chronic periodontal disease: a randomized controlled split-mouth clinical trial. OBJECTIVES: The aim of the present randomized controlled split-mouth clinical trial is to evaluate the effectiveness of the adjunctive use of photodynamic low-level laser therapy (670Â nm), applying methylene blue as photosensitizer, and the effectiveness of a diode laser (940Â nm) compared with conventional non-surgical mechanical treatment in a group of patients with chronic periodontal disease. MATERIALS AND METHODS: Twenty-one patients with moderate to severe periodontal disease with presence of 3 or more quadrants, each containing at least three sites with periodontal pocket depth (PPD) of â‰¥â€‰5Â mm, were included in the study. Periodontal treatment comprising scaling and root planing (SRP) was accomplished for the whole mouth. Applying a split-mouth design, each quadrant was randomly treated with SRP alone (control group), SRP with diode laser (diode group), and SRP with photodynamic therapy (photodynamic group). RESULTS: All treatment modalities in this study lead to statistically significant improvements in the evaluated clinical parameters at 3Â months and 6Â months compared with baseline. There was no statistically significant difference regarding PD and BOP between groups. There was only a tendency for greater reduction of PD in the diode group for deep pockets at 3Â months, but not statistically significant. CONCLUSIONS: After 6Â months of evaluation, the high intensity diode laser and the antimicrobial photodynamic therapy have not shown any additional benefits to the conventional periodontal treatment. CLINICAL RELEVANCE: The diode or photodynamic laser therapy in conjunction with conventional SRP does not seem to be superior in reducing probing depth and bleeding on probing than SRP alone 6Â months after treatment. More studies are necessary to prove the actual need of these types of lasers in the periodontal clinical practice. Anti-Infective Agents Anti-Infective Agents;Chronic Periodontitis;Dental Scaling;Humans;Lasers, Semiconductor;Photochemotherapy;Root Planing;Treatment Outcome

Photobiomodulation therapy can change actin filaments of 3T3 mouse fibroblast. The purpose of this study was to investigate the effects that photobiomodulation therapy might produce in cells, in particular, related to their structure. Thus, this paper presents the results of morphological changes in fibroblasts following low-intensity light illumination. Mouse fibroblasts were grown on glass coverslips on either 4Â kPa or 16Â kPa gels, to mimic normal tissue conditions. Cells were photo-irradiated with laser light at either 625Â nm or 808Â nm (total energies ranging from 34 to 47Â J). Cells were fixed at 5Â min, 1Â h, or 24Â h after photo-irradiation, stained for both actin filaments and the cell nucleus, and imaged by confocal microscopy. A non-light exposed group was also imaged. A detailed analysis of the images demonstrated that the total polymerized actin and number of actin filaments decrease, while the nucleus area increases in treated cells shortly after photo-irradiation, regardless of substrate and wavelength. This experiment indicated that photobiomodulation therapy could change the morphological properties of cells and affect their cytoskeleton. Further investigations are required to determine the specific mechanisms involved and how this phenomenon is related to the photobiomodulation therapy mechanisms of action. 3T3 Cells;Actin Cytoskeleton;Animals;Cell Nucleus;Cytoskeleton;Fibroblasts;Low-Level Light Therapy;Mice;Microscopy, Confocal

Fluorescence biomodulation in the management of canine interdigital pyoderma cases: a prospective, single-blinded, randomized and controlled clinical study. BACKGROUND: Interdigital pyoderma is a common multifactorial, inflammatory disease of the canine interdigital skin. Lesions commonly become infected secondarily. In addition to management of the underlying cause, management of

the chronic inflammatory changes in the interdigital skin created by secondary infection and by the release of keratin into deep tissues is required. Fluorescence biomodulation appears to modulate the inflammatory process in dermatological disorders and has shown promise in preliminary studies evaluating its use in superficial and deep pyoderma in dogs. HYPOTHESIS/OBJECTIVES: To evaluate the effect of a fluorescence biomodulation (FB) system used in conjunction with systemic antibiotic on clinical manifestations of canine interdigital pyoderma (CIP), compared to dogs treated with antibiotic alone. ANIMALS: Thirty-six dogs diagnosed with CIP. METHODS AND MATERIALS: Dogs were randomly allocated to treatment groups of either antibiotic alone (Group A) or antibiotic plus twice-weekly FB application (Group B). Dogs were scored over a 12 week period on the basis of two measured parameters: a global lesion score composed of four different lesions types and neutrophil engulfing bacterial scores. RESULTS: A statistically significant decrease was seen by Week 3 in both measured parameters for Group B compared to Group A. The mean time-to-resolution of lesions was 4.3Â weeks in Group B and 10.4Â weeks in Group A. CONCLUSION AND CLINICAL IMPORTANCE: The FB system shows promise as an adjunct therapy to systemic antibiotic use in the management of CIP. Anti-Bacterial Agents;Cephalexin Animals;Anti-Bacterial Agents;Cephalexin;Dog Diseases;Dogs;Foot Diseases;Low-Level Light Therapy;Pyoderma;Skin

Assessment of Allergic Rhinitis among Children after Low-Level Laser Therapy. BACKGROUND: Allergic rhinitis (AR) represents one of the most common global health problems with seriously increasing incidence over the last decades. The goal of the treatment of rhinitis is to prevent or reduce the symptoms caused by the inflammation of affected tissues. Intranasal steroids and oral antihistamines are recommended as first lines of treatment. Acupuncture had reported a significant improvement in daily symptoms and an increase of symptom-free days in many studies enrolling adults' patients. AIM: This study aimed to evaluate the laser acupuncture effect on the treatment of children AR in comparison to the effect of the medication and to assess the anti-inflammatory effect of laser acupuncture through measurement of serum inflammatory marker (hs-CRP). METHODS: Sixty patients with allergic rhinitis their age group ranged from 4 to 18 years were divided randomly into two groups. Group 1 enrolled 30 patient that received AR in the form of intranasal steroids, antihistaminic, leukotriene antagonists while group2 thirty patients received 12 laser acupuncture sessions (2 sessions a \ week) on specific traditional Chinese acupuncture points. RESULTS: There was a significant improvement in the severity score symptoms in both groups through and by the end of the study. High Significant improvement in the levels of the inflammatory marker in both groups, especially in the group which receive laser acupuncture sessions. CONCLUSION: Laser acupuncture is a reliable, painless and non-invasive successful technique, which may be used as a complementary treatment for pediatric allergic rhinitis.

Low level laser therapy for the patients with painful diabetic peripheral neuropathy - A systematic review. BACKGROUND: Low Level Laser Therapy (LLLT) is an emerging treatment modality for management of neuropathic pain. It works by triggering biochemical changes with in cells. OBJECTIVE: This systematic review focused on finding evidence on the effectiveness of LLLT on treatment of painful diabetic neuropathy. METHODS: We conducted a systematic review (PubMed, Web of Science, CINAHL and Cochrane) to find the evidence on effectiveness of LLLT on treatment of painful diabetic neuropathy. Randomized and non-randomized studies were included in the review. RESULTS: A total of 627 studies were screened. After the exclusion criteria (duplicate, animal studies, LLLT for treating other neuralgias) 6 studies were included in the study. The outcome measure that were considered were the difference in pain score and nerve conduction velocity test and quality of life questionnaire. CONCLUSION: The evidence obtained shows LLLT has a positive effect in controlling diabetic neuropathic pain. Diabetic Neuropathies;Humans;Low-Level Light Therapy;Neuralgia;Prognosis;Quality of Life

A DOUBLE-MASKED, RANDOMIZED, SHAM-CONTROLLED, SINGLE-CENTER STUDY WITH PHOTOBIOMODULATION FOR THE TREATMENT OF DRY AGE-RELATED MACULAR DEGENERATION. PURPOSE: The LIGHTSITE I study investigated the efficacy and safety of photobiomodulation (PBM) treatment in subjects with dry age-related macular degeneration. METHODS: Thirty subjects (46 eyes) were treated with the Valeda Light Delivery System, wherein subjects underwent two series of treatments (3Ã— per week for 3-4 weeks) over 1 year. Outcome measures included best-corrected visual acuity, contrast sensitivity, microperimetry, central drusen volume and drusen thickness, and quality of life assessments. RESULTS: Photobiomodulation-treated subjects showed a best-corrected visual acuity mean letter score gain of 4 letters immediately after each treatment series at Month 1 (M1) and Month 7 (M7). Approximately 50% of PBM-treated subjects showed improvement of â‰¥5 letters versus 13.6% in sham-treated subjects at M1. High responding subjects (â‰¥5-letter improvement) in the PBM-treated group showed a gain of 8 letters after initial treatment ($P < 0.01$) and exhibited earlier stages of age-related macular degeneration disease. Statistically significant improvements in contrast sensitivity, central drusen volume, central drusen thickness, and quality of life were observed ($P < 0.05$). No device-related adverse events were reported. CONCLUSION: Photobiomodulation treatment statistically improved clinical and anatomical outcomes with more robust benefits observed in subjects with earlier stages of dry age-related macular degeneration. Repeated PBM treatments are necessary to maintain benefits. These pilot findings support previous reports and suggest the utility of PBM as a safe and effective therapy in subjects with dry age-related macular degeneration. Aged;Aged, 80 and over;Contrast Sensitivity;Double-Blind Method;Female;Geographic Atrophy;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Quality of Life;Retinal Drusen;Surveys and Questionnaires;Treatment Outcome;Visual Acuity;Visual Field Tests;Visual Fields

Emerging Nonsteroid-Based Procedural Therapies for Alopecia Areata: A Systematic Review. BACKGROUND: Alopecia areata (AA) is a common form of patchy, nonscarring hair loss. Although intralesional steroid injections are currently the mainstay procedural therapy for AA, other nonsteroid-based procedural therapies, including platelet-rich plasma (PRP), ultraviolet radiation (UVR), and laser-based modalities, are emerging as practical options. OBJECTIVE: To systematically review nonsteroid-based procedural therapies for AA and recapitulate the available clinical data. MATERIALS AND METHODS: A systematic review of the literature was performed searching PubMed/MEDLINE databases identifying studies investigating PRP, UVR, and laser-based modalities for AA treatment. RESULTS: Literature search yielded 644 articles encompassing PRP, UVR, and laser treatment modalities for AA. Of the 644 articles, 46 met inclusion criteria. Although numerous reports demonstrate strong potential for PRP, UVR, and laser modalities in treating AA, high-quality evidence supporting their efficacy is still lacking. CONCLUSION: There is an abundance of evidence for nonsteroid-based procedural therapies in the treatment of AA. Randomized control trials comparing these treatment options head-to-head should be performed to better understand the true efficacy of these treatments. Alopecia Areata;Dermatology;Evidence-Based Medicine;Humans;Injections, Intralesional;Low-Level Light Therapy;Platelet-Rich Plasma;Treatment Outcome;Ultraviolet Therapy

Photobiomodulation therapy and NMES improve muscle strength and jumping performance in young volleyball athletes: a randomized controlled trial study in Brazil. The purpose of this study was to investigate the effectiveness of adding photobiomodulation therapy and neuromuscular electrical stimulation (NMES) to volleyball athletes' training, focusing on muscle strength and jumping skills. Thirty-six athletes were randomly placed into three groups: control, photobiomodulation therapy, and NMES. The athletes trained to improve their muscle strength and jumping skills. The athletes in the photobiomodulation therapy group were submitted to photobiomodulation therapy (850Â nm,

continuous, energy density 0.8Â J/cm(2), radiant energy per point 6Â J, total radiant energy 36Â J) before undergoing strength and plyometric training. The NMES group additionally underwent NMES-based quadriceps femoris muscle strength training (base frequency 1Â kHz, frequency modulation 70Â Hz, intensity maximum tolerable). The variables analyzed were muscle strength, jumping ability, global impression, and jump frequency; they were measured at baseline and during follow-ups at 6 and 8Â weeks. The statistical analysis was conducted on an intention-to-treat basis. The between-group differences and their respective 95% CIs were calculated using linear mixed models by using group, time, and group-versus-time interaction terms. Dominant lower limb strength improved the most in the NMES group compared to the control group (mean differenceâ€‰=â€‰1.4, 95% CIâ€‰=â€‰.5 to 2.4). Non-dominant lower limb strength increased in both the photobiomodulation therapy group (mean differenceâ€‰=â€‰1.1, 95% CIâ€‰=â€‰.3 to 2) and the NMES group (mean differenceâ€‰=â€‰1.9, 95% CIâ€‰=â€‰1.1 to 2.8) compared to the control group, but the NMES group improved more than the photobiomodulation therapy group (mean differenceâ€‰=â€‰0.8, 95% CIâ€‰=â€‰0.1 to 1.7). The NMES group had the greatest improvement in global perceived effect scale compared to the control group (mean differenceâ€‰=â€‰1.1, 95% CIâ€‰=â€‰1 to 2.2). Dominant lower limb strength improved in the NMES group compared to the control group. Non-dominant lower limb strength increased in both the photobiomodulation therapy group and the NMES group compared to the control group, but the NMES group improved significantly more than the photobiomodulation therapy group; the NMES group also improved in the global perceived effect scale compared to the control group. This study found that, for volleyball athletes, photobiomodulation therapy and NMES both promoted benefits in terms of muscle-strength gain. In addition, these benefits were maintained for 2Â weeks even after training was interrupted. Dominant lower limb strength improved in the NMES group compared to the control group. Non-dominant lower limb strength increased in both the photobiomodulation therapy group and the NMES group compared to the control group, but the NMES group improved significantly more than the photobiomodulation therapy group; the NMES group also improved in global impression of jumps compared to the control group. Adolescent;Athletes;Brazil;Electric Stimulation;Electrodes;Humans;Locomotion;Low-Level Light Therapy;Lower Extremity;Male;Muscle Strength;Volleyball

Physiopathology and current treatments of androgenetic alopecia: Going beyond androgens and anti-androgens. Androgenetic alopecia (AGA) is the most diagnosed hair loss dysfunction. Its physiopathology comprises a genetic predisposition affording an exacerbated response of the hair follicles cells to androgens aggravated by scalp inflammation and extrinsic factors. This paper presents a review of the mechanisms and extrinsic factors involved in the AGA physiopathology as well as its conventional and emerging treatments. The research focused on reports regarding AGA physiopathology and treatments published between January 2001 and July 2019 in medical and related journals. The most used medical treatments for AGA-minoxidil and finasteride-present non satisfactory results in some cases. Currently, the low-level laser therapy is recognized as a safe and effective treatment for AGA. Some minimally invasive techniques-mesotherapy, microneedling, carboxytherapy, and platelet-rich plasma-are also used to stimulate hair growth. Pharmaceutical substances with mechanisms differing from the anti-androgen activity are under current investigation and many of them have botanical origins; however, formulations with higher performance are required, and the hair follicles ability of being a drug and nanoparticle reservoir has been researched. The association of different strategies, that is, substances with synergic mechanisms and the use of advantageous technologies associated with lifestyle changes could improve the treatment outcomes. Androgen Antagonists;Finasteride;Minoxidil Adult;Alopecia;Androgen Antagonists;Finasteride;Genetic Predisposition to Disease;Hair;Humans;Low-Level Light

Therapy;Male;Middle Aged;Minoxidil;Platelet-Rich Plasma;Prognosis;Risk Assessment;Treatment Outcome

Improvement in viability and mineralization of osteoporotic bone marrow mesenchymal stem cell through combined application of photobiomodulation therapy and oxytocin. The probable positive effects of photobiomodulation therapy (PBMT) and oxytocin (OT) treatments together or alone were evaluated on cell viability along with the changes in the gene expression of Osteocalcin (OC), Osteoprotegerin (OPG), and Runt-related transcription factor 2 (Runx2) levels of sham (healthy)-Bone marrow mesenchymal stem cell(BMMSC) and ovariectomy-induced osteoporosis (OVX)-BMMSC. BMMSC was harvested from healthy and OVX rats and was cultured in osteogenic induction medium (OIM). There were five groups of BMMSCs: (1) sham -BMMSCs; (2) control -OVX-BMMSCs; (3) OT-treated-OVX-BMMSCs; (4) PBMT-treated-OVX-BMMSCs, and (5) OT + PBMT-OVX-BMMSCs. In all 5 groups, BMMSC viability and proliferation as well as gene expression of OC, OPG, and RUNX2 were evaluated. PBMT and PBMT + OT treatments showed a promising effect on the increased viability of OVX-BMMSC (ANOVA test; LSD test, pâ€‰=â€‰0.01, pâ€‰=â€‰0.002). The results of gene expression analysis revealed that the sham- BMMSCs responded optimally to OT treatment. It was also found that OVX-BMMSCs responded optimally to PBMT + OT and PBMT treatments at early and middle stages of osteogenic induction process. Nevertheless, they responded optimally to PBMT + OT and OT especially at the late stage of osteogenic induction process. PBMT and PBMT + OT treatments significantly increased viability of OVX-BMMSC in OIM in vitro. Both PBMT and PBMT + OT treatments could promote mineralization of OVX-BMMSC in the culture medium at early and middle stages of osteogenic induction process. Both OT and PBMT + OT treatments could promote mineralization of OVX-BMMSC in vitro at late stages of osteogenic induction process. Oxytocin Animals;Calcification, Physiologic;Cell Differentiation;Cell Survival;Combined Modality Therapy;Female;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteoporosis;Oxytocin;Rats

The Unhappy Cosmetic Patient: Lessons From Unfavorable Online Reviews of Laser and Intense Pulsed Light Treatments. Consumer Health Informatics;Cosmetic Techniques;Humans;Intense Pulsed Light Therapy;Lasers;Low-Level Light Therapy;Patient Satisfaction;Skin;Skin Pigmentation

Remote photobiomodulation: an emerging strategy for neuroprotection.

A randomized clinical trial comparing the efficacy of low-level laser therapy (LLLT) and laser acupuncture therapy (LAT) in patients with temporomandibular disorders. This study compared the efficacy of low-level laser therapy (LLLT) versus laser acupuncture therapy (LAT) in patients with temporomandibular disorders (TMDs). In this randomized, double-blind clinical trial, 45 TMD patients were randomly divided into three groups. In group 1 (LLLT), a GaAlAs laser was applied on painful masticatory muscles and TMJs (810Â nm, 200Â mW, 30Â s per point, Gaussian beam, spot size 0.28Â cm(2), 21Â J/cm(2)) two times a week for 5Â weeks. In group 2 (LAT), the laser was emitted bilaterally on acupuncture points (ST6, ST7, LI4) with the same settings as the LLLT group. Group 3 (placebo) underwent treatment with sham laser. The patients were evaluated before treatment (T1), after 5 (T2) and 10 (T3) laser applications, and 1Â month later (T4). The mandibular range of motion as well as pain intensity in masticatory system was recorded at each interval. There was no significant difference in mouth opening between the groups (pÂ >â€‰0.05), but the amount of lateral excursive and protrusive movements was significantly greater in LLLT and LAT groups than the placebo group at some intervals (pÂ <â€‰0.05). The overall pain intensity and pain degree at masticatory muscles (except temporal muscle) and TMJs were significantly lower in both experimental groups than the placebo group at most intervals after therapy (pÂ <â€‰0.05). Both LLLT and LAT were effective in reducing pain and increasing excursive and protrusive mandibular motion in TMD patients. LAT could be suggested as a suitable alternative to LLLT, as it provided effective results while taking less chair

time. Acupuncture Therapy;Adult;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Pain;Range of Motion, Articular;Temporomandibular Joint Disorders;Treatment Outcome

Photobiomodulation induces hypotensive effect in spontaneously hypertensive rats. To evaluate whether acute photobiomodulation can elicit a hypotensive effect in spontaneously hypertensive rats (SHR). Male SHR were submitted to the implantation of a polyethylene cannula into the femoral artery. After 24Â h, baseline measurements of the hemodynamic parameters: systolic, diastolic, and mean arterial pressure, and heart rate were accomplished for 1Â h. Afterwards, laser application was simulated, and the hemodynamic parameters were recorded for 1Â h. In the same animal, the laser was applied at six different positions of the rat's abdomen, and the hemodynamic parameters were also recorded until the end of the hypotensive effect. The irradiation parameters were red wavelength (660Â nm); average optical power of 100Â mW; 56Â s per point (six points); spot area of 0.0586Â cm(2); and irradiance of 1.71Â W/cm(2) yielding to a fluency of 96Â J/cm(2) per point. For measuring plasma NO levels, blood was collected before the recording, as well as immediately after the end of the mediated hypotensive effect. Photobiomodulation therapy was able to reduce the systolic arterial pressure in 69% of the SHR submitted to the application, displaying a decrease in systolic, diastolic, and mean arterial pressure. No change in heart rate was observed. Nevertheless, there was an increase in serum nitric oxide levels in the SHR responsive to photobiomodulation. Our results suggest that acute irradiation with a red laser at 660Â nm can elicit a hypotensive effect in SHR, probably by a mechanism involving the release of NO, without changing the heart rate. Nitric Oxide Animals;Blood Pressure;Heart Rate;Hemodynamics;Hypertension;Low-Level Light Therapy;Male;Nitric Oxide;Rats;Rats, Inbred SHR

Technological Advances in Wound Treatment of Exotic Pets. Although most research about the use of technological advances for wound healing was performed in laboratory animals but oriented to human medicine, recent technological advances allowed its application not only to small animals but also to exotic pets. This article reviews the literature available about some of these techniques (negative wound pressure therapy, photobiomodulation [laser therapy], electrical stimulation therapy, therapeutic ultrasonography, hyperbaric oxygen therapy), and other advances in wound management (skin expanders, xenografts, and bioengineered autologous skin substitutes) in exotic pet species. Animals;Animals, Exotic;Bioreactors;Electric Stimulation Therapy;Heterografts;Humans;Hyperbaric Oxygenation;Low-Level Light Therapy;Negative-Pressure Wound Therapy;Tissue Expansion Devices;Ultrasonic Therapy;Wound Healing;Wounds and Injuries

Effect of Photobiomodulation on Secretion of IL-6 and IL-8 by Human Gingival Fibroblasts In Vitro. Objective: The aim of this study was to evaluate the effects of 940-nm diode laser irradiation on proinflammatory cytokine secretions [interleukin (IL)-6 and IL-8] by human gingival fibroblasts in vitro. Background: Photobiomodulation has been routinely used in many dental procedures; however, the exact biological action mechanism of photobiomodulation and its therapeutic benefits have not been established. Methods: Cells derived from systemically healthy individuals were treated with three different laser parameters-6â€‰J for 20â€‰sec [0.84â€‰J/cm(2) (0.04 W/cm(2))], 10â€‰J for 20â€‰sec [1.4â€‰J/cm(2) (0.07 W/cm(2))], and 14â€‰J for 20â€‰sec [1.97â€‰J/cm(2) (0.09 W/cm(2))]-in the presence and absence of 1â€‰Î¼g/mL lipopolysaccharide (LPS) stimulation. Laser irradiations were carried out by a 940-nm diode laser device in continuous pain therapy mode with a deep tissue handpiece. Changes in cell viability, cytokine secretions, and mitogen-activated protein kinase pathway expressions were investigated, and results were compared with negative (medium) and positive control (1â€‰Î¼g/mL LPS) groups. The data obtained were statistically analyzed by the Mann-Whitney U test for pairwise comparisons among groups at the 0.05 level of significance. Results: Laser therapy with 0.84-1.4â€‰J/cm(2) amplified IL-6 and IL-8

secretions, whereas 1.97â€‰J/cm(2) suppressed IL-6 and IL-8 release in LPS-stimulated cells. Cell viability did not show a variation with photobiomodulation. Conclusions: These results demonstrate that photobiomodulation can alter IL-6 and IL-8 release, with cytokine suppression potency at a relatively high dose, as demonstrated previously. However, in contrast, we found that a low level of stimulation (6â€‰J) in the presence of inflammation (LPS stimulation) may further enhance IL-6 and IL-8 release. We also found that p38 and ERK1/2 pathways are activated by LPS as well as by photobiomodulation. Interleukin-6;Interleukin-8 Cell Proliferation;Cell Survival;Fibroblasts;Gingiva;Humans;In Vitro Techniques;Interleukin-6;Interleukin-8;Lasers, Semiconductor;Low-Level Light Therapy

Intracerebral Transcatheter Laser Photobiomodulation Therapy in the Treatment of Binswanger's Disease and Vascular Parkinsonism: Research and Clinical Experience. Objective: This research is devoted to intracerebral transcatheter laser photobiomodulation therapy (PBMT) in the treatment of ischemic and neurodegenerative lesions of cerebral white matter in patients with Binswanger's disease (BD) and vascular parkinsonism (VP) in comparison with conservative treatment methods. Background: Recent studies have shown PBMT high potential in the treatment of various cerebral lesions. Materials and methods: Twenty-seven patients with BD, 58-81 years of age (mean age 78), 17 (62.96%) men, and 10 (27.04%) women. Of these, test group 1-14 (51.85%) patients-underwent intracerebral transcatheter laser PBMT, and control group 1-13 (48.15%) patients-had conservative treatment. Besides, 62 patients with VP, 52-80 years of age (mean age 77), 48 (77.42%) men, and 14 (22.58%) women. Of these, test group 2-37 (59.68%) patients-underwent intracerebral transcatheter laser PBMT, and control group 2-25 (40.32%) patients-had conservative treatment. Results: Good and satisfactory clinical results were obtained in Test group 1 and Test group 2 patients in 49 (92.45%) cases, with a persistent decrease of dementia and motor impairment, and recovery of cognitive functions and daily life activity. Control group 1 and Control group 2 patients showed a satisfactory clinical result in 6 (15.79%) cases. Persistent positive dynamics was not observed. Conclusions: Intracerebral transcatheter laser PBMT is a pathogenetically justified, effective treatment for BD and VP; it restores cerebral collateral and capillary blood supply, improves microcirculation, restores cellular and tissue metabolism, stimulates neurogenesis, and causes regenerative processes in the brain. Aged;Aged, 80 and over;Brain;Case-Control Studies;Catheterization;Cognitive Dysfunction;Conservative Treatment;Dementia, Vascular;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Neuropsychological Tests;Parkinson Disease, Secondary;Prognosis;Reference Values;Risk Assessment;Treatment Outcome

Immediate responses of multi-focal low level laser therapy on quadriceps in knee osteoarthritis patients. Low-level laser therapy (LLLT) applying on knee osteoarthritis (OA) patients has shown positive outcomes in analgesic effect and functional recovery. However, few studies applied such therapy on large area of quadriceps muscle in these patients. The aim of this study was to evaluate immediate effect of multi-focal LLLT on quadriceps of knee OA patients in pain and functional performance. Fifty-one participants with knee OA were enrolled and evaluated before (T1) and immediately after intervention (T2) by knee joint pain in numeric rating scale (NRS), walking speed, timed five-chair stands, and quadriceps strength by isokinetic dynamometer. Intervention with two multi-focal Gallium-Aluminum-Arsenide laser devices, each device with 36 laser diodes (wavelength 808â€‰Â± 10 nm, continuous, mean power 50â€‰mW, 30â€‰minutes), applied simultaneously over bilateral quadriceps with a total dose of 180â€‰J for each thigh. The multi-focal LLLT significantly improved knee joint pain as measured by the NRS (54% reduction), timed five-chair stands, and walking speed (P <â€‰.05). Knee extensor strength also increased in terms of peak torque and force of concentric and eccentric contraction as measured by isokinetic dynamometer (P

<â€‰.05). In conclusion, single-session multi-focal LLLT on quadriceps in knee OA patients has immediate beneficial effect on knee pain reduction, quadriceps strengthening and functional performance recovery. Long-term effect requires further investigation. Multi-focal LLLT on quadriceps might serve as an alternative non-invasive treatment option in these patients. Aged;Female;Humans;Low-Level Light Therapy;Male;Muscle Contraction;Osteoarthritis, Knee;Pain;Quadriceps Muscle;Treatment Outcome

Peri-Implant Disease, a Consensus for Treatment: A Case Study. The aim of this case report was to find common treatment with the use of laser energy to treat failing implants. This article discusses definition of peri-implantitis and how-to diagnosis peri-implantitis. The article shows a case report of treatment with the use of two different lasers. Dental Implants Consensus;Dental Implants;Humans;Lasers;Peri-Implantitis

Effect of Low-Level Laser Irradiation on Stability and Marginal Bone of Narrow Implants Retaining Overdentures in Moderately Controlled Diabetic Patients. The researchers investigated the influence of low-level laser irradiation (LLLI) on implant stability and marginal bone of small-diameter implants retaining mandibular overdentures in patients with moderately controlled diabetes. Twenty patients (mean age = 59.32 Â± 4.1 years) with moderately controlled diabetes mellitus (glycated hemoglobin A1c [HbA1c] = 8.1%-10.0 %) were rehabilitated by maxillary and mandibular conventional dentures. Two small-diameter implants (3 Ã— 12 mm) were inserted in the canine areas of the mandible and immediately loaded by mandibular dentures. In a split-mouth design, LLLI was applied to 1 of the 2 implants in a random order (study group [SG]); the other implant was left as a control (control group [CG]). For each patient, gallium aluminum-arsenide diode low-level laser (940-nm wavelength, 0.50 Â± 2 mW output power, 0.004 cm(2) spot size; Epic, Biolase, Inc, San Clemente, Calif) was applied around each implant with total delivered energy of 90 J (equally divided by 6 irradiation points) in 3 sessions. The application was done immediately after implant insertion, 3 days and 1 week after surgery. Implant stability (measured by Periotest) and marginal bone loss (MBL; measured by cone beam computerized tomography) were evaluated at implant loading (T1), 6 months (T6), and 12 months (T12). One implant failed in the CG and no failures occurred in the SG, resulting in 95% and 100% survival rates, respectively. The SG recorded higher Periotest values than the CG at all observation times. However, the difference was significant (P = .039) at T6 only. The SG recorded lower MBL values than the CG. No difference in MBL was detected between groups or peri-implant sites (mesial, distal, buccal, and lingual) at T6 and T12. Within the limits of this study, LLLI had no effect on marginal bone around immediately loaded small-diameter implants retaining overdentures in patients with moderately controlled diabetes. However, it was beneficial in improving implant stability 6 months after overdenture insertion. Dental Implants Alveolar Bone Loss;Dental Implants;Dental Prosthesis, Implant-Supported;Denture, Overlay;Diabetes Mellitus;Follow-Up Studies;Humans;Mandible;Middle Aged;Treatment Outcome

Clinical characteristics and treatment of 52 cases of phakomatosis pigmentovascularis. Phakomatosis pigmentovascularis is a rare syndrome characterized by widespread capillary malformation and pigmented nevus. The objective of this study was to evaluate its characteristics and treatment. Fifty-two patients presenting between 2003 and 2017 were retrospectively reviewed. Type IIa (port-wine stain and dermal melanocytosis with oculocutaneous involvement) was most common. Systemic involvement was observed in 17.3% and it was not significantly correlated to extent of capillary malformation or pigmented nevus. However, systemic involvement was significantly frequent in patients with nevus of Ota and in patients with pigmented nevus located on the head and neck (P = 0.004 and 0.035, respectively). Capillary malformation was almost cleared in 28.6% of patients using pulsed dye laser, whereas pigmented nevus was almost cleared in 23.7% and completely cleared in 42.1% of patients using Q-switched neodymium:yttrium-aluminum-garnet

laser. Treatment outcome score showed significant inverse correlation with the extent of port-wine stain or pigmented nevus (P = 0.047, Ï• = -0.308 and P = 0.011, Ï• = -0.410, respectively). Pigmented nevus demonstrated better treatment response to lasers than did capillary malformation. Smaller lesions tended to show better treatment outcomes for both capillary malformation and pigmented nevus. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Infant;Infant, Newborn;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neurocutaneous Syndromes;Nevus of Ota;Port-Wine Stain;Retrospective Studies;Skin Neoplasms;Treatment Outcome;Young Adult

Photobiomodulation combined with photodynamic therapy using ruthenium phthalocyanine complexes in A375 melanoma cells: Effects of nitric oxide generation and ATP production. Light irradiation has been used in clinical therapy for several decades. In this context, photobiomodulation (PBM) modulates signaling pathways via ROS, ATP, Ca(2+), while photodynamic therapy (PDT) generates reactive oxygen species by excitation of a photosensitizer. NO generation could be an important tool when combined with both kinds of light therapy. By using a metal-based compound, we found that PBM combined with PDT could be a beneficial cancer treatment option. We used two types of ruthenium compounds, ([Ru(Pc)], Pcâ€¯=â€¯phthalocyanine) and trans-[Ru(NO)(NO(2))(Pc)]. The UV-vis spectra of both complexes displayed a band in the 660â€¯nm region. In the case of 0.5â€¯Î¼M trans-[Ru(NO)(NO(2))(Pc)], light irradiation at the Q-band reduced the percentage of viable human melanoma (A375) cells to around 50% as compared to [Ru(Pc)]. We hypothesized that these results were due to a synergistic effect between singlet oxygen and nitric oxide. Similar experiments performed with PDT (660â€¯nm) combined with PBM (850â€¯nm) induced more photocytotoxicity using both [Ru(Pc)] and trans-[Ru(NO)(NO(2))(Pc)]. This was interpreted as PBM increasing cell metabolism (ATP production) and the consequent higher uptake of the ruthenium phthalocyanine compounds and more efficient apoptosis. The use of metal-based photosensitizers combined with light therapy may represent an advance in the field of photodynamic therapy. Coordination Complexes;Organometallic Compounds;Photosensitizing Agents;ruthenium phthalocyanine;Singlet Oxygen;Nitric Oxide;Adenosine Triphosphate Adenosine Triphosphate;Cell Line, Tumor;Cell Survival;Coordination Complexes;Humans;Light;Melanoma;Nitric Oxide;Organometallic Compounds;Photochemotherapy;Photosensitizing Agents;Singlet Oxygen

Comparison of efficacy and safety of fractional radiofrequency and fractional Er:YAG laser in facial and neck wrinkles: Six-year experience with 333 patients. Lasers and other light sources are popular treatment options for facial rejuvenation in recent years. In this study, we aimed to compare the efficacy and safety of fractional radiofrequency (RF) and fractional Erbium: YAG (Er:YAG) laser for facial and neck skin wrinkles, objectively. Three hundred and thirty-three patients treated with fractional RF and fractional Er:YAG laser were evaluated by two blinded dermatologists. Fractional Er:YAG laser was more effective for the periorbital area; whereas fractional RF treatment was more effective for perioral, nasolabial and jawline areas. There was no statistically significant difference in side effects between two treatment groups. In conclusion, both modalities significantly improve skin wrinkles; however, it should be considered that there may be regional differences between the treatment outcomes of them. Adult;Cohort Studies;Esthetics;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neck;Patient Satisfaction;Rejuvenation;Retrospective Studies;Skin Aging;Statistics, Nonparametric;Treatment Outcome

Paradoxical adipose hyperplasia after noninvasive radiofrequency treatment: A novel report and review. The past decade has experienced a surge in the frequency of nonsurgical procedures, including injectables, skin rejuvenation, and nonsurgical fat reduction. Nonsurgical fat reduction methods include cryolipolysis (Coolsculpting), ultrasound (Vaser Shape), laser (Liposonix), and

radiofrequency (Vanquish). These methods generally produce good results, with cryolipolysis gaining much popularity over the past few years. Multiple reports of paradoxical adipose hyperplasia have been reported with Coolsculpting, with an incidence of 0.025% to 1%. This entity has never been reported with other methods of nonsurgical fat reduction, including noninvasive radiofrequency (Vanquish). We present a case of paradoxical adipose hyperplasia in a 57-year-old male following treatment with noninvasive radiofrequency (Vanquish) to the abdomen. He was treated with power-assisted liposuction to the abdomen and flanks. This is the first case in the literature of paradoxical adipose hyperplasia in a patient treated with this form of noninvasive fat reduction. Body Contouring;Cryosurgery;Extracorporeal Shockwave Therapy;Humans;Hyperplasia;Lipectomy;Low-Level Light Therapy;Male;Middle Aged;Radiofrequency Therapy;Subcutaneous Fat, Abdominal;Treatment Outcome

Assessment of photobiomodulation therapy by an 8l0-nm diode laser on the reversal of soft tissue local anesthesia in pediatric dentistry: a preliminary randomized clinical trial. During the injection of local anesthesia in pediatric dental procedures, from the injection time until the elimination of tissue anesthesia, inevitable problems were reported. According to the encouraging results of previous studies addressing the positive effects of laser therapy on increasing the microcirculation, we aimed to investigate the clinical effect of photobiomodulation therapy on the reversal of soft tissue anesthesia in children. Using a split-mouth design, 34 children aged 4 to 8Â years old, candidate for receiving local infiltration injection at both right and left side in mandible, were enrolled in the study. The mandibular right and left quadrants were randomly assigned to groups of laser or sham laser: in laser side, patients received 810-nm laser irradiation, and in the sham laser group, the patients had the laser in off mode at 45Â min after injection with an interval of 7-10Â days between two sessions of each quadrant treatments. The degree of anesthesia was evaluated using the palpation technique alternately every 15Â min. Data were analyzed using paired sample t test and multiple linear regression test. The mean duration of anesthesia expressed in minutes was equal to 145.15â€‰Â±â€‰23.27 and 188.82â€‰Â±â€‰12.31 for the laser group and sham laser group, respectively. There was a significant difference in duration of anesthesia between two groups (Pâ€‰<â€‰0.001). Considering the results and limitations of the present study, photobiomodulation therapy by 810-nm diode laser can be proposed as a non-invasive method in order to reduce the duration of anesthesia in pediatric patients. Anesthesia, Dental;Anesthesia, Local;Child;Child, Preschool;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pediatric Dentistry;Time Factors

Ablative fractional laser resurfacing for treatment of sclerosis and contractures in chronic graft-versus-host disease: A pilot study. Biopsy;Chronic Disease;Contracture;Dose Fractionation, Radiation;Graft vs Host Disease;Humans;Joints;Lasers, Gas;Low-Level Light Therapy;Pilot Projects;Prospective Studies;Range of Motion, Articular;Sclerosis;Skin;Treatment Outcome

Effects of transcranial photobiomodulation and methylene blue on biochemical and behavioral profiles in mice stress model. The effectiveness of transcranial photobiomodulation (tPBM) and methylene Blue (MB) in treating learning and memory impairments is previously reported. In this study, we investigated the effect of tPBM and MB in combination or alone on unpredictable chronic mild stress (UCMS)-induced learning and memory impairments in mice. Fifty-five male BALB/c mice were randomly allocated to five groups: control, laser sham + normal saline (NS), tPBM + NS, laser sham + MB, and tPBM + MB. All groups except the control underwent UCMS and were treated simultaneously for 4Â weeks. Elevated plus maze (EPM) was used to evaluate anxiety-like behaviors. Novel object recognition (NOR) test and Barnes maze tests were used to evaluate learning and memory function. The serum cortisol and brain nitric oxide (NO), reactive oxygen species (ROS), total

antioxidant capacity (TAC), glutathione peroxidase (GPx), and superoxide dismutase (SOD) levels were measured by spectrophotometric methods. Behavioral tests revealed that UCMS impaired learning and memory, and treatment with PBM, MB, and their combination reversed these impairments. Levels of NO, ROS, SOD activity in brain, and serum cortisol levels significantly increased while brain GPx activity and total antioxidant capacity significantly decreased in the sham + NS animals when compared with the controls. A significant improvement was observed in treatment groups due to reversion of the aforementioned molecular analysis caused by UCMS when it was compared with control levels. Both tPBM and MB in combination or alone have significant therapeutic effects on learning and memory impairments in UCMS-received animals. Antioxidants;Reactive Oxygen Species;Glutathione Peroxidase;Superoxide Dismutase;Methylene Blue Animals;Antioxidants;Behavior, Animal;Brain;Disease Models, Animal;Glutathione Peroxidase;Low-Level Light Therapy;Male;Maze Learning;Memory;Methylene Blue;Mice;Mice, Inbred BALB C;Reactive Oxygen Species;Recognition, Psychology;Skull;Superoxide Dismutase

Photobiomodulation for Alzheimer's Disease: Has the Light Dawned? Next to cancer, Alzheimer's disease (AD) and dementia is probably the most worrying health problem facing the Western world today. A large number of clinical trials have failed to show any benefit of the tested drugs in stabilizing or reversing the steady decline in cognitive function that is suffered by dementia patients. Although the pathological features of AD consisting of beta-amyloid plaques and tau tangles are well established, considerable debate exists concerning the genetic or lifestyle factors that predispose individuals to developing dementia. Photobiomodulation (PBM) describes the therapeutic use of red or near-infrared light to stimulate healing, relieve pain and inflammation, and prevent tissue from dying. In recent years PBM has been applied for a diverse range of brain disorders, frequently applied in a non-invasive manner by shining light on the head (transcranial PBM). The present review discusses the mechanisms of action of tPBM in the brain, and summarizes studies that have used tPBM to treat animal models of AD. The results of a limited number of clinical trials that have used tPBM to treat patients with AD and dementia are discussed.

Chronic Neck Pain: Nonpharmacologic Treatment. Acupuncture Therapy;Chronic Pain;Exercise Therapy;Humans;Low-Level Light Therapy;Massage;Mind-Body Therapies;Neck Pain;Physical Therapy Modalities;Relaxation Therapy

Effect of Low-Level Laser Therapy in Treatment of Chemotherapy Induced Oral Mucositis. Introduction: Oral mucositis (OM) is an unavoidable condition of the oral cavity that accompanies chemotherapy for various malignant cases. Chemotherapy-induced oral Mucositis (COM) is a frequent complication due to mucotoxic drugs and is known to deteriorate the general health significantly, while negatively affecting the quality of life (QOL). Studies have reported that low-level laser therapy (LLLT) promotes the tissue healing. The objective of the present study was to explore the efficacy of gallium-arsenide (GaAs) laser in treating COM and its impact on inflammatory cytokine levels in patients receiving chemotherapy for various malignancies. Methods: A total of 80 patients with COM received LLLT 6 days/week. OM was graded according to the World Health Organization (WHO) grading scale. The outcome parameters were the serum levels of tumor necrosis factor-alpha (TNF-Î±) and interleukin-6 (IL-6) measured before, during and after administration of LLLT. Results: After LLLT, a significant decrease was found in the mean values of mucositis grade from 2.35 Â± 0.695 to 1.13 Â± 0.333 after ($P < 0.001$). A significant reduction in the level of TNF-Î± was found after LLLT among breast cancer patients ($P = 0.0045$), but not in head and neck cancer and lymphoma patients. A significant reduction was also found in IL-6 level after treatment among head and neck and breast cancer patients ($P = 0.0307$ and 0.019, respectively). Conclusion: The use of GaAs LLLT in treating COM in patients with various malignancies is well tolerated by patients, it results in improvement of

mucositis, however; mechanism of action does not seem to be completely linked to the change of pro or anti-inflammatory cytokines.

The Effects of Photobiomodulation Therapy on Post-Surgical Pain. Introduction: One of the major complains after surgery is pain. Recent advances in the prevention and reduction of postoperative pain have provided several modalities. One of them is the use of laser irradiation on the surgical area. Objectives: To evaluate the effects of low level laser therapy (LLLT) on pain and side effects after surgery. Methods: In this research, databases such as: PubMed, Science Direct, Google Scholar, Springer and Cochrane were used and the words of laser therapy, photobiomodulation, therapeutic laser, low level laser therapy, surgery and pain were searched. Articles, including systematic reviews, original articles, case series, and clinical intervention studies related to these words, were studied. The language of all articles was English and consists of papers from 2009 until 2017. Results: A total of 370 papers were studied and 10 articles that met inclusion criteria were selected for this review. Few of these articles were followed up. Surgery included a wide range of surgeries including mastectomy, breast augment post-fracture, episiotomy, tonsillectomy and hernia. The methodological quality score on the PEDro scale was between 5 and 11. 8 trials reported positive effects and 2 trials reported negative effects. In order to study clinical effect size of laser therapy after surgery, only 4 papers met entry criteria and the mean effect sizes were 0.13 to 2.77. Accordingly, the best treatment protocol included a red laser dose of 4 J/cm(2) for the post-operative pain of tonsillectomy, which was irradiated through the infra mandibular angle on the tonsils. Conclusion: LLLT may be an appropriate modality for reducing pain after surgery, nevertheless the effect size of this modality is variable. Therefore, further research based on proper protocols for these patients and follow-up of therapeutic course should be designed and implemented.

High Power Laser and Photobiomodulation in Oral Surgery: Case Report. Introduction: The labial frenum is a fold of mucous membrane that attaches the lip and the cheek to the alveolar mucosa, the gingiva, and the underlying periosteum. In some cases, its presence can cause a midline diastema, periodontal diseases related to food impaction, or retention of biofilm, among others. In such cases, lip frenectomy is indicated as treatment, which can be performed with a scalpel (conventional method), an electric scalpel, or a surgical laser. Objective: To show a clinical case performed at Laser Extension Project in Dentistry, Federal University of MaranhÃ£o grounded in a literature review. Case Presentation: A laser frenectomy was performed on a female patient, aged 20, who had a diastema between the upper central incisors and an indication for frenum removal. The high-power diode laser is excellent for procedures in soft tissue because its wavelength is well absorbed by hemoglobin and other pigments; its use also allows a reduction in the amount of anesthetic and medicines used. The parameters used were 2 W, in a continuous mode, 808 nm infrared emission; with delivery of the beam through optical fiber 300 Î¼M; energy of 120 J; 20 pps. Conclusion: the high power diode laser allowed a satisfactory result, the procedure was safe, the technique was a simple one and of reduced clinical time, as mentioned in the literature. It is worth noting that the technique is dependent on the skill of the professional performing it.

The Use of Laser Therapy for Patients with Fibromyalgia: A Critical Literary Review. The management of pain - despite many anaesthetic drugs - remains to be an urgent task. If the goal is to achieve permanent pain relief - and not to temporarily mask the pain (masking pathology) - then this goal can only be achieved by treating pain with physiotherapeutic methods, the most universal and effective of which, is low level laser therapy (LLLT). The treatment methods vary fundamentally in the case of neuropathic (nonspecific, primary) pain, which includes pain with the localization of the trigger points (TP) and nociceptive (specific, secondary), which includes all types of pain resulting from trauma, inflammation, etc. When treating patients with fibromyalgia (FM), a comprehensive approach is required, using different methods of laser therapy and guided by well-known rules. These

rules include setting all the correct parameters of the laser exposure (wavelength, operating mode, power, exposure, etc), limiting exposure and power to optimal values and limiting the total time of the procedure and the number of procedures per course.

Correction to: Photobiomodulation therapy at different wavelength impacts on retinoid acid-dependent SH-SY5Y differentiation. After publication of this paper, the authors determined an error in the author group. The correct presentation of authors are below.

Computational Modeling of the Photon Transport, Tissue Heating, and Cytochrome C Oxidase Absorption during Transcranial Near-Infrared Stimulation. Transcranial near-infrared stimulation (tNIRS) has been proposed as a tool to modulate cortical excitability. However, the underlying mechanisms are not clear where the heating effects on the brain tissue needs investigation due to increased near-infrared (NIR) absorption by water and fat. Moreover, the risk of localized heating of tissues (including the skin) during optical stimulation of the brain tissue is a concern. The challenge in estimating localized tissue heating is due to the light interaction with the tissues' constituents, which is dependent on the combination ratio of the scattering and absorption properties of the constituent. Here, apart from tissue heating that can modulate the cortical excitability ("photothermal effects"); the other mechanism reported in the literature is the stimulation of the mitochondria in the cells which are active in the adenosine triphosphate (ATP) synthesis. In the mitochondrial respiratory chain, Complex IV, also known as the cytochrome c oxidase (CCO), is the unit four with three copper atoms. The absorption peaks of CCO are in the visible (420-450 nm and 600-700 nm) and the near-infrared (760-980 nm) spectral regions, which have been shown to be promising for low-level light therapy (LLLT), also known as "photobiomodulation". While much higher CCO absorption peaks in the visible spectrum can be used for the photobiomodulation of the skin, 810 nm has been proposed for the non-invasive brain stimulation (using tNIRS) due to the optical window in the NIR spectral region. In this article, we applied a computational approach to delineate the "photothermal effects" from the "photobiomodulation", i.e., to estimate the amount of light absorbed individually by each chromophore in the brain tissue (with constant scattering) and the related tissue heating. Photon migration simulations were performed for motor cortex tNIRS based on a prior work that used a 500 mW cm - 2 light source placed on the scalp. We simulated photon migration at 630 nm and 700 nm (red spectral region) and 810 nm (near-infrared spectral region). We found a temperature increase in the scalp below 0.25 Â°C and a minimal temperature increase in the gray matter less than 0.04 Â°C at 810 nm. Similar heating was found for 630 nm and 700 nm used for LLLT, so photothermal effects are postulated to be unlikely in the brain tissue.

Low-level laser therapy as adjunctive treatment for a sodium hypochlorite accident: a case report. A 39-year-old woman sought specialized treatment complaining of a large, painful oral ulcer in the right buccal vestibule after receiving emergency endodontic treatment 3 days earlier. The patient reported that the tooth, the mandibular right first premolar, was not isolated with a rubber dam and that she felt the extrusion of a liquid in the buccal tissues. Clinically, a necrotic area with raised erythematous borders was observed in the mandibular right side. The clinical diagnosis was a chemically induced ulcer caused by a sodium hypochlorite accident. Dexamethasone and amoxicillin were prescribed to control pain and prevent secondary infection. The large size of the lesion was an indication for application of low-level laser therapy (LLLT), which was delivered at a wavelength of 685 nm (output power, 30 mW; power density, 0.5 mWâ•„cm2 ; energy density, 6 Jâ•„cm2) every 2 days for a total of 6 sessions. The LLLT was applied to the necrotic area with a punctual mode (2 points) for 12 seconds per point. The patient reported a substantial reduction in pain after the second application, and the wound was completely healed after 6 sessions. The results observed in this patient suggest that LLLT could aid patients in recovering from NaOCl-related lesions. Sodium

Hypochlorite Accidents;Adult;Bicuspid;Female;Humans;Low-Level Light Therapy;Oral Ulcer;Sodium Hypochlorite

Combined low level light therapy and intense pulsed light therapy for the treatment of meibomian gland dysfunction. PURPOSE: To evaluate the effects of combined intense pulsed light therapy (IPL) and low-level light therapy (LLLT) on clinical measures of dry eye related to severe meibomian gland disease (MGD) in subjects unresponsive to previous medical management. PATIENTS AND METHODS: This was a retrospective chart review of patients treated by 4 physicians at 3 centers. All patients were documented treatment failures with traditional pharmaceutical therapy. They all had their MGD evaluated before treatment using a grading scale (0-4), tear breakup time in seconds and the Ocular Surface Disease Index (OSDI) questionnaire. To be included, all patients had to have had a short course of adjunct pharmaceutical or device-related therapy, along with a combined IPL/LLLT treatment. As well, a second MGD evaluation with the same three measures had to have been conducted 1-3Â months post treatment. RESULTS: A total of 460 eyes of 230 patients were identified for inclusion in the data set. Mean OSDI scores were significantly lower after treatment; 70.4% of patients had pretreatment OSDI scores indicative of dry eye; this dropped to 29.1% of patients after treatment. A 1-step or greater reduction in MGD grading was observed in 70% of eyes, with 28% of eyes having a 2-step or greater reduction. Tear breakup time was â‰¤6Â seconds in 86.7% of eyes pretreatment, dropping to 33.9% of eyes after treatment. There were no ocular or facial adverse events or side effects related to the combined light treatment. CONCLUSION: The use of combined IPL/LLLT for the treatment of severe MGD appears to be beneficial in patients who have failed topical and/or systemic therapy.

Use of a hand-held spectroradiometer for the measurement of neonatal phototherapy lamp outputs. The measurement capability of a hand-held spectroradiometer for validation of phototherapy light treatment for neonates is described. This function is compared with that of a double grating monochromator system with photomultiplier detector, where parameters evaluated included wavelength accuracy and accuracy of irradiance within set wavelength intervals - 460â€¯nm to 490â€¯nm and 400â€¯nm to 550â€¯nm. Measurements carried out in a clinical setting revealed that the hand-held spectroradiometer provided an acceptable level of accuracy for determining output characteristics of the phototherapy devices investigated. It was observed that measurement errors were more significant for studies involving direct contact with light emitting surfaces. It was identified that the spectral resolution of the MSC15 device could act to degrade the accuracy of the device where narrow spectrum peaks occurred around the limits of specific identified bandwidths - such as at 460â€¯nm and 490â€¯nm. This was identified not to be an issue with typical light emitting diode phototherapy systems, where the spectral outputs do not contain narrow spectral components. The device lends itself also to use by clinical staff in the clinical environment to verify the output of phototherapy lamps. The availability of such hand-held spectroradiometer devices represents an advance on the use of output meters suppled by equipment manufacturers. Equipment Design;Hand;Humans;Infant, Newborn;Phototherapy;Radiometry

Efficacy of laser acupuncture for carpal tunnel syndrome: A study protocol for a prospective double-blind randomized controlled trial. INTRODUCTION: Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy that causes hand discomfort and work disability. Since no satisfactory conventional treatments for mild to moderate CTS exist, we apply complementary alternative medicine (CAM) to this problem. Laser acupuncture (LA), a new, non-invasive therapy which uses low-level-laser therapy (LLLT) in acupuncture could help to manage CTS. However, only one small randomized, double-blind and crossover trial had been conducted, which is not enough to provide an evidence-based assessment of the effects of LA on CTS. OBJECTIVES: The aim of this study protocol is to investigate the efficacy of LA therapy on patients with mild to moderate CTS through

sonography of the median nerve and offer clear parameters of LLLT. METHODS: This study protocol is a prospective double-blind randomized controlled trial. Forty subjects aged 20 to 80 years old and diagnosed as having mild to moderate CTS will be randomly assigned to the intervention group (real LA, 3-sessions a week for 2 weeks) and control group (sham LA, 3-sessions a week for 2 weeks). All subjects will be asked to wear night splints as the fundamental management approach. The laser parameters will include a wavelength of 808â€Šnm, power output of 300 mW and power density of 300 mW/mm, with ten seconds of treatment for each acupuncture point (PC4, PC6, PC7, PC8, LI4, LI10, LI11, HT3, HT7, and LU10). Sham LA treatment will be applied without any laser power output. The primary outcome will be based the Boston Carpal Tunnel Syndrome Questionnaire and secondary outcomes included a visual analog scale, cross sectional area of median nerve by sonography and electrophysiological test before interventions and after 2, 4, 8, 12 weeks postintervention. TRIAL REGISTRATION: ClinicalTrials.gov (Identifier: NCT03580265). Acupuncture Therapy;Adult;Aged;Aged, 80 and over;Carpal Tunnel Syndrome;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Visual Analog Scale;Young Adult;Randomized Controlled Trials as Topic

The use of lasers and light sources in skin rejuvenation. Smooth, wrinkle-free skin is associated with supposed attractiveness, youthfulness, and health, while rhytids have a negative impact on one's perceived appearance, image, and self-esteem. Noninvasive esthetic procedures such as laser or light therapy have been used to achieve and attain a more youthful appearance. Currently, there is a wide range of lasers and devices available for the regeneration and healing of skin. Lasers and light sources for skin rejuvenation involve the removal of aged skin tissue via thermal heat from high-powered lasers, stimulating the surrounding tissues to recover through natural wound-healing processes. In contrast, photobiomodulation, which makes use of low energy lasers or light emitting diodes, uses no heat and has shown positive effects in the reduction of wrinkles and improving skin laxity. Cosmetic Techniques;Humans;Laser Therapy;Phototherapy;Rejuvenation;Skin Aging

Skin aging revisited. Sunscreening Agents Aging;Carcinoma, Basal Cell;Cardiovascular Diseases;Environment;Female;Genome-Wide Association Study;Humans;Laser Therapy;Life Style;Low-Level Light Therapy;Male;Neurodegenerative Diseases;Phototherapy;Skin Aging;Skin Neoplasms;Sunlight;Sunscreening Agents

Effectiveness of Low-Level Laser Therapy with a 915 Nm Wavelength Diode Laser on the Healing of Intraoral Mucosal Wound: An Animal Study and a Double-Blind Randomized Clinical Trial. Background and objectives: Diode laser has been the most popular low-level laser therapy (LLLT) technique in dentistry due to its good tissue penetration, lower financial costs, small size for portable application, and convenience to use. A series of recent studies with 940 nm or 980 nm lasers demonstrated that LLLT showed positive effects after third molar extraction or periodontal flap surgery. However, the effects of LLLT on intraoral mucosal wound healing after surgical incision have not yet been determined in human clinical study. Materials and Methods: The present study was performed to determine the efficacy and safety of 915 nm wavelength low-level laser therapy (LLLT) in mucosal wound healing. A total of 108 Sprague-Dawley rats were used. They were divided into three groups: Abrasive wound group, immediate LLLT once group, and daily LLLT group. As a clinical study, a total of 16 patients with split-mouth design subjected to bilateral mandibular third molar extraction were allocated into the LLLT group and placebo group. The process of LLLT was performed on postoperative days 0, 1, and 7, and parameters related to wound healing were analyzed on days 1, 7, and 14. Results: Repeated laser irradiation promoted mucosal wound healing of the rats. In the clinical study, although there were no significant statistical differences between the LLLT and placebo groups in all inflammatory parameters, the early stage mucosal healing tendency of wound dehiscence was higher in the LLLT group than in the placebo group clinically on postoperative day 1.

Conclusions: The present results showed that 915 nm LLLT could be applied safely as an auxiliary therapy for mucosal wound healing.
Adolescent;Adult;Animals;Female;Humans;Male;Rats;Young Adult;Analysis of Variance;Disease Models, Animal;Double-Blind Method;Low-Level Light Therapy;Molar, Third;Mucous Membrane;Rats, Sprague-Dawley;Republic of Korea;Treatment Outcome;Wound Healing

Interaction between low-level laser therapy and Guarana (Paullinia cupana) extract induces antioxidant, anti-inflammatory, and anti-apoptotic effects and promotes proliferation in dermal fibroblasts. BACKGROUND: Low-level laser therapy (LLLT) has several clinical applications; however, its benefits are not universal. Therefore, combination therapy with LLLT and extracts from the guarana (Paullinia cupana) plant may improve its effectiveness as guarana extracts exhibit anti-aging properties. OBJECTIVES: To evaluate the antioxidant, anti-inflammatory, anti-apoptotic, and proliferative effects of combined LLLT and guarana extract therapy on human dermal fibroblasts. METHODS: Human dermal fibroblasts (HFF-1) were cultured and initially exposed to several concentrations (1, 3, 5, 10, 30Â Âµg/mL) of guarana extract. The experimental concentration of guarana extract was selected by analyzing cytokine levels, DNA oxidation, and apoptotic markers in LLLT-exposed (4Â J/cm(2)) and LLLT-unexposed fibroblast cultures. After 72Â hours, the cells were analyzed using spectrophotometric, fluorimetric, immunological, and gene expression (qRT-PCR) assays. Flow cytometry was used to evaluate the effect of each treatment on cell cycle. RESULTS: Fibroblasts treated with guarana (5Â Âµg/mL) exhibited anti-inflammatory and anti-apoptotic properties been used in complementary protocols. Combined guarana and LLLT treatment significantly decreased protein carbonylation, lipoperoxidation, and DNA oxidation, downregulated the mRNA and protein expression of pro-inflammatory molecules, and upregulated IL-10 gene and protein expression. Guarana plus LLLT also decreased the levels of caspases 1, 3, and 8, increased the percentage of S-phase cells, and decreased FGF-1 and KGF-1 levels. Some of these changes were also observed after treatment with guarana or LLLT alone. CONCLUSIONS: Our results suggest that concomitant treatment with guarana and LLLT may promote fibroblast biostimulation and thus is clinically relevant. Plant Extracts Apoptosis;Cell Line;Cell Proliferation;Combined Modality Therapy;Drug Evaluation, Preclinical;Fibroblasts;Humans;Low-Level Light Therapy;Oxidation-Reduction;Paullinia;Plant Extracts;Skin;Skin Aging

Photothermal-Induced Antibacterial Activity of Gold Nanorods Loaded into Polymeric Hydrogel against Pseudomonas aeruginosa Biofilm. In this study, the photothermal-induced bactericidal activity of phospholipid-decorated gold nanorods (DSPE-AuNR) suspension against Pseudomonas aeruginosa planktonic and biofilm cultures was investigated. We found that the treatment of planktonic culture of Pseudomonas aeruginosa with DSPE-AuNR suspension (0.25-0.03 nM) followed by a continuous laser beam exposure resulted in ~6 log cycle reduction of the bacterial viable count in comparison to the control. The percentage reduction of Pseudomonas aeruginosa biofilm viable count was ~2.5-6.0 log cycle upon laser excitation with different concentrations of DSPE-AuNR as compared to the control. The photothermal ablation activity of DSPE-AuNR (0.125 nM) loaded into poloxamer 407 hydrogel against Pseudomonas aeruginosa biofilm resulted in ~4.5-5 log cycle reduction in the biofilm viable count compared to the control. Moreover, transmission electron microscope (TEM) images of the photothermally-treated bacteria revealed a significant change in the bacterial shape and lysis of the bacterial cell membrane in comparison to the untreated bacteria. Furthermore, the results revealed that continuous and pulse laser beam modes effected a comparable photothermal-induced bactericidal activity. Therefore, it can be concluded that phospholipid-coated gold nanorods present a promising nanoplatform to eradicate Pseudomonas aeruginosa biofilm responsible for common skin diseases. Anti-Bacterial Agents;Hydrogels;Phosphatidylethanolamines;Poloxamer;1,2-

distearoylphosphatidylethanolamine;Gold Anti-Bacterial Agents;Biofilms;Colony Count, Microbial;Gold;Hydrogels;Low-Level Light Therapy;Microscopy, Electron, Transmission;Nanotubes;Phosphatidylethanolamines;Plankton;Poloxamer;Pseudomonas aeruginosa

Effects of Different Protocols of Low-Level Laser Therapy on Collagen Deposition in Wound Healing. The low-level laser has proven successful in stimulating the production of collagen in wound healing assays. However, diversity has been observed in the protocols used. This work has evaluated the effects of three protocols of low-level laser therapy (LLLT) in the healing of open wounds in rats. Standard-sized wounds of 1 cm2 were performed with a scalpel in the middorsal region of 60 male Wistar rats weighing 225Â±25 g, and they were assigned into four groups (n=15): CTR (non-irradiated animals), LT1 (20 J/cm2 daily), LT2 (16 J/cm2 daily) and LT3 (20 J/cm2 daily). After 7, 14 and 21 days, five animals/day were euthanized and the wounds analyzed histologically. Data were subjected to normality analysis of distribution using Shapiro-Wilk test. Gaussian data were analyzed using ANOVA and Bonferroni tests whereas non-Gaussian data were analyzed using Kruskal-Wallis and Dunn tests, considering significant p values less than 0.05. The LLLT in all protocols reduced the inflammation and collagen deposition increased significantly ($p<0.05$). However, LT2 showed the highest levels of collagen in all phases of the study ($p<0.05$) induced faster replacement of immature collagen III by mature collagen I in the early stages of repair and early collagen remodeling promoted by providing better organization architectural beams deposited. It was concluded that all protocols induced an increase in collagen scar. However, the protocol 2 (16 J /cm2, daily application) promoted the most significant increases in collagen deposition, accelerated maturation of collagen and showed the best architecture of the final fibrous scarring. Collagen Animals;Collagen;Laser Therapy;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Efficacy of Low-Level Laser Therapy for the Therapeutic Management of Neuropathic Orofacial Pain: A Systematic Review. AIMS: To evaluate the efficacy of low-level laser therapy (LLLT) for the therapeutic management of neuropathic orofacial pain. METHODS: This systematic review was conducted according to PRISMA guidelines. A comprehensive search of the literature was conducted in the PubMed/MEDLINE, Scopus, and Cochrane Library databases up to March 8, 2018, using terms such as low-level laser therapy, neuropathic pain, orofacial pain, neuralgia, neuropathy, and all the entities described in section 13 of the International Classification of Headache Disorders, third edition. The primary outcome was measurement of pain intensity. RESULTS: A total of 997 studies were obtained with the initial search; 13 (8 randomized controlled trials, 2 prospective studies, and 3 case series) met the inclusion criteria and were analyzed for data extraction. Three provided data for the treatment of trigeminal neuralgia, 1 for occipital neuralgia, and 10 for burning mouth syndrome. All studies showed a reduction in pain intensity (most of them significant). The different studies analyzed LLLT alone and compared to placebo, to another treatment, or to different LLLT application protocols. CONCLUSION: LLLT seems to be effective as a treatment option for different neuropathic orofacial pain entities such as trigeminal neuralgia, occipital neuralgia, and burning mouth syndrome as a single or combined treatment. However, more quality studies assessing all outcome measures of chronic pain are needed in the medium and long terms. Furthermore, due to the lack of standardization of the application technique, more well-designed studies are required to confirm the results of this systematic review. Chronic Pain;Facial Pain;Humans;Low-Level Light Therapy;Neuralgia;Prospective Studies

Cellular transformations in near-infrared light-induced apoptosis in cancer cells revealed by label-free CARS imaging. Photobiomodulation (PBM) involves light to activate cellular signaling pathways leading to cell proliferation or death. In this work, fluorescence and Coherent anti-Stokes Raman Scattering (CARS) imaging techniques were applied to assess apoptosis in human cervical cancer cells (HeLa) induced by near infrared (NIR) laser light (808â€‰nm). Using the Caspase 3/7 fluorescent

probe to identify apoptotic cells, we found that the pro-apoptotic effect is significantly dependent of irradiation dose. The highest apoptosis rate was noted for the lower irradiation doses, that is, 0.3â€‰J/cm(2) (~58%) and 3 J/cm(2) (~28%). The impact of light doses on proteins/lipids intracellular metabolism and distribution was evaluated using CARS imaging, which revealed apoptosis-associated reorganization of nuclear proteins and cytoplasmic lipids after irradiation with 0.3 J/cm(2) . Doses of NIR light causing apoptosis (0.3, 3 and 30â€‰J/cm(2)) induced a gradual increase in the nuclear protein level over time, in contrast to proteins in cells non-irradiated and irradiated with 10 J/cm(2) . Furthermore, irradiation of the cells with the 0.3 J/cm(2) dose resulted in lipid droplets (LDs) accumulation, which was apparently caused by an increase in reactive oxygen species (ROS) generation. We suggest that PBM induced apoptosis could be caused by the ability of NIR light to trigger excessive LDs formation which, in turn, induces cellular cytotoxicity. Reactive Oxygen Species;Caspase 3;Caspase 7 Apoptosis;Caspase 3;Caspase 7;Cell Transformation, Neoplastic;HeLa Cells;Humans;Image Processing, Computer-Assisted;Infrared Rays;Intracellular Space;Molecular Imaging;Reactive Oxygen Species;Spectrum Analysis, Raman

Effects of Low-Level Laser Irradiation in a Mouse Model of Allergic Rhinitis. BACKGROUND AND OBJECTIVES: To evaluate the antiallergic effect of low-level laser irradiation (LLLI) at 650â€‰nm in a mouse model of allergic rhinitis (AR), and to examine the underlying mechanisms. STUDY DESIGN/MATERIALS AND METHODS: BALB/c mice were sensitized with ovalbumin (OVA) and alum and challenged intranasally with OVA. Straight- and diffusion-type LLLI were applied directly into the intranasal cavity of the mice once daily for 10 days (650â€‰nm, 5â€‰mW, 15â€‰min/day) and multiple allergic parameters were evaluated. RESULTS: LLLI reduced allergic symptoms, such as rubbing and sneezing, and suppressed the serum total immunoglobulin E (IgE), OVA-specific IgE, and OVA-specific IgG1 levels. Diffusion-type LLLI significantly reduced eosinophil infiltration of nasal mucosa and lymph nodes (LNs). LLLI reduced the expression of interleukin-4 (IL-4) and IL-17 in cervical LN and splenocyte culture supernatant, as well as their messenger RNA levels in nasal mucosa. However, the expression of interferonÎ³ (IFN-Î³) and IL-6 was unaffected by LLLI. The levels of reactive oxygen species (ROS) and nitric oxide (NO) in LN cells and the nasal mucosa, which were increased in the AR group, were reduced by LLLI, suggesting involvement of ROS and NO within their mechanism. CONCLUSIONS: LLLI exerted an antiallergic effect by decreasing local and systemic IL-4, IL-17, and IgE levels, as well as eosinophilic infiltration into the nasal mucosa, in a mouse model of AR by modulating ROS and NO levels. Diffusion-type LLLI exhibited greater efficacy against AR than straight-type LLLI. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Cytokines;Immunoglobulin G;Immunoglobulin E Animals;Cytokines;Disease Models, Animal;Female;Immunoglobulin E;Immunoglobulin G;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Rhinitis, Allergic

Photobiomodulation therapy compensate the impairments of diabetic bone marrow mesenchymal stem cells. Pathophysiologic conditions associated with diabetes mellitus affect mesenchymal stem cells (MSCs), and this phenomenon may lead to some diabetic secondary complications. The present study was conducted to evaluate the impact of photobiomodulation (PBM) on rat diabetic MSC (DMSC) behavior in vitro. For the purpose of PBM, we used helium-neon laser with a wavelength of 632.8Â nm at three different energy densities (0.5, 1, 2Â J/cm(2)) and radiation periodicity of once, twice, and thrice. The survival, proliferation, and apoptosis in the normal MSCs (NMSCs), DMSCs, and diabetic MSCs, which were laser irradiated (DMSCs+L), were assessed using MTT assay, Ki67 immunofluorescence staining, and TUNEL assay, respectively. Our results demonstrated that DMSCs have significantly lower survival ($P < 0.05$) and proliferation rates ($P < 0.001$), and dramatically higher population doubling time (PDT, $P < 0.001$) and apoptosis rates ($P < 0.001$) as compared to NMSCs. Moreover, PBM with energy density of 1Â J/cm(2) and the periodicity of 1 or 2 times could improve diabetic MSC capabilities in the term of survival, proliferation, and apoptosis. Considering these

findings, it is suggested that PBM could improve the ability of diabetic MSCs in vitro prior to transplantation or may rise their capabilities in their native niche in vivo. Animals;Apoptosis;Cell Proliferation;Cell Survival;Diabetes Mellitus;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Rats

Painless injections-a possibility with low level laser therapy. BACKGROUND: Dental procedures commonly involve the injection of local anesthetic agents, which causes apprehension in patients. The objective of dental practice is to provide painless treatment to the patient. The purpose of this study was to evaluate the effect of Low Level Laser Therapy (LLLT) in reducing the pain due to local anesthetic injection. MATERIALS AND METHODS: A prospective, split-mouth study was conducted on 25 patients. In Condition A, LLLT was administered followed by the administration of a standard local anesthetic agent. Patients' perception of pain with use of LLLT was assessed based on a Visual Analogue Scale (VAS). In Condition B, LLLT was directed to the mucosa but not activated, followed by the administration of local anesthesia. VAS was used to assess the pain level without the use of LLLT. RESULTS: Comparison between Condition A and Condition B was done. A P value < 0.001 was considered significant, indicating a definite statistical difference between the two conditions. CONCLUSION: In our study, we observed that LLLT reduced pain during injection of local anesthesia. Further multi-centric studies with a larger sample size and various modifications in the study design are required.

Effect of Low Level Laser Therapy on serum vitamin D and magnesium levels in patients with diabetic peripheral neuropathy - A pilot study. BACKGROUND: Diabetic Peripheral neuropathy (DPN) is the most distressing complication of diabetic population leading to loss of sensation, pain, and amputation. Low-level laser therapy (LLLT) has been used to manage nerve injuries as it holds the potential to induce a biostimulatory effect with no side effects. Hence we planned to study the biochemical effect and therapeutic outcomes of LLLT on patients with painful diabetic peripheral neuropathy as a preliminary work. MATERIALS AND METHODS: Pre-posttest analysis was done on 40 patients diagnosed with DPN confirmed using 10â€¯g Monofilament test and Michigan Neuropathy Screening Instrument (MNSI). Vibration sensation and pain measured by Vibration perception threshold (VPT) and Numeric pain rating scale (NPRS). All patients were given LLLT (3.1â€¯J/cm(2)) on plantar and dorsal of the foot for 10 days. Serum samples were collected at baseline and 4 weeks after LLLT to estimate Vitamin D and Magnesium and compared the results. RESULTS: There was a significant increase in Vitamin D and Magnesium levels after LLLT. We observed a considerable improvement in the quality of life after LLLT demonstrated by a decrease in VPT and MNSI and a reduction in NPRS in DPN patients. CONCLUSION: In this study, we found that LLLT improved the QL and hence may be a useful therapeutic option in treating peripheral neuropathic pain in type 2 diabetic patients. The progress in the serum Magnesium and Vit. D levels were proportional to the QL and may be a good indicator of the prognosis of DPN after LLLT. Biomarkers;Vitamins;Vitamin D;Magnesium Adult;Aged;Biomarkers;Diabetes Mellitus, Type 2;Diabetic Neuropathies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Magnesium;Male;Middle Aged;Pilot Projects;Prognosis;Prospective Studies;Quality of Life;Vitamin D;Vitamins

Potential Application of Upconverting Nanoparticles for Brain Photobiomodulation. Brain photobiomodulation (PBM) describes the use of visible to near-infrared light for modulation or stimulation of the central nervous system in both healthy individuals and diseased conditions. Although the transcranial approach to delivering light to the head is the most common technique to stimulate the brain, delivery of light to deeper structures in the brain is still a challenge. The science of nanoparticle engineering in combination with biophotonic excitation could provide a way to overcome this problem. Upconversion is an anti-Stokes process that is capable of transforming low energy photons that penetrate tissue well to higher energy photons with a greater biological effect,

but poor tissue penetration. Wavelengths in the third optical window are optimal for light penetration into brain tissue, followed by windows II, IV, and I. The combination of trivalent lanthanide ions within a crystalline host provides a nanostructure that exhibits the upconversion phenomenon. Upconverting nanoparticles (UCNPs) have been successfully used in various medical fields. Their ability to cross the brain-blood barrier and their low toxicity make them a good candidate for application in brain disorders. It is possible that delivery of UCNPs to the brainstem or deeper parts of the cerebral tissue, followed by irradiation using light wavelengths with good tissue penetration properties, could allow more efficient PBM of the brain. Lanthanoid Series Elements Animals;Brain;Female;Humans;Lanthanoid Series Elements;Low-Level Light Therapy;Male;Nanoparticles;Sensitivity and Specificity

Feeling the Heat: Evolutionary and Microbial Basis for the Analgesic Mechanisms of Photobiomodulation Therapy. Background: The clinical therapeutic benefits of Photobiomodulation (PBM) therapy have been well established in many clinical scenarios. However, we are far from having developed a complete understanding of the underlying mechanisms of photon-biological tissue interactions. Concurrent to ongoing PBM studies, there are several parallel fields with evidences from cell and tissue physiology such as evolutionary biology, photobiology, and microbiology among others. Objective: This review is focused on extrapolating evidences from an expanded range of studies that may contribute to a better understanding of PBM mechanisms especially focusing on analgesia. Further, the choice of a PBM device source and relevant dosimetry with regards to specific mechanisms are discussed to enable broader clinical use of PBM therapies. Materials and methods: This discussion article is referenced from an expanded range of peer reviewed publications, including literature associated with evolutionary biology, microbiology, oncology, and photo-optical imaging technology, amongst others. Results and discussion: Materials drawn from many disparate disciplines is described. By inference from the current evidence base, a novel theory is offered to partially explain the cellular basis of PBM-induced analgesia. It is proposed that this may involve the activity of a class of transmembrane proteins known as uncoupling proteins. Furthermore, it is proposed that this may activate the heat stress protein response and that intracellur microthermal inclines may be of significance in PBM analgesia. It is suggested that the PBM dose response as a simple binary model of PBM effects as represented by the Arndt-Schulz law is clinically less useful than a multiphasic biological response. Finally, comments are made concerning the nature of photon to tissue interaction that can have significance in regard to the effective choice and delivery of dose to clinical target. Conclusions: It is suggested that a re-evaluation of phototransduction pathways may lead to an improvement in outcome in phototheraphy. An enhanced knowledge of safe parameters and a better knowledge of the mechanics of action at target level will permit more reliable and predictable clinical gain and assist the acceptance of PBM therapy within the wider medical community. Analgesia;Biological Evolution;Eukaryota;Hot Temperature;Humans;Low-Level Light Therapy;Mitochondria;Patient Safety

Successful treatment of late-onset nevus comedonicus with Er:YAG laser. Nevus comedonicus, a rare congenital hamartoma of the pilosebaceous unit, is characterized by keratotic plugging. It usually occurs after birth and during early childhood. It rarely appears in adulthood. Despite the benign nature of the condition, it usually requires treatment due to aesthetic reasons. Several treatments have been reported in nevus comedonicus, most of them resulting with recurrences. Here, we report a case of nevus comedonicus with adult onset, successfully treated with erbium-doped yttrium aluminum garnet (Er:YAG) laser therapy. Asymptomatic Diseases;Biopsy;Hamartoma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin;Skin Abnormalities;Treatment Outcome

Efficacy of 1064 Q switched Nd:YAG laser in the treatment of oral lichen planus. Background: The erosive-atrophic form of oral lichen planus (OLP) is usually presented with severe pain and burning sensation that is usually refractory to traditional treatment. Topical corticosteroid is considered the first line despite their adverse effects. Therefore, new therapeutic approaches are required.Aim: This study aimed to examine the effectiveness of Nd:YAG laser in the treatment of long-standing erosive-atrophic OLP.Patients and methods: Twenty-four patients diagnosed with OLP were included in this study. A total of 59 lesions was assessed as regards to the degree of pain by visual analog scale and clinical scores by Thongprasom sign scoring system before and after treatment. All patients were treated by Nd:YAG laser therapy with (1064â€‰nm 0.5â€‰W, 30â€‰s, 1.2â€‰J/cm(2)) three times weekly and for 1 month. Treatment efficacy index was determined after the end of therapy.Results: A significant pain reduction was detected after Nd:YAG laser treatment (pâ€‰<â€‰.0001). In addition to that, complete resolution was achieved in about 37.3% of the lesions and improvement in clinical signs was found in 59.3% of the lesions. By the end of therapy, about 30.5% showed score 1 while 11.9% of them were scored 3. Also, 8.5% of the lesion was scored 2, 6.8% were scored 4 and 5.1% were scored 5. Actually, all of the participating patients showed some degree of improvement and most of them achieved moderate recovery.Conclusion: The results of this study can indicate that Nd:YAG laser is an effective modality that can be used safely in the management of erosive-atrophic OLP. Dermatologic Agents;Mometasone Furoate Adult;Aged;Dermatologic Agents;Female;Humans;Lasers, Solid-State;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Mometasone Furoate;Severity of Illness Index;Treatment Outcome;Young Adult

Red LED Light Is Influenced by IL-6 to Promote the Migration Ability of Oral Squamous Cell Carcinoma Cell Line. AIM: The purpose of this study was to search for the influence of red LED light of oral squamous cell carcinoma cells (OSCC) Material & Methods: HSC-3 was irradiated with red LED light (630 nm/3 J). Proliferative capacity was analyzed using WST-1. Transwell migration assay, real-time PCR, and ELISA method were also used to analyze migratory ability. CONCLUSIONS: HSC-3 cells irradiated with red LED light showed increased migration ability. Interestingly, we clarified that the expression of Interleukin-6 (IL-6), which promotes the migratory ability of cancer cells, is induced. Interleukin-6 Cell Line, Tumor;Cell Movement;Humans;Interleukin-6;Light;Mouth Neoplasms;Squamous Cell Carcinoma of Head and Neck

Effect of Low-Level Laser Therapy versus Electroacupuncture on Postnatal Scanty Milk Secretion: A Randomized Controlled Trial. OBJECTIVE: Postnatal scanty milk secretion is a common complaint. Some physical and medical interventions were advocated to help milk production. These interventions should be effective and safe for the mother and the infant. This study aimed to compare the effects of low-level laser therapy and electroacupuncture on postnatal scanty milk secretion. STUDY DESIGN: A randomized controlled study conducted on 60 healthy primiparous mothers with insufficient lactation. They were randomly divided into three equal groups: group A (control), group B (those who received low-power He-Ne laser beam on both breasts), and group C (those who received faradic current stimulation at Spleen 6, Liver 3, and Small Intestine 1 acupuncture points on both sides). All participants received 10â€‰mg Domperidone three times a day and were given advice about lactation, nutrition, and fluid intake. Evaluation was done before and after the treatment program. RESULTS: The mean serum prolactin, infant weight, and visual analog scale (VAS) score were significantly increased in the three groups posttreatment when compared with their corresponding levels pretreatment. Posttreatment serum prolactin was significantly elevated in group C more than the other two groups (pâ€‰=â€‰0.001 and 0.012, respectively). Also, it was significantly elevated in group B more than in group A (pâ€‰=â€‰0.001). The mean value of infant weight was significantly elevated in group C when compared with its

corresponding values in both groups A (pâ€‰=â€‰0.001) and B (pâ€‰=â€‰0.029). The VAS score was significantly increased in both groups B and C when compared with group A (pâ€‰=â€‰0.001). CONCLUSION: Electroacupuncture is more effective than low-level laser therapy in increasing postnatal scanty milk secretion. CLINICAL TRIAL REGISTRATION: NCT03806062. Prolactin Adult;Electroacupuncture;Female;Humans;Infant;Infant, Newborn;Lactation;Low-Level Light Therapy;Prolactin;Visual Analog Scale;Weight Gain;Young Adult

The Treatment of Acne Scars, a 30-Year Journey. Over the past 30Â years, the treatment of acne scars has undergone changes that have been significantly influenced by the concurrent development of new devices. The advent of fractional resurfacing lasers was a watershed moment for acne scarring therapy. The author recounts a career history of considerations of acne scarring treatments as well as the literature supporting the experiences causing changes in practice. Fractional ablative and nonablative lasers, sublative radiofrequency, picosecond lasers, microneedling with and without radiofrequency and fillers are the bulk of the treatments covered, along with a discussion of combination therapy. A practical algorithm for acne scarring for selection of treatment modalities is presented. Dermal Fillers Ablation Techniques;Acne Vulgaris;Adolescent;Adult;Algorithms;Child;Cicatrix;Combined Modality Therapy;Dermal Fillers;Dermatology;Female;History, 20th Century;History, 21st Century;Humans;Lasers;Low-Level Light Therapy;Needles;Platelet-Rich Plasma;Radiofrequency Therapy;Skin;Treatment Outcome;Young Adult

The impact of photobiomodulation of major salivary glands on caries risk. Dental caries is a complex multifactorial chronic infectious disease guided by several risk or protective factors. Saliva has an important role in caries and the remineralization process. Caries risk assessment is defined as the probability of new caries lesion development or the existing lesion progression in a given time period. Caries diagnostics and risk factor assessment are followed by targeted elimination of risk factors and less conservative but abundant preventive therapeutic measures. The aim of our prospective randomized study was to elucidate on how photobiomodulation of major salivary glands with polychromatic light or LED light affects caries risk factors in high caries-risk patients. Thirty-six patients were assigned to one of the following three experimental groups: the first, irradiated with polarized polychromatic light (40Â mW/cm(2), wavelengths 480-3400Â nm); the second, a continuous LED light (16Â mW/cm(2), wavelengths 625, 660, 850Â nm); the third, same LED light in a pulsed mode. The fourth group was the control, for which a non-therapeutic visible light was used. Light was administered extra-orally bilaterally above the parotid and submandibular glands for 10Â min and intra-orally above the sublingual glands for 5Â min, 3 times a week, for 4 consecutive weeks. Each patient's caries risk was assessed according to Cariogram before and after therapy. Caries risk factors were determined from samples of saliva before therapy, two weeks after it commenced, at the end of therapy, and four weeks after the end of therapy. At the end of treatment, the following findings were obtained: In the group irradiated with polarized polychromatic light and in the group irradiated with continuous LED light, the Streptococcus mutans and Lactobacillus counts decreased and salivary buffering capacity increased (pÂ <â€‰0.05). In the group irradiated with pulsed LED light, Streptococcus mutans counts decreased and unstimulated salivary flow and salivary buffering capacity increased (pÂ <â€‰0.05). In all three experimental groups, caries risk was lower (pÂ <â€‰0.05). In the placebo control group, there were no statistically significant differences between parameters before and after therapy. We concluded that photobiomodulation of major salivary glands in high caries-risk patients can reduce the cariogenic bacteria in saliva and improve some salivary parameters, thus reducing caries risk. Bacterial Load;Dental Caries;Female;Humans;Lactobacillus;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Risk Assessment;Salivary Glands;Streptococcus mutans

Intraoral photobiomodulation diminishes pain and improves functioning in women with temporomandibular disorder: a randomized, sham-controlled, double-blind clinical trial : Intraoral photobiomodulation diminishesÂ pain in women with temporomandibular disorder. The aim of the present study was to evaluate the effect of intraoral photobiomodulation involving super-pulsed laser (905Â nm) combined with red (640Â nm) and infrared (875Â nm) light-emitting diodes on pain, mandibular range of motion, and functioning in women with myogenous temporomandibular disorder. A randomized, sham-controlled, double-blind clinical trial was conducted involving 30 women with myogenous temporomandibular disorder diagnosed using the Research Diagnostic Criteria for Temporomandibular Disorders. The participants were randomly allocated to two groups (active and sham photobiomodulation). The evaluations involved this use of the visual analog scale, digital calipers, and a functional scale. Photobiomodulation was administered intraorally in the region of the pterygoid muscles, bilaterally, in all participants for a total of six sessions. Evaluations were performed on five occasions: prior to the intervention, immediately after the first session, 24Â h and 48Â h after the first session, and after the six sessions. Significant differences between groups were found regarding pain (pâ€‰â‰¤â€‰0.01) and functioning (pâ€‰â‰¤â€‰0.04). However, no statistically significant difference was found regarding range of mandibular motion. The findings demonstrate that intraoral photobiomodulation involving super-pulsed laser (905Â nm) combined with red (640Â nm) and infrared (875Â nm) light-emitting diodes diminishes pain and improves functioning but does not exert an influence on mandibular range of motion in women with temporomandibular disorder.Trial registration: NCT02839967. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Mandible;Pain;Pain Measurement;Range of Motion, Articular;Temporomandibular Joint Disorders;Time Factors;Visual Analog Scale

Photobiomodulation Alleviates Postoperative Discomfort After Mandibular Third Molar Surgery. PURPOSE: Surgical removal of mandibular third molars is associated with some degree of postoperative pain, trismus, and facial swelling. The purpose of the study was to evaluate the effect of photobiomodulation in reducing these postoperative side effects after surgical removal of mandibular third molars. MATERIALS AND METHODS: This randomized, double-blinded, split-mouth pilot study was carried out in the Department of Oral and Maxillofacial Surgery, Post Graduate Institute of Dental Sciences, Rohtak, India, among patients with impacted mandibular third molars. In each patient, 1 side was treated by photobiomodulation and the other side received placebo. Photobiomodulation was performed by intraoral and extraoral application of an 830-nm and 30-mW laser at different time points. Pain, trismus, and facial swelling were evaluated at all time points. The number of analgesics taken also was recorded. The data were analyzed using descriptive, bivariate and multivariate statistics. RESULTS: The study was conducted in 25 patients (56% male patients) with a mean age of 22.16Â Â±Â 4.60Â years. There were 50 sites divided equally into both groups. The sites treated with photobiomodulation showed a significant reduction in pain and swelling (PÂ <Â .05) compared with the sites in the placebo group. Moreover, an increase in mouth opening was noted after photobiomodulation compared with that in the placebo group, but this was not statistically significant (PÂ >Â .05). CONCLUSIONS: The results of this study suggest that photobiomodulation is effective in reducing pain and swelling after mandibular third molar surgery. Hence, it can be used as an alternative and effective modality after surgical removal of mandibular third molars, thereby improving the quality of life of the patients.
Adolescent;Adult;Edema;Female;Humans;India;Male;Mandible;Molar, Third;Pain, Postoperative;Phototherapy;Pilot Projects;Quality of Life;Tooth Extraction;Tooth, Impacted;Trismus;Young Adult

Proteomic Analysis Reveals Anti-Fibrotic Effects of Blue Light Photobiomodulation on Fibroblasts. BACKGROUND AND OBJECTIVES: This study was aimed at determining the effects of blue light

photobiomodulation on primary adult mouse dermal fibroblasts (AMDFs) and the associated signaling pathways. STUDY DESIGN/MATERIALS AND METHODS: Cultured AMDFs from adult C57BL/6 mice were irradiated by blue light from a light-emitting diode (wavelengthâ€‰=â€‰463â€‰Â±â€‰50â€‰nm; irradianceâ€‰=â€‰5â€‰mW/cm(2) ; energy densityâ€‰=â€‰4-8â€‰J/cm(2)). The cells were analyzed using mass spectrometry for proteomics/phosphoproteomics, AlamarBlue assay for mitochondrial activity, time-lapse video for cell migration, quantitative polymerase chain reaction for gene expression, and immunofluorescence for protein expression. RESULTS: Proteomic/phosphoproteomic analysis showed inhibition of extracellular signal-regulated kinases/mammalian target of rapamycin and casein kinase 2 pathways, cell motility-related networks, and multiple metabolic processes, including carbon metabolism, biosynthesis of amino acid, glycolysis/gluconeogenesis, and the pentose phosphate pathway. Functional analysis demonstrated inhibition of mitochondrial activities, cell migration, and mitosis. Expression of growth promoting insulin-like growth factor 1 and fibrosis-related genes, including transforming growth factor Î²1 (TGFÎ²1) and collagen type 1 É‘2 chain diminished. Protein expression of Î±-smooth muscle actin, an important regulator of myofibroblast functions, was also suppressed. CONCLUSIONS: Low-level blue light exerted suppressive effects on AMDFs, including suppression of mitochondrial activity, metabolism, cell motility, proliferation, TGFÎ²1 levels, and collagen I production. Low-level blue light can be a potential treatment for the prevention and reduction of tissue fibrosis, such as hypertrophic scar and keloids. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Cytokines Animals;Cell Adhesion;Cell Culture Techniques;Cell Movement;Cell Proliferation;Cytokines;Fibroblasts;Fibrosis;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Proteomics;Signal Transduction

FLUORESCENT LIGHT ENERGY: The Future for Treating Inflammatory Skin Conditions? Background: We have previously reported clinical efficacy with a novel form of photobiomodulation-a biophotonic platform inducing fluorescent light energy (FLE)-in both disease-affected and healthy skin; however, the cellular mechanisms remain largely unknown. Objective: This study investigated the cellular mechanism of action of FLE on key skin and immune cells. Methods: We examined the effects of FLE on the clinical presentation of inflammation in a representative patient with acne vulgaris. The effect of FLE and an FLE-mimicking control lamp on collagen production from primary human dermal fibroblast (HDF) cells was assessed in the presence and absence of the proinflammatory cytokine, interferon gamma (IFN-Î³). Cytokine production was assessed from HDF and human epidermal keratinocytes (HEK) exposed to M1 macrophage-conditioned media following illumination with either a blue light-emitting diode (LED) or FLE. Finally, the effects of FLE on angiogenesis were assessed in human aortic endothelial (HAE) cells. Results: FLE reduced inflammatory lesions and associated redness in the representative acne patient. Following the resolution of inflammation there was an overall enhancement of the skin's texture. FLE enhanced collagen production from nonstressed HDF cells, decreased the inflammatory profile of HDF and HEK cells, and enhanced angiogenesis in HAE cells. Conclusion: Our results suggest FLE is capable of enhancing collagen production, modulating cutaneous inflammation, and encouraging angiogenesis. While further research is required, our findings have important implications for approaches to treating inflammatory skin conditions and achieving better aesthetic outcomes.

Fractionated Irradiation in Photobiomodulation Therapy of Ankle Sprain. OBJECTIVE: The aim of this study was to test whether fractionated irradiation in photobiomodulation therapy enhances short-term recovery in patients with moderate severity ankle sprain. DESIGN: Nineteen patients were randomly assigned to one of two groups: one group receiving photobiomodulation therapy combined with the standard rest, icing, compression, and elevation treatment, or a group receiving only standard treatment. Group 1 patients were irradiated using a laser system (635 nm, 15 mW)

according to a double-fractionated irradiation scheme consisting of two sessions (4.5 and 9 J/cm) separated by a 30-min time interval. Short-term outcomes (reflectance, pain, and clinical outcomes) were assessed at baseline, 10 days, and 6 wks after treatment. RESULTS: Reflectance data analysis showed significant changes in group 1 (P = 0.027). There was also an ankle function score improvement more in group 1 than in group 2, with a significant short-term effect (P = 0.011) but without significant long-term effects (P = 0.178). Compared with group 2, group 1 had an immediate effect on pain reduction, but no long-term effect (P = 0.074). CONCLUSIONS: Combined with standard treatment, fractionated irradiation photobiomodulation therapy has been shown to have favorable short-term effects on the recovery of patients with ankle sprains, but its long-term effects should be improved. Adult;Ankle Injuries;Cohort Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Recovery of Function;Sprains and Strains;Treatment Outcome;Young Adult

Enhancement of Healing of Periodontal Intrabony Defects Using 810 nm Diode Laser and Different Advanced Treatment Modalities: A Blind Experimental Study. BACKGROUND: Low-level laser therapy (LLLT) in the early stage of bone healing was demonstrated as a positive local biostimulative effect. It was also shown that platelet-rich fibrin (PRF) and nanohydroxyapatite alloplast (NanoHA) are effective in treating periodontal intrabony defects. AIM: The study aimed to evaluate the combined effects of LLLT (810 nm), PRF and NanoHA on induced intrabony periodontal defects healing. MATERIAL AND METHODS: The study was conducted on 16 defects in 8 adult male rabbits (n = 16) divided into 4 groups; Control non-treated group (C), laser irradiated control group (CL), PRF+NanoHA graft (NanoHA-Graft+PRF) treated group and laser irradiated and treated group (NanoHA-Graft+PRF+L). CT radiography was made at baseline, 15 and 30 days later. The defects were induced in the form of one osseous wall defects of 10 mm height, 4 mm depth between the 1(st) and the 2(nd) molars using a tapered fissure drill coupled to a high-speed motor. Statistical analysis was done using ANOVA. RESULTS: (NanoHA-Graft+PRF+L) group significantly produced bone density higher than C, CL and NanoHA-G+PRF alone. CONCLUSION: The combination of LLLT+PRF+NanoHA as a treatment modality induced the best results in bone formation in the bone defect more than LLLT alone or PRF+NanoHA alone.

Intra-Articular Laser Treatment Plus Platelet Rich Plasma (PRP) Significantly Reduces Pain in Many Patients Who Had Failed Prior PRP Treatment. Background: In our practice, Platelet Rich Plasma (PRP) injections effectively reduce pain in most, but not all, arthritic patients. When PRP treatment fails, joint replacement surgery is often the only good alternative. Surface Low-Level-Laser-Therapy (LLLT) has not been helpful for osteoarthrosis in our experience. We hypothesized that intra-articular laser (IAL) treatment combined with PRP would improve results in patients with prior ineffective PRP treatment. Methods: We offered Intra-articular Low-Level-Laser-Therapy (IAL) treatment simultaneously with repeat PRP injection to patients who had received no benefit from PRP alone. They were the treatment and also historical control group since all had failed PRP treatment alone. Thirty joints were treated: 22 knees, 4 hips, 2 shoulder glenohumeral joints and 2 first carpo-metacarpal (1st CMC). Results: No adverse events were seen at any time after treatment in any patient. Twenty-eight joints were available for re-evaluation: â‰¥ 40% improvement was seen in 46% (6 months), 32% (12 months) and 32% (24 months) post-treatment. Mean SANE scores improved significantly at 1 and 2 years. Thirteen patients failed treatment and had joint replacement. Conclusions: PRP with IAL allowed avoidance of surgery and good pain control at least two years post-treatment in nearly half of patients who had failed PRP treatment alone.

Effect of Low-Level Laser on Some Metals Related to Redox State and Histological Alterations in the Liver and Kidney of Irradiated Rats. Low-level laser therapy (LLLT) is a type of medicine that uses laser light at low levels to activate the cellular chromophores and the initiation of cellular signaling.

This study aimed to evaluate the photomodulation effect of LLL against ionizing radiation (IR)-induced metal disorders related to redox state in the liver and kidney of male rats. Rats were divided into 4 groups (control, LLLT, IR (7Gy), IR+LLLT). The results showed that LLLT 870Â nm one time for 3Â days post-irradiation revealed redistribution of iron (Fe), copper (Cu), zinc (Zn),calcium (Ca), magnesium (Mg), manganese (Mn), and selenium (Se) in the liver and kidney tissues. Moreover, LLLT attenuated the oxidative stress manifested by a marked reduction of hydrogen peroxide (H(2)O(2)), 4-hydroxynonenal (4-HNE), total oxidant state (TOS), and oxidative stress index (OSI) associated with a significant increase in total antioxidant status (TAS), glutathione (GSH) content, and glutathione peroxide (GPx), glutathione reductase (GRx), superoxide dismutase(SOD), and catalase (CAT) activities. Moreover, LLLT displayed an increase in glutathione-S-transferase (GSH-T) and ceruloplasmin activities and a decrease in the activity of gamma-glutamyl transferase (Î³-GT). Besides, LLLT significantly attenuated the histological changes in the liver and kidney tissues, denoted by a reduction in the necrotic and degenerative changes of hepatocytes and an improvement in the corpuscles and tubules of the kidney. In conclusion, LLLT could be used as an adjuvant treatment post-exposure to radiation, while it is not beneficial to use it on the normal tissue.
Antioxidants;Hydrogen Peroxide;Catalase;Superoxide Dismutase;Glutathione
Animals;Antioxidants;Catalase;Glutathione;Hydrogen Peroxide;Kidney;Lasers;Liver;Male;Oxidation-Reduction;Oxidative Stress;Rats;Superoxide Dismutase

Effectiveness of Laser Acupuncture in Alleviating Chronic Insomnia: A Single-Blinded Randomized Controlled Trial. STUDY OBJECTIVES: This study investigates the therapeutic effect of Low Level Laser Therapy (LLLT) acupuncture for chronic insomnia. METHODS: Thirty-seven adult subjects with chronic insomnia were recruited and randomly assigned to three groups, namely, Group A (6 pairs of acupoints: Ex-HN 22, HT 7, SP 6, KI 3, LR 3, and PC 6, bilaterally distributed); Group B (acupoints as for Group A other than PC 6, which was applied only on the left side [i.e., the dominant side of the PC meridian] and the addition of DU 20, which is the main tonic acupoint for integration of all the meridians); and a control group (sham LLLT). The subjects in the treatment groups (i.e., Groups A and B) received LLLT acupuncture and those in the control group received sham LLLT for 15 minutes per session twice a week for five weeks. The sleep quality of all the subjects was evaluated using the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), the Hospital Anxiety and Depression Scale (HADS), and a sleep diary. In addition, the sympathetic activity before and after every treatment sessions was measured using the Heart Rate Variability (HRV). RESULTS: All three groups showed an improved PSQI score. However, only Group A showed a significant reduction in the sleep onset latency and number of awakenings at night and a higher sleep efficiency and ESS score. Furthermore, Group B showed an increased low frequency power and normalized low frequency of the HRV signal and a lower normalized high frequency power, suggesting an increased sympathetic activity and decreased parasympathetic activity. CONCLUSIONS: For chronic insomnia insomniacs, LLLT appears to shorten the sleep latency, decrease the number of awakening events at night, and improve the sleep efficiency.

Non-Ablative Fractional 1,540-nm Er:Glass Laser in the Treatment of Atrophic Cutaneous Leishmaniasis Scars. OBJECTIVES: To evaluate the efficacy of nonablative fractional 1,540â€‰nm laser to treat the atrophic scars caused by the cutaneous leishmaniasis (CL). METHODS: This clinical trial with a pre- and a posttreatment measurement was conducted on patients with atrophic CL scars. The lesions were treated with nonablative fractional 1,540â€‰nm laser. We evaluated the patients initially and then monthly, before each treatment session. The final follow-up was done 6 months after the end of study for all patients. Patient assessment was performed by two physicians using the modified Manchester Scar Scale (MSS) as well as the interpretation of captured digital photographs. Moreover, the patients performed a self-assessment by filling in a researcher-

made questionnaire. The data were statistically analyzed by SPSS software. Pâ€‰<â€‰0.05 was considered statistically significant. RESULTS: Thirty patients with 37 skin lesions participated in the study. The pairwise comparison demonstrated a statistically significant difference between the modified MSS parameters (Pâ€‰<â€‰0.05); however, no significant difference was observed between the modified MSS of the third and fourth (Pâ€‰=â€‰0.82) as well as fourth and fifth (Pâ€‰=â€‰0.636) sessions. The lesions improvement was significant based on the physician's evaluation (Pâ€‰<â€‰0.001). Furthermore, patients' level of satisfaction was significantly increased in all six follow-ups (Pâ€‰<â€‰0.001). No persistent complication was found. CONCLUSIONS: Nonablative fractional 1,540â€‰nm laser is an effective and safe therapeutic choice for atrophic CL, even in darker skins. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc.
Adolescent;Adult;Child;Cicatrix;Female;Humans;Iran;Lasers, Solid-State;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Male

Comparative Evaluation of Effect of Lasers and Biodentine in Dentine Regeneration: A Clinical Study. AIM: To compare and evaluate the effect of different liners separately and in combination with lasers that is resin modified glass-ionomer cement (RMGIC), Laser+RMGIC, Biodentine, Laser+Biodentinein the treatment of deep carious lesions. MATERIALS AND METHODS: Forty patients with deep caries indicated for pulp capping were selected. Curative procedure including the cavity preparation with maximal removal of softened dentine using spoon excavator, slow speed handpiece with round burs was performed. Patients were divided into four groups with 10 patients in each group In group A RMGIC liner, group B laser biostimulation followed by RMGIC liner, group C biodentine liner, group D laser biostimulation followed by Biodentine liner were placed in the cavity after caries removal. Cavities were temporarily restored with IRM for 8 weeks. After 8 weeks, liners in each group were removed, and cavities were permanently restored lower half of the cavity with a layer of flowable Z350 XT composite, and then the remaining half of the cavity with P60 filled composites (3 M ESPE, USA) in all the groups. The observation period was 12 months. RESULTS: All the patients showed a positive response to cold test and electric pulp test at 3 months, 6 months, 12 months follow-up. In group A (RMGIC) two patients and in group B (Laser+Biodentine) three patients did not return back for the follow-up. To standardize the samples, seven patients were selected from each group with a total of 28 samples included in the study (n = 7) and statistical analysis was done using analysis of variance (ANOVA) test. The mean for the total amount of dentine deposited after 12 months was highest in: Group D-(Laser+Biodenitne) 0.32 mm > Group C-(Biodentine) 0.25 mm > Group B-(Laser+RMGIC) 0.10 > Group A-(RMGIC) 0.07 mm Conclusion: Within the limitation of the present study the following conclusion was drawn: â€¢ Lasers and biodentine are good indirect pulp capping agents â€¢ Laser has an additional effect on the tertiary dentine formation. CLINICAL SIGNIFICANCE: Lasers with antibacterial effect penetrate into dentinal tubules and accelerate the rate of dentin bridge formation in deep carious lesions. Calcium Compounds;Glass Ionomer Cements;Silicates;tricalcium silicate Calcium Compounds;Dentin;Glass Ionomer Cements;Humans;Regeneration;Silicates

Effects of photobiomodulation on mitochondria of brain, muscle, and C6 astroglioma cells. The purpose of this study was to investigate the effect of different doses of photobiomodulation (PBM) on mitochondrial respiratory complexes and oxidative cellular energy metabolic enzymes in the mitochondria of brain, muscle, and C6 glioma cells after different time intervals. C6 cells were irradiated with an AlGaInP laser at 10, 30, and 60â€¯J/cm(2) for 20, 60, and 120â€¯s, respectively. After irradiation, the cells were maintained in serum-free Dulbecco's Modified Eagle's medium for 24â€¯h, and biochemical measurements were made subsequently. Mitochondrial suspensions from adult rat skeletal muscles/brains were irradiated with an AlGaInP laser at the abovementioned doses. In one group, the reaction was stopped 5â€¯min after irradiation and in the other 60â€¯min after

irradiation. Both the C6 cells that received the doses of 10 and 30â€¯J/cmÂ² showed increased complex I activity; the cells that were irradiated at 30â€¯J/cm(2) showed increased hexokinase activity. Five minutes after the introduction of PBM of the muscle mitochondria (at 30 and 60â€¯J/cm(2)), the activity of complex I increased, while the activity of complex IV increased only at 60â€¯J/cm(2). One hour after the laser session, complex II activity increased in the cells treated with 10 and 60â€¯J/cmÂ²; however, complex IV activity showed an increase in all PBM groups. In brain mitochondria, 5â€¯min after irradiation only the activity of complex IV increased in all PBM groups. One hour after the laser session, complex II activity increased at 60â€¯J/cm(2), and complex IV activity increased for all PBM groups when compared to controls. PBM could increase the activity of respiratory chain complexes in an apparently dose- and time-dependent manner.
Astrocytoma;Brain;Cell Line, Tumor;Dose-Response Relationship, Radiation;Electron Transport;Humans;Low-Level Light Therapy;Mitochondria;Muscles;Time Factors

Characterizing the Antimicrobial Properties of 405â€‰nm Light and the CorningÂ® Light-Diffusing Fiber Delivery System. BACKGROUND AND OBJECTIVES: Hospital-acquired infections (HAIs) and multidrug resistant bacteria pose a significant threat to the U.S. healthcare system. With a dearth of new antibiotic approvals, novel antimicrobial strategies are required to help solve this problem. Violet-blue visible light (400-470â€‰nm) has been shown to elicit strong antimicrobial effects toward many pathogens, including representatives of the ESKAPE bacterial pathogens, which have a high propensity to cause HAIs. However, phototherapeutic solutions to prevention or treating infections are currently limited by efficient and nonobtrusive light-delivery mechanisms. STUDY DESIGN/MATERIALS AND METHODS: Here, we investigate the in vitro antimicrobial properties of flexible CorningÂ® light-diffusing fiber (LDF) toward members of the ESKAPE pathogens in a variety of growth states and in the context of biological materials. Bacteria were grown on agar surfaces, in liquid culture and on abiotic surfaces. We also explored the effects of 405â€‰nm light within the presence of lung surfactant, human serum, and on eukaryotic cells. Pathogens tested include Enterococcus spp, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Enterobacter spp., Staphylococcus epidermidis, Streptococcus pyogenes, Candida albicans, and Escherichia coli. RESULTS: Overall, the LDF delivery of 405â€‰nm violet-blue light exerted a significant degree of microbicidal activity against a wide range of pathogens under diverse experimental conditions. CONCLUSIONS: The results exemplify the fiber's promise as a non-traditional approach for the prevention and/or therapeutic intervention of HAIs. Lasers Surg. Med. Â© 2019 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc.
Candida albicans;Candidiasis;Cross Infection;Disinfection;Gram-Negative Bacteria;Gram-Negative Bacterial Infections;Gram-Positive Bacteria;Gram-Positive Bacterial Infections;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microbial Sensitivity Tests;Optical Fibers

Rituximab as a trigger factor of medication-related osteonecrosis of the jaw. A case report. Rituximab, an anti-CD20 monoclonal antibody, is an effective treatment for rheumatoid arthritis. Here we report the case of a patient with rheumatoid arthritis, having taken risedronate for 14 months to prevent corticosteroid-induced osteoporosis, more than 2 years ago, who presented osteonecrosis of jaw following herpetic gingivostomatitis two weeks after the beginning of a rituximab treatment associated with her usual anti-rheumatic drugs. Eight weeks later, no bone and/or gum healing was observed and a stage 2 medication-related osteonecrosis of the jaw (MRONJ) was diagnosed. A conservative approach was decided with antiseptic mouth washes, low-level laser treatment (LLLT) and systemic therapy with teriparatide. Complete mucosal coverage was obtained after more two years of follow-up. We suggest that rituximab as immunosuppressant might be a cause or a decompensating factor of MRONJ. Non-surgical periodontal treatment with LLLT and teriparatide are candidates for the treatment of MRONJ. Bone Density Conservation

Agents;Diphosphonates;Rituximab Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Female;Humans;Osteoporosis;Rituximab
Photobiomodulation (660â€‰nm) therapy reduces oxidative stress and induces BDNF expression in the hippocampus. Photobiomodulation therapy (PBMT) effects an important role in neural regeneration and function enhancement, such as expression of nerve growth factor and nerve regeneration, in neuronal tissues, and inhibition of cell death by amyloid beta in neurons is inhibited by PBMT. However, there no studies evaluated the effects of PBMT on oxidative stress in the hippocampus. The aim of this study is to evaluate the effects of PBMT on oxidative stress in the hippocampus. This study assessed the anti-oxidative effect, the expression of BDNF and antioxidant enzymes, as well as the activation of cAMP response element binding (CREB) and extracellular signal-regulated kinase (ERK) signal transduction pathways assess using a hippocampal cell line (HT-22) and mouse organotypic hippocampal tissues by PBMT (LED, 660â€‰nm, 20â€‰mW/cm(2)). PBMT inhibited HT-22 cell death by oxidative stress and increased BDNF expression via ERK and CREB signaling pathway activation. In addition, PBMT increased BDNF expression in hippocampal organotypic slices and the levels of phosphorylated ERK and CREB, which were reduced by oxidative stress, as well as the expression of the antioxidant enzyme superoxide dismutase. These data demonstrate that PBMT inhibits hippocampal damage induced by oxidative stress and increases the expression of BDNF, which can be used as an alternative to treat a variety of related disorders that lead to nerve damage. Activation and redox homeostasis in neuronal cells may be a notable mechanism of the 660-nm PBMT-mediated photobioreactivity. Antioxidants;Bdnf protein, mouse;Brain-Derived Neurotrophic Factor;Creb1 protein, mouse;Cyclic AMP Response Element-Binding Protein;Enzymes Animals;Antioxidants;Brain-Derived Neurotrophic Factor;Cell Death;Cyclic AMP Response Element-Binding Protein;Enzymes;Hippocampus;Low-Level Light Therapy;MAP Kinase Signaling System;Mice, Inbred C57BL;Organ Culture Techniques;Oxidative Stress;Signal Transduction
Fast dose fractionation using ultra-short laser accelerated proton pulses can increase cancer cell mortality, which relies on functional PARP1 protein. Radiotherapy is a cornerstone of cancer management. The improvement of spatial dose distribution in the tumor volume by minimizing the dose deposited in the healthy tissues have been a major concern during the last decades. Temporal aspects of dose deposition are yet to be investigated. Laser-plasma-based particle accelerators are able to emit pulsed-proton beams at extremely high peak dose rates (~10(9)â€‰Gy/s) during several nanoseconds. The impact of such dose rates on resistant glioblastoma cell lines, SF763 and U87-MG, was compared to conventionally accelerated protons and X-rays. No difference was observed in DNA double-strand breaks generation and cells killing. The variation of the repetition rate of the proton bunches produced an oscillation of the radio-induced cell susceptibility in human colon carcinoma HCT116 cells, which appeared to be related to the presence of the PARP1 protein and an efficient parylation process. Interestingly, when laser-driven proton bunches were applied at 0.5â€‰Hz, survival of the radioresistant HCT116 p53(-/-) cells equaled that of its radiosensitive counterpart, HCT116 WT, which was also similar to cells treated with the PARP1 inhibitor Olaparib. Altogether, these results suggest that the application modality of ultrashort bunches of particles could provide a great therapeutic potential in radiotherapy. Phthalazines;Piperazines;Protons;PARP1 protein, human;olaparib Cell Line, Tumor;Cell Survival;DNA Breaks, Double-Stranded;Dose Fractionation, Radiation;Glioblastoma;HCT116 Cells;Humans;Lasers;Low-Level Light Therapy;Phthalazines;Piperazines;Poly (ADP-Ribose) Polymerase-1;Poly(ADP-ribose) Polymerase Inhibitors;Protons;X-Rays
Organic small molecular nanoparticles based on self-assembly of amphiphilic fluoroporphyrins for photodynamic and photothermal synergistic cancer therapy. Two new porphyrin-based organic

compounds (Por and ZnPor) were synthesized by introducing hydrophilic polyethylene glycol chains and pentafluorobenzene moieties onto the parent porphyrin structure. After self-assembling into nanoparticles, the absorption spectrum of (Zn)Por NPs broadened and red-shifted to some extent, relative to that of organic molecules. Meanwhile, the fluorescence of organic molecule nanoparticles was quenched significantly, which facilitated the nonradiative thermal generation for potential applications in photothermal cancer therapy. Por NPs and ZnPor NPs presented spherical structure with average diameter about 100â€¯nm, endowing them with tumor targeting properties based on the enhanced permeability and retention (EPR) effect. Due to the heavy atom effect, ZnPor NPs presented the higher efficiency of ROS generation than that of Por NPs. In contrast, Por NPs exhibited the better photothermal effect relative to that of ZnPor NPs under irradiation of a 635-nm laser. The photothermal conversion efficiency of Por NPs was calculated to be 16.34%. The in vitro experiments suggested that Por NPs and ZnPor NPs could enter tumor cells efficiently with good biocompatibility and exhibited high photocytotoxicity with IC(50) of 7.3â€¯Î¼g/mL and 3.0â€¯Î¼g/mL, respectively. Thus, the as-prepared porphyrin nanomaterials can be used as potential photosensitizers for cancer photodynamic/photothermal synergistic therapy in vivo, benefiting from their good biocompatibility, strong near-infrared absorption, and high photodynamic and photothermal effects. Benzaldehydes;Benzenesulfonates;Coordination Complexes;Photosensitizing Agents;Porphyrins;Reactive Oxygen Species;Polyethylene Glycols;Zinc Benzaldehydes;Benzenesulfonates;Cell Survival;Combined Modality Therapy;Coordination Complexes;HeLa Cells;Humans;Hydrophobic and Hydrophilic Interactions;Low-Level Light Therapy;Nanoparticles;Photochemotherapy;Photosensitizing Agents;Polyethylene Glycols;Porphyrins;Reactive Oxygen Species;Zinc

A case of lichen aureus successfully treated with 595 nm wavelength pulsed-dye laser. BACKGROUND: Lichen aureus (LA) is a variant of pigmented purpuric dermatosis (PPDs) that typically presents with the acute onset of a solitary, unilateral, purple to rust-yellow colored lichenoid patch or plaque on lower extremities. Treatment remains challenging and is based on anecdotal case reports often with poor results. AIMS: Describe a case of LA successfully treated with 595 nm wavelength pulsed-dye laser (PDL). PATIENT/METHOD: A 46-year-old woman with segmental LA was treated using a 595 nm PDL at a uniform spot size of 10 mm, with pulse durations of 10 milliseconds and fluence of 6 J/cm2. The patient had received previous treatments with no improvement. RESULTS: Clearance was archived after three sessions with PDL. Sessions were performed at intervals of 4 weeks, with no serious adverse events nor recurrence. CONCLUSION: We hypothesize the favorable clinical outcome with PDL is due to the affinity of the wavelength for oxyhemoglobin (allowing uniform vessel penetration and energy delivery to fragile capillaries and intraluminal blood) and to its anti-inflammatory profile. PDL seems to be an alternative for patients with progressive LA that have failed other therapies. Biopsy;Female;Humans;Lasers, Dye;Lichenoid Eruptions;Low-Level Light Therapy;Middle Aged;Purpura;Skin;Treatment Outcome

Evaluation of autologous adipose-derived stem cells vs. fractional carbon dioxide laser in the treatment of post acne scars: a split-face study. BACKGROUND: Scarring is a distressing outcome of acne, as it causes cosmetic and psychological problems to the patients. Unfortunately no single treatment is satisfactory; instead, employing multiple modalities may have better outcome. Autologous adipose tissue-derived adult stem cells (AT-ASCs) and their secretory factors can stimulate collagen synthesis; angiogenesis and migration of fibroblasts thus regenerate damaged tissues. Also, conventional treatments for acne scarring, such as lasers and topical regimens, induce new collagen synthesis via activation of dermal fibroblasts or growth factors. The aim of the study was to verify the effectiveness of AT-ASCs for the treatment of acne scarring vs. the fractional carbon dioxide laser (FxCR). SUBJECTS AND METHODS: Split face comparative study included 10 adult

patients with post-acne scars on both sides of the face. One side received AT-ASCs single injection while the other received three sessions of FxCR. Scars were then assessed using the global scoring system Goodman and Baron, scar area percent using NIH ImageJ software and functional assessment by measuring the transepidermal water loss (TEWL) and skin hydration. Both sides were followed for three months. RESULTS: A significant improvement in the degree of scar severity, scar area percent, skin hydration, and TEWL after 3Â months of treatment on both sides of the face with insignificant differences between both treatment modalities, provided that AT-ASCs treatment was employed once vs. three sessions of FxCR. CONCLUSION: One injection of AT-ASCs is as effective as three sessions of FxCR in the treatment of atrophic acne scars. Acne Vulgaris;Adipose Tissue;Adult;Adult Stem Cells;Cicatrix;Female;Follow-Up Studies;Humans;Lasers, Gas;Lipectomy;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Severity of Illness Index;Skin;Stem Cell Transplantation;Time Factors;Transplantation, Autologous;Treatment Outcome;Water Loss, Insensible;Young Adult

Laser Acupuncture: A Concise Review. Background: Laser acupuncture (LA)-the use of nonthermal, low-intensity laser irradiation to stimulate acupuncture points-has become more common among acupuncture practitioners in recent years. LA is promoted as a safer pain-free alternative to traditional acupuncture, with minimal adverse effects and greater versatility. However, little is known about the mechanism of action of LA, laser characteristics, and effectiveness of LA therapy. Objective: This concise review of LA describes basic parameters and procedures, potential mechanisms of action, and the current evidence for its clinical efficacy. The article also highlights the need for more robust research on LA that can be translated into evidence-based clinical practices. Conclusions: LA has many features that make it an attractive option as a treatment modality, including minimal sensation; short duration of treatment; and minimal risks of infection, trauma, and bleeding complications. Future studies with high-quality methodologies, ample sample sizes, and consistent and reproducible laser parameters are critically needed to increase understanding and establish potential future clinical applications.

Photobiomodulation Therapy Does Not Attenuate Fatigue and Muscle Damage in Judo Athletes: A Randomized, Triple-Blind, Placebo-Controlled Trial. Fatigue and muscle damage negatively affect performance in lower limb exercises involving the stretch-shortening cycle in judo athletes during competition and training sessions. Photobiomodulation therapy has emerged as an effective non-invasive strategy to attenuate fatigue and muscle damage when applied before different types of exercises. Our objective was to investigate the effects of photobiomodulation therapy on fatigue and muscle damage in judo athletes. Sixteen judo athletes participated in the study (23.1 Â± 3.8 years, 77.9 Â± 14.9 kg, 173.1 Â± 8.9 cm, 17.5 Â± 7.3 body fat%, 12.9 Â± 5.0 years of practice). Each participant received, in a randomized manner, photobiomodulation in one limb and placebo in the contralateral limb on the same day. Thereafter, subjects performed a stretch-shortening cycle protocol to induce muscle fatigue and damage. Countermovement jump (impulse, peak power, peak velocity, and peak force), echo intensity (rectus femoris and vastus lateralis), and muscle soreness were assessed at different time points before, during, immediately post, and 24 and 48 h after the protocol. Muscle fatigue was detected due to reductions in countermovement jump impulse (14.7 Â± 9.8 and 15.9 Â± 15.5%), peak power (12.9 Â± 8.5 and 11.9 Â± 6.9%), peak velocity (8.6 Â± 8.1 and 6.5 Â± 6.0%), and peak force (7.0 Â± 5.3 and 8.0 Â± 6.1%) after the protocol ($p < 0.001$), for placebo and photobiomodulation therapy, respectively. Muscle damage was detected due to reductions in countermovement jump impulse (-6.1 Â± 19.2% and -4.5 Â± 9.2%, $p < 0.05$), increases in echo intensity (rectus femoris, 21.0 Â± 11.9 and 20.8 Â± 9.0%; and vastus lateralis, 22.4 Â± 23.2%; and 16.7 Â± 23.8%; $p < 0.001$), and quadriceps muscle soreness (3.6 Â± 1.6 and 3.5 Â± 1.7 a.u; $p < 0.011$), 48 h after the protocol, for placebo and photobiomodulation therapy, respectively. No differences were

observed between photobiomodulation therapy and placebo at any time points for any variables ($p > 0.05$), indicating no positive effect favoring photobiomodulation therapy. In conclusion, our findings suggest no effect of photobiomodulation therapy applied before exercise to reduce lower limb muscle fatigue and damage during and following a stretch-shortening cycle protocol in judo athletes.

A Randomized, Double-Blind, Controlled Trial Evaluating the Efficacy of Nd:YAG 1064 nm Short-Pulse Laser Compared With Placebo in the Treatment of Toenail Onychomycosis. INTRODUCTION: Laser and light-based therapies have emerged as interesting treatment options with minimal side effects or contraindications to treat onychomycosis. Although increasing reports of successful treatment exist, few randomized, controlled, prospective studies have evaluated their true efficacy. We conducted a prospective, randomized, double-blind, controlled trial to evaluate the cure rate of onychomycosis treated by laser. METHODS: Fifty-one patients were randomized to receive 3 treatments (0, 12, 24 weeks) of 1064 Nd:YAG short-pulse (Cutera GenesisPlus) laser or placebo sham laser. The primary efficacy end point is the proportion of patients with a complete cure rate of the target great toenail at week 52. The secondary efficacy end points, at week 52, were treatment success defined as almost clear nail (â‰¤ 10%) and negative mycology, completely or almost clear nail of the great toenail, negative mycology, improvement from one OSI severity class to another of the target toenail, and the difference in proximal nail plate clearance between baseline and week 52. RESULTS: No patient (0%) in the laser group and 2 patients (7.7%) in the placebo group reached the primary outcome. One patient (4.8%) in the laser group reached treatment success vs 2 (7.7%) in the placebo group. Only 6 patients (33%) had negative cultures in the laser group vs 11 (50%) in the placebo group. None of the secondary end points were met. CONCLUSIONS: This study demonstrated that 3 treatments of Nd:YAG 1064 nm laser at 3-month intervals were not effective to treat onychomycosis. Adult;Aged;Colony Count, Microbial;Double-Blind Method;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Prospective Studies;Toes;Treatment Failure

Radiographic Evaluation of Low-Level Laser Therapy-Enhanced Maxillary Sinus Augmentation with Simultaneous Dental Implant Placement. BACKGROUND: To evaluate the effect of low-level laser therapy (LLLT) on bone healing in patients undergoing bilateral sinus lifting and simultaneous dental implant application. METHODS: Twelve patients with total/partial posterior maxillary edentulism who needed bilateral sinus bone augmentation were included in the study. Dental implants were inserted in the same session. LLLT (Î» = 630-660 nm, 25 mW/cm(2), 6 min) was used for one operation side on the 1(st), 3(rd), 5(th), and 7(th) days, whereas contralateral side served as control side. Preoperative and postoperative 1(st), 3(rd), and 6(th) month orthopantomograms were obtained using the aluminum step-wedge technique. Optic density analyses were performed using a Cardinal Health Digital Densitometer (Fluke Biomedical 07-443) with 1 mm diameter. Digital densitometry results were obtained as the equivalent aluminum thickness for each radiograph. These data were used to evaluate the changes in optical bone density and to compare the treatment side with the control side for each patient. RESULTS: The LLLT side showed better results than the control side according to the densitometry results. Increase in the bone density at all the postoperative intervals was statistically significant ($P < 0.05$). CONCLUSIONS: LLLT enhances bone regeneration in sinus augmentation with simultaneous dental implant placement.

Physical energies to the rescue of damaged tissues. Rhythmic oscillatory patterns sustain cellular dynamics, driving the concerted action of regulatory molecules, microtubules, and molecular motors. We describe cellular microtubules as oscillators capable of synchronization and swarming, generating mechanical and electric patterns that impact biomolecular recognition. We consider the biological relevance of seeing the inside of cells populated by a network of molecules that behave as bioelectronic circuits and chromophores. We discuss the novel perspectives disclosed by

mechanobiology, bioelectromagnetism, and photobiomodulation, both in term of fundamental basic science and in light of the biomedical implication of using physical energies to govern (stem) cell fate. We focus on the feasibility of exploiting atomic force microscopy and hyperspectral imaging to detect signatures of nanomotions and electromagnetic radiation (light), respectively, generated by the stem cells across the specification of their multilineage repertoire. The chance is reported of using these signatures and the diffusive features of physical waves to direct specifically the differentiation program of stem cells in situ, where they already are resident in all the tissues of the human body. We discuss how this strategy may pave the way to a regenerative and precision medicine without the needs for (stem) cell or tissue transplantation. We describe a novel paradigm based upon boosting our inherent ability for self-healing.

The effectiveness of photobiomodulation in the management of temporomandibular pain sensitivity in rats: behavioral and neurochemical effects. This study analyzed the effects of photobiomodulation (PBM) with low-level laser therapy on nociceptive behavior and neuronal activity in the trigeminal nucleus after experimental unilateral temporomandibular joint (TMJ) disc injury. The animals were divided into 4 groups (nâ€‰=â€‰10 each): group 1, surgical injury of the articular disc and PBM; group 2, sham-operated subjected to PBM; group 3, surgical injury of the articular disc; and group 4, control (NaÃ¯ve). Ten sessions of PBM were performed using GaAs laser with a wavelength of 904Â nm, power of 75Â W pico, average power of 0.043Â W, area of the beam of 0.13Â cm(2), duration of the pulses of 60Â nseg (in the frequency of 9500Â Hz), energy density of 5.95Â J/cm(2), energy per point of 0.7Â J, and power density of 333.8Â mW/cm(2), and the irradiation was done for 18Â s per point. Neuropathic symptoms were evaluated using the von Frey test. Trigeminal ganglion samples underwent immunoblotting to examine the expression of substance P, vanilloid transient potential receptor of subtype-1 (TRPV-1), and peptide related to the calcitonin gene (CGRP). There was a total decrease in pain sensitivity after the second session of PBM in operated animals, and this decrease remains until the last session. There was a significant decrease in the expression of SP, TRPV-1, and CGRP after PBM. Photobiomodulation therapy was effective in reducing nociceptive behavior and trigeminal nucleus neuronal activity after TMJ disc injury.
Neuropeptides;TRPV Cation Channels;Trpv1 protein, rat;Substance P;Calcitonin Gene-Related Peptide
Animals;Behavior, Animal;Calcitonin Gene-Related Peptide;Lasers, Semiconductor;Low-Level Light Therapy;Male;Neuropeptides;Pain;Pain Threshold;Rats, Wistar;Substance P;TRPV Cation Channels;Temporomandibular Joint;Treatment Outcome

Comments on "Photobiomodulation Improved the First Stages of Wound Healing Process After Abdominoplasty: An Experimental, Double-Blinded, Non-randomized Clinical Trial".
Abdominoplasty;Wound Healing

Effectiveness of Low-Level Laser Therapy during Tooth Movement: A Randomized Clinical Trial.
The present study evaluated the effects of low-level laser therapy (LLLT) by means of a diode laser in accelerating orthodontic tooth movement (OTM). After extraction of the first upper premolars for orthodontic purpose, 82 maxillary canines which needed distalization were analyzed in 41 enrolled patients (21 males, 20 females, mean age 13.4 Â± 2.1 years). On all experimental sites, an orthodontic force of 50/N was applied by a nickel-titanium (NiTi) closed coil spring (G&H, Franklin, IN, USA) in order to obtain the space closure. Using a split mouth randomized design, the test side was treated using a diode laser (Wiser Laser Doctor Smile, Brendola, Italy) operating at 810 nm wavelength in continuous wave mode at both the buccal and palatal side on three points/side (distal, medial and mesial) (1 W output power, continuous wave of 66.7 J/cm(2), energy density of 8 J) at baseline and at 3, 7, and 14 days and every 15 days until the space closed. On the control side, the opposite selected canine was treated only using orthodontic traction. The primary outcome chosen was the overall time needed to complete the levelling and closing space, measured on a study cast. The secondary

outcome chosen was the evaluation of pain levels related to tooth traction, using a Visual Analogue Scale (VAS), recorded at 3, 7, and 14 days after treatments. The mean space closures of the maxillary canines were comparable between groups [Test, 4.56 mm (95% CI 3.9-4.8); Control, 4.49 mm (95% CI 3.8-4.7), p = 0.456]. The laser group yielded less mean time [84.35 Â± 12.34 days (95% CI 79.3-86)] to accomplish space closure compared to the control group [97.49 Â± 11.44 days (91.7-102.3)] (p < 0.001). The test side showed a significant reduction in the average range of dental pain at 3 [Test, 5.41 (95% CI 5.1-5.6); Control, 7.23 (95% CI 6.9-7.6), p < 0.001], 7 [Test, 4.12 (95% CI 3.8-4.7); Control, 5.79 (95% CI 5.4-5.8), p < 0.001], and at 14 days [Test, 2.31 (95% CI 1.8-2.3); Control, 3.84 (95% CI 3.3-4.2), p < 0.001] after treatment (p < 0.001). This study demonstrates that the use of LLLT therapy was effective in accelerating tooth movement and reducing pain levels related to OTM.

Combined treatment of low-level laser therapy and phloroglucinol for inhibition of fibrosis. BACKGROUND AND OBJECTIVES: Fibrosis is a highly prevalent disease, which is responsible for 45% of deaths through pathological effects in developed countries. Previous studies have reported that low-level laser therapy (LLLT) can modulate fibrotic activity, but significant enhancement of therapeutic efficacy is still required for clinical translation. The aim of this study is to evaluate the feasible effect of LLLT combined with phloroglucinol (PHL) on the inhibition of fibrosis in vitro. STUDY DESIGN/MATERIALS AND METHODS: NIH/3T3 murine embryonic fibroblasts cells were cultured and transforming growth factor-Î²1 (TGF-Î²1) was treated for transition of fibroblasts. After TGF-Î²1 treatment, LLLT and PHL were used, respectively, and in combination to suppress fibrosis. 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide and BrdU assays were performed to estimate the cell viability and proliferation. To evaluate the expression of fibrotic markers, we used confocal immunofluorescence and western blot. RESULTS: When compared with respectively treated groups, the group with the combined treatment of LLLT and PHL significantly reduced cell viability and proliferation. Immunofluorescence staining showed that the combined group minimized more Î±-smooth muscle actin (Î±-SMA) and type I collagen than the other groups. Western blot analysis showed that the combined treatment had significant decreases in Î±-SMA, TGF-Î²1, and type I collagen. CONCLUSIONS: PHL-assisted LLLT may be an effective treatment to inhibit fibrosis due to its additive effects. The combined treatment has a potential to be an alternative treatment for fibrosis. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Phloroglucinol Animals;Cells, Cultured;Fibroblasts;Fibrosis;Low-Level Light Therapy;Mice;NIH 3T3 Cells;Phloroglucinol

Light-emitting diode therapy protects against ventricular arrhythmias by neuro-immune modulation in myocardial ischemia and reperfusion rat model. BACKGROUND: Sympathetic overactivation and inflammation are two major mediators to post-myocardial ischemia-reperfusion (I/R)-induced ventricular arrhythmia (VA). The vicious cycle between microglia and sympathetic activation plays an important role in sympathetic hyperactivity related to cardiovascular diseases. Recently, studies have shown that microglial activation might be attenuated by light-emitting diode (LED) therapy. Therefore, we hypothesized that LED therapy might protect against myocardial I/R-induced VAs by attenuating microglial and sympathetic activation. METHODS: Thirty-six male anesthetized rats were randomized into four groups: control group (nÂ =â€‰6), LED group (nâ€‰=â€‰6), I/R group (nâ€‰=â€‰12), and LED+I/R group (nâ€‰=â€‰12). I/R was generated by left anterior descending artery occlusion for 30â€‰min followed by 3â€‰h reperfusion. ECG and left stellate ganglion (LSG) neural activity were recorded continuously. After 3â€‰h reperfusion, a programmed stimulation protocol was conducted to test the inducibility of VA. Furthermore, we extracted the brain tissue to examine the microglial activation, and the peri-ischemic myocardium to examine the expression of NGF and inflammatory cytokines (IL-1Î², IL-18, IL-6, and TNF-Î±). RESULTS: As compared to the I/R group, LED illumination significantly inhibited the LSG neural activity (Pâ€‰<â€‰0.01) and reduced the inducibility of VAs (arrhythmia score 4.417â€‰Â±â€‰0.358 vs. 3â€‰Â±â€‰0.3257,

Pâ€‰<â€‰0.01) in the LED+I/R group. Furthermore, LED significantly attenuated microglial activation and downregulated the expression of inflammatory cytokines and NGF in the peri-infarct myocardium. CONCLUSIONS: LED therapy may protect against myocardial I/R-induced VAs by central and peripheral neuro-immune regulation. Animals;Male;Myocardial Reperfusion Injury;Neuroimmunomodulation;Phototherapy;Random Allocation;Rats;Rats, Sprague-Dawley;Ventricular Fibrillation

Systematic review of photobiomodulation for the management of oral mucositis in cancer patients and clinical practice guidelines. PURPOSE: To systematically review the literature and update the evidence-based clinical practice guidelines for the use of photobiomodulation (PBM), such as laser and other light therapies, for the prevention and/or treatment of oral mucositis (OM). METHODS: A systematic review was conducted by the Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society for Oral Oncology (MASCC/ISOO) using PubMed and Web of Science. We followed the MASCC methods for systematic review and guidelines development. The rigorously evaluated evidence for each intervention, in each cancer treatment setting, was assigned a level-of-evidence (LoE). Based on the LoE, one of the following guidelines was determined: Recommendation, Suggestion, or No Guideline Possible. RESULTS: Recommendations are made for the prevention of OM and related pain with PBM therapy in cancer patients treated with one of the following modalities: hematopoietic stem cell transplantation, head and neck (H&N) radiotherapy (without chemotherapy), and H&N radiotherapy with chemotherapy. For each of these modalities, we recommend 1-2 clinically effective protocols; the clinician should adhere to all parameters of the protocol selected. Due to inadequate evidence, currently, No Guideline Possible for treatment of established OM or for management of chemotherapy-related OM. The reported clinical settings were extremely variable, limiting data integration. CONCLUSIONS: The evidence supports the use of specific settings of PBM therapy for the prevention of OM in specific patient populations. Under these circumstances, PBM is recommended for the prevention of OM. The guidelines are subject to continuous update based on new published data. Clinical Protocols;Humans;Low-Level Light Therapy;Male;Mucositis;Neoplasms;Practice Guidelines as Topic;Stomatitis

Quantitative assessment of rat bone regeneration using complex master-slave optical coherence tomography. BACKGROUND: The need for hard and soft tissues in oral implantology determined the development of methods and techniques to increase bone volume and their quality with different alternative materials used as substituents of patient's natural bone. In addition, laser radiation can be used to accelerate the repair of fractures and to produce an increased volume of formed callus, as well as an increased bone mineral density. METHODS: The aim of this work is to evaluate the capability of an in-house developed multimodal complex master slave (CMS) enhanced swept source (SS) optical coherence tomography (OCT) imaging instrument to analyze the increase in the quantity and the improvement of the quality of newly-formed bone using low level laser therapy (LLLT). Bone formation is quantitatively assessed in 5 mm cylindrical defects made in the calvaria part of the skull of living rats. Samples are divided in three study groups: A, a negative control group, for which the natural healing process of the defect is investigated; B, a positive control group, for which bovine graft is used to stimulate bone formation, and C, a study group, in which bovine graft is added to the created defects and LLLT is applied throughout the entire healing period. The animals are sacrificed after 14, 21, and 30 days, and the samples are imaged using the multimodal CMS/SS-OCT instrument. RESULTS: The method allows for the simultaneous monitoring of the bone tissue via two perpendicular cross-sections and nine en-face images taken at adjustable depths into the sample. A global image with course axial resolution allows for the positioning of the field-of-view of the system on the area of interest on the tissue. The quantitative assessment of the process of bone formation is completed using the differences in brightness between the native bone, the artificial bone graft, and

the newly-formed bone. CONCLUSIONS: Group C is demonstrated to have a higher volume of newly-formed bone than Group B, which is better from this point of view than Group A. By analyzing the evolution of this volume of new bone in time, the most significant difference was after 21 days, therefore approximately after two thirds of the total time interval analyzed. After 30 days, the volumes of bone tend to move closer, as they begin to fill the available gap. The study demonstrates that OCT can assess quantitatively the positive impact of LLLT on bone regeneration.

Photobiomodulation with a combination of two wavelengths in the treatment of oral mucositis in children: The PEDIALASE feasibility study. Photobiomodulation is recommended in adults for the prevention of mucositis induced by cervicofacial irradiation or pre-transplant chemotherapy. The results of pediatric studies are promising but this support treatment is still underused. The objective was to conduct a feasibility study in the pediatric hematology-oncology unit at X Children's Hospital. Extra- and intraoral scans were performed a minimum of three times every 2 days for grade 2 or higher mucositis in children (median age, 8.6 years) using the Oncolase laser (Biophoton, Saint Alban, France), with a combination of two wavelengths (635 and 815nm). The effect of the laser on mucositis grade, pain, the child's tolerance, and the time dedicated to this care were also evaluated. The success of the procedure was 77% in 1 year, with the inclusion of 84% of the patients (n=22) and 146 laser treatment sessions (median of four per episode of mucositis). We observed excellent tolerance and pain relief with a gain of two points on the VAS and the HEDEN mucositis scale. This study shows that photobiomodulation that incorporates two application modes (intra- and extraoral) through the combination of two wavelengths is feasible when integrated into the care of a pediatric hematology-oncology department and is perfectly tolerated, even by young children. Along with oral hygiene and analgesic management, it alleviates pain associated with oral mucositis. Adolescent;Child;Child, Preschool;Feasibility Studies;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Prospective Studies;Stomatitis;Treatment Outcome

Comparative effects of photobiomodulation therapy at wavelengths of 660 and 808Â nm on regeneration of inferior alveolar nerve in rats following crush injury. The aim of the present study was to investigate the therapeutic effects of 660-nm and 880-nm photobiomodulation therapy (PBMT) following inferior alveolar nerve (IAN) crush injury. Following the nerve crush injuries of IAN, 36 Wistar rats were randomly divided into three groups as follows: (1) control, (2) 660-nm PBMT, and (3) 808-nm PBMT (GaAlAs laser, 100Â J/cm(2), 70Â mW, 0.028-cm(2) beam). PBMT was started immediately after surgery and performed once every 3Â days during the postoperative period. At the end of the 30-day treatment period, histopathological and histomorphometric evaluations of tissue sections were made under a light and electron microscope. The ratio of the inner axonal diameter to the total outer axonal diameter (g-ratio) and the number of axons per square micrometer were evaluated. In the 808-nm PBMT group, the number of nerve fibers with suboptimal g-ratio ranges of 0-0.49 (pâ€‰<â€‰0.001) is significantly lower than expected, which indicates better rate of myelinization in the 808-nm PBMT group. The number of axons per square micrometer was significantly higher in the 808-nm PBMT group when compared with the control (pâ€‰<â€‰0.001) and 660-nm PBMT group (pâ€‰=â€‰0.010). The data and the histopathological investigations suggest that the PBMT with the 808-nm wavelength along with its settings was able to enhance IAN regeneration after nerve crush injury. Animals;Axons;Crush Injuries;Female;Lasers, Semiconductor;Light;Low-Level Light Therapy;Mandibular Nerve;Nerve Crush;Nerve Regeneration;Rats, Wistar

Comparison of Anti-Microbial Effects of Low-Level Laser Irradiation and Microwave Diathermy on Gram-Positive and Gram-Negative Bacteria in an In Vitro Model. Background and Objectives: The aim of this study was to compare the effects of low-level laser therapy and continuous microwave diathermy on the growth of Gram-negative and Gram-positive bacteria and to establish their efficacy

as an alternative therapeutic modality. MATERIALS AND METHODS: Laser fluence of 13 Joules (J)/cm(2), 18 J/cm(2) and 30 J/cm(2) were used against several bacterial strains. Microwave dosages of 25, 50 and 100 watts (W) were used, respectively. RESULTS: A significant difference between the three groups was observed using repeated analysis of variance (RANOVA) (F value: 0.74, and p value: 0.001). The Greenhouse-Geisser correction (GG) revealed significant results for laser irradiation alone. However, effect size calculation showed effects with microwave diathermy as well as laser fluence. CONCLUSIONS: Low-level laser therapy appears to be an effective modality of treatment when compared with continuous microwave diathermy on the Gram-negative and the Gram-positive bacterial strains tested. Microwave diathermy revealed large and medium effects on the bacterial cell counts with dominant effects on Gram-negative strains. Anti-Infective Agents Analysis of Variance;Anti-Infective Agents;Diathermy;Gram-Negative Bacteria;Gram-Positive Bacteria;Humans;Low-Level Light Therapy

Effect of single and multiple doses of low-level laser therapy on viability and proliferation of stem cells from human exfoliated deciduous teeth (SHED). The present study aimed to evaluate in vitro whether the low-level laser (LLL) delivering fractionated total energy (multiple irradiation) or single irradiation stimulates regeneration-associated events (viability and proliferation) in stem cells from human exfoliated deciduous teeth (SHED). Cells received LLL irradiation (InGaAlP-660Â nm), according to the following experimental groups: G1 (single irradiation 2.5Â J/cm(2), 10Â mW, 10Â s, 0.10Â J), G2 (single irradiation 5.0Â J/cm(2), 10Â mW, 20Â s, 0.20Â J), G3 (single irradiation 7.5Â J/cm(2), 10Â mW, 30Â s, 0.30Â J), G4 (twoÂ irradiations 2.5Â J/cm(2), 10Â mW, 10Â s; total energy 0.20Â J), G5 (threeÂ irradiations 2.5Â J/cm(2), 10Â mW, 10Â s; total energy 0.30Â J), and G6 (non-irradiated). Cell viability was assessed by MTT and trypan blue exclusion (TBE) methods, while cell proliferation was evaluated by crystal violet (CV) and sulforhodamine B (SRB) assays after 24, 48, and 72Â h after the first irradiation. By MTT, there was no difference between groups at 24 and 72Â h. At 48Â h, the groups subjected to multiple irradiation (G4 and G5) presented higher cell viability rates. The average percentages of viable cells for all groups by TBE method were 91.04%, 96.63%, and 97.48% at 24, 48, and 72Â h, respectively. By CV, there was no significant difference between groups at 24 and 48Â h; at 72Â h, G2, G3, and G4 presented higher cell proliferation. By SRB, G1 and G4 presented lower proliferation rates in all the periods. When the groups presenting the same total energy were compared, G2 (0.20Â J) presented lower cell viability rates and higher cell proliferation rates in comparison with G4; G3 (0.30Â J) presented similar results to those of G5, with higher cell viability and proliferation. The application of laser delivering fractionated total energy (two or three applications of 2.5Â J/cm(2)) induced higher cell viability at 48Â h, while the single irradiation with 2.5Â J/cm(2) did not stimulate metabolic activity in such period and the proliferation over time. The 5.0 and 7.5Â J/cm(2) single doses and the threeÂ applications of 2.5Â J/cm(2) maintained cell viability and stimulated proliferation of SHED at 72Â h. Cell Count;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Stem Cells;Tooth Exfoliation;Tooth, Deciduous

Laser Light Therapy in Inflammatory, Musculoskeletal, and Autoimmune Disease. PURPOSE OF REVIEW: The goal of this review is to summarize the field to date and to discuss strengths and limitations of low-level laser (light) therapy (LLLT) for the future investigation as a treatment of inflammatory disease. RECENT FINDINGS: LLLT is a promising therapeutic, particularly for those diseases of skin and joints because they are most accessible to treatment. Indeed, the known mechanisms of LLLT support its use for anti-inflammatory purposes, as well as stimulation of tissue growth and repair. Although the standard of care for the majority of inflammatory diseases is immunosuppressive agents such as corticosteroids with undesirable toxicities, LLLT offers a unique approach by being non-invasive and incurring minimal side effects. It is also relatively inexpensive and

accessible and even has the possibility to be patient directed at home. There is evidence that LLLT is able to modulate the immune system at the skin and joint, and it has been shown to be efficacious in humans by affecting bacterial colonization as it may pertain to chronic rhinosinusitis. However, there is variability in the methods of laser application as well as a lack of evidence for laser type, dose-ranging studies, and wavelength selection that create barriers to the implementation of LLLT without further more rigorous and standardized study. The heterogeneity makes it difficult to draw strong conclusions about the efficacy of LLLT and its mechanisms. Animals;Autoimmune Diseases;Humans;Inflammation;Laser Therapy;Low-Level Light Therapy;Musculoskeletal Diseases

Applications of Photobiomodulation Therapy to Musculoskeletal Disorders and Osteoarthritis with Particular Relevance to Canada. Background: Musculoskeletal disorders caused by osteoarthritis (MSDs/OA) are a growing problem in the modern industrialized society in Canada. Overall aging of the general population and a progressive lack of exercise contribute to this alarming increase. Moreover, a range of chronic conditions including cardiovascular and mental diseases show significantly higher comorbidity with MSDs/OA. Conventional medical treatment for MSDs/OA includes nonsteroidal anti-inflammatory drugs and opiate pain killers. These drugs have major drawbacks such as a relative lack of efficacy, potential for addiction, and even death (Vioxx scandal). Photobiomodulation (PBM) was discovered over 50 years ago but has still not attained widespread acceptance by the medical community. This is partly due to uncertainty about the precise molecular mechanisms of action and a bewildering array of different wavelengths and dosimetric parameters employed in reported studies. Objective: The goal of this review was to survey literature reports of PBM, also known as low-level laser therapy used for treatment of MSDs/OA, concentrating on the growth over time, different wavelengths employed, and application to different joints. Methods: We searched the PubMed database for publication of study on PBM to treat the most common joints. Results: We show that the field of PBM to treat MSDs/OA is expanding exponentially over the past 20 years. A trend has emerged over time for more power to achieve better effective treatments, and the understanding of the physiological effect of safe parameters has improved. There is, however, no consensus on the best set of parameters to treat a specific patient indication. Conclusions: Finally, we highlight gaps in our knowledge and the barriers to further clinical trials. We suggest that the growing body of evidence indicating efficacy, and the almost total lack of side effects, should encourage continued clinical research to support clinical applications where better rehabilitation treatments are much needed. Canada;Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Osteoarthritis

Raman spectroscopy of dorsal root ganglia from streptozotocin-induced diabetic neuropathic rats submitted to photobiomodulation therapy. In this study, we used Raman spectroscopy as a new tool to investigate pathological conditions at the level of chemical bond alterations in biological tissues. Currently, there have been no reports on the spectroscopic alterations caused by diabetic neuropathy in the dorsal root ganglia (DRG). DRG are a target for the treatment of neuropathic pain, and the need for more effective therapies is increasing. Photobiomodulation therapy (PBMT) through infrared low-level laser irradiation (904â€‰nm) has shown analgesic effects on the treatment of neuropathy. Thus, the aim of this study was to use Raman spectroscopy to characterize the spectral DRG identities of streptozotocin (STZ)-induced diabetic neuropathic (hyperalgesic) rats and to study the influence of PBMT over such spectra. Characteristic DRG peaks were identified at 2704, 2850, 2885, 2940, 3061 and 3160â€‰cm(-1) , whose assignments are CH(2) /CH(3) symmetric/asymmetric stretches, and Câ”€H vibrations of lipids and proteins. DRG from hyperalgesic rats showed an increased normalized intensity of 2704, 2850, 2885 and 3160â€‰cm(-1) . These same peaks had their normalized intensity reduced after PBMT treatment, accompanied by an anti-hyperalgesic effect. Raman spectroscopy was able to diagnose spectral alterations in DRG of hyperalgesic rats and the

PBMT reduced the intensity of hyperalgesia and the altered Raman spectra. Streptozocin Animals;Diabetic Neuropathies;Ganglia, Spinal;Low-Level Light Therapy;Male;Rats;Spectrum Analysis, Raman;Streptozocin

Is photobiomodulation therapy effective in reducing pain caused by toxicities related to head and neck cancer treatment? A systematic review. Photobiomodulation therapy (PBMT) has been considered an effective method for preventing and managing certain cancer-related toxicities in head and neck cancer (HNC) patients treated with radiotherapy and chemotherapy. However, the potential effects of PBMT on pain control and analgesia resulting from these toxicities is still controversial. The aim of this systematic review was to compile available evidence of the effects of PMBT on pain control and reduced use of analgesics in HNC patients. We searched three indexed databases: MEDLINE/PubMed, Embase, and Scopus. The databases were reviewed up to and including December 2018. Only human clinical studies in English language were selected. Information was only available for mucositis and radiodermatitis. Fifteen out of 1112 studies met the inclusion criteria (14 for oral mucositis (OM) and 1 for radiodermatitis). From the 14 studies involving the prevention and treatment of OM, 10 had the study subjects compared to a placebo group. Of these 10 studies, all but 1 showed statistically significant difference related to pain control favoring the PBMT group. The study that compared PBMT with other treatment modality showed better results in pain control with PBMT. It appears that PBMT application frequency and potency impact on pain control. The only study involving the prevention and treatment of radiodermatitis was compared to placebo arm and showed statistically significant difference related to pain control favoring the PBMT group. Seven studies compared the need of analgesic medication between PBMT and placebo groups. Of these, five studies showed that the use of analgesic medication was significantly higher in the placebo group. The current evidence supports that PBMT is effective in pain control resulting from OM and radiodermatitis and may also reduce the need for analgesics. The evidence is not yet available of the effects of PBMT in other HNC treatment-related toxicities. Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Pain;Stomatitis

Photobiomodulation therapy combined with carvedilol attenuates post-infarction heart failure by suppressing excessive inflammation and oxidative stress in rats. The post-myocardial infarction heart failure (HF) still carries a huge burden since current therapy is unsuccessful to abrogate poor prognosis. Thus, new approaches are needed, and photobiomodulation therapy (PBMt)Â may be a way. However, it is not known whether PBMt added to a standard HF therapy provides additional improvement in cardiac remodeling in infarcted rats. This study sought to determine the combined carvedilol-drug and PBMt with low-level laser therapy value in HF. Rats with large infarcts were treated for 30 days. The functional fitness was evaluated using a motorized treadmill. Echocardiography and hemodynamic measurements were used for functional evaluations of left ventricular (LV). ELISA, Western blot and biochemical assays were used to evaluate inflammation and oxidative stress in the myocardium. Carvedilol and PBMt had a similar action in normalizing pulmonary congestion and LV end-diastolic pressure, attenuating LV dilation, and improving LV systolic function. Moreover, the application of PBMtÂ to carvedilol-treated rats inhibited myocardial hypertrophy and improved +dP/dt of LV. PBMt alone prevented inflammation with a superior effect than carvedilol. Carvedilol and PBMtÂ normalized 4-hydroxynonenal (a lipoperoxidation marker) levels in the myocardium. However, importantly, the addition of PBMt to carvedilol attenuated oxidized protein content and triggered a high activity of the anti-oxidant catalase enzyme. In conclusion, these data show that the use of PBMt plus carvedilol therapy results in a significant additional improvement in HF in a rat model of myocardial infarction. These beneficial effects were observed to be due, at least in part, to decreased myocardial inflammation and oxidative stress. Tumor Necrosis Factor-alpha;Carvedilol;Catalase Animals;Carvedilol;Catalase;Disease Models,

Animal;Echocardiography;Female;Heart Failure;Hemodynamics;Inflammation;Low-Level Light Therapy;Myocardial Infarction;Myocardium;Oxidative Stress;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha;Ventricular Function, Left

Transcranial photobiomodulation with 1064-nm laser modulates brain electroencephalogram rhythms. Noninvasive transcranial photobiomodulation (tPBM) with a 1064-nm laser has been reported to improve human performance on cognitive tasks as well as locally upregulate cerebral oxygen metabolism and hemodynamics. However, it is unknown whether 1064-nm tPBM also modulates electrophysiology, and specifically neural oscillations, in the human brain. The hypothesis guiding our study is that applying 1064-nm tPBM of the right prefrontal cortex enhances neurophysiological rhythms at specific frequency bands in the human brain under resting conditions. To test this hypothesis, we recorded the 64-channel scalp electroencephalogram (EEG) before, during, and after the application of 11Â min of 4-cm-diameter tPBM (CW 1064-nm laser with 162â€‰â€‰mW/cm2 and 107â€‰â€‰J/cm2) to the right forehead of human subjects (n =Â 20) using a within-subject, sham-controlled design. Time-resolved scalp topographies of EEG power at five frequency bands were computed to examine the tPBM-induced EEG power changes across the scalp. The results show time-dependent, significant increases of EEG spectral powers at the alpha (8 to 13Â Hz) and beta (13 to 30Â Hz) bands at broad scalp regions, exhibiting a front-to-back pattern. The findings provide the first sham-controlled topographic mapping that tPBM increases the strength of electrophysiological oscillations (alpha and beta bands) while also shedding light on the mechanisms of tPBM in the human brain.

Effects of low-level laser therapy and mechanical vibration on orthodontic pain caused by initial archwire. INTRODUCTION: The aim of this study was to evaluate the effects of mechanical vibration and low-level laser therapy on orthodontic pain after placement of the initial archwire. METHODS: Sixty subjects with 3-6Â mm maxillary dental crowding, a nonextraction fixed treatment plan, and no medical history were included in this study. The subjects were randomly divided into 3 groups, equally distributed by sex. In each subject, preadjusted edgewise appliances were placed in the maxillary arch from the left first molar to the right first molar, and a 0.014-inch round nickel-titanium archwire was fully engaged with elastomeric ties and cut at the end of first molar bondable tube. In group 1 (mean age 13.98Â Â±Â 2.68Â y), mechanical vibration was performed 3 times: immediately, 24Â hours, and 48Â hours after engagement of the initial archwire. In group 2 (mean age 14.86Â Â±Â 2.06Â y), low-level laser therapy was applied once: immediately after the insertion of the initial archwire. Group 3 (mean age 14.41Â Â±Â 1.78Â y) served as the control group. Pain scores were determined with the use of a visual analog scale (VAS). RESULTS: Although no statistically significant differences were found among the groups (P >0.05), the mean VAS scores for the mechanical vibration group were consistently lower than those of the control and low-level laser therapy groups at all measured time points. CONCLUSIONS: The mechanical vibration group had lower, though nonsignificant, VAS scores for all measured time points. Additional clinical trials are recommended for more definitive conclusions. titanium nickelide;Nickel;Titanium Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Malocclusion;Maxilla;Molar;Nickel;Orthodontic Appliance Design;Orthodontic Wires;Pain;Pain Management;Pain Measurement;Titanium;Tooth Movement Techniques;Vibration;Young Adult

The effect of low level laser therapy for pain in major muscles controlling two joints. BACKGROUND AND AIMS: Chronic pain is a significant health care problem which is often encountered in medical institute out-patient clinics . In previous studies we have reported on the benefits of low level laser therapy (LLLT) for chronic musculoskeletal pain patients. The present study is a report on the effects of LLLT in patients with pain in major muscles which govern the motion of

two joints (2-joint muscles). MATERIALS AND METHODS: Over the past 5 years, 19 subjects visited our out-patient clinic with complaints of pain in 2-joint muscles (biceps brachii muscle or gastrocnemius muscle). They were treated with LLLT using a 1000 mW semi-conductor laser device delivering 20.1 J/cm(2) per point at 830 nm in continuous wave. Four shots were given per session (1 treatment) twice a week for 2 months (total of 16 treatments). RESULTS: A treatment approach modified from the methods of Shiroto and Ohshiro, was used, and the efficacy of LLLT for pain attenuation in the affected muscle was determined. After the end of the treatment regimen, excellent and good improvement was observed in 16 patients out of 19. Discussions with the patients revealed that it was important for them to learn how to modify their everyday life to avoid posture and activities of daily life that could cause them pain in the 2-joint muscles, in order to enjoy continuous benefits from the treatment. CONCLUSION: The present study demonstrated that LLLT was an effective form of treatment for pain in the biceps brachii and gastrocnemius muscles. To maximize and prolong treatment efficacy, advice should be given to patients to avoid adopting any posture and activities of daily living which would cause pain in these specific muscles.

Effect of photodynamic therapy and ErCrYSGG laser irradiation on the push-out bond strength between fiber post and root dentin. BACKGROUND: To evaluate the push out bond strength and modes of failure of fiber post by using photodynamic therapy (PDT), Er,Cr:YSGG laser and conventional cleaning and shaping (CCS). METHODS: Sixty maxillary anterior teeth were sectioned horizontaly 2â€¯mm incisal to the cemento-enamel junction, and root canal were prepared for post space. Tapered fiber posts were placed inside the root canal after post space was made. The fiber posts were subjected to PDT, Er,Cr:YSGG laser and CSS with 20 specimens in each group. The specimens obtained were sectioned in cervical and apical sections. A universal testing machine was used to perform the push out test and the push out bond strength was formulated by Ïƒâ€¯=â€¯C/A, expressed in mega-pascals (MPa). RESULTS: The highest mean push out bond strength was achieved by PDT group (8.08â€¯Â±â€¯2.73â€¯MPa) and the lowest was shown by specimens in CCS group (7.45â€¯Â±â€¯1.04â€¯MPa). ANOVA showed no statistical difference among the experimental groups (pâ€¯=â€¯0.481). In the cervical segments, the mean push-out bond strength was found to be slightly higher for all three groups compared to apical segments (Pâ€¯<â€¯0.05). The independent t-tests results showed that the mean push-out bond strength values of the cervical segments were slightly higher than the apical segments in PDT, Er,Cr:YSGG and CSS groups (Pâ€¯<â€¯0.05). Significant differences were observed when mean push-out bond strengths were compared for both cervical (pâ€¯=â€¯0.037) and apical (pâ€¯=â€¯0.019) segments between all the groups. Twenty-one failures were found at the interface between the adhesive and the dentin surface, 6 failures were observed at the interface between the adhesive and post, whereas 5 failures were mixed. CONCLUSION: Push-out bond strength to root canal dentin were not affected by Er,Cr:YSGG compared with conventional cleaning and shaping. However, PDT produced the smallest number of failure modes and slightly higher push-out bond strength to root dentin. Dental Implants;Photosensitizing Agents;Methylene Blue Dental Implants;Dentin;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Methylene Blue;Photochemotherapy;Photosensitizing Agents

Treatment of alopecia areata with nonablative fractional laser combined with topical minoxidil. BACKGROUND: Alopecia areata (AA) is a relatively common dermatosisÂ with the sudden burst of hair loss on the scalp and other hair-bearing regions. However, because of high relapse and side effects, no satisfactory therapy has been widely accepted. OBJECTIVE: To observe the efficiency and safety of theÂ combinationÂ therapy of a nonablative fractional (NAF) laser and topical minoxidil for AA. METHODS: Eight Chinese AAÂ patients were included in this study. These patients receivedÂ 10 treatments every two weeks. At every time, the subject was given 10 to 15Â mJ of energy with a total

intensity of 300Â spots/cm(2) . After the laser treatment, a topical 5% minoxidil tincture was immediately applied twice daily andÂ continued until the final laser treatment. RESULTS: Hair regrowth was observed 1-2Â months after treatment. There was complete regrowth in 2 patients, and the lesions of 2 children with alopecia universalis were covered with 30% and 50% regrowth, respectively. All patients except 1 had no relapse at the 1-year follow-up examination. CONCLUSION: The combination of nonablative laser and topical minoxidil may be a good alternative therapy for AA patients, includingÂ alopecia totalis and alopecia universalis, without systemic and local side effects. Minoxidil Administration, Topical;Adult;Alopecia;Alopecia Areata;Child;Combined Modality Therapy;Female;Follow-Up Studies;Hair;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Minoxidil;Scalp;Treatment Outcome

Effect of NIR laser therapy by MLS-MiS source against neuropathic pain in rats: in vivo and ex vivo analysis. Neuropathic pain is characterized by an uncertain etiology and by a poor response to common therapies. The ineffectiveness and the frequent side effects of the drugs used to counteract neuropathic pain call for the discovery of new therapeutic strategies. Laser therapy proved to be effective for reducing pain sensitivity thus improving the quality of life. However, its application parameters and efficacy in chronic pain must be further analyzed. We investigated the pain relieving and protective effect of Photobiomodulation Therapy in a rat model of compressive mononeuropathy induced by Chronic Constriction Injury of the sciatic nerve (CCI). Laser (MLS-MiS) applications started 7 days after surgery and were performed ten times over a three week period showing a reduction in mechanical hypersensitivity and spontaneous pain that started from the first laser treatment until the end of the experiment. The ex vivo analysis highlighted the protective role of laser through the myelin sheath recovery in the sciatic nerve, inhibition of iNOS expression and enhancement of EAAT-2 levels in the spinal cord. In conclusion, this study supports laser treatment as a future therapeutic strategy in patients suffering from neuropathic pain induced by trauma. Excitatory Amino Acid Transporter 2;Myelin Basic Protein;Slc1a2 protein, rat;Nitric Oxide Synthase Type II;Nos2 protein, rat Animals;Behavior, Animal;Excitatory Amino Acid Transporter 2;Hyperalgesia;Inflammation;Lasers;Low-Level Light Therapy;Male;Myelin Basic Protein;Myelin Sheath;Neuralgia;Nitric Oxide Synthase Type II;Pain Threshold;Pressure;Quality of Life;Rats;Rats, Sprague-Dawley;Sciatic Nerve;Spinal Cord

Photobiomodulation using low-level 808 nm diode laser rescues cochlear synaptopathy after acoustic overexposure in rat. A certain degree of noise can cause hearing problems without a permanent change in the hearing threshold, which is called hidden hearing loss and results from partial loss of auditory synapses. Photobiomodulation (PBM) enhances neural growth and connections in the peripheral nervous systems. In this study, we assessed whether PBM could rescue cochlear synaptopathy after acoustic overexposure in rat. PBM was performed for 7 days after noise exposure. The auditory brainstem responses (ABRs) were acquired before and after noise exposure using a tone and a paired-click stimulus. Auditory response to paired click sound with short time interval was performed to evaluate auditory temporal processing ability. In the result, hearing threshold recovered 2 weeks after noise exposure in both groups. Peak wave 1 amplitude of the ABR and ABR recovery threshold did not recover in the noise only group, whereas it fully recovered in the noise + PBM group. The number of synaptic ribbons was significantly different in the control and noise only groups, while there was no difference between the control and noise + PBM group. These results indicate that PBM rescued peak wave 1 amplitude and maintained the auditory temporal processing ability resulting from a loss of synaptic ribbons after acoustic overexposure. Acoustics;Animals;Auditory Threshold;Cochlea;Hearing;Lasers, Semiconductor;Low-Level Light Therapy;Male;Noise;Rats;Synapses

Optimal cosmetic outcomes for basal cell carcinoma: a retrospective study of nonablative laser management. Although Mohs micrographic surgery (MMS) is the gold standard for treatment of nonmelanoma skin cancers (NMSCs), laser management has been an emerging treatment option that continues to be studied. Nonablative laser therapy is a noninvasive alternative. This study used a combined pulsed dye laser (PDL) and fractional laser approach to treat basal cell carcinomas (BCCs) in conjunction with noninvasive imaging such as reflectance confocal microscopy (RCM) and optical coherence tomography (OCT) to enhance efficacy rates. Adult;Aged;Aged, 80 and over;Carcinoma, Basal Cell;Dermoscopy;Facial Neoplasms;Humans;Lasers, Dye;Low-Level Light Therapy;Microscopy, Confocal;Middle Aged;Neoplasm Recurrence, Local;Neoplasm, Residual;Retrospective Studies;Skin Neoplasms;Tomography, Optical Coherence;Treatment Outcome

Evaluation of the Effects of Low-Level Laser Therapy on Diabetic Bone Healing. The aim of the present study was to evaluate the effects of low-level laser therapy (LLLT) and biphasic alloplastic bone graft material on diabetic bone healing. Induction of diabetes was performed in 14 male Sprague-Dawley rats by intraperitoneal injection of a 50â€Šmg/kg dose of streptozotocin. Two bilaterally symmetrical non-critical-sized bone defects were created in the parietal bones in each rat. Right defects were filled with biphasic alloplastic bone graft. Rats were randomly divided into 2 groups, with 1 group receiving 10 sessions of LLLT (GaAlAs, 78.5â€ŠJ/cm, 100mW, 0.028â€Šcm beam). The LLLT was started immediately after surgery and once every 3 days during postoperative period. At the end of treatment period, new bone formation and osteoblast density were determined using histomorphometry. Empty (control), graft-filled, LLLT-treated and both graft-filled and LLLT-treated bone defects were compared. New bone formation was higher in the graft treatment samples compared with the control (Pâ€Š=â€Š0.009) and laser samples (Pâ€Š=â€Š0.029). In addition, graft-laser combination treatment samples revealed higher bone formation than control (Pâ€Š=â€Š0.008) and laser (Pâ€Š=â€Š0.026) samples. Osteoblast density was significantly higher in the laser treatment (Pâ€Š<0.001), graft treatment (Pâ€Š=â€Š0.001) and graft-laser combination treatment (Pâ€Š<0.001) samples than control samples. In addition, significantly higher osteoblast density was observed in the graft-laser combination treatment samples compared to the graft treatment samples (Pâ€Š=â€Š0.005). The LLLT was effective to stimulate osteoblastogenesis but failed to increase bone formation. Graft augmentation for treatment of bone defects seems essential for proper bone healing in diabetes, regeneration may be supported by the LLLT to enhance osteoblastogenesis. Animals;Bone Regeneration;Bone Transplantation;Diabetes Complications;Diabetes Mellitus;Low-Level Light Therapy;Male;Osteoblasts;Osteogenesis;Parietal Bone;Rats;Rats, Sprague-Dawley;Wound Healing

Sensory-motor and cardiorespiratory sensory rehabilitation associated with transcranial photobiomodulation in patients with central nervous system injury: Trial protocol for a single-center, randomized, double-blind, and controlled clinical trial. BACKGROUND: Central nervous system diseases such as stroke, spinal cord injury, traumatic brain injury, and multiple sclerosis can be fatal or cause sequelae, affecting sensorimotor and cardiorespiratory systems and quality of life. These subjects present a low response to aerobic and resistance exercise, due to decreased recruitment of muscle fibers and reduction of metabolic capacity. Aerobic exercises bring benefits in terms of fatigue retardation, gait improvement, regulation of the autonomic nervous system, neuroprotection of the brain, stimulation of the production of endogenous neutrotransmitters related to general well-being, and a favoring of neuroplasticity. Photobiomodulation (PBM Therapy) (previously known as low-level laser therapy), and especially transcranial PBM Therapy, has shown benefits in animals and humans such as cognitive improvement, memory, and behavioral improvement, including attenuation of depression and anxiety, and increased cortical oxygenation. The aims of this trial will be to evaluate the parameters related to the function of the musculoskeletal and cardiorespiratory system and the

impact of PBM therapy on these parameters, as part of a rehabilitation and training program for people with reduced mobility. METHODS: This is a randomized, double-blind, placebo-controlled trial with 3 groups: Control, only cardiorespiratory rehabilitation (CCR), CCR with PBM Therapy (CR-PBM), CCR and placebo PBM Therapy (CR-PlaceboPBM). nâ€Š=â€Š90, 30 per group. PBM Therapy parameters: 810â€Šnm laser, 0.028â€Šcm, 100â€ŠmW, 3.5â€ŠW/cm, 30â€Šseconds per point, 3â€ŠJ per point, 107.1â€ŠJ /cm to 3 electroencephalogram points F7 and F8 and AFz. The trial will be conducted at the University Clinics and the sessions will be 1â€Šhour twice a week for 9 weeks. Baseline, intermediate (4th week), final (9th week), and 2-month follow-up will be performed. Muscular activation, heart rate variability, lung volumes and capacities, fatigability, exercise tolerance, cognition, and quality of life at baseline will be evaluated. Subsequent to baseline evaluations, the PBM Therapy groups will be offered laser therapy (active or inactive); all groups will then receive CCR. TRIAL REGISTRATION NUMBER: ClinicalTrials.gov ID - NCT03751306 (approval date: November 22, 2018). Adolescent;Adult;Aged;Aged, 80 and over;Brain Injuries, Traumatic;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Multiple Sclerosis;Neuropsychological Tests;Quality of Life;Randomized Controlled Trials as Topic;Recovery of Function;Respiratory Function Tests;Spinal Cord Injuries;Treatment Outcome;Young Adult

Trial does not show any benefits of low-level laser therapy in pain, swelling, and mandibular movements in patients undergoing orthognathic surgery. Edema;Humans;Low-Level Light Therapy;Mandible;Orthognathic Surgery;Orthognathic Surgical Procedures;Pain

Near-infrared LEDS provide persistent and increasing protection against E. faecalis. In a previous study, we have shown that non-coherent light-emitting diodes (LEDs) are able to significantly decrease Enterococcus faecalis viability, in vitro. In particular, the concurrent treatment for 5â€¯min with sodium hypochlorite (NaOCl) 1.0% and LED permitted to obtain the total inactivation of the culture. The primary outcome of this study was to verify if the photoinactivation was only temporary or stable over 1â€¯week. The secondary outcome was to verify if using a minor concentration of NaOCl together with LED irradiation, it was possible to reach the total inactivation of the culture. Bacterial suspensions were subjected to different protocols. NaOCl samples were treated with 0.5% sodium hypochlorite for 5â€¯min; LED 5 were subjected to 880-nm LED irradiation for 5â€¯min and LED+NaOCl were contemporary subjected to LED irradiation and 0.5% sodium hypochlorite for 5â€¯min. Then the colony forming units per milliliter (CFU/mL) were analyzed and recorded at 5â€¯min, 24â€¯h, 48â€¯h and 1â€¯week. The data were submitted to ANOVA and LSD post hoc tests at a level of significance of 0.05. Live dead assay and fluorescent microscope observations were also performed for all group at all timing points. The results showed that the 3 protocol treatments were able to decrease significantly the bacterial count respect controls, however, after 5â€¯min, 24â€¯h and 48â€¯h the most effective reduction was measured for NaOCl and NaOCl+LED 5. In the first 48â€¯h LED 5 alone reduced significantly the bacterial count respect controls, but it was higher respect the other tested groups. On the contrary, after 1â€¯week we found an interesting result: samples treated with LED were characterized by a decrement of bacterial count, independently from the addition of sodium hypochlorite. Samples treated with NaOCl alone were characterized by a mild increment of bacterial count, although results were still significant respect C+. The secondary outcome was not confirmed: a concentration of NaOCl 0.5% together with LED irradiation did not permit to reach the total inactivation of the culture. Sodium Hypochlorite Enterococcus faecalis;Infrared Rays;Microscopy, Fluorescence;Sodium Hypochlorite

Photobiomodulation rescues cognitive flexibility in early stressed subjects. Neglectful parenting is one of the most prevalent forms of child mistreatment. This early life stress leads to long-term alterations in all the psychological domains, as well as brain alterations. Animal models have been

developed to emulate and further study this early life stress, and one of most widely used models is maternal separation. In both human and animal models, cognitive flexibility has been found to be altered. In this study, we performed maternal separation (10â€¯days, 4â€¯h per day) in rats, and in adulthood, we tested their spatial navigation and cognitive flexibility. In addition, we delivered photobiomodulation treatment (Low-level light therapy: 1064â€¯nm, 30â€¯mW, 60 cycles) on the rats' brains, and we tested energy oxidative metabolism using cytochrome c oxidase histochemistry. Early life stress delivered in the form of maternal separation on the first 10 postnatal days leads to cognitive flexibility impairment and a general increase in energy metabolism in adulthood. Low-level light therapy seems to be useful for treating these unwanted outcomes, because it rescued cognitive flexibility and returned the oxidative energy metabolism to balanced scores, without harming controls' brains or behavior. Photobiomodulation is a promising tool in the treatment of chronic stress-related consequences because it rescued cognitive flexibility. Electron Transport Complex IV Animals;Brain;Cognition;Electron Transport Complex IV;Low-Level Light Therapy;Male;Maternal Deprivation;Rats;Rats, Wistar;Spatial Navigation;Stress, Psychological

A cosmetic treatment based on the secretion of Cryptomphalus aspersa 40% improves the clinical results after the use of nonablative fractional laser in skin aging. INTRODUCTION: The main purpose of this study was to evaluate whether the application of a cosmetic treatment based on the secretion of Cryptomphalus aspersa (SCA) enhances the clinical results, tolerance, and skin regeneration after nonablative laser treatment in patients with moderate photoaging. METHODS: Randomized, double-blind, split-face trial in 20 patients with moderate aging. Two sessions with fractional nonablative laser were performed, and the cosmetic treatments (SCA 40% on one hemiface and vehicle on the other) were applied immediately after laser session and daily during the study (28Â days). Tewameter, Cutometer, Visioscan, VisioFace, photography, dermoscopy, and clinical evaluation were assessed. Side effects were also evaluated. RESULTS: A significant decrease in the density of microcolumns (25%, 71%, 32%, and 61% less density, respectively, at T3 PÂ =Â 0.008, T7 PÂ =Â 0.002, T22 PÂ <Â 0.001, and T24 PÂ <Â 0.001) was observed on the side treated with SCA compared to the vehicle-treated side. Cutaneous elasticity, area of wrinkles, and hydration on the SCA-treated side also showed a significant improvement compared to the vehicle-treated side. Both the researcher and patients observed a significant improvement on the side treated with SCA compared to the vehicle-treated side. Significantly fewer side effects (erythema, burning, and dryness) were also detected. CONCLUSION: A cosmetic product with SCA 40% applied immediately after laser and for a period thereafter enhances and accelerates repair of damage produced by the laser and significantly reduces related adverse effects. In addition, SCA treatment could improve clinical results. In conclusion, we suggest that SCA enhances the effectiveness of laser in the treatment of cutaneous aging. Biological Products;Cosmetics Administration, Cutaneous;Aged;Animals;Biological Products;Combined Modality Therapy;Cosmetic Techniques;Cosmetics;Dermoscopy;Double-Blind Method;Face;Female;Healthy Volunteers;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Regeneration;Rejuvenation;Skin;Skin Aging;Snails;Treatment Outcome

Photobiomodulation increases cell viability via AKT activation in an in vitro model of diabetes induced by glucose neurotoxicity. Peripheral neuropathy (PN) is a serious complication of diabetes mellitus (DM) and is known to be resistant to conventional treatment. Photobiomodulation (PBM) is demonstrated to be effective in treating PN and in protecting nerve fiber damage. To better understand the mechanisms underlying the regenerative effects of PBM on diabetic neuropathy, we conducted a study in an in vitro model of diabetes induced by glucose neurotoxicity. Neuro 2A cells (1â€‰Ã—â€‰10(4) cells/ well; N2A) were cultured in Minimum Essential Medium (MEM) supplemented with high glucose concentrations (100Â mM) for 48Â h and after the incubation period

were submitted to either one or three consecutive applications of PBM, once a day (low-level InGaAlP, continuous wave mode, 660Â nm, 30Â mW, 1.6Â J/cm(2), 15Â s, per well). Cell viability was measured by MTT method, neurotoxicity by LDH release, neurite outgrowth was evaluated through morphometric analysis, and AKT/ERK protein expression levels were assessed by western blotting. Results demonstrate that PBM increased N2A viability as well as induced neurogenesis observed by the increase in neurite outgrowth being this effect modulated by AKT activation. Data obtained herein reinforce the regenerative potential of PBM in the treatment of PN and strongly suggests that phototherapy should be considered adjuvant in the treatment of diabetes. L-Lactate Dehydrogenase;Proto-Oncogene Proteins c-akt;Glucose Animals;Cell Line, Tumor;Cell Survival;Diabetic Neuropathies;Enzyme Activation;Glucose;L-Lactate Dehydrogenase;Low-Level Light Therapy;Mice;Neuronal Outgrowth;Proto-Oncogene Proteins c-akt

Two cases of bile duct carcinoma patients who underwent the photodynamic therapy using talaporfin sodium (Laserphyrin(Â®)). The efficacy of adjuvant photodynamic therapy (PDT) using the new photosensitizer, talaporfin sodium (TPS) has been clinically examined in some patients with bile duct carcinoma (BDC). Based on our previous cohorts, a prospective clinical trial was attempted; however, only two cases were ultimately enrolled in 27Â months. A 664-nm semiconductor laser (100Â J/cm(2)) was applied through an endoscope to the tumor lesion within 6Â h of an intravenous injection of 40Â mg/m(2) TPS according to the protocol for lung cancer. Case 1 was an 82-y.o. female patient with BDC at the left hepatic duct with biliary obstruction, percutaneous transhepatic biliary drainage (PTBD) was achieved, and the patient did not consent to surgery. She was followed up for 15Â months to search for non-surgical treatments and eventually received PDT. Although mild photosensitivity occurred, she was discharged without severe adverse events. Biliary stenosis markedly extended and a PTBD tube was scheduled at 1Â month. However, cancer immediately metastasized to the liver and she died 155Â days after PDT. Case 2 was a 70-y.o. female with perihilar BDC and multiple biliary stenoses. Multiple biliary stenting was considered to be difficult. She received PDT and no adverse events were observed. Biliary stenoses markedly improved and multiple stenting was successfully performed. On day 132, she died of cancer progression. These two cases demonstrated the safety and efficacy of biliary malignant stenosis soon after PDT; however, long-term survival and a sufficient quality of life were not achieved. The combination of the PDT protocol and system chemotherapy or brachytherapy needs to be examined in clinical trials for advanced stage BDC. Photosensitizing Agents;Porphyrins;Talaporfin Aged;Aged, 80 and over;Bile Duct Neoplasms;Carcinoma;Female;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Porphyrins

Analgesic effect of Photobiomodulation Therapy: An in vitro and in vivo study. Laser therapy, also known as Photobiomodulation (PBM) is indicated to reduce pain associated with different pathologies and applied using protocols that vary in wavelength, irradiance and fluence. Its mechanisms of action are still unclear and possibly able to directly impact on pain transmission, reducing nociceptor response. In our study, we examined the effect of two specific laser wavelengths, 800 and 970â€‰nm, extensively applied in the clinical context and known to exert important analgesic effects. Our results point to mitochondria as the primary target of laser light in isolated dorsal root ganglion (DRG) neurons, reducing adenosine triphosphate content and increasing reactive oxygen species levels. Specifically, the 800â€‰nm laser wavelength induced mitochondrial dysregulation, that is, increased superoxide generation and mitochondrial membrane potential. When DRG neurons were firstly illuminated by the different laser protocols and then stimulated with the natural transient receptor potential cation channel subfamily V member 1 (TRPV1) ligand capsaicin, only the 970â€‰nm wavelength reduced the calcium response, in both amplitude and frequency. Consistent results were obtained in vivo in mice, by subcutaneous injection of capsaicin.

Our findings demonstrate that the effect of PBM depends on the wavelength used, with 800â€‰nm light mainly acting on mitochondrial metabolism and 970â€‰nm light on nociceptive signal transmission. Reactive Oxygen Species;Calcium Animals;Calcium;Female;Ganglia, Spinal;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice;Nociception;Pain;Reactive Oxygen Species;Sensory Receptor Cells

The influence of LLLT applied on applied on calvarial defect in rats under effect of cigarette smoke. OBJECTIVE: Considering the global public health problem of smoking, which can negatively influence bone tissue repair, the aim of this study is to analyze the influence of photobiomodulation therapy (PBM) on calvaria defects created surgically in specimens under the effect of cigarette smoke and analyzed with use of histomorphometric and immunohistochemistry techniques. METHODOLOGY: Calvaria defects 4.1 mm in diameter were surgically created in the calvaria of 90-day-old rats (n=60) that were randomly divided into 4 experimental groups containing 15 animals each: control group (C), smoking group (S), laser group (L), and smoke associated with laser group (S+L). The animals were subjected to surgery for calvaria defects and underwent PBM, being evaluated at 21, 45, and 60 days post-surgery. The specimens were then processed for histomorphometric and immunohistochemistry analyses. The area of bone neoformation (ABN), percentage of bone neoformation (PBNF), and the remaining distance between the edges of the defects (D) were analyzed histometrically. Quantitative analysis of the TRAP immunolabeled cells was also performed. The data were subjected to analysis of variance (ANOVA) in conjunction with Tukey's test to verify the statistical differences between groups ($p<0.05$). RESULTS: The smoking group showed less ABN compared to the other experimental groups in all periods, and it also showed more D at 21 days compared to the remaining groups and at 45 days compared to the laser group. The smoking group showed a lower PNBF compared to the laser group in all experimental periods and compared to smoking combined with LLLT group at 21 days. CONCLUSIONS: PBM acted on bone biomodulation, thus stimulating new bone formation and compensating for the negative factor of smoking, which can be used as a supportive therapy during bone repair processes. Animals;Bone Regeneration;Cigarette Smoking;Female;Immunohistochemistry;Low-Level Light Therapy;Osteogenesis;Random Allocation;Rats, Wistar;Reproducibility of Results;Skull;Time Factors;Treatment Outcome;Wound Healing

The Rationale for Photobiomodulation Therapy of Vaginal Tissue for Treatment of Genitourinary Syndrome of Menopause: An Analysis of Its Mechanism of Action, and Current Clinical Outcomes. Objective: Light, particularly in the visible to far-infrared spectrum, has been applied to the female genital tract with lasers and other devices for nearly 50 years. These have included procedures on both normal and neoplastic tissues, management of condylomata, endometriosis, and menometrorrhagia, and, more recently, a number of fractional laser devices have been applied for the management of genitourinary syndrome of menopause (GSM) and stress urinary incontinence (SUI), and to achieve so-called vaginal rejuvenation. Photobiomodulation therapy (PBMT) has been proposed as an alternative for use in managing GSM and SUI. Methods: This article reviews the biological basis, symptoms, and management of GSM, and investigates the current status and rationale for the use of PBMT. Results and conclusions: Based on the preliminary evidence available, PBMT is safe and appears to be efficacious in treating GSM. Female;Female Urogenital Diseases;Humans;Low-Level Light Therapy;Menopause;Syndrome;Urinary Incontinence, Stress

Effects of low level laser therapy in cancer cells-a systematic review of the literature. The aim of the present study was to conduct a systematic review regarding the use of photobiomodulation (PBM) therapy in tumoral cells, addressing the different types of lasers and parameters used. An electronic search was performed in PubMed/MEDLINE, Cochrane Library, and EMBASE databases. The inclusion criteria were being an in vitro study, with tumoral cells, and have at least one group of

treatment with low-power laser and a control group (without treatment). Were excluded studies that used only non-carcinogenic cells, in vivo studies, studies that used high-power laser or the association with photosensitizers. The primary outcome evaluated was the cellular viability, and the secondary outcomes were the apoptosis rate and gene and inflammatory mediators' expression. Nineteen studies were identified among the lists of citations of studies that met the exclusion/inclusion criteria. There is a wide divergence regarding the wavelengths and doses used, as well as the type of laser, and each variation leads to different results, with some studies showing an increase in cell proliferation, while other studies showed a decrease. It is possible to suggest that PBM can be used in cancerous lesions in order to decrease the proliferation of these cells depending on the parameters used; however, the lack of standardization of laser irradiation protocols for in vitro investigations does not allow the establishment of ideal parameters for this purpose. Therefore, PBM should be used with caution in cancer patients until more studies are performed. Apoptosis;Cell Proliferation;Cell Survival;Humans;Low-Level Light Therapy;Neoplasms

Correction to: Role of low-level laser therapy added to facial expression exercises in patients with idiopathic facial (Bell's) palsy. The published version contains a mistake in Figure 1. Below is the correct figure.

Laser Skin Rejuvenation With Fractional 1064 Q-switched Nd:YAG In 252 Patients: An Indian Experience. OBJECTIVE: The objective of our study was to present the results and safety profile of fractional 1064 Q-switched Nd: YAG laser treatment in skin rejuvenation in Indian patients with Fitzpatrick skin type III-VI. MATERIALS AND METHODS: We studied our clinical data of 252 patients who underwent treatment for facial skin rejuvenation with the Q switched Nd:YAG laser 1064 wavelength, using the fractional mode of 5mm spot size with fluences from 1.2Â JÂ ~Â 2Â J/cm(2) and the energy ranging from 300-500Â mJ, a repetition rate of 7Hz and pulse duration of 8 ns for 6 sessions at two weekly intervals. We evaluated results with the aid of clinical photography taken before start of treatment, on 3rd and 5th sessions along with patient satisfaction and dermatologist assessment scores. Any adverse events were also recorded. RESULTS: At the end of 6 sessions, both patients and dermatologists reported visible improvement in skin texture and tone. The laser sessions resulted in an immediate improvement in skin texture and tone in the first session itself that increased over 3 sessions and then stabilized. Transient erythema was reported in a few cases. No hypo- or hyperpigmentation were noted. CONCLUSIONS: The 1064 QSNYL is popularly used for skin rejuvenation especially in the Asian countries. But there is lack of substantial clinical data to validate the clinical results. We present the first study that shows the fractional 1064 Qswitched ND:YAG laser is a safe and effective option for skin rejuvenation in skin types III-VI. Adult;Dose Fractionation, Radiation;Erythema;Face;Female;Humans;India;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Rejuvenation;Retrospective Studies;Skin Aging;Treatment Outcome

Acute effect of photobiomodulation using light-emitting diodes (LEDs) on baroreflex sensitivity during and after constant loading exercise in patients with type 2 diabetes mellitus. To evaluate the photobiomodulation (PBM) effect on the cardiovascular autonomic control, analyzed by baroreflex sensitivity (sequence method), during constant load exercise and recovery in diabetic men, we evaluated 11 men with type 2 diabetes (DM2) (40-64Â years). The constant workload exercise protocol (TECC) was performed on two different days, 14Â days apart from each other, to guarantee PBM washout period. After PBM by light-emitting diode (LED) irradiation (150Â J or 300Â J or placebo), 10Â min of rest (REST) was performed. After this period, the volunteer was positioned on a cycloergometer to start the test (1-min rest, 3-min free-load heating, 6-min constant workload-EXERCISE, 6-min free-load cool-down, 1-min rest) followed by a sitting period of 10Â min (RECOVERY). The constant workload corresponded to 80%VO(2GET) (gas exchange threshold) identified by a

previous cardiopulmonary exercise test (CPET). PBM was applied in continuous mode, contact technique, bilaterally, on both femoral quadriceps and gastrocnemius muscle groups. The electrocardiogram R-R intervals (BioAmp FE132) and the peripheral pulse pressure signals (Finometer PRO) were collected continuously throughout the protocol. Stable sequences of 256 points were chosen at REST, EXERCISE, and RECOVERY. The baroreflex sensitivity (BRS) was computed in time domain according to the sequence method (Î±(seq)). The comparison between therapies (150Â J/300Â J/placebo) and condition (REST, EXERCISE, and RECOVERY) was performed using the ANOVA two-way repeated measures test. There was no interaction between therapy and conditions during the TECC. There was only the condition effect (pâ€‰<â€‰0.001), showing that the behavior of Î±(seq) was similar regardless of the therapy. Photobiomodulation with 150Â J or 300Â J applied previously to a moderate-intensity TECC in DM2 was not able to promote cardiovascular autonomic control changes leading to an improvement in BRS. Baroreflex;Blood Pressure;Diabetes Mellitus, Type 2;Diastole;Exercise;Heart Rate;Humans;Male;Middle Aged;Systole

Corneal neovascularization: updates on pathophysiology, investigations & management. Objective. Corneal neovascularization is a sight-threatening condition affecting more than 1.4 million people per year. Left untreated, it can lead to tissue scarring, oedema, lipid deposition, and persistent inflammation that may significantly affect visual prognosis and quality of life. The aim was to review the recent evidence relating to the pathophysiology, investigations and management of corneal neovascularization. Methods. Literature review of prospective and retrospective studies, clinical trials and animal models relating to the pathophysiology, investigation and management of corneal neovascularization. Results. Corneal neovascularization is characterized by the invasion of new blood vessels into the cornea caused by an imbalance between angiogenic and antiangiogenic factors that preserve corneal transparency as a result of various ocular insults and hypoxic injuries. Risk factors that have been implicated in the pathogenesis of the disease include contact lens wear, ocular surface disease, trauma, previous surgery and herpes. The results highlighted the current and future management modalities of corneal neovascularization, which includes corneal transplantation, laser - phototherapy, injections and topical treatment. Conclusion. The future of corneal neovascularization is promising and this paper discusses the upcoming revolution in local gene therapy. Abbreviations. HSK = herpes stromal keratitis, VEGF = vascular endothelial growth factor, VEGFR-1 = VEGF Receptor-1, FGF = Fibroblast growth factor, PDGF = Platelet-derived growth factor, IL-6 = interleukin-6, IL-7 = interleukin-7, IL-8 = interleukin-8, IRS-1 = insulin receptor substrate-1. Angiogenesis Inhibitors Angiogenesis Inhibitors;Animals;Cornea;Corneal Neovascularization;Disease Management;Genetic Therapy;Humans;Keratoplasty, Penetrating;Visual Acuity

Low-Level Laser Therapy: A Noninvasive Method of Relieving Postactivation Orthodontic Pain-A Randomized Controlled Clinical Trial. INTRODUCTION: Pain is an unavoidable squeal of orthodontic treatment and it is known to decrease patient compliance and eventually affects treatment results. Numerous methods are available in literature to manage orthodontic pain after activation but they have their own limitations. This has led to exploring further options for management of pain. AIM: The aim of this study was to evaluate the effectiveness of low-level laser therapy (LLLT) in alleviating orthodontic pain after activation. MATERIALS AND METHODS: 20 subjects were randomly divided into an experimental and a control group. Each participant was given a retraction force of 200 gm/cm(2)/side. Subjects in the experimental group were exposed to low-level laser light at 980 nm and those in the control group were exposed to red LED light as placebo. The pain perceived after 0 hour, 1 hour, 3 hours, 48 hours, and 1 week of activation was recorded by patient using Visual Analog Scale. Statistical analysis was done using Mann-Whitney test. RESULTS: Results of the study showed that pain experienced by the subjects after orthodontic activation was higher in experimental group at T(0) than in placebo group. At T(1), T(2), T(4), and T(5), the pain

experienced by the subjects was less in the experimental group compared to the placebo group. Pain experienced by the subjects in the experimental group at T(3) was significantly less as compared to those in the placebo group. CONCLUSION: A single dose of LLLT at 980nm, 2.5 W/cm(2), and 600 J is effective in relieving orthodontic pain after activation.

Effects of photobiomodulation on muscle strength in post-menopausal women submitted to a resistance training program. The aim of this study was to compare the effects of resistance training of low volume and high intensity with or without photobiomodulation (PBM) on muscle strength and functional performance in post-menopausal women. Thirty-four post-menopausal women were randomized into resistance training (RTG, nâ€‰=â€‰17) or resistance training plus PBM (PBMG, nâ€‰=â€‰17). Individuals from both groups received the same RT protocol consisting of leg-press 45Â°, front lat pulldown, leg curl, chest press, and squat performed in two sets of 10 repetitions with a workload of 75% of one repetition maximum (1RM), twice per week, during 8Â weeks. PBMG individuals also received, prior to the exercise session, PBM through a cluster containing 7 visible diodes (630Â nm) and 7 infrared diodes (850Â nm) with power of 100Â mW each and energy of 4Â J per diode, applied to the quadriceps femoris muscle; individuals from RTG received placebo PBM prior to the sessions, applied with the same device switched off. Muscle strength (1RM; isometric dynamometer), functional performance (Time Up and Go; Berg Balance Scale; 6-min walk test), and quality of life (World Health Organization Quality of Life-Bref) were performed before and after 8Â weeks. Both groups increased muscle strength (pâ€‰<â€‰0.001) for all exercises, without group differences (pâ€‰=â€‰0.651). Quality of life (pâ€‰=â€‰0.015) and balance (pâ€‰=â€‰0.006) increased only in the RTG. The results suggest that PBM were not able for inducing additional benefits to RT to improve muscle strength in post-menopausal women. Exercise;Exercise Therapy;Female;Humans;Knee;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Postmenopause;Quadriceps Muscle;Quality of Life;Resistance Training;Torque

Examining tumor modulating effects of photobiomodulation therapy on head and neck squamous cell carcinomas. Photobiomodulation (PBM) therapy is an effective method for preventing and managing oral mucositis (OM) in head and neck squamous cell carcinoma (HNSCC) patients undergoing radiotherapy alone or in combination with chemotherapy. However, the potential effects of PBM therapy on premalignant and malignant cells eventually present in the treatment site are yet unknown. The aim of this systematic review was to analyze the effects of PBM therapy on HNSCC. A literature search was conducted in four indexed databases as follows: MEDLINE/PubMed, EMBASE, Web of Science, and Scopus. The databases were reviewed for papers published up to and including in October 2018. In vitro and in vivo studies that investigated the effects of PBM therapy on HNSCC were selected. From the 852 initially gathered studies, 15 met the inclusion criteria (13 in vitro and 2 in vivo). Only three in vitro studies were noted to have a low risk of bias. The included data demonstrated wide variations of study designs, PBM therapy protocols, and study outcomes. Cell proliferation and viability were the primary evaluation outcome in the in vitro studies. Of the 13 in vitro studies, seven noted a positive effect of PBM therapy on inhibiting or preventing an effect on HNSCC tumor cells, while six studies saw increased proliferation. One in vivo study reported increased oral SCC (OSCC) progression, while the other observed reduced tumor progression. Overall, the data from the studies included in the present systematic review do not support a clear conclusion about the effects of PBM therapy on HNSCC cells. Cell Proliferation;Databases, Factual;Head and Neck Neoplasms;Humans;Lasers, Gas;Low-Level Light Therapy;Squamous Cell Carcinoma of Head and Neck

The effect of low level laser on number of Candida albicans colonies in-vitro: a new finding. BACKGROUND: Candida albicans is a commensal organism that causes a wide variety of diseases in humans. One of these diseases is oral candidiasis, which occurs at a high recurrence rate in spite of

available treatments. The purpose of this study was to compare the effect of low-level laser therapy (LLLT) with the use of nystatin on in-vitro growth of Candida albicans. METHOD: We prepared two samples of Candida albicans at different concentrations: 10(4) viable cells/ml and 10(6) viable cells/ml. Specimens from each sample were divided into a control group, a nystatin-treated group, and a group treated with LLLT. The control group was cultured without any intervention. The second group was treated with nystatin and the solution was vibrated for 30â€‰s or 60â€‰s. The third group was irradiated with a gallium-aluminum-argon (Ga-Al-Ar) diode laser (Epic 10; Biolase Inc.)in continuous mode using a wavelength of 940â€‰nm and a power of 1â€‰W for 30â€‰s or 60â€‰s (38â€‰J/cm(2) and 76â€‰J/cm(2)). The specimens from the nystatin group and the LLLT group were cultured and the number of colony-forming units (CFU/ml) for each group was counted and compared. RESULTS: Nystatin completely eliminated the colonies (0 colonies) in all specimens. There was an increase in the number of colonies in the LLLT group for both cell concentrations at 30â€‰s and at 60â€‰s. However, this increase was statistically significant only for a concentration of 10(4) viable cells/ml at an exposure time of 30s. The increase in the concentration of 10(6) viable cells/ml at both 30â€‰s and 60â€‰s was statistically significant compared with the control group, although the highest number of colonies remained after an exposure time of 60s. CONCLUSION: LLLT led to an increase in the growth of Candida colonies. However, there was no significant difference related to the exposure time between the different cell concentrations. Nystatin Candida;Candida albicans;Candidiasis, Oral;Humans;Low-Level Light Therapy;Nystatin

Oral Lichen Planus - Known and Unknown: a Review. Lichen planus is a chronic mucocutaneous inflammatory disease aff ecting 1-2% of the general population with maximum prevalence of the disease in women above the age of 40. Its aetiology remains unclear and the pathogenesis is still the object of much speculation. It is considered to be an autoimmune disorder mediated mainly by the T-lymphocytes. The present paper presents the most well-known external agents (viruses in particular), internal agents like stress, and the heat shock protein thought to be trigger factors and describes the action of diff erent cells and proteins associated with the development of that disease. Diagnosis is based on clinical and histopathologic evidence; direct and indirect immunofluorescence techniques can also be of use. Despite the wide variety of therapeutic modalities, treatment outcomes are often insufficient. Currently, topical corticosteroids are widely accepted as a standard therapy, but also retinoids, calcineurin inhibitors and other immunosuppressants can be administered. Because of the aspect relevant to these drugs, priority is given to alternative harmless methods such as LLLT and PDLT. There is an ongoing controversy in the literature about the possible premalignant character of oral lichen planus, however, periodic followup is recommended. Heat-Shock Proteins;Immunosuppressive Agents Autoimmunity;Female;Genetic Predisposition to Disease;Heat-Shock Proteins;Hepacivirus;Human papillomavirus 16;Humans;Immunosuppressive Agents;Lichen Planus, Oral;Lichenoid Eruptions;Male;Risk Factors;Stress, Psychological

Comparative Study of 660 and 830â€‰nm Photobiomodulation in Promoting Orthodontic Tooth Movement. Objective: Photobiomodulation (PBM) can usefully promote wound healing and relieve pain via its biological effects, with a wide range of applications in clinical medicine. The aim of the present study was to investigate the effect of 660 and 830â€‰nm PBM on orthodontic tooth movement. Background data: PBM is based on the biological effects of diode laser irradiation on tissues, promoting cell proliferation and activity. Materials and methods: An orthodontic force was applied to the upper right first molars exposed to a 660 and 830â€‰nm PBM (LHH-500I; Beijing Long Hui Heng Medical Science and Technology Development Corporation) on days 0, 1, 2, 3, 4, 5, and 7 for 50â€‰sec with power density of 0.1 W/cm(2) (a beam area of 0.5â€‰cm(2), radiate power of 0.05 W), energy density of 5â€‰J/cm(2) within 14 days, and a control group with no laser irradiation. Tooth movement was analyzed using a stereomicroscope, the number of osteoclasts determined by

tartrate-resistant acid phosphatase (TRAP), and the expression of bone remodeling factors evaluated by immunohistochemistry. Results: The expression of IL-1Î², RANKL, and OPG was significantly stimulated in the 660 and 830â€‰nm groups. The expression of RANKL was significantly higher in the 660â€‰nm group than in the 830â€‰nm group on days 5 and 7; however, there was no significant difference in the expression of OPG and IL-1Î² between the 660 and 830â€‰nm groups on days 1, 2, 3, 4, 5, 7, and 14. On days 3 and 5, the number of osteoclasts in the 660â€‰nm group was higher than that in the 830â€‰nm group, and the difference was statistically significant. Tooth movement over 14 days was significantly higher in the 660 and 830â€‰nm groups than in the control group, and there was no significant difference between the 660 and 830â€‰nm groups finally. Conclusions: Both 660 and 830â€‰nm can accelerate the orthodontic tooth movement and promote alveolar bone remodeling on the compression side. Although the difference of tooth movement over 14 days between the two groups was not statistically significant; however, 660â€‰nm PBM to accelerate bone remodeling is stronger than 830â€‰nm PBM at an early stage. Interleukin-1beta;Osteoprotegerin;Tartrate-Resistant Acid Phosphatase Animals;Bone Remodeling;Cell Proliferation;Immunohistochemistry;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar;Osteoclasts;Osteoprotegerin;Rats;Rats, Sprague-Dawley;Tartrate-Resistant Acid Phosphatase;Tooth Movement Techniques

Photothermal Effects of Defocused Initiated Versus Noninitiated Diode Implant Irradiation. Background: Diode lasers have been used for implant decontamination. However, the use of initiated or noninitiated tips remains unevaluated to verify potential photothermal risks. Objective: To assess the photothermal effects of defocused-initiated versus noninitiated irradiation. Materials and methods: A dental implant (3.5â€‰Ã—â€‰11â€‰mm) was placed into an artificial bone, an infrabony defect was created to simulate a four-wall peri-implant defect. Irradiation was performed using pulsed diode lasers of 940, 975, and 980â€‰nm. The laser tips were positioned parallel to the implant (maximum 2W pulsed mode). The implant was irradiated for 30â€‰sec using noninitiated, cork-, and blue paper-initiated tips. Temperature differences were observed at the apical and coronal regions of the implant. The data were statistically evaluated and compared using one-way analysis of variance and Tukey tests. Results: The average temperature increase and the amount of time that it took to yield the critical temperature were comparable at the coronal level for the 940 and 975â€‰nm diode lasers (pâ€‰>â€‰0.05). For the 980â€‰nm laser, blue-initiated tip had the highest temperature increase (22.4Â°C), followed by cork (18.8Â°C) and noninitiated tip (17.3Â°C). The critical threshold at the coronal portion for the 980â€‰nm laser was reached in 11.5, 8.79, and 6.46â€‰sec for the blue paper-, cork-, and noninitiated tips, respectively. The 975 and 980â€‰nm lasers had average temperature increases, comparable among the blue paper-, cork-, and noninitiated tips at the apical level (pâ€‰>â€‰0.05). Apically, for the 940â€‰nm, the noninitiated tip had the highest temperature increase (5.57Â°C), followed by the cork- (4.96Â°C) and blue paper-initiated tip (4.54Â°C). Conclusions: The initiator does not affect the temperatures produced during implant decontamination although noninitiated diode lasers may overheat (within 30â€‰sec) than initiated tips. There is minimal risk of overheating at the apical portion. It seems that the 940â€‰nm diode is the safest of the evaluated laser systems. Decontamination;Lasers, Semiconductor;Low-Level Light Therapy;Peri-Implantitis;Temperature

Comparative In Vitro Study: Examining 635â€‰nm Laser and 265â€‰nm Ultraviolet Interaction with Blood. Objective: This study represents a viable assessment of the effect of the low-level laser (LLL) of 635â€‰nm and ultraviolet (UV) of 265â€‰nm on biophysical properties of blood. Materials and methods: Blood samples were divided into two main groups: one for irradiation by LLL and the other for irradiation by UV. Each group was divided into three aliquots. First aliquot: whole blood was exposed to radiation. The second aliquot: erythrocytes were exposed to radiation and resuspended in

autologous plasma. The third aliquot: plasma was exposed to radiation, and erythrocytes were resuspended in it. The following parameters were measured after irradiation by LLL and UV for all aliquots: whole blood viscosity, microscopic aggregation index, deformation index, and Zeta potential. Results: A decrease in whole blood viscosity due to irradiation by LLL was observed. To the contrary, an increase in whole blood viscosity due to irradiation by UV was detected. A significant reduction in erythrocytes' aggregation was observed as a result of LLL and UV radiation. Erythrocytes' deformability was strongly affected by UV radiation, while there was no significant effect from LLL. Another noticeable change observed was an increase in Zeta potential due to UV and a decrease in Zeta potential values, as a result of LLL irradiation. Conclusions: It can be concluded from this study that LLL and UV can be used to change some biological processes, as well as cellular properties. Adult;Blood;Blood Viscosity;Dose-Response Relationship, Radiation;Erythrocyte Aggregation;Erythrocyte Deformability;Erythrocytes;Healthy Volunteers;Humans;In Vitro Techniques;Low-Level Light Therapy;Male;Middle Aged;Plasma;Ultraviolet Rays

Photobiomodulation of Matrix Metalloproteinases in Rat Calcaneal Tendons. Objective: The main objective was to verify the modulatory effects of MMP-1, MMP-3, and MMP-13 levels on the partially injured calcaneal tendons of rat exposure to photobiomodulation. Background: Photobiomodulation has been shown to have anti-inflammatory and regenerative effects on tendon injuries. However, there is still uncertainty regarding the beneficial effects in matrix metalloproteinase (MMP) levels, especially MMP-1, -3, and -13. Materials and methods: Sixty-five male Wistar rats were used. Sixty were submitted to a direct trauma on the calcaneal tendons and were randomly distributed into the following six groups: LASER 1, 3, and 7 (10 partially injured calcaneal tendons in each group treated with photobiomodulation for 1, 3, and 7 days, respectively) and Sham 1, 3, and 7 (same injury, with simulated photobiomodulation). The remaining five animals were allocated to the normal group (no injury or treatment procedure). The 780â€‰nm low-level laser was applied with 70â€‰mW of mean power and 17.5â€‰J/cm(2) of fluency for 10â€‰sec, once a day. The tendons were surgically removed and analyzed for MMP-1, MMP-3, and MMP-13 through immunohistochemistry. Results: MMP-3 levels remained close to normal in all experimental groups (pâ€‰>â€‰0.05); however, reductions (pâ€‰<â€‰0.05) in MMP-1 and MMP-13 levels were detected in the groups submitted to one, three, and seven low level laser therapy applications. Conclusions: The photobiomodulation protocol was able to reduce MMP-1 and MMP-13 levels in injured calcaneal tendons. Matrix Metalloproteinase 13;Mmp13 protein, rat;Matrix Metalloproteinase 3;MMP1 protein, rat;Matrix Metalloproteinase 1 Achilles Tendon;Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Matrix Metalloproteinase 1;Matrix Metalloproteinase 13;Matrix Metalloproteinase 3;Rats;Rats, Wistar;Tendinopathy

Effect of Low-Level Laser Irradiation on Proliferative Activity of Wharton's Jelly Mesenchymal Stromal Cells. We studied the effect of low-level laser irradiation on proliferative activity of cultured human Wharton's jelly mesenchymal stromal sells. Cells were irradiated with a solid-state laser emitting at 650 nm; irradiation doses were 0.04, 0.4, or 4 J/cm2. Laser irradiation was performed once at the start of the cell proliferation experiment or daily throughout the experiment. Cells were cultured for 7 days. The number of viable cells was assessed using the MTT test. An increase in cell proliferative activity was detected after daily laser irradiations; the maximum stimulating effect was achieved at a dose of 0.04 J/cm(2). These results substantiate medical use of lasers for expansion of cells intended for transplantation. Cell Differentiation;Cell Proliferation;Cells, Cultured;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Umbilical Cord;Wharton Jelly

Intravenous laser wavelength radiation effect on LCAT, PON1, catalase, and FRAP in diabetic rats. The main purpose of this study is to evaluate the effect of intravenous irradiation of different low-level laser wavelengths on the activity of lecithin-cholesterol acyltransferase (LCAT), paraoxonase

(PON1), catalase, and ferricÂ reducing ability of plasma (FRAP) in diabetic rats. First, diabetes was induced in rats using streptozotocin (STZ). Enzymes' activity was measured in the blood samples and compared before and after intravenous laser blood irradiation. We used four continuous-wave lasers-IR (Î»â€‰=â€‰808Â nm), Red (Î»â€‰=â€‰638Â nm), Green (Î»â€‰=â€‰532Â nm), and Blue (Î»â€‰=â€‰450Â nm)-to compare the wavelength's effect on different enzymes' activity. Laser power was fixed at 0.01Â mW and laser energy was changed by 2-, 4-, 6-, and 8-min time of radiations.The enzymes' activity of blood samples was measured 2, 6, and 24Â h after radiation. The results show an increase in the activity of different enzymes when compare with diabetic non-radiated samples. More importantly, with a constant laser energy, the enzymes' activity increased with decreasing laser wavelength. It is important to note that with a constant laser energy, as the wavelength decreases, the photon energy increases and the number of photons decrease, while the enzyme's activity elevation increases. As a result, we can conclude that in intravenous low-level laser therapy, photon energy is more important than the number of photons even if their product, energy, is kept constant. Antioxidants;Iron;Catalase;Phosphatidylcholine-Sterol O-Acyltransferase;Aryldialkylphosphatase
Animals;Antioxidants;Aryldialkylphosphatase;Catalase;Diabetes Mellitus, Experimental;Iron;Lasers;Male;Phosphatidylcholine-Sterol O-Acyltransferase;Rats

Under the spotlight: mechanisms of photobiomodulation concentrating on blue and green light. Photobiomodulation (PBM) describes the application of light at wavelengths ranging from 400-1100 nm to promote tissue healing, reduce inflammation and promote analgesia. Traditionally, red and near-infra red (NIR) light have been used therapeutically, however recent studies indicate that other wavelengths within the visible spectrum could prove beneficial including blue and green light. This review aims to evaluate the literature surrounding the potential therapeutic effects of PBM with particular emphasis on the effects of blue and green light. In particular focus is on the possible primary and secondary molecular mechanisms of PBM and also evaluation of the potential effective parameters for application both in vitro and in vivo. Studies have reported that PBM affects an array of molecular targets, including chromophores such as signalling molecules containing flavins and porphyrins as well as components of the electron transport chain. However, secondary mechanisms tend to converge on pathways induced by increases in reactive oxygen species (ROS) production. Systematic evaluation of the literature indicated 72% of publications reported beneficial effects of blue light and 75% reported therapeutic effects of green light. However, of the publications evaluating the effects of green light, reporting of treatment parameters was uneven with 41% failing to report irradiance (mW cm(-2)) and 44% failing to report radiant exposure (J cm(-2)). This review highlights the potential of PBM to exert broad effects on a range of different chromophores within the body, dependent upon the wavelength of light applied. Emphasis still remains on the need to report exposure and treatment parameters, as this will enable direct comparison between different studies and hence enable the determination of the full potential of PBM.

Association of Bioglass/Collagen/Magnesium composites and low level irradiation: effects on bone healing in a model of tibial defect in rats. BACKGROUND AND AIMS: Bioglass (BG) and Magnesium (Mg) composites have been used for bone tissue engineering proposes due to its osteogenic activity and increased mechanical properties respectively. The introduction of Collagen (Col) is a common and efficient approach for bone tissue engineering applications toward cell proliferation. Recently, studies demonstrated that BG/Col/Mg composites presented proper mechanical properties and were non-cytotoxic. Although the osteogenic potential of BG/Col/Mg composites, in specific situations, biomaterials may not be capable of stimulating bone tissue. Therefore, combining biomaterial matrices and effective post-operative therapies (such as low level lasertherapy; LLLT) may be necessary to appropriately stimulate bone tissue. In this context, the aim

of this study was to develop intra- and extra-operatively bone regenerative therapeutical strategies, based on the association of Col-enriched BG/Mg composites with LLLT. MATERIALS AND METHODS: Thereby, an in vivo study, using tibial defect in Wistar rats, was performed in order to investigate the bone regenerative capacity. LLLT treatment (Ga-Al-As laser 808 nm, 30 mW, 2.8 J, 94 s) was performed 3 times a week, in non-consecutive days. Histology, histomorphometry, immunohistochemical analysis and mechanical test were done after 15 and 45 days post-implantation. RESULTS: The results showed that Col could be successfully introduced into BG/Mg and the association of BG/Mg/Col and LLLT constituted an optimized treatment for accelerating material degradation and increasing bone deposition. Additionally, mechanical tests showed an increased maximal load for BG/Mg + LLLT compared to other groups. CONCLUSIONS: These results lead us to conclude that the Col enriched BG/Mg composites irradiated with LLLT presented superior biological and mechanical properties, demonstrating to be a promising bone graft.

Efficacy Comparison of Nd:YAG laser, diode laser and dentine bonding agent in dentine hypersensitivity reduction: a clinical trial. PURPOSE: Dentin hypersensitivity is characterized by short, sharp pain arising from exposed dentin in response to external stimuli. Several modalities have been suggested for treatment of this condition such as low-level laser therapy (LLLT) and application of dentin bonding agents. The aim of this study was to compare the clinical efficacy of diode laser, Nd:YAG laser and dentin bonding agent for treatment of dentin hypersensitivity. MATERIALS AND METHODS: In this study, 135 teeth of 22 patients diagnosed with dentin hypersensitivity were divided into three groups: In group 1, the teeth were irradiated by diode laser with 810 nm wavelength for 30 seconds and in group 2, the teeth were irradiated by Nd:YAG laser with 1064 nm wavelength for 40 seconds. CLEARFIL SE BOND was applied on teeth in group 3. LLLT was carried out in 3 sessions with 7-day intervals between sessions, during a period of 3 consecutive weeks. Hypersensitivity was assessed by cold test according to the criteria proposed by Uchida at baseline, immediately after treatment and at 1, 3 and 6 months, postoperatively. RESULTS: Reduction of dentin hypersensitivity was observed at 3 and 6 months following the use of Nd:YAG laser ($p < 0.001$). Reduction in dentin hypersensitivity was observed immediately after treatment in all groups. Statistically significant differences in level of dentin hypersensitivity were found between groups at 3 and at 6 months (p â‰¤ 0.001). The reduction in dentin hypersensitivity by Nd:YAG laser was significantly superior to that in other groups at this time. CONCLUSION: The efficacy of Nd:YAG laser in reduction of dentin hypersensitivity was significantly superior to that of other modalities at 3 and 6 months.

Efficacy of stem cell-conditioned medium vs. platelet-rich plasma as an adjuvant to ablative fractional CO(2) laser resurfacing for atrophic post-acne scars: a split-face clinical trial. OBJECTIVES: To explore the impact of using topical stem cell-conditioned medium (SC-CM) after fractional carbon dioxide laser (FCL) vs. combined FCL and platelet-rich plasma (PRP) or FCL alone in treatment of atrophic acne scars. METHODS: Thirty-three patients were randomly divided into two split-face groups. Group I (nâ€‰â€‰=â€‰â€‰17) received FCL plus topical SC-CM on one side or FCL plus saline on the other. Group II (nâ€‰â€‰=â€‰â€‰16) received FCL plus topical PRP or SC-CM. All patients had three monthly sessions. Clinical assessment was done at each visit, with a final assessment after 3Â months. Skin biopsies were obtained for histological and quantitative molecular analysis after treatment. RESULTS: No significant difference in clinical improvement of acne scars was observed between the FCL/SC-CM and FCL only sides (pâ€‰=â€‰.63), while better and faster improvement was detected on FCL/PRP side compared to FCL/SC-CM side (pâ€‰=â€‰.006). There was no significant difference in downtime or adverse effects between the treated sides in either group. Dermal collagen was increased and procollagen type I gene was upregulated in both FCL/PRP and FCL/SC-CM sides compared to FCL only sides (pâ€‰=â€‰.001 and pâ€‰=â€‰.041, respectively). CONCLUSIONS: Topical SC-CM could potentially enhance the efficacy of FCL. However,

PRP seems to be a better alternative. Adjuvants, Immunologic;Culture Media, Conditioned Acne Vulgaris;Adjuvants, Immunologic;Adult;Cicatrix;Culture Media, Conditioned;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Platelet-Rich Plasma;Prospective Studies;Severity of Illness Index;Stem Cells;Treatment Outcome;Young Adult

Author's reply. Minoxidil Alopecia;Humans;Low-Level Light Therapy;Minoxidil

Combined chemo/photothermal therapy based on mesoporous silica-Au core-shell nanoparticles for hepatocellular carcinoma treatment. Chemotherapy has been widely used for treatment to malignant cancer, such as hepatocellular carcinoma (HCC). Chemotherapeutic effect was not often efficient to achieve totally tumor ablation due to the poor cellular uptake and drug resistance. To address these problems, a novel nanoplatform was constructed based on nontoxic mesoporous silica nanoparticles (MSNs) for a combined chemo/photothermal therapy to enhance tumor cell accumulation and promote toxicity of chemotherapeutic drugs. Prepared MSNs were consisted of Au nanoshell for photothermal conversion and a first-line anti-HCC drug-sorafenib (SO) for chemotherapy. The SO-Au-MSNs could help SO accumulate more in hepatic cancer cells. Under near infrared irradiation, SO-Au-MSNs exerted a high cell inhibition rate which could be attributed to the enhanced toxicity of SO under hyperthermia and synergistic chemo/photothermal therapy. SO-Au-MSNs showed a good compatibility as well as efficient cell cytotoxicity. Overall, SO-Au-MSNs would be a promising candidate for further enhancing the antitumor effect on HCC. Antineoplastic Agents;Drug Carriers;Gold;Silicon Dioxide;Sorafenib Antineoplastic Agents;Carcinoma, Hepatocellular;Cell Line, Tumor;Cell Survival;Combined Modality Therapy;Drug Carriers;Drug Compounding;Drug Liberation;Gold;Humans;Hyperthermia, Induced;Lasers;Liver Neoplasms;Low-Level Light Therapy;Metal Nanoparticles;Porosity;Silicon Dioxide;Sorafenib

Objective analysis of volume restoration in atrophic acne scars and skin pores: a split study using human stem cell-conditioned media. Background: It is anticipated that the combined treatments of ablative laser and human stem cell-conditioned media produce the synergistic effects.Objectives: To investigated the effects of human stem cell-conditioned media (HSCM) as a post-procedural agent after fractional CO(2) laser procedure in patients with atrophic acne scars and skin pores. Method: Both cheeks of 15 subjects were treated with a fractional CO(2) laser. HSCM was randomly applied to one of the resurfacing sites (T) and normal saline was applied to the other site as a control (C). During the next six days, a solution containing 80% HSCM and hyaluronic acid (HA) was applied on the treated side (T) and HA alone was applied to the control side (C). Scar volume and erythema were objectively evaluated using an Antera 3D(Â®) CS. Result: After two months, the scar volume was reduced by 23.5% (T) versus 15.0% (C) (pâ€‰=â€‰.143) and the volume of the skin pores was reduced by 37.6% (T) versus 15.9% (C) (pâ€‰=â€‰.006), while the erythema was increased by 2.8% (T) versus 3.1% (C) (pâ€‰=â€‰.934). Atrophic scar and the skin pores in the HSCM-applied area improved by at least 15.0% after a single treatment session, suggesting better results compared with the control side.Conclusion: HSCM may augment the regenerative effects of fractional CO(2) laser. Culture Media, Conditioned;Hyaluronic Acid Acne Vulgaris;Adult;Aged;Cicatrix;Culture Media, Conditioned;Erythema;Female;Humans;Hyaluronic Acid;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Skin;Stem Cells;Treatment Outcome;Young Adult

The Role of Low-Intensity Biostimulation Laser Therapy in Transforming Growth Factor Î²1, Bone Alkaline Phosphatase and Osteocalcin Expression during Orthodontic Tooth Movement in Cavia porcellus. OBJECTIVE: The aim of this study is to analyze the low-intensity laser therapy (LILT) biostimulation mechanism as adjuvant therapy within orthodontic treatment as a means of accelerating bone remodeling by transforming growth factor Î²1 (TGF-Î²1), bone alkaline phosphatase (BALP), and osteocalcin (OSC) expression. MATERIALS AND METHODS: An analytical experimental method incorporating a posttest only randomized the control group design. The sample consisted of

24 3- to 4-month-old male Cavia porcellus weighing between 300 and 500 g divided into three groups (group 1: control, group 2: received orthodontic treatment, and group 3: received orthodontic treatment with irradiation LILT). LILT biostimulation at a dose of 4 joule/cm(2) was performed daily for 3 min on the mesial-distal labial-palatal of the first dextra and sinistra incisor for 2 weeks. The TGF-Î²1, BALP, and OSC expression was subjected to immunohistochemical analysis. An analysis of variance with multiple comparison, a Tukey's honestly significant difference test, a Kruskal-Wallis test, and a Wilcoxon-Mann-Whitney test were all performed ($p < 0.05$). RESULTS: TGF-Î²1 expression was significantly different ($p = 0.047$; $p < 0.05$) in the tension area, but not in the compression side ($p = 0.154$; $p > 0.05$). BALP expression was significantly different in both the tension ($p = 0.009$) and compression areas ($p = 0.005$; $p < 0.05$). OSC expression was significantly different ($p = 0.034$; $p < 0.05$) in the tension side, but not in the compression area ($p = 1.194$; $p > 0.05$). CONCLUSION: LILT biostimulation can increase TGF-Î²1, BALP, and OSC expression during orthodontic tooth movement.

Photobiomodulation therapy for acute radiodermatitis. PURPOSE OF REVIEW: The number of clinical trials on the use of photobiomodulation therapy (PBMT) for the management of cancer therapy-related complications is growing steadily. One of the side-effects that is under investigation is acute radiodermatitis (ARD), an inflammatory skin reaction caused by radiotherapy. In this review, an overview is given on the state of art of the application of PBMT for the prevention and management of ARD. RECENT FINDINGS: Up to now about seven clinical trials have been performed, investigating the use of PBMT in the prevention and/or management of ARD. Results demonstrate that PBMT can effectively reduce the incidence of severe ARD, decrease the accompanying pain, and improve the patients' quality of life. Moreover, the technique seems to be well tolerated in oncologic patients. SUMMARY: On the basis of the available evidence, there could be a strong recommendation to use PBMT in the prevention and management of ARD in cancer patients. Animals;Humans;Low-Level Light Therapy;Neoplasms;Radiodermatitis;Randomized Controlled Trials as Topic

The effect of red-to-near-infrared (R/NIR) irradiation on inflammatory processes. Introduction: Near-infrared (NIR) and red-to-near-infrared (R/NIR) radiation are increasingly applied for therapeutic use. R/NIR-employing therapies aim to stimulate healing, prevent tissue necrosis, increase mitochondrial function, and improve blood flow and tissue oxygenation. The wide range of applications of this radiation raises questions concerning the effects of R/NIR on the immune system. Methods: In this review, we discuss the potential effects of exposure to R/NIR light on immune cells in the context of physical parameters of light. Discussion: The effects that R/NIR may induce in immune cells typically involve the production of reactive oxygen species (ROS), nitrogen oxide (NO), or interleukins. Production of ROS after exposure to R/NIR can either be inhibited or to some extent increased, which suggests that detailed conditions of experiments, such as the spectrum of radiation, irradiance, exposure time, determine the outcome of the treatment. However, a wide range of immune cell studies have demonstrated that exposure to R/NIR most often has an anti-inflammatory effect. Finally, photobiomodulation molecular mechanism with particular attention to the role of interfacial water structure changes for cell physiology and regulation of the inflammatory process was described. Conclusions: Optimization of light parameters allows R/NIR to act as an anti-inflammatory agent in a wide range of medical applications.
Animals;Blood;Granulocytes;Humans;Inflammation;Infrared Rays

Review of non-invasive body contouring devices for fat reduction, skin tightening and muscle definition. Non-invasive body contouring is a rapidly growing field in cosmetic dermatology. Non-invasive contouring devices improve the body's appearance through the removal of excess adipose tissue, particularly in areas in which fat persists despite optimal diet and exercise routine. The technology can also be used for skin tightening. This article reviews the five FDA-approved non-invasive body contouring modalities: cryolipolysis, laser, high-intensity focused electromagnetic field,

radiofrequency and high-intensity focused ultrasound. These devices have emerged as a popular alternative to surgical body contouring due to their efficacy, favourable safety profile, minimal recovery time and reduced cost. Although they do not achieve the same results as liposuction, they are an attractive alternative for patients who do not want the risks or costs associated with surgery. When used appropriately and correctly, these devices have demonstrated excellent clinical efficacy and safety. Body Contouring;Cryotherapy;Extracorporeal Shockwave Therapy;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Radiofrequency Therapy;Rhytidoplasty

Effects of red and near-infrared LED light therapy on full-thickness skin graft in rats. The aim of the present study was to evaluate the in vivo response of different wavelengths (red and near-infrared) of light-emitting diode (LED) on full-thickness skin grafts (FTSG) in rats. Thirty rats were randomly allocated into three experimental groups: control group (C); red LED treated group (R); and near-infrared LED group (NIR). Skin grafts were irradiated daily for ten consecutive days, starting immediately after the surgery using a red (630Â nm) or near-infrared (850Â nm) LED. The results showed that the red wavelength LED significantly enhanced the skin graft score in relation to the NIR group and increased transforming growth factor beta (TGF-Î²) protein expression and density of collagen fibers compared with the other experimental groups. These results suggest that the red wavelength LED was efficient to improve the dermo-epidermal junction and modulate the expression proteins related to tissue repair. Transforming Growth Factor beta;Collagen Animals;Collagen;Epidermis;Gene Expression Regulation;Infrared Rays;Male;Phototherapy;Rats;Skin Transplantation;Transforming Growth Factor beta;Wound Healing

Acute low-level laser therapy effects on peripheral muscle strength and resistance in patients with fibromyalgia.

Effect of Photobiomodulation Therapy on the Increase of Viability and Proliferation of Human Mesenchymal Stem Cells. BACKGROUND AND OBJECTIVES: We have investigated how low intensity laser irradiation emitted by a multiwave-locked system (MLS M1) affects the viability and proliferation of human bone marrow mesenchymal stem cells (MSCs) depending on the parameters of the irradiation. STUDY DESIGN/MATERIALS AND METHODS: Cells isolated surgically from the femoral bone during surgery were identified by flow cytometry and cell differentiation assays. For irradiation, two wavelengths (808 and 905â€‰nm) with the following parameters were used: power density 195, 230, and 318â€‰mW/cm (2) , doses of energy 3, 10, and 20â€‰J (energy density 0.93-6.27â€‰J/cm (2)), and in continuous (CW) or pulsed emission (PE) (frequencies 1,000 and 2,000 Hz). RESULTS: There were statistically significant increases of cell viability and proliferation after irradiation at 3â€‰J (CW; 1,000â€‰Hz), 10â€‰J (1,000â€‰Hz), and 20â€‰J (2,000â€‰Hz). CONCLUSIONS: Irradiation with the MLS M1 system can be used in vitro to modulate MSCs in preparation for therapeutic applications. This will assist in designing further studies to optimize the radiation parameters and elucidate the molecular mechanisms of action of the radiation. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Cell Proliferation;Cell Survival;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells

Comparison of photobiomodulation using either an intraoral or an extraoral laser on oral mucositis induced by chemotherapy in rats. PURPOSE: The aim of the present study was to compare the effect of intraoral (IO) and extraoral (EO) diode laser irradiation on oral mucositis (OM) induced by 5-fluorouracil (5-FU) in rats. METHODS: Animals (nÂ =â€‰78) were divided into the following groups: negative control (NC), positive control (PC), IO 6Â J/cm(2), EO with 6Â J/cm(2) (EO 6Â J/cm(2)), and 12Â J/cm(2) (EO 12Â J/cm(2)). OM was induced with an intraperitoneal injection of 5-FU and scarification of the buccal mucosa. Over the following 14Â days, animals received photobiomodulation (PBM) daily. Clinical and histological evaluation was done by scores at days 8,

10, and 14. The redox state was evaluated by reactive species levels, antioxidant network, and immunohistochemistry analysis. RESULTS: Clinically, on day 8, PBM groups showed lower scores of OM with EO 6Â J/cm(2) presenting a significantly lower degree compared to PC (pÂ <â€‰0.05). On days 10 and 14, all PBM groups exhibited improvement of OM compared to PC (pÂ <â€‰0.01). On day 8, all PBM groups exhibited an accelerated healing process compared to PC (pÂ <â€‰0.01) and reduction of reactive species (pÂ <â€‰0.001). Also, all PBM groups demonstrated higher levels of antioxidant GPx compared to PC (pÂ <â€‰0.001). Analysis of nitrotyrosine revealed that on day 14, this protein damage marker was significantly reduced in the EO 6Â J/cm(2) group (pÂ >â€‰0.05). CONCLUSIONS: An EO diode laser protocol promoted positive effects in the clinical, histopathological, and redox state in OM induced by 5-FU in rats. Among the EO protocols, EO 6Â J/cm(2) showed the most encouraging results. Animals;Drug Therapy;Drug-Related Side Effects and Adverse Reactions;Humans;Low-Level Light Therapy;Male;Oxidative Stress;Rats;Stomatitis

The Anti-Inflammatory and Anti-Oxidant Mechanisms of the Keap1/Nrf2/ARE Signaling Pathway in Chronic Diseases. Oxidative stress is defined as an imbalance between production of free radicals and reactive metabolites or [reactive oxygen species (ROS)] and their elimination by through protective mechanisms, including (antioxidants). This Such imbalance leads to damage of cells and important biomolecules and cells, with hence posing a potential adverse impact on the whole organism. At the center of the day-to-day biological response to oxidative stress is the Kelch-like ECH-associated protein 1 (Keap1) - nuclear factor erythroid 2-related factor 2 (Nrf2)- antioxidant response elements (ARE) pathway, which regulates the transcription of many several antioxidant genes that preserve cellular homeostasis and detoxification genes that process and eliminate carcinogens and toxins before they can cause damage. The redox-sensitive signaling system Keap1/Nrf2/ARE plays a key role in the maintenance of cellular homeostasis under stress, inflammatory, carcinogenic, and pro-apoptotic conditions, which allows us to consider it as a pharmacological target. Herein, we review and discuss the recent advancements in the regulation of the Keap1/Nrf2/ARE system, and its role under physiological and pathophysiological conditions, e.g. such as in exercise, diabetes, cardiovascular diseases, cancer, neurodegenerative disorders, stroke, liver and kidney system, etc. and such.

Prophylactic Use of Laser Light and Methylene Blue on Ischemia and Liver Reperfusion Injury. OBJECTIVE: This study aimed to evaluate the effect of hepatic preconditioning with laser light in the presence of methylene blue (MB) in the liver ischemia-reperfusion injury process. METHOD: Forty male Wistar rats were divided into 8 experimental groups (nÂ = 5). Saline (.5 mL) or MB (15 mg/kg) was injected intravenously (inferior vena cava). After 2 minutes, 660 nm laser light was applied at a dose of 112.5 DE. Fifteen minutes after the application of saline or MB, 1 hour partial ischemia followed by 15 minutes of reperfusion was applied when the rats were sacrificed. The mitochondrial function parameters (O(2) consumption rates in states 3 and 4 and the respiratory control ratio), osmotic swelling, and determination of malondialdehyde were evaluated. Hepatic function was studied using the serum determination of the alanine aminotransferase and aspartate aminotransferase enzymes. RESULTS AND CONCLUSIONS: MB therapy alone showed the capacity of preserving the rate of oxygen consumption in the mitochondrial respiratory state of the group submitted to ischemia compared to the sham group. However, when combined with low-intensity laser therapy, it failed to replicate the relevant protective effects in relation to oxidative phosphorylation or the mitochondrial membrane ischemia/reperfusion injury. Whether or not MB was combined with laser treatment, it was shown to be efficient in reducing oxidative stress. In relation to alanine aminotransferase enzymes, whether or not laser treatment was combined with MB had a protective effect on the hepatic lesion, whereas in relation to aspartate aminotransferase enzymes only laser treatment was able to provide this protection. Enzyme Inhibitors;Methylene

Blue Animals;Enzyme Inhibitors;Lasers;Liver;Male;Methylene Blue;Oxidative Stress;Oxygen Consumption;Rats;Rats, Wistar;Reperfusion Injury
Effect of photobiomodulation on the stability and displacement of orthodontic mini-implants submitted to immediate and delayed loading: a clinical study. The aim of this study was to evaluate the effect of photobiomodulation (PBM) on the stability and displacement of orthodontic mini-implants (MIs) submitted to loading. Forty-eight and 35 mini-implants (1.5â€‰Ã—â€‰8â€‰Ã—â€‰1Â mm) were assessed for stability and displacement, respectively (19 patients). MIs were allocated according to the intervention in 1-PBM + immediate loading (IL), 2-PBM + delayed loading (DL) (fourÂ weeks after implantation), 3-IL only, and 4-DL only. PBM (Therapy XT, DCM) was implemented using a red emission (660Â nm, 4Â J/cm(2), 0.1Â W, 20Â s) immediately after implantation (day 0) and infrared emissions (808Â nm; 8Â J/cm(2), 0.1Â W, 40Â s) in the following appointments every 48-72Â h duringÂ twoÂ weeks (days 2, 4, 7, 9, 11, and 14). Loading of 150Â gF was applied duringÂ threeÂ months for all MIs. The stability was assessed by resonance frequency analysis (Osstell ISQ), and images from Cone beam computed tomography were evaluated to determine the amount of the displacement of the MI's head. MIs from the PBM groups presented lower loss of stability (Pâ€‰=â€‰0.0372). When the analysis considered the loading protocol as an additional variable, group twoÂ showed the lowest loss of stability, being significantly different from groups that did not receive PBM (Pâ€‰=â€‰0.0161). There was no difference between groups twoÂ and fourÂ during the period without loading (Pâ€‰>â€‰0.05). DL groups presented lower loss when the effective period of loading was assessed, independently of the application of PBM (Pâ€‰<â€‰0.0001). All groups showed displacement of the MIs head without significant differences (Pâ€‰>â€‰0.05). DL potentiated the effect of PBM, decreasing the loss of stability. Dental Implants Adolescent;Anatomic Landmarks;Cone-Beam Computed Tomography;Dental Implants;Female;Humans;Low-Level Light Therapy;Male;Orthodontics;Young Adult
Photobiomodulation effects on keratinocytes cultured in vitro: a critical review. Photobiomodulation therapy (PBMT) has been widely used for the promotion of tissue repair. Despite these therapeutic benefits, in some cases, PBMT appears to be unsuccessful, and the strongest hypothesis is that this failure is due to inadequate light dosimetry and wavelengths. The objective of the present critical review was to evaluate the effects of PBMT on cultured keratinocytes using blue, red, or near-infrared light categorized into arbitrary ranges of energy density (0.1-5.0, 5.1-10.0, 10.1-15.0, and over 15.0Â J/cm(2)). The electronic searches were conducted in PubMed, Web of Science, Scopus and LILACS databases, and included LASER or LED devices. A total of 55 articles evaluating the effects of PBMT on cell viability, proliferation, migration, and cytokine and growth factor production were included. Overall, the studies failed to provide detailed information about light dosimetry or detailed experimental conditions. The vast majority of the energy densities tested produced unmodified results regardless of the wavelength applied. However, it was possible to observe that red and near-infrared light had more stimulatory effects than blue light. In addition, for all parameters analyzed, favorable outcomes were mostly obtained in the range of 0.1-5.0Â J/cm(2). The less explored energy densities were within the 10.1-15.0Â J/cm(2) range. Energy densities above 15.0Â J/cm(2) were ineffective or tended to cause cell death. The heterogeneity of the data does not allow us to define a PBMT range setting protocol that would have beneficial effects on keratinocytes. Cytokines;Intercellular Signaling Peptides and Proteins Cells, Cultured;Cytokines;Humans;Intercellular Signaling Peptides and Proteins;Keratinocytes;Low-Level Light Therapy
Effect of low-level laser therapy and zoledronic acid on bone repair process. This study aimed to evaluate, through histomorphometric analysis, the bone repair process in the tibia of rats treated with zoledronic acid and submitted to 808-nm low-level laser therapy (LLLT) by using arsenide

aluminum gallium laser. For this purpose, 20 rats were used and distributed according to treatment: group 1-saline administration; group 2-treated with LLLT; group 3-treated with zoledronic acid; and group 4-treated with zoledronic acid and LLLT. The zoledronic acid was administered at a dose of 0.035Â mg/kg every 2Â weeks for 8Â weeks. Subsequently, bone defects of 2Â mm were prepared in the tibias of all groups. The bone defects in groups 2 and 4 were irradiated with LLLT in the immediate post-operative period. After 14 and 28Â days of application, the animals were submitted and euthanized for histomorphometric analysis. The results were submitted to statistical analysis (Î±â€‰=â€‰5%), and the intragroup comparison was performed using the t test. On the other hand, for intergroup comparison, the ANOVA test was performed, and to the groups presenting statistically significant difference, the Student-Newman-Keuls test was used. In intergroup comparison, group 1 (mean Â± SD=â€‰45.2â€‰Â±â€‰18.56%) showed a lower bone formation compared with groups 2 (64.13â€‰Â±â€‰3.51%) (pâ€‰=â€‰0.358) and 4 (15.2â€‰Â±â€‰78.22%) (pâ€‰=â€‰0.049), at the 14-day period. Group 3 (20.99â€‰Â±â€‰7.42%) also presented a lower amount of neoformed bone tissue, with statistically significant difference when compared with groups 1 (pâ€‰=â€‰0.002), 2, and 4 (pâ€‰â‰¤â€‰0,001). After 28Â days, group 1 presented a lower amount of neoformed bone tissue compared with the other groups, with pâ€‰=â€‰0.020. Thus, it was concluded that LLLT associated with zoledronic acid is effective for stimulating bone formation in surgically created defects in rats, at the periods studied. Zoledronic Acid Animals;Female;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Osteotomy;Rats, Wistar;Tibia;Wound Healing;Zoledronic Acid

Evaluation of treatment of experimentally induced canine model of multiple sclerosis using laser activated non-expanded adipose derived stem cells. Multiple sclerosis (MS) is a progressive demyelinating disease of the central nervous system that destroys oligodendrocytes. This work aims to evaluate the treatment of experimentally induced MS in dogs using laser activated non-expanded adipose derived stem cells. The results showed amelioration of the clinical signs over time confirmed by the resolution of the previous lesions on MRI. Positive migration of the injected cells to the site of lesion, increased remyelination detected by Myelin Basic Proteins, positive differentiation into Olig2 positive oligodendrocytes, prevented the glial scar formation and restored axonal architecture. The study concluded that treatment using laser activated stem cells holds a promising therapeutic option for treatment of MS in a canine model. Myelin Basic Protein;OLIG2 protein, human;Oligodendrocyte Transcription Factor 2 Adipocytes;Adipose Tissue;Animals;Cell Differentiation;Disease Models, Animal;Dogs;Immunohistochemistry;Lasers;Magnetic Resonance Imaging;Mesenchymal Stem Cells;Multiple Sclerosis;Myelin Basic Protein;Oligodendrocyte Transcription Factor 2;Oligodendroglia;Random Allocation;Spinal Cord

Adjunctive application of antimicrobial photodynamic therapy in the prevention of medication-related osteonecrosis of the jaw following dentoalveolar surgery: A case series. BACKGROUND: Medication-related osteonecrosis of the jaw (MRONJ) is a debilitating complication strongly associated to antiresorptive agents. The present study aimed to describe the use of antimicrobial photodynamic therapy (aPDT) in the prevention of MRONJ. METHODS: The sample consisted of 11 non-oncologic osteoporotic subjects in therapy with non-intravenous antiresorptive agents, requiring tooth extractions and/or implant removal. After minimally invasive surgical extractions, each alveolar socket was debrided and bony edges were smoothened. At this point, aPDT was performed using methylene blue-based phenothiazine chloride dye irradiated with a hand-held 100â€¯mW diode laser with a wavelength of 660â€¯Â±â€¯10â€¯nm. Flaps were sutured to achieve first intention closure. Soft tissue healing was promoted with weekly applications of low-level laser therapy for 6 weeks. Recall visits were scheduled weekly for the first two months and monthly thereafter up to 6 months. At the 6-month appointment, healing was assessed clinically and radiographically. RESULTS: A total of

62 surgical extractions were performed in both jaws, including 51 natural elements and 11 dental implants. No intraoperative complications were observed. Immediate post-operative period was generally uneventful except for mild pain and ecchymosis that occurred rarely and resolved spontaneously. Healing proceeded uneventfully, with no clinical or radiological prodromal manifestations of MRONJ up to the latest follow-up visit. CONCLUSIONS: aPDT might constitute a promising preventive treatment to reduce the risk of MRONJ in non-oncologic osteoporotic patients treated with non-intravenous antiresorptive agents that underwent dentoalveolar surgery. Photosensitizing Agents;Methylene Blue Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Debridement;Female;Humans;Lasers, Semiconductor;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Tooth Extraction;Wound Healing

Differential expression of inflammatory and anti-inflammatory mediators by M1 and M2 macrophages after photobiomodulation with red or infrared lasers. In response to stimuli in the microenvironment, macrophages adopt either the M1 or M2 phenotype to coordinate the tissue repair process. Photobiomodulation (PBM) plays an important role in the modulation of acute inflammation, including cellular influx, macrophage polarization, and the release of inflammatory mediators. The aim of the present study was to evaluate the effects of red and infrared PBM on the mRNA expression of cytokines and chemokines in macrophages polarized to the M1 and M2 phenotypes. J774 macrophages activated to induce M1 (lipopolysaccharide + interferon gamma) or M2 (interleukin-4) phenotypes were irradiated with red or infrared PBM (1Â J). After 4 and 24Â h, gene expression was analyzed by qPCR. PBM at 660Â nm decreased the mRNA expression of CCL3, CXCL2, and TNF-Î± in M1 macrophages and CXCL2 in M2 macrophages 4Â h after irradiation. Similarly, PBM at 780Â nm decreased mRNA expression levels of CCL3 and IL-6 by M1 macrophages 24Â h after irradiation. Moreover, PBM at 780Â nm increased the mRNA expression of TGFÎ²1 4Â h after irradiation and decreased the expression of this gene after 24Â h in M2 macrophages. Although red and infrared PBM were able to modulate and reduce M1/M2a-related markers, infrared laser irradiation promoted a temporal increase in the expression of TGFÎ²1 in M2 macrophages. Thus, depending on the time PBM is used on injured tissue, different parameters can promote optimal results by modulating specific macrophage phenotypes. Biomarkers;Inflammation Mediators Animals;Biomarkers;Cell Line;Gene Expression Regulation;Inflammation;Inflammation Mediators;Infrared Rays;Lasers;Low-Level Light Therapy;Macrophage Activation;Macrophages;Mice, Inbred BALB C;Phenotype

Low-Level Laser Therapy for Fibromyalgia: A Systematic Review and Meta-Analysis. BACKGROUND: Fibromyalgia is a chronic disorder characterized by widespread pain and tenderness. Low-level laser therapy (LLLT), an emerging nonpharmacological treatment, has been used for relieving musculoskeletal or neuropathic pain. OBJECTIVE: The objective of this review and meta-analysis was to determine the efficacy of LLLT on patients with fibromyalgia. STUDY DESIGN: This study involved systematic review and quantitative meta-analysis of published randomized controlled trials (RCTs). SETTING: This study examined all RCTs evaluating the effect of LLLT on fibromyalgia. METHODS: We performed a systematic review and meta-analysis of RCTs evaluating the effect of LLLT on patients with fibromyalgia. PubMed, EMBASE, and the Cochrane Library were searched for articles published before August 2018. RCTs meeting our selection criteria were included. The methodological quality of the RCTs was evaluated according to the Cochrane risk-for-bias method. Review Manager version 5.3 was used to perform the meta-analysis. The primary outcomes were the total scores on the Fibromyalgia Impact Questionnaire (FIQ), pain severity, and number of tender points. The secondary outcomes were changes in fatigue, stiffness, anxiety, and depression. Standardized mean difference (SMD), 95% confidence intervals (CI), and P values were calculated for outcome analysis. RESULTS: We identified 9 RCTs that included 325 fibromyalgia patients undergoing LLLT or placebo

laser treatment with or without an exercise program. The meta-analysis showed that patients receiving LLLT demonstrated significantly greater improvement in their FIQ scores (SMD: 1.16; 95% CI, 0.64-1.69), pain severity (SMD: 1.18; 95% CI, 0.82-1.54), number of tender points (SMD: 1.01; 95% CI, 0.49-1.52), fatigue (SMD: 1.4; 95% CI, 0.96-1.84), stiffness (SMD: 0.92; 95% CI, 0.36-1.48), depression (SMD: 1.46; 95% CI, 0.93-2.00), and anxiety (SMD: 1.46; 95% CI, 0.45-2.47) than those receiving placebo laser. Furthermore, when compared with the standardized exercise program alone, LLLT plus the standardized exercise program provided no extra advantage in the relief of symptoms. On the other hand, the results of the only RCT using combined LLLT/LED phototherapy showed significant improvement in most outcomes except for depression when compared to placebo. When compared with pure exercise therapy, combined LLLT/LED phototherapy plus exercise therapy had additional benefits in reducing the severity of pain, number of tender points, and fatigue. LIMITATIONS: There were some limitations in this review, mostly because of the low-to-middle methodological quality of the selected studies; for example, there was no clear allocation process and only patients were blinded in most studies. In addition, one study used per-protocol analysis with a 20% loss to follow-up. On the other hand, the differences in laser types, energy sources, exposure times, and associated medication status in these studies may have resulted in some heterogeneity. CONCLUSIONS: Our results provided the most up-to-date and relevant evidence regarding the effects of LLLT in fibromyalgia. LLLT is an effective, safe, and well-tolerated treatment for fibromyalgia. KEY WORDS: Low-level laser therapy, fibromyalgia, meta-analysis, FIQ, pain, tender points,exercise. Fibromyalgia;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Stereological and gene expression examinations on the combined effects of photobiomodulation and curcumin on wound healing in type one diabetic rats. We examined the effects of photobiomodulation (PBM) independently and combined with curcumin on stereological parameters and basic fibroblast growth factor (bFGF), hypoxia-inducible factor-1Î± (HIF-1Î±), and stromal cell-derived factor-1Î± (SDF-1Î±) gene expressions in an excisional wound model of rats with type one diabetes mellitus (T1DM). T1DM was induced by an injection of streptozotocin (STZ) in each of the 90 male Wistar rats. One round excision was generated in the skin on the back of each of the 108 rats. The rats were divided into six groups (nâ€‰=â€‰18 per group): control (diabetic), untreated group; vehicle (diabetic) group, which received sesame oil; PBM (diabetic) group; curcumin (diabetic) group; PBMâ€‰+â€‰curcumin (diabetic) group; and a healthy control group. On days 4, 7, and 15, we conducted both stereological and quantitative real-time PCR (qRT-PCR) analyses. The PBM and PBMâ€‰+â€‰curcumin groups had significantly better inflammatory response modulation in terms of macrophages (Pâ€‰<â€‰.01), neutrophils (Pâ€‰<â€‰.001), and increased fibroblast values compared with the other groups at day 4 (Pâ€‰<â€‰.001), day 7 (Pâ€‰<â€‰.01), and day 15 (Pâ€‰<â€‰.001). PBM treatment resulted in increased bFGF gene expression on days 4 (Pâ€‰<â€‰.001) and 7 (Pâ€‰<â€‰.001), and SDF-1Î± gene expression on day 4 (Pâ€‰<â€‰.001). The curcumin group had increased bFGF (Pâ€‰<â€‰.001) expression on day 4. Both the PBM and PBMâ€‰+â€‰curcumin groups significantly increased wound healing by modulation of the inflammatory response, and increased fibroblast values and angiogenesis. The PBM group increased bFGF and SDF-1Î± according to stereological and gene expression analyses compared with the other groups. The PBM and PBMâ€‰+â€‰curcumin groups significantly increased the skin injury repair process toÂ more rapidly reachÂ the proliferation phase of the wound healing in T1DM rats. Curcumin Analysis of Variance;Animals;Curcumin;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Fibroblasts;Gene Expression Regulation;Low-Level Light Therapy;Macrophages;Neovascularization, Physiologic;Rats, Wistar;Wound Healing

Correction to: Are the ergogenic effects of photobiomodulation therapy age-dependent? A randomized double-blinded placebo-controlled trial. The author name Bruno Menfridini Baroni

was incorrectly captured in the original article. The correct author name is Bruno Manfredini Baroni. The original article has been corrected.

Efficacy of phototherapy in the adhesive bonding of different dental posts to root dentin: A systematic review. BACKGROUND: The aim of the current systematic review was to evaluate the efficacy of phototherapy in the adhesive bonding of different dental posts to root dentin. METHODS: The outline of this systematic review followed the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) guidelines. Searches in both electronic and manual literature were performed in the main databases 'MEDLINE' and 'EMBASE' up to March 2019 using the following terms: (Phototherapy) AND (push out test) AND (bond strength) AND (post) OR (fibre) OR (metal) AND (smear layer). RESULTS: Six in-vitro studies were included and processed for data extraction. All studies incorporated the use of fiber posts. The mean shear bond strength for test group ranged from 2.23 to 15.17â€¯MPa while mean shear bond strength for control group ranged from 2.93 to 9.38â€¯MPa. The wavelengths of diode lasers ranged from 660 to 2940â€¯nm (nm). Power was reported in 5 studies ranging from 0.075â€¯W to 3â€¯W. All studies compared shear bond strength of phototherapy in the adhesive bonding of different dental posts to root dentin. In all the included studies, greater bond strength achieved by phototherapy compared to nonirradiated group. CONCLUSION: Within the limits, this study shows that the dentin to post bond strength was significantly enhanced by phototherapy. Dental Cements;Dental Implants Dental Cements;Dental Implants;Dentin;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy

Photobiomodulation via a cluster device associated with a physical exercise program in the level of pain and muscle strength in middle-aged and older women with knee osteoarthritis: a randomized placebo-controlled trial. Osteoarthritis (OA) is a chronic joint disease that leads to pain and functional incapacity. The aim of the study is to investigate the effects of the incorporation of photobiomodulation (PBM) (via cluster) into a physical exercise program on the level of pain, lower limb muscle strength, and physical capacity, in patients with knee OA. Sixty-two female volunteers with a diagnosis of knee OA were distributed in 4 groups: exercise associated with placebo PBM group, exercise associated with active PBM group, active PBM group, and placebo PBM group. Sixteen sessions of lower limb strength exercises and PBM via cluster (808Â nm, 100Â mW, 7 points each side, 56Â J total) were performed. The level of pain, physical capacity, and lower limb muscle strength were evaluated with the use of the numeric pain rating scale (NPRS), 6-min walking test (6-MWT) and timed up and go (TUG), and maximal voluntary isometric torque (MVIT) before and after the interventions. Both groups presented a significant decrease in the level of pain when compared with the placebo-treated women. Furthermore, the 6-MWT showed that the trained groups (with or without PBM) demonstrated higher values in the distance walked comparing pre and post-treatment values. The same behavior was found for the MVIT load before and after intervention. TUG was higher for all the treated with exercise groups comparing the pre and post-treatment values. Physical exercise and PBM showed analgesic effects. However, PBM did not have any extra effect along with the effects of exercise in improving the distance walked, the TUG, and the muscle strength.Trial registration: RBR-7t6nzr. Placebos Aged;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Middle Aged;Muscle Strength;Osteoarthritis, Knee;Pain;Placebos

Treatment of acne scars with PRP and laser therapy: an up-to-date appraisal. Clinically significant scarring is a common complication of acne vulgaris. Recent treatments have included the use of platelet-rich plasma (PRP), especially in combination with laser therapy. Here, we offer backgrounds on PRP and laser therapy and review combination treatment for acne scars. It is important to note that current data are limited to small studies and that there is no standard protocol for PRP administration. Larger studies are needed to better evaluate combination treatment and determine the best modality. Acne Vulgaris;Blood Transfusion, Autologous;Cicatrix;Combined

Modality Therapy;Humans;Low-Level Light Therapy;Platelet-Rich Plasma;Severity of Illness Index;Skin;Treatment Outcome

Photobiomodulation by a 635nm Diode Laser on Peri-Implant Bone: Primary and Secondary Stability and Bone Density Analysis-A Randomized Clinical Trial. INTRODUCTION: Various procedures in dental implantology are performed to enhance the bone healing process and implant stability. One of these methods can be a low-level laser therapy (LLLT). OBJECTIVES: The aim of our study was to evaluate the stabilization (primary and secondary) and bone density in peri-implant zone after LLLT protocol using a 635 nm diode laser. MATERIAL AND METHODS: The research included 40 implants placed in the posterior region of a mandible in 24 patients (8 women and 16 man; age: 46.7 Â± 8.7 years). The patients were randomly divided into 2 groups G1 (n=12, 18 implants) and G2 (n=12, 22 implants) according to the treatment procedure; G1 (test): 635 nm laser, with handpiece diameter: 8mm, output power: 100mW, spot area: 0.5024cm(2), average power density: 199.04mW/cm(2), continuous mode, dose: 4J per point (8J/cm(2)), time: 40 sec per point, 2 points (irradiation on a buccal and a lingual side of the alveolus/implant), and total energy per session 8J; G2 (control): no laser irradiation. The G1 (test) group's implants were irradiated according to the following protocol: 1 day before surgery, immediately after the surgery and 2, 4, 7, and 14 days after. The total energy after all therapeutic sessions was 48J. The implants stability was measured employing a Periotest device (Periotest Test Value: PTV) (measured immediately after the surgery, 7 days, 2 weeks, 4 weeks, and 2 and 3 months after the surgery) and the bone density using cone-beam computed tomography (grayscale value) (measured immediately after the surgery, 4 weeks and 12 weeks after the treatment). RESULTS: The average implant stability at different time points showed lower PTV value (higher stability) at 2(nd) and 4(th) week after 635 nm laser irradiation (G1) compared with a control (G2) group ($p<0.01$). The secondary stability of the implants after 12 weeks observation was not significantly higher for the laser group in contrast to none-irradiated implants ($p>0.05$). The mean grayscale value at the apical, middle, and cervical level of the titanium implants showed the reduction of pixel grayscale value after 2 weeks and was lower for the G1 group in contrast to the G2 group ($p<0.01$). The value of grayscale after 12 weeks was significantly higher at the middle and apical level of the implants in the G1group in contrast to the G2 group ($p<0.01$). CONCLUSION: The application of the 635 nm diode laser enhanced secondary implant stability and bone density. However, to assess the impact of the LLLT on peri-implant bone with different bone densities, further well-controlled long-term trials on larger study groups are needed. Dental Implants Bone Density;Case-Control Studies;Cone-Beam Computed Tomography;Dental Implants;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged

Use of combined fractional carbon dioxide laser and fractional microneedle radiofrequency for the treatment of acne scars: A retrospective analysis of 1-month treatment outcome on scar severity and patient satisfaction. BACKGROUND: Acne scars lead to social and psychological problems for patients, and they should be treated effectively. Ablative and nonablative lasers have been used for the treatment of acne scars in recent years. AIMS: The aim of this study was to evaluate the effectivity of combined FCL and FmRF treatment for acne scars retrospectively. METHODS: A total of 72 patients with acne scars who received FCLÂ +Â FmRF treatment between 2014 and 2016 were included in this study. Photographs of patients before treatment and 1Â month following the last treatment session were scored by two blinded researchers, according to the ECCA acne scar scoring method. Patients were contacted via telephone after 1Â month following the last treatment and asked to evaluate their satisfaction with the treatment outcome using a 5-point Likert-type scale. RESULTS: A significant decrease was noted in ECCA scores after the treatment along with temporary side effects. Change from pretreatment scores was significantly higher in patients very satisfied vs satisfied with treatment. The number of treatment sessions was positively correlated with treatment-

related change in ECCA scores. CONCLUSIONS: In conclusion, our findings revealed association of FCLÂ +Â FmRF treatment with significantly improved ECCA scores, mild pain experience, and low rate of side effects in patients with acne scars, despite usage of high-energy FLC dose and five sessions of treatment on average. More remarkable improvement in ECCA scores during treatment seems to be associated with higher patient satisfaction and to be more likely in patients with darker skin types. Acne Vulgaris;Adult;Cicatrix;Combined Modality Therapy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Needles;Pain Measurement;Pain, Procedural;Patient Satisfaction;Radiofrequency Therapy;Retrospective Studies;Treatment Outcome;Young Adult

Bactericidal Effect of 2780â€‰nm Er,Cr:YSGG Laser Combined with 940â€‰nm Diode Laser in Enterococcus faecalis Elimination: A Comparative Study. Objective: This study aims to compare the bactericidal efficacy of different Er,Cr:YSGG disinfection methods, particularly combined application of Er,Cr:YSGG and Diode laser. Background: Root canal disinfection is important for long-term endodontic success. Different laser systems are proposed as alternatives to conventional techniques in bacterial elimination. Materials and methods: Ninety-five straight, single-rooted premolars with similar canal dimensions were selected. After the mechanical preparation, the samples were sterilized, and root canals were infected with Enterococcus faecalis. The samples were randomly divided into five groups (nâ€‰=â€‰15): 5% NaOCl, Er,Cr:YSGG, Er,Cr:YSGG +5% NaOCl, Er,Cr:YSGG + Diode, and control group. Results: The maximal bacterial elimination was observed in Er,Cr:YSGG + NaOCl group (pâ€‰<â€‰0.005). More bacteria were found in Er,Cr:YSGG and Er,Cr:YSGG + Diode groups compared with 5% NaOCl group (pâ€‰<â€‰0.005). Marginal significance was detected between the Er,Cr:YSGG group and the Er,Cr:YSGG + Diode group (pâ€‰=â€‰0.091). Conclusions: The most successful E. faecalis elimination was obtained from laser-activated irrigation group. As combined application of Er,Cr:YSGG and Diode laser gives suggestive results, further studies with larger sample sizes are needed to clarify the outcome. Root Canal Irrigants;Sodium Hypochlorite Bicuspid;Dental Pulp Cavity;Disinfection;Enterococcus faecalis;Humans;In Vitro Techniques;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Random Allocation;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite

Light-emitting diode-based photobiomodulation reduces features of allergic asthma in mice. Airway Remodeling;Animals;Asthma;Female;Hypersensitivity;Low-Level Light Therapy;Mice;Mice, Inbred BALB C

Photobiomodulation therapy reduces acute pain and inflammation in mice. Photobiomodulation (PBM) is a therapy suggested for the treatment of pain and inflammation. Different mechanisms have been proposed to explain the analgesic and inflammatory effects of photobiomodulation, but there are still gaps on the mechanisms underlying. The objective was to investigate the analgesic and anti-inflammatory effect of red LED, as well as to investigate the possible mechanism of action in acute nociception models. Radiation was applied with red LED (660â€¯nm, 215â€¯mW, 84.64â€¯mW/cm(2), 2.531â€¯J/cm(2) (30s); 5.07â€¯J/cm(2) (60s) 7.61â€¯J/cm(2) (90s) and 10.15â€¯J/cm(2) (120â€¯s)). The red LED applied 60â€¯s before the experiments, promoted reduction of the nociceptive neurogenic (1st phase) and inflammatory pain (2nd phase) induced by intraplantar (i.pl.) injection of formalin. This effect duration in the second phase was 180â€¯min after pretreatment of the LED. Red LED also reduced nociception induced by intraperitoneal injection of acetic acid. Furthermore, red LED prevented nociception induced by i.pl. injection of cinnamaldehyde, capsaicin, menthol and acidified saline. It was demonstrate the involvement of glutamatergic system with the reduction the nociception induced by glutamate. The red LED was able to prevent nociception induced by intracellular signaling cascades activators, phorbol 12-myristate 13-acetate (PMA), bradykinin, forskolin and prostaglandin. In addition, red LED, respectively, from 30 to 90s demonstrated an antiedematogenic effect on ear edema and reduction the migration of inflammatory cells induced by

single application of croton oil. Thus, the new findings in this study support some underlying mechanism by which red LED phototherapy reduces acute pain. However, need further clarification regarding analgesic and anti-inflammatory effect of the photobiomodulation in preclinical studies. Acrolein;Dinoprostone;cinnamaldehyde Acrolein;Acute Pain;Animals;Dinoprostone;Ear;Edema;Inflammation;Light;Low-Level Light Therapy;Male;Mice;Nociception

Pediatric Laser Therapy in Pigmented Conditions. Advances in laser therapy have led to novel therapeutic approaches to common pediatric skin conditions. As a non-invasive alternative to surgical options, laser therapy is efficacious in treating a broad range of conditions, from vascular and pigmented lesions to tattoo and hair removal. This paper reviews the basic mechanics of laser therapy, its role in common pigmented pediatric dermatoses, and special considerations for this unique age group. Anesthetics, Local Age Factors;Anesthetics, Local;Child;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Nevus, Pigmented;Pain;Pain Management;Pigmentation Disorders;Skin;Skin Neoplasms;Skin Pigmentation;Tattooing;Treatment Outcome

Low-level laser therapy affects dentinogenesis and angiogenesis of in vitro 3D cultures of dentin-pulp complex. To investigate the effects of gallium-aluminum-arsenide (GaAlAs) diode laser low-level laser therapy (LLLT) on angiogenesis and dentinogenesis of the dentin-pulp complex in a human tooth slice-based in vitro model. Forty tooth slices were prepared from 31 human third molars. Slices were cultured at 37Â Â°C, 5% CO(2), and 95% humidity and randomly assigned to one of the following groups: group I: no laser treatment, group II: 660-nm diode laser; energy densityâ€‰=â€‰1Â J/cm(2), group III: 660-nm diode laser; energy densityâ€‰=â€‰3Â J/cm(2), group IV: 810-nm diode laser; energy densityâ€‰=â€‰1Â J/cm(2) and group V: 810-nm diode laser; energy densityâ€‰=â€‰3Â J/cm(2). LLLT was applied on the third and fifth days of culture. After 7Â days, tissues were retrieved for real-time RT-PCR analysis to investigate the expression of VEGF, VEGFR2, DSPP, DMP-1, and BSP in respect to controls. Lower energy density (1Â J/cm(2)) with the 660Â nm wavelength showed a statistically significant up-regulation of both angiogenic (VEGF: 15.3-folds and VEGFR2: 3.8-folds) and odontogenic genes (DSPP: 6.1-folds, DMP-1: 3-fold, and BSP: 6.7-folds). While the higher energy density (3Â J/cm(2)) with the 810Â nm wavelength resulted in statistically significant up-regulation of odontogenic genes (DSPP: 2.5-folds, DMP-1: 17.7-folds, and BSP: 7.1-folds), however, the angiogenic genes had variable results where VEGF was up-regulated while VEGFR2 was down-regulated. Low-level laser therapy could be a useful tool to promote angiogenesis and dentinogenesis of the dentin-pulp complex when parameters are optimized. Adult;Cell Culture Techniques;Dental Pulp;Dentinogenesis;Female;Humans;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Odontogenesis;Young Adult

Treatment of CafÃ©-Au-Lait Spots Using Q-Switched Alexandrite Laser: Analysis of Clinical Characteristics of 471 Children in Mainland China. BACKGROUND AND OBJECTIVES: CafÃ©-au-lait spots, also known as cafÃ©-au-lait macules (CALMs), are a common pigmentary disorder. Although various laser modalities have been used to treat CALMs, the efficacy of laser treatment in children differs from that in adults. We investigated the efficacy, safety, and clinical factors of the treatment of CALMs using Q-switched alexandrite laser (755â€‰nm) therapy in children. METHODS: In total, 471 children with CALMs underwent Q-switched alexandrite laser therapy at a treatment interval of 3-12 months. The safety and efficacy of the laser treatment were evaluated by reviewing clinical records and photographs before and after treatments. RESULTS: Of the 471 patients, 140 (29.72%) were cured completely, 124 (26.33%) showed substantial improvement, 110 (23.35%) showed improvement, and 97 (20.60%) showed no improvement after one to nine treatments. The overall treatment success rate was 79.41%, and the treatment efficacy was positively correlated with

the number of laser treatments (rsâ€‰=â€‰0.26, Pâ€‰<â€‰0.0001). Sex and the interval of laser treatments were also associated with significant differences in treatment outcomes (Pâ€‰<â€‰0.05). No obvious adverse effects were observed. Multivariate logistic regression analysis showed that the number of treatments influenced the treatment efficacy (odds ratio, 2.130; 95% confidence interval, 1.561-2.908). CONCLUSIONS: Q-switched alexandrite laser (755â€‰nm) therapy is safe and highly effective for CALMs in children, and the number of treatments affects the treatment efficacy. Lasers Surg. Med. Â© 2019 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Adolescent;Age Factors;Cafe-au-Lait Spots;Child;Child, Preschool;China;Cohort Studies;Esthetics;Female;Follow-Up Studies;Humans;Infant;Lasers, Solid-State;Logistic Models;Low-Level Light Therapy;Male;Multivariate Analysis;Prospective Studies;Risk Assessment;Sex Factors;Time Factors;Treatment Outcome

Low-level laser therapy alleviates the deleterious effect of doxorubicin on rat adipose tissue-derived mesenchymal stem cells. Cancer is a leading cause of death worldwide, and doxorubicin (DOX) has become one of the most commonly prescribed drugs. Stem cell (SC) therapy is proving to be a promising strategy to alleviate DOX adverse effects on non-cancerous cells. However, the drug also has a toxic action on SCs, reducing the efficiency of cell therapy from a preventive view. The present study shows that the DOX toxicity in mesenchymal SCs (MSCs) can be partially overcome by low-level laser irradiation (LLLI). To achieve this, we applied the low-level red laser (wavelength: 660â€¯nm; output power: 30â€¯mW; laser beam: 0.028â€¯cm(2); irradiation: 1.07â€¯mW/cm(2); Ga-Al-As Photon Laser III, DMC, SÃ£o Paulo, Brazil) in rat adipose tissue-derived MSCs before their exposure to different DOX concentrations. Results revealed that the DOX reduced the viability and adenosine triphosphate level of MSCs. These findings were followed by significantly increased apoptosis as well as oxidative stress in the MSCs. Interestingly, LLLI at the dose of 0.2â€¯J alleviated the effects of DOX on cell viability and apoptosis, and inhibited oxidative stress in the MSCs. In summary, this study provides a crucial step toward the future application of LLLI as a protective approach against DOX-induced toxicity in MSCs, particularly cell death. This study also lays the groundwork for further investigation into the role of oxidative stress and inflammation as an instructive milieu for cell protection. Cytokines;Doxorubicin;Adenosine Triphosphate Adenosine Triphosphate;Adipose Tissue;Animals;Apoptosis;Cell Survival;Cells, Cultured;Cytokines;Doxorubicin;Lasers;Mesenchymal Stem Cells;Oxidative Stress;Rats

Corrigendum to "Effects of laser acupuncture in a patient with a 12-year history of facial paralysis: A case report" [Complement. Ther. Med. 43 (April) (2019) 306-310]. BACKGROUND: Traumatic facial palsy, whether accidental or iatrogenic, is a common cause of facial paralysis. Laser acupuncture therapy (LAT) is a non-invasive, pain-free method to stimulate traditional acupuncture points with non-thermal laser irradiation. Low-level laser therapy has proven beneficial in the regeneration of peripheral nerves. This case report describes the feasibility of this innovative treatment in a patient with a 12-year history of traumatic facial palsy and severe sequelae. CASE SUMMARY: A52-year-old male presented with a severe left-sided facial paralysis that had lasted for 12 years. At initial presentation, the man could not fully close his left eye and had difficulty eating solid foods. The paralysis of his left-sided facial muscles had resulted in dysarthria. He was administered 30 LAT sessions in the Acupuncture Department of China Medical University Hospital, Taichung, Taiwan, over a 4-month period. His recovery was monitored by scores on the Facial Disability Index, the Sunnybrook Facial Nerve Grading System and measurements of the vertical palpebral distance in his left eye. Photographs were taken after every treatment. On the 10(th) treatment, a change in closure of the left eye was noticed and facial muscle strength was improved. After 22 treatments, the patient could fully close his left eye. CONCLUSION: LAT significantly

improved the sequelae of long-term facial paralysis in this patient. Large-scale prospective studies are needed to confirm this observation.

Thermographic evaluation of occlusal splint and low level laser therapy in myofascial pain syndrome. OBJECTIVE: The purpose of this study was to compare and evaluate the effects of occlusal splint and low dose laser treatments clinically and thermographically in patients with myofascial pain syndrome. METHODS: Twenty patients aged 18-45 with myofascial pain syndrome were involved into this study. Patients were examined by clinically and Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) was used for the diagnosis of TMD. Patients divided into two groups. First group treated with stabilisation splint, while the other one with low level laser therapy (LLLT). Pre- and post-treatment pain intensity, muscle sensitivity and the superficial skin temperature differences over the masseter and anterior temporal muscle were assessed, and comparison was made within and between the groups pre- and post-operatively. RESULTS: In both groups, there was a significant decrease in temperature values, especially in the masseter region (pâ€‰<â€‰0.05) and post-treatment pain intensity and muscle sensitivity values were lower than the pre-treatment values (pâ€‰<â€‰0.05). In addition, the heat values in certain regions of the masseter were lower in the LLLT group than in the splint group and there was a statistical difference in these regions between two groups (pâ€‰<â€‰0.05). However, there was no statistical difference in the pain intensity and muscle sensitivity between both groups (pâ€‰>â€‰0.05). CONCLUSION: It was concluded that both occlusal splint therapy and low level laser therapy were effective in the treatment of MPS, and when thermographic data were taken into account, LLLT treatments could provide more advantageous results in these patients. Adult;Female;Humans;Low-Level Light Therapy;Myofascial Pain Syndromes;Occlusal Splints;Pain Measurement;Thermography;Treatment Outcome

Combined Effect of Low-Level Laser Treatment and Levothyroxine on Wound Healing in Rats With Hypothyroidism. Introduction: Hypothyroidism delays wound healing by reducing the synthesis of keratinocytes, fibroblast cells, and collagen. Methods for enhancement of wound healing include laser therapy and hormone therapy. The current study evaluated the combined effect of laser and levothyroxine therapy to cure wounds in male rats with hypothyroidism. Methods: Sixty male Wistar rats were randomly divided into 5 groups: (1) healthy controls; (2) controls with hypothyroidism; (3) hypothyroidism + laser treatment; (4) hypothyroidism + levothyroxine treatment; (5) hypothyroidism + laser + levothyroxine treatment. Hypothyroidism was induced by dissolving 4 mg of methimazole in 100 mL of drinking water daily for 28 days. After hypothyroidism had been confirmed, a longitudinal incisional wound was created on the dorsal rib cages of the rats. The wounds that received laser treatment were divided into 12 sections and treated at 810 nm wavelength and 0.2 J/cm2 of energy density for 200 seconds. Levothyroxine was administrated in doses of 20 Âµg/kg/d i.p. All groups were divided into 3 subgroups for testing on days 4, 7 and 14. Samples were collected in all the subgroups. Results: The results showed that hypothyroidism reduced fibrous tissue volume, fibroblasts, and basal cell numbers. The combined effect of laser and levothyroxine improved all parameters. Conclusion: Combined laser and levothyroxine treatment showed the best effect on wound healing and accelerated the closure of the wounds.

Effect of Laser Irradiation on Cell Cycle and Mitosis. Introduction: In this research, low-level helium-neon (He-Ne) laser irradiation effects on monkey kidney cells (Vero cell line) mitosis were studied. Methods: The experiment was carried out on a monkey kidney cell line "Vero (CCL-81)". This is a lineage of cells used in cell cultures and can be used for efficacy and media testing. The monolayer cells were formed on coating glass in a spectral cuvette (20Ã—20Ã—30 mm). The samples divided into two groups. The first groups as irradiated monolayer cells were exposed by a He-Ne laser (PolyaronNPO, L'vov, Ukraine) with Î»=632.8 nm, max power density (P) = 10 mW/cm2 , generating linearly polarized and the second groups as the control monolayer cells were located in a cuvette

protected by a lightproof screen from the first cuvette and also from the laser exposure. Then, changing functional activity of the monolayer cells, due to the radiation influence on some physical factors were measured. Results: The results showed that low-intensity laser irradiation in the range of visible red could make meaningful changes in the cell division process (the mitosis activity). These changes depend on the power density, exposure time, the presence of a magnetic field, and the duration of time after exposure termination. The stimulatory effects on the cell division within the power density of 1-6 mW/(cm2) and exposure time in the range of 1-10 minutes was studied. It is demonstrated that the increase in these parameters (power density and exposure time) leads to destructing the cell division process. Conclusion: The results are useful to identify the molecular mechanisms caused by low-intensity laser effects on the biological activities of the cells. Thus, this study helps to optimize medical laser technology as well as achieving information on the therapeutic effects of low-intensity lasers.

Low-Power Laser Irradiation (LPLI): A Clinical Point of View on a Promising Strategy to Improve Liver Regeneration. The capacity of the liver to regenerate is an important clinical issue after major hepatectomies and makes the difference between life and death in some cases of post-operative malfunction when the liver remnant is too small or has an impaired regenerative capacity. Several approaches have been tested to stimulate hepatic regeneration after post-operative hepatic failure syndrome; however, they have produced controversial results. A quick, simple, and harmless method that can be used intraoperatively and capable of promoting an increased regenerative capacity of the remaining liver would be very welcome. Thus, based on the data in the literature, we presented low-power laser irradiation (LPLI) as a quick, simple, and harmless method to improve liver regeneration after major hepatectomies. This article highlights the current evidence about the effects of LPLI on liver regeneration, and also suggests laser therapy as an important tool for regenerative stimulation in clinical practice.

Low-level laser therapy in treatment of chemoradiotherapy-induced mucositis in head and neck cancer: results of a randomised, triple blind, multicentre phase III trial. BACKGROUND: Low-level laser therapy (LLLT) also called Photobiomodulation therapy (PBMT) could reduce oral mucositis (OM) incidence and severity in head and neck cancer patients treated by chemoradiotherapy, however randomised data about efficacy and safety are missing with curative dose 4â€‰J/cm(2). METHODS: This phase III trial was conducted in patients with oral cavity, or oro/hypopharyngeal cancers (stage III or IV). Patients were treated by lasertherapy on OM lesions gradeâ€‰â‰¥â€‰2 (4â€‰J/cm(2) or placebo), during chemoradiotherapy and until recovery. Severity of OM (incidence and duration of grades â‰¥3) was used as primary endpoint and blindly assessed. RESULTS: Among 97 randomised patients, 83 patients (85.6%) could be assessed finally (erroneous inclusions, chemoradiotherapy interruptions) and 32 patients had no lasertherapy because of unreachable OM lesions. Randomisation and population characteristics (sex ratio, age, chemoradiotherapy procedures, toxicities incidence) were still comparable between the two LLLT/PBMT groups. An acute OM (gradeâ€‰â‰¥â€‰3) was observed in 41 patients (49.4%): 23 patients (54.8%) of the active laser group versus 18 (43.9%) in the control group (modified intend to treat, pâ€‰=â€‰0.32). Median time before occurrence of OMâ€‰â‰¥â€‰grade 3 in half of the patients was 8â€‰weeks in active laser group (vs. 9â€‰weeks in control group). However, 95% of patients exhibited a very good tolerance of LLLT/PBMT. CONCLUSIONS: This study assessed LLLT/PBMT according to the Multinational Association of Supportive care in Cancer recommendations but lacked power. LLLT/PBMT was well tolerated with a good safety profile, which promotes its use in clinical routine for severe OM treatment. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT01772706 . TITLE: Laser Mucite ORL: Effectiveness of Laser Therapy for Mucositis Induced by a Radio-chemotherapy in Head and Neck Cancer (LaserMucite). Study Start Date: October 2008. Primary Completion Date: October

2016. Responsible Party: Institut de CancÃ©rologie de l'Ouest - Paul Papin. Principal Investigator: Eric Jadaud, M.D., Institut de CancÃ©rologie de l'Ouest - Paul Papin. FUNDING: French Ministry of Health, French national funding scheme (PHRC 2008). Aged;Carcinoma, Squamous Cell;Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Prognosis;Quality of Life;Severity of Illness Index;Stomatitis

The effect of 808â€‰nm and 905â€‰nm wavelength light on recovery after spinal cord injury. We investigated the effect of a Multiwave Locked System laser (with a simultaneous 808â€‰nm continuous emission and 905â€‰nm pulse emission) on the spinal cord after spinal cord injury (SCI) in rats. The functional recovery was measured by locomotor tests (BBB, Beam walking, MotoRater) and a sensitivity test (Plantar test). The locomotor tests showed a significant improvement of the locomotor functions of the rats after laser treatment from the first week following lesioning, compared to the controls. The laser treatment significantly diminished thermal hyperalgesia after SCI as measured by the Plantar test. The atrophy of the soleus muscle was reduced in the laser treated rats. The histopathological investigation showed a positive effect of the laser therapy on white and gray matter sparing. Our data suggests an upregulation of M2 macrophages in laser treated animals by the increasing number of double labeled CD68+/CD206+ cells in the cranial and central parts of the lesion, compared to the control animals. A shift in microglial/macrophage polarization was confirmed by gene expression analysis by significant mRNA downregulation of Cd86 (marker of inflammatory M1), and non-significant upregulation of Arg1 (marker of M2). These results demonstrated that the combination of 808â€‰nm and 905â€‰nm wavelength light is a promising non-invasive therapy for improving functional recovery and tissue sparing after SCI. Antigens, CD;Antigens, Differentiation, Myelomonocytic;B7-2 Antigen;CD68 antigen, human;Lectins, C-Type;Mannose Receptor;Mannose-Binding Lectins;Receptors, Cell Surface Animals;Antigens, CD;Antigens, Differentiation, Myelomonocytic;B7-2 Antigen;Lectins, C-Type;Locomotion;Low-Level Light Therapy;Male;Mannose Receptor;Mannose-Binding Lectins;Rats;Rats, Wistar;Receptors, Cell Surface;Spinal Cord;Spinal Cord Injuries;Spinal Cord Regeneration

Tumor safety and side effects of photobiomodulation therapy used for prevention and management of cancer treatment toxicities. A systematic review. Photobiomodulation therapy (PBMT), also known as low-level laser therapy (LLLT), has been increasingly used for the treatment of toxicities related to cancer treatment. One of the challenges for the universal acceptance of PBMT use in cancer patients is whether or not there is a potential for the light to stimulate the growth of residual malignant cells that evaded oncologic treatment, increasing the risk for tumor recurrences and development of a second primary tumor. Current science suggests promising effects of PBMT in the prevention and treatment of breast cancer-related lymphedema and oral mucositis, among other cancer treatment toxicities. Nevertheless, this seems to be the first systematic review to analyze the safety of the use of PBMT for the management of cancer-related toxicities. Scopus, MEDLINE/PubMed, and Embase were searched electronically. A total of 27 articles met the search criteria. Selected studies included the use of PBMT for prevention and treatment of oral mucositis, lymphedema, radiodermatitis, and peripheral neuropathy. Most studies showed that no side effects were observed with the use of PBMT. The results of this systematic review, based on current literature, suggest that the use of PBMT in the prevention and management of cancer treatment toxicities does not lead to the development of tumor safety issues. Humans;Low-Level Light Therapy;Lymphedema;Neoplasms;Randomized Controlled Trials as Topic;Stomatitis;Treatment Outcome

Revisiting the Photon/Cell Interaction Mechanism in Low-Level Light Therapy. Objective: Several reports claim that the enzyme cytochrome c oxidase (CCO) is the primary absorber for red-to-near-infrared (R-NIR) light in cells and causal for mitochondrial adenosine triphosphate (ATP) upregulation,

and that pulsed R-NIR light has frequent therapeutic effects, which are superior to those of the continuous wave (CW) mode used in low-level light therapy (LLLT). Background data: Convincing evidence that the absorption of R-NIR photons by CCO is involved in mitochondrial ATP upregulations as well as a coherent explanation for the superiority of the pulsed irradiation mode is presently lacking in the literature. Methods: A comprehensive literature search and rigorous analysis of the data published on the idea that CCO is the primary absorber for R-NIR light, and of the claim that the effectivity of the pulsed irradiation mode can be derived from the absorption of R-NIR photons by CCO, reveal a number of severe inconsistencies. Results: A systematical analysis covering both the theory that CCO is the primary acceptor for R-NIR light and of its use to interpret differences between the biological effect of pulsed light and CW casts doubt on the general validity of the CCO-based hypothesis. Instead, we are offered a simple and conflict-free model accounting for both ATP upregulation and superiority of the pulsed mode in LLLT, which is in agreement with the results of recent laboratory experiments. Conclusions: CCO is not the primary acceptor for R-NIR light. Adenosine Triphosphate;Electron Transport Complex IV Adenosine Triphosphate;Cell Communication;Electron Transport Complex IV;Low-Level Light Therapy;Mitochondria;Photons;Up-Regulation

Parameters and Effects of Photobiomodulation in Plantar Fasciitis: A Meta-Analysis and Systematic Review. Objective: This systematic review and meta-analysis updated the effects of photobiomodulation therapy (PBMT) on pain, the Foot Function Index (FFI), and the effects on fascial thickness in adults with acute or chronic plantar fasciitis (PF). Methods: A systematic literature search was conducted in the PubMed (Public/Publisher MEDLINE), EMBASE (Excerpta Medica Database), and CINAHL (Cumulative Index to Nursing and Allied Health Literature) databases. Two researchers independently screened titles and abstracts of the retrieved studies for eligibility. A random-effects model was used for this meta-analysis. Subgroup meta-analyses were conducted to evaluate the influence of PBMT in pain and foot function under investigation and the study design on the overall weighted mean effect size. Results: From a total of 3865 studies, 7 randomized controlled trials were selected after final review and 4 were selected for meta-analysis. There was a significant difference between PBMT and control for Visual Analog Scale (Chi(2)â€‰=â€‰29.30; pâ€‰<â€‰0.00001) with an I(2) value of 90% in favor of PBMT versus the control. The overall effect of PBMT was statistically significant (pâ€‰<â€‰0.02) with PBMT favoring for thickness of the plantar fascia reduction. FFI between PBMT and control group [Chi(2) -83.46, dfâ€‰=â€‰1 (pâ€‰<â€‰0.00001)]; I(2)â€‰=â€‰99% in favor of the PBMT. Conclusions: This meta-analysis presents evidence that PBMT is an effective treatment modality to reduce pain and improvement of foot function in patients with chronic PF, however, a broad discrepancy was found in the PBMT dosimetry. The ideal treatment parameters for PF need to be elucidated. Fasciitis, Plantar;Humans;Low-Level Light Therapy

Noninvasive light emitting diode therapy: A novel approach for postinfarction ventricular arrhythmias and neuroimmune modulation. BACKGROUND: Sympathetic neural activation plays a key role in the incidence and maintenance of acute myocardial infarction (AMI) induced ventricular arrhythmia (VA). Furthermore, previous studies showed that AMI might induce microglia and sympathetic activation and that microglial activation might contribute to sympathetic activation. Recently, studies showed that light emitting diode (LED) therapy might attenuate microglial activation. Therefore, we hypothesized that LED therapy might reduce AMI-induced VA by attenuating microglia and sympathetic activation. METHODS: Thirty anesthetized rats were randomly divided into three groups: the Control group (nâ€‰=â€‰6), AMI group (nâ€‰=â€‰12), and AMIâ€‰+â€‰LED group (nâ€‰=â€‰12). Electrocardiogram (ECG) and left stellate ganglion (LSG) neural activity were continuously recorded. The incidence of VAs was recorded during the first hour after AMI.

Furthermore, we sampled the brain and myocardium tissue of the different groups to examine the microglial activation and expression of nerve growth factor (NGF), interleukin-18 (IL-18), and IL-1Î², respectively. RESULTS: Compared to the AMI group, LED therapy significantly reduced the incidence of AMI-induced VAs (ventricular premature beats [VPB] number: 85.08â€‰Â±â€‰13.91 vs 27.5â€‰Â±â€‰9.168, Pâ€‰<â€‰.01; nonsustained ventricular tachycardia (nSVT) duration: 34.39â€‰Â±â€‰8.562 vs 9.005â€‰Â±â€‰3.442, Pâ€‰<â€‰.05; nSVT number: 18.92â€‰Â±â€‰4.52 vs 7.583â€‰Â±â€‰3.019, Pâ€‰<â€‰.05; incidence rate of SVT/VF: 58.33% vs. 8.33%, Pâ€‰<â€‰.05) and reduced the LSG neural activity (Pâ€‰<â€‰.01) in the AMIâ€‰+â€‰LED group. Furthermore, LED significantly attenuated microglial activation and reduced IL-18, IL-1Î², and NGF expression in the peri-infarct myocardium. CONCLUSION: LED therapy may protect against AMI-induced VAs by suppressing sympathetic neural activity and the inflammatory response. IL1B protein, rat;Interleukin-18;Interleukin-1beta;Ngf protein, rat;Nerve Growth Factor Action Potentials;Animals;Disease Models, Animal;Heart;Heart Rate;Interleukin-18;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microglia;Myocardial Infarction;Myocardium;Nerve Growth Factor;Neuroimmunomodulation;Paraventricular Hypothalamic Nucleus;Rats, Sprague-Dawley;Stellate Ganglion;Tachycardia, Supraventricular;Tachycardia, Ventricular;Time Factors;Ventricular Premature Complexes

Carbon@polypyrrole nanotubes as a photosensitizer in laser phototherapy of Pseudomonas aeruginosa. Phototherapy has been offered as an alternative and promising antibacterial strategy to overcome the antibiotic resistance problem. This study evaluated the antibacterial and phototherapy effects of carbon nanotubes with a polypyrrole coating in a core@shell structure (CNTs@PPy) on Pseudomonas aeruginosa (P. aeruginosa). P. aeruginosa was treated with CNTs@PPy at different concentrations (50-500â€‰Î¼g mL(-1)) in dark or laser light irradiation with a wavelength of 808â€‰nm, a power density of 1000â€‰mW cm(-2) for 20â€‰min. Temperature increment, cell viability, formation of reactive oxygen species (ROS) and protein/nucleic acid leakage subsequent the P. aeruginosa treatment were evaluated. The results showed that near-infrared laser irradiation of CNTs@PPy caused to a temperature increment confirming the ability of powerful photokilling of P. aeruginosa in a photothermal route. On the other hand, while CNTs@PPy represented just a 30-50% P. aeruginosa killing rate in dark, laser irradiation of 250 and 500â€‰Î¼g mL(-1) concentrations of CNTs@PPy resulted in a Ëœ70% P. aeruginosa killing rate, along with significant ROS production into the medium and protein and nucleic acid leakage from P. aeruginosa. These later effects were assigned to a photodynamic route activity of CNTs@PPy upon laser irradiation. Therefore, CNTs@PPy acted as a photosensitizer in both photothermal and photodynamic therapies to present an enhanced bactericidal activity to annihilate and destroyed the gram-negative bacteria P. aeruginosa, a cause of many infectious diseases. Nanotubes, Carbon;Photosensitizing Agents;Polymers;Pyrroles;polypyrrole Colony Count, Microbial;Fluorescence;Laser Therapy;Nanotubes, Carbon;Photosensitizing Agents;Polymers;Pseudomonas aeruginosa;Pyrroles;Temperature

Combined treatment of recalcitrant papulopustular rosacea involving pulsed dye laser and fractional microneedling radiofrequency with low-dose isotretinoin. BACKGROUND: While a considerable number of cases with papulopustular rosacea (PPR) are resistant to conventional medications, therapeutic regimens are not currently established. Pulsed dye laser (PDL) and fractional microneedling radiofrequency (FMR) have previously demonstrated satisfactory results for anti-angiogenesis, anti-inflammation, and dermal remodeling. AIMS: To evaluate the efficacy and safety of novel combination regimen with low-dose oral isotretinoin, PDL, and FMR in the treatment of recalcitrant PPR. PATIENTS AND METHODS: A retrospective study was undertaken for recalcitrant PPR patients to evaluate the clinical course of novel combination regimen. Twenty-five PPR patients who

had failed in previous first-line therapies were enrolled. They were treated with three sessions of PDL and FMR consecutively at 4-week intervals, maintaining daily oral administration of 10Â mg isotretinoin for 8Â weeks. Objective assessments, erythema index measurement, and patients' subjective satisfaction were evaluated at each visit and 16Â weeks after the final treatment. RESULTS: At the final follow-up visit, the number of papules and pustules decreased by 71%, and erythema index by 54% compared with baseline (PÂ <Â 0.05 for both). Physician's global assessment based on rosacea severity score and patients' subjective assessments paralleled with these results. No serious side effect was observed during whole study periods. CONCLUSION: This novel combination regimen demonstrated satisfactory efficacy with reasonable safety profiles for the treatment of recalcitrant PPR. Isotretinoin Administration, Oral;Adult;Combined Modality Therapy;Dose-Response Relationship, Drug;Female;Follow-Up Studies;Humans;Isotretinoin;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Needles;Patient Satisfaction;Radiofrequency Therapy;Retrospective Studies;Rosacea;Severity of Illness Index;Treatment Outcome

ALA-PDT combined with holmium laser therapy of postoperative recurrent extramammary Paget's disease. Extramammary Paget's disease (EMPD) is a rare intraepithelial neoplasm arising in apocrine rich area of the skin. Surgery is the standard treatment but relapse is common. The postoperative skin defects, penile reconstruction, functional effects and old age are also challenges for curing disease. Herein, a case of postoperative recurrent EMPD, which was treated by combination therapy of non-invasive repeatable ALA-PDT and deep penetrated holmium laser is reported. Ultrasonography monitor of lesions showed light vascularity and the formerly hypoechoic lesion disappeared after treatment. Photosensitizing Agents;Aminolevulinic Acid Aged;Aminolevulinic Acid;Combined Modality Therapy;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Paget Disease, Extramammary;Photochemotherapy;Photosensitizing Agents

How to Write a Good Photobiomodulation Article. Humans;Low-Level Light Therapy;Medical Writing;Periodicals as Topic;Publishing;Research Design;Terminology as Topic

Photobiomodulation for the treatment of periodontal pockets in patients with type 2 diabetes: 1-year results of a randomized clinical trial. This study investigated the local effect of photobiomodulation (PBM) for the treatment of periodontal pockets in patients with periodontitis and type 2 diabetes. Thirty-eight periodontal pockets presenting probing depth (PD) and clinical attachment level (CAL)â€‰â‰¥â€‰5Â mm were selected from 19 patients (two pockets/patient). The selected periodontal pockets were randomly assigned to receive mechanical debridement only (control group) or mechanical debridement with PBM (PBM group). Clinical measures, such as PD, CAL, bleeding on probing (BoP), and presence of supragingival biofilm (PI), were collected and compared at baseline, 3, 6, and 12Â months. After 12Â months, no statistically difference was observed for mean PD and mean CAL when control and PBM groups were compared. The frequency of pockets with PD 5-6Â mm was significantly lower for the PBM group at 6Â months when compared to the control group. Pockets with PDâ€‰â‰¥â€‰7Â mm changed significantly between baseline and 3, 6, and 12Â months for the PBM group, while for the control group, statistical significance was only observed between baseline and 6Â months. The PBM protocol used in this study did not provide significant changes for PD and CAL in periodontal pockets when compared to mechanical therapy only. However, PBM was more effective in reducing the percentage of moderate periodontal pockets at 6Â months in patients with type 2 DM. Debridement;Diabetes Mellitus, Type 2;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Pocket

Low-level laser therapy dosimetry most used for oral mucositis due to radiotherapy for head and neck cancer: a systematic review and meta-analysis. Dosimetry for low-level laser therapy (LLLT) depends on several parameters, such as target tissue type, lesion type and laser equipment used. This

study aimed to determine the most used LLLT dosimetry for the treatment and prevention of oral mucositis (OM) resulting from radiation therapy (RT) in head and neck cancer patients (HNCP). This research was conducted according to the PRISMA guidelines using the PICO framework. After extensively searching PubMed, Web of Science, Embase, Scopus, BVS and Cochrane Library databases, we found 130 records and selected 7 studies, involving 363 HNCP with an average age of 60.6 years who received RT. Briefly, sites affected by tumors were the following: oral cavity (170), oropharynx (91), throat (42), larynx (32), nasopharynx (11), hypopharynx (9), and in 8 cases, sites were not reported. These studies used several classifications for OM (RTOG/EORTC, WHO, NCI-CTC) and pain (NRS, VAS and modified VAS). These various researchers performed the LLLT punctual application of different forms using several protocols making analysis difficult. However, LLLT was effective regardless of the parameters used (632.8â€‰nm to 685â€‰nm, 1.8â€‰J/cm(2) to 3.0â€‰J/cm(2), 10â€‰mW to 60 Mw, 0.8â€‰J to 3.0â€‰J). The meta-analysis showed a better results with preventive LLLT 660â€‰nm, 3.8â€‰J/cm(2), 15â€‰mW; 0.15â€‰J compared to preventive LLLT 660â€‰nm, 1.3â€‰J/cm(2), 5â€‰mW; 0.05â€‰J (OMS: pâ€‰=â€‰0.03; NCI-CTC: pâ€‰=â€‰0.027). We conclude that there is, as of yet, no evidence of better laser dosimetry being more effective. Thus, randomized clinical trials to determine which doses of LLLT are most appropriate for treating and preventing OM due to RT are lacking and should be further investigated. Adult;Aged;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Middle Aged;Radiation Injuries;Radiometry;Stomatitis

Acne Treatment With Light Absorbing Gold Microparticles and Optical Pulses: An Open-Label European Multi-Centered Study in Moderate to Moderately Severe Acne Vulgaris Patients. BACKGROUND AND OBJECTIVE: Recently, a novel acne treatment based on selective photothermolysis of pilosebaceous units with follicular delivery of inert gold microparticles as an exogenous chromophore and diode laser pulses has been developed. To evaluate the efficacy and safety of a single monotherapy treatment regimen with gold microparticles and diode laser exposure in patients with moderate and moderately severe acne. Further, to evaluate the added benefit of a second treatment regimen combined with pharmaceutical acne treatment in patients with inadequate initial response. MATERIALS AND METHODS: Patients with moderate and moderately severe facial acne were recruited in this open-label, pilot study. A single treatment regimen consisted of three weekly facial treatments with topically applied gold microparticles and diode laser pulses. Outcome measures were the proportion of patients with â‰¥40% improvement in number of acne lesions (weighted lesion count [WLC]) at 12 weeks (single treatment regimen, primary outcome measure), 24, and 36 weeks from baseline (two treatment regimens), safety, and patient satisfaction. RESULTS: A total of 28 patients were enrolled in the study (18 males, 10 females, 19 patients with moderate acne severity, 9 with moderately severe, mean age: 19.8 years). Twenty-five patients underwent analysis for outcome measures. After a single monotherapy treatment regimen, 76% patients (19/25) achieved â‰¥40% reduction in WLC (mean WLC reduction: 63%; SD: 13%). Of the patients undergoing two treatment regimens (nâ€‰=â€‰9 patients), 56% experienced a reduction in acne lesion burden (WLC) â‰¥40% at 24 weeks and 89% 36 weeks post-baseline. Mean pain score was 4.0 (SD: 1.3), and transient erythema and perifollicular edema were commonly noted after treatment. Most patients (81%) were either "satisfied" or "very satisfied" with the treatment. CONCLUSION: Acne therapy based on selective photothermolysis with gold microparticles shows promise and may be used in treatment of moderate to moderately severe acne. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Particulate Matter;Gold Acne Vulgaris;Adolescent;Adult;Denmark;Esthetics;Female;Follow-Up Studies;Gold;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Particulate Matter;Patient Satisfaction;Pilot Projects;Prospective Studies;Severity of Illness Index;Switzerland;Treatment Outcome;Young Adult

Efficacy of Combined Intense Pulsed Light (IPL) With Fractional CO(2) -Laser Ablation in the Treatment of Large Hypertrophic Scars: A Prospective, Randomized Control Trial. BACKGROUND AND OBJECTIVES: Scar rehabilitation is a complex process that incorporates medical, surgical, and physical therapeutic measures to best restore function and visual normalcy. Lasers have emerged as essential tools in the management of scars, with devices available to address scar size, dyschromia, and contour irregularities. As different lasers treat these different features, multi-laser, same session therapeutic approaches may offer a more comprehensive approach to scar revision. In this study, we aim to demonstrate the effect of a combinatorial, same session treatment with intense pulsed light (IPL) and fractional ablative CO(2) as compared to single laser treatment with fractional ablative CO(2) laser alone or control in the treatment of mature hypertrophic scars. MATERIALS AND METHODS: This institutional review board-approved, randomized controlled trial, enrolled 23 healthy adults with large (>100â€‰cm(2)) hypertrophic scars who were randomized to one of three treatment arms: (i) IPL and CO(2) ablative fractional laser (AFL), (ii) CO(2) AFL alone, and (iii) control (no laser treatment). Subjects underwent a total of four treatment sessions at 6-8-week intervals with follow-up visits at 1, 3, and 6 months following the last treatment session. Primary endpoints included blinded scoring of before and after photographs via the Manchester Scar Scale (MSS). Secondary endpoints included the Patient-Observer Scar Assessment Scale (POSAS). RESULTS: As compared to control and CO(2) AFL laser alone, the combination of CO(2) AFL and IPL demonstrated statistically significant improvement across a greater number of scar domains, as assessed by the MSS. 100% of subjects in both treatment groups showed a statistically significant decrease in the POSAS scale after the series of four treatment sessions. No adverse events were reported. CONCLUSION: Treatment with combined IPL and CO(2) AFL demonstrated higher average improvements across the majority of assessed scar domains, as compared to both control and CO(2) laser alone. The difference was not statistically significant in overall MSS score as expected due to the role of CO(2) as the main source of improvement. However, only the combination group had statistically significant improvement in both color and texture. These findings support the assertion that a multi-photo-thermolytic approach with combined IPL and CO(2) AFL can have a positive impact on the treatment of hypertrophic scars by using multiple wavelengths to maximize laser-skin interactions in targeting the different chromophores expressed in scar tissue. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Adult;Analysis of Variance;Biopsy, Needle;Cicatrix, Hypertrophic;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Risk Assessment;Severity of Illness Index;Treatment Outcome;Young Adult

Photobiomodulation Therapy in the Treatment of Chronic Dysphagia Post Hormonal Therapy in a Breast Cancer Patient. Among the few supportive care measures available for the management of dysphagia, Photobiomodulation (PBM) therapy, defined as the therapeutic use of light, has shown significant promise. In this case report, effective management of chronic dysphagia post hormonal therapy in a breast cancer patient was made. Experts in the supportive care in cancer and PBM proposed and requested further investigations of the protocol used in this case report in the management of dysphagia. In this case report, the protocol of PBM was proposed by experts in supportive care in cancer. Functional outcome swallowing scale for staging oropharyngeal dysphagia was used to assess the effectiveness of the treatment in pre-operative, per and post-operative stage. This case reports that PBM is effective in the management of dysphagia, a side effect of hormonal therapy in a cancer patient.

Photobiomodulation as an Inflammatory Therapeutic Following Dental Prophylaxis in Canines. Objective: The aim of this study was to determine if a single photobiomodulation treatment can reduce oral erythema and edema following routine dental prophylaxis in canines. Background:

Photobiomodulation therapy has been documented to accelerate healing time through mitigation of erythema and edema in human and veterinary patients. Methods: Canine patients were randomly assigned into three groups: CG (Control, nâ€‰=â€‰9, mock gingiva treatment without irradiation), LTG (left side treated, nâ€‰=â€‰8, irradiation of left upper and lower dental arcade), and RTG (right side treated, nâ€‰=â€‰7, irradiation of right upper and lower dental arcade). Immediately following anesthetized dental prophylaxis, the canines in the RTG and LTG received four points of irradiation (GaAlInP-650â€‰nm, continuous wave, 0.1 W, 0.2 W/cm(2), 100â€‰sec, 10â€‰J, 20â€‰J/cm(2)). Erythema and edema along the gingival surface of each dental arcade were scored 24â€‰h after treatment by a blinded veterinary evaluator. Analysis of variance and Bonferroni correction were used for data analysis. Results: Using a composite evaluation, there was significantly lower inflammation scores for the RTG (pâ€‰=â€‰0.017) and LTG (pâ€‰=â€‰0.025) relative to the CG at the location of the lower right dental arcade. Evaluating erythema individually, a significant reduction was found in the LTG (pâ€‰=â€‰0.049) when compared with the CG for the lower left dental arcade. Conclusions: Despite the limitations in this study, the canines who received a single photobiomodulation treatment demonstrated some degree of reduction in oral inflammation and erythema following dental prophylaxis. Animals;Dental Prophylaxis;Dogs;Edema;Erythema;Female;Gingiva;Lasers, Semiconductor;Low-Level Light Therapy;Male;Periodontal Diseases

Photobiomodulation Therapy Versus Extracorporeal Shock Wave Therapy in the Treatment of Lateral Epicondylitis. Objective: To compare the effects of photobiomodulation therapy (PBMT) and extracorporeal shock wave therapy (ESWT) on lateral epicondylitis (LE). Background: Although several authors have investigated the effects of PBMT and ESWT on LE, only one study to date has compared ESWT with PBMT. Ours is also the first study assessing patient satisfaction levels and quality of life in addition to comparing the two methods. Methods: Forty-three patients were randomly divided into two groups: 23 (mean age: 48.2â€‰Â±â€‰9.4; 17 female, 6 male) were included in the PBMT group and 20 (mean age: 48.0â€‰Â±â€‰9.9; 15 female, 5 male) in the ESWT group. PBMT was applied three times a week for 4 weeks, and ESWT once a week for 4 weeks. Stretching and eccentric strengthening exercises were also given to both groups as a home program. The Mayo Elbow Performance Score and disabilities of the arm, shoulder, and hand (DASH) were used for evaluating upper extremity functions. Pain intensity was evaluated using a visual analog scale (VAS), and muscle strengths were also assessed using a hand-held dynamometer. The 12-Item Short Form (SF-12) Survey Physical and Mental Component Scales were used to evaluate quality of life, and the global rating of change scale to evaluate patient satisfaction. Patients were assessed before treatment and at 12-week follow-up. Results: Improvements for elbow extension and shoulder flexion strength and for VAS movement were observed only in the PBMT group, whereas improvement of handgrip strength was present in both groups (pâ€‰<â€‰0.05). However, handgrip strength was superior in the PBMT group than in the ESWT group (pâ€‰=â€‰0.02). Conclusions: Both PBMT and ESWT are useful and can be used in the treatment of LE. Adult;Exercise Therapy;Extracorporeal Shockwave Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Pain Measurement;Patient Satisfaction;Quality of Life;Range of Motion, Articular;Tennis Elbow;Treatment Outcome

Low-Level Laser Therapy and Light Energy. Humans;Low-Level Light Therapy

Effects of Erbium:Yttrium-Aluminum-Garnet Laser Irradiation on Bovine Dentin Contaminated by Cariogenic Bacteria. Objective: This study was performed to determine the bactericidal effects of erbium:yttrium-aluminum-garnet (Er:YAG) laser irradiation and the morphological and chemical composition changes in bovine dentin. Methods: Dentin slabs were prepared from bovine incisors, and then cultured with Streptococcus mutans to produce bacteria-infected dentin samples. The

samples were randomly divided into five groups with Er:YAG laser irradiation energy densities of 0, 6.37, 12.73, 19.11, and 25.47â€‰J/cm(2). After irradiation, samples were stained and observed by confocal laser scanning microscopy. The bactericidal abilities were measured using live/dead staining. The morphology and chemical components were investigated by scanning electron microscopy and energy-dispersive spectrometry. Results: After irradiation, the elimination of bacteria and the smear layer were significantly better in the high energy density groups (19.11, 25.47â€‰J/cm(2)) than in the low energy density groups (6.37, 12.73â€‰J/cm(2); pâ€‰<â€‰0.001). On morphological examination, the group with minimum energy density (6.37â€‰J/cm(2)) showed superficial melting. In the high energy density groups (12.73, 19.11, and 25.47â€‰J/cm(2)), laser-irradiated dentin showed a clean surface with open orifices. Significant increases were observed in the weight percentages of calcium (from 19.75 Â± 0.69 to 34.47 Â± 2.91, pâ€‰<â€‰0.001) and phosphate (from 8.58 Â± 0.43 to 15.10 Â± 1.81, pâ€‰<â€‰0.001), whereas significant decreases were observed for oxygen (from 49.84 Â± 0.69 to 36.39 Â± 2.86, pâ€‰<â€‰0.001) and carbon (from 26.06 Â± 3.58 to 12.80 Â± 2.26, pâ€‰<â€‰0.01) with increasing energy density. Conclusions: This study confirmed that Er:YAG laser irradiation has bactericidal and dentin conditioning effects. Animals;Cattle;Dentin;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Confocal;Streptococcus mutans;Tissue Culture Techniques

Complementary low-level laser therapy for breast cancer-related lymphedema: a pilot, double-blind, randomized, placebo-controlled study. This pilot, double-blind, randomized, placebo-controlled study is aimed at evaluating the effectiveness of low-level laser therapy (LLLT) as a complementary treatment to complete decongestive therapy (CDT) treating lymphedema among breast cancer patients for 12Â months post-intervention. Study population was breast cancer patients who were diagnosed and referred to lymphedema clinic for CDT. Participants (nâ€‰=â€‰22) were randomized and assigned into either an active laser intervention group or an inactive laser placebo-control group. Active LLLT was administered to participants twice a week at the beginning of each CDT session. Outcome measures included lymphedema symptoms, symptom distress, and limb volume by an infrared perometer. Participants in the active and placebo laser groups were comparable in demographic and clinical predictors of lymphedema. In comparison with the placebo group (83.3%), significantly fewer participants in the active laser group (55.6%) reported more than one lymphedema symptom (pâ€‰=â€‰0.012) at 12Â months post-intervention. Significantly, more patients in the active laser group (44.4%) reported less than two impaired limb mobility symptoms in comparison with the placebo group (33.3%) at 12Â months post-intervention (pâ€‰=â€‰0.017). The active laser group had statistically significant improvements in symptom distress of sadness (pâ€‰=â€‰0.005) from 73 to 11% and self-perception (pâ€‰=â€‰0.030) from 36 to 0% over time from baseline to 12-months post-intervention. There was no significant reduction in limb volume. Findings of the trial demonstrated significant benefits of complementary LLLT for relieving symptoms and improvement of emotional distress in breast cancer patients with lymphedema. Placebos Breast Neoplasms;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Lymphedema;Middle Aged;Patient Compliance;Placebos;Treatment Outcome

Treatment of skin soft tissue embolism after hyaluronic acid injection for injection rhinoplasty in Asian patients. INTRODUCTION: The purpose of this manuscript is to investigate the treatment of skin soft tissue embolization or vascular occlusion after the injection of hyaluronic acid (HA) for Injection Rhinoplasty (IR) in Asians with a special interest in the time occurrence of the occlusion. METHODS: A total of 35 cases were evaluated after receiving HA injections for IR who presented with a vascular occlusive event. They were divided into three stages based on the time to embolization. Immediate, â‰¤5Â hours; early, â‰¤3Â days; and late, >3Â days. There were two cases of immediate, 28 deemed early, and five late. Methods to prevent tissue necrosis are reviewed in the

manuscript based on these stages. RESULTS: Skin color gradually recovered to normal after 11 treatments in 11 patients with mild embolization. No ischemic aggravation or skin necrosis was observed in 19 patients with moderate embolization; red scarring was seen in two and hypertrophic scar with uneven skin color in one patient. The five patients in the severe category had longer healing, more red scars, and more hypertrophic scarring. CONCLUSION: The treatment of skin soft tissue embolization or vascular occlusion after HA IR in Asians can be effected by identifying the stage and degree of embolization and treating appropriately with the outlines presented in this manuscript. Anti-Inflammatory Agents;Dermal Fillers;Vasodilator Agents;Hyaluronic Acid;Hyaluronoglucosaminidase Adult;Anti-Inflammatory Agents;Asian People;Cicatrix, Hypertrophic;Dermal Fillers;Embolism;Female;Humans;Hyaluronic Acid;Hyaluronoglucosaminidase;Injections, Subcutaneous;Lasers, Dye;Low-Level Light Therapy;Male;Massage;Necrosis;Rhinoplasty;Skin;Time Factors;Vasodilator Agents;Young Adult

Concomitant Use of Hyaluronic Acid and Laser in Facial Rejuvenation. BACKGROUND: Facial aging is a process that involves many different changes. Therefore, in many patients, it may be necessary to perform a combined treatment. Botulinum toxin A and dermal fillers are the two most popular nonsurgical cosmetic procedures performed globally to treat age-associated changes. However, there are not many studies reporting the concomitant use of dermal fillers and laser technology for facial rejuvenation. This review aims to assess the concomitant use of dermal hyaluronic acid (HA) fillers and laser technology for facial rejuvenation. METHODS: The present updated consensus recommendations are based on the experience and opinions of the authors and on a literature search. RESULTS: If a combined procedure (HA and light treatments) is to be performed, on the same day, the panel recommends starting always with the light treatments, avoiding skin manipulations after having injected HA. To customize the therapeutic management, it is crucial to establish a precise diagnosis of the photodamage and loss of volumes suffered by the patients. CONCLUSIONS: The currently available scientific evidence about the combined use of HA fillers and laser-radiofrequency-intense pulsed light (laser/RF/IPL) is limited and encompasses mainly small and nonrandomized studies. Nevertheless, most of these studies found that, on average, the concomitant use (same day) of laser and HA fillers for facial rejuvenation represents an effective and safe strategy which improves clinical results and patient's satisfaction. Future well-designed clinical studies are needed regarding the effectiveness and safety of combination filler/laser treatments. LEVEL OF EVIDENCE IV: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Dermal Fillers;Hyaluronic Acid Aged;Combined Modality Therapy;Dermal Fillers;Esthetics;Face;Female;Humans;Hyaluronic Acid;Injections, Subcutaneous;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Rejuvenation;Risk Assessment;Skin Aging;Treatment Outcome

Biological effects of low-level laser irradiation (LLLI) on stem cells from human exfoliated deciduous teeth (SHED). OBJECTIVES: To investigate the effects of low-level laser irradiation (LLLI) on viability/proliferation, migration, osteo/odontogenic differentiation, and in vitro biomineralization of stem cells from human exfoliated deciduous teeth (SHED). MATERIALS AND METHODS: SHED cultures were established by enzymatic dissociation from pulps of deciduous teeth. SHED were irradiated with a diode laser (InGaAsP; 940Â nm; 0.2Â W, continuous mode) at energy fluences 4, 8, and 16Â J/cm(2) in the dark, while non-irradiated SHED served as control. Cell viability/proliferation was evaluated by MTT assay and cell mobilization by Transwellâ„¢ migration assay. Expression of osteo/odontogenesis-related genes (ALP, BMP-2, BGLAP, DSPP, MSX2, RUNX2) was assessed by real-time PCR, while in vitro biomineralization by Alizarin Red staining. Statistical analysis was performed by two-way ANOVA and Tukey's post hoc tests (*pâ€‰<â€‰0.05, **pâ€‰<â€‰0.01). RESULTS: Statistically significant

stimulation of cell viability/proliferation was observed at all energy fluences, reaching the highest effect for the 4 and 16Â J/cm(2). Although the 8Â J/cm(2) fluence showed the lowest stimulatory effect on cell viability/proliferation, it was the most effective in inducing SHED migration, upregulation of odontogenesis-related genes (DSPP, ALP, BMP-2) at specific time-points, and the in vitro biomineralization potential of SHED compared to the other two energy fluences. CONCLUSIONS: LLLI proved beneficial in promoting SHED biological processes critical for pulp repair in deciduous teeth. Overall, the 8Â J/cm(2) energy fluence showed the most beneficiary effects. CLINICAL RELEVANCE: These results provide insights on a narrow "therapeutic window" of LLLI application in vital pulp therapies of deciduous teeth, paving the way for the establishment of effective clinical protocols. Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Dental Pulp;Humans;Lasers;Stem Cells;Tooth, Deciduous

Light-emitting diode irradiation using 660â€‰nm promotes human fibroblast HSP90 expression and changes cellular activity and morphology. We evaluated changes in cell viability and morphology in response to low-level light irradiation and underlying variations in the levels of heat shock proteins (HSPs). Human fibroblasts were irradiated with a light-emitting diode (LED) array at 660â€‰nm (50â€‰mW for 15, 30, and 60â€‰minutes). Cell viability and morphological changes were evaluated via epifluorescence analysis; we also assessed cell viability and length changes. The expression levels of adenosine triphosphate (ATP) and various HSPs (HSP27, 60, 70, and 90) were analyzed by immunohistochemical staining, Western blotting and microarray analysis. After LED irradiation, cellular viability and morphology changed. Of the several HSPs analyzed, the HSP90 level increased significantly, suggesting that this protein played roles in the morphological and cellular changes. Thus, low-level irradiation triggered cellular changes mediated by increased HSP90 expression; this may explain why skin irradiation enhances wound-healing. Chaperonin 60;HSP70 Heat-Shock Proteins;HSP90 Heat-Shock Proteins;HSPD1 protein, human;Mitochondrial Proteins;Adenosine Triphosphate Adenosine Triphosphate;Cell Proliferation;Cell Survival;Chaperonin 60;Fibroblasts;Gene Expression Profiling;Gene Expression Regulation;HSP70 Heat-Shock Proteins;HSP90 Heat-Shock Proteins;Humans;Immunohistochemistry;Low-Level Light Therapy;Microscopy, Fluorescence;Mitochondrial Proteins;Skin;Wound Healing

Clinical evidence of photobiomodulation therapy (PBMT) on implant stability and success: a systematic review and meta-analysis. BACKGROUND: Photobiomodulation therapy (PBMT), a type of light therapy that uses the concept of photobiomodulation, is developed to promote bone healing. Clinical studies have been conducted to assess the influence of PBMT on dental implant stability and success rate. This is the first systematic review and meta-analysis to assess the effect of PBMT and methodological quality of these studies on implants in human clinical trials. METHODS: An electronic search was performed in Pubmed, Embase, and the Cochrane Controlled Register of Trials (CENTRAL). RESULTS: Initially, 675 articles were identified, among which only 8 met the inclusion criteria. Four of the 8 studies presented a low risk of bias, whereas the other 4 were of moderate risk. Our review focused on implant success rates and implant stability measured at days 0 and 10, and at 3, 4, 6, and 12â€‰weeks. No significant differences were observed between the PBMT group and the control group regarding implant stability or success rate. CONCLUSIONS: The existing clinical studies did not provide sufficient evidence to observe positive effects of PBMT on implants in patients. An increased number of high-quality clinical randomized controlled trials (RCTs) are required to verify the data and to draw convincing conclusions. Dental Implants Dental Implantation, Endosseous;Dental Implants;Humans;Low-Level Light Therapy

A prospective study comparing topic platelet-rich plasma vs. placebo on reducing superficial perioral wrinkles and restore dermal matrix. Introduction: The goal of our prospective study was to assess the efficacy of the topical Platelet-rich plasma on reducing superficial perioral wrinkles and

restoring the dermal matrix. Materials and methods: 50 women with moderate to severe perioral wrinkles were treated on the perioral area by a single session of fractional CO2 laser skin resurfacing plus intradermal injection of prp. 25 patients (group 1) applied topically prp twice a day for 12Â weeks as post laser treatment. 25 (group 2) applied gentamicin and betamethasone twice a day for the first 7Â days and then hyaluronic acid gel for the following 12Â weeks. Results: In group 1, moisture ($p < 0.001$), amount of collagen fiber ($p < 0.001$) skin elasticity ($p < 0.001$), PSAI ($p < 0.001$) and SSAI ($p < 0.001$) improved significantly. In group 2 all the parameters investigated improved but did not reach significant difference. Discussion: Our medical device with a plasma-like formulation is able to maintain prp active for a period of 7Â days so patients are able to apply topically growth factors at home. Conclusions: Our prospective study proves that the use of topical prp reduces superficial perioral wrinkles and restore dermal matrix when used at home for 12Â weeks. Anti-Bacterial Agents;Anti-Inflammatory Agents;Gentamicins;Hyaluronic Acid;Collagen;Betamethasone Administration, Cutaneous;Adult;Anti-Bacterial Agents;Anti-Inflammatory Agents;Betamethasone;Collagen;Combined Modality Therapy;Cosmetic Techniques;Face;Female;Gentamicins;Humans;Hyaluronic Acid;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Platelet-Rich Plasma;Prospective Studies;Regenerative Medicine;Rejuvenation;Skin Aging

Pulsed dye laser in the treatment of basal cell carcinoma: A single session versus two sessions - a randomized controlled trial. BACKGROUND: Basal cell carcinoma is the most common form of skin cancer worldwide. It has a specialized microvasculature system that can be targeted by the pulsed dye laser using the theory of selective photothermolysis. OBJECTIVE: To evaluate the efficacy and safety of single session versus two sessions of pulsed dye laser in the treatment of basal cell carcinoma. METHODS: A total of 22 patients with basal cell carcinoma were collected in this randomized controlled trial. The patients were divided into two groups: Group I - 11 patients were treated by one session of pulsed dye laser, and Group II - 11 patients received two sessions of pulsed dye laser 2 weeks apart. The patients were assessed clinically and histopathologically after end of the treatment. RESULTS: There was a significant improvement of basal cell carcinoma clinically and histopathologically. Maximal histological clearance rate was achieved in superficial basal cell carcinoma type, small-sized basal cell carcinoma < 0.7 cm and in cases with strong inflammatory response after laser treatment. Treatment of basal cell carcinoma with two sessions of pulsed dye laser was more effective than one session treatment. LIMITATIONS: The small sample size of patients and the limited location of the lesions on the head compared with trunk and extremities. Also, the lack of adequate study power may prevent generalization of results. CONCLUSION: Pulsed dye laser proved to be a safe, effective and noninvasive modality for the treatment of basal cell carcinoma that can be used as a monotherapy in small-sized lesions. Also, it can be used to debulk large-sized lesions before surgery. Adult;Aged;Carcinoma, Basal Cell;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Skin Neoplasms;Treatment Outcome

SMILE With Low Energy Levels: Assessment of Early Visual and Optical Quality Recovery. PURPOSE: To assess early visual and optical quality recovery according to preoperative refraction after small incision lenticule extraction (SMILE) at low energy level for myopia and myopic astigmatism treatment. METHODS: This prospective study included 101 eyes of 101 patients separated into three groups: low myopia (30 eyes), with a mean spherical equivalent (SE) of -2.13 Â± 0.73 diopters (D); moderate myopia (33 eyes), with a mean SE of -4.53 Â± 0.86 D; and high myopia (38 eyes), with a mean SE of -6.54 Â± 0.78 D. Visual acuity, contrast sensitivity, refraction, corneal higher order aberrations, modulation transfer function, Strehl ratio, and Objective Scatter Index (OSI) were measured. RESULTS: All eyes had a corrected distance visual acuity of 20/20 or better at 1 day in the low myopia group and 1 month in the moderate and high myopia groups. The contrast sensitivity

preoperative values recovered at 8 days in the low myopia group and 1 month in the moderate and high myopia groups. At 1 month, the low myopia group recovered the OSI preoperative values (0.61 to 0.69) and the OSI values were slightly higher than the preoperative value in the moderate and high myopia groups (0.74 to 1.00 and 0.8 to 1.14, respectively). CONCLUSIONS: The recovery time of visual and optical quality in the first month after SMILE correlated with preoperative refraction and the amount of postoperative scattering. Patients with low myopia recovered visual acuity faster and with less ocular scattering than patients with moderate or high myopia. [J Refract Surg. 2019;35(5):285-293.]. Adult;Astigmatism;Contrast Sensitivity;Corneal Stroma;Corneal Surgery, Laser;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Myopia;Prospective Studies;Recovery of Function;Refraction, Ocular;Treatment Outcome;Vision Tests;Visual Acuity;Young Adult

Clinical Outcomes of Low-level Laser Therapy in Management of Advanced Implant Surgery Complications: A Comparative Clinical Study. INTRODUCTION: Nowadays, implant insertion is accompanied by undesired consequences. As surgery techniques become more and more complex, an increase of intra- and post-op complications can be expected. Application of low-level laser (LLL) is one of the conservative approaches to control the complications with any side effects and low treatment costs. The present study aimed to evaluate the effect of 650 nm LLL irradiation on the reduction of complications after advanced implant surgeries. MATERIALS AND METHODS: In this triple-blinded clinical trial, 30 patients aged between 25 to 65 years were in need of bone graft or sinus lift procedure for simultaneously implant insertion. In the LLL treatment group, the surgical site of each implant was treated with 650 nm laser. The same method and duration were applied in the placebo group. The pain levels, facial swelling, and wound healing were evaluated. RESULTS: This study indicated that pain levels were reduced in the laser group ($p < 0.05$). Also, facial swelling in the 3rd and 7th day after the surgery relieved more in laser group. Furthermore, investigation of the surgical site showed a higher level of wound healing in the laser group ($p < 0.05$). CONCLUSION: Regarding the biological effects of advanced implant surgeries and accompanying complications, adjuvant treatment with a laser could significantly improve wound healing and reduce the severity and duration of pain and swelling. CLINICAL SIGNIFICANCE: This clinical trial demonstrates reductions of the level of pain, facial swelling and improvements of wound healing are followed by the use of low-level laser therapy. Adult;Aged;Edema;Humans;Low-Level Light Therapy;Middle Aged;Wound Healing

Polarized Polychromatic Noncoherent Light (Bioptron Light) as Adjunctive Treatment in Chronic Oral Mucosal Pain: A Pilot Study. Objective: Aim of this study was to assess the efficacy of polarized polychromatic noncoherent light (Bioptron light) in the treatment of chronic oral mucosal pain (COMP). Patients and methods: Twenty-two patients affected by COMP were treated with standardized pharmacological protocols in association with Bioptron light (90â€‰W; light wavelengthâ€‰=â€‰480-3400â€‰nm; degree of polarizationâ€‰=â€‰95%; specific power densityâ€‰=â€‰40â€‰mW/cm(2); energy densityâ€‰=â€‰2.4â€‰J/cm). The outcome measures were intensity of pain [measured by visual analog scale (VAS) score] and signs reduction (measured by Eisen score) recorded at baseline (t(0)), after 4 weeks (t(1)), and after 8 weeks (t(2)). Signs and symptoms scores were compared with those of a cohort of comparable patients selected from institutional medical record files. Results: Patients in pharmacological treatment associated with Bioptron showed a significant VAS score decrease at t(1) and t(2) (t(0)â€‰=â€‰6.9, t(1)â€‰=â€‰3.9, t(2)â€‰=â€‰1.8, pâ€‰<â€‰0.05), whereas the patients in exclusive pharmacological treatment showed a significant VAS score improvement only at t(2). Comparing the VAS score at t(1) and t(2) in the two groups, a significant improvement was recorded in patients undergoing Bioptron adjunctive treatment (t(1)â€‰=â€‰3.9 vs. 5.9; pâ€‰<â€‰0.05 and

t(2)â€‰=â€‰1.8 vs. 3.6; pâ€‰<â€‰0.05). In both groups Eisen score improved at t(1) and t(2), but in the Bioptron-treated patients the improvement was statistically better at t(1) (1.9 vs. 0.8; pâ€‰<â€‰0.05) and at t(2) (2.7 vs. 1.4; pâ€‰<â€‰0.05). Conclusions: In COMP patients, Bioptron use associated with pharmacological treatment allows a better and faster signs and symptoms reduction when compared with the exclusive pharmacological treatment. Further controlled studies are needed to establish the relative and absolute effectiveness of Bioptron in COMP management. Adult;Aged;Chronic Pain;Facial Pain;Female;Humans;Male;Middle Aged;Pain Measurement;Phototherapy;Pilot Projects;Symptom Assessment

Photobiomodulation with Low-Level Laser in the Treatment of Trismus After Radiotherapy: A Case Report. Background: Radiotherapy is one of the treatments for cancer, which leads to many oral side effects that affect the quality of life of the patient; among them, trismus is considered. Objective: Considering the various therapies to treat this collateral effect of radiotherapy, photobiomodulation (PBM) with low-level laser is a contemporary alternative. Methods: In this article, an all-clinical case report is presented in which the patient was given trismus after radiotherapy and PBM with low-level laser. The measurement of the buccal opening was evaluated in each treatment session with a digital caliper, and the pain was evaluated through the visual analog scale (VAS). Results: The efficacy of the PBM protocol on the trismus after radiotherapy was evidenced by the decrease of pain and increase of the buccal opening. Conclusions: The use of PBM with low-level laser is an option for the treatment of trimus after radiotherapy. Aged;Humans;Low-Level Light Therapy;Male;Oropharyngeal Neoplasms;Pain Measurement;Trismus

CO(2) Laser Treatment of Xanthelasma Palpebrarum in Skin Types III-IV: Efficacy and Complications After 9-Month Follow-Up. Objective: Ultrapulse CO(2) laser has been used for several decades for removal of xanthelasma lesions. However, most studies to date have focused on Caucasian patients (skin types I-II). We sought to assess the efficacy and complications of CO(2) laser therapy for xanthelasma palpebrarum (XP) in Chinese patients (skin types III-IV). Methods: Data of 38 patients with xanthelasma who received CO(2) laser treatment between December 2013 and January 2016 at our hospital were retrospectively analyzed. Patients were followed up for 9 months. Results: Recurrence occurred in 19/38 (50%) patients. Recurrence was significantly more common in patients with multiple lesions (15/24; 62.5%) than in patients with single lesions (4/14; 28.6%). At 3 months after treatment, the complication rate was 63.16%. The complications included hypopigmentation (23/24; 95.8%) and scarring (1/24; 4.2%). In all patients, the hypopigmentation had disappeared by end of the 9-month follow-up. Conclusions: Ultrapulse CO(2) laser appears to be capable of completely removing XP in patients with medium skin type III-IV. The most common complication is hypopigmentation, but this resolves with time. Carbon Dioxide Adult;Aged;Carbon Dioxide;Eyelids;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Xanthomatosis

Photobiomodulation Therapy in Cancer Patients with Mucositis: A Clinical Evaluation. Objective: To evaluate the use of photobiomodulation therapy (PBM-T) in patients undergoing chemotherapy and/or radiotherapy and affected by oral mucositis (OM). Background: Few clinical studies have evaluated PBM-T, particularly in combination with photodynamic therapy (PDT), for the treatment of OM. Methods: Thirty-one patients were divided by convenience into two groups. One received PBM-T (nâ€‰=â€‰17) alone, consisting of low-intensity laser (LIL) irradiation (wavelength 660â€‰nm, continuous mode, spot energy 4â€‰J, energy density 142â€‰J/cm(2), irradiation time 40â€‰s per spot), once weekly for 4 weeks. The other (nâ€‰=â€‰14) received a combination of PBM-T and PDT, with curcumin as photosensitizer. Patients were instructed to rinse their mouth with 20â€‰mL of curcumin solution for 5â€‰min. The oral cavity was irradiated with a blue light-emitting diode (power 1200â€‰mV, wavelength 468â€‰nm) for 5â€‰min. LIL was applied as in the PBM-T group.

After treatment, OM severity was reassessed. The results were analyzed by the Wilcoxon and Mann-Whitney tests. Results: Both PBM-T alone and PBM-T+PDT yielded significant reductions in OM grade (pâ€‰<â€‰0.01). PDT+PBM-T resulted in a significantly shorter healing time compared with PBM-T alone (pâ€‰=â€‰0.0321). Conclusions: Within the parameters of this study, PBM-T+PDT was an effective method to accelerate the OM healing process. Photosensitizing Agents;Curcumin Adult;Aged;Aged, 80 and over;Curcumin;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Photochemotherapy;Photosensitizing Agents;Stomatitis;Treatment Outcome

Besides Photothermal Effects, Low-Level CO(2) Laser Irradiation Can Potentiate Skin Microcirculation Through Photobiomodulation Mechanisms. Background: Improvement of microcirculation is one of the important mechanisms of low-level laser therapy (LLLT) to treat some diseases such as wound healing. Most previous studies have been carried out with multiple lasers other than the 10,600-nm CO(2) laser. Recently, the CO(2) laser has been used not only as a tool for excision of soft tissues but also for therapeutic applications. Objective: To study whether low-level CO(2) laser irradiation can influence microcirculation and further explore the underlying mechanisms. Methods: Seventy-milliwatt (70-mW) CO(2) lasers irradiated the forearms of 12 participants and skin blood perfusion (SkBP) was measured with a laser speckle imager. The thermal effect of irradiation was evaluated by measuring the irradiated skin in vivo and the exposed cell suspensions in vitro. Extracellular adenosine triphosphate (eATP) of the human mast cell line (HMC-1) is assessed by luciferin-luciferase assay to explore the potential mechanisms. Results: Irradiation caused dose-dependent increase in SkBP. At a medium dose of 262â€‰J/cm(2), SkBP reached its maximum value at 195.8%â€‰Â±â€‰18.6% of the baseline (nâ€‰=â€‰12, pâ€‰<â€‰0.01). Such laser irradiation had a mild thermal effect, heating local skin temperature (SkT) by 6.1Â°Câ€‰Â±â€‰0.3Â°C (nâ€‰=â€‰10) and warming cell suspensions by 4.5Â°Câ€‰Â±â€‰0.8Â°C (nâ€‰=â€‰6). Irradiation dose-dependently lowered eATP levels of HMC-1 cells in vitro. At a medium dose of 262â€‰J/cm(2), eATP levels declined to the minimum at 74.8%â€‰Â±â€‰5.5% of the baseline (nâ€‰=â€‰12, pâ€‰<â€‰0.01). This downregulation effect could be significantly inhibited by 100-Î¼M ARL67156, a nonspecific ecto-ATPase inhibitor. On the contrary, heating itself slightly raised the level of eATP. Conclusions: Low-level CO(2) laser irradiation can improve microcirculation. Besides the thermal effect, regulation of extravascular eATP by the photobiomodulation mechanism may be involved. This implies that CO(2) lasers might be used in LLLT. Carbon Dioxide Carbon Dioxide;Cell Culture Techniques;Cell Line;Forearm;Humans;Lasers, Gas;Low-Level Light Therapy;Mast Cells;Microcirculation;Skin;Skin Temperature

Effects of Home Photobiomodulation Treatments on Cognitive and Behavioral Function, Cerebral Perfusion, and Resting-State Functional Connectivity in Patients with Dementia: A Pilot Trial. Objective: To examine the effects of transcranial and intranasal photobiomodulation (PBM) therapy, administered at home, in patients with dementia. Background: This study sought to replicate and build upon a previously published case series report describing improved cognitive function in five patients with mild-to-moderate dementia after 12 weeks of transcranial and intranasal near-infrared (NIR) PBM therapy. Materials and methods: Eight participants (mean age: 79.8â€‰Â±â€‰5.8 years old) diagnosed with dementia by their physicians were randomized to 12 weeks of usual care (UC, nâ€‰=â€‰4) or home PBM treatments (nâ€‰=â€‰4). The NIR PBM treatments were administered by a study partner at home three times per week with the Vielight Neuro Gamma device. The participants were assessed with the Alzheimer's Disease Assessment Scale-cognitive (ADAS-cog) subscale and the Neuropsychiatric Inventory (NPI) at baseline and 6 and 12 weeks, and with arterial spin-labeled perfusion magnetic resonance imaging (MRI) and resting-state functional MRI at baseline and 12 weeks. Results: At baseline, the UC and PBM groups did not differ demographically or

clinically. However, after 12 weeks, there were improvements in ADAS-cog (groupâ€‰Ã—â€‰time interaction: F(1,6)â€‰=â€‰16.35, pâ€‰=â€‰0.007) and NPI (groupâ€‰Ã—â€‰time interaction: F(1,6)â€‰=â€‰7.52, pâ€‰=â€‰0.03), increased cerebral perfusion (groupâ€‰Ã—â€‰time interaction: F(1,6)â€‰=â€‰8.46, pâ€‰<â€‰0.03), and increased connectivity between the posterior cingulate cortex and lateral parietal nodes within the default-mode network in the PBM group. Conclusions: Because PBM was well tolerated and associated with no adverse side effects, these results support the potential of PBM therapy as a viable home treatment for individuals with dementia. Aged;Aged, 80 and over;Cerebrovascular Circulation;Cognition;Dementia;Female;Gyrus Cinguli;Home Care Services;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Pilot Projects;Treatment Outcome

Clinical and Microbiological Effects of the Use of Erbium: Yttrium-Aluminum-Garnet Laser on Chronic Periodontitis in Addition to Nonsurgical Periodontal Treatment: A Randomized Clinical Trial-6 Months Follow-Up. Background and objective: The purpose of this randomized controlled clinical trial is to evaluate the efficiency of erbium-doped:yttrium-aluminum-garnet (Er:YAG) laser adjunct to nonsurgical periodontal debridement on clinical periodontal parameters and red complex periodontopathogens. Materials and methods: Thirty-eight systematically healthy, never-smoker patients with chronic periodontitis were randomly assigned to one of two groups in a parallel design: 1-scaling and root planing (SRP) and 2-SRP + Laser (SRP + L). SRP and SRPâ€‰+â€‰L administration were completed within 24â€‰h. Clinical attachment level (CAL), probing depth (PD), plaque index (PI), and bleeding on probing (BOP) were recorded at baseline and 3 and 6 months after treatment. Subgingival plaque samples were also measured 1 month after treatment. Microbiological evaluation was performed using real-time polymerase chain reaction. Results: All clinical parameters significantly improved 3 and 6 months after treatment in both groups. In the deep and moderately deep pockets, PD reduction and CAL gain between baseline and 6 months were significantly different between the groups (pâ€‰<â€‰0.05). There were no statistically significant differences regarding BOP and PI between the groups. There were no statistically significant differences in Pg, Tf, and Td levels between the SRP and SRPâ€‰+â€‰L groups at any time point (pâ€‰>â€‰0.05). Conclusions: Within the limits of this randomized clinical trial, the adjunctive use of Er:YAG laser with SRP may be beneficial in moderately deep and deep pockets to improve CAL and PD. However, Er:YAG laser failed to demonstrate additional microbiological benefits in nonsurgical periodontal treatment. Clinicaltrials.gov #NCT03387371. Adult;Chronic Periodontitis;Dental Scaling;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Treatment Outcome

Rapid Reversal of Cognitive Decline, Olfactory Dysfunction, and Quality of Life Using Multi-Modality Photobiomodulation Therapy: Case Report. Objective: We present a case report of reversal of cognitive impairment, olfactory dysfunction, and quality of life measures in a patient with cognitive decline after multi-modality photobiomodulation (PBM) therapy. Background: Transcranial and intranasal PBM has been introduced as a light-based therapeutic technique in which exposure to low levels of red to near-infrared (NIR) light stimulates neuronal function, leading to beneficial neurological effects. Materials and methods: Patient received twice-daily PBM therapy at home using three different wearable light-emitting diode (LED) devices. For the first week containing a mixture of continuous wave mode red (635â€‰nm) and NIR (810â€‰nm) LEDs, a prototype transcranial light helmet and a body pad were used. The body pad was placed on various areas on the lower back and the helmet was worn while seated. After the first week of treatment, an intranasal LED device, 10-Hz pulsed wave mode NIR (810â€‰nm), was initiated in the left nostril twice daily. All three devices were applied simultaneously for an irradiation time of 25â€‰min per session. Results: The patient showed a significant improvement in the Montreal Cognitive Assessment score from 18 to 24 and in

the Working Memory Questionnaire score from 53 to 10. The cognitive enhancement was accompanied by reversal of olfactory dysfunction as measured by the Alberta Smell Test and peanut butter odor detection test. Quality-of-life measures improved and caregiver stress was reduced. No adverse effects were reported. Conclusions: PBM therapy may be a promising noninvasive approach for patients with neurodegenerative diseases. Alzheimer Disease;Cognitive Dysfunction;Female;Humans;Low-Level Light Therapy;Middle Aged;Olfaction Disorders;Quality of Life

What Is the Importance and Status of International Multicenter Photobiomodulation Trials? Humans;Internationality;Low-Level Light Therapy;Multicenter Studies as Topic

The Effect of Fluence on Macrophage Kinetics, Oxidative Stress, and Wound Closure Using Real-Time In Vivo Imaging. Objective: The aim of our study was to quantify the effect of doses delivered by a He:Ne laser on individual macrophage kinetics, tissue oxidative stress, and wound closure using real-time in vivo imaging. Background: Photobiomodulation has been reported to reduce tissue inflammation and accelerate wound closure; however, precise parameters of laser settings to optimize macrophage behavior have not been established. We hypothesized that quantitative and real-time in vivo imaging could identify optimal fluence for macrophage migration, reduction of reactive oxygen species, and acceleration of wound closure. Methods: Larval zebrafish Tg(mpeg-dendra2) were loaded with dihydroethidium for oxidative stress detection. Fish were caudal fin injured, treated with 635â€‰nm continuous 5â€‰mW He:Ne laser irradiation at 3, 9, or 18â€‰J/cm(2) and time-lapsed imaged within the first 120â€‰min postinjury. Images taken 1 and 24-h postinjury were compared for percentage wound closure. Results: A fluence of 3â€‰J/cm(2) demonstrated significant increases in macrophage migration speed, fewer stops along the way, and greatest directed migration toward the wound. These findings were associated with a significant reduction in wound content reactive oxygen species when compared with control wounded fins. Both 3 and 9â€‰J/cm(2) significantly accelerated wound closure when compared with nonirradiated control fish. Conclusions: Wound macrophage activity could be manipulated by applied fluence, leading to reduced levels of wound reactive oxygen species and accelerated wound closure. The zebrafish model provides a means to quantitatively compare wound macrophage behavior in response to a variety of laser treatment parameters in real time. Animals;Cell Movement;Kinetics;Low-Level Light Therapy;Macrophages;Microscopy, Fluorescence;Oxidative Stress;Wound Healing;Zebrafish

Effects of Carbon Arc Lamp Irradiation on Wound Healing in a Rat Cutaneous Full-Thickness Wound Model. Objective: The objective of the present study was to investigate the application of a carbon arc lamp on wound healing in a rat cutaneous full-thickness wound model. Background data: In clinical practice, wound healing has been promoted by irradiation with a carbon arc lamp. However, the corresponding mechanism has not been clearly defined. Methods: A cutaneous full-thickness wound on the back of rats was irradiated using a carbon arc lamp at a wavelength peak range of 620-740â€‰nm with 54â€‰J/cm(2). Injured sham-irradiated control rats were used as the control. The rats were euthanized after 7, 14, and 21 days, while wound reepithelialization and healing quality were examined by histological analyses with comparison between groups. Cell proliferation was observed by 5-bromo-2'-deoxyuridine (BrdU) immunohistochemical staining. Results: Irradiation by the carbon arc lamp significantly accelerated wound healing. The wound-healing rate in the treated group at day 21 was 98.42%â€‰Â±â€‰0.56%, compared with 93.58%â€‰Â±â€‰1.26% in the control group (pâ€‰<â€‰0.05). Significant increases in the length of epithelial edges, collagen content, and microvessel density were observed in the wound sites in the treated group at days 7, 14, and 21 (pâ€‰<â€‰0.05). Moreover, the number of BrdU-labeled cells increased in the wound edge at days 7 and 14 due to irradiation (pâ€‰<â€‰0.05). Conclusions: The results demonstrated that the carbon arc lamp can promote wound healing together with

improvement in its quality by stimulating cell proliferation. Carbon Animals;Carbon;Cell Proliferation;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Soft Tissue Injuries;Wound Healing

Does the Photon-Induced Photoacoustic Streaming Activation of Irrigation Solutions Alter the Dentin Microhardness? Objective: The aim of this in vitro study was to evaluate the efficacy of photon-induced photoacoustic streaming (PIPS) activation of sodium hypochlorite (NaOCl), chlorhexidine (CHX) or ethylenediaminetetraacetic acid (EDTA) on the dentin microhardness and to assess the compositional changes of root dentin. Background data: It is still unclear whether PIPS activation of irrigants alters the dentin microhardness and mineral content of dentin. Materials and methods: Root canals of 72 extracted single-rooted teeth were prepared and teeth were fixed in microcentrifuge tubes with silicone impression material. After setting of the silicone, teeth were removed and split longitudinally in buccolingual direction. One half was used as control (pretreatment) while the other was placed into the tube (posttreatment). Then specimens were divided into six test groups (three with and three without PIPS activation). The irrigants tested were 2.5% NaOCl, 17% EDTA, and 2% CHX. Experimental tooth specimens were irrigated with 6â€‰mL of test solution, with additional PIPS activation applied to the PIPS groups. Then specimens were subjected to Vickers microhardness testing. Percentage change of microhardness was calculated. Energy dispersive X-ray spectroscopy (SEM-EDX) was performed to measure element content. Results: Among the irrigant-alone groups, NaOCl and CHX did not alter the dentin microhardness, whereas statistically lower microhardness values were obtained in EDTA group. Chemical composition of dentin was affected from all irrigants used. PIPS activation led to no additional alteration in dentin microhardness. PIPS significantly increased the phosphorus level in NaOCl group. Conclusions: Dentin microhardness was significantly affected by the irrigation solution, not by the PIPS activation. Root Canal Irrigants;Edetic Acid;Sodium Hypochlorite;Chlorhexidine Chlorhexidine;Dentin;Disinfection;Edetic Acid;Hardness;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Photons;Root Canal Irrigants;Sodium Hypochlorite;Spectrometry, X-Ray Emission

Therapeutic Efficacy of Home-Use Photobiomodulation Devices: A Systematic Literature Review. Objective: Perform systematic literature review on photobiomodulation (PBM) devices used at home for nonesthetic applications. Background: Home-use PBM devices have been marketed for cosmetic and therapeutic purposes. This is the first systematic literature review for nonesthetic applications. Methods: A systematic literature search was conducted for PBM devices self-applied at home at least thrice a week. Two independent reviewers screened the articles and extracted the data. Treatment dosage appropriateness was compared to the World Association for Laser Therapy (WALT) recommendations. The efficacy was evaluated according to the relevant primary end-point for the specific indication. Results: Eleven studies were suitable. Devices were applied for a range of indications, including pain, cognitive dysfunction, wound healing, diabetic macular edema, and postprocedural side effects, and were mostly based on near-infrared, pulsed light-emitting diodes with dosages within WALT recommendations. Regarding efficacy, studies reported mostly positive results. Conclusions: Home-use PBM devices appear to mediate effective, safe treatments in a variety of conditions that require frequent applications. Conclusive evaluation of their efficacy requires additional, randomized controlled studies. Humans;Low-Level Light Therapy;Self Care

A Conservative Approach for Localized Spongiotic Gingivitis Hyperplasia Using Photodynamic Therapy: A Case Report and Review of the Literature. Objective: To describe a clinical case of successful conservative management of Localized Juvenile Spongiotic Gingivitis Hyperplasia (LJSGH) using photodynamic therapy (PDT) and reviews the current literature on this pathology. Background data: LJSGH is a recently described rare disease with controversial treatment results. As of today, 13 publications report surgical treatment approaches. The use of CO(2) laser and cryotherapy was

reported only in one study. The use of PDT was not previously reported. Patients and methods: A 9-year-old male patient was referred to our institution with the chief complaint of asymptomatic "inflamed gingiva" starting 1 year before. Clinical examination revealed an erythematous line accompanying the gingival contour, with a certain degree of hyperplasia. The diagnosis of LJSGH was performed based on clinical features and later confirmed histopathologically. A novel approach using PDT was then proposed. The photosensitizer was methylene blue, and a semiconductor laser diode was used. Results: One week after starting PDT, gingival hyperplasia was partially reduced. Immediately after the end of treatment, a significant reduction of gingival hyperplasia was observed. PDT proved to be safe, quick and painless, with no esthetic harm. Conclusions: This case illustrates the benefit of a more conservative approach as opposed to surgical procedure, with good clinical response and decreased morbidity over a 2-year follow-up period. Photosensitizing Agents;Methylene Blue Child;Gingival Hyperplasia;Humans;Lasers, Semiconductor;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents

Photobiomodulation Therapy of Cells in the Bone Marrow: A Novel Therapeutic Approach in Cell Therapy and Regenerative Medicine. Animals;Bone Marrow Cells;Cell- and Tissue-Based Therapy;Humans;Low-Level Light Therapy;Regenerative Medicine

Four-Session Protocol Effectiveness in Reducing Cervical Dentin Hypersensitivity: A 24-Week Randomized Clinical Trial. Objective: A single-blind randomized clinical trial was conducted to evaluate the effectiveness of desensitizing agents with different action mechanisms in reducing cervical dentin hypersensitivity (CDH) after four application sessions, with 24-week follow-up. Materials and methods: Sixty patients with CDH were selected in the study and were allocated in three groups of treatment: Desensibilize KF 2%, Clinpro XT Varnish, and Photon Lase III (100â€‰mW, 4â€‰J/cm(2)-1â€‰J/cm(2) each point, 10â€‰sec per point with wavelength of 808â€‰nm). There were four application sessions performed, with a 48-h interval between each one. The evaporative stimuli and visual analog scale were used to evaluate the CDH level at baseline, immediately after treatment, and at 2, 4, 8, and 24 weeks after the application. Mixed-model effects test was used for comparison (Î±â€‰=â€‰0.05).Results: All three groups showed significant reduction in CDH from baseline to each all-subsequent follow-up. All the groups maintained the CDH reduction, and presented no statistical differences between each other after treatment (pâ€‰=â€‰0.885), 2 (pâ€‰=â€‰0.857), 4 (pâ€‰=â€‰0.928), 8 (pâ€‰=â€‰0.206), and 24 weeks (pâ€‰=â€‰0.073) of follow-up.Conclusions: The four-session protocol was an effective approach in reduction of CDH (even after 24 weeks), regardless of desensitization mechanism. Dentin Desensitizing Agents Adolescent;Adult;Clinical Protocols;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Treatment Outcome;Young Adult

Infrared Light Cannot Be Doing What You Think It Is Doing (re: DOI: 10.1089/photob.2018.4489). Animals;Brain Injuries, Traumatic;Humans;Infrared Rays;Low-Level Light Therapy;Treatment Outcome

Pulsed Transcranial Red/Near-Infrared Light Therapy Using Light-Emitting Diodes Improves Cerebral Blood Flow and Cognitive Function in Veterans with Chronic Traumatic Brain Injury: A Case Series. Objective: This study explored the outcome of applying red/near-infrared light therapy using light-emitting diodes (LEDs) pulsed with three different frequencies transcranially to treat traumatic brain injury (TBI) in Veterans. Background: Photobiomodulation therapy (PBMT) using LEDs has been shown to have positive effects on TBI in humans and animal models. Materials and methods: Twelve symptomatic military Veterans diagnosed with chronic TBI >18 months post-trauma received pulsed transcranial PBMT (tPBMT) using two neoprene therapy pads containing 220 infrared and 180 red LEDs, generating a power output of 3.3â€‰W and an average power density of 6.4â€‰mW/cm(2) for 20â€‰min, thrice per week over 6 weeks. Outcome measures included standardized

neuropsychological test scores and qualitative and quantitative single photon emission computed tomography (SPECT) measures of regional cerebral blood flow (rCBF). Results: Pulsed tPBMT significantly improved neuropsychological scores in 6 of 15 subscales (40.0%; pâ€‰<â€‰0.05; two tailed). SPECT analysis showed increase in rCBF in 8 of 12 (66.7%) study participants. Quantitative SPECT analysis revealed a significant increase in rCBF in this subgroup of study participants and a significant difference between pre-treatment and post-treatment gamma ray counts per cubic centimeter [tâ€‰=â€‰3.77, dfâ€‰=â€‰7, pâ€‰=â€‰0.007, 95% confidence interval (95,543.21-21,931.82)]. This is the first study to report quantitative SPECT analysis of rCBF in regions of interest following pulsed tPBMT with LEDs in TBI. Conclusions: Pulsed tPBMT using LEDs shows promise in improving cognitive function and rCBF several years after TBI. Larger, controlled studies are indicated. Adult;Brain Injuries, Traumatic;Brain Injury, Chronic;Cerebrovascular Circulation;Cognition;Cohort Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Neuropsychological Tests;Tomography, Emission-Computed, Single-Photon;Treatment Outcome;Veterans;Young Adult

Effect of Root Canal Disinfection with a Diode Laser on Postoperative Pain After Endodontic Retreatment. Objective: The aim of this randomized clinical trial was to evaluate the influence of root canal disinfection with a 940-nm diode laser on the intensity of pain after endodontic retreatment. Background data: Microorganisms are the most common causes of tooth pain. Therefore, clinical studies are needed to explore the effect of disinfection techniques on postoperative pain. Methods: Eighty-four patients scheduled for endodontic retreatment were allocated to two groups in a 1:1 ratio (nâ€‰=â€‰42 each). After root canal filling removal and chemomechanical procedures, the root canals were disinfected with a 940-nm diode laser in one group [laser disinfection (LD) group]. In the other group, a mock application of laser was made with the power off [pseudo-laser disinfection (PLD) group]. All retreatment procedures were completed in a single visit. The patients assessed their pain levels at 24, 48, and 72â€‰h after retreatment using a numeric rating scale. The number of analgesic pills used during this period was also recorded. The collected data were statistically analyzed using Mann-Whitney U and Wilcoxon tests. Results: Postoperative pain on the first 2 days was significantly lesser in the LD group than in the PLD group (pâ€‰<â€‰0.05), and the difference became insignificant on the third day (pâ€‰>â€‰0.05). Moreover, analgesic intake over 3 days and pain on percussion on the fourth day were significantly lesser in the LD group than in the PLD group (pâ€‰<â€‰0.05). Conclusions: Elimination of microorganisms from root canals is important for preventing postoperative complications. Our findings suggest that diode LD can reduce postoperative pain and provide comfort after endodontic retreatment. This study is registered in www.ClinicalTrials.gov database with the identifier number NCT03584880. Adolescent;Adult;Cohort Studies;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain, Postoperative;Root Canal Obturation;Root Canal Preparation;Young Adult

Laser Photobiomodulation 904â€‰nm Promotes Inhibition of Hormone-Sensitive Lipase Activity in 3T3-L1 Adipocytes Differentiated Cells. Background: The lipid metabolism is essential for maintaining the body's energy responses. Laser photobiomodulation triggers many important cellular effects, but these effects on lipid metabolism are not well described. In this study, we analyzed the laser photobiomodulation in the hormone-sensitive lipase (HSL) activity, a key enzyme in the triglycerides (TAG) hydrolysis in adipose tissue 3T3-L1. Methods: Cells were submitted to the differentiation protocol in adipose cells, irradiated with 1, 2, and 3J with laser (904â€‰nm-60â€‰mw-laser diode) and incubated for 4â€‰h after irradiation. Results: The response of laser photobiomodulation was able to trigger an inhibition of HSL activity (controlâ€‰=â€‰0.057â€‰Â±â€‰0.0008; 1Jâ€‰=â€‰0.050â€‰Â±â€‰0.0003; 2Jâ€‰=â€‰0.0477â€‰Â±â€‰0.002; 3Jâ€‰=â€‰0.051â€‰Â±â€‰0.002; pâ€‰=â€‰0.0003

against the control), but no modulation was observed in TAG levels into the medium (controlâ€‰=â€‰26.5856â€‰Â±â€‰0.52; 1Jâ€‰=â€‰26.5856â€‰Â±â€‰0.52; 2Jâ€‰=â€‰27.2372â€‰Â±â€‰1.41; 3Jâ€‰=â€‰25.9991â€‰Â±â€‰0.1303; pâ€‰=â€‰0.18). Conclusions: This is the first study of HSL activity modulation with laser radiation, suggesting that photobiomodulation can influence adipose tissue metabolism and open a new field of study. Sterol Esterase 3T3-L1 Cells;Adipocytes;Animals;Cell Culture Techniques;Cell Differentiation;Lipid Metabolism;Low-Level Light Therapy;Mice;Sterol Esterase

Near Infrared Light-Emitting Diodes Do More Than You Think (re: DOI: 10.1089/photob.2018.4603). Animals;Brain Injuries, Traumatic;Humans;Infrared Rays;Low-Level Light Therapy;Treatment Outcome

Light-Emitting Diode Therapy and Low-Level Light Therapy Are Photobiomodulation Therapy. Humans;Low-Level Light Therapy;Terminology as Topic

Use of Exogenous and Endogenous Photomediators as Efficient ROS Modulation Tools: Results and Perspectives for Therapeutic Purposes. Reactive Oxygen Species (ROS) play an essential dual role in living systems. Healthy levels of ROS modulate several signaling pathways, but at the same time, when they exceed normal physiological amounts, they work in the opposite direction, playing pivotal functions in the pathophysiology of multiple severe medical conditions (i.e., cancer, diabetes, neurodegenerative and cardiovascular diseases, and aging). Therefore, the research for methods to detect their levels via light-sensitive fluorescent probes has been extensively studied over the years. However, this is not the only link between light and ROS. In fact, the modulation of ROS mediated by light has been exploited already for a long time. In this review, we report the state of the art, as well as recent developments, in the field of photostimulation of oxidative stress, from photobiomodulation (PBM) mediated by naturally expressed light-sensitive proteins to the most recent optogenetic approaches, and finally, we describe the main methods of exogenous stimulation, in particular highlighting the new insights based on optically driven ROS modulation mediated by polymeric materials. Antioxidants;Reactive Oxygen Species Aging;Animals;Antioxidants;Cardiovascular Diseases;Diabetes Mellitus;Humans;Neurodegenerative Diseases;Oxidative Stress;Reactive Oxygen Species;Signal Transduction

Treating Hypertrophic Burn Scar With 2940-nm Er:YAG Laser Fractional Ablation Improves Scar Characteristics as Measured by Noninvasive Technology. Their group previously demonstrated high-patient satisfaction for the treatment of hypertrophic burn scar (HBS) with the erbium: yttrium aluminum garnet (Er:YAG) laser, but this and other literature supporting the practice suffer from a common weakness of a reliance on subjective assessments by patients or providers. Herein, they sought to prospectively study the effects of Er:YAG fractional ablation on HBS using noninvasive, objective technologies to measure outcomes. Patients with HBS had identical regions of scar designated for treatment by the Er:YAG laser (TREAT) or to be left untreated (CONTROL). They prospectively collected scar measurements of TREAT and CONTROL regions preoperatively, 3 weeks, and 3 months after Er:YAG treatment. Scar measurements included viscoelastometry, transepidermal water loss, optical coherent tomography, and high-frequency ultrasound. Outcomes were measured for the aggregate difference between the TREAT group vs the CONTROL group, as well as within each group in isolation. Seventeen patients were seen preoperatively, followed by n = 15 at 3 weeks and n = 11 at 3 months. A mixed-model repeated measures analysis showed no significant effect of fractional ablation when comparing the overall TREAT group measurements with those of the CONTROL group. However, when considered as within-group measurements, TREAT scars showed significant improvement in viscoelastic deformity (P = .03), elastic deformity (P = .004), skin roughness (P = .05), and wrinkle depth (P = .04) after fractional ablation, whereas CONTROL scars showed no such within-group changes. HBS treated by the Er:YAG laser showed objective improvements, whereas no such changes were seen within the untreated scars over the same time frame.

Adult;Burns;Cicatrix;Cicatrix, Hypertrophic;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Treatment Outcome
Effects of photobiomodulation therapy in aerobic endurance training and detraining in humans: Protocol for a randomized placebo-controlled trial. INTRODUCTION: Over the last 10 years, it has been demonstrated that photobiomodulation therapy (PBMT), also known as phototherapy, using low-level laser therapy (LLLT) and/or light-emitting diode therapy (LEDT) has ergogenic effects, improving athletic performance and also accelerating post-exercise recovery. However, many aspects related to these effects and its clinical applicability remain unknown. Therefore, the aim of this project is to evaluate the ergogenic effects of PBMT in detraining after an aerobic endurance training protocol. METHODS AND ANALYZES: A randomized, triple-blind, placebo-controlled clinical trial will be carried out. Healthy male volunteers will be randomly distributed into 4 experimental groups: PBMT before and after training sessions + PBMT during detraining, PBMT before and after training sessions + placebo during detraining, placebo before and after training sessions + PBMT during detraining, and placebo before and after training sessions + placebo during detraining. The aerobic endurance training sessions will be carried out using motorized treadmills during 12 weeks, and the detraining period will consist in the next 4 weeks after that. It will be analyzed the time until exhaustion, maximal oxygen uptake (VO2max), and fat percentage of volunteers. DISCUSSION: Despite the increasing body of evidence for the use of PBMT as an ergogenic agent, several aspects remain unknown. The findings of this study will contribute to the advance of knowledge in this field regarding clinical applications. ETHICS AND DISSEMINATION: This study was approved by the Research Ethics Committee of Nove de Julho University. The results from this study will be further disseminated through scientific publications in international peer-reviewed journals and presentations at national and international scientific meetings. TRIAL REGISTRATION NUMBER: NCT03879226. Performance-Enhancing Substances;Placebos Adolescent;Adult;Athletic Performance;Body Fat Distribution;Endurance Training;Exercise Test;Humans;Low-Level Light Therapy;Male;Oxygen Consumption;Performance-Enhancing Substances;Placebos;Young Adult
Efficacy of low-level laser therapy in pain management after root canal treatment or retreatment: a systematic review. The aim of this study was to assess the effectiveness of low-level laser therapy (LLLT) for pain management after root canal treatment or retreatment. An electronic search for randomized controlled trials was conducted prior to November 2018, through PubMed, EMBASE, the Cochrane library (CENTRAL), and Web of Science. After filtering, seven articles were included, five related to root canal therapy (RCT) and two related to root canal retreatment (RCR). Six of the included studies presented a moderate risk of bias and a one low risk of bias, based on the Cochrane tool of risk of bias evaluation. The laser treatment included diode laser and indium-gallium-aluminum laser. LLLT was compared with placebo, blank, and ibuprofen treatment. Clinical outcome variables included the prevalence of pain, pain intensity, and need for analgesics after treatment. Three studies showed LLLT could reduce the prevalence of pain significantly after RCT or RCR. Although the effect of LLLT on pain intensity varied at different observation time points and among different studies, most of them found patients had lower pain intensity in the LLLT group. Of the three studies that assessed the need for analgesics after treatment, two studies showed significant benefits. Based on the current evidence, the use of LLLT for pain control in postendodontic therapy may be promising. However, solid conclusions should not be drawn definitely, given that more high-quality randomized controlled trials are required to further evaluate the efficacy of LLLT for pain management after RCT and RCR. Analgesics Adult;Analgesics;Dental Pulp Cavity;Female;Humans;Low-Level Light Therapy;Male;Pain;Pain Management;Publication Bias;Retreatment;Risk Assessment;Root Canal Therapy

Photobiomodulation as potential novel third line tool for non-invasive treatment of hidradenitis suppurativa. Hidradenitis Suppurativa (HS) is a severe inflammatory pathology of the skin characterized by chronic recurrent inflamed lesions, nodules, sinus tracts and abscesses usually manifests after puberty, which involves scalp, neck, axillae, perineum and infra-mammary areas. Nowadays treatment options range from short or long courses of antibiotics, anti-inflammatory and biologic drugs, to surgery. Other suggested treatments consider the employment of laser devices, mainly microsurgical lasers (such as CO2 and intense pulsed lasers) and photodynamic therapy. This review explores the potential use of photobiomodulation (PBM), already used for the treatment of other skin conditions, such as acne, hypertrophic scars, wrinkles, and burns, as potential novel therapy for HS. PBM has been reported to have beneficial effects on promoting wound healing, angiogenesis, vasodilation, and relieving from pain and inflammation, as recently demonstrated in an in-vitro model mimicking HS disease. In addition, PBM, specifically set at the blue wavelength, has been recently reported as exerting an anti-bacterial activity. Therefore, considering all these PBM features especially its ability to decrease pain and inflammation and to lead to faster wound healing, thus improving patients' quality of life, we hypothesize its employment as adjuvant third line treatment for the management of HS both in young and adult patients. Anti-Bacterial Agents;Anti-Inflammatory Agents;Biological Products Anti-Bacterial Agents;Anti-Inflammatory Agents;Biological Products;Hidradenitis Suppurativa;Humans;Laser Therapy;Low-Level Light Therapy;Photochemotherapy;Quality of Life;Wound Healing

Comparison of Single Versus Multiple Low-Level Laser Applications on Bone Formation in Extraction Socket Healing in Rabbits (Histologic and Histomorphometric Study). PURPOSE: This study evaluated the effect of low-level laser therapy (LLLT) on bone healing after tooth extraction in healthy rabbits and compared the effect between single and multiple doses of laser therapy. MATERIALS AND METHODS: Thirty-six New Zealand white male rabbits were randomly divided into 3 equal groups: a control (C) group, a single laser (SL) group, and a multiple laser (ML) group. The mandibular right first premolar was extracted. The SL group received a single dose of diode laser immediately after extraction. The ML group received a dose immediately after extraction and then every 72Â hours for 12Â days. The CÂ group extraction sites were left untreated by laser. Eighteen animals were sacrificed at each of the experimental periods 3 and 6Â weeks after extraction. The sockets were removed from the harvested mandibles and prepared for light microscopic examination and histomorphometric analysis. RESULTS: The SL and ML groups showed more bone formation and rapid maturation compared with the CÂ group at 3 and 6Â weeks postoperatively. At 6Â weeks, the SL group showed the formation of compact bone. Furthermore, the ML group exhibited well-vascularized bone marrow spaces. Histomorphometric analysis showed an increase in the percentage of newly formed bone in the SL and ML groups compared with the C group. Moreover, the difference in the percentage of newly formed between the SL and ML groups was not statistically relevant. CONCLUSION: This rabbit model showed that single or multiple diode laser applications can be used to enhance bone formation after tooth extraction. Animals;Low-Level Light Therapy;Male;Osteogenesis;Rabbits;Tooth Extraction;Tooth Socket;Wound Healing

Effects of Light-emitting Diode Therapy on the of Biceps Brachii Muscle of Young Healthy Males after 8 Weeks of Strength Training: A Randomized Controlled Clinical Trial: Erratum.

Successful treatment of facial vascular skin diseases with a 577-nm pro-yellow laser. BACKGROUND: Treatment of vascular skin diseases is one of the most important indications of the laser. AIMS: To evaluate the effectiveness of 577-nm pro-yellow laser in the treatment of some vascular skin diseases. PATIENTS/METHODS: Ninety-five patients with vascular skin diseases were included in this prospective monocentric study. They were classified into: port-wine stain birthmarks (nÂ =Â 37), papulopustular rosacea (nÂ =Â 20), facial telangiectasia (nÂ =Â 16), and facial erythema

(nÂ =Â 22). All participants received a monthly session of 577-nm pro-yellow laser. Follow-up was done by comparing the photographs before and at every follow-up visit. RESULTS: At the final visit, there was a significant improvement (>50%) occurred in 24/37 (64.82%), 12/20 (60%), 10/16 (62.5%), and 19/22 (86.3%) cases and poor response occurred in 6/37 (16.2%), 2/20 (10%), 2/16 (12.5%), and 0/22 cases after a mean number of sessions 7.76Â Â±Â 2.28, 3.1Â Â±Â 1.8, 3.63Â Â±Â 1.12, and 1.8Â Â±Â 0.85 in port-wine stain, rosacea-, facial telangiectasia-, and facial erythema-treated groups, respectively. Transient irritation and erythema during the session were the only complications reported in the study. CONCLUSION: Facial port-wine stains, rosacea, telangiectasia, and erythema can be successfully treated with a single pass of 577-nm pro-yellow laser with a minimal side effect. Facial erythema showed the highest degree of success with the least number of sessions, while more sessions needed for the treatment of port-wine stain.
Adolescent;Adult;Erythema;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Photography;Port-Wine Stain;Prospective Studies;Rosacea;Skin;Skin Diseases, Vascular;Telangiectasis;Time Factors;Treatment Outcome;Young Adult

1064 nm Nd:YAG laser light affects transmembrane mitochondria respiratory chain complexes. Photobiomodulation (PBM) is a non-plant-cell manipulation through a transfer of energy by means of light sources at the non-ablative or thermal intensity. Authors showed that cytochrome-c-oxidase (complex IV) is the specific chromophore's target of PBM at the red (600-700â€‰nm) and NIR (760-900â€‰nm) wavelength regions. Recently, it was suggested that the infrared region of the spectrum could influence other chromospheres, despite the interaction by wavelengths higher than 900â€‰nm with mitochondrial chromophores was not clearly demonstrated. We characterized the interaction between mitochondria respiratory chain, malate dehydrogenase, a key enzyme of Krebs cycle, and 3-hydroxyacyl-CoA dehydrogenase, an enzyme involved in the Î²-oxidation (two mitochondrial matrix enzymes) with the 1064â€‰nm Nd:YAG (100mps and 10 Hz frequency mode) irradiated at the average power density of 0.50, 0.75, 1.00, 1.25 and 1.50â€‰W/cm(2) to generate the respective fluences of 30, 45, 60, 75 and 90â€‰J/cm(2) . Our results show the effect of laser light on the transmembrane mitochondrial complexes I, III, IV and V (adenosine triphosphate synthase) (window effects), but not on the extrinsic mitochondrial membrane complex II and mitochondria matrix enzymes. The effect is not due to macroscopical thermal change. An interaction of this wavelength with the Fe-S proteins and Cu-centers of respiratory complexes and with the water molecules could be supposed. Adenosine Triphosphate;3-Hydroxyacyl-CoA Dehydrogenase;Malate Dehydrogenase;Electron Transport Complex IV;Oxygen 3-Hydroxyacyl-CoA Dehydrogenase;Adenosine Triphosphate;Citric Acid Cycle;Electron Transport;Electron Transport Complex IV;Humans;Lasers, Solid-State;Low-Level Light Therapy;Malate Dehydrogenase;Mitochondria;Mitochondrial Membranes;Oxygen;Photochemistry;Spectroscopy, Near-Infrared;Temperature

Will Repeated Ablative Er:YAG Laser Treatment Sessions Cause Facial Skin Sensitivity? Results of a 12-Month, Prospective, Randomized Split-Face Study. Whether multiple laser irradiations affect skin sensitivity is still elusive. We aimed to investigate if repeated ablative erbium:yttrium-aluminum-garnet (Er:YAG) laser therapy could cause or increase skin sensitivity in the treatment areas. Nineteen healthy females received three sessions of a randomized, split-face, Er:YAG laser treatment in a scanning ablative mode (MicroLaserPeelâ„¢), with a 6-mm spot size, 8-Î¼m ablative depths, and 30% of pulse overlap first. The next round was conducted in the fractional mode (ProFractionalâ„¢) at depths ranging from 100 to 150â€‰Î¼m, with one pass by at coverage of 11% in the coagulation mode. Objective biophysical parameters, including transepidermal water loss (TEWL), skin glossiness, epidermal and dermal thickness and density, sensory nerve current perception threshold (CPT), and local blood flow, were measured before and after treatment. Quantitative evaluation of the Er:YAG

laser treatment's effect on skin sensitivity is presented. Seventeen volunteers completed a follow-up of 12 months. On days 1 and 3, skin TEWL and epidermal thickness increased, while glossiness decreased. On day 7, there was no significant difference in the skin barrier function between the treated and the control side. Similarly, there was no significant difference in CPT values or local microvascular blood flow between sides at any time point before or after treatment, except that the local microvascular blood flow on the treated side was higher on the first day post-treatment. Er:YAG laser treatment does not influence skin sensitivity in healthy subjects in a long-term follow-up. Adult;Face;Female;Humans;Hypersensitivity;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Prospective Studies;Skin Aging;Skin Physiological Phenomena

Mitochondrial cytochrome c oxidase is not the primary acceptor for near infrared light-it is mitochondrial bound water: the principles of low-level light therapy.

The effect of a single irradiation of low-level laser on nipple pain in breastfeeding women: a randomized controlled trial. Photobiomodulation with low-level laser therapy (PBM-LLLT) has been introduced as a new tool to relieve nipple pain and repair nipple damage in breastfeeding women; however, evidence is needed to assess its effectiveness. The aim was to evaluate the effect of a single application of PBM-LLLT for breastfeeding women with nipple pain and damage; side effects were also collected. We conducted a randomized double-blinded controlled trial with women with nipple damage who were exclusively breastfeeding and rooming-in at Amparo Maternal maternity service, SÃ£o Paulo, Brazil (May 2016 to May 2017). Women were randomly assigned into laser (nâ€‰=â€‰40) or control group (nâ€‰=â€‰40). Intervention was a single irradiation (660Â nm, 100Â mW, 2Â J, 66.66Â J/cm(2), 3.3Â W/cm(2), 20Â s of irradiation, punctual, and continuous mode) applied directly. Women reported pain levels at recruitment (before and immediately after irradiation), 6 and 24Â h after the treatment. Pain level during a breastfeed was assessed using the Visual Analogue Scale (0 to 10). The primary outcome was the level of nipple pain immediately after the laser irradiation. Data were analyzed using hierarchical model and Wald test. At baseline, pain levels were similar (mean of 7.4 in laser group and 7.1 in control group). Women's perception of pain reduced approximately one point in both groups. Thirty-one percent of participants in the laser group (11/36) reported secondary effects, such as tingling (10/36) and pricking (2/36). The laser protocol of a single application was not effective in reducing pain in women with damaged nipples. Tingling sensation may be experienced by women receiving laser treatment for nipple damage. Adult;Breast Feeding;Case-Control Studies;Female;Humans;Infant;Low-Level Light Therapy;Male;Nipples;Pain;Pregnancy;Visual Analog Scale

Photobiomodulation and gametogenic potential of human Wharton's jelly-derived mesenchymal cells. Recently, light emitting diode (LED) irradiation has been introduced as a new strategy to enhance proliferation and affect differentiation of stem cells. Human Wharton's jelly-derived mesenchymal (hWJM) cells have unique characteristics that make them an appropriate source of stem cells for use in basic and clinical applications. In this study, we aimed to evaluate the effect of polarized (PL) and non-polarized (NPL) red light irradiation on gametogenic differentiation of hWJM cells in the presence or absence of bone morphogenetic protein 4 (BMP4) and retinoic acid (RA). Exposure of hWJM cells to PL and NPL red LED (625â€¯nm, 1.9â€¯J/cm(2)) with or without BMP4+RA pre-treatment effectively differentiated them into germ lineage when the gene expression pattern (Fragilis, DAZL, VASA, SCP3 and Acrosin) and protein synthesis (anti-DAZL, anti-VASA, anti-SCP3 and anti-Acrosin antibodies) of the induced cells was evaluated. These data demonstrated that photobiomodulation may be applied for gametogenic differentiation in-vitro. Bone Morphogenetic Protein 4;Cell Cycle Proteins;DAZL protein, human;DNA-Binding Proteins;RNA-Binding Proteins;SYCP3 protein, human;Tretinoin;Acrosin;DDX4 protein, human;DEAD-box RNA Helicases Acrosin;Bone Morphogenetic Protein 4;Cell Cycle Proteins;Cell Differentiation;Cells, Cultured;DEAD-

box RNA Helicases;DNA-Binding Proteins;Gene Expression Regulation;Germ Cells;Humans;Light;Mesenchymal Stem Cells;RNA-Binding Proteins;Tretinoin;Wharton Jelly

DNA-enabled rational design of fluorescence-Raman bimodal nanoprobes for cancer imaging and therapy. Recently, surface-enhanced Raman scattering nanoprobes have shown tremendous potential in oncological imaging owing to the high sensitivity and specificity of their fingerprint-like spectra. As current Raman scanners rely on a slow, point-by-point spectrum acquisition, there is an unmet need for faster imaging to cover a clinically relevant area in real-time. Herein, we report the rational design and optimization of fluorescence-Raman bimodal nanoparticles (FRNPs) that synergistically combine the specificity of Raman spectroscopy with the versatility and speed of fluorescence imaging. DNA-enabled molecular engineering allows the rational design ofÂ FRNPs with a detection limit as low as 5â€‰Ã—â€‰10(-15)â€‰M. FRNPs selectively accumulate in tumor tissue mouse cancer models and enable real-time fluorescence imaging for tumor detection, resection, and subsequent Raman-based verification of clean margins. Furthermore, FRNPs enable highly efficient image-guided photothermal ablation of tumors, widening the scope of the NPs into the therapeutic realm. Drug Carriers;Fluorescent Dyes;Silver;DNA Animals;Brain Neoplasms;Cell Line, Tumor;DNA;Drug Carriers;Female;Fluorescent Dyes;Genetic Engineering;Humans;Laser Therapy;Limit of Detection;Low-Level Light Therapy;Metal Nanoparticles;Mice;Optical Imaging;Ovarian Neoplasms;Phantoms, Imaging;Silver;Spectrum Analysis, Raman;Xenograft Model Antitumor Assays

Effect of photobiomodulation therapy on neuronal injuries by ouabain: the regulation of Na, K-ATPase; Src; and mitogen-activated protein kinase signaling pathway. BACKGROUND: To determine whether photobiomodulation (PBM) rescued the disruption of Na(+)/Ca(2+) homeostasis and mitochondrial membrane potential by ouabain; the Na, K-ATPase inhibitor. For PBM in this study, a 660Â nm LED array was used at energy densities of 0.78, 1.56, 3.12, 6.24, and 9.36Â J/cm(2). RESULTS: HCN-2 neuronal cells treated with ouabain showed loss of cell polarity, disrupted cell morphology, and decreased cell viability, which were improved after PBM treatment. We found that ouabain-induced Na, K-ATPase inhibition promoted activation of downstream signaling through Src, Ras, and mitogen-activated protein kinase (MAPK), which were suppressed after PBM treatment. This provided evidence of Na, K-ATPase Î±-subunit inactivation and intracellular Ca(2+) increase. In response to ouabain, we observed activation of Src and MAPK by Na, K-ATPase, decreased mitochondrial membrane potential, and Na(+)-dependent Ca(2+) increases, which were restored by PBM treatment. CONCLUSIONS: This study demonstrated that Na(+)/K(+) imbalance could be regulated by PBM treatment in neuronal cells, and we suggest that PBM is a potential therapeutic tool for Na, K-ATPase targeted neuronal diseases. Ouabain;src-Family Kinases;Mitogen-Activated Protein Kinases;ras Proteins;Sodium-Potassium-Exchanging ATPase;Calcium Calcium;Cell Survival;Cells, Cultured;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mitogen-Activated Protein Kinases;Neurons;Ouabain;Signal Transduction;Sodium-Potassium-Exchanging ATPase;ras Proteins;src-Family Kinases

Practical Applications for Medical and Aesthetic Treatment of Skin of Color With a New 650-Microsecond Laser. The following roundtable is edited from discussion between the authors concerning treatment with the 650-microsecond 1064nm Nd:YAG laser. These dermatologist experts share their expertise, experience, and treatment pearls regarding the device for medical and aesthetic use, and in treatment of skin of color (SOC). Acne Vulgaris;Adult;Female;Hair Diseases;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Rejuvenation;Skin;Skin Aging;Skin Pigmentation;Sunlight;Treatment Outcome

Novel photo-thermally active polyvinyl alcohol-Prussian blue nanoparticles hydrogel films capable of eradicating bacteria and mitigating biofilms. Antibacterial treatment is an essential issue in many diverse fields, from medical device treatments (for example prostheses coating) to food preservation.

However, there is a need of novel and light-weight materials with high antibacterial efficiency (preferably due to the physical activation). Utilization of photo-thermally active nanoparticles can lead to novel and re-usable materials that can be remotely activated on-demand to thermally eradicate bacteria and mitigate biofilm formation, therefore meeting the above challenge. In this study polyvinyl alcohol (PVA) hydrogel films containing non-toxic and highly photo-thermally active Prussian blue (PB) nanoparticles were fabricated. The confocal microscopy studies indicated a uniform nanoparticle distribution and a low degree of aggregation. Upon near-infrared (NIR; 700 and 800 nm) light irradiation of PVA-PB films, the local temperature increases rapidly and reaches a plateau (up to Î”TÂ â‰…Â 78 Â°C), withinÂ â‰ˆ6-10 s under relatively low laser intensities, IÂ â‰…Â 0.3 W cm(-2). The high and localized increase of temperature on the fabricated films resulted in an efficient antibacterial effect on Pseudomonas aeruginosa (P. aeruginosa) bacteria. In addition, the localized photo-thermal effect was also sufficient to substantially mitigate biofilms growth. Anti-Bacterial Agents;Ferrocyanides;polyvinyl alcohol hydrogel;Polyvinyl Alcohol;ferric ferrocyanide Anti-Bacterial Agents;Biofilms;Ferrocyanides;Hot Temperature;Lasers;Low-Level Light Therapy;Nanoparticles;Phototherapy;Polyvinyl Alcohol;Pseudomonas aeruginosa

Are the ergogenic effects of photobiomodulation therapy age-dependent? A randomized double-blinded placebo-controlled trial.

The "in's and outs" of laser hair removal: a mini review. Conventional treatments for excessive hair are tedious and time consuming. Laser hair removal has become the leading therapy option for long-term results. It works on the principle of selective photothermolysis, whereby photons destroy the hair follicle while sparing the surrounding tissue. As demand increases, there has been an increase in the regulation of these treatments. Laser hair removal is not risk-free and side effects are associated with the treatment. Adequate training is vital to minimise adverse side effects. Certain countries have regulatory boards that laser operators need to register with, as well as the completion of mandatory hours. Others require laser operators to register with a Care Quality Commission (CQC) to ensure that minimum training and safety standards are met. Currently, in South Africa, the lack of regulatory boards and mandatory hours poses a risk to the public as anyone with little or no qualification is allowed to perform laser hair removal treatments, placing patients at risk. This review looks at some of the devices used and basic mechanisms of action of laser hair removal, its associated risks, side effects and current regulation. Clinical Competence;Hair Removal;Humans;Lasers;Low-Level Light Therapy;Patient Safety

Laser Treatment of Skin of Color for Medical and Aesthetic Uses With a New 650-Microsecond Nd:YAG 1064nm Laser. Individuals with skin of color are a rapidly growing portion of the cosmetic procedures market. There are unique challenges to treating skin conditions in skin of color patients. This article and roundtable discussion focus on the use of energy-based modalities, particularly a 650-microsecond 1064nm laser that delivers energy in a collimated beam. Alone or in combination with other therapies, the 650-microsecond 1064nm laser has been used successfully to treat melasma, acne, postinflammatory hyperpigmentation, pseudofolliculitis barbae, hair removal, acne keloidalis nuchae, and aging skin in skin of color. J Drugs Dermatol. 2019;18(4 Suppl 1):s135-137. Adult;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin Aging;Skin Diseases;Skin Pigmentation;Treatment Outcome;Young Adult

Low-level laser therapy enhances the number of osteocytes in calvaria bone defects of ovariectomized rats. BACKGROUND: Osteoporosis can make bone repair difficult. Low-level laser therapy (LLLT) has been shown to be a promising tool for bone neoformation. This study aimed to analyze the effect of LLLT on calvaria bone defects of ovariectomized rats using stereology. METHODS: Fifty-four Wistar rats were subjected to bilateral ovariectomy, and bone defects were created in calvaria after 150Â days. The animals were divided into nine groups (nÂ =Â â€‰6 per

group), and 24Â hours after the bone defects were created they received 3, 6 or 12 sessions of LLLT at 0, 20 or 30Â J/cm(2), using a 780-nm low-intensity GaAlAs laser. One-way ANOVA followed by Tukey's post hoc test was used for data processing. A difference of PÂ <Â 0.05 was considered statistically significant. The parameters evaluated were osteocyte density (Nv (ost)), total osteocyte number (Nto (ost)), trabecular surface density (Sv (t)), and trabecular surface area (Sa (t)). RESULTS: Data obtained showed that Nto (ost), Sv (t), and Sa (t) in group G2 rats were significantly different from G1 (0Â J/cm(2)) (PÂ <Â 0.05). Compared to group G4, G5 presented higher values for the parameters Sv (t) and Sa (t), and G6 presented significantly higher values for almost all the analyzed parameters (Nv (ost), Nto (ost), Sv (t), and Sa (t)) (PÂ <Â 0.05). Compared to group G7, G8 showed a higher value only for the parameter Sa (t), and G9 showed significantly higher values for parameters Nv (ost), Nto (ost), Sv (t), and Sa (t). CONCLUSION: We conclude that LLLT stimulated bone neoformation and contributed to an increase in the total number of osteocytes, especially with a laser energy density of 30Â J/cm(2) given for 6 and 12 sessions.

Effect of Low-Level Laser Therapy (LLLT) in Pulmonary Inflammation in Asthma Induced by House Dust Mite (HDM): Dosimetry Study. Asthma is characterized by chronic inflammation in the airways. Several models have been proposed for the discovery of new therapies. Low-Level Laser Therapy (LLLT) is relatively new and effective, very low cost, with no side effects. However, there is still no consensus on the optimal dose to be used. In this sense, the objective of the present study was to evaluate the best dose in an experimental model of asthma induced by House Dust Mite (HDM). Balb/c mice received administration of 100â€‰ug/animal HDM and LLLT applications (diode laser: 660â€‰nm, 100â€‰mW and four different energies 1J, 3J, 5J, and 7.5J) for 16 days. After 24 hours, we studied inflammatory, functional, and structural parameters. The results showed that LBI was able to modulate the pulmonary inflammation observed by reducing the number of cells in Bronchoalveolar Lavage Fluid (BALF) as well as reducing the percentage of neutrophils, eosinophils and T lymphocytes. On the other hand, LLLT increased the level of IL-10 and reduced levels of IL-4, IL-5 and IL-13 in BALF. LLLT was able to reduce the production of mucus, peribronchial eosinophils, collagen deposition, bronchoconstriction index, and bronchial and muscular thickening in the airways. We concluded that the use of LLLT in the treatment of chronic inflammation of the airways attenuated the inflammatory process and functional and structural parameters. We emphasize, in general, that the 1J and 3J laser presented better results. Thus, photobiomodulation may be considered a promising tool for the treatment of chronic pulmonary allergic inflammation observed in asthma.

Short-term Efficacy Comparison of High-intensity and Low-intensity Laser Therapy in the Treatment of Lateral Epicondylitis: A Randomized Double-blind Clinical Study. OBJECTIVES: This study aims to evaluate and compare the short-term efficacies of high-intensity laser therapy (HILT) and low-intensity laser therapy (LILT) in the treatment of lateral epicondylitis (LE). PATIENTS AND METHODS: Sixty patients (16 males, 44 females; mean age 44.2Â±9.3 years; range, 18 to 65 years) with unilateral elbow pain were randomized into two groups as 30 patients treated with HILT (9 males and 21 females) and 30 patients treated with LILT (7 males and 23 females). The HILT (1,064 nm) and LILT (904 nm) were administered three times a week for three weeks, and each treatment was combined with an epicondylitis bandage. A visual analog scale (VAS), quick Disabilities of the Arm, Shoulder, and Hand (QDASH) questionnaire, Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36), and hand grip strength test were used to evaluate the patients before and three weeks after treatment. RESULTS: The two groups had similar demographic characteristics, including age, sex, occupation, and body mass index (p>0.05). There were no statistically significant differences between the two groups in terms of the pretreatment VAS, QDASH, hand grip strength, and SF-36 scores (p>0.05). After three weeks, both groups showed significant improvements in all of the parameters

(p<0.05). However, in the HILT group, the QDASH, hand grip strength, and SF-36 physical component summary (PCS) scores showed superior improvement compared to the LILT group (p<0.05). CONCLUSION: Each treatment modality was found to be effective and safe for the short-term treatment of LE. However, the HILT exhibited more significant effects on the hand grip strength, QDASH, and SF-36 PCS scores than the LILT.

A successful combination therapy of tacrolimus, hydroxychloroquine and picosecond laser for lichen planus pigmentosus. Hydroxychloroquine;Tacrolimus Administration, Oral;Administration, Topical;Biopsy, Needle;Combined Modality Therapy;Facial Dermatoses;Female;Humans;Hydroxychloroquine;Immunohistochemistry;Lichen Planus;Low-Level Light Therapy;Middle Aged;Prognosis;Severity of Illness Index;Tacrolimus;Treatment Outcome

Transcranial near-infrared photobiomodulation could modulate brain electrophysiological features and attentional performance in healthy young adults. The aim of the present study was to investigate the electrophysiological effects of the photobiomodulation (PBM) by the quantitative electroencephalography (qEEG) as a diagnostic method. The neurotherapeutic potential of transcranial PBM has been recently investigated in preclinical and clinical studies. According to the PBM mechanisms of action on increasing the cerebral blood flow and the neuronal firing, a change may occur in cortical electrical activity after transcranial PBM that could be revealed in qEEG. A total of 30 participants (15 males and 15 females) were included in this experimental study in a convenience sampling method. A 19-channel EEG was obtained from subjects, before and after receiving sham or real 850-nm PBM by light emitting diode (LED) array on the right prefrontal cortex (PFC). An attentional task also was completed by the participant before and after the irradiation. Results presented that the effect of PBM on the reaction time was significant (pâ€‰=â€‰0.001) in favor of the real-treatment group (pâ€‰<â€‰0.05). For the absolute power, repeated-measures ANOVA showed a significant interaction of group Ã— time Ã— frequency (pâ€‰=â€‰0.04). In the real-treatment group, absolute power of delta band was significantly reduced in all electrodes (pâ€‰<â€‰0.05). Also, a similar significant interaction of group Ã— time Ã— frequency was seen for relative power (pâ€‰=â€‰0.04). Post-hoc analysis showed a significant decrease in delta band after PBM in the real treatment group (pâ€‰<â€‰0.05). The study presented that light irradiation with 850-nm LED source on right PFC could change brain electrical activity and has beneficial effects on attentional performance. Adult;Attention;Behavior;Brain;Delta Rhythm;Electrodes;Electroencephalography;Electrophysiological Phenomena;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Reaction Time;Task Performance and Analysis;Young Adult

A prospective randomized comparative study on 60 Indian patients of melasma, comparing pixel Q-switched NdYAG (1064 nm), super skin rejuvenation (540 nm) and ablative pixel erbium YAG (2940 nm) lasers, with a review of the literature. Background: Treating melasma is a challenge due to suboptimal efficacy and recurrence encountered with most modalities. There is inadequate literature regarding the use of lasers for melasma in Indian skin. We compared three modalities SSR (Super Skin Rejuvenation 540 nm), PQSNDY (pixel Q-switched Nd: YAG 1064 nm), and ablative pixel-Er: YAG (2940 nm) laser in melasma, amongst Indian patients. Materials/Methods: Sixty patients of recalcitrant melasma were enrolled and randomized into three groups with 20 patients each. These were treated with SSR, low fluence PQSNDY, and pixel-Er: YAG, respectively, for five sessions at 3-week intervals. Results were evaluated using Modified melasma area severity index (mMASI) by blinded comparison of digital photographs at baseline, each visit and 6 months (i.e. 2 months after the last session). Results: All groups showed a highly significant reduction in the mMASI score ($p < .001$). Pixel-Er: YAG maximally reduced mMASI and homogeneity ($p < .001$), while the other groups showed a more uniform fading. Epidermal melasma had best results with SSR and PQSNDY ($p < .001$), while

recalcitrant cases of dermal and mixed melasma with pixel-Er: YAG laser (p < .001). There was no persistent or rebound pigmentation observed. Conclusions: All three modalities are effective and safe for melasma in Indian patients. Fractional technology, low fluences, adequate recovery time between sessions and a sound maintenance plan ensure efficacy and safety. Adult;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Rejuvenation;Severity of Illness Index;Treatment Outcome

Effects of low-level laser and low-intensity pulsed ultrasound therapy on treatment duration and pain perception. Humans;Lasers;Low-Level Light Therapy;Orthodontics;Pain Perception;Ultrasonic Waves

Low-Intensity Pulsed Ultrasound Prevents Development of Bisphosphonate-Related Osteonecrosis of the Jaw-Like Pathophysiology in a Rat Model. We developed a rat model of bisphosphonate-related osteonecrosis of the jaw (BRONJ) by removing a maxillary molar tooth (M1) from ovariectomized rats after treatment with alendronate. To mimic periodontitis, some of the rats were administered Porphyromonas gingivalis (p. gingivalis) at the M1 site every 2 to 3 d for 2 wk. Rats pretreated with alendronate plus p. gingivalis showed delayed healing of socket epithelia, periosteal reaction of alveolar bone formation and lower bone mineral density in the alveolus above adjacent M2 teeth. These abnormalities were prevented by tooth socket exposure to 20 min/d low-intensity pulsed ultrasound (LIPUS), which restored diminished expression of RANKL, Bcl-2, IL-6, Hsp70, NF-ÎºB and TNF-Î± messenger ribonucleic acids in remote bone marrow, suggesting LIPUS prevented development of BRONJ-like pathophysiology in rat by inducing systemic responses for regeneration, in addition to accelerating local healing. Non-invasive treatment by LIPUS, as well as low-level laser therapy, may be useful for medication-related osteonecrosis of the jaw patients. Animals;Bisphosphonate-Associated Osteonecrosis of the Jaw;Disease Models, Animal;Female;Osteogenesis;Periodontitis;Rats;Rats, Wistar;Tooth Socket;Ultrasonic Therapy;Ultrasonic Waves

Tattoo removal by Q-switched Nd:YAG laser: an objective evaluation using histometry. Background: Tattoos have played an important role in variousÂ human cultures for thousands of years. The creation of high power, short pulse Q-switched lasers (QS) has provided a tool for considerable therapeutic advances in tattoo removal. Objective: The aim of the study is to correlate the clinical efficacy of QS Nd: YAG laser for tattoo removal with histological as well as histometric findings. Patients and Methods: QS Nd: YAG laser was used for blue tattoo removal in 12 Egyptian patients. Sessions were done every 2 months for about 6-10 sessions (average 7). Skin phototypes of patients ranged from phototype III to V. Photographs were taken before and after every treatment session. Skin biopsies were taken from the patients before treatment and after six sessions to perform histological and histometric analysis. Results: Eight patients (66.7%) showed excellent response and four patients (33.3%) good response. No textural change or scarring was observed in any patient. Histological examination confirmed the clinical response. Haematoxylin and Eosin (H&E) stained sections showed a significant decrease or almost complete disappearance of the tattoo pigment. Meanwhile, histometric study objectively confirmed a significant decrease in ink particle surface area after treatment. Conclusion: QS Nd: YAG laser effectively treats tattoos in dark-skinned Egyptian patients with excellent cosmetic outcome and minimal side effects. The histopathologic and histometric findings significantly correlated with the clinical response. Adult;Egypt;Humans;Lasers, Solid-State;Low-Level Light Therapy;Tattooing;Young Adult

Pulsed Near Infrared Transcranial and Intranasal Photobiomodulation Significantly Modulates Neural Oscillations: a pilot exploratory study. Transcranial photobiomodulation (tPBM) is the application of low levels of red or near-infrared (NIR) light to stimulate neural tissues. Here, we administer tPBM in the form of NIR light (810â€‰nm wavelength) pulsed at 40â€‰Hz to the default

mode network (DMN), and examine its effects on human neural oscillations, in a randomized, sham-controlled, double-blinded trial. Using electroencephalography (EEG), we found that a single session of tPBM significantly increases the power of the higher oscillatory frequencies of alpha, beta and gamma and reduces the power of the slower frequencies of delta and theta in subjects in resting state. Furthermore, the analysis of network properties using inter-regional synchrony via weighted phase lag index (wPLI) and graph theory measures, indicate the effect of tPBM on the integration and segregation of brain networks. These changes were significantly different when compared to sham stimulation. Our preliminary findings demonstrate for the first time that tPBM can be used to non-invasively modulate neural oscillations, and encourage further confirmatory clinical investigations. Aged;Brain;Brain Waves;Cross-Over Studies;Double-Blind Method;Female;Humans;Male;Middle Aged;Nerve Net

Molecular impacts of photobiomodulation on bone regeneration: AÂ systematic review. Photobiomodulation (PBM) encompasses a light application aimed to increase healing process, tissue regeneration, and reducing inflammation and pain. PBM is specifically aimed to modify the expression of cellular molecules; however, PBM impacts on cellular and molecular pathways especially in bone regenerative medicine have been investigated in scattered different studies. The purpose of the current study is to systematically review evidence on molecular impact of PBM on bone regeneration. A comprehensive electronic search in Medline, Scopus, EMBASE, EBSCO, Cochrane library, web of science, and google scholar was conducted from January 1975 to October 2018 limited to English language publications on administrations of photobiomodulation for bone regeneration which evaluated biological factors. In addition, hand search of selected journals was done to retrieve all articles. This systematic review was performed based on PRISMA guideline. Among these studies, five articles reported inÂ vitro results, twelve articles were inÂ vivo, and three of them were clinical trials. The data tabulated according to the type of markers (osteogenic markers, angiogenic markers, growth factors, and inflammation mediators). PBM's effects depend on many parameters which energy density is more important than the others. PBM can significantly enhance expression of osteocalcin, collagen, RUNX-2, vascular endothelial growth factor, bone morphogenic proteins, and COX-2. Although since the heterogeneity of the studies and their limitations, an evidence-based decision for definite therapeutic application of PBM is still unattainable, the findings of our review can help other researchers to ameliorate their study design and elect more efficient approach for their investigation. Biomarkers;Core Binding Factor alpha Subunits;Vascular Endothelial Growth Factor A;Osteocalcin;Collagen Biomarkers;Bone Regeneration;Cell Proliferation;Collagen;Core Binding Factor alpha Subunits;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteocalcin;Osteogenesis;Vascular Endothelial Growth Factor A

Photobiomodulation increases intrusion tooth movement and modulates IL-6, IL-8 and IL-1Î² expression during orthodontically bone remodeling. This study investigated the effects of photobiomodulation (PBM) on upper molar intrusion movement, regarding acceleration of orthodontic movement and its molecular effects. The sample consisted of 30 patients with indication of tooth intrusion for oral rehabilitation. Teeth were divided into three different groups: G1 (nâ€‰=â€‰10) pre-molars without force or laser application (control); G2 (nâ€‰=â€‰10) upper molar intrusion; and G3 (nâ€‰=â€‰10) upper molar intrusion and PBM. On PBM treated molars, the teeth were irradiated with a low-power diode laser (808â€‰nm, 100â€‰mW), receiving 1â€‰J per point, density of 25â€‰J/cm(2) , with application of 10â€‰s per point, 10 points (5 per vestibular and 5 per palatal region). Orthodontic force of intrusion applied every 30â€‰days and PBM was performed immediately, 3 and 7â€‰days after force application for 3â€‰months. Gingival crevicular fluid was collected at the same time periods as the laser applications and interleukins (IL) 1-Î², -6 and -8 were evaluated by enzyme-linked immunosorbent assay. Clinical measures were

performed monthly to verify the amount of intrusion. The levels of IL-6, IL-8 and IL-1Î² increased under orthodontic force (G2 and G3) when compared to control group (G1), however, the cytokines levels were significantly higher after PBM (G3). The mean intrusion velocity was 0.26â€‰mm/month in the irradiated group (G3), average duration of 8â€‰months vs 0.17â€‰mm/month for the non-irradiated group (G2), average duration of 12â€‰months. This study suggests that PBM accelerates tooth movement during molar intrusion, due to modulation of IL-6, IL-8 and IL-1Î² during bone remodeling. IL1B protein, human;Interleukin-1beta;Interleukin-6;Interleukin-8;Interleukins Adult;Aged;Bone Remodeling;Female;Gene Expression Regulation;Humans;Interleukin-1beta;Interleukin-6;Interleukin-8;Interleukins;Low-Level Light Therapy;Male;Middle Aged;Tooth Movement Techniques

Assessment of epigenetic mechanisms and DNA double-strand break repair using laser micro-irradiation technique developed for hematological cells. BACKGROUND: Certain tumors rely heavily on their DNA repair capability to survive the DNA damage induced by chemotherapeutic agents. Therefore, it is important to monitor the dynamics of DNA repair in patient samples during the course of their treatment, in order to determine whether a particular drug regimen perturbs the DNA repair networks in cancer cells and provides therapeutic benefits. Quantitative measurement of proteins and/or their posttranslational modification(s) at DNA double strand breaks (DSBs) induced by laser microirradiation provides an applicable diagnostic approach to examine DNA repair and its dynamics. However, its use is restricted to adherent cell lines and not employed in suspension tumor cells that include the many hematological malignancies. METHODS: Here, we report the development of an assay to laser micro-irradiate and quantitatively measure DNA repair transactions at DSB sites in normal mononuclear cells and a variety of suspension leukemia and lymphoma cells including primary patient samples. FINDINGS: We show that global changes in the H3K27me3-ac switch modulated by inhibitors of Class I HDACs, EZH2 methyltransferase and (or) H3K27me3 demethylases do not reflect the dynamic changes in H3K27me3 that occur at double-strand break sites during DNA repair. INTERPRETATION: Results from our mechanistic studies and proof-of-principle data with patient samples together show the effectiveness of using the modified micro-laser-based assay to examine DNA repair directly in suspension cancer cells, and has important clinical implications by serving as a valuable tool to assess drug efficacies in hematological cancer cells that grow in suspension. Chromatin;Histones Blood Cells;Cell Line, Tumor;Chromatin;DNA Breaks, Double-Stranded;DNA Damage;DNA Repair;Epigenesis, Genetic;Histones;Humans;Lasers;Low-Level Light Therapy;Lymphoma, Large B-Cell, Diffuse

Evaluation of the efficacy of a new low-level laser therapy home protocol in the treatment of temporomandibular joint disorder-related pain: A randomized, double-blind, placebo-controlled clinical trial. Objective: This study analyzed a home, low-level laser therapy (LLLT) protocol to manage temporomandibular joint disorders (TMJDs)-related pain.Methods: Ninety TMJD patients (12M, 78F) between 18 and 73 years were randomly subdivided into three groups. Study group (SG) received 1-week home protocol LLLT by B-cure Dental Pro: 808 nm, 5 J/min, 250 mW, 15 KHz for 8', 40 J each, over pain area, twice daily. Placebo group (PG) followed the same protocol using sham devices. Drugs group (DG) received conventional drugs. Pain was evaluated by visual analog scale (VAS) before and after therapy.Results: Statistical analysis showed that treatment was effective ($F(2,83) = 4.882$; $p = .010$). Bonferroni post-hoc analysis indicated a lower pain decrease in PG. SG registered a 34-point decrease per patient, while in PG and DG, the reduction was 25.6 and 35.3, respectively.Conclusion: The study supports the efficacy of home LLLT management of TMJD related pain. Double-Blind Method;Humans;Low-Level Light Therapy;Pain;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome

Photobiomodulation associated to cellular therapy improve wound healing of experimental full thickness burn wounds in rats. Adipose derived stromal vascular fraction (SVF) is a method of cell therapy potentially applicable for treatment of full thickness burns. Here we investigated if the association of photobiomodulation (PBM) with SVF therapy could improve wound healing in experimentally induced full thickness burn wounds in rats compared to the topical agent 2% silver sulfadiazine in a dose-dependent manner. Sixty-six male Wistar rats were divided in 4 groups containing 5 animals each which received the following treatments: 2% sulfadiazine (SD), SVF, SVF plus PBM at 30â€¯mW (SVFL30), and SVF plus PBM at 100â€¯mW (SVFL100). Two donor animals were used for each experimental series with 3, 7 and 30â€¯days. Digital photography, microscopic analysis with Hematoxilin and Eosin (H&E), quantification of collagen type I by picrosirius red staining analysis and wound contraction evaluation were performed in order to quantify the results. At day 3 SVF alone or combined with PBM promoted increased early inflammatory response compared to SD. At day 7 SVFL30 and SVFL100 enhanced inflammatory cells infiltration, angiogenesis and fibroblast content compared to SVF and SD groups. At day 30 collagen concentration and wound contraction were higher in SVFL30 when compared to the other groups. In conclusion PBM promotes a synergistic outcome with SVF therapy with a dose dependent effect potentializing wound healing of experimental full thickness burns in rats through amplification of early inflammatory response, enhanced angiogenesis, fibroblast content, accentuated wound contraction and collagen concentration. Animals;Burns;Cell- and Tissue-Based Therapy;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Low-level laser as a complementary therapy in orofacial granulomatosis management: a case report. Orofacial granulomatosis (OFG) is a chronic inflammatory disease that typically affects the soft tissues of the orofacial region. The most common clinical manifestation of OFG is lip swelling, which may be associated with intrabuccal ulcerations and increased growth of the gingiva and mucosa, as well as cutaneous erythema and facial edema. The treatment for OFG is challenging, and sometimes considered unsatisfactory. Thus, this study presents a case report of OFG and the therapeutic regimen applied. A 47-year-old man presented with increased lip volume which had started 10 months earlier. His lips were thick with a fibroelastic consistency, which were painless upon palpation. Incisional biopsy and histopathological analysis of the upper lip revealed non-specific granulomatous inflammation and the diagnosis of OFG was subsequently made. Low-level laser therapy was successfully used to treat OFG in this case, and appears to be an efficient treatment for OFG when corticosteroid therapy is not enough. Chronic Disease;Complementary Therapies;Granulomatosis, Orofacial;Humans;Inflammation;Lip;Male;Middle Aged

Effects of photobiomodulation therapy on inflammatory mediators in patients with chronic non-specific low back pain: Protocol for a randomized placebo-controlled trial. INTRODUCTION: Low back pain (LBP) is ranked as one of the most prevalent health conditions. It is likely that some inflammatory mediators could be associated with pain and disability in these patients. Photobiomodulation therapy (PBMT) is a non-pharmacological therapy often used in patients with LBP and one of the possible mechanisms of action of therapy is modulate inflammatory mediators. However, to date there are no studies that evaluated the effects of PBMT on the levels of inflammatory mediators in patients with LBP. The aim of this study is to evaluate the acute effects of PBMT on systemic levels of inflammatory mediators and pain intensity in patients with chronic non-specific low back pain. METHODS AND ANALYSIS: This is a prospectively registered, two-arm randomized placebo-controlled trial with blinded patients, assessors and therapists. Eighteen patients with chronic non-specific LBP will be randomized into 2 groups: placebo or active PBMT. The treatment will be provided in a single session. The primary outcome will be levels of prostaglandin E2 (PGE2). The secondary outcomes will be levels of necrosis factor alpha (TNF-Î±), interleukin 6 (IL-6)

and pain intensity. Biochemical and clinical outcomes will be measured at baseline and 15 minutes after the single treatment session. DISCUSSION: Despite PBMT be used in musculoskeletal disorders such as LBP, to the best of our knowledge this is the first study that will investigate a possible biological mechanism behind the positive clinical effects of PBMT on non-specific chronic low back pain. ETHICS AND DISSEMINATION: The study was approved by the Regional Research Ethics Committee. The results will be disseminated through publication in peer-reviewed international journal and conferences. TRIAL REGISTRATION NUMBER: NCT03859505. IL6 protein, human;Interleukin-6;Tumor Necrosis Factor-alpha;Dinoprostone Adult;Chronic Pain;Clinical Protocols;Dinoprostone;Double-Blind Method;Female;Humans;Interleukin-6;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Patient Selection;Tumor Necrosis Factor-alpha;Young Adult

Efficacy of laser acupuncture for patients with chronic Bell's palsy: A study protocol for a randomized, double-blind, sham-controlled pilot trial. BACKGROUND: Bell's palsy is the most frequent cause of unilateral peripheral facial palsy, a common condition that third of patients can have inadequate recovery and subsequent physical and social impairments. The largely ineffective and even controversial nature of the various medical and surgical treatment options means that novel, alternative approaches are needed. In preclinical and clinical evidence, low-level laser therapy (LLLT) has demonstrated the ability to regenerate peripheral nerves. Laser acupuncture treatment (LAT), the stimulation of traditional acupoints with low-intensity, non-thermal laser irradiation, is a common treatment modality, but its efficacy in chronic Bell's palsy is undetermined. This study aims to evaluate the efficacy of LAT in patients experiencing inadequate recovery from Bell's palsy. METHODS: This 2-armed, parallel, randomized, subject-assessor-blinded, single-center, sham-controlled pilot trial will randomly assign 32 eligible patients into either a real LAT group (nâ€Š=â€Š16) or a sham LAT group (nâ€Š=â€Š16). The real LAT group will receive 3 LAT sessions each week for 6 weeks (a total of 18 sessions), delivered to acupoints corresponding with the affected side of the face. The sham LAT group will receive the same treatment as the real LAT group, but with a sham laser device. The primary outcome measure will be the change from baseline at week 6 in the Facial Disability Index score. Secondary outcomes will monitor changes during treatment in the House-Brackmann and Sunnybrook facial nerve grading systems and stiffness scale, at weeks 1, 3, and 6. DISCUSSION: To the best of our knowledge, this double-blind, randomized, sham-controlled trial is the first such investigation into the efficacy of LAT in chronic Bell's palsy. Clinical trials using LLLT have shown positive therapeutic effects in acute Bell's palsy, although as yet, the feasibility and efficacy of LAT remain unclear in patients experiencing inadequate recovery from Bell's palsy. TRIAL REGISTRATION: This trial protocol has been approved by the Research Ethics Committee of the China Medical University Hospital, Taichung, Taiwan (Protocol ID: CMUH107-REC1-030) also registered at ClinicalTrials.gov (identifier no. NCT03592797). Acupuncture Therapy;Bell Palsy;Chronic Disease;Clinical Protocols;Double-Blind Method;Humans;Low-Level Light Therapy;Patient Selection;Pilot Projects

Photobiomodulation and Coenzyme Q(10) Treatments Attenuate Cognitive Impairment Associated With Model of Transient Global Brain Ischemia in Artificially Aged Mice. Disturbances in mitochondrial biogenesis and bioenergetics, combined with neuroinflammation, play cardinal roles in the cognitive impairment during aging that is further exacerbated by transient cerebral ischemia. Both near-infrared (NIR) photobiomodulation (PBM) and Coenzyme Q(10) (CoQ(10)) administration are known to stimulate mitochondrial electron transport that potentially may reverse the effects of cerebral ischemia in aged animals. We tested the hypothesis that the effects of PBM and CoQ(10), separately or in combination, improve cognition in a mouse model of transient cerebral ischemia superimposed on a model of aging. We modeled aging by 6-week administration of D-galactose (500

mg/kg subcutaneous) to mice. We subsequently induced transient cerebral ischemia by bilateral occlusion of the common carotid artery (BCCAO). We treated the mice with PBM (810 nm transcranial laser) or CoQ(10) (500 mg/kg by gavage), or both, for 2 weeks after surgery. We assessed cognitive function by the Barnes and Lashley III mazes and the What-Where-Which (WWWhich) task. PBM or CoQ(10), and both, improved spatial and episodic memory in the mice. Separately and together, the treatments lowered reactive oxygen species and raised ATP and general mitochondrial activity as well as biomarkers of mitochondrial biogenesis, including SIRT1, PGC-1Î±, NRF1, and TFAM. Neuroinflammatory responsiveness declined, as indicated by decreased iNOS, TNF-Î±, and IL-1Î² levels with the PBM and CoQ(10) treatments. Collectively, the findings of this preclinical study imply that the procognitive effects of NIR PBM and CoQ(10) treatments, separately or in combination, are beneficial in a model of transient global brain ischemia superimposed on a model of aging in mice.

Effects of photobiomodulation in the treatment of fractures: a systematic review and meta-analysis of randomized clinical trials. Several therapeutic strategies have been proposed to optimize the conventional treatment of fractures. Photobiomodulation (PBM) appears to help reduce pain and control inflammation, and it also accelerates bone repair. This systematic review aimed to evaluate the effectiveness and safety of PBM with low-level laser therapy (LLLT) in the bone fracture healing process. We included randomized controlled trials (RCTs) comparing the effects of PBM with those of any other intervention in adults with lower or upper limb bone fractures. The primary outcomes investigated were pain reduction, radiographic healing, and adverse events. The searches were conducted in October 2018. Two RCTs were included that compared PBM to the placebo. A meta-analysis showed significant difference in favor of PBM for pain reduction (MD 1.19, 95% CI [0.61 to 1.77], 106 participants, two RCTs), but this difference was not clinically significant. One RCT (50 participants) showed a clinical and statistical improvement in physical function (MD -â€‰14.60, 95% CI [-â€‰21.39 to -â€‰7.81]) and no difference in radiographic healing, regarding absence of fracture line (RR 1.00, 95% CI [0.93 to 1.08]) and visible bone callus (RR 0.33, 95% CI [0.01 to 7.81]). The certainty of evidence was classified as low to very low. Based on the evidence of low to very low certainty, PBM seems to be associated with the improvement of pain and function. Therefore, new RCTs are required that meet the recommendations of CONSORT to prove the effectiveness and safety of this intervention and support its recommendation in clinical practice. Fracture Healing;Fractures, Bone;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Efficacy of Non-ablative Laser Therapy for Lichen Sclerosus: A Randomized Controlled Trial. OBJECTIVE: The aim of this randomized controlled trial was to evaluate the safety and efficacy of neodymium: yttrium aluminum garnet laser treatment of lichen sclerosus (LS) by comparing it with topical corticosteroid treatment. METHODS: A total of 40 female patients with vulvar LS were randomized 1:1 into a study (laser) group and a control (topical corticosteroids) group. The laser group received three laser treatments. Blinded evaluators evaluated biopsies and graded improvement on clinical photographs at baseline and at 3 months. Patients graded the intensity of symptoms on a 0 to 10 visual analogue scale at baseline and 1-, 3-, and 6-month follow-up. Patients also rated the tolerability of laser treatments, and side effects were monitored. (Canadian Task Force classification I) RESULTS: Laser treatment discomfort was on average 1.5 of 10 on the visual analogue scale. At 1- and 3-month follow-up, patients in the laser group had significantly greater improvement in LS symptoms (burning, itching, pain, and dyspareunia), better patient satisfaction, and greater reduction of sclerosis than patients in the topical corticosteroid group. At 6-month follow-up, the improvement of symptoms in the laser group was still significant. The correct order of photographs (before and after treatment) was assigned significantly more often in the laser-treated patients compared with the control group. CONCLUSION: Laser therapy for LS caused minimal patient discomfort during the treatment, with no adverse effects, and demonstrated better efficacy than in

the control group, with significant improvement lasting up to 6 months. Laser therapy is a promising option for patients not responding to topical corticosteroid therapy or patients wishing to reduce long-term corticosteroid maintenance use. Glucocorticoids;Betamethasone Adult;Aged;Betamethasone;Female;Glucocorticoids;Humans;Lasers, Solid-State;Lichen Sclerosus et Atrophicus;Low-Level Light Therapy;Middle Aged

Fibrin Sealant Derived from Human Plasma as a Scaffold for Bone Grafts Associated with Photobiomodulation Therapy. Fibrin sealants derived from human blood can be used in tissue engineering to assist in the repair of bone defects. The objective of this study was to evaluate the support system formed by a xenograft fibrin sealant associated with photobiomodulation therapy of critical defects in rat calvaria. Thirty-six rats were divided into four groups: BC (n = 8), defect filled with blood clot; FSB (n = 10), filled with fibrin sealant and xenograft; BC(PBMT) (n = 8), blood clot and photobiomodulation; FSB(PBMT) (n = 10), fibrin sealant, xenograft, and photobiomodulation. The animals were killed after 14 and 42 days. In the histological and microtomographic analysis, new bone formation was observed in all groups, limited to the defect margins, and without complete wound closure. In the FSB group, bone formation increased between periods (4.3 Â± 0.46 to 6.01 Â± 0.32), yet with lower volume density when compared to the FSB(PBMT) (5.6 Â± 0.45 to 10.64 Â± 0.97) group. It was concluded that the support system formed by the xenograft fibrin sealant associated with the photobiomodulation therapy protocol had a positive effect on the bone repair process. Fibrin Tissue Adhesive Animals;Bone Regeneration;Bone Transplantation;Fibrin Tissue Adhesive;Humans;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Acceleration of newborn rats' development with the use of photobiomodulation and the near possibility of application in human premature babies. Photobiomodulation was explored to find evidence of stimulation during the development of newborn rats. A light chamber device was used, and rat pups were divided into groups after birth. Investigation of the process' security was performed before the full experiment. Following a protocol of alternating illumination and mother's presence during the first 13â€‰days, we observed that, in the group that received photobiomodulation, the pups opened their eyes faster, indicating earlier achievement of maturity. The rate of weight gain also indicates faster metabolic activity in the group that was photostimulated. This study is the first step toward the use of photobiomodulation for premature newborn human babies. Acceleration;Animals;Animals, Newborn;Body Weight;Growth and Development;Humans;Low-Level Light Therapy;Premature Birth;Rats

Photobiomodulation-induced analgesia in experimental temporomandibular disorder involves central inhibition of fractalkine. Temporomandibular disorder (TMD) is a collective term that encompasses a set of clinical problems that affect the masticatory muscles, the temporomandibular joint, and associated structures. Despite their high clinical prevalence, the mechanisms of chronic craniofacial muscle pain are not yet well understood. Treatments for TMD pain relief and control should be minimally invasive, reversible, and conservative. Photobiomodulation (PBM) is a promising option once it is known to inhibit inflammatory response and to relief painful symptoms. Herein, the effects of PBM (660Â nm, 30Â mW, 16Â J/cm(2), 0.2Â cm(2), 15Â s in a continuous frequency) on the pain sensitivity of rats submitted to an experimental model of TMD induced by CFA was evaluated. Experimental TMD was induced in rats by the injection of complete Freund's adjuvant (CFA) injection into the masseter muscle. Nociceptive behavior was evaluated by electronic von Frey before CFA and after 1Â h, 3Â h, 6Â h, and 24Â h and 7, 14, and 21Â days after PBM treatment. Inflammatory infiltrate was evaluated by histology of the masseter muscle and fractalkine expression was evaluated by immunohistochemistry of the trigeminal ganglia. PBM reversed the mechanical hypersensitivity of the animals by inhibiting the local inflammatory response, observed by the decrease of the inflammatory infiltrate in the masseter muscle of rats and by a central inhibition of fractalkine

observed in the trigeminal ganglion. These data provide new insights into the mechanisms involved in the effects of photobiomodulation therapy emphasizing its therapeutic potential in the treatment of TMD. Chemokine CX3CL1;Freund's Adjuvant Analgesia;Animals;Chemokine CX3CL1;Freund's Adjuvant;Low-Level Light Therapy;Male;Masseter Muscle;Microglia;Pain;Pain Management;Rats, Sprague-Dawley;Regeneration;Temporomandibular Joint Disorders;Trigeminal Ganglion

Effects of Photobiomodulation on Root Resorption Induced by Orthodontic Tooth Movement and RANKL/OPG Expression in Rats. The aim of this study was to evaluate the effects of photobiomodulation on the repair of induced root resorption (RR) after orthodontic tooth movement. Twenty male rats were used in this study. Forty right and left upper first molars were evaluated and divided into four groups (nÂ =Â 10): negative control group (NC), no tooth movement or irradiation; positive control group (PC), induced tooth movement and root resorption; conventional treatment group (CT), force was removed after 7Â days; and photobiomodulation group (PBM) after force removal molars were irradiated every 48Â h for 7Â days using GaAlAs diode laser (810Â nm). Energy per point was 1.5Â J (100Â mW, 15Â s, 75Â JÂ cm(-2)). NC and PC were euthanized on day 7; CT and PBM on day 14. Histomorphometric and immunohistochemsitry analyses showed increase in area of root resorption in all groups (PÂ <Â 0.05) compared to NC. RR lacunae were larger in CT compared to PC and PBM at the compression side of the distal root. OPG was higher in PBM group (PÂ <Â 0.05). PBM group showed low expression of RANKL compared to PC and CT on the tension side. PBM can potentially affect RR progression by increasing OPG expression in the compression area and decreasing number of clastic cells in the root surface. Osteoprotegerin;RANK Ligand;Tnfrsf11b protein, rat Animals;Low-Level Light Therapy;Male;Osteoprotegerin;RANK Ligand;Rats;Rats, Wistar;Root Resorption;Tooth Movement Techniques

The Effects of Nerve and Tendon Gliding Exercises Combined with Low-level Laser or Ultrasound Therapy in Carpal Tunnel Syndrome. BACKGROUND: Carpal tunnel syndrome (CTS) is a common medical condition that doctors and physiotherapists come across in clinical practice. There are no explicit recommendations concerning which physical therapy methods should be applied in its treatment; however, there have also been no studies on the effects of combining low-level laser therapy (LLLT) or ultrasound with nerve and tendon gliding exercises. The purpose of this study was to evaluate the therapeutic efficacy of ultrasound and LLLT combined with gliding exercises. MATERIALS AND METHODS: A total of seventy patients with mild to moderate CTS, divided into two groups, were included in this study. Group 1 received ultrasound treatment, whereas Group 2 underwent LLLT. The treatment lasted 2 weeks (5 sessions/week). In addition, both groups were treated with nerve and tendon gliding exercises three times daily. The clinical evaluation involved an interview on subjective and objective sensory abnormalities, the intensity of pain, the measurement of grip strength, Phalen's test, Tinel's sign, and the Boston Carpal Tunnel Questionnaire. The assessment was performed before and after the treatment. RESULTS: A decrease in sensory impairments, improvement in visual analog scale, hand grip strength and the Boston Questionnaire results were significant in all patients after therapy. No meaningful differences between groups were noted in any of the examined variables after treatment. No adverse effects were observed. CONCLUSIONS: The results of this study may suggest the clinical efficacy of LLLT or ultrasound combined with gliding exercises in patients with mild to moderate CTS.

Photosensitizer effects of MWCNTs-COOH particles on CT26 fibroblastic cells exposed to laser irradiation. In the current study, photosensitizer effect of carboxylate multiwalled carbon nanotubes (MWCNTs-COOH) on CT26 fibroblastic cells following near infrared (NIR) irradiation was quantized in photo-thermal therapy (PTT). Moreover, it was tried to achieve optimal dose of

MWCNTs-COOH and laser exposure time. Characterizations of MWCNTs-COOH were scrutinized using scanner electron microscope (SEM), spectrophotometer, and particle size analyzer. The seeded CT26 cells were treated with nontoxic concentrations of MWCNTs-COOH and then irradiated. Finally, viability (%) of the CT26 cells was determined using MTT assay. The findings revealed that 10, 50, and 80 Î¼g/mL of MWCNTs-COOH have remarkable photosensitizer effects on CT26 cancerous cell lines against NIR irradiation (2.5 W/cm(2)). It was shown that using the 80 Î¼g/mL concentration of MWCNTs-COOH against 60, 120, 180, 240, and 300 s of NIR irradiation and also, 10 and 50 Î¼g/mL concentration of MWCNTs-COOH against 180, 240, and 300 s of NIR irradiation can lead to significant decrease in mean cell viability (%) by more than 50%. According to the obtained data, it seems that using the PPT with MWCNTs-COOH, as adjunct therapy in CT26 fibroblastic cells, can help to increase therapeutic ratio of main modalities of cancer treatment such as radiotherapy, chemotherapy, and surgery. Carboxylic Acids;Nanotubes, Carbon;Photosensitizing Agents Carboxylic Acids;Cell Line;Cell Survival;Fibroblasts;Humans;Low-Level Light Therapy;Nanotubes, Carbon;Photosensitizing Agents;Temperature

Q-switched double-frequency Nd:YAG (532Â nm) laser is an effective treatment for racial lip pigmentation. INTRODUCTION: Lip darkening is a relatively common condition, especially in the Middle East and Southeast Asia. It is well documented in the literature and generally considered to be multifactorial. The presentation can be physiologic or pathologic and caused by a variety of local or systemic factors. CASE PRESENTATION: A 32-year-old female with skin type IV presented to the clinic with concerns of darkening lips with no associated symptoms or history of disease. On examination, her lips were homogenously dark brown with the upper lip slightly darker than the lower lip. OBJECTIVE: To report effectivness of Q-switched 532 nm laser for treatment of lip pigmentation. METHOD: Topical 2.5% lidocaine/prilocaine (EMLA) cream was applied 30 minutes prior to laser therapy. The region was treated with Q-switched 532 nm laser (Medlite). RESULT: Two weeks after laser treatment , threre was satisfying subjective and objective improvment in lip pigmnetation. CONCLUSION: Q-Switched 532 nm laser effectively reduces lip pigmentation after one session with minimal adverse effects and lasting results.
Adult;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Lip;Low-Level Light Therapy;Photography;Treatment Outcome

Evaluation of The Bio-Stimulatory Effect of Platelet Rich Fibrin Augmented by Diode LASER Compared to Platelet Rich Fibrin Alone on Dental Implant Replacing Posterior Mandibular Teeth. Randomised Clinical Trial: Split Mouth Study. BACKGROUND: Restoring masticatory function and replacing missing teeth with minimal pain and discomfort are the most important issues for the patient and clinician. Nowadays dental implants became the most popular line of treatment to replace missing teeth; offering a comfortable long lasting prosthesis. Osseo-integration reflects the long term success of a dental implant. Many bio-modulators are used aiming to improve the osseointegration and healing around dental implants such as Low-Level Laser treatment (LLLT) and Platelet Rich Fibrin (PRF). PRF has been proven to improve bone repair process around the dental implant. LLLT is considered a noninvasive, safe technique that stimulates osteogenesis and alleviates post-operative pain. AIM: Evaluation of the bio-stimulatory effect of LLLT on a dental implant with PRF compared to PRF alone clinically and radiographically. METHODS: A randomised clinical trial with the split-mouth design was conducted on nine patients with bilaterally missing lower posterior tooth. All patients received one dental implant on each side with PRF. LASER application was performed to one side twice weekly for one month starting on the day of insertion. Post-operative pain was assessed daily through the first week using numerical rating pain scale (NRS) as the primary outcome. Relative peri-implant bone density was measured using direct digital intraoral radiography immediately after insertion, one, four and nine months postoperatively. Implants stability were measured using radio

frequency assessment immediately after insertion, four and nine months post-operative as secondary outcomes. RESULTS: The NRS for pain was significantly decreased by the end of the first-week postoperatively in the intervention and control group with a mean of (2.22 Â± 1.56) (2.11 Â± 1.83) respectively. However, there was no statistically significant difference between the test groups at P-Value (0.892). The relative bone density values were decreased by the end of the ninth month of follow-up in the intervention and control group with a mean of (134.42 Â± 16.13) (128.77 Â± 33.54) respectively. No statistically significant difference was observed between the two test groups at P-value (0.863). The radiofrequency values for implant stability showed no statically significant difference after nine months of follow up when compared to the initial stability values at the day of insertion in the intervention and control group. The mean radiofrequency values were (67.24 Â± 1.79) and (66.9 Â± 2.57) respectively, and no statistically significant difference was observed between the two test groups at P-value (0.793). CONCLUSION: There are no statistically significant differences in post-operative pain values, implant stability and bone density between the implant sites treated with PRF augmented by Diode laser compared to implant sites treated by PRF alone.

Treatment of Osteoarthritis With Low-level Laser Therapy, Acupuncture, and Herbal Therapy: A Case Report. Osteoarthritis is a challenging diagnosis to navigate and treat. Management options range from nonpharmacological agents to surgical repair. No specific combination of therapies has yet been identified for optimal management although a variety of therapeutic options have been studied. This case report details the use of low-level laser therapy, acupuncture, and herbal medicine in a 64-y-old female with radiographically confirmed osteoarthritis. Near-complete resolution of her symptoms was associated with the multiple therapies outlined in this case report.

Brain Photobiomodulation: A New Strategy to Enhance Cognitive Function?

Effects of photobiomodulation therapy on the extracellular matrix of human dental pulp cell sheets. Photobiomodulation therapy (PBMT) and the cell sheet (CS) technology improve processes relevant to tissue regeneration. The aim of this study was to investigate the effects of different PBMT parameters on the architecture (histology), protein composition (Western blotting and immunohistochemistry) and ultrastructure [scanning electron microscopy (SEM) and transmission electron microscopy (TEM)] of the extracellular matrix (ECM) synthesized by CSs composed by human dental pulp stem cells (hDPSCs). METHODS: Thawed cells were recharacterized by the expression profile of the surface molecules of mesenchymal stem cells (MSCs) using flow cytometry. Clonogenic medium supplemented with vitamin C (20â€¯Î¼g/ml) was used for obtaining the CSs. PBMT was performed with continuous-wave diode laser (660â€¯nm, 20â€¯mW, 0.028cm(2), 0.71â€¯W/cm(2)) in punctual and contact mode. The CSs were allocated in 3 experimental groups: Control: no further treatment; PBMT1 [4â€¯s, 3â€¯J/cm(2) (lower energy density), 0.08â€¯J/point] and PBMT2 [7â€¯s, 5â€¯J/cm(2) (higher energy density), 0.14â€¯J/point]. Statistical comparisons were performed (pâ€¯â‰¤â€¯.05). RESULTS: The cells presented the classical immunoprofile of MSCs. Type I and type III collagens and fibronectin were present in the ECM of the CSs. PBMT1 induced higher amount of fibronectin. The overall ultrastructure of the CSs in the PBMT1 was epithelial-like, whereas the PBMT2 leads to CSs with fusiform cells arranged in bundles. TEM identified a more mature ECM and signs of apoptosis and necrosis in the PBMT2 group. CONCLUSION: PBMT influence the composition and ultrastructure of the ECM of CSs of hDPSCs. Thus, PBMT, specifically when applied in the lower energy density, could be of importance in the determination of the mechanical quality of CSs, which may favor cell therapy by improving the CS transplantation approach. Cell Line;Dental Pulp;Extracellular Matrix;Humans;Low-Level Light Therapy;Stem Cells

Photobiomodulation therapy on the palliative care of temporomandibular disorder and orofacial/cervical skull pain: study protocol for a randomized controlled clinical trial. BACKGROUND: Temporomandibular disorder (TMD) is the most common cause of orofacial and

cervical skull pain and is considered to be a public health problem, affecting 5% to 12% of the world population. TMD is multifactorial and there are several types of treatment, with the conservative types being indicated more often as they are less aggressive and reversible. The main aim of these treatments is to relieve symptoms, reduce of pain, and restore orofacial and cervical skull functions. Photobiomodulation therapy (PBMT), a noninvasive therapy, is an option for the management of musculoskeletal disorders due to its analgesic, anti-inflammatory, and regenerative effects. METHODS: The aim of the proposed study is to verify whether PBMT is effective for use in palliative care of TMD and orofacial and cervical skull pain. A randomized, triple-blinded, placebo-controlled clinical trial is proposed. This study will involve 200 adult participants (over 18â€‰years of age) who will be randomly divided into two groups (nâ€‰=â€‰100): Group 1, active treatment (PBMT); and Group 2, placebo. Participants will be subjected to three sessions of PBMT or placebo and will be evaluated using the research diagnostic criteria (RDC) for TMD. Pain level (measured by a visual analog scale (VAS)), mandibular movements (measured by ruler and caliper), quality of life (measured by the Oral Health Impact Profile (OHIP)-14), and quality of sleep (measured by the Epworth scale) will be recorded. This study is being conducted at the Special Laboratory of Lasers in Dentistry (LELO) of the School of Dentistry of the University of Sao Paulo (USP). DISCUSSION: This study will verify whether PBMT is effective in reducing TMD and orofacial and cervical skull pain. PBMT may be an option for the management of musculoskeletal disorders due to its analgesic, anti-inflammatory, and regenerative effects, in addition to being a noninvasive technique. TRIAL REGISTRATION: Registro Brasileiro de Ensaios ClÃ-nicos, RBR-9b6mnj . Registered on 27 March 2018. Trial registry name: Laser de baixa potÃªncia no cuidado paliativo da disfunÃ§Ã£o temporomandibular e dor crÃ¢nio orofacial e cervical. Ethics committee: #1774930 approved on 14 October 2016. Brazil;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Neck Pain;Pain Measurement;Palliative Care;Quality of Life;Randomized Controlled Trials as Topic;Sleep;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome

A transient protective effect of low-level laser irradiation against disuse-induced atrophy of rats. Satellite cells, a population of skeletal muscular stem cells, are generally recognized as the main and, possibly, the sole source of postnatal muscle regeneration. Previous studies have revealed the potential of low-level laser (LLL) irradiation in promoting satellite cell proliferation, which, thereby, boosts the recovery of skeletal muscle from atrophy. The purpose of this study is to investigate the beneficial effect of LLL on disuse-induced atrophy. The optimal irradiation condition of LLL (808Â nm) enhancing the proliferation of Pax7(+ve) cells, isolated from tibialis anterior (TA) muscle, was examined and applied on TA muscle of disuse-induced atrophy model of the rats accordingly. Healthy rats were used as the control. On one hand, transiently, LLL was able to postpone the progression of atrophy for 1Â week through a reduction of apoptosis in Pax7(-ve)MyoD(+ve) (myocyte) population. Simultaneously, a significant enhancement was observed in Pax7(+ve)MyoD(+ve) population; however, most of the increased cells underwent apoptosis since the second week, which suggested an impaired maturation of the population. On the other hand, in normal control rats with LLL irradiation, a significant increase in Pax7(+ve)MyoD(+ve) cells and a significant decrease of apoptosis were observed. As a result, a strengthened muscle contraction was observed. Our data showed the capability of LLL in postponing the progression of disuse-induced atrophy for the first time. Furthermore, the result of normal rats with LLL irradiation showed the effectiveness of LLL to strengthen muscle contraction in healthy control. PAX7 Transcription Factor Animals;Apoptosis;Cell Proliferation;Disease Models, Animal;Low-Level Light Therapy;Male;Muscle Contraction;Muscle, Skeletal;Muscular Disorders, Atrophic;PAX7 Transcription Factor;Rats, Sprague-Dawley

Effect of irradiation with intravascular laser on the hemodynamic variables of hypertensive patients: Study protocol for prospective blinded randomized clinical trial. BACKGROUND: High blood pressure (HBP) is a multifactorial clinical condition, with a high morbidity and mortality rate and low rates of control. Due to its high prevalence, it is necessary to search for methods which aim to improve the quality of life of hypertensive patients. Studies have shown that low level laser therapy (LLLT) is capable of inducing a photobiological response within the cells which modifies the micro and macrovascular response; this accompanies evidence showing the systemic effects of intravascular laser irradiation of blood (ILIB). In the hypothesis that the use of LLLT can influence blood pressure levels, and perhaps facilitate adherence to treatment, this study aims to present a clinical research protocol with the goal of determining the effect of photobiomodulation in relation to changes in the hemodynamic parameters of hypertensive and normotensive patients. METHOD: Forty-four participants, frequent attendees of an ambulatory university clinic, will be subdivided into 4 groups, and then submitted to protocol sessions of ILIB. The technique is noninvasive and consists of a laser which is attached to a bracelet which has been specifically developed for the light beam to be transcutaneously carried over the radial artery. Before the procedure, at the end of the photobiomodulation cycles, and 1 month after the end of therapy, blood samples will be collected for the evaluation of C-reactive protein, interleukin 6, and nitric oxide, to be analyzed by immunoturbidimetric, ELISA, and Griess reactions, respectively. ANALYSIS OF RESULTS: Results will be analyzed using descriptive and inferential statistics and will be compiled into tables and/or graphs, with the help of SPSS version 24.0 with the adopted significance level for all tests being Î±â€Š=â€Š0.05. DISCUSSION: The treatment of HBP involves both pharmacological and nonpharmacological therapy. Animal studies with photobiomodulation have previously shown hypotensive effects. Gaps in the literature exist regarding the applicability of this nonpharmacological therapy in humans. This study aims to consider the possibility of offering nonpharmacological therapy to hypertensive patients with the goal of increasing adherence to the treatment as well as minimizing morbidity and mortality caused by hypertension. Adult;Clinical Protocols;Female;Humans;Hypertension;Low-Level Light Therapy;Male;Prospective Studies;Radial Artery;Randomized Controlled Trials as Topic;Single-Blind Method;Treatment Outcome

A comparison of physical modalities in Galli-Galli disease: Erbium:YAG laser, Intense Pulsed Light and Electrofulguration. Erbium Adult;Biopsy, Needle;Erbium;Esthetics;Female;Follow-Up Studies;Humans;Hyperpigmentation;Immunohistochemistry;Laser Coagulation;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Risk Assessment;Severity of Illness Index;Skin Diseases, Genetic;Skin Diseases, Papulosquamous;Treatment Outcome

Ultraviolet A/blue light-emitting diode therapy for vulvovaginal candidiasis: a case presentation. Vulvovaginal candidiasis (VVC) is a frequent infection of the female genitourinary tract. It is considered the second most common genital infection in women, after bacterial vaginosis. VVC is treated with oral or topical azole derivatives. However, these agents may lead to adverse reactions and their chronic use might lead to resistance to antifungal agents. Given that the ultraviolet A/blue light-emitting diode (LED) is an electromagnetic radiation source with antimicrobial properties, it is hypothesized that this resource may be a non-drug alternative to the treatment of vulvovaginitis. A technical/experimental safety test was conducted to characterize the light source spectrum and temperature generation of the device, followed by a pilot study in a 52-year-old patient with a clinical diagnosis of VVC confirmed by culture and examination of fresh vaginal samples, owing to the presence of lumpy vaginal discharge and a complaint of pruritus. The vulva and vagina were exposed to 401â€‰Â±â€‰5Â nm ultraviolet A/blue LED irradiation in a single session, divided into two applications. A reassessment was performed 21Â days after the treatment. The light-emitting device had a visible spectrum, in the violet and blue ranges, and a maximum temperature increase of 7Â Â°C.

During the reassessment, the culture was found to be negative for fungus, and the signs and symptoms of the patient had disappeared. A light-emitting device with a spectrum in the range of 401â€‰Â±â€‰5Â nm could potentially be an alternative treatment modality for women with VVC, as it led to the resolution of clinical and microbiological problems in our patient. Candidiasis, Vulvovaginal;Female;Humans;Middle Aged;Pilot Projects;Temperature;Ultraviolet Therapy

Authors' response. Interleukin-1beta Algorithms;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Low-Level Light Therapy;Tooth Movement Techniques

Low-level laser therapy increases interleukin-1Î² in gingival crevicular fluid and enhances the rate of orthodontic tooth movement. Interleukin-1beta Gingival Crevicular Fluid;Humans;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Tooth Movement Techniques

Effects of laser acupuncture in a patient with a 12-year history of facial paralysis: A case report. BACKGROUND: Traumatic facial palsy, whether accidental or iatrogenic, is a common cause of facial paralysis. Laser acupuncture therapy (LAT) is a non-invasive, pain-free method to stimulate traditional acupuncture points with non-thermal laser irradiation. Low-level laser therapy has proven beneficial in the regeneration of peripheral nerves. This case report describes the feasibility of this innovative treatment in a patient with a 12-year history of traumatic facial palsy and severe sequelae. CASE SUMMARY: A52-year-old male presented with a severe left-sided facial paralysis that had lasted for 12 years. At initial presentation, the man could not fully close his left eye and had difficulty eating solid foods. The paralysis of his left-sided facial muscles had resulted in dysarthria. He was administered 30 LAT sessions in the Acupuncture Department of China Medical University Hospital, Taichung, Taiwan, over a 4-month period. His recovery was monitored by scores on the Facial Disability Index, the Sunnybrook Facial Nerve Grading System and measurements of the vertical palpebral distance in his left eye. Photographs were taken after every treatment. On the 10th treatment, a change in closure of the left eye was noticed and facial muscle strength was improved. After 22 treatments, the patient could fully close his left eye. CONCLUSION: LAT significantly improved the sequelae of long-term facial paralysis in this patient. Large-scale prospective studies are needed to confirm this observation [added] Acupuncture Points;Acupuncture Therapy;Facial Nerve;Facial Paralysis;Humans;Male;Middle Aged

Photobiomodulation enhancement of cell proliferation at 660â€¯nm does not require cytochrome c oxidase. Photobiomodulation (PBM) therapy is based on the use of specific light parameters to promote tissue repair. Although demonstrated in different cell models and tissues, the mechanism by which photobiomodulation operates is not well understood. Previous studies suggested that the cell proliferation enhancement triggered by red and near-infrared PBM involves the activation of the mitochondrial respiratory chain enzyme cytochrome c oxidase (CCO). It was suggested that light in this range would displace inhibitory nitric oxide bound to CCO. To test this mechanism, we took advantage of cell lines lacking CCO, including a mouse line knockout for Cox10 (a gene required for the synthesis of heme a, the prosthetic group of CCO) and a human cell line with an mtDNA mutation in the tRNA Lysine gene, leading to mitochondrial protein synthesis impairment and the lack of three critical CCO subunits. In both models we showed the complete absence of assembled CCO. PBM (660â€¯nm) was applied to these proliferating cells using various parameters. In most of the conditions tested, increased cell proliferation was associated with PBM in both control and CCO negative cells, demonstrating that CCO is not required for PBM enhancement of cellular proliferation. Additional experiments showed that PBM increased both ATP levels and citrate synthase activity and levels. These results showed that although metabolic changes are associated with PBM, CCO is not

required for its cell proliferation enhancing effect. Electron Transport Complex IV Cell Line;Cell Proliferation;Electron Transport Complex IV;Low-Level Light Therapy;Mitochondria

Is Low-Level Laser Therapy an Effective Method to Alleviate Pain Induced by Active Orthodontic Alignment Archwire? A Randomized Clinical Trial. OBJECTIVE: The aim of this study is to assess if low-level laser therapy (LLLT) alleviates pain after the placement of orthodontic alignment archwire and if there could be a specific indication for the usage of LLLT according to the amount of dental crowding. MATERIALS AND METHODS: Ninety subjects were included and randomly assigned to the tested group (orthodontic treatment and LLLT), placebo group (orthodontic treatment and simulated LLLT), and control group (orthodontic treatment only). Inclusion criteria are age between 13 and 30Â years, completely erupted mandibular teeth, and lower crowding ofÂ â‰¥3Â mm. Exclusion criteria are spaces or diastema in the lower arch, ectopic teeth, treatment plan including extractions or the use of auxiliary devices, and previous orthodontic treatment. Patients reported the pain experienced by using a numeric rating scale, ranging from 0 to 10, at specific time intervals, that is, 2Â hours, 6Â hours, 24Â hours, and from day 2 to 7. Kruskal-Wallis H Test was used to assess differences in the maximum pain and pain experienced at each time interval among the three groups and in the maximum pain reported among subjects with different degree of crowding. RESULTS: The final sample consisted of 84 patients, 41 male and 43 female patients, with a mean age of 16.5Â Â±Â 2.8Â years. The pain experienced at each time interval and the maximum pain score were significantly lower in the tested group, whereas no differences were found between control and placebo groups. Moreover, no differences were found in the pain experienced among subjects with mild, moderate, and severe incisor crowding in all groups. CONCLUSIONS: LLLT is effective in alleviating the intensity and duration of pain experienced by patients after the engagement of alignment archwire. However, there is no specific indication for the usage of LLLT according to the amount of crowding. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Wires;Pain;Pain Management;Research Design;Young Adult

A case of latanoprost-induced diffuse facial skin hyperpigmentation. INTRODUCTION: Latanoprost is a prostaglandin F2Î± analogue, which has been used as a first-line drug for open-angle glaucoma. Common side effects of latanoprost include hyperpigmentation. While it usually occurs on irides or periocular skin, diffuse facial hyperpigmentation is rarely reported. CASE PRESENTATION: A 71-year-old woman was presented with diffuse gray-brown colored maculopatches on her face. The symptom appeared 1Â week after she started to use latanoprost eye drops for glaucoma. Biopsy specimen revealed vacuolar degeneration of dermo-epidermal junction and pigment incontinence in dermis. OBJECTIVE: The aim of this paper is to introduce a rare adverse effect of latanoprost and effective way of treatment. METHODS: We stopped her from using latanoprost. She was also treated with 532-nm potassium titanyl phosphate laser and low-fluence 1064-nm Q-switched Nd:YAG laser, while using topical agents. RESULT: After 10Â weeks, we observed hyperpigmentation of her face was effectively and safely treated. The patient was satisfied with the result. CONCLUSION: Diffuse facial pigmentation could be one of the latanoprost-induced adverse effects and the laser treatments with topical agents we used can make it improve faster. Antihypertensive Agents;Dermatologic Agents;Ophthalmic Solutions;Brimonidine Tartrate;Latanoprost Administration, Cutaneous;Administration, Ophthalmic;Aged;Antihypertensive Agents;Biopsy;Brimonidine Tartrate;Dermatologic Agents;Drug Substitution;Face;Female;Glaucoma;Humans;Hyperpigmentation;Lasers, Solid-State;Latanoprost;Low-Level Light Therapy;Ophthalmic Solutions;Skin;Skin Pigmentation;Treatment Outcome

Assessment of Inhibition of Mineral Loss from Human Tooth Enamel by Carbon Dioxide Laser and 1.23% Acidulated Phosphate Fluoride. AIMS AND OBJECTIVES: The efficacy of carbon dioxide

(CO(2)) laser irradiation combined with fluoride in inhibiting enamel demineralization has been demonstrated by several laboratory investigations. However, there are very few reports about the in situ or in vivo caries preventive effect of CO(2) laser combined with topical fluoride on dental enamel. Hence, an in situ study was designed and carried out to assess inhibition of mineral loss from human tooth enamel by CO(2) laser and 1.23% acidulated phosphate fluoride (APF). MATERIAL AND METHODS: Impressions of upper and lower arch of the volunteers were made in alginate impression material. Study models were poured, duplicated, and duly labeled. On the working model, appliances were fabricated in acrylic resin to fit the upper dental arch of the volunteers. Four enamel slabs (one from each group) were fitted on the palatal surface of the appliance as close as possible to posterior teeth. Surfaces of slabs were kept below the outer surface of acrylic. The analysis was done using SPSS version 15 (SPSS Inc., Chicago, IL, USA) Windows software program. RESULTS: Statistically significant increase in inhibition of mineral loss of enamel slabs when treated individually or in a combination of low power CO(2) laser and 1.23% APF solution. The application of 1.23% APF solution after low power CO(2) laser treatment showed maximum inhibition of mineral loss. CONCLUSION: The combined use of this specific laser treatment plus fluoride was more successful than either laser treatment or fluoride alone in the inhibition of mineral loss in the mouth. The results of this study also suggest that the combination of low power laser treatment with fluoride therapy may be effective as a caries inhibition treatment.

Propionibacterium acnes susceptibility to low-level 449â€‰nm blue light photobiomodulation. BACKGROUND AND OBJECTIVE: Recent advances in low-level light devices have opened new treatment options for mild to moderate acne patients. Light therapies have been used to treat a variety of skin conditions over the years but were typically only available as treatments provided by professional clinicians. Clinical application of blue light has proven to be effective for a broader spectral range and at lower fluences than previously utilized. Herein, we tested the hypothesis that sub-milliwatt/cm(2) levels of long-wave blue light (449â€‰nm) effectively kills Propionibacterium acnes, a causative agent of acne vulgaris, in vitro. MATERIALS AND METHODS: Two types of LED light boards were designed to facilitate in vitro blue light irradiation to either six-well plates containing fluid culture or a petri plate containing solid medium. P. acnes. Survival was determined by counting colony forming units (CFU) following irradiation. P. acnes was exposed in the presence and absence of oxygen. Coproporphyrin III (CPIII) photoexcitation was spectrophotometrically evaluated at 415 and 440â€‰nm to compare the relative photochemical activities of these wavelengths. RESULTS: 422 and 449â€‰nm blue light killed P. acnes in planktonic culture. Irradiation with 449â€‰nm light also effectively killed P. acnes on a solid agar surface. Variation of time or intensity of light exposure resulted in a fluence-dependent improvement of antimicrobial activity. The presence of oxygen was necessary for killing of P. acnes with 449â€‰nm light. CPIII displayed clear photoexcitation at both 415 and 440â€‰nm, indicating that both wavelengths are capable of initiating CPIII photoexcitation at low incident light intensities (50â€‰uW/cm(2)). CONCLUSION: Herein we demonstrate that sub-milliwatt/cm(2) levels of long-wave blue light (449â€‰nm) effectively kill P. acnes. The methods and results presented allow for deeper exploration and design of light therapy treatments. Results from these studies are expanding our understanding of the mode of action and functionality of blue light, allowing for improved options for acne patients. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Acne Vulgaris;Humans;In Vitro Techniques;Low-Level Light Therapy;Propionibacterium acnes;Sampling Studies;Sensitivity and Specificity

Photobiomodulation of red and green lights in the repair process of third-degree skin burns. The aim of this study was to evaluate the photobiomodulation of red and green lights in the repair process of third-degree skin burns in rats through clinicopathological and immunohistochemical parameters. Sixty male Wistar rats were divided into three groups: control (CTRL) (nâ€‰=â€‰20),

red LED (RED) (nâ€‰=â€‰20), and green LED (GREEN) (nâ€‰=â€‰20), with subgroups (nâ€‰=â€‰5) for each time of euthanasia (7, 14, 21, and 28Â days). Daily applications in RED (Î»630â€‰Â±â€‰10Â nm, 300Â mW) and GREEN groups (Î»520â€‰Â±â€‰30Â nm, 180Â mW) were performed at four points of the wound (total 36Â J/cm(2) in RED and 240Â J/cm(2) in GREEN). After euthanasia, the wound retraction index (WRI) was evaluated. In histological sections, the re-epithelialization degree, the angiogenic index (AI), and the amount of myofibroblasts in wounds were analyzed. At 14 and 21Â days, the RED group induced higher re-epithelialization and WRI compared to CTRL (pâ€‰>â€‰0.05) and GREEN groups (pâ€‰<â€‰0.05). At 7 and 14Â days, greater AI were observed in the GREEN group, with significant difference in relation to CTRL group at 7Â days (pâ€‰<â€‰0.05). At 21 and 28Â days, a trend was observed for greater amount of myofibroblasts in the GREEN group, with significant difference in relation to CTRL group at 21Â days (pâ€‰<â€‰0.05). The results suggest greater potential of the green light to stimulate angiogenesis in the initial periods and myofibroblastic differentiation in the final periods of the repair of third-degree skin burns. Red light may stimulate further re-epithelialization and wound retraction, especially in advanced repair phases. Animals;Burns;Light;Low-Level Light Therapy;Male;Myofibroblasts;Neovascularization, Physiologic;Rats, Wistar;Re-Epithelialization;Skin;Wound Healing

Improvements in Gulf War Illness Symptoms After Near-Infrared Transcranial and Intranasal Photobiomodulation: Two Case Reports. At least one-fourth of US veterans who served in the 1990-1991 Gulf War (GW) are affected by the chronic symptomatic illness known as Gulf War illness (GWI). This condition typically includes some combination of fatigue, headaches, cognitive dysfunction, musculoskeletal pain, and respiratory, gastrointestinal and dermatologic complaints. To date, effective treatments for GWI have been elusive. Photobiomodulation (PBM) describes the non-pharmacological, non-thermal use of light to stimulate, heal, and protect tissue that has either been injured, is degenerating, or else is at risk of dying. Significant benefits have been reported following application of transcranial PBM to humans with acute stoke, traumatic brain injury (TBI), and dementia. This report describes the first documentation of improved GWI symptoms in two GW veterans following 12 weeks of PBM treatments. Humans;Infrared Rays;Low-Level Light Therapy;Persian Gulf Syndrome;Syndrome;United States;United States Department of Veterans Affairs;Veterans

Photobiomodulation therapy at different wavelength impacts on retinoid acid-dependent SH-SY5Y differentiation.

Combination of Fractional Resurfacing and Dermabrasion Techniques to Improve Aesthetic Outcomes of Facial Grafts. The use of full-thickness skin grafts (FTSG) in facial reconstruction during dermatologic surgery is well-established. Surgical sites that commonly receive a skin graft include the scalp, nose and ear Cicatrix;Dermabrasion;Esthetics;Face;Humans;Lasers, Gas;Low-Level Light Therapy;Mohs Surgery;Postoperative Complications;Skin Neoplasms;Surgical Flaps;Treatment Outcome

Pseudofolliculitis Barbae: A Review of Current Treatment Options. The purpose of this review is to discuss the disease process and wide variety of treatment options for psuedofolliculitis barbae (PFB), or razor bumps. PFB is caused by hair follicles penetrating the skin and causing an inflammatory response. PFB can occur to anyone who shaves, and is more likely in those with curly hair. PFB can cause significant hyperpigmentation and scarring, more noticeable in darker skin types. PFB can be treated with a variety of topical, systemic, or light/laser therapies. Minimal progress has been made in treating PFB in recent years, partially due to the success of well-established current treatments discussed in this review. The most effective treatments involve a multifaceted approach including behavioral changes in shaving habits as well as the use of topical therapies. J Drugs Dermatol.

2019;18(3):246-250. Anti-Bacterial Agents;Dermatologic Agents;KRT75 protein, human;Keratins, Hair-Specific;Keratins, Type II Administration, Cutaneous;Administration, Oral;Anti-Bacterial Agents;Dermatologic Agents;Face;Habits;Hair Diseases;Hair Follicle;Hair Removal;Humans;Keratins, Hair-Specific;Keratins, Type II;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Treatment Outcome

Involvement of Substance P in the Analgesic Effect of Low-Level Laser Therapy in a Mouse Model of Chronic Widespread Muscle Pain. BACKGROUND: Low-level laser therapy (LLLT) is widely used in pain control in the field of physical medicine and rehabilitation and is effective for fibromyalgia pain. However, its analgesic mechanism remains unknown. A possible mechanism for the effect of LLLT on fibromyalgia pain is via the antinociceptive signaling of substance P in muscle nociceptors, although the neuropeptide has been known as a neurotransmitter to facilitate pain signals in the spinal cord. OBJECTIVE: To establish an animal model of LLLT in chronic muscle pain and to determine the role of substance P in LLLT analgesia. METHODS: We employed the acid-induced chronic muscle pain model, a fibromyalgia model proposed and developed by Sluka et al., and determined the optimal LLLT dosage. RESULTS: LLLT with 685â€‰nm at 8â€‰J/cm2 was effective to reduce mechanical hyperalgesia in the chronic muscle pain model. The analgesic effect was abolished by pretreatment of NK1 receptor antagonist RP-67580. Likewise, LLLT showed no analgesic effect on Tac1-/- mice, in which the gene encoding substance P was deleted. Besides, pretreatment with the TRPV1 receptor antagonist capsazepine, but not the ASIC3 antagonist APETx2, blocked the LLLT analgesic effect. CONCLUSIONS: LLLT analgesia is mediated by the antinociceptive signaling of intramuscular substance P and is associated with TRPV1 activation in a mouse model of fibromyalgia or chronic muscle pain. The study results could provide new insight regarding the effect of LLLT in other types of chronic pain. APETx2 protein, Anthopleura elegantissima;Acids;Cnidarian Venoms;Protein Precursors;TRPV Cation Channels;TRPV1 protein, mouse;Tachykinins;protachykinin;Substance P;capsazepine;Capsaicin Acids;Animals;Capsaicin;Chronic Pain;Cnidarian Venoms;Disease Models, Animal;Dose-Response Relationship, Drug;Fibromyalgia;Laser Therapy;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Mice, Knockout;Musculoskeletal Pain;Protein Precursors;Signal Transduction;Substance P;TRPV Cation Channels;Tachykinins

Letter to the Editor concerning the article "Application of red light phototherapy in the treatment of radioactive dermatitis in patients with head and neck cancer". The aim of this Letter to the Editor was to report some methodological shortcomings in the recently published article "Application of red light phototherapy in the treatment of radioactive dermatitis in patients with head and neck cancer" by Zhang et al. There are some issues regarding the incomplete photobiomodulation (PBM) parameters, the chosen outcome measures, and some missing reference articles. In conclusion, the results of this study should be interpreted with caution and further research is necessary. Dermatitis;Head and Neck Neoplasms;Humans;Phototherapy;Prognosis

Changes in local skin temperature after the application of a pulsed Nd:YAG laser to healthy subjects: a prospective crossover controlled trial. Pulsed Nd:YAG laser (1064Â nm) is a recent modality that is used for the rehabilitation of musculoskeletal disorders, but there is no evidence about its thermal effects. The aim of the study was to investigate the changes in local skin temperature (LST) after the application of a pulsed Nd:YAG laser to healthy subjects. The study participants were 30 male subjects with an average age of 21.96 (Â±â€‰0.92) years. A rectangular area (15â€‰Ã— â€‰10Â cm(2)) was marked at the front of the dominant thigh and scanned with a laser beam at 3000Â J with 20Â J/cm(2) for 15Â min. The other thigh was considered as a control side. The minimum, average, and maximum LSTs were measured using a thermographic camera. The measurements were performed before laser application, immediately after, and then every minute until the LST returned to the pre-treatment value. An independent t test and repeated measures

ANOVA were used to analyze the changes in LST. The level of significance was set at pâ€‰<â€‰0.05. The pulsed Nd:YAG laser significantly increased the minimum, average, and maximum LSTs in comparison with the control. The increase was significant for up to 5Â min after the application, and it took 10Â min to reach the baseline values. The level of increase was 1.23-4.03Â Â°C, and the average increase was 2.6Â Â°C. The pulsed Nd:YAG laser significantly increased the minimum, average, and maximum LSTs of the thigh area in normal subjects, and the thermal effect lasted for 5Â min after application. Cross-Over Studies;Humans;Lasers, Solid-State;Light;Low-Level Light Therapy;Male;Prospective Studies;Skin Temperature;Young Adult

Comparative effectiveness of purpuragenic 595 nm pulsed dye laser versus sequential emission of 595 nm pulsed dye laser and 1,064 nm Nd:YAG laser: a double-blind randomized controlled study. INTRODUCTION: Erythematotelangiectatic rosacea is a common condition in Caucasians. The most frequently used lasers to treat this condition are pulsed dye laser (PDL) and neodymium:yttrium-aluminum-garnet laser (Nd:YAG). This study compares the treatment efficacy of purpuragenic PDL with that of sequential emission of 595 nm PDL and 1,064 nm Nd:YAG (multiplexed PDL/Nd:YAG). METHODS: We performed a prospective, randomized, and controlled split-face study. Both cheeks were treated, with side randomization to receive treatment with PDL or multiplexed PDL/Nd:YAG. Efficacy was evaluated by spectrophotometric measurement, visual photograph evaluation, the Dermatology Quality of Life Index questionnaire, and a post-treatment questionnaire. RESULTS: Twenty-seven patients completed the study. Treatment was associated with a statistically significant improvement in quality of life ($p < 0.001$). PDL and multiplexed PDL/Nd:YAG modalities significantly reduced the erythema index (EI; $p < 0.05$). When comparing the degree of EI reduction, no differences were observed between the two treatment modalities. PDL was associated with a higher degree of pain and a higher percentage of purpura. Multiplexed PDL/Nd:YAG modality was associated with fewer side effects and greater global satisfaction, and 96.3% of the patients would recommend this treatment to a friend. CONCLUSIONS: Both laser modalities are efficacious in the treatment of erythematotelangiectatic rosacea. The multiplexed PDL/Nd:YAG modality was preferred by the patients. Double-Blind Method;Esthetics;Facial Dermatoses;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Quality of Life;Risk Assessment;Rosacea;Severity of Illness Index;Treatment Outcome

[Effects of low level laser combined with basic periodontal therapy on cytokines and LPS, leptin in gingival crevicular fluid of diabetes mellitus complicated with chronic periodontitis patients]. PURPOSES: To analyze the effect of low level laser treatment combined with basic therapy periodontal on cytokines and lipopolysaccharide, leptin in gingival sulcus of patients with diabetes mellitus complicated with chronic periodontitis (DMCP). METHODS: From January 2016 to January 2017, 80 patients with DMCP were randomly divided into experimental group and control group. Patients in the control group received basic periodontal therapy, while patients in the experimental group received low dose laser combined with basic periodontal treatment. Before treatment and 3 months after treatment, oral PD, SBI and CAL levels were detected in all patients. Venous blood was collected, HbA1c and FPG levels in blood serum were detected. TNF-Î±, IL-1, hs-CRP, LPS, leptin in gingival crevicular fluid were detected. Statistical analyses were performed using SPSS19.0 software package. RESULTS: After treatment, CAL, PD, SBI, FBG, HbA1c, TNF-Î±, IL-1, hs-CRP, LPS levels were significantly decreased, Leptin level increased in both group, and the difference was significant ($P<0.05$). After treatment, CAL, PD, SBI, FBG, HbA1c, TNF-Î±, hs-CRP, IL-1 and the level of LPS in the experimental group was significantly lower than the control group ($P<0.05$), and the level of leptin was significantly higher than that of the control group ($P<0.05$). CONCLUSIONS: Low level laser combined with basic periodontal treatment can effectively reduce LPS level of DMCP patients in gingival sulcus, and improve the level of Leptin, significantly improve the inflammatory reaction and

clinical efficacy. Cytokines;Leptin;Lipopolysaccharides Chronic Periodontitis;Cytokines;Diabetes Complications;Diabetes Mellitus;Gingival Crevicular Fluid;Humans;Laser Therapy;Leptin;Lipopolysaccharides;Periodontal Index

Photobiomodulation can improve ovarian activity in polycystic ovary syndrome-induced rats. Follicular cystic ovary disease is a common reproductive disorder in women and females of domestic animals, characterized by anovulation and the persistence of follicle is a common cause of reproductive failure in mammalian. Polycystic ovary syndrome (PCOS) is characterized by hyperandrogenism (HA), chronic anovulation and polycystic ovaries, and it is a common reproductive endocrine disease with clinical manifestations including hirsutism, acne, infertility and obesity that can affect 5-20% of women in their reproductive age. Photobiomodulation (PBM) has been investigated and used in clinical practice, related to biomodulatory influences on cellular functions in animals and humans, both in vivo and in vitro. In this study, we include endocrine and reproductive features in a rat model for PCOS and the effects of PBM on ovarian activities. Forty-five adult female Wistar rats PCOS-induced by a single dose of the estradiol valerate (EV) were used in the study. After the EV injection for PCO induction, rats were divided into 9 groups (nâ€¯=â€¯5/group) named C30, C45 and C60 (Control group), S30, S45 and S60 (PCO group) and L30, L45 and L60 (PCO/Laser group). The rats were irradiated with laser 3 times/week. The results shown that EV PCO-induced rats had increased body mass, reduced ovary mass, and reduced GSI. The plasma levels of P4 and T were increased, and the LH plasma level was decreased by PBM stimulation. The number of ovarian follicles and corpus luteum were increased, and the number of ovarian cysts was decreased by PBM stimulation. Thus, reproductive and endocrine characteristics were modulated by PBM. Hormones Animals;Corpus Luteum;Estrous Cycle;Female;Hormones;Low-Level Light Therapy;Ovary;Polycystic Ovary Syndrome;Rats;Rats, Wistar

The role of photobiomodulation when associated with microneedling in female pattern hair loss: A randomized, double blind, parallel group, three arm, clinical study protocol. The female hair loss pattern was originally described as a synonym for androgenetic alopecia. It has been defined as progressive miniaturizations of the hair follicles, with a great impact on the quality of life of affected patients, causing significant psychosocial limitations. It was recently proven that photobiomodulation is a safe and effective way to treat the different types of hair loss. It was also known that microneedling is a minimally invasive dermatological procedure that is applied to a wide range of dermatological conditions, including androgenic alopecia, telogen effluvium, as well as other facial and bodily conditions. GOAL: The aim of this study is to verify if there is an increase in the capillary density of strands of hair, when combining 660â€Šnm red laser photobiomodulation and microneedling in addressing female pattern hair loss (FPHL). METHODS: There will be 66 patients divided into 3 treatment groups. G1: microneedling and 660â€Šnm red laser photobiomodulation sham; G2: 660â€Šnm red laser photobiomodulation and microneedling sham; G3: microneedling and 660â€Šnm red laser photobiomodulation. The treatment will consist in 36 sessions, 3 times a week for 3 consecutive months, with an insertion of microneedling every 30 days. The patients and the researchers will be blinded. The patients will be evaluated before, during, and after the treatments, by digital photography and the trichoscopy method (dermoscopic imaging of the scalp and hair). EXPECTED RESULTS: It is expected that differences will be found in the growth rates of a strand of hair in mm/d, in the density of a strand of hair in n/cm, in the diameter of a strand of hair, as well as in the anagen/telogen ratio. ETHICS AND DISSEMINATION: This protocol was approved by the Research Ethics Committee of the Nove de Julho University, SÃ£o Paulo, Brazil, on the date of November 28, 2018 (CAAE: 01381718.0.0000.5511 - Acceptance Number: 3044061). This trial has been registered with the Brazilian Registry of Clinical Trials (REBEC TRIAL RBR-76VCCV). This study is not yet recruiting. Issue date: February 20, 2019. Adolescent;Adult;Alopecia;Brazil;Combined Modality

Therapy;Cosmetic Techniques;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Middle Aged;Needles;Research Design;Young Adult

A single-blind, dose-escalation, phase I study of high-fluence light-emitting diode-red light on Caucasian non-Hispanic skin: study protocol for a randomized controlled trial. BACKGROUND: Visible light (400 to 700â€‰nm) is common in our environment, comprising 44% of total solar radiation and a large component of environmental light exposure. The effects of visible light on skin remain undefined. The red light portion of the visible spectrum (600 to 700â€‰nm) may be used to treat skin diseases as a monotherapeutic modality or in combination with other agents. Light-emitting diode-red light (LED-RL) phototherapy may represent an important advance in light-based treatment modalities because it is non-invasive, inexpensive, portable, and easily combinable with other therapies. We previously determined the maximum tolerated dose (MTD) of high-fluence LED-RL (HF-LED-RL) in skin of color individuals to be 320â€‰J/cm(2). To the best of our knowledge, no clinical trials have been performed to determine the safety of higher doses of HF-LED-RL in Caucasian non-Hispanic individuals. The aim of this study is to investigate the safety of HF-LED-RL at doses of 480â€‰and 640â€‰J/cm(2) in healthy Caucasian non-Hispanic individuals. METHODS: This is a single-blind, dose-escalation, randomized, controlled, phase I trial titled Safety Trial Assessing Red-light on Skin (STARS) 2. Healthy subjects will be randomly assigned to groups of five (three subjects randomly assigned to HF-LED-RL phototherapy and two subjects randomly assigned to mock therapy). Subjects in group 1 will receive HF-LED-RL or mock irradiation at the starting dose of 480â€‰J/cm(2), and the dose will be escalated in the subsequent group (group 2) to 640â€‰J/cm(2). The MTD is defined as the dose level below the dose at which two or more subjects (>20% of the cohort) experience a dose-limiting toxicity (DLT). After either the MTD is established or the study endpoint of 640â€‰J/cm(2) is achieved, additional HF-LED-RL phototherapy subjects and mock therapy subjects will be enrolled at that fluence (group 3) for a total number of up to 60 subjects. Each subject will receive a total of nine irradiation sessions, three times per week for three consecutive weeks. DISCUSSION: This follow-up study aims to provide important knowledge about safety and cutaneous effects of HF-LED-RL phototherapy of 480â€‰and 640â€‰J/cm(2) in Caucasian non-Hispanic subjects. The importance of this clinical trial is that it may establish new treatment paradigms and a safety profile for LED-RL based on race and ethnicity. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT03433222 . Registered on February 1, 2018 - Retrospectively registered. Protocol date and version: January 12, 2018; version 1. Female;Humans;Male;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Research Design;Single-Blind Method;Skin;White People;Clinical Trials, Phase I as Topic;Radiation Dosage

Successful Treatment of Keratosis Follicularis Spinulosa Decalvans With an 800-nm Diode Laser. Alopecia;Biopsy;Genetic Diseases, X-Linked;Humans;Ichthyosis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Scalp;Skin;Skin Diseases, Genetic;Treatment Outcome;Young Adult

Effect of intracanal diode laser application and low-level laser therapy on CGRP change. The aim of this study was to investigate the effect of a placebo, intracanal diode laser application, and low-level laser therapy (LLLT) on the change of the total amount of calcitonin gene-related peptide (CGRP) in the gingival crevicular fluid (GCF) (split-mouth study design). GCF sampling was performed on a contralateral tooth and experimental tooth (root canal-treated tooth) of thirty-nine patients. The patients were divided into three groups (n = 13), as follows: placebo (mock laser application), intracanal laser application, and LLLT. GCF sampling was repeated at the same sites (experimental and control teeth) one week after root canal treatment. The data were analyzed using the Pearson's correlation analysis and the independent-samples t-tests (p=0.05). In the placebo group, the total CGRP level changes in the GCF before and after treatment was significantly higher for experimental teeth than for control teeth (p<0.05). However, there was no significant difference between

experimental and control teeth in the intracanal laser application and LLLT groups ($p > 0.05$). Intracanal laser application and low-level laser therapy have immunomodulation effects linked to the modulation of the total amount of CGRP in the GCF. Calcitonin Gene-Related Peptide Adult;Calcitonin Gene-Related Peptide;Case-Control Studies;Female;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Root Canal Therapy;Treatment Outcome

Histologic Evaluation of Early Bone Regeneration Treated with Simvastatin Associated with Low-Level Laser Therapy. PURPOSE: This histologic study aimed at assessing bone healing after treatment with simvastatin in association with low-level laser therapy (LLLT). METHODS: Twenty-four male rats (Wistar) were submitted to surgery to create a bone defect of 5 mm in diameter in the parietal bone. These rats were randomly and equally divided into four treatment groups (n = 6): control (C), in which no treatment was performed; simvastatin (SIM), in which rats received daily subcutaneous doses of 2.5 mg/kg of simvastatin; LLLT, which was daily applied to the bone defect; and SIM-LLLT, in which both SIM and LLLT were daily applied. All laser irradiations were carried out with a 830-nm infrared diode laser (GaAlAs) with maximum output of 100 mW and a dose of 4 J, totaling 16 J per session. Rats were euthanized on the 12th postoperative day. Formalin-fixed paraffin-embedded bone samples were obtained and stained with hematoxylin-eosin (HE) and toluidine blue for optical microscope analysis. Degree of inflammation, new vascular formation, tissue repair, and osteoblastic activity were assessed. RESULTS: Categorical analysis of the histologic slides revealed newly formed bone reaching the center of the surgical wound in two animals from the SIM group, two from the LLLT group, and three from the SIM-LLLT group. Greater new bone formation and a lower degree of inflammation were observed in the animals that had bone neoformation at the center of the defect, especially in the LLLT and SIM-LLLT groups. SIM and C groups presented greater angiogenesis than LLLT and SIM-LLLT. SIMLLLT therapy showed a statistically significant reduction in the degree of inflammation when compared to the control group ($P < .05$). CONCLUSION: Within the limitations of this study, the present results suggest that a combination of simvastatin and low-level laser therapy may stimulate better bone formation. Hydroxymethylglutaryl-CoA Reductase Inhibitors;Simvastatin Animals;Bone Regeneration;Hydroxymethylglutaryl-CoA Reductase Inhibitors;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Simvastatin;Wound Healing

The Effects of Photobiomodulation on Inflammatory Infiltrate During Muscle Repair in Advanced-Age Rats. Photobiomodulation (PBM) enhances muscle repair in aged animals, but its effect on the modulation of the phenotype of immune cells has not yet been determined. Rats (20-month-old) were submitted to cryoinjury of the tibialis anterior muscle and were treated with PBM. After 1, 3, and 7 days, the muscles were submitted to immunohistochemical analysis for the determination of neutrophils and macrophage phenotypes. The muscles treated with PBM exhibited a smaller number of neutrophils after 1 day of treatment and a greater number of both M1 and M2 macrophages after 3 days of treatment. The irradiated tissues exhibited a smaller amount of both macrophage phenotypes after 7 days of treatment. PBM produced temporal alterations in the phenotype of the inflammatory cells during muscle repair process in advanced-age animals, indicating that these mechanisms may contribute to the beneficial effects of this therapy in the treatment of muscle injuries. Age Factors;Animals;Inflammation;Low-Level Light Therapy;Macrophages;Male;Muscle, Skeletal;Neutrophils;Rats;Rats, Wistar

Effects of Endurance Running Training Associated With Photobiomodulation on 5-Km Performance and Muscle Soreness: A Randomized Placebo-Controlled Trial. This study aimed to investigate the influence of endurance running training associated with PBM on endurance performance variables and muscle soreness in untrained men. Thirty untrained men were distributed randomly

into a placebo (PLA) group and photobiomodulation group (PBMG) and they performed 8 weeks of running training. The PBMG had the PBM performed before all training sessions. The PBM was applied using LED equipment with 56 diodes of red light (660 nm) and 48 diodes of infrared light (850 nm). The application was performed in 5 points per leg, with a dose of 60 J at each point and a total energy delivered per leg of 300 J. Peak running velocity, time limit tests and 5-km performance were assessed pre and post-training; muscle soreness was evaluated before all training sessions. The V(peak) increased and 5-km running time (t(5-km)) decreased ($P < 0.001$) in both groups. In addition, the magnitude based-inference analysis showed a possibly positive effect on V(peak) and t(5-km) and for PBMG compared to PLA group. Furthermore, there was a moderate ES of 0.82 on attenuation in muscle soreness in the third week of endurance running training. Therefore, although the magnitude-based inference analysis demonstrated a possibly positive effect on V(peak) and t(5-km) and for PBMG compared to PLA group and a moderate ES on attenuation in muscle soreness in the last weeks of endurance running training, no significant difference were found between PBMG and PLA interventions.

Role of the PI3K/AKT (mTOR and GSK3Î²) signalling pathway and photobiomodulation in diabetic wound healing. Activated phosphatidylinositol 3 kinase/Protein kinase B (PI3K/AKT) signalling with increased or reduced mTOR and GSK3Î² activity influences the wound repair process. Diabetic wounds, usually ulcerated, are characterised by reduced growth factors and cellular performance. The occurrence of diabetic ulcers is linked to peripheral arterial disease, neuropathy, and wound contamination. Lasers or light emitting diodes (LEDs) provide photon energy with therapeutic benefits (Photobiomodulation-PBM), and has been broadly commended to quicken diabetic wound healing. PBM is efficient in the visible red and near-infrared electromagnetic spectrum, and fluencies ranging from 2 to 6â€‰J/cm(2). However, cellular and molecular mechanisms induced by PBM are not fully understood. In this review we discuss PBM and the PI3K/AKT pathway with specific focus on the mTOR and GSK3Î² downstream activity in diabetic wound healing. Glycogen Synthase Kinase 3 beta;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases Animals;Diabetes Complications;Fibroblasts;Glycogen Synthase Kinase 3 beta;Humans;Low-Level Light Therapy;Mice;Phosphatidylinositol 3-Kinases;Proto-Oncogene Proteins c-akt;Signal Transduction;TOR Serine-Threonine Kinases;Wound Healing;Wounds and Injuries

Dose-response of human follicles during laser-based hair removal: Ex vivo photoepilation model with classification system embracing morphological and histological features. OBJECTIVES: Photoepilation is a commonly used technology in home-use devices (HUDs) and in professional systems to remove unwanted body hair using pulses of laser or intense pulsed light (IPL). Albeit HUDs and professional systems operate at different fluences and treatment regimes, both demonstrate high hair reduction. The underlying mechanisms, however, remain unknown partly due to high divergence of the existing literature data. The objective of this study was to develop an ex vivo photoepilation model with a set of criteria evaluating response to light pulses; and to investigate dose-response behavior of hair follicles (HFs) subjected to a range of fluences. METHODS: After ex vivo treatment (single pulse, 810â€‰nm, 1.7-26.4â€‰J/cm(2) , 4-64â€‰ms pulse) human anagen HFs were isolated and maintained in culture for 7-10 days. Response to light was evaluated based on gross-morphology and histological examination (H&E and TUNEL stainings). RESULTS: HFs treated ex vivo demonstrated a dose-dependent response to light with five distinct classes defined by macroscopic and microscopic criteria. Fluences below 13.2â€‰J/cm(2) provoked catagen-like transition, higher fluences resulted in coagulation in HF compartments. CONCLUSION: Observed changes in the HF organ culture model were reflected by clinical efficacy. The developed photoepilation model provides an easy and fast method to predict clinical efficacy and permanency of light-based hair removal devices. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc.

Adult;Aged;Analysis of Variance;Dose-Response Relationship, Radiation;Female;Hair Follicle;Hair Removal;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Sampling Studies

Photobiomodulation Therapy for Wound Care: A Potent, Noninvasive, Photoceutical Approach. Female;Humans;Low-Level Light Therapy;Male;Prognosis;Wound Healing;Wounds and Injuries

Photobiomodulation Therapy for Wound Care: A Potent, Noninvasive, Photoceutical Approach. GENERAL PURPOSE: To provide background and examine evidence for the therapeutic application of light energy treatments for wound healing. TARGET AUDIENCE: This continuing education activity is intended for physicians, physician assistants, nurse practitioners, and nurses with an interest in skin and wound care. LEARNING OBJECTIVES/OUTCOMES: After completing this continuing education activity, you should be better able to:1. Explain the basics of lasers, light-emitting diodes, and light-tissue interactions as they apply to photobiomodulation therapy.2. Summarize the results of the authors' literature review of the evidence regarding the therapeutic applications of photobiomodulation treatments for wound healing. ABSTRACT: To provide background and examine evidence for the therapeutic applications of light energy treatments for wound healing.A search was performed in PubMed for peer-reviewed scientific articles published in the last 5 years using the search terms "photobiomodulation therapy" and "low-level laser therapy," and these terms combined with "wound," using a "human species" filter. This search yielded 218 articles on photobiomodulation therapy or low-level laser therapy and wounds. Of these, only articles on in vivo wound care using light treatments were specifically included in this review (n = 11).The wound healing effects of low-dose laser treatments were first described over 50 years ago. Various doses ranging from 0.1 to 10 J/cm and wavelengths ranging from 405 to 1,000 nm appear to provide therapeutic benefits for a broad range of chronic wounds. A range of light energy sources from LEDs to lasers have been used and have specific advantages and limitations. There is a lack of consensus on standardized treatment parameters such as wavelengths, dose, and therapeutic outcomes in the reviewed studies, preventing direct comparison and clinical protocol recommendation. An expert opinion based on ongoing research studies and reported literature is offered.Noninvasive, economical, and multipurpose light devices are an attractive tool for wound management. However, there is an urgent need in the wound care community to develop optimal clinical protocols for use based on well-designed, rigorous clinical research studies. Burns;Chronic Disease;Diabetic Foot;Disease Management;Education, Medical, Continuing;Evidence-Based Medicine;Female;Humans;Low-Level Light Therapy;Male;Pressure Ulcer;Prognosis;Severity of Illness Index;Treatment Outcome;Varicose Ulcer;Wound Healing;Wounds and Injuries

Transcranial photobiomodulation prevents anxiety and depression via changing serotonin and nitric oxide levels in brain of depression model mice: A study of three different doses of 810â€‰nm laser. OBJECTIVES: The effectiveness of transcranial photobiomodulation (TPBM) in treating anxiety and depression disorders is a demonstrated and identified issue. However, the optimum therapeutic dose and the underlying mechanism of action are not fully understood. In this study, the therapeutic effects of three different near-infrared (NIR) doses on anxiety- and depression-like behaviors as well as cerebral levels of serotonin (5-HT) and nitric oxide (NO) were evaluated in a mouse model of chronic restraint stress (CRS). MATERIALS AND METHODS: CRS procedure (3â€‰hours/day, over 3 weeks) was performed as a typical stress model to study anxiety and depression along with laser treatment (3 times/week, over 3 weeks), which began simultaneously with CRS. A NIR diode laser (810â€‰nm wavelength, 10â€‰Hz) with the output power of 200â€‰mW and power density of 4.75â€‰W/cm(2) was implemented to deliver three different doses of 4, 8, and 16â€‰J/cm(2) to the cerebral cortex of mice. Behavioral experiments including open field, tail suspension, and elevated plus maze tests as well as serum cortisol levels were assessed to evaluate the anti-anxiety

and anti-depressive effects of NIR TPBM. The changes of 5-HT and NO levels in the prefrontal cortex (PFC) and hippocampus (Hipp) were assessed. RESULTS: CRS procedure induced anxiety- and depression-like behaviors, increased serum cortisol levels, decreased 5-HT and increased NO levels in the PFC and Hipp areas. NIR TPBM improved behavioral results, decreased serum cortisol levels, increased 5-HT and decreased NO concentrations in the PFC and Hipp. A dose of 8â€‰J/cm(2) of NIR TPBM showed the maximum effects on behavioral and molecular results, while a decline was observed from the optimum effects at both lower (4â€‰J/cm(2)) and higher (16â€‰J/cm(2)) doses. CONCLUSION: Our results demonstrated that NIR TPBM had an anti-anxiety and anti-depressive effect in CRS mice, which is probably linked to increasing 5-HT and decreasing NO levels in the PFC and Hipp areas. Also, the maximum anti-anxiety and anti-depressive effect was produced at dose of 8â€‰J/cm(2) . Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Biomarkers;Nitric Oxide;Serotonin Animals;Anxiety;Biomarkers;Depression;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Nitric Oxide;Random Allocation;Restraint, Physical;Serotonin;Treatment Outcome

Hypertrophic Scar After Treatment of Ecchymoses With Pulsed-Dye Laser. Adult;Cicatrix, Hypertrophic;Ecchymosis;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Combination of Sclerotherapy and Dual-Wavelength Laser in the Management of Infantile Hemangiomas in Chinese Infants. OBJECTIVE: To evaluate the efficacy and safety of combination therapy with sclerotherapy and dual-wavelength pulsed dye laser (PDL) & Nd:YAG for infantile hemangiomas (IHs). PATIENTS AND METHODS: Fifty-nine patients with IH received treatment with sclerotherapy and dual-wavelength PDL & Nd:YAG treatment at 4-week intervals. Observers assessed the size and color of IH using a size rating scale and color rating scale before and after treatments. RESULTS: The study showed that IH improved significantly after several sessions of treatment. Sclerotherapy reduced the size of IH, whereas dual-wavelength laser lightened the color of IH. No serious adverse effects occurred. CONCLUSION: Combined sclerotherapy and dual-wavelength laser treatment is an effective and safe option for IH. Asian People;Color;Combined Modality Therapy;Female;Hemangioma, Capillary;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Sclerotherapy;Skin;Skin Neoplasms;Treatment Outcome

Letter in response to "The effectiveness of adding low-level light therapy to minoxidil 5% solution in the treatment of patients with androgenetic alopecia". Vasodilator Agents;Minoxidil Alopecia;Humans;Low-Level Light Therapy;Minoxidil;Vasodilator Agents

Transcutaneous transmission of photobiomodulation light to the spinal canal of dog as measured from cadaver dogs using a multi-channel intra-spinal probe. The target level photobiomodulation (PBM) irradiances along the thoracic to lumbar segment of the interior spinal canal in six cadaver dogs resulting from surface illumination at 980Â nm were measured. Following a lateral hemi-laminectomy, a flexible probe fabricated on a plastic tubular substrate of 6.325Â mm diameter incorporating nine miniature photodetectors was embedded in the thoracic to lumbar segment of the spinal canal. Intra-spinal irradiances at the nine photodetector sites, spanning an approximate 8Â cm length caudal to T13, were measured for various applied powers of continuous wave (CW) surface illumination at 980Â nm with a maximal power of 10Â W corresponding to a surface irradiance of 3.14Â W/cm(2). The surface illumination conditions differed in skin transmission when the probe was off-contact with tissue and probe-skin contact when the skin was in place. For each condition of surface illumination, the beam was directed to respectively T13 (surface site 1), a spinal column site 4Â cm caudal to T13 (surface site 5), and a spinal column site 8Â cm caudal to T13 (surface site 9). Off-contact surface irradiation of 3.14Â W/cm(2) at surface sites 1, 5, and 9 transmitted respectively 234.0â€‰Â±â€‰120.7Â Î¼W/cm(2), 230.7â€‰Â±â€‰178.3Â Î¼W/cm(2),

and 130.2â€‰Â±â€‰169.6Â Î¼W/cm(2) to the spinal canal without the skin, and respectively 35.7â€‰Â±â€‰33.2Â Î¼W/cm(2), 50.9â€‰Â±â€‰75.3Â Î¼W/cm(2), and 15.7â€‰Â±â€‰16.3Â Î¼W/cm(2) with the skin. Transmission with skin was as low as 12% of the transmission without the skin. On-contact surface irradiation of 3.14Â W/cm(2) at surface sites 1, 5, and 9 transmitted respectively 44.6â€‰Â±â€‰43.1Â Î¼W/cm(2), 85.4â€‰Â±â€‰139.1Â Î¼W/cm(2), and 22.0â€‰Â±â€‰23.6Â Î¼W/cm(2) to the spinal canal. On-contact application increased transmission by a maximum of 67% comparing to off-contact application. The information gathered highlights the need to clinically consider the impact of skin transmission and on-contact application technique when attempting to treat spinal cord disease with PBM. Animals;Cadaver;Dogs;Low-Level Light Therapy;Radiometry;Skin;Spinal Canal

Ultra-Low-Level Laser Therapy and Acupuncture Libralux: What Is so Special? Contrary to the most credited theories on laser therapy that see power/energy as the major factors to its effectiveness, a technique using an extremely low power/energy laser stimulation to treat musculoskeletal pain and dysfunction is proposed. The stimulus consists of a 20 s train of modulated pulses with an average power below 0.02 mW and is applied on sequences of acupuncture points selected according to the impaired segment of the patient's body. Methods: Modifications on the extracellular soft tissue matrix and on the "fascia" were sonographically demonstrated. Laboratory and clinical tests confirmed the effectiveness. Results: Responses similar to those experienced in acupuncture were observed. The device-a CE Class IIa certified medical device named Libralux-affords a clinically proven effectiveness exceeding 80% in the treatment of musculoskeletal conditions and associated motor dysfunctions. An average of just three application sessions was generally sufficient to overcome the dysfunction. Conclusions: The development of the method is supported by over 20 years of R&D activities, with a range of experiments discussed in several papers published in indexed peer-reviewed journals. A few considerations regarding the possible physiological action mechanisms involved are proposed in this paper.

Non-pharmacological interventions for acute pain management in patients with opioid abuse or opioid tolerance: a scoping review protocol. OBJECTIVE: The objective of this scoping review is to identify and map the evidence on non-pharmacological interventions for acute pain management in patients with opioid tolerance and opioid abuse. INTRODUCTION: The mainstay of pain management for adults experiencing moderate to severe acute pain is opioid therapy. However, in light of the known risks of opioid use and the growing number of patients with opioid tolerance or opioid abuse, non-pharmacological interventions are of increasing interest to healthcare providers. Non-pharmacological techniques have shown potential in reducing postoperative pain, opioid consumption, stress and anxiety. INCLUSION CRITERIA: Eligible studies will include participants in a hospital or healthcare facility who are experiencing acute pain and have a tolerance to or dependence on opioids. Studies that examine non-pharmacological interventions for treating acute pain in these patients will be considered. Non-pharmacological interventions may include, but are not limited to, acupuncture, electroacupuncture, massage, mindfulness, electroanalgesia, laser therapy, low-level light therapy, meditation, biofeedback, hypnosis and relaxation techniques. Only studies published in English will be included, and there will be no limit on dates of publication. METHODS: PubMed, CINAHL, Scopus, Embase, Europe PubMed Central, PsycINFO, Cochrane Central Register of Controlled Trials and ClinicalTrials.gov will be searched, as well as sources of unpublished studies. After screening the titles and abstracts of identified citations, two independent reviewers will retrieve potentially relevant full-text studies, assess methodological quality and extract data. Data will be presented in diagrammatic or tabular form, and a qualitative thematic analysis will be undertaken. A narrative summary will accompany the tabulated results. Acupuncture Therapy;Acute

Pain;Biofeedback, Psychology;Drug Tolerance;Hospitals;Humans;Massage;Mindfulness;Opioid-Related Disorders;Pain Management;Pain, Postoperative

Correction to: Photobiomodulation can alter mRNA levels cell death-related. The authors wish to clarify that FÃ¡via de Paoli refers to "FlÃ¡via de Paoli". The authors apologise for this error.

Photobiomodulation Elicits a Differential Cytokine Response in a Cultured Analogue of Human Skin. Background: The study of photobiomodulation in wound healing is encumbered by limited wound study models. The aim of this study was to investigate the efficacy of a 3-dimensional dermal tissue culture model as a cost-saving alternative to conventional photobiomodulation study techniques. Methods: Nine dermal analogue tissue cultures were treated for 2 days with sham or 660-nm wavelength of light at either 1.5 or 3 mW/cm(2) of energy. Tissue cytokine mRNA production was assessed by real-time reverse transcription-polymerase chain reaction, and tissue and supernatant protein were evaluated by immunofluorescence, enzyme-linked immunosorbent assay, and Western blot. Results: Photobiomodulation with 660-nm wavelength light induced transcription of IL-1Î² and IL-6 mRNA and decreased that of IL-8. Tissue protein content of IL-6 and IL-8 was unchanged, whereas supernatant protein content of IL-8 was significantly increased (P = .023) by 1.5 mW/cm(2) treatment. To describe the localization of cytokines between tissue and supernatant, the relative diffusion of each was calculated and found to be 15-fold higher for IL-6 than for IL-8 despite an overall higher concentration of IL-8 in the tissue. Conclusion: In this study, photobiomodulation elicited mRNA and protein changes quantifiable in both the tissue and supernatant. In addition, the use of this advanced culture model allowed for histological assessment and the comparison of "local" versus "circulatory" responses between the tissue and supernatant, respectively.

Low-level laser irradiation potentiates anticancer activity of p-coumaric acid against human malignant melanoma cells. p-Coumaric acid (PCA) is a kind of phenolic compound, and as one of the cinnamic acid derivatives, it has many biological functions such as antioxidants, anti-inflammatory, antiplatelet, and anticancer activity. Low-level laser irradiation has received increasing interest in the fields of tissue regeneration and wound healing. In this study, the effect of low-level laser irradiation on human fibroblast cells (human dermal fibroblast) and human melanoma cancer cells (A375 and SK-MEL-37) treated with PCA was investigated. The human dermal fibroblast, A375, and SK-MEL-37 cells were exposed to low-level laser at 660-nm wavelength with 3 J/cm for 90â€‰s, and then the cells were treated with different concentrations of PCA (0-1000 Î¼g/ml for 24â€‰h), separately. In another experiment, first the cells were treated by PCA and then irradiated with low-level laser as described before. The effect of various irradiation energy (1-6 J/cm) on the melanoma cells, which were then treated by PCA, was studied. The cell viability using MTT assay and lactate dehydrogenase assay was determined. Morphological changes owing to apoptosis induction by irradiation and PCA were detected by fluorescence microscopy using acridine orange/ethidium bromide double staining. The results showed that pretreatment with low-level laser irradiation and then PCA reduced the survival and growth of melanoma cells more than the early treatment with PCA and then low-level laser irradiation. Lactate dehydrogenase activity was reduced significantly by preirradiation and then PCA treatment in comparison with the dark group in melanoma cells. The cell cytotoxicity at different irradiation energy and then IC50 concentration of PCA was increased up to 3 J/cm and then decreased following increasing irradiation energy. The morphology study with light microscopy and apoptotic assay using acridine orange/ethidium bromide dual staining confirmed the MTT results. This study showed that low-level laser irradiation alone is not able to kill human normal fibroblast and human melanoma cancer cells. Preirradiation followed by treatment with PCA did not change the cell viability in human fibroblast significantly but reduced the cell viability in melanoma cells presumably through the apoptosis pathway. Anti-Infective Agents;Coumaric Acids;Propionates;p-coumaric

acid Anti-Infective Agents;Cell Line, Tumor;Coumaric Acids;Humans;Low-Level Light Therapy;Melanoma;Propionates;Skin Neoplasms
Effects of Therapy with Light Emitting Diode (LED) in the Calcaneal Tendon Lesions of Rats: A Literature Review. The objective of this review was to analyze original articles about the effects of therapy with LED in experimental models of calcaneal tendon lesions of rats. The search was performed in the period from February to May 2018, in the following electronic databases: MEDLINE, SciELO, and LILACS, besides the Google Scholar, using the descriptors "Achilles tendon", "Rats", "LED", "Tendinopathy", and "Low-level Light Therapy", as well as their matching parts in the Portuguese and Spanish languages, related to and in association with the relevant terms to the content sought. From the descriptors used 215 works were found. After application of eligibility criteria 8 works were selected, in which positive results were found after the application of the LED. Regarding the main results found with phototherapy, we observed a significant reduction in inflammation. Only one article mentioned little reduction of inflammation. In relation to the number of sessions, there was wide variation, with an average of approximately 5 sessions every 24 hours. Studies in this review pointed out, therefore, positive results in the repair of the calcaneal tendon after therapy with irradiation LED; however, carrying out more experimental studies that help the standardization of parameters to be used in this therapy for further clinical studies becomes necessary. Achilles Tendon;Animals;Low-Level Light Therapy;Rats;Tendon Injuries
Sex, but not skin tone affects penetration of red-light (660 nm) through sites susceptible to sports injury in lean live and cadaveric tissues. Red-light treatment is emerging as a novel therapy for promoting tissue recovery but data on red-light penetration through human tissues are lacking. We aimed to: (1) determine the effect of light irradiance, tissue thickness, skin tone, sex and bone/muscle content on 660â€‰nm light penetration through common sites of sports injuries, and (2) establish if cadaver tissues serve as a useful model for predicting red-light penetration in live tissues. Live and cadaver human tissues were exposed to 660â€‰nm light at locations across the skull, spinal cord and upper and lower limbs. Red-light was produced by a light emitting diode array of various irradiances (15-500â€‰mW/cm(2)) and measured by a light-probe positioned on the tissue surface opposite to the light emitting diodes. 100â€‰mW/cm(2) successfully penetrated tissue <50â€‰mm thick; a disproportionate irradiance increase was required to achieve deeper penetration. Penetration was unaffected by skin tone, increased with irradiance and relative bone/muscle composition, and decreased with greater tissue thickness and in males. Live and cadaveric tissue penetration did not differ statistically for tissues <50â€‰mm but cadavers required more red-light to penetrate >50â€‰mm. These results assist clinicians and researchers in determining red-light treatment intensities for penetrating human tissues. Absorption, Physicochemical;Adult;Athletic Injuries;Cadaver;Disease Susceptibility;Female;Humans;Light;Male;Organ Specificity;Sex Characteristics;Skin Pigmentation
An Overview of Acne Therapy, Part 1: Topical therapy, Oral Antibiotics, Laser and Light Therapy, and Dietary Interventions. Therapeutic actives for acne have changed little in the last decade. Recognition that acne is an inflammatory condition, not an infectious one, has led to a call for reduction in antibiotic use. This has culminated in a re-evaluation of highly efficacious combination topical therapy and improved vehicle technology. Laser and light modalities, although not sufficiently studied for first-line use, show promise for the future. The role that diet plays in the initiation and continuation of acne is unclear but remains one of our patients' most frequently asked questions. Anti-Bacterial Agents;Dermatologic Agents;Dicarboxylic Acids;Retinoids;Dapsone;azelaic acid Acne Vulgaris;Administration, Cutaneous;Administration, Oral;Anti-Bacterial Agents;Combined Modality Therapy;Dapsone;Dermatologic Agents;Dicarboxylic Acids;Diet Therapy;Drug Therapy, Combination;Humans;Inflammation;Low-Level Light Therapy;Phototherapy;Retinoids

What's New in Pigmentary Disorders. Pigmentary disorders are common and can be very distressing to patients. There is a need for better, standardized therapies. The authors review the most recent data for topical, systemic, light, and laser treatments for vitiligo, melasma, and postinflammatory hyperpigmentation. There is a paucity of large-scale, well-designed, randomized, controlled trials for these treatments. Treatment options are often drawn from smaller trials and case series. The treatments described in this article are promising candidates for larger follow-up studies. Antifibrinolytic Agents;Dermatologic Agents;Hydroquinones;Janus Kinase Inhibitors;Skin Lightening Preparations;Sunscreening Agents;alpha-MSH;Tranexamic Acid;afamelanotide;Bimatoprost;hydroquinone Antifibrinolytic Agents;Bimatoprost;Dermatologic Agents;Humans;Hydroquinones;Inflammation;Janus Kinase Inhibitors;Keratinocytes;Lasers, Solid-State;Low-Level Light Therapy;Melanocytes;Melanosis;Pigmentation Disorders;Skin Lightening Preparations;Sunscreening Agents;Tranexamic Acid;Vitiligo;alpha-MSH

Effect of low power laser in biomodulation of cultured osteoblastic cells of Wistar rats1. PURPOSE: To analyze aspects of the biomodulating effect of light in biological tissues, bone cells from surgical explants of the femur of rats were irradiated with low intensity laser. METHODS: Bone cells were cultured and irradiated with LASER light (GaAlAs). Growth, cell viability, mineralized matrix formation, total protein dosage, immunostimulatory properties, cytochemical analysis, gene expression of bone proteins were examined using live cell imaging and cell counting by colorimetric assay. The gene expression of: alkaline phosphatase (ALP), type 1 collagen, osteocalcin and osteopontin through the real-time polymerase chain reaction. RESULTS: At 8 days, the viability of the irradiated culture was 82.3% and 72.4% in non-irradiated cells. At 18 days, the cellular viability (with laser) was 77.42% and 47.62% without laser. At 8 days, the total protein concentration was 21.622 mg / mol in the irradiated group and 16, 604 mg / mol in the non-irradiated group and at 18 days the concentration was 37.25 mg / mol in the irradiated group and 24, 95 mg / mol in the non-irradiated group. CONCLUSION: The laser interfered in the histochemical reaction, cell viability, matrix mineralization, and maintained the cellular expression of proteins. Animals;Cell Differentiation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Osteoblasts;Rats;Rats, Wistar;Time Factors

Quantitative proteomic analysis of dermal papilla from male androgenetic alopecia comparing before and after treatment with low-level laser therapy. BACKGROUND: Currently, low-level laser therapy (LLLT) has been approved as a new treatment for androgenetic alopecia (AGA). However, it has not been elucidated how LLLT promotes hair growth in vivo. OBJECTIVES: To investigate the change in protein expression from dermal papilla (DP) tissues in male AGA patients after LLLT treatment using liquid chromatography tandem mass spectrometry (LC-MS/MS) analysis. METHODS: This is an open-label, prospective, single-arm study obtained punch scalp biopsy specimens from patients with AGA before and after LLLT treatment. Each subject was self-treated with helmet type of LLLT (655â€‰nm, 5â€‰mW) device at home for 25 minutes per treatment every other day for 24 weeks. LC-MS/MS analysis based on the dimethyl labeling strategy for protein quantification was used to identify proteins expressed in DP tissues from AGA patients. RESULTS: Proteomic analysis revealed 11 statistically significant up-regulated and 2 down-regulated proteins in LLLT treated DP compared with baseline (Pâ€‰<â€‰0.05). A bioinformatic analysis signifies that these proteins are involved in several biological processes such as regulation of cellular transcription, protein biosynthesis, cell energy, lipid homeostasis, extracellular matrix (ECM), ECM structural constituent, cell-cell/cell-matrix adhesion as well as angiogenesis. ATP-binding cassette sub-family G member, a transporter involved in cellular lipid homeostasis, was the most up-regulated protein. Additionally, LLLT increased the main ECM proteins in DP which results in a bigger volume of DP and a clinical

improvement of hair diameter in AGA patients. CONCLUSION: We identified the proteome set of DP proteins of male patients with AGA treated with LLLT which implicates the role of LLLT in promoting hair growth and reversing of miniaturization process of AGA by enhancing DP cell function. Our results strongly support the benefit of LLLT in the treatment of AGA. Lasers Surg. Med. Â© 2019 Wiley Periodicals, Inc. Biomarkers Alopecia;Biomarkers;Chromatography, Liquid;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Proteomics;Tandem Mass Spectrometry;Treatment Outcome;Up-Regulation

A Comparative Study Between the Effectiveness of 980 nm Photobiomodulation Delivered by Hand-Piece With Gaussian vs. Flat-Top Profiles on Osteoblasts Maturation. Photobiomodulation (PBM) is a clinically accepted tool in regenerative medicine and dentistry to improve tissue healing and repair and to restore the functional disability. The current in vitro study aimed to investigate the photobiomodulatory effects of 980 nm wavelength (the real energy at the target: ~0.9 W, ~0.9 W/cm(2), 60 s, ~55 J/cm(2) and a single energy ~55 J in CW) on MC3T3-E1 pre-osteoblast, delivered with flattop profile in comparison to the standard profile. The laser groupings and their associated energies were: Group 1 - once per week (total energy 110 J); Group 2 - three times per week (alternate day) (total energy 330 J); Group 3 - five times per week (total energy 550 J). The metabolic activity and the osteoblasts maturation were analyzed by alkaline phosphatase assay, alizarin red S histological staining, immunoblot and/or double immunolabeling analysis for Bcl2, Bax, Runx-2, Osx, Dlx5, osteocalcin, and collagen Type 1. Our data, for the first time, prove that laser irradiation of 980 nm wavelength with flat-top beam profile delivery system, compared to standard-Gaussian profile, has improved photobiomodulatory efficacy on pre-osteoblastic cells differentiation. Mechanistically, the irradiation enhances the pre-osteoblast differentiation through activation of Wnt signaling and activation of Smads 2/3-Î²catenin pathway.

Photobiomodulation Enhances the Angiogenic Effect of Mesenchymal Stem Cells to Mitigate Radiation-Induced Enteropathy. Radiation-induced enteropathy remains a major complication after accidental or therapeutic exposure to ionizing radiation. Recent evidence suggests that intestinal microvascular damage significantly affects the development of radiation enteropathy. Mesenchymal stem cell (MSC) therapy is a promising tool to regenerate various tissues, including skin and intestine. Further, photobiomodulation (PBM), or low-level light therapy, can accelerate wound healing, especially by stimulating angiogenesis, and stem cells are particularly susceptible to PBM. Here, we explored the effect of PBM on the therapeutic potential of MSCs for the management of radiation enteropathy. In vitro, using human umbilical cord blood-derived MSCs, PBM increased proliferation and self-renewal. Intriguingly, the conditioned medium from MSCs treated with PBM attenuated irradiation-induced apoptosis and impaired tube formation in vascular endothelial cells, and these protective effects were associated with the upregulation of several angiogenic factors. In a mouse model of radiation-induced enteropathy, treatment with PBM-preconditioned MSCs alleviated mucosal destruction, improved crypt cell proliferation and epithelial barrier functions, and significantly attenuated the loss of microvascular endothelial cells in the irradiated intestinal mucosa. This treatment also significantly increased angiogenesis in the lamina propria. Together, we suggest that PBM enhances the angiogenic potential of MSCs, leading to improved therapeutic efficacy for the treatment of radiation-induced enteropathy. Angiogenic Proteins Acute Radiation Syndrome;Angiogenic Proteins;Animals;Human Umbilical Vein Endothelial Cells;Humans;Intestinal Mucosa;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mice;Mice, Inbred C57BL;Neovascularization, Physiologic

Green light-emitting diode phototherapy for neonatal hyperbilirubinemia: Randomized controlled trial. BACKGROUND: The main photochemical pathway in phototherapy for neonatal hyperbilirubinemia is the production and elimination (in bile or urine) of cyclobilirubin, which is a

structural photoisomer of bilirubin, and which is most efficiently produced by green light. Green light-emitting diode (LED) phototherapy, however, has not been evaluated in the clinical setting because it is not recommended in American Academy of Pediatrics guidelines. We therefore compared the efficacy of green LED phototherapy and blue LED phototherapy in patients with neonatal hyperbilirubinemia. METHODS: In this prospective randomized controlled trial, neonates with hyperbilirubinemia were randomly allocated to a green LED or blue LED phototherapy group. Both groups underwent 24 h of phototherapy, and blood was sampled before and after 24 h of phototherapy. Total serum bilirubin (TSB) was measured using enzymatic methods and bilirubin photoisomers were measured on high-performance liquid chromatography. RESULTS: Thirty-four infants were randomized (green, n = 16; blue, n = 18). TSB decreased significantly from 15.3 Â± 1.5 to 13.9 Â± 1.5 mg/dL in the green LED group (P < 0.01) and from 16.2 Â± 1.3 to 14.5 Â± 1.7 mg/dL in the blue LED group (P < 0.01) after 24 h of phototherapy. No significant difference was found in TSB reduction after phototherapy between the groups. CONCLUSIONS: Both light sources produced a significant reduction in TSB, indicating clinical effectiveness. Bilirubin Bilirubin;Color;Female;Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Male;Phototherapy;Prospective Studies;Treatment Outcome

Low-level laser therapy as a modifier of erythrocytes morphokinetic parameters in hyperadrenalinemia. Low-level laser therapy (LLLT) is widely used in clinical practice for treatment of various pathologies. It is assumed that LLLT impact on microcirculation is among the mechanisms underlying its therapeutic effect. The microcirculation disorder is observed in the pathogenesis of any inflammatory process and is significantly influenced by red blood cells (RBCs). On this point, studying the RBCs morphology under the influence of LLLT on alterated organism is of scientific interest and practical importance. The aim of the present study was to analyze the LLLT effect on morphokinetic parameters of RBCs in hyperadrenalinemia. The LLLT effect was analyzed on rats intraperitoneally injected with adrenaline hydrochloride solution (0.1Â mg/kg). As the comparison groups, the effects of LLLT, adrenaline, or saline injection as well as the parameters of intact animals were studied. LLLT was applied on the occipital region of rats for 10Â min. The light irradiation with pulse frequency 415Â Hz at 890Â nm wavelength and average power density in the plane of the output window at 193Â Î¼W/cm(2) was used. The dynamics of morphological characteristics of RBCs was studied by phase interference microscopy; the RBC electrophoretic mobility was tested by microelectrophoresis technique; photometric analyses of the RBCs amount, hemoglobin content, and osmotic fragility were performed. The adrenaline injection resulted in a significant increase in the amount of RBC pathological forms and a decrease in discocytes and normocytes by more than 50%. An increase in the optical density of RBC phase portraits, a decline in osmotic resistance, and electronegativity of RBC membranes and a reduction of their number in peripheral blood were also registered. The revealed effects persisted for 1Â week after the adrenaline administration. LLLT did not significantly impact on the RBC parameters 1Â h after adrenaline injection. However, a day later, LLLT reduced the severity of the adrenaline effect on RBSs, which was manifested in a decreased amount of the pathological forms of RBCs, restored RBC phase portraits, higher electrophoretic mobility and osmotic resistance, and RBSs amount in peripheral blood restored up to the level of intact animals. We suppose that the mechanism of LLLT action is realized both at cellular level through the laser radiation effect on RBC membranes, and at systemic level through the activation of stress-realizing systems of the organism with subsequent limitation of inflammatory response. Hemoglobins;Epinephrine Animals;Cell Size;Epinephrine;Erythrocyte Count;Erythrocytes;Female;Hemoglobins;Low-Level Light Therapy;Osmotic Fragility;Rats

Effects of Different Parameters of Diode Laser on Acceleration of Orthodontic Tooth Movement and Its Effect on Relapse: An Experimental Animal Study. AIM: Recent studies have demonstrated that low-level laser therapy (LLLT) can accelerate orthodontic tooth movement. However, there is still controversy about the optimum parameters that can cause acceleration. The present study was designed to examine two different doses of LLLT in the acceleration of orthodontic tooth movement and their effect on relapse. METHODS: An orthodontic appliance was designed to induce tooth movement on lower incisors of rabbits. The in-al-as diode laser was used to radiate different groups of rabbits according to a specific protocol. The amount of tooth movement was measured for 21 days, and then the orthodontic appliance was removed, and the relapse was measured till day 28. RESULTS: The amount of tooth movement was significantly greater in the group with irradiation of low dose in comparison with the high dose group and the control group. The relapse was greatest in the group of low dose irradiation and least in the control group. CONCLUSION: The findings suggest that LLLT with a low dose accelerate the orthodontic tooth movement while LLLT with a high dose was not able to have the same effect. LLLT had a reverse effect on relapse tendency; an increase in the relapse tendency was seen with low dose irradiation.

Patterning Perfluorinated Surface with Graphene Oxide and the Microarray Applications. A method was developed to pattern the surface of perfluorinated materials with graphene oxide thin film, and various biological applications of the patterned perfluorinated surface were illustrated. Perfluorinated surfaces such as Teflon, Cytop, and other perfluorinated materials are known to be both hydrophobic and oleophobic, with low adhesion for most materials. Modifying the perfluorinated surfaces has been difficult due to the extraordinary chemical inertness, which limits the applications of perfluorinated materials as anti-fouling substrates. Herein we successfully patterned Cytop surfaces with graphene oxide. Patterns of the graphene oxide thin film with feature dimension down to 40 microns were formed and remained stable on the Cytop surface against washing with water, ethanol and acetone. The graphene oxide thin film on the Cytop surface allowed non-specific protein adsorption. To illustrate the applications of the patterned Cytop surface, we used the patterned Cytop surface as the substrate to study the protein-protein interactions, stem cell culture, and stem cell proliferation.

Methodological correctness of aÂ recent publicationÂ on pain entitled "Evaluating the effect of photobiomodulation with a 940-nm diode laser on post-operative pain in periodontal flap surgery". Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain, Postoperative;Periodontium;Surgical Flaps;Visual Analog Scale

A 22-Year-Old Man With Painful Vesicles on His Flank. Blister;Diagnosis, Differential;Humans;Lasers, Gas;Low-Level Light Therapy;Lymphangioma;Male;Skin Diseases, Infectious;Staphylococcal Skin Infections;Thorax;Young Adult

Study of transcranial therapy 904Â nm in experimental model of stroke. Cerebrovascular accidents (CVAs), commonly known as strokes, can damage the brain through vascular injuries caused by either blood vessel blockages (ischemic stroke) or ruptures (hemorrhagic stroke) which disrupt regular brain blood supply and can cause severe damage to the individual. The objective of the present study was to evaluate the effects of photobiomodulation with a light-emitting diode (LED) device (904Â nm, 110Â mW, 7Â J/cm(2)) on neurogenesis, muscle resistance, and motor behavior in animals submitted to an experimental model of hemiplegia. The sample consisted of 30 Wistar rats, divided into two groups: control group (GC) and 904-nm LED-treated group (TG). All animals underwent stereotactic surgery for electrode implant and subsequent electrolytic injury to induce an ischemic stroke. TG was subjected to daily LED irradiation (904Â nm, 110Â mW, 7Â J/cm(2)) for 63Â s. Suspension test results indicate an improvement of TG muscle resistance when compared with baseline evaluation (BLT); a reduction in open-field freezing time and the number of fecal bolus

pellets suggest diminished anxiety induced by 904-nm LED treatment on treatment days 7 and 21 (TG7 and TG21) compared with the baseline results; and lastly, histological analysis showed important signs of neurogenesis in TG in comparison to CG, especially on treatment days 7 and 21 (TG7 and TG21). In conclusion, the present study suggests that 904-nm LED irradiation may beneficially affect neurogenesis, muscle resistance, and animal motor behavior following ischemic CVA. Animals;Brain;Disease Models, Animal;Hindlimb Suspension;Low-Level Light Therapy;Male;Rats, Wistar;Stroke

Comparison of the efficacy of low-level laser therapy and photodynamic therapy on oral mucositis in rats. Cancer treatment with chemotherapy or radiotherapy is associated with some side effects including in the oral cavity. One of the more significant oral complications is oral mucositis (OM) which induces severe pain and limits fundamental life behaviors such as eating, drinking, and talking. Although advancements in cancer treatment improved the survival rate, severe OM and opportunistic infection affect treatment adversely. Therefore, the control of OM is important for oral health quality of life and prognosis. Low-level laser therapy (LLLT) and photodynamic therapy (PT) are noninvasive methods that reduce inflammation and pain during wound healing. The aim of this study is to evaluate immunohistochemical and histological examination of the OM region of the PT comparing LLLT. In this study, 24 Sprague-Dawley rats were divided into three groups as control, LLLT, and PT groups. All groups received 5-fluorouracil intraperitoneally and a linear trauma to the mouth pouch with a needle. After the formation of OM in the mouth, the control group had no treatment; the LLLT group was administered LLLT, and the PT group had LLLT after indocyanine green application. Then all groups were sacrificed, and histological analyses and protein level detection of basic fibroblast growth factor (bFGF), transforming growth factor (TGF-Î²), and platelet-derived growth factor (PDGF-BB) were evaluated in all groups. PT was determined to be more statistically significantly than LLLT with bFGF and PDGF-BB. However, regarding TGF-Î², no statistically significant difference was observed between the groups. Within the limitations of this study, indocyanine green may accelerate the LLLT effect. However, further studies on this subject are required. Transforming Growth Factor beta;Fibroblast Growth Factor 2;Becaplermin;Fluorouracil Animals;Becaplermin;Body Weight;Fibroblast Growth Factor 2;Fluorouracil;Low-Level Light Therapy;Photochemotherapy;Rats, Sprague-Dawley;Stomatitis;Transforming Growth Factor beta;Treatment Outcome

Low-fluenced erbium:yttrium-aluminium-garnet laser treatment in combination with broadband light pretreatment for various pigmentation disorders in Asian patients. BACKGROUND: Low-fluenced 2940-nm erbium (Er):yttrium-aluminium-garnet (YAG) resurfacing elicits ablative photothermal tissue reactions confined to the uppermost parts of the epidermis. OBJECTIVE: To demonstrate the efficacy and safety of low-fluenced ablative Er:YAG laser treatment in combination with broadband light (BBL) pretreatment for various pigmentation disorders. METHODS: In total, 35 Korean patients with various pigmentation disorders were pretreated with BBL, and then, low-fluenced Er:YAG laser resurfacing was performed with a beam size of 4Â mm and a fluence of 1.0-1.5Â J/cm(2) . RESULTS: An average of 1.1Â Â±Â 0.4 sessions of combined BBL and low-fluenced Er:YAG resurfacing treatment was delivered to the patients. Most post-Er:YAG scaling fell off spontaneously over 3-5Â days, and most of the post-BBL crusting disappeared spontaneously over 5-7Â days. At 2Â months after final treatment, the mean global aesthetic improvement scale score for the clinical improvement of pigmentation lesions was estimated as 2.5Â Â±Â 0.8, and that for the improvement of overall skin tone, texture, and wrinkles was 2.8Â Â±Â 1.0. CONCLUSION: Our data demonstrated that post-BBL, low-fluenced Er:YAG laser resurfacing can be used to effectively treat various pigmentation disorders in Asian patients. Further improvements in overall skin tone, texture, and wrinkles were also achieved without major side effects. Adult;Aged;Asian People;Combined Modality Therapy;Female;Humans;Lasers,

Solid-State;Light;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Rejuvenation;Skin;Skin Aging;Treatment Outcome

Photobiomodulation in Parkinson's disease: A randomized controlledÂ trial.

Photobiomodulation therapy modulates epigenetic events and NF-ÎºB expression in oral epithelial wound healing. The aim of this study was to evaluate the effect of photobiomodulation therapy (PBMT) on histone 3 acetylation (acH3) and NF-ÎºB expression during oral ulcer healing. A total of 48 male Wistar rats were divided into control group (CG) and PBMT group (nÂ =â€‰24 each). Traumatic ulcers were created in the dorsum of the rats' tongue with a punch tool. Irradiation with InGaAlP laser, 660Â nm, 40Â mW, 0.04Â cm(2) spot size, 4Â J/cm(2), 4Â s, and 0.16Â J per spot was performed once a day in close contact for 10 consecutive days. CG received only daily handling. Rats were euthanized on days 3, 5, and 10 (nÂ =â€‰8) and were monitored daily to assess wound status. Immunohistochemical analysis for acH3 and NF-ÎºB detection was performed. One thousand epithelial cells were counted, and mean acH3- and NF-ÎºB-positive cells were calculated and compared between the groups. PBMT accelerated the repair of oral ulcers. On day 3, PBMT showed significantly higher means for acH3- and NF-ÎºB-positive cells than CG. On day 5, no difference was observed between the groups concerning both markers. On day 10, PBMT presented lower acH3 and NF-ÎºB means than the control group. We concluded that PBMT stimulates keratinocyte migration in the early stage of oral wound healing and keratinocyte differentiation at the final stage by modulating histone acetylation and NF-ÎºB expression. Histones;NF-kappa B Acetylation;Animals;Epigenesis, Genetic;Histones;Low-Level Light Therapy;Male;Mouth Mucosa;NF-kappa B;Rats, Wistar;Re-Epithelialization;Wound Healing

Quadriceps femoris performance after resistance training with and without photobiomodulation in elderly women: a randomized clinical trial. The study assessed if quadriceps femoris muscle performance of older women can be improved by applying photobiomodulation therapy after a resistance training program. This study is a randomized, controlled trial with concealed allocation, intention-to-treat analysis, and blinded outcome evaluators. Forty-five healthy sedentary older women classified as active or insufficiently active were randomized to groups receiving 8Â weeks of quadriceps femoris resistance training plus active group or placebo group, or a control group (no training or photobiomodulation). Surface electromyographic fatigue indexes of vastus medialis, rectus femoris, and vastus lateralis; one-maximum repetition (1-MR); and analysis of inflammatory biomarkers (IL-6, IL-8, and TNF-Î± cytokines, plus CK and LDH enzymes) were measured at baseline and twice in a 24Â h-period after 8Â weeks. No differences among the three groups were found in fatigue indexes for all three muscles, although in general, the active group presented improved fatigue indexes from baseline to 8-week outcome, while the other groups did not. Both training groups improved in 1-MR over the 8-week period. Inflammatory biomarkers were not different at long- or short-term among the three groups, except differences in groups for long-term IL-8 changes, differences in time for long-term LDH and short-term TNF-Î± changes, and interactions of time by group for short-term LDH changes. Quadriceps femoris performance of older women was not improved when photobiomodulation was associated to the proposed quadriceps femoris resistance training, when compared to training without photobiomodulation and a sedentary group. Inflammation Mediators Aged;Analysis of Variance;Biomechanical Phenomena;Electromyography;Female;Follow-Up Studies;Humans;Inflammation Mediators;Low-Level Light Therapy;Quadriceps Muscle;Resistance Training

Tattoo Removal as a Resettlement Service to Reduce Incarceration Among Mexican Migrants. In Mexico, tattooed migrants face discrimination and are at high-risk of incarceration, thus, we assessed whether receiving laser tattoo removal affected the likelihood of incarceration. In 2015-2016, 89 adults agesâ€‰â‰¥â€‰18Â years with visible tattoos were recruited at a free-clinic to receive laser

tattoo removal or assigned to the wait-list; all completed baseline and 6-month questionnaires. Overall, 97.8% of participants ever migrated to the USA. In multivariate analyses restricted to migrants (nâ€‰=â€‰87), those receiving laser tattoo removal [Adjusted Odds Ratio (AOR) 0.27, 95% CI 0.07-0.89] and possessing a Mexican Voting card (AOR 0.14; 95% CI 0.03-0.58) were significantly less likely than wait-list participants to be incarcerated at 6-months. Previously incarcerated participants were significantly more likely to be incarcerated at follow-up. Tattoo removal may reduce incarceration among Mexican migrants. Future studies can assess other health and social benefits of tattoo removal for migrants/deportees returning to Mexico. Adult;Age Factors;Female;Humans;Interpersonal Relations;Lasers, Solid-State;Low-Level Light Therapy;Male;Mexican Americans;Mexico;Middle Aged;Prisoners;Sex Factors;Socioeconomic Factors;Tattooing;Time Factors;Transients and Migrants;United States;Waiting Lists

Current and emerging treatment strategies for hair loss in women of color. Hair loss is common in women of color, and is associated with significant psychosocial complaints. Early clinical recognition and prompt initiation of intervention with medical treatment is critical to halt the disease process. In this article, we review the clinical presentations of nonscarring and scarring alopecias in women of color, use of dermoscopy for early recognition of the disease process, and medical, procedural, and surgical interventions. In conditions that result in scarring alopecia, such as late-stage traction, frontal fibrosing, or central centrifugal cicatricial alopecia, patients may benefit from procedural interventions, such as hair transplantation, platelet rich plasma injections, low-level laser therapy, or scalp therapy.

Effect of Low-Level Laser Irradiation on the Function of Glycated Catalase. Introduction: The aim of this work is to evaluate the effect of low-level laser irradiation (LLLI), by lasers with different wavelengths, on glycated catalase enzyme in vitro experimentally. Methods: This is done by measuring the activity and structure properties of glycated catalase enzyme. The structure properties were evaluated with circular dichroism (CD) and fluoroscopy methods. Three continuous wave (CW) lasers in the visible spectrum (Î» =450, 530, 638 nm) and a 100-ns pulsed laser in the infrared spectrum (Î» =905 nm) were chosen for comparison. For the infrared laser, same effects have been investigated for different energy doses. The effect of photon energy (hÏ…) at different wavelengths was measured on activity, CD, and fluoroscopy properties of catalase, and compared with the control group (samples without irradiation). The energy intensity of laser should not exceed 0.1 J/cm(2) . Experiments were performed on glycated catalase between 2 to 16 weeks after glycation of catalase. The LLLI effect was also investigated on the samples, by comparing the catalase activity, CD and fluoroscopy for different wavelengths. Results: Our results indicated, the decrease in catalase activity as a function of glycation time (weeks) for all samples, and a slight increase on its activity by different laser wavelengths irradiation for any fixed period of glycation time. Finally, the catalase activity has been increased as the laser's photon energy (hÏ…) intensified. More specifically, the blue laser (Î» =450 nm) had the most and the red laser (Î» =638 nm) had the least effect, and the green laser (Î» =530 nm) had the medium effect on catalase activity as well. Furthermore, pulsed laser had an additional effect by increasing energy dosage. Conclusion: As we expected in all experiments, an increase in the catalase activity was coincident with a decrease in the catalase fluoroscopy and CD parameters.

The Impacts of Low-Level Laser Therapy - A Complementary Treatment in the Management of Side Effects After Implant Surgery. Introduction: One of the most important medical applications of laser is low-level laser therapy (LLLT). In this method, laser radiation penetrates easily into the target tissue. The aim of this study was to investigate whether LLLT can reduce the side effects of advanced implant surgery. Methods: In this triple-blind clinical trial, 30 patients aged 25 to 65 years were selected for implant insertion and divided into two groups. In the laser group, immediately after the

surgery, 72 hours and 1 week after the surgery, the surgical site was irradiated with an 830 nm laser. The dose required for the laser therapy was 5 J/cm(2) . The degree of pain, facial swelling and wound healing were analyzed using statistical methods. Results: Our results showed that at 12, 24, 48, and 72 hours after the surgery, the pain level was reduced in the laser group compared with the placebo group (P<0.05). Swelling of the face was also significantly reduced 7 days after surgery in the laser group (P<0.05). The investigation on the recovery conditions of the surgical site showed that on the 3rd, 7th and 14th days after the surgery, higher levels of wound healing have been achieved (P<0.05). Conclusion: Our results suggest that laser, as a complementary therapy; can be used to reduce the severity and duration of pain. Also, laser can reduce facial swelling and accelerate wound healing.

Comparative Evaluation of the Efficacy of Laser Therapy and Fibroblastic Growth Factor Injection on Mucosal Wound Healing in Rat Experimental Model. Introduction: The aim of the present study was to compare the effects of laser and basic fibroblastic growth factor (bFGF) treatment on operative wound healing in a rat model. Methods: Sixty-six male Wistar rats were employed in this study. A 10-mm surgical wound was created on the buccal mucosa of each rat, under anesthesia, and then the rats were divided into 3 groups of 22: (1) GF group (received subcutaneous injection of bFGF), (2) laser group (treated with low-level laser irradiation), and (3) control group (received no treatment). On day 5, half of the rats in each group and on day 10 the other half, were sacrificed. Afterward, samples were taken from rats' buccal mucosa for histological assay and scoring. The data were analyzed using MannWhitney test (Î± =5%). Results: On day 5 there was not any significant difference between GF and control groups; however, the laser group showed clinically delayed wound coverage, compared to other groups (P<0.05). On day 10, histological examination demonstrated marked vascular granulation tissue (GT) in GF group. Collagen production was significantly prominent in laser group compared to GF treated samples (P=0.004). Inflammation of GT in GF and laser groups was significantly less than that in control samples (P=0.005 and P=0.001, respectively). Conclusion: The components of wound matrix induced by GF and laser treatment were significantly different. Although bFGF or laser treatment of oral wounds, under the conditions of the present study, did not accelerate wound healing, they showed some other notable effects on the quality of healing.

Low-level laser therapy in patients with Burning Mouth Syndrome: A double-blind, randomized, controlled clinical trial. BACKGROUND: Evaluate the effect of LLLT in the treatment of burning mouth syndrome (BMS). MATERIAL AND METHODS: Twenty-one BMS patients were randomly assigned to two groups: 12 in the laser group (LG) and 9 in the control group (CG). Patients in the LG underwent 2-week sessions of LLLT for 4 weeks. The spot tip area of this tool is 0.088cm2, semi-conductor GaAlAs, with a wavelength of 808nm Â±5nm (infrared), 200 mW output power, 1.97W/cm2 of power density, 3 J energy per point and application time 15 seconds per point. LLLT was applied punctually, in continuous emissions, on each of the sites where there was a symptom. Symptoms were evaluated with a visual analogue scale (VAS) and patient psychological profiles were assessed using the Hospital Anxiety-Depression Scale. No side effects were recorded. Statistical analysis was carried out via ANOVA and logistic regression analysis. RESULTS: The initial VAS score mean was 8.9 for the LG and 8.3 for the CG (p >0.05). After the eighth session the VAS score was 5.5 and 5.8 respectively, and at two months it was 4.7 and 5.1 respectively. Improvement variables were established by dichotomizing the pain scales. We obtained levels of significance for the improvement variable for the LG at the two-month follow-up (p=0.0038) and for the univariate analysis of the treatment. The improvement was marginally significant in the multivariant analysis of: dry mouth, dysgeusia, pain and the treatment (p=0.0538). CONCLUSIONS: LLLT may be an alternative treatment for the relief of oral burning in patients with BMS. Key words:Burning mouth syndrome, oral pain, laser dentistry, laser therapy, low intensity laser therapy.

Longitudinal evaluation of the effects of low-power laser phototherapy on mandibular movements, pain, and edema after orthognathic surgery. The aim of this study was to longitudinally evaluate mandibular movements, pain, and edema in patients who underwent low-power laser (LPL) phototherapy after bimaxillary orthognathic surgery. A double-blind, randomized, controlled clinical trial was conducted using 30 patients, who were divided into a study group (nÂ =Â 15) and control group (nÂ =Â 15). The former group received postoperative LPL (3Â J/cm(2), 808Â nm, and 100Â mW) and the latter group received placebo LPL phototherapy. Over a period of 60 days, these groups were evaluated for: mandibular movements - opening, laterality, and protrusion; pain - visual analogue scale; and edema - measured between cephalometric points. The study group showed significantly better jaw opening (pÂ =Â 0.009), laterality (pÂ =Â 0.036), and protrusion (pÂ =Â 0.029) after 2 weeks in most comparisons. The study group showed significantly less postoperative pain (pÂ <Â 0.001) in most comparisons, and they recovered from pain earlier than the control group. There was a reduction in edema, with no statistically significant difference for most measurements. As observed in most analyses, there were increases in values for all mandibular movements, no significant differences in the occurrence of edema, and decreases in the occurrence of pain. Double-Blind Method;Edema;Humans;Low-Level Light Therapy;Movement;Orthognathic Surgery;Pain, Postoperative

Voigt-Futcher pigmentary demarcation lines. Pigmentary demarcation lines (PDLs) are physiological abrupt transitions between hyperpigmented and lighter skin, a common and sometimes troubling feature of normal skin. They are seen in a majority of dark-complexioned women and a substantial percentage of light-complexioned ones too. We review this salient finding and approaches to its management. Dermatologic Agents Administration, Cutaneous;Dermatologic Agents;Diagnosis, Differential;Female;Humans;Lasers;Low-Level Light Therapy;Male;Pigmentation Disorders;Pregnancy;Pregnancy Complications;Skin Pigmentation

Nevus depigmentosus: review of a mark of distinction. Nevus depigmentosus (ND), also known as nevus achromicus or achromic nevus, is an uncommon congenital hypomelanosis of the skin that is often characterized as being nonprogressive and having serrated borders. It needs to be distinguished from other hypopigmented skin conditions such as nevus anemicus, hypomelanosis of Ito, Fitzpatrick patches (ash leaf spots) of tuberous sclerosis, vitiligo, indeterminate leprosy, and pigment demarcation lines. Treatment may be desired for aesthetic and possible psychosocial considerations. We review and update knowledge about ND and its simulants. Diagnosis, Differential;Esthetics;Humans;Hypopigmentation;Leprosy;Low-Level Light Therapy;Melanocytes;Nevus;PUVA Therapy;Risk Factors;Tuberous Sclerosis

Selective photobiomodulation for emotion regulation: model-based dosimetry study. The transcranial photobiomodulation (t-PBM) technique is a promising approach for the treatment of a wide range of neuropsychiatric disorders, including disorders characterized by poor regulation of emotion such as major depressive disorder (MDD). We examine various approaches to deliver red and near-infrared light to the dorsolateral prefrontal cortex (dlPFC) and ventromedial prefrontal cortex (vmPFC) in the human brain, both of which have shown strong relevance to the treatment of MDD. We apply our hardware-accelerated Monte Carlo simulations to systematically investigate the light penetration profiles using a standard adult brain atlas. To better deliver light to these regions-of-interest, we study, in particular, intranasal and transcranial illumination approaches. We find that transcranial illumination at the F3-F4 location (based on 10-20 system) provides excellent light delivery to the dlPFC, while a light source located in close proximity to the cribriform plate is well-suited for reaching the vmPFC, despite the fact that accessing the latter location may require a minimally invasive approach. Alternative noninvasive illumination strategies for reaching vmPFC are also studied and both transcranial illumination at the Fp1-FpZ-Fp2 location and intranasal illumination

in the mid-nose region are shown to be valid. Different illumination wavelengths, ranging from 670 to 1064Â nm, are studied and the amounts of light energy deposited to a wide range of brain regions are quantitatively compared. We find that 810Â nm provided the overall highest energy delivery to the targeted regions. Although our simulations carried out on locations and wavelengths are not designed to be exhaustive, the proposed illumination strategies inform the design of t-PBM systems likely to improve brain emotion regulation, both in clinical research and practice.

A brief literature review and own clinical experience in prophylaxis of oral mucositis in children using low level laser therapy. OBJECTIVE: The article describes the experience of clinical application of low level laser therapy in pediatric oncology for the prevention and treatment of chemotherapy complications such as oral mucositis. BACKGROUND: For this purpose, for the first time in the world non-invasive laser blood illumination is used on the sinocarotid zone (on the projection of the common carotid artery symmetrically) and popliteal fossa in order to stimulate the phagocytic activity of leukocytes. METHODS: 25 children with different oncological diseases were given non-invasive laser blood illumination treatment (904 nm, pulse mode, 100 ns, 50-150 Hz, 5-7 W, 4 cm(2), 1-2 minutes daily per each procedure) 1-3 days before the beginning of chemotherapy. For the objectification of the results of treatment, the phagocytic activity of leukocytes was evaluated. RESULTS: None of the children who underwent low level laser therapy course had any complications and no cases of oral mucositis developed. CONCLUSIONS: Clinical experience has shown high efficacy and safety of low level laser therapy aimed at preventing the development of complications of chemotherapy, primarily oral mucositis, and stimulating the phagocytic activity of leukocytes.

A Novel Combined Light-Based Treatment of Acne Vulgaris With 1,450-nm Diode Laser and 450-nm Blue Light. BACKGROUND: Nonablative 1,450-nm diode laser (DL) and visible blue light (BL) have been effectively used for acne with superior safety profiles. OBJECTIVE: To evaluate synergistic effects of sequential DL and BL application for acne. METHODS: A 20-week, randomized split-face study was conducted to compare clinical courses between 2 facial sides either receiving sequential application of DL and BL or BL alone in 24 patients with mild to moderate facial acne vulgaris. Patients were scheduled to receive 3 consecutive sessions at 4-week intervals. Objective assessments, including revised Leeds grades, lesion counts, and sebum output measurements, and patients' subjective satisfaction were investigated. RESULTS: Both combination and BL sides demonstrated steady improvement of inflammatory acne lesions with 62.3% and 35.2% decreases at the 12-week follow-up visit compared with baseline respectively. For noninflammatory lesions and seborrhea, only combination regimen demonstrated improvement. Patients' subjective assessments paralleled objective findings. For safety profiles, no severe adverse effect was observed on both sides, and mild symptoms resolved spontaneously within a day. CONCLUSION: The combination regimen demonstrated synergistic efficacies for acne and seborrhea, with satisfactory safety profiles. Therefore, a few sessions of these light-based applications would be a viable option for acne treatments. Acne Vulgaris;Adolescent;Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Severity of Illness Index;Treatment Outcome;Young Adult

Female Pattern Hair Loss and Androgen Excess: A Report From the Multidisciplinary Androgen Excess and PCOS Committee. OBJECTIVE: To determine the current state of knowledge and provide evidence-based recommendations that could be valid for all specialists taking care of female pattern hair loss (FPHL), a common form of hair loss in women that is characterized by the reduction of hair density in the central area of the scalp, whereas the frontal hairline is generally well conserved. PARTICIPANTS: An expert task force appointed by the Androgen Excess and PCOS Society, which included specialists from dermatology, endocrinology, and reproductive endocrinology. DESIGN: Levels of evidence were assessed and graded from A to D. Peer-reviewed studies evaluating FPHL

published through December 2017 were reviewed. Criteria for inclusion/exclusion of the published papers were agreed on by at least two reviewers in each area and arbitrated by a third when necessary. CONCLUSIONS: (i) The term "female pattern hair loss" should be used, avoiding the previous terms of alopecia or androgenetic alopecia. (ii) The two typical patterns of hair loss in FPHL are centrifugal expansion in the mid scalp, and a frontal accentuation or Christmas tree pattern. (iii) Isolated FPHL should not be considered a sign of hyperandrogenism when androgen levels are normal. (iv) The assessment of patients with FPHL is primarily clinical. (v) In all patients with FPHL, assessment of a possible androgen excess is mandatory. Measurement of vitamin D, iron, zinc, thyroid hormones, and prolactin are optional but recommended. (vi) Treatment of FPHL should start with minoxidil (5%), adding 5Î±-reductase inhibitors or antiandrogens when there is severe hair loss or hyperandrogenism. 5-alpha Reductase Inhibitors;Androgen Antagonists;Mineralocorticoid Receptor Antagonists;Vasodilator Agents;Spironolactone;Minoxidil 5-alpha Reductase Inhibitors;Alopecia;Androgen Antagonists;Female;Humans;Hyperandrogenism;Low-Level Light Therapy;Mineralocorticoid Receptor Antagonists;Minoxidil;Platelet-Rich Plasma;Polycystic Ovary Syndrome;Scalp;Spironolactone;Vasodilator Agents

Acute Effects Using Light-Emitting Diode Therapy (LEDT) for Muscle Function during Isometric Exercise in Asthma Patients: A Pilot Study. The aim of this study was to evaluate the effectiveness of acute application of LEDT in improving peripheral muscle performance during isometric exercise in patients with asthma. Eleven patients, with a mean age 38 Â± 10, underwent a single LEDT and sham application in the femoral quadriceps' dominant member (cluster with 50 LED Î» = 850 nm, 50 mW, 15 s; 37.5 J), 48 h apart in a randomized crossover design. Before and after LEDT and sham application, the patients were submitted an isometric endurance test (60% of the maximum isometric voluntary contraction), up to the limit of tolerance simultaneous recording of surface electromyography. There were no statistically significant differences between groups at the time of contraction (before 41Â±14 versus 44Â±16; after 46Â±12 versus 45Â±20 s) during the isometric contraction test and inflammatory markers before and after a single LEDT application. A single application of LEDT in the parameters and dose according to the equipment used in the study were not able to promote differences in the time of contraction and the fatigue response in asthmatic patients. However, the chronic effects of LEDT application for improving muscle performance in these patients are unknown and may present different responses during applications for a long time. Adult;Asthma;Exercise;Female;Humans;Isometric Contraction;Low-Level Light Therapy;Male;Middle Aged;Muscle Fatigue;Muscle, Skeletal;Quadriceps Muscle

Do electrical current and laser therapies improve bone remodeling during an orthodontic treatment with corticotomy? OBJECTIVES: Evaluate the bone remodeling during orthodontic movement with corticotomy when submitted to low-intensity electrical stimulation application (microcurrent-MC) and low-level laser therapy (LLLT). MATERIAL AND METHODS: One hundred and fifty Wistar rats were divided into the following 5 groups: (C) submitted to tooth movement; (Cort) tooth movement/corticotomy; (Cort-L) tooth movement/corticotomy/laser AsGaAl 808Â nm (4.96J/50s); (Cort-Mc) tooth movement/corticotomy/microcurrent (10Â Î¼A/5Â min); (Cort-L-Mc) tooth movement/corticotomy and laser/microcurrent alternated. Inflammation, angiogenesis, and osteogenesis were evaluated in the periodontal ligament (PDL) and alveolar bone on the 7th, 14th, and 21st days of orthodontic movement. RESULTS: The quantification of inflammatory infiltrate, angiogenesis and expression of TGF-Î²1, VEGF, and collagen type I were favorably modulated by the application of therapies such as low-level laser therapy (LLLT), MC, or both combined. However, electrical stimulation increased fibroblasts, osteoclasts and RANK numbers, birefringent collagen fiber organization, and BMP-7 and IL-6 expression. CONCLUSIONS: Low-level laser therapy (LLLT) and MC application both improved the process of bone remodeling during orthodontic treatment with

corticotomy. Still, electrical current therapy promoted a more effective tooth displacement but presented expected root resorption similar to all experimental treatments. CLINICAL RELEVANCE: It is important to know the effects of minimally invasive therapies on cellular and molecular elements involved in the bone remodeling of orthodontic treatment associated with corticotomy surgery, in order to reduce the adverse effects in the use of this technique and to establish a safer clinical routine. Alveolar Process;Animals;Bone Remodeling;Laser Therapy;Male;Rats;Rats, Wistar;Root Resorption;Tooth Movement Techniques

Nonablative Fractional 1,550-nm Laser for the Treatment of an Unusual Nevus Sebaceus. Biopsy;Dose Fractionation, Radiation;Face;Female;Humans;Lasers;Low-Level Light Therapy;Neck;Nevus;Skin;Skin Neoplasms;Treatment Outcome;Young Adult

Effects of low-level laser therapy on the organization of articular cartilage in an experimental microcrystalline arthritis model. The aim of this study was to evaluate the effects of low-level laser therapy using the gallium arsenide laser (Î»â€‰=â€‰830Â nm) on the articular cartilage (AC) organization from knee joint in an experimental model of microcrystalline arthritis in adult male Wistar rats. Seventy-two animals were divided into three groups: A (control), B (induced arthritis), and C (induced arthritis + laser therapy). The arthritis was induced in the right knee using 2Â mg of Na(4)P(2)O(7) in 0.5Â mL of saline solution. The treatments were daily applied in the patellar region of the right knee after 48Â h of induction. On the 7th, 14th, and 21st days of treatment, the animals were euthanized and their right knees were removed and processed for structural and biochemical analysis of the AC. The chondrocytes positively labeled for the TUNEL reaction were lower in C than in B on the 14th and 21st days. The content of glycosaminoglycans and hydroxyproline in A and C was higher than B on the 21st day. The amount of tibial TNF-Î± in B and C was lower than in A. The amount of tibial BMP-7 in B and C was higher than in A. The femoral MMP-13 was lower in B and C than for A. The tibial TGF-Î² for C was higher than the others. The femoral ADAMT-S4 content of A and C presented similar and inferior data to B on the 21st day. The AsGa-830Â nm therapy preserved the content of glycosaminoglycans, reduced the cellular changes and the inflammatory process compared to the untreated group. Bone Morphogenetic Protein 7;Transforming Growth Factor beta;Matrix Metalloproteinase 13;ADAMTS4 Protein ADAMTS4 Protein;Animals;Apoptosis;Arthritis, Experimental;Bone Morphogenetic Protein 7;Cartilage, Articular;Chondrocytes;Disease Models, Animal;Femur;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Rats, Wistar;Tibia;Transforming Growth Factor beta

Laser Therapy for Incision Healing in 9 Dogs. Laser therapy is becoming common place in veterinary medicine with little evidence proving efficacy or dosages. This study evaluated surgical wound healing in canines. Twelve Dachshunds underwent thoraco-lumbar hemilaminectomies for intervertebral disc disease (IVDD). Digital photographs were taken of their incisions within 24 h of surgery and 1, 3, 5, 7, and 21 days postoperatively. The first three dogs were used to create a standardized scar scale to score the other dogs' incision healing. The remaining 9 dogs were randomly assigned to either receive 8 J/cm(2) laser therapy once a day for 7 days or the non-laser treated control group. Incision healing was scored based on the scar scale from 0 to 5, with zero being a fresh incision and five being completely healed with scar contraction and hair growth. All scar scores significantly improved with increasing time from surgery (<0.001). Good agreement was achieved for inter-rater reliability ($p = 0.9$). Laser therapy increased the scar scale score, showed improved cosmetic healing, by day seven and continued to be significantly increased on day 21 compared to control dogs ($p < 0.001$). Daily application of laser therapy at 8J/cm2 hastened wound healing in Dachshunds that received thoracolumbar hemilaminectomies for IVDD. It also improved the cosmetic appearance.

Effects of Laser Acupuncture on Delayed Onset Muscle Soreness of the Biceps Brachii Muscle: A Randomized Controlled Trial. OBJECTIVES: The aim of this study was to explore the effects of laser acupuncture on improvement of recovery and muscle performance in delayed muscle soreness (DOMS) when applied before exercise. METHODS: This randomized, blinded, and controlled study included healthy participants (n = 40) who were randomized into laser acupuncture and placebo groups. Laser acupuncture was applied to the Tianquan (PC2) and Chihtseh acupoints (LU5) at a dose of 36 J and energy density of 9.7 J/cm(2) before inducing DOMS. The placebo group received sham laser acupuncture with no laser output. Visual analog scale (VAS), proprioception, pressure pain threshold (PPT), arm circumference, and muscle strength were observed at the baseline and 24, 48, 72, and 96â€‰h after induction of DOMS. RESULTS: Significant changes in the VAS (F(4,â€‰â€‰43.96) = 31.47; p = 0.001), PPT (F(4,â€‰â€‰1.35) = 35.07; p = 0.001), normalized arm circumference (F(4,â€‰â€‰0.001) = 3.87; p = 0.005), and normalized muscle strength (F(4,â€‰â€‰0.31) = 24.99; p = 0.001) were observed within the groups over time ($p < 0.05$), but there were no significant differences between the two groups ($p > 0.05$). Normalized arm circumference was significantly different between the two groups at 48 and 72â€‰h after induction of DOMS ($p < 0.05$). CONCLUSION: Photobiomodulation therapy on Tianquan (PC2) and Chihtseh acupoints (LU5) before the exercise did not significantly decrease DOMS and increase muscle performance. Laser acupuncture as a supplemental therapy seemed to have no effect on DOMS prevention.

In vitro antimicrobial efficacy of laser exposed chlorpromazine against Gram-positive bacteria in planktonic and biofilm growth state. Aqueous chlorpromazine solutions exposed to 266â€¯nm generated as fourth harmonic of Nd:YAG pulsed laser along time intervals from 1â€¯min to 240â€¯min were investigated for their antimicrobial activity against planktonic and adherent Gram-positive bacterial strains. Qualitative and quantitative assays based on microbiological methods and flow cytometry assays were performed to establish the minimum inhibitory and minimum biofilm eradication concentrations and to reveal some of the possible mechanisms of antimicrobial activity. Optimal irradiation conditions and combinations of photoproducts for achieving the best antimicrobial and antibiofilm effects are suggested. It was confirmed that chlorpromazine solutions irradiated for 15â€¯min and 30â€¯min have the best antimicrobial and antibiofilm activity against Staphylococcus aureus ATCC 6538, methicillin susceptible Staphylococcus aureus, methicillin resistant Staphylococcus aureus, Enterococcus faecium 17-VAR, Enterococcus faecalis 2921, and Bacillus subtilis 6633. Flow cytometry revealed that two of the possible mechanisms of the antimicrobial activity of irradiated chlorpromazine are the inhibition of efflux pumps activity and induction of cellular membrane lesions. Chlorpromazine Biofilms;Chlorpromazine;Flow Cytometry;Gram-Positive Bacteria;Low-Level Light Therapy;Microbial Sensitivity Tests

Red and near-infrared light induces intracellular Ca(2+) flux via the activation of glutamate N-methyl-D-aspartate receptors. Red and near-infrared (NIR) light effect on Ca(2+) ions flux through the influence on N-methyl-D-aspartate receptors (NMDARs) and their functioning in HeLa cells was studied in vitro. Cells were irradiated by 650 and 808â€‰nm laser light at different power densities and doses and the obtained effect was compared with that caused by the pharmacological agents. The laser light was found to elevate Ca(2+) influx into cell cytoplasm in a dose-dependent manner without changes of the NMDAR functioning. Furthermore, the light of both wavelengths demonstrated the ability to elevate Ca(2+) influx under the pharmacological blockade of NMDARs and also might partially abolish the blockade enhancing Ca(2+) influx after selective stimulation of the receptors with NMDA. Simultaneously, the light at moderate doses demonstrated a photobiostimulating effect on cells. Based on our experiments and data reported in the literature, we suggest that the low-power visible and NIR light can instigate a cell membrane depolarization via

nonthermal activation, resulting in the fast induction of Ca(2+) influx into cells. The obtained results also demonstrate that NIR light can be used for nonthermal and nonpharmacological stimulation of NMDARs in cancer cells.

Influence of low-level laser therapy on orthodontically-induced inflammatory root resorption. A systematic review. OBJECTIVE: The aim was to assess the influence of low-level laser therapy (LLLT) on orthodontically-induced inflammatory root resorption (OIIRR). METHODS: A systematic search was conducted in indexed databases following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The eligibility criteria were as follows: (a) original clinical and animal/experimental studies; (b) prospective studies; (c) intervention: effect of LLLT on OIIRR; (d) control group (OIIRR without LLLT); (e) statistical analysis; and (f) tomographic or histologic assessment of OIIRR. Quality assessment of the experimental and clinical studies was performed following the Animal Research Reporting In-vivo Experiments (ARRIVE) and Consolidated Standards of Reporting Trials (CONSORT) guidelines, respectively. The risk of bias of the included studies was also determined. RESULTS: Nine (7 experimental and 2 clinical) of the initially identified 39 studies were included. One clinical and 2 experimental studies showed that LLLT during orthodontic tooth movement (OTM) significantly reduces OIIRR. One experimental study reported that LLLT during OTM in sockets treated with alloplastic materials significantly reduces OIIRR. One experimental study found that LLLT after OTM significantly repairs OIIRR, whereas one clinical study did not report a significant reparative affect. Three experimental studies showed that LLLT increases OIIRR during OTM, corticotomized-OTM, and OTM into grafted defects, respectively. The minimum, median and highest ARRIVE scores (out of 20) of the included experimental studies were 15, 17 and 19, respectively. The mean CONSORT score of the included clinical studies was 23 (out of 25). CONCLUSIONS: In conclusion, the influence of LLLT on OIIRR remains debatable. Animals;Humans;Inflammation;Low-Level Light Therapy;Prospective Studies;Root Resorption;Tooth Movement Techniques

Low-level laser and adipose-derived stem cells altered remodelling genes expression and improved collagen reorganization during tendon repair. OBJECTIVES: The cellular therapy using adipose-derived mesenchymal stem cells (ASCs) aims to improve tendon healing, considering that repaired tendons often result in a less resistant tissue. Our objective was to evaluate the effects of the ASCs combination with a low-level laser (LLL), an effective photobiostimulation for the healing processes. MATERIALS AND METHODS: Rats calcaneal tendons were divided into five groups: normal (NT), transected (T), transected and ASCs (SC) or LLL (L), or with ASCs and LLL (SCL). RESULTS: All treated groups presented higher expression of Dcn and greater organization of collagen fibres. In comparison with T, LLL also up-regulated Gdf5 gene expression, ASCs up-regulated the expression of Tnmd, and the association of LLL and ASCs down-regulated the expression of Scx. No differences were observed for the expression of Il1b, Timp2, Tgfb1, Lox, Mmp2, Mmp8 and Mmp9, neither in the quantification of hydroxyproline, TNF-Î±, PCNA and in the protein level of Tnmd. A higher amount of IL-10 was detected in SC, L and SCL compared to T, and higher amount of collagen I and III was observed in SC compared to SCL. CONCLUSIONS: Transplanted ASCs migrated to the transected region, and all treatments altered the remodelling genes expression. The LLL was the most effective in the collagen reorganization, followed by its combination with ASCs. Further investigations are needed to elucidate the molecular mechanisms involved in the LLL and ASCs combination during initial phases of tendon repair. Basic Helix-Loop-Helix Transcription Factors;GDF5 protein, rat;Growth Differentiation Factor 5;Membrane Proteins;Scx protein, rat;Tnmd protein, rat;Collagen Animals;Basic Helix-Loop-Helix Transcription Factors;Collagen;Gene Expression;Growth Differentiation Factor 5;Low-Level Light Therapy;Male;Membrane Proteins;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Rats;Rats, Inbred Lew;Rats, Transgenic;Rats, Wistar;Tendon Injuries;Wound Healing

Photobiomodulation with simultaneous use of red and infrared light emitting diodes in the treatment of temporomandibular disorder: study protocol for a randomized, controlled and double-blind clinical trial. INTRODUCTION: Temporomandibular disorder (TMD) is considered the main cause of orofacial pain of non-dental origin, and a public health problem. The symptomatology is muscular and/or articular pain, restriction of the mandibular range of motion, and changes in the mandibular movement pattern. Due to its complexity there are already treatments using various forms of therapy. Photobiomodulation using light sources, such as low-level laser or light emitting diodes (LED), with different wavelengths, in a single or combined form, allows one more therapeutic resource to be explored. The objective of this study is to evaluate the effects of photobiomodulation with the simultaneous use of red and infrared LEDs, on pain, range of mandibular movements, and on the electrical activity of masticatory muscles in individuals with TMD. METHODS: A randomized, controlled, double-blind clinical trial is proposed, which will involve 33 individuals (nâ€Š=â€Š11 per group) of both sexes, ages 18 to 45 years in 3 groups: LED group; placebo group; and control group, submitted to 6 non-consecutive sessions of photobiomodulation totaling 2 weeks of treatment. The Research Diagnostic Criteria for Temporomandibular Disorders-RDC/TMD will be used to assess and determine the participants' TMD. The pain will be assessed using the Visual Analog Scale - VAS, the mandibular range of motion will be determined with the aid of a digital caliper, and the electrical activity of the masticatory muscles will be verified by electromyography. A mixed plate of 18 red LEDs-660â€Šnm and 18 infrared LEDs-850â€Šnm with power of 3.5â€ŠmW per LED, 4.45â€ŠmW/cm, radiant exposure of 5.35â€ŠJ/cm, will be used for photobiomodulation. The irradiated area will be 14.13â€Šcm, and energy of 75.6â€ŠJ, in the TMJ region and in the bilateral masseter and temporal muscles. Participants from all groups will be reassessed after the first therapeutic intervention, and at the end of treatment. DISCUSSION: We expect the use of photobiomodulation with LEDs, infra and red, to reduce pain, improve temporomandibular joint function in patients with TMD, and thus improve the general conditions of the patient. Adolescent;Adult;Double-Blind Method;Electromyography;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Mandible;Masticatory Muscles;Middle Aged;Randomized Controlled Trials as Topic;Range of Motion, Articular;Temporomandibular Joint;Temporomandibular Joint Disorders;Treatment Outcome;Visual Analog Scale;Young Adult

Efficacy of low-level laser for treatment of cancer oral mucositis: a systematic review and meta-analysis. Review effectiveness of low-level laser therapy (LLLT) in the curative treatment of oral mucositis (OM) in patients receiving cancer therapy. A systematic review with meta-analysis was performed using Medline, Embase, and Cochrane Library databases according to PRISMA guidelines, to identify randomized controlled trials (RCT) on OM in patients during and/or after cancer therapy and in which the therapeutic approach was LLLT, with wavelengths between 632 and 970Â nm. We considered grade of OM as a dichotomous variable (such as an improvement or not in severe OM on the seventh day of therapy), with the analysis of subgroups of adult patients or children and adolescents and as a continuous variable with determination of the time for the complete resolution and the subgroup analysis occurred with the strata of the samples by treatment only with chemotherapy or chemotherapy and radiotherapy. This paper's protocol was registered a priori at https://www.crd.york.ac.uk/PROSPERO . We found five RCT (total of 315 patients) with adequate methodology. LLLT was effective, presenting a 62% risk reduction of severe mucositis on the seventh day of evaluation (RRâ€‰=â€‰0.38 [95% CI, 0.19-0.75]). When we analyzed subgroups, RR was 0.28 (95% CI 0.17-0.46) in the adult studies and 0.90 (95% CI, 0.46-1.78) in the studies with children and adolescents. We demonstrated a mean reduction of 4.21Â days in the time of complete resolution of OM (CI -â€‰5.65 to -â€‰2.76) in favor of LLLT. There is moderate evidence that LLLT is effective in resolving OM lesions in adult patients undergoing cancer therapy. LLLT demonstrates potential for

decreasing the resolution time of OM lesions by approximately 4.21Â days.
Adult;Child;Humans;Low-Level Light Therapy;Mouth Neoplasms;Pain Management;Publication Bias;Risk Factors;Severity of Illness Index;Stomatitis;Treatment Outcome

Photobiomodulation can alter mRNA levels cell death-related. Photobiomodulation (PBM) by low-level laser has demonstrated excellent results for inflammatory treatments, promoting repair of injured tissues. Knowledge regarding the molecular mechanisms involved in this process has been increasing, but its effect on cell death/survival-related gene expression after laser irradiation with different doses is not well understood. So, it is important to know these effects in order to guarantee the safety of therapeutic protocols based on PBM. This study aimed to investigate the mRNA levels of genes related to proteins involved in cell death/survival pathways of healthy tissues from talocrural joint of mice after PBM. Mice were divided into three groups: control, PBM at 3Â JÂ cm(-2), and PBM at 30Â JÂ cm(-2). Laser irradiation was performed on talocrural joint during four consecutive days. Morphological analyses, immunocytochemistry, FasL, Fas, Bax, Apaf1, Caspase9, Caspase3, Caspase6, Bcl2 mRNA levels, and DNA fragmentation were performed to verify cell death induction after laser irradiation. PBM can increase mRNA levels of almost genes pro-apoptotic. On the other hand, mRNA level of anti-apoptotic protein Bcl-2 gene was not significantly altered. Bcl-2/Bax ratio (indicator of protective molecular response) was decreased after PBM at 30Â JÂ cm(-2), trending to DNA fragmentation. Results obtained in this study indicate that PBM by low-level infrared laser alters mRNA relative levels of genes involved in cell death pathways. However, these molecular alterations were not able to cause DNA fragmentation in cells in talocrural joint tissues, indicating that infrared laser was not enough to cause cell death. RNA, Messenger;bcl-2-Associated X Protein
Animals;Apoptosis;DNA Fragmentation;Gene Expression Regulation;Low-Level Light Therapy;Male;Mice, Inbred C57BL;RNA, Messenger;bcl-2-Associated X Protein

The Effect of Low-Level Laser on Postoperative Pain After Elective Cesarean Section.
BACKGROUND: Postoperative pain is one of the major concerns about a cesarean in pregnant women that can lead to serious complications and delayed recovery for patients. OBJECTIVES: The objective is to investigate the effect of low power laser on acute pain after elective cesarean. METHODS: In this randomized, double-blind clinical trial, 80 candidates for an elective cesarean were divided randomly into two groups, control and laser. The type of surgery was the same for both groups, which contained the spinal anesthesia technique. At the end of surgery, the surgical incision in patients who were treated with laser, (GaAlAs: 804 nm and GaAlInp: 650 nm) was irradiated by laser. The control group also received laser off by the same method. Patients were monitored for 24 hours to assess the severity of postoperative pain by VAS, the first request for analgesic and the total consumption of analgesic. RESULTS: The results demonstrated significant reduction of pain in the laser group 1, 4, 8, 12, 16, 24 hours after surgery, compared with the control group (P value < 0.05). Additionally, the average of total received analgesic in the group laser was less than the controls (P value = 0.006). The first request for analgesic in the laser received group was significantly longer than the controls (P value = 0.005). CONCLUSIONS: Low power laser therapy is a good method to reduce postoperative pain due to the fact that it is a safe and non-invasive method which is also accepted by patients.

Effect of photobiomodulation and exercise on early remodeling of the Achilles tendon in streptozotocin-induced diabetic rats. The aim of this study was to compare the treatment effects of laser photobiomodulation (LPBM) therapy and aerobic exercise on the biomechanical properties, tissue morphology and the expression of tendon matrix molecules during early remodeling of Achilles tendon (AT) injury in diabetic rats. Animals were randomly assigned to five groups: injured non diabetic (I, n = 15), injured diabetic (ID, n = 15), injured diabetic plus LPBM (IDL, n = 16), injured diabetic plus aerobic exercise (IDE, n = 16) and injured diabetic plus aerobic exercise and LPBM (IDEAL, n = 17). Type 1 diabetes was induced via a single intravenous injection of Streptozotocin at a

dose of 40 mg/kg. A partial tenotomy was performed in the right AT. LPBM was performed with an indium-gallium-aluminum-phosphide 660 nm 10 mW laser device (spot size 0.04 cm2, power density 250 mW/cm2, irradiation duration 16 s, energy 0.16 J, energy density 4 J/cm2) on alternate days for a total of 9 sessions over 3 weeks (total energy 1.44 J), using a stationary contact technique to a single point over the dorsal aspect of the AT. Moderate aerobic exercise was performed on a motorized treadmill (velocity 9 m/min for 60 minutes). At 3 weeks post-injury, biomechanical analyzes as well as assessment of fibroblast number and orientation were performed. Collagen 1 (Col1) and 3 (Col3) and matrix metalloproteinases (MMPs) -3 and 13 protein distributions were studied by immunohistochemistry; while Col1 and Col3 and MMP-2 and 9 gene expression were assessed by quantitative RT-PCR (qRT-PCR). IDEAL exhibited significant increases in several biomechanical parameters in comparison to the other groups. Moreover, IDEAL presented stronger Col1 immunoreactivity when compared to ID, and weaker Col3 immunoreactivity than IDE. Both IDL and IDEAL demonstrated weaker expression of MMP-3 in comparison to I, while IDL presented no expression of MMP-13 when compared to ID. ID, IDL and IDE showed an increased number of fibroblasts in comparison to I, while IDEAL decreased the number of these cells in comparison to ID and IDE. IDL and IDEAL groups exhibited decreased angular dispersion among the fibroblasts when compared to I. The gene expression results showed that IDE demonstrated a downregulation in Col1 mRNA expression in comparison to I and ID. IDEAL demonstrated upregulation of Col1 mRNA expression when compared to IDL or IDE alone and increased MMP-2 expression when compared to IDL and IDE. MMP-9 expression was upregulated in IDEAL when compared to I, IDL and IDE. Our results suggest a beneficial interaction of combining both treatment strategies i.e., aerobic exercise and LPBM, on the biomechanical properties, tissue morphology and the expression of matrix molecules in diabetic tendons. Collagen Type I;Collagen Type III;RNA, Messenger;Streptozocin;Metalloendopeptidases Achilles Tendon;Animals;Collagen Type I;Collagen Type III;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Fibroblasts;Low-Level Light Therapy;Male;Metalloendopeptidases;RNA, Messenger;Rats;Rats, Wistar;Streptozocin;Tendon Injuries;Up-Regulation;Wound Healing

Comparative study on laser and LED influence on tissue repair and improvement of neuropathic symptoms during the treatment of diabetic ulcers. To compare the influence of laser and LED on tissue repair and neuropathic symptoms during treatment of diabetic foot. An intervention survey conducted in a health center located in Brazil, contemplating ten sessions, twice a week, with randomization in two groups. In one group, the wounds were treated with GaAlAs laser, with a wavelength of 830Â nm, 30Â mW, and power density 0.84Â W/cm(2), the other group by LED 850Â nm, 48Â mW, and power density 1.05Â W/cm(2). For the analysis of wound size, photographic records analyzed by the ImageJÂ® software were used, and the neuropathy evaluation card examined. With regard to the laser group, a reduction in wound extension of 79.43% was observed at the end of the 10th session; the patients in the LED group had a 55.84% decrease in the healing process; comparing the two therapies was observed a better healing in the participants of the laser group, with 81.17%, in relation to the LED after the end of the sessions; regarding the evaluation of the neuropathic condition, there was a significant improvement in both therapies. There was improvement of the neuropathic signs and symptoms, also improvement of the tissue repair in the two therapeutic modalities; however, the laser presented a higher rate of speed in relation to the LED. Diabetic Foot;Diabetic Neuropathies;Female;Humans;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Wound Healing

In vitro effect of low-level laser therapy on the proliferative, apoptosis modulation, and oxi-inflammatory markers of premature-senescent hydrogen peroxide-induced dermal fibroblasts. Skin aging is a complex biological process induced by intrinsic and extrinsic factors which is

characterized by clinical and cellular changes, especially dermal fibroblasts. It is possible that, some procedures, such as low-level laser therapy (LLLT), could decelerate this process. To test this hypothesis, this study evaluated the in vitro LLLT on dermal fibroblast cell line (HFF-1) with premature senescence H(2)O(2)-induced. HFF-1 cells were cultured in standardized conditions, and initially H(2)O(2) exposed at different concentrations. Fibroblasts were also just exposed at different LLLT (660Â nm) doses. From these curves, the lowest H(2)O(2) concentration that induced indicators of premature senescence and the lowest LLLT doses that triggered fibroblast proliferation were used in all assays. Cellular mortality, proliferation, and the levels of oxidative, inflammatory cytokines, apoptotic markers, and of two growth signaling molecules (FGF-1 and KGF) were compared among treatments. The H(2)O(2) at 50Â Î¼M concentration induced some fibroblast senescence markers and for LLLT, the best dose for treatment was 4Â J (pÂ <â€‰0.001). The interaction between H(2)O(2) at 50Â Î¼M and LLLT at 4Â J showed partially reversion of the higher levels of DNA oxidation, CASP 3, CASP 8, IL-1B, IL-6, and INFy induced by H(2)O(2) exposure. LLLT also trigger increase of IL-10 anti-inflammatory cytokine, FGF-1 and KGF levels. Cellular proliferation was also improved when fibroblasts treated with H(2)O(2) were exposed to LLLT (pÂ <â€‰0.001). These results suggest that in fibroblast with some senescence characteristics H(2)O(2)-induced, the LLLT presented an important protective and proliferative action, reverting partially or totally negative effects triggering by H(2)O(2). Antioxidants;Biomarkers;Cytokines;DNA;Hydrogen Peroxide;Caspase 3;Caspase 8 Antioxidants;Apoptosis;Biomarkers;Caspase 3;Caspase 8;Cell Cycle;Cell Proliferation;Cells, Cultured;Cellular Senescence;Cytokines;DNA;Dermis;Fibroblasts;Humans;Hydrogen Peroxide;Low-Level Light Therapy

Randomized controlled clinical effectiveness of adjunct 660-nm light-emitting diode irradiation during non-surgical periodontal therapy. BACKGROUND/PURPOSE: The irradiation of 660-nm light-emitting diodes (LEDs) has exhibited potential to accelerate oral wound healing and prevent periodontal breakdown in rodents. This study was to evaluate the clinical effectiveness of 660-nm LEDs during non-surgical periodontal therapy (NSPT). METHODS: Nineteen patients with at least one periodontitis-involved tooth in three quadrants received NSPT, and three protocols of LED light irradiation, including LED light irradiation from initial clinical assessment (T0) until the completion of scaling and root planning (T1) (LED01), LED light irradiation from T1 until re-evaluation (T2) (LED02), and no LED light irradiation (control treatment), were randomly assigned to respective quadrant. Clinical parameters were assessed at T0 and T2, and such biomarkers as IL-1Î² and MMP-8 from gingival crevicular fluid were assessed at T0, T1, and T2. RESULTS: At T2, all examined sites exhibited significantly reduced probing pocket depth (PD), clinical attachment level (CAL), gingival bleeding index, plaque score, and visual analog scale. In the sites with greatest initial PD and CAL, LED01 and LED02 significantly reduced PD and CAL compared with the control treatment. IL-1Î² and MMP-8 were reduced in all groups at T1 and T2, and the reduction of MMP-8 was the most notable in LED01. CONCLUSION: LED light irradiation during or after scaling and root planing assisted in the recovery of periodontium and can be used as an adjunct treatment during NSPT, specifically for sites with severe periodontal breakdown. Biomarkers;IL1B protein, human;Interleukin-1beta;MMP8 protein, human;Matrix Metalloproteinase 8 Adult;Aged;Biomarkers;Chronic Periodontitis;Combined Modality Therapy;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Periodontal Index;Root Planing;Treatment Outcome;Visual Analog Scale;Young Adult

Effect of photobiomodulation on the severity of oral mucositis and molecular changes in head and neck cancer patients undergoing radiotherapy: a study protocol for a cost-effectiveness randomized clinical trial. BACKGROUND: Oral mucositis (OM) is the most frequent and debilitating acute side effect associated with head and neck cancer (HNC) treatment. When present, severe OM negatively

impacts the quality of life of patients undergoing HNC treatment. Photobiomodulation is a well-consolidated and effective therapy for the treatment and prevention of severe OM, and is associated with a cost reduction of the cancer treatment. Although an increase in the quality of life and a reduction in the severity of OM are well described, there is no study on cost-effectiveness for this approach considering the quality of life as a primary outcome. In addition, little is known about the photobiomodulation effects on salivary inflammatory mediators. Thus, this study aimed to assess the cost-effectiveness of the photobiomodulation therapy for the prevention and control of severe OM and its influence on the salivary inflammatory mediators. METHODS/DESIGN: This randomized, double-blind clinical trial will include 50 HNC patients undergoing radiotherapy or chemoradiotherapy. The participants will be randomized into two groups: intervention group (photobiomodulation) and control group (preventive oral care protocol). OM (clinical assessment), saliva (assessment of collected samples) and quality of life (Oral Health Impact Profile-14 and Patient-Reported Oral Mucositis Symptoms questionnaires) will be assessed at the 1st, 7th, 14th, 21st and 30th radiotherapy sessions. Oxidative stress and inflammatory cytokine levels will be measured in the saliva samples of all participants. The costs are identified, measured and evaluated considering the radiotherapy time interval. The incremental cost-effectiveness ratio will be estimated. The study will be conducted according to the Brazilian public health system perspective. DISCUSSION: Photobiomodulation is an effective therapy that reduces the cost associated with OM treatment. However, little is known about its cost-effectiveness, mainly when quality of life is the effectiveness measure. Additionally, this therapy is not supported by the Brazilian public health system. Therefore, this study widens the knowledge about the safety of and strengthens evidence for the use of photobiomodulation therapy, providing information for public policy-makers and also for dental care professionals. This study is strongly encouraged due to its clinical relevance and the possibility of incorporating new technology into public health systems. TRIAL REGISTRATION: Brazilian Registry of Clinical Trials-ReBEC, RBR-5h4y4n . Registered on 13 June 2017.
Biomarkers;Cytokines;Inflammation Mediators Biomarkers;Brazil;Chemoradiotherapy;Cost-Benefit Analysis;Cranial Irradiation;Cytokines;Double-Blind Method;Head and Neck Neoplasms;Health Care Costs;Humans;Inflammation Mediators;Low-Level Light Therapy;Oxidative Stress;Radiation Injuries;Randomized Controlled Trials as Topic;Risk Factors;Saliva;Salivary Glands;Severity of Illness Index;Stomatitis;Time Factors;Treatment Outcome

Photobiomodulation with polychromatic light increases zone 4 survival of transverse rectus abdominis musculocutaneous flap. OBJECTIVE: The aim of this study was to evaluate the effect of relatively novel approach of application of polychromatic light waves on flap survival of experimental musculocutaneous flap model and to investigate efficacy of this modality as a delay procedure to increase vascularization of zone 4 of transverse rectus abdominis musculocutaneous (TRAM) flap. METHODS: Twenty-one Wistar rats were randomized and divided into 3 experimental groups (nâ€‰=â€‰7 each). In group 1 (control group), after being raised, the TRAM flap was sutured back to its bed without any further intervention. In group 2 (delay group), photobiomodulation (PBM) was applied for 7 days as a delay procedure, before elevation of the flap. In group 3 (PBM group), the TRAM flap was elevated, and PBM was administered immediately after the flap was sutured back to its bed for therapeutic purpose. PBM was applied in 48 hours interval from 10â€‰cm. distance to the whole abdominal wall both in groups 2 and 3 for one week. After 7 days of postoperative follow-up, as the demarcation of necrosis of the skin paddle was obvious, skin flap survival was further evaluated by macroscopic, histological and microangiographic analysis. RESULTS: The mean percentage of skin flap necrosis was 56.17â€‰Â±â€‰23.68 for group 1, 30.92â€‰Â±â€‰17.46 for group 2 and 22.73â€‰Â±â€‰12.98 for group 3 PBM receiving groups 2 and 3 revealed less necrosis when compared to control group and this difference was statistically significant. Vascularization in

zone 4 of PBM applied groups 2 and 3 was higher compared to group 1 (Pâ€‰=â€‰0.001). Acute inflammation in zone 4 of group 1 was significantly higher compared to groups 2 and 3 (Pâ€‰=â€‰0.025). Similarly, evaluation of zone 1 of the flaps reveled more inflammation and less vascularization among the samples of the control group (Pâ€‰=â€‰0.006 and Pâ€‰=â€‰0.007, respectively). Comparison of PBM receiving two groups did not demonstrate further difference in means of vascularization and inflammation density (Pâ€‰=â€‰0.259). CONCLUSION: Application of PBM in polychromatic fashion enhances skin flap survival in experimental TRAM flap model both on preoperative basis as a delay procedure or as a therapeutic approach. Lasers Surg. 51:538-549, 2019. Â© 2019 Wiley Periodicals, Inc. Animals;Graft Survival;Male;Models, Animal;Myocutaneous Flap;Necrosis;Phototherapy;Rats;Rats, Wistar;Rectus Abdominis;Skin Transplantation;Wound Healing

Comparative effectiveness of low-level laser therapy for adult androgenic alopecia: a system review and meta-analysis of randomized controlled trials. The purpose of this review is to explore the effectiveness of low-level laser therapy (LLLT) in the treatment of adult androgenic alopecia (AGA). A systematic search of studies on LLLT for AGA was conducted mainly in Pubmed, Embase, and Cochrane Systematic Reviews. The standardized mean difference (SMD) in the changes of hair density treated by LLLT versus sham devices was analyzed. The meta-analysis included 8 studies comprising a total of 11 double-blinded randomized controlled trials. The quantitative analysis showed a significant increase in hair density for those treated by LLLT versus sham group (SMD 1.316, 95% confidence interval, CI 0.993 to 1.639). The subgroup analysis demonstrated that LLLT increases hair growth in both genders, in both comb- and helmet-type devices, and in short- and long-term treatment course. The subgroup analysis also showed a more significant increase of hair growth for the LLLT versus sham in the low-frequency treatment group (SMD 1.555, 95% CI 1.132 to 1.978) than in the high-frequency group (SMD 0.949, 95% CI 0.644 to 1.253). The review was limited by the heterogeneity of included trials. LLLT significantly increased hair density in AGA. The meta-analysis suggests that low treatment frequency by LLLT have a better hair growth effect than high treatment frequency. LLLT represents a potentially effective treatment for AGA in both male and female. The types of LLLT devices and LLLT treatment course duration did not affect the effectiveness in hair growth. Adult;Alopecia;Female;Hair;Humans;Low-Level Light Therapy;Male;Publication Bias;Randomized Controlled Trials as Topic;Treatment Outcome

Laser and laser compound therapy for melasma: a meta-analysis. Background: Treatment of melasma is challenging because its pathogenesis is unclear and it is prone to recurrence. We performed a meta-analysis to evaluate the efficacy and safety of laser and laser compound therapy for melasma.Methods: We searched the Cochrane, Embase, and Medline databases for all relevant studies published from inception to July 2018. All randomized controlled trials of melasma describing treatment with lasers or laser compound therapy were included.Results: A total of 346 patients were enrolled in nine RCT studies. Laser therapy and laser compound therapy had better PGA (MD: 1.96 (95% CI: 0.17, 3.75); I(2) = 0%) and mMASI scores (MD: -1.57 (95% CI: -3.08, -0.05); I(2) = 19%) than drug and laser therapy, respectively. Four studies were assessed to be of low risk of bias. Subgroup analysis was consistent with the results of the meta-analysis, reflecting the reliability of our results.Linking evidence to action: The results of this meta-analysis provide evidence that laser and laser compound therapy can improve the area and severity of melasma. Further high-quality clinical studies should be carried out in the future to confirm this conclusion. Abbreviations: MASI: Melasma Area and Severity Index; mMASI: modified Melasma Area and Severity Index; PGA: patient global assessment; MI: melasma index. Databases, Factual;Humans;Laser Therapy;Low-Level Light Therapy;Melanosis;Recurrence;Severity of Illness Index

Differential responses of myoblasts and myotubes to photobiomodulation are associated with mitochondrial number. OBJECTIVE: Photobiomodulation (PBM) is the application of light to promote tissue healing. Current indications suggest PBM induces its beneficial effects in vivo through upregulation of mitochondrial activity. However, how mitochondrial content influences such PBM responses have yet to be evaluated. Hence, the current study assessed the biological response of cells to PBM with varying mitochondrial contents. METHODS: DNA was isolated from myoblasts and myotubes (differentiated myoblasts), and mitochondrial DNA (mtDNA) was amplified and quantified using a microplate assay. Cells were seeded in 96-wellplates, incubated overnight and subsequently irradiated using a light-emitting diode array (400, 450, 525, 660, 740, 810, 830 and white light, 24â€‰mW/cm(2) , 30-240â€‰seconds, 0.72-5.76J/cm(2)). The effects of PBM on markers of mitochondrial activity including reactive-oxygen-species and real-time mitochondrial respiration (Seahorse XFe96) assays were assessed 8 hours post-irradiation. Datasets were analysed using general linear model followed by one-way analysis of variance (and post hoc-Tukey tests); Pâ€‰=â€‰0.05). RESULTS: Myotubes exhibited mtDNA levels 86% greater than myoblasts (Pâ€‰<â€‰0.001). Irradiation of myotubes at 400, 450 or 810â€‰nm induced 53%, 29% and 47% increases (relative to non-irradiated control) in maximal respiratory rates, respectively (Pâ€‰<â€‰0.001). Conversely, irradiation of myoblasts at 400 or 450â€‰nm had no significant effect on maximal respiratory rates. CONCLUSION: This study suggests that mitochondrial content may influence cellular responses to PBM and as such explain the variability of PBM responses seen in the literature. Animals;Cell Line;Low-Level Light Therapy;Mice;Mitochondria;Mitochondrial Size;Muscle Fibers, Skeletal;Myoblasts

Mechanisms of repigmentation induced by photobiomodulation therapy in vitiligo. Photobiomodulation (PBM) therapy is based on the exposure of biological tissues to low-level laser light (coherent light) or light-emitting diodes (LEDs; noncoherent light), leading to the modulation of cellular functions, such as proliferation and migration, which result in tissue regeneration. PBM therapy has important clinical applications in regenerative medicine. Vitiligo is an acquired depigmentary disorder resulting from disappearance of functional melanocytes in the involved skin. Vitiligo repigmentation depends on available melanocytes derived from (a) melanocyte stem cells located in the bulge area of hair follicles and (b) the epidermis at the lesional borders, which contains a pool of functional melanocytes. Since follicular melanoblasts (MBs) are derived from the melanocyte stem cells residing at the bulge area of hair follicle, the process of vitiligo repigmentation presents a research model for studying the regenerative effect of PBM therapy. Previous reports have shown favourable response for treatment of vitiligo with a low-energy helium-neon (He-Ne) laser. This review focuses on the molecular events that took place during the repigmentation process of vitiligo triggered by He-Ne laser (632.8Â nm, red light). Monochromatic radiation in the visible and infrared A (IRA) range sustains matrix metalloproteinase (MMP), improves mitochondrial function, and increases adenosine triphosphate (ATP) synthesis and O(2) consumption, which lead to cellular regenerative pathways. Cytochrome c oxidase in the mitochondria was reported to be the photoacceptor upon which He-Ne laser exerts its effects. Mitochondrial retrograde signalling is responsible for the cellular events by red light. This review shows that He-Ne laser initiated mitochondrial retrograde signalling via a Ca(2+) -dependent cascade. The impact on cytochrome c oxidase within the mitochondria, an event that results in activation of CREB (cyclic-AMP response element binding protein)-related cascade, is responsible for the He-Ne laser promoting functional development at different stages of MBs and boosting functional melanocytes. He-Ne laser irradiation induced (a) melanocyte stem cell differentiation; (b) immature outer root sheath MB migration; (c) differentiated outer root sheath MB melanogenesis and migration; and (d) perilesional melanocyte migration and proliferation. These photobiomodulation effects result in perifollocular and marginal

repigmentation in vitiligo. Adenosine Triphosphate;Electron Transport Complex IV;Matrix Metalloproteinases Adenosine Triphosphate;Cell Movement;Electron Transport Complex IV;Epidermal Cells;Hair Follicle;Humans;Hypopigmentation;Infrared Rays;Lasers;Lasers, Gas;Light;Low-Level Light Therapy;Matrix Metalloproteinases;Melanocytes;Oxygen Consumption;Regenerative Medicine;Signal Transduction;Skin Pigmentation;Stem Cells;Vitiligo

Advanced care planning 5Â years on: An observational study of multi-centred service development for children with life-limiting conditions. AIM: The purpose of this study was to compare how planning has developed over the 5Â years across a range of children's health care services in a single U.K. city. BACKGROUND: Advanced planning for end of life care (EOLC) is an essential component of care for children with life-limiting and life-threatening (LLLT) conditions. We report the findings of a follow-up study (R2) completed 5Â years after the initial review (R1). Documented advanced care planning (ACP) was measured against published children's palliative care standards. METHOD: We used a manual retrospective review of health care records, using focused data collection. Inclusion criteria were children who died before the age of 18Â years, as a consequence of an LLLT condition, over an 18-month period and had lived locally to a regional children's hospital. RESULTS: The first review (R1) included 48 patients with 114 health care records: median age at death 0Â years (range 0 to 18Â years). The follow-up review (R2) included 47 patients, with 80 health care records: median age at death 2Â years (range 0 to 17Â years). The proportion of records containing evidence of a prognostic discussion had risen from 73% (R1) to 91% (R2), pÂ <Â 0.005. The proportion of health care records with ACP was consistent between R1 and R2 (75% and 72%, respectively). An ACP tool was found to be in regular use in R2 compared with no examples in R1. The acute hospital trust plans were more detailed in R2 than R1. The proportion of cases where preferred location of death matched actual location was stable, around half. CONCLUSIONS: EOLC conversations increased over the 5Â years studied. In the acute hospital trust, there is evidence of a better quality ACP although quantity is stable: enabled by the implementation of an ACP tool and education programme. Challenges remain in engaging children and young people in advanced planning. Adolescent;Advance Directives;Child;Child Health Services;Child, Preschool;Critical Illness;Female;Follow-Up Studies;Health Services Research;Humans;Infant;Infant, Newborn;Male;Outcome and Process Assessment, Health Care;Professional-Family Relations;Retrospective Studies;Terminal Care;Total Quality Management

Photobiomodulation by Led Does Not Alter Muscle Recovery Indicators and Presents Similar Outcomes to Cold-Water Immersion and Active Recovery. Purpose: The aim of the present study was to investigate the effectiveness of photobiomodulation therapy (PBMT) on muscle recovery based on inflammation (interleukin-10 [IL-10]; tumor necrosis factor-Î± [TNFÎ±]), muscle damage markers (creatine kinase [CK]; lactate dehydrogenase [LDH]), delay onset muscle soreness (DOMS), and countermovement jump performance (CMJ) after two sprint interval training (SIT) sessions compared with a placebo condition (part-I), as well as to compare the effectiveness of PBMT with active recovery (AR) and cold-water immersion (CWI) (part-II). Methods: Part-I was conducted as a double-blind, randomized and placebo-controlled study and part-II as a parallel-group study. Thirty-six men participated in the studies (12 participants in part-I and 36 participants in part-II). Volunteers performed two SITs interspaced by 24-h (SIT(1) and SIT(2)) to mimic the effect of accumulating 2 consecutive days of SIT. In part-I, only after SIT(2), PBMT [Total energy: 600J (300J per leg in 5 spots); wavelength: 660-850 nm] or placebo interventions were performed, while in part-II PBMT (part-I data), AR (15-min; 50% of the maximal aerobic power), or CWI (10-min; 10Â°C) were carried out, also after SIT(2). Blood samples were collected before (i.e., baseline), and 0.5, 1, 24, 48, and 72-h after SIT(2), while CMJ and DOMS were measured before, 24, 48, and 72-h after SIT(2). Results: In part-I, there were no interactions between PBMT and placebo conditions for any blood markers (P â‰¥

0.313), DOMS (P = 0.052), and CMJ (P = 0.295). However, an effect of time was found with increases in LDH, CK, and IL-10 (P â‰¤ 0.043) as well as a decrease in DOMS at 72-h compared with 24-h (P = 0.012). In part-II, there were no interactions between the PBMT, AR, and CWI groups for any markers at the same moments (P â‰¥ 0.189) and for the peak and integral values (P â‰¥ 0.193), for DOMS (P = 0.314) and CMJ (P = 0.264). However, an effect of time was found with an increase in CK and IL-10 (P = 0.003), while DOMS decreased at 48 and 72-h compared with 24-h (P = 0.001). Conclusion: In summary, PBMT had no effect on inflammation, muscle damage, CMJ performance, or DOMS after two consecutive sprint interval training sessions compared to placebo, CWI, and AR strategies.

Assessment of healing following low-level laser irradiation after gingivectomy operations using a novel soft tissue healing index: A randomized, double-blind, split-mouth clinical pilot study. BACKGROUND: Lasers have become a part of modern dentistry since the past three decades. A wide-ranging assortment of lasers is being used in periodontology for both soft and hard tissue surgical procedures. Regardless of the frequent practice of using these well-known surgical lasers, there is another lesser familiar class of lasers called the low-level lasers. The main doctrine behind using low-level laser therapy (LLLT) is centered on the biostimulation, or the biomodulation effect, which relies on the dexterity of low-intensity laser energy when irradiated at a specific wavelength, is able to modify cellular activities (increase in cell metabolism and fibroblast and keratinocyte proliferation). AIM: The aim of the present study was to investigate the adjunctive use of LLLT on gingival healing after gingivectomy procedures. MATERIALS AND METHODS: Ten systemically healthy patients requiring gingivectomy or gingivoplasty procedures bilaterally in either the maxillary or mandibular teeth were included in the study. After surgical intervention, a diode laser (810 nm) was randomly activated to one side of the operated area while other side did not receive any treatment and served as the control. The healing index given by Landry et al. was used to evaluate the soft tissue healing immediately postsurgery and at the 3(rd) day, 1 week, and 2 weeks postoperatively. After the follow-up period, results were analyzed using appropriate statistical tests. RESULTS: There was no statistically significant difference observed in the surface epithelialization between both groups on the 3(rd) and 7(th)-postoperative days, but highly significant differences were observed on the 14(th) day. CONCLUSION: Within the confines of this pilot study, the outcomes have indicated that gingival wound healing may be improved using LLLT after gingivectomy and gingivoplasty operations.

Effects of Light-Emitting Diode Therapy on the Performance of Biceps Brachii Muscle of Young Healthy Males After 8 Weeks of Strength Training: A Randomized Controlled Clinical Trial. Vieira, KVSG, Ciol, MA, Azevedo, PH, Pinfildi, CE, Renno, ACM, Colantonio, E, and Tucci, HT. Effects of light-emitting diode therapy on the performance of biceps brachii muscle of young healthy males after 8 weeks of strength training: a randomized controlled clinical trial. J Strength Cond Res 33(2): 433-442, 2019-We assessed the effect of adding light-emitting diode therapy (LEDT) to an 8-week strength training of biceps brachii in healthy young males. Forty-five participants were randomized into training plus LEDT, training plus sham LEDT, and control groups (n = 15 each). Individuals in the LEDT groups participated in strength training performed in a Scott machine at their maximum number of elbow flexion-extension repetitions. The LEDT was applied to biceps brachii of dominant limb at the end of training sessions (device "on" for LEDT and "off" for sham LEDT). Training loads were re-evaluated every 2 weeks. Controls did not receive training during 8 weeks. All groups were evaluated for 1 repetition maximum (1RM) and fatigue at baseline and 8 weeks. Additionally, the 2 LEDT groups were evaluated every 2 weeks for 1-RM and number of elbow flexion-extension repetitions. The groups were statistically different in mean difference and mean percent change of 1-RM from baseline to week 8 ($p < 0.001$). Analyzing the 2 LEDT groups, we found an interaction between group and time ($p = 0.02$), with a slightly faster increase in 1-RM for the LEDT than the sham LEDT. Over time, both groups decreased the number of repetitions of elbow flexion-extension (differences not

statistically significant), possibly because of the increase of load over time. We found no difference in change of fatigue index among the 3 groups. Our study showed potential benefits to 1RM when LEDT is applied after a strength training session. Future studies might assess whether different doses of LEDT can reduce fatigue in strength training. Adolescent;Adult;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle Strength;Muscle, Skeletal;Resistance Training;Young Adult

Comparison of 311-nm Titanium:Sapphire laser and 308-nm excimer laser treatment for vitiligo: A randomized controlled non-inferiority trial. OBJECTIVES: The 308-nm excimer laser (EL) has been widely used for localized vitiligo. The recently developed Titanium:Sapphire laser, emits a wavelength of 311â€‰nm, would be expected to be as effective as excimer laser in treatment of vitiligo but few controlled trials have been reported. We sought to compare the efficacy and safety of the TSL and EL as vitiligo treatments. METHODS: A randomized controlled non-inferiority trial based on split-body was conducted. Patients with stable vitiligo between June 2016 and May 2017 were enrolled. Paired symmetrical vitiligo lesions were randomized to either the EL or TSL treatment group, and treated with a 308-nm EL or a 311-nm TSL twice weekly for 12 weeks. The extent of repigmentation was assessed every 4 weeks, and the non-inferiority margin was set to 10%. We also recorded any adverse events. RESULTS: Seventy-four paired lesions in 21 patients were assigned to both the EL group or TSL group. The mean difference between two groups (EL minus TSL) was -2.862%, and the 95% confidence interval (-6.531% to 0.807%) was lower than the non-inferiority margin. No serious adverse events were noted in either group. CONCLUSIONS: The Titanium:Sapphire laser showed similar therapeutic effect to excimer laser in localized vitiligo with good safety profiles in this non-inferiority randomized controlled trial. The Titanium: Sapphire laser can serve as an alternative treatment option for localized vitiligo. Lasers Surg. Med. 51:239-244, 2019. Â© 2019 Wiley Periodicals, Inc. Titanium;Aluminum Oxide Adult;Aged;Aluminum Oxide;Female;Humans;Lasers, Excimer;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Titanium;Treatment Outcome;Vitiligo;Young Adult

Use of low-power He-Ne laser therapy to accelerate regeneration processes of injured sciatic nerve in rabbit. BACKGROUND: Photostimulation using low-power laser had been used for nervous repair with interesting results. This study aimed to evaluate the influence of 20â€‰mW low-power He-Ne laser on the regeneration of a peripheral sciatic nerve after trauma using the Albino rabbit as an animal model for experimental treatment. METHODS: Six adult male rabbits were randomly assigned into two equal groups (control- and laser-treated). General anesthesia was administered intramuscularly, and exploration of the sciatic nerve was done in the lateral aspect of the legs. Complete longitudinal and reverse sections of the nerve were performed, which was followed by crushing of the neural sheath. Treatment was carried out directly after the trauma. Irradiation doses of low-level laser therapy (LLLT-31.5â€‰J/cm(2)) with once a day application for 10 consecutive days and observed for 30â€‰days. The animals were followed up for an extra 2Â weeks. Two important factors were examined histopathology and functionality of the nerve. RESULTS: Compared to the control group, significant variations in regeneration were observed, including thicker nerve fibers, and more regular myelin layers in the treated group. CONCLUSIONS: The results of the present study suggest that laser therapy may be a viable approach for nerve regeneration and repair.

Publisher Correction: Low-level light therapy reduces platelet destruction during extracorporeal circulation. A correction to this article has been published and is linked from the HTML and PDF versions of this paper. The error has been fixed in the paper.

A Novel Blue-Red Photobiomodulation Therapy Patch Effects on a Repetitive Elbow-Flexion Fatigue Task. BACKGROUND: Photobiomodulation (laser/light) therapy has reduced skeletal muscle fatigue and improved performance in previous research. OBJECTIVE: To determine if the application of a novel blue (450Â nm) and red (645Â nm) light-emitting diode photobiomodulation therapy patch

improves muscle function and decreases perceived exertion after an elbow-flexion fatigue protocol. PARTICIPANTS: Thirty-four strength-trained individuals (male = 32 and female = 2, age = 22.5 [2.7]Â y). METHODS: Participants were randomly assigned to an active or placebo treatment. OnÂ visit 1, participants' 1-repetition maximal biceps curl was determined, and an orientation session of the fatigue task occurred to ensure no learning effects. Fifty percent of the participants' 1-repetition maximum was used during the fatigue protocol. On visit 2, participants performed biceps curl repetitions at a speed of 25 repetitions per minute until they could not physically move the weight past 90Â° of elbow flexion or stay with the set pace. After the fatigue protocol, a 30-minute blue/red light (wavelength = 450 and 645Â nm, peak irradiance = 9Â mW/cm2, duty cycle = pulsed 33%, and fluence = 5.4Â J/cm2) or sham treatment was administered based on the randomized group assignment. Immediately following, the participants repeated the fatigue protocol. The number of complete repetitions was counted, and the participants rated their perceived level of exertion on the Borg scale immediately after each fatigue bout. RESULTS: Overall, fatigue occurred between the 2 exercise bouts (pretreatment = 44.1 [12.3] and posttreatment = 37.4 [9.6] repetitions, P = .02). However, less fatigue was noted in the number of participants of the active treatment group than the sham treatment group. During the posttreatment fatigue task, 29.4% of participants in the active treatment group improved compared to 0% in the sham treatment (P = .045). CONCLUSION: Nearly 30% of participants had an increase benefit during a repeated-bout fatigue task due to the blue/red light-emitting diode photobiomodulation light patch. Adolescent;Adult;Elbow Joint;Female;Healthy Volunteers;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fatigue;Young Adult

Low level laser therapy: a promising adjunct therapeutic modality for pain control after coronary artery bypass graft surgery.

Laserpuncture Increases Serum Concentration of Insulin-Like Growth Factor-1 in Adolescent Rats. Objective: Previous studies have demonstrated that laserpuncture has a positive effect on longitudinal bone growth within varying parameters. The current authors hypothesized that laserpuncture affects serum concentration of insulinlike growth factor 1 (IGF-1), a growth factor that influences growth plates, and ghrelin, a growth hormone (GH) secretagogue. The goal of this research was to investigate if laserpuncture could increase serum concentrations of IGF-1 and ghrelin in adolescent rats. Materials and Methods: This was an experimental study with a post-test only and a controlled group design. The study was performed in a laboratory on 40 male Wistar rats, age Â±3 weeks and weighing >40â€‰g. The rats were divided randomly into 2 groups, A and B, each receiving laserpuncture for 10 days and 15 days, respectively. There were 4 subgroups in each group: control (C); GV 20; ST 36; and GV 20 + ST 36. The rats were stimulated by laserpuncture with a KX Laser GX-2000B (Kangxing), a semiconductor-based low-level laser therapy (LLLT) device emitting a cold red laser (635-680â€‰nm/5â€‰mW) for 60 seconds (0.3â€‰J/cm(2)) The length of each rat's lower limb was measured using a caliper; IGF-1 and ghrelin concentrations were assessed using enzyme-linked immunosorbent assays. Results: A marked increase in IGF-1 concentration was observed in the ST 36 and GV 20 + ST 36 subgroups after 15 days, compared to the C subgroup (Pâ€‰=â€‰0.001 and Pâ€‰=â€‰0.002, respectively). The GV 20 subgroup had a lower IGF-1 concentration than the C subgroup (Pâ€‰=â€‰0.06) at both 10 and 15 days. Laserpuncture did not influence ghrelin concentrations significantly, compared to the C subgroups. Conclusions: Laserpuncture administered to both the ST 36 and GV 20 + ST 36 subgroups with a power density of 0.3â€‰J/cm(2) increased serum concentrations of IGF-1 in adolescent rats.

Effects of low-power laser auriculotherapy on the physical and emotional aspects in patients with temporomandibular disorders: A blind, randomized, controlled clinical trial. OBJECTIVES: This study evaluated the effects of low-power laser auriculotherapy (LA) on the physical and emotional

symptoms of patients with temporomandibular disorders (TMDs), in comparison with occlusal splints (OS). DESIGN: Randomized, blinded, prospective, non-inferiority clinical trial. INTERVENTIONS: The patients received OS (control group) or LA (experimental group). MAIN OUTCOME MEASURES: Following the Consolidated Standards of Reporting Trials (CONSORT) guidelines, patients with TMD were evaluated by using axes I and II of the Research Diagnostic Criteria for RDC-TMD. Both intra- and intergroup quantitative variables were analyzed with ANOVA (pâ€‰<â€‰0.05), while qualitative variables were analyzed with the Kruskal-Wallis (intergroup evaluations; pâ€‰<â€‰0.05) or Mann-Whitney tests (intragroup analyses; pâ€‰<â€‰0.05). RESULTS: OS improved five physical symptoms of TMD (pain in the right temporal muscle, right and left masseter muscles, left joint, and left intraoral region), while LA improved six (jaw functioning; pain in left masseter muscle, right and left joints, and right and left intraoral regions). Similarly, OS improved seven emotional symptoms (degree of depression, degree of non-specific physical symptoms, excluding pain, degree of non-specific physical symptoms including pain, average pain value in the past 6 months, presence of depression, intensity and characteristics of pain, non-specific physical symptoms including pain), while LA improved five (degree of non-specific physical symptoms including pain, presence of depression, intensity and characteristics of pain, non-specific physical symptoms including pain, non-specific physical symptoms excluding pain). CONCLUSION: LA improved the physical and emotional symptoms of TMD, with results similar to OS. CLINICAL RELEVANCE: For the physical and emotional symptoms associated with TMD, LA showed similar outcomes as OS.
Adult;Auriculotherapy;Depression;Emotions;Female;Humans;Jaw;Low-Level Light Therapy;Middle Aged;Muscle, Skeletal;Occlusal Splints;Pain;Pain Management;Pain Measurement;Single-Blind Method;Temporomandibular Joint Disorders;Treatment Outcome

Effects of light-emitting diode therapy (LEDT) on cardiopulmonary and hemodynamic adjustments during aerobic exercise and glucose levels in patients with diabetes mellitus: A randomized, crossover, double-blind and placebo-controlled clinical trial. The aim of this study was to evaluate the acute effects of light-emitting diode therapy (LEDT) on cardiopulmonary adjustments and muscle oxygenation dynamics during transition to moderate exercise, as well as in glucose and lactate levels in patients with type 2 diabetes mellitus (T2DM). Sixteen individuals with T2DM (age 55.1Â±5.4 years) performed four separate tests receiving LEDT or placebo in random order, at intervals of at least 14 days. A light-emitting diode array (50GaAlAs LEDs, 850nm, 75mW per diode) was used to perform LEDT bilaterally on the quadriceps femoris and triceps surae muscles for 40s at each site. After, a moderate cycling exercise was performed and oxygen uptake, muscular deoxyhemoglobin, heart rate and cardiac output were measured. Lactate and glucose levels were measured before LEDT/placebo and after the exercise. The LEDT decreased the glucose levels after the exercise compared with values before LEDT (173.7Â±61.0 to 143.5Â±53.5 mg/dl, P=0.02) and it did not affect the cardiopulmonary and hemodynamic adjustments in exercise, as well as lactate levels in both groups. In conclusion, the LEDT in combination with moderate exercise acutely decreased the glucose levels in men with T2DM. Lactic Acid;Glucose Cross-Over Studies;Diabetes Mellitus, Type 2;Double-Blind Method;Exercise;Female;Glucose;Heart;Heart Rate;Hemodynamics;Humans;Lactic Acid;Low-Level Light Therapy;Lung;Male;Middle Aged;Oxygen Consumption;Quadriceps Muscle

Use of photobiomodulation induced by polarized polychromatic non-coherent light in the management of adult chronic periodontitis. Adult;Chronic Periodontitis;Humans;Light;Phototherapy

The effect of low-level laser radiation on improving inferior alveolar nerve damage after sagittal split osteotomy: a systematic review. Inferior alveolar nerve (IAN) damage is a common complication occurring after sagittal split osteotomy (SSO) and results in sensory disorders of the jaw region. In

recent years, published experimental and clinical evidence suggests that low-level laser (LLL) radiation is effective in nerve recovery. Therefore, the aim of the present study was to review clinical trial studies investigating the effect of LLL radiation on improving the sensory defects of IAN after SSO. The keywords associated with SSO and LLL were searched in PubMed, Medline (via Ovid), Web of Science (WOS), Scopus, and Cochrane Library databases. Then, controlled clinical trial studies published before November 2017 regarding LLL radiation conducted on patients with IAN neuropathy due to SSO were investigated. The articles fulfilling the study criteria were further scrutinized and the necessary information was extracted from them. A total of seven papers were included in the study. The diode laser used had a wavelength range of 760-930Â nm, radiation power of 20-200Â mw, and radiation energy of 10.2-95Â J (per point of radiation). In the mentioned studies, the patients underwent 3-20 sessions of laser irradiation and were monitored for an additional 0-23Â months after completion of the laser intervention. The tests performed in the mentioned studies dealt with examining the perceptions of superficial touch and pressure, two-point discrimination, stimulus movement on skin, temperature, and pain. Furthermore, the patients' general awareness regarding sensory perception in the mandibular region was gauged. In six studies, laser irradiation caused relative improvement in the IAN sensory disorder for a subjective test as well as for one or more objective tests. In the reviewed clinical trial studies, LLL was generally found to be effective in improving the IAN sensory disturbance resulting from SSO, though there was no placebo effect. Adult;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Mandibular Nerve;Middle Aged;Osteotomy;Publication Bias;Risk Factors;Treatment Outcome

Frontal Fibrosing Alopecia: An Update on Pathogenesis, Diagnosis, and Treatment. Frontal fibrosing alopecia (FFA), first described by Kossard in the early 1990s, is a form of primary lymphocytic cicatricial alopecia characterizedÂ by selective involvement of the frontotemporal hairline and eyebrows. Since the original description, an increasing number of cases have been reported worldwide and the clinical aspects of the disease have been better characterized. However, the pathogenesis is still unknown and several hypotheses have been made about possible triggering factors, including hormones, neurogenic inflammation, smoking, UV filters, and ingredients in leave-on facial products. A genetic basis has also been hypothesized as the disease can occur in siblings and members of the same family. Besides its pathogenesis, research is also focused on treatment; FFA is a chronic condition and at present there is no validated or approved treatment for this disorder. Commonly prescribed topical treatments include corticosteroids, minoxidil, and calcineurin inhibitors. Systemic treatments include 5Î±-reductase inhibitors, hydroxychloroquine, and retinoids. Intralesional triamcinolone acetonide is also utilized, especially for the eyebrows. Other possible treatments include pioglitazone, naltrexone, tofacitinib, and lasers. 5-alpha Reductase Inhibitors;Calcineurin Inhibitors;Dermatologic Agents;Glucocorticoids;Minoxidil;Triamcinolone Acetonide 5-alpha Reductase Inhibitors;Administration, Topical;Alopecia;Calcineurin Inhibitors;Chronic Disease;Cicatrix;Dermatologic Agents;Eyebrows;Fibrosis;Forehead;Glucocorticoids;Humans;Injections, Intralesional;Low-Level Light Therapy;Minoxidil;Skin;Treatment Outcome;Triamcinolone Acetonide

Efficacy of Biophysical Energies on Healing of Diabetic Skin Wounds in Cell Studies and Animal Experimental Models: A Systematic Review. We have systematically assessed published cell studies and animal experimental reports on the efficacy of selected biophysical energies (BPEs) in the treatment of diabetic foot ulcers. These BPEs include electrical stimulation (ES), pulsed electromagnetic field (PEMF), extracorporeal shockwave (ECSW), photo energies and ultrasound (US). Databases searched included CINAHL, MEDLINE and PubMed from 1966 to 2018. Studies reviewed include animal and cell studies on treatment with BPEs compared with sham, control or other BPEs. Information regarding the objective measures of tissue healing and data was extracted. Eighty-two

studies were eventually selected for the critical appraisal: five on PEMF, four each on ES and ECSW, sixty-six for photo energies, and three about US. Based on the percentage of original wound size affected by the BPEs, both PEMF and low-level laser therapy (LLL) demonstrated a significant clinical benefit compared to the control or sham treatment, whereas the effect of US did not reveal a significance. Our results indicate potential benefits of selected BPEs in diabetic wound management. However, due to the heterogeneity of the current clinical trials, comprehensive studies using well-designed trials are warranted to confirm the results. Animals;Biophysical Phenomena;Diabetic Foot;Disease Models, Animal;Electric Stimulation;Humans;Low-Level Light Therapy;Wound Healing

Brain Photobiomodulation-Preliminary Results from Regional Cerebral Oximetry and Thermal Imaging. A new piece of equipment for LED (light emitting diode) brain photobiomodulation is introduced. Preliminary results from regional cerebral oxygen saturation and from thermography are shown before, during and after stimulation. The procedure offers a new way to quantify the biological effects of a possible innovative therapeutic method. However further measurements are absolutely necessary.

Clinical efficacy of low-level laser therapy in plantar fasciitis: A systematic review and meta-analysis. BACKGROUND: Emerging evidence suggests that low-level laser therapy (LLLT) for plantar fasciitis (PF) may be beneficial. However, the convincing study investigating its effectiveness for treatment of PF was scarce. Therefore, a systematic review and meta-analysis was conducted to assess whether LLLT significantly relieve pain of patients with PF. METHODS: PubMed, EMBASE, EBSCO, Web of Science, China Biological Medicine Database, China National Knowledge Infrastructure, Chinese Wan fang, and Cochrane CENTRAL were searched systematically up to March 2018. RESULTS: A total of 6 randomized controlled trials were included. The meta-analysis indicated that compared with control group, visual analogue scale (VAS) score significantly decreased at the end point of the treatment in LLLT group. In addition, this improvement is continued for up to 3 months. However, no significant difference was observed according to the Foot Function Index-pain subscale (FFI-p). CONCLUSION: This meta-analysis indicates that the LLLT in patients with PF significantly relieves the heel pain and the excellent efficacy lasts for 3 months after treatment. Adult;Fasciitis, Plantar;Female;Heel;Humans;Low-Level Light Therapy;Male;Treatment Outcome

Photobiomodulation preconditioning prevents cognitive impairment in a neonatal rat model of hypoxia-ischemia. Neonatal hypoxia-ischemia (HI) injury caused by oxygen deprivation is the most common cause of mortality and severe neurologic deficits in neonates. The present work evaluated the preventative effect of photobiomodulation (PBM) preconditioning, and its underlying mechanism of action on brain damage in an HI model in neonatal rats. According to the optimal time response of ATP levels in brain samples removed from normal rats, a PBM preconditioning (PBM-P) regimen (808â€‰nm CW laser, 1â€‰cm(2) spot, 100â€‰mW/cm(2) , 12â€‰J/cm(2)) was delivered to the scalp 6â€‰hours before HI. PBM-P significantly attenuated cognitive impairment, volume shrinkage in the brain, neuron loss, dendritic and synaptic injury after HI. Further mechanistic investigation found that PBM-P could restore HI-induced mitochondrial dynamics and inhibit mitochondrial fragmentation, followed by a robust suppression of cytochrome c release, and prevention of neuronal apoptosis by inhibition of caspase activation. Our work suggests that PBM-P can attenuate HI-induced brain injury by maintaining mitochondrial dynamics and inhibiting the mitochondrial apoptotic pathway. Cytochromes c Animals;Animals, Newborn;Apoptosis;Behavior, Animal;Cognitive Dysfunction;Cytochromes c;Dendritic Cells;Disease Models, Animal;Female;Hypoxia-Ischemia, Brain;Low-Level Light Therapy;Male;Mitochondrial Dynamics;Neurons;Rats;Rats, Sprague-Dawley;Synapses

Efficacy of phototherapy with different conventional surface treatments on adhesive quality of lithium disilicate ceramics. AIM: The aim of the present study was to evaluate shear bond strength (SBS) of LDC and resin composite in combination with phototherapy and different ceramic surface treatments. MATERIALS AND METHOD: Forty Lithium Disilicate Glass Ceramic (LDC) disks measuring (4â€‰Ã—â€‰4â€‰xâ€‰9â€‰mm) were fabricated. The specimens were randomly divided into four groups (nâ€‰=â€‰10 each) according to the surface treatment. Group 1â€‰Hâ€‰Fâ€‰+â€‰Silane (Control); Group 2 HFâ€‰+â€‰Ultrasonic bathâ€‰+â€‰Silane; Group 3 SECP (Self etch ceramic primer) and Group 4 phototherapy (Er, Cr: YSGG) + Silane. On each ceramic disk a resin build-up was done. For SBS the specimens were subjected to increasing load with a transversal velocity of 1â€‰ml/min on a universal testing machine on a ceramic resin interface. Failure mode was evaluated using digital microscope. The failure modes were divided into adhesive, cohesive and admixed interface. Data through bond strength testing was tabulated using statistical program for social science (SPSS). Means and standard deviations were compared using analysis of variance and Tukey's post hoc test (pâ€‰<â€‰0.05). RESULTS: The maximum and minimum bond strength was observed in group 2 [19.58(1.011)] and group 1 [17.14(1.122)] respectively. The bond strength among experimental group 1 [17.14 (1.122)] and group 4 [17.48(1.145)] were found to be comparable. Specimens in Group 2 displayed significantly higher bond strength among all experimental groups. Commonly adhesive failure mode was observed in the present study, with an incidence of 60%, 100% and 70% in groups 1,2 and 3 correspondingly. CONCLUSION: Phototherapy using laser at frequency 30â€‰Hz and 4.5â€‰W can be used as a surface conditioner for LDC alternate to HF acid. Conditioning of LDC using Self-etch ceramic primer showed better SBS outcomes as compared to phototherapy (Er, Cr: YSGG laser). Adhesives;Resin Cements;lithia disilicate;Dental Porcelain Adhesives;Dental Bonding;Dental Porcelain;Lasers, Solid-State;Low-Level Light Therapy;Resin Cements;Surface Properties

Influence of phototherapy on adhesive strength and microleakage of bleached enamel bonded to orthodontic brackets: An in-vitro study. AIM: The aim of the present in-vitro study was to explore bleached enamel reversal with phototherapy (Er,Cr:YSGG) when using two dissimilar bonding system to bond brackets on microleakage and shear bond strength. MATERIAL AND METHODS: Amongst one twenty samples, ninety samples were bleached using 35% hydrogen peroxide. After the bleaching procedure, the teeth were randomly divided into three groups according to surface conditioning treatment (nâ€‰=â€‰30 each). Group 1: treated with Er,Cr:YSGG (ECL) Group 2: 10% sodium ascorbate (SA) and Group 3: Bleached only (BO). Based on the type of adhesive, specimens were further classified into eight subgroups. In subgroup 1,2,3 and no treatment (NT) (nâ€‰=â€‰15) adhesive Transbond XT was applied on already etched surface and these subgroups were named as NT-TEP, BO-TEP, ECL-TEP and SA-TEP. Similarly, in subgroup 5,6,7 and NT specimens (nâ€‰=â€‰15) were conditioned with Transbond Plus self-etching primer and these subgroups were named as NT-SEP, BO-SEP, ECL-SEP and SA-SEP. Samples from each subgroup were exposed to increasing load for evaluation of shear bond strength. Microleakage among subgroups were tested by immersing samples in Methylene blue prior one day. Analysis of variance and Tukey multiple comparisons test was used to assess data. RESULTS: The maximum and minimum bond strength was observed in group NT-TEP [17.14(2.54)] and BO-SEP [6.14(0.215)] respectively. Samples conditioned with phototherapy ECL-TEP [16.14(1.231)] exhibited comparable bond strength to specimens conditioned with sodium ascorbate (SA-TEP) [16.72(1.298)]. Similarly, bond strength values of ECL-SEP [13.43(0.921)] and SA-SEP were comparable. The highest microleakage score was demonstrated in BO-SEP [83.21(38.21)] whereas, the lowest microleakage scores were displayed in NT-TEP [23.73(13.45)]. CONCLUSION: Er,Cr:YSGG phototherapy reversal on bleached enamel with etch and rinse adhesives has a potential to be used in clinical settings alternate to conventional sodium

ascorbate when bonding orthodontic brackets. Adhesives;Hydrogen Peroxide;Ascorbic Acid Adhesives;Ascorbic Acid;Dental Bonding;Humans;Hydrogen Peroxide;Lasers, Solid-State;Low-Level Light Therapy;Orthodontic Brackets;Tooth Bleaching

Comparative evaluation of the early effects of the low-level laser therapy versus intra-articular steroids on temporomandibular joint acute osteoarthritis in rats: A histochemical, molecular and imaging evaluation. BACKGROUND: Osteoarthritis (OA) is a serious degenerative joint disease. It is one of the main causes of disability in the world. Current treatment modalities have numerous side effects. Subsequently, health experts are looking for alternative therapies. OBJECTIVES: The aim of the study was to evaluate the early effects of low-level laser therapy (LLLT) vs intraarticular (IA) corticosteroids (CS) on acute temporomandibular joint osteoarthritis (TMJOA). MATERIAL AND METHODS: Sixty rats were divided into 3 groups: group 1- untreated OA; group 2 - OA treated with CS; and group 3 - OA treated with LLL. Half of the animals in each group were sacrificed at 1 and 4 weeks post treatment. The temporomandibular joint was dissected and evaluated histochemically, using quantitative real-time polymerase chain reaction (qRT-PCR), and radiographically. RESULTS: Histochemically, Safranin-O staining revealed an obvious reduction in proteoglycans in the untreated osteoarthritic group. However, both of the treated groups showed a moderate increase in glycosaminoglycan (GAG) staining. As for the qRT-PCR results, caspase-3 showed the highest mean value in the untreated OA group, followed by the CS group, while the lowest mean value was recorded in the LLL group. Radiographically, the condyle showed erosion, flattening, osteophyte formation, and sclerosis in the untreated group, but there was great improvement in both of the treated groups. CONCLUSIONS: Both laser and cortisone showed reparative and formative effects, as evidenced by the increases in the proteoglycan content. However, LLL was superior in its anti-apoptotic effects. Cone beam computed tomography (CBCT) is a valuable tool in assessing osseous abnormalities. Anti-Inflammatory Agents;Dexamethasone;Caspase 3 Animals;Anti-Inflammatory Agents;Caspase 3;Cone-Beam Computed Tomography;Dexamethasone;Disease Models, Animal;Female;Injections, Intra-Articular;Low-Level Light Therapy;Osteoarthritis;Rats;Real-Time Polymerase Chain Reaction;Temporomandibular Joint;Temporomandibular Joint Disorders

A multicentre, randomized, split face and/or neck comparison of 308-nm excimer laser and 0Â·1% tacrolimus ointment for stable vitiligo plus intramuscular slow-releasing betamethasone for active vitiligo. Betamethasone;Tacrolimus Administration, Cutaneous;Adult;Betamethasone;Combined Modality Therapy;Face;Female;Humans;Injections, Intramuscular;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Neck;Skin Pigmentation;Tacrolimus;Treatment Outcome;Vitiligo

New insights into the treatment of non-healing diabetic foot ulcers. Diabetic foot ulcers (DFUs) are one of the most serious and devastating complication of diabetes mellitus, affecting about 15% of diabetic patients. This review describes the innovative treatment options currently available in the treatment of non-healing DFUs. The use of Platelet-Rich-Plasma (PRP) is a safe and valid approach in the treatment of DFUs. However, the methods used to obtain and prepare autologous PRP vary between the studies, thus further evidences are eagerly awaited. Adipose tissue-derived mesenchymal stem cells (ADSCs) are a promising tool in the treatment of DFUs, but additional largescale and long-term follow-up clinical trials are needed. Bone marrow mesenchymal stem cells (BM-MSCs) transplantation, on the other hand, revealed effective in reducing incidents and improving the quality of life of patients with amputations. Autologous Peripheral Blood Mononuclear Cells (A-PBMNCs) showed a good efficacy in the treatment of diabetic patients with CLI, but further RCTs are awaited to best investigate this new therapeutic approach. Photobiomodulation (PBM) therapy revealed effective in the treatment of DFUs in two RCTs, but a standardization of therapeutic protocols as well as level-I studies are needed. Diabetic Foot;Humans;Leukocytes,

Mononuclear;Mesenchymal Stem Cell Transplantation;Platelet-Rich Plasma;Quality of Life;Wound Healing
Laser-Assisted Delivery of Topical Rapamycin: mTOR Inhibition for Birt-Hogg-Dube Syndrome. FLCN protein, human;Ointments;Proto-Oncogene Proteins;Tumor Suppressor Proteins;MTOR protein, human;TOR Serine-Threonine Kinases;Sirolimus Administration, Cutaneous;Aged;Biopsy;Birt-Hogg-Dube Syndrome;Combined Modality Therapy;Humans;Lasers;Low-Level Light Therapy;Male;Ointments;Proto-Oncogene Proteins;Signal Transduction;Sirolimus;Skin;TOR Serine-Threonine Kinases;Treatment Outcome;Tumor Suppressor Proteins
Laser Therapy for Actinic Purpura. Humans;Lasers, Solid-State;Low-Level Light Therapy;Purpura;Severity of Illness Index;Skin Aging;Sunlight;Treatment Outcome
Combined Therapeutic Strategies for Keloid Treatment. BACKGROUND: Recent advances in keloid management favor the administration of combination therapy over monotherapy. OBJECTIVE: The authors evaluated the safety and efficacy of combination therapy to treat keloids using fractional lasers, cryotherapy, and intralesional corticosteroids. MATERIALS AND METHODS: The authors performed a retrospective study involving 35 Korean patients. Each patient underwent treatment using the 1,550 nm nonablative fractional erbium-glass laser, followed by the 10,600 nm ablative fractional carbon dioxide laser. Laser treatment was immediately followed by the administration of superficial cryotherapy and intralesional triamcinolone injection. Therapeutic efficacy was assessed using the Vancouver Scar Scale (VSS) score and the 7-point patient self-assessment score. RESULTS: The mean total and subcategory VSS scores showed statistically significant improvements. The height and pliability scores showed the most significant and quickest responses to the combination therapy. The patients reported remarkable improvement in itching, pain, and limitations of motion after a single combination therapy session. Twenty patients were followed up for 1 year after the discontinuation of the combination treatment, and the recurrence was observed only in one patient. No significant adverse effects were observed throughout the follow-up period. CONCLUSION: Combination keloid therapy using fractional lasers, superficial cryotherapy, and intralesional triamcinolone injection is safe and more effective than individual monotherapies. Glucocorticoids;Triamcinolone Acetonide Combined Modality Therapy;Cryotherapy;Dose Fractionation, Radiation;Female;Glucocorticoids;Humans;Injections, Intralesional;Keloid;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome;Triamcinolone Acetonide
Evaluation of low-level diode laser irradiation and various irrigant solutions on the biological response of stem cells from exfoliated deciduous teeth. This study aimed to evaluate cytotoxic effects and the apoptosis of Gallium-Aluminum-Arsenide (GaAlAs) diode laser irradiation, sodium hypochlorite (NaOCl), ozonated water and ethylene diamine tetraacetic acid (EDTA) on stem cells from human exfoliated deciduous teeth (SHEDs). Cells were exposed to EDTA (5%, 8.5%, 17%), NaOCl (1%, 2.5%, 5%) ozonated water (5, 10, 20â€¯Î¼g/ml) and GaAlAs diode laser irradiation (energy densities of 0.5, 1, 1.5â€¯j/cm(2)). Culture medium included D-MEM, supplemented with 15% foetal bovine serum, 1% l-glutamine, 1% penicillin-streptomycin, 1% gentamycin, amphotericin-B and served as control group. The prepared irrigants were added to the relevant wells and incubated with the cells at 37â€¯Â°C for 5, 10 and 15â€¯min. The cells in the laser group were also incubated at 37â€¯Â°C for 5, 10 and 15â€¯min after the laser application. Cell viability and proliferation were analysed with the 3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide (MTT) assay. The percentage of cell viability showed a significant reduction in all concentrations of the EDTA and NaOCl groups when compared to the control group, diode laser irradiation and ozonated water groups at 5th, 10th and 15th minutes respectively but high cytotoxic effects of all EDTA and NaOCl groups with decreased over 50% of cell viability were observed at the 15th minute. Also EDTA group with 17% concentration (17%E) presented the lowest survival rate on SHEDs with mean of 21.67%â€¯Â±â€¯6.101 at this time interval.

The lowest toxic effects were observed at the 5th minutes compared to other time periods at experimental groups. For detection of apoptotic cells, the terminal deoxynucleotidyl transferase-mediated deoxyuridine triphosphate nick end labelling (TUNEL) method was performed. According to the MTT results, doses showed the highest toxicity (cell survival decreased over 50%) in each group were selected for TUNEL assay (17% EDTA; 1% NaOCl; 10â€¯Î¼g/ml Ozonated water; 1.5â€¯j/cm(2) diode laser irradiation). The significantly lowest percentages of TUNEL-positive cells were detected in ozonated water (10.67%â€¯Â±â€¯2.93) and diode laser irradiation (13.24%â€¯Â±â€¯7.61) compared to EDTA (39.89%â€¯Â±â€¯11.54) and NaOCl (31.15%â€¯Â±â€¯10.64) respectively. Also the difference between percentage of TUNEL-positive cells in EDTA and NaOCl groups was not significant. Synergistic combination of ozonated water and diode laser irradiation may be used in the disinfection step of necrotic root canals. Solutions;Ozone;Edetic Acid;Sodium Hypochlorite Cell Proliferation;Cell Survival;Disinfection;Edetic Acid;Humans;Lasers, Solid-State;Ozone;Sodium Hypochlorite;Solutions;Stem Cells;Time Factors;Tooth, Deciduous

Combined effect of recombinant human bone morphogenetic protein-2 and low level laser irradiation on bisphosphonate-treated osteoblasts. OBJECTIVES: The purpose of this study was to evaluate the synergic effect of recombinant human bone morphogenetic protein-2 (rhBMP-2) and low-level laser therapy (LLLT) on bisphosphonate-treated osteoblasts. MATERIALS AND METHODS: Human fetal osteoblast cells (hFOB 1.19) were cultured with 100 ÂμM alendronate. Low-level Ga-Al-As laser alone or with 100 ng/mL rhBMP-2 was then applied. Cell viability was measured with MTT assay. The expression levels of receptor activator of nuclear factor kappa-B ligand (RANKL), macrophage colony-stimulating factor (M-CSF), and osteoprotegerin (OPG) were analyzed for osteoblastic activity inducing osteoclastic activity. Collagen type and transforming growth factor beta-1 were also evaluated for bone matrix formation. RESULTS: The results showed that rhBMP-2 and LLLT had a synergic effect on alendronate-treated osteoblasts for enhancing osteoblastic activity and bone matrix formation. Between rhBMP-2 and LLLT, rhBMP-2 exhibited a greater effect, but did not show a significant difference. CONCLUSION: rhBMP-2 and LLLT have synergic effects on bisphosphonate-treated osteoblasts through enhancement of osteoblastic activity and bone formation activity.

[Cytotoxic Effect of Low-Intensity Infrared Laser Irradiation on Human Melanoma Cells]. Continuous low-intensity laser irradiation (LILI) affects the state of cells in culture, including their proliferation rate. Data collected with various cell models vary significantly, but most studies have reported positive effects of LILI on cell proliferation. The effects of continuous infrared LILI (835 nm) was studied using three independent different melanoma cell lines. The LILI effect was shown to strongly depend on the irradiation dose. Higher doses (230 kJ/m^(2)) significantly suppressed the cell growth. A further increase in LILI dose led to a significant cytotoxic effect, which increased disproportionately quickly with the increasing light intensity. Human mesenchymal stem cells (MSCs) were found to be significantly more resistant to the cytotoxic effect of higher-dose LILI. Importantly, the effects were not due to the difference in culture conditions. Control experiments showed that 15 non-melanoma tumor cell lines were more resistant to LILI than melanoma cells. Selective sensitivity of melanoma cells to LILI in vitro was assumed to provide a basis for LILI-based approaches to melanoma treatment. Cell Line, Tumor;Cell Proliferation;Cell Survival;Humans;Low-Level Light Therapy;Melanoma;Mesenchymal Stem Cells

Doyne honeycomb retinal dystrophy - functional improvement following subthreshold nanopulse laser treatment: a case report. BACKGROUND: Based on phenotypic similarities between age-related macular degeneration and the autosomal disorder Doyne honeycomb retinal dystrophy, we report on a single nanolaser treatment of a patient with genotype Doyne honeycomb retinal dystrophy confirmation and evidence of disease progression over 12â€‰months. The case study is the first report of short-term results of subthreshold nanolaser treatment in a patient with Doyne

honeycomb retinal dystrophy. CASE PRESENTATION: A 43-year-old CaucasianÂ man with moderate loss of visual acuity in his left eye (20/40) and normal visual acuity in his right eye (20/20), with clinical Doyne honeycomb retinal dystrophy diagnosis and genetic confirmation of the common heterozygous mutation (EFEMP1) by genetic testing, underwent nanopulse subthreshold laser treatment in his left eye. A safety examination, carried out 7â€‰days after treatment, and clinical follow-up, conducted 60â€‰days following laser treatment, showed improvement of visual acuity from baseline by two letters and a subjective improvement of blurring. While no apparent morphological changes were found on fundoscopy, increased autofluorescence in the treated eye was observed on imaging. In addition, 2â€‰months after nanopulse subthreshold laser treatment, rod-mediated and cone-mediated full-field electroretinography b-wave amplitudes showed an increase from baseline in both the treated eye (300%) and untreated eye (50%). At 2â€‰months after nanopulse subthreshold laser treatment, multifocal electroretinograms showed improvement. Acuity and full-field electroretinography improvement persisted at 6-month follow-up. CONCLUSIONS: Sustained improvements in retinal function on electroretinography persisted in both eyes 6â€‰months after treatment, suggesting an enhancement of phototransduction and retinoid recycling induced by nanopulse subthreshold laser treatment. The functional improvement observed in the untreated eye is hypothesized to arise from an increased expression and release of metalloproteinases that circulate systemically. Adult;Humans;Low-Level Light Therapy;Male;Optic Disk Drusen;Treatment Outcome

Pre-conditioning with Remote Photobiomodulation Modulates the Brain Transcriptome and Protects Against MPTP Insult in Mice. Transcranial photobiomodulation (PBM), which involves the application of low-intensity red to near-infrared light (600-1100â€¯nm) to the head, provides neuroprotection in animal models of various neurodegenerative diseases. However, the absorption of light energy by the human scalp and skull may limit the utility of transcranial PBM in clinical contexts. We have previously shown that targeting light at peripheral tissues (i.e. "remote PBM") also provides protection of the brain in an MPTP mouse model of Parkinson's disease, suggesting remote PBM might be a viable alternative strategy for overcoming penetration issues associated with transcranial PBM. This present study aimed to determine an effective pre-conditioning regimen of remote PBM for inducing neuroprotection and elucidate the molecular mechanisms by which remote PBM enhances the resilience of brain tissue. Balb/c mice were irradiated with 670-nm light (4â€¯J/cm(2) per day) targeting dorsum and hindlimbs for 2, 5 or 10â€¯days, followed by injection of the parkinsonian neurotoxin MPTP (50â€¯mg/kg) over two consecutive days. Despite no direct irradiation of the head, 10â€¯days of pre-conditioning with remote PBM significantly attenuated MPTP-induced loss of midbrain tyrosine hydroxylase-positive dopaminergic cells and mitigated the increase in FOS-positive neurons in the caudate-putamen complex. Interrogation of the midbrain transcriptome by RNA microarray and pathway enrichment analysis suggested upregulation of cell signaling and migration (including CXCR4(+) stem cell and adipocytokine signaling), oxidative stress response pathways and modulation of the blood-brain barrier following remote PBM. These findings establish remote PBM preconditioning as a viable neuroprotective intervention and provide insights into the mechanisms underlying this phenomenon. Animals;Brain;Caudate Nucleus;Dopaminergic Neurons;Low-Level Light Therapy;Male;Mice, Inbred BALB C;Parkinsonian Disorders;Pars Compacta;Putamen;Transcriptome

Growth factors expression and ultrastructural morphology after application of low-level laser and natural latex protein on a sciatic nerve crush-type injury. The effects of low-level laser therapy (LLLT) and natural latex protein (F1, Hevea brasiliensis) were evaluated on crush-type injuries (15kg) to the sciatic nerve in the expressions of nerve growth factor (NGF) and vascular endothelium growth factor (VEGF) and ultrastructural morphology to associate with previous morphometric data using the

same protocol of injury and treatment. Thirty-six male rats were allocated into six experimental groups (n = 6): 1-Control; 2-Exposed nerve; 3-Injured nerve; 4-LLLT (15J/cm2, 780nm, 30mW, Continuous Wave) treated injured nerve; 5-F1 (0,1mg) treated injured nerve; and 6-LLLT&F1 treated injured nerve. Four or eight weeks after, sciatic nerve samples were processed for analysis. NGF expression were higher ($p<0.05$) four weeks after in all injured groups in comparison to Control (Med:0.8; Q1:0; Q3:55.5%area). Among them, the Injured (Med:70.7; Q1:64.4; Q3:77.5%area) showed the highest expression, and F1 (Med:17.3; Q1:14.1; Q3:21.7%area) had the lowest. At week 8, NGF expressions decreased in the injured groups. VEGF was expressed in all groups; its higher expression was observed in the injured groups 4 weeks after (Injured. Med:29.5; F1. Med:17.7 and LLLT&F1. Med:19.4%area). At week 8, a general reduction of VEGF expression was noted, remaining higher in F1 (Med:35.1; Q1.30.6; Q3.39.6%area) and LLLT&F1 (Med:18.5; Q1:16; Q3:25%area). Ultrastructural morphology revealed improvements in the treated groups; 4 weeks after, the F1 group presented greater quantity and diameter of the nerve fibers uniformly distributed. Eight weeks after, the F1 and LLLT&F1 showed similar characteristics to the non-injured groups. In summary, these results and our previous studies indicated that F1 and LLLT may favorably influence the healing of nerve crush injury. Four weeks after nerve injury F1 group showed the best results suggesting recovery acceleration; at 8th week F1 and LLLT&F1 groups presented better features and higher vascularization that could be associated with VEGF maintenance. Intercellular Signaling Peptides and Proteins;Latex;Plant Proteins Animals;Crush Injuries;Disease Models, Animal;Hevea;Humans;Intercellular Signaling Peptides and Proteins;Latex;Low-Level Light Therapy;Male;Microscopy, Electron, Transmission;Nerve Regeneration;Peripheral Nerve Injuries;Plant Proteins;Rats;Rats, Wistar;Recovery of Function;Sciatic Nerve;Wound Healing

Impact of low-level laser therapy on the dynamics of pressure ulcer-induced changes considering an infectious agent and cathelicidin LL-37 concentration: a preliminary study. INTRODUCTION: Low-level laser therapy is used in managing chronic wounds including pressure ulcers. Less is known about its impact on the healing process if an inhibitive agent e.g. bacterial infection takes place. Modulating non-specific immunity processes might eliminate bacteria if laser therapy is applied. AIM: To investigate the impact of low-level laser therapy on pressure ulcer dynamics considering an infectious agent and cathelicidin LL-37 concentration. MATERIAL AND METHODS: The study comprised 6 patients with pressure ulcers ranging from stage II to III in Torrance classification and 12 patients without pressure ulcers. Venous blood sample and decubitus wound swab were taken - in study groups A at baseline and after 2 weeks; in control group B once - at a specific point of time. The swabs served for species identification. Drug susceptibility of isolated pathogens and cathelicidin LL-37 in serum concentration were measured. RESULTS: In study group A, the following bacteria predominantly occurred: S. aureus, E. faecalis, P. mirabilis, P. aeruginosa, while in control group B, excluding one MRSA case, S. hominis, S. epidermidis, D. nishinomiyaensis, A. haemolyticus (physiological flora) were present. HLGR resistance mechanisms were detected when analyzing drug susceptibility panels. Study group A findings demonstrated a statistically significant difference between the levels of cathelicidin LL-37 concentration at baseline and at the end. CONCLUSIONS: There is insufficient information to accurately determine the effect of LLLT on pressure ulcer dynamics considering an infectious agent. These effects may occur if innate immunity processes are modulated so that laser therapy might eliminate bacteria indirectly.

Assessing the impact of low level laser therapy (LLLT) on biological systems: a review. PURPOSE: Low level laser therapy (LLLT) in the visible to near infrared spectral band (390-1100â€‰nm) is absorption of laser light at the electronic level, without generation of heat. It may be applied in a wide range of treatments including wound healing, inflammation and pain reduction. Despite its potential beneficial impacts, the use of lasers for therapeutic purposes still remains controversial in

mainstream medicine. Whilst taking into account the physical characteristics of different qualities of lasers, this review aims to provide a comprehensive account of the current literature available in the field pertaining to their potential impact at cellular and molecular levels elucidating mechanistic interactions in different mammalian models. The review also aims to focus on the integral approach of the optimal characteristics of LLLT that suit a biological system target to produce the beneficial effect at the cellular and molecular levels. METHODS: Recent research articles were reviewed that explored the interaction of lasers (coherent sources) and LEDs (incoherent sources) at the molecular and cellular levels. RESULTS: It is envisaged that underlying mechanisms of beneficial impact of lasers to patients involves biological processes at the cellular and molecular levels. The biological impact or effects of LLLT at the cellular and molecular level could include cellular viability, proliferation rate, as well as DNA integrity and the repair of damaged DNA. This review summarizes the available information in the literature pertaining to cellular and molecular effects of lasers. CONCLUSIONS: It is suggested that a change in approach is required to understand how to exploit the potential therapeutic modality of lasers whilst minimizing its possible detrimental effects. DNA Damage;DNA Repair;Humans;Lasers, Semiconductor;Low-Level Light Therapy

A review of the FDA's 510(k) approvals process for electromagnetic devices used in body contouring. Introduction: Greater demand for noninvasive techniques to reduce cellulite and contour the body has led to the growth of electromagnetic and radiofrequency devices. In this study, we aimed to characterize the evolution and safety of electromagnetic devices marketed in the U.S. over the last two decades. Methods: We examined records from a U.S. FDA database documenting premarket approval of electromagnetic devices between January 1, 2000 and October 31, 2018. Additionally, we searched the Manufacturer and User Facility Device Experience (MAUDE) database for reports of adverse events. Results: Thirty-one devices were approved from 2012-2018. Initially marketed to temporarily reduce muscle pain and cellulite, indications for these devices have expanded. The MAUDE database revealed 61 reports of adverse events including acute skin damage, dyspigmentation, infection, hair growth, scarring, and others. Discussion: Although electromagnetic devices are gaining increasing public attention and marketed to be safe, the frequency and types of adverse events are not well-documented. Importantly, the MAUDE database has limitations including submission of incomplete, inaccurate, untimely, or unverified data make determining the true number of adverse events difficult. Further investigation is greatly needed to define appropriate parameters and outcomes for the use of electromagnetic devices in body contouring and skin enhancement. Body Contouring;Databases, Factual;Device Approval;Electromagnetic Fields;Female;Humans;Low-Level Light Therapy;United States;United States Food and Drug Administration

Treatment of telangiectasia on the cheeks with a compact yellow (585â€‰nm) semiconductor laser and a green (532â€‰nm) KTP laser: a randomized double-blinded split-face trial. OBJECTIVES: The primary objective of this study was to compare a traditional green KTP laser to a new investigational yellow laser (PhotoLase) in the treatment of facial telangiectasia in terms of the treatment outcomes. The secondary objective was to assess the functionality and reliability of the PhotoLase system from the perspective of the user. STUDY DESIGN/METHODS: The study was a randomized split-face double-blinded study that compared the treatment efficacy of the 532-nm KTP laser and the investigational 585-nm PhotoLase laser. One or two treatments were given based on the response of the first treatment. The improvement of telangiectasia was graded according to a 7-point Telangiectasia Grading Scale (TGS) by the subjects and blinded physicians. The subjects assessed the amount of pain during the treatments using Visual Analogue Scale (VAS), and evaluated adverse effects 2-3 days after the treatment(s) using a self-assessment form. RESULTS: At least 50% improvement was seen in 15/18 subjects after the first PhotoLase treatment, and a similar result was

observed for KTP, as assessed by the blinded physicians (Pâ€‰=â€‰0.29). In the subjects' assessment, 7/18 subjects had at least 50% improvement after the first PhotoLase treatment, whereas at least 50% improvement was observed for 10/18 subjects in the KTP side, the difference being significant (Pâ€‰=â€‰0.008). The amount of pain was higher with PhotoLase compared to KTP (67.7 vs. 34.6, Pâ€‰<â€‰0.001). There was no difference in the frequency of erythema, crusting or purpura between the devices, but more blistering and less edema were seen after PhotoLase treatment (Pâ€‰<â€‰0.05). Treatment with PhotoLase was evaluated to be 4.7-fold faster than with KTP and the PhotoLase system was more compact, narrower, lighter, and easier to carry than KTP. CONCLUSIONS: The investigational PhotoLase laser enables significantly faster treatments, but the process is somewhat more painful than with KTP, otherwise providing a similar clinical outcome in the treatment of facial telangiectasia. Treatment Protocol Lasers Surg. Med. 51:223-229, 2019. Â© Wiley Periodicals, Inc. Adult;Cheek;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Reproducibility of Results;Telangiectasis;Treatment Outcome

Radiation-induced skin reactions: mechanism and treatment. Radiotherapy (RT) is a major treatment for malignant tumors. The latest data show that >70% of patients with malignant tumors need RT at different periods. Skin changes can be experienced by up to 95% of patients who underwent RT. Inflammation and oxidative stress (OS) have been shown to be generally associated with radiation-induced skin reactions (RISRs). Inflammatory response and OS interact and promote each other during RISRs. Severe skin reactions often have a great impact on the progress of RT. The treatment of RISRs is particularly critical because advanced RT technology can also lead to skin reactions. RISRs are classified into acute and chronic reactions. The treatment methods for acute RISRs include steroid treatment, creams, ointments, and hydrocolloid dressings, depending on the reaction grading. Chronic RISRs includes chronic ulcerations, telangiectasias, and fibrosis of the skin, and advanced treatments such as mesenchymal stem cells, hyperbaric oxygen therapy, superoxide dismutase, and low-intensity laser therapy can be considered. Here, we review and summarize the important mechanisms that cause RISRs as well as the standard and advanced treatments for RISRs.

Effects of Ultrasound, Laser and Exercises on Temporomandibular Joint Pain and Trismus Following Head and Neck Cancer. OBJECTIVE: To compare the effects of low intensity ultrasound (LIUS), traditional exercise therapy (TET), low level laser therapy (LLLT) and TET on temporomandibular joint (TMJ) pain and trismus following recovery from head and neck cancer (HNC). METHODS: Sixty participants following, who had experienced HNC, were randomly allocated to three groups of 20 people each. Each group received different therapy. Group A received LIUS and TET; group B received LLLT and TET; while group C received TET. All 60 participants were evaluated under the visual analog scale (VAS), the University of Washington Quality of Life questionnaire (UW-QOL) and the Vernier caliper scale (VCS) at the beginning of the therapies and after 4 weeks. RESULTS: ANOVA test revealed significant improvements across all three groups with outcomes of $p<0.05$. The results of the UW-QOL questionnaire showed a significant difference between groups A, B and C in favor of group A ($p<0.05$). The VAS results showed a more improvement in group A as compared to group B ($p<0.05$), while there was no statistical difference between groups B and C ($p>0.05$). The VCS results showed more improvement for the individuals in group B as compared to those in group C ($p<0.05$), while there was minimal difference between groups A and B ($p>0.05$). CONCLUSION: The LIUS and TET are more effective than LLLT and/or TET in reducing TMJ pain and trismus following HNC.

Photobiomodulation therapy as a tool to prevent hamstring strain injuries by reducing soccer-induced fatigue on hamstring muscles. Muscle fatigue is a potential risk factor for hamstring strain injuries in soccer players. The aim of this study was to verify the effect of photobiomodulation therapy (PBMT) on the hamstrings' muscle fatigue of soccer players during a simulated match. Twelve

male amateur soccer players (~â€‰25Â years) participated in this randomized, crossover, double-blinded, placebo-controlled trial. The volunteers were evaluated in two sessions, with a minimum 7-day interval. At each session, volunteers received either PBMT (300Â J per thigh) or placebo treatment on the hamstrings prior to the simulated soccer match. Muscle strength and functional capacity were evaluated through isokinetic dynamometry and countermovement jump (CMJ) tests, respectively, before and immediately after the simulated soccer match. Players had lower reductions on hamstring eccentric peak torque [4.85% (ESâ€‰=â€‰0.31) vs. 8.72% (ESâ€‰=â€‰0.50)], hamstring-to-quadriceps torque ratio [3.60% (ESâ€‰=â€‰0.24) vs. 7.75% (ESâ€‰=â€‰0.50)], and CMJ height [1.77% (ESâ€‰=â€‰0.09) vs. 5.47% (ESâ€‰=â€‰0.32)] when treated with PBMT compared to placebo. Magnitude-based inference supports that PBMT promoted 75%, 69%, and 53% chances for beneficial effects on hamstring eccentric peak torque, hamstring-to-quadriceps torque ratio, and CMJ height, respectively, compared to placebo treatment. In conclusion, PBMT applied before a simulated soccer match proved to be effective in attenuating the hamstrings' muscle fatigue. These findings support PBMT as a promising tool to prevent hamstring strain injury in soccer players. Placebos Adult;Athletes;Hamstring Muscles;Humans;Locomotion;Low-Level Light Therapy;Male;Muscle Fatigue;Placebos;Soccer

Effects of different settings for 940 nm diode laser on expanded suture in rats. OBJECTIVES: To evaluate the effects of the Indium Gallium Arsenide Phosphoride (InGaAsP) diode laser at different energy levels on orthopedically expanded midpalatal sutures of rats. MATERIALS AND METHODS: Eighty Wistar rats were randomly divided into four groups: a control group and low-, moderate-, and high-level laser groups with amounts of energy irradiated at 0 J, 18 J, 42 J, and 60 J, respectively. Each group was divided into two subgroups (n = 10) according to the schedule of sacrifice (7 and 21 days). Laser application (940 Â± 10 nm, 0.1 W) was completed twice weekly until sacrifice. The number of osteoblasts (OB), osteocytes (OC), and vessels (V); area of connective tissue (CT); inflammation (IN); and newly formed bone (NB); as well as the ratio of newly formed bone to the total bone area (N/T) were evaluated statistically at a significance level of $P < .05$. RESULTS: For the low-level laser group, OB, NB, and N/T were significantly higher, and CT was lower, on both the 7th and 21st days. The amount of OC was significantly higher in the low-level laser group compared with the control group on the 7th day and the control and high-level laser groups on the 21st day. The IN was significantly higher for the high-level group on the 21st day compared with other groups. Both the moderate-level and high-level laser groups possessed fewer vessels than the low-level laser group on the 21st day. CONCLUSIONS: The InGaAsP laser at the low dosage induced a favorable effect on bone formation in the orthopedically expanded midpalatal suture of rats. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Palatal Expansion Technique;Rats;Rats, Wistar;Sutures

Combined Treatment with Low-Level Laser and rhBMP-2 Promotes Differentiation and Mineralization of Osteoblastic Cells under Hypoxic Stress. BACKGROUND: The aim of this study was to evaluate the combined effect of low-level laser treatment (LLLT) and recombinant human bone morphological protein-2 (rhBMP-2) applied to hypoxic-cultured MC3T3-E1 osteoblastic cells and to determine possible signaling pathways underlying differentiation and mineralization of osteoblasts under hypoxia. METHODS: MC3T3-E1 cells were cultured under 1% oxygen tension for 72Â h. Cell cultures were divided into four groups: normoxia control, low-level laser (LLL) alone, rhBMP-2 combined with LLLT, and rhBMP-2 under hypoxia. Laser irradiation was applied at 0, 24, and 48Â h. Cells were treated with rhBMP-2 at 50Â ng/mL. Alkaline phosphatase activity was measured at 3, 7, and 14Â days to evaluate osteoblastic differentiation. Cell mineralization was determined with Alizarin red S staining at 7 and 14Â days. Western blot assays were performed to evaluate whether p38/protein kinase D (PKD) signaling was involved. RESULTS: The results indicate that LLLT and rhBMP-2

synergistically increased alkaline phosphatase (ALP) activity and mineralization. Western blot analyses showed that expression of type I collagen, runt-related transcription factor 2 (RUNX2), and Osterix (Osx), increased and expression of hypoxia-inducible factor 1-alpha (HIF-1Î±), decreased more in the LLLT and rhBMP-2 combined group than in the rhBMP-2 or LLL alone groups. Moreover, LLLT and rhBMP-2 stimulated p38 phosphorylation and rhBMP-2 and LLLT increased Prkd1 phosphorylation. CONCLUSION: Combined treatment with rhBMP-2 and LLL induced differentiation and mineralization of hypoxic-cultured MC3T3-E1 osteoblasts by activating p38/PKD signaling in vitro.

Is Low-Level Laser Therapy Effective on Sensorineural Recovery After Bilateral Sagittal Split Osteotomy? Randomized Trial. PURPOSE: When performing a sagittal osteotomy of the mandibular ramus, one must consider the risk of long-term postsurgical sensory abnormalities from lesions to the inferior alveolar nerve. One treatment for these changes is low-level laser therapy (LLLT). Thus, the aim of this research was to evaluate the effectiveness of LLLT on sensorineural recovery after split ramus osteotomy of the mandible. MATERIALS AND METHODS: This randomized, double-blinded, split-mouth design trial included patients who underwent advanced surgery of the mandible and then received LLLT on 1 side of the mandible (experimental) and a random placebo (control) treatment on the opposite site. Patients were divided into 2 groups: group 1 was treated during the short postoperative period (within 30Â days) and group 2 was treated for persistent sensory abnormalities during the late postoperative period (6Â months to 1Â yr). Each patient received 5 LLLT and control sessions with intervals of 3 to 4Â weeks between sessions. The experimental side in each patient received LLLT in the extraoral area (mandibular ramus and entire length of the inferior alveolar nerve to the mental region) and the intraoral area (mental foramen region). The control side received simultaneous placebo treatments. The sensorineural response was analyzed before the onset of treatment and after each LLLT and control session using the Semmes-Weinstein monofilament test. RESULTS: Twenty adult patients (mean age, 35.6Â years; 70.0% women) showed improvement in the experimental and control sides during the follow-up period. However, the experimental side in groups 1 and 2 exhibited a marked improvement in sensorineural recovery over the course of the sessions, and group 1 had the best results. CONCLUSION: LLLT was effective in the recovery from sensorineural disorders after orthognathic surgery during the short postoperative period, particularly in the fifth session. Adult;Chin;Female;Humans;Low-Level Light Therapy;Male;Mandible;Mandibular Nerve;Orthognathic Surgical Procedures;Osteotomy, Sagittal Split Ramus

Joint SASMA and Bricscess Congress: Cape Town - South Africa, Thursday 10 - Sunday 13 October 2019.

Exploring the efficacy of low-level laser therapy and exercise for knee osteoarthritis. BACKGROUND: Knee Osteoarthritis (KOA) is a prevalent, chronic disorder with excessive functional, social and economic burdens. The goal of treatment is to alleviate the symptoms and slow the progression. Documenting the effects of exercise and LLLT as co-modalities in the management of KOA allows practitioners to implement this management tool as part of KOA rehabilitation, resulting in the earlier discharge from a supervised rehabilitation setting. OBJECTIVE: The purpose of this study was to determine the effect of low-level laser therapy (LLLT) in the treatment of knee osteoarthritis (KOA). A randomised controlled trial (RCT) was conducted on 111 participants (aged between 40-75 years) diagnosed with KOA. Participants were randomised into an exercise (n=39), LLLT (n=40), or a combined exercise-LLLT (n=32) group. METHODS: The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale was used to assess pain and functionality. Knee range of motion was assessed using a goniometer, and the one-minute timed sit-to-stand test measured physical functionality at four time points: (T1) baseline, (T2) post 12-session intervention, (T3) one-month post intervention and (T4) three-month's post intervention. Knee circumference was measured using a

measuring tape. RESULTS: WOMAC pain and functionality scale and knee circumference scores decreased in all three groups (P<0.05), but the combined exercise-LLLT group demonstrated better outcomes than the LLLT or exercise alone groups respectively. The combined exercise-LLLT group showed better acute and long-term benefits with participants experiencing a 3.5 centimetre decrease in knee circumference, 24 point improvement in the WOMAC pain and functionality scale, and a four repetition increase in physical functionality. CONCLUSION: The findings suggest that LLLT is a viable tool for managing KOA when used in conjunction with physical exercise.

Clinical and scientific recommendations for the use of photobiomodulation therapy in exercise performance enhancement and post-exercise recovery: current evidence and future directions. BACKGROUND: There is about ten years since the first randomized controlled trial looking for the effects of photobiomodulation therapy using low-level laser therapy and/or light emitting diodes therapy in athletic performance enhancement was published. Since then, the knowledge in this field has increasing exponentially. OBJECTIVE: Given the fast advance in clinical interest, research and development in the use of photobiomodulation therapy for athletic performance enhancement and also to accelerate post-exercise recovery, as pioneers in this research field we felt the need to establish recommendations to ensure the correct use of the therapy, and also to guide the further studies in this area looking for the achievement of highest scientific evidence. It is important to highlight that the establishment of both clinical and scientific recommendations in this masterclass article were based on the most recent systematic reviews with meta-analysis and randomized controlled trials published in this field. It is important to stress that the recommendations of this masterclass article are based on most recent systematic reviews with meta-analysis and RCTs published in this research field. Future guidelines must follow the same direction and must be based only at the highest scientific evidence, avoiding overstatements and extrapolations based on animal experiments and case-studies. Athletic Performance;Exercise;Humans;Low-Level Light Therapy;Phototherapy

Photobiomodulation with low-level laser therapy reduces oral mucositis caused by head and neck radio-chemotherapy: prospective randomized controlled trial. The objective of this study was to assess the effectiveness of photobiomodulation with low-level laser therapy (LLLT) as a preventive and therapeutic procedure for the treatment of oral and oropharyngeal mucositis caused by radio-chemotherapy in patients diagnosed with oral squamous cell carcinoma (SCC). An experimental, prospective, double-blind, randomized controlled study was conducted involving patients diagnosed with oral SCC undergoing oncological treatment. The variables analyzed included grade, appearance, and remission of mucositis. A final sample of 26 patients was included: 11 (42.3%) in the study group and 15 (57.7%) in the control group; their average age was 60.89Â±9.99years. Statistically significant differences between the groups were observed from week 5 of oncological treatment; 72.7% of the laser group showed normal mucosa (mucositis grade 0), while in the control group, 20.0% showed grade 0 mucositis and 40.0% showed grade 2 mucositis (P<0.01). No statistically significant difference between the groups was found regarding the application or use of medication throughout the study period (P>0.05). The tolerance evaluation did not show any statistically significant difference between the groups regarding the occurrence of side effects or adverse events during the trial (P>0.05). Photobiomodulation with LLLT reduces the incidence and severity of mucositis in patients treated with radiotherapyÂ±chemotherapy. Aged;Carcinoma, Squamous Cell;Double-Blind Method;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Middle Aged;Mouth Neoplasms;Prospective Studies;Stomatitis

Interventions for rosacea based on the phenotype approach: an updated systematic review including GRADE assessments. BACKGROUND: Rosacea is a common chronic facial dermatosis. Classification of rosacea has evolved from subtyping to phenotyping. OBJECTIVES: To update our

systematic review on interventions for rosacea. METHODS: We searched CENTRAL, MEDLINE, Embase, LILACS, Science Citation Index and ongoing trials registers (March 2018) for randomized controlled trials. Study selection, data extraction, risk-of-bias assessment and analyses were carried out independently by two authors. Grading of Recommendations, Assessment, Development and Evaluations (GRADE) was used to assess certainty of evidence. RESULTS: We included 152 studies (46 were new), comprising 20Â 944 participants. Topical interventions included brimonidine, oxymetazoline, metronidazole, azelaic acid, ivermectin and other topical treatments. Systemic interventions included oral antibiotics, combinations with topical treatments or other systemic treatments. Several studies evaluated laser or light-based treatment. We present the most current evidence for rosacea management based on a phenotype-led approach. CONCLUSIONS: For reducing temporarily persistent erythema there was high-certainty evidence for topical brimonidine and moderate certainty for topical oxymetazoline; for erythema and mainly telangiectasia there was low-to-moderate-certainty evidence for laser and intense pulsed light therapy. For reducing papules/pustules there was high-certainty evidence for topical azelaic acid and topical ivermectin; moderate-to-high-certainty evidence for doxycycline 40 mg modified release (MR) and isotretinoin; and moderate-certainty evidence for topical metronidazole, and topical minocycline and oral minocycline being equally effective as doxycycline 40Â mg MR. There was low-certainty evidence for tetracycline and low-dose minocycline. For ocular rosacea, there was moderate-certainty evidence that oral omega-3 fatty acids were effective and low-certainty evidence for ciclosporin ophthalmic emulsion and doxycycline. Anti-Bacterial Agents;Dermatologic Agents;Brimonidine Tartrate;Oxymetazoline Administration, Cutaneous;Administration, Oral;Anti-Bacterial Agents;Brimonidine Tartrate;Combined Modality Therapy;Dermatologic Agents;Dermatology;Drug Therapy, Combination;Evidence-Based Medicine;Facial Dermatoses;Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Oxymetazoline;Randomized Controlled Trials as Topic;Rosacea;Severity of Illness Index;Treatment Outcome

Global perspectives for the management of onychomycosis. Onychomycosis is a fungal nail infection caused by dermatophytes, nondermatophyte molds, and yeasts. This difficult-to-treat chronic infection has a tendency to relapse despite treatment. This paper aims to offer a global perspective on onychomycosis management from expert physicians from around the world. Overall, the majority of experts surveyed used systemic, topical, and combination treatments approved in their countries and monitored patients based on the product insert or government recommendations. Although the basics of treating onychomycosis were similar between countries, slight differences in onychomycosis management between countries were found. These differences were mainly due to different approaches to adjunctive therapy, rating the severity of disease and use of prophylaxis treatment. A global perspective on the treatment of onychomycosis provides a framework of success for the committed clinician with appreciation of how onychomycosis is managed worldwide. Antifungal Agents Administration, Oral;Administration, Topical;Antifungal Agents;Arthrodermataceae;Clinical Trials as Topic;Comorbidity;Drug Interactions;Foot Dermatoses;Global Burden of Disease;Global Health;Humans;Low-Level Light Therapy;Onychomycosis;Photochemotherapy;Prevalence;Recurrence;Tinea Pedis;Treatment Outcome;Yeasts

Correction to: Photobiomodulation versus light-emitting diode (LED) therapy in the treatment of temporomandibular disorder: study protocol for a randomized, controlled clinical trial. After publication of our article [1] we became aware that several sections of text in our Methods section were copied from a previously published article [2].

Upper molar distalization with Invisalign treatment accelerated by photobiomodulation. Cephalometry;Malocclusion, Angle Class II;Maxilla;Molar;Orthodontic Appliances, Removable;Tooth Movement Techniques

Behaviour and Prevention of 5'Fluorouracil and Doxorubicin-induced Oral Mucositis in Immunocompetent Patients with Solid Tumors: A Randomised Trial. PURPOSE: This study evaluated the efficacy of four methods to prevent chemotherapy-induced oral mucositis (OM) in patients with solid tumors (ST). In addition, the behaviour of OM was investigated in these oncological patients. MATERIALS AND METHODS: Forty-eight patients, aged 27-84, were randomly allocated to different groups from the first day of chemotherapy (CT), in the following sequence: group 1: intensive oral care programme (IOCP); group 2: 0.12% chlorhexidine mouthrinse; group 3: 0.03% triclosan mouthrinse; group 4: low-level laser therapy (LLLT). Oral mucositis was evaluated on the 7th and 14th days by means of the Oral Mucositis Assessment Scale (OMAS). RESULTS: Thirty-one (64.5%) patients developed OM in the first cycle of CT and the pain was significantly associated with OM severity ($p < 0.0001$). The statistically significantly worst OMAS score was found for the lips and buccal mucosa ($p < 0.0001$). Despite a lack of statistical significance, IOCP and LLLT notably demonstrated potential effects to prevent OM in patients who presented with only oral erythema (75%) and lower peak of severity during the follow up, respectively. CONCLUSIONS: Improved oral care awareness is needed in patients undergoing 5'fluorouracil and doxorubicin, mainly to avoid pain caused by oral mucositis. Oral mucositis was more prevalent and aggressive in oral sites exposed to chronic trauma. The IOCP and LLLT approaches showed positive results to prevent oral mucositis and should be further investigated in similar and larger samples. Antibiotics, Antineoplastic;Antimetabolites, Antineoplastic;Doxorubicin;Fluorouracil Adult;Aged;Aged, 80 and over;Antibiotics, Antineoplastic;Antimetabolites, Antineoplastic;Doxorubicin;Fluorouracil;Humans;Immunocompetence;Middle Aged;Neoplasms;Prospective Studies;Stomatitis

Low laser therapy as an effective treatment of recurrent aphtous ulcers: a clinical case reporting two locations. Apthous ulcers, commonly referred to as canker sores, are the most common ulcerative lesions of the oral mucosa. These are usually painful and are associated with redness and occasional bleeding from the affected area(s). Low Level Laser Therapy (LLLT) has shown excellent results in relieving the pain and complete remission of the oral ulcers. Through a clinical case, we report two locations of oral ulcers treated successfully with diode laser. Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Recurrence;Stomatitis, Aphthous;Treatment Outcome

Low-level laser therapy for the treatment of androgenetic alopecia in Thai men and women: a 24-week, randomized, double-blind, sham device-controlled trial. Low-level laser/light therapy (LLLT) has been increasingly used for promoting hair growth in androgenetic alopecia (AGA). Our institute developed a new home-use LLLT device, RAMACAP, with optimal penetrating energy, aiming to improve therapeutic efficacy and compliance. To evaluate the efficacy and safety of the new helmet-type LLLT device in the treatment of AGA, a 24-week, prospective, randomized, double-blind, sham device-controlled clinical trial was conducted. Forty subjects with AGA (20 men and 20 women) were randomized to treat with a laser helmet (RAMACAP) or a sham helmet in the home-based setting for 24Â weeks. Hair density, hair diameter, and adverse events were evaluated at baseline and at weeks 8, 16, and 24. Global photographic assessment for hair regrowth after 24Â weeks of treatment was performed by investigators and subjects. Thirty-six subjects (19 in the laser group and 17 in the sham group) completed the study. At week 24, the laser helmet was significantly superior to the sham device for increasing hair density and hair diameter (pâ€‰=â€‰0.002 and pâ€‰=â€‰0.009, respectively) and showed a significantly greater improvement in global

photographic assessment by investigators and subjects. Reported side effects included temporary hair shedding and scalp pruritus. In conclusion, the novel helmet-type LLLT device appears to be an effective treatment option for AGA in both male and female patients with minimal adverse effects. However, the limitations of this study are small sample size, no long-term follow-up data, and use of inappropriate sham devices, which do not reflect the true negative control. Trial registration: http://clinicaltrials.in.th/index.php?tp=regtrials&menu=trialsearch&smenu=fulltext&task=search&task2=view1&id=2061 , identifier TCTR20160910003. Adult;Alopecia;Double-Blind Method;Female;Hair;Humans;Low-Level Light Therapy;Male;Prospective Studies;Thailand;Treatment Outcome

Correction to: Photobiomodulation with single and combination laser wavelengths on bone marrow mesenchymal stem cells: proliferation and differentiation to bone or cartilage. In the originally published article, the name of the 3rd and 4th authors were labeled incorrectly. The correct names are Mohammadreza Baghaban Eslaminejad and Leila Taghiyar. Also, affiliation 4 has been corrected.

Comparison of two different laser photobiomodulation protocols on the viability of random skin flap in rats. To identify the best low level laser photobiomodulation application site at the same irradiation time to increase the viability of the skin flap in rats. Eighteen male rats (Rattus norvegicus: var. Albinus, Rodentia Mammalia) were randomly distributed into three groups (nâ€‰=â€‰6). Group I (GI) was submitted to simulated laser photobiomodulation; group II (GII) was submitted to laser photobiomodulation at three points in the flap cranial base, and group III (GIII) was submitted to laser photobiomodulation at 12 points distributed along the flap. All groups were irradiated with an Indium, Galium, Aluminum, and Phosphorus diode laser (InGaAlP), 660Â nm, with 50Â mW power, irradiated for a total time of 240Â s in continuous emission mode. The treatment started immediately after performing the cranial base random skin flap (10â€‰Ã—â€‰4Â cm(2) dimension) and reapplied every 24Â h, with a total of five applications. The animals were euthanized after the evaluation of the percentage of necrosis area, and the material was collected for histological analysis on the seventh postoperative day. GII animals presented a statistically significant decrease for the necrosis area when compared to the other groups, and a statistically significant increase in the quantification of collagen when compared to the control. We did not observe a statistical difference between the TGFÎ² and FGF expression in the different groups evaluated. The application of laser photobiomodulation at three points of the flap cranial base was more effective than at 12 points regarding the reduction of necrosis area. Transforming Growth Factor beta;Fibroblast Growth Factors;Collagen Animals;Cell Nucleus;Collagen;Fibroblast Growth Factors;Fibroblasts;Lasers, Semiconductor;Low-Level Light Therapy;Male;Necrosis;Rats, Wistar;Skin;Surgical Flaps;Tissue Survival;Transforming Growth Factor beta

Complications of laser and light-based devices therapy in patients with skin of color. Lasers and light-based devices are indispensable to an aesthetic dermatology practice. The growing popularity of lasers has been matched by a sharp increase in the incidence of complications. The Indian skin with its high melanin content is more prone to injury and careful setting of laser parameters, early detection of complications and immediate therapy are vital to avoiding permanent sequelae. We review the various complications that occur during laser procedures and their management. Blister;Edema;Humans;Laser Therapy;Low-Level Light Therapy;Phototherapy;Postoperative Complications;Skin Pigmentation

Evaluation of the Effect of Combined Low Energy Laser Application and Micro-Osteoperforations versus the Effect of Application of Each Technique Separately On the Rate of Orthodontic Tooth Movement. AIM: The study was conducted to evaluate the effect of combined low energy laser application and Micro-Osteoperforations versus the effect of the application of each technique separately on the rate of orthodontic tooth movement. PATIENTS AND METHODS: Three parallel

groups (each group contained 10 patients) were performed; Group A: In which one side was controlled side, and the other side received micro-osteoperforations (MOPs), Group B: In which one side was controlled side, and the other side received low-level laser therapy (LLLT), Group C: In which one side was controlled side, and the other side received both MOPs and LLLT. RESULTS: Significant statistical differences were obvious in the rate of canine retraction between each intervention and the control sides as following; the MOPs increased the rate of canine retraction by 1.6 fold more than the control side, LLLT increased the rate of canine retraction by 1.3 fold than the control side, and combination of both techniques resulted in an increase in the rate of canine retraction by 1.8 fold more than the control side. CONCLUSION: Combination of MOPs and LLLT proved to be more efficient regarding increasing the rate of canine retraction than the application of each technique separately.

Photobiomodulation therapy in neuroischaemic diabetic foot ulcers: a novel method of limb salvage. OBJECTIVE: Low-level laser therapy (also known as photobiomodulation therapy, PBMT) promotes accelerated healing of diabetic foot ulcers (DFUs), thereby preventing the risk of future complications and amputation. The aim of this study was to determine the effect of PBMT, with structured, graded mobilisation and foot care, on DFU healing dynamics. METHOD: Patients diagnosed with type 2 diabetes, diabetic peripheral neuropathy and presenting with a chronic neuroischaemic DFU, were treated with PBMT using scanning and non-contact probe methods. The DFU was clinically observed and the area measured every seven days until complete healing. Neuropathic parameters were also measured. The PBMT was administered until complete closure of the DFU and patients also undertook a programme of graded mobilisation. RESULTS: A total of 17 participants were recruited, with a mean age of 69Â±8 years, and a mean duration of diabetes of 13Â±5 years. Mean complete closure time was 26Â±11days. In addition, a mean reduction of the semi-quantitative vibration pressure threshold from 49Â±2 volts to 20Â±4 volts was observed in all participants. CONCLUSION: PBMT can be effectively used as a treatment mode for neuroischaemic DFUs in patients with type 2 diabetes. Graded mobilisation with focused foot care could improve the function of people living with type 2 diabetes with a chronic DFU. Aged;Diabetic Foot;Diabetic Neuropathies;Female;Humans;Limb Salvage;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Wound Healing

Intravitreal fluocinolone acetonide implant (ILUVIENÂ®) for diabetic macular oedema: a literature review. Diabetic macular oedema (DMO) is a common complication of diabetic retinopathy and may lead to severe visual loss. In this review, we describe the pathophysiology of DMO and review current therapeutic options such as macular laser photocoagulation, anti-vascular endothelial growth factor agents, and steroid implants with a focus on the new fluocinolone acetonide implant, ILUVIENÂ®. The results of the Fluocinolone Acetonide in Diabetic Macular Edema (FAME) studies are also presented together with the results of real-world studies to support the clinical use of ILUVIENÂ® in achieving efficient resolution of DMO and improving vision and macular anatomy in this challenging group of patients. Angiogenesis Inhibitors;Anti-Inflammatory Agents;Drug Implants;VEGFA protein, human;Vascular Endothelial Growth Factor A;Fluocinolone Acetonide Angiogenesis Inhibitors;Anti-Inflammatory Agents;Diabetic Retinopathy;Drug Implants;Fluocinolone Acetonide;Humans;Intravitreal Injections;Light Coagulation;Low-Level Light Therapy;Macular Edema;Patient Safety;Treatment Outcome;Vascular Endothelial Growth Factor A

Improvement in infected wound healing in type 1 diabetic rat by the synergistic effect of photobiomodulation therapy and conditioned medium. We investigated the effects of photobiomodulation therapy (PBMT) and conditioned medium (CM) of human bone marrow mesenchymal stem cells (hBM-MSC) individually and/or in combinationÂ on the stereological parametersÂ and the expression of basic fibroblast growth factor (bFGF), hypoxia-inducible factor (HIF-1Î±), and stromal cell-derived factor-1Î± (SDF-1Î±) in a wound model infected with methicillin-

resistant Staphylococcus aureus (MRSA) in diabetic rats.Â CM was provided by culturing hBM-MSCs. Type 1 diabetes mellitus (T1DM) was induced in 72 rats, divided into four groups,Â harboring 18 rats each: group 1 served as a control group, group 2 received PBMT, group 3 received CM, and group 4 received CMâ€‰+â€‰PBMT. On days 4, 7, and 15, six animals from each group were euthanized and the skin samples were separated for stereology examination and gene expression analysis by real-time polymerase chain reaction. In the CMâ€‰+â€‰PBMT, CM, and PBMT groups, significant decreases were induced in the number of neutrophils (1460â€‰Â±â€‰93, 1854â€‰Â±â€‰138, 1719â€‰Â±â€‰248) and macrophages (539â€‰Â±â€‰69, 804â€‰Â±â€‰63, 912â€‰Â±â€‰41), and significant increases in the number of fibroblasts (1073â€‰Â±â€‰116, 836â€‰Â±â€‰75, 912â€‰Â±â€‰41) and angiogenesis (15â€‰230â€‰Â±â€‰516, 13â€‰318â€‰Â±â€‰1116, 14â€‰041â€‰Â±â€‰867), compared with those of the control group (2690â€‰Â±â€‰371, 1139â€‰Â±â€‰145, 566â€‰Â±â€‰90, 12â€‰585â€‰Â±â€‰1219). Interestingly, the findings of the stereological examination in the CMâ€‰+â€‰PBMT group were statistically more significant than thoseÂ in the other groups. In the PBMT group, in most cases, the expression of bFGF, HIF-1Î±, and SDF-1Î±, on day 4 (27.7â€‰Â±â€‰0.14, 28.8â€‰Â±â€‰0.52, 27.5â€‰Â±â€‰0.54) and day 7 (26.8â€‰Â±â€‰1.4, 29.6â€‰Â±â€‰1.4, 28.3â€‰Â±â€‰1.2) were more significant than thoseÂ in the control (day 4, 19.3â€‰Â±â€‰0.42, 25.5â€‰Â±â€‰0.08, 22.6â€‰Â±â€‰0.04; day 7, 22.3â€‰Â±â€‰0.22, 28.3â€‰Â±â€‰0.59, 24.3â€‰Â±â€‰0.19) and other treatment groups. The application of PBMT + CM induced anti-inflammatory and angiogenic activities, and hastened wound healing process in a T1 DM model of MRSA infected wound.
Culture Media, Conditioned Animals;Bone Marrow Cells;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Methicillin-Resistant Staphylococcus aureus;Rats;Staphylococcal Infections;Wound Healing;Wound Infection

Self-assembly of porphyrin-grafted lipid into nanoparticles encapsulating doxorubicin for synergistic chemo-photodynamic therapy and fluorescence imaging. The limited clinical efficacy of monotherapies in the clinic has urged the development of novel combination platforms. Taking advantage of light-triggered photodynamic treatment combined together with the controlled release of nanomedicine, it has been possible to treat cancer without eliciting any adverse effects. However, the challenges imposed by limited drug loading capacity and complex synthesis process of organic nanoparticles (NPs) have seriously impeded advances in chemo-photodynamic combination therapy. In this experiment, we utilize our previously synthesized porphyrin-grafted lipid (PGL) NPs to load highly effective chemotherapeutic drug, doxorubicin (DOX) for synergistic chemo-photodynamic therapy. Methods: A relatively simple and inexpensive rapid injection method was used to prepare porphyrin-grafted lipid (PGL) NPs. The self-assembled PGL NPs were used further to encapsulate DOX via a pH-gradient loading protocol. The self-assembled liposome-like PGL NPs having a hydrophilic core were optimized to load DOX at an encapsulation efficiency (EE) of ~99%. The resultant PGL-DOX NPs were intact, highly stable and importantly these NPs successfully escaped from the endo-lysosomal compartment after laser irradiation to release DOX in the cytosol. The therapeutic efficacy of the aforementioned formulation was validated both in vitro and in vivo. Results: PGL-DOX NPs demonstrated excellent cellular uptake, chemo-photodynamic response, and fluorescence imaging ability in different cell lines. Under laser irradiation, cells treated with a low molar concentration of PGL-DOX NPs reduced cell viability significantly. Moreover, in vivo experiments conducted in a xenograft mouse model further demonstrated the excellent tumor accumulation capability of PGL-DOX NPs driven by the enhanced permeability and retention (EPR) effect. Through fluorescence imaging, the biodistribution of PGL-DOX NPs in tumor and major organs was also easily monitored in real time in vivo. The inherent ability of porphyrin to generate ROS under laser irradiation combined

with the cytotoxic effect of the anticancer drug DOX significantly suppressed tumor growth in vivo. Conclusion: In summary, the PGL-DOX NPs combined chemo-photodynamic nanoplatform may serve as a potential candidate for cancer theranostics. Antibiotics, Antineoplastic;Drug Carriers;Fluorescent Dyes;Liposomes;Porphyrins;Doxorubicin Animals;Antibiotics, Antineoplastic;Carcinoma;Cell Survival;Disease Models, Animal;Doxorubicin;Drug Carriers;Drug Therapy;Fluorescent Dyes;HeLa Cells;Heterografts;Humans;Liposomes;Low-Level Light Therapy;Mice;Nanoparticles;Neoplasm Transplantation;Optical Imaging;PC-3 Cells;Photochemotherapy;Porphyrins;Theranostic Nanomedicine;Treatment Outcome

A Biomimetic Gold Nanocages-Based Nanoplatform for Efficient Tumor Ablation and Reduced Inflammation. Gold nanocages (AuNCs), with high photothermal conversion efficiency and unique hollow interiors, have become a promising nanoplatform for synergistic phototheraml therapy (PTT)-chemotherapy. However, the insufficient tumor targeting, in vivo premature drug leakage and low drug loading efficiency responsible for the spatial-temporal un-synchronization of PTT-chemotherapy, as well as inflammatory response might compromise the anticancer treatment of AuNCs-based drug delivery systems. Methods: Cancer cell membrane (CCM)-coated AuNCs were developed to load anticancer drug doxorubicin (DOX@CAuNCs) by transmembrane ammonium sulfate gradient method. In vitro and in vivo analysis, including characterization, macrophage phagocytosis and tumor targeting capacity, near-infrared (NIR) laser-induced drug release, antitumor efficacy and inflammation response were systematically performed. Results: DOX@CAuNCs showed a high DOX loading capacity and on-demand NIR laser-triggered DOX release compared with CAuNCs passively loading DOX by electrostatic adsorption, a commonly used method to load drug to AuNCs. Meanwhile, in view of the properties of CCM coated on AuNCs, DOX@CAuNCs exhibited decreased macrophage phagocytosis, prolonged blood circulation and enhanced internalization by cancer cells, generating preferable tumor targeting ability. With these integrated advantages, DOX@CAuNCs demonstrated highly efficient and precise spatial-temporal synchronization of PTT-chemotherapy, achieving complete tumor ablation with no obvious side effects. Besides, coating with CCM significantly alleviated AuNCs-induced inflammatory response. Conclusion: This biomimetic AuNCs-based platform might be a prospective drug delivery system for precision PTT and chemotherapy, acquiring desired cancer treatment efficacy and low inflammatory response. Antineoplastic Agents;Drug Carriers;Gold;Doxorubicin Animals;Antineoplastic Agents;Biomimetic Materials;Carcinoma;Doxorubicin;Drug Carriers;Drug Therapy;Drug-Related Side Effects and Adverse Reactions;Gold;Hyperthermia, Induced;Inflammation;Liver Neoplasms;Low-Level Light Therapy;Mice, Inbred BALB C;Molecular Targeted Therapy;Nanoparticles;Neoplasms, Experimental;Phototherapy;Prospective Studies;Treatment Outcome

Photodynamic therapy at ultra-low NIR laser power and X-Ray imaging using Cu(3)BiS(3) nanocrystals. Materials with efficient potential in imaging as well as therapy are gaining particular attention in current medical research. Photodynamic therapy (PDT) has been recently recognized as a promising treatment option for solid tumors. Still, most of the nanomaterial-based PDT modules either employ an additional photosensitizer or require high power laser sources. Also, they suffer from a lack of responsiveness in the near-infrared (NIR) region. Nanomaterials that could realize PDT independently (without any photosensitizer), at safe laser dose and in the deep tissue penetrative NIR region would definitely be better solid tumor treatment options. Methods: Herein, Cu- and Bi-based bimetal chalcogenide (Cu(3)BiS(3)), with absorption in the NIR region was developed. High-performance PDT of cancer and high-contrast x-ray imaging of tumor were performed in vivo. Biocompatibility of the NCs was also assessed in vivo. Results: The highlight of the results was the realization of ultra-low dose NIR laser-mediated PDT, which has not been achieved before, leading to complete tumor regression. This could be a breakthrough in providing a pain- and scar-less treatment option,

especially for solid tumors and malignant/benign subcutaneous masses. Though the NCs are active in the photo-thermal therapy (PTT) regime as well, focus is given to the exciting aspect of extremely low power-induced PDT observed here. Conclusion: Their extended in vivo biodistribution with commendable hemo- and histo-compatibilities, along with imaging and multi-therapeutic capabilities, project these Cu(3)BiS(3) NCs as promising, prospective theranostic candidates.
Sulfides;Copper;Bismuth;bismuth sulfide Adenocarcinoma;Animals;Bismuth;Cell Line, Tumor;Copper;Disease Models, Animal;Heterografts;Humans;Low-Level Light Therapy;Mice, Inbred BALB C;Mice, Nude;Nanoparticles;Neoplasm Transplantation;Photochemotherapy;Radiography;Sulfides;Theranostic Nanomedicine;Treatment Outcome

Review of light parameters and photobiomodulation efficacy: dive into complexity. Photobiomodulation (PBM) therapy, previously known as low-level laser therapy, was discovered more than 50 years ago, yet there is still no agreement on the parameters and protocols for its clinical application. Some groups have recommended the use of a power density less than 100â€‰â€‰mW/cm2 and an energy density of 4 to 10â€‰â€‰J/cm2 at the level of the target tissue. Others recommend as much as 50â€‰â€‰J/cm2 at the tissue surface. The wide range of parameters that can be applied (wavelength, energy, fluence, power, irradiance, pulse mode, treatment duration, and repetition) in some cases has led to contradictory results. In our review, we attempt to evaluate the range of effective and ineffective parameters in PBM. Studies in vitro with cultured cells or in vivo with different tissues were divided into those with higher numbers of mitochondria (muscle, brain, heart, nerve) or lower numbers of mitochondria (skin, tendon, cartilage). Graphs were plotted of energy density against power density. Although the results showed a high degree of variability, cells/tissues with high numbers of mitochondria tended to respond to lower doses of light than those with lower number of mitochondria. Ineffective studies in cells with high mitochondrial activity appeared to be more often due to over-dosing than to under-dosing.
Animals;Cells, Cultured;Humans;Infrared Rays;Low-Level Light Therapy;Mice;Mitochondria;Radiation Dosage

Low-level laser therapy versus trunk stabilization exercises on sternotomy healing after coronary artery bypass grafting: a randomized clinical trial. The aim of this study was to investigate the effects of low-level laser therapy (LLLT) versus trunk stabilization exercises on sternotomy healing following coronary artery bypass grafting (CABG) surgery. Forty-five male patients who had acute sternal instability post-CABG surgery in the age range of 45-65Â years were divided randomly into three equal groups (nâ€‰=â€‰15). The laser group received LLLT, while the exercise group received trunk stabilization exercises. The control group only received a routine cardiac rehabilitation programme, which was also provided to both the laser and the exercise groups. All groups were offered 12 sessions over 4Â weeks. Sternal separation, median sternotomy photographic analysis, pain and activities of daily living (ADL) performance were evaluated pre- and post-treatment. Statistical significance was set at Pâ€‰<â€‰0.05. There was a significant decrease among the laser group in upper-sternal separation, while the exercise and control groups showed a non-significant decrease. In terms of mid-sternal separation, laser and exercise groups showed a significant decrease while the control group showed a non-significant decrease. In terms of lower-sternal separation, the exercise group showed a significant decrease, while the laser and control groups showed a non-significant decrease. Post-treatment between-groups analysis showed a significant difference only among the laser and control groups with regard to upper-sternal separation, while analysis of the laser, exercise and control groups in the case of upper-sternal separation and the between-groups comparison in terms of mid- and lower-sternal separation revealed no significant differences. LLLT and trunk stabilization exercises were found to be the most effective methods for sternotomy healing

post-CABG surgery, with LLLT offering superior performance in the case of the upper sternum while trunk stabilization exercises were more effective for the lower sternum. Activities of Daily Living;Aged;Coronary Artery Bypass;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Physical Therapy Modalities;Sternotomy;Sternum;Torso;Visual Analog Scale;Wound Healing

IUGA committee opinion: laser-based vaginal devices for treatment of stress urinary incontinence, genitourinary syndrome of menopause, and vaginal laxity. This committee opinion reviews the laser-based vaginal devices for treatment of genitourinary syndrome of menopause, vaginal laxity, and stress urinary incontinence. The United States Food and Drug Administration has issued a warning for unsubstantiated advertising and use of energy-based devices. Well-designed case-control studies are required to further investigate the potential benefits, harm, and efficacy of laser therapy in the treatment of genitourinary syndrome of menopause, vaginal laxity, and stress urinary incontinence. The therapeutic advantages of nonsurgical laser-based devices in urogynecology can only be recommended after robust clinical trials have demonstrated their long-term complication profile, safety, and efficacy. Atrophy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Menopause;Syndrome;Urinary Incontinence, Stress;Vagina;Vaginal Diseases;Vulva

Ensuring precise beard and eyebrow shaping with laser: Innovative use of tongue depressor. Cosmetic Techniques;Eyebrows;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male

Photobiomodulation at Multiple Wavelengths Differentially Modulates Oxidative Stress In Vitro and In Vivo. Photobiomodulation (PBM) is emerging as an effective strategy for the management of multiple inflammatory conditions, including oral mucositis (OM) in cancer patients who receive chemotherapy or radiotherapy. Still, the poor understanding of the mechanisms by which the light interacts with biological tissues and the heterogeneity of light sources and protocols employed worldwide significantly limits its applicability. Reactive oxygen species (ROS) are massively generated during the early phases of OM and play a major role in the pathogenesis of inflammation in general. Here, we report the results of a clinical and experimental study, aimed at evaluating the effect of laser light at different wavelengths on oxidative stress in vivo in oncologic patients suffering from OM and in vitro in two cell types abundantly present within the inflamed oral mucosa, neutrophil polymorphonuclear (PMN) granulocytes, and keratinocytes. In addition to standard ROS detection methods, we exploited a roGFP2-Orp1 genetically encoded sensor, allowing specific, quantitative, and dynamic imaging of redox events in living cells in response to oxidative stress and PBM. We found that the various wavelengths differentially modulate ROS production. In particular, the 660â€‰nm laser light increases ROS production when applied either before or after an oxidative stimulus. In contrast, the 970â€‰nm laser light exerted a moderate antioxidant activity both in the saliva of OM patients and in both cell types. The most marked reduction in the levels of ROS was detected in cells exposed either to the 800â€‰nm laser light or to the combination of the three wavelengths. Overall, our study demonstrates that PBM exerts different effects on the redox state of both PMNs and keratinocytes depending on the used wavelength and prompts the validation of a multiwavelength protocol in the clinical settings. Adult;Aged;Aged, 80 and over;Female;Humans;Keratinocytes;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neutrophils;Oxidation-Reduction;Oxidative Stress;Stomatitis

Safety and Efficacy of Low-Level Laser Therapy in Autoimmune Thyroiditis: Long-Term Follow-Up Study. INTRODUCTION: A randomized clinical trial (RCT) was performed to evaluate the efficacy of low-level laser therapy (LLLT) for hypothyroidism induced by chronic autoimmune thyroiditis (CAT). OBJECTIVE: The objective was to assess the safety and actions of LLLT 6 years after completion of the RCT. MATERIALS AND METHODS: Forty-three participants were invited to participate in this study 6

years after completion of the RCT. Twenty-five were subjected to LLLT (group L), and 18 were subjected to placebo (group P). Primary outcome measure: frequency of thyroid nodules, which were subjected to fine-needle aspiration biopsy. Secondary outcome measures: dose of levothyroxine required to treat hypothyroidism, thyroid peroxidase antibodies (anti-TPO), and anti-thyroglobulin antibodies (anti-Tg). RESULTS: In group L, a nodule was observed in three patients, who all had a Bethesda II classification. In group P, a nodule was also observed in three patients, with two classified as Bethesda II and one as Bethesda III. The levothyroxine dose required by group L was significantly lower than that required by group P (P = 0.002). The anti-TPO and anti-Tg levels did not differ between the groups. CONCLUSION: LLLT, by the methods described, has been shown to be safe for the treatment of hypothyroidism resulting from CAT. This trial is registered with ClinicalTrials.gov Identifier: NCT02240563.

Laser Acupuncture in Open-Angle Glaucoma Treatment: A Retrospective Study of Eye Blood Flow. Patients with glaucoma can show blood flow anomalies at the eye vesselÂ level. A causal relationship is reasonably expected, butÂ so far, it has not been demonstrated. Traditional Chinese medicine indicates that acupuncture can promote specific blood perfusion in specific body districts. Ninety-eight patients with open-angle glaucoma were treated with an ultralow light-level laser, according to a specific acupuncture protocol, and their blood flow was measured before and after a six-week treatment cycle. Doppler measurements showed significant modifications in both pulsatility and resistivity indexes. The most relevant outcome of this study is that the applied treatment demonstrated its effectiveness not only in vasodilation butÂ alsoÂ in perfusion control that seems to restore appropriate functionality. The protocol therefore should be investigated in future controlled studies and perhaps in other blood perfusion-related pathologies. Acupuncture Points;Acupuncture Therapy;Adult;Aged;Aged, 80 and over;Blood Flow Velocity;Eye;Female;Glaucoma, Open-Angle;Hemodynamics;Humans;Male;Middle Aged;Regional Blood Flow;Retrospective Studies;Treatment Outcome;Young Adult

Low-level light-assisted photodynamic therapy using a wearable cap-like device for the treatment of actinic keratosis of the scalp. BACKGROUND: Daylight photodynamic therapy (dlPDT) is a painless and increasingly cost-effective treatment for actinic keratosis (AK). New protocols avoid incubation, minimizing pain and adverse events. However, it is time-consuming and dependent on specific weather conditions. In patients with AK of the scalp, we evaluated the efficacy of indoor photodynamic therapy (PDT) using a wearable low-level light therapy (LLLT) device, without pre-incubation with a photosensitizing agent. METHODS: In this pilot study, 27 patients with thin and moderately thick AK (Olsen Grades I-II) underwent a single 15-minute session of LLLT using a wearable cap-like device immediately after application of methyl-aminolevulinate (MAL) cream, with no prior preparation of the affected area. Treatment efficacy was quantified by measuring the reduction in AK lesion number and the AK quality of life (AKQoL) score. All AK lesions were mapped at baseline for follow-up 2 months later. Paired pre/post scalp biopsies from 5 patients were analysed using histological and immunohistochemical techniques (p53, p27, cyclin D1, p63, and Ki67 expression). Data were analysed using the Wilcoxon signed-rank test. RESULTS: In all patients we observed a global reduction in the number of AK lesions (71%; pâ€‰<â€‰0.0001) and AKQoL score (from 5.6 to 4.4; pâ€‰=â€‰0.034) 2 months after treatment. Histology and immunohistochemistry of skin biopsies from 5 patients also revealed marked improvements after LLLT. No patients reported any pain during treatment. CONCLUSION: PDT using LLLT is a rapid, painless, and efficacious modality for the treatment of AK. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Aged;Aged, 80 and over;Aminolevulinic Acid;Combined Modality Therapy;Female;Humans;Keratosis, Actinic;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Pilot Projects;Prospective Studies;Scalp Dermatoses;Severity of Illness Index

Image Gallery: Cutaneous lesions of Erdheim-Chester disease treated with carbon dioxide laser therapy. Erdheim-Chester Disease;Face;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases;Treatment Outcome

A Protocol for Transcranial Photobiomodulation Therapy in Mice. Transcranial photobiomodulation is a potential innovative noninvasive therapeutic approach for improving brain bioenergetics, brain function in a wide range of neurological and psychiatric disorders, and memory enhancement in age-related cognitive decline and neurodegenerative diseases. We describe a laboratory protocol for transcranial photobiomodulation therapy (PBMT) in mice. Aged BALB/c mice (18 months old) are treated with a 660 nm laser transcranially, once daily for 2 weeks. Laser transmittance data shows that approximately 1% of the incident red light on the scalp reaches a 1 mm depth from the cortical surface, penetrating the dorsal hippocampus. Treatment outcomes are assessed by two methods: a Barnes maze test, which is a hippocampus-dependent spatial learning and memory task evaluation, and measuring hippocampal ATP levels, which is used as a bioenergetics index. The results from the Barnes task show an enhancement of the spatial memory in laser-treated aged mice when compared with age-matched controls. Biochemical analysis after laser treatment indicates increased hippocampal ATP levels. We postulate that the enhancement of memory performance is potentially due to an improvement in hippocampal energy metabolism induced by the red laser treatment. The observations in mice could be extended to other animal models since this protocol could potentially be adapted to other species frequently used in translational neuroscience, such as rabbit, cat, dog, or monkey. Transcranial photobiomodulation is a safe and cost-effective modality which may be a promising therapeutic approach in age-related cognitive impairment. Aging;Animals;Cognition;Cognitive Dysfunction;Hippocampus;Low-Level Light Therapy;Maze Learning;Memory Disorders;Mice;Mice, Inbred BALB C;Organ Culture Techniques;Spatial Memory

Low-Level Laser Therapy Prevents Treadmill Exercise-Induced Progression of Arthrogenic Joint Contracture Via Attenuation of Inflammation and Fibrosis in Remobilized Rat Knees. We investigated whether the combination of exercise and anti-inflammatory/anti-fibrotic treatment using low-level laser therapy (LLLT) promotes recovery from joint contracture without arthrogenic contracture progression. Rat knees were immobilized for 3Â weeks in a flexed position. After fixator removal, rats were divided into no intervention (RM), daily treadmill walking (WALK), and daily treadmill walking and LLLT (Wâ€‰+â€‰L) groups. Total and arthrogenic contractures were assessed by restrictions of passive range of motion (ROM) before (m-ROM) and after myotomy (a-ROM), respectively. After 7Â days of remobilization, m-ROM restriction decreased equally in all groups. Conversely, a-ROM restriction further increased after remobilization in the RM and WALK groups. Furthermore, this restriction was significantly larger in the WALK group compared with the RM group. In the Wâ€‰+â€‰L group, however, progression of a-ROM restriction during remobilization was prevented. After 1 or 7Â days of remobilization, inflammatory and fibrotic reactions in the joint capsule were induced in the RM group and were more pronounced in the WALK group, but these reactions were milder in the Wâ€‰+â€‰L group than in the WALK group. m-ROM restriction representing total contracture initially established by immobilization was partially improved by remobilization. Additional LLLT and exercise intervention did not further reduce total contracture, but LLLT suppressed the progression of arthrogenic contracture caused by ambulation and treadmill exercise. Therefore, exercise with LLLT in the early phase of remobilization would be one possible adjunct therapy to prevent further progression of arthrogenic contracture. Animals;Contracture;Disease Progression;Fibrosis;Inflammation;Knee Joint;Low-Level Light Therapy;Muscle Strength;Myotomy;Physical Conditioning, Animal;Range of Motion, Articular;Rats

Association of facial massage, dry needling, and laser therapy in Temporomandibular Disorder: case report. This case report aims to evaluate the treatment of Temporomandibular Disorder (TMD)

of muscular origin by associating facial massage (FM), dry needling (DN), and low-level laser therapy (LLLT). The pre- and post-treatment evaluations consisted of clinical examinations based on the Research Diagnostic Criteria (RDC) for TMD, pain intensity quantification by means of the Visual Analog Scale (VAS), mandibular movement measurement, and electromyographic (EMG) analysis of the masseter and temporal muscles. Post-therapy assessment indicated a decrease in pain sites of 58%, in pain intensity mean (1.3), and an increase in the maximum aperture of 10 mm, in addition to normalization of EMG signals. We conclude that, after application of the treatment protocol, there was a decrease in painful sites, gain in amplitude of mandibular movements, and normalization of EMG activity. Adult;Combined Modality Therapy;Complementary Therapies;Electromyography;Facial Muscles;Facial Pain;Female;Humans;Low-Level Light Therapy;Massage;Needles;Pain Measurement;Reproducibility of Results;Temporomandibular Joint Disorders;Treatment Outcome

Low-Level Laser Treatment Is Ineffective for Capsular Contracture: Results of the LaTCon Randomized Controlled Trial. BACKGROUND: Breast reconstruction with implants can be complicated by symptomatic capsular contracture, especially after radiotherapy. A phase I, nonrandomized clinical trial demonstrated improvement in capsular contracture and avoidance of revision surgery with low-level laser therapy. This phase II, double-blind, randomized controlled trial assessed the efficacy of low-level laser for treating capsular contracture in women with breast reconstruction following mastectomy for breast cancer. METHODS: Participants had completed their definitive implant-based reconstruction a minimum of 6 months previously and were randomized to weekly treatments over 6 weeks with either an active or inactive low-level laser handpiece (Riancorp LTU-904). Pain, tightness, arm movement, and appearance were assessed by patient questionnaires. Breast symmetry, shape, naturalness, softness, and grade of contracture were assessed by clinician reports. Participants were assessed at 1 and 6 months after completion of the treatments. RESULTS: A total of 42 patients (intervention arm, n = 20; placebo, n = 22) were assessed in the trial. Thirty-two had postmastectomy radiotherapy. There was no significant difference in the change in any patient-reported outcomes or clinician-reported outcomes of breast symmetry, shape, or naturalness for the two groups. There was a significantly greater improvement in clinician-reported breast softness ($p < 0.05$) and degree of contracture ($p < 0.05$) in the placebo group at both 1- and 6-month follow-up. CONCLUSION: Low-level laser is not an effective therapy for breast implant capsular contracture in reconstruction patients. CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, I. Adult;Breast Implantation;Double-Blind Method;Female;Follow-Up Studies;Humans;Implant Capsular Contracture;Low-Level Light Therapy;Middle Aged;Multivariate Analysis;Treatment Outcome

Does Low-Level Laser Therapy Affect Recovery of Lingual and Inferior Alveolar Nerve Injuries? PURPOSE: Iatrogenic damage to the inferior alveolar nerve (IAN) and lingual nerve (LN) may occur during routine oral and maxillofacial surgery procedures. The primary aim of this study was to determine, using a prospective, double-blind, randomized controlled clinical trial, whether the proportion of nerve-injured patients with postoperative neurosensory improvement over a 3-month period differed significantly between a control group and a low-level laser therapy (LLLT) group. PATIENTS AND METHODS: The study sample consisted of 35 patients with iatrogenic nerve injury due to third molar odontectomy, dental implant placement, or local anesthetic injection. The investigators used a randomized, double-blind laser delivery system to administer either placebo or LLLT to patients who met the inclusion criteria. The outcome variable of neurosensory improvement was defined as a minimum 1-unit increase from baseline in visual analog scale rating and was based on standard objective clinical neurosensory testing. Study variables included the affected nerve (IAN or LN) and time from injury to treatment (3 to 12Â months or >12Â months). Univariate statistical analysis (Ï‡(2) test) was performed to determine significance between the groups. RESULTS:

Neurosensory improvement was observed in 46.7% of the LLLT patients, who showed at least a 1-unit improvement at 3Â months, compared with 38.5% improvement for controls (PÂ =Â .66), regardless of the specific nerve involved (IAN or LN). In addition, no observed difference was noted between the study groups based on time from injury to treatment. CONCLUSIONS: This study failed to provide sufficient evidence to conclude that a difference in neurosensory improvement exists between the LLLT and placebo groups with IAN or LN injuries. However, this study is unique in the prospective double-blind study design and comprehensive neurosensory testing protocols. There is a continued need for further clinical studies on LLLT in oral and maxillofacial surgery nerve injuries. Adult;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Postoperative Complications;Prospective Studies;Treatment Outcome;Trigeminal Nerve Injuries

Treatment of Chemotherapy-Induced Peripheral Neuropathy: Systematic Review and Recommendations. BACKGROUND: Chemotherapy-induced peripheral neuropathy (CIPN) is a commonly encountered disease entity following chemotherapy for cancer treatment. Although only duloxetine is recommended by the American Society of Clinical Oncology (ASCO) for the treatment of CIPN in 2014, the evidence of the clinical outcome for new pharmaceutic therapies and non-pharmaceutic treatments has not been clearly determined. OBJECTIVE: To provide a comprehensive review and evidence-based recommendations on the treatment of CIPN. STUDY DESIGN: A systematic review of each treatment regimen in patients with CIPN. METHODS: The literature on the treatment of CIPN published from 1990 to 2017 was searched and reviewed. The 2011 American Academy of Neurology Clinical Practice Guidelines Process Manual was used to grade the evidence and risk of bias. We reviewed and updated the recommendations of the ASCO in 2014, and evaluated new approaches for treating CIPN. RESULTS: A total of 26 treatment options in 35 studies were identified. Among these, 7 successful RCTs, 6 failed RCTs, 18 prospective studies, and 4 retrospective studies were included. The included studies examined not only pharmacologic therapy but also other modalities, including laser therapy, scrambler therapy, magnetic field therapy and acupuncture, etc. Most of the included studies had small sample sizes, and short follow-up periods. Primary outcome measures were highly variable across the included studies. No studies were prematurely closed owing to its adverse effects. LIMITATIONS: The limitations of this systematic review included relatively poor homogeneous, with variations in timing of treatment, primary outcomes, and chemotherapeutic agents used. CONCLUSION: The evidence is considered of moderate benefit for duloxetine. Photobiomodulation, known as low level laser therapy, is considered of moderate benefit based on the evidence review. Evidence did not support the use of lamotrigine and topical KA (4% ketamine and 2% amitriptyline). The evidence for tricyclic antidepressants was inconclusive as amitriptyline showed no benefit but nortriptyline had insufficient evidence. Further research on CIPN treatment is needed with larger sample sizes, long-term follow-up, standardized outcome measurements, and standardized treatment timing. KEY WORDS: Chemotherapy-induced neuropathy, peripheral neuropathy, chemotherapy-tumor, neuropathic pain, chronic pain, toxicology, treatment, reduction of pain, level of evidence. Antineoplastic Agents Adult;Antineoplastic Agents;Humans;Neuralgia;Pain Management;Peripheral Nervous System Diseases;Prospective Studies;Retrospective Studies

Low level laser therapy (LLLT) modulates ovarian function in mature female mice. It is known that LLLT has beneficial effects on several pathological conditions including wound healing, pain and inflammation. LLLT modulates biological processes, including cell proliferation, apoptosis and angiogenesis. In the present study, we examined the effect of local application of LLLT on follicular dynamics, ovarian reserve, AMH expression, progesterone levels, apoptosis, angiogenesis, and reproductive outcome in adult mice. LLLT (200â€¯J/cm(2)) increased the percentage of primary and

preantral follicles, whilst decreasing the percentage of corpora lutea compared to control ovaries. LLLT-treated ovaries did not exhibit any changes regarding the number of primordial follicles. We observed a higher percentage of AMH-positive follicles (in early stages of development) in LLLT-treated ovaries compared to control ovaries. LLLT reduced the P(4) concentration and the apoptosis in early antral follicles compared to control ones. LLLT caused a reduction in the endothelial cell area and an increase in the periendothelial cell area in the ovary. Additionally, LLLT was able to improve oocyte quality. Our findings suggest that local application of LLLT modulates follicular dynamics by regulating apoptosis and the vascular stability in mouse ovary. In conclusion, these data indicate that LLLT might become a novel and useful tool in the treatment of several pathologies, including female reproductive disorders. Progesterone;Anti-Mullerian Hormone Animals;Anti-Mullerian Hormone;Apoptosis;Cell Line;Cell Proliferation;Corpus Luteum;Female;Fertilization in Vitro;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Mice, Inbred C57BL;Neovascularization, Physiologic;Ovarian Follicle;Ovary;Progesterone;Superovulation

Post Filler Ecchymosis Resolution With Intense Pulsed Light. Bruising after dermal filler and neuromodulator injections is a common side effect and can have durations of 1 to 2 weeks. While it ultimately resolves, faster resolution can produce better outcomes for patients and also make patients more likely to return for future treatments. We report the successful reduction in bruising following injections of fillers with an intense pulsed light source. We also documented the onset of action of bruising resolution with serial photographs. Resolution started within the first hour of treatment and continued rapidly over 48 hours. This is the first-time reported study of resolution of bruising from injectables with intense pulsed light. Patient satisfaction is improved when such adverse events are minimized. Dermal Fillers Cosmetic Techniques;Dermal Fillers;Ecchymosis;Humans;Injections, Subcutaneous;Intense Pulsed Light Therapy;Lasers, Dye;Low-Level Light Therapy;Patient Satisfaction;Photography;Rejuvenation;Skin Aging;Treatment Outcome

A Comparative Split-Face Trial of Plant-Based Hypoallergenic Ointment vs Petroleum-Based Ointment Following Fractionated Carbon Dioxide Laser Resurfacing of the Face. Purpose: Fractionated carbon dioxide (CO2) laser resurfacing uses fractional photothermolysis with an ablative 10,600-nm wavelength for treatment of rhytides and photodamage. Although associated with reduced side effect profile from traditional ablative lasers, fractionated lasers can lead to significant erythema, edema, crusting, and exudation for 14 days. Post-care includes regular distilled water soaks and healing ointment. This study evaluated efficacy and patient satisfaction of a novel plant-based hypoallergenic ointment (Doctor Rogers RESTOREÂ®Healing Balm; Product 1) compared to petroleum-based lanolin-containing ointment (AquaphorÂ® Healing Ointment; Product 2) to accelerate wound healing post-laser resurfacing of the face. Design: This was a single-center, prospective randomized, double-blinded, split-face comparative study of 10 subjects with photo-aging and rhytids who received treatment with fractionated CO2 laser between September 2017 and January 2018. Product 1 and Product 2 were randomized to each half of the face and applied from days 0 to 7 with an option to continue to day 14. The primary outcome measures were Investigator-rated degree of erythema, edema, crusting, exudation, and percentage healing, with follow-up evaluations performed at days 2, 4, 7, 14, and 30. The secondary outcome measure was patient satisfaction. Summary: Based on investigator post-resurfacing scores, day 4 showed improved erythema (50%), edema (50%), crusting (40%), and percentage healing (60%) on the Product 1-treated side compared to Product 2, with the majority of remaining patients scoring the same as Product 2. On day 14, Product 1 demonstrated improvement in erythema (50%), edema (30%), and percentage healing (30%) compared to Product 2, with all remaining patients scoring the same as Product 2. Crusting was the same between the two products on day 14. Ninety percent of patients preferred Product 1 over Product 2, found it easier to use, and were more likely to use it in the

future. Conclusion: Product 1 is a plant-based hypoallergenic ointment that is safe and effective post-laser treatment and is associated with high patient satisfaction and preference. Ointments;Petroleum;Plant Extracts Administration, Cutaneous;Aged;Edema;Erythema;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Ointments;Patient Satisfaction;Petroleum;Plant Extracts;Prospective Studies;Rejuvenation;Skin Aging;Treatment Outcome;Wound Healing

Integrated Cooling-Vacuum-Assisted Non-Fractional 1540-nm Erbium:Glass Laser: A New Modality for the Simultaneous Effective Treatment of Acne Lesions and Scars. Introduction: Acne vulgaris is a common skin disorder with a significant impact on patients' quality of life. There is currently no treatment designated to treat acne lesions and scars concurrently. However, mid-infrared lasers may promote neocollagenesis within atrophic scars, while exerting a beneficial effect on acne lesions. Objectives: To determine the safety and efficacy of an integrated cooling-vacuum-assisted non-fractional 1540-nm Erbium:Glass laser for the treatment of acne lesions and scars. Patients and Methods: Twenty-two patients (8 male, 14 female) with mild-to-moderate acne and moderate-to-severe acne scars were included. Patients were treated using a non-fractional 1540-nm Er:Glass laser (Harmony XLâ„¢, Alma Lasers Ltd.). Acne lesions and scars were exposed to 3-4 stacked pulses emitted at a rate of 3Hz for up to two passes per treatment session (spot size, 4 mm; fluence, 400-600 mJ/pulse), receiving overall 3-7 treatments with 2-3-week intervals. Patients were followed-up one and three months following their last treatment. Clinical evaluation including (i) overall aesthetic appearance, (ii) acne lesions, and (iii) acne scars, assessed independently by two dermatologists and graded on a scale of 0 (exacerbation) to 4 (76-100 percent improvement); and (iv) pain perception, adverse effects and patientsâ€™ satisfaction. Results: All but one patient completed treatment and follow-up and had moderate-to-significant improvement in all outcomes (overall aesthetic appearance, mean 3.9 [1 month] and 3.75 [3 month] improvement; acne lesions, 3.5 [1 month] and 2.3 [3 month] improvement; scarring 4 [1 month] and 4.2 [3 month] improvement). Pain and adverse effects were mild and transient. Patients' mean satisfaction was 4.2. Conclusion: Cooling-vacuum-assisted 1540 nm laser is a safe and effective modality for the simultaneous treatment of acne lesions and scars. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain;Patient Satisfaction;Quality of Life;Severity of Illness Index;Treatment Outcome;Young Adult

[The application of combined low-intensity laser therapy for the treatment of the patients presenting with trophic ulcers associated with chronic venous insufficiency of the lower extremities]. AIM: The objective of the present study was the evaluation of the effectiveness of the combined treatment of the patients presenting with trophic ulcers associated with chronic venous insufficiency of the lower extremities of venous etiology with the application of low-intensity laser therapy (LILT) at different wavelengths. MATERIAL AND METHODS: The study included the patients presenting with chronic venous insufficiency (CVI) (class C6 in accordance with the CEAP clinical classification). The ultrasonic Doppler examination (USDG) of the lower extremities revealed valvular insufficiency in the saphenous veins in 98.8% of the examined patients, in the deep venous system in 58% of them, and in the perforating veins in 72% of the cases. The laser Doppler flowmetry technique was used to assess the state of the microcirculation. Group 1 was comprised of 34 (43.59%) patients undergoing the traditional conservative treatment that consisted of pharmacotherapy (including antibiotic therapy, depending on the sensitivity of microflora assessed by the culture technique), the local treatment in the form of dressing in compliance with the standard surgical treatment schemes depending on the phase of the wound healing process, and elastic compression of the lower extremities. The main group 2 consisted of 44 patients (56.41%) who were treated, in addition to the traditional conservative therapy, with the use of LILT according to the new technique that combines

the external laser exposure of the trophic ulcer region using the 'LASMIK' laser device during a single 2 minute session per zone in the pulsed mode (light pulse duration of 100-130 ns, frequency 80 Hz), at a wavelength of 635 nm, by a matrix emitter (consisting of eight laser diodes with the surface area of 8 cm(2)), at a distance up to 7 cm, with pulsed power of 40 W, power density of 5 W/cm(2), and the intravenous laser blood illumination (fiber output power 2 mW) with a wavelength of 365 nm (UV range) and 525 nm (green spectrum) alternately, every other day. Each patient underwent 12 daily procedures per course. RESULTS: Combined low-intensity laser therapy promoted the rapid recovery of the sympathetic regulation of the microvascular tone and normalization of arteriolar-venular relationships which contributed to the improvement of blood supply to the tissues, the reduction of inflammation, enhanced activation of the reparative processes, and acceleration of epithelialization of trophic ulcerous defects. CONCLUSION: The combined strategy makes it possible to carry out the more effective treatment of the patients presenting with trophic ulcers with the three-fold reduction of the ulcer healing time and the pronounced stimulation of the persistent adaptation of the physiological responses preventing the development of the relapses. Chronic Disease;Humans;Laser Therapy;Lower Extremity;Treatment Outcome;Varicose Ulcer;Venous Insufficiency

Photobiomodulation Improved the First Stages of Wound Healing Process After Abdominoplasty: An Experimental, Double-Blinded, Non-randomized Clinical Trial. BACKGROUND: Photobiomodulation is widely studied for its potential benefits in the wound healing process. Numerous scientific studies have highlighted its effect on various phases of wound repair, but clinical validations are few. This comparative trial aims to evaluate the influence of photobiomodulation on the post-abdominoplasty healing process. METHODS: Seventeen Caucasian women (aged 18-55) who underwent an abdominoplasty were enrolled in this double-blinded, controlled clinical trial. The postoperative scars were divided into two areas; the right side of the scars was treated with ten sessions of photobiomodulation (consisting in three types of wavelengths). The other part of the scars was used as control and did not receive any additional treatment. Clinical assessments of both parts of the scars were scheduled at 1, 6 and 12Â months postoperative. RESULTS: Within six months following surgery, significantly improved quality of the scars on the treated side compared with the untreated side was reported by patients and experienced professionals according to Vancouver Scar Scale, Patient and Observer Scar Assessment Scale (pâ€‰<â€‰0.05) and standardized photographs (pâ€‰<â€‰0.05). At 1Â year of follow-up, patients observed no differences between the treated and untreated sides of the scars. This suggests that photobiomodulation appears to play an early role in the wound healing process, accelerating the first stages of cicatrization. CONCLUSION: This study statistically validates the positive impact of photobiomodulation treatment on the first stages of the postoperative healing process. Carried out on Caucasians participants only, this study should, however, be performed on a more heterogeneous population to definitively confirm these effects on an international population. CLINICAL TRIAL REGISTRY: Registro Brasileiro de ensaios clÃ-nicos: http://www.ensaiosclinicos.gov.br , Trial RBR-49PK78. LEVEL OF EVIDENCE II: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Immunologic Factors Abdominoplasty;Adolescent;Adult;Brazil;Cicatrix;Double-Blind Method;Esthetics;Female;Follow-Up Studies;Hospitals, Public;Humans;Immunologic Factors;Middle Aged;Observer Variation;Phototherapy;Postoperative Care;Reference Values;Treatment Outcome;Wound Healing

Hybrid Fractional Laser: A Multi-Center Trial on the Safety and Efficacy for Photorejuvenation. BACKGROUND: Laser skin resurfacing has continued to evolve over the past two decades. One of the most recent advances included a hybrid fractional laser resurfacing system that can sequentially

utilize two wavelengths in its delivery, non-ablative coagulation with 1470 nm, and ablative vaporization with 2940 nm. The 1470 nm laser wavelength is absorbed by water, which is ideal for creating controlled zones of coagulation to chosen depths into the dermis up to 700 micrometers. The 2940 nm laser wavelength has a large water absorption coefficient, which results in precise ablation as desired in the epidermis up to 110 micrometers. This combination allows for fractionated non-ablative and ablative skin resurfacing simultaneously resulting in a cosmetic improvement in pigmentation, tone, texture of skin as well as other effects of photoaging. METHODS: Open-label prospective, multi-center study in which 34 female subjects were enrolled with Fitzpatrick skin types I-IV, mean age of 52 Â± 14 years. Each subject underwent two treatments, spaced 4-6 weeks apart. Follow up visits at 1 week, 2 weeks, and 1, 2, and 3 months after the first treatment. Photographs, numeric pain scores during treatment, and subject satisfaction survey questionnaires were evaluated. Photographs were analyzed by six blinded evaluators. The primary endpoint was to evaluate safety and efficacy of hybrid laser treatments for photodamage and dyschromia. The secondary endpoints included evaluating the tolerability of the treatment using the Wong Baker Face scale and patient satisfaction survey results. RESULTS: Of the 29 subjects completing the study, 80% showed significant skin improvement on photographic analysis. Average numeric pain score was a 4 on a 0-10 scale. Survey results showed 100% satisfaction with treatment and achieved results. Two patients experienced post-inflammatory hyperpigmentation that resolved within 90 days. No other adverse events were reported. CONCLUSION: The non-ablative and ablative hybrid fractional laser can be used to safely and efficaciously treat photodamaged skin with high patient satisfaction and minimal adverse events. J Drugs Dermatol. 2018;17(11):1164-1168. Facial Dermatoses;Female;Florida;Humans;Lasers, Solid-State;Low-Level Light Therapy;Maryland;Middle Aged;Pain, Postoperative;Patient Satisfaction;Prospective Studies;Rejuvenation;Skin Aging;Treatment Outcome

Treatment of poikiloderma of Civatte using a redesigned pulsed dye laser with a 15â€‰mm diameter treatment spot. OBJECTIVES: The pulsed-dye laser has long been a gold standard in the treatment of poikiloderma of Civatte. Recent advances in pulsed dye laser technology enable output energies 50% higher, enabling beam diameters of up to 15â€‰mm with clinically relevant fluences. In this study, we investigate this new laser for treatment of this condition. MATERIALS AND METHODS: Twenty subjects were enrolled in the study. A total of four treatments were administered at monthly intervals. Blinded assessment of digital, cross-polarized photographs taken at baseline and two months following the last treatment was performed by blinded physician raters using an 11-point clearance scale. Subject reported pain scores immediately following treatment and side effects at all visits were recorded by the investigator. RESULTS: Seventeen subjects completed the study. Blinded reviewers correctly identified the baseline photo in 48 of 51 cases (94%). All three reviewers mis-identified the same subjects. The blinded reviewers scored 14 out of the 17 subjects with an improvement greater than 40% and 10 out of the 17 subjects greater than 50%. Average improvement was 49% for all 17 subjects. Side effects were limited to mild edema, and mild to moderate erythema and purpura. Pain scores averaged 3.5 on using an 11-point scale. CONCLUSION: This study demonstrates the safety and effectiveness of a new pulsed-dye laser with a 15â€‰mm spot and 50% higher fluences for the treatment of poikiloderma of Civatte. Lasers Surg. Med. 51:54-58, 2019. Â© 2018 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Adult;Aged;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Neck;Pigmentation Disorders;Telangiectasis

Clinical benefit of using a multifractional Er:YAG laser combined with a spatially modulated ablative (SMA) module for the treatment of striae distensae: A prospective pilot study in 20 patients. BACKGROUND AND OBJECTIVE: Striae distensae (SD) are cutaneous lesions that often occur on the

breasts, abdomen, hips, and thighs. The aim of this study is to evaluate the effectiveness of a new technique using a non-invasive Er:YAG laser combined with Spatially Modulated Ablation (SMA) module for the treatment of SD. STUDY DESIGN/MATERIALS AND METHODS: This prospective pilot clinical study included 20 patients with skin phototypes I to IV who are affected by SD. The Er:YAG 2940â€‰nm laser with SMA module was used in scanning mode with fluences of 2.3â€‰J/cm(2) , frequency of 3â€‰Hz, and pulse duration of 0.3 milliseconds. The laser beam is split into several microspots and penetrates only by 50â€‰Î¼m in the epidermis thickness. This technology induces also the generation of acoustic waves to stimulate tissue regeneration. Each patient underwent six laser sessions. An objective and subjective assessment of SD were used. All adverse events were reported. RESULTS: Most patients reported good improvement and expressed their satisfaction with the treatment. Cutometric analysis showed significant improvement in skin elasticity at the end of study. Moreover, ultrasound analysis revealed an increase in dermal thickness (Pâ€‰<â€‰0.01). POSAS scores decreased significantly at 3 and 6 months, reflecting improved skin quality. The average recovery time was 5 days, with no adverse effects reported. CONCLUSION: Using Er:YAG laser (2,940â€‰nm) with SMA technology to treat SD resulted in improved volume and textural appearance without side effects. The elasticity and thickness of the dermis also improved. The Er:YAG laser with SMA module may be considered as a novel and effective technique to treat SD lesions with minimal time recovery. Lasers Surg. Med. 51:230-238, 2019. Â© 2018 Wiley Periodicals, Inc. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pilot Projects;Prospective Studies;Striae Distensae;Treatment Outcome;Young Adult

"Let there be light." Research on phototherapy, light therapy, and photobiomodulation for healing - Alternative therapy becomes mainstream. Complementary Therapies;Humans;Phototherapy

Low-Level Laser Therapy and Electrotherapy for Neck Pain: "Clinical Practice Guideline for Physical Therapy Assessment and Treatment in Patients with Nonspecific Neck Pain," Bier JD, Scholten-Peeters WGM, Staal JB, et al. Phys Ther. 2018;98:162-171. Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Neck Pain

Treatment of oral manifestations of toxic epidermal necrolysis with low-level laser therapy in a pediatric patient. Drug-induced reactions are complications associated with high mortality and significant morbidity. Stevens-Johnson Syndrome (SJS) and toxic epidermal necrolysis (TEN) are examples of these conditions, which are characterized by skin and mucous lesions. Here, we report a case of a 9-year-old girl who presented with blisters associated with an extensive vesicular rash and multiple ulcerations on the lips and oral cavity. A drug-induced hypersensitivity reaction to antibiotics was suspected, and a diagnosis of TEN was made. The patient was managed with withdrawal of the suspected causative agent, and the oral lesions were treated with low-level laser therapy (LLLT) and oral hygiene. This case highlights that TEN requires interdisciplinary intervention with dental assistance and follow-up to improve symptoms, nutrition, systemic condition, and quality of life. Anti-Bacterial Agents Anti-Bacterial Agents;Child;Female;Humans;Low-Level Light Therapy;Mouth Diseases;Skin;Stevens-Johnson Syndrome

Photobiomodulation improves the frontal cognitive function of older adults. OBJECTIVES: The frontal lobe hypothesis of age-related cognitive decline suggests that the deterioration of the prefrontal cortical regions that occurs with aging leads to executive function deficits. Photobiomodulation (PBM) is a newly developed, noninvasive technique for enhancing brain function, which has shown promising effects on cognitive function in both animals and humans. This randomized, sham-controlled study sought to examine the effects of PBM on the frontal brain function of older adults. METHODS/DESIGNS: Thirty older adults without a neuropsychiatric history performed cognitive tests of frontal function (ie, the Eriksen flanker and category fluency tests)

before and after a single 7.5-minute session of real or sham PBM. The PBM device consisted of three separate light-emitting diode cluster heads (633 and 870Â nm), which were applied to both sides of the forehead and posterior midline, and delivered a total energy of 1349Â J. RESULTS: Significant group (experimental, control)Â Ã—Â time (pre-PBM, post-PBM) interactions were found for the flanker and category fluency test scores. Specifically, only the older adults who received real PBM exhibited significant improvements in their action selection, inhibition ability, and mental flexibility after vs before PBM. CONCLUSIONS: Our findings support that PBM may enhance the frontal brain functions of older adults in a safe and cost-effective manner.
Aged;Attention;Cognition;Executive Function;Female;Frontal Lobe;Humans;Low-Level Light Therapy;Male

Role of Stem Cells in the Pathogenesis of Chronic Obstructive Pulmonary Disease and Pulmonary Emphysema. There are only few human translational studies performed in the area of stem cell research in patients with chronic obstructive pulmonary disease (COPD) and/or pulmonary emphysema. Before progress to clinical trials with stem cells we strongly believe that more human translational studies are essential, otherwise, the clinical rationale would be solely based on limited in vitro and animal studies. In the future, stem cell therapy could be a treatment for this incurable disease. As of now, stem cell therapy is still to be considered as an area of active research, lacking any strong rationale for performing clinical trials in COPD. Although stem cells would be likely to represent a heterogeneous population of cells, the different cell subsets and their importance in the pathogenesis of the different clinical phenotypes need to be fully characterised before progressing to clinical trials. Moreover, the potential side effects of stem cell therapy are underestimated. We should not ignore that some of the most deadly neoplasms are arising from stem cells.
Animals;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Mice;Models, Animal;Pulmonary Disease, Chronic Obstructive;Pulmonary Emphysema;Smoking;Stem Cell Transplantation;Stem Cells;Translational Research, Biomedical

Does low-level laser therapy on degenerated ovine testes improve post-thawed sperm characteristics? Low-level laser therapy (LLLT) can modulate redox state of the cell which could be useful to treat testicular degeneration and also prevent injuries by sperm cryopreservation. The aim of this study was to evaluate the effects of LLLT treatment on semen cryopreservation from rams submitted or not to testicular degeneration by testicular insulation. Eleven White Dorper rams were divided into four groups: animals that were not insulated (Control) and not treated (No Laser) (nâ€‰=â€‰2); animals that were not insulated and treated with LLLT (nâ€‰=â€‰3); animals that were insulated and not treated with LLLT (nâ€‰=â€‰3), and animals that were insulated and treated with LLLT (nâ€‰=â€‰3). Testicular insulation was performed using scrotal insulation bags for 72Â h. LLLT treatment was 28Â J/cm(2) energy, 808Â nm of wavelength, and 30Â mW of power output, irradiated on testis for 15Â days with an interval of 48Â h. Three ejaculates from each ram were collected: before insulation, 23, and 59Â days after insulation bag removal. Cryopreservation was performed of the third ejaculate. Sperm evaluation was performed before and after cryopreservation considering sperm motility, morphology, acrosomal and plasma membrane integrity, mitochondrial potential, and oxidative stress. As expected, cryopreservation had a negative effect on several sperm motility characteristics and sperm membranes. LLLT treatment did not improve sperm quality from rams submitted to testicular insulation. Thus, testicular insulation and cryopreservation effects on spermatozoa were not attenuated by LLLT in this study. Reactive Oxygen Species Acrosome;Animals;Cell Membrane;Cryopreservation;Low-Level Light Therapy;Male;Membrane Potential, Mitochondrial;Mitochondria;Oxidative Stress;Reactive Oxygen Species;Semen;Semen Preservation;Sheep;Spermatozoa;Testis

White Spot Lesion Remineralisation Agents in Primary Teeth: A Systematic Review. PURPOSE: To perform a systematic review of articles related to the clinical efficacy of topical fluoride varnishes/gels, casein phosphopeptide-amorphous calcium phosphate (CPP-ACP), and other remineralisation agents of white spot lesions (WSL) in primary teeth. MATERIALS AND METHODS: Electronic and manual searches were conducted through diverse electronic databases. The search was limited to randomised, clinical, controlled trials, and quasi-experimental papers in full-text version. Suitable individual studies were evaluated through a previously reported quality system, their data extracted and carefully analysed. RESULTS: The search identified 298 citations, and 95 were chosen and reviewed in full text. Nine relevant citations met the eligibility criteria for inclusion in the systematic review. Pair comparisons were made between fluoride varnishes, CPP-ACP, dental lasers, and control interventions. CONCLUSIONS: Clinicians are encouraged to discuss more high-quality studies in order to provide sufficient evidence and to confirm the clinical utility of remineralisation agents of WSL in primary teeth. Cariostatic Agents;Caseins;Fluorides, Topical;Pit and Fissure Sealants;casein phosphopeptide-amorphous calcium phosphate nanocomplex Cariostatic Agents;Caseins;Dental Caries;Fluorides, Topical;Humans;Lasers, Solid-State;Low-Level Light Therapy;Pit and Fissure Sealants;Tooth Remineralization;Tooth, Deciduous

Photobiomodulation (PBM) promotes angiogenesis in-vitro and in chick embryo chorioallantoic membrane model. The application of light in various therapeutic settings known as Photobiomodulation (PBM) is well established. Indications are the improvement of wound healing and tissue regeneration, scarring, and perfusion as well as pain therapy. Tissue perfusion is mandatory for successful wound healing. Nevertheless, there is a lack of mechanistic studies. We investigate the potential effect of PBM from light emitting diodes (LED) at 635â€‰nm, 80â€‰mW/cm(2), 24â€‰J/cm(2) on angiogenesis in a two-part study: 1.) Investigation of the effect of PBM on the proliferation of endothelial cells and on vasculogenesis in a co-culture model of endothelial cells and stem cells. 2.) Investigation of the influence of PBM at chick egg chorioallantoic membrane (CAM) assays with fresh human skin xenografts. In both study phases, we observed a stimulating effect of PBM at 635â€‰nm; in part 1: for proliferation of HUVEC (human umbilical vein endothelial cells) (25833â€‰Â±â€‰12859 versus 63002â€‰Â±â€‰35760 cells/well, pâ€‰<â€‰0.05, for cellular network formation (2.1â€‰Â±â€‰2.1 versus 4.6â€‰Â±â€‰3.5, pâ€‰<â€‰0.05) and for less cell compactness pâ€‰=â€‰0.01; in part 2: for the increase of number of vessel junctions per ROI (region of interest) (15.9â€‰Â±â€‰2.6 versus 20.8â€‰Â±â€‰5.4, pâ€‰<â€‰0.05). Our results suggest significant promotion of angiogenesis by PBM at 635â€‰nm in vitro and in vivo. Adipose Tissue;Animals;Cell Proliferation;Cells, Cultured;Chick Embryo;Chorioallantoic Membrane;Coculture Techniques;Human Umbilical Vein Endothelial Cells;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Models, Biological;Neovascularization, Physiologic;Skin Transplantation;Stem Cells;Wound Healing

The effect of low-level laser irradiation on hyperglycemia-induced inflammation in human gingival fibroblasts. Hyperglycemia-induced inflammation can greatly increase the risk of periodontal disease in people with diabetes. Low-level laser irradiation (LLLI) has been used for wound healing and anti-inflammation in many cases, and LLLI is known to inhibit the lipopolysaccharide (LPS)-stimulated inflammatory response. However, the therapeutic effect of LLLI in diabetes patients with periodontitis remains unknown. In this study, we cultured human gingival fibroblasts (HGFs) in high-glucose medium (35Â mM) to mimic a hyperglycemic environment, and then measured the anti-inflammatory effect of LLLI by assessing the expression of pro-inflammatory genes including tumor necrosis factor-Î± (TNF-Î±), interleukin (IL)-1Î², IL-6, and IL-8 by quantitative real-time polymerase chain reaction. The results demonstrated no significant inflammatory response in HGFs cultured in

mannitol medium and in those treated only with LLLI. However, HGFs cultured only in high-glucose medium showed significantly higher expression of pro-inflammatory cytokine than in those treated together with LLLI. We then observed that LLLI reduced the expression of pro-inflammatory cytokines in HGFs cultured in high-glucose medium by modulating cAMP signaling. We also investigated whether antioxidant (vitamin C) treatment reduced the inflammatory effect of oxidative stress in HGFs cultured in high-glucose medium but found no additive effect upon co-treatment with LLLI, suggesting that LLLI may activate cAMP signaling, but not reactive oxygen species (ROS) signaling, to reduce the high glucose-induced inflammation. In conclusion, LLLI may have an anti-inflammatory effect on HGFs in a high glucose environment and may benefit the treatment of periodontal disease in diabetes patients. Cytokines;Inflammation Mediators;RNA, Messenger;Ascorbic Acid Ascorbic Acid;Cell Death;Cell Survival;Cells, Cultured;Cytokines;Fibroblasts;Gingiva;Humans;Hyperglycemia;Inflammation;Inflammation Mediators;Low-Level Light Therapy;RNA, Messenger

Low-level laser irradiation modulates the proliferation and the osteogenic differentiation of bone marrow mesenchymal stem cells under healthy and inflammatory condition. The aim of this in vitro study was to evaluate the effects of low-level laser therapy (LLLT) at different energy intensities on proliferation and osteogenic differentiation of bone marrow mesenchymal stem cells (BMSCs) under healthy and inflammatory microenvironments. Human BMSCs and BMSCs from inflammatory conditions (i-BMSCs, BMSCs treated with tumor necrosis factor Î±; TNF-Î±) were subject to LLLT (Nd:YAG;1064Â nm) at different intensities. We designed one control group (without irradiation) and four testing groups (irradiation at 2, 4, 8, and 16Â J/cm(2)) for both BMSCs and i-BMSCs. Cell proliferation was measured using colony-forming unit fibroblast assay and 3-(4,5-dimethylthiazol-2yl)-2,5-diphenyltetrazolium bromide assay. Osteogenic capacity of cells was determined by alkaline phosphatase (ALP) staining, ALP activity assay, Alizarin Red S staining and the mRNA transcript levels of genes runt-related transcription factor 2 (Runx2), ALP, and osteocalcin. Moreover, the effects of LLLT on secretion of TNF-Î± in BMSCs and i-BMSCs were measured by enzyme-linked immunosorbent assay. Our results demonstrated LLLT could significantly promote BMSC proliferation and osteogenesis at densities of 2 and 4Â J/cm(2). LLLT at density of 8Â J/cm(2) could promote the proliferation and osteogenesis of i-BMSCs. However, LLLT at 16Â J/cm(2) significantly suppressed the proliferation and osteogenesis of BMSCs both in healthy and in inflammatory microenvironment. Moreover, we also found that the expression of TNF-Î± was obviously inhibited by LLLT at 4, 8, and 16Â J/cm(2), in an inflammatory microenvironment. Considering these findings, LLLT could improve current in vitro methods of differentiating BMSCs under healthy and inflammatory microenvironments prior to transplantation. Interleukin-1;Tumor Necrosis Factor-alpha Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Cells, Cultured;Humans;Inflammation;Interleukin-1;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Tumor Necrosis Factor-alpha

Efficiency of hyperuricemia correction by low level laser therapy in the treatment of arterial hypertension. OBJECTIVE: Introduction: Uric acid (UA) is the risk factors for the development of arterial hypertension (AH). Development of alternative methods of UA level reduction becomes relevant. The aim - to determine the correlation between UA and endothelial dysfunction and blood pressure level (BP), and to evaluate the effectiveness of low level laser therapy (LLLT). PATIENTS AND METHODS: Material and methods: Patients were divided according to the BP level: the first group included 30 patients with the hyperuricemia and normal BP; the second group - 34 patients with hyperuricemia and AH. Endothelium function was evaluated by test with reactive hyperemia. LLLT was provided by using of the apparatus "Mustang-2000" with wavelength 635 nm. RESULTS: Results: There is a mean value negative correlation on the Chaddock's scale r = - 0,6209 between UA and ED; a

mean value positive correlation r = 0,48 between UA and daySBP; a weak positive correlation r = 0,33 between UA and DayDBP. LLLT reduces UA level by 4,7% more effective in patients with hyperuricemia without AH than in patients with AH combined with hyperuricemia. LLLT can increase EDVD by 9,87%, reduce UA level by 15,4%, DaySBP and DayDBP - about 7% in patients with AH combined with hyperuricemia than in patients with hyperuricemia along. CONCLUSION: Conclusion: Decreasing of DayDBP in hyperuricemia group and both DaySBP and DayDBP in the group of patients with AH combined with hyperuricemia demonstrated the influence of UA on EDVD and AH and the possibility to correct these cardiovascular risk factors with the using of LLLT. Uric Acid Humans;Hypertension;Hyperuricemia;Low-Level Light Therapy;Risk Factors;Uric Acid

Regenerative Medicine Therapies for Equine Wound Management. Wound management in horses can strike fear in some and passion in others. Wounds are common injuries in horses of all descriptions and requires exceptional knowledge and care to achieve a successful outcome. New treatments to overcome the critical challenges with equine wounds are always desired: managing dehisced and/or nonhealing wounds, managing exuberant granulation tissue, and ultimately achieving a functional tissue coverage. Regenerative medicine represents a broad set of tools with great promise to manipulate the deficiencies recognized in equine wound healing and improve the outcome. Animals;Horse Diseases;Horses;Regenerative Medicine;Wound Healing;Wounds and Injuries

Effect of photodynamic therapy by 810 and 940 nm diode laser on Herpes Simplex Virus 1: An in vitro study. INTRODUCTION: Herpes simplex virus (HSV) is among the most common viruses in humans. HSV1 is often responsible for oral and perioral herpetic lesions. Photodynamic therapy (PDT) is a novel antimicrobial modality that involves the use of laser and a photosensitizer with a specific wavelength. This study aimed to assess and compare the effect of PDT with 810 and 940â€‰nm diode laser and indocyanine green (ICG) photosensitizer on HSV1. METHODS: In this in vitro study, HSV1 isolated from herpes labialis and there were 6 experimental groups.The irradiation parameters were the same for all groups. Number of remaining viruses per milliliter in each group was determined using real-time polymerase chain reaction (PCR) and statistically analyzed by ANOVA. RESULTS: The virus count in all groups significantly decreased compared to the control group (Pâ€‰<â€‰0.05) except in group ICG- without irradiation (Pâ€‰>â€‰0.05). Comparison of groups 810- and 940- (use of each laser alone) with groups 810+ and 940+ (use of each laser plus ICG) revealed that reduction in virus count in groups 810+ and 940+ was significantly greater than that in groups 810- and 940-. CONCLUSION: 810â€‰nm diode laser irradiation and ICG causes the greatest reduction in number of HSV1 compared to all the other groups. ICG without laser irradiation has not significant efficacy on reduction of virus count. Photosensitizing Agents;Indocyanine Green Herpesvirus 1, Human;Humans;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

Low-level light therapy reduces platelet destruction during extracorporeal circulation. Extracorporeal circulation causes many deleterious effects on blood cells. Low-level light therapy (LLLT) in the red/near-infrared spectral range is known for its cytoprotective properties but its use during cardiopulmonary bypass (CPB) has not yet been studied. We aimed to assess whether LLLT protects platelets during CPB. 24 pigs were connected to 1-hour-CPB and observed for the next 23â€‰hours. In 12 animals, blood circulating through the oxygenator was treated with LLLT. Platelet count and function were monitored throughout the experiment. The decrease in platelet count was greater in the control group, especially during CPB and after 24â€‰hours. In LLLT group CD62P expression remained quite stable up to the 12(th) hour of the experiment, whereas in the control group it continuously decreased till the end of observation. Platelets in the control group were more prone to aggregation in the postoperative period than at the beginning of the experiment, whereas

platelets in the LLLT group aggregated similarly or less intense. Limitation of platelet loss, pattern of aggregation and CD62P expression suggest that LLLT may stabilize platelet function during CPB and diminish the negative effects associated with the interaction of cells with an artificial surface. P-Selectin Animals;Blood Platelets;Cardiopulmonary Bypass;Extracorporeal Circulation;Humans;Low-Level Light Therapy;P-Selectin;Platelet Aggregation;Platelet Count;Swine;Thrombocytopenia

Photobiomodulation modulates the resolution of inflammation during acute lung injury induced by sepsis. Sepsis is a big health problem and one of the most common causes of acute lung injury (ALI) leading to high mortality. Pro-resolving mediators play an important role in abrogating the inflammation and promoting tissue homeostasis restoration. ALI treatment is still a clinical health problem, so new therapies are needed. Here, we evaluated the effect of photobiomodulation treatment on the resolution process of ALI induced by lipopolysaccharide (LPS). Male Balb/c mice were submitted to LPS (ip) or vehicle and irradiated or not with light emitting diode (LED) 2 and 6Â h after LPS or vehicle injection, and the parameters were investigated 3 and 7Â days after the injections. Our results showed that after 3Â days of LED treatment the blood and bronchoalveolar lavage (BAL) cells as well as interleukins (IL) including IL-6 and IL-17 were reduced. No differences were observed in the bone marrow cells, tracheal reactivity, and lipoxin A4 and resolvin E2. Indeed, after 7Â days of LED treatment the bone marrow cells, lymphocytes, and lipoxin A4 were increased, while IL-6, IL-17, and IL-10 were decreased. No differences were observed in the blood cells and tracheal reactivity. Thus, our results showed that LED treatment attenuated ALI induced by sepsis by modulating the cell mobilization from their reserve compartments. In addition, we also showed later effects of the LED up to 7Â days after the treatment. This study proposes photobiomodulation as therapeutic adjuvant to treat ALI. Cholinergic Agents;Cytokines;Lipopolysaccharides;Lipoxins;lipoxin A4;resolvin E2;Eicosapentaenoic Acid Acute Lung Injury;Animals;Bone Marrow;Bronchoalveolar Lavage;Cell Movement;Cholinergic Agents;Cytokines;Eicosapentaenoic Acid;Inflammation;Lipopolysaccharides;Lipoxins;Low-Level Light Therapy;Lung;Male;Mice, Inbred BALB C;Muscle Contraction;Muscle, Smooth;Sepsis

The Efficacy of Low-Level Laser Therapy in Burning Mouth Syndrome - A Pilot Study. The aim of this clinical study was to compare low-level laser therapy (LLLT) switched on and switched off in the treatment of burning mouth syndrome (BMS). BMS is a debilitating condition for patients and highly demanding for physicians, characterized by burning symptoms in the oral cavity. Despite extensive research, so far only cognitive behavioral therapy and clonazepam have been proven successful for its treatment in randomized controlled trials. Forty-four patients with BMS were randomly assigned to the study laser group (LLLT) or the sham laser group. LLLT was performed with the GaAlAs laser (830 nm) used in non-contact mode on the site in the mouth where burning symptoms were present; study patients received 10 sessions (10 days). Each participant filled out the visual analog scale (VAS) and oral health impact on the quality of life scale (OHIP-CRO 14) before and after either therapy protocol. There were no significant differences between the groups before and after LLLT (switched on and off) in the quality of life (OHIP CRO 14 scores) ($p>0.05$). There was significant decrease in pain symptoms (VAS) in both LLLT switched on and LLLT switched off groups ($p <0.05$). Both LLLT switched on and switched off decreased pain symptoms (VAS) in patients with BMS; however, neither LLLT switched off or switched on im-proved the OHIP-CRO 14 scores. Burning Mouth Syndrome;Humans;Low-Level Light Therapy;Pain Measurement;Pilot Projects;Quality of Life

Changes in choriocapillaris and retinal morphology after laser photocoagulation by OCT angiography: A case report. RATIONALE: Earlier studies have shown that laser photocoagulation treatments are associated with good long-term visual acuity in most patients with severe nonproliferative diabetic retinopathy (S-NPDR). Histopathologic studies of autopsied eyes have demonstrated defects

in the choriocapillaris beneath the retinal laser lesions secondary to photocoagulation for S-NPDR. These lesions have been observed to expand centrifugally over time especially in the posterior pole, and the atrophy of the retinal pigment epithelium (RPE) can be significantly enlarged. There are, however, limited studies detailing the in vivo changes that occur in the RPE and choriocapillaris following laser photocoagulation. PATIENT CONCERNS: A 46-year-old woman presented with visual disturbances in both eyes. DIAGNOSES: Fundus examinations showed many retinal hemorrhages and soft exudates in the four quadrants due to S-NPDR. INTERVENTIONS: Laser photocoagulations with a 532-nm wavelength argon laser with power of 170 to 230 mW and spot size of 200â€Šî¼m were performed to treat the S-NPDR. The changes in the choriocapillaris and retinal vasculature were followed by optical coherence tomography (OCT) angiography. OUTCOMES: The choriocapillaris beneath the laser spots was disrupted from 1 hour following the photocoagulation but it was restored at week 2. The choriocapillaris appeared almost normal at some laser spots, but they were still some spots that were altered at 1 year. The outer retina and RPE were disrupted beneath the laser spots at 1 year. On the contrary, there were no visible retinal vascular changes in the superficial and deep plexuses of retinal vasculature determined by OCT angiography with manual and automated segmentation. LESSONS: The choriocapillaris in human eyes can recover after laser photocoagulation although the outer retina and RPE remain disrupted and do not recover. Angiography;Animals;Choroid;Diabetic Retinopathy;Female;Humans;Laser Coagulation;Low-Level Light Therapy;Middle Aged;Postoperative Period;Retina;Tomography, Optical Coherence;Treatment Outcome

Botulinum toxin A (BT-A) versus low-level laser therapy (LLLT) in chronic migraine treatment: a comparison. OBJECTIVE: The aim of this work was to evaluate patients with chronic migraine treated with botulinum toxin A (BT-A) and compare this with low level laser therapy (LLLT), referencing: pain days, pain intensity, intake of drugs/self-medication, anxiety and sleep disorders. METHODS: Patients were randomized into two groups: BT-A group (n = 18) and LLLT group (n = 18). Each patient kept three pain diaries: one before (baseline) (30 days), one during treatment (30 days) and one after the post-treatment phase (30 days). Repeated ANOVA plus the Bonferroni post-test, Student's t test, and factorial analysis were applied, and $p < 0.05$ was accepted as significant. RESULTS: Our data showed that both treatments were able to reduce headache days, acute medication intake and decrease the intensity of pain. Anxiety was reduced in the BT-A group, while sleep disturbance was reduced in the LLLT group. CONCLUSION: Our data showed that both treatments can be used to treat chronic migraine, without notable differences between them. Acetylcholine Release Inhibitors;Botulinum Toxins, Type A Acetylcholine Release Inhibitors;Adult;Anxiety;Botulinum Toxins, Type A;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Migraine Disorders;Pain Measurement;Pilot Projects;Sleep Wake Disorders;Treatment Outcome;Young Adult

Editorial. Dermal Fillers;Botulinum Toxins Botulinum Toxins;Cosmetic Techniques;Dermal Fillers;Humans;Lasers;Low-Level Light Therapy

Photobiomodulation Therapy in the Treatment of Oral Mucositis, Dysgeusia and Oral Dryness as Side-Effects of Head and Neck Radiotherapy in a Cancer Patient: A Case Report. Successful management of oral mucositis, dysgeusia and oral dryness was made with fivesessions of photobiomodulation. The severity of oral mucositis was measured according to the World Health Organization scale for the assessment of oral mucositis. Dysgeusia testing was performed according to the International Standards Organization (ISO). For the assessment of oral dryness or hyposalivation, quantity of the total resting and stimulated saliva (Q-sal, mL/min) was measured.Photobiomodulation parameters, applications, and treatment protocol used were suggested by an international multidisciplinary panel of clinicians and researchers with expertise in

the area of supportive care in cancer and/or PBM clinical application and dosimetry. This case report confirms the effectiveness of photobiomodulation therapy in the management of oral mucositis, dysgeusia, and oral dryness.

Erythrocytic bioactivation of nitrite and its potentiation by far-red light. BACKGROUND: Nitrite is reduced by heme-proteins and molybdenum-containing enzymes to form the important signaling molecule nitric oxide (NO), mediating NO signaling. Substantial evidence suggests that deoxygenated hemoglobin within red blood cells (RBCs) is the main erythrocytic protein responsible for mediating nitrite-dependent NO signaling. In other work, infrared and far red light have been shown to have therapeutic potential that some attribute to production of NO. Here we explore whether a combination of nitrite and far red light treatment has an additive effect in NO-dependent processes, and whether this effect is mediated by RBCs. METHODS AND RESULTS: Using photoacoustic imaging in a rat model as a function of varying inspired oxygen, we found that far red light (660â€¯nm, five min. exposure) and nitrite feeding (three weeks in drinking water at 100â€¯mg/L) each separately increased tissue oxygenation and vessel diameter, and the combined treatment was additive. We also employed inhibition of human platelet activation measured by flow cytometry to assess RBC-dependent nitrite bioactivation and found that far red light dramatically potentiates platelet inhibition by nitrite. Blocking RBC-surface thiols abrogated these effects of nitrite and far-red light. RBC-dependent production of NO was also shown to be enhanced by far red light using a chemiluminescence-based nitric oxide analyzer. In addition, RBC-dependent bioactivation of nitrite led to prolonged lag times for clotting in platelet poor plasma that was enhanced by exposure to far red light. CONCLUSIONS: Our results suggest that nitrite leads to the formation of a photolabile RBC surface thiol-bound species such as an S-nitrosothiol or heme-nitrosyl (NO-bound heme) for which far red light enhances NO signaling. These findings expand our understanding of RBC-mediated NO production from nitrite. This pathway of NO production may have therapeutic potential in several applications including thrombosis, and, thus, warrants further study. Nitrites;Sulfhydryl Compounds;Nitric Oxide;Heme;Oxygen Animals;Blood Platelets;Erythrocyte Membrane;Erythrocytes;Heme;Light;Microvessels;Models, Biological;Nitric Oxide;Nitrites;Oxygen;Platelet Activation;Rats;Sulfhydryl Compounds

Photobiomodulation Therapy in Bone Repair Associated with Bone Morphogenetic Proteins and Guided Bone Regeneration: A Histomorphometric Study. OBJECTIVE: To evaluate the efficacy of photobiomodulation for bone repair of critical surgical wounds with implants of bone morphogenetic proteins (BMPs) and bovine biological membranes, using histological and histomorphometric analysis. BACKGROUND: Tissue engineering has been developing rapidly through the use of various biomaterials for the treatment of bone defects, such as mechanical barriers consisting of biological membranes and implants of biomaterials for bone supply. MATERIALS AND METHODS: Thirty-two male rats were divided into four groups (nâ€‰=â€‰8): group I-C: control; group II-PT: photobiomodulation therapy; group III-PM: Gen-Pro(Â®) BMPs+Gen-Derm(Â®) membrane; and group IV-PMPT: Gen-Pro(Â®) BMPs+Gen-Derm(Â®) membrane+photobiomodulation therapy. A 3â€‰mm bone cavity was performed in the upper third of the lateral surface of the right rat femur to obtain a bone defect considered to be critical. The irradiated groups received seven applications of AlGaAs diode laser 830â€‰nm, Pâ€‰=â€‰40â€‰mW, continuous wave (CW) emission mode, fâ€‰âˆ¼â€‰0.6â€‰mm, 4â€‰J/cm(2) per point (north, south, east, and west) at 48â€‰h intervals, for a total of 16â€‰J/cm(2) per session (final dose: 112â€‰J/cm(2)). Bone repair was evaluated at sacrifice 15 and 30 days after the procedure. The specimens were embedded in paraffin and stained with hematoxylin and eosin and Picrosirius for analysis by light microscopy and by the Leica interactive measurement module software. Statistical analysis was performed (pâ€‰<â€‰0.05%). RESULTS: Histological analysis confirmed the histomorphometric results, with

the experimental groups showing bone neoformation of significantly higher quality and quantity at the end of 30 days compared with the control group. CONCLUSIONS: Photobiomodulation therapy was effective for bone repair mainly when associated with BMPs and a biological membrane. The results of this study are promising and stimulate further scientific and clinical research. Bone Morphogenetic Proteins;Membranes, Artificial Animals;Bone Morphogenetic Proteins;Bone Regeneration;Cattle;Femur;Guided Tissue Regeneration;Lasers, Semiconductor;Low-Level Light Therapy;Male;Membranes, Artificial;Models, Animal;Random Allocation;Rats;Rats, Wistar

Application of Cell Therapy for Anti-Aging Facial Skin. The human skin undergoes the complex process of aging which is prompted by the interplay of intrinsic mechanisms and extrinsic influences. Aging is unavoidable but can be somewhat delayed. Numerous approaches have been developed to slow down facial skin aging process as it is of interest to stake holders in the beauty and fashion world as well as to plastic surgeons. Adipose-derived stem cell [ADSC] and mesenchymal stem cell [MSC] as potential anti-aging agents to some extent have provided a promising and effective alternative in managing skin and facial skin aging. Furthermore, bone marrow-derived mesenchymal stem cells [BMMSC] have exhibited similar ability to rejuvenate aged skin. This review is aimed at giving a comprehensive account of the application of stem cells especially ADSCs and MSCs to reduce or slow down the rate of facial skin aging process. Antioxidants;Sunscreening Agents Adipose Tissue;Animals;Antioxidants;Bone Marrow Cells;Hormone Replacement Therapy;Humans;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Rejuvenation;Skin;Skin Aging;Skin Care;Sunscreening Agents

Pulsed Transcranial Red/Near-Infrared Light Therapy Using Light-Emitting Diodes Improves Cerebral Blood Flow and Cognitive Function in Veterans with Chronic Traumatic Brain Injury: A Case Series. OBJECTIVE: This study explored the outcome of applying red/near-infrared light therapy using light-emitting diodes (LEDs) pulsed with three different frequencies transcranially to treat traumatic brain injury (TBI) in Veterans. BACKGROUND: Photobiomodulation therapy (PBMT) using LEDs has been shown to have positive effects on TBI in humans and animal models. MATERIALS AND METHODS: Twelve symptomatic military Veterans diagnosed with chronic TBI >18 months post-trauma received pulsed transcranial PBMT (tPBMT) using two neoprene therapy pads containing 220 infrared and 180 red LEDs, generating a power output of 3.3â€‰W and an average power density of 6.4â€‰mW/cm(2) for 20â€‰min, thrice per week over 6 weeks. Outcome measures included standardized neuropsychological test scores and qualitative and quantitative single photon emission computed tomography (SPECT) measures of regional cerebral blood flow (rCBF). RESULTS: Pulsed tPBMT significantly improved neuropsychological scores in 6 of 15 subscales (40.0%; pâ€‰<â€‰0.05; two tailed). SPECT analysis showed increase in rCBF in 8 of 12 (66.7%) study participants. Quantitative SPECT analysis revealed a significant increase in rCBF in this subgroup of study participants and a significant difference between pre-treatment and post-treatment gamma ray counts per cubic centimeter [tâ€‰=â€‰3.77, dfâ€‰=â€‰7, pâ€‰=â€‰0.007, 95% confidence interval (95,543.21-21,931.82)]. This is the first study to report quantitative SPECT analysis of rCBF in regions of interest following pulsed tPBMT with LEDs in TBI. CONCLUSIONS: Pulsed tPBMT using LEDs shows promise in improving cognitive function and rCBF several years after TBI. Larger, controlled studies are indicated.

Therapeutic Efficacy of Home-Use Photobiomodulation Devices: A Systematic Literature Review. OBJECTIVE: Perform systematic literature review on photobiomodulation (PBM) devices used at home for nonesthetic applications. BACKGROUND: Home-use PBM devices have been marketed for cosmetic and therapeutic purposes. This is the first systematic literature review for nonesthetic applications. METHODS: A systematic literature search was conducted for PBM devices self-applied at home at least thrice a week. Two independent reviewers screened the articles and extracted the

data. Treatment dosage appropriateness was compared to the World Association for Laser Therapy (WALT) recommendations. The efficacy was evaluated according to the relevant primary end-point for the specific indication. RESULTS: Eleven studies were suitable. Devices were applied for a range of indications, including pain, cognitive dysfunction, wound healing, diabetic macular edema, and postprocedural side effects, and were mostly based on near-infrared, pulsed light-emitting diodes with dosages within WALT recommendations. Regarding efficacy, studies reported mostly positive results. CONCLUSIONS: Home-use PBM devices appear to mediate effective, safe treatments in a variety of conditions that require frequent applications. Conclusive evaluation of their efficacy requires additional, randomized controlled studies.

Non-pharmacological and non-surgical interventions to manage patients with knee osteoarthritis: An umbrella review. Objective - Update the last known umbrella review and summarize the available high-quality evidence from systematic reviews on the effectiveness of non-pharmacological and non-surgical interventions for patients with knee OA. Methods - The systematic reviews were identified thought electronic databases such as, MEDLINE, Embase, Physiotherapy Evidence Database (PEDro), The Cochrane Library, SciELo, Science Direct, Google Scholar, Research Gate and B-ON. The studies selection respected the following terms to guide the search strategy using the P (humans with knee osteoarthritis) I (non-pharmacological and non-surgical treatments) C (pharmacological, surgical, placebo, no intervention, or other non-pharmacological/ non-surgical conservative treatments) O (pain, functional status, stiffness, inflammation, quality of life and patient global assessment) model. Results - Following the PRISMA statement, 41 systematic reviews were found on the electronic databases that could be included in the umbrella review. After methodical analysis (R-AMSTAR), only 35 had sufficient quality to be included. There is gold evidence that Standard Exercise programs can reduce pain and improve physical function in patients with knee OA. Additionally, there is silver evidence for Acupuncture, Aquatic Exercise, Electroacupuncture, Interferential Current, Kinesio Taping, Manual Therapy, Moxibustion, Pulsed Electromagnetic Fields, Tai Chi, Ultrasound, Yoga, and Whole-Body Vibration. For other interventions, the quality of evidence is low or did not show sufficient efficacy from the systematic reviews to support their use. Conclusion - Comparing to last known umbrella review, similar results were achieved on Acupuncture and Exercise interventions to improve the patients' pain, stiffness, function and quality of life, but it was found different results regarding the utilization of Transcutaneous Electrical Nerve Stimulation and Low-Level Laser Therapy as they do not improved the patients' pain and physical function. Humans;Osteoarthritis, Knee;Systematic Reviews as Topic

Comparative effectiveness of extracorporeal shock wave, ultrasound, low-level laser therapy, noninvasive interactive neurostimulation, and pulsed radiofrequency treatment for treating plantar fasciitis: A systematic review and network meta-analysis. BACKGROUND: Plantar fasciitis is one of the most common causes of adult heel pain. The aim of this study is to comprehensively compare the effectiveness of various therapies for plantar fasciitis using network meta-analysis. METHODS: Studies were comprehensively searched on Embase, MEDLINE via PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), and the Physiotherapy Evidence Database (PEDro) up to December 4, 2017. Randomized controlled trials that used extracorporeal shock wave therapy, ultrasound, ultrasound-guided pulsed radiofrequency treatment (UG-PRF), intracorporeal pneumatic shock therapy (IPST), low-level laser therapy (LLLT), and noninvasive interactive neurostimulation (NIN) for the treatment of plantar fasciitis were included. The primary outcome is change in pain relief. Risk of bias was assessed using the Cochrane risk of bias tool. Quality assessment was performed using the GRADE system. RESULTS: Nineteen trials with 1676 patients with plantar fasciitis plantar fasciitis were included. In the pair-wise meta-analysis, radial extracorporeal shock wave therapy (RSW), LLLT, and IPST showed a significant pooled reduction in the visual analogue scale (VAS) compared with placebo

at 0 to 6 weeks [mean difference (MD)â€Š=â€Š6.60, 95% confidence interval (CI): (6.04,â€Š-7.16); MDâ€Š=â€Š2.34, 95% CI: (1.60, 3.08); MDâ€Š=â€Š2.24, 95% CI: (1.44, 3.04), respectively]. Compared with placebo, UG-PRF [MDâ€Š=â€Š2.31, 95% CI: (1.26, 3.36)] and high-intensity focused extracorporeal shock wave (H-FSW) [MDâ€Š=â€Š0.82, 95% CI: (0.20, 1.45)] showed superior pain-relieving effects at 2 to 4 months; UG-PRF [MDâ€Š=â€Š1.11, 95% CI: (0.07, 2.15)] and IPST [MDâ€Š=â€Š4.92, 95% CI: (4.11, 5.73)] showed superior effects at 6 to 12 months. In the network meta-analysis, only RSW induced significant pain reduction compared with placebo at 0 to 6 weeks [MDâ€Š=â€Š3.67, 95% CI: (0.31, 6.9)]. No significant differences were found for the 2 to 4-month and 6 to 12-month periods because of the wide 95% CIs. CONCLUSIONS: We recommend treating plantar fasciitis with RSW. The commonly used ultrasound and focused extracorporeal shock wave (FSW) therapies can be considered as alternative treatment candidates. IPST, NIN, and LLLT may potentially be better alternatives, although their superiority should be confirmed by additional comprehensive evidence.PROSPERO registration number: PROSPERO (CRD42015017353). Electric Stimulation;Fasciitis, Plantar;Humans;Low-Level Light Therapy;Network Meta-Analysis;Pain Management;Pain Measurement;Pulsed Radiofrequency Treatment;Ultrasonic Therapy

Effects of Photobiomodulation on Functionality in Wistar Rats with Sciatic Nerve Injury. A peripheral nerve injury (PNI) can result in motor or sensory disorders. Low-level laser therapy (LLLT) has demonstrated positive results as a treatment option for PNI. Wistar rats were divided into five groups: Control, Injury, InjuryÂ +Â LLLTn (nerve), InjuryÂ +Â LLLTm (muscle) and InjuryÂ +Â LLLTnÂ +Â m (nerve and muscle irradiation). The groups were analyzed after one, two, three and four weeks. PNI was achieved by crushing the sciatic nerve. Laser treatment (780Â nm, 3.2Â J) was realized over the nerve and/or tibialis anterior muscle. In gait analyses, the groups irradiated over the nerve demonstrated an improvement after two weeks. In the analysis of mechanical sensitivity, the InjuryÂ +Â LLLTn demonstrated a reduction after one week in comparison with Injury group; the InjuryÂ +Â LLLTnÂ +Â m and InjuryÂ +Â LLLTm demonstrated an increase after two weeks in comparison with Injury group; and the irradiated groups demonstrated a reduction in nociception after four weeks in comparison with Injury group. In the analysis of muscle atrophy, the InjuryÂ +Â LLLTn demonstrated more muscle mass after two weeks. LLLT improves functional aspects related to gait, mechanical sensitivity and muscle mass, with better results regarding motor aspects and muscle mass when administered over the injured nerve and better results regarding sensory aspects when administered over the muscle. Animals;Disease Models, Animal;Gait;Low-Level Light Therapy;Muscle, Skeletal;Organ Size;Peripheral Nerve Injuries;Rats;Rats, Wistar;Sciatic Nerve

Efficacy of erbium glass laser in the treatment of Old World cutaneous leishmaniasis: A case series. BACKGROUND: Treatment of cutaneous leishmaniasis remains a challenge; new physical treatment modalities including laser systems are of interest in the treatment of localized lesions. METHOD: Fourteen patients (10 females) with 20 lesions of Old World cutaneous leishmaniasis underwent weekly treatments of 1540 nm erbium glass fractional laser (Palomar) using 10Â mm spot size hand piece in four passes of 50-70Â mJ/cm(2) fluence and 10Â ms pulse duration. RESULTS: Twelve lesions were available for assessment: six (50%) improved at 6Â weeks and eleven lesions (91.7%) at 12Â weeks. There were no recurrences at 6- and 12-month follow-ups. CONCLUSION: Erbium glass fractional laser may be an alternative treatment for localized cases of Old World cutaneous leishmaniasis. Adolescent;Adult;Child;Female;Humans;Lasers, Solid-State;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Male;Pain;Treatment Outcome;Young Adult

Is there a measure for low power laser dose? Low power lasers have been used successfully for treatment of many diseases in soft and bone tissues. Basic and clinical researches have developed quickly being the scientific basis to therapeutic protocols based on these lasers. However, there are

difficulties to compare experimental and clinical results obtained from different researchers because a complicated and intricate list of physical and biological parameters should be checked before the irradiation procedures as well as part of these parameters are omitted or inaccurately reported. This review focuses on the physical and biological parameters proposed to make experimental and clinical protocols accurate and reproducible as well as suggests dose parameters based on biological effects induced by low power lasers. A variety of parameters are reported by different authors and the number of parameter suggested could overcome three dozens. Thus, laser dose and laser dose equivalent are defined based on laser-induced biological effects and suggested as simplified dose parameters for low power lasers. These parameters could simplify and be useful to researchers and clinicians, permitting comparisons and decreasing mistakes and inaccuracies when laser-induced effects are evaluated and compared with those obtained in previous studies. The laser dose and laser dose equivalent could contribute significantly to improve accuracy, effectiveness, and safety of clinical protocols based on low power lasers. Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Organ Specificity

Effects of Physical-Agent Pain Relief Modalities for Fibromyalgia Patients: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. PURPOSE: We conducted a systematic review and meta-analysis to investigate the effects of the following physical-agent modalities for pain relief in fibromyalgia (FM) patients. METHODS: We identified randomized controlled studies of adults with FM in the MEDLINE, CINAHL, and PEDro databases. The primary outcome measure was pain relief measured by a visual analogue scale (VAS), and the secondary outcome measures of interest were subjective improvements in the number of tender points, Fibromyalgia Impact Questionnaire (FIQ), and quality of life (QOL) scores. RESULTS: Eleven studies were included in our review. The studies' physical-agent modalities were low-level laser therapy (LLLT), thermal therapy, electromagnetic field therapy, and transcutaneous electrical nerve stimulation (TENS). LLLT did not reduce VAS scores, but it significantly reduced both the number of tender points and FIQ score. Thermal therapy was associated with significantly reduced VAS scores, tender points, and FIQ scores. Electromagnetic field therapy was associated with significantly reduced VAS score and FIQ score. TENS significantly reduced VAS scores. CONCLUSION: Our analyses revealed that thermal therapy and LLLT had a partial effect on pain relief in FM patients, and this beneficial effect may have a positive influence on FM patients' health status. Databases, Bibliographic;Fibromyalgia;Humans;Low-Level Light Therapy;Pain;Pain Management;Pain Measurement;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Transcutaneous Electric Nerve Stimulation

Evaluation of fluorescence biomodulation in the real-life management of chronic wounds: the EUREKA trial. OBJECTIVE: Fluorescence biomodulation (FB), a form of photobiomodulation (PBM) that is also known as low energy level light (LELL), has become an increasingly used clinical tool to induce wound healing in wounds that remain recalcitrant to treatment. In a real-life clinical setting, the aim of the EUREKA (EvalUation of Real-lifE use of Klox biophotonic system in chronic wound mAnagement) study was to confirm the efficacy and safety of LumiHeal, a system based on FB, in the treatment of chronic wounds such as venous leg ulcers (VLUs), diabetic foot ulcers (DFUs) and pressure ulcers (PUs). The effects of this FB system on the modulation of wound healing in chronic ulcers through FB induction were previously examined in an interim analysis of this study. METHOD: A multicenter, prospective, observational, uncontrolled trial in 12 clinical sites in Italy. The wound was cleansed with saline and a 2mm thick layer of a chromophore gel was applied to the affected area in a biweekly regimen. The area was then illuminated with the LED activator for five minutes at a distance of 5cm. Treatment was used in combination with standard of care specific to each type of chronic wound (VLU, DFU, PU). Wound area evaluation was assessed using the Silhouette Imaging System and quality of life (QoL) with the Cardiff Wound Impact Schedule (CWIS). A seven-point evaluation of the

clinicans' view was also examined. RESULTS: We enrolled 100 subjects, with the final analysis including 99 patients/ulcers consisting of 52 VLUs, 32 DFUs and 15 PUs. Total wound closure at the end of the study was achieved in 47 patients by aetiology: 26 VLUs (50% of VLUs); 16 DFUs (50% of DFUs); and five PUs (33.3% of PUs). The mean wound area regression at last study assessment was significant for VLUs (41.0%; p<0.001) and DFUs (52.4%; p<0.001). After four weeks of treatment, it was possible to significantly predict if the ulcer would respond (defined as a decrease of wound size) to the study treatment. Adherence was high (95.2%) and no related serious adverse events were reported during the study. QoL significantly improved, with an increase of 15.4% of the total score, using the CWIS (p<0.001). CONCLUSION: The study confirmed a positive efficacy profile of the FB system in inducing the wound healing process in three different types of hard-to-heal chronic wounds. The treatment was shown to be safe and well tolerated by the patients, with a significant improvement in patient QoL. This approach offers an effective modality for the treatment of hard-to-heal chronic ulcers. Adult;Aged;Aged, 80 and over;Chronic Disease;Diabetic Foot;Female;Fluorescence;Humans;Italy;Low-Level Light Therapy;Male;Middle Aged;Pressure Ulcer;Prospective Studies;Treatment Outcome;Varicose Ulcer;Wound Healing

Laser treatment for facial acne scars: A review. BACKGROUND AND OBJECTIVES: Acne scarring is a widely prevalent condition that can have a negative impact on a patient's quality of life and is often worsened by aging. A number of options are available for the treatment of acne scarring, including retinoids, microdermabrasion, dermal fillers, and surgical techniques such as subcision. The aim of this review is to evaluate the different laser modalities that have been used in peer-reviewed clinical studies for treatment of atrophic acne scars, and summarize current clinical approaches. MATERIALS AND METHODS: A Medline search spanning from 1990 to 2016 was performed on acne scarring. Search terms included "atrophic acne scars," "ablative'', "nonablative," "fractional," "nonfractional," "neodymium," "alexandrite," "pulsed dye" lasers, and results are summarized. RESULTS: Various types of lasers have been evaluated for the treatment of atrophic acne scars. While they are efficacious overall, they differ in terms of side effects and clinical outcomes, depending on patients skin and acne scar type. A new emerging trend is to combine lasers with other energy-based devices and/or topicals. CONCLUSION: Evaluation of the literature examining acne scar treatment with lasers, revealed that clinical outcomes are dependent on various patient factors, including atrophic acne scar subtype, patient skin type, treatment modality, and side-effect profile. Acne Vulgaris;Cicatrix;Combined Modality Therapy;Face;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy

Pulsed-dye laser as a novel therapeutic approach for post-filler bruises. Fillers have become popular worldwide as the demand for enhancements in rejuvenating effects and esthetic improvements is continually increasing. With broader applications and the increasing number of cosmetic procedures using fillers, more filler-related complications are being reported. These filler-related complications range from mild bruising to severe vascular complications. Because of the severe and irreversible outcomes of vascular complications, treatment protocols for such complications are being investigated and updated actively. However, not much attention is paid to mild bruises that develop after filler injections. Simple observation is the treatment of choice for bruises in current filler complication protocols. In the present study, the possible effect of a pulsed-dye laser (PDL) on bruises is reported, with a case report of a female patient who received PDL treatment for a bruise that developed after a filler injection. Dermal Fillers;Hyaluronic Acid Adult;Contusions;Cosmetic Techniques;Dermal Fillers;Female;Humans;Hyaluronic Acid;Injections, Intradermal;Lasers, Dye;Low-Level Light Therapy;Treatment Outcome

Intravaginal Co(2) laser as an emergent treatment of genitourinary syndrome. Dyspareunia;Female;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Middle

Aged;Mucous Membrane;Surveys and Questionnaires;Syndrome;Urinary Incontinence;Urinary Tract Infections;Vagina

An improvement in acute wound healing in mice by the combined application of photobiomodulation and curcumin-loaded iron particles. Here, we examined the combined effect of pulse wave photobiomodulation (PBM) with curcumin-loaded superparamagnetic iron oxide (Fe(3)O(4)) nanoparticles (curcumin), in an experimental mouse model of acute skin wound. Thirty male adult mice were randomly allocated into 5 groups. Group 1 was served as the control group. Group 2 was a placebo and received distilled water, as a carrier of curcumin. Group 3 received laser (890Â nm, 80Â Hz, 0.2Â J/cm(2)). Group 4 received curcumin by taking four injections around the wound. Group 5 received laser + curcumin. One full-thickness excisional round wound was made on the back of all the mice. On days 0, 4, 7, and 14, bacterial flora, wound surface area, and tensile strength were examined and microbiological examinations were performed. In case of wound closure, the two-way ANOVA shows that wound surface area of entire groups decreased progressively. However, the decrease in laser + curcumin and laser groups, and especially data from laser + curcumin group were statistically more significant, in comparison with the other groups (F statistics = 2.28, sig = 0.019). In terms of microbiology, the two-way ANOVA showed that laser, and laser + curcumin groups have statistically a lower bacterial count than the curcumin, control, and carrier groups (F statistics = 35, sig = 0 = 000). Finally, the one-way ANOVA showed that laser + curcumin, curcumin, and curcumin significantly increased wound strength, compared to the control and carrier groups. Furthermore, laser + curcumin significantly increased wound strength, compared to the control, laser, and curcumin groups (LSD test, pâ€‰=â€‰0.003, pâ€‰=â€‰0.002, and pâ€‰=â€‰0.005, respectively). In conclusion, curcumin nanoparticles, pulse wave laser, and pulse wave laser + curcumin nanoparticles accelerate wound healing, through a significant increase in wound closure rate, as well as wound strength, and a significant decrease in Staphylococcus aureus counts. Furthermore, the statistical analysis of our data suggests that the combined treatment of pulse wave laser + curcumin nanoparticles enhances the wound closure rate, and wound strength, compared to the laser and curcumin nanoparticles alone. Iron;Curcumin Analysis of Variance;Animals;Bacteria;Body Weight;Colony Count, Microbial;Combined Modality Therapy;Curcumin;Disease Models, Animal;Iron;Low-Level Light Therapy;Male;Mice;Microbial Sensitivity Tests;Particle Size;Tensile Strength;Tissue Distribution;Wound Healing

Near-infrared photobiomodulation combined with coenzyme Q(10) for depression in a mouse model of restraint stress: reduction in oxidative stress, neuroinflammation, and apoptosis. This study was aimed to evaluate the effects of near-infrared (NIR) photobiomodulation (PBM) combined with coenzyme Q(10) (CoQ(10)) on depressive-like behavior, cerebral oxidative stress, inflammation, and apoptosis markers in mice. To induce a depressive-like model, mice were subjected to sub-chronic restraint stress for 5 consecutive days. NIR PBM (810â€‰nm laser, 33.3â€‰J/cm(2)) and/or CoQ(10) (500â€‰mg/kg/day, gavage) were administered for five days concomitantly with immobilization. Behavior was evaluated by the forced swim test (FST), tail suspension test (TST), and open field test (OFT). Mitochondrial membrane potential as well as oxidative stress, neuroinflammatory, and markers of apoptosis were evaluated in the prefrontal cortex (PFC) and hippocampus (HIP). The serum levels of pro-inflammatory cytokines, cortisol, and corticosterone were also measured. PBM or CoQ(10), or the combination, ameliorated depressive-like behaviors induced by restraint stress as indicated by decreased immobility time in both the FST and TST. PBM and/or CoQ(10) treatments decreased lipid peroxidation and enhanced total antioxidant capacity (TAC), GSH levels, GPx and SOD activities in both brain areas. The neuroinflammatory response in the HIP and PFC was suppressed, as indicated by decreased NF-kB, p38, and JNK levels in PBM and/or CoQ(10) groups. Intrinsic apoptosis biomarkers, BAX, Bcl-2, cytochrome c release, and caspase-3 and -9, were also significantly down-

regulated by both treatments. Furthermore, both treatments decreased the elevated serum levels of cortisol, corticosterone, TNF-Î±, and IL-6 induced by restraint stress. Transcranial NIR PBM and CoQ(10) therapies may be effective antidepressant strategies for the prevention of psychopathological and behavioral symptoms induced by stress. Antidepressive Agents;Antioxidants;Ubiquinone;coenzyme Q10 Animals;Antidepressive Agents;Antioxidants;Apoptosis;Behavior, Animal;Depression;Depressive Disorder;Disease Models, Animal;Hippocampus;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Neuroimmunomodulation;Oxidative Stress;Prefrontal Cortex;Stress, Psychological;Ubiquinone

Dual-triggered drug-release vehicles for synergistic cancer therapy. Cancer is a complex and tenacious disease. Drug-delivery systems in combination with multimodal therapy strategies are very promising candidates for cancer theranostic applications. In this study, a new drug-delivery vehicle that combine human serum albumin (HSA)- and poly(sodium 4-styrenesulfonate) (PSS)-coated gold nanorod nanoparticles(GNR/PSS/HSA NPs) was developed for synergistic cancer therapy. Doxorubicin (DOX) was loaded onto GNR/PSS/HSA NPs, by electrostatic and hydrophobic forces, to create multimodal DOX@GNR/PSS/HSA NPs. DOX@GNR/PSS/HSA NPs were found to be highly biocompatible and stable in physiological solutions. Furthermore, GNR/PSS/HSA NPs with or without DOX were designed to exhibit strong absorbance in the near-infrared region and high photothermal conversion efficiency. Therefore, bimodal DOX release from DOX@GNR/PSS/HSA NPs could be triggered by an acidic pH and by near-infrared irradiation after NPs preferentially accumulated at tumor sites, leading to a significant chemotherapeutic effect. Moreover, DOX@GNR/PSS/HSA NPs were designed to be applied during chemo- and photo-thermal combination therapy and exhibited a synergistic anticancer effect that was superior to the effect of monotherapy, from both in vitro and in vivo results. These results suggest that DOX@GNR/PSS/HSA NPs are a strong candidate for a nanoplatform for future antitumor therapeutic strategies. Antibiotics, Antineoplastic;Delayed-Action Preparations;Polymers;Sulfonic Acids;Gold;Doxorubicin;Serum Albumin, Human;styrenesulfonic acid polymer Animals;Antibiotics, Antineoplastic;Combined Modality Therapy;Delayed-Action Preparations;Doxorubicin;Drug Compounding;Drug Liberation;Female;Gold;HeLa Cells;Humans;Hydrogen-Ion Concentration;Infrared Rays;Injections, Subcutaneous;Low-Level Light Therapy;Mice;Mice, Nude;Molecular Targeted Therapy;Nanotubes;Neoplasms;Polymers;Serum Albumin, Human;Sulfonic Acids;Xenograft Model Antitumor Assays

Definition of Laser Acupuncture and All Kinds of Photo Acupuncture. This editorial contains a general definition of laser acupuncture and all kinds of photo acupuncture accepted by the World Association for photobiomoduLation Therapy (WALT).

Effects of the photobiomodulation using different energy densities on the periodontal tissues under orthodontic force in rats with type 2 diabetes mellitus. To evaluate the impact of the GaAlAs diode laser with energy densities of 160 J/cm2, 320 J/cm2, and 640 J/cm2 on the periodontal tissues under continuous orthodontic force application and on the rate of orthodontic tooth movement in rats with type-2 diabetes mellitus. The intensity of primary alveolar bone formation was also investigated through the immune-positive osteocytes for OPN antibody. Forty adult male Wistar rats were divided into eight groups of 5 rats: normoglycemic (N), 160 J-laser-normoglycemic (160 J-LN), 320 J-laser-normoglycemic (320 J-LN), 640 J-laser-normoglycemic (640 J-LN), diabetic (D), 160 J-laser-diabetic (160 J-LD), 320 J-laser-diabetic (320 J-LD), and 640 J-laser-diabetic (640 J-LD) rats. Diabetes mellitus was induced by a single intravenous injection of 40 mg/kg monohydrated-alloxan. An orthodontic force magnitude of 20cN was applied. The laser parameters were continuous emission of 780-nm wavelength, output power of 20mW, and fiber probe with a spot size of 0.04 cm in diameter. Radiographic, histomorphological, and immunohistochemical analysis were performed after a period

of 21 days. The photobiomodulation using the energy density of 640 J/cm2 strongly stimulated the alveolar bone formation and contributed the reorganization of the soft periodontal tissues, followed by the 320 J/cm2. Extensive alveolar bone loss, intense infiltration of inflammatory cells, and degradation of the PDJ tissue were mainly found in the D and 160 J-LD groups. The rate of orthodontic tooth movement was represented by the interdental distance between the cementoenamel junctions of the right mandibular first and second molars . This distance was larger in the diabetic groups (D: 39.98Â±1.97, 160 J-LD: 34.84Â±6.01, 320 J-LD: 29.82Â±1.73, and 640 J-LD: 35.47Â±4.56) than in the normoglycemic groups (N: 21.13Â±1.19; 160 J-LN: 22.69Â±0.72, 320 J-LN: 22.28Â±0.78, and 640 J-LN: 24.56Â±2.11). The number of osteopontin-positive osteocytes was significantly greater in the 640 J-LD (14.72 Â± 0.82; $p < 0.01$) and 640 J-LN (13.62 Â± 1.33; $p < 0.05$) groups than with D (9.82 Â± 1.17) and 160 J-LD (9.77 Â± 1.10) groups. Therefore, the energy density of 640 J/cm2 provided the best maintenance and integrity of the periodontal tissue microarchitecture under continuous orthodontic force when compared with the other dosages, mainly in the uncontrolled diabetic rats. The interdental distance was greater in the D and 160 J-LD groups due to presence of severe periodontitis caused by diabetes plus the mechanical stress generated by continuous orthodontic forces, implying, thus, an insufficient biostimulatory effect for the dosage of 160 J/cm2. Osteopontin Alveolar Bone Loss;Animals;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontic Appliances;Osteoclasts;Osteocytes;Osteogenesis;Osteopontin;Periodontium;Radiation Dosage;Radiography;Random Allocation;Rats, Wistar;Reference Values;Reproducibility of Results;Tooth Movement Techniques

Correction: Photobiomodulation: lasers vs. light emitting diodes? Correction for 'Photobiomodulation: lasers vs. light emitting diodes?' by Vladimir Heiskanen and Michael R. Hamblin, Photochem. Photobiol. Sci., 2018, 17, 1003-1017.

Cardio-light: nitric oxide uncaged. Photobiomodulation (PB) is a utilization of low-level laser therapy (LLLT) in the far red (R) to near infrared (NIR) spectrum (600-1000Â nm) to wield its therapeutic effects. To explore the therapeutic potential of biomodulation of different tissues, LLLT has been extensively researched, especially in the light of its very low side effect profile. We believe there is an opportunity to unearth its dynamic effects on the coronaries which can be promising for the patients with chronic stable angina. NIR treatment of the heart may be protective on patients after acute myocardial infarction or on ischemic heart conditions that are not accessible to current revascularization procedures. Nitric Oxide Cardiovascular Diseases;Humans;Myocardium;Nitric Oxide

Adipose-derived mesenchymal stem cells treatments for fibroblasts of fibrotic scar via downregulating TGF-Î²1 and Notch-1 expression enhanced by photobiomodulation therapy. Actins;Culture Media, Conditioned;Receptors, Notch;Transforming Growth Factor beta1 Actins;Adipose Tissue;Animals;Apoptosis;Cell Movement;Cell Proliferation;Cicatrix, Hypertrophic;Culture Media, Conditioned;Down-Regulation;Fibroblasts;Fibrosis;Humans;Keloid;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Phenotype;Receptors, Notch;Transforming Growth Factor beta1

Effects of photobiomodulation therapy associated with resistance training in elderly men: a randomized double-blinded placebo-controlled trial. PURPOSE: The purpose of this study was to investigate the effects of photobiomodulation therapy (PBMT) combined with resistance training on knee extensors muscle mass, strength and functional capacity in elderly men. METHODS: In this randomized double-blinded placebo-controlled trial, healthy elderly men (age 60-80Â years) completed 12 weeks of resistance training (2Ã—/week) with application of placebo (nâ€‰=â€‰13)

or active PBMT (nâ€‰=â€‰11) on quadriceps muscles (850Â nm, 240Â J per limb) before each training session. Leg press and knee extension one-repetition maximum (1RM) tests, isometric and concentric peak torques, rectus femoris (RF) and vastus lateralis (VL) muscle thickness, timed up-and-go (TUG) and chair rise-to-standing (CRS) tests were performed before and after the intervention period. RESULTS: There were significant improvements in all outcomes for both groups (pâ€‰<â€‰0.05), except for RF muscle thickness for the placebo group (pâ€‰=â€‰0.09). Large effect sizes (ESâ€‰>â€‰0.8) were observed for leg press and leg extension 1RM and CRS tests for both groups, as well as for TUG test for PBMT group. Isokinetic peak torque for both groups and TUG for placebo group had moderate increases (ESâ€‰>â€‰0.5). Muscle thicknesses and isometric peak torque had small increases (ESâ€‰>â€‰0.2) in both groups. Both null hypothesis analysis and magnitude-based inference support similar effects of PBMT and placebo treatments. CONCLUSION: Different than previously evidenced in young subjects, PBMT with the parameters used in this study did not provide any additional benefits in comparison to placebo application on muscle mass, strength and functional capacity of healthy elderly men engaged in a resistance training program. Aged;Aged, 80 and over;Humans;Knee;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Muscle, Skeletal;Resistance Training

Effect of photobiomodulation with low-level laser therapy combined with potassium nitrate on controlling post-bleaching tooth sensitivity: clinical, randomized, controlled, double-blind, and split-mouth study. OBJECTIVES: To evaluate the effect of photobiomodulation with low-level laser therapy (PBM-LLLT) combined with 5% potassium nitrate (KNO(3)) on controlling tooth sensitivity (TS) after in-office tooth bleaching. MATERIALS AND METHODS: Fifty volunteers were selected based on the inclusion and exclusion criteria and were randomly allocated into four groups: G1 (control): placebo gel application, 35% hydrogen peroxide bleaching (HP35) and mock PBM-LLLT without light emission; G2: placebo gel application, bleaching with HP35 and PBM-LLLT; G3: application of KNO(3), bleaching with HP35 and mock PBM-LLLT; and G4: application of KNO(3), bleaching with HP35 and PBM-LLLT. A pain assessment questionnaire was used to evaluate TS during the 21Â days of treatment. The Friedman test was used for intragroup analysis, and the Wilcoxon and Mann-Whitney tests were used for intergroup comparisons. RESULTS: The intragroup evaluation showed significant differences among the evaluation times in all groups (pâ€‰â‰¤â€‰0.05). The highest pain sensitivity levels were recorded on the 1st, 8th, and 15th days. In G1, TS manifested for up to 3Â days after each bleaching session, while G2, G3, and G4 presented TS only on the days of the bleaching sessions. Intergroup analysis showed that TS manifestation differed significantly between G1 and the other groups (pâ€‰â‰¤â€‰0.05) but did not differ significantly among G2, G3, and G4 (pâ€‰â‰¥â€‰0.05). CONCLUSION: PBM-LLLT and KNO(3) are effective at reducing pain sensitivity after tooth bleaching, but no synergistic effect between these treatments was observed for the different evaluation periods. CLINICAL RELEVANCE: The effect of PBM-LLLT combined with KNO(3) on post-bleaching tooth sensitivity is similar to their individual use alone. Nitrates;Potassium Compounds;Tooth Bleaching Agents;Hydrogen Peroxide;potassium nitrate Adult;Dentin Sensitivity;Double-Blind Method;Female;Humans;Hydrogen Peroxide;Low-Level Light Therapy;Male;Nitrates;Potassium Compounds;Tooth Bleaching;Tooth Bleaching Agents;Treatment Outcome;Young Adult

Polydopamine-mediated bio-inspired synthesis of copper sulfide nanoparticles for T(1)-weighted magnetic resonance imaging guided photothermal cancer therapy. Copper sulfide nanoparticles(CuS NPs) have attracted considerable interest in the field of photothermal therapy(PTT) due to its low cost, easy preparation and favorable photothermal effect. However, lack of reliable visualization and relatively poor biocompatibility restrict its further bio-application. To overcome these limitations, polydopamine(PDA, a melanin-like biopolymer) stabilized CuS NPs and further

chelated with iron ions (denoted as CuPDF) were designed as a versatile nanoplatform for T(1)-weighted MR imaging-guided PTT. In this system, PDA served as both bio-template to synthesis CuS NPs and an active platform to give MRI diagnostic capability. The as-prepared CuPDF NPs demonstrated strong absorption at NIR region, nearly three times higher than that of pure PDA NPs at 808â€‰nm. Moreover, toxicity studies and histology evalution verified that CuPDF NPs possess excellent biocompatibility. In addition, CuPDF NPs showed significant MRI signal enhancement with high longitudinal relaxivity (r(1)â€‰=â€‰4.59â€‰mM(-1)â€‰s(-1)). In vivo MRI and biodistribution test confirmed the efficient accumulation of CuPDF NPs in the tumor region. After intravenous injection of CuPDF, irreversible tumor ablation was successfully achieved without inducing any obvious side effects by using 808-nm laser irradiation. All in all, these results indicated that the developed CuPDF NPs hold great potential as an effective theranostic agent for MR imaging guided PTT in vivo. Antibiotics, Antineoplastic;Indoles;Polymers;polydopamine;Copper;Doxorubicin;cupric sulfide Animals;Antibiotics, Antineoplastic;Cell Line, Tumor;Copper;Doxorubicin;Drug Compounding;Drug Liberation;Female;Hydrogen-Ion Concentration;Indoles;Infrared Rays;Injections, Subcutaneous;Low-Level Light Therapy;Magnetic Resonance Imaging;Mammary Glands, Animal;Mice;Mice, Inbred BALB C;Molecular Targeted Therapy;Nanoparticles;Neoplasms;Polymers;Theranostic Nanomedicine

THE EFFECT OF COMBINED ACTION OF ANTIBACTERIAL DRUGS WITH LOW-INTENSIVE LASER RADIATION ON CLINICAL STRAINS S. AUREUS AND S. SALIVARIUS IN THE ORAL CAVITY. The oral mucosa is constantly contaminated by a large number of microorganisms that may cause diseases such as periodontitis and caries. The present paper aims to study the effectiveness of the antimicrobial effect of combined use of antibacterial drugs (AD) and low-intensity laser radiation (LLR) on S. aureus S. salivarius isolated from the oral cavity. The study included 20 individuals with dental caries, 20 individuals with periodontitis and 10 without any signs of dental disease. The material for theÂ microbacterial study was collected from surfaces of the teeth, oral cavity with dental caries and periodontal pockets. The intensity of bacterial isolation was estimated by two factors: the frequency of isolation and percentage of other aerobic microorganisms. The obtained data demonstrated that the use of several antibacterial drugs had a different impact on the strains of S. salivarius and S. aureus, depending on the source of their collection. The collected isolates were used to determine the effect of a 5 minute laser radiation combined with antibacterial drugs. The simultaneous use of antibacterial therapy and laser radiation showed an increase in the therapeutic effect of all investigated antibiotics followed by the inhibition of the growth presentations in S. aureus and S. salivarius. The application of photodynamic therapy, e.g. LLR, combined with antibacterial drugs allowed to achieve a complete inhibition of the microbial growth. Anti-Bacterial Agents Adult;Anti-Bacterial Agents;Dental Caries;Humans;Low-Level Light Therapy;Middle Aged;Mouth;Periodontitis;Staphylococcus;Staphylococcus aureus

Evaluation of the safety and efficacy of the dual wavelength picosecond laser for the treatment of benign pigmented lesions in Asians. BACKGROUND AND OBJECTIVES: Cutaneous pigmentary disorders are both more common and more difficult to treat in patients with skin color given the higher melanin content in the epidermis. Although Q-switched lasers are widely considered to be the standard treatment for both epidermal and dermal pigmentary conditions, a very high risk of post-inflammatory hyperpigmentation (PIH) of up to 25% is seen in patients with skin of color. Recently, the novel picosecond laser with pulse durations operating at sub-nanosecond domains has been shown to be effective in tattoo removal and in the treatment of acne scars. The objective of this study is to examine the safety and efficacy of the dual wavelength picosecond laser for the treatment of benign pigmented skin lesions in Asian patients. METHODS: Twelve subjects with benign pigmentary disorders and Fitzpatrick skin types III to IV were recruited in a prospective clinical study to examine

the safety and efficacy of the dual wavelength picosecond laser. Patients were treated at approximately 2-6 week intervals depending of the type of lesion. The primary efficacy endpoint is the global percent of clearance which was evaluated by blinded observers using post treatment photographs compared to baseline photographs. Safety was evaluated before and after each laser treatment and patients were asked to rate the level of pain according to the Visual Analog Scale after each treatment session. Patient satisfaction was assessed at the completion of treatment with questionnaires. All patients were followed up at 4, 8, and 12 weeks after the last treatment session. RESULTS: The pigmentary conditions treated included melasma, freckles, lentiginies, cafÃ© au lait macules, and Hori's macules. Three months after treatment, 53.8% of all pigments achieved excellent response (75-94% lightening,) 30.8% of pigments achieved good response (50-74% lightening,) and 7.7% of pigments achieved both fair (25-49% lightening) and poor responses (0-24% lightening), respectively. The average number of treatment sessions required to reach at least 50% clearance was 4.5 for melasma, 1 for freckles, 1.5 for lentigines and 1 for cafÃ© au lait. The patient with Hori's macules did not reach 50% clearance after a total of six treatments. Sixty three percent of patients reported satisfaction in the subjective assessment, while 27.3% were neutral and 9.1% were very dissatisfied. The post inflammatory hyperpigmentation rate was 4.8% and 6.5% of subjects developed blistering as a side effect of treatment. CONCLUSION: The dual wavelength picosecond laser is a safe and effective treatment of benign pigmentary conditions in patients with skin of color. In particular, superior clinical efficacy is demonstrated for treatment of freckles and lentigines with a low risk of PIH. Lasers Surg. Med. 51:14-22, 2019. Â© 2018 Wiley Periodicals, Inc.
Adult;Esthetics;Face;Female;Hong Kong;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Safety;Prospective Studies

Effects of Low Level Laser Therapy on Erosive-atrophic Oral Lichen Planus. BACKGROUND: The erosive-atrophic form of oral lichen planus (OLP) is associated with severe pain and burning sensation and is often unresponsive to treatment. Topical corticosteroids are considered as a medication of first choice but they can produce adverse effects. Therefore, new therapeutic approaches are required. AIM: The aim of this study was to investigate the effectiveness of biomodulation with diode laser in patients presenting with long-standing erosive-atrophic OLP. MATERIALS AND METHODS: Twelve patients, clinically and histologically diagnosed with OLP, participated in this study. The level of pain and the clinical scores of total 59 lesions were recorded before treatment using visual analog scale and Thongprasom sign scoring system respectively. All patients received low level laser therapy (LLLT) with diode laser (810 nm) with parameters (0.5 W, 30 s, 1.2 J/cm2) three times weekly for a month. The response rate was assessed according to the decrease in pain and sign scores. Treatment efficacy index was calculated. RESULTS: There was a significant reduction in pain after LLLT ($p<0.0001$). Improvement in clinical signs was achieved in 59.3% of the lesions. At the end of the treatment 5.1% of the lesions exhibited score 5; 6.8% - score 4, 11.9% of the lesions were scored 3 and 8.5% and 30.5% showed score 2 and score 1, respectively. Complete resolution was revealed in 37.3% of the lesions. All patients experienced some degree of improvement. Most of the cases showed moderate recovery. CONCLUSION: The present results indicate that LLLT is an effective and harmless modality for management of erosive-atrophic OLP. Adult;Aged;Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Treatment Outcome;Young Adult

Low-intensity laser for harvesting palatal graft for the treatment of gingival recession: A systematic review. The aim of the present study was to assess the efficacy of low-intensity laser therapy (LILT) for harvesting palatal connective tissue graft (PCTG) in the treatment of gingival recession. Databases were searched up to May 2018. The addressed focused question was: Is adjunctive LILT effective in the healing of donor palatine area after harvesting PCTG? Screening of the initially

identified studies resulted in four clinical studies. All studies showed that LILT was effective in improving clinical outcomes, such as tissue thickness, postoperative discomfort, remaining wound area, and visual analog score at follow up. Upon comparison with the control group, two studies showed significantly greater improvements in the clinical parameters and patient-centered outcomes for LILT than control groups at follow up. Due to the low number of included clinical studies, it remains debatable whether LILT improves clinical and patient-centered outcomes of PCTG procedures. Further randomized controlled trials are needed to evaluate the outcomes of LILT on the healing of donor palatine area after harvesting PCTG. Connective Tissue;Databases, Factual;Gingiva;Gingival Recession;Humans;Low-Level Light Therapy;Palate;Surgical Flaps;Tissue Transplantation;Treatment Outcome;Wound Healing

A comparison of inverted and upright laser-activated titanium nitride micropyramids for intracellular delivery. The delivery of biomolecules into cells relies on porating the plasma membrane to allow exterior molecules to enter the cell via diffusion. Various established delivery methods, including electroporation and viral techniques, come with drawbacks such as low viability or immunotoxicity, respectively. An optics-based delivery method that uses laser pulses to excite plasmonic titanium nitride (TiN) micropyramids presents an opportunity to overcome these shortcomings. This laser excitation generates localized nano-scale heating effects and bubbles, which produce transient pores in the cell membrane for payload entry. TiN is a promising plasmonic material due to its high hardness and thermal stability. In this study, two designs of TiN micropyramid arrays are constructed and tested. These designs include inverted and upright pyramid structures, each coated with a 50-nm layer of TiN. Simulation software shows that the inverted and upright designs reach temperatures of 875â€‰Â°C and 307â€‰Â°C, respectively, upon laser irradiation. Collectively, experimental results show that these reusable designs achieve maximum cell poration efficiency greater than 80% and viability greater than 90% when delivering calcein dye to target cells. Overall, we demonstrate that TiN microstructures are strong candidates for future use in biomedical devices for intracellular delivery and regenerative medicine. titanium nitride;Titanium Cell Membrane;Drug Delivery Systems;Endocytosis;HeLa Cells;Humans;Low-Level Light Therapy;Temperature;Titanium

Transcranial Photobiomodulation for the Treatment of Major Depressive Disorder. The ELATED-2 Pilot Trial. Objective: Our objective was to test the antidepressant effect of transcranial photobiomodulation (t-PBM) with near-infrared (NIR) light in subjects suffering from major depressive disorder (MDD). Background: t-PBM with NIR light is a new treatment for MDD. NIR light is absorbed by mitochondria; it boosts cerebral metabolism, promotes neuroplasticity, and modulates endogenous opioids, while decreasing inflammation and oxidative stress. Materials and methods: We conducted a double-blind, sham-controlled study on the safety and efficacy [change in Hamilton Depression Rating Scale (HAM-D(17)) total score at end-point] of adjunct t-PBM NIR [823â€‰nm; continuous wave (CW); 28.7â€‰Ã—â€‰2â€‰cm(2); 36.2â€‰mW/cm(2); up to 65.2â€‰J/cm(2); 20-30â€‰min/session], delivered to dorsolateral prefrontal cortex, bilaterally and simultaneously, twice a week, for 8 weeks, in subjects with MDD. Baseline observation carried forward (BOCF), last observation carried forward (LOCF), and completers analyses were performed. Results: The effect size for the antidepressant effect of t-PBM, based on change in HAM-D(17) total score at end-point, was 0.90, 0.75, and 1.5 (Cohen's d), respectively for BOCF (nâ€‰=â€‰21), LOCF (nâ€‰=â€‰19), and completers (nâ€‰=â€‰13). Further, t-PBM was fairly well tolerated, with no serious adverse events. Conclusions: t-PBM with NIR light demonstrated antidepressant properties with a medium to large effect size in patients with MDD. Replication is warranted, especially in consideration of the small sample size. Depressive Disorder, Major;Double-Blind Method;Humans;Low-Level Light Therapy;Pilot Projects;Randomized Controlled Trials as Topic

Effectiveness of low-level diode laser therapy on pain during cavity preparation on permanent teeth. PURPOSE: To evaluate the effectiveness of low-level laser therapy (LLLT) on dental pain felt during cavity preparation of carious lesions in permanent teeth of adults. METHODS: The study was carried out on 88 teeth with dental caries requiring class I restorations in 24 subjects with a pain score â‰¥ 7 but < 10 measured using a 0-10 visual analogue scale (VAS) in a preliminary test of pain threshold (PTPT) for each subject receiving a class I cavity preparation on another tooth without local anesthesia. The 88 teeth included were randomly allocated to test and control groups, each with 44 teeth. All teeth were treated with LLLT prior to the mechanical preparation of the cavity without local anesthesia, except that the laser device was kept in idle mode in the control group. After cavity preparation, subjects scored pain intensity using the VAS. The Wilcoxon test was used to analyze data and the values with P< 0.05 were considered significant. RESULTS: All subjects scored a pain reduction in the test group compared with the control group (P< 0.0001), with a reduction of 42% and 16%, respectively, compared to pain felt during the PTPT. The use of LLLT prior to mechanical preparation of a cavity by lowering pain intensity might reduce the quantity of drugs used for pain control required during restorative procedures. CLINICAL SIGNIFICANCE: Dental treatments could be more comfortable by using a preliminary phase of low-power lasers, limiting or eliminating pharmacological agents for pain control. Adult;Dental Caries;Dental Cavity Preparation;Dental Restoration, Permanent;Humans;Laser Therapy;Low-Level Light Therapy;Pain;Random Allocation

Photobiomodulation Using a Low-Level Light-Emitting Diode Improves Cognitive Dysfunction in the 5XFAD Mouse Model of Alzheimer's Disease. Photobiomodulation using low-level light-emitting diode can be rapidly applied in neurological and physiological disorders safely and noninvasively. Photobiomodulation is effective for chronic diseases because of fewer side effects than drugs. Here we investigated the effects of photobiomodulation using light-emitting diode on amyloid plaques, gliosis, and neuronal loss to prevent and/or recover cognitive impairment, and optimal timing of photobiomodulation initiation for recovering cognitive function in a mouse model of Alzheimer's disease. 5XFAD mice were used as an Alzheimer's disease model. Animals receiving photobiomodulation treatment were divided into two groups: an early group starting photobiomodulation at 2 months of age (5XFAD+Early), and a late group starting photobiomodulation at 6 months of age (5XFAD+Delay). Both groups received photobiomodulation 20 minutes per session three times per week for 14 weeks. The Morris water maze, passive avoidance, and elevated plus maze tests were performed at 10 months of age. Immunohistochemistry and Western blot were performed after behavioral evaluation. The results showed that photobiomodulation treatment at early stages reduced amyloid accumulation, neuronal loss, and microgliosis and alleviated the cognitive dysfunction in 5XFAD mice, possibly by increasing insulin degrading enzyme related to amyloid-beta degradation. Photobiomodulation may be an excellent candidate for advanced preclinical Alzheimer's disease research. APP protein, human;Amyloid beta-Protein Precursor;Mutant Proteins Age Factors;Alzheimer Disease;Amyloid beta-Protein Precursor;Animals;Avoidance Learning;Cerebral Cortex;Cognition;Disease Models, Animal;Gliosis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maze Learning;Mice;Mice, Transgenic;Microglia;Mutant Proteins;Mutation, Missense;Proteolysis

Complications of Cryolipolysis: Paradoxical Adipose Hyperplasia (PAH) and Beyond. BACKGROUND: Cryolipolysis is a fairly popular procedure performed in North America, Europe, and many other countries. Although it is considered a rather safe procedure, there are underreported side effects such as paradoxical adipose hyperplasia (PAH), contour irregularities, skin and soft tissue atrophy, and asymmetries. Our knowledge regarding the prevalence and treatment of such complications is limited. OBJECTIVES: We hereby report a case series of 5 patients treated for various complications of cryolipolysis, including PAH, that persisted for more than 12 months after their last

treatment. METHODS: Five patients with various complications of cryolipolysis (4 patients with PAH and 1 with atrophy and indentations) presented in our private office between 2015 and 2018. Three of the 4 patients with PAH were treated at other facilities with ultrasonic liposuction, laser lipolysis, and radiofrequency skin tightening devices respectively. The fourth patient developed PAH after liposuction at another facility. The fifth patient developed several areas of indentations and atrophy and received mesotherapy and lymphatic massages at another facility. All 5 patients were subsequently treated in our office by means of a customized approach specific to their underlying complications. RESULTS: Near-normal results were achieved in all 5 patients. None of our patients showed any recurrences of their initial complication for which they were treated. All 5 patients were extremely satisfied with their results. CONCLUSIONS: Cryolipolysis, just like any other form of lipolysis, has certain specific adverse effects associated with it, including but not limited to PAH. Complications of cryolipolysis must be individually recognized and treated accordingly.
Adult;Cryotherapy;Female;Humans;Hyperplasia;Lipectomy;Low-Level Light Therapy;Mesotherapy;Postoperative Complications;Reoperation;Subcutaneous Fat;Treatment Outcome

Folate receptor-targeted liposomal nanocomplex for effective synergistic photothermal-chemotherapy of breast cancer in vivo. An effective nanoparticle-based drug delivery platform holds great promise for non-invasive cancer therapy. This study explores the breast tumor regression in vivo by synergistic photothermal-chemotherapy based on liposomal nanocomplex (folic acid-gold nanorods-anticancer drug-liposome). The proposed liposomal nanocomplex can enhance the tumor targeting by functionalizing folic acid (FA) molecules on the surface of liposome that encapsulates both gold nanorods (AuNRs) and the doxorubicin (DOX) to combine the photothermal therapy and the chemotherapy, respectively. Herein, 7-nm gold nanorods were fabricated and co-encapsulated with DOX into nanoliposomes functionalized with FA, with an average diameter of 154â€‰nm, for active targeting to the cancer cells. The experimental results showed that the FA targeting liposomes had better cellular uptake than the non-targeting liposomes (AuNRs-DOX-LPs). Especially, upon 5â€‰min exposure to near infrared (NIR) irradiation (808â€‰nm) triggered DOX release could be achieved to 46.38% in 60â€‰min at pH 5.5. In addition, in vitro cell proliferation assays indicated that, with synergistic photothermal-chemotherapy, the targeting liposomes could significantly enhance the toxicity towards the cancer cells with the IC(50) value of 1.90â€‰Â±â€‰0.12â€‰Î¼g mL(-1). Furthermore, in vivo experiments on the breast tumor-bearing mice showed that the targeting liposomes could effectively inhibit the growth of the tumors using the combined strategy.
Antibiotics, Antineoplastic;Folate Receptors, GPI-Anchored;Liposomes;Gold;Doxorubicin;Folic Acid Animals;Antibiotics, Antineoplastic;Cell Line, Tumor;Combined Modality Therapy;Doxorubicin;Drug Compounding;Drug Liberation;Female;Folate Receptors, GPI-Anchored;Folic Acid;Gold;Hydrogen-Ion Concentration;Infrared Rays;Injections, Subcutaneous;Liposomes;Low-Level Light Therapy;Mammary Glands, Animal;Mice;Molecular Targeted Therapy;Nanotubes;Neoplasms;Protein Binding

Role of photobiomodulation on the activation of the Smad pathway via TGF-Î² in wound healing. Wound healing is an essential process in which the separated or destroyed tissue attempts to restore itself into its normal state. In some instances, healing is prolonged and remains stagnant in the inflammatory phase, and is referred to as a chronic wound. At a cellular and molecular level, many factors are required during the process of successful wound healing, such as cytokines, polypeptide growth factors and components of the extracellular matrix (ECM). Transforming growth factor-beta (TGF-Î²) is considered as one of the essential growth factors in wound healing. Working through the Smad pathway, it is the main inducer of fibroblast differentiation which is essential for wound healing. Photobiomodulation (PBM) shows significant advantages in wound healing, and may stimulate cellular processes and tissue regeneration that results in an increase in growth factors and a

decrease in inflammatory cytokines. Moreover, it leads to enhanced cell proliferation, migration, angiogenesis, and increased adenosine triphosphate (ATP) and cytochrome C oxidase (CCO) activity. In this review paper, we discuss the effects of PBM and its role on the activation of the TGF-Î²/Smad pathway in the process of wound healing. Smad Proteins;Transforming Growth Factor beta Animals;Cell Differentiation;Fibroblasts;Humans;Phototherapy;Signal Transduction;Smad Proteins;Transforming Growth Factor beta;Wound Healing

Effect of 650-nm low-level laser irradiation on c-Jun, c-Fos, ICAM-1, and CCL2 expression in experimental periodontitis. This study was designed to investigate the effect of 650-nm low-level laser irradiation (LLLI) as an adjunctive treatment of experimental periodontitis. To investigate possible LLLI-mediated anti-inflammatory effects, we utilized an experimental periodontitis (EP) rat model and analyzed c-Jun, c-Fos, ICAM-1, and CCL2 gene expressions on PB leukocytes and in the gingival tissue. Total RNA was isolated from the gingivae and peripheral blood (PB) leukocytes of normal, EP, scaling, and root planing (SRP)-treated EP and LLLI + SRP-treated EP rats, and gene expressions were analyzed by real-time PCR. The productions of c-Jun, c-Fos, ICAM-1, and CCL2 in gingivae were analyzed immunohistochemically. Tartrate-resistant acid phosphatase (TRAP) staining was used to determine osteoclast activity in alveolar bone. The c-Jun and ICAM-1 messenger RNA (mRNA) levels were significantly decreased in the EP rat gingival tissue treated by SRP + LLLI than by SRP, the c-Jun, ICAM-1, and c-Fos mRNA levels on PB leukocytes reduced after LLLI treatment but did not show any significant differences in both groups. There was no significant difference in CCL2 mRNA levels on PB leukocytes and in gingivae between the SRP + LLLI and the SRP groups. The c-Fos mRNA levels in gingivae did not show significant difference in both groups. Immunohistochemistry showed that the CCL2, ICAM-1, c-Jun, and c-Fos productions were significantly reduced in rats of the SRP + LLLI group compared with the only SRP group. LLLI significantly decreased the number of osteoclasts as demonstrated by TRAP staining. The 650-nm LLLI might be a useful treatment modality for periodontitis. Chemokine CCL2;Proto-Oncogene Proteins c-fos;Proto-Oncogene Proteins c-jun;RNA, Messenger;Intercellular Adhesion Molecule-1 Animals;Chemokine CCL2;Gene Expression Regulation;Gingiva;Intercellular Adhesion Molecule-1;Low-Level Light Therapy;Male;Osteoclasts;Periodontitis;Proto-Oncogene Proteins c-fos;Proto-Oncogene Proteins c-jun;RNA, Messenger;Rats, Sprague-Dawley

Arrabidaea chica for oral mucositis in patients with head and neck cancer: a protocol of a randomised clinical trial. INTRODUCTION: Oral mucositis is an iatrogenic condition of erythematous inflammatory changes which tends to occur on buccal and labial surfaces, the ventral surface of the tongue, the floor of the mouth and the soft palate of patients receiving chemotherapy. This protocol of ongoing randomised parallel group clinical trial aims to access the therapeutic effect of an herbal gel containing 2.5% Arrabidaea chica Verlot standardised extract on oral mucositis in patients with head and neck cancer compared with low-level laser therapy. METHODS AND ANALYSIS: Patients with head and neck cancer held at Clinics Hospital of University of Campinas, Sao Paulo, who develop early signs/symptoms of oral mucositis are eligible. Baseline characteristics of participants include oral mucositis grade and quality of life assessments. Enrolment started in November 2017 with allocation of patients to one of the study groups by means of randomisation. Patients will be treated either with Arrabidaea chica or laser until wound healing. Monitoring includes daily assessment of mucositis grade and diameter measurement by photographs and millimetre periodontal probe. Treatments will be concluded once mucositis is healed. A blinded assessor will evaluate mucositis cure after referred by the study team. At this point, the gel tube will be weighed to indirectly assess patient's compliance. At close-out, data will be analysed by a blinded researcher following the procedures described in the statistical analyses. ETHICS AND DISSEMINATION: This clinical trial was approved by the ethics committee of research in humans at the Faculty of Medical Sciences of University of

Campinas (report no. 1,613,563/2016). Results from this trial will be communicated in peer-reviewed publications and scientific presentations. TRIAL REGISTRATION NUMBER: RBR-5Ã—4397. Plant Extracts Antineoplastic Protocols;Bignoniaceae;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Plant Extracts;Randomized Controlled Trials as Topic;Stomatitis

Platelet-rich plasma: Potential role in combined therapy for vitiligo. Dermatologic Agents Combined Modality Therapy;Dermatologic Agents;Humans;Lasers, Gas;Low-Level Light Therapy;Platelet-Rich Plasma;Skin Pigmentation;Time Factors;Treatment Outcome;Ultraviolet Therapy;Vitiligo

[Effects of low level laser irradiation on the osteogenic capacity of sodium alginate/gelatin/human adipose-derived stem cells 3D bio-printing construct]. OBJECTIVE: To explore the effects of low level laser irradiation (LLLI) on the osteogenic capacity of three-dimensional (3D) structure by 3D bio-printing construct used human adipose-derived stem cells (hASCs) as seed cells. METHODS: Using hASCs as seed cells, we prepared sodium alginate/gelatin/hASCs 3D bio-printing construct, and divided them into four groups: PM (proliferative medium), PM+LLLI, OM (osteogenic medium) and OM+LLLI, and the total doses of LLLI was 4 J/cmÂ². Immunofluorescence microscopy was used to observe the viability of the cells, and analyze the expression of the osteogenesis-related protein Runt-related transcription factor 2 (Runx2) and osteocalcin (OCN). RESULTS: The 3D constructs obtained by printing were examined by microscope. The sizes of these 3D constructs were 10 mmÃ—10 mmÃ—1.5 mm. The wall thickness of the printed gelatin mold was approximately 1 mm, and the pores were round and had a diameter of about 700 Î¼m. The cell viability of sodium alginate/gelatin/hASCs 3D bio-printing construct was high, and the difference among the four groups was not significant. On day 7, the expression of OCN from high to low was group OM+LLLI, PM+LLLI, OM and PM. There were significant differences among these groups ($P<0.01$), but there was no significant difference between group PM+LLLI and OM. On day 14, the expression of OCN in each group was higher than that on day 7, and there was no significant difference between group OM+LLLI and OM. The expression of Runx2 in group OM+LLLI was more than 90%, significantly higher than that in group OM ($P<0.01$). But the expression of Runx2 in group PM+LLLI and OM+LLLI were significantly lower than that in the non-irradiated groups. The expression of osteogenesis-related protein Runx2 and OCN were higher in OM groups than in PM groups. Furthermore, the irradiated groups were significantly higher than the non-irradiated groups. CONCLUSION: LLLI does not affect the cell viability of sodium alginate/gelatin/hASCs 3D bio-printing construct, and may promote the osteogenic differentiation of hASCs. Alginates;Gelatin Adipocytes;Alginates;Cell Differentiation;Cell Proliferation;Gelatin;Humans;Lasers;Osteogenesis;Printing, Three-Dimensional;Stem Cells

A Conservative Approach for Localized Spongiotic Gingivitis Hyperplasia Using Photodynamic Therapy: A Case Report and Review of the Literature. OBJECTIVE: To describe a clinical case of successful conservative management of Localized Juvenile Spongiotic Gingivitis Hyperplasia (LJSGH) using photodynamic therapy (PDT) and reviews the current literature on this pathology. BACKGROUND DATA: LJSGH is a recently described rare disease with controversial treatment results. As of today, 13 publications report surgical treatment approaches. The use of CO(2) laser and cryotherapy was reported only in one study. The use of PDT was not previously reported. PATIENTS AND METHODS: A 9-year-old male patient was referred to our institution with the chief complaint of asymptomatic "inflamed gingiva" starting 1 year before. Clinical examination revealed an erythematous line accompanying the gingival contour, with a certain degree of hyperplasia. The diagnosis of LJSGH was performed based on clinical features and later confirmed histopathologically. A novel approach using PDT was then proposed. The photosensitizer was methylene blue, and a semiconductor laser diode was used. RESULTS: One week after starting PDT, gingival hyperplasia was partially reduced. Immediately after the end of treatment, a significant reduction of gingival hyperplasia was observed.

PDT proved to be safe, quick and painless, with no esthetic harm. CONCLUSIONS: This case illustrates the benefit of a more conservative approach as opposed to surgical procedure, with good clinical response and decreased morbidity over a 2-year follow-up period.

Laser photobiomodulation is more effective than ultrasound therapy in patients with chronic nonspecific low back pain: a comparative study. The purpose of this study was to compare the effects of laser photobiomodulation therapy (lPBMt) and ultrasound therapy (UST) in patients with chronic non-specific low back pain (CNLBP). Forty-five patients with CNLBP aged 30-40Â years were divided randomly into three groups of 15 subjects each. The lPBMt group received 8Â weeks of lPBMt with an exercise program, while the UST group received 8Â weeks of UST with the same exercise program; the control group received only the exercise program for 8Â weeks. Pain, disability, functional performance, and lumbar range of motion were assessed at the beginning of the study and after 8Â weeks. There were no significant differences in demographic and clinical characteristics among the three groups at baseline (pâ€‰>â€‰0.05). At the end of the study, there were significant improvements in pain, disability, and functional performance in the two experimental groups (pâ€‰<â€‰0.05), but changes in the control group were non-significant. However, lumbar range of motion was significantly improved only in the lPBMt group (pâ€‰<â€‰0.05). When the three groups were compared in terms of a change in clinical variables, there was a significant difference among the three groups in all measures in favor of lPBMt group. Based on our results, both lPBMt or UST combined with an 8-week exercise program seemed to be effective methods for decreasing pain, reducing disability, and increasing functional performance in patients with CNLBP, although lPBMt is more effective than UST. Adult;Chronic Disease;Exercise Therapy;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Pain Measurement;Range of Motion, Articular;Treatment Outcome;Ultrasonic Therapy

Influence of low-level laser irradiation on osteocalcin protein and gene expression in bone tissue1. PURPOSE: To evaluate osteocalcin gene and protein expression in vitro and in an in vivo model of ostectomy. METHODS: Twenty Wistar rats were assigned into two groups A (n=10, laser) and B (n=10, control). Ostectomy was performed in the femur diaphysis; the twenty fragments removed, composed in vitro groups named as in vivo (A and B) and cultivated in CO2 atmosphere for thirteen days. Low-level laser irradiation was performed in groups A (in vivo and in vitro) by an GaAlAs device (Î»=808 nm, dose of 2J/cm2, power of 200mW, power density of 0.2W/cm2, total energy of 1.25J, spot diameter of 0.02mm) for 5 seconds, at one point, daily. It was performed immunocytochemistry assays in vivo and in vitro groups. In vitro groups were also submitted to RNA extraction, cDNA synthesis and gene expression by quantitative PCR. Statistical analysis was realized with $p<0.05$. RESULTS: Immunocytochemistry scores showed no significant differences between control and laser groups either in vivo and in vitro. Gene expression also showed no statistical differences. CONCLUSION: Low-level laser irradiation did not alter osteocalcin protein and gene expression in vivo and in vitro in the studied period but it may have been expressed them in an earlier period. Osteocalcin Animals;Femur;Gene Expression;Immunohistochemistry;Low-Level Light Therapy;Male;Models, Animal;Osteocalcin;Osteotomy;Rats;Rats, Wistar

Modulation of exercise-induced muscular damage and hyperalgesia by different 630Â nm doses of light-emitting diode therapy (LEDT) in rats. We compared the acute effects of different doses of 630Â nm light-emitting diode therapy (LEDT) on skeletal muscle inflammation and hyperalgesia in rats submitted to exercise-induced muscle damage (EIMD). Wistar rats were divided into five experimental groups (nâ€‰=â€‰5-8/group): sedentary control (CON); exercise + passive recovery (PR); and exercise + LEDT (1.2Â J/cm(2), 1.8Â J; 4.2Â J/cm(2), 6.3Â J; 10.0Â J/cm(2), 15Â J). After 100Â min of swimming, the rats in the LEDT groups were exposed to phototherapy on the triceps surae muscle. For mechanical hyperalgesia evaluation, paw withdrawal threshold was assessed

before and 24Â h after swimming. Immediately after hyperalgesia tests, blood samples were collected to analyze creatine kinase (CK) activity and the soleus muscle was removed for histological and tumor necrosis factor (TNF)-Î± immunohistological analyses. In all LEDT groups, plasma CK activity was reduced to levels similar to those measured in the CON group. Paw withdrawal threshold decreased in the PR group (-â€‰11.9â€‰Â±â€‰1.9Â g) when compared to the CON group (2.2â€‰Â±â€‰1.5Â g; pâ€‰<â€‰0.01) and it was attenuated in the group LEDT 4.2Â J/cm(2) (-â€‰3.3â€‰Â±â€‰2.4Â g, pâ€‰<â€‰0.05). Less leukocyte infiltration and edema and fewer necrotic areas were found in histological sections of soleus muscle in LEDT (4.2Â J/cm(2)) and LEDT (10.0Â J/cm(2)) groups compared to the PR group. Also, LEDT (4.2Â J/cm(2)) and LEDT (10.0Â J/cm(2)) groups showed less immunostaining for TNF-Î± in macrophages or areas with necrosis of muscle fibers compared to the PR group. LEDT (4.2Â J/cm(2), 6.3Â J)-reduced muscle inflammation and nociception in animals submitted to EIMD. Tumor Necrosis Factor-alpha;Creatine Kinase Animals;Creatine Kinase;Dose-Response Relationship, Radiation;Edema;Hyperalgesia;Leukocyte Count;Leukocytes;Light;Male;Muscle, Skeletal;Necrosis;Phototherapy;Physical Conditioning, Animal;Rats, Wistar;Swimming;Tumor Necrosis Factor-alpha

The effect of low-level laser therapy and physical exercise on pain, stiffness, function, and spatiotemporal gait variables in subjects with bilateral knee osteoarthritis: a blind randomized clinical trial. Objective: To evaluate the effects of individual and combination therapies (low-level laser therapy and physical exercises) on pain, stiffness, function, and spatiotemporal gait variables in subjects with bilateral knee osteoarthritis (OA).Methods: Subjects with knee OA (Grades 1-3) were evaluated and randomized into four groups: Control Group (CG), untreated; Laser Group (LG), treated with laser at 808â€‰nm, 5.6 J; Exercise Group (EG), treated with exercise; and Laserâ€‰+â€‰Exercise Group (LEG), treated with laser and exercises. The treatment was carried out twice a week for 2â€‰months. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire was applied for evaluation and reevaluation; evaluation of spatiotemporal gait variables was performed using GAITRite equipment.Results: The EG showed significant improvement in pain (pâ€‰=â€‰0.006) and function (pâ€‰=â€‰0.01) according to WOMAC. Regarding gait variables, in intergroup analysis after 8â€‰weeks all groups receiving intervention showed a significant increase in gait speed: LG versus CG (pâ€‰=â€‰0.03); EG versus CG (pâ€‰=â€‰0.04) and LEG versus CG (pâ€‰=â€‰0.005). Only the group treated with laserâ€‰+â€‰exercise showed a significant increase (pâ€‰=â€‰0.009) in the cadence and duration of single right limb support (pâ€‰=â€‰0.04), and only the groups treated with exercise and laserâ€‰+â€‰exercise showed significant decreases in the duration of right limb support (pâ€‰=â€‰0.035 and pâ€‰=â€‰0.003, respectively), compared to the CG.Conclusions: The group treated only with exercise showed improvement in WOMAC questionnaire scores. Regarding the gait variables, all groups undergoing the interventions showed increases in the gait speed compared to the CG. The laser and exercise combination therapy provided the best results for the other gait variables (cadence and duration of right limb support and duration of single right limb support).Implications for rehabilitationThere are differences in gait patterns in patients with knee OA, including decreased gait speed, cadence, and step length.The results shown in the present study provide additional information about the physical therapy approaches that should be chosen during clinical practical to improve gait performance in individuals with knee osteoarthritis.The improvement in gait performance is a relevant issue due to the fact that is associated to physical independence and better quality of life. Arthralgia;Combined Modality Therapy;Exercise Therapy;Female;Gait;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Patient Reported Outcome Measures;Range of Motion, Articular;Single-Blind Method

Long pulsed dye laser with a back-to-back double-pulse technique and compression for the treatment of epidermal pigmented lesions. BACKGROUND: In the recent past, long pulsed dye lasers (LPDL) have been investigated for the treatment of epidermal pigmented lesions (EPLs). Using a pigmented lesion compression headpiece, blood is pushed laterally out of the laser field focusing laser energy on melanin. Recent studies have demonstrated excellent responses using a single-pulse at the following settings: 9-12â€‰J/cm(2) , 1.5â€‰milliseconds, 7-10â€‰mm spot size with compression. However, the majority of these studies report patients requiring up to four treatments for lesion resolution. Herein, we describe our experiences utilizing a back-to-back double-pulse technique to decrease the total number of treatments needed for EPL clearance. METHODS: Thirty-six patients (27 females, 9 males; skin types I-IV) with benign facial EPLs were included. Each lesion received two back-to-back pulses (fluence of 9-12â€‰J/cm(2) , 1.5â€‰milliseconds duration, and 7â€‰mm spot size). If needed, a second treatment was delivered 4-8 weeks later. Pre- and post-photos after the first treatment were evaluated by two independent board-certified dermatologists. RESULTS: Lesion clearance after the first treatment was graded on a Likert scale as: 1â€‰=â€‰poor (<25% clearance); 2â€‰=â€‰fair (25-50%); 3â€‰=â€‰good (51-75%); and 4â€‰=â€‰excellent (>75%). Of the 36 participants, 23 had excellent clearing, 10 with good, 2 with fair and 1 with poor clearance. There was only one case of post-inflammatory hyperpigmentation that subsequently resolved, and no cases or scarring or hypopigmentation. CONCLUSION: LPDL with compression continues to be a safe and effective modality for treatment of EPLs. Double-pulsing decreases the total number of treatments needed for lesion resolution, while maintaining safety and potentially decreasing cost. Lasers Surg. Med. 51:136-140, 2019. Â© 2018 Wiley Periodicals, Inc.
Face;Female;Humans;Hyperpigmentation;Lasers, Dye;Low-Level Light Therapy;Male

Stimuli-Responsive Release of Antimicrobials Using Hybrid Inorganic Nanoparticle-Associated Drug-Delivery Systems. Recently, the combination of metallic nanoparticles (NPs) of Au, Ag, Fe(2) O(3) , and Fe(3) O(4) with traditional soft matter drug-delivery systems has emerged as a promising strategy to achieve site-specific and controlled release of antimicrobial agents. By harnessing the plasmonic and magnetic properties of inorganic NPs, the disruption of antibiotic-loaded liposomes, polymersomes, and hydrogels can be remotely triggered by mechanisms such as photo- and magneto-thermal effects, microbubble cavitation, magnetic positioning, and pH-changes, hence offering significant advantages in improving antibacterial efficacy, reducing side effects, and in overcoming antimicrobial resistance. This review highlights the latest development of stimuli-responsive antibiotic delivery systems incorporating inorganic NPs. The methods employed for preparation of hybrid inorganic NP-associated drug-delivery systems and the effects this has upon the system are discussed. Finally, a detailed exposition of the NP-mediated triggering mechanisms is provided and pertinent examples of their use in antimicrobial applications are presented. Anti-Bacterial Agents;Hydrogels;Liposomes Animals;Anti-Bacterial Agents;Bacteria;Drug Compounding;Drug Delivery Systems;Drug Liberation;Humans;Hydrogels;Hydrogen-Ion Concentration;Liposomes;Low-Level Light Therapy;Magnetic Fields;Magnets;Metal Nanoparticles;Microbubbles

Image Gallery: 308-nm ultraviolet B excimer laser treatment for cutaneous B-cell lymphoma nodular lesions on the face. Aged, 80 and over;Face;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Lymphoma, B-Cell;Skin Neoplasms;Treatment Outcome;Ultraviolet Therapy

Photobiomodulation and bacterial cellulose membrane in the treatment of third-degree burns in rats. Burns are injuries caused mainly by thermal trauma, which can progress to unsatisfactory results healing. This study aimed to evaluate the biomaterial (bacterial cellulose membrane) and photobiomodulation, exclusively and associated, in the treatment of third degree burns in rats. Forty male Wistar rats (Â±280Â g) were randomly divided into four groups, with 10 animals each: control

group (CG); bacterial cellulose membrane group (MG); laser group (LG) and bacterial cellulose membrane and laser group (MGÂ +Â L). The burn was caused with a 1Â cm(2) aluminum plate heated to 150â€¯Â°C and pressed on the animal's back for 10â€¯s. The treatments were started immediately after induction of injury. For to laser irradiation (660â€¯nm, 100â€¯mW, 25â€¯J/cm(2) and energy of 1â€¯J) on five distinct application points were used, on alternate days, a total of five sessions. After ten days of treatment the animals were euthanized for collected samples. One-way ANOVA and Tukey's tests (Pâ€¯<â€¯0.05) were used. Histological analysis revealed differences regarding the healing process phase in each experimental group. MG showed the proliferative phase. The LG demonstrated greater amount of blood vessels and immune expression of VEGF. However, when the treatments were combined, the number of vessels and the immune expression of VEGF factor was lower than LG. Thus, it was concluded that both treatments proposed (biomaterial and LLLT) are good alternatives for third degree burns when applied isolated because they stimulate the healing process by acting on the modulation of the inflammatory phase and promote stimulation of angiogenesis. Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, mouse;Cellulose;Ptgs2 protein, mouse;Cyclooxygenase 2 Analysis of Variance;Animals;Burns;Cellulose;Cyclooxygenase 2;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Vascular Endothelial Growth Factor A;Wound Healing

Effect of light-emitting diodes, platelet-rich plasma, and their combination on the activity of sheep tenocytes. Healthy tendons play an important role in joint movements and subjected to a group of pathologies called tendinopathy due to multiple factors. Tendons have a slowly repairing process due to the low vascularity and cellularity. Treatment options aimed at potentiating the healing response and relieving symptoms. Phototherapy and platelet-rich plasma were novel treatment modalities in tendons based on photobiomodulation and growth factors during healing, and the results were encouraging suggesting calibrating treatment parameters. This study utilizes cell culture to explore the potential effect of light-emitting diode and/or growth factors in the form of platelet-rich plasma (PRP) on the activity of tenocytes isolated from sheep Achilles tendons by measuring the cell metabolism and cell mobility using cell viability and migration assays to proof safety and confirm activity. Results showed that sheep tenocyte-cultured groups treated with 5% platelet-rich plasma alone or combined with 4Â J/cm(2) light-emitting diode have increased viability significantly when compared to control group after a 48Â h, while light-emitting diode treatment has not decreased cell migration significantly when compared with control. Result suggests that using platelet-rich plasma alone or combined with light-emitting diode might have potential to enhance healing response at the conditions applied. PRP could enhance proliferation while LED could enhance migration and proliferation. Further research is needed at longer durations. Animals;Cell Survival;Cells, Cultured;Light;Models, Biological;Phototherapy;Platelet-Rich Plasma;Sheep;Tendinopathy;Tenocytes;Wound Healing

Efficacy of diode-emitting diode (LED) photobiomodulation in pain management, facial edema, trismus, and quality of life after extraction of retained lower third molars: A randomized, double-blind, placebo-controlled clinical trial: Erratum.

Low-level laser therapy modulates demyelination in mice. There are no effective therapies for remyelination. Low-level laser therapy (LLLT) has been found advantageous in neurogenesis promotion, cell death prevention, and modulation of inflammation in central and peripheral nervous system models. The purpose of this study was to analyse LLLT effects on cuprizone-induced demyelination. Mice were randomly distributed into three groups: Control Laser (CTL), Cuprizone (CPZ), and Cuprizone Laser (CPZL). Mice from CPZ and CPZL groups were exposed to a 0.2% cuprizone oral diet for four complete weeks. Six sessions of transcranial laser irradiation were applied on three consecutive days, during the third and fourth weeks, with parameters of 36â€¯J/cm(2), 50â€¯mW,

0.028â€¯cm(2) spot area, continuous wave, 1â€¯J, 20â€¯s, 1.78â€¯W/cm(2) in a single point equidistant between the eyes and ears of CTL and CPZL mice. Motor coordination was assessed by the rotarod test. Twenty-four hours after the last laser session, all animals were euthanized, and brains were extracted. Serum was obtained for lactate dehydrogenase toxicity testing. Histomorphological analyses consisted of Luxol Fast Blue staining and immunohistochemistry. The results showed that laser-treated animals presented motor performance improvement, attenuation of demyelination, increased number of oligodendrocyte precursor cells, modulated microglial and astrocytes activation, and a milder toxicity by cuprizone. Although further studies are required, it is suggested that LLLT represents a feasible therapy for demyelinating diseases. Cuprizone;L-Lactate Dehydrogenase Animals;Cell Count;Cuprizone;Demyelinating Diseases;L-Lactate Dehydrogenase;Low-Level Light Therapy;Mice;Motor Activity;Oligodendrocyte Precursor Cells

Therapeutic effects of simultaneous Photobiomodulation therapy (PBMT) and Meloxicam administration on experimental acute spinal cord injury: Rat animal model. STUDY DESIGN: Application of Photobiomodulation therapy (PBMT) and meloxicam in acute spinal cord injury, functional recovery and histological evaluation. OBJECTIVE: Evaluation of the effect of simultaneous PBMT and meloxicam on treatment of acute experimental spinal cord injury and comparing it with the effect of application of each of them separately. SETTING: The study was conducted at the Department of Surgery & Radiology, Faculty of Veterinary Medicine and Institute of Biomedical Research, University of Tehran, Tehran, Iran. METHODS: Twenty four rats were used in this study. A compression injury was induced to the T8-T9 segment of the spinal cord of rats using a Fogarty embolectomy catheter. Rats were randomly divided into 4 groups including: Control group, PBMT (810â€¯nm-200â€¯mw-8â€¯s-2â€¯weeks) group, Meloxicam (1â€¯mg/kg) group, and PBMT and Meloxicam (mixed) group. After inducing injury, hind limb performance of the rats was evaluated, using BBB test and then treatment intervention was performed and continued for 2â€¯weeks. RESULTS: Four â€¯weeks after injury induction, BBB test results were significantly higher in all treatment groups in comparison to control group, however, there were no significant differences among the treatment groups. In addition, histological findings revealed no significant difference between all 4 study groups. CONCLUSION: According to the results of this study we can conclude that simultaneous and separate application of PBMT and Meloxicam play an effective role in treatment of acute spinal cord injuries. Anti-Inflammatory Agents, Non-Steroidal;Meloxicam Animals;Anti-Inflammatory Agents, Non-Steroidal;Combined Modality Therapy;Low-Level Light Therapy;Meloxicam;Rats;Spinal Cord Injuries;Treatment Outcome

Efficacy of photobiomodulation on accelerating bone healing after tooth extraction: a systematic review. Post-extraction healing of the socket may take up to 24Â weeks to complete. This systematic review aims to evaluate whether photobiomodulation accelerates bone healing in those sockets. A search strategy was developed in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. PubMed, Cochrane Library, and Scopus electronic databases were searched for in vivo studies with restrictions on the year (<â€‰50Â years old) and language (English). After applying the inclusion criteria, ten studies were selected for review. Test subjects included humans (3), rats (5), and rabbits (2), either healthy or with specified systemic condition(s). Laser parameters applied varied between studies significantly. Six studies measured bone density or bone trabeculae percentage, while remaining studies measured secondary outcome measures such as osteogenesis markers, patient's self-reported pain scores, and clinical epithelial regeneration. No side effects of photobiomodulation have been reported. Higher concentration of osteogenesis markers Ocn and Runx2 were consistently reported across studies, as well as higher percentage of bony trabeculae and bone density. Within the limitations of this review, improvement in bone repair can be found when using photobiomodulation in extraction sockets.

Animals;Bone and Bones;Humans;Lasers;Low-Level Light Therapy;Osteogenesis;Outcome Assessment, Health Care;Rabbits;Rats;Tooth Extraction;Treatment Outcome;Wound Healing

Fractal dimension in the evaluation of different treatments of muscular injury in rats. OBJECTIVES: To evaluate alterations from different therapies in muscular injury using the Fractal Dimension (FD) method. METHODS: 35 animals were allocated in Control Group (C), Injury Control Group (IC), Injury Low Level Laser Therapy Group (ILT), Injury Platelet Rich Plasma Group (IP), and Injury LLLT and PRP Group (ILP). The animals suffered a stretch injury in gastrocnemius muscle and after that IP and ILP groups received PRP application. The ILT and ILP groups received daily LLLT applications for seven days. After seven days the animals were euthanized and the gastrocnemius muscle removed and frozen. The muscles were stained with Hematoxylin and Eosin (HE) and Picrosirius Red, for observation of the morphology of the injury and semi-quantitative and quantitative analysis through the Fractal Dimension (FD) method. RESULTS: In the qualitative and semi-quantitative analysis, in relation to IC group, the ILT presented a reduction in rounded fibers and the IP in angular fibers. The ILP group demonstrated a reduction in both polymorphic fibers and inflammatory infiltrate. The FD of the muscles stained with HE was higher in the groups that suffered the injury when compared to the C group (pâ€‰<â€‰0.05); the FD of the collagen demonstrated no statistical difference between the groups. CONCLUSION: Both treatments were able to accelerate injury repair, and the association of both presented better results than the isolated applications. However, the FD method showed no sensitivity to differentiate the treatments, either in the histological aspects or the injury in collagen. Animals;Fractals;Low-Level Light Therapy;Male;Muscle, Skeletal;Platelet-Rich Plasma;Rats;Rats, Wistar;Treatment Outcome

Successful resolution of coats disease by photodynamic therapy: a case report. BACKGROUND: Coats disease is a retinal disease characterized by exudative retinal detachment due to abnormal retinal blood vessels. Coats disease is generally treated using laser photocoagulation and cryotherapy to ablate the abnormal retinal blood vessels. However, if abnormal blood vessels are present near the posterior pole of the eye and there is a severe exudative change there, it is difficult to perform these standard treatments. We describe a case of Coats disease with severe exudative retinal change and retinal vascular abnormality near the posterior pole for which we performed photodynamic therapy and successfully suppressed the disease and improved vision. CASE PRESENTATION: A 15-year-old Japanese boy presented to hospital with a chief complaint of decreased vision in his right eye. At the initial examination, corrected visual acuity of the right eye was 20/100. On the right fundus, exudative retinal detachment with subretinal haemorrhage was observed from the upper intermediate periphery to the posterior pole. Abnormal telangiectatic vessels and microaneurysms were found at the nasal peripheral retina. From these findings, we diagnosed the case as Coats disease. We conducted photodynamic therapy for the right eye. At 10Â months after treatment, both the subretinal haemorrhage and the exudative retinal detachment had disappeared completely. Further, the retinal structure of the macula had recovered, and right vision had improved to 20/20. CONCLUSION: Photodynamic therapy may be an effective and safe treatment for Coats disease in cases that present with abnormal retinal vessels close to the posterior pole of the eye. Photosensitizing Agents;Porphyrins;Verteporfin Adolescent;Fluorescein Angiography;Fundus Oculi;Humans;Injections, Intravenous;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Porphyrins;Retinal Telangiectasis;Ultrasonography;Verteporfin

Melanocyte activation and skin barrier disruption induced in melasma patients after 1064Â nm Nd:YAG laser treatment. Melasma is a frequently acquired hyperpigmentary skin disorder, for which several therapies are available. Among them, 1064Â nm QS Nd:YAG laser therapy is an effective method, but the recurrence rate of laser treatment is still high. The aim of the present study

was to elucidate the mechanism of the high relapse rate of melasma after 1064Â nm Nd:YAG laser treatment. Twenty-five female melasma patients were treated with 1064Â nm Nd:YAG laser for 10 times. The lesional skin and non-lesional skin were evaluated by means of a reflectance confocal laser scanning microscope before and after laser treatment. Melanin content and transepidermal water loss (TEWL) were measured by an MPA9 skin multifunction tester accordingly. The melanin index value was significantly decreased in the lesional skin after laser treatment, while the non-lesional skin had no difference. The dendritic cells were observed at the level of the dermal-epidermal junction (DEJ) in the lesions of 8 patients before laser treatment, while after laser treatment, the dendritic cells were observed in all 25 subjects. Moreover, there was significant difference between the TEWL value of the lesions before and after laser treatment. Furthermore, the TEWL value was higher in lesions of the 8 subjects which had dendritic cells compared with other 17 subjects which had no dendritic cells, no matter before or after laser treatment. The relapse patients of melasma had higher TEWL value compared with the non-relapse patients. Melanocyte activation and skin barrier disruption may be related to the high relapse rate of melasma after laser treatment. Melanins Adult;Dendritic Cells;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Melanocytes;Melanosis;Skin;Water Loss, Insensible

Biocompatible graphene-based nanoagent with NIR and magnetism dual-responses for effective bacterial killing and removal. Antibiotics have been widely used in clinical applications to treat pathogenic infections at present, but the problem of drug-resistance associated with the abuse of antibiotics has become a large threat to human beings. Herein, we developed an antibacterial nanoagent by coating quaternized chitosan (QCS) on the surface of Fe(3)O(4) nanoparticles-anchored graphene oxide (GO), which enabled QCS and GO to achieve synergistic effects on killing the drug-resistant bacteria. Systematical antibacterial experiments showed that the prepared nanoagent had antibacterial ability, which was significantly enhanced after the introduction of near-infrared (NIR). Importantly, the nanoagent could be easily recycled and reused without the reduction of the antibacterial ability. During the test time, this nanoagent exhibited no obviously toxic side effect to cells. Given the above advantages, we anticipate that the nanoagent has a promising future in various applications such as wound disinfection, water purification, and surface sterilization of medical devices. Anti-Bacterial Agents;Coated Materials, Biocompatible;Magnetite Nanoparticles;Oxides;Graphite;Chitosan;Ferrosoferric Oxide Anti-Bacterial Agents;Cell Survival;Chitosan;Coated Materials, Biocompatible;Drug Resistance, Multiple, Bacterial;Equipment Reuse;Escherichia coli;Ferrosoferric Oxide;Graphite;Human Umbilical Vein Endothelial Cells;Humans;Infrared Rays;Low-Level Light Therapy;Magnetite Nanoparticles;Oxides;Staphylococcus aureus

Poly(d,l-lactic-co-glycolic acid) (PLGA) hollow fiber with segmental switchability of its chains sensitive to NIR light for synergistic cancer therapy. This work introduces a new fibrous system for synergistic cancer therapy. The system consists of poly(d,l-lactic-co-glycolic acid) (PLGA) fibers with a core encapsulating an anticancer drug and a shell entrapping gold nanorods (AuNRs) as a photothermal agent. On exposure to NIR light, the photothermal agent generates heat to raise the local temperature of the fibers. If the temperature is above a glass transition (T(g)) of the polymer, the polymer chains will be mobile, increasing free volume in size within the shell. As a result, a rapid release of the drug can be achieved. When NIR light is turned off, the release will stop with inactivity of the photothermal agent, followed by freezing the segmental motion of the polymer chains. The on-off switching of NIR light in a time-controllable manner allows a repeated and accurate release of the drug, leading to the significant enhancement of anticancer activity in combination with the hyperthermia effect arising from the photothermal agent. Antibiotics, Antineoplastic;Delayed-Action Preparations;Polylactic Acid-Polyglycolic Acid Copolymer;Gold;Doxorubicin;Cetrimonium

Antibiotics, Antineoplastic;Cell Death;Cell Line, Tumor;Cetrimonium;Delayed-Action Preparations;Doxorubicin;Drug Compounding;Drug Delivery Systems;Drug Liberation;Electrochemical Techniques;Epithelial Cells;Female;Gold;Humans;Hyperthermia, Induced;Infrared Rays;Kinetics;Low-Level Light Therapy;Metal Nanoparticles;Nanotubes;Polylactic Acid-Polyglycolic Acid Copolymer

Early Low-Level Laser Therapy Improves the Passive Range of Motion and Decreases Pain in Patients with Flexor Tendon Injury. BACKGROUND: To obtain the best result from flexor tendon repair surgery, proper surgical technique, appropriate materials, good rehabilitation, and patient satisfaction are essential to consider. Nevertheless, no general unique protocol still exists between researchers, for a suitable treatment plan. OBJECTIVE: The aim of the present random clinical trial (RCT) was to determine the adjuvant effect of low-level laser therapy (LLLT) on healing tendon injury in patients. MATERIALS AND METHODS: In an RCT, 97 patients (114 fingers) with sharp injury in three zones of their hands were randomly divided into LLLT and control groups, using the unequal treatment allocation approach. Thirty-nine patients (31 males and 8 females, 46 fingers) were enrolled in the LLLT group, receiving 8-10 sessions of LLLT (red and infrared lasers) over the flexor tendon repaired area. In the control group, 58 patients were included, 20 patients did not come back for follow-up, and 38 patients (29 males and 9 females, 46 fingers) participated in the study. Patients were visited in days 28â€‰-â€‰32 after surgery. Passive range of motion (PROM), pain severity of groups, and patient satisfaction from LLLT were all recorded. The two observers, blind to the LLLT group assessed the data independently. RESULTS: In two groups, no rupture was observed during 4 weeks postsurgery. None of the patients in the control group was able to perform the full passive flexion. There was a significant increase in PROM (tâ€‰=â€‰82.925, pâ€‰=â€‰0.000) and a significant pain reduction (tâ€‰=â€‰-11.96, pâ€‰=â€‰0.000) in the LLLT group, compared with the control group. All Patients in the LLLT group were satisfied. CONCLUSIONS: LLLT is a proper adjuvant therapy in flexor tendon repair. Evidently, LLLT promotes tendon healing, alleviates the pain, and assists flexibility of soft tissue and joints, leading to the tremendous improvement in patient cooperation and compliance. Adult;Female;Humans;Low-Level Light Therapy;Male;Pain;Range of Motion, Articular;Recovery of Function;Tendon Injuries;Treatment Outcome;Wound Healing;Young Adult

Low-power laser alters mRNA levels from DNA repair genes in acute lung injury induced by sepsis in Wistar rats. Acute lung injury (ALI) is defined as respiratory failure syndrome, in which the pathogenesis could occur from sepsis making it a life-threatening disease by uncontrolled hyperinflammatory responses. A possible treatment for ALI is the use of low-power infrared lasers (LPIL), whose therapeutical effects depend on wavelength, power, fluence, and emission mode. The evaluation mRNA levels of repair gene related to oxidative damage after exposure to LPIL could provide important information about the modulation of genes as treatment for ALI. Thus, the aim of this study was to evaluate the mRNA levels from OGG1, APEX1, ERCC2, and ERCC1 genes in lung tissue from Wistar rats affected by ALI and after exposure to LPIL (808Â nm; 100Â mW). Adult male Wistar rats (nâ€‰=â€‰30) were randomized into six groups (nâ€‰=â€‰5, for each group): control, 10Â J/cm(2) (2Â J), 20Â J/cm(2) (5Â J), ALI, ALI + LPIL 10Â J/cm(2) and ALI + LPIL 20Â J/cm(2). ALI was induced by intraperitoneal E. coli lipopolysaccharide injection (10Â mg/kg). Lungs were removed, and samples were withdrawn for total RNA extraction, cDNA synthesis, and mRNA levels were evaluated by RT-qPCR. Data normality was verified by Kolmogorov-Smirnov, comparisons among groups were by Student's t test, Mann-Whitney test, one-way ANOVA, Kruskal-Wallis followed by post-tests. Data showed that OGG1 (0.39â€‰Â±â€‰0.10), ERCC2 (0.67â€‰Â±â€‰0.24), and ERCC1 (0.60â€‰Â±â€‰0.19) mRNA levels are reduced in ALI group when compared with the control group (1.00â€‰Â±â€‰0.07, 1.03â€‰Â±â€‰0.25, 1.01â€‰Â±â€‰0.16, respectively) and, after LPIL, mRNA relative levels from DNA repair genes are altered when compared to non-exposed ALI group.

Our research shows that ALI alter mRNA levels from genes related to base and nucleotide excision repair genes, suggesting that DNA repair is part of cell response to sepsis, and that photobiomodulation could modulate the mRNA levels from these genes in lung tissue. Lipopolysaccharides;RNA, Messenger;DNA Glycosylases;OGG1 protein, rat;Xeroderma Pigmentosum Group D Protein;Apex1 protein, rat;DNA Repair Enzymes;ERCC1 protein, rat Acute Lung Injury;Animals;DNA Glycosylases;DNA Repair;DNA Repair Enzymes;DNA-(Apurinic or Apyrimidinic Site) Lyase;Escherichia coli;Gene Expression Regulation;Lasers;Lipopolysaccharides;Lung;Male;RNA, Messenger;Rats;Rats, Wistar;Sepsis;Xeroderma Pigmentosum Group D Protein

Efficacy of photobiomodulation on oral lichen planus: a protocol study for a double-blind, randomised controlled clinical trial. INTRODUCTION: Oral lichen planus (OLP) is an idiopathic chronic mucocutaneous disease with a wide range of clinical manifestations, including white reticular patches, erosive/ulcerative and atrophic lesions, both associated with intense symptomatology. Topical corticosteroids are commonly used as standard therapy. However, patients frequently present relapses after the discontinuation of treatment as well as developing resistance to corticosteroid therapy. Photobiomodulation (PBM) has been shown to be a potential therapeutic tool to treat inflammatory disorders, including OLP. The aim of this study was to compare the efficacy of PBM (660â€‰nm) with corticosteroid therapy with clobetasol propionate 0.05% for the treatment of OLP. METHODS AND ANALYSIS: Forty-four patients with symptomatic and histopathological diagnosis of OLP will be randomised into two experimental groups in a double-blind manner: control group (n=22): clobetasol propionate 0.05%+placebo PBM, and experimental group (n=22): PBM (Î»=660â€‰nm, power 100â€‰mW, radiant exposure: 177â€‰J/cm(2) and 0.5J per point)+placeboâ€‰gel. Laser will be applied 2Ã—/week for 1â€‰month and clobetasol propionate three times a day for 30 days and the same for placebo treatments. The primary variable (pain) and the secondary variables (clinical score, evaluation of functional scores, clinical resolution, OLP recurrence, quality of life and anxiety and depression) will be evaluated at the baseline, once a week during treatment (depending on the variables) and after 30 days and 60 days of follow-up. Pain will be evaluated using visual analogue scale and clinical characteristics will be scored using the Thongprasom Index. The quality of life and anxiety and depression will be evaluated by Oral Health Impact Profile-14 questionnaire and by Hospital Anxiety and Depression Scale for anxiety scale, respectively. The serum and salivary levels of interleukin (IL)-6, IL-10, IL-1Î², INF-Î³ and tumour necrosis factor-Î± will be evaluated by ELISA at baseline and at the end of treatment. ETHICS AND DISSEMINATION: This protocol was approved (#2.375.410) by the Nove de Julho University (UNINOVE) Research Ethics Committee. The data gathered using this protocol will be published in a peer-reviewed journal. TRIAL REGISTRATION NUMBER: NCT03320460. Anti-Inflammatory Agents;Glucocorticoids;Clobetasol Administration, Topical;Anti-Inflammatory Agents;Clobetasol;Double-Blind Method;Germany;Glucocorticoids;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Quality of Life;Randomized Controlled Trials as Topic;Treatment Outcome

Evaluation of chemical and morphological changes in radicular dentin after different final surface treatments. The aim of this study was to evaluate the chemical and morphological effects of different lasers as a final surface treatment for endodontic therapy through energy dispersive X-ray spectroscopy (EDS) and scanning electron microscopy (SEM) respectively. Twenty-five maxillary canines were selected and instrumented with K3 system. Roots were randomly distributed into five groups (nâ€‰=â€‰5) according to the surface treatment: GI (distilled water), GII (NaOClâ€‰+â€‰EDTA), GIII (NaOClâ€‰+â€‰EDTAâ€‰+â€‰980 nm diode laser), GIV (NaOClâ€‰+â€‰EDTA+ 1,064 nm Nd:YAG laser), and GV (NaOClâ€‰+â€‰EDTA+ 2,780 nm Er, Cr:YSGG laser). Lasers were applied for 20 s and samples were bisected, exposing the treated surface and then subjected to elements quantification by EDS and morphological evaluation by scanning

electron microscope (SEM). EDS data were submitted to ANOVA-two way, and SEM scores were submitted to two-way Kruskal-Wallis and Dunn's tests. The EDS analysis showed no difference for the chemical elements and Ca/P ratio between groups (pâ€‰>â€‰.05). Statistical analysis showed more intense results for GV and less intense results for GI (pâ€‰<â€‰.05). The GIII showed an amorphous organic matrix surface, while GV provided greater removal of intertubular dentin forming craters, and GIV promoted dentin fusion. The EDS method used in this study was not able to verify any chemical changes in root canal dentin; Nd:YAG, Er, Cr:YSGG, and 980 nm diode laser were capable of modifying the dentin morphology, correlating characteristics features for each one, which are essential clinical knowledge to establish the correct indication for each case. RESEARCH HIGHLIGHTS: EDS was not able to verify any chemical changes in root canal dentin after 980 nm diode, Nd:YAG and Er;Cr:YSGG laser treatments Nd:YAG, Er, Cr:YSGG, and 980 nm diode laser modified dentin morphology, correlating characteristics features for each one. Cuspid;Dentin;Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Spectrometry, X-Ray Emission;Surface Properties;Tooth Root;Tooth, Nonvital

The Efficacy of Low-Level Laser Therapy in Treating Oral Papilloma: A Case Reporting A Lingual Location. Oral papilloma is a benign proliferation of the stratified epithelium, which results in a papillary or verrucous exophytic mass, which can be induced by human papillomavirus. These oral mucosa lesions are most often asymptomatic and have small progression. Laser-assisted surgery is common nowadays with several advantages including successful hemostasis, devoid of sutures, wound sterilization and minimal postoperative pain, and edema. The aim of this report is to present the oral papilloma in a 40-year-old female patient and its treatment with soft-tissue laser. The lesion was excised with diode laser, and the healing was uneventful in a follow-up visit after 1 month. Oral papillomas can be found in young adult patient's oral cavity, and laser dentistry can be used by dental clinicians to treat these kinds of oral lesions and should be considered as an alternative to conventional surgery.

Comparative evaluation of a low-level laser and topical desensitizing agent for treating dentinal hypersensitivity: A randomized controlled trial. AIM: The aim of this randomized, controlled, double-blinded, clinical study is to evaluate and compare the clinical effectiveness of low-level diode GaAlAs laser and glutaraldehyde-based topical desensitizing agent on cervical dentin hypersensitivity with the help of visual analog scale (VAS). MATERIALS AND METHODS: Fifty teeth of patients aged between 20 and 50 years were included, and VAS was used to assess the dentin hypersensitivity. The teeth were randomly allocated to either Group 1 or 2 using flip coin technique. Group 1 received glutaraldehyde desensitizer and Group 2 received 905 nm low-level laser. The sensitivity scores were recorded, immediately, after1 week and 3 months after therapy. Data was analyzed using Mann-Whitney U test for intergroup comparison and Friedman's test for intragroup comparison. RESULTS: There was a significant reduction in pain in both the groups at 3 months evaluation (P = 0.001).However, Group 2 showed a significant decrease in mean VAS scores when compared with Group 1 at both the one week and three month follow ups (P = 0.04, P = 0.03, respectively). CONCLUSION: Although topical desensitizer and Low Level Laser are both effective in reducing dentinal hypersensitivity, Low Level Lasers are comparatively more effective at the studied time intervals.

[Clinical comparative study of pulsed dye laser and ultra-pulsed fractional carbon dioxide laser in the treatment of hypertrophic scars after burns]. Objective: To compare the efficacy and safety of pulsed dye laser (PDL) and ultra-pulsed fractional carbon dioxide laser (UFCL) in treating hypertrophic scars after burns. Methods: Two hundred and twenty one patients with hypertrophic scar after burns conforming to the study criteria were admitted to our unit from February 2015 to October 2017, and their data were retrospectively analyzed. Patients were divided into group PDL (n=122) and group

UFCL (n=99) according to the treatment method. Patients in group PDL were treated with PDL once every 3-4 weeks. Patients in group UFCL were treated with UFCL once every 6-12 weeks. Patients in both groups were treated until 12 months after having scar. Scars were scored by Vancouver Scar Scale (VSS) before and after treatment. Patients' pain was evaluated by Visual Analogue Scale (VAS) method before and after treatment. Blood flow in scar was monitored and recorded before treatment and in treatment months 6 and 12. Satisfaction degree of patients was recorded 3-6 months after treatment, and the satisfaction rate was calculated. Adverse reactions including duration of erythema/purpura, VAS in treatment, and loss of working time were recorded. Data were processed with one-way analysis of variance, t test, and Chi-square test. Results: (1) VSS scores of patients in groups PDL and UFCL after treatment were significantly lower than those before treatment in the same group (t=11.34, 12.77, P<0.05). The decreasing VSS scores of patients after treatment in groups PDL and UFCL were (5.8Â±1.1) and (6.0Â±1.4) points, respectively, and there was no statistically significant difference between the two groups (t=1.91, P>0.05). (2) VAS of patients in groups PDL and UFCL after treatment were significantly lower than those before treatment in the same group (t=7.12, 5.23, P<0.05). The decreasing VAS of patients after treatment in groups PDL and UFCL were (4.0Â±0.6) and (3.2Â±1.3) points, respectively, and there was no statistically significant difference between the two groups (t=1.93, P>0.05). (3) Scar blood flow of patients in group PDL in treatment months 6 had no obvious change compared with that before treatment (t=1.59, P>0.05), while that in treatment months 12 significantly decreased compared with that before treatment and that in treatment months 6 (t=3.17, 6.96, P<0.05). Scar blood flow of patients in group UFCL in treatment months 6 significantly increased compared with that before treatment (t=6.01, P<0.05), while that in treatment months 12 significantly decreased compared with that in treatment months 6 (t=4.52, P<0.05), but had no obvious change compared with that before treatment (t=0.92, P>0.05). (4) The satisfaction degree of patients in group PDL was 80.3% (98/122), which in group UFCL was 76.8% (76/99), and there was no statistically significant difference between the two groups (Ï‡(2)=0.97, P>0.05). (5) The duration of erythema/purpura of patients in group PDL was (5.2Â±0.7) d, significantly shorter than (6.1Â±0.5) d in group UFCL (t=2.49, P<0.05). The VAS of patients in group PDL during treatment was (1.9Â±0.9) points, significantly lower than (4.7Â±0.4) points in group UFCL (t=4.85, P<0.05). Loss of working time of patients in group UFCL was (9.17Â±0.72) d, which was significantly longer than (3.96Â±0.23) d in group PDL (t=3.17, P<0.05). Conclusions: PDL and UFCL have definite effects on hypertrophic scar, while PDL with light pain, minor wound, and fast recovery time, is safe and effective for treatment of early hypertrophic scar and worthy of clinical promotion and application, especially for children and patients with poor pain tolerance.
Adult;Burns;Child;Cicatrix, Hypertrophic;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Pain Measurement;Retrospective Studies;Severity of Illness Index;Treatment Outcome

Clearance of facial tattoo with triple-wavelength picosecond laser and fractionated carbon dioxide laser. Adult;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Skin;Tattooing;Treatment Outcome

Use of a novel 589-nm solid-state laser for treatment of facial erythema. OBJECTIVE: To evaluate the efficacy and safety associated with use of a 589-nm solid-state laser for treatment of facial erythema. METHODS: A prospective, IRB-approved study was conducted. Participants who were interested in treatment for facial erythema were recruited. They received four monthly treatments with the 589-nm laser. Erythema of the right and left face was graded on a scale of 0-4, 4 being most severe, by both investigators and participants prior to each treatment and at follow-up. Safety was assessed by any reported side effects. RESULTS: Twenty-four participants enrolled in the study, 16 women (67%) and 8 men (33%), with an average age of 51.1Â years. Investigator grades showed a statistically significant improvement in erythema of 31% for both the right and left face. Participant

grades showed a statistically significant improvement in erythema of 23.2% for the right face and 22.8% for the left face. Side effects were limited to transient erythema posttreatment. CONCLUSION: A 589-nm solid-state laser achieved a modest improvement in facial erythema when evaluating results 1Â month after four monthly treatments. No major safety issues were reported. Adult;Aged;Erythema;Facial Dermatoses;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies

Photobiomodulation on critical bone defects of rat calvaria: a systematic review. Bone defects following trauma represent a high impact on the quality of life of millions of people around the world. The aim of this study was to review photobiomodulation (PBM) action in the treatment of bone critical defects in rat calvaria, related to evaluation of the current protocols applied. One hundred and forty-seven articles related to the subject were found by searching the main databases (Pubmed, Lilacs, Web of Science, and Scopus) considering the period of publication until the year 2017, and only 14 corresponded the inclusion criteria established for this systematic review. The main parameters of the PBM were expressed in Table 1. In addition, it was possible to observe the use of two different wavelengths (red and infrared), which are considered therapeutic. Most of the evaluated articles presented positive results that describe a greater amount of neoformed bone, an increase in collagen synthesis, and a contribution to microvascular reestablishment. However, two studies report no effect on the repair process when the PBM was used. In addition, we observed considerable variations between the values of power, fluence, and total energy, which make it difficult to compare the results presented between the selected studies. It was possible to conclude that the infrared laser was more effective in positively stimulating the bone repair process of critical defects. Furthermore, a discrepancy was found in the parameter values used, which made it difficult to choose the best protocol for the treatment of this type of lesion. Animals;Lasers;Low-Level Light Therapy;Rats;Skull

Photobiomodulation effect on the proliferation of adipose tissue mesenchymal stem cells. The use of mesenchymal stem cells (MSCs) in tissue engineering has been extensively investigated. The greater the proliferation of this cellular group, the greater the regenerative and healing capacity of the tissue to which they belong. In this context, photobiomodulation (PBM) is an efficient technique in proliferation of distinct cell types. However, its parameters and mode of action are still unclear and require further investigation. This study aimed to evaluate the PBM action with different energies in MSCs of adipose tissue (hASCs). We used hASCs, seeded in 24-well plates, with 3â€‰Ã—â€‰10(4) cells per well, in culture media. We used a total of four experimental groups, one with hASCs and simulated PBM and three other groups, which received PBM irradiation at 24, 48, and 72Â h, with a 660-nm laser and power of 40Â mW and energy of 0.56, 1.96, and 5.04Â J. We performed analyses of MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromidefor) and trypan blue to evaluate cell proliferation and viability, 1Â h after PBM irradiation. Software Graph PadPrism 7.0 was used. Intergroup comparisons were performed with ANOVA two-way and we used the Tukey post hoc test. Mitochondrial activity evaluated by MTT revealed the statistical difference in the first 24Â h for group with more high energy when compared to control group; and in the 72Â h for two irradiated groups when compared to the control group. The trypan blue test showed significant differences at the end of the experiment for two irradiated groups LG1 (4.52â€‰Ã—â€‰10(4)â€‰Â±â€‰0.2) and LG2 (4.85â€‰Ã—â€‰104â€‰Â±â€‰0.8), when compared to the control group (1.87â€‰Ã—â€‰10(4)â€‰Â±â€‰0.7). Both tests failed to be statistically different at the end of the experiment for groups LG1 and LG2 and observed a reduction in cellular mitochondrial growth and activity for group LG3. We conclude that PBM with energy close to 0.56 and 1.96Â J promote proliferation of hASCs, and higher energy, such as 5.04Â J, can be harmful. Adipose Tissue;Cell

Proliferation;Cell Survival;Cells, Cultured;Humans;Lasers;Low-Level Light Therapy;Mesenchymal Stem Cells;Mitochondria

Photobiomodulation Affects Key Cellular Pathways of all Life-Forms: Considerations on Old and New Laser Light Targets and the Calcium Issue. After 50Â years of studies on photobiomodulation (PBM), there is still so much to investigate to understand the laser light-nonplant cells interactions. The current scientific knowledge allows to say that the phenomena induced by PBM are based on cellular pathways that are the key points of cell life. The mitochondria chromophores, also present on the bacterial membrane, the calcium channels, ion that regulates the life-and-death cellular processes, as well as the TRP family, whose genes have been found in protozoa and suggest that its basic mechanism evolved long before the appearance of animals, seem to be elective targets in photobiomodulatory events by wavelengths from 600 up to 980Â nm. The ambiguous resulting cellular communication way, mediated by ATP, ROS and/or calcium, leads to cell manipulation, which modifies its metabolism and whose response connects all life-forms from bacteria to vertebrates. Because of the Giano-Bifronte features of ROS and calcium, as well as the fine balance of energetic mitochondrial processes, whose alteration is responsible for several diseases, the PBM can show unpredictable results and it requires scrupulous approach to avoid cellular damages. However, when carefully applied, PBM is able to improve nonhealthy cell's responses and represents a reliable support in human and veterinary medicine. Calcium Channels;Reactive Oxygen Species;Adenosine Triphosphate;Calcium Adenosine Triphosphate;Animals;Calcium;Calcium Channels;Calcium Signaling;Humans;Low-Level Light Therapy;Metabolic Networks and Pathways;Mitochondria;Reactive Oxygen Species

CaP Coating and Low-Level Laser Therapy to Stimulate Early Bone Formation and Improve Fixation of Rough Threaded Implants. PURPOSE: This study aimed to compare in vivo osteogenesis on rough threaded dental implants with and without calcium phosphate (CaP) coating deposition, alone or in association with low-level laser therapy (LLLT) by gallium aluminum arsenide. MATERIAL AND METHODS: Four groups were studied: G1: implant; G2: implant + CaP coating; G3: implant + LLLT; and G4: implant + CaP coating + LLLT. LLLT was applied for 7 days at the surgical site before and after placing the implant. Topographic characterization was performed before surgery using scanning electron microscopy and energy dispersion spectrophotometry. Bone-implant contact (BIC) was measured after 1, 2, and 6 weeks and reverse torque after 6 weeks. In short periods, G2, G3, and G4 showed significantly greater BIC than G1 ($P < 0.05$), but no difference in BIC was observed at 6 weeks. However, the values for the removal torque test at 6 weeks were higher in G2 and G4 ($P < 0.05$). CONCLUSION: Both CaP coating alone and using LLLT induce cellular stimulation and improve BIC in short-term healing, resulting in higher implant fixation, and should be considered in clinical practice due to their low cost and high effectiveness. Calcium Phosphates;Dental Implants;calcium phosphate Animals;Calcium Phosphates;Dental Implantation, Endosseous;Dental Implants;Low-Level Light Therapy;Male;Osteogenesis;Rabbits;Wound Healing

Low-fluence Q-switched Nd:YAG laser for the treatment of melasma in Asian patients. BACKGROUND: Melasma is a common acquired facial pigmentary disorder that is resistant to various modalities of treatment. Recently, the low-fluence 1064-nm Q-switched neodymium-doped yttrium aluminum garnet laser (QSNY) has emerged as the new gold standard of melasma treatment in Asia. OBJECTIVE: To evaluate the efficacy and safety of low-fluence 1064-nm QSNY in Asian patients with melasma. METHODS: Data of patients with melasma treated with low-fluence QSNY in the department of dermatology at the Korea University Anam Hospital were reviewed retrospectively. A 1064-nm QSNY with 8Â mm spot size and fluence of 1.2-2.0Â J/cm(2) at 10Â Hz was used. The results were evaluated using the modified Melasma Area and Severity Index (mMASI) score and the physician's global assessment (PGA). RESULTS: A total of 40 Korean patients with Fitzpatrick skin type

III to IV were included. Patients were treated for a median of 10 sessions at a median of 1-week intervals. The mean mMASI score decreased by 54.23% from a baseline of 3.19Â Â±Â 2.64 to 1.46Â Â±Â 1.06 after treatment. On PGA, 1 out of 40 patients (2.5%) showed excellent improvement, 14 (35%) good, 15 (37.5%) fair, 6 (15%) poor, and 4 (10%) no improvement. However, two patients showed mottled hypopigmentation and rebound hyperpigmentation. CONCLUSION: Low-fluence 1064-nm QSNY appears to be a safe and effective treatment for Asian patients with melasma. Adult;Aged;Aged, 80 and over;Asian People;Female;Humans;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Republic of Korea;Retrospective Studies;Severity of Illness Index

Effect of blue LED on the healing process of third-degree skin burns: clinical and histological evaluation. The aim of this study was to evaluate the effects of blue light-emitting diode (LED) on the healing process of third-degree skin burns in rats through clinical and histological parameters. Forty male Wistar rats were divided into two groups: control (CTR) (nâ€‰=â€‰20) and blue LED (BLUE) (nâ€‰=â€‰20), with subgroups (nâ€‰=â€‰5) for each time of euthanasia (7, 14, 21, and 28Â days). LED (470Â nm, 1Â W, 12.5Â J/cm(2) per point, 28Â s) was applied at four points of the wound (total, 50Â J/cm(2)). Feed intake was measured every other day. It was observed that there were no statistically significant differences in the Wound Retention Index (WRI) of the BLUE group in relation to CTR group (pâ€‰>â€‰0.05) at the evaluation times. After 14, 21, and 28Â days, it was observed that the animals in the BLUE group consumed more feed than animals in the CTR group (pâ€‰<â€‰0.05). At 7Â days, there was a statistically significant increase in the angiogenic index (AI) in BLUE (median: 6.2) when compared to CTR (median: 2.4) (pâ€‰=â€‰0.01) and all animals in BLUE had already started re-epithelialization. This study suggests that blue LED, at the dosimetry used, positively contributed in important and initial stages of the healing process of third-degree skin burns. Animals;Burns;Feeding Behavior;Granulation Tissue;Inflammation;Light;Male;Neovascularization, Physiologic;Phototherapy;Rats, Wistar;Re-Epithelialization;Skin;Wound Healing

Biophysical skin measurements to evaluate the effectiveness of photobiomodulation therapy in the prevention of acute radiation dermatitis in breast cancer patients. PURPOSE: The purpose of this study was to evaluate objectively the effectiveness of photobiomodulation therapy (PBMT) for the prevention of acute radiation dermatitis (ARD) by using biophysical skin measurements. METHODS: A randomized, placebo-controlled trial with 120 breast cancer patients who underwent an identical radiotherapy (RT) regimen post-lumpectomy was performed (TRANSDERMIS trial). Patients were randomized to receive PBM (808Â nm CW/905Â nm pulsed, 168Â mW/cm(2), spot size 19.6Â cm(2), fluence 4Â J/cm(2)) or placebo treatments from the first day of RT (2Ã—/week). Biophysical skin measurements were collected to assess the skin pigmentation and barrier function. Measurements were collected at the first day of RT, a RT dose of 40Â Gray (Gy), and the end of RT (66Â Gy). RESULTS: The incidence of moist desquamation was significantly higher in the control than in the PBMT group at the end of RT (30 vs. 7%, respectively, odds ratioâ€‰=â€‰6, pâ€‰=â€‰0.004). The biophysical skin measures showed that the mean percentage change from the baseline transepidermal water loss (TEWL), erythema, and melanin values was significantly higher in the control than in the PBMT group at the end of RT (psâ€‰<â€‰0.05). Logistic regression analysis revealed that the risk on moist desquamation was significantly increased for patients with a large (>â€‰800Â cc) breast volume (odds ratioâ€‰=â€‰4, pâ€‰=â€‰0.017). CONCLUSIONS: This is the first randomized controlled trial demonstrating by objective measurements that PBMT is effective in reducing the incidence of moist desquamation in breast cancer patients undergoing RT. Additionally, a large breast volume is an important risk factor for the development of moist desquamation. Acute Disease;Adult;Aged;Biophysical Phenomena;Breast;Breast Neoplasms;Combined Modality

Therapy;Female;Humans;Hypertrophy;Low-Level Light Therapy;Mastectomy, Segmental;Middle Aged;Prognosis;Radiodermatitis;Radiotherapy, Adjuvant;Risk Factors;Secondary Prevention;Skin;Treatment Outcome

Effect of laser irradiation on aphthae pain management: A four different wavelengths comparison. Recurrent Aphthous Stomatitis (RAS) is an oral condition characterized by painful ulcerations of the mucosa, healing spontaneously in 10-14â€¯days but sometimes, due to their number, size and frequency of recurrence, lesions may be the cause of a severe disconfort with an impact on the quality of life of the patients due to the increased difficulty to eat, swallow and speak. For RAS, different protocols and treatments have been proposed as standard topical treatment to provide symptomatic relief, immunomodulating drugs as thalidomide, colchicine and steroids have been also proposed with the outcome to relief the pain, accelerating the healing process and increase the duration of ulcer-free period but without definitive results and without side effects. In this study we analysed the effect of laser treatment of aphthous lesions with four devices available on the market, two with wavelength in the infra-red region (2940â€¯nm 808â€¯nm) and two with a wavelength in the visible region (450â€¯nm and 635â€¯nm). Diode lasers 808â€¯nm and 450â€¯nm defined almost the same results with an improvement starting already after the application and gradually improving until 7â€¯days after treatment without any statistically significant difference between them. Diode 635â€¯nm was the device gaining the earliest effect reducing the pain already during the treatment and maintaining it at low level immediately after the laser application and after 3 and 7â€¯days with levels of pain comparable with them obtained with 808â€¯nm and 450â€¯nm lasers. Er:YAG laser with the used parameters obtained a pain relief only during the treatment. The originality of this study was to compare different laser wavelengths, some of them never used for this purpose, and to compare also the two different ways to use lasers, the photobiomodulation (LLLT) and the high-power irradiation. Humans;Infrared Rays;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Light;Low-Level Light Therapy;Pain;Pain Management;Phototherapy;Stomatitis, Aphthous

Low-level laser therapy increases interleukin-1Î² in gingival crevicular fluid and enhances the rate of orthodontic tooth movement. INTRODUCTION: The aim of this investigation was to evaluate the effects of low-level laser therapy on interleukin-1Î² (IL-1Î²) levels in gingival crevicular fluid and its correlation with orthodontic tooth movement. METHODS: A split-mouth design was used in 10 subjects (6 female, 4 male) aged 14 to 25Â years, whose maxillary first premolars were extracted. A gallium-aluminum-arsenide semiconductor diode laser (wavelength, 940Â nm; energy density, 8Â J/cm2; power output, 100Â mW) delivered low-level laser therapy to the experimental canine undergoing distalization at 10 points. The control canine was distalized without low-level laser therapy. The experimental and control canines were distalized using a force of 150Â g provided by nickel-titanium closed-coil springs. Gingival crevicular fluid was collected at 5 time points from the control and experimental sides, and the levels of IL-1Î² were analyzed by enzyme-linked immuno-sorbent assay (ELISA). The distal movements of the maxillary canines were measured and compared. RESULTS: Increased levels of IL-1Î² were observed in the experimental canines compared with the control canines (PÂ <0.001). Cumulative tooth movements over an 8-week experimental period were greater for the experimental canines (occlusogram and software, 4.450 and 4.4903Â mm, respectively) compared with the control canines (occlusogram and software, 2.025 and 2.0501Â mm, respectively). A positive correlation existed between the IL-1Î² levels and the amounts of tooth movement across all time intervals. CONCLUSIONS: In combination with light orthodontic force, application of low-level laser therapy increased the levels of IL-1Î² in gingival crevicular fluid and accelerated orthodontic tooth movement. Interleukin-1beta;titanium nickelide;Nickel;Titanium Adolescent;Adult;Anatomic Landmarks;Bicuspid;Cuspid;Female;Gingival Crevicular Fluid;Humans;India;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light

Therapy;Male;Nickel;Orthodontics;Prospective Studies;Time Factors;Titanium;Tooth Apex;Tooth Exfoliation;Tooth Movement Techniques;Young Adult

Laser phototherapy in acute posttraumatic trismus - Case-series study. BACKGROUD AND AIMS: There are very few studies on laser phototherapy (LPT) in acute temporomandibular disorders (TMDs). Our objective is to assess the effectiveness of laser phototherapy (LPT) on the limitation of the mouth opening due to an acute mandibular trauma. SUBJECTS AND METHODS: Fourteen women of 41 Â± 3 years and 24 men of 38 Â± 3 years, with no history of TMD and having sustained a mandibular trauma within the prior 20 hours, were treated exclusively by using an 810-nm laser beam in a continuous wave mode, with an output power of 1 W. At a speed of 2 cm/s, it scanned twice, for 60 seconds, with a pause in between of 2 minutes, a large cutaneous area (25 cm(2)), covering the temporomandibular joint (TMJ), the masseter muscle and a part of the temporalis fossa; also, it scanned just once, for 7 seconds, a small mucous area (3 cm(2)), covering the internal pterygoid muscle. The clinical outcomes were evaluated by comparing the maximum unassisted opening (MUO), measured at the baseline and immediately after the end of the LPT procedure. RESULTS: The MUO improvement of 24.6 Â± 4.4 mm represented a highly significant difference ($p < .0001$) between the measurements, in all the patients, regardless of gender. CONCLUSIONS: By scanning with an 810-nm laser beam, within less than 20 hours after the trauma, large areas of all the involved tissues and not just a few points, as described until now, the limited mouth opening in acute posttraumatic trismus was immediately and greatly resolved.

Effectiveness of Low Level Laser Therapy (LLLT) in the treatment of Lateral elbow tendinopathy (LET): an umbrella review. PURPOSE: The aim of this umbrella review is to determine the effectiveness of LLLT in the treatment of LET and to provide recommendations based on this evidence. METHODS: A comprehensive and systematic review was undertaken using Medline, EBSCO and EMBASE. Systematic reviews or meta-analysis were included if they compared Laser with at least one of the following: (i) placebo, (ii) no treatment, (iii) another treatment, conservative (physical therapy intervention or medical) or operative of LET. Principal outcomes included the assessment of short and long-term effect on functional status, pain, grip strength (pain-free or maximum) and a global measure (overall improvement). RESULTS: Seven papers met the inclusion criteria for the umbrella review, Five papers were of moderate and two of low methodological quality. All reviews reported benefits associated with laser therapy Vs other intervention or placebo, however the significance of the identified benefits differed between studies and reviews. No review reported negative effects of laser therapy or harm to patients. All reviews noted significant variance between included studies with 2 reviews citing statistically significant heterogeneity. It is essential to consider this in the interpretation of these data. CONCLUSION: This umbrella review found poor results for the effectiveness of LLLT in the management of LET. Therefore, further research with well-designed RCTs is required to provide meaningful evidence on the effectiveness (absolute and relative) of LLLT for the management of LET.

A case control series for the effect of photobiomodulation in patients with low back pain and concurrent depression. BACKGROUND AND AIMS: To present incidental findings in patients with low back pain (LBP) who received photobiomodulation (PBM) administered to the back and thighs as an adjunct to physical therapy (PT) and then experienced improvement in concurrent depression. MATERIALS AND METHODS: Five outpatients with LBP and concurrent self-reported depression were treated for LBP over five weeks with PT (5-sessions) and concurrent PBM (final 3-sessions), and retrospectively matched to five control patients treated with PT alone (5-sessions). The PBM device emitted light at 850nm and 660 nm with an irradiance of 100 mW/cm(2) and fluence of 3 J/cm(2) on 12 symmetrical posterior sites (thoracic, lumbar and thighs) for 30 sec/site. RESULTS: Both groups had non-significant differences in all baseline scores, except for higher functional status (ARGS) in the

PBM-group (33.6 Â± 12.2 vs.18.6 Â± 3.6, t(8) = 2.638, p = 0.030). After treatment, the mean decrease in depression scores (OMSQ-12 item #6) was significantly larger in the PBM-group (43.0 Â± 22.0 vs. 8.0 Â± 5.7, t(8) = 3.449, p = 0.009). Improvement in functional status (ARGS) in the PBM-group was similar to that in the controls (42.0 Â± 13.5 vs. 43.4 Â± 11.1, t(8) = 0.179, p = 0.862), suggesting group differences in antidepressant effect were independent of functional status improvement. CONCLUSIONS: This preliminary investigation suggests that an antidepressant effect may result from PBM to the back and thighs in patients with LBP and concurrent depression.

Combination of Natural Extracts and Photobiomodulation in Keratinocytes Subjected to UVA Radiation. Natural extracts (NE) with antioxidant properties can minimize the effects of photoaging. Photobiomodulation (PBM) has proven to be a useful tool for the modulation of cell metabolism. Here, we investigate the associations of antioxidants with PBM with the aim of promoting skin rejuvenation. We began with standardization of the experimental protocol. Extracts of chamomile, rosemary, blueberry, green tea, figs, pomegranate and nutwood were tested. A custom irradiation system (366Â Â±Â 10Â nm) was used to simulate sun exposure. A light emitting diode system (640Â Â±Â 12.5Â nm) was used for PBM. Viability assessments were performed by the (3-(4,5-Dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide) MTT assay method. Based on the results, radiant exposure to UVA was defined as 9 and 1Â JÂ cm(-2) for PBM. Extract concentrations were established on the basis of dark toxicities, which ranged from 0.01% to 0.3%. The data show that PBM is a promising therapy to restore keratinocytes after UVA damage; however, the detailed mechanism and effects require further exploration. Moreover, although the combination of PBM with NE may be a useful strategy, the choice of a NE is challenging, since the working concentration and other properties, such as photosensitivity, may bring about unwanted results. Plant Extracts Cell Line, Transformed;Keratinocytes;Light;Plant Extracts;Ultraviolet Rays

Surface electromyography after lower level laser therapy application on skeletal muscles in individuals with heart failure. The purpose of this study was to investigate the effects of low-level laser therapy (LLLT) applied before a fatigue protocol through the effects on the electrical activation in the quadriceps muscle in patients with HF. Fourteen patients with the diagnosis of heart failure (HF) were selected for this double-blind, crossover type clinical trial. These participants have attended to a familiarization, LLLT, and placebo sessions, totaling three visits. The LLLT was applied in the quadriceps muscle (850Â nm, 5Â J per diode). The fatigue protocol consisted of concentric and eccentric isokinetic contractions (cc/ec) until exhaustion or up to 50Â cc/ec. The muscular fatigue was evaluated with surface electromyography, by the analysis of integral, median frequency, and entropy. Only one application of LLLT is not able to decrease skeletal muscle activation in patients with HF. There was no reduction of muscle fatigue among the proposed protocols. Single LLLT session has no effect on the reduction of skeletal muscle fatigue in patients with HF. Adult;Aged;Cross-Over Studies;Double-Blind Method;Dyspnea;Electromyography;Female;Heart Failure;Humans;Linear Models;Low-Level Light Therapy;Male;Middle Aged;Muscle Fatigue;Muscle, Skeletal

Photobiomodulation therapy before futsal matches improves the staying time of athletes in the court and accelerates post-exercise recovery. This study aimedÂ to analyze PBMT effects on futsal player's performance and recovery in a non-controlled field environment. It is a randomized, triple-blinded, placebo-controlled, crossover clinical trial. The research included six professional athletes and in each match phototherapy treatments were performed before matches (40 minutes), blood samples were collectedÂ before treatments, and samples immediately after the end of the matches and 48Â h after. Furthermore, videos were analyzed to quantify the time athletes spent on the pitch and the distance they covered. PBMT was performed at 17 sites of each lower limb (40 minsÂ beforeÂ matches), employing a cluster with 12 diodes (4 laser diodes of 905Â nm, 4 LEDs of 875Â nm, and 4 LEDs of 640Â nm, 30Â J per site). The performance of the athlete could be quantified

considering the time on the pitch and the distance covered; the biochemical markers evaluated were creatine kinase, lactate dehydrogenase, bloodÂ lactate, and oxidative damage to lipids and proteins. PBMT significantly increased the time of staying in the pitch and a significant improvement in all the biochemical markers evaluated. No statistically significant difference was found for the distance covered. Pre-exercise PBMT can enhance performance and accelerate recovery of high-level futsal players. Biomarkers Adult;Athletes;Biomarkers;Cross-Over Studies;Double-Blind Method;Exercise;Humans;Low-Level Light Therapy;Male;Physical Endurance;Sports;Time Factors

Photobiomodulation with single and combination laser wavelengths on bone marrow mesenchymal stem cells: proliferation and differentiation to bone or cartilage. Tissue engineering aims to take advantage of the ability of undifferentiated stem cells to differentiate into multiple cell types to repair damaged tissue. Photobiomodulation uses either lasers or light-emitting diodes to promote stem cell proliferation and differentiation. The present study aimed to investigate single and dual combinations of laser wavelengths on mesenchymal stem cells (MSCs). MSCs were derived from rabbit iliac bone marrow. One control and eight laser irradiated groups were designated as Infrared (IR, 810Â nm), Red (R, 660Â nm), Green (G, 532Â nm), Blue (B, 485Â nm), IR-R, IR-B, R-G, and B-G. Irradiation was repeated daily for 21Â days and cell proliferation, osseous, or cartilaginous differentiation was then measured. RT-PCR biomarkers were SOX9, aggrecan, COL 2, and COL 10 expression for cartilage and ALP, COL 1, and osteocalcin expression for bone. Cellular proliferation was increased in all irradiated groups except G. All cartilage markers were significantly increased by IR and IR-B except COL 10 which was suppressed by IR-B combination. ALP expression was highest in R and IR groups during osseous differentiation. ALP was decreased by combinations of IR with B and with R, and also by G alone. R and B-G groups showed stimulated COL 1 expression; however, COL 1 was suppressed in IR-B, IR-R, and G groups. IR significantly increased osteocalcin expression, but in B, B-G, and G groups it was reduced. Cartilage differentiation was stimulated by IR and IR-B laser irradiation. The effects of single or combined laser irradiation were not clear-cut on osseous differentiation. Stimulatory effects on osteogenesis were seen for R and IR lasers, while G laser had inhibitory effects. Collagen Type I;Collagen Type II;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone and Bones;Cartilage;Cell Differentiation;Cell Lineage;Cell Proliferation;Cell Shape;Cells, Cultured;Chondrogenesis;Collagen Type I;Collagen Type II;Gene Expression Regulation;Lasers;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Rabbits

Effects of Laser Photobiomodulation and Ozone Therapy on Palatal Epithelial Wound Healing and Patient Morbidity. OBJECTIVE: The aim of this study was to compare the effects of laser photobiomodulation (PBM) and topical ozone therapy on the reepithelialization of palatal donor site wounds through clinical assessment and computer-aided image analysis and to assess the patient morbidity following free gingival graft (FGG) surgeries. MATERIAL AND METHODS: Thirty-six patients requiring FGG were randomly allocated into three groups: laser group (nâ€‰=â€‰12), ozone group (nâ€‰=â€‰12), and control group (nâ€‰=â€‰12). Epithelialization was evaluated by applying 3% hydrogen peroxide (H(2)O(2)) to the wound area and also measured by using digital image analysis (ImageJ). Bland-Altman plots were used for assessing agreement between H(2)O(2) and ImageJ measurements. Parameters in relation to patient morbidity were assessed by using visual analog scale (VAS) on the first 3, 7, 14, and 30 days postoperatively. RESULTS: At day 14, statistically significant smaller wounds were observed with digital image analysis in the ozone group as compared with the control group (pâ€‰=â€‰0.034). However, intergroup comparison of the remaining wound area evaluated by the clinician using the H(2)O(2) method did not reveal any significant differences (pâ€‰>â€‰0.05). Nonetheless, according to Bland-Altman analysis, the lower and upper limits showed a moderate agreement between the two measurement methods. The mean VAS sores exhibiting postoperative discomfort was observed to be significantly higher in the control group

compared with the laser group (pâ€‰=â€‰0.002) and ozone group (pâ€‰<â€‰0.001) at day 7. CONCLUSIONS: Adjunctive ozone therapy could have a significantly beneficial effect on the acceleration of palatal wound healing following FGG procedures. Both PBM and ozone treatment modalities reduced postoperative discomfort as compared with spontaneous healing. Ozone;Hydrogen Peroxide Adult;Combined Modality Therapy;Female;Gingival Recession;Humans;Hydrogen Peroxide;Low-Level Light Therapy;Male;Mouth Mucosa;Ozone;Pain Measurement;Palate;Prospective Studies;Re-Epithelialization;Transplant Donor Site;Treatment Outcome;Turkey;Wound Healing

Effective treatment for hypertrophic scar with dual-wave-length PDL and Nd:YAG in Chinese patients. There are several ways to prevent and treat hypertrophic scars. In recent years, lasers have been quite extensively used in treating scars. For example, Pulsed Dye Laser (PDL) and Intense Pulsed Light (IPL) can accelerate mutation of scar, whereas non-ablative and ablative fractional laser can improvescar texture. Dual-wave-length laser treatment is extensively used for blood vessel diseases but is rarely used and less reported for treatment of hypertrophic scars. Our study focuses on the efficacy and safety of dual-wave-length PDL and Nd:YAG in treatment of hypertrophic scars. Twenty-five patients in our study complaining of hypertrophic scars were treated with combined PDL/Nd:YAG laser at 4-6 weeks intervals. Following this, the patients and observers assessed these scars by using Patient Scar Assessment Scale (PSAS) and Observer Scar Assessment Scale (OSAS). The resultsshowed that hypertrophic scar was significantly improved after several laser treatments, and no severe adverse effects were observed. Considering the safety and satisfactory effects of dual-wave-length laser treatment, it can be regarded as a good method for treating hypertrophic scars. This study clearly demonstrates that combined PDL/Nd:YAG laser treatment is an effective, safe and well-tolerated treatment option for hypertrophic scars. Adolescent;Adult;Child;China;Cicatrix, Hypertrophic;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male

Acute effects of photobiomodulation therapy (PBMT) combining laser diodes, light-emitting diodes, and magnetic field in exercise capacity assessed by 6MST in patients with COPD: a crossover, randomized, and triple-blinded clinical trial. Chronic obstructive pulmonary disease (COPD) is characterized by dyspnea, as well as musculoskeletal and systemic manifestations. Photobiomodulation therapy (PBMT) with use of low-level laser therapy (LLLT) and/or light-emitting diode therapy (LEDT) is an electrophysical intervention that has been found to minimize or delay muscle fatigue. The aim of this study was to evaluate the acute effect of PBMT with combined use of lasers diodes, light-emitting diodes (LEDs), magnetic field on muscle performance, exercise tolerance, and metabolic variables during the 6-minute stepper test (6MST) in patients with COPD. Twenty-one patients with COPD (FEV(1) 46.3% predicted) completed the 6MST protocol over 2Â weeks, with one session per week. PBMT/magnetic field or placebo (PL) was performed before each 6MST (17 sites on each lower limb, with a dose of 30Â J per site, using a cluster of 12 diodes 4â€‰Ã—â€‰905Â nm super-pulsed laser diodes, 4â€‰Ã—â€‰875Â nm infrared LEDs, and 4â€‰Ã—â€‰640Â nm red LEDs; Multi Radiance Medicalâ„¢, Solon, OH, USA). Patients were randomized into two groups before the test according to the treatment they would receive. Assessments were performed before the start of each protocol. The primary outcomes were oxygen uptake and number of steps, and the secondary outcome was perceived exertion (dyspnea and fatigue in the lower limbs). PBMT/magnetic field applied before 6MST significantly increased the number of steps during the cardiopulmonary exercise test when compared to the results with placebo (129.8â€‰Â±â€‰10.6 vs 116.1â€‰Â±â€‰11.5, pâ€‰=â€‰0.000). PBMT/magnetic field treatment also led to a lower score for the perception of breathlessness (3.0 [1.0-7.0] vs 4.0 [2.0-8.0], pâ€‰=â€‰0.000) and lower limb fatigue (2.0 [0.0-5.0] vs 4.0 [0.0-7.0], pâ€‰=â€‰0.001) compared to that with placebo treatment. This study showed that the combined application of PBMT and magnetic field increased the number

of steps during the 6MST and decreased the sensation of dyspnea and lower limb fatigue in patients with COPD. Adult;Cross-Over Studies;Exercise;Exercise Test;Female;Humans;Knee;Lasers, Semiconductor;Low-Level Light Therapy;Magnetic Fields;Male;Middle Aged;Pulmonary Disease, Chronic Obstructive

Shedding light on the FDA's 510(k) approvals process: low-level laser therapy devices used in the treatment of androgenetic alopecia. Introduction: Low-level laser therapy has demonstrated superior efficacy relative to other nonsurgical treatment options for the treatment of androgenetic alopecia. Methods: Records from a public U.S. FDA database for premarket approval of low-level laser therapy devices approved between January 1 2000 and July 15 2018 were reviewed. Results: 47 devices received 510(k) premarket approval, with an increasing number of devices available since 2007. More options are now available and product indications have expanded for use in a wider audience, including both men and women. Discussion: Growing recognition of lasers has led to an increasing number of devices available as well as innovative options in terms of design and convenience. In the past few years, these devices have adopted broader indications for use in both men and women. However, marketed indications have not been adequately explored and current devices on the market have the potential to mislead consumers. Alopecia;Cross-Sectional Studies;Databases, Factual;Device Approval;Female;Humans;Low-Level Light Therapy;Male;Retrospective Studies;United States;United States Food and Drug Administration

In Vivo Analysis of Photobiomodulation Genotoxicity Using the Somatic Mutation and Recombination Test. BACKGROUND: Photobiomodulation (PBM) has been studied mainly for its effects on the repair, regeneration, and healing of tissue due to its direct and indirect actions on cell proliferation. However, it is necessary to consider the way in which laser acts, that is, whether it affects the rates of spontaneous mutation and mitotic recombination of cells. OBJECTIVE: This study investigated the genotoxic potential of PBM (904â€‰nm) based on an in vivo bioassay that concomitantly evaluates mitotic recombination and point and chromosomal mutations. METHODS: Strains of Drosophila melanogaster that carry specific marker genes were used to detect the induction of mutation and somatic recombination when exposed to different fluences (3, 5, 10, and 20â€‰J/cm(2)). DNA damage was measured using the somatic mutation and recombination test (SMART), which is based on the identification of wing hair with mutant phenotypes that express lesions at DNA level. RESULTS: The doses 5, 10, and 20â€‰J/cm(2) induced significant increase in the total number of spots compared with the negative control. The highest frequency of spots was caused by the 10â€‰J/cm(2). CONCLUSIONS: Besides recombination events, the quantitative and qualitative analysis of mutant hairs revealed the occurrence of mutagenic events, both punctual and chromosomal. In addition, the results point to a dose-dependent response. Animals;DNA Damage;Drosophila melanogaster;Low-Level Light Therapy;Mutagenicity Tests;Mutation;Recombination, Genetic

Short-term evaluation of photobiomodulation therapy on the proliferation and undifferentiated status of dental pulp stem cells. The aim of this in vitro study was to analyze the effect of photobiomodulation therapy (PBMT) on the proliferation and undifferentiating status of stem cell from human exfoliated deciduous teeth (SHEDs). PBMT was carried out with an aluminum gallium indium phosphide (InGaAlP) diode laser in contact and punctual mode (continuous wave, 660Â nm, 20Â mW, 0.028Â cm(2), and average energy densities of 1 (1Â s), 3 (4Â s), 5 (7Â s), 10 (14Â s), 15 (21Â s), or 20 (28Â s) J/cm(2) per point). The immunoprofile of the SHEDs was analyzed using flow cytometry. Cell proliferation was assessed by the MTT reduction assay. Gene expressions of mesenchymal stem cell markers (OCT4, Nestin, CD90, and CD105) were assessed by RT-qPCR 48Â h after PBMT. Data were compared by analysis of variance (ANOVA) and Tukey's test (pâ€‰â‰¤â€‰0.05). Cells cultured under nutritional deficit and treated with PBMT at 5Â J/cm(2)

presented similar cell growth than those of positive control group. Cell growth was significantly higher than those of other groups. Mesenchymal stem cell gene markers were still expressed after PBMT at 5Â J/cm(2). In a short-term analysis, PBMT increases the number of stem cells with no interference in the undifferentiated state of the irradiated cells, which opens wide possibilities for application in tissue regeneration. Cell Differentiation;Cell Proliferation;Cells, Cultured;Dental Pulp;Gene Expression Regulation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Stem Cells;Time Factors;Tooth Exfoliation;Tooth, Deciduous

Transcranial and systemic photobiomodulation for major depressive disorder: A systematic review of efficacy, tolerability and biological mechanisms. BACKGROUND: Photobiomodulation (PBM) with red and near-infrared light (NIR) -also known as Low-Level Light Therapy-is a low risk, inexpensive treatment-based on non-retinal exposure-under study for several neuropsychiatric conditions. The aim of this paper is to discuss the proposed mechanism of action and to perform a systematic review of pre-clinical and clinical studies on PBM for major depressive disorder (MDD). METHODS: A search on MEDLINE and EMBASE databases was performed in July 2017. No time or language restrictions were used. Studies with a primary focus on MDD and presenting original data were included (nâ€¯=â€¯17). References on the mechanisms of action of PBM also included review articles and studies not focused on MDD. RESULTS: Red and NIR light penetrate the skull and modulate brain cortex; an indirect effect of red and NIR light, when delivered non-transcranially, is also postulated. The main proposed mechanism for PBM is the enhancement of mitochondrial metabolism after absorption of NIR energy by the cytochrome C oxidase; however, actions on other pathways relevant to MDD are also reported. Studies on animal models indicate a benefit from PBM that is comparable to antidepressant medications. Clinical studies also indicate a significant antidepressant effect and good tolerability. LIMITATIONS: Clinical studies are heterogeneous for population and treatment parameters, and most lack an appropriate control. CONCLUSIONS: Preliminary evidence supports the potential of non-retinal PBM as a novel treatment for MDD. Future studies should clarify the ideal stimulation parameters as well as the overall efficacy, effectiveness and safety profile of this treatment. Animals;Depressive Disorder, Major;Humans;Infrared Rays;Low-Level Light Therapy;Mitochondria

Therapeutic applications of polarized light: Tissue healing and immunomodulatory effects. As the population grows and ages, non-pharmaceutical options for the treatment and management of wounds, disease and injury are required to ensure adequate care. Polarized light therapy (PLT) utilizes visible-spectrum polarized light for a number of clinical applications. The advantage of polarized light is that it is able to penetrate the skin to a depth of up to 5â€‰cm, reaching deeper tissues involved in wound healing. PLT has been shown to accelerate the healing process for ulcers, surgical wounds and dermal burns as well as a small number of musculoskeletal injuries. As research into the histological and physiological effects of PLT is largely absent, studies related to other light therapy modalities, largely low-level laser therapy, may pave the way to identify putative mechanisms by which PLT might exert its effects. Changes to cell signalling and secretion of substances required for wound healing have been identified in response to phototherapies. The reviewed literature suggests that PLT may be efficacious in some wound and injury healing contexts, though a gap in the literature exists regarding its mechanisms of action. Future studies should fully explain the therapeutic effects of PLT and the physiological mechanisms underpinning them.
Animals;Burns;Humans;Immunomodulation;Musculoskeletal Diseases;Phototherapy;Skin;Skin Ulcer;Wound Healing

Can the severity of orofacial myofunctional conditions interfere with the response of analgesia promoted by active or placebo low-level laser therapy? OBJECTIVE: To analyze the influence of orofacial myofunctional condition (OMC) on pain perception, temporomandibular disorders (TMD)

severity, and the response to low-level laser therapy (LLLT) in women with painful TMD. METHODS: Seventy-eight women, 59 with TMD, received active laser (30) or placebo (29), with 19 controls. OMC, TMD severity, pain intensity, and pressure pain threshold (PPT) were assessed at different times during the masticatory test: before treatment (LLLT dose: 780nm), during, and after 30Â days. RESULTS: No correlation was found between OMC and pain perception or TMD severity (pÂ >Â 0.05). The active and placebo LLLT showed reduction of pain during chewing and better recovery levels during the rest period (pÂ >Â 0.05), without differences between OMC groups. DISCUSSION: The perception of pain and severity of TMD are not correlated with the OMC, and the response of analgesia promoted by active LLLT or placebo is not associated with OMC.
Analgesia;Female;Humans;Low-Level Light Therapy;Pain;Pain Management;Temporomandibular Joint Disorders

Wound-healing effects of 635-nm low-level laser therapy on primary human vocal fold epithelial cells: an in vitro study. Low-level laser therapy (LLLT) has been promoted for its beneficial effects on tissue healing and pain relief for skin and oral applications. However, there is no corresponding literature reporting on vocal fold wound healing. Our purpose was to assess the potential wound-healing effects of LLLT on primary human vocal fold epithelial cells (VFECs). In this study, normal vocal fold tissue was obtained from a 58-year-old male patient who was diagnosed with postcricoid carcinoma without involvement of the vocal folds and underwent total laryngectomy. Primary VFECs were then cultured. Cells were irradiated at a wavelength of 635Â nm with fluences of 1, 4, 8, 12, 16, and 20Â J/cm(2) (50Â mW/cm(2)), which correspond to irradiation times of 20, 80, 160, 240, 320, and 400Â s, respectively. Cell viability of VFECs in response to varying doses of LLLT was investigated by the Cell Counting Kit-8 (CCK-8) method. The most effective irradiation dose was selected to evaluate the cell migration capacity by using the scratch wound-healing assay. Real-time polymerase chain reaction (RT-PCR) was used to detect the gene expression of TGF-Î²1, TGF-Î²3, EGF, IL-6, and IL-10. Irradiation with doses of 8Â J/cm(2) resulted in 4% increases in cell proliferation differing significantly from the control group (pâ€‰<â€‰0.05). With subsequent doses at 48 and 72Â h after irradiation, the differences between the experimental and the control groups became greater, up to 9.8% (pâ€‰<â€‰0.001) and 19.5% (pâ€‰<â€‰0.001), respectively. It also increased cell migration and the expression of some genes, such as EGF, TGF-Î²1, TGF-Î²3, and IL-10, involved in the tissue healing process. This study concludes that LLLT at the preset parameters was capable of stimulating the proliferation and migration of human vocal fold epithelial cells in culture as well as increase the expression of some genes involved in tissue healing process. Additionally, successive laser treatments at 24Â h intervals have an additive beneficial effect on the healing of injured tissues. RNA, Messenger Cell Movement;Cell Proliferation;Epithelial Cells;Gene Expression Regulation;Humans;Low-Level Light Therapy;Male;Middle Aged;RNA, Messenger;Vocal Cords;Wound Healing

Biochemical changes in injured sciatic nerve of rats after low-level laser therapy (660Â nm and 808Â nm) evaluated by Raman spectroscopy. The aim of this study was to identify biochemical changes in sciatic nerve (SN) after crush injury and low-level laser therapy (LLLT) with 660Â nm and 808Â nm by Raman spectroscopy (RS) analysis. A number of 32 Wistar rats were used, divided into four groups (control 1, control 2, LASER 660Â nm, and LASER 808Â nm). All animals underwent surgical procedure of the SN and groups control 2, LASER 660Â nm, and LASER 808Â nm were submitted to SN crush damage (axonotmesis). The LLLT in the groups LASER 660Â nm and LASER 808Â nm was applied daily for 21 consecutive days (100Â mW, 30Â s, 133Â J/cm(2) fluence). The hind paw was removed and the SN was dissected and positioned on an aluminum support to collect dispersive Raman spectra (830Â nm excitation, 30Â s accumulation). To estimate the biochemical changes in the SN associated with LLLT, the principal component analysis (PCA) was applied. The

Raman spectra of the sciatic nerve fragments showed peaks of the major biochemical components of the nerve, especially sphingolipids, phospholipids, glycoproteins, and collagen. The spectral features identified in some of the principal component loading vectors are referred to the biochemical elements present on the SN and were increased in the groups treated with LLLT, mainly lipids (sphingo and phospholipids) and proteins (collagen)-constituents of the myelin sheath. The RS was effective in identifying the biochemical differences in the SN after the crush injury, and LASER 660Â nm was more efficient than the LASER 808Â nm in cell proliferation and repair of the injured SN. Animals;Female;Low-Level Light Therapy;Principal Component Analysis;Rats, Wistar;Sciatic Nerve;Spectrum Analysis, Raman

Photobiomodulation Therapy in Veterinary Medicine: A Review. Laser therapy, or photobiomodulation, has rapidly grown in popularity in human and veterinary medicine. With a number of proposed indications and broad, sometimes anecdotal, use in practice, research interest has expanded aimed at providing scientific support. Recent studies have shown that laser therapy alters the inflammatory and immune response as well as promotes healing for a variety of tissue types. This review will cover the history of the modality, basic principles, proposed mechanisms of action, evidence-based clinical indications, and will guide the practitioner through its application in practice. Animals;Low-Level Light Therapy

A preliminary study of fractional CO(2) laser added to topical tacrolimus combined with 308 nm excimer lamp for refractory vitiligo. Fractional CO(2) laser has been proposed recently to be effective and well tolerated in patients with refractory vitiligo. In this preliminary, prospective study, 21 patients with multiple, localized, refractory, non-segmental vitiligo lesions were randomized to receive either tacrolimus ointment plus 308â€‰nm excimer lamp (control), with or without the addition of fractional CO(2) laser. There was no statistically significant improvement in the repigmentation on the laser side compared to the control side. Treatment was generally well-tolerated; only localized adverse effects were noted. Overall the triple combination therapy was not superior to tacrolimus ointment plus 308â€‰nm excimer lamp. Treatment failure may reflect insufficient penetration of tacrolimus ointment through the holes created by fractional CO(2) laser on the skin. Immunosuppressive Agents;Tacrolimus China;Combined Modality Therapy;Female;Humans;Immunosuppressive Agents;Lasers, Excimer;Lasers, Gas;Low-Level Light Therapy;Male;Preliminary Data;Prospective Studies;Skin Pigmentation;Tacrolimus;Time Factors;Treatment Outcome;Vitiligo

Topical brimonidine-assisted laser treatment for the prevention of therapy-related erythema and hyperpigmentation. Postinflammatory hyperpigmentation (PIH) and erythema are the most common adverse effects associated with laser treatment, particularly in dark-skinned individuals. Several methods have been used to prevent or minimize these adverse effects; however, to date, no definitive precautions/strategies are known to prevent post-laser PIH and erythema. We investigated whether the topical application of the Î±-adrenergic receptor agonist brimonidine could reduce laser treatment-related complications such as erythema and PIH. Adrenergic alpha-2 Receptor Agonists;Brimonidine Tartrate Administration, Topical;Adolescent;Adrenergic alpha-2 Receptor Agonists;Brimonidine Tartrate;Erythema;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Tattooing

Emerging Applications of Photobiomodulation Therapy: The Interaction Between Metabolomics and the Microbiome. Humans;Low-Level Light Therapy;Metabolomics;Microbiota

Photobiomodulation is associated with a decrease in cell viability and migration in oral squamous cell carcinoma. The treatment of squamous cell carcinoma (SCC) involves surgery, chemotherapy, and/or radiotherapy, which can cause mucositis (inflammation of the oral mucosa that causes considerable pain and can compromise the continuity of oncological treatment). Photobiomodulation

(PBM) has been successfully used in the treatment of mucositis, but doubts arise regarding the use of laser for areas in which tumor cells may remain. In this study, the effect of PBM on the viability, mitochondrial activity, proliferation, apoptosis, and migration of cells derived from oral SCC was evaluated. SCC9 cells were irradiated with laser (660 and 780Â nm, using 11 dosimetric parameters) and submitted to mitochondrial and caspase 3 activity tests after 1 and 3Â days. Based on the results, cell viability (neutral red assay), proliferation (BrdU assay), and migration (scratch-wound assay) were evaluated using only the dosimetric parameters recommended for mucositis. Non-irradiated cells served as the control. The experiments were performed in triplicate. The 11 parameters diminished mitochondrial activity and induced tumor cell apoptosis. Using the parameters recommended for mucositis, irradiation with 780Â nm (70Â mW, 4Â J/cm(2)) proved to be the safest and led to a reduction in cell viability, the induction of apoptosis, and a reduction in the migration capacity of the tumor cells. Caspases Apoptosis;Carcinoma, Squamous Cell;Caspases;Cell Line, Tumor;Cell Movement;Cell Proliferation;Cell Survival;Humans;Low-Level Light Therapy;Mitochondria;Mouth Neoplasms

Effect of photobiomodulation on neural differentiation of human umbilical cord mesenchymal stem cells. Photobiomodulation therapy (PBMT) can enhance the mesenchymal stem cell (MSC) proliferation, differentiation, and tissue repair and can therefore be used in regenerative medicine. The objective of this study is to investigate the effects of photobiomodulation on the directional neural differentiation of human umbilical cord mesenchymal stem cells (hUC-MSCs) and provide a theoretical basis for neurogenesis. hUC-MSCs were divided into control, inducer, laser, and lasers combined with inducer groups. A 635-nm laser and an 808-nm laser delivering energy densities from 0 to 10Â J/cm(2) were used in the study. Normal cerebrospinal fluid (CSF) and injured cerebrospinal fluid (iCSF) were used as inducers. The groups were continuously induced for 3Â days. Cellular proliferation was evaluated using MTT. The marker proteins nestin (marker protein of the neural precursor cells), NeuN (marker protein of neuron), and GFAP (glial fibrillary acidic protein, marker proteins of glial cells) were detected by immunofluorescence and western blot. We found that irradiation with 635-nm laser increased cell proliferation, and that with 808Â nm laser by itself and combined with cerebrospinal fluid treatment generated significant neuron-like morphological changes in the cells at 72Â h. Nestin showed high positive expression at 24Â h in the 808Â nm group. The expression of GFAP increased in the 808-nm combined inducer group at 24Â h but decreased at 72Â h. The expression of neuN protein increased only at 72Â h in both the 808-nm combined inducer group and inducer group. We concluded that 808Â nm laser irradiation could help CSF to induce neuronal differentiation of hUC-MSCs in early stage and tend to change to neuron rather than glial cells. Antigens, Nuclear;Glial Fibrillary Acidic Protein;Nerve Tissue Proteins;Nestin;neuronal nuclear antigen NeuN, human Antigens, Nuclear;Cell Differentiation;Cell Proliferation;Cell Shape;Cells, Cultured;Glial Fibrillary Acidic Protein;Humans;Immunophenotyping;Low-Level Light Therapy;Mesenchymal Stem Cells;Nerve Tissue Proteins;Nestin;Neurogenesis;Neurons;Umbilical Cord

Editorial. Cosmetic Techniques;Humans;Lasers;Low-Level Light Therapy

Effects and parameters of the photobiomodulation in experimental models of third-degree burn: systematic review. This systematic review was performed to identify the role of photobiomodulation therapy in experimental models of third-degree burns used to induce oxidative stress. EMBASE, PubMed, and CINAHL databases were searched for studies published between January 2003 and January 2018 on the topics of photobiomodulation therapy and third-degree burns. Any study that assessed the effects of photobiomodulation therapy in animal models of third-degree burns was included in the analysis. A total of 17 studies were selected from 1182 original articles targeted on photobiomodulation therapy and third-degree burns. Two independent raters with a structured tool for rating the research quality critically assessed the articles. Although the small

number of studies limits the conclusions, the current literature research indicates that photobiomodulation therapy can be an effective short-term approach to accelerate the healing process of third-degree burns, to increase and modulate the inflammatory process, to accelerate the proliferation of fibroblasts, and to enhance the quality of the collagen network. However, differences still exist in the terminology used to describe the parameters and the dose of photobiomodulation therapy. Animals;Burns;Disease Models, Animal;Journal Impact Factor;Low-Level Light Therapy;Publication Bias;Risk Factors

Treatment of purpura with Nd:YAG laser in skin types IV-VI. Dermal Fillers Dermal Fillers;Ecchymosis;Humans;Injections, Subcutaneous;Lasers, Solid-State;Low-Level Light Therapy;Purpura;Skin Pigmentation

The Management of Melasma on Skin Types V and VI Using Light Emitting Diode Treatment. OBJECTIVE: This study investigated light emitting diode (LED) treatment for patients with melasma on darker skin types. BACKGROUND: Melasma is a common disfiguring skin condition in women which is difficult to treat and is refractory. The cause of melasma remains unclear. METHODS: In this study, 60 female participants aged between 25 and 60 years, who presented with melasma, were enrolled (nâ€‰=â€‰39.85). They were purposely assigned to two groups according to their skin types. Both groups received a total of 36 LED light treatments over a period of 9 months. RESULTS: Both subjective and objective results indicated a significant improvement of melasma. Statistical analyses revealed significant improvements in both groups. CONCLUSIONS: The results of this study suggest that LED is effective in managing melasma. These results will provide a basis for future therapeutic use of phototherapy to improve melasma. Adult;Female;Humans;Melanosis;Middle Aged;Phototherapy;Skin Pigmentation;Treatment Outcome

Stereological Method in Optical Coherence Tomography for In Vivo Evaluation of Laser-Induced Choroidal Neovascularization. BACKGROUND AND OBJECTIVE: To evaluate a stereological method in optical coherence tomography (OCT) as an in vivo volume measurement of laser-induced choroidal neovascularization (L-CNV) lesion size. PATIENTS AND METHODS: Laser photocoagulation was applied in rats to rupture Bruch's membrane and induce L-CNV. In vivo OCT images of neovascular lesions were acquired with a spectral-domain OCT system at days 0, 3, 7, 10, and 14 after laser surgery. A stereological image-processing method was used to calculate lesion volumes from the OCT images. Rats were euthanized at day 14, and confocal microscopy was used to obtain accurate volume measurements of the lesions ex vivo. Lesion sizes calculated from OCT and confocal were compared. RESULTS: In vivo assessment by OCT allowed three distinct stages of L-CNV to be visualized: the initial early reaction, neovascular proliferation, and regression. At day 14, correlations between OCT and confocal lesion volumes showed a positive association (Pearson's $r = 0.50$, $P < .01$). Except for the largest lesions, volumes measured by OCT were statistically similar to those measured by the confocal gold standard ($P = .90$). CONCLUSION: The stereological approach used to measure neovascular lesion volume from OCT images offers an accurate means to track L-CNV lesion size in vivo. [Ophthalmic Surg Lasers Imaging Retina. 2018;49:e65-e74.]. Animals;Choroid;Choroidal Neovascularization;Disease Models, Animal;Fluorescein Angiography;Fundus Oculi;Low-Level Light Therapy;Macular Degeneration;Male;Rats;Rats, Inbred BN;Tomography, Optical Coherence

Effects of transcranial photobiomodulation with near-infrared light on sexual dysfunction. OBJECTIVES: Transcranial photobiomodulation (t-PBM) consists of the delivery of near-infrared (NIR) or red light to the scalp designed to penetrate to subjacent cortical areas of the brain. NIR t-PBM has recently emerged as a potential therapy for brain disorders. This study assessed the efficacy of repeated sessions of NIR t-PBM on sexual dysfunction. METHODS: We performed a secondary analysis of a double-blind clinical trial on t-PBM for major depressive disorder (MDD). Twenty

individuals received NIR t-PBM (nâ€‰=â€‰9) or sham therapy (nâ€‰=â€‰11) twice a week for 8 weeks. Sexual desire, arousal, and orgasm were assessed using the Systematic Assessment for Treatment-Emergent Effects-Specific Inquiry (SAFTEE-SI). RESULTS: The mean improvement in sexual function (decrease in SAFTEE sex total score) in subjects receiving t-PBM in NIR-mode was significantly greater than in subjects receiving sham-mode in the whole sample (NIR [nâ€‰=â€‰9] -2.55â€‰Â±â€‰1.88 vs. sham [nâ€‰=â€‰11] -0.45â€‰Â±â€‰1.21; zâ€‰=â€‰2.548, Pâ€‰=â€‰0.011]) and in the completers (NIR [nâ€‰=â€‰5] -3.4â€‰Â±â€‰1.95 vs. sham [nâ€‰=â€‰7] -0.14â€‰Â±â€‰1.21; zâ€‰=â€‰2.576, Pâ€‰=â€‰0.010]). CONCLUSION: This exploratory study with a small sample size indicates that repeated sessions of NIR t-PBM may be associated with therapeutic effects on sexual dysfunction. The latter appeared unrelated to the antidepressant effect of t-PBM in our cohort. Lasers Surg. Med. 51:127-135, 2019. Â© 2018 Wiley Periodicals, Inc. Adolescent;Adult;Aged;Brain;Depressive Disorder, Major;Double-Blind Method;Humans;Infrared Rays;Low-Level Light Therapy;Middle Aged;Sexual Dysfunctions, Psychological

Does photobiomodulation influence ageing? Adenosine Triphosphate Adenosine Triphosphate;Aging;Humans;Low-Level Light Therapy

Effect of photodynamic therapy on surface decontamination in clinical orthodontic instruments. The objective was to develop, characterize and test a box containing light emission diode (LED), Patent Deposit MU-BR20.2017.002297-3, which was named "Photodynamic Inactivation Device" (PID) and verify if it's suitable in microbial reduction or disinfection action of solid surfaces using PID. The equipment was made in a container of polypropylene with a lid of the same material and, for a better use of irradiation the internal part was covered with a layer of reflective aluminum. In addition, sixty boards of red LED 660â€‰nm wavelength, containing three radiators each, for which the distribution of irradiation and spectral irradiance in all of the six internal faces were calculated in this device. That way, a low cost alternative was tested over three types of microorganisms present on the human microbiota: two strains Gram-positive (Gram +), Staphylococcus aureus and Streptococcus mutans and one strain Gram-negative (Gram -), Escherichia coli, inoculated in orthodontic instruments previously autoclaved. To assess the Photodynamic Inactivation (PDI) over these bacteria, instruments were contaminated by bacterial suspensions (3â€‰Ã—â€‰10â•¸ CFU/mL) and ulterior treatment with a solution of 100â€‰Î¼mol/L of MB for 20â€‰min, and irradiated for another 20â€‰min (energy density of 026â€‰J/cmÂ²). Microbial reduction was assessed by number counting of Colony Forming Units (CFU). At the end, microbial reduction of the surface of orthodontic metal instruments was compared with the positive group of each group. Results showed that PID caused a significant reduction (pâ€‰<â€‰0.05) of the microbial charge stuck in the orthodontic instruments. Thus, the photo prototype of the drawing is appropriate for phototherapy studies, granting itÂ´s advantageous to the low level light therapy as well as for the antimicrobial photodynamic therapy. The perspective is that PID may potentialize the dissemination of phototherapy studies for determining its proper use in health science. And, thus, propose a low cost and atoxic alternative for disinfection of biomedical appliances as non-critical instruments, allowing also for use in the food industry. Photosensitizing Agents;Methylene Blue Disinfection;Escherichia coli;Methylene Blue;Orthodontics;Photochemotherapy;Photosensitizing Agents;Stem Cells;Streptococcus

Bell's palsy treated with photobiomodulation in an adolescent: Rare case report and review of the published literature. BACKGROUND: Bell's palsy represents a peripheral unilateral facial nerve paralysis, being an acute, idiopathic disorder, which can affect children and adolescents. Some therapeutic approaches have been proposed including facial exercises, biofeedback, photobiomodulation, electrotherapy, massage, and thermotherapy. The present report documents a

rare case of Bell's palsy in an adolescent successfully treated with a new protocol of photobiomodulation, consisting of a short-term treatment. CASE REPORT: A 13-year-old girl presented absence of facial movement on the right side when smiling, inability to close the right eye and to raise the right eyebrow, intense painful symptoms on the right side of the face, difficult in chewing and talking, and sialorrhea. She was diagnosed with an idiopathic facial paralysis or Bell's palsy associated with right masseter myalgia, and treated with three sessions of photobiomodulation using infrared laser, 100Â mW output power, 100Â J/cm(2) of energy density, 28Â seconds per point, applied at the origin and insertion of the right superficial masseter muscle. The patient presented complete regression of paralysis, improvement of speech and chewing, and absence of muscular pain. CONCLUSION: Photobiomodulation was effective to treat Bell's palsy in a pediatric patient, being a true noninvasive approach and with no side effects, although there is still no established definitive protocol. Adolescent;Bell Palsy;Female;Humans;Infrared Rays;Laser Therapy;Low-Level Light Therapy;Masseter Muscle;Movement;Pain;Sialorrhea;Treatment Outcome

The effects of photobiomodulation therapy on mouse pre-osteoblast cell line MC3T3-E1 proliferation and apoptosis via miR-503/Wnt3a pathway. Photobiomodulation therapy (PBMT) has been demonstrated as regulating osteoblast proliferation. MicroRNAs (miRNAs) are involved in various pathophysiologic processes in osteoblast, but the role of miRNAs in the PBMT-based promotion of osteoblast proliferation remains unclear. This study aimed to investigate the effects of PBMT treatment (3.75Â J/cm(2)) on mouse pre-osteoblast cell line MC3T3-E1 proliferation and apoptosis via the miR-503/Wnt3a pathway; meanwhile, detect the expressions of miR-503 and Wnt3a after PBMT treatment and the role of miR-503 in regulating Wnt signaling molecules Wnt3a, Î²-catenin, Runx2, apoptotic proteins caspase-3, and Bcl-2 in vitro. The PBMT parameters were as follows: 808Â nm continuous wavelength, 0.401Â W output power, 0.042Â W/cm(2) power density, 9.6Â cm(2) spot size, 36Â J energy, 3.75Â J/cm(2) energy density, 90Â s irradiation for three times per 12Â h, 14.5Â cm distance of the laser source and the angle of divergence of the laser beam was 7Â°. In our present study, the target relationship was predicted and verified by bioinformatics analysis and luciferase reporter assays. Gene mRNA and protein expressions were examined by qPCR and western blot analysis. The MTT method was used to evaluate the effect of miR-503 on MC3T3-E1 cells proliferation. And cell apoptosis was examined by flow cytometry. The results showed that PBMT treatment reduced the expression of miR-503 and increased the level of Wnt3a (pâ€‰<â€‰0.01). Bioinformatics analysis and luciferase reporter assays revealed that Wnt3a was a target of miR-503, and Wnt3a was regulated by miR-503. Furthermore, miR-503 was found to functionally inhibit proliferation and promote apoptosis (pâ€‰<â€‰0.01). And during this process, Wnt3a, Î²-catenin, Runx2, and Bcl-2 expressions were significantly inhibited (pâ€‰<â€‰0.01); however, caspase-3 level was upregulated (pâ€‰<â€‰0.01). These results suggest that miR-503 plays a role in osteoblast proliferation and apoptosis in response to PBMT, which is potentially amenable to therapeutic manipulation for clinical application. MicroRNAs;Mirn503 microRNA, mouse;RNA, Messenger;Wnt3 Protein Animals;Apoptosis;Base Sequence;Cell Line;Cell Proliferation;Down-Regulation;Low-Level Light Therapy;Mice;MicroRNAs;Osteoblasts;RNA, Messenger;Signal Transduction;Up-Regulation;Wnt3 Protein

Free gingival graft adjunct with low-level laser therapy: a randomized placebo-controlled parallel group study. OBJECTIVES: This study aimed to evaluate the effect of low-level laser therapy (LLLT) in terms of enhancing wound healing, reducing free gingival graft (FGG) shrinkage and postoperative pain. MATERIALS AND METHODS: Thirty patients were randomly assigned to receive either FGGâ€‰+â€‰LLLT (test, nâ€‰=â€‰15) or FGGâ€‰+â€‰plasebo LLLT (control, nâ€‰=â€‰15). In the test group, a diode laser (810Â nm, 0.1Â W, energy density 6Â J/cm(2)) was applied immediately after surgery and 1, 3, 7, and 14Â days later. Measurements of the graft surface

areas of the groups were made with an image-analyzing software at baseline and first, third, and sixth months. Complete wound epithelialization and visual analogue scale (VAS) for pain score were evaluated after surgery. RESULTS: Shrinkage of the graft was statistically higher in the control than the test group at third and sixth months (pâ€‰<â€‰0.05). In terms of epithelization of the graft area, the test and control groups did not show any significant difference during the 28-day period (pâ€‰>â€‰0.05). Besides this, statistically significant differences were observed for VAS pain score and the number of analgesic used (pâ€‰<â€‰0.05). CONCLUSIONS: The use of an 810-nm diode laser provided additional benefits to FGG in terms of less shrinkage of the graft dimensions and postoperative pain. CLINICAL RELEVANCE: Low-level laser therapy reduced the shrinkage of free gingival graft's surface area after 6Â months and enhanced postoperative pain relief. Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative;Wound Healing

Effect of red light and near infrared laser on the generation of reactive oxygen species in primary dermal fibroblasts. Irradiation with red light or near-infrared (NIR) lasers can bio-modulate cellular processes or revitalize injured tissues and therefore, widely been used for therapeutic interventions. Mechanistically, this cellular or biological process, referred as Photobiomodulation (PBM), is achieved by the generation of oxide free radicals in cells and tissues. This explorative study using red light (636â€¯nm) and Near Infra-Red (NIR, 825â€¯nm) laser at various irradiation exposures reckons the level of oxidative stress induced by these free radicals in human primary fibroblasts. Freshly isolated dermal fibroblasts were irradiated with red light and NIR at power densities of 74 and 104â€¯mV/cm(2), respectively and, at varying fluences ranging from 5 to 25â€¯J/cm(2). Cellular oxidative stress, measured by Reactive Oxygen Species (ROS) upon quantifying fluorescently labelled oxide free radicals in cells, detected considerable variations between the irradiation exposures of red light and NIR laser. The NIR laser demonstrated high levels of ROS at all fluences, except 10â€¯J/cm(2) indicating its ability in generating of two types of oxide radicals in dermal fibroblasts, often illustrated as biphasic response. Further, the responses of these cells to variable fluences of red light and NIR laser were measured to evaluate the immediate effect of PBM on cellular activity. The production of cellular energy coincides with the amount of oxidative stress, which was two-fold higher in cells irradiated with the NIR laser, as compared with the red light. This outcome indicates that the ROS production within biological systems are more dependent on the wavelength of the laser rather than its fluences. Further studies are required to avoid 'overdosing of PBM' and to analyse ROS qualitatively for making the best use of the red light and NIR laser in clinics. Reactive Oxygen Species Cell Survival;Cells, Cultured;Fibroblasts;Humans;Infrared Rays;Light;Oxidative Stress;Reactive Oxygen Species

Efficacy of diode-emitting diode (LED) photobiomodulation in pain management, facial edema, trismus, and quality of life after extraction of retained lower third molars: A randomized, double-blind, placebo-controlled clinical trial. BACKGROUND: In dentistry, one of the most common surgical procedures is the removal of retained third molars. This surgery generates great morbidity to the participants for causing pain, edema, and trismus due to surgical trauma. The objective of the present study is to evaluate the efficacy of photobiomodulation with light emitting diode (LED) in the control of pain, facial edema, trismus, and quality of life resulting from the extraction of retained lower third molars. METHODS: A randomized, double-blind, placebo-controlled clinical trial involving 38 adult participants, who meet the criteria of eligibility and agree to participate in the study. Before the surgeries are performed, the facial and mouth opening measures of all the participants will be taken. Immediately after the surgeries, participants will be randomized into 2 groups. In the LED group, participants will receive LED applications (intra oral with 660â€Šnm, 12J and extraoral with 850â€Šnm, 108J) in the immediate postoperative, first and second days after the surgical procedure.

In the control group, the participants will be attended in the same way as in the LED group, however, the person in charge of the application will simulate the irradiation. Pain (EVA and NRS-101), postoperative edema, trismus, temperature, dysphagia, and hematoma will be evaluated after 1, 2, 5, and 7 days. The oral health impact profile (OHIP-14 Questionnaire) and anxiety analysis (Beck anxiety inventory -BAI) questionnaires will be applied preoperatively and 7 days after treatment. The appropriate statistical tests will be applied for each specific analysis in a significance level of 5%. DISCUSSION: Although the use of low-power laser in the postoperative has shown good results in the control of postoperative sequelae, this is the first study on the efficacy of the use of LED in this situation. Double-Blind Method;Edema;Face;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Molar, Third;Pain Management;Quality of Life;Research Design;Tooth Extraction;Trismus

Low-Level Laser Therapy Stimulates Proliferation in Head and Neck Squamous Cell Carcinoma Cells. Objectives: Low-level laser therapy (LLLT) is a promising non-invasive treatment option for oropharyngeal mucositis, which is a common side effect of many oncological treatments. LLLT is known for its wound healing properties due to the stimulation of cellular processes, such as proliferation, migration and differentiation. Controversy exists on the possible stimulatory effect of LLLT on head and neck cancer (HNSCC) cells in patients treated with radiotherapy. The aim of this study was to evaluate the biostimulatory effect together with the underlying mechanisms of LLLT on HNSCC cancer cells and normal epithelial cells. Materials and methods: HNSCC cell lines (SCC154, SQD9, and SCC61) and human tonsil epithelial cells were exposed to a Gallium-Aluminum-Arsenide diode laser (830 nm, 150 mW) with energy densities of 0, 1, and 2 J/cm2. The proliferation potential of the cells was assessed by Sulforhodamine B assay, immunoblotting (mitogenic pathways), immunocytochemistry (Ki67), and flow cytometry (PI cell cycle staining). Results: Cell proliferation was increased in HNSCC cell lines after laser irradiation with 1 J/cm2, whereas no significant increase was seen after laser irradiation with 2 J/cm2. In contrast, no effect on cell proliferation was seen in the human tonsil epithelial cells after laser irradiation with any of the energy densities. The increased proliferation was associated with elevated levels of pAKT, pERK, and Ki67 protein expression and cell cycle progression. Conclusion: Our results show that LLLT increases cell proliferation in a dose-dependent manner in HNSCC cells but not in normal epithelial tonsil cells. These results suggest that LLLT has to be used with caution when treating oropharyngeal mucositis in HNSCC patients since tumor cells present in the LLLT irradiation field could be triggered by LLLT.

Corrigendum to "Low-Level Laser Irradiation Exerts Antiaggregative Effect on Human Platelets Independently on the Nitric Oxide Metabolism and Release of Platelet Activation Markers". [This corrects the article DOI: 10.1155/2017/6201797.].

Effect of low-level laser therapy on wound healing and patients' response after scalpel gingivectomy: A randomized clinical split-mouth study. BACKGROUND: Low-level laser therapy (LLLT) is based on the principle of biostimulation or biomodulation effect. LLLT after gingivectomy has resulted in better wound healing because of its action on collagen synthesis, angiogenesis, and growth factor release. AIM: The aim of this split-mouth controlled clinical trial was to assess the effect of LLLT, using diode laser (InGaAsP), on wound healing and patients' response after scalpel gingivectomy. MATERIALS AND METHODS: Forty patients with gingival enlargement in the maxillary and mandibular anterior region (bilaterally symmetrical) were included in the study. After gingivectomy, a diode laser (InGaAsP) was randomly applied to one side of the surgical area on the 1(st), 3(rd), and 7(th) day postoperatively. The surgical areas were disclosed by a solution (Alpha Plac(Â®)) to visualize the areas where the epithelium was absent. Comparison of the surface areas on the LLLT-applied sites and controls was made clinically by visualizing the stained area by two examiners. RESULTS: LLLT-applied sites had significantly lower stained areas signifying improved wound healing compared with the

controls on the postoperative 7(th) and 30(th) day. CONCLUSION: Within the limitations of this study, the results indicated that LLLT might improve wound healing after gingivectomy.

Picosecond Laser Treatment for Acquired Bilateral Nevus of Ota-like Macules.
Adult;Facial Neoplasms;Female;Humans;Low-Level Light Therapy;Middle Aged;Nevus of Ota;Skin Neoplasms

Low-Level Nighttime Light Therapy for Age-Related Macular Degeneration: A Randomized Clinical Trial. PURPOSE: To investigate the safety, acceptability, and effectiveness of light therapy on the progression of AMD over 12 months. METHODS: This was a phase I/IIa, prospective, proof-of-concept, single-center, unmasked randomized controlled trial. Sixty participants (55 to 88 years) with early AMD in the study eye and neovascular AMD (nAMD) in the fellow eye were recruited from a hospital nAMD clinic. Eligible participants were randomized (ratio 1:1) to receive light therapy or to an untreated control group. Light therapy was delivered via a light-emitting mask (peak 505 nm, 23 scotopic Td), which was worn each night for 12 months. Co-primary outcome measures were disease progression (onset of nAMD or increased drusen volume beyond test-retest limits) and change in time constant of cone dark adaptation. Other main outcomes included adverse events, compliance, and subjective sleep quality data. RESULTS: Disease progression over 12 months was seen in 38.1% (18.1%-61.6% confidence interval [CI]) of intervention participants and 48.3% (29.4%-67.5% CI) of controls (Mantel-Haenszel test, common odds ratio = 0.763, P = 0.495). A significantly larger delay in cone adaptation was observed in the intervention group (1.66 Â± 0.61 minutes) than in the control group (0.66 Â± 0.49 minutes) over the follow-up period. No reported adverse events were deemed to be associated with the intervention. CONCLUSIONS: Although acceptable to the patients, light therapy did not have a substantial effect on the progression of early AMD over 12 months. Further investigation is necessary to discover the permanency and cause of the adverse effect of light therapy on dark adaptation. Aged;Aged, 80 and over;Dark Adaptation;Disease Progression;Female;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Prospective Studies;Retinal Cone Photoreceptor Cells;Sickness Impact Profile;Sleep;Surveys and Questionnaires;Visual Acuity

Photobiomodulation therapy improves multilineage differentiation of dental pulp stem cells in three-dimensional culture model. Photobiomodulation therapy (PBM) has shown positive effects on stem cell differentiation in monolayer cell culture model, but little is known about its effect on three-dimensional (3-D) agarose gel culture. This study evaluated the PBM effect of human dental pulp stem cells (hDPSCs) differentiation and phosphatase alkaline activity (ALP) using an agarose 3-D model under different nutritional conditions. hDPSCs were characterized and seeded on a 0.3% agarose gel layer with different media (osteogenic, adipogenic, chondrogenic) and were assigned into four groups: control 10% fetal bovine serum (FBS), control 5% FBS, PBM 10% FBS, and PBM 5% FBS. Irradiation was performed with continuous-wave InGaAlP laser, 660Â nm, 100Â mW, 3,3â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2, spot size 0.3â€‰â€‰cm2, 10Â s of exposure time, and 1Â J of energy per point with 6-h interval between sessions. All groups were evaluated at 7 and 14 days. ALP assay was performed to analyze the deposition of mineralized tissue. At 7 days, PBM 5% FBS group presented better stimulation in osteogenic and adipogenic differentiation compared with control. After 14 days, hDPSCs cultured in 3-D exhibited osteogenic, adipogenic, and chondrogenic differentiation; furthermore, compared to control, PBM significantly stimulated all differentiation processes (pâ€‰â€‰<â€‰â€‰0.05). It can be concluded that hDPSCs cultured in 3-D agarose associated to PBM could be a promising tool for tissue engineering applications.
Adolescent;Cell Culture Techniques;Cell Differentiation;Cells, Cultured;Dental Pulp;Humans;Low-Level Light Therapy;Osteoblasts;Osteogenesis;Stem Cells

Modulation of immune response to induced-arthritis by low-level laser therapy. As low-level laser therapy immune cells responses are not always clarified, this study aimed to evaluate cytokines and immune cells profile after low-level laser therapy (LLLT) on arthritis-induced model. Arthritis was induced in C57BL/6 mice divided into five groups: euthanized 5 hours after inflammation induction; untreated; dexamethasone treated; LLLT at 3 Jcm(-2) ; LLLT at 30 Jcm(-2) . Cytokine measurements by enzyme-linked immunosorbent assay and mRNA cytokine relative levels by real-time quantitative polymerase chain reaction were performed with arthritic ankle (IL-1Î², IL-6, TNF-Î±, IL-10 and TGF-Î²). Macrophages, dendritic cells, natural killer cells, lymphocytes CD4(+) , CD8(+) , Treg and costimulatory proteins were quantified in proximal lymph node by flow cytometry. Data showed decrease in all cytokine levels after LLLT and alteration in mRNA relative levels, depending on the energy density used. LLLT was able to increase of immune cell populations analyzed in the lymph node as well as costimulatory proteins expression on macrophages and dendritic cells. Treg TCD4(+) and TCD8(+) population enrichment were observed in LLLT at 3 and 30 Jcm(-2) groups, respectively. Furthermore, Treg TCD8(+) cells expressing higher levels of CD25 were observed at LLLT at 30 Jcm(-2) group. Our results indicate that LLLT could change the inflammatory course of arthritis, tending to accelerate its resolution through immune cells photobiostimulation. Cytokines Adaptive Immunity;Animals;Antigen-Presenting Cells;Arthritis;Cytokines;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL

Efficacy of adjunctive low-level laser therapy in the treatment of aggressive periodontitis: A systematic review. The aim of the present study was to systematically review the efficacy of low-level laser therapy (LLLT) as an adjunct to scaling and root planing (SRP) vs SRP alone in the treatment of aggressive periodontitis (AgP). The addressed PICO (Population, Interventions, Comparisons and Outcomes) question was: Is LLLT as an adjunct to SRP effective in the treatment of AgP? Electronic databases, including MEDLINE via PubMed, Cochrane Central Register of Controlled Trials and Cochrane Oral Health Group Trials, and EMBASE, were searched until March 2018. Four clinical studies were included. Three studies showed significant improvement in periodontal outcomes among LLLT group compared to SRP alone, whereas only one study showed comparable periodontal outcomes between the adjunctive LLLT and SRP groups at follow up. The overall mean difference for clinical attachment level gain (weighted mean difference [WMD]Â =Â -1.69, 95% confidence interval [CI]Â =Â -3.46 to 0.07, PÂ <Â 0.061) was not significant. However, significant difference for probing depth reduction (WMDÂ =Â -0.95, 95% CIÂ =Â -1.66 to 0.23, PÂ =Â 0.009) was noticed between groups at follow up. Whether LLLT as an adjunct to SRP is more effective than SRP alone in the treatment of AgP remains debatable. Further randomized, clinical trials are required with long follow-up periods and standard laser parameters to reach a strong conclusion. Aggressive Periodontitis;Combined Modality Therapy;Dental Scaling;Humans;Low-Level Light Therapy;Root Planing;Treatment Outcome

Facial nevus depigmentosus getting remarkable repigmentation by treatment with a 308-nm excimer laser: A case report. Nevus depigmentosus (ND) is a rare, congenital, nonprogressive depigmented lesion with irregular outline. To date, the few therapeutic approaches that have been developed to treat ND have yielded unsatisfactory results. We reported on a 6-month-old girl who presented with a ND on the right side of her face for 5 months. Treatment with a 308-nm excimer laser was started once a week at 300â€‰mJ/cm(2) and then was increased by 50-100â€‰mJ/cm(2) in each subsequent session until post-treatment erythema occurred. After 10 treatments, repigmentation in the lesion was evident and remained stable 1 month later at follow up. This case supports that the 308-nm excimer laser may be a good choice for the treatment of ND. Facial Dermatoses;Female;Humans;Hypopigmentation;Infant;Lasers, Excimer;Low-Level Light Therapy;Skin Pigmentation

A randomized blind placebo-controlled trial investigating the effects of photobiomodulation therapy (PBMT) on canine elbow osteoarthritis. The effect of photobiomodulation therapy (PBMT) or sham light therapy on pain, nonsteroidal anti-inflammatory drug (NSAID) requirement, and lameness was studied in 20 dogs with naturally occurring elbow osteoarthritis. Dogs (n = 20) were randomly assigned to receive either PBMT (group PBMT; n = 11) 10 to 20 J/cm(2) or a placebo treatment (sham light group S; n = 9) treatment 0 J/cm(2), to both elbows for 6 weeks. Lameness score, pain score, and NSAID dose were recorded by blinded study personnel before and 7 to 10 days after last treatment. Reduction in NSAID dose occurred in 9/11 dogs in the PBMT group, and in 0/9 of group S dogs (P = 0.0003). There was greater improvement in lameness score post PMBT versus S therapy (P = 0.001). A greater reduction in pain score was detected in 9/11 parameters in group PBMT (P < 0.05). Regularly scheduled PBMT at 10 to 20 J/cm(2) per joint for 6 weeks was successful in improving lameness and pain scores, and in lowering NSAID requirement in canine elbow osteoarthritis patients. Anti-Inflammatory Agents, Non-Steroidal Animals;Anti-Inflammatory Agents, Non-Steroidal;Dogs;Female;Forelimb;Lameness, Animal;Low-Level Light Therapy;Male;Osteoarthritis;Pain;Prospective Studies;Random Allocation

Label-Free Spectral Imaging Unveils Biochemical Mechanisms of Low-Level Laser Therapy on Spinal Cord Injury. BACKGROUND/AIMS: Low-level laser therapy (LLLT) leads to complex photochemical responses during the healing process of spinal cord injury (SCI). Confocal Raman Microspectral Imaging (in combination with multivariate analysis) was adopted to illustrate the underlying biochemical mechanisms of LLLT treatment on a SCI rat model. METHODS: Using transversal tissue sections, the Raman spectra can identify areas neighboring the injury site, glial scar, cavity, and unharmed white matter, as well as their correlated cellular alterations, such as demyelination and up-regulation of chondroitin sulfate proteoglycans (CSPGs). Multivariate data analysis methods are used to depict the underlying therapeutic effects by highlighting the detailed content and distribution variations of the biochemical constituents. RESULTS: It is confirmed that photon-tissue interactions might lead to a decay of the inhibitory response to remyelination by suppressing CSPG expression, as also morphologically demonstrated by reduced glial scar and cavity areas. An inter-group comparison semi-quantitatively confirms changes in lipids, phosphatidic acid, CSPGs, and cholesterol during SCI and its LLLT treatment, paving the way for in vitro and in vivo understanding of the biochemical changes accompanying pathobiological SCI events. CONCLUSION: The achieved results in this work not only have once again proved the well-known cellular mechanisms of SCI, but further illustrate the underlying biochemical variability during LLLT treatment, which provide a sound basis for developing real-time Raman methodologies to monitor the efficacy of the SCI LLLT treatment. Chondroitin Sulfate Proteoglycans;Phosphatidic Acids;Cholesterol Animals;Cholesterol;Chondroitin Sulfate Proteoglycans;Cluster Analysis;Disease Models, Animal;Female;Lasers, Semiconductor;Lipid Metabolism;Low-Level Light Therapy;Microscopy, Confocal;Phosphatidic Acids;Principal Component Analysis;Rats;Rats, Sprague-Dawley;Spectrum Analysis, Raman;Spinal Cord;Spinal Cord Injuries

Clinical effectiveness of multi-wavelength photobiomodulation therapy as an adjunct to extracorporeal shock wave therapy in the management of plantar fasciitis: a randomized controlled trial. The goal of our study was to investigate the cumulative effect of combining medium-energy extracorporeal shock wave therapy (ESWT) and photobiomodulation therapy (PBMT), as well as to compare between their relative effectiveness in the management of plantar fasciitis (PF). One hundred twenty participants with chronic PF, more than 6Â months with failure to respond to conservative treatment, were randomly assigned into four equal groups. Participants received either ESWT with PBMT, ESWT (once a week), PBMT (three times a week), or sham-PBMT (three times a week) for three consecutive weeks. A home exercise program was also included for all four groups. Outcome measures included pressure pain threshold (PPT), visual analogue scale (VAS), and

functional foot index disability subscale (FFI-d) that were collected prior to the first treatment session and at the end of the 3-week treatment period, as well as at a follow-up session, 12Â weeks after the final treatment session. There were statistically significant improvements in post-intervention and follow-up PPT, VAS, and FFI-d values in all treatment groups (Pâ€‰<â€‰0.0001). As for the sham-PBMT, no significant difference was found between the pre-, post-intervention and follow-up values (Pâ€‰>â€‰0.05). Bonferroni correction test revealed that there was a significant difference between all the four groups in PPT, VAS, and FFI-d values (Pâ€‰<â€‰0.0001). All active treatment groups maintained the treatment effect at the 12-week follow-up. Both ESWT and PBMT were effective in increasing PPT values, decreasing pain and increasing functional ability. Additionally, application of PBMT after ESWT was shown to be superior over ESWT and PBMT alone, and ESWT was superior over PBMT in terms of reducing pain sensitivity and increasing function.Level of Evidence II. Disability Evaluation;Extracorporeal Shockwave Therapy;Fasciitis, Plantar;Female;Foot;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain Threshold;Treatment Outcome;Visual Analog Scale

Optical and thermal simulations for the design of optodes for minimally invasive optogenetics stimulation or photomodulation of deep and large cortical areas in non-human primate brain. The use of optogenetics or photobiomodulation in non-human primate (NHP) requires the ability to noninvasively stimulate large and deep cortical brain tissues volumes. In this context, the optical and geometrical parameters of optodes are critical. Methods and general guidelines to optimize these parameters have to be defined. OBJECTIVE: We propose the design of an optode for safe and efficient optical stimulation of a large volume of NHP cortex, down to 3-5â€‰mm depths without inserting fibers into the cortex. APPROACH: Monte Carlo simulations of optical and thermal transport have been carried out using the Geant4 application for tomographic emission (GATE) platform. Parameters such as the fiber diameter, numerical aperture, number of fibers and their geometrical arrangement have been studied. Optimal hardware parameters are proposed to obtain homogeneous fluence above the fluence threshold for opsin activation without detrimental thermal effects. MAIN RESULTS: The simulations show that a large fiber diameter and a large numerical aperture are preferable since they allow limiting power concentration and hence the resulting thermal increases at the brain surface. To obtain a volume of 200-500â€‰mm(3) of brain tissues receiving a fluence above the opsin activation threshold for optogenetics or below a phototocixity threshold for photobiomodulation, a 4 fibers configuration is proposed. The optimal distance between the fibers was found to be 4â€‰mm. A practical implementation of the optode has been performed and the corresponding fluence and thermal maps have been simulated. SIGNIFICANCE: The present study defines a method to optimize the design of optode and the choice of stimulation parameters for optogenetics and more generally light delivery to deep and large volumes of tissues in NHP brain with a controlled irradiance dosimetry. The general guidelines are the use of silica fibers with a large numerical aperture and a large diameter. The combination of several fibers is required if large volumes need to be stimulated while avoiding thermal effects. Mineral Fibers;Opsins Animals;Cerebral Cortex;Computer Simulation;Hot Temperature;Mineral Fibers;Monte Carlo Method;Motor Cortex;Opsins;Optogenetics;Photic Stimulation;Physical Stimulation;Primates

Laser therapy as an adjunct in the treatment of sodium hypochlorite extrusion through a root perforation: a case report. Accidental sodium hypochlorite extrusion can occur during endodontic irrigation procedures. The symptoms appear immediately and include severe pain, swelling, and probable tissue necrosis adjacent to the root of the treated tooth. Treatment of sodium hypochlorite extrusion involves immediate and copious saline irrigation to neutralize the area and prescription of analgesic, anti-inflammatory, and antibiotic medications. Low-level laser therapy (LLLT) might be useful as an adjuvant treatment for damaged soft tissues to improve healing. This

case report describes the treatment of accidental extrusion of 1% sodium hypochlorite through a root canal perforation in a mandibular incisor during endodontic treatment. The extrusion caused minor swelling within the mentolabial sulcus and a large area of necrosis in the gingivolabial mucosa and right edentulous premolar area. Conventional treatment was performed in association with LLLT. Clinical and radiographic examinations after 6 months showed complete healing of the necrotic area without paresthesia and the repair of apical tissues. Root Canal Irrigants;Sodium Hypochlorite Dental Pulp Cavity;Gingiva;Humans;Low-Level Light Therapy;Male;Middle Aged;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite

Local interventions for actinic keratosis in organ transplant recipients: a systematic review. BACKGROUND: Actinic keratosis (AK) in organ transplant recipients (OTRs) has a high risk of progressing to invasive squamous cell carcinoma of the skin. Thus, early and consequent treatment of AKs is warranted in OTRs. OBJECTIVES: To summarize the current evidence for nonsystemic treatments of AKs in OTRs. METHODS: We performed a systematic literature search in MEDLINE, Embase and the Cochrane Central Register of Controlled Trials (CENTRAL) and hand-searched pertinent trial registers up to 22 August 2018. Randomized controlled trials (RCTs) evaluating nonsystemic interventions for AKs in OTRs were included. The risk of bias was estimated using the Cochrane Risk of Bias Tool. RESULTS: Of 663 records initially identified, eight RCTs with 242 OTRs were included in a qualitative synthesis. Most studies evaluated methyl aminolaevulinate photodynamic therapy (MAL-PDT), followed by ablative fractional laser (AFXL) and diclofenac sodium 3% in hyaluronic acid, imiquimod 5% cream and 5-fluorouracil 5% cream (5-FU). MAL-PDT showed the highest rates of participant complete clearance (40-76Â·4%), followed by imiquimod (27Â·5-62Â·1%), diclofenac (41%) and 5-FU (11%). Similar results were observed for lesion-specific clearance rates. Treatment with AFXL alone revealed low lesion clearance (5-31%). Local skin reactions were most intense in participants treated with a combination of AFXL and daylight MAL-PDT. There were no therapy-related transplant rejections or worsening of graft function in any trial. The overall risk of bias was high. CONCLUSIONS: Limited evidence is available for the treatment of AKs in OTRs. MAL-PDT is currently the best-studied intervention. Lesion-specific regimens may not be sufficient to achieve disease control. Field-directed regimens are preferable in this high-risk population. Dermatologic Agents;Photosensitizing Agents Carcinoma, Squamous Cell;Cryotherapy;Dermatologic Agents;Disease Progression;Graft Rejection;Humans;Immunocompromised Host;Immunosuppression Therapy;Keratosis, Actinic;Low-Level Light Therapy;Organ Transplantation;Photochemotherapy;Photosensitizing Agents;Randomized Controlled Trials as Topic;Skin Neoplasms;Transplant Recipients;Treatment Outcome

Long-Term Effect of Pulsed Nd:YAG Laser in the Treatment of Patients with Rotator Cuff Tendinopathy: A Randomized Controlled Trial. OBJECTIVE: The purpose of the present study was to investigate the long-term effect of pulsed Nd:YAG laser on the treatment of rotator cuff tendinopathy. METHODS: Sixty patients with rotator cuff tendinopathy participated and completed the study. The mean age was 50.2â€‰Â±â€‰3.6 years. Participants were randomly assigned to one of two groups: the control group and the treatment group. Both groups were treated with an exercise program, in addition to the pulsed Nd:YAG laser received by the treatment group and the "sham" laser received by the control group, both for three sessions per week for 4 weeks. Outcome measures included pain, assessed by the visual analog scale, and range of motion (ROM), assessed using a traditional goniometer, while the shoulder pain and disability index were used to evaluate the functional recovery of the shoulder joint. Evaluation was carried out before treatment, immediately after treatment, 3 months posttreatment, and 6 months posttreatment. Statistical analyses were used to investigate the effect of interventions and to compare the study groups' pretreatment, posttreatment, and at follow-up points. The significance level was set to pâ€‰<â€‰0.05. RESULTS:

Pain was significantly decreased after treatment and at follow-up points, while ROM and shoulder functions were significantly improved after treatment and at follow-up intervals in both groups. The improvement was more significant in the treatment group than in the control group posttreatment and at follow-up intervals. CONCLUSIONS: Pulsed Nd:YAG laser combined with an exercise program seems to be more effective in the treatment of patients with rotator cuff tendinopathy than a sham laser with exercises. Exercise Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Range of Motion, Articular;Recovery of Function;Rotator Cuff;Tendinopathy;Treatment Outcome

Comparison of Er,Cr:YSGG Laser Handpieces for Class II Preparation and Microleakage of Silorane- or Methacrylate-Based Composite Restorations. OBJECTIVE: The aim of this study was to evaluate the influence of cavity preparation with different Er,Cr:YSGG laser handpieces on microleakage of different posterior composite restorations. METHODS: Fifty-four extracted intact human premolars were randomly assigned to three groups according to cavity preparation method: Bur Group: high-speed diamond bur (Diatech), MD Group: Er,Cr:YSGG laser Waterlase MD handpiece (Biolase Millennium II), and Turbo Group: Er,Cr:YSGG laser Waterlase MD TURBO handpiece (Biolase Millennium II). One hundred eight Class II slot cavities were prepared on the mesial and distal proximal surfaces of each tooth, and the cavity preparation times required were determined. The groups were then subdivided according to the restorative systems used (nâ€‰=â€‰12): a conventional methacrylate-based microhybrid composite (Filtek P60+Adper Single Bond 2/3M); a silorane-based resin composite (Filtek Silorane+Silorane System Adhesive/3M); and a nanohybrid methacrylate-based composite (Kalore+G-Bond/GC). The restorative systems were applied according to the manufacturers' recommendations. Following thermocycling (X5000; 5Â°C-55Â°C), the teeth were coated with nail varnish except the restoration margins, immersed in 0.5% basic fuchsin dye solution, and sectioned in a mesiodistal direction. Dye penetration was evaluated under a light microscope for occlusal and cervical margins. Data were analyzed with one-way ANOVA and chi-square tests (pâ€‰<â€‰0.05). RESULTS: The cavity preparation time (meanâ€‰Â±â€‰SD) required for Bur, MD, and Turbo group was 31.25â€‰Â±â€‰3.82, 222.94â€‰Â±â€‰15.85, and 92.5â€‰Â±â€‰7.42â€‰sec, respectively, and the differences among the groups were statistically significant (pâ€‰<â€‰0.05). Comparing the occlusal and cervical microleakage scores, no statistically significant differences were found among the groups and subgroups (pâ€‰>â€‰0.05). CONCLUSIONS: Er;Cr:YSGG laser cavity preparation with the Turbo handpiece needed shorter time than the MD handpiece, although it needed longer time than the conventional diamond bur. The use of different handpieces of Er,Cr:YSGG laser did not differ from conventional preparation with diamond bur in terms of microleakage with the tested methacrylate- and silorane-based posterior composite restorative systems. Composite Resins;Methacrylates;Silorane Resins;silorane composite resin Bicuspid;Composite Resins;Dental Cavity Preparation;Dental Leakage;Humans;Lasers, Solid-State;Low-Level Light Therapy;Methacrylates;Silorane Resins;Tissue Culture Techniques

Low-Level Laser Therapy and World Association for Laser Therapy Dosage Recommendations in Musculoskeletal Disorders and Injuries. Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Practice Guidelines as Topic;Radiotherapy Dosage

Photobiomodulation using high- or low-level laser irradiations in patients with lumbar disc degenerative changes: disappointing outcomes and remarks. BACKGROUND: Laser therapy seems to be a beneficial physical agent for chronic low back pain (LBP), and it is commonly used in the clinical rehabilitation practice. However, there are still no indisputable and clearly defined protocols and practical guidelines, and further, the methodology of the previous reports leaves many unsatisfied and raises some reservations. OBJECTIVE: The aim of this study was to evaluate the

effectiveness of low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) in patients with lumbar disc degenerative changes based on the analysis of the short- and long-term results and in comparison with the placebo effect. DESIGN: This study was a prospective and placebo-controlled clinical trial. MATERIALS AND METHODS: A group of 68 participants were qualified for the therapy and were assigned to four comparative groups in the order they volunteered: HILT of 1,064 nm, 60 J/cm(2), 10 minutes (HILT); sham (HILT placebo); LLLT of 785 nm, 8 J/cm(2), 8 minutes; and sham (LLLT placebo). The following tests were used to assess the effectiveness of treatment: 1) the visual analogue scale; 2) the Laitinen Questionnaire Indicators of Pain; 3) the Oswestry Disability Index; 4) the Roland-Morris Disability Questionnaire; 5) Lasegue test; and 6) Schober's test. All measurements were carried out before and after irradiations (3 weeks) and in follow-ups (1 and 3 months). RESULTS: After applying verum or placebo laser irradiation, therapeutic progress was observed in all comparative groups; however, no statistically significant differences were observed among the procedures. CONCLUSION: The high- and low-energy laser therapy methods used in the present article are ineffective in relation to patients with lumbar disc degenerative changes in both the short- and long-term perspectives and do not show a significant advantage over the placebo effect.
Adult;Female;Humans;Laser Therapy;Low Back Pain;Low-Level Light Therapy;Lumbar Vertebrae;Male;Middle Aged;Pain Measurement;Prospective Studies;Treatment Outcome

Physical properties of root cementum: Part 27. Effect of low-level laser therapy on the repair of orthodontically induced inflammatory root resorption: A double-blind, split-mouth, randomized controlled clinical trial. INTRODUCTION: The purpose of this 2-arm-parallel split-mouth trial was to investigate the effect of low-level laser therapy (LLLT) on the repair of orthodontically induced inflammatory root resorption (OIIRR). METHODS: Twenty patients were included in this study, with 1 side randomly assigned to receive LLLT, and the other side served as a sham. Eligibility criteria included need for bilateral maxillary first premolar extractions as part of fixed appliance treatment. OIIRR was generated by applying 150Â g of buccal tipping force on the maxillary first premolars for 4Â weeks. After the active force was removed, the teeth were retained for 6Â weeks. LLLT commenced with weekly laser applications using a continuous beam 660-nm, 75-mW aluminum-gallium-indium-phosphorus laser with 1/e(2) spot size of 0.260Â cm(2), power density of 0.245Â W/cm(2), and fluence of 3.6Â J/cm(2). Contact application was used at 8 points buccally and palatally above the mucosa over each tooth root for 15Â seconds with a total treatment time of 2Â minutes. After 6Â weeks, the maxillary first premolars were extracted and scanned with microcomputed tomography for primary outcome OIIRR calculations. Subgroup analysis included assessment per root surface, per vertical third, and sites of heaviest compressive forces (buccal-cervical and palato-apical). Randomization was generated using www.randomization.com, and allocation was concealed in sequentially numbered, opaque, sealed envelopes. Blinding was used for treatment and outcome assessments. Two-tailed paired t tests were used to determine whether there were any statistically significant differences in total crater volumes of the laser vs the sham treated teeth. RESULTS: Total crater volumes were 0.746Â mm(3) for the laser treated teeth and 0.779Â mm(3) for the sham. There was a mean difference of 0.033Â Â±Â 0.39Â mm(3) (95% CI, -0.21 to 0.148Â mm(3)) greater resorption crater volume in the sham group compared with the laser group; this was not statistically significant (PÂ =Â 0.705). No harm was observed. CONCLUSIONS: No significant difference was found between LLLT and sham control groups in OIIRR repair.
Adolescent;Bicuspid;Dental Cementum;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Appliance Design;Orthodontic Brackets;Orthodontic Wires;Root Resorption;Stress, Mechanical;Tooth Extraction;Tooth Movement Techniques;Tooth Root;Treatment Outcome;X-Ray Microtomography

The effect of photobiomodulation on total amount of substance P in gingival crevicular fluid: placebo-controlled randomized clinical trial. To investigate the effect of photobiomodulation (PBM) and placebo on total amount of substance P in gingival crevicular fluid (GCF) pre- and postoperatively. Twenty-six patients having tooth with symptomatic apical periodontitis were enrolled in this study. GCF was collected preoperatively. The patients were assigned into two groups (nâ€‰=â€‰13), as follows: placebo and PBM. Sampling was repeated 7Â days after root canal treatment. Two independent samples T test was used for analyzing of the differences between preoperative and postoperative substance P levels in GCF (pâ€‰=â€‰.05). The Pearson correlation analysis was used for determination of correlation among substance P levels and other variables. For placebo group, there is no significant difference between preoperative and postoperative total amounts of substance P level (pâ€‰=â€‰0.553). For PBM group, postoperative total amount of substance P level was significantly higher than those of preoperative level (pâ€‰=â€‰0.005). Within the limitation of the present study, PBM has immunomodulation effect linked to the modulation of the total amount of substance P in the gingival crevicular fluid. Thai Clinical Trials Registry: TCTR20161228002. Placebos;Substance P Adult;Female;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Pain, Postoperative;Periodontitis;Placebos;Preoperative Care;Substance P

Comparative study of shockwave therapy and low-level laser therapy effects in patients with myofascial pain syndrome of the trapezius. The objective of the study was to compare the effects of shockwave therapy and laser therapy on pain, neck functionality, and quality of life in patients with myofascial pain syndrome of the trapezius. 61 patients (>â€‰18Â years) were randomly allocated to two treatment groups: (1) 31 patients received soft laser therapy once daily in a 3-week period for a total of 15 sessions, (2) 30 patients received shockwave therapy once in a week for 3Â weeks, totalling 3 treatments. Resting pain and pain tolerance were assessed by a 100Â mm visual analogue scale; functional status and quality of life were measured by specific questionnaires (Neck Disability Index, SF-36) before and after the 3-week therapy and at the 15th week follow-up visit. All measured parameters improved significantly in both groups at week 3 and week 15. Comparing the two groups, patients receiving shockwave therapy demonstrated significantly better changes in pain tolerance (mean between-group differences at visit 1-0â€‰=â€‰14.911, 95% CIâ€‰=â€‰2.641-27.182, mean between-group differences at visit 2-0â€‰=â€‰17.190, 95% CIâ€‰=â€‰4.326-30.055 in the left trapezius), neck functionality (mean between-group differences at visit 1-â€‰0â€‰=â€‰0.660, 95% CIâ€‰=â€‰-â€‰1.933 to 3.253, mean between-group differences at visit 2-0â€‰=â€‰1.072, 95% CIâ€‰=â€‰-â€‰2.110 to 4.254), and in all domains using SF-36 QoL questionnaire. The only parameter in which the laser group showed significantly higher benefits was at week 15 for resting pain (mean between-group differences at visit 2-0â€‰=â€‰-â€‰1.345, 95% CIâ€‰=â€‰-â€‰14.600 to 11.910). The results of our study point to a conclusion that both laser and shockwave therapy are effective in myofascial pain syndrome, though we found shockwave therapy to be somewhat more beneficial. Clinical trial registration number NCT03436459 (https://clinicaltrials.gov/ct2/show/NCT03436459). Adult;Aged;Disability Evaluation;Extracorporeal Shockwave Therapy;Facial Neuralgia;Female;Humans;Hungary;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain Threshold;Quality of Life;Remission Induction;Superficial Back Muscles;Surveys and Questionnaires;Time Factors;Treatment Outcome

Evaluation of a non-ablative, fractional 1565Â nm laser for the improvement of striae distensae albae. BACKGROUND AND OBJECTIVE: Striae distensae (SD) represent therapeutically challenging forms of dermal atrophic scarring. In addition to topical ointments, medical needling and various energy-based devices, non-ablative fractional lasers have been suggested for their improvement. However, objective evaluations of their efficacy are widely missing. In this study, we aimed to assess the clinical improvement of SD albae after three treatments with a non-ablative fractional 1565Â nm Er: glass

laser by employing three-dimensional analysis and several questionnaires. METHODS: A total of 16 Caucasians suffering from SD albae were included in this prospective study. EveryÂ patient received three treatments - one every 4Â weeks - using a non-ablative, fractional 1565Â nm laser (two passes: 300Â Î¼beams/cm(2) , 40Â mJ inside the SD; 150Â Î¼beams/cm(2) , 50Â mJ inside the SD and within the surrounding area). Questionnaires (DLQI, POSAS), digital photography and three-dimensional analysis employing PRIMOS(Â®) software and VECTRA(Â®) camera system were taken at baseline, 1 and 6Â months after the last treatment. RESULTS: Evaluation of objective measurements at 6-month follow-up (FU) showed a significant reduction in depth of atrophic lesions by 31.7% and less skin irregularities with S(max) at baseline of 621.2Â Î¼m decreasing to 411.6Â Î¼m (PÂ <Â 0.01, respectively). Improvement in objective measurements was supported by significant changes in patients' rating of skin appearance. POSAS patient total score declined from 33.5 points to 17.5 points throughout the study (PÂ <Â 0.001). From baseline to 6-month FU, patients' life quality improved by 68.0% (DLQI score). Procedures showed no lasting negative side-effects and little to no down time. CONCLUSION: The use of a fractional non-ablative 1565Â nm laser represents a safe approach for the treatment of SD albae. Clinically observed improvements were supported by significant data from objective measurements. The results achieved at 1-month FU represented at 6-month FU, showing stable clinical improvements. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Patient Satisfaction;Prospective Studies;Quality of Life;Striae Distensae;Surveys and Questionnaires;Treatment Outcome;Young Adult

Does blue light restore human epidermal barrier function via activation of Opsin during cutaneous wound healing? BACKGROUND AND OBJECTIVE: Visible light has beneficial effects on cutaneous wound healing, but the role of potential photoreceptors in human skin is unknown. In addition, inconsistency in the parameters of blue and red light-based therapies for skin conditions makes interpretation difficult. Red light can activate cytochrome c oxidase and has been proposed as a wound healing therapy. UV-blue light can activate Opsin 1-SW, Opsin 2, Opsin 3, Opsin 4, and Opsin 5 receptors, triggering biological responses, but their role in human skin physiology is unclear. MATERIALS AND METHODS: Localization of Opsins was analyzed in situ in human skin derived from face and abdomen by immunohistochemistry. An ex vivo human skin wound healing model was established and expression of Opsins confirmed by immunohistochemistry. The rate of wound closure was quantitated after irradiation with blue and red light and mRNA was extracted from the regenerating epithelial tongue by laser micro-dissection to detect changes in Opsin 3 (OPN3) expression. Retention of the expression of Opsins in primary cultures of human epidermal keratinocytes and dermal fibroblasts was confirmed by qRT-PCR and immunocytochemistry. Modulation of metabolic activity by visible light was studied. Furthermore, migration in a scratch-wound assay, DNA synthesis and differentiation of epidermal keratinocytes was established following irradiation with blue light. A role for OPN3 in keratinocytes was investigated by gene silencing. RESULTS: Opsin receptors (OPN1-SW, 3 and 5) were similarly localized in the epidermis of human facial and abdominal skin in situ. Corresponding expression was confirmed in the regenerating epithelial tongue of ex vivo wounds after 2 days in culture, and irradiation with blue light stimulated wound closure, with a corresponding increase in OPN3 expression. Expression of Opsins was retained in primary cultures of epidermal keratinocytes and dermal fibroblasts. Both blue and red light stimulated the metabolic activity of cultured keratinocytes. Low levels of blue light reduced DNA synthesis and stimulated differentiation of keratinocytes. While low levels of blue light did not alter keratinocyte migration in a scratch wound assay, higher levels inhibited migration. Gene silencing of OPN3 in keratinocytes was effective (87% reduction). The rate of DNA synthesis in OPN3 knockdown keratinocytes did not change following irradiation with blue light, however, the level of differentiation was decreased. CONCLUSIONS: Opsins are expressed in the epidermis and dermis of

human skin and in the newly regenerating epidermis following wounding. An increase in OPN3 expression in the epithelial tongue may be a potential mechanism for the stimulation of wound closure by blue light. Since keratinocytes and fibroblasts retain their expression of Opsins in culture, they provide a good model to investigate the mechanism of blue light in wound healing responses. Knockdown of OPN3 led to a reduction in early differentiation of keratinocytes following irradiation with blue light, suggesting OPN3 is required for restoration of the barrier function. Understanding the function and relationship of different photoreceptors and their response to specific light parameters will lead to the development of reliable light-based therapies for cutaneous wound healing. Lasers Surg. Med. Â© 2018 Wiley Periodicals, Inc. Biomarkers;Opsins Biomarkers;Female;Humans;Immunohistochemistry;In Vitro Techniques;Light;Low-Level Light Therapy;Opsins;Skin;Soft Tissue Injuries;Wound Healing

[The influence of laser radiation of the infrared range with a wavelength of 1270 nm on mice Balb/cNude]. BACKGROUND: The effects of low-intensity laser radiation (LILR) on the skin depend on the wavelength and density of the irradiation flux. Moreover, the vast receptor field of the skin facilitates the systemic influence of irradiation on the body. AIMS: The objective of the present study was to evaluate the effects of low-intensity laser irradiation (LIRI) of the infrared range with a wavelength of 1270 nm on the skin of mice Balb/cNude. MATERIAL AND METHODS: The study was carried out with the use of the linear immunodeficient mice Balb/c nude obtained from the animal house of the Pushchino branch of the Academicians M.M. Shemyakin and Yu.A. Ovchinnikov Institute of Biorganic Chemistry. The animals were irradiated once with a fiber laser of stimulated Raman scattering with a wavelength (Î») of 1270 nm, a power of 1.96 mW during the 2 min exposure at an intensity of 10 mW/cm(2), and an energy flux density of 1.2 J/cm(2). The histological studies and morphometry of the skin autoptate were performed. In adition, the expression of microRNA-21, -31, -130a, -191, -200c, -205, -218 was determined in the skin. Reverse transcription and real-time PCR reactions with Taq-Man probes and primers were performed on the nucleic acid amplifier CFX96 ('BioRad', USA).MicroRNA-191 was chosen as the reference gene. The bioinformation analysis of signaling pathways involving the studied microRNAs was performed using the DJANA miRPath database v.3.0. RESULTS: A significant increase in the amount of keratinocytes of the basal layer was documented together with diffuse lymphoid-leukocyte infiltration of the interlobular connective tissue of the subcutaneous fat and endomysium after LILR. The pattern of microRNA expression was tissue-specific. An increase in the expression of micro-RNA-31 and-21 in the skin and a multidirectional change in miRNA-200 and -218 levels were shown. The bioinformation analysis showed that miR21 and miR31 were involved in the regulation of such signaling pathways as PI3K-Akt, Jak-STAT, MAPK, and mTOR of importance for carcinogenesis. Also, they have a signaling significance in the development of melanoma, kidney cancer, prostate cancer and malignant glioma. CONCLUSION: The data obtained in this study suggest activation of the tumor cell-specific and basic processes in the skin of immunodeficient Balb/cNude mice under the influence of low-intensity laser radiation with a wavelength of 1270 nm applied at a dose of 1.2 J/m(2). Animals;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Mice, Nude;Skin

Ultrasound imaging for lateral knee pain: popliteus tendon highlighted. Anti-Inflammatory Agents, Non-Steroidal Anti-Inflammatory Agents, Non-Steroidal;Arthralgia;Combined Modality Therapy;Humans;Knee Joint;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Recovery of Function;Tendon Injuries;Treatment Outcome;Ultrasonography, Doppler

Effect of Laser Therapy on the Osseointegration of Immediately Loaded Dental Implants in Patients under Vitamin C, Omega-3 and Calcium Therapy. BACKGROUND: The use of laser therapy in the biostimulation of bone repair has been growing steadily. AIM: This study aimed to evaluate the radio-densitometric effect of low-intensity laser therapy on the osseointegration of immediately loaded

dental implants in patients under vitamin C, omega-3 and calcium therapy. PATIENTS AND METHODS: A single implant was placed in the mandibular first molar region of twenty patients which were equally divided into two groups. In the non-laser group, the healing phase was left to progress spontaneously without any intervention, while in the laser group it was augmented with low-level laser therapy of wavelength 904 nm in contact mode, continuous wave, 20 mW output power and exposure time 30 sec with a dose 4.7 J/cm(2). Patients in both groups were given vitamin C, calcium and omega-3 starting one month preoperatively. Postoperative digital panoramas were taken immediately after surgery, 1.5 months and 6 months postoperatively. Changes in bone density along the bone-implant interface at the mesial, distal and apical sides were assessed using the Digora software. RESULTS: Independent student t-test was used to compare means of variables between the laser and the non-laser group while repeated measures ANOVA was used to compare bone densities at different times for the same group. Significant increased differences were observed at the mesial, distal and apical sides surrounding the implants of both groups per time. However, the rate of increase was significantly higher in the laser group. The mean difference at the mesial side after 6 months was 21.99 Â± 5.48 in the laser group and 14.21 Â± 4.95 in the non-laser group, while it read 21.74 Â± 3.56 in the laser group and 10.78 Â± 3.90 in non-laser group at the distal side and was 18.90 Â± 5.91 in the laser group and 10.39 Â± 3.49 in non-laser group at the apical side. Significance was recorded at P = 0.004, P = 0.0001, and 0.001 at the mesial, distal and apical sides respectively. CONCLUSION: The low-intensity laser irradiation significantly promoted bone healing and speeded up the osseointegration process emphasising the laser's biostimulatory effect.

Three-dimensional evaluation of the effect of low-level laser therapy on facial swelling after lower third molar surgery: A randomized, placebo-controlled study. PURPOSE: This study aimed to evaluate the effect of a low-level laser therapy (LLLT) on pain, trismus, and swelling of patients whose impacted 3(rd) molar tooth was extracted compared to placebo or "sham" treatment and measure volumetrically the edema with a three-dimensional (3D) surface imaging device (3dMD face system). MATERIALS AND METHODS: Forty-five patients over 17 years of age were included in the study. Patients were randomized to three groups; Group 1, the control group, received only routine management (ice application) (n = 15); Group 2, received single-dose LLLT immediately after surgery (n = 15); and Group 3, placebo group, received sham therapy immediately after surgery (n = 15). In this study, a gallium-aluminum-arsenide diode laser device was used. The laser was applied extraorally (0.3 W, 40 s, 4 J/cm(2)). The trismus, pain, and facial swelling were evaluated. A 3D surface imaging device (3dMD Photogrammetric System) was used to evaluate the volumetric changes of the swelling. The 3D morphology of the facial swelling was recorded using this imaging device immediately before surgery, the second day after surgery, and the 7(th) day after surgery. IBM SPSS statistics 22.0 program was used in the statistical assessment and $P < 0.05$ was considered statistically significant. RESULTS: There was no statistically significant difference in the edema and trismus between the groups. The pain level in Group 2 was significantly lower than that in Group 3 at all-time points. Furthermore, the pain level in Group 2 was significantly lower than that in Group 1 on day 7. CONCLUSIONS: LLLT reduced the intensity of pain following third molar surgery by single dose. The results of this study revealed that LLLT reduced facial swelling, but no significant differences were found among the three groups. In addition, a 3D craniomaxillofacial imaging method provided insight into volume changes after 3(rd) molar surgery and the evaluation of facial swelling in an objective way. Adult;Double-Blind Method;Edema;Face;Female;Humans;Imaging, Three-Dimensional;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain Management;Pain, Postoperative;Pilot Projects;Prospective Studies;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Trismus

Laser therapy for ocular lesions of naevus of Ota. Adolescent;Adult;Eye Neoplasms;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Sclera;Scleral Diseases;Skin Neoplasms;Young Adult

Methods of accelerating orthodontic tooth movement: A review of contemporary literature. Technological progress and the introduction of modern therapeutic methods are constantly changing contemporary orthodontics. More and more orthodontic patients are working adults, who expect satisfactory therapeutic effects as soon as possible, increasing the importance of methods accelerating tooth movement. The aim of this study was to review the current literature regarding methods of accelerating tooth movement and reducing the duration of the active phase of therapy. The literature was collected from the PubMed and EBSCO databases using "accelerated orthodontic tooth movement" as the search key words. The methods described were categorized as conservative and surgical. The pharmacological agents used in conservative treatment, such as growth hormone, parathyroid hormone, thyroxine, and vitamin D, are especially worth mentioning. They stimulate osteoclasts to increase resorption through a variety of mechanisms. Effective methods also include physical stimuli, e.g., vibrations or photobiomodulation. Most studies describing the effects of pharmacological agents were based on animal subjects and they may therefore lack clinical relevancy. Corticotomy and its modifications based on the regional acceleratory phenomenon (RAP) might prove to be a useful augmentation of orthodontic treatment, especially in adults, including patients with periodontal disease. Adrenergic beta-2 Receptor Antagonists;Parathyroid Hormone;Vitamins;Vitamin D;Growth Hormone;Thyroxine Adrenergic beta-2 Receptor Antagonists;Alveolar Process;Cortical Bone;Electromagnetic Fields;Growth Hormone;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Parathyroid Hormone;Piezosurgery;Thyroxine;Tooth Mobility;Tooth Movement Techniques;Vibration;Vitamin D;Vitamins

Efficacy and safety of picosecond 755-nm alexandrite laser with diffractive lens array for non-ablative rejuvenation in Chinese skin. BACKGROUND AND OBJECTIVES: The picosecond alexandrite laser with diffractive lens array (DLA) offers the dual advantages of a picosecond pulse duration and the fractionated delivery of laser energy. This study explores the efficacy and safety of the DLA for treatment of multiple aesthetic concerns associated with photoaging of the face including skin texture irregularities, dyspigmentation, enlarged pore size, rhytides, and skin laxity. METHODS: This prospective, evaluator-blinded trial enrolled Fitzpatrick skin type III-IV patients with mild to moderate signs of facial photoaging. Patients received six full face treatments at 4 week intervals for a total of 107 treatments. Standardized photography was obtained at baseline and at 1, 2, and 3 month follow-up visits. Two independent blinded evaluators rated each of the five signs of photoaging on a 10-point visual analog scale (VAS) at each follow-up visit compared to baseline. A global aesthetic improvement score was also assigned at each follow-up visit. Secondary outcomes included patient-rated pain and heat sensation on a 10-point VAS, and overall satisfaction. Adverse events were noted after each treatment and at each follow-up visit. RESULTS: A total of 18 Chinese patients age 35-59 completed the study. A statistically significant improvement in skin texture and dyspigmentation scores was noted at the 1 month follow-up that was sustained at 3 months. No significant improvements wer--e observed in pore size, rhytides, or skin laxity. The mean pain score was 5.1â€‰Â±â€‰2 and mean heat sensation was 3.6â€‰Â±â€‰2.1. Expected transient erythema and edema occurred in 95.3% (102/107) and 1.9% (2/108) of treatments, respectively, and resolved in hours. No incidences of post-inflammatory hyperpigmentation (PIH) were noted at the 1, 2, and 3 month visits. CONCLUSION: The 755-nm picosecond laser with DLA is a safe and effective non-ablative modality for targeting facial skin texture irregularities and dyspigmentation in Chinese skin. Patients tolerated the treatment well with adverse effects limited to transient erythema and edema. Lasers Surg. Med. 51:8-13, 2019. Â© 2018 Wiley Periodicals, Inc.

Adult;China;Esthetics;Face;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Safety;Prospective Studies;Rejuvenation;Skin Aging

Comparative study of fractional Erbium: YAG laser vs combined therapy with topical steroid as an adjuvant treatment in melasma. BACKGROUND: Melasma is an acquired disorder of symmetrical hyperpigmentation. Several treatment methods are available for patients with melasma, including topical compounds, broad-spectrum photoprotection, camouflage, chemical peels, and laser and light therapies which represent potentially promising options for patients who are refractory to other modalities. OBJECTIVE: To evaluate and compare the clinical, histopathological, and immunohistochemical changes in melasma after fractional Er:YAG laser versus fractional Er:YAG laser and topical steroids. METHODS: Twenty-two patients were treated with fractional Er:YAG laser on both sides of the face with the use of topical steroid only on the left side to make left-to-right-side comparison. Clinical evaluation, histopathological, and immunohistochemical assessment for skin specimens were performed before treatment and 3Â months after the end of sessions. RESULTS: Treatment by fractional Er:YAG laser on the right side showed significant decrease in MASI score with clinical outcome which considered as excellent in three patients (13.6%), very good in six (27.2%), good in eight (36.3%), and fair in five (22.7%) with significant decrease in basal pigmentation and reorganization of dermal collagen and decreased number of MART1-positive cells. After combined therapy, the decrease in MASI score was highly significant with the clinical outcome which considered as excellent in six patients (27.2%), very good in 10 (45.4%), good in three (13.6%), and fair in three (13.6%). The histological changes were highly evident and more significant. CONCLUSION: Clinical, histopathological, and immunohistochemical improvement was evident on both sides, with more significant better outcome with the use of combined therapy on the left side. However, combined therapy was more beneficial for Fitzpatrick skin type III rather than type IV. Glucocorticoids Administration, Topical;Adult;Biopsy;Chemotherapy, Adjuvant;Dose Fractionation, Radiation;Face;Female;Glucocorticoids;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Skin;Treatment Outcome;Young Adult

[Effect of pulsed dye laser on inhibiting early scar after maxillofacial trauma]. PURPOSE: The study was designed to explore an effective method to control early scar after maxillofacial trauma and improve the satisfaction of clinical treatment. METHODS: Fifty skin lesions after maxillofacial trauma were divided into the experimental group and control group. Patients in the experimental group were treated with pulsed dye laser when taking out stitches, 15, 30 and 60 days later. Digital microscope photos were taken and lesion area was measured before and 3 months after laser irradiation. Adverse effects were recorded during and after each treatment as well. All patients were asked to rate their satisfaction at 3-month of follow-up. Statistical analysis was performed using SPSS 13.0 software package. RESULTS: The efficiency of the experimental group was 74% and 37 lesions were cured or significantly improved, while the efficiency rate was 22% in the control group. Area reduction of maxillofacial lesions before and after treatment between the two groups was significantly different (Pï¼œ0.05). Patients in the experimental group were highly satisfied with the final outcomes. No severe adverse events were observed. CONCLUSIONS: Pulsed dye laser is safe and effective in inhibiting early scar following maxillofacial trauma. Cicatrix;Humans;Lasers, Dye;Low-Level Light Therapy;Maxillofacial Injuries;Personal Satisfaction

Photobiomodulation with 808-nm diode laser light promotes wound healing of human endothelial cells through increased reactive oxygen species production stimulating mitochondrial oxidative phosphorylation. Photobiomodulation of cells using near-infrared (NIR) monochromatic light can affect cell functions such as proliferation, viability, and metabolism in a range of cell types. Evidence for the effects of near-infrared light on endothelial cells has been reported, but the studies were mainly performed using VIS light emitted by low-energy lasers, because NIR wavelengths seemed

negatively stimulate these cells. Cell viability, free radical-induced oxidative stress, NF-ÎºB activation, nitric oxide release, mitochondrial respiration, and wound healing repair were assessed in human endothelial cells (HECV) irradiated with 808-nm diode laser light (laser setupâ€‰=â€‰1Â W/cm(2), 60Â s, 60Â J/cm(2), CW vs measured energy parameterâ€‰=â€‰0.95Â W/cm(2), 60Â s, 57Â J/cm(2), mode CW) emitted by an handpiece with flat-top profile. No difference in viability was detected between controls and HECV cells irradiated with 808-nm diode laser light for 60Â s. Irradiated cells demonstrated higher proliferation rate and increased migration ability associated to moderate increase in ROS production without a significant increase in oxidative stress and oxidative stress-activated processes. Near-infrared light stimulated mitochondrial oxygen consumption and ATP synthesis in HECV cells. Short near-infrared irradiation did not affect viability of HECV cells, rather led to a stimulation of wound healing rate, likely sustained by ROS-mediated stimulation of mitochondrial activity. Our results demonstrating that near-infrared led to a shift from anaerobic to aerobic metabolism provide new insight into the possible molecular mechanisms by which photobiomodulation with 808-nm diode laser light protects against inflammation-induced endothelial dysfunction, seemingly promising to enhance their therapeutic properties. Reactive Oxygen Species;Nitric Oxide Aerobiosis;Cell Line;Cell Proliferation;Cell Survival;Endothelial Cells;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mitochondria;Nitric Oxide;Oxidative Phosphorylation;Reactive Oxygen Species;Wound Healing

Effects of Nd:YAG laser irradiation on the growth of Candida albicans and Streptococcus mutans: in vitro study. The purpose of this study was to evaluate the effects of Nd:YAG laser with flat-top handpiece on the in vitro growth of Candida albicans and Streptococcus mutans. The incidence of C. albicans (opportunistic commensal) and S. mutans (facultatively anaerobic) infections is increasing, despite available treatments. Cultures of Streptococcus mutans and Candida albicans were irradiated using Nd:YAG laser (LightWalker, Fotona) with flat-top handpiece (Genova, LightWalker, Fotona) at the following parameters: group G1: 0.25Â W, 10Â Hz, 15Â s, 3Â J and group G2: 1Â W, 10Â Hz, 60s, 59Â J. The results were evaluated directly and 24Â h after irradiation using a quantitative culture method (estimation of colony-forming units in 1Â ml of suspension, cfu/ml), and microscopic analysis with Janus green stain and compared with control group in which laser was not applied. C. albicans was reduced by 20 up to 54% for G1, and for G2 by 10 up to 60% directly after the application. The cfu/ml values for S. mutans decreased by 13% (pâ€‰=â€‰0.1771) for G1 and 89% (pâ€‰<â€‰0.0001) for G2. In both test groups 24Â h after the application, the number of colony-forming units decreased by 15-46% for G1 and by 15-64% for G2. The arrested cell division, increasing the surface area and increasing the number of metabolically inactive cells, were observed in morphometric analysis. Macroscopic and microscopic analyses revealed a reduction in cell number and a significant decrease of cell metabolism after laser application for both C. albicans and S. mutans. Candida albicans;Humans;Lasers, Solid-State;Microbial Viability;Streptococcus mutans

Effect of Low-level Laser Therapy on Postoperative Pain in Molars with Symptomatic Apical Periodontitis: A Randomized Placebo-controlled Clinical Trial. INTRODUCTION: In this clinical trial, we evaluated the effect of low-level laser therapy (LLLT) on postoperative pain in mandibular molar teeth with symptomatic apical periodontitis. METHODS: Forty-two patients were included in the study according to the inclusion and exclusion criteria. Root canal treatment was conducted using reciprocating instruments. The patients were randomly distributed into 3 groups using a Web program as follows: control (no laser was applied), placebo (mock laser therapy), and LLLT. Postoperative pain levels on the 1st, 3rd, 5th, 7th, and 30th day and postoperative percussion pain levels on the visual analog scale were recorded. The chi-square, 1-way analysis of variance, and least significant difference post hoc tests were performed to analyze the data (PÂ =Â .05). RESULTS: LLLT

resulted in lower pain levels than those noted in the control and placebo groups on days 1 and 3 (PÂ <Â .05). There were no significant differences among the placebo, LLLT, and control groups in terms of postoperative percussion pain levels (PÂ <Â .05). CONCLUSIONS: LLLT can be beneficial in reducing postoperative pain in endodontics. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain, Postoperative;Periapical Periodontitis;Root Canal Therapy;Treatment Outcome;Young Adult

Improved singlet oxygen generation and antimicrobial activity of sulphur-doped graphene quantum dots coupled with methylene blue for photodynamic therapy applications. Due to their many unique properties, graphene quantum dots (GQDs) have attracted much attention and are a promising material with potential applications in many fields. One application of GQDs is as a photodynamic therapy agent that generates singlet oxygen. In this work, GQDs were grown by focusing nanosecond laser pulses into benzene and then were later combined with methylene blue (MB) and used to eradicate the Gram-negative bacteria, Escherichia coli, and Gram-positive bacteria, Micrococcus luteus. Theoretical calculation of pressure evolution was calculated using the standard finite difference method. Detailed characterization was performed with transmission electron microscopy (TEM), scanning electron microscopy (SEM), Fourier-transform infrared (FTIR), UV-vis (UV-vis), and photoluminescence (PL) spectra. Furthermore, MB-GQD singlet oxygen generation was investigated by measuring the rate of 9,10-anthracenediyl-bis(methylene) dimalonic acid photobleaching. Combining MB with GQDs caused enhanced singlet oxygen generation. Our results show that the MB-GQD combination efficiently destroys bacteria. The (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) (MTT) assay was used to determine if GQDs in dark conditions caused human cellular side-effects and affected cancer and noncancer cellular viability. We found that even high concentrations of GQDs do not alter viability under dark conditions. These results suggest that the MB-GQD combination is a promising form of photodynamic therapy. Sulfur Compounds;Singlet Oxygen;Graphite;Methylene Blue Cell Survival;Graphite;Lasers, Solid-State;Low-Level Light Therapy;Methylene Blue;Quantum Dots;Singlet Oxygen;Sulfur Compounds

Photo-modulation of zinc phthalocyanine-treated breast cancer cell line ZR-75-1 inhibited the normal tumor activity in vitro. Regarding post-complication of convenient therapies against breast cancer, the emergence of effective approaches is essential. Photodynamic therapy is touted as a novel invasive therapeutic approach by the application of a photosensitizer promoted by laser irradiation. This study aimed to investigate the combined regime of low-level laser irradiation with zinc phthalocyanine in human breast cancer ZR-75-1 cell line. Cells were treated with 0.01 and 5Â Î¼g/ml of ZnPc for 24Â h and exposed to radiation (70Â mW) for 60Â s. Cell viability was evaluated by MTT and flow cytometry. Cell migration capacity was monitored by scratch test, Transwell migration insert, and gelatin zymography. The function of MDR in treated cells was examined by Rhodamine 123 exclusion test. The level of GALNT11 was measured by ELISA. The expression of Bax and Bcl-2 genes was evaluated by real-time PCR. Laser irradiation and zinc phthalocyanine induced cell cytotoxicity in a dose-dependent manner. Flow cytometry analysis showed the induction of apoptotic and necrotic changes in treated cells. We found a reduction in migration rate and MMP-9 activity in cells undergoing the experimental procedure (pâ€‰<â€‰0.05). Immunofluorescence imaging revealed the intracellular accumulation of Rhodamine 123 coincided with a reduction in the level of GALNT11 in treated cells, showing the reduction of MDR activity and tumor cell resistance. Similar to flow cytometry assay, the reduction of Bcl-2 (approximately twofold) and upregulation of Bax genes were found in treated cells. Photodynamic therapy could be as an effective and alternative method for the treatment of breast cancer in a human. ATP Binding Cassette Transporter, Subfamily B;Indoles;Isoindoles;Organometallic Compounds;Photosensitizing Agents;Zinc Compounds;bcl-2-Associated X Protein;Rhodamine 123;GALNT11 protein, human;N-

Acetylgalactosaminyltransferases;Matrix Metalloproteinase 9 ATP Binding Cassette Transporter, Subfamily B;Apoptosis;Breast Neoplasms;Cell Count;Cell Line, Tumor;Cell Movement;Cell Survival;Drug Resistance, Neoplasm;Female;Humans;Indoles;Isoindoles;Light;Matrix Metalloproteinase 9;N-Acetylgalactosaminyltransferases;Necrosis;Organometallic Compounds;Photochemotherapy;Photosensitizing Agents;Rhodamine 123;Zinc Compounds;bcl-2-Associated X Protein
Yttrium Aluminum Garnet (YAG) Treatment for Persistent Fetal Vasculature: Nonsurgical Lens-Sparing Procedure to Cut Fibrovascular Stalk. yttrium-aluminum-garnet;Yttrium;Aluminum Aluminum;Child, Preschool;Humans;Lens, Crystalline;Low-Level Light Therapy;Persistent Hyperplastic Primary Vitreous;Yttrium
Exploring the use of transcranial photobiomodulation in Parkinson's disease patients.
Remote tissue conditioning is neuroprotective against MPTP insult in mice. Current treatments for Parkinson's disease (PD) are primarily symptomatic, leaving a need for treatments that mitigate disease progression. One emerging neuroprotective strategy is remote tissue conditioning, in which mild stress in a peripheral tissue (e.g. a limb) induces protection of life-critical organs such as the brain. We evaluated the potential of two remote tissue conditioning interventions - mild ischemia and photobiomodulation - in protecting the brain against the parkinsonian neurotoxin MPTP. Further, we sought to determine whether combining these two interventions provided any added benefit. Male C57BL/6 mice (nÂ =Â 10/group) were pre-conditioned with either ischemia of the leg (4Â Ã—Â 5Â min cycles of ischemia/reperfusion), or irradiation of the dorsum with 670Â nm light (50Â mW/cm(2), 3Â min), or both interventions, immediately prior to receiving two MPTP injections 24Â hours apart (50Â mg/kg total). Mice were sacrificed 6Â days later and brains processed for tyrosine hydroxylase immunohistochemistry. Stereological counts of functional dopaminergic neurons in the substantia nigra pars compacta revealed that both remote ischemia and remote photobiomodulation rescued around half of the neurons that were compromised by MPTP (pÂ <Â 0.001). Combining the two interventions provided no added benefit, rescuing only 40% of vulnerable neurons (pÂ <Â 0.01). The present results suggest that remote tissue conditioning, whether ischemia of a limb or photobiomodulation of the torso, induces protection of brain centers critical in PD. The lack of additional benefit when combining these two interventions suggests they may share common mechanistic pathways. Further research is needed to identify these pathways and determine the conditioning doses that yield optimal neuroprotection.
Laser therapy for treatment of peri-implant mucositis and peri-implantitis: An American Academy of Periodontology best evidence review. BACKGROUND: Peri-implant diseases are prevalent, with numerous therapies studied in an attempt to combat this condition. The present review aims to systematically evaluate the effectiveness of laser therapy with non-surgical or surgical therapy in managing peri-implant mucositis and peri-implantitis. METHODS: An electronic search of three databases and a hand search of peer-reviewed journals for relevant articles published (in English) from January 1980 to June 2016 were performed. Human clinical trials ofÂ â‰¥Â 10 patients with peri-implant diseases, treated with surgical or non-surgical approaches and laser therapy, and a follow-up period ofÂ â‰¥Â 6 months, were included. Random-effects meta-analyses were performed to analyze weighted mean difference (WMD) and confidence interval for the recorded variables according to PRISMA guidelines. Risk of bias assessment was also performed for randomized controlled trials included. RESULTS: From 22 articles selected, 11 were included in the meta-analyses. The outcomes of using lasers as a monotherapy could not be evaluated since no controlled studies were identified. Therefore, all reported results were the outcomes of applying lasers as an adjunct to surgical/non-surgical treatment. For the non-surgical approach, WMD of probing depth (PD), clinical attachment level (CAL), bleeding on probing (BOP), plaque index (PI), marginal bone level (MBL) and

recession (REC) was 0.15Â mm (PÂ =Â 0.50), -0.10Â mm (PÂ =Â 0.32), 21.08% (PÂ =Â 0.02), -0.07 (PÂ =Â 0.002), -0.22Â mm (PÂ =Â 0.04) and -0.11Â mm (PÂ =Â 0.34), respectively. For the surgical approach with a long-term follow up, WMD of PD, CAL, BOP, and PI was 0.45Â mm (PÂ =Â 0.11), 0.22Â mm (PÂ =Â 0.56), 7.26% (PÂ =Â 0.76) and -0.09 (PÂ =Â 0.84), respectively. CONCLUSIONS: Current evidence shows laser therapy in combination with surgical/non-surgical therapy provided minimal benefit in PD reduction, CAL gain, amount of REC improvement, and PI reduction in the treatment of peri-implant diseases. Lasers when used as an adjunct to non-surgical therapy might result in more BOP reduction in the short term. However, current evidence allowed for analysis of only Er:YAG, CO(2) , and diode lasers. Studies on others failed to have controlled evidence supporting their evaluation. Dental Implants Dental Implants;Humans;Laser Therapy;Low-Level Light Therapy;Mucositis;Peri-Implantitis;Randomized Controlled Trials as Topic;Stomatitis;United States

Efficacy of low-level laser therapy as an adjunct to button anchored coronally advanced flap for gingival recession: A Doppler study. Coverage of the exposed root is one of the periodontal plastic surgical procedures, which is one of the important periodontal treatment modalities. The introduction of innovation in new interdisciplinary treatment modalities has allowed us the use of orthodontic button in root coverage procedures using a coronally advanced flap (CAF) to provide the initial stabilization. This case report also evaluates the effectiveness of low-level laser therapy (LLLT) to detect the microvascular blood flow changes in the gingiva and alveolar mucosa where LLLT has been given after button-anchored CAF procedure during postoperative healing to detect blood flow changes of mucosa where LLLT was not given in other surgical sites. Three-month postoperative results showed that the LLLT used as an adjunct to CAF with the orthodontic button for stabilization is an effective surgical approach in the management of Miller's Class I recession defects.

Evaluation of the antibacterial efficacy of various root canal disinfection methods against Enterococcus faecalis biofilm. An ex-vivo study. BACKGROUND: Complete elimination of bacteria and their by-products from the root canal system is very difficult with current techniques. The purpose of this study was to compare the antibacterial efficacy of different disinfection protocols against Enterococcus faecalis (E. faecalis) biofilms. METHODS: Seventy-six extracted single-rooted human teeth were selected. Root canal preparation was done by proTaper rotary instruments. The smear layer was removed by 17% EDTA, followed by 5.25% sodium hypochlorite. After sterilization using gamma irradiation, sterilized specimens were inoculated with an E. faecalis suspension, incubated for 4 days and 4 weeks and then randomly divided into two experimental groups (4 days, 4 weeks old biofilms). After the confirmation of biofilm formation with SEM, the specimens in the experimental groups were randomly divided into five experimental subgroups according to the method of disinfection applied, which included: Diode laser irradiation (810â€¯nm, 2â€¯W), Light activated disinfection (LAD) with Indocyanine Green, 0.2% Chlorhexidine gluconate (0.2% CHX), 0.2% CHXâ€¯+â€¯LAD and 0.2% CHXâ€¯+â€¯Diode groups. RESULTS: Complete biofilm bacterial elimination was not observed in either of the experimental groups. CHXâ€¯+â€¯LAD (0.2%) method exhibited the highest reduction value in biofilm and only Diode alone revealed the lowest in all the root canal portions. Disinfection protocols also showed significantly lower antibacterial efficacy against 4-week old than the 4-day old matured biofilms (Pâ€¯<â€¯0.05). CONCLUSION: All the evaluated methods in this study were effective in the relative elimination of the E. faecalis biofilms except diode laser alone. Nevertheless, 0.2% CHXâ€¯+â€¯LAD exhibited significantly higher efficacy in reducing both 4-day and 4-week old biofilms. Anti-Infective Agents, Local;Edetic Acid;Sodium Hypochlorite;Indocyanine Green;chlorhexidine gluconate;Chlorhexidine Anti-Infective Agents, Local;Biofilms;Chlorhexidine;Dental Pulp Cavity;Edetic Acid;Enterococcus faecalis;Humans;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Sodium Hypochlorite

Effects of Er:YAG and Diode Laser Irradiation on Dental Pulp Cells and Tissues. Vital pulp therapy (VPT) is to preserve the nerve and maintain healthy dental pulp tissue. Laser irradiation (LI) is beneficial for VPT. Understanding how LI affects dental pulp cells and tissues is necessary to elucidate the mechanism of reparative dentin and dentin regeneration. Here, we show how Er:YAG-LI and diode-LI modulated cell proliferation, apoptosis, gene expression, protease activation, and mineralization induction in dental pulp cells and tissues using cell culture, immunohistochemical, genetic, and protein analysis techniques. Both LIs promoted proliferation in porcine dental pulp-derived cell lines (PPU-7), although the cell growth rate between the LIs was different. In addition to proliferation, both LIs also caused apoptosis; however, the apoptotic index for Er:YAG-LI was higher than that for diode-LI. The mRNA level of odontoblastic gene markers-two dentin sialophosphoprotein splicing variants and matrix metalloprotease (MMP)20 were enhanced by diode-LI, whereas MMP2 was increased by Er:YAG-LI. Both LIs enhanced alkaline phosphatase activity, suggesting that they may help induce PPU-7 differentiation into odontoblast-like cells. In terms of mineralization induction, the LIs were not significantly different, although their cell reactivity was likely different. Both LIs activated four MMPs in porcine dental pulp tissues. We helped elucidate how reparative dentin is formed during laser treatments. Extracellular Matrix Proteins;Phosphoproteins;Sialoglycoproteins;dentin sialophosphoprotein;Matrix Metalloproteinase 20 Animals;Apoptosis;Cell Differentiation;Cell Line;Cell Proliferation;Dental Pulp;Extracellular Matrix Proteins;Gene Expression Regulation;Lasers, Semiconductor;Low-Level Light Therapy;Matrix Metalloproteinase 20;Odontoblasts;Phosphoproteins;Sialoglycoproteins;Swine

The effect of low-level laser 810 nm and light-emitting diode photobiomodulation (626 nm) on the stability of the implant and inflammatory markers interleukin-1 beta and prostaglandin E2, around implants. BACKGROUND: One of the most common problems in edentulous patients is the low stability of lower dentures. The most effective method to overcome this problem is implant-supported overdentures. After placing an implant, for the process of osseointegration to be complete and successful, it is better that patients do not use their denture for few months. This may be nonconvenient for patient because they are unable to speak and eat properly. The aim of this study was to evaluate the effect of low level laser (LLL) and light-emitting diode (LED) photobiomodulation on implant stability as well as their effect on interleukin-1 beta (IL-1Î²) and prostaglandin E2 (PGE2) biomarkers around implant in lower anterior region (over denture). MATERIALS AND METHODS: In this clinical trial, 36 implants were placed in fully edentulous mandibles (12 people per person - three implants in areas of midline and canine). Each of the implants was randomly placed in one of three groups of laser, LED, and control. LLL (power of 50 mw and the amount of 20 J/cm(2) for each implant) and LED with dose (20 mw/cm(2)) were irradiated on the day of surgery (zero), 3, 7, 10, and 14 days. The stability of implants was measured on the day of surgery and weeks 3, 4, and 8 after surgery with Periotest. The inflammatory biomarkers of IL-1Î² and PGE2 were also collected from gingival crevicular fluid around implants in 4 and 8 weeks. The collected data were analyzed by ANOVA statistical tests.pvalue<0.05 considered significant. RESULTS: The amounts of Periotest significantly increased 3(rd) week after surgery in the control group ($P < 0.001$). However, the laser group and LED group were associated with minimal changes, which indicates lower stability of implant in 3(rd) week in control group but no changes in stability of test groups (laser and LED). Laser and LED had no effect on the level of IL-1Î² and PGE2 in 4 and 8 weeks. CONCLUSION: The use of LLL or LED has a positive effect on the stability of the implants 3 weeks after surgery.

Effect of laser therapy on expression of angio- and fibrogenic factors, and cytokine concentrations during the healing process of human pressure ulcers. Objective: To evaluate the effect of laser irradiation at different wavelengths on the expression of selected growth factors and inflammatory mediators at particular stages of the wound healing process. Methods: Sixty-seven patients were

recruited, treated, and analyzed (group A - 940 nm: 17 patients; group B - 808 nm: 18 patients; group C - 658 nm: 16 patients; group D - sham therapy: 17 patients). Patients received a basic treatment, including repositioning and mobilization, air pressure mattress and bed support surfaces, wound cleansing and drug therapy. Additionally, patients received laser therapy once a day, 5 times a week for 1 month in use of a semiconductor lasers (GaAlAs) which emitted a continuous radiation emission at separate wavelengths of 940 nm (group A), 808 nm (group B) and 658 nm (group C). In group D (sham therapy), laser therapy was applied in the same manner, but the device was off during each session (only the applicator was switched on to scan pressure ulcers using none coherent red visible light). Results: The positive changes in the measured serum (IL-2, IL-6 and TNF-Î±) and wound tissue (TNF-Î±, VEGF and TGFÎ²1) parameters appeared to be connected only with the wavelength of 658 nm. The significant change in pro-inflammatory mediator levels [interleukin 2 (IL-2) with p=0.008 and interleukin 6 (IL-6) with p=0.016] was noticed after two weeks of laser therapy. In the other groups, the inflammation was also reduced, but the process was not as marked as in group C. Similarly, in the case of tumor necrosis factor (TNF-Î±) concentration, where after two weeks of treatment with irradiation at a wavelength of 658 nm, a rapid suppression was observed (p=0.001), whereas in the other groups, these results were much slower and not as obvious. Interestingly, again in the case of group C, the change in TNF-Î± concentration in wound tissue was most intensive (â‰ˆ75% reduction), whereas the changes in other groups were not as obvious (â‰ˆ50% reduction). After irradiation (658 nm), the VEGF expression increased significantly within the first two weeks, and then it decreased and maintained a stable level. In contrast, the TGFÎ²1 activity remained level, but always higher in comparison to other groups Conclusions: The effective healing of pressure ulcers is connected with laser irradiation at a wavelength of 658 nm. We believe that this effect is related to the inhibition of inflammatory processes in the wound and stimulation of angiogenesis and fibroblast proliferation at this specific radiation (based both on concentration of interleukins and TNF-Î± serum level and VEGF, TGFÎ²1, TNF-Î± activities in wound biopsies). Laser therapy at wavelengths of 940 and 808 nm does not significantly affect the above-mentioned repair processes, which explains its low effectiveness in the treatment of pressure ulcers. Cytokines Aged;Aged, 80 and over;Cytokines;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Pressure Ulcer;Wound Healing

A preliminary comparison between the effects of red and infrared laser irradiation on viability and proliferation of SHED. The aim of this preliminary study was to compare the effects of different energy densities from red and infrared low-level laser (LLL) on viability and proliferation of stem cells from human exfoliated deciduous teeth (SHED). SHED were irradiated with red laser (R) or infrared laser (IR) set with the following dosimetry: 1.2Â J/cm(2) (0.05Â J), 2.5Â J/cm(2) (0.1Â J), 5.0Â J/cm(2) (0.2Â J), and 7.5Â J/cm(2) (0.3Â J). Positive (C+) and negative (C-) control groups comprised non-irradiated cells. Data were analyzed by two-way ANOVA followed by Tukey's test (PÂ <â€‰0.05). At 24- and 48-h period, group R5.0 showed significantly higher cell viability rates than R1.2 and R2.5. At 48Â h, R2.5 also revealed lower proliferation than R5.0. Comparing to the C+ group, R2.5 exhibited lower viability at 72Â h, and proliferation at 24 and 48Â h. Groups R1.2, IR1.2, and IR5.0 were less viable at 24Â h, while R1.2, IR2.5, and IR5.0 revealed lower proliferative capacity at 48Â h. Overall, our results showed that LLL can favor viability and proliferation of SHED, especially when cells receive red laser irradiation at 5.0Â J/cm(2). Therefore, according to this preliminary investigation, 5Â J/cm(2) applied by red LLL induced high rates of cell viability and proliferation, while the same irradiation dose using infrared laser led to negative effects. LLL irradiation with 1.2 and 2.5Â J/cm(2) was deleterious to metabolic activity and proliferation of SHED regardless of the type of laser. Further studies are necessary to gain in-depth knowledge about the effects of different wavelengths of LLL on

SHED viability and proliferation. Cell Proliferation;Cell Survival;Humans;Infrared Rays;Lasers;Stem Cells;Tooth Exfoliation;Tooth, Deciduous

Therapeutic efficacy of early photobiomodulation therapy on the zones of stasis in burns: An experimental rat model study. This study aimed to investigate the role of photobiomodulation therapy in preventing zones of stasis in burn wounds. We hypothesized that photobiomodulation therapy could promote tissue formation and release of nitric oxide (NO), and reduce inflammatory responses, thereby dilating local microvessels, reducing necrosis and apoptosis. Thirty rats were randomly divided into control group (CG) and laser group (LG). The zone of stasis was formed by applying a brass comb to the skin resulting in four rectangular burns separated by three unburned interspaces. The left side was laser wound (LW), while the right side was shielded wound (SW). The LW of LG was immediately subjected to photobiomodulation therapy, followed by once-daily 30-minutes photobiomodulation therapy sessions. Skin ultrasound and Doppler angiography analyses were used to evaluate the statuses of the zones of stasis at 1, 24, and 96 hours after injury. Harvested burn wound tissue was subjected to hematoxylin-eosin staining and HMGB1, caspase 3, and thrombomodulin immunohistochemistry, and the contents of NO and TNF-Î± were measured in stasis tissue. Thrombomodulin, HMGB1, and caspase 3 immunohistochemistry revealed significantly lower positive staining rates in the LW of LG rats relative to the others at 96 hours ($p < 0.05$), as well as a significantly higher skin blood flow relative to the others ($p < 0.05$). The NO content was significantly higher in the LW of LG, compared with other wounds, at 24 and 96 hours after injury ($p < 0.05$). The TNF-Î± level was significantly lower in the LW of LG than in other wounds at 96 hours ($p < 0.05$). Early, local photobiomodulation therapy can effectively ameliorate injury progression in the zone of stasis. However, these beneficial effects are limited to the directly irradiated sites. Nitric Oxide Animals;Apoptosis;Burns;Cell Proliferation;Disease Models, Animal;Disease Progression;Low-Level Light Therapy;Necrosis;Nitric Oxide;Random Allocation;Rats;Skin;Wound Healing

Lack of dermal penetration of topically applied gentamicin as pharmacokinetic evidence indicating insufficient efficacy. BACKGROUND: Treatment of skin and superficial soft tissue infections with topically applied antibiotics is a controversial topic, because only few clinical studies exist and target site concentrations after topical treatment are widely unknown. OBJECTIVES: This study aimed to investigate the target site concentration of topically applied gentamicin as a potential cause of therapeutic failure and to explore if microporation by laser might be used to improve penetration of gentamicin through the skin barrier. METHODS: Six healthy volunteers were included in this cross-over Phase 1 study. On two study days, separated by a washout period, microdialysate and plasma sampling was performed for 6â€‰h after administration of 500â€‰mg of gentamicin cream on a predefined area. On one of the study days the skin was microporated before drug application using the P.L.E.A.S.E. Professional laser system. RESULTS: In intact skin, Cmax and AUC values were 3.3â•Ÿâ±â•Ÿ5.64â€‰ng/mL and 5.4â•Ÿâ±â•Ÿ10.4â€‰ngÂ·h/mL, respectively; thereby far under the threshold needed to treat common pathogens. With a Cmax of 474.2â•Ÿâ±â•Ÿ555.3â€‰ng/mL laser application showed a significant increase in tissue penetration and decrease in pharmacokinetic variability; however, even after microporation no therapeutically active concentrations were achieved as indicated by Cmax/epidemiological cut-off ratios of 0.237 and 0.059 for Staphylococcus aureus and Pseudomonas aeruginosa, respectively. Solely after administration on microporated skin, plasma concentrations of gentamicin were quantifiable (lower limit of quantification 10â€‰pg/mL). CONCLUSIONS: This study confirmed that after topical administration gentamicin penetration through the dermal barrier is insufficient, providing pharmacokinetic evidence that topical gentamicin in its current form might be inappropriate to treat skin infections. Anti-Bacterial Agents;Gentamicins Administration, Topical;Adult;Anti-Bacterial Agents;Cross-Over

Studies;Gentamicins;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Micropore Filters;Plasma;Skin;Young Adult

Photothermally Triggered Endosomal Escape and Its Influence on Transfection Efficiency of Gold-Functionalized JetPEI/pDNA Nanoparticles. Plasmonic nanoparticles for drug delivery have attracted increasing interest over the last few years. Their localized surface plasmon resonance causes photothermal effects on laser irradiation, which allows for delivering drugs in a spatio-temporally controlled manner. Here, we explore the use of gold nanoparticles (AuNP) as carriers for pDNA in combination with pulsed laser irradiation to induce endosomal escape, which is currently considered to be one of the major bottlenecks in macromolecular drug delivery on the intracellular level. In particular, we evaluate nanocomplexes composed of JetPEI (polyethylenimine)pDNA and 10 nm AuNP, which do not exhibit endosomal escape by themselves. After incubating HeLa cells with these complexes, we evaluated endosomal escape and transfection efficiency using low- and high-energy laser pulses. At low laser energy heat is produced by the nanocomplexes, while, at higher laser energy, explosive vapour nanobubbles (VNB) are formed. We investigated the ability of heat transfer and VNB formation to induce endosomal escape and we examine the integrity of pDNA cargo after inducing both photothermal effects. We conclude that JetPEI/pDNA/AuNP complexes are unable to induce meaningful transfection efficiencies because laser treatment causes either dysfunctionality of the cargo when VNB are formed or forms too small pores in the endosomal membrane to allow pDNA to escape in case of heating. We conclude that laser-induced VNB is the most suitable to induce effective pDNA endosomal escape, but a different nanocomplex structure will be required to keep the pDNA intact. Gold;Polyethyleneimine;DNA DNA;Endosomes;Gold;HeLa Cells;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Metal Nanoparticles;Neoplasms;Polyethyleneimine;Transfection

Short term histopathological effects of GaAlAs laser on experimentally induced TMJ osteoarthritis in rabbits. The aim of this study was to evaluate the biostimulation (BS) effect of the gallium-aluminum-arsenide (GaAlAs) diode laser by histopathology with an experimental osteoarthritis (OA) model in the temporomandibular joints (TMJ) of rabbits, in the early period. GaAlAs diode laser is used for pain reduction in TMJ disorders. Twenty-four adult male New Zealand white rabbits were randomly divided into three equal groups: Control Group (CG), Study Group 1 (SG-1), and Study Group 2 (SG-2). Mono-iodoacetate (MIA) was administered to the right TMJs of all rabbits. The rabbits did not undergo any treatment for four weeks to allow the development of osteoarthritis. In SG-1, laser BS was applied to the rabbits at 940 nm, 5 W, and 15 J/cm2 in continuous wave mode at 48-hour intervals for 14 sessions; and in SG-2, laser BS was applied with the same parameters at 24-hour intervals for 28 sessions. Laser BS was not applied to the rabbits in CG. All rabbits were sacrificed simultaneously. The TMJ cartilage, osteochondral junction, chondrocyte appearance, and subchondral ossification were evaluated histopathologically. There was no statistically significant difference between the groups in terms of cartilage, osteochondral junction, chondrocyte appearance, and subchondral ossification values ($p > 0.05$). The laser BS protocol used in the study had no positive histopathological effects on TMJ OA in the early period.
Animals;Chondrocytes;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoarthritis;Rabbits;Reproducibility of Results;Temporomandibular Joint;Temporomandibular Joint Disorders;Treatment Outcome

Photobiomodulation promotes adenoviral gene transduction in auditory cells. Gene therapy is the delivery of a therapeutic gene into target cells to treat disorders by replacing disease-causing mutated genes with healthy ones. Gene therapy of the inner ear has been recently described, with applications for sensorineural hearing loss. However, gene delivery to the location of the inner ear, and thus efficacy of therapy, is challenging. Photobiomodulation (PBM) with a low-level laser has

been suggested to have a therapeutic effect and has the potential to augment gene therapy. To investigate whether PBM improves the rate of adenovirus (Ad)-mediated viral delivery, we compared low-level laser therapy (LLLT) and non-LLLT HEI-OC1 cells treated with an Ad viral vector carrying green fluorescent protein (GFP). Cultured HEI-OC1 cells were divided into six groups: no treatment control, LLLT only, 1Â Î¼L Ad-GFP, 3Â Î¼L Ad-GFP, 1Â Î¼L Ad-GFPâ€‰+â€‰LLLT, and 3Â Î¼L Ad-GFPâ€‰+â€‰LLLT (LLLT: 808Â nm at 15Â mW for 15Â min). Cells were irradiated twice: at 2Â h and again at 24Â h. A nonparametric Mann-Whitney U test was used to statistically analyze differences between the control and treatment groups. The viral inoculations used in this study did not change the amount of viable HEI-OC1 cells (Nâ€‰=â€‰4-8). The 1Â Î¼L Ad-GFPâ€‰+â€‰LLLT and 3Â Î¼L Ad-GFPâ€‰+â€‰LLLT groups showed an increased density of GFP-positive cells compared to 1Â Î¼L and 3Â Î¼L Ad-GFP cells (Nâ€‰=â€‰5-8, 1Â Î¼L: pâ€‰=â€‰0.0159; 3Â Î¼L: pâ€‰=â€‰0.0168,). The quantitative analysis of the epifluorescence of the 1Â Î¼L Ad-GFPâ€‰+â€‰LLLT, and 3Â Î¼L Ad-GFPâ€‰+â€‰LLLT groups revealed increased GFP expression/cell compared to 1Â Î¼L and 3Â Î¼L Ad-GFP cells (Nâ€‰=â€‰6-15, 1Â Î¼L: pâ€‰=â€‰0.0082; 3Â Î¼L: pâ€‰=â€‰0.0012). The RT-qPCR results were consistent (Nâ€‰=â€‰4-5, pâ€‰=â€‰0.0159). These findings suggest that PBM may enhance the gene delivery of Ad-mediated viral transduction, and the combination of the two may be a promising tool for gene therapy for sensorineural hearing loss. Green Fluorescent Proteins Adenoviridae;Animals;Cell Line;Cell Survival;Fluorescence;Green Fluorescent Proteins;Hair Cells, Auditory;Low-Level Light Therapy;Mice;Transduction, Genetic

Laser Depigmentation in Extensive Vitiligo. Female;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged;Vitiligo

Low level laser therapy reduces oral leukoplakia lesion size: Results from a preliminary study. Humans;Leukoplakia, Oral;Low-Level Light Therapy;Tumor Burden

Mitochondrial dynamics (fission and fusion) and collagen production in a rat model of diabetic wound healing treated by photobiomodulation: comparison of 904â€¯nm laser and 850â€¯nm light-emitting diode (LED). OBJECTIVE: Mitochondrial dysfunction has been associated with the development of diabetes mellitus which is characterized by disorders of collagen production and impaired wound healing. This study analyzed the effects of photobiomodulation (PBM) mediated by laser and light-emitting diode (LED) on the production and organization of collagen fibers in an excisional wound in an animal model of diabetes, and the correlation with inflammation and mitochondrial dynamics. METHODS: Twenty Wistar rats were randomized into 4 groups of 5 animals. Groups: (SHAM) a control non-diabetic wounded group with no treatment; (DC) a diabetic wounded group with no treatment; (DLASER) a diabetic wounded group irradiated by 904â€¯nm pulsed laser (40â€¯mW, 9500â€¯Hz, 1â€¯min, 2.4â€¯J); (DLED) a diabetic wounded group irradiated by continuous wave LED 850â€¯nm (48â€¯mW, 22â€¯s, 1.0â€¯J). Diabetes was induced by injection with streptozotocin (70â€¯mg/kg). PBM was carried out daily for 5â€¯days followed by sacrifice and tissue removal. RESULTS: Collagen fibers in diabetic wounded skin were increased by DLASER but not by DLED. Both groups showed increased blood vessels by atomic force microscopy. Vascular endothelial growth factor (VEGF) was higher and cyclooxygenase (COX2) was lower in the DLED group. Mitochondrial fusion was higher and mitochondrial fusion was lower in DLED compared to DLASER. CONCLUSION: Differences observed between DLASER and DLED may be due to the pulsed laser and CW LED, and to the higher dose of laser. Regulation of mitochondrial homeostasis may be an important mechanism for PBM effects in diabetes. Membrane Proteins;Mitochondrial Proteins;Vascular Endothelial Growth Factor A;Collagen;Cyclooxygenase 2;GTP Phosphohydrolases;Mfn2 protein, rat Animals;Collagen;Cyclooxygenase 2;Diabetes Mellitus, Experimental;Disease Models, Animal;GTP Phosphohydrolases;Lasers;Light;Male;Membrane Proteins;Microscopy, Atomic Force;Mitochondrial

Dynamics;Mitochondrial Proteins;Rats;Rats, Wistar;Skin;Vascular Endothelial Growth Factor A;Wound Healing

High-performance, robustly verified Monte Carlo simulation with FullMonte. We introduce the FullMonte tetrahedral 3-D Monte Carlo (MC) software package for simulation, visualization, and analysis of light propagation in heterogeneous turbid media including tissue. It provides the highest computational performance and richest set of input, output, and analysis facilities of any open-source tetrahedral-mesh MC light simulator. It also provides a robust framework for statistical verification. A scripting interface makes set-up of simulation runs simple, including parameter sweeps, while simultaneously providing customization options. Data formats shared with class-leading visualization tools, VTK and Paraview, facilitate interactive generation of publication-quality fluence and irradiance maps. The simulator can read and write file formats supported by other similar simulators, such as TIM-OS, MMC, COMSOL (finite-element simulations), and MCML to support comparison. Where simulator features permit, FullMonte can take a single test case, run it in multiple software packages, and load the results together for comparison. Example meshes, optical properties, set-up scripts, and output files are provided for user convenience. We demonstrate its use in several test cases, including photodynamic therapy of the brain, bioluminescence imaging (BLI) in a mouse phantom, and a comparison against MCML for layered geometries. Application domains that can benefit from use of FullMonte include photodynamic, photothermal, and photobiomodulation therapies, BLI, diffuse optical tomography, MC software development, and biophotonics education. Since MC results may be used for preclinical or even clinical experiments, a robust and rigorous verification process is essential. Being a stochastic numerical method, MC simulation has unique challenges associated with verification of output results since observed differences may be due simply to output variance or actual differences in expected output. We describe and have implemented a rigorous and statistically justified framework for comparing between simulators of the same class and for performing regression testing. Animals;Brain;Computer Simulation;Humans;Mice;Models, Biological;Monte Carlo Method;Phantoms, Imaging;Photochemotherapy;Software;Tomography, Optical

Characterization of Skeletal Muscle Strain Lesion Induced by Stretching in Rats: Effects of Laser Photobiomodulation. BACKGROUND: Unusual and exhaustive physical exercise can lead to muscle lesions depending on the type of contraction, intensity, duration, age, and level of conditioning. Different therapies have been proposed to prevent or reduce exercise-induced muscle damage. OBJECTIVE: In this study, we investigate the effects of low-level laser therapy on skeletal muscle strain in an experimental model in rats. MATERIALS AND METHODS: Male Wistar rats (200â€‰g) were used. The animals were randomized into groups of six animals. We performed tibialis muscle elongation using a previously described protocol. The animals were anesthetized and submitted to passive stretching of the anterior tibial muscle attached to a weight corresponding to 150% of the body mass of the animal for 20â€‰min, rested for 3â€‰min, and received a second traction for 20â€‰min. The cytokines, tumor necrosis factor-Î± (TNF-Î±), interleukin-1Î² (IL-1Î²), IL-6, and IL-10, edema, and C-reactive protein (CRP) levels were determined in the tibialis anterior muscle. RESULTS: Plasma extravasation of groups treated with different doses of laser energy, lesion +1â€‰J (2.61â€‰Â±â€‰0.46), lesion +3â€‰J (2.33â€‰Â±â€‰0.13), lesion +6â€‰J (2.92â€‰Â±â€‰0.91), and lesion +9â€‰J (2.80â€‰Â±â€‰0.55), shows a significant reduction of extravasation when compared with the injury group (5.46â€‰Â±â€‰1.09). Laser therapy was able to significantly reduce CRP and cytokine levels (TNF-Î±, IL-1Î², IL-6, and IL-10). CONCLUSIONS: Laser photobiomodulation reduced skeletal muscle edema as well as cytokines and CRP, leading to a significant reduction in inflammatory markers. Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Muscle Stretching Exercises;Muscle, Skeletal;Rats;Rats, Wistar;Sprains and Strains

A paper-based photothermal array using Parafilm to analyze hyperthermia response of tumour cells under local gradient temperature. Temperature is a critical extrinsic physical parameter that determines cell fate. Hyperthermia therapy has become an efficient treatment for tumor ablation. To understand the response of tumor cells under thermal shocks, we present a paper-based photothermal array that can be conveniently coupled with commercial 96-well cell culture plates. This paper chip device was fabricated in one step using ParafilmÂ® and KimwipersÂ® based on a heat lamination strategy. Liquid was completely adsorbed and confined within the cellulose fibres of hydrophilic regions. Then, Prussian blue nanoparticles (PB NPs) as the photothermal initiator were introduced into the loading wells, and thermal energy was generated via near infrared (NIR) laser irradiation. After assembling the paper device with a 96-well plate, the temperature of each well could be individually controlled by varying the loading amount of PB NPs and laser irradiation time. As a proof-of-concept study, the effects of local thermal shocks on HeLa cells were investigated using MTT cell viability assay and Live/Dead cell staining. The variation of cell viability could be monitored in situ with controllable temperature elevation. The proposed paper photothermal array loaded with thermal initiators represents an enabling tool for investigating the hyperthermia responses of biological cells. Moreover, the facile fabrication technique for paper patterning is advantageous for customizing high-throughput microfluidic paper-based analytical devices (Î¼PADs) with extremely low cost. Ferrocyanides;Paraffin;ferric ferrocyanide Colorimetry;Ferrocyanides;HeLa Cells;Humans;Hyperthermia, Induced;Lasers;Low-Level Light Therapy;MCF-7 Cells;Nanoparticles;Neoplasms;Paper;Paraffin;Temperature

Comparison of the efficacy and safety of a picosecond alexandrite laser and a Q-switched alexandrite laser for the treatment of freckles in Chinese patients. Melanins Asian People;Dendritic Cells;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Melanocytes;Melanosis;Microscopy, Confocal;Pain;Patient Satisfaction

Singular and combined effects of transcranial infrared laser stimulation and exposure therapy: A randomized clinical trial. This RCT will test whether transcranial infrared laser stimulation (TILS) administered immediately following standard exposure therapy enhances the retention of fear extinction for naturally acquired pathological fear. A second aim is to investigate the efficacy of TILS as a stand-alone intervention for reducing pathological fear. Participants with elevated fear in any one of the following four domains: (a) fear of enclosed spaces, (b) fear of contamination, (c) fear of public speaking, or (d) fear of anxiety (i.e., anxiety sensitivity) will be recruited from introductory psychology classes and the greater Austin community. Participants displaying marked fear responding will be stratified on baseline fear responding and fear domain and randomized to one of four treatment arms: (1) Exposure + TILS, (2) Exposure + sham TILS, (3) TILS alone, or (4) Sham TILS alone. We anticipate that TILS will enhance exposure therapy outcome relative to sham TILS and that this enhancement effect will be most pronounced for (a) those displaying higher baseline fear responding, and (b) those showing greater fear reduction during exposure. Study rationale as well as additional predictions and clinical implications are discussed. Humans;Anxiety;Combined Modality Therapy;Fear;Implosive Therapy;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Obsessive-Compulsive Disorder;Panic Disorder;Phobia, Social;Phobic Disorders;Prefrontal Cortex;Randomized Controlled Trials as Topic;Speech

Is Photodynamic Therapy Resistance a Special Case of Photobiomodulation? Photosensitizing Agents Cell Survival;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents

Photobiomodulation, Photomedicine, and Laser Surgery: A New Leap Forward Into the Light for the 21(st) Century. History, 21st Century;Humans;Laser Therapy;Low-Level Light Therapy;Phototherapy

Assessment of Laser Biostimulation in Induction of Ovulation. AIM: This study aimed to evaluate a new modality of low power laser biostimulation in rat ovaries, in comparison with the conventional medical therapy by clomiphene citrate that depends on up-regulation of the hypothalamic-pituitary-ovarian axis to induce ovulation. STUDY DESIGN: A Prospective experimental study carried out from January 2014 to February 2016. SETTING: University-based photobiology laboratory. MATERIALS AND METHODS: Seventy-two (72) Female-Wistar Albino rats were used in this study, divided into three groups: 17 rats used as a control group, 19 rats received clomiphene citrate (Clomid group), 36 rats exposed to diode laser 660 nm wavelength (laser group). RESULTS: Biochemical assessment of serum Estradiol and serum Progesterone was done in the three study groups. Serum Estradiol & Progesterone levels were statistically significantly higher in clomiphene and laser treated groups than non-interventional controls, while no significant difference between clomiphene and laser groups as regard of both hormones. CONCLUSION: This study shows that ovarian laser biostimulation is a new encouraging method for induction of ovulation, at least in animals. This had been proven biochemically by a significant increase in serum Estradiol and serum Progesterone.

Sperm motility is enhanced by Low Level Laser and Light Emitting Diode photobiomodulation with a dose-dependent response and differential effects in fresh and frozen samples. BACKGROUND: The effects of Low Level Light Therapy (LLLT) on cellular function arise predominantly from stimulation of ATP production and reduction of oxidative stress. These effects are dose dependent and a function of beam irradiance and irradiation time. Human sperm motility has been shown to increase with LLLT irradiation. The objective of this study was to investigate the effects of laser and Light Emitting Diode (LED) LLLT photobiomodulation on human spermatozoa motility and DNA integrity. METHODS: An in-vitro controlled trial was performed within an IVF clinic laboratory using three human semen specimens, one fresh and two frozen. Sperm were exposed to light from a GaAlAs single laser (810 nm 200 mW) and an LED cluster (660 nm and 850 nm total power 2 W) for various irradiation times. Sperm motility for the test and control aliquots was assessed using a SQA-IIB analyser, but fertilizing ability was not. Sperm chromatin integrity was tested using the Sperm Chromatin Structure Assay. RESULTS: The Sperm Motility Index and Total Functional Sperm Count increased up to four fold compared to controls with inhibitory effects observed at higher doses (longer irradiation times). The maximum effect varied with irradiance and irradiation time and whether the sample was fresh or frozen. DISCUSSION: Human sperm motility is modified by exposure to LLLT and this motility modification is dependent upon beam irradiance and irradiation time as well as the condition of the sample. A higher stimulatory dose provides a rapid increase in motility that is short in duration, while a lower stimulatory dose provides a slower increase in motility. An inhibitory does causes reduced motility. Future research could consider animal models, such as the mouse, to test fertilization capacity and the safety of resulting fetuses.

High-fluence low-power laser irradiation promotes odontogenesis and inflammation resolution in periodontitis by enhancing stem cell proliferation and differentiation. Periodontitis can exert a severe impact on the life of patients, and the use of stem cell therapy for this disease is promising. The inflammatory response consequent to periodontitis can promote stem cell proliferation. Activated inflammation triggers inhibitory cytokine secretion, thus reducing inflammation subsequent to stem cell activation. Highâ€‘fluence lowâ€‘power laser irradiation (HFâ€‘LPLI) has the ability to regulate stem cell function through its effect on inflammation. Thus, the aim of the present study was to examine whether HFâ€‘LPLI is able to activate stem cells to promote regeneration in periodontitis by promoting inflammation resolution, as well as to evaluate the underlying mechanism of action if an effect is observed. Stem cells were treated with HFâ€‘LPLI following inflammation activation. Reverse transcriptionâ€‘quantitative polymerase chain reaction and EdU assay were used to evaluate cell proliferation and differentiation. Flow cytometry and immunofluorescence were also used to

detect the ability of HFâ€‘LPLI to regulate the surrounding inflammatory environment. AnimalÂ models of periodontal disease were treated with stem cells and HFâ€‘LPLI, and regeneration was detected by hematoxylin and eosin staining and inÂ vivo imaging. It was observed that HFâ€‘LPLI promoted inflammation resolution by reducing the excessive inflammatory response, and finally stimulated stem cell proliferation and differentiation. Furthermore, inÂ vivo results revealed that stem cells treated with HFâ€‘LPLI induced bone regeneration. HFâ€‘LPLI stimulated stem cell proliferation and differentiation by promoting inflammation resolution subsequent to stem cell activation, providing a new strategy for the clinical treatment of periodontitis. Adolescent;Adult;Animals;Apoptosis;Cell Differentiation;Enzyme-Linked Immunosorbent Assay;Female;Flow Cytometry;Humans;Inflammation;Lasers;Male;Odontogenesis;Periodontitis;Rats, Sprague-Dawley;Young Adult

Light emitting diode (LED) therapy reduces local pathological changes induced by Bothrops asper snake venom. The therapeutic effect of the Light Emitting Diode (LED) treatment in two wavelengths (635 or 945â€¯nm) was evaluated in the local pathological alterations induced by Bothrops asper snake venom. Mice received irradiation of infrared LED (120â€¯mW, 945â€¯nm) or red LED (110â€¯mW, 635â€¯nm) applied immediately, 1 and 2â€¯h after venom injection. LED treatment reduced edema formation in the plantar region and gastrocnemius muscle and significantly reduced neutrophil migration and hyperalgesia after the venom injection. Also, both infrared LED and red LED treatment significantly reduced myonecrosis, as revealed by muscle CK and plasma CK levels. Histological analysis corroborated the reduction in the extent of venom-induced myonecrosis. In conclusion, our data demonstrates that PBM with LED light in both red and infrared wavelengths, when applied after envenomation in mice, reduces the extent of myotoxicity, edema, inflammatory infiltrate and hyperalgesia, suggesting that photobiomodulation is a potential therapeutic approach that should be further investigated for the treatment of local effects of Bothrops snakebite. Crotalid Venoms Animals;Bothrops;Crotalid Venoms;Edema;Hyperalgesia;Infrared Rays;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Muscular Diseases;Snake Bites

Effect of low-level laser therapy combined with 5000 parts per million fluoride dentifrice on postbleaching sensitivity: A clinical, randomized, and double-blind study. OBJECTIVE: The aim of this double-blind, randomized, controlled clinical study was to assess the efficacy of low-level laser therapy (LLLT) combined with 5000 ppm fluoride dentifrice on postbleaching sensitivity in teeth exposed to 35% hydrogen peroxide for four weeks. MATERIALS AND METHODS: Twenty-five volunteers were evaluated using the split-mouth model in which the right and left maxillary/mandibular quadrants were randomized and allocated to one of two groups: GPLACEBO, in which the laser tip was positioned without the emission of light (placebo effect)â€‰+â€‰5000 ppm sodium fluoride, or GLASER, which comprised LLLTâ€‰+â€‰5000 ppm sodium fluoride. For both groups, LLLT and placebo were used before bleaching, whereas fluoride was applied after bleaching. LLLT was applied at two points: on the central cervical and medial regions of the incisors, canines, and premolars in the corresponding hemi-arch. At each point, 60 J/cm(2) was applied for 16 seconds with an irradiance of 3.75 W/cm(2) using the therapeutic infrared device. To assess tooth sensitivity, a modified visual analogue scale was used after an evaporative stimulus, and a daily pain questionnaire was also applied. RESULTS: The Wilcoxon and Friedman tests demonstrated a significant difference in the incidence of sensitivity pain between GPLACEBO and GLASER (Pâ€‰â‰¤â€‰.05), with different evaluation times. CONCLUSION: Teeth treated with laser therapy in combination with the topical use of sodium fluoride at each bleaching session demonstrated less sensitivity compared with the application of sodium fluoride only. CLINICAL SIGNIFICANCE: The use of a low-level laser therapy in combination with topical use of sodium fluoride improves symptoms of dentin sensitivity at each

bleaching session. Dentifrices;Fluorides Dentifrices;Dentin Sensitivity;Double-Blind Method;Fluorides;Humans;Low-Level Light Therapy;Tooth Bleaching;Treatment Outcome

Multimodal cancer cell therapy using Au@Fe(2)O(3) core-shell nanoparticles in combination with photo-thermo-radiotherapy. In this study, gold coated iron oxide nanoparticle (Au@Fe(2)O(3) NP) was synthesized in a core-shell structure. Photothermal and radiosensitization effects of Au@Fe(2)O(3) NPs were investigated on KB human mouth epidermal carcinoma cell line. Cell death and apoptosis were measured to study the effects of nanoparticles in combination with both radiotherapy (RT) and photothermal therapy (PTT). The KB cells were treated with Au@Fe(2)O(3) NPs (20â€‰Î¼g/ml; 4â€‰h) and then received different treatment regimens of PTT and/or RT using laser (808â€‰nm, 6â€‰W/cm(2), 10â€‰min) and/or 6â€‰MV X-ray (single dose of 2â€‰Gy). Following the various treatments, MTT assay was performed to evaluate the cell survival rate. Also, the mode of cell death was determined by flow cytometry using an annexinV-fluorescein isothiocyanate/propidium iodide apoptosis detection kit. No significant cell death was observed due to laser irradiation. The viability of the cells firstly incubated with NPs and then exposed to the laser was significantly decreased. Additionally, our results demonstrated that Au@Fe(2)O(3) NP is a good radiosensitizer at megavoltage energies of X-ray. When nanoparticles loaded KB cells were received both laser and X-ray, the cell viability substantially decreased. Following such a combinatorial treatment, flow cytometry determined that the majority of cell death relates to apoptosis. In conclusion, Au@Fe(2)O(3) NP has a great potential to be applied as a photo-thermo-radiotherapy sensitizer for treatment of head and neck tumors. Ferric Compounds;ferric oxide;Gold Cell Death;Cell Line, Tumor;Combined Modality Therapy;Ferric Compounds;Gold;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Metal Nanoparticles;Phototherapy

Influence of Er: Cr: YSGG laser on adhesive strength and microleakage of dentin bonded to resin composite. In-vitro study. BACKGROUND: The aim of this study was to evaluate the surface treatment of dentin with phototherapy (ER-CR-YSGG laser) in the presence of different bonding systems on their shear bond strength and microleakage. MATERIALS AND METHODS: Eighty intact human third molars were divided into two groups. Forty teeth were treated with conventional flat wheel diamond bur and the remaining forty were treated with Er Cr YSGG laser (phototherapy). The two groups i.e. treated with laser (l) and group treated with abrasive bur (NL) were further divided into two subgroups of twenty samples each. Subgroup 1 was surface treated with etch and rinse (ER) and other 20 remaining samples were treated with self- etch (SE) bonding regime. Specimens from all the groups were assessed for shear bond strength and microleakage scores. Ten samples from all groups were immersed in 2% methylene blue for 24â€‰h and assessed under a digital microscope for microleakage. Data was assessed using analysis of variance and tukey multiple comparisons test. RESULTS: The lowest bond strength was achieved in laser prepared phototherapy group bonded with self-etch (LSE-11.87â€‰Â±â€‰1.21). The maximum bond strength score was observed in non-laser-etch and rinse group (NLER-23.66â€‰Â±â€‰2.56). The highest mean microleakage was observed among laser bonded with self-etch (LSE) specimens (1.0â€‰Â±â€‰0.13). The lowest microleakage scores were seen in group treated with non-phototherapy etch and rinse (NLER-0.4â€‰Â±â€‰0.11) regime. CONCLUSION: Use of etch and rinse dentin bonding regime in combination with ER-CR-YSGG phototherapy dentin treatment has the potential for clinical application in comparison to conventional conditioning technique. Composite Resins;Photosensitizing Agents Composite Resins;Dental Bonding;Dentin;Humans;Lasers, Solid-State;Molar;Photochemotherapy;Photosensitizing Agents

Photobiomodulation of extracellular matrix enzymes in human nucleus pulposus cells as a potential treatment for intervertebral disk degeneration. Intervertebral disc (IVD) degeneration is associated with imbalances between catabolic and anabolic responses, regulated by extracellular

matrix (ECM)-modifying enzymes such as matrix metalloproteinases (MMPs) and their endogenous tissue inhibitors of metalloproteinases (TIMPs). Potential contributing factors, such as interleukin (IL)-1Î² and tumor necrosis factor (TNF)-Î±, derived from infiltrated, activated macrophages within IVD tissues, can trigger abnormal production of ECM-modifying enzymes and progression of IVD degeneration. Novel therapies for regulating ECM-modifying enzymes can prevent or ameliorate IVD degeneration. Photobiomodulation (PBM), known to regulate wound repair, exhibits regenerative potential by modulating biological molecules. This study examined the effects of PBM, administered at various wavelengths (630, 525, and 465â€‰nm) and energy densities (16, 32, and 64â€‰J/cm(2)), on the production of ECM-modifying enzymes in replicated degenerative IVD. Our results showed that PBM selectively inhibited the production of ECM-modifying enzymes in a dose- and wavelength-dependent manner, suggesting that it could be a novel tool for treating symptomatic IVD degeneration. IL1B protein, human;Interleukin-1beta;Tissue Inhibitor of Metalloproteinases;Tumor Necrosis Factor-alpha;Matrix Metalloproteinases Disease Progression;Extracellular Matrix;Gene Expression Regulation;Humans;Interleukin-1beta;Intervertebral Disc;Intervertebral Disc Degeneration;Low-Level Light Therapy;Macrophages;Matrix Metalloproteinases;Nucleus Pulposus;Primary Cell Culture;Tissue Inhibitor of Metalloproteinases;Tumor Necrosis Factor-alpha

Local and systemic effects of low-level light therapy with light-emitting diodes to improve erythema after fractional ablative skin resurfacing: a controlled study. Therapy with light-emitting diodes (LED) has been associated with the reduction of erythema and accelerated wound healing. LED phototherapy has been used in various clinical practices including post-laser wound healing enhancement. Fractional laser resurfacing is one of the popular dermatological procedures; however, the duration and degree of downtime may limit daily life activity and studies on the effect of LED low-level light therapy (LED-LLLT) on post-ablative laser wound care are still limited. To evaluate local and systemic effects of LED-LLLT on post-ablative laser erythema and wound healing acceleration after fractional ablative laser resurfacing. The study was divided into two arms. First, a prospective split-face randomized controlled and single-blinded study involved 17 patients (split-face group) to determine the local and systemic effect of LED-LLLT. Patients with acne scars or rhytides were treated with a single session of fractional CO(2) laser followed by 830/590Â nm LED-LLLT on one side of their faces. The duration of post-laser erythema, the erythema index, and transepidermal water loss were collected at baseline, and compared with 7-daily follow-up visits posttreatment for the non LED- and LED-treated sides. The second controlled arm of the study was performed on an additional 19 subjects (CO(2) group). The patients received a single fractional CO(2) laser treatment without any LED-LLLT with the same follow-up protocol. All measurements were compared with the results from the patients from the split-face group. In the split-face group, the duration of erythema post laser was equal (7.4â€‰Â±â€‰2.8Â days). No significant reduction in the erythema index and transepidermal water loss was seen in the LED-treated vs the non-treated side (p valuesâ€‰=â€‰0.99 and 0.78 respectively). For the second part of the study that compared the results between the split-face group and the control CO(2) only group, the duration of the post-laser erythema was comparable (p valueâ€‰=â€‰0.32). However, the percentage difference of the erythema index from baseline in the split-face group was significantly lower than the CO(2) group on days 1, 4, 5, and 7 post-laser treatment (p valueâ€‰=â€‰0.03 on days 1, 4, 5, and 0.04 on day 7) and the LED-treated side provided the lowest percentage difference of the erythema index followed by the non LED-treated side compared with the control CO(2) only group. 830/590Â nm LED-LLLT may provide both local and systemic effects on the degree of post-ablative laser erythema in human skin, however, appropriate protocol settings should be considered to achieve a significant clinical

outcome. Adult;Cicatrix;Erythema;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Prospective Studies;Skin;Water Loss, Insensible

Photobiomodulation of the microbiome: implications for metabolic and inflammatory diseases. The human microbiome is intimately associated with human health, with a role in obesity, metabolic diseases such as type 2 diabetes, and divergent diseases such as cardiovascular and neurodegenerative diseases. The microbiome can be changed by diet, probiotics, and faecal transplants, which has flow-on effects to health outcomes. Photobiomodulation has a therapeutic effect on inflammation and neurological disorders (amongst others) and has been reported to influence metabolic disorders and obesity. The aim of this study was to examine the possibility that PBM could influence the microbiome of mice. Mice had their abdomen irradiated with red (660Â nm) or infrared (808Â nm) low-level laser, either as single or multiple doses, over a 2-week period. Genomic DNA extracted from faecal pellets was pyrosequenced for the 16S rRNA gene. There was a significant (pâ€‰<â€‰0.05) difference in microbial diversity between PBM- and sham-treated mice. One genus of bacterium (Allobaculum) significantly increased (pâ€‰<â€‰0.001) after infrared (but not red light) PBM by day 14. Despite being a preliminary trial with small experimental numbers, we have demonstrated for the first time that PBM can alter microbiome diversity in healthy mice and increase numbers of Allobaculum, a bacterium associated with a healthy microbiome. This change is most probably a result of PBMt affecting the host, which in turn influenced the microbiome. If this is confirmed in humans, the possibility exists for PBMt to be used as an adjunct therapy in treatment of obesity and other lifestyle-related disorders, as well as cardiovascular and neurodegenerative diseases. The clinical implications of altering the microbiome using PBM warrants further investigation. RNA, Ribosomal, 16S Animals;Feces;Humans;Inflammation;Low-Level Light Therapy;Male;Metabolic Diseases;Mice, Inbred BALB C;Microbiota;Phylogeny;Principal Component Analysis;RNA, Ribosomal, 16S

The Effect of Different Implant Surfaces and Photodynamic Therapy on Periodontopathic Bacteria Using TaqMan PCR Assay following Peri-Implantitis Treatment in Dog Model. INTRODUCTION: Peri-implantitis is one of the late complications that leads to implant failure and is associated with specific microorganisms identified as periodontopathic bacteria. The objective of this study was to evaluate the relationship between the different implant surfaces and number of Porphyromonas gingivalis, Tannerella forsythia, and Treponema denticola using TaqMan PCR assay after peri-implantitis treatment using photodynamic therapy. METHOD: Forty-eight dental implants with four different surface treatments (M: machined; SA: sandblasted acid-etched; S: 1 Âµm sputter HA-coated; and P: plasma spraying HA-coated) were inserted in six beagle dogs. After nine months of peri-implantitis induction, a split mouth design was used; on control side decontamination was performed using open flap mechanical debridement OFD with plastic curette, while photodynamic therapy PDT using diode laser (Ga Al As 830-nm) was used in the test side. For the following 2 weeks low-level laser therapy LLLT (10mW) was applied for the test side on alternative days for 6 sec on each implant side. Peri-implant microbial samples were collected using paper points and analyzed using TaqMan PCR before peri-implantitis treatment, immediately after treatment and 5 months posttreatment. RESULTS: Both treatment modalities showed significant decrease in all bacterial count from baseline to immediately after treatment (P< 0.0001). The count increased between immediately after treatment to 5 months after treatment (P< 0.0001); however, the count after 5 months was significantly lower than at baseline. PDT had a stronger effect on reducing P. gingivalis count than T. denticola and T. forsythia compared to OFD. For T. forsythia, implant surface treatment had the greatest effect which was also statistically significant (P= 0.02) with considerably lower effect of PDT or their interaction. CONCLUSION: The results suggest that PDT and OFD have significant benefits in peri-implantitis treatment by reducing bacterial count. The presence of bacterial complex with

different response to therapeutic modality suggests the use of combined decontamination methods for peri-implantitis treatment. Dental Implants Animals;Dental Implants;Disease Models, Animal;Dogs;Finland;Japan;Peri-Implantitis;Photochemotherapy;Polymerase Chain Reaction

Effect of Low-level Laser Therapy on Orthodontic Movement of Human Canine: a Systematic Review and Meta-analysis of Randomized Clinical Trials. BACKGROUND: Low-level Laser Therapy (LLLT) is a noninvasive method of accelerating tooth movement. Herein, this meta-analysis was aimed to assess the efficacy of LLLT in accelerating orthodontic tooth movement of human maxilla or mandible canine. METHODS: Five databases including Web of Science, Scopus, PubMed, ScienceDirect, and Cochrane Library were used for searching the studies. Studies on LLLT for orthodontic tooth movement of human canine, randomized clinical trial (RCT), and outcome variables such as distance or speed of the tooth movement in treatment duration were considered for the final analysis. RevMan 5.3 was used for calculating the mean difference (MD) and 95% confidence intervals (CIs) on random-effects model. RESULTS: Out of 275 studies retrieved from five databases, six RCTs were included and analyzed in this meta-analysis. The results showed that the orthodontic movement of canine was statistically increased in the LLLT group compared with the control group in 21 days (MD: 0.74; 95%CI: 0.17, 1.31; P = 0.01), one month (MD: 0.40; 95%CI: 0.10, 0.69; P = 0.008), 1.5 months (MD: 0.72; 95%CI: 0.51, 0.93; P < 00001), two months (MD: 0.84; 95%CI: 0.23, 1.44; P = 0.006) three months (MD: 0.92; 95%CI: 0.06, 1.78; P = 0.04), and 4.5 months (MD: 1.53; 95%CI: 0.92, 2.14; P < 0.00001). CONCLUSION: The LLLT can speed up the rate of tooth movement of human canine and consequently decrease the treatment time. LLLT represents a proper adjuvant therapy for fixed orthodontic treatment.

Bone Formed After Maxillary Sinus Floor Augmentation by Bone Autografting With Hydroxyapatite and Low-Level Laser Therapy: A Randomized Controlled Trial With Histomorphometrical and Immunohistochemical Analyses. PURPOSE: The aim of this study was to evaluate the bone formed after maxillary sinus floor augmentation (MSFA) by bone autografting combined with hydroxyapatite (HA) that had been either treated with low-level laser therapy (LLLT) or not. MATERIALS AND METHODS: Twelve biopsies were obtained from patients 6 months after MSFA using a combination of 50% of autogenous bone (AB) and 50% of HA (AB/HA group, n = 6) followed by LLLT (AB/HA-LLLT group, n = 6). The laser used in this study was gallium-aluminium-arsenide laser with a wavelength of 830 nm (40 mW; 5.32 J/point; 0.57 W/cm). Samples obtained were subjected to histological, histometric, and immunohistochemical analysis for detection of tartrate-resistant acid phosphatase and runt-related transcription factor 2. The data were submitted to statistical analysis (Shapiro-Wilk and Student t tests; Î± = 5%). RESULTS: Statistical analysis revealed no significant difference in vital bone presence and immunohistochemical analysis between the groups. There was no reduction in bone marrow or fibrous tissue in the AB/HA group and AB/HA-LLLT group. There was a decrease in the amount of remaining biomaterial between the groups (P = 0.0081). CONCLUSION: LLLT did not increase the formation of new bone; instead, it accelerated the bone remodeling process. Durapatite Adult;Alveolar Process;Bone Transplantation;Durapatite;Humans;Low-Level Light Therapy;Middle Aged;Osteogenesis;Sinus Floor Augmentation;Young Adult

Effects of low-level laser therapy on bone healing and signs of pain in dogs following tibial plateau leveling osteotomy. OBJECTIVE To assess the effect of low-level laser therapy (LLLT) on markers of synovial inflammation and signs of pain, function, bone healing, and osteoarthritis following tibial plateau leveling osteotomy (TPLO) in dogs with spontaneous cranial cruciate ligament rupture (CCLR). ANIMALS 12 client-owned dogs with unilateral CCLR. PROCEDURES All dogs were instrumented with an accelerometer for 2 weeks before and 8 weeks after TPLO. Dogs were randomly assigned to receive LLLT (radiant exposure, 1.5 to 2.25 J/cm(2); n = 6) or a control (red light; 6) treatment immediately before and at predetermined times for 8 weeks after TPLO. Owners completed a Canine

Brief Pain Inventory weekly for 8 weeks after surgery. Each dog underwent a recheck appointment, which included physical and orthopedic examinations, force plate analysis, radiography and synoviocentesis of the affected joint, and evaluation of lameness and signs of pain, at 2, 4, and 8 weeks after surgery. Select markers of inflammation were quantified in synovial fluid samples. Variables were compared between the 2 groups. RESULTS For the control group, mean ground reaction forces were greater at 2 and 4 weeks after TPLO and owner-assigned pain scores were lower during weeks 1 through 5 after TPLO, compared with corresponding values for the LLLT group. CONCLUSIONS AND CLINICAL RELEVANCE Results suggested that the LLLT protocol used had no beneficial effects on signs of pain or pelvic limb function following TPLO. Further research is necessary to evaluate the effects of LLLT and to determine the optimum LLLT protocol for dogs with CCLR. Acceleration;Animals;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Bone Plates;Dog Diseases;Dogs;Female;Inflammation;Low-Level Light Therapy;Male;Osteoarthritis;Osteotomy;Pain;Pain Management;Radiography;Rupture;Stifle;Synovial Fluid;Tibia;Time Factors

Acute effect of photobiomodulation therapy on handgrip strength of chronic kidney disease patients during hemodialysis. Pre-exercise photobiomodulation therapy (PBMT) reduces fatigue and enhances performance in different populations. However, PBMT benefits have never been tested on chronic kidney disease (CKD) patients, who present muscle weakness, fatigue, and reduced functional performance. The objective of this study was to evaluate the acute effect of three different doses of the PBMT on maximal handgrip strength of CKD patients. Fifteen volunteers (58â€‰Â±â€‰8Â years, 10 male/5 female) under chronic hemodialysis treatment (6â€‰Â±â€‰4Â years) participated in a randomized, crossover, double-blind, placebo-controlled trial. Each patient was assessed at four hemodialysis sessions with 1Â week interval between evaluations. Placebo or PBMT (cluster probe with five 850Â nm/200Â mW laser diodes) were applied at three sites along the flexors of the finger (total doses of 60, 90, or 120Â J per arm). The maximal handgrip strength was evaluated before and after PBMT/placebo treatment in each session. Repeated measures ANOVA and intraclass correlation coefficients (ICC) confirmed no learning effect on handgrip tests, and high scores for test-retest reliability (ICC scoresâ€‰=â€‰0.89 to 0.95). Significant strength increases occurred after PBMT application with doses of 60Â J/arm (4.85%, pâ€‰=â€‰0.005, ESâ€‰=â€‰0.32) and 90Â J/arm (4.45%, pâ€‰=â€‰0.013, ESâ€‰=â€‰0.25), while no changes were detected with placebo or 120Â J/arm. In conclusion, in consensus with a recent systematic review, a single bout of the 60Â J/arm was the best dose/response for increased strength of the small muscles (handgrip strength). In view of the increasing implementation of exercise programs during hemodialysis, the current study opens a new field for PBMT for CKD patients. Adult;Cross-Over Studies;Double-Blind Method;Exercise;Female;Hand Strength;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Renal Dialysis;Renal Insufficiency, Chronic;Reproducibility of Results

The application of 595-nm pulsed dye laser for vascular anomalies in a Chinese population: a 10-year experience. BACKGROUND: The 595-nm pulsed dye laser (PDL) has been used to treat vascular anomalies for about 30Â years; however, there are insufficient data in Chinese patients concerning therapeutic efficacy, optimized parameters, and procedure techniques. OBJECTIVE: To study the efficacy and relevant factors in PDL therapy for vascular anomalies in Chinese patients. METHOD: We enrolled 431 patients with 8 different vascular anomalies and no previous treatment in this retrospective study. A detailed classification of vascular anomalies and various parameters and techniques of PDL were studied. The clinical outcomes were analysed using the Investigator Global Assessment. RESULTS: Improvements were significantly correlated with infantile haemangioma (IH) subtypes (pÂ <Â 0.05). A significant correlation between efficacy and lesion colour, anatomical sites,

and hypertrophic-type port-wine stain (PWS) was found (pÂ <Â 0.05). There was no significant correlation between efficacy and age or sex (pÂ >Â 0.05). CONCLUSION: PDL is an effective and safe therapeutic modality for managing vascular anomalies in Chinese patients. We determined that differentiating and identifying IH subtypes prior to treatment could be a useful parameter for predicting therapeutic results.Â Lesion colour, sites, and hypertrophic changes in PWS are relevant therapeutic factors. PDL parameters and techniques differ according to the various vascular anomalies to achieve optimal results. Adolescent;Adult;Chi-Square Distribution;Child;Child, Preschool;China;Female;Hemangioma, Capillary;Humans;Infant;Infant, Newborn;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Photography;Port-Wine Stain;Retrospective Studies;Skin Neoplasms;Telangiectasis;Treatment Outcome;Young Adult

Combination of medicinal honey and 904â€¯nm superpulsed laser-mediated photobiomodulation promotes healing and impedes inflammation, pain in full-thickness burn. Burn wound is a complex multi-factorial pathophysiology producing excruciating pain and psychological discomfort among patients, which imposes a major burden on the healthcare system. Multi-target therapy focuses on augmented healing by regulating different phases of tissue repair. Recently, photobiomodulation (PBM)-induced wound healing has achieved profound impetus as a non-invasive, drug-free biophysical therapeutic approach. On the other hand, medicinal honey known to possess antibacterial and immunomodulatory properties and is being used as an effective treatment option for infected wounds. The present study aimed to determine whether the combination of medicinal honey and PBM using superpulsed 904â€¯nm laser treatment could additively accelerate full-thickness burn wound repair in rats. Animals were randomly allocated into 4 experimental groups: control (C), PBM superpulsed 904â€¯nm laser treated (PBMT), honey treated (HT) and combined treatment (CT). The dual treatment exhibited an enhanced wound area contraction and hexosamine content as compared to the other groups. Histopathological analysis revealed increased cellular proliferation, extracellular matrix accumulation and decreased inflammation in the CT group. Further, the CT group demonstrated synergistically attenuated inflammation, pain and enhanced cell adhesion, migration as evidenced by significantly reduced protein expression of TNF-Î±, NF-ÎºB, IL-1Î², COX-2, substance-P receptor and up-regulation of fibronectin, respectively as compared with the other groups. Thus, the findings of present study signify that the combination of medicinal honey and PBMT accelerates the repair process of burn wounds. The study showed that therapeutic efficacy of 904â€¯nm superpulsed laser-mediated PBM augments in the presence of medicinal honey by enhancing cellular proliferation and attenuation of inflammation and pain in burn wound healing. Hexosamines;Interleukin-1beta;Tumor Necrosis Factor-alpha;Cyclooxygenase 2 Animals;Burns;Cyclooxygenase 2;Down-Regulation;Hexosamines;Honey;Inflammation;Interleukin-1beta;Lasers;Low-Level Light Therapy;Male;Mitochondria;Pain;Rats;Rats, Sprague-Dawley;Skin;Tumor Necrosis Factor-alpha;Up-Regulation;Wound Healing

Photobiomodulation: lasers vs. light emitting diodes? Photobiomodulation (PBM) is a treatment method based on research findings showing that irradiation with certain wavelengths of red or near-infrared light has been shown to produce a range of physiological effects in cells, tissues, animals and humans. Scientific research into PBM was initially started in the late 1960s by utilizing the newly invented (1960) lasers, and the therapy rapidly became known as "low-level laser therapy". It was mainly used for wound healing and reduction of pain and inflammation. Despite other light sources being available during the first 40 years of PBM research, lasers remained by far the most commonly employed device, and in fact, some authors insisted that lasers were essential to the therapeutic benefit. Collimated, coherent, highly monochromatic beams with the possibility of high power densities were considered preferable. However in recent years, non-coherent light sources such as light-emitting diodes (LEDs) and broad-band lamps have become common. Advantages of LEDs

include no laser safety considerations, ease of home use, ability to irradiate a large area of tissue at once, possibility of wearable devices, and much lower cost per mW. LED photobiomodulation is here to stay.

Which wavelength is optimal for transcranial low-level laser stimulation? One of the challenges in transcranial low-level laser therapy (LLLT) is to optimally choose illumination parameters, such as wavelength. However, there is sparse study on the wavelengths comparison especially on human transcranial LLLT. Here, we employed Monte Carlo modeling and visible human phantom to compute the penetrated photon fluence distribution within cerebral cortex. By comparing the fluence distribution, penetration depth and the intensity of laser-tissue-interaction within brain among all candidate wavelengths, we found that 660, 810â€‰nm performed much better than 980, 1064â€‰nm with much stronger, deeper and wider photon penetration into cerebral tissue; 660â€‰nm was shown to be the best and slightly better than 810â€‰nm. Our computational finding was in a surprising accordance with previous LLLT-neurobehavioral studies on mice. This study not only offered quantitative comparison among wavelengths in the effect of LLLT light penetration effectiveness but also anticipated a delightful possibility of online, precise and visible optimization of LLLT illumination parameters. Humans;Low-Level Light Therapy;Monte Carlo Method;Optical Phenomena;Phantoms, Imaging;Skull

The Energy Density and Treatment Times Are the Main Factors That Affect the Efficacy of Long-Pulsed 1,064-nm Nd:YAG Laser Treatment for Onychomycosis Caused by Trichophyton rubrum. BACKGROUND: No optimal regimen exists for the LPNYL (long-pulsed 1,064-nm neodymium:yttrium-aluminum-garnet laser) for treating onychomycosis. OBJECTIVE: To establish an optimal LPNYL treatment regimen for onychomycosis caused by Trichophyton rubrum (OCTr). PATIENTS AND METHODS: First, 511 infected nails of 177 patients were treated using LPNYL with orthogonally designed regimens according to various energy densities, spot sizes, pulse widths, and treatment times. The optimal treatment regimen was established by multivariate analysis. Next, 69 patients with 221 infected nails were randomized to receive oral itraconazole (drug group) and the optimal regimen of LPNYL treatment (laser group). The clinical efficacy (CE) and mycological efficacy (ME) were evaluated at 6 and 12 months following the start of treatment, and adverse reactions were recorded in both groups. RESULTS: Both CE and ME were significantly correlated with the energy density ($p < 0.05$) and treatment times ($p < 0.05$), but not with the spot size ($0.071 < p < 0.083$) or pulse width ($0.051 < p < 0.060$), at 6 or 12 months. There were no significant differences at 6 or 12 months ($p > 0.05$), and no significant difference was observed in CE at 12 months between the two groups ($p > 0.05$). At 6 months, the CE in the laser group was significantly higher than that in the drug group ($p < 0.001$). CONCLUSIONS: LPNYL is effective and safe for treating OCTr. The energy density and treatment times are the main factors that affect the efficacy. The optimal regimen for LPNYL is an energy density of 45 J/cm2, pulse width of 35 ms, spot size of 4 mm, frequency of 1 Hz, and 6 treatments with 1-week intervals. Laser treatment has rapid clinical recovery. Antifungal Agents;Itraconazole Adolescent;Adult;Antifungal Agents;Female;Foot Dermatoses;Humans;Itraconazole;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Treatment Outcome;Trichophyton;Young Adult

Evaluation of long-term efficacy, safety, and effect on life quality of pulsed dye laser in rosacea patients. Background: Rosacea is a chronic disease affecting the patients' life quality negatively. Although various laser systems are used in the rosacea treatment, studies reporting efficacy and long-term continuity of benefit of laser therapies are scarce. Objectives: We aimed to evaluate the efficacy, safety, continuity of benefit, and effect on life quality of pulsed dye laser (PDL) in the rosacea patients. Methods: Fourteen rosacea patients treated with PDL were enrolled in the study. The number of treatment sessions were varied from one to four. The efficacy was evaluated by the

physicians' clinical assessment (PCA), patients' self-assessment (PSA), and erythema and telengiectasia grading scores. Additionally, the patients were asked about the continuity of the benefit and improvement in their life qualities after the treatment. Results: Both the erythema and telangiectasia scores were significantly improved after the treatment (pÂ <Â 0.001). According to PCA, nine patients had a clinical improvement of >50%. According to PSA, 11 patients had good/excellent improvement. Moderate/significant benefit of treatment continued in 12 patients at the follow-up period (mean 21.64Â Â±Â 14.25Â months). The life quality scores were significantly improved. No serious side effects were observed. Conclusion: PDL has high and long-term efficacy in the treatment of rosacea with a good safety profile. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Patient Safety;Patient Satisfaction;Quality of Life;Rosacea

Comment on "efficacy of low-level laser therapy in management of recurrent herpes labialis: a systematic review". Antiviral Agents Antiviral Agents;Herpes Labialis;Humans;Low-Level Light Therapy;Recurrence

Photobiomodulation Therapy Attenuates Hypoxic-Ischemic Injury in a Neonatal Rat Model. Photobiomodulation (PBM) has been demonstrated as a neuroprotective strategy, but its effect on perinatal hypoxic-ischemic encephalopathy is still unknown. The current study was designed to shed light on the potential beneficial effect of PBM on neonatal brain injury induced by hypoxia ischemia (HI) in a rat model. Postnatal rats were subjected to hypoxic-ischemic insult, followed by a 7-day PBM treatment via a continuous wave diode laser with a wavelength of 808Â nm. We demonstrated that PBM treatment significantly reduced HI-induced brain lesion in both the cortex and hippocampal CA1 subregions. Molecular studies indicated that PBM treatment profoundly restored mitochondrial dynamics by suppressing HI-induced mitochondrial fragmentation. Further investigation of mitochondrial function revealed that PBM treatment remarkably attenuated mitochondrial membrane collapse, accompanied with enhanced ATP synthesis in neonatal HI rats. In addition, PBM treatment led to robust inhibition of oxidative damage, manifested by significant reduction in the productions of 4-HNE, P-H2AX (S139), malondialdehyde (MDA), as well as protein carbonyls. Finally, PBM treatment suppressed the activation of mitochondria-dependent neuronal apoptosis in HI rats, as evidenced by decreased pro-apoptotic cascade 3/9 and TUNEL-positive neurons. Taken together, our findings demonstrated that PBM treatment contributed to a robust neuroprotection via the attenuation of mitochondrial dysfunction, oxidative stress, and final neuronal apoptosis in the neonatal HI brain. Animals;Apoptosis;Cerebral Cortex;Female;Hippocampus;Hypoxia-Ischemia, Brain;Low-Level Light Therapy;Male;Mitochondria;Oxidative Stress;Protein Carbonylation;Rats

Dose analysis of photobiomodulation therapy on osteoblast, osteoclast, and osteocyte. The objective of this study was to evaluate the effects of varying light doses on the viability and cellular activity of osteoblasts, osteocytes, and osteoclasts. A light application device was developed to apply 940-nm wavelength light from light-emitting diodes on three cultured cells, MC3T3-E1, MLO-A5, and RANKL-treated RAW264.7 cells. The doses (energy density) on cells were 0, 1, 5, and 7.5â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2. The corresponding light power densities at the cell site were 0, 1.67, 8.33, and 12.5â€‰â€‰mWâ€‰â€‰/â€‰â€‰cm2, respectively, and the duration was 10Â min. The results showed that the three cell types respond differently to light and their responses were dose dependent. Low-dose treatment (1â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2) enhanced osteoblast proliferation, osteoclast differentiation, and osteoclastic bone resorption activity. Osteocyte proliferation was not affected by both low- and high-dose (5â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2) treatments. While 1â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2 did not affect viability of all three cell types, 5â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2 significantly decreased

viability of osteocytes and osteoclasts. Osteoblast viability was negatively impacted by the higher dose (7.5â€‰â€‰Jâ€‰â€‰/â€‰â€‰cm2). The findings suggest that optimal doses exist for osteoblast and osteoclast, which can stimulate cell activities, and there is a safe dose range for each type of cell tested. Animals;Cell Line;Cell Physiological Phenomena;Low-Level Light Therapy;Mice;Osteoblasts;Osteoclasts;RAW 264.7 Cells

The effectiveness of adding low-level light therapy to minoxidil 5% solution in the treatment of patients with androgenetic alopecia. BACKGROUND: Androgenetic alopecia is the commonest type of alopecia affecting over half of men and women. Low-level light therapy is a new technique for stimulating hair growth in both genders. AIMS: To overcome the shortcomings of previous epidemiological studies and a lack of controlled clinical trials on the subject, this study compared the effectiveness of adding low-level light therapy to minoxidil topical solution in the treatment of androgenetic alopecia in patients presenting to two skin clinics in Isfahan, Iran during 2014-2015. MATERIALS AND METHODS: This clinical trial included 50 patients aged 17-45 presenting to Khorshid and Alzahra educational centers and skin diseases research center for androgenetic alopecia during 2014-2015. The patients were randomly divided into a control and a case group. The case group received topical minoxidil 5% solution plus low-level light therapy twice per day. The control group was given the same topical solution and a laser comb system that was turned off to act as a placebo. Changes in patients' hair density and diameter and its overall regrowth as well as their satisfaction with the treatment were assessed at months 0 (baseline), 3, 6, 9 and 12. RESULTS: The percentage of recovery from androgenetic alopecia and the patients' satisfaction with their treatment were significantly higher in the case group compared to the control group. The patients' mean hair density and diameter were found to be higher in the case group after the intervention compared to the control group. LIMITATIONS: The study limitations included patient compliance, small sample size, patient insight due to novelty of the method and clinical judgement. CONCLUSION: As a new method of treatment, low-level light therapy can help improve the percentage of recovery from androgenetic alopecia and increase patients' satisfaction with their treatment. Vasodilator Agents;Minoxidil Adolescent;Adult;Alopecia;Clinical Protocols;Combined Modality Therapy;Double-Blind Method;Drug Compounding;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Minoxidil;Patient Satisfaction;Treatment Outcome;Vasodilator Agents;Young Adult

Evaluation of the Effects of Low Level Laser Therapy on the Healing Process After Skin Graft Surgery in Burned Patients (A Randomized Clinical Trial). Introduction: Skin graft is the standard therapeutic technique in patients with deep ulcers, but like every surgical procedure, it may present some complications. Although several modern dressings are available to enhance comfort of donor site, the use of techniques that accelerate wound healing may enhance patient's satisfaction. Low level laser therapy (LLLT) has been used in several medical fields, especially for wound healing, but it may take several months for large ulcers treated with laser to heal completely. Methods: Nine patients with bilateral similar grade 3 burn ulcers in both hands or both feet were selected as candidates for split-thickness skin graft (STSG). One side was selected for laser irradiation and the other side as control, randomly. Laser was irradiated every day for 7 days with red 655 nm light, 150 mW, 2 J/cm(2) at the bed of the ulcer and with infra-red 808 nm light, 200 mW for the margins. Results: The rate of wound dehiscence after skin graft surgery was significantly lower in laser treated group in comparison to control group which received only classic dressing (P=0.019). Conclusion: The results showed LLLT to be a safe effective method which improves graft survival and wound healing process and decreases the rate of wound dehiscence in patients with deep burn ulcers.

Photobiomodulation therapy on bothrops snake venom-induced local pathological effects: A systematic review. Bothrops snakebite treatment is antivenom therapy, which is ineffective in neutralizing the severe local effects caused by these envenomations. There are evidence that

photobiomodulation therapy (PBMT) has emerged as a promising tool to counteract the venom-induced local effects. The purpose was to write a narrative review of the literature about PBMT as a treatment for Bothrops snakebites. We reviewed articles indexed in PubMed, SCOPUS and Scientif Direct database with filter application. Included studies had to investigate local effects induced by Bothrops snake venom in any animal model using any type of photobiomodulation irradiation and at least one quantitative measure of local effects of Bothrops envenomation. Sixteen studies were selected from 54 original articles targeted PBMT (low-level laser or light emitting diode) as a complementary tool for local effects treatment induced by snakebites, and all its assessments. Articles were critically assessed by two independent raters with a structured tool for rating the research quality. PBMT demonstrate to be a promising tool for local treatment effects caused by snakebite by reducing local edema, hyperalgesia, leukocyte influx and myonecrosis and accelerating tissue regeneration related to myotoxicity. However, the mechanism is not well understood and additional studies are needed. Antivenins;Crotalid Venoms Animals;Antivenins;Bothrops;Crotalid Venoms;Disease Models, Animal;Low-Level Light Therapy;Muscle, Skeletal;Snake Bites

Photobiomodulation and different macrophages phenotypes during muscle tissue repair. Macrophages play a very important role in the conduction of several regenerative processes mainly due to their plasticity and multiple functions. In the muscle repair process, while M1 macrophages regulate the inflammatory and proliferative phases, M2 (anti-inflammatory) macrophages direct the differentiation and remodelling phases, leading to tissue regeneration. The aim of this study was to evaluate the effect of red and near infrared (NIR) photobiomodulation (PBM) on macrophage phenotypes and correlate these findings with the repair process following acute muscle injury. Wistar rats were divided into 4 groups: control; muscle injury; muscle injuryÂ +Â red PBM; and muscle injuryÂ +Â NIR PBM. After 2, 4 and 7Â days, the tibialis anterior muscle was processed for analysis. Macrophages phenotypic profile was evaluated by immunohistochemistry and correlated with the different stages of the skeletal muscle repair by the qualitative and quantitative morphological analysis as well as by the evaluation of IL-6, TNF-Î± and TGF-Î² mRNA expression. Photobiomodulation at both wavelengths was able to decrease the number of CD68(+) (M1) macrophages 2Â days after muscle injury and increase the number of CD163(+) (M2) macrophages 7Â days after injury. However, only NIR treatment was able to increase the number of CD206(+) M2 macrophages (Day 2) and TGF-Î² mRNA expression (Day 2, 4 and 7), favouring the repair process more expressivelly. Treatment with PBM was able to modulate the inflammation phase, optimize the transition from the inflammatory to the regeneration phase (mainly with NIR light) and improve the final step of regeneration, enhancing tissue repair. Antigens, CD;Antigens, Differentiation, Myelomonocytic;CD163 antigen;Receptors, Cell Surface Animals;Antigens, CD;Antigens, Differentiation, Myelomonocytic;Cell Differentiation;Humans;Low-Level Light Therapy;Macrophages;Muscle Development;Muscle, Skeletal;Muscles;Rats;Receptors, Cell Surface;Regeneration;Wound Healing

Effects of diode laser application on inflammation and mpo in periodontal tissues in a rat model. OBJECTIVE: In this study, we aimed to histologically and immunologically evaluate the effect of diode laser treatment when applied adjunctive to scaling and root planing (SRP) in an experimental periodontitis model. MATERIALS AND METHODS: We used Wistar-Albino rats (n=60) with average weight of 230 g. Experimental periodontitis was induced by ligature at the right and left first mandibular molar teeth in all rats. After 11 days, the ligature was removed and rats were divided into two groups. The control group (n=30) received only SRP treatment, while the laser group (n=30) received a diode laser (GaAlAs, 810 nm, 1 W, 10 J, 20 s) treatment adjunctive to SRP. Ten rats in each group were sacrificed after 7, 15, and 30 days. Histopathological examination was performed in the left mandible of rats. Myeloperoxidase (MPO) was evaluated by western blot in the gingival

specimens from the right mandible. RESULTS: MPO levels in the laser group were statistically significantly lower compared with the control group (pâ‰¤0.05). There was no statistically significance at any time between MPO levels in the control group (p>0.05). MPO levels in the laser group at the 7th day were statistically significantly higher compared to the 15th (pâ‰¤0.05) and the 30th day (pâ‰¤0.05). Inflammatory cell infiltration decreased over time in both groups and was statistically significantly lower in the laser group than in the control group at all times (pâ‰¤0.01). CONCLUSIONS: Within the limits of this study, we suggest that diode laser application is an adjunctive treatment because it reduced inflammation and MPO when applied in addition to SRP. On the other hand, more studies are needed for the assessment of the effects of diode laser application to periodontal tissues. Peroxidase Animals;Blotting, Western;Combined Modality Therapy;Dental Scaling;Disease Models, Animal;Lasers, Semiconductor;Ligation;Low-Level Light Therapy;Periodontitis;Peroxidase;Random Allocation;Rats, Wistar;Reproducibility of Results;Time Factors;Treatment Outcome

A case of herpes simplex virus reactivation after fractional ablative carbon dioxide laser to treat a burn scar. Fractional photothermolysis was initially introduced by Manstein in 2004 .Fractional CO2 laser technology introduced has allowed physicians to obtain good cosmetic results with a lower rate of complications than non-fractionated ablative laser treatment. However, adverse effects may still occur.Reported cases of HSV infection after fractional photothermolysis are rare. A 48-year-old woman with Fitzpatrick skin type III presented with a scar in her perioral area desiring esthetic improvement of her burn scar. She didn't have a history of recurrent herpes simplex virus (HSV) infection periorally. A fractionated resurfacing laser Quadralase (Candela) was used to treat her perioral burn scar. Two sessions were performed with a month interval. Five days after the second session of laser therapy even after she took antiviral prophylaxis based on valacyclovir 500mg twice daily 24 hours before the laser session and 3 days after, she presented with a rash on the perioral area preceded by pain. Correlation of the history and the clinical presentation was consistent with HSV reactivation. Treatment was initiated with acyclovir 10mg/kg/8h administered intravenously for 10 days with a clearing of her vesicular eruption. Fractional CO2 laser is a very safe procedure when used with accepted parameters. Early recognition, close monitoring and careful wound care will prevent long term sequelae when complications occur. Antiviral Agents;Acyclovir Acyclovir;Administration, Intravenous;Antibiotic Prophylaxis;Antiviral Agents;Burns;Cicatrix;Dose Fractionation, Radiation;Female;Follow-Up Studies;Herpes Simplex;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Mouth;Simplexvirus;Treatment Outcome;Virus Activation

A randomized, single-blind, study evaluating a 755-nm picosecond pulsed Alexandrite laser vs. a non-ablative 1927-nm fractionated thulium laser for the treatment of facial photopigmentation and aging. Background: Laser toning is one of the most popular strategies to treat facial photopigmentation and aging. Several laser modalities, including fractional non-ablative, Q-switched (QS) lasers and new generation picosecond lasers have been used for this indication. However, there is paucity of head to head comparisons of older generation of lasers with new ones. Objective: To compare a 755Â nm picosecond pulsed alexandrite laser with a non-ablative 1927Â nm fractionated thulium laser for the treatment of facial photopigmentation and aging through a randomized, single-blind study. Materials and methods: 20 subjects (skin types I-IV) were randomized to receive either four 755-nm picosecond alexandrite laser treatments, spaced 3 weeks apart, or two dual wavelength thulium fiber fractionated 1550/1927Â nm laser treatments, spaced 6Â weeks apart. Follow-up assessment visits occurred 4 and 12Â weeks after the last study treatment. Results: At the 4- and 12-week follow-up, both groups showed significant improvement of photoaging, pigmentation, skin quality according to the investigator and subjects assessments. When comparing the two groups, subjects in 755Â nm group had statistically significant greater improvement in investigator assessments of

photoaging/skin quality and subject satisfaction than those in the 1927Â nm group. Conclusion: Both the non-ablative 1927 and 755Â nm picosecond laser can improve facial photopigmentation, but the latter can yield superior results with less pain and side effects according to patient and investigator assessments. Thulium Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Severity of Illness Index;Single-Blind Method;Skin Aging;Skin Pigmentation;Thulium

A novel staged wrist sensorimotor rehabilitation program for a patient with triangular fibrocartilage complex injury: A case report. STUDY DESIGN: Case report. INTRODUCTION: Studies have highlighted the sensory innervations and stabilizing role of forearm muscles on wrist joint and implications to wrist sensorimotor rehabilitation. This case explored the novel incorporation of dart-throwing motion and proprioceptive neuromuscular facilitation in wrist sensorimotor rehabilitation. PURPOSE OF THE STUDY: To describe and evaluate a staged wrist sensorimotor rehabilitation program for a patient with triangular fibrocartilage complex (TFCC) injury. METHODS: The patient participated in the staged program for 9 sessions over a 3-month period. Treatment involved neuromuscular strengthening at the wrist and movement normalization of the upper extremity. Outcome measures were grip strength, visual analog scale, joint position sense, Quick Disabilities of the Arm, Shoulder and Hand, and patient-rated wrist evaluation. RESULTS: The patient showed improvement in all outcome measures. Most outcomes exceeded the established minimal clinically important difference values. DISCUSSION: The results suggest that dart-throwing motion and proprioceptive neuromuscular facilitation are beneficial in rehabilitation of TFCC injury. CONCLUSIONS: This is the first study that incorporated dart-throwing motion and proprioceptive neuromuscular facilitation in the sensorimotor rehabilitation of TFCC injury and yielded promising results. There is a need to further evaluate the program in prospective randomized controlled trial recruiting a larger group of patients with TFCC injury. Arthralgia;Disability Evaluation;Female;Hand Strength;Humans;Low-Level Light Therapy;Orthotic Devices;Physical Therapy Modalities;Triangular Fibrocartilage;Visual Analog Scale;Wrist Joint;Young Adult

Photobiomodulation improved stereological parameters and sperm analysis factors in streptozotocin-induced type 1 diabetes mellitus. The aim of this study was to evaluate the effect of photobiomodulation (PBM) on testicular tissues and fresh sperm analysis factors in streptozotocin (STZ)-induced type one diabetes mellitus (T1DM) mice. T1DM was induced in 15 male Syrian mice by injection of 200â€¯mg/kg STZ. After one month, mice were divided randomly into three groups, harboring 5 mice each: 1, control group; 2, first laser group (890â€¯nm, 80â€¯Hz, 0.03â€¯J/cm(2)) and 3, second laser group (0.2â€¯J/cm(2)). Then the mice were euthanized and testicles were dissected for stereological studies, and both epididymis and vas deferens were removed for fresh sperm analysis. Data were analyzed by statistical methods. A significant increase was observed in the Sertoli cell count in both PBM groups, compared to the control group. In addition, the second PBM group shows a significant increase in the Sertoli cell count, compared to the first PBM group. Both PBM groups show significant increase in the Leydig cell count, compared to the control group. There were significant increases of the length in the seminiferous tubules in both PBM groups, compared to the control group. In addition, the second PBM group showed a significant increase of the length in the seminiferous tubules, compared to the first PBM group. The second PBM group showed a significant increase in the sperm count, compared to the control, and first PBM groups. The first PBM group showed a significant increase in sperm count, compared to the control group. The sperm motility and count were significantly increased in the second PBM group, compared to the control and first PBM groups. The sperm motility was significantly increased in the first PBM group, compared to the control group. PBM with 0.2â€¯J/cm(2) and 0.03â€¯J/cm(2) energy densities significantly improved the stereological parameters and fresh sperm analysis factors, compared to the control group in STZ-

induced T1DM in mice. Moreover, the PBM with 0.2â€¯J/cm(2) energy density was statistically more effective, compared to the 0.03â€¯J/cm(2). Blood Glucose;Streptozocin Animals;Blood Glucose;Body Weight;Diabetes Mellitus, Experimental;Lasers;Male;Mice;Seminiferous Tubules;Sertoli Cells;Spermatogonia;Spermatozoa;Streptozocin;Testis

Epidermal grafting for leukoderma resulting from 1064-nm quality-switched neodymium-doped yttrium aluminium garnet laser toning. Leukoderma secondary to Q-switched 1064-nm neodymium-doped yttrium aluminium garnet laser is usually refractory to treatment. The pathogenesis was cumulative phototoxic damage to melanocytes and eventually resulted in melanocytopenia. Wood's light or UV imaging can help observe early leukoderma before it becomes apparent clinically and determine the degree of melanocytopenia before conducting a biopsy. NB-UVB phototherapy and 308-nm excimer laser can potentially worsen the pre-existing melasma lesions and may not be effective if the lesions have already become melanocytopenic. Epidermal grafting can replenish the hypopigmented area with melanocytes without worsening melasma. Neodymium;Yttrium Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanocytes;Melanosis;Neodymium;Nevus, Halo;Skin Transplantation;Treatment Outcome;Yttrium

Laser pulpotomy-an effective alternative to conventional techniques-a systematic review of literature and meta-analysis. The aim of this systematic review and subsequent meta-analysis was to elaborate the efficacy of laser pulpotomy over the formocresol pulpotomy of human primary teeth. Published materials in the MedLine were looked for through "PUBMED" and "PUBMED CENTRAL". The MESH terms of "Laser", "Pulpotomy", "Primary teeth", and "Children" were used to carry the search from the years 1999 to 2017. Collected data were assessed by four investigators using inclusion and exclusion criteria in order to select those studies with precise method targeted. Only clinical trials on all types of lasers were included for this systematic reviews but only four articles were used for the meta-analysis as the rest did not meet the requirements. Statistical analysis was conducted to see the differences. Seventeen articles completely fulfilled the inclusion criteria of this study. In general, high clinical, radiographic, and histopathological success rates were reported in laser groups in comparison to other assessed methods. Meta-analysis indicated that except at 36Â months, in all other time intervals, Laser proved better or close results to formocresol. At 36Â months, laser showed better clinical results. Laser may be considered as an adjuvant alternative for vital pulp therapy on human primary teeth but due to the limited number of high-quality clinical research articles on laser-assisted pulpotomy, various types of laser application methods, and different follow-up periods, reaching a net consensus is still challenging. Formocresols;formocresol Dental Pulp;Formocresols;Humans;Lasers;Low-Level Light Therapy;Pulpotomy;Treatment Outcome

Efficacy of low-level light therapy for treatment of diabetic foot ulcer: A systematic review and meta-analysis of randomized controlled trials. AIMS: The goal of this systematic review and meta-analysis based on seven Randomized control trials (RCTs) is to examine whether Low-level light therapy (LLLT) is effective at healing diabetic foot ulcer (DFU) and to provide evidence-based recommendations and clinical guidelines for the future clinical treatment of DFUs. METHODS: Medline, Embase, Scopus, Cochrane Library, and Web of Science databases were searched for studies published up to June 30, 2017, without language or data restrictions. RCTs that investigated the use of LLLT for DFU treatment were included. Standard methods of meta-analysis were performed to evaluate outcomes of LLLT on the healing of DFU. RESULTS: Seven RCTs involving 194 participants were eligible for this systematic review and meta-analysis. The results of meta-analysis showed that LLLT has emerged as a potential noninvasive treatment for DFUs, as LLLT was found to effectively reduce the ulcer area [weighted mean difference (WMD) 34.18, 95% confidence intervals (CI) 19.38-

48.99, Pâ€¯<â€¯0.00001], improve the complete healing rate [odds ratio (OR) 6.72, 95% CI 1.99-22.64, Pâ€¯=â€¯0.002]. Qualitative analysis of the included RCTs found that LLLT also played a role in the treatment of DFUs through promoting rapid granulation formation and shortening ulcer closure time, as well as alleviating foot ulcer pain. None of the treatment-related adverse event was reported. CONCLUSIONS: LLLT was recognized as a potential method in the comprehensive treatment of DFUs. Further well designed and high-quality studies are required to confirm the role of LLLT in the management of DFUs. Adolescent;Adult;Aged;Diabetic Foot;Humans;Low-Level Light Therapy;Middle Aged;Randomized Controlled Trials as Topic;Young Adult

The effects of photodynamic and low-level laser therapy for treatment of oral lichen planus-A systematic review and meta-analysis. BACKGROUND: Oral lichen planus (OLP) is a chronic immune-mediated disorder that inflicts oral mucosa in 0.5-2% of the population. Surgery, photodynamic therapy, laser therapy and most commonly pharmacological therapy (like corticosteroids) has been used for treating OLP. New phototherapy approaches have been shown to have positive effects on treating some oral lesions and the aim of our study was to assess the effects of different phototherapy treatments on OLP. METHODS: We conducted a comprehensive electronic search using the determined search strategy in MEDLINE, EMBASE and CENTRAL electronic databases. A hand search of the reference list of the relevant studies and related systematic reviews was also performed. RESULTS: For low-level laser therapy, before and after studies showed a significant difference in pain (MDâ€¯=â€¯-4.39, Câ€¯=â€¯95% -4.83, -3.96) and sign score (MDâ€¯=â€¯-1.86, Câ€¯=â€¯95% -2.53, -1.19) after treatment. The comparison between corticosteroid therapy and LLLT also showed a significant difference in their effects for severity (MDâ€¯=â€¯0.57, Câ€¯=â€¯95% 0.04, 1.09), but no differences in sign (MDâ€¯=â€¯0.21, Câ€¯=â€¯95% -0.83, 1.24)and pain (MDâ€¯=â€¯-0.10, Câ€¯=â€¯95% -0.57,0.38) score was found between these two methods. Before and after studies of photodynamic therapy did not reveal any differences in lesion size. (MDâ€¯=â€¯-1.95, Câ€¯=â€¯95% -4.39, 0.490). CONCLUSION: Low-level laser therapy seems to be a reliable alternative to corticosteroids for treating OLP without the adverse effects associated with the pharmacological method. No conclusive evidence for the effectiveness of photodynamic therapy in treating OLP lesion exists. Adrenal Cortex Hormones Adrenal Cortex Hormones;Clinical Trials as Topic;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Photochemotherapy

970â€¯nm low-level laser affects bone metabolism in orthodontic tooth movement. OBJECTIVE: During orthodontic tooth movement (OTM), the speed of movement depends on the rate of bone turnover. In this study, we used a rat model to investigate the effect of 970â€¯nm low-level laser therapy (LLLT) on OTM under different dose and frequency protocols. METHODS: We first compared the OTM rates between the OTM only control and the OTMâ€¯+â€¯LLLT group (1250â€¯J/cm(2)) in Experiment 1 and showed that LLLT significantly increased OTM. In Experiment 2, we employed 3 different LLLT protocols: the low-dose group and the high-dose group receiving 5 doses of 750â€¯J/cm(2) and 15,000â€¯J/cm(2) of LLLT every 3â€¯days, respectively, and the early high-dose group which received 5 daily doses at 15,000â€¯J/cm(2) at the beginning of the experiments. The OTM-only control group received no LLLT. Tooth movement rate was measured through sequential silicone impressions. MicroCT was also performed to evaluate bone de-mineralization rate. Bone histmorphometry was used to compare the bone turnover rate between LLLT group and control group. Finally, TRAP, Osteocalcin, and VEGF expression is evaluated by immunohistochemistry (IHC) in tissue sections. RESULTS: When LLLT treatment was given every three days, both the 1250â€¯J/cm(2) and 15,000â€¯J/cm(2) groups showed significantly increased OTM compared to the control group. No significant difference was observed in the 750â€¯J/cm(2) group, or in the early irradiation group, when compared with controls, although 750â€¯J/cm(2) showed the same trend of accelerating OTM.

The MicroCT result of rat maxilla demonstrated that LLLT increased bone remodeling and showed decreased bone mineral density and bone volume/total volume in the furcation areas of the maxillary first molars at the end of experiment. LLLT without OTM increased bone turnover as evidenced by fluorochrome incorporation. Immunohistochemistry analyses revealed high osteocalcin expression at later stages of OTM in the LLLT group, while VEGF expression was highly induced in the LLLTâ€¯+â€¯OTM group at an early stage. CONCLUSION: Our results suggest that the 970â€¯nm LLLT increases the rate of OTM in a dose-sensitive and frequency-dependent manner. Further animal and human studies are needed to determine the optimal timing and dosage of LLLT for OTM acceleration.
Vascular Endothelial Growth Factor A;Osteocalcin;Tartrate-Resistant Acid Phosphatase
Animals;Bone Density;Bone Regeneration;Bone Remodeling;Immunohistochemistry;Low-Level Light Therapy;Mandible;Maxilla;Models, Animal;Molar;Osteocalcin;Rats;Rats, Wistar;Tartrate-Resistant Acid Phosphatase;Tooth Movement Techniques;Vascular Endothelial Growth Factor A;X-Ray Microtomography

Combination Ablative Approach to Laser Therapy in Advanced Aging of the Face. BACKGROUND AND OBJECTIVE: Misperceptions have persisted regarding scanning full-field erbium laser that have caused it to be overshadowed by fractional ablative resurfacing. This can lead to sub-optimally treating the periocular and perioral skin. Our report describes the utility of a combined approach of fractional ablative CO2 with full-field erbium ablation for full face rejuvenation. Each laser has a role in creating the optimal outcomes for advanced photoaging in the fewest treatments. METHODS: A patient with severe photodamage and etched-in lines underwent full face fractional ablative CO2 (CO2RE, Syneron Candela) and full-field ablative perioral and periocular erbium laser (Contour TRL, Sciton Inc.). The pre-procedure consultations included evaluation of the severity of the photodamage and etched-in lines, as well as discussion of patient goals and appropriate treatment options. Photos of similar patients and post-treatment recovery were reviewed. Fully ablative lasers are generally avoided in Fitzpatrick skin type IV-VI. Prior to treatment, full face nerve blocks and topical anesthesia was provided. Full facial fractional ablative CO2 laser was then applied in one orthoganol pass to the whole face. This was followed by treating the infraorbital and perioral skin with four passes of full field erbium laser. Visualized residual lines were focally treated. Marked improvement was seen in a single treatment session. RESULTS: Standardized digital imaging revealed dramatic improvement in skin texture and etched lines. CONCLUSION: For appropriately selected patients, combination fractional ablative CO2 and full-field ablative erbium resurfacing for facial rejuvenation is safe, efficacious and merits consideration. J Drugs Dermatol. 2018;17(7):796-799.
Aged;Combined Modality Therapy;Face;Female;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Rejuvenation;Rhytidoplasty;Skin;Skin Aging;Treatment Outcome

Effects of Photobiomodulation on Degranulation and Number of Mast Cells and Wound Strength in Skin Wound Healing of Streptozotocin-Induced Diabetic Rats. BACKGROUND: A lack of effective treatments still exists for patients suffering from diabetes mellitus. Photobiomodulation is proved as a beneficial therapeutic modality for wounds. OBJECTIVE: The aim of this study is to examine the effect of degranulation of mast cells and total number of mast cells in the remodeling step of an ischemic model of wound healing under the influence of photobiomodulation and conditioned medium (CM) from human bone marrow-derived mesenchymal stem cells (hBM-MSCs-CM), or CM, administered alone and or in combination. MATERIALS AND METHODS: Initially, type 1 diabetes mellitus was induced in 72 male adult rats. Then, after a month, one incision was made on the back of each rat. Subsequently, the rats were divided into four groups. The first group was considered as the control (placebo) group, the second group received CM, the third group received photobiomodulation, and the fourth group received photobiomodulation+CM. On days 4, 7, and 15, samples were extracted from the wound for histological and tensiometric examinations. The total

number of mast cells, including the three types of mast cells, was counted by the stereological methods. The tensiometric properties of the repairing tissue were examined. RESULTS: The administration of photobiomodulation and CM, alone or in combination, significantly increased the tensiometric properties within the healing wounds. Histologically, photobiomodulation+CM, CM, and photobiomodulation groups showed a significant decrease in the three types of mast cells and in the total number of mast cells compared with the control group on day 15. CONCLUSIONS: We conclude that photobiomodulation and CM alone and or in combination significantly accelerated the healing process in a rat with a diabetic and ischemic wound, and significantly decreased the total number of mast cells and degranulation of mast cells. We suggest that the increased number of type 2 mast cells in the control group adversely affected the tensiometric properties of wounds in this group. Culture Media, Conditioned Animals;Bone Marrow Transplantation;Cell Count;Cell Degranulation;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Ischemia;Low-Level Light Therapy;Male;Mast Cells;Mesenchymal Stem Cell Transplantation;Rats;Rats, Wistar;Skin;Wound Healing;Wounds and Injuries

Effects of Nd:YAG low-level laser irradiation on cultured human osteoblasts migration and ATP production: in vitro study. Low-level laser therapy has become one of the fastest growing fields of medicine in recent years. Many in vivo and in vitro studies have shown that laser irradiation activates a range of cellular processes in a variety of cell types and can promote tissue repair. However, few in vitro experiments have evaluated the effects of laser irradiation on cells in real time. The purpose of this study was to examine the effects of neodymium-doped yttrium aluminum garnet (Nd:YAG) laser irradiation on the migration of cultured human osteoblasts. A dedicated 96-well plate was used, and confluent cultures of the human osteoblast-like cell line, Saos-2, were injured with a wound maker. The wounded cells were then exposed to the Nd:YAG laser (wavelength of 1064Â nm) for 60Â s at 0.3Â W (10Â pps, 30Â mJ). The total energy density was about 10.34Â J/cm(2). Images of the wounds were automatically acquired inside the CO(2) incubator by the IncuCyte ZOOMâ„¢ software. In addition, after laser irradiation, the production of adenosine triphosphate (ATP) was measured using the CellTiter-Gloâ„¢ Luminescent Cell Viability Assay. Migration of cells from the border of the original scratch zone was accelerated by laser irradiation. In addition, compared with the control group, significant enhancement of ATP production was observed in the irradiated group. The present study showed that Nd:YAG laser irradiation (wavelength of 1064Â nm, 0.3Â W, 10 pps, 30Â mJ, 10.34Â J/cm(2), irradiation time 60Â s) may contribute to the regeneration of bone tissues owing to enhanced osteoblast cell migration. Adenosine Triphosphate Adenosine Triphosphate;Cell Movement;Cell Survival;Cells, Cultured;Humans;Lasers, Solid-State;Low-Level Light Therapy;Osteoblasts;Wound Healing

Low-level laser therapy for treatment of venous ulcers evaluated with the Nursing Outcome Classification: study protocol for a randomized controlled trial. BACKGROUND: Different methods are available for the treatment of venous ulcers. Most current approaches focus on a combination of topical and compressive therapy. Adjuvant low-level laser therapy may be helpful in lesions with a protracted healing course, but evidence for its use is still limited. This paper describes the protocol of a randomized controlled trial designed to compare the effect of adjuvant low-level laser therapy versus conventional venous ulcer tissue repair, evaluated by a nurse using clinical indicators from the Nursing Outcomes Classification (NOC). METHODS/DESIGN: For this prospective randomized controlled trial, 40 adult patients of both sexes with active venous ulcers will be recruited. Subjects will be selected by the sealed-envelope method without any annotation or external identification that might refer to the type of study group. At the time of unblinding, a label with the description of the group to which the patient belongs (that is, control or intervention) will be found inside the envelope. Conventional treatment (topical medication and compressive therapy) will

be offered to both groups. Additionally, the intervention group will receive adjuvant low-level laser therapy. All patients will be followed weekly until ulcer healing or for a maximum of 16Â weeks. Evaluation of tissue repair will be based on 14 clinical indicators drawn from NOC for wound healing (secondary intention) and tissue integrity (skin and mucous membranes). The primary endpoint will be decreased wound size and scar formation. This laser therapy is expected to enhance the quality, speed, and effectiveness of the treatment of venous ulcers, a chronic condition. This should reduce associated costs to the health service and allow patients to resume their daily activities sooner. DISCUSSION: This randomized clinical trial will use aÂ validated method to investigate the effect of a novel intervention for the treatment of venous ulcers. TRIAL REGISTRATION: ClinicalTrials.gov, NCT03229330 . Registered on July 2017. Activities of Daily Living;Brazil;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Nursing Staff, Hospital;Prospective Studies;Randomized Controlled Trials as Topic;Recovery of Function;Standardized Nursing Terminology;Time Factors;Treatment Outcome;Varicose Ulcer;Wound Healing

Adjunctive laser-stimulated stem-cells therapy to primary reperfusion in acute myocardial infarction in humans: Safety and feasibility study. BACKGROUND: Low-level laser therapy (LLLT) has photobiostimulatory effects on stem cells and may offer cardioprotection. This cell-based therapy may compliment primary percutaneous coronary intervention (PPCI) in patients with ST-segment elevation myocardial infarction (STEMI). OBJECTIVE: In this randomized control trial, our primary objective was to determine the safety and feasibility of LLLT application to the bone marrow in patients with STEMI undergoing PPCI. METHODS: We randomly assigned patients undergoing PPCI to LLLT or non-laser therapy (NLT). In the LLLT group, 100â€‰s of laser therapy was applied to the tibia bone prior to PPCI, as well as 24 and 72â€‰h post-PPCI. In the control group, the power source was turned off. The primary outcome was the difference in door-to-balloon (D2B) time, and additional outcomes included differences in circulating cell counts, cardiac enzymes, and left-ventricular ejection fraction (LVEF) at pre-specified intervals post-PPCI. RESULTS: Twenty-four patients were randomized to LLLT (Nâ€‰=â€‰12) or NLT (Nâ€‰=â€‰12). No adverse effects of the treatment were detected. The D2B time was not significantly different between the groups (41â€‰Â±â€‰8 vs 48â€‰Â±â€‰1â€‰min; Pâ€‰=â€‰0.73). Creatinine Phosphokinase area under the curve, was lower after LLLT (22â€‰Â±â€‰10) compared to NLT (49â€‰Â±â€‰12), but this was not statistically significant (Pâ€‰=â€‰0.08). Troponin-T was significantly lower after LLLT (2.7â€‰Â±â€‰1.4â€‰ng/mL) in comparison to NLT (5.2â€‰Â±â€‰1.8â€‰ng/mL. Pâ€‰<â€‰0.05). At 9 months, LVEF improved in both groups without a significant difference between LLLT (55â€‰Â±â€‰9%) and NLT (52â€‰Â±â€‰9%; Pâ€‰=â€‰0.90). CONCLUSION: LLLT is a safe and feasible adjunctive cell-based therapy to PPCI that may benefit ischemic myocardium. Troponin T;Creatine Kinase Aged;Blood Cell Count;Bone Marrow;Combined Modality Therapy;Creatine Kinase;Echocardiography;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Operative Time;Percutaneous Coronary Intervention;ST Elevation Myocardial Infarction;Stem Cells;Stroke Volume;Treatment Outcome;Troponin T

Influence of Low-Intensive Red Light on the Myocardium in Experimental Asphyxia. We studied the effects of low-intensity broadband red light on electrical activity of the heart and oxidative modification of proteins in the myocardium of rats after asphyxia. It was shown that low-intensity red light reduced the content of oxidatively modified proteins in rat heart after oxidative stress caused by asphyxia. Exposure to low-intensity red light normalized ECG parameters in rats after asphyxia. Glycation End Products, Advanced Animals;Asphyxia;Disease Models, Animal;Electrocardiography;Glycation End Products, Advanced;Heart Conduction System;Low-Level Light Therapy;Male;Myocardium;Oxidation-Reduction;Oxidative Stress;Rats

Low-level laser therapy (830Â nm) on orthodontic pain: blinded randomized clinical trial. The objective of this research was to compare the effect single low-level laser therapy (LLLT) irradiation on pain perception in patients having fixed appliance treatment in the clinic of orthodontics. Sixty-two patients were recruited to participate in this randomized, double-blinded, placebo-controlled study. The patients were assigned to four groups: group I-laser on the right side; group II-placebo on the right side; group III-laser on the left side; group IV-placebo on the left. The laser or placebo was applied before separation, 24 and 48Â h after separation of their first permanent molars in the lower arch. Just after the separation, the average of the pain for the placebo group was 1.6, significantly greater than the average of 1.1 registered for the laser group (pâ€‰=â€‰0.013). After 24Â h and before the new irradiation, the values registered among the different groups did not show any differences. In relation to the gender, only after the first irradiation in placebo group, the female had a level of pain (0.1) significantly higher (pâ€‰=â€‰0.04) compared to male, and after 48Â h, the group where the laser was applied had a difference (pâ€‰=â€‰0.04) among the gender with a value of lower pain for men (0.6) than for women (1.6).The laser irradiation to minimize the pain was only effective when applied immediately after treatment and separation. In general way, there were no differences between the genders, except after the first placebo group irradiation in which the female had a significantly higher level of pain compared to male and after 48Â h. The pain cycle observed in this study had its peak in 24Â h, both for laser's and placebo's group. Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Appliances, Fixed;Orthodontics;Pain;Pain Measurement;Pain Perception;Young Adult

Comparative effectiveness of photobiomodulation and manual therapy alone or combined in TMD patients: a randomized clinical trial. The effectiveness of photobiomodulation (PBM) and manual therapy (MT), alone or combined (CT), were evaluated in pain intensity, mandibular movements, psychosocial aspects, and anxiety symptoms of temporomandibular disorder (TMD) patients. Fifty-one TMD patients were randomly assigned to three groups: the PBM group (n = 18), which received PBM with 808 nm, 100 mW, 13.3 J/cm2, and 4 J per point; the MT group (n=16) for 21 minutes each session on masticatory muscles and temporomandibular joint TMJ; and the CT group (n = 17), applied during twelve sessions. Seven evaluations were performed in different moments using visual analogue scale (VAS), Research Diagnosis Criteria for Temporomandibular Disorders (RDC/TMD) Axis I and II, and Beck anxiety inventory (BAI). All groups demonstrated reductions in pain and improvement in jaw movements during treatment and at follow-up (< 0.001). The assessment of psychosocial aspects of TMD, comparing baseline and follow-up in all treatment groups, revealed that treatment did not promote modification in the intensity of chronic pain (p > 0.05). However, depression symptoms showed a reduction in PBM and CT groups (pâ‰¤0.05). All treatments promoted reduction in physical symptoms with and without pain and enhancement of jaw disabilities (p â‰¤ 0.05). MT promotes improvement in 5 functions, PBM in 2, and CT in 1 (p < 0.001). BAI analysis revealed that all treatments lead to a reduction in anxiety symptoms (pâ‰¤0.05). All protocols tested were able to promote pain relief, improve mandibular function, and reduce the negative psychosocial aspects and levels of anxiety in TMD patients. However, the combination of PBM and MT did not promote an increase in the effectiveness of both therapies alone. Adult;Aged;Anxiety;Chronic Pain;Combined Modality Therapy;Depression;Female;Follow-Up Studies;Humans;Jaw;Low-Level Light Therapy;Male;Masticatory Muscles;Middle Aged;Musculoskeletal Manipulations;Pain Management;Pain Measurement;Reference Values;Reproducibility of Results;Surveys and Questionnaires;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome;Visual Analog Scale;Young Adult

PBMT and topical diclofenac as single and combined treatment on skeletal muscle injury in diabetic rats: effects on biochemical and functional aspects. Physical exercise generates several benefits

in a short time in patients with diabetes mellitus. However, it can increase the chances of muscle damage, a serious problem for diabetic patients. Nonsteroidal anti-inflammatory drugs (NSAIDs) are widely used to treat these injuries, despite the serious adverse effects. In this way, photobiomodulation therapy (PBMT) with low-level laser therapy (LLLT) and/or light emitting diode therapy (LEDT) can be used as an alternative in this case. However, its efficacy in tissue repair of trauma injuries in diabetes mellitus until now is unknown, as well as the combination between PBMT and NSAIDs. The objective of the present study was to evaluate the effects of NSAIDs and PBMT applied alone or combined on functional and biochemical aspects, in an experimental model of muscle injury through controlled trauma in diabetic rats. Muscle injury was induced by means of a single trauma to the animals' anterior tibialis muscle. After 1Â h, the rats were treated with PBMT (830Â nm; continuous mode, with a power output of 100Â mW; 3.57Â W/cm(2); 3Â J; 107.1Â J/cm(2), 30Â s), diclofenac sodium for topical use (1Â g), or combination of them. Our results demonstrated that PBMT + diclofenac, and PBMT alone reduced the gene expression of cyclooxygenase-2 (COX-2) at all assessed times as compared to the injury and diclofenac groups (pÂ <â€‰0.05 and pÂ <â€‰0.01 respectively). The diclofenac alone showed reduced levels of COX-2 only in relation to the injury group (pÂ <â€‰0.05). Prostaglandin E(2) levels in blood plasma demonstrated similar results to COX2. In addition, we observed that PBMT + diclofenac and PBMT alone showed significant improvement compared with injury and diclofenac groups in functional analysis at all time points. The results indicate that PBMT alone or in combination with diclofenac reduces levels of inflammatory markers and improves gait of diabetic rats in the acute phase of muscle injury.
Diclofenac;Dinoprostone Administration, Topical;Animals;Combined Modality Therapy;Diabetes Mellitus, Experimental;Diclofenac;Dinoprostone;Gene Expression Regulation;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats, Wistar

[The treatment of the patients suffering from acute bacterial external otitis with the use of intravenous blood illumination by low-intensity laser radiation at a wavelength of 445 nm].
BACKGROUND: The prevalence of allergic reactions to the pharmaceutical products and the development of antibiotic resistance limit the provision of the high-quality medical care to the patients presenting with acute bacterial external otitis media (ABEO). AIM: The objective of the present study was to evaluate the effectiveness of the treatment of the patients suffering from ABEO with the application of the new technique based on intravenous blood illumination by low-intensity laser radiation at a wavelength of 445 nm (ILBI-445). MATERIAL AND METHODS: This open comparative clinical study was carried out from April 2017 till June 2017 and included the patients with ABEO who were divided into two groups. The patients of the main group underwent the standard treatment in the combination with low-intensity laser radiation at a wavelength of 445 nm. Those comprising the control group were given the conventional treatment alone. The end point of the study was the complete disappearance of local inflammatory signs in the region of the external auditory canal (EAC) and auricle, the restoration of the volume of the EAC, the absence of complaints estimated based on the visual analogue scale (VAS), and the complete disappearance of symptoms of intoxication. The local signs of inflammation in the region of the EAC and auricle were assessed from the otoscopic picture. The measurement of the volume of the external auditory canal were carried out by filling it with a furacilin solution at a temperature of 36(0)C using a 2 ml syringe. The character of the inflammatory changes in the external auditory canal, the intensity of pain and itching, as well as the degree of hearing loss were estimated at 10 points based on the 10-point visual analogue scale (with 0 points standing for the absence of complaints and 10 points denoting the maximum severity of the complaints). The symptoms of intoxication were determined from the measurements of body temperature. RESULTS: The combined treatment of the patients with ABEO using ILBI-445 resulted in their earlier recovery in comparison with that achieved by means of the standard therapy. The

differences were especially pronounced on the 5th day of treatment. Complaints of pain and the loss of hearing were documented only in the patients of the control group. Itching was a significantly less serious trouble in the patients of the main group than it was in those comprising the control group. The volume of the external auditory canal in the patients of the main group on the 5(th) day after the onset of the treatment was more than 16.7% greater than in the control one. CONCLUSIONS: The high therapeutic effectiveness and simplicity of the approach employed in the present study taken together with a minimum of contraindications for its application give reason to recommend intravenous blood illumination by low-intensity laser radiation at a wavelength of 445 nm for the treatment of the patients suffering from acute bacterial external otitis. Acute Disease;Bacterial Infections;Humans;Low-Level Light Therapy;Otitis Externa;Treatment Outcome

Measurements of the optical coefficients of the protoporphyrin IX endogenously producing yeast-based model in the visible and NIR. Models mimicking the endogenous production of protoporphyrin IX (PpIX), as well as its fluorescence, are of high interest for applied and fundamental studies in the fields of cancer detection by fluorescence imaging, photodynamic therapy (PDT), and photobiomodulation (PBM). Here, we present and describe optical properties of the yeast-based models able to produce PpIX endogenously after the administration of 5-aminolevulinic acid (ALA) and/or 2,2'-bipyridyl. As their optical properties have an important impact on the spatial distribution of the fluence rate in these liquid models, their absorption and reduced scattering coefficients were determined to be between 400 and 808Â nm for two yeast solutions previously described by our group. These coefficients were derived from measurements of the total reflectance and light penetration depth using a dedicated Monte Carlo simulation. We observed that absorption and scattering coefficients were smaller than those of soft tissues at all wavelengths. This work will enable the production of a low-cost optical phantom loaded with appropriate amounts of light-absorbing and -scattering particles to mimic tumors containing PpIX, offering a useful tool to optimize the spectral and radiometric design of certain cancer photodetection setups. Protoporphyrins;Aminolevulinic Acid;protoporphyrin IX Aminolevulinic Acid;Models, Biological;Monte Carlo Method;Phantoms, Imaging;Protoporphyrins;Spectroscopy, Near-Infrared;Yeasts

Laser treatment contributes to maintain membrane integrity in stem cells from human exfoliated deciduous teeth (shed) under nutritional deficit. This study aimed to analyze the effects of laser irradiation on the membrane integrity and viability of stem cells from human exfoliated deciduous teeth (SHED) that were kept in serum starvation. Nutritional deficit was used to mimic the cellular stress conditions of SHED isolation for regenerative dental approaches, where laser therapy could be beneficial. SHED were cultured under serum starvation (MEMÎ± + 1%FBS) for 1 or 24Â h pre-irradiation (protocols A and B, respectively). Then, cells received low-level laser therapy (LLLT; 660Â nm) at 2.5Â J/cm(2) (0.10Â W; groups I and V), 5.0Â J/cm(2) (0.20Â W; groups II and VI), 7.5Â J/cm(2) (0.30Â W; groups III and VII), or remained non-irradiated (groups IV and VIII). During irradiation, cells were maintained in 1% FBS (groups I-IV) or 10% FBS (normal culture conditions; groups V-VIII). Membrane integrity was evaluated by quantifying lactate dehydrogenase (LDH) release (immediately after irradiation), and cell viability was assessed by the MTT assay (24, 48, and 72Â h post-irradiation). Serum starvation did not alter LDH release by non-irradiated SHED, while LDH release decreased significantly in groups irradiated in 1% FBS (I and III), but not in groups irradiated in 10% FBS (V-VII), regardless the pre-irradiation conditions (protocols A/B). Cell viability was significantly higher 24Â h after irradiation, in most protocol A groups. In contrast, cell viability remained mostly unaltered in protocol B groups. LLLT contributed to maintain membrane integrity in SHED subjected to nutritional deficit before and during irradiation with 0.10 or 0.30Â W. Short serum starvation before irradiation improved SHED viability at 24Â h post-irradiation. L-Lactate

Dehydrogenase Cell Membrane;Cell Proliferation;Cell Survival;Cells, Cultured;Humans;L-Lactate Dehydrogenase;Lasers;Nutritional Physiological Phenomena;Serum;Stem Cells;Tooth Exfoliation;Tooth, Deciduous
CO(2) laser treatment for pearly penile papules - personal experience. Pearly penile papules (PPP) are physiological lesions in the epithelium of the corona of the glans penis which extend to its neck. These lesions may also appear on both sides of the frenulum. Although they are not pathological, the lesions frequently cause concern or embarrassment/discomfort in patients. They are the most common reason for seeing a dermatologist. There are several methods of treatment for PPP such as cryosurgery, electrocoagulation, treatment with CO(2), Er:YAG, or pulsed dye lasers. This paper describes the authors' experience in removing PPP with a CO(2) laser. Anti-Bacterial Agents;Antiviral Agents Adult;Anti-Bacterial Agents;Antiviral Agents;Body Image;Condylomata Acuminata;Diagnosis, Differential;Dose Fractionation, Radiation;Embarrassment;Epithelium;Humans;Hygiene;Lasers, Gas;Low-Level Light Therapy;Male;Molluscum Contagiosum;Penile Diseases;Penis;Photography;Sexual Health;Treatment Outcome
Near-Infrared Light Responsive Imaging-Guided Photothermal and Photodynamic Synergistic Therapy Nanoplatform Based on Carbon Nanohorns for Efficient Cancer Treatment. Indocyanine green (ICG) is an effective light absorber for laser-mediated photodynamic therapy. However, applications of ICG are limited due to its rapid degradation and poor photostability in water. Herein, we report the development of a multifunctional nanoplatform by coating ICG on the surface of single-walled carbon nanohorns (SWNHs) through ï€-ï€ stacking, obtaining SWNH-ICGs with high solubility and stability under physiological conditions. The SWNH-ICGs could be used as a single nanoplatform to simultaneously produce satisfactory hyperthermia and reactive oxygen species under near-infrared (NIR) laser irradiation. In addition, the SWNH-ICGs not only improved the photostability of ICG in different media, but also protected it from light degradation. The SWNH-ICGs exhibited highly efficient thermal/photoacoustic (PA) imaging-guided photothermal therapy (PTT) and photodynamic therapy (PDT) effects, even under low-power laser irradiation (0.3â€…Wâ€‰cm(-2)) in vitro. Combined PTT and PDT effectively killed triple-negative breast cancer 4T1 cells, demonstrating a markedly improved and synergistic therapeutic effect compared to PTT or PDT alone. Furthermore, significant tumor growth inhibition as well as tumor cell death were observed following PTT/PDT at 808â€…nm laser irradiation, confirming the synergistic effects of SWNH-ICGs over free ICG in vivo. This facile and simple methodology for thermal/PA imaging-guided PTT/PDT suggests that SWNH-ICGs may serve as an effective nanoplatform for cancer therapy. Antineoplastic Agents;Drug Carriers;Reactive Oxygen Species;Carbon;Indocyanine Green Animals;Antineoplastic Agents;Carbon;Cell Line, Tumor;Cell Survival;Combined Modality Therapy;Drug Carriers;Female;Hyperthermia, Induced;Indocyanine Green;Infrared Rays;Low-Level Light Therapy;Mammary Neoplasms, Animal;Mice;Nanoparticles;Photochemotherapy;Reactive Oxygen Species;Surface Properties;Tissue Distribution;Ultrasonic Waves
Evaluating the effect of photobiomodulation with a 940-nm diode laser on post-operative pain in periodontal flap surgery. The aim of this study was to evaluate the efficacy of low-power of 940-nm diode laser on post-operative pain after undisplaced flap surgery. This randomized clinical trial study was conducted using a split-mouth design. The study participants comprised 30 patients who needed periodontal flap surgery for periodontal pockets on the same tooth on both sides of the mandible. One side of the mandible was subjected to undisplaced flap surgery plus treatment with a 940-nm diode laser, and on the contralateral side, the surgery was conducted without applying the laser. Patients received anti-inflammatory medication and analgesics after surgery. The patients were asked to report the number of analgesics they took and the pain they experienced each night for

1Â week using a visual analogue scale. An independent-sample t test was used to compare the results between the two groups. Patients reported less pain on days 2, 3, 4, 5, 6, and 7 after surgery in the laser-treated group (pâ€‰<â€‰0.05). Furthermore, fewer analgesics were used in this group on days 3, 4, 5, 6, and 7 following the surgery (pâ€‰<â€‰0.05). The 940-nm diode laser with the settings used in this study could significantly reduce pain and the number of analgesics taken by patients after undisplaced flap surgery. Analgesics Adult;Analgesics;Case-Control Studies;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Periodontal Pocket;Surgical Flaps;Treatment Outcome;Young Adult

The effectiveness of combination therapy with 308-nm excimer laser in vitiligo in Han Chinese People. Calcineurin Inhibitors;Dermatologic Agents;Betamethasone;halometasone;Tacrolimus Adult;Asian People;Betamethasone;Calcineurin Inhibitors;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Tacrolimus;Vitiligo

Evaluation of scars in children after treatment with low-level laser. Burn scars are known for their tendency to worsen with hypertrophy and contracture, causing esthetic and functional problems. The objective is to analyze the effectiveness of low-level laser therapy on post-burn hypertrophic scar tissue in children. A randomized controlled study included 15 children, ranging from 2 to 10Â years of age, presented with post-burn hypertrophic scars. They received He-Ne laser and topical treatment. Each scar was divided into two halves. One half was treated with laser therapy and topical treatment (study area), and the other half was treated with topical treatment only (control area). The children were evaluated before, and after 3Â months of the study by Vancouver Scar Scale (VSS), ultrasonography, and laser Doppler perfusion imaging. Significant improvement was reported in the studied area, compared to the control area for patients with P values (PÂ =â€‰0.003) and (PÂ =â€‰0.005), for VSS and U/S scores, respectively. No differences were detected for blood perfusion of the scar between both areas (Pâ€‰=â€‰0.73). In addition, no adverse effects were reported. Photobiomodulation (PBM) is an efficient and safe therapeutic modality for post-burn hypertrophic scars in children, with no side effects, and should be considered a part of combination therapy for better results. Burns;Child;Child, Preschool;Cicatrix, Hypertrophic;Female;Humans;Low-Level Light Therapy;Male;Treatment Outcome

Prophylactic application of laser light restores L-FABP expression in the livers of rats submitted to partial ischemia. OBJECTIVES: The objective of the present study was to evaluate the protective effect of pre-conditioning treatment with laser light on hepatic injury in rats submitted to partial ischemia using mitochondrial function and liver fatty acid binding protein as markers. METHODS: Rats were divided into four groups (n=5): 1) Control, 2) Control + Laser, 3) Partial Ischemia and 4) Partial Ischemia + Laser. Ischemia was induced by clamping the hepatic pedicle of the left and middle lobes of the liver for 60 minutes. Laser light at 660 nm was applied to the liver immediately prior to the induction of ischemia at 22.5 J/cm2, with 30 seconds of illumination at five individual points. The animals were sacrificed after 30 minutes of reperfusion. Blood and liver tissues were collected for analysis of mitochondrial function, determination of malondialdehyde and analysis of fatty acid binding protein expression by Western blot. RESULTS: Mitochondrial function decreased in the Partial Ischemia group, especially during adenosine diphosphate-activated respiration (state 3), and the expression of fatty acid binding protein was also reduced. The application of laser light prevented bioenergetic changes and restored the expression of fatty acid binding protein. CONCLUSION: Prophylactic application of laser light to the livers of rats submitted to partial ischemia was found to have a protective effect in the liver, with normalization of both mitochondrial function and fatty acid binding protein tissue expression. Fabp1 protein, mouse;Fatty Acid-Binding

Proteins;Malondialdehyde;Aspartate Aminotransferases;Alanine Transaminase Alanine Transaminase;Animals;Aspartate Aminotransferases;Blotting, Western;Fatty Acid-Binding Proteins;Ischemic Preconditioning;Liver;Low-Level Light Therapy;Malondialdehyde;Mitochondrial Membranes;Mitochondrial Swelling;Rats, Wistar;Reperfusion Injury;Reproducibility of Results
Photobiomodulation therapy reduces viral load and cell death in ZIKV-infected glioblastoma cell line. Cell Death;Cell Line, Tumor;Glioblastoma;Humans;Low-Level Light Therapy;Viral Load;Zika Virus;Zika Virus Infection
Red (635 nm), Near-Infrared (808 nm) and Violet-Blue (405 nm) Photobiomodulation Potentiality on Human Osteoblasts and Mesenchymal Stromal Cells: A Morphological and Molecular In Vitro Study. Photobiomodulation (PBM) has been used for bone regenerative purposes in different fields of medicine and dentistry, but contradictory results demand a skeptical look for its potential benefits. This in vitro study compared PBM potentiality by red (635 Â± 5 nm) or near-infrared (NIR, 808 Â± 10 nm) diode lasers and violet-blue (405 Â± 5 nm) light-emitting diode operating in a continuous wave with a 0.4 J/cmÂ² energy density, on human osteoblast and mesenchymal stromal cell (hMSC) viability, proliferation, adhesion and osteogenic differentiation. PBM treatments did not alter viability (PI/Syto16 and MTS assays). Confocal immunofluorescence and RT-PCR analyses indicated that red PBM (i) on both cell types increased vinculin-rich clusters, osteogenic markers expression (Runx-2, alkaline phosphatase, osteopontin) and mineralized bone-like nodule structure deposition and (ii) on hMSCs induced stress fiber formation and upregulated the expression of proliferation marker Ki67. Interestingly, osteoblast responses to red light were mediated by Akt signaling activation, which seems to positively modulate reactive oxygen species levels. Violet-blue light-irradiated cells behaved essentially as untreated ones and NIR irradiated ones displayed modifications of cytoskeleton assembly, Runx-2 expression and mineralization pattern. Although within the limitations of an in vitro experimentation, this study may suggest PBM with 635 nm laser as potential effective option for promoting/improving bone regeneration. Calcification, Physiologic;Cell Adhesion;Cell Differentiation;Cell Line;Cell Proliferation;Cell Survival;Humans;Lasers, Semiconductor;Light;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis
Photobiomodulation therapy promotes in vitro wound healing in nicastrin KO HaCaT cells. Mutations in NCSTN gene (encoding for nicastrin protein) are associated with hidradenitis suppurativa (HS), a chronic inflammatory disease involving hair follicles. HS is clinically handled with drugs but the most severe cases are treated with surgery. Photobiomodulation (PBM) therapy, already used in the treatment of skin diseases such as acne, herpes virus lesions, ultraviolet damage, vitiligo, hypertrophic scar, keloid, burn, psoriasis and diabetic chronic wounds, could be beneficial as an adjuvant supportive treatment to promote and foster the healing process after skin excision in HS. The effects of PBM therapy in promoting the wound closure are evaluated in a HaCaT cells NCSTN-/-, assessing cell metabolism, migration rate, proliferation and cell cycle progression. In our experimental model, PBM exerts a potent action on metabolism of mutated keratinocytes, incrementing adenosine triphosphate (ATP) production at 2 hours, while after 24â€‰hours an increase of metabolism with a decrement of intracellular ATP levels were recorded. Moreover, PBM speeds up the wound closure, inducing cells' migration without affecting their proliferation.Based on our findings, we suggest the use of PBM in HS patients, who undergo major surgery with large skin excision. Membrane Glycoproteins;nicastrin protein;Amyloid Precursor Protein Secretases Amyloid Precursor Protein Secretases;Cell Cycle;Cell Line;Cell Movement;Cell Proliferation;Gene Knockout Techniques;Humans;Keratinocytes;Low-Level Light Therapy;Membrane Glycoproteins;Wound Healing
Photobiomodulation Optimization for Spinal Cord Injury Rat Phantom Model. Spinal Cord Injury (SCI) causes interruption along the severed axonal tract(s) resulting in complete or partial loss of sensation and motor function. SCI can cause tetraplegia or paraplegia. Both these conditions can have

lifelong excessive medical costs, as well as can reduce life expectancy. Preclinical research showed that Photobiomodulation therapy (PBMT), also known as Low-level laser (light) therapy (LLLT), possesses reparative and regenerative capabilities that have the potential to be used as a complimentary or supplementary SCI therapy. Despite the promising effects of PBMT, there are still no standardized irradiation parameters (i.e. different wavelengths, power, fluence, irradiance, beam type, beam diameters, and irradiation time) and there is also a lack of standardized experimental protocol(s), which makes it difficult to compare different studies. It is, nonetheless, essential to standardize such irradiation parameters in order to provide better PBMTs. The aim of this study, therefore, is to evaluate the delivery of light in a 3D voxelated SCI rat model for PBMT using different irradiation parameters (wavelengths: 660, 810, and 980 nm; beam types: Gaussian and Flat beam; and beam diameters: 0.04-1.2 cm) using Monte Carlo simulation. This study also aids in providing standardization for preclinical research for PBMT, which will eventually translate into clinical standardization upon clinical research studies and results.

Effect of low-level laser therapy on tooth-related pain and somatosensory function evoked by orthodontic treatment. Low-level laser therapy (LLLT) may have an effect on the pain associated with orthodontic treatment. The aim of this study was to evaluate the effect of LLLT on pain and somatosensory sensitization induced by orthodontic treatment. Forty individuals (12-33 years old; meanâ€‰Â±â€‰standard deviations: 20.8â€‰Â±â€‰5.9 years) scheduled to receive orthodontic treatment were randomly divided into a laser group (LG) or a placebo group (PG) (1:1). The LG received LLLT (810-nm gallium-aluminium-arsenic diode laser in continuous mode with the power set at 400â€‰mW, 2â€‰JÂ·cm(-2)) at 0â€‰h, 2â€‰h, 24â€‰h, 4 d, and 7 d after treatment, and the PG received inactive treatment at the same time points. In both groups, the non-treated side served as a control. A numerical rating scale (NRS) of pain, pressure pain thresholds (PPTs), cold detection thresholds (CDTs), warmth detection thresholds (WDTs), cold pain thresholds (CPTs), and heat pain thresholds (HPTs) were tested on both sides at the gingiva and canine tooth and on the hand. The data were analysed by a repeated measures analysis of variance (ANOVA). The NRS pain scores were significantly lower in the LG group (Pâ€‰=â€‰0.01). The CDTs, CPTs, WDTs, HPTs, and PPTs at the gingiva and the PPTs at the canine tooth were significantly less sensitive on the treatment side of the LG compared with that of the PG (Pâ€‰<â€‰0.033). The parameters tested also showed significantly less sensitivity on the non-treatment side of the LG compared to that of the PG (Pâ€‰<â€‰0.043). There were no differences between the groups for any quantitative sensory testing (QST) measures of the hand. The application of LLLT appears to reduce the pain and sensitivity of the tooth and gingiva associated with orthodontic treatment and may have contralateral effects within the trigeminal system but no generalized QST effects. Thus, the present study indicated a significant analgesia effect of LLLT application during orthodontic treatment. Further clinical applications are suggested. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Pain Management;Pain Measurement;Pain Threshold;Tooth Movement Techniques;Toothache;Treatment Outcome;Young Adult

Efficacy and Safety of a Low-Level Light Therapy for Androgenetic Alopecia: A 24-Week, Randomized, Double-Blind, Self-Comparison, Sham Device-Controlled Trial. BACKGROUND: Previous studies have reported the benefits of low-level/light laser therapy (LLLT) for the promotion of hair regrowth. However, the effectiveness of LLLT for the treatment of androgenetic alopecia (AGA) is still a topic of debate. OBJECTIVE: To investigate the efficacy and safety of LLLT on hair regrowth in patients with AGA. METHODS: This 24-week, randomized, double-blind, self-comparison, sham device-controlled trial enrolled 100 patients with AGA. All participants were randomly assigned to receive the investigational LLLT on one side of the head and sham light treatment on the contralateral side, 3 times weekly for 30 minutes each, over a 24-week period. Global scalp photography,

phototrichogram assessment, the investigator's global assessment (IGA) of hair regrowth, and the subject's assessment of the treatment satisfaction were used for evaluation. RESULTS: After 24 weeks of treatment, the LLLT-treated scalp exhibited significantly greater hair coverage than the sham light-treated side (14.2% vs. 11.8%, p < .001). A significantly greater improvement from baseline in hair thickness, hair count, hair coverage, and IGA were also observed in the LLLT-treated side than in the sham light-treated side at the 12- and 24-week visits. No serious adverse events were observed. CONCLUSION: The use of LLLT might be an effective, safe, well-tolerated treatment for AGA. Adult;Alopecia;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Taiwan;Treatment Outcome

Effects of Low-Level Laser Therapy in Autism Spectrum Disorder. The study examined the efficacy of low-level laser therapy, a form of photobiomodulation, for the treatment of irritability associated with autistic spectrum disorder in children and adolescents aged 5-17Â years. Twenty-one of the 40 participants received eight 5-min procedures administered to the base of the skull and temporal areas across a 4-week period (test, i.e., active treatment participants). All the participants were evaluated with the Aberrant Behavior Checklist (ABC), with the global scale and five subscales (irritability/agitation, lethargy/social withdrawal, stereotypic behavior, hyperactivity/noncompliance, and inappropriate speech), and the Clinical Global Impressions (CGI) Scale including a severity-of-illness scale (CGI-S) and a global improvement/change scale (CGI-C). The evaluation took place at baseline, week 2 (interim), week 4 (endpoint), and week 8 (post-procedure) of the study. The adjusted mean difference in the baseline to study endpoint change in the ABC irritability subscale score between test and placebo participants was -15.17 in favor of the test procedure group. ANCOVA analysis found this difference to be statistically significant (FÂ =Â 99.34, pÂ <Â 0.0001) compared to the baseline ABC irritability subscale score. The study found that low-level laser therapy could be an effective tool for reducing irritability and other symptoms and behaviors associated with the autistic spectrum disorder in children and adolescents, with positive changes maintained and augmented over time. Adolescent;Autism Spectrum Disorder;Child;Child, Preschool;Humans;Low-Level Light Therapy;Treatment Outcome

Neuroprotective effect of a new photobiomodulation technique against AÎ²(25-35) peptide-induced toxicity in mice: Novel hypothesis for therapeutic approach of Alzheimer's disease suggested. INTRODUCTION: Photobiomodulation was assessed as a novel treatment of Alzheimer's disease (AD) by the use of a new device RGn500 combining photonic and magnetic emissions in a mouse model of AD. METHODS: Following the injection of amyloid Î² 25-35 peptide in male Swiss mice, RGn500 was applied once a day for 7 days either on the top of the head or the center of abdomen or both. RESULTS: RGn500 daily application for 10 min produced a neuroprotective effect on the neurotoxic effects of amyloid Î² 25-35 peptide injection when this type of photobiomodulation was applied both on the head and on the abdomen. Protection was demonstrated by memory restoration and on the normalization of key markers of AD (amyloid Î² 1-42, pTau), oxidative stress (lipid peroxidation), apoptosis (Bax/Bcl2) and neuroinflammation. DISCUSSION: RGn500 displays therapeutic efficacy similar to other pharmacological approaches evaluated in this model of AD.

Administration of low-level laser on muscles of mastication following the induction of initial fatigue: protocol for a randomized, controlled, clinical trial. BACKGROUND: Orofacial pain encompasses painful conditions, such as temporomandibular disorder (TMD). Multidisciplinary health teams seek to control such musculoskeletal disorders to improve the quality and functional capacity of the muscles of mastication. The aim of the proposed study is to evaluate the effect of low-level laser therapy as a form of treatment for the prevention of initial fatigue of the muscles of mastication (masseter and anterior temporal muscles) as well as the recovery of these muscles after induced exhaustion (caused by isometric contraction) in young adults. METHODS: The participants will be 78

healthy male and female volunteers between 18 and 34 years of age. The volunteers will be randomly allocated to a laser group (nâ€Š=â€Š26), sham group (nâ€Š=â€Š26), and control group (nâ€Š=â€Š26). All participants will be submitted to a clinical evaluation to record mandibular movements, bite force, muscle sensitivity to palpation, and initial muscle fatigue. Initial fatigue will be induced by isometric contraction of the jaws. Maximum voluntary contraction will be performed to record the time until initial exhaustion of the masseter muscle (determined by electromyography). The groups will then be submitted to the interventions: active laser therapy (wavelength: 780â€Šnm; fluence: 134â€ŠJ/cm; power: 50â€ŠmW; irradiance: 1.675â€ŠW/cm; exposure time: 80â€Šseconds per point) on 3 points of the masseter and 1 point on the anterior temporal muscles on each side; sham laser (placebo effect); or no intervention (control). Maximum voluntary contraction will be performed again after the interventions to record the time until initial exhaustion of the masseter muscle (determined by electromyography). Differences in individual time until exhaustion between the pre- and postintervention evaluations will be measured to determine the effect of low-level laser therapy. DISCUSSION: Although studies have been made with the use of low-level laser therapy in TMDs and on the effect of photobiomodulation on fatigue, this the first study to test this therapy in the prevention of fatigue in this region. The clinical relevance lies in the fact that longer dental procedures could take place if the patients are less prone to fatigue.
Adolescent;Adult;Electromyography;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Mastication;Muscle Fatigue;Research Design;Temporal Muscle;Young Adult

The Effectiveness of Photobiomodulation Therapy Versus Cryotherapy for Skeletal Muscle Recovery: A Critically Appraised Topic. Clinical Scenario: Cryotherapy is one of the most commonly used modalities for postexercise muscle recovery despite inconsistencies in the literature validating its effectiveness. With the need to find a more effective modality, photobiomodulation therapy (PBMT) has gained popularity because of recent research demonstrating its ability to accelerate the muscle recovery process. Focused Clinical Question: Is PBMT more effective than cryotherapy at reducing recovery time and decreasing delayed onset muscle soreness after strenuous exercise? Summary of Key Findings: Three moderate- to high-quality double-blinded, randomized, placebo-controlled trials and 2 low- to moderate-quality translational studies performed on rats were included in this critically appraised topic. All 5 studies supported the use of PBMT over cryotherapy as a treatment for postexercise muscle recovery following exercise. PBMT was superior in reducing creatine kinase, inflammation markers, and blood lactate compared with cryotherapy, following strenuous/high intensity aerobic or strength muscular exercise. PBMT was also shown to improve postexercise muscle performance and function more than cryotherapy. Clinical Bottom Line: There is moderate evidence to suggest the use of PBMT over cryotherapy postexercise to enhance muscle recovery in trained and untrained athletes. Shorter recovery times and increased muscle performance can be seen 24 to 96Â hours following PBMT application. Strength of Recommendation: Based on consistent findings from all 5 studies, there is grade B evidence to support the use of PBMT over cryotherapy for more effective postexercise recovery of skeletal muscle performance. Biomarkers
Athletes;Biomarkers;Cryotherapy;Exercise;Humans;Low-Level Light Therapy;Muscle Fatigue;Muscle, Skeletal;Myalgia;Recovery of Function

Photobiomodulation for Global Cerebral Ischemia: Targeting Mitochondrial Dynamics and Functions. Hypothermia is currently the only approved therapy for global cerebral ischemia (GCI) after cardiac arrest; however, it unfortunately has multiple adverse effects. As a noninvasive procedure, photobiomodulation (PBM) therapy has emerged as a potential novel treatment for brain injury. PBM involves the use of low-level laser light therapy to influence cell behavior. In this study, we evaluated the therapeutic effects of PBM treatment with an 808-nm diode laser initiated 6Â h after GCI. It was

noted that PBM dose-dependently protected against GCI-induced neuronal death in the vulnerable hippocampal CA1 subregion. Functional assessments demonstrated that PBM markedly preserved both short-term (a week) and long-term (6Â months) spatial learning and memory function following GCI. Further mechanistic studies revealed that PBM post-treatment (a) preserved healthy mitochondrial dynamics and suppressed substantial mitochondrial fragmentation of CA1 neurons, by reducing the detrimental Drp1 GTPase activity and its interactions with adaptor proteins Mff and Fis1 and by balancing mitochondrial targeting fission and fusion protein levels; (b) reduced mitochondrial oxidative damage and excessive mitophagy and restored mitochondrial overall health status and preserved mitochondrial function; and (c) suppressed mitochondria-dependent apoptosome formation/caspase-3/9 apoptosis-processing activities. Additionally, we validated, in an in vitro ischemia model, that cytochrome c oxidase served as a key PBM target for mitochondrial function preservation and neuroprotection. Our findings suggest that PBM serves as a promising therapeutic strategy for the functional recovery after GCI, with mechanisms involving PBM's preservation on mitochondrial dynamics and functions and the inhibition of delayed apoptotic neuronal death in GCI.
Animals;Brain Ischemia;Cell Death;Hippocampus;Low-Level Light Therapy;Male;Maze Learning;Mitochondria;Mitochondrial Dynamics;Neurons;Rats;Rats, Sprague-Dawley

Photobiomodulation reduces neutrophil migration and oxidative stress in mice with carrageenan-induced peritonitis. The purpose of the study is to investigate the effects of two doses of photobiomodulation (PBM) on inflammatory parameters including cell migration and oxidative stress in carrageenan-induced peritonitis models. Twenty-eight mice were divided into four groups: saline; untreated carrageenan (Cg; inflammation induced); and PMB treatment groups L1 and L5 (inflammation induced with carrageenan followed by laser irradiation at 1 and 5Â J/cm(2), respectively). After 30Â min of inducing inflammation, laser irradiation was administered every hour, for 4Â h. Peritoneal fluid was collected for analyses. The total leukocyte number in the peritoneal fluid in L1 (4.33â€‰Â±â€‰2.34) and L5 (4.95â€‰Â±â€‰2.86) after PBM was lower than that in Cg (10.93â€‰Â±â€‰5.15Â cells/ml). The average differential count of neutrophils in the Cg was 9.46â€‰Â±â€‰4.31Â cells/ml, which was higher than that in L1 (3.7â€‰Â±â€‰2.08) and L5 (4.94â€‰Â±â€‰2.57). Myeloperoxidase activity was also lower in L1 (1.89â€‰Â±â€‰0.43) and L5 (4.84â€‰Â±â€‰2.62) than in Cg (22.92â€‰Â±â€‰4.52Â UMPO/ml). Malondialdehyde content was lower in L1 (137.5â€‰Â±â€‰12.33) and L5 (169.6â€‰Â±â€‰22.77) than in Cg (345.7â€‰Â±â€‰65.67Â nmol/ml). Glutathione peroxidase concentration was significantly higher in L1 (155.2â€‰Â±â€‰12.43) and L5 (145.9â€‰Â±â€‰9.585) than in Cg (79.75â€‰Â±â€‰9.567Â Î¼/ml). Nitrite concentration was lower in L1 (0.3317Â Î¼Mâ€‰Â±â€‰0.0669) and L5 (0.2429Â Î¼Mâ€‰Â±â€‰0.0232) than in Cg (0.8380Â Î¼Mâ€‰Â±â€‰0.01615). Laser irradiation at 1 and 5Â J/cm(2) reversed the inflammation (as indicated by neutrophil infiltration and oxidative stress).
Nitrates;Nitrites;Malondialdehyde;Carrageenan;Peroxidase;Glutathione
Animals;Carrageenan;Cell Movement;Glutathione;Low-Level Light Therapy;Male;Malondialdehyde;Mice;Neutrophils;Nitrates;Nitrites;Oxidative Stress;Peritonitis;Peroxidase

Treatment of mucositis with combined 660- and 808-nm-wavelength low-level laser therapy reduced mucositis grade, pain, and use of analgesics: a parallel, single-blind, two-arm controlled study.
Oral squamous cell carcinoma (OSCC) is the most frequent oral malignant neoplasia. As consequence of OSCC treatment, oral mucositis (OM) is one of the most common adverse effects of OSCC treatment. Currently, there is no consensus for OM treatment. The purpose of the current study was to test the combination of red and infrared low-level laser therapy (LLLT) for OM treatment. Primary culture of human fibroblast was performed to identify LLLT dose. After laboratory tests, a two-arm

parallel, single-blind, controlled study was conducted. The two arms were group 1, both 660- and 808-nm wavelengths (300Â J/cm(2), 9Â J of total energy, 100Â mW, spot size 3Â mm(2)), and group 2, only 660-nm wavelength (300Â J/cm(2), 9Â J of total energy, 100Â mW, spot size 3Â mm(2)). Both treatments were performed twice a week. Group 1 presented a reduction of mucositis grade in comparison to group 2. Group 1 also presented reduction of analgesics prescription. But no significant differences between groups 1 and 2 were observed according to the pain scale. In conclusion, the current study demonstrated that a combination of red and infrared at a higher dose (300Â J/cm(2)) reduced both oral mucositis grade and analgesics prescription. The effects of the combination of RT and LLLT are unclear and need more studies. Analgesics Administration, Oral;Adult;Aged;Aged, 80 and over;Analgesics;Female;Fibroblasts;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Single-Blind Method;Stomatitis

Effects of laser therapy on patients who underwent rapid maxillary expansion; a systematic review. Rapid maxillary expansion (RME) is one of the common treatments of transverse maxillary deficiency, and low-level laser therapy (LLLT) is one of the recommended solutions to enhance biological wound or bone healing. This review article aims to answer the following question: "What are the effects of LLLT, on patients who underwent surgical or non-surgical RME, in improving clinical success, wound healing, and bone regeneration?" A search in PubMed, Scopus, Web of Science, and ProQuest databases was performed, with a focus on the appropriate key words. Related articles, up to May 2017, were screened, and the full text of the randomized controlled trials (RCT) were comprehensively read and subjected to quality assessments. A total of 1804 articles were included after the initial search. Four RCTs were eligible in randomization and methodology. The applied wavelength varied from 660 to 830Â nm with an output range of 40-100Â mW. Also, the highest exposed energy was 420Â J/cm(2) and the lowest was 100Â J/cm(2). The exposure time differed from 20 to 84Â s in each defined point in the palate. Based on the RCTs available, LLLT is better to be used at initial phase of RME, because it has some benefits in increasing the rate of bone remodeling. Adolescent;Adult;Child;Humans;Low-Level Light Therapy;Palatal Expansion Technique;Randomized Controlled Trials as Topic;Young Adult

A pilot study of laser energy transmission through bone and gingiva. BACKGROUND: The use of low-level laser therapy is growing in the field of dentistry especially in orthodontics to speed up tooth movement and in implantology to aid osseointegration. In these dental applications, the laser energy needs to penetrate through the periodontium to the target site to stimulate photobiomodulation. The percentage of energy loss when laser is transmitted through the periodontium has not been previously studied. With the use of an 808-nanometer diode laser, the aim was to investigate the percentage loss of laser energy when transmitted through the periodontium to the extraction socket. METHODS: The percentage energy loss of an 808-nm diode laser through the periodontium was measured in 27 tooth sockets by using a specifically designed photodiode ammeter. RESULTS: For each millimeter of increased bone thickness there was 6.81% reduction in laser energy (95% confidence interval, 5.02% to 8.60%). The gingival thickness had no statistically significant effect on energy penetration. CONCLUSION: Energy penetration depends markedly on bone thickness and is independent of gingival thickness. PRACTICAL IMPLICATIONS: To the best of the authors' knowledge, this study is one of the first to investigate laser penetration through the periodontium. Evidence from this study showed that laser energy penetration through the periodontium is markedly affected by bone thickness but less so by gingival thickness. Clinicians need to be aware of the biological factors that could affect laser energy penetration to the target site and adjust their laser dosages accordingly. These findings may guide dental practitioners in selecting the appropriate laser dosage parameters for low-level laser therapy. Gingiva;Periodontium;Pilot Projects;Tooth Movement Techniques;Tooth Socket

Laser Irradiation of Organic Tattoo PigmentsÂ Releases Carcinogens with 3,3'-Dichlorobenzidine Inducing DNA Strand Breaks in Human Skin Cells. Carcinogens;Coloring Agents;3,3'-Dichlorobenzidine;DNA 3,3'-Dichlorobenzidine;Animals;Carcinogens;Cells, Cultured;Coloring Agents;DNA;DNA Breaks;Gas Chromatography-Mass Spectrometry;Genomic Instability;Humans;Keratinocytes;Low-Level Light Therapy;Skin;Swine;Tattooing

Phototherapy on Management of Creatine Kinase Activity in General Versus Localized Exercise: A Systematic Review and Meta-Analysis. OBJECTIVE: The main focus of this systematic review was to determine the efficacy of phototherapy in the management of creatine kinase (CK) activity after exercise and furthermore to identify for which exercise model protocol phototherapy provides the best results. DESIGN: Meta-analysis comparing phototherapy with a control condition. SETTING: The MEDLINE, EMBASE, SPORTDiscus, PEDro, and CENTRAL databases were searched from their earliest records to October 03, 2016. Data were pooled in a meta-analysis and described as standardized mean difference (SMD) with 95% confidence intervals (CIs) using a random effects model. PARTICIPANTS: Healthy subjects (no restrictions were applied, eg, age, sex, and exercise level). INTERVENTION: Phototherapy (low-level laser therapy and/or light-emitting diode therapy) before or after exercise and a placebo or control condition. MAIN OUTCOME MEASURES: Creatine kinase activity (no restriction to any analysis, eg, serum, plasma, or capillary blood). RESULTS: Fourteen studies were included for review. The results revealed that phototherapy has a more positive effect than control condition in management of CK activity [SMD = 0.77, 95% CI (0.32 to 1.22); P = 0.0007; I = 72%]. In exploratory analysis, the results showed that phototherapy was effective only in the exercise protocol with localized exercise with large effect size [localized exercise: SMD = 0.89, 95% CI (0.26 to 1.51); P = 0.0002; I = 76%; general exercise: SMD = 0.61, 95% CI (-0.05 to 1.26); P = 0.07; I = 67%]. CONCLUSIONS: The available evidence suggest that phototherapy has beneficial effects on the management of CK activity and demonstrate a possible relationship based on damage caused by exercise, providing a greater effect in studies that used localized exercise. Biomarkers;Creatine Kinase Athletic Performance;Biomarkers;Creatine Kinase;Exercise;Humans;Muscle, Skeletal;Myalgia;Phototherapy;Recovery of Function

Antimicrobial photodynamic therapy as a new approach for the treatment of vulvovaginal candidiasis: preliminary results. In this work, we present the efficacy of photodynamic therapy against yeast cells in an animal model. We tested two photosensitizers, methylene blue and protoporphyrin IX. Thirty-seven female BALB-c mice with a body mass of 20-25Â g were used. To achieve persistent vaginitis, estrus was induced by subcutaneous injection of 0.1Â mg/mL estradiol valerate applied weekly. Three days after pseudo-estrus, intravaginal inoculation with Candida albicans was performed. Mice were anesthetized with ketamine (80Â mg/kg) and xylazine (10Â mg/kg) by intraperitoneal injection before inoculation, and antimicrobial photodynamic therapy (aPDT) was performed 5Â days after fungal inoculation. Two photosensitizers were tested, methylene blue (MB; 100Â Î¼M) and protoporphyrin IX (PpNetNI; 10Â Î¼M). Two custom-made LEDs emitting light at 660 and 630Â nm at approximately 800Â mW each were used for irradiation. The aPDT treatment reduced the fungal colony-forming units (CFUs) by one order of magnitude for the MB (pâ€‰=â€‰0.020) and PpNetNI (pâ€‰=â€‰0.018) photosensitizers. Seven days after the treatment, there were significantly fewer CFUs compared to the control group (pâ€‰=â€‰0.041 and pâ€‰=â€‰0.035 for MB and PpNetNI, respectively), but this was not increased compared to the initial number immediately after aPDT. Using aPDT as a therapeutic option to decrease fungal infection in a vaginal candidiasis model resulted in a significant reduction in the C. albicans population. Both photosensitizers were effective for preventing reinfection within 7Â days. The aPDT also had no effect on the vaginal mucosa at the ultrastructural level. In addition to the fungicide effect, we observed reduced swelling and lack of the formation of abscesses, microabscesses coating

the cornified epithelial layer, and the accumulation of neutrophils in the submucosa. Anti-Infective Agents;Photosensitizing Agents;Protoporphyrins;protoporphyrin IX;Methylene Blue
Animals;Anti-Infective Agents;Candida albicans;Candidiasis, Vulvovaginal;Female;Humans;Inflammation;Methylene Blue;Mice, Inbred BALB C;Neutrophils;Photochemotherapy;Photosensitizing Agents;Protoporphyrins;Vagina

Low-level laser therapy combined to functional exercise on treatment of fibromyalgia: a double-blind randomized clinical trial. This study aims to investigate the effects of low-level laser therapy (LLLT) combined to a functional exercise program on treatment of FM. A double-blind and placebo-controlled randomized clinical trial composed of 22 women divided into two groups: placebo group (functional exercise program associated with placebo phototherapy nâ€‰=â€‰11) and laser group (same exercise program associated with active phototherapy; nâ€‰=â€‰11). Each session lasted from 40 to 60Â min and was performed three times a week for 8Â weeks. Phototherapy (808Â nm, 100Â mW, 4Â J, and 142.85Â J/cm(2) per point) was bilaterally applied to different points of the quadriceps (8), hamstrings (6), and triceps sural muscles (3) immediately after each exercise session. Pre- and post-intervention evaluations regarding pain (sites, intensity, and threshold), functional performance (balance, functional tests), muscle performance (flexibility and isokinetic variables), depression, and quality of life were conducted. A reduction in pain and improvement in functional and muscular performance, depression, and quality of life were observed in both groups (pâ€‰<â€‰0.05); however, with no significant differences between them (pâ€‰>â€‰0.05). In conclusion, the benefic effects of functional exercise were not improved by combination with LLLT.
Adult;Combined Modality Therapy;Depression;Double-Blind Method;Exercise Therapy;Female;Fibromyalgia;Humans;Low-Level Light Therapy;Middle Aged;Pain;Pain Threshold;Phototherapy;Quality of Life

Non-pharmacological pain relief during orthodontic treatment. Data sourcesA comprehensive literature search in all languages was carried out. Cochrane Oral Health's Information Specialist searched the following databases: Cochrane Oral Health's Trials Register (till 6 October 2016), the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, 2016, Issue 9), MEDLINE Ovid (1946 till October 6th, 2016), Embase Ovid (1980 till October 6th, 2016) and EThOS (till October 6th, 2016). ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform. Authors were contacted to clarify study information.Study selectionThe inclusion criteria of studies were defined as patients undergoing orthodontic treatment, up to 18 years of age. INTERVENTIONS: orthodontic treatment, exposure: non-pharmacological orthodontic pain intervention (low-level laser therapy, vibratory stimulation, chewing adjuncts, brain wave music or cognitive behavioral therapy and post-treatment communication 'text message'). OUTCOME: pain.Data extraction and synthesisTwo authors reviewed each study independently. A third author was used to resolve any disagreement on the eligibility of the included studies. The authors excluded papers that had unsuitable study design, and assessed the risk of bias on each paper they included. Data were combined using a random effect model and expressed results as mean differences (MD) with 95% confidence intervals (CIs).ResultsThe authors included 14 randomised controlled trials (RCTs) that randomised 931 participants. Intervention modalities included: low-level laser therapy (LLLT) (four studies); vibratory devices (five reviews); chewing adjuncts (three studies); brainwave music or cognitive behavioral therapy (one study) and post-treatment communication in the form of a text message (one study). Twelve studies involved self-report assessment of pain on a continuous scale and two studies used questionnaires to assess the nature, intensity and location of pain. The combined data from two studies involving 118 participants provided low-quality evidence that LLLT reduced pain at 24 hours by 20.27 mm (95% CI -24.50 to -16.04, P < 0.001; IÂ² = 0%). LLLT also appeared to reduce pain at six hours, three days and seven days. The results for the other

comparisons are inconclusive due to low evidence quality.ConclusionsThe overall results of the current study are inconclusive. There is low quality evidence that non-pharmacological interventions reduce pain during orthodontic treatment. Adolescent;Cognitive Behavioral Therapy;Female;Humans;Low-Level Light Therapy;Male;Music Therapy;Orthodontics;Pain Management

Effect of led photobiomodulation on analgesia during labor: Study protocol for a randomized clinical trial. BACKGROUND: Labor pain is one of the most intense pains experienced by women, which leads to an increase in the number of women opting to undergo a cesarean delivery. Pharmacological and nonpharmacological analgesia methods are used to control labor pain. Epidural analgesia is the most commonly used pharmacological analgesia method. However, it may have side effects on the fetus and the mother. Light-emitting diode (LED) photobiomodulation is an effective and noninvasive alternative to pharmacological methods. OBJECTIVES: To evaluate the effects of LED photobiomodulation on analgesia during labor. METHODS: In total, 60 women in labor admitted to a public maternity hospital will be selected for a randomized controlled trial. The participants will be randomized into 2 groups: intervention group [analgesia with LED therapy (nâ€Š=â€Š30)] and control group [analgesia with bath therapy (nâ€Š=â€Š30)]. The perception of pain will be assessed using the visual analogue scale (VAS), with a score from 0 to 10 at baseline, that is, before the intervention. In both the groups, the procedures will last 10â€Šminutes and will be performed at 3 time points during labor: during cervical dilation of 4 to 5â€Šcm, 6 to 7â€Šcm, and 8 to 9â€Šcm. At all 3 time points, pain perception will be evaluated using VAS shortly after the intervention. In addition, the evaluation of membrane characteristics (intact or damaged), heart rate, uterine dynamics, and cardiotocography will be performed at all time points. EXPECTED OUTCOMES: The use of LED photobiomodulation will have an analgesic effect superior to that of the bath therapy. Adult;Analgesia, Epidural;Analgesia, Patient-Controlled;Cesarean Section;Female;Humans;Labor Pain;Labor Stage, First;Low-Level Light Therapy;Monitoring, Physiologic;Pain Management;Pain Measurement;Pregnancy;Research Design

Photobiomodulation prevents DNA fragmentation of alveolar epithelial cells and alters the mRNA levels of caspase 3 and Bcl-2 genes in acute lung injury. Acute respiratory distress syndrome (ARDS) and acute lung injury (ALI) are defined as pulmonary inflammation that could occur from sepsis and lead to pulmonary permeability and alveolar edema making them life-threatening diseases. Photobiomodulation (PBM) properties have been widely described in the literature in several inflammatory diseases; although the mechanisms of action are not always clear, this could be a possible treatment for ARDS/ALI. Thus, the aim of this study was to evaluate the mRNA levels from caspase-3 and BCL-2 genes and DNA fragmentation in lung tissue from Wistar rats affected by ALI and subjected to photobiomodulation by exposure to a low power infrared laser (808 nm; 100 mW; 3.571 W cm-2; four points per lung). Adult male Wistar rats were randomized into 6 groups (n = 5, for each group): control, PBM10 (10 J cm-2, 2 J and 2 seconds), PBM20 (20 J cm-2, 5 J and 5 seconds), ALI, ALI + PBM10 and ALI + PBM20. ALI was induced by intraperitoneal Escherichia coli lipopolysaccharide injection. Lung samples were collected and divided for mRNA expression of caspase-3 and Bcl-2 and DNA fragmentation quantifications. Data show that caspase-3 mRNA levels are reduced and Bcl-2 mRNA levels increased in ALI after low power infrared laser exposure when compared to the non-exposed ALI group. DNA fragmentation increased in inflammatory infiltrate cells and reduced in alveolar cells. Our research shows that photobiomodulation can alter relative mRNA levels in genes involved in the apoptotic process and DNA fragmentation in inflammatory and alveolar cells after lipopolysaccharide-induced acute lung injury. Also, inflammatory cell apoptosis is part of the photobiomodulation effects induced by exposure to a low power infrared laser. RNA, Messenger;Caspase 3 Acute Lung Injury;Animals;Apoptosis;Caspase 3;DNA Fragmentation;Gene

Expression Regulation;Genes, bcl-2;Infrared Rays;Low-Level Light Therapy;Lung;Male;RNA, Messenger;Rats, Wistar

Low-level laser treatment applied at auriculotherapy points to reduce postoperative pain in third molar surgery: A randomized, controlled, single-blinded study. OBJECTIVE: Evaluate the effectiveness of LLL (Low level laser therapy) in auriculotherapy points for pain reduction following lower third molar extractions. STUDY DESIGN: Randomized, controlled, single-blinded study. METHODS: Eighty-four bilateral, symmetrical third molar surgeries were performed in 42 healthy patients using a split-mouth design. In the immediate postoperative period, each side was randomly treated in a single-blind method with an LLL at the auriculotherapy points or simulation of its use (contralateral side) over a 21-day interval. This protocol was repeated 24 and 48 hours after surgery. All patients used the same analgesic (paracetamol) but only in case of pain. The primary variable was postoperative pain according to the visual analogue scale, and the secondary variables were mouth opening, edema, local temperature, dysphagia, and the presence of infection (systemic temperature, lymphadenopathy). These variables were evaluated at baseline and at 24 hours, 48 hours and seven days after surgery. Adverse effects were recorded and reported. RESULTS: There was no difference between the groups in relation to any of the evaluated parameters ($p>0.05$). CONCLUSION: For this experimental model, application of a low-intensity laser at auriculotherapy points did not prevent postoperative pain following lower third molar surgery. TRIAL REGISTRATION: This trial is registered at ClinicalTrials.gov; the registration number is NCT02657174 and the Unique Protocol ID number is 1.100.869.
(https://register.clinicaltrials.gov/prs/app/template/EditRecord.vm?epmode=View&listmode=Edit&uid=U0002BEY&ts=11&sid=S0006026&cx=6g4wff).
Adult;Auriculotherapy;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Pain, Postoperative;Single-Blind Method;Tooth Extraction

Photobiomodulation in the Postoperative of Bichectomy Surgeries: Case Series. BACKGROUND: Several photobiomodulation (PBM) protocols with low-power lasers have been reported for pain control and tissue repair in the postoperative period of oral surgeries. However, there are still no reports of a protocol for bichectomy surgeries' postoperative period. OBJECTIVE: This article presents six reports of clinical cases in which bichectomy surgery was performed. METHODS: In the postoperative period, three patients were submitted to PBM with low-power lasers, while three patients did not receive it. Facial edema was evaluated using a millimeter tape. Pain was determined using the visual analog scale. RESULTS: Data of each clinical case were evaluated in a descriptive way and compared. CONCLUSIONS: The efficacy of the PBM protocol on the postoperative period of bichectomy surgeries was evidenced by the decrease of edema and pain.
Adult;Cheek;Dermatologic Surgical Procedures;Edema;Female;Humans;Low-Level Light Therapy;Male;Pain, Postoperative

Motorized 0.8-mm micropunch grafting for refractory vitiligo: A retrospective study of 230 cases. BACKGROUND: Punch grafting for vitiligo is time-consuming and can result in cobblestone-like appearances. We devised a motorized 0.8-mm micropunch grafting procedure to overcome these limitations. OBJECTIVE: To assess the therapeutic effectiveness and adverse events associated with micropunch grafting in refractory vitiligo. METHODS: We retrospectively reviewed 230 cases in 208 patients with stable vitiligo who underwent motorized 0.8-mm micropunch grafting during January 2015-August 2017. Treatment success was defined as â‰¥75% repigmentation, and factors associated with the outcome were assessed. RESULTS: Overall, 181 of 230 lesions (78.7%) achieved treatment success after a median of 6Â months with postoperative excimer therapy. Lesions on the face and neck, and disease stability of â‰¥12 months were good prognostic factors for treatment success. Common adverse events were color mismatch (24.8%) and cobblestone appearance (18.3%).

Overall, the treatment was tolerable. LIMITATIONS: This was a retrospective study. CONCLUSION: Micropunch grafting using a motorized 0.8-mm punch can successfully treat refractory vitiligo with short procedure times and excellent outcomes. This technique could be a rapid and convenient surgical option with acceptable adverse events and is promising for treating refractory vitiligo on an outpatient basis, particularly in patients who are unlikely to tolerate prolonged surgery. Adolescent;Adult;Aged;Analysis of Variance;Biopsy, Needle;Cohort Studies;Esthetics;Female;Humans;Lasers, Excimer;Logistic Models;Low-Level Light Therapy;Male;Middle Aged;Multivariate Analysis;Postoperative Care;Prognosis;Recovery of Function;Recurrence;Retrospective Studies;Risk Assessment;Skin Transplantation;Treatment Outcome;Vitiligo;Young Adult

Recent Advances in the Etiology and Treatment of Burning Mouth Syndrome. Burning mouth syndrome (BMS) is a debilitating condition that has a striking female predilection. Although the oral mucosa is normal in appearance, patients with BMS experience oral burning that most commonly localizes to the lips and tongue. BMS is a diagnosis of exclusion, and all underlying pathoses associated with allodynia must be ruled out prior to rendering the diagnosis. The etiopathogenesis of BMS remains poorly understood, and thus patient management is challenging. Data indicate that oral and systemic factors both contribute to the development and persistence of the condition. Of particular interest, emerging work identifies structural and functional deficits within the nervous system that may lead to a more mechanistic understanding of BMS pathology. In addition, several novel findings suggest that circadian rhythm dysfunction may be a previously unappreciated yet clinically significant driver of disease. Circadian rhythm controls pain perception, mood, and sleep and plays a key role in the regulation of the hypothalamic-pituitary-adrenal axis. Since these are altered in patients with BMS, this may be reflective of underlying circadian dysfunction. While evidence-based treatment strategies for BMS are lacking, current treatment approaches consist of local and systemic medications, such as clonazepam, alpha lipoic acid, capsaicin, low-level laser therapy, gabapentin, and amitriptylin. In addition, the use of cognitive behavioral therapy is reported. This review provides an overview of the recent literature related to the etiology and treatment of BMS and identifies current challenges facing researchers and clinicians alike. Burning Mouth Syndrome;Humans

Techniques for Optimizing Surgical Scars, Part 3: Erythema, Hyperpigmentation, and Hypopigmentation. Surgical management of benign or malignant cutaneous tumors may result in noticeable scars that are of great concern to patients, regardless of sex, age, or ethnicity. Techniques to optimize surgical scars are discussed in this three-part review. Part 3 focuses on scar revision for erythema, hyperpigmentation, and hypopigmentation. Scar revision options for erythematous scars include moist exposed burn ointment (MEBO), onion extract, silicone, methyl aminolevulinate-photodynamic therapy (MAL-PDT), pulsed dye laser, intense pulsed light (IPL), and nonablative fractional lasers. Hyperpigmented scars may be treated with tyrosinase inhibitors, IPL, and nonablative fractional lasers. Hypopigmented scars may be treated with needle dermabrasion, medical tattoos, autologous cell transplantation, prostaglandin analogues, retinoids, calcineurin inhibitors, excimer laser, and nonablative fractional lasers. Dermatologic Agents;Retinoids Cicatrix;Dermabrasion;Dermatologic Agents;Dermatologic Surgical Procedures;Erythema;Esthetics;Female;Humans;Hyperpigmentation;Hypopigmentation;Low-Level Light Therapy;Male;Retinoids;Skin Neoplasms;Treatment Outcome

Photobiomodulation therapy (PBMT) on acute pain and inflammation in patients who underwent total hip arthroplasty-a randomized, triple-blind, placebo-controlled clinical trial. When conservative treatments fail, hip osteoarthritis (OA), a chronic degenerative disease characterized by cartilage wear, progressive joint deformity, and loss of function, can result in the need for a total hip

arthroplasty (THA). Surgical procedures induced tissue trauma and incite an immune response. Photobiomodulation therapy (PBMt) using low-level laser therapy (LLLT) and/or light-emitting diode therapy (LEDT) has proven effective in tissue repair by modulating the inflammatory process and promoting pain relief. Therefore, the aim of this study was to analyze the immediate effect of PBMt on inflammation and pain of patients undergoing total hip arthroplasty. The study consisted of 18 post-surgical hip arthroplasty patients divided into two groups (nâ€‰=â€‰9 each) placebo and active PBMt who received one of the treatments in a period from 8 to 12Â h following THA surgery. PBMt (active or placebo) was applied using a device consisting of nine diodes (one super-pulsed laser of 905Â nm, four infrared LEDs of 875Â nm, and four red LEDs 640Â nm, 40.3Â J per point) applied to 5 points along the incision. Visual analog scale (VAS) and blood samples for analysis of the levels of the cytokines TNF-Î±, IL-6, and IL-8 were recorded before and after PBMt application. The values for the visual analog scale as well as those in the analysis of TNF-Î± and IL-8 serum levels decreased in the active PBMt group compared to placebo-control group (pâ€‰<â€‰0.05). No decrease was observed for IL-6 levels. We conclude that PBMt is effective in decreasing pain intensity and post-surgery inflammation in patients receiving total hip arthroplasty. Interleukin-6;Placebos;Tumor Necrosis Factor-alpha Acute Pain;Aged;Arthroplasty, Replacement, Hip;Female;Humans;Inflammation;Interleukin-6;Low-Level Light Therapy;Male;Pain Measurement;Placebos;Tumor Necrosis Factor-alpha

Antibacterial and Smear Layer Removal Efficacy of Er:YAG Laser Irradiation by Photon-Induced Photoacoustic Streaming in Primary Molar Root Canals: A Preliminary Study. OBJECTIVE: The objective of this study was to compare antibacterial and smear layer removal efficacy of the erbium:yttrium-aluminium-garnet (Er:YAG) laser irradiation by photon-induced photoacoustic streaming (PIPS), neodymium:yttrium-aluminium-garnet (Nd:YAG), and diode lasers and conventional irrigation agent in primary molar root canals. BACKGROUND: The selection, application, and activation of the irrigant are important factors affecting the success of the endodontic treatment. MATERIALS AND METHODS: Distal root canals of human primary mandibular molar teeth used for antimicrobial efficacy evaluation were first inoculated with Enterococcus faecalis (nâ€‰=â€‰25). Smear layer removal efficacy was evaluated on the noninoculated specimens (nâ€‰=â€‰20). The root canals in the first treatment groups were irrigated with a conventional technique using 5% sodium hypochlorite (NaOCl). In the laser groups, the root canals were irradiated with either Nd:YAG (1064â€‰nm) or diode lasers (940â€‰nm) followed by NaOCl irrigation agent. In the fourth groups, the NaOCl irrigation agent was activated with an Er:YAG laser (2940â€‰nm) by PIPS tip using nonablative settings. Antibacterial efficacy was determined by viable counts of E. faecalis after treatments. The treated root canals were examined by scanning electron microscopy to determine the smear layer removal efficacy of treatments. RESULTS: Statistically significant (pâ€‰<â€‰0.05) reductions in the number of E. faecalis were achieved in Nd:YAG and diode laser groups and Er:YAG laser by PIPS-activated irrigation groups compared to the NaOCl group. Er:YAG laser by PIPS-activated irrigation resulted in more cleaning of the root canal walls and a higher quantity of open tubules. CONCLUSIONS: These findings suggest that Er:YAG laser by PIPS-activated irrigation can be considered as an effective irrigant agitation technique in pediatric endodontics. Disinfectants;Sodium Hypochlorite Dental Pulp Cavity;Disinfectants;Enterococcus faecalis;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Molar;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Tissue Culture Techniques

Low-Level Light Therapy Protects Red Blood Cells Against Oxidative Stress and Hemolysis During Extracorporeal Circulation. Aim: An activation of non-specific inflammatory response, coagulation disorder, and blood morphotic elements damage are the main side effects of the extracorporeal circulation (ECC). Red-to-near-infrared radiation (R/NIR) is thought to be capable of

stabilizing red blood cell (RBC) membrane through increasing its resistance to destructive factors. We focused on the development of a method using low-level light therapy (LLLT) in the spectral range of R/NIR which could reduce blood trauma caused by the heart-lung machine during surgery. Methods: R/NIR emitter was adjusted in terms of geometry and optics to ECC circuit. The method of extracorporeal blood photobiomodulation was tested during in vivo experiments in an animal, porcine model (1 h of ECC plus 23 h of animal observation). A total of 24 sows weighing 90-100 kg were divided into two equal groups: control one and LLLT. Blood samples were taken during the experiment to determine changes in blood morphology [RBC and white blood cell (WBC) counts, hemoglobin (Hgb)], indicators of hemolysis [plasma-free hemoglobin (PFHgb), serum bilirubin concentration, serum lactate dehydrogenase (LDH) activity], and oxidative stress markers [thiobarbituric acid reactive substances (TBARS) concentration, total antioxidant capacity (TAC)]. Results: In the control group, a rapid systemic decrease in WBC count during ECC was accompanied by a significant increase in RBC membrane lipids peroxidation, while in the LLLT group the number of WBC and TBARS concentration both remained relatively constant, indicating limitation of the inflammatory process. These results were consistent with the change in the hemolysis markers like PFHgb, LDH, and serum bilirubin concentration, which were significantly reduced in LLLT group. No differences in TAC, RBC count, and Hgb concentration were detected. Conclusion: We presented the applicability of the LLLT with R/NIR radiation to blood trauma reduction during ECC.

[Outcomes of ER:YAG LASER treatment of stress urinary incontinence in women]. AIM: To evaluate the effectiveness of a new method of treatment for stress urinary incontinence in women using an ER: YAG laser in SMOOTH mode and investigate pathophysiological and pathomorphological changes induced by erbium laser. MATERIALS AND METHODS: This study comprised 98 women aged 37-63 years, who between 2014 and 2016 were diagnosed with SUI (type 1 and 2a, 2b) and grade 0-2 vaginal prolapse. The treatment was performed with a 2940 nm Er:YAG laser (Fotona, Slovenia) using a SMOOTH mode. Clinical assessment included PFIQ-7 and PISQ-12 questionnaires, uroflowmetry, laser Doppler flowmetry and biopsy of the anterior vaginal wall. The examination was carried out at baseline and 1-2 months after the treatment. RESULTS: The effectiveness of treatment was 73%. There was no deterioration after the procedure. Analysis of PFIQ-7 and PISQ-12 questionnaires showed that patients with mild incontinence had the greatest difference between pre- and posttreatment results. Uroflowmetry parameters improved in a majority of patients. Results of laser Doppler flowmetry demonstrated the improvement of blood flow in the microvascular bed. An important feature of the vaginal biopsy after laser exposure was an increase in neoangiogenesis. DISCUSSION: The findings of questionnaires and clinical evaluation of patients with SUI and vaginal prolapse before and after treatment with Er: YAG laser showed high therapeutic effectiveness of this treatment modality. CONCLUSION: Clinical effectiveness of ER: YAG laser in SMOOTH mode was 73%. Patients with type 1 and 2a SUI and mild or moderate incontinence have the best prognosis after treatment with this method. Adult;Female;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Middle Aged;Surveys and Questionnaires;Urinary Incontinence, Stress;Uterine Prolapse;Vagina

The Fourth Industrial Revolution and Photobiomodulation. Humans;Low-Level Light Therapy

Carpal Tunnel Syndrome: Evaluation of the Effects of Low-Level Laser Therapy With Ultrasound Strain Imaging. OBJECTIVES: To evaluate the efficacy of low-level laser therapy on median nerve stiffness by using strain elastography in carpal tunnel syndrome (CTS). METHODS: This study included 37 wrists of 34 patients with mild or moderate CTS between January 2016 and August 2016. The control group comprised 17 patients (18 wrists) with CTS who were treated with wrist splinting for 3 weeks. The low-level laser therapy group included 17 patients (19 wrists) with CTS who were treated

with a combination of splinting and low-level laser therapy, which was applied 5 times per week for 3 weeks. Clinical assessment scales, including the Symptom Severity Scale (SSS) and Functional Status Score (FSS), were obtained from our database. The cross-sectional area by ultrasound and strain ratio by elastography were studied. The differences in the strain ratio, cross-sectional area, SSS, and FSS between pretreatment and posttreatment periods in the groups were compared by the paired-sample t test. The correlations between changes in the strain ratio and the cross-sectional area, SSS, and FSS were analyzed by Pearson correlation coefficients. RESULTS: The control group included 13 women and 4 men, and the therapy group included 14 women and 3 men. In the therapy group, the mean values of the strain ratio, cross-sectional area, SSS, and FSS decreased significantly after laser therapy (Pâ€‰<â€‰.001) in contrast to the control group. No significant correlation was observed between the decreasing degree of the strain ratio and the cross-sectional area, SSS, and FSS after laser therapy. CONCLUSIONS: The strain ratio and cross-sectional area of the median nerve decrease after low-level laser therapy. These changes may be related to the therapeutic effects of low-level laser therapy, such as nerve regeneration and improvement of the vascular supply.
Adult;Carpal Tunnel Syndrome;Combined Modality Therapy;Elasticity Imaging Techniques;Female;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Retrospective Studies;Splints;Treatment Outcome;Ultrasonography

Photobiomodulation Therapy (PBMT) in Peripheral Nerve Regeneration: A Systematic Review. Photobiomodulation therapy (PBMT) has been investigated because of its intimate relationship with tissue recovery processes, such as on peripheral nerve damage. Based on the wide range of benefits that the PBMT has shown and its clinical relevance, the aim of this research was to carry out a systematic review of the last 10 years, ascertaining the influence of the PBMT in the regeneration of injured peripheral nerves. The search was performed in the PubMed/MEDLINE database with the combination of the keywords: low-level laser therapy AND nerve regeneration. Initially, 54 articles were obtained, 26 articles of which were chosen for the study according to the inclusion criteria. In the qualitative aspect, it was observed that PBMT was able to accelerate the process of nerve regeneration, presenting an increase in the number of myelinated fibers and a better lamellar organization of myelin sheath, besides improvement of electrophysiological function, immunoreactivity, high functionality rate, decrease of inflammation, pain, and the facilitation of neural regeneration, release of growth factors, increase of vascular network and collagen. It was concluded that PBMT has beneficial effects on the recovery of nerve lesions, especially when related to a faster regeneration and functional improvement, despite the variety of parameters.

Is Low-level laser therapy and gaseous ozone application effective on osseointegration of immediately loaded implants? PURPOSE: The purpose of this study was to investigate the effects of biostimulation lasers and ozone therapy on osseointegration of immediately loaded implants. MATERIALS AND METHODS: A total number of 100 implants (DTI Implant Systems) were applied to 25 patients evenly. Temporary crowns were applied to each patient on the same session as the surgery. Implants were divided into four treatment groups (Group 1: low-level laser therapy (LLLT) group, Group 2: ozone therapy group, Group 3: different protocol of ozone therapy group, and Group 4: control group) each with 25 implants. The irradiations were performed with a gallium-aluminum-arsenide diode low-level laser (Laser BTL-4000) to Group 1. Ozone therapy was performed using an ozone generator (OzoneDTA) with an intraoral probe to Group 2 and Group 3. RESULTS: In this study, the overall implant survival rate was 92% after a 6-month observation period. The implant stability quotient values were found significantly higher in Group 1 (LLLT group) and Group 3 (different protocol of ozone therapy group) than the other groups ($P < 0.05$). There was no significant difference in Group 2 (ozone therapy group) and the control group ($P > 0.05$). CONCLUSIONS: Our results suggest that both LLLT and ozone therapy with prolonged application time are promising methods to

enhance bone healing around immediately loaded implants and increase implant stability; however, there is a need for more studies on this subject for these methods to become routine applications. Dental Implants;Ozone Dental Implantation, Endosseous;Dental Implants;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Osseointegration;Ozone

Resolution of herpes simplex in the nose wing region using photodynamic therapy and photobiomodulation. Photosensitizing Agents;Methylene Blue Combined Modality Therapy;Female;Herpes Simplex;Herpesvirus 1, Human;Humans;Low-Level Light Therapy;Methylene Blue;Nose;Photochemotherapy;Photosensitizing Agents;Young Adult

Investigation of effects of low level laser therapy in distraction osteogenesis. PURPOSE: The purpose of the study was to investigate the histopathological effects of low level laser therapy (LLLT) application in distraction osteogenesis (DO). MATERIALS AND METHODS: Twenty adult female New Zealand white rabbits were included in the study. Under general anesthesia unilateral mandibular corpus osteotomy was performed. Custom made external distractors were placed to right mandibles of rabbits. After five days of latency period, distractors were activated once a day for 5 days with 1mm/day frequency. Animals in the study group were exposed to LLLT from six different points transcutanously after each distractor activation. Control group was not exposed to laser irradiation. Animals were sacrificed after 15 and 30 days of consolidation periods and mandibles were processed for histopathological investigation under light microscope. Bone healing was analyzed with a semi-quantitative 4 point scale. RESULTS: Osteoblastic activity and vascularization were found higher in the study group than control group after 15 days consolidation. Chondroblastic activity of the control group was significantly higher than the study group in both 15 and 30 days of consolidation groups. Osteoblastic activity and trabecular bone formation were found significantly higher in the study group than the control group after 15 days consolidation. CONCLUSIONS: The use of LLLT in activation period of distraction osteogenesis stimulates bone repair in the early stages of distraction osteogenesis by inducing intramembranous healing and less cartilage tissue formation in the bone callus. Animals;Bony Callus;Female;Low-Level Light Therapy;Mandible;Mandibular Osteotomy;Osteogenesis, Distraction;Rabbits

Dual wavelength treatment protocol with a picosecond laser for the reduction of facial wrinkles. INTRODUCTION: The potential of a dual wavelength picosecond laser, as a new modality for treating photoaged skin, was investigated in this clinical study. MATERIAL AND METHODS: Subjects with bilateral mild-to-moderate facial wrinkling received four picosecond laser treatments, at 3-8Â weeks apart, with a double-pass of both 532-nm and 1064-nm split-beam handpieces. Blinded evaluation of clinical photography, by two independent physicians, using the Fitzpatrick Elastosis Scale, was performed at 12Â weeks after the fourth treatment. RESULTS: Twenty subjects (19 females; mean age 55Â Â±Â 7Â years, Fitzpatrick Skin Types II-IV) were treated. Blinded evaluation demonstrated 75% (15/20) of the treated faces had improvement of at least one point. Investigator assessments showed a 100% improvement rate in the appearance of wrinkles and a mean elastosis score (ES) improvement of 2.1Â Â±Â 0.8 points. Subject satisfaction rate was 74%. Treatments were associated with no to mild discomfort with a mean score of 3.7Â Â±Â 1.9 on a scale of 0 (no pain) to 10. Common treatment responses included erythema (98%) and edema (7.5%) that generally resolved within several hours of treatment. CONCLUSION: In this study, picosecond laser treatments resulted in significant improvement in facial wrinkles. There were no complications with treatment and minimal downtime. Adult;Aged;Cosmetic Techniques;Edema;Erythema;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Rejuvenation;Skin Aging;Treatment Outcome

Effects of Low-Power Light Therapy on the Tissue Repair Process of Chronic Wounds in Diabetic Feet. OBJECTIVE: To analyze the efficacy of the therapeutic use of Low-Level Laser Therapy (LLLT) on the tissue repair process of chronic wounds in patients with diabetic feet through the analysis of Pressure Ulcer Scale for Healing (PUSH) scales, pain and the measurement done using the ImageJ(Â©) software. METHODS: This clinical trial was carried out with 18 patients 30-59 years of age, who had chronic wounds on their foot due to complications of diabetes mellitus. The patients were randomly allocated in two different groups of equal numbers: Control and Laser Groups. The LLLT equipment used in the research has a wavelength of 660â€‰nm, 30â€‰mW power, continuous mode emission, 6â€‰J/cm(2) dosimetry, 48/48â€‰h in a 4-week period. Measurement and the aspect of wounds were noted in the PUSH scale and the pain was evaluated weekly. The Mann-Whitney U nonparametric test was used to compare groups. RESULTS: The Laser Group presented a significant increase of the tissue repair index when compared with the Control Group, with a significant statistical difference (pâ€‰<â€‰0.013). There was no significant difference between the groups in all the weeks using the PUSH scale. CONCLUSIONS: The use of LLLT on chronic wounds in a diabetic foot demonstrated efficacy on the progression of the tissue repair process in a short period. Adult;Chronic Disease;Diabetic Foot;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Wound Healing

Effect of 810â€‰nm Near-Infrared Laser on Revascularization of Ischemic Flaps in Rats. OBJECTIVE: To investigate the effect of 810â€‰nm near-infrared (NIR) laser on the revascularization of ischemic flaps. BACKGROUND: It has long been proved that photobiomodulation therapy (PBMT) improves the blood supply of flaps. NIR laser improves the treatment of hypodermis-located lesions and of flap survival, but basic research on the use of 810â€‰nm NIR laser for ischemic flap revascularization is still lacking. MATERIALS AND METHODS: We prepared two symmetrical long random-pattern flaps on the backs of 60 rats. Each flap was 6â€‰cm long, 1â€‰cm wide, and 1â€‰cm to the middle line. The flaps were divided into an irradiated flap group and an internal control group. The irradiated flaps underwent postoperative 810â€‰nm laser therapy with the energy density of 11.30â€‰J/cm(2) daily. The control flaps were covered by stainless steel to avoid laser irradiation. We observed the viability of the flaps. The flaps underwent Hematoxylin and Eosin (H&E) staining for the observation of histomorphology, immunohistochemical staining of factor VIII for the capillary count, Î±-smooth muscle actin for the small arterial count, and vascular endothelial growth factor for the integrated optical density (OD) of the positive stained color. RESULTS: The irradiated flaps showed significantly better flap survival than the control flaps. H&E staining showed that the irradiated flaps had clear tissue structure and little inflammatory cell infiltration. The control flaps demonstrated comparatively worse results. Vascular endothelial growth factor staining showed that the difference in integrated OD between the irradiated flaps and the control flaps was not statistically significant. Î±-smooth muscle actin and factor VIII staining showed significantly greater numbers of arterioles and capillaries in the irradiated flaps than the control flaps after 4 days of irradiation. CONCLUSIONS: PBMT with 810â€‰nm NIR laser could enhance ischemic flap revascularization and increase flap viability. Animals;Ischemia;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Surgical Flaps

Non-mammalian Hosts and Photobiomodulation: Do All Life-forms Respond to Light? Photobiomodulation (PBM), also known as low-level laser (light) therapy, was discovered over 50 years ago, but only recently has it been making progress toward wide acceptance. PBM originally used red and near-infrared (NIR) lasers, but now other wavelengths and non-coherent light-emitting diodes (LEDs) are being explored. The almost complete lack of side effects makes the conduction of controlled clinical trials relatively easy. Laboratory research has mainly concentrated on mammalian cells (normal or cancer) in culture, and small rodents (mice and rats) as models of different diseases.

A sizeable body of work was carried out in the 1970s and 1980s in Russia looking at various bacterial and fungal cells. The present review covers some of these studies and a recent number of papers that have applied PBM to so-called "model organisms." These models include flies (Drosophila), worms (Caenorhabditis elegans), fish (zebrafish) and caterpillars (Galleria). Much knowledge about the genomics and proteomics, and many reagents for these organisms already exist. They are inexpensive to work with and have lower regulatory barriers compared to vertebrate animals. Other researchers have studied different models (snails, sea urchins, Paramecium, toads, frogs and chickens). Plants may respond to NIR light differently from visible light (photosynthesis and photomorphogenesis) but PBM in plants has not been much studied. Veterinarians routinely use PBM to treat non-mammalian patients. The conclusion is that red or NIR light does indeed have significant biologic effects conserved over many different kingdoms, and perhaps it is true that "all life-forms respond to light." Animals;Caenorhabditis elegans;Drosophila;Light;Low-Level Light Therapy;Plants;Zebrafish

A Comparative Evaluation of Interleukin 1 Beta and Prostaglandin E2 with and without Low-level Laser Therapy during En masse Retraction. BACKGROUND AND OBJECTIVES: Orthodontic forces are known to produce mechanical damage and inflammatory mediators such as prostaglandins (PGs) and interleukin (IL)-1, in the periodontium and dental pulp. Low-level laser therapy (LLLT) is a stimulator of the on-going biological process in tissue and found to be effective in modulating cell activity, which is involved in orthodontic tooth movement. Here, a humble effort has been made to study two such cytokines, namely IL-1 Î² and PG E2 (PGE2) which are partially responsible for bone turnover. The purpose of this study was to compare the changes occurring in the values of IL-1 Î² and PGE2 in the gingival crevicular fluid (GCF) during en masse retraction with and without LLLT. METHODOLOGY: GCF was collected using micropipettes from the distal ends of upper canines. The experimental side was exposed to biostimulation using 810 nm gallium-aluminum-arsenide diode laser and the contralateral side taken as control. A total of 10 irradiations for 10 s per site were given, five on the buccal side and five on the palatal side, to cover the entire periodontal fibers and the alveolar process around the tooth. After 7 days and 21 days of retraction, GCF sample was collected. Quantitative analysis of IL-1 Î² and PGE2 in the GCF samples was assessed using a commercially available RaybiotechÂ® IL-1 Î² and Human PGE2. RESULTS: (1) IL-1 Î² and PGE2 levels showed significant results from baseline to 21 days after LLLT irradiation. (2) LLLT-assisted retraction was significantly faster than conventional retraction. INTERPRETATION AND CONCLUSION: It was concluded from the study that IL-1 Î² and PGE2 levels peaked after LLLT. The difference in the levels of both cytokines was statistically significant.

A Comparison of the Rate of Retraction with Low-level Laser Therapy and Conventional Retraction Technique. BACKGROUND AND OBJECTIVES: A major concern of orthodontic patients is treatment time. Reducing the treatment time requires increasing the rate of orthodontic tooth movement. Research has proved that bone resorption is the rate-limiting step in tooth movement. Therefore, any procedure that potentiates osteoclastic activity is capable of increasing the rate of orthodontic tooth movement. Low-level laser has been indicated to have the capability to facilitate the differentiation of the osteoclastic and osteoblastic cells, which are responsible for the bone remodeling process. The purpose of this study was to evaluate whether the low-level laser therapy can accelerate orthodontic tooth movement during en masse retraction. METHOD: The study was a split-mouth design. The experimental side was exposed to biostimulation using 810 nm gallium-aluminium-arsenide diode laser. A total of 10 irradiations for 10 s per site were given 5 on the buccal side and 5 on the palatal side of the tooth. The total energy density at each application was 10 J with an interappointment gap of 3 weeks. The retraction was carried using a constant force of 150 gm. A digital vernier caliper measurement was used to measure the distance between the contact points of the maxillary canine and second premolar on 1(st) and 84(th) day. RESULTS: The rate of orthodontic

tooth movement was faster on the experimental side, and the difference between the two sides was statistically significant (P < 0.014). INTERPRETATION AND CONCLUSION: It was concluded that biostimulation carried out using an 810 nm diode laser is capable of increasing the rate of extraction space closure. Hence, it is capable of increasing the rate of orthodontic tooth movement.

Effects of low-intensity laser therapy on the stability of orthodontic mini-implants: a randomised controlled clinical trial. OBJECTIVE: To investigate the effect of low-intensity laser therapy on mini-implant stability using resonance frequency analysis during canine retraction with fixed appliances. DESIGN: A split-mouth randomised clinical trial. SETTING: Subjects were recruited and treated in the outpatient clinic, Department of Orthodontics, Faculty of Dentistry, Cairo University. PARTICIPANTS: Fifteen subjects with mean age 20.9 (Â±3.4) years who required extraction of maxillary first premolar teeth and mini-implant-supported canine retraction. METHODS: Thirty orthodontic mini-implants were inserted bilaterally in the maxillary arches of recruited subjects following alignment and levelling. Mini-implants were immediately loaded with a force of 150â€…g using nickel titanium coil springs with split-mouth randomisation to a low-intensity laser-treated side and control side. The experimental sides were exposed to low-intensity laser therapy from a diode laser with a wavelength of 940â€…nm at (0, 7, 14, 21 days) after mini-implant placement. Mini-implant stability was measured using resonance frequency analysis at (0, 1, 2, 3, 4, 6, 8, 10 weeks) after implant placement. RESULTS: A total sample of 28 mini-implants were investigated with 14 in each group. Clinically, both mini-implant groups had the same overall success rate of 78.5%. There were no significant differences in resonance frequency scores between low-intensity laser and control sides from baseline to week 2. However, from week 3 to 10, the low-intensity laser sides showed significantly increased mean resonance frequency values compared to control (Pâ€‰>â€‰0.05). CONCLUSIONS: Despite evidence of some significant differences in resonance frequency between mini-implants exposed to low-intensity laser light over a 10 weeks period there were no differences in mini-implant stability. Low-intensity laser light cannot be recommended as a clinically useful adjunct to promoting mini-implant stability during canine retraction. Dental Implants Bicuspid;Dental Implants;Humans;Laser Therapy;Maxilla;Orthodontic Anchorage Procedures;Orthodontics

Guidelines for the diagnosis and treatment of male-pattern and female-pattern hair loss, 2017 version. Male-pattern hair loss (MPHL, androgenetic alopecia) is a slowly progressive form of alopecia which begins after puberty. In 2010, we published the first Japanese edition of guidelines for the diagnosis and treatment of MPHL. It achieved the original goal of providing physicians and patients in Japan with evidence-based information for choosing efficacious and safe therapy for MPHL. Subsequently, new therapeutic drugs and treatment methods have been developed, and women's perception of MPHL has undergone change and the term "female-pattern hair loss (FPHL)" is becoming more common internationally. Thus, here we report a revised version of the 2010 guidelines aimed at both MPHL and FPHL. In these guidelines, finasteride 1Â mg daily, dutasteride 0.5Â mg daily and topical 5% minoxidil twice daily for MPHL, and topical 1% minoxidil twice daily for FPHL, are recommended as the first-line treatments. Self-hair transplantation, irradiation by light-emitting diodes and low-level lasers, and topical application of adenosine for MPHL are recommended, whereas prosthetic hair transplantation and oral administration of minoxidil should not be performed. Oral administration of finasteride or dutasteride are contraindicated for FPHL. In addition, we have evaluated the effectiveness of topical application of carpronium chloride, t-flavanone, cytopurine, pentadecane and ketoconazole, and wearing a wig. Unapproved topical application of bimatoprost and latanoprost, and emerging hair regeneration treatments have also been addressed. We believe that the revised guidelines will improve further the diagnostic and treatment standards for MPHL add FPHL in Japan. Finasteride;Minoxidil;Adenosine;Dutasteride

Adenosine;Administration, Oral;Administration, Topical;Alopecia;Dutasteride;Female;Finasteride;Hair;Humans;Japan;Lasers, Semiconductor;Low-Level Light Therapy;Male;Minoxidil;Sex Factors;Treatment Outcome

A feasibility study of a novel low-level light therapy for digital ulcers in systemic sclerosis. BACKGROUND: Locally acting, well-tolerated treatments for systemic sclerosis (SSc) digital ulcers (DUs) are needed. OBJECTIVES: Our primary aim was to investigate the safety, feasibility, and tolerability of a novel low-level light therapy (LTTT). A secondary aim was to tentatively assess efficacy. METHODS: A custom-built device comprising infrared (850â€‰nm), red (660â€‰nm), and violet (405â€‰nm) LEDs was utilized. DUs were irradiated with 10Â J/cm(2) twice weekly for 3Â weeks, with follow-up at weeks 4 and 8. Any safety concerns were documented. Patient opinion on time to deliver, feasibility, and pain visual analogue score (VAS; 0-100, 100 most severe) was collected. Patient and clinician DU global assessment VAS were documented. DUs were evaluated by laser Doppler perfusion imaging pre- and post-irradiation. RESULTS: In all, 14 DUs in eight patients received a total of 46 light exposures, with no safety concerns. All patients considered LTTT 'took just the right amount of time' and was 'feasible', with a low associated mean pain VAS of 1.6 (SD: 5.2). Patient and clinician global DC VAS improved during the study (mean change: -7.1 and -5.2, respectively, both pâ€‰<â€‰.001). DU perfusion significantly increased post-irradiation. CONCLUSIONS: LTTT for DUs is safe, feasible, and well tolerated. There was an early tentative suggestion of treatment efficacy. Adult;Aged;Feasibility Studies;Female;Fingers;Humans;Low-Level Light Therapy;Male;Middle Aged;Scleroderma, Systemic;Skin Ulcer;Treatment Outcome

Low-Level Laser Therapy for Temporomandibular Disorders: A Systematic Review with Meta-Analysis. OBJECTIVES: We systematically reviewed randomized controlled trials (RCTs) of the effect of low-level laser therapy (LLLT) versus placebo in patients with temporomandibular disorder (TMD). METHODS: A systematic search of multiple online sources electronic databases was undertaken. The methodological quality of each included study was assessed using the modified Jadad scale, and the quality of evidence was evaluated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system. RESULTS: A total of 31 RCTs were included. Total modified Jadad scale scores showed that the methodological quality was high in 30 studies and low in 1 study. Combining data from all clinically heterogeneous studies revealed positive effects of LLLT on pain relief, regardless of the visual analogue scale (VAS) score or the change of VAS score between the baseline and the final follow-up time point, while dosage analyses showed discrepant results about the effects of high or low doses for patients with TMD. Follow-up analyses showed that LLLT significantly reduced pain at the short-term follow-up. Temporomandibular joint function outcomes indicated that the overall effect favored LLLT over placebo. CONCLUSION: This systematic review suggests that LLLT effectively relieves pain and improves functional outcomes in patients with TMD. Follow-Up Studies;Humans;Laser Therapy;Outcome Assessment, Health Care;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Visual Analog Scale

Near infrared laser irradiation induces NETosis via oxidative stress and autophagy. NETosis is a novel immune defense strategy in which neutrophil activation results in the formation of extracellular DNA/protein network which is able to kill microbial populations. NETosis can be induced in vitro by lipopolysaccharide (LPS) or phorbol myristate acetate (PMA). Due to the importance of NETosis in different physiological and pathological processes, photobiostimulation effect on this neutrophil activation mechanism has been investigated. Human granulocytes, isolated from venous blood of healthy donors, were stimulated with a diode laser emitting at 980Â nm with an energy intensity ranging from 0 to 75 joules. After 3Â h of laser stimulation, granulocytes were fixed and colored with crystal violet in order to assess the NETosis morphology while extracellular DNA produced has been

quantified using Sytox Green fluorescent dye. To evaluate ROS production and autophagy role in photobiostimulation-induced NETosis, granulocytes were pre-treated with ROS scavengers (vitamin C, sodium pyruvate, L-NAME, sodium azide), and an autophagy inhibitor (wortmannin). Laser stimulation induced an energy-dependent neutrophil extracellular trap (NET) production in human granulocytes starting from 50-J laser intensity. ROS scavengers and the autophagy inhibitor were able to abrogate both morphological features of NETosis and extracellular DNA production without modifying the basal level of NETosis. Photobiostimulation induced an increase in NET production due to an increase in ROS levels and autophagy activation. DNA Autophagy;DNA;Extracellular Traps;Humans;Infrared Rays;Lasers;Low-Level Light Therapy;Neutrophils;Oxidative Stress

Efficacy of phototherapy to treat facial ageing when using a red versus an amber LED: a protocol for a randomised controlled trial. INTRODUCTION: The skin undergoes morphological and physiological changes with the advancing age of an individual. These changes may be caused by intrinsic and extrinsic factors that contribute to cellular ageing and consequent skin ageing. The term photoageing is used to characterise the ageing of the skin caused by solar radiation. Clinically, the skin becomes more flaccid, thicker and hyperpigmented, while there is an early appearance of wrinkles and other skin changes, such as skin cancer. Nowadays, there are numerous treatments for ageing skin, and one of them is with the use of phototherapy, which uses light-emitting diodes (LEDs). The objective of this study will be to evaluate the percentages of reduction in the volume of periocular wrinkles when treated with red and amber LEDs. METHODS AND ANALYSIS: All of the participants will receive photobiomodulation to treat their periocular wrinkles. They will be using red and amber LEDs, with one colour being used on each hemiface. The facial side to be treated with each colour will be randomised. After an interval of 180 days, the participants will receive a cross-treatment. The primary variable of the study is the volume of periocular wrinkles (crow's feet), which will be measured by a VisioFace equipment. The secondary variables are elasticity (measured by Cutometer) and hydration (measured by Corneometer). Quality of life and self-assessment of the participants will be measured using the adapted Melasma Quality of Life scale - Brazilian Portuguese adaption (MelasQoL-BP) and Skindex-29 questionnaires. All of the variables will be measured before and after a group of 10 sessions. ETHICS AND DISSEMINATION: This protocol was approved by the Research Ethics Committee of the Nove de Julho University (acceptance number: 2.550.732). This trial has been registered in the Registro Brasileiro de Ensaios ClÃ-nicos (Brazilian Clinical Trials Registry) (REBEC number: RBR-6YFCBM). This study is not recruiting yet. TRIAL REGISTRATION NUMBER: RBR6YFCBM; Pre-results.
Adult;Aged;Aging;Color;Elasticity;Face;Female;Humans;Light;Middle Aged;Phototherapy;Quality of Life;Research Design;Skin;Skin Aging;Treatment Outcome

Effectiveness of 904nm Gallium-Arsenide Diode Laser in Treatment of Oral Lichen Planus: Report of 2Cases. Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy

Effect of Laser Bio-Stimulation on Mandibular Distraction Osteogenesis: An Experimental Study. PURPOSE: The aim of this study was to evaluate the osseous response to laser bio-stimulation clinically and histologically during distraction osteogenesis (DO) induced in the mandibles of mongrel dogs. MATERIALS AND METHODS: Thirty dogs were divided into 3 groups of 10 (5 with and 5 without laser treatment) according to sacrifice periods (2, 4, and 8Â weeks after distraction). DO was performed between the mandibular second and third premolars using an internal linear distractor. After a 7-day latency period, the distractor was activated at the rate of 1Â mm per day for 10Â days followed by a consolidation period during which the right mandibular side was irradiated with a diode laser (wavelength [Î»], 970Â nm; power, 2Â W; spot size, 320Â Î¼m; total energy [E], 840Â J), whereas the control group was not irradiated, after distraction. Histologic specimens were prepared and

histomorphometric analysis of specimens was performed. RESULTS: Clinical examinations showed that the low-intensity laser diode had a pronounced effect on the quality and quantity of newly formed bone in the DO regenerate in the laser groups compared with the control groups. Histopathologic sections from laser groups I, II, and III displayed the bio-stimulatory effect of laser on new bone through an increased rate of osteoblast proliferation and differentiation, an accelerated rate of intramembranous ossification, and increased neoangiogenesis compared with the control groups. Moreover, the histomorphometric results showed that mean bone trabecular size, bone trabecular total area, and bony area fraction of the regenerate were larger and statistically significant (PÂ <Â .05) especially in laser groups I and II (early stages of bone formation) compared with the control groups. CONCLUSION: The low-level diode laser had a positive role as a potential bio-stimulator and local inducer in enhancing bone formation during DO and resulted in early stability of the bone regenerate, a shorter total treatment time, and improved new bone quality and quantity. Animals;Bone Regeneration;Disease Models, Animal;Dogs;Lasers, Semiconductor;Low-Level Light Therapy;Mandible;Osteogenesis;Osteogenesis, Distraction;Photomicrography;Treatment Outcome

Lichen sclerosus associated with Nd:YAG laser therapy. Laser is the most efficient and popular method in hair removal. The most common side effects of laser assisted hair removal are pain, erythema, edema, hypopigmentation, hyperpigmentation, blistering, crusting, erosions, purpura, folliculitis, and scar formation (1). Herein, for the first time we describe a case of lichen sclerosus (LS) following hair removal with long pulsed 1064Â nm Nd:YAG laser therapy. Adult;Cosmetic Techniques;Female;Hair Removal;Humans;Lasers, Solid-State;Lichen Sclerosus et Atrophicus;Low-Level Light Therapy

Histological Study of Induced Incisions on Rabbits' Tongues with Three Diode Lasers with Different Wavelengths in Continuous Mode. OBJECTIVE: Diode lasers have multiple indications in everyday dental practice. They allow carrying out incisions, coagulation of soft tissue, and Low-Level Laser Therapy. The goal of this study is to compare histologically the tissue interaction zones and edges of an induced laser incision on rabbits' tongues with three different wavelengths of 810, 940, and 980â€‰nm in continuous mode. METHODS: Fourteen male rabbits were divided into six groups. Each animal underwent three incisions of 10â€‰mm length on the right ventral face of the tongue, carried out in continuous mode with three diode lasers with different wavelengths of 810, 940, and 980â€‰nm. Rabbits were sacrificed at 0, 1, 2, 6, and 15 hours and 14 days. Five rabbits were sacrificed at 0 hours and 2 hours and one rabbit was sacrificed at 1, 6, and 15 hours and at 14 days. The appearance of neutrophils marked the onset time of the inflammatory reaction. Histological study of the incisions was chosen to evaluate the edges and to measure the depth and width of carbonization and necrotic and inflammatory zones. Healing was evaluated at 14 days. Friedman test was used to assess statistical differences between groups. RESULTS: In the experimental adopted conditions, the carbonization zone was marked by degradation of vacuoles and an elongation of nuclei and was observed on the edges of incisions. Carbonization and necrotic and inflammatory zones were measured for rabbits sacrificed at 0, 1, 2, 6, and 15 hours but the onset of inflammation zone marked by the infiltration of neutrophils did not appear before 6 hours. The neutrophils infiltration was higher at 15 hours than at 6 hours. Complete healing was shown at 14 days. According to the time for the regularity of the edges, the interpretation was qualitative without a statistical test. The statistical analysis of the three different diode lasers in this study showed nonsignificant difference between the different groups for the depth ($p = 0.121$) and width ($p = 0.376$) of the incisions, the carbonization zone ($p = 0.692$), and the necrotic zone ($p = 0.223$). For the inflammation zone at 6 and 15 hours, statistical analysis was not carried out; only one rabbit was enough to evaluate onset of neutrophils infiltration and to compare its density for 6 and 15 hours. CONCLUSION: These results indicate that diode laser used in the continuous mode is predictable for induced

incision. The use of three diode lasers with different wavelengths of 810, 940, and 980â€‰nm did not reveal a significant statistical difference according to depth and width of the incision and for carbonization and necrotic zone. The appearance of neutrophils was marked between 4 and 6 hours and was higher at 15 hours.

OBJECTIVES: Many interventions are available to manage chronic pain; understanding the durability of treatment effects may assist with treatment selection. We sought to assess which noninvasive nonpharmacological treatments for selected chronic pain conditions are associated with persistent improvement in function and pain outcomes at least 1 month after the completion of treatment. DATA SOURCES: Electronic databases (Ovid MEDLINEÂ®, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews) through November 2017, reference lists, and ClinicalTrials.gov. REVIEW METHODS: Using predefined criteria, we selected randomized controlled trials of noninvasive nonpharmacological treatments for five common chronic pain conditions (chronic low back pain; chronic neck pain; osteoarthritis of the knee, hip, or hand; fibromyalgia; and tension headache) that addressed efficacy or harms compared with usual care, no treatment, waitlist, placebo, or sham intervention; compared with pharmacological therapy; or compared with exercise. Study quality was assessed, data extracted, and results summarized for function and pain. Only trials reporting results for at least 1 month post-intervention were included. We focused on the persistence of effects at short term (1 to <6 months following treatment completion), intermediate term (â‰¥6 to <12 months), and long term (â‰¥12 months). RESULTS: Two hundred eighteen publications (202 trials) were included. Many included trials were small. Evidence on outcomes beyond 1 year after treatment completion was sparse. Most trials enrolled patients with moderate baseline pain intensity (e.g., >5 on a 0 to 10 point numeric rating scale) and duration of symptoms ranging from 3 months to >15 years. The most common comparison was against usual care. Chronic low back pain: At short term, massage, yoga, and psychological therapies (primarily CBT) (strength of evidence [SOE]: moderate) and exercise, acupuncture, spinal manipulation, and multidisciplinary rehabilitation (SOE: low) were associated with slight improvements in function compared with usual care or inactive controls. Except for spinal manipulation, these interventions also improved pain. Effects on intermediate-term function were sustained for yoga, spinal manipulation, multidisciplinary rehabilitation (SOE: low), and psychological therapies (SOE: moderate). Improvements in pain continued into intermediate term for exercise, massage, and yoga (moderate effect, SOE: low); mindfulness-based stress reduction (small effect, SOE: low); spinal manipulation, psychological therapies, and multidisciplinary rehabilitation (small effects, SOE: moderate). For acupuncture, there was no difference in pain at intermediate term, but a slight improvement at long term (SOE: low). Psychological therapies were associated with slightly greater improvement than usual care or an attention control on both function and pain at short-term, intermediate-term, and long-term followup (SOE: moderate). At short and intermediate term, multidisciplinary rehabilitation slightly improved pain compared with exercise (SOE: moderate). High-intensity multidisciplinary rehabilitation (â‰¥20 hours/week or >80 hours total) was not clearly better than nonâ€“high-intensity programs. Chronic neck pain: At short and intermediate terms, acupuncture and Alexander Technique were associated with slightly improved function compared with usual care (both interventions), sham acupuncture, or sham laser (SOE: low), but no improvement in pain was seen at any time (SOE: llow). Short-term low-level laser therapy was associated with moderate improvement in function and pain (SOE: moderate). Combination exercise (any 3 of the following: muscle performance, mobility, muscle re-education, aerobic) demonstrated a slight improvement in pain and function short and long term (SOE: low). Osteoarthritis: For knee osteoarthritis, exercise and ultrasound demonstrated small short-term improvements in function compared with usual care, an attention control, or sham procedure (SOE: moderate for exercise, low

for ultrasound), which persisted into the intermediate term only for exercise (SOE: low). Exercise was also associated with moderate improvement in pain (SOE: low). Long term, the small improvement in function seen with exercise persisted, but there was no clear effect on pain (SOE: low). Evidence was sparse on interventions for hip and hand osteoarthritis. Exercise for hip osteoarthritis was associated with slightly greater function and pain improvement than usual care short term (SOE: low). The effect on function was sustained intermediate term (SOE: low). Fibromyalgia: In the short term, acupuncture (SOE: moderate), CBT, tai chi, qigong, and exercise (SOE: low) were associated with slight improvements in function compared with an attention control, sham, no treatment, or usual care. Exercise (SOE: moderate) and CBT improved pain slightly, and tai chi and qigong (SOE: low) improved pain moderately in the short term. At intermediate term for exercise (SOE: moderate), acupuncture, and CBT (SOE: low), slight functional improvements persisted; they were also seen for myofascial release massage and multidisciplinary rehabilitation (SOE: low); pain was improved slightly with multidisciplinary rehabilitation in the intermediate term (SOE: low). In the long term, small improvements in function continued for multidisciplinary rehabilitation but not for exercise or massage (SOE: low for all); massage (SOE: low) improved long-term pain slightly, but no clear impact on pain for exercise (SOE: moderate) or multidisciplinary rehabilitation (SOE: low) was seen. Short-term CBT was associated with a slight improvement in function but not pain compared with pregabalin. Chronic tension headache: Evidence was sparse and the majority of trials were of poor quality. Spinal manipulation slightly improved function and moderately improved pain short term versus usual care, and laser acupuncture was associated with slight pain improvement short term compared with sham (SOE: low). There was no evidence suggesting increased risk for serious treatment-related harms for any of the interventions, although data on harms were limited. CONCLUSIONS: Exercise, multidisciplinary rehabilitation, acupuncture, CBT, and mind-body practices were most consistently associated with durable slight to moderate improvements in function and pain for specific chronic pain conditions. Our findings provided some support for clinical strategies that focused on use of nonpharmacological therapies for specific chronic pain conditions. Additional comparative research on sustainability of effects beyond the immediate post-treatment period is needed, particularly for conditions other than low back pain.

Evaluation of the Effects of Photobiomodulation on Partial Osteotomy in Streptozotocin-Induced Diabetes in Rats. OBJECTIVE: We examined the effects of photobiomodulation (PBM) on stereological parameters, and gene expression of Runt-related transcription factor 2 (RUNX2), osteocalcin, and receptor activator of nuclear factor kappa-B ligand (RANKL) in repairing tissue of tibial bone defect in streptozotocin (STZ)-induced type 1 diabetes mellitus (TIDM) in rats during catabolic response of fracture healing. BACKGROUND DATA: There were conflicting results regarding the efficacy of PBM on bone healing process in healthy and diabetic animals. MATERIALS AND METHODS: Forty-eight rats have been distributed into four groups: group 1 (healthy control, no TIDM and no PBM), group 2 (healthy test, no TIDM and PBM), group 3 (diabetic control, TIDM and no PBM), and group 4 (diabetic test, no TIDM and PBM). TIDM was induced in the groups 3 and 4. A partial bone defect in tibia was made in all groups. The bone defects of groups second and fourth were irradiated by a laser (890â€‰nm, 80â€‰Hz, 1.5â€‰J/cm(2)). Thirty days after the surgery, all bone defects were extracted and were submitted to stereological examination and real-time polymerase chain reaction (RT-PCR). RESULTS: PBM significantly increased volumes of total callus, total bone, bone marrow, trabecular bone, and cortical bone, and the numbers of osteocytes and osteoblasts of callus in TIDM rats compared to those of callus in diabetic control. In addition, TIDM increased RUNX2, and osteocalcin in callus of tibial bone defect compared to healthy group. PBM significantly decreased osteocalcin gene expression in TIDM rats. CONCLUSIONS: PBM significantly increased many stereological parameters of bone repair in an STZ-induced TIDM during catabolic response of

fracture healing. Further RT-PCR test demonstrated that bone repair was modulated in diabetic rats during catabolic response of fracture healing by significant increase in mRNA expression of RUNX2, and osteocalcin compared to healthy control rats. PBM also decreased osteocalcin mRNA expression in TIDM rats. Core Binding Factor Alpha 1 Subunit;RANK Ligand;Runx2 protein, rat;Osteocalcin Animals;Core Binding Factor Alpha 1 Subunit;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Disease Models, Animal;Female;Fracture Healing;Low-Level Light Therapy;Osteocalcin;Osteotomy;RANK Ligand;Rats;Rats, Wistar;Tibia;Tibial Fractures

Low level laser therapy for the management of breast cancer-related lymphedema: A randomized controlled feasibility study. OBJECTIVES: This study aimed to determine the feasibility of conducting a full scale randomized controlled trial investigating the effectiveness of low level laser therapy (LLLT), also known as photobiomodulation (PBM) therapy, used in addition to conventional therapy, for managing breast cancer related lymphedema (BCRL). MATERIALS AND METHODS: Patients with BCRL were recruited from the Southern District Health Board (New Zealand) via lymphedema therapists' referrals, and randomly allocated into either the laser group, which received BCRL conventional therapy (e.g., wearing compression garments, massage therapy, and/or exercise) plus a 6-week LLLT (PBM) intervention program (wavelength: 980/810â€‰nm (80:20 ratio); output power: 500â€‰mW beam spot size: 5â€‰cm(2) ; irradiance: 100â€‰mW/cm(2) ; treatment time per area: 1 minute dosage per area treated: 30J (6J/cm(2)); 10 points of treatment from axilla to wrist total LLLT (PBM) treatment time: 10 minutes total dosage delivered: 300â€‰J), or the control group, which received BCRL conventional therapy alone. Feasibility was determined by recruitment and randomization rates, retention of participants and treatment protocol adherence, and was assessed during the recruiting and intervention periods. Data on participant satisfaction and adverse reactions of LLLT (PBM) were collected on completion of this study. Clinical outcomes (i.e., limb circumference, participant's perceived symptoms, psychological impacts, and activity disability) were assessed at baseline, and 6 and 12 weeks post-randomization. RESULTS: Over a 6-month recruitment window, 17 participants with BCRL were recruited in the study, and randomized into the two groups (recruitment rate of 81%, and randomization rate of 100%). Treatment adherence was high in the laser group (88.9% of participants completed all treatments). Retention rates were 88.9% for the laser group and 100% for the control group at both 6 and 12 weeks post-randomization. All participants who completed LLLT (PBM) treatment indicated that they were satisfied with the treatment. No serious adverse reactions were reported in this study. Clinical outcomes failed to show additional benefits of LLLT (PBM) intervention. CONCLUSION: This study demonstrated that it is feasible to conduct a fully powered RCT to definitively test the effectiveness of the additional use of LLLT (PBM) in the management of BCRL. For such a trial, 114 participants will be needed at baseline. Lasers Surg. Med. 50:924-932, 2018. Â© 2018 Wiley Periodicals, Inc. Aged;Breast Cancer Lymphedema;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Middle Aged;Outcome Assessment, Health Care;Research Design

Effects of different photobiomodulation dosimetries on temporomandibular dysfunction: a randomized, double-blind, placebo-controlled clinical trial. Changes involving temporomandibular joint, masticatory musculature, and associated structures characterize temporomandibular dysfunction (TMD). The analgesic and anti-inflammatory effect produced by photobiomodulation has contributed to pain relief and functional improvement. However, the parameters to be used have not yet been well established. The aim of this study is to compare the efficacy of three different photobiomodulation dosimetries in the treatment of patients with TMD. A randomized, double-blind, placebo-controlled clinical trial with 44 subjects divided into the groups 8Â J/cm(2) (nâ€‰=â€‰11), 60Â J/cm(2) (nâ€‰=â€‰11), 105Â J/cm(2) (nâ€‰=â€‰11), and control (nâ€‰=â€‰11). Pain, symptom severity, and joint mobility were evaluated before and after a ten-

session protocol of photobiomodulation with AlGaAs laser (830Â nm), at a power density of 30Â mW/cm(2). The mouth opening increased in the 8-J/cm(2) group from 10.49â€‰Â±â€‰4.68 to 15.40â€‰Â±â€‰6.43 degrees, and in the right protrusion from 9.80â€‰Â±â€‰4.2 to 12.56â€‰Â±â€‰5.40 degrees after the intervention protocol (pâ€‰<â€‰0.05). All groups significantly decreased pain (pâ€‰<â€‰0.05). 830-nm laser photobiomodulation was effective in reducing TMD pain and symptoms at all doses tested. Only the doses of 8Â J/cm(2) were effective regarding maximal opening and protrusion of the mandible. Placebos Adolescent;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Mandible;Middle Aged;Placebos;Radiometry;Range of Motion, Articular;Surveys and Questionnaires;Temporomandibular Joint;Temporomandibular Joint Disorders;Young Adult

Effect of photobiomodulation therapy on oxidative stress markers of gastrocnemius muscle of diabetic rats subjected to high-intensity exercise. This study aimed to determine whether photobiomodulation therapy (PBMT) in diabetic rats subjected to high-intensity exercise interferes with the expression of the oxidative stress marker in the gastrocnemius muscle. Twenty-four male Wistar rats were included in this study comprising 16 diabetic and eight control rats. The animals were allocated into three groups-control, diabetic fatigue, and diabetic PBMT fatigue groups. Diabetes was induced via the intraperitoneal administration of streptozotocin (50Â mg/kg). We subsequently assessed blood lactate levels and PBMT. The animals of the diabetic fatigue group PBMT were irradiated before the beginning of the exercises, with dose of 4Â J and 808Â nm, were submitted to treadmill running with speed and gradual slope until exhaustion, as observed by the maximum volume of oxygen and lactate level. The animals were euthanized and muscle tissue was removed for analysis of SOD markers, including catalase (CAT), glutathione peroxidase (GPx), and 2-thiobarbituric acid (TBARS) reactive substances. CAT, SOD, and GPx activities were significantly higher in the diabetic PBMT fatigue group (pâ€‰<â€‰0.05) than in the diabetic fatigue group. Outcomes for the diabetic PBMT fatigue group were similar to those of the control group (pâ€‰>â€‰0.05), while their antioxidant enzymes were significantly higher than those of the diabetic fatigue group. PBMT mitigated the TBARS concentration (pâ€‰>â€‰0.05). PBMT may reduce oxidative stress and be an alternative method of maintaining physical fitness when subjects are unable to perform exercise. However, this finding requires further testing in clinical studies. Biomarkers;Thiobarbituric Acid Reactive Substances;Lactic Acid;Catalase;Glutathione Peroxidase;Superoxide Dismutase Animals;Biomarkers;Catalase;Diabetes Mellitus, Experimental;Glutathione Peroxidase;Lactic Acid;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxidation-Reduction;Oxidative Stress;Physical Conditioning, Animal;Rats, Wistar;Running;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances

Role of laser or photodynamic therapy in treatment of denture stomatitis: A systematic review. STATEMENT OF PROBLEM: Denture stomatitis (DS) is an inflammatory oral lesion that occurs mostly in elderly denture wearers and that can negatively affect their quality of life. The conventional treatment plan for DS is topical or systemic fungicidal drug therapy, which are not without side effects. PURPOSE: The purpose of this systematic review was to evaluate the clinical outcomes of using low-level laser therapy (LLLT) or photodynamic therapy (PDT) in the treatment of DS by reviewing high-quality published articles. MATERIAL AND METHODS: The Cochrane Library, Web of Science, Google Scholar, PubMed, ProQuest, Scopus, Embase, and Ovid databases were searched using appropriate key words. Related titles and abstracts published up to May 2017 were screened and selected based on defined inclusion criteria. The full texts of all selected articles were read, and citation lists were checked for missing references. All randomized controlled trials (RCT) were subjected to quality assessments. RESULTS: A total of 760 articles were included in the study after the initial search. Six studies were selected for assessment of eligibility, and 4 of them were sufficiently

reliable in methodology and randomization to be included in the study. The applied wavelength varied from 455 nm to 830 nm. Also, the highest energy patients were exposed to was 122 J/cm(2), and the lowest was 1 J/cm(2). Exposure times ranged from 10 seconds to 26 minutes in the reviewed studies. CONCLUSIONS: Based on the available RCTs, LLLT has a significant role in the clinical treatment of DS. However, the results of PDT were similar to those of conventional antifungal therapies. Humans;Low-Level Light Therapy;Photochemotherapy;Stomatitis, Denture;Treatment Outcome

Evaluation of red light scattering in gingival tissue - in vivo study. Antimicrobial photodynamic therapy (aPDT) has been used to treat periodontal disease, thus the aim of this study was to investigate red light (ÊŽâ€¯=â€¯660â€¯nm) attenuation in gingival tissue. This clinical trial included 30 patients with chronic periodontitis; three incisors from each patient were selected for the experimental procedures. A laser source with a radiant power output of 100â€¯mW was used. Two digital photographs were taken of each selected incisor (in frontal and occlusal position). The images were analyzed in the ImageJ program. The results demonstrated that at a 3â€¯mm distance from the laser probe, there is an attenuation of light intensity of 50%, along frontal and occlusal views. Light attenuation in gingival tissue should be considered when setting optimal parameters for antimicrobial photodynamic therapy or photobiomodulation. Chronic Disease;Gingiva;Humans;Infrared Rays;Lasers, Semiconductor;Light;Periodontitis

Effectiveness of low level laser therapy for treating male infertility. In half of the cases, the infertility of the couple is due to the disorder of the male fertility. The leading factors that cause male infertility are urogenital infections, disorders of the immune system, testicular and prostate pathology, as well as endocrine disorders. Low level laser therapy (LLLT) is a very effective physical therapy method, used in many areas of medicine, including obstetrics and gynaecology, andrology and urology; and it is recommended as an integral part of the complex treatment of infertility. The literature review showed that LLLT is beneficial in treating male infertility. Laser can significantly improve the survival, motility and speed of movement of spermatozoa. Laser therapy of patients with prostatitis and vesiculitis can eliminate infiltrative-exudative changes, improve reproductive and copulatory functions. Local illumination of red (635 nm) and infrared (904 nm) spectra should be combined with intravenous laser blood illumination (ILBI) of red (635 nm) and ultraviolet (UV) (365 nm) spectra.

Expression patterns of oxyR induced by oxidative stress from Porphyromonas gingivalis in response to photo-activated disinfection. INTRODUCTION: Porphyromonas gingivalis, an important endodontic pathogen, may be exposed to sublethal doses of photo-activated disinfection (sPAD) during root canal therapy. Such an exposure can affect bacterial survival and virulence features. In this study, we evaluated the effect of sPAD-related oxidative stresses on the expression of oxidative stress response gene (oxyR) in P. gingivalis clinical isolates surviving in vitro photodynamic treatment. MATERIALS AND METHODS: To determine the sPAD, 16 clinical P. gingivalis isolates photosensitized with toluidine blue O (TBO), methylene blue (MB), and indocyanine green (ICG) were irradiated with specific wavelength and energy density of diode laser corresponding to the photosensitizers following bacterial viability measurements. The effects of sPAD on the expression ratio of oxyR of 16 clinical P. gingivalis isolates were then assessed using quantitative real-time PCR (qRT-PCR) assay. RESULTS: Maximum values of sPAD against P. gingivalis were 6.25, 15.6, and 25 Î¼g/mL at fluencies of 171.87, 15.6, and 93.75 J/cm(2), respectively, for TBO-, ICG-, and MB-sPAD (P>0.05). ICG-, MB-, and TBO-sPAD could increase the oxyR gene expression of the clinical P. gingivalis isolates 12.3-, 5.6-, and 8.5-fold, respectively. ICG-sPAD increased the expression of oxyR gene in clinical isolates of P. gingivalis ~1.5- and 2-fold higher than TBO- and MB-sPAD, respectively. CONCLUSION: Our results showed that upregulation of oxyR during sPAD may lead to better survival and increased pathogenicity of P.

gingivalis isolates. Therefore, selection of appropriate photo-activated disinfection dosage should be considered for the successful treatment of endodontic infection.

Comparative evaluation of various low-level laser therapies on bone healing following tooth extraction: An experimental animal study. PURPOSE: The aim of this study was to evaluate the effects of helium-neon and gallium-aluminum-arsenide lasers with various doses on bone healing following tooth extraction. MATERIALS AND METHODS: Maxillary right incisor teeth of 30 female albino Wistar rats were extracted. Five groups were established: four groups treated with helium-neon or gallium-aluminum-arsenide lasers and a control group. Both laser groups' rats received energy doses of 6Â J/cm(2) and 10Â J/cm(2) for 7 days. At the end of 30 days, all subjects were sacrificed for histological and morphological evaluations. RESULTS: Laser groups showed faster bone healing and gallium-aluminum-arsenide lasers increased vascular immunoreactivity. The most widespread organized bone formation in the extraction socket was observed in the gallium-aluminum-arsenide laser group with the energy dose of 10Â J/cm(2) (pÂ <Â 0.05). CONCLUSION: This study demonstrated that low-level laser therapies were effective on alveolar bone healing and that an energy dose of 10Â J/cm(2) did not have an inhibition effect on bone regeneration.
Alveolar Process;Animals;Female;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Radiotherapy Dosage;Rats, Wistar;Tooth Extraction;Wound Healing

Custom paper shield to prevent perilesional hyperpigmentation after excimer laser treatment for vitiligo. Female;Humans;Hyperpigmentation;Lasers, Excimer;Low-Level Light Therapy;Male;Paper;Radiation Protection;Vitiligo

Efficacy of low-level laser therapy in management of recurrent herpes labialis: a systematic review. Recurrent herpes labialis (RHL) is a highly prevalent viral infection that affects the oro-facial region. Current treatment options have limited efficacy in reducing healing time and recurrence rate of the disease. Recently, low-level laser therapy has been proposed as a potential treatment alternative for the management of RHL with no side effects. This systematic review aims to evaluate the effectiveness of laser therapy in the management and prevention of RHL. A comprehensive search of Medline/PubMed, Scopus, and Web of Science was carried out to identify published clinical trials comparing laser intervention to active and/or non-active controls for the treatment of RHL. Due to marked heterogeneity of available data, studies were assessed qualitatively, and no statistical analysis was performed. Of the retrieved 227 articles, six clinical trials met the eligibility criteria. The wavelengths, the power output, and energy density ranged between 632.5-870Â nm, 5-80Â W, and 2.04-48Â J/cm(2), respectively. All included studies found laser to be effective in the management and prevention of RHL, without any side effects. The findings of this review suggest that laser is potentially a safe and effective treatment alternative for the management of RHL. However, due to high variability in study designs and inconsistency in laser parameters among the included studies, more well-designed randomized clinical trials with standardized laser parameters are highly warranted. Adolescent;Adult;Edema;Herpes Labialis;Humans;Low-Level Light Therapy;Middle Aged;Pain Measurement;Recurrence;Time Factors;Treatment Outcome;Wound Healing;Young Adult

Antimicrobial photodynamic therapy associated with partial removal of carious tissue in a patient with amyotrophic lateral sclerosis. Photosensitizing Agents;Methylene Blue
Amyotrophic Lateral Sclerosis;Combined Modality Therapy;Dental Caries;Female;Humans;Low-Level Light Therapy;Methylene Blue;Middle Aged;Photochemotherapy;Photosensitizing Agents

[The role of CO2-laser in scarring management]. AIM: To assess the role of CO2-laser in treatment of various scars and to determine the indications for its application. PATIENTS AND METHODS: It has been carried out a prospective analysis of treatment of 218 patients with scars of different duration, locations and anatomic areas with the use of CO2-laser for the period 2011-2017.

POSAS scale and sonography were used for analysis. RESULTS: 1. Laser therapy is not effective for scarring-related functional defects (contractures, ectropion, microstomia), when surgery is indicated. 2. The outcomes of treatment (both surgical and laser) depend on the time of existence of the scars rather their cause and anatomical region. 3. Laser therapy is not effective enough for formed scars existing over 12 months. 4. Laser therapy is effective for immature scars, especially indicated for cicatricial deformation when the aesthetics cannot be repaired with traditional surgery. CONCLUSION: Application of CO2-laser in scars treatment with regard to its real efficiency determines the effectiveness of therapy. Adult;Cicatrix;Contracture;Female;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Selection;Treatment Outcome

Efficacy of non-surgical treatments for androgenetic alopecia: a systematic review and network meta-analysis. Androgenetic alopecia, or male/female pattern baldness, is the most common type of progressive hair loss disorder. The aim of this study was to review recent advances in non-surgical treatments for androgenetic alopecia and identify the most effective treatments. A network meta-analysis (NMA) was conducted of the available literature of the six most common non-surgical treatment options for treating androgenetic alopecia in both men and women; dutasteride 0.5Â mg, finasteride 1Â mg, low-level laser therapy (LLLT), minoxidil 2%, minoxidil 5% and platelet-rich plasma (PRP). Seventy-eight studies met the inclusion criteria, and 22 studies had the data necessary for a network meta-analysis. Relative effects show LLLT as the superior treatment. Relative effects show PRP, finasteride 1Â mg (male), finasteride 1Â mg (female), minoxidil 5%, minoxidil 2% and dutasteride (male) are approximately equivalent in mean change hair count following treatment. Minoxidil 5% and minoxidil 2% reported the most drug-related adverse events (nÂ =Â 45 and nÂ =Â 23, respectively). The quality of evidence of minoxidil 2% vs. minoxidil 5% was high; minoxidil 5% vs. placebo was moderate; dutasteride (male) vs. placebo, finasteride (female) vs. placebo, minoxidil 2% vs. placebo and minoxidil 5% vs. LLLT was low; and finasteride (male) vs. placebo, LLLT vs. sham, PRP vs. placebo and finasteride vs. minoxidil 2% was very low. Results of this NMA indicate the emergence of novel, non-hormonal therapies as effective treatments for hair loss; however, the quality of evidence is generally low. High-quality randomized controlled trials and head-to-head trials are required to support these findings and aid in the development of more standardized protocols, particularly for PRP. Regardless, this analysis may aid physicians in clinical decision-making and highlight the variety of non-surgical hair restoration options for patients. 5-alpha Reductase Inhibitors;Vasodilator Agents;Finasteride;Minoxidil;Dutasteride 5-alpha Reductase Inhibitors;Alopecia;Dutasteride;Finasteride;Humans;Low-Level Light Therapy;Minoxidil;Network Meta-Analysis;Platelet-Rich Plasma;Vasodilator Agents

Interleukin-10 and collagen type II immunoexpression are modulated by photobiomodulation associated to aerobic and aquatic exercises in an experimental model of osteoarthritis. The aim of this study was to compare the effects of photobiomodulation (PBM) associated with an aerobic and an aquatic exercise training on the degenerative process related to osteoarthritis (OA) in the articular cartilage in rats. Fifty male Wistar rats were randomly divided into 5 groups: OA control group (CG), OA plus aerobic training group (AET), OA plus aquatic training group (AQT), OA plus aerobic training associated with PBM group (AETL), OA plus aquatic training associated with PBM group (AQTL). The aerobic training (treadmill; 16Â m/min; 50Â min/day) and the aquatic training (water jumping; 50-80% of their body mass) started 4Â weeks after the surgery and they were performed 3Â days/week for 8Â weeks. Moreover, PBM was performed after the physical exercise trainings on the left joint. Morphological characteristics and immunoexpression of IL-10, TGF-Î², and collagen type I (Col I) and II (Col II) of the articular cartilage were evaluated. The results showed that all the treated groups (exercise and PBM) presented less intense signs of degradation (measured by

histopathological analysis and OARSI grade system). Additionally, aerobic and aquatic exercise training rats (associated or not with PBM) showed increased IL-10 (AET pâ€‰=â€‰0.0452; AETL pâ€‰=â€‰0.03; AQTL pâ€‰=â€‰0.0193) and Col II (AET pâ€‰=â€‰0.012; AQT pâ€‰=â€‰0.0437; AETL pâ€‰=â€‰0.0001; AQTL pâ€‰=â€‰0.0001) protein expression compared to CG. Furthermore, a statistically higher TGF-Î² expression was observed in AET (pâ€‰=â€‰0.0084) and AETL (pâ€‰=â€‰0.0076) compared to CG. These results suggest that PBM associated with aerobic and aquatic exercise training were effective in mediating chondroprotective effects and maintaining the integrity of the articular tissue in the knees of OA rats. Collagen Type I;Collagen Type II;Transforming Growth Factor beta;Interleukin-10 Animals;Cartilage, Articular;Collagen Type I;Collagen Type II;Disease Models, Animal;Humans;Interleukin-10;Low-Level Light Therapy;Male;Osteoarthritis;Physical Conditioning, Animal;Rats, Wistar;Transforming Growth Factor beta

Low Level Laser Therapy for Radial Nerve Palsy Patients : Our Experience. BACKGROUND AND AIMS: Peripheral nerve injury is one of the frequent complaints which is seen in the outpatient clinic of our medical institute. In previous studies we have reported on the benefits of low level laser therapy (LLLT) for central nerve system disorders, namely cerebrovascular accidents and cerebral palsy. The present study is a report on our experience of the effects of LLLT for peripheral nerve palsy. MATERIALS AND METHODS: Over the past 5 years, 13 subjects visited the out-patient clinic with the chief complaint of radial nerve palsy caused by compression of the nerve through with abnormal positioning, and sleeping posture at night. The patients were treated with LLLT. A 1000 mW semi-conductor laser device was used, delivering 830 nm in continuous wave at a dose of 20.1 J/cm(2) /point, and five points were treated per session (i.e., 1 treatment) twice a week for 3 months (total 24 treatments). In 6 patients LLLT was combined with brace therapy. RESULTS: Modified Daniels' manual muscle testing was used to determine the effects of LLLT for the muscle power of the extensor carpi radialis, and on completing the treatment regimen excellent improvement was observed in 9 cases out of 13. Combination treatment (laser therapy with bracing) resulted in 4 excellent cases out of 6 cases. Discussions with the patients clarified that it was important for them to learn how to avoid the particular posture that could cause them radial nerve palsy in daily life in order to have continuous benefits from the treatment. CONCLUSION: The present study demonstrated that LLLT was an effective form of treatment for radial nerve palsy. In addition, patients were advised to avoid any incorrect posture which might induce radial nerve palsy.

Photobiomodulation or low-level laser therapy in the management of cancer therapy-induced mucositis, dermatitis and lymphedema. PURPOSE OR REVIEW: There is a large body of evidence supporting the efficacy of low-level laser therapy (LLLT) also known as PhotoBioModulation (PBM) when used for the prevention and/or treatment of oral mucositis in patients undergoing radiotherapy for head and neck cancer, or high-dose chemotherapy regimens. This review aims at giving the state of the art of this technique in this indication. RECENT FINDINGS: Recent advances in LLLT/PBM technology, together with a better understanding of mechanisms involved and dosimetric parameters may lead to the management of a broader range of complications associated with cancer treatment. This could enhance patient adherence to cancer therapy, and improve quality of life and treatment outcomes. SUMMARY: The article discusses LLLT/PBM mechanisms of action, dosimetry, and safety, and aims to identify some cancer treatment side-effects for which LLLT/PBM may prove to be effective (oral mucositis, radiation dermatitis, lymphedema). In addition, LLLT/PBM parameters for each of these complications are suggested and future research directions are discussed. Dermatitis;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Lymphedema;Mucositis;Randomized Controlled Trials as Topic

Osteoradionecrosis of the jaws: case series treated with adjuvant low-level laser therapy and antimicrobial photodynamic therapy. BACKGROUND: Osteoradionecrosis of the jaw (ORNJ) is the most severe and complex sequel of head and neck radiotherapy (RT) because of the bone involved, it may cause pain, paresthesia, foul odor, fistulae with suppuration, need for extra oral communication and pathological fracture. We treated twenty lesions of ORNJ using low-level laser therapy (LLLT) and antimicrobial photodynamic therapy (aPDT). The objective of this study was to stimulate the affected area to homeostasis and to promote the healing of the oral mucosa. METHODS: We performed aPDT on the exposed bone, while LLLT was performed around the bone exposure (red spectrum) and on the affected jaw (infrared spectrum). Monitoring and clinical intervention occurred weekly or biweekly for 2 years. RESULTS: 100% of the sample presented clinical improvement, and 80% presented complete covering of the bone exposure by intact oral mucosa. CONCLUSION: LLLT and aPDT showed positive results as an adjuvant therapy to treat ORNJ. Anti-Infective Agents Adult;Aged;Anti-Infective Agents;Chemoradiotherapy, Adjuvant;Dose-Response Relationship, Radiation;Female;Homeostasis;Humans;Jaw Diseases;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Osteoradionecrosis;Photochemotherapy;Prospective Studies;Reproducibility of Results;Time Factors;Treatment Outcome;Wound Healing

Effect of photobiomodulation (670Â nm) associated with vitamin A on the inflammatory phase of wound healing. Wound healing is a complex biological process with specific phases. Photobiomodulation (PBM) decreases the inflammatory infiltrate, stimulating fibroblast proliferation and angiogenesis, and therefore, is indicated for wound healing. Vitamin A is used to reverse the inhibitory effects on wound healing and accelerate the healthy granulation tissue. The study aimed to evaluate the effect of topical vitamin A and PBM (GaAlAs) in inflammatory phase of cutaneous wounds. Forty Wistar male rats were separated into four groups: (1) control (CG); (2) laser group (LG) GaAlAs, 670Â nm, 30Â mW, energy per point of 0.9Â J, radiating by 1 point in 30Â s; (3) vitamin A group (VitAG); and (4) laser group plus vitamin A (LGâ€‰+â€‰VitAG). Wounds were surgically made by a punch biopsy with 10Â mm of diameter on the back of the animals and all treatments were started according to the experiment. The treatments were administered for four consecutive days and biopsy was performed on day 4. We performed both H&E and immunohistochemistry analysis. The results were compared between groups by one-way analysis of variance ANOVA test with post hoc Tukey (pâ€‰<â€‰0.05). Inflammatory infiltrate increased significantly in LG compared to CG and VitAG (pâ€‰<â€‰0.05). Regarding angiogenesis, VEGF expression was increased significantly in LG and LGâ€‰+â€‰VitAG groups, pâ€‰<â€‰0.01. The results indicate that proposed treatments were effective on the healing process improved by LG and LGâ€‰+â€‰VitAG. We show that laser plus vitamin A enhances healing by reducing the wound area and may have potential application for clinical management of cutaneous wounds. Vascular Endothelial Growth Factor A;Vitamin A;Cyclooxygenase 2 Animals;Biopsy;Cyclooxygenase 2;Immunohistochemistry;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats, Wistar;Skin;Vascular Endothelial Growth Factor A;Vitamin A;Wound Healing

Photobiomodulation therapy in the management of oral mucositis: search for the optimal clinical treatment parameters. This commentary attempts to clarify the setting of photobiomodulation (BPM) therapy in the management of oral mucositis. The suggested dose range balances efficacy data with our current understanding about PBM safety. The literature about the molecular basis of photobiomodulation and its controversial relationship to malignant transformation is briefly presented. Humans;Low-Level Light Therapy;Stomatitis

Effect of 2.94 Âµm Er: YAG laser on the chemical composition of hard tissues. The aim was to investigate the effect of the Er-YAG laser radiation on morphology and chemical composition of enamel, dentin, and bone. The specimens of the three groups were irradiated with a very long pulse

mode (VLP) of 2.94 Âµm Er-YAG laser with 100 mJ pulse energy and energy density of 8.42 J/ cm2 for 30 s, at a repetition rate of 15 Hz. The organic and inorganic content of the samples were investigated by Fourier Transforms Infrared spectroscopy (FTIR). The morphological characteristics were investigated with scanning electron microscopy (SEM) and elemental analysis (calcium and phosphorus) with energy-dispersive X-ray spectroscopy (EDX). FTIR data were analyzed with a One-Way ANCOVA test and EDX data with the independent sample t-test. Following the laser radiation, FTIR showed a significant decrease in the organic content of all tissues. The weight percentage (wt %) calcium content of dentin and bone increased significantly following irradiation with a p-value of .002 for both tissues, but the wt % of phosphorus content was not influenced significantly. The morphological alterations expressed signs of fusion in all the samples. Inorganic Chemicals;Organic Chemicals Bicuspid;Bone and Bones;Dental Enamel;Dentin;Humans;Inorganic Chemicals;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Organic Chemicals;Spectrometry, X-Ray Emission;Spectroscopy, Fourier Transform Infrared

Lymphangioma Circumscriptum Post Radiotherapy for Penile Cancer Treated with COâ,, Laser. Lymphangioma circumscriptum (LC) is a rare, benign condition, predominantly characterized by the malformation of lymphatic skin vessels. Its onset may be congenital or due to secondary causes such as radiotherapy, infections, or surgical procedures. We present the case of a 55-year-old patient with a pathologic history of squamous cell carcinoma of the penis followed by radical penectomy. Due to metastasis to the locoregional lymph nodes, the entire affected area was subsequently treated with radiation therapy, receiving a total dose of 55.8 Gray. Eight years after this treatment, translucent vesicles filled with a clear liquid appeared on the scrotum. Histopathology confirmed the diagnosis of LC and therapy with CO2 laser was applied, resulting in a favorable outcome. LC of the scrotum may present a long-term radiotherapy-induced complication of this site. Our clinical experience showed that the CO2 laser was the therapy of choice as the vesicles entirely disappeared and healed as white scar-like lesions. Carcinoma, Squamous Cell;Humans;Lasers, Gas;Low-Level Light Therapy;Lymphangioma;Male;Middle Aged;Neoplasms, Radiation-Induced;Penis;Prognosis;Radiotherapy Dosage;Radiotherapy, Adjuvant;Risk Assessment;Scrotum;Skin Neoplasms;Treatment Outcome

Photomodulation multiple sessions as a promising preventive therapy for medication-related osteonecrosis of the jaws after tooth extraction in rats. The aim of this study was to evaluate the effects of photobiomodulation (PBM) with multiple sessions of low-level laser on the alveolar repair process of rats with major risk factors for medication-related osteonecrosis of the jaws (MRONJ). Senile rats received 0.45â€¯mL of vehicle (VEH and VEH-PBM) or 0.45â€¯mL of 100â€¯Î¼g/kg zoledronate (ZOL and ZOL-PBM) administrated intraperitoneally every two days during seven weeks. After three weeks of initiation of drug treatment the first lower left molar was extracted. No local treatment was performed in VEH and ZOL. VEH-PBM and ZOL-PBM were submitted to laser irradiation (660â€¯Â±â€¯10â€¯nm; 0.035â€¯W; 2.1â€¯J; 60â€¯s) on the extraction site at 0, 2 and 4â€¯days postoperatively. Euthanasia was performed 28â€¯days after tooth extraction. Histological sections of the hemimandible were submitted to histopathological and histomorphometric analysis, as well as to histochemistry for collagen fiber maturation and immunohistochemistry for pro-inflammatory cytokines. In ZOL, general impairment of tissue repair, areas with osteonecrosis, lower newly formed bone tissue (NFBT), smaller amount of mature collagen fibers and increased immunoreactivity for TNFÎ±, IL-1Î² and IL-6 were observed when compared to VEH and VEH-PBM. ZOL-PBM showed significant improvement in some parameters compared to ZOL, such as positive repair tissue, higher NFBT, greater amount of mature collagen fibers, besides TNFÎ± and IL-1Î² immunoreactivity decrease. Zoledronate treatment severely compromised the tissue repair process of the tooth extraction site in rats with major risk factors for MRONJ. Based on parameters employed

in the present study, PBM in multiple sessions can improve the alveolar repair process, constituting a promising preventive therapy to avoid the onset of post-extraction MRONJ. Zoledronic Acid Animals;Immunohistochemistry;Jaw;Low-Level Light Therapy;Osteonecrosis;Rats;Tooth Extraction;Zoledronic Acid

Pharmacological modulation of radiation-induced oral mucosal complications. Radiation-induced mucositis is a common toxicity, especially in patients with head and neck cancers. Despite recent technological advances in radiation therapy, such as intensity-modulated radiotherapy, radiation-induced mucositis is still causing treatment disruptions, negatively affecting patients' long and short term quality of life, and impacting medical resources use with economic consequences. The objective of this article was to review the latest updates in the management of radiation-induced mucositis, with a focus on pharmaceutical strategies for the prevention or treatment of mucositis. Although numerous studies analysing the prevention and management of oral radiation-induced mucositis have been conducted, there are still few reliable data to guide daily clinical practice. Furthermore, most of the tested drugs have shown no (anti-inflammatory cytokine, growth factors) or limited (palifermin) effect. Therapies for acute oral mucositis are predominantly focused on improving oral hygiene and providing symptoms control. Although low-level laser therapy proved efficient in preventing radiation-induced oral mucositis in patients with head and neck cancer, this intervention requires equipment and trained medical staff, and is therefore insufficiently developed in clinical routine. New effective pharmacological agents able to prevent or reverse radio-induced mucositis are required. Analgesics;Anti-Inflammatory Agents;Mouthwashes;Radiation-Protective Agents;Glutamine;Fibroblast Growth Factor 7;Benzydamine;Zinc;Amifostine Amifostine;Analgesics;Anti-Inflammatory Agents;Benzydamine;Dietary Supplements;Fibroblast Growth Factor 7;Glutamine;Humans;Low-Level Light Therapy;Mouthwashes;Mucositis;Oral Hygiene;Radiation-Protective Agents;Radiotherapy;Risk Factors;Zinc

Influence of Photobiomodulation Therapy on Gingivitis Induced by Multi-Bracket Appliances: A Split-Mouth Randomized Controlled Trial. OBJECTIVE: The objective of this split-mouth trial was to investigate the influence of photobiomodulation therapy (PBMT) on adjuvant treatment of gingivitis induced by multi-bracket appliances, after bracket debonding and professional tooth cleaning. MATERIALS AND METHODS: Thirteen patients (mean age 16.15 years; standard deviation Â±2.12 years) who had completed active orthodontic treatment with fixed orthodontic appliances in an orthodontic clinic were included on a randomized basis. At time point T0, after bracket debonding and professional tooth cleaning, the papilla bleeding index (PBI) and bleeding on probing (BOP) were assessed in the upper jaw by the blinded investigator (M.S.), who was not aware at any time of which quadrant received PBMT. The study was based on a patient-blinded split-mouth design. In each patient, PBMT was administered by a practitioner (S.S.) in one upper quadrant (wavelength: 660â€‰nm; Power: 100â€‰mW; Power density: 100â€‰mW/cm(2); Energy density per application pointâ€‰=â€‰2â€‰J/cm(2); Energy per application pointâ€‰=â€‰2â€‰J; Total doseâ€‰=â€‰52â€‰J/cm(2); Total energyâ€‰=â€‰52â€‰J; Irradiation time: 26â€‰Ã—â€‰20â€‰sec), while the other upper quadrant received a simulated laser application with the laser system turned off. Randomized equal allocation of the sides was accomplished. The second PBI and BOP assessment followed 4-6 days after laser irradiation (T1) by M.S. RESULTS: No statistical differences were observed between the sides with regard to PBI and BOP values at T0 (pâ€‰>â€‰0.05). The PBI and BOP values decreased significantly between T0 and T1 on both sides (pâ€‰<â€‰0.05). At T1, the PBI and BOP values were significantly lower in the laser side in comparison with the control side (pâ€‰<â€‰0.05). CONCLUSIONS: On the basis of these results and study parameters, adjuvant PBMT is able to accelerate the healing process in patients with gingivitis induced by multi-bracket appliances. Adolescent;Dental Debonding;Dental

Prophylaxis;Female;Gingivitis;Humans;Low-Level Light Therapy;Male;Orthodontic Brackets;Single-Blind Method
Low-level laser irradiation promotes the differentiation of bone marrow stromal cells into osteoblasts through the APN/Wnt/Î²-catenin pathway. OBJECTIVE: The relationship between adiponectin (APN) pathway and Wnt pathway was explored through BMSCs, and the effect of low-level laser irradiation (LLLI) on bone marrow stromal cells (BMSCs) and its mechanism were further studied. MATERIALS AND METHODS: 3-week-old Sprague-Dawley (SD) rats were selected, and mesenchymal stem cells were separately cultured and purified. 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay was used to analyze cell proliferation. After osteogenic and adipogenic induction, cultures were conducted, respectively, cells were stained with alizarin red and oil red O. Reverse transcription-polymerase chain reaction (RT-PCR) was used to detect the expressions of osteogenesis-related genes, runt-related transcription factor 2 (RUNX2), and osteocalcin (OC) and those of adipogenesis-related genes, peroxisome proliferator-activated receptor-gamma (PPARÎ³) and CCAAT/enhancer-binding protein alpha (c/EBPÎ±). Western blotting was used to detect the expressions of Î²-catenin in the cytoplasm and nucleus. The lentiviral expression vector of adiponectin receptors (APN-R) was constructed, and the expression of APN receptor genes was silenced. The expressions of Î²-catenin in APN receptors and the nucleus within cells were detected. RESULTS: LLLI promoted the bone formation by inducing the differentiation direction of mesenchymal stem cells, increasing the number of osteoblasts in the bone marrow and inhibiting the reduction of the number of adipocytes. LLLI regulates the Wnt pathway, promotes the entry of Î²-catenin into the nucleus, activates the osteogenic effect of the Wnt pathway so as to promote the bone formation of osteoblasts and inhibit bone resorption of osteoclasts. LLLI promotes the entry of Î²-catenin into the nucleus and the osteogenic differentiation of BMSCs through the APN pathway. CONCLUSIONS: In summary, LLLI can promote osteogenesis and inhibit adipocytes formation, thus attenuating bone resorption of osteoclasts. The mechanism of LLLI is that it promotes the entry of Î²-catenin into the nucleus and regulates the Wnt pathway and the differentiation direction of mesenchymal stem cells through the APN signal pathway, thus promoting bone formation. Adiponectin;beta Catenin Adiponectin;Animals;Bone Marrow Cells;Cell Differentiation;Cells, Cultured;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis;Rats;Rats, Sprague-Dawley;Stromal Cells;Wnt Signaling Pathway;beta Catenin
An open-label non-randomized prospective pilot study of the efficacy of Q-switched Nd-YAG laser in management of facial lichen planus pigmentosus. Lichen planus pigmentosus (LPP) is a cosmetically disfiguring condition. Many treatment options are available which are effective in halting the progression of the disease. The treatment of persistent pigmentation is still a challenge. We describe the use of Q-switched Nd-YAG laser in 13 patients with stable LPP using a standard protocol. Most of our patients showed complete to near-complete resolution of pigment without much complications. Cosmetic Techniques;Face;Female;Humans;Lasers, Solid-State;Lichen Planus;Low-Level Light Therapy;Male;Pilot Projects;Prospective Studies
Evaluation of long pulsed Nd-YAG laser in the treatment of onychomycosis. Adult;Female;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis
A novel non-invasive strategy for low-level laser-induced cancer therapy by using new Ag/ZnO and Nd/ZnO functionalized reduced graphene oxide nanocomposites. In the present research, an effective drug-free approach was developed to kill MCF7 breast cancer cells using low-level laser therapy (LLLT) combined with reduced graphene oxide (rGO)-based hybrid nanocomposites (NCs). Here, fruit extract of Rosa canina was used for the first time to obtain the rGO/ZnO, Ag-ZnO/rGO and Nd-ZnO/rGO NCs by green synthesis. Physico/photochemical properties of these NCs were evaluated

using FTIR, XRD, Raman, XPS, SEM/EDX, UV-Vis, DLS and AFM. The potential of the as-synthesized NCs on ROS generating and antioxidant activity were assessed by DPPH. After optimizing the proper concentration of the NCs their anti-tumoral efficacy were evaluated by DAPI staining and MTT assay tests for laser therapy on MCF7 breast cancer cells. Interestingly, cell death was increased dramatically by increasing irradiation dose from 8-32â€‰J/cm(2) and then decreased by enhancing laser dose. The maximum amount of cell death is 50% which was observed in the presence of ZnO/rGO 20% by irradiation dose of 32â€‰J/cm(2). Furthermore, in comparison with 810â€‰nm, 630â€‰nm lasers were more effective in LLLT of MCF7 cells. The results show the potential of using rGO-based NCs in LLLT, which may be combined with other therapeutic approaches to assist our fight against cancer. Antioxidants;Reactive Oxygen Species;Neodymium;Silver;Graphite;Zinc Oxide Antioxidants;Combined Modality Therapy;Graphite;Humans;Low-Level Light Therapy;MCF-7 Cells;Nanocomposites;Neodymium;Oxidation-Reduction;Reactive Oxygen Species;Silver;Zinc Oxide

Clinical Outcome of 1064-nm Picosecond Neodymium-Doped Yttrium Aluminium Garnet Laser for the Treatment of Hypertrophic Scars. BACKGROUND: Currently no study has evaluated the effect of the novel 1064-nm picosecond neodymium-doped:yttrium aluminium garnet laser (ps-Nd:YAG) for reducing Hypertrophic scarring (HS). OBJECTIVE: The aim of this study was to verify the efficacy and safety of a 1064-nm ps-Nd:YAG in the management of HS. MATERIALS AND METHODS: A retrospective chart review and photographic analysis were conducted on patients treated with a low-fluence 1064-nm ps-Nd:YAG for HS improvement. The Vancouver Scar Scale (VSS), 5-point Global Assessment Score (GAS), and patient satisfaction score were used to determine the effect of scar improvement. RESULTS: A total of 24 Korean patients (9 males and 15 females; mean age of 33.25Â Â±Â 15.50Â years) were retrospectively evaluated. Mean treatment settings were 1064-nm wavelength, 750Â ps pulse duration, 7.94Â mm spot size, 0.93Â J/cm(2) fluence, and 9.69Â Hz frequency. The average VSS score decreased significantly (from 5.33 to 2.71) after laser treatment (pÂ <Â 0.001). The average GAS (3.02Â Â±Â 0.93) showed fair cosmetic improvement, and patient satisfaction scores (6.88Â Â±Â 2.66) indicated moderate satisfaction. CONCLUSION: The novel low-fluence 1064-nm ps-Nd:YAG could be considered as an effective and safe optional modality for the treatment of HS in Asian skin. Adult;Asian People;Cicatrix, Hypertrophic;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Retrospective Studies

Wavelength-dependence of vasodilation and NO release from S-nitrosothiols and dinitrosyl iron complexes by far red/near infrared light. Far red/near infrared (R/NIR) energy is a novel therapy, but its mechanism of action is poorly characterized. Cytochrome c oxidase (Cco) of the mitochondrial electron transport chain is considered the primary photoacceptor for R/NIR to photolyze a putative heme nitrosyl in Cco to liberate free nitric oxide (NO). We previously observed R/NIR light directly liberates NO from nitrosylated hemoglobin and myoglobin, and recently suggested S-nitrosothiols (RSNO) and dinitrosyl iron complexes (DNIC) may be primary sources of R/NIR-mediated NO. Here we indicate R/NIR light exposure induces wavelength dependent dilation of murine facial artery, with longer wavelengths (740, and 830â€¯nm) exhibiting reduced potency when compared to 670â€¯nm. R/NIR also stimulated NO release from pure solutions of low molecular weight RSNO (GSNO and SNAP) and glutathione dinitrosyl iron complex (GSH-DNIC) in a power- and wavelength-dependent manner, with the greatest effect at 670â€¯nm. NO release from SNAP using 670 was nearly ten-fold more than GSNO or GSH-DNIC, with no substantial difference in NO production at 740â€¯nm and 830â€¯nm. Thermal effects of irradiation on vasodilation or NO release from S-nitrosothiols and DNIC was minimal. Our results suggest 670â€¯nm is the optimal wavelength for R/NIR treatment of certain vascular-related diseases. Nitric Oxide Donors;Nitrogen Oxides;S-Nitrosothiols;Nitric

Oxide;dinitrosyl iron complex;Iron Animals;Arteries;Infrared Rays;Iron;Light;Mice, Inbred C57BL;Nitric Oxide;Nitric Oxide Donors;Nitrogen Oxides;S-Nitrosothiols;Vasodilation

Low-level laser therapy with 850â€¯nm recovers salivary function via membrane redistribution of aquaporin 5 by reducing intracellular Ca(2+) overload and ER stress during hyperglycemia. The overall goal is to study the effect of low-level laser therapy (LLLT) on membrane distribution of major water channel protein aquaporin 5 (AQP5) in salivary gland during hyperglycemia. Par C10 cells treated with high glucose (50â€¯mM) showed a reduced membrane distribution of AQP5. The functional expression of AQP5 was downregulated due to intracellular Ca(2+) overload and ER stress. This reduction in AQP5 expression impairs water permeability and therefore results in hypo-salivation. A reduced salivary flow was also observed in streptozotocin (STZ)-induced diabetic mice model and the expression of AQP5 and phospho-AQP5 was downregulated. Low-level laser treatment with 850â€¯nm (30â€¯mW, 10â€¯minâ€¯=â€¯18â€¯J/cm(2)) reduced ER stress and recovered AQP5 membrane distribution via serine phosphorylation in the cells. In the STZ-induced diabetic mouse, LLLT with 850â€¯nm (60â€¯J/cm(2)) increased salivary flow and upregulated of AQP5 and p-AQP5. ER stress was also reduced via downregulation of caspase 12 and CHOP. In silico analysis confirmed that the serine 156 is one of the most favorable phosphorylation sites of AQP5 and may contribute to the stability of the protein. Therefore, this study suggests high glucose inhibits phosphorylation-dependent AQP5 membrane distribution. High glucose induces intracellular Ca(2+) overload and ER stress that disrupt AQP5 functional expression. Low-level laser therapy with 850â€¯nm improves salivary function by increasing AQP5 membrane distribution in hyperglycemia-induced hyposalivation. Aqp5 protein, mouse;Aquaporin 5;Calcium Animals;Aquaporin 5;Calcium;Cell Membrane;Diabetes Mellitus, Experimental;Endoplasmic Reticulum Stress;Hyperglycemia;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Phosphorylation;Salivary Glands;Xerostomia

Laser phototherapy induces angiogenesis in the periodontal tissue after delayed tooth replantation in rats. BACKGROUND: Laser phototherapy (LPT) has been suggested as a new therapeutic tool to improve the repair of replanted teeth. However, its effects and mechanism of action are not yet completely understood. OBJECTIVES: This study evaluated histologically the effect of laser phototherapy (LPT) Î»808 and Î»660 nm on angiogenesis in the periodontal tissue of replanted teeth in rats. MATERIAL AND METHODS: Twenty maxillary right incisors were extracted from twenty Wistar rats and randomly assigned to four groups (n = 5): PN - teeth were stored in paper napkin for 45 min; WM - teeth were immersed in 20 ml of UHT whole cow milk for 45 min; PNL and WML - teeth received the same treatment described for PN and WM, respectively, plus LPT at Î»808 and Î»660 nm. All root canals were prepared and filled with calcium hydroxide paste. The animals were euthanized 15 days after tooth replantation and angiogenesis was scored by blood vessel counting in the area of periodontal ligament and alveolar bone, using the ImageJ software. Data were analyzed statistically by ANOVA and Tukey's test (Î± = 5%). RESULTS: LPT at Î»808 and Î»660 nm caused significant increased angiogenesis on irradiated groups (PNL and WML) when compared to the non-irradiated groups (PN and WM) ($p<0.05$). There was no statistically significant difference between PN and WM as well as between PNL and WML ($p>0.05$). CONCLUSIONS: LPT is capable of stimulating angiogenesis in vivo in the periodontal tissue of replanted teeth. Key words:Angiogenesis, lasers, tooth avulsion, tooth replantation, wound healing.

Photobiomodulation induces antinociception, recovers structural aspects and regulates mitochondrial homeostasis in peripheral nerve of diabetic mice. Diabetic peripheral neuropathy (DPN) is a nervous disorder caused by diabetes mellitus, affecting about 50% of patients in clinical medicine. Chronic pain is one of the major and most unpleasant symptoms developed by those patients, and conventional available treatments for the neuropathy, including the associated pain, are still

unsatisfactory and benefit only a small number of patients. Photobiomodulation (PBM) has been gaining clinical acceptance once it is able to promote early nerve regeneration resulting in significant improvement in peripheral nerves disabilities. In this work, the effects of PBM (660â€‰nm, 30â€‰mW, 1.6 J/cm(2) , 0.28â€‰cm(2) , 15â€‰s in a continuous frequency) on treating DPN-induced pain and nerve damage were evaluated in an experimental model of diabetic-neuropathy induced by streptozotocin in mice. PBM-induced antinociception in neuropathic-pain mice was dependent on central opioids release. After 21 consecutive applications, PBM increased nerve growth factor levels and induced structural recovery increasing mitochondrial content and regulating Parkin in the sciatic nerve of DPN-mice. Taking together, these data provide new insights into the mechanisms involved in the effects of PBM-therapy emphasizing its therapeutic potential in the treatment of DPN. Animals;Biomechanical Phenomena;Diabetes Mellitus, Experimental;Homeostasis;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Mitochondria;Nociception;Sciatic Nerve

Patient education and rehabilitation after hip arthroplasty in an Italian spa center: a pilot study on its feasibility. Nowadays, some spa centers are suitable for providing rehabilitative and preventive treatment in association with traditional spa therapy. This study aims to evaluate the feasibility and the effectiveness of an intensive rehabilitation program after hip arthroplasty in an Italian spa center. Early after total hip arthroplasty for severe osteoarthritis (â‰¤â€‰10Â days after the intervention), 12 consecutive patients (5 males and 7 females) aged between 50 and 85Â years were enrolled for this study. All the patients performed a 2-week thermal multimodal rehabilitation program, which consisted of education and physical rehabilitative measures. Patients had 2-h and half/day session of land-based and hydrokinesitherapy (aquatic therapy) consisted in active and passive joint mobilization, respiratory and functional re-education exercises, gait and balance training, resistance exercise, and power training mainly for the upper limb associated to physical therapy modalities (electrotherapy and low-level laser therapy). An educational program was performed to both patients and families. Both before and after the rehabilitation treatment, patients underwent clinical evaluation, hip flexion/abduction range of motion, and Numeric Pain Rating Scale. Harris Hip Score (HHS) and SF-12 questionnaires (physical-PCS-12-and mental health component-MCS-12) were also administered. After the 2-week thermal spa treatment, hip flexion/abduction improved significantly (pâ€‰<â€‰0.05), but there was no statistically significant reduction in pain (pâ€‰=â€‰0.350). The HHS score improved significantly from 62.6â€‰Â±â€‰12.8 to 82.15â€‰Â±â€‰12.7 (pâ€‰<â€‰0.05), and the PCS-12 score from 36.37â€‰Â±â€‰8.4 to 43.61â€‰Â±â€‰8.95 (pâ€‰<â€‰0.05). There was no adverse event during spa treatment. After total hip arthroplasty, patients who underwent an intensive post-acute multimodal rehabilitation program showed an improvement in motor and functional recovery and a positive impact on quality of life. Therefore, we believe that the thermal setting is a suitable place for providing intensive rehabilitative treatment in orthopedic musculoskeletal disability. Aged;Aged, 80 and over;Arthroplasty, Replacement, Hip;Balneology;Exercise Therapy;Female;Humans;Italy;Male;Middle Aged;Osteoarthritis, Hip;Patient Education as Topic;Pilot Projects;Quality of Life;Treatment Outcome

Photobiomodulation therapy and vitamin C on longevity of cell sheets of human dental pulp stem cells. Photobiomodulation therapy (PBMT) can improve processes relevant to tissue regeneration, such as survival, proliferation, migration, and differentiation of cells, including stem cells. Thus, PBMT could be applied as auxiliary therapy for tissue regeneration. Cell sheets (CSs) induced by vitamin C (VC) can generate large amount of cells, which would also be useful for tissue regeneration. VC and PBMT cause opposite effects on cell metabolism (e.g., VC is antioxidative, and PBMT generates reactive oxygen species); however, hDPSC CSs were formed when VC and PBMT+VC were applied. Thus, this study showed that PBMT does not interfere with the formation of cell sheets

induced by VC. Additionally, PBMT improved the functional differentiation of the cells isolated from the CSs. Thus, due to the clinical benefits of PBMT, the association of this therapy with cell sheets seems promising for future applications in tissue regeneration. Ascorbic Acid Ascorbic Acid;Cell Differentiation;Dental Pulp;Epithelial Cells;Humans;Low-Level Light Therapy;Muscle, Skeletal;Stem Cells;Wound Healing

Indocyanine green-mediated photobiomodulation on human osteoblast cells. Photobiomodulation (PBM) and photodynamic therapy (PDT) share similar mechanisms but have opposite aims. Increased levels of reactive oxygen species (ROS) in the target tissue in response to light combined photosensitizer (PS) application may lead to cell proliferation or oxidative damage depending on the ROS amount. The purpose of the present study is to investigate the effect of indocyanine green (ICG)-mediated PBM on osteoblast cells by measuring cell viability, proliferation, alkaline phosphatase (ALP) activity, mineralization, and gene expressions of three phenotypic osteoblast markers. A diode laser irradiating at 809Â nm (10Â W output power, 50Â mW/cm(2) power density) was used at 0.5, 1, and 2Â J/cm(2) energy densities (10, 20, and 40Â s respectively) was applied following ICG incubation. No inhibitory effect was observed in cell viability and proliferation according to the (4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) and Alamar Blue assays. ICG-mediated PBM did not alter cell viability but increased ALP activity and enhanced mineralization of existing osteoblasts. These results were also confirmed by real-time polymerase chain reaction (RT-PCR) analysis of osteoblastic markers. PS can be combined to PBM not only to damage the malignant cells as aimed in PDT studies, but also to promote cellular activity. The findings of this in vitro study may contribute to in vivo studies and ICG-mediated PBM can have promising outcomes in bone healing and regeneration therapies in future. Photosensitizing Agents;Reactive Oxygen Species;Indocyanine Green Cell Line;Cell Proliferation;Cell Survival;Gene Expression Regulation;Humans;Indocyanine Green;Osteoblasts;Photochemotherapy;Photosensitizing Agents;Reactive Oxygen Species

Bactericide effect of methylene blue associated with low-level laser therapy in Escherichia coli bacteria isolated from pressure ulcers. The present study analyzed the bactericidal effect of methylene blue associated with low-level lasers on Escherichia coli isolated from a pressure ulcer. Microbiological material from a pressure ulcer was isolated using an aseptic swab, and antimicrobial activity was verified using the diffusion disc method. Methylene blue was used at concentrations of 0.001 and 0.005%, and low-level lasers of 670, 830, and 904Â nm, with the energy densities of 4, 8, 10, and 14Â J/cm(2), were tested on three plates each and combined with methylene blue of each concentration. In addition, three control plates were used, with each concentration and energy density separated without any interventions. The results were analyzed using the paired sample t test to determine the bactericidal effect of the methylene blue and using the ANOVA test to compare the effects of the energy densities and wavelengths among the low-level laser treatment protocols. The results showed bacterial reduction at wavelengths of 830 and 904Â nm and more proliferation in wavelengths of 670Â nm. In wavelength of 830Â nm, a bacterial reduction was observed in the conditions with 0.001% methylene blue in all energy density utilized, with 0.005% methylene blue in energy density of 10Â J/cm(2), and without methylene blue in energy density at 10Â J/cm(2). And in a wavelength of 904Â nm, all condition showed bacterial reduction with or without methylene blue. We concluded that the low-level lasers of 904 and 830Â nm have bactericidal effects and at better energy densities (10Â and 14Â J/cm(2)). Anti-Bacterial Agents;Methylene Blue Anti-Bacterial Agents;Escherichia coli;Humans;Low-Level Light Therapy;Methylene Blue;Pressure Ulcer

Effect of photobiomodulation treatment in the sublingual, radial artery region, and along the spinal column in individuals with multiple sclerosis: Protocol for a randomized, controlled, double-blind, clinical trial. BACKGROUND: Multiple sclerosis (MS) is an autoimmune disease, for which the

forms of treatment are medication and rehabilitation. However, in vitro and in vivo studies have demonstrated that photobiomodulation can be an effective treatment modality for inflammatory diseases, including MS. Photobiomodulation has a broad range of benefits, such as the avoidance of cell and tissue death, the stimulation of healing and injury repair, reductions in pain, edema and inflammation, cell proliferation, and even apoptosis. The outcomes of photobiomodulation include the regeneration of cells, the stimulation of the growth of Schwann cells, a reduction in spasticity, functional improvements, a reduction in nitric oxide levels, and the upregulation of the cytokine IL10, demonstrating that this therapeutic modality can offer neuroprotection. METHODS: A randomized, controlled, double-blind, clinical trial is proposed. The patients will be divided into 6 groups. Groups 1 and 2 will receive sham and active photobiomodulation in the sublingual region, respectively. Groups 3 and 4 will receive sham and active photobiomodulation along the spinal cord, respectively. Group 5 will receive placebo treatment with photobiomodulation on the skin in the region of the radial artery with a specific bracelet. Group 6 will be treated with photobiomodulation on the skin in the region of the radial artery. DISCUSSION: Treatment for MS is directed at the immune response and slowing the progression of the disease. This is one of the first clinical trials involving photobiomodulation in the sublingual region and along the spinal cord, which could help establish a promising new form of nonpharmacological treatment for autoimmune diseases. This is one of the first clinical trials with sublingual photobiomodulation and along the spinal cord that could help establish a new form of promising treatment of the disease associated with pharmacological treatment. Double-Blind Method;Humans;Inflammation;Low-Level Light Therapy;Monitoring, Physiologic;Mouth Floor;Multiple Sclerosis;Oxidative Stress;Research Design;Spinal Cord

Evaluation of photobiomodulation therapy associated with guided bone regeneration in critical size defects. In vivo study. The repair of bone defects raises the interest of investigators in several health specialties. Grafting techniques with bone substitutes and laser therapies have been investigated to replace autogenous bone and accelerate the bone healing process. Objective To evaluate the effect of photobiomodulation therapy (PBMT) associated with guided bone regeneration (GBR) in critical size defects. Material and Methods The study was conducted on 80 male rats (Rattus norvegicus albinus, Wistar) submitted to surgical creation of a critical size defect on the calvaria, divided into eight study groups: group C (control - only blood clot); group M (collagen membrane); group PBMT (photobiomodulation therapy); group AB (autogenous bone); group AB+PBMT; group AB+M; group PBMT+M; group AB+PBMT+M. The animals were killed 30 days postoperatively. After tissue processing, bone regeneration was evaluated by histomorphometric analysis and statistical analyses were performed (Tukey test, $p<0.05$). Results All groups had greater area of newly formed bone compared to group C (9.96Â±4.49%). The group PBMT+M (achieved the greater quantity of new bone (64.09Â±7.62%), followed by groups PBMT (47.67Â±8.66%), M (47.43Â±15.73%), AB+PBMT (39.15Â±16.72%) and AB+PBMT+M (35.82Â±7.68%). After group C, the groups AB (25.10Â±16.59%) and AB+M (22.72Â±13.83%) had the smallest quantities of newly formed bone. The area of remaining particles did not have statistically significant difference between groups AB+M (14.93Â±8.92%) and AB+PBMT+M (14.76Â±6.58%). Conclusion The PBMT utilization may be effective for bone repair, when associated with bone regeneration techniques. Collagen Animals;Autografts;Bone Regeneration;Collagen;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Osteogenesis;Random Allocation;Rats, Wistar;Reference Values;Reproducibility of Results;Skull;Treatment Outcome;Wound Healing

Successful treatment of intravenous drug use-related pigmentation with Q-switched Alexandrite laser: a case report of two patients. Patients with a history of intravenous drug usage (IVDU) often develop pathognomonic linear hyperpigmented dermatoses near injection sites. This drug use-related pigmentation can be very distressing for patients as they persist for life, are very difficult to

treat, and remain a constant reminder of prior drug usage. The difficulty of treatment is due to the location of the deposited material and its exogenous nature. This article reports two cases of linear hyperpigmentation due to IVDU successfully treated using the Q-switched Alexandrite laser. Adult;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Substance Abuse, Intravenous

Unconventional use of fractional ablative CO(2) laser in necrobiosis lipoidica. Adult;Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Necrobiosis Lipoidica

In vitro impact of laser irradiation on platelet aggregation. The review of blood optical and rheological parameters plays an important role in many medical routine diagnosis and therapeutic applications and is the best way to understand the mechanism of action of low-level laser irradiation on biological tissues. The aim of this study was to investigate the in vitro effect of laser radiation on platelet count and aggregation. Blood samples were obtained from 30 healthy volunteers; each sample was divided into four aliquots, one of them was considered as a control while the other three were exposed to three different laser doses. A wavelength of 532Â nm and a low power of 100Â mW were used for irradiation with a 4-mm-diameter beam spot. The irradiation times were 1.8, 3.7, and 6.2Â s giving doses of irradiation 1.5, 3, and 5Â J/cm(2), respectively. Microsoft Excel was used for statistical analysis. Low laser irradiation induced significant changes in platelet aggregation in the presence of weak agonists such as adenosine diphosphate (ADP) (Pâ€‰â‰¤â€‰0.05) and epinephrine (Pâ€‰â‰¤â€‰0.01). Low-level laser therapy has no influence on platelet count; however, it promotes platelet aggregation in response to weak agonists, specifically ADP and epinephrine. Adenosine Diphosphate;Epinephrine Adenosine Diphosphate;Adult;Epinephrine;Female;Humans;Lasers;Male;Platelet Aggregation

Incorporation of photobiomodulation therapy into a therapeutic exercise program for knee osteoarthritis: A placebo-controlled, randomized, clinical trial. OBJECTIVE: To investigate the clinical effects of incorporation of phototherapy in a therapeutic exercise program for individuals with knee osteoarthritis (OA) when compared to a group that received exercise alone and to a group that received exerciseâ€‰+â€‰placebo phototherapy. MATERIALS AND METHODS: This is a randomized, blinded and placebo-controlled trial. Thus, sixty male and female individuals aged 40-80 years with knee pain in the previous 6 months participated of the study, with diagnosis of unilateral knee OA based on the criteria established by the American College of Rheumatology and radiographic confirmation and Grades 2 or 3 of the Kellgren-Lawrence Classification. The individuals were equally divided in the groups exercise alone, exerciseâ€‰+â€‰active phototherapy (nine-diode cluster device: one 905â€‰nm super-pulsed diode laser, four 875â€‰nm LED and four 640â€‰nm LED; energy per quadrant: 7.85â€‰J; total energy: 23.55â€‰J per session), or exerciseâ€‰+â€‰placebo phototherapy. Treatments were performed twice a week for 5 consecutive weeks. Patients were evaluated before and after the sessions of treatment. The outcome measures were: Western Ontario and McMaster University Osteoarthritis Index (WOMAC), Lower Extremity Functional Scale (LEFS), Numerical Rating Pain Scale (NRPS), pressure pain threshold (PPT) in two points of knee, muscle strength, and the Functional Reach Test (FRT). RESULTS: Exerciseâ€‰+â€‰active phototherapy was significantly more effective than exercise alone (mean difference [MD]â€‰=â€‰2.75, 95% confidence interval [CI]â€‰=â€‰3.17 to 2.32) and exerciseâ€‰+â€‰placebo phototherapy (MDâ€‰=â€‰2.38, 95% CIâ€‰=â€‰2.79 to 1.96) only with regard to the NRPS, considering minimal clinically important difference. No clinical significant results were found for function, the pressure pain threshold, muscle strength or balance. CONCLUSIONS: The combination of phototherapy and an exercise program is effective at reducing pain intensity among individuals with knee osteoarthritis than exercise alone or exerciseâ€‰+â€‰placebo phototherapy in a short-term

protocol. Lasers Surg. Med. 50:819-828, 2018. Â© 2018 Wiley Periodicals, Inc.
Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Prospective Studies;Treatment Outcome

Transcranial light-emitting diode therapy for neuropsychological improvement after traumatic brain injury: a new perspective for diffuse axonal lesion management. The cost of traumatic brain injury (TBI) for public health policies is undeniable today. Even patients who suffer from mild TBI may persist with cognitive symptoms weeks after the accident. Most of them show no lesion in computed tomography or conventional magnetic resonance imaging, but microstructural white matter abnormalities (diffuse axonal lesion) can be found in diffusion tensor imaging. Different brain networks work together to form an important part of the cognition process, and they can be affected by TBI. The default mode network (DMN) plays an important central role in normal brain activities, presenting greater relative deactivation during more cognitively demanding tasks. After deactivation, it allows a distinct network to activate. This network (the central executive network) acts mainly during tasks involving executive functions. The salience network is another network necessary for normal executive function, and its activation leads to deactivation of the DMN. The use of red or near-infrared (NIR) light to stimulate or regenerate tissue is known as photobiomodulation. It was discovered that NIR (wavelength 800-900 nm) and red (wavelength 600 nm) light-emitting diodes (LEDs) are able to penetrate through scalp and skull and have the potential to improve the subnormal, cellular activity of compromised brain tissue. Based on this, different experimental and clinical studies were done to test LED therapy for TBI, and promising results were found. It leads us to consider developing different approaches to maximize the positive effects of this therapy and improve the quality of life of TBI patients.

Evaluation of the low-level laser therapy application parameters for skin burn treatment in experimental model: a systematic review. Burn is defined as a traumatic injury of thermal origin, which affects the organic tissue. Low-level laser therapy (LLLT) has gained great prominence as a treatment in this type of injury; however, the application parameters are still controversial in the literature. The aims of this study were to review the literature studies that use LLLT as a treatment in burns conducted in an experimental model, discuss the main parameters used, and highlight the benefits found in order to choose an appropriate therapeutic window to be applied in this type of injury. The selection of the studies related to the theme was carried out in the main databases (PubMed, Cochrane Library, LILACS, Web of Science, and Scopus in the period from 2001 to 2017). Subsequently, the articles were then chosen that fell within the inclusion criteria previously established. In the end, 22 were evaluated, and the main parameters were presented. The analyzed studies presented both LLLT use in continuous and pulsed mode. Differences between the parameters used (power, fluence, and total energy) were observed. In addition, the protocols are distinct as to the type of injury and the number of treatment sessions. Among the results obtained by the authors are the improvements in the local microcirculation and cellular proliferation; however, a study reported no effects with LLLT as a treatment. LLLT is effective in accelerating the healing process. However, there is immense difficulty in establishing the most adequate protocol, due to the great discrepancy found in the applied dosimetry values. Animals;Burns;Evaluation Studies as Topic;Humans;Low-Level Light Therapy;Skin;Wound Healing

Photomodulation in the treatment of chronic pain in patients with temporomandibular disorder: protocol for cost-effectiveness analysis. INTRODUCTION: Epidemiological data show that the signs and symptoms of temporomandibular disorder (TMD) start becoming apparent from 6â€‰years of age, and during adolescence these signs and symptoms are similar to those of adults. The present study aims to estimate the direct costs for treatment of chronic muscle pain with photobiomodulation therapy, occlusal splint and placebo in patients with TMD; to evaluate the

effectiveness of photobiomodulation therapy and occlusal splint for treatment of muscle pain in patients with TMD; to analyse the cost-effectiveness of the two proposed treatments for pain; and to describe and compare the results of the analyses of these treatments. METHODS AND ANALYSIS: This is a prospective trial of clinical and economic analyses that will include 135 patientswith TMD aged between 15 years and 25 years, randomly assigned to a treatment group: G1 (photobiomodulation), G2 (occlusal splint) and G3 (placebo). The analyses will be based on the cost of each treatment during the 12-month period. The outcome of the analysis of effectiveness will be pain, measured periodically by means of clinical examination of Research Diagnostic Criteria for Temporomandibular Disorders. The cost-effectiveness ratio will be calculated using, as end points, pain and the ratio of the differences in costs between the groups studied. The evaluation of the impact of the treatment on quality of life will be determined by applying the adapted EuroQol-5D. ETHICS AND DISSEMINATION: This protocol has been ethically approved by the local medical ethical committee, protocol number 2.014.339. Results will be submitted to international peer-reviewed journals and presented at international conferences. TRIAL REGISTRATION NUMBER: NCT03096301.
Adolescent;Adult;Brazil;Chronic Pain;Cost-Benefit Analysis;Female;Humans;Low-Level Light Therapy;Male;Occlusal Splints;Pain Management;Pain Measurement;Prospective Studies;Quality of Life;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Treatment Outcome;Young Adult

Evaluation of bone repair after application of a norbixin membrane scaffold with and without laser photobiomodulation (Î» 780Â nm). Biocompatible membranes are widely used in medicine to stimulate bone repair. Several studies have demonstrated that laser photobiomodulation (PBM) also stimulates osteoblast proliferation and osteogenesis at the fracture site, leading to a greater deposition of bone mass and accelerating the process of bone consolidation. This work assessed the therapeutic effect of 780-nm laser PBM and a polystyrene membrane coated with norbixin and collagen (PSNC) on bone healing in rats with calvarial bone defect. Histological staining, Raman spectroscopy, and scanning electron microscopy (SEM) were used to evaluate the bone repair process. Four experimental treatment groups were compared: C, control; M, membrane only; L, laser PBM only; and ML, membrane + laser PBM. A bone defect was created in the calvaria of each animal, with each group subdivided into two subgroups that underwent euthanasia after 15 and 30Â days treatment. The L and ML groups were irradiated (Î»â€‰=â€‰780Â nm, EDâ€‰=â€‰6Â J/cm(2), Pâ€‰=â€‰60Â mW, tâ€‰=â€‰4Â s) postoperatively on alternate days until they were euthanized. The bone concentration of hydroxyapatite (CHA) showed a clear gradation with increasing phosphate area in the order B (normal cortical bone)â€‰>â€‰Lâ€‰>â€‰Mâ€‰>â€‰MLâ€‰>â€‰C for both periods. The PSNC membrane was effective in reducing the inflammatory process and served as a scaffold for bone repair. The laser PBM also showed positive effects on the bone repair process with increased deposition and organization of the newly formed bone. However, laser PBM failed to improve the bioactive properties of the membrane scaffold.
Polystyrenes;Carotenoids;Collagen;Durapatite;norbixin Animals;Bone and Bones;Carotenoids;Collagen;Durapatite;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Polystyrenes;Rats, Wistar;Skull;Spectrum Analysis, Raman;Wound Healing

Management of radiation-induced mucosal necrosis with photobiomodulation therapy.
Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Necrosis;Oropharynx;Radiation Injuries

The Efficacy of Low-level Laser Therapy on Pain caused by Placement of the First Orthodontic Archwire: A Clinical Study. Aim: This study was conducted to clinically evaluate the effect of low-level laser therapy (LLLT) as a method of reducing pain reported by patients after placement of their first orthodontic archwires. Materials and methods: A sample of 10 patients with an age group of 12 to 26 years with moderate-to-severe anterior crowding was selected. Each patient was assigned to an

experimental group (left quadrant with laser therapy) and a control group (right quadrant with no laser therapy). Low-level laser therapy was given immediately after the placement of initial archwire. All patients were instructed to fill up a survey form at home over the next 7 days. Results: The results revealed that the average onset of pain in the experimental group (16.10 hours) was significantly reduced when compared with the control group (3.10 hours). The most painful day was similar for both the groups. The pain ceased much sooner in the experimental group than in the control group. The intensity of pain was lesser in the experimental group when compared with the control group. Conclusion: Low-level laser therapy was an effective and noninvasive method for controlling pain in orthodontic patients after receiving their first archwires. The duration and intensity of pain reduced with the application of LLLT Clinical significance: Pain reduction during orthodontic procedures. Keywords: Low-level laser therapy, Nickel-titanium wires, Orthodontic pain. Adolescent;Adult;Child;Female;Humans;Low-Level Light Therapy;Male;Malocclusion;Orthodontic Wires;Pain;Pain Management;Pain Measurement;Young Adult

Healing Tumors with Light: Science Fiction or the Future of Medicine? Cells, Cultured;Female;Forecasting;Humans;Low-Level Light Therapy;Male;Neoplasms;Stem Cells

Multicenter randomized, double-blind controlled trial to evaluate the efficacy of laser therapy for the treatment of severe oral mucositis induced by chemotherapy in children: laMPO RCT. OBJECTIVES: To demonstrate the efficacy of laser photobiomodulation (PBM) compared to that of placebo on severe oral mucositis (OM) in pediatric oncology patients. The primary objective was the reduction of OM grade (World Health Organization [WHO] scale) 7 days after starting PBM. Secondary objectives were reduction of pain, analgesic consumption, and incidence of side effects. METHODS: One hundred and one children with WHO gradeÂ >Â 2 chemotherapy-induced OM were enrolled in eight Italian hospitals. Patients were randomized to either PBM or sham treatment for four consecutive days (days +1 to +4). On days +4, +7, and +11, OM grade, pain (following a 0-10 numeric pain rating scale, NRS) and need for analgesics were evaluated by an operator blinded to treatment. RESULTS: Fifty-one patients were allocated to the PBM group, and 50 were allocated to the sham group. In total, 93.7% of PBM patients and 72% of sham patients had OM gradeÂ <Â 3 WHO on day +7 (PÂ =Â 0.01). A significant reduction of pain was registered on day +7 in the PBM versus sham group (NRS 1 [0-3] vs. 2.5 [1-5], PÂ <Â 0.006). Reduced use of analgesics was reported in the PBM group, although it was not statistically significant. No significant adverse events attributable to treatment were recorded. CONCLUSIONS: PBM is a safe, feasible, and effective treatment for children affected by chemotherapy-induced OM, as it accelerates mucosal recovery and reduces pain. Antineoplastic Agents Adolescent;Antineoplastic Agents;Child;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Neoplasms;Stomatitis;Treatment Outcome

Treatment to External Labia and Vaginal Canal With CO2 Laser for Symptoms of Vulvovaginal Atrophy in Postmenopausal Women. BACKGROUND: Increasingly, women have sought alternatives to traditional options (lubricants, estrogen products, and hormone replacement therapy) for unwelcome vaginal changes of menopause. OBJECTIVES: This study evaluated whether a series of three monthly fractional CO2 laser treatments significantly improves and maintains vaginal health indices of elasticity, fluid volume, pH level, epithelial integrity, and moisture. Self-reported symptoms of vaginal atrophy were also measured. Biopsy samples after a series of three treatments were evaluated for histological changes to vaginal canal tissue. METHODS: Forty postmenopausal women were treated extravaginally and internally with a fractional CO2 laser. Objective measurements of vaginal health index, as well as subjective measurements of symptoms of vulvovaginal atrophy (VVA), urinary incontinence, and sexual function were reported at baseline. Follow-up evaluations were at one, three, six, and 12 months after the third treatment. RESULTS: Vaginal health index improved significantly after the first treatment and was maintained with mean improvement of 9.6 Â± 3.3 (P <

0.001) and 9.5 Â± 3.3 (P < 0.001) at the 6- and 12-month follow ups, respectively. Vaginal symptoms of dryness, itching, and dyspareunia improved significantly (P < 0.05) at all evaluations. Histological findings showed increased collagen and elastin staining, as well as a thicker epithelium with an increased number of cell layers and a better degree of surface maturation. CONCLUSIONS: Fractional CO2 laser treatments were well tolerated and were associated with improvement in vaginal health and amelioration of symptoms of VVA. Histological changes in the epithelium and lamina propria, caused by fractional CO2 laser treatments, correlated with clinical restoration of vaginal hydration and pH to premenopausal levels. Adult;Aged;Atrophy;Biopsy;Dose Fractionation, Radiation;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Postmenopause;Prospective Studies;Treatment Outcome;Vagina;Vaginal Diseases;Vulva;Vulvar Diseases

High-fluence 1064-nm Q-Switched Nd:YAG laser: Safe and effective treatment of cafÃ©-au-lait macules in Asian patients. OBJECTIVES: CafÃ©-au-lait macules (CALMs) are benign cutaneous hyperpigmentary disorders. Usually, laser therapies for cosmetic concerns result in more severe side effects in the people of Asian descent than that of Caucasians. Unfortunately, there is no gold standard for the laser treatment of CALMs in skin of people of Asian descent. To investigate the efficacy and safety of a high-fluence 1064-nm Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser treatment of CALMs in Asian patients. STUDY DESIGN: The medical records of 35 Korean patients (age range: 1 to 40Â years old, mean age: 18.5Â years) diagnosed with isolated CALMs were reviewed retrospectively. METHODS: The patients were treated with a 1064-nm Q-switched Nd:YAG laser. The parameters were a spot size of 7Â mm, a fluence of 2.2-2.4Â J/cm(2) with a slow single sliding-stacking pass, and a pulse rate of 10Â Hz with a 1-week interval for 20-50 sessions. RESULTS: At the week of the final treatment, all treated CALMs showed considerable pigmentation removal without any permanent side effects, such as scaring, mottled hypopigmentation and postinflammatory hyperpigmentation (PIH). All treated CALMs showed more than 50% clinical improvement. No recurrence was observed in any of the patients after 12Â months of follow-up. CONCLUSION: A high-fluence 1064-nm Q-switched Nd:YAG laser treatment of CALMs in Asian patients is a safe and effective method without side effects and recurrence. Adolescent;Adult;Asian People;Cafe-au-Lait Spots;Child;Child, Preschool;Female;Humans;Infant;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome;Young Adult

Low-level laser irradiation modifies the effect of hyperglycemia on adhesion molecule levels. Endothelium plays a key role in maintaining vascular homeostasis by secreting active factors involved in many biological processes such as hemostasis, angiogenesis, and inflammation. Hyperglycemia in diabetic patients causes dysfunction of endothelial cells. Soluble fractions of adhesion molecules like sE-selectin and vascular cell adhesion molecule (sVCAM) are considered as markers of endothelial damage. The low-level laser therapy (LLLT) effectively supports the conventional treatment of vascular complications in diabetes, for example hard-to-heal wounds in patients with diabetic foot syndrome. The aim of our study was to evaluate the effect of low-energy laser at the wavelength of 635Â nm (visible light) and 830Â nm (infrared) on the concentration of adhesion molecules: sE-selectin and sVCAM in the supernatant of endothelial cell culture of HUVEC line. Cells were cultured under high-glucose conditions of 30Â mM/L. We have found an increase in sE-selectin and sVCAM levels in the supernatant of cells cultured under hyperglycemic conditions. This fact confirms detrimental influence of hyperglycemia on vascular endothelial cell cultures. LLLT can modulate the inflammation process. It leads to a decrease in sE-selectin and sVCAM concentration in the supernatant and an increase in the number of endothelial cells cultured under hyperglycemic conditions. The influence of LLLT is greater at the wavelength of 830Â nm. Cell Adhesion

Molecules;E-Selectin;Vascular Cell Adhesion Molecule-1 Cell Adhesion Molecules;Cell Count;E-Selectin;Human Umbilical Vein Endothelial Cells;Humans;Hyperglycemia;Low-Level Light Therapy;Solubility;Vascular Cell Adhesion Molecule-1

Platelet-Rich Plasma (PRP) Rinses for the Treatment of Non-Responding Oral Lichen Planus: A Case Report. Platelet-rich plasma (PRP) has been proposed for different applications in the medical field and in maxillofacial surgery thanks to its many growth factors, such as epidermal growth factor (EGF), fibroblast growth factor (FGF), and keratinocyte growth factor (KGF). Oral lichen planus (OLP) is a disease that affects the oral mucosa in a chronic way. This disease frequently worsens the quality of life of patients, particularly when clinical manifestations are of the erythematous or erosive/ulcerative type. The properties of PRP that are supported by scientific literature in both oral medicine and other medical fields have suggested the introduction of PRP in clinical practice for the medical treatment of different soft tissues diseases, such as when OLP patients do not respond to conventional therapies, or when conventional treatments have some contraindications or side effects. The aim of this work is to describe the use of PRP used as an oral rinse for the treatment of a patient diagnosed as affected by OLP at the Dentistry, Special Needs and Maxillo-Facial Surgery Unit of the Hospital of Piacenza. PRP protocol was started after the failure of conventional therapies based on the use of topical and systemic corticosteroids, hydroxychloroquine, and low-level laser therapy applications.

Low-level laser therapy and interferential current in patients with knee osteoarthritis: a randomized controlled trial protocol. The aim of this study is to investigate the effects of low-level laser therapy and interferential current (IFC) on pain intensity, central sensitization, muscle strength and functional capacity in patients with knee osteoarthritis. Participants will be patients aged between 50 and 80Â years, with knee osteoarthritis, pain intensity ranging from 3 to 8 points (0-10 scale), Lequesne Algofunctional Index ranging from 5 to 15 points, and Kellgren & Lawrence gradeÂ â‰¥2. A total of 168 patients will be randomly allocated into four groups as follows: active IFCÂ +Â laser sham (G1), IFC shamÂ +Â active laser (G2), active IFCÂ +Â laser (G3) and IFCÂ +Â laser sham (G4). Evaluators will be blinded to group allocation. Primary outcomes will be pain at rest and during movement measured with the visual analog pain scale. Clinical Trials Registry (NCT02898025. Registered on 20Â April 2016). Aged;Aged, 80 and over;Central Nervous System Sensitization;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Middle Aged;Osteoarthritis, Knee;Pain;Pain Management;Pain Measurement;Pain Threshold;Research Design;Treatment Outcome

Near infrared low-level laser therapy and cell proliferation: The emerging role of redox sensitive signal transduction pathways. Lasers devices are widely used in various medical fields (eg, surgery, dermatology, dentistry, rehabilitative medicine, etc.) for different applications, ranging from surgical ablation of tissues to biostimulation and pain relief. Laser is an electromagnetic radiation, which effects on biological tissues strongly depends on a number of physical parameters. Laser wavelength, energy output, irradiation time and modality, temperature and tissue penetration properties have to be set up according to the clinical target tissue and the desired effect. A less than optimal operational settings, in fact, could result in a null or even lethal effect. According to the first law of photobiology, light absorption requires the presence of a specific photoacceptor that after excitation could induce the activation of downstream signaling pathways. Low-level lasers operating in the red/near infrared portion of the light spectra are generally used for biostimulation purposes, a particular therapeutic application based on the radiant energy ability to induce nonthermal responses in living cells. Biostimulation process generally promotes cell survival and proliferation. Emerging evidences support a low-level laser stimulation mediated increase in "good" reactive oxygen species, able to activate redox sensitive signal transduction pathways such as Nrf-2, NF-kB, ERK which act as

key redox checkpoints. Animals;Cell Proliferation;Humans;Infrared Rays;Low-Level Light Therapy;Oxidation-Reduction;Signal Transduction

Retrospective Study on Laser Treatment of Oral Vascular Lesions Using the "Leopard Technique": The Multiple Spot Irradiation Technique with a Single-Pulsed Wave. OBJECTIVE: This study aimed to retrospectively evaluate the efficacy and safety of laser treatment of oral vascular lesions using the multiple spot irradiation technique with a single-pulsed wave. BACKGROUND DATA: In laser therapy for vascular lesions, heat accumulation induced by excessive irradiation can cause adverse events postoperatively, including ulcer formation, resultant scarring, and severe pain. To prevent heat accumulation and side effects, we have applied a multiple pulsed spot irradiation technique, the so-called "leopard technique" (LT) to oral vascular lesions. This approach was originally proposed for laser treatment of nevi. It can avoid thermal concentration at the same spot and spare the epithelium, which promotes smooth healing. The goal of the study was to evaluate this procedure and treatment outcomes. PATIENTS AND METHODS: The subjects were 46 patients with 47 oral vascular lesions treated with the LT using a Nd:YAG laser (1064â€‰nm), including 24 thick lesions treated using a combination of the LT and intralesional photocoagulation. RESULTS: All treatment outcomes were satisfactory without serious complications such as deep ulcer formation, scarring, bleeding, or severe swelling. CONCLUSIONS: Laser therapy with the LT is a promising less-invasive treatment for oral vascular lesions. Adolescent;Adult;Aged;Aged, 80 and over;Child;Child, Preschool;Female;Hemangioma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases;Retrospective Studies;Treatment Outcome;Vascular Malformations;Young Adult

Bactericidal Effect of Various Laser Irradiation Systems on Enterococcus faecalis Biofilms in Dentinal Tubules: A Confocal Laser Scanning Microscopy Study. OBJECTIVE: The aim of this study was to compare the bactericidal effect of various laser irradiation systems on Enterococcus faecalis biofilms in dentinal tubules by using a novel dentin infection model and confocal laser scanning microscopy (CLSM). BACKGROUND DATA: Laser-activated irrigations have been proposed as an adjuvant to conventional protocols of root canal treatment to enhance the smear layer removal, which is a promising protocol for root canal disinfection. MATERIALS AND METHODS: E. faecalis were centrifuged into the dentinal tubules, cultured for 3 weeks, and then received 1- and 3-min treatments as follows: (A) 5.25% sodium hypochlorite (NaOCl) irrigation, (B) Nd:YAG laser irradiation, (C) diode laser irradiation, (D) Nd:YAP laser irradiation, (E) Er,Cr:YSGG laser-activated NaOCl irrigation, and (F) Er:YAG laser-activated NaOCl irrigation. Bacterial reductions were assessed by CLSM using a LIVE/DEAD(Â®) bacterial viability stain method. RESULTS: For each group, the bacterial reduction increased as the treatment time increased (pâ€‰<â€‰0.05). The Er,Cr:YSGG and Er:YAG laser significantly enhanced the bactericidal effect of NaOCl (pâ€‰<â€‰0.05). Under the conditions of the same treatment time, bacterial reductions were presented in the descending order of Er:YAG + NaOCl, Er,Cr:YSGG + NaOCl > Nd:YAP > Nd:YAG, diode > NaOCl. CONCLUSIONS: Under the conditions of present study, treatments of Er:YAG + NaOCl and Er,Cr:YSGG + NaOCl presented the strongest bactericidal effect among the tested protocols and are potential protocols for root canal disinfection. Disinfectants;Sodium Hypochlorite Biofilms;Dentin;Disinfectants;Enterococcus faecalis;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Confocal;Root Canal Preparation;Sodium Hypochlorite;Tissue Culture Techniques

Low-level laser irradiation induces a transcriptional myotube-like profile in C2C12 myoblasts. Low-level laser irradiation (LLLI) has been used as a non-invasive method to improve muscular regeneration capability. However, the molecular mechanisms by which LLLI exerts these effects remain largely unknown. Here, we described global gene expression profiling analysis in C2C12 myoblasts after LLLI that identified 514 differentially expressed genes (DEG). Gene ontology and

pathway analysis of the DEG revealed transcripts among categories related to cell cycle, ribosome biogenesis, response to stress, cell migration, and cell proliferation. We further intersected the DEG in C2C12 myoblasts after LLLI with publicly available transcriptomes data from myogenic differentiation studies (myoblasts vs myotube) to identify transcripts with potential effects on myogenesis. This analysis revealed 42 DEG between myoblasts and myotube that intersect with altered genes in myoblasts after LLLI. Next, we performed a hierarchical cluster analysis with this set of shared transcripts that showed that LLLI myoblasts have a myotube-like profile, clustering away from the myoblast profile. The myotube-like transcriptional profile of LLLI myoblasts was further confirmed globally considering all the transcripts detected in C2C12 myoblasts after LLLI, by bi-dimensional clustering with myotubes transcriptional profiles, and by the comparison with 154 gene sets derived from previous published in vitro omics data. In conclusion, we demonstrate for the first time that LLLI regulates a set of mRNAs that control myoblast proliferation and differentiation into myotubes. Importantly, this set of mRNAs revealed a myotube-like transcriptional profile in LLLI myoblasts and provide new insights to the understanding of the molecular mechanisms underlying the effects of LLLI on skeletal muscle cells. RNA, Messenger Animals;Cell Line;Cell Movement;Cell Proliferation;Cell Survival;Gene Expression Profiling;Gene Expression Regulation;Low-Level Light Therapy;Mice;Muscle Fibers, Skeletal;Myoblasts;RNA, Messenger;Transcription, Genetic

Effects of low-level laser therapy on soft and hard tissue healing after endodontic surgery. The aim of this prospective study was to examine possible benefits of low-level laser therapy (LLLT) on soft and hard tissue healing after endodontic surgery. Seventy-six endo-surgery cases on maxillary incisors were included. The patients were assigned randomly into control and laser groups. In the laser group, gallium-aluminum-arsenide (GaAlAs) diode laser irradiation (810Â nm, 129Â mW, 3.87Â J/cm(2)) was performed immediately after surgery and daily for postoperative 7Â days from buccal and palatal surfaces (5Â min for each side). In the control group, patients were not subjected laser therapy. The patients were compared in terms of pain, clinical and radiological findings, and life quality indexes [Oral Health Impact Profile-14 (OHIP-14) and General Oral Health Assessment Index (GOHAI)]. Seventy-one patients completed the study (nâ€‰=â€‰37 for control group, nâ€‰=â€‰34 for laser group). The laser group showed better results in edema, wound healing, and the number of analgesic tablets used on the 1st, 3rd, and 7th postoperative days. Significant reduction in ecchymoses was observed in the laser group on the postop 3rd and 7th days. The patients had significantly lower pain on the 1st and 3rd postop days in laser group. The laser group showed significantly better results in OHIP-14 and GOHA indexes on postop days 1 and 3. The laser group showed significantly favorable results in terms of bone density, defect volume and area, and periapical index in the postop 3rd month. This study concluded that LLLT improved soft and hard tissue healing after endodontic surgery and also showed favorable effects on pain and life quality of patients especially in the early phase of healing period. Bone Density;Cone-Beam Computed Tomography;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oral Surgical Procedures;Prospective Studies;Surveys and Questionnaires;Wound Healing

Effect of 405Â nm low intensity irradiation on the absorption spectrum of in-vitro hyperlipidemia blood. BACKGROUND: Laser therapy is reported to be clinically effective for improving microcirculation, rheological properties and blood lipid profiles despite the lack of certainty on the mechanism. OBJECTIVE: This study intends to provide methods to drop blood lipid level of hyperlipidemia samples by low-intensity laser irradiation therapy and provide reasoning of mechanism. METHODS: Twenty whole blood samples of high level of lipids profile are irradiated by 405 nm low-intensity laser at 12Â J/cm2 twice a day for 3 days and compared with normal lipids profile group. Then whole blood sample are centrifuged to obtain result of erythrocyte for further interpretation. Multi-scan spectrum microplate reader is used to measure absorption spectrum and

data is analyzed by software SPSS 14.0. RESULTS: Results show that after 405 nm low-intensity laser irradiation, whole blood samples of high lipid level statistically have higher absorbance peak value than normal samples while erythrocyte samples have lower absorbance peak value. CONCLUSIONS: From the divergence of absorption peak value change after low-intensity laser irradiation for whole blood sample and erythrocyte, we suspect that low level laser irradiation affects the enzymes activity of lipid metabolism, improves the cholesterol balance of plasma and cytoplasm in erythrocyte, and decreases aggregation of the erythrocyte. Adult;Aged;Aged, 80 and over;Erythrocytes;Female;Humans;Hyperlipidemias;In Vitro Techniques;Low-Level Light Therapy;Male;Middle Aged;Spectrum Analysis

Photobiomodulation with red light-emitting diodes accelerates hepatocyte proliferation through reactive oxygen species/extracellular signal-regulated kinase pathway. AIM: Cell-based transplantation is an alternate method of liver transplantation to delay the onset of end-stage liver diseases. For successful treatment, cells need to be expended in vitro expeditiously. However, autogenetic hepatocytes as the ideal cell source for therapy remain in quiescence so proliferation is rare. Photobiomodulation therapy has been used to stimulate some kinds of cell proliferation, but is unknown whether red light-emitting diode (LED) irradiation can promote primary hepatocyte proliferation. The aim of this study was to evaluate the effect of red LED irradiation on hepatocytes in vitro. METHODS: Mouse primary hepatocytes were isolated and received red LED treatment. The cell viability, reactive oxygen species (ROS) levels, phosphorylated extracellular signal-regulated kinase1/2 (pERK1/2) and some cell cycle-related proteins were observed. Additionally, ROS inhibition and pERK1/2 inhibition were carried out to determine the effect of ROS and ERK1/2 in red LED irradiation. RESULTS: The red LED irradiation increased hepatocyte proliferation, elevated intracellular ROS levels, and stimulated ERK1/2 activation and cell cycle-related gene expression. The mitosis promoting effect of red LED irradiation could be disturbed by ROS or pERK inhibition. The red LED irradiation promoted hepatocyte proliferation through the ROS/pERK1/2 pathway. CONCLUSIONS: Red LED irradiation could accelerate hepatocyte proliferation through the ROS/pERK1/2 pathway. Red LED irradiation might be a potential method to increase hepatocyte cell numbers in vitro and support cell-based transplantation in clinical work.

Comment on "Photobiomodulation delays the onset of skeletal muscle fatigue in a dose-dependent manner". Muscle Contraction;Muscle Fatigue;Muscle, Skeletal

Use of low-level laser therapy on children aged 1 to 5 years with energy-protein malnutrition: A clinical trial. BACKGROUND: Episodes of malnutrition in early childhood can produces alterations in the salivary glands. The investigation of mechanisms that can reduce the impact of malnutrition on the defenses of the organism is of the utmost important and interest to public health. The aim of this study is to evaluate the effect of low-level laser on the saliva of children aged 1 to 5 years with energy-protein malnutrition. METHODS: Mandatory inclusion criteria are diagnosis of malnutrition. The sample will consist of 50 men and women malnourished children aged 12 to 71 months. Saliva will be collected and the volume of saliva will be measured and the salivary flow rate will be determined (mL/min). Concentrations of salivary IgA in all samples will be measured using a commercial Enzyme-Linked Immunosorbent Assay (ELISA) kit. Low-level laser (laser diode) will be administered in the region of the parotid glands bilaterally as well as in the regions of the submandibular and sublingual glands. DISCUSSION: This study will be the first that investigate the effects of local laser therapy on the salivary glands of malnourished children. TRIAL REGISTRATION: Clinical.trials.gov as NCT03355313, first received in 21 November 2017. Immunoglobulin A, Secretory Child Nutrition Disorders;Child, Preschool;Enzyme-Linked Immunosorbent Assay;Female;Humans;Immunoglobulin A, Secretory;Infant;Lasers, Semiconductor;Low-Level Light

Therapy;Male;Nutritional Status;Parotid Gland;Protein-Energy Malnutrition;Saliva;Salivary Glands;Sublingual Gland;Submandibular Gland;Treatment Outcome

Effect of near-infrared photobiomodulation therapy in a cellular wound healing model. Cells, Cultured;Fibroblasts;Humans;Infant;Low-Level Light Therapy;Male;Models, Biological;Wound Healing

Efficacy of Low-Level Laser Therapy in the Treatment of Temporomandibular Myofascial Pain: A Systematic Review and Meta-Analysis. AIMS: To conduct a systematic review and meta-analysis to determine the efficacy of low-level laser therapy (LLLT) in treating temporomandibular myofascial pain in adults compared to laser placebo. METHODS: Randomized, placebo-controlled studies were identified by a search on March 2, 2016 and updated on February 9, 2017 in the PubMed, Web of Science, and Cochrane Library databases. Three of the authors assessed the studies for risk of bias. Outcomes included pain reduction on a visual analog scale (VAS) and interincisal opening. RESULTS: The initial search strategy yielded 142 unduplicated references assessed independently by three review authors. After evaluation, this number was reduced to eight relevant studies for inclusion in this review. Of these eight studies, four were at unclear risk of bias and four were at high risk. In a meta-analysis, pain intensity was significantly reduced after treatment in the group that received LLLT as compared to laser placebo (an average of 2.2 units on a scale of 0 to 10) (P = .005) and an average of 2.4 units 3 to 4 weeks later (P = .022). Pooled results showed a significant increase in interincisal opening at 1 month after treatment (P = .012), but not when the treatment was completed (P = .079). CONCLUSION: The findings from this systematic review showed that LLLT seems to be effective in reducing pain in patients with temporomandibular myofascial pain with moderate-quality evidence. However, due to the high heterogeneity, small number, and high risk of bias of the included studies, the results are not definitive, and further well-designed studies are needed. Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome

Influence of class IV laser therapy on the outcomes of tibial plateau leveling osteotomy in dogs. OBJECTIVE: To determine the effects of low-level laser therapy (LLLT) on clinical outcomes in dogs with cranial cruciate ligament disease treated with tibial plateau leveling osteotomy (TPLO). STUDY DESIGN: Randomized, placebo-controlled clinical trial. Owners and surgeons (care providers and assessors) were masked. ANIMALS: Ninety-five dogs were admitted for TPLO and assigned to 1 of 2 groups, laser group (LG; nâ€‰=â€‰51) or placebo group (PG; nâ€‰=â€‰44). METHODS: Three treatments (laser or placebo) were administered within a 4-day perioperative period. A fourth treatment was recommended and was accepted in 28.4% of cases (LG, nâ€‰=â€‰14; PG, nâ€‰=â€‰13). Dogs in the LG group received laser at wavelengths 660 nm red (100 mW) and at 800, 905 and 970 nm infrared (maximum 15 W continuous wave, 20 W peak pulsed wave), administered simultaneously. Dogs in the PG group received placebo laser (660 nm, 4 mW). Other treatments were identical. Outcomes were measured by difference in clinical metrology instruments (Liverpool Osteoarthritis in Dogs and adjusted Canine Orthopedic Index [COI]), osteotomy healing on a radiographic scale, time to cessation of nonsteroidal anti-inflammatory drug administration, and wound healing by owner questionnaire. RESULTS: The only difference detected between groups consisted of a greater improvement in the gait section of the adjusted COI (ACOI) in the LG group (median [interquartile range; IQR]â€‰=â€‰6 [4-7.5]) compared with the PG group (median [IQR]â€‰= 4 [2-6]; Pâ€‰<â€‰.05). CONCLUSION: The laser protocol used in this study was associated with a greater improvement in ACOI gait in dogs treated with TPLO but did not improve any other clinical metrology instrument scores or bone healing. CLINICAL SIGNIFICANCE: This study provides some evidence that LLLT may improve the gait of dogs recovering from a TPLO, as assessed

by owners. Animals;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Dog Diseases;Dogs;Female;Gait;Low-Level Light Therapy;Male;Osteoarthritis;Osteotomy;Stifle;Tibia

Photobiomodulation effects on mRNA levels from genomic and chromosome stabilization genes in injured muscle. Muscle injuries are the most prevalent type of injury in sports. A great number of athletes have relapsed in muscle injuries not being treated properly. Photobiomodulation therapy is an inexpensive and safe technique with many benefits in muscle injury treatment. However, little has been explored about the infrared laser effects on DNA and telomeres in muscle injuries. Thus, the aim of this study was to evaluate photobiomodulation effects on mRNA relative levels from genes related to telomere and genomic stabilization in injured muscle. Wistar male rats were randomly divided into six groups: control, laser 25Â mW, laser 75Â mW, injury, injury laser 25Â mW, and injury laser 75Â mW. Photobiomodulation was performed with 904Â nm, 3Â J/cm(2) at 25 or 75Â mW. Cryoinjury was induced by two applications of a metal probe cooled in liquid nitrogen directly on the tibialis anterior muscle. After euthanasia, skeletal muscle samples were withdrawn and total RNA extracted for evaluation of mRNA levels from genomic (ATM and p53) and chromosome stabilization (TRF1 and TRF2) genes by real-time quantitative polymerization chain reaction. Data show that photobiomodulation reduces the mRNA levels from ATM and p53, as well reduces mRNA levels from TRF1 and TRF2 at 25 and 75Â mW in injured skeletal muscle. In conclusion, photobiomodulation alters mRNA relative levels from genes related to genomic and telomere stabilization in injured skeletal muscle. RNA, Messenger;TATA Box Binding Protein-Like Proteins;TATA box-binding protein-related factor 2, rat;Telomeric Repeat Binding Protein 1;Tumor Suppressor Protein p53;Ataxia Telangiectasia Mutated Proteins Animals;Ataxia Telangiectasia Mutated Proteins;Chromosomes, Mammalian;Genome;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats, Wistar;TATA Box Binding Protein-Like Proteins;Telomeric Repeat Binding Protein 1;Tumor Suppressor Protein p53

Prolotherapy and Low Level Laser Therapy: A Synergistic Approach to Pain Management in Chronic Osteoarthritis. Regenerative injection therapy and low level laser therapy are alternative remedies known for their success in the treatment and symptomatic management of chronic musculoskeletal conditions. In response to the growing demand for alternative therapies in the face of the opioid epidemic, the authors conduct a literature review to investigate the potential for prolotherapy and LLLT to be used adjunctively to manage chronic osteoarthritis (OA). OA is a degenerative chronic musculoskeletal condition on the rise in North America, and is frequently treated with opioid medications. The regenerative action of prolotherapy and pain-modulating effects of LLLT may make these two therapies well-suited to synergistically provide improved outcomes for osteoarthritis patients without the side effects associated with opioid use. A narrative descriptive review through multiple medical databases (Google Scholar, PubMed, and MedLine) is conducted, restricted by the use of medical subject headings. 71 articles were selected for reading in full, and 40 articles were selected for use in the study after reading in full. A review of the literature revealed good clinical results in the use of prolotherapy and LLLT separately to manage chronic musculoskeletal pain due to osteoarthritis and other chronic conditions. It is also recognized in the literature that prolotherapy works most effectively when used adjunctively with other treatments. Downsides to the use of prolotherapy include mild side effects of pain, stiffness and bruising and potential adverse events as a result of injection. This study is limited by the lack of clinical trials available involving both LLLT and prolotherapy injections used adjunctively, and by the low number of high impact literature concerning the treatment of (specifically) osteoarthritis by alternative methods. The authors suggest that practicing health care providers consider utilizing LLLT and prolotherapy together as a supplementary method in the management of chronic pain due to

osteoarthritis, to minimize the long-term prescription of opioids and emphasize a less invasive treatment for this debilitating condition.

Evaluation of Oral Mucositis Occurrence in Oncologic Patients under Antineoplastic Therapy Submitted to the Low-Level Laser Coadjuvant Therapy. Low-level laser therapy has been widely used in treating many conditions, including oral mucositis. The purpose of this study was to evaluate the occurrence of oral mucositis in patients undergoing antineoplastic therapy submitted to preventive and therapeutic treatment with low-level laser therapy. This cross-sectional study was carried out with 51 children and adolescents of both sexes with malignant neoplasias who developed oral mucositis and underwent low-level laser therapy. Data were collected on sex, age, type and degree of neoplasia, region affected, and remission time. 64.7% of the patients were male and were between 3 and 6 years of age (39.2%). Acute lymphoid leukemia was the most frequent neoplasm (37.3%). Regarding the maximum oral mucositis, grade 2 (41.2%) was predominant, with jugal mucosa (29.9%) and tongue (17.7%) being the most affected regions. The majority of cases presented lesion remission time between 4 and 7 days (44.0%). Most patients were young, male, and diagnosed with acute lymphoid leukemia. Predominance of grade 2 oral mucositis was observed, with jugal mucosa and tongue being the most affected regions, with the majority of cases presenting lesion remission time between 4 and 7 days. Low-level laser therapy has been shown to be an essential therapy in the prevention and treatment of these lesions, since it is a non-invasive and low-cost method.

Multi-layered tumor-targeting photothermal-doxorubicin releasing nanotubes eradicate tumors in vivo with negligible systemic toxicity. Multi-layered single-walled carbon nanotubes, termed SWNT@BSA@Au-S-PEG-FA@DOX, which integrate photothermal therapy with small molecule drug delivery, were prepared using a facile layer-by-layer assembly process. Oxidized and cut single-walled carbon nanotubes (SWNTs) were coated with bovine serum albumin (BSA) to provide abundant active sites for the nucleation of Au seeds, which are subsequently converted into gold nanoparticles (Au NPs) by in situ reduction. The resulting SWNT@BSA@Au material exhibits ideal photothermal properties. Further modification of the nanomaterial with folic acid terminated-polyglycol (FA-PEG-SH) and subsequent loading with doxorubicin (DOX) afford the SWNT@BSA@Au-S-PEG-FA@DOX. The FA terminated PEG endows the material with high water-dispersibility, biocompatibility and cancer cell selectivity. A high drug loading ratio for DOX of up to 590% was achieved, with the drug release being pH and temperature dependent, adding to the selectivity of the system. High efficacy of the SWNT@BSA@Au-S-PEG-FA@DOX material, when combined with photothermal therapy (irradiation of the tumor with an 808 nm laser, 1 W cm-2 for 5 min, 24 h after systemic injection of the nanomedicine), was demonstrated in vivo, resulting in complete tumor eradication. Remarkably, the side effects are negligible with only minor damage to normal tissues including the liver and kidneys being observed. Drug Carriers;Nanotubes, Carbon;Serum Albumin, Bovine;Polyethylene Glycols;Gold;Doxorubicin;Folic Acid Animals;Doxorubicin;Drug Carriers;Drug Liberation;Female;Folic Acid;Gold;HeLa Cells;Humans;Low-Level Light Therapy;Metal Nanoparticles;Mice, Nude;Nanotubes, Carbon;Neoplasms, Experimental;Polyethylene Glycols;Serum Albumin, Bovine

American Academy of Periodontology best evidence consensus statement on the efficacy of laser therapy used alone or as an adjunct to non-surgical and surgical treatment of periodontitis and peri-implant diseases. Consensus;Humans;Laser Therapy;Low-Level Light Therapy;Peri-Implantitis;Periodontitis;United States

Evaluation of Four Pulpotomy Techniques in Primary Molars: A Randomized Controlled Trial. INTRODUCTION: This trial was designed to evaluate the clinical and radiographic success rates of calcium-enriched mixture (CEM) cement with and without low level laser therapy (LLLT) and compare

them to that of formocresol (FC) and ferric sulfate (FS) in primary molar pulpotomies. METHODS AND MATERIALS: This randomized clinical trial was conducted on a total of 160 teeth selected from 40 patients aged 3-9 years. Patients with at least four primary molars needing pulpotomy, were included in order to have each tooth assigned randomly in one of the four following groups; FC, FS, CEM, and LLLT/CEM. Six- and twelve-month follow-up periods were conducted in order to enable a clinical and radiographic evaluation of the treated teeth. Collected data were analyzed using Cochran Q Tests. RESULTS: The 12-month clinical success rate for each technique was: FC=100%, FS=95%, CEM=97.5% and LLLT/CEM=100% with no significant differences (P>0.05). Furthermore, 12-month radiographic success rate for each technique was: FC=100%, FS=92.5%, CEM=95% and LLLT/CEM=100% with no significant differences (P>0.05). CONCLUSION: Favorable outcomes of four treatment techniques in pulpotomy of primary molar teeth were comparable. CEM with/without LLLT may be considered as a safe and successful pulpotomy treatment modality compared to current conventional methods.

Effects of transcranial LED therapy on the cognitive rehabilitation for diffuse axonal injury due to severe acute traumatic brain injury: study protocol for a randomized controlled trial. BACKGROUND: Photobiomodulation describes the use of red or near-infrared light to stimulate or regenerate tissue. It was discovered that near-infrared wavelengths (800-900Â nm) and red (600Â nm) light-emitting diodes (LED) are able to penetrate through the scalp and skull and have the potential to improve the subnormal cellular activity of compromised brain tissue. Different experimental and clinical studies were performed to test LED therapy for traumatic brain injury (TBI) with promising results. One of the proposals of this present study is to develop different approaches to maximize the positive effects of this therapy and improve the quality of life of TBI patients. METHODS/DESIGN: This is a double-blinded, randomized, controlled trial of patients with diffuse axonal injury (DAI) due to a severe TBI in an acute stage (less than 8Â h). ThirtyÂ two patients will be randomized to active coil helmet and inactive coil (sham) groups in a 1:1 ratio. The protocol includes 18 sessions of transcranial LED stimulation (627Â nm, 70Â mW/cm(2), 10Â J/cm(2)) at four points of the frontal and parietal regions for 30Â s each, totaling 120Â s, three times per week for 6Â weeks, lasting 30Â min. Patients will be evaluated with the Glasgow Outcome Scale Extended (GOSE) before stimulation and 1, 3, and 6Â months after the first stimulation. The study hypotheses are as follows: (1) transcranial LED therapy (TCLT) will improve the cognitive function of DAI patients and (2) TCLT will promote beneficial hemodynamic changes in cerebral circulation. DISCUSSION: This study evaluates early and delayed effects of TCLT on the cognitive rehabilitation for DAI following severe acute TBI. There is a paucity of studies regarding the use of this therapy for cognitive improvement in TBI. There are some experimental studies and case series presenting interesting results for TBI cognitive improvement but no clinical trials. TRIAL REGISTRATION: ClinicalTrials.gov, NCT03281759 . Registered on 13 September 2017. Adolescent;Adult;Brain;Brain Injuries, Traumatic;Brazil;Cerebrovascular Circulation;Cognition;Diffuse Axonal Injury;Double-Blind Method;Female;Glasgow Coma Scale;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neurologic Examination;Quality of Life;Randomized Controlled Trials as Topic;Recovery of Function;Time Factors;Treatment Outcome;Young Adult

Efficacy of High-Intensity Laser Therapy in Treating Knee Osteoarthritis: A First Systematic Review. OBJECTIVE: The aim of this study was to evaluate the efficacy of high-intensity laser therapy (HILT) in the treatment of knee osteoarthritis (OA). BACKGROUND: Due to increased number of randomized controlled trials evaluating efficiency of HILT in patients with knee OA, there was a need to present them in the form of systematic review. METHODS: The search includes the databases as well as a manual search until August, 2017. The quality of the selected articles was determined in accordance with the revised guidelines of the CONSORT statement. RESULTS: Six studies were included. Laser fluence ranged from 0.51 to 120â€‰J/cm(2) for one treatment. The total energy transmitted during

one treatment ranged from 1250 to 3000â€‰J. All the selected studies found HILT to be beneficial in treatment of knee OA. CONCLUSIONS: HILT seems to be efficient in reducing pain and for providing functional improvements in patients with knee OA. Humans;Low-Level Light Therapy;Osteoarthritis, Knee

Correction: Gross and histologic evaluation of effects of photobiomodulation, silver sulfadiazine, and a topical antimicrobial product on experimentally induced full-thickness skin wounds in green iguanas (Iguana iguana).

Photobiomodulation of a flowable matrix in a human skin ex vivo model demonstrates energy-based enhancement of engraftment integration and remodeling. The use of dermal substitutes to treat skin defects such as ulcers has shown promising results, suggesting a potential role for skin substitutes for treating acute and chronic wounds. One of the main drawbacks with the use of dermal substitutes is the length of time from engraftment to graft take, plus the risk of contamination and failure due to this prolonged integration. Therefore, the use of adjuvant energy-based therapeutic modalities to augment and accelerate the rate of biointegration by dermal substitute engraftments is a desirable outcome. The photobiomodulation (PBM) therapy modulates the repair process, by stimulating cellular proliferation and angiogenesis. Here, we evaluated the effect of PBM on a collagen-glycosaminoglycan flowable wound matrix (FWM) in an ex vivo human skin wound model. PBM resulted in accelerated rate of re-epithelialization and organization of matrix as seen by structural arrangement of collagen fibers, and a subsequent increased expression of alpha-smooth muscle actin (Î±-SMA) and vascular endothelial growth factor A (VEGF-A) leading to an overall improved healing process. The use of PBM promoted a beneficial effect on the rate of integration and healing of FWM. We therefore propose that the adjuvant use of PBM may have utility in enhancing engraftment and tissue repair and be of value in clinical practice. Glycosaminoglycans;Collagen Collagen;Glycosaminoglycans;Humans;Low-Level Light Therapy;Skin;Tissue Engineering;Tissue Survival;Wound Healing

Laser/LED phototherapy on the repair of tibial fracture treated with wire osteosynthesis evaluated by Raman spectroscopy. The aim of the present study was to assess, by means of Raman spectroscopy, the repair of complete surgical tibial fractures fixed with wire osteosynthesis (WO) treated or not with infrared laser (Î»780Â nm) or infrared light emitting diode (LED) (Î»850â€‰Â±â€‰10Â nm) lights, 142.8Â J/cm(2) per treatment, associated or not to the use of mineral trioxide aggregate (MTA) cement. Surgical tibial fractures were created on 18 rabbits, and all fractures were fixed with WO and some groups were grafted with MTA. Irradiated groups received lights at every other day during 15Â days, and all animals were sacrificed after 30Â days, being the tibia removed. The results showed that only irradiation with either laser or LED influenced the peaks of phosphate hydroxyapatite (~â€‰960Â cm(-1)). Collagen (~â€‰1450Â cm(-1)) and carbonated hydroxyapatite (~â€‰1070Â cm(-1)) peaks were influenced by both the use of MTA and the irradiation with either laser or LED. It is concluded that the use of either laser or LED phototherapy associated to MTA cement was efficacious on improving the repair of complete tibial fractures treated with wire osteosynthesis by increasing the synthesis of collagen matrix and creating a scaffold of calcium carbonate (carbonated hydroxyapatite-like) and the subsequent deposition of phosphate hydroxyapatite. Collagen;Durapatite Analysis of Variance;Animals;Bone Wires;Collagen;Durapatite;Fracture Fixation, Internal;Fracture Healing;Low-Level Light Therapy;Male;Rabbits;Spectrum Analysis, Raman;Tibia;Tibial Fractures

Low-Level Laser Therapy Reduces Lung Inflammation in an Experimental Model of Chronic Obstructive Pulmonary Disease Involving P2X7 Receptor. Chronic obstructive pulmonary disease (COPD) is a progressive disease characterized by irreversible airflow limitation, airway inflammation and remodeling, and enlargement of alveolar spaces. COPD is in the top five leading causes of deaths

worldwide and presents a high economic cost. However, there are some preventive measures to lower the risk of developing COPD. Low-level laser therapy (LLLT) is a new effective therapy, with very low cost and no side effects. So, our objective was to investigate if LLLT reduces pulmonary alterations in an experimental model of COPD. C57BL/6 mice were submitted to cigarette smoke for 75 days (2x/day). After 60 days to smoke exposure, the treated group was submitted to LLLT (diode laser, 660â€‰nm, 30â€‰mW, and 3â€‰J/cm(2)) for 15 days and euthanized for morphologic and functional analysis of the lungs. Our results showed that LLLT significantly reduced the number of inflammatory cells and the proinflammatory cytokine secretion such as IL-1Î², IL-6, and TNF-Î± in bronchoalveolar lavage fluid (BALF). We also observed that LLLT decreased collagen deposition as well as the expression of purinergic P2X7 receptor. On the other hand, LLLT increased the IL-10 release. Thus, LLLT can be pointed as a promising therapeutic approach for lung inflammatory diseases as COPD. Receptors, Purinergic P2X7 Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Pneumonia;Pulmonary Disease, Chronic Obstructive;Receptors, Purinergic P2X7

Photobiomodulation mechanisms in the kinetics of the wound healing process in rats. OBJECTIVES: The healing process of cutaneous lesions is considered a complex event divided into distinct and overlapping phases, which responds satisfactorily to photobiomodulation (PBM). PBM is indicated as a therapeutic resource capable of assisting tissue repair. The present study aimed to analyze the kinetics of cutaneous wounds healing process after application of the GaAlAs laser for treating wounds on the dorsum of rats. MATERIALS AND METHODS: This study was approved by the Animal Ethics Committee of UFSCar. The animals were divided into 2 groups (nâ€¯=â€¯10); control group (CG) used 0.9% saline solution and the laser group (LG) used GaAlAs, 670â€¯nm continuous pulse, 30â€¯mW power, 14.28â€¯J/cm(2) energy density, irradiating 1 point per wound for 30s, totaling 15 consecutive days of treatment. Samples were collected on the 4th, 11th and 16th days for histological analysis of HE, Picrosirius-Red, immunohistochemistry (Collagen1, TNF-Î±, VEGF). Statistical analyzes used the one-way ANOVA test for intra and inter group evaluations, and the Tukey post-test. Level of significance was set at pâ€¯<â€¯0.05. RESULTS: The histopathological analysis (HE) showed a statistically significant difference for lower values of inflammatory infiltrate in LG versus CG on the 16th day; and for the increase of collagen in the 11th and 16th days of treatment. There was a statistically significant difference in the increase of VEGF on the 11th day for LG; decrease of TNF-Î± on the 4th and 11th day for LG, and increase of collagen type 1 on the 4th and 16th days for LG. The birefringence analysis of the percentage of collagen fibers presented on the 11th day of treatment revealed a greater quantity and significant statistical difference. Collagen fibers showed improved organization and arrangement on the 11th day for LG. CONCLUSION: Our results show that PBM is effective in helping the kinetics of the cutaneous wound healing process in rats and promotes the necessary stimuli for the satisfactory evolution of healing process, ultimately leading to structurally desirable tissue. Collagen Type I;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A Animals;Birefringence;Collagen Type I;Immunohistochemistry;Lasers, Semiconductor;Male;Rats;Rats, Wistar;Skin;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A;Wound Healing

Variation of Energy in Photobiomodulation for the Control of Radiotherapy-Induced Oral Mucositis: A Clinical Study in Head and Neck Cancer Patients. Oral mucositis (OM) is a frequent and severe adverse effect of therapy against head and neck cancer. Photobiomodulation with the low-power laser is known to be effective against OM, but the diversity of protocols and the possibility of stimulating residual tumor cells are still obstacles. The present study aimed to compare two doses of laser energy delivered to the oral mucosa of patients under oncologic treatment for head and neck cancer, looking for differences in the control of mucositis, as well as in the frequency of tumoral

recurrences. Fifty-eight patients undergoing radiotherapy were randomized into two groups, distinguished according to the energy delivered by laser irradiation, namely, 0.25â€‰J and 1.0â€‰J. The groups were compared according to frequency, severity, or duration of OM, as well as the frequency of tumoral recurrences. OM was significantly less frequent in patients receiving 1.0â€‰J of energy, but the groups did not differ regarding severity or duration of OM. Tumoral recurrence also did not vary significantly between the groups. Photobiomodulation with a higher dose of energy (1.0â€‰J versus 0.25â€‰J) is associated with better control of radiotherapy-induced OM and does not significantly increase the risk of neoplastic recurrence.

Urologists' attitudes to sexual complications of LUTS/BPH treatments. INTRODUCTION: Many LUTS/BPH treatments currently available may affect sexual function (SD). We wished to assess urologists' attitude and practice in this area. METHODS: Attendees of an international meeting were randomly selected, interviewed and stratified by professional status and LUTS/BPH cases seen per month. There were four questions: treatment options offered, frequency of discussing erectile dysfunction (ED) with each treatment, frequency of discussing ejaculatory dysfunction (EjD) with each treatment, and offering alternative treatment based on the risks of sexual dysfunction. RESULTS: 199 of the 245 interviewed (81%) were urologists. The most common treatments offered were Î±-blockers (99.5%), 5-ARI (95.0%) and TURP (92.5%). About 70% of the specialists discuss ED before Î±-blockers (not known to cause ED). Regarding EjD, 70% discuss this prior to prescribing Î±-blockers, 60% before 5-ARI therapy, while 80% before TURP. A significant minority fails to discuss this complication in all areas. Many respondents do not routinely discuss alternative therapies on the risk of SD. The higher the caseload, the less likely was a urologist to offer alternative therapies, with 37% of urologists seeing over 30 LUTS/BPH patients per month stating they would "Not at all often" offer alternative therapies for this reason. CONCLUSIONS: There is a significant discrepancy in attitudes to counselling patients on SD related to LUTS/BPH treatments. This may, in some cases, affect the validity of consent to the treatment. Most urologists do not discuss alternative treatments with patients based on the risks of different outcomes and complications, and this seems more marked in those with the busier practices. This may sit ill with the concept of personalised healthcare. 5-alpha Reductase Inhibitors;Adrenergic alpha-Antagonists 5-alpha Reductase Inhibitors;Adrenergic alpha-Antagonists;Attitude of Health Personnel;Erectile Dysfunction;Health Care Surveys;Health Knowledge, Attitudes, Practice;Humans;Low-Level Light Therapy;Lower Urinary Tract Symptoms;Male;Patient Education as Topic;Premature Ejaculation;Prostatic Hyperplasia;Transurethral Resection of Prostate;Urinary Bladder Neck Obstruction;Urologists

Phototherapy with LED Shows Promising Results in Healing Chronic Wounds in Diabetes Mellitus Patients: A Prospective Randomized Double-Blind Study. OBJECTIVE: The study examined the influence of phototherapy with light-emitting diodes (LEDs) on chronic diabetic wound healing. BACKGROUND: Chronic diabetic wounds are very difficult to treat due to underlying conditions such as angiopathy and neuropathy, resulting in slow healing rates. Conventional treatment options are often insufficient and do not provide satisfactory outcomes. Phototherapy with LED enhances the healing processes through mechanisms of energy exchange between incoming photons and their target, the main one being cytochrome-c oxidase in mitochondria. METHODS: A double-blind, randomized study included 60 patients with a chronic diabetic wound treated at the University Medical Center Ljubljana between October 1, 2012 and December 1, 2014. Patients were randomized into either an active group (LED group) or a control group (Co-group). The active group was treated with LED 2.4â€‰J/cm(2) (wavelengths 625, 660, 850â€‰nm) three times a week for 8 weeks. The Co-group was treated with light that simulated LED. Healing was evaluated using the Falanga wound bed score and wound surface area. RESULTS: The average baseline wound surface before treatment was 1315â€‰mm(2) in the LED group and 1584â€‰mm(2) in the Co-group (pâ€‰=â€‰0.80). After

8 weeks, the mean surface in the LED group was 56% of the baseline surface and 65% in the Co-group (pâ€‰>â€‰0.05). Falanga score evaluation showed significantly faster wound bed healing in the LED group compared with the Co-group (pâ€‰<â€‰0.05). CONCLUSIONS: According to our results, LED significantly improves healing of chronic diabetic wounds and prepares the wound bed for further coverage options. Aged;Diabetes Complications;Double-Blind Method;Female;Humans;Leg Ulcer;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Prospective Studies;Wound Healing

Effect of Pulsed High-Intensity Laser Therapy on Pain, Adhesions, and Quality of Life in Women Having Endometriosis: A Randomized Controlled Trial. OBJECTIVE: The purpose of this study was to assess the effectiveness of pulsed high-intensity laser therapy on pain, adhesions, and quality of life in women with endometriosis. BACKGROUND DATA: Endometriosis is among the most common gynecological problems affecting females of childbearing age. The majority of women with endometriosis seek treatment to alleviate pain. MATERIALS AND METHODS: The sample included 40 women with endometriosis to either a mild or a moderate degree aged between 24 and 32 years. They were randomly assigned to two groups, group I of 20 women received pulsed high-intensity laser therapy three times per week for 8 weeks, as well as the usual regimen of hormonal treatment given to endometriosis patients, and group II of 20 women were given sham laser treatment three times per week for 8 weeks and the usual regimen of hormonal treatment. For all patients, pain, the degree of endometriosis, and quality of life were measured using present pain intensity and pain relief scales, laparoscopy, and the Endometriosis Health Profile (EHP-5) before treatment began and at the end of the 8 weeks. RESULTS: In comparison to the sham laser treatment, pulsed high-intensity laser therapy produced a significantly different result (pâ€‰<â€‰0.0001), in women with endometriosis. CONCLUSIONS: Pulsed high-intensity laser therapy is an effective method of pain alleviation, reducing adhesions, and improving the quality of life in women with endometriosis. Adult;Endometriosis;Female;Humans;Low-Level Light Therapy;Pain;Quality of Life;Tissue Adhesions;Young Adult

Differential response of human dermal fibroblast subpopulations to visible and near-infrared light: Potential of photobiomodulation for addressing cutaneous conditions. BACKGROUND OBJECTIVES: The past decade has witnessed a rapid expansion of photobiomodulation (PBM), demonstrating encouraging results for the treatment of cutaneous disorders. Confidence in this approach, however, is impaired not only by a lack of understanding of the light-triggered molecular cascades but also by the significant inconsistency in published experimental outcomes, design of the studies and applied optical parameters. This study aimed at characterizing the response of human dermal fibroblast subpopulations to visible and near-infrared (NIR) light in an attempt to identify the optical treatment parameters with high potential to address deficits in aging skin and non-healing chronic wounds. MATERIALS AND METHODS: Primary human reticular and papillary dermal fibroblasts (DF) were isolated from the surplus of post-surgery human facial skin. An in-house developed LED-based device was used to irradiate cell cultures using six discrete wavelengths (450, 490, 550, 590, 650, and 850â€‰nm). Light dose-response at a standard oxygen concentration (20%) at all six wavelengths was evaluated in terms of cell metabolic activity. This was followed by an analysis of the transcriptome and procollagen I production at a protein level, where cells were cultured in conditions closer to in vivo at 2% environmental oxygen and 2% serum. Furthermore, the production of reactive oxygen species (ROS) was accessed using real-time fluorescence confocal microscopy imaging. Here, production of ROS in the presence or absence of antioxidants, as well as the cellular localization of ROS, was evaluated. RESULTS: In terms of metabolic activity, consecutive irradiation with short-wavelength light (â‡•530â€‰nm) exerted an inhibitory effect on DF, while longer wavelengths (>=590â€‰nm) had essentially a neutral effect. Cell behavior following treatment with 450â€‰nm was biphasic with two distinct states: inhibitory at low- to mid- dose

levels (<=30â€‰J/cm(2)), and cytotoxic at higher dose levels (>30â€‰J/cm(2)). Cell response to blue light was accompanied by a dose-dependent release of ROS that was localized in the perinuclear area close to mitochondria, which was attenuated by an antioxidant. Overall, reticular DFs exhibited a greater sensitivity to light treatment at the level of gene expression than did papillary DFs, with more genes significantly up- or down- regulated. At the intra-cellular signaling pathway level, the up- or down- regulation of vital pathways was observed only for reticular DF, after treatment with 30â€‰J/cm(2) of blue light. At the cellular level, short visible wavelengths exerted a greater inhibitory effect on reticular DF. Several genes involved in the TGF-Î² signaling pathway were also affected. In addition, procollagen I production was inhibited. By contrast, 850â€‰nm near-infrared (NIR) light (20â€‰J/cm(2)) exerted a stimulatory metabolic effect in these cells, with no detectable intracellular ROS formation. Here too, reticular DF were more responsive than papillary DF. This stimulatory effect was only observed under in vivo-like low oxygen conditions, corresponding to normal dermal tissue oxygen levels (approximately 2%). CONCLUSION: This study highlights a differential impact of light on human skin cells with upregulation of metabolic activity with NIR light, and inhibition of pro-collagen production and proliferation in response to blue light. These findings open-up new avenues for developing therapies for different cutaneous conditions (e.g., treatment of keloids and fibrosis) or differential therapy at distinct stages of wound healing. Lasers Surg. Med. 50:859-882, 2018. Â© 2018 Wiley Periodicals, Inc. Cell Culture Techniques;Cell Proliferation;Fibroblasts;Humans;Infrared Rays;Low-Level Light Therapy;Radiation Dosage;Skin Diseases

Safety of a Perfluorodecalin-Infused Silicone Patch in Picosecond Laser-Assisted Tattoo Removal: A Retrospective Review. Biocompatible Materials;Dermatologic Agents;Fluorocarbons;Silicones;perfluorodecalin Adult;Biocompatible Materials;Dermatologic Agents;Female;Fluorocarbons;Humans;Low-Level Light Therapy;Male;Retrospective Studies;Silicones;Tattooing

Treatment of atrophic acne scarring with fractional micro-plasma radio-frequency in Chinese patients: A prospective study. BACKGROUND: Acne scarring is a common disfiguring sequela of acne vulgaris which can lead to serious psychosocial problems and have a negative effect on patients' quality of life. Although a variety of approaches can be used to treat atrophic acne scars, disadvantages such as long-healing time, dyspigmentation, infections, and prolonged erythema make these treatments unsatisfactory especially for Asians. Fractional micro-plasma radio-frequency is a novel technology that produces minor ablation to the epidermis to promote rapid re-epithelialization, while the radio-frequency evoked thermal effect can stimulate regeneration and remodeling of dermal fibroblasts. OBJECTIVE: To evaluate the clinical effectiveness and safety of micro-plasma radio-frequency for the treatment of facial acne scars in Chinese patients. MATERIALS AND METHODS: A total of 95 patients with facial atrophic acne scars were treated by micro-plasma radio-frequency using three sessions at 2-month intervals. Patients were seen 1 week after each treatment and 1, 3, 6 months after the final treatment. Improvement was assessed by three independent dermatologists who compared photographs taken before the first treatment and 6 months after the last treatment. Adverse effects were evaluated by a dermatologist who did not participated in the study. Patients also provided self-evaluation of satisfaction levels at the last follow-up visit. RESULTS: A total of 86 patients with atrophic acne scars completed the entire study. There was a significant improvement in acne scars after three treatments. The mean score of ECCA grading scale (Echelle d'Evaluation Clinique des Cicatrices d'AcnÃ©) was reduced from 107.21 to 42.27 (Pâ€‰<â€‰0.05). A total of 15 of 86 patients showed more than 75% improvement, 57 patients showed 50-75% improvement, and 14 patients showed 25-50%. After three treatments, all subjects showed improvements in spots, large pores, texture, UV damage, red areas, and porphyrin fluorescence. Pain,

erythema, edema, effusion, and scab formation were observed in all patients. The average pain score on a visual analog scale was 6.14â€‰Â±â€‰1.12 and all patients tolerated the treatments. The average duration of erythema was 6.26â€‰Â±â€‰0.92 days. Hyperpigmentation, hypopigmentation, infections, and worsening of scarring were not seen. All patients were either "very satisfied" or "satisfied" with the treatment outcomes. CONCLUSIONS: Fractional micro-plasma radio-frequency is an effective and safe treatment for acne scars, and might be a good choice for patients with darker skin. Lasers Surg. Med. 50:844-850, 2018. Â© 2018 Wiley Periodicals, Inc. Acne Vulgaris;Adult;Asian People;China;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Treatment Outcome;Young Adult

Cell Adhesion Molecules are Mediated by Photobiomodulation at 660 nm in Diabetic Wounded Fibroblast Cells. Diabetes affects extracellular matrix (ECM) metabolism, contributing to delayed wound healing and lower limb amputation. Application of light (photobiomodulation, PBM) has been shown to improve wound healing. This study aimed to evaluate the influence of PBM on cell adhesion molecules (CAMs) in diabetic wound healing. Isolated human skin fibroblasts were grouped into a diabetic wounded model. A diode laser at 660 nm with a fluence of 5 J/cmÂ² was used for irradiation and cells were analysed 48 h post-irradiation. Controls consisted of sham-irradiated (0 J/cmÂ²) cells. Real-time reverse transcription (RT) quantitative polymerase chain reaction (qPCR) was used to determine the expression of CAM-related genes. Ten genes were up-regulated in diabetic wounded cells, while 25 genes were down-regulated. Genes were related to transmembrane molecules, cell–cell adhesion, and cell–matrix adhesion, and also included genes related to other CAM molecules. PBM at 660 nm modulated gene expression of various CAMs contributing to the increased healing seen in clinical practice. There is a need for new therapies to improve diabetic wound healing. The application of PBM alongside other clinical therapies may be very beneficial in treatment.

Effect of low level laser and low intensity pulsed ultrasound therapy on bone remodeling during orthodontic tooth movement in rats. BACKGROUND: Quality bone regeneration, which leads to the improvement of bone remodeling, is essential for orthodontic treatment. In order to improve bone regeneration and increase the amount of tooth movement, different techniques have been implemented. The object of this study is to compare the effects of low-level laser therapy (LLLT), low-intensity pulsed ultrasound (LIPUS), and their combination on bone remodeling during orthodontic tooth movement. METHODS: Eighty (80) male, 6-week-old Sprague Dawley rats were grouped in to four groups, the first group was irradiated with (940Â nm) diode laser, second group with LIPUS, and third group with combination of both LLLT and LIPUS. A forth group used was a control group in an incomplete block split-mouth design. The LLLT and LIPUS were used to treat the area around the moving tooth once a day on days 0-7, then the experiment was ended in each experimental endpoint (1, 3, 7, 14, and 21Â days). For amount of tooth movement, models were imaged and analyzed. Histological examination was performed after staining with (hematoxylin and eosin) and (alizarin red and Alcian Blue) stain. One step reverse transcription-polymerase chain reaction RT-PCR was also performed to elucidate the gene expression of RANK, RANKL, OPG, and RUNX-2. RESULTS: The amount of tooth movement, the histological bone remodeling, and the RT-PCR were significantly greater in the treatment groups than that in the control group. Among the treatment groups, the combination group was the highest and the LIPUS group was the lowest. CONCLUSION: These findings suggest that LLLT and LIPUS can enhance the velocity of tooth movement and improve the quality of bone remodeling during orthodontic tooth movement. Animals;Bone Remodeling;Low-Level Light Therapy;Male;Maxilla;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Staining and Labeling;Tooth Movement Techniques;Ultrasonic Waves

Effect of photobiomodulation therapy on postoperative pain after endodontic treatment: a randomized, controlled, clinical study. OBJECTIVE: The aim of this prospective, randomized, clinical study was to assess the effect of photobiomodulation therapy (PBM) with low-level laser irradiation (LLLI) on postoperative pain after endodontic treatment. MATERIALS AND METHODS: Sixty patients, diagnosed with irreversible pulpitis in lower molar teeth, participated in the study. All treatments were performed by a single operator. Participants were randomly divided into two groups: in the experimental group (EG), endodontic treatment was performed with a reciprocating system, immediately followed by PBM with LLLI; and only endodontic treatment was performed in the control group (CG). Postoperative pain was assessed by a second examiner, who was blinded, using two scales: verbal rating scale (VRS) and numerical rating scale (NRS). Assessment was carried out at 6, 12, and 24Â h after treatment. Data were analyzed using chi-squared, Fisher's exact, Mann-Whitney tests, ordinal, and non-parametric regression analyses. RESULTS: For the prevalence of pain, the difference between the groups was significant for the evaluations performed after 6Â h (pÂ =â€‰0.04) and 24Â h (pÂ =â€‰0.02). The difference after 24Â h remained significant after stratification by sex and extrusion of filling material. Increased pain intensity was associated with extrusion of root canal filling material to the periapical region in the two scales used. CONCLUSION: The effect of PBM therapy after endodontic treatment showed a significant decreasein prevalence of postoperative pain. CLINICAL RELEVANCE: The PBM reduces the prevalence of postoperative pain and may benefit patients who need endodontic treatment. Adolescent;Adult;Brazil;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Prospective Studies;Pulpitis;Root Canal Therapy;Treatment Outcome

Dual Effect of Photobiomodulation on Melasma: Downregulation of Hyperpigmentation and Enhanced Solar Resistance-A Pilot Study. Overview. Melasma is a resistant, sun-induced facial hyperpigmentation capable of remaining present for decades with ensuing psychological distress. Treatment is difficult and focuses on an array of measures to reduce skin hyperpigmentation resulting from triggered hyperactive melanocytes. The pathogenesis of melanoma is not clearly understood but it has been reported that some growth factors and specific cell-signaling pathways are involved. Objective. The objective of the current study was to evaluate the use of pulsed photobiomodulation to modulate melasma via the regulation of gene expression pertaining to skin pigmentation. Methods. We evaluated a two-step approach via a spilt-face pilot study involving seven patients with bilateral dermal melasma who had formerly undergone unsuccessful treatments. During treatment, the initial mobilization phase with microdermabrasion was closely followed by the modulation phase, delivering low-energy pulsed photons (940nm) to downregulate highly metabolic melanocytes in the dermis. A weekly treatment was performed for eight consecutive weeks. White light pictures, ultraviolet pictures, melanin index scores, and Melasma Area and Severity Index scores were obtained at baseline and at Week 12. Results. The pulsed photobiomodulation-treated side versus the control side showed statistically significant results for pigment reduction. Conclusion. This pilot study shows that dermal melasma can be significantly improved with pulsed photobiomodulation. Interestingly, it might also precondition the skin, helping it to build a resistance to future solar ultraviolet ray exposure.

Prescribing Habits for Androgenic Alopecia Among Dermatologists in Spain in 2017: A Cross-Sectional Study. BACKGROUND: Topical minoxidil and oral finasteride are the only drugs approved for the treatment of androgenetic alopecia (AGA) in Spain. However, the management of this condition is highly variable because numerous treatments are used off-label. The main aim of this study was to describe the prescribing habits of dermatologists in Spain for male AGA (MAGA) and female AGA (FAGA). MATERIAL AND METHODS: Descriptive cross-sectional study using online questionnaires completed by dermatologists working in Spain. RESULTS: The responses of 241 dermatologists were

analyzed. The most common treatments prescribed for MAGA were minoxidil (98%), oral finasteride (96%), nutricosmetics (44%), topical finasteride (37%), oral dutasteride (33%), platelet-rich plasma (14%), and low-level laser therapy (8%). For premenopausal FAGA, the most common treatments were topical minoxidil (98%), oral contraceptives (81%), nutricosmetics (72%), cyproterone acetate (58%), oral finasteride (39%), topical finasteride (39%), spironolactone (27%), platelet-rich plasma (20%), oral dutasteride (20%), oral flutamide (18%), and low-level laser therapy (7%). Finally, for postmenopausal FAGA, the most common treatments prescribed were topical minoxidil (98%), oral finasteride (84%), nutricosmetics (68%), topical finasteride (50%), oral dutasteride (35%), platelet-rich plasma (21%), spironolactone (16%), cyproterone acetate (16%), oral flutamide (9%), and low-level laser therapy (9%). A limitation of our study is that we did not analyze novel AGA treatments such as oral minoxidil and dutasteride mesotherapy. CONCLUSIONS: The most common treatments prescribed for AGA by dermatologists in Spain are topical minoxidil, oral finasteride, and nutricosmetics for MAGA and postmenopausal FAGA and topical minoxidil, oral contraceptives, and nutricosmetics for premenopausal FAGA. Alopecia;Cross-Sectional Studies;Dermatology;Drug Prescriptions;Female;Humans;Male;Practice Patterns, Physicians';Private Practice;Public Sector;Self Report;Spain

Effects of low-level laser therapy on the healing of surgically closed incisions and surgically created open wounds in dogs. OBJECTIVE: To determine the effects of low-level laser therapy (LLLT) on primarily closed incisions and full thickness open wounds in dogs. STUDY DESIGN: Prospective, masked, placebo-controlled design. ANIMAL POPULATION: Healthy intact female dogs (nâ€‰=â€‰10). METHODS: Dogs underwent bilateral flank ovariectomy procedures, and open wounds were created bilaterally with a punch biopsy. Each side of the dog (incision and open wound) was randomly assigned to the treatment (TX) group or the control (CN) group. The TX group received LLLT once daily for 5 days with a 980-nm laser and a total energy density of 5 J/cm(2) . The CN group received a sham treatment (laser turned off) for an identical amount of time each day. The wounds were assessed visually; measured; photographed at postoperative days 3, 7, 11, and 14; and biopsied on postoperative days 7 and 14. A 2-way repeated measures multivariate analysis of variance was used to analyze differences between groups. RESULTS: There was no difference between groups for subjective assessment of healing time and wound measurements (Pâ€‰=â€‰.7). There was no difference in histopathologic assessment except that the CN group had more necrosis and perivascular lymphocytes and macrophages at day 7 (Pâ€‰=â€‰.03). The TX group had more perivascular lymphocytes and macrophages at day 14 (Pâ€‰=â€‰.01). CONCLUSION: LLLT did not appear to influence the healing of surgically created incisions and small wounds with the methodology reported here. CLINICAL SIGNIFICANCE: Results of this study do not support recommending LLLT to stimulate healing of uncomplicated, small wounds and incisions. Animals;Biopsy;Dogs;Female;Low-Level Light Therapy;Ovariectomy;Prospective Studies;Skin;Surgical Wound;Wound Healing

Hemolasertherapy: A Novel Procedure for Gingival Papilla Regeneration-Case Report. BACKGROUND: Interdental papilla is of major importance to patients' orofacial aesthetics, especially regarding anterior teeth as part of the smile's harmony. Loss of gingival tissue, which constitutes interdental papilla, forms what in odontology is called black spaces. This loss, besides affecting the smile's aesthetics, also provokes phonetic and functional damage. OBJECTIVE: The objective of the authors is to present the result of three clinical cases treated with an innovative technique called hemolasertherapy, which stimulates growth of gingival papilla and thus permanently fills in the black spaces. METHODS: The photobiomodulation therapy (PBMT) used a 660â€‰nm diode laser (Laser Duo, MMO-SÃ£o Carlos, SP, Brazil), punctual, contact mode in two steps: before the bleeding (first PBMT) and immediately after bleeding (second PBMT). Parameters used were power output:

100â€‰mW, CW; diameter tip: 5â€‰mm; spot area: 0.19â€‰cm(2); irradiation exposure time per point: 20â€‰sec; 14 points per daily session; total of 2 sessions, with a 1-week interval; E: 2â€‰J per point; E: per daily session, 28â€‰J; irradiance per point: 0.52 W/cm(2); fluence per point: 10.4â€‰J/cm(2). Total in two daily sessions: total energy: 56â€‰J; total fluence: 294.75â€‰J/cm, 560â€‰sec total time. An in vitro preliminary study was simultaneously carried out to demonstrate what could happen at cellular level in hemotherapy clinical cases associated with PBMT laser application. RESULTS: This initial study demonstrated that the blood clot originated from the bleeding provoked in the gingival area is rich in mesenchymal stem cells. PBMT enables preservation, viability, and further differentiation, stimulating the return of gingival stem cells, which would support their survival and differentiation in the blood clot, thus favoring interdental papilla regeneration. CONCLUSIONS: Follow-up was done for a time span of 4-5 years and considered excellent with regard to papilla preservation. Adult;Dental Veneers;Female;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Regeneration

Shear Bond Strength of Composite and Ceromer Superstructures to Direct Laser Sintered and Ni-Cr-Based Infrastructures Treated with KTP, Nd:YAG, and Er:YAG Lasers: An Experimental Study. OBJECTIVE: The aim of this study was to examine the shear bond strength (SBS) of ceromer and nanohybrid composite to direct laser sintered (DLS) Cr-Co and Ni-Cr-based metal infrastructures treated with erbium-doped yttrium aluminum garnet (Er:YAG), neodymium-doped yttrium aluminum garnet (Nd:YAG), and potassium titanyl phosphate (KTP) laser modalities in in vitro settings. METHODS: Experimental specimens had four sets (nâ€‰=â€‰32) including two DLS infrastructures with ceromer and nanohybrid composite superstructures and two Ni-Cr-based infrastructures with ceromer and nanohybrid composite superstructures. Of each infrastructure set, the specimens randomized into four treatment modalities (nâ€‰=â€‰8): no treatment (controls) and Er:YAG, Nd:YAG, and KTP lasers. The infrastructures were prepared in the final dimensions of 7â€‰Ã—â€‰3â€‰mm. Ceromer and nanohybrid composite was applied to the infrastructures after their surface treatments according to randomization. The SBS of specimens was measured to test the efficacy of surface treatments. Representative scanning electron microscopy (SEM) images after laser treatments were obtained. RESULTS: Overall, in current experimental settings, Nd:YAG, KTP, and Er:YAG lasers, in order of efficacy, are effective to improve the bonding of ceromer and nanohybrid composite to the DLS and Ni-Cr-based infrastructures (pâ€‰<â€‰0.05). Nd:YAG laser is more effective in the DLS/ceromer infrastructures (pâ€‰<â€‰0.05). KTP laser, as second more effective preparation, is more effective in the DLS/ceromer infrastructures (pâ€‰<â€‰0.05). SEM findings presented moderate accordance with these findings. CONCLUSIONS: The results of this study supported the bonding of ceromer and nanohybrid composite superstructures to the DLS and Ni-Cr-based infrastructures suggesting that laser modalities, in order of success, Nd:YAG, KTP, and Er:YAG, are effective to increase bonding of these structures. Composite Resins;Dental Alloys;ceromer Ceramics;Composite Resins;Dental Alloys;Dental Bonding;Dental Etching;Humans;Lasers, Solid-State;Low-Level Light Therapy;Shear Strength;Tissue Culture Techniques

Efficacy of Various Pretreatments on the Bond Strength of Denture Teeth to Denture Base Resins. OBJECTIVE: This in vitro study evaluated the shear bond strength (SBS) of heat-cured denture base resin (PMMA) to acrylic resin teeth treated with different pretreatments, especially laser irradiation of different powers (1-4 W). MATERIALS AND METHODS: The acrylic resin teeth were separated into seven groups (nâ€‰=â€‰10) for the following different pretreatments: control group (no surface treatment) (G1), grinding with a tungsten carbide bur (G2), sandblasting (G3), and erbium, chromium: yttrium, scandium, gallium, garnet (Er,Cr:YSGG) laser irradiation at 1 W, 2 W, 3 W, 4 W output powers in (G4-7), respectively. Test specimens were produced according to the PMMA manufacturers' instructions and were subjected to a SBS test at a crosshead speed of 1â€‰mm/min until fracture.

Debonded surfaces were evaluated by a stereomicroscope for the type of failure. SEM (scanning electron microscope) analyses were done to estimate the surface changes of the acrylic resin teeth. The data were submitted using a one-way ANOVA and post hoc Tukey-Kramer multiple comparison tests (pâ€‰=â€‰0.05). RESULTS: The highest bond strength was obtained in G3, and similar SBS values were considered in other groups, and no significant differences were found among the surface treatments and the control group (pâ€‰<â€‰0.05). All groups had a high percentage of adhesive failures. CONCLUSIONS: Laser irradiations promote surface topography alterations. However laser irradiation of the adhesive surface was found ineffective. The SBS of acrylic resin teeth to a PMMA denture base material is independent of the surface pretreatments Er,Cr:YSGG laser irradiation, sandblasting, and grinding with a carbide bur. All the surface treatments provided a similar bond between the acrylic denture base and the teeth. Acrylic Resins;Tungsten Compounds;tungsten carbide;Polymethyl Methacrylate Acrylic Resins;Dental Bonding;Dental Etching;Dentures;Humans;Lasers, Solid-State;Low-Level Light Therapy;Polymethyl Methacrylate;Tensile Strength;Tungsten Compounds

Photobiomodulation in Light of Our Biological Clock's Inner Workings. Biological Clocks;Brain;Brain Diseases;Humans;Light;Low-Level Light Therapy

Electromyographic evaluation of a low-level laser protocol for the treatment of temporomandibular disorder: a randomized, controlled, blind trial. [Purpose] Problems involving the temporomandibular joint and associated structures can lead to temporomandibular disorder (TMD). The aim of the present study was to evaluate muscle activity in individuals with a diagnosis of TMD before and after treatment with low-level laser therapy (LLLT) through the use of electromyography (EMG). [Subjects and Methods] Male and female individuals aged 14 to 23â€…years were evaluated. TMD was determined by a clinical examination and the administration of the Research Diagnostic Criteria for Temporomandibular Disorders, followed by the evaluation of sensitivity to palpation of the masseter and anterior temporal muscles as well as the EMG determination of muscle activity. The participants were randomly allocated to an active LLLT group (n=9) and sham group (n=7). Twelve sessions of LLLT were conducted using a wavelength of 780â€…nm, energy density of 25â€…J/cm(2), power of 50â€…mW, power density of 1.25â€…W/cm(2) and a 20-second exposure time or sham LLLT. Muscle activity was determined prior to treatment and after the last session. [Results] During the isometric evaluation of the masseter and anterior temporal muscles, an increase in the mean EMG signal was found in the group submitted to active LLLT. When evaluated individually, some participants in the active LLLT group demonstrated a reduction in muscle activity, but no significant differences were found in the mean EMG signal between the initial and final evaluations. [Conclusion] Further studies with a larger sample size are needed to confirm the present findings.

Photobiomodulation Leads to Reduced Oxidative Stress in Rats Submitted to High-Intensity Resistive Exercise. The aim of this study was to determine whether oxidative stress markers are influenced by low-intensity laser therapy (LLLT) in rats subjected to a high-intensity resistive exercise session (RE). Female Wistar rats divided into three experimental groups (Ctr: control, 4J: LLLT, and RE) and subdivided based on the sampling times (instantly or 24â€‰h postexercise) underwent irradiation with LLLT using three-point transcutaneous method on the hind legs, which was applied to the gastrocnemius muscle at the distal, medial, and proximal points. Laser (4J) or placebo (device off) were carried out 60â€‰sec prior to RE that consisted of four climbs bearing the maximum load with a 2â€‰min time interval between each climb. Lipoperoxidation levels and antioxidant capacity were obtained in muscle. Lipoperoxidation levels were increased (4-HNE and CL markers) instantly post-RE. LLLT prior to RE avoided the increase of the lipid peroxidation levels. Similar results were also notified for oxidation protein assays. The GPx and FRAP activities did not reduce instantly or 24â€‰h after RE. SOD increased 24â€‰h after RE, while CAT activity did not change with RE or LLLT. In conclusion,

LLLT prior to RE reduced the oxidative stress markers, as well as, avoided reduction, and still increased the antioxidant capacity. Animals;Female;Lipid Peroxidation;Low-Level Light Therapy;Muscles;Oxidative Stress;Physical Conditioning, Animal;Rats, Wistar

Pulsed dye laser treatment of rosacea using a novel 15â€‰mm diameter treatment beam. BACKGROUND: The pulsed-dye laser has been used to treat facial redness and rosacea for decades. Recent advances in dye laser technology enable 50% higher output energies supporting 50% larger treatment areas, and beam-diameters up to 15â€‰mm with clinically-relevant fluences. In this study, we investigate this novel pulsed-dye laser using a 15â€‰mm diameter beam for treatment of rosacea. METHODS: Twenty subjects with erythemato-telangiectatic rosacea were enrolled in the study. A total of 4 monthly treatments were administered, first treating linear vessels with a 3â€‰Ã—â€‰10â€‰mm elliptical beam, then diffuse redness with a 15-mm diameter circular beam. Blinded assessment of digital, cross-polarized photographs taken 2 months following the last treatment was performed using an 11-point clearance scale. RESULTS: Nineteen subjects completed the study. Blinded reviewers correctly identified baseline photos in 55 out of the total of 57 images (96.5%). The blinded reviewers scored 17 of the 19 subjects with an improvement greater than 40%, and 11 of the 19 subjects greater than 50%. The average improvement was 53.9%. Side effects were limited to mild edema, mild to moderate erythema, and mild to moderate bruising. CONCLUSION: This study demonstrates that a newly designed pulsed-dye laser having a novel 15-mm diameter treatment beam improves the appearance of rosacea with a favorable safety profile. Lasers Surg. Med. 50:808-812, 2018. Â© 2018 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Adult;Aged;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Rosacea;Treatment Outcome

Preliminary study on the treatment of vitiligo with carbon dioxide fractional laser together with tacrolimus. BACKGROUND: Tacrolimus is a conventional medication for the treatment of vitiligo, but the effect of a single medication is limited. OBJECTIVE: This paper aims at observing the effects, adverse responses, and repigmentation results of the joint treatment of vitiligo by Carbon dioxide (CO(2)) fractional laser together with tacrolimus. METHODS: Forty-five patients with vitiligo were randomly divided into two groups: treatment (T) group and control (C) group, and each group was further divided into three subgroups (face, torso and limbs, and hand and foot) according to the location of the skin defect. Both groups used topical 0.1% tacrolimus cream, but the T group was given one CO(2) fractional laser treatment each month. We observed the clinical efficacy, adverse responses, and repigmentation results after 6 months. RESULTS: Compared to the C group, the T group showed better improvement in both objective and subjective assessments. When the treatment time was increased, the efficacy was also improved, and the repigmentation in the T group occured in three ways: perifollicular repigmentation, marginal repigmentation and diffuse repigmentation. There were three cases of isomorphic responses (2 cases in the rapid progression stage, one case in the progression stage), and 1 case formed scarring on the neck in the T group. CONCLUSIONS: The treatment of vitiligo by CO(2) fractional laser together with tacrolimus is significantly effective and is most suitable for patients in the progression stage. Patients in the rapid progression stage should use this approach with caution, and its efficacy was limited for patients in the stable stage. An extended course of treatment is helpful for the repigmentation of white patches. All three forms of repigmentation can occur in the joint treatment of vitiligo by CO(2) fractional laser together with tacrolimus. Lasers Surg. Med. 50:829-836, 2018. Â© 2018 Wiley Periodicals, Inc. Calcineurin Inhibitors;Tacrolimus Adult;Calcineurin Inhibitors;Combined Modality Therapy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Tacrolimus;Treatment Outcome;Vitiligo

Laser-assisted photodynamic therapy for superficial basal cell carcinoma and Bowen's disease: a randomized intrapatient comparison between a continuous and a fractional ablative CO(2) laser mode. BACKGROUND: Laser-assisted photodynamic therapy is being explored as a method to enhance efficacy of photodynamic therapy (PDT). OBJECTIVE: To compare a continuous (CL) and a fractional (FL) ablative CO(2) laser-assisted methyl aminolevulinate (MAL) PDT in the management of superficial basal cell carcinoma (sBCC) and Bowen's disease (BD). METHODS: Thirty treatment areas in fifteen patients with inoperable, histologically verified sBCC or BD received CL or FL after intrapatient randomization. Laser treatment was followed by MAL application and illumination occurred 3Â h later. This treatment was repeated after 2Â weeks. An equivalence analysis was performed on the primary endpoint efficacy, while secondary endpoints pain, side-effects and aesthetics were evaluated using paired samples tests. Patients were also asked for their preferred treatment. RESULTS: An excellent efficacy of 92.9% (sBCC, 100%; BD, 80%) was found in both CLÂ +Â PDT and FLÂ +Â PDT after 12Â months. Equivalence could not be established. Little pain was perceived in most patients during PDT illumination. PDT treatment in FLÂ +Â PDT was less painful, significantly during the second treatment (PÂ =Â 0.026). Side-effects were mild to moderate with erythema being the most frequent immediate side-effect, followed by oedema, crusting and burning sensation. Pigmentary changes occurred in 21% (CLÂ +Â PDT) to 29% (FLÂ +Â PDT), and aesthetics were good to excellent in all patients. CLÂ +Â PDT and FLÂ +Â PDT did not significantly differ in side-effects (PÂ =Â 0.219-1.000) or aesthetics (PÂ =Â 0.157-1.000). CONCLUSIONS: Results in this pilot study support the promising role of laser-assisted PDT. Both treatment arms demonstrated the same efficacy as well as comparable side-effects and aesthetics. PDT illumination was significantly less painful in the FLÂ +Â PDT group, suggesting a preference for FLÂ +Â PDT. The authors recommend further investigation with a larger sample size, a subgroup analysis between sBCC and BD and comparison of different treatment protocols before one technique could be preferred to another. Aged;Bowen's Disease;Carcinoma, Basal Cell;Combined Modality Therapy;Confidence Intervals;Female;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Invasiveness;Neoplasm Staging;Photochemotherapy;Pilot Projects;Prognosis;Risk Assessment;Single-Blind Method;Skin Neoplasms;Statistics, Nonparametric;Survival Rate;Treatment Outcome

Investigation of Protein Recruitment to DNA Lesions Using 405 Nm Laser Micro-irradiation. The DNA Damage Response (DDR) uses a plethora of proteins to detect, signal, and repair DNA lesions. Delineating this response is critical to understand genome maintenance mechanisms. Since recruitment and exchange of proteins at lesions are highly dynamic, their study requires the ability to generate DNA damage in a rapid and spatially-delimited manner. Here, we describe procedures to locally induce DNA damage in human cells using a commonly available laser-scanning confocal microscope equipped with a 405 nm laser line. Accumulation of genome maintenance factors at laser stripes can be assessed by immunofluorescence (IF) or in real-time using proteins tagged with fluorescent reporters. Using phosphorylated histone H2A.X (Î³-H2A.X) and Replication Protein A (RPA) as markers, the method provides sufficient resolution to discriminate locally-recruited factors from those that spread on adjacent chromatin. We further provide ImageJ-based scripts to efficiently monitor the kinetics of protein relocalization at DNA damage sites. These refinements greatly simplify the study of the DDR dynamics. DNA DNA;DNA Damage;Fluorescent Antibody Technique;Humans;Low-Level Light Therapy;Microscopy, Confocal

The effect of high-intensity versus low-level laser therapy in the management of plantar fasciitis: a randomized clinical trial. We aimed to compare the efficacy of low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) in the treatment of plantar fasciitis (PF). Seventy patients were randomized into either the LLLT (8 men, 27 women; mean age 48.65â€‰Â±â€‰10.81Â years) or

HILT (7 men, 28 women; mean age 48.73â€‰Â±â€‰11.41Â years) groups. LLLT (904Â nm) and HILT (1064Â nm) were performed three times per week, over a period of 3Â weeks. Each treatment combined with silicone insole and stretching exercises. Patients' pain and functional status were evaluated with Visual Analog Scale, Heel Tenderness Index, and Foot and Ankle Outcome Score before and after treatment. A chi-square test was performed to compare demographic and clinical characteristics. Within-group and between-group differences were also investigated. Paired samples t test was used to analyze the differences between baseline and after treatment values, while independent samples t test was used to compare the two groups. Both groups contained similar demographic characteristics including age, sex, and body mass index (all pâ€‰>â€‰0.05). Three and two patients in the HILT and LLLT group, respectively, were lost to follow-up. At the study onset, there were no statistically significant differences between the two groups in the Visual Analog Scale, Heel Tenderness Index, and Foot And Ankle Outcome Scores. Three weeks later, both groups showed significant improvement in all parameters (pâ€‰<â€‰0.05). The HILT group demonstrated better improvement in all parameters than the LLLT group. Although both treatments improved the pain levels, function, and quality of life in patients with PF, HILT had a more significant effect than LLLT. Ankle;Demography;Fasciitis, Plantar;Female;Foot;Humans;Low-Level Light Therapy;Male;Middle Aged;Quality of Life;Treatment Outcome;Visual Analog Scale

Combined effects of photobiomodulation and alendronate on viability of osteoporotic bone marrow-derived mesenchymal stem cells. Osteoporotic bone marrow mesenchymal stem cells (BMMSCs) are involved in the pathogenesis of osteoporosis (OP). Photobiomodulation (PBM) has positive effects on healthy BMMSCs. The goal of current experiment was to evaluate the combined influence of photobiomodulation PBM and alendronate (ALN) incubation on ovariectomized induced osteoporosis(OVX)- BMMSC viability in vitro. 15 female adult Wistar rats were distributed into the 2 groups: (1) 3 healthy (sham)control rats, (2) 12 OVX- rats. All OVX rats underwent ovariectomy. After 3.5â€¯months sham and OVX rats were euthanized and their MSC harvested and cultured in a complete osteogenic incubation medium (OM). As the next step, in sham and OVX groups flowcytometry and osteogenic differentiation assays were performed. OVX- rats were divided into (2) OVX-control, (3) OVX- PBM (HeNe laser, 623.8â€¯nm, 1.2â€¯J/cm(2), one time), (4) OVX-ALN (10(-8)â€¯M, three times incubations), and (5) OVX-PBMâ€¯+â€¯ALN, Finally BMMSC viability of all five groups were evaluated using MTT (3-(4, 5-dimethylthiazol-2-yl)-2,5diphenyltetrazolium bromide) assay. Based on our observations, PBM significantly increased optical density of OVX-BMMSCs (2.15â€¯Â±â€¯0.11) compared to control -OVX-BMMSCs (1.55â€¯Â±â€¯0.10) and healthy -BMMSCs (1.65â€¯Â±â€¯0.10)(LSD test, both pâ€¯<â€¯0.05). Further, we found that both ALN, and ALNâ€¯+â€¯PBM significantly increased optical densities of OVX-BMMSCs (24â€¯h:2.40â€¯Â±â€¯0.03;48â€¯h:2.06â€¯Â±â€¯0.00[ALN],both pâ€¯<â€¯0.01) and 1.88â€¯Â±â€¯0.05[ALNâ€¯+â€¯PBM], pâ€¯<â€¯0.05 compared to control -OVX-BMMSCs (24â€¯h: 1.46â€¯Â±â€¯0.01; 48â€¯h: 1.83â€¯Â±â€¯0.00 and 1.57â€¯Â±â€¯0.08). It was concluded that PBM significantly increased cell viability of OVX-BMMSCs compared to control -OVX-BMMSCs and healthy -BMMSCs. Alendronate Alendronate;Animals;Bone Marrow Cells;Cell Differentiation;Cell Survival;Female;Lasers;Mesenchymal Stem Cells;Osteoporosis;Rats;Rats, Wistar

High doses of laser phototherapy can increase proliferation in melanoma stromal connective tissue. It is well established that laser phototherapy (LP) is contraindicated directly over cancer cells, due to its bio modulatory effects in cell and blood vessel proliferation. The aim of the present study was to analyze the influence of typical low-level laser therapy (LLLT) and high intensity laser therapy (HILT) and an in-between dose of 9Â J on collagen fibers and blood vessels content in melanoma tumors (B16F10) implanted in mice. Melanoma tumor cells were injected in male Balb C mice which were distributed in four groups: control (no irradiated) or irradiated by 3, 9, or 21Â J (150; 450, or

1050Â J/cm(2)). LP was performed in daily sessions for 3Â days with a InGaAlP-660Â nm (mean output: 50Â mW, spot size: 2Â mm(2)). Tumor volume was analyzed using (1) picrosirius staining to quantify collagen fibers content and (2) Verhoeff's method to quantify blood vessels content. Tumor growth outcome measured in the 3-J group was not significantly different from controls. Nine and 21-J groups, presented significant and dose-dependent increases in tumor volume. Quantitative analysis of the intensity of collagen fibers and their organization in stroma and peri-tumoral microenvironment showed significant differences between irradiated and control group. Blood vessels count of 21-J group outnumbered the other groups. High doses (â‰¥Â 9Â J) of LP showed a dose-dependent tumor growth, different collagen fibers characteristics, and eventually blood vessel growth, while a typical LLLT dose (3Â J) appeared harmless on melanoma cell activity. Collagen Type I;Fibrillar Collagens Animals;Cell Proliferation;Collagen Type I;Connective Tissue;Dose-Response Relationship, Radiation;Fibrillar Collagens;Low-Level Light Therapy;Male;Melanoma, Experimental;Mice, Inbred BALB C;Staining and Labeling;Stromal Cells;Tumor Burden

Low power laser irradiation and human adipose-derived stem cell treatments promote bone regeneration in critical-sized calvarial defects in rats. Both stem cell therapy and physical treatments have been shown to be beneficial in accelerating bone healing. However, the efficacy of combined treatment with stem cells and physical stimuli for large bone defects remains uncertain. The aim of this study was to evaluate the bone regeneration effects of low-power laser irradiation (LPLI) and human adipose-derived stem cell (ADSC) treatments during fracture repair using a comparative rat calvarial defect model. We evaluated the viability of human ADSCs, which were cultured on a porous PLGA scaffold using an MTS assay. The critical-sized calvarial bone defect rats were divided into 4 groups: control group, LPLI group, ADSC group, and ADSC+LPLI group. Bone formation was evaluated using micro-CT. New bone formation areas and osteogenic factor expression levels were then examined by histomorphological analysis and immunohistochemical staining. Our data showed that PLGA had no cytotoxic effect on human ADSCs. Micro-CT analyses revealed that both the LPLI and ADSC groups showed improved calvarial bone defect healing compared to the control group. In addition, the ADSC+LPLI group showed significantly increased bone volume at 16 weeks after surgery. The area of new bone formation ranked as follows: control group < LPLI group < ADSC group < ADSC+LPLI group. There were significant differences between the groups. In addition, both ADSC and ADSC+LPLI groups showed strong signals of vWF expression. ADSC and LPLI treatments improved fracture repair in critical-sized calvarial defects in rats. Importantly, the combined treatment of ADSCs and LPLI further enhances the bone healing process. Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid Adipocytes;Adipose Tissue;Adult Stem Cells;Animals;Bone Regeneration;Cell Differentiation;Cells, Cultured;Humans;Lactic Acid;Low-Level Light Therapy;Male;Osteogenesis;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer;Rats;Rats, Sprague-Dawley;Skull;Stem Cell Transplantation;Tissue Scaffolds

In-office laryngeal procedures (IOLP) in Canada: current safety practices and procedural care. BACKGROUND: The advent of chip tip technology combined with advanced endoscopy has revolutionized the field of laryngology in the past decade. Procedures such as transnasal esophagoscopy, site-specific steroid injections, injection laryngoplasty and laryngeal laser treatment can now be performed in the office setting under local anaesthesia. Although In-Office Laryngeal Procedures (IOLPs) have become standard-of-care in many American and several Canadian centers, there are no guidelines regulating the practice of these procedures. The goal of this report was to evaluate the current method of IOLP delivery in Canada. METHODS: An electronic survey was dispersed to 22 practicing Canadian laryngologists to assess safety and procedural care measures undertaken when performing IOLP. The survey consisted of 37 questions divided into 6 categories; 1) Demographic dataÂ 2) Facilities 3) Staff/personnel 4) Patient screening/monitoring 5) Procedure and

emergency equipment 6) Reporting of adverse events. RESULTS: Data was collected for 16/22 laryngologists (72.7% response rate). Only 1 respondent did not perform IOLP. All performed injection augmentation laryngoplasty. Most performed laryngeal biopsies, intramuscular injection and/or electromyography guided injection for the treatment of spasmodic dysphonia and glottic/subglottic steroid injections. Only 4 respondents performed in-office KTP laser. Significant variation was found in procedural processes including intra procedural monitoring, anticoagulation screening, access to emergency equipment and documentation. CONCLUSION: Our survey demonstrates that the delivery of IOLP in Canada varies considerably. The construct of IOLP practice guidelines based on the evidence with consistent documentation would promote safe, efficient and quality care for patient with voice disorders. Ambulatory Surgical Procedures;Biopsy;Canada;Clinical Protocols;Dilatation;Female;Humans;Injections;Larynx;Low-Level Light Therapy;Male;Otorhinolaryngologic Surgical Procedures;Practice Patterns, Physicians';Surveys and Questionnaires

Comparative effect of photobiomodulation associated with dexamethasone after sciatic nerve injury model. To analyze the effect of photobiomodulation and dexamethasone on nerve regeneration after a sciatic nerve crushing model. Twenty-six Swiss mice were divided into the following groups: naive; sham; injured, low-level laser therapy (LLLT) (660Â nm, 10Â J/cm(2), 0.6Â J, 16.8Â J total energy emitted during the 28Â days of radiation, 20Â s, for 28Â days); dexamethasone (Dex) (local injection of 2Â mg/kg for 10 consecutive days); and LLLT group associated with Dex (LLLT/Dex), with the same parameters of the other groups. For nerve injury, a portable adjustable pinch was used. The animals were evaluated using the Sciatic Functional Index (SFI) and Sciatic Static Index (SSI). The results obtained were evaluated with Image Jâ„¢ and Kinoveaâ„¢. Data and images were obtained at baseline and after 7, 14, 21, and 28Â days after surgery. The evaluation of hyperalgesia, using Hargreaves, and behavior through the open field was also performed. In functional and static analysis, all groups presented significant differences when compared to the injured group. In the analysis of the SSI results, the group treated with both LLLT and dexamethasone was more effective in improving the values of this parameter, and in the SFI, the laser-treated group obtained better results. In the evaluation through the open field and the Hargreaves, there was no difference. The application of LLLT and dexamethasone was effective in nerve regeneration according to the results and was more effective when LLLT was associated with dexamethasone than in LLLT alone for the SSI. Dexamethasone Animals;Dexamethasone;Disease Models, Animal;Low-Level Light Therapy;Male;Mice;Nerve Regeneration;Sciatic Nerve;Sciatic Neuropathy

Physical properties of hydrogel wound dressing and its use in low-level laser therapy (LLLT). Hydrogel dressings are routinely used in the treatment of superficial skin wounds. Due to their excellent transparency, we decided to evaluate their usefulness in laser-based medical procedures. We focused on assessing selected physical properties of HydroAid hydrogel wound dressing, used for low-level laser therapy (LLLT) aka laser biostimulation procedures. For the two wavelengths of 660 and 808Â nm used in the biostimulation laser POLARIS 2, a dressing transmittance of 92 and 98%, respectively, was determined. Using a FLIR i7 thermal imaging camera, the changes in temperature distribution across the surface of the dressing were assessed, during a 3-h period following its unpacking and placing on the skin of a patient or leaving it at the ambient temperature. The results of the thermal imaging, as well as temperature measurements using a digital thermometer, showed that the cooling properties of a hydrogel dressing were maintained throughout the entire experiment and that it was capable to keep the temperature at least 5Â° below the skin/ambient (room) temperature. During the 6-h observation using the holographic microscope, which provided indirect insight into the processes occurring within the hydrogel, only minimum topographical changes (observable at a micrometre scale) were recorded, although dressing thickness and its flexibility decreased

significantly with time. Additionally, the possibility to regenerate the hydrogel dressing by treating it with distilled water or a physiological salt solution was tested. Hydrogels;Water Bandages;Humans;Hydrogels;Imaging, Three-Dimensional;Low-Level Light Therapy;Skin;Skin Diseases;Temperature;Water;Wound Healing

Ischemic oculomotor nerve palsy due to hyaluronic acid filler injection. Hyaluronic acid (HA) is the most popular agent today for intradermal injections to improve wrinkles and other cosmetic defects. Ischemic necrosis due to injection of HA is one of the serious complications. Because there are many vascular branches around the nose, caution and care should be given during facial filler injection. Although the incidence is rare, blindness and permanent visual loss may occur. We describe a 29-year-old woman presented with painful erythematous swelling with violaceous patch on right periocular area and glabella after HA filler injection. After injecting the filler, she felt pain and dizziness, and her vision became blurred. She immediately received hyaluronidase around the HA filler inject area and during hospitalized for 10 days, she was successfully treated with systemic steroid, vasodilator, prophylactic antibiotics, and LLLT (low-level laser therapy) without any defects. Dermal Fillers;Hyaluronic Acid Adult;Dermal Fillers;Female;Humans;Hyaluronic Acid;Injections, Subcutaneous;Ischemia;Nose;Oculomotor Nerve Diseases

Stereological and molecular studies on the combined effects of photobiomodulation and human bone marrow mesenchymal stem cell conditioned medium on wound healing in diabetic rats. We investigated the effects of conditioned medium (CM) from human bone marrow mesenchymal stem cells (h BMMSC)s and pulse wave photobiomodulation (PW PBM), applied alone or in combination, on the stereological parameters and gene expression of some growth factors, during wound healing in a streptozotocin (STZ)-induced rat model of type one diabetes mellitus (T1DM). T1DM was induced in 72 rats and two incisions were made in each animal. The rats were assigned to one of four groups: a control (placebo) group, a Laser group (890â€¯nm, 80â€¯Hz, 0.2â€¯J/cm(2)); a CM group, and a combined CMâ€¯+â€¯Laser group. On post-surgical days 4, 7, and 15, skin samples were extracted for stereology and reverse transcription PCR (RT-PCR) analyses of gene expression of basic fibroblast growth factor (bFGF), hypoxia-inducible factor (HIF-1Î±), and stromal cell-derived factor-1Î± (SDF-1Î±). The stereological examinations of the proximal and distal wounds revealed significantly enhanced healing in all the treated groups, compared to the control group. The extent of healing was significantly greater in the CMâ€¯+â€¯Laser group than in the other treatment groups. The RT-PCR results also indicated greater gene expression in the CMâ€¯+â€¯Laser and Laser groups than in the CM and control groups. Application of CM and PW PBM, alone or in combination accelerated the process of wound healing in T1DM rats. The results of combined application of CM and PW PBM, indicated a synergistic effect, and the combination treatment was statistically more effective than single applications of CM or PW PBM. Culture Media, Conditioned;Fibroblast Growth Factor 2 Animals;Bone Marrow Cells;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Disease Models, Animal;Fibroblast Growth Factor 2;Fibroblasts;Gene Expression;Humans;Lasers;Male;Mesenchymal Stem Cells;Neutrophils;Rats;Wound Healing

Photobiomodulation of freshly isolated human adipose tissue-derived stromal vascular fraction cells by pulsed light-emitting diodes for direct clinical application. A highly interesting source for adult stem cells is adipose tissue, from which the stromal vascular fraction (SVF)-a heterogeneous cell population including the adipose-derived stromal/stem cells-can be obtained. To enhance the regenerative potential of freshly isolated SVF cells, low-level light therapy (LLLT) was used. The effects of pulsed blue (475Â nm), green (516Â nm), and red (635Â nm) light from light-emitting diodes applied on freshly isolated SVF were analysed regarding cell phenotype, cell number, viability, adenosine triphosphate content, cytotoxicity, and proliferation but also osteogenic, adipogenic, and proangiogenic differentiation potential. The colony-forming unit fibroblast assay revealed a

significantly increased colony size after LLLT with red light compared with untreated cells, whereas the frequency of colony-forming cells was not affected. LLLT with green and red light resulted in a stronger capacity to form vascular tubes by SVF when cultured within 3D fibrin matrices compared with untreated cells, which was corroborated by increased number and length of the single tubes and a significantly higher concentration of vascular endothelial growth factor. Our study showed beneficial effects after LLLT on the vascularization potential and proliferation capacity of SVF cells. Therefore, LLLT using pulsed light-emitting diode light might represent a new approach for activation of freshly isolated SVF cells for direct clinical application. Adipose Tissue;Cell Differentiation;Cell Separation;Cell Survival;Female;Humans;Low-Level Light Therapy;Middle Aged;Neovascularization, Physiologic;Stromal Cells

Should open excisions and sutured incisions be treated differently? A review and meta-analysis of animal wound models following low-level laser therapy. Although low-level laser therapy (LLLT) was discovered already in the 1960s of the twentieth century, it took almost 40Â years to be widely used in clinical dermatology/surgery. It has been demonstrated that LLLT is able to increase collagen production/wound stiffness and/or improve wound contraction. In this review, we investigated whether open and sutured wounds should be treated with different LLLT parameters. A PubMed search was performed to identify controlled studies with LLLT applied to wounded animals (sutured incisions-tensile strength measurement and open excisions-area measurement). Final score random effects meta-analyses were conducted. Nineteen studies were included. The overall result of the tensile strength analysis (eight studies) was significantly in favor of LLLT (SMDâ€‰=â€‰1.06, 95% CI 0.66-1.46), and better results were seen with 30-79Â mW/cm(2) infrared laser (SMDâ€‰=â€‰1.44, 95% CI 0.67-2.21) and 139-281Â mW/cm(2) red laser (SMDâ€‰=â€‰1.52, 95% CI 0.54-2.49). The overall result of the wound contraction analysis (11 studies) was significantly in favor of LLLT (SMDâ€‰=â€‰0.99, 95% CI 0.38-1.59), and the best results were seen with 53-300Â mW/cm(2) infrared laser (SMDâ€‰=â€‰1.18, 95% CI 0.41-1.94) and 25-90Â mW/cm(2) red laser (SMDâ€‰=â€‰1.6, 95% CI 0.27-2.93). Whereas 1-15Â mW/cm(2) red laser had a moderately positive effect on sutured wounds, 2-4Â mW/cm(2) red laser did not accelerate healing of open wounds. LLLT appears effective in the treatment of sutured and open wounds. Statistical heterogeneity indicates that the tensile strength development of sutured wounds is more dependent on laser power density compared to the contraction rate of open wounds.
Animals;Diabetes Mellitus;Disease Models, Animal;Low-Level Light Therapy;Surgical Wound;Sutures;Tensile Strength;Wound Healing;Wounds and Injuries

Low-level laser irradiation at a high power intensity increased human endothelial cell exosome secretion via Wnt signaling. The distinct role of low-level laser irradiation (LLLI) on endothelial exosome biogenesis remains unclear. We hypothesize that laser irradiation of high dose in human endothelial cells (ECs) contributes to the modulation of exosome biogenesis via Wnt signaling pathway. When human ECs were treated with LLLI at a power density of 80Â J/cm(2), the survival rate reduced. The potential of irradiated cells to release exosomes was increased significantly by expressing genes CD63, Alix, Rab27a, and b. This occurrence coincided with an enhanced acetylcholine esterase activity, pseudopodia formation, and reduced zeta potential value 24Â h post-irradiation. Western blotting showed the induction of LC3 and reduced level of P62, confirming autophagy response. Flow cytometry and electron microscopy analyses revealed the health status of the mitochondrial function indicated by normal Î”Î¨ activity without any changes in the transcription level of PINK1 and Optineurin. When cells exposed to high power laser irradiation, p-Akt/Akt ratio and in vitro tubulogenesis capacity were blunted. PCR array and bioinformatics analyses showed the induction of transcription factors promoting Wnt signaling pathways and GTPase activity. Thus, LLLI at high power intensity increased exosome biogenesis by the induction of autophagy and Wnt signaling.

LLLI at high power intensity increases exosome biogenesis by engaging the transcription factors related to Wnt signaling and autophagy stimulate. CD63 protein, human;Tetraspanin 30;Acetylcholinesterase Acetylcholinesterase;Autophagy;Exosomes;Gene Expression;Gene Expression Regulation;Gene Regulatory Networks;Human Umbilical Vein Endothelial Cells;Humans;Low-Level Light Therapy;Neovascularization, Physiologic;Tetraspanin 30;Wnt Signaling Pathway

Long-Term Near-Infrared Photobiomodulation for Anxious Depression Complicated by Takotsubo Cardiomyopathy. Aged;Anxiety;Depressive Disorder, Major;Female;Humans;Infrared Rays;Low-Level Light Therapy;Takotsubo Cardiomyopathy

Evaluation of Low-Level Laser Therapy on Orthodontic Tooth Movement: A Randomized Control Study. BACKGROUND: Fixed orthodontic treatment is time-consuming procedure. Pain is usually associated with orthodontic treatment. The aim of the present study was to evaluate the role of low-level laser therapy (LLLT) on orthodontic tooth movement (OTM) duration and pain perception. MATERIALS AND METHODS: This randomized double-blind splint-mouth controlled clinical study includes 20 (8 males and 12 females) orthodontic patients requiring bilateral canine retraction. Time taken for canine retraction with LLLT (Group A) over control (Group B) quadrant on the same patient was assessed along with pain experience using facial pain scale. The data were tabulated and statistically evaluated using SPSS 20 for windows (Microsoft, Chicago, IL, USA) and t-test with $P < 0.05$. The difference in pain was evaluated with Wilcoxon signed-rank test. RESULTS: There was no difference in values for age and sex of patient for tooth movement and pain ($P > 0.05$). There was statistically significant decrease in rate of canine retraction in Group A compared to Group B. There was statistically significant difference for maxillary and mandibular arches in Group A whereas it was not significant in Group B. Pain experience was statistically significant till 2(nd) day, and after 3(rd) day, it was not significant between the groups. CONCLUSION: LLLT can reduce the fixed OTM timing and pain experience.

The effectiveness of the low-power laser and kinesiotaping in the treatment of carpal tunnel syndrome, a pilot study. In mild and moderate cases of carpal tunnel syndrome (CTS), the conservative approach is suggested. The purpose of this study is to assess and compare the effect of low-power laser versus the combination of low-power laser and kinesiotaping on pain, muscle strength, functionality, and electrophysiologic parameters in the patients with CTS. The study was planned as single-blind, prospective, randomized control. 64 hands diagnosed with CTS were included in the study. The patients were randomly divided into three groups by closed envelope method. Low-power laser therapy was applied to Group 1 (21 hands), kinesiotaping and low-power laser therapy in group 2 (22 hands), sham laser therapy in Group 3 (21 hands). All patients were assessed by visual numeric pain scale (VNS), hand grip strength (HGS), finger pinch strength (FPS), the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ), before treatment, after treatment (3rd week), and after (12th week) 3Â months the treatment with the same physician. Motor and sensory nerve conduction studies were performed with electroneuromyography (ENMG) before the treatment (0th week) and at the end of the 12th week. Comparison of the group 1 with the group 3 showed significantly better improvement in the former in VNS, BCTSQ at 3rd week and 12th week compared to 0th week, and in FPS and HGS at 3rd week. Comparison of the group 2 with the group 3 showed significantly better improvement in the former VNS, BCTSQ, FPS and HGS at 3rd and 12th week compared to 0th week. When Group 1 and Group 2 were compared there was no statistically significant difference in any parameters in the 3rd week, but there was a statistically significant difference in favor of group 2 in FPS and HGS parameters at the 12th week. We have found that the kinesiotaping method applied with low-power laser treatment does not provide any additional benefit to the low-power laser treatment in the short term, however, in the long term, the increase in the HGS and FPS has occurred.

In conclusion, low-power laser and kinesiotaping method in the treatment of CTS may be an effective and reliable treatment option in clinical parameters. Adult;Athletic Tape;Carpal Tunnel Syndrome;Combined Modality Therapy;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neural Conduction;Neurologic Examination;Pain Measurement;Pilot Projects;Pinch Strength;Prospective Studies;Recovery of Function;Single-Blind Method;Time Factors;Treatment Outcome;Turkey

Histological evaluation of orthodontic tooth movement following low level laser irradiation in rabbits. BACKGROUND: Reduction of orthodontic treatment time is a major concern for orthodontists. Low level laser therapy (LLL) has been widely used in dentistry and it has been claimed that it could stimulate bone formation. OBJECTIVE: The aim of the present study was to evaluate histological effects of LLL on alveolar bone remodeling during experimental tooth movement in rabbits. METHODS: In this experimental study which was performed in the animal lab of Mashhad Dental School in 2016 twenty pre-pubertal female albino rabbits with the mean age of 8Â±1 weeks were randomly assigned into two groups. All the rabbits were examined by a veterinarian, and underweight or diseased rabbits were excluded from the study. Fifty gram orthodontic force was applied via 0.014 stainless steel spring on central teeth in both groups. In the first group, low level laser KLO3 (wave length: 980 nm, Power: 80mw) was irradiated three minutes from the buccal aspect of central teeth for 21 days. In the second group, rabbits were not exposed to laser irradiation and served as our control group. After this period, the distance between mesial corners of incisors was measured blindly by a caliper calibrated as 0.1mm. All rabbits in both groups were sacrificed by vital perfusion for histological evaluation to determine the number of resorption lacuna and amount of fibrous tissue. Independent sample t-test was used to analyze the data. RESULTS: The number of resorption lacuna, the rate of tooth movement and fibrous tissue were significantly greater in the lased group (p=0.05). CONCLUSION: Low level laser irradiation could accelerate tooth movement in rabbits via increased resorptive activity in alveolar bone.

Optimal management of orthodontic pain. Pain is an undesirable side effect of orthodontic tooth movement, which causes many patients to give up orthodontic treatment or avoid it altogether. The aim of this study was to investigate, through an analysis of the scientific literature, the best method for managing orthodontic pain. The methodological aspects involved careful definition of keywords and diligent search in databases of scientific articles published in the English language, without any restriction of publication date. We recovered 1281 articles. After the filtering and classification of these articles, 56 randomized clinical trials were selected. Of these, 19 evaluated the effects of different types of drugs for the control of orthodontic pain, 16 evaluated the effects of low-level laser therapy on orthodontic pain, and 21 evaluated other methods of pain control. Drugs reported as effective in orthodontic pain control included ibuprofen, paracetamol, naproxen sodium, aspirin, etoricoxib, meloxicam, piroxicam, and tenoxicam. Most studies report favorable outcomes in terms of alleviation of orthodontic pain with the use of low-level laser therapy. Nevertheless, we noticed that there is no consensus, both for the drug and for laser therapy, on the doses and clinical protocols most appropriate for orthodontic pain management. Alternative methods for orthodontic pain control can also broaden the clinician's range of options in the search for better patient care.

Optimal Laser Phototherapy Parameters for Pain Relief. BACKGROUND AND OBJECTIVE: Studies on laser phototherapy for pain relief have used parameters that vary widely and have reported varying outcomes. The purpose of this study was to determine the optimal parameter ranges of laser phototherapy for pain relief by analyzing data aggregated from existing primary literature. MATERIALS AND METHODS: Original studies were gathered from available sources and were screened to meet the pre-established inclusion criteria. The included articles were then subjected to meta-analysis using Cohen's d statistic for determining treatment effect size. From these studies,

ranges of the reported parameters that always resulted into large effect sizes were determined. These optimal ranges were evaluated for their accuracy using leave-one-article-out cross-validation procedure. RESULTS: A total of 96 articles met the inclusion criteria for meta-analysis and yielded 232 effect sizes. The average effect size was highly significant: dâ€‰=â€‰+1.36 [confidence interval (95% CI)â€‰=â€‰1.04-1.68]. Among all the parameters, total energy was found to have the greatest effect on pain relief and had the most prominent optimal ranges of 120-162 and 15.36-20.16â€‰J, which always resulted in large effect sizes. The cross-validation accuracy of the optimal ranges for total energy was 68.57% (95% Câ€‰=â€‰53.19-83.97). Fewer and less-prominent optimal ranges were obtained for the energy density and duration parameters. None of the remaining parameters was found to be independently related to pain relief outcomes. CONCLUSIONS: The findings of meta-analysis indicate that laser phototherapy is highly effective for pain relief. Based on the analysis of parameters, total energy can be optimized to yield the largest effect on pain relief.
Humans;Low-Level Light Therapy;Pain

Double Pass 595â€‰nm Pulsed Dye Laser Does Not Enhance the Efficacy of Port Wine Stains Compared with Single Pass: A Randomized Comparison with Histological Examination.
OBJECTIVE: To compare the efficacy and safety of double-pass pulsed dye laser (DWL) and single-pass PDL (SWL) in treating virgin port wine stain (PWS). BACKGROUND: The increase in the extent of vascular damage attributed to the use of double-pass techniques for PWS remains inconclusive. A prospective, side-by-side comparison with a histological study for virgin PWS is still lacking. MATERIALS AND METHODS: Twenty-one patients (11 flat PWS, 10 hypertrophic PWS) with untreated PWS underwent 3 treatments at 2-month intervals. Each PWS was divided into three treatment sites: SWL, DWL, and untreated control. Chromametric and visual evaluation of the efficacy and evaluation of side effects were conducted 3 months after final treatment. Biopsies were taken at the treated sites immediately posttreatment. RESULTS: Chromametric and visual evaluation suggested that DWL sites showed no significant improvement compared with SWL (pâ€‰>â€‰0.05) in treating PWS. The mean depth of photothermal damage to the vessels was limited to a maximum of 0.36-0.41â€‰mm in both SWL and DWL sides. Permanent side effects were not observed in any patients. CONCLUSIONS: Double-pass PDL does not enhance PWS clearance. To improve the clearance of PWS lesions, either the depth of laser penetration should be increased or greater photothermal damage to vessels should be generated. Adolescent;Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Prospective Studies;Single-Blind Method;Treatment Outcome;Young Adult

Gross and histologic evaluation of effects of photobiomodulation, silver sulfadiazine, and a topical antimicrobial product on experimentally induced full-thickness skin wounds in green iguanas (Iguana iguana). OBJECTIVE To assess effects of photobiomodulation, silver sulfadiazine, and a topical antimicrobial product for the treatment of experimentally induced full-thickness skin wounds in green iguanas (Iguana iguana). ANIMALS 16 healthy subadult green iguanas. PROCEDURES Iguanas were anesthetized, and three 5-mm cutaneous biopsy specimens were obtained from each iguana (day 0). Iguanas were randomly assigned to 2 treatment groups, each of which had a control treatment. Wounds in the topical treatment group received silver sulfadiazine, a topical antimicrobial product, or no treatment. Wounds in the laser treatment group received treatment with a class 4 laser at 5 or 10 J/cm(2) or no treatment. Wound measurements were obtained daily for 14 days. Iguanas were euthanized, and treatment sites were evaluated microscopically to detect ulceration, bacterial contamination, reepithelialization, necrosis, inflammation, fibrosis, and collagen maturity. RESULTS On day 14, wounds treated with a laser at 10 J/cm(2) were significantly smaller than those treated with silver sulfadiazine, but there were no other significant differences among treatments. Histologically, there were no significant differences in ulceration, bacterial infection,

reepithelialization, necrosis, inflammation, fibrosis, and collagen maturity among treatments. CONCLUSIONS AND CLINICAL RELEVANCE Photobiomodulation at 10 J/cm(2) appeared to be a safe treatment that was tolerated well by green iguanas, but it did not result in substantial improvement in histologic evidence of wound healing, compared with results for other treatments or no treatment. Anti-Infective Agents;Silver Sulfadiazine Administration, Topical;Animals;Anti-Infective Agents;Bacterial Infections;Iguanas;Low-Level Light Therapy;Silver Sulfadiazine;Wound Healing

Low-level laser therapy as an adjunct to connective tissue graft procedure in the treatment of gingival recession defects: A systematic review and meta-analysis. OBJECTIVE: The aim of this study was to systematically evaluate the effectiveness of low level laser therapy (LLLT) as an adjunct to connective tissue graft (CTG) procedure for the treatment of gingival recession (GR). MATERIALS AND METHODS: The addressed PICO question was; "In patients with Miller Class I or II recession defects (Population), what is the effect of LLLT as adjunct to CTG (Intervention) in comparison to CTG alone (Comparison) on gingival recession depth (Outcome)" Electronic databases were searched up to December 2017. Primary outcomes included gingival recession depth (GRD), whereas secondary outcomes were width of keratinized tissue (WKT) and relative clinical attachment level gain (RCAL). The weighted mean differences (WMD) of outcomes and 95% confidence intervals (CI) for each variable were calculated using random effect model. RESULTS: Four randomized clinical studies were included. Two studies showed significantly greater improvements with LLLT whereas, 2 studies showed comparable outcomes between LLLT and CTG group. Considering the effects of adjunctive LLLT as compared to CTG, a high degree of heterogeneity for GRD (Q valueâ€‰=â€‰9.40, Pâ€‰=â€‰.02, I(2) =68.11%) and WKT ((Q valueâ€‰=â€‰16.04, Pâ€‰=â€‰.001, I(2) =81.31%) was noticed among both the groups. Meta-analysis showed a statistically significant GRD (WMD= -0.61, 95% CI= -1.23 to 0.004, Pâ€‰=â€‰.05) for LLLTâ€‰+â€‰CTG treatment versus CTG alone only. CONCLUSIONS: LLLT improves clinical and patient-centered outcomes of CTG procedures for the treatment of GR remains debatable. However, due to the small number of included studies and high heterogeneity in the laser parameters, precautions must be exercised when interpreting the results of the present systematic review. CLINICAL SIGNIFICANCE: Gingival recessions in dentistry are of major esthetic concern. Minimal gingival recessions can be treated by flap operations, but the predictability and stability of the outcomes is debatable. In the present review, low level laser therapy (LLLT) adjunct to connective tissue graft (CTG) depicted a significant improvement in the predictability and stability of root coverage outcomes compared with CTG alone. Connective Tissue;Gingiva;Gingival Recession;Humans;Low-Level Light Therapy;Surgical Flaps;Treatment Outcome

Effects of low-level laser therapy following surgical extraction of the lower third molar with objective measurement of swelling using a three-dimensional system. The aim of the present study was to evaluate and compare the effects of single- and two-dose low-level laser therapy (LLLT) on the postoperative swelling, trismus and pain of patients undergoing extraction of impacted mandibular third molars. In addition, edema was volumetrically measured with a 3dMD face system. A total of 45 patients were randomly divided into three treatment groups (15 patients in each group) as follows: Group 1, receiving routine management with ice application and serving as the control group; Group 2, receiving a single dose of LLLT immediately following surgery; and Group 3, receiving two doses of LLLT, immediately following surgery and on day 2 after surgery. In the present study, a gallium-aluminum-arsenide (0.3 W, 40 sec, 4 J/cm(2)) diode laser device was applied extraorally at the insertion point of the masseter muscle. The trismus, pain level and facial swelling of the patients were evaluated. The visual analog scale (VAS) was used to examine the pain degree, while a 3dMD face photogrammetric system was used to evaluate the volumetric alterations of the swelling. The results indicated no statistically significant differences in the mean swelling or trismus among the three

groups. The mean VAS measurements did not differ significantly among the groups at postoperative day 2; however, significantly reduced VAS values were observed in Group 2 compared with Group 1 at postoperative day 7 (P<0.05). The present study demonstrated that, although single-dose or two-dose LLLT had beneficial effects on the swelling, trismus and pain level, a significant reduction was only observed in the pain level at postoperative day 7.

Remote Control of Mammalian Cells with Heat-Triggered Gene Switches and Photothermal Pulse Trains. Engineered T cells are transforming broad fields in biomedicine, yet our ability to control cellular activity at specific anatomical sites remains limited. Here we engineer thermal gene switches to allow spatial and remote control of transcriptional activity using pulses of heat. These gene switches are constructed from the heat shock protein HSP70B' (HSPA6) promoter, show negligible basal transcriptional activity, and activate within an elevated temperature window of 40-45 Â°C. Using engineered Jurkat T cells implanted in vivo, we use plasmonic photothermal heating to trigger gene expression at specific sites to levels greater than 200-fold. We show that delivery of heat as thermal pulse trains significantly increase cellular thermal tolerance compared to continuous heating curves with identical area-under-the-curve (AUC), enabling long-term control of gene expression in Jurkat T cells. This approach expands the toolkit of remotely controlled genetic devices for basic and translational applications in synthetic immunology. HSP70 Heat-Shock Proteins;HSPA6 protein, human Animals;Area Under Curve;Body Temperature;Gene Expression Regulation;Genes, Switch;Genetic Engineering;HSP70 Heat-Shock Proteins;Hot Temperature;Humans;Jurkat Cells;Lasers;Low-Level Light Therapy;Mice, Nude;Nanotubes;Promoter Regions, Genetic;Surface Plasmon Resonance

Protective effects of photobiomodulation against resistance exercise-induced muscle damage and inflammation in rats. We investigated whether low-level laser therapy (LLLT) prior to or post resistance exercise could attenuate muscle damage and inflammation. Female Wistar rats were assigned to non-LLLT or LLLT groups. An 830-nm DMC Laser Photon III was used to irradiate their hind legs with 2J, 4J, and 8J doses. Irradiations were performed prior to or post (4J) resistance exercise bouts. Resistance exercise consisted of four maximum load climbs. The load work during a resistance exercise bout was similar between Control (non-LLLT, 225Â Â±Â 10Â g), 2J (215Â Â±Â 8Â g), 4J (210Â Â±Â 9Â g), and 8J (226Â Â±Â 9Â g) groups. Prior LLLT did not induce climbing performance improvement, but exposure to 4J irradiation resulted in lower blood lactate levels post-exercise. The 4J dose decreased creatine kinase and lactic dehydrogenase levels post-exercise regardless of the time of application. Moreover, 4-J irradiation exposure significantly attenuated tumor necrosis factor alpha, interleukin-6, interleukin-1Î², cytokine-induced neutrophil chemoattractant-1, and monocyte chemoattractant protein-1. There was minor macrophage muscle infiltration in 4J-exposed rats. These data indicate that LLLT prior to or post resistance exercise can reduce muscle damage and inflammation, resulting in muscle recovery improvement. We attempted to determine an ideal LLLT dose for suitable results, wherein 4J irradiation exposure showed a significant protective role. Biomarkers;Cytokines;Lactic Acid;L-Lactate Dehydrogenase;Creatine Kinase Animals;Biomarkers;Creatine Kinase;Cytokines;Female;Inflammation;L-Lactate Dehydrogenase;Lactic Acid;Low-Level Light Therapy;Macrophage Activation;Muscle, Skeletal;Physical Conditioning, Animal;Rats, Wistar;Resistance Training

Etiological periodontal treatment with and without low-level laser therapy on IL-1Î² level in gingival crevicular fluid: an in vivo multicentric pilot study. Cytokine proteins may have important roles during different human physiological and pathological processes. In the oral cavity, the bone loss and periodontal tissue pathology was related to inflammatory process activation. The aim of the present study was to assess the effects of etiological periodontal therapy with and without the use of Low Level Laser Therapy (LLLT) on clinical periodontal parameters and interleukin (IL)-1Î² level in gingival

crevicular fluid (GCF) from chronic periodontitis (CP) patients. Thirty non-smoker CP patients were selected from the Foggia University Dental Clinic and other 2 private dental clinics. All patients were divided into two homogeneous randomized groups: 15 patients were treated with only scaling and root planing (group 1) and 15 patients with scaling and root planing etiological treatment and LLLT (group 2). In all sites, at baseline before treatment, the periodontal pocket depth (PPD) and bleeding on probing (BOP) were measured. In the PPD sites, the GCF samples were collected from 30 deep (â‰¥5 mm) and shallow (â‰¤3 mm) sites and IL-1Î² were evaluated at baseline, after 10 days and 1 month. In all the samples at baseline, the IL-1Î² concentration in GCF and BOP rate were significantly higher at deep PPD sites than at the shallow ones. After 10 days in all samples no PPD improvement was observed in the BOP rate but the IL-1 Î² level was statistically significantly improved ($p<0.005$) in group 2 compared to group 1. At 10 days and 1 month, in all deep PPD sites, PPD and BOP improvements were observed. At same time, IL-1Î² levels were lower and statistically significantly ($p<0.005$) improved in group 2 compared to group 1. The results confirmed that the periodontal etiology treatment of deep PPD sites with or with-out associated LLLT promotes periodontal health. Etiological treatment associated with LLLT, improves BOP and inflammation in periodontal disease. Moreover, the IL-1Î² concentration changes in GCF suggest these cytokines as a predictable marker of gingival inflammation in chronic periodontitis patients. Interleukin-1beta Adult;Chronic Periodontitis;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects

The effect of MLS laser radiation on cell lipid membrane. INTRODUCTION: Authors of numerous publications have proved the therapeutic effect of laser irradiation on biological material, but the mechanisms at cellular and subcellular level are not yet well understood. OBJECTIVE: The aim of this study was to assess the effect of laser radiation emitted by the MLS M1 system (Multiwave Locked System) at two wavelengths (808 nm continuous and 905 nm pulsed) on the stability and fluidity of liposomes with a lipid composition similar to that of human erythrocyte membrane or made of phosphatidylocholine. MATERIAL AND METHODS: Liposomes were exposed to low-energy laser radiation at surface densities 195 mW/cm(2) (frequency 1,000 Hz) and 230 mW/cm(2) (frequency 2,000 Hz). Different doses of radiation energy in the range 0-15 J were applied. The surface energy density was within the range 0.46 - 4.9 J/cm (2). RESULTS: The fluidity and stability of liposomes subjected to such irradiation changed depending on the parameters of radiation used. CONCLUSIONS: Since MLS M1 laser radiation, depending on the parameters used, affects fluidity and stability of liposomes with the lipid content similar to erythrocyte membrane, it may also cause structural and functional changes in cell membranes. Liposomes;Membrane Lipids Cell Membrane;Erythrocytes;Humans;Lasers;Liposomes;Low-Level Light Therapy;Membrane Fluidity;Membrane Lipids

The effect of combined pulsed wave low-level laser therapy and mesenchymal stem cell-conditioned medium on the healing of an infected wound with methicillin-resistant Staphylococcal aureus in diabetic rats. This study aims to investigate the combined effects of Pulsed wave low-level laser therapy (PW LLLT) and human bone marrow mesenchymal stem cell-conditioned medium (hBM-MSC-CM) on the microbial flora and tensiometrical properties of an infected wound model with methicillin-resistant staphylococcal aureus (MRSA) in an experimental model for Type 1 diabetes mellitus (TIDM). TIDM was induced in rats by streptozotocin (STZ). One full-thickness excision was made on the backs of the rats. Next, the rats were divided into the following groups: Group 1 was the control (placebo) group; Group 2 received hBM-MSCs-CM four times; Group 3 were laser PWLLLT (890â€‰nm, 80â€‰Hz, 0.2â€‰J/cm(2)); and Group 4 received hBM-MSCs-CM +LASER. Wounds were infected with MRSA. Microbiological examinations were performed on days 4, 7, and 15. Tensiometerical examinations were carried out on the 15th day. One-way analysis of variance

showed that laser and CM alone and/or in combination significantly increases the tensiomerical properties of the repaired wounds compared with control wounds. A combination of PW laser and CM was statistically more effective than other treated groups. Two-way analysis of variance showed that laser and CM alone and/or in combination significantly decreases the colony-forming units (CFUs) compared with the control group. The application of hBM-MSC-CM and PWlaser alone and/or together significantly accelerates the wound-healing process in MRSA-infected cutaneous wounds in TI DM in rats. Additionally, a combined application of hBM-MSC-CM and PWlaser demonstrates a synergistic effect on the wound-healing process in MRSA-infected cutaneous wounds in Type I DM rats. Culture Media, Conditioned Animals;Bone Marrow Cells;Combined Modality Therapy;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Disease Models, Animal;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Methicillin-Resistant Staphylococcus aureus;Rats;Rats, Wistar;Staphylococcal Infections;Wound Healing;Wound Infection

Interventional management of hyperhidrosis in secondary care: a systematic review. BACKGROUND: Hyperhidrosis is uncontrollable excessive sweating, which occurs at rest, regardless of temperature. The symptoms of hyperhidrosis can significantly affect quality of life. OBJECTIVES: To undertake a systematic review of the clinical effectiveness and safety of treatments available in secondary care for the management of primary hyperhidrosis. METHODS: Fifteen databases (including trial registers) were searched to July 2016 to identify studies of secondary-care treatments for primary hyperhidrosis. For each intervention randomized controlled trials (RCTs) were included where available; where RCT evidence was lacking, nonrandomized trials or large prospective case series were included. Outcomes of interest included disease severity, sweat rate, quality of life, patient satisfaction and adverse events. Trial quality was assessed using a modified version of the Cochrane Risk of Bias tool. Results were pooled in pairwise meta-analyses where appropriate, otherwise a narrative synthesis was presented. RESULTS: Fifty studies were included in the review: 32 RCTs, 17 nonrandomized trials and one case series. The studies varied in terms of population, intervention and methods of outcome assessment. Most studies were small, at high risk of bias and poorly reported. The interventions assessed were iontophoresis, botulinum toxin (BTX) injections, anticholinergic medications, curettage and newer energy-based technologies that damage the sweat gland. CONCLUSIONS: The evidence for the effectiveness and safety of treatments for primary hyperhidrosis is limited overall, and few firm conclusions can be drawn. However, there is moderate-quality evidence to support the use of BTX for axillary hyperhidrosis. A trial comparing BTX with iontophoresis for palmar hyperhidrosis is warranted. Cholinergic Antagonists;Botulinum Toxins, Type A Botulinum Toxins, Type A;Cholinergic Antagonists;Curettage;Humans;Hyperhidrosis;Iontophoresis;Low-Level Light Therapy;Patient Satisfaction;Radiofrequency Ablation;Randomized Controlled Trials as Topic;Secondary Care;Severity of Illness Index;Sweat Glands;Treatment Outcome

The impact of photobiomodulation on osteoblast-like cell: a review. In this study, we present a review of the literature on the impact of photobiomodulation on osteoblast-like cell culture. Searches were performed in the PubMed/MEDLINE (Medical Literature Analysis and Retrieval System Online), SCOPUS, and SPIE digital library databases for original articles regarding the effects of LLLT on osteoblast-like cells in experimental models using LLLT published in English from the last 20Â years. The search identified 1439 studies. After the analysis of the abstracts, 1409 studies were excluded and 30 studies were then selected for the full-text analysis, 8 of which were excluded. Thus, 22 studies were included for a critical evaluation of the impact of photobiomodulation on osteoblast-like cell culture. The cell lineages studied were primary rat, primary human, saos-2, Osteo-1, MC3T3, MG63, and OFCOL II. Moreover, a wide variety of experimental models were used to experimentally analyze the impact of photobiomodulation, the most common of which were alkaline phosphatase,

MTT, and cell count. This review suggests that osteoblastic-like cells are susceptible to photobiomodulation but that most of the light parameters varied by different authors have little to no influence on proliferation but very high levels of irradiance have demonstrated deleterious effects on proliferation, highlighting the bi-phasic effect of photobiomodulation. Alkaline Phosphatase Alkaline Phosphatase;Animals;Cell Proliferation;Cells, Cultured;Humans;Low-Level Light Therapy;Osteoblasts

Perspective on Broad-Acting Clinical Physiological Effects of Photobiomodulation. Research into photobiomodulation reveals beneficial effects of light therapy for a rapidly expanding list of medical conditions and illnesses. Although it has become more widely accepted by the mainstream medicine, the effects and mechanisms of action appear to be poorly understood. The therapeutic benefits of photobiomodulation using low-energy red lasers extend far beyond superficial applications, with a well-described physics allowing an understanding of how red lasers of certain optimum intensities may cross the cranium. We now have a model for explaining potential therapeusis for applications in functional neurology that include stroke, traumatic brain injury, and neurodegenerative conditions in addition to the currently approved functions in lipolysis, in onychomycosis treatment, and in pain management. Brain Injuries, Traumatic;Humans;Lipolysis;Low-Level Light Therapy;Neurodegenerative Diseases;Onychomycosis;Pain;Stroke

Photobiomodulation reduces gliosis in the basal ganglia of aged mice. This study explored the effects of long-term photobiomodulation (PBM) on the glial and neuronal organization in the striatum of aged mice. Mice aged 12Â months were pretreated with PBM (670Â nm) for 20Â minutes per day, commencing at 5Â months old and continued for 8Â months. We had 2 control groups, young at 3 months and aged at 12Â months old; these mice received no treatment. Brains were aldehyde-fixed and processed for immunohistochemistry with various glial and neuronal markers. We found a clear reduction in glial cell number, both astrocytes and microglia, in the striatum after PBM in aged mice. By contrast, the number of 2 types of striatal interneurons (parvalbumin(+) and encephalopsin(+)), together with the density of striatal dopaminergic terminals (and their midbrain cell bodies), remained unchanged after such treatment. In summary, our results indicated that long-term PBM had beneficial effects on the aging striatum by reducing glial cell number; and furthermore, that this treatment did not have any deleterious effects on the neurons and terminations in this nucleus. Aging;Animals;Basal Ganglia;Cell Count;Gliosis;Low-Level Light Therapy;Male;Mice, Inbred C57BL;Neuroglia;Time Factors

Current and Future Trends in Adipose Stem Cell Differentiation into Neuroglia. BACKGROUND: Neurological diseases and disorders pose a challenge for treatment and rehabilitation due to the limited capacity of the nervous system to repair itself. Adipose stem cells (ASCs) are more pliable than any adult stem cells and are capable of differentiating into non-mesodermal tissues, including neurons. Transdifferentiating ASCs to specific neuronal lineage cells enables us to deliver the right type of cells required for a replacement therapy into the nervous system. METHODS: Several methodologies are being explored and tested to differentiate ASCs to functional neurons and glia with cellular factors and chemical compounds. However, none of these processes and prototypes has been wholly successful in changing the cellular structure and functional status of ASCs to become identical to neuroglial cells. In addition, successful integration and functional competence of these cells for use in clinical applications remain problematic. Photobiomodulation or low-level laser irradiation has been successfully applied to not only improve ASC viability and proliferation but has also shown promise as a possible enhancer of ASC differentiation. CONCLUSIONS: Studies have shown that photobiomodulation improves the use of stem cell transplantation for neurological applications. This review investigates current neuro-differentiation inducers and suitable methodologies, including photobiomodulation, utilizing ASCs for induction of differentiation into neuronal lineages.

Adipocytes;Animals;Cell Differentiation;Cell Survival;Humans;In Vitro Techniques;Low-Level Light Therapy;Neuroglia;Sensitivity and Specificity;Stem Cell Transplantation

Aging Is a Sticky Business. OBJECTIVE: The objective of this work is to put forward a mechanism by which low-level light [red-to near infrared (NIR) laser or light emitting diodes (LED)] is instrumental in the process of accelerating the healing of wounds. BACKGROUND DATA: Interaction modalities of low-level light with oxidatively stressed cells and tissues are the focus of intense research efforts. Several models of the light/cell-interaction mechanism have been proposed. In the most popular model, cytochrome c oxidase is believed to play the role of the principal acceptor for red-to NIR photons. METHODS: Using as an illustrative example the successful LED treatment of an edematous limb ulcer, the results of recent in vitro tests and complementary laboratory experiments are presented and discussed. RESULTS: The most plausible mechanism of biostimulatory effect of red-to NIR light consists of its impact on the nanoscopic interfacial water layers in mitochondria and the extracellular matrix (ECM) where mitochondrial reactive oxygen species (ROS) induce an increase in the viscosity of the water layers bound to the predominantly hydrophilic surfaces in the intramitochondrial space as well as the ECM, where the process progressively propagates with age. The biostimulatory effect of red-to NIR light consists of counteracting the ROS-induced elevation of interfacial water viscosities, thereby instantly restoring the normal mitochondrial function, including the synthesis of adenosine triphosphate (ATP) by the rotary motor (ATP synthase). CONCLUSIONS: An understanding of the mechanism of interaction of red-to NIR light with mitochondria, cells, and tissues safeguards progress in the field of low-level light therapy (LLLT) and puts us in the position to design better therapies. Reactive Oxygen Species Aging;Humans;Lasers, Semiconductor;Leg Ulcer;Low-Level Light Therapy;Mitochondria;Oxidative Stress;Reactive Oxygen Species;Sensitivity and Specificity;Wound Healing

The earthworm Dendrobaena veneta (Annelida): A new experimental-organism for photobiomodulation and wound healing. Photobiomodulation (PBM) is a manipulation of cellular behavior using non-ablative low intensity light sources. This manipulation triggers a cascade of metabolic effects and physiological changes resulting in improved tissue repair, of benefit in the treatment of tissue injury, degenerative or autoimmune diseases. PBM has witnessed an exponential increase in both clinical instrument technology and applications. It is therefore of benefit to find reliable experimental models to test the burgeoning laser technology for medical applications. In our work, we proposed the earthworm Dendrobaena veneta for the study of non-ablative laser-light effects on wound healing. In our preliminary work, D. veneta has been shown to be positively affected by PBM. New tests using D. veneta were set up to evaluate the effectiveness of a chosen 808 nm-64 J/cm2-1W-CW laser therapy using the AB2799 hand-piece with flat-top bean profile, on the wound healing process of the earthworm. Effective outcome was assimilated through examining the macroscopic, histological, and molecular changes on the irradiated posterior-segment of excised-earthworms with respect to controls. Three successive treatments, one every 24 hours, were concluded as sufficient to promote the wound healing, by effects on muscular and blood vessel contraction, decrement of bacteria load, reduction of inflammatory processes and tissue degeneration. D. veneta was demonstrated to be a reliable experimental organism that meets well the 3Rs principles and the National Science Foundation statement. Through their genetic and evolutionary peculiarity, comparable to those of scientifically accredited models, D. veneta allows the effect of laser therapies by multidisciplinary methods, at various degree of complexity and costs to be investigated. HSP70 Heat-Shock Proteins;HSP72 Heat-Shock Proteins Animals;Bacterial Load;Disease Models, Animal;HSP70 Heat-Shock Proteins;HSP72 Heat-Shock Proteins;Low-Level Light Therapy;Oligochaeta;Reference Standards;Survival Analysis;Temperature;Wound Healing

Effects of single-dose, low-level laser therapy on pain associated with the initial stage of fixed orthodontic treatment: A randomized clinical trial. OBJECTIVE: The aim of this study was to assess the analgesic effect of a single application of low-level laser therapy (LLLT) on spontaneous pain and pain on chewing after placement of initial archwires. METHODS: Forty-two patients (26 women, 16 men) were randomly recruited for this split-mouth randomized clinical trial. Each patient received super-elastic nickel-titanium (NiTi) initial archwires (0.012, 0.014, 0.016, and 0.018-inch [in]) in the maxilla for leveling and alignment for an interval of 4 weeks between archwires. One side of the mouth was randomly designated as experimental, while the other side served as placebo. After insertion of each archwire, the experimental side was irradiated with a diode laser for 3 seconds each on 5 points facially and palatally per tooth, from the central incisor to first molar. On the placebo side, the laser device was held the same way but without laser application. A numerical rating scale was used to assess the intensity of spontaneous and masticatory pain for the following 7 days. The Mann-Whitney U test was used to compare pain scores between sides. RESULTS: Patients in the LLLT group exhibited significantly lower mean scores for spontaneous pain after insertion of the initial two archwires (0.012-in and 0.014-in NiTi; $p < 0.05$), while there was no significant difference for 0.016-in and 0.018-in wires between the LLLT and placebo groups. LLLT significantly reduced chewing pain scores ($p < 0.05$) for all archwires. CONCLUSIONS: A single dose of LLLT considerably lessened postoperative pain accompanying the placement of super-elastic NiTi wires for initial alignment and leveling.

Nano-Pulsed Laser Therapy Is Neuroprotective in a Rat Model of Blast-Induced Neurotrauma.
We have developed a novel, non-invasive nano-pulsed laser therapy (NPLT) system that combines the benefits of near-infrared laser light (808â€‰nm) and ultrasound (optoacoustic) waves, which are generated with each short laser pulse within the tissue. We tested NPLT in a rat model of blast-induced neurotrauma (BINT) to determine whether transcranial application of NPLT provides neuroprotective effects. The laser pulses were applied on the intact rat head 1â€‰h after injury using a specially developed fiber-optic system. Vestibulomotor function was assessed on post-injury days (PIDs) 1-3 on the beam balance and beam walking tasks. Cognitive function was assessed on PIDs 6-10 using a working memory Morris water maze (MWM) test. BDNF and caspase-3 messenger RNA (mRNA) expression was measured by quantitative real-time PCR (qRT-PCR) in laser-captured cortical neurons. Microglia activation and neuronal injury were assessed in brain sections by immunofluorescence using specific antibodies against CD68 and active caspase-3, respectively. In the vestibulomotor and cognitive (MWM) tests, NPLT-treated animals performed significantly better than the untreated blast group and similarly to sham animals. NPLT upregulated mRNA encoding BDNF and downregulated the pro-apoptotic protein caspase-3 in cortical neurons. Immunofluorescence demonstrated that NPLT inhibited microglia activation and reduced the number of cortical neurons expressing activated caspase-3. NPLT also increased expression of BDNF in the hippocampus and the number of proliferating progenitor cells in the dentate gyrus. Our data demonstrate a neuroprotective effect of NPLT and prompt further studies aimed to develop NPLT as a therapeutic intervention after traumatic brain injury (TBI). Animals;Blast Injuries;Brain Injuries, Traumatic;Disease Models, Animal;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Ultrasonography

[Topical ozone therapy: An innovative solution to patients with herpes zoster]. To observe the clinical efficacy and safety of topical ozone therapy for patients with herpes zoster by reflectance confocal microscopy (RCM).â€© Methods: A total of 60 patients with herpes zoster were divided into a control group and an ozone treatment group (n=30). In the control group, patients took oral valacyclovir tablets or granules (0.3 g per day, three times a day) and they were subjected to local weak laser irradiation treatment plus topical 2% mupirocin ointment twice a day. In the ozone group,

the treatment is same as the control group except mupirocin ointment was replaced with topical ozone treatment (hydrotherapy every day plus ozonated oil twice a day). The clinical symptoms, discoid cell and adverse reactions were observed and taken records at day 0, 3, 7 and 14. Statistical analysis was performed to compare the clinical efficacy between the 2 groups. â€© Results: On the seventh day of treatment, the discoid cells of the ozone group disappeared, and the difference between the control group and the ozone group was statistically significant (P<0.05). The difference of decreased percentage of pain scores at each time point between the 2 groups was statistically significant (P<0.05). The clinical efficacy was 100% in the ozone group and 86.7% in the control group, with significant difference between the 2 groups (P<0.05).â€© Conclusion: Topical ozone therapy in patients with herpes zoster is helpful in relieving pain, shortening the course as well as improving the clinical efficacy without obvious adverse reactions. It is worth to be popularized. Antiviral Agents;Oils;Ozone;Mupirocin;Valine;Valacyclovir;Acyclovir Acyclovir;Administration, Oral;Administration, Topical;Antiviral Agents;Case-Control Studies;Combined Modality Therapy;Drug Administration Schedule;Herpes Zoster;Humans;Hydrotherapy;Low-Level Light Therapy;Microscopy, Confocal;Mupirocin;Oils;Ozone;Pain Management;Pain Measurement;Treatment Outcome;Valacyclovir;Valine

Has the time come to include low-level laser photobiomodulation as an adjuvant therapy in the treatment of impaired endometrial receptivity? Low-level laser therapy (LLLT) has been used in photobiomodulation to promote healing, regenerate, and restore tissue function. Women with persistent thin endometrium were assumed to encounter diminished activity in the regenerative and functional capacity of their endometrium. The aim of this study was to examine the ability of LLLT in 635Â nm wavelength to enhance the proliferation and gene expression of in vitro cultured endometrial cells. Single (SE) versus multiple exposures (ME) to LLLT were examined in the study groups and compared to controls. A fluence dose of 4.27Â J/cm(2) for 16Â min was given once in the SE or divided in three equal sessions in days 2, 4, and 6 of the culture in ME. Cellular response was evaluated by measuring viable cell numbers and surface area. Pattern of MUC1, ITGA5, ITGB3, LIF, and PTEN gene expression was assessed using the qRT-PCR. Greater numbers of cells were found in both study groups (Pâ€‰<â€‰0.001) as compared to controls. The surface area of cells at the end of culture phase was highly significant (Pâ€‰<â€‰0.001) in ME when compared to SE and controls. A statistically significant difference was found in terms of gene expression in both irradiated groups (Pâ€‰<â€‰0.001) as compared to controls, although greater difference in PTEN tumour suppressor gene (Phosphatase and tensin homolog) expression was toward ME. The introduction of LLLT to the armamentarium of infertility will serve as a new adjuvant therapy in this field. The current study proofed that LLLT was able to increase the proliferative and functional capacity of cultured endometrial cells. Adult;Cells, Cultured;Endometrium;Female;Gene Expression;Humans;Infertility, Female;Low-Level Light Therapy;Radiotherapy, Adjuvant;Regeneration;Wound Healing;Young Adult

The comparison of skin rejuvenation effects of vitamin A, fractional laser, and their combination on rat. BACKGROUND: Because of long-term exposure of skin, skin aging is an unavoidable natural law with age. Traditional Vitamin A and novel ablative fractional laser technique both have the effects of skin rejuvenation, and studies have demonstrated both of them have apparent clinical efficacy and histology-improving effects on photo-aging skin. MATERIALS AND METHODS: 45 female healthy Wistar rats were selected and the depilation areas of every rat were divided into four regions: control region(Region A), Vitamin A acid region(Region B), combination treatment region(Region C), and fractional laser region(Region D). 0.025% Vitamin A acid cream was applied to Region B and C every day for 3Â weeks; Region C and D were irradiated once with 10600nm CO(2) fractional laser on the first day of the trail. The skin tissue was dissected and placed into liquid nitrogen according to the

design. The real-time quantitative PCR and western blotting methods were taken to detect the expression changes of miR-29a, Akt, TGF-Î², and mRNA of type III pre-collagen. RESULTS: It can be seen from the results of the real-time quantitative PCR that the mRNA expression levels of type III pre-collagen, Akt, and TGF-Î² in the treatment regions are up-regulated and the expression levels of miR-29a mRNA are down-regulated compared to the Region A. The hybridization tests showed that changes of the expression of type III pre-collagen, Akt gene, miR-29a gene, and TGF-Î² gene across the experiment regions are all significantly different in the third week, and the expression levels of them all achieve the highest value in the third week, the expression level of miR-29a gene achieves the lowest value in the third week, which are consistent with the results of real-time quantitative PCR. CONCLUSION: It is indicated that the combination region of Vitamin A acid and fractional laser may lead to low expression of miR-29a, thus the inhibition of downstream Akt activation is loss, Akt activation is enhanced, enhancement of the expression of TGF-Î² is induced, leading to proliferation of fibroblasts, and promotion of the collagen proteins' synthesis in skin. Therefore miR-29a/Akt/TGF-Î² signal pathway may participate in the skin rejuvenation mechanism of action Vitamin A acid and fractional laser. This may provide a new treatment approach for skin rejuvenation. Collagen Type III;Keratolytic Agents;MicroRNAs;Transforming Growth Factor beta;Tretinoin Animals;Collagen Type III;Combined Modality Therapy;Cosmetic Techniques;Female;Keratolytic Agents;Lasers, Gas;Low-Level Light Therapy;MicroRNAs;Rats;Rats, Wistar;Rejuvenation;Skin Aging;Transforming Growth Factor beta;Tretinoin

Manipulating the mitochondria activity in human hepatic cell line Huh7 by low-power laser irradiation. Low-power laser irradiation of red light has been recognized as a promising tool across a vast variety of biomedical applications. However, deep understanding of the molecular mechanisms behind laser-induced cellular effects remains a significant challenge. Here, we investigated mechanisms involved in the death process in human hepatic cell line Huh7 at a laser irradiation. We decoupled distinct cell death pathways targeted by laser irradiations of different powers. Our data demonstrate that high dose laser irradiation exhibited the highest levels of total reactive oxygen species production, leading to cyclophilin D-related necrosis via the mitochondrial permeability transition. On the contrary, low dose laser irradiation resulted in the nuclear accumulation of superoxide and apoptosis execution. Our findings offer a novel insight into laser-induced cellular responses, and reveal distinct cell death pathways triggered by laser irradiation. The observed link between mitochondria depolarization and triggering ROS could be a fundamental phenomenon in laser-induced cellular responses.

Effect of GaAlAs low-level laser therapy on mouth opening after orthognathic surgery. To evaluate low-level laser therapy (LLLT) as an adjunct to enhance postoperative mouth opening after orthognathic surgery. Prospective clinical trial of 82 patients allocated into an intervention group (laser, LG) and a control group (no laser, CG) and subgroups according to the procedure type : (1) surgically assisted rapid maxillary expansion (SARME); (2) maxillary surgery; (3) mandibular surgery; or (4) bimaxillary surgery. LG patients received LLLT immediately after surgery and every 24Â h thereafter for 3Â days, using a gallium-aluminum-arsenide (GaAlAs) diode laser (780Â nm, 28 spots, 14 on each side of the face, output power 2Â J/spot). Maximum mouth opening was measured using digital calipers at five time points: preoperative baseline and postoperative days 2, 7, 14, and 21. ANOVA was used to evaluate difference in mouth opening across groups. Significance was accepted at Pâ€‚â€‰â€‰â€‰

were no significant differences between the SARME and isolated maxillary/mandibular surgery groups. In the bimaxillary groups, average mouth opening was increased in all patients who received LLLT, significantly so in male patients. LLLT with a GaAlAs diode laser (780Â nm) did not affect postoperative mouth opening after SARME, isolated maxillary surgery, or isolated mandibular surgery. However, it improved mouth opening in men who had undergone bimaxillary orthognathic surgery. Adolescent;Adult;Case-Control Studies;Female;Humans;Lasers, Semiconductor;Male;Middle Aged;Mouth;Orthognathic Surgery;Palatal Expansion Technique;Prospective Studies;Young Adult

High-power, red-light-emitting diode irradiation enhances proliferation, osteogenic differentiation, and mineralization of human periodontal ligament stem cells via ERK signaling pathway. BACKGROUND: Light-emitting diode (LED) is attracting attention as a new light source for phototherapy. However, its effects on periodontal tissue regeneration remain unknown. The aim of this study was to examine the effects of high-power, red LED irradiation on human periodontal ligament stem cells (PDLSCs), which play an important role in periodontal tissue regeneration. METHODS: PDLSCs were derived from adult human third molars. The light source was red LED (peak wavelength: 650Â nm). Energy densities ranging from 0 to 10 J/cm(2) were tested to determine the optimal dose. PDLSC proliferation was measured using two parameters: live cell protease and ATP levels. After the cells were induced to differentiate, the effect of LED irradiation on osteogenic differentiation and mineralization was examined, with particular focus on the extracellular signal-regulated kinase (ERK)1/2 signaling pathway using an ERK inhibitor (PD98059). RESULTS: LED irradiation at 8 J/cm(2) led to a significant increase in PDLSC proliferation and enhanced Runx2 and Osterix mRNA expression, Alkaline phosphatase activity, procollagen type I C-peptide and osteocalcin production, calcium deposition, and alizarin red S staining. In addition, LED induced the activation of ERK1/2, and the effects of LED on PDLSC proliferation, differentiation, and mineralization could be suppressed by treatment with PD98059. CONCLUSIONS: The results of this study show that 650-nm high-power, red, LED irradiation increases PDLSCs proliferation, and osteogenic differentiation and mineralization, mediated by ERK1/2 activation. These findings suggest that LED may be a useful tool for periodontal tissue regeneration. Alkaline Phosphatase Adult;Alkaline Phosphatase;Cell Differentiation;Cell Proliferation;Cells, Cultured;Humans;Osteogenesis;Periodontal Ligament;Signal Transduction;Stem Cells

Efficiencies of Low-Level Laser Therapy (LLLT) and Gabapentin in the Management of Peripheral Neuropathy: Diabetic Neuropathy. Diabetic neuropathy (DN) is the highly occurred complication of diabetes mellitus; it has been defined as an event of peripheral nerve dysfunction characterized by pain, allodynia, hyperalgesia, and paraesthesia. The current study was conducted to evaluate the efficacy of low-level laser therapy (LLLT) in the management of neuropathy in diabetic rats. The used animals were divided into the following groups: negative control, streptozotocin-induced diabetic rats, and diabetic rats with peripheral neuropathy (DNP) and DNP treated with gabapentin or with LLLT. Behavioral tests were carried out through hotplate test for the determination of pain sensations and the Morris water maze test for spatial reference memory evaluation. Blood samples were collected at the end of treatment for biochemical determinations. In the current study, the latency of hind-paw lick decreased significantly when DNP are treated with gabapentin or LLLT. The Morris water maze test showed that LLLT treatment improved memory that deteriorated in DNP more than gabapentin do. The results of the biochemical study revealed that LLLT could not affect the level of beta-endorphin that decreased in DNP but significantly decreased S100B that rose in DNP. PGE2 and cytokines IL-1Î², IL-10, and TNF-Î± showed significant increase in DNP compared with control group. The gabapentin administration or LLLT application significantly reversed the levels of the mentioned markers towards the normal values of the controls. Levels of serum MDA and nitric oxide increased

significantly in the DNP but rGSH showed significant decrease. These markers were improved significantly when the DNP were treated with gabapentin or LLLT. The treatment with gabapentin or LLLT significantly decreased the raised level in total cholesterol in DNP but could not decrease the elevated level of triglycerides, while LDL cholesterol decreased significantly in DNP treated with gabapentin but not affected by LLLT. Values of serum alanine aminotransferase (ALAT), aspartate aminotransferase (ASAT), urea, and creatinine increased significantly in the DPN and diabetic rats without peripheral neuropathy (PN) compared with control group. The treatment of DNP with gabapentin induced significant increases in ALAT and ASAT activities but LLLT treatment induced significant decreases in ALAT and ASAT activities as compared with DNP group. Neither gabapentin nor LLLT could improve the elevated levels of serum urea and creatinine in the DNP. It could be concluded that LLLT is more safe and effective than gabapentin in the management of neuropathy in diabetic rats. Amines;Cyclohexanecarboxylic Acids;Cytokines;S100 Calcium Binding Protein beta Subunit;S100b protein, rat;gamma-Aminobutyric Acid;Streptozocin;Gabapentin;Urea;Creatinine;Dinoprostone Amines;Animals;Combined Modality Therapy;Creatinine;Cyclohexanecarboxylic Acids;Cytokines;Diabetes Mellitus, Experimental;Diabetic Neuropathies;Dinoprostone;Gabapentin;Low-Level Light Therapy;Male;Maze Learning;Peripheral Nervous System Diseases;Rats;S100 Calcium Binding Protein beta Subunit;Streptozocin;Urea;gamma-Aminobutyric Acid

The Effects of Photobiomodulation of 808 nm Diode Laser Therapy at Higher Fluence on the in Vitro Osteogenic Differentiation of Bone Marrow Stromal Cells. The literature has supported the concept of mesenchymal stromal cells (MSCs) in bone regeneration as one of the most important applications in oro-maxillofacial reconstructions. However, the fate of the transplanted cells and their effects on the clinical outcome is still uncertain. Photobiomodulation (PBM) plays an important role in the acceleration of tissue regeneration and potential repair. The aim of this in vitro study is to evaluate the effectiveness of PBM with 808 nm diode laser therapy, using a flat-top hand-piece delivery system at a higher-fluence (64 J/cm(2)) irradiation (1 W, continuous-wave) on bone marrow stromal cells (BMSCs). The BMSCs of 3 old female Balb-c mice were analyzed. The cells were divided into two groups: irradiated group and control group. In the former the cells were irradiated every 24 h during 0 day (T0), 5 (T1), 10 (T2), and 15 (T3) days, whereas the control group was non-irradiated. The results have shown that the 64 J/cm(2) laser irradiation has increased the Runt-related transcription factor 2 (Runx2). Runx2 is the most important early marker of osteoblast differentiation. The higher-fluence suppressed the synthesis of adipogenic transcription factor (PPARÎ³), the pivotal transcription factor in adipogenic differentiation. Also, the osteogenic markers such as Osterix (Osx) and alkaline phosphatase (ALP) were upregulated with an increase in the matrix mineralization. Furthermore, western blotting data demonstrated that the laser therapy has induced a statistically valid increase in the synthesis of transforming growth factor Î²1 (TGF-Î²1) but had no effects on the tumor necrosis factor Î± (TNFÎ±) production. The data has statistically validated the down-regulation of the important pro-inflammatory cytokines such as interleukin IL-6, and IL-17 after 808 nm PBM exposition. An increase in anti-inflammatory cytokines such as IL-1rÎ± and IL-10 was observed. These in vitro studies provide for first time the initial proof that the PBM of the 808 nm diode laser therapy with flat-top hand-piece delivery system at a higher-fluence irradiation of 64 J/cm(2) (1 W/cm(2)) can modulate BMSCs differentiation in enhancing osteogenesis.

Intraocular lens power adjustment by a femtosecond laser: InÂ vitro evaluation of power change, modulation transfer function, light transmission, and light scattering in a blueÂ light-filtering lens. PURPOSE: To evaluate intraocular lens (IOL) power, modulation transfer function (MTF), light transmission, and light scattering of a blue light-filtering IOL before and after power adjustment by a femtosecond laser obtained through increased hydrophilicity of targeted areas within the optic,

creating the ability to build a refractive-index-shaping lens within an existing IOL. SETTING: John A. Moran Eye Center, University of Utah, Salt Lake City, Utah, USA. DESIGN: Experimental study. METHODS: Ten CT Lucia 601PY single-piece yellow hydrophobic acrylic IOLs were used in this study. The IOL power and MTF were measured with a power and modulation transfer function device. Light transmission was measured using a Lambda 35 UV-VIS spectrophotometer. Backlight scattering was assessed with a Scheimpflug camera within the IOL substance. All measurements were done with hydrated IOLs. The IOLs were also evaluated under light microscopy (LM) before and after laser adjustment. RESULTS: After laser adjustment, a mean power change of -2.037 diopters was associated with a MTF change of -0.064 and a light transmittance change of -1.4%. Backlight scattering increased within the IOL optic in the zone corresponding to the laser treatment at levels that are not expected to be clinically significant. Treated areas within the optic could be well appreciated under LM without damage to the IOLs. CONCLUSION: Power adjustment of a commercially available hydrophobic acrylic blue light-filtering IOL by a femtosecond laser produced an accurate change in dioptric power while not significantly affecting the quality of the IOL. Acrylic Resins Acrylic Resins;Lenses, Intraocular;Light;Low-Level Light Therapy;Microscopy;Optical Phenomena;Scattering, Radiation

An optical system via liquid crystal photonic devices for photobiomodulation. Photobiomodulation or low-level light therapy (LLLT) has extensive applications based on light-induced effects in biological systems. Photobiomodulation remains controversial because of a poorly understood biochemical mechanism limited by the well-known biphasic dose response or Arndt-Schulz curve. The Arndt-Schulz curve states that an optimal dose of light is a key factor for realizing a therapeutic effect. In this report, we demonstrate a tunable optical system for photobiomodulation to aid physicians in overcoming the constraints of light due to biphasic dose response. The tunable optical system is based on a white light-emitting diode and four liquid crystal (LC) photonic devices: three LC phase retarders, and one LC lens. The output light of the tunable optical system exhibits electrical tunability for the wavelength, energy density and beam size. The operating principle is introduced, and the experimental results are presented. The proposed concept can be further extended to other electrically tunable photonic devices for different clinical purposes for photobiomodulation.

A retrospective analysis of the clinical efficacies and recurrence of Q-switched Nd:YAG laser treatment of nevus of Ota in 224 Chinese patients. BACKGROUND: Nevus of Ota can be treated successfully using the Q-switched (QS) laser; but few studies are long-term retrospective of the efficacy and influencing factor, studies on the recurrence is even less. PURPOSE: Retrospective analysis of the clinical characteristics and recurrence of QS Nd:YAG laser treatment of nevus of Ota in 224 Chinese patients at Laser Cosmetology Center of Department of Dermatology, the Second Hospital, Xi'an Jiaotong University. METHODS: The data of 224 patients with nevus of Ota were analyzed retrospectively, which included the correlation among lesion color, treatment sessions, gender, age, lesion types and effect, and all patients were followed up for 2-10Â years. RESULTS: Higher number of treatment sessions that were conducted using the QS Nd:YAG laser system was positively associated with better responses to treatment. 99.11% of patients acquired more than 75% improvement with an average of 3.7 sessions. Only eight patients (3.57%) who had been completely cleared developed recurrence at the same site as before. CONCLUSION: The treatment of nevus of Ota with QS Nd:YAG laser is safe and effective with rare recurrence. Adolescent;Adult;Age Factors;Age of Onset;Asian People;Child;Child, Preschool;China;Female;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Retrospective Studies;Sex Factors;Skin Neoplasms;Young Adult

Class IV laser therapy for trapeziometacarpal joint osteoarthritis: Study protocol for a randomized placebo-controlled trial. OBJECTIVE: Osteoarthritis (OA) is a chronic and prevalent joint disorder with great impact on quality of life and high economic burden. Although a number of conservative therapies have proven to be effective for the management of hand OA, only modest treatment effects were reported for most individual interventions. The aim of the proposed study is to assess the effect of Class IV laser therapy (LT) on pain and pinch strength in patients with thumb carpometacarpal (TCMC) OA. METHODS: A randomized, controlled, single-centre, double-blind, clinical trial, with 1:1 allocation ratio, will be carried out involving patients presenting TCMC-OA Grades 1-2 (aged >18Â years). Both assessor and statistician will remain blinded. Patients with TCMC-OA will be randomly assigned to the experimental group (will receive LT) and control group (will receive a placebo treatment). Outcome measures will be pain scores at the base of the thumb measured with visual analogue scale (0-10: 0, no pain and 10, worst pain) and changes in pinch strength, both collected at baseline, 4, and 12Â weeks. Statistical analyses will be based on an intention-to-treat analysis using the last value forward method. A two-tailed independent Student's t test for the continuous variable of age and baseline scores will be used for comparison of baseline characteristics and outcome variables. Paired Student's t tests will be used to determine the level of significance of the differences between the pretreatment and posttreatment measurements of the individual groups. Repeated measures analysis of variance will be used to determine the differences in time as the within-subjects factor and group as the between-subjects factor. DISCUSSION: To our knowledge, the results of this study will provide the first double-blinded evidence for Class IV LT in patients with TCMC-OA. Analysis of Variance;Carpometacarpal Joints;Chronic Disease;Double-Blind Method;Female;Follow-Up Studies;Hand Strength;Humans;Laser Therapy;Male;Middle Aged;Osteoarthritis;Pain Measurement;Range of Motion, Articular;Risk Assessment;Thumb;Trapezium Bone;Treatment Outcome

Effect of 660Â nm visible red light on cell proliferation and viability in diabetic models in vitro under stressed conditions. The current study evaluated the photobiomodulatory effect of visible red light on cell proliferation and viability in various fibroblast diabetic models in vitro, namely, unstressed normal (N) and stressed normal wounded (NW), diabetic wounded (DW), hypoxic wounded (HW) and diabetic hypoxic wounded (DHW). Cells were irradiated at a wavelength of 660Â nm with a fluence of 5Â J/cm(2) (11.23Â mW/cm(2)), which related to an irradiation time of 7Â min and 25Â s. Control cells were not irradiated (0Â J/cm(2)). Cells were incubated for 48Â h and cellular proliferation was determined by measuring 5-bromo-2'-deoxyuridine (BrdU) in the S-phase (flow cytometry), while viability was assessed by the Trypan blue exclusion test and Apoptox-glo triplex assay. In comparison with the respective controls, PBM increased viability in N- (Pâ€‰â‰¤â€‰0.001), HW- (Pâ€‰â‰¤â€‰0.01) and DHW-cells (Pâ€‰â‰¤â€‰0.05). HW-cells showed a significant progression in the S-phase (Pâ€‰â‰¤â€‰0.05). Also, there was a decrease in the G2M phase in HW- and DHW-cells (Pâ€‰â‰¤â€‰0.05 and Pâ€‰â‰¤â€‰0.05, respectively). This study concludes that hypoxic wounded and diabetic hypoxic wounded models responded positively to PBM, and PBM does not damage stressed cells but has a stimulatory effect on cell viability and proliferation to promote repair and wound healing. This suggests that the more stressed the cells are the better they responded to photobiomodulation (PBM). Cell Line;Cell Movement;Cell Proliferation;Cell Survival;Diabetes Complications;Fibroblasts;Humans;Light;Low-Level Light Therapy;Wound Healing

Can photobiomodulation associated with implantation of mesenchymal adipose-derived stem cells attenuate the expression of MMPs and decrease degradation of type II collagen in an experimental model of osteoarthritis? This study aimed to determine whether photobiomodulation therapy (PBMT) could improve the bioavailability and chondroprotective benefits of mesenchymal stem cells

injected into the knees of rats used as an experimental model of osteoarthritis (OA) as well as reduce the expression of matrix metalloproteinases (MMPs) and degradation of type II collagen (COL2-1) in the cartilage. Adipose-derived stem/stromal cells (ADSCs) were collected from three male Fischer 344 rats and characterized by flow cytometry. Fifty female Fischer 344 rats were distributed into five groups of 10 animals each. These groups were as follows: control, OA, OA PBMT, OA ADSC, and OA ADSC PBMT. OA was induced in the animals using a 4% papain solution. Animals from the OA ADSC and OA ADSC PBMT groups received an intra-articular injection of 10â€‰Ã—â€‰10(6) ADSCs and were treated with PBMT by irradiation (wavelength: 808Â nm, power: 50Â mW, energy: 42Â J, energy density: 71.2Â J/cm(2), spot size: 0.028). Euthanasia was performed 7Â days after the first treatment. The use of PBMT alone and the injection of ADSCs resulted in downregulation of pro-inflammatory cytokines and MPs in cartilage compared to the OA group. PBMT and ADSCs caused upregulation of tissue inhibitors of MPs 1 and 2 and mRNA and protein expression of COL2-1 in cartilage compared to the OA group. The intra-articular injection of ADSCs and PBMT prevented joint degeneration resulting from COL2-1 degradation and modulated inflammation by downregulating cytokines and MMPs in the OA group. Collagen Type II;Cytokines;Matrix Metalloproteinases Animals;Collagen Type II;Combined Modality Therapy;Cytokines;Disease Models, Animal;Female;Gene Expression;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Osteoarthritis;Rats;Rats, Inbred F344

Editorial. Esthetics;Female;Gynecologic Surgical Procedures;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Rejuvenation;Surgery, Plastic

Light-emitting diode therapy (photobiomodulation) effects on oxygen uptake and cardiac output dynamics during moderate exercise transitions: a randomized, crossover, double-blind, and placebo-controlled study. Light-emitting diodes (LEDs) might have a beneficial impact on cytochrome-c oxidase enzyme activity. Thus, it was hypothesized that photobiomodulation by light-emitting diode therapy (LEDT) could influence aerobic metabolism dynamics. Possible LEDT-mediated aerobic improvements were investigated mainly by a precise characterization of the pulmonary O(2) uptake dynamics during moderate exercise transitions. Eight healthy young adults were enrolled in this randomized, double-blind, placebo-controlled, crossover study. A multi-diode array of LEDs was used for muscular pre-conditioning 30Â min and 6Â h before exercise testing. Pulmonary O(2) uptake, carbon dioxide output, cardiac output, heart rate, stroke volume, and total arteriovenous oxygen difference dynamics were evaluated by frequency domain analysis. Comparisons revealed no statistical (pâ€‰>â€‰0.05) differences between LEDT and placebo, suggesting no significant changes in aerobic system dynamics. These results challenge earlier publications that reported changes in pulmonary O(2) uptake during incremental exercise until exhaustion after LEDT. Perhaps, increments in peak pulmonary O(2) uptake after LEDT may be a consequence of higher exercise tolerance caused by non-aerobic-related factors as opposed to an improved aerobic response. Oxygen Adult;Cardiac Output;Cross-Over Studies;Double-Blind Method;Exercise;Exercise Tolerance;Female;Heart Rate;Humans;Infrared Rays;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Oxygen;Oxygen Consumption;Young Adult

Photobiomodulation versus direct restoration in a patient presenting with dentinal hypersensitivity: a 6-month follow-up. Despite nearly a century of research, the treatment of cervical dentinal hypersensitivity (DH) remains challenging. This case report discusses the indications for different approaches to the treatment of DH in a single patient; the chosen alternatives took into account the different degrees of tooth wear and levels of pain at different sites. A 31-year-old woman reported DH in the maxillary right canine and first premolar and the maxillary left lateral incisor and canine in response to thermal, tactile, and osmotic stimuli. Clinical examination revealed that the teeth on the right side presented noncarious cervical lesions deeper than 1 mm, while the teeth on the left side

presented only minimal wear. Therefore, the right canine and premolar were restored with composite resin to create a mechanical barrier against stimuli and reestablish form, function, and esthetics. Prior to restoration, the teeth on the right side were irradiated with a low-power laser (808 nm, 100 mW, 1.1 J/point, 10 seconds), which was applied in a single session at 2 locations on each tooth. In contrast, the left lateral incisor and canine were irradiated in 3 sessions with the low-power laser, which reduces pain levels and depolarizes nerve fibers by means of cell biomodulation, and received no restorations. A visual analog scale (0.0-10.0) was used to record the patient's pain, and it was found that pain levels for the restored teeth decreased from 9.4 initially to 0.0 immediately after restoration, and pain levels for the irradiated teeth decreased from 5.4 initially to 2.0 after 3 sessions. After 6 months of clinical evaluation, both sets of teeth showed scores of 0.0 (no pain). Based on the results presented, it can be concluded that both treatments provided satisfactory outcomes when applied for the appropriate indication. Composite Resins Adult;Bicuspid;Composite Resins;Cuspid;Dental Restoration, Permanent;Dentin Sensitivity;Esthetics, Dental;Female;Humans;Low-Level Light Therapy;Pain Measurement;Tooth Wear

Evaluation of laser therapy and alpha-lipoic acid for the treatment of burning mouth syndrome: a randomized clinical trial. The aim of this study was to evaluate the efficacy of low-level laser therapy (LLLT) and alpha-lipoic acid (ALA) in the treatment of burning mouth syndrome (BMS) and secondary oral burning (SOB) by unstimulated sialometry, symptom assessment, and measurement of salivary TNF-Î± levels. Forty-four patients were randomized into four treatment groups: BMS/laser (nÂ =â€‰10), BMS/ALA (nÂ =â€‰5), SOB/laser (nÂ =â€‰15), and SOB/ALA (nÂ =â€‰14). The control group consisted of eight healthy female subjects. Unstimulated salivary flow was measured before and after treatment, and the collected saliva was stored at -â€‰20Â Â°C for the analysis of TNF-Î±. Symptoms were evaluated before and after treatment using a pain visual analog scale. Most patients were women (81.8%) during menopause (72.2%). LLLT and ALA were efficient in increasing salivary flow only in BMS but provided symptom relief in both conditions. TNF-Î± levels did not differ between patients with BMS and SOB or between those patients and the control group. No differences were observed in posttreatment TNF-Î± levels in either condition. The results of this study suggest that LLLT and ALA are efficient therapies in reducing burning mouth symptoms, with LLLT being more efficient than ALA. Tumor Necrosis Factor-alpha;Thioctic Acid Burning Mouth Syndrome;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Saliva;Thioctic Acid;Tumor Necrosis Factor-alpha;Visual Analog Scale

Modulation of Tumor Cell Metabolism by Laser Photochemotherapy with Cisplatin or Zoledronic Acid In Vitro. BACKGROUND/AIM: Laser photochemotherapy is a new approach in cancer treatment using low-level laser therapy (LLLT) to enhance the effect of chemotherapy. MATERIALS AND METHODS: In order to evaluate the effect of LLLT on tumor cells, HeLa cells were treated with cisplatin or zoledronic acid (ZA) followed by LLLT. Cell viability was evaluated with 2,3-bis-(2-methoxy-4-nitro-5-sulfophenyl)-2H-tetrazolium-5-carboxanilide assay. Oxidative phosphorylation and glycolysis were measured using extracellular flux analysis. Immunocytochemistry of heat-shock protein 70 (HSP70) and western blot analysis were performed. RESULTS: LLLT alone increased viability and was associated with lower oxidative phosphorylation but higher glycolysis rates. Cisplatin and ZA alone lowered cell viability, glycolysis and oxidative phosphorylation. This effect was significantly enhanced in conjunction with LLLT and was accompanied by reduced oxidative phosphorylation and collapse of glycolysis. CONCLUSION: Our observations indicate that LLLT may raise the cytotoxicity of cisplatin and ZA by modulating cellular metabolism, pointing to a possible application in cancer treatment. Bone Density Conservation Agents;Diphosphonates;HSP70 Heat-Shock Proteins;Imidazoles;Radiation-Sensitizing Agents;Zoledronic Acid;Cisplatin Blotting, Western;Bone Density Conservation Agents;Cell Survival;Cisplatin;Diphosphonates;Glycolysis;HSP70 Heat-Shock Proteins;HeLa

Cells;Humans;Imidazoles;Lasers;Low-Level Light Therapy;Oxidative Phosphorylation;Photochemotherapy;Radiation-Sensitizing Agents;Zoledronic Acid

A 2017 update: Challenging the cosmetic procedural delay following oral isotretinoin therapy. For decades it has been widely accepted that elective procedures should be delayed for at least 6-months following completion of isotretinoin therapy. However, numerous 2017 publications demonstrate the need for change in best practice. The evidence has yet to be succinctly summarized in a single article or in a stand-alone quick reference algorithm for physicians. This article's review of all 2017 publications confirms that the 6-month delay is not necessary for all procedures and provides a simple algorithmic approach to summarize the updated recommendations for procedural delay of cosmetic procedures following systemic isotretinoin therapy. This is a useful tool for clinicians and allows patients to receive the most appropriate and timely cosmetic therapy to minimize the psychosocial impact of the skin condition. Dermatologic Agents;Isotretinoin Dermabrasion;Dermatologic Agents;Humans;Isotretinoin;Low-Level Light Therapy;Time Factors

[Antimicrobial anti-inflammatory photodynamic and light-emitting-diode phototherapy of the consequences of the gunshot and mine-blast injury to the face, head, and neck including damage to the ENT organs]. The objective of the present study was the enhancement of the effectiveness of the treatment of the consequences of the gunshot wounds and mine-blast injuries inflicted to the face, head, and neck encountered in the otolaryngological practice as well as the prevention of the formation of the large demarcation areas in the injured tissues and the preparation of these tissues for the further restorative treatment. Anti-microbial and anti-inflammatory photodynamic therapy (PDT) as well as light-emitting-diode (LED) phototherapy were carried out in 20 patients who suffered gunshot wounds and mine-blast injuries to the face, head, and neck. The photodynamic therapy was performed with the use of an aqueous solution of methylene blue at a concentration of 0.1%, the 'Alod-1' infrared laser ('Granat' modification, Russia), and the 'AFS-Solaris' light-emitting diode-based phototherapeutic apparatus (Russia). The analysis of the results of the study has demonstrated the high efficiency of the proposed approach that made it possible to prevent the development of severe septic complications, reduce the amount of drug therapy, significantly shorten duration of the treatment, and create the conditions for the earlier rehabilitation and further plastic and cosmetic restoration of the tissue structures. Blast Injuries;Craniocerebral Trauma;Ear;Humans;Infrared Rays;Larynx;Lasers, Semiconductor;Male;Neck Injuries;Nose;Pharynx;Photochemotherapy;Phototherapy;Treatment Outcome;Wounds, Gunshot

The effect of combined photobiomodulation and curcumin on skin wound healing in type I diabetes in rats. The purpose of the present scientific study was to analyze the effects of combined pulsed wave Photobiomodulation (PW PBM) and Curcumin on the microbial flora; in addition, the tensiometrical wounds properties for type one diabetes mellitus (TIDM) in an experimental animal model. TIDM induction was performed in thirty rats. In the entire animals, one full-thickness excision was implemented on their backs. Randomly, the divisions of rats into 5 groups took place. The primary group was considered as the control group and did not receive any treatment. The secondary group (placebo) received sesame oil by gastric gavage. The third group received PWPBM (890â€¯nm, 80â€¯Hz, 0.2â€¯J/cm(2)). The fourth group received curcumin (40â€¯mg/kg, which was dissolved in sesame oil) by gastric gavage. Eventually, the fifth group received PW PBMâ€¯+â€¯curcumin. Precisely, on day 7, microbiological examinations, and on the 15th day microbiological and tensiometrical examinations were conducted. The data were analyzed by statistical tests. PW PBM, significantly exacerbated tensiometrical properties of the TIDM repairing wound. PW PBM, curcumin, and PWPBMâ€¯+â€¯curcumin significantly decreased colony forming units compared to the control and the placebo groups indeed. It was remarkably attained that PW PBM significantly accelerated the process of wound healing in the STZ-induced TIDM. The PW PBM was statistically more compelling

compared to the curcumin and PWPBMâ€¯+â€¯curcumin. PW PBM, curcumin, and PWPBMâ€¯+â€¯curcumin significantly decreased colony forming units compared to the control and placebo groups. Photosensitizing Agents;Curcumin Animals;Curcumin;Diabetes Mellitus, Experimental;Lasers;Male;Photosensitizing Agents;Rats;Rats, Wistar;Skin;Staphylococcus aureus;Wound Healing

Pain management using photobiomodulation: Mechanisms, location, and repeatability quantified by pain threshold and neural biomarkers in mice. Photobiomodulation (PBM) is a simple, efficient and cost-effective treatment for both acute and chronic pain. We previously showed that PBM applied to the mouse head inhibited nociception in the foot. Nevertheless, the optimum parameters, location for irradiation, duration of the effect and the mechanisms of action remain unclear. In the present study, the pain threshold in the right hind paw of mice was studied, after PBM (810â€‰nm CW laser, spot size 1 or 6 cm(2) , 1.2-36â€‰J/cm(2)) applied to various anatomical locations. The pain threshold, measured with von Frey filaments, was increased more than 3-fold by PBM to the lower back (dorsal root ganglion, DRG), as well as to other neural structures along the pathway such as the head, neck and ipsilateral (right) paw. On the other hand, application of PBM to the contralateral (left) paw, abdomen and tail had no effect. The optimal effect occurred 2 to 3 hours post-PBM and disappeared by 24â€‰hours. Seven daily irradiations showed no development of tolerance. Type 1 metabotropic glutamate receptors decreased, and prostatic acid phosphatase and tubulin-positive varicosities were increased as shown by immunofluorescence of DRG samples. These findings elucidate the mechanisms of PBM for pain and provide insights for clinical practice. Biomarkers Animals;Biomarkers;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Nervous System;Pain Management;Pain Threshold

The effect of phototherapy on sister chromatid exchange with different light density in newborn hyperbilirubinemia. AIM: Concerns of possible genotoxic effects of hyperbilirubinemia and phototherapy were raised from experimental and observational studies in neonates. The purpose of this study was to assess the effect of hyperbilirubinemia and phototherapy with three different methods on DNA damage by investigating sister chromatid exchange frequency. MATERIAL AND METHODS: Patients whose gestational ages were >37 weeks and bilirubin levels above phototherapy limits were enrolled into three groups and each group was planned to receive 25 babies. Group 1 received enhanced light-emitting diode phototherapy, group 2 had light-emitting diode phototherapy, and group 3 received conventional phototherapy. Infants with hyperbilirubinemia but did not require phototherapy comprised the control group, which was subdivided into two groups regarding bilirubin levels (<or>10mg/dL). Blood samples were collected before and after phototherapy for sister chromatid exchange frequency and samples were examined by a biologist who was blinded to the study groups. RESULTS: The mean pre-treatment sister chromatid exchange frequency was 1.41Â±0.34/cell, post-treatment 2.65Â±0.68/cell, and 1.61Â±0.61/cell for the control group ($p<0.05$). A statistically significant increase in sister chromatid exchange frequency after phototherapy was observed in all three intervention groups (p values: 0.01, 0.01, and 0.008, respectively). When the treatment groups were compared with each other in terms of irradiance, no significant difference was found ($p=0.08$). CONCLUSIONS: Phototherapy causes an increase in the frequency of sister chromatid exchange regardless of the irradiance. Phototherapy could have some genotoxic adverse effects on chromosomes; however, further investigations are warranted to enlighten as to whether these effects are permanent or clinically important.

A prospective, randomized, double-blinded, split-face pilot study comparing Q-switched 1064-nm Nd:YAG versus 532-nm Nd:YAG laser for the treatment of solar lentigines. Treating photoaging with laser technologies has increased in popularity due to their efficacy, minimal downtime, and side effects. New Q-Switched (QS) Nd:YAG lasers' frequency doubled with 532Â nm wavelength can both

target epidermal chromophores as well as stimulate collagen production. The objective of this study was to compare single-pulsed 1064-nm Nd:YAG with dual-pulsed 532-nm/1064-nm QS laser for reducing solar lentigines. Ten subjects with solar lentigines were enrolled in this prospective, randomized, double-blind, split-face study. Subjects received six laser treatments (half-face dual, half single) at 2-week intervals. Blinded investigator and subject assessments were conducted 1 month posttreatment to evaluate global skin improvement, safety, and patient satisfaction. Blinded investigator assessments showed statistically significant improvement in the dual-treated side. Patient satisfaction was also statistically significantly increased in the dual-treated side. In conclusion, dual laser treatment can result in superior and safe global improvement of photoaging. Adult;Cosmetic Techniques;Double-Blind Method;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pilot Projects;Prospective Studies;Skin Aging

aPDT for periodontitis treatment in ovariectomized rats under systemic nicotine. BACKGROUND: This study evaluated the antimicrobial photodynamic therapy (aPDT) as an adjunctive therapy to scaling and root planning (SRP) for the treatment of experimental periodontitis (EP) in ovariectomized rats under systemic nicotine. METHODS: Female ovariectomized rats (nâ€¯=â€¯180) were divided into two groups: vehicle administration (Veh) and nicotine administration (Nic). Mini-pumps containing either vehicle or nicotine were inserted in the rats 30â€¯days before the induction of EP, which was induced by placing a ligature around the left mandibular first molar. The rats were randomly divided into three treatment subgroups: SRP, SRP plus low-level laser therapy (LLLT), and SRP plus aPDT. aPDT consisted of the application of a phenothiazine photosensitizer followed by LLLT. Ten animals from each group were euthanized at days 7, 15, and 30 after periodontal treatment. The furcation region was evaluated using histological, histometric analyses and immunolabelling for PCNA, TRAP, RANKL, and OPG. RESULTS: Nicotine administration resulted in greater bone loss (BL). aPDT resulted in lower BL compared to SRP. aPDT showed higher quantities of PCNA-positive cells compared to SRP, regardless of the nicotine status. aPDT resulted in less recruitment of osteoclasts and lower RANKL immunolabelling compared to LLLT and SRP. CONCLUSION: aPDT was effective in animals treated with nicotine. Phenothiazines;Photosensitizing Agents;RANK Ligand;Nicotine;phenothiazine Animals;Combined Modality Therapy;Dental Scaling;Disease Models, Animal;Female;Low-Level Light Therapy;Nicotine;Osteoclasts;Ovariectomy;Periodontitis;Phenothiazines;Photochemotherapy;Photosensitizing Agents;RANK Ligand;Random Allocation;Rats;Root Planing

Photobiomodulation Therapy on Physiological and Performance Parameters During Running Tests: Dose-Response Effects. Dellagrana, RA, Rossato, M, Sakugawa, RL, Baroni, BM, and Diefenthaeler, F. Photobiomodulation therapy on physiological and performance parameters during running tests: Dose-response effects. J Strength Cond Res 32(10): 2807-2815, 2018-This study was aimed at verifying effects of photobiomodulation therapy (PBMT) with different energy doses (15, 30, and 60 J per site) on physiological and performance parameters during running tests. Fifteen male recreational runners participated in a crossover, randomized, double-blind, and placebo-controlled trial. They performed testing protocol in 5 sessions with different treatments: control, placebo, and PBMT with 15, 30, or 60 J per site (14 sites in each lower limb). Physiological and performance variables were assessed during submaximal (at 8 and 9 kmÂ·h) and maximal running tests. Photobiomodulation therapy with 30 J significantly improved running economy (RE) at 8 and 9 kmÂ·h (3.01%, p=0.008 and 3.03%, p=0.009, respectively), rate of perceived exertion (RPE) at 8 km/h21 (7.86%, p=0.033), velocity at V[Combining Dot Above]O2max (3.07%, p= 0.029), peak of velocity (PV) (1.49%, p=0.035), and total time to exhaustion (TTE) (3.41%, p=0.036) compared with placebo. Photobiomodulation therapy with 15 J improved running economy at 9 km/h21 (2.98%, p=0.025), rate of perceived exertion at 8 km/h21 (4.80%, p=0.010), PV (1.33%, p=0.008), total time to exhaustion (3.06%, p=0.008), and total distance (4.01%, p=0.011) compared with the placebo;

whereas PBMT with 60 J only increased RE at 9 km/h21 (3.87%, p=0.024) compared with placebo. All PBMT doses positively affected physiological and/or performance parameters; however, magnitude-based inference reported that PBMT applied with 30 J led to more beneficial effects than 15 and 60 J. Lactic Acid Adult;Athletic Performance;Cross-Over Studies;Double-Blind Method;Humans;Lactic Acid;Low-Level Light Therapy;Lower Extremity;Male;Muscle Fatigue;Oxygen Consumption;Running;Young Adult

Evaluation of Antibacterial Efficiency of Different Root Canal Disinfection Techniques in Primary Teeth. BACKGROUND: A successful primary root canal treatment depends on effective shaping and cleaning the root canal system and finally filling it with a hermetic sealer. Clinically, roots of primary teeth are difficult to shape and the irrigation/disinfection protocol has great importance on prognosis. OBJECTIVE: The present study evaluated the antibacterial efficiency of Endosafe (Orangedental GmbH & Co. KG), photo-activated disinfection (PAD; Orangedental GmbH & Co. KG), diode laser (Epic 10; Biolase, Inc.), ozone (O(3), Ozonytron; Biozonix, MÃ¼nchen, Germany), and sodium hypochloride applications in primary root canals that were infected with Enterococcus faecalis after standard mechanical instrumentation. METHODS: The study was conducted on roots of 100 human primary molar teeth, which were extracted due to excessive caries. The roots were divided in 5 groups with 15 roots in each root disinfection protocol. In addition, 15 samples and 10 samples served as positive and negative controls, respectively. The Shapiro-Wilk test, the Kruskal-Wallis test and then by post hoc group comparisons with the Bonferroni-adjusted Mann-Whitney U test (unpaired observations) was used. RESULTS: Sodium hypochlorite (NaOCl) exhibited the highest antibacterial effect (0 colony-forming units per mL). Diode laser irradiation was statistically more effective than the ozone, PAD, and Endosafe groups (pâ€‰<â€‰0.001). Endosafe, PAD, and ozone groups showed similar antibacterial effect (pâ€‰>â€‰0.05). Although not statistically significant, the Endosafe was more effective in reducing the bacterial count when compared with ozone and PAD. CONCLUSIONS: The five tested irrigation systems were shown to be effective in disinfection of the E. faecalis-contaminated primary root canals and best results were obtained with 2.5% NaOCl and diode laser. Disinfectants;Oxidants, Photochemical;Root Canal Irrigants;Ozone;Sodium Hypochlorite Disinfectants;Disinfection;Enterococcus faecalis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Oxidants, Photochemical;Ozone;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite;Tissue Culture Techniques;Tooth, Deciduous

Learning from clinical phenotypes: Low-dose biophotonics therapies in oral diseases. This narrative review on the use of biophotonics therapies for management of oral diseases is written as a tribute to Prof. Crispian Scully. His seminal contributions to the field are highlighted by the detailed, comprehensive description of clinical presentations of oral diseases. This has enabled a more thorough, fundamental understanding of many of these pathologies by research from his group as well as inspired mechanistic investigations in many groups globally. In the same vein, a major emphasis of this narrative review is to focus on the evidence from human case reports rather than in vitro or in vivo animal studies that showcases the growing and broad impact of biophotonics therapies. The similarities and differences between two distinct forms of low-dose biophotonics treatments namely photodynamic therapy and photobiomodulation therapy are discussed. As evident in this review, a majority of these reports provide promising evidence for their clinical efficacy. However, a lack of adequate technical details, precise biological rationale, and limited outcome measures limits the current utility of these treatments. Future investigations should attempt to address these shortcomings and develop better designed, rigorous, controlled studies to fully harness the tremendous potential of low-dose biophotonics therapies. Bacterial Infections;Biofilms;Endodontics;Humans;Laser Therapy;Learning;Low-Level Light Therapy;Mouth Diseases;Optics and Photonics;Phenotype;Photochemotherapy;Photons

Medication-related osteonecrosis of the jaw: Surgical or non-surgical treatment? Medication-related osteonecrosis of the jaw (MRONJ) is a severe side effect of antiresorptive (bisphosphonates and denosumab) and anti-angiogenic therapy used in the management of oncologic and, less frequently, osteoporotic patients. While there is good international agreement on the diagnostic and staging criteria of MRONJ and the cessation of antiresorptive/anti-angiogenic treatments, the gold standard of treatment is still controversial, in particular between non-surgical and surgical approaches. The former usually includes antiseptic mouth rinse, cyclic antibiotic therapy, low-level laser therapy and periodic dental checks; the latter consists of surgical necrotic bone removal. The purpose of this retrospective study was to describe the therapeutic approaches and outcomes of 131 lesions from 106 MRONJ patients treated at the Policlinic of Bari. Non-surgical treatments were chosen for 24 lesions that occurred in 21 patients who, due to comorbidities and/or the impossibility of stopping oncologic therapies, could not undergo surgical treatment. As to the outcome, all the surgically treated lesions (107) showed complete healing, with the exception of 13.5% of the lesions, all of which were stage III, which did not completely heal but showed reduction to stage I. The 24 non-surgically treated lesions never completely healed and, rather, generally remained stable. Only two cases exhibited a reduction in staging. Based on our observations, MRONJ occurring both in neoplastic and non-neoplastic patients benefits more from a surgical treatment approach, whenever deemed possible, as non-surgical treatments do not seem to allow complete healing of the lesions. Bone Density Conservation Agents;Diphosphonates;Denosumab Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Denosumab;Diphosphonates;Female;Humans;Male;Treatment Outcome

Ultrasound plus low-level laser therapy for knee osteoarthritis rehabilitation: a randomized, placebo-controlled trial. This study evaluated the synergistic effects of ultrasound (US) and low-level laser therapy (LLLT) with or without therapeutic exercises (TE) in women with knee osteoarthritis. Forty-two Caucasian women with knee osteoarthritis were allocated into three groups: (1) the placebo group who did not perform TE, but the prototype without emitting light or ultrasonic waves was applied, (2) the USâ€‰+â€‰LLLT group in which only the prototype was applied and (3) the TEâ€‰+â€‰USâ€‰+â€‰LLLT group that performed TE before the prototype was applied. However, 35 women completed the full clinical trial. Pressure pain thresholds (PPT) using an algometer and functional performance during the sit-to-stand test were carried out. The average PPT levels increased for USâ€‰+â€‰LLLT (41â€‰Â±â€‰9 to 54â€‰Â±â€‰15Â N, pâ€‰<â€‰0.01) and TEâ€‰+â€‰USâ€‰+â€‰LLLT (32â€‰Â±â€‰8 to 45â€‰Â±â€‰9Â N, pâ€‰<â€‰0.01) groups. The number of sit-to-stands was significantly higher for all groups. However, the change between pre-treatment and post-treatment (delta value) was greater for the USâ€‰+â€‰LLLT (4â€‰Â±â€‰1) and TEâ€‰+â€‰USâ€‰+â€‰LLLT groups (5â€‰Â±â€‰1) than for the placebo group (2â€‰Â±â€‰1) with a significant intergroup difference (pâ€‰<â€‰0.05). This study showed reduced pain and increased physical functionality after 3Â months of USâ€‰+â€‰LLLT with and without TE. Aged;Arthralgia;Brazil;Combined Modality Therapy;Exercise Therapy;Female;Humans;Knee Joint;Low-Level Light Therapy;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Recovery of Function;Time Factors;Treatment Outcome;Ultrasonic Therapy

Quercetin and low level laser therapy promote wound healing process in diabetic rats via structural reorganization and modulatory effects on inflammation and oxidative stress. This study aimed to evaluate the effect of quercetin and the photo-stimulatory effect of low energy 632.8â€¯nm laser irradiation on excisional wound healing in non-diabetic and diabetic rats. Streptozotocin (45â€¯mg/kg body weight) was intraperitoneally applied for diabetes induction. A full-thickness skin wound (2â€¯Ã—â€¯2â€¯cm(2)) was aseptically created with a scalpel in non-diabetic and diabetic rats on the shaved back of the animals. The wounded non-diabetic and diabetic rats were treated every other

day with quercetin by oral gavage at dose 25â€¯mg/kg body weight and/or with low level laser therapy (LLLT) for 14 days. The wound closure percent calculated during the course of the experiment at days 1, 7 and 14 was remarkably increased as a result of treatment of non-diabetic and diabetic wounded rats with quercetin and LLLT; the treatment with both was the most potent. The elevated blood glucose and the lowered serum insulin levels were significantly improved in diabetic wounded rats treated with quercetin and LLLT as compared to the diabetic wounded control. The histological findings indicated that the wounded skin showed a marked increase in collagen fibers which become well oriented in sub-epidermal tissue, intact epidermis and presence of hyperplasia covering well-developed granulation tissue in the wounded rats treated with quercetin and LLLT as compared to the corresponding wounded control. The elevated levels of serum pro-inflammatory cytokines, IL-1Î² and TNF-Î±, as well as PGE-2 and LTB-4 were decreased in non-diabetic and diabetic wounded rats with quercetin and LLLT while the lowered level of serum anti-inflammatory cytokine, IL-10, was increased. The augmented oxidative stress represented by increased serum lipid peroxides level was decreased and the serum level of non-enzymatic anti-oxidant glutathione was increased as a result of treatment with quercetin and LLLT. Thus, it can be suggested that the improvements in glycemic state, cytokines involved in inflammation and antioxidant defense system as well as structural reorganization after treatment with quercetin and LLLT may play pivotal roles in promoting the wound healing process. The study also concluded that the treatment with quercetin in association with LLLT was better in improving wound healing in non-diabetic and diabetic rats than the use of either of each. Antioxidants;Inflammation Mediators;Quercetin Animals;Antioxidants;Combined Modality Therapy;Diabetes Mellitus, Experimental;Inflammation;Inflammation Mediators;Low-Level Light Therapy;Male;Oxidative Stress;Quercetin;Rats;Wound Healing

Red light accelerates the formation of a human dermal equivalent. Development of biomaterials' substitutes and/or equivalents to mimic normal tissue is a current challenge in tissue engineering. Thus, three-dimensional cell culture using type I collagen as a polymeric matrix cell support designed to promote cell proliferation and differentiation was employed to create a dermal equivalent in vitro, as well to evaluate the photobiomodulation using red light. Polymeric matrix cell support was prepared from porcine serous collagen (1.1%) hydrolyzed for 96 h. The biomaterial exhibited porosity of 95%, a median pore of 44 Âµm and channels with an average distance between the walls of 78â€‰Â±â€‰14â€‰Âµm. The absorption of culture medium was 95%, and the sponge showed no cytotoxicity to Vero cells, a non-tumor cell line. Additionally, it was observed that irradiation with light at 630â€‰nm (fluency 30â€‰Jâ€‰cm(-2)) leads to the cellular photobiomodulation in both monolayer and human dermal equivalent (three-dimensional cell culture system). It was also verified that the cells cultured in the presence of the polymeric matrix cell support, allows differentiation and extracellular matrix secretion. Therefore, the results showed that the collagen sponge used as polymeric matrix cell support and the photobiomodulation at 630 nm are efficient for the production of a reconstructed human dermal equivalent in vitro. Biocompatible Materials;Collagen Animals;Biocompatible Materials;Cells, Cultured;Chlorocebus aethiops;Collagen;Dermis;Humans;Light;Porosity;Skin, Artificial;Swine;Tissue Engineering;Tissue Scaffolds;Vero Cells

The effects of exercise training associated with low-level laser therapy on biomarkers of adipose tissue transdifferentiation in obese women. Investigations suggest the benefits of low-level laser therapy (LLLT) to improve noninvasive body contouring treatments, inflammation, insulin resistance and to reduce body fat. However, the mechanism for such potential effects in association with exercise training (ET) and possible implications in browning adiposity processes remains unclear. Forty-nine obese women were involved, aged between 20 and 40Â years with a body mass index

(BMI) of 30-40Â kg/m(2). The volunteers were divided into Phototherapy (808Â nm) and SHAM groups. Interventions consisted of exercise training and phototherapy applications post exercise for 4Â months, with three sessions/week. Body composition, lipid profile, insulin resistance, atrial natriuretic peptide (ANP), WNT5 signaling, interleukin-6 (IL-6), and fibroblast growth factor-21 (FGF-21) were measured. Improvements in body mass, BMI, body fat mass, lean mass, visceral fat, waist circumference, insulin, HOMA-IR, total cholesterol, LDL-cholesterol, triglycerides, and ANP in both groups were demonstrated. Only the Phototherapy group showed a reduction in interleukin-6 and an increase in WNT5 signaling. In addition, it was possible to observe a higher magnitude change for the fat mass, insulin, HOMA-IR, and FGF-21 variables in the Phototherapy group. In the present investigation, it was demonstrated that exercise training associated with LLLT promotes an improvement in body composition and inflammatory processes as previously demonstrated. The Phototherapy group especially presented positive modifications of WNT5 signaling, FGF-21, and ANP, possible biomarkers associated with browning adiposity processes. This suggests that this kind of intervention promotes results applicable in clinical practice to control obesity and related comorbidities. Biomarkers;Insulin;Wnt-5a Protein Adipose Tissue;Adult;Biomarkers;Body Mass Index;Cell Transdifferentiation;Exercise;Female;Humans;Inflammation;Insulin;Insulin Resistance;Intra-Abdominal Fat;Low-Level Light Therapy;Obesity;Phototherapy;Signal Transduction;Wnt-5a Protein;Young Adult

Photonic technology for the treatments of venous and arterial ulcers: Case report. In this report, we report a case study on a 50-year-old male patient with different chronic wounds, such as venous ulcer and arterial ulcer in both legs. These wounds have persisted for more than 10 years, despite the different treatments applied, including, different dressings, hyperbaric camera, as well as the used of several medicines of oral and topical application. The case is addressed with the aim to evaluate if treatment that uses combined techniques such as low level laser therapy (LLLT), photodynamic therapy and cellulose membrane is able to improve healing and reduction of time of treatment in those types of chronic wounds. The results show the clinical protocol is effective for the healing of arterial and venous ulcers and can be considered as a promising possibility. Chronic Disease;Combined Modality Therapy;Humans;Leg Ulcer;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Wound Healing

Guide for health professionals addressing oral care for individuals in oncological treatment based on scientific evidence. OBJECTIVE: Oncological treatment can cause changes in the oral cavity compromising oral functions. The aim of the study was, based on a systematic review, to draft a guide directed at the team of health professionals involved in the oral care of oncological patients. METHODS: A systematic search of the literature was performed for articles published between 2000 and April 2017. Searches were made of electronic databases and hand search. The inclusion criteria were systematic reviews of randomized clinical trials (RCTs) and RCTs published in English, involving pediatric and adult oncological patients and focused on the prevention and treatment of oral complications as well as studies addressing the maintenance of oral health. Among the 1237 studies identified, 129 were pre-selected and 54 were selected to form the basis for the clinical guide. RESULTS: The studies analyzed stress the need for oral assessments as well as preventive and curative actions prior to oncological treatment. To minimize the severity of oral problems, the studies emphasize daily oral care, the treatment of xerostomia with saliva substitute and hydration, and low-level laser therapy, nystatin, acyclovir, respectively, for the prevention and treatment of oral mucositis, oral candidiasis, and infection by herpes simplex virus. Thus, the guide produced addresses oral assessments and professional and home care before, during, and after oncological treatment. CONCLUSION: The guide drafted has the function of assisting health professionals involved in the oral

care of patients with cancer, enabling the prevention or treatment of oral complications stemming from oncological treatment. Adult;Health Personnel;Humans;Neoplasms;Oral Health
Treatment of multiple eccrine hidrocystoma with oral isotretinoin following erbium-yttrium aluminum garnet laser. Eccrine hidrocystomes (EH) are benign cystic tumors of dermal eccrine ducts. There is still no gold standard treatment option for EH because of the large number of lesions, the risk of cicatrization and the different treatment options offered. We offer combined oral isotretinoin and following erbium-yttrium aluminum garnet laser treatment as an alternative treatment option in difficult patients with EH. Dermatologic Agents;Isotretinoin Combined Modality Therapy;Dermatologic Agents;Hidrocystoma;Humans;Isotretinoin;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged
Activation of Wnt/Î²-catenin signaling is involved in hair growth-promoting effect of 655-nm red light and LED in in vitro culture model. Activation of the Wnt/Î²-catenin signaling pathway plays an important role in hair follicle morphogenesis and hair growth. Recently, low-level laser therapy (LLLT) was evaluated for stimulating hair growth in numerous clinical studies, in which 655-nm red light was found to be most effective and practical for stimulating hair growth. We evaluated whether 655-nm red light + light-emitting diode (LED) could promote human hair growth by activating Wnt/Î²-catenin signaling. An in vitro culture of human hair follicles (HFs) was irradiated with different intensities of 655-nm red light + LED, 21Â h7 (an inhibitor of Î²-catenin), or both. Immunofluorescence staining was performed to assess the expression of Î²-catenin, GSK3Î², p-GSK3Î², and Lef1 in the Wnt/Î²-catenin signaling. The 655-nm red light + LED not only enhanced hair shaft elongation, but also reduced catagen transition in human hair follicle organ culture, with the greatest effectiveness observed at 5Â min (0.839Â J/cm(2)). Additionally, 655-nm red light + LED enhanced the expression of Î²-catenin, p-GSK3Î², and Lef1, signaling molecules of the Wnt/Î²-catenin pathway, in the hair matrix. Activation of Wnt/Î²-catenin signaling is involved in hair growth-promoting effect of 655-nm red light and LED in vitro and therefore may serve as an alternative therapeutic option for alopecia. Adult;Animals;Hair;Hair Follicle;Humans;Light;Models, Biological;Organ Culture Techniques;Wnt Signaling Pathway
Acute Effects of Low-Level Laser Therapy on Patients' Functional Capacity in the Postoperative Period of Coronary Artery Bypass Graft Surgery: A Randomized, Crossover, Placebo-Controlled Trial. OBJECTIVE: The aim of this study was to evaluate the acute effects of low-level laser therapy (LLLT) on the functional capacity to exercise tested by incremental shuttle walking test (ISWT) after coronary artery bypass graft (CABG) surgery. METHODS: Fifteen male patients (60â€‰Â±â€‰9 years) were crossed over during the experiment, to compare the outcomes after active LLLT and placebo LLLT treatments. LLLT (850â€‰nm, 200â€‰mW, 30â€‰J to each point, resulting in a total of 240â€‰J per quadriceps muscle), using a multidiode cluster (five spots; 6â€‰J/spot) in eight points per leg was performed 3â€‰min before the ISWT. We analyzed distance walked, Borg scale of perceived exertion, heart rate, and brachial arterial blood pressure. Markers of tissue damage [lactate dehydrogenase (LDH)] and oxidative stress [lipid peroxidation, total thiol levels, and antioxidant enzyme activity of superoxide dismutase (SOD) and catalase (CAT)] were also measured in peripheral blood. RESULTS: Comparison of the distances walked revealed no significant differences between the LLLT and placebo LLLT groups (pâ€‰=â€‰0.779). Regarding the Borg scale (pâ€‰=â€‰0.567), heart rate (pâ€‰=â€‰0.506) as well as systolic and diastolic blood pressure (pâ€‰=â€‰0.164 and pâ€‰=â€‰0.140, respectively), no differences were observed between LLLT and placebo LLLT groups. Application of LLLT was not able to change levels of LDH (pâ€‰=â€‰0.214), oxidative lipid damage (pâ€‰=â€‰0.733), total thiol levels (pâ€‰=â€‰0.925), SOD (pâ€‰=â€‰0.202), and CAT (pâ€‰=â€‰0.825) enzyme activities. CONCLUSIONS: Acute LLLT improved neither functional capacity to exercise nor the markers of oxidation after CABG. TRIAL REGISTRATION: Registered as a

clinical trial (NCT02688426). Aged;Coronary Artery Bypass;Coronary Artery Disease;Cross-Over Studies;Exercise Test;Exercise Tolerance;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Quadriceps Muscle;Recovery of Function

Infrared Laser Improves Collagen Organization in Muscle and Tendon Tissue During the Process of Compensatory Overload. BACKGROUND: The photobiomodulation using the low-level laser therapy (LLLT) exerts a positive modulating effect on the synthesis of collagen in skeletal muscles and tendons. However, few studies have addressed this effect during the compensatory overload. OBJECTIVE: Evaluate the effect of infrared laser on the deposition and organization of collagen fibers in muscle and tendon tissue during compensatory overload of the plantar muscle in rats. MATERIALS AND METHODS: Wistar rats were submitted to bilateral ablation of the synergist muscles of the hind paws and divided in groups: Control, Hypertrophy, and Hypertrophy (H)+LLLT (780â€‰nm, 40â€‰mW, 9.6â€‰J/cm(2) and 10â€‰s/point, 8 points, total energy 3.2â€‰J, daily), evaluated at 7 and 14 days. Muscle cuts were stained with Picrosirius-Red and hematoxylin-eosin and tendon cuts were submitted to birefringence for determination of collagen distribution and organization. RESULTS: After 7 days an increase was observed in the area between beam muscles in H+LLLT (25.45%â€‰Â±â€‰2.56) in comparison to H (20.3%â€‰Â±â€‰3.31), in mature fibers and fibrilis in H+LLLT (29346.88â€‰Î¼m(2)â€‰Â±â€‰2182.56; 47602.8â€‰Î¼m(2)â€‰Â±â€‰2201.86 respectively) in comparison to H (26656.5â€‰Î¼m(2)â€‰Â±â€‰1880.46; 45630.34â€‰Î¼m(2)â€‰Â±â€‰2805.82 respectively) and in the collagen area in H+LLLT (2.25%â€‰Â±â€‰0.19) in comparison to H (2.0%â€‰Â±â€‰0.15). However, after 14 days a reduction was observed in the area between beam muscles in H+LLLT (13.88%â€‰Â±â€‰2.54) in comparison to H (19.1%â€‰Â±â€‰2.61), in fibrils and mature fibers in H+LLLT (17174.1â€‰Î¼m(2)â€‰Â±â€‰2563.82; 32634.04â€‰Î¼m(2)â€‰Â±â€‰1689.38 respectively) in comparison to H (55249.86â€‰Î¼m(2)â€‰Â±â€‰1992.65; 44318.36â€‰Î¼m(2)â€‰Â±â€‰1759.57) and in the collagen area in H+LLLT (1.76%â€‰Â±â€‰0.16) in comparison to H (2.09â€‰Â±â€‰0.27). A greater organization of collagen fibers in the tendon was observed after 7 and 14 days in H+LLLT groups. CONCLUSIONS: Infrared laser irradiation induces an improvement in collagen organization in tendons and a reduction in the total area of collagen in muscles during compensatory atrophy following the ablation of synergist muscles. Collagen Animals;Collagen;Disease Models, Animal;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Tendons;Wound Healing

Photobiomodulation and Cancer: What Is the Truth? BACKGROUND: Photobiomodulation (PBM) therapy is a rapidly growing approach to stimulate healing, reduce pain, increase athletic performance, and improve general wellness. OBJECTIVE: Applying PBM therapy over the site of a tumor has been considered to be a contraindication. However, since another growing use of PBM therapy is to mitigate the side effects of cancer therapy, this short review seeks to critically examine the evidence of whether PBM therapy is beneficial or harmful in cancer patients. MATERIALS AND METHODS: PubMed and Google Scholar were searched. RESULTS: Although there are a few articles suggesting that PBM therapy can be detrimental in animal models of tumors, there are also many articles that suggest the opposite and that light can directly damage the tumor, can potentiate other cancer therapies, and can stimulate the host immune system. Moreover, there are two clinical trials showing increased survival in cancer patients who received PBM therapy. CONCLUSIONS: PBM therapy may have benefits in cancer patients and should be further investigated. Animals;Disease Models, Animal;Forecasting;Humans;Low-Level Light Therapy;Neoplasms;Radiation Dosage;Rats;Risk Assessment;Survival Analysis;Treatment Outcome

Determination of Optimum Operation Parameters for Low-Intensity Pulsed Ultrasound and Low-Level Laser Based Treatment to Induce Proliferation of Osteoblast and Fibroblast Cells. OBJECTIVE: The

aim of this study was to determine the optimum operating parameters (pulse duration, energy levels, and application time) to promote induction of osteoblast and fibroblast cell proliferation and to maintain cell viability treated with low-intensity pulsed ultrasound (LIPUS) and low-level laser therapy (LLLT). BACKGROUND DATA: The positive effects of LIPUS and LLLT on cellular activity have been reported in recent years. Comparisons between experimental parameters of previous studies are difficult because scientific studies reported frequencies and the duty cycles of LIPUS and wavelengths and doses of LLLT in a wide range of parameters. However, optimum amount of energy and optimum time exposure must be determined to induce bone and tissue cell proliferation for effective healing process and to avoid cell damage. MATERIAL AND METHODS: Fibroblast and osteoblast cell cultures were irradiated with LIPUS (10-50% pulse and continuous mode at 1 and 3â€‰MHz for 1, 3, and 5â€‰min) and LLLT (4, 8, and 16â€‰J at 50, 100, 200, 300, 400, and 500â€‰mW). Cell cultures were analyzed using XTT assay. RESULTS: For both cell types, LIPUS treatment with 10% pulse (1:9 duty cycle), 3â€‰MHz, and for 1â€‰min and LLLT treatment over 100â€‰mV for 4, 8, and 16â€‰J modalities contributed to the growth, and may help bone repair and tissue healing process optimally. CONCLUSIONS: Bio-stimulating effects of LLLT irradiation promote proliferation and maintain cell viability better than LIPUS treatment without causing thermal response for both cell types, and the therapeutic modality above 200â€‰mV has maximum effectiveness. Animals;Cell Proliferation;Cell Survival;Cells, Cultured;Fibroblasts;Low-Level Light Therapy;Mice;Osteoblasts;Radiation Dosage;Sensitivity and Specificity;Ultrasonic Therapy;Ultrasonic Waves

[Morphological evaluation of singlet phototherapy in the treatment of periodontal diseases in an experimental study]. The aim of the study was to compare the effectiveness of laser singlet phototherapy and traditional photodynamic therapy the treatment of periodontal diseases in an animal model. The experimental model involved 70 male rats Wistar in which periodontitis was modeled and treated: in group I (30 animals) a nanosecond laser device for medical use with a wavelength of 1270 nm was used for 7 sessions in a 400 ns pulse mode, an average radiation power of 2 W, and a radiation density of 200 J/cm(2), group II (30 animals) received photodynamic therapy with the administration of a photosensitizer, followed by irradiation with a laser wavelength of 660 nm for 7 sessions 2 Wt average radiation power, group III (controls, 10 animals) - traditional drug therapy. Morphological studies were performed on 7, 14 and 21 day after treatment. On day 7th and 14th the study revealed In group I the presence of full blood vessels and diffuse expressed leukocyte infiltration with an admixture of macrophages, in group II - pronounced edema of the tissue and vasoconstriction. On day 21 the picture included in group I regenerated periodontal ligament with dilated full blood vessels on the border with the bone beams of the alveolar bone, in group II a moderately pronounced edema of the periodontal ligament with single dilated vessels, in controls significantly destroyed periodontal ligament substituted with granulation tissue and periodontal ligament. Thus, the treatment of periodontitis with the methods of singlet phototherapy leads to the development of reactive inflammation and significant vascularization of periodontal tissues which contributes to the rapid regeneration and stability of remission. Photosensitizing Agents;Singlet Oxygen Animals;Disease Models, Animal;Low-Level Light Therapy;Male;Periodontal Ligament;Periodontitis;Photochemotherapy;Photosensitizing Agents;Rats;Rats, Wistar;Regeneration;Singlet Oxygen

Efficiency of Lasers and a Desensitizer Agent on Dentin Hypersensitivity Treatment: A Clinical Study. AIM: The aim of this clinical study was to determine and compare the efficiency of the glutaraldehyde-containing agent (GCA), Nd:YAG, Er,Cr:YSGG lasers, and the combination of them on the dentin hypersensitivity (DH) treatment. SUBJECTS AND METHODS: This study was performed with the participation of 17 healthy adult patients having 100 teeth with DH; the patients were randomly

divided into five groups according to the treatment protocol: (1) application of GCA on sensitive teeth, (2) Nd:YAG laser (1 W/cm(2), 10 Hz) irradiation on sensitive teeth, (3) application of GCA on sensitive teeth and then Nd:YAG laser irradiation, (4) Er,Cr:YSGG laser (0.25 W/cm(2), 20 Hz) irradiation on sensitive teeth, (5) application of GCA on sensitive teeth and then Er,Cr:YSGG laser irradiation. Sensitivity levels were assessed by the Yeaple probe on the buccal surfaces of the teeth at a force setting of 10 g. Measurements were performed for 30 min, after 7, 90, and 180 days of the therapy to assess the effects of desensitization. The evaluations were analyzed using the one-way analysis of variance and repeated measurement test ($P < 0.05$). RESULTS: After sessions, DH was significantly reduced in all groups at each measurement point. The Er,Cr:YSGG laser with or without GCA application were the most effective ones in DH treatment ($P < 0.05$). Comparison of the treatment regimens demonstrated that the scores achieved with the Yeaple probe were not significantly higher for the Nd:YAG laser groups than the GCA alone group. CONCLUSIONS: This clinical study shows that the Er,Cr:YSGG laser have promising potential for the treatment of DH. Methacrylates;gluma desensitizer;Glutaral Adolescent;Adult;Dentin Sensitivity;Female;Glutaral;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Methacrylates;Middle Aged;Pain Measurement;Young Adult
Promising therapeutic option for cutaneous plasmacytosis: 308-nm excimer lamp. Adrenal Cortex Hormones;IL6 protein, human;Interleukin-6;Photosensitizing Agents;Ficusin Adrenal Cortex Hormones;Aged;Cell Proliferation;Ficusin;Humans;Hyperplasia;Interleukin-6;Japan;Lasers, Excimer;Low-Level Light Therapy;Male;PUVA Therapy;Photosensitizing Agents;Plasma Cells;Skin;Skin Diseases;Treatment Outcome
The long-term effect of pulsed dye laser on Necrobiosis Lipoidica: A case study. A 57-year-old female was presented with an irrepressible case of Necrobiosis Lipoidica considering the possibility of a surgical skin graft. Instead, a pulsed dye laser treatment was used as an alternate treatment. Previous case studies have been found in the literature on the effect of pulsed dye laser on Necrobiosis Lipoidica. The use of a pulsed dye laser in this case resulted in rendering the lesions asymptomatic for pain and a reduction in volume. Prolonged control was exhibited. From this case, we conclude that pulsed dye laser therapy is effective when increasing the number of treatments of laser therapy, and can be used as a treatment for Necrobiosis Lipoidica. Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Necrobiosis Lipoidica
Preconditioning With Low-Level Laser Irradiation Enhances the Therapeutic Potential of Human Adipose-derived Stem Cells in a Mouse Model of Photoaged Skin. This study was conducted to explore the therapeutic potential of human adipose-derived stem cells (ADSCs) irradiated with a low-level laser (LLL). Cultured ADSCs were treated with 650-nm GaAlAs laser irradiation at 2, 4 and 8 J cm(-2) . Cell proliferation was quantified by MTT assays, cytokine secretion was determined by enzyme-linked immunosorbent assays, and adipogenic differentiation was examined by oil red O staining. Additionally, the expression profiles of putative ADSC surface markers were analyzed by quantitative real-time PCR. In addition, a mouse photoaged skin model was established by UVB irradiation. Effects of GaAlAs laser-treated ADSCs on the thicknesses of the epidermis and dermis were analyzed by hematoxylin and eosin staining. The results showed that GaAlAs laser treatment of cells at a radiant exposure of 4 J cm(-2) enhanced ADSC proliferation and adipogenic differentiation and increased secretion of growth factors. Furthermore, GaAlAs laser irradiation upregulated the expression of putative ADSC surface markers. In the mouse model of photoaged skin, ADSCs treated with GaAlAs laser irradiation had markedly decreased the epidermal thickness and increased the dermal thickness of photoaged mouse skin. Our data indicate that LLL irradiation is an effective biostimulator of ADSCs and might enhance the therapeutic potential of ADSCs for clinical use. Biomarkers;Cytokines Adult;Animals;Biomarkers;Cell Differentiation;Cell Proliferation;Cells,

Cultured;Combined Modality Therapy;Cytokines;Female;Flow Cytometry;Gene Expression;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Nude;Middle Aged;Models, Animal;Skin Aging;Young Adult

Improved Wound Remodeling Correlates with Modulated TGF-beta Expression in Skin Diabetic Wounds Following Combined Red and Infrared Photobiomodulation Treatments. Diabetic wounds are a major cause of morbidity among patients with poorly controlled blood glucose levels. Conventional empirical wound care strategies have shown limited efficacy, and there is an urgent need to develop novel therapeutic strategies. Photobiomodulation treatments have shown positive therapeutic effects in several cell culture and animal models. In this study, we examined wound healing in diabetic rats following treatments with two laser wavelengths, namely red (660 nm) and infrared (808 nm) individually and in combination as compared to routine wound dressings. Immunostaining for TGF-Î² expression was performed at various times postwounding. We noted that the combination of red and infrared laser treatments correlated with decreased TGF-Î²1 levels at late stages in healing. There was no statistical significance with any treatments at an earlier time point. This study emphasizes the role of appropriate laser treatment protocols in modulating wound healing and remodeling responses. Tgfb1 protein, rat;Transforming Growth Factor beta1;Streptozocin Animals;Bandages;Diabetes Mellitus, Experimental;Immunohistochemistry;Low-Level Light Therapy;Male;Mouth Diseases;Mouth Mucosa;Rats, Wistar;Streptozocin;Transforming Growth Factor beta1;Treatment Outcome;Wound Healing

Pulsed dye laser versus intense pulsed light in melasma: a split-face comparative study. BACKGROUND: Recent reports suggest that melasma may have a vascular component. Vascular targeting lasers and light treatment can be a therapeutic option that will provide benefits to the patients. OBJECTIVES: To compare the efficacy and tolerability of pulsed dye laser (PDL) and intense pulsed light in treatment of melasma. PATIENTS AND METHODS: Twenty-eight Egyptian female patients with melasma were treated with PDL on the right hemiface (Group A) and with the intense pulsed light on the left hemiface (Group B). Clinical assessment was performed according to the hemifacial modified Melasma Area and Severity Index score (mMASI). Tissue biopsies were taken from patients for immunohistochemical staining with vascular endothelial growth factor (VEGF) antibody. RESULTS: The hemifacial mMASI score was significantly reduced after treatment in studied groups with no statistically significant difference. Intense pulsed light (IPL) group showed higher efficacy of treatment than PDL group in the epidermal melasma and in melasma lesions which had a vascular component. The expression level and intensity score of VEGF were significantly reduced after treatment in both groups. CONCLUSIONS: Both PDL and IPL were effective and safe treatment modalities for lightening of melasma. VEGF can be proved as a possible mechanism underlying the action of both PDL and IPL on melasma. Vascular Endothelial Growth Factor A Adult;Epidermis;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Melanosis;Middle Aged;Severity of Illness Index;Treatment Outcome;Vascular Endothelial Growth Factor A

Photobiomodulation (PBM) therapy at 904Â nm mitigates effects of exercise-induced skeletal muscle fatigue in young women. Muscle fatigue is a process influenced by several mechanisms such as concentration of metabolic substrates, changes in blood flow, and increases in reactive oxygen species that impair contractile muscle function. In this context, photobiomodulation has been investigated for preventing muscle fatigue, with reports of positive effects on muscle performance. This study aimed to investigate the effects of 904-nm LASER photobiomodulation on rectus femoris muscle performance in young women. Eighteen young women participated in a randomized, participant and assessor-blinded crossover trial with placebo control. Active LASER (904Â nm, 60Â mW, 250Â Hz, 3.6Â J per diode, total dose of 129.6Â J) intervention was applied prior to an

isokinetic fatigue protocol consisting of a set of 60 concentric quadricep contractions at a constant dynamometer angular velocity of 180Â°/s. Compared to placebo, LASER photobiomodulation significantly reduced muscle fatigue across a range of indicators including reduced ratings of perceived exertion (Pâ€‰=â€‰0.0139), and increased electromyographic fatigue index (EFI) (Pâ€‰=â€‰0.005). The isokinetic dynamometer performance analysis demonstrated that LASER photobiomodulation increased peak torque (Pâ€‰=â€‰0.04), time to peak torque (Pâ€‰=â€‰0.042), total work (Pâ€‰=â€‰0.032), average power (Pâ€‰=â€‰0.0007), and average peak torque (Pâ€‰=â€‰0.019) between both experimental conditions. No significant difference was observed for work fatigue index (Pâ€‰=â€‰0.29) or for lactate concentration (Pâ€‰>â€‰0.05). Photobiomodulation at 904Â nm was effective in reducing fatigue levels and increasing muscle performance in young active women but had no effect on lactate levels. Lactic Acid Adult;Cross-Over Studies;Double-Blind Method;Electromyography;Exercise;Female;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle Strength Dynamometer;Muscle, Skeletal;Torque;Young Adult

The short-term effectiveness of low-level laser, phonophoresis, and iontophoresis in patients with lateral epicondylosis. STUDY DESIGN: Randomized parallel group trial. INTRODUCTION: Various treatment options for lateral epicondylosis have been reported in the literature. PURPOSE OF STUDY: We aimed to compare the effectiveness of low-level laser therapy (LLLT), phonophoresis, and iontophoresis in terms of pain, function, and grip strength. METHODS: This study that comprised 37 patients with lateral epicondylosis was planned as a prospective randomized parallel group trial. Twelve participants were randomized to the LLLT group, 12 to the phonophoresis group, and 13 to the iontophoresis group. The Visual Analog Scale (VAS), pressure algometer, the Patient-Rated Tennis Elbow Evaluation, and grip strength dynamometer were used to measure outcomes. The measurements were performed at baseline and at the end of 15 sessions. RESULTS: Investigation of the pain scores revealed that all VAS scores were improved in both the laser and iontophoresis groups (VAS at rest: PÂ =Â .015, effect size (ES)Â =Â 1.49 and PÂ =Â .016, ESÂ =Â 0.58, respectively; VAS during activity: PÂ =Â .008, ESÂ =Â 1.05 and PÂ =Â .008, ESÂ =Â 1.16, respectively; VAS at night: PÂ =Â .013, ESÂ =Â 1.01 and PÂ =Â .016, ESÂ =Â 0.72, respectively). Only advance in function and grip strength was associated with the iontophoresis group (Patient-Rated Tennis Elbow Evaluation PÂ =Â .006, ESÂ =Â 0.78; grip strength with elbow extension PÂ =Â .011, ESÂ =Â 1.03; with elbow flexion PÂ =Â .003, ESÂ =Â 0.52). DISCUSSION: The most effective approach could not be highlighted among the existing studies in the literature as they were applied in combination with other therapies. CONCLUSION: In our study, we observed that LLLT provides a benefit only for pain, whereas iontophoresis is beneficial for both pain and function. If the effect size is evaluated, LLLT is more influential than iontophoresis for decreasing pain. However, when we compared phonophoresis and iontophoresis in terms of effectiveness, we found that iontophoresis has better effects for pain, function, and grip strength. Adult;Female;Hand Strength;Humans;Iontophoresis;Low-Level Light Therapy;Male;Middle Aged;Phonophoresis;Prospective Studies;Tennis Elbow;Visual Analog Scale

Successful treatment of Schamberg's disease with fractional non-ablative 1540 nm erbium:glass laser. Schamberg's disease is one of the pigmented purpuric dermatoses (PPD). PPD encompass a large and heterogeneous group of dermatologic disorders featuring purpuric lesions often located on the lower limbs. The various forms of PPD are notoriously known to be resistant to treatment. Fractional photothermolysis has been described as a successful and safe method to induce dermal remodeling. We report three patients with Schamberg's disease who were successfully treated with 4 monthly sessions of fractional non-ablative 1540Â nm erbium:glass laser, with resolution of their purpuric

pigmented rash lasting up to 9Â months after the last treatment session. Adult;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders

Fractional non-ablative laser-assisted drug delivery leads to improvement in male and female pattern hair loss. Androgenetic alopecia, also known as male and female pattern hair loss, is a very prevalent condition; however, approved therapeutic options are limited. Fractionated laser has been proposed to assist in penetration of topical medications to the cutaneous tissue. We present four cases of androgenetic alopecia that underwent treatment with a non-ablative erbium glass fractional laser followed by the application of topical finasteride 0,05% and growth factors including basic fibroblast growth factor, insulin-like growth factor, vascular endothelial growth factor, and copper peptide 1%. During all laser treatment sessions, eight passes were performed, at 7 mJ, 3-9% of coverage and density of 120 mzt/cm(2). A positive response was observed in all of the four patients. Photographs taken 2 weeks after the last session showed improvement in hair regrowth and density. No significant side effects were observed. 5-alpha Reductase Inhibitors;Intercellular Signaling Peptides and Proteins;Finasteride 5-alpha Reductase Inhibitors;Adult;Aged;Alopecia;Combined Modality Therapy;Female;Finasteride;Humans;Intercellular Signaling Peptides and Proteins;Lasers, Solid-State;Low-Level Light Therapy;Male

All done procedure by laser in free gingival graft treatment: A case series study. AIM: This case series study evaluated the application of Er;Cr:YSGG laser for a free gingival graft procedure and the effect of low level laser therapy on post surgical pain and wound healing. CASES: 6 cases with mucogingival problems needing free gingival grafts were selected. First, the recipient site was anesthetized and de-epithelialization was done with a Er;Cr:YSGG laser. After tracing the palatal donor site with the laser, the graft was harvested. For root modification of the recipient tooth, conditioning of the dentin was done by the same laser. The inner side of graft was trimmed by the laser before suturing at the recipient site. After final adaptation of the grafts and suturing process, the recipient and donor sites were irradiated by therapeutic laser for reduction of post surgical complications. RESULTS: All patients reported the reduction in pain level after day 2 on donor and recipient site. Also, the wound healing was achieved after 14Â days in all cases in donor site. CONCLUSION: According to high surface absorbance, better incision, coagulation and application on both soft and hard tissues, Er;Cr:YSGG laser can be safe, minimally invasive manner and useful for all steps of the free gingival graft procedure. Adult;Cosmetic Techniques;Female;Gingiva;Gingivoplasty;Humans;Lasers, Solid-State;Male;Surgical Flaps

Treatment of striae distensae: An evidence-based approach. Striae distensae (SD), otherwise known as "stretchmarks," are a common presenting complaint, particularly in young healthy women. SD are hypothesized to form in a patient when the cross-linked collagen is "overstretched" and rupture of this collagen matrix causes the striae. Thus, many treatments work by increasing collagen synthesis. This review critically appraises the evidence to date for the treatment of SD, including both energy-based devices and topical treatments. Keratolytic Agents;Tretinoin Dermabrasion;Evidence-Based Medicine;Female;Humans;Keratolytic Agents;Low-Level Light Therapy;Phototherapy;Striae Distensae;Tretinoin

Effects of 915Â nm laser irradiation on human osteoblasts: a preliminary in vitro study. Photobiomodulation (PBM) is a non-invasive treatment that uses laser or led devices making its effects a response to light and not to heat. The possibility of accelerating dental implant osteointegration and orthodontic movements and the need to treat refractory bone lesions, such as bisphosphonate related osteonecrosis of the jaws, has led researchers to consider the effects of PBM on bone for dentistry purposes. The aim of our study was to investigate the effects of 915Â nm light supplied with a GaAs diode laser on human osteoblasts in vitro. Osteoblasts were isolated from mandibular cortical bone of a young healthy donor. The irradiation parameters were as follows:

dosesâ€‰=â€‰5, 15 and 45Â J/cm(2); power densitiesâ€‰=â€‰0.12 and 1.25Â W/cm(2); and irradiation timesâ€‰=â€‰41.7, 125 and 375Â s. We performed one irradiation per day for 3 and 6Â days to study proliferation and differentiation, respectively. Microscopic analysis showed a greater amount of bone nodules in samples treated with 5Â J/cm(2) and 0.12Â W/cm(2) compared to controls (56.00â€‰Â±â€‰10.44 vs 19.67â€‰Â±â€‰7.64, Pâ€‰=â€‰0.0075). Cell growth and quantification of calcium deposition did not show any differences when comparing irradiated and non-irradiated samples. Photobiomodulation, with the parameters investigated in the present study, positively modulated the mineralization process in human osteoblasts, inducing the formation of a greater amount of bone nodules, but did not increase cell proliferation. Bone and Bones;Cell Differentiation;Cell Proliferation;Colorimetry;Humans;Lasers;Lasers, Semiconductor;Osteoblasts
Effect of prior application with and without post-injury treatment with low-level laser on the modulation of key proteins in the muscle repair process. The aim of the present study was to evaluate the effects of LLLT prior to muscle injury with and without post-injury irradiation on the expression of isoforms of myosin heavy chain (MyHC), calcineurin (CaN), and myostatin during the repair process. Wistar rats were divided into five groups: control (nâ€‰=â€‰7); injury (nâ€‰=â€‰21); LLLT + injury (nâ€‰=â€‰21); injury + LLLT (nâ€‰=â€‰21), and LLLT + injury + LLLT (nâ€‰=â€‰21). Cryoinjury was performed on the tibialis anterior (TA) muscle. The injured groups were euthanized at 3, 7, and 14Â days after injury. LLLT was performed using an infrared laser (780Â nm) with the following parameters: 10Â J/cm(2), 40Â mW, 10Â s per point, 8 points, and 3.2Â J of total energy. At the end of each period, the TA muscle was removed for the analysis of MyHC, CaN, and myostatin gene expression using real-time PCR. The data were tested statistically by Kruskal-Wallis with Dunn's post hoc test (pâ€‰<â€‰0.05). The results demonstrated that prior irradiation reduced the mRNA expression of all proteins at 3Â days. Post irradiation reduced the mRNA expression of MyHC-1, MyHC-2a, MyHC-2b, and CaN at 7Â days. Prior irradiation combined with post-injury irradiation reduced the mRNA expression of MyHC-2x and CaN at 14Â days and increased the mRNA expression of myostatin in the same period. In conclusion, different protocols of photobiomodulation can modulate the expression of the different isoforms of MyHC, CaN, and myostatin during the repair process. It is noteworthy that the combination of the prior and post-injury irradiation was the protocol that most promoted changes in the final phase of the repair process. Muscle Proteins;RNA, Messenger Animals;Gene Expression Regulation;Low-Level Light Therapy;Male;Muscle Proteins;Muscle, Skeletal;RNA, Messenger;Rats, Wistar;Regeneration;Wound Healing
Beneficial Role of Low-Intensity Laser Irradiation on Neural Î²-tubulin III Protein Expression in Human Bone Marrow Multipotent Mesenchymal Stromal Cells. The purpose of the present study was to evaluate the neural protein expression pattern of human multipotent mesenchymal stromal cells (hMSCs) treated with forskolin (free-form/FF). The study investigated forskolin's capacity to enhance intracellular levels of cyclic adenosine monophosphate (cAMP) by activating adenylate cyclase and probably by inducing neuron-like cells in vitro. In addition, because nanotechnology is a growing field of tissue engineering, we also assessed the action of a new system called the nanostructured-forskolin (NF) to examine the improvement of drug delivery. Afterwards, the cells were submitted to low-level laser irradiation to evaluate possible photobiostimulatory effects. Investigations using the immunofluorescence by confocal microscopy and Western blot methods revealed the expression of the neuronal marker Î²-tubulin III. Fluorescence intensity quantification analysis using INCell Analyzer System for Î²-tubulin III was used to examine significant differences. The results showed that after low-level laser irradiation exposure, there was a tendency to increase the Î²-tubulin III expression in all groups, as expected in the photobiostimulation process. Notably, this process induced for

irradiation was more pronounced in irradiated nanoforskolin cells (INF) compared to non-irradiated free-forskolin control cells (NFFC). However, there was also an increase in Î²-tubulin III protein expression in the groups: irradiated nanocontrol cells (INC) compared to non-irradiated free-forskolin control cells (NFF) and after treatment with non-irradiated free-forskolin (NFF) and non-irradiated nanoforskolin (NNFC). We concluded that the methods using low-level laser irradiation and/or nanoparticles showed an up-regulation of neural-protein expression in hMSCs that could be used to facilitate cellular therapy protocols in the near future. Tubulin;Vasodilator Agents;Colforsin Bone Marrow Cells;Cell Differentiation;Cells, Cultured;Colforsin;Dose-Response Relationship, Radiation;Humans;Lasers;Mesenchymal Stem Cells;Neurons;Tubulin;Vasodilator Agents

Effect of preoperative ibuprofen in controlling postendodontic pain with and without low-level laser therapy in single visit endodontics: A randomized clinical study. AIM: The aim of this study is to evaluate the effect of low-level laser irradiation and ibuprofen in reducing the onset and severity of postoperative pain following single visit endodontics. MATERIALS AND METHODS: One hundred and twenty patients were recruited for this study. Group A (n = 30) patients were administered 400 mg of ibuprofen orally 1 h before the institution of an endodontic procedure. Group B (n = 30) patients were given irradiation of a low-level laser at 50 Hz for 3 min after the standard endodontic procedure at the periapical region on both buccal and lingual aspect. Group C (n = 30) patients were given preoperative ibuprofen followed with a low-level laser at 50 Hz for 3 min after endodontic treatment. Group D (n = 30) patients were administered no preoperative ibuprofen nor low-level laser irradiation after the endodontic procedure. The patient immediately recorded his/her pain perception on the Heft Parker pain survey after completion of the appointment and at 4, 8, 12, 24, and 48 h postoperatively. Inter group analysis was carried out using the analysis of variances with "least significant difference" post hoc test. For intra group analysis, Student's t-test was used. Chi-square test was applied for nonparametric data. RESULTS: Pain was significantly reduced in all the treatment groups postoperatively. Ibuprofen showed significant pain reduction at 4 h and 8 h period. The combination of low-level laser and ibuprofen showed the best results in terms of postoperative pain reduction. CONCLUSION: This study proved that low-level laser therapy can be an effective alternative for conventional use of nonsteroidal anti-inflammatory drugs in controlling postendodontic pain thereby eliminating the adverse effects of such drugs on the patients. Analgesics, Non-Narcotic;Ibuprofen Adolescent;Adult;Analgesics, Non-Narcotic;Female;Humans;Ibuprofen;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Preoperative Care;Root Canal Therapy;Young Adult

Photobiomodulation improves motor response in patients with spinal cord injury submitted to electromyographic evaluation: randomized clinical trial. Photobiomodulation is a treatment that has been widely used in neurotrauma and neurodegenerative diseases. In the present study, low-level laser therapy was administered to patients with spinal cord injury. Twenty-five individuals were divided into two groups: placebo photobiomodulation plus physiotherapy and active photobiomodulation plus physiotherapy. Electromyographic evaluations were performed before and after 12 sessions of phototherapy as well as 30Â days after the end of treatment. In the active phototherapy group, median frequency values of the brachial biceps and femoral quadriceps muscles were higher at rest and during isotonic contraction 30Â days after photobiomodulation (pâ€‰=â€‰0.0258). No significant results were found regarding the rest and isotonic conditions in the pre-photobiomodulation period (pâ€‰=â€‰0.950) or immediately following photobiomodulation (pâ€‰=â€‰0.262). The data provide evidence that phototherapy improves motor responses in individuals with spinal cord injury, as demonstrated by differences in the EMG signal before and after treatment. TRIAL REGISTRATION: NCT 03031223.

Adult;Electromyography;Female;Humans;Isotonic Contraction;Low-Level Light Therapy;Male;Middle Aged;Muscle, Skeletal;Spinal Cord;Spinal Cord Injuries;Treatment Outcome
Modulation of oxidative phosphorylation (OXPHOS) by radiation- induced biophotons. Radiation-induced biophotons are an electromagnetic form of bystander signalling. In human cells, biophoton signalling is capable of eliciting effects in non-irradiated bystander cells. However, the mechanisms by which the biophotons interact and act upon the bystander cells are not clearly understood. Mitochondrial energy production and ROS are known to be involved but the precise interactions are not known. To address this question, we have investigated the effect of biophoton emission upon the function of the complexes of oxidative phosphorylation (OXPHOS). The exposure of bystander HCT116 p53 +/+ cells to biophoton signals emitted from Î²-irradiated HCT116 p53 +/+ cells induced significant modifications in the activity of Complex I (NADH dehydrogenase or NADH:ubiquinone oxidoreductase) such that the activity was severely diminished compared to non-irradiated controls. The enzymatic assay showed that the efficiency of NADH oxidation to NAD+ was severely compromised. It is suspected that this impairment may be linked to the photoabsorption of biophotons in the blue wavelength range (492-455â€¯nm). The photobiomodulation to Complex I was suspected to contribute greatly to the inefficiency of ATP synthase function since it resulted in a lower quantity of H(+) ions to be available for use in the process of chemiosmosis. Other reactions of the ETC were not significantly impacted. Overall, these results provide evidence for a link between biophoton emission and biomodulation of the mitochondrial ATP synthesis process. However, there are many aspects of biological modulation by radiation-induced biophotons which will require further elucidation. HCT116 Cells;Humans;Mitochondria;Oxidation-Reduction;Oxidative Phosphorylation;Radiation Injuries;Radio Waves;Signal Transduction
The influence of different illumination parameters on protoporphyrin IX induced cell death in squamous cell carcinoma cells. BACKGROUND: Topical photodynamic therapy (PDT) is a highly effective therapy especially for extended cancerized fields of the skin. Whenever extended fields are treated pain management is advisable. Light source mediated pain management can be performed by reducing fluence rates, as long as this does not compromise efficacy. METHODS: Two squamous cell carcinoma cell lines (A431 and SCC-13) were subjected to in vitro PDT using two different ALA concentrations and synthesis intervals and protoporphyrin IX (PpIX) synthesis was assessed. Two total light doses (6â€¯J/cm(2) and 37â€¯J/cm(2)) were applied at three different fluence rates and cell viability was measured using the MTS-test. RESULTS: Both cell lines synthetized PpIX at different kinetics. A431 cells produced a maximum 28.6â€¯nmol/l PpIX, while SCC-13 reached only a production of 8.7â€¯nmol/l. Illumination reduced cell viability depending on PpIX content and light dose. When a lower light dose (6â€¯J/cm(2)) was applied, only the combination with the highest PpIX content was effective in A431 cells and no effect could be detected in SCC-13 cells. With a light dose of 37â€¯J/cm(2), lower PpIX amounts became effective in A431 and cell death could be induced in SCC-13 cells. Light fluence rate had no differential effect in this setup. CONCLUSIONS: In both, A431 and SCC-13 cells, total light dose is a key factor for photodynamic efficacy. Additionally, our results hint towards a threshold concentration of PpIX upon which a drastic loss of viability occurs. Light fluence rate in the analyzed range is not a limiting factor of photodynamic cytotoxicity. This may allow for the clinical implementation of low fluence rate protocols for pain management without compromising efficacy. Photosensitizing Agents;Protoporphyrins;Aminolevulinic Acid;protoporphyrin IX Aminolevulinic Acid;Carcinoma, Squamous Cell;Cell Death;Cell Line, Tumor;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Protoporphyrins;Radiation Dosage
Prevention of acute radiodermatitis by photobiomodulation: A randomized, placebo-controlled trial in breast cancer patients (TRANSDERMIS trial). OBJECTIVE: Acute radiodermatitis (RD) is a

distressing and painful skin reaction that occurs in 95% of the patients undergoing radiotherapy (RT). The aim of this study was to evaluate the effectiveness of photobiomodulation therapy (PBMT) in the prevention of acute RD in breast cancer (BC) patients undergoing RT. METHODS: This study was a randomized, placebo-controlled trial including 120 BC patients that underwent an identical RT regimen post-lumpectomy. Patients were randomly assigned to the laser therapy (LT) or placebo group, with 60 patients in each group. Laser or placebo treatments were applied 2 days a week, immediately after the RT session, starting at the first day of RT. PBMT was delivered using a class IV MLS(Â®) M6 laser that combines two synchronized laser diodes in the infrared range (808-905â€‰nm) with a fixed energy density (4â€‰J/cm(2)). Skin reactions were scored based on the criteria of the Radiation Therapy Oncology Group (RTOG) and the Radiation-Induced Skin Reaction Assessment Scale (RISRAS). The patients completed the Skindex-16 questionnaire to evaluate their quality of life. All the measurements were collected at the first day, at a RT dose of 40 Gray (Gy), and at the end of RT (total dose 66â€‰Gy). RESULTS: At a RT dose of 40â€‰Gy, there was no significant difference between the groups in the distribution of RTOG grades. However, at the end of RT the severity of the skin reactions significantly differed between the two groups (Pâ€‰=â€‰0.004), with a larger percentage of patients experiencing RTOG grade 2 or higher (e.g., moist desquamation) in the placebo group (30% vs. 6.7%, for the placebo and laser group, resp.). The objective RISRAS score confirmed these results. In addition, the Skindex-16 and RISRAS subjective score demonstrated that the patients' quality of life was significantly better in the LT than in the control group. CONCLUSIONS: The results of this trial show that PBMT is an effective tool to prevent the development of grade 2 acute RD or higher in BC patients. In addition, it also reduces the patients' symptoms related to RD. Lasers Surg. Med. Â© 2018 Wiley Periodicals, Inc.

Locally advanced oral squamous cell carcinoma patients treated with photobiomodulation for prevention of oral mucositis: retrospective outcomes and safety analyses. PURPOSE: The well-established clinical efficacy of photobiomodulation (PBM) therapy in management of oral mucositis (OM) is leading to increasing use in oncology care. This protection and enhanced repair of damage to mucosal tissue have led to the question of the potential effects of PBM therapy on pre-malignant and malignant cells. The purpose of this study was to examine the outcome of cancer therapy and incidence of tumor recurrence in locally advanced oral squamous cell carcinoma (OSCC) patients treated with PBM therapy for OM. METHODS: A retrospective clinical analysis of 152 advanced OSCC patients treated with prophylactic PBM therapy for radiotherapy-induced OM from January 2009 to December 2014 was conducted. RESULTS: Of the 152 OSCC patients treated with PBM therapy in this study, 19 (12.5%) had stage III and 133 (87.5%) had stage IV tumors. Of these, 52 (34.2%) received initial treatment with surgery followed by adjuvant radiotherapy, 94 (61.8%) with exclusive chemoradiation, and 6 (4%) with induction chemotherapy followed by surgery and radiotherapy. After a mean follow-up of 40.84 (Â±â€‰11.71) months, the overall survival and disease-free survival rates were 46.7 and 51.8%, respectively. Forty-five (29.6%) patients developed local-regional recurrence, 10 (6.57%) patients developed distant relapse, and 19 (12.5%) developed new (second) primary tumors. CONCLUSIONS: Clinicopathological features and survival outcomes in the PBM-treated patients were similar to previously published data for conventional treatments in patients with advanced OSCC. In this study, prophylactic use of PBM therapy did not impact treatment outcomes of the primary cancer, recurrence or new primary tumors, or survival in advanced OSCC patients. Carcinoma, Squamous Cell;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Neoplasms;Retrospective Studies;Stomatitis

A novel cosmetic and clinically practicable laser immunotherapy for facial verruca plana: Intense pulsed light combined with BCG-PSN. BACKGROUND: There is no standard method to remove facial verruca plana and achieve better cosmetic effects. The present study is the first study to use

intense pulsed light (IPL) as photothermal therapy (PTT) combined with intra-gluteal injection of bacillus calmette-guerin polysaccharide nucleic acid (BCG-PSN), which function as immunotherapy, contracting a new type of clinically available laser immunotherapy (LIT) for the treatment of facial verruca plana. The aim of this study was to evaluate the efficacy, cosmetic outcome, and adverse reactions of IPL combined with BCG-PSN for facial verruca plana. METHODS: Twenty-three patients with facial verruca plana were treated with IPL (560-nm filter, 15-17â€¯J/cm(2)) and all patients were given intra-gluteal injections of BCG-PSN twice a week for 8 weeks combined with IPL once a month in two times. The clinical responses, recurrences, adverse reactions, and rejuvenation outcomes were evaluated. RESULTS: A complete and excellent response was noted in 17 patients (74%). Of the 676 treated warts, 548 were eradicated and the overall clearance rate was 81%. No patient relapsed during the 20-week follow-up. No obvious adverse reactions was observed. Almost all patients showed an improvement in skin texture after IPL treatment CONCLUSION: We conclude that a novel LIT based on BCG-PSN and IPL for the treatment of facial verruca plana proved to be a well-tolerated and effective treatment modality. This novel LIT can clear skin lesions and achieve a very good cosmetic effect. Adjuvants, Immunologic;Photosensitizing Agents;Polysaccharides, Bacterial Adjuvants, Immunologic;Adolescent;Adult;Cosmetic Techniques;Face;Female;Humans;Immunomodulation;Low-Level Light Therapy;Male;Middle Aged;Mycobacterium bovis;Photochemotherapy;Photosensitizing Agents;Polysaccharides, Bacterial;Warts;Young Adult

Efficacy of photodynamic therapy or low level laser therapy against steroid therapy in the treatment of erosive-atrophic oral lichen planus. BACKGROUND: The efficacy of photodynamic therapy (PDT) or low level laser therapy (LLLT) in the treatment of oral lichen planus (OLP) is debatable. The aim of this study was to compare the effects of PDT, LLLT or topical corticosteroid application in the treatment of erosive-atrophic OLP. MATERIALS AND METHODS: Forty-five adult patients with erosive-atrophic biopsy-proven OLP on the tongue or buccal mucosa (size â‰¤3â€¯cm) were randomly divided into three groups. Group-1: patients receiving PDT topical application of 50â€¯Î¼l toluidine blue (1â€¯mg/ml) with micropipette and after 10â€¯min treated by laser irradiation using GaAlAs laser (630â€¯nm, 10â€¯mW/cm(2), continuous wave, spot size: 1â€¯cm(2)); Group-2: patients receiving LLLT using diode laser (630â€¯nm, 10â€¯mW, continuous wave, spot size: 1â€¯cm(2)); and Group-3: patients receiving topical corticosteroid applications consisting of dexamethasone (0.5â€¯mg in 5â€¯ml water) mouthwash for 5â€¯min. Demographic data, type, and severity of the lesions and pain were recorded before and after treatment and then at the 1â€¯year follow-up. RESULTS: There was a significant difference in sign score changes before and after the treatment in the PDT group (pâ€¯=â€¯0.03), LLLT group (pâ€¯=â€¯0.04) and in the control group (pâ€¯=â€¯0.02). There was a statistically significant difference between group-1 (pâ€¯=â€¯0.001) and group-2 (pâ€¯=â€¯0.001) against group-3 before and after treatment. Mean amount of improvement in pain was significantly greater in the control group in comparison with the PDT and LLLT groups (pâ€¯<â€¯0.001). The efficacy index of the PDT group improved significantly more than the LLLT (pâ€¯=â€¯0.001) and corticosteroid groups (pâ€¯=â€¯0.001). CONCLUSION: Within the limits of the present RCT, it is indicated that PDT and LLLT are effective in the treatment of erosive-atrophic forms of OLP in adult patients. However, further comparative clinical trials are needed to obtain strong conclusions in this regard. Anti-Inflammatory Agents;Photosensitizing Agents;Tolonium Chloride;Dexamethasone Adult;Aged;Anti-Inflammatory Agents;Dexamethasone;Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Severity of Illness Index;Tolonium Chloride

Indications and Use of Isotretinoin in Facial Plastic Surgery. Isotretinoin is a first generation retinoid with pleiotropic effects on keratinocyte differentiation, proliferation, and activity of sebaceous glands. For years, there has been intense debate on whether the use of isotretinoin combined with cosmetic or surgical procedures is safe and potentially more efficient than either therapy alone. Due to delays in wound healing and keloid formation, conservative recommendations were not to combine isotretinoin with any plastic surgery or local treatment at 6 to 12 months after discontinuation of the drug. However, there is increasing evidence that a combination approach is not only safe, but may also provide excellent cosmetic outcomes in acne scars, sebaceous gland hyperplasia, and thick-skinned patients undergoing facial plastic surgery. In particular, low-dose regimens of isotretinoin may offer advantages over standard dosage treatments because of better tolerability and safety in long-term use adjunct with surgical interventions. In this article, the authors aim to summarize the current evidence on the use of isotretinoin in facial plastic surgery and to share their experience from selected patients. Isotretinoin Acne Vulgaris;Combined Modality Therapy;Esthetics;Female;Humans;Isotretinoin;Low-Level Light Therapy;Male;Rhytidoplasty;Risk Assessment;Surgery, Plastic;Treatment Outcome

Lichen amyloidosis successfully treated with fractional ablative laser CO(2): A new alternative therapeutic. Lichen amyloidosis is a primary localized cutaneous amyloidosis. Different types of treatment have been used without complete resolution. Herein, we report a case of patient suffering from lichen amyloidosis successfully treated with fractional ablative laser CO(2). He was a 59-year-old man diagnosed lichen amyloidosis localized on the legs 10Â years ago. He was treated with topical corticosteroids without any improvement. Then, we started treating the affected area with CO(2) laser (Iimmer*) at a setting of 5-8 J/cm(2) and 8Â mm laser spot size. A considerable improvement was noticed after the first session. A total healing was reported after four sessions. To the best of our knowledge, only 11 reported cases of lichen amyloidosis have been successfully treated with laser CO(2). However, our clinical finding seems to be one of the best reported results. Amyloidosis, Familial;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases, Genetic

Picosecond alexandrite laser is superior to Q-switched Nd:YAG laser in treatment of minocycline-induced hyperpigmentation: A case study and review of the literature. Minocycline is a commonly prescribed tetracycline antibiotic used for the treatment of a number of dermatological conditions including acne and rosacea. Long-term adverse effects of minocycline include cutaneous hyperpigmentation. Various treatment options have been suggested for the treatment of minocycline pigmentation. We report a case of a patient on long-term low-dose minocycline for the treatment of rosacea with type III minocycline hyperpigmentation. A comparison was made between Q-Switch Nd:YAG and picosecond laser over a nine 9-period with treatments spaced 1 month apart, with a clearance in the patient pigmentation after four treatments with picosecond laser. Anti-Bacterial Agents;Minocycline Aged, 80 and over;Anti-Bacterial Agents;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Minocycline

Effect of high-frequency near-infrared diode laser irradiation on periodontal tissues during experimental tooth movement in rats. BACKGROUND AND OBJECTIVES: Tooth movement during orthodontic treatment is associated with bone neoplasticity and bone resorption on the tension and pressure sides. Previous clinical studies have suggested that low-power laser irradiation can accelerate tooth movement during orthodontic treatment, although the underlying mechanism remains unclear. In this study, we used a high-frequency near-infrared diode laser that generates less heat and examined the histologic changes in periodontal tissue during experimental tooth movement with laser irradiation. METHODS: A nickel-titanium closed coil was mounted between the maxillary left side first molar and incisor of rats to model experimental tooth movement. The laser-irradiation

and the control groups were set, and the amount of movement of the first molar on 7th and 14th days after the start of pulling of the first molar tooth on the maxillary left was measured by three-dimensional analysis of ÂμCT. After tooth movement, tissue samples from the mesial and tension sides were collected, and successive horizontal sections were prepared and examined using hematoxylin-eosin and TRAP staining and immunohistochemical staining for RANKL, OPG, ALP, and proliferating cell nuclear antigen (PCNA). Changes in tissue temperature following laser irradiation were also examined. RESULTS: Laser irradiation significantly increased tooth movement compared with non-irradiated controls. Histologic staining of the pressure-side mesial root in laser-irradiated rats revealed enhanced RANKL expression and increased numbers of TRAP-positive cells compared with controls. By contrast, on the tension side, laser irradiation led to increased expression of ALP and PCNA. These data indicate that high-frequency near-infrared diode laser irradiation on the pressure side upregulates RANKL expression and accelerates osteoclast differentiation, facilitating bone resorption, whereas bone formation is induced on the tension side. CONCLUSION: This study demonstrates that high-frequency near-infrared diode laser irradiation of periodontal tissue leads to metabolic activation, which ultimately increases the rate of tooth movement. Lasers Surg. Med. Â© 2018 Wiley Periodicals, Inc.

Effects of myogenic precursor cells (C2C12) transplantation and low-level laser therapy on muscle repair. OBJECTIVE: The aim of the present study was to evaluate the effects of myoblast inoculation in combination with photobiomodulation therapy (PBMT) on skeletal muscle tissue following injury. MATERIALS AND METHODS: Sixty-five Wistar rats were divided into five groups: Control-animals not submitted to any procedure; Injury-cryoinjury of the tibialis anterior muscle; HBSS-animals submitted to cryoinjury and intramuscular Hank's Balanced Salt Solution; Injuryâ€‰+â€‰Cells-animals submitted to cryoinjury, followed by myogenic precursor cells (C2C12) transplantation; Injuryâ€‰+â€‰Cellsâ€‰+â€‰LLLT-animals submitted to cryoinjury, followed by myogenic precursor cells (C2C12) transplantation and PBMT (780â€‰nm, 40â€‰mW, 3.2â€‰J in 8 points). The periods analyzed were 1, 3, and 7 days. The tibialis anterior muscle was harvest for histological analysis, collagen analysis, and immunolabeling of macrophages. RESULTS: No differences were found between the HBSS group and injury group. The Injuryâ€‰+â€‰Cells group exhibited an increase of inflammatory cells and immature fibers as well as a decrease in the number of macrophages on Day 1. The Injuryâ€‰+â€‰Cellsâ€‰+â€‰LLLT group exhibited a decrease in myonecrosis and inflammatory infiltrate at 7 days, but an increase in inflammatory infiltrate at 1 and 3 days as well as an increase in blood vessels at 3 and 7 days, an increase in macrophages at 3 days and better collagen organization at 7 days. CONCLUSION: Cell transplantation combined with PBMT led to an increase in the number of blood vessels, a reduction in myonecrosis and total inflammatory cells as well as better organization of collagen fibers during the skeletal muscle repair process. Lasers Surg. Med. Â© 2018 Wiley Periodicals, Inc.

Adjunct Use of Low-Level Laser Therapy on the Treatment of Necrotizing Ulcerative Gingivitis: A Case Report. Necrotizing ulcerative gingivitis (NUG) is a microbial disease of the gingiva in the context of an impaired host response. This form of gingivitis is relatively rare. NUG is an infection characterized by gingival necrosis presenting as "punched-out" papillae, spontaneous bleeding, pain, oral malodor, and pseudomembrane formation. The primary predisposing factors are bacterial plaque and an inadequate diet, but smoking and psychological stress may also affect the disease severity. NUG is associated with a characteristic bacterial flora, which includes fusiform bacteria, spirochetes, and Prevotella intermedia. Conventional treatment includes control of both the bacterial plaque and the secondary factors, as well as topical or systemic treatment biostimulative effect on wound healing, pain control, and inflammatory processes. Patients with NUG were treated using adjunct use of a diode laser (980 nm) for the control of pain and to accelerate the wound healing at day 2. 3. 5. 9,

energy density was 9 J/cm(2) . After treatment, the patients' quality of life improved faster than with conventional treatment. These results suggest that low-level laser therapy (LLLT) is an effective treatment for the reduction of pain levels and healing times. As a result, our case report shows that LLTT has a positive effect in relieving the symptoms of NUG.

Therapeutic and Analgesic Efficacy of Laser in Conjunction With Pharmaceutical Therapy for Trigeminal Neuralgia. Introduction: Trigeminal neuralgia (TN) is the most common neuralgia in the head and neck region and a common cause of orofacial pain. It is routinely treated with carbamazepine. Laser, acupuncture and radiofrequency are among other treatment modalities for this condition. This study sought to assess the efficacy of laser therapy in conjunction with carbamazepine for treatment of TN. Methods: A total of 30 patients who met the inclusion criteria were divided into 2 groups of cases and controls (n=15) by double blind randomized controlled clinical trial. All patients received 100 mg carbamazepine at baseline and another 100 mg after 2 days for pain control. In the case group, low level laser therapy (LLLT) was also performed in addition to pharmaceutical therapy. Sham laser was used in the control group instead of LLLT. Treatment was continued for 9 sessions (3 days a week). The intensity of pain was measured and compared in the 2 groups using visual analog scale (VAS) in 3 period. The qualitative variables among the groups were compared using the repeated measures analysis of variance (ANOVA). Results: The severity of pain was lower at the end of treatment in the case compared to the control group so this difference was statistically significant (P=0.003). The severity of pain decreased in both groups over time. Significant difference was noted in this regard between the 2 groups either (P=0.003). At the end of treatment pain intensity dropped in the intervention group from 6/8 to 1/2 and control group from 6/6 to 2/7. Conclusion: Laser therapy did add to the value of pharmaceutical therapy for treatment of TN. Both groups experienced significant improvement over time. So it is better to used laser complementary therapy to reduce side effects and the medicine dosage.

The Effect of Photobiomodulation on the Depth of Anesthesia During Endodontic Treatment of Teeth With Symptomatic Irreversible Pulpitis (Double Blind Randomized Clinical Trial). Introduction: Achieving appropriate anesthesia in patients with symptomatic irreversible pulpitis in mandibular molars during endodontic treatment is always one of the most challenging aspects. Photobiomodulation (PBM) has been used in dentistry due to its anti-inflammatory properties and regenerative effects. This study evaluates the effects of PBM in the depth of anesthesia in inferior alveolar nerve block. Methods: In this randomized clinical trial, 44 patients requiring endodontic treatment in lower molar, left or right were selected, half of them were randomly treated with PBM therapy. Laser irradiation by 980 nm diode laser with a single dose (15 J/cm2, for 20 seconds) before anesthesia was performed at the buccal aspect. Inferior alveolar nerve block was performed once. Success was defined as no or mild pain (no need for any supplemental injection), based on the visual analogue scale during access cavity preparation. Results were evaluated using SPSS software. RESULTS: The results of this study showed that the necessity for supplemental injection was lower in the group receiving laser than in the group without laser (P = 0.033). The mean pain intensity during dentin cutting was lower in the group receiving laser than in the group without laser (P = 0.031). Also, the mean pain intensity during pulp dropping was lower in the group receiving laser, than the group without laser (P = 0.021). Conclusion: Based on the results of this study, it seems that the application of PBM before anesthesia is effective on increasing depth of anesthesia.

The Combined Effects of Levothyroxine and Low Level Laser Therapy on Wound Healing in Hypothyroidism Male Rat Model. Introduction: Hypothyroidism is caused by inadequate production and storage of thyroid hormones. Hypothyroidism is associated with delayed wound healing. Laser therapy may stimulate wound regeneration. The aim of this study was to determine the combined effects of levothyroxine and low level laser therapy during the wound healing process on

skin of hypothyroidism male rat model. Methods: Thirty male Wistar rats were randomly divided into 5 groups: control group, hypothyroidism group, hypothyroidism group treated by laser, hypothyroidism group treated by levothyroxine, and hypothyroidism group treated by laser and levothyroxine. To induce hypothyroidism, methimazole was given at a dose of 4 mg/100 mL in their drinking water. After hypothyroidism was proven through immunoassay commercial kit, rats were generally anesthetized with ketamine and xylazine, then, an incisional skin wound was created in a length of 1.2 cm on the back of the ribcage. The surgical day is considered as the zero day. The third and fifth groups were treated with a pulse laser, 810 nm wavelength 80 Hz frequency and 0.2 J/cm(2) energy densities for 200 seconds. Levothyroxine was injected to the fourth and fifth groups intraperitoneally. On the 14th day, a normal sample of each healing skin wound was harvested for biomechanical examination. The obtained data were analyzed by the SPSS software 21 and reported as a mean Â± standard error of mean (SEM). $P < 0.05$ was considered statistically significant. Results: The results showed that the mean maximum force and the accomplished work (energy) made a significant difference in the group receiving both laser and levothyroxine synchronously rather than the other groups (P â‰¤ 0.05). The elasticity of the wound healing in the groups that received laser and levothyroxine synchronously was significantly higher in comparison with the control and hypothyroidism groups but the difference was not significant in comparison with the laser or levothyroxine groups. Conclusion: The results of our study showed that the application of laser and levothyroxine synchronously improves the biomechanical parameters of wound during healing in comparison to the use of laser and levothyroxine solely.

In Vitro Influence of Low-Power Diode Laser Irradiation Time on Human Red Blood Cells. OBJECTIVE: The present study investigates whether the exposure to low-power diode laser induces denaturation in red blood cell (RBC) membrane protein composition, and determines the irradiation time for when denaturation of membrane protein process begins. BACKGROUND: A low-energy laser has been used extensively in medical applications. Several studies indicated significant positive effects of laser therapy on biological systems. In contrast, other studies reported that laser induced unwanted changes in cell structure and biological systems. The present work studied the effect of irradiation time of low-power diode laser on the structure of membrane proteins of human RBCs. MATERIALS AND METHODS: The RBC suspension was divided into five equal aliquots. One aliquot served as control. The remaining four aliquots were exposed to low-power diode laser (wave lengthâ€‰=â€‰650â€‰nm, powerâ€‰=â€‰50â€‰mW) for 10, 20, 30, and 40â€‰min, respectively. After each given time, the percentage of denatured RBCs was calculated in each sample as described later. RESULTS: Irradiation of RBCs by this laser for 20â€‰min did not cause any change in membrane protein composition. While increasing the irradiation time to 30â€‰min caused denaturation of membrane proteins, resulting in the formation of cross-bonding in a considerable number of RBCs, and the percentage of denatured cells increased in a dose-dependent manner to the irradiation. CONCLUSIONS: It can be concluded that the effect of low-power diode laser on RBC membrane protein structure depends on irradiation time. Membrane Proteins Dose-Response Relationship, Radiation;Erythrocytes;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Membrane Proteins;Risk Assessment;Sampling Studies;Time Factors

Comparison of Different Energy Levels of Er:YAG Laser Regarding Intrapulpal Temperature Change During Safe Ceramic Bracket Removal. OBJECTIVE: This study was done to compare the intrapulpal temperature change generated by different energy levels of Er:YAG laser used during debonding of ceramic brackets and find the most suitable level for clinical use. MATERIAL AND METHODS: Eighty polycrystalline alumina brackets were bonded on bovine incisor teeth, which were randomly divided into 4 groups of 20. One group was assigned as control. In the study groups, after laser exposure with 2, 4, or 6 Watt energy levels, brackets were debonded using an Instron Universal

Testing machine. Adhesive remnant index (ARI) scores were recorded to evaluate the site of debonding. To assess intrapulpal thermal increase, 60 human premolar teeth that were prepared in the same way, at the same energy levels, by a thermocouple were used. RESULTS: When the debonding forces, intrapulpal temperature increases, and ARI of the groups were examined, statistically significant difference was observed between the groups. Mean temperature increases of 0.67Â°Câ€‰Â±â€‰0.12Â°C, 1.25Â°Câ€‰Â±â€‰0.16Â°C, and 2.36Â°Câ€‰Â±â€‰0.23Â°C were recorded for the 2, 4, and 6 Watt laser groups. The mean shear bond strength was 21.35â€‰Â±â€‰3.43 megapascals (MPa) for the control group, whereas they were 8.79â€‰Â±â€‰2.47, 3.28â€‰Â±â€‰0.73, and 2.46â€‰Â±â€‰0.54â€‰MPa for the 2, 4, and 6 Watt laser groups, respectively. CONCLUSIONS: Four watts is the most efficient and safe energy level to be used, utilizing Er:YAG laser with water cooling spray for 6â€‰sec by scanning method during debonding of polycrystalline alumina brackets without any carbonization effects and detrimental temperature changes at debond sites. Animals;Body Temperature;Cattle;Ceramics;Dental Debonding;Dental Pulp;Lasers, Solid-State;Low-Level Light Therapy;Orthodontic Brackets

Comparison of the effectiveness of pulsed dye laser vs pulsed dye laser combined with ultrapulse fractional CO(2) laser in the treatment of immature red hypertrophic scars. INTRODUCTION: The objective was to investigate the clinical effect of an adjustable pulse width Pulsed Dye Laser (PDL) vs an adjustable pulse width PDL combined with fractional CO(2) laser in treating immature red hypertrophic scars. METHODS: Fifty-six patients (56 sites)were randomly divided into a treatment group and control group. The control group was treated with the 595Â nm PDL at a fluence of 7-15J/cm(2) and pulse widths of 1.5-3Â ms, 7Â mm spot size. The treatment group was treated with a fractional CO(2) laser (UltraPulse CO(2) : Deep FX, Energy: 30~50Â mJ, Frequency: 300Â Hz, Density 5%, Scan Shape, and Spot Size were decided by shape and area of scar) after utilizing the 595Â nm adjustable pulse width PDL (Fluence: 7-15J/cm(2) , Pulse widths: 1.5-3Â ms, Spot size: 7Â mm). MEBT/MEBO, previously described as a post-treatment wound ointment, was used after laser treatment. The scars of the treatment group and the control group were evaluated for changes in pigment, height, vascularity, and pliability using the Vancouver Scar Scale (VSS) after two laser treatments. RESULTS: The total VSS score, as well as the score for melanin, height, vascularity, pliability in both groups, showed an obvious decrease following the treatments. There were statistically significant differences between before treatment and after treatment (PÂ <Â .05); however, the total score of the VSS, and score of the melanin, height, vascularity, and pliability in the control group decreased more than that of treatment group, and there was a statistically significant difference (PÂ <Â .05). CONCLUSIONS: The 595Â nm adjustable pulse width PDL combined with the fractional CO(2) fractional laser appears to have a beneficial clinical effect on fresh red hypertrophic scars, with no severe adverse reactions seen. Adolescent;Adult;Biopsy, Needle;Child;Cicatrix, Hypertrophic;Combined Modality Therapy;Esthetics;Female;Follow-Up Studies;Humans;Hyperpigmentation;Immunohistochemistry;Lasers;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Risk Assessment;Severity of Illness Index;Treatment Outcome;Young Adult

Nanosecond Laser Treatment for Age-Related Macular Degeneration Does Not Induce Focal Vision Loss or New Vessel Growth in the Retina. PURPOSE: Subthreshold, nanosecond pulsed laser treatment shows promise as a treatment for age-related macular degeneration (AMD); however, the safety profile needs to be robustly examined. The aim of this study was to investigate the effects of laser treatment in humans and mice. METHODS: Patients with AMD were treated with nanosecond pulsed laser at subthreshold (no visible retinal effect) energy doses (0.15-0.45 mJ) and retinal sensitivity was assessed with microperimetry. Adult C57BL6J mice were treated at subthreshold (0.065 mJ) and suprathreshold (photoreceptor loss, 0.5 mJ) energy settings. The retinal and vascular

responses were analyzed by fundus imaging, histologic assessment, and quantitative PCR. RESULTS: Microperimetry analysis showed laser treatment had no effect on retinal sensitivity under treated areas in patients 6 months to 7 years after treatment. In mice, subthreshold laser treatment induced RPE loss at 5 hours, and by 7 days the RPE had retiled. Fundus imaging showed reduced RPE pigmentation but no change in retinal thickness up to 3 months. Electron microscopy revealed changes in melanosomes in the RPE, but Bruch's membrane was intact across the laser regions. Histologic analysis showed normal vasculature and no neovascularization. Suprathreshold laser treatment did not induce changes in angiogenic genes associated with neovascularization. Instead pigment epithelium-derived factor, an antiangiogenic factor, was upregulated. CONCLUSIONS: In humans, low-energy, nanosecond pulsed laser treatment is not damaging to local retinal sensitivity. In mice, treatment does not damage Bruch's membrane or induce neovascularization, highlighting a reduced side effect profile of this nanosecond laser when used in a subthreshold manner. Eye Proteins;Nerve Growth Factors;RNA, Messenger;Serpins;Vascular Endothelial Growth Factor A;pigment epithelium-derived factor;vascular endothelial growth factor A, mouse Aged;Animals;Blindness;Eye Proteins;Female;Fluorescein Angiography;Humans;Immunohistochemistry;Lasers, Solid-State;Low-Level Light Therapy;Macular Degeneration;Male;Melanosomes;Mice;Mice, Inbred C57BL;Microscopy, Confocal;Middle Aged;Nerve Growth Factors;RNA, Messenger;Real-Time Polymerase Chain Reaction;Retina;Retinal Neovascularization;Retinal Pigment Epithelium;Serpins;Vascular Endothelial Growth Factor A;Visual Acuity;Visual Field Tests

To test or not to test: A study examining the return rates of rosacea patients treated with a pulsed dye laser. Pulsed dye laser (PDL) is an effective treatment option for erythematotelangiectatic rosacea. The use of a test spot allows patients to experience the procedure on a small area prior to further treatment. The purpose of this study was to elucidate whether the use of a no charge test spot influenced return rates for further PDL treatment. Data were obtained retrospectively using International Classification of Diseases (ICD)-10 codes for rosacea. Sixty charts were identified: 26 patients initially received a PDL test area free of charge, whereas 34 patients initially underwent full PDL treatment. Patients who experienced the test spot laser treatment had a lower return rate compared to those that directly underwent full PDL treatment. However, this difference was not statistically significant (Fisher's exact test pÂ =Â 0.2883). Future studies evaluating and identifying factors that influence PDL return rates are needed. Abbreviations: ETR: Erythematotelangiectatic rosacea; PDL: pulsed dye laser; ICD: International classification of diseases. Humans;Lasers, Dye;Low-Level Light Therapy;Patient Acceptance of Health Care;Retrospective Studies;Rosacea

Comparison of efficacy between long-pulsed Nd:YAG laser and pulsed dye laser to treat rosacea-associated nasal telangiectasia. BACKGROUND: Rosacea is characterized by erythema on face, especially erythema and linear telangiectasia on the nose. Currently, various vascular lasers are used for treatment, and among them, are long-pulsed Nd:YAG(LPNY) and pulsed dye laser (PDL). OBJECTIVES: This study compared the efficacy of LPNY and PDL in treating rosacea-associated nasal telangiectasia. METHODS: Patients with rosacea who showed erythema and telangiectasia on the nose were included. Each patient was treated with PDL on the left side of the nasal bridge, and LPNY on the right side, three times with 4-week intervals. At the end of the treatment, two independent dermatologists evaluated overall treatment response compared with baseline. RESULTS: The physician's assessment of treatment concluded that good improvement was seen in six PDL and seven LPNY patients, and excellent improvement five PDL and four LPNY patients. There was no significant difference (pÂ =Â 0.62, 95%CI) between the groups. Overall improvement was similar; however, LPNY induced a greater response in thick, dilated vessels, while erythema with mild telangiectasia was more responsive to PDL. CONCLUSION: Both LPNY and PDL are effective in treating

rosacea-associated nasal telangiectasia. If LPNY is used properly to avoid side effects with careful consideration, it can also be used as a good modality. Adult;Aged;Erythema;Facial Dermatoses;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nose;Rosacea;Telangiectasis;Treatment Outcome

Time Response of Photobiomodulation Therapy on Muscular Fatigue in Humans. Rossato, M, Dellagrana, RA, Sakugawa, RL, Lazzari, CD, Baroni, BM, and Diefenthaeler, F. Time response of photobiomodulation therapy on muscular fatigue in humans. J Strength Cond Res 32(11): 3285-3293, 2018-The aim of this study was to identify the effects of 2 different time responses on fatigue of knee extensor. Sixteen male volunteers (26 Â± 6.0 years, 81 Â± 12 kg, and 181 Â± 7.4 cm) participated in the study. Participants performed the same protocol in 5 sessions {control, placebo (placebo applied both 6 hours before and immediately before the test), 6 hours before + immediately before (photobiomodulation therapy [PBMT] applied both 6 hours before and immediately before the test), 6 hours before (PBMT applied 6 hours before and placebo applied immediately before the test), and immediately before (placebo applied 6 hours before and PBMT applied immediately before the test)}. Photobiomodulation therapy was applied on knee extensor (9 sites; 30 J per site). Maximal isometric voluntary contraction (MIVC) was assessed before and after an isokinetic fatigue (45 flexion-extension concentric at 180Â°Â·s), associated with electromyography (root mean square [RMS] and median of frequency [MF]). For MIVC, there was no treatment Ã— time interaction for all variables. Time effect was observed for peak torque (PT), RMS, and MF. Treatment effect was verified for PT, and 6 hours before + immediately before condition presented higher PT during MIVCpre than control ($p = 0.004$) and placebo ($p = 0.044$). The immediately before presented higher PT values than control ($p = 0.047$). Regarding MIVCpost, the PT for 6 hours before + immediately before presented higher values than control ($p = 0.001$) and placebo ($p = 0.004$). Peak torque during MIVC (pre to post) was reduced in 6 hours before + immediately before treatment (26%) compared with control (33%), placebo (29%), and immediately before (32%). The application of PBMT 6 hours + immediately before and immediately before exercise protocol is able to reduce the fatigue. Adult;Cross-Over Studies;Double-Blind Method;Electromyography;Exercise;Fatigue;Humans;Isometric Contraction;Knee Joint;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Time Factors;Torque;Young Adult

Evidence for encephalopsin immunoreactivity in interneurones and striosomes of the monkey striatum. In this study, we examined the cellular distribution of encephalopsin (opsin 3; OPN3) expression in the striatum of non-human primates. In addition, because of our long standing interest in Parkinson's disease and neuroprotection, we examined whether parkinsonian (MPTP; 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) insult and/or photobiomodulation (670Â nm) had any impact on encephalopsin expression in this key area of the basal ganglia. Striatal sections of control naÃ¯ve monkeys, together with those that were either MPTP- and/or photobiomodulation-treated were processed for immunohistochemistry. Our results revealed two populations of striatal interneurones that expressed encephalopsin, one of which was the giant, choline acetyltransferase-containing, cholinergic interneurones. The other population had smaller somata and was not cholinergic. Neither cell group expressed the calcium-binding protein, parvalbumin. There was also rich encephalopsin expression in a set of terminals forming striosome-like patches across the striatum. Finally, we found that neither parkinsonian (MPTP) insult nor photobiomodulation had any effect on encephalopsin expression in the striatum. In summary, our results revealed an extensive network of encephalopsin containing structures throughout the striatum, indicating that external light is in a position to influence a range of striatal activities at both the interneurone and striosome level. OPN3 protein, human;Rod Opsins Animals;Corpus Striatum;Immunohistochemistry;Interneurons;Low-Level Light Therapy;MPTP Poisoning;Macaca fascicularis;Rod Opsins

Low-Level Laser Irradiation Exerts Antiaggregative Effect on Human Platelets Independently on the Nitric Oxide Metabolism and Release of Platelet Activation Markers. AIM: The goal of the study is to develop a model allowing to investigate precisely the effect of low-level laser therapy (LLLT) on platelet aggregation and to verify the hypothesis regarding the role of the nitric oxide (NO) bioavailability and platelet activation markers in modulating platelet aggregation. METHODS: A total of 41 healthy volunteers at the age of 21-45 years were investigated. At first, platelet aggregation in response to three agonists (TRAP, ADP, and collagen) was evaluated following previous exposure to different doses of laser radiation (Î»â€‰=â€‰662â€‰nm) to assess the dose-response effect. Subsequently, plasma levels of platelet activation markers (PF4-platelet factor-4 and sP-selectin) as well as the substrate for nitric oxide synthase, L-arginine, and its competitive inhibitors (ADMA-asymmetric dimethylarginine and SDMA-symmetric dimethylarginine) were measured. RESULTS: All doses of laser irradiation significantly reduced the aggregation. However, the most pronounced effect was observed for 19.7â€‰J/cm(2). No significant differences in the levels of platelet activation markers nor in the nitric-oxide-metabolic-pathway compounds between analyzed groups were noted. CONCLUSIONS: We have demonstrated in the established in vitro experimental model that the LLLT in a reproducible manner decreases the whole blood platelet aggregation regardless of the NO bioavailability or changes in the platelet activation markers. Biomarkers;P-Selectin;Nitric Oxide;Platelet Factor 4 Adult;Biomarkers;Blood Platelets;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nitric Oxide;P-Selectin;Platelet Aggregation;Platelet Factor 4

[The commonest therapeutic methods for laser irradiation of blood]. One of the most widely employed methods of laser therapy is laser irradiation of blood (LIB). There are two modifications of this technique, one being intravenous low-intensity laser irradiation of blood (ILIB), the other non-invasive blood irradiation(NLIB). The two methods have been developing independently since either has its advantages and disadvantages. The present article was designed to review the main currently available techniques for laser irradiation of blood which are presented in the form of tables (charts). Replacing the UV irradiation of blood with UV lamps by laser ultraviolet irradiation of blood (LUVIBÂ®) has made it possible to significantly simplify the technique and enhanced its efficiency. The most effective options for ILIB are the combined techniques: ILIB-635 + LUVIBÂ® and ILIB-525 + LUVIB. The most effective technique for ELIB is believed to be the use of low-intensity pulsed laser light with a wavelength of 635 nm and output power up to 40 W. Blood;Humans;Low-Level Light Therapy

[Laser therapy for mens infertility. Part 2. Systematic review of clinical trials]. Male infertility is a multifactorial syndrome associated with a wide range of pathological conditions affecting both the sexual and other body systems: endocrine, nervous, blood, and immune. Laser therapy is a form of modern physiotherapy that applies low-intensity laser irradiation (LILI) in various parts of the body. It is widely used in all areas of modern medicine due to its high efficiency, ease of use, the absence of contraindications and side effects. The authors reviewed the results of 171 studies investigating laser therapy, of which 93 were experimental (20 in Russian and 73 international publications), four clinical and experimental (all in Russian), 74 clinical (73 in Russian and 1 in English).Along with domestic literature, publications in Russian from Belarus, Georgia, Kyrgyzstan, Uzbekistan, and Ukraine were also reviewed. The review suggests that laser therapy should be used as much as possible in the management of male infertility not just due to high effectiveness, but also because of the lack of alternatives. For local application, optimal laser irradiation regimens are pulsed LILI of red (635 nm) and infrared (904 nm) spectra. For intravenous laser blood irradiation, the authors recommend alternating a continuous LILI with a wavelength of 635 nm (red spectrum) and 365 nm (ultraviolet spectrum). Clinical Trials as Topic;Humans;Infertility, Male;Low-Level Light Therapy;Male

Effectiveness of laser adjunctive therapy for surgical treatment of gingival recession with flap graft techniques: a systematic review and meta-analysis. Various flap graft techniques in the treatment of gingival recession have already been reported in the literatures for root coverage. Laser therapy has effects of ablative, hemostatic, and decontamination. Therefore, we performed a meta-analysis of randomized controlled trials (RCTs) to compare the efficacy of flap surgery combined with laser with surgery alone for treating gingival recession. The studies were searched from PubMed, Embase, Web of science, and the Cochrane Central Register of Controlled Trials by two reviewers up to August 2017. The quality of RCTs was assessed by Cochrane Handbook. Data were extracted from studies and analyzed by Review Manager 5.3. 95% confidence interval (CI) and risk ratio (RR) were calculated for dichotomous data. Seven RCTs with 173 patients and 296 teeth were included in the meta-analysis. We found no statistically significant differences between two groups in GRD (gingival recession depth) (Pâ€‰=â€‰0.21), GRW (gingival recession width) (Pâ€‰=â€‰0.92), RES (root esthetic score) (Pâ€‰=â€‰0.21), and CRC (complete root coverage) (Pâ€‰=â€‰0.09). Statistically significant differences were found between two groups in the WKT (width of keratinized tissue) (Pâ€‰<â€‰0.0001) and 1-year follow-up of PD (probing depth) (Pâ€‰=â€‰0.03) and CAL (clinical attachment level) (Pâ€‰<â€‰0.00001). The meta-analysis found that surgery with laser therapy provided clinical advantages in terms of WKT and 1-year follow-up of PD and CAL. However, flap graft associated with laser did not offer additional benefit to root coverage and esthetics in treating gingival recession. More long-term studies are required to assess these parameters.
Gingiva;Gingival Recession;Humans;Low-Level Light Therapy;Surgical Flaps;Tooth Root;Treatment Outcome

Photobiomodulation versus light-emitting diode (LED) therapy in the treatment of temporomandibular disorder: study protocol for a randomized, controlled clinical trial. BACKGROUND: Temporomandibular disorder (TMD) is described as a subgroup of orofacial pain with a set of signs and symptoms that involve the temporomandibular joint, masticatory muscles, ears, and neck. TMD can occur unilaterally or bilaterally and approximately 70% of the population is affected with at least one sign. The disorder progresses with orofacial pain, muscle pain involving the masticatory and cervical muscles, joint noises (clicks and pops), joint block, mandibular dysfunction, and headache. The etiology can be abnormal occlusion and/or posture, trauma involving local tissues, repetitive microtrauma, parafunctional habits, and an increase in emotional stress. Studies have demonstrated that phototherapy is an efficient option for the treatment of TMD, leading to improvements in pain and orofacial function. METHODS: The aim of the proposed study is to compare the effects of two sources of photobiomodulation in individuals with TMD. A randomized, controlled, double-blind, clinical trial is proposed, which will involve 80 individuals aged 18-65 years allocated to either a laser group or light-emitting diode (LED) group submitted to 12 sessions of phototherapy. The Research Diagnostic Criteria for TMDs will be used to evaluate all participants. Pain will be measured using the visual analog scale and maximum vertical mandibular movement will be determined with the aid of digital calipers. DISCUSSION: This study compares the effects of two modalities of laser therapy on the pain and orofacial function of patients with TMD dysfunction. Photobiomodulation and LED therapy are treatment options for reducing the inflammatory process and pain as well as inducing the regeneration of the target tissue. TRIAL REGISTRATION: ClinicalTrials.gov, NCT03257748 . Registered on 8 August 2017.
Adolescent;Adult;Aged;Brazil;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Masticatory Muscles;Middle Aged;Pain Measurement;Randomized Controlled Trials as Topic;Recovery of Function;Temporomandibular Joint;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome;Young Adult

A Single-Center, Randomized, Double-Blind, Placebo-Controlled Clinical Trial of the Effectiveness of ANT1 Soybean Extract Cream on Skin Recovery After Nd: YAG Laser Treatment. Nd:YAG laser has been used extensively for its versatility in treating many common aesthetic problems, but numerous adverse effects are often complained by recipients of Nd:YAG laser. This study introduces the ANT1 soybean extract cream, which was formulated to alleviate adverse effects after laser therapy. This study explores whether ANT1 enhances the repair mechanism of the postlaser skin, decreases laser-induced complication, and shortens recovery time. The study also aims to pinpoint the ANT1 concentration that is most effective in improving the skin condition after Nd-YAG laser therapy. MATERIALS AND METHODS: This study was a single-center, randomized, double-blind, placebo-controlled trial. Patients eligible for the study were Asian women, aged 25 to 40 years, who were free of dermatological diseases and allergic reaction. There were a total of 45 subjects. Each subject received a session of Nd-YAG laser therapy every 2 weeks, totaling 3 sessions. Facial skin assessment was achieved via VISIA complexion analysis. VISIA complexion analysis quantitatively assessed the skin condition and tracked the recovery progress of each subject at baseline, immediately after all 3 laser sessions, and a week after the final laser treatment. RESULTS: Skin condition was evaluated by VISIA complexion analysis. Skin condition was recorded in aspects of pigmented spots, wrinkles, texture, pores, and red area. After Nd-YAG laser therapy, postlaser inflammation was observed in all subjects. Throughout the laser sessions and the outpatient follow-up clinic, the adverse effects of laser therapy, such as redness, spots, wrinkles, pores, and textures, decreased with the use of ANT1 cream. There has been a marked effect in wrinkle reduction in the patients who received a higher concentration of ANT1 cream (P â‰¤ 0.05). Statistically significant improvement in spots and pores is also seen (P â‰¤ 0.05). CONCLUSIONS: Through this study, the results suggest that the application of ANT1 soybean extract cream ameliorates the complications and enhances the cosmetic effects of Nd-YAG laser therapy. A higher concentration of the ANT1 cream significantly reduces wrinkles and redness after laser. All in all, this study proves that the ANT1 soy extract cream may be a useful addition to postlaser care for an overall enhancement in skin condition and recovery. Emollients;Plant Extracts Academic Medical Centers;Administration, Topical;Adult;Dermatitis, Irritant;Double-Blind Method;Emollients;Esthetics;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Plant Extracts;Reference Values;Risk Assessment;Glycine max;Taiwan;Treatment Outcome;Young Adult

Pulsed-dye laser therapy for carcinoma in situ of the penis. Adult;Carcinoma in Situ;Feasibility Studies;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Neoplasm Recurrence, Local;Penile Neoplasms;Penis;Treatment Outcome

Effect of low-level laser therapy on the healing process of donor site in patients with grade 3 burn ulcer after skin graft surgery (a randomized clinical trial). Skin graft is a standard therapeutic technique in patients with deep ulcers, but managing donor site after grafting is very important. Although several modern dressings are available to enhance the comfort of donor site, using techniques that accelerate wound healing may enhance patient satisfaction. Low-level laser therapy (LLLT) has been used in several medical fields, including healing of diabetic, surgical, and pressure ulcers, but there is not any report of using this method for healing of donor site in burn patients. The protocols and informed consent were reviewed according to Medical Ethics Board of Shahid Beheshti University of Medical Sciences (IR.SBMU.REC.1394.363) and Iranian Registry of Clinical Trials (IRCT2016020226069N2). Eighteen donor sites in 11 patients with grade 3 burn ulcer were selected. Donor areas were divided into 2 parts, for laser irradiation and control randomly. Laser area was irradiated by a red, 655-nm laser light, 150Â mW, 2Â J/cm(2), on days 0 (immediately after surgery), 3, 5, and 7. Dressing and other therapeutic care for both sites were the same. The patients and the person who analyzed the results were blinded. The size of donor site reduced in both groups during

the 7-day study period (PÂ <â€‰0.01) and this reduction was significantly greater in the laser group (PÂ =â€‰0.01). In the present study, for the first time, we evaluate the effects of LLLT on the healing process of donor site in burn patients. The results showed that local irradiation of red laser accelerates wound healing process significantly. Adult;Burns;Case-Control Studies;Female;Humans;Iran;Low-Level Light Therapy;Male;Skin Transplantation;Tissue Donors;Ulcer;Wound Healing

High-intensity laser application in Orthodontics. INTRODUCTION: In dental practice, low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) are mainly used for dental surgery and biostimulation therapy. Within the Orthodontic specialty, while LLLT has been widely used to treat pain associated with orthodontic movement, accelerate bone regeneration after rapid maxillary expansion, and enhance orthodontic tooth movement, HILT, in turn, has been seen as an alternative for addressing soft tissue complications associated to orthodontic treatment. OBJECTIVE: The aim of this study is to discuss HILT applications in orthodontic treatment. METHODS: This study describes the use of HILT in surgical treatments such as gingivectomy, ulotomy, ulectomy, fiberotomy, labial and lingual frenectomies, as well as hard tissue and other dental restorative materials applications. CONCLUSION: Despite the many applications for lasers in Orthodontics, they are still underused by Brazilian practitioners. However, it is quite likely that this demand will increase over the next years - following the trend in the USA, where laser therapies are more widely used. Animals;Gingivectomy;Humans;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Orthodontics;Surgery, Oral;Tooth Movement Techniques

Flexible nine-channel photodetector probe facilitated intraspinal multisite transcutaneous photobiomodulation therapy dosimetry in cadaver dogs. Noninvasive photobiomodulation therapy (PBMT) of spinal cord disease remains speculative due to the lack of evidence for whether photobiomodulatory irradiances can be transcutaneously delivered to the spinal cord under a clinically acceptable PBMT surface irradiation protocol. We developed a flexible nine-channel photodetection probe for deployment within the spinal canal of a cadaver dog after hemilaminectomy to measure transcutaneously transmitted PBMT irradiance at nine sites over an eight-cm spinal canal length. The probe was built upon a 6.325-mm tubular stem, to the surface of which nine photodiodes were epoxied at approximately 1Â cm apart. The photodiode has a form factor of 4.80â€‰â€‰mmÃ—2.10â€‰â€‰mmÃ—1.15â€‰â€‰mm (lengthÃ—widthÃ—height). Each photodiode was individually calibrated to deliver 1Â V per 7.58â€‰â€‰Î¼W/cm2 continuous irradiance at 850Â nm. The outputs of eight photodiodes were logged concurrently using a data acquisition module interfacing eight channels of differential analog signals, while the output of the ninth photodiode was measured by a precision multimeter. This flexible probe rendered simultaneous intraspinal (nine-site) measurements of transcutaneous PBMT irradiations at 980Â nm in a pilot cadaver dog model. At a surface continuous irradiance of 3.14â€‰â€‰W/cm2 applied off-contact between L1 and L2, intraspinal irradiances picked up by nine photodiodes had a maximum of 327.48â€‰â€‰Î¼W/cm2 without the skin and 5.68â€‰â€‰Î¼W/cm2 with the skin. Animals;Cadaver;Calibration;Diffusion;Dogs;Light;Low-Level Light Therapy;Muscle, Skeletal;Needles;Radiometry;Skin;Spinal Cord Diseases;Surface Properties

Light-emitting diodes in dermatology: A systematic review of randomized controlled trials. OBJECTIVE: In dermatology, patient and physician adoption of light-emitting diode (LED) medical technology continues to grow as research indicates that LEDs may be used to treat skin conditions. The goal of this systematic review is to critically analyze published randomized controlled trials (RCTs) and provide evidence-based recommendations on the therapeutic uses of LEDs in dermatology based on published efficacy and safety data. METHODS: A systematic review of the published literature on the use of LED treatments for skin conditions was performed on September 13th 2017. RESULTS:

Thirty-one original RCTs were suitable for review. CONCLUSIONS: LEDs represent an emerging modality to alter skin biology and change the paradigm of managing skin conditions. Acne vulgaris, herpes simplex and zoster, and acute wound healing received grade of recommendation B. Other skin conditions received grade of recommendation C or D. Limitations of some studies include small patient sample sizes (nâ€‰<â€‰20), absent blinding, no sham placebo, and varied treatment parameters. Due to few incidences of adverse events, affordability, and encouraging clinical results, we recommend that physicians use LEDs in clinical practice and researchers continue to explore the use of LEDs to treat skin conditions. Lasers Surg. Med. 9999:1-16, 2018. Â© 2018 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc.

670nm light treatment following retinal injury modulates MÃ¼ller cell gliosis: Evidence from in vivo and in vitro stress models. Photobiomodulation (PBM) with 670â€¯nm light has been shown to accelerate wound healing in soft tissue injuries, and also to protect neuronal tissues. However, little data exist on its effects on the non-neuronal components of the retina, such as MÃ¼ller cells (MCs), which are the principal macroglia of the retina that play a role in maintaining retinal homeostasis. The aim of this study was to explore the effects of 670â€¯nm light on activated MCs using in vivo and in vitro stress models. Adult Sprague-Dawley rats were exposed to photo-oxidative damage (PD) for 24â€¯h and treated with 670â€¯nm light at 0, 3 and 14 days after PD. Tissue was collected at 30 days post-PD for analysis. Using the in vitro scratch model with a human MC line (MIO-M1), area coverage and cellular stress were analysed following treatment with 670â€¯nm light. We showed that early treatment with 670â€¯nm light after PD reduced MC activation, lowering the retinal expression of GFAP and FGF-2. 670â€¯nm light treatment mitigated the production of MC-related pro-inflammatory cytokines (including IL-1Î²), and reduced microglia/macrophage (MG/MÎ¦) recruitment into the outer retina following PD. This subsequently decreased photoreceptor loss, slowing the progression of retinal degeneration. In vitro, we showed that 670â€¯nm light directly modulated MC activation, reducing rates of area coverage by suppressing cellular proliferation and spreading. This study indicates that 670â€¯nm light treatment post-injury may have therapeutic benefit when administered shortly after retinal damage, and could be useful for retinal degenerations where MC gliosis is a feature of disease progression. Cytokines;GFAP protein, rat;Glial Fibrillary Acidic Protein;Fibroblast Growth Factor 2 Animals;Cell Line;Cell Movement;Cell Survival;Cytokines;Disease Models, Animal;Ependymoglial Cells;Fibroblast Growth Factor 2;Flow Cytometry;Fluorescent Antibody Technique, Indirect;Glial Fibrillary Acidic Protein;Gliosis;Humans;Light;Oxidative Stress;Phototherapy;Radiation Injuries;Radiation Injuries, Experimental;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Retina;Retinal Degeneration

Photobiomodulation at 660nm stimulates proliferation and migration of diabetic wounded cells via the expression of epidermal growth factor and the JAK/STAT pathway. Photobiomodulation (PBM) modulates cellular processes to enhance diabetic wound healing. The photon energy activates wounded cells to proliferate and migrate. However, the signalling pathways responsible for these observations remain unknown. This study aimed to determine if PBM stimulates cellular proliferation and migration via the expression of epidermal growth factor (EGF) and activation of the Janus kinase/Signal transducer and activators of transcription (JAK/STAT) signalling pathway. Normal, wounded, diabetic and diabetic wounded cell models were exposed to PBM at a wavelength of 660nm and fluence of 5J/cm(2) and incubated for 48h. Non-irradiated cells (0J/cm(2)) and cells exposed to exogenous EGF (rh EGF) served as controls. Cellular migration was determined microscopically at 0, 24 and 48h. Flow cytometry (BrdU) was used to determine cell proliferation, while the Trypan blue exclusion assay and adenosine triphosphate (ATP) luminescence was used to determine cell viability. The enzyme linked immunosorbent assay (ELISA) was used to analyse EGF

expressed in the culture media, and phosphorylated (p-) EGF receptor (p-EGFR), p-JAK2, p-STAT1 and p-STAT5 in cells. Irradiated diabetic wounded cells showed a significant increase in EGF, and activation of its receptor (p-EGFR) and JAK/STAT (p-JAK2, p-STAT1 and p-STAT5). PBM at 660nm and 5J/cm(2) is able to modulate cellular autocrine signalling, particularly the EGF/EGFR loop leading to activation of the JAK/STAT pathway which in turn stimulates cell proliferation and migration. STAT Transcription Factors;Epidermal Growth Factor;ErbB Receptors;JAK2 protein, human;Janus Kinase 2 Cell Movement;Cell Proliferation;Cells, Cultured;Diabetes Mellitus;Enzyme-Linked Immunosorbent Assay;Epidermal Growth Factor;ErbB Receptors;Fibroblasts;Gene Expression;Humans;Janus Kinase 2;Light;Phosphorylation;STAT Transcription Factors;Signal Transduction;Skin

Photobiomodulation induces in vitro re-epithelialization via nitric oxide production. Photobiomodulation is a widely used tool in regenerative medicine thanks to its ability to modulate a plethora of physiological responses. Wound re-epithelialization is strictly regulated by locally produced chemical mediators, such as nitric oxide (NO), a highly reactive free radical generated by the nitric oxide synthase (NOS) enzymatic family. In this study, it has been hypothesized that a 980-nm low-level laser stimulation could increase NO production in human keratinocytes and that such event might be directly related to the re-epithelialization process. Human keratinocytes were irradiated with increasing energy outputs (10-75Â J) in the absence or presence of L-NAME, a NOS inhibitor. Laser stimulation induced an increase in NO production, resulting in an energy-dependent increase in both keratinocytes proliferation and re-epithelialization ability. The direct link between increased NO production and the observed physiological responses was confirmed by their inhibition in L-NAME pre-treated samples. Since NO production increase is a quick event, it is conceivable that it is due to an increase in existing NOS activity rather than to a de novo protein synthesis. For this reason, it could be hypothesized that photobiomodulation-derived NO positive effects on keratinocytes behavior might rely on a near infrared mediated increase in NOS conformational stability and cofactors as well as substrate binding ability, finally resulting in an increased enzymatic activity. Enzyme Inhibitors;Nitric Oxide;Nitric Oxide Synthase;NG-Nitroarginine Methyl Ester Cell Line;Cell Movement;Cell Proliferation;Enzyme Inhibitors;Humans;Keratinocytes;Low-Level Light Therapy;NG-Nitroarginine Methyl Ester;Nitric Oxide;Nitric Oxide Synthase;Re-Epithelialization;Spectroscopy, Near-Infrared

Therapeutic efficacy and safety of a 1927-nm fractionated thulium laser on pattern hair loss: an evaluator-blinded, split-scalp study. Laser- or light-assisted therapies have been used to improve the perifollicular environment by upregulating the expression of growth factors and signaling molecules for hair restoration. The aim of our study was to preclinically and clinically evaluate the therapeutic efficacy and safety of a 1927-nm fractionated thulium laser on pattern hair loss (PHL). An in vivo hairless mouse study and an in vivo human skin environmental scanning electron microscopy (ESEM) study were performed with different power and energy settings. Thereafter, an evaluator-blinded, split-scalp study was conducted to evaluate hair thickness and density in 10 PHL patients treated with 12 sessions of fractionated thulium laser treatment with or without post-laser treatment application of a growth factor-containing (GF) solution. In in vivo hairless mouse skin, inverted cone-shaped zones of thulium laser-induced tissue coagulation (LITC) were noted immediately after treatment in the epidermis and upper to mid-dermis without remarkable ablative tissue injury. The ESEM study revealed round to oval-shaped zones of non-ablative LITC on the surface of the stratum corneum of a human subject immediately after laser irradiation. In PHL patients, 12 sessions of thulium laser monotherapy at 1-week intervals resulted in significantly increased hair density and thickness. Post-laser treatment application of GF solution offered additional therapeutic efficacy by improving hair density and thickness on the split scalp. The use of a fractionated thulium laser with or

without post-laser therapy application of GF solution to treat PHL elicited remarkable improvements in hair thickness and hair counts. Intercellular Signaling Peptides and Proteins Adult;Aged;Alopecia;Animals;Hair;Humans;Intercellular Signaling Peptides and Proteins;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Middle Aged;Scalp;Single-Blind Method;Skin;Treatment Outcome

Effect of Low-Level Laser on the Healing of Bone Defects Filled with Autogenous Bone or Bioactive Glass: In Vivo Study. PURPOSE: This study evaluated the effect of low-level laser therapy (LLLT) on the healing of bone defects filled with autogenous bone or bioactive glass. MATERIALS AND METHODS: A critical size defect with 5-mm diameter was created on the calvaria of 60 adult male rats divided into 6 groups (n = 10): group C (control), group LLLT (LLLT - GaAlAs, wavelength of 780 nm, power of 100 mW, energy density of 210 J/cm(2) per point during 60 seconds/point, in five points, only once, after creation of the surgical defect), group AB (autogenous bone), group AB+LLLT (autogenous bone + LLLT), group BG (bioactive glass), group BG+LLLT (bioactive glass + LLLT). All animals were sacrificed at 30 days after surgery. The areas of newly formed bone (ANFB) and areas of remaining particles (ARP) were calculated in relation to the total area (TA). RESULTS: The highest mean Â± SD ANFB was observed for group LLLT (47.67% Â± 8.66%), followed by groups AB+LLLT (30.98% Â± 16.59%) and BG+LLLT (31.13% Â± 16.98%). There was a statistically significant difference in relation to ANFB between group C and the other groups, except for comparison with group BG (Tukey test, P > .05). There was no statistically significant difference in ANFB values between group AB and the other study groups (Tukey test, P > .05), group AB+LLLT and groups BG and BG+LLLT (Tukey test, P > .05), and between groups BG and BG+LLLT (Tukey test, P > .05). The highest mean Â± SD ARP was found for group BG (25.15% Â± 4.82%), followed by group BG+LLLT (17.06% Â± 9.01%), and there was no significant difference between groups (t test, P > .05). CONCLUSION: The LLLT, in the present application protocol, did not increase the area of new bone formation when associated with autogenous bone or bioactive glass. Bone Substitutes;bioactive glass 45S5 Animals;Bone Regeneration;Bone Substitutes;Bone Transplantation;Ceramics;Glass;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;Skull;Transplantation, Autologous;Wound Healing

Nevus anelasticus in a school-aged girl: ultrastructural observation and Er:YAG laser treatment. Child;Elastic Tissue;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus;Skin Neoplasms;Treatment Outcome

Macrophage membrane-coated iron oxide nanoparticles for enhanced photothermal tumor therapy. Nanotechnology possesses the potential to revolutionize the diagnosis and treatment of tumors. The ideal nanoparticles used for in vivo cancer therapy should have long blood circulation times and active cancer targeting. Additionally, they should be harmless and invisible to the immune system. Here, we developed a biomimetic nanoplatform with the above properties for cancer therapy. Macrophage membranes were reconstructed into vesicles and then coated onto magnetic iron oxide nanoparticles (Fe(3)O(4) NPs). Inherited from the Fe(3)O(4) core and the macrophage membrane shell, the resulting Fe(3)O(4)@MM NPs exhibited good biocompatibility, immune evasion, cancer targeting and light-to-heat conversion capabilities. Due to the favorable in vitro and in vivo properties, biomimetic Fe(3)O(4)@MM NPs were further used for highly effective photothermal therapy of breast cancer in nude mice. Surface modification of synthetic nanomaterials with biomimetic cell membranes exemplifies a novel strategy for designing an ideal nanoplatform for translational medicine. Magnetite Nanoparticles;Ferrosoferric Oxide Animals;Biological Transport;Breast Neoplasms;Cell Membrane;Female;Ferrosoferric Oxide;Humans;Hyperthermia, Induced;Immune Evasion;Low-Level Light Therapy;MCF-7 Cells;Magnetite Nanoparticles;Mice;Mice, Inbred BALB C;Mice, Inbred ICR;Mice, Nude;Molecular Targeted Therapy;RAW 264.7 Cells;Theranostic Nanomedicine;Xenograft Model Antitumor Assays

High final energy of gallium arsenide laser increases MyoD gene expression during the intermediate phase of muscle regeneration after cryoinjury in rats. The aim of this study was to determine the effects of gallium arsenide (GaAs) laser on IGF-I, MyoD, MAFbx, and TNF-Î± gene expression during the intermediate phase of muscle regeneration after cryoinjury 21 Wistar rats were divided into three groups (nâ€‰=â€‰7 per group): untreated with no injury (control group), cryoinjury without GaAs (injured group), and cryoinjury with GaAs (GaAs-injured group). The cryoinjury was induced in the central region of the tibialis anterior muscle (TA). The region injured was irradiated once a day during 14Â days using GaAs laser (904Â nm; spot size 0.035Â cm(2), output power 50Â mW; energy density 69Â JÂ cm(-2); exposure time 4Â s per point; final energy 4.8Â J). Twenty-four hours after the last application, the right and left TA muscles were collected for histological (collagen content) and molecular (gene expression of IGF-I, MyoD, MAFbx, and TNF-Î±) analyses, respectively. Data were analyzed using one-way ANOVA at Pâ€‰<â€‰0.05. There were no significant (Pâ€‰>â€‰0.05) differences in collagen density and IGF-I gene expression in all experimental groups. There were similar (Pâ€‰<â€‰0.05) decreases in MAFbx and TNF-Î± gene expression in the injured and GaAs-injured groups, compared to control group. The MyoD gene expression increased (Pâ€‰=â€‰0.008) in the GaAs-injured group, but not in the injured group (Pâ€‰=â€‰0.338), compared to control group. GaAs laser therapy had a positive effect on MyoD gene expression, but not IGF-I, MAFbx, and TNF-Î±, during intermediary phases (14Â days post-injury) of muscle repair. MyoD Protein;Tumor Necrosis Factor-alpha;Insulin-Like Growth Factor I;Collagen Animals;Athletic Injuries;Cold Temperature;Collagen;Gene Expression;Insulin-Like Growth Factor I;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha

Effect of low-level laser therapy on the healing of sites grafted with coagulum, deproteinized bovine bone, and biphasic ceramic made of hydroxyapatite and Î²-tricalcium phosphate. In vivo study in rats. OBJECTIVE: The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) on the healing of biomaterial graft areas (i.e., coagulum, deproteinized bovine bone, and biphasic ceramics comprising hydroxyapatite and Î²-tricalcium phosphate). MATERIAL AND METHODS: Ninety rats were divided into two groups according to laser irradiation use (Î» 808â€‰nm, 100â€‰mW, Ï† â¼600â€‰Î¼m, seven sessions with 28â€‰J of irradiation dose in total): a laser group and a control group. Each of these groups was divided into three subgroups of 15 animals each according to the type of biomaterial used: Coagulum (COA), deproteinized bovine bone (DBB), and hydroxyapatite/Î²-tricalcium phosphate (HA/Î²TCP). Biomaterials were inserted into Teflon domes, and these domes were grafted to the lateral aspect of the mandibular branch of the rats. The animals were sacrificed after 30, 60, and 90 days. Scarring patterns were evaluated by microtomography and histometry. The expression levels of BMP2, osteocalcin (OCN), and alkaline phosphatase (ALP) were evaluated by immunohistochemistry. The mRNA expression levels of ALP, BMP2, Jagged1, Osterix, Runx2, and TGFÎ²1 were determined by RT-qPCR. RESULTS: The animals treated with LLLT exhibited increased mineralized tissues and bone, particularly after 90 days. These increases were associated with increased BMP2, OCN, and ALP protein expression and ALP, BMP2, and Jagged1 mRNA expression. CONCLUSION: LLLT improved the osteoconductive potential of DBB and HA/Î²TCP grafts and bone formation in ungrafted areas. Lasers Surg. Med. Â© 2018 Wiley Periodicals, Inc.

Effectiveness for dentin hypersensitivity treatment of non-carious cervical lesions: a meta-analysis. OBJECTIVE: The aim of this review is to conduct a systematic review and meta-analysis comparing the effectiveness of in-home or in-office treatments for dentin hypersensitivity. MATERIALS AND METHODS: An electronic search without restriction on dates or languages was performed in four electronic databases until March 2017. In addition, hand-searches in regular journals and in the gray literature were also conducted. To develop the search strategy, clinical questions were formulated using the PICOS method. Eligibility criteria included randomized clinical trials (RCTs) that compared

the effectiveness of different agents for the treatment of dentin hypersensitivity through chemical occlusion, physical occlusion, nerve desensitization, or photobiomodulation (low-level light therapy). This systematic review was registered in PROSPERO under number CRD42016039394. RESULTS: Twenty-five RCTs (16 parallel; 9 split-mouth), published from 1992 to 2016, were included. The results of the meta-analysis showed that in-office subgroups treated with chemical or physical occlusion of dentin tubules and nerve desensitization had a statistically significant difference from placebo, with Pâ€‰<â€‰0.00001, Pâ€‰<â€‰0.00001, and Pâ€‰=â€‰0.02, respectively. For in-home treatments, the results of the meta-analysis showed that only those subgroups treated with chemical occlusion of dentin tubules and nerve desensitization exhibited a statistically significant difference from placebo, with Pâ€‰<â€‰0.00001 and Pâ€‰=â€‰0.03, respectively. CONCLUSIONS: The results of pairwise meta-analysis suggest that among in-office treatments, dentinal tubule occlusion (whether chemical or physical) and nerve desensitization provide the best outcomes for treatment of dentin hypersensitivity. For in-home treatments, only chemical occlusion of dentin tubules and nerve desensitization showed a greater treatment efficacy than placebo and the difference was statistically significant. Dentin Desensitizing Agents Dentin Desensitizing Agents;Dentin Sensitivity;Humans;Low-Level Light Therapy;Tooth Demineralization

Combination Therapy Versus Exercise and Orthotic Support in the Management of Pain in Plantar Fasciitis: A Randomized Controlled Trial. BACKGROUND: This study aimed at estimating the effectiveness of two commonly used modalities-extracorporeal shock wave therapy (ESWT) and low-level laser therapy (LLLT)-each combined with usual care (exercises and orthotic supports) in comparison to only usual care to relieve pain in patients with plantar fasciitis (PF). METHODS: Participants with PF were randomly allocated into 3 groups: ESWT (n = 25), LLLT (n = 24), and control (n = 17). All participants received a home exercise program with orthotic support. The ESWT group received 2000 shock waves with 0.02 mJ/mm(2) for 3 sessions, once a week; LLLT group received gallium-aluminum-arsenide laser with 850 nm wavelength for 10 sessions, 3 times a week. Pain was measured by Foot Function Index-pain subscale (FFI-p) and Numerical Rating Scale for pain (NRS-p). The scores were recorded at baseline, third week, and third month after the treatment. Analysis was performed using repeated measures ANOVA. RESULTS: There was a significant improvement in pain over the 3 months in all groups on both FFI-p (P < .001) and NRS-p (P < .001). In NRS-p, LLLT group had significantly lower pain than ESWT (P = .002) at the third week and control (P = .043) and ESWT (P = .003) at third month. In FFI-p total score, ESWT group had higher pain than LLLT (P = .003) and control (P = .035) groups at third week and LLLT (P = .010) group at third month. CONCLUSION: When LLLT and ESWT were combined with usual care, LLLT was found to be more effective than ESWT in reducing pain in PF at short-term follow-up. LEVEL OF EVIDENCE: Level II, comparative study. Combined Modality Therapy;Exercise;Fasciitis, Plantar;High-Energy Shock Waves;Humans;Pain Management;Treatment Outcome

Clinical, microbiological and cytomorphometric evaluation of low-level laser therapy as an adjunct to periodontal therapy in patients with chronic periodontitis. OBJECTIVE: A clinical prospective study was designed to evaluate microbiological, cytomorphometric and clinical efficacy of low-level laser therapy (LLLT) as an adjunct to periodontal therapy in the treatment of chronic periodontitis. METHODS: Sixty subjects were included and randomly assigned into 2 groups: SRP (scaling root planning) group (nÂ =Â 30) and LLLTÂ +Â SRP group (nÂ =Â 30). Clinical parameters were measured before intervention, after the fifth treatment, and after a month. All subjects received oral hygiene instructions and full-mouth conservative periodontal treatment (removal of dental plaque followed by SRP). Afterwards, in group II, Kavo LLLT (980Â nm, 0.2Â W, 6Â J/cm(2)) was applied. Subgingival samples were collected at baseline and after the fifth treatment to quantify Aggregatibacter actinomycetemcomitans, Prevotella intermedia, Porphyromonas gingivalis, Tannerella forsythensis

and Treponema denticola by polymerase chain reaction (PCR). Gingival swabs were taken, and direct smears were prepared on slides for cytomorphometric analysis. RESULTS: Evaluation using clinical parameters showed better results in LLLT group. A statistically significant decrease in the prevalence of bacteria after treatment in LLLT group was observed for the following: T.Â forsythensis and T.Â denticola (PÂ <Â .001), P.Â gingivalis (PÂ <Â .01), A.Â actinomycetemcomitans and P.Â intermedia (PÂ <Â .05). The values of nuclear area, perimeter and Ferret's diameter were significantly lower in both studied groups after treatment, but statistical significance was higher in LLLT group (PÂ <Â .001) than in the SRP therapy group (PÂ <Â .05). CONCLUSION: Low-level laser therapy as an adjunct to periodontal therapy demonstrates short-term additional bacteriological, cytological and clinical benefits. Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Scaling;Female;Humans;Low-Level Light Therapy;Male;Polymerase Chain Reaction;Prospective Studies;Root Planing;Treatment Outcome

Brain Photobiomodulation Therapy: a Narrative Review. Brain photobiomodulation (PBM) therapy using red to near-infrared (NIR) light is an innovative treatment for a wide range of neurological and psychological conditions. Red/NIR light is able to stimulate complex IV of the mitochondrial respiratory chain (cytochrome c oxidase) and increase ATP synthesis. Moreover, light absorption by ion channels results in release of Ca(2+) and leads to activation of transcription factors and gene expression. Brain PBM therapy enhances the metabolic capacity of neurons and stimulates anti-inflammatory, anti-apoptotic, and antioxidant responses, as well as neurogenesis and synaptogenesis. Its therapeutic role in disorders such as dementia and Parkinson's disease, as well as to treat stroke, brain trauma, and depression has gained increasing interest. In the transcranial PBM approach, delivering a sufficient dose to achieve optimal stimulation is challenging due to exponential attenuation of light penetration in tissue. Alternative approaches such as intracranial and intranasal light delivery methods have been suggested to overcome this limitation. This article reviews the state-of-the-art preclinical and clinical evidence regarding the efficacy of brain PBM therapy. Animals;Apoptosis;Brain;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Neurogenesis;Oxidative Stress

Bioluminescence Analysis of Antibacterial Photodynamic Therapy Using Methylene Blue Mediated by Low-Intensity Level Laser Against Cariogenic Biofilms. OBJECTIVE: A non-destructive and real-time bioluminescence (BL) assay was used to determine the utility of antimicrobial photodynamic therapy (aPDT) treatments mediated by methylene blue (MB) and laser irradiation (LI) against intact biofilms that are capable of producing caries (cariogenic). The efficacy of antibacterial photodynamic treatments has been currently determined by using either viable colony counts (VCC) or metabolic assays (Alamar Blue) that were demonstrated to have critical limitations when used on microcolony-forming bacteria such as Streptococcus mutans. MATERIALS AND METHODS: Resin composite specimens were fabricated, wet-polished, ultraviolet-sterilized, and stored in water (72â€‰h). S. mutans (strain JM10) biofilms were grown [24â€‰h; 0.65â€‰Ã—â€‰THY with 0.1% (w/v) sucrose] on the surfaces of sterile specimens. Antibacterial treatments were performed by using MB (0.0005% and 0.001%) with or without LI (660â€‰Â±â€‰10â€‰nm, 6â€‰J/cm(2)). Specimens treated with chlorhexidine gluconate served as the negative control group. The efficacy of aPDT treatments was determined in terms of BL for intact biofilms and VCC for sonicated bacteria. RESULTS: BL results were corrected by using the Greenhouse-Geisser method and were analyzed with repeated-measures analysis of variance and post hoc Bonferroni test (Î±â€‰=â€‰0.05). VCC results were analyzed by using Kruskal-Wallis and Dunn's multiple-comparisons post hoc tests (Î±â€‰=â€‰0.05). Our findings demonstrated that experimental treatments significantly decreased the viability of S. mutans biofilms (pâ€‰<â€‰0.05). Moderate reductions in cellular viability were observed on biofilms subjected to aPDT treatments. CONCLUSIONS: This study demonstrated that aPDT has promising potential to be

used as an additional method to control oral cariogenic biofilms. Anti-Infective Agents;Methylene Blue Anti-Infective Agents;Biofilms;Colony Count, Microbial;Dental Caries;Humans;Low-Level Light Therapy;Luminescent Measurements;Methylene Blue;Photochemotherapy;Streptococcus mutans

Photobiomodulation using low-level laser therapy (LLLT) for patients with chronic traumatic brain injury: a randomized controlled trial study protocol. BACKGROUND: Photobiomodulation using low-level laser therapy (LLLT) has been tested as a new technique to optimize recovery of patients with traumatic brain injury (TBI). The aim of this study is to evaluate inhibitory attentional control after 18 sessions of active LLLT and compare with the placebo group (sham LLLT). Our exploratory analysis will evaluate the efficacy of the active LLLT on verbal and visuospatial episodic memory, executive functions (working memory, verbal and visuospatial fluency, attentional processes), and anxiety and depressive symptoms compared to the sham group. METHODS/DESIGN: A randomized double-blinded trial will be made in 36 patients with moderate and severe TBI. The active LLLT will use an optical device composed of LEDs emitting 632Â nm of radiation at the site with full potency of 830Â mW. The cranial region with an area of 400Â cm(2) will be irradiated for 30Â min, giving a total dose per session of 3.74Â J/cm(2). The sham LLLT group contains only an LED device with powerâ€‰<â€‰1Â mW, only serving to simulate the irradiation. Each patient will be irradiated three times per week for six weeks, totaling 18 sessions. Neuropsychological assessments will be held one week before the beginning of the sessions, after one week, and three months after the end of LLLT sessions. Memory domain, attention, executive functioning, and visual construction will be evaluated, in addition to symptoms of depression, anxiety, and social demographics. DISCUSSION: LLLT has been demonstrated as a safe and effective technique in significantly improving the memory, attention, and mood performance in healthy and neurologic patients. We expect that our trial can complement previous finds, as an effective low-cost therapy to improve cognitive sequel after TBI. TRIAL REGISTRATION: ClinicalTrials.gov, NCT02393079 . Registered on 20 February 2015. Adolescent;Adult;Affect;Anxiety;Attention;Brain;Brain Injuries, Traumatic;Brain Injury, Chronic;Brazil;Depression;Double-Blind Method;Executive Function;Female;Humans;Low-Level Light Therapy;Male;Memory, Episodic;Middle Aged;Multicenter Studies as Topic;Neuropsychological Tests;Prospective Studies;Radiation Dosage;Randomized Controlled Trials as Topic;Time Factors;Treatment Outcome;Young Adult

Transcranial near-infrared photobiomodulation attenuates memory impairment and hippocampal oxidative stress in sleep-deprived mice. Sleep deprivation (SD) causes oxidative stress in the hippocampus and subsequent memory impairment. In this study, the effect of near-infrared (NIR) photobiomodulation (PBM) on learning and memory impairment induced by acute SD was investigated. The mice were subjected to an acute SD protocol for 72â€¯h. Simultaneously, NIR PBM using a laser at 810â€¯nm was delivered (once a day for 3â€¯days) transcranially to the head to affect the entire brain of mice. The Barnes maze and the What-Where-Which task were used to assess spatial and episodic-like memories. The hippocampal levels of antioxidant enzymes and oxidative stress biomarkers were evaluated. The results showed that NIR PBM prevented cognitive impairment induced by SD. Moreover, NIR PBM therapy enhanced the antioxidant status and increased mitochondrial activity in the hippocampus of SD mice. Our findings revealed that hippocampus-related mitochondrial damage and extensive oxidative stress contribute to the occurrence of memory impairment. In contrast, NIR PBM reduced hippocampal oxidative damage, supporting the ability of 810â€¯nm laser light to improve the antioxidant defense system and maintain mitochondrial survival. This confirms that non-invasive transcranial NIR PBM therapy ameliorates hippocampal dysfunction, which is reflected in enhanced memory function. Aldehydes;Reactive Oxygen Species;Thiobarbituric Acid Reactive Substances;mitotracker green FM;Malondialdehyde;Glutathione

Peroxidase;Glutathione Reductase;Glutathione Aldehydes;Animals;Glutathione;Glutathione Peroxidase;Glutathione Reductase;Hippocampus;Lipid Peroxidation;Low-Level Light Therapy;Male;Malondialdehyde;Maze Learning;Memory Disorders;Mice;Mice, Inbred BALB C;Mitochondria;Oxidative Stress;Reactive Oxygen Species;Sleep Deprivation;Thiobarbituric Acid Reactive Substances;Time Factors

The effects of transcutaneous low-level laser therapy on the skin healing process: an experimental model. We aim to evaluate the action of transcutaneous laser in the initial wound healing process. The use of low-level laser therapy (LLLT) has proven to be effective on inflammatory modulation and wound healing. The trial was performed on five groups of rats, through a dorsal incision. All groups received treatment on auricular artery. Groups 1 and 3 were treated with transcutaneous LLLT over a period of 15Â min. Groups 2 and 4 received one and two inactive laser applications (placebo), respectively. Group 5 was the control one. Blood samples were collected 2Â h after the last application of LLLT so that cytokine levels could be measured by ELISA. Tissue fragments were harvested for morphometric, histomorphometric, and RT-qPCR analyses. The morphometric analysis revealed a greater decrease in the wounded area in G1 when compared with G2, whereas in G3, the improvement in the area was greater when compared with G4. Finally, the histomorphometric analysis showed that G1 was the group closer to G5 in terms of collagen fiber count. G2 and G4 had higher amounts of collagen fibers than G5 while G3 had a lower quantity. The use of the transcutaneous LLLT in the current study influenced the wound healing process. Biomarkers;Collagen Animals;Biomarkers;Collagen;Inflammation;Low-Level Light Therapy;Male;Models, Theoretical;Rats, Wistar;Skin;Wound Healing

Effects of high-frequency near-infrared diode laser irradiation on the proliferation and migration of mouse calvarial osteoblasts. Laser irradiation activates a range of cellular processes and can promote tissue repair. Here, we examined the effects of high-frequency near-infrared (NIR) diode laser irradiation on the proliferation and migration of mouse calvarial osteoblastic cells (MC3T3-E1). MC3T3-E1 cells were cultured and exposed to high-frequency (30Â kHz) 910-nm diode laser irradiation at a dose of 0, 1.42, 2.85, 5.7, or 17.1Â J/cm(2). Cell proliferation was evaluated with BrdU and ATP concentration assays. Cell migration was analyzed by quantitative assessment of wound healing using the Incucyt(Â®) ZOOM system. In addition, phosphorylation of mitogen-activated protein kinase (MAPK) family members including p38 mitogen-activated protein kinase (p38), stress-activated protein kinase/Jun-amino-terminal kinase (SAPK/JNK), and extracellular signal-regulated protein kinase (ERK)1/2) after laser irradiation was examined with western blotting. Compared to the control, cell proliferation was significantly increased by laser irradiation at a dose of 2.85, 5.7, or 17.1Â J/cm(2). Laser irradiation at a dose of 2.85Â J/cm(2) induced MC3T3-E1 cells to migrate more rapidly than non-irradiated control cells. Irradiation with the high-frequency 910-nm diode laser at a dose of 2.85Â J/cm(2) induced phosphorylation of MAPK/ERK1/2 15 and 30Â min later. However, phosphorylation of p38 MAPK and SAPK/JNK was not changed by NIR diode laser irradiation at a dose of 2.85Â J/cm(2). Irradiation with a high-frequency NIR diode laser increased cell division and migration of MT3T3-E1 cells, possibly via MAPK/ERK signaling. These observations may be important for enhancing proliferation and migration of osteoblasts to improve regeneration of bone tissues. Adenosine Triphosphate;DNA Adenosine Triphosphate;Animals;Cell Line;Cell Movement;Cell Proliferation;DNA;Infrared Rays;Lasers, Semiconductor;Mice;Osteoblasts;Signal Transduction;Skull

[Laser and light therapy for treatment of radiation dermatitis]. Radiation dermatitis (RD), an inflammatory skin disease that can be an unwanted side effect of medical radiation therapy (RT), most commonly occurs in patients undergoing cancer of the ENT, anal, and vulvar regions. The side effects on the skin and mucous membranes occur within a few weeks after the initiation of RT; however, late side effects can develop months to years after the RT. Therapeutically, various

treatment approaches are considered such as pentoxifylline, hyperbaric oxygen therapy, laser therapy, and PBMT. In order to limit the reduced quality of life of patients with RT-induced fibrosis, supportive care consisting of pain therapy, psychological support, and wound care is necessary. Chronic Disease;Clinical Trials as Topic;Fibrosis;Humans;Laser Therapy;Low-Level Light Therapy;Neoplasms;Phototherapy;Radiodermatitis;Telangiectasis
[Curative laser therapy]. Laser Therapy;Low-Level Light Therapy
Intrapulpal Temperature Increases Caused by 445-nm Diode Laser-Assisted Debonding of Self-Ligating Ceramic Brackets During Simulated Pulpal Fluid Circulation. OBJECTIVE: This study investigated temperature increases in dental pulp resulting from laser-assisted debonding of ceramic brackets using a 445-nm diode laser. MATERIALS AND METHODS: Eighteen ceramic brackets were bonded in standardized manner to 18 caries-free human third molars. Pulpal fluid circulation was simulated by pumping distilled water at 37Â°C through the pulp chamber. The brackets were irradiated with a 445-nm diode laser. Temperatures were measured using a thermal camera at points P1 (center of the pulp) and P2 (in the hard dental tissue) at the baseline (T0), at the start and end of laser application (T1 and T2), and the maximum during the sequence (T(max)). RESULTS: Significant differences in the temperatures measured at P1 and P2 were observed among T0, T1, T2, and T(max). Significant increases in temperature were noted at points P1 and P2, between T1 and T2, T1 and T(max), and T2 and T(max). The maximum P2 values were significantly higher than at P1. The maximum temperature increase measured in the pulp was 2.23Â°C, lower than the critical threshold of 5.5Â°C. CONCLUSIONS: On the basis of the laser settings used, there is no risk to the vitality of dental pulp during laser-assisted debonding of ceramic brackets with a 445-nm diode laser. Body Temperature;Ceramics;Dental Debonding;Dental Pulp;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Molar;Orthodontic Brackets;Tissue Culture Techniques
Uncertainty about usefulness of low-level laser therapy for improving implant outcomes. Dental Implants Dental Implants;Lasers, Semiconductor;Low-Level Light Therapy;Osseointegration;Uncertainty
Systematic review of low-level laser therapy for adult androgenic alopecia. Alopecia is a common disorder affecting over half of the world's population. Within this condition, androgenic alopecia (AA) is the most common type, affecting 50% of males over 40 and 75% of females over 65. Anecdotal paradoxical hypertrichosis noted during laser epilation has generated interest in the possibility of using laser to stimulate hair growth. In this study, we aimed to critically appraise the application of low-level laser therapy for the treatment of AA in adults. A systematic review was performed on studies identified on Medline, EMBASE, Cochrane database, and clinicaltrials.org. Double-blinded randomized controlled trials were selected and analyzed quantitatively (meta-analysis) and qualitatively (quality of evidence, risk of bias). Low-level laser therapy appears to be a promising noninvasive treatment for AA in adults that is safe for self-administration in the home setting. Although shown to effectively stimulate hair growth when compared to sham devices, these results must be interpreted with caution. Further studies with larger samples, longer follow-up, and independent funding sources are necessary to determine the clinical effectiveness of this novel therapy. Adult;Alopecia;Hair;Humans;Low-Level Light Therapy
Effects of corticopuncture (CP) and low-level laser therapy (LLLT) on the rate of tooth movement and root resorption in rats using micro-CT evaluation. The aim of this study was to compare the rate of tooth displacement, quantity of root resorption, and alveolar bone changes in five groups: corticopuncture (CP), low-level laser therapy (LLLT), CP combined with LLLT (CPâ€‰+â€‰LLLT), control (C), and negative control (NC). A total of 60 half-maxilla from 30 male Wistar rats (10Â weeks old) were divided randomly into five groups: three (CP, LLLT, and CPâ€‰+â€‰LLLT) test groups with different stimulation for accelerated-tooth-movement (ATM), one control (C) group, and one

negative control (NC) group with no tooth movement. Nickel-titanium coil springs with 50Â g of force were tied from the upper left and right first molars to micro-implants placed behind the maxillary incisors. For the CP and CPâ€‰+â€‰LLLT groups, two perforations in the palate and one mesially to the molars were performed. For the LLLT and CPâ€‰+â€‰LLLT groups, GaAlAs diode laser was applied every other day for 14Â days (810Â nm, 100Â mW, 15Â s). The tooth displacements were measured directly from the rat's mouth and indirectly from microcomputer (micro-CT) tomographic images. Bone responses at the tension and compression sites and root resorption were analyzed from micro-CT images. The resulting alveolar bone responses were evaluated by measuring bone mineral density (BMD), bone volume fraction (BV/TV), and trabecular thickness (TbTh). Root resorption crater volumes were measured on both compression and tension sides of mesial and distal buccal roots. The tooth displacement in the CPâ€‰+â€‰LLLT group was the greatest when measured clinically, followed by the CP, LLLT, and control groups (C and NC), respectively (pâ€‰<0.05). The tooth movements measured from micro-CT images showed statistically higher displacement in the CP and CPâ€‰+â€‰LLLT groups compared to the LLLT and control groups. The BMD, BV/TV, and TbTh values were lower at the compression side and higher at the tension side for all three test groups compared to the control group. The root resorption crater volume of the distal buccal root was higher in the control group, followed by CP, LLLT, and CPâ€‰+â€‰LLLT, mostly at the compression site. Combining corticopuncture and low-level laser therapy (CPâ€‰+â€‰LLLT) produced more tooth displacement and less root resorption at the compression side. The combined technique also promoted higher alveolar bone formation at the tension side. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxilla;Molar;Rats;Rats, Wistar;Root Resorption;Tooth Mobility;Tooth Movement Techniques;Tooth Root;X-Ray Microtomography

Photobiomodulation increases mitochondrial citrate synthase activity in rats submitted to aerobic training. This study investigated the effects of photobiomodulation by low-laser laser therapy (LLLT) on the activities of citrate synthase (CS) and lactate dehydrogenase (LDH) and the anaerobic threshold (AT) in rats submitted to treadmill exercise. Fifty-four rats were allocated into four groups: rest control (RCG), rest laser (RLG), exercise control (ECG), and exercise laser (ELG). The infrared LLLT was applied daily on the quadriceps, gluteus maximum, soleus, and tibialis anterior muscles. Muscle samples (soleus, tibialis anterior, and cardiac muscles) were removed 48Â h after the last exercise session for spectrophotometric analysis of the CS and LDH. The CS activity (Î¼mol/protein) in ELG (16.02 and 0.49) was significantly greater (Pâ€‰<â€‰0.05) than RCG (2.34 and 0.24), RLG (6.25 and 0.17), and ECG (6.76 and 0.26) in the cardiac and soleus muscles, respectively. The LDH activity (in 1Â Mm/protein) in soleus muscle was smaller (Pâ€‰<â€‰0.05) for ELG (0.33) compared to ECG (0.97), RLG (0.79), and RCG (1.07). For cardiac muscle, the LDH activity was smaller (Pâ€‰<â€‰0.05) in ELG (1.38) compared to ECG (1.91) and RCG (2.55). The ECG and ELG showed increases in the maximum speed and a shift of the AT to higher effort levels after the training period, but no differences occurred between the exercised groups. In conclusion, the aerobic treadmill training combined with LLLT promotes an increase of oxidative capacity in this rat model, mainly in muscles with greater aerobic capacity. L-Lactate Dehydrogenase Animals;Citrate (si)-Synthase;Infrared Rays;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Mitochondria, Muscle;Muscle, Skeletal;Myocardium;Physical Conditioning, Animal;Rats;Rats, Wistar;Running

A Combined Treatment for a Case of Peri-Implant Bisphosphonate-Related Osteonecrosis of the Jaw. OBJECTIVE: Bisphosphonate-related osteonecrosis of the jaws (BRONJ) is rarely reported as a complication after implants placement. In this article we report a combined treatment for a rare case of peri-implant BRONJ. METHODS: A 71-year-old female patient presented for follow-up of a 4.3 x 13 mm implant placed on first upper-left premolar position 3 years prior. She was complaining of soreness of the area and bleeding when brushing. The patient had a history of breast cancer

(removed 7 years prior) for which she was taking anastrozole 1 mg/day, causing a decrease in mineral bone density as side effect, for which she was prescribed a side-therapy of oral risedronate 35 mg/week taken for 4 years and stopped 2 years prior. A 9 mm deep pocket was detected on the mesial-buccal aspect of the implant. At the first visit local minocycline microspheres delivery was performed as antibacterial and anti-inflammatory agent. The patient was seen 10 weeks later with the presence of a bone sequestrum on the mesial-palatal aspect of the implant. A surgical minimally invasive single-flap approach was done to minimize periosteal elevation. Decontamination with EDTA-gel followed by delivery of rh-PDGF (recombinant platelet derived growth factor) with Î²-TCP (Î²-tricalcium phosphate) stabilized with a CaSOâ„„ barrier. A cycle of four consecutive 810 nm diode-laser-biostimulation visits was performed to promote fibroblasts growth. An 18-month post-surgical follow-up showed 3 mm residual probing depth (PD) and an absence of gingival inflammation with no symptoms reported by the patient. RESULTS: Antimicrobial, regenerative and biostimulation therapies were implemented to successfully treat BRONJ around an osseointegrated implant. The results showed noticeable PD reduction and radiographic bone regeneration after 18 months. CONCLUSIONS: A combined therapy aiming at regeneration of bone and soft tissues around osseointegrated implants was successful for treatment of implant-associated BRONJ.

Effects of Photobiomodulation on SOFAT, A T-cell-derived Cytokine, May Explain Accelerated Orthodontic Tooth Movement. Orthodontic tooth movement is based on mechanical forces inducing bone remodeling, and several methods have been proposed to increase tooth movement, including photobiomodulation. This study evaluated, in an animal model, the effects of photobiomodulation on SOFAT-a secreted osteoclastogenic factor of activated T cells and RANK-L during tooth movement. The results showed that tooth displacement, RANK-L and SOFAT levels were significantly greater compared to Control group. SOFAT may play an important role in bone remodeling during orthodontic movement, possibly increasing the osteoclast cells at the compression area and bone remodeling activity. Cytokines;RANK Ligand;Tnfsf11 protein, mouse;Carbon-Oxygen Lyases;Thnsl2 protein, rat Animals;Bone Remodeling;Carbon-Oxygen Lyases;Cytokines;Dental Prosthesis Design;Light;Male;RANK Ligand;Rats, Wistar;T-Lymphocytes;Tooth Movement Techniques

Low-level laser therapy and anesthetic infiltration for orofacial pain in patients with fibromyalgia: a randomized clinical trial. BACKGROUND: To compare the analgesic effect of anesthetic infiltration of lidocaine 2% and low-level laser therapy (LLLT) by GaAlAs into tender points of patients with orofacial pain and fibromyalgia (FM). MATERIAL AND METHODS: A randomized clinical trial was performed with adults (N=66) that were allocated into two groups (1:1): Group A received LLLT irradiation by Diode Laser GaAlAs (780nm) with expositions twice a week during six weeks and Group B was treated with anesthetic infiltration of lidocaine 2% without vasoconstrictor once a week for four weeks. The pain assessment included the Visual Analogic Scale (VAS) and tenderness to palpation. RESULTS: No dropout and adverse effect was observed during the study. The pain decreased significantly in each group after the treatment ($p=0.0001$, $Î²=1.0$), even though no statistical difference was found between both treatments ($p=0.46$, $Î²= 0.82$). The presence of tender points decreased after both treatments, with responsively in some types of masticatory muscles ($p<0.05$) except posterior temporalis muscle. The patients perception showed that both treatments were effective and a few patients reported that the treatment did not improve welfare. CONCLUSIONS: The LLLT by GaAlAs and anesthetic infiltration of lidocaine 2% were equally effective to control orofacial pain in FM individuals. Anesthetics, Local;Lidocaine Anesthesia, Local;Anesthetics, Local;Facial Pain;Female;Fibromyalgia;Humans;Lasers, Semiconductor;Lidocaine;Low-Level Light Therapy;Male;Middle Aged;Pain Management

Low-level laser therapy in the management of plantar fasciitis: a randomized controlled trial. This study aimed at estimating the extent to which a combination therapy of low-level laser therapy (LLLT) with exercise and orthotic support (usual care) affects functional ability in the patient with plantar fasciitis (PF) when compared to usual care alone. Participants with PF were randomly allocated into two groups: LLLT (nâ€‰=â€‰27) and control (nâ€‰=â€‰22). All the participants received home exercise program with orthotic support. In addition, the LLLT group received a gallium-aluminum-arsenide laser with a 850-nm wavelength for ten sessions, three times a week. Functional outcomes were measured by function subscale of American Orthopedic Foot and Ankle Society Score (AOFAS-F) and 12-min walking test including walking speed, cadence, and activity-related pain using visual analog scale (VAS).The scores were recorded at baseline, third week, and third month after the treatment. Analysis was performed using repeated measures ANOVA and an intention to treat approach using multiple imputations. There was a significant improvement in AOFAS-F total score at 3Â weeks in both groups (LLLT, pâ€‰<â€‰0.001; control, pâ€‰=â€‰0.002), but the improvements were seen only for the LLLT group for AOFAS-F total score (pâ€‰=â€‰0.04) and two individual items of AOFAS-F (walking distance (pâ€‰<â€‰0.001) and walking surface (pâ€‰=â€‰0.01)) at 3Â months. The groups were comparable with each other for both walking speed and cadence at all assessment times (pâ€‰>â€‰0.05). Both groups showed significant reduction in pain over 3Â months (LLLT, pâ€‰<â€‰0.001; control, pâ€‰=â€‰0.01); however, the LLLT group had lower pain than the control group at 3Â months (pâ€‰=â€‰0.03). The combination therapy of LLLT with usual care is more effective to improve functional outcomes and activity-related pain when compared to usual care alone. Adult;Demography;Fasciitis, Plantar;Female;Gait;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Visual Analog Scale

Exosomes secreted by mice adipose-derived stem cells after low-level laser irradiation treatment reduce apoptosis of osteocyte induced by hypoxia. OBJECTIVE: KienbÃ¶ck's disease is a commonly seen posttraumatic avascular necrosis characterized by avascular necrosis of the lunate bone of the wrist which involves the dominant hand. In our study, we aimed to present midterm outcomes of 12 cases treated with radial metaphyseal core decompression. PATIENTS AND METHODS: In our clinic, 12 patients who applied to our outpatient clinic with intractable pain despite at least six weeks of conservative treatment were previously diagnosed and evaluated as KienbÃ¶ck's disease between the years 2006 and 2014. Patients at early stage received radial metaphyseal core decompression. RESULTS: The patients were evaluated as postoperative grip strength, flexion-extension gap, ulnar-radial deviation gap, VAS, Quick DASH and MAYO wrist scoring and patient satisfaction. CONCLUSIONS: We determined that interventions performed for KienbÃ¶ck's disease cannot halt radiological progression. We are of the opinion that radial metaphyseal core decompression, aiming at increasing blood perfusion, improve early diagnosis and treatment of KienbÃ¶ck's disease, increasing the patient satisfaction. Adipose Tissue;Animals;Apoptosis;Cell Hypoxia;Exosomes;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Osteocytes;Stem Cells

[What is the value of low-energie lasers in the treatment of androgenetic alopecia ?]. Male and female androgenetic alopecia is a common, chronic, psychologically stressful disorder affecting more than 50 % of the individuals by 50 years of age. Despite the current topical (minoxidil) or oral (the inhibitors of 5-? reductase finasteride or dutasteride) treatments, there is a need for more effective management options. The current clinical evidence, the possible mechanisms of action and the rare adverse events of the low level laser therapy in the treatment of androgenetic alopecia are presented. Alopecia;Female;Hair;Humans;Low-Level Light Therapy;Male;Treatment Outcome

Low-level laser therapy for the treatment of androgenic alopecia: a review. There are many new low-level laser technologies that have been released commercially that claim to support hair regrowth. In this paper, we will examine the clinical trials to determine whether the body of evidence supports the use of low-level laser therapy (LLLT) to treat androgenic alopecia (AGA). A literature search was conducted through Pubmed, Embase, and Clinicaltrials.gov for clinical trials using LLLT to treat AGA. Thirteen clinical trials were assessed. Review articles were not included. Ten of 11 trials demonstrated significant improvement of androgenic alopecia in comparison to baseline or controls when treated with LLLT. In the remaining study, improvement in hair counts and hair diameter was recorded, but did not reach statistical significance. Two trials did not include statistical analysis, but showed marked improvement by hair count or by photographic evidence. Two trials showed efficacy for LLLT in combination with topical minoxidil. One trial showed efficacy when accompanying finasteride treatment. LLLT appears to be a safe, alternative treatment for patients with androgenic alopecia. Clinical trials have indicated efficacy for androgenic alopecia in both men and women. It may be used independently or as an adjuvant of minoxidil or finasteride. More research needs to be undertaken to determine the optimal power and wavelength to use in LLLT as well as LLLT's mechanism of action. Alopecia;Clinical Trials as Topic;Hair;Humans;Low-Level Light Therapy

EUREKA study - the evaluation of real-life use of a biophotonic system in chronic wound management: an interim analysis. OBJECTIVE: Interest has grown regarding photobiomodulation (PBM) with low-level light therapy, which has been shown to positively affect the stages of the wound healing process. In a real-life context clinical setting, the objective of the EUREKA study was to investigate efficacy, safety, and quality of life associated with the use of a BioPhotonic gel (LumiHealâ„¢) in the treatment of chronic wounds such as venous leg ulcers (VLUs), diabetic foot ulcers (DFUs), and pressure ulcers (PUs). This BioPhotonic gel represents a new, first-in-class emission spectrum of light, including fluorescence, to induce PBM and modulate healing. DESIGN: The multicenter, prospective, interventional, uncontrolled, open-label study enrolled 100 patients in 12 wound centers in Italy. We performed an early interim analysis based on the first 33 subjects (13 VLU, 17 DFU, 3 PU) in seven centers who completed the study. MAIN RESULTS: Seventeen patients (52%) achieved total wound closure (full re-epithelialization for 2 weeks) during the study period. Two patients (6%) were considered "almost closed" (decrease of the wound area of more than 90% at study end) and three others (9%) were considered "ready for skin grafting". No related serious adverse events were observed, and the compliance was excellent. After the treatment, the average time to "pain-free" was 11.9 days in the VLU group. Quality of life was improved with overall increase of 26.4% of the total score (Cardiff Wound Impact Schedule, p=0.001). CONCLUSION: The study revealed a positive efficacy profile of the BioPhotonic gel in promoting wound healing and reactivating the healing process in different types of chronic, hard-to-heal wounds. The treatment was shown to be safe and well tolerated by the patients, and a reduction of pain perception was also detected during the treatment period. The improvement of the quality of life was accompanied by a high level of clinician satisfaction. Gels Aged;Chronic Disease;Fluorescence;Gels;Humans;Italy;Phototherapy;Prospective Studies;Quality of Life;Ulcer;Wound Healing

The analgesic effect of photobiomodulation therapy (830 nm) on the masticatory muscles: a randomized, double-blind study. This study assesses the efficacy of photobiomodulation therapy (830 nm) for myalgia treatment of masticatory muscles. Sixty patients with muscular myalgia were selected and randomly allocated into 2 groups (n=30): Group A comprised patients given a placebo (control), and Group B consisted of those undergoing photobiomodulation therapy (PBMT). PBMT and placebo were applied bilaterally to specific points on the masseter and temporal muscles.

Referred pain elicited by palpation and maximum mouth opening were measured before (EV1) and after (EV2) the treatments. The data were analyzed using statistical tests, considering a significance level of 5%. No significant differences in range were observed for active or passive mouth opening (p â‰¥ 0.05). Comparing the final outcomes (EV1-EV2) of both treatments, statistical significance was verified for total pain in the right masseter muscle (p = 0.001) and total pain (p = 0.005). In EV2, significant differences in pain reported with palpation were found between Groups A and B for the following: left posterior temporal muscle (p = 0.025), left superior masseter muscle (p = 0.036), inferior masseter muscle (p = 0.021), total pain (left side) (p = 0.009), total masseter muscle (left side) (p = 0.014), total temporal (left side) (p = 0.024), and total pain (p = 0.035). We concluded that PBMT (830 nm) reduces pain in algic points, but does not influence the extent of mouth opening in patients with myalgia. Adolescent;Adult;Aged;Chronic Pain;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Middle Aged;Myalgia;Pain Measurement;Radiation Dosage;Reference Values;Reproducibility of Results;Statistics, Nonparametric;Temporal Muscle;Temporomandibular Joint Disorders;Treatment Outcome;Young Adult

Effect of laser therapy on quality of life in patients with radiation-induced breast telangiectasias. OBJECTIVE: To evaluate the effects of laser monotherapy on quality of life in breast cancer patients with chronic radiation dermatitis. STUDY DESIGN: A prospective, IRB-approved study was conducted at Memorial Sloan Kettering Cancer Center. Breast cancer patients with chronic radiation dermatitis completed health-related quality of life (HR-QOL) questionnaires before and after laser monotherapy for radiation-induced breast telangiectasias (RIBT). METHODS: After informed consent, all patients were issued the Skindex-16 and Breast-Q Adverse Effects of Radiation HR-QOL questionnaires prior to receiving laser treatment. Patients were treated with a 595â€‰nm pulsed dye laser at 4- to 6-week intervals, with percent telangiectasia clearance and adverse events recorded at each visit. Post-treatment HR-QOL questionnaires were collected after clinician-assessed telangiectasia clearance of >50%. Median HR-QOL scores before and after therapy were reported for individual HR-QOL domains (Skindex-16) and HR-QOL totals (Skindex-16 and Breast-Q Adverse Effects of Radiation). Before- and after-differences were calculated using the Wilcoxon Signed-Rank Test. RESULTS: Twenty-two female patients (average age 56 years) enrolled in this study. A majority (13/22, 59%) exhibited telangiectasias across the dÃ©colletage and axilla in addition to the breast. Sixteen patients reached the 50% RIBT clearance threshold during the study period, and 11 of these patients (69%) completed follow-up HR-QOL questionnaires. Patients showed statistically significant improvements in emotional and functional Skindex-16 HR-QOL domains and in overall Skindex-16 HR-QOL score. Breast-Q scores also improved significantly, illustrating a decrease in specific physical and cosmetic concerns common to radiated breast skin. Common adverse events were transient post-treatment pain and redness. CONCLUSION: Breast cancer patients with RIBT presented with substantial deficits in several HR-QOL arenas. Laser monotherapy effectively treated the appearance of radiation dermatitis in these patients and also significantly improved HR-QOL. Lasers Surg. Med. 50:284-290, 2018. Â© 2017 Wiley Periodicals, Inc. Adult;Aged;Breast Neoplasms;Cancer Care Facilities;Cohort Studies;Female;Follow-Up Studies;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Quality of Life;Radiodermatitis;Radiotherapy, Adjuvant;Retrospective Studies;Risk Assessment;Statistics, Nonparametric;Telangiectasis;Treatment Outcome

In vitro investigations of propulsion during laser lithotripsy using video tracking. OBJECTIVES: Ureteroscopic laser lithotripsy is an important and widely used method for destroying ureter stones. It represents an alternative to ultrasonic and pneumatic lithotripsy techniques. Although these techniques have been thoroughly investigated, the influence of some physical parameters that may be relevant to further improve the treatment results is not fully understood. One crucial topic is the

propulsive stone movement induced by the applied laser pulses. To simplify and speed up the optimization of laser parameters in this regard, a video tracking method was developed in connection with a vertical column setup that allows recording and subsequently analyzing the propulsive stone movement in dependence of different laser parameters in a particularly convenient and fast manner. MATERIALS AND METHODS: Pulsed laser light was applied from below to a cubic BegoStone phantom loosely guided within a vertical column setup. The video tracking method uses an algorithm to determine the vertical stone position in each frame of the recorded scene. The time-dependence of the vertical stone position is characterized by an irregular series of peaks. By analyzing the slopes of the peaks in this signal it was possible to determine the mean upward stone velocity for a whole pulse train and to compare it for different laser settings. For a proof of principle of the video tracking method, a specific pulse energy setting (1â€‰J/pulse) was used in combination with three different pulse durations: short pulse (0.3â€‰ms), medium pulse (0.6â€‰ms), and long pulse (1.0â€‰ms). The three pulse durations were compared in terms of their influence on the propulsive stone movement in terms of upward velocity. Furthermore, the propulsions induced by two different pulse energy settings (0.8â€‰J/pulse and 1.2â€‰J/pulse) for a fixed pulse duration (0.3â€‰ms) were compared. A pulse repetition rate of 10â€‰Hz was chosen for all experiments, and for each laser setting, the experiment was repeated on 15 different freshly prepared stones. The latter set of experiments was compared with the results of previous propulsion measurements performed with a pendulum setup. RESULTS: For a fixed pulse energy (1â€‰J/pulse), the mean upward propulsion velocity increased (from 120.0 to 154.9â€‰mmâ€‰Â·â€‰s(-1)) with decreasing pulse duration. For fixed pulse duration (0.3â€‰ms), the mean upward propulsion velocity increased (from 91.9 to 123.3â€‰mmâ€‰Â·â€‰s(-1)) with increasing pulse energy (0.8â€‰J/pulse and 1.2â€‰J/pulse). The latter result corresponds roughly to the one obtained with the pendulum setup (increase from 61 to 105â€‰mmâ€‰Â·â€‰s(-1)). While the mean propulsion velocities for the two different pulse energies were found to differ significantly (Pâ€‰<â€‰0.001) for the two experimental and analysis methods, the standard deviations of the measured mean propulsion velocities were considerably smaller in case of the vertical column method with video tracking (12% and 15% for nâ€‰=â€‰15 freshly prepared stones) than in case of the pendulum method (26% and 41% for nâ€‰=â€‰50 freshly prepared stones), in spite of the considerably smaller number of experiment repetitions ("sample size") in the first case. CONCLUSION: The proposed vertical column method with video tracking appears advantageous compared to the pendulum method in terms of the statistical significance of the obtained results. This may partly be understood by the fact that the entire motion of the stones contributes to the data analysis, rather than just their maximum distance from the initial position. The key difference is, however, that the pendulum method involves only one single laser pulse in each experiment run, which renders this method rather tedious to perform. Furthermore, the video tracking method appears much better suited to model a clinical lithotripsy intervention that utilizes longer series of laser pulses at higher repetition rates. The proposed video tracking method can conveniently and quickly deliver results for a large number of laser pulses that can easily be averaged. An optimization of laser settings to achieve minimal propulsive stone movement should thus be more easily feasible with the video tracking method in connection with the vertical column setup. Lasers Surg. Med. 50:333-339, 2018. Â© 2017 Wiley Periodicals, Inc.
Humans;In Vitro Techniques;Lasers, Solid-State;Lithotripsy, Laser;Low-Level Light Therapy;Models, Anatomic;Phantoms, Imaging;Reproducibility of Results;Ureteral Calculi;Ureteroscopy;Video Recording

Combination of platelet rich plasma in fractional carbon dioxide laser treatment increased clinical efficacy of for acne scar by enhancement of collagen production and modulation of laser-induced inflammation. BACKGROUND: Platelet-rich plasma (PRP) which contains large amounts of

growth factors has been tried to enhance therapeutic efficacy of laser treatment for acne scar with unknown underlying mechanism. OBJECTIVES: The present study was conducted to investigate the molecular mechanism of increased clinical efficacy of PRP when combined with fractional laser treatment for treating acne scars. METHODS: Subjects with mild to moderate acne scars were treated with two sessions of fractional CO(2) laser therapy given with and without co-administration of PRP. Skin biopsy specimens were obtained at baseline, 1, 3, 7, and 28 days for investigation of molecular profiles associated with skin changes produced by laser plus PRP treatment. RESULTS: The PRP treatment increased clinical efficacy with decreased severity of adverse effects such as erythema, swelling and oozing. Productions of TGFÎ²1 and TGFÎ²3 proteins were more highly elevated on the PRP-treated side of the face compared to the control side at day 28. Furthermore, PRP-treated side showed significant increase of c-myc, TIMP, and HGF expression. Experimental fibroblast culture model was also used. PRP administration after laser irradiation increased expressions of p-Akt, TGFÎ²1, TGFÎ²3, Î²-catenin, collagen 1, and collagen 3 in both dose-dependent and time dependent manners in fibroblast. Moreover, we acquired clinical and histological data through randomized control clinical trial. CONCLUSION: Taken together with human study results combined with the data from cell experiments we suggest that PRP treatment increased fibrogenetic molecules induced by fractional CO(2) laser, which have association with clinical effect. Lasers Surg. Med. 50:302-310, 2018. Â© 2017 Wiley Periodicals, Inc. Collagen Acne Vulgaris;Adult;Biopsy, Needle;Cicatrix;Collagen;Combined Modality Therapy;Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Prospective Studies;Reference Values;Severity of Illness Index;Single-Blind Method;Statistics, Nonparametric;Treatment Outcome;Young Adult

Comparative Safety of Needle, EndoActivator, and Laser-Activated Irrigation in Overinstrumented Root Canals. OBJECTIVE: To evaluate the safety of sodium hypochlorite (NaOCl) irrigation using three different techniques during the final rinse in overinstrumented root canals. BACKGROUND DATA: The effect of irrigant activation on irrigant extrusion from overinstrumented root canals is still unclear. METHODS: A total of 30 single-rooted teeth were decoronated. The working lengths were determined and the roots were divided into two groups of 15 teeth each: group 1, instrumentation 0.5â€‰mm short of the apical foramen and group 2, instrumentation 0.5â€‰mm beyond the apical foramen (overinstrumented). Needle irrigation (NI), sonic irrigation with EndoActivator (EAI), and laser-activated irrigation (LAI) were used for the final rinse in each group; each root underwent the three irrigation procedures in a randomized crossover manner. A modified container-foam model was used to collect apically extruded NaOCl. The weight of the extruded NaOCl was calculated by subtracting the initial weights of the containers from their final weights. All data were statistically analyzed. RESULTS: The amount of NaOCl extrusion was similar with all three irrigation systems in group 1. In group 2, the amount of extruded NaOCl was significantly greater with EAI than with NI and LAI. EAI and LAI caused significantly greater extrusion in group 2 than in group 1. CONCLUSIONS: EAI, NI, and LAI are equally safe for irrigating canals with intact apices. However, the risk of irrigant extrusion can increase in overinstrumented canals, with EAI associated with a greater risk compared with NI and LAI. Disinfectants;Root Canal Irrigants;Sodium Hypochlorite Disinfectants;Humans;Lasers, Solid-State;Low-Level Light Therapy;Needles;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite;Tissue Culture Techniques

Comparison of Photobiomodulation and Anti-Inflammatory Drugs on Tissue Repair on Collagenase-Induced Achilles Tendon Inflammation in Rats. BACKGROUND: Tendinopathy is characterized by pain, edema, and structural changes in tendon tissue. OBJECTIVE: In this animal study we decided to compare the short- and medium-term effects of low-level laser therapy (LLLT), dexamethasone, and diclofenac on inflammation and tendon tissue repair in collagenase-induced tendinitis. MATERIALS

AND METHODS: Two hundred five female Wistar rats were randomly divided into five groups. Animals in the control group were given a saline injection and the experimental groups received a collagenase injection (100â€‰Î¼g/tendon) in the peritendinous Achilles and received no treatment, LLLT (3â€‰J, 810â€‰nm, 100â€‰mW), diclofenac (1.1â€‰mg/kg), or dexamethasone (0.02â€‰mg/kg). Histological analyses were performed at 10 time points up to 60 days (nâ€‰=â€‰5/group each time point), and included an assessment of the severity of inflammation, collagen fiber content, and organization. RESULTS: Collagenase injection induced a severe inflammatory reaction with significant reduction in collagen content for 48â€‰h, and disorientation of collagen fibers lasting between 14 and 21 days. Diclofenac and dexamethasone reduced inflammatory signs during the first 2 days, although there was prolongation of the inflammatory phase and slower normalization of tendon quality, particularly in the dexamethasone group. LLLT prevented hemorrhage, reduced inflammation severity, and preserved tendon morphology compared with the other groups. CONCLUSIONS: LLLT showed a significant superiority over commonly used anti-inflammatory pharmaceutical agents in acute collagenase-induced tendinitis. Anti-Inflammatory Agents;Collagenases Achilles Tendon;Animals;Anti-Inflammatory Agents;Collagenases;Disease Models, Animal;Female;Low-Level Light Therapy;Rats, Wistar;Tendinopathy;Wound Healing

Photobiomodulation in the Metabolism of Lipopolysaccharides-exposed Epithelial Cells and Gingival Fibroblasts. This study assessed the effects of photobiomodulation (PBM) to cells previously exposed to lipopolysaccharides (LPS). Human gingival fibroblasts (HGF) and epithelial cells (HaCaT) were seeded in wells of 24-well plates containing complete culture medium (DMEM). After 24 h, the DMEM was replaced by serum-free DMEM, and cells were exposed to LPS of Escherichia coli (E. coli) (10 Î¼g mL(-1)) for 24, 48, and 72 h. The cells were subjected to specific parameters of phototherapy (PT) (LASERTable-InGaAsP-780 Â± 3 nm, 25 mW, 3 J cm(-2)). Cell proliferation (alamarBlue(Â®)), viability (Trypan Blue) and synthesis of CCL2 (ELISA) were evaluated. Data were statistically analyzed by the Kruskal-Wallis and Mann-Whitney test (Î± = 5%). Proliferation and viability of both cell lines decreased after LPS treatment at 48 and 72 h. Enhanced synthesis of CCL2 by gingival fibroblasts occurred at 24 h, while epithelial cells increased synthesis of this chemokine at 48 and 72 h. PBM enhanced cell proliferation and viability in a time-dependent manner for both cell lines exposed or not to LPS, while synthesis of CCL2 by cells exposed to PT decreased over time. PBM caused biomodulatory effects on gingival fibroblasts and epithelial cells previously treated with LPS. These effects may decrease tissue inflammatory response and accelerate wound healing of oral mucosal tissue. CCL2 protein, human;Chemokine CCL2;Culture Media, Serum-Free;Lipopolysaccharides Cell Proliferation;Cell Survival;Chemokine CCL2;Culture Media, Serum-Free;Epithelial Cells;Escherichia coli;Fibroblasts;Gingiva;Humans;Lipopolysaccharides;Photochemical Processes

Low-level Laser Therapy on Postoperative Pain after Mandibular Third Molar Surgery. INTRODUCTION: The analgesic effect of low-level laser therapy (LLLT) after mandibular third molar (MTM) extraction is controversial. The aim is to evaluate the effect of intraoral LLLT on postoperative pain after MTMs extraction. METHODS: Thirty patients with bilateral symmetrical impacted MTMs underwent surgical extractions. Experimental and control sides were randomly selected to receive LLLT or placebo. Following suturing, a dental assistant applied 810 nm gallium aluminum arsenide (GaAlAs) at three points for 30 s each with a total energy of 9 J. Pain was recorded on a visual analog scale on the 7 successive days. RESULTS: Data analyzed by IBM SPSS Statistics 23 for Windows with P â‰¤ 0.05 significance level. LLLT appeared to have a high significant effect on pain reduction; however, there was a mild increase in pain after the 4(th) day. CONCLUSION: Intraoral 810 nm GaAlAs is effective in reducing postoperative pain when a dose of 32.86 J/cm(2) is used.

FUNCTIONAL AND CELLULAR EVALUATION OF THE LIVER AFTER LOW-POWER LASER STIMULATION DURING SURGERY. BACKGROUND: Partial hepatectomy is a surgical intervention of the liver that can trigger its regenerative process, where the residual lobes deflagrate a compensatory hyperplasia, causing its restoration almost to the original volume. Nevertheless, depending on the extent of liver damage its regeneration might be impaired. The low-power laser has been studied with beneficial results. AIM: To investigate the possible functional and mutagenic damage arising from the use of low-power laser used in liver regeneration after partial hepatectomy. METHODS: Fifteen male adult Wistar rats were hepatectomizated in 70% and laser irradiated or not with dose of 70 J/cm2, 650 nm, 100 mW, directly on the remaining liver, during the perioperative period. These animals were divided into four groups: G1 (control, 7 days); G2 (laser, 7 days); G3 (control, 14 days); G4 (laser, 14 days). Were analyzed the liver weight; number of hepatocytes; deposition of collagen fibers; liver function tests: serum alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, gamma glutamyl transferase, bilirubin and micronucleus test in peripheral blood erythrocyte. RESULTS: The liver weight was greater in G3 and G4 (p=0.001 and p=0.002) compared to other groups. The deposition of collagen fibers in G1 was statistically higher than the other groups (p=0.01). In tests of liver function and micronucleus test was not found significant differences between the studied groups. CONCLUSION: Low-power laser stimulation did not cause loss of liver function or mutagenic damage. Animals;Hepatectomy;Liver Regeneration;Low-Level Light Therapy;Male;Mutation;Rats;Rats, Wistar

Photostimulation of osteogenic differentiation on silk scaffolds by plasma arc light source. Low-level laser therapy (LLLT) has been used for more than 30Â years to heal wounds. In recent years, LLLT or photostimulation has been indicated as an effective tool for regenerative and dental medicine by using monochromatic light. The aim of this study is to indicate the usability of plasma arc light source for bone regeneration. This is why we used polychromatic light source providing effective wavelengths in the range of 590-1500Â nm for cellular response and investigated photostimulation effects on osteogenic differentiation of human mesenchymal stem cells (hMSCs) seeded on 3D silk scaffolds. Cellular responses were examined by using cell culture methods in terms of proliferation, differentiation, and morphological analyses. The results showed that photostimulation with a polychromatic light source (applied for 5Â min from the 3rd day after seeding up to the 28th day in 2-day intervals with 92-mW/cm(2) power from 10-cm distance to the cells) enhanced osteogenic differentiation of hMSCs according to higher alkaline phosphatase (ALP) activity, collagen and calcium content, osteogenic gene expressions, and matrix mineralization. In conclusion, we suggest that the plasma arc light source that was used here has a great potential for bone regeneration. Silk;Collagen;Alkaline Phosphatase;Calcium Alkaline Phosphatase;Bone Regeneration;Calcium;Cell Culture Techniques;Cell Differentiation;Cell Proliferation;Cells, Cultured;Collagen;Humans;Infrared Rays;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Silk;Tissue Scaffolds

A review of monochromatic light devices for the treatment of alopecia areata. There are many laser technologies that are being tested that claim to support hair regrowth for patients with alopecia areata (AA). In this paper, we will determine whether the body of evidence supports the use of devices using monochromatic light sources to treat AA. Articles were gathered from PubMed, Embase, and the Cochrane database using these keywords: lasers, excimer laser, low-level laser therapy (LLLT), low-level light therapy, alopecia, alopecia areata, and hair loss with a category modifier of English. Ten clinical trials and seven case reports/abstracts were assessed. Eight clinical trials and two case reports demonstrated hair regrowth with the 308-nm excimer laser/light in men, women, and children. One case report demonstrated hair regrowth with the ALBA 355Â® laser. One clinical trial and two case reports demonstrated hair regrowth with LLLT. While two case reports

demonstrated hair regrowth with fractional laser therapy, one clinical trial showed no improvement. The 308-nm excimer laser is a safe and effective treatment for men, women, and children with refractory AA of the scalp and beard. Larger, double-blinded clinical trials should be conducted to compare excimer laser therapy to standard treatments. More data is needed to determine the efficacy of LLLT and fractional laser therapy in the treatment of AA. Alopecia Areata;Child;Clinical Trials as Topic;Female;Hair;Humans;Laser Therapy;Lasers, Excimer;Low-Level Light Therapy;Male;Treatment Outcome

Comment on "Low-level laser therapy with 940 nm diode laser on stability of dental implants: a randomized controlled clinical trial". Dental Implants;Titanium Dental Implants;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Titanium

Infrared photobiomodulation (PBM) therapy improves glucose metabolism and intracellular insulin pathway in adipose tissue of high-fat fed mice. Obesity represents a continuously growing global epidemic and is associated with the development of type 2 diabetes mellitus. The etiology of type 2 diabetes is related to the resistance of insulin-sensitive tissues to its action leading to impaired blood glucose regulation. Photobiomodulation (PBM) therapy might be a non-pharmacological, non-invasive strategy to improve insulin resistance. It has been reported that PBM therapy in combination with physical exercise reduces insulin resistance. Therefore, the aim of this study was to investigate the effects of PBM therapy on insulin resistance in obese mice. Male Swiss albino mice received low-fat control diet (nâ€‰=â€‰16, LFC) or high-fat diet (nâ€‰=â€‰18, HFD) for 12Â weeks. From 9th to 12th week, the mice received PBM therapy (LASER) or Sham (light off) treatment and were allocated into four groups: LFC Sham (nâ€‰=â€‰8), LFC PBM (nâ€‰=â€‰8), HFD Sham (nâ€‰=â€‰9), and HFD PBM (nâ€‰=â€‰9). The PBM therapy was applied in five locations: to the left and right quadriceps muscle, upper limbs and center of the abdomen, during 40Â s at each point, once a day, 5Â days a week, for 4Â weeks (780Â nm, 250Â mW/cm(2), 10Â J/cm(2), 0.4Â J per site; 2Â J total dose per day). Insulin signaling pathway was evaluated in the epididymal adipose tissue. PBM therapy improved glucose tolerance and phosphorylation of Akt (Ser473) and reversed the HFD-induced reduction of GLUT4 content and phosphorylation of AS160 (Ser588). Also, PBM therapy reversed the increased area of epididymal and mesenteric adipocytes. The results showed that chronic PBM therapy improved parameters related to obesity and insulin resistance in HFD-induced obesity in mice. Insulin;Lipids;Glucose Adipocytes;Adipose Tissue;Adiposity;Animals;Body Weight;Diet, High-Fat;Epididymis;Glucose;Hypertrophy;Infrared Rays;Insulin;Intracellular Space;Lipids;Low-Level Light Therapy;Male;Mice;Sample Size;Signal Transduction

Light and Laser Modalities in the Treatment of Cutaneous Sarcoidosis: A Systematic Review. Sarcoidosis is a systemic non-caseating granulomatous disease of unknown aetiology. Cutaneous manifestations are present in approximately 10-30% of the patients with the systemic form. Therapy is indicated in case of disabling symptoms, organ dysfunction or cosmetically distressing manifestation. Despite different therapeutic possibilities, cutaneous sarcoidosis remains exceptionally difficult to treat. Light and laser therapy may be a promising alternative. In this systematic review, we summarised the available treatments according to the literature concerning light and laser therapy for cutaneous sarcoidosis. Publications written in English and German, published between January 1990 and July 2016 in the database PubMed, MEDLINE, Embase, and Scopus were analysed. Light therapy with intense pulsed light, photodynamic therapy, and ultraviolet A light therapy, as well as laser therapy with pulsed dye laser, YAG laser, and Q-switched ruby laser were described. The results are based on individual case reports and small case series. Randomised controlled studies are lacking. Humans;Low-Level Light Therapy;Phototherapy;Remission Induction;Sarcoidosis;Skin;Skin Diseases;Treatment Outcome

Effect of 670â€‰nm laser photobiomodulation on vascular density and fibroplasia in late stages of tissue repair. This study aimed to investigate the effects of gallium-aluminum-arsenium (GaAlAs) (670â€‰nm) laser therapy on neoangiogenesis and fibroplasia during tissue remodelling. Forty male Wistar rats underwent cutaneous surgery and were divided into 2 experimental groups: the Control and Laser group (9â€‰mW, 670â€‰nm, 0.031â€‰W/cm(2) , 4â€‰J/cm(2)). After 14, 21, 28, and 35â€‰days, the animals were euthanised. Descriptive and quantitative analyses were performed in sections stained with haematoxylin-eosin and Sirius Red, respectively. The amounts of VEGF+ and CD31+ cells were evaluated by immunohistochemistry and histomorphometric analysis, respectively. Statistical analysis was performed using the Mann-Whitney, Friedman, and Spearman correlation test, Pâ€‰<â€‰0.05. The collagen expression was significantly higher in the laser group compared with the control group on days 14 and 21 after the creation of the skin wound (Pâ€‰=â€‰0.008; Pâ€‰=â€‰0.016) and in the control group between 14 and 28 and 14 and 35â€‰days (Pâ€‰=â€‰0.001; Pâ€‰=â€‰0.007). There were more blood vessels in three periods of the study only in the (Laser) treated group, with statistical significance at day 14 (Pâ€‰=â€‰0.016). There was no statistically significant difference in VEGF+ cell count in the different experimental groups throughout the study, although a positive correlation was shown with the area of collagen on days 14 and 28 (Pâ€‰=â€‰0.037). Laser treatment had a positive effect in the late course of healing, particularly with regards to collagen expression and the number of newly formed vessels. VEGF+ cells were present in both experimental groups, and VEGF appeared to influence fibroplasia in the treated group. Collagen;Gallium;Aluminum Aluminum;Animals;Collagen;Gallium;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Rats;Rats, Wistar;Skin;Wound Healing;Wounds and Injuries

Complications and posttreatment care following invasive laser skin resurfacing: A review. OBJECTIVE: Laser skin resurfacing (LSR) has been used for facial rejuvenation for the last 20 years. Posttreatment care after LSR is essential to decrease the risk of complications. Currently, no unified standards or criteria exist for invasive LSR posttreatment care. We aimed to identify the optimal wound care timing and choice of specific local, systemic, and general medical measures required to decrease complications. METHODS: We performed a systematic search of the PubMed/MEDLINE electronic databases and included only articles written and published in the English language, with no restrictions on the publication time (year). RESULTS: The search yielded 316 potentially relevant articles, 133 of which met our review criteria. Most of the studies on this topic have focused on wound care during the early stage, typically the first 2 weeks. Closed dressings may offer a more ideal, moist wound environment. The use of medications must be judicious. The ongoing emergence of new methods and products warrants evaluation in future large clinical trials. SUMMARY: Familiarity with the complications following invasive LSR and the provision of optimal, effective, and timely posttreatment care may substantially decrease the risks associated with the treatment modality. Hydroquinones;Epidermal Growth Factor;Collagen;Elastin;hydroquinone Antibiotic Prophylaxis;Bandages;Collagen;Cosmetic Techniques;Elastin;Epidermal Growth Factor;Humans;Hydroquinones;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Melanocytes;Platelet-Rich Plasma;Rejuvenation;Severity of Illness Index;Skin;Skin Aging;Time Factors;Wound Healing;Wounds and Injuries

A case of heroin linear track hyperpigmentation: histopathology and treatment with Q-switched Nd:YAG 1064nm laser. Adult;Biopsy, Needle;Female;Follow-Up Studies;Heroin Dependence;Humans;Hyperpigmentation;Immunohistochemistry;Lasers, Solid-State;Low-Level Light Therapy;Substance Abuse, Intravenous;Treatment Outcome

Influence of different types of light on the response of the pulp tissue in dental bleaching: a systematic review. OBJECTIVES: This systematic review (PROSPERO register: CRD42016053140)

investigated the influence of different types of light on the pulp tissue during dental bleaching. MATERIALS AND METHODS: Two independent authors conducted a systematic search and risk of bias evaluations. An electronic search was undertaken (PubMed/Medline, Embase, The Cochrane Library, and other databases) until May 2017. The population, intervention, comparison, outcomes (PICO) question was: "Does the light in dental bleaching change the response of the pulp to the bleaching procedure?" The intervention involved pulp tissue/cells after bleaching with light, while the comparison involved pulp tissue/cells after bleaching without light. The primary outcome was the inflammation/cytotoxicity observed in pulp after bleaching. RESULTS: Out of 2210 articles found, 12 articles were included in the review; four were in vivo studies (one study in dogs/others in human), and eight were in vitro studies (cell culture/with artificial pulp chamber or not). The light source used was halogen, light-emitting diode (LED), and laser. Only one in vivo study that used heat to simulate light effects showed significant pulp inflammation. Only two in vitro studies demonstrated that light influenced cell metabolism; one using halogen light indicated negative effects, and the other using laser therapy indicated positive effects. Given that animal and in vitro studies have been identified, there remain some limitations for extrapolation to the human situation. Furthermore, different light parameters were used. CONCLUSIONS: The effects of dental bleaching on the pulp are not influenced by different types of light, but different light parameters can influence these properties. CLINICAL RELEVANCE: There is insufficient evidence about the influence of different types of light on inflammation/cytotoxicity of the pulp. Halogens;Tooth Bleaching Agents Animals;Curing Lights, Dental;Dental Pulp;Dogs;Halogens;Humans;Low-Level Light Therapy;Tooth Bleaching;Tooth Bleaching Agents

Beneficial effects of low-level laser irradiation on senile osteoporosis in rats. OBJECTIVE: To investigate the effect of low-level laser irradiation (LLLI) on bone mineral density (BMD), bone structures, bone biomechanical properties and bone metabolism in senile osteoporosis, and to explore a relatively more secure and effective way to prevent and treat osteoporosis. MATERIALS AND METHODS: Sprague-Dawley (SD) male rats at different age stages (4 months old, 12 months old and 20 months old) were selected and randomly divided into six groups. The rats in the treatment group were treated with LLLI for 12 weeks, and then the microstructure of bones was analyzed by micro-computed tomography (micro-CT) scanning. The biomechanical indexes of the femur were detected by the three-point bending test. Levels of the blood calcium (Ca)2+, blood phosphorus (P)3+, urine Ca, urine P and urine creatinine (CREA) were detected using an automatic biochemical analyzer. The contents of serum osteocalcin (OCN) and bone alkaline phosphatase (BAP) were measured by enzyme-linked immunosorbent assay (ELISA). The bone formation rate (BFR) was analyzed by double fluorescent labeling with calcein and tetracycline. Hematoxylin and eosin (HE) staining and toluidine blue staining were used to analyze the number of bone marrow osteoblasts and adipocytes. RESULTS: Micro-CT results showed that compared with those in the young group, the bone mineral density (BMD) in the old group was significantly decreased, and the trabecular microstructure was seriously damaged. LLLI could significantly enhance the BMD and improve the damage to the trabecular microstructure; the three-point bending test revealed that LLLI could significantly improve the biomechanical properties and enhance the mechanical strength of the femur in the old group; the biochemical analysis showed that LLLI could significantly reduce Ca and P losses and elevate the levels of serum BAP and OCN; the bone histomorphology analysis results indicated that LLLI could increase BFR and mineral apposition rate (MAR), increase the number of osteoblasts and decrease the number of adipocytes in the bone marrow in the old group. CONCLUSIONS: LLLI can effectively improve osteoporosis, increase BMD, improve bone structure and improve bone biomechanical properties in old rats; at the same time, it increases the levels of serum BAP and OCN and the number of osteoblasts in the bone marrow, suggesting that the osteogenesis function of osteoblasts is

enhanced. Phosphorus;Creatinine;Calcium Animals;Biomechanical Phenomena;Bone Density;Calcium;Creatinine;Enzyme-Linked Immunosorbent Assay;Low-Level Light Therapy;Male;Osteoporosis;Phosphorus;Rats;Rats, Sprague-Dawley;Tomography, X-Ray Computed

Use of low-level laser therapy in treatment of the androgenic alopecia, the first systematic review. Alopecia is a common disease affecting more than half of the world total number of people. Alopecia exists in different types, but one of the most common of these types is the Androgenic Alopecia which has affected approximately 51% of the total number of males ranging between the age bracket of 40Â years and 75Â years. This type of alopecia is more common in females who are above the age of 65Â years and above. Despite this widespread effect, much has not been done regarding identifying the possible drugs for treating this disease. At present, there exist only two possible medications that have been scientifically approved to cure this disease, include finasteride and minoxidil. Also, another possible form of treatment has been the case of hair transplantation. Despite the new possible treatment options available for treatment of different types of hair loss, there is a need for the invention for more efficient management and treatment options that are less costly, environmentally friendly, and most importantly human consumption friendly. Due to the recent evaluation that low-level laser therapy stimulated hair growth. This systematic review and meta-analysis was to determine whether the use of low-level laser therapy is an effective therapy for treatment of the Androgenic alopecia and also to some degree we reviewed the level of the patient's satisfaction. Some earlier studies had shown that the use of low-level laser therapy stimulated the hair growth when mice were treated with chemotherapy which was induced by the alopecia and also the other type of alopecia called alopecia areata. The researchers hypothesized that the primary mechanism of treating Androgenic alopecia to be the stimulation of the epidermal stem cells which are in the hair follicle making them bulge and shift the follicles into the anagen phase. Alopecia;Hair;Humans;Low-Level Light Therapy;Patient Satisfaction

Aging of lymphoid organs: Can photobiomodulation reverse age-associated thymic involution via stimulation of extrapineal melatonin synthesis and bone marrow stem cells? Thymic atrophy and the subsequent reduction in T-cell production are the most noticeable age-related changes affecting lymphoid organs in the immune system. In fact, thymic involution has been described as "programmed aging." New therapeutic approaches, such as photobiomodulation (PBM), may reduce or reverse these changes. PBM (also known as low-level laser therapy) involves the delivery of non-thermal levels of red or near-infrared light that are absorbed by mitochondrial chromophores, in order to prevent tissue death and stimulate healing and regeneration. PBM may reverse or prevent thymic involution due to its ability to induce extrapineal melatonin biosynthesis via cyclic adenosine monophosphate (AMP) or NF-kB activation, or alternatively by stimulating bone marrow stem cells that can regenerate the thymus. This perspective puts forward a hypothesis that PBM can alter thymic involution, improve immune functioning in aged people and even extend lifespan. Melatonin Aging;Animals;Humans;Low-Level Light Therapy;Melatonin;Mesenchymal Stem Cells;T-Lymphocytes;Thymus Gland

Photobiomodulation: How Many Sessions and How Often? Humans;Low-Level Light Therapy;Periodontics

Two-Step Irradiance Treatment Can Achieve Excellent Pain Control During Red Light 5-Aminolevulinic Acid Photodynamic Therapy for Actinic Keratoses. OBJECTIVE: To evaluate the ability of two-step irradiance to maintain pain control during red light 5-aminolevulinic acid (ALA) photodynamic therapy (PDT) for actinic keratoses (AK) and assess factors influencing pain. BACKGROUND: PDT provides excellent clinical and cosmetic results in the treatment AK and early basal cell carcinomas (BCC). Widespread use of PDT is limited, in part, by pain. A two-step irradiance method for PDT has previously been shown to significantly reduce PDT-associated pain during the treatment of BCC, but

the ability of this method to limit pain during the treatment of AKs has not been reported. METHODS: We performed a retrospective chart review to assess the level of pain during AK treatment by red light PDT (nâ€‰=â€‰99). Natural density filter was used to reduce the irradiance of the light source and initially 10â€‰J/cm(2) dose was delivered at 35â€‰mW/cm(2) and then, 65â€‰J/cm(2) dose was delivered at 70â€‰mW/cm(2). Pain level was measured using a 10-point visual analog scale at three points during the procedure. RESULTS: Pain was low to moderate in most patients (meanâ€‰Â±â€‰standard error of the mean pain score: 2.35â€‰Â±â€‰0.19). Higher pain was seen midprocedure versus at the beginning (pâ€‰<â€‰0.0001) and at the end (pâ€‰=â€‰0.003) of PDT. There was no significant difference in pain perception between genders and different treatment areas. CONCLUSIONS: Our results provide evidence that red light ALA PDT of AKs is very well tolerated with the two-step irradiance protocol. Photosensitizing Agents;Aminolevulinic Acid Aged;Aminolevulinic Acid;Female;Humans;Keratosis, Actinic;Low-Level Light Therapy;Male;Middle Aged;Pain;Photochemotherapy;Photosensitizing Agents;Retrospective Studies

A network meta-analysis in comparing prophylactic treatments of radiotherapy-induced oral mucositis for patients with head and neck cancers receiving radiotherapy. OBJECTIVES: The objective of this network meta-analysis is to optimize the prophylactic treatment for radiotherapy-induced oral mucositis in patients with head and neck cancer (HNSCC) receiving postoperative or definitive radiotherapy with or without chemotherapy. MATERIALS AND METHODS: We searched electronic databases to identify all eligible randomized clinical trials on oral mucositis. The endpoint was grade 0-2 oral mucositis. Odds ratios (OR) and the corresponding 95% confidence intervals (CI) were extracted. Network meta-analysis was performed using the frequentist approach to conduct multiple treatment comparisons. RESULTS: In total, 57 trials with 5261 patients were eligible for this study. Both direct and network meta-analysis revealed that low-level laser additional to standard oral care (SOC) was better than most of the other treatments and achieved the highest effect on grade 0-2 oral mucositis, with a surface under the cumulative ranking curve (SUCRA) of 95.8%; however, SOC with or without placebo had worse effect than most of the other treatments and was ranked worst (SUCRAâ€¯=â€¯0.4%). Moreover, sensitivity analysis performed after we had combined the SOC and placebo groups (non-medication treatment, NMT) yielded similar results, with SUCRA of 91.3% and 3.5% for low-level laser and NMT, respectively. CONCLUSIONS: Low-level laser additional to SOC may be a more effective prophylactic treatment for reducing severe radiotherapy-induced oral mucositis; SOC alone is insufficient for patients with HNSCC receiving postoperative or definitive radiotherapy with or without chemotherapy. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Network Meta-Analysis;Radiotherapy;Randomized Controlled Trials as Topic;Stomatitis

State-of-the-art lasers and light treatments for vascular lesions: from red faces to vascular malformations. Notable milestones in the treatment of vascular lesions have been achieved over the past century. Many cutaneous vascular lesions can be successfully treated with lightbased devices. In this review, we will discuss the treatment of port-wine birthmarks, lymphatic malformations, infantile hemangiomas, rosacea, venous lakes, pyogenic granulomas, cherry angiomas, and angiofibromas using lasers, total reflection amplification of spontaneous emission of radiation, intense pulsed light, and photodynamic therapy. In addition, for several of these diagnoses, we will review medical therapies that can be combined with light-based devices to provide enhanced results. Angiofibroma;Facial Dermatoses;Granuloma, Pyogenic;Hemangioma;Hemangioma, Capillary;Humans;Intense Pulsed Light Therapy;Laser Therapy;Low-Level Light Therapy;Lymphatic Abnormalities;Photochemotherapy;Port-Wine Stain;Rosacea;Skin Neoplasms;Vascular Malformations

Synthesis and characterization of small-sized gold nanoparticles coated by bovine serum albumin (BSA) for cancer photothermal therapy. In the present study, small gold nanoparticles <5â€¯nm coated with natural protein Bovine Serum Albumin (BSA) was synthesized and characterized using

UV-vis spectrophotometer, Dynamic Light Scattering (DLS), Transmission Electron Microscopy (TEM), zeta potential and scanning electron microscopy (SEM). Three types of cancer cell lines; Rhabdomyosarcoma (RD), Murine fibroblast (L20B) and RAW 264.7 monocyte-macrophage (MQ) were tested and treated by photothermal strategy, in vitro, by conjugating BSA-AuNPs complex of (0.125, 0.25, 0.5 and 1â€¯mg/ml) concentrations with continuous low power laser irradiation, green (532â€¯nm) and near-infrared (NIR) (800â€¯nm) at 0.5, 1, 2 and 3â€¯min, separately. Cytotoxicity effect was determined by MTT assay. The vital impact of photothermal technique has investigated at 1â€¯mg/ml and 3â€¯min irradiation period as identified in RD cell line in comparison with other types; where cytotoxicity more than 74% was reached. Prominent results were demonstrated in the green and NIR region by pH -induced aggregation effect of small nanoparticles inside the cancer cells, which make the small-sized BSA-AuNPs are promising agents for cancer photothermal therapy. Drug Carriers;Serum Albumin, Bovine;Gold Animals;Cattle;Cell Line, Tumor;Drug Carriers;Gold;Hydrogen-Ion Concentration;Low-Level Light Therapy;Metal Nanoparticles;Mice;Microscopy, Electron, Transmission;RAW 264.7 Cells;Serum Albumin, Bovine

Low-level laser therapy may reduce the time of recovery from paresthesia after orthognathic surgery. Humans;Low-Level Light Therapy;Orthognathic Surgery;Orthognathic Surgical Procedures;Paresthesia;Randomized Controlled Trials as Topic

Venous Malformations of the Head and Neck. Venous malformations (VMs) of the head and neck arise from deficits in the development of venous network. Clinically, VMs are highly variable, from small and asymptomatic varicosities to massive cervicofacial lesions. Therapeutic approaches include surgery; laser photocoagulation; sclerotherapy; and, more recently, systemic targeted drugs. This article discusses the natural history, diagnosis, and management of VMs. Diagnosis, Differential;Head;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Neck;Sclerotherapy;Surgical Procedures, Operative;Vascular Malformations;Veins

Low level laser therapy (Photobiomodulation therapy) for breast cancer-related lymphedema: a systematic review. BACKGROUND: Breast cancer related lymphedema (BCRL) is a prevalent complication secondary to cancer treatments which significantly impacts the physical and psychological health of breast cancer survivors. Previous research shows increasing use of low level laser therapy (LLLT), now commonly referred to as photobiomodulation (PBM) therapy, for BCRL. This systematic review evaluated the effectiveness of LLLT (PBM) in the management of BCRL. METHODS: Clinical trials were searched in PubMed, AMED, Web of Science, and China National Knowledge Infrastructure up to November 2016. Two reviewers independently assessed the methodological quality and adequacy of LLLT (PBM) in these clinical trials. Primary outcome measures were limb circumference/volume, and secondary outcomes included pain intensity and range of motion. Because data were clinically heterogeneous, best evidence synthesis was performed. RESULTS: Eleven clinical trials were identified, of which seven randomized controlled trials (RCTs) were chosen for analysis. Overall, the methodological quality of included RCTs was high, whereas the reporting of treatment parameters was poor. Results indicated that there is strong evidence (three high quality trials) showing LLLT (PBM) was more effective than sham treatment for limb circumference/volume reduction at a short-term follow-up. There is moderate evidence (one high quality trial) indicating that LLLT (PBM) was more effective than sham laser for short-term pain relief, and limited evidence (one low quality trial) that LLLT (PBM) was more effective than no treatment for decreasing limb swelling at short-term follow-up. CONCLUSIONS: Based upon the current systematic review, LLLT (PBM) may be considered an effective treatment approach for women with BCRL. Due to the limited numbers of published trials available, there is a clear need for well-designed high-quality trials in this area. The optimal treatment parameters for clinical application have yet to be elucidated.

Breast Cancer Lymphedema;Female;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic
Photobiomodulation of mesenchymal stem cells encapsulated in an injectable rhBMP4-loaded hydrogel directs hard tissue bioengineering. Photobiomodulation (PBM) therapy displays relevant properties for tissue healing and regeneration, which may be of interest for the tissue engineering field. Here, we show that PBM is able to improve cell survival and to interact with recombinant human Bone Morphogenetic Protein 4 (rhBMP4) to direct and accelerate odonto/osteogenic differentiation of dental derived mesenchymal stem cells (MSCs). MSCs were encapsulated in an injectable and thermo-responsive cell carrier (Pluronic(Â®) F-127) loaded with rhBMP4 and then photoactivated. PBM improved MSCs self-renewal and survival upon encapsulation in the Pluronic(Â®) F-127. In the presence of rhBMP4, cell odonto/osteogenic differentiation was premature and markedly improved in the photoactivated MSCs. An in vivo calvarial critical sized defect model demonstrated significant increase in bone formation after PBM treatment. Finally, a balance in the reactive oxygen species levels may be related to the favorable results of PBM and rhBMP4 association. PBM may act in synergism with rhBMP4 and is a promise candidate to direct and accelerate hard tissue bioengineering. BMP4 protein, human;Bone Morphogenetic Protein 4;Drug Carriers;Hydrogels;NF-kappa B;Reactive Oxygen Species;Poloxamer Adolescent;Adult;Animals;Bone Morphogenetic Protein 4;Bone Regeneration;Cell Differentiation;Cell Proliferation;Cell Self Renewal;Cell Survival;Cells, Cultured;Drug Carriers;Humans;Hydrogels;Injections;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice, Nude;NF-kappa B;Osteogenesis;Parietal Bone;Poloxamer;Reactive Oxygen Species;Time Factors;Tissue Engineering;Tissue Scaffolds;Young Adult
Low-level ultrahigh-frequency and ultrashort-pulse blue laser irradiation enhances osteoblast extracellular calcification by upregulating proliferation and differentiation via transient receptor potential vanilloid 1. BACKGROUND AND OBJECTIVE: Low-level laser irradiation (LLLI) exerts various biostimulative effects, including promotion of wound healing and bone formation; however, few studies have examined biostimulation using blue lasers. The purpose of this study was to investigate the effects of low-level ultrahigh-frequency (UHF) and ultrashort-pulse (USP) blue laser irradiation on osteoblasts. STUDY DESIGN/ MATERIALS AND METHODS: The MC3T3-E1 osteoblast cell line was used in this study. Following LLLI with a 405â€‰nm newly developed UHF-USP blue laser (80â€‰MHz, 100â€‰fs), osteoblast proliferation, and alkaline phosphatase (ALP) activity were assessed. In addition, mRNA levels of the osteoblast differentiation markers, runt-related transcription factor 2 (Runx2), osterix (Osx), alkaline phosphatase (Alp), and osteopontin (Opn) was evaluated, and extracellular calcification was quantified. To clarify the involvement of transient receptor potential (TRP) channels in LLLI-induced biostimulation, cells were treated prior to LLLI with capsazepine (CPZ), a selective inhibitor of TRP vanilloid 1 (TRPV1), and subsequent proliferation and ALP activity were measured. RESULTS: LLLI with the 405â€‰nm UHF-USP blue laser significantly enhanced cell proliferation and ALP activity, compared with the non-irradiated control and LLLI using continuous-wave mode, without significant temperature elevation. LLLI promoted osteoblast proliferation in a dose-dependent manner up to 9.4â€‰J/cm(2) and significantly accelerated cell proliferation in in vitro wound healing assay. ALP activity was significantly enhanced at doses up to 5.6â€‰J/cm(2) , and expression of Osx and Alp mRNAs was significantly increased compared to that of the control on days 3 and 7 following LLLI at 5.6â€‰J/cm(2) . The extent of extracellular calcification was also significantly higher as a result of LLLI 3 weeks after the treatment. Measurement of TRPV1 protein expression on 0, 3, and 7 days post-irradiation revealed no differences between the LLLI and control groups; however, promotion of cell proliferation and ALP activity by LLLI was

significantly inhibited by CPZ. CONCLUSION: LLLI with a 405â€‰nm UHF-USP blue laser enhances extracellular calcification of osteoblasts by upregulating proliferation and differentiation via TRPV1. Lasers Surg. Med. 50:340-352, 2018. Â© 2017 Wiley Periodicals, Inc. TRPV Cation Channels;TRPV1 protein, mouse;TRPV1 receptor;Osteopontin;Alkaline Phosphatase Alkaline Phosphatase;Animals;Calcinosis;Cell Line;Cell Proliferation;Lasers, Dye;Low-Level Light Therapy;Mice;Osteoblasts;Osteopontin;Real-Time Polymerase Chain Reaction;Sensitivity and Specificity;TRPV Cation Channels;Up-Regulation

Non-specific effects and clusters of women with painful TMD responders and non-responders to LLLT: double-blind randomized clinical trial. The aim was to analyze the non-specific effects (placebo, spontaneous remission, and regression to the mean) of the low-level laser therapy (LLLT) in women with myofascial pain (painful temporomandibular disorder (TMD)), as well as to differentiate between responders and non-responder clusters to active and placebo LLLT according to the anxiety levels, salivary cortisol, use of oral contraceptives, and premenstrual period. Sixty-four women diagnosed with myofascial pain (Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)) were included, divided into laser (nâ€‰=â€‰20), placebo group (nâ€‰=â€‰21), and 23 controls (without treatment (WT)). The LLLT applied was 780Â nm, masseter and temporalâ€‰=â€‰5Â J/cm(2) (20Â mW-0.5Â W/cm(2)), and TMJ areaâ€‰=â€‰7.5Â J/cm(2) (30Â mW-0.8Â W/cm(2)), eight sessions, twice a week. The pain intensity (visual analogue scale (VAS)), anxiety (Beck Anxiety Inventory), salivary cortisol, and menstrual cycle's data at the baseline, T1-T8, and 30Â days after LLLT (follow-up) were evaluated. The laser group showed 80% of pain reduction, placebo 85%, and WT 43% in T8. Women with severe anxiety and at the premenstrual period did not reduce pain with any LLLT. Active and placebo LLLT had similar effectiveness during the treatment period; however, women with moderate anxiety, cortisol levels above 10Â ng/ml, and without contraceptive use maintain analgesia longer with active LLLT than placebo (follow-up 30Â days). Women with low levels of anxiety, salivary cortisol below 10Â ng/ml, and with contraceptive use showed the higher pain reduction. The analgesia promoted by LLLT in women with myofascial pain is a result of non-specific effects during the treatment period, although active LLLT is more effective in maintaining the analgesia after treatment (30Â days) for the cluster of women with moderate anxiety, salivary cortisol above 10Â ng/ml, and without contraceptive use. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Pain Measurement;Temporomandibular Joint Disorders;Treatment Outcome;Visual Analog Scale

Photobiomodulation therapy protects skeletal muscle and improves muscular function of mdx mice in a dose-dependent manner through modulation of dystrophin. This study aimed to analyze the protective effects of photobiomodulation therapy (PBMT) with combination of low-level laser therapy (LLLT) and light emitting diode therapy (LEDT) on skeletal muscle tissue to delay dystrophy progression in mdx mice (DMD (mdx)). To this aim, mice were randomly divided into five different experimental groups: wild type (WT), placebo-control (DMD (mdx)), PBMT with doses of 1Â J (DMD (mdx)), 3Â J (DMD (mdx)), and 10Â J (DMD (mdx)). PBMT was performed employing a cluster probe with 9 diodes (1 x 905nm super-pulsed laser diode; 4 x 875nm infrared LEDs; and 4 x 640nm red LEDs, manufactured by Multi Radiance MedicalÂ®, Solon - OH, USA), 3 times a week for 14Â weeks. PBMT was applied on a single point (tibialis anterior muscle-bilaterally). We analyzed functional performance, muscle morphology, and gene and protein expression of dystrophin. PBMT with a 10Â J dose significantly improved (pâ€‰<â€‰0.001) functional performance compared to all other experimental groups. Muscle morphology was improved by all PBMT doses, with better outcomes with the 3 and 10Â J doses. Gene expression of dystrophin was significantly increased with 3Â J (pâ€‰<â€‰0.01) and 10Â J (pâ€‰<â€‰0.01) doses when compared to placebo-control group. Regarding protein expression of dystrophin, 3Â J (pâ€‰<â€‰0.001) and 10Â J (pâ€‰<â€‰0.05)

doses also significantly showed increase compared to placebo-control group. We conclude that PBMT can mainly preserve muscle morphology and improve muscular function of mdx mice through modulation of gene and protein expression of dystrophin. Furthermore, since PBMT is a non-pharmacological treatment which does not present side effects and is easy to handle, it can be seen as a promising tool for treating Duchenne's muscular dystrophy. Dystrophin;Placebos;RNA, Messenger Animals;Dose-Response Relationship, Radiation;Dystrophin;Gene Expression Regulation;Low-Level Light Therapy;Mice, Inbred C57BL;Mice, Inbred mdx;Muscle, Skeletal;Muscular Dystrophy, Duchenne;Placebos;RNA, Messenger

Global Health Journal Club: Is Honey Effective as a Treatment for Chemotherapy-induced Mucositis in Paediatric Oncology Patients? Oral mucositis (OM) is an inflammatory response of mucosal epithelium to the cytotoxic effects of chemotherapy and radiotherapy causing severe oral pain and ulceration, which may complicate the management of cancer. The Mucositis Prevention Guideline Development Group has developed an international guideline for the prevention of mucositis in children receiving treatment for cancer or undergoing haematopoietic stem cell transplantation. Evidence-based preventative strategies include cryotherapy, low-level light therapy and keratinocyte growth factor. However, these strategies are often not available in resource-poor settings. There is some evidence that honey may be a suitable treatment for OM in adult patients. We performed a literature search of 11 databases to find papers exploring the use of honey to treat chemotherapy-associated mucositis in paediatric oncology patients. We found four papers, which provide Grade C evidence that honey is effective as a preventative and therapeutic measure for OM in paediatric oncology patients. Antineoplastic Agents Adolescent;Antineoplastic Agents;Apitherapy;Child;Child, Preschool;Female;Global Health;Honey;Humans;Male;Neoplasms;Stomatitis;Treatment Outcome

Retinal pigment epithelium in the pathogenesis of age-related macular degeneration and photobiomodulation as a potential therapy? The retinal pigment epithelium (RPE) comprises a monolayer of cells located between the neuroretina and the choriocapillaries. The RPE serves several important functions in the eye: formation of the blood-retinal barrier, protection of the retina from oxidative stress, nutrient delivery and waste disposal, ionic homeostasis, phagocytosis of photoreceptor outer segments, synthesis and release of growth factors, reisomerization of all-trans-retinal during the visual cycle, and establishment of ocular immune privilege. Age-related macular degeneration (AMD) is the leading cause of blindness in developed countries. Dysfunction of the RPE has been associated with the pathogenesis of AMD in relation to increased oxidative stress, mitochondrial destabilization and complement dysregulation. Photobiomodulation or near infrared light therapy which refers to non-invasive irradiation of tissue with light in the far-red to near-infrared light spectrum (630-1000 nm), is an intervention that specifically targets key mechanisms of RPE dysfunction that are implicated in AMD pathogenesis. The current evidence for the efficacy of photobiomodulation in AMD is poor but its safety profile and proposed mechanisms of action motivate further research as a novel therapy for AMD. Animals;Blood-Retinal Barrier;Humans;Macular Degeneration;Membrane Potential, Mitochondrial;Mitochondria;Oxidative Stress;Phototherapy;Retinal Pigment Epithelium;Vision, Ocular

Is photobiomodulation (PBM) effective for the treatment of dentin hypersensitivity? A systematic review. The present study aims to evaluate the current scientific data regarding the effectiveness of photobiomodulation (PBM) in the treatment of dentin hypersensitivity (DH) as an alternative method for pain control. A systematic review was conducted to assess the effectiveness of PBM as treatment for DH. A complete literature search was performed up to October 2016. Searches were conducted using Boolean operators and MeSH terms. References of all selected full-text articles and related reviews were scanned. A total of 280 articles were identified (241 articles were excluded

by the title and abstract). Of the 39 articles selected for analysis, 36 were excluded because they presented one or more exclusion criteria. Therefore, three articles were qualified for inclusion in this systematic review. PBM may not lead to adverse effects provided that adequately controlled parameters are followed when treating DH. More consistent studies should be conducted in order to adequately observe the advantageous therapeutic effect of PBM. Dentin Sensitivity;Female;Humans;Low-Level Light Therapy;Male;Randomized Controlled Trials as Topic

Muscle fiber conduction velocity and EMG amplitude of the upper trapezius muscle in healthy subjects after low-level laser irradiation: a randomized, double-blind, placebo-controlled, crossover study. Although low-level laser therapy (LLLT) is an important resource for the treatment of non-specific neck pain patients, the dose which presents the greatest therapeutic potential for the treatment of this pathology is still unclear. The present study aimed to evaluate the immediate effect of LLLT on the muscle fiber conduction velocity (MFCV) and electromyographic activity (EMG) of the upper trapezius (UT) muscle in healthy individuals. A total of 20 healthy subjects were enrolled in a randomized, double-blind, crossover study. Active LLLT (820Â nm wavelength, 30Â mW, energy total 18Â J) or placebo LLLT (pLLLT) was delivered on the UT muscle. Each subject was subjected to a single session of active LLLT and pLLLT. Surface electromyography (sEMG) signal of the UT muscle was recorded during five different step contractions of shoulder elevation force (10-30% maximal voluntary contraction) pre- and post-LLLT irradiation. The values of MFCV and sEMG global amplitude (RMS(G)) were used to calculate the effects of LLLT. The results showed no difference in the MFCV comparing the LLLT and pLLLT groups (Fâ€‰=â€‰0.72 pâ€‰=â€‰0.39, Î· (p)(2)â€‰=â€‰0.004). However, a significant difference was observed in the RMS(G) between the LLLT and pLLLT (F (1,2)â€‰=â€‰16.66; Pâ€‰<â€‰0.0001, Î· (p)(2)â€‰=â€‰0.09). Individuals who received active LLLT presented a significant decrease in RMS(G) after laser application (Fâ€‰=â€‰61.28; pâ€‰<â€‰0.0001, Î· (p)(2)â€‰=â€‰0.43). In conclusion, the 820Â nm LLLT, with energy total of 18Â J, did not alter the MFCV but significantly reduced the sEMG signal amplitude of the upper trapezius muscle in healthy subjects to a level of up to 30% of maximal voluntary contraction. Placebos Cervical Vertebrae;Cross-Over Studies;Double-Blind Method;Electromyography;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Muscle Fibers, Skeletal;Placebos;Young Adult

Generation and Role of Reactive Oxygen and Nitrogen Species Induced by Plasma, Lasers, Chemical Agents, and Other Systems in Dentistry. The generation of reactive oxygen and nitrogen species (RONS) has been found to occur during inflammatory procedures, during cell ischemia, and in various crucial developmental processes such as cell differentiation and along cell signaling pathways. The most common sources of intracellular RONS are the mitochondrial electron transport system, NADH oxidase, and cytochrome P450. In this review, we analyzed the extracellular and intracellular sources of reactive species, their cell signaling pathways, the mechanisms of action, and their positive and negative effects in the dental field. In dentistry, ROS can be found-in lasers, photosensitizers, bleaching agents, cold plasma, and even resin cements, all of which contribute to the generation and prevalence of ROS. Nonthermal plasma has been used as a source of ROS for biomedical applications and has the potential for use with dental stem cells as well. There are different types of dental stem cells, but their therapeutic use remains largely untapped, with the focus currently on only periodontal ligament stem cells. More research is necessary in this area, including studies about ROS mechanisms with dental cells, along with the utilization of reactive species in redox medicine. Such studies will help to provide successful treatment modalities for various diseases. Photosensitizing Agents;Plasma Gases;Reactive Nitrogen Species;Reactive Oxygen Species;Cytochrome P-450 Enzyme System;NADPH Oxidases Cytochrome P-450 Enzyme System;Humans;Lasers;Low-Level Light

Therapy;NADPH Oxidases;Oxidative Stress;Photosensitizing Agents;Plasma Gases;Reactive Nitrogen Species;Reactive Oxygen Species;Stem Cells;Tooth Diseases
Various Wavelengths of Light-Emitting Diode Light Regulate the Proliferation of Human Dermal Papilla Cells and Hair Follicles via Wnt/Î²-Catenin and the Extracellular Signal-Regulated Kinase Pathways. BACKGROUND: The human dermal papilla cells (hDPCs) play an important role in regulation of hair cycling and growth. OBJECTIVE: The aim of this study was to investigate the effect of different wavelengths of light-emitting diode (LED) irradiation on the proliferation of cultured hDPCs and on the growth of human hair follicles (HFs) in vitro. METHODS: We examined the effect of LED irradiation on Wnt/Î²-catenin signaling and mitogen-activated protein kinase (MAPK) pathways in hDPCs. Anagen HFs were cultured with LED irradiation and elongation of each hair shaft was measured. RESULTS: The most potent wavelength in promoting the hDPC proliferation is 660 nm and 830 nm promoted hDPC proliferation to a lesser extent than 660 nm. Various wavelengths significantly increased Î²-catenin, Axin2, Wnt3a, Wnt5a and Wnt10b mRNA expression. LED irradiation significantly increased Î²-catenin and cyclin D expression, and the phosphorylation of MAPK and extracellular signal-regulated kinase (ERK). HFs irradiated with 415 nm and 660 nm grew longer than control. CONCLUSION: Our result suggests that LED has a potential to stimulate hDPC proliferation via the activation of Wnt/Î²-catenin signaling and ERK pathway. To our best knowledge, this is the first report which investigated that the effect of various wavelengths of LED on hDPC proliferation and the underlying mechanisms.
Low-intensity LED therapy (658Â nm) on burn healing: a series of cases. The objective of this study was to evaluate the effects of LED on burns healing. Five patients with skin burns were submitted to photobiomodulation by LED, GaAsIP diode, (Î» 658Â nm) with 40Â mW, 7Â J/cm(2) on every other day. Biopsies of burned skin were performed and the healing process was photographed. Patients with bilateral burns were used as self-control, having one limb being irradiated and the contralateral limb irradiated with placebo. The burns treated with LED showed higher epithelization, with keratinocytes and fibroblasts proliferation, increased collagen synthesis, decreased pain, and pruritus. In conclusion, there was a faster clinical improvement in the irradiated limbs. Adult;Biopsy;Burns;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Wound Healing
Effectiveness of low-level laser therapy in lichen planopilaris. Aged;Cohort Studies;Female;Humans;Lichen Planus;Low-Level Light Therapy;Male;Middle Aged;Prognosis;Prospective Studies;Scalp Dermatoses;Severity of Illness Index;Spain;Treatment Outcome
Chondroitin sulfate and glucosamine sulfate associated to photobiomodulation prevents degenerative morphological changes in an experimental model of osteoarthritis in rats. The aim of this study was to compare the effects of combined treatment with chondroitin sulfate and glucosamine sulfate (CS/Gl) and photobiomodulation (PBM) on the degenerative process related to osteoarthritis (OA) in the articular cartilage in rats. Forty male Wistar rats were randomly divided into four groups: OA control group (CG); OA animals submitted to PBM treatment (PBM); OA animals submitted to CS/Gl treatment (CS/Gl); OA submitted to CS/GS associated with PBM treatments (GS/Gl + PBM). The CS/Gl started 48Â h after the surgery, and they were performed for 29 consecutive days. Moreover, PBM was performed after the CS/Gl administration on the left joint. Morphological characteristics and immunoexpression of interleukin 10 (IL-10) and 1 beta (IL-1Î²) and collagen type II (Col II) of the articular cartilage were evaluated. The results showed that all treated groups (CS/Gl and PBM) presented attenuation signs of degenerative process (measured by histopathological analysis) and lower density chondrocytes [PBM (pâ€‰=â€‰0.0017); CS/Gl (pâ€‰=â€‰0.0153) and CS/Gl + PBM (pâ€‰=â€‰0.002)]. Additionally, CS/Gl [associated (pâ€‰=â€‰0.0089) or not with PBM

(pâ€‰=â€‰0.0059)] showed significative lower values for OARSI grade evaluation. Furthermore, CS/GS + PBM decreased IL-1Î² protein expression (pâ€‰=â€‰0.0359) and increased IL-10 (pâ€‰=â€‰0.028) and Col II imunoexpression (pâ€‰=â€‰0.0204) compared to CG. This study showed that CS/Gl associated with PBM was effective in modulating inflammatory process and preventing the articular tissue degradation in the knees OA rats. Collagen Type II;Interleukin-1beta;Interleukin-10;Chondroitin Sulfates;Glucosamine Animals;Chondrocytes;Chondroitin Sulfates;Collagen Type II;Combined Modality Therapy;Disease Models, Animal;Glucosamine;Immunohistochemistry;Interleukin-10;Interleukin-1beta;Low-Level Light Therapy;Male;Osteoarthritis;Rats, Wistar

Laser for bone healing after oral surgery: systematic review. The purpose of this study is to perform a systematic review on the use of lasers in oral surgery for bone healing. Selection of articles was carried out by two evaluators in Pubmed and Web of Science databases for published articles and OpenGray for gray literature. Search strategy was developed based on the PICO Question "Does the use of lasers after oral surgery improve bone healing?". Eligibility criteria were: being on laser; evaluate bone healing; involve oral surgery; do not be about implant, periodontics, orthodontics, osteonecrosis or radiotherapy, nor revisions, clinical cases, etc. Data were collected from each article in a structured spreadsheet and a descriptive analysis was performed. Risk assessment of bias of the articles was carried out through the tool elaborated by the Cochrane collaboration. A total of 827 potentially relevant references were identified. No articles were found in OpenGray. Eleven articles met the eligibility criteria and were included in the systematic review. Most of studies were in vivo and in jaw, being conducted with low-power lasers which were applied immediately after the surgical procedure of extraction. Neoformation and bone density were the outcomes of choice and there was a tendency of increase in bone density, neoformation, regeneration, mineralization, or bone condensation when laser was applied. Regarding the bias risk assessment, studies were not clear in reporting most of the parameters. Low-power laser therapy seems to reduce time of bone healing in oral surgery, although there are no defined protocols and the level of evidence is still considered weak. Bone and Bones;Humans;Lasers;Oral Surgical Procedures;Publication Bias;Risk Factors;Wound Healing

Complete cure of Fusarium solani sp. complex onychomycosis with Qs NdYAG treatment. The incidence of non dermatophytic mould (NDM) onychomycosis (OM) has been steadily increasing Fusarium spp is the most common cause of NDM OM in most geographical locations. Fusarium spp and other NDMs are largely resistant to commonly used anti-fungals. The successful use of laser and light based devices has been demonstrated in dermatophytic OM, but there is no previous report of their successful use in any NDM OM. We describe a patient with OM caused by Fusarium solani spp, who was clinically (with a normal appearing nail) and mycologically (with negative microscopy and culture on repeated samples) cured of her infection following treatment with 2 sessions of Qs NdYAG (532nm and 1064nm) given 1 month apart. Adult;Female;Foot Dermatoses;Fusariosis;Fusarium;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nails;Onychomycosis;Treatment Outcome

Could adverse effects and complications of selective laser trabeculoplasty be decreased by low-power laser therapy? Selective laser trabeculoplasty (SLT) has been used for treatment of primary open-angle glaucoma, ocular hypertension, pigmenter and pseudoexfoliative glaucoma being considered a low-risk procedure. Therefore, transitory and permanent adverse effects have been reported, including corneal changes, subclinical edema, and reduction in endothelial cells and in central corneal thickness. Despite rarer, serious corneal complications after SLT can be permanent and lead to visual impairment, central corneal haze, opacity and narrowing. The mechanism involves increase of vasoactive and chemotactic cytokines causing inflammatory infiltrate, destruction of

stromal collagen by fibroblasts and increase of matrix metalloproteinases type 2, which impair reepithelization. SLT also increases free radical production and reduces antioxidant enzymes, resulting in endothelium damages. Low-power laser therapy (LPLT) has been used in regenerative medicine based on its biostimulatory and anti-inflammatory effects. Biostimulation occurs through the interaction of laser photons with cytochrome C oxidase enzyme, which activates intracellular biochemical cascades causing synthesis of a number of molecules related to anti-inflammatory, regenerative effects, pain relief and reduction in edema. It has been showed that LPLT reduces gene expression related to pro-inflammatory cytokines and matrix metalloproteinases, and it increases expression of growth factors related to its proliferative and healing actions. Although radiations emitted by low-power lasers are considered safe and able to induce therapeutic effects, researches based on experimental models for glaucoma could bring important data if LPLT could be an alternative approach to improve acceptation for patients undergoing SLT.
Glaucoma;Humans;Intraocular Pressure;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Postoperative Complications;Trabeculectomy

When is the best moment to apply photobiomodulation therapy (PBMT) when associated to a treadmill endurance-training program? A randomized, triple-blinded, placebo-controlled clinical trial. Photobiomodulation therapy (PBMT) employing low-level laser therapy (LLLT) and/or light emitting diode therapy (LEDT) has emerged as an electrophysical intervention that could be associated with aerobic training to enhance beneficial effects of aerobic exercise. However, the best moment to perform irradiation with PBMT in aerobic training has not been elucidated. The aim of this study was to assess the effects of PBMT applied before and/or after each training session and to evaluate outcomes of the endurance-training program associated with PBMT. Seventy-seven healthy volunteers completed the treadmill-training protocol performed for 12Â weeks, with 3 sessions per week. PBMT was performed before and/or after each training session (17 sites on each lower limb, using a cluster of 12 diodes: 4â€‰Ã—â€‰905Â nm super-pulsed laser diodes, 4â€‰Ã—â€‰875Â nm infrared LEDs, and 4â€‰Ã—â€‰640Â nm red LEDs, dose of 30Â J per site). Volunteers were randomized in four groups according to the treatment they would receive before and after each training session: PBMT before + PBMT after, PBMT before + placebo after, placebo before + PBMT after, and placebo before + placebo after. Assessments were performed before the start of the protocol and after 4, 8, and 12Â weeks of training. Primary outcome was time until exhaustion; secondary outcome measures were oxygen uptake and body fat. PBMT applied before and after aerobic exercise training sessions (PBMT before + PBMT after group) significantly increased (pâ€‰<â€‰0.05) the percentage of change of time until exhaustion and oxygen uptake compared to the group treated with placebo before and after aerobic exercise training sessions (placebo before + placebo after group) at 4th, 8th, and 12th week. PBMT applied before and after aerobic exercise training sessions (PBMT before + PBMT after group) also significantly improved (pâ€‰<â€‰0.05) the percentage of change of body fat compared to the group treated with placebo before and after aerobic exercise training sessions (placebo before + placebo after group) at 8th and 12th week. PBMT applied before and after sessions of aerobic training during 12Â weeks can increase the time-to-exhaustion and oxygen uptake and also decrease the body fat in healthy volunteers when compared to placebo irradiation before and after exercise sessions.Â OurÂ outcomes show that PBMT applied before and after endurance-training exercise sessions lead to improvement of endurance three times faster than exercise only. Placebos Adipose Tissue;Adult;Double-Blind Method;Exercise Test;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Oxygen Consumption;Physical Endurance;Placebos

Vibrational spectroscopy of muscular tissue intoxicated by snake venom and exposed to photobiomodulation therapy. The pathogenesis of myonecrosis caused by myotoxins from

bothropic venom is associated with local extracellular matrix (ECM) disintegration, hemorrhage, and inflammation. Search for alternative methods associated with serum therapy is mandatory to neutralize the fast development of local damage following snakebites. The experimental use of photobiomodulation therapy (PBMT) in murine models has shown promising results relative to structural and functional recovery from bothropic snakebite-induced myonecrosis. This study pioneered in using Raman and Fourier transform infrared (FTIR) spectroscopies to characterize biochemical alterations in the gastrocnemius that had been injected with Bothrops jararacussu venom and exposed to local PBMT. Results show that vibrational spectra from lyophilized and diluted venom (1307Â cm (-1)) was also found in the envenomed gastrocnemius indicating venom presence in the unirradiated muscle 48Â h post-injection; but any longer visible after PBMT at this time exposure or 72Â h post-injection regardless irradiated or not. Raman and FTIR analyses indicated that the bands with higher area and intensity were 1657 and 1547Â cm(-1) and 1667 and 1452Â cm(-1), respectively; all are assignments for proteins, especially collagen, and are higher in the PBMT-exposed gastrocnemius. The infrared spectra suggest that laser treatment was able to change protein in tissue and that such change indicates collagen as the main target. We hypothesize that the findings reflect remodeling of ECM with key participation of collagen and faster tissue recovery for an anabolic condition. Snake Venoms Animals;Bothrops;Freeze Drying;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Snake Venoms;Spectroscopy, Fourier Transform Infrared;Spectrum Analysis, Raman;Vibration

Laser photobiomodulation in pressure ulcer healing of human diabetic patients: gene expression analysis of inflammatory biochemical markers. Pressure ulcers (PU) are wounds located mainly on bone surfaces where the tissue under pressure suffers ischemia leading to cellular lesion and necrosis , its causes and the healing process depend on several factors. The aim of this study was evaluating the gene expression of inflammatory/reparative factors: IL6, TNF, VEGF, and TGF, which take part in the tissue healing process under effects of low-level laser therapy (LLLT). In order to perform lesion area analysis, PUs were photographed and computer analyzed. Biochemical analysis was performed sa.mpling ulcer border tissue obtained through biopsy before and after laser therapy and quantitative real-time PCR (qRT-PCR) analysis. The study comprised eight individuals, mean age sixty-two years old, and sacroiliac and calcaneous PU, classified as degree III and IV according to the National Pressure Ulcer Advisory Panel (NPUAP). PUs were irradiated with low-level laser (InGaAIP, 100Â mW, 660Â nm), energy density 2Â J/cm(2), once a day, with intervals of 24Â h, totaling 12 applications. The lesion area analysis revealed averaged improvement of the granulation tissue size up to 50% from pre- to post-treatment. qRT-PCR analysis revealed that IL6 values were not significantly different before and after treatment, TNF gene expression was reduced, and VEFG and TGF-Î² gene expression increased after treatment. After LLLT, wounds presented improvement in gross appearance, with increase in factors VEFG and TGF-Î², and reduction of TNF; despite our promising results, they have to be analyzed carefully as this study did not have a control group. Biomarkers;Interleukin-6;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A Biomarkers;Diabetes Mellitus;Female;Gene Expression Regulation;Granulation Tissue;Humans;Inflammation;Interleukin-6;Low-Level Light Therapy;Male;Middle Aged;Pressure Ulcer;Real-Time Polymerase Chain Reaction;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Vascular Endothelial Growth Factor A;Wound Healing

Effect of photobiomodulation on connective tissue remodeling and regeneration of skeletal muscle in elderly rats. The purpose of this study was to evaluate the effects of low-level laser therapy (LLLT) on morphological aspects, IL-6 and IL-1Î² expressions, as well as the distribution and organization of collagen in the tibialis anterior (TA) muscle of elderly rats submitted to cryoinjury.

Histological photomicrographs were taken of TA muscles stained with HE and picrosirius red. Immunohistochemistry was used for the evaluation of IL-6 and IL-1Î². Male Wistar rats, aged 20Â months, were distributed into three groups: (1) control animals not injured or treated with LLLT (nâ€‰=â€‰5), (2) cryoinjury without LLLT treatment (nâ€‰=â€‰15), and (3) cryoinjury treated with infrared LLLT (nâ€‰=â€‰15). LLLT was applied to the TA 2Â h after of the injury induction and consisted of daily applications until the sacrifice (1, 3, and 7Â days). The following parameters were used: Î»â€‰=â€‰780Â nm, power density 1Â W/cm(2), output power 40Â mW, 10Â s per point, 8 points, and 3.2Â J of total energy. In the histomorphological analysis, the treated group exhibited a significant decrease in inflammatory infiltrate (pâ€‰<â€‰0.001) as well as an increase immature fibers and new blood vessels at 7Â days compared to the untreated group (pâ€‰<â€‰0.05). Furthermore, treatment induced a better collagen distribution and organization at 7Â days in comparison to the untreated group (pâ€‰<â€‰0.05). In conclusion, LLLT demonstrated a modulatory effect on the muscle repair process in elderly animals with regard to the collagen remodeling and morphological aspects of muscle tissue. Fibrillar Collagens;Interleukin-1beta;Interleukin-6 Aging;Animals;Connective Tissue;Fibrillar Collagens;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats, Wistar;Regeneration

Analysis of Aloe vera cytotoxicity and genotoxicity associated with endodontic medication and laser photobiomodulation. This study aims to evaluate, in vitro, the effect of Aloe vera associated with endodontic medication, with or without laser photobiomodulation (FTL) irradiation in FP6 human pulp fibroblasts. The materials were divided into eight groups: CTR - control; CL - FTL alone; AA - Aloe vera with distilled water; AL - Aloe vera with distilled water and FTL; HA - calcium hydroxide P.A. with distilled water; HL - calcium hydroxide P.A. with distilled water and FTL; HAA - calcium hydroxide P.A. with Aloe vera and distilled water; HAL - calcium hydroxide P.A. with Aloe vera, distilled water, and FTL. The cytotoxicity was evaluated by MTT assay at 24, 48, and 72h and the genotoxicity by micronucleus test assay. This study was performed in triplicate. Data obtained in both tests were statistically analyzed by ANOVA and Tukey's tests (pâ‰¤0.05). Group AA presented high genotoxicity and low cytotoxicity. After 24, 48, and 72h, the group HAA significantly reduced the cell viability. Interaction with FTL showed slightly increase cell viability after 24 and 48h in groups CL and HL ($p<0.001$), despite the high genotoxicity in group CL and low genotoxicity in group HL. Group AL showed higher cell survival rate at 72h ($p<0.05$) and high genotoxicity ($p<0.001$). It was concluded that Aloe vera allowed higher cell viability in human pulp fibroblasts in the presence of calcium hydroxide or with FTL separately, but genotoxicity increased in these associations. Plant Extracts;Calcium Hydroxide Aloe;Calcium Hydroxide;Cell Line;Cell Survival;Endodontics;Humans;Lasers;Micronucleus Tests;Microscopy, Fluorescence;Plant Extracts;Plant Leaves

Evidence-based (S3) guideline for the treatment of androgenetic alopecia in women and in men - short version. Androgenetic alopecia is the most common hair loss disorder, affecting both men and women. Initial signs of androgenetic alopecia usually develop during teenage years leading to progressive hair loss with a pattern distribution. Moreover, its frequency increases with age and affects up to 80% Caucasian men and 42% of women. Patients afflicted with androgenetic alopecia may undergo significant impairment of quality of life. The European Dermatology Forum (EDF) initiated a project to develop evidence-based guidelines for the treatment of androgenetic alopecia. Based on a systematic literature research the efficacy of the currently available therapeutic options was assessed and therapeutic recommendations were passed in a consensus conference. The purpose of the guideline is to provide dermatologists with an evidence-based tool for choosing an efficacious and safe therapy for patients with androgenetic alopecia. 5-alpha Reductase Inhibitors;Vasodilator Agents;Finasteride;Minoxidil;Dutasteride 5-alpha Reductase

Inhibitors;Alopecia;Drug Therapy, Combination;Dutasteride;Evidence-Based Medicine;Female;Finasteride;Hair;Humans;Low-Level Light Therapy;Male;Minoxidil;Outcome Assessment, Health Care;Platelet-Rich Plasma;Practice Guidelines as Topic;Vasodilator Agents

Skin color and tissue thickness effects on transmittance, reflectance, and skin temperature when using 635 and 808â€‰nm lasers in low intensity therapeutics. OBJECTIVE: To examine the role of skin color and tissue thickness on transmittance, reflectance, and skin heating using red and infrared laser light. METHODS: Forty volunteers were measured for skin color and skin-fold thickness at a standardized site near the elbow. Transmittance, reflectance and skin temperature were recorded for energy doses of 2, 6, 9, and 12â€‰Joules using 635â€‰nm (36â€‰mW) and 808â€‰nm (40â€‰mW) wavelength laser diodes with irradiances within American National Standards Institute safety guidelines (4.88â€‰mm diameter, 0.192â€‰W/cm(2) and 4.88â€‰mm diameter, 0.214â€‰W/cm(2) , respectively). RESULTS: The key factors affecting reflectance to an important degree were skin color and wavelength. However, the skin color effects were different for the two wavelengths: reflectance decreased for darker skin with a greater decrease for red light than near infrared light. Transmittance was greater using 808â€‰nm compared with 635â€‰nm. However, the effect was partly lost when the skin was dark rather than light, and was increasingly lost as tissue thickness increased. Dose had an increasing effect on temperature (0.7-1.6Â°C across the 6, 9, and 12â€‰J doses); any effects of wavelength, skin color, and tissue thickness were insignificant compared to dose effects. Subjects themselves were not aware of the increased skin temperature. Transmittance and reflectance changes as a function of energy were very small and likely of no clinical significance. Absorption did not change with higher energy doses and increasing temperature. CONCLUSION: Skin color and skin thickness affect transmittance and reflectance of laser light and must be accounted for when selecting energy dose to ensure therapeutic effectiveness at the target tissue. Skin heating appears not to be a concern when using 635 and 808â€‰nm lasers at energy doses of up to 12â€‰J and irradiance within American National Standards Institute standards. Photobiomodulation therapy should never exceed the American National Standards Institute recommendation for the maximum permissible exposure to the skin. Lasers Surg. Med. 50:291-301, 2018. Â© 2017 Wiley Periodicals, Inc. Healthy Volunteers;Humans;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Radiation Injuries;Sensitivity and Specificity;Skin;Skin Pigmentation;Skin Temperature

Cardiac autonomic responses and number of repetitions maximum after LED irradiation in the ipsilateral and contralateral lower limb. The aim of this study was to verify the maximum number of repetitions, fatigue index, blood lactate concentration ([Lac]), and cardiac autonomic responses after LED irradiation (LEDI) in the ipsilateral and contralateral limb. Twelve male subjects (22.0â€‰Â±â€‰3.86Â years; weight 82.94â€‰Â±â€‰12.58Â kg; height 1.77â€‰Â±â€‰0.05Â m), physically active, took part in this study. The subjects underwent a one repetition maximum (1RM) test and performed four randomly experimental sessions in the horizontal leg press exercise, which consisted in four sets of maximum repetitions at 80% of 1RM. The subjects performed two experimental sessions applying LED active or placebo on ipsilateral limb and two experimental sessions applying LED active or placebo on contralateral limb prior exercise and in the interval of sets on quadriceps and hamstrings muscles. A number of repetitions and fatigue index were verified. [Lac] and heart rate variability (HRV) were collected during post-exercise recovery and analyzed. It was observed that active LEDI promoted an increase in maximal number of repetitions (LEDIâ€‰=â€‰44.4â€‰Â±â€‰9.0 vs placeboâ€‰=â€‰39.9â€‰Â±â€‰11.4; pâ€‰<â€‰0.05) and decreases the fatigue index (LEDIâ€‰=â€‰34.3â€‰Â±â€‰21.8% vs placeboâ€‰=â€‰50.0â€‰Â±â€‰26.6%; pâ€‰<â€‰0.05) comparing to placebo situation, only in the ipsilateral application. There were no differences on [Lac] and in HRV parameters comparing LEDI

vs placebo on post-exercise recovery in both applications (pâ€‰>â€‰0.05). The LEDI improves performance only in the ipsilateral application, but there were no differences on [Lac] and cardiac autonomic responses after exercise for both the applications. Placebos Adult;Autonomic Nervous System;Exercise;Heart;Heart Rate;Humans;Light;Lower Extremity;Male;Muscle Fatigue;Placebos;Quadriceps Muscle;Young Adult

Photobiomodulation effect on children's scars. The management of burn scars has become one of the major clinical challenges in the developing countries which involve enormous treatment cost; this needs new methods for better cost benefit relationship. The objective of the study is to analyze the effectiveness of low-level laser therapy on post-burn scar tissue in children. A randomized controlled study included 15 children, ranging from 2 to 10Â years of age, presenting with burn scars. They received diode laser and topical treatment. Each scar was divided into two halves. One half was treated with laser therapy and topical treatment (study area), and the other half was treated with topical treatment only (control area). The children were evaluated before and after 3Â months of the study by Vancouver Scar Scale (VSS), ultrasonography (U/S), and laser Doppler perfusion imaging. Significant improvement was reported in the studied area compared to the control area for patients with P values (Pâ€‰=â€‰0.005) and (Pâ€‰=â€‰0.0001) for VSS and U/S scores, respectively. No difference was detected for blood perfusion to the scar between both areas (Pâ€‰=â€‰0.18). In addition, no adverse effect was reported. Photobiomodulation is an efficient and safe therapeutic modality for post-burn hypertrophic scars in children and should be considered a part of combination therapy for better results. Child;Child, Preschool;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Perfusion;Treatment Outcome

Corneal Cross-Linking With Verteporfin and Nonthermal Laser Therapy. PURPOSE: To test whether verteporfin with a nonthermal laser increases corneal mechanical stiffness and resistance to enzymatic degradation ex vivo. METHODS: Thirty human corneas (n = 5 per group) were treated with verteporfin alone (V), irradiated with nonthermal laser therapy (689 nm) alone (NTL), or received combined treatment of verteporfin with nonthermal laser therapy for 1 sequence (V+NTL1) or 6 sequences (V+NTL6) of 1 minute of NTL exposure. Positive controls were pretreated with 0.1% riboflavin/20% dextran every 3 to 5 minutes for 30 minutes and irradiated with ultraviolet light type A (Î» = 370 nm, irradiance = 3 mW/cm) for 30 minutes using the Dresden protocol (R+UVA). Untreated corneas were used as negative controls. The corneal biomechanical properties were measured with enzymatic digestion, compression, creep, and tensile strength testing. RESULTS: V+NTL6- and R+UVA-treated corneas acquired higher rigidity and more pronounced curvature than untreated corneas. The stress-strain tests showed that V+NTL6 and R+UVA corneas became significantly stiffer than controls ($P < 0.005$). The V+NTL6 group seemed to be slightly stiffer than the R+UVA group, although the differences were not statistically significant. V+NTL6 corneas were found to have a significantly lower absolute creep rate (-1.87 vs. -3.46, $P < 0.05$) and significantly higher maximum stress values (7.67 vs. 3.02 $P < 0.05$) compared with untreated corneas. CONCLUSIONS: Verteporfin-NTL (V+NTL6) increases corneal mechanical stiffness and resistance to enzymatic collagenase degradation. Although a clinical study is needed, our results suggest that V+NTL6 induces corneal cross-linking and corneal biomechanical changes that are similar to those induced by standard corneal collagen cross-linking. Cross-Linking Reagents;Photosensitizing Agents;Porphyrins;Verteporfin;Collagen Biomechanical Phenomena;Collagen;Cornea;Cross-Linking Reagents;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Porphyrins;Tensile Strength;Verteporfin

Photodynamic therapy for treatment of oral mucositis: Pilot study with pediatric patients undergoing chemotherapy. BACKGROUND: Oral mucositis has become a major dose-limiting toxicity of antineoplastic treatment. AIM: The aim of this study was to evaluate the effect of photodynamic therapy (PDT) and low level laser therapy (LLLT) on the treatment of chemotherapy-induced

mucositis in pediatric patients. METHODS: An open, controlled, and blind, randomized clinical trial was conducted with 29 patients, from 10 months to 18 years old, who were divided into two groups. Group A was submitted to photodynamic therapy (0.01% Methylene Blue and red laser, Î»660â€¯nm) with 3J energy per point; and Group B submitted to low level laser therapy (Î»660â€¯nm) with 1J energy per point. The results were evaluated by using the WHO and ChIMES mucositis scales. The Chi-square, Exact Fisher, Student's-t and Mann-Whitney tests, and the mixed linear regression model were used for comparison between the groups, with the maximum error admitted of 5%. RESULTS: There was no difference between the groups as regards the number of sessions necessary for clinical cure of the oral lesions (pâ€¯=â€¯0.954) or reduction in pain reported by the patients (pâ€¯=â€¯0.258; pâ€¯=â€¯0.486). Within each group, however, there was significant reduction in pain (pâ€¯=â€¯0.032; pâ€¯=â€¯0.003). The number needed to treat (NNT) was 4.75. CONCLUSIONS: PDT or LLLT could be used for treatment of oral mucositis in children/young patients. Each were well tolerated and presented satisfactory results in reducing pain associated with the lesion. Antineoplastic Agents;Photosensitizing Agents;Methylene Blue Adolescent;Antineoplastic Agents;Child;Child, Preschool;Female;Humans;Infant;Low-Level Light Therapy;Male;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Pilot Projects;Stomatitis

Effect of photodynamic and laser therapy in the treatment of peri-implant mucositis: A systematic review. BACKGROUND: The present study systematically reviewed the literature to investigate the effect of photodynamic therapy (PDT) or laser therapy (LT) in the management of peri-implant mucositis (p-iM). METHODS: The electronic databases were searched until October 2017. Outcome measures were bleeding on probing (BOP), plaque index (PI), or probing depth (PD). The addressed PICO question was: "Is PDT and LT effective in the management of p-iM?" RESULTS: A total of five studies included in the qualitative analysis, two of which had a low risk of bias. Three studies used PDT while two studies used LT. All studies reported a significant improvement in clinical peri-implant inflammatory parameters in p-iM. For PDT, one study demonstrated a significant reduction for PDT group as compared to manual debridement (MD), while one study indicated comparable outcomes when tested with probiotics at follow-up. One study used PDT alone and indicated significant improvements in peri-implant parameters at follow-up. However, in the studies using LT, one study demonstrated a significant improvement in peri-implant parameters as compared to scaling and root planing alone, while other study indicated comparable outcomes when compared with manual debridement/chlorhexidine group at follow-up. CONCLUSION: This systematic review demonstrated inconclusive findings to show the effect of PDT or LT in the management of p-iM due to methodological heterogeneity such as non-standard control groups, laser parameters and short follow-up period. The results of this review should be considered preliminary and further, more robust, well-designed studies with long-term follow up and standardized comparators with laser parameters are warranted. Dental Plaque Index;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Peri-Implantitis;Periodontal Debridement;Periodontal Index;Photochemotherapy

Easy Debonding of Ceramic Brackets Bonded with a Light-Cured Orthodontic Adhesive Containing Microcapsules with a CO(2) Laser. OBJECTIVE: An easy debonding method for ceramic brackets using a light-cured Bis-GMA resin containing heat-expandable microcapsules and CO(2) laser was investigated. BACKGROUND: Ceramic brackets are used frequently in orthodontic treatment because of their desirable esthetic properties. However, the application of heavy force to ceramic brackets in debonding can fracture the tooth enamel and ceramic brackets, causing tooth pain. MATERIALS AND METHODS: In total, 60 freshly extracted bovine permanent mandibular incisors were divided randomly into 10 groups of 6 specimens each, corresponding to the number of variables tested. Ceramic brackets were bonded to bovine permanent mandibular incisors using an orthodontic

bonding agent containing heat-expandable microcapsules at different levels (0-30â€‰wt%) and resin composite paste, and cured by a curing device. The bond strengths were measured before and after CO(2) laser irradiation, and the temperature increase in the pulp chamber in fresh human first premolars was also evaluated. RESULTS: With CO(2) laser irradiation for 5â€‰sec to the bracket, the bond strength in the 25% microcapsule group decreased significantly, to âˆ¼0.17-fold, compared with that of the no-laser group (pâ€‰<â€‰0.05). The maximum temperature increase in the pulp chamber was 5.3Â°C with laser irradiation, which was less than the level that induces pulp damage. CONCLUSIONS: From these results, it seems likely that the combined use of a light-cured orthodontic bonding agent containing microcapsules and a CO(2) laser is a simple debonding system for ceramic brackets, with less debonding time and enamel damage. Capsules;Dental Cements Animals;Capsules;Cattle;Dental Cements;Dental Debonding;Lasers, Gas;Low-Level Light Therapy;Orthodontic Brackets

Randomized, blinded, controlled trial on effectiveness of photobiomodulation therapy and exercise training in the fibromyalgia treatment. This study evaluated the role of the phototherapy and exercise training (EXT) as well as the combined treatment in general symptoms, pain, and quality of life in women suffering from fibromyalgia (FM). A total of 160 women were enrolled and measures were carried out in two sets: it was sought to identify the acute effect for a single phototherapy and EXT session (Set 1); long-term effect (10Â weeks) of the interventions (Set 2). Phototherapy irradiation was performed at 11 locations in their bodies, employing a cluster with nine diodes (one super-pulsed infrared 905Â nm, four light-emitting diodes [LEDs] of 640Â nm, and four LEDs of 875Â nm, 39.3Â J per location). Algometry and VAS instrument were applied to evaluate pain. The FM symptoms were evaluated with Fibromyalgia Impact Questionnaire (FIQ) and Research Diagnostic Criteria (RDC) instruments. Quality of life was assessed through SF-36 survey. Set 1: pain threshold was improved with the phototherapy, and EXT improved the pain threshold for temporomandibular joint (right and left body side) and occipital site (right body side). Set 2: there was improved pain threshold in several tender points with the phototherapy and EXT. There was an overlap of therapies to reduce the tender point numbers, anxiety, depression, fatigue, sleep, and difficulty sleeping on FIQ/RDC scores. Moreover, quality of life was improved with both therapies. The phototherapy and EXT improved the pain threshold in FM women. A more substantial effect was noticed for the combined therapy, in which pain relief was accomplished by improving VAS and FIQ scores as well as quality of life. Adult;Combined Modality Therapy;Exercise Therapy;Female;Fibromyalgia;Humans;Low-Level Light Therapy;Pain Measurement;Pain Threshold;Quality of Life;Surveys and Questionnaires;Treatment Outcome

Healing of self-inflicted thermal injury of palatal mucosa by low-level laser therapy. Self-inflicted injury to oral mucosa is a rare entity. These injuries can be premeditated, accidental, or can result from an abnormal habit. These uncommon gingival injuries can sometimes test the clinician's diagnostic abilities as well as treatment planning skills. In conventional treatment, removal of etiology and application of topical drugs is usually sufficient for healing. However, some cases require alternative or adjunctive wound healing methods. Low-level laser therapy (LLLT) has been reported to be effective in pain management and improvement in wound healing through promotion, fortification, and commissioning of cellular cycle to generate productive and substitute cells. This report presents a case of 25-year-old female with complaints of a painful, nonhealing wound on the palate for last 6 months. She had an unusual habit of keeping burning matchsticks in her mouth. Although she had quit the habit 2 months ago after psychiatric counseling, the wound on her palate did not show any improvement in symptoms. Based on the history and clinical findings, diagnosis of chronic wound by self-inflicted thermal injury was made. LLLT was administered on the wound every

48 hours for next 10 days. The burn wound healed completely after five applications of LLLT. Adult;Burns;Female;Humans;Low-Level Light Therapy;Palate;Self-Injurious Behavior

Photobiomodulation Inhibits Long-term Structural and Functional Lesions of Diabetic Retinopathy. Previous studies demonstrated that brief (3 to 4 min) daily application of light at 670 nm to diabetic rodents inhibited molecular and pathophysiologic processes implicated in the pathogenesis of diabetic retinopathy (DR) and reversed diabetic macular edema in small numbers of patients studied. Whether or not this therapy would inhibit the neural and vascular lesions that characterize the early stages of the retinopathy was unknown. We administered photobiomodulation (PBM) therapy daily for 8 months to streptozotocin-diabetic mice and assessed effects of PBM on visual function, retinal capillary permeability, and capillary degeneration using published methods. Vitamin D receptor and Cyp24a1 transcripts were quantified by quantitative real-time PCR, and the abundance of c-Kit(+) stem cells in blood and retina were assessed. Long-term daily administration of PBM significantly inhibited the diabetes-induced leakage and degeneration of retinal capillaries and also significantly inhibited the diabetes-induced reduction in visual function. PBM also inhibited diabetes-induced reductions in retinal Cyp24a1 mRNA levels and numbers of circulating stem cells (CD45(-)/c-Kit(+)), but these effects may not account for the beneficial effects of PBM on the retinopathy. PBM significantly inhibits the functional and histopathologic features of early DR, and these effects likely are mediated via multiple mechanisms. Biomarkers;Eye Proteins;Nerve Tissue Proteins;Receptors, Calcitriol;Streptozocin;Cyp24a1 protein, mouse;Vitamin D3 24-Hydroxylase Adult Stem Cells;Animals;Biomarkers;Capillary Permeability;Diabetes Mellitus, Experimental;Diabetic Retinopathy;Disease Progression;Eye Proteins;Gene Expression Regulation;Image Processing, Computer-Assisted;Low-Level Light Therapy;Male;Mice, Inbred C57BL;Microscopy, Fluorescence;Nerve Tissue Proteins;Neurons;Receptors, Calcitriol;Retina;Retinal Vessels;Streptozocin;Vision, Ocular;Vitamin D3 24-Hydroxylase

Photobiomodulation in dry age-related macular degeneration. Eye Diseases;Geographic Atrophy;Humans;Macular Degeneration

Mechanisms and Mitochondrial Redox Signaling in Photobiomodulation. Photobiomodulation (PBM) involves the use of red or near-infrared light at low power densities to produce a beneficial effect on cells or tissues. PBM therapy is used to reduce pain, inflammation, edema, and to regenerate damaged tissues such as wounds, bones, and tendons. The primary site of light absorption in mammalian cells has been identified as the mitochondria and, more specifically, cytochrome c oxidase (CCO). It is hypothesized that inhibitory nitric oxide can be dissociated from CCO, thus restoring electron transport and increasing mitochondrial membrane potential. Another mechanism involves activation of light or heat-gated ion channels. This review will cover the redox signaling that occurs in PBM and examine the difference between healthy and stressed cells, where PBM can have apparently opposite effects. PBM has a marked effect on stem cells, and this is proposed to operate via mitochondrial redox signaling. PBM can act as a preconditioning regimen and can interact with exercise on muscles. Ion Channels;Transcription Factors;Electron Transport Complex IV Animals;Disease Models, Animal;Electron Transport Complex IV;Humans;Ion Channels;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mitochondria;Oxidation-Reduction;Stem Cells;Transcription Factors

Pulse frequency dependency of photobiomodulation on the bioenergetic functions of human dental pulp stem cells. Photobiomodulation (PBM) therapy contributes to pain relief, wound healing, and tissue regeneration. The pulsed wave (PW) mode has been reported to be more effective than the continuous wave (CW) mode when applying PBM to many biological systems. However, the reason for the higher effectiveness of PW-PBM is poorly understood. Herein, we suggest using delayed luminescence (DL) as a reporter of mitochondrial activity after PBM treatment. DL originates

mainly from mitochondrial electron transport chain systems, which produce reactive oxygen species (ROS) and adenosine triphosphate (ATP). The decay time of DL depends on the pulse frequencies of applied light, which correlate with the biological responses of human dental pulp stem cells (hDPSCs). Using a low-power light whose wavelength is 810â€‰nm and energy density is 38 mJ/cm(2), we find that a 300-Hz pulse frequency prolonged the DL pattern and enhanced alkaline phosphatase activity. In addition, we analyze mitochondrial morphological changes and their volume density and find evidence supporting mitochondrial physiological changes from PBM treatment. Our data suggest a new methodology for determining the effectiveness of PBM and the specific pulse frequency dependency of PBM in the differentiation of hDPSCs. Reactive Oxygen Species;Alkaline Phosphatase Alkaline Phosphatase;Cell Proliferation;Cell Shape;Dental Pulp;Energy Metabolism;Humans;Low-Level Light Therapy;Luminescence;Mitochondria;Reactive Oxygen Species;Stem Cells;Time Factors

Low level laser therapy induces increased viability and proliferation in isolated cancer cells. OBJECTIVES: Low level laser therapy (LLLT), which stimulates natural biological processes in the application region, is frequently used in dental treatments. The aim of our study was to evaluate the effects of LLLT which could activate precancerous cells or increase existing cancerous tissue in case of clinically undetectable situations. MATERIALS AND METHODS: Saos-2 osteoblast-like osteosarcoma cells and A549 human lung carcinoma cells were used. Twenty-four hours after preparation of cell culture plates, laser irradiation was performed 1, 2 and 3 times according to the test groups using Nd:YAG laser with the power output 0.5, 1, 2 and 3Â W. Cell proliferation analysis was performed by MTT assay at the 24th hour following the last laser applications. RESULTS: Generally, it was observed that the proliferation rates increased as the number of applications increased, when compared to the controls, especially in those cases in which the irradiation was performed 2 or 3 times more. CONCLUSION: The findings of this study have led to the conclusion that LLLT increases cancer cell proliferation, depending on the power output level of the laser and the number of applications. In addition to the proliferation and mitotic activity of the cancer tissue cells, we concluded that LLLT, which is frequently used in dental practice, could activate precancerous cells or increase existing cancerous tissue. A549 Cells;Bone Neoplasms;Cell Proliferation;Cell Survival;Humans;Low-Level Light Therapy;Lung Neoplasms;Osteosarcoma

The effect of low-level laser therapy (660Â nm) on the gene expression involved in tissue repair. The effect of low-level laser therapy (LLLT) on the healing of skin lesions has been evaluated in many studies; however, the molecular mechanisms involved in the biostimulatory effects resulting from this treatment need to be better understood. The paper aims to analyze the effects of LLLT (660Â nm) at doses of 1 and 5Â J/cm(2) on cell viability and expression of vascular endothelial growth factor (VEGF) and interleukin (IL6) genes in L929 fibroblast cells. The dose-response curve was performed with the GaInAlAs (660Â nm) laser-treated cells at energy rates of 1 and 5Â J/cm(2). Cell viability was quantified at 24, 48, and 72Â h after irradiation and the effects of TLBP on the cytoskeleton and endoplasmic reticulum were evaluated by fluorescence microscopy and the RT-qPCR method was used for the analysis of gene expression. It was observed that the 72Â h group had a statistically significant increase in cell viability compared to the 48Â h group (pÂ <Â 0.01) and when compared to the 72Â h control (pÂ =Â 0.03). In 72Â h, a greater distribution of the cytoskeleton filaments and the more evident endoplasmatic reticulum was verified, indicating an increase in the protein synthesis when compared with the control group. In the expression of the VEGF gene, a significant increase of 1.98 times (pÂ <Â 0.05) in the number of transcripts was observed; whereas for the IL6 gene, a decrease of the transcripts was 4.05 times (pÂ <Â 0.05), both occurring within 72Â h after irradiation at 5Â J/cm(2). The LLLT (660Â nm) at the dose of 5Â J/cm(2) should modulate cellular viability, upregulated VEGF, and downregulated IL6 expression of messenger RNA in culture of L929 fibroblast

cells. Interleukin-6;RNA, Messenger;Vascular Endothelial Growth Factor A Animals;Cell Proliferation;Cell Survival;Down-Regulation;Fibroblasts;Gene Expression Regulation;Interleukin-6;Low-Level Light Therapy;Mice;Microscopy, Fluorescence;RNA, Messenger;Time Factors;Up-Regulation;Vascular Endothelial Growth Factor A;Wound Healing

Design and construction of a tennis elbow brace with light-emitting diode in subjects with lateral epicondylitis. Adult;Braces;Equipment Design;Female;Humans;Low-Level Light Therapy;Tennis Elbow;Visual Analog Scale

Of diamond surfaces, red light photobiomodulation and fertility: lessons from the laboratory.

Effects of blue light on inflammation and skin barrier recovery following acute perturbation. Pilot study results in healthy human subjects. BACKGROUND/PURPOSE: While growing evidence supports the therapeutic effect of 453Â nm blue light in chronic inflammatory skin diseases, data on its effects on acutely perturbed human skin are scarce. In this study, we investigated the impact of 453Â nm narrow-band LED light on healthy skin following acute perturbation. METHODS: Tape stripping and histamine iontophoresis were performed on the forearm of 22 healthy volunteers on 2 consecutive weeks. In 1Â week, challenges were followed by irradiation for 30Â minutes. In the other week (control), no light was administered. Reactions were evaluated up to 72Â hours thereafter by transepidermal water loss (TEWL), diffuse reflectance spectroscopy, and skin surface biomarkers. RESULTS: Skin barrier disruption resulted in upregulation of IL-1Î± at 24Â hours after tape stripping (PÂ =Â .029). In contrast, irradiation abrogated this effect (PÂ >Â .05). Irradiation also resulted in higher TEWL at 24Â hours and in higher b* value at 72Â hours after tape stripping compared to the control (PÂ =Â .034 and PÂ =Â .018, respectively). At 30Â minutes following histamine iontophoresis and irradiation, a trend toward a higher a* value compared to the control was observed (PÂ =Â .051). CONCLUSION: We provide the first in vivo evidence that blue light at 453Â nm exerts biological effects on acutely perturbed healthy human skin. IL1A protein, human;Interleukin-1alpha Adult;Dermatitis;Female;Humans;Interleukin-1alpha;Light;Male;Pilot Projects;Skin;Up-Regulation

Low-level laser therapy may reduce postoperative pain levels after root canal retreatment in patients with low preoperative pain levels. Dental Pulp Cavity;Humans;Low-Level Light Therapy;Pain, Postoperative;Retreatment;Root Canal Therapy

Susceptibility of In Vitro Melanoma Skin Cancer to Photoactivated Hypericin versus Aluminium(III) Phthalocyanine Chloride Tetrasulphonate. The sensitivity of human melanoma cells to photoactivated Hypericin (Hyp) compared to aluminium(III) phthalocyanine chloride tetrasulphonate (AlPcS(4)Cl) is reported in this study. Melanoma cells (A375 cell line) were treated with various concentrations of Hyp or AlPcS(4)Cl alone, for 1, 4, and 24â€‰hrs; varying doses of laser irradiation alone (594 or 682â€‰nm); or optimal concentrations of PSs combined with laser irradiation. Changes in cell morphology, viability, membrane integrity, and proliferation after treatment of cells were determined using inverted microscopy, Trypan blue cell exclusion, Lactate Dehydrogenase (LDH) membrane integrity, and adenosine triphosphate (ATP) cell proliferation assay, respectively. More than 60% of cell survival was observed when cells were treated with 2.5â€‰Î¼M of Hyp or AlPcS(4)Cl alone at all incubation times or with 5â€‰J/cm(2) of 594 or 682â€‰nm laser alone. Combination of PSs and respective lasers leads to a statistically significant incubation time-dependent decrease in survival of cells. Flow cytometry using the FITC Annexin V/PI apoptosis kit demonstrated that cell death induced after Hyp-PDT is via early and late apoptosis whereas early apoptosis was the main mechanism observed with AlPcS(4)Cl-PDT. Hyp-PDT compared to AlPcS(4)Cl-PDT is indicated to be a more effective cancer cell death inducer in melanoma cells. Anthracenes;Coordination Complexes;Indoles;Perylene;hypericin;Aluminum Aluminum;Anthracenes;Cell Line, Tumor;Coordination Complexes;Humans;Indoles;Low-Level Light Therapy;Melanoma;Perylene;Photochemotherapy;Skin Neoplasms

Port-Wine Stains: A Focused Review on Their Management. Port-wine stain (PWS) is the second most common congenital vascular malformation characterized as ectatic capillaries and venules in the dermis that clinically appears as a deep red to purple patch on the skin. Typically, PWS progressively darken and may become hypertrophic or nodular without treatment. There are several treatment options available for PWS from topical antiangiogenic agents to laser therapies. Vascular-specific lasers are the gold standard in treating PWS and classically pulsed dye lasers are usually the treatment of choice. However, some patients with PWS are recalcitrant to PDL and may require a combination of treatment methods. Nonetheless, even with the advancements in laser therapies utilized today, it is can be difficult to achieve complete clearance of the PWS. Thus, new innovations for treating recalcitrant PWS are underway in order to improve overall patient treatment outcomes. J Drugs Dermatol. 2017;16(11):1145-1151. . Humans;Laser Therapy;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain

Efficacy of Low-Fluence Nd:YAG 1064 nm Laser for the Treatment of Post-Inflammatory Hyperpigmentation in the Axillary Area. OBJECTIVE: Post-inflammatory hyperpigmentation results in aesthetically unpleasant discoloration of the skin in the affected area. The efficacy of low-fluence Q-switched 1064-nm Nd:YAG laser has so far not been evaluated for the treatment of the axilla. This observational study was designed to evaluate whether the application of the laser treatment can satisfactorily reduce axillary hyperpigmentation. MATERIAL AND METHODS: 17 females (mean age, 34.27 Â± 9.24; range, 19-48) were treated in a single center between 2014 and 2016 for post-inflammatory hyperpigmentation of the axillary area. One treatment session was done every 2 weeks. Pairwise pre- / post-treatment assessment was graded by the practitioner, the patient, and an independent non-medical observer for consistency using a standardized grading scale. RESULTS: Post-treatment evaluation revealed an improvement score of 4 Â± 0.44; range, 4-5 (good improvement) with a variance of 0.19 after the treatment. The scoring of the practitioner rs= 0.31 correlated higher with the patient-related outcome than with the scoring of the independent non-medical observer rs= 0.17. The minimum number of sessions needed for an excellent patient-evaluated improvement was 3, but an increased number of sessions was not significantly correlated with the outcome. The results of the treatment lasted for at least 6 months after the last session. CONCLUSION: A low-fluence Q-switched 1064-nm Nd:YAG laser provided safe and effective treatment for post-inflammatory hyperpigmentation in the axillary area, with good-to-excellent improvement after a minimum of 3 sessions. J Drugs Dermatol. 2017;16(11):1118-1123. . Adult;Axilla;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Treatment Outcome;Young Adult

Lasers, Light, and the Treatment of Acne: A Comprehensive Review of the Literature. INTRODUCTION: Acne vulgaris is common dermatologic condition with an estimated prevalence of 70 to 87%. Acne has been shown to have a significant impact on patient quality of life and mental health, especially as inflammatory lesions typically occur on cosmetically sensitive areas with the potential for permanent scarring. There have been numerous advances in the treatment of inflammatory acne with light-based and laser devices. OBJECTIVE: To review the current evidence for light-based and laser treatments in the management of inflammatory acne. METHODS: An analysis was conducted of PubMed indexed English language literature regarding management of inflammatory acne using light-based and laser treatments. RESULTS: Evidence for the utilization of laser and light-based therapy for acne was summarized in a comprehensive review. Laser and light-based treatment holds the advantages of improved patient compliance and safety profiles in comparison to pharmacologic therapy. Efficacy of device based treatment varied in comparison to standard topical treatment regimens, often more effective when used in combination therapy. Adverse effects reported were generally self-limited. DISCUSSION: These treatments do and will continue to play an important and

enlarging role in the management of acne. Larger scale studies with standardization of treatment protocols are warranted. J Drugs Dermatol. 2017;16(11):1095-1102. . Acne Vulgaris;Humans;Lasers, Gas;Low-Level Light Therapy;Randomized Controlled Trials as Topic

Treatment of Photoaging With a Dual-Wavelength, 532 nm and 1,064 nm Picosecond-Domain Laser Producing a Fractionated Treatment Beam Using a Holographic Optic. BACKGROUND: A dual-wavelength, picosecond-domain, fractionated laser delivering 1,064nm and 532nm laser energy through a holographic optic was investigated for safety and effectiveness at improving the appearance of chronic photoaging. MATERIALS AND METHODS: A total of 27 subjects were enrolled with 24 completing the study, and 14 subjects were treated with 1,064 nm and 10 with 532 nm. The 1,064 nm-treated subjects received 5 monthly treatments while the 532 nm-treated subjects received 4 monthly treatments. Improvement was measured by blinded evaluation of pre- and post-treatment images 12 weeks following the final treatment. Subjects also evaluated treatment effect and side-effects. RESULTS: Blinded reviewers correctly identified the baseline image in 52 of 72 paired images, or 72% of the time, with a mean improvement score of 1.4 using an 11-point rating scale (P less than 0.0001). Post-treatment erythema, mild edema, and petechiae were the only side effects noted. CONCLUSION: The fractionated, picosecond-domain, 532 nm and 1,064 nm laser is safe and effective for improvement of facial photodamage. The laser was well tolerated with mild erythema, edema, and petechiae as the most common side-effects. J Drugs Dermatol. 2017;16(11):1077-1082. . Adolescent;Adult;Aged;Double-Blind Method;Equipment Safety;Facial Dermatoses;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Skin Aging;Treatment Outcome;Young Adult

Cord blood platelet gel alone or in combination with photobiomodulation therapy for the treatment of oral ulcerations in patients with epidermolysis bullosa: A pilot clinical comparative study. Adolescent;Adult;Blood Platelets;Child;Epidermolysis Bullosa;Female;Fetal Blood;Humans;Low-Level Light Therapy;Male;Oral Ulcer;Pilot Projects

Using normal and high pulse coverage with picosecond laser treatment of wrinkles and acne scarring: Long term clinical observations. OBJECTIVE: The picosecond 755â€‰nm alexandrite laser using a diffractive lens array has demonstrated consistent clinical efficacy for improving the appearance of acne scarring and wrinkles amongst other benefits. This small pilot study is to assess the difference, if any, in clinical benefit if a higher than the standard protocol for number of pulses delivered to a tissue area is used compared to the standard protocol guidelines. METHOD: Seven subjects received treatment to one side of the face with a standard protocol number of laser pulses with the other side of the face receiving higher than standard number of pulses from the same 755â€‰nm picosecond laser using an additional diffractive lens array. Photographs at final follow up were compared to baseline by two blinded Board Certified Dermatologists and assessed for improvements to acne scarring using a 6-point grading score, for wrinkles using the Fitzpatrick Wrinkle & Elastosis 3-point grading scale and a Global Aesthetic Improvement Scale assessment. Subjects also completed a satisfaction questionnaire. RESULTS: For the acne scarring subjects, the average improvement from baseline to final follow up was 4.0â€‰+/-â€‰1.0 for the standard treated side and 4.5â€‰+/-â€‰0.5 for the high pulse side. There was no statistically significant difference between the two treated sides (Pâ€‰>â€‰0.05, nâ€‰=â€‰3 paired t-test). For the wrinkle subjects, the average grading of the standard pulse side improved from 2.0â€‰+/-â€‰0.82 to 1.75â€‰+/-â€‰1.0 from baseline to final follow-up. The high pulse side improved from 1.5â€‰+/-â€‰1.0 to 1.125â€‰+/-â€‰0.25 from baseline to final follow-up. There was no statistically significant difference between the improvement of the standard and high pulse treatment sides (Pâ€‰>â€‰0.05, nâ€‰=â€‰4 paired t-test). The comparison of baseline to final follow-up images of each subject found both sides to be Much or Very Much improved with no statistically significant difference between the standard

and high pulse sides (Pâ€‰>â€‰0.05, nâ€‰=â€‰7 paired t-test). Six of the seven subjects did not note any difference between the effect on different sides of the face and four of the seven rated their overall improvement after treatment as Good, three subjects as Reasonable and one subject with Slight Improvement. All subjects found the treatment comfortable and easy to tolerate and there was no increased incidence of side effects other than the mild occurrences typically observed for this type of treatment. CONCLUSION: This is a small pilot study with limited subject numbers and further data is needed to be able to make firm conclusions of observed trends, which suggest that the use of higher than standard suggested protocol number of pulses with the diffractive lens array and the 755â€‰nm picosecond laser does not appear to offer any additional benefit over that that can already be achieved with the standard number of pulses, but also does not increase risk of detrimental post treatment effects either. Lasers Surg. Med. 50:51-55, 2018. Â© 2017 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Acne Vulgaris;Adult;Aged;Cicatrix;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pilot Projects;Skin Aging;Time Factors;Treatment Outcome

Prevention and treatment of acute and chronic radiodermatitis. More than half the number of patients with cancer, who are treated with radiotherapy, will have radiodermatitis at some point during their treatment. Radiodermatitis either occurs early on in the treatment period or appears months or up to several years later. Acute radiodermatitis is a burn injury that varies in severity according to both treatment and inherent patient factors. Most acute radiodermatitis reactions resolve after several weeks but some reactions persist and can cause complications. Late-onset radiodermatitis is characterized by telangiectasia that forms on atrophic and fragile skin. These radiodermatitis reactions can have a significant negative impact on concomitant and subsequent therapeutic protocols and most particularly on the patient's quality of life. Today, treatment of radiodermatitis reactions is in its infancy. Although there is insufficient evidence available to form recommendations that would prevent or reduce radiodermatitis, some advances have been made using low level light therapy (LLLT) or vascular lasers to control the symptoms. Some recent preclinical and clinical research suggests that LLLT has biostimulating properties which allow the tissues to regenerate and heal faster, reduce inflammation, and prevent fibrosis. Also, in late-onset radiodermatitis pulsed dye laser treatment has been shown to be beneficial in clearing radiation-induced telangiectasia. In the absence of evidence-based recommendations, the objective of this paper is to review how to prevent or manage the symptoms of radiodermatitis reactions.

[Laser therapy for male infertility. Part 1. Etiology and pathogenesis. experimental studies]. Male infertility is associated with a wide range of pathological conditions affecting both the sexual and other body systems: endocrine, nervous, blood, and immune. Laser therapy is a form of modern physiotherapy that applies low-intensity laser radiation in various parts of the body. It is widely used in all areas of modern medicine due to its high efficiency, ease of use, the absence of contraindications and side effects. The authors reviewed the results of 171 studies investigating laser therapy, of which 93 were experimental (20 in Russian and 73 international publications), 4 clinical and experimental (all in Russian), 74 clinical (73 in Russian and 1in English). Along with domestic literature, publications in Russian from Belarus, Georgia, Kyrgyzstan, Uzbekistan and Ukraine were studied. The article analyzes the experimental studies, somehow related to the problem of infertility and its treatment using low-intensity lasers. The analysis findings suggest that there are all prerequisites to develop a laser therapy as an effective modality for treating infertile men. Animals;Humans;Infertility, Male;Low-Level Light Therapy;Male

Prospective studies of the efficacy and safety of the picosecond 755, 1,064, and 532â€‰nm lasers for the treatment of infraorbital dark circles. BACKGROUND: Infraorbital dark circles result from a

combination of factors. The fractionated picosecond 755â€‰nm alexandrite laser and dual wavelength picosecond Nd:YAG laser have not been examined as a method of addressing infraorbital hyperpigmentation. OBJECTIVE: To determine the efficacy and safety of treatment of infraorbital dark circles using fractionated picosecond 755â€‰nm and dual wavelength picosecond Nd:YAG laser. METHODS AND MATERIALS: These trials did not utilize a comparative design; rather, these were separate, prospective, open-label, evaluator-blinded trials utilizing two treatment regimens: (i) 19 adult subjects were treated in a single session with the dual wavelengths of 532â€‰nm and 1,064â€‰nm in consecutive passes using the fractionated lens; (ii) 10 adult subjects were treated using the picosecond 755â€‰nm laser via the fractionated lens in three treatment sessions at 3 week intervals. Subjects in both studies were followed-up for blinded-investigator assessment of infraorbital hyperpigmentation, adverse events, and improvement compared to baseline. RESULTS: The dual wavelength picosecond Nd:YAG laser, blinded-investigator assessment did not demonstrate a significant improvement in infraorbital hyperpigmentation at day 60 (Pâ€‰=â€‰0.16). The picosecond 755â€‰nm alexandrite laser significantly improved infraorbital hyperpigmentation by day 42, with improvement maintained through day 132 (Pâ€‰=â€‰0.07 and 0.00001, respectively). Adverse events were mild and temporary. CONCLUSION: A single treatment with the fractionated picosecond 1,064/532â€‰nm lasers did not produce a significant improvement in infraorbital hyperpigmentation. A series of three treatments with the fractionated picosecond 755â€‰nm laser resulted in significant improvement in hyperpigmentation. Lasers Surg. Med. 50:45-50, 2018. Â© 2017 Wiley Periodicals, Inc. Adult;Aged;Aged, 80 and over;Facial Dermatoses;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Single-Blind Method;Treatment Outcome

Laser and Platelet-Rich Plasma to treat Medication-Related Osteonecrosis of the Jaws (MRONJ): a case report. AIMS: The appropriate management of Medication-Related OsteoNecrosis of the Jaw (MRONJ) is still a challenge for dentists and oral surgeons and in these last years high-technology instruments have been proposed at the different steps of interventions, also combined with promoters of tissue repair.The aim of this report is to show the advantages of a combined approach (laser and PRP) for the treatment of MRONJ. METHODS: It is described the case of a patient positive for MRONJ observed at the Odontostomatology and Maxillo-Facial Surgery Unit of the Hospital of Piacenza where surgical approach was performed by using different devices: Er:YAG laser (2940 nm) to remove and vaporize necrotic hard tissue until bleeding bone; Platelet-Rich Plasma (PRP) to stimulate hard and soft tissue healing; diode laser (808 nm) to biostimulate the surgical site. RESULTS: At the time of suture removal, wound closure was observed and the complete healing of the MRONJ site was observed for the 2 years follow up. CONCLUSION: This case may suggest that this kind of combined approach during all the steps of MRONJ treatment allows to perform a faster and less invasive surgery with a more comfortable postoperative healing process and it represents an innovative approach in this severe adverse event.

Effect of low-level laser therapy on fracture healing in rabbits. BACKGROUND AND AIMS: The purpose of this study was to investigate the effect of low-level laser therapy (LLLT) on radial bone fracture gap healing in a rabbit model. MATERIALS SUBJECTS AND METHODS: Thirty male white New Zealand rabbits under general anesthesia had a 3mm slice of radial bone surgically removed. Fifteen rabbits were treated by 830 nm laser at 4 J/cm(2) and 15 were used as non-treated controls. Callus development was assessed by X-ray and radiographs every 7 days for 3 weeks. RESULTS: Significant radiologic changes were observed in both groups against time ($P > 0.001$) or from week to week ($P > 0.05$). However, there was no statistical difference in radiologic scores after week 2 ($P = 0.087$) or week 3 ($P = 0.077$) between control and laser treated bone. CONCLUSIONS: Findings suggest that in

this study, laser treatment did not enhance callus formation nor reduce repair time of complete fracture of the radius in rabbits.

Evaluation of adjunctive effect of low-level laser Therapy on pain, swelling and trismus after surgical removal of impacted lower third molar: A double blind randomized clinical trial. BACKGROUND AND AIM: Wisdom teeth remains impacted in the jaw due to several reasons and surgery of impacted wisdom teeth is one of the most common surgeries in dental clinics. Pain, swelling and trismus are the common complications after this surgery which affect quality of life. In articles, various methods are introduced to control immediate inflammatory-response associated with third-molar surgery. The aim of this study is to evaluate the adjunctive effect of low-level laser Therapy on pain, swelling and trismus after surgical removal of impacted lower third molar. MATERIALS AND METHODS: This double-blind randomized controlled trial (RCT) was conducted on two groups of 24 patients (age range of 18-35) that had referred to surgical ward of Faculty of Dentistry, Tabriz University of Medical Sciences for surgery of their mandibular third molar(2015-16). All the subjects were systemically healthy and had at least one impacted mandibular third molar. After surgery, in experimental group, the laser was applied intraorally (inside the tooth socket) and extraorally (at the insertion point of the masseter muscle) immediately after surgery in contact with the target area for 25 seconds each. The laser energy was 2.5 J per area with an energy density of 5 J/ cm(2) at the surface of the probe (spot size= 0.5 cm(2)). In the other group, as the control group, it was pretended to radiate. Trismus, pain, and swelling were evaluated on the first and seventh days after surgery. The obtained data were evaluated using SPSS 16 software and independent samples T-test. FINDINGS: In the group where LLLT had been used, P> 0.05 was calculated for pain, swelling, and trismus on days 1 and 7 after surgery that was not statistically significant. CONCLUSION: Under limitations of this study, using low-power laser with mentioned parameters, clinically reduces pain, swelling and trismus after surgical removal of impacted mandibular wisdom, but not statistically significant.

Non-thermal near-infrared exposure photobiomodulates cellular responses to ionizing radiation in human full thickness skin models. Ionizing and near-infrared radiation are both part of the therapeutic spectrum in cancer treatment. During cancer therapy ionizing radiation is typically used for non-invasive reduction of malignant tissue, while near-infrared photobiomodulation is utilized in palliative medical approaches, e.g. for pain reduction or impairment of wound healing. Furthermore, near-infrared is part of the solar wavelength spectrum. A combined exposure of these two irradiation qualities - either intentionally during medical treatment or unintentionally due to solar exposure - is therefore presumable for cancer patients. Several studies in different model organisms and cell cultures show a strong impact of near-infrared pretreatment on ionizing radiation-induced stress response. To investigate the risks of non-thermal near-infrared (NIR) pretreatment in patients, a human in vitro full thickness skin models (FTSM) was evaluated for radiation research. FTSM were pretreated with therapy-relevant doses of NIR followed by X-radiation, and then examined for DNA-double-strand break (DSB) repair, cell proliferation and apoptosis. Double-treated FTSM revealed a clear influence of NIR on X-radiation-induced stress responses in cells in their typical tissue environment. Furthermore, over a 24h time period, double-treated FTSM presented a significant persistence of DSBs, as compared to samples exclusively irradiated by X-rays. In addition, NIR pretreatment inhibited apoptosis induction of integrated fibroblasts, and counteracted the radiation-induced proliferation inhibition of basal keratinocytes. Our work suggests that cancer patients treated with X-rays should be prevented from uncontrolled NIR irradiation. On the other hand, controlled double-treatment could provide an alternative therapy approach, exposing the patient to less radiation. Ki-67 Antigen Apoptosis;Cell Proliferation;DNA Breaks, Double-Stranded;DNA Repair;Dose-Response Relationship, Radiation;Fibroblasts;Humans;Infant;Infrared Rays;Ki-67 Antigen;Skin;X-Rays

In Vitro Effects of High-Intensity Laser Photobiomodulation on Equine Bone Marrow-Derived Mesenchymal Stem Cell Viability and Cytokine Expression. OBJECTIVE: This study aimed to examine the influence of neodymium-doped yttrium aluminum garnet (Nd:YAG) laser irradiation on equine bone marrow-derived mesenchymal stem cell (MSC) viability, proliferation, and cytokine expression in vitro. BACKGROUND: Photobiomodulation of cells using monochromatic light is a technique designed to influence cellular processes. Previous studies have shown dose-dependent effects of low-level laser irradiation on cell proliferation and cytokine expression in a range of cell types and species. Evidence for the influence of 1064â€‰nm wavelength near-infrared irradiation on MSCs is sparse, and high-energy doses have shown inhibitory effects. METHODS: MSC cultures from six horses were exposed to 1064â€‰nm irradiation with an energy density of 9.77â€‰J/cm(2) and a mean output power of 13.0â€‰W for 10â€‰sec. MSC viability and proliferation were evaluated through flow cytometry and real-time live cell analysis. Gene expression and cytokine production in the first 24â€‰h after irradiation were analyzed through polymerase chain reaction (PCR), multiplex assay, and enzyme-linked immunosorbent assay. RESULTS: No difference in viability was detected between irradiated and control MSCs. Irradiated cells demonstrated slightly lower proliferation rates, but remained within 3.5% confluence of control cells. Twenty-four hours after irradiation, irradiated MSCs demonstrated a significant increase in expression of interleukin (IL)-10 and vascular endothelial growth factor (VEGF) compared with control MSCs. CONCLUSIONS: Under these irradiation parameters, equine MSCs remained viable and expressed increased concentrations of IL-10 and VEGF. IL-10 has an anti-inflammatory action by inhibiting the synthesis of proinflammatory cytokines at the transcriptional level. This response to 1064â€‰nm irradiation shows promise in the photobiomodulation of MSCs to enhance their therapeutic properties. Cytokines Animals;Cell Proliferation;Cell Survival;Cells, Cultured;Cytokines;Enzyme-Linked Immunosorbent Assay;Horses;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Mesenchymal Stem Cells;Polymerase Chain Reaction;Radiotherapy Dosage;Sensitivity and Specificity

Photobiomodulation for traumatic brain injury and stroke. There is a notable lack of therapeutic alternatives for what is fast becoming a global epidemic of traumatic brain injury (TBI). Photobiomodulation (PBM) employs red or near-infrared (NIR) light (600-1100nm) to stimulate healing, protect tissue from dying, increase mitochondrial function, improve blood flow, and tissue oxygenation. PBM can also act to reduce swelling, increase antioxidants, decrease inflammation, protect against apoptosis, and modulate microglial activation state. All these mechanisms of action strongly suggest that PBM delivered to the head should be beneficial in cases of both acute and chronic TBI. Most reports have used NIR light either from lasers or from light-emitting diodes (LEDs). Many studies in small animal models of acute TBI have found positive effects on neurological function, learning and memory, and reduced inflammation and cell death in the brain. There is evidence that PBM can help the brain repair itself by stimulating neurogenesis, upregulating BDNF synthesis, and encouraging synaptogenesis. In healthy human volunteers (including students and healthy elderly women), PBM has been shown to increase regional cerebral blood flow, tissue oxygenation, and improve memory, mood, and cognitive function. Clinical studies have been conducted in patients suffering from the chronic effects of TBI. There have been reports showing improvement in executive function, working memory, and sleep. Functional magnetic resonance imaging has shown modulation of activation in intrinsic brain networks likely to be damaged in TBI (default mode network and salience network). Animals;Brain Injuries, Traumatic;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Stroke;Transcription, Genetic

Successful and safe use of Q-switched lasers in the treatment of nevus of Ota in children with phototypes IV-VI. OBJECTIVE: Nevus of Ota represents congenital dermal melanocytosis in a

trigeminal distribution, most commonly occurring in Asian individuals and other individuals with skin of color. Evidence suggests early treatment is beneficial. Multiple reports have shown efficacy and safety of Q-switched laser treatment in adults. There is little data on children and in non-Asian skin types. This series was done to demonstrate safe and effective use of Q-switched laser therapy in children of multiple skin types. STUDY DESIGN: Retrospective case series. METHODS: This was a chart review of patients under 18 years old who presented to our practice from 2002 to 2015 with a clinical diagnosis of nevus of Ota who were treated with Q-switched lasers (694 and 1,064â€‰nm). Patients were treated without the use of general anesthesia or sedation, and corneal shields were used in appropriate cases. Percentage of improvement as well as side effects were rated by five physicians independently. Improvement, when present, was rated in quartiles (1-25%, 26-50%, 51-75%, and 76-100% improvement). RESULTS: Twenty-four children were included. The average age at the start of treatment was 3.9 years old (range of 3 months to 12.4 years), and patients had Fitzpatrick skin types IV through VI. The mean number of treatments was 9.3. Assessment revealed excellent response (76-100% improvement) in 70% of patients and good to excellent response (51-100% improvement) in 86%. Two patients (8%) had post-inflammatory hyperpigmentation, one of whom also had focal hypopigmentation. CONCLUSION: Treatment of nevus of Ota with Q-switched lasers in children with skin of color, without general anesthesia or sedation, is safe and effective. Early intervention should be encouraged for better efficacy and to prevent psychosocial distress in later childhood and adulthood. Lasers Surg. Med. 50:56-60, 2018. Â© 2017 Wiley Periodicals, Inc. Child;Child, Preschool;Facial Neoplasms;Female;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Nevus of Ota;Retrospective Studies;Skin Neoplasms;Skin Pigmentation;Treatment Outcome

Only lasers can be used for low level laser therapy. The question of lasers' exclusivity, as well as the degree of influence of special properties of low-intensity laser illumination (LILI), such as coherence, polarity and monochromaticity, on the effectiveness of low level laser therapy (LLLT) continues to cause arguments. The study analyzes publications from 1973 to 2016, in which laser and conventional light sources are compared, and the following conclusions are drawn. First, there are a lot of publications with incorrect comparison or unfounded statements. Secondly, other sources of light are often meant by LILI without any justification. Thirdly, all studies, in which the comparison is carried out correctly and close parameters of the impact and the model are used, have a firm conclusion that laser light is much more effective. Fourthly, it is uniquely identified that the most important parameter that determines the efficiency of lasers is monochromaticity, i.e., a much narrower spectral width than for all other light sources. Only laser light sources can be used for LLLT!

A systematic review and meta-analysis of the effect of low-level laser therapy (LLLT) on chemotherapy-induced oral mucositis in pediatric and young patients. Oral mucositis is one of the most frequent complications after chemotherapy, occurring in approximately 52 to 80% of children receiving treatment for cancer. Recently, it has been suggested that the use of low-energy laser could reduce the grade of oral mucositis and alleviate the symptoms. In 2014, Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology has recommended low-level laser therapy in prevention of mucositis for hematopoietic stem cell transplantation patients because of its beneficial effects in majority of recent studies. However, the recommendation was made for adult patients, not pediatric patients. Data about the effect of low-level laser therapy in pediatric patients is limited. This study aims to synthesize the available clinical evidences on the effects of low-level laser therapy (LLLT) in the prevention and treatment of chemotherapy-induced oral mucositis (OM). A meta-analysis was performed using trials identified through the Cochrane Central Register of Controlled Trials, Embase, MEDLINE, Web of Science, China Biology Medicine (CBM), Wanfang Database, and China National Knowledge Infrastructure (CNKI). Data on occurrence,

duration, and severity of oral mucositis were collected. All randomized controlled studies and clinical controlled studies comparing LLLT to routine qualified prevention or treatment during or after chemotherapy were critically appraised and analyzed. We found 8 qualified clinical trials with a total of 373 pediatric patients; the methodological quality was acceptable. After prophylactic LLLT, the odds ratio for developing OM was significantly lower compared with placebo(ORâ€‰=â€‰0.50, 95% CI 0.29 to 0.87, Pâ€‰=â€‰0.01), the odds ratio for developing grade III OM or worse was statistically significantly lower compared with placebo (ORâ€‰=â€‰0.30, 95% CI (0.10, 0.90), Pâ€‰=â€‰0.03), and the OM severity was statistically significantly lower compared with placebo (SMDâ€‰=â€‰-â€‰0.56, 95% CI (-â€‰0.98, -â€‰0.14), Pâ€‰=â€‰0.009). For therapeutic LLLT, the OM severity was significantly reduced compared to routine care (SMDâ€‰=â€‰-â€‰1.18, 95% CI (-â€‰1.52, -â€‰0.84), Pâ€‰<â€‰0.00001). Oral pain was also reduced after LLLT over routine care (MDâ€‰=â€‰-â€‰0.73, 95% CI (-â€‰1.36, -â€‰0.11), Pâ€‰=â€‰0.02). CONCLUSION: Prophylactic LLLT reduces mucositis and severe mucositis and decreases the average severity of oral mucositis in pediatric and young patients with cancer. Therapeutic LLLT also reduces the average severity of oral mucositis and oral pain. Further research should investigate the optimal parameter of LLLT in pediatric and young patients, and studies with higher methodological quality should be performed. What is known: â€¢ Low-level laser therapy (LLLT) was recommended by Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology; however, evidences about LLLT on oral mucositis in pediatric and young patients were insufficient and lack supportive synthesized data. â€¢ Recently, there have been several new RCTs or CCTs for pediatric patients or young adults. What is new: â€¢ Prophylactic LLLT reduces the occurrence of mucositis and severe mucositis and decreases the average severity of oral mucositis in pediatric and young patients. â€¢ Therapeutic LLLT reduces the average severity of oral mucositis and oral pain. Antineoplastic Agents Adolescent;Antineoplastic Agents;Child;Child, Preschool;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Severity of Illness Index;Stomatitis;Treatment Outcome;Young Adult

Comparison of the inÂ vitro effects of low-level laser therapy and low-intensity pulsed ultrasound therapy on bony cells and stem cells. To compare the inÂ vitro effectiveness of Low-Level Laser Therapy (LLLT) and Low Intensity Pulsed Ultrasound (LIPUS) on bony cells and related stem cells. In this study, we aim to systematically review the published scientific literature which explores the use of LLLT and LIPUS to biostimulate the activity or the proliferation of bony cells or stem cells inÂ vitro. We searched the database PubMed for LLLT or LIPUS, with/without bone, osteoblast, osteocyte, stem cells, the human osteosarcoma cell line (MG63), bone-forming cells, and cell culture (or inÂ vitro). These studies were subdivided into categories exploring the effect of LLLT or LIPUS on bony cells, stem cells, and other related cells. 75 articles were found between 1987 and 2016; these included: 50 full paper articles on LLLT and 25 full papers on LIPUS. These articles met the eligibility criteria and were included in our review. A detailed and concise description of the LLLT and the LIPUS protocols and their individual effects on bony cells or stem cells and their results are presented in five tables. Based on the main results and the conclusions of the reviewed articles in the current work, both, LLLT and LIPUS, apply a biostimulatory effect on osteoblasts, osteocytes, and enhance osteoblast proliferation and differentiation on different bony cell lines used in inÂ vitro studies, and therefore, these may be useful tools for bone regeneration therapy. Moreover, in consideration of future cell therapy protocols, both, LLLT and LIPUS (especially LLLT), enhnce a significant increase in the initial number of SCs before differentiation, thus increasing the number of differentiated cells for tissue engineering, regenerative medicine, and healing. Further studies are necessary to determine the LLLT or the LIPUS parameters, which are optimal for biostimsulating bony cells and SCs for bone healing

and regenerative medicine. Bone and Bones;Humans;Low-Level Light Therapy;Stem Cells;Ultrasonic Therapy
Effects of Low-Level Laser Therapy With a Herbal Extract on Alveolar Bone Healing. PURPOSE: This study investigated the effect of a gallium-aluminum-arsenide (GaAlAs) diode laser used in low-level laser therapy (LLLT) with the application of Mecsina Hemostopper on mandibular alveolar bone healing. MATERIALS AND METHODS: Standard semispherical bone defects were created in left mandibular diastema sites of 32 female Long-Evans rats. Experimental animals were allocated to 1 of 4 groups: control group (no treatment), laser group (GaAlAs LLLT), Mecsina group, and laser-Mecsina combination group. Liquid Mecsina 0.01Â mL was applied to the bone defects. Laser treatment was performed for 7Â days after surgery at an energy dose of 10Â J/cm(2). All animals were sacrificed to observe hard tissue healing histologically, immunohistochemically, and radiologically at 30Â days after surgery. RESULTS: Histologic assessment showed significantly more calcified tissue areas and significantly more osteoblast cells in the laser and laser-Mecsina groups than in the other groups (PÂ <Â .01). Qualitative morphologic assessment showed that more bone tissue was present in the laser-Mecsina group than in the other groups. CONCLUSION: This study showed that LLLT, Mecsina application, and combined treatments were effective in healing alveolar bone among all tested treatment modalities. Hemostatics Alveolar Process;Animals;Female;Hemostatics;Lasers, Semiconductor;Low-Level Light Therapy;Mandible;Rats;Wound Healing
Diode Laser Assisted Excision and Low Level Laser Therapy in the Management of Mucus Extravasation Cysts: A Case Series. Introduction: Mucus extravasation cyst is a commonly occurring lesion in oral cavity that may result from traumatic severance of a salivary gland duct with subsequent extravasation of mucus into fibrous connective tissue. After a conventional excision or marsupialization, recurrence is not uncommon. Diode laser offers an effective modality for management of such lesions. Case Reports: Four patients were referred with painless fluctuant swellings on labial and buccal mucosa. After recording history and clinical examination, provisional diagnosis of mucocele was made. All the lesions were excised with a diode laser and biopsy was performed. Surgical wounds were treated with low-level laser therapy (LLLT). Results: Uneventful healing was observed in all 4 cases. Significant reduction in postoperative discomfort was recorded after application of LLLT. Histopathological findings were suggestive of mucus extravasation cysts. Conclusion: Diode laser appears to be a good alternative to conventional modalities for the management of mucus extravasation cysts.
Efficiency of a New Combined Laser Therapy in Patients With Trophic Ulcers of Lower Extremities and Chronic Venous Insufficiency. Introduction: Treating patients with trophic ulcers (TUs) of venous etiology (VE) is a complicated socio-medical and economic problem. One of the ways to increase treatment efficiency can be a complex therapy, including combined laser action. Methods: The objective of this study was a comparative evaluation of the efficiency of traditional treatment methods in patients with chronic venous diseases of C6 class, and combined laser therapy (LT) according to a new method by LASMIKÂ® device. External exposure was conducted on the 1-4 affected area during one session for 2 minutes per zone (pulsed mode, light pulse duration of 100-130 ns, wavelength 635 nm, by a matrix emitter consisting of eight laser diodes with a surface area of 8 cm2, at a distance of up to 7 cm, pulsed power 40 W). Intravenous laser blood illumination (ILBI) was conducted in continuous mode with a wavelength of 365-405 nm (UV-spectrum) and 520-525 nm (green spectrum) alternately, during 12 daily sessions, according to a special scheme. Results: The new method reduces time periods for wound surface cleansing from purulo-necrotic masses, stimulates proliferation and epithelialization processes by 2-2.7 times, compared with the conventional method. Conclusion: The high efficiency of a new combined LT has been demonstrated in the treatment of TU of VE in combination with traditional methods of patients' medical treatment.

Management of Post Endodontic Retreatment Pain With Low Level Laser Therapy. Introduction: Pharmacotherapy with analgesics and non-steroidal anti-inflammatory drugs has been traditionally used to relief post-operative pain of endodontic treatments. However, due to the side effects reported for these drugs, some efforts have been made to decrease the post-operative pain of the endodontic treatments through laser irradiation. The present study aimed to evaluate the effects of low level laser therapy (LLLT) on the reduction of pain after root canal retreatment. Methods: In this clinical trial, 61 patients requiring endodontic retreatments in posterior teeth were selected. A single visit endodontic retreatment was performed. After biomechanical preparation, low level laser was irradiated to the buccal and lingual mucosa overlying the apices of the target tooth in the experimental group. In the control group patients received placebo laser to eliminate the probable psychological effects of laser. Laser irradiation was done with a single dose of 808 nm wavelength (Whitening Lase II- Laser DMC, Samsung, Korea) with 100 mW power, and dose of 70 J/cm(2) for 80 seconds. Pain severity was recorded before, immediately after and 4, 8, 12, 24 and 48 hours after the treatment by visual analogue scale (VAS). The pain scores were statistically analyzed by chi-square test between 2 groups. The effects of different variables on the post-operative pain experience were also studied by means of Logistic regression. Results: Pain scores decreased significantly through time until 48 hours after treatment. No significant differences were observed between the 2 modalities regarding pain scores at any time. According to regression analysis, pain severity scores were lower in the laser-irradiated specimens than control groups (OR = 5.69); however, this difference was not statistically significant. Consumption of analgesics after the treatment had significant effect in decreasing post-operative pain experience (OR = 56) while factors of age, gender, laser irradiation, pre-treatment pain scores and education level did not. Conclusion: Low level laser irradiation had limited effects to decrease pain associated with the endodontic retreatments in the first and second molars; however, more studies are required to assess the effects of different parameters of low level laser in this regard.

Effect of Low-Level Laser Therapy and Strength Training Protocol on Hand Grip by Dynamometry. Introduction: The purpose of this study was to investigate the effect of low-level laser therapy (LLLT) - 660 nm and 904 nm - before grip strength protocol in healthy subjects. Methods: The study included 45 healthy volunteers with an average age of 22.7 (Â±1.4) years, subdivided into the following groups, control group: grip strength training associated with placebo LLLT; 660 nm group: LLLT (660 nm, 20 J/cm(2), power of 30 mW, and beam area of 0.06 cm(2), continuous, energy 1.2 J, and exposure time 40 seconds per point) before grip strength training and 904 nm group: LLLT (904 nm, 10 J/cm(2), peak power of 70 W and 0.13 cm(2) beam area, with pulsed beam 9.500 Hz and 30 seconds of exposure time per point and emitted energy 1.2 J) before grip strength training. The LLLT was timed to contact 10 points located in the region of the superficial and deep flexor muscles of the fingers, with a total energy of 12.0 J per session. For the strength training protocol, the volunteer exercised their fingers with the dominant hand on a small table, elbow flexed at 90Â°, forearm in neutral, using a light extension handle. The Oxford protocol was performed during four weeks. The grip strength was assessed using a dynamometer (Jamarâ„¢). The data were evaluated by the analysis of variance (ANOVA) statistical method. Results: In the comparison of intragroup evaluation, only the 904 nm group showed a difference compared to the baseline assessment after 4 weeks ($P < 0.05$), in the final intergroup evaluation, a difference was observed in the comparison between the control and 904 nm groups Conclusion: In conclusion, LLLT (904 nm) applied before resistance training was effective in gaining grip strength when compared to LLLT (660 nm) and isolated strength training after 4 weeks.

[What physiotherapeutic method for the treatment of post-mastectomy lymphedema is the most effective?]. We have undertaken the search for the publications of interest in the following

databases: Scopus, Web of Science, MedLine, The Cochrane Library, CyberLeninka, and Russian science citation index. In addition, we evaluated the effectiveness of the physical agents and procedures having different mechanisms of action of the known factors responsible for the development of post-mastectomy lymphedema. Such agents and procedures include self-massage, manual lymphatic drainage, therapeutic physical exercises, compression bandaging, wearing elastic compression garments, Kinesio Tex taping, pneumatic compression, ultrasonic, electrostatic, extracorporeal shock wave therapy, electrical muscle stimulation, microcurrent and low-intensity laser therapy. These methods and products were used by the authors of selected publications either separately or in the combined modes taking into consideration the significant differences between effects of the application of individual techniques. The results of the treatment are presented for different time periods, either in absolute units (cm or ml) in the majority of the cases or in relative units (%) only in part of them without information concerning the statistical significance of the results obtained. There is thus far neither the universal classification of post-mastectomy lymphedema nor the generally accepted approaches to its diagnostics and treatment. Therefore, it is impossible to give an unambiguous answer as regards the effectiveness of one or another method for the diagnostics and treatment of this condition. The author of the present article observed 172 patients at the age of 56.8Â±9.7 years suffering from late grade I-IV lymphedema treated with the use of local low-intensity low-frequency electric and magnetic therapy in the combination with pneumatic compression applied during 15 days. The results of the treatment were evaluated using water and impedance plethysmography. Within 4 weeks after the onset of therapy, the volume of the upper limb decreased on the average for all stages of lymphedema by 37.7Â±9.3% under effect of pneumatic compression alone, by 49.5Â±10.7% under the influence of its combination with electrotherapy, by 59.9Â±5.4% under the action of the combination of pneumatic compression with magnetotherapy, and by 76.3Â±7.3% after the application of all the three techniques together ($p<0.05$). Electrical neurostimulation of the blood vessels and skeletal muscles proved especially effective for the treatment of I-II grade lymphedema while magnetic therapy was most efficient for the management of grade III-IV lymphedema. The proposed method of combined physiotherapy looks very encouraging for the treatment of late lymphedema but does not completely solve all problems pertaining to the management of this pathological condition.
Aged;Female;Humans;Lymphedema;Mastectomy;Middle Aged;Physical Therapy Modalities;Postoperative Complications

[The effectiveness of combined laser therapy for the treatment of the patients presenting with bronchial asthma and concomitant allergic rhinitis]. A total of 137 patients suffering from bronchial asthma (BA) and concomitant allergic rhinitis (AR) were available for the examination at the stage of the rehabilitative treatment under conditions of the southern coast of the Crimea. All the patients were divided into three groups. The patients of group 1 underwent the standard complex of spa and health resort-based climatic therapy procedures (SCT), for those comprising group 2 SCT was supplemented by non-invasive magnetic laser therapy (NMLT) while patients included in group 3 received SCT and the combination of NMLT with endonasal laser radiation (ENLR). The study has demonstrated that the combined application of physiotherapeutic procedures (NMLT and ENLR) enhances the effectiveness of SCT in comparison with either NMLT or SCT alone in terms of improvement of clinical manifestations of the disease, external respiratory function, laboratory characteristics, and immunological status of the patients suffering from bronchial asthma.
Adult;Asthma;Female;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Rhinitis, Allergic

Low-level laser therapy for xerostomia in primary SjÃ¶gren's syndrome: a randomized trial. To evaluate the effectiveness of low-level laser therapy (LLLT) in the treatment of xerostomia in primary

SjÃ¶gren's syndrome (SS), a randomized clinical trial of patients with dry mouth symptoms associated with primary SS receiving care at a university hospital was conducted. Sixty-six patients were randomly assigned with a 1:1 allocation ratio to receive LLLT (laser group, nÂ =Â 33) or placebo treatment (placebo group, nÂ =Â 33). Patients in the laser group received LLLT twice a week for 6Â weeks, for a total of 12 treatment sessions. Laser irradiation was performed with an aluminum-gallium-arsenide laser diode at a wavelength of 808Â nm, 100-mW output power, and energy density of 4.0Â J/cm(2) per irradiation point per session. Placebo treatment was performed following the same protocol used for irradiated patients and using the same laser device to mimic a real irradiation, but with no active laser emission and the tip of the laser probe covered with aluminum foil. The outcomes of interest were xerostomia inventory scores, salivary flow rate, salivary beta-2 microglobulin levels, and salivary sodium and chlorine concentrations. Patients in both groups showed no improvement in xerostomia. Likewise, there was no significant improvement in xerostomia inventory scores (pÂ =Â 0.301) or salivary flow rate (pÂ =Â 0.643) in either group. There was no difference in salivary beta-2 microglobulin levels, sodium concentration, and chlorine concentration before and after intervention or between the two groups. The LLLT protocol used in this study effected no improvement in xerostomia or salivary flow rate in patients with primary SS. ClinicalTrials.gov Identifier: NCT02066896. Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Sjogren's Syndrome;Treatment Outcome;Xerostomia

Low-level laser therapy improves the VO(2) kinetics in competitive cyclists. Some evidence supports that low-level laser therapy (LLLT) reduces neuromuscular fatigue, so incrementing sports performance. A previous randomized controlled trial of our group showed increased exercise tolerance in male competitive cyclists treated with three different LLLT doses (3, 6, and 9Â J/diode; or 135, 270, and 405Â J/thigh) before time-to-exhaustion cycling tests. Now, the present study was designed to evaluate the effects of these LLLT doses on the VO(2) kinetics of athletes during cycling tests. Twenty male competitive cyclists (29Â years) participated in a crossover, randomized, double-blind, and placebo-controlled trial. On the first day, the participants performed an incremental cycling test to exhaustion to determine maximal oxygen uptake (VO(2MAX)) and maximal power output (PO(MAX)), as well as a familiarization with the time-to-exhaustion test. In the following days (2 to 5), all participants performed time-to-exhaustion tests at PO(MAX). Before the exhaustion test, different doses of LLLT (3, 6, and 9Â J/diode; or 135, 270, and 405Â J/thigh, respectively) or placebo were applied bilaterally to the quadriceps muscle. All exhaustion tests were monitored online by an open-circuit spirometry system in order to analyze the VO(2) amplitude, VO(2) delay time, time constant (tau), and O(2) deficit. Tau and O(2) deficit were decreased with LLLT applications compared to the placebo condition (pÂ <Â 0.05). No differences (pÂ >Â 0.05) were found between the experimental conditions for VO(2) amplitude and VO(2) delay time. In conclusion, LLLT decreases tau and O(2) deficit during time-to-exhaustion tests in competitive cyclists, and these changes in VO(2) kinetics response can be one of the possible mechanisms to explain the ergogenic effect induced by LLLT. Adult;Bicycling;Cross-Over Studies;Double-Blind Method;Exercise;Exercise Test;Humans;Kinetics;Low-Level Light Therapy;Male;Oxygen Consumption

Anti-inflammatory effects of low-level laser therapy on human periodontal ligament cells: in vitro study. Periodontal disease is a chronic inflammatory disease that is commonly treated with surgical and nonsurgical techniques. However, both approaches have limitations. Low-level laser therapy (LLLT) has been widely applied in reducing inflammatory reactions, and research indicates that LLLT induces an anti-inflammatory effect that may enhance periodontal disease therapy. The purpose of this study was to investigate the anti-inflammatory effect of LLLT on human periodontal ligament cells (hPDLCs) in an inflammatory environment and aimed to determine the possible mechanism of action. Cells were cultured and treated with or without lipopolysaccharide (LPS) from

Porphryromonas gingivalis or Escherichia coli, followed by irradiation with a gallium-aluminum-arsenide (GaAlAs) laser (660Â nm) at an energy density of 8Â J/cm(2). Quantitative real-time polymerase chain reactions were used to assess the expression of pro-inflammatory genes, including tumor necrosis factor-Î± (TNF-Î±), interleukin (IL)-1Î², IL-6, and IL-8. The dual-luciferase reporter assay was used to examine nuclear factor-ÎºB (NF-ÎºB) transcriptional activity. An enzyme-linked immunosorbent assay was used to monitor the concentration of intracellular cyclic adenosine monophosphate (cAMP). Both LPS treatments significantly induced the mRNA expression of pro-inflammatory cytokines. However, LLLT inhibited the LPS-induced pro-inflammatory cytokine expression and elevated intracellular levels of cAMP. The LLLT inhibitory effect may function by downregulating NF-ÎºB transcriptional activity and by increasing the intracellular levels of cAMP. LLLT might inhibit LPS-induced inflammation in hPDLCs through cAMP/NF-ÎºB regulation. These results should be further studied to improve periodontal therapy. Anti-Inflammatory Agents;Cytokines;Inflammation Mediators;Lipopolysaccharides;NF-kappa B;Cyclic AMP;Adenine Adenine;Anti-Inflammatory Agents;Cell Death;Cell Survival;Cyclic AMP;Cytokines;Gene Expression Regulation;Humans;Inflammation;Inflammation Mediators;Lipopolysaccharides;Low-Level Light Therapy;NF-kappa B;Periodontal Ligament;Transcription, Genetic

Low-power laser irradiation decreases lipid droplet accumulation in the parotid glands of diabetic rats. Lipid droplet accumulation has been related to salivary gland hypofunction in diabetes. In this study, the effect of laser irradiation on the parotid glands (PGs) of diabetic rats was analyzed with regard to its effect on lipid droplet accumulation, intracellular calcium concentration and calmodulin expression. The animals were distributed into 6 groups: D0, D5, D20 and C0, C5, C20, for diabetic (D) and control animals (C), respectively. Twenty-nine days following diabetes induction, PGs of groups D5 and C5; D20 and C20 were irradiated with 5 and 20â€‰J/cm(2) of a red diode laser at 100â€‰mW, respectively. After 24â€‰hours, PGs were removed for histological, biochemical, and western blotting analysis. The diabetic animals showed lipid droplet accumulation, which was decreased after irradiation. Ultrastructurally, the droplets were nonmembrane bound and appeared irregularly located in the cytoplasm. Moreover, diabetic animals showed an increased intracellular calcium concentration. In contrast, after laser irradiation a progressive decrease in the concentration of this ion was observed, which would be in agreement with the results found in the increased expression of calmodulin in D20. These data are promising for using laser to decrease lipid droplet accumulation in PGs, however, more studies are necessary to better understand its mechanisms. Micrographs showing decreased lipid accumulation after laser irradiation in light micrographs (LM), and morphology of lipid droplet in transmission electron microscopic (TEM). LM: (A) PGs from nondiabetic rats that did not receive Laser irradiation (LI), (B) PGs from nondiabetic rats that received a dose of 20â€‰J/cm(2) , (C) lipid accumulation (arrows) in the secretory cells from diabetic rats that did not receive irradiation, (D) reduction of lipid accumulation in the secretory cells from diabetic rats that received a dose of 20â€‰J/cm(2) and TEM: (E) scale barâ€‰=â€‰5 Î¼m, (F) scale barâ€‰=â€‰1 Î¼m, and (G) scale barâ€‰=â€‰0.5 Î¼m. Calcium Animals;Calcium;Diabetes Mellitus, Experimental;Female;Intracellular Space;Lipid Droplets;Low-Level Light Therapy;Parotid Gland;Rats;Rats, Wistar

A comparative study with a 755â€‰nm picosecond Alexandrite laser with a diffractive lens array and a 532â€‰nm/1064â€‰nm Nd:YAG with a holographic optic. BACKGROUND AND OBJECTIVES: This study was performed to better understand the cutaneous effects of using a fractional picosecond laser at 755â€‰nm with a diffractive lens array and a picosecond Nd:YAG laser at 532â€‰mn and 1064â€‰nm with a holographic optic. We characterized the injuries created by these devices on skin clinically and histologically over 24â€‰hours. With this information we modeled the effects of these devices on a cutaneous target. METHODS: Eight patients, representing Fitzpatrick skin types I-VI, were

treated on their backs with a picosecond Alexandrite laser with a diffractive lens array, as well as a picosecond Nd:YAG laser at 532â€‰nm and 1064â€‰nm with a holographic optic. Photographs were taken 15 minutes and 24 hours after treatments. Punch biopsies were obtained at 24 hours and examined histologically. RESULTS: Treatment with the picosecond Nd:YAG laser at both 532â€‰nm and 1064â€‰nm with the holographic optic revealed erythema and small scatted areas of petechial hemorrhage areas immediately and in many cases at 24 hours after treatment. The 755â€‰nm picosecond Alexandrite laser with diffractive lens array produced erythema immediately after treatment, which largely dissipated 24 hours later. Histologies revealed intra-epidermal vacuoles with all three wavelengths. Fractional picosecond Nd:YAG laser at 532â€‰nm and 1064â€‰nm with the holographic optic showed focal areas of dermal and intra-epidermal hemorrhage with areas of vascular damage in some patients. CONCLUSIONS: This study demonstrates that both fractional picosecond devices produce vacuoles in the skin, which are most likely due to areas of laser induced optical breakdown (LIOB). In the patients (skin type II-IV) we observed scatter areas of hemorrhage in the skin, due to vascular damage with the 532â€‰nm and 1064â€‰nm, but not with 755â€‰nm wavelengths. Lasers Surg. Med. 50:37-44, 2018. Â© 2017 Wiley Periodicals, Inc. Adolescent;Adult;Erythema;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Purpura;Skin;Young Adult

Fractional Carbon Dioxide Laser as an "Add-on" Treatment for Vitiligo: A Meta-analysis with Systematic Review. Treatment of vitiligo is challenging and requires a multidisciplinary approach. Fractional carbon dioxide (CO2) laser as an add-on to conventional treatment has been reported to be effective, but there is no consensus on its use. A systematic review was performed by searching major databases for relevant publications to February 2017. Six studies with 85 participants were included. For those with refractory vitiligo, the addition of fractional CO2 laser to routine treatment modalities was superior to conventional treatment alone in terms of >â€‰50% re-pigmentation (risk ratio (RR) 4.90, 95% confidence interval (95% CI), 1.15-20.93; pâ€‰=â€‰0.03), physician improvement score (mean difference (MD) 0.81, 95% CI 0.33-1.29; pâ€‰<â€‰0.001), <â€‰25% re-pigmentation (RR 0.64, 95% CI, 0.49-0.85; p=0.002) and patient satisfaction (MD 1.61, 95% CI 0.73-2.49; p<â€‰0.001). Side-effects were minor. These results provide evidence supporting that fractional CO2 laser is a valuable treatment modality for patients with vitiligo, especially for those with refractory vitiligo. Chi-Square Distribution;Combined Modality Therapy;Humans;Lasers, Gas;Low-Level Light Therapy;Odds Ratio;Risk Factors;Skin;Skin Pigmentation;Treatment Outcome;Vitiligo

New-Generation Therapies for the Treatment of Hair Loss in Men. Hair loss affects millions of people worldwide and can have devastating effects on an individual's psychoemotional well-being. Today hair restoration technologies through hair transplantation have advanced with the use of robots and follicular unit extraction/grafting that can offer patients excellent clinical results. Adjuvant modalities, such as platelet-rich plasma injections, lasers, and stem cells, can further enhance durability, health, and appearance of hair transplants. Cytokines Alopecia;Cosmetic Techniques;Cytokines;Dietary Supplements;Humans;Low-Level Light Therapy;Male;Needles;Platelet-Rich Plasma

Antimicrobial photodynamic therapy (aPDT) and photobiomodulation (PBM - 660nm) in a dog with chronic gingivostomatitis. Chronic gingivostomatitis in dogs is an inflammatory syndrome of the oral cavity, which treatment and control of concomitant periodontitis allow healing in most of the cases. In the presence of recurrent lesions, invasive methods are necessary to treat lesions and pain. As a conservative adjuvant method, photobiomodulation (PBM) with low power laser is able to promote reduction of tissue pain and tissue inflammation besides increasing vascularization and healing, restoring the normal function of the irradiated organ in a shorter time. In veterinary

medicine, there is no standardization of technique for its use in oral tissue for treating gingivostomatitis in dogs. In the present case, a dog was submitted to aPDT (7.2J/point, 3min/point, 180J/cm(2)) and PBM (1.6J/point, 40s/point, 25J/cm(2)), using a semiconductor diode laser, with wavelength of 660nm, spot size of â€‹â€‹0.04cm(2) and output power of 40mW. The established protocol proved to be effective as coadjutant treatment for chronic gingivostomatitis, restoring the integrity of dog's affected mucosa and gingiva. Photosensitizing Agents;Methylene Blue Animals;Child, Preschool;Combined Modality Therapy;Dogs;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Stomatitis

Laser photobiomodulation of pro-inflammatory mediators on Walker Tumor 256 induced rats. Laser photobiomodulation or low-level laser therapy (LLLT) is recognized worldwide for its expansive use in medicine. LLLT has been reported to increase enzymatic activity, increasing the mitochondrial transmembrane potential, leading to an increased energy availability and signal transduction. Nevertheless, an inhibitory effect is also observed by the production of excessive ROS which can result the shutdown of mitochondrial energy production, and finally to apoptosis. However, the mechanism of apoptosis induced by LLLT is still not well understood. The main objective of the present study was to investigate the hypothesis that LLLT induces oxidative stress and stimulates the generation of pro-inflammatory markers interfering in tumor progression. METHODS: Seventy-two female Walker Tumor induced Wistar rats (eight weeks of age, 200g body weight) were used for this study. TW-256 cells were suspended in phosphate buffered saline and then subcutaneously inoculated at 1Ã—107viabletumorcells/ml per rat into the right flank (tumor-bearing rats). After a period of 14days in order to assess the development of the solid tumor mass, the animals were randomized and distributed in four groups (n=8 animals/group): (1) Control or irradiated by LLLT (2) Laser 1J - 35,7J/cm(2), (3) Laser 3J - 107,14J/cm(2) and (4) Laser 6J - 214,28J/cm(2); (Thera Laser - 660nm, 100mW DMCÂ®, SÃ£o Carlos, Brazil) at four equidistant points according to their respective treatment groups, conducted three times on alternate days. The regulation and expression of inflammatory mediators IL-1Î², IL-6, IL-10, TNF-Î± was assessed by ELISA and gene expression of COX-1, COX-2, iNOS, eNOS was analyzed by RT-PCR. RESULTS: We found that the 1Joule (J) treated group promoted a significant increase in the levels of different inflammatory markers IL-1Î², the gene expression of COX-2, iNOS, which was statistically different ($p<0.05$) when compared among different treatment and control groups. With Respect IL-6, IL-10, TNF-Î± levels statistically significant reduce was observed in 1Joule treated group when comparing to different energies groups and control group. CONCLUSION: Our results suggest the evidence 1J-35,7J/cm(2) treatment was able to produce cytotoxic effects by generation of ROS causing acute inflammation and thus may be employed as the best energy dose associated with Photodynamic Therapy. Biomarkers, Tumor;Cytokines;Inflammation Mediators;Reactive Oxygen Species;Nitric Oxide Synthase Type II;Nitric Oxide Synthase Type III;Cyclooxygenase 1;Cyclooxygenase 2 Animals;Biomarkers, Tumor;Breast Neoplasms;Cell Line, Tumor;Cyclooxygenase 1;Cyclooxygenase 2;Cytokines;Enzyme-Linked Immunosorbent Assay;Female;Gene Expression;Inflammation Mediators;Lasers, Solid-State;Low-Level Light Therapy;Nitric Oxide Synthase Type II;Nitric Oxide Synthase Type III;Rats;Rats, Wistar;Reactive Oxygen Species

Effects of low-level laser irradiation on the rate of orthodontic tooth movement and associated pain with self-ligating brackets. INTRODUCTION: The aim of this study was to evaluate the effect of low-level laser irradiation applied at 3-week intervals on orthodontic tooth movement and pain associated with orthodontic tooth movement using self-ligating brackets. METHODS: Twenty-two patients (11 male, 11 female; mean age, 19.8Â Â±Â 3.1Â years) with Angle Class II Division 1 malocclusion were recruited for this split-mouth clinical trial; they required extraction of maxillary

first premolars bilaterally. After leveling and alignment with self-ligating brackets (SmartClip SL3; 3M Unitek, St Paul, Minn), a 150-g force was applied to retract the canines bilaterally using 6-mm nickel-titanium closed-coil springs on 0.019 x 0.025-in stainless steel archwires. A gallium-aluminum-arsenic diode laser (iLas; Biolase, Irvine, Calif) with a wavelength of 940Â nm in a continuous mode (energy density, 7.5Â J/cm(2)/point; diameter of optical fiber tip, 0.04Â cm(2)) was applied at 5 points buccally and palatally around the canine roots on the experimental side; the other side was designated as the placebo. Laser irradiation was applied at baseline and then repeated after 3Â weeks for 2 more consecutive follow-up visits. Questionnaires based on the numeric rating scale were given to the patients to record their pain intensity for 1Â week. Impressions were made at each visit before the application of irradiation at baseline and the 3 visits. Models were scanned with a CAD/CAM scanner (Planmeca, Helsinki, Finland). RESULTS: Canine retraction was significantly greater (1.60Â Â±Â 0.38Â mm) on the experimental side compared with the placebo side (0.79Â Â±Â 0.35Â mm)Â (PÂ <0.05). Pain was significantlyÂ less on the experimental side only on the first day after application of LLLI and at the second visit (1.4Â Â±Â 0.82 and 1.4Â Â±Â 0.64) compared with the placebo sides (2.2Â Â±Â 0.41 and 2.4Â Â±Â 1.53). CONCLUSIONS: Low-level laser irradiation applied at 3-week intervals can accelerate orthodontic tooth movement and reduce the pain associated with it. Female;Humans;Low-Level Light Therapy;Male;Orthodontic Appliance Design;Orthodontic Brackets;Pain;Single-Blind Method;Time Factors;Tooth;Tooth Movement Techniques;Young Adult

Laser acupuncture-induced analgesic effect and molecular alterations in an incision pain model: a comparison with electroacupuncture-induced effects. Low-level laser acupuncture (LLLA) produces photobiomodulation through acupuncture point and is an alternative to low-level laser therapy. Although the analgesic effect of LLLA on chronic pain has been proven, its effect on acute postincisional pain has yet to be investigated. A plantar incision (PI) model was used to mimic human postsurgical pain. Male adult rats received GaAlAs laser irradiation at the right ST36 acupoint immediately after operation and on the following 4Â days. Three laser treatment groups (two red laser groups with a 30- or 15-min treatment duration and one 30-min near-infrared laser group) were compared with sham LLLA and naive groups and an electroacupuncture (EA) group (separate study). Behavioral withdrawal thresholds of both hind paws were measured before and after incision. Expression of mitogen-activated protein kinases (p-ERK and p-p38), inducible nitric oxide synthase (iNOS), and tumor necrosis factor (TNF) in the spinal cord was analyzed. All three LLLA treatments attenuated post-PI tactile allodynia in the ipsilateral paw, but only the 30-min red laser treatment affected the contralateral paw and had similar efficacy to that of EA. All laser treatments barely reduced heat hyperalgesia in both hind paws. At 3Â days after PI, the 30-min red laser group showed reversed increases of PI-induced p-ERK, p-p38, and iNOS but not TNF expression in the spinal cord. Repetitive LLLA treatments ameliorated PI-induced mechanical pain. The inhibition of multiple sensitization signals highlights the unique clinical role of LLLA. Thus, LLLA is an alternative to EA as an adjuvant for postoperative pain control. Analgesics;Nitric Oxide Synthase Type II;Extracellular Signal-Regulated MAP Kinases;p38 Mitogen-Activated Protein Kinases Acupuncture Points;Analgesics;Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Electroacupuncture;Extracellular Signal-Regulated MAP Kinases;Humans;Hyperalgesia;Laser Therapy;Male;Nitric Oxide Synthase Type II;Pain;Pain Management;Rats, Sprague-Dawley;p38 Mitogen-Activated Protein Kinases

Laser-induced autofluorescence-based objective evaluation of burn tissue repair in mice. Management of burn injuries are a growing concern, especially in determining the progression of healing. Several techniques are being practiced in clinics and have been considered all-time standard approaches to determine pre- and post-treatment outcomes of a healthy healing. However, these

kinds of methods involve repeated biopsies and thereby hindering tissue repair. In view of this, our perspective was to develop a non-invasive tool in an attempt to provide a solution to determine the progression of healing, in vivo. Hence, the present study was designed to investigate the ability of laser-induced fluorescence (LIF) to monitor the variations in collagen intensity at various time points (0, 2, 6, 12, 18, 24, and 30Â days) during burn tissue repair in mice, post low-power laser therapy (LPLT). The spectral findings demonstrated a significant change in collagen intensity as observed on day 24 (pÂ <Â 0.05) and 30 (pÂ <Â 0.01), when treated with LPLT (830Â nm 3Â J/cm(2)) as compared to untreated control. From the observation, it was evident that the LIF could objectively monitor the progression of burn tissue repair in vivo. Collagen Animals;Area Under Curve;Burns;Collagen;Female;Lasers;Male;Mice;Spectrometry, Fluorescence;Wound Healing

Dose-response effect of photobiomodulation therapy on neuromuscular economy during submaximal running. The purpose of this study was to verify the photobiomodulation therapy (PBMT) effects with different doses on neuromuscular economy during submaximal running tests. Eighteen male recreational runners participate in a randomized, double-blind, and placebo-controlled trial, which each participant was submitted to the same testing protocol in five conditions: control, placebo, and PBMT with doses of 15, 30, and 60Â J per site (14 sites in each lower limb). The submaximal running was performed at 8 and 9Â kmÂ h(-1) during 5Â min for each velocity. Muscle activation of the vastus lateralis (VL), vastus medialis (VM), rectus femoris (RF), biceps femoris (BF), and gastrocnemius lateralis (GL) was collected during the last minute of each running test. The root mean square (RMS) was normalized by maximal isometric voluntary contraction (MIVC) performed a priori in an isokinetic dynamometer. The RMS sum of all muscles (RMS(LEG)) was considered as main neuromuscular economy parameter. PBMT with doses of 15, 30, and 60Â J per site [33 diodes = 5 lasers (850Â nm), 12 LEDs (670Â nm), 8 LEDs (880Â nm), and 8 LEDs (950Â nm)] or placebo applications occurred before running tests. For the statistical analysis, the effect size was calculated. Moreover, a qualitative inference was used to determine the magnitude of differences between groups. Peak torque and RMS during MIVCs showed small effect sizes. According to magnitude-based inference, PBMT with dose of 15Â J per site showed possibly and likely beneficial effects on neuromuscular economy during running at 8 and 9Â kmÂ h(-1), respectively. On other hand, PBMT with doses of 30 and 60Â J per site showed possible beneficial effects only during running at 9Â kmÂ h(-1). We concluded that PBMT improve neuromuscular economy and the best PBMT dose was 15Â J per site (total dose of 420Â J). Adult;Dose-Response Relationship, Radiation;Double-Blind Method;Electromyography;Humans;Isometric Contraction;Leg;Low-Level Light Therapy;Male;Muscle, Skeletal;Running;Torque

Beyond the Laboratory, Into the Clinic: What Dogs with Disk Disease Have Taught Us About Photobiomodulation for Spinal Cord Injury. BACKGROUND: For spinal-cord-injured (SCI) patients, integrative medicine approaches such as photomedicine and acupuncture can renew hope and offer previously unrecognized ways to help regain function and improve quality of life. OBJECTIVE: By understanding the mechanisms of action that these two modalities share, practitioners can better target specific attributes of spinal cord pathophysiology that are limiting recovery. Naturally occurring intervertebral disk disease (IVDD) in dogs affords unparalleled translational opportunities to develop treatment strategies involving photobiomodulation and acupuncture. CONCLUSIONS: Insights derived through clinical trials of dogs with IVDD have the potential to raise the standard of care for both human and canine SCI patients. Acupuncture Therapy;Animals;Disease Models, Animal;Dog Diseases;Dogs;Intervertebral Disc Degeneration;Intervertebral Disc Displacement;Low-Level Light Therapy;Rats;Spinal Cord Injuries

Pre-Exercise Infrared Photobiomodulation Therapy (810â€‰nm) in Skeletal Muscle Performance and Postexercise Recovery in Humans: What Is the Optimal Power Output? BACKGROUND:

Photobiomodulation therapy (PBMT) has recently been used to alleviate postexercise muscle fatigue and enhance recovery, demonstrating positive results. A previous study by our research group demonstrated the optimal dose for an infrared wavelength (810â€‰nm), but the outcomes could be optimized further with the determination of the optimal output power. OBJECTIVE: The aim of the present study was to evaluate the effects of PBMT (through low-level laser therapy) on postexercise skeletal muscle recovery and identify the best output power. MATERIALS AND METHODS: A randomized, placebo-controlled double-blind clinical trial was conducted with the participation of 28 high-level soccer players. PBMT was applied before the eccentric contraction protocol with a cluster with five diodes, 810â€‰nm, dose of 10â€‰J, and output power of 100, 200, 400â€‰mW per diode or placebo at six sites of knee extensors. Maximum isometric voluntary contraction (MIVC), delayed onset muscle soreness (DOMS) and biochemical markers related to muscle damage (creatine kinase and lactate dehydrogenase), inflammation (IL-1Î², IL-6, and TNF-Î±), and oxidative stress (catalase, superoxide dismutase, carbonylated proteins, and thiobarbituric acid) were evaluated before isokinetic exercise, as well as at 1â€‰min and at 1, 24, 48, 72, and 96â€‰h, after the eccentric contraction protocol. RESULTS: PBMT increased MIVC and decreased DOMS and levels of biochemical markers (pâ€‰<â€‰0.05) with the power output of 100 and 200â€‰mW, with better results for the power output of 100â€‰mW. CONCLUSIONS: PBMT with 100â€‰mW power output per diode (500â€‰mW total) before exercise achieves best outcomes in enhancing muscular performance and postexercise recovery. Another time it has been demonstrated that more power output is not necessarily better. Biomarkers Adolescent;Adult;Biomarkers;Double-Blind Method;Exercise;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Recovery of Function;Soccer

Photobiomodulation in Neuroscience: A Summary of Personal Experience. OBJECTIVE: This review summarizes personal experience with laser photobiomodulation and its potentials for the treatment of peripheral and central nerve system injuries. METHODS AND RESULTS: Laser photobiomodulation was shown to induce nerve cell activation, have a positive effect on metabolism of the nerve cells, and to stimulate nerve sprouting processes. Studies investigating the effects of laser photobiomodulation on injured peripheral nerves in rats reported immediate protective effects which increase the functional activity of the nerve, decrease or prevent scar tissue formation at the injured site, prevent or decrease degeneration in corresponding motor neurons of the spinal cord, and significantly increase axonal growth and myelinization. A direct application of laser on the spinal cord had a positive impact on the corresponding injured peripheral nerve and promoted recovery. A 780-nm laser phototherapy was applied following peripheral nerve reconstruction using a guiding nerve tube. Results showed myelinated axons crossing through the nerve tube and the continuation of axonal sprouting through the tube toward the distal part of the nerve. In a double-blind, placebo-controlled randomized pilot clinical trial in patients with incomplete stable long-term peripheral nerve injury (PNI), 780-nm laser irradiation progressively improved peripheral nerve function and led to substantial functional recovery. Muscle atrophy represents a major challenge in restorative medicine. Laser phototherapy was shown to increase biochemical activity and improve morphological recovery in muscle and, thus, could have a direct therapeutic application, especially during progressive muscle atrophy resulting from PNI. The effectiveness of composite implants of cultured embryonal nerve cells and the role of laser irradiation on regeneration and repair of the completely transected rat spinal cord were examined. Results suggested that laser photobiomodulation treatment accelerates the axonal growth. CONCLUSIONS: The significance of the performed experimental and clinical studies is in the provision of new laser technology in field of cell therapy and its therapeutic value for peripheral nerve and spinal cord injuries. Additional well-designed clinical studies are needed to evaluate the effectiveness and role of laser photobiomodulation treatment in a

clinical setting. Animals;Humans;Low-Level Light Therapy;Nerve Regeneration;Neurons;Peripheral Nerve Injuries;Peripheral Nerves;Rats;Recovery of Function

Low-level laser therapy prevents endothelial cells from TNF-Î±/cycloheximide-induced apoptosis. Low-level laser therapy (LLLT), widely used in physiotherapy, has been known to enhance wound healing and stimulate cell proliferation, including fibroblast and endothelial cells. Applying LLLT can increase cell proliferation in many kinds of cells including fibroblasts and endothelial cells. However, the protective mechanisms of LLLT on endothelial apoptosis remain unclear. We hypothesized LLLT can protect endothelial cells from inflammation-induced apoptosis. Human endothelial cell line, EA.hy926 cells, and TNF-Î±/cycloheximide (TNF/CHX) were used to explore the protective effects of LLLT (660Â nm) on inflammation-induced endothelial apoptosis. Cell viability, apoptosis, caspase-3/7/8/9 activity, MAPKs signaling, NF-ÎºB activity, and inducible/endothelial nitric oxide synthase (iNOS/eNOS) expression were measured. Our results showed that LLLT increased EA.hy926 cell proliferation, attenuated the TNF/CHX-induced apoptosis, and reduced the TNF/CHX-mediated caspase-3/7/8/9 activation. In addition, LLLT increased ERK MAPK phosphorylation and suppressed the TNF/CHX-increased p38 MAPK, JNK, IKK phosphorylation, NF-ÎºB translocation, and iNOS expression. The caspases-3 cleavage and cell death were not increased in cells treating with ERK inhibitor U0126, which implicated that ERK is not to be responsible for the protective effects of LLLT. After treating with p38 mitogen-activated protein kinase (MAPK) activator, the protection of LLLT in cell apoptosis was no longer existed, showing that LLLT protected the endothelial cells by suppressing p38 MAPK signaling. Our results provide a new insight into the possible molecular mechanisms in which LLLT protects against inflammatory-induced endothelial dysfunction. NF-kappa B;Tumor Necrosis Factor-alpha;Cycloheximide;Nitric Oxide Synthase Type II;Extracellular Signal-Regulated MAP Kinases;p38 Mitogen-Activated Protein Kinases;Caspase 3 Apoptosis;Caspase 3;Cell Line;Cell Proliferation;Cell Survival;Cycloheximide;Endothelial Cells;Enzyme Activation;Extracellular Signal-Regulated MAP Kinases;Humans;Low-Level Light Therapy;MAP Kinase Signaling System;NF-kappa B;Nitric Oxide Synthase Type II;Phosphorylation;Tumor Necrosis Factor-alpha;p38 Mitogen-Activated Protein Kinases

Low-level red LED light inhibits hyperkeratinization and inflammation induced by unsaturated fatty acid in an in vitro model mimicking acne. BACKGROUND AND OBJECTIVE: Acne vulgaris is a chronic inflammatory disease of the pilosebaceous units (PSU), associated with increased sebum production, abnormal follicular keratinization (hyperkeratinization), follicular overgrowth of Propionibacterium acnes (P. acnes), and increased inflammatory mediator release. Light therapy has attracted medical interests as a safe alternative treatment for acne. Both blue and red light therapies at high doses >10â€‰J/cm(2) have demonstrated marked effects on inflammatory acne lesions. However, few studies have investigated the effects of lower doses of light. The aim of this study is to investigate the biological effects of lower doses of red light at 0.2-1.2â€‰J/cm(2) for acne using an in vitro model previously developed to mimic the inflammation and hyperkeratinization observed clinically in acne. MATERIALS AND METHODS: Human epidermal equivalents were topically exposed to an unsaturated fatty acid, oleic acid (OA), followed by red light-emitting diode (LED) light treatments (light-plus-OA treatments). Endpoints evaluated included the proinflammatory cytokine IL-1Î±, epidermal barrier integrity, as measured by transepithelial electrical resistance (TEER), and stratum corneum (SC) thickness to monitor hyperkeratinization. RESULTS: OA-induced IL-1Î± release was significantly (Pâ€‰<â€‰0.05) reduced following red LED light at 0.2, 0.5, and 1.2â€‰J/cm(2) , from 266â€‰Â±â€‰11â€‰pg/ml of no-light-plus-OA-treated (OA treatment without light) controls to 216â€‰Â±â€‰9, 231â€‰Â±â€‰8, and 212â€‰Â±â€‰7â€‰pg/ml, respectively. Histological examination showed that SC thickening following OA treatment was reduced from 43% of total epidermis for no-light-plus-OA treatment to 37% and 38% of total epidermis following 0.5 and

1.1â€‰J/cm(2) red light plus OA treatment, respectively (Pâ€‰<â€‰0.05). Moreover, 1.1â€‰J/cm(2) red-light-plus-OA treatment improved OA-induced TEER changes from 29% of baseline for no-light-plus-OA treatment, to 36% of baseline. CONCLUSION: Low level red LED light therapy could provide beneficial effects of anti-inflammation, normalizing pilosebaceous hyperkeratinization, and improving barrier impairment in Acne vulgaris. Lasers Surg. Med. 50:158-165, 2018. Â© 2017 Wiley Periodicals, Inc. Biomarkers;Oleic Acid;Keratins Acne Vulgaris;Biomarkers;Epidermis;Humans;In Vitro Techniques;Inflammation;Keratins;Oleic Acid;Phototherapy

Low-level laser irradiation promotes proliferation of cryopreserved adipose-derived stem cells. OBJECTIVE: To evaluate the effect of low-level laser irradiation on proliferation and viability of murine adipose-derived stem cells previously submitted to cryopreservation. METHODS: Adipose-derived stem cells were isolated from inguinal fat pads of three mice, submitted to cryopreservation in fetal bovine serum with 10% dimethylsulfoxide for 30 days and then thawed and maintained in normal culture conditions. Culture cells were either irradiated or not (control) with an InGaAIP diode laser at zero and 48 hours, using two different energy densities (0.5 and 1.0J/cm2). Cell proliferation was evaluated by trypan blue exclusion method and MTT assay at intervals of zero, 24, 48, and 72 hours after the first laser application. Cell viability and apoptosis of previously cryopreserved cells submitted to laser therapy were evaluated by flow cytometry. RESULTS: The Irradiated Groups (0.5 and 1.0J/cm2) showed an increased cell proliferation ($p<0.05$) when compared to the Control Group, however no significant difference between the two energy densities was observed. Flow cytometry revealed a percentage of viable cells higher than 99% in all groups. CONCLUSION: Low-level laser irradiation has stimulatory effects on the proliferation of adipose-derived stem cells previously submitted to cryopreservation. Adipocytes;Animals;Apoptosis;Cell Proliferation;Cell Survival;Cells, Cultured;Cryopreservation;Flow Cytometry;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Stem Cells

Photobiomodulation therapy for the improvement of muscular performance and reduction of muscular fatigue associated with exercise in healthy people: a systematic review and meta-analysis. Researches have been performed to investigate the effects of phototherapy on improving performance and reduction of muscular fatigue. However, a great variability in the light parameters and protocols of the trials are a concern to establish the efficacy of this therapy to be used in sports or clinic. The aim of this study is to investigate the effectiveness, moment of application of phototherapy within an exercise protocol, and which are the parameters optimally effective for the improvement of muscular performance and the reduction of muscular fatigue in healthy people. Systematic searches of PubMed, PEDro, Cochrane Library, EMBASE, and Web of Science databases were conducted for randomized clinical trials to March 2017. Analyses of risk of bias and quality of evidence of the included trials were performed, and authors were contacted to obtain any missing or unclear information. We included 39 trials (861 participants). Data were reported descriptively through tables, and 28 trials were included in meta-analysis comparing outcomes to placebo. Meta-analysis was performed for the variables: time until reach exhaustion, number of repetitions, isometric peak torque, and blood lactate levels showing a very low to moderate quality of evidence and some effect in favor to phototherapy. Further investigation is required due the lack of methodological quality, small sample size, great variability of exercise protocols, and phototherapy parameters. In general, positive results were found using both low-level laser therapy and light-emitting diode therapy or combination of both in a wavelength range from 655 to 950Â nm. Most of positive results were observed with an energy dose range from 20 to 60Â J for small muscular groups and 60 to 300Â J for large muscular groups and maximal power output of 200Â mW per diode.

Dose-Response Relationship, Radiation;Exercise;Humans;Low-Level Light Therapy;Muscle Fatigue;Muscles;Publication Bias

Effectiveness of Low-Level Laser Therapy in Reducing Orthodontic Pain: A Systematic Review and Meta-Analysis. OBJECTIVES: To assess the effectiveness of low-level laser therapy (LLLT) in reducing orthodontic pain after the application of orthodontic force (OF). METHODS: A systematic search was conducted in the MEDLINE, EMBASE, Scopus, Cochrane Library, Web of Science, and EBSCOhost databases. The study included randomized clinical trials (RCT) which analysed the effectiveness of LLLT in reducing orthodontic pain assessed at 24 and 72â€‰hrs after the application of OF. The risk of bias of the eligible trials was assessed using the Cochrane Collaboration's risk of bias tool. Standard mean difference was calculated and pooled by meta-analysis using random effect models. RESULTS: Of 467 identified articles, 20 RCT were finally included. In the risk of bias assessments, 13 studies presented a high risk, 5 an unclear risk, and 2 a low risk. The meta-analysis showed that in patients treated with laser versus placebo there was a difference in favour of LLLT in spontaneous pain 24 and 72â€‰hrs after the installation of light archwires and spontaneous pain and chewing pain 24 and 72â€‰hrs after the installation of elastomeric separators. CONCLUSIONS: LLLT proved to be effective in promoting a reduction in spontaneous and chewing pain after the application of OF; however, the poor quality of the evidence requires these results to be treated with caution. Databases, Factual;Humans;Low-Level Light Therapy;Pain;Pain Management;Tooth Diseases

An unusual case report of an early proliferative verrucous leukoplakia. Proliferative verrucous leukoplakia (PVL) is a very rare kind of leukoplakia with great risk of cancerization. The previously reported PVL are mostly elderly patients with a longer progress. We received one rare case of an early PVL patient. The early clinical manifestations, possible pathogenic factors, clinical monitoring and treatment methods were analyzed comprehensively.

Low-level laser therapy with 940Â nm diode laser on stability of dental implants: a randomized controlled clinical trial. Low-level laser therapy (LLLT) is a non-invasive modality to promote osteoblastic activity and tissue healing. The aim of this study was to evaluate the efficacy of LLLT for improvement of dental implant stability. This randomized controlled clinical trial was performed on 80 dental implants placed in 19 patients. Implants were randomly divided into two groups (nÂ =Â 40). Seven sessions of LLLT (940Â nm diode laser) were scheduled for the test group implants during 2Â weeks. Laser was irradiated to the buccal and palatal sides. The same procedure was performed for the control group implants with laser hand piece in "off" mode. Implant stability was measured by Osstell Mentor device in implant stability quotient (ISQ) value immediately after surgery and 10Â days and 3, 6, and 12Â weeks later. Repeated measures ANOVA was used to compare the mean ISQ values (implant stability) in the test and control groups. Statistical test revealed no significant difference in the mean values of implant stability between the test and control groups over time (PÂ =Â 0.557). Although the mean values of implant stability changed significantly in both groups over time (PÂ <Â 0.05). Although the trend of reduction in stability was slower in the laser group in the first weeks and increased from the 6th to 12th week, LLLT had no significant effect on dental implant stability. Dental Implants Adult;Dental Implants;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osseointegration;Time Factors

Treatment of drug-resistant fibromyalgia symptoms using high-intensity laser therapy: a case-based review. Fibromyalgia is a chronic musculoskeletal condition characterized by widespread pain in the body and is associated with tender points at the shoulder, back and hip regions. A wide variety of pharmacologic drugs and dietary supplements have been used with limited success in treating the musculoskeletal pain. Early clinical studies with low level laser therapy (LLLT) alone or in combination with drugs commonly used to treat fibromyalgia suggested that LLLT may be effective in reducing

musculoskeletal pain and stiffness, as well as the number of tender locations. However, a sham-controlled study reported that LLLT was not significantly better than the sham treatment and kinesiotape. Preliminary studies with high-intensity laser therapy (HILT) suggest that it may be more effective than LLLT for treating chronic pain syndromes. Therefore, we evaluated low (1Â W), intermediate (42Â W) and high level (75Â W) HILT in a woman with long-standing fibromyalgia syndrome which was resistant to both standard pharmacotherapy and treatment in an interdisciplinary pain management program. The patient received a series of treatments with a HILT device (Phoenix Thera-lase) at a wavelength of 1275Â nm administered at both the paraspinous region and tender points in the shoulder and hip regions. Although the 1Â W treatment produced minimal symptom relief, both the 42 and the 75Â W treatments produced a dramatic reduction in her overall pain, improved quality of sleep, and increased her level of physical activity for 4-10Â days after these treatment sessions. This case illustrates the potential beneficial effects of using higher power levels of HILT for patients with fibromyalgia syndrome who have failed to respond to conventional interdisciplinary treatment regimens. Analgesics Aged;Analgesics;Drug Resistance;Female;Fibromyalgia;Humans;Laser Therapy;Musculoskeletal Pain;Pain Management;Pain Measurement;Quality of Life;Recovery of Function;Treatment Outcome

Effect of Low-level LASER Therapy on P6 Acupoint to Control Gag Reflex in Children: AÂ Clinical Trial. OBJECTIVE: To investigate the effect of low level laser therapy (LLLT) on PC6 acupuncture point in suppressing gag reflex, regulating pulse rates and oxygen saturation, thereby reducing the anxiety levels. MATERIALS AND METHOD: A total of 40 patients who demonstrated hyperactive gag reflex in the age group of 4-14 years were included in the study. In Group A (20 patients), maxillary impression was recorded. In the second step, PC6 acupuncture point was stimulated with LLLT followed by recording of second maxillary impression. In group B (20 patients), steps were reversed. Gag reflex, anxiety levels, pulse rate and oxygen saturation levels were assessed. RESULTS: Values of pulse rate and oxygen saturation were regulated to normal, signifying lowered anxiety levels. Gag reflex was also significantly decreased after stimulating PC6 acupuncture point with LLLT. CONCLUSION: LLLT on PC6 point was found to be effective in lowering anxiety levels as observed by faces modified anxiety rating scale. Further, it was authenticated as the pulse rates were significantly reduced and oxygen saturation levels were significantly increased. Also, gag reflex was significantly controlled when LASER stimulation was done at PC6. Acupuncture Points;Adolescent;Child;Dental Impression Technique;Female;Gagging;Humans;Low-Level Light Therapy;Male

Effects of Photobiomodulation Therapy on Oxidative Stress in Muscle Injury Animal Models: A Systematic Review. This systematic review was performed to identify the role of photobiomodulation therapy on experimental muscle injury models linked to induce oxidative stress. EMBASE, PubMed, and CINAHL were searched for studies published from January 2006 to January 2016 in the areas of laser and oxidative stress. Any animal model using photobiomodulation therapy to modulate oxidative stress was included in analysis. Eight studies were selected from 68 original articles targeted on laser irradiation and oxidative stress. Articles were critically assessed by two independent raters with a structured tool for rating the research quality. Although the small number of studies limits conclusions, the current literature indicates that photobiomodulation therapy can be an effective short-term approach to reduce oxidative stress markers (e.g., thiobarbituric acid-reactive) and to increase antioxidant substances (e.g., catalase, glutathione peroxidase, and superoxide dismutase). However, there is a nonuniformity in the terminology used to describe the parameters and dose for low-level laser treatment. Animals;Disease Models, Animal;Female;Humans;Low-Level Light Therapy;Male;Mice;Muscular Diseases;Oxidative Stress;Rats;Rats, Wistar

No clinical quantifiable benefits between non-surgical and surgical endodontic treatment. Data sourcesThe authors searched the following electronic databases: the Cochrane Oral Health Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL), Medline Ovid and Embase Ovid. The US National Registry of Clinical Trials (ClinicalTrials.gov) and the World Health Organisation (WHO) International Clinical Trials Registry Platform were searched for ongoing trials. There were no restrictions regarding language and publication date. The authors hand-searched the reference lists of the studies retrieved and key journals in the field of endodontics.Study selectionRandomised controlled trials (RCTs) involving people with periapical pathosis including comparison of surgical versus non-surgical treatment or different types of surgery. Outcome measures were healing of the periapical lesion assessed after one-year follow-up or longer, postoperative pain and discomfort and adverse effects such as tooth loss, mobility, soft tissue recession, abscess, infection, neurological damage or loss of root sealing material evaluated through radiographs.Data extraction and synthesisTwo review authors independently extracted data from the included studies and assessed their risk of bias. Study authors were contacted to obtain missing information. The authors combined results of trials assessing comparable outcomes using the fixed-effect model, with risk ratios (RRs) for dichotomous outcomes and mean differences (MDs) for continuous outcomes, and 95% confidence intervals (CIs) and they used generic inverse variance for split-mouth studies.ResultsThe review included 20 RCTs. Two trials at high risk of bias assessed surgery versus a non-surgical approach: root-end resection with root-end filling versus root canal retreatment. The other 18 trials evaluated different surgical protocols.There was no clear evidence of superiority in the surgical or non-surgical approach for healing at one-year follow-up (RR 1.15, 95% CI 0.97 to 1.35; two RCTs, 126 participants) or at four- or ten-year follow-up (one RCT, 82 to 95 participants), although the evidence is very low quality. More participants in the surgically treated group reported pain in the first week after treatment (RR 3.34, 95% CI 2.05 to 5.43; one RCT, 87 participants; low quality evidence).In terms of surgical protocols, there was some inconclusive evidence that ultrasonic devices for root-end preparation may improve healing one year after retreatment, when compared with the traditional bur (RR 1.14, 95%CI 1.00 to 1.30; one RCT, 290 participants; low quality evidence). There was evidence of better healing when root-ends were filled with MTA than when they were treated by smoothing of orthograde GP root filling, after one-year follow-up (RR 1.60, 95% CI 1.14 to 2.24; one RCT, 46 participants; low quality evidence).There was no evidence that using CBCT rather than radiography for preoperative evaluation was advantageous for healing (RR 1.02, 95% CI 0.70 to 1.47; one RCT, 39 participants; very low quality evidence), nor that any magnification device affected healing more than any other (loupes versus endoscope at one year: RR 1.05, 95% CI 0.92 to 1.20; microscope versus endoscope at two years: RR 1.01, 95% CI 0.89 to 1.15; one RCT, 70 participants, low quality evidence). There was no evidence that antibiotic prophylaxis reduced incidence of postoperative infection (RR 0.49, 95% CI 0.09 to 2.64; one RCT, 250 participants; low quality evidence).There was some evidence that using a papilla base incision (PBI) may be beneficial for preservation of the interdental papilla compared with complete papilla mobilisation (one RCT (split-mouth), 12 participants/24 sites; very low quality evidence). There was no evidence of less pain in the PBI group at day one post surgery (one RCT, 38 participants; very low quality evidence).There was evidence that adjunctive use of a gel of plasma rich in growth factors reduced postoperative pain compared with no grafting (measured on visual analogue scale: one day postoperative MD -51.60 mm, 95% CI -63.43 to -39.77; one RCT, 36 participants; low quality evidence). There was no evidence that use of low energy level laser therapy (LLLT) prevented postoperative pain (very low quality evidence).ConclusionsAvailable evidence does not provide clinicians with reliable guidelines for treating periapical lesions. Further research is necessary to understand the effects of surgical versus non-surgical approaches, as well as to determine which surgical procedures provide the best results for periapical lesion healing and postoperative quality of life. Future studies should use standardised

techniques and success criteria, with precisely-defined outcomes and the participant as the unit of analysis. Dental Care;Humans;Quality of Life;Retreatment;Root Canal Therapy

The Effect of Low-Level Laser Therapy on Bone Healing After Rapid Maxillary Expansion: A Systematic Review. OBJECTIVE: The study aimed to systematically appraise the evidence on the effects of low level laser therapy (LLLT) on bone healing following rapid maxillary expansion (RME). METHODS: Electronic search was performed in MEDLINE, Scopus, and Embase databases using appropriate Medical Subject Heading terms, with no time restriction. ClinicalTrials.gov (www.clinicaltrials.gov) was also searched using the terms "low level laser therapy" and "maxillary expansion." SELECTION CRITERIA: Original research articles on human clinical trials that involved both RME and LLLT were included. Animal studies were also assessed on an exploratory basis. RESULTS: The search strategy resulted in 12 publications (4 randomized controlled trials, 8 animal studies). In human studies, bone density was assessed radiographically (either two-dimensional or three-dimensional imaging). Regardless of the discrepancies in the intervention protocols, the total of the trials revealed that LLLT had stimulatory effects on bone regeneration after RME. The studies in animal models measured the formation and maturation of new bone qualitatively or quantitatively. CONCLUSIONS: Despite the limited evidence, LLLT seems to be a promising intervention for stimulating immediate bone regeneration and healing after midpalatal suture expansion. Long-term, randomized clinical trials are needed to formulate safe results and establish a reliable clinical protocol, rendering the method clinically applicable. Adolescent;Bone Regeneration;Child;Controlled Clinical Trials as Topic;Female;Humans;Low-Level Light Therapy;Male;Palatal Expansion Technique;Prognosis;Randomized Controlled Trials as Topic;Treatment Outcome

Laser Assisted Treatment of Extra Oral Cutaneous Sinus Tract of Endodontic Origin: A Case Report. Introduction: Sinus tract (or fistula) is a common manifestation of pulpal necrosis with periapical pathosis that requires conventional or rarely surgical- endodontic treatment in order to heal. It is mainly identified intraorally and in rare cases manifestation is extra orally, which may frequently be misdiagnosed with cutaneous lesion and incorrectly treated. New technologies such as lasers have been developed as adjuncts to standard endodontic antimicrobial procedures in order to increase the success rate of endodontic therapy while complying with the desire of saving a natural tooth. Case Presentation: Herein, we present a clinical case of extra oral sinus tract with periodic pus drainage that was successfully treated by combining conventional endodontic therapy, intra canal photodynamic therapy (PDT), extra oral low level laser therapy (LLLT) and laser treatment for extra oral fistula. Conclusion: Treatment of the odontogenic lesion among with the extra oral lesion was an ingenious and successful technique which was achieved via laser technology and winded up to patient's consent and satisfactory results.

Alterations in Auditory Electrophysiological Responses Associated With Temporary Suppression of Tinnitus Induced by Low-Level Laser Therapy: A Before-After Case Series. Introduction: Tinnitus is the phantom auditory perception of sound in the absence of an external or internal acoustic stimulus. The treatment is difficult due to multiple etiologies and great psychological influence. The purpose of this study was to determine alterations in auditory physiological and electrophysiological responses associated with temporary suppression of tinnitus induced by low-level laser (LLL) irradiation. Methods: This study was conducted on 20 subjects with subjective tinnitus. All subjects signed the informed consent form and satisfied all the study eligibility criteria. Visual analog scale (VAS) for loudness, loudness matching of tinnitus (LMT), pitch matching of tinnitus (PMT), Persian-tinnitus questionnaire (P-TQ) and Persian-tinnitus handicap inventory (P-THI) were conducted pre- and post-low level laser therapy (LLLT) for all the subjects. Electrocochleography (ECochG) and distortion product otoacoustic emissions (DPOAEs) were recorded in 11 subjects. Continuous wave diode lasers, including red (630 nm) and infra-red (808 nm) were applied, and were both designed by

the Canadian Optic and Laser (COL) Center. Twelve sessions of laser therapy were performed, 2 sessions per week for each subject. Total dose was 120 Joule/ ear/session. Results: LLL irradiation could cause a significant decrease in subjective tests scores consisting of VAS for loudness, PMT, P-TQ, P-THI, but did not result in a significant improvement of objective evaluating parameters except for compound action potential (CAP) amplitude. Conclusion: LLLT might be a subjectively effective treatment for short-term improvement of tinnitus. Defining a new protocol for optimizing LLLT parameters may be an option to improve parameters of objective tests.

Stimulation Effect of Low Level Laser Therapy on Sciatic Nerve Regeneration in Rat. Introduction: Recent studies showed that low-level laser therapy (LLLT) accelerates the regeneration process of injured peripheral nerve tissue. The objective of this study was investigate the effect of LLLT (780 nm) on regeneration of injured right sciatic nerve of male Wistar rat. Methods: In this research work, the effect of LLLT (780 nm) on the regeneration process and reconstruction of injured peripheral right side sciatic nerve was investigated. Twelve adult male Wistar rats underwent surgery in aseptic conditions under general anesthesia to induce a lesion to their right side sciatic nerve according to standard protocol. Before suturing the location, only the experimental group was treated by laser. The damaged nerve was directly irradiated with (2 J, 100 mW, 40 seconds). The irradiation procedure was terminated in 21 days with little improvement (4 J, 200 mW, 40 seconds) across the skin surface of experimental group. Rats were selected randomly from each group to be sacrificed on different periods and histopathological examination was carried out on the extracted nerves. Results: Significant acceleration of revascularization and angiogenesis of the injury site was observed in the experimental group. Furthermore, a reduction of hemorrhages and increase in blood supply was observed. Also, Wallerian degeneration decreased while higher axonal density compared to the control rats was observed. Moreover, the cross-section analysis of the injured area on the 14th and 21st days as post-surgery showed that the nerve sheath diameter in the lesion area of the experimental group was reduced. While the ratio between thicknesses increased in the control group. Conclusion: The results of the current study suggest that laser phototherapy at 780 nm exactly could accelerate the regeneration process of injured peripheral nerves tissue.

Comparative effectiveness of Low Level Laser therapy and Transcutaneous Electric Nerve Stimulation on Temporomandibular Joint Disorders. Introduction: Temporomandibular joint disorders (TMDs) are the most common source of pain on the face. There are multiple etiologies, and several types of treatment have been reported. The use of non-invasive and reversible therapies in the treatment of such problems is recommended. The present study evaluated the effect of low-level laser (LLL) therapy and transcutaneous electric nerve stimulation (TENS) on TMDs. Methods: In this single-blind study, 40 patients with temporomandibular disorders were randomly divided into four groups: TENS (TENSTem dental), LLL (diode 810 nm CW), shamTENS, and sham-LLL. All subjects were examined and data on pain and tenderness in the temporomandibular joint (TMJ) and masticatory muscles (using the visual analogue scale) and mouth-opening (distance between incisal edges before feeling pain; mm) were collected before baseline (T1), after each session (T2-T5) and one month after the end of the sessions (T6)), and analyzed using repeated measure analysis of variance (ANOVA) and Bonferroni statistical tests. A P value < 0.05 was considered significant. Results: The decrease in pain ($P=0.000$), tenderness ($P=0.000$) and increase in mouth-opening ability ($P=0.002$) was greater in the TENS and LLL groups than in the placebo groups. At the one-month follow-up, significant decrease in pain and tenderness was recorded in the TENS and LLL groups ($P=0.000$). There was no significant differences between TENS and LLL and the placebo groups for maximum mouth-opening at the end of the study ($P=0.692$). Conclusion: Using TENS or LLL therapy can improve TMD symptoms at least for the short term. Although the effects of the placebo played a role in improving symptoms, their effects were less important.

The Effect of Combination of Red, Infrared and Blue Wavelengths of Low-Level Laser on Reduction of Abdominal Girth: A Before-After Case Series. Introduction: The objective of this study was to assess the efficacy of a combination of 3 wavelengths (including red, infra-red, and blue) of low-level laser (LLL) as a non-invasive therapeutic method to reduce abdominal girth. To achieve biochemical activity on adipocytes, a red laser was used in our selective laser combination. Near-infrared laser was used to increase depth of penetration. Nitrosyl complexes of hemoglobin (NO-Hb) are sensitive to blue light, thereby leading to increase in release of biologically active nitric oxide (NO), which can affect tissue perfusion. Thus, a blue LED was added to the laser combination. Methods: Eighteen females participated in the study. Twelve sessions of laser therapy were performed, 2 sessions per week for each subject. Continuous wave diode lasers, including red (630 nm), infra-red (808 nm), and a blue LED (450 nm) were applied and were all designed by the Canadian Optic and Laser Center. Results: Statistical analyses revealed that upper abdomen size significantly decreased from pre- (91.86 Â± 11.16) to post- (87.41 Â± 10.52) low-level laser therapy (LLLT) ($P<0.001$). Middle abdomen size showed significant reduction from pre- (97.02 Â± 8.82) to post- (91.97 Â± 8.49) LLLT ($P<0.001$). Lower abdomen size significantly decreased from pre- (100.36 Â± 9.45) to post- (95.80 Â± 8.52) LLLT ($P<0.001$). Conclusion: Based on this case series pilot investigation, the combination of 3 different wavelengths of LLL was effective for abdominal girth reduction in 100% of our subjects ($P<0.001$), without any side effects. Future studies will assess the long-term benefits of this laser combination for reduction of subcutaneous fat deposits.

Safety and Effectiveness of Low-Level Laser Therapy in Patients With Knee Osteoarthritis: A Systematic Review and Meta-analysis. Introduction: Low-level laser therapy (LLLT) was introduced as an alternative non-invasive treatment for osteoarthritis, but its effectiveness is still controversial. The main objective of this article was to determine the safety and efficacy of LLLT in patients with knee osteoarthritis (KOA). Methods: In order to gather evidence, main medical databases as well as relevant websites were browsed without time limit. We searched with appropriate keywords and strategies. After quality assessment of studies, study data were extracted by two reviewers. Standard mean difference proposed through inverse variance was used in the meta-analysis using the random-effects model. Twelve values were used for the evaluation of heterogeneity. Results: A total of 823 studies, 14 randomized controlled trials (RCTs) were selected after final review. There was a significant difference between LLLT and placebo in pain at rest ($P=0.02$), pain at activity ($P=0.01$), total pain ($P=0.03$), WOMAC function ($P=0.01$), WOMAC stiffness ($P=0.02$) and WOMAC total ($P<0.0001$) in favor of the LLLT. There was no significant difference between LLLT and Placebo in WOMAC pain ($P=0.09$) and range of motion ($P=0.1$). Conclusion: In spite of some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected with important factors: wavelength, energy density, treatment duration, numbers of sessions the treatment, severity of KOA and site of application.

Successful Use of Lower-Level Laser Therapy in the Treatment of Medication-Related Osteonecrosis of the Jaw. Case Presentation: This study aimed to report a case of medication related osteonecrosis of the jaw (MRONJ) of a 65-year-old female patient referred to the Oral and Maxillofacial Surgery team from AraÃ§atuba Dental School, complaining about mobility of a previously dental implant placed on the posterior maxillary region. Clinical examination revealed an extensive necrosis area around the implant region. The patient reported bisphosphonate therapy with sodium alendronate for prevention of osteoporosis 5 years ago. A diagnosis of MRONJ was reached and the treatment decided was to remove the dental implant damaged and use the lower-level laser therapy (LLLT) associated with antibiotic therapy with clindamycin 300 mg and mouth rinses with chlorhexidine 0.12%. Conclusion: Six months after the treatment with LLLT a complete healing of the affected area was observed and 12 months after treatment the patient was

rehabilitated with fixed dental prosthesis and showed excellent tissue healing of the necrosis areas. It was concluded that the use of LLLT showed to be a good option in the treatment of MRONJ.

The Effect of Low Level Laser Therapy on Pemphigus Vulgaris Lesions: A Pilot Study. Introduction: Pemphigus vulgaris is a chronic blistering skin disease. Management of recalcitrant pemphigus ulcers is a great problem. Low Level Laser Therapy (LLLT) is known to supply direct biostimulative light energy to body cells. This study evaluates the efficacy of low power laser in the healing of pemphigus lesions. Methods: Ten patients with pemphigus vulgaris were enrolled in the trial. The LED-LLLT system used was the Thor LED clusters (109, 69 or 19 diode) (England) with 660 nm wavelength in continuous wave (CW) and 30 mW energy. Both sides of the patients' lesion were photographed prior to the study and in each laser therapy session. Results: The pattern of changes in qualitative wound score (QWS) patterns differed significantly over time between the two therapies (treatment Ã— time interactions, P<0.0001). When compared to the routine therapy, the laser therapy showed more decrease in mean QWS in all sessions in comparison with baseline. Conclusion: Application of low level laser simultaneously with conventional therapy could result in sensational healing of ulcers especially in patients who do not respond to conventional treatment or suffering from recalcitrant lesions.

Effects of photobiomodulation therapy in patients with chronic non-specific low back pain: protocol for a randomised placebo-controlled trial. INTRODUCTION: Low back pain (LBP) is one of the largest and most frequent public health problems worldwide. Photobiomodulation therapy (PBMT) is a frequently used non-pharmacological therapy for the treatment of musculoskeletal disorders. However, there is little high-quality scientific evidence that demonstrates the effectiveness of PBMT in the treatment of patients with chronic LBP in the short, medium and long term. Therefore, the objective of this clinical trial is to evaluate the effects of PBMT in patients with chronic non-specific LBP in the short, medium and long term. METHODS AND ANALYSES: This is a prospectively registered, two-arm randomised placebo-controlled trial with blinded patients, assessors and treatment providers. One hundred and forty-eight patients with chronic non-specific LBP will be recruited. Treatment sessions will be provided three times a week for 4 weeks (totaling 12 sessions) with patients receiving either placebo or active PBMT. For ethical reasons, all patients, regardless of treatment allocation, will also receive an information booklet based on 'The Back Book'. Clinical outcomes will be measured at baseline, at the end of treatment, as well as 3, 6 and 12 months after randomisation. The primary outcomes will be pain intensity and disability measured after 12 sessions of treatment. The secondary outcomes will be pain intensity and disability measured at 3, 6 and 12 months after randomisation, in addition to specific disability and global perceived effect in all time points. ETHICS AND DISSEMINATION: The study was approved by the Research Ethics Committee of Universidade Cidade de SÃ£o Paulo. The results will be disseminated through scientific publications and presentations at national and international scientific meetings. TRIAL REGISTRATION NUMBER: NCT03089424. Brazil;Chronic Pain;Humans;Low Back Pain;Low-Level Light Therapy;Pain Measurement;Prospective Studies;Research Design;Treatment Outcome

Long-Term Effect of Pulsed Nd-YAG Laser Combined with Exercise on Bone Mineral Density in Men with Osteopenia or Osteoporosis: 1 Year of Follow-Up. BACKGROUND: A pulsed Nd-YAG laser is an effective physiotherapy modality used as a class IV high-intensity laser therapy (HILT). OBJECTIVE: The aim of this study is to investigate the efficacy of HILT alone or combined with exercise (HILT+EX) on bone mineral density (BMD) after 24 weeks and at 1 year of follow-up in men with osteopenia or osteoporosis. METHODS: One hundred men with osteopenia or osteoporosis (mean age, 53.78 [2.89] years; weight, 80.56 [7.33] kg; height 175 [5.30] cm) participated in the study. The T-scores were â‰¤-1.5. Patients were randomly assigned to four groups: HILT+EX (group I), placebo laser plus exercise (PL+EX; group II), HILT alone (HILT; group III), and PL (group IV). HILT was applied to the lower

back and hip regions. Aerobic, weight-bearing, flexibility, strengthening, and balance exercises were performed three times per week for 24 weeks. The measured outcomes were BMD of the L(2)-L(4) spine and total hip. Measurements were taken before and after 24 weeks and at 1 year of follow-up. RESULTS: Lumbar and total hip BMD significantly increased post-treatment in the HILT+EX and PL+EX groups, but insignificantly in the HILT and PL groups. HILT+EX showed a significantly greater effect than PL+EX did on lumbar BMD, with no significant difference in total hip BMD, after 24 weeks and at follow-up. CONCLUSIONS: Although HILT alone did not effectively increase lumbar and total hip BMD, HILT combined with exercise was more effective than exercise alone at increasing lumbar BMD after 24 weeks of treatment, with effects lasting up to 1 year. Aged;Analysis of Variance;Bone Density;Bone Diseases, Metabolic;Combined Modality Therapy;Exercise Therapy;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Osteoporosis;Time;Treatment Outcome

Study on mechanism of release oxygen by photo-excited hemoglobin in low-level laser therapy. According to the calculated results on the charge distribution of oxygenated heme and deoxygenated heme, and based on the theory of electron excitations in photo-acceptor molecules and the absorption spectra of hemoglobin, it is found that low-level laser within the waveband of about 800-1060Â nm can promote the release of oxygen from oxyhemoglobin and improve the oxygen supply of capillaries to surrounding tissues. Furthermore, the reasons have been explained that why the low-level laser at a wavelength of 830Â nm is better in the treatment on burn injury and stimulation of hair growth. We also explained why the near-infrared laser of 1064Â nm is applied to the forehead to improve cerebral oxygenation in healthy humans. Finally, according to comparison of atomic charge distribution in heme before and after bound to small molecule of carbon monoxide or nitric oxide, it could be inferred that the low-level laser with an appropriate wavelength can promote the carbon monoxide hemoglobin and nitric oxide hemoglobin to dissociate the carbon monoxide molecules and the nitric oxide molecules. This may be used for adjuvant therapy of carbon monoxide poisoning or nitric oxide poisoning. Glycated Hemoglobin A;Hemoglobins;Oxyhemoglobins;hemoglobin A, glycosylated-nitric oxide complex;Nitric Oxide;Heme;Oxygen Carbon Monoxide Poisoning;Glycated Hemoglobin;Heme;Hemoglobins;Humans;Light;Low-Level Light Therapy;Nitric Oxide;Oxygen;Oxyhemoglobins;Spectrum Analysis

A clinical review of phototherapy for psoriasis. Psoriasis is an autoimmune inflammatory skin disease. In the past several decades, phototherapy has been widely used to treat stable psoriatic lesions, including trunk, scalp, arms and legs, and partial nail psoriasis. A variety of light/lasers with different mechanisms of action have been developed for psoriasis including ultraviolet B (UVB), psoralen ultraviolet A (PUVA), pulsed dye laser (PDL), photodynamic therapy (PDT), intense pulsed light (IPL), light-emitting diodes (LED), and so on. Because light/laser each has specific therapeutic and adverse effects, it is important to adequately choose the sources and parameters in management of psoriasis with different pathogenic sites, severities, and duration of the disorder. This review aims at providing most updated clinic information to physicians about how to select light/laser sources and individual therapeutic regimens. To date, UV light is primarily for stable plaque psoriasis and PDL for topical psoriatic lesions with small area, both of which are safe and effective. On the other hand, PUVA has better curative effects than UVB for managing refractory psoriasis plaques, if its side effects can be better controlled. PDL provides optimal outcomes on nail psoriasis compared with other lasers. Although the trails of low-level light/laser therapy (LLLT) are still small, the near infrared (NIR) and visible red light with low energy show promise for treating psoriasis due to its strong penetration and encouraging photobiomodulation. IPL is rarely reported for psoriasis treatment, but PDT-IPL has been found to offer a moderate effect on nail psoriasis. In brief, various phototherapies have been used either in different combinations or as monotherapy. The modality has become a mainstay in the

treatment of mild-to-moderate psoriasis without systemic adverse events in today's clinical practice. Humans;Low-Level Light Therapy;Nail Diseases;Phototherapy;Psoriasis;Risk Factors;Ultraviolet Therapy

Smartphone-Driven Low-Power Light-Emitting Device. Low-level light (laser) therapy (LLLT) has been widely researched in the recent past. Existing LLLT studies were performed based on laser. Recently, studies using LED have increased. This study presents a smartphone-driven low-power light-emitting device for use in colour therapy as an alternative medicine. The device consists of a control unit and a colour probe. The device is powered by and communicates with a smartphone using USB On-The-Go (OTG) technology. The control unit controls emitting time and intensity of illumination with the configuration value of a smartphone application. Intensity is controlled by pulse width modulation (PWM) without feedback. A calibration is performed to resolve a drawback of no feedback. To calibrate, intensity is measured in every 10 percent PWM output. PWM value is linearly calibrated to obtain accurate intensity. The device can control the intensity of illumination, and so, it can find application in varied scenarios. Equipment Design;Humans;Inflammation;Low-Level Light Therapy;Smartphone

Hair Transplantation Controversies. BACKGROUND: Hair transplant surgery creates consistently natural appearing transplanted hair for men. It is increasingly popular procedure to restore natural growing hair for men with hair loss. OBJECTIVE: To review some current controversies in hair transplant surgery. MATERIALS AND METHODS: Review of the English PubMed literature and specialty literature in hair transplant surgery. RESULTS: Some of the controversies in hair transplant surgery include appropriate donor harvesting technique including elliptical donor harvesting versus follicular unit extraction whether manual versus robotic, the role of platelet-rich plasma and low-level light surgery in hair transplant surgery. CONCLUSION: Hair transplant surgery creates consistently natural appearing hair. As with all techniques, there are controversies regarding the optimal method for performing the procedure. Some of the current controversies in hair transplant surgery include optimal donor harvesting techniques, elliptical donor harvesting versus follicular unit extraction, the role of low-level light therapy and the platelet-rich plasma therapy in the procedure. Future studies will further clarify their role in the procedure. Alopecia;Cosmetic Techniques;Hair Follicle;Humans;Laser Therapy;Male;Platelet-Rich Plasma;Tissue and Organ Harvesting

Effects of photobiomodulation on experimental models of peripheral nerve injury. Phototherapy has demonstrated positive effects in the treatment of peripheral nerve injury, but there is a need to investigate the dosimetric parameters. Thus, the aim of the present study was to conduct a literature review on the effects of photobiomodulation with the use of low-level laser therapy (LLLT) on the treatment of peripheral nerve injury in experimental models. The databases of PubMed/MEDLINE, SCOPUS, and SPIE Digital Library were searched for articles on the use of LLLT in experimental models of peripheral nerve injury published in English between January 2007 and March 2016. The laser parameter variability was wavelength (632.8 to 980Â nm), power (10 to 190Â mW), and total energy (0.15 to 90Â J) in pulsed or continuous wave and single or multiple points. Eighteen original articles demonstrating the effects of LLLT on the acceleration of functional recovery, morphological aspects as well as the modulation of the expression inflammatory cytokines, and growth factors were selected. LLLT is a viable phototherapeutic modality for the treatment of peripheral nerve injury, demonstrating positive effects on the neuromuscular repair process using either red or infrared light. The majority of studies used a power of up to 50Â mW and total energy of up to 15Â J administered to multiple points. The determination of these parameters is important to the standardization of a LLLT protocol to enhance the regeneration process following a peripheral nerve injury. Animals;Disease Models, Animal;Low-Level Light Therapy;Nerve Regeneration;Peripheral Nerve Injuries;Recovery of Function

Effect of laser diode light irradiation on growth capability of human hair follicle dermal papilla cells. Low level laser therapy is widely used to relieve pain and inflammation, and to restore cellular functions. The photons of light are absorbed by mitochondria in cells, leading to an increase in the production of adenosine triphosphate (ATP), nitric oxide release, blood flow, and reactive oxygen species (ROS). This study proposed the use of a laser diode array at 808 nm to stimulate the proliferation and to activate the functions of dermal papilla cells, which were an important part of the hair growth cycle. These cells were isolated from human hair follicles and were exposed to 808 nm light at various doses from 0.5, 1, 2.5, 4, and 6 J/cm(2). The rate of cell proliferation and the gene expression profile of dermal papilla cells were investigated and compared with the control in which the cells did not received any light treatment. The growth curves of the dermal papilla cells were used to determine the specific growth rates. Higher specific growth rates were observed in the cells exposed to laser at doses higher than 0.5 J/cm(2). The effect of the laser light treatment on several gene markers, specifically for dermal papilla cells, was evaluated using real-time polymerase chain reaction (qPCR). Our result shows that collagen type 1 (Col1), alkaline phosphatase (Alp), and versican (Vcan) did not increase when the cells were irradiated by the laser light. Interestingly, sex determining region y-box 2 (Sox2) gene was up-regulated when 0.5 J/cm(2), and 1 J/cm(2) light was used, while an increase in the level of fibroblast growth factor 7 (Fgf7) gene was observed with light irradiation at 0.5 J/cm(2), 1 J/cm(2), 2.5 J/cm(2), and 4 J/cm(2). Too high irradiation dose was shown to yield no effect on the gene expression of dermal papilla cells. Reactive Oxygen Species Cell Proliferation;Cells, Cultured;Dermis;Hair;Hair Follicle;Humans;Low-Level Light Therapy;Reactive Oxygen Species

Photobiomodulation therapy promotes neurogenesis by improving post-stroke local microenvironment and stimulating neuroprogenitor cells. Recent work has indicated that photobiomodulation (PBM) may beneficially alter the pathological status of several neurological disorders, although the mechanism currently remains unclear. The current study was designed to investigate the beneficial effect of PBM on behavioral deficits and neurogenesis in a photothrombotic (PT) model of ischemic stroke in rats. From day 1 to day 7 after the establishment of PT model, 2-minute daily PBM (CW, 808nm, 350mW/cm(2), total 294J at scalp level) was applied on the infarct injury area (1.8mm anterior to the bregma and 2.5mm lateral from the midline). Rats received intraperitoneal injections of 5-bromodeoxyuridine (BrdU) twice daily (50mg/kg) from day 2 to 8 post-stoke, and samples were collected at day 14. We demonstrated that PBM significantly attenuated behavioral deficits and infarct volume induced by PT stroke. Further investigation displayed that PBM remarkably enhanced neurogenesis and synaptogenesis, as evidenced by immunostaining of BrdU, Ki67, DCX, MAP2, spinophilin, and synaptophysin. Mechanistic studies suggested beneficial effects of PBM were accompanied by robust suppression of reactive gliosis and the production of pro-inflammatory cytokines. On the contrary, the release of anti-inflammatory cytokines, cytochrome c oxidase activity and ATP production in peri-infarct regions were elevated following PBM treatment. Intriguingly, PBM could effectively switch an M1 microglial phenotype to an anti-inflammatory M2 phenotype. Our novel findings indicated that PBM is capable of promoting neurogenesis after ischemic stroke. The underlying mechanisms may rely on: 1) promotion of proliferation and differentiation of internal neuroprogenitor cells in the peri-infarct zone; 2) improvement of the neuronal microenvironment by altering inflammatory status and promoting mitochondrial function. These findings provide strong support for the promising therapeutic effect of PBM on neuronal repair following ischemic stroke. Cytokines;Dcx protein, rat;Doublecortin Protein;Electron Transport Complex IV Animals;Behavior, Animal;Brain Ischemia;Cell Differentiation;Cell Proliferation;Cellular Microenvironment;Cerebral Infarction;Cytokines;Doublecortin Protein;Electron

Transport Complex IV;Low-Level Light Therapy;Male;Microglia;Mitochondria;Neural Stem Cells;Neurogenesis;Rats;Rats, Sprague-Dawley;Stroke;Synapses

Low-level laser therapy for treatment of neurosensory disorders after orthognathic surgery: A systematic review of randomized clinical trials. BACKGROUND: Low-level laser has been widely used in Dentistry and many studies have focused on its application in oral surgeries. This study was conducted with the aim of searching for scientific evidence concerning the effectiveness of laser to reduce pain or paresthesia related to orthognathic surgery. MATERIAL AND METHODS: An electronic search was performed in PubMed, Scopus, Science Direct, LILACS, SciELO, CENTRAL, Google Scholar, OpenGrey, and ClinicalTrials.gov, up to November 2016, with no restrictions on language or year of publication. Additionally, a hand search of the reference list of the selected studies was carried out. The PICOS strategy was used to define the eligibility criteria and only randomized clinical trials were selected. RESULTS: Out of 1,257 identified citations, three papers fulfilled the criteria and were included in the systematic review. The risk of bias was assessed according to the Cochrane Guidelines for Clinical Trials and results were exposed based on a descriptive analysis. One study showed that laser therapy was effective to reduce postoperative pain 24 hours (P=0.007) and 72 hours (P=0.007) after surgery. Other study revealed the positive effect of laser to improve neurosensory recovery 60 days after surgery, evaluated also by the two-point discrimination (P=0.005) and sensory (P=0.008) tests. The third study reported an improvement for general sensibility of 68.75% for laser group, compared with 21.43% for placebo (P=0.0095), six months after surgery. CONCLUSIONS: Individual studies suggested a positive effect of low-level laser therapy on reduction of postoperative pain and acceleration of improvement of paresthesia related to orthognathic surgery. However, due to the insufficient number and heterogeneity of studies, a meta-analysis evaluating the outcomes of interest was not performed, and a pragmatic recommendation about the use of laser therapy is not possible. This systematic review was conducted according to the statements of PRISMA and was registered at PROSPERO under the number CRD42016043258. Humans;Low-Level Light Therapy;Orthognathic Surgical Procedures;Pain, Postoperative;Paresthesia;Postoperative Complications;Randomized Controlled Trials as Topic

Fat Graft Survival After Recipient Site Pretreatment With Fractional Carbon Dioxide Laser. BACKGROUND: Fat grafting is a commonly performed procedure not only for augmenting the soft tissue but also for regeneration in esthetic and reconstructive plastic surgery.However, unpredictable fat survival rate because of high resorption rate is remained as the main problem. The purpose of this study was to investigate the effect of pretreatment of the recipient site to the fat survival using fractional carbon dioxide (CO_2) laser. METHODS: The rats were divided to 2 groups. Inguinal fat pads of rats were transplanted to the dorsum without pretreatment in the control group. The study group was preconditioned by fractional CO_2 laser to the recipient site 1 week before fat graft.The pulse energy was set to 100 mJ. Transplanted fat tissues were harvested at postoperative days 1, 3, 7, 14, and 28 and were analyzed morphologically, histologically, and immunohistochemically. RESULTS: Weight and volume in the control group was more decreased than in the study group at postoperative day 28. Histological evaluation showed less inflammation, less fibrosis, less vacuolization, and better integrity of adipocytes. Immunohistologically, microvessel density in the study group was higher than in the control group ($P < 0.05$) at postoperative day 1. Survival rate in the study group was higher than in the control group at postoperative days 1, 3, 7, and 14 ($P < 0.05$). CONCLUSIONS: Pretreatment of recipient site using fractional CO_2 laser helped vascularization in the early stage in fat graft and solved the ischemic condition, so it improved fat survival rate. Adipose Tissue;Animals;Disease Models, Animal;Graft Rejection;Graft Survival;Lasers, Gas;Low-Level Light Therapy;Male;Preoperative Care;Random Allocation;Rats;Rats, Sprague-Dawley;Plastic Surgery Procedures;Reference Values;Statistics, Nonparametric;Tissue Transplantation;Wound Healing

Effect of Laser Etching on Glass Fiber Posts Cemented with Different Adhesive Systems. BACKGROUND: Glass fiber-reinforced posts have been preferred frequently because of some physical properties similar to the dentin, chemically bonding to dentin, biocompatibility, and esthetics. OBJECTIVE: This study aimed to evaluate the microleakage and bond strength of glass fiber posts cemented with various adhesive systems on laser-etched root canal walls. METHODS: Roots of 120 human mandibular premolars were divided into two groups for push-out bond strength test and the microleakage test (nâ€‰=â€‰60). Erbium-doped yttrium-aluminum-garnet (Er:YAG) laser etching of the root canal walls was carried out on half of the specimens in both test groups. The laser-treated and laser-nontreated groups were divided again into three subgroups (nâ€‰=â€‰10). Glass fiber posts (everStick Post) were luted using three different resin cements: total-etch (Variolink N), self-etch (Panavia F 2.0), and self-adhesive (Rely X Unicem). Three dentin discs were obtained from each root, and the bond strength of the glass fiber posts was measured by push-out tests. The dye penetration method was used to investigate coronal microleakage. In addition, surface treatments and the bonding interfaces were observed using scanning electron microscope. RESULTS: The highest bond strengths were observed for the total-etch and self-adhesive resin cement groups with laser etching (pâ€‰<â€‰0.05), and the lowest bond strength was obtained for the self-etch resin cement group (pâ€‰<â€‰0.05). There were no statistically significant differences in terms of microleakage (pâ€‰>â€‰0.05), except for the self-adhesive resin cement group (pâ€‰<â€‰0.05). CONCLUSIONS: Er:YAG laser etching enhances the bonding strength of glass fiber posts. In addition, laser etching can reduce microleakage of self-adhesive resin cement. Resin Cements;fiberglass;Adhesive cement Dental Bonding;Dental Pulp Cavity;Dental Stress Analysis;Glass;Humans;Lasers, Solid-State;Low-Level Light Therapy;Post and Core Technique;Resin Cements;Sampling Studies;Shear Strength

Photobiomodulation Therapy Alleviates Tissue Fibroses Associated with Chronic Graft-Versus-Host Disease: Two Case Reports and Putative Anti-Fibrotic Roles of TGF-Î². OBJECTIVE: Patients who receive allogeneic hematopoietic stem cell transplantation may experience oral complications due to chronic graft-versus-host disease (cGVHD). The manifestations may include progressive sclerosis-like changes that may involve various body sites, including the oropharynx. METHODS AND RESULTS: We present two cGVHD cases of oropharyngeal fibrotic changes that affected functions that were treated with photobiomodulation (PBM) therapy. These case reports suggest that PBM therapy represents an additional, innovative approach affecting discrete phases in cGVHD-associated fibrotic changes. CONCLUSIONS: We discuss these observations in the context of currently understood molecular mechanisms, especially induction of transforming growth factor beta and NFÎºB that appear to be counter-intuitive to their known roles in matrix synthesis and inflammation that contribute to tissue fibroses. The clinical benefit noted in the two cases presented clearly indicates that there are distinct mechanistic and biological insights in the regulation of these molecular pathways in determining therapeutic efficacy with PBM therapy. Transforming Growth Factor beta Adult;Child;Chronic Disease;Female;Fibrosis;Follow-Up Studies;Graft vs Host Disease;Hematopoietic Stem Cell Transplantation;Humans;Leukemia, Myeloid, Acute;Low-Level Light Therapy;Male;Precursor Cell Lymphoblastic Leukemia-Lymphoma;Radiotherapy Dosage;Sampling Studies;Time Factors;Transforming Growth Factor beta;Treatment Outcome

Combined carbon dioxide laser with photodynamic therapy for the treatment of nodular and infiltrative basal cell carcinoma. Adult;Aged, 80 and over;Carcinoma, Basal Cell;Combined Modality Therapy;Facial Neoplasms;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Mohs Surgery;Neoplasm Recurrence, Local;Photochemotherapy;Skin Neoplasms;Treatment Outcome

The effects of low level laser irradiation on proliferation of human dental pulp: a narrative review. Mesenchymal stem cells (MSCs) have the capability for self-renewal, proliferation, and differentiation in various types of specialized cells, so they are very important in cellular therapies. MSC from dental pulp are simply obtainable and have high proliferative capability. Among the therapies that can stimulate the proliferation of certain cell types, low-level laser therapy (LLLT) stands out. The target of this study is to perform a literature review to investigate these effects of low-level laser irradiation on proliferation of human dental pulp.The electronic search of scientific papers was conducted in the Lilacs, Scielo, Medline and PubMed databases through scientific articles published in national and international journals in the past 20 years.The results of this review suggest that LLLT may be a useful and important tool for future advances in cell therapy and tissue engineering associated to stem cells. Studies on cell therapy for regenerating dental tissues has already been done, and shows promising results. Cell Differentiation;Cell Proliferation;Dental Pulp;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells

Photobiomodulation of local alterations induced by BthTX-I, a phospholipase A(2) myotoxin from Bothrops jararacussu snake venom: In vivo and in vitro evaluation. This report describes the effect of photobiomodulation (PBM) on edema formation, leukocyte influx, prostaglandin E(2) (PGE(2)) biosynthesis and cytotoxicity caused by bothropstoxin-I (BthTX-I), a phospholipase A(2) (PLA(2)) homologue isolated from Bothrops jararacussu snake venom. Swiss mice or C2C12 cells were irradiated with low-level laser (LLL) at 685nm wavelength, an energy density of 4.6J/cm(2) and an irradiation time of 13s. To evaluate the effect on edema formation and leukocyte influx, LLL was applied to the site of inoculation 30min and 3h post-injection. C2C12 cells were exposed to BthTX-I and immediately irradiated. PBM significantly reduced paw edema formation, peritoneal leukocyte influx and PGE(2) synthesis, but increased the viability of C2C12 muscle cells after BthTX-I incubation. These findings demonstrate that PBM attenuated the inflammatory events induced by BthTX-I. The attenuation of PGE(2) synthesis could be an important factor in the reduced inflammatory response caused by laser irradiation. The ability of LLL irradiation to protect muscle cells against the deleterious effects of BthTX-I may indicate preservation of the plasma membrane. Snake Venoms;Phospholipases A2;Dinoprostone Animals;Bothrops;Cell Line;Cell Survival;Dinoprostone;Edema;Leukocytes;Low-Level Light Therapy;Male;Mice;Muscle Cells;Peritoneum;Phospholipases A2;Snake Venoms

Comparison of the Effects of Transcutaneous Electrical Nerve Stimulation and Low-Level Laser Therapy on Drug-Resistant Temporomandibular Disorders. STATEMENT OF THE PROBLEM: Temporomandibular disorder (TMD) is a clinical term used for clinical signs and symptoms that affect the temporomandibular joints, masticatory muscles, and associated structures. Surgical and non-surgical treatments can be used for management of TMD. Non-surgical route is the main part of the treatment, since clinicians prefer non-aggressive treatment for TMD such as pharmacological and physical therapy. Low-level laser therapy (LLLT) and transcutaneous electrical nerve stimulation (TENS) are the main procedures in physical therapy. PURPOSE: The aim of this study was to evaluate the effectiveness of TENS and LLLT in treatment of TMD patients who did not respond to pharmacological therapy. MATERIALS AND METHOD: This clinical trial was performed on 45 patients who randomly received either TENS or LLLT for 8 sessions. LLLT was applied with diode laser (Ga-Al-As, 980nm, dose 5j/cm(2)) and TENS by using two carbon electrodes with 75 Hz frequency (0.75 msec pulse width). Helkimo index and visual analogue scale (VAS) were measured during the treatment period and throughout the follow-up sessions. RESULTS: Significant reduction in the VAS and Helkimo index was observed in both TENS and LLLT group. There was no significant difference between the two methods during the treatment; however, TENS was more effective in pain reduction in follow-ups. CONCLUSION: This study justified the use of TENS therapy as well as LLLT in drug-resistant TMD.

Both were useful in relieving the pain and muscles tenderness, although, TENS was more effective than LLLT.

Multi-Watt Near-Infrared Phototherapy for the Treatment of Comorbid Depression: An Open-Label Single-Arm Study. BACKGROUND: The treatment of depression has been hampered by low efficacy of antidepressant medications and safety concerns with alternative modalities. Recent work demonstrated that multi-Watt transcranial near-infrared light therapy (NILT) can effectively treat traumatic brain injury (TBI). The current objective is to explore multi-Watt NILT efficacy in a proof-of-concept study as a treatment for depression. METHODS: Thirty-nine sequential patients treated for TBI between March 2013 and May 2017 provided depression self-assessment data and/or were administered the Hamilton depression rating scale. Each completed the Quick Inventory of Depression Symptomatology-Self Report (QIDS) before and after treatment. Patients received multi-Watt NILT using near-infrared lasers (810/980â€‰nm at 8-15â€‰W) applied to forehead and temporal regions bilaterally for 9-12â€‰min to each area. Pre- and posttreatment scores were analyzed by paired t-tests. RESULTS: All met QIDS criteria for mild to severe depression and 69% had prior antidepressant trials. For 36 of the 39 patients, after 16.82â€‰Â±â€‰6.26 treatments, QIDS scores indicated a robust response (decrease of QIDS total score by â‰¥50%). For 32 of 39 patients, posttreatment QIDS scores indicated a remission from depression (decrease of QIDS total score â‰¤5). Overall, the QIDS score fell from 14.10â€‰Â±â€‰3.39 to 3.41â€‰Â±â€‰3.30 SD (pâ€‰=â€‰6.29â€‰Ã—â€‰10(-19)). With 12 or fewer treatments, QIDS score dropped from 14.83â€‰Â±â€‰2.55 to 4.17â€‰Â±â€‰3.93. Patients receiving â‰¥13 treatments showed a change in QIDS score from 13.67â€‰Â±â€‰3.64 to 3.11â€‰Â±â€‰3.14. Those (Nâ€‰=â€‰15) who received the entire treatment course within â‰¤8â€‰weeks (5.33â€‰Â±â€‰1.72â€‰weeks) showed a change in QIDS score from 13.86â€‰Â±â€‰3.14 to 4.5â€‰Â±â€‰3.94. Suicidal ideation resolved in all, but two patients. Patients remained in remission for up to 55â€‰months after a single course of treatment. CONCLUSION: This is the first report of high-powered NILT showing efficacy for depression. Multi-Watt NILT showed far greater efficacy and persistent benefit compared to low-power (<1 Watt) infrared light treatments. Patients saw benefit often within four treatments and resolution of depressive symptoms occurred within 4â€‰weeks for some. These data raise an intriguing possibility-that multi-Watt NILT may be a safe, effective, and rapid treatment for depression comorbid with TBI and possibly primary major depression disorder. A double-blind, placebo controlled trial is warranted to verify these proof-of-concept data.

The JAK/STAT signaling pathway and photobiomodulation in chronic wound healing. Wound healing is a physiological process that occurs in overlapping phases namely hemostasis, inflammation, proliferation, and remodeling. Chronic wounds fail to proceed through these reparative processes to achieve the functional integrity within the expected time. Wound healing relies upon growth factors and cytokines for the precise and accurate regulation of cellular responses. These are achieved through the use of complex growth factor/cytokine induced signaling pathways. The Janus kinase/signal transducers and activators of transcription (JAK/STAT) pathway transmits extracellular signals to the nucleus for the transcription of genes involved in proliferation and differentiation, to name but a few. Photobiomodulation (PBM) is an emerging area of interest within the scientific community and researchers are currently exploring its underlying mechanism and the associated signaling pathways involved. PBM is a light based therapy making use of low powered lasers or light emitting diodes (LEDs) to enhance tissue repair, and reduce pain and inflammation. Current conventional treatments for chronic wounds are frequently associated with failure and have limited therapeutic efficacy. Thus there is a need for efficient wound healing interventions and the identification and development of new treatments is required. In this review we summarize the involvement of JAK/STAT signaling and PBM in chronic wounds. STAT Transcription Factors;Janus

Kinases Animals;Chronic Disease;Humans;Janus Kinases;Low-Level Light Therapy;STAT Transcription Factors;Signal Transduction;Wound Healing
Low-level laser therapy may not provide any benefit in preventing and minimizing tooth sensitivity after dental bleaching. Tooth Bleaching Agents Dentin Sensitivity;Humans;Low-Level Light Therapy;Tooth;Tooth Bleaching;Tooth Bleaching Agents
Laser Sintering Technology and Balling Phenomenon. OBJECTIVE: The aim of this review was to evaluate the balling phenomenon which occurs typically in Selective Laser Sintering (SLS). BACKGROUND DATA: The balling phenomenon is a typical SLS defect, and observed in laser sintered powder, significantly reduces the quality of SLS, and hinders the further development of SLS Technology. METHODS: Electronic database searches were performed using Google Scholar. The keywords "laser sintering, selective laser sintering, direct metal laser melting, and balling phenomenon" were searched in title/abstract of publications, limited to December 31, 2016. The inclusion criteria were SLS, balling phenomenon, some alloys (such as Cr-Co, iron, stainless steel, and Cu-based alloys) mechanical properties, microstructure and bond strength between metal-ceramic crown, laboratory studies, full text, and in English language. RESULTS: A total of 100 articles were found the initial search and yielded a total of 50 studies, 30 of which did not fulfill the inclusion criteria and were therefore excluded. In addition, 20 studies were found by screening the reference list of all included publications. Finally, 40 studies were selected for this review. CONCLUSIONS: The method in question is regulated by powder material characteristics and the conditions of laser processing. The procedure of formation, affecting factors, and the mechanism of the balling effect are very complex. Chromium Alloys;Metal Ceramic Alloys Chromium Alloys;Dental Bonding;Dental Casting Technique;Equipment Design;Humans;Lasers;Low-Level Light Therapy;Materials Testing;Metal Ceramic Alloys;Quality Control;Stress, Mechanical;Surface Properties
Low-intensity LED therapy (Î» 640Â Â±Â 20Â nm) on saphenectomy healing in patients who underwent coronary artery bypass graft: a randomized, double-blind study. Myocardial revascularization surgery (CABG) is the most appropriate treatment for coronary artery disease. Currently, the great challenge is to reduce postoperative complications, such as wound infections, dehiscence, pain, and patients' quality of life. The saphenectomy is the target of complications in 10% of cases, which can cause greater morbidity, time, and cost of hospitalization. Studies show that low-intensity laser or light-emitted diode (LED) therapy promotes positive biomodulation of the tissue repair process, culminating in a lower incidence of dehiscence, pain reduction, and improvement in quality of life. The objective of the present study was to evaluate clinically the saphenous tissue repair after LED therapy. Forty subjects of both genders who underwent CABG with extracorporeal circulation were randomly divided into two groups: the placebo (PG) and experimental (EG). The experimental group underwent low-intensity LED therapy (Î» 640Â Â±Â 20Â nm, 6Â J/cm(2)) on saphenectomy. The tissue repair was analyzed by digital photogrammetry on the first and fifth postoperative day. The border closure was blindly evaluated by three researchers. The hematoma and hyperemia area was quantitatively analyzed using ImageJÂ© software. The results showed that in the experimental group, there were less bleeding points and no dehiscence in saphenectomy, as compared to the placebo group. There was also a smaller area of hematoma and hyperemia in the experimental group (pÂ <Â 0.0009). These data lead to the conclusion that the type of phototherapy protocol employed can assist in tissue repair. Coronary Artery Bypass;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Photography;Quality of Life;Saphenous Vein;Wound Healing
Low-level laser irradiation induces in vitro proliferation of stem cells from human exfoliated deciduous teeth. The aim of this study was to evaluate the effect of low-level laser irradiation

(LLLI) on the proliferation and viability of stem cells from human exfoliated deciduous teeth (SHED). Cells were irradiated or not (control) with an InGaAlP laser diode (660Â nm, 30Â mW, continuous action mode) using two different energy densities (0.5Â J/cm(2)-16Â s; 1.0Â J/cm(2)-33Â s). Irradiation was performed at 0 and 48Â h, with the laser probe fixed at a distance of 0.5Â cm from the cells. Cell proliferation was analyzed at 0, 24, 48, and 72Â h by the Trypan blue exclusion method and MTT assay. Cell cycle and Ki67 expression were analyzed by flow cytometry. Apoptosis-related events were evaluated by expression of annexin V/PI and nuclear morphological changes by staining with DAPI. Differences between groups at each time were analyzed by the Kruskal-Wallis and Mann-Whitney tests, adopting a level of significance of 5% (pÂ <Â 0.05). The results showed that an energy density of 1.0Â J/cm(2) promoted an increase in cell proliferation at 48 and 72Â h compared to the control and 0.5Â J/cm(2) groups. Cell cycle analysis revealed a predominance of cells in the S and G2/M phases in the irradiated groups. This finding was confirmed by the increased expression of Ki67. Low positive staining for annexin V and PI was observed in all groups, and no nuclear changes were detected, indicating that cell viability was not affected by the energy densities tested. It can be concluded that the LLLI parameters used (660Â nm, 30Â mW, 1.0Â J/cm(2)) promote the proliferation of SHEDs and the maintenance of cell viability. Biomarkers Biomarkers;Cell Cycle;Cell Proliferation;Cell Survival;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Stem Cells;Time Factors;Tooth Exfoliation;Tooth, Deciduous

Photobiomodulation alters matrix protein activity in stressed fibroblast cells in vitro. A balance is maintained between matrix synthesis and degradation, and a prolonged increase in matrix metalloproteinases (MMPs) affects healing. Photobiomodulation (PBM) speeds up healing and alters wound environment. The study aimed to determine changes in protein and gene expression of collagen type 1 (Col-I), MMP-3 and -9 and TIMP-1 in fibroblasts irradiated at 660 or 830 nm. Commercially purchased human skin fibroblast cells were modeled into five groups namely, normal, normal wounded, diabetic wounded, hypoxic wounded and diabetic hypoxic wounded. Control cells were sham irradiated. Laser irradiation was conducted at 660 or 830 nm (108/or 94 mW, 9.1 cm(2) , 420/or 483 s) with 5 J/cm(2) . Forty-eight hours post-irradiation, protein expression of TIMP-1, MMP-3, -9 and Col-I was determined by flow cytometry and immunofluorescence, and gene expression by real-time RT-PCR. There was an increase in TIMP-1 and Col-I, and a decrease in MMP-3 and -9, as well as an alteration in mRNA expression of MMP3, MMP9, TIMP1 and COL1A1 in irradiated cells. Due to the responsiveness of the diabetic hypoxic wounded model, the findings propose this model as appropriate for wound healing studies and suggest that PBM promotes the remodeling phase of wound healing by decreasing matrix degradation and upregulating synthesis. Collagen Type I;Tissue Inhibitor of Metalloproteinase-1;Matrix Metalloproteinases Cell Line;Collagen Type I;Fibroblasts;Gene Expression Regulation;Humans;Low-Level Light Therapy;Matrix Metalloproteinases;Stress, Physiological;Tissue Inhibitor of Metalloproteinase-1;Wound Healing

Evaluation of the Effect of Phototherapy in Patients with Mandibular Fracture on Mandibular Dynamics, Pain, Edema, and Bite Force: A Pilot Study. OBJECTIVE: The aim of this study was to evaluate the effect of phototherapy on bite force, facial swelling, mandibular movements, and pain in patients having undergone surgical treatment for mandibular fractures. BACKGROUND: These are among the predominant types of facial fractures, and treatment involving surgical fixation with titanium plates is one of the most common procedures in oral-maxillofacial surgery. Phototherapy has been used to accelerate the muscle healing process and significantly improves muscle regeneration by inducing the formation of new muscle fibers. METHODS: The patients were divided into two groups: Group 1-active phototherapy, and Group 2-sham phototherapy. Both groups underwent the surgical procedure by the same surgeon using the same surgical technique. Dosimetric parameters are wavelength, 660â€‰nm; power, 108â€‰mW; radiant energy, 21.6â€‰J; fluency,

21.6â€‰J/cm(2); radiance, 38197â€‰mW/cm(2); exposure time, 200â€‰sec per point, 10 points bilaterally. Photobiomodulation was performed in 15 sessions. RESULTS: The primary variable was bite force measured with a gnathodynamometer and the secondary variables were facial swelling, mandibular movements (measured with digital calipers), and pain. The Student's t-test was used to determine intergroup differences. CONCLUSIONS: The findings suggest improvements in the laser group in comparison with the sham group with regard to mandibular dynamics, a reduction in postoperative facial swelling, a reduction in pain, and an increase in bite force. Adolescent;Adult;Bite Force;Cohort Studies;Edema;Female;Fracture Fixation, Internal;Fracture Healing;Humans;Low-Level Light Therapy;Male;Mandibular Fractures;Pain, Postoperative;Phototherapy;Pilot Projects;Prognosis;Risk Assessment;Treatment Outcome;Young Adult

Photobiomodulation for Achilles Tendinopathy. Adrenal Cortex Hormones Achilles Tendon;Adrenal Cortex Hormones;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Orthopedic Procedures;Prognosis;Risk Factors;Severity of Illness Index;Tendinopathy;Treatment Outcome

Manual Operated Ultraviolet Surface Decontamination for Healthcare Environments. OBJECTIVE: The aim of this study was to evaluate the effectiveness of a new handheld equipment based on a mercury low-pressure vapor lamp. The Surface UV(Â®) device was tested in Staphylococcus aureus, Streptococcus mutans, Streptococcus pneumoniae, two strains of Escherichia coli, Pseudomonas aeruginosa, Candida albicans, and other clinical microorganisms isolated from different surfaces of a public health hospital. BACKGROUND DATA: The incidence of hospital infections has increased in recent years. Despite the variety of available chemicals to reduce the microorganisms, the search for antimicrobial agents and the characterization of novel targets are a continued need. Also, the minimization of chemical procedures is a constant need, and the use of ultraviolet (UV) light as a germicidal device for microorganisms' inactivation has been an alternative and one possible approach for the reduction of contamination. MATERIALS AND METHODS: The in vitro decontamination was performed by application of Surface UV in different species of microorganisms (study 1). The surface decontamination was carried out by application of Surface UV on each surface of hospital environment (study 2). The device presents ultraviolet C (UV-C) light at 254â€‰nm and produces an irradiance of 13â€‰mW/cm(2) at a distance of 1â€‰cm of the surfaces. The light dose was 0.78â€‰J/cm(2) for 60â€‰sec of application in both studies. RESULTS: The results for in vitro decontamination indicated a log(10) reduction factor of 6.5 for S. aureus, 6.7 for S. mutans, 6.2 for S. pneumoniae, 5.4 for E. coli, 5.2 for E. coli (ATCC 8739), 5.4 for P. aeruginosa, and 6.7 for C. albicans. The hospital level of microorganisms decreases more by 75% after the procedure. CONCLUSIONS: The study highlights the development and successful application of a new portable device that can reduce the risk of contamination in health settings. Our results suggest that Surface UV is efficient and may be an alternative decontamination method. Decontamination;Disinfection;Hospitals, Public;Low-Level Light Therapy;Ultraviolet Rays

Effectiveness of Low-Intensity Laser Therapy on Tissue Repair Following Saphenectomy in Patients Who Underwent Coronary Artery Bypass Graft: A Randomized, Double-Blind Study. OBJECTIVE: To verify the effectiveness of low-intensity laser therapy (LLLT) on tissue repair following saphenectomy during postoperative period in patients having undergone coronary artery bypass graft (CABG). MATERIALS AND METHODS: A randomized clinical trial, controlled and double-blind study was conducted with 40 volunteers, divided into 2 groups: a placebo group (PG, nâ€‰=â€‰20) and a laser group (LG, nâ€‰=â€‰20). The patients in the LG group were irradiated with laser during saphenectomy (InGaAlP, Î» 660â€‰nm, energy density 6â€‰J/cm(2)) daily from the first to the fourth postoperative day. The surgical incision was clinically evaluated and imaged at the beginning

and at the end of the treatment. The areas of hematoma and hyperemia were evaluated using the software ImageJ 1.4(Â©), and border closure was evaluated by three researchers, who were blinded concerning the allocation of the participants. RESULTS: The LG group presented a reduction of the areas of hematoma and hyperemia (pâ€‰=â€‰0.0003) and better border closure (pâ€‰=â€‰0.009), when compared with the PG group. CONCLUSIONS: The proposed LLLT protocol improved the tissue repair following saphenectomy in CABG patients. Adult;Aged;Coronary Artery Bypass;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Risk Assessment;Saphenous Vein;Time Factors;Treatment Outcome;Wound Healing

Laser Biophotomodulation in Patients with Neurosensory Disturbance of the Inferior Alveolar Nerve After Sagittal Split Ramus Osteotomy: A 2-Year Follow-Up Study. OBJECTIVE: To evaluate the effect of the application of photobiomodulation in a 2-year follow-up period in patients who have been intervened with a sagittal ramus split osteotomy and present neurosensory disturbance of the inferior alveolar nerve. BACKGROUND: Photobiomodulation is a common clinical tool in dentistry, for its beneficial effects have been shown in surgical and periodontal wound healing, reducing of swelling and pain, neurosensory recovery, and treatment of temporomandibular joint disorders. METHODS: This is a 2-year follow-up study with an experimental (Laser) group (nâ€‰=â€‰33) that received photobiomodulation, and a control (Sham) group (nâ€‰=â€‰9), placebo. All patients from the Laser group received laser applications (continuous wave of 0.353â€‰W/cm(2), 27â€‰J in 270â€‰sec per session) on days 1, 2, 3, 5, 10, 14, 21, and 28 after surgery. Neurosensory disturbance was evaluated with five tests: Visual Analog Scale (VAS) for pain and sensitivity, sensitivity threshold test, two-point discrimination, and thermal discrimination. All tests were performed before (24â€‰h before surgery) and after surgery (24â€‰h, 28 days, 60 days, 6 months, 1 year, 2 years, more than 2 years). Participants and evaluator were blinded to intervention. Variables were described with absolute frequencies, percentages, and medians. Ordinal and dichotomous variables were compared with Mann-Whitney's and Fisher's tests, respectively. RESULTS: Clinical improvement was observed during the follow-up period for the Laser group; general VAS for sensitivity was normal in 11 participants from the Laser group at 2 years postsurgery (40.74%), while no participants from the Sham group achieved this (pâ€‰=â€‰0.0341). Twenty-three participants recovered initial values for two-point discrimination (69.7%) after 2 years of follow-up (pâ€‰=â€‰0.0025) as well as sensitivity threshold test. General VAS for pain was normal in 31 patients from the Laser group after 2 years of follow-up (93.94%, pâ€‰=â€‰0.0254). CONCLUSIONS: Photobiomodulation was effective for neurosensory recovery on sample studied. Adolescent;Adult;Case-Control Studies;Cranial Nerve Injuries;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Mandibular Nerve;Middle Aged;Nerve Regeneration;Osteotomy, Sagittal Split Ramus;Postoperative Complications;Risk Assessment;Somatosensory Disorders;Statistics, Nonparametric;Time Factors;Treatment Outcome;Young Adult

Different Protocols of Photobiomodulation Therapy of Hyposalivation. OBJECTIVE: Photobiomodulation (PBM) therapy has proved to be effective for a wide range of oral pathologies including oral dryness, but the literature still lacks reports of clinical trials and protocols. The purpose of our study was to evaluate the effects of different wavelengths of PBM on salivation in patients suffering from hyposalivation aiming at determination of optimal treatment protocol. MATERIALS AND METHODS: This study included 30 patients whose major salivary glands were treated with low-intensity diode laser BTL2000 (Medical Technologies, s.r.o., Czech Republic) during 10 consecutive days. Patients were randomly assigned into two groups, each of 15 patients, and treated with PBM of 830â€‰nm and PBM of 685â€‰nm, respectively. The whole unstimulated and stimulated saliva quantities were measured each day during 10 days, before and after laser treatment, and at 10th day

after treatment was ended. RESULTS: Results have shown that the laser treatment significantly improves salivation (pâ€‰<â€‰0.0001) in both groups after 10 days treatment. The salivation also remains improved 10 days after the end of treatment. The patients treated with PBM of 830â€‰nm have had continuously higher values of quantity of saliva. CONCLUSIONS: Our results have shown that both laser wavelengths were effective in increasing salivary flow rate, and the improvement in salivation was statistically significant. The effect of treatment could be observed 10 days after the completion of treatment, thus providing evidence not only of stimulative effect but also indicating regenerative potential of PBM therapy. Aged;Aged, 80 and over;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Middle Aged;Radiotherapy Dosage;Risk Assessment;Salivary Glands;Salivation;Time Factors;Treatment Outcome;Xerostomia

Long-term outcome of a patient with paradoxical hypertrichosis after laser epilation. One underreported, rare side effect of laser hair removal is paradoxical hypertrichosis. It is largely unknown what the long-term outcomes are of patients who develop this complication. We report a 21-year-old, Fitzpatrick II, male patient, who had patchy areas of dark hair affecting various body areas. An Alexandrite 755Â nm laser was used to address the desired areas at energies between 20 and 22Â J/cm(2) at 10-12-week intervals over a course of seven treatments. After three treatments, the patient noted a significant increase in the density and length of hairs involving the back, shoulders, neck, and upper arms. The patient was followed on a biannual basis, without further epilatory intervention. After 10Â years, the areas of paradoxical hair growth were sparser compared to immediate post-treatment but remained denser compared to pre-treatment. This case illustrates improvement in the condition over time without intervention. Further studies are needed to determine the etiopathogenesis of this phenomenon. Hair Removal;Humans;Hypertrichosis;Lasers, Solid-State;Low-Level Light Therapy;Male;Young Adult

Efficacy of low-level laser therapy as an auxiliary tool for management of acute side effects of head and neck radiotherapy. INTRODUCTION: Head and neck radiotherapy (HNRT) is associated with acute and chronic side effects, some of which result in great morbidity. The aim of this study was to determine the efficacy of low-level laser therapy (LLLT) as an oral care tool for the management of these effects. MATERIALS AND METHODS: Clinical information was collected from 216 patients undergoing HNRT; these individuals were divided into a control group without laser therapy (nÂ =Â 108) and a laser group (nÂ =Â 108). The intervention of the laser group was performed in a different period to the control group and was applied three times weekly. All data were analyzed by a descriptive statistical analysis. RESULTS: The presence and severity of mucositis were similar between the groups. However, the laser group showed a lower frequency of interruption of oncologic therapy related to mucositis (pÂ =Â 0.030) and the need of nasogastric tube nutrition during the HNRT (pÂ =Â 0.027). In addition, trismus was less intense in the laser group (pÂ =Â 0.023). CONCLUSIONS: The introduction of laser therapy in the supportive care for patients undergoing HNRT showed benefits for the patient and the medical system, reducing morbidity and costs associated with side-effects. Adult;Aged;Case-Control Studies;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged

A retrospective analysis of the influencing factors and complications of Q-switched lasers in tattoo removal in China. BACKGROUND AND OBJECTIVE: Q-switched (QS) lasers are the gold standard for tattoo removal. The purpose of the present study was to gain a more comprehensive understanding of the factors that influence the efficacy of QS lasers and their associated complications in the removal of tattoos in China. PATIENTS AND METHODS: Clinical data of 266 patients were analyzed retrospectively. The tattoo clearance rate was evaluated using the 4-point scale. The Cox regression model was applied to analyze the factors that affected the efficacy of QS

lasers in tattoo removal. In addition, treatment-related adverse reactions were analyzed. RESULTS: The results showed that several variables had a statistically significant effect (pÂ <Â 0.05) on the efficacy of QS laser-mediated tattoo removal treatment, including the patients' age, the tattoo's age, type, color, or ink density and the number of treatments. A variety of adverse responses occurred during the laser treatment. The overall incidence of adverse responses was approximately 24.06%, including pigmentation, hypopigmentation, bulla formation, allergic reactions, and skin texture changes or hypertrophic scarring. CONCLUSION: Some factors may influence the efficacy of QS lasers in the treatment of tattoos and certain adverse reactions may occur during this process. Adolescent;Adult;Age Factors;China;Cicatrix, Hypertrophic;Cosmetic Techniques;Female;Humans;Hypersensitivity;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Skin;Tattooing;Young Adult

Silicone gel enhances the efficacy of Er:YAG laser treatment for atrophic acne scars: A randomized, split-face, evaluator-blinded, placebo-controlled, comparative trial. BACKGROUND: The effect of topical silicone gel has been studied to prevent scars from burn, postoperative wound and to treat hypertrophic scars. No previous studies have been done to evaluate the efficacy of topical silicone gel on atrophic acne scars. MATERIAL AND METHODS: Nineteen patients were treated with three sessions of ablative Er:YAG laser with 1-month intervals. Following each laser treatment, the randomlyassigned silicone gel or placebo was applied in split-face manner. Objective assessments, which included roughness, smoothness, hydration, transepidermal water loss were measured at baseline and prior to each treatment. Subjective assessments by dermatologists and subjects were done at baseline and 1Â month after last laser treatment. RESULTS: The laser treatments were well tolerated and resulted in clinical improvements. Topical silicone gel treatment resulted in significantly less roughness at weeks 4 and 12 compared with placebo (pÂ <Â 0.05). CONCLUSION: Adding topical silicone gel to ablative Er:YAG laser treatment may provide additional benefits in improving acne scars. Silicone Gels Acne Vulgaris;Administration, Topical;Adult;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Silicone Gels;Single-Blind Method;Young Adult

Photobiomodulation therapy for androgenetic alopecia: A clinician's guide to home-use devices cleared by the Federal Drug Administration. The market for home-use photobiomodulation devices to treat androgenetic alopecia has rapidly expanded, and the Food and Drug Administration (FDA) has recently cleared many devices for this purpose. Patients increasingly seek the advice of dermatologists regarding the safety and efficacy of these hair loss treatments. The purpose of this guide was threefold: (1) to identify all home-use photobiomodulation therapy devices with FDA-clearance for treatment of androgenetic alopecia; (2) to review device design, features and existing clinical evidence; and (3) to discuss practical considerations of photobiomodulation therapy, including patient suitability, treatment goals, safety, and device selection. A search of the FDA 510(k) Premarket Notification database was conducted using product code "OAP" to identify all home-use devices that are FDA-cleared to treat androgenetic alopecia. Thirteen commercially available devices were identified and compared. Devices varied in shape, wavelength, light sources, technical features, price, and level of clinical evidence. To date, there are no head-to-head studies comparing the efficacy of these devices. Photobiomodulation therapy devices have an excellent safety profile and mounting evidence supporting their efficacy. However, long-term, high quality studies comparing these devices in diverse populations are lacking. As these devices become increasingly popular, dermatologists should be familiar with this treatment modality to add to their therapeutic armamentarium. ABBREVIATIONS: AGA, androgenetic alopecia; FDA, Food and Drug Administration; IEC, International Electrotechnical Commission; LED, light-emitting diode; PBMT, photobiomodulation therapy. Alopecia;Device Approval;Humans;Low-Level Light Therapy;Patient Care

Planning;Patient Selection;Self-Management;United States;United States Food and Drug Administration
Laser-assisted hair removal for facial hirsutism in women: A review of evidence. Poly cystic ovarian syndrome (PCOS) has been described as the common diagnosis for hirsutism in women. Facial hirsutism is by far the most distressing symptom of hyperandrogenism in women with PCOS. A statistically significant improvement in psychological well-being has been reported in patients with PCOS allocated for laser-assisted hair removal. The theory of selective photothermolysis has revolutionized laser hair removal in that it is effective and safe, when operated by sufficiently trained and experienced professionals. Long-pulsed ruby (694 nm), long-pulsed alexandrite (755 nm), diode (800-980 nm), and long-pulsed Nd:YAG (1064 nm) are commercially available laser devices for hair removal most widely studied. This article will introduce the fundamentals and mechanism of action of lasers in hair removal, in a contemporary literature review looking at medium to long term efficacy and safety profiles of various laser hair removal modalities most widely commercially available to date. Female;Hair Removal;Hirsutism;Humans;Lasers, Solid-State;Low-Level Light Therapy;Polycystic Ovary Syndrome
Effects of a fractional picosecond 1,064â€‰nm laser for the treatment of dermal and mixed type melasma. BACKGROUND: Picosecond laser is a novel modality for pigmented skin disorders with extremely short pulse duration. Little is known about the effects of the picosecond laser in melasma. OBJECTIVE: This study aimed to investigate the efficacy of fractional picosecond 1,064â€‰nm laser in melasma treatment. STUDY DESIGN: A prospective, randomized, assessor-blinded, intra-individual split face comparative study. METHODS: Female subjects with melasma were enrolled and received fractional picosecond 1,064â€‰nm laser plus 4% hydroquinone cream on one randomly assigned side of the face; the results were compared to the use of hydroquinone cream only on the contralateral side. The modified melasma area severity index (mMASI) score, melanin index by Mexameter MX18Â®, participant satisfaction score by quartile rating scale, and the quality of life by the dermatology life quality index (DLQI) were evaluated over 12Â weeks. RESULTS: Thirty female subjects completed the protocol. The mean (Â± standard deviation, SD) mMASI score at the 12-week visit was significantly reduced in the picosecond laser-treated areas compared to controls (3.52Â Â±Â 1.4 and 4.18Â Â±Â 2.03 respectively; pÂ =Â 0.035). No differences were observed in the mean Mexameter melanin index, participant satisfaction score, and DLQI score. The observed adverse effects included transient mild erythema and mild skin desquamation. CONCLUSION: The addition of fractional picosecond 1,064â€‰nm laser to 4% hydroquinone was effective and significantly better than 4% hydroquinone alone for the treatment of melasma. Hydroquinones;hydroquinone Adult;Erythema;Female;Humans;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction;Prospective Studies;Quality of Life;Severity of Illness Index;Single-Blind Method;Time Factors
The effect of low-level laser therapy on orthodontically induced root resorption: a pilot double blind randomized controlled trial. BACKGROUND: The effect of low-level laser therapy (LLLT) on accelerating orthodontic tooth movement has been extensively studied; however, there is limited knowledge on the use of LLLT on orthodontic root resorption. OBJECTIVE: To investigate the effect of LLLT on orthodontically induced inflammatory root resorption (OIIRR) and to compare the difference between pulsed and continuous LLLT on OIIRR. TRIAL DESIGN: Double-blind, single-centre 3-arm parallel split-mouth randomized controlled trial. PARTICIPANTS: Twenty adolescent patients who required bilateral maxillary first premolar (MFP) orthodontic extractions were recruited from the Sydney Dental Hospital between October 2014 and December 2014. INTERVENTION: All MFPs were tipped buccally for 28 days to induce OIIRR. The experimental premolars (n = 20) received LLLT and the control premolars (n = 20) received placebo-laser on days 0, 1, 2, 3, 7, 14, and 21. Ten

experimental premolars received LLLT via continuous delivery and 10 received pulsed delivery. LASER PARAMETER: AlGaAs diode laser of 808 nm wavelength, 0.18 W power, 1.6 J per point, and duration of 9s for continuous mode and 4.5 s for pulsed mode. OUTCOME: The difference in root resorption crater volume between LLLT and placebo-laser and continuous or pulsed laser delivery after 28 days. RANDOMIZATION: Randomization was computer-generated, with allocation concealment by opaque sequentially numbered sealed envelopes. BLINDING: The participants and operator were blinded. RESULTS: Eighty-eight patients were screened and 20 patients were randomized. Forty premolars were analysed. LLLT resulted in 23 per cent less root resorption compared to the placebo (P = 0.026). Pulsed laser delivery resulted in 5 per cent less root resorption than continuous; however, this was not statistically significant (P = 0.823). No harm was observed. CONCLUSION: Teeth treated with LLLT had less total root resorption than placebo-laser. Furthermore, there was minimal difference between pulsed or continuous delivery of LLLT. TRIAL REGISTRATION: Clinical Trials Registry (ACTRN12616000829415). PROTOCOL: The protocol was not published before trial commencement. Adolescent;Bicuspid;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pilot Projects;Radiotherapy Dosage;Root Resorption;Tooth Movement Techniques

A Novel Treatment of Acne Keloidalis Nuchae by Long-Pulsed Alexandrite Laser. BACKGROUND: Acne keloidalis nuchae (AKN) is a dermatological condition characterized by follicular-based papules and pustules that later form hypertrophic or keloid-like scars. Laser-assisted hair reduction such as 810-nm diode laser and 1,064-nm Nd:YAG laser have been used for treating AKN with promising results. OBJECTIVE: To evaluate the therapeutic effect and safety of alexandrite laser in the treatment of different lesions of AKN. METHODS: Seventeen male patients with AKN received 6 sessions of 755-nm alexandrite laser. Papule and pustule count, keloidal plaque size, pliability, tenderness, and itching were assessed at the fourth session and 4 weeks after the sixth session. Patient satisfaction and Dermatology Life Quality Index (DLQI) questionnaire were performed at the end of treatment. Patients were followed up for 3 months after the final treatment. RESULTS: There was a significant decrease in the mean papule, pustule count, keloidal plaque size, and pliability at the fourth and sixth laser sessions when compared with baseline. Reduction of the hair density in the treated area is the only complication observed, which was accepted by the patients because of its reversible course. There was a statistically significantly higher percentage of improvement in the early lesions (papulopustular) compared with late (keloidal plaque) lesions. By the end of laser sessions, DLQI scores were significantly reduced. Temporary hair loss was noted in 4 patients in the treated sites. No lesional recurrence was detected in the follow-up period. CONCLUSION: Using 755-nm alexandrite laser for treatment of AKN is a safe and effective procedure with low recurrence rates. Alexandrite laser can significantly improve the quality of life of those patients suffering from this disfiguring chronic disorder. Acne Keloid;Adult;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neck;Prospective Studies;Young Adult

Effects of 445-nm Diode Laser-Assisted Debonding of Self-Ligating Ceramic Brackets on Shear Bond Strength. OBJECTIVE: The aim of this study was to measure the effect of irradiation with a novel 445-nm diode laser on the shear bond strength (SBS) of ceramic brackets before debonding. MATERIALS AND METHODS: Thirty ceramic brackets (In-Ovation(Â®) C, GAC) were bonded in standard manner to the planed and polished buccal enamel surfaces of 30 caries-free human third molars. Each tooth was randomly allocated to the laser or control group, with 15 samples per group. The brackets in the laser group were irradiated with the diode laser (SIROLaser Blue(Â®); Sirona) on three sides of the bracket bases for 5â€‰sec each (lateral-coronal-lateral, a total of 15â€‰sec) immediately before debonding. SBS values were measured for the laser group and control group. To assess the adhesive remnant index (ARI) and the degree of enamel fractures, micrographs of the enamel surface were taken with 10-fold magnification after debonding. RESULTS: The SBS values

were significantly lower statistically in the laser group in comparison with the control group (pâ€‰<â€‰0.05). The ARI scores were also significantly lower statistically in the laser group in comparison with the control group (pâ€‰<â€‰0.05). No bracket fractures or enamel fractures occurred in either group after debonding. CONCLUSIONS: Irradiation of ceramic brackets with the novel diode laser before debonding significantly reduces the SBS values. This is of clinical importance, as it means that the risk of damage to the teeth, bracket fractures, and the overall treatment time can be reduced. Ceramics;Dental Debonding;Dental Stress Analysis;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Molar;Orthodontic Brackets;Random Allocation;Reference Values;Shear Strength

Shorter Treatment Intervals of East Asians with Port-Wine Stain with Pulsed Dye Laser Are Safe and Effective-A Prospective Side-by-Side Comparison. OBJECTIVE: To compare the safety and efficacy of pulsed dye laser (PDL) at different intervals for the treatment of East Asians with Port-Wine Stain (PWS). BACKGROUND: The population of East Asians around the world is about 1.6 billion, and they are considered to have more melanin in their skin compared with Caucasians. Nevertheless, no studies about the optimal treatment intervals for East Asians with PWS have been carried out. METHODS: We prospectively investigated 39 East Asian patients with untreated PWS. Half of the PWS lesion was randomly allocated to be treated at 3 weeks and the other half at 6 weeks. Both halves of the PWS were treated three times in total. The efficacy outcome 2 months post final treatment was evaluated by visual and chromameter evaluation. RESULTS: The average blanching rate was 40.27% and 44.17% for PDL treatments at the 3- and 6-week interval sites, respectively (pâ€‰>â€‰0.05). No patient developed scarring or permanent pigmentation change. LIMITATIONS: There was no age criteria involved in the enrollment of patients in this study. Additionally, there is no comparison with long-term treatments at different intervals. CONCLUSIONS: PDL treatment at 3-week interval proved to be safe for East Asians with PWS. This can reduce the total duration of the course of treatments and had no increase in side effects compared with the standard interval treatments. Adolescent;Child;Child, Preschool;Cohort Studies;Facial Dermatoses;Asia, Eastern;Female;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Patient Safety;Port-Wine Stain;Prognosis;Prospective Studies;Statistics, Nonparametric;Time Factors;Treatment Outcome;Young Adult

Management of radiation-induced mucosal necrosis with photobiomodulation therapy. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Necrosis;Oropharynx;Radiation Injuries

Efficacy of adjuvant laser therapy in reducing postsurgical complications after the removal of impacted mandibular third molars: A systematic review update and meta-analysis. BACKGROUND: The authors updated a previously published systematic review to assess the effects of low-level laser therapy (LLLT) on reducing complications after the removal of impacted mandibular third molars. TYPES OF STUDIES REVIEWED: The authors searched for randomized clinical trials in which the investigators evaluated the efficacy of LLLT compared with that of placebo or no treatment. Two reviewers independently screened studies, extracted data, and assessed risk of bias. The authors used random effects model meta-analysis and the Grading of Recommendations Assessment, Development and Evaluation approach to rate the certainty of evidence. RESULTS: The authors included 21 studies. There was low-certainty evidence that LLLT results in less pain at 2 days after surgery (mean difference [MD], -1.42 on a 10 point scale; 95% confidence interval [CI], -2.18 to -0.67) and moderate certainty that it results in negligibly less pain at 7 days (MD, -0.59; 95% CI, -0.96 to -0.22); moderate-certainty evidence that LLLT has a negligible benefit on reducing trismus at 2 days (MD, -3.42 millimeters; 95% CI, -5.34 to -1.50) and at 7 days after surgery (MD, -2.30 mm; 95% CI, -3.96 to -0.64); lastly, there was moderate-certainty evidence that LLLT results in less postoperative swelling at 2 days (standardized MD, -0.82; 95% CI, -1.28 to -0.35) and low-certainty evidence that

LLLT results in negligibly less postoperative swelling at 7 days after surgery (standardized MD, -0.17; 95% CI, -0.4 to 0.07). Low-quality evidence suggests that LLLT will not cause adverse effects. CONCLUSIONS AND PRACTICAL IMPLICATIONS: LLLT probably has negligible benefits but may not result in adverse events. Evidence does not support the use of LLLT in clinical practice to reduce complications after impacted mandibular third-molar surgical extractions. Humans;Low-Level Light Therapy;Mandible;Molar, Third;Postoperative Complications;Randomized Controlled Trials as Topic;Tooth, Impacted

Review of Literature on Low-level Laser Therapy Benefits for Nonpharmacological Pain Control in Chronic Pain and Osteoarthritis. INTRODUCTION: Low-level laser therapy (LLLT) is a form of light therapy that triggers biochemical changes within cells. Photons are absorbed by cellular photoreceptors, triggering chemical alterations and potential biochemical benefits to the human body. LLLT has been used in pain management for years and is also known as cold laser therapy, which uses low-frequency continuous laser of typically 600 to 1000 nm wavelength for pain reduction and healing stimulation. Many studies have demonstrated analgesic and anti-inflammatory effects provided by photobiomodulation in both experimental and clinical trials. OBJECTIVE: The purpose of this research article was to present a summary of the possible pain management benefits of LLLT. RESULTS: In cold laser therapy, coherent light of wavelength 600 to 1000 nm is applied to an area of concern with hope for photo-stimulating the tissues in a way that promotes and accelerates healing. This is evidenced by the similarity in absorption spectra between oxidized cytochrome c oxidase and action spectra from biological responses to light. LLLT, using the properties of coherent light, has been seen to produce pain relief and fibroblastic regeneration in clinical trials and laboratory experiments. LLLT has also been seen to significantly reduce pain in the acute setting; it is proposed that LLLT is able to reduce pain by lowering the level of biochemical markers and oxidative stress, and the formation of edema and hemorrhage. Many studies have demonstrated analgesic and anti-inflammatory effects provided by photobiomodulation in both experimental and clinical trials. CONCLUSION: Based on current research, the utilization of LLLT for pain management and osteoarthritic conditions may be a complementary strategy used in clinical practice to provide symptom management for patients suffering from osteoarthritis and chronic pain. Chronic Pain;Humans;Low-Level Light Therapy;Osteoarthritis;Pain Management;Treatment Outcome

The effect of light-emitting diode (590/830Â nm)-based low-level laser therapy on posttraumatic edema of facial bone fracture patients. PURPOSE: Posttraumatic edema in facial bone fracture patients may interfere with the operation field and delay the schedule. Thus, swiftly reducing the edema alleviates patient discomfort and advances the operation date. Ice packing and compression bandages are often used for such a purpose, but such methods are often inconvenient for the face. In this study, we aim to analyze the effect of light-emitting diode (LED) (590/830Â nm)-based low-level laser therapy (LLLT) in posttraumatic edema in facial bone fracture patients. MATERIALS AND METHODS: We conducted a prospective cohort study of 40 patients who were admitted to a single institution for facial bone fracture. The patients were divided into two groups of 20 each, treated either with LLLT or with sham treatment light. We used an LLLT device that consists of planar LED-based arrays with double wavelengths 590Â nm and 830Â nm. The patients were treated with either true or sham light from posttraumatic day 1-5, twice a day. After each treatment, the volume of a patient's face was measured with a 3-dimensional camera. We analyzed and compared the changes in facial edema. The Wilcoxon rank sum test was conducted for statistical comparison of the two groups, and significance was set to the level of pÂ <Â 0.05. RESULTS: The sex ratio and mean age of the two groups were of little difference. The fracture sites included the nasal bone, orbital wall, zygomaticomaxillary bone, mandible, and frontal sinus. Mechanisms of injury included fall, assault, traffic accident, sports, and gunshot. The total operation rate of both groups was equal to 85%. Our

analysis showed a 16.5% reduction of edema in the LLLT group and 7.3% in the sham light group. The edema reduction was statistically significantly greater in the LLLT group than in the sham light group (pÂ <Â 0.047). CONCLUSION: LED-based LLLT is recently receiving attention worldwide for its cost-effectiveness and large coverage area compared to traditional laser therapy. Recent studies support its effectiveness in various areas such as wound healing, skin rejuvenation, and pain alleviation. In this study, we treated facial bone fracture patients with LED-based LLLT, and showed its effectiveness in reducing posttraumatic edema. Cost-Benefit Analysis;Edema;Facial Bones;Female;Humans;Low-Level Light Therapy;Male;Prospective Studies;Skull Fractures

Advances in the understanding and management of mucositis during stem cell transplantation. PURPOSE OF REVIEW: Mucositis is a severe and common side effect of anticancer treatments, with an incidence of between 40 and 80% depending on the cytotoxic regimen used. The most profound mucositis burden is experienced during conditioning regimens for hematopoietic stem cell transplant (HSCT), where the use of highly mucotoxic agents with or without total body irradiation leads to serious damage throughout the alimentary tract. Currently, the assessment and management of both oral and gastrointestinal mucositis lack authoritative guideline, with recommendations only achieved in narrow clinical scenarios. This review provides a brief overview of current management guidelines for mucositis in both adult and pediatric patients receiving HSCT, highlights recent advances in mucositis prevention and discusses future research avenues. RECENT FINDINGS: The Multinational Association of Supportive Care in Cancer and International Society for Oral Oncology (MASCC/ISOO) guidelines for the prevention of mucositis in HSCT are scarce, with low level laser therapy (photobiomodulation) and palifermin only recommended for oral mucositis. Loperamide and octreotide remain gold-standard for the treatment of diarrhea, despite poor efficacy. Although several interventions have been trialled in pediatric cohorts, no recommendations currently exist for children receiving high-dose chemotherapy or total body irradiation for HSCT. SUMMARY: HSCT continues to be associated with mucositis, which impacts on patients' ability and willingness to receive engraftment, and worsens clinical outcome. Research into the prevention and treatment of mucositis in this setting remains limited, with an overwhelming amount of small, single-center studies that fail to achieve a sufficient level of evidence that warrant recommendation(s). As such, our ability to manage mucotoxic side effects of high-dose chemotherapy and irradiation is limited, particularly in children. Fibroblast Growth Factor 7 Adult;Child;Fibroblast Growth Factor 7;Gastrointestinal Diseases;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Mucositis;Stomatitis;Transplantation Conditioning

Effects of photobiomodulation therapy and topical non-steroidal anti-inflammatory drug on skeletal muscle injury induced by contusion in rats-part 1: morphological and functional aspects. Musculoskeletal injuries are very frequent and are responsible for causing pain and impairment of muscle function, as well as significant functional limitations. In the acute phase, the most prescribed treatment is with non-steroidal anti-inflammatory drugs (NSAIDs), despite their questionable effectiveness. However, the use of photobiomodulation therapy (PBMT) in musculoskeletal disorders has been increasing in the last few years, and this therapy appears to be an interesting alternative to the traditional drugs. The objective of the present study was to evaluate and compare the effects of PBMT, with different application doses, and topical NSAIDs, under morphological and functional parameters, during an acute inflammatory process triggered by a controlled model of musculoskeletal injury induced via contusion in rats. Muscle injury was induced by means of a single trauma to the animals' anterior tibialis muscle. After 1Â h, the rats were treated with PBMT (830Â nm; continuous mode, with a power output of 100Â mW; 3.57Â W/cm(2); 1Â J-35.7Â J/cm(2), 3Â J-107.1Â J/cm(2), and 9Â J-321.4Â J/cm(2); 10, 30, and 90Â s) or diclofenac sodium for topical use (1Â g). Morphological analysis (histology) and functional analysis (muscle work) were performed, 6,

12, and 24Â h after induction of the injury. PBMT, with all doses tested, improved morphological changes caused by trauma; however, the 9Â J (321.4Â J/cm(2)) dose was the most effective in organizing muscle fibers and cell nuclei. On the other hand, the use of diclofenac sodium produced only a slight improvement in morphological changes. Moreover, we observed a statistically significant increase of muscle work in the PBMT 3Â J (107.1Â J/cm(2)) group in relation to the injury group and the diclofenac group (pÂ <Â 0.05). The results of the present study indicate that PBMT, with a dose of 3Â J (107.1Â J/cm(2)), is more effective than the other doses of PBMT tested and NSAIDs for topical use as a means to improve morphological and functional alterations due to muscle injury from contusion. Anti-Inflammatory Agents, Non-Steroidal;Diclofenac Administration, Topical;Animals;Anti-Inflammatory Agents, Non-Steroidal;Contusions;Diclofenac;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats, Wistar

Low-power laser irradiation inhibits PDGF-BB-induced migration and proliferation via apoptotic cell death in vascular smooth muscle cells. Vascular restenosis after injury of blood vessel has been implicated in various responses including apoptosis, migration, and proliferation in vascular smooth muscle cells (VSMCs) stimulated by diverse growth factors underlying platelet-derived growth factor (PDGF). Previous studies evaluated the effects of low-power laser (LPL) irradiation over various wavelength ranges on VSMC events in normal and pathologic states. However, whether VSMC responses are affected by LPL irradiation remains unclear. The purpose of this study is to explore the effects of LPL (green diode laser 532-nm pulsed wave of 300Â mW at a spot diameter of 1Â mm) irradiation on the responses, apoptosis, migration, and proliferation of VSMCs. The effect of LPL irradiation was tested on VSMCs through cytotoxicity, proliferation, migration, and apoptotic assays. Aortic ring assay was used to assess the effect of LPL irradiation on aortic sprout outgrowth. Protein expression levels were determined by western blotting. LPL irradiation did not affect VSMC viability but slightly attenuated PDGF-BB-induced proliferation in VSMCs. In addition, LPL irradiation inhibited PDGF-BB-evoked migration of VSMCs. Aortic sprout outgrowth in response to PDGF-BB was diminished in cells treated with LPL. In contrast, LPL irradiation evoked apoptosis in VSMCs in the presence of PDGF-BB. Similarly, activation of caspase-3 and Bax, as well as p38 mitogen-activated protein kinase (MAPK), in VSMCs treated with PDGF-BB was enhanced by exposure to LPL. These findings indicate that LPL irradiation induces vascular apoptosis via p38 MAPK activation and simultaneously inhibits VSMC proliferation and migration in response to PDGF-BB. Proto-Oncogene Proteins c-sis;Becaplermin Animals;Aorta;Apoptosis;Becaplermin;Cell Movement;Cell Proliferation;Cells, Cultured;Low-Level Light Therapy;Male;Muscle, Smooth, Vascular;Myocytes, Smooth Muscle;Proto-Oncogene Proteins c-sis;Rats, Sprague-Dawley

Photobiomodulation Therapy Improves Acute Inflammatory Response in Mice: the Role of Cannabinoid Receptors/ATP-Sensitive K(+) Channel/p38-MAPK Signalling Pathway. Although photobiomodulation therapy (PBM) has been applied clinically for the treatment of pain and inflammation, wound healing, sports and soft tissue injuries, as well as to repair injured spinal cords and peripheral nerves, it remains unclear which molecular substrates (receptor) are implicated in the cellular mechanisms of PBM. Here, we reported that PBM (660Â nm, 30Â mW, 0.06Â cm(2), 50Â J/cm(2), plantar irradiation) significantly inhibited carrageenan-induced paw oedema, but not noxious thermal response, through positive modulation to both CB1 and CB2 cannabinoid receptors. The use of CB1 antagonist AM281 or CB2 antagonist AM630 significantly reversed the anti-inflammatory effect of PBM. Analysis of signalling pathway downstream of cannabinoid receptors activation reveals that anti-inflammatory effects of PBM depend, in great extent, on its ability to activate ATP-dependent K(+) channels and p38 mitogen-activated protein kinase. Moreover, PBM therapy significantly reduced the levels of pro-inflammatory cytokine IL-6 in both paw and spinal cord, and restored the reduction of the level of anti-inflammatory cytokine IL-10 in spinal cord after

carrageenan injection. Unlike the potent cannabinoid receptor agonist (WIN 55212-2), PBM did not exert any CNS-mediated effects in the tetrad assay. Finally, PBM does not reduce inflammation and noxious thermal response induced by LPS and zymosan, a TLR4 and TLR2/dectin-1 ligand, respectively. Thus, cannabinoid receptors and, possibly, the endocannabinoid system, represent an important site of action of PBM that opens the possibility of complementary and nonpsychotropic therapeutic interventions in clinical practice. Graphical Abstract á…Ÿ. Cytokines;KATP Channels;Lectins, C-Type;Receptor, Cannabinoid, CB1;Receptor, Cannabinoid, CB2;Toll-Like Receptors;dectin 1;Carrageenan;p38 Mitogen-Activated Protein Kinases Animals;Carrageenan;Cytokines;Edema;Hyperalgesia;Immunomodulation;Inflammation;KATP Channels;Lectins, C-Type;Low-Level Light Therapy;MAP Kinase Signaling System;Male;Mice;Models, Biological;Receptor, Cannabinoid, CB1;Receptor, Cannabinoid, CB2;Spinal Cord;Toll-Like Receptors;p38 Mitogen-Activated Protein Kinases

Preconditioning by light-load eccentric exercise is equally effective as low-level laser therapy in attenuating exercise-induced muscle damage in collegiate men. BACKGROUND/OBJECTIVE: Previous studies have already reported an independent effect of light-load eccentric exercise (10% eccentric exercise contraction [EEC]) and low-level laser therapy (LLLT) as a protective measure against more strenuous eccentric exercise. However, the difference between these two interventions is largely unknown. Therefore, the present study aimed to compare the preconditioning effect of 10% EEC vs. LLLT on subjective, physiological, and biochemical markers of muscle damage in elbow flexors in collegiate men. METHODS: All 36 enrolled subjects were randomly assigned to either 10% EEC or LLLT group. Subjects in 10% EEC group performed 30 repetitions of an eccentric exercise with 10% maximal voluntary contraction strength 2 days prior to maximal eccentric exercise bout, whereas subjects in LLLT group were given LLLT. All the indirect markers of muscle damage were measured pre-exercise and at 24, 48, and 72 hours after the exercise-induced muscle damage protocol. RESULTS: The muscle soreness was reduced in both groups ($p = 0.024$); however, soreness was attenuated more in LLLT group at 48 hours (33.5 vs. 42.7, $p = 0.004$). There was no significant difference between the effect of 10% EEC and LLLT groups on other markers of muscle damage like a maximum voluntary isometric contraction ($p = 0.47$), range of motion ($p = 0.16$), upper arm circumference ($p = 0.70$), creatine kinase ($p = 0.42$), and lactate dehydrogenase ($p = 0.08$). Within-group analysis showed both interventions provided similar protection over time. CONCLUSION: This study indicated that light-load eccentric exercise confers similar protective effect against subsequent maximal eccentric exercise as LLLT. Both the treatments could be used reciprocally based on the patient preference, costs, and feasibility of the equipment.

Beneficial effects of Red Light-Emitting Diode treatment in experimental model of acute lung injury induced by sepsis. Sepsis is a severe disease with a high mortality index and it is responsible for the development of acute lung injury (ALI). We evaluated the effects of light-emitting diode (LED) on ALI induced by sepsis. Balb-c mice were injected with lipopolysaccharide or saline and then irradiated or not with red LED on their tracheas and lungs for 150â€‰s, 2 and 6â€‰h after LPS injections. The parameters were investigated 24â€‰h after the LPS injections. Red LED treatment reduced neutrophil influx and the levels of interleukins 1Î², 17â€‰A and, tumor necrosis factor-Î±; in addition to enhanced levels of interferon Î³ in the bronchoalveolar fluid. Moreover, red LED treatment enhanced the RNAm levels of IL-10 and IFN-Î³. It also partially reduced the elevated oxidative burst and enhanced apoptosis, but it did not alter the translocation of nuclear factor ÎºB, the expression of toll-like receptor 4 (TLR4), as well as, oedema or mucus production in their lung tissues. Together, our data has shown the beneficial effects of short treatment with LED on ALI that are caused by gram negative bacterial infections. It is suggested that LED applications are an inexpensive and non-invasive additional treatment for sepsis. Interleukin-17;Interleukin-1beta;NF-kappa B;Tlr4 protein,

mouse;Toll-Like Receptor 4;Tumor Necrosis Factor-alpha Acute Lung Injury;Animals;Bronchoalveolar Lavage Fluid;Disease Models, Animal;Gene Expression Regulation;Humans;Interleukin-17;Interleukin-1beta;Light;Lung;Mice;Mice, Inbred BALB C;NF-kappa B;Sepsis;Signal Transduction;Toll-Like Receptor 4;Tumor Necrosis Factor-alpha

Acute effects of low-level laser therapy (660 nm) on oxidative stress levels in diabetic rats with skin wounds. BACKGROUND: Laser therapy influences oxidative stress parameters such as the activity of antioxidant enzymes and the production of reactive oxygen species. OBJECTIVE: To analyze the effects of low-level laser therapy on oxidative stress in diabetics rats with skin wounds. METHODS: Thirty-six animals were divided into 4 groups: NDNI: non-diabetic rats with cutaneous wounds that not received laser therapy; NDI: non-diabetic rats with cutaneous wounds that received laser therapy; DNI: diabetic rats with skin wounds who did not undergo laser therapy; DI: rats with diabetes insipidus and cutaneous wounds and received laser therapy. The animals were treated with LLLT (660 nm, 100 mW, 6 J/cm, spot size 0.028 cm). On the day of killing the animals, tissue-wrapped cutaneous wounds were collected and immediately frozen, centrifuged, and stored to analyze malondialdehyde (MDA) levels. RESULTS: Significant difference was observed within the groups of MDA levels (ANOVA, p = 0.0001). Tukey's post-hoc test showed significantly lower values of MDA in irradiated tissues, both in diabetic and non-diabetic rats. ANOVA of the diabetic group revealed a significant difference (p < 0.01) when all groups, except NDI and DI, were compared. CONCLUSIONS: LLLT was effective in decreasing MDA levels in acute surgical wounds in diabetic rats. Reactive Oxygen Species;Malondialdehyde Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Malondialdehyde;Oxidative Stress;Rats;Rats, Wistar;Reactive Oxygen Species;Skin;Wounds and Injuries

Metal-Organic Frameworks@Polymer Composites Containing Cyanines for Near-Infrared Fluorescence Imaging and Photothermal Tumor Therapy. As a noninvasive treatment method, photothermal therapy (PTT) has been widely investigated for cancer therapy. In this work, metal-organic frameworks@polymer composites (UiO-66@CyP) with bioimaging and PTT activity were prepared by introducing cyanine-containing polymer (CyP) via multicomponent Passerini reaction in the presence of Zr-based nanoscale metal-organic frameworks (UiO-66). As-prepared UiO-66@CyP not only possesses uniformed size, controllable morphology, and excellent dispersibility in aqueous media, but also indicates strong near-infrared absorption and high photothermal conversion efficiency. Due to these combined merits, UiO-66@CyP appears to be an excellent phototherapy agent for ablation of tumor cells under a low-power laser irradiation and near-infrared fluorescence imaging agent. This work might open up a new avenue to develop multifunctional composites by integrating metal-organic frameworks with carboxyl, aldehyde, and isocyano-containing materials. Carbocyanines;Organometallic Compounds;Polymers Animals;Carbocyanines;Cell Line, Tumor;HeLa Cells;Humans;Hyperthermia, Induced;Male;Mice, Inbred BALB C;Neoplasms;Optical Imaging;Organometallic Compounds;Phototherapy;Polymers

ANALYSIS OF THE LONG-TERM CLINICAL RESULTS OF USING 940 Î¼m DIODE LASER IN PATIENTS WITH GENERALIZED MODERATE CHRONIC PERIODONTITIS. The experience of using a diode laser with a wavelength of 940 Î¼m in the treatment of patients with generalized periodontitis of moderate severity of chronic course is presented. 30 patients were examined, including 17 men (56.6%), and 13 women (43.4%) aged 35-44 with chronic generalized periodontitis of moderate severity. It is concluded that the use of diode laser of 940 Î¼m in the complex therapy of patients with chronic generalized periodontitis of moderate severity is clinically justified and an effective auxiliary method of treatment. The long-term results of the clinical study indicate that the additional use of a diode laser allows for more stable remission and a greater reduction in the volume of surgical interventions

compared with control group. Adult;Case-Control Studies;Chronic Periodontitis;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male

Low-Level Laser Therapy for the Treatment of Provoked Vestibulodynia-A Randomized, Placebo-Controlled Pilot Trial. BACKGROUND: Low-level laser therapy (LLLT) is an emerging medical technology in which non-thermal laser irradiation is applied to treat pain. Because LLLT has been found effective in treating various pain syndromes without known side effects, we conducted a study evaluating the effect of LLLT on provoked vestibulodynia (PVD), a complex sexual pain disorder characterized by pain confined to the vulvar vestibule in response to contact or pressure. AIM: To investigate the effectiveness of LLLT for PVD in a randomized, placebo-controlled, double-blinded trial. METHODS: Patients with PVD were randomly assigned to receive treatment with LLLT or sham treatment. Patients were treated twice weekly for 6 weeks, for a total of 12 LLLT or placebo sessions. Patients who showed improvement after LLLT were followed for 1 year by clinical pain report and Q-tip examination. OUTCOMES: Change in pain scores obtained in response to the Q-tip test, clinical pain report, visual analog scale score, pain with tampon insertion, daily pain intensity, intercourse pain intensity, frequency of intercourse, and a battery of quality-of-life measures. RESULTS: Thirty-four patients with PVD participated, 18 received LLLT and 16 received placebo. In the clinical pain report at study completion, 14 of 18 patients (78%) receiving LLLT reported improvement compared with 7 of 16 (44%) in the placebo group (PÂ = .042). This effect was not apparent in other outcome measurements. None of the patients reported side effects during the study. At 1-year follow-up, eight patients (57%) reported lasting improvement. CLINICAL IMPLICATIONS: Larger studies with various treatment protocols are needed to define which patients can benefit from LLLT therapy. STRENGTHS AND LIMITATIONS: Strengths include a placebo-controlled, double-blinded design, measurement of a large number of multidimensional end points, and a follow-up period of 1 year. Limitations include the small number of patients recruited, no improvement in measurable parameters, a high improvement rate in the placebo group, the absence of use of validated questionnaires, and the lack of evaluation of psychological and interpersonal factors that might have influenced the results. CONCLUSIONS: Given the results of this pilot study, LLLT cannot currently be recommended as a treatment for PVD. Further studies with a larger population, various treatment protocols, and evaluation of LLLT in different subgroups of PVD are needed to define which patients can benefit from this therapy. Lev-Sagie A, Kopitman A, Brzezinski A. Low-Level Laser Therapy for the Treatment of Provoked Vestibulodynia-A Randomized, Placebo-Controlled Pilot Trial. J Sex Med 2017;14:1403-1411. Adult;Clinical Protocols;Coitus;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pilot Projects;Sexual Behavior;Surveys and Questionnaires;Treatment Outcome;Vulvodynia

Effect of Low-level Laser Therapy on Postoperative Pain after Root Canal Retreatment: A Preliminary Placebo-controlled, Triple-blind, Randomized Clinical Trial. INTRODUCTION: Low-level laser therapy (LLLT) is a practical, nonpharmacologic technique for reducing pain. This study evaluated the effect of LLLT on postoperative pain after root canal retreatment (RCR). METHODS: This study enrolled patients (NÂ =Â 36) who required root canal retreatment (RCR) on mandibular molar teeth, presented with periapical lesions with periapical index scores of 2 or 3, and had a pain visual analog scale (VAS)Â <50 and a percussion pain VAS <50. The participants were divided into 2 groups: (1) patients scheduled for RCR followed by LLLT (nÂ =Â 18) and (2) patients scheduled for RCR followed by a mock LLLT (placebo) (nÂ =Â 18). Postoperative pain was assessed using the VAS. Data were collected and statistically analyzed with the chi-square test, the independent sample t test, and the Mann-Whitney U test (PÂ =Â .05). RESULTS: On the first 4Â days, postoperative pain significantly reduced in the LLLT group compared with the placebo group (PÂ <Â .05). However, no statistically significant differences in postoperative pain were found between the 2 groups after 5 and 7Â days

(PÂ >Â .05). The number of patients who needed analgesics was lower in the LLLT group than in the placebo group (PÂ <Â .05). No patient reported pain during LLLT application. CONCLUSIONS: LLLT may reduce postoperative pain after RCR of mandibular molars. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Reoperation;Root Canal Therapy

Treatment of acne scarring with a novel fractionated, dual-wavelength, picosecond-domain laser incorporating a novel holographic beam-splitter. BACKGROUND AND OBJECTIVES: Fractional treatment with a dual wavelength 1,064 and 532â€‰nm picosecond-domain laser, delivering a 10â€‰Ã—â€‰10 array of highly focused beamlets via a holographic optic, was investigated for the treatment of acne scars. STUDY: Twenty-seven of 31 subjects completed the study, 19 were treated using 1,064â€‰nm and 8 were treated at 532â€‰nm, all having four-monthly treatments. Blinded evaluation of digital images by three physician evaluators comparing pre- and 3-month post-treatment images measured efficacy using a 10-point scale. Subject self-assessment of treatment effects were also recorded. Safety was measured by recording subject discomfort scores and adverse effects. RESULTS: Blinded reviewers correctly identified the baseline image in 61 of the 81 image sets (75%), and baseline acne scar scores were 1.8â€‰Â±â€‰0.7 and 1.8â€‰Â±â€‰0.5 for the 1,064 and 532â€‰nm cohorts, and decreased to 1.1â€‰Â±â€‰0.5 (Pâ€‰<â€‰0.001) and 1.1â€‰Â±â€‰0.0 (Pâ€‰<â€‰0.005), respectively. Post-treatment erythema, mild edema, and petechiae were the only side effects noted. CONCLUSION: The 1,064 and 532â€‰nm picosecond-domain laser incorporating a 10â€‰Ã—â€‰10 holographic beam-splitting handpiece was found to be safe and effective for the treatment of facial acne scars. The treatments were well tolerated and the subjects experienced little to no downtime. Lasers Surg. Med. 49:796-802, 2017. Â© 2017 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc. Acne Vulgaris;Adult;Aged;Cicatrix;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Treatment Outcome;Young Adult

Comparative study of the efficacy of pulsed electromagnetic field and low level laser therapy on mitogen-activated protein kinases. Mitogen-Activated Protein Kinases (MAPKs) consist of three major signaling members: extracellular signal-regulated kinase (ERK), p38 and C-JUN N-terminal kinase (JNK). We investigated physiological effects of Pulsed Electromagnetic Field Therapy (PEMFT) and Low Level Laser Therapy (LLLT) on human body, adopting the expression level of mitogen-activated protein kinases as an indicator via assessment of the activation levels of three major families of MAPKS, ERK, p38 and JNK in the peripheral lymphocytes of patients before and after the therapies. Assessment for the expression levels of MAPKs families' were done, in the peripheral lymphocytes of patients recently have appendectomy, using flow cytometric analysis of multiple signaling pathways, pre and post LLLT and PEMFT application (twice daily for 6 successive days) on the appendectomy wound. There were non-significant differences in the expression levels of MAPKs families' pre- therapies application. But there were significant increase in the ERK expression levels post application of LLLT compared to its pre application ($p<0.01$). Also, there was significant increase in the ERK, p38 and C-Jun N terminal expression level values post application of PEMFT compared to its pre application expression levels ($p<0.01$ for each). The present study demonstrates that PEMFT has a powerful healing effect more than LLLT as it increase the activation of ERK, P38 and C-Jun-N Terminal while LLLT only increase the activation of ERK. LLLT has more potent pain decreasing effect than PEMFT as it does not activate P38 pathway like PEMFT.

Applications of Light Emitting Diodes in Health Care. Light emitting diodes (LEDs) have become the main light sources for general lighting, due to their high lumen efficiency and long life time. Moreover, their high bandwidth and the availability of diverse wavelength contents ranging from ultraviolet to infrared empower them with great controllability in tuning brightness, pulse durations

and spectra. These parameters are the essential ingredients of the applications in medical imaging and therapies. Despite the fast advances in both LED technologies and their applications, few reviews have been seen to link the controllable emission properties of LEDs to these applications. The objective of this paper is to bridge this gap by reviewing the main control techniques of LEDs that enable creating enhanced lighting patterns for imaging and generating effective photon doses for photobiomodulation. This paper also provides the basic mechanisms behind the effective LED therapies in treating cutaneous and neurological diseases. The emerging field of optogenetics is also discussed with a focus on the application of LEDs. The multidisciplinary topics reviewed in this paper can help the researchers in LEDs, imaging, light therapy and optogenetics better understand the basic principles in each other's field; and hence to stimulate the application of LEDs in health care. Animals;Delivery of Health Care;Diagnostic Imaging;Humans;Light;Low-Level Light Therapy;Optogenetics

Impact of heat on metabolic and hemodynamic changes in transcranial infrared laser stimulation measured by broadband near-infrared spectroscopy. Transcranial infrared laser stimulation (TILS) has shown effectiveness in improving human cognition and was investigated using broadband near-infrared spectroscopy (bb-NIRS) in our previous study, but the effect of laser heating on the actual bb-NIRS measurements was not investigated. To address this potential confounding factor, 11 human participants were studied. First, we measured time-dependent temperature increases on forehead skin using clinical-grade thermometers following the TILS experimental protocol used in our previous study. Second, a subject-averaged, time-dependent temperature alteration curve was obtained, based on which a heat generator was controlled to induce the same temperature increase at the same forehead location that TILS was delivered on each participant. Third, the same bb-NIRS system was employed to monitor hemodynamic and metabolic changes of forehead tissue near the thermal stimulation site before, during, and after the heat stimulation. The results showed that cytochrome-c-oxidase of forehead tissue was not significantly modified by this heat stimulation. Significant differences in oxyhemoglobin, total hemoglobin, and differential hemoglobin concentrations were observed during the heat stimulation period versus the laser stimulation. The study demonstrated a transient hemodynamic effect of heat-based stimulation distinct to that of TILS. We concluded that the observed effects of TILS on cerebral hemodynamics and metabolism are not induced by heating the skin.

The Effects of Diode Laser Therapy as an Adjunct to Scaling and Root Planing in the Treatment of Aggressive Periodontitis: A 1-Year Randomized Controlled Clinical Trial. OBJECTIVE: The aim of this study was to investigate and compare the clinical, microbial, and inflammatory effects of a diode laser as an adjunct to scaling and root planing (SRP) versus SRP alone for the treatment of generalized aggressive periodontitis (GAgP). METHODS: Using a split-mouth design, 31 patients with GAgP were enrolled in the study. The maxillary right and left quadrants were randomly assigned to SRP+diode laser or SRP alone. Patients were examined on a regular basis for clinical, microbiological, and inflammatory mediator changes over a 1-year period. Clinical attachment level (CAL) was the primary outcome variable chosen. In addition, subgingival biofilm samples and gingival crevicular fluid (GCF) inflammatory mediators were analyzed at each follow-up session. RESULTS: Compared to baseline, both treatments demonstrated an improvement in periodontal parameters at 1 year. However, SRP+diode laser produced a significant improvement in probing depth (PD; 2.56â€‰Â±â€‰0.44 vs. 3.36â€‰Â±â€‰0.51â€‰mm, pâ€‰<â€‰0.05) and CAL (3.47â€‰Â±â€‰0.25 vs. 4.11â€‰Â±â€‰0.26â€‰mm, pâ€‰<â€‰0.05) values compared to SRP alone. Similarly, in the SRP+diode laser group, the bacteria of orange complex group were significantly reduced at 30 and 60 days compared to SRP alone. Moreover, SRP+diode laser determined a reduction in mean GCF level of interleukin (IL)-1Î² and IL-1Î²/IL-10 ratio at 15 and 30 days compared to SRP alone

(pâ€‰<â€‰0.05). CONCLUSIONS: At 1 year, SRP+diode laser yielded a significant reduction in some clinical parameters, while microbial and inflammatory mediator changes were not significantly reduced compared to SRP alone. Adult;Aggressive Periodontitis;Dental Scaling;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Root Planing

Wnt/Î²-catenin and ERK pathway activation: A possible mechanism of photobiomodulation therapy with light-emitting diodes that regulate the proliferation of human outer root sheath cells. BACKGROUND: Outer root sheath cells (ORSCs) play important roles in maintaining hair follicle structure and provide support for the bulge area. The hair growth promoting effects of photobiomodulation therapy (PBMT) have been reported, but the mechanisms for this in human ORCs (hORSCs) have rarely been studied. OBJECTIVE: The aim of this study was to investigate the effect of various wavelengths of light-emitting diode (LED) irradiation on human ORSCs (hORSCs). METHODS: LED irradiation effects on hORSC proliferation and migration were examined with MTT assay, BrdU incorporation assay and migration assays. hORSCs were irradiated using four LED wavelengths (415, 525, 660, and 830â€‰nm) with different low energy levels. LED irradiation effects on the expression of molecules associated with the Wnt/Î²-catenin signaling and ERK pathway, hair stem cell markers, and various growth factors and cytokines in hORSCs were examined with real-time PCR and Western blot assay. The effect of the LED-irradiated hORSCs on cell proliferation of human dermal papilla cells (hDPCs) was examined with co-culture and MTT assay. RESULTS: PBMT with LED light variably promoted hORSC proliferation and suppressed cell apoptosis depending on energy level. LED irradiation induced Wnt5a, Axin2, and Lef1 mRNA expression and Î²-catenin protein expression in hORSCs. Phosphorylation of ERK, c-Jun, and p38 in hORSCs was observed after LED light irradiation, and ERK inhibitor treatment before irradiation reduced ERK and c-Jun phosphorylation. Red light-treated hORSCs showed substantial increase in IL-6, IL-8, TNF-a, IGF-1, TGF-Î²1, and VEGF mRNA. Light irradiation at 660 and 830â€‰nm projected onto hORSCs accelerated in vitro migration. LED-irradiated hORSCs increased hDPCs proliferation when they were co-cultured. The conditioned medium from LED-irradiated hORSCs was sufficient to stimulate hDPCs proliferation. CONCLUSION: These results demonstrate that LED light irradiation induced hORSC proliferation and migration and inhibited apoptosis in vitro. The growth-promoting effects of LEDs on hORSCs appear to be associated with direct stimulation of the Wnt5a/Î²-catenin and ERK signaling pathway. Lasers Surg. Med. 49:940-947, 2017. Â© 2017 Wiley Periodicals, Inc. Biomarkers;Cytokines;Intercellular Signaling Peptides and Proteins Apoptosis;Biomarkers;Blotting, Western;Cell Migration Assays;Cell Movement;Cell Proliferation;Cell Survival;Cells, Cultured;Cytokines;Hair Follicle;Humans;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;MAP Kinase Signaling System;Real-Time Polymerase Chain Reaction;Wnt Signaling Pathway

Carpal Tunnel Syndrome: Effectiveness of Physical Therapy and Electrophysical Modalities. An Updated Systematic Review of Randomized Controlled Trials. OBJECTIVE: To review scientific literature studying the effectiveness of physical therapy and electrophysical modalities for carpal tunnel syndrome (CTS). DATA SOURCES: The Cochrane Library, PubMed, Embase, CINAHL, and Physiotherapy Evidence Database. STUDY SELECTION: Two reviewers independently applied the inclusion criteria to select potential eligible studies. DATA EXTRACTION: Two reviewers independently extracted the data and assessed the methodologic quality using the Cochrane Risk of Bias Tool. DATA SYNTHESIS: A best-evidence synthesis was performed to summarize the results of the included studies (2 reviews and 22 randomized controlled trials [RCTs]). For physical therapy, moderate evidence was found for myofascial massage therapy versus ischemic compression on latent, or active, trigger points or low-level laser therapy in the short term. For several electrophysical modalities, moderate evidence was found in the short term (ultrasound vs placebo, ultrasound as single intervention vs other nonsurgical interventions, ultrasound vs corticosteroid injection plus a neutral

wrist splint, local microwave hyperthermia vs placebo, iontophoresis vs phonophoresis, pulsed radiofrequency added to wrist splint, continuous vs pulsed vs placebo shortwave diathermy, and interferential current vs transcutaneous electrical nerve stimulation vs a night-only wrist splint). In the midterm, moderate evidence was found in favor of radial extracorporeal shockwave therapy (ESWT) added to a neutral wrist splint, in favor of ESWT versus ultrasound, or cryo-ultrasound, and in favor of ultrasound versus placebo. For all other interventions studied, only limited, conflicting, or no evidence was found. No RCTs investigating the long-term effects of physical therapy and electrophysical modalities were found. Because of heterogeneity in the treatment parameters used in the included RCTs, optimal treatment parameters could not be identified. CONCLUSIONS: Moderate evidence was found for several physical therapy and electrophysical modalities for CTS in the short term and midterm. Future studies should concentrate on long-term effects and which treatment parameters of physical therapy and electrophysical modalities are most effective for CTS.
Carpal Tunnel Syndrome;Electric Stimulation Therapy;Humans;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Time Factors;Treatment Outcome

LLLT Effects on Oral Keratinocytes in an Organotypic 3D Model. Several inÂ vitro studies evaluated the cellular and molecular events related to interactions between phototherapy and target tissues, including oral keratinocytes and fibroblasts, providing elucidative data about phototherapy-induced healing. However, these interactions were limited to the application of a bidimensional cell culture model of oral mucosal cells. Thus, thisstudy evaluated the use of an organotypic oral epithelium model to elucidate the morphological and phenotypic responses of cells subjected to low-level laser therapy (LLLT). Oral keratinocytes were seeded in the exÂ vivo-produced oral mucosal equivalent (EVPOME) model, with a porcine acellular dermal matrix. LLLT was applied by means of the LaserTABLE device (780Â nm, 25Â mW) at 0.5, 1.5 and 3Â JÂ cm(-2) . After three irradiations, morphology, proliferation and gene expression of growth factors were assessed. LLLT and control groups presented similar morphological features, characterized by the formation of a stratified, differentiated and keratinized epithelium. LLLT enhanced the cell proliferation and gene expression of keratinocytes (hKGF) as well as epidermal (hEGF) growth factors. In general, analysis of these data shows that the three-dimensional cell culture model can be applied for phototherapy studies and that the positive effects of LLLT were confirmed by the use of an organotypic model. FGF7 protein, human;Fibroblast Growth Factor 7;Epidermal Growth Factor Acellular Dermis;Analysis of Variance;Animals;Cell Culture Techniques;Cell Differentiation;Cell Proliferation;Epidermal Growth Factor;Fibroblast Growth Factor 7;Gene Expression;Gingiva;Humans;Keratinocytes;Low-Level Light Therapy;Swine

The Effects of Photobiomodulation Delivered by Light-Emitting Diode on Stem Cells from Human Exfoliated Deciduous Teeth: A Study on the Relevance to Pluripotent Stem Cell Viability and Proliferation. OBJECTIVE: Photobiomodulation (PBM) can modulate the proliferation of some types of stem cells. However, few reports have addressed the effects of PBM delivered by light-emitting diode (LED) on stem cells obtained from the pulp tissue of deciduous teeth. The aim of the present study was to investigate the effect of PBM delivered by red LED (630â€‰nm, 75â€‰mW, 37â€‰mW/cm(2)) with different radiant exposures on the cell cycle, mitochondrial membrane potential, and senescence of stem cells from human exfoliated deciduous teeth (SHED). MATERIALS AND METHODS: Cultures were irradiated with LED (2, 4, 8, 16, and 32â€‰J/cm(2)). After 24â€‰h, the cell cycle and mitochondrial membrane potential of the cultures were evaluated using flow cytometry. Nonirradiated cultures served as control. RESULTS: Cultures irradiated with 16â€‰J/cm(2) had higher percentages of cells in the synthesis phase than control cultures (pâ€‰<â€‰0.05), and no significant differences were found regarding the percentage of cells with viable mitochondria between irradiated and control cultures. No significant difference in cell

senescence was found between control cultures and cultures irradiated with 2 or 16â€‰J/cm(2). CONCLUSIONS: LED irradiation at 630â€‰nm (37â€‰mW/cm(2), 75â€‰mW) with radiant exposure of 16â€‰J/cm(2) was capable of inducing a proliferative response in stem cells from the pulp tissue of deciduous teeth without affecting mitochondrial function or inducing senescence. Cell Culture Techniques;Cell Proliferation;Cell Survival;Child;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pluripotent Stem Cells;Tooth, Deciduous

Effectiveness of Biology-Based Methods for Inhibiting Orthodontic Tooth Movement. A Systematic Review. INTRODUCTION: Several experimental studies in the literature have tested different biology-based methods for inhibiting or decreasing orthodontic tooth movement (OTM) in humans. This systematic review investigated the effects of these interventions on the rate of tooth movement. STUDY DESIGN: Electronic [MedLine; SCOPUS; Cochrane Library; OpenGrey;Web of Science] and manual searches were conducted up to January 26th, 2016 in order to identify publications of clinical trials that compared the decreasing or inhibiting effects of different biology-based methods over OTM in humans. A primary outcome (rate of OTM deceleration/inhibition) and a number of secondary outcomes were examined (clinical applicability, orthodontic force used, possible side effects). Two reviewers selected the studies complying with the eligibility criteria (PICO format) and assessed risk of bias [Cochrane Collaboration's tool]. Data collection and analysis were performed following the Cochrane recommendations. RESULTS: From the initial electronic search, 3726 articles were retrieved and 5 studies were finally included. Two types of biology-based techniques used to reduce the rate of OTM in humans were described: pharmacological and low-level laser therapy. In the first group, human Relaxin was compared to a placebo and administered orally. It was described as having no effect on the inhibition of OTM in humans after 32 days, while the drug tenoxicam, injected locally, inhibited the rate of OTM by up to 10% in humans after 42 days. In the second group, no statistically significant differences were reported, compared to placebo, for the rate of inhibition of OTM in humans after 90 days of observation when a 860 nm continuous wave GaAlA slow-level laser was used. CONCLUSIONS: The currently available data do not allow us to draw definitive conclusions about the use of various pharmacological substances and biology-based therapies in humans able to inhibit or decrease the OTM rate. There is an urgent need for more sound well-designed randomized clinical trials in the field. Humans;Tooth;Tooth Mobility;Tooth Movement Techniques

Effects of low-level laser therapy and platelet concentrate on bone repair: Histological, histomorphometric, immunohistochemical, and radiographic study. PURPOSE: Low-level laser therapy (LLLT) can increase bone metabolism, cell proliferation, and maturation, and reduce inflammation, while platelet concentrate (PC) assists bone healing process by releasing proteins and growth factors. Here, we evaluated the efficacy of combined LLLT and PC therapy in the healing of critical-size bone defects. MATERIALS AND METHODS: Calvarial critical-size defects 5Â mm in diameter were made in 48 Wistar rats. Bones were removed, milled, and used as autogenous bone grafts. Animals were randomized into four groups: LP (LLLTÂ +Â PC), PC, L (LLLT), and C (control, autogenous graft only). Animals were sacrificed at day 30 and 60 post-surgery. Specimens were submitted to radiographic (digital and conventional), histological, histomorphometric, and immunohistochemical analyses. RESULTS: Digital radiography was shown to be a better image analysis method compared with conventional radiography. Histological analysis demonstrated a significant difference in bone formation between animals in group L (pÂ =Â 0.049) at day 60 than in other groups. Higher rates of inflammatory infiltrates and fibrosis were observed in the LP and PC groups at days 30 and 60, whereas the groups not receiving PC showed a higher rate of bone maturity. The inflammatory processes were reduced in the animals in the L group, together with new bone formation and maturation. Groups L and C had higher scores of positive osteocalcin

immunostaining in bone and extracellular matrix. CONCLUSIONS: LLLT reduces inflammation and contributes to increased bone formation. PC treatment was shown to maintain connective tissue and to induce fibrosis during bone repair. Combined LLLT and PC treatment did not improve bone repair. Animals;Fibrosis;Image Processing, Computer-Assisted;Immunohistochemistry;Low-Level Light Therapy;Male;Osseointegration;Platelet-Rich Plasma;Radiography;Random Allocation;Rats, Wistar;Skull;Wound Healing

Red/near infrared light stimulates release of an endothelium dependent vasodilator and rescues vascular dysfunction in a diabetes model. Peripheral artery disease (PAD) is a morbid condition whereby ischemic peripheral muscle causes pain and tissue breakdown. Interestingly, PAD risk factors, e.g. diabetes mellitus, cause endothelial dysfunction secondary to decreased nitric oxide (NO) levels, which could explain treatment failures. Previously, we demonstrated 670nm light (R/NIR) increased NO from nitrosyl-heme stores, therefore we hypothesized R/NIR can stimulate vasodilation in healthy and diabetic blood vessels. Vasodilation was tested by ex vivo pressure myography in wild type C57Bl/6, endothelial nitric oxide synthase (eNOS) knockout, and db/db mice (10mW/cm(2) for 5min with 10min dark period). NOS inhibition with N-Nitroarginine methyl ester (L-NAME) or the NO scavenger Carboxy-PTIO (c-PTIO) tested the specificity of NO production. 4,5-Diaminofluorescein diacetate (DAF-2) measured NO in human dermal microvascular endothelial cells (HMVEC-d). R/NIR significantly increased vasodilation in wild type and NOS inhibited groups, however R/NIR dilation was totally abolished with c-PTIO and blood vessel denudation. Interestingly, the bath solution from intact R/NIR stimulated vessels could dilate light naÃ¯ve vessels in a NO dependent manner. Characterization of the bath identified a NO generating substance suggestive of S-nitrosothiols or non heme iron nitrosyl complexes. Consistent with the finding of an endothelial source of NO, intracellular NO increased with R/NIR in HMVEC-d treated with and without L-NAME (1mM), yet c-PTIO (100Âµm) reduced NO production. R/NIR significantly dilated db/db blood vessels. In conclusion, R/NIR stimulates vasodilation by release of NO bound substances from the endothelium. In a diabetes model of endothelial dysfunction, R/NIR restores vasodilation, which lends the potential for new treatments for diabetic vascular disease. Endothelium-Dependent Relaxing Factors;Nitric Oxide;Nitric Oxide Synthase Type III Animals;Diabetes Mellitus, Experimental;Endothelium, Vascular;Endothelium-Dependent Relaxing Factors;Humans;Infrared Rays;Light;Mice;Mice, Inbred C57BL;Nitric Oxide;Nitric Oxide Synthase Type III

Identification, assessment and management of breast oedema after treatment for cancer. Advances in breast cancer management, including breast-conserving surgery, have resulted in an increase in the incidence of breast oedema. However, this is addressed by professionals less often than arm lymphoedema. Breast oedema results in significant physical and psychological morbidity, makes finding a comfortably fitting bra very difficult, and can act as a reminder of the initial breast cancer diagnosis. Psychological difficulties can be compounded by clinicians' failure to acknowledge the impact. Assessing and managing breast oedema requires a sensitive, skilled approach to ensure all the relevant issues are identified and addressed in a comprehensive care plan; taking time to listen to patients and acknowledging the impact can be very therapeutic. The principles of managing breast oedema are based on lymphoedema practice, particularly manual lymphatic drainage and kinesio taping. This article gives an overview of the identification, assessment and management of breast oedema following treatment of cancer. Athletic Tape;Breast Neoplasms;Diagnosis, Differential;Exercise;Female;Humans;Low-Level Light Therapy;Lymphedema;Massage;Risk Factors;Skin Care;Upper Extremity

Immunomodulatory effects of two different physical therapy modalities in patients with chronic obstructive pulmonary disease. [Purpose] Counteracting the systemic cytokine release and its inflammatory effects by improving respiratory muscle strength and controlling lung inflammation

may be important for improving immune system in patients with chronic obstructive pulmonary disease, So the aim of the present study was to evaluate the effect of low level laser therapy and inspiratory muscle training on interleukin-6 (IL-6) as a marker of inflammation and CD4+/CD8+ ratio as a marker for T Lymphocytes in these patients. [Subjects and Methods] Forty male patients with stable COPD participated in the study, their ages ranged between 55-65â€…years. They were randomly divided into group (A) who received inspiratory muscle training and group (B) who received low level laser (LLL) acupuncture stimulation for about 8 week. [Results] There was a reduction in the concentration of plasma IL-6 associated with an increase in CD4+/CD8+ ratio in both groups, but laser was superior to inspiratory muscle training. IL-6 and CD4+/CD8+ were negatively correlated. [Conclusion] Both inspiratory muscle training and low level laser therapy are effective physical therapy modalities in promoting immune disturbances. The results also supported the superior role of LLLT over IMT in managing immune disturbances.

Laser Treatment of Professional Tattoos With a 1064/532-nm Dual-Wavelength Picosecond Laser. BACKGROUND: Picosecond-domain laser pulses improve the photomechanical disruption of tattoos. OBJECTIVE: This study evaluates the efficacy and safety of a novel, dual-wavelength, 1,064/532-nm, picosecond-domain laser for tattoo clearance. MATERIALS AND METHODS: This was a prospective, self-controlled, clinical study of 34 subjects with 39 tattoos treated at 2 sites with an interval of 4.8 Â± 1.6 weeks and up to 10 treatments (mean, 7.5). Blinded evaluation and investigator assessment of serial digital images was performed to evaluate treatment efficacy in the 36 tattoos that received at least 3 treatments. Investigators also assessed efficacy before each treatment visit up to 10 treatments. Safety and tolerability was evaluated for all 39 tattoos that underwent at least 1 treatment. RESULTS: Blinded evaluation demonstrated that lightening of tattoos was achieved in all subjects, with 86% (31 of 36 tattoos) showing at least a 50% clearance after 3 treatments. Adverse events were few and transient in nature. Patient satisfaction and treatment tolerability were high. CONCLUSION: Treatment of single-colored and multicolored tattoos with this novel 1,064/532-nm picosecond laser is highly safe and effective. Adult;Aged;Cosmetic Techniques;Female;Humans;Ink;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Tattooing;Young Adult

Editorial. Dermal Fillers Cosmetic Techniques;Dermal Fillers;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Aging

Ranibizumab after laser photocoagulation failure in retinopathy of prematurity (ROP) treatment. The purpose of this study was to investigate the anatomical and functional outcomes of the two-stage treatment of severe retinopathy of prematurity (ROP) using laser photocoagulation and intravitreal ranibizumab injection. The medical records of 53 eyes of 28 infants treated by conventional laser photocoagulation with deferred intravitreal 0.25â€‰mg/0.025â€‰mL ranibizumab injection were analysed. All patients had at least 11 months of follow-up. In the analysed group, the mean gestational age at birth was 25â€‰weeks and mean birthweight was 790â€‰g. The mean time of laser photocoagulation was 34â€‰weeks of postmenstrual age (PMA). Ranibizumab injection was performed on average at 37â€‰weeks of PMA. The mean time between interventions was 19 days. Retinal detachment occurred in 12 eyes (22.6%), in three children bilaterally. Visual responses were obtained in 23 of 28 treated children. Our results indicate that ranibizumab injection can be taken into consideration in the selected cases of laser photocoagulation failure. The unsatisfactory results of this study elicited a change in the ROP treatment protocol in our medical centre. The study gives an insight into anatomical and functional outcomes of ROP treatment in the Central and Eastern European population. Ranibizumab Female;Follow-Up Studies;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Ranibizumab;Recovery of Function;Retinopathy of Prematurity;Retrospective Studies;Vision, Ocular

Fractional laser exposure induces neutrophil infiltration (N1 phenotype) into the tumor and stimulates systemic anti-tumor immune response. BACKGROUND: Ablative fractional photothermolysis (aFP) using a CO2 laser generates multiple small diameter tissue lesions within the irradiation field. aFP is commonly used for a wide variety of dermatological indications, including treatment of photodamaged skin and dyschromia, drug delivery and modification of scars due to acne, surgical procedures and burns. In this study we explore the utility of aFP for treating oncological indications, including induction of local tumor regression and inducing anti-tumor immunity, which is in marked contrast to current indications of aFP. METHODOLOGY/PRINCIPAL FINDINGS: We used a fractional CO2 laser to treat a tumor established by BALB/c colon carcinoma cell line (CT26.CL25), which expressed a tumor antigen, beta-galactosidase (beta-gal). aFP treated tumors grew significantly slower as compared to untreated controls. Complete remission after a single aFP treatment was observed in 47% of the mice. All survival mice from the tumor inoculation rejected re-inoculation of the CT26.CL25 colon carcinoma cells and moreover 80% of the survival mice rejected CT26 wild type colon carcinoma cells, which are parental cells of CT26.CL25 cells. Histologic section of the FP-treated tumors showed infiltrating neutrophil in the tumor early after aFP treatment. Flow cytometric analysis of tumor-infiltrating lymphocytes showed aFP treatment abrogated the increase in regulatory T lymphocyte (Treg), which suppresses anti-tumor immunity and elicited the expansion of epitope-specific CD8+ T lymphocytes, which were required to mediate the tumor-suppressing effect of aFP. CONCLUSION: We have demonstrated that aFP is able to induce a systemic anti-tumor adaptive immunity preventing tumor recurrence in a murine colon carcinoma in a mouse model. This study demonstrates a potential role of aFP treatments in oncology and further studies should be performed. Animals;CD8-Positive T-Lymphocytes;Cell Line, Tumor;Colonic Neoplasms;Female;Immunity, Cellular;Lasers;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Neutrophil Infiltration;Neutrophils;T-Lymphocytes, Regulatory

Erbium:Yttrium Aluminum Garnet Laser-Activated Sodium Hypochlorite Irrigation: A Promising Procedure for Minimally Invasive Endodontics. OBJECTIVE: This study was to evaluate the potential of Erbium:Yttrium Aluminum Garnet laser-activated sodium hypochlorite irrigation (Er:YAG + NaOCl) for minimally invasive endodontics (MIE). BACKGROUND DATA: Er:YAG laser irradiation can dramatically enhance the penetration of NaOCl, which may be a promising protocol for MIE. METHODS: Extracted human teeth were contaminated with Enterococcus faecalis for 4 weeks. The infected canals were then shaped to different apical terminal working widths (ATWW, 15#/0.04, 20#/0.04, 25#/0.04, 30#/0.04, and 40#/0.04) and treated with either Er:YAG + NaOCl (0.3â€‰W, 20â€‰sec) or NaOCl alone. Then, the ATWW were fixed at 15#/0.04, and the canals were treated with Er:YAG + NaOCl at 0.3â€‰W for 40 and 60â€‰sec, or at 0.5 and 1.0â€‰W for 20â€‰sec. Finally, bacterial reductions were evaluated using the cell count method. RESULTS: Er:YAG + NaOCl showed a higher disinfection efficacy at each ATWW compared with NaOCl alone (pâ€‰<â€‰0.001). The maximum bacterial reduction was 99.9% for the 40#/Er:YAG + NaOCl group and 93.6% for the 40#/NaOCl group. To achieve similar disinfection efficacy, the Er:YAG + NaOCl group needed a smaller ATWW than the NaOCl group. At a fixed ATWW, increasing the output power of the Er:YAG laser was more effective than increasing the radiation time to improve the disinfection efficacy of Er:YAG + NaOCl. The 15#/Er:YAG + NaOCl group reached the maximum bacterial reduction of 99.2% when the Er:YAG laser was activated at 1.0â€‰W for 20â€‰sec. CONCLUSIONS: The 15#/Er:YAG + NaOCl with the Er:YAG laser irradiation at 1.0â€‰W for 20â€‰sec may be considered a promising procedure for MIE. Root Canal Irrigants;Sodium Hypochlorite Dental Pulp Cavity;Enterococcus faecalis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite

Assessment of Low-Level Laser Therapy Effects After Extraction of Impacted Lower Third Molar Surgery. Introduction: The aim of this study was to assess the effect of low-level laser therapy (LLLT) on pain, swelling and maximum mouth opening in patients undergoing third molar surgery. Methods: A prospective, randomized double-blind study was undertaken on 44 patients at the Dental School, Ahvaz Jundishapur University of Medical Sciences, in 2015. A low-level laser was randomly applied on one of the two sides after surgery of 15 patients. The experimental side received 18 J/cm(2) of energy density, wavelength of 980 nm, and output power of 1.8 W. On the control side, a hand-piece was applied intra-orally, but laser was not activated. In addition, in order to evaluate trismus, 13 patients were treated by unilateral laser therapy and 16 patients did not receive laser therapy at all. The laser was administered intraorally on two points of vestibular and lingual sides at 1 cm from the surgery site, and extraorally at the emergence of the masseter muscle, immediately after surgery, and repeated 24 hours later. The pain, swelling and maximum mouth opening (MMO) were compared between the two groups at 24 hours and a week after surgery. Results: The mean score of pain 24 hours after surgery in the laser therapy group (2.3 Â± 3.5) was significantly lower than the mean score of pain in the drug therapy (4.19 Â± 3.09) (P = 0.036). Moreover, the mean score of pain at one week after surgery in the laser therapy group (0.13 Â± 2.33) was significantly lower than the drug therapy group (1.43 Â± 2.45) (P = 0.046). The amount of swelling according to different measurements did not significantly differ between the two groups neither at 24 hours nor at 1 week after surgery. Conclusion: Our findings showed that LLLT was useful in reducing pain and could slightly reduce swelling compared to drug therapy in impacted third molar surgery.

Relieving Pain in Oral Lesions of Pemphigus Vulgaris Using the Non-ablative, Non-thermal, CO(2) Laser Therapy (NTCLT): Preliminary Results of a Novel Approach. Introduction: Pemphigus vulgaris (PV) is a chronic, serious autoimmune mucocutaneous bullous disease. Oral lesions in PV may be extremely painful. This pain may adversely affect the patients' oral intake and quality of life. This before-after clinical trial was designed to assess the pain relieving effects of single session of non-ablative, non-thermal CO(2) laser therapy (NTCLT) in oral lesions of PV. Methods: Fifty painful oral lesions of fourteen patients with PV were illuminated by CO(2) laser (power: 1 W, scanning the lesions with rapid circular motion of the handpiece) passing through a thick layer of transparent gel with high water content. The pain severity of the oral lesions was reported by the patients up to the fourth postoperative day. They were also asked to continue their existing systemic treatment during the course of this study as a precondition for the participation. Results: The severity of contact and non-stimulate (non-contact) pain declined immediately and significantly after NTCLT ($P < 0.001$). The pain relieving effect was sustained during the four successive days of follow-up. The procedure was pain free and no kind of analgesics was required. Following NTCLT, there were no visible thermal complications such as destruction, ablation or irritation of the oral lesions. Conclusion: The results of the trial proposed that single session of NTCLT could immediately and significantly relieve pain in oral lesions of PV, without any visible thermal complications.

Clinical and Histological Evaluations of Enlarged Facial Skin Pores After Low Energy Level Treatments With Fractional Carbon Dioxide Laser in Korean Patients. BACKGROUND: Enlarged facial pores can be an early manifestation of skin aging and they are a common aesthetic concern for Asians. However, studies of improving the appearance of enlarged pores have been limited. OBJECTIVE: The authors aimed to study the application of CO2 fractional laser treatment in patients with enlarged facial pores. METHODS: A total of 32 patients with dilated facial pores completed 3 consecutive sessions of low energy level treatments with a fractional CO2 laser at 4-week intervals. Image analysis was performed to calculate the number of enlarged pores before each treatment session and 12 weeks after the final treatment. RESULTS: After application of laser treatments, there was a significant decrease in the number of enlarged pores. The mean number of enlarged pores was

decreased by 28.8% after the second session and by 54.5% at post-treatment evaluation. Post-treatment side effects were mild and transitory. Histological and immunohistochemical analyses demonstrated clear increases in the number of collagen fibers and the expression of transforming growth factor-Î²1. CONCLUSION: The short-term results showed that treatment with low energy level CO2 fractional laser therapy could be a safe and effective option for patients with Fitzpatrick skin Types III and IV who are concerned with enlarged pores. Adult;Asian People;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Skin;Skin Aging

Photobiomodulation with 670Â nm light ameliorates MÃ¼ller cell-mediated activation of microglia and macrophages in retinal degeneration. MÃ¼ller cells, the supporting cells of the retina, play a key role in responding to retinal stress by releasing chemokines, including CCL2, to recruit microglia and macrophages (MG/MÎ¦) into the damaged retina. Photobiomodulation (PBM) with 670Â nm light has been shown to reduce inflammation in models of retinal degeneration. In this study, we aimed to investigate whether 670Â nm light had an effect on MÃ¼ller cell-initiated inflammation under retinal photo-oxidative damage (PD) inÂ vivo and inÂ vitro. Sprague-Dawley rats were pre-treated with 670Â nm light (9J/cm(2)) once daily over 5 days prior to PD. The expression of inflammatory genes including CCL2 and IL-1Î² was analysed in retinas. InÂ vitro, primary MÃ¼ller cells dissociated from neonatal rat retinas were co-cultured with 661W photoreceptor cells. Co-cultures were exposed to PD, followed by 670Â nm light treatment to the MÃ¼ller cells only, and MÃ¼ller cell stress and inflammation were assessed. Primary MG/MÎ¦ were incubated with supernatant from the co-cultures, and collected for analysis of inflammatory activation. To further understand the mechanism of 670Â nm light, the expression of COX5a and mitochondrial membrane potential (Î”Î¨m) were measured in MÃ¼ller cells. Following PD, 670Â nm light-treated MÃ¼ller cells had a reduced inflammatory activation, with lower levels of CCL2, IL-1Î² and IL-6. Supernatant from 670Â nm light-treated co-cultures reduced activation of primary MG/MÎ¦, and lowered the expression of pro-inflammatory cytokines, compared to untreated PD controls. Additionally, 670Â nm light-treated MÃ¼ller cells had an increased expression of COX5a and an elevated Î”Î¨m following PD, suggesting that retrograde signaling plays a role in the effects of 670Â nm light on MÃ¼ller cell gene expression. Our data indicates that 670Â nm light reduces MÃ¼ller cell-mediated retinal inflammation, and offers a potential cellular mechanism for 670Â nm light therapy in regulating inflammation associated with retinal degenerations. Chemokines;Cytochrome c Group;Interleukins Animals;Chemokines;Cytochrome c Group;Disease Models, Animal;Ependymoglial Cells;Interleukins;Macrophages;Membrane Potential, Mitochondrial;Microglia;Oxidative Stress;Rats;Rats, Sprague-Dawley;Retinal Degeneration

No trustworthy evidence about the effectiveness of laser therapy or ibuprofen to minimize pain during orthodontic treatment with fixed appliances owing to major limitations in the process to conduct a systematic review. Ibuprofen Humans;Ibuprofen;Low-Level Light Therapy;Orthodontic Appliances, Fixed;Pain;Randomized Controlled Trials as Topic

Safety and Effectiveness of Holmium Laser Enucleation of the Prostate Using a Low-power Laser. OBJECTIVE: To assess the safety and effectiveness of holmium laser enucleation of the prostate (HoLEP) using a low-power 30-W holmium laser with an en bloc enucleation technique. MATERIALS AND METHODS: We retrospectively analyzed 74 patients with a diagnosis of benign prostatic hyperplasia treated with HoLEP using a 30-W laser set at 1.5â€‰J with a frequency of 20â€‰Hz, as a low-power setting. The enucleation process was performed using the en bloc technique. Forty-four patients were operated on by an experienced surgeon, whereas 30 patients were operated on by 2 less experienced surgeons. We evaluated the surgical parameters and practicality of the low-power laser. RESULTS: All patients underwent successful HoLEP with the low-power setting; it was not

necessary to increase the output of the laser in any case. Mean preoperative estimated prostate volume was 94.5â€‰mL (range 22-489â€‰mL). Mean total operating time and enucleation time were 91.9â€‰minutes (range 30-232â€‰minutes) and 45.4â€‰minutes (range 13-101â€‰minutes), respectively. No patient required blood transfusion postoperatively. Other intraoperative complications, including capsular perforation and ureteral orifice injury, did not occur. In 55 patients without preoperative stress urinary incontinence (SUI), postoperative SUI was observed in 7 patients (12.7%) at 1 month postoperatively, and in 3 patients (5.5%) at 3 months postoperatively. CONCLUSION: HoLEP using a low-power 30-W holmium laser can be performed safely and without any technical problems; this low-power setting is thought to be sufficient for performing HoLEP. As the introduction costs can be reduced by using a low-power laser, HoLEP could become widespread. Aged;Aged, 80 and over;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prostatic Hyperplasia;Retrospective Studies;Treatment Outcome

An Unusual Case of Contact Dermatitis. We report a case of acute psoriasiform contact dermatitis of the forehead and scalp related to the use of a low-laser light cap. The patient had a positive patch test to dimethylol dihydroxyethyleneurea (DMDE), methylisothiazolinone, kathon CG, and cobalt. We believe that DMDE in the fabric of the cap was responsible for the allergic contact dermatitis in this case as the lesions resolved with cessation of cap use.

The impact of wavelengths of LED light-therapy on endothelial cells. Low level light therapy receives increasing interest in the fields of tissue regeneration and wound healing. Several in vivo studies demonstrated the positive effects of LLLT on angiogenesis. This study aimed to investigate the underlying properties in vitro by comparing the effects of light therapy by light emitting diodes of different wavelengths on endothelial cells in vitro. Human umbilical vein endothelial cells were treated with either 475â€‰nm, 516â€‰nm or 635â€‰nm light. Control cells were not illuminated. 2D proliferation was quantified by manual counting. HUVEC migration was analyzed by performing a 2D wound scratch assay and a 3D bead assay. The influence of LLLT on early vasculogenic events was determined in a 3D fibrin co-culture model with adipose-derived stem cells. Stimulation with both red and green pulsed LED light significantly increased HUVEC proliferation and 3D migration. Moreover, HUVEC showed increased 2D migration potential with green light stimulation. The treatment with blue light was ineffective. Several parameters showed that green light was even more potent to stimulate proliferation and migration of endothelial cells than clinically well-established red light therapy. Further studies have to focus on intracellular mechanisms induced by different wavelengths in order to optimize this promising therapy in tissue regeneration. Biomarkers;Reactive Oxygen Species;Nitric Oxide Biomarkers;Cell Movement;Cell Proliferation;Cells, Cultured;Endothelial Cells;Gene Expression;Genes, Reporter;Human Umbilical Vein Endothelial Cells;Humans;Light;Nitric Oxide;Phototherapy;Reactive Oxygen Species

Treatment of experimental periodontal disease by laser therapy in simvastatin-modified rats. OBJECTIVE: The aim of this study was to evaluate low-level laser therapy (LLLT) as an adjuvant treatment for scaling and root planing (SRP) for the treatment of induced periodontitis in simvastatin-modified rats. MATERIAL AND METHODS: A total of 180 rats were evenly divided into two groups: Veh - receiving oral administration of polyethylene glycol (vehicle); S - receiving oral administration of Simvastatin. Periodontal disease was induced in both groups at the first mandibular molar. After seven days, the ligature was removed and the animals were divided into subgroups according to the following local treatments: NT - no treatment; SRP - scaling and root planing and irrigation with saline solution; and LLLT Â¬- SRP and laser irradiation (660 nm; 0.03 W; 4 J). Ten animals in each subgroup/local treatment were euthanized at 7, 15 and 30 days. Samples of gingival tissue were processed to analyze the tissue oxidative damage and radiographic analysis. Levels of oxidative stress were analyzed by the expressions of Tripeptideglutathione (TG), Malondialdehyde (MDA) and

Carbonylated Proteins (CP). RESULTS: The animals in S group had higher levels of TG and lower levels of MDA and CP compared with Veh group ($p<0.05$). Radiographically, in the intragroup analysis Veh and S, LLLT showed lower bone loss (BL) compared with NT and SRP, in all experimental periods ($p<0.01$). In addition, a lower BL was observed for the animals of Veh group treated with LLLT compared with treatment SRP in the S group, in all experimental periods. CONCLUSION: Within the limits of this study, we can conclude that LLLT was effective as adjuvant treatment for SRP protecting against the occurrence of oxidative tissue damages as well as for reducing alveolar bone loss in experimentally induced periodontitis simvastatin-modified rats. Hydroxymethylglutaryl-CoA Reductase Inhibitors;Malondialdehyde;Simvastatin;Glutathione Animals;Dental Scaling;Gingiva;Glutathione;Hydroxymethylglutaryl-CoA Reductase Inhibitors;Lasers, Semiconductor;Low-Level Light Therapy;Male;Malondialdehyde;Mandible;Periodontitis;Protein Carbonylation;Radiotherapy, Adjuvant;Random Allocation;Rats, Wistar;Reference Values;Reproducibility of Results;Simvastatin;Time Factors;Treatment Outcome

Lymphedema: Pathogenesis and Novel Therapies. Lymphedema affects up to 1 in 6 patients who undergo treatment for a solid tumor in the United States. Its prevalence has increased as more effective oncologic therapies have improved patient survival, but there remains no definitive cure. Recent research has elucidated new details in the pathogenesis of the disease and has demonstrated that it is fundamentally an immunologic process that ultimately results in inflammation, fibroadipose deposition, impaired lymphangiogenesis, and dysfunctional lymphatic pumping. These findings have allowed for the development of novel medical and surgical therapies that may potentially alter the standard of care for a disease that has largely been treated by compression. This review seeks to provide an overview of the emerging therapies and how they can be utilized for effective management of lymphedema. Vascular Endothelial Growth Factor C Breast Cancer Lymphedema;Disease Progression;Exercise Therapy;Genetic Therapy;Humans;Intermittent Pneumatic Compression Devices;Lipectomy;Low-Level Light Therapy;Lymph Nodes;Lymphatic Vessels;Lymphedema;Manual Lymphatic Drainage;Severity of Illness Index;Stem Cell Transplantation;Stockings, Compression;Vascular Endothelial Growth Factor C;Vascular Surgical Procedures;Veins;Weight Reduction Programs

Quantum dot light emitting devices for photomedical applications. While OLEDs have struggled to find a niche lighting application that can fully take advantage of their unique form factors as thin, flexible, lightweight and uniformly large-area luminaire, photomedical researchers have been in search of low-cost, effective illumination devices with such form factors that could facilitate widespread clinical applications of photodynamic therapy (PDT) or photobiomodulation (PBM). Although existing OLEDs with either fluorescent or phosphorescent emitters cannot achieve the required high power density at the right wavelength windows for photomedicine, the recently developed ultrabright and efficient deep red quantum dot light emitting devices (QLEDs) can nicely fit into this niche. Here, we report for the first time the in-vitro study to demonstrate that this QLED-based photomedical approach could increase cell metabolism over control systems for PBM and kill cancerous cells efficiently for PDT. The perspective of developing wavelength-specific, flexible QLEDs for two critical photomedical fields (wound repair and cancer treatment) will be presented with their potential impacts summarized. The work promises to generate flexible QLED-based light sources that could enable the widespread use and clinical acceptance of photomedical strategies including PDT and PBM.

Insufficient Evidence Supports the Use of Low-Level Laser Therapy to Accelerate Tooth Movement, Prevent Orthodontic Relapse, and Modulate Acute Pain During Orthodontic Treatment. ARTICLE TITLE AND BIBLIOGRAPHIC INFORMATION: Efficacy of low-level laser therapy in accelerating tooth movement, preventing relapse and managing acute pain during orthodontic treatment in humans: A

systematic review. Sonesson M, De Geer E, Subraian J, PetrÃ©n S. BMC Oral Health 2017;17:11. SOURCE OF FUNDING: No funding was obtained for this study TYPE OF STUDY/DESIGN: Systematic review. Acute Pain;Humans;Low-Level Light Therapy;Recurrence;Tooth Movement Techniques;Treatment Outcome

Improvement of dairy cow embryo yield with low level laser irradiation. The goal of this study is to estimate the effects of low-level laser irradiation (LLLI) on the superovulatory response according to the number of corpora lutea (CL), follicles (F) and the embryo yield. In recent years, while searching for new, more efficient and organic methods to improve superovulatory response and embryo yield with respect to the conventional methods, low-level laser irradiation (LLLI) is a more sensitive and less costly technology that can be used to improve animal reproduction, namely, artificial insemination and the embryo production system. The dairy-cow donors were treated for superovulation with PlusetÂ®, at any time during the oestrus cycle, and the total dose per donor was 700 IU. The first group of the donors (n=25), test group (TG), was irradiated on the sacroiliac area for 180 seconds per day, from the 1st to 11th superovulatory treatment (ST) days in a row, with LLLI in the 870-970-nm wavelength, 65.93 J/cm dose, frequencies in the 20-2000 Hz range and pulse durations commonly in the range of about 1 second. For the second control group (CG) (n=25), the ST was performed without LLLI. After the ST, The mean number of CL in the right side ovaries in the TG was 25.43% ($p<0.05$) greater than in those of the CG. The number of total recovered and transferable embryos was greater in the TG compared with the CG by 28.97% ($p<0.05$) and 15.8% ($p>0.05$), respectively. With respect to conventional methods, LLLI can be used to improve the superovulatory response and embryo yield as a supplementary environment and animal-friendly method of treatment. Luteinizing Hormone;Follicle Stimulating Hormone Animals;Cattle;Embryo Transfer;Embryo, Mammalian;Female;Follicle Stimulating Hormone;Lasers;Luteinizing Hormone;Ovary;Ovulation Induction;Superovulation

EDITORIAL. Cosmetic Techniques;Humans;Lasers, Excimer;Low-Level Light Therapy;Skin Aging

Treatment of mild to moderate carpal tunnel syndrome in patients with diabetic neuropathy using low level laser therapy versus ultrasound controlled comparative study. AIM: The aim of the present study was to investigate and compare between Low Level Laser Therapy (LLLT) and Ultrasound (US) in treatment of Carpal Tunnel Syndrome (CTS) using the advantage of application of treatment directly over the transverse carpal ligament, as well as over the course of the median nerve in the forearm simultaneously. DESIGN: Fifty patients (25-55Â years) with diabetic neuropathy, diagnosed as unilateral carpal tunnel syndrome participated in the study. They were equally divided and randomly assigned into two groups; each group consisted of 25 patients. MATERIALS AND METHODS: Patients in group (A) received a program of IR Gallium Arsenide LLLT (wavelength 904Â nm, average power 20Â mW, laser probe 7Â mm diameter), with a total application of 4.8Â J, while patients in group (B) received a program of US (frequency 1Â MHz, power 1.0Â W/cm(2), pulsed mode 1:5). RESULTS & DISCUSSION: The results of our study showed that there were no statistical significance differences (PÂ >Â 0.05) were observed between the two groups. It was concluded that both low level laser (20Â mW power, 904Â nm Wavelength) and ultrasound (1.0Â w/cm(2) power, 1Â MHz frequency) are effective in the treatment of mild and moderate CTS patients.

Evaluation of autologous platelet-rich plasma plus ablative carbon dioxide fractional laser in the treatment of acne scars. INTRODUCTION: Acne scar is a common distressing complication of acne vulgaris. CO(2) laser resurfacing proved effective for the treatment of this problem, but the associated complications may limit its use. Platelet-rich plasma (PRP) may increase the chance of favorable outcome. AIM OF THE WORK: To evaluate the synergistic effects of autologous PRP with

fractional CO(2) laser resurfacing in the treatment of acne scars among Egyptian patients. PATIENTS AND METHOD: This study included 30 patients suffering from post-acne scars. CO(2) laser treatment was applied to both sides of the face followed by PRP injection for the right side. Evaluation was carried out through operating physicians, two blinded physicians as well as through patient's satisfaction. RESULT: The right side of the face (PRP-treated side) achieved excellent improvement in 13.3% of the patients, while there was no excellent improvement on the left side. CONCLUSION: Combination of fractional CO(2) laser resurfacing and intradermal PRP was superior to CO(2) laser alone for acne scar treatment. Acne Vulgaris;Adolescent;Adult;Cicatrix;Egypt;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Platelet-Rich Plasma;Single-Blind Method;Young Adult

Treatment of peripheral vestibular dysfunction using photobiomodulation. Gentamicin, which is still used in modern medicine, is a known vestibular toxic agent, and various degrees of balance problems have been observed after exposure to this pharmacologic agent. Photobiomodulation is a candidate therapy for vertigo due to its ability to reach deep inner ear organs such as the cochlea. Previous reports have suggested that photobiomodulation can improve hearing and cochlea function. However, few studies have examined the effect of photobiomodulation on balance dysfunction. We used a rat model to mimic human vestibulopathy resulting from gentamicin treatment and evaluated the effect of photobiomodulation on vestibular toxicity. Slow harmonic acceleration (SHA) rotating platform testing was used for functional evaluation and both qualitative and quantitative epifluorescence analyses of cupula histopathology were performed. Animals were divided into gentamicin only and gentamicin plus laser treatment groups. Laser treatment was applied to one ear, and function and histopathology were evaluated in both ears. Decreased function was observed in both ears after gentamicin treatment, demonstrated by low gain and no SHA asymmetry. Laser treatment minimized the damage resulting from gentamicin treatment as shown by SHA asymmetry and recovered gain in the treated ear. Histology results reflected the functional results, showing increased hair cell density and epifluorescence intensity in laser-treated cupulae. Anti-Bacterial Agents;Gentamicins Animals;Anti-Bacterial Agents;Cochlea;Ear, Inner;Gentamicins;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Vertigo;Vestibular Neuronitis;Vestibule, Labyrinth

Effect of in vivo low-level laser therapy on bone marrow-derived mesenchymal stem cells in ovariectomy-induced osteoporosis of rats. Postmenopausal osteoporosis (PMOP) is considered by decreased bone strength that escalates the threat of fractures. Positive effects of photobiomodulation (PBM) with pulse wave have been demonstrated in cell culture and animal models. The aim of this study was to assess the in vivo effects of PBM on viability and calcium ion release of ovariectomy induced osteoporosis (OVX) - bone marrow derived mesenchymal stem cells (BMMSCs). MATERIAL AND METHODS: 18 female rats were distributed into the following groups: 1) control healthy, 2) LASER-healthy (890nm, 80Hz, 1.5J/cm(2), three days weekly, 60days), 3) control OVX, 4) LASER-OVX, 5) Alendronate (Alen.)-OVX [0.5mg/kg, 5days per week, 60days], and 6) Alen.+LASER-OVX. Ovariectomy was done on rats of groups 3, 4, 5 and 6. After that all rats were euthanized and their MSC harvested and cultured in complete osteogenic medium. In all groups, BMMSC viability, and calcium colorimetric assay were performed. RESULTS: We observed a significant increase in optical density (OD) of BMMSCs viability in LASER healthy group compared to control-OVX, Alen.-OVX, LASER-OVX, LASER+Alen.-OVX, groups. LASER+Alen.-OVX group displayed a significant escalation in OD of BMMSCs viability compared to LASER-OVX, Alen.-OVX, and control-OVX groups. There were a significant increase in calcium ion release of LASER-healthy group compared to control healthy, control-OVX, Alen.-OVX, LASER-OVX, and LASER+Alen.-OVX groups. LASER+Alen.-OVX group displayed a significant escalation in calcium ion release compared to LASER-OVX, Alen.-OVX, and control-OVX groups. CONCLUSION: Pulse wave (PW) PBM significantly stimulated viability and cell

proliferation of healthy BMMSCs compared to those of control-OVX, OVX-alendronate, OVX-LASER, and LASER+alendronate-OVX. In addition stimulatory effect of LASER+alendronate on viability and cell proliferation of OVX-BMMSCs compared to those of control-OVX, alendronate-OVX, and LASER-OVX groups were found. Bone Density Conservation Agents;Calcium;Alendronate Alendronate;Animals;Bone Density Conservation Agents;Bone Marrow Cells;Calcium;Cell Differentiation;Cell Survival;Cells, Cultured;Colorimetry;Female;Immunophenotyping;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Osteoporosis;Ovariectomy;Rats;Rats, Wistar

Stimulation of morphofunctional repair of the facial nerve with photobiomodulation, using the end-to-side technique or a new heterologous fibrin sealant. This research evaluated the influence of Photobiomodulation Therapy (PBMT) on lesions of the facial nerve repaired with the end-to-side technique or coaptation with a new heterologous fibrin sealant. Thirty-two Wistar rats were separated into 5 groups: Control group (CG), where the buccal branch of the facial nerve was collected; Experimental Suture Group (ESG) and Experimental Fibrin Group (EFG), in which the buccal branch was end-to-side sutured to the zygomatic branch on the right side of the face or coaptated with fibrin sealant on the left side; Experimental Suture Laser Group (ESLG) and Experimental Fibrin Laser Group (EFLG), in which the same procedures were performed as the ESG and EFG, associated with PBMT (wavelength of 830nm, energy density 6.2J/cm(2), power output 30mW, beam area of 0.116cm(2), power density 0.26W/cm(2), total energy per session 2.16J, cumulative dose of 34.56J). The laser was applied for 24s/site at 3 points on the skin's surface, for a total application time of 72s, performed immediately after surgery and 3 times a week for 5weeks. A statistically significant difference was observed in the fiber nerve area between the EFG and EFLG (57.49Â±3.13 and 62.52Â±3.56Î¼m(2), respectively). For the area of the axon, fiber diameter, axon diameter, myelin sheath area and myelin sheath thickness no statistically significant differences were found ($p<0.05$). The functional recovery of whisker movement occurred faster in the ESLG and EFLG, which were associated with PBMT, with results closer to the CG. Therefore, PBMT accelerated morphological and functional nerve repair in both techniques. Fibrin Tissue Adhesive;Snake Venoms Animals;Facial Nerve;Facial Nerve Injuries;Fibrin Tissue Adhesive;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron, Transmission;Rats;Rats, Wistar;Snake Venoms

Laser therapy seems to have benefits when used for treating oral pigmentation, yet there is no evidence of its relative effectiveness compared with other treatments. Humans;Laser Therapy;Low-Level Light Therapy;Oral Ulcer;Pigmentation;Treatment Outcome

cDNA microarray analysis of human keratinocytes cells of patients submitted to chemoradiotherapy and oral photobiomodulation therapy: pilot study. Oral mucositis is an acute toxicity that occurs in patients submitted to chemoradiotherapy to treat head and neck squamous cell carcinoma. In this study, we evaluated differences in gene expression in the keratinocytes of the oral mucosa of patients treated with photobiomodulation therapy and tried to associate the molecular mechanisms with clinical findings. From June 2009 to December 2010, 27 patients were included in a randomized double-blind pilot study. Buccal smears from 13 patients were obtained at days 1 and 10 of chemoradiotherapy, and overall gene expression of samples from both dates were analyzed by complementary DNA (cDNA) microarray. In addition, samples from other 14 patients were also collected at D1 and D10 of chemoradiotherapy for subsequent validation of cDNA microarray findings by qPCR. The expression array analysis identified 105 upregulated and 60 downregulated genes in our post-treatment samples when compared with controls. Among the upregulated genes with the highest fold change, it was interesting to observe the presence of genes related to keratinocyte differentiation. Among downregulated genes were observed genes related to cytotoxicity and immune response. The results indicate that genes known to be induced during differentiation of

human epidermal keratinocytes were upregulated while genes associated with cytotoxicity and immune response were downregulated in the laser group. These results support previous clinical findings indicating that the lower incidence of oral mucositis associated with photobiomodulation therapy might be correlated to the activation of genes involved in keratinocyte differentiation. DNA, Complementary Chemoradiotherapy;DNA, Complementary;Double-Blind Method;Female;Gene Expression Profiling;Gene Expression Regulation;Humans;Keratinocytes;Low-Level Light Therapy;Male;Microarray Analysis;Middle Aged;Mouth Mucosa;Pilot Projects;Stomatitis

New photobiomodulation protocol prevents oral mucositis in hematopoietic stem cell transplantation recipients-a retrospective study. Oral mucositis (OM) is an adverse side effect among hematopoietic stem cell transplantation (HSCT) recipients. The objective of this retrospective study was to evaluate the preventive effect of photobiomodulation (PBM) applied three times per week versus seven times per week in patients undergoing HSCT. The risk factors related to the incidence and severity of OM were also assessed. This was a retrospective study that evaluated 99 HSCT recipients who received different PBM protocols. Group I received three sessions per week, and group II received daily treatment. PBM was applied using a continuous-wave diode laser (InGaAlP; MM Optics, SÃ£o Carlos, SP, Brazil) at a wavelength of 660Â nm (visible-red) and a total radiant energy of 0.24Â J per point. The baseline disease, type of transplant, type of conditioning, prophylaxis against graft-versus-host disease, OM grade, absolute leukocyte and platelet counts, and levels of liver and renal function markers were collected from medical records. The patients' age ranged from 13 to 71Â years (mean/SD, 40.54Â Â±Â 16.45). No significant difference was observed between groups I and II regarding sex, age, ethnic, diagnosis, donor type, and conditioning treatment. Both PBM protocols were equally efficient in preventing OM (pÂ =Â 0.34, ANOVA). Independent of the PBM protocol used, patients who received allogeneic transplant (pÂ <Â 0.01-Fischer's exact test), total body irradiation (TBI-12Gy) (pÂ =Â 0.01-chi-square test), busulfan + cyclophosphamide (pÂ <Â 0.01-chi-square test), or methotrexate-containing regimens (pÂ <Â 0.01-Fischer's exact test) demonstrated higher OM incidence and severity. Myelosuppression (pÂ <Â 0.01-Mann-Whitney test) and impaired renal function (pÂ =Â 0.02-Mann-Whitney test) were also considered risk factors for OM. Based on this retrospective data, PBM was effective in preventing OM in patients undergoing HSCT even when it was applied three times a week. A prospective study might be necessary to confirm these findings. Adult;Demography;Female;Hematopoietic Stem Cell Transplantation;Humans;Immunosuppression Therapy;Kidney;Lasers;Low-Level Light Therapy;Male;ROC Curve;Retrospective Studies;Stomatitis;Transplantation Conditioning

Low-level laser therapy: A novel therapeutic approach to temporomandibular disorder - A randomized, double-blinded, placebo-controlled trial. AIMS AND OBJECTIVE: The objective of this study was to assess the effectiveness of low-level laser therapy (LLLT)/low intensity laser therapy (LILT) in the management of temporomandibular joint (TMJ) pain in a random and double-blind research design. MATERIALS AND METHODS: TMJ pain patients, randomly assigned into two groups: Group 1 (n = 20) and Group 2 (n = 20), received 2-3 treatments per week for 8 sessions of active LILT with diode laser (gallium aluminum arsenide, 810 nm, 0.1 W). Measures of TMJ pain during function were evaluated at baseline, after completion of 8 sessions of laser treatment, and 30 days after the final laser therapy. RESULTS: At the final treatment point, within-group, pain reduction was observed in both active LLLT and placebo groups at day 0 (P = 0.000), 8th session (P = 0.000), and 1 month (P = 0.001). Between the groups, there is no significant difference at day 0 (P = 0.214), 8th session (P = 0.806), and 1 month (P = 0.230). Significant increased mouth opening was observed in both Group 1 and Group 2 (P = 0.006 and P = 0.021, respectively) after treatment. However, no significant difference was found between the two groups (P = 0.330). Furthermore, significant improvement in clicking was recorded before and after treatment both in Group 1 (P = 0.000) and Group 2 (P = 0.001).

CONCLUSION: The study suggests that LLLT is not better than placebo at reducing TMJ pain during function. It may be assumed that a more tailored application of LLLT should be developed to take into account the multifactorial aspect of the disorder. Adolescent;Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Temporomandibular Joint Disorders;Temporomandibular Joint Dysfunction Syndrome;Young Adult

Enhanced survival of ischemic skin flap by combined treatment with bone marrow-derived stem cells and low-level light irradiation. The aim of this study is to examine the enhanced survival effect of ischemic skin flap by combined treatment with bone marrow-derived stem cells (BMSCs) and low-level light irradiation (LLLI). The neovasculogenic effect of BMSCs induced by LLLI was detected using a wound healing and tube formation assay. ICR mice were divided into four groups: control group, LLLI group, BMSCs group, and combine-treated group. The percentage of skin flap necrosis area was calculated on the seventh post-operative day. Specimens were harvested for histologic analyses. LLLI promoted BMSC migration and tube formation. The flap survival rate of combined treated group was significantly higher than that of the control group. Histologic results demonstrated a significant increase in neovascularization in the combined treatment group. This study demonstrates that combination treatment of BMSCs and LLLI could enhance the survival of ischemic skin flap in a mouse model. Biomarkers Animals;Biomarkers;Immunohistochemistry;Ischemia;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice, Inbred ICR;Necrosis;Neovascularization, Physiologic;Perfusion;Reproducibility of Results;Surgical Flaps;Wound Healing

Atraumatic restorative treatment associated with antimicrobial photodynamic therapy applied to a patient of an intensive care unit. Combined Modality Therapy;Dental Atraumatic Restorative Treatment;Dental Caries;Female;Humans;Intensive Care Units;Low-Level Light Therapy;Mitral Valve Insufficiency;Photochemotherapy;Pneumonia;Young Adult

Low-level laser therapy for carpal tunnel syndrome. BACKGROUND: The role of low-level laser therapy (LLLT) in the management of carpal tunnel syndrome (CTS) is controversial. While some trials have shown distinct advantages of LLLT over placebo and some other non-surgical treatments, other trials have not. OBJECTIVES: To assess the benefits and harms of LLLT versus placebo and versus other non-surgical interventions in the management of CTS. SEARCH METHODS: On 9 December 2016 we searched CENTRAL, MEDLINE, Embase, and Science Citation Index Expanded for randomised controlled trials (RCTs). We also searched clinical trial registries for ongoing studies. We checked the references of primary studies and review articles, and contacted trial authors for additional studies. SELECTION CRITERIA: We considered for inclusion RCTs (irrespective of blinding, publication status or language) comparing LLLT versus placebo or non-surgical treatment for the management of CTS. DATA COLLECTION AND ANALYSIS: Two review authors independently identified trials for inclusion and extracted the data. For continuous outcomes, we calculated the mean difference (MD) or standardised mean difference (SMD) with a 95% confidence interval (CI) using the random-effects model, calculated using Review Manager. For dichotomous data, we reported risk ratio (RR) and 95% CI. MAIN RESULTS: We identified 22 trials randomising 1153 participants that were eligible for inclusion; nine trials (525 participants, 256 randomised to LLLT) compared LLLT with placebo, two (150 participants, 75 randomised to LLLT) compared LLLT with ultrasound, one compared LLLT with placebo and LLLT with ultrasound, two compared LLLT with steroid injection, and one trial each compared LLLT with other non-surgical interventions: fascial manipulation, application of a pulsed magnetic field, transcutaneous electrical nerve stimulation (TENS), steroid injection, tendon gliding exercises, and applying a wrist splint combined with non-steroidal anti-inflammatory drugs. Three studies compared LLLT as part of multiple interventions. Risk of bias varied across the studies, but was high or unclear in most assessed domains in most studies. Most studies were small, with few

events, and effect estimates were generally imprecise and inconsistent; the combination of these factors led us to categorise the quality of evidence for most outcomes as very low or, for a small number, low. At short-term follow-up (less than three months), there was very low-quality evidence for any effect over placebo of LLLT on CTS for the primary outcome of Symptom Severity Score (scale 1 to 5, higher score represents worsening; MD -0.36, 95% CI -0.78 to 0.06) or Functional Status Scale (scale 1 to 5, higher score represents worsened disability; MD -0.56, 95% CI -1.03 to -0.09). At short-term (less than three months) follow-up, we are uncertain whether LLLT results in a greater improvement than placebo in visual analogue score (VAS) pain (scale 0 to 10, higher score represents worsening; MD -1.47, 95% CI -2.36 to -0.58) and several aspects of nerve conduction studies (motor nerve latency: higher score represents worsening; MD -0.09 ms, 95% CI -0.16 to -0.03; range 3.1 ms to 4.99 ms; sensory nerve latency: MD -0.10 ms, 95% CI -0.15 to -0.06; range 1.8 ms to 3.9 ms), as the quality of the evidence was very low. When compared with placebo at short-term follow-up, LLLT may slightly improve grip strength (MD 2.58 kg, 95% CI 1.22 to 3.95; range 14.2 kg to 25.23 kg) and finger-pinch strength (MD 0.94 kg, 95% CI 0.43 to 1.44; range 4.35 kg to 5.7 kg); however, the quality of evidence was low. Only VAS pain and finger-pinch strength results reached the minimal clinically important difference (MCID) as previously published. We are uncertain about the effect of LLLT in comparison to ultrasound at short-term follow-up for improvement in VAS pain (MD 2.81, 95% CI 1.21 to 4.40) and motor nerve latency (MD 0.61 ms, 95% CI 0.27 to 0.95), as the quality of evidence was very low. When compared with ultrasound at short-term follow-up, LLLT may result in slightly less improvement in finger-pinch strength (MD -0.71 kg, 95% CI -0.94 to -0.49) and motor nerve amplitude (MD -1.90 mV, 95% CI -3.63 to -0.18; range 7.10 mV to 9.70 mV); however, the quality of evidence was low. There was insufficient evidence to assess the long-term benefits of LLLT versus placebo or ultrasound. There was insufficient evidence to show whether LLLT is better or worse in the management of CTS than other non-surgical interventions. For all outcomes reported within these other comparisons, the quality of evidence was very low. There was insufficient evidence to assess adverse events, as only one study reported this outcome. AUTHORS' CONCLUSIONS: The evidence is of very low quality and we found no data to support any clinical effect of LLLT in treating CTS. Only VAS pain and finger-pinch strength met previously published MCIDs but these are likely to be overestimates of effect given the small studies and significant risk of bias. There is low or very low-quality evidence to suggest that LLLT is less effective than ultrasound in the management of CTS based on short-term, clinically significant improvements in pain and finger-pinch strength. There is insufficient evidence to support LLLT being better or worse than any other type of non-surgical treatment in the management of CTS. Any further research of LLLT should be definitive, blinded, and of high quality.

Effect of low-level laser therapy (Î»780Â nm) on the mechanically damaged dentin-pulp complex in a model of extrusive luxation in rat incisors. In order to regenerate the dental pulp, many strategies have been developed as phototherapy. In the pulp repair, we do not know if gallium-aluminum-arsenide (GaAlAs) laser preserves the primary odontoblasts or stimulates the formation of more dentin matrix when dental pulp is damaged. The aim of the present study was to examine the effect of laser phototherapy (Î»780Â nm) on vascularization, inflammation, density of the primary odontoblast layer, and formation of reactionary and reparative dentin in the dental pulp by provoking extrusion of the rat incisor. The upper incisors were extruded 3Â mm and then repositioned into their original sockets followed by a laser irradiation of the palatal mucosa (Î»Â =Â 780Â nm; pÂ =Â 70Â mW; CW; 4.2Â J/cm(2); 60Â s) every 48Â h. Non-traumatized and/or non-irradiated incisors were used as the controls. At 8 and 30Â days after surgery, incisors were processed for histological and histomorphometric analysis. Morphological analysis revealed no differences in vascularization between groups, but showed discrete inflammation in some non-irradiated and

injured specimens, which correlated with a more irregular reparative dentin. The density of primary odontoblasts in the groups treated with lasers was higher when compared to non-irradiated groups, but no statistically significant difference between groups (pÂ >Â 0.05). The thickness of the tertiary dentin was increased in both traumatized groups with no statistically significant difference between non-irradiated and irradiated groups (pÂ >Â 0.05).The present findings revealed that the GaAlAs laser induced small changes on dentin-pulp complex, with more regular dentin matrix in the irradiated dental pulps. Animals;Cells, Cultured;Dental Pulp;Dentin;Disease Models, Animal;Incisor;Low-Level Light Therapy;Male;Odontoblasts;Rats, Wistar;Tooth Avulsion

The influence of low level laser irradiation on vascular reactivity. PURPOSE: The mechanism of action of low level laser irradiation on tissues is unclear. Authors of publications present the positive clinical impact of low and medium power laser irradiation on vascular reactivity. The purpose of this study was to analyze the role of vascular endothelium in laser-induced constricted by endothelin-1 and phenylephrine. MATERIALS AND METHODS: Experiments were performed on isolated and perfused rat tail arteries of weighing 250-350g male Wistar rats. Contractility of arteries as a response to endothelin-1 and phenylephrine was measured after exposure to laser stimulation (10, 30 and 110mW). RESULTS: Laser irradiation inhibits vascular smooth muscle contraction induced by endothelin-1 and an alpha-adrenergic receptor agonist, phenylephrine proportionally to the laser power. Concentration-response curves were shifted to the right with significant reduction in maximal response. Laser irradiation at the power of 10mW, 30mW, and 110mW reduced the maximum response of arteries stimulated with phenylephrine sequentially to 88%, 72%, and 52%. Similar findings were observed during stimulation of endothelin-1. Laser irradiation at the power of 10mW, 30mW and 110mW resulted in maximal response respectively reduced to 94%, 62% and 38%. CONCLUSION: Our results strongly suggest that during low level laser irradiation vascular smooth muscle cells reactivity is reduced, this effect is present in arteries with normal endothelium. The mechanism of action of laser biosimulation on tissues is unclear. Authors of publications present the positive clinical impact of low level laser irradiation on vascular reactivity. Endothelin-1;Phenylephrine Animals;Arteries;Endothelin-1;Low-Level Light Therapy;Muscle Contraction;Perfusion;Phenylephrine;Pressure;Rats, Wistar

Treatment of lesions associated with herpes labialis with low level laser therapy may result in a decrease of pain and recovery time compared with acyclovir.

Superficial hemangioma is better treated by topical 5-aminolevulinic followed by 595-nm pulsed dye laser therapy rather than 595-nm laser therapy alone. The aim of this study was to compare the efficacy and adverse effects of a 595-nm pulsed dye laser therapy alone (PDL alone) with a 5-aminolevulinic (5-ALA) local application followed by a 595-nm PDL (5-ALA PDL) in the treatment of superficial hemangioma (SH). A prospectively randomized study in 181 patients with SH was carried out over a period of 24Â months. One hundred and ninety-three patients were seen. One hundred and eighty-one patients with SH were enrolled, of which 165 completed final follow-up. One hundred and nineteen patients received PDL alone and 46 received 5-ALA PDL. The patients were assessed clinically and the patient's parents were given a satisfaction questionnaire. Baseline patient data (gender, lesion size, lesion site, treatment times, cure rate, and adverse reactions) were recorded and the results of the treatment of the two groups were analyzed and compared. Complete clearing of the lesion (recovery grade 4) was achieved in 44/119 (37.0%) of the PDL alone group and 31/46 (67.4%) of the 5-ALA PDL group (X (2)Â =Â 10.30, pÂ <Â 0.001). Atrophic scars, hyper- and hypopigmentation occurred in both groups (X (2)Â =Â 3.32, pÂ =Â 0.564). The patients' parents' satisfaction was greater in the 5-ALA PDL group. The clinical outcome of 5-ALA PDL was superior to that of PDL alone in the treatment of SH and only minor adverse events occurred in each group. Aminolevulinic Acid Administration, Topical;Aminolevulinic

Acid;Female;Hemangioma;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies

Efficacy of fractional lasers in treating alopecia: a literature review. Hair loss stemming from different types of alopecia, such as androgenic alopecia and alopecia areata, negatively affects over half the population and, in many circumstances, causes serious psychosocial distress. Current treatment options for alopecia, such as minoxidil, anthralin, and intralesional corticosteroids, vary efficacy and side effect profiles. It is known that low-level laser/light therapies (LLLT), or photobiomodulations, such as the US FDA-cleared HairMax LasercombÂ®, He-Ne laser, and excimer laser, are relatively affordable, user-friendly, safe, and effective forms of treatment for hair loss. While less is known about the effectiveness of fractional lasers for combating hair loss, research suggests that by creating microscopic thermal injury zones, fractional lasers may cause an increase in hair growth from a wound healing process, making them potential therapeutic options for alopecia. A literature review was performed to evaluate the effectiveness of fractional lasers on hair regrowth. The specific fractional laser therapies include the 1550-nm nonablative fractional erbium-glass laser, the ablative fractional 2940-nm erbium:YAG laser, and the ablative fractional CO(2) fractional laser. Additional randomized controlled trials are necessary to further evaluate the effectiveness of the lasers, as well as to establish appropriate parameters and treatment intervals.
Alopecia;Combined Modality Therapy;Hair;Humans;Laser Therapy;Photolysis;Treatment Outcome

[Endoscopic ultra dream pulse laser surgery of laryngomalacia. Our experiences gained during the introduction of the method in Hungary]. INTRODUCTION: Congenital stridor and dyspnoe are caused by laryngomalacia in most cases. AIM: In this article we present a new, surgical method for treating severe laryngomalacia in patients under the age of 1, where ultrapulsated (UDP) laser beam is used for supraglottoplasty. Ultra dream pulse laser creates lesser thermical side damage in the tissue, therefore the risk of postoperative laryngeal oedema and scarring is lower. METHOD: We present 10 cases and the endoscopic UDP-laser surgery of patients under the age of 1 with severe laryngomalacia. RESULTS: After the surgery the stridorous symptoms disappeared, and there was no evidence of postoperative laryngeal oedema, there was no need for reoperation or tracheotomy in any of the cases. CONCLUSION: UDP-laser surgery of laryngomalacia is proven to be a safe and effective surgial modality. During the follow up visits we experienced neither recurrence of stridor nor laryngeal scarring. Orv Hetil. 2017; 158(33): 1288-1292.
Endoscopy;Female;Humans;Infant;Infant, Newborn;Laryngeal Diseases;Low-Level Light Therapy;Male;Treatment Outcome

How do red and infrared low-level lasers affect folliculogenesis cycle in rat's ovary tissue in comparison with clomiphene under in vivo condition. Folliculogenesis is a cycle that produces the majority of oocyte. Any disruption to this cycle leads to ovulation diseases, like polycystic ovarian syndrome (PCOS). Treatments include drugs and surgery; lasers have also been used complementarily. Meanwhile, still there is no definite treatment for PCOS. This study investigated the photo-bio stimulation effect of near-infrared and red low-level laser on producing follicles and compared the result with result of using common drug, clomiphene. Therefore, the aim of this study was to propose the use of lasers autonomously treatment. So, there was one question: how do lasers affect folliculogenesis cycle in rat's ovary tissue? In this study, 28 rats were assigned to four groups as follows: control (CT), clomiphene drug (D), red laser (RL), and near-infrared laser (NIRL). Afterwards, 14 rats of RL and NIRL groups received laser on the first 2Â days of estrous cycle, each 6Â days, for 48Â days. During treatment period, each rat received energy density of 5Â J/cm(2). Seven rats in D group received clomiphene. After the experiment, lasers' effects at two wavelengths of 630 and 810Â nm groups have been investigated and compared with clomiphene and CT groups. Producing different follicles to complement folliculogenesis cycle increased in NIRL and RL groups, but this

increase was significant only in the NIRL group. This indicates that NIRL increases ovarian activity to produce oocyte that certainly can be used in future studies for finding a cure to ovarian negligence to produce more oocyte and treat diseases caused by it like PCOS. Fertility Agents, Female;Hormones;Clomiphene Animals;Clomiphene;Female;Fertility Agents, Female;Hormones;Infrared Rays;Low-Level Light Therapy;Ovarian Follicle;Rats, Wistar

Effects of PBM in different energy densities and irradiance on maintaining cell viability and proliferation of pulp fibroblasts from human primary teeth. This study aimed to compare the effects of photobiomodulation (PBM) in different energy densities and irradiances on maintaining cell viability, and proliferation of pulp fibroblasts from human primary teeth (HPF) were cultured in DMEM and used between the fourth and eighth passages. Then, HPF were irradiated with the following different energy densities: 1.25Â J/cm(2) (a), 2.50Â J/cm(2) (b), 3.75Â J/cm(2) (c), 5.00Â J/cm(2) (d), and 6.25Â J/cm(2) (e); but varying either the time of irradiation (groups 1a-1e) or the output power (groups 2a-2e). Positive (groups 1f and 2f) and negative controls (groups 1g and 2g), respectively, comprised non-irradiated cells grown in regular nutritional conditions (10% fetal bovine serum [FBS]) and under nutritional deficit (1% FBS). Cell viability and proliferation were respectively assessed through MTT and crystal violet (CV) assays at 24, 48, and 72Â h after irradiation. Statistical analysis was performed by two-way ANOVA, followed by Tukey test (PÂ <Â 0.05). The negative controls showed significantly lower viability in relation to most of the corresponding subgroups, both for MTT and CV assays. For both assays, the intragroup comparison showed that the periods of 24Â h exhibited lower viability than the periods of 48 and 72Â h for most of the subgroups, except the negative controls with lower viability. The different irradiation protocols (equal energy densities applied with different irradiances) showed no statistically significant differences on cell viability and proliferation at the evaluated periods. The proposed PBM in different energy densities and irradiance did not affect the viability and proliferation of pulp fibroblasts from human primary teeth. Animals;Cell Count;Cell Proliferation;Cell Shape;Cell Survival;Cells, Cultured;Child;Child, Preschool;Dental Pulp;Fibroblasts;Humans;Low-Level Light Therapy;Mitochondria;Tooth, Deciduous

Red (660â€‰nm) or near-infrared (810â€‰nm) photobiomodulation stimulates, while blue (415â€‰nm), green (540â€‰nm) light inhibits proliferation in human adipose-derived stem cells. We previously showed that blue (415â€‰nm) and green (540â€‰nm) wavelengths were more effective in stimulating osteoblast differentiation of human adipose-derived stem cells (hASC), compared to red (660â€‰nm) and near-infrared (NIR, 810â€‰nm). Intracellular calcium was higher after blue/green, and could be inhibited by the ion channel blocker, capsazepine. In the present study we asked what was the effect of these four wavelengths on proliferation of the hASC? When cultured in proliferation medium there was a clear difference between blue/green which inhibited proliferation and red/NIR which stimulated proliferation, all at 3â€‰J/cm(2). Blue/green reduced cellular ATP, while red/NIR increased ATP in a biphasic manner. Blue/green produced a bigger increase in intracellular calcium and reactive oxygen species (ROS). Blue/green reduced mitochondrial membrane potential (MMP) and lowered intracellular pH, while red/NIR had the opposite effect. Transient receptor potential vanilloid 1 (TRPV1) ion channel was expressed in hADSC, and the TRPV1 ligand capsaicin (5uM) stimulated proliferation, which could be abrogated by capsazepine. The inhibition of proliferation caused by blue/green could also be abrogated by capsazepine, and by the antioxidant, N-acetylcysteine. The data suggest that blue/green light inhibits proliferation by activating TRPV1, and increasing calcium and ROS. Reactive Oxygen Species;TRPV Cation Channels;TRPV1 protein, human;Adenosine Triphosphate;Capsaicin;Calcium Adenosine Triphosphate;Adipose Tissue;Calcium;Capsaicin;Cell Proliferation;Cells, Cultured;Humans;Infrared

Rays;Membrane Potential, Mitochondrial;Mesenchymal Stem Cells;Reactive Oxygen Species;TRPV Cation Channels;Ultraviolet Rays

Cutaneous collagenous vasculopathy - remission of perivascular deposits after pulsed dye laser therapy. Aged;Biopsy;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Skin;Skin Diseases, Vascular

Effects of photobiomodulation therapy and topical non-steroidal anti-inflammatory drug on skeletal muscle injury induced by contusion in rats-part 2: biochemical aspects. Muscle injuries trigger an inflammatory process, releasing important biochemical markers for tissue regeneration. The use of non-steroidal anti-inflammatory drugs (NSAIDs) is the treatment of choice to promote pain relief due to muscle injury. NSAIDs exhibit several adverse effects and their efficacy is questionable. Photobiomodulation therapy (PBMT) has been demonstrated to effectively modulate inflammation induced from musculoskeletal disorders and may be used as an alternative to NSAIDs. Here, we assessed and compared the effects of different doses of PBMT and topical NSAIDs on biochemical parameters during an acute inflammatory process triggered by a controlled model of contusion-induced musculoskeletal injury in rats. Muscle injury was induced by trauma to the anterior tibial muscle of rats. After 1Â h, rats were treated with PBMT (830Â nm, continuous mode, 100Â mW of power, 35.71Â W/cm(2); 1, 3, and 9Â J; 10, 30, and 90Â s) or diclofenac sodium (1Â g). Our results demonstrated that PBMT, 1Â J (35.7Â J/cm(2)), 3Â J (107.1Â J/cm(2)), and 9Â J (321.4Â J/cm(2)) reduced the expression of tumor necrosis factor alpha (TNF-Î±) and cyclooxygenase-2 (COX-2) genes at all assessed times as compared to the injury and diclofenac groups (pÂ <Â 0.05). The diclofenac group showed reduced levels of COX-2 only in relation to the injury group (pÂ <Â 0.05). COX-2 protein expression remained unchanged with all therapies except with PBMT at a 3-J dose at 12Â h (pÂ <Â 0.05 compared to the injury group). In addition, PBMT (1, 3, and 9Â J) effectively reduced levels of cytokines TNF-Î±, interleukin (IL)-1Î², and IL-6 at all assessed times as compared to the injury and diclofenac groups (pÂ <Â 0.05). Thus, PBMT at a 3-J dose was more effective than other doses of PBMT and topical NSAIDs in the modulation of the inflammatory process caused by muscle contusion injuries. Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Diclofenac;Cyclooxygenase 2 Administration, Topical;Animals;Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Contusions;Cyclooxygenase 2;Diclofenac;Gene Expression Regulation;Inflammation;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats, Wistar;Tumor Necrosis Factor-alpha

Therapeutic comparison between treatments for Vulvar Lichen Sclerosus: study protocol of a randomized prospective and controlled trial. BACKGROUND: Vulvar lichen sclerosus (VLS) is a lymphocyte-mediated disease of unknown etiology that can cause intense itching as well stenosis, hindering the evacuation and urination. It can also limit the sex life due to severe local pruritus, pain and dyspareunia (pain during sexual intercourse). The standard treatment for this disease is the use of topical corticosteroids to reduce the clinical symptoms and to try to increase disease-free intervals. Photodynamic therapy (PDT), a treatment that associates a light radiation with a photosensitizing agent and photobiomodulation (PBM) are therapies that can promote effective immunomodulatory responses at the application site by means of photophysical and photochemical phenomena from the molecular to the systemic level, which promote their use in chronic dermatoses. The aim is to compare the effects of PDT, PBM, and topical corticosteroid in VLS evaluating clinical, histological, immunohistochemical and spectroscopic responses. METHODS: The study is prospective, randomized and controlled, in a population of 60 women with histological diagnoses of VLS. There will be 3 treatments groups: PDT, PBM and topical corticosteroid (control group), where will be allocated by randomization 20 patients in each one. The clinical course will be monitored by measuring local temperature, itching, atrophy, and the area of the lesion. Histologically, the slides will be classified

and will have the ordering of collagen fibers quantified. Immunohistochemical analysis will be done using the markers IFN-Î³, TGF-Î², CD4, CD8, IL-1, p53 and Ki-67. Finally, the spectroscopic evaluation will be done by reflectance. Descriptive and inferential statistical analyses will be conducted to compare the groups and make associations between different responses. The study is an open-label for patients with active symptomatic disease with a period of 1Â year follow-up to determine the rate of recurrence in each groups. DISCUSSION: The immunological effects of PDT and PBM are described by several authors in inflammatory skin diseases, stimulating the production and organization of the associated collagen. Thus, it is reasonable to determine the efficacy and safety of these new treatments in VLS, in comparison to the control group, analyzing the recurrence time, the impact on the optical properties of the skin, and the benefit to patients. TRIAL REGISTRATION: ClinicalTrials.gov: NCT02416531 . Glucocorticoids;Photosensitizing Agents Adult;Female;Glucocorticoids;Humans;Middle Aged;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Treatment Outcome;Ultraviolet Therapy;Vulvar Lichen Sclerosus

Evaluation of muscle activity, bite force and salivary cortisol in children with bruxism before and after low level laser applied to acupoints: study protocol for a randomised controlled trial. BACKGROUND: Bruxism is a repetitive activity that causes tooth wear, audible sounds, and discomfort. Preventive measures have been studied for conditions that can exert a negative influence on physiological development in children. Low-level laser therapy administered over acupoints is an effective, painless, low-cost treatment option that has achieved good results. Thus, the aim of the proposed study is to evaluate changes in muscle activity, bite force and salivary cortisol in children with bruxism after the application of low-level laser to accupoints. METHODS: The children will be randomly allocated to four groups of 19 individuals: G1 - low-level laser; G2 - occlusal splint; G3 - placebo laser; and G4 - control (without bruxism). The BTS TMJOINT electromyography will be used to determine muscle activity and a digital gnathodynamometer will be used to measure bite force. Salivary cortisol will be analysed at baseline as well as one and six months after treatment. Two-way ANOVA will be employed and complemented by Tukey's test. DISCUSSION: Bruxism is a repetitive activity of the masticatory muscles that can have negative consequences if not treated, such as tooth wear, noises, discomfort and anxiety. Thus, control and treatment measures should be taken. Although low-level laser therapy over acupoints has been indicated for children, the effects of this treatment modality have not yet been studied. TRIAL REGISTRATION: NCT02757261 on 8 April 2016. This study protocol received a grant from the Brazilian fostering agency SÃ£o Paulo Research Foundation (FAPESP: #2015/24731-0). Hydrocortisone Acupuncture Points;Bite Force;Bruxism;Child;Electromyography;Female;Humans;Hydrocortisone;Low-Level Light Therapy;Male;Masticatory Muscles;Research Design;Saliva;Treatment Outcome

Evaluation effect of low level Helium-Neon laser and Iranian propolis extract on Collagen Type I gene expression by human gingival fibroblasts: an in vitro study. BACK GROUND AND AIM: production of collagen by fibroblast cells is a key component in wound healing. Several studies have shown that low level laser therapy (LLLT) and propolis extract stimulate collagen Type I production. The aim of this study is to evaluation the combined effect of LLL helium neon (632.8 nm) and Iranian propolis extract on collagen Type I gene expression by human gingival fibroblasts (HGF3-PI 53). METHODS AND MATERIALS: Human gingival fibroblasts after culturing divided into six experimental groups: G1- control group, which received no irradiation and propolis extract, G2-irradiated at1.5 J/cm(2), G3- irradiated at 0.15 J/cm(2), G4-recived extract of propolis, G5- combined extract of propolis and 1.5 J/cm(2) laser irradiation and G6- combined extract of propolis and 0.15 J/cm(2) laser irradiation. The experiments were conducted in triplicate. After 24 hour, the total RNA was extracted and cDNA synthesis was performed. Type I collagen mRNA expression was determined with real time PCR. RESULTS: The obtained results illustrated a statistically significant difference between G3 (0.15

J/cm(2)) and G1 (control group) in levels of collagen Type I messenger RNA (mRNA) expression ($p<0.05$). The irradiated cells showed a 1.4 times increase in mRNA expression of the collagen Type I gene. Expression of this gene decreases in other groups that this difference was statistically significant. CONCLUSION: LLLT in different dosage and propolis extract may result in decreased or increased collagen type I gene expression. However this effect should be investigated in clinical studies.

The History of Photobiomodulation: Endre Mester (1903-1984). History, 20th Century;Humans;Hungary;Low-Level Light Therapy

Photobiomodulation in the Prevention of Tooth Sensitivity Caused by In-Office Dental Bleaching. A Randomized Placebo Preliminary Study. OBJECTIVE: Analyze the effect of photobiomodulation in the prevention of tooth sensitivity after in-office dental bleaching. BACKGROUND DATA: Tooth sensitivity is a common clinical consequence of dental bleaching. Therapies for prevention of sensitivity have been investigated in literature. MATERIALS AND METHODS: This study was developed as a randomized, placebo blind clinical trial. Fifty patients were selected (nâ€‰=â€‰10) and randomly divided into five groups: (1) control, (2) placebo, (3) laser before bleaching, (4) laser after bleaching, and (5) laser before and after bleaching. Irradiation was performed perpendicularly, in contact, on each tooth during 10â€‰sec per point in two points. The first point was positioned in the middle of the tooth crown and the second in the periapical region. Photobiomodulation was applied using the following parameters: 780â€‰nm, 40â€‰mW, 10â€‰J/cm(2), 0.4â€‰J per point. Pain was analyzed before, immediately after, and seven subsequent days after bleaching. Patients were instructed to report pain using the scale: 0â€‰=â€‰no tooth sensitivity, 1â€‰=â€‰gentle sensitivity, 2â€‰=â€‰moderate sensitivity, 3â€‰=â€‰severe sensitivity. RESULTS: There were no statistical differences between groups at any time (pâ€‰>â€‰0.05). More studies, with others parameters and different methods of tooth sensitivity analysis, should be performed to complement the results found. CONCLUSIONS: Within the limitation of the present study, the laser parameters of photobiomodulation tested in the present study were not efficient in preventing tooth sensitivity after in-office bleaching. Tooth Bleaching Agents Adult;Dental Offices;Dentin Sensitivity;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Reference Values;Risk Assessment;Single-Blind Method;Tooth Bleaching;Tooth Bleaching Agents;Treatment Outcome;Young Adult

Efficacy of Multiwave Locked System Laser on Pain and Function in Patients with Chronic Neck Pain: A Randomized Placebo-Controlled Trial. BACKGROUND: Multiwave locked system (MLS) laser therapy utilizes the synchronized emission of an 808â€‰nm continuous laser and a 905â€‰nm pulsed laser. It is postulated that MLS enables greater penetration and therapeutic benefit than single-wavelength low-level laser therapy (LLLT). OBJECTIVE: The aim of this research was to evaluate the efficacies of MLS laser therapy and the 830â€‰nm laser in the treatment of patients with chronic neck pain (CNP). MATERIALS AND METHODS: Seventy-five patients with CNP (mean age 46.28â€‰Â±â€‰5.89, weight 83.78â€‰Â±â€‰5.65â€‰kg, height 1.72â€‰Â±â€‰4.96â€‰m, and duration of illness of 5.98â€‰Â±â€‰1.44 months). They were randomized into three groups. Group I received MLS laser therapy and exercises, Group II received LLLT and exercises, and Group III received placebo laser therapy plus exercises (PL + EX). Neck pain levels and neck function were measured using the visual analogue scale (VAS) and neck disability index (NDI), respectively. RESULTS: Both VAS and NDI were significantly reduced post-treatment for all treatment groups. After 6 weeks of treatment, MLS plus exercise showed a significantly greater decrease in pain and disability scores {Î” VAS (6.68) and Î” NDI (39.84)} compared to both LLLT plus exercise group {Î” VAS (5.72) and Î” NDI (37.88)} and PL + EX {Î” VAS (4.84) and Î” NDI (36.68)}. CONCLUSIONS: MLS laser therapy in conjunction with exercises decreased pain and increased functional activity following 6 months of

therapy. MLS laser therapy in combination with exercises is a more effective therapy for CNP compared to exercise plus LLLT or exercise alone. Adult;Chronic Pain;Disability Evaluation;Follow-Up Studies;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Male;Middle Aged;Neck Pain;Pain Measurement;Radiation Dosage;Treatment Outcome

Differing energy densities with laser 670nm InGaP controls inflammation and collagen reorganization in burns. PURPOSE: This study compared different energy densities of laser on second degrees burns in rats aiming to determine the most effective dosimetry in stimulation of the healing process. METHODS: Burns were induced in the dorsal skin of 54 animals divided into three groups (n: 18): 1-without treatment; 2-irradiated lesions by the Indium Gallium Phosphide (InGaP) 670nm (4.93J/cm(2)) laser; 3-irradiated lesions by the InGaP-670nm (9.86J/cm(2)) laser. Samples were collected on the 2, 10 and 18 days after injury for structural, morphometry, biochemical analysis and Western blotting. RESULTS: The energy densities examined were effective in significantly increasing the total number of fibroblasts and blood vessels and reduce the number of inflammatory cells particularly in irradiated lesions with 9.86J/cm(2). This same energy density significantly increased the amount of GAGs (Glycosaminoglycans), decreased the TGF-Î²1 (Transforming Growth Factor Î²1) and increased the VEGF (Vascular and Endothelial Growth Factor) during the experimental period. This energy density also significantly increased the Collagen type I and decreased Collagen type III and the active isoform of metalloproteinase 9 (MMP-9). CONCLUSIONS: The energy density of 9.86J/cm(2) was more effective in promoting cellular responses related to neoangiogenesis, decreasing inflammation and collagen fibers reorganization. Collagen Type I;Collagen Type III;Glycosaminoglycans;Phosphines;Tgfb1 protein, rat;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Indium;gallium phosphide;Gallium;Matrix Metalloproteinase 9;Mmp9 protein, rat;Hydroxyproline Animals;Blotting, Western;Burns;Collagen Type I;Collagen Type III;Dose-Response Relationship, Radiation;Fibroblasts;Gallium;Glycosaminoglycans;Hydroxyproline;Indium;Inflammation;Low-Level Light Therapy;Male;Matrix Metalloproteinase 9;Phosphines;Rats;Rats, Wistar;Skin;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;Wound Healing

Post-SSRI Sexual Dysfunction: A Literature Review. INTRODUCTION: Selective serotonin reuptake inhibitors (SSRIs) are a widely used class of drug. Post-SSRI sexual dysfunction (PSSD) is a condition in which patients continue to have sexual side effects after discontinuation of SSRI use. The prevalence of persistent sexual side effects after discontinuing SSRIs is unknown. The recognition and study of PSSD will increase our knowledge base of this underreported and distressing condition. AIM: To provide coverage of the current literature on PSSD, update information on the pathophysiology of PSSD, and discuss potential management options. METHODS: Comprehensive review of literature pertaining to PSSD. MAIN OUTCOME MEASURES: The symptoms, classification, pathophysiology, diagnostic considerations, and management of PSSD were reviewed. RESULTS: Common PSSD symptoms include genital anesthesia, pleasure-less or weak orgasm, decreased sex drive, erectile dysfunction, and premature ejaculation. Different theories have been proposed to explain the pathophysiology of PSSD: epigenetic gene expression theory, cytochrome actions, dopamine-serotonin interactions, proopiomelanocortin and melanocortin effects, serotonin neurotoxicity, downregulation of 5-hydroxytryptamine receptor 1A, and hormonal changes in the central and peripheral nervous systems. The diagnosis of PSSD is achieved by excluding all other etiologies of sexual dysfunction. Treating PSSD is challenging, and many strategies have been suggested and tried, including serotonergic antagonists and dopaminergic agonists. There is still no definitive treatment for PSSD. Low-power laser irradiation and phototherapy have shown some promising results. CONCLUSION: PSSD is a debilitating condition that adversely affects quality of life. Further studies are warranted to investigate the prevalence, pathophysiology, and treatment of PSSD. Bala A, Nguyen

HMT, Hellstrom WJG. Post-SSRI Sexual Dysfunction: A Literature Review. Sex Med Rev 2018;6:29-34. Adrenergic alpha-Antagonists;Serotonin Uptake Inhibitors Adrenergic alpha-Antagonists;Cognitive Behavioral Therapy;Depression;Humans;Selective Serotonin Reuptake Inhibitors;Sexual Behavior;Sexual Dysfunction, Physiological

Long-term results of a randomized, controlled, double-blind study of low-level laser therapy before exercises in knee osteoarthritis: laser and exercises in knee osteoarthritis. OBJECTIVES: To assess the long-term effects of low-level laser therapy (LLLT), in combination with strengthening exercises in patients with osteoarthritis of the knee. DESIGN: Follow-up results at three and six months in a previously published randomized, double-blind, placebo-controlled trial. SETTING: Specialist Rehabilitation Services. SUBJECTS: Forty participants of both genders, aged 50-75â€‰years with knee osteoarthritis grade 2-4 on Kellgren-Lawrence scale. INTERVENTION: The LLLT group received 10 LLLT treatments with invisible infrared laser (904â€‰nm, 3â€‰Joules/point) over threeâ€‰weeks followed by an eight-week supervised strengthening exercise program. The placebo LLLT group received identical treatment, but the infrared laser output was disabled. MAIN MEASURES: Pain on a visual analogue scale, paracetamol consumption, and osteoarthritis severity measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Lequesne Index. RESULTS: The new data obtained during the follow-up period showed that all outcomes remained stable and there were no significant differences between the groups at three and sixâ€‰months. However, daily consumption of rescue analgesics (paracetamol) was significantly lower in the LLLT group throughout the follow-up period, ending at a group difference of 0.45 vs. 3.40 units (Pâ€‰<â€‰0.001) at sixâ€‰months follow-up. We conclude that within the limitations of this small study, the previously reported improvement after LLLT plus exercise was maintained for a period of sixâ€‰months. CONCLUSION: We find that the immediate post-intervention improvements from LLLT plus strengthening exercises were maintained for sixâ€‰months.
Aged;Canada;Combined Modality Therapy;Double-Blind Method;Exercise Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Range of Motion, Articular;Severity of Illness Index;Treatment Outcome;Visual Analog Scale

Methylene blue mediated photobiomodulation on human osteoblast cells. Photobiomodulation (PBM) and photodynamic therapy (PDT) are two major methods, which use light in medicine and dentistry. PBM uses low-level laser light to induce cell proliferation and activity. In contrast, PDT use laser light combined with a photosensitizer (PS) to cause cell death. Due to similar, not fully understood mechanisms and biphasic response of light, unexpected and complex outcomes may be observed. In the present study, the effect of 635Â nm laser light, with power density 50Â mW/cm(2), at three different energy densities (0.5, 1, and 2Â J/cm(2) which last 10, 20, and 40Â s, respectively) mediated by methylene blue (MB) on the human osteoblast cell line (ATCC-CRL-11372, Rockville, MD, USA) was investigated. Cell viability (MTT assay and acridine orange/propidium iodide staining) and proliferation (Alamar Blue assay) were assessed at 24, 48, and 72Â h post irradiation. Alkaline phosphatase (ALP) activity, mineralization (Alizarin Red staining) and gene expressions (RT-PCR analysis) were analyzed at 7th and 14th days after treatment. Five groups were formed as the control group (no MB, no irradiation), MB (only 0.05Â Î¼M MB), MBÂ +Â 0.5Â J/cm(2), MBÂ +Â 1Â J/cm(2), and MBÂ +Â 2Â J/cm(2). Cell viability was decreased at 72Â h (ANOVA; pÂ <Â 0.05) for MBÂ +Â 0.5Â J/cm(2), MBÂ +Â 1Â J/cm(2), and MBÂ +Â 2Â J/cm(2) groups. Although proliferation does not seem to be effected by MB-mediated laser application, osteo-anabolic activity is altered. ALP activity was significantly increased at day 7 (ANOVA; pÂ <Â 0.05) for MB-combined laser groups; on the other hand, mineralization was significantly decreased (ANOVA; pÂ <Â 0.05) in all treatment groups. Alkaline phosphatase and collagen-I expressions were upregulated in MBÂ +Â 2Â J/cm(2) group at 7th and 14th days, respectively. These results may contribute to the low-dose PDT

researches and understanding PBM effects on osteoblast behavior but further studies are needed since inappropriate conditions may lead to undesirable results for both therapies. Alkaline Phosphatase;Methylene Blue Alkaline Phosphatase;Calcification, Physiologic;Cell Line;Cell Proliferation;Cell Survival;Gene Expression Regulation;Humans;Lasers;Low-Level Light Therapy;Methylene Blue;Osteoblasts;Staining and Labeling

Low-intensity laser therapy efficacy evaluation in mice subjected to acute arthritis condition. Acute arthritis is an inflammation that affects many joints. The principal treatment options comprise drugs (corticosteroids), invasive and painful surgery. The objective of this study was to evaluate the efficacy of low intensity laser therapy (LILT), a non-invasive treatment, in a murine model of acute inflammation model. 48 mice received a synovial injection of Zymosan A into one knee. Mice were treated with LILT by three different wavelengths, either as a single (S) or dual (D) application immediately after the injury or after 24h following initiation of an inflammatory response. The histological analysis aimed at identifying inflammatory infiltrate and the structure of the articular surfaces as an indicator of a long-term damage due to inflammation. Statistical analysis (Kruskal-Wallis test), did not allow to reject the null hypothesis. However, LILT promoted histological alterations in some treatment groups. Histological evidence (Median and confidence interval) of anti-inflammatory effects was especially noticeable in knees of mice irradiated with lasers emitting moderate intensity and continuous 660nm (S=18.5 (11.4; 27.6); D=16.0 (6.93; 27.0)) and high intensity and pulsed 905nm (S=17.5 (10.2; 24.79), with decrease of the resorbed region. However, the 905nm pulsed laser was responsible for exacerbation of inflammation for multiple LILT sessions with a short delay (D=45.0 (22.84; 63.83)), tending to aggravate the resorption of the articular surface ($p<0.05$). LILT showed signs of an anti-inflammatory effect when applied once, but promoted increased resorptive area when used for two sessions, indicating the importance of a controlled LILT protocol to reach therapeutic effects. Lipopolysaccharides;Osteoprotegerin;RANK Ligand;Osteocalcin;Acp5 protein, mouse;Tartrate-Resistant Acid Phosphatase Acute Disease;Animals;Arthritis;Lipopolysaccharides;Low-Level Light Therapy;Male;Mice;Osteocalcin;Osteoprotegerin;RANK Ligand;Tartrate-Resistant Acid Phosphatase

Efficacy of low-level laser therapy compared to steroid therapy in the treatment of oral lichen planus: A systematic review. BACKGROUND: Low-level laser therapy (LLLT) has been proposed as a potential treatment strategy for the treatment of oral lichen planus (OLP). The aim of this systematic review was to assess the efficacy of LLLT, in comparison with corticosteroid therapy, in the treatment of OLP. MATERIALS AND METHODS: This systematic review aimed to address the following focused question: "Does LLLT yield better clinical outcomes than corticosteroid therapy in the treatment of OLP?" Indexed databases were searched up to and including April 2017. Clinical trials in humans diagnosed clinically and/or histologically with OLP allocated to test (LLLT) versus control (steroid therapy) groups were included. RESULTS: Five clinical studies were included. The risk of bias was considered high in four studies and moderate in one study. Laser wavelengths, power, spot size, and duration of laser exposure ranged between 630 and 970 nm, 10-3000 mW, 0.2-1.0â€‰cm(2) , and 6-480 seconds, respectively. The follow-up period ranged from 4 to 48 weeks. All included studies reporting clinical scores showed that LLLT was effective in the treatment of OLP in adult patients at follow-up. Three studies showed significantly higher improvements with topical use of corticosteroids compared to LLLT, while one study showed significant improvement with LLLT. One study showed comparable outcomes between LLLT and corticosteroid application. CONCLUSION: It remains debatable whether LLLT is more effective as compared to corticosteroids in the treatment of OLP, given that the scientific evidence is weak. These findings are preliminary and further randomized clinical trials are recommended. Adrenal Cortex Hormones;Steroids Administration,

Topical;Adrenal Cortex Hormones;Adult;Databases, Factual;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Steroids;Treatment Outcome

Laser biostimulation effects on invertebral disks: histological evidence on intra-observer samples. Retrospective double-blind study. Background and aims: The intervertebral disk degeneration is a pathological process determined by a decrease of mucopolysaccharides in the nucleus pulposus with the consequent dehydration and degeneration of the elastic fibers in the annulus fibrosus of the disk. The laser is a therapeutic tool that has, on the treated tissues, biostimulation effects with an increase of oxidative phosphorylation and production of ATP with an acceleration of the mucopolysaccharides synthesis with a consequent rehydration, biostimulation and production of new elastic fibers. The goal of this project is studying whether the laser stimulation may treat degenerated intervertebral disks. Materials and methods: 60 subjects with the same anthropometric parameters were selected and divided into two randomized groups. 30 subjects underwent laser stimulation, whereas 30 underwent placebo. All 60 subjects underwent a discectomy surgery and the intraoperative findings were examined in a lab, studying the positivity of the PAS reaction and the presence of potential newly formed elastic fibers. Results: It has been shown a higher number of mucopolysaccharides and young newly formed elastic fibers in the group that was treated with laser irradiation with a statistically significant difference, compared to the placebo group ($p < 0.0001$). Conclusions: Laser biostimulation can be an effective strategy in the therapy of the invertebral disks.

Treatment of pseudoxanthoma elasticum-like papillary dermal elastolysis with nonablative fractional resurfacing laser resulting in clinical and histologic improvement in elastin and collagen. OBJECTIVE: Pseudoxanthoma elasticum-like papillary dermal elastolysis (PXE-PDE) is a rare skin condition seen predominantly in elderly females. These asymptomatic lesions are brought to the dermatologist's attention due to patient's displeasure in their appearance. We report a case of a 28-year-old female with PXE-PDE on the right neck treated with nonablative fractional resurfacing (NAFR). CASE: The patient on examination had yellow-to-skin-colored papules that coalesced into a cobblestone-appearing plaque on her lateral neck. The area was treated with NAFR to improve texture and cosmesis. After three treatments, the patient noted at least a 50% improvement of appearance and texture in the affected skin. Adverse effects were mild without development of serious side effects, such as scarring and/or permanent dyspigmenation. CONCLUSION: Established therapies for elastin disorders like PXE-PDE have yielded unsatisfactory results by patient and clinician standards. Positive results with NAFR, illustrated in our PXE-PDE case, further provides a role for NAFR in elastin disorders. Collagen;Elastin Adult;Collagen;Elastic Tissue;Elastin;Female;Humans;Low-Level Light Therapy;Pseudoxanthoma Elasticum;Skin Diseases

Effects of early combinatorial treatment of autologous split-thickness skin grafts in red duroc pig model using pulsed dye laser and fractional CO(2) laser. BACKGROUND AND OBJECTIVE: The use of pulsed dye laser (PDL) and fractional CO(2) (FX CO(2)) laser therapy to treat and/or prevent scarring following burn injury is becoming more widespread with a number of studies reporting reduction in scar erythema and pruritus following treatment with lasers. While the majority of studies report positive outcomes following PDL or FX CO(2) therapy, a number of studies have reported no benefit or worsening of the scar following treatment. The objective of this study was to directly compare the efficacy of PDL, FX CO(2) , and PDLâ€‰+â€‰FX CO(2) laser therapy in reducing scarring post burn injury and autografting in a standardized animal model. MATERIALS AND METHODS: Eight female red Duroc pigs (FRDP) received 4 standardized, 1 in. x 1 in. third degree burns that were excised and autografted. Wound sites were treated with PDL, FX CO(2) , or both at 4, 8, and 12 weeks post grafting. Grafts receiving no laser therapy served as controls. Scar appearance, morphology, size, and erythema were assessed and punch biopsies collected at weeks 4, 8, 12, and 16. At week 16, additional tissue was collected for biomechanical analyses and markers for inflammatory cytokines,

extracellular matrix (ECM) proteins, re-epithelialization, pigmentation, and angiogenesis were quantified at all time points using qRT-PCR. RESULTS: Treatment with PDL, FX CO(2) , or PDLâ€‰+â€‰FX CO(2) resulted in significantly less contraction versus skin graft only controls with no statistically significant difference among laser therapy groups. Scars treated with both PDL and FX CO(2) were visually more erythematous than other groups with a significant increase in redness between two and three standard deviations above normal skin redness. Scars treated with FX CO(2) were visually smoother and contained significantly fewer wrinkles. In addition, hyperpigmentation was significantly reduced in scars treated with FX CO(2) . CONCLUSIONS: The use of fractional carbon dioxide or pulsed dye laser therapy within 1 month of autografting significantly reduced scar contraction versus control, though no statistically significant difference was detected between laser modalities or use of both modalities. Overall, FX CO(2) therapy appears to be modestly more effective at reducing erythema, and improving scar texture and biomechanics. The current data adds to prior studies supporting the role of laser therapy in the treatment of burn scars and indicates more study is needed to optimize delivery protocols for maximum efficacy. Lasers Surg. Med. 50:78-87, 2018. Â© 2017 Wiley Periodicals, Inc. Animals;Burns;Cicatrix;Disease Models, Animal;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Skin Transplantation;Swine

Short-pulse neodymium:yttrium-aluminium garnet (Nd:YAG 1064nm) laser irradiation photobiomodulates mitochondria activity and cellular multiplication of Paramecium primaurelia (Protozoa). Few studies exist to explore the potential photobiomodulation (PBM) effect of neodymium:yttrium-aluminium garnet (Nd:YAG) laser irradiation using a flat-top handpiece delivery system. In this study, we explored the photobiomodulation effect of that laser, on Paramecium primaurelia. The parameters for the different study groups were: 0.50W, 10Hz, 100msp, 30J/cm(2); 0.75W, 10Hz, 100msp, 45J/cm(2); 1.00W, 10Hz, 100msp, 60J/cm(2); 1.25W, 10Hz, 100msp, 75J/cm(2) and 1.50W, 10Hz, 100msp, 90J/cm(2). Our results suggest that only the parameter 0.5W, 10Hz, 100msp, 30J/cm(2) positively photobiomodulates the Paramecium cells inducing an increment in oxygen consumption, endogenous ATP synthesis and fission rate rhythm. Applying the laser energy with parameters of 1.25W, 10Hz, 100msp, 75J/cm(2) and 1.50W, 10Hz, 100msp, 90J/cm(2), induce adverse effect on the Paramecium cells, which protect themselves through the increase in Heat Shock Protein-70 (HSP70). The data presented in our work support our assumption that, when using appropriate parameters of irradiation, the 1064nm Nd:YAG laser with flat-top handpiece could be a valuable aid for effective clinical application of PBM. Neodymium;Yttrium;Aluminum Aluminum;Cell Proliferation;Lasers, Solid-State;Mitochondria;Neodymium;Oxygen Consumption;Paramecium;Yttrium

Photobiomodulation therapy by NIR laser in persistent pain: an analytical study in the rat. Over the past three decades, physicians have used laser sources for the management of different pain conditions obtaining controversial results that call for further investigations. In order to evaluate the pain relieving possibilities of photobiomodulation therapy (PBMT), we tested two near infrared (NIR) laser systems, with different power, against various kinds of persistent hyperalgesia animal models. In rats, articular pain was reproduced by the intra-articular injection of sodium monoiodoacetate (MIA) and complete Freund's adjuvant (CFA), while compressive neuropathy was modelled by the chronic constriction injury of the sciatic nerve (CCI). In MIA and CFA models, (NIR) laser (MLS-Mphi, ASA S.r.l., Vicenza, Italy) application was started 14Â days after injury and was performed once a day for a total of 13 applications. In MIA-treated animals, the anti-hyperalgesic effect of laser began 5Â min after treatment and vanished after 60Â min. The subsequent applications evoked similar effects. In CFA-treated rats, laser efficacy started 5Â min after treatment and disappeared after 180Â min. In rats that underwent CCI, two treatment protocols with similar fluence but different power output were tested using a new experimental device called Multiwave Locked System laser (MLS-HPP). Treatments

began 7Â days after injury and were performed during 3Â weeks for a total of 10 applications. Both protocols reduced mechanical hyperalgesia and hindlimb weight bearing alterations until 60Â min after treatment with a higher efficacy recorded for the animals treated using the higher power output. In conclusion, this study supports laser therapy as a potential treatment for immediate relief of chronic articular or neuropathic pain. Freund's Adjuvant;Iodoacetic Acid Animals;Disease Models, Animal;Freund's Adjuvant;Inflammation;Infrared Rays;Injections, Intra-Articular;Iodoacetic Acid;Lasers;Low-Level Light Therapy;Male;Neuralgia;Osteoarthritis;Pain;Rats, Sprague-Dawley

Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. Photobiomodulation (PBM) also known as low-level level laser therapy is the use of red and near-infrared light to stimulate healing, relieve pain, and reduce inflammation. The primary chromophores have been identified as cytochrome c oxidase in mitochondria, and calcium ion channels (possibly mediated by light absorption by opsins). Secondary effects of photon absorption include increases in ATP, a brief burst of reactive oxygen species, an increase in nitric oxide, and modulation of calcium levels. Tertiary effects include activation of a wide range of transcription factors leading to improved cell survival, increased proliferation and migration, and new protein synthesis. There is a pronounced biphasic dose response whereby low levels of light have stimulating effects, while high levels of light have inhibitory effects. It has been found that PBM can produce ROS in normal cells, but when used in oxidatively stressed cells or in animal models of disease, ROS levels are lowered. PBM is able to up-regulate anti-oxidant defenses and reduce oxidative stress. It was shown that PBM can activate NF-kB in normal quiescent cells, however in activated inflammatory cells, inflammatory markers were decreased. One of the most reproducible effects of PBM is an overall reduction in inflammation, which is particularly important for disorders of the joints, traumatic injuries, lung disorders, and in the brain. PBM has been shown to reduce markers of M1 phenotype in activated macrophages. Many reports have shown reductions in reactive nitrogen species and prostaglandins in various animal models. PBM can reduce inflammation in the brain, abdominal fat, wounds, lungs, spinal cord.

Treatment of Facial Acne Scarring With Fractional Carbon Dioxide Laser in Asians, a Retrospective Analysis of Efficacy and Complications. BACKGROUND: Fractional carbon dioxide (CO2) laser resurfacing unites the idea of fractional photothermolysis with an ablative 10,600-nm wavelength. This technology permits effective treatment of acne scarring, with shorter recovery and a decreased side effect profile as compared to traditional CO2 laser resurfacing. OBJECTIVE: The aims of this study were to study the efficacy and safety of fractional CO2 laser for acne scars in Asian patients. METHODS: This was a retrospective study of all patients treated with the fractional CO2 laser for facial acne scarring between January 2, 2008, and December 31, 2010, at the National Skin Centre, Singapore. Data reviewed included sex, age, and severity of acne, type of scarring, previous treatment history, frequency of treatments, adverse events, and efficacy. RESULTS: Two hundred and ten fractional CO2 laser treatments for facial acne scars were performed on 107 patients (65 men and 42 women, Fitzpatrick skin Types II to V) during the study period. Sixteen of 107 patients experienced (15.0%) adverse events. The adverse events include hyperpigmentation (6.4%), blistering (4.0%), crusting (2.9%), aggravation of inflammatory acne lesions (1.7%), and scarring (0.6%). There were no reported side effects of hypopigmentation, bacterial or viral infection. Follow-up results after final laser treatment showed that 66.4% of patients reported Grade 1 skin texture improvement, that is, <25% (n = 71); 30.0% had Grade 2 improvement, that is, 25% to 50% improvement (n = 31); 3.7% had Grade 3 improvement, that is, 51% to 75% improvement (n = 4); and 0.9% had Grade 4 improvement, that is, >75% improvement (n = 1). CONCLUSION: The study demonstrated the efficacy and safety of a fractional CO2 laser in the treatment of acne scars in Asian. Future studies are required to establish optimum treatment parameters and achieve better clinical results. Acne

Vulgaris;Adult;Asian People;Cicatrix;Facial Dermatoses;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Young Adult

No evidence for toxicity after long-term photobiomodulation in normal non-human primates. In this study, we explored the effects of a longer term application, up to 12Â weeks, of photobiomodulation in normal, naÃ¯ve macaque monkeys. Monkeys (nÂ =Â 5) were implanted intracranially with an optical fibre device delivering photobiomodulation (red light, 670Â nm) to a midline midbrain region. Animals were then aldehyde-fixed and their brains were processed for immunohistochemistry. In general, our results showed that longer term intracranial application of photobiomodulation had no adverse effects on the surrounding brain parenchyma or on the nearby dopaminergic cell system. We found no evidence for photobiomodulation generating an inflammatory glial response or neuronal degeneration near the implant site; further, photobiomodulation did not induce an abnormal activation or mitochondrial stress in nearby cells, nor did it cause an abnormal arrangement of the surrounding vasculature (endothelial basement membrane). Finally, because of our interest in Parkinson's disease, we noted that photobiomodulation had no impact on the number of midbrain dopaminergic cells and the density of their terminations in the striatum. In summary, we found no histological basis for any major biosafety concerns associated with photobiomodulation delivered by our intracranial approach and our findings set a key template for progress onto clinical trial on patients with Parkinson's disease.
Animals;Corpus Striatum;Dopaminergic Neurons;Low-Level Light Therapy;Macaca fascicularis;Mesencephalon;Optical Fibers;Prostheses and Implants

Effect of Low-Level Laser Therapy on Bone Regeneration During Osseointegration and Bone Graft. BACKGROUND: The effect of low-level laser therapy (LLLT) on bone regeneration during osseointegration and bone graft is very controversial. Despite many positive reports of in vitro and in vivo studies and more than 50 randomized clinical trials claiming a positive effect of photobiomodulation (PBM), many reports found no significant effect of lasers. OBJECTIVE: The aim of this study was to evaluate studies correlating PBM and bone regeneration and to assesses parameters that produce positive results based on dose and output power used. MATERIALS AND METHODS: Four electronic databases were used: PubMed, Springer, Google Scholar, and Cochrane. RESULTS: The research yielded 230 articles. The full texts of all articles were evaluated and scored using eligibility criteria adapted from Cericato et al. After evaluation, only 19 articles met the inclusion criteria. CONCLUSIONS: A positive effect of low-level laser energy on bone regeneration within a certain relationship between dose and output power was found. LLLT stimulates cellular metabolism, increasing protein synthesis and subsequent bone regeneration. A high dose combined with low power or a low dose combined with high power appears to produce a positive effect.
Bone Regeneration;Bone Transplantation;Humans;Low-Level Light Therapy;Osseointegration

A review of available laser and intense light source home devices: A dermatologist's perspective. BACKGROUND: Home optical devices are becoming an increasingly popular treatment modality sought out by patients for dermatologic pathologies such as acne, hair removal and anti-aging, as these devices are a low-cost and convenient therapy choice. METHODS: An Internet search using PubMed.gov was completed with search terms, "home device dermatology," "home device acne," "home device hair" or "hair removal," and "home device aging." RESULTS: Currently, there are multiple home optical devices available on the market. These devices have been approved for the treatment of acne, scars, hair removal, and wrinkles using intense pulsed light, light-emitting diode, heat, infrared, low-level light therapy, and laser. Although studies on home devices are limited, current dermatologic literature shows that these devices are promising with significant post-treatment results as well as a high level of safety. CONCLUSIONS: Home optical devices are mostly used without medical practitioner supervision. As home devices usually deliver less energy per

session than with professional treatments, it is important that consumers are given realistic expectations of post-treatment outcomes. Patients may use home devices without disclosure to their physician and it is important as healthcare professionals to be aware of the existence of these devices, how to use the devices properly (including what diseases can be treated and which skin types are considered safe for use), as well as any adverse effects that may occur. New research endeavors are being completed to explore the used of home devices for the treatment of chronic inflammatory diseases such as psoriasis. Acne Vulgaris;Hair Removal;Humans;Intense Pulsed Light Therapy;Laser Therapy;Phototherapy;Self Care;Skin Aging

Low Level Laser Therapy in patients with chronic foot and ankle joint pain. BACKGROUND AND AIMS: Chronic foot and ankle joint pain is one of the most frequent complaints which is regularly seen in the out-patient clinic of our medical institute. In previous studies we have reported on the benefits of low level laser therapy (LLLT) for chronic pain in the elbow, hand, finger and the lower back. The present study examined the effects of LLLT on chronic foot and ankle joint pain. MATERIALS AND METHODS: Over the past 5 years, 17 subjects visited the out-patient clinic with complaints of chronic foot and ankle joint pain of a variety of aetiologies. The patients received LLLT using a 1000 mW semi-conductor laser device, delivering 20.1 J/cm(2) per point at 830 nm in continuous wave. Each patient was given four shots per session per foot twice a week for 4 weeks. RESULTS: A visual analogue scale (VAS) was used to determine the effects of LLLT for the chronic pain and after the end of the treatment regimen a significant improvement was observed ($p < 0.01$). All but 2 of the patients showed improvement: excellent (2) and good (13). After treatment, no significant differences were observed in the ankle joint range of motion, however. Discussions with the patients revealed that it was important for them to learn how to avoid overuse of the ankle when walking, poor walking posture and a poor pacing technique that would caused them foot and ankle pain in everyday life. Following these postural guidelines could ensure continuous benefits from the treatment. CONCLUSION: The present study demonstrated that LLLT was an effective form of treatment for chronic foot and ankle joint pain, in conjunction with postural education during all activities of daily living.

Adipose-derived stem cell spheroid treated with low-level light irradiation accelerates spontaneous angiogenesis in mouse model of hindlimb ischemia. BACKGROUND AIMS: We investigated whether low-level light irradiation (LLLI) before adipose-derived stromal cells (ASCs) spheroid transplantation improved hind-limb functional recovery by stimulation of angiogenesis. METHODS: The spheroid, composed of ASCs, was irradiated with low-level light and expressed angiogenic factors, including vascular endothelial growth factor and basic fibroblast growth factor. From immunochemical staining analysis, the spheroid of ASCs included CD31(+), KDR(+) and CD34(+), whereas monolayer-cultured ASCs were negative for these markers. To evaluate the therapeutic effect of the ASC spheroid treated with LLLI in vivo, phosphate-buffered saline, monolayer ASCs, LLLI-monolayer ASCs, spheroid ASCs and LLLI-spheroid ASCs were transplanted into a hind-limb ischemia model. RESULTS: The LLLI-spheroid ASCs transplanted into the hind-limb ischemia differentiated into endothelial cells and remained differentiated. Transplantation of LLLI-spheroid ASCs into the hind-limb ischemia significantly elevated the density of vascular formations through angiogenic factors released by the ASCs and enhanced tissue regeneration at the lesion site. Consistent with these results, the transplantation of LLLI-spheroid ASCs significantly improved functional recovery compared with ASC or spheroid ASC transplantation and PBS treatment. CONCLUSIONS: These findings suggest that transplantation of ASC spheroid treated with LLLI may be an effective stem cell therapy for the treatment of hind-limb ischemia and peripheral vascular disease. Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2 Adipose Tissue;Animals;Cell Differentiation;Cells, Cultured;Disease Models, Animal;Fibroblast Growth Factor

2;Hindlimb;Humans;Ischemia;Low-Level Light Therapy;Male;Mice, Inbred BALB C;Neovascularization, Physiologic;Spheroids, Cellular;Stem Cell Transplantation;Vascular Endothelial Growth Factor A

Transcranial low-level laser therapy improves brain mitochondrial function and cognitive impairment in D-galactose-induced aging mice. Mitochondrial function plays a key role in the aging-related cognitive impairment, and photoneuromodulation of mitochondria by transcranial low-level laser therapy (LLLT) may contribute to its improvement. This study focused on the transcranial LLLT effects on the D-galactose (DG)-induced mitochondrial dysfunction, apoptosis, and cognitive impairment in mice. For this purpose, red and near-infrared (NIR) laser wavelengths (660 and 810Â nm) at 2 different fluencies (4 and 8Â J/cm(2)) at 10-Hz pulsed wave mode were administrated transcranially 3Â d/wk in DG-received (500Â mg/kg/subcutaneous) mice model of aging for 6 weeks. Spatial and episodic-like memories were assessed by the Barnes maze and What-Where-Which (WWWhich) tasks. Brain tissues were analyzed for mitochondrial function including active mitochondria, adenosine triphosphate, and reactive oxygen species levels, as well as membrane potential and cytochrome c oxidase activity. Apoptosis-related biomarkers, namely, Bax, Bcl-2, and caspase-3 were evaluated by Western blotting method. Laser treatments at wavelengths of 660 and 810Â nm at 8Â J/cm(2) attenuated DG-impaired spatial and episodic-like memories. Also, results showed an obvious improvement in the mitochondrial function aspects and modulatory effects on apoptotic markers in aged mice. However, same wavelengths at the fluency of 4Â J/cm(2) had poor effect on the behavioral and molecular indexes in aging model. This data indicates that transcranial LLLT at both of red and NIR wavelengths at the fluency of 8Â J/cm(2) has a potential to ameliorate aging-induced mitochondrial dysfunction, apoptosis, and cognitive impairment. Reactive Oxygen Species;Adenosine Triphosphate;Galactose Adenosine Triphosphate;Animals;Apoptosis;Brain;Cognitive Aging;Cognitive Dysfunction;Disease Models, Animal;Galactose;Low-Level Light Therapy;Male;Memory, Episodic;Mice, Inbred BALB C;Mitochondria;Mitochondrial Diseases;Reactive Oxygen Species;Spatial Memory

Histological analysis of the association of low level laser therapy and platelet-rich plasma in regeneration of muscle injury in rats. OBJECTIVE: Muscle injuries are common, and their treatment requires costs and time off. Platelet rich plasma and low level laser therapy have been shown to be affordable and easy to use. The aim of this study was to evaluate the associated effects of low level laser therapy and platelet rich plasma on the treatment of the soleus muscle injured by strain in rats. METHODS: Thirty-five rats were randomly allocated into five groups: Control (C), Injury Control (IC), injury PRP (IP), injury LLLT (ILT) and injury LLLT and PRP (ILTP). The strain injury was induced in the soleus muscle and the IP group received application of platelet rich plasma immediately after the lesion, while the ILT group received low level laser therapy. After seven days, all animals were euthanized and the soleus muscle removed for further histological analysis. RESULTS: The association of both treatments (ILTP) resulted in better histological aspects than the low level laser therapy and platelet rich plasma alone, when compared with the injury group (IC). The collagen analysis exhibited a significant increase in the ILT group (2.99 SD=1.13) compared to the C (1.88 SD=0.41, p=0.012) and IP (2.04 SD=0.44, p=0.018). CONCLUSION: The association of low level laser therapy with platelet rich plasma produced better results on muscle injury compared to the isolated use of these therapies. Furthermore, none of the treatments could modulate the collagen deposition in relation to injury group. Collagen Animals;Collagen;Low-Level Light Therapy;Muscle, Skeletal;Platelet-Rich Plasma;Rats;Rats, Wistar;Regeneration;Wound Healing

Low-level laser therapy may reduce dentin hypersensitivity after scaling and root planing.

Does laser phototherapy influence the proliferation of myoepithelial cells in the salivary gland of hypothyroid rats? Thyroid hormones influence both development and growth of organs and tissues and guarantee metabolic demands that interfere with the quality of digestive secretions,

including those of the salivary glands. Laser phototherapy - LPT can modulate various biological phenomena and its diverse effects permit the action on different cell types. The aim of this study was to evaluate the influence of laser phototherapy on myoepithelial cells of salivary glands of hypothyroid rats. Forty-two albino Wistar rats were divided into two main groups: euthyroid (EU) and hypothyroid (HYPO). Hypothyroidism was induced using propylthiouracil (PTU) for 4weeks. Each group was divided into subgroups: control (without laser) and laser groups (Red/infrared - IR). LPT was used on the submandibular gland and was carried out using a diode laser (Î»660 or Î»780nm, 40mW, spot size 0.04cm(2), irradiation area 1cm(2), 300s, 6J/cm(2) per gland, 12J/cm(2) per session) and started two weeks after PTU treatment. LPT was repeated every other day for two weeks. After animal death, the glands were removed, dissected and processed for immunohistochemical analysis. It was observed an increase in the number of myoepithelial cells of hypothyroid control rats in comparison to euthyroid controls (p=0.001). Visible LPT (Î»660nm) caused significant higher proliferation of myoepithelial cells in EU rats when compared to IR LPT (Î» 780nm)(pâ‰¤0.001).It is concluded that, despite the LPT protocol used did not influence myoepithelial proliferation on hypothyroid rats it significantly increased the proliferation on euthyroid animals. Propylthiouracil;Thyroxine Animals;Cell Proliferation;Disease Models, Animal;Epithelial Cells;Hypothyroidism;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Luminescent Measurements;Male;Microscopy, Fluorescence;Propylthiouracil;Rats;Rats, Wistar;Salivary Glands;Thyroxine

Vessel-Targeted Chemophototherapy with Cationic Porphyrin-Phospholipid Liposomes. Cationic liposomes have been used for targeted drug delivery to tumor blood vessels, via mechanisms that are not fully elucidated. Doxorubicin (Dox)-loaded liposomes were prepared that incorporate a cationic lipid; 1,2-dioleoyl-3-trimethylammonium-propane (DOTAP), along with a small amount of porphyrin-phospholipid (PoP). Near-infrared (NIR) light caused release of entrapped Dox via PoP-mediated DOTAP photo-oxidation. The formulation was optimized to enable extremely rapid NIR light-triggered Dox release (i.e., in 15 seconds), while retaining reasonable serum stability. In vitro, cationic PoP liposomes readily bound to both MIA PaCa-2 human pancreatic cancer cells and human vascular endothelial cells. When administered intravenously, cationic PoP liposomes were cleared from circulation within minutes, with most accumulation in the liver and spleen. Fluorescence imaging revealed that some cationic PoP liposomes also localized at the tumor blood vessels. Compared with analogous neutral liposomes, strong tumor photoablation was induced with a single treatment of cationic PoP liposomes and laser irradiation (5 mg/kg Dox and 100 J/cm(2) NIR light). Unexpectedly, empty cationic PoP liposomes (lacking Dox) induced equally potent antitumor phototherapeutic effects as the drug loaded ones. A more balanced chemo- and phototherapeutic response was subsequently achieved when antitumor studies were repeated using higher drug dosing (7 mg/kg Dox) and a low fluence phototreatment (20 J/cm(2) NIR light). These results demonstrate the feasibility of vessel-targeted chemophototherapy using cationic PoP liposomes and also illustrate synergistic considerations. Mol Cancer Ther; 16(11); 2452-61. Â©2017 AACR. Fatty Acids, Monounsaturated;Phospholipids;Porphyrins;Quaternary Ammonium Compounds;liposomal doxorubicin;Polyethylene Glycols;Doxorubicin Animals;Cell Line, Tumor;Cell Proliferation;Doxorubicin;Drug Delivery Systems;Drug Liberation;Fatty Acids, Monounsaturated;Humans;Infrared Rays;Low-Level Light Therapy;Mice;Pancreatic Neoplasms;Phospholipids;Polyethylene Glycols;Porphyrins;Quaternary Ammonium Compounds

Evaluation of the effects of photobiomodulation on vertebras in two rat models of experimental osteoporosis. The aim of this study was to evaluate the effects of photobiomodulation (PBM) on cancellous bone in rat models of ovariectomized induced osteoporosis (OVX-D) and glucocorticoid-induced osteoporosis (GIOP). The experiment comprised of nine groups. A group of healthy rats was

used for baseline evaluations. The OVX-D rats were further divided into groups as follows: control rats with osteoporosis, OVX-D rats that received alendronate (1Â mg/kg 60Â days), OVX-D rats treated with pulsed wave laser (890Â nm, 80Â Hz, 900Â s, 0.0061Â W/cm(2), 5.5Â J/cm(2), three times a week, 60Â days), and OVX-D rats treated with alendronate + pulsed laser. Dexamethasone was administered to the remaining rats that were split into four groups: control, alendronate-treated rats, laser-treated rats, and GIOP rats treated with alendronate + laser. T12, L1, L2, and L3 vertebrae were subjected to laser. Results of the current study demonstrated that OVX-D and GIOP significantly decreased some stereological parameters, and type 1 collagen gene expression compared to the healthy group. There was a significant increase in osteoclast number in both OVX-D and glucocorticoid administration compared to the healthy group. However, the detrimental effect of the OVX-D procedure on bone was more serious than glucocorticoid administration. Results showed that laser alone had a detrimental effect on trabecular bone volume, and cortical bone volume in groups GIOP and OVX-D compared to those in the healthy group. Alendronate significantly improved total vertebral bone volume, trabecular bone volume, and cortical bone volume, in GIOP and OVX-D groups compared to the laser-treated groups. Furthermore, the alendronate + laser in OVX-D rats and GIOP rats produced significantly increased osteoblast number and type 1 collagen gene expression and caused a significant decrease in osteoclast number compared to the controls. Bone Morphogenetic Protein 2;Collagen Type I;Transforming Growth Factor beta1;Insulin-Like Growth Factor I Animals;Bone Morphogenetic Protein 2;Cell Count;Collagen Type I;Disease Models, Animal;Female;Insulin-Like Growth Factor I;Low-Level Light Therapy;Lumbar Vertebrae;Male;Osteoblasts;Osteocytes;Osteoporosis;Ovariectomy;Rats, Sprague-Dawley;Transforming Growth Factor beta1

Combine effect of Chondroitinase ABC and low level laser (660nm) on spinal cord injury model in adult male rats. After spinal cord injury (SCI) there are many recoveries inhibiting factors such as chondroitin sulfate proteoglycan (CSPG) and inflammation. The present study investigated the combinational effect of low level laser therapy (LLLT) as anti-inflammatory agent and Chondroitinase ABC (ChABC) enzyme as CSPG digesting factor on spinal cord after injury. This study performed on 44 male Wistar rats, spinal cord injury induced by a clip compression injury. Animals received two-weeks treatment of 660nm low level laser (LLL) and intraspinal injection of 1Î¼g ChABC. Functional recovery, cavity size, myelination, axonal projections around the cavity, fibroblast invasion and expression of glycogen synthase kinase-3Î² (GSk 3Î²), CSPG and aquaporin 4 (AQP4) expression were evaluated. In statistical evaluation $p<0.05$ considered significant. Result showed the combination of LLLT and ChABC have more effect on reduction of cavity size, improvement of myelination and number of axons around the cavity and decreasing the expression of GSK3Î², CSPG and AQP4 expression compared to LLLT and ChABC alone. In the laser and laser+enzyme groups AQP4 expression decreased significantly after SCI. Functional recovery, improved in LLLT and ChABC treated animals, but higher recovery belonged to the combination therapy group. The current study showed combination therapy by LLLT and ChABC is more efficient than a single therapy with each of them. Anti-Inflammatory Agents;Aqp4 protein, rat;Aquaporin 4;Chondroitin Sulfate Proteoglycans;Glycogen Synthase Kinase 3 beta;Chondroitin ABC Lyase Animals;Anti-Inflammatory Agents;Aquaporin 4;Chondroitin ABC Lyase;Chondroitin Sulfate Proteoglycans;Disease Models, Animal;Fibroblasts;Glycogen Synthase Kinase 3 beta;Inflammation;Low-Level Light Therapy;Male;Myelin Sheath;Nerve Regeneration;Rats, Wistar;Recovery of Function;Spinal Cord Injuries

Photobiomodulation therapy improves both inflammatory and fibrotic parameters in experimental model of lung fibrosis in mice. Lung fibrosis (LF) is a chronic and progressive lung disease characterized by pulmonary parenchyma progressive lesion, inflammatory infiltration, and interstitial

fibrosis. It is developed by excessive collagen deposition and other cellular matrix components, resulting in severe changes in the alveolar architecture. Considering the absence of effective treatment, the aim of this study was to investigate the effect of photobiomodulation therapy (PBMT) on the development of PF. For this purpose, we used C57BL6 mice subjected to induction of LF by bleomycin administration (1.5Â U/kg) by orotracheal route and, after 14Â days of the induction, mice were treated with PBMT applied to the thorax 1Ã—/day for 8Â days (wavelength 660Â Â±Â 20Â nm, power 100Â mW, radiant exposure 5Â J/cm(2), irradiance 33.3Â mW/cm(2), spot size 2.8cm(2), total energy 15Â J, time of irradiation: 150Â s) and inflammatory and fibrotic parameters were evaluated with or without PBMT. Our results showed that PBMT significantly reduced the number of inflammatory cells in the alveolar space, collagen production, interstitial thickening, and static and dynamic pulmonary elastance. In addition, we observed reduced levels of IL-6 e CXCL1/KC released by pneumocytes in culture as well as reduced level of CXCL1/KC released by fibroblasts in culture. We can conclude that the PBMT improves both inflammatory and fibrotic parameters showing a promising therapy which is economical and has no side effects. Chemokine CXCL1;Cxcl1 protein, mouse;Interleukin-6;Bleomycin;Interferon-gamma;Collagen Alveolar Epithelial Cells;Animals;Bleomycin;Bronchoalveolar Lavage;Chemokine CXCL1;Collagen;Disease Models, Animal;Fibroblasts;Inflammation;Interferon-gamma;Interleukin-6;Low-Level Light Therapy;Lung;Male;Mice, Inbred C57BL;Pulmonary Fibrosis

Various LED Wavelengths Affected Myofiber Development and Satellite Cell Proliferation of Chick Embryos via the IGF-1 Signaling Pathway. An effect of monochromatic light illumination on muscle mass has been discovered in chickens; however, its effect on the development of embryonic muscle remains unclear. Our previous studies demonstrated that monochromatic green light promoted satellite cell proliferation and muscle growth in posthatching broilers. In this study, we investigated the effects and mechanisms of monochromatic light exposure on muscle development in late embryogenesis. Seven hundred and fifty fertile broiler eggs were randomly assigned to blue (B-group), green (G-group), red (R-group), white (W-group) lights or darkness (D-group) throughout the incubation period. The muscle weight and fiber size were highest in the G-group compared to the other groups during embryonic days (E) 17 to E20. The proliferation of satellite cells isolated from the G-group was highest, and inÂ vivo green light remarkably increased the number of proliferating cell nuclear antigen (PCNA)-positive cells in skeletal muscle. Meanwhile, plasma IGF-1 was higher (15.5-16.2%) in the G-group than that in D- and R-groups, and the satellite cells isolated from the G-group had a more sensitive response to IGF-1. These findings demonstrate green monochromatic photobiomodulation promoted the muscle growth and satellite cell proliferation was related to the IGF-1 signaling pathway in late embryogenesis. IGF1 protein, human;Insulin-Like Growth Factor I Animals;Cell Proliferation;Chick Embryo;Immunohistochemistry;Insulin-Like Growth Factor I;Light;Muscle Development;Muscle, Skeletal;Signal Transduction

Biofunctionalized Hybrid Magnetic Gold Nanoparticles as Catalysts for Photothermal Ablation of Colorectal Liver Metastases. Purpose To demonstrate that anti-MG1 conjugated hybrid magnetic gold nanoparticles (HNPs) act as a catalyst during photothermal ablation (PTA) of colorectal liver metastases, and thus increase ablation zones. Materials and Methods All experiments were performed with approval of the institutional animal care and use committee. Therapeutic and diagnostic multifunctional HNPs conjugated with anti-MG1 monoclonal antibodies were synthesized, and the coupling efficiency was determined. Livers of 19 Wistar rats were implanted with 5 Ã— 10(6) rat colorectal liver metastasis cell line cells. The rats were divided into three groups according to injection: anti-MG1-coupled HNPs (n = 6), HNPs only (n = 6), and cells only (control group, n = 7). Voxel-wise R2 and R2* magnetic resonance (MR) imaging measurements were obtained before, immediately after, and 24 hours after injection. PTA was then performed with a fiber-coupled near-

infrared (808 nm) diode laser with laser power of 0.56 W/cm(2) for 3 minutes, while temperature changes were measured. Tumors were assessed for necrosis with hematoxylin-eosin staining. Organs were analyzed with inductively coupled plasma mass spectrometry to assess biodistribution. Therapeutic efficacy and tumor necrosis area were compared by using a one-way analysis of variance with post hoc analysis for statistically significant differences. Results The coupling efficiency was 22 Î¼g/mg (55%). Significant differences were found between preinfusion and 24-hour postinfusion measurements of both T2 (repeated measures analysis of variance, P = .025) and T2* (P < .001). Significant differences also existed for T2* measurements between the anti-MG1 HNP and HNP-only groups (P = .034). Mean temperature Â± standard deviation with PTA in the anti-MG1-coated HNP, HNP, and control groups was 50.2Â°C Â± 7.8, 51Â°C Â± 4.4, and 39.5Â°C Â± 2.0, respectively. Inductively coupled plasma mass spectrometry revealed significant tumor targeting and splenic sequestration. Mean percentages of tumor necrosis in the anti-MG1-coated HNP, HNP, and control groups were 38% Â± 29, 14% Â± 17, and 7% Â± 8, respectively (P = .043). Conclusion Targeted monoclonal antibody-conjugated HNPs can serve as a catalyst for photothermal ablation of colorectal liver metastases by increasing ablation zones. (Â©) RSNA, 2017. Antibodies, Monoclonal;MUC5B protein, human;Magnetite Nanoparticles;Mucin-5B;Nanoconjugates;Gold Animals;Antibodies, Monoclonal;Cell Line, Tumor;Colorectal Neoplasms;Gold;Hyperthermia, Induced;Liver Neoplasms;Low-Level Light Therapy;Magnetite Nanoparticles;Mucin-5B;Nanoconjugates;Rats;Rats, Wistar;Treatment Outcome

Current treatments of acne: Medications, lights, lasers, and a novel 650-Î¼s 1064-nm Nd: YAG laser. The treatment of acne, especially severe acne, remains a challenge to dermatologists. Therapies include retinoids, antibiotics, hormones, lights, lasers, and various combinations of these modalities. Acne is currently considered a chronic rather than an adolescent condition. The appropriate treatment depends on the patient and the severity of disease. The purpose of this study was to review current therapies for acne of all severities and to introduce the 650-Î¼s 1064-nm laser for the treatment of acne. Androgen Receptor Antagonists;Anti-Bacterial Agents;Anti-Inflammatory Agents;Contraceptives, Oral;Dermatologic Agents;Retinoids;Isotretinoin;Triamcinolone Acetonide;Benzoyl Peroxide Acne Vulgaris;Androgen Receptor Antagonists;Anti-Bacterial Agents;Anti-Inflammatory Agents;Benzoyl Peroxide;Contraceptives, Oral;Dermatologic Agents;Drug Therapy, Combination;Humans;Injections, Intradermal;Isotretinoin;Lasers, Solid-State;Low-Level Light Therapy;Retinoids;Triamcinolone Acetonide

Photobiomodulation with polarized light in the treatment of cutaneous and mucosal ulcerative lesions. In recent decades, regenerative medicine has achieved an important evolution at both a conceptual level and scientific production, which explains the current and future possibilities of therapy and daily clinical practice. The main aim of regenerative medicine is the complex system of repair/regeneration. The current literature on the subject demonstrates the advantage of visible light therapy for skin injuries and diseases with the photobiomodulation in which light at low energy levels modulates intra- and extra-cellular photoreceptors by molecular and cellular processes that can stimulate both anti-inflammatory mechanisms and cell proliferative response. The irradiation effects are activated soon after exposure. The anti-inflammatory action on some classes of cytokines and cells (e.g. mast cells and macrophages) is completed with the stimulation of the nitric oxide production, which has an anti-inflammatory and vasodilation action, and gives analgesic relief. Our attention focused on photobiomodulator medical device emitting polarized light. 30 patients (19 women and 11 men) were enrolled in the present study. They were treated for chronic lesions using BioptronÂ® Light Therapy System device. Patients were initially subjected to BioptronÂ® light for 20 min after cleansing of the lesion. The operating protocol provides 24 sessions: twice per week for 12 weeks. Twenty patients have been studied for symptoms, histological samples and ulcer

characteristics. After 2 months, a reduction of 50% of the lesions was recorded in 18 patients (60%), while in the remaining patients a slower healing was observed. The total wound healing was achieved after 3 months in 13 patients (43%). The examined parameters of the symptom were exudation, pain and signs of infection. Results at 1 and 3 months were, Exudation: at 1 month reduction and positive modulation was observed in 16 patients (53%) and in 25 patients at 3 months; Pain: (evaluated with Vas scale), decreased in 21 patients at 1 month (70%) and in 100% of cases at 3 months; Infections: regressed or disappeared in 100% of cases after the first month. Today, it is no longer time for monotherapy applications, especially in regenerative medicine and the adoption of biophysical therapies can play a positive anti-inflammatory and regenerative role enhancing the function of non-invasive therapies.

Photobiomodulation in the treatment of chronic non-responding wounds. We present a protocol of care and therapeutic approach to skin lesions, called AIMED (Anti Inflammatory Regenerative Medicine), which is based on the circularity of its phases and applied therapeutic methodologies. We used photobiomodulation (PBM) for the examination non-responding skin lesions. PBM is an adjuvant treatment for the stimulation of regenerative cellular processes, reduction of inflammation and pain and biochemical modulation of molecular response. We used PBM for the examination of skin lesions, which were not responding to other therapies. LumiHealTM protocol treatment has been applied for 3 months on 8 patients affected by infected vascular ulcers of the lower limbs resistant to previous treatments. Three patients reached positive results immediately, and the remaining 5, at the first follow-up. The use of LumiHealTM in combination with other treatments, method allowed an effective and rapid improvement of the lesions via modulation of the immune response.

Infrared neural stimulation induces intracellular Ca(2+) release mediated by phospholipase C.
The influence of infrared laser pulses on intracellular Ca(2+) signaling was investigated in neural cell lines with fluorescent live cell imaging. The probe Fluo-4 was used to measure Ca(2+) in HT22 mouse hippocampal neurons and nonelectrically excitable U87 human glioblastoma cells exposed to 50 to 500â€‰ms infrared pulses at 1470â€‰nm. Fluorescence recordings of Fluo-4 demonstrated that infrared stimulation induced an instantaneous intracellular Ca(2+) transient with similar dose-response characteristics in hippocampal neurons and glioblastoma cells (half-maximal effective energy density EC(50) of around 58â€‰J.cm(-2)). For both type of cells, the source of the infrared-induced Ca(2+) transients was found to originate from intracellular stores and to be mediated by phospholipase C and IP(3) -induced Ca(2+) release from the endoplasmic reticulum. The activation of phosphoinositide signaling by IR light is a new mechanism of interaction relevant to infrared neural stimulation that will also be widely applicable to nonexcitable cell types. The prospect of infrared optostimulation of the PLC/IP(3) cell signaling cascade has many potential applications including the development of optoceutical therapeutics. Aniline Compounds;Fluo 4;Xanthenes;Type C Phospholipases;Calcium Aniline Compounds;Calcium;Cell Line, Tumor;Hippocampus;Humans;Infrared Rays;Intracellular Space;Neurons;Temperature;Type C Phospholipases;Xanthenes

Low Power Laser Therapy: A Strategy to Promote the Osteogenic Differentiation of Deciduous Dental Pulp Stem Cells from Cleft Lip and Palate Patients. Dental pulp stem cells (DPSCs) can undergo several types of differentiation, including osteogenic differentiation. One osteogenesis-inducing factor that has been previously described is in vitro low-power laser irradiation of cells. Laser irradiation promotes the acceleration of bone matrix mineralization of the cell strain. However, no consensus exists regarding the dose and treatment time. We used DPSC strains from cleft lip and palate patients because new bone tissue engineering strategies have used DPSCs in preclinical and clinical trials for the rehabilitation of alveolar bone clefts. Optimizing bone tissue engineering techniques for cleft and lip palate patients by applying low-power laser therapy (LPLT) to DPSCs

obtained from these patients can help improve current strategies to quickly close large alveolar clefts. The aim of this study was to investigate the effects of LPLT at different energy densities in DPSC strains obtained from cleft lip and palate patients during in vitro osteogenic differentiation. Ten DPSC strains were obtained from cleft lip and palate patients and then used in the following study groups: group 1: control, the strains underwent osteogenic differentiation for 21 days; and groups 2, 3, and 4: the strains were irradiated each day with a low-power red laser (660â€‰nm) (5, 10, and 20â€‰J) during 21 days of osteogenic differentiation. Using Bonferroni's test, a statistically significant difference in the mean values was found between the irradiated groups (2, 3, and 4) and the control group (pâ€‰<â€‰0.001). However, no significant difference in osteogenic potential was found among the irradiated groups. Our findings showed that the osteogenic potential of DPSCs increases with red laser irradiation at 5, 10, and 20â€‰J, and this treatment could be considered a new approach for preconditioning these cells to be used in bone tissue engineering. Cell Differentiation;Cells, Cultured;Cleft Lip;Cleft Palate;Dental Pulp;Humans;Low-Level Light Therapy;Osteogenesis;Stem Cells;Tissue Engineering

Fractional carbon dioxide (CO(2)) laser combined with topical tretinoin for the treatment of different forms of cystic acne. Nodulocystic acne is prone to scarring and difficult to treat with treatments other than oral isotretinoin. The aim of this article is to discuss the role of a single session of a fractional carbon dioxide (CO(2)) laser combined with a topical treatment with a tretinoin and antibiotic gel for a month as a successful treatment to improve nodulocystic acne and chronic microcystic acne. Two cases were involved: the first with nodulocystic acne lesions that persisted after oral retinoids and the second with chronic microcystic acne resistant to topical treatments. After only one session of treatment with the CO(2) laser and the topical treatment, a complete healing of the nodulocystic acne lesions was observed with minimal secondary effects. The microcystic acne showed great improvement. No other topical or oral treatment was needed. This treatment could be a safe and effective treatment for nodulocystic acne lesions and microcystic acne when other treatments fail. More studies should be performed to confirm our results. Anti-Bacterial Agents;Keratolytic Agents;Tretinoin Acne Vulgaris;Administration, Topical;Adolescent;Anti-Bacterial Agents;Combined Modality Therapy;Female;Humans;Keratolytic Agents;Lasers, Gas;Low-Level Light Therapy;Tretinoin;Young Adult

The use of lasers in the treatment of skin cancer: A review. BACKGROUND: In considering skin cancer, a number of factors-including effectiveness, simplicity of treatment, cost, and esthetic outcomes-are important to ensure patient's satisfaction. There are several existing interventions, such as electrodessication and curettage, excision, Mohs surgery, radiation therapy, cryotherapy, and topical/oral treatments. Laser therapy has emerged as a new promising alternative that should be explored. OBJECTIVE: To review the literature on the dermatological use of laser therapy in the treatment of skin cancer. RESULTS: A review of articles available on the MEDLINE and Web of Science databases until May 2017 yielded 24 and 6 studies, respectively, on laser therapy in the treatment of skin cancers, particularly melanoma, basal cell carcinoma, and squamous cell carcinoma. The four laser subtypes included solid-state, diode, dye, and gas lasers. CONCLUSION: Review of the literature demonstrates the progress of dermatological understanding of the clinical implications of laser therapy in the treatment of premalignant and malignant neoplasms of the skin, and suggests that this treatment modality might be a viable option for some patients. Carcinoma, Basal Cell;Carcinoma, Squamous Cell;Humans;Laser Therapy;Lasers, Dye;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Melanoma;Skin Neoplasms

Effect of endovascular coronary low-level laser therapy during angioplasty on the release of endothelin-1 and nitric oxide. BACKGROUND: Nitric oxide (NO) and endothelin-1 are potentially significant factors contributing to the pathogenesis of post-angioplasty restenosis. It may be

postulated that low-level laser therapy (LLLT) can favorably influence the process of restenosis by affecting those factors. OBJECTIVES: The aim of the study was to evaluate the effect of LLLT applied during percutaneous coronary intervention (PCI) on the factors participating in the homeostasis of vascular tone - NO and endothelin-1. MATERIAL AND METHODS: In a randomized, prospective study of 52 subjects undergoing PCI, an additional 808 nm intravascular LLLT was applied at a dose of 9 J/cm2 in the lesion part. The control group was 49 subjects with PCI only. We assessed the concentration of nitrites/nitrates reflecting NO metabolism as well as endothelin-1 in both groups before PCI, and at 6 h, 12 h and 1 month after the procedure. In addition, half a year after PCI, a follow-up angiography was performed. RESULTS: Statistically higher nitrite/nitrate concentrations were observed in the laser group as compared to the control group in all tests except the pre-PCI assays. Endothelin-1 levels were significantly higher in the laser group 6 h after PCI with a significant decrease in subsequent tests, which was not observed in the control group. The restenosis rate was 15.0% in the laser group and 32.4% in the control group (however the difference was not statistically significant). CONCLUSIONS: LLLT applied during the PCI procedure can influence the process of restenosis by modifying NO and endothelin-1 concentrations. Endothelin-1;Nitric Oxide
Aged;Coronary Stenosis;Endothelin-1;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nitric Oxide;Percutaneous Coronary Intervention;Prospective Studies

Analgesic effects of preinjection low-level laser/light therapy (LLLT) before third molar surgery: a double-blind randomized controlled trial. OBJECTIVE: The aim of this study was to evaluate the analgesic effects of low-level laser therapy (LLLT) on preinjection sites in patients scheduled for third molar removal. STUDY DESIGN: This double-blind randomized controlled trial included 163 healthy patients undergoing third molar extractions. The study participants were randomly divided into an LLLT and a placebo group. Objective and subjective data sets were obtained from physiologic feedback (heart rate and sweat response) and a questionnaire, respectively. In the LLLT group, each targeted injection site was irradiated twice with 198Â mW continuous wave for 30Â seconds with a 0.088Â cm(2) focal spot at an applied energy of 5.94Â J and fluence of 67.50Â J/cm(2). Measurements were recorded from 4 time-points during data acquisition. RESULTS: There was no significant difference between the LLLT and placebo groups in pain experience scores associated with the injected sites for maxillary or mandibular third molar extractions. Mean heart rates before and during injection were lower in the LLLT group than in the placebo group for both maxillary and mandibular regions. No statistically significant differences were observed for any remaining parameters. CONCLUSIONS: The present data indicated that preinjection LLLT did not effectively decrease the pain felt during local anesthetic injections before third molar surgery.
Adolescent;Adult;Aged;Anesthesia, Dental;Dental Anxiety;Double-Blind Method;Feedback, Physiological;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Molar, Third;Pain Management;Pain Measurement;Tooth Extraction;Treatment Outcome

Comparison of effects of LLLT and LIPUS on fracture healing in animal models and patients: A systematic review. The aim of this paper is to study the inÂ vivo potency of low-level laser therapy (LLLT) and low intensity pulsed ultrasound (LIPUS) alone, accompanied by bone grafts, or accompanied by other factors on fracture healing in animal models and patients. In this paper, we aim to systematically review the published scientific literature regarding the use of LLLT and LIPUS to accelerate fracture healing in animal models and patients. We searched the PubMed database for the terms LLLT or LIPUS and/or bone, and fracture. Our analysis also suggests that both LIPUS and LLLT may be beneficial to fracture healing in patients, and that LIPUS is more effective. These finding are of considerable importance in those treatments with a LIPUS, as a laser device may reduce healing time. The most clinically relevant impact of the LIPUS treatment could be a significant reduction in the proportion of patients who go on to develop a nonunion. If it is confirmed that the therapeutic

influence is true and reliable, patients will obtain benefits from LIPUS and LLLT. Further clinical trials of high methodological quality are needed in order to determine the optimal role of LIPUS and LLLT in fracture healing in patients. Animals;Fracture Healing;Humans;Low-Level Light Therapy;Models, Animal

Long-term survival of a randomized phase III trial of head and neck cancer patients receiving concurrent chemoradiation therapy with or without low-level laser therapy (LLLT) to prevent oral mucositis. BACKGROUND: The impact of low-level laser therapy (LLLT) to prevent oral mucositis in patients treated with exclusive chemoradiation therapy remains unknown. This study evaluated the overall, disease-free and progression-free survival of these patients. METHODS: Overall, disease-free and progression-free survival of 94 patients diagnosed with oropharynx, nasopharynx, and hypopharynx cancer, who participated on a phase III study, was evaluated from 2007 to 2015. The patients were subjected to conventional radiotherapy plus cisplatin every 3weeks. LLLT was applied with an InGaAlP diode (660nm-100mW-1J-4J/cm(2)). RESULTS: With a median follow-up of 41.3months (range 0.7-101.9), patients receiving LLLT had a statistically significant better complete response to treatment than those in the placebo group (LG=89.1%; PG=67.4%; p=0.013). Patients subjected to LLLT also displayed increase in progression-free survival than those in the placebo group (61.7% vs. 40.4%; p=0.030; HR:1:93; CI 95%: 1.07-3.5) and had a tendency for better overall survival (57.4% vs. 40.4%; p=0.90; HR:1.64; CI 95%: 0.92-2.91). CONCLUSION: This is the first study to suggest that LLLT may improve survival of head and neck cancer patients treated with chemoradiotherapy. Further studies, with a larger sample, are necessary to confirm our findings. Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Stomatitis;Survival Analysis

Quantitative Biology of Exercise-Induced Signal Transduction Pathways. Exercise is essential in regulating energy metabolism. Exercise activates cellular, molecular, and biochemical pathways with regulatory roles in training response adaptation. Among them, endurance/strength training of an individual has been shown to activate its respective signal transduction pathways in skeletal muscle. This was further studied from the viewpoint of quantitative difference (QD). For the mean values, [Formula: see text], of two sets of data, their QD is defined as [Formula: see text] ([Formula: see text]). The function-specific homeostasis (FSH) of a function of a biosystem is a negative-feedback response of the biosystem to maintain the function-specific conditions inside the biosystem so that the function is perfectly performed. A function in/far from its FSH is called a normal/dysfunctional function. A cellular normal function can resist the activation of other signal transduction pathways so that there are normal function-specific signal transduction pathways which full activation maintains the normal function. RESULTS: An acute endurance/strength training may be dysfunctional, but its regular training may be normal. The normal endurance/strength training of an individual may resist the activation of other signal transduction pathways in skeletal muscle so that there may be normal endurance/strength training-specific signal transduction pathways (NEPs/NSPs) in skeletal muscle. The endurance/strength training may activate NSPs/NEPs, but the QD from the control is smaller than 0.80. The simultaneous activation of both NSPs and NEPs may enhance their respective activation, and the QD from the control is larger than 0.80. The low level laser irradiation pretreatment of rats may promote the activation of NSPs in endurance training skeletal muscle. CONCLUSION: There may be NEPs/NSPs in skeletal muscle trained by normal endurance/strength training. Adaptation, Physiological;Energy Metabolism;Exercise;Humans;Muscle Strength;Muscle, Skeletal;Physical Endurance;Resistance Training;Signal Transduction

A Double-Blind, Placebo-Controlled Randomized Evaluation of the Effect of Low-Level Laser Therapy on Venous Leg Ulcers. This study aimed to determine the effect of low-level laser therapy (LLLT) on chronic venous leg ulcers (VLUs). A double-blinded prospective randomized controlled trial was

conducted to compare incidence of complete wound closure, ulcer size and pain reduction in patients randomized to 24 treatments of placebo or LLLT (635 nm) over 12 weeks. Patients presented with a 6-week history of VLUs ranging in size from 5 to 20 cm(2). Venous origin was confirmed by Doppler ultrasound and an ankle brachial index of 0.8 or greater. Of 24 patients, 23% of the test group (n = 13) and 18% of placebo group (n = 11) achieved complete wound closure. At 12 weeks, patients in test and placebo groups had a mean surface area reduction of 6.26 cm(2) (P < .0001) and 6.72 cm(2) (P < .005), respectively, and a mean pain score decrease of 43.54 points (P < .0001) and 25.73 points (P = .002) respectively. Differences between groups was not statistically significant for wound closure (P = 1.0) or ulcer size (P = .80). Mean ulcer pain was significantly reduced from initiation of treatment compared with 4 weeks' follow-up after 12 weeks with LLLT (P < .01). Within the limitations of the study, LLLT may not have early effects as an adjunctive therapy to wound healing of VLUs, but LLLT may have delayed effects on VLU healing and associated pain, which requires further study. Aged;Ankle Brachial Index;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Management;Pain Measurement;Treatment Outcome;Ultrasonography, Doppler;Varicose Ulcer;Wound Healing

The potential of low-power laser for reducing dental sensitivity after in-office bleaching: a case report. Postoperative sensitivity is one of the most common side effects of in-office bleaching with hydrogen peroxide. Laser phototherapy (LPT) has been suggested as an adjunctive treatment to prevent or minimize tooth sensitivity. This case report aimed to verify the efficacy of LPT in the reduction of sensitivity after in-office bleaching. Tooth bleaching was performed with 35% hydrogen peroxide activated with a hybrid LED-laser device. Immediately after the bleaching treatment, the patient reported dental sensitivity, as measured with a visual analog scale (VAS). To reduce sensitivity, LPT was applied with a 780-nm laser using the following parameters: 70 mW, exposure time of 10 seconds per point of irradiation (middle region of the buccal surfaces of each compromised tooth) in contact mode, energy of 1 J per point. Immediately after LPT, the patient reported a substantially lower level of pain on the VAS. Twenty-four hours after bleaching, the score on the VAS indicated that sensitivity levels had rebounded, and the patient received additional LPT. After 48 hours, the patient reported no dental sensitivity. The results in this patient indicated that irradiation with an infrared low-power laser substantially reduced dental pain generated by bleaching, suggesting that LPT should be considered as an auxiliary method to reduce postbleaching tooth sensitivity. Adult;Dentin Sensitivity;Humans;Low-Level Light Therapy;Male;Pain Measurement;Tooth Bleaching

Treatment of cafÃ©-au-lait macules with a high-fluenced 1064-nm Q-switched neodymium:yttrium aluminum garnet laser. CafÃ©-au-lait macules (CALMs) are light to dark brown macules or patches of increased melanin concentration found along the dermoepidermal junction. Although many attempts to treat CALMs using various kinds of laser/light-based devices have been reported, CALMs remain refractory thereto with high recurrence rates. In this case series, we describe four patients with idiopathic CALMs that were effectively and safely treated with a non-ablative, high-fluenced, Q-switched (QS), 1064-nm neodymium:yttrium aluminum garnet (Nd:YAG) laser. The typical laser parameters for treating CALMs, including a spot size of 7-7.5Â mm, a fluence of 2.4-2.5Â J/cm(2), and one to two passes until the appearance of mild erythema, but not petechiae, were utilized in this study over 12-24 treatment sessions at 2-week intervals. We suggest that high-fluenced QS 1064-nm Nd:YAG laser treatment can be used as an effective and alternative treatment modality for CALMs with minimal risk of side effects. Adult;Cafe-au-Lait Spots;Child;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Young Adult

Effect of low-level laser therapy and oxytocin on osteoporotic bone marrow-derived mesenchymal stem cells. Postmenopausal osteoporosis (OP) is a major concern for public health. Low-level

laser therapy (LLLT) has a positive effect on the health of bone marrow mesenchymal stem cells (BMMSCs). The purpose of this study is to evaluate the influence of LLLT and oxytocin (OT) incubation-individually and in combination-on osteoporotic BMMSCs in ovariectomized rats. Twelve female rats were randomized into two groups to undergo either a sham surgery (sham group) or ovariectomy-induced osteoporosis (OVX group). MSCs harvested from the BM of healthy and OVX rats underwent culture expansion. There were five groups. In Groups one (sham-BMMSC) and two (OVX-BMMSC) the cells were held in osteogenic condition medium without any intervention. In the group three (OT), OT incubation with optimum dose was performed for 48â€‰h (two times, 10(-12) molar). In Group four, laser-treated-OVX-BMMSCs were treated with optimum protocol of LLLT (one time, 1.2â€‰J/cm(2)). In Group five (laserâ€‰+â€‰OT group), the OT incubation plus the laser irradiation was performed. The biostimulatory effect of LLLT is demonstrated by a significant increase in the viability of OVX-BMMSCs, cell cycle, and extracellular levels of Transforming growth factor beta (TGF-Î²), insulin-like growth factor-I (IGF-I), and Alkaline phosphatase (ALP) compared to control OVX-BMMSCs and/or the sham group. OT incubation and laserâ€‰+â€‰OT incubation have a positive effect on OVX-BMMSCs. However, LLLT is more effective statistically. We conclude that LLLT significantly improved cell viability, enhanced the osteogenic potential of the OVX-BMMSCs, and increased the extracellular levels of the TGF-Î², IGF-I, and ALP. Transforming Growth Factor beta;insulin-like growth factor-1, rat;Oxytocin;Insulin-Like Growth Factor I;Alkaline Phosphatase Alkaline Phosphatase;Animals;Apoptosis;Cell Culture Techniques;Cell Differentiation;Cell Survival;Cells, Cultured;Disease Models, Animal;Female;Humans;Insulin-Like Growth Factor I;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteogenesis;Osteoporosis, Postmenopausal;Oxytocin;Random Allocation;Rats;Transforming Growth Factor beta

Effect of low-level laser-treated mesenchymal stem cells on myocardial infarction. Cardiovascular disease is the leading cause of death worldwide. Although cardiac transplantation is considered the most effective therapy for end-stage cardiac diseases, it is limited by the availability of matching donors and the complications of the immune suppressive regimen used to prevent graft rejection. Application of stem cell therapy in experimental animal models was shown to reverse cardiac remodeling, attenuate cardiac fibrosis, improve heart functions, and stimulate angiogenesis. The efficacy of stem cell therapy can be amplified by low-level laser radiation. It is well established that the bio-stimulatory effect of low-level laser is influenced by the following parameters: wavelength, power density, duration, energy density, delivery time, and the type of irradiated target. In this review, we evaluate the available experimental data on treatment of myocardial infarction using low-level laser. Eligible papers were characterized as in vivo experimental studies that evaluated the use of low-level laser therapy on stem cells in order to attenuate myocardial infarction. The following descriptors were used separately and in combination: laser therapy, low-level laser, low-power laser, stem cell, and myocardial infarction. The assessed low-level laser parameters were wavelength (635-804Â nm), power density (6-50Â mW/cm(2)), duration (20-150Â s), energy density (0.96-1Â J/cm(2)), delivery time (20Â min-3Â weeks after myocardial infarction), and the type of irradiated target (bone marrow or in vitro-cultured bone marrow mesenchymal stem cells). The analysis focused on the cardioprotective effect of this form of therapy, the attenuation of scar tissue, and the enhancement of angiogenesis as primary targets. Other effects such as cell survival, cell differentiation, and homing are also included. Among the evaluated protocols using different parameters, the best outcome for treating myocardial infarction was achieved by treating the bone marrow by one dose of low-level laser with 804 nm wavelength and 1Â J/cm(2) energy density within 4Â h of the infarction. This approach increased stem cell survival, proliferation, and homing. It has also decreased the infarct size and cell apoptosis, leading to enhanced heart functions. These effects were stable for 6Â weeks. However, more studies are still required to assess the effects of low-level

laser on the genetic makeup of the cell, the nuclei, and the mitochondria of mesenchymal stromal cells (MSCs). Animals;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Myocardial Infarction

Photobiomodulation therapy action in wound repair skin induced in aged rats old: time course of biomarkers inflammatory and repair. Previous studies have discussed an inverse correlation between age and wound healing, because it relates to the association of aging with a gradual decrease in healing capacity. Treatment with photobiomodulation therapy (PBMT) improves wound healing by inducing increases in mitotic activity, numbers of fibroblasts, collagen synthesis, and neovascularization. Therefore, this study aimed to evaluate the effects of PBMT in cutaneous wound healing in aged rats. A punch biopsy of 8Â mm in diameter was performed to produce a skin wound. The study included 45 male rats, of which 15 were young (30Â days) and 30 were elderly (500Â days). The 45 animals were distributed into 3 experimental groups, which were subjected to skin wounds and 1 aged group received PBMT, with a 30-mW laser beam (power density of 1.07Â W/cm(2)), beam area of 0.028Â cm(2), and Î»660Â nm produced through active phosphide Gallium-Aluminum-Indio (InGaAlP). The PBMT application took the form of a single-point transcutaneous method, with a total energy of 2 joules per wound site, energy density of 72Â J/cm(2), and time of 1Â min and 7Â s. Analysis was performed to verify the effect of PBMT on the quantity of collagen I and III, metalloproteinase 3 and 9 (MMP-3 and MMP-9), tissue inhibitor of metalloproteinase-2 (TIMP-2) and of vascular endothelial growth factor (VEGF) at the wound site by immunohistochemistry, cytokine-induced neutrophil chemoattractant (CINC)-1, by enzyme-linked immunosorbent assay (ELISA) and interleukin (IL)-6 real-time polymerase chain reaction (RT-PCR). That we conclude LLLT is effective in the modulation of inflammatory mediators IL-6, CINC-1, VEGF, MMP-3, MMP-9 and TIMP-2 as well as increased collagen production in aged animals during different phases of the tissue regeneration process. However, the effects of PBMT obtained in the aged animals (aged LLLT group) suggest that new dosimetries should be tested to achieve better results. Biomarkers;Chemokine CXCL1;Collagen Type I;Cxcl1 protein, rat;Interleukin-6;RNA, Messenger;Vascular Endothelial Growth Factor A;Tissue Inhibitor of Metalloproteinase-2;Matrix Metalloproteinase 3;Matrix Metalloproteinase 9 Aging;Animals;Biomarkers;Chemokine CXCL1;Collagen Type I;Inflammation;Interleukin-6;Low-Level Light Therapy;Male;Matrix Metalloproteinase 3;Matrix Metalloproteinase 9;RNA, Messenger;Rats, Wistar;Skin;Time Factors;Tissue Inhibitor of Metalloproteinase-2;Vascular Endothelial Growth Factor A;Wound Healing

Achilles Tendon Penetration for Continuous 810â€‰nm and Superpulsed 904â€‰nm Lasers Before and After Ice Application: An In Situ Study on Healthy Young Adults. BACKGROUND AND OBJECTIVE: There is a lack of knowledge about the influence tissue temperature may have on laser light penetration and tendon structure. The purpose of this study was to investigate whether penetration of laser energy in human Achilles tendons differed before and after ice pack application. MATERIALS AND METHODS: The Achilles tendons (nâ€‰=â€‰54) from 27 healthy young adults were irradiated with two class 3B lasers (810â€‰nm 200â€‰mW continuous mode laser and a 904â€‰nm 60â€‰mW superpulsed mode laser). The optical energy penetrating the Achilles area was measured before and after 20â€‰min of ice application. Measurements were obtained after 30, 60, and 120â€‰sec irradiation with the 904â€‰nm laser and after 30 and 60â€‰sec irradiation with the 810â€‰nm laser. Achilles tendon thickness was measured with ultrasonography. RESULTS: Optical energy penetration increased significantly (pâ€‰<â€‰0.01) after ice application for both lasers and at all time points from 0.34% to 0.39% of energy before ice application to 0.43-0.52% of energy after ice application for the 904â€‰nm laser and from 0.24% to 0.25% of energy before ice application to 0.30-0.31% of energy after ice application for the 810â€‰nm laser. The energy loss per centimeter of irradiated tissue was significantly higher (pâ€‰<â€‰0.05) at all time points after ice

application. Ultrasonography imaging of skin-to-skin and transversal tendon thickness was significantly reduced after ice application at pâ€‰=â€‰0.05 and pâ€‰=â€‰0.03, respectively. Achilles tendon thickness in the longitudinal plane remained unchanged (pâ€‰=â€‰0.49). CONCLUSIONS: The penetration of laser light increased significantly through healthy Achilles tendons subjected to 20â€‰min of cooling. These findings occurred in the presence of a significant reduction in skin temperature and Achilles tendon thickness. Achilles Tendon;Cryotherapy;Female;Healthy Volunteers;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Radiotherapy Dosage;Reference Values;Ultrasonography, Doppler;Young Adult

Effects of the GaAlAs diode laser (780Â nm) on the periodontal tissues during orthodontic tooth movement in diabetes rats: histomorphological and immunohistochemical analysis. The purposes of the present study are to assess the effects of the GaAlAs diode laser on the periodontal tissues and to investigate its action on the alveolar bone remodeling process during orthodontic tooth movement in normoglycemic and diabetic rats. Sixty adult male Wistar rats were divided into four groups of 15 rats: normoglycemic (N), diabetic (D), laser-normoglycemic (LN), and laser-diabetic (LD) rats. Diabetes mellitus was induced by a single intravenous injection of 40Â mg/kg monohydrated alloxan. The orthodontically moved tooth underwent a force magnitude of 20Â cN. The laser irradiation with a continuous emission of a 780-nm wavelength, an output power of 20Â mW, and a fiber probe with a spot size of 0.04Â cm in diameter and an area of 0.00126Â cm(2) were used. Moreover, an energy density of 640Â J/cm(2) was applied in an exposition time of 40Â s. Histomorphological and immunohistochemical analysis was performed. The photobiomodulation (PBM) strongly stimulated the periodontal tissue response, establishing mainly the balance between the bone formation and resorption. Intense inflammatory cell infiltration and extensive loss of bone tissue were mainly found in the D group from 14Â days. The number of osteopontin-positive osteocytes was significantly greater in the LN group, followed by the LD, especially at 7 and 14Â days, whereas osteoprotegerin-positive osteoblasts were significantly higher in the LN and LD groups than in the N and D groups, respectively, in all periods. The PBM strongly stimulated the alveolar bone remodeling and favored the continuous reorganization of the soft periodontal tissues, leading to the maintenance and integrity of the periodontal microstructure under orthodontic force, especially in uncontrolled diabetic rats. Osteoprotegerin;RANK Ligand;Osteopontin Animals;Diabetes Mellitus, Experimental;Immunohistochemistry;Lasers, Semiconductor;Male;Orthodontics;Osteoblasts;Osteoclasts;Osteopontin;Osteoprotegerin;Periodontium;RANK Ligand;Rats, Wistar;Tooth Movement Techniques

Antinociceptive effects of low-level laser therapy at 3 and 8â€‰j/cm(2) in a rat model of postoperative pain: possible role of endogenous Opioids. Low-level laser therapy (LLLT) is the direct application of light to stimulate cell responses (photobiomodulation) to promote tissue healing, reduce inflammation, and induce analgesia; the molecular basis for these effects of LLLT remains unclear. The objective of this study was to evaluate the analgesic effect of LLLT in the rat plantar incision model of postoperative pain as well as to investigate some of the possible mechanisms involved in this effect. Wistar rats were submitted to plantar incision and treated with LLLT (830â€‰nm, continuous-mode, 30â€‰mW/cm(2) , 1-12â€‰J/cm(2)). Postoperative thermal and mechanical hypersensitivity were monitored for 24 hours post-incision. In addition, the animals were pretreated with saline, naloxone (a nonselective opioid receptor antagonist; 20â€‰Âµg/5â€‰Âµl) or methysergide (5-HT(2C) , 5-HT(2A) , 5-HT(7) , 5-HT(5a) , 5-HT(6,) and 5-HT(1F) receptors antagonist; 30â€‰Âµg/5â€‰Âµl). Moreover, 24 hours after incision and treatment, the TNF-Î± and IL-1Î² levels in serum were evaluated. Our results demonstrate, for the first time, that LLLT at 3 or 8â€‰J/cm(2) , but not at 1-2, 4-7, or 9-12â€‰J/cm(2) , induced an analgesic effect on postoperative pain. Naloxone, but not methysergide, blocked the LLLT-induced anti-nociceptive effect. Additionally, IL-1-Î² and TNF-

Î± production significantly decreased after LLLT at 3 or 8â€‰J/cm(2) . Our results suggest that LLLT at 3 or 8â€‰J/cm(2) primarily modulates the endogenous opioids system and is not directly mediated by serotonergic receptors. Reduction of IL-1Î² and TNF-Î± may play a role in the antinociceptive action of LLLT. Lasers Surg. Med. 49:844-851, 2017. Â© 2017 Wiley Periodicals, Inc. Cytokines;Narcotic Antagonists;Opioid Peptides;Serotonin Antagonists;Naloxone;Methysergide Animals;Cytokines;Disease Models, Animal;Low-Level Light Therapy;Male;Methysergide;Naloxone;Narcotic Antagonists;Opioid Peptides;Pain Threshold;Pain, Postoperative;Rats;Rats, Wistar;Serotonin Antagonists

Laser irradiation promotes the proliferation of mouse pre-osteoblast cell line MC3T3-E1 through hedgehog signaling pathway. Low-level laser could promote osteoblast proliferation, and it has been applied in clinical practice to promote wound healing and tissue regeneration. However, the mechanism related to laser irradiation remains unclear. This study aimed to investigate the effects of low-level laser irradiation on the cell proliferation and the expressions of hedgehog signaling molecules Indian hedgehog (Ihh), Ptch, and Gli in vitro. In our present study, the MTT method was used to evaluate the effect on cell proliferation of laser irradiation on MC3T3-E1 cells. And cell cycle was examined by flow cytometry. Gene and protein expressions of hedgehog signaling molecules, including Ihh, Ptch, Smoothened (Smo), and Gli, were examined by qRT-PCR and western blot analysis. The results showed that laser irradiation at dosage of 3.75Â J/cm(2) enhances the proliferation of MC3T3-E1 cells compared with control groups (pÂ =Â 0.00). Moreover, laser irradiation (3.75Â J/cm(2)) increased the cell amount at S phase (pÂ =Â 0.00). In addition, the expressions of Ihh, Ptch, Smo, and Gli were significantly increased compared to the control during laser irradiation (3.75Â J/cm(2))-induced MC3T3-E1 osteoblast proliferation. After adding the hedgehog signaling inhibitor CY (cyclopamine), cell proliferation and Ihh, Ptch, Smo, and Gli expressions were inhibited (pÂ =Â 0.00), and the cell amount at S phase was reduced compared with combination groups (pÂ =Â 0.00). These results indicated that laser irradiation promotes proliferation of MC3T3-E1 cells through hedgehog signaling pathway. Our findings provide insights into the mechanistic link between laser irradiation-induced osteogenesis and hedgehog signaling pathway. Hedgehog Proteins;Veratrum Alkaloids;cyclopamine Animals;Cell Cycle;Cell Line;Cell Proliferation;Gene Expression Regulation;Hedgehog Proteins;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Osteoblasts;Osteogenesis;Signal Transduction;Veratrum Alkaloids

Application of photodynamic therapy, laser therapy, and a cellulose membrane for calcaneal pressure ulcer treatment in a diabetic patient: A case report. Diabetes mellitus is a metabolic disorder in which a person has high blood glucose levels due to inadequate insulin production by the pancreas. Wounds in these individuals cannot heal properly over time due to circulatory changes that hinder and stagnate the healing process. We report the case of an 82-year-old female type 2 diabetes mellitus carrier, presenting to clinical-dermatological examination pressure ulcer (PU) in the right calcaneus region. The patient was treated with photodynamic therapy using curcumin and blue light-emitting diodes (LEDs), laser therapy, and the application of a cellulose membrane in order to promote ulcer decontamination by local action, accelerate wound healing, and maintain favorable conditions of asepsis and moisture, respectively. The ulcer healing occurred after 30days of treatment and total epithelialization was observed. From the results obtained in this case report, we conclude that the combination of photodynamic therapy, laser therapy, and coating with a cellulose membrane is a promising treatment for the healing of PU in diabetic patients. Photosensitizing Agents;Curcumin Aged, 80 and over;Combined Modality Therapy;Curcumin;Diabetes Mellitus, Type 2;Diabetic Foot;Female;Heel;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Pressure Ulcer;Wound Healing

Treatment of xanthelasma palpebrarum with a 1064-nm, Q-switched Nd:YAG laser. BACKGROUND: Xanthelasma palpebrarum is the most common cutaneous xanthoma characterized by soft, yellow papules or plaques that arise on the periorbital skin. As these lesions can be cosmetically disfiguring, many patients seek medical help to remove these lesions. OBJECTIVE: To determine the effectiveness and minimum number of treatment sessions with a 1064-nm, Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser for the treatment of xanthelasma. METHODS: A retrospective review of patients with xanthelasma consecutively treated with Q-switched Nd:YAG laser was conducted. Forty-six patients with 103 lesions were identified from January 2012 through August 2015. Photographs taken of patients immediately before treatment and 4-8Â weeks after treatment were independently evaluated by 2 dermatologists. RESULTS: After a single treatment session, 93.2% of lesions had some degree of clearance. All lesions had excellent-to-complete clearance after at least 4 treatment sessions. Patients usually required 4 treatment sessions for optimal results. LIMITATIONS: This was a retrospective study. Treatment parameters varied, follow-up periods were not uniform, and response was not assessed with a validated scale. CONCLUSION: The Q-switched Nd:YAG laser is effective and well tolerated in the treatment of xanthelasma in our study population. Adult;Aged;Eyelid Diseases;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Photography;Retrospective Studies;Xanthomatosis

Effects of Light-Emitting Diode Therapy on Muscle Hypertrophy, Gene Expression, Performance, Damage, and Delayed-Onset Muscle Soreness: A Case-Control Study With a Pair of Identical Twins. Case-Control Studies;Humans;Hypertrophy;Muscle, Skeletal;Myalgia;Twins, Monozygotic

Genital angiokeratomas of Fordyce 595-nm variable-pulse pulsed dye laser treatment. BACKGROUND: Angiokeratoma of Fordyce (AF) represents dark red or blue-black papules with a scaly surface located on scrotum, labia majora, and penis. Though usually asymptomatic, bleeding after mechanical trauma and sexual intercourse may occur. AF should be differentiated from malignant melanoma, angiosarcoma, and other pigmented lesions. The treatment, usually asked from patients as the result of anxiety and social embarrassment, should be performed in a non-aggressive manner. OBJECTIVES: To determine the safety and effectiveness of 595-nm variable-pulse pulsed dye laser (VPPDL) with a Dynamic Cooling Device (DCD) in the treatment of AF. METHODS: Twenty-four patients (22 men and two women) aged 40.88 Â± 12.48 years with AF were included in the retrospective study. Lesions located on scrotum, labia majora, and penis were treated with 595-nm VPPDL in the intervals of one to three months. Variable spot, fluence, and pulse-width parameters were used with and/or without DCD skin cooling. RESULTS: AF were successfully removed in all patients in one to seven (mean Â± SD = 3.38 Â± 2.16) treatment sessions with no permanent side effects or complications such as dyspigmentations or scarring. Recidives were observed in four patients after 0.5-1 year intervals. CONCLUSIONS: 595-nm VPPDL with DCD represents an efficient and safe method for the removal of multiple lesions of AF in genital localization. Adult;Angiokeratoma;Female;Genital Diseases, Female;Genital Diseases, Male;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies

The effect of pulsed dye laser on cutaneous leishmaniasis and its impact on the Dermatology Life Quality Index. BACKGROUND AND OBJECTIVE: Cutaneous leishmaniasis is a prevalent skin condition especially in the Middle Eastern region. The use of pulsed dye laser (PDL) for the treatment of cutaneous leishmaniasis (CL) has not been thoroughly evaluated. We assessed primarily the efficacy of 595-nm PDL in the treatment of CL lesions and interpreted its impact on the quality of life (QOL) of affected patients as measured by the Dermatology Life Quality Index (DLQI). PATIENTS AND METHODS: Twenty-five lesions from 12 patients were treated with a single pass of PDL over the whole lesions to develop a purpuric end point. Parameters used for this treatment were 7 J/cm(2)

fluence, 10-mm spot size, and 0.45-ms pulse duration. The laser settings were maintained in all subsequent treatments. RESULTS: Excellent response was noted in 13 of the 25 lesions after 3 sessions, while 12 of the remaining 25 lesions required 4 sessions toward complete recovery. The mean DLQI scores pre- and post-laser treatments were 12.67 and 4.25, respectively. All patients experienced a statistically significant improvement in their QOL ($p < 0.05$, paired t-test). CONCLUSION: The PDL is a new safe modality for treating cases of CL with further larger-scale studies could better determine its role. Adult;Female;Humans;Lasers, Dye;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Male;Quality of Life

Long-term results of the treatment of pregnancy-induced striae distensae using a 1550-nm non-ablative fractional laser. BACKGROUND: Striae distensae (SD) are a type of dermal scarring that is quite common and difficult to treat. Two forms are known: striae rubrae (SR) and striae albae (SA). OBJECTIVE: We compared the long-term clinical effectiveness of a 1550-nm non-ablative fractional laser (NAFL) in treating SR and SA. MATERIALS AND METHODS: We included 16 female patients (8 with SR and 8 with SA) who had developed abdominal SD during pregnancy. All underwent five moderately high-energy sessions of 1550-nm NAFL treatment at 4-week intervals. The strial widths and lengths were measured before, and 1 month and 1 year after treatment. RESULTS: The mean strial width decreased from 6.94 mm before treatment to 3.25 mm at the first follow-up visit ($p = 3.95$ Ã— 10(-5)) and to 3.13 mm at the second follow-up visit ($p = 2.44$ Ã— 10(-5)). Similarly, the mean strial length decreased from 6.06 to 2.88 cm at the first follow-up visit ($p = 1.7$ Ã— 10(-4)) and to 2.75 cm at the second follow-up visit ($p = 9.52$ Ã— 10(-5)). CONCLUSION: NAFL treatment was effective long term in both SR and SA patients. Abdominal Wall;Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Pregnancy;Pregnancy Complications;Retrospective Studies;Striae Distensae;Time Factors;Young Adult

Effect of photobiomodulation therapy on reducing the chemo-induced oral mucositis severity and on salivary levels of CXCL8/interleukin 8, nitrite, and myeloperoxidase in patients undergoing hematopoietic stem cell transplantation: a randomized clinical trial. Oral mucositis (OM) is the most common debilitating complication among patients undergoing hematopoietic stem cell transplantation (HSCT). Photobiomodulation therapy (PBM) has shown beneficial effects in the treatment of OM, but few studies have evaluated its biological effects. This study evaluated the effect of PBM on the reduction of OM severity in patients undergoing HSCT and its relation to the modulation of the inflammatory response. Fifty-one patients were randomly assigned to two groups: PBM [submitted to PBM from admission (AD) to D+7] (nÂ =Â 27) and control (nÂ =Â 24) [received oral hygiene]. OM severity was assessed daily using the WHO scale. Saliva samples were collected on AD, D+7, and hospital discharge (HD) to measure CXCL8/interleukin 8, using cytometric bead array analysis and nitrite (NO) and myeloperoxidase (MPO) using colorimetric methods. PBM significantly reduced the severity of OM from D+7 to D+11 (pÂ <Â 0.05). All non-interventional patients (controls) who developed grade 2 or higher OM induced an increase of CXCL8 in saliva (nÂ =Â 14) on D+7. PBM led to a decrease in CXCL8 on D+7 in 85% of patients, while 70.8% of patients in the control group presented an increase in this chemokine (pÂ =Â 0.007). NO decreased from AD to D+7 in the PBM group (pÂ >Â 0.05). MPO significantly decreased on D+7 in both groups (pÂ <Â 0.05). PBM brought about a reduction in the severity of OM in patients undergoing HSCT, and this reduction was associated with a decrease in CXCL8 salivary levels. CXCL8 protein, human;Inflammation Mediators;Interleukin-8;Nitrites;Peroxidase Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Inflammation Mediators;Interleukin-8;Low-Level Light Therapy;Male;Nitrites;Peroxidase;Saliva;Severity of Illness Index;Stomatitis

Scattering and absorption control in biocompatible fibers towards equalized photobiomodulation. Transparent tissue scaffolds enable illumination of growing tissue to accelerate cell proliferation and improve other cell functions through photobiomodulation. The biphasic dose response of cells exposed to photobiomodulating light dictates that the illumination be evenly distributed across the scaffold such that the cells are neither under nor over exposed to light. However, equalized illumination has not been sufficiently addressed. Here we analyze and experimentally demonstrate spatially equalizing illumination by three methods, namely: engineered surface scattering, reflection by a gold mirror, and traveling-waves in a ring mesh. Our results show that nearly equalized illumination is achievable by controlling the light scattering-to-loss ratio. This demonstration furthers opportunities for dose-optimized photobiomodulation in tissue regeneration.

Pulsed-Dye Laser Treatment of a Nonhealing Chronic Wound That Developed After Incision and Drainage of a Hidradenitis Suppurativa Abscess. Abscess;Adolescent;Axilla;Chronic Disease;Drainage;Hidradenitis Suppurativa;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Surgical Wound;Wound Healing

A new imaging technique for assessment of the effectiveness of long pulse Nd:YAG 532 nm laser in treatment of facial port wine stain. BACKGROUND: PWS is a vascular malformation presented at birth and associated with a psychological problem to the patients. Many types of laser systems were used to solve this problem. AIM OF THE STUDY: To assess the efficacy of long-pulsed Nd:YAG 532-nm laser in the treatment of port wine stain both clinically and by imaging technique. PATIENTS AND METHODS: This is an interventional therapeutic clinical study for the treatment of facial port-twine stain with long-pulsed, 532-nm, Nd:YAG laser. The treatment sessions were done every 4 weeks for 12 sessions and follow-up after 3 months of the last session. The assessment of the response was done before and at the end of follow-up period, both objectively (percent of improvement, photo comparison by using PSNR) and subjectively (patient satisfaction). RESULTS: Sixteen patients completed all sessions of the treatment. The improvement score for the PWS were failure = 0%, mild = 6.25%, moderate = 12.5%, good = 31.25%, and excellent = 50%. The values of PSNR for all the patients have been recorded and were fewer than 25 which means that the response for the treated lesions was very good. CONCLUSION: The long-pulsed Nd:YAG laser 532 nm is an effective and safe method of treatment of facial PWSs without significant residue. The PSNR was a new, simple, cheap and noninvasive method for assessment of the response of PWSs to laser therapy. Adolescent;Adult;Child;Face;Female;Follow-Up Studies;Humans;Image Processing, Computer-Assisted;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Photography;Port-Wine Stain;Signal-To-Noise Ratio;Treatment Outcome;Young Adult

Inactivation of Pseudomonas aeruginosa biofilm after ultraviolet light-emitting diode treatment: a comparative study between ultraviolet C and ultraviolet B. The objective of this study was to test the inactivation efficiency of two different light-based treatments, namely ultraviolet B (UVB) and ultraviolet C (UVC) irradiation, on Pseudomonas aeruginosa biofilms at different growth stages (24, 48, and 72 h grown). In our experiments, a type of AlGaN light-emitting diodes (LEDs) was used to deliver UV irradiation on the biofilms. The effectiveness of the UVB at 296 nm and UVC at 266 nm irradiations was quantified by counting colony-forming units. The survival of less mature biofilms (24 h grown) was studied as a function of UV-radiant exposure. All treatments were performed on three different biological replicates to test reproducibility. It was shown that UVB irradiation was significantly more effective than UVC irradiation in inactivating P. aeruginosa biofilms. UVC irradiation induced insignificant inactivation on mature biofilms. The fact that the UVB at 296 nm exists in daylight and has such disinfection ability on biofilms provides perspectives for the treatment of infectious diseases. Biofilms;Disinfection;Microbial Viability;Pseudomonas aeruginosa;Reproducibility of Results;Ultraviolet Rays

Photobiomodulation of breast and cervical cancer stem cells using low-intensity laser irradiation. Breast and cervical cancers are dangerous threats with regard to the health of women. The two malignancies have reached the highest record in terms of cancer-related deaths among women worldwide. Despite the use of novel strategies with the aim to treat and cure advanced stages of cancer, post-therapeutic relapse believed to be caused by cancer stem cells is one of the challenges encountered during tumor therapy. Therefore, further attention should be paid to cancer stem cells when developing novel anti-tumor therapeutic approaches. Low-intensity laser irradiation is a form of phototherapy making use of visible light in the wavelength range of 630-905â€‰nm. Low-intensity laser irradiation has shown remarkable results in a wide range of medical applications due to its biphasic dose and wavelength effect at a cellular level. Overall, this article focuses on the cellular responses of healthy and cancer cells after treatment with low-intensity laser irradiation alone or in combination with a photosensitizer as photodynamic therapy and the influence that various wavelengths and fluencies could have on the therapeutic outcome. Attention will be paid to the biomodulative effect of low-intensity laser irradiation on cancer stem cells. Breast;Breast Neoplasms;Cell Proliferation;Female;Humans;Low-Level Light Therapy;Neoplastic Stem Cells;Uterine Cervical Neoplasms

Human adipose-derived stem cell spheroid treated with photobiomodulation irradiation accelerates tissue regeneration in mouse model of skin flap ischemia. Skin flap grafting is a form of transplantation widely used in plastic surgery. However, ischemia/reperfusion injury is the main factor which reduces the survival rate of flaps following grafting. We investigated whether photobiomodulation (PBM) precondition prior to human adipose-derived stromal cell (hASC) spheroid (PBM-spheroid) transplantation improved skin tissue functional recovery by the stimulation of angiogenesis and tissue regeneration in skin flap of mice. The LED had an emission wavelength peaked at 660Â Â±Â 20Â nm (6Â J/cm(2), 10Â mW/cm(2)). The expression of angiogenic growth factors in PBM-spheroid hASCs was much greater than that of not-PBM-treated spheroid or monolayer-cultured hASCs. From immunochemical staining analysis, the hASCs of PBM-spheroid were CD31(+), KDR(+), and CD34(+), whereas monolayer-cultured hASCs were negative for these markers. To evaluate the therapeutic effect of hASC PBM-spheroid in vivo, PBS, monolayer-cultured hASCs, and not-PBM-spheroid were transplanted into a skin flap model. The animals were observed for 14Â days. The PBM-spheroid hASCs transplanted into the skin flap ischemia differentiated into endothelial cells and remained differentiated. Transplantation of PBM-spheroid hASCs into the skin flap ischemia significantly elevated the density of vascular formations through angiogenic factors released by the skin flap ischemia and enhanced tissue regeneration at the lesion site. Consistent with these results, the transplantation of PBM-spheroid hASCs significantly improved functional recovery compared with PBS, monolayer-cultured hASCs, and not-PBM-spheroid treatment. These findings suggest that transplantation of PBM-spheroid hASCs may be an effective stem cell therapy for the treatment of skin flap ischemia. Adipose Tissue;Animals;Cell Differentiation;Cell Survival;Disease Models, Animal;Endothelial Cells;Epithelial Cells;Humans;Ischemia;Low-Level Light Therapy;Mice;Myocytes, Smooth Muscle;Neovascularization, Physiologic;Regeneration;Skin;Spheroids, Cellular;Stem Cell Transplantation;Stem Cells;Surgical Flaps;Wound Healing

Low-Level Laser Therapy in Russia: History, Science and Practice. In Russia (formerly USSR) study of biomodulation action (BMA) mechanisms of low-intensity laser irradiation (LILI) began in 1964, immediately after the development of lasers. During the period from 1965 to 1972 several dozens of scientific conferences were held, hundreds of studies were published. Generally, secondary mechanisms and results of LILI effect on patients with various diseases were studied. This data was immediately implemented into practical medicine in the fields of oncology, surgery, dermatology and

dentistry, and since 1974 low level laser therapy (LLLT) is included in the standard of state medical care. For 50 years no less than 1000 books were published (monographs, collections, methodical and clinical materials), thousands of researches were carried out. Primary mechanism and patterns of interaction of LILI with acceptors within cells can be represented in the following order: absorption of photon's energy - emergence of a local temperature gradient - release of Ca(2+) from intracellular stores - stimulating Ca(2+)-dependent processes. Understanding of this process allowed the explanation of all known secondary effects, optimized methods and extremely increased effectiveness of LLLT. Owing to the knowledge of BMA mechanisms of LILI, numerous associated and combined LLLT techniques were developed and are widely used nowadays: locally, on the projection of internal organs, laser acupuncture, reflexology, intracavitary, transdermal and intravenous laser blood illumination, magnetic-laser therapy, laser phoresis, laser-vacuum massage, biomodulation, etc. About 400 000 laser therapeutic devices are used in Russian practical healthcare. Unique, having no analogues in the world devices, are produced - red pulsed laser diodes (wavelength 635 nm, power 5-40 W, pulse duration 100 ns, frequency 10 000 Hz) are designed specially for effective laser therapy.

In Vivo Investigation of the Safety and Efficacy of Pulsed Dye Laser with Two Spot Sizes in Port-Wine Stain Treatment: A Prospective Side-by-Side Comparison. OBJECTIVE: Pulsed dye laser (PDL) with 7 and 10â€‰mm spot sizes is widely used on a regular basis for the treatment of port-wine stain (PWS). BACKGROUND DATA: No studies have reported on the differences in efficacy outcomes resulting from the use of different laser spot sizes in the treatment of PWS by PDL. Thus, an in vivo investigation into the differences in safety and efficacy of treatment between two spot sizes (7 vs. 10â€‰mm) of PWS by PDL was conducted. MATERIALS AND METHODS: A total of 35 PWS patients underwent three treatment sessions by using a 595â€‰nm wavelength PDL (Vbeam(Â®), Candela Corp) with two laser settings: (1) 7â€‰mm spot size, radiant exposure of 12â€‰J/cm(2) and (2) 10â€‰mm spot size, radiant exposure of 10â€‰J/cm(2). Cryogen spray cooling and 1.5â€‰msec pulse duration were applied. Therapeutic outcomes were evaluated by visual and chromametric evaluation 3 months after the final treatment. RESULTS: Average blanching rates were 34.03% and 36.51% at sites treated by PDL with 7 and 10â€‰mm laser spot sizes, respectively (pâ€‰<â€‰0.05). CONCLUSIONS: On the basis of the laser setting, the therapeutic outcomes of PDL with 7 and 10â€‰mm spot sizes were similar. PDL with a 10â€‰mm laser spot size is more efficacious with lower radiant exposure than PDL with a 7â€‰mm spot size; it can also reduce the treatment time. Adolescent;Adult;Age Factors;Child;Child, Preschool;Cohort Studies;Esthetics;Facial Dermatoses;Female;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Patient Safety;Port-Wine Stain;Prospective Studies;Radiotherapy Dosage;Sex Factors;Treatment Outcome;Young Adult

Invisalign with Photobiomodulation: Optimizing Tooth Movement and Treatment Efficacy with a Novel Self-Assessment Algorithm. Adolescent;Female;Humans;Low-Level Light Therapy;Male;Malocclusion;Malocclusion, Angle Class I;Middle Aged;Orthodontic Appliance Design;Overbite;Tooth Movement Techniques

Comparison of Emla cream and topical lidocaine tape for pain relief of V-beam laser treatment. The authors compared the analgesic effects of two topical applications; Emla(Â®) cream (Sato Pharmaceutical Co. Ltd., Tokyo, Japan) and 60% lidocaine tape (Penles(Â®) tape; Maruho, Osaka, Japan). The authors examined 20 outpatients with capillary malformations. Emla(Â®) cream or Penles(Â®) tape was applied 1â€‰h before laser irradiation using V-Beam. After V-Beam irradiation, pain intensity was measured using Pain Vision(Â®) (NIPRO, Osaka, Japan), while subjective pain was converted into numerical values using the VAS system. In the assessment using Pain Vision(Â®), pain was significantly lower in patients who received Emla(Â®) cream (Welch test), whereas no difference was observed in VAS ratings between the two applications (student's t test). The objective system

showed that Emla(Â®) cream had a significantly greater analgesic effect. We plan to evaluate the analgesic effects of these topical anesthetics by applying them to other anatomical areas. Anesthetics, Local;Lidocaine, Prilocaine Drug Combination;Prilocaine;Lidocaine Adult;Aged;Ambulatory Care;Anesthetics, Local;Capillaries;Cohort Studies;Female;Follow-Up Studies;Humans;Japan;Lidocaine;Lidocaine, Prilocaine Drug Combination;Low-Level Light Therapy;Male;Middle Aged;Pain Management;Pain Measurement;Prilocaine;Retrospective Studies;Risk Assessment;Treatment Outcome;Vascular Malformations

Reply to the Letter to the Editor on "Effects of Light-Emitting Diode Therapy on Muscle Hypertrophy, Gene Expression, Performance, Damage, and Delayed-Onset Muscle Soreness: Case-Control Study With a Pair of Identical Twins". Case-Control Studies;Humans;Hypertrophy;Muscle, Skeletal;Myalgia;Twins, Monozygotic

CO(2) low-level laser therapy has an early but not delayed pain effect during experimental tooth movement. OBJECTIVES: To test the hypothesis that the use of low-level laser therapy (LLLT) reduces elevated pain by controlling the release of neurochemicals during orthodontic tooth movement. SETTING AND SAMPLE POPULATION: Department of Orthodontics and Dentofacial Orthopedics, Okayama University. Sixty-five Sprague Dawley rats were subjected to tooth movement and LLLT. MATERIALS AND METHODS: Adult Sprague Dawley rats were used in this study. Groups included day 0 controls, irradiation only controls and with or without irradiation sacrificed at 1, 3, 5, 7 and 14Â days after tooth movement (n=5 each, total n=65). Tooth movement was achieved by insertion of an elastic module between molar teeth. Immunohistochemistry for CD-11b, GFAP and c-fos in the brain stem was performed. Stains were quantified by constructing a three-dimensional image using IMARIS, and counted using NEURON TRACER and WinROOF software. Two-way ANOVA followed by a Tukey's post hoc test (P<.05) was used for statistical comparison between groups. RESULTS: C-fos expression was significantly increased at one and three days after tooth movement. LLLT significantly diminished this increase in c-fos expression only at one day after tooth movement CD-b11 and GFAP expression also significantly increased after tooth movement. No significant change was observed for CD-11b and GFAP expression in the central nervous system upon LLLT. CONCLUSION: Low-level laser therapy may reduce early neurochemical markers but have no effect on delayed pain neurochemical markers after tooth movement. Biomarkers;Carbon Dioxide Animals;Biomarkers;Carbon Dioxide;Lasers, Gas;Low-Level Light Therapy;Pain Management;Pain Measurement;Rats;Rats, Sprague-Dawley;Tooth Movement Techniques

Comparing the effect of diode laser against acyclovir cream for the treatment of herpes labialis. BACKGROUND: Recently alternative therapies such as the use of diode laser therapy have been introduced for recurrent herpes labial infection. The aim of this study was to evaluate the effectiveness of diode laser for treatment of recurrent herpes labialis. MATERIAL AND METHODS: This was single-blind randomized clinical trial to evaluate the efficacy of diode laser for the treatment of recurrent herpes labial. In total, 60 patients whit recurrent herpes simplex labialis were selected and randomly divided in to three groups. 20 patients received treatment whit diode laser (at a wavelength of 870 nm, energy density 4.5 j/cm2), 20 patients were treated with acyclovir cream 5%, 20 patients received treatment with laser-off (placebo). The end point was lesions crusting. Data analyzed by Tukey HSD Test and One-way ANOVA (at a significance level of 0.05) in SPSS-20 software. RESULTS: The mean length of recovery time (day) in the laser, off laser, and acyclovir groups was 2.20Â±0.41, 4.30Â±1.03, and 3.4Â±1.142, respectively. There is a significant difference between three groups in this regard (P<0.0001). The mean duration of pain (day) was 1.35Â±0.74, 2.65Â±1.27, and 2.30Â±0.92 for laser, off laser, and acyclovir groups, respectively (P<0.0001). CONCLUSIONS: Treatment with diode laser reduced the length of recovery time and pain severity faster than treatment with acyclovir cream. Key words:Recurrent herpes labial, Acyclovir, Low level laser therapy.

Magnetic Resonance Imaging and Clinical Outcomes of Laser Therapy, Ultrasound Therapy, and Extracorporeal Shock Wave Therapy for Treatment of Plantar Fasciitis: A Randomized Controlled Trial. We determined and compared the effectiveness of low-level laser therapy (LLLT), therapeutic ultrasound (US) therapy, and extracorporeal shock wave therapy (ESWT) using magnetic resonance imaging (MRI). We performed a randomized, prospective, comparative clinical study. A total of 60 patients with a diagnosis of chronic plantar fasciitis were divided randomly into 3 treatment groups: group 1 underwent 15 sessions of LLLT (8Â J/cm(2); 830Â nm); group 2 underwent 15 sessions of continuous US (1 mHz; 2Â W/cm(2)); and group 3 underwentÂ 3 sessions of ESWT (2000 shocks). All patients were assessed using the visual analog scale (VAS), heel tenderness index (HTI), American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale, Roles-Maudsley score, and MRI before and 1Â month after treatment. The primary efficacy success criterion was the percentage of decrease in heel pain of >60% from baseline at 1Â month after treatment for â‰¥2 of the 3 heel pain (VAS) measurements. Significant improvement was measured using the mean VAS, AOFAS scale, and HTI scores for all 3 groups. The thickness of the plantar fascia had decreased significantly on MRI in all 3 groups. The treatment success rate was 70.6% in the LLLT group, 65% in the ESWT group, and 23.5% in the US group. LLLT and ESWT proved significantly superior to US therapy using the primary efficacy criterion (pÂ =Â .006 and pÂ =Â .012, respectively), with no significant difference between the LLLT and ESWT groups (pÂ >Â .05). The treatment of chronic plantar fasciitis with LLLT and ESWT resulted in similar outcomes and both were more successful than US therapy in pain improvement and functional outcomes. Adult;Aged;Chronic Disease;Extracorporeal Shockwave Therapy;Fasciitis, Plantar;Female;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Treatment Outcome;Young Adult

Do Patients With Carpal Tunnel Syndrome Benefit From Low-Level Laser Therapy? A Systematic Review of Randomized Controlled Trials. OBJECTIVE: To systematically review the literature on the effectiveness of low-level laser therapy for patients with carpal tunnel syndrome. DATA SOURCES: The Cochrane Library, PubMed, Embase, CINAHL, and Physiotherapy Evidence Database were searched for relevant systematic reviews and randomized controlled trials (RCTs) up to April 8,Â 2016. STUDY SELECTION: Two reviewers independently applied the inclusion criteria to select potential studies. DATA EXTRACTION: Two reviewers independently extracted the data and assessed the methodologic quality. DATA SYNTHESIS: A best-evidence synthesis was performed to summarize the results of the 2 systematic reviews and 17 RCTs that were included. Strong evidence was found for the effectiveness of low-level laser therapy compared with placebo treatment in the very short term (0 to â‰¤5wk). After 5 weeks, the positive effects of low-level laser therapy on pain, function, or recovery diminished over time (moderate and conflicting evidence were found at 7- and 12-wk follow-up, respectively). CONCLUSIONS: In the very short term, low-level laser therapy is more effective as a single intervention than placebo low-level laser therapy in patients with carpal tunnel syndrome, after which the positive effects of low-level laser therapy tend to subside. Evidence in the midterm and long term is sparse. Carpal Tunnel Syndrome;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Treatment Outcome

Effectiveness of a Nutraceutical During Non-Ablative 1927 nm Fractional Laser on Patients With Facial Hyperpigmentation and Photoaging. Background: Fractional lasers have been proven to treat hyperpigmentation and photoaging. Little research has been done on the effects of supplements on healing post-laser resurfacing. A nutraceutical could offer the benefit of faster healing of the skin and fewer side effects. Objective: Evaluate the effectiveness of a nutraceutical associated with fractional 1927 nm laser in healing time and effectiveness on hyperpigmentation and photoaging. Methods & Materials: A prospective, randomized, evaluator-blinded, pilot study included Fitzpatrick skin types I-III patients with hyperpigmentation and photoaging randomly

assigned to two groups. Group 1 was laser treatment and Group 2 was laser treatment and nutraceutical. Results were compared with objective biometric TEWL (transepidermal water loss), mexameter, corneometer, and cutometer parameters. A blinded physician-evaluator and the subjects completed questionnaires to evaluate skin improvements. Results: Twenty women were included. Eight in Group 1 and 10 in Group 2 completed the study. Group 2 presented a faster recovery of the skin barrier function post procedure. Three months after the procedure, Group 2 presented with significantly improved skin glossiness, hydration, and melanin rebound levels. Group 2 presented more overall aesthetic improvement determined by the patient and the blinded physician-evaluator. Conclusion: The nutraceutical improved the results of the laser treatment. J Drugs Dermatol. 2017;16(5):501-506. . Adult;Dietary Supplements;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Prospective Studies;Single-Blind Method;Skin Aging;Treatment Outcome

Current Considerations for Low-Level Laser Therapy/Photobiomodulation Therapy in the Management of Side Effects of Chemoradiation Therapy for Cancer. Chemoradiotherapy;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mucositis;Prognosis;Quality of Life;Severity of Illness Index;Treatment Outcome

Photoactivation of ERK/CREB/VMAT2 pathway attenuates MPP(+)-induced neuronal injury in a cellular model of Parkinson's disease. The vesicular monoamine transporter 2 (VMAT2) pumps dopamine from cytoplasm into synaptic vesicles for subsequent release, and the deficits of VMAT2 has been implicated in the dopaminergic neuronal cell loss which is considered as a typical pathological feature of Parkinson's disease (PD). Low-power laser irradiation (LPLI), a potent noninvasive physiotherapy approach, is capable of penetrating into nerve tissue to exert beneficial effects such as promoting nerve regeneration and ATP production. In the present study, we demonstrated that LPLI protects against MPP(+)-induced neurotoxicity via upregulation of VMAT2 in SH-SY5Y human dopaminergic neuroblastoma cells. The photoactivation of ERK phosphorylated cAMP-response element binding protein (CREB) at Ser133, and thus increased the ability of CREB binding to the promoter region of VMAT2, leading to elevated VMAT2 expression, which contributes to dopamine release and cell survival. Taken together, for the first time to our knowledge, the results showed that LPLI attenuates MPP(+)-induced neurotoxicity through activation of ERK/CREB/VMAT2 pathway, suggesting that the manipulation of VMAT2 by LPLI may provide a potential therapeutic strategy for PD. CREB1 protein, human;Cyclic AMP Response Element-Binding Protein;SLC18A2 protein, human;Vesicular Monoamine Transport Proteins;Extracellular Signal-Regulated MAP Kinases;1-Methyl-4-phenylpyridinium 1-Methyl-4-phenylpyridinium;Cell Line, Tumor;Cell Survival;Cyclic AMP Response Element-Binding Protein;Extracellular Signal-Regulated MAP Kinases;Humans;Low-Level Light Therapy;Neurons;Parkinson Disease, Secondary;Signal Transduction;Vesicular Monoamine Transport Proteins

Comparing the effectiveness of fractional CO(2) laser and the combination therapy with micro-needling and topical 10% trichloroacetic acid to remove infra-orbital dark circles in Tehran women. BACKGROUND: Infra orbital dark circles are now recognized as being a cosmetic problem that should be considered in treatment issue. The present study aimed to assess and compare the clinical efficiency of the combination of micro-needling and 10% trichloroacetic acid (TCA) cream as well as carbon dioxide laser in the management of infra-orbital dark circles. METHODS: This randomized clinical trial was performed on women aged 28-62 years who complained of infra-orbital dark circles. The patients were randomly assigned to be treated with micro-needling combined with 10% TCA cream topically or CO(2) laser. The treatment period in each group included three sessions with an interval of one month between sessions. The assessment was based on both subjective and objective methods. RESULTS: the mean of Î”E (the difference in the intensity of darkening at infra-orbital points

and other points of the face) was significantly higher in the laser group than in the other group in all sessions. The patients who were treated with laser were found to have a higher level of satisfaction in the fifth visit when compared to those who received the other treatment method. CONCLUSION: Regarding clinical effectiveness and the patients' compliance, fractional CO(2) laser was more preferred in the combination therapy with micro-needling and topical TCA for removing infra-orbital dark circles. Trichloroacetic Acid Adult;Combined Modality Therapy;Cosmetic Techniques;Eye;Female;Humans;Hyperpigmentation;Iran;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Needles;Skin Cream;Trichloroacetic Acid

The effects of low-level laser therapy on the healing of bone defects in streptozotocin-induced diabetic rats: A histological and morphometric evaluation. BACKGROUND: The aim of the present study was to evaluate the effects of low-level laser therapy (LLLT) on the healing of bone defects in rats with streptozotocin (STZ)-induced DM. METHODS: 28 male Sprague-Dawley rats were used in this study. 14 animals received a single dose of STZ intraperitoneally (65 mg/kg) to induce Type I DM, whereas others were injected only with sterile saline solution. Four weeks later, standard bone defects were created in the tibiae of rats. Surgical wounds in one group from each of the diabetic and non-diabetic animals were irradiated with diode laser for every other day for 4 weeks and they were described as DM + LLLT and CONT + LLLT groups, respectively. Remaining two groups received no laser treatment. New bone formation, osteoblast and blood vessel counts were calculated in histologic sections. RESULTS: DM group had significantly smaller bone area and lower blood vessel count when compared to DM + LLLT, CONT and CONT + LLLT groups ($p < 0.05$ for each). CONT and CONT + LLLT groups had significantly larger bone area than DM + LLLT group ($p < 0.05$ for both). CONCLUSIONS: LLLT application promoted vascularization and new bone formation in animals with DM to a limited extent, since it was unable to support the healing process up to the level of non-diabetic animals. Streptozocin Animals;Blood Vessels;Cell Count;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Lasers, Semiconductor;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Osteoblasts;Osteogenesis;Rats, Sprague-Dawley;Streptozocin;Tibia;Wound Healing

Presenting a Method to Improve Bone Quality Through Stimulation of Osteoporotic Mesenchymal Stem Cells by Low-Level Laser Therapy. OBJECTIVE: This review aims to present a method to improve bone quality through stimulation of osteoporotic mesenchymal stem cells (MSCs) by low-level laser therapy (LLLT). BACKGROUND: Osteoporosis (OP) is characterized by decreased bone mass and bone strength, which results in an increased incidence of bone fractures. These fractures often lead to additional disability and mortality. Osteoporotic MSCs have reduced osteogenic differentiation when cultured in their standard differentiation media. LLLT has a biostimulatory effect on fibroblasts and osteoblasts. MSCs have the ability to generate cells of connective tissue lineages, which includes the bones. Recently, transplantation of in vitro cultured bone marrow (BM) MSCs into sites at risk for development of osteoporotic bone has resulted in improved bone structure. METHODS: Comprehensive research was performed using PubMed, and biostimulatory effect of LLLT on bony cells and MSCs were studied. RESULTS: LLLT can stimulate growth, proliferation, and differentiation of SCs in vitro and in vivo. This ability of LLLT is an essential prerequisite for performing experiments related to disease control in humans. Thus, laser-treated osteoporotic autologous BMMSCs may represent a promising therapeutic method to protect the bones in patients with OP and prevent fractures in these patients. Therefore, researchers hypothesize that transplantation of in vitro laser-treated autologous cultured osteoporotic BMMSCs that have the appropriate osteogenic phenotype into sites at risk for development of osteoporotic bone may result in improved bone structure. In this respect, investigators have successfully used LLLT to restore autologous osteoporotic MSCs in vitro. Subsequently, these cells have been differentiated into osteoblast cell lines with the

use of laser treatment after which they were transplanted into osteoporotic animal models. CONCLUSIONS: This technique might improve bone quality and structure. However, additional research must be undertaken to understand the underlying mechanisms of this treatment, validate its effectiveness, and assess the feasibility for clinical application of LLLT to treat MSCs in regeneration of osteoporotic bone. Cell Differentiation;Cell Proliferation;Cells, Cultured;Fibroblasts;Humans;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis;Osteoporosis

Light-Emitting Diode at 460â€‰Â±â€‰20â€‰nm Increases the Production of IL-12 and IL-6 in Murine Dendritic Cells. BACKGROUND DATA: Light emitting diode (LED) therapy has been proposed as an option for the treatment of many skin inflammatory processes. Dendritic cells (DCs) are important cells of skin that participate in the initiation and activation of skin immunity. The modulation of these cells by LED could explain much of its effects. OBJECTIVE: Thus, the aim of this study was to examine the effects of LED at 460â€‰Â±â€‰20â€‰nm on cytokine production and the expression of surface markers on DCs. MATERIALS AND METHODS: DCs were obtained from mouse bone marrow-derived dendritic cells (BMDCs). The LED was applied giving a fluence of 3.3, 8.2, or 16.5â€‰J/cm(2) on BMDCs or lipopolysaccharide (LPS)-matured BMDCs. The production of cytokine was analyzed by enzyme linked immunosorbant assay (ELISA) and the expression of DC co- and stimulatory was analyzed markers by cytometry. RESULTS: LED increases IL-12p40 and IL-6 production in both nonstimulated BMDCs and LPS-matured BMDCs. The expression of MHC-II molecule was inhibited and the expression of the CD86 molecule was increased in nonstimulated BMDCs but not in LPS-matured BMDCs. The production of tumor necrosis factor alpha (TNF-Î±) and interleukin-10 (IL-10) and the expression of CD40 were not altered. CONCLUSIONS: These results demonstrate that LED stimulated cytokine production in BMDCs, suggesting a proinflammatory role in the tested conditions and maybe it can increase DC maturation. Cytokines;Interleukin-6;Interleukin-12 Analysis of Variance;Animals;Cell Differentiation;Cells, Cultured;Cytokines;Dendritic Cells;Enzyme-Linked Immunosorbent Assay;Interleukin-12;Interleukin-6;Lasers, Semiconductor;Mice;Mice, Inbred C57BL

Ibuprofen and Low-level Laser Therapy for Pain Control during Fixed Orthodontic Therapy: A Systematic Review of Randomized Controlled Trials and Meta-analysis. INTRODUCTION: To systematically review high-quality randomized controlled trials (RCTs) and meta-analysis on the effectiveness of use of ibuprofen and low-level laser therapy (LLLT) for pain control during fixed orthodontic appliance therapy. MATERIALS AND METHODS: A web-based systematic search of PubMed and Medline database using relevant keywords was performed in August 2016 limited to the English language studies. Based on inclusion and exclusion criteria, RCTs utilizing blind approach were selected. The quality of studies was analyzed and only high-quality studies were included. Following data extraction, meta-analysis was performed by standardized mean difference Hedges' (adjusted) g with 95% confidence interval. RESULTS: A total number of six studies (four ibuprofen and two LLLT) comprising 315 patients were included. Heterogeneity among ibuprofen studies was small, while large heterogeneity was found among LLLT studies. The results showed that both ibuprofen and LLLT could reduce pain intensity during fixed orthodontic therapy and during 17 days follow-up period. However, this reduction was statistically significant only at 6 to 24 hours postoperatively for ibuprofen and 2 hours and 3 to 7 days for LLLT ($p < 0.05$). CONCLUSION: Considering the limitations of the current meta-analysis, ibuprofen could alleviate orthodontic archwire activation pain during the 1st day with relatively high level of evidence. Low-level laser therapy could reduce this pain in the long term with limited evidence. Further well-designed RCTs are required to provide more evidence. Analgesics, Non-Narcotic;Ibuprofen Analgesics, Non-Narcotic;Humans;Ibuprofen;Low-Level Light Therapy;Orthodontic Appliances;Pain;Randomized Controlled Trials as Topic

[Clinical MedicineThe Evaluation of He-Ne Laser Therapy Help Wound Healing of Nail Surgery]. OBJECTIVES: To investigate the effect of He-Ne laser therapy on wound healing after nail surgery. METHODS: Patients who needed nail surgery were divided into treatment group (n=20) and control group (n=20) randomly.The He-Ne laser was applied to the wound after nail surgery in treatment group. The wound healing time, the inflammation duration, the pain rating, and the nail plate full-grown time were compared with control group. RESULTS: No significant differences in baseline of two groups were observed. The wound healing time was (16.00Â±2.51) d in control group and (11.35Â±1.73) d in treatment group, the inflammation duration was (9.10Â±2.10) d in control group and (7.20Â±1.44) d in treatment group (P<0.05), both above differences were significant (P<0.05).The nail plate full-grown time was (21.00Â±2.13) weeks in treatment group, whereas (21.40Â±1.05) weeks in control group (P>0.05).The pain rating of the 2 groups was different from 25 h (after 3 times treatment)(P<0.05). Pain disappeared in 85.0% (17/20) patients of treatment group after 49 h (5 times treatment), and completely disappeared (20/20) after 54 h (6 times treatment), which were faster than those of control group at the same time points (pain disappeared only in 50.0% and 98.5% of patients respectively). CONCLUSIONS: He-Ne laser therapy can help wound healing after nail surgery. Humans;Laser Therapy;Low-Level Light Therapy;Nails;Pain;Pain Management;Wound Healing

Effects of photobiomodulation therapy on Bothrops moojeni snake-envenomed gastrocnemius of mice using enzymatic biomarkers. Bothropic venom contains a range of biologically active substances capable of causing severe local and systemic envenoming symptomatology within its victims. The snake anti-venom is effective against systemic effects but has no neutralizing effect against the fast developing local effects. Herein, mice gastrocnemius injected with Bothrops moojeni venom (40Â Î¼g/kg) or saline solution were irradiated with HeNe (632.8Â nm) and GaAs (904Â nm) lasers (daily energy density of 4Â J/cm(2); 0.03/0.21 power density; 0.07/0.16 spot size; 1.2/0.04 total energy, 1Â cm off contact, for HeNe and GaAs lasers, respectively) and euthanized in periods ranging from 3Â h to 21Â days. Blood biochemistry for creatine kinase (CK), alkaline phosphatase (ALP), acid phosphatase (AP), lactate dehydrogenase (LDH), aspartate transaminase (AST), and myoglobin and histopathological analysis, for assessing the degree of myonecrosis and regeneration of gastrocnemius, were done at every time interval. GaAs laser promoted faster photobiomodulation therapy (PBMT) effects, and the GaAs group exhibited a better clinical outcome than the HeNe group. Within the GaAs group, the serum levels of CK, LDH, AP, AST, and myoglobin, which were increased by the physiological effects of the venom, were reduced to initial baseline before snake envenomation in less time than those irradiated by the HeNe laser. However, the group receiving irradiation from the HeNe laser returned the levels of ALP activity to baseline faster than those of the GaAs group. Histopathological analysis revealed enhanced muscle regeneration in mice groups treated with both lasers. PBM promoted by GaAs and HeNe showed well-developed centrally nucleate regenerating cells and an increased number of newly formed blood vessels when compared to unirradiated muscle. We therefore suggest that GaAs had the best outcomes likely derived from a deeper penetrating longer wavelength. We conclude that PMBT is a promising, non-invasive approach to be further tested in pre-clinical studies with a goal to further its clinical use in skeletal muscle recovery in snakebite victims. Biomarkers;Crotalid Venoms;Enzymes;Myoglobin Animals;Biomarkers;Bothrops;Crotalid Venoms;Enzymes;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Myoglobin;Regeneration;Snake Bites

Non-Fourier thermal transport induced structural hierarchy and damage to collagen ultrastructure subjected to laser irradiation. Comprehending the mechanism of thermal transport through biological tissues is an important factor for optimal ablation of cancerous tissues and minimising collateral tissue damage. The present study reports detailed mapping of the rise in internal

temperature within the tissue mimics due to NIR (1064â€‰nm) laser irradiation, both for bare mimics and with gold nanostructures infused. Gold nanostructures such as mesoflowers and nanospheres have been synthesised and used as photothermal converters to enhance the temperature rise, resulting in achieving the desired degradation of malignant tissue in targeted region. Thermal history was observed experimentally and simulated considering non-Fourier dual phase lag (DPL) model incorporated Pennes bio-heat transfer equation using COMSOL Multiphysics software. The gross deviation in temperature i.e. rise from the classical Fourier model for bio-heat conduction suggests additional effects of temperature rise on the secondary structures and morphological and physico-chemical changes to the collagen ultrastructures building the tissue mass. The observed thermal denaturation in the collagen fibril morphologies have been explained based on the physico-chemical structure of collagen and its response to thermal radiation. The large shift in frequency of amides A and B is pronounced at a depth of maximum temperature rise compared with other positions in tissue phantom. Observations for change in band of amide I, amide II, and amide III are found to be responsible for damage to collagen ultra-structure. Variation in the concentration of gold nanostructures shows the potentiality of localised hyperthermia treatment subjected to NIR radiation through a proposed free radical mechanism. Collagen Collagen;Humans;Hyperthermia, Induced;Low-Level Light Therapy

Low level laser therapy accelerates the extracellular matrix reorganization of inflamed tendon. In tendon lesions, inflammation indicates the beginning of tissue repair and influences cell proliferation and the remodeling of the extracellular matrix (ECM). Low level laser (LLL) therapy has been an important method to induce tissue repair, and several studies have sought to better understand the therapeutic possibilities of this modality. This study analyzed the effect of LLL on the ECM of rat tendons during the early phase of the inflammatory process. Wistar rats received an intratendinous application of carrageenan adjacent to the osteotendinous region in the right paw. The animals were divided into the following groups: G1-intact, G2-animals with no treatment after the inflammation induction, G3-animals treated with LLL 1 and 3h after induction of inflammation (4J/cm(2) continuous). After 4h of application, the animals of the two groups were euthanized with isoflurane overdose. Our results demonstrate that LLL therapy can promote decrease in non-collagenous protein and glycosaminoglycans content, as well as an increase in metalloproteinases -9, which proved, for the first time, that LLL therapy promotes alterations in the inflamed tendons even when analyzed only four hours after this process occur and could be a useful tool to improve the balance in inflamed tissues. Animals;Extracellular Matrix;Inflammation;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tendinopathy;Tendons

Biosilicate/PLGA osteogenic effects modulated by laser therapy: In vitro and in vivo studies. The main purpose of the present work was to evaluate if low laser level therapy (LLLT) can improve the effects of BiosilicateÂ®/PLGA (BS/PLGA) composites on cell viability and bone consolidation using a tibial defects of rats. The composites were characterized by scanning electron microscope (SEM) and reflection Fourier transform infrared spectrometer (FTIR). For the in vitro study, fibroblast and osteoblast cells were seeded in the extract of the composites irradiated or not with LLLT (Ga-Al-As, 808nm, 10J/cm(2)) to assess cell viability after 24, 48 and 72h. For the in vivo study, 80 Wistar rats with tibial bone defects were distributed into 4 groups (BS; BS+LLLT; BS/PLGA and BS/PLGA+LLLT) and euthanized after 2 and 6weeks. Laser irradiation Ga-Al-As (808nm, 30J/cm(2)) in the rats was performed 3 times a week. The SEM and FTIR results revealed that PLGA were successfully inserted into BS and the microparticles degraded over time. The in vitro findings demonstrated higher fibroblast viability in both BS/PLGA groups after 24h and higher osteoblast viability in BS/PLGA+LLLT in all periods. As a conclusion, animals treated with BS/PLGA+LLLT demonstrated an improved material degradation and an increased amount of granulation tissue and newly formed bone.

Biocompatible Materials;Silicates;Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid Animals;Biocompatible Materials;Biomechanical Phenomena;Cell Line;Cell Survival;Lactic Acid;Low-Level Light Therapy;Male;Osteogenesis;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer;Rats;Rats, Wistar;Silicates

A comparison of the outcomes of four minimally invasive treatment methods for anterior disc displacement of the temporomandibular joint. The purpose of this study was to compare the effectiveness of four non-surgical conservative treatment methods for temporomandibular disorders (TMD). The study group comprised 40 patients with unilateral TMD who fell into group II of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). Patients were divided into four groups according to the treatment method: splint therapy, arthrocentesis, medical therapy, and low-level laser therapy. Magnetic resonance imaging (MRI) was performed before treatment and at the 1-month follow-up. The type of TMD and joint effusion were examined in the MRI scans. Patients were followed up after treatment for 6 months. Mouth opening increased and pain scores decreased at 1, 3, and 6 months after treatment in all groups ($P<0.05$). No statistically significant difference in the improvements in clinical symptoms was observed between the groups. A positive correlation was found between pain and effusion ($P<0.05$). A significant positive relationship was also found between internal derangement and effusion ($P<0.05$). All treatment methods were successful at improving the clinical symptoms. It was determined that the effusion demonstrated on MRI was associated with pain. Although the symptoms improved after treatment, joint effusion did not show any decrease in the 1-month follow-up MRI. Anti-Inflammatory Agents, Non-Steroidal Adolescent;Adult;Anti-Inflammatory Agents, Non-Steroidal;Arthrocentesis;Conservative Treatment;Facial Pain;Female;Humans;Joint Dislocations;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Occlusal Splints;Pain Measurement;Self Care;Temporomandibular Joint Disc;Temporomandibular Joint Disorders;Treatment Outcome

Experimental and numerical investigation on the transient vascular thermal response to multi-pulse Nd:YAG laser. BACKGROUND AND OBJECTIVE: Port wine stains (PWS) are congenital vascular malformations that progressively darken and thicken with age. Laser therapy is currently the most effective way in clinical practice for PWS. A 1,064â€‰nm Nd:YAG laser in the near-infrared band can achieve a deeper treatment depth compared to the current widely adopted pulsed dye laser. However, because of its relatively weak absorption by blood, single-pulse Nd:YAG laser requires high energy density to cause effective vessel damage, but may inflict undesirable burning to surrounding collagen. Multi-pulse laser has great potential in clinical treatment because it needs less energy density for each pulse. This paper presented an experimental and theoretical study of the transient thermal effects of low-energy multi-pulse Nd:YAG laser on blood vessels. STUDY DESIGN/MATERIALS AND METHODS: In vivo experiments were performed on dorsal skin chamber. By using a high speed camera (up to 2,000 fps), the complete and dynamic thermal response of blood vessels during laser irradiation and between pulse intervals was obtained. In vitro experiment in capillary tubes and Numerical simulations by two-scale heat transfer model were also conducted to further explore the in vivo experimental findings. RESULTS: The complete and dynamic response of blood vessels were obtained, including vessel dilation, thrombus formation, partial vessel constriction, thread-like constriction, cavitation and bubbles, and hemorrhage. Thread-like constriction is the desirable treatment end point, which will only occur after thrombus completely occludes the vessel lumen. Cavitation can cause hemorrhage when thrombus fails to occlude the vessel lumen. In vitro experiment found that vessel constriction was due to the constriction of thrombus induced by laser irradiation. Theoretical investigation revealed that the mechanism for the effective reduction of energy density by multi-pulse Nd:YAG laser was due to enhanced light absorption of the blood with thrombus formation. CONCLUSIONS: For multi-pulse treatment, laser parameters are recommended

as repetition rate of 10â€‰Hz and pulse number of 10. The incident energy in each pulse should be strong enough to induce blood coagulation through seven or eight pulses and should be lower than the threshold of blood cavitation. Lasers Surg. Med. 49:852-865, 2017. Â© 2017 Wiley Periodicals, Inc. Animals;Blood Vessels;Female;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Rats;Rats, Sprague-Dawley;Tissue Culture Techniques;Vasoconstriction;Vasodilation

Photobiomodulation with Near Infrared Light Helmet in a Pilot, Placebo Controlled Clinical Trial in Dementia Patients Testing Memory and Cognition. Alzheimer's disease (AD) is a common, chronic expensive debilitating neurodegenerative disease with no current treatments to prevent the physical deterioration of the brain and the consequent cognitive deficits. The current pathophysiology of Alzheimer's disease is the accumulation of neurofibrillary tangles (NFTs) of hyperphosphorylated tau protein and amyloid-beta (AÎ²) plaques. Antibody therapy of Tau and Amyloid beta, vaccines and other methods to decrease Tau and or Amyloid have not been successful after considerable pharmaceutical and biotech efforts. For example, Eli Lilly announced a major change to its closely watched clinical trial for the Alzheimer's drug solanezumab which failed to reach statistical significance. Recently, a report on animal models using photomodulation with near infrared light to treat AD pathology in K369I tau transgenic model (K3) l engineered to develop neurofibrillary tangles, and the APPs/PSEN1dE9 transgenic model (APP/PS1) to develop amyloid plaques. Mice were treated with NIR 20 times over a four-week period and NIR treatment (600-1000 nm) was associated with a reduction in the size and number of amyloid-Î² plaques in the neocortex and hippocampus. We now report a small pilot double blind, placebo-controlled trial (n=11) 6 active, 3 controls and 2 dropouts assessing the effect of 28 consecutive, sixminute transcranial sessions of near infrared (NIR) stimulation using 1060-1080 nm light emitting diodes. Subjects were independently diagnosed with dementia conducted in an outpatient behavioral healthcare clinic. IRB approval was obtained through the Quietmind Foundation's institutional review Board (IRB). Results showed changes in executive functioning; clock drawing, immediate recall, praxis memory, visual attention and task switching (Trails A&B) as well as a trend of improved EEG amplitude and connectivity measures. Neuroplasticity has also been reported with NIR light stimulation and mitochondrial enhancement.

Photobiomodulation of human dermal fibroblasts in vitro: decisive role of cell culture conditions and treatment protocols on experimental outcome. Photobiomodulation-based (LLLT) therapies show tantalizing promise for treatment of skin diseases. Confidence in this approach is blighted however by lamentable inconsistency in published experimental designs, and so complicates interpretation. Here we interrogate the appropriateness of a range of previously-reported treatment parameters, including light wavelength, irradiance and radiant exposure, as well as cell culture conditions (e.g., serum concentration, cell confluency, medium refreshment, direct/indirect treatment, oxygen concentration, etc.), in primary cultures of normal human dermal fibroblasts exposed to visible and near infra-red (NIR) light. Apart from irradiance, all study parameters impacted significantly on fibroblast metabolic activity. Moreover, when cells were grown at atmospheric O(2) levels (i.e. 20%) short wavelength light inhibited cell metabolism, while negligible effects were seen with long visible and NIR wavelength. By contrast, NIR stimulated cells when exposed to dermal tissue oxygen levels (approx. 2%). The impact of culture conditions was further seen when inhibitory effects of short wavelength light were reduced with increasing serum concentration and cell confluency. We conclude that a significant source of problematic interpretations in photobiomodulation reports derives from poor optimization of study design. Further development of this field using in vitro/ex vivo models should embrace significant standardization of study design, ideally within a design-of-experiment setting. Dermis;Energy Metabolism;Fibroblasts;Humans;Light;Oxygen Consumption;Phototherapy

Efficacy of low-level laser therapy in carpal tunnel syndrome management: a systematic review and meta-analysis. We performed this meta-analysis to investigate the efficacy of low-level laser therapy (LLLT), a physiotherapy modality with anti-inflammatory and analgesic effects, in the management of mild-to-moderate carpal tunnel syndrome (CTS). We searched PubMed, Web of Knowledge, Scopus, Cochrane Central, and Virtual Health Library for randomized controlled trials (RCTs) that compared the effects of LLLT with or without splinting versus placebo on functional and electromyographic outcomes in CTS. All outcomes were pooled as mean differences (MD) under the inverse variance or random effects model, using the statistical add-in (MetaXL, version 5.0). Eight RCTs (473 patients/631 wrists) were eligible for the final analysis. The overall effect estimates did not favor LLLT therapy group over placebo in all primary outcomes: visual analogue scale (MD -1.11, 95% CI [-2.58, 0.35]), symptom severity scale score (MD -1.41, 95% CI [-5.12, 2.29]), and functional status scale score (MD -1.33, 95% CI [-3.27, 0.61]). However, LLLT was superior to placebo in terms of grip strength (MD 2.19, 95% CI [1.63, 2.76]) and inferior to placebo in terms of sensory nerve action potential (MD -2.74, 95% CI [-3.66, -1.82]). Laser therapy is superior to placebo in terms of improving the grip strength; however, no significant difference was found between both groups in terms of functional status improvement, pain reduction, or motor electrodiagnostic evaluations. Further high-quality trials with longer follow-up periods are required to establish the efficacy of LLLT for CTS treatment. Carpal Tunnel Syndrome;Electrophysiological Phenomena;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Publication Bias;Severity of Illness Index;Treatment Outcome

Photobiomodulation and the brain: a new paradigm. Transcranial photobiomodulation (PBM) also known as low level laser therapy (tLLLT) relies on the use of red/NIR light to stimulate, preserve and regenerate cells and tissues. The mechanism of action involves photon absorption in the mitochondria (cytochrome c oxidase), and ion channels in cells leading to activation of signaling pathways, up-regulation of transcription factors, and increased expression of protective genes. We have studied PBM for treating traumatic brain injury (TBI) in mice using a NIR laser spot delivered to the head. Mice had improved memory and learning, increased neuroprogenitor cells in the dentate gyrus and subventricular zone, increased BDNF and more synaptogenesis in the cortex. These highly beneficial effects on the brain suggest that the applications of tLLLT are much broader than at first conceived. Other groups have studied stroke (animal models and clinical trials), Alzheimer's disease, Parkinson's disease, depression, and cognitive enhancement in healthy subjects.

Effect of low-level laser therapy (LLLT) and light-emitting diodes (LEDT) applied during combined training on performance and post-exercise recovery: protocol for a randomized placebo-controlled trial. BACKGROUND: Previous studies have shown positive results of phototherapy for improving performance and accelerating recovery; however, the effects of phototherapy during training and after a primary adaptation remain unclear. The aim of this randomized controlled trial is to analyze the effects of phototherapy and combined training on clinical, functional, and psychological outcomes and on vascular endothelial growth factor. METHODS: This randomized placebo-controlled trial by stratified sample will involve 45 healthy male participants. In phase 1, the participants will undergo six weeks of combined training (sprints and squats). In phase 2, participants will be allocated through stratified randomization (based on adaptation capacity) into three groups: active phototherapy group (AG), placebo group (PG), and non-treatment control group (CG). A new six-week training program will then start and the participants will receive the recovery strategy between sprints and squats. The primary outcome will be maximal isometric contraction. The secondary outcomes include strength and power testing, maximal incremental test, squat jump, sprint test, muscle soreness, pain threshold, perceptions of exertion and recovery, psychological questionnaire, and vascular endothelial growth factor. CONCLUSIONS: This will be the first trial to include phototherapy during

training. We believe that this strategy will combine the ergogenic and prophylactic effects in the same session. Furthermore, an application protocol performed after primary adaptation may reflect the real effect of the technique. Vascular Endothelial Growth Factor A
Exercise;Humans;Low-Level Light Therapy;Muscle, Skeletal;Phototherapy;Randomized Controlled Trials as Topic;Vascular Endothelial Growth Factor A

Effect of pre-operatory low-level laser therapy on pain, swelling, and trismus associated with third-molar surgery. BACKGROUND: The extraction of impacted third molars is commonly associated to pain, edema, trismus, limited jaw opening and movements. The aim of this retrospective study is to verify if pre-surgical low-level laser therapy (LLLT) associated with the extraction of impacted lower third molars could add benefits to the postoperative symptoms respect LLLT performed only after surgery. MATERIAL AND METHODS: Data from 45 patients subjected to a surgical extraction of lower third molars were pooled and divided into three groups. Patients that received only routine management were inserted in the control group. Group 1, were patients that received LLLT immediately after surgery and at 24 hours. In group 2 were included patients treated with LLLT immediately before the extraction and immediately after the end of the procedure. Data were analyzed using linear regression and descriptive statistics. RESULTS: Both laser-treated groups were characterized by minor events of post-surgery complications of pain, edema, trismus. The use of NSAIDs in the first 24 hours was significantly inferior in Group 2. CONCLUSIONS: Pre-surgical LLLT treatment seems to increase the analgesic effect of LLLT. However, trismus and edema were reduced in both laser treated groups, independently from the period of irradiation.
Edema;Humans;Low-Level Light Therapy;Molar, Third;Pain, Postoperative;Postoperative Complications;Preoperative Care;Retrospective Studies;Tooth Extraction;Tooth, Impacted;Trismus

Direct (1)O(2) optical excitation: A tool for redox biology. Molecular oxygen (O(2)) displays very interesting properties. Its first excited state, commonly known as singlet oxygen ((1)O(2)), is one of the so-called Reactive Oxygen Species (ROS). It has been implicated in many redox processes in biological systems. For many decades its role has been that of a deleterious chemical species, although very positive clinical applications in the Photodynamic Therapy of cancer (PDT) have been reported. More recently, many ROS, and also (1)O(2), are in the spotlight because of their role in physiological signaling, like cell proliferation or tissue regeneration. However, there are methodological shortcomings to properly assess the role of (1)O(2) in redox biology with classical generation procedures. In this review the direct optical excitation of O(2) to produce (1)O(2) will be introduced, in order to present its main advantages and drawbacks for biological studies. This photonic approach can provide with many interesting possibilities to understand and put to use ROS in redox signaling and in the biomedical field. Reactive Oxygen Species;Singlet Oxygen
Animals;Humans;Oxidation-Reduction;Photochemotherapy;Photons;Reactive Oxygen Species;Singlet Oxygen

Low-intensity laser therapy efficacy evaluation in FVB mice subjected to acute and chronic arthritis. Rheumatoid arthritis, an autoimmune inflammation, has a high prevalence in the population, and while therapy is available, it required often injection of drugs causing discomfort to patients. This study evaluates the clinical and histological effect of low-intensity laser therapy (LILT) as an alternative treatment, in a murine model of acute and chronic inflammation. FVB mice received either a Zymosan A injection into one knee joint inducing acute inflammation, followed after 15Â min or 24Â h by LILT or a collagen bovine type II injection emulsified in "Freund's Complete Adjuvant" to induce chronic arthritis, followed at 4Â weeks with multiple LILT sessions. LILT mediated by either 660, 808, or 905Â nm and tissue response was evaluated based on clinical symptoms and histological analysis of inflammatory infiltrate and damage to the articular surfaces. LILT can be effective in elevating clinical symptoms, so Kruskal-Wallis testing indicated no significant differences between

knees affected by acute arthritis and treated once with LILT and an injured knee without treatment (pÂ >Â 0.05) for 660 and 808Â nm with some improvements for the 905-nm LILT. Mice receiving two treatments for acute arthritis showed exacerbation of inflammation and articular resorption following therapy with a 660-nm continuous laser (pÂ <Â 0.05). For chronic inflammation, differences were not noted between LILT treated and untreated injured knee joints (pÂ >Â 0.05). Among the lasers, the 905Â nm tends to show better results for anti-inflammatory effect in acute arthritis, and the 660Â nm showed better results in chronic arthritis. In conclusion, LILT wavelength selection depends on the arthritis condition and can demonstrate anti-inflammatory effects for chronic arthritis and reduced resorption area in this murine model. Collagen Type II;Freund's Adjuvant;Zymosan Acute Disease;Animals;Arthritis, Experimental;Cartilage, Articular;Cattle;Chronic Disease;Collagen Type II;Disease Models, Animal;Freund's Adjuvant;Immunohistochemistry;Knee Joint;Low-Level Light Therapy;Male;Mice;Zymosan

Efficacy of Laser Photobiomodulation on Morphological and Functional Repair of the Facial Nerve. OBJECTIVE: Evaluate the efficacy of low-level laser therapy (LLLT) on qualitative, quantitative, and functional aspects in the facial nerve regeneration process. MATERIALS AND METHODS: Forty-two male Wistar rats were used, randomly divided into a control group (CG; nâ€‰=â€‰10), in which the facial nerve without lesion was collected, and four experimental groups: (1) suture experimental group (SEG) and (2) fibrin experimental group (FEG), consisting of 16 animals in which the buccal branch of the facial nerve was sectioned on both sides of the face; an end-to-end epineural suture was performed on the right side, and a fibrin sealant was used on the left side for coaptation of the stumps; and (3) laser suture experimental group (LSEG) and (4) laser fibrin experimental group (LFEG), consisting of 16 animals that underwent the same surgical procedures as SEG and FEG with the addition of laser application at three different points along the surgical site (pulsed laser of 830â€‰nm wavelength, optical output power of 30â€‰mW, power density of 0.2586â€‰W/cm(2), energy density of 6.2â€‰J/cm(2), beam area of 0.116â€‰cm(2), exposure time of 24â€‰sec per point, total energy per session of 2.16â€‰J, and cumulative dose of 34.56â€‰J). The animals were submitted to functional analysis (subjective observation of whisker movement) and the data obtained were compared using Fisher's exact test. Euthanasia was performed at 5 and 10 weeks postoperative. The total number and density of regenerated axons were analyzed using the unpaired t-test (pâ€‰<â€‰0.05). RESULTS: Laser therapy resulted in a significant increase in the number and density of regenerated axons. The LSEG and LFEG presented better scores in functional analysis in comparison with the SEG and FEG. CONCLUSIONS: LLLT enhanced axonal regeneration and accelerated functional recovery of the whiskers, and both repair techniques allowed the growth of axons. Animals;Disease Models, Animal;Facial Nerve;Facial Nerve Injuries;Injury Severity Score;Low-Level Light Therapy;Male;Nerve Regeneration;Random Allocation;Rats;Rats, Wistar;Sensitivity and Specificity

Effects of low-level laser therapy on the modulation of tissue temperature and hyperalgesia following a partial Achilles tendon injury in rats. The aim of the present study was to evaluate the effects of low-level laser therapy (LLLT) on the modulation of tissue temperature and hyperalgesia following a partial injury to the Achilles tendon in rats. Forty-five rats were randomly divided into three groups: a control group, a group treated with LLLT at a dose of 1.4 J (808 nm, 50 mW, 1.4 J), and a group treated with LLLT at a dose of 2.1 J (808 nm, 50 mW, 2.1 J). LLLT was administered to a single point immediately following the partial injury of the Achilles tendon. Tissue temperature and hyperalgesia were evaluated 6, 24, and 48 hours following the injury. Thus, a significant group-versus-time interaction was found for tissue temperature ($F = 4.097$, $p = 0.001$) and hyperalgesia ($F = 106.605$, $p < 0.001$), with a greater reduction in theses outcomes in the group that received LLLT at a dose of 2.1 J evaluated 48 hours after the injury. Therefore, LLLT at a wavelength of 808 nm and dose of 2.1 J

administered immediately following a partial injury to the Achilles tendon led to a reduction in tissue temperature and hyperalgesia at the injury site in rats, especially 48 hours after injury. Achilles Tendon;Animals;Hyperalgesia;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Wistar;Temperature;Thermography;Time Factors

The efficacy of fractional carbon dioxide (CO(2)) laser combined with terbinafine hydrochloride 1% cream for the treatment of onychomycosis. BACKGROUND: Although systemic and topical antifungal agents are widely used to treat onychomycosis, oral medications can cause adverse effects and the efficacy of topical agents is not satisfying. Currently, laser treatment has been studied for its efficacy in the treatment of onychomycosis. Our study was aimed to evaluate the efficacy of fractional carbon dioxide (CO(2)) laser treatment combined with terbinafine cream for 6 months in the treatment of onychomycosis and to analyze the influencing factors. METHODS: A total of 30 participants (124 nails) with clinical and mycological diagnosis of onychomycosis received fractional CO(2) laser treatment at 2-week interval combined with terbinafine cream once daily for 6 months. The clinical efficacy rate (CER) was assessed from the percentage of fully normal-appearing nails or nails with â‰¤5% abnormal appearance, and the mycological clearance rate (MCR) was assessed from the percentage of nails with negative fungal microscopy. RESULTS: The CER was evaluated at 3 time points: at the end of treatment (58.9%), at 1 month after the last treatment (63.5%), and at 3 months after the last treatment (68.5%). The MCRs at 1 month and 3 months after the last treatment were 77.4 and 74.2%, respectively. The evaluation of influencing factors showed significantly higher CER ($p < 0.05$) in nails of participants with age <50 years, distal lateral subungual onychomycosis (DLSO), superficial white onychomycosis (SWO), nail thickness <2 mm, affected first-to-fourth finger/toenails, Trichophyton rubrum, and Trichophyton mentagrophytes. All participants experienced tolerable mild burning sensation during laser treatment, but there were no other adverse reactions reported. CONCLUSIONS: Fractional CO(2) laser treatment combined with terbinafine cream for 6 months was an effective and safe method for the treatment of onychomycosis. There were 5 factors that positively influenced the treatment outcome: age, clinical type of onychomycosis, nail thickness, involved nail, and species of fungus. Antifungal Agents;Naphthalenes;Terbinafine Adolescent;Adult;Aged;Antifungal Agents;Child;Combined Modality Therapy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Naphthalenes;Onychomycosis;Patient Satisfaction;Terbinafine;Young Adult

Construction and temporal behaviour study of multi RLC intense light pulses for dermatological applications. Driving a flash lamp in an intense pulsed light system requires a high-voltage DC power supply, capacitive energy storage and a flash lamp triggering unit. Single, double, triple and quadruple-mesh discharge and triggering circuits were constructed to provide intense light pulses of variable energy and time durations. The system was treated as [Formula: see text] circuit in some cases and [Formula: see text] circuit in others with a light pulse profile following the temporal behaviour of the exciting current pulse. Distributing the energy delivered to one lamp onto a number of LC meshes permitted longer current pulses, and consequently increased the light pulse length. Positive results were obtained when using the system to treat skin wrinkles. Cosmetic Techniques;Humans;Lasers, Excimer;Low-Level Light Therapy;Skin Aging

Low-level laser therapy (780Â nm) combined with collagen sponge scaffold promotes repair of rat cranial critical-size defects and increases TGF-Î², FGF-2, OPG/RANK and osteocalcin expression. The aim of this study was to evaluate the effect of collagen sponge scaffold (CSS) implantation associated with low-level laser therapy (LLLT) on repairing bone defects. A single 5-mm cranial defect was surgically created in forty Wistar rats, which then received one of the following four interventions (nÂ =Â 10 per group): no treatment (G0); bone defect implanted with collagen sponge scaffold (CSS) alone (G1); defect treated with low-level laser therapy (LLLT) (wavelength 780Â nm;

total energy density 120Â J/cm(2) ; power 50Â mW) alone (G2); and CSS associated with LLLT treatment (G3). After surgery, animals in each group were euthanized at 21Â days and 30Â days (nÂ =Â 5 per euthanasia time group). Bone formation was monitored by X-ray imaging analysis. Biopsies were collected and processed for histological analysis and immunohistochemical evaluation of transforming growth factor-beta (TGF-Î²), fibroblast growth factor-2 (FGF-2), osteoprotegerin (OPG) and receptor activator of nuclear factor Æ™ (RANK). Osteocalcin (OCN) was detected by immunofluorescence analysis. Compared to the G0 group, defects in the 30-day G3 group exhibited increased bone formation, both by increase in radiopaque areas (PÂ <Â 0.01) and by histomorphometric analysis (PÂ <Â 0.001). The histopathological analysis showed a decreased number of inflammatory cells (PÂ <Â 0.001). The combined CCSÂ +Â LLLT (G3) treatment also resulted in the most intense immunostaining for OPG, RANK, FGF-2 and TGF-Î², and the most intense and diffuse OCN immunofluorescent labelling at 30Â days postsurgery (G3 vs. G0 group, PÂ <Â 0.05). Therefore, the use of CCS associated with LLLT could offer a synergistic advantage in improving the healing of bone fractures. Osteoprotegerin;Tnfrsf11b protein, rat;Transforming Growth Factor beta;Fibroblast Growth Factor 2;Osteocalcin;Collagen Animals;Bone Regeneration;Collagen;Fibroblast Growth Factor 2;Fluorescent Antibody Technique;Immunohistochemistry;Low-Level Light Therapy;Male;Microscopy, Confocal;Osteocalcin;Osteoprotegerin;Radiography;Random Allocation;Rats;Rats, Wistar;Single-Blind Method;Skull;Transforming Growth Factor beta

Remote tissue conditioning - An emerging approach for inducing body-wide protection against diseases of ageing. We have long accepted that exercise is 'good for us'; that - put more rigorously - moderate exercise is associated with not just aerobic fitness but also reduced morbidity and reduced mortality from cardiovascular disease and even malignancies. Caloric restriction (moderate hunger) and our exposure to dietary phytochemicals are also emerging as stresses which are 'good for us' in the same sense. This review focuses on an important extension of this concept: that stress localized within the body (e.g. in a limb) can induce resilience in tissues throughout the body. We describe evidence for the efficacy of two 'remote' protective interventions - remote ischemic conditioning and remote photobiomodulation - and discuss the mechanisms underlying their protective actions. While the biological phenomenon of remote tissue conditioning is only partially understood, it holds promise for protecting critical-to-life tissues while mitigating risks and practical barriers to direct conditioning of these tissues. Aging;Chronic Disease;Humans;Ischemic Preconditioning;Low-Level Light Therapy;Stress, Physiological

Effect of laser photobiomodulation on wound healing and postoperative pain following free gingival graft: A split-mouth triple-blind randomized controlled clinical trial. BACKGROUND AND AIM: Free gingival graft (FGG) is one of the most predictable techniques for gingival augmentation. However, patient's discomfort and pain during healing period are significant concerns. The aim of this study was to assess if laser photobiomodulation (PBM) was effective in terms of enhancing wound healing and reducing postoperative pain. METHODS AND MATERIALS: Twelve patients participated in this split-mouth randomized controlled clinical trial. Each patient had a 30-day interval between the two procedures. In the test group, donor and recipient sites received diode laser (660nm, 200mW, continuous mode, time of irradiation:32s, energy density: 4J/cm(2), spot size:0.5cm) immediately after FGG surgery, and 1,2,4 and 7days later. The control side received the same sequence of irradiation with the laser-off. Complete wound epithelialization of donor site and clinical wound healing and visual analogue scale (VAS) pain score of donor and recipient sites were evaluated after surgery. RESULTS: At 14 and 21days after surgery, the number of donor sites with complete epithelialization was greater in laser group compared to the placebo. After 21days, all donor sites in the test group were epithelialized completely, while at the same time, only eight donor sites in the

control group showed complete epithelialization (P value=0.05). In terms of clinical healing of the recipient and donor sites, the test and control groups did not show any significant difference during the 45-day period, except at days 1 (for recipient site) and 14 (for donor site), when the test group showed better results (P values: 0.01 and 0.03, respectively). The VAS pain score did not show statistically significant difference between two groups during the study period, except for the first 3h after procedure when laser group showed greater VAS pain score (P values<0.05). CONCLUSION: PBM following FGG procedure with the parameters used in this study could accelerate the rate of epithelialization at the donor site. However, it did not reduce postoperative pain. Anti-Inflammatory Agents, Non-Steroidal Adult;Anti-Inflammatory Agents, Non-Steroidal;Female;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases;Pain, Postoperative;Placebo Effect;Wound Healing

Skin reactions after photodynamic therapy are unaffected by 839â€‰nm photobiomodulation therapy: A randomized, double-blind, placebo-controlled, clinical trial. BACKGROUND AND OBJECTIVE: Photodynamic therapy (PDT) is associated with erythema and edema. Photobiomodulation (PBM) therapy may stimulate the skin recovery process. We investigated the potential of PBM to reduce PDT-induced skin reactions. STUDY DESIGN AND METHODS: Healthy volunteers (nâ€‰=â€‰20) were randomized to receive left- or right side PBM (near-infrared 839/595â€‰nm) or placebo-PBM (595â€‰nm) on their buttocks. Corresponding test areas were exposed to standardized PDT reactions, using ablative fractional laser-assisted PDT (AFXL-PDT) with methyl-aminolevulinate (MAL) incubated for 30, 90, and 180 minutes before red-light illumination. Each buttock received PBM and placebo-PBM for five consecutive days, starting one day before PDT interventions. Follow-up visits were performed 4 and 11 days after PDT. Outcome measure included blinded, observer-assessed skin reactions, substantiated by objectively measured erythema and pigment percentages and skin temperatures. RESULTS: PDT interventions induced a standardized range of erythema and edema in all subjects. Skin reactions were clinically unaffected by PBM throughout the active treatment period and at all subsequent follow-up visits (PBM vs. placebo-PBM, Pâ€‰=â€‰1.000). Clinical results were supported by similar erythema intensities and skin temperatures in PBM and placebo-PBM treated skin: median erythema 28.1% versus 30.3% (AFXL-PDT with 30â€‰minutes MAL-incubation), 36.1% versus 35.2% (90â€‰minutes MAL-incubation) and 39.4% versus 40.9% (180â€‰minutes MAL-incubation) (Day 4, Pâ€‰>â€‰0.05). No differences in clinical hyperpigmentation or pigment percentages were observed between corresponding test areas in any subject on the final 11-day follow-up. CONCLUSION: Under the current study conditions, PDT-induced skin reactions were unaffected by PBM. Lasers Surg. Med. 49:810-818, 2017. Â© 2017 Wiley Periodicals, Inc. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Adolescent;Adult;Aminolevulinic Acid;Double-Blind Method;Edema;Erythema;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Treatment Failure;Young Adult

Comparison of photobiomodulation therapy and suprascapular nerve-pulsed radiofrequency in chronic shoulder pain: a randomized controlled, single-blind, clinical trial. Shoulder pain can be difficult to treat due to its complex anatomic structure, and different treatment methods can be used. We aimed to examine the efficacy of photobiomodulation therapy (PBMT) and suprascapular nerve (SSN)-pulsed radiofrequency (RF) therapy. In this prospective, randomized, controlled, single-blind study, 59 patients with chronic shoulder pain due to impingement syndrome received PBMT (group H) or SSN-pulsed RF therapy (group P) in addition to exercise therapy for 14 sessions over 2Â weeks. Records were taken using visual analog scale (VAS), Shoulder Pain and Disability Index (SPADI), and Nottingham Health Profile (NHP) scoring systems for pretreatment (PRT), posttreatment (PST), and PST follow-up at months 1, 3, and 6. There was no statistically significant difference in initial VAS

score, SPADI, and NHP values between group H and group P (pÂ >Â 0.05). Compared to the values of PRT, PST, and PST at months 1, 3, and 6, VAS, SPADI, and NHP values were statistically significantly lower in both groups (pÂ <Â 0.001). There was no statistically significant difference at all measurement times in VAS, SPADI, and NHP between the two groups. We established that PBMT and SSN-pulsed RF therapy are effective methods, in addition to exercise therapy, in patients with chronic shoulder pain. PBMT seems to be advantageous compared to SSN-pulsed RF therapy, as it is a noninvasive method. Adult;Aged;Chronic Pain;Demography;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Pulsed Radiofrequency Treatment;Shoulder;Shoulder Impingement Syndrome;Shoulder Pain;Single-Blind Method;Visual Analog Scale

The influence of low-intensity He-Ne laser on the wound healing in diabetic rats. The low-level laser irradiation at certain wavelengths is reported to facilitate the healing process of diabetic wounds. Thus, this study carried out to look for the suitable laser parameters that could speed up the healing process. Fourteen healthy male and female rats were used in which a circular wound with a diameter of 2.5Â Â±Â 0.2Â cm was created on the dorsum in each rat after injected them with alloxan to induced diabetic. They have been divided into two groups: control group (NÂ =Â 7) and study group (NÂ =Â 7) to conduct the study. He-Ne laser with a wavelength of 632.8Â nm at power density of 4.0Â mW/cm(2) was used to irradiate the study group for five times a week until the wound healed (closed) completely, while the control group was kept untreated. The results showed that the laser-treated group healed (wounds were totally closed) faster compared to the control group. In numbers, the laser-treated group healed on average at the 21st day (0.0Â Â±Â 0.0Â cm) (PÂ â‰¤Â 0.005), whereas the control group healed after 40Â days or even 60Â days in some cases (sample no. 2). This confirms that laser promotes the tissue repair process of diabetic wounds and reduces the healing period to the half. Animals;Diabetes Mellitus, Experimental;Female;Lasers, Gas;Low-Level Light Therapy;Male;Rats, Wistar;Skin;Wound Healing

Effect of Low-Level Laser and Light-Emitting Diode on Inferior Alveolar Nerve Recovery After Sagittal Split Osteotomy of the Mandible: A Randomized Clinical Trial Study. PURPOSE: The major concern of sagittal split osteotomy (SSO) is the neurosensory disturbance. The authors investigated the effect of low-level laser therapy and light-emitting diode on the inferior alveolar nerve recovery after SSO. METHODS: In this double-blinded randomized clinical trial, 20 subjects with inferior alveolar nerve injury after SSO of the mandible were studied. Neurosensory recovery was assessed by 6 tests: visual analog scale (VAS), brush stroke, 2-point discrimination, contact detect detection, pinprick nociception, and thermal discrimination, and each one was performed before and after the surgery on days 1, 3, 7, 14, 60, and 180. RESULTS: After 1 week, the VAS score in the laser group significantly improved in comparison with the control group. Visual analog scale score improvement was 25% (P = 0.015) at 2 weeks, 21% (Pâ€Š=â€Š0.001) at 2 months, and 24% (Pâ€Š=â€Š0.001) at 6 months. After 2 weeks, the brush stroke score improvement was significant in the laser group. The improvement values were 21.5% (Pâ€Š=â€Š0.002) at 2 months and 15.1% (Pâ€Š=â€Š0.004) at 6 months. CONCLUSION: Low-level laser therapy and light-emitting diode may improve VAS scores, 2-point discrimination, and brush stroke test results without any effect on the pinprick or contact detection test results. Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Mandibular Nerve;Middle Aged;Osteotomy;Pain Measurement;Postoperative Complications;Recovery of Function;Trigeminal Nerve Injuries

Laser Medicine and Surgery as a Single, Comprehensive, and Multi-Disciplinary Field. Forecasting;Humans;Interdisciplinary Communication;Laser Therapy;Lasers;Low-Level Light Therapy

Efficacy of low-level laser therapy in management of symptomatic oral lichen planus: a systematic review. Oral lichen planus (OLP) is a chronic inflammatory disease of unknown etiology and

indefinite cure. This systematic review assessed the efficacy of low-level laser therapy in the treatment of symptomatic OLP. Electronic databases (PubMed, Scopus, and Web of Science) were searched from date of inception till and including December 2016, using various combinations of the following keywords: oral lichen planus, laser therapy, low-level laser therapy, and phototherapy. Owing to heterogeneity of data, no statistical analyses were conducted. Initially, 227 publications were identified. After selection, only six studies were included in this systematic review. In these studies, the laser wavelengths, power output, and duration of irradiation ranged between 630-980Â nm, 20-300Â mW, and 10Â s-15Â min, respectively. All of the included studies found laser to be effective in management of OLP, without any reported adverse effects. The results of the included studies confirm that low-level laser therapy is effective in management of symptomatic OLP and can be used as an alternative to corticosteroids. However, due to variety of methods and substantial variations in laser parameters among these studies, more randomized clinical trials with large sample sizes are highly warranted. Adult;Aged;Female;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Efficacy of photobiomodulation therapy on masseter thickness and oral health-related quality of life in children with spastic cerebral palsy. The study aimed to evaluate the efficacy of photobiomodulation therapy (PBMT) on bilateral masseter muscle thickness and amplitude of mouth opening in children with spastic cerebral palsy (CP), and the impact on their oral health-related quality of life (OHRQOL). Three groups were included: experimental CP group (EG: nÂ =Â 26 with oral complaints), positive control CP group (PCG: nÂ =Â 26 without complaints), and negative control group (NCG: nÂ =Â 26 without CP). In the EG, the masseter muscles on both sides were irradiated with an infrared low-level Ga-Al-As laser (Î»Â =Â 808Â Â±Â 3Â nm, 120Â mW) using a 3Â J/cm(2) energy dose per site, with a 20Â s exposure time per site (spot area: 4Â mm(2); irradiance: 3Â W/cm(2); energy delivery per point: 2.4Â J) six times over six consecutive weeks. Masseter thickness, assessed through ultrasonography, and the amplitude of mouth opening were measured in the EG before and after six applications of PBMT and once in the PCG and NCG. The Parental-Caregiver Perception Questionnaire (P-CPQ) was used to evaluate OHRQOL. ANOVA, chi-square, t tests, and multilevel linear regression were used for statistical analysis. In the EG, the study results revealed average increments of 0.77 (0.08) millimeter in masseter thickness (PÂ <Â 0.05) and 7.39 (0.58) millimeter for mouth opening (PÂ <Â 0.05) and reduction in all P-CPQ domains (PÂ <Â 0.001), except for social well-being. The six applications of PBMT increased masseter thickness and mouth opening amplitude and reduced the impact of spastic CP on OHRQOL. Case-Control Studies;Cerebral Palsy;Child;Female;Humans;Linear Models;Low-Level Light Therapy;Male;Masseter Muscle;Oral Health;Quality of Life;Surveys and Questionnaires

Successful treatment of lichen amyloidosis accompanied by atopic dermatitis by fractional CO(2) laser. Lichen amyloidosis (LA) is a subtype of primary cutaneous amyloidosis that is presented as persistent, multiple-grouped hyperkeratotic papules usually located on the shins, back, forearms or thighs. The treatment of LA has been considered to be difficult, and of the various methods available, recent studies have reported the efficacy of fractional CO(2) lasers. LA may be accompanied by atopic dermatitis (AD) in which the treatment options may be more limited. Herein, we report three cases of LA accompanied by AD treated by a fractional CO(2) laser. Adult;Amyloidosis, Familial;Dermatitis, Atopic;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Skin Diseases, Genetic

Protective treatments and their target retinal ganglion cells in diabetic retinopathy. Diabetic retinopathy(DR)is one of the complications of diabetes which could cause severe vision loss. Retinal ganglion cell(RGC)injury has been confirmed prior to micro-vascular damage. Over the past few decades, a number of animal and clinical studies have confirmed that RGC impairment leads to an early deterioration of vision in DR. Inhibition of aldose reductase (AR), advanced glycation end

product (AGE), oxidative stress, glutamate toxicity, and an inflammatory response may play important roles in protecting RGCs in DR. Furthermore, nicotinamide mononucleotide adenylyl transferase-1 (Nmnat1), neurotrophins and neurotrophic factors may become new therapeutic targets. Photobiomodulation (PBM) may be used as adjunctive therapy in protective treatment of RGCs. In this review, we highlight and discuss protective treatments and their targets which have shown great promise for treatment of RGC injury in DR. Neuroprotective Agents Animals;Diabetic Retinopathy;Humans;Low-Level Light Therapy;Neuroprotective Agents

Comparison of Ozone and Photo-Biomodulation Therapies on Mental Nerve Injury in Rats. PURPOSE: This study compared photo-biomodulation (PBM) and ozone therapy (OT) for mental nerve injury by counting Schwann cells (SCs) and fasciculated nerve branches and measuring fascicular nerveÂ areas. MATERIALS AND METHODS: The effects of OT and PBM on mental nerve injury were evaluated. Mental nerves of 27 rats were partly sutured and allocated into 3 groups. Group 1 received no treatment, group 2 received OT, and group 3 received PBM. The number of fascicules beyond nerve branches and the number of SCs before and after nerve injury were evaluated histologically. RESULTS: A better healing pattern was observed in the treatment groups. The number of SCs was markedly larger in the OT and PBM groups than in the control group. CONCLUSIONS: Oral and maxillofacial surgeons should be familiar with the differential diagnosis, prevention, and management of neurosensory disturbances. This study provides insights into the management of neurosensory disturbances related to mental nerve injury using OT and PBM. This study clearly suggests that OT and PBM are promising novel methods for the treatment of mental nerve injury. Ozone Animals;Low-Level Light Therapy;Ozone;Rats;Rats, Wistar;Trigeminal Nerve Injuries

Low-Level Laser Therapy After Wisdom Teeth Surgery: Evaluation of Immunologic Markers (Secretory Immunoglobulin A and Lysozyme Levels) and Thermographic Examination: Placebo Controlled Study. OBJECTIVE: The goal of this investigation is to analyze the effect of therapeutic low-level laser therapy (LLLT) to have a possibility to check pain and inflammation connected with surgical removal of impacted lower third molars in general anesthesia or even phobia [not accompanied by pain or fear of dental treatment, using immunologic markers-secretory immunoglobulin A (sIgA) and lysozyme]. The healing process was also monitored by infrared thermography. BACKGROUND DATA: LLLT can accelerate the proliferation phase of healing and decrease the inflammatory reaction, but the effect is not really clear. MATERIALS AND METHODS: The treatment group comprised 213 impacted third molars (144 laser group and 74 placebo group). Laser radiation (diode laser 830â€‰nm) was applied. The effectivity of laser therapy was evaluated based on immunological tests, that is, before and after treatment with sIgA and lysozyme in nonstimulated saliva. Thermographic examination was performed by infrared camera. RESULTS: After laser irradiation, the sIgA decreases from 546.91â€‰mg/L (SD 354.58) to 304.91â€‰mg/L (SD 191.96), and in the control group from 602.25â€‰mg/L (SD 343.62) to 425.62â€‰mg/L (SD 220.51); the differences were significant, the lysozyme value being lower. After laser therapy, the laser and placebo sides in the area of the third molars were differed in 0.2Â°C. CONCLUSIONS: The 830â€‰nm wavelength penetrates to deep-seated tissues. A positive association was found between concentration of salivary sIgA and lysozyme in the saliva after LLLT application. The deep-seated wounds after wisdom teeth extraction had no effect on temperature rise in the face. Immunoglobulin A;Muramidase Adolescent;Adult;Female;Humans;Immunoglobulin A;Inflammation;Low-Level Light Therapy;Male;Molar, Third;Muramidase;Pain Measurement;Pain, Postoperative;Saliva;Thermography;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Wound Healing

The effect of low-level diode laser on COX-2 gene expression in chronic periodontitis patients. Adjunctive treatments to scaling and root planing (SRP) such as lasers, have been utilized in the

treatment of chronic periodontitis, mainly aiming to suppress and eliminate the bacteria, as well as enhancing the healing response. Eighty gingival papilla biopsy samples were obtained from 60 patients diagnosed with chronic advanced periodontitis; randomly assigned to three treatment groups (n = 20), as well as 20 subjects with no periodontal disease [group A]. Group B received SRP on a single quadrant/day for four consecutive days. On day 5, all quadrants were rescaled. Groups C and D received the same treatment as group B plus laser application with the low-level diode laser (630-670 nm, 1.875 J/cm2) for five and ten consecutive days, respectively. Papilla biopsies were obtained from subjects and evaluated by RT-PCR for expression of COX-2. The values in the control group were 0.028 0.014 and baseline values for the examined groups were 0.16 0.18. Significantly decreased level of COX-2 expression for groups C and D was found after treatment, while lowest average expression was found in the group that had the 10 laser treatments supplemental to SRP (0,035 0,014). The results of this study show suppression of COX-2 in gingival tissue after low-level laser treatment as adjunct to SRP. Adult;Aged;Analysis of Variance;Chronic Periodontitis;Female;Gene Expression Regulation, Enzymologic;Humans;Lasers, Semiconductor;Male;Middle Aged

Classic medical tools for the prevention of adverse technology-associated events: Tongue depressors and lasers. Burns;Cosmetic Techniques;Equipment Design;Eyebrows;Female;Humans;Low-Level Light Therapy;Male;Primary Prevention;Protective Devices;Radiation Injuries;Sensitivity and Specificity

Comparison of the effects of 665 nm low level diode Laser Hat versus and a combination of 665 nm and 808nm low level diode Laser Scanner of hair growth in androgenic alopecia. BACKGROUND: This study aimed to evaluate the effectiveness of a combined set of low level diode laser scanner (665 nm and 808nm) on hair growth, and assessment of safety and effectiveness of a new laser scanner on hair growth treatment procedure in androgenic alopecia. METHODS: 90 patients (18 to 70 years) with androgenic alopecia were randomized into three groups. The first group (n=30) received 655 nm red light using laser hat, the second group (n=30) received 655 nm red laser plus 808 nm infrared laser using a laser scanner of hair growth device (with the patent number: 77733) and the third group (n=30) received no laser as the control group. RESULTS: Patients in laser scanner group had better results and showed a higher increase in terminal hair density compared with laser hat group (mean of 9.61 versus 9.16 per cm(2)). We found significant decrease in terminal hair density from baseline in control group (mean -1.8 per cm(2), p<0.0001). CONCLUSION: Results showed a statistically significant improvement in the laser scanner of the hair growth group compared with laser hat and the control group. The study showed that treatment with new laser devise had a promising result without any observable adverse effects.

Variability of high-dose melphalan exposure on oral mucositis in patients undergoing prophylactic low-level laser therapy. The present study outlines the clinical impact and risk factors of oral mucositis in 79 patients with multiple myeloma following high-dose melphalan for autologous transplant. All patients underwent daily prophylactic low-level indium gallium aluminum phosphate diode laser therapy (660Â nm, 15Â mW, 3.75Â J/cm(2), 10Â s per point) from the beginning of the conditioning regimen up to day +2. Oral mucositis assessments were made daily until hospital discharge. For analysis, oral mucositis was divided into two groups according to severity: group 1, patients with oral mucositis grade <III (nÂ =Â 71) and group 2, patients with oral mucositis grade â‰¥III (nÂ =Â 8). Univariate logistic models were used to determine the risk factors. Patients in group 1 were found to have statistically fewer days of oral pain than those in group 2 (3.94 and 6.25Â days, respectively, pÂ =Â 0.014). Morphine was required in 75% of patients in group 2, versus 42.25% in group 1 (pÂ =Â 0.06). Risk of severe oral mucositis was associated with higher serum creatinine levels (ORÂ =Â 6.10; 95% CI 1.25-31.60; pÂ =Â 0.02) and older age (ORÂ =Â 1.21; 95% CI 1.05-1.47; pÂ =Â 0.027). Severe oral mucositis was associated with worse clinical outcomes. Older patients and

those with renal dysfunction previous autologous transplant had the greatest risk for severe oral mucositis despite prophylactic laser treatment. Our results highlight the importance of further research to define the dose, application time, and number of prophylactic laser sessions in those patients with the greatest risk for severe oral mucositis. Melphalan Adult;Aged;Dose-Response Relationship, Drug;Female;Hematopoietic Stem Cell Transplantation;Humans;Logistic Models;Low-Level Light Therapy;Male;Melphalan;Middle Aged;Multiple Myeloma;Risk Factors;Stomatitis;Transplantation Conditioning;Transplantation, Autologous;Treatment Outcome

Combined Fractional Treatment of Acne Scars Involving Non-ablative 1,550-nm Erbium-glass Laser and Micro-needling Radiofrequency: A 16-week Prospective, Randomized Split-face Study. An optimized therapeutic regimen involving a non-ablative fractionated laser or radiofrequency therapy for acne scars has not yet been established. To evaluate whether the combination of a non-ablative fractional laser (NAF) and fractional micro-needling radiofrequency (FMR) has clinical advantages for the treatment of atrophic acne scars compared with NAF alone, a 16-week prospective, randomized split-face study was performed. Each facial side of a patient was treated with 3 sessions of either NAF with FMR or NAF alone, with a 4-week interval between each session. Although both sides demonstrated significant decreases in the Ã©chelle d'Ã©valuation clinique des cicatrices d'acnÃ© (ECCA) score, the facial side treated using the combination regimen demonstrated greater improvement in ECCA score regarding degree and onset time than the NAF-treated side. Histopathological and immunohistochemical results confirmed the clinical findings. This study demonstrated that a combination regimen involving NAF and FMR could be a viable option with satisfactory efficacy. Acne Vulgaris;Adult;Cicatrix;Combined Modality Therapy;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Needles;Photography;Prospective Studies;Seoul;Time Factors;Treatment Outcome;Young Adult

Evaluation of the effectiveness of the photobiomodulation in the treatment of dentin hypersensitivity after basic therapy. A randomized clinical trial. BACKGROUND: Dentin hypersensitivity (DH) in one of the most common causes of patient discomfort in the general population and its prevalence is higher in patients who have received basic or surgical periodontal treatment. Efficiency of the diode laser with different wavelengths has been studied by several authors, showing an improvement rate of the DH between 60-98%. The aim of the present study was to evaluate the effect of photobiomodulation (PBM) treatment on the reduction of DH after non surgical periodontal treatment. MATERIAL AND METHODS: A randomized split mouth clinical trial was performed involving 30 patients (120 teeth) diagnosed with DH after scaling and root planning. Two teeth of the experimental side were treated with the laser and 2 teeth of the control side were treated without activating the laser. The laser treatment parameters for each tooth were 660nm, 200mW, CW, illuminated area 1.15cm2, 173mW/cm2, 60 seconds, 12 J, 10.4J/cm2. Age, gender, smoking, plaque index, gingival recession, probing and VAS (for tactile and thermal stimulation) were registered before the laser treatment, immediate post treatment (after 2 minutes), 2 weeks, 1 month and 2 months after treatment. RESULTS: There was significant difference ($p<0.01$) in discomfort to thermal and mechanical stimulation between the control and diode laser treatment sites at all evaluation periods. The level of discomfort decreased immediately following diode laser therapy, and continued to demonstrate a decrease for the duration of the study. All teeth remained vital after laser treatment, without adverse reactions or complications. CONCLUSIONS: The PBM can be used to reduce DH without detrimental pulpal effects. Key words:Dental hypersensitivity, laser, diode laser, photobiomodulation.

Evolution of some indicators of systemic immunity in patients with acne while using laser therapy. INTRODUCTION: One of the important problems in modern dermatology is to improve treatment

efficiency of acne being a common cause for cicatricial skin changes, loss of performance capability and social activity and negatively affects the psycho-emotional state of patients and their quality of life. The topicality of the disease is due to the high degree of its proliferation, chronic and recurrent course, and resistance to existing therapies. Reducing the effectiveness of skin diseases treatment, including that of acne, at present, is associated with developing resistance to drugs, which causes the use of non-drug methods in dermatology nowadays, including low-intensity laser therapy. Objective - to determine evolution of the systemic immunity indices in patients with acne with different degrees of severity in the course of a standard and comprehensive treatment by laser therapy. MATERIALS AND METHODS: We observed 77 patients with acne aged 18-25 years; 32 of them received standard therapy, other 45 patients were additionally prescribed combined (superficial venous and external) laser therapy. We determined the indices of all patients' systemic immunity using well-known techniques. RESULTS: It has been established, that using laser therapy in comprehensive treatment of patients with acne promotes the normalization or a tendency to normalization of the systemic immunity and phagocytosis with significant difference between the indices of the individuals who received a standard therapy alone. Biomarkers Acne Vulgaris;Adolescent;Adult;Biomarkers;Chemoradiotherapy;Humans;Immune System;Low-Level Light Therapy;Treatment Outcome;Young Adult

Low-level laser treatment stimulates hair growth via upregulating Wnt10b and Î²-catenin expression in C3H/HeJ mice. This study was conducted in order to evaluate the role of low-level laser treatment (LLLT) in hair growth in C3H/HeJ mice. Healthy C57BL/6 mice were randomly divided into two groups: with and without low-level laser treatment. The skin color of each mouse was observed each day. Skin samples were collected for H&E, immunofluorescence, PCR, and western blot analysis, to observe the morphology of hair follicles and detect the expression levels of Wnt10b and Î²-catenin. Observation of skin color demonstrated that black pigmentation started significantly earlier in the laser group than in the control group. Hair follicle number in both groups showed no difference; however, the hair follicle length presented a significant difference. Wnt10b protein was detected on the second day in hair matrix cells in the LLLT group but not in the control group. PCR and western blot results both illustrated that expression of Wnt10b and Î²-catenin was significantly higher in the LLLT group than in the control group. Our study illustrated that low-level laser treatment can promote hair regrowth by inducing anagen phase of hair follicles via initiating the Wnt10b/Î²-catenin pathway. RNA, Messenger;Wnt Proteins;Wnt10b protein, mouse;beta Catenin Animals;Female;Hair;Hair Follicle;Low-Level Light Therapy;Mice;Mice, Inbred C3H;Mice, Inbred C57BL;RNA, Messenger;Signal Transduction;Skin Pigmentation;Up-Regulation;Wnt Proteins;beta Catenin

Comparison of low level laser therapy and interferential current on post stroke shoulder pain.
The objective of the study was to compare the effects of LASER therapy and Interferential current on post stroke shoulder pain. Diagnosed patients (n=38) of post stroke shoulder pain were randomly divided into two groups i.e., LASER group (LG =20 patients) and Interferential current group (IFCG=18 patients). The variables under study were pain, satisfaction, disability, and function level before and after treatment. Improvement in pain and satisfaction level after LASER therapy was significant ($p<0.001$). However improvement in functional level was not significant ($p> 0.05$). The study findings revealed that LASER therapy is more effective than Interferential current in decreasing pain and increasing satisfaction level of stroke patients having shoulder pain. Adult;Electric Stimulation Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Shoulder Pain;Stroke;Treatment Outcome

Effect of low-level laser therapy on tissue repair after dental extraction in rats administered zoledronic acid and dexamethasone. Bisphosphonates (BPs) are being increasingly used for the treatment of metabolic and oncological pathologies involving the skeletal system. Because of the

severity of the BP associated osteonecrosis of the jaws, the difficulties of treatment, and patient discomfort, additional support methods for their management are needed. Laser therapy has an easy handling, photobiostimulator effect on tissues healing, so it can be considered a preferred therapy. The aim of this study was to evaluate the influence of low-level laser therapy in the 685- and 830-nm wavelength in the healing process of the bone and soft tissues in rats under BP therapy [zoledronic acid (ZA)] and dexamethasone concomitantly that underwent a surgery for the extraction of upper molars. There were statistically significant differences in the clinical evaluation of the wound and the weight of the animals. Regarding the histological evaluation, it was possible to observe the different maturations of the healing stage between groups. The effect of drug therapy with ZA and dexamethasone in the bone tissue repair process induces osteonecrosis of the jaw in rats and slows down the healing process. In the laser groups, at the stipulated dosimetry, a positive influence on the bone and soft tissue repair process was observed. Anti-Inflammatory Agents;Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid;Dexamethasone Animals;Anti-Inflammatory Agents;Bone Density Conservation Agents;Dexamethasone;Diphosphonates;Humans;Imidazoles;Low-Level Light Therapy;Rats;Tooth Extraction;Wounds and Injuries;Zoledronic Acid

Photostimulation of mitochondria as a treatment for retinal neurodegeneration. Absorption of photon energy by neuronal mitochondria leads to numerous downstream neuroprotective effects. Red and near infrared (NIR) light are associated with significantly less safety concerns than light of shorter wavelengths and they are therefore, the optimal choice for irradiating the retina. Potent neuroprotective effects have been demonstrated in various models of retinal damage, by red/NIR light, with limited data from human studies showing its ability to improve visual function. Improved neuronal mitochondrial function, increased blood flow to neural tissue, upregulation of cell survival mediators and restoration of normal microglial function have all been proposed as potential underlying mechanisms of red/NIR light. Animals;Disease Models, Animal;Humans;Light;Mitochondria;Neurodegenerative Diseases;Retinal Diseases

Next-generation Sequencing Identified a Novel EDA Mutation in a Chinese Pedigree of Hypohidrotic Ectodermal Dysplasia with Hyperplasia of the Sebaceous Glands. EDA protein, human;Ectodysplasins Adult;Asian People;Biopsy;China;DNA Mutational Analysis;Ectodermal Dysplasia 1, Anhidrotic;Ectodysplasins;Genetic Predisposition to Disease;Hair Follicle;High-Throughput Nucleotide Sequencing;Humans;Hyperplasia;Lasers, Gas;Low-Level Light Therapy;Male;Mutation;Pedigree;Phenotype;Predictive Value of Tests;Sebaceous Glands;Treatment Outcome

Medication-related osteonecrosis of the jaw: risk factors in patients under biphosphonate versus patients under antiresorptive-antiangiogenic drugs. BACKGROUND: Biphosphonate-related osteonecrosis of the jaw (BRONJ) is a potential side effect associated with the administration of bisphosphonates; the aim of this work is to highlight the possible epidemiological differences between two groups of patients affected by medication related osteonecrosis of the jaw (MRONJ) treated at the Center of Oral Medicine, Pathology and Laser Surgery of the Academic Hospital at the University of Parma, Italy, between January 2004 and June 2016. METHODS: Medical charts of 303 patients (214 females and 89 males, mean age: 67 years old) treated at the Center of Oral Medicine, Pathology and Laser Surgery of the Academic Hospital at the University of Parma, between January 2004 and June 2016, were retrospectively analyzed. Patients were divided in 2 groups according to drugs therapy they underwent: group 1 (G1) including patients treated with bisphosphonates alone and group 2 (G2) including patients receiving antiresorptive-antiangiogenic drugs in association with bisphosphonates or antiresorptive-antiangiogenic drugs alone. Than 269 MRONJ sites treated with 5 different therapeutical approaches were analyzed. RESULTS: Results showed G1 consisting mainly in

female patients undergoing bisphosphonates for oncologic disease, stage II was most frequently diagnosed and MRONJ developed mainly after dental extraction or bone surgery. G2 consisted mainly in males patients, whom took antiresorptive-antiangiogenic drugs in association with bisphosphonate or antiresorptive-antiangiogenic drugs alone for oncologic disease. Stage II was most frequently diagnosed and MRONJ developed most frequently "spontaneous". CONCLUSIONS: This study showed how a new population affected by MRONJ is emerging. Men affected by kidney cancer treated with new antiresorptive-antiangiogenic drugs will represent a growing portion of the pool of patients at risk. In our experience, a strict follow-up is of outmost importance to early detect MRONJ also in patients with spontaneous cases. When MRONJ occurs, surgical laser treatment with Er:YAG seems to represent the option with highest percentage of success; for patients with contraindication to surgery, LLLT helps to improve outcomes of the medical therapy. Angiogenesis Inhibitors;Antibodies, Monoclonal;Bone Density Conservation Agents;Dental Implants;Diphosphonates;Metronidazole;Amoxicillin-Potassium Clavulanate Combination Aged;Aged, 80 and over;Amoxicillin-Potassium Clavulanate Combination;Angiogenesis Inhibitors;Antibodies, Monoclonal;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Bone Neoplasms;Combined Modality Therapy;Dental Implants;Diphosphonates;Drug Therapy, Combination;Female;Humans;Laser Therapy;Lasers, Solid-State;Male;Metronidazole;Middle Aged;Osteoporosis;Postoperative Complications;Retrospective Studies;Risk;Risk Factors;Tooth Extraction

Is Low-Level Laser Therapy Effective for Treatment of Neurosensory Deficits Arising From Sagittal Split Ramus Osteotomy? PURPOSE: This study investigated the effectiveness of low-level laser therapy (LLLT) for treating neurosensory impairment after bilateral sagittal split osteotomy (BSSO). MATERIALS AND METHODS: This randomized, double-blinded, split-mouth trial included patients requiring BSSO. After surgery, 1 side of each patient was randomly assigned to laser therapy and the other side served as the control. At 24, 48, and 72Â hours after surgery, LLLT was accomplished by intraoral application of a 660-nm laser around the surgical site (200Â mW, 10Â seconds, 2Â J, 1.5Â J/cm(2)) followed by extraoral irradiation by an 810-nm laser (200Â mW, 10Â seconds, 2Â J, 7Â J/cm(2)) along the distribution of the inferior alveolar nerve. Subsequently, extraoral irradiation was repeated 2 times per week for 3Â weeks along the path of the inferior alveolar nerve, lower lip, and chin. On the control side, the treatment was similar to the laser side but with laser simulation. The main outcome was assessing nerve damage by a "2-point discrimination test" before and up to 60Â days after surgery. RESULTS: The sample consisted of 16 patients. No significant difference was found between the laser and control sides before and after surgery and on postoperative days 15 and 30 (PÂ >Â .05). The 2-point discrimination distance was significantly shorter on the laser side than on the control side on postoperative days 45 and 60 (PÂ <Â .05). CONCLUSION: LLLT was effective in the treatment of neurosensory disturbances arising from BSSO. Therefore, LLLT can be recommended to accelerate the recovery of sensory aberrations in patients undergoing BSSO. Cranial Nerve Diseases;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Mandibular Nerve;Osteotomy, Sagittal Split Ramus;Postoperative Complications;Prospective Studies;Sensation Disorders;Treatment Outcome;Young Adult

Influence of low-level laser on pain and inflammation in type 2 diabetes mellitus with diabetic dermopathy - A case report. Numerous skin lesions have been commonly observed in individuals with diabetes mellitus. The common skin manifestations of diabetes mellitus are erythrasma, xanthomatosis, xanthelasma, phycomycetes and cutaneous infections like furuncolosis, candidiasis, carbuncle, dermatophytosis, etc. Diabetic dermopathy is the most common skin lesion found in patients with diabetes. It is typically seen in men aged above 50 years. In low-level laser therapy (LLLT), the entire lower limb was illuminated with the frequency of 20 Hz and wavelength of 830 nm

for 9 min, and the treatment was divided into four parts. With the continued sessions of LLLT, the skin manifestations and neuropathy conditions improved drastically. On the 21st day, the skin colour was found to be normal. Also, there were significant changes in clinical findings for diabetic peripheral neuropathy. LLLT with specific exercises can promote healing of skin manifestations in individuals with type 2 diabetes mellitus. It can be used as an effective treatment modality for treating diabetic dermopathy. Diabetes Mellitus, Type 2;Diabetic Neuropathies;Humans;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases

Editorial. Ablation Techniques;Cosmetic Techniques;Humans;Low-Level Light Therapy;Radiofrequency Therapy;Rejuvenation;Rhytidoplasty;Skin Aging;Temperature

Treatment of recalcitrant plantar warts with long-pulsed Nd:YAG laser versus cantharidin-podophylline resin-salicylic acid. BACKGROUND: Treatment for recalcitrant plantar warts remains a continuing challenge as the options for treatment have differing levels of success. long-pulsed Nd:YAG laser is considered a good treatment modality in resistant plantar warts. On the other hand, high cure rates have been reported with a topical proprietary formulation consisting of 1% cantharidin, 5% podophyllotoxin, 30% salicylic acid. AIM: To compare the efficacy of 1% cantharidin, 20% podophylline resin and 30% salicylic acid (CPS) versus long-pulsed Nd:YAG laser in the treatment of recalcitrant plantar warts. METHODS: This study included 30 patients with single or multiple recalcitrant plantar warts; patients were assigned to two groups: the first group included 15 patients with 71 recalcitrant plantar warts who were treated by long-pulsed Nd:YAG laser (group I) and the second group included 15 patients with 78 recalcitrant plantar warts who received CPS (group II). The diagnosis of plantar warts was made by clinical examination. RESULTS: Fourteen patients (93%) were completely cleared of their warts with topical CPS, while 11 patients (73%) showed complete clearance with long-pulsed Nd:YAG laser with statistically significant difference between the two groups. CONCLUSION: Topical CPS is safe and efficacious and represents a promising therapeutic modality than long-pulsed Nd:YAG laser in the treatment of recalcitrant plantar warts. Drug Combinations;Keratolytic Agents;Cantharidin;Podophyllotoxin;Salicylic Acid Adult;Cantharidin;Drug Combinations;Female;Humans;Keratolytic Agents;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Podophyllotoxin;Salicylic Acid;Warts

Low level light-minoxidil 5% combination versus either therapeutic modality alone in management of female patterned hair loss: A randomized controlled study. BACKGROUND: Female pattern hair loss (FPHL) is the most common form of hair loss in women. Nevertheless, its management represents a real challenge. Among the FDA approved therapeutic modalities for FPHL are topical minoxidil and more recently low-level light therapy (LLLT). AIM OF WORK: Assess the efficacy and safety of LLLT in comparison to topical minoxidil 5% and to a combination of both therapies in the treatment of FPHL. PATIENTS AND METHODS: This study included 45 female patients with proven FPHL. They were randomly divided into three equal groups, where group (i) patients were instructed to apply topical minoxidil 5% twice daily, group (ii) patients received LLLT using the helmet iGrowÂ® device for 25 minutes 3 days weekly, and group (iii) patients received a combination of both topical minoxidil 5% twice daily and LLLT for 25 minutes 3 days weekly for 4 months (study duration). Evaluation was done according to clinical, dermoscopic (folliscopic), and ultrasound bio-microscopic (UBM) parameters. Patient satisfaction and side effects were reported. RESULTS: The efficacy and safety of both topical minoxidil and LLLT were highlighted with comparable results in all parameters. The combination group (iii) occupied the top position regarding Ludwig classification and patient satisfaction. UBM and dermoscopic findings showed significant increase in the number of regrowing hair follicles at 4 months in all groups, whereas only UBM showed such significant increase at 2 months in the combination group (iii). A non-significant increase in the hair diameter was also documented in the three groups. CONCLUSION: LLLT is an effective and safe tool with comparable

results to minoxidil 5% in the treatment of FPHL. Owing to the significantly better results of combination therapy, its usage is recommended to hasten hair regrowth. Lasers Surg. Med. 49:835-843, 2017. Â© 2017 Wiley Periodicals, Inc. Vasodilator Agents;Minoxidil Adult;Alopecia;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Microscopy, Acoustic;Middle Aged;Minoxidil;Patient Satisfaction;Treatment Outcome;Vasodilator Agents

Low-level laser and antimicrobial photodynamic therapy on experimental periodontitis in rats submitted to chemotherapy by 5-fluorouracil. PURPOSE: The aim of this study was to evaluate the effects of low-level laser therapy (LLLT) and antimicrobial photodynamic therapy (aPDT) as adjuvant to mechanical treatment of experimental periodontitis (EP) in adult rats submitted to 5-fluorouracil (5-FU) chemotherapy. METHODS: EP was induced through ligature around the left mandibular first molar for 7Â days. The ligature was removed and the animals separated into groups: EP, no treatment; 5FU, systemic administration of 5-FU (80 and 40Â mg/kg); 5FU/scaling and root planing (SRP), systemic application of 5-FU and SRP; 5FU/SRP/LLLT, systemic application of 5-FU, SRP, and LLLT (660Â nm, 0.035Â W; 29.4Â J/cm(2)); and 5FU/SRP/aPDT, systemic application of 5-FU, SRP, and aPDT (methylene blue irrigation and LLLT). The animals were euthanized 7, 15, and 30Â days after treatments. Histological sections from mandibles were processed for histomorphometric and immunohistochemical analysis (TRAP, RANKL, OPG, TNF-Î±, IL-6, IL-10). The alveolar bone loss (BL) area in the furcation region of the mandibular first molar was analyzed histometrically. RESULTS: There was less bone loss in 5FU/SRP/aPDT compared with 5FU at 7Â days (pÂ <Â 0.05). The immunohistochemical analysis showed no significant difference for TRAP and osteoprotegerin, but lower RANKL immunolabeling was observed in the 5FU/SRP/LLLT and 5FU/SRP/aPDT groups compared with the 5FU group at 15Â days. There was lower TNF-Î± and IL-6 immunolabeling in the 5FU/SRP/LLLT and 5FU/SRP/aPDT groups and higher IL-10 immunolabeling in 5FU/SRP/aPDT at 30Â days. CONCLUSION: LLLT and aPDT adjuvant to SRP minimized the effects of 5-FU on periodontal disease. Furthermore, aPDT promoted greater benefits in bone loss control and inflammatory response. Anti-Infective Agents;Fluorouracil Alveolar Bone Loss;Animals;Anti-Infective Agents;Combined Modality Therapy;Fluorouracil;Low-Level Light Therapy;Male;Periodontitis;Photochemotherapy;Rats;Rats, Wistar;Treatment Outcome

New lasers and light sources - old and new risks? Recent developments (new wavelengths, treatment concepts, and combinations) in the field of lasers, intense pulsed light (IPL), LED, as well as new energy and light sources have opened up new therapeutic options that extend beyond mere aesthetic indications. Thus, while fractional lasers used to be employed to merely treat wrinkles, the same devices - in the context of laser-assisted drug delivery -Â have now become important tools in the treatment of scars, field cancerization, and epithelial tumors. The requirements posed to physicians, both with respect to establishing the indication and conducting treatment, have been growing along with the increase in technological complexity as well as the rising number of comorbidities and comedications in a patient population that continues to age. At the same time, home-use devices have been introduced for a variety of indications. These devices are characterized by low power and special safety features aimed at preventing accidents, risks, and side effects. Despite the reduced efficacy of such self-treatment devices, there is an increased risk of misuse, given that the basic prerequisite for adequate treatment cannot be ensured, to wit, the exact diagnosis and therapeutic indication. Consequently, during hair removal or anti-wrinkle treatment, pigmented lesions and cutaneous neoplasms may be altered, thus giving rise to expected, unexpected and new side effects and complications. In the aforementioned setting, it is important that all potential users of these new technologies be properly trained in a manner that ensures those treated a maximum of safety and efficacy in accordance with the guiding principle "diagnosis certa - ullae therapiae fundamentum". Equipment Design;Evidence-Based Medicine;Humans;Laser

Therapy;Lasers;Low-Level Light Therapy;Skin Diseases;Technology Assessment, Biomedical;Treatment Outcome

Evaluating low-level laser therapy effect on reducing orthodontic pain using two laser energy values: a split-mouth randomized placebo-controlled trial. BACKGROUND: No randomized controlled trial before has evaluated the role of low-level laser energy in its analgesic effects in orthodontics. OBJECTIVE: To evaluate the effect of single application of low-level laser with 4-Joule or 16-Joule energy on pain reduction following elastomeric separators placement. TRIAL DESIGN: A two-arm parallel-group single-blind placebo-controlled randomized controlled trial, with implementation of split-mouth technique in each group. MATERIALS AND METHODS: Twenty-six patients in need of orthodontic treatment with a fixed orthodontic appliance were enrolled and randomly allocated to either the 4-Joule or the 16-Joule laser energy group. Elastomeric separators were applied for the mandibular first molars. For each patient one molar received a single low-level laser dose using an 830-nm Ga-Al-As laser device with either 4-Joule or 16-Joule laser beam energy, while the other molar received a placebo treatment by applying the laser device in the same method and parameters as the counterpart molar without emitting the laser beam. The molar to be irradiated was also randomly chosen using simple randomization technique. Allocation was concealed and patients were blinded to which side would receive the laser irradiation. Main outcome measure was the degree of pain scored during mastication for each mandibular first molar after 1, 6, 12, 24, 48, and 72 hours of both laser and placebo treatments application. A questionnaire with an 100-mm Visual Analogue Scale (VAS) was used for pain assessment. RESULTS: Thirty-six patients were evaluated for eligibility, 10 of them were excluded making the final randomized number 26 patients. One patient dropped out later for not completing the questionnaire. Accordingly, the results of 25 patients were statistically analysed. No statistical significance was found for both low-level laser energy values in comparison to the corresponding placebo treatments. No harms were encountered. LIMITATIONS: Intervention provider was not blinded to the intervention. CONCLUSION: Low-level laser therapy, applied at two different laser energy values, is ineffective in relieving elastomeric separators induced orthodontic pain. TRIAL REGISTRATION: This trial was not registered. FUNDING: No funding to be declared. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Mastication;Molar;Orthodontic Appliances, Fixed;Orthodontics, Corrective;Pain;Pain Measurement;Single-Blind Method;Surveys and Questionnaires

Laser treatment of onychomycosis due to Neoscytalidium dimidiatum: An open prospective study. Conventional systemic and topical treatments have proven ineffective for the treatment of onychomycosis caused by Neoscytalidium dimidiatum. Our aim was to evaluate the effectiveness and safety of laser monotherapy for the treatment of onychomycosis caused by this pathogen. Patients with clinical onychomycosis of the toenails and positive results both on direct mycological examination and N. dimidiatum culture underwent four 1064Â nm Nd:YAG laser sessions with 6-week intervals between sessions. Participants were monitored by clinical examination supported by dermoscopy, measurement of diseased nail and the onychomycosis severity index (OSI), and by mycological examination for 12 months after completion of treatment. Treatment outcome was based on clinical and laboratory criteria and was divided in complete or partial cure, clinical improvement, treatment failure and relapse. No patient had complete or partial cure at any time during the study. Clinical improvement was observed in 40.6% of the patients at the end of the laser sessions; however, it did not persist during the follow-up. Treatment failure was observed in 64.7% of the patients at the end of 12 month follow-up period. Direct microscopy and culture results remained positive in most patients. Adverse events, in addition to treatment-related pain, were observed and considered severe in one case. The 1064 nm Nd:YAG laser was not able to cure onychomycosis caused by N. dimidiatum but temporarily improved the clinical appearance of the nail; however,

adverse events may occur. Adult;Aged;Aged, 80 and over;Ascomycota;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Prospective Studies;Recurrence;Treatment Outcome

At-home laser treatment of oral neuronal disorders: Case reports. The neuronal disorders occurring in the oral district are mainly anaesthesia, paraesthesia, hypoesthesia and hyperaesthesia and they may occur frequently after surgical procedures. Medical treatment depends on degree of severity of the nerve injury but, in every case, it must be immediately carried out to reduce immune inflammatory reaction. The aim of this report is to investigate the effectiveness in the recovery of the peripheral nerve lesions of a new laser device recently proposed by the commerce that, due to its reduced size and to be a class I laser according the ANSI classification, may be used at home by the patient himself. Three different cases were treated with this "at-home approach": complete resolution of symptomatology was obtained after laser treatment with a good compliance for the patient and without reporting any side effect. Key words:Laser, biomodulation, low level laser therapy, oral neuronal disorders, at-home treatment, paresthesia.

Indications of Potassium Titanyl Phosphate Laser Therapy for Slow-Flow Vascular Malformations in Oral Region. BACKGROUND: Indications for laser therapy for slow-flow vascular malformations in the oral and maxillofacial regions have not been clearly documented. The authors aimed to estimate the frequency of resolution of slow-flow vascular malformations and to identify risk and prognostic factors associated with resolution in potassium titanyl phosphate (KTP) laser treatment. METHODS: This study was designed as a prospective cohort study. Patients who had diagnosed slow-flow vascular malformations were continuously assigned to receive KTP laser therapy. All patients had intralesional laser photocoagulation performed under local anesthesia. Administered power of the KTP laser was fixed at 2 watts throughout the procedure in all patients. The primary endpoint was to understand the frequency of resolution of slow-flow vascular malformations in KTP laser treatment. Secondary endpoints were: treatment outcomes based on lesion size; treatment outcomes based on location; treatment outcomes based on total energy in joules; types of complications. Treatment outcomes were judged by a clinical assessment as well as reduction in lesion size on magnetic resonance imaging. RESULTS: Data were obtained from 26 patients (9 men, 17 women) with 38 lesions. The average lesion size was 13.5â€ŠÂ±â€Š7.7â€Šmm. Treatment outcomes based on lesion size showed that cure and regression were obtained in lesions less than 30â€Šmm in size. However, lesions larger than 30â€Šmm showed no response. Lesions in the tongue and lips showed higher cure rates than in other areas. Treatment outcomes based on administered total energy in joules showed that 68% of lesions were treated and responded well at less than 400 joules. Complication rate was relatively high in the buccal mucosal lesions. Immediate postoperative complications such as necrosis were more common in high-energy administration than in low-energy administration. CONCLUSION: Our results indicated that KTP laser therapy was effective for slow-flow vascular malformations less than 30â€Šmm in size without significant side effects. Phosphates;potassium titanylphosphate;Titanium Blood Flow Velocity;Female;Follow-Up Studies;Hemodynamics;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Middle Aged;Mouth;Phosphates;Prospective Studies;Surgery, Oral;Titanium;Treatment Outcome;Ultrasonography, Doppler, Color;Vascular Malformations

Beneficial neurocognitive effects of transcranial laser in older adults. Transcranial infrared laser stimulation (TILS) at 1064Â nm, 250Â mW/cm(2) has been proven safe and effective for increasing neurocognitive functions in young adults in controlled studies using photobiomodulation of the right prefrontal cortex. The objective of this pilot study was to determine whether there is any effect from TILS on neurocognitive function in older adults with subjective memory complaint at risk for cognitive decline (e.g., increased carotid artery intima-media thickness or mild traumatic brain injury). We

investigated the cognitive effects of TILS in older adults (ages 49-90, nÂ =Â 12) using prefrontal cortex measures of attention (psychomotor vigilance task (PVT)) and memory (delayed match to sample (DMS)), carotid artery intima-media thickness (measured by ultrasound), and evaluated the potential neural mechanisms mediating the cognitive effects of TILS using exploratory brain studies of electroencephalography (EEG, nÂ =Â 6) and functional magnetic resonance imaging (fMRI, nÂ =Â 6). Cognitive performance, age, and carotid artery intima-media thickness were highly correlated, but all participants improved in all cognitive measures after TILS treatments. Baseline vs. chronic (five weekly sessions, 8Â min each) comparisons of mean cognitive scores all showed improvements, significant for PVT reaction time (pÂ <Â 0.001), PVT lapses (pÂ <Â 0.001), and DMS correct responses (pÂ <Â 0.05). The neural studies also showed for the first time that TILS increases resting-state EEG alpha, beta, and gamma power and promotes more efficient prefrontal blood-oxygen-level-dependent (BOLD)-fMRI response. Importantly, no adverse effects were found. These preliminary findings support the use of TILS for larger randomized clinical trials with this non-invasive approach to augment neurocognitive function in older people to combat aging-related and vascular disease-related cognitive decline. Oxygen Aged;Aged, 80 and over;Aging;Brain;Carotid Intima-Media Thickness;Cognition;Electroencephalography;Female;Humans;Lasers;Magnetic Resonance Imaging;Male;Middle Aged;Oxygen;Pilot Projects;Prefrontal Cortex;Rest;Task Performance and Analysis

Efficacy of Nd:YAG laser therapy for the treatment of verrucae: a literature review. Verrucae are benign epithelial proliferations, characteristically 1-20Â mm in diameter, caused by human papilloma virus (HPV) infection occurring on the skin and mucosa (Photomed Laser Surg 33(6):338-42, 2015; Lasers Med Sci 29(3):1111-6, 2014). Prevalence of verrucae is 5-20% in children and young adults with peak incidence reported during teenage years (Lasers Med Sci 29(3):1111-6, 2014; J Am Acad Dermatol 22(4):547-66, 1990; J Korean Med Sci 24(5):889-93, 2009). Patients often express significant displeasure with quality of life due to this cosmetic insecurity, as well as functional problems and physical discomfort when they occur on palms of hands and soles of feet. Traditional therapeutic options for warts, such as topical salicyclic acid, topical imiquimod, bleomycin injections, cryotherapy, surgical excision, and electrocautery, have proven somewhat effective but often lead to high recurrence rates or scarring (Photomed Laser Surg 33(6):338-42, 2015). Laser therapy offers an alternative solution by employing selective tissue destruction with minimal risks. We performed a broad literature search in PubMed to obtain all available published articles that studied the treatment of verrucae on the skin with 1064-nm neodymium-doped yttrium aluminum garnet laser. This laser is specifically suited for verruca treatment due to its deeply penetrating 1064-nm wavelength and relatively low risk of pigmentation changes in dark skin types (Photomed Laser Surg 33(6):338-42, 2015). Laser therapy is effective in the treatment of verrucae and has enabled clinicians to provide direct, targeted treatment of warts.
Adult;Child;Cryotherapy;Female;Humans;Hyperthermia, Induced;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Quality of Life;Warts;Young Adult

[Low level laser therapy : A narrative literature review on the efficacy in the treatment of rheumatic orthopaedic conditions]. BACKGROUND: In low level laser therapy (LLLT) low wattage lasers are used to irradiate the affected skin areas, joints, nerves, muscles and tendons without any sensation or thermal damage. Although the exact mechanism of its effect is still unknown, it seems beyond dispute that LLLT induces aÂ variety of stimulating processes at the cellular level affecting cell repair mechanisms, the vascular system and lymphatic system. LLLT has been popular among orthopaedic practitioners for many years, whereas university medicine has remained rather sceptical about it. OBJECTIVES: Overview of studies on the efficacy of LLLT in the treatment of rheumatic orthopaedic conditions, i.â€‰e. muscle, tendon lesions and arthropathies. MATERIALS AND METHODS: Narrative

literature review (PubMed, Web of Science). RESULTS: While earlier studies often failed to demonstrate the efficacy of LLLT, several recent studies of increasing quality proved the efficacy of LLLT in the treatment of multiple musculoskeletal pain syndromes like neck or lower back pain, tendinopathies (especially of the Achilles tendon) and epicondylolpathies, chronic inflammatory joint disorders like rheumatoid arthritis or chronic degenerative osteoarthritis of the large and small joints. In addition, there is recent evidence that LLLT can have a preventive capacity and can enhance muscle strength and accelerate muscle regeneration. CONCLUSION: LLLT shows potential as an effective, noninvasive, safe and cost-efficient means to treat and prevent aÂ variety of acute and chronic musculoskeletal conditions. Further randomized controlled studies, however, are required to confirm this positive assessment. Arthritis, Rheumatoid;Fibromyalgia;Humans;Low-Level Light Therapy;Muscle Strength;Muscle, Skeletal;Osteoarthritis;Regeneration;Tendinopathy;Treatment Outcome

Drug "Pent-Up" in Hollow Magnetic Prussian Blue Nanoparticles for NIR-Induced Chemo-Photothermal Tumor Therapy with Trimodal Imaging. The study reports a biocompatible smart drug delivery system based on a doxorubicin (DOX) blending phase-change material of 1-pentadecanol loaded hollow magnetic Prussian blue nanoparticles, resulting in HMNP-PB@Pent@DOX. The system possesses concentration-dependent high thermogenesis (>50 Â°C) when applying a near-infrared (NIR) laser irradiation only for 5 min. Furthermore, the system realizes near "zero release" of drug and is efficiently triggered by NIR for drug delivery in an "on" and "off" manner, thus inducing cell apoptosis in vitro and in vivo. Moreover, the system clearly indicates tumor site with trimodal imaging of magnetic resonance imaging, photoacoustic tomography imaging, and infrared thermal imaging. Furthermore, the system achieves efficient chemo-photothermal combined tumor therapy in vivo with 808 nm laser irradiation for 5 min at 1.2 W cm(-2) , revealing the good tumor inhibition effect comparing with those of chemotherapy or photothermal therapy alone. The system is also confirmed to be biocompatible in regard to the mortality rate. Ferrocyanides;Doxorubicin;ferric ferrocyanide Animals;Doxorubicin;Ferrocyanides;Hep G2 Cells;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Magnetics;Mice;Mice, Inbred ICR;Mice, Nude;Nanoparticles;Neoplasms, Experimental;Xenograft Model Antitumor Assays

Low-level light emitting diode therapy promotes long-term functional recovery after experimental stroke in mice. We aimed to investigate the effects of low-level light emitting diode therapy (LED-T) on the long-term functional outcomes after cerebral ischemia, and the optimal timing of LED-T initiation for achieving suitable functional recovery. Focal cerebral ischemia was induced in mice via photothrombosis. These mice were assigned to a sham-operated (control), ischemic (vehicle), or LED-T group [initiation immediately (acute), 4â€…days (subacute) or 10â€…days (delayed) after ischemia, followed by once-daily treatment for 7â€…days]. Behavioral outcomes were assessed 21 and 28â€…days post-ischemia, and histopathological analysis was performed 28â€…days post-ischemia. The acute and subacute LED-T groups showed a significant improvement in motor function up to 28â€…days post-ischemia, although no brain atrophy recovery was noted. We observed proliferating cells (BrdU(+)) in the ischemic brain, and significant increases in BrdU(+) /GFAP(+) , BrdU(+) /DCX(+) , BrdU(+) /NeuN(+) , and CD31(+) cells in the subacute LED-T group. However, the BrdU(+) /Iba-1(+) cell count was reduced in the subacute LED-T group. Furthermore, the brain-derived neurotrophic factor (BDNF) was significantly upregulated in the subacute LED-T group. We concluded that LED-T administered during the subacute stage had a positive impact on the long-term functional outcome, probably via neuron and astrocyte proliferation, blood vessel reconstruction, and increased BDNF expression. Picture: The rotarod test for motor coordination showed that acute and subacute LED-T improves long-term functional recovery after cerebral ischemia. Brain-Derived Neurotrophic Factor;Dcx protein, mouse;Doublecortin Protein Animals;Astrocytes;Brain Ischemia;Brain-

Derived Neurotrophic Factor;Cell Differentiation;Cell Proliferation;Disease Models, Animal;Doublecortin Protein;Male;Mice;Mice, Inbred C57BL;Microglia;Neurons;Phototherapy;Recovery of Function;Stroke;Time Factors

Photobiomodulation therapy on wound treatment subsequent to Q-switched Nd: YAG laser tattoo removal in rat model. Q-switched Nd: YAG laser is the most effective laser for tattoo removal. Photobiomodulation (PBM) therapy is an alternative method applied to accelerate the wound healing. This paper investigated the effects of PBM therapy using 808â€…nm diode laser on tattooed skin after laser tattoo removal. Forty-five rats were selected and tattooed with black ink on their dorsal, and then distributed into three groups. G0 was received non-laser irradiation. G1 was treated by laser tattoo removal using 1064â€…nm with energy density of 3.4â€…J/cm(2) without PBM therapy, while G2 was treated daily with PBM therapy using 808â€…nm diode laser of 5â€…J/cm(2) after a single session of laser tattoo removal. The effects of tattoo removal and healing progress of the wound were analyzed using histological studies. Findings showed 808â€…nm laser promotes the healing process through enhancing epithelialization and collagen deposition. Moreover, PBM therapy stimulated immune cells to improve phagocytosis process for removing the tattoo ink fragments effectively. The PBM therapy treated group was capable of improving the healing process and increasing the quality of skin following the laser tattoo removal. It was also found that stimulation of cellular function by PBM therapy increased tattoo clearance efficiency. Collagen Animals;Cell Proliferation;Collagen;Lasers, Solid-State;Low-Level Light Therapy;Pain Management;Rats;Skin;Tattooing;Wound Healing

Photobiomodulation leads to enhanced radiosensitivity through induction of apoptosis and autophagy in human cervical cancer cells. The radiomodulatory effect of photobiomodulation (PBM) has recently been studied in cancer cells. The aim of this study was to investigate cellular mechanisms involved in the X-ray radiosensitivity of HeLa cells pre-exposed to PBM. HeLa cells were irradiated with 685â€…nm laser at different energy densities prior to X-ray ionizing radiation. After irradiation, clonogenic cell survival, cell death due to apoptosis and autophagy were determined. Levels of intracellular reactive oxygen species (ROS), DNA damage and, cell cycle distribution after PBM were measured. PBM at different energy densities (5-20â€…J/cm(2)) was not cytotoxic. However, HeLa cells pre-exposed to 20â€…J/cm(2) showed enhanced inhibition of colony formation following ionizing radiation. Enhanced radiosensitivity was due to increased oxidative stress, DNA damage, and radiation-induced apoptosis and autophagy. These results suggest that 685â€…nm PBM at a higher energy density could possibly be a promising radiosensitizing agent in cervical cancer, to decrease the radiation dose delivered, and therefore prevent the side-effects that are associated with cancer radiotherapy. Apoptosis;Autophagy;Cell Cycle Checkpoints;DNA Damage;Female;HeLa Cells;Humans;Light;Oxidative Stress;Radiation Tolerance;Uterine Cervical Neoplasms

Laser acupuncture versus reflexology therapy in elderly with rheumatoid arthritis. The purposes of this study are to determine and compare efficacy of laser acupuncture versus reflexology in elderly with rheumatoid arthritis. Thirty elderly patients with rheumatoid arthritis aged between 60 and 70Â years were classified into two groups, 15 patients each. Group A received laser acupuncture therapy (904Â nm, beam area of 1cm(2), power 100Â mW, power density 100Â mW/cm(2), energy dosage 4Â J, energy density 4Â J/cm(2), irradiation time 40Â s, and frequency 100,000Â Hz). The acupuncture points that were exposed to laser radiation are LR3, ST25, ST36, SI3, SI4, LI4, LI11, SP6, SP9, GB25, GB34, and HT7. While group B received reflexology therapy, both offered 12 sessions over 4Â weeks. The changes in RAQoL, HAQ, IL-6, MDA, ATP, and ROM at wrist and ankle joints were measured at the beginning and end of treatment. There was significant decrease in RAQoL, HAQ, IL-6, and MDA pre/posttreatment for both groups (pÂ <Â 0.05); significant increase in ATP

pre/posttreatment for both groups (pÂ <Â 0.05); significant increase in ankle dorsi-flexion, plantar-flexion, wrist flexion, extension, and ulnar deviation ROM pre/posttreatment in group A (pÂ <Â 0.05); and significant increase in ankle dorsi-flexion and ankle plantar-flexion ROM pre/posttreatment in group B (pÂ <Â 0.05). Comparison between both groups showed a statistical significant decrease in MDA and a statistical significant increase in ATP in group A than group B. Percent of changes in MDA was 41.82%â†“ in group A versus 21.68%â†“ in group B; changes in ATP was 226.97%â†‘ in group A versus 67.02%â†‘ in group B. Moreover, there was a statistical significant increase in ankle dorsi-flexion, ankle plantar-flexion, wrist flexion, wrist extension, and radial deviation in group A than group B. Laser therapy is associated with significant improvement in MDA and ATP greater than reflexology. In addition, it is associated with significant improvement in ankle dorsi-flexion, ankle plantar-flexion, wrist flexion, wrist extension, and radial deviation greater than reflexology in elderly patients with rheumatoid arthritis. Interleukin-6;Malondialdehyde;Adenosine Triphosphate Acupuncture Therapy;Adenosine Triphosphate;Aged;Ankle;Arthritis, Rheumatoid;Female;Humans;Interleukin-6;Low-Level Light Therapy;Male;Malondialdehyde;Massage;Middle Aged;Quality of Life;Range of Motion, Articular;Surveys and Questionnaires;Wrist

Highly specific noninvasive photoacoustic and positron emission tomography of brain plaque with functionalized croconium dye labeled by a radiotracer. Highly-efficient targeting probes are desirable for disease diagnosis and functional imaging. However, most of the current near-infrared (NIR) probes suffer from low signal conversion, insufficient photostability, poor probe specificity, and limited functions. Herein, an NIR ultrahigh absorbing croconium dye for amyloid (CDA) was designed and synthesized to specifically bind to cerebrovascular amyloid without antibody linkage. This unique CDA is able to strongly bind the hydrophobic channels of amyloid beta (AÎ²) fiber with a very strong binding energy of -9.3 kcal mol(-1). Our experimental results demonstrate that the amphipathic dye with an intense absorption peak at 800 nm generated a significant local temperature surge under low-power laser irradiation. Compared with representative prominent indocyanine green, Prussian blue, and gold nanorods, this probe can produce the strongest photoacoustic signal based on the same mass concentration. Labeled with radioactive (18)F, this multifunctional probe allowed for the ultrasensitive photoacoustic tomography (PAT)/positron emission tomography (PET)/fluorescence imaging of AÎ² plaques in the brain cortex. Featured with high spatial resolution and optical specificity, PAT was intrinsically suitable for imaging pathological sites on cortical vessels, whereas PET revealed whole-body anatomy with quantitative biodistribution information. Our study shows that a CDA-based functionalized dye aided with PAT and PET is capable of plaque diagnosis and localization.

Randomized, controlled trial split-faced study of 595-nm pulsed dye laser in the treatment of acne vulgaris and acne erythema in adolescents and early adulthood. The high prevalence of acne vulgaris in teenagers has increased comorbidities. Lasers offer alternative options for acne treatment because they have rapid action, low systemic adverse effects, and do not require everyday treatment. To study the efficacy and patients' satisfaction of 595-nm pulse dye laser (PDL) treatment of acne vulgaris and acne erythema in adolescents and early adulthood, we designed a blocked-randomized, split-faced 595-nm PDL (fluence 8 J/cm(3) pulse duration 10 ms, spot size 7 mm, 2 session every 2 weeks) study in patients with mild to moderate acne by comparing the laser-treated and non-treated side. The acne lesion counts, acne erythema grading, and acne severity grading were evaluated at baseline and 2, 4, and 8 weeks. Thirty patients were recruited. The results showed no statistically significant difference except the papule count at week 4 which was -1.828 on the treated side and 0.103 on the non-treated side of the face, P-value 0.0018. There was no statistically significant difference of acne severity grading and acne erythema grading between both sides of the face. The mean scores of patients' satisfaction on the laser-treated side were 75, 81, and 81%, respectively. The

PDL treatment in this study reveals no significant improvement in acne therapy; however, the patients were satisfied with this laser treatment. Acne Vulgaris;Adolescent;Erythema;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Patient Satisfaction;Severity of Illness Index;Young Adult

Biological effects and medical applications of infrared radiation. Infrared (IR) radiation is electromagnetic radiation with wavelengths between 760nm and 100,000nm. Low-level light therapy (LLLT) or photobiomodulation (PBM) therapy generally employs light at red and near-infrared wavelengths (600-100nm) to modulate biological activity. Many factors, conditions, and parameters influence the therapeutic effects of IR, including fluence, irradiance, treatment timing and repetition, pulsing, and wavelength. Increasing evidence suggests that IR can carry out photostimulation and photobiomodulation effects particularly benefiting neural stimulation, wound healing, and cancer treatment. Nerve cells respond particularly well to IR, which has been proposed for a range of neurostimulation and neuromodulation applications, and recent progress in neural stimulation and regeneration are discussed in this review. The applications of IR therapy have moved on rapidly in recent years. For example, IR therapy has been developed that does not actually require an external power source, such as IR-emitting materials, and garments that can be powered by body heat alone. Another area of interest is the possible involvement of solar IR radiation in photoaging or photorejuvenation as opposites sides of the coin, and whether sunscreens should protect against solar IR? A better understanding of new developments and biological implications of IR could help us to improve therapeutic effectiveness or develop new methods of PBM using IR wavelengths. Adipose Tissue;Cell Proliferation;Humans;Infrared Rays;Low-Level Light Therapy;Neurons;Phototherapy;Regeneration;Skin Aging;Wound Healing

Comparison of Three Final Irrigation Activation Techniques: Effects on Canal Cleanness, Smear Layer Removal, and Dentinal Tubule Penetration of Two Root Canal Sealers. OBJECTIVE: The aim of this study was to compare three final irrigation activation techniques with respect to their effects on debridement efficacy, smear layer removal, and dentinal tubule penetration of two different root canal sealers. BACKGROUND DATA: Different applications to improve the delivery of irrigating solutions within the root canal system are currently being investigated, as not all of the mechanisms and effects of these techniques have been clearly identified. MATERIALS AND METHODS: One hundred forty-two single-rooted teeth were randomly divided into a control group and three experimental groups based on the irrigant activation technique used: EndoVac (EV) system, photon-induced photoacoustic streaming (PIPS), and conventional syringe irrigation (CSI). Thirteen specimens from each experimental group were evaluated for debris and smear layer removal using scanning electron microscopy. The remaining 30 specimens per group were divided into two subgroups according to the root canal sealer used: AH Plus and TotalFill BC. The maximum depth and total percentage of sealer penetration were measured using confocal laser scanning microscopy. RESULTS: PIPS resulted in significantly less debris in the middle third of the root canal compared with CSI (pâ€‰<â€‰0.01). There were no significant differences among CSI, EV, and PIPS concerning debris removal at coronal and apical levels or smear layer removal at all levels (pâ€‰>â€‰0.05). TotalFill BC use after final irrigation with EV and CSI at 2â€‰mm or PIPS at 5â€‰mm exhibited a significantly higher percentage of sealer penetration than that with AH Plus (pâ€‰<â€‰0.05). When AH Plus was used, PIPS allowed deeper sealer penetration than CSI at 2â€‰mm (pâ€‰<â€‰0.05). CONCLUSIONS: The effects of EV, PIPS, and CSI on debridement efficacy, smear layer removal, and dentinal tubule penetration were almost comparable. TotalFill BC showed superior tubular penetration than AH Plus. Root Canal Filling Materials;Root Canal Irrigants Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Filling Materials;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Therapeutic Irrigation

Evaluation of the Effects of Photobiomodulation on Biomechanical Properties and Hounsfield Unit of Partial Osteotomy Healing in an Experimental Rat Model of Type I Diabetes and Osteoporosis. BACKGROUND: Pulsed wave (PW) lasers exhibit biostimulatory effects on fractures in healthy and diabetic animals. OBJECTIVE: This study aims to assess the effects of photobiomodulation on bone strength and Hounsfield unit (HU) for repair of a bone defect in an experimental rat model of type I diabetes mellitus (TIDM) and osteoporosis (OP). METHODS: We divided 30 female rats into six groups of nâ€‰=â€‰5 per group: (1) ovariectomy (OVX) control, (2) OVXâ€‰+â€‰PW laser and no TIDM, (3) OVX controlâ€‰+â€‰TIDM, (4) OVXâ€‰+â€‰TIDMâ€‰+â€‰PW laser, (5) OVXâ€‰+â€‰TIDMâ€‰+â€‰alendronate, and (6) OVXâ€‰+â€‰TIDMâ€‰+â€‰PW laserâ€‰+â€‰alendronate. TIDM was induced in rats by streptozotocin (STZ). A partial osteotomy was made in the right tibia of each rat. We used an infrared laser (890â€‰nm, 80â€‰Hz, 1.5â€‰J/cm(2)) 3 times per week. At 30 days after surgery, the callus areas within the rats' tibias were submitted to computed tomography scanning followed by the three-point bending test. RESULTS: The PW laserâ€‰+â€‰alendronate group had significantly increased HU and biomechanical properties of repairing bone defect in STZâ€‰+â€‰OVX rats compared with the control groups. CONCLUSIONS: Combined treatment of PW laser and alendronate significantly enhanced bone repair in an experimental model rat of TIDM and OP. Blood Glucose;Alendronate Alendronate;Animals;Biomechanical Phenomena;Blood Glucose;Diabetes Mellitus, Type 1;Disease Models, Animal;Female;Low-Level Light Therapy;Osteoporosis;Osteotomy;Ovariectomy;Random Allocation;Rats;Rats, Wistar;Reference Values;Stress, Mechanical;Tibia;Wound Healing

Analysis of Human Tooth Pulp Chamber Temperature After 670â€‰nm Laser Irradiation: In Vitro Study. OBJECTIVE: One of the limiting factors of employing laser radiation on dental therapies is the potential of causing thermal injuries to pulp tissues. The purpose of this study was to evaluate intra-chamber temperature increase on extracted human teeth exposed to 670â€‰nm wavelength InGaAlP laser diode radiation. MATERIALS AND METHODS: In vitro intra-chamber temperature measurements of 12 standardized human teeth (incisors, canines, premolars, and molars; nâ€‰=â€‰3) were taken both before and after laser radiation. A type-K thermocouple fast-response thermocouple wire with a 0.5â€‰mm diameter probe was inserted into the tooth pulp chamber (ICEL-Manaus-brand). The laser device Lasotronic-brand InGaAlP laser diode was used to irradiate tooth enamel, perpendicularly to the external surface for 30â€‰sec, with power of levels of 340, 272, 204, 136, and 68â€‰mW. The measurements were taken at three time points: 0, 30â€‰sec, and 3â€‰min after the laser irradiation. Measurements were repeated 24â€‰h after removal and reinsertion of the probe in the pulp chamber. The temperature gradient (Î”T in Â°C) was calculated (Î”Tâ€‰=â€‰final temperature-initial temperature) for each group. Data of Î”T were statistically analyzed by two-way analysis of variance (ANOVA) at the 95% confidence level and compared by Tukey post hoc test (Î±â€‰=â€‰0.05). RESULTS: ANOVA showed statistically significant differences to the interaction of factors (pâ€‰<â€‰0.05). The highest Î”T values obtained were observed to incisors with 340â€‰mW, 272â€‰mW; 204â€‰mW of power (respectively 4.7Â°C, 4.2Â°C, and 3.1Â°C); and canines presented the lowest Î”T (0.8Â°C-0.3Â°C) with no influence of power output. CONCLUSIONS: Since the thermal increase was observed in this study, especially in incisors, attention should be paid to avoid pulpal damage. Analysis of Variance;Bicuspid;Dental Pulp Cavity;Humans;In Vitro Techniques;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Temperature

Penetration Time Profiles for Two Class 3B Lasers in In Situ Human Achilles at Rest and Stretched. BACKGROUND AND OBJECTIVE: The majority of studies investigating penetration of laser light are performed in vitro on skin flaps, with measures of immediate penetration depth and energy loss. The aim of this study was to investigate the penetration time profiles for two different lasers used in low-

level laser therapy, during 150â€‰sec of exposure both in stretched and relaxed human Achilles in situ. MATERIALS AND METHODS: Thirty-four Achilles tendons from 17 healthy volunteers were irradiated by an 810â€‰nm, 200â€‰mW, continuous- and a 904â€‰nm, 60â€‰mW, super-pulsed laser. Irradiation was performed with the Achilles tendons in relaxed and stretched condition. The energy penetrating skin-skin was measured every 30â€‰sec using an optical power meter. RESULTS: The 810â€‰nm laser penetration ability did not differ significantly in relaxed and stretched condition with 0.17% [standard error of the mean (SEM) 0.02] of mean output power (MOP) and 0.02% (SEM 0.004) of MOP, respectively. The 904â€‰nm laser demonstrated a statistical significant (pâ€‰<â€‰0.05) and almost linear increasing penetration ability both in relaxed and stretched Achilles from 0.25% (SEM 0.03) to 0.38% (SEM 0.04) of MOP and from 0.05% (SEM 0.01) to 0.13% (SEM 0.01) of MOP, respectively. The penetrated ability differed between lasers and tissue conditions at all measure points (pâ€‰<â€‰0.05). CONCLUSIONS: The 904â€‰nm laser penetrates relatively more energy than the 810â€‰nm laser in in situ human Achilles. Moreover, penetration from the super-pulsed 904â€‰nm laser increased during exposure time, whereas penetration from the 810â€‰nm laser was constant. In addition, stretching the Achilles causes a higher energy attenuation by the tissue. Achilles Tendon;Healthy Volunteers;Humans;Lasers;Low-Level Light Therapy;Male;Muscle Stretching Exercises;Reference Values;Rest;Sampling Studies;Time Factors

Photobiomodulation therapy associated with treadmill training in the oxidative stress in a collagen-induced arthritis model. Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by chronic and systemic inflammation, which leads to the destruction of the cartilage and bone and affects tissues in multiple joints. Oxidative stress has been implicated with regards to involvement in various disease conditions, such as diabetes mellitus and neurodegenerative, respiratory, cardiovascular, and RA diseases. In vivo experimental studies using photobiomodulation therapy (PBMT) have shown positive effects in reducing lipid peroxidation and in increasing antioxidant activity. The regular practice of physical exercise has also been reported to be a beneficial treatment capable of reducing oxidative damage. Thus, the aim of this study was to analyze the effects of photobiomodulation therapy at 2- and 4-J doses associated with physical exercise on oxidative stress in an experimental model of RA in protein expression involving superoxide dismutase (SOD), glutathione peroxidase (GPX), and/or catalase (CAT) on thiobarbituric acid reactive substances (TBARS). In this study, 24 male Wistar rats divided into four groups were submitted to an RA model (i.e., collagen-induced arthritis, CIA), with the first immunization performed at the base of the tail on days 0 and 7 were included. After 28Â days, a third intraarticular dose was administered in both knees of the animals. After the last induction, PBMT was started immediately, transcutaneously at two points (i.e., the medial and lateral), with a total of 15 applications. Treadmill exercise was also started the day after the last induction, and lasted for 5Â weeks. With respect to results, we obtained the decreases in the lipid peroxidation and the increases of the antioxidant activities of SOD, GPX and CAT, with physical exercise associated to PBMT in doses of 2 and 4Â J. In conclusion, physical exercise associated with PBMT decreases lipid peroxidation and increases antioxidant activity. Antioxidants;Thiobarbituric Acid Reactive Substances;Malondialdehyde;Catalase;Glutathione Peroxidase;Superoxide Dismutase Animals;Antioxidants;Arthritis, Experimental;Catalase;Disease Models, Animal;Glutathione Peroxidase;Lipid Peroxidation;Low-Level Light Therapy;Male;Malondialdehyde;Oxidative Stress;Physical Conditioning, Animal;Rats, Wistar;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances

The role of low level laser therapy on neuropathic pain relief and interleukin-6 expression following spinal cord injury: An experimental study. INTRODUCTION: The effect of Low Level Laser Therapy (LLLT) as a non-invasive treatment of spinal cord injury (SCI) is still under investigation. Therefore, the present study aimed to evaluate the effectiveness of LLLT on neuropathic pain and interleukin-6 (IL-6)

expression following SCI in male rats. METHODS: 46 adult male rats were divided into 5 groups of control, SCI, treatment with methylprednisolone sodium succinate (MPSS), 1-week LLLT and 2-week LLLT. Animals underwent behavioral evaluations for motor behavior, level of allodynia and hyperalgesia every week. At the end, spinal cord was extracted and IL-6 level was assessed by ELISA method. RESULTS: Treatment with MPSS and 2-week LLLT had led to motor function recovery (df: 24, 145; F=223.5; p <0.001). SCI did not affect mechanical (df: 24, 145; F=0.5; p=0.09), and cold allodynia (df: 24, 145; F=0.3; p=0.17) but significantly increased mechanical (df: 24, 145; F=21.4; p<0.001) and heat hyperalgesia (df: 24, 145; F=16.1; p<0.001). Treatment with MPSS and 1 and 2-weeks LLLT improved mechanical hyperalgesia (p<0.05) and heat hyperalgesia (p<0.01). The increased level of IL-6 following SCI was also compensated by administration of MPSS or LLLT (df: 4, 10; F=8.74; p=0.003). CONCLUSION: Findings show that long periods of LLLT have better effects in improving the complication of SCI. In summation, since LLLT does not cause the side effects of MPSS, long-term use of LLLT may be a proper alternative for MPSS in decreasing post SCI side effects. Il6 protein, rat;Interleukin-6;Neuroprotective Agents;Methylprednisolone Hemisuccinate Animals;Disease Models, Animal;Interleukin-6;Low-Level Light Therapy;Male;Methylprednisolone Hemisuccinate;Neuralgia;Neuroprotective Agents;Rats;Rats, Wistar;Recovery of Function;Spinal Cord Injuries

Effect of Laser Energy and Tip Insertion Depth on the Pressure Generated Outside the Apical Foramen During Er:YAG Laser-Activated Root Canal Irrigation. OBJECTIVE: The risk of extrusion of irritative irrigants into the extraradicular tissue should be minimized during root canal irrigation. This study aimed to examine the pressure generated outside the apex during Er:YAG laser-activated irrigation (LAI) in comparison with passive ultrasonic irrigation (PUI) and conventional syringe irrigation (SI). BACKGROUND DATA: LAI is reported to be efficient for root canal debridement, whereas the apical pressure generated during LAI has not been investigated in detail. METHODS: Plastic root canal models (apical diameterâ€‰=â€‰0.40â€‰mm, taperâ€‰=â€‰6%, and lengthâ€‰=â€‰20â€‰mm) were irrigated with water using either LAI with an Er:YAG laser (Erwin AdvEr; 30, 50, or 70â€‰mJ, 10â€‰pps), PUI, or SI. The tip insertion depth was set at 2, 5, or 10â€‰mm from the apex. The pressure generated outside the apical foramen was measured with a pressure sensor connected to the apex of the model. RESULTS: When the tip was positioned at 2â€‰mm and the power setting was changed, the mean maximum pressure values were LAI (30â€‰mJ)â€‰=â€‰PUI < LAI (70â€‰mJ) < SI (pâ€‰<â€‰0.05). When LAI was performed at 70â€‰mJ and the tip was positioned at 5 or 10â€‰mm, the pressure values were PUI < LAIâ€‰=â€‰SI (pâ€‰<â€‰0.05). CONCLUSIONS: LAI generated similar or lower pressure outside the apical foramen compared with SI, irrespective of the laser energy and tip insertion depth examined. However, LAI generated higher pressure compared with PUI. Root Canal Irrigants Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Root Canal Irrigants;Root Canal Preparation;Therapeutic Irrigation;Tooth Apex

Medium-sized nevus spilus of the neck treated with pulsed dye laser. Patients with large benign melanocytic lesions located on the neck represent a therapeutic challenge since the neck is a high-risk area for hypertrophic scarring and/or retraction. When treating a benign, extensive and visible melanocytic lesion, the choice of therapy mainly depends on the likelihood of improved cosmesis. We report a case of a 33-year-old woman with a medium-sized Nevus Spilus located on the neck, successfully treated with four sessions of pulsed dye laser. We achieved an excellent clinical and cosmetic result in such a challenging area. No scarring, distortion or significant dyscromia were observed after 24 months. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Neck;Nevus, Pigmented;Skin Neoplasms

Improvement of Performance and Reduction of Fatigue With Low-Level Laser Therapy in Competitive Cyclists. Evidence indicates that low-level laser therapy (LLLT) minimizes fatigue effects on muscle performance. However, the ideal LLLT dosage to improve athletes'performance during sports activities such as cycling is still unclear. Therefore, the goal of this study was to investigate the effects of different LLLT dosages on cyclists'performance in time-to-exhaustion tests. In addition, the effects of LLLT on the frequency content of the EMG signals to assess fatigue mechanisms were examined. Twenty male competitive cyclists participated in a crossover, randomized, double-blind, placebo-controlled trial. They performed an incremental cycling test to exhaustion (on day 1) followed by 4 time-to-exhaustion tests (on days 2-5) at their individual maximal power output. Before each time-to-exhaustion test, different dosages of LLLT (135, 270, and 405â€‰J/thigh, respectively) or placebo were applied at the quadriceps muscle bilaterally. Power output and muscle activation from both lower limbs were recorded throughout the tests. Increased performance in time-to-exhaustion tests was observed with the LLLT-135 J (âˆ¼22Â s; Pâ€‰<â€‰.01), LLLT-270 J (âˆ¼13Â s; Pâ€‰=â€‰.03), and LLLT-405 J (âˆ¼13Â s; Pâ€‰=â€‰.02) compared to placebo (149â€‰Â±â€‰23Â s). Although LLLT-270 J and LLLT-405 J did not show significant differences in muscle activation compared with placebo, LLLT-135 J led to an increased high-frequency content compared with placebo in both limbs at the end of the exhaustion test (Pâ€‰â‰¤â€‰.03). In conclusion, LLLT increased time to exhaustion in competitive cyclists, suggesting this intervention as a possible nonpharmacological ergogenic agent in cycling. Among the different dosages, LLLT-135 J seems to promote the best effects. Adult;Bicycling;Cross-Over Studies;Double-Blind Method;Exercise Test;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Physical Endurance;Quadriceps Muscle

A new path in defining light parameters for hair growth: Discovery and modulation of photoreceptors in human hair follicle. BACKGROUND AND OBJECTIVE: Though devices for hair growth based on low levels of light have shown encouraging results, further improvements of their efficacy is impeded by a lack of knowledge on the exact molecular targets that mediate physiological response in skin and hair follicle. The aim of this study was to investigate the expression of selected light-sensitive receptors in the human hair follicle and to study the impact of UV-free blue light on hair growth ex vivo. MATERIAL AND METHODS: The expression of Opsin receptors in human skin and hair follicles has been characterized using RT-qPCR and immunofluorescence approaches. The functional significance of Opsin 3 was assessed by silencing its expression in the hair follicle cells followed by a transcriptomic profiling. Proprietary LED-based devices emitting two discrete visible wavelengths were used to access the effects of selected optical parameters on hair growth ex vivo and outer root sheath cells in vitro. RESULTS: The expression of OPN2 (Rhodopsin) and OPN3 (Panopsin, Encephalopsin) was detected in the distinct compartments of skin and anagen hair follicle. Treatment with 3.2â€‰J/cm(2) of blue light with 453â€‰nm central wavelength significantly prolonged anagen phase in hair follicles ex vivo that was correlated with sustained proliferation in the light-treated samples. In contrast, hair follicle treatment with 3.2â€‰J/cm(2) of 689â€‰nm light (red light) did not significantly affect hair growth ex vivo. Silencing of OPN3 in the hair follicle outer root sheath cells resulted in the altered expression of genes involved in the control of proliferation and apoptosis, and abrogated stimulatory effects of blue light (3.2â€‰J/cm(2) ; 453â€‰nm) on proliferation in the outer root sheath cells. CONCLUSIONS: We provide the first evidence that (i) OPN2 and OPN3 are expressed in human hair follicle, and (ii) A 453â€‰nm blue light at low radiant exposure exerts a positive effect on hair growth ex vivo, potentially via interaction with OPN3. Lasers Surg. Med. 49:705-718, 2017. Â© 2017 Wiley Periodicals, Inc. Biomarkers;OPN3 protein, human;Rod Opsins;Rhodopsin Adult;Aged;Alopecia;Apoptosis;Biomarkers;Cell Proliferation;Female;Hair;Hair Follicle;Humans;In Vitro Techniques;Light;Low-Level Light Therapy;Male;Middle Aged;Rhodopsin;Rod Opsins

Light-Emitting Diode treatment ameliorates allergic lung inflammation in experimental model of asthma induced by ovalbumin. Since asthma is a multifactorial disease where treatment sometimes is not effective, new therapies that improve the respiratory discomfort of patients are of great importance. Phototherapy as Light-emitting diode (LED) has emerged as a treatment that presents good results for diseases that are characterized by inflammation. Thus, our objective was to investigate the effects of LED on lung inflammation, by an evaluation of lung cell infiltration, mucus secretion, oedema, and the production of cytokines. Male Balb/c mice were or not sensitized and challenged with ovalbumin (OVA) and treated or not with LED therapy (1â€…h and 4â€…h after each OVA challenge). Twenty-four hours after the last OVA challenge, analyzes were performed. Our results showed that LED treatment in asthmatic mice reduced the lung cell infiltration, the mucus production, the oedema, and the tracheal's contractile response. It also increased the IL-10 and the IFN-gamma levels. The effects of LED treatment on lung inflammation may be modulated by IL-10, IFN-gamma, and by mast cells. This study may provide important information about the effects of LED, and in addition, it may open the possibility of a new approach for the treatment of asthma. Cytokines;Ovalbumin Animals;Asthma;Bronchoalveolar Lavage Fluid;Cell Count;Cytokines;Disease Models, Animal;Granulocytes;Lymphocytes;Macrophages;Male;Mast Cells;Mice;Mice, Inbred BALB C;Muscle Contraction;Ovalbumin;Phototherapy;Pneumonia;Trachea

[Effect of low-level laser irradiation on proliferation and osteogenic differentiation of human adipose-derived stromal cells]. OBJECTIVE: To examine the in vitro effects of low-level laser irradiation (LLLI) on proliferation and differentiation of human adipose-derived stromal cells (hASCs). METHODS: Cultured cells were exposed to different doses of LLLI with a semiconductor diode laser (980 nm; 100 mW-12 W power output). The effects of laser on proliferation were assessed daily up to seven days of culture in cells irradiated for four consecutive days with laser doses of 2, 4, 6 or 8 J/cm(2), the cells without irradiation were used as controls. Half of the cells were changed to osteogenic medium (OM) when they had grown to 70% confluence. The hASCs both with and without osteogenic supplements were divided into three groups, and each group was irradiated at doses of 0, 2 and 4 J/cm(2). In order to examine the in vitro effects of LLLI on osteogenic differentiation of hASCs, the alkaline phosphatase activity was assessed on day 7, and alizarin red staining (AR-S) and quantitative detection were assessed on days 14 and 21. The expression of osteoblast master genes (ALP and Runx2) were tested on days 7 and 14. RESULTS: The proliferation medium(PM)+LLLI4 J/cm(2) group had the highest multiplication rate. In the groups with osteogenic supplements, LLLI increased alkaline phosphatase activity and mineralized nodule formation, and stimulated the expression of ALP and Runx2. Furthermore, the effect became more obvious at high dose. CONCLUSION: Our data demonstrated that hASCs proliferation and osteogenic differentiation were enhanced by LLLI. With the increase of laser dose, the effect of LLLI would be enhanced at first, and then be decreased after reaching a peak. Alkaline Phosphatase Adipocytes;Alkaline Phosphatase;Calcification, Physiologic;Cell Differentiation;Cell Line;Cell Proliferation;Cells, Cultured;Humans;Lasers, Semiconductor;Mesenchymal Stem Cells;Osteoblasts;Osteogenesis

Hypotensive acute effect of photobiomodulation therapy on hypertensive rats. The purpose of this study was to evaluate the acute effect of photobiomodulation therapy (PBM) on arterial pressure in hypertensive and normotensive rats with application in an abdominal region. Normotensive (2K) and hypertensive (2K-1C) wistar rats were treated with PBM. Systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP) and heart rate (HR) were measured before, during and after PBM application. The nitric oxide (NO) serum concentration was measured before and after PBM application. Vascular reactivity study was performed in isolated thoracic aortas. Aluminum gallium arsenide (GaAlAs) diode laser was used, at 660nm wavelength and 100mW optical output. The PBM application induced a decrease of SAP in 2K-1C rats. In 2K rats, the PBM application

had no effect on SAP, DAP and MAP. Moreover, the magnitude of hypotensive effect was higher in 2K-1C than in 2K rats. The PBM application induced a decrease of HR in 2K-1C and 2K, with higher effect in 2K-1C rats. In 2K-1C, the hypotensive effect induced by PBM was longer than that obtained in 2K rats. PBM application induced an elevation of NO concentration in serum from 2K-1C and 2K rats, with higher effect in 2K-1C. In isolated aortic rings PBM effect is dependent of NO release, and is not dependent of nitric oxide synthase (NOS) activation. Our results indicate that the abdominal acute application of PBM at 660nm is able to induce a long lasting hypotensive effect in hypertensive rats and vasodilation by a NO dependent mechanism. Nitric Oxide;Nitric Oxide Synthase Animals;Aorta, Thoracic;Arterial Pressure;Disease Models, Animal;Heart Rate;Hypertension;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nitric Oxide;Nitric Oxide Synthase;Rats;Rats, Wistar;Time Factors;Vasodilation

Successful Treatment of a Residual, Thick, Infantile Hemangioma in a Darker Phototype Pediatric Patient Using the 755-nm Long-Pulsed Alexandrite Laser. Cardiovascular Agents;Propranolol Cardiovascular Agents;Child, Preschool;Female;Hemangioma, Capillary;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Propranolol

Laser-Assisted Photodynamic Therapy: Two Novel Protocols for Enhanced Treatment Results. Photodynamic therapy (PDT) uses a topical photosensitizing agent which is activated by a light source to cause destruction of specific cells. Commonly used for the treatment of actinic keratoses and photodamage, PDT can also be used for other conditions including acne and sebaceous hyperplasia. Here we report our experience with two treatment protocols. The first protocol utilizes laser assisted delivery of topical 5-aminolevulinic acid for enhanced efficacy of blue light photodynamic therapy in the treatment of actinic keratoses and photodamage. The second protocol utilizes red light photodynamic therapy followed by pulsed dye laser to effectively target sebaceous glands in patients with extensive sebaceous hyperplasia. J Drugs Dermatol. 2017;16(4):329-331. . Photosensitizing Agents;Aminolevulinic Acid Administration, Cutaneous;Aged;Aminolevulinic Acid;Clinical Protocols;Dermatitis, Phototoxic;Female;Humans;Keratosis, Actinic;Lasers, Dye;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Sebaceous Glands;Treatment Outcome

The effectiveness of treatments for androgenetic alopecia: A systematic review and meta-analysis. BACKGROUND: Androgenetic alopecia, or male pattern hair loss, is a hair loss disorder mediated by dihydrotestosterone, the potent form of testosterone. Currently, minoxidil and finasteride are Food and Drug Administration (FDA)-approved, and HairMax LaserComb, which is FDA-cleared, are the only treatments recognized by the FDA as treatments of androgenetic alopecia. OBJECTIVE: This systematic review and meta-analysis assesses the efficacy of nonsurgical treatments of androgenetic alopecia in comparison to placebo for improving hair density, thickness, growth (defined by an increased anagen:telogen ratio), or subjective global assessments done by patients and investigators. METHODS: A systematic review of randomized controlled trials was conducted. PubMed, Embase, and Cochrane were searched up to December 2016, with no lower limit on the year. We included only randomized controlled trials of good or fair quality based on the US Preventive Services Task Force quality assessment process. RESULTS: A meta-analysis was conducted separately for 5 groups of studies that tested the following hair loss treatments: low-level laser light therapy in men, 5% minoxidil in men, 2% minoxidil in men, 1Â mg finasteride in men, and 2% minoxidil in women. All treatments were superior to placebo (PÂ <Â .00001) in the 5 meta-analyses. Other treatments were not included because the appropriate data were lacking. LIMITATIONS: High heterogeneity in most studies. CONCLUSIONS: This meta-analysis strongly suggests that minoxidil, finasteride, and low-level laser light therapy are effective for promoting hair growth in men with androgenetic alopecia and

that minoxidil is effective in women with androgenetic alopecia. Finasteride;Minoxidil Alopecia;Finasteride;Humans;Low-Level Light Therapy;Minoxidil;Randomized Controlled Trials as Topic;Treatment Outcome
Efficacy of Manual Therapy Including Neurodynamic Techniques for the Treatment of Carpal Tunnel Syndrome: A Randomized Controlled Trial. OBJECTIVE: The purpose of this randomized trial was to compare the efficacy of manual therapy, including the use of neurodynamic techniques, with electrophysical modalities on patients with mild and moderate carpal tunnel syndrome (CTS). METHODS: The study included 140 CTS patients who were randomly assigned to the manual therapy (MT) group, which included the use of neurodynamic techniques, functional massage, and carpal bone mobilizations techniques, or to the electrophysical modalities (EM) group, which included laser and ultrasound therapy. Nerve conduction, pain severity, symptom severity, and functional status measured by the Boston Carpal Tunnel Questionnaire were assessed before and after treatment. Therapy was conducted twice weekly and both groups received 20 therapy sessions. RESULTS: A baseline assessment revealed group differences in sensory conduction of the median nerve ($P < .01$) but not in motor conduction ($P = .82$). Four weeks after the last treatment procedure, nerve conduction was examined again. In the MT group, median nerve sensory conduction velocity increased by 34% and motor conduction velocity by 6% (in both cases, $P < .01$). There was no change in median nerve sensory and motor conduction velocities in the EM. Distal motor latency was decreased ($P < .01$) in both groups. A baseline assessment revealed no group differences in pain severity, symptom severity, or functional status. Immediately after therapy, analysis of variance revealed group differences in pain severity ($P < .01$), with a reduction in pain in both groups (MT: 290%, $P < .01$; EM: 47%, $P < .01$). There were group differences in symptom severity ($P < .01$) and function ($P < .01$) on the Boston Carpal Tunnel Questionnaire. Both groups had an improvement in functional status (MT: 47%, $P < .01$; EM: 9%, $P < .01$) and a reduction in subjective CTS symptoms (MT: 67%, $P < .01$; EM: 15%, $P < .01$). CONCLUSION: Both therapies had a positive effect on nerve conduction, pain reduction, functional status, and subjective symptoms in individuals with CTS. However, the results regarding pain reduction, subjective symptoms, and functional status were better in the MT group. Adult;Carpal Tunnel Syndrome;Electromyography;Female;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Musculoskeletal Manipulations;Neural Conduction;Pain Measurement;Patient Satisfaction;Physical Therapy Modalities;Prognosis;Risk Assessment;Severity of Illness Index;Single-Blind Method;Treatment Outcome;Ultrasonic Therapy
[Prevention of thrombohemorrhagic postoperative complications in patients with benign prostatic hyperplasia]. AIM: To improve the results of surgical treatment of benign prostatic hyperplasia. MATERIALS AND METHODS: The study investigated the effectiveness of a comprehensive preoperative preparation of patients with benign prostatic hyperplasia. The clinical efficacy of traditional methods of preoperative preparation (compression bandaging of the lower extremities during surgery and in the postoperative period and Fraxiparine at a prophylactic dose) was compared with the same preoperative protocol used in combination with intravenous laser blood irradiation. The explored parameters included changes in clinical and laboratory coagulation indices and prostatic blood flow measured by Doppler sonography. The real time visualization was used to assess the effect of intravenous laser irradiation of blood on the morphofunctional state of platelets. CONCLUSION: The study findings showed a high effectiveness of intravenous laser blood irradiation in preoperative preparation of patients with benign prostatic hyperplasia. It was found to reduce the incidence of thrombotic events by 6% and hemorrhagic complications by 4.9% ($p<0.05$). Fibrinolytic Agents;Nadroparin Fibrinolytic Agents;Hemorrhage;Humans;Low-Level Light

Therapy;Male;Nadroparin;Postoperative Complications;Preoperative Care;Prostatectomy;Prostatic Hyperplasia;Thrombosis

Effect of Laser-Activated Irrigations on Smear Layer Removal from the Root Canal Wall. OBJECTIVE: The purpose of this study was to evaluate the effect of laser-activated irrigations (LAI) by using the Erbium: Yttrium Aluminum Garnet (Er:YAG) laser and the Erbium Chromium: Yttrium Scandium Gallium Garnet (Er,Cr:YSGG) laser on removing smear layer (SL) from the root canal wall. BACKGROUND DATA: LAI has been proposed as an adjuvant to conventional protocols of endodontic treatment to enhance the disinfection, which is a promising protocol for SL removal. MATERIALS AND METHODS: SL was generated by preparing the root canals of extracted human teeth to a #35/.04 M3 instrument. The SL then received treatments of one of the following: (A) NaOCl, 5.25% sodium hypochlorite (NaOCl) for 60â€‰sec; (B) EDTA, 17% ethylenediamine tetraacetic acid (EDTA) for 60â€‰sec; (C) NaOCl+EDTA, NaOCl, and EDTA for 30â€‰sec each; (D) LAI+NaOCl, LAI with NaOCl for 60â€‰sec; (E) LAI+EDTA, LAI with EDTA for 60â€‰sec; and (F) LAI+NaOCl+EDTA, LAI with NaOCl, and EDTA for 30â€‰sec each. Efficacies of SL removal were evaluated by using a five-grade scoring system under scanning electron microscopy. RESULTS: The laser activations significantly enhanced the effect of the NaOCl, EDTA, and NaOCl+EDTA irrigations in removing SL. The efficacies of SL removal were presented in a descending order of LAI+NaOCl+EDTA, LAI+EDTA>LAI+NaOCl, NaOCl+EDTA>EDTA>NaOCl. CONCLUSIONS: Among the treatments, the LAI+NaOCl+EDTA was the most effective protocol in removing SL from the entire root canal wall, which may be effective for root canal treatment. Root Canal Irrigants;Edetic Acid;Sodium Hypochlorite Edetic Acid;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Therapeutic Irrigation

The effect of low-level laser therapy as an adjunct to non-surgical periodontal treatment on gingival crevicular fluid levels of transforming growth factor-beta 1, tissue plasminogen activator and plasminogen activator inhibitor 1 in smoking and non-smoking chronic periodontitis patients: AÂ split-mouth, randomized control study. BACKGROUND AND OBJECTIVE: This study aimed to investigate the effects of low-level laser therapy (LLLT) as an adjunct to scaling and root planing (SRP) on smoking and non-smoking patients with chronic periodontitis. MATERIAL AND METHODS: The study was conducted using a split-mouth design with 30 patients with chronic periodontitis (15 smokers, 15 non-smokers) and 30 healthy individuals matched for age, sex and smoking status as controls. Groups were constituted as follows: Cp+SRP+Sham: non-smokers with chronic periodontitis treated with SRP; Cp+SRP+LLLT: non-smokers with chronic periodontitis treated with SRP+LLLT; SCp+SRP+Sham: smokers with chronic periodontitis treated with SRP; SCp+SRP+LLLT: smokers with chronic periodontitis treated with SRP+LLLT; C: control group comprised of periodontally healthy non-smokers; SC: control group comprised of periodontally healthy smokers. LLLT was first applied on the same day as SRP and again on days 2 and 7 after SRP treatment. Clinical parameters were recorded before non-surgical periodontal treatment (baseline) and on day 30. Gingival crevicular fluid samples were collected before periodontal treatment (baseline) and during follow-up visits on days 7, 14 and 30. Gingival crevicular fluid transforming growth factor (TGF)-Î²1, tissue plasminogen activator (tPA) and plasminogen activator inhibitor 1 (PAI-1) levels were measured using enzyme-linked immunosorbent assay. RESULTS: All clinical parameters showed significant reductions between baseline and day 30 following SRP treatment in both the LLLT and sham groups (P<.001). No significant differences were observed between the LLLT and sham groups of either the smokers or non-smokers (P>.05). Gingival crevicular fluid PAI-1 levels decreased significantly in the SCp+SRP+sham and SCp+SRP+LLLT groups (P<.05), and gingival crevicular fluid tPA levels decreased significantly in the Cp+SRP+sham, Cp+SRP+LLLT and SCp+SRP+LLLT groups (P<.05). Gingival crevicular fluid TGF-Î²1 levels decreased significantly in all treatment groups (P<.05). Although no significant

differences were found between the gingival crevicular fluid PAI-1, tPA and TGF-Î²1 levels of the LLLT versus sham groups (P>.05) at any of the time points measured, both LLLT groups showed significant reductions in tPA/PAI-1 ratios over time. CONCLUSION: Within the limits of this study, LLLT may be understood to play a role in the modulation of periodontal tissue tPA and PAI-1 gingival crevicular fluid levels, particularly in smoking patients with chronic periodontitis, and may thus be recommended as an adjunct to non-surgical periodontal treatment. Plasminogen Activator Inhibitor 1;SERPINE1 protein, human;Transforming Growth Factor beta1;PLAT protein, human;Tissue Plasminogen Activator Adult;Chronic Periodontitis;Dental Plaque Index;Dental Scaling;Gingival Crevicular Fluid;Humans;Laser Therapy;Low-Level Light Therapy;Periodontal Index;Periodontal Pocket;Plasminogen Activator Inhibitor 1;Root Planing;Smoking;Time Factors;Tissue Plasminogen Activator;Transforming Growth Factor beta1;Wound Healing

Low-Level Light Therapy with 410 nm Light Emitting Diode Suppresses Collagen Synthesis in Human Keloid Fibroblasts: An In Vitro Study. BACKGROUND: Keloids are characterized by excessive collagen deposition in the dermis, in which transforming growth factor Î² (TGF-Î²)/Smad signaling plays an important role. Low-level light therapy (LLLT) is reported as effective in preventing keloids in clinical reports, recently. To date, studies investigating the effect of LLLT on keloid fibroblasts are extremely rare. OBJECTIVE: We investigated the effect of LLLT with blue (410 nm), red (630 nm), and infrared (830 nm) light on the collagen synthesis in keloid fibroblasts. METHODS: Keloid fibroblasts were isolated from keloid-revision surgery samples and irradiated using 410-, 630-, 830-nm light emitting diode twice, with a 24-hour interval at 10 J/cm(2). After irradiation, cells were incubated for 24 and 48 hours and real-time quantitative reverse transcription polymerase chain reaction was performed. Western blot analysis was also performed in 48 hours after last irradiation. The genes and proteins of collagen type I, TGF-Î²1, Smad3, and Smad7 were analyzed. RESULTS: We observed no statistically significant change in the viability of keloid fibroblasts after irradiation. Collagen type I was the only gene whose expression significantly decreased after irradiation at 410 nm when compared to the non-irradiated control. Western blot analysis showed that LLLT at 410 nm lowered the protein levels of collagen type I compared to the control. CONCLUSION: LLLT at 410 nm decreased the expression of collagen type I in keloid fibroblasts and might be effective in preventing keloid formation in their initial stage.

Evaluation of different treatment protocols for dentin hypersensitivity: an 18-month randomized clinical trial. This randomized and longitudinal in vivo study aimed to assess different protocols for the treatment of dentin hypersensitivity with low-power laser (with different doses), high-power laser, and a desensitizing agent, for a period of 12 and 18Â months. The lesions from 32 patients (117 lesions), who were submitted to the inclusion and exclusion criteria, were divided into nine groups (nÂ =Â 13): G1: Gluma Desensitizer (Heraeus Kulzer), G2: low-power laser with low dose (three points of irradiation in vestibular portion and an apical point 30Â mW, 10Â J/cm(2), 9Â s per point with the wavelength of 810Â nm, with three sessions with an interval of 72Â h), G3: low-power laser with high dose (one point in the cervical area, and one apical point 100Â mW, 40Â J/cm(2), 11Â s per point with the wavelength of 810Â nm in three sessions with an interval of 72Â h), G4: low-power laser with low dose + Gluma Desensitizer, G5: low-power laser with high dose + Gluma Desensitizer, G6: Nd:YAG laser (Power Laserâ„¢ ST6, ResearchÂ® in contact 1.0Â W, 10Â Hz and 100Â mJ, â‰ˆ85Â J/cm(2), with the wavelength of 1064Â nm), G7: Nd:YAG laser + Gluma Desensitizer, G8: low-power laser with low dose + Nd:YAG laser, and G9: low-power laser with high dose + Nd:YAG laser. The level of sensitivity of each volunteer was assessed by visual analog scale of pain (VAS) with the aid of air from the triple syringe and exploration probe, 12 and 18Â months after treatment. All analyses were performed separately for air and probe stimulus. The level of significance was considered for values of pÂ <Â 0.05. After statistical analysis, all treatments were shown to be effective in reducing dentinal

hypersensitivity, and the results were considered not statistically different from those at 12Â months. Therefore, until the 18-month evaluation, it could be said that no statistical differences were observed in the sensitivity levels for all treatments. Methacrylates;gluma desensitizer;Glutaral Adult;Air;Dentin;Dentin Sensitivity;Glutaral;Humans;Lasers, Solid-State;Longitudinal Studies;Low-Level Light Therapy;Methacrylates;Middle Aged;Pain Measurement;Young Adult

Effects of two wattages of low-level laser therapy on orthodontic tooth movement. INTRODUCTION: Mixed outcomes have been found in animal and clinical studies with regard to the use of low-level laser therapy (LLLT) as a modality to accelerate orthodontic tooth movement (OTM). One major reason for the variable findings is the different methodologies and protocols for laser therapy use. OBJECTIVE: The aim of this study was to determine whether orthodontically moved molars exposed to two different wattages at the same energy density of LLLT exhibited differences in the amount of tooth movement and molecular and histological changes in the adjacent periodontal areas. METHODS: An orthodontic force was applied to rat upper first molars exposed to 500mW (EX-500) and 1000mW (EX-1000) of laser application, with a control group (CT) with no laser application. Gene expression in the periodontal ligament (PDL) and histology of the palatal gingiva of the molars were analyzed. RESULTS: There was a statistically significant difference for OTM between EX-500 but not between EX-1000 and CT groups. RANKL and MMP-13 expression levels in the PDL of orthodontically moved molars, however, were increased significantly in laser-exposed groups compared to CT. Early signs of dysplasia were observed in over half of the animals in the EX-1000 group. CONCLUSIONS: Our results provide evidence for molecular changes and the potential dysplastic effects of laser on the surrounding soft tissues. Further studies are needed to better identify an optimum laser protocol to maximize the desired effect. RANK Ligand;Matrix Metalloproteinase 13 Animals;Gingiva;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Molar;Periodontal Ligament;RANK Ligand;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Tooth Movement Techniques;Up-Regulation

Combined pulsed dye laser and fiberoptic Nd-YAG laser for the treatment of hypertrophic port wine stain. The hypertrophic Port Wine Stain (PWS) is only partially and superficially treated with the Pulsed dye laser (PDL) because of its limited depth of penetration. We used combined PDL and fiberoptic 1444-nm Nd-YAG laser to treat a case with hypertrophic PWS. METHOD: After tumescent anesthesia, few holes were made by a 16-gauge needle on different sides of the lesion. The fiberoptic tip of 1444-nm Nd-YAG laser was inserted within the holes and was pushed forward while triggering. In a fan pattern and by a back and forth movement, the subcutaneous and deep dermal areas were coagulated. The skin and outer mucosal surfaces were then treated by PDL. The fiberoptic system used was Accusculpt 1444-nm Nd-YAG laser (Lutronic lasers, South Korea), and the PDL used was 585 nm Nlite system (Chromogenex UK). The parameters used for PDL were fluence = 9 Joules/cm(2) and the spot size was 5 mm. The parameters used for fiberoptic 1444-nm Nd-YAG laser were: Pulse rate = 30 Hz, pulse energy = 300 mJ, power = 6 W, and the total energy = 4000 J for the whole face and mucosa. RESULT: Little sign of regression and moderate purpura were detected immediately after combined fiberoptic Nd-YAG and PDL therapy. The lesion gradually regressed within 4 months with satisfactory color and volume change. CONCLUSION: Combined fiberoptic Nd-YAG laser and PDL can be used for the treatment of deeper and superficial layers of hypertrophic PWS. Adult;Cosmetic Techniques;Female;Humans;Iraq;Lasers, Solid-State;Low-Level Light Therapy;Port-Wine Stain

The efficacy and safety of the fractional radiofrequency technique for the treatment of atrophic acne scar in Asians: A meta-analysis. BACKGROUND: The fractional radiofrequency (fRF) technique is a recently emerged technique. However, the exact outcomes of fRF for treating atrophic acne scar in Asians are still unclear. OBJECTIVE: To compare the clinical outcomes of fRF with the fractional laser

technique in Asians with atrophic acne scar. MATERIALS AND METHODS: The databases MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, and Chinese National Knowledge Infrastructure (CNKI) were searched. Main clinical outcomes were participant-reported scar improvement, investigator-reported scar improvement, post-inflammatory hyperpigmentation (PIH), erythema duration, scab duration, and the pain level. RESULT: Six randomized controlled trials were included in this meta-analysis. The scar improvement was similar in both groups regarding participant-reported scar improvement ($p = 0.48$) and investigator-reported scar improvement ($p = 0.89$). However, the incidence of PIH in fRF group was lower in comparison with the laser group ($p < 0.001$). The average duration of erythema was shorter in fRF group than in the laser group ($p < 0.001$). The mean time for debridement was shorter in fRF group than the carbon dioxide fractional laser system ($p = 0.02$). The pain level did not differ significantly in the two groups ($p = 0.53$). CONCLUSION: Although some bias exists in our study, fRF appears to be a superior alternative for the treatment of atrophic acne scar in Asians. Acne Keloid;Asian People;Cosmetic Techniques;Erythema;Humans;Hyperpigmentation;Lasers, Gas;Low-Level Light Therapy;Radio Waves;Radiofrequency Therapy;Randomized Controlled Trials as Topic

Apoptosis induced by low-level laser in polymorphonuclear cells of acute joint inflammation: comparative analysis of two energy densities. Anti-inflammatory property of low-level laser therapy (LLLT) has been widely described in literature, although action mechanisms are not always clarified. Thus, this study aimed to evaluate apoptosis mechanisms in the LLLT anti-inflammatory effects on the arthritis experimental model in vivo at two different energy densities (3 and 30Â Jcm(-2)). Arthritis was induced in mice by zymosan solution, animals were distributed into five groups, and morphological analysis, immunocytochemistry and gene expressions for apoptotic proteins were performed. Data showed an anti-inflammatory effect, DNA fragmentation in polymorphonuclear (PMN) cells and alteration in gene expression of proteins related to apoptosis pathways after LLLT. p53 gene expression increased at both energy densities, Bcl2 gene expression increased at 3Â Jcm(-2), and Bcl2 tissue expression decreased at 30Â Jcm(-2). In addition, apoptosis was restricted to PMN cells. Results suggest that apoptosis in PMN cells comprise part of LLLT anti-inflammatory mechanisms by disbalance promotion between expression of pro-apoptotic (Bax and p53) and anti-apoptotic (Bcl-2) proteins, with pro-apoptotic gene expression selectively in PMN cells. Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;Zymosan Acute Disease;Animals;Apoptosis;Arthritis, Experimental;DNA Fragmentation;Gene Expression Regulation;Inflammation;Joints;Low-Level Light Therapy;Male;Mice, Inbred C57BL;Neutrophils;Proto-Oncogene Proteins c-bcl-2;RNA, Messenger;Zymosan

Low-level laser facilitates alternatively activated macrophage/microglia polarization and promotes functional recovery after crush spinal cord injury in rats. Macrophages and resident microglia play an import role in the secondary neuroinflammation response following spinal cord injury. Reprogramming of macrophage/microglia polarization is an import strategy for spinal cord injury restoration. Low-level laser therapy (LLLT) is a noninvasive treatment that has been widely used in neurotrauma and neurodegenerative diseases. However, the influence of low-level laser on polarization of macrophage/microglia following spinal cord injury remains unknown. The present study applied low-level laser therapy on a crush spinal cord injury rat model. Using immunofluorescence, flow cytometry, RT-qPCR, and western blot assays, we found that low-level laser therapy altered the polarization state to a M2 tendency. A greater number of neurons survived in the pare injury site, which was accompanied by higher BBB scores in the LLLT group. Furthermore, low-level laser therapy elevated expression of interleukin 4 (IL-4) and interleukin 13 (IL-13). Results from this study show that low-level laser therapy has the potential for reducing inflammation, regulating macrophage/microglia polarization, and promoting neuronal survival. These beneficial

effects demonstrate that low-level laser therapy may be an effective candidate for clinical treatment of spinal cord injury. Biomarkers;Cytokines;Inflammation Mediators Animals;Astrocytes;Behavior, Animal;Biomarkers;Cytokines;Disease Models, Animal;Inflammation Mediators;Laser Therapy;Macrophage Activation;Macrophages;Microglia;Neurons;Neuroprotection;Phenotype;Rats;Recovery of Function;Spinal Cord Injuries

Peri-Procedure Laser Scar Therapy Protocol: A Pilot Survey of Plastic Surgeons' Practices. BACKGROUND: Scar management using laser phototherapy continues to evolve as it gains wide acceptance among patients and providers. Despite widespread use of laser therapy, there are no guidelines or consensus published regarding optimal pre- and post-procedure patient management. Our objective is to gain insight into the best laser practices; we decided to poll colleagues nationwide. METHODS: An online survey was distributed to members of the American Society of Plastic Surgeons. The survey consisted of 34 questions regarding pre- and post-procedure protocols related to laser scar therapy. RESULTS: Forty plastic surgeons responded to the survey. The survey demonstrated that ten types of lasers are currently used to treat scars. The most commonly used lasers are fractional Er:YAG (44.7%), pulsed dye (42.1%), and fractional CO(2) (36.8%). On a Likert 3-point scale, providers favored the use of pre-procedural sunblock (2.12), topical analgesics (1.91), and oral antivirals (1.83). They also preferred the use of topical moisturizer (2.45), oral analgesics (2.29), and oral antivirals (1.97) as a part of the post-laser treatment regimen. CONCLUSION: The study verified there is no consensus regarding peri-procedure laser scar therapy regimens. As laser scar management continues to grow in popularity, this lack of consensus suggests the need for experts in the field to come together and propose agreeable protocols to be used as guidelines. LEVEL OF EVIDENCE V: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Adult;Cicatrix;Cross-Sectional Studies;Esthetics;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Risk Assessment;Severity of Illness Index;Societies, Medical;Surgery, Plastic;Surveys and Questionnaires;Treatment Outcome;United States

Evaluation of the bony repair in rat cranial defect using near infrared reflectance spectroscopy and discriminant analysis. We set out to determine whether near infrared reflectance spectroscopy (NIRS) combined with principal component analysis-linear discriminant analysis (LDA) or, variable selection techniques employing successive projection algorithm or genetic algorithm (GA) could evaluate the bone repair in cranial critical-size (5 mm) defect after stimulation with collagen sponge scaffold and/or infrared low-level laser therapy directly on the local. Forty-five Winstar rats were divided into nine groups of five each, namely: group H - healthy, nâ€‰=â€‰5 (without treatment and without cranial critical-size defect), (GI positive control - nâ€‰=â€‰5, 21 days or nâ€‰=â€‰5, 30 days) without treatment and with cranial critical-size defect; (GII-nâ€‰=â€‰5, 21 days or nâ€‰=â€‰5, 30 days) cranial critical-size defect filled with collagen sponge scaffold; (GIII-nâ€‰=â€‰5, 21 days or nâ€‰=â€‰5, 30 days) cranial critical-size defect submitted to low-level laser therapy; (GIV-nâ€‰=â€‰5, 21 days or nâ€‰=â€‰5, 30 days) cranial critical-size defect submitted to combined collagen sponge scaffoldâ€‰+â€‰low-level laser therapy treatment. In relation to the histological analysis, the collagen sponge scaffoldâ€‰+â€‰low-level laser therapy treatment group (GIV) 30 days showed the best result with the presence of secondary bone, immature bone (osteoid) and newly formed connective tissue (periosteum). GA-LDA model also successfully classified control class of the others classes. Thus, the results provided by the good-quality classification model revealed the feasibility of NIRS for application to evaluation of the wound healing in rat cranial defect, thanks to the short analysis time of a few seconds and nondestructive

advantages of NIRS as an alternative approach for bone repair purposes. Â© 2017 American Institute of Chemical Engineers Biotechnol. Prog., 33:1160-1168, 2017. Collagen Algorithms;Animals;Bone Regeneration;Collagen;Discriminant Analysis;Lasers;Low-Level Light Therapy;Male;Principal Component Analysis;Rats;Rats, Wistar;Skull;Spectroscopy, Near-Infrared

Semiconductor diode laser device adjuvanting intradermal vaccine. A brief exposure of skin to a low-power, non-tissue damaging laser light has been demonstrated to augment immune responses to intradermal vaccination. Both preclinical and clinical studies show that this approach is simple, effective, safe and well tolerated compared to standard chemical or biological adjuvants. Until now, these laser exposures have been performed using a diode-pumped solid-state laser (DPSSL) devices, which are expensive and require labor-intensive maintenance and special training. Development of an inexpensive, easy-to-use and small device would form an important step in translating this technology toward clinical application. Here we report that we have established a handheld, near-infrared (NIR) laser device using semiconductor diodes emitting either 1061, 1258, or 1301nm light that costs less than $4000, and that this device replicates the adjuvant effect of a DPSSL system in a mouse model of influenza vaccination. Our results also indicate that a broader range of NIR laser wavelengths possess the ability to enhance vaccine immune responses, allowing engineering options for the device design. This small, low-cost device establishes the feasibility of using a laser adjuvant approach for mass-vaccination programs in a clinical setting, opens the door for broader testing of this technology with a variety of vaccines and forms the foundation for development of devices ready for use in the clinic. Influenza Vaccines Animals;Female;Influenza Vaccines;Injections, Intradermal;Lasers, Semiconductor;Low-Level Light Therapy;Mice, Inbred C57BL;Treatment Outcome;Vaccination

Laser therapy for the restoration of vaginal function. Laser therapy has a therapeutic role in various medical conditions and most recently has gained interest as a non-hormonal treatment for genitourinary syndrome of menopause (GSM) and as a non-invasive option for stress urinary incontinence (SUI). Several therapies are available to alleviate GSM symptoms, including hormonal and non-hormonal products. Both microablative fractional CO(2) laser and the non-ablative vaginal Er:YAG laser (VEL) induce morphological changes in the vaginal tissues, and data from non-randomized clinical trials suggest that laser therapy can alleviate vaginal dryness and dyspareunia. VEL has been reported to improve SUI as well as vaginal prolapse. Although large randomized trials have not been reported, the evidence suggests that VEL can be offered as a safe and efficacious alternative to hormone replacement therapy (HRT) for GSM, as well as a first-line treatment for mild to moderate SUI, before surgical procedures are resorted to. Randomized studies are needed to compare laser treatments with other therapies, as well as to assess the duration of the therapeutic effects and the safety of repeated applications. Research is presently evaluating both an automated robotic probe for VEL treatments and an intraurethral probe for the treatment of severe and type III SUI. Atrophy;Dyspareunia;Female;Humans;Laser Therapy;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Menopause;Syndrome;Urinary Incontinence, Stress;Uterine Prolapse;Vaginal Diseases;Vulvar Diseases

Treatment of recurrent aphthous stomatitis with Er,Cr:YSGG laser irradiation: A randomized controlled split mouth clinical study. The present randomized controlled split mouth clinical study aimed to investigate the efficacy of Er,Cr:YSGG laser irradiation on pain reduction and healing rate of recurrent aphthous stomatitis. 40 patients with RAS were recruited for this study and RAS ulcerations of each patient were randomly assigned to the control or test group. In the test group, Er,Cr:YSGG laser with non-contact mode was used to irradiate RAS lesions. In the placebo group, RAS lesions were irradiated with the same device without laser emission. Pain was evaluated with visual analog scale (VAS) while a clinician graded healing of RAS (HRAS). In the placebo group at immediate;

scores of VAS presented no statistically significance; in the test group, laser application showed significant pain reducing, at 1st day control. In the test group, a significantly healing effect at 1st day control was observed and this effect was maintained throughout the study. In the placebo group, scores of HRAS were statistically significant at controls on 3, 7, 10days. Statistically significant difference between the scores of VAS and HRAS was found for all control days except day 10 according to the intergroup comparisons. Based on these findings, Er,Cr:YSGG laser application at 0.25W without water may be appropriate to reduce pain and also accelerate the healing of RAS. Adolescent;Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Stomatitis, Aphthous;Treatment Outcome;Wound Healing;Young Adult

Pilot study on laser propagation in maxillary and mandibular bone: Grey level image analysis for optical measurements. BACKGROUND: Bone tissue anatomy, density and porosity vary among subjects in different phases of life and even within areas of a single specimen. The optical characteristics of changes in bone tissue are analyzed based on these properties. Photobiomodulation has been used to improve bone healing after surgery or fractures. Thus, knowledge on light propagation is of considerable importance to the obtainment of successful clinical outcomes. OBJECTIVE: This study determines light penetration and distribution in human maxillary and mandibular bones in three different regions (anterior, middle, and posterior). METHODS: A HeNe laser (633nm) irradiated maxillary and mandibular bones in the cervical-apical direction. The light propagation and scattering pattern were acquired and the grey level of the images was analyzed. Three-dimensional plots of the intensity profile and attenuation profiles were created. RESULTS: Differences in optical properties were found between the mandibular and maxillary bones. The maxilla attenuated more light than the mandible at all sites, leading to a shallower penetration depth. CONCLUSION: Our results provide initial information on the behavior of the propagation of red laser on alveolar bone using an optical method. Absorption, Radiation;Light;Mandible;Maxilla;Photography, Dental;Photometry;Pilot Projects;Radiation Dosage;Scattering, Radiation

Effect of Laser Photobiomodulation with Gradual or Constant Doses in the Regeneration of Rats' Mental Nerve After Lesion by Compression. OBJECTIVE: Assess morphologically the efficacy of constant dose (CD) or gradual dose (GD) in photobiomodulation therapy (PBMT) during the regeneration process of rats' mental nerve after compression lesion. MATERIALS AND METHODS: Forty-eight male Wistar rats were used and divided into four groups (nâ€‰=â€‰12): negative control (NC): lesion by compression; positive control (PC): no lesion; GD: lesion by compression and PBMT with GD; and CD: lesion by compression and PBMT with CD. One day after the surgery, the groups GD and CD underwent PBMT daily in three equidistant points around the incision area. The parameters were wavelength of 808â€‰nm, 100â€‰mW, CD received treatment with 120â€‰J/cm(2), while GD underwent the protocol of application: 1st and 4th sessions: 80â€‰J/cm(2); 5th to 8th sessions: 90â€‰J/cm(2); 9th to 12th sessions: 100â€‰J/cm(2); 13th to 16th sessions: 110â€‰J/cm(2); and 17th to 20th sessions: 120â€‰J/cm(2). Euthanasias were performed at 3, 7, 14, and 21 days. Qualitative and quantitative analysis of the mental nerves were performed with ANOVA (analysis of variance) and Tukey tests (pâ€‰â‰¤â€‰0.05). RESULTS: It was observed that PBMT was able to accelerate the process of nerve regeneration presenting an increase in the number of myelinated fibers starting at 14 days of treatment for groups CD and GD, and at 21 days they were similar to PC. It was observed a better lamellar organization of myelin sheath at 7 days for GD and at 14 days for CD, similar to PC. Both GD and CD presented significant differences compared to NC and PC for thickness of the myelin sheath, outer perimeter, internal area, and number of myelin fibers. CONCLUSIONS: PBMT presented positive effect on the regeneration of nerve starting at 14 days, and after 21 days there was no difference between GD and CD.

Animals;Disease Models, Animal;Dose-Response Relationship, Radiation;Electron Microscope Tomography;Low-Level Light Therapy;Male;Maxillary Nerve;Nerve Regeneration;Radiotherapy Dosage;Random Allocation;Rats;Rats, Wistar;Reference Values;Time Factors;Trigeminal Nerve;Trigeminal Nerve Injuries

Evaluation of the Effects of Photobiomodulation on Bone Healing in Healthy and Streptozotocin-Induced Diabetes in Rats. OBJECTIVE: This study aimed to assess the effects of Photobiomodulation (PBM) with pulsed wave laser on Hounsfield unit (HU) and bone strength at a catabolic response (bone resorption) of a callus bone defect in healthy and streptozotocin (STZ)-induced type I diabetes mellitus (TI DM) in rats. BACKGROUND DATA: Conflicting results exist regarding the effect of PBM on bone healing in healthy and diabetic animals. MATERIALS AND METHODS: We randomly divided 20 adult female rats into the following groups: (1) control, no TI DM, and no PBM; (2) no TI DM and PBM; (3) TI DM and no PBM; and (4) TI DM and PBM. TI DM was induced by STZ. All rats underwent partial transversal standardized osteotomies in their right tibias. The rats received PBM (890â€‰nm, 80â€‰Hz, 1.5â€‰J/cm(2)) thrice per week during 30 days. At 4 weeks after the surgery, the rats were sacrificed and their tibias submitted to computed tomography scanning to measure HU. The samples underwent a three-point bending test to evaluate bone strength. RESULTS: Analysis of variance (ANOVA) (pâ€‰=â€‰0.013) results showed that treatment by PBM significantly increased the biomechanical property (stress high load) of the callus defect from the partial tibia osteotomy in healthy rats compared to the control groups. However, we observed no significant increase in the biomechanical properties of the laser-treated diabetic bone defect compared to the control diabetic group. The ANOVA for the HU of callus density produced a p value of 0.000. A significant increase existed in the mean callus density in the healthy groups compared to the diabetic groups. CONCLUSIONS: The 80-Hz laser did not significantly enhance bone repair from an osteotomy of the tibia in an experimental model of TI DM rats. Analysis of Variance;Animals;Biomechanical Phenomena;Bone Regeneration;Diabetes Mellitus, Experimental;Disease Models, Animal;Female;Fracture Healing;Low-Level Light Therapy;Osteotomy;Random Allocation;Rats;Rats, Wistar;Reference Values;Tensile Strength;Tibia

3D printing scaffold coupled with low level light therapy for neural tissue regeneration. 3D printing has shown promise for neural regeneration by providing customized nerve scaffolds to structurally support and bridge the defect gap as well as deliver cells or various bioactive substances. Low-level light therapy (LLLT) exhibits positive effects on rehabiliation of degenerative nerves and neural disorders. With this in mind, we postulate that 3D printed neural scaffold coupling with LLLT will generate a new strategy to repair neural degeneration. To achieve this goal, we applied red laser light to stimualte neural stem cells on 3D printed scaffolds and investigated the subsequent cell response with respect to cell proliferation and differentiation. Here we show that cell prolifeartion rate and intracellular reactive oxgen species synthesis were significantly increased after 15 s laser stimulation follwed by 1 d culture. Over culturing time of 14 d in vitro, the laser stimulation promoted neuronal differentiation of neural stem cells, while the glial differentiation was suppressed based on results of both immunocytochemistry studies and real-time quantitative reverse transcription polymerase chain reaction testing. These findings suggest that integration of 3D printing and LLLT might provide a powerful methodology for neural tissue engineering. Methacrylates;Nestin;Reactive Oxygen Species;Polyethylene Glycols;Gelatin Animals;Cell Differentiation;Cell Proliferation;Gelatin;Gene Expression Regulation;Immunohistochemistry;Low-Level Light Therapy;Methacrylates;Mice;Microscopy, Fluorescence;Nerve Regeneration;Nestin;Neural Stem Cells;Neurons;Polyethylene Glycols;Printing, Three-Dimensional;Reactive Oxygen Species;Tissue Engineering;Tissue Scaffolds

Pretreatment with light-emitting diode therapy reduces ischemic brain injury in mice through endothelial nitric oxide synthase-dependent mechanisms. Photostimulation with low-level light emitting diode therapy (LED-T) modulates neurological and psychological functions. The purpose of this study was to evaluate the effects of LED-T pretreatment on the mouse brain after ischemia/reperfusion and to investigate the underlying mechanisms. Ischemia/reperfusion brain injury was induced by middle cerebral artery occlusion. The mice received LED-T twice a day for 2 days prior to cerebral ischemia. After reperfusion, the LED-T group showed significantly smaller infarct and edema volumes, fewer behavioral deficits compared to injured mice that did not receive LED-T and significantly higher cerebral blood flow compared to the vehicle group. We observed lower levels of endothelial nitric oxide synthase (eNOS) phosphorylation in the injured mouse brains, but significantly higher eNOS phosphorylation in LED-T-pretreated mice. The enhanced phospho-eNOS was inhibited by LY294002, indicating that the effects of LED-T on the ischemic brain could be attributed to the upregulation of eNOS phosphorylation through the phosphoinositide 3-kinase (PI3K)/Akt pathway. Moreover, no reductions in infarct or edema volume were observed in LED-T-pretreated eNOS-deficient (eNOS(-/-)) mice. Collectively, we found that pretreatment with LED-T reduced the amount of ischemia-induced brain damage. Importantly, we revealed that these effects were mediated by the stimulation of eNOS phosphorylation via the PI3K/Akt pathway. Nitric Oxide Synthase Type III;Nos3 protein, mouse Animals;Brain Injuries;Brain Ischemia;Light;Lighting;Male;Mice;Mice, Inbred C57BL;Nitric Oxide Synthase Type III;Phototherapy;Preoperative Care;Radiation Dosage;Semiconductors;Treatment Outcome

Effect of laser on pain relief and wound healing of recurrent aphthous stomatitis: a systematic review. The aim of this systematic review was to assess a potential benefit of laser use in the treatment of recurrent aphthous stomatitis (RAS). The primary outcome variables were pain relief, duration of wound healing and reduction in episode frequency. A PICO approach was used as a search strategy in Medline, Embase and Cochrane databases. After scanning and excluding titles, abstracts and full texts, 11 studies (ten RCTs and one non-randomised controlled trial) were included. Study selection and data extraction was done by two observers. Study participants varied between 7-90 for the laser and 5-90 for the control groups. Laser treatment included Nd:YAG laser ablation, CO(2) laser applied through a transparent gel (non-ablative) and diode laser in a low-level laser treatment (LLLT) mode. Control groups had placebo, no therapy or topical corticosteroid treatment. Significant pain relief immediately after treatment was found in five out of six studies. Pain relief in the days following treatment was recorded in seven studies. The duration of RAS wound healing was also reduced in five studies. However, criteria of evaluation differed between the studies. The episode frequency was not evaluated as only one study addressed this outcome parameter, but did not discriminate between the study (LLLT) and control (corticosteroid) groups. Jadad scores (ranging from 0 to 5) for quality assessment of the included studies range between 0 and 2 (meanâ€‰=â€‰1.0) for studies analysing pain relief and between 0 and 3 (meanâ€‰=â€‰1.1) for studies evaluating wound healing. The use of lasers (CO(2) laser, Nd:YAG laser and diode laser) to relieve symptoms and promote healing of RAS is a therapeutic option. More studies for laser applications are necessary to demonstrate superiority over topical pharmaceutical treatment and to recommend a specific laser type, wavelength, power output and applied energy (ablative versus photobiomodulation). Humans;Laser Therapy;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Pain;Recurrence;Stomatitis, Aphthous;Wound Healing

The effect of LED on blood microcirculation during chronic wound healing in diabetic and non-diabetic patients-a prospective, double-blind randomized study. Chronic wounds, especially in diabetic patients, represent a challenging health issue. Since standard treatment protocols often do not provide satisfactory results, additional treatment methods-like phototherapy using low-level light

therapy-are being investigated. The aim of our study was to evaluate the effect of phototherapy with light-emitting diodes on chronic wound treatment in diabetic and non-diabetic patients. Since a sufficient blood supply is mandatory for wound healing, the evaluation of microcirculation in the healthy skin at a wound's edge was the main outcome measure. Forty non-diabetic patients and 39 diabetics with lower limb chronic wounds who were referred to the University Medical Center Ljubljana between October 2012 and June 2014 were randomized to the treated and control groups. The treated group received phototherapy with LED 2.4Â J/cm(2) (wavelengths 625, 660, 850Â nm) three times a week for 8Â weeks, and the control group received phototherapy with broadband 580-900Â nm and power density 0.72Â J/cm(2). Microcirculation was measured using laser Doppler. A significant increase in blood flow was noted in the treated group of diabetic and non-diabetic patients (pâ€‰=â€‰0.040 and pâ€‰=â€‰0.033), while there was no difference in the control groups. Additional Falanga wound bed score evaluation showed a significant improvement in both treated groups as compared to the control group. According to our results, phototherapy with LED was shown to be an effective additional treatment method for chronic wounds in diabetic and non-diabetic patients. Placebos Aged;Chronic Disease;Diabetes Mellitus;Double-Blind Method;Female;Hemorheology;Humans;Male;Microcirculation;Middle Aged;Phototherapy;Placebos;Prospective Studies;Wound Healing

Phase-Transition Nanodroplets for Real-Time Photoacoustic/Ultrasound Dual-Modality Imaging and Photothermal Therapy of Sentinel Lymph Node in Breast Cancer. Pathological status of lymph nodes (LNs) plays a critical role in staging and treatment for the patients with breast cancer. Sentinel lymph node biopsy has become the standard method in determining pathological status of axillary LNs. Therefore, the determination of sentinel lymph nodes (SLNs) and therapy of metastatic LNs are highly desirable in clinic. Herein, an unprecedented carbon nanoparticles (CNs)-incorporated liquid-gas phase-transition nanodroplets (CNPs) with strong near-infrared (NIR) absorption, good biocompatibility, excellent photoacoustic (PA) and ultrasound (US) contrast, and high photothermal-conversion efficiency are reported in this study. Upon laser irradiation, liquid-gas phase transition of the CNPs has been demonstrated to provide excellent contrasts for PA/US dual-modality imaging both in vitro and in vivo. Additionally, the CNPs are capable of staining lymph nodes, which can contribute significantly to the identification of LNs with naked eyes. With increased laser energy, the CNPs exhibit the high performance in killing the breast cancer cells both in vitro and in vivo, due to the photothermal effect induced from the CNs within CNPs. These results suggest that the developed multifunctional phase-transition nanodroplets have high potential to act as the theranostic agents in both SLNs detection and therapy of metastatic LNs. Carbon Animals;Breast Neoplasms;Carbon;Cell Line;Cell Line, Tumor;Female;Humans;Low-Level Light Therapy;Lymphatic Metastasis;Mice;Multimodal Imaging;Nanoparticles;Phase Transition;Photoacoustic Techniques;Rabbits;Sentinel Lymph Node

Role of diode lasers in oro-facial pain management. With the increasing use of low level laser therapy (LLLT) in clinical dentistry, the aim of the present study was to assess the effectiveness of diode lasers in the management of orofacial pain. Indexed databases were searched without language and time restrictions up to and including July 2016 using different combinations of the following key words: oral, low level laser therapy, dental, pain, diode lasers, discomfort and analgesia. From the literature reviewed it is evident that LLLT is effective compared to traditional procedures in the management of oro-facial pain associated to soft tissue and hard tissue conditions such as premalignant lesions, gingival conditions and dental extractions. However, it remains to be determined which particular wavelength will produce the more favorable and predictable outcome in terms of pain reduction. It is highly recommended that further randomized control trials with well-defined control groups should be performed to determine the precise wavelengths of the diode

lasers for the management of oro-facial pain. Within the limits of the present review, it is concluded that diode lasers therapy is more effective in the management of oro-facial pain compared to traditional procedures. Facial Pain;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Oral Surgical Procedures;Pain Management

Neurochemical effects of photobiostimulation in the trigeminal ganglion after inferior alveolar nerve injury. Orofacial pain is associated with peripheral and central sensitization of trigeminal nociceptive neurons. Nerve injury results in release of chemical mediators that contribute to persistent pain conditions. The activation of the transient receptor potential vanilloid 1 (TRPV1), promotes release of calcitonin gene-related peptide (CGRP) and substance P (SP) from trigeminal nerve terminals. CGRP and SP contribute to the development of peripheral hyperalgesia. The expression of SP and CGRP by primary afferent neurons is rapidly increased in response to peripheral inflammation. CGRP receptor activation promotes activation of AMPA receptors, leading to increased firing of neurons which is reflected as central sensitization. In this study we investigated whether inferior alveolar nerve (IAN) injury influences AMPA receptors, CGRP, SP and TRPV1 expression in the trigeminal ganglion (TG). The relative expression of the protein of interest from naive rats was compared to those from injured rats and animals that received low level laser therapy (LLLT). IAN-injury did not change expression of GluA1, GluA2 and CGRP, but increased the expression of TRPV1 and SP. LLLT increases GluA1 and GluA2 expression and decreases TVPV1, SP and CGRP. These results, together with previous behavioral data, suggest that IAN-injury induced changes in the proteins analyzed, which could impact on nociceptive threshold. These data may help to understand the molecular mechanisms of pain sensitization in the TG. Receptors, AMPA;TRPV Cation Channels;Trpv1 protein, rat;Substance P;Calcitonin Gene-Related Peptide;glutamate receptor ionotropic, AMPA 2;glutamate receptor ionotropic, AMPA 1 Animals;Calcitonin Gene-Related Peptide;Facial Nerve Injuries;Gene Expression Regulation;Low-Level Light Therapy;Male;Mandibular Nerve;Neurons, Afferent;Photic Stimulation;Rats;Rats, Sprague-Dawley;Receptors, AMPA;Signal Transduction;Substance P;TRPV Cation Channels;Trigeminal Ganglion

Role of low-level laser therapy added to facial expression exercises in patients with idiopathic facial (Bell's) palsy. The aim of the present study was to investigate the efficacy of low-level laser therapy in conjunction with conventional facial exercise treatment on functional outcomes during the early recovery period in patients with facial paralysis. Forty-six patients (mean age 41Â Â±Â 9.7Â years; 40 women and 6 men) were randomized into two groups. Patients in the first group received low-level laser treatment as well as facial exercise treatment, while patients in the second group participated in facial exercise intervention alone. Laser treatment was administered at a wavelength of 830Â nm, output power of 100Â Mw, and frequency of 1Â KHz using a gallium-aluminum-arsenide (GaAIAs, infrared laser) diode laser. A mean energy density of 10Â J/cm(2) was administered to eight points of the affected side of the face three times per week, for a total of 6Â weeks. The rate of facial improvement was evaluated using the facial disability index (FDI) before, 3Â weeks after, and 6Â weeks after treatment. Friedman analysis of variance was performed to compare the data from the parameters repeatedly measured in the inner-group analysis. Bonferroni correction was performed to compare between groups as a post hoc test if the variance analysis test result was significant. To detect the group differences, the Bonferroni Student t test was used. The Mann-Whitney U test was used to compare numeric data between the groups. In the exercise group, although no significant difference in FDI scores was noted between the start of treatment and week 3 (pÂ <Â 0.05), significant improvement was observed at week 6 (pÂ <Â 0.001). In the laser group, significant improvement in FDI scores relative to baseline was observed at 3 and 6Â weeks (pÂ <Â 0.001). Improvements in FDI scores were significantly greater at weeks 3 and 6 in the laser group than those in the exercise group (pÂ <Â 0.05). Our findings indicate that combined treatment

with low-level laser therapy (LLLT) and exercise therapy is associated with significant improvements in FDI when compared with exercise therapy alone. Adult;Bell Palsy;Combined Modality Therapy;Exercise Therapy;Facial Expression;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Physical Therapy Modalities

Aqueous-phase synthesis of iron oxide nanoparticles and composites for cancer diagnosis and therapy. The design and development of multifunctional nanoplatforms for biomedical applications still remains to be challenging. This review reports the recent advances in aqueous-phase synthesis of iron oxide nanoparticles (Fe(3)O(4) NPs) and their composites for magnetic resonance (MR) imaging and photothermal therapy of cancer. Water dispersible and colloidally stable Fe(3)O(4) NPs synthesized via controlled coprecipitation route, hydrothermal route and mild reduction route are introduced. Some of key strategies to improve the r(2) relaxivity of Fe(3)O(4) NPs and to enhance their uptake by cancer cells are discussed in detail. These aqueous-phase synthetic methods can also be applied to prepare Fe(3)O(4) NP-based composites for dual-mode molecular imaging applications. More interestingly, aqueous-phase synthesized Fe(3)O(4) NPs are able to be fabricated as multifunctional theranostic agents for multi-mode imaging and photothermal therapy of cancer. This review will provide some meaningful information for the design and development of various Fe(3)O(4) NP-based multifunctional nanoplatforms for cancer diagnosis and therapy. Contrast Media;Magnetite Nanoparticles;Water;Ferrosoferric Oxide Animals;Cell Line, Tumor;Chemistry Techniques, Synthetic;Contrast Media;Ferrosoferric Oxide;HeLa Cells;Hep G2 Cells;Humans;Hyperthermia, Induced;Injections, Intralesional;Low-Level Light Therapy;Magnetite Nanoparticles;Mice;Neoplasms, Glandular and Epithelial;Theranostic Nanomedicine;Water;Xenograft Model Antitumor Assays

Prevention of gastrointestinal side-effects in paediatric oncology: what are the guidelines? PURPOSE OF REVIEW: Gastrointestinal side-effects, particularly with regard to alimentary tract mucositis and chemotherapy-induced nausea and vomiting (CINV), continue to be frequent and debilitating symptomatic conditions among children and adolescents receiving cytotoxic cancer therapy. Further avenues of progress for mucositis and CINV prevention in paediatric oncology setting are warranted. RECENT FINDINGS: The current article reviews the major guidelines and literature published in 2016 pertaining to the prevention of mucositis and CINV. Considerable professional organizational efforts have been made to develop consensus-based or evidence-based guidelines that periodically update to define basic standards of mucositis and CINV prevention. There are a few published works in 2016 that may contribute to the emerging evidence on prevention of mucositis and CINV in the paediatric setting for future guideline updates. SUMMARY: The concomitant use of 5-HT3 receptor antagonist and dexamethasone are effective to prevent acute and delayed CINV in children who are to receive highly or moderately emetogenic chemotherapy. Optimal control of acute and delayed CINV can prevent anticipatory CINV. Oral care protocols would be beneficial to prevent mucositis in children across all cancer treatment modalities. Cryotherapy or low-level light therapy may be applied to cooperative children undergoing chemotherapy or haematological stem cell transplant conditioning regimens with a high rate of mucositis. Antiemetics;Antineoplastic Agents;Serotonin 5-HT3 Receptor Antagonists;Dexamethasone Adolescent;Antiemetics;Antineoplastic Agents;Child;Dexamethasone;Drug Therapy, Combination;Humans;Mucositis;Nausea;Neoplasms;Practice Guidelines as Topic;Randomized Controlled Trials as Topic;Serotonin 5-HT3 Receptor Antagonists;Vomiting

Biostimulation with diode laser positively regulates cementoblast functions, in vitro. The aim of this study was to evaluate the effects of diode laser biostimulation on cementoblasts (OCCM.30). A total of 40 root plates were obtained from healthy third molar teeth and assigned to the following two groups: (1) control group and (2) laser-treated group. Root plates were placed into the cell

culture inserts, and OCCM.30 cells were seeded onto root plates. Cells were irradiated with a low level of diode laser (power: 0.3Â W in continuous wave, 60Â s/cm(2)). Proliferation and mineralized tissue-associated gene's and BMP's messenger RNA (mRNA) expressions of cementoblasts were evaluated. Total RNAs were isolated on day 3 and integrin-binding sialoprotein (Ibsp), bone gamma-carboxyglutamate protein (Bglap), Type I collagen (Col1a1), osteoblastic transcription factor, runt-related transcription factor (Runx2), and Bone Morphogenetic Protein (BMP)-2, 3, 4, 6, and 7 mRNA expressions were determined using quantitative RT-PCR. von Kossa staining was performed to evaluate biomineralization of OCCM.30 cells. In the proliferation experiment, while there was no significant difference until 96Â h, laser irradiation retarded the decrease in cell proliferation trend after 96Â h compared to the untreated control group. Statistically significant increase in Ibsp, Bglap, and BMP-2,3,6,7 mRNA expressions were noted in the laser groups when compared to the untreated control group (pÂ <Â 0.05). Laser irradiation induced mineralized nodule formation of cementoblasts. The results of this study reveal that the biostimulation setting of diode laser modulates the behavior of cementoblasts inducing mineralized tissue-associated gene's mRNA expressions and mineralization. Therefore, biostimulation can be used during regenerative periodontal therapies to trigger cells with periodontal attachment apparatus. RNA, Messenger Animals;Calcification, Physiologic;Cell Adhesion;Cell Line;Cell Proliferation;Cell Survival;Dental Cementum;Gene Expression Regulation;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Molar;RNA, Messenger;Tooth Root

Photobiomodulation with LED and laser in repair of mandibular socket rabbit: clinical evaluation, histological, and histomorphometric. PURPOSE: The aim of this study was to evaluate the effects of LED and low-intensity laser on the healing of rabbit dental alveoli. METHODS: A total of 18 rabbits were divided into three groups of six; all rabbits underwent surgical extraction of the first lower right premolar. Following surgery, group 1 received LED irradiation, group 2 received laser irradiation, and group 3 were untreated controls. The initial applications of LED and laser began 48Â h after tooth extraction and were given perpendicularly to the dental alveoli. The three groups were clinically evaluated for 18Â days in the postoperative period. At 90Â days, the rabbits were euthanized and the mandibular fragments containing the healing alveoli were collected. These fragments initially underwent computed tomography scans and bone density was measured in Hounsfield units. Following this, the fragments were processed and stained with hematoxylin and eosin for histological and histomorphometric analysis. RESULTS: The results were compatible between the clinical, histological, and histomorphometric parameters evaluated. There were no statistical differences between the LED and laser groups. However, the difference of the average bone density between laser and control group was not statistically significant. CONCLUSIONS: It was found that photobiomodulation with LASER and LED presented effects. However, only the LED demonstrated a beneficial effect on the process of bone repair in the dental alveoli of rabbits.
Animals;Bone Density;Low-Level Light Therapy;Rabbits;Tooth Socket;Wound Healing

The Clinical and Histological Effect of a Low-Fluence Q-Switched 1,064-nm Neodymium: Yttrium-Aluminum-Garnet Laser for the Treatment of Melasma and Solar Lentigenes in Asians: Prospective, Randomized, and Split-Face Comparative Study. BACKGROUND: The low-fluence Q-switched 1,064-nm neodymium:yttrium-aluminum-garnet laser (QSNYL) is popular for melasma treatment among Asians. OBJECTIVE: This study was to evaluate the clinical and histological effects of the low-fluence QSNYL for treatment of melasma and solar lentigenes. MATERIALS AND METHODS: In this randomized split-face clinical study, 22 patients with melasma or solar lentigo received low-fluence QSNYL weekly for 10 sessions on one cheek. The treatment efficacy was determined by Mexameter skin colorimetry, physician and patient assessment, and by evaluating histological changes. RESULTS: The treated sides had statistically significant reductions in the melanin and erythema indices (EI); 50.0% of melasma and 62.5% of solar lentigo patients had >50% clearance after the final treatment.

The increased EI, vascularity, and mast cell activity in patients with melasma and large-sized solar lentigo showed no improvement. The recurrence rates were 16.7% and 12.7% for melasma and solar lentigo, respectively. Postinflammatory hyperpigmentation developed in 1 patient, but no serious side effects were noted. CONCLUSION: Low-fluence QSNYL is effective in treating melasma and small type solar lentigo in Asians. The authors' study also demonstrated that lesion thickness, vascularity, and mast cell activity can be used to predict the efficacy of the treatment of these lesions. Adult;Asian People;Cheek;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Melanosis;Middle Aged;Prospective Studies

Novel Approach to Treating Androgenetic Alopecia in Females With Photobiomodulation (Low-Level Laser Therapy). BACKGROUND: Photobiomodulation, also referred to as low-level laser therapy (LLLT), has been studied and used for (among other diseases) the promotion of hair regrowth. OBJECTIVE/MATERIALS AND METHODS/RESULTS: A clinical study was developed to define the physiologic effects that occur when the human hair follicle and surrounding tissue structures are exposed to laser light using a novel device that is fitted with an array of laser diode sources operating at 650 nm and placed inside a sports cap to promote discretion while in use. The study demonstrates that low-level laser treatment of the scalp every other day for 17 weeks using the HANDI-DOME LASER device is a safe and effective treatment for androgenetic alopecia in healthy females between the ages of 18 to 60 with Fitzpatrick skin Types I to IV and Ludwig-Savin Baldness Scale I-2 to II-2 baldness patterns. Subjects receiving LLLT at 650 nm achieved a 51% increase in hair counts as compared with sham-treated control patients in this multicenter randomized controlled trial. CONCLUSION: These results suggest that the emerging technology of low-level laser therapy may play a potentially significant role in health care providers' armamentarium for the disease androgenic alopecia. Adolescent;Adult;Alopecia;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Middle Aged;Young Adult

Photobiomodulation with non-thermal lasers: Mechanisms of action and therapeutic uses in dermatology and aesthetic medicine. BACKGROUND: Non-thermal laser therapy in dermatology, is a growing field in medical technology by which therapeutic effects are achieved by exposing tissues to specific wavelengths of light. OBJECTIVES: The purpose of this review was to gain a better understanding of the science behind non-thermal laser and the evidence supporting its use in dermatology. METHODS: A group of dermatologists and surgeons recently convened to review the evidence supporting the use of non-thermal laser for body sculpting, improving the appearance of cellulite, and treating onychomycosis. RESULTS: The use of non-thermal laser for body sculpting is supported by three randomized, double-blind, sham-controlled studies (N = 161), one prospective open-label study (N = 54), and two retrospective studies (N = 775). Non-thermal laser application for improving the appearance of cellulite is supported by one randomized, double-blind, sham-controlled study (N = 38). The use of non-thermal laser for the treatment of onychomycosis is supported by an analysis of three non-randomized, open-label studies demonstrating clinical improvement of nails (N = 292). CONCLUSIONS: Non-thermal laser is steadily moving into mainstream medical practice, such as dermatology. Although present studies have demonstrated the safety and efficacy of non-thermal laser for body sculpting, cellulite reduction and onychomycosis treatment, studies demonstrating the efficacy of non-thermal laser as a stand-alone procedure are still inadequate. Cosmetic Techniques;Esthetics;Evidence-Based Medicine;Female;Humans;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Male;Onychomycosis;Treatment Outcome

Bond Strength of Abraded and Non-Abraded Bleached Enamel to Resin After Er,Cr:YSGG Laser Irradiation. OBJECTIVE: The objective of the study was to evaluate the microtensile bond strength (Î¼TBS) of a composite resin to abraded or non-abraded bleached enamel after Er,Cr:YSGG laser irradiation and to observe the fracture patterns of the tested interfaces. MATERIALS AND

METHODS: Two hundred twenty-eight bovine incisors were sectioned, resulting in 228 enamel blocks (7â€‰Ã—â€‰4â€‰Ã—â€‰4â€‰mm(3)) that were divided into 12 groups (nâ€‰=â€‰19) according to the factors "adhesion" after bleaching (immediate adhesion; after 14 days; and a control group with adhesion on unbleached teeth); enamel "abrasion" (with or without abrasion simulating cavity preparation); and "laser" (with or without Er,Cr:YSGG laser irradiation). Bleached enamel groups were treated with 20% carbamide peroxide, 8â€‰h/day for 21 days. Abrasion was performed with silicon carbide sandpaper. Specimens were restored with adhesive system and a composite resin (Adper Single Bond 2 and Z250; 3M ESPE). After 7 days, specimens were prepared by cutting into 1â€‰mm beans to Î¼TBS test performed in a universal testing machine. Fracture mode analysis was performed by using a stereoscopic loupe. The Î¼TBS data were statistically analyzed by three-way analysis of variance with 95% confidence level and compared by running a Tukey post hoc test (Î±â€‰=â€‰0.05). RESULTS: There was no statistically significant difference between triple interaction and double interactions among factors. There was no significant difference between the factors "adhesion," "abrasion," and "laser." Laser irradiation produced significantly lower bond strength values in irradiated groups compared with the non-irradiated ones. All groups had a high percentage of adhesive failures. CONCLUSIONS: Abrasion provided no benefit to bond strength of composite resins to bleached enamel. Er,Cr:YSGG (20â€‰Hz, 0.5â€‰W, 3.97â€‰J/cm(2)) treatment reduced the bond strength of composite resins to enamel. Composite Resins Analysis of Variance;Animals;Cattle;Composite Resins;Dental Bonding;Dental Enamel;In Vitro Techniques;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Sensitivity and Specificity;Tensile Strength;Tooth Bleaching

Photobiomodulation of wound healing via visible and infrared laser irradiation. Fibroblast cells are known to be one of the key elements in wound healing process, which has been under the scope of research for decades. However, the exact mechanism of photobiomodulation on wound healing is not fully understood yet. Photobiomodulation of 635 and 809Â nm laser irradiation at two different energy densities were investigated with two independent experiments; first, in vitro cell proliferation and then in vivo wound healing. L929 mouse fibroblast cell suspensions were exposed with 635 and 809Â nm laser irradiations of 1 and 3Â J/cm(2) energy densities at 50Â mW output power separately for the investigation of photobiomodulation in vitro. Viabilities of cells were examined by means of MTT assays performed at the 24th, 48th, and 72nd hours following the laser irradiations. Following the in vitro experiments, 1Â cm long cutaneous incisional skin wounds on Wistar albino rats (nÂ =Â 24) were exposed with the same laser sources and doses in vivo. Wound samples were examined on 3rd, 5th, and 7th days of healing by means of mechanical tensile strength tests and histological examinations. MTT assay results showed that 635Â nm laser irradiation of both energy densities after 24Â h were found to be proliferative. One joule per square centimeter laser irradiation results also had positive effect on cell proliferation after 72Â h. However, 809Â nm laser irradiation at both energy densities had neither positive nor negative affects on cell viability. In vivo experiment results showed that, 635Â nm laser irradiation of both energy densities stimulated wound healing in terms of tensile strength, whereas 809Â nm laser stimulation did not cause any stimulative effect. The results of mechanical tests were compatible with the histological evaluations. In this study, it is observed that 635Â nm laser irradiations of low energy densities had stimulative effects in terms of cell proliferation in vitro and mechanical strength of incisions in vivo. However, 809Â nm laser irradiations at the same doses did not have any positive effect. Animals;Cell Proliferation;Cell Survival;Fibroblasts;Infrared Rays;Low-Level Light Therapy;Male;Mice;Rats, Wistar;Staining and Labeling;Tensile Strength;Wound Healing

A combination of Yiqiqubai granule and 308-nm excimer laser in treatment of segmental vitiligo: a prospective study of 233 patients. OBJECTIVE: To study the effect of Yiqiqubai granule combined

with 308-nm excimer laser treatment for segmental vitiligo (SV). METHODS: A prospective research was performed in 233 patients with SV treated in Shanghai General Hospital from 11 February 2015 to 25 August 2016, they were divided into group A (nâ€‰=â€‰75), group B (nâ€‰=â€‰78) and group C (nâ€‰=â€‰80) according to the random number table. Group A was treated with Yiqiqubai granule, group B treated with 308-nm excimer laser and group C treated with combined treatments. The treatment time lasts for 6 months. The clinical efficacy, color-reverse rate and quality of life of the three groups were assessed. RESULTS: After treatment, the effective rate and markedly effective rate of group C (87.5%, 51.3%) were significantly higher than group A (74.7%, 42.7%) and group B (80.8%, 47.4%) (pâ€‰<â€‰.05). Color-reverse rate of group C (66.5â€‰Â±â€‰17.6%) was much higher than group A (47.2â€‰Â±â€‰16.4%) and group B (49.9â€‰Â±â€‰24.2%) (pâ€‰<â€‰.05). Significant differences were found among three groups after treatment in terms of embarrassment, social and work (pâ€‰<â€‰.05). CONCLUSIONS: The combination of 308-nm excimer laser and Yiqiqubai granule in the treatment of SV has good clinical effect.
Adolescent;Adult;Child;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Medicine, Chinese Traditional;Middle Aged;Prospective Studies;Quality of Life;Vitiligo;Young Adult

Phototherapy for Improvement of Performance and Exercise Recovery: Comparison of 3 Commercially Available Devices. CONTEXT: â€ƒ Recent studies suggest the prophylactic use of low-powered laser/light has ergogenic effects on athletic performance and postactivity recovery. Manufacturers of high-powered lasers/light devices claim that these can produce the same clinical benefits with increased power and decreased irradiation time; however, research with high-powered lasers is lacking. OBJECTIVE: â€ƒ To evaluate the magnitude of observed phototherapeutic effects with 3 commercially available devices. DESIGN: â€ƒ Randomized double-blind placebo-controlled study. SETTING: â€ƒ Laboratory. PATIENTS OR OTHER PARTICIPANTS: â€ƒ Forty healthy untrained male participants. INTERVENTION(S): â€ƒ Participants were randomized into 4 groups: placebo, high-powered continuous laser/light, low-powered continuous laser/light, or low-powered pulsed laser/light (comprising both lasers and light-emitting diodes). A single dose of 180 J or placebo was applied to the quadriceps. MAIN OUTCOME MEASURE(S): â€ƒ Maximum voluntary contraction, delayed-onset muscle soreness (DOMS), and creatine kinase (CK) activity from baseline to 96 hours after the eccentric exercise protocol. RESULTS: â€ƒ Maximum voluntary contraction was maintained in the low-powered pulsed laser/light group compared with placebo and high-powered continuous laser/light groups in all time points (P < .05). Low-powered pulsed laser/light demonstrated less DOMS than all groups at all time points (P < .05). High-powered continuous laser/light did not demonstrate any positive effects on maximum voluntary contraction, CK activity, or DOMS compared with any group at any time point. Creatine kinase activity was decreased in low-powered pulsed laser/light compared with placebo (P < .05) and high-powered continuous laser/light (P < .05) at all time points. High-powered continuous laser/light resulted in increased CK activity compared with placebo from 1 to 24 hours (P < .05). CONCLUSIONS: â€ƒ Low-powered pulsed laser/light demonstrated better results than either low-powered continuous laser/light or high-powered continuous laser/light in all outcome measures when compared with placebo. The increase in CK activity using the high-powered continuous laser/light compared with placebo warrants further research to investigate its effect on other factors related to muscle damage. Adult;Athletic Performance;Double-Blind Method;Exercise;Female;Humans;Lasers;Male;Muscle, Skeletal;Myalgia;Phototherapy;Quadriceps Muscle;Recovery of Function

Depigmentation Therapies for Vitiligo. The general goals of medical management of vitiligo are to repigment vitiliginous areas of skin and to stabilize the progression of depigmentation. However, for some patients with vitiligo affecting extensive body surface areas who are unresponsive to repigmentation therapies, depigmentation of the remaining normal skin may be a better choice.

Candidates for depigmentation therapy should be carefully screened and patient education is essential. Permanent topical therapies used for depigmentation include monobenzyl ether of hydroquinone, 4-methoxyphenol, and 88% phenol. Physical modalities, such as cryotherapy and lasers, are also being used successfully. Adjuvants, Immunologic;Aminoquinolines;Anisoles;Cyclopropanes;Hydroquinones;Protein Kinase Inhibitors;Skin Lightening Preparations;Phenol;mequinol;Imatinib Mesylate;monobenzone;diphenylcyclopropenone;Imiquimod Adjuvants, Immunologic;Aminoquinolines;Anisoles;Body Surface Area;Cryotherapy;Cyclopropanes;Humans;Hydroquinones;Imatinib Mesylate;Imiquimod;Low-Level Light Therapy;Patient Selection;Phenol;Protein Kinase Inhibitors;Severity of Illness Index;Skin Lightening Preparations;Vitiligo

Phototherapy and Combination Therapies for Vitiligo. Vitiligo is a disease characterized by disappearance of melanocytes from the skin. It can negatively influence the physical appearance of affected individuals, and may profoundly affect a person's psychosocial function and quality of life. Therefore, vitiligo should not be considered as merely a condition that affects a patient's appearance, but needs to be actively treated in patients who seek medical help. Phototherapy has been used as the main treatment modality for patients with vitiligo. Different forms of phototherapy for vitiligo include broadband UVB, narrowband UVB, excimer light and excimer laser, and psoralen plus UVA. Humans;Lasers, Excimer;Low-Level Light Therapy;PUVA Therapy;Ultraviolet Therapy;Vitiligo

Medical and Maintenance Treatments for Vitiligo. Medical treatments alone, or in combination with phototherapy, are key approaches for treating nonsegmental vitiligo and, to a lesser extent, segmental vitiligo. The treatments are useful for halting disease progression and have been proven effective for inducing repigmentation and decreasing risk of relapses. Although the treatments have side effects and limitations, vitiligo often induces a marked decrease in quality of life and in most cases the risk:benefit ratio is in favor of an active approach. Systemic and topical agents targeting the pathways involved in loss of melanocytes and in differentiation of melanocyte stem cells should provide more effective approaches in the near future. Adrenal Cortex Hormones;Anti-Bacterial Agents;Calcineurin Inhibitors;Immunosuppressive Agents;Oxytocics;Piperidines;Protein Kinase Inhibitors;Pyrimidines;Pyrroles;Vitamin D;alpha-MSH;tofacitinib;Minocycline;Dinoprostone;afamelanotide;Methotrexate Administration, Cutaneous;Adrenal Cortex Hormones;Anti-Bacterial Agents;Calcineurin Inhibitors;Dinoprostone;Humans;Immunosuppressive Agents;Low-Level Light Therapy;Methotrexate;Minocycline;Oxytocics;Phototherapy;Piperidines;Protein Kinase Inhibitors;Pyrimidines;Pyrroles;Ultraviolet Therapy;Vitamin D;Vitiligo;alpha-MSH

Neuropeptide expression and morphometric differences in crushed alveolar inferior nerve of rats: Effects of photobiomodulation. Inferior alveolar nerve (IAN) injuries may occur during various dental routine procedures, especially in the removal of impacted lower third molars, and nerve recovery in these cases is a great challenge in dentistry. Here, the IAN crush injury model was used to assess the efficacy of photobiomodulation (PBM) in the recovery of the IAN in rats following crushing injury (a partial lesion). Rats were divided into four experimental groups: without any procedure, IAN crush injury, and IAN crush injury with PBM and sham group with PBM. Treatment was started 2Â days after surgery, above the site of injury, and was performed every other day, totaling 10 sessions. Rats were irradiated with GaAs Laser (Gallium Arsenide, Laserpulse, Ibramed Brazil) emitting a wavelength of 904Â nm, an output power of 70Â mWpk, beam spot size at target âˆ¼0.1Â cm(2), a frequency of 9500Â Hz, a pulse time 60Â ns, and an energy density of 6Â J/cm(2). Nerve recovery was investigated by measuring the morphometric data of the IAN using TEM and by the expression of laminin, neurofilaments (NFs), and myelin protein zero (MPZ) using Western blot analysis. We found

that IAN-injured rats which received PBM had a significant improvement of IAN morphometry when compared to IAN-injured rats without PBM. In parallel, all MPZ, laminin, and NFs exhibited a decrease after PBM. The results of this study indicate that the correlation between the peripheral nerve ultrastructure and the associated protein expression shows the beneficial effects of PBM. Laminin;Myelin P0 Protein;Neuropeptides Animals;Densitometry;Intermediate Filaments;Laminin;Low-Level Light Therapy;Male;Mandibular Nerve;Myelin P0 Protein;Nerve Crush;Neuropeptides;Rats, Wistar

Effectiveness of adjunctive interventions for accelerating orthodontic tooth movement: a systematic review of systematic reviews. This study was aimed to summarise published systematic reviews (SRs) that assess the effects of adjunctive interventions on the acceleration of orthodontic tooth movement (OTM). Electronic and manual searches were performed up to August 2016. Systematic reviews investigating the impact of adjunctive techniques on the promotion of OTM were included. The methodological quality of the included reviews was evaluated using the A Measurement Tool to Assess Systematic Reviews (AMSTAR) scale. The quality of evidence for each intervention was assessed using GRADE. The Jadad decision algorithm was used to select a study to provide body evidence from discordant reviews on the same intervention. A total of 11 SRs were included in this study. AMSTAR scores ranged from 4 to 10 of 11. The quality of evidence ranged from very low to low. The short-term (1-3 months) effects of low-level laser therapy (LLLT, 5 and 8 J cm(-2)) and corticotomy were supported by low-quality evidence. The evidence regarding the efficacy of photobiomodulation, pulsed electromagnetic field, interseptal bone reduction, two vibrational devices (Tooth Masseuse and Orthoaccel) and electrical current was of very low quality. Relaxin injections and extracorporeal shock waves were reported to have no impact on OTM according to low- and very low-quality evidence, respectively. Based on currently available information, we conclude that low-quality evidence indicates that LLLT (5 and 8 J cm(-2)) and corticotomy are effective to promote OTM in the short term. Future high-quality trials are required to determine the optimal protocols, as well as the long-term effects of LLLT and corticotomy, before warranting recommendations for orthodontics clinics. Electric Stimulation Therapy;Evidence-Based Dentistry;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Review Literature as Topic;Tooth Movement Techniques;Treatment Outcome

Successful Treatment of Generalized Essential Telangiectasia With 6-Mercaptopurine. Generalized essential telangiectasia (GET) is a notoriously difficult to treat disorder with no current satisfactory treatments. This case and discussion report the use of 6-mercaptopurine (6-MP) as a successful treatment for GET. Moreover, we show that GET may represent a state of increased angiogenesis, a paradigm shift from the current understanding that these telangiectasias represent dilatations of only pre-existing vessels. This new view of GET may drive others to look at novel agents for treatment. J Drugs Dermatol. 2017;16(3):280-282. . Antigens, CD34;Antimetabolites, Antineoplastic;Biomarkers;Collagen Type IV;Platelet Endothelial Cell Adhesion Molecule-1;Fibrinogen;Mercaptopurine;Metalloproteases Antigens, CD34;Antimetabolites, Antineoplastic;Biomarkers;Colitis, Ulcerative;Collagen Type IV;Endothelial Cells;Female;Fibrinogen;Humans;Lasers, Dye;Low-Level Light Therapy;Mercaptopurine;Metalloproteases;Middle Aged;Neovascularization, Pathologic;Platelet Endothelial Cell Adhesion Molecule-1;Telangiectasis

Reduce Adverse Effects of Laparoscopic Cholecystectomy with Pulse Width Modulated LED Light (625â€‰nm, 76â€‰Hz, 23% Duty Cycle). OBJECTIVE: Reducing adverse effects in laparoscopic cholecystectomy (LCE) is important to avoid complications. After removal, the porta hepatis and gallbladder bed of liver were treated with pulse width modulated (PWM) red LED light with parameters Î»â€‰=â€‰625â€‰Â±â€‰5â€‰nm, full width at half maximum 17â€‰nm,

76â€‰Hz, duty cycle 23%, 15-30â€‰mW/cm(2), and 0.9-1.8â€‰J/cm(2). The changes of eight blood parameters were studied: red blood cell, hemoglobin, white blood cell, erythrocyte sedimentation rate (ESR), bilirubin, aspartate transaminase (AST), alanine transaminase (ALT), and amylase. BACKGROUND DATA: Other current methods of reducing undesirable effects of LCE significantly affect surgery and are not commonly used in practice. MATERIALS AND METHODS: Before LCE, 263 patients were randomized into the control and test groups. Patients in the test group were treated with light radiated for 2â€‰min during the surgery on the bed of the removed gallbladder and porta hepatis. Blood samples were taken before surgery and on the third day after surgery, studied, and compared by nonparametric statistical methods. RESULTS: The test group revealed significant reduction in postsurgery gain of levels of ALT, AST, and ESR compared with the control group. CONCLUSIONS: Treatment of the removed gallbladder bed and porta hepatis by red LED PWM radiation during LCE significantly reduces the adverse effects of surgery while increasing its time insignificantly and does not affect the surgical best practices deployed. Adult;Aged;Chi-Square Distribution;Cholecystectomy, Laparoscopic;Cholelithiasis;Chronic Disease;Combined Modality Therapy;Female;Follow-Up Studies;Gallbladder;Humans;Intraoperative Care;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Prospective Studies;Risk Assessment;Time Factors;Treatment Outcome

Improvement in moderate to severe vitiligo using a novel combination of 308Â nm excimer laser and a surgical needling technique. Adolescent;Adult;Aged;Combined Modality Therapy;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Needles;Vitiligo;Young Adult

Photobiomodulation-induced changes in a monkey model of Parkinson's disease: changes in tyrosine hydroxylase cells and GDNF expression in the striatum. Intracranial application of red to infrared light, known also as photobiomodulation (PBM), has been shown to improve locomotor activity and to neuroprotect midbrain dopaminergic cells in rodent and monkey models of Parkinson's disease. In this study, we explored whether PBM has any influence on the number of tyrosine hydroxylase (TH)(+)cells and the expression of GDNF (glial-derived neurotrophic factor) in the striatum. Striatal sections of MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine)-treated mice and monkeys and 6-hydroxydopamine (6OHDA)-lesioned rats that had PBM optical fibres implanted intracranially (or not) were processed for immunohistochemistry (all species) or western blot analysis (monkeys). In our MPTP monkey model, which showed a clear loss in striatal dopaminergic terminations, PBM generated a striking increase in striatal TH(+) cell number, 60% higher compared to MPTP monkeys not treated with PBM and 80% higher than controls. This increase was not evident in our MPTP mouse and 6OHDA rat models, both of which showed minimal loss in striatal terminations. In monkeys, the increase in striatal TH(+) cell number in MPTP-PBM cases was accompanied by similar increases in GDNF expression, as determined from western blots, from MPTP and control cases. In summary, these results offer insights into the mechanisms by which PBM generates its beneficial effects, potentially with the use of trophic factors, such as GDNF. Glial Cell Line-Derived Neurotrophic Factor;Tyrosine 3-Monooxygenase Animals;Caudate Nucleus;Cell Count;Disease Models, Animal;Glial Cell Line-Derived Neurotrophic Factor;Low-Level Light Therapy;Macaca fascicularis;Mice;Mice, Inbred BALB C;Parkinsonian Disorders;Putamen;Rats;Rats, Wistar;Tyrosine 3-Monooxygenase

Accelerated orthodontic treatment - what's the evidence? The demand and accessibility of orthodontic care has increased but has also been accompanied by patient requests for shorter treatment times. Longer orthodontic treatment increases the risk of decalcification, gingival recession, and root resorption and so shorter treatment times have multiple advantages as well as appealing to patient's desires. Numerous techniques and materials have been suggested to reduce

treatment times but, in most cases, are based upon selected case reports with no prospective clinical trials to validate claims. The present review examines many of the current options purported to accelerate orthodontic tooth movement and the level of evidence presently available. There is some evidence to suggest that low-level laser therapy and a corticotomy involving the raising of a muco-periosteal flap are associated with accelerated orthodontic tooth movement; however, the current level of evidence is low to moderate in quality. For this reason, further research is required before routine application could be recommended. Humans;Low-Level Light Therapy;Malocclusion;Osteotomy;Tooth Movement Techniques

TP53 and ATM mRNA expression in skin and skeletal muscle after low-level laser exposure. Low-level lasers are widespread in regenerative medicine, but the molecular mechanisms involved in their biological effects are not fully understood, particularly those on DNA stability. Therefore, this study aimed to investigate mRNA expression of genes related to DNA genomic stability in skin and skeletal muscle tissue from Wistar rats exposed to low-level red and infrared lasers. For this, TP53 (Tumor Protein 53) and ATM (Ataxia Telangiectasia Mutated gene) mRNA expressions were evaluated by real-time quantitative PCR (RT-qPCR) technique 24 hours after low-level red and infrared laser exposure. Our data showed that relative TP53 mRNA expression was not significantly altered in both tissues exposed to lasers. For ATM, relative mRNA expression in skin tissue was not significantly altered, but in muscle tissue, laser exposure increased relative ATM mRNA expression. Low-level red and infrared laser radiations alter ATM mRNA expression related to DNA stability in skeletal muscle tissue. RNA, Messenger;TP53 protein, human;Tumor Suppressor Protein p53;Ataxia Telangiectasia Mutated Proteins Animals;Ataxia Telangiectasia Mutated Proteins;Gene Expression;Low-Level Light Therapy;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Tumor Suppressor Protein p53

Efficacy of Low-Level Laser Therapy in Subjective Tinnitus Patients with Temporomandibular Disorders. OBJECTIVE AND BACKGROUND: Tinnitus is an apparent sound, perceived in the ear with no stimulus. It has been described as a sound originating from the brain. It affects 17% of the general population. Etiological factors for tinnitus include temporomandibular joint disorders (TMJ, TMD) and Costen's syndrome. The aim of treatment is to eliminate the tinnitus or at least decrease its apparent volume. MATERIALS AND METHODS: In total, 46 patients referred to our department with bilateral subjective tinnitus with TMDs were selected for this study. Low-level laser therapy (LLLT) with an neodymium-doped yttrium aluminum garnet (Nd:YAG) (1064â€‰nm) laser, LLLT with a diode laser (810â€‰nm), and placebo treatment were applied to the patients. There were 15 patients each in the Nd:YAG and placebo groups and 16 patients in the 810â€‰nm diode laser group. LLLT was applied for 10 days, once per day. A visual analog scale (VAS) was used, with values between 0 and 10. VAS scores were recorded before treatment, on the last day of treatment, and 1 month after treatment. The VAS scores were the same on the last day of treatment and 1 month after treatment. The VAS scores before treatment and at 1 month after treatment were compared in a statistical analysis. RESULTS: There were statistically significant differences in the Nd:YAG laser (pâ€‰=â€‰0.001) and 810â€‰nm diode laser groups (pâ€‰=â€‰0.005), but no difference in the placebo group (pâ€‰=â€‰0.065). CONCLUSIONS: Both the Nd:YAG and 810â€‰nm diode lasers were effective for the treatment of subjective tinnitus related to TMDs. Adolescent;Adult;Aged;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Severity of Illness Index;Single-Blind Method;Statistics, Nonparametric;Temporomandibular Joint Disorders;Tinnitus;Treatment Outcome;Young Adult

The Effects of Transcutaneous and Intraoral Low-Level Laser Therapy After Extraction of Lower Third Molars: A Randomized Single Blind, Placebo Controlled Dual-Center Study. OBJECTIVE AND BACKGROUND: The surgical removal of impacted third molars is one of the most common procedures

performed by oral and maxillofacial surgeons. The purpose of this study is to determine whether either transcutaneous or intraoral low-level laser therapy (LLLT) reduces postoperative pain and assists in the healing of mandibular third molar extraction. MATERIALS AND METHODS: This randomized, placebo controlled, single-blind, split-mouth design study was conducted on 60 patients with full bony impacted similar position mandibular third molars bilaterally. The patients were divided into two groups of 30 each: transcutaneous LLLT and intraoral LLLT and the other side of each group treated with nonactive laser (60 teeth). The laser treatment consisted of administering laser energy immediately before and after the extraction procedure with gallium aluminum arsenide (GaAlAs) 830â€‰nm diode lasers. Postoperative pain and healing of the sockets were compared in transcutaneous and intraoral group with placebo for 1 week following the extraction. Descriptive and bivariate statistics was computed, and the p-value was set at 0.05. RESULTS: Intraoral LLLT application resulted in a statistically significant reduction of postoperative pain in comparison with transcutaneous laser group and placebo. The unhealed socket numbers were compared in two groups at seventh day and no differences were observed. CONCLUSIONS: The results of this study suggest that single-session intraoral LLLT is more effective than extraoral application for reducing postoperative pain. It was postulated that the differences between skin and mucosa could have effect on the results. Although intraoral use would allow closer application to the surgical site, the size of some laser devices precludes their use intraorally. Adult;Female;Humans;Low-Level Light Therapy;Male;Mandible;Molar, Third;Mouth;Pain, Postoperative;Reference Values;Risk Factors;Single-Blind Method;Statistics, Nonparametric;Tooth Extraction;Treatment Outcome;Wound Healing

Influence of low-level laser therapy on the healing of human bone maxillofacial defects: A systematic review. PURPOSE: This systematic review evaluates the effectiveness of low-level laser therapy (LLLT) to enhance maxillofacial area bone repair. METHODS: A comprehensive search of studies published up to February 2017 and listed in PubMed/MEDLINE, Scopus, and Cochrane Library databases was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. RESULTS: The 15 selected studies evaluated a total of 374 patients (mean age, 28.5years) who were treated with LLLT. Gallium-arsenide (GaAs) and gallium aluminium arsenide (GaAlAs) were the most commonly used devices, and LLLT parameters varied greatly. Wavelengths varied from 500 to 1000nm. Tooth extraction, distraction osteogenesis, maxillary expansion, periodontal defects, orthodontic movement and maxillary cystic defects were evaluated. From the 15 selected studies, six evaluated bone repair (primary outcomes). Of these, four studies showed improvement in bone formation after using LLLT, two demonstrated improved results for only one follow up period, and one showed no additional benefits. The other 9 studies evaluated secondary parameters related to healing (secondary outcomes) in the maxillofacial area after applying LLLT, including anti-inflammatory, analgesic, and healing accelerator effects, and quality of life related to oral health. There were no adverse or negative effects of LLLT reported. CONCLUSION: Within the limitation of this review, a possible improvement in bone density can be found when LLLT is applied postoperatively in maxillofacial bony defects. LLLT also seems to promote anti-inflammatory and analgesic effects and accelerate healing, as well as enhance quality of life related to oral health. However, LLLT use protocols need to be standardized before more specific conclusions can be drawn about this subject. Adult;Humans;Low-Level Light Therapy;Maxillofacial Abnormalities;Maxillofacial Injuries;Osteogenesis;Wound Healing

Spotlight on the delivery of photosensitizers: different approaches for photodynamic-based therapies. Nanomedicine development allowed the discovery of new photosensitizers (PS) and drug delivery systems (DDS) to overcome current issues on phototherapy. Nano-engineered materials have the potential to improve the solubility of PS, control drug pharmacokinetics, decreasing side

effects, increasing bioavailability, and overcoming multidrug resistance. A recent approach is the co-delivery of PS with other therapeutic agents in a multimodal platform for synergic and improved results. Areas covered: This paper discusses the delivery of PS-nanostructured platforms for conventional, photothermal, and antimicrobial photodynamic therapies, as well as in a recent therapeutic modality for photobiomodulation, covering applications of cancer diagnosis, targeting to skin pathogens, photoregeneration and wound healing. The focus of the present review is to describe the use of different DDS to enhance the therapeutic outcomes triggered by the combination of delivered PS, light, and oxygen. Expert opinion: Nanotechnology allowed the development of site-specific delivery of PS molecules, expanding possibilities poorly explored before to enhance photodynamic efficacy and extrapolate the concept to other treatment protocols. Research in this area embraces potential and pitfalls of PS delivery, allowing new clinical phase outcomes and long-term issues to be established, which will impact on several biomedical applications.
Photosensitizing Agents Drug Delivery Systems;Drug Resistance;Drug Therapy, Combination;Humans;Nanostructures;Photochemotherapy;Photosensitizing Agents

The effect of low-level laser therapy on tooth movement during canine distalization. The aim of the study is to determine the effects of low level laser therapy on tooth movement during canine distalization by evaluating IL-1Î², TGF-Î²1 levels in gingival crevicular fluid. Maxillary first premolars of the 15 Angle Class II division I patients (12-19Â years old) were extracted. Right maxillary canines were distalized by standard protocol as control group whereas the left maxillary canines distalized by laser application. A gallium-aluminum-arsenide diode laser with an output power of 20Â mW was applied as five doses from the buccal and the palatal side on the day 0, and the 3rd, 7th, 14th, 21th 30th, 33st, 37th, 60th, 63th, and 67th days. Gingival crevicular fluid samples were obtained with filtration paper at the initial, 7th, 14th, and 21th days, and the IL-1ÃŸ and TGF-ÃŸ1 cytokine levels were analyzed. Orthodontic models and periodontal indices were taken initially and on the days 30th, 60th, and 90th of canine distalization period. Tooth movement was assessed by scanning models (3Shape). The amount of tooth movement in the laser group was 40% more than the control group. First day IL-1ÃŸ levels were statistically higher than initial and 21st day levels (P=â€‰0.003, Pâ€‰=â€‰0.012). The rise in IL-1ÃŸ levels caused the negative correlations between 7th day IL-1Î² and 21st day TGF-Î²1 levels describes the tissue effects of laser application. Periodontal indices showed no sign of gingival inflammation during canine distalization period. As conclusion, laser does accelerate tooth movement and could shorten the whole treatment duration. Interleukin-1beta;Transforming Growth Factor beta1 Adolescent;Adult;Animals;Case-Control Studies;Cuspid;Dental Plaque;Female;Gingival Crevicular Fluid;Hemorrhage;Humans;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Periodontal Index;Tooth Migration;Transforming Growth Factor beta1

Laser Treatment of Tattoos: Basic Principles. Tattooing has become very popular worldwide during the past decades, and millions of people have one or many tattoos at different anatomical sites. The color of tattoos is mainly black, followed by red, green, blue, and other colors. A part of the tattooed people regret tattooing or have permanent problems with tattoos and therefore seek for tattoo removal. Tattoos consist of solid pigment particles in the skin. Thus, tattoo removal requires fragmentation of these permanently incorporated particles. The gold standard of tattoo removal is laser therapy. Short light pulses at high intensities are applied to the tattooed skin surface. The laser light penetrates the skin and is selectively absorbed in the pigment particles. The absorbed laser light leads to heat-up and fragmentation of the particles. Due to the complex chemistry of the various tattoo pigments, the efficacy of this fragmentation process is frequently unpredictable. Due to the short and intense pulses, nonlinear effects of light and thermal properties of tattoo particles may play a role, and the assumptions of selective photothermolysis may not reflect the real process of tattoo

particle fragmentation as a whole. In case fragmentation occurs, the concentration of pigment particles in the skin decreases, yielding a fading of the tattoo color in the skin. Laser therapy is most effective in black tattoos and less effective for colored tattoos. The rate of side effects is low due to the selectivity of the treatment. Laser light may change the chemistry of the tattoo pigments and hence provoke toxic decomposition products. Coloring Agents Color;Coloring Agents;Dermatologic Surgical Procedures;Germany;Humans;Ink;Laser Therapy;Low-Level Light Therapy;Skin;Tattooing

Prospective pilot study on combined use of pulsed dye laser and 1% topical rapamycin for treatment of nonfacial cutaneous capillary malformation. BACKGROUND: The regeneration or revascularization of blood vessels after pulsed dye laser (PDL) treatment is one of the causes of treatment failures of cutaneous capillary malformations (CM). Recently, topical administration of rapamycin was introduced as a possible adjunctive therapeutic option to minimize postlaser revascularization in facial CM. OBJECTIVES: We evaluated the effect of combined use of 1% topical rapamycin with PDL compared to PDL alone in cutaneous CM of trunk or extremities and tried to identify the optimal duration of topical rapamycin application. METHODS: Three adjacent areas of cutaneous CM that had never been treated before were selected in each patient and underwent the following regimens: (A) PDLâ€‰+â€‰vehicle for 8â€‰weeks post-PDL; (B) PDLâ€‰+â€‰topical rapamycin for 1-week post-PDL and (C) PDLâ€‰+â€‰topical rapamycin for 8â€‰weeks post-PDL. Each test site was treated by PDL for two sessions with 8â€‰weeks interval. RESULTS: Only one of six patients showed clinical improvement with combined rapamycin treatment. Overall, there was no statistically significant difference in erythema and blanching rate among PDL alone and combined rapamycin regimens. CONCLUSION: One percent topical rapamycin does not seem to be effective as a treatment modality for cutaneous CM of trunk or extremities. Immunosuppressive Agents;Sirolimus Administration, Topical;Adult;Combined Modality Therapy;Erythema;Female;Humans;Immunosuppressive Agents;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Port-Wine Stain;Prospective Studies;Sirolimus;Treatment Outcome;Young Adult

Epithelial cell-enhanced metabolism by low-level laser therapy and epidermal growth factor. Reepithelialization and wound closure are the desired outcome for several ulcerative conditions. Such resolution reduces the possibility of wound contamination and maintenance of the injury and improves the reestablishment of tissue morphology and functions. Investigators are seeking adjuvant therapies that can accelerate wound healing and are developing new strategies for clinical applications. This study compared the effects of epidermal growth factor (EGF) application and low-level laser therapy (LLLT) on cultured epithelial cells. Cells were seeded in 24-well plates. After a 24-h incubation, the epithelial cells were either treated with EGF (100Â Î¼M in serum-free DMEM for 72Â h) or subjected to LLLT (780Â nm, 25Â mW, 0.5, 1.5, and 3Â J/cm(2)) by three applications every 24Â h. Seventy-two hours after cells were treated with EGF or LLLT, cell migration, viability, proliferation, and collagen synthesis were assessed. Cells treated with EGF showed increased cell viability, proliferation, and collagen synthesis compared with those cells that received no treatment. LLLT enhanced cell migration; however, no significant effects of laser irradiation on other cell functions were observed. Comparison of both therapies demonstrated that EGF and LLLT enhanced specific epithelial cell activities related to wound healing. Epidermal Growth Factor;Collagen Cell Movement;Cell Proliferation;Cell Survival;Cells, Cultured;Collagen;Epidermal Growth Factor;Epithelial Cells;Humans;Low-Level Light Therapy

Effect of photobiomodulation therapy (808Â nm) in the control of neuropathic pain in mice. Neuropathic pain can be defined as the pain initiated or caused by a primary lesion or dysfunction of the central or peripheral nervous system. Photobiomodulation therapy (PBM) stands out among the

physical therapy resources used for analgesia. However, application parameters, especially the energy density, remain controversial in the literature. Therefore, this study aimed to investigate the PBM effect, in different energy densities to control neuropathic pain in mice. Fifty (50) mice were induced to neuropathy by chronic constriction surgery of the sciatic nerve (CCI), treated with PBM (808Â nm), and divided into five groups: GP (PBM simulation), GS (sham), GL10, GL20, GL40 (energy density of 10, 20, and 40Â J/cm(2), respectively). The evaluations were carried out using the hot plate test and Randall and Selitto test, before and after the CCI surgery, every 15Â days during the 90Â days experiment. Î²-Endorphin blood dosage was also tested. For both the hot plate and Randall and Selitto tests, the GL20 and GL40 groups presented reduction of the nociceptive threshold from the 30th day of treatment, the GL10 group only after day 75, and the GP group did not show any improvement throughout the experiment. The Î²-endorphin dosage was higher for all groups when compared to the GP group. However, only the GL20 group and GL40 presented a significant increase. This study demonstrates that PBM in higher energy density (20, 40Â J/cm(2)) is more effective in the control of neuropathic pain. beta-Endorphin Animals;Constriction;Enzyme-Linked Immunosorbent Assay;Hyperalgesia;Low-Level Light Therapy;Male;Mice;Neuralgia;Rats, Sprague-Dawley;Sciatic Nerve;beta-Endorphin

The effect of combined photobiomodulation and metformin on open skin wound healing in a non-genetic model of type II diabetes. This study intended to examine the combined influences of photobiomodulation (PBM) and metformin on the microbial flora and biomechanical parameters of wounds in a non-genetic model of type II diabetes mellitus (TII DM). We induced a non-genetic model of TII DM in 20 rats by feeding them a 10% fructose solution for 2weeks followed by an injection of streptozotocin (STZ, 40mg/kg). After 21days from the injection of STZ, we induced one full-thickness skin wound in each of the diabetic rats. We randomly divided the rats into four groups: i) placebo; ii) pulsed wave laser (890nm, 80Hz, 0.324J/cm(2)); iii) metformin; and iv) laser+metformin. Rats received daily intraperitoneal injections of metformin (50mg/kg). On days 7and 15 we inspected the microbial flora of each wound. On day 15 we obtained a standard sample from each healing wound for biomechanical analyses. PBM significantly decreased colony-forming units (CFUs) 7days after wound infliction compared to the placebo group (LSD test, p=0.012). Metformin significantly enhanced the biomechanical property (stress high load) of the wounds compared to the placebo group (LSD test, p=0.028). We observed the same significant result for PBM compared to the placebo group (LSD test, p=0.047). PBM significantly accelerated the wound healing process and significantly reduced CFUs of bacteria in a non-genetic rat model of TII DM. Metformin Animals;Colony Count, Microbial;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 2;Low-Level Light Therapy;Metformin;Rats;Skin;Stress, Mechanical;Wound Healing

Histomorphologic and ultrastructural recovery of myopathy in rats treated with low-level laser therapy. The purpose of the present work was to study the effect of low-level laser therapy (LLLT): helium-neon (He-Ne) and gallium arsenide (Ga-As) laser on the histomorphology of muscle and mitochondria in experimental myopathy in rats. Thirty SuquÃ-a strain female rats were distributed in groups: (A) control (intact), (B) injured, (C) injured and treated with He-Ne laser, (D) injured and treated with Ga-As laser, (E) irradiated with He-Ne laser on the non-injured muscle, and (F) irradiated with Ga-As laser on the non-injured muscle. Myopathy was induced by injecting 0.05Â mg/rat/day of adrenaline in the left gastrocnemius muscle at the same point on five consecutive days, in groups B, C, and D. LLLT was applied with 9.5Â JÂ cm(-2) daily for seven consecutive days in groups C, D, E, and F. The muscles were examined with optic and electronic microscopy. The inflammation was classified as absent, mild, and intense and the degree of mitochondrial alteration was graded I, II, III, and IV. Categorical data were statistically analyzed by Chi-square and the Fisher-Irwin Bilateral test, setting significant difference at pâ€‰<â€‰0.05. The

damage found in muscle and mitochondria histomorphology in animals with induced myopathy (B) was intense or severe inflammation with grade III or IV of mitochondrial alteration. They underwent significant regression (pâ€‰<â€‰0.001) compared with the groups treated with He-Ne (C) and Ga-As (D) laser, in which mild or moderate inflammation was seen and mitochondrial alteration grades I and II, recovering normal myofibrillar architecture. No differences were found between the effects caused by the two lasers, or between groups A, E, and F. Group A was found to be different from B, C, and D (pâ€‰<â€‰0.001). LLLT in experimental myopathy caused significant muscular and mitochondrial morphologic recovery. Animals;Female;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Mitochondria;Muscle, Skeletal;Muscle, Striated;Muscular Diseases;Rats

Clinical Evaluation of High and Low-Level Laser Treatment (CO2vsInGaAlP Diode Laser) for Recurrent Aphthous Stomatitis. STATEMENT OF THE PROBLEM: Recurrent aphthous stomatitis (RAS) is one of the most common lesions in the oral cavity. Due to its multifactorial nature, there is no definitive treatment for RAS. Laser therapy is one of the suggested treatments to reduce patient's discomfort. PURPOSE: The purpose of the present clinical trial is to assess the effect of low and high level laser therapy on pain control and wound healing of RAS. MATERIALS AND METHOD: Thirty six patients with minor RAS were divided into three groups. Group 1 (n=14) received CO2 laser, group 2 (n=12) were treated with InGaAlP Diode laser and group 3 (n=10) received sham laser as placebo. All patients were evaluated daily up to 15 days after receiving one session of laser therapy. Pain severity before and after treatment, wound healing, patient's satisfaction, and functional disturbance before and after treatment were recorded for each patient. RESULTS: According to statistical analysis, pain reduction after treatment in group 1 was 7.00Â±2.41, in group 2 was 2.08Â±2.31, and in group 3 was 1.40Â±1.77. In addition, a significant difference was observed in the reduction of functional complications in CO(2) laser treated patients compared to the other two groups. CONCLUSION: High-level laser treatment showed analgesic effects on RAS, but no healing was observed. Low-level laser therapy demonstrated no positive effect on recurrent aphthous ulcers.

Biochemical changes induced by grape seed extract and low level laser therapy administration during intraoral wound healing in rat liver: an experimental and in silico study. In the present study, the changes that occur in rat liver tissue as a result of the use of grape seed extract (GSE) and low level laser therapy (LLLT) in intraoral wound (IW) healing are analyzed using biochemical parameters. Diode laser application groups received 8Â J/cm(2) dose LLLT once a day for 4Â days (810Â nm wavelength, continuous mode, 0.25Â W, 9Â s). As a result of the biological parameter analysis, it was determined that the oxidative damage caused by the IWs and recovery period on 7th and 14th days could be substantially removed with GSE applications that have antioxidant capacity especially in rat liver tissue. In addition, the active compound of grape seed, catechin is studied in the active site of glycogen synthase kinase 3 (GSK3) target using molecular modeling approaches. Post-processing molecular dynamics (MD) results for catechin is compared with a standard GSK3 inhibitor. MD simulations assisted for better understanding of inhibition mechanism and the crucial amino acids contributing in the ligand binding. These results along with a through free energy analysis of ligands using sophisticated simulations methods are quite striking and it suggests a greater future role for simulation in deciphering complex patterns of molecular mechanism in combination with methods for understanding drug-receptor interactions. Antioxidants;Grape Seed Extract;Glycogen Synthase Kinase 3 Administration, Oral;Animals;Antioxidants;Glycogen Synthase Kinase 3;Grape Seed Extract;Humans;Laser Therapy;Liver;Low-Level Light Therapy;Oxidative Stress;Rats;Wound Healing

The effectiveness of low-level laser therapy on pain, self-reported hand function, and grip strength compared to placebo or "sham" treatment for adults with carpal tunnel syndrome: A systematic

review. BACKGROUND: Carpal tunnel syndrome (CTS) is one of the most common peripheral neuropathies in the upper extremity. OBJECTIVE: The aim of this review was to systematically and critically appraise the available literature for the effectiveness of Low-Level Laser Therapy (LLLT) on pain, self-reported hand function, and grip strength compared to placebo treatment in adults with CTS. METHODOLOGY: Seven databases were searched from 2000 to March 2015 namely: Cinahl, Cochrane Library, EBSCOhost, PEDro, PubMed, Science Direct, and Scopus. Key search terms were: CTS, LLLT, and physiotherapy. Specific inclusion and exclusion criteria were applied. The methodological quality was appraised with the PEDro scale. Data were extracted and captured on an Excel spreadsheet. RESULTS: The nine included randomized control trials (RCTs) had an average score of 8.2/11 according to the PEDro scale. The heterogeneity of the LLLT regimes used made statistical pooling inappropriate for this review and results were described narratively. CONCLUSION: No strong evidence exists concerning the effects of LLLT on CTS in adults. Studies that used 780-860 nm Lasers and energy dosages of 9-11 J/cm(2) or 10.8 J reported a more favorable outcome for pain, symptom severity, and functional ability as well as grip strength at the end of treatment and short-term follow up. Adult;Carpal Tunnel Syndrome;Female;Hand;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Placebo Effect;Randomized Controlled Trials as Topic;Recovery of Function;Research Design;Treatment Outcome

Effect of low-level light therapy on diabetic foot ulcers: a near-infrared spectroscopy study. Diabetic foot ulcer (DFU) is a diabetic complication due to peripheral vasculopathy and neuropathy. A promising technology for wound healing in DFU is low-level light therapy (LLLT). Despite several studies showing positive effects of LLLT on DFU, LLLTâ€™s physiological effects have not yet been studied. The objective of this study was to investigate vascular and nervous systems modification in DFU after LLLT. Two samples of 45 DFU patients and 11 healthy controls (HCs) were recruited. The total hemoglobin (totHb) concentration change was monitored before and after LLLT by near-infrared spectroscopy and analyzed in time and frequency domains. The spectral power of the totHb changes in the very-low frequency (VLF, 20 to 60 mHz) and low frequency (LF, 60 to 140 mHz) bandwidths was calculated. Data analysis revealed a mean increase of totHb concentration after LLLT in DFU patients, but not in HC. VLF/LF ratio decreased significantly after the LLLT period in DFU patients (indicating an increased activity of the autonomic nervous system), but not in HC. Eventually, different treatment intensities in LLLT therapy showed a different response in DFU. Overall, our results demonstrate that LLLT improves blood flow and autonomic nervous system regulation in DFU and the importance of light intensity in therapeutic protocols. Diabetic Foot;Humans;Low-Level Light Therapy;Spectroscopy, Near-Infrared;Treatment Outcome;Wound Healing

Effects of radiofrequency, electroacupuncture, and low-level laser therapy on the wrinkles and moisture content of the forehead, eyes, and cheek. [Purpose] The purpose of this study was to investigate the effects of radiofrequency (RF), electroacupuncture (EA), and low-level laser therapy (LLLT), which are used in physical therapies, on facial wrinkles and moisture. [Subjects and Methods] A total of 30 female participants aged 30-55 years participated in this study and the results will be used as a reference for further development of skin physical therapy. Thirty adult females were assigned to an LLLT (n=10), EA (n=10), or RF group (n=10). The intervention was performed in two 15-minute sessions per week for six weeks. Subjects' skin tone and pigmentation were observed before and after the intervention. [Results] Treatment of the under eye area showed that wrinkles were significantly decreased on both sides after RF, EA, and LLLT. Treatment of the eye rims indicated that wrinkles significantly decreased on the right side after RF, EA, and LLLT. [Conclusion] The application of LLLT, EA, and RF had positive effects on wrinkle and moisture content of adult women's faces.

Low level laser therapy modulates viability, alkaline phosphatase and matrix metalloproteinase-2 activities of osteoblasts. Low level laser therapy (LLLT) has been shown to stimulate bone cell

metabolism but their impact on the matrix metalloproteinase (MMP) expression and activity is little explored. This study evaluated the influence of LLLT at two different wavelengths, red and infrared, on MC3T3-E1 preosteoblast viability, alkaline phosphatase (ALP) and MMP-2 and -9 activities. To accomplish this, MC3T3-E1 cells were irradiated with a punctual application of either red (660nm; InGaAIP active medium) or infrared (780nm; GaAlAs active medium) lasers both at a potency of 20mW, energy dose of 0.08 or 0.16J, and energy density of 1.9J/cm(2) or 3.8J/cm(2), respectively. The control group received no irradiation. Cellular viability, ALP and MMP-2 and -9 activities were assessed by MTT assay, enzymatic activity and zymography, respectively, at 24, 48 and 72h. The treatment of cells with both red and infrared lasers significantly increased the cellular viability compared to the non-irradiated control group at 24 and 48h. The ALP activity was also up modulated in infrared groups at 24 and 72h, depending on the energy densities. In addition, the irradiation with red laser at the energy density of 1.9J/cm(2) promoted an enhancement of MMP-2 activity at 48 and 72h. However, no differences were observed for the MMP-9 activity. In conclusion, when used at these specific parameters, LLL modulates both preosteoblast viability and differentiation highlighted by the increased ALP and MMP-2 activities induced by irradiation. Alkaline Phosphatase;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 3T3 Cells;Alkaline Phosphatase;Animals;Cell Differentiation;Cell Survival;Humans;Infrared Rays;Lasers;Light;Low-Level Light Therapy;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Mice;Osteoblasts

LLLT actives MMP-2 and increases muscle mechanical resistance after nerve sciatic rat regeneration. The purpose of this study was to analyze the low-level laser therapy (LLLT) on metalloproteinase expression and the mechanical strength of skeletal muscle regeneration after peripheral nerve injury. Rats were subjected to crush injury of the right sciatic nerve, followed by LLLT (830Â nm, 35, 70, 140, and 280Â J/cm(2)) for 21 consecutive days. Functional gait analysis was performed at weekly intervals and the animals were sacrificed after the last evaluation at day 21 for collection of the gastrocnemius muscles, which were submitted to analysis of resistance, and the tibialis anterior, for evaluation of metalloproteinase-2 (MMP-2). The results were statistically analyzed at a significance level of 5%. The irradiated groups showed a significant decrease in the sciatic functional index and a significant increase in the mechanical strength when compared to the injured group with no treatment (pâ€‰<â€‰0.05), with no significant difference among the energy densities used. While no difference among groups was observed for the activity of MMP-2 in pro-active band, at the intermediate band, the activity was significantly higher (pâ€‰<â€‰0.05) for the groups irradiated with 35, 70, and 140Â J/cm(2), and at the active band, the activity was significantly more intense in the group irradiated with 280Â J/cm(2). The present study demonstrated that injury of the sciatic nerve, with consequent muscle denervation, are benefited by the laser therapy, which restores neuromuscular function, active MMP-2 and increases the maximum breaking strength. Matrix Metalloproteinase 2 Animals;Biomechanical Phenomena;Gait;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Muscle, Skeletal;Nerve Regeneration;Rats, Wistar;Sciatic Nerve

Impact of low-level laser therapy on hyposalivation, salivary pH, and quality of life in head and neck cancer patients post-radiotherapy. Late effects of radiotherapy for head and neck cancer treatment have been increasingly investigated due to its impact on patients' quality of life. The purpose of this study was to evaluate the effect of low-level laser therapy on hyposalivation, low salivary pH, and quality of life in head and neck cancer patients post-radiotherapy. Twenty-nine patients with radiation-induced xerostomia received laser sessions twice a week, during 3Â months (24 sessions). For this, a continuous wave Indium-Gallium-Aluminium-Phosphorus diode laser device was used punctually on the major salivary glands (808Â nm, 0.75Â W/cm(2), 30Â mW, illuminated area 0.04Â cm(2), 7.5Â J/cm(2), 10Â s, 0.3Â J). Six extraoral points were illuminated on each parotid

gland and three on each submandibular gland, as well as two intraoral points on each sublingual gland. Stimulated and unstimulated salivary flow rate, pH (two scales with different gradations), and quality of life (University Of Washington Quality of Life Questionnaire for Patients with Head and Neck Cancer) were assessed at baseline and at the end of the treatment. There were significant increases in both mean salivary flow rates (unstimulated: pâ€‰=â€‰0.0012; stimulated: pâ€‰<â€‰0.0001), mean pH values (pâ€‰=â€‰0.0002 and pâ€‰=â€‰0.0004), and mean score from the quality of life questionnaire (pâ€‰<â€‰0.0001). Low-level laser therapy seems to be effective to mitigate salivary hypofunction and increase salivary pH of patients submitted to radiotherapy for head and neck cancer, thereby leading to an improvement in quality of life. Adult;Aged;Demography;Female;Head and Neck Neoplasms;Humans;Hydrogen-Ion Concentration;Low-Level Light Therapy;Male;Middle Aged;Quality of Life;Saliva;Surveys and Questionnaires;Xerostomia

Transcranial LED therapy on amyloid-Î² toxin 25-35 in the hippocampal region of rats. Excessive AÎ² deposition in the brain is associated with the formation of senile plaques, and their diffuse distribution is related to Alzheimer's disease. Thirty rats (EG) were irradiated with light-emitting diode (photobiomodulation (PBM)) in the frontal region of the skull after being inoculated with the AÎ² toxin in the hippocampus; 30 rats were used as the control group (CG). The analysis was conducted at 7, 14, and 21Â days after irradiation. We observed a decreased in AÎ² deposits in treated animals compared with animals in the CG. The behavioral and motor assessment revealed that the EG group covered a larger ground distance and explored the open field than the CG group on days 14 and 21 (pâ€‰<â€‰0.05). The EG group was statistically significant in the spatial memory test compared to the CG group on day 14. The use of PBM significantly reduced the presence of AÎ² plaques and improved spatial memory and behavioral and motor skills in treated animals on day 21. Amyloid beta-Peptides;Peptide Fragments Amyloid beta-Peptides;Animals;Behavior, Animal;Hippocampus;Laser Therapy;Low-Level Light Therapy;Male;Motor Activity;Peptide Fragments;Rats, Wistar

Precise Spatially Selective Photothermolysis Using Modulated Femtosecond Lasers and Real-time Multimodal Microscopy Monitoring. The successful application of lasers in the treatment of skin diseases and cosmetic surgery is largely based on the principle of conventional selective photothermolysis which relies strongly on the difference in the absorption between the therapeutic target and its surroundings. However, when the differentiation in absorption is not sufficient, collateral damage would occur due to indiscriminate and nonspecific tissue heating. To deal with such cases, we introduce a novel spatially selective photothermolysis method based on multiphoton absorption in which the radiant energy of a tightly focused near-infrared femtosecond laser beam can be directed spatially by aiming the laser focal point to the target of interest. We construct a multimodal optical microscope to perform and monitor the spatially selective photothermolysis. We demonstrate that precise alteration of the targeted tissue is achieved while leaving surrounding tissue intact by choosing appropriate femtosecond laser exposure with multimodal optical microscopy monitoring in real time. Animals;Hyperthermia, Induced;Lasers;Low-Level Light Therapy;Mice, Inbred NOD;Mice, SCID;Microscopy;Multimodal Imaging;Skin

Light-based epilation device-related injury to the cornea. Adult;Corneal Injuries;Diagnosis, Differential;Face;Female;Hair Removal;Humans;Low-Level Light Therapy

Does Low-Level Laser Therapy Enhance the Efficiency of Orthodontic Dental Alignment? Results from a Randomized Pilot Study. OBJECTIVE: To assess if low-level laser therapy (LLLT) enhances the efficiency of orthodontic dental alignment. BACKGROUND: There is no evidence of the effect of LLLT on the orthodontic treatment time from randomized clinical trials. METHODS: Thirty-six subjects were included in this interventional pilot study and randomly assigned for treatment with fixed appliance

and LLLT (test group) or with fixed appliance only (control group). A single monthly administration of LLLT was performed intraorally using a Diode laser (980â€‰nm, 1â€‰W, continuous wave, total energy densityâ€‰=â€‰150â€‰J/cm(2); Doctor Smile-Lambda Spa). The date of brackets bonding (T1) and the date of complete resolution of dental crowding (T2) were recorded. The alignment treatment time was defined in days as T2 - T1. The number of monthly scheduled control visits was also recorded. Treatment time duration was assessed in both groups with the log-rank (Mantel-Cox) Test for survival analysis. Mann-Whitney U tests was used to compare the number of control visits from T1 to T2 between the two groups. RESULTS: Patients' age, sex, and amount of crowding were equally distributed between the two groups. The alignment treatment time was significantly shorter (pâ€‰<â€‰0.001) in the tested group (211.8 days) compared to the control (284.1 days). Consequently, control visits (pâ€‰<â€‰0.001) were lower in the test group (7 visits, median value) compared to the control group (9.5 visits, median value). CONCLUSIONS: The results of this pilot study suggest that the administration of LLLT might significantly increase the efficiency of orthodontic treatment during dental alignment. Adolescent;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mouth;Orthodontic Brackets;Orthodontics;Pilot Projects;Reference Values;Single-Blind Method;Statistics, Nonparametric;Tooth Movement Techniques;Treatment Outcome

[The application of the method of radiofrequency myringotomy under the experimental conditions and in the clinical practice]. Exudative otitis media is a widespread pathological condition in the human population. In the recent years, the treatment with the electric current having the frequency up to 3.8 MHz has found the increasingly frequent application, in addition to shunting and laser myringotomy, for the perforation of the tympanic membrane to facilitate removal of exudate. The objective of the present study was to evaluate the effectiveness of the application of the electric current with the frequency up to 4 MHz for myringotomy in the patients presenting with exudative otitis media under the experimental conditions and in the clinical practice. The experimental studies were carried out with the use of the isolated temporal bones (ex vivo) and laboratory animals (in vivo). The clinical studies included the surgical treatment of 41 patients presenting with exudative otitis media using the electric current with the frequency of 4 MHz and laser irradiation with the subsequent evaluation of the inflammatory manifestations in the tympanic membrane tissues during the early post-operative period. It was shown that the method of myringotomy with the application of the electric current having the frequency of 4 MHz is safe and causes no complications. Moreover, it is accompanied by the development of the minimally active inflammatory processes in the tympanic membrane tissues during the early post-operative period. Catheter Ablation;Humans;Low-Level Light Therapy;Middle Ear Ventilation;Otitis Media with Effusion;Otitis Media, Suppurative;Outcome and Process Assessment, Health Care

Treatment of dentinal hypersensitivity using low-level laser therapy and 5% potassium nitrate: A randomized, controlled, three arm parallel clinical study. AIM: The present randomized study was aimed to compare the efficacy 5% potassium nitrate (KNO(3)) toothpaste, low-level laser therapy (LLLT), and LLLT with 5% KNO(3) toothpaste in the treatment of dentinal hypersensitivity (DH). MATERIALS AND METHODS: Total of 45 patients complaining of DH with visual analog scale (VAS) score being â‰¥2 were recruited and were divided into three groups. Group A was treated with 5% KNO(3) toothpaste, Group B using LLLT along with the application of 5% KNO(3) toothpaste, and Group C using LLLT alone. VAS scores were recorded at the baseline, 1(st), 2(nd), and 3(rd) weeks by the examiner who is blinded toward the treatment. The sensitivity response was evaluated using air spray and tactile sensation (explorer). RESULTS: A greater reduction of DH was recorded at the end of 3 weeks in Group C and Group B when compared to Group A. Better results were noted in Group C at the end of the 1(st) week when compared to Group B. According to this study, there was no

additional benefit of using toothpaste along with LLLT. CONCLUSION: A greater reduction of DH was recorded at the end of 3 weeks in Group C and Group B when compared to Group A. Better results were noted in Group C at the end of the 1(st) week when compared to Group B. According to this study, there was no additional benefit of using toothpaste along with LLLT.

Interventions for the management of radiotherapy-induced xerostomia and hyposalivation: A systematic review and meta-analysis. INTRODUCTION: Salivary gland hypofunction is a common and permanent adverse effect of radiotherapy to the head and neck. Randomised trials of available treatment modalities have produced unclear results and offer little reliable guidance for clinicians to inform evidence-based therapy. We have undertaken this systematic review and meta-analysis to estimate the effectiveness of available interventions for radiotherapy-induced xerostomia and hyposalivation. METHODS: We searched MEDLINE, Cochrane Central, EMBASE, AMED, and CINAHL database through July 2016 for randomised controlled trials comparing any topical or systemic intervention to active and/or non-active controls for the treatment of radiotherapy-induced xerostomia. The results of clinically and statistically homogenous studies were pooled and meta-analyzed. RESULTS: 1732 patients from twenty studies were included in the systematic review. Interventions included systemic or topical pilocarpine, systemic cevimeline, saliva substitutes/mouthcare systems, hyperthermic humidification, acupuncture, acupuncture-like transcutaneous electrical nerve stimulation, low-level laser therapy and herbal medicine. Results from the meta-analysis, which included six studies, suggest that both cevimeline and pilocarpine can reduce xerostomia symptoms and increase salivary flow compared to placebo, although some aspects of the relevant effect size, duration of the benefit, and clinical meaningfulness remain unclear. With regard to interventions not included in the meta-analysis, we found no evidence, or very weak evidence, that they can reduce xerostomia symptoms or increase salivary flow in this population. CONCLUSIONS: Pilocarpine and cevimeline should represent the first line of therapy in head and neck cancer survivors with radiotherapy-induced xerostomia and hyposalivation. The use of other treatment modalities cannot be supported on the basis of current evidence. Humans;Radiotherapy;Randomized Controlled Trials as Topic;Salivation;Xerostomia

Photobiomodulation therapy for the management of radiation-induced dermatitis : AÂ single-institution experience of adjuvant radiotherapy in breast cancer patients after breast conserving surgery. BACKGROUND: Radiation therapy (RT) comprises aÂ key component in the treatment of breast cancer. Radiation-induced skin toxicity is the major adverse event experienced by patients; however, radiodermatitis (RD) prevention and management remains trivial. It is proven that photobiomodulation (PBM) therapy using light-emitting diode (LED) increases wound healing and depicts an anti-inflammatory effect. This single-institute study evaluates the beneficial role of PBM-LED in preventing/reducing RD during breast cancer RT. PATIENTS AND METHODS: Of 70Â consecutively treated patients, 25Â patients were treated with PBM-LED twice aÂ week prior to adjuvant 3D conformal RT after breast-conserving surgery. RD was reported using Common Toxicity Criteria for Adverse Events VersionÂ 4.0 and pain intensity using aÂ visual analog scale (VAS). For comparison, aÂ control group (nÂ = 45) received RT without PBM-LED. In addition, aÂ "matched" group (nÂ = 25) was generated from the control group based on propensity for potentially confounding variables. RESULTS: In the PBM group, 22Â patients (88%) presented gradeÂ 1 and 3 (12%) gradeÂ 2 RD. In the control group, 25Â patients (55.6%) developed gradeÂ 1 reactions, 18Â patients (40%) gradeÂ 2, and 2 (4.4%) patients gradeÂ 3 RD. Concerning pain intensity, 15Â patients (60%) of the PBM treatment arm reported no pain, 5Â patients (20%) VASÂ 2, and 5 (20%) VASÂ 3. In the control group, 13Â patients (28.9%) reported no pain, 2 (4.4%) VASÂ 1, 7 (15.6%) VASÂ 2, 9Â patients (20%) reported VASÂ 3, 12 (26.7%) patients VASÂ 4, and 2 (4.4%) patients VASÂ 5. CONCLUSION: PBM-LED therapy applied prior to RT might be effective in decreasing the

incidence and sequelae of radiation-induced skin toxicity in breast cancer patients treated with breast-conserving surgery. Adult;Aged;Aged, 80 and over;Breast Neoplasms;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Mastectomy, Segmental;Middle Aged;Radiodermatitis;Radiotherapy, Adjuvant;Radiotherapy, Conformal;Treatment Outcome

Low-power laser irradiation inhibits arecoline-induced fibrosis: an in vitro study. Oral submucous fibrosis (OSF) is a potentially malignant disorder that is characterized by a progressive fibrosis in the oral submucosa. Arecoline, an alkaloid compound of the areca nut, is reported to be a major aetiological factor in the development of OSF. Low-power laser irradiation (LPLI) has been reported to be beneficial in fibrosis prevention in different damaged organs. The aim of this study was to investigate the potential therapeutic effects of LPLI on arecoline-induced fibrosis. Arecoline-stimulated human gingival fibroblasts (HGFs) were treated with or without LPLI. The expression levels of the fibrotic marker genes alpha-smooth muscle actin (Î±-SMA) and connective tissue growth factor (CTGF/CCN2) were analysed by quantitative real-time reverse transcription polymerase chain reaction (RT-PCR) and western blots. In addition, the transcriptional activity of CCN2 was further determined by a reporter assay. The results indicated that arecoline increased the messenger RNA and protein expression of CCN2 and Î±-SMA in HGF. Interestingly, both LPLI and forskolin, an adenylyl cyclase activator, reduced the expression of arecoline-mediated fibrotic marker genes and inhibited the transcriptional activity of CCN2. Moreover, pretreatment with SQ22536, an adenylyl cyclase inhibitor, blocked LPLI's inhibition of the expression of arecoline-mediated fibrotic marker genes. Our data suggest that LPLI may inhibit the expression of arecoline-mediated fibrotic marker genes via the cAMP signalling pathway. Actins;CCN2 protein, human;Connective Tissue Growth Factor;Colforsin Actins;Areca;Blotting, Western;Cell Survival;Colforsin;Connective Tissue Growth Factor;Fibroblasts;Gingiva;Humans;In Vitro Techniques;Low-Level Light Therapy;Oral Submucous Fibrosis;Real-Time Polymerase Chain Reaction

A 1-Year Follow-Up of Post-operative Scars After the Use of a 1210-nm Laser-Assisted Skin Healing (LASH) Technology: A Randomized Controlled Trial. BACKGROUND: Laser therapies are used prophylactically for excessive scar formation. The Laser-Assisted Skin Healing treatment induces a controlled heat stress that promotes tissue regeneration. This comparative trial is the first to evaluate the performance of a new automated 1210-nm laser system, compatible with all Fitzpatrick scale phototypes. METHODS: Forty women undergoing bilateral breast reduction were enrolled in this double-blinded randomized controlled trial. The horizontal sutured incision of one breast was treated with the portable 1210-nm laser while in the operating theatre. The other breast was used as the study control. Objective measurements, subjective clinical assessments and safety evaluation were carried out over 1Â year by both clinicians and patients. RESULTS: Six weeks following surgery, better overall appearance and modified OSAS scores were reported for the laser-treated scars when compared to the control group (pÂ =Â 0.024 and pÂ =Â 0.079). This supports an early effect of the laser treatment during the inflammatory stage of the healing process. After a post-treatment period of 6Â months, there continued to be a strong tendency in favour of the laser treatment based on the subjective scores and corroborated by the objective improvement of the treated scar volume (pÂ =Â 0.038). At 1Â year, the laser-treated scars continued to improve compared to the control ones in terms of volume (pÂ =Â 0.004), surface (pÂ =Â 0.017) and roughness (pÂ =Â 0.002), and these comparatively better results were strengthened with the blind expression of patients' preference for their laser-treated scar (pÂ =Â 0.025). CONCLUSIONS: This new 1210-nm laser treatment, used as a single session performed immediately after surgery, provides significant objective and subjective improvements in scar appearance. These data can be useful when preparing patients to undergo their surgical procedure. LEVEL OF EVIDENCE I: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the

Table of Contents or the online Instructions to Authors www.springer.com/00266 . Adult;Cicatrix;Double-Blind Method;Esthetics;Female;Follow-Up Studies;France;Humans;Low-Level Light Therapy;Mammaplasty;Middle Aged;Postoperative Complications;Prospective Studies;Time Factors;Treatment Outcome;Wound Healing

Effect of laser-assisted scaling and root planing on the expression of pro-inflammatory cytokines in the gingival crevicular fluid of patients with chronic periodontitis: A systematic review. BACKGROUND: The aim of the present systematic review was to assess the efficacy of laser-assisted (low level laser therapy [LLLT], high intensity laser therapy [HILT], or antimicrobial photodynamic therapy [aPDT]) scaling and root planing (SRP) compared with SRP alone on the expression of inflammatory cytokines in the gingival crevicular (GCF) of patients with chronic periodontitis (CP). METHODS: In order to address the focused question: "What is the efficacy of SRP with and without laser and/or aPDT on the expression of pro-inflammatory cytokines in the GCF of patients with CP?" an electronic search without time or language restrictions was conducted up to and including February 2017 in indexed databases using various key words. RESULTS: Twenty-two randomized control trials were included in the present systematic review. Nine studies and six studies assessed the efficacy of LLLT and HILT, as adjunct to SRP, respectively. Seven studies assessed the efficacy of aPDT as adjunct to SRP on down-regulating the expression of pro-inflammatory cytokines in the GCF among patients with CP. The outcomes of the studies included based upon the reduction in the levels of pro-inflammatory cytokines were inconsistent. CONCLUSION: The role of laser-assisted SRP on the expression of pro-inflammatory cytokines in the GCF of patients with CP remains unclear. Further long term and well-designed randomized clinical trials are needed in this regard. Cytokines Chronic Disease;Combined Modality Therapy;Cytokines;Dental Scaling;Evidence-Based Medicine;Gingival Crevicular Fluid;Humans;Laser Therapy;Periodontitis;Photochemotherapy;Prevalence;Treatment Outcome

The potential of transcranial photobiomodulation therapy for treatment of major depressive disorder. Major depressive disorder is a common debilitating mood disorder that affects quality of life. Prefrontal cortex abnormalities, an imbalance in neurotransmitters, neuroinflammation, and mitochondrial dysfunction are the major factors in the etiology of major depressive disorder. Despite the efficacy of pharmacotherapy in the treatment of major depressive disorder, 30%-40% of patients do not respond to antidepressants. Given this, exploring the alternative therapies for treatment or prevention of major depressive disorder has aroused interest among scientists. Transcranial photobiomodulation therapy is the use of low-power lasers and light-emitting diodes in the far-red to near-infrared optical region for stimulation of neuronal activities. This non-invasive modality improves the metabolic capacity of neurons due to more oxygen consumption and ATP production. Beneficial effects of transcranial photobiomodulation therapy in the wide range of neurological and psychological disorders have been already shown. In this review, we focus on some issue relating to the application of photobiomodulation therapy for major depressive disorder. There is some evidence that transcranial photobiomodulation therapy using near-infrared light on 10-Hz pulsed mode appears to be a hopeful technique for treatment of major depressive disorder. However, further studies are necessary to find the safety of this method and to determine its effective treatment protocol. Animals;Depressive Disorder, Major;Humans;Infrared Rays;Low-Level Light Therapy

Experimental burns: Comparison between silver sulfadiazine and photobiomodulation. OBJECTIVE: To analyze morphological characteristics and organization of the collagen fibers of third degree burns from scalding compared to laser therapy and silver sulfadiazine, the latter considered as the gold standard. METHOD: Were selected 12 animals (Rattus norvegicus) also divided into three groups (control group [CG] - untreated burns; sulfadiazine group [SG] - burns were treated with silver

sulfadiazine at 1%; laser group [LG] - burns were treated with photobiomodulation). The scald burns were carried out by using PVC mold, and the material collected on the 14th day after burn was prepared for morphological and optical retardation analysis for evaluation of inflammatory infiltrates and collagen organization, respectively. RESULTS: On the 14th day, the laser and sulfadiazine groups had mild inflammatory response, while the control group showed an intense inflammatory process, with statistical significance between laser and control groups, but not between sulfadiazine and control groups. Laser and sulfadiazine groups no longer had granulation tissue, opposite to what was seen in the control group. The presence of hair follicles and ulcer did not significantly differ between groups. The optical retardation of collagen fibers was higher in sulfadiazine group, followed by laser and control groups. As for systemic effect, we were able to identify it by simply analyzing the presence or absence of granulation tissue. CONCLUSION: Morphologically, the laser or silver sulfadiazine treatments were similar and both provided better organization of collagen fibers in relation to the untreated group. However, the sulfadiazine group modulated the deposition of collagen fibers more efficiently than the laser group. Collagen;Silver Sulfadiazine Animals;Burns;Collagen;Disease Models, Animal;Female;Low-Level Light Therapy;Rats;Silver Sulfadiazine;Time Factors;Wound Healing

Treating cognitive impairment with transcranial low level laser therapy. This report examines the potential of low level laser therapy (LLLT) to alter brain cell function and neurometabolic pathways using red or near infrared (NIR) wavelengths transcranially for the prevention and treatment of cognitive impairment. Although laser therapy on human tissue has been used for a number of medical conditions since the late 1960s, it is only recently that several clinical studies have shown its value in raising neurometabolic energy levels that can improve cerebral hemodynamics and cognitive abilities in humans. The rationale for this approach, as indicated in this report, is supported by growing evidence that neurodegenerative damage and cognitive impairment during advanced aging is accelerated or triggered by a neuronal energy crisis generated by brain hypoperfusion. We have previously proposed that chronic brain hypoperfusion in the elderly can worsen in the presence of one or more vascular risk factors, including hypertension, cardiac disease, atherosclerosis and diabetes type 2. Although many unanswered questions remain, boosting neurometabolic activity through non-invasive transcranial laser biostimulation of neuronal mitochondria may be a valuable tool in preventing or delaying age-related cognitive decline that can lead to dementia, including its two major subtypes, Alzheimer's and vascular dementia. The technology to achieve significant improvement of cognitive dysfunction using LLLT or variations of this technique is moving fast and may signal a new chapter in the treatment and prevention of neurocognitive disorders. Aged;Aged, 80 and over;Brain;Cognitive Dysfunction;Dementia;Humans;Low-Level Light Therapy;Mitochondria;Neurons

Do TMJ symptoms improve and last across time after treatment with red (660 nm) and infrared (790 nm) low level laser treatment (LLLT)? A survival analysis. OBJECTIVE: Temporomandibular disorder (TMD) is a variety of clinical problems that originate from the area of the temporomandibular joint (TMJ), masticatory muscles, and surrounding tissues. There are different treatment options; however, there is no evidence that low level laser treatment (LLLT) will last about six months. The aim of this study was to determine the survival rate of treatment with red (660Â nm) and infrared (790Â nm) laser in cases of TMDs. METHODS: In 19 subjects, one side of the face (half face) was randomly selected to receive intervention, in a total of 116 sensitive points. Pain was measured at baseline and time intervals of 24Â h, 30, 90, and 180Â days after treatment. Laser irradiation with 4Â j/cmÂ² in the TMJs and 8Â j/cmÂ² in the muscles was used in three sessions. Kaplan-Meier survival analysis and logistic regression were performed. RESULTS: Both treatments showed statistically significant results (pÂ <Â 0.001). The survival rate for red and infrared laser was

0.24 and 0.30, respectively, at 180Â days. Grinding teeth and headache were associated with recurrent pain. DISCUSSION: Both lasers were effective in the treatment of TMD symptoms and had a low survival rate at 180Â days. Adult;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Survival Analysis;Temporomandibular Joint Disorders;Treatment Outcome

Mechanisms and Effects of Transcranial Direct Current Stimulation. The US Air Force Office of Scientific Research convened a meeting of researchers in the fields of neuroscience, psychology, engineering, and medicine to discuss most pressing issues facing ongoing research in the field of transcranial direct current stimulation (tDCS) and related techniques. In this study, we present opinions prepared by participants of the meeting, focusing on the most promising areas of research, immediate and future goals for the field, and the potential for hormesis theory to inform tDCS research. Scientific, medical, and ethical considerations support the ongoing testing of tDCS in healthy and clinical populations, provided best protocols are used to maximize safety. Notwithstanding the need for ongoing research, promising applications include enhancing vigilance/attention in healthy volunteers, which can accelerate training and support learning. Commonly, tDCS is used as an adjunct to training/rehabilitation tasks with the goal of leftward shift in the learning/treatment effect curves. Although trials are encouraging, elucidating the basic mechanisms of tDCS will accelerate validation and adoption. To this end, biomarkers (eg, clinical neuroimaging and findings from animal models) can support hypotheses linking neurobiological mechanisms and behavioral effects. Dosage can be optimized using computational models of current flow and understanding dose-response. Both biomarkers and dosimetry should guide individualized interventions with the goal of reducing variability. Insights from other applied energy domains, including ionizing radiation, transcranial magnetic stimulation, and low-level laser (light) therapy, can be prudently leveraged.

Application of Diode Laser in the Treatment of Dentine Hypersensitivity. INTRODUCTION: Dentine hypersensitivity is characterized by acute, sharp pain arising from the exposed dentine, most commonly in response to thermal, tactile, or chemical stimuli, and which cannot be linked to any other pathological changes in the tooth or the environment. Therapy uses various impregnating agents in the form of solutions or gels and, in more recent times, laser. AIM: The aim of this research was to examine the effects of treatment of hypersensitive dental cervix with diode laser. MATERIALS AND METHODS: The study included 18 patients with 82 sensitive teeth. The degree of dentine hypersensitivity was evaluated by visual analogue scale (VAS), and the treatment was carried out by application of low-power diode laser over the span of three visits, which depended on the initial sensitivity. RESULTS: There is a significant difference in VAS values measured at the onset of treatment (baseline) and immediately after the first laser treatment (t=9.275; p=0.000), after 7 days, after the second laser treatment (14 days) (t=7.085, p=0.000), as well as after 14 days and the third laser treatment (t=5.517, p=0.000), which confirms the effectiveness of this therapeutic procedure. The results showed a reduction of hypersensitivity in response to tactile stimulus with a probe after the third treatment, even with teeth whose value on the VAS was very high at the beginning of treatment (baseline). CONCLUSION: Within the scope of the conducted study, laser therapy has provided extremely safe and effective results in the treatment of cervical dentine hypersensitivity. Adult;Dentin Sensitivity;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Treatment Outcome

The alpha-herpesviridae in dermatology : Varicella zoster virus. The second part of this publication deals with varicella zoster virus (VZV) and presents an overview of new, rare, and atypical clinical manifestations, including photolocalized varicella, hemorrhagic bullae during varicella, the implication of VZV in immunoglobulinÂ AÂ vasculitis, VZV-related alopecia, ulcerative varicella skin lesions, childhood herpes zoster (HZ), prolonged prodromal pains, recurrent HZ, VZV implication in

burning mouth syndrome, verruciform VZV lesions, the significance of satellite lesions during HZ, and late HZ complications, either neurological or internal. Furthermore, certain associations between the occurrence of HZ and subsequent internal pathologies, as well as risk factors for HZ and new developments in vaccination against HZ will be addressed. FV-100;Herpes Zoster Vaccine;Organophosphonates;Pyrimidine Nucleosides;brincidofovir;Cytosine Adult;Child;Child, Preschool;Cytosine;Herpes Zoster Vaccine;Herpesvirus 3, Human;Humans;Infant;Low-Level Light Therapy;Middle Aged;Organophosphonates;Pyrimidine Nucleosides;Recurrence;Risk Factors;Varicella Zoster Virus Infection;Virulence

The Efficacy and Safety of 660 nm and 411 to 777 nm Light-Emitting Devices for Treating Wrinkles. BACKGROUND: Low-level light therapy (LLLT) using light-emitting diodes (LEDs) is considered to be helpful for skin regeneration and anti-inflammation. OBJECTIVE: To evaluate the efficacy and safety of 2 types of LLLTs using 660 nm-emitting red LEDs and 411 to 777 nm-emitting white LEDs in the treatment of facial wrinkles. MATERIALS AND METHODS: A prospective, randomized, double-blinded, comparative clinical trial involving 52 adult female subjects was performed. The faces of the subjects were irradiated daily with 5.17 J of red or white LEDs for 12 weeks. RESULTS: In both groups treated with red and white LEDs, the wrinkle measurement from skin replica improved significantly from baseline at Week 12. The red LED group showed slightly better improvement, but there were no statistical differences. In assessments by blinded dermatologists, no significant differences were observed in both groups. In the global assessment of the subjects, the mean improvement score of the red LED group was higher than that of the white LED group. CONCLUSION: Low-level light therapy using 660 nm LEDs or 411 to 777 nm LEDs significantly improved periocular wrinkles. Especially, 660 nm LEDs could be an effective and tolerable treatment option for wrinkles. Adult;Aged;Double-Blind Method;Equipment Safety;Female;Humans;Light;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Skin Aging;Treatment Outcome

Low-Level Laser Application in the Early Myocardial Infarction Stage Has No Beneficial Role in Heart Failure. Low-level laser therapy (LLLT) has been targeted as a promising approach that can mitigate post-infarction cardiac remodeling. There is some interesting evidence showing that the beneficial role of the LLLT could persist long-term even after the end of the application, but it remains to be systematically evaluated. Therefore, the present study aimed to test the hypothesis that LLLT beneficial effects in the early post-infarction cardiac remodeling could remain in overt heart failure even with the disruption of irradiations. Female Wistar rats were subjected to the coronary occlusion to induce myocardial infarction or Sham operation. A single LLLT application was carried out after 60 s and 3 days post-coronary occlusion, respectively. Echocardiography was performed 3 days and at the end of the experiment (5 weeks) to evaluate cardiac function. After the last echocardiographic examination, LV hemodynamic evaluation was performed at baseline and on sudden afterload increases. Compared with the Sham group, infarcted rats showed increased systolic and diastolic internal diameter as well as a depressed shortening fraction of LV. The only benefit of the LLLT was a higher shortening fraction after 3 days of infarction. However, treated-LLLT rats show a lower shortening fraction in the 5th week of study when compared with Sham and non-irradiated rats. A worsening of cardiac function was confirmed in the hemodynamic analysis as evidenced by the higher LV end-diastolic pressure and lower +dP/dt and -dP/dt with five weeks of study. Cardiac functional reserve was also impaired by infarction as evidenced by an attenuated response of stroke work index and cardiac output to a sudden afterload stress, without LLLT repercussions. No significant differences were found in the myocardial expression of Akt(1)/VEGF pathway. Collectively, these findings illustrate that LLLT improves LV systolic function in the early post-infarction cardiac remodeling. However, this beneficial effect may be dependent on the maintenance of phototherapy.

Long-term studies with LLLT application are needed to establish whether these effects ultimately translate into improved cardiac remodeling.
Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. DESCRIPTION: The American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. METHODS: Using the ACP grading system, the committee based these recommendations on a systematic review of randomized, controlled trials and systematic reviews published through April 2015 on noninvasive pharmacologic and nonpharmacologic treatments for low back pain. Updated searches were performed through November 2016. Clinical outcomes evaluated included reduction or elimination of low back pain, improvement in back-specific and overall function, improvement in health-related quality of life, reduction in work disability and return to work, global improvement, number of back pain episodes or time between episodes, patient satisfaction, and adverse effects. TARGET AUDIENCE AND PATIENT POPULATION: The target audience for this guideline includes all clinicians, and the target patient population includes adults with acute, subacute, or chronic low back pain. RECOMMENDATION 1: Given that most patients with acute or subacute low back pain improve over time regardless of treatment, clinicians and patients should select nonpharmacologic treatment with superficial heat (moderate-quality evidence), massage, acupuncture, or spinal manipulation (low-quality evidence). If pharmacologic treatment is desired, clinicians and patients should select nonsteroidal anti-inflammatory drugs or skeletal muscle relaxants (moderate-quality evidence). (Grade: strong recommendation). RECOMMENDATION 2: For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment with exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction (moderate-quality evidence), tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation (low-quality evidence). (Grade: strong recommendation). RECOMMENDATION 3: In patients with chronic low back pain who have had an inadequate response to nonpharmacologic therapy, clinicians and patients should consider pharmacologic treatment with nonsteroidal anti-inflammatory drugs as first-line therapy, or tramadol or duloxetine as second-line therapy. Clinicians should only consider opioids as an option in patients who have failed the aforementioned treatments and only if the potential benefits outweigh the risks for individual patients and after a discussion of known risks and realistic benefits with patients. (Grade: weak recommendation, moderate-quality evidence). Analgesics Acupuncture Therapy;Acute Pain;Analgesics;Chronic Pain;Hot Temperature;Humans;Laser Therapy;Low Back Pain;Mind-Body Therapies;Physical Therapy Modalities;Psychotherapy
Nonsurgical Laser Treatment (NSLT) of Central and Peripheral Nervous System Injuries. Humans;Low-Level Light Therapy;Peripheral Nerve Injuries;Spinal Cord Injuries
Prospective, open-label, rater-blinded and self-controlled pilot study of the treatment of proliferating superficial infantile hemangiomas with 0.5% topical timolol cream versus 595-nm pulsed dye laser. Topical timolol and 595-nm pulsed dye laser (PDL) are both widely used in the treatment of superficial infantile hemangiomas (IH). However, to date, there is no reliable study comparing the therapeutic outcomes between the two treatment options. We designed the present study to evaluate and compare the efficacy and safety of timolol cream and PDL in the treatment of superficial proliferating IH. Twenty-one patients with superficial IH were included in the study. Each lesion was divided into two regions; one part was treated with 0.5% topical timolol cream four times daily, and the other part was treated monthly with PDL. Both treatments were continued for 2-6 months. Five independent and blinded assessors were asked to judge the results in both the topical timolol-treated and PDL-treated parts by comparing photographs taken before and after treatment. Both treatments

resulted in significant clinical improvements after 3.39 sessions in the 2-month follow up. The average visual evaluation showed that PDL had significantly better results than topical timolol (6.55 Â± 2.26 to 4.98 Â± 2.92, P < 0.01). No patients experienced permanent side-effects during the treatment. Our short-term study revealed that PDL had better results compared with topical timolol cream application in the treatment of superficial proliferating IH. Further studies with longer follow-up time and larger sample size are required to validate our findings. Adrenergic beta-Antagonists;Timolol Administration, Cutaneous;Adrenergic beta-Antagonists;Female;Hemangioma;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Pilot Projects;Prospective Studies;Timolol

Comparison of laser and ozone treatments on oral mucositis in an experimental model. Oral mucositis (OM) induces severe pain and limits fundamental life behaviors such as eating, drinking, and talking for patients receiving chemotherapy or radiotherapy. In addition, through opportunistic microorganisms, OM frequently leads to systemic infection which then leads to prolonged hospitalization. Severe lesions often adversely affect curative effects in cancer cases. Therefore, the control of OM is important for oral health quality of life and prognosis. Low-level laser therapy (LLLT) and ozone may be useful to accelerate wound healing. In this study, 24 Sprague-Dawley rats were divided into three groups as control, ozone, and laser groups. All groups received 5-fluorouracil intraperitoneally and trauma to the mouth pouch with a needle. After the formation of OM in the mouth, the control group had no treatment; the ozone group was administered ozone, and the laser group, LLLT. Then, all groups were sacrificed and basic fibroblast growth factor (bFGF), transforming growth factor (TGF-Î²), and platelet-derived growth factor (PDGF) were evaluated in all groups. LLLT was determined to be statistically significantly more effective than ozone on FGF and PDGF. However, in respect of TGF-Î², no statistically significant difference was observed between the groups. In conclusion, within the limitations of this study, LLLT is more effective than ozone. However, further studies on this subject are required. Ozone Animals;Disease Models, Animal;Lasers;Low-Level Light Therapy;Male;Ozone;Rats, Sprague-Dawley;Stomatitis;Wound Healing

Erratum to: Titanium scaffold osteogenesis in healthy and osteoporotic rats is improved by the use of low-level laser therapy (GaAlAs).

Biochemical changes on the repair of surgical bone defects grafted with biphasic synthetic micro-granular HA + Î²-tricalcium phosphate induced by laser and LED phototherapies and assessed by Raman spectroscopy. This work aimed the assessment of biochemical changes induced by laser or LED irradiation during mineralization of a bone defect in an animal model using a spectral model based on Raman spectroscopy. Six groups were studied: clot, laser (Î»â€‰=â€‰780Â nm; 70Â mW), LED (Î»â€‰=â€‰850â€‰Â±â€‰10Â nm; 150Â mW), biomaterial (biphasic synthetic micro-granular hydroxyapatite (HA) + Î²-tricalcium phosphate), biomaterial + laser, and biomaterial + LED. When indicated, defects were further irradiated at a 48-h interval during 2Â weeks (20Â J/cm(2) per session). At the 15th and 30th days, femurs were dissected and spectra of the defects were collected. Raman spectra were submitted to a model to estimate the relative amount of collagen, phosphate HA, and carbonate HA by using the spectra of pure collagen and biomaterials composed of phosphate and carbonate HA, respectively. The use of the biomaterial associated to phototherapy did not change the collagen formation at both 15 and 30Â days. The amount of carbonate HA was not different in all groups at the 15th day. However, at the 30th day, there was a significant difference (ANOVA, pâ€‰=â€‰0.01), with lower carbonate HA for the group biomaterial + LED compared to biomaterial (pâ€‰<â€‰0.05). The phosphate HA was higher in the groups that received biomaterial grafts at the 15th day compared to clot (significant for the biomaterial; pâ€‰<â€‰0.01). At the 30th day, the phosphate HA was higher for the group biomaterial + laser, while this was lower for all the other groups. These results indicated that the use of laser phototherapy improved the repair of bone defects grafted with the biomaterial by increasing the deposition of phosphate HA.

Biocompatible Materials;Hydroxyapatites;hydroxyapatite-beta tricalcium phosphate;Collagen Analysis of Variance;Animals;Biocompatible Materials;Bone and Bones;Collagen;Hydroxyapatites;Linear Models;Low-Level Light Therapy;Male;Rats, Wistar;Spectrum Analysis, Raman;Wound Healing

Effects of Near-Infrared Light on Cerebral Bioenergetics Measured with Phosphorus Magnetic Resonance Spectroscopy. OBJECTIVE: Cerebral photobiomodulation (PBM) improves mood and cognition. Cerebral metabolic enhancement is a mechanism proposed to underlie PBM effects. No PBM studies to date have applied phosphorus magnetic resonance spectroscopy ((31)P MRS), which can be used to assess metabolic intermediates such as phosphocreatine (PCr) and adenosine triphosphate, the latter of which is elevated by PBM. Accordingly, we used 9.4 Tesla (31)P MRS to characterize effects of single and repeat cerebral PBM treatments on metabolism. PBM was delivered to healthy adult beagles in the form of transcranial laser treatment (TLT) at a wavelength of 808â€‰nm, which passes safely through the skull and activates cytochrome C oxidase, a mitochondrial respiratory chain enzyme. METHODS: Isoflurane-anesthetized subjects (nâ€‰=â€‰4) underwent a baseline (31)P MRS scan followed by TLT applied sequentially for 2â€‰min each to anterior and posterior cranium midline locations, to irradiate the dorsal cortex. Subjects then underwent (31)P MRS scans for 2â€‰h to assess acute TLT effects. After 2 weeks of repeat TLT (3 times/week), subjects were scanned again with (31)P MRS to characterize effects of repeat TLT. RESULTS: TLT did not induce acute (31)P MRS changes over the course of 2â€‰h in either scan session. However, after repeat TLT, the baseline PCr/Î²-nucleoside triphosphate ratio was higher than the scan 1 baseline (pâ€‰<â€‰0.0001), an effect attributable to increased PCr level (pâ€‰<â€‰0.0001). CONCLUSIONS: Our findings are consistent with reports that bioenergetic effects of PBM can take several hours to evolve. Thus, in vivo (31)P MRS may be useful for characterizing bioenergetic effects of PBM in brain and other tissues. Phosphorus Isotopes Animals;Brain;Disease Models, Animal;Dogs;Energy Metabolism;Female;Low-Level Light Therapy;Magnetic Resonance Spectroscopy;Phosphorus Isotopes;Random Allocation;Sensitivity and Specificity;Spectroscopy, Near-Infrared

Significant Improvement in Cognition in Mild to Moderately Severe Dementia Cases Treated with Transcranial Plus Intranasal Photobiomodulation: Case Series Report. OBJECTIVE: This study investigated whether patients with mild to moderately severe dementia or possible Alzheimer's disease (AD) with Mini-Mental State Exam (MMSE) Baseline scores of 10-24 would improve when treated with near-infrared photobiomodulation (PBM) therapy. BACKGROUND: Animal studies have presented the potential of PBM for AD. Dysregulation of the brain's default mode network (DMN) has been associated with AD, presenting the DMN as an identifiable target for PBM. MATERIALS AND METHODS: The study used 810â€‰nm, 10â€‰Hz pulsed, light-emitting diode devices combining transcranial plus intranasal PBM to treat the cortical nodes of the DMN (bilateral mesial prefrontal cortex, precuneus/posterior cingulate cortex, angular gyrus, and hippocampus). Five patients with mild to moderately severe cognitive impairment were entered into 12 weeks of active treatment as well as a follow-up no-treatment, 4-week period. Patients were assessed with the MMSE and Alzheimer's Disease Assessment Scale (ADAS-cog) tests. The protocol involved weekly, in-clinic use of a transcranial-intranasal PBM device; and daily at-home use of an intranasal-only device. RESULTS: There was significant improvement after 12 weeks of PBM (MMSE, pâ€‰<â€‰0.003; ADAS-cog, pâ€‰<â€‰0.023). Increased function, better sleep, fewer angry outbursts, less anxiety, and wandering were reported post-PBM. There were no negative side effects. Precipitous declines were observed during the follow-up no-treatment, 4-week period. This is the first completed PBM case series to report significant, cognitive improvement in mild to moderately severe dementia and possible AD cases. CONCLUSIONS: Results suggest that larger, controlled studies are warranted. PBM

shows potential for home treatment of patients with dementia and AD. Aged;Aged, 80 and over;Alzheimer Disease;Female;Humans;Low-Level Light Therapy;Male;Neuropsychological Tests;Prognosis;Risk Assessment;Sampling Studies;Severity of Illness Index;Treatment Outcome

A Role for Photobiomodulation in the Prevention of Myocardial Ischemic Reperfusion Injury: A Systematic Review and Potential Molecular Mechanisms. Myocardial ischemia reperfusion injury is a negative pathophysiological event that may result in cardiac cell apoptosis and is a result of coronary revascularization and cardiac intervention procedures. The resulting loss of cardiomyocyte cells and the formation of scar tissue, leads to impaired heart function, a major prognostic determinant of long-term cardiac outcomes. Photobiomodulation is a novel cardiac intervention that has displayed therapeutic effects in reducing myocardial ischemia reperfusion related myocardial injury in animal models. A growing body of evidence supporting the use of photobiomodulation in myocardial infarct models has implicated multiple molecular interactions. A systematic review was conducted to identify the strength of the evidence for the therapeutic effect of photobiomodulation and to summarise the current evidence as to its mechanisms. Photobiomodulation in animal models showed consistently positive effects over a range of wavelengths and application parameters, with reductions in total infarct size (up to 76%), decreases in inflammation and scarring, and increases in tissue repair. Multiple molecular pathways were identified, including modulation of inflammatory cytokines, signalling molecules, transcription factors, enzymes and antioxidants. Current evidence regarding the use of photobiomodulation in acute and planned cardiac intervention is at an early stage but is sufficient to inform on clinical trials.
Antioxidants;Biomarkers;Cytokines;Inflammation Mediators;Intercellular Signaling Peptides and Proteins Animals;Antioxidants;Bias;Biomarkers;Cytokines;Cytoskeleton;Dose-Response Relationship, Radiation;Humans;Inflammation Mediators;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mitochondria;Myocardial Reperfusion Injury;Oxidation-Reduction;Risk;Signal Transduction;Time Factors

Up-regulation of cerebral cytochrome-c-oxidase and hemodynamics by transcranial infrared laser stimulation: A broadband near-infrared spectroscopy study. Transcranial infrared laser stimulation (TILS) is a noninvasive form of brain photobiomulation. Cytochrome-c-oxidase (CCO), the terminal enzyme in the mitochondrial electron transport chain, is hypothesized to be the primary intracellular photoacceptor. We hypothesized that TILS up-regulates cerebral CCO and causes hemodynamic changes. We delivered 1064-nm laser stimulation to the forehead of healthy participants (nâ€‰=â€‰11), while broadband near-infrared spectroscopy was utilized to acquire light reflectance from the TILS-treated cortical region before, during, and after TILS. Placebo experiments were also performed for accurate comparison. Time course of spectroscopic readings were analyzed and fitted to the modified Beer-Lambert law. With respect to the placebo readings, we observed (1) significant increases in cerebral concentrations of oxidized CCO (Î”[CCO]; >0.08â€‰ÂµM; pâ€‰<â€‰0.01), oxygenated hemoglobin (Î”[HbO]; >0.8â€‰ÂµM; pâ€‰<â€‰0.01), and total hemoglobin (Î”[HbT]; >0.5â€‰ÂµM; pâ€‰<â€‰0.01) during and after TILS, and (2) linear interplays between Î”[CCO] versus Î”[HbO] and between Î”[CCO] versus Î”[HbT]. Ratios of Î”[CCO]/Î”[HbO] and Î”[CCO]/Î”[HbT] were introduced as TILS-induced metabolic-hemodynamic coupling indices to quantify the coupling strength between TILS-enhanced cerebral metabolism and blood oxygen supply. This study provides the first demonstration that TILS causes up-regulation of oxidized CCO in the human brain, and contributes important insight into the physiological mechanisms. Oxyhemoglobins;Electron Transport Complex IV Adult;Brain;Electron Transport Complex IV;Energy Metabolism;Equipment Design;Hemodynamics;Humans;Infrared Rays;Low-Level Light Therapy;Neuroprotection;Oxidation-Reduction;Oxyhemoglobins;Spectroscopy, Near-Infrared;Up-Regulation;Young Adult

Low-Level Laser Effect on Proliferation, Migration, and Antiapoptosis of Mesenchymal Stem Cells. Mesenchymal stem cells (MSCs) have been proved to be an important element in cell-based therapy. Photobiomodulation used extremely low-level lasers (LLLs) to affect the behavior of cells. The effect mechanism of LLLs on MSCs from human remained to be discovered. In this study, cell viability was assessed using MTS assays and cell cycle was evaluated by fluorescence-activated cell sorting (FACS). The influence of LLLs on mitochondrial biogenesis (fission or fusion) and function (ATP, reactive oxygen species [ROS], nitric oxide [NO]) was evaluated by transmission electron microscope, FACS, quantitative real time polymerase chain reaction (q-PCR), and immunocytochemistry. Cell migration and cytoskeleton alteration (actin and tubulin) were evaluated using transwell assay, immunocytochemistry, enzyme-linked immunosorbent assay, and western blotting. Cell apoptosis was evaluated using FACS, immunocytochemistry, and western blotting. We investigated that certain influence of LLLs on MSCs in vitro 6 or 24â€‰h after 1â€‰h of LLL irradiation. The mechanism of the effects included proliferation rate increase mediated by increased S phase proportion; mitochondrial biogenesis and function alteration mediated by fusion (Mfn1, Mfn2, and Opa-1) and fission (Fis1, Drp-1, and MTP18)-related proteins, NRF1, TFAM, PGC-1a, and upregulated intracellular ROS and NO concentration; migration acceleration through the ERK1/2 and FAK pathway and upregulation of growth factors such as HGF and PDGF; and resistance to apoptosis with increased Bcl-2 and decreased Bax, or through tunneling nanotube formation between LLL-treated MSCs and 5-fluorouracil-induced apoptotic MSCs. These observations suggested that LLLs enhanced stem cell survival and therapeutic function, which could appear to be an innovative pretreatment in the application of MSCs. Adipose Tissue;Apoptosis;Cell Movement;Cell Proliferation;Cells, Cultured;Cytoskeleton;Humans;Lasers;Light;Low-Level Light Therapy;Mesenchymal Stem Cells;Mitochondria

Efficacy of iontophoresis-assisted ablative fractional laser photodynamic therapy with short incubation time for the treatment of actinic keratosis: 12-month follow-up results of a prospective, randomised, comparative trial. BACKGROUND: Iontophoresis is a transdermal drug-delivery technique that enhances the transport of ionic species across membranes and may have significant benefit for the treatment of actinic keratosis (AK) by ablative fractional laser-primed photodynamic therapy (AFL-PDT). The aims of this study were to compare the efficacy, recurrence rate, cosmetic outcome and safety of iontophoresis-assisted AFL-PDT with 2h of incubation vs. those of conventional AFL-PDT with 2- and 3-h incubation in patients with facial and scalp AK. METHODS: Patients were randomly assigned to iontophoresis-assisted AFL-PDT with a 2-h incubation time (group A) and conventional AFL-PDT with a 2-h (group B) and 3-h (group C) incubation time. All patients underwent AFL-PDT, and group A patients were assigned to treatment with iontophoresis after methyl-aminolevulinate (MAL) application. After 2 or 3h, MAL-applied lesions were irradiated using a red light. Patients were followed up at 1-week, 3 months and 12 months after treatment. Efficacy, cosmetic outcomes and adverse events were assessed. RESULTS: In total, 41 patients (160 AK lesions) completed the study and were evaluated. Efficacy was significantly higher in Group A (88.7%) than in Group B (73.2%); the efficacy of groups A and C (92.2%) at 3 months follow-up was comparable. The recurrence rates were not significantly different between the groups at 12 months (P=0.841). The three groups did not differ in terms of cosmetic outcomes and safety. CONCLUSIONS: Iontophoresis-assisted AFL-PDT showed higher efficacy than AFL-PDT with short incubation time. Iontophoresis may effectively reduce the incubation time in AFL-PDT. Photosensitizing Agents Aged;Combined Modality Therapy;Dose Fractionation, Radiation;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Humans;Iontophoresis;Keratosis, Actinic;Laser Therapy;Longitudinal Studies;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Single-Blind Method;Treatment Outcome

Evaluation of therapeutic laser influences on the healing of third-degree burns in rats according to different wavelengths. INTRODUCTION: One of the most important innovative methods for tissue repair promotion is therapeutic lasers with photobiomodulution effects. The aim of this study was to investigate the effect of four different wavelengths of therapeutic laser (405, 532, 660 and 810 nm) on healing of third-degree burns from both clinical and pathological standpoints in rats. MATERIALS AND METHODS: 60 male Wistar rats were used. Animals were anesthetized and dorsal hairs were shaved and third-degree skin burns were created by use of a 95Â°C copper stamp. Lesions were irradiated with 1.5 J/cm(2) energy densities and 200 mW/cm(2) power densities. RESULTS: Statistical analyses of the "wound contraction" changes between five groups during the study showed more reduction in wound size in all laser groups in comparison with the control group; but these differences were not statistically significant except between red and blue lasers on the last day of experiment. DISCUSSION: Results of our study showed that using therapeutic lasers with green, blue, red, and infrared wavelengths may accelerate healing process. This trend is more obvious in red and infrared groups especially after acute phase, however, this effect was neither statistically nor clinically significant. Photosensitizing Agents Animals;Burns;Infrared Rays;Low-Level Light Therapy;Male;Photosensitizing Agents;Rats;Rats, Wistar;Wound Healing

Development and application of LED arrays for use in phototherapy research. Lasers/LEDs demonstrate therapeutic effects for a range of biomedical applications. However, a consensus on effective light irradiation parameters and efficient and reliable measurement techniques remain limited. The objective here is to develop, characterise and demonstrate the application of LED arrays in order to progress and improve the effectiveness and accuracy of in vitro photobiomodulation studies. 96-well plate format LED arrays (400-850 nm) were developed and characterised to accurately assess irradiance delivery to cell cultures. Human dental pulp cells (DPCs) were irradiated (3.5-142Â mW/cm(2) : 15-120Â s) and the biological responses were assessed using MTT assays. Array calibration was confirmed using a range of optical and analytical techniques. Multivariate analysis of variance revealed biological responses were dependent on wavelength, exposure time and the post-exposure assay time (PÂ <Â 0.05). Increased MTT asbsorbance was measured 24Â h post-irradiation for 30 s exposures of 3.5Â mW/cm(2) at 470, 527, 631, 655, 680, 777, 798 and 826Â nm with distinct peaks at 631Â nm and 798Â nm (PÂ <Â 0.05). Similar wavelengths were also effective at higher irradiances (48-142Â mW/cm(2)). LED arrays and high throughput assays provide a robust and reliable platform to rapidly identify irradiation parameters which is both time- and cost-effective. These arrrays are applicable in photobiomodulation, photodynamic therapy and other photobiomedical research. Electrical Equipment and Supplies;Phototherapy

Low-level light emitting diode (LED) therapy suppresses inflammasome-mediated brain damage in experimental ischemic stroke. Use of photostimulation including low-level light emitting diode (LED) therapy has broadened greatly in recent years because it is compact, portable, and easy to use. Here, the effects of photostimulation by LED (610Â nm) therapy on ischemic brain damage was investigated in mice in which treatment started after a stroke in a clinically relevant setting. The mice underwent LED therapy (20Â min) twice a day for 3 days, commencing at 4 hours post-ischemia. LED therapy group generated a significantly smaller infarct size and improvements in neurological function based on neurologic test score. LED therapy profoundly reduced neuroinflammatory responses including neutrophil infiltration and microglia activation in the ischemic cortex. LED therapy also decreased cell death and attenuated the NLRP3 inflammasome, in accordance with down-regulation of pro-inflammatory cytokines IL-1Î² and IL-18 in the ischemic brain. Moreover, the mice with post-ischemic LED therapy showed suppressed TLR-2 levels, MAPK signaling and NF-kB activation. These findings suggest that by suppressing the inflammasome, LED therapy can attenuate neuroinflammatory responses and tissue damage following ischemic stroke. Therapeutic

interventions targeting the inflammasome via photostimulation with LED may be a novel approach to ameliorate brain injury following ischemic stroke. Effect of post-ischemic low-level light emitting diode therapy (LED-T) on infarct reduction was mediated by inflammasome suppression. Inflammasomes;Tlr2 protein, mouse;Toll-Like Receptor 2;Mitogen-Activated Protein Kinases Animals;Brain;Brain Ischemia;Cell Death;Disease Models, Animal;Inflammasomes;Low-Level Light Therapy;Mice;Mitogen-Activated Protein Kinases;Stroke;Toll-Like Receptor 2

Efficacy of low-level laser therapy in temporomandibular disorders: A systematic review. PURPOSE: The aim of this systematic review was to assess the efficacy of low-level laser therapy (LLLT) in patients with temporomandibular disorders (TMDs). METHODS: Medline search was done from 1997 to 2011 using search terms appropriate to establishing a relation between LLLT and TMD. Only randomized controlled trials were included in this study. Outcome variables related to pain, muscle tenderness, mandibular movements, and Electromyographic (EMG) activity were considered. Of the 242 articles examined, 13 were finally included in the critical analysis conducted as a part of the present systematic review. RESULTS: Of the 242 titles reviewed, only 13 articles were considered eligible. 7 articles showed significant improvement in the study group, whereas 5 showed no significant improvement between the study and control groups. The primary outcome of most of the studies was pain. Other variables considered were muscle tenderness, mandibular movements; EMG activity was considered. CONCLUSION: Our results have shown that LLLT seems to be effective in reducing pain in TMD's. It may be a treatment option for patients with an interest in a noninvasive, complementary therapy.

Low-level laser therapy (LLLT) accelerates the sternomastoid muscle regeneration process after myonecrosis due to bupivacaine. BACKGROUND: Because of its long-lasting analgesic action, bupivacaine is an anesthetic used for peripheral nerve block and relief of postoperative pain. Muscle degeneration and neurotoxicity are its main limitations. There is strong evidence that low-level laser therapy (LLLT) assists in muscle and nerve repair. The authors evaluated the effects of a Gallium Arsenide laser (GaAs), on the regeneration of muscle fibers of the sternomastoid muscle and accessory nerve after injection of bupivacaine. METHODS: In total, 30 Wistar adult rats were divided into 2 groups: control group (C: n=15) and laser group (L: n=15). The groups were subdivided by antimere, with 0.5% bupivacaine injected on the right and 0.9% sodium chloride on the left. LLLT (GaAs 904nm, 0,05W, 2.8J per point) was administered for 5 consecutive days, starting 24h after injection of the solutions. Seven days after the trial period, blood samples were collected for determination of creatine kinase (CK). The sternomastoid nerve was removed for morphological and morphometric analyses; the surface portion of the sternomastoid muscle was used for histopathological and ultrastructural analyses. Muscle CK and TNFÎ± protein levels were measured. RESULTS: The anesthetic promoted myonecrosis and increased muscle CK without neurotoxic effects. The LLLT reduced myonecrosis, characterized by a decrease in muscle CK levels, inflammation, necrosis, and atrophy, as well as the number of central nuclei in the muscle fibers and the percentage of collagen. TNFÎ± values remained constant. CONCLUSIONS: LLLT, at the dose used, reduced fibrosis and myonecrosis in the sternomastoid muscle triggered by bupivacaine, accelerating the muscle regeneration process. Bupivacaine Animals;Bupivacaine;Fibrosis;Low-Level Light Therapy;Muscular Diseases;Neck Muscles;Necrosis;Neurotoxicity Syndromes;Rats;Rats, Wistar;Regeneration

The effect of different cleaning methods on the surface and temperature of failed titanium implants: an in vitro study. The aims of this in vitro study are to compare the efficacy of different cleaning methods in removing debris of failed implants and to detect thermal changes of the implants treated by various scaling instruments. Twenty-seven failed implants and two unused implants as control were included to this study-group 1: plastic curette (P), group 2: titanium curette (T), group 3: carbon

curette (C), group 4: titanium brush (TB), group 5: Er:YAG laser (laser 1 (L1) 100Â mJ/pulse at 10Â Hz), group 6: Er:YAG laser (laser 2 (L2) 150Â mJ/pulse at 10Â Hz), group 7: Er:YAG laser (laser 3 (L3) 200Â mJ/pulse at 10Â Hz), group 8: ultrasonic scaler appropriate for titanium (US), group 9: air abrasive method (AA)â€‰+â€‰citric acid, and group 10: implantoplasty (I). The changes on the treated/untreated titanium surfaces and remnant debris were observed by scanning electron microscopy (SEM). Temperature of the implants before and after treatment was detected using a thermocouple. The use of air abrasive and citric acid combination and Er:YAG laser groups was found as the best methods for the decontamination of titanium surfaces of failed implant. When the hand instruments were compared, titanium curette was found better than both the plastic and the carbon curettes which leave plastics and carbon remnants on the titanium surface. The temperature was higher after hand instrumentation when compared to other experimental groups (pâ€‰<â€‰0.05). Within the limitations of the present in vitro model, it can be concluded that the best method for decontamination of the implant surface is the use of air abrasives and Er:YAG laser. Dental Implants;Titanium Decontamination;Dental Implants;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Surface Properties;Temperature;Titanium

Effect of Nd:YAG and CO(2) Laser Irradiation on Prevention of Enamel Demineralization in Orthodontics: In Vitro Study. OBJECTIVE: The aim of this study was to investigate Nd:YAG and CO(2) laser effects in the prevention of demineralization in deeper layers of enamel via successive acid challenge cycles. BACKGROUND DATA: Lasers are promising in the prevention of enamel demineralization around the orthodontic brackets; however, there are very few studies that evaluate if the effects of treatment could be extended after successive acid challenge cycles due to permanent enamel structural alterations. MATERIALS AND METHODS: Human enamel samples were divided into five groups (nâ€‰=â€‰12): G1-application of 1.23% acidulated fluoride phosphate gel (AFP, control); G2-Nd:YAG laser irradiation (0.6â€‰W, 84.9â€‰J/cm(2), 10â€‰Hz, 110â€‰Î¼s, contact mode); G3-Nd:YAG laser irradiation associated with AFP; G4-CO(2) laser irradiation (0.5â€‰W, 28.6â€‰J/cm(2), 50â€‰Hz, 5â€‰Î¼s, and 10â€‰mm focal distance); and G5-CO(2) laser irradiation associated with AFP. The samples were submitted to successive acid challenge cycles. Quantitative light-induced fluorescence and scanning electron microscopy were used to assess enamel demineralization. The data were statistically compared (Î±â€‰=â€‰5%). RESULTS: G1: 50.87â€‰Â±â€‰4.57; G2: 47.72â€‰Â±â€‰2.87; G3: 50.96â€‰Â±â€‰4.01; G4: 28.21â€‰Â±â€‰2.19; and G5: 30.13â€‰Â±â€‰6.38. The CO(2) laser groups had significantly lower mineral losses than those observed in all other groups after successive acid challenge cycles. CONCLUSIONS: Only the CO(2) laser (10.6â€‰Î¼m) irradiation prevents enamel demineralization around the orthodontic brackets even after exposure to successive acid challenges. The CO(2) laser at 10.6â€‰Î¼m showed a deeper effect in enamel regarding caries prevention. Dental Enamel;Humans;In Vitro Techniques;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Orthodontics;Sensitivity and Specificity;Tooth Demineralization

Transdermal optogenetic peripheral nerve stimulation. OBJECTIVE: A fundamental limitation in both the scientific utility and clinical translation of peripheral nerve optogenetic technologies is the optical inaccessibility of the target nerve due to the significant scattering and absorption of light in biological tissues. To date, illuminating deep nerve targets has required implantable optical sources, including fiber-optic and LED-based systems, both of which have significant drawbacks. APPROACH: Here we report an alternative approach involving transdermal illumination. Utilizing an intramuscular injection of ultra-high concentration AAV6-hSyn-ChR2-EYFP in rats. MAIN RESULTS: We demonstrate transdermal stimulation of motor nerves at 4.4â€‰mm and 1.9â€‰mm depth with an incident laser power of 160 mW and 10 mW, respectively. Furthermore, we employ this technique to accurately

control ankle position by modulating laser power or position on the skin surface. SIGNIFICANCE: These results have the potential to enable future scientific optogenetic studies of pathologies implicated in the peripheral nervous system for awake, freely-moving animals, as well as a basis for future clinical studies. Action Potentials;Animals;Female;Low-Level Light Therapy;Muscle Contraction;Muscle, Skeletal;Optogenetics;Rats;Rats, Inbred F344;Rats, Sprague-Dawley;Sciatic Nerve;Transcutaneous Electric Nerve Stimulation

Photobiomodulation laser and pulsed electrical field increase the viability of the musculocutaneous flap in diabetic rats. The purpose of this study is to investigate the effect of pulsed electrical field (PEF) and photobiomodulation laser (PBM) on the viability of the TRAM flap in diabetic rats. Fifty Wistar rats were divided into five homogeneous groups: Group 1-control; Group 2-diabetics; Group 3-diabetics + PEF; Group 4-diabetic + laser 660Â nm, 10Â J/cm(2), 0.27Â J; Group 5-diabetic + laser 660Â nm, 140Â J/cm(2), 3.9Â J. The percentage of necrotic area was evaluated using software Image JÂ®. The peripheral circulation of the flap was evaluated by infrared thermography FLIR T450sc (FLIRÂ® Systems-Oregon USA). The thickness of the epidermis (haematoxylin-eosin), mast cell (toluidine blue), leukocytes, vascular endothelial growth factor, fibroblast and newly formed blood vessels were evaluated. For the statistical analysis, the Kruskal-Wallis test was applied followed by Dunn and ANOVA test followed by Tukey with critical level of 5% (pâ€‰<â€‰0.05). The PEF reduced the area of necrosis, decreased the leukocytes, increased the mast cells, increased the thickness of epidermis and increased newly formed blood vessels when it was compared to the untreated diabetic group of animals. Laser 660Â nm, fluence 140Â J/cm(2) (3.9Â J) showed better results than the 10Â J/cm(2) (0.27Â J) related to reduction of the area of necrosis and the number of leukocytes, increased mast cells, increased thickness of the epidermis, increased vascular endothelial growth factor, increased fibroblast growth factor and increase of newly formed blood vessels in diabetic animals. The laser and pulsed electrical field increase the viability of the musculocutaneous flap in diabetic rats. Vascular Endothelial Growth Factor A;Fibroblast Growth Factors Animals;Cell Survival;Diabetes Mellitus, Experimental;Electricity;Fibroblast Growth Factors;Leukocytes;Low-Level Light Therapy;Male;Mast Cells;Myocutaneous Flap;Necrosis;Rats, Wistar;Skin Temperature;Vascular Endothelial Growth Factor A

Pulsed alexandrite laser for treatment of melasma in Asian patients. BACKGROUND: Melasma is a common acquired facial hypermelanosis with irregular brownish macules and patches. The clinical course is often fluctuated and refractory to treatment. The present study was conducted to evaluate the efficacy and safety of pulsed alexandrite laser for the treatment of melasma. MATERIALS AND METHODS: In the present study, we enrolled Asian patients with melasma. All the patients received four monthly treatments with a pulsed alexandrite laser. The severity of melasma was evaluated by a blinded dermatologist, using the Modified Melasma Area and Severity Index (MMASI), and by patient assessment, using a visual analogue scale, at baseline, before each treatment, and at the 1-month and 3-month follow-up visits after the last treatment. RESULTS: Twenty-three patients completed all treatments and follow-up visits. The MMASI scores decreased significantly from 8.71 Â± 5.83 at baseline to 6.07 Â± 4.65 after four sessions of treatment ($P < 0.05$) and 6.91 Â± 4.97 at 3 months after the last laser treatment ($P < 0.05$). After 4 sessions of treatment, 10 patients (43.5%) described their improvement as marked and excellent (>60% improvement). The treatments were well tolerated with only mild skin reaction. CONCLUSION: In the present study, we demonstrated that the pulsed alexandrite laser is safe and effective to treat melasma in Asian skin. Adult;Asian People;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Retrospective Studies;Treatment Outcome

Effects of low-level laser therapy on pain in patients with musculoskeletal disorders: a systematic review and meta-analysis. INTRODUCTION: This meta-analysis investigated the effectiveness of

low-level laser therapy (LLLT) on pain in adult patients with musculoskeletal disorders. EVIDENCE ACQUISITION: A systematic literature search was conducted in the Medline and PEDro databases. Two researchers independently screened titles and abstracts of the retrieved studies for eligibility. Quality assessment of the eligible studies was conducted using the PEDro rating scale. Studies that scored â‰¥4 were included. A random-effects model was used for this meta-analysis. Subgroup meta-analyses were conducted to evaluate the influence of the adherence of the applied LLLT to the World Association of Laser Therapy (WALT) guidelines, the anatomical site under investigation and the study design on the overall weighted mean effect size. Meta regression was used to assess the possible influence of the study quality on the individual study effect sizes. EVIDENCE SYNTHESIS: Eighteen studies allowing for 21 head-to-head comparisons (totaling N.=1462 participants) were included. The pooled raw mean difference (D) in pain between LLLT and the control groups was -0.85 (95% CI: -1.22 to -0.48). There was high (IÂ²=85.6%) and significant between study heterogeneity (Cochran's Q =139.2; df=20; P<0.001). The subgroup meta-analysis of the comparisons not following the WALT guidelines revealed a D=-0.68 (95% CI: -1.09 to -0.27). In this group, heterogeneity decreased to IÂ²=72.6% (Q=51.2; df=14; P<0.001). In the WALT subgroup D equaled -1.52 (95% CI: -2.34 to -0.70). This between groups difference was clinically relevant although statistically not significant (Q=3.24; df=1; P=0.072). CONCLUSIONS: This meta-analysis presents evidence that LLLT is an effective treatment modality to reduce pain in adult patients with musculoskeletal disorders. Adherence to WALT dosage recommendations seems to enhance treatment effectiveness. Evidence-Based Medicine;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Musculoskeletal Diseases;Pain;Pain Measurement;Risk Assessment;Treatment Outcome

The Effect of Low Level Laser Therapy on Direct Pulp Capping in Dogs. Introduction: The aim of this study was to determine the histologic effect of low level laser therapy (LLLT) with or without the use of mineral trioxide aggregate (MTA) on exposed pulp tissues of dogs. Methods: Twenty-five premolar teeth in three healthy mature dogs were randomly divided into five groups. In group 1, the pulp tissue was capped with MTA. In groups 2 and 3, before capping with MTA, the exposure site was irradiated by low power lasers at 630 nm (20 mW, 150 seconds, 7.5 J/cm(2)) and 810 nm (peak power 80 W, average power 50 mW, 1500 Hz, 50 seconds, 6.25 J/cm(2)) wavelengths, respectively. In groups 4 and 5, the exposure site was irradiated similar to that described in groups 2 and 3, but the pulp tissue was covered by gold foil instead of MTA. After 2 months, the animals were sacrificed and the samples were prepared for histologic evaluation. Results: There were differences in pulpal response and dentinal barrier formation among the study groups. The morphology of pulpal tissue and the integrity of dentinal barrier and formation of odontoblastic layer were more favorable in the first three groups. The occurrence of extensive and intense inflammation and necrosis was more frequent in groups 4 and 5. Conclusion: Under the conditions used in this study, the presence of MTA as a pulp capping material was more important than laser therapy in the success of direct pulp capping (DPC) treatment. MTA proved to be an effective material either alone or in combination with laser irradiation in vital pulp therapy.

Preliminary evaluation of the effects of photobiomodulation therapy and physical rehabilitation on early postoperative recovery of dogs undergoing hemilaminectomy for treatment of thoracolumbar intervertebral disk disease. OBJECTIVE To evaluate the effects of postoperative photobiomodulation therapy and physical rehabilitation on early recovery variables for dogs after hemilaminectomy for treatment of intervertebral disk disease. ANIMALS 32 nonambulatory client-owned dogs. PROCEDURES Dogs received standard postoperative care with photobiomodulation therapy (n = 11), physical rehabilitation with sham photobiomodulation treatment (11), or sham photobiomodulation treatment only (10) after surgery. Neurologic status at admission, diagnostic and

surgical variables, duration of postoperative IV analgesic administration, and recovery grades (over 10 days after surgery) were assessed. Time to reach recovery grades B (able to support weight with some help), C (initial limb movements present), and D (ambulatory [â‰¥ 3 steps unassisted]) was compared among groups. Factors associated with ability to ambulate on day 10 or at last follow-up were assessed. RESULTS Time to reach recovery grades B, C, and D and duration of postoperative IV opioid administration did not differ among groups. Neurologic score at admission and surgeon experience were negatively associated with the dogs' ability to ambulate on day 10. The number of disk herniations identified by diagnostic imaging before surgery was negatively associated with ambulatory status at last follow-up. No other significant associations and no adverse treatment-related events were identified. CONCLUSIONS AND CLINICAL RELEVANCE This study found no difference in recovery-related variables among dogs that received photobiomodulation therapy, physical rehabilitation with sham photobiomodulation treatment, or sham photobiomodulation treatment only. Larger studies are needed to better evaluate effects of these postoperative treatments on dogs treated surgically for intervertebral disk disease. Animals;Dog Diseases;Dogs;Female;Intervertebral Disc Degeneration;Intervertebral Disc Displacement;Laminectomy;Low-Level Light Therapy;Male;Pain, Postoperative;Postoperative Period;Thoracic Vertebrae;Treatment Outcome

Photobiostimulation reverses allodynia and peripheral nerve damage in streptozotocin-induced type 1 diabetes. For better evaluation of the efficacy of low-level laser therapy in treating painful diabetic neuropathy and in protecting nerve fiber damage, we conducted a study with type 1 diabetic rats induced by streptozotocin. It is well known that diabetic peripheral neuropathy is the leading cause of pain in those individuals who suffer from diabetes. Despite the efficacy of insulin in controlling glucose level in blood, there is no effective treatment to prevent or reverse neuropathic damage for total pain relief.Male Wistar rats were divided into saline, vehicle, and treatment groups. A single intraperitoneal (i.p.) injection of streptozotocin (STZ) (85Â mg/kg) was administered for the induction of diabetes. The von Frey filaments were used to assess nociceptive thresholds (allodynia). Behavioral measurements were accessed 14, 28, 48, and 56Â days after STZ administration. Rats were irradiated with GaAs Laser (Gallium Arsenide, Laserpulse, Ibramed Brazil) emitting a wavelength of 904Â nm, an output power of 45 mWpk, beam spot size at target 0.13Â cm(2), a frequency of 9500Â Hz, a pulse time 60Â ns, and an energy density of 6,23Â J/cm(2).The application of four sessions of low-level laser therapy was sufficient to reverse allodynia and protect peripheral nerve damage in diabetic rats.The results of this study indicate that low-level laser therapy is feasible to treat painful diabetic condition in rats using this protocol. Although its efficacy in reversing painful stimuli and protecting nerve fibers from damage was demonstrated, this treatment protocol must be further evaluated in biochemical levels to confirm its biological effects. Streptozocin Animals;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Diabetic Neuropathies;Hyperalgesia;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain;Rats;Rats, Wistar;Streptozocin

Median canaliform nail dystrophy treated with a 1064-nm quasi-long pulsed Nd:YAG laser. Median canaliform nail dystrophy (MCND) is an uncommon and idiopathic dystrophic change, which typically appears as central, longitudinal groove or split involving one or both thumbnails. Various treatments including a potent topical steroid, an intralesional injection of triamcinolone 2.5-3 mg/dL, medications for systemic treatment, and topical psoralen plus ultraviolet A (PUVA) have been tried to treat the disease. However, each treatment has limitations including severe pain, inconsistent treatment results, long treatment periods, and dissatisfaction with effects of treatment. In recent years, 1064-nm Nd:YAG laser is used for skin rejuvenation by the effect of collagen synthesis and remodeling via induction of growth factor expression. Therefore, we tried 1064-nm Nd:YAG laser to

treat this nail dystrophy. A 53-year-old man presented with median nail dystrophy on both thumbs for 3 years. The nail dystrophy was treated only with 1064-nm quasi-long pulsed Nd:YAG laser. He was offered 10 sessions of treatment, and the right thumbnail showed good response and the left thumbnail showed fair response. He experienced severe pain during the treatment (Numerical rating scale (NRS) 8) and was satisfied moderately with the results (NRS 6.5). We report a case of treatment of MCND with 1064-nm quasi-long pulsed Nd:YAG laser with excellent clinical improvement. Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Nails, Malformed;Thumb;Treatment Outcome

Retrospective analysis of the treatment of melasma lesions exhibiting increased vascularity with the 595-nm pulsed dye laser combined with the 1927-nm fractional low-powered diode laser. BACKGROUND: Melasma presents a significant challenge to laser surgeons. Aggressive treatments often result in rebound melasma or post-inflammatory pigmentary alteration. Recent reports suggest melasma pathogenesis may have a vascular component. Spectrocolorimetry can detect subtle or sub-clinical telangiectatic erythema within melasma lesions. For certain patients identified by spectrocolorimetry, effective melasma treatment may include vascular-targeted therapy together with pigment-specific treatment modalities. Such combined therapies may reduce the likelihood of melasma recurrence. OBJECTIVE: To evaluate the efficacy of treating melasma lesions exhibiting subtle or sub-clinical telangiectatic erythema with the 595-nm pulsed dye laser (PDL) combined with the 1927-nm fractional low-powered diode laser (FDL). METHODS: A retrospective review was performed over a 2-year period as follows. Evaluated patients (nâ€‰=â€‰11) include 10 women and 1 man, average age of 38.7 years, and Fitzpatrick skin types II-IV. Each patient exhibited melasma lesions with subtle or sub-clinical telangiectatic erythema identified by spectrocolorimetry. Each underwent a series of treatments (average of four) at approximate 4-6 week intervals of the PDL followed by the FDL. Treatments were performed same-day, sequentially, with 10-15â€‰minute interim time allowance for skin cooling. The following PDL parameters were utilized: 10â€‰mm spot, 10-20â€‰ms pulse duration, 7.5-8.5â€‰J/cm(2) fluence, 30/30 DCD. Eight passes with the FDL (Clearâ€‰+â€‰Brilliant(Â®) Permeaâ„¢, Solta Medical, Hayward, CA) were then performed utilizing a "low" treatment level. Clinical endpoint was mild erythema and edema. Patients were encouraged to practice strict photoprotection and apply topical skin lightening agents, but compliance was not measured. An independent physician evaluated photographs taken at baseline and at follow-up after last treatment session (average follow-up of 96 days). A quartile improvement score was used to grade the improvement of melasma and underlying telangiectatic erythema. At time of data analysis, patient satisfaction was self-graded on a three-point scale (0â€‰=â€‰not satisfied, 1â€‰=â€‰satisfied, 2â€‰=â€‰very satisfied). RESULTS: Six out of eleven patients (54%) demonstrated greater than 50% improvement in melasma presentation. Improvement in melasma generally paralleled improvement in erythema. No rebound melasma, post-inflammatory changes, or adverse events were noted. Patient satisfaction responses averaged 1.6, with all (10) patients reporting 1 "satisfied" or 2 "very satisfied." CONCLUSIONS: Melasma lesions exhibiting subtle or sub-clinical telangiectatic erythema may be improved by combined vascular-targeted laser therapy together with fractional low-powered diode laser therapy. A parallel improvement in telangiectatic erythema suggests a relationship between the underlying vasculature and hyperpigmentation. There is a low risk of adverse effects and overall patient satisfaction is high. Follow-up to optimize treatment parameters and determine long-term durability is needed. Lasers Surg. Med. 49:20-26, 2017. Â© 2016 Wiley Periodicals, Inc. Adult;Cohort Studies;Combined Modality Therapy;Esthetics;Facial Dermatoses;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Retrospective Studies;Risk Assessment;Treatment Outcome;Young Adult

Special dermatology/plastic surgery issue 2017.
Dermatology;Female;Forecasting;Humans;Low-Level Light Therapy;Male;Periodicals as Topic;Surgery, Plastic

Dosimetric study of photobiomodulation therapy in 5-FU-induced oral mucositis in hamsters.
Oral mucositis (OM) is a debilitating consequence of cancer treatment that could be treated with photobiomodulation therapy (PBMT); however, there is no consensus about its dosimetric parameters for OM healing. The aim of this study was to compare different PBMT protocols on OM treatment, through clinical and histological analysis. Thirty hamsters were used, in an induced model of OM by 5-fluorouracil (5-FU) and superficial scratching, in seven days of follow-up. The animals were divided into five groups: control (C), which received only anesthesia and chemotherapeutic vehicle; chemotherapy (Ch), which received anesthesia, 5-FU, and scratches; laser 1 (L1), the same as Ch group, PBMT 6 ?? J / c m 2 and 0.24 J (one point); laser 2 (L2), the same as Ch group, PBMT 25 ?? J / c m 2 and 1 J (one point); and laser 3 (L3), the same as Ch group, PBMT 4 points of 0.24 J and 6 ?? J / c m 2 each. The laser used has ? = 660 ?? nm , 0.04 ?? c m 2 of spot area, and 40 mW. The best PBMT protocol to maintain lowest OM levels compared to Ch group was L1, followed by L2 and L3. Our results suggest that the application mode of PBMT and the energy delivered per area could interfere with the OM healing. Fluorouracil Animals;Cricetinae;Fluorouracil;Low-Level Light Therapy;Stomatitis;Wound Healing

Scar Remodeling with the Association of Monopolar Capacitive Radiofrequency, Electric Stimulation, and Negative Pressure. OBJECTIVE: A study was established to objectively assess the effects of low-intensity electromagnetic and electric stimulation plus negative pressure on mature scars. BACKGROUND: Radiofrequency plus negative pressure therapy demonstrated a favorable reorganization and regeneration of the collagen and elastic fibers and was proposed for the treatment of cellulitis and skin stretch marks. METHODS: Twenty-six mature scars in 20 Caucasian patients (15 females and 5 males) were enrolled in the study. The treatments were carried out with a Class I, BF-type electromedical device equipped with a radiofrequency generator, an electric pulse generator, and a vacuum pump twice a week for 3 months. Corneometry, transepidermal water loss, elastometry, colorimetry, and three-dimensional skin surface pattern were objectively assessed with Multi Probe Adapter System MPA and PRIMOS pico. A subjective assessment was carried out with the VAS and PSAS scales. Each scar was compared before and after the treatment and with the skin in the corresponding healthy contralateral anatomical area at the same times. RESULTS: Reduction of the scar surface wrinkling and overall scar flattening were demonstrated after the treatment. The scar slightly tended to approach the color and elasticity of healthy skin too. CONCLUSIONS: The combined local treatment of mature scars with low-intensity electromagnetic and electric stimulation in association with negative pressure might suggest a favorable synergic effect on the scar collagen and elastic fiber remodeling. Adult;Analysis of Variance;Biopsy, Needle;Cicatrix, Hypertrophic;Cohort Studies;Colorimetry;Combined Modality Therapy;Elasticity;Elasticity Imaging Techniques;Electric Stimulation Therapy;Female;Humans;Imaging, Three-Dimensional;Immunohistochemistry;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Negative-Pressure Wound Therapy;Prognosis;Regeneration;Risk Assessment;Statistics, Nonparametric;Treatment Outcome;Young Adult

The effects of low level laser therapy on both HIV-1 infected and uninfected TZM-bl cells. Human immunodeficiency virus (HIV-1) infection remains a major health problem despite the use of highly active antiretroviral therapy (HAART), which has greatly reduced mortality rates. Due to the unavailability of an effective vaccine and treatment that would completely eradicate the virus in infected individuals, the quest for new therapies continues. Low level laser therapy (LLLT) involves the exposure of cells to low levels of red or infrared light. LLLT has been widely used in different medical

conditions, but not in HIV-1 infection. This study aimed to determine the effects of LLLT on HIV-1 infected and uninfected TZM-bl cells. Both infected and uninfected cells were irradiated at a wavelength of 660Â nm with different fluences from 2Â J/cm(2) to 10Â J/cm(2) . Changes in cellular responses were assessed using cell morphology, viability, proliferation, cytotoxicity and luciferase activity assays. Upon data analysis, uninfected irradiated cells showed no changes in cell morphology, viability, proliferation and cytotoxicity, while the infected irradiated cells did. In addition, laser irradiation reduced luciferase activity in infected cells. Finally, laser irradiation had no inhibitory effect in uninfected cells, whereas it induced cell damage in a dose dependent manner in infected cells. Adenosine Triphosphate;L-Lactate Dehydrogenase;Luciferases Adenosine Triphosphate;HEK293 Cells;HIV Infections;HIV-1;Humans;L-Lactate Dehydrogenase;Low-Level Light Therapy;Luciferases

Comparative Study Using Autologous Fat Grafts Plus Platelet-Rich Plasma With or Without Fractional CO(2) Laser Resurfacing in Treatment of Acne Scars: Analysis of Outcomes and Satisfaction With FACE-Q. BACKGROUND: A multitude of options are traditionally used for the treatment of acne scars; however, newer treatment modalities are emerging to decrease the propensity for post-inflammatory hyperpigmentation and upregulate new collagen production. The aim of this study was to evaluate the efficacy of nanofat and platelet-rich plasma (PRP) infiltration alone and combined with fractional CO(2) laser resurfacing to improve atrophic scars of the face. METHODS: From March 2014 to June 2015, 30 patients with atrophic acne scars on the cheeks were selected for this study. Patients were evaluated pre- and postoperatively by physical examination, photographs and ultrasound with a 22-MHz probe to measure subcutaneous tissue thickness. All patients were treated with infiltration of nanofat plus PRP. The production of PRP was achieved using the RegenLab THT tube(Â®) method. In 15 randomly chosen patients, a fractional CO(2) laser resurfacing at 15Â W was also performed right after the infiltration. An Italian version of the FACE-Q postoperative module was administered to analyze each patient's satisfaction and aesthetic perception of the result. RESULTS: The average preoperative thickness of subcutaneous tissue of patients from group A was 0.532Â cm, while the average preoperative thickness of subcutaneous tissue of patients from group B was 0.737Â cm. The average postoperative thickness of subcutaneous tissue was 1.201Â cm in group A and 1.367Â cm in group B. The improvement of thickness of subcutaneous tissue was 0.668Â cm in group A and 0.63Â cm in group B. We applied a t test on unpaired data, comparing the difference in thickness obtained with the treatment in both group A and in group B, with a p value =0.7289 (not significant). All patients in both groups had a treatment benefit, confirmed with FACE-Q postoperative module, but without a significant difference between the two groups. CONCLUSIONS: Subcutaneous infiltration with nanofat and PRP seems to be effective to improve atrophic scars, either alone or combined with fractional CO(2) laser resurfacing. The FACE-Q module confirmed the impact of treatment of facial acne scars in social life and relationships. LEVEL OF EVIDENCE III: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Acne Vulgaris;Adipose Tissue;Adult;Cicatrix;Cohort Studies;Combined Modality Therapy;Esthetics;Female;Follow-Up Studies;Humans;Italy;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pilot Projects;Platelet-Rich Plasma;Retrospective Studies;Severity of Illness Index;Transplantation, Autologous;Treatment Outcome;Young Adult

Efficacy and safety of far infrared radiation in lymphedema treatment: clinical evaluation and laboratory analysis. Swelling is the most common symptom of extremities lymphedema. Clinical evaluation and laboratory analysis were conducted after far infrared radiation (FIR) treatment on the main four components of lymphedema: fluid, fat, protein, and hyaluronan. Far infrared radiation is a kind of hyperthermia therapy with several and additional benefits as well as promoting

microcirculation flow and improving collateral lymph circumfluence. Although FIR therapy has been applied for several years on thousands of lymphedema patients, there are still few studies that have reported the biological effects of FIR on lymphatic tissue. In this research, we investigate the effects of far infrared rays on the major components of lymphatic tissue. Then, we explore the effectiveness and safety of FIR as a promising treatment modality of lymphedema. A total of 32 patients affected by lymphedema in stage II and III were treated between January 2015 and January 2016 at our department. After therapy, a significant decrease of limb circumference measurements was noted and improving of quality of life was registered. Laboratory examination showed the treatment can also decrease the deposition of fluid, fat, hyaluronan, and protein, improving the swelling condition. We believe FIR treatment could be considered as both an alternative monotherapy and a useful adjunctive to the conservative or surgical lymphedema procedures. Furthermore, the real and significant biological effects of FIR represent possible future applications in wide range of the medical field. Humans;Infrared Rays;Low-Level Light Therapy;Lymphedema;Lymphoid Tissue;Microcirculation;Quality of Life

Pseudohypertension-Like Presentation: An Exceptionally Rare Presentation in an Athletic Female Patient with Morphea. Introduction. Pseudohypertension is a condition which mainly occurs due to thickening-calcification of tunica intima of the arterial wall, leading to a faulty measurement of the intra-arterial blood pressure. To the best of our knowledge, this is the first case report in literature, of a pseudohypertension-like presentation in association with Morphea en plaque. Case Presentation. This is a rare presentation of a young athletic female and a professional tennis player, with pseudohypertension-like presentation. The patient had a traumatic injury to the right elbow joint; the injury occurred during a professional tennis match. The injury was managed by immobilization, physiotherapy, and Low-Level Laser Therapy. Soon after that, the patient had a circumscribed sclerotic ivory plaque affecting the skin of the right cubital fossa. The histopathology analysis, together with the serological-hematological tests and the clinical picture, along with positive Osler's signs, leads to the conclusive diagnosis of Morphea en plaque. The peculiar anatomic localization of the plaque anterior to the brachial artery leads to faulty blood pressure measurement as recorded by mercurial sphygmomanometer. Conclusion. This unique presentation of Morphea en plaque carries an important message in relation to the basic medical practice and in relation to the accurate measurement of the vital signs.

Low level laser therapy alters satellite glial cell expression and reverses nociceptive behavior in rats with neuropathic pain. BACKGROUND: Nerve injury often results in persistent or chronic neuropathic pain characterized by spontaneous burning pain accompanied by allodynia and hyperalgesia. Low level laser therapy (LLLT) is a noninvasive method that has proved to be clinically effective in reducing pain sensitivity and consequently in improving the quality of life. Here we examined the effects of LLLT on pain sensitivity induced by chronic constriction injury (CCI) in rats. CCI was performed on adult male rats, subjected thereafter to 10 sessions of LLLT, every other day, and starting 14 days after CCI. Over the treatment period, the animals were evaluated for nociception using behavioral tests, such as allodynia, thermal and mechanical hyperalgesia. Following the sessions, we observed the involvement of satellite glial cells in the dorsal root ganglion (DRG) using immunoblotting and immunofluorescence approaches. In addition we analyzed the expression levels of interleukin 1 (IL-1Î²) and fractalkine (FKN) after the same stimulus. RESULTS: LLLT induced an early reduction (starting at the second session; p â‰¤ 0.001) of the mechanical and thermal hyperalgesia and allodynia in CCI rats, which persisted until the last session. Regarding cellular changes, we observed a decrease of GFAP (50%; p â‰¤ 0.001) expression after LLLT in the ipsilateral DRG when compared with the naive group. We also observed a significant increase of pro-inflammatory cytokines after CCI, whereas LLLT dramatically inhibited the overexpression of these proteins.

CONCLUSIONS: These data provide evidence that LLLT reverses CCI-induced behavioral hypersensitivity, reduces glial cell activation in the DRG and decreases pro-inflammatory cytokines; we suggest that this involvement of glial cells can be one potential mechanism in such an effect. Chemokine CX3CL1;Interleukin-1 Animals;Chemokine CX3CL1;Enzyme-Linked Immunosorbent Assay;Ganglia, Spinal;Hyperalgesia;Interleukin-1;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microscopy, Fluorescence;Neuralgia;Neuroglia;Rats;Rats, Wistar

Review of the Mechanisms and Effects of Noninvasive Body Contouring Devices on Cellulite and Subcutaneous Fat. CONTEXT: Today, different kinds of non-invasive body contouring modalities, including cryolipolysis, radiofrequency (RF), low-level laser therapy (LLLT), and high-intensity focused ultrasound (HIFU) are available for reducing the volume of subcutaneous adipose tissue or cellulite. Each procedure has distinct mechanisms for stimulating apoptosis or necrosis adipose tissue. In addition to the mentioned techniques, some investigations are underway for analyzing the efficacy of other techniques such as whole body vibration (WBV) and extracorporeal shockwave therapy (ESWT). In the present review the mechanisms, effects and side effects of the mentioned methods have been discussed. The effect of these devices on cellulite or subcutaneous fat reduction has been assessed. EVIDENCE ACQUISITION: We searched pubmed, google scholar and the cochrane databases for systemic reviews, review articles, meta-analysis and randomized clinical trials up to February 2015. The keywords were subcutaneous fat, cellulite, obesity, noninvasive body contouring, cryolipolysis, RF, LLLT, HIFU, ESWT and WBV with full names and abbreviations. RESULTS: We included seven reviews and 66 original articles in the present narrative review. Most of them were applied on normal weight or overweight participants (body mass index < 30 kg/m(2)) in both genders with broad range of ages (18 to 50 years on average). In the original articles, the numbers of included methods were: 10 HIFU, 13 RF, 22 cryolipolysis, 11 LLLT, 5 ESWT and 4 WBV therapies. Six of the articles evaluated combination therapies and seven compared the effects of different devices. CONCLUSIONS: Some of the noninvasive body contouring devices in animal and human studies such as cryolipolysis, RF, LLLT and HIFU showed statistical significant effects on body contouring, removing unwanted fat and cellulite in some body areas. However, the clinical effects are mild to moderate, for example 2 - 4 cm circumference reduction as a sign of subcutaneous fat reduction during total treatment sessions. Overall, there is no definitive noninvasive treatment method for cellulite. Additionally, due to the methodological differences in the existing evidence, comparing the techniques is difficult.

One-Pot Aqueous Synthesization of Near-Infrared Quantum Dots for Bioimaging and Photodynamic Therapy of Gliomas. BACKGROUND: As the early detection and total destruction of gliomas are essential for longer survival, we attempted to synthesize a quantum dot (QD) that is capable of recognizing glioma cells for imaging and photodynamic therapy. METHODS: Using a one-pot aqueous approach, near infrared-emitting CdTe was produced. After detection of its physicochemical characteriistics, it was conjugated with RGD. The emission images were observed with confocal microscopy. To test its toxicity, CdTe-RGD at various concentrations was separately added to a human glioma cell line (U251) and a mouse embryo fibroblast cell line (3T3) (control) for incubation in dark conditions. To test its photodynamic effect, the U251 and 3T3 cells were then irradiated for 5-60 min, using a 632.8-nm laser. RESULTS: This QD (Î¦ = 3.75 nm, photoluminescence (PL) peak wavelength = 700 nm, photoluminescence quantum yield (PLQY) = 20 %), was a spherical crystal with excellent monodispersity. Under a confocal microscope, U251 cells were visualized, but not the 3T3 cells. In dark conditions, the survival rates of both U251 and 3T3 cells were above 85 %. After laser irradiation, the survival rate of U251 cells decreased to 37 Â± 1.6 % as the irradiation time and the CdTe-RGD concentration were increased. CONCLUSIONS: With good physicochemical characteriistics and low toxicity, this QD-RGD has broad prospects for use in the biomedical imaging and photodynamic therapy of gliomas. Antineoplastic Agents;Cadmium Compounds;Oligopeptides;arginyl-glycyl-

aspartic acid;Tellurium;cadmium telluride 3T3 Cells;Animals;Antineoplastic Agents;Brain Neoplasms;Cadmium Compounds;Cell Line, Tumor;Cell Survival;Glioblastoma;Glioma;Humans;In Vitro Techniques;Low-Level Light Therapy;Mice;Microscopy, Confocal;Oligopeptides;Photochemotherapy;Quantum Dots;Tellurium
Treatment of nail psoriasis with Pulse Dye Laser plus calcipotriol betametasona gel vs. Nd:YAG plus calcipotriol betamethasone gel: An intrapatient left-to-right controlled study. BACKGROUND: Treatment of nail psoriasis remains a challenging and often disappointing situation. OBJECTIVE: To compare the efficacy, adverse reactions and tolerability of treatment of nail psoriasis with PDL vs. Nd:YAG, in association with betametasona calcipotriol gel. METHODS: An open, prospective intrapatient left-to-right study was designed. The right hand of each patient received treatment with PDL and the left hand with Nd:YAG. Betamethasone calcipotriol gel was applied once a day during the first week after each laser session. A total of four sessions were administered. RESULTS: The clinical efficacy was evaluated according to the NAPSI score. All patients showed improvement in nail bed and nail matrix psoriasis. The global NAPSI mean declined in 15.46 ($p<0.000$). There was neither statistical difference between the reduction in nail bed and matrix NAPSI nor in the treatment with PDL vs. Nd:YAG. The administration of Nd:YAG was more painful. No serious adverse effects were documented. LIMITATIONS: No random assignment and the small number of patients. CONCLUSIONS: PDL and Nd:YAG have proven to be an effective treatment for nail psoriasis with no serious adverse effect. No statistically significant difference was found between the two treatments. Drug Combinations;Gels;calcipotriene;Betamethasone;Calcitriol Adult;Aged;Betamethasone;Calcitriol;Combined Modality Therapy;Drug Combinations;Female;Gels;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nail Diseases;Prospective Studies;Psoriasis;Treatment Outcome
Efficacy of Stellate Ganglion Blockade Applied with Light Irradiation: A Systemic Review and Meta-analysis. OBJECTIVE: Stellate ganglion block has mostly been used to relieve symptoms of neuropathic pain; several potential complications have been reported. Noninvasive stellate ganglion block application using light irradiation (SG-LI) can be used as an alternative to conventional injection blockades. Based on the variety of application protocols among previous studies, it was needed to further identify the clinical efficacy of SG-LI in managing neuropathic pain or other disorders associated with sympathetic hyperactivity. DESIGN: A comprehensive search of online databases was performed to identify experimental or observational studies reporting the efficacy of SG-LI in treating patients with disorders requiring sympatholytic management. The included studies were subjected to a meta-analysis and risk-of-bias assessment. RESULTS: Twenty-one experimental studies with a Physiotherapy Evidence Database score of 6/10 and 5 observational studies with a Newcastle-Ottawa scale score of 7/9 were included in the analysis. A significant effect on pain relief favoring SG-LI was identified at a standard mean difference (SMD) of -2.05 [95% confidence interval (CI), -2.49 to -1.61; $P < 0.00001$]. Similar effects favoring SG-LI were found in peripheral blood flow (SMD, 1.26; 95% CI, 0.26-2.25; $P = 0.01$) and skin temperature (SMD, 1.31; 95% CI, 0.55, 2.08; $P = 0.0007$). CONCLUSIONS: Stellate ganglion block application using light irradiation effectively relieves pain of various etiologies and successfully induces a sympatholytic response. Stellate ganglion block application using light irradiation may be a valuable addition to the contemporary pain management armamentarium. Autonomic Nerve Block;Blood Flow Velocity;Heart Rate;Humans;Low-Level Light Therapy;Pain Measurement;Patient Outcome Assessment;Skin Temperature;Stellate Ganglion;Sympathetic Nervous System
Low-level laser therapy in the treatment of pressure ulcers: systematic review. The aim of this study was to evaluate the effects of low-level laser therapy (LLT) in pressure ulcers (PU) in humans through a systematic review of randomized studies. The search includes the databases MEDLINE,

PEDro, Cochrane CENTRAL, and Lilacs, as well a manual search until May, 2016. This included randomized clinical trials of LLT compared with other interventions, different types of LLT, LLT placebo, or control in the treatment of PU. The outcomes evaluated were the ulcer area, healing rate, and overall healing rate. The risk of bias was evaluated using the tool of the Cochrane Collaboration, and the results were analyzed descriptively. From the 386 articles identified, only four studies were included, with two LLT used with single wavelength (1: 904Â nm vs. control and 2: 940Â nm vs. 808Â nm vs. 658Â nm vs. placebo) and two LLT used to probe cluster. One study compared to different single wavelengths showed a significant 71% reduction of the PU and an improved healing rate in which 47% of PU healed completely after 1Â month of therapy with the use of LLT with a wavelength of 658Â nm compared with other lengths. The other analyzed wavelengths were not significant in the assessed outcomes. Significant results were observed in the use of LLT with a 658Â nm wavelength, and no evidence was found for use of wavelengths above that for the treatment of PU. Therefore, we also found no evidence in the laser used to probe the cluster.Registration number: CRD42016036648. Adult;Aged;Aged, 80 and over;Humans;Low-Level Light Therapy;Pressure Ulcer;Publication Bias;Wound Healing

Investigation of photobiomodulation potentiality by 635 and 809Â nm lasers on human osteoblasts. Photobiomodulation (PBM) describes light-induced photochemical reactions achieved by the application of red or near infrared lasers/LED light with low energy densities. This noninvasive and painless method has been used in some clinical areas but controversial outcomes demand a skeptical look for its promising and potential effects. In this detailed in vitro study, the osteoblast cells were irradiated with 635 and 809Â nm diode lasers at energy densities of 0.5, 1, and 2Â J/cm(2). Cell viability, proliferation, bone formation, and osteoblast differentiation were evaluated by methylthiazole tetrazolium (MTT) assay, Alamar Blue assay, acridine orange/propidium iodide staining, alkaline phosphatase (ALP) activity, Alizarin red staining, and reverse-transcription polymerase chain reaction (RT-PCR) to test the expression of collagen type I, ALPL, and osteocalcin. The results indicate that studied energy doses have a transient effect (48Â h after laser irradiation) on the osteoblast viability and proliferation. Similarly, laser irradiation did not appear to have any effect on ALP activity. These results were confirmed by RT-PCR analysis of osteoblast markers. This study suggests that several irradiation parameters and variations in the methods should be clearly established in the laboratory before laser treatment becomes a postulated application for bone tissue regeneration in clinical level. Alkaline Phosphatase Alkaline Phosphatase;Calcification, Physiologic;Cell Differentiation;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Gene Expression Regulation;Humans;Lasers;Low-Level Light Therapy;Osteoblasts;Staining and Labeling

Inconclusive evidence for the effectiveness of nonconventional methods in accelerating orthodontic tooth movement. Electromagnetic Fields;Humans;Low-Level Light Therapy;Oral Surgical Procedures;Tooth Movement Techniques

Low-level laser therapy in the treatment of muscle-skelet pain in patients affected by temporo-mandibular disorders. BACKGROUND: The purpose of the study is to evaluate the effectiveness of Low-Level Laser Therapy in reducing joint and muscle pain in patients with acute and chronic temporomandibular dysfunction. MATERIALS AND METHODS: The study was conducted on a sample of 180 patients. The sample was divided into two groups according to the time of onset of the disease: acute TMD (<6 months) and chronic TMD (> 6 months). The treatment for all patients provided for the irradiation with Diode Laser Wiser Doctor Smile with tip plane wave at wavelength of 830 nm, continuous beam to 40nW diameter and radius of 6 mm. The irradiated areas were the joint area, temporal, masseter and pterygoid. The irradiation time for each zone was 60s.The protocol adopted consisted of two weekly treatment for six weeks. Pain assessment was performed using the

Visual Analog Scale (VAS), in which different scores (s) depending accused of pain by the patient: s0 no pain, s1-3 mild pain, s4-6 moderate pain, s7-9 severe pain and s10 excessive pain. The pain monitoring was performed before treatment, after 15 days and after one month. RESULTS: The sample included 80 patients with acute TMD and 100 with chronic TMD. The sample belonging to acute TMD group before treatment, was distributed as follows: 0% in s0; 12,5% in s1-3; 31.3% in s4-6; 53.6% in s7-9 and 2.5% in s10. After 15 days the distribution was was as follows: 6.25% in s0; 47.5% in s1-3; 20% in s4-6; 26.3% in s7-9 and 0% in s10. After 30 days the sample was well distributed: 35% in s0; 45% in 1-3; 10% in s4-6; 10% in s7-9 and 0% in s10. The sample belonging to the chronic TMD group, at time zero, was as follows: 0% at s0; 48% in S1-3; 35% in s4-6; 15% in s7-9 and 2% in s10. After 15 days the distribution was: 29% in s0; 28% in S1-3; 33% in s4-6; 10% in s7-9 and 0% in s10. After 30 days the sample was well distributed: 45% in s0; 36% in S1-3; 15% in s4-6; 4% in s7-9 and 0% in s10. CONCLUSIONS: The Low-Level-Laser-Therapy is a valuable tool that can significantly decrease the perception of pain in patients with temporomandibular joint dysfunction, acute and chronic.

The Effects of Low-Power Laser Irradiation on Inflammation and Apoptosis in Submandibular Glands of Diabetes-Induced Rats. Diabetes can lead to dysfunction of the secretory capacity in salivary glands. Activation of the receptor for advanced glycation end products (RAGE) and its ligands has been suggested to participate in chronic disorders such as diabetes and its complications. In this study, the expression of RAGE, high mobility group box 1 (HMGB1) and advanced glycation end products (AGE), as well as the effects of low-power laser irradiation (LPLI) in salivary glands of diabetic rats were evaluated, and the mechanisms involved were characterized. The expression of RAGE and HMGB1 at the protein and mRNA levels was observed in submandibular glands (SMGs) of streptozotocin-induced diabetic rats. A diode laser was applied at 660 nm, 70 mW, 20 J/cm2, 0.56 J/point, with a spot area of 0.028 cm2 and its in vivo effects and the pathways involved were evaluated. Immunohistochemistry and western blotting analysis were performed for inflammatory and apoptosis markers. Diabetes up-regulates HMGB1/AGE/RAGE axis gene expression in SMGs that is associated with activation of the nuclear factor kappa B (NF-ÎºB) pathway. Interestingly, LPLI suppresses NF-ÎºB activation induced by inflammation. LPLI also reduces diabetes-induced apoptosis. That effect was accompanied by decreased levels of Bax, and cleaved caspase 3, which were up-regulated in diabetes. Taken together, our data suggest that LPLI reduces diabetes-induced inflammation by reducing the induction of HMGB1, ultimately leading to inhibition of apoptosis in submandibular glands of diabetic rats. Ager protein, rat;Glycation End Products, Advanced;HMGB1 Protein;Hbp1 protein, rat;Receptor for Advanced Glycation End Products Animals;Apoptosis;Diabetes Mellitus, Experimental;Female;Glycation End Products, Advanced;HMGB1 Protein;Low-Level Light Therapy;Rats;Rats, Wistar;Receptor for Advanced Glycation End Products;Sialadenitis;Submandibular Gland

Prospective Evaluation of the Safety and Efficacy of a 1060-nm Large Spot Size, Vacuum-Assisted Hair Removal Diode Laser System in Asian/Pacific Fitzpatrick's Skin Types IV-V Patients. Laser-based photoepilation of dark skin types demands a delicate combination of appropriate light wavelengths and spot size to achieve optimal epidermal-to-follicular energy absorption ratios. This prospective study assessed the axillary, arm, thigh, and back hair clearing ef cacy of the LightSheer In nity 1060 nm diode laser in 10 Fitzpatrick skin type IV-V patients. Each area was treated up to ve times, at 4-6-week intervals, after which immediate skin responses and adverse events were recorded. Hair count, color and coarseness were assessed before each treatment session, as well as 1, 3, and 6 months following the last session. Both patients and the treating physician rated the degree of improvement with time, and patients also ranked their satisfaction with the treatment outcome. Percent hair reduction from baseline gradually increased with treatment and peaked at 74.6%, 68.4%, and 65.7% for axillary, arm and thigh regions, respectively, 6 months following the last treatment session.

Baseline hair growth patterns precluded effective selection of a representative area for hair counting. Patients satisfaction was consistently higher for axillary hair clearance rates, followed by thigh and arm responses. Throughout the follow-up period, the investigator rated 50-67% of the treated axillae as presenting "good" or "very good" hair clearance, and provided similar ratings for 67% of the treated thigh regions at both the 1 and 6 month follow-up sessions. Immediate responses to treatment were mild to moderate and short-lived and no incidents of brosis or scarring were reported. Taken together, the LightSheer In nity 1060 HS Handpiece provided for an ideal ef cacy-safety balance in treating dark-skinned patients, providing for long-term hair clearance with minimal downtime. J Drugs Dermatol. 2016;15(11):1427-1434. Adolescent;Adult;Asian People;Female;Follow-Up Studies;Hair Follicle;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Prospective Studies;Skin Pigmentation;Treatment Outcome;Vacuum;Young Adult

Successful Treatment of Rhinophyma With Fractionated Carbon Dioxide (CO2) Laser in an African-American Man: Case Report and Review of Literature of Fractionated CO2 Laser Treatment of Rhinophyma. Rhinophyma, a late complication of rosacea (phymatous subtype), is a chronic, progressive dermatological condition. The classic pre- sentation of rhinophyma is nodular, thickened skin over the distal nose, and is often accompanied by underlying erythema secondary to in ammation. Due to the unpleasant aesthetic and dis guring appearance, rhinophyma may be associated with a signi cant nega- tive psychosocial impact, resulting in decreased patient quality-of-life. Treatment of rhinophyma is challenging as topical and systemic pharmacotherapies have shown limited ef cacy. We present a case of a 39-year-old African-American male with long-standing, mild rhinophyma who was successfully treated with two sessions of fractionated carbon dioxide (CO2) laser. We also review the medical literature on fractionated CO2 laser treatment of rhinophyma. To the best of our knowledge, this is the rst report of successful treat- ment of rhinophyma using fractionated CO2 laser in an African-American man (Fitzpatrick VI). We believe that fractionated CO2 laser may be a safe and ef cacious treatment modality for rhinophyma in skin of color patients (Fitzpatrick IV-VI) and early intervention with fractionated CO2 laser to prevent rhinophyma worsening may yield better results than late intervention. J Drugs Dermatol. 2016;15(11):1465-1468.. Adult;Black or African American;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Rhinophyma;Treatment Outcome

Successful Treatment of Traumatic Onychodystrophy and Associated Pterygium Unguis With Fractionated Carbon Dioxide Laser: Case Report and Review of the Literature. Onychodystrophy is a common, chronic malformation of the nail that is aesthetically displeasing and can signi cantly impact patient quality-of-life. Onychodystrophy can be associated with pterygium unguis that contributes to pain and appears as a V-shaped exten- sion of the proximal nail fold skin. Treatment options are limited, and topical or intralesional corticosteroids have minimal ef cacy and cause signi cant patient discomfort. Surgical revision of onychodystrophy is complex, and symptomatic or aesthetic improvements are difficult to achieve. There is limited published literature on laser treatment of noninfectious onychodystrophy or associated pterygium unguis. We present a case of a 68-year-old man with a 10-year history of painful traumatic onychodystrophy with associated pterygium unguis, who was successfully treated after three treatments of fractionated carbon dioxide (CO2) laser. Additionally, we review the medical literature on laser treatment of noninfectious onychodystrophy and pterygium unguis. To our knowledge, this is the first reported successful treatment of painful traumatic onychodystrophy and associated pterygium unguis using fractionated CO2 laser. We hope clinicians consider this treatment modality to relieve pain and improve aesthetics associated with traumatic onychodystrophy and associated pterygium unguis. We envision additional research investigating the mechanism of action of fractionated CO2 laser may con rm this treatment

option for the management of traumatic onychodystrophy and associated pterygium unguis. J Drugs Dermatol. 2016;15(11):1461-1464.. Aged;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Nail Diseases;Pterygium;Treatment Outcome

The Efficacy of Q-Switched ND:YAG 1064 nm Laser in Recalcitrant Macular Amyloidosis: A Case Report. Macular amyloidosis typically presents as small, dusky-brown or greyish pigmented macules, the result of altered keratin deposition. Treatment of these hyperpigmented regions with topical and systemic therapies remains challenging, however Q-Switched neodymi- um-doped yttrium aluminum garnet (ND:YAG) laser has proven to be an effective treatment modality to reduce hyperpigmentation. In this case report we investigated the ef cacy of Q-Switched Nd:YAG laser treatment on a 34-year old woman with recalcitrant macular amyloidosis who failed to respond to over-the-counter bleaching creams. The patient was treated with 7 treatment sessions of Q- Switched Nd:YAG laser at one month intervals. According to our photographic analysis and patient self-assessment, the patient ap- peared to improve with each treatment session. Post-recurrence of the lesion after reaction to Triluma (uocoinolone actetonide 0.01%, hydroquinone 4%, tretinoin 0.05%), the patient has been continuing to respond well to a second round of treatment with Q-switched Nd:YAG laser at 1064 nm. J Drugs Dermatol. 2016;15(11):1456-1458.. Adult;Amyloidosis;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome

Self-Resolving Eruptive Keratoacanthomas After Full-Field Erbium Laser Resurfacing. Keratoacanthoma (KA) is a subtype of squamous cell carcinoma whose development has been linked to excessive sun exposure, immunosuppression, and trauma. Given the rapidly expanding therapeutic armamentarium for anti-aging modalities in dermatology, reports of KA secondary to invasive cosmetic procedures are on the rise. We present a case of eruptive KAs after full- eld ablative Erbium:YAG 2940 nm laser resurfacing of the face that resolved with minimal intervention. This case demonstrates the potential for a rare yet signi cant laser complication that may warrant discussion during the consenting process. J Drugs Dermatol. 2016;15(11):1453-1455.. Female;Humans;Keratoacanthoma;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged

Q-Switched Nd:YAG Laser Removal of Facial Amateur Tattoos in Patients With Fitzpatrick Type VI: Case Series. INTRODUCTION: Q-switched neodymium:YAG (Nd:YAG) lasers are reported to be gold standard for laser tattoo removal. In particular, the Q-switched Nd:YAG laser at 1064 nm is widely recognized for the removal of blue/black amateur tattoos. However, treatment modalities in Fitzpatrick Type VI skin carry a greater risk of complications including alterations in pigmentation compared to fairer skin (Fitzpatrick Type I-IV skin). Therefore, the aim of this case series was to describe with the use of the Q-Switched Nd:YAG laser, the removal of carbon-based amateur tattoos on patients with Fitzpatrick Type VI skin as an effective and safe method. METHODS: Twenty- five patients with Fitzpatrick type VI skin, from Ethiopian origins, with facial tribal tattoos, were treated with the Q- Switched Nd:YAG laser at 1064 nm. Digital images were taken upon every treatment and the clearance rates of the tattoo was evalu- ated by imaging software. RESULTS: We observed an average tattoo clearance rate of 95% among the 45 facial tattoos in 25 patients presented in the case series with minimal pigmentary and textual changes evident. DISCUSSION: These positive aesthetic results have a signi cant psychosocial impact on the lives of those with Fitzpatrick Type VI skin, in particular the Ethiopian Jewish population. J Drugs Dermatol. 2016;15(11):1448-1452.. Adolescent;Adult;Cohort Studies;Ethiopia;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Tattooing;Young Adult

Combination Therapy for Acne Scarring: Personal Experience and Clinical Suggestions. Acne is one of the most prevalent skin conditions seen by dermatologists. The cosmetic sequelae of severe acne, including scarring and pigmentation, have a profound psychological impact on those in icted.

Topical (eg, retinoids, antibiotics, dapsone, hydroxyacids) and oral treatments (eg, antibiotics and/or spironolactone) are often bene cial to control acne or in the instance of oral isotretinoin use, rid the acne permanently; however, these treatments have very little affect on the ultimate cosmetic outcome of the acne scarring and skin texture that results. Given the variety of scar types that can form and the variability of responses seen in various skin types and textures, treatment options are vast without appropriate guidelines for pathways that dictate best timing, combinations, and options in given clinical scenarios. Current treatment options include solo or combina- tions of energy-based (eg, laser, radiofrequency), chemical-based (eg, peels, TCA cross), surgical-based options (eg, subcision, punch excision), microneedling, and llers and/or fat injections. Most recently, fractional radiofrequency-based treatments have been used to improve acne scarring with less reported downtime as compared to lasers or chemical peels and the ability to treat darker or sensitive skin types with less risk of scarring or hyperpigmentation. In severe cystic ares, scarring treatments are often postposed till the acne is under control and in many instances this can limit the dermatologists ability to affect future cosmetic treatments. Based on personal experience of various clinical scenarios in a busy laser practice that treats a signi cant number of patients with acne scarring, fractional radiofrequency is an excellent choice for treating all forms of acne scars with minimal risk to patients, even those on concurrent treatments such as isotretinoin. Additionally, fractional radiofrequency can be used in combination with all other treatment options to speed the time to clinical improvement appreciated by the patient. Here we present personal experiences of combination treatments for acne scarring, pigmentation and textural issues, and suggest that fractional radiofrequency be considered a "gold standard" treatment of acne scarring in those with dark or sensitive skin types or those on concurrent isotretinoin. J Drugs Dermatol. 2016;15(11):1413-1419. Acne Vulgaris;Chemexfoliation;Cicatrix;Combined Modality Therapy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Radiofrequency Therapy;Young Adult

Evaluation of the Safety and Efficacy of a Low Fluence, Picopulsed, Alexandrite Laser in a Pico-Toning Technique With a Diffractive Lens Optic for the Treatment of Photodamage and Textural Improvement in "Off the Face" Applications. BACKGROUND: The diffractive optic coupled with a picosecond pulsed alexandrite laser has been shown to effectively minimize pigmen- tation while improving the appearance of textural irregularities and rhytides. We evaluated the safety and ef cacy of the diffractive optic laser treatment for off of the face applications including the hands and dÃ©colletage in a pico-toning technique. STUDY: 20 healthy female patients (40-70 years of age) were treated with a picosecond pulsed alexandrite laser with a diffractive lens. 10 of the patients were enrolled in a prospective hand assessment study (20 hands) while the remaining 10 subjects were enrolled in an IRB approved study treating photodamage of the dÃ©colletage. Protocol for both groups included 4 treatments to the designated area with a picopulsed alexandrite laser with a diffractive lens on a 6mm handpiece delivering 0.71 j/cm2 with 10 hz repetition at 3 week intervals (+- 7 days) with follow up at 1 month and 3 months post fourth treatment using standardized digital photography. RESULTS: Statistically signi cant improvement in the overall appearance of pigmentation, texture and rhytides were recorded at each sub- sequent visit and at 1 and 3 months post the nal laser treatment. Clinical photographs were evaluated from baseline to the final photo at 3 months post last laser treatment by the treating physician, patient, and an independent evaluator. All hand subjects and chest subjects showed improvement in all 3 areas which were found to be statistically signi cant. No adverse events occurred in either study group. CONCLUSION: These study results show signi cant improvement in not only pigmentation, but in texture and rhytides in all subjects receiving pico-toning laser treatments to off of the face areas. The laser was well tolerated by all patients with no adverse effects. The use of a diffractive lens optic on a 6 mm xed spot size

handpiece with a picopulsed alexandrite laser, in a pico-toning technique, provides a safe, low uence, yet effective treatment for not only pigment dyschromia but also textural irregularities and rhytides when treating the hands and dÃ©colletage. J Drugs Dermatol. 2016;15(11):1398-1401.. Adult;Aged;Female;Follow-Up Studies;Hand;Humans;Lasers, Solid-State;Light;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Prospective Studies;Skin Aging;Thorax;Treatment Outcome

A Prospective Split-Face Study of the Picosecond Alexandrite Laser With Specialized Lens Array for Facial Photoaging in Chinese. BACKGROUND: A 755nm picosecond alexandrite laser with a diffractive lens array has been reported for the treatment of acne scar and photoaging with clinical ef cacy. In this study, we evaluated the application of the 755nm picosecond alexandrite laser with a diffractive lens array for facial photoaging in Chinese. MATERIALS AND METHODS: Ten subjects with moderate facial photoaging were enrolled in a prospective, evaluator-blinded, open-label, and split-face trial to assess the ef cacy and safety of the 755nm picosecond alexandrite laser with a diffractive lens array for facial photoaging. Each subject received a series of four treatment sessions on the right side of the face at two-week intervals. The left side of the face served as the control side. Blinded evaluation of baseline, pre-treatment, and two-month follow-up visit was performed by two independent dermatologists on a 5-point global photoaging scale (GPS) and a 6/8-point Asian photographic scale (APS). Adverse events and discomfort associated with the treatment were also assessed. RESULTS: Signi cant improvement in photoaged tissue was observed on the treated side of the face, with a mean GPS score decrease from 2.67 to 1.44 at the two-month follow-up visit. A greater improvement in wrinkles was observed (2.78 vs 1.89; P less than 0.05) when com- pared to the improvement in pigmentation (2.67 vs 2.11; P less than 0.05). No changes were observed on the control side. Treatment results improved gradually throughout the treatment program and continued to the two-month follow up. In addition, skin tightening was perceived in all subjects, and shallower nasolabial folds were observed in 60% of the subjects on the treated side of face. Moderate pain and transient erythema were observed as the two main discomforts associated with the treatment. CONCLUSIONS: The 755nm picosecond alexandrite laser with a diffractive lens array is efficacious and safe for rejuvenation of photodamaged facial tissue in Chinese. J Drugs Dermatol. 2016;15(11):1390-1396.. Adult;Asian People;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Prospective Studies;Rejuvenation;Single-Blind Method;Skin Aging;Time Factors

Acne Treatment With 3-Step Broadband Light Protocol. BACKGROUND AND OBJECTIVE: A new 3-step protocol using broadband light allows patients with moderate to severe in ammatory acne to avoid potential side effects of systemic acne treatments and the risks and uncertainties associated with laser and light treatments to date. The protocol also addresses acne scarring and, with appropriate modi cations, all skin types. METHODS: The protocol consists of 6 to 8 treatments performed with a single device that allows the user to select wavelength, spot size, uence, and pulse duration. Step 1 uses blue light with a large spot size and low uence to kill Propionibacterium acnes. Step 2 features red and yellow light with a smaller spot size and higher uence, which together exert anti-in ammatory effects and trigger neocollagenesis. Step 3 employs visible and infrared (IR) light with a high uence and 12-second pulse length, delivered with a constant motion technique, to enhance previous results while also targeting areas of frequent breakouts. RESULTS: Challenging cases treated with the protocol include a young adult female with a nearly decade-long history of in ammatory and cystic acne. Her skin remained clear more than 6 months post-treatment. She reported her scarring reduction at 90%. Having treated more than 100 patients with the protocol, the author reports that approximately 80% of patients clear completely or achieve at least a 75% improvement in their in ammatory acne. Acne improvements start appearing 2 to 3 days after a

treatment session. Red, purple, raised, or depressed acne scars less than 1 to 2 years old begin to fade 1 to 3 weeks post-treatment. CONCLUSION: The 3-step protocol is safe and effective for patients with moderate to severe in ammatory acne and acne scarring. J Drugs Dermatol. 2016;15(11):1382-1388.. Acne Vulgaris;Cicatrix;Female;Humans;Low-Level Light Therapy;Middle Aged;Treatment Outcome;Young Adult

The Diagnostic Role of Optical Coherence Tomography (OCT) in Measuring the Depth of Burn and Traumatic Scars for More Accurate Laser Dosimetry: Pilot Study. BACKGROUND: In recent decades, a number of optimal diagnostic technologies have emerged to assist in tissue visualization. Real-time monitoring of skin during laser therapies will help optimize laser parameters for more ef cient therapies. One of these technologies, optimal coherence tomography (OCT), may be used to help visualize burn and traumatic scars. When lasing severe scars, lasers have tunable pulse energies, which are made proportional to the scar thickness as estimated by palpation and the physician eye. This has historically been estimated by the clinician with no objective data. OCT is an emerging non-invasive imaging technique that provides a cross-sectional image of tissue micro-architecture from a depth of 0.7 - 1.5 mm. The signal intensity is related to the tissue optical scattering properties, which in turn is related to tissue constituents such as collagen density. Thus, OCT may provide an objective non-invasive measurement of scar depth. STUDY: Thirty burn and traumatic scars were imaged with quality, traceable, and veri able OCT data from burn and trauma patients both pre- and post- laser therapy. OCT was rapid and ef cient (approximately 2 minutes) to scan skin to visualize real-time scar tissue in different areas of heterogenous scars. The OCT image of the scar was compared to that of normal tissue in order to identify scar tissue and estimate its depth. Laser parameters were then dialed to treat full thickness of the scar. RESULTS: Clinical and OCT correlation between atrophic versus hypertrophic scars was found. However, in most cases the clinicians underestimated the depth of the scar in the dermis. CONCLUSION: The treatment of burn and traumatic scars for both civilian and wounded warriors can be challenging. As these scars are often very deep, OCT allows for non-invasive examination of the thickness of the scar allowing the physician better accuracy for laser settings in the treatment for the full thickness of the scar tissue. J Drugs Dermatol. 2016;15(11):1375-1380.. Adult;Burns;Cicatrix, Hypertrophic;Female;Humans;Laser Therapy;Low-Level Light Therapy;Pilot Projects;Tomography, Optical Coherence

Treatment of Facial Photodamage With Mass Market Topical Products vs Non-ablative Fractional Laser. METHODS: In this split-face, evaluator-blinded study, 18 subjects were randomly assigned to receive either the SSR or NFL treatments on each side of the face. For the SSR facial sides subjects followed two morning-evening regimens. On the NFL sides subjects were treated 3 times with the 1927-nm laser at 4-week intervals. Three physician evaluators were asked to rate hyperpigmentation, global photoaging, and ne lines and wrinkles for each side of the face at baseline and at 3 months using a 5-point scale. RESULTS: The SSR and NFL treatments provided comparable results for each skin attribute. Improvement from baseline was signi - cant in both treatment programs for each skin attribute. The greatest 3-month improvement for both programs was in hyperpigmen- tation. For global photoaging and ne lines and wrinkles, positive responses were slightly greater in the NFL than in the SSR facial sides. Subject preference for the SSR over the NFL was greatest for ne lines around the eyes, ne lines around the mouth, smooth texture, radiant complexion, and overall improvement while the NFL was preferred for skin rmness and evenness. When the study was completed5 of 18 split-face subjects decided to undergo NFR laser treatment on the non laser treated side along with using the SSR product and 13 of the 18 subjects continued to use the SSR products to their full face after the study. CONCLUSION: The mass market skin care system of the present study provides improvement in hyperpigmentation, global photoaging, and ne lines and wrinkles comparable to that of a series of treatments with a non-ablative fractional laser. J Drugs Dermatol.

2016;15(11):1366-1372.. Administration, Topical;Adult;Face;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Single-Blind Method;Skin Aging;Skin Care;Skin Cream;Treatment Outcome

Integrated Cooling-Vacuum-Assisted Non-Fractional 1540 nm Erbium:Glass Laser is Effective in Treating Acne Scars. INTRODUCTION: Acne scars are a common result of in ammatory acne, affecting many patients worldwide. Among which, atrophic scars are the most prevalent form, presenting as dermal depressions caused by inflammatory degeneration of dermal collagen. Mid-infrared laser skin interaction is characterized by its modest absorption in water and nite penetration to the mid-dermis. Since collagen is a desirable laser target, 1540-nm wavelength is amenable for collagen remodeling within the depressed area of atrophic scars. OBJECTIVES: To evaluate the safety and efficacy of acne scars treatment using an integrated cooling-vacuum-assisted 1540 nm Erbium: Glass Laser. PATIENTS AND METHODS: This interventional prospective study included 25 volunteers (10 men, 15 women) with post acne atrophic scars. Patients were treated with a mid-infrared non-fractional 1540 nm Er:Glass laser (Alma Lasers Ltd. Caesarea, Israel) with integrat- ed cooling- vacuum assisted technology. Acne scars were exposed to 3 stacked laser pulses (400-600 mJ/pulse, 4 mm spot size, frequency of 3 Hz). Patients underwent 3-6 treatment sessions with a 2-3 week interval and were followed-up 1 month and 3 months after the last treatment. Clinical photographs were taken by high resolution digital camera before and after treatment. Clinical evaluation was performed by two independent dermatologists and results were graded on a scale of 0 (exacerbation) to 4 (76%-100% improvement). Patients' and physicians' satisfaction were also recorded (on a 1-5 scale). Pain perception and adverse effects were evaluated as well. RESULTS: Almost all patients (24/25) demonstrated a moderate to significant improvement. Average improvement was 3.9 and 4.1 points on the quartile scale used for outcome assessment 1 and 3 months following the last session, respectively. Patient satisfaction rate was 4.2. Side effects were minimal and transient: erythema, mild transient vesicles, and mild pain or inconvenience. CONCLUSION Cooling-Vacuum-Assisted mid-infrared non-fractional Er:Glass 1540 nm laser is safe and effective in the treatment of atrophic acne scars. J Drugs Dermatol. 2016;15(11):1359-1363.. Acne Vulgaris;Cicatrix;Cold Temperature;Cryotherapy;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Treatment Outcome;Vacuum

Comparison of the Cutaneous Thermal Signatures Over Twenty-Four Hours With a Picosecond Alexandrite Laser Using a Flat or Fractional Optic. INTRODUCTION: This study explored immediate heat signatures with different passing techniques and the delayed thermal data points with the picosecond Alexandrite laser with the 6mm at and fractional optic during and after treatment. We sought to clarify the im- mediate effects of heating and understand the thermal and short term clinical difference when using these optics. RESULTS: There were no immediate differences or a signi cant temperature rise with different passing techniques using the at or the fractional optic. However, after treatments a signi cant temperature elevation over 24 hours with manageable erythema was noted with the fractional optic. Only faint redness was appreciated with the at optic. CONCLUSION: The different passing methods with these optics did not result in a significant thermal change. However, the fractional optic produces a localized area of epidermal necrosis which results in a significant clinical and a delayed thermal effect. With multiple treatments over time, collagen, elastic tissue, and mucin is produced resulting in improvement of acne scars and photo-damaged skin. This process suggests that a well-placed epidermal injury can stimulate an inflammatory cascade with dermal remodeling. J Drugs Dermatol. 2016;15(11):1347-1352.. Acne Vulgaris;Administration, Cutaneous;Cicatrix;Epidermal Cells;Epidermis;Erythema;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Aging;Temperature;Time Factors

A Split-Face Assessment of the Synergistic Potential of Sequential Q-Switched Nd:YAG Laser and 1565 nm Fractional Nonablative Laser Treatment for Facial Rejuvenation in Fitzpatrick Skin Type II-V Patients. Recent appreciation of the multifactorial pathophysiology of skin aging has led to increased use of parallel treatment regimens. This prospective, split-face, randomized study assessed the safety and efficacy of same-day sequential Q-switched Nd:YAG laser and 1565 nm non-ablative fractional laser (SST) facial rejuvenation treatment in comparison to fractional non-ablative laser (NAFL) treatment only. Seventeen patients underwent three treatment sessions, conducted at 4-6-week intervals, in which SST treatment was delivered on a randomly selected side of the face followed by NAFL treatment on the contralateral side immediately thereafter. Immediate skin responses were assessed within 30 minutes of treatment, while wrinkle/elastosis scores, and skin tone and texture were evaluated 1, 3, and 6 months following the final treatment session. While SST and NAFL proved equally safe, SST was associated with signi cantly lower pain scores in all three treatment sessions. Both treatment regimens yielded signi cant improvements in wrinkle/elastosis scores, which were maintained throughout the 6 months of follow up. Physician-evaluated skin tone and patient ratings of skin texture and overall improvement of the SST-treated side were consistently higher than the contralateral NAFL-treated side. Histological analysis suggested a broader effect, alongside sparing of the outermost epidermal layer with the SST versus NAFL treatment. Although the SST regimen failed to demonstrate statistically signi cant clinical superiority over the NAFL regimen, the significantly lower pain levels, consistently higher physician and patient ratings following SST may justify its regular use as a skin rejuvenation technique. J Drugs Dermatol. 2016;15(11):1335-1342.. Aged;Combined Modality Therapy;Cosmetic Techniques;Female;Follow-Up Studies;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Pain;Rejuvenation;Skin Aging;Skin Pigmentation

Clinical Evaluation of Hair Removal Using an 810 nm Diode Laser With a Novel Scanning Device. INTRODUCTION: Diode lasers are often considered as the gold standard preference for hair removal due to the deep penetration and ef- fective targeting of the hair follicle. A wide variety of diode lasers are available, which can differ in terms of their parameters (such as fluence, pulse duration, repetition rate, scanner, and cooling). OBJECTIVE: The objective of the study was to evaluate the safety and ef cacy of hair removal with an 810 nm novel scanning diode laser, up to six months after last treatment. METHODS: A scanning 810 nm diode laser was used for axillary hair removal of 14 female patients who received 3 treatments, 4-6 weeks apart. Follow-up on hair count was conducted 3 and 6 months after last treatment and compared to baseline hair count. RESULTS: No unexpected or signi cant adverse events were recorded. An average hair count reduction of 72.8% after 3 months and 67.6% 6 months after the last treatment is demonstrated. CONCLUSIONS: The examined 810 nm diode laser was proven to be safe and effective for hair removal. Results were sustained for 6 months after last treatment. Longer follow-up data are followed for further substantiation of the clinical effect. Scanning technology can provide for potentially faster and safer treatments. J Drugs Dermatol. 2016;15(11):1330-1333.. Adult;Axilla;Female;Follow-Up Studies;Hair Follicle;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Treatment Outcome;Young Adult

The Two Faces of Fractionated Photodynamic Therapy: Increasing Efficacy With Light Fractionation or Adjuvant Use of Fractional Laser Technology. "Fractionated photodynamic therapy (PDT)" is a new term being used by dermatologists to describe advances in PDT technology including fractionated light or the adjuvant use of fractional lasers. Although dermatologists have used PDT since the early 1990s for the treatment of photodamage and precancerous lesions, newer developments in technology have allowed for the treatment of non-melanoma skin cancers (NMSCs), in ammatory disorders, and even uses in the eld of anti-aging. Recent developments in fractionated

light therapy have allowed for PDT with dark intervals and two-fold illumination schemes to increase cellular damage and apoptosis. Combining PDT with fractional laser technology has allowed for enhanced dermal penetration of topical photosensitizers including 5-aminolevulinic acid (ALA) and methyl aminolevulinate (MAL), as well as increased ef cacy of treatment. These advances in PDT technology will allow for increased convenience, decreased treatment time, only one application of topical photosensitizer, and decreased cost to the patient and dermatologist. J Drugs Dermatol. 2016;15(11):1324-1328.. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Administration, Cutaneous;Aminolevulinic Acid;Clinical Trials as Topic;Combined Modality Therapy;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Skin Diseases;Treatment Outcome

Safety and Efficacy Evaluation of Pulsed Dye Laser Treatment, CO(2) Ablative Fractional Resurfacing, and Combined Treatment for Surgical Scar Clearance. BACKGROUND & OBJECTIVE: Surgical scars are an unwanted sequela following surgical procedures. Several different treatment modalities and approaches are currently being employed to improve the cosmesis of surgical scars with each having varying degrees of success. The objective of this study was to assess the ef cacy and safety pulsed dye laser treatment, CO2 ablative fractional resurfacing, and a combined treatment with these two modalities for the cosmetic improvement of surgical scarring that occurred following the surgical removal of skin cancer from different anatomic areas. MATERIALS AND METHODS: Twenty-five patients with surgical scarring most frequently on the face following recent surgical excision of skin cancer with Mohs surgery were included in this multicenter, prospective clinical study. Patients were randomized into 4 treatment arms, namely, pulsed dye laser alone, CO2 laser alone, a combined treatment with these two modalities, and CO2 ablative fractional resurfacing on the same day of surgery to half of the scar, followed by a combined treatment with the two modalities to that half of the scar. Patients in each study arm received a total of 3-4 treatments, while those patients in Arm 4 underwent an additional treatment with CO2 laser immediately after surgery. Patients were followed up at 1 and 3 months after the final treatment session. RESULTS: No adverse events were seen. Significant improvements in the appearance of scars were achieved in all study arms, as as- sessed by the Vancouver Scar Scale and Global Evaluation Response scales, with the best clinical outcomes seen in those scars that underwent a combination treatment. All patients reported very high satisfaction from treatment. CONCLUSION: Both pulsed dye laser treatment and CO2 ablative fractional resurfacing, when used as a monotherapy, are safe and effective in the treatment and improvement of recent surgical scarring. When both of these modalities are used in combination, however, they appear to potentially have a synergistic effect and an accelerated outcome on the cosmesis of recent surgical scars. J Drugs Dermatol. 2016;15(11):1315-1319.. Adult;Aged;Aged, 80 and over;Cicatrix;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Mohs Surgery;Prospective Studies;Surgical Wound;Treatment Outcome

An Anatomical Approach to Evaluating and Treating Cellulite. Cellulite is the common rippling or dimpling of skin of the thighs and buttocks of women, formed from a confluence of skin laxity, tethering fibrous septa, and fat herniation. We describe an anatomical approach to evaluating the cellulite patient and selecting the best treatment from among available non-invasive, minimally invasive, and invasive therapies. It is crucial to consider the anatomy of the patient and the morphology of cellulite while choosing a treatment. Diffuse rippling represents increased adiposity and/or increased skin laxity which may stand to benefit from lipolytic and skin tightening modalities. Dimpling represents tethering by fibrous septa which may stand to improve from subcision by minimally invasive devices such as Cell na. Patients with both morphologies may be treated with a combination of treatments or Cellulaze. Careful evaluation of the patient can help identify the best

therapeutic strategy. J Drugs Dermatol. 2017;16(1):58-61.. Retinoids Adipose Tissue;Buttocks;Cellulite;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Retinoids;Thigh

1060 nm Diode Hyperthermic Laser Lipolysis:The Latest in Non-Invasive Body Contouring. Non-invasive body contouring is becoming increasingly popular in the United States. Using the 1060 nm diode laser to achieve hyperthermic temperatures within the adipose tissue with subsequent lipolysis is one of the most recent advancements in this field and is the first of its kind. This wavelength was carefully chosen to effectively target the unwanted adipocytes while sparing the overlying skin and adnexae. Appreciable results are achieved after a single treatment, and these results are comparable to other non-invasive technologies. The 25-minute procedure is well tolerated among patients, with no downtime required. This versatile system allows for treatment of multiple body sites, which can be customized for a particular patient's needs. Herein, we discuss in detail the mechanism of action, efficacy, and safety of 1060 nm diode hyperthermic laser lipolysis. Amongst the various body contouring modalities available today, the 1060 nm diode hyperthermic laser is a worthy addition providing a safe, quick, and effective non-invasive fat reduction option for patients. J Drugs Dermatol. 2017;16(1):48-52.. Adipocytes;Adipose Tissue;Clinical Trials as Topic;Cosmetic Techniques;Humans;Hyperthermia, Induced;Lasers, Semiconductor;Lipolysis;Low-Level Light Therapy;Myalgia;Subcutaneous Fat

Laser and photochemotherapy for the treatment of oral mucositis in young patients: Randomized clinical trial. BACKGROUND: The aim of the present study was to evaluate the effect of low-level laser therapy (LLLT) combined with photochemotherapy (PCT) for the treatment of chemotherapy-induced oral mucositis in young patients. METHODS: A randomized, blind, clinical trial with a split-mouth design was conducted involving a sample of 15 cancer patients aged three to 16 years at the Aldenora Bello Hospital in the city of SÃ£o LuÃ-s, Brazil. The treatments (PCT+LLLT and LLLT alone) were randomly determined for each side of the oral cavity. The patients were blinded to the type of therapy performed on each side. The outcome was the area of the lesion measured in cm(2) over an eight-day evaluation period. Treatment and follow up of the lesions under evaluation as well as other lesions occurred until complete remission. Friedman and Wilcoxon tests were employed. Significance was set at a 95% confidence level (Î±=0.05) and the effect size was calculated. RESULTS: A statistically significant difference was found between therapies for lesion area on Days 6-8 (p=0.020, 0.011 and 0.005, respectively), which was confirmed by the moderate effect size. Lesions submitted to PCT+LLLT had a smaller area at the end of the evaluation period. CONCLUSION: Based on the present findings, PCT+LLLT had a greater therapeutic effect in comparison to LLLT alone regarding the reduction in the degree of severity of chemotherapy-induced oral mucositis. Antineoplastic Agents;Photosensitizing Agents Adolescent;Antineoplastic Agents;Child;Child, Preschool;Combined Modality Therapy;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Male;Photochemotherapy;Photosensitizing Agents;Stomatitis;Treatment Outcome

Low-Level Laser Irradiation Improves Motor Recovery After Contusive Spinal Cord Injury in Rats. This study investigated the therapeutic effects of low-level laser irradiation (LLLI) on the recovery of motor function and its underlying mechanisms in rats with spinal cord injury (SCI). The spinal cord was contused at the T11 level using a New York University impactor. Thirty-eight rats were randomly divided into four groups: LLLI with 0.08 J, 0.4 J, 0.8 J, and sham. We transcutaneously applied at the lesion site of the spinal contusive rats 5 min after injury and then daily for 21 days. The Basso, Beattie and Bresnahan (BBB) locomotor scale and combined behavioral score (CBS) were used to evaluate motor function. The spinal segments of rostral and caudal from the lesion site, the epicenter, and L4-5 were collected from normal and the all groups at 7 days after SCI. The expression of tumor necrosis

factor-Î± (TNF-Î±) and inducible nitric oxide synthase (iNOS) was compared across groups in all regions. In the present study, LLLI with 0.4 J and 0.8 J led to a significant improvement in motor function compared to sham LLLI, which significantly decreased TNF-Î± expression at the lesion epicenter and reduced iNOS expression in the caudal segment for all LLLI groups and in the L4-5 segments for the 0.4 J and 0.8 J groups when compared to sham LLLI group. Our results demonstrate that transcutaneous LLLI modulate inflammatory mediators to enhance motor function recovery after SCI. Thus, LLLI in acute phase after SCI might have therapeutic potential for neuroprotection and restoration of motor function following SCI.

Low-Level Laser Therapy in Enhancing Wound Healing and Preserving Tissue Thickness at Free Gingival Graft Donor Sites: A Randomized, Controlled Clinical Study. OBJECTIVE: The aim of this study was to determine the effects of low-level laser therapy (LLLT) on wound healing at free gingival graft (FGG) donor sites. MATERIALS AND METHODS: Forty patients requiring FGG were selected for this randomized, controlled, and double-blinded prospective clinical trial. The FGG donor sites were treated with LLLT and compared with an untreated control group. The Wound-Healing Index (WHI), tissue consistency, color match, and H(2)O(2) bubbling test for the evaluation of complete wound epithelialization were recorded on the 3rd, 7th, 14th and 21st days. The pain-burning level, number of analgesics, and bleeding were recorded for 7 days. Donor area soft tissue thickness (TT) was measured at baseline and at the first month. RESULTS: The prevalence of Complete Wound Epithelization was higher in the LLLT group than in the control group on the 14th day (pâ€‰<â€‰0.001). The bleeding was lower in the test group than in the control group during the first 2 days (pâ€‰â‰¤â€‰0.001). Higher WHI Scores were observed in the test group relative to the control group at all visits (pâ€‰â‰¤â€‰0.001). Color match scores were higher in the test group than in the control group at the first 3 visits (pâ€‰<â€‰0.05). The TT changed from 4.62â€‰Â±â€‰0.79 to 4.71â€‰Â±â€‰0.82â€‰mm in the LLLT group and from 4.23â€‰Â±â€‰0.62 to 4.01â€‰Â±â€‰0.68â€‰mm in the control group. CONCLUSIONS: It can be concluded that LLLT enhances FGG donor site wound healing and preserves TT at palatinal donor sites. Adult;Cicatrix;Female;Free Tissue Flaps;Gingiva;Humans;Low-Level Light Therapy;Male;Prospective Studies;Reference Values;Statistics, Nonparametric;Transplant Donor Site;Transplantation, Autologous;Wound Healing

Temperature Development on the External Root Surface During Laser-Assisted Endodontic Treatment Applying a Microchopped Mode of a 980â€‰nm Diode Laser. OBJECTIVE: The aim of this article was to investigate the temperature increase of the external root surface during laser-assisted endodontic treatment using a diode laser (980â€‰nm) in a microchopped mode. METHODS: Ten freshly extracted, human maxillary incisors with mature apices were collected, prepared to size F4 at working length (ProTaper; Dentsply Maillefer, Ballaigues, Switzerland), mounted to a holder, and irradiated (using spiral movements in coronal direction) with a diode laser (GENTLEray 980 Classic Plus; KaVo, Biberach, Germany) with a 200â€‰Î¼m fiber in four different treatment groups: Group 1 (control group) was irradiated in six cycles of 5-sec irradiation/20-sec pause with 2.5â€‰W in the pulse mode. Groups 2 to 4 were irradiated at six cycles of 5-sec irradiation/20-sec pause in the microchopped mode (Group 2-1.6â€‰W; Group 3-2.0â€‰W; Group 4-2.5â€‰W). The applied mode was 25â€‰ms on/25â€‰ms off. Within the on period, the laser delivered an intermittent sequence of energy complexes and the maximum output was equal to the nominated output of the device (12â€‰W). Canals were kept moist by sterile saline irrigation in between irradiations, and temperature changes were continuously measured using a thermal imaging camera. Recordings were analyzed by a mixed model (analysis of variance [ANOVA] for repeated measurements). RESULTS: The highest mean of temperature rise, 1.94Â°Câ€‰Â±â€‰1.07Â°C, was measured in Group 4, followed by Group 3 (1.74Â°Câ€‰Â±â€‰1.22Â°C) and Group 2 (1.58Â°Câ€‰Â±â€‰1.18Â°C). The lowest

increase occurred in Group 1 (1.06Â°Câ€‰Â±â€‰1.20Â°C). There was a significant difference (pâ€‰=â€‰0.041) between the groups. Significant differences were found between Groups 1 and 4 (pâ€‰=â€‰0.007) and 1 and 2 (pâ€‰=â€‰0.035). In addition, a marginally significant difference between Groups 1 and 2 (pâ€‰=â€‰0.052) was noted. There was no significant difference between Groups 2, 3, and 4. Despite the low mean values reported, the highest temperature increase (+5.7Â°C) was measured in one of the specimens of treatment Group 2 at the middle third. CONCLUSIONS: Under the conditions used and within the limitations of the study, the microchopped diode laser irradiation is a safe possible treatment option in laser-assisted endodontic treatment, concerning the temperature elevation on the external root surface. Analysis of Variance;Dental Pulp Cavity;Endodontics;Hot Temperature;Humans;In Vitro Techniques;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Tooth Extraction;Tooth Root

Dynamic optical absorption characteristics of blood after slow and fast heating. Laser treatment is the most effective therapy in dermatology for vascular skin disorders, such as port-wine stains (PWS). Changes in heat-induced absorbance in blood must be determined for accurate numerical simulation and implementation of multi-pulse laser therapy for treatment of PWS. Thermally induced absorbance changes in hemoglobin in blood were compared in vitro between slow water bath heating and fast heating irradiated by using sub-millisecond Nd:YAG laser. Blood composition at different temperatures was calculated by comparing blood absorption spectra with those of pure HbO(2), Hb, and metHb at room temperature. Blood absorbance to heat energy were categorized into three stages distinguished by metHb and coagulation points, which are the validity and security thresholds of the optimized therapy, respectively. Rapid laser heating can distinctively enhance blood absorbance by photochemically induced strong instability compared with slow heating at a constant temperature. Slow heating facilitates metHb point at 70Â Â°C and coagulation point at 75Â Â°C as the temperature of the water bath increases. However, the temperature at which metHb or coagulation point shifts to higher than 10Â Â°C when pulses and fluence in laser irradiation change. Laser fluence less than 20Â J/cm(2) and more than 50Â J/cm(2) is unsuitable for laser treatment because of its low probability to coagulate vascular hyperplasia and high probability to damage normal tissues adjacent to target lesions, respectively. Few bubbles formed after mediate fluence is beneficial to minimize adverse side-effects. Considering blood absorbance, temperature evolution, and bubble formation, we recommend 30-40Â J/cm(2) and 2-4Â Hz frequency as the optimal laser parameters in sub-millisecond Nd:YAG laser. Hemoglobins;deoxyhemoglobin Heating;Hemoglobins;Hot Temperature;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male

A novel combination treatment to stimulate bone healing and regeneration under hypoxic conditions: photobiomodulation and melatonin. Melatonin has anabolic effects on the bone, even under hypoxia, and laser irradiation has been shown to improve osteoblastic differentiation. The aim of this study was to investigate whether laser irradiation and melatonin would have synergistic effects on osteoblastic differentiation and mineralization under hypoxic conditions. MC3T3-E1 cells were exposed to 1% oxygen tension for the hypoxia condition. The cells were divided into four groups: G1-osteoblast differentiation medium only (as the hypoxic condition), G2-treatment with 50Â Î¼M melatonin only, G3-laser irradiation (808Â nm, 80Â mW, GaAlAs diode) only, and G4-treatment with 50Â Î¼M melatonin and laser irradiation (808Â nm, 80Â mW, GaAlAs diode). Immunoblotting showed that osterix expression was markedly increased in the melatonin-treated and laser-irradiated cells at 48 and 72Â h. In addition, alkaline phosphatase activity significantly increased and continued to rise throughout the experiment. Alizarin Red staining showed markedly increased mineralized nodules as compared with only melatonin-treated or laser-irradiated cells at day 7, which significantly increased by day 14. Moreover, when melatonin-treated cells were laser-irradiated, the differentiation and mineralization of cells were found to involve p38 MAPK and PRKD1 signaling mechanisms. However,

the enhanced effects of laser irradiation with melatonin were markedly inhibited when the cells were treated with luzindole, a selective melatonin receptor antagonist. Therefore, we concluded that laser irradiation could promote the effect of melatonin on the differentiation and mineralization of MC3T3-E1 cells under hypoxic conditions, and that this process is mediated through melatonin 1/2 receptors and PKRD/p38 signaling pathways. p38 Mitogen-Activated Protein Kinases;Alkaline Phosphatase;Melatonin Alkaline Phosphatase;Animals;Bone Regeneration;Cell Differentiation;Combined Modality Therapy;Hypoxia;Lasers, Semiconductor;Low-Level Light Therapy;Melatonin;Mice;Osteoblasts;Osteogenesis;p38 Mitogen-Activated Protein Kinases

GaAs laser therapy reestablishes the morphology of the NMJ and nAChRs after injury due to bupivacaine. BACKGROUND: Local anesthetics are used to relieve pre- and postoperative pain, acting on both sodium channels and nicotinic acetylcholine receptors (nAChR) at the neuromuscular junction (NMJ). Bupivacaine acts as a non-competitive antagonist and has limitations, such as myotoxicity, neurotoxicity, and inflammation. Low-level laser therapy (LLLT) has anti-inflammatory, regenerative, and analgesic effects. The aim of the present study was to evaluate the effects of a gallium arsenide laser (GaAs) on the morphology of the NMJ and nAChRs after application of bupivacaine in the sternomastoid muscle. METHODS: Thirty-two adult male Wistar rats received injections of bupivacaine 0.5% (Bupi: right antimere) and 0.9% sodium chloride (Cl: left antimere). Next, the animals were divided into a Control group (C) and a Laser group (LLLT). The laser group received LLLT (GaAs 904nm, 50mW, 4,8J) in both antimeres for five consecutive days. After seven days, the animals were euthanized and the surface portion of the sternomastoid muscle was removed, frozen, and subjected to morphological and morphometric analyses of the NMJs (nonspecific esterase reaction), confocal laser scanning, and an ultrastructural analysis. The nAChRs were quantified by Western blotting. RESULTS: In the chloride group, the morphology and morphometry of the NMJs remained stable. The maximum diameters of the NMJs were lower in the Bupi (15.048Â±1.985) and LLLT/Bupi subgroups (15.456Â±1.983) compared to the Cl (18.502Â±2.058) and LLLT/Cl subgroups (19.356Â±2.522) ($p<0.05$). Ultrastructurally, LLLT reduced myonecrosis observed after application of bupivacaine, with recovery in the junctional folds and active zone. There was an increase in the perimeter of the LLLT/Bupi subgroup (150.33) compared to the Bupi subgroup (74.69) ($p<0.01$) observed by confocal microscopy. There was also an increase in the relative planar area of the NMJ after LBI (8.75) compared to CBupi (4.80) ($p<0.01$). An analysis of the protein expression of nAChRÎ±1 showed no major differences in the groups studied. There was an increase in protein expression of the Îµ subunit after application of LLLT (13.055) compared to Bupi (0.251) ($p<0.01$). Taken together, the present experiments indicate that there was a positive association of the Î± and Î³ subunits ($p<0.05$). CONCLUSIONS: These results demonstrate that LLLT at the dose used in this study reduced structural alterations in the NMJ and molecular changes in nAChRs triggered by bupivacaine, providing important data supporting the use of LLLT in therapeutic protocols for injuries triggered by local anesthetics. Anesthetics, Local;Receptors, Nicotinic;Bupivacaine Anesthetics, Local;Animals;Blotting, Western;Bupivacaine;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microscopy, Confocal;Neuromuscular Junction;Rats;Rats, Wistar;Receptors, Nicotinic

Effect of Laser-Activated Irrigation on the Push-Out Bond Strength of ProRoot Mineral Trioxide Aggregate and Biodentine in Furcal Perforations. OBJECTIVE: The objective of the present study was to assess the effect of erbium, chromium: yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser-activated irrigation (LAI) of NaOCl on the push-out bond strength of furcal perforations repaired with ProRoot mineral trioxide aggregate (MTA) and Biodentine. BACKGROUND DATA: Several studies investigated the adhesion of calcium silicate-based cements after exposure to endodontic irrigants, while effect of LAI on bond strength remains to be elucidated. MATERIALS AND METHODS: Bur-cut furcal perforations with standard dimensions were created in 100 extracted human mandibular

molars. Teeth were randomly distributed into two groups (nâ€‰=â€‰50/group) according to the repair material applied: (1) ProRoot MTA or (2) Biodentine. The specimens were further assigned into five subgroups according to the irrigation regimens used over the set materials: (a) distilled water with needle irrigation; (b) 5.25% NaOCl with needle irrigation; (c) distilled water with LAI; (d) 5.25% NaOCl with LAI; and (e) no irrigation (control). Bond strengths of the test materials were assessed by using push-out bond strength test. RESULTS: Biodentine showed significantly higher dislocation resistance than ProRoot MTA (pâ€‰<â€‰0.05). Laser activation of 5.25% NaOCl and distilled water did not significantly affect the push-out bond strength results (pâ€‰>â€‰0.05). CONCLUSIONS: Biodentine showed higher dislocation resistance than ProRoot MTA as a perforation repair material. Er,Cr:YSGG laser activation of irrigation aqueous solutions had no adverse effect on push-out bond strength of Biodentine and ProRoot MTA. Aluminum Compounds;Calcium Compounds;Drug Combinations;Oxides;Root Canal Filling Materials;Silicates;mineral trioxide aggregate;tricalcium silicate Aluminum Compounds;Analysis of Variance;Calcium Compounds;Dental Bonding;Dental Stress Analysis;Drug Combinations;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Molar;Multivariate Analysis;Oxides;Root Canal Filling Materials;Root Canal Preparation;Silicates

RESULTS OF THE MEGAVEREBRATE ANALGESIA SURVEY: GIRAFFE AND HIPPOPOTAMUS. Results of an online survey posted on the American Association of Zoo Veterinarians listserv examined the patterns of analgesic medication and pain management modalities used for captive giraffe and hippopotami. Compiled data included signalment, drugs administered, dosing regimens, subjective efficacy scores, ease of administration, and adverse events. Nineteen institutions exhibiting hippopotami (Hippopotamus amphibious) and pygmy hippopotami (Choeropsis liberiensis) and 45 exhibiting giraffe (Giraffa camelopardalis spp.) responded. Phenylbutazone was the most-commonly administered nonsteroidal anti-inflammatory drug (NSAID), followed by flunixin meglumine, but doses varied widely. Eight institutions reported adverse events from NSAID administration. Tramadol was the most-commonly administered opioid followed by butorphanol. Only one adverse event was reported for opioids. Twenty-three of 45 institutions exhibiting giraffe utilized alternative analgesia methods including gabapentin, glucosamine-chondroitin, local anesthetics, and low level laser therapy. Six of 19 institutions exhibiting hippopotami administered omega 3-6 fatty acids, gabapentin, glucosamine-chondroitin, and Î±-2 adrenergics to provide analgesia. While all reporting zoological institutions administered similar drugs, there was substantial variation and diversity in both dosing regimens and frequencies, indicating the need for both preclinical and clinical studies supporting dosing regimens. Analgesics Analgesia;Analgesics;Animal Husbandry;Animals;Animals, Zoo;Antelopes;Artiodactyla;Data Collection;Pain;Surveys and Questionnaires

Case report: Rapid improvement of crossed cerebellar diaschisis after intravascular laser irradiation of blood in a case of stroke. RATIONALE: Crossed cerebellar diaschisis (CCD) is a poor prognostic factor after stroke because without immediate cerebral reperfusion no further improvements in the patient's condition can be achieved. We investigated the clinical effects of intravascular laser irradiation therapy (ILIB) on CCD and evaluated the therapeutic effect in the sub-acute post-stroke stage. PATIENT CONCERNS: The 77-year-old male with cerebral infarction in the territory of the right anterior cerebral artery only underwent conservative treatment including hydration and aspirin in the acute post-stroke stage. DIAGNOSIS: He was diagnosed as stroke based on the clinical presentations and imaging findings. INTERVENTION: Once the patient was in stable condition, he underwent a daily hour-long ILIB (He-Ne laser) for ten consecutive days during the sub-acute post-stroke stage. OUTCOMES: We used single-photon emission computed tomography (SPECT) before and after intravascular laser irradiation to detect changes in cerebral and cerebellar perfusion. Then, we compared the two images. CCD was detected using the first SPECT. After intervention by ILIB, the

second SPECT showed greater perfusion in the affected cerebellar hemisphere. LESSONS: We found that ILIB helped eliminate CCD, which was previously shown to be an untreatable condition using any intervention during the sub-acute post-stroke stage. Stroke patients could therefore greatly benefit from ILIB. Aged;Cerebellar Diseases;Endovascular Procedures;Humans;Infarction, Anterior Cerebral Artery;Low-Level Light Therapy;Male

Effect of low energy light irradiation by light emitting diode on U937 cells. Photobiomodulation (PBM) can induce a set of different biological modulators either in vitro or in vivo. Experimental evidence has highlighted the role of light effects on the mechanisms related to inflammation, apoptosis and autophagy. The goal of this project was the evaluation of PBM on U937, an established cell line of histiocytic lymphoma origin. Several aspects of modulation of proinflammatory pathways were analyzed and autophagic and proapoptotic mechanisms related to low laser light exposure of cells were studied. As a source of low energy light emission, we used an NIR-LED device, characterized by an 880 nm-wavelength as light source. Flow cytometry analysis was performed on supernatants of controls and treated U937 cells to detect inflammatory cytokine levels. In order to evaluate NF-kB and caspase3 expressions, Western blot analysis was performed according to standard procedures. In this report, we show the effect of PBM on a monocyte/macrophage established tumor cell line (U-937). We demonstrate that LED exposure, in the presence or absence of lipopolysaccharide (LPS), activates cell degranulation, increased expression of Interleukin-8 (IL-8) and modulation of beta galactosidase activity. Evidence shows that the well-known pro-inflammatory nuclear factor kappa-light-chain-enhancer of activated B cells (NF-kB) and the apoptotic marker (caspase3/cleaved-caspase3 ratio) are up-regulated in response to a proinflammatory biochemical pathway. Interleukin-8;NF-kappa B;Caspase 3 Apoptosis;Blotting, Western;Caspase 3;Cell Degranulation;Flow Cytometry;Humans;Inflammation;Interleukin-8;Low-Level Light Therapy;Macrophages;Monocytes;NF-kappa B;U937 Cells

Efficacy of pulsed Nd:YAG laser in the treatment of patients with knee osteoarthritis: a randomized controlled trial. The purpose of this study was to investigate the effects of pulsed Nd:YAG laser plus glucosamine/chondroitin sulfate (GCS) in patients with knee osteoarthritis (KOA) by examining changes in pain and knee function, as well as synovial thickness (ST) and femoral cartilage thickness (FCT). Sixty-seven male patients participated, with a mean (SD) age of 53.85 (4.39) years, weight of 84.01 (4.70) kg, height of 171.51 (3.96) cm, and BMI of 28.56 (1.22). Group 1 was treated with high-intensity laser therapy (HILT), GCS, and exercises (HILTâ€‰+â€‰GCSâ€‰+â€‰EX). Group 2 was treated with GCS plus exercises (GCSâ€‰+â€‰EX), and group 3 received placebo laser plus exercises (PLâ€‰+â€‰EX). The outcomes measured were pain level and functional disability using the visual analog scale (VAS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), respectively. ST and FCT were measured by ultrasound examination. Statistical analyses were performed to compare differences between baseline and after 6Â weeks of treatment and then after 3Â months of follow-up. Statistical significance was set at pâ€‰<â€‰0.05. VAS and WOMAC were significantly decreased in all groups after 6Â weeks, with nonsignificant differences between 6Â weeks and 3Â months of follow-up. ST was significantly decreased in the HILTâ€‰+â€‰GCSâ€‰+â€‰EX group posttreatment, with nonsignificant decreases in the GCSâ€‰+â€‰EX and PLâ€‰+â€‰EX groups, as well as nonsignificant differences to FCT in all groups. Overall, pulsed Nd:YAG laser combined with GCS and exercises was more effective than GCSâ€‰+â€‰EX and exercises alone in the treatment of KOA patients. Chondroitin Sulfates;Glucosamine Chondroitin Sulfates;Combined Modality Therapy;Exercise Therapy;Glucosamine;Humans;Knee Joint;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Management;Pain Measurement;Single-Blind Method;Treatment Outcome;Visual Analog Scale

The efficacy of low-level 940 nm laser therapy with different energy intensities on bone healing. The aim of this study was to evaluate the efficacy of low-level 940 nm laser therapy with energy intensities of 5, 10 and 20 J/cm2 on bone healing in an animal model. A total of 48 female adult Wistar rats underwent surgery to create bone defects in the right tibias. Low-level laser therapy (LLLT) was applied immediately after surgery and on post-operative days 2, 4, 6, 8, 10 and 12 in three study groups with energy intensities of 5 J/cm2, 10 J/cm2 and 20 J/cm2 using a 940 nm Gallium-Aluminium-Arsenide (Ga-Al-As) laser, while one control group underwent only the tibia defect surgery. All animals were sacrificed 4 or 8 weeks post-surgery. Fibroblasts, osteoblasts, osteocytes, osteoclasts and newly formed vessels were evaluated by a histological examination. No significant change was observed in the number of osteocytes, osteoblasts, osteoclasts and newly formed vessels at either time period across all laser groups. Although LLLT with the 10 J/cm2 energy density increased fibroblast activity at the 4th week in comparison with the 5 and 20 J/cm2 groups, no significant change was observed between the laser groups and the control group. These results indicate that low-level 940 nm laser with different energy intensities may not have marked effects on the bone healing process in both phases of bone formation. Animals;Bone Regeneration;Dose-Response Relationship, Radiation;Female;Fibroblasts;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteoclasts;Osteogenesis;Rats, Wistar;Reference Values;Reproducibility of Results;Tibia;Time Factors;Treatment Outcome;Wound Healing

The mechanistic basis for photobiomodulation therapy of neuropathic pain by near infrared laser light. BACKGROUND AND OBJECTIVE: Various irradiances have been reported to be beneficial for the treatment of neuropathic pain with near infrared light. However, the mechanistic basis for the beneficial outcomes may vary based on the level of irradiance or fluence rate used. Using in vivo and in vitro experimental models, this study determined the mechanistic basis of photobiomodulation therapy (PBMT) for the treatment of neuropathic pain using a high irradiance. STUDY DESIGN/MATERIALS AND METHODS: In vitro experiments: Cultured, rat DRG were randomly assigned to control or laser treatment (LT) groups with different irradiation times (2, 5, 30, 60, or 120 seconds). The laser parameters were: output powerâ€‰=â€‰960â€‰mW, irradianceâ€‰=â€‰300â€‰mW/cm(2) , 808â€‰nm wavelength, and spot sizeâ€‰=â€‰3â€‰cm diameter/areaâ€‰=â€‰7.07cm(2) , with different fluences according to irradiation times. Mitochondrial metabolic activity was measured with the MTS assay. The DRG neurons were immunostained using a primary antibody to Î²-Tubulin III. In vivo experiments: spared nerve injury surgery (SNI), an animal model of persistent peripheral neuropathic pain, was used. The injured rats were randomly divided into three groups (nâ€‰=â€‰5). (i) Control: SNI without LT; (ii) Short term: SNI with LT on day 7 and euthanized on day 7; (iii) Long term: SNI with LT on day 7 and euthanized on day 22. An 808â€‰nm wavelength laser was used for all treatment groups. Treatment was performed once on day 7 post-surgery. The transcutaneous treatment parameters were: output power: 10â€‰W, fluence rate: 270â€‰mW/cm(2) , treatment time: 120 seconds. The laser probe was moved along the course of the sciatic/sural nerve during the treatment. Within 1 hour of irradiation, behavior tests were performed to assess its immediate effect on sensory allodynia and hyperalgesia caused by SNI. RESULTS: In vitro experiments: Mitochondrial metabolism was significantly lower compared to controls for all LT groups. Varicosities and undulations formed in neurites of DRG neurons with a cell body diameter 30â€‰Âµm or less. In neurites of DRG neurons with a cell body diameter of greater than 30â€‰Âµm, varicosities formed only in the 120 seconds group. In vivo experiments: For heat hyperalgesia, there was a statistically significant reduction in sensitivity to the heat stimulus compared to the measurements done on day 7 prior to LT. A decrease in the sensitivity to the heat stimulus was found in the LT groups compared to the control group on days 15 and 21. For cold allodynia and mechanical hyperalgesia, a significant decrease in sensitivity to

cold and pin prick was found within 1 hour after LT. Sensitivity to these stimuli returned to the control levels after 5 days post-LT. No significant difference was found in mechanical allodynia between control and LT groups for all time points examined. CONCLUSION: These in vitro and in vivo studies indicate that treatment with an irradiance/fluence rate at 270â€‰mW/cm(2) or higher at the level of the nerve can rapidly block pain transmission. A combination therapy is proposed to treat neuropathic pain with initial high irradiance/fluence rates for fast pain relief, followed by low irradiance/fluence rates for prolonged pain relief by altering chronic inflammation. Lasers Surg. Med. 49:516-524, 2017. Â© 2017 Wiley Periodicals, Inc. Animals;Disease Models, Animal;Ganglia, Spinal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Neuralgia;Pain Threshold;Rats;Rats, Sprague-Dawley

Ablative fractional laser resurfacing: A powerful tool to help restore form and function during international medical exchange. Burns;Cicatrix, Hypertrophic;Global Health;Humans;Injury Severity Score;Low-Level Light Therapy;Male;Medical Missions;Medically Underserved Area;Middle Aged;Poverty;World Health Organization;Wounds and Injuries

High-precision, non-invasive anti-microvascular approach via concurrent ultrasound and laser irradiation. Antivascular therapy represents a proven strategy to treat angiogenesis. By applying synchronized ultrasound bursts and nanosecond laser irradiation, we developed a novel, selective, non-invasive, localized antivascular method, termed photo-mediated ultrasound therapy (PUT). PUT takes advantage of the high native optical contrast among biological tissues and can treat microvessels without causing collateral damage to the surrounding tissue. In a chicken yolk sac membrane model, under the same ultrasound parameters (1â€‰MHz at 0.45â€‰MPa and 10â€‰Hz with 10% duty cycle), PUT with 4â€‰mJ/cm(2) and 6â€‰mJ/cm(2) laser fluence induced 51% (pâ€‰=â€‰0.001) and 37% (pâ€‰=â€‰0.018) vessel diameter reductions respectively. With 8â€‰mJ/cm(2) laser fluence, PUT would yield vessel disruption (90%, pâ€‰<â€‰0.01). Selectivity of PUT was demonstrated by utilizing laser wavelengths at 578â€‰nm or 650â€‰nm, where PUT selectively shrank veins or occluded arteries. In a rabbit ear model, PUT induced a 68.5% reduction in blood perfusion after 7 days (pâ€‰<â€‰0.001) without damaging the surrounding cells. In vitro experiments in human blood suggested that cavitation may play a role in PUT. In conclusion, PUT holds significant promise as a novel non-invasive antivascular method with the capability to precisely target blood vessels. Animals;Blood;Chickens;Ear;Humans;Low-Level Light Therapy;Neovascularization, Pathologic;Rabbits;Ultrasonic Therapy;Yolk Sac

Low-intensity laser (660 NM) has analgesic effects on sternotomy of patients who underwent coronary artery bypass grafts. BACKGROUND: The aim of this study was to evaluate the efficacy of low-level laser therapy for reducing the acute pain of sternotomy in patients who underwent a coronary artery bypass graft (CABG). METHODS: This study was conducted with ninety volunteers who electively submitted to CABG. The volunteers were randomly allocated into three groups of equal size (n = 30): control, placebo, and laser (Î» of 660 nm and spatial average energy fluency of 1.06 J/cm 2). Pain when coughing was assessed by a visual analog scale (VAS) and McGill Pain Questionnaire, according to sensory, affective, evaluative, and miscellaneous domains. The patients were followed for 1 month after the surgery. RESULTS: The laser group had a greater decrease in pain with analogous results, as indicated by both the VAS and the McGill questionnaire (P â‰¤ 0.05) on sensory and affective scores, on days 6 and 8 postsurgery compared to the placebo and control groups. CONCLUSION: Laser seems to be effective promoting pain reduction after coronary-arterial bypass grafting. Coronary Artery Bypass;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Sternotomy;Treatment Outcome

Clinical effectiveness of low-level laser treatment on peripheral somatosensory neuropathy. Peripheral sensory neuropathy treatment is one of the common treatment problems and causes morbidity and mortality in people suffering from that. Although treatment depends on the underlying cause of the condition, nevertheless, in some cases, there is no cure for it, and it requires palliative and symptomatic treatment. In laboratory studies, low-level laser has been effective in the nerves protection and restoration. The aim of this article is to investigate the clinical efficacy of low-level laser on improvement of the peripheral somatosensory neuropathy. Search in the articles published up to 30 October 2015 (full text and abstracts) in databases PubMed (Medline), Cochrane library, Physiotherapy Evidence Database was performed. The studies of low-level laser trials on patients with peripheral neuropathy were carried out and evaluated in terms of the exclusion criteria. There are 35 articles among which 10 articles had the intended and required criteria. 1, 3, and 6 articles study the patients with diabetes, neuropathy caused by trauma, and carpal tunnel syndrome, respectively. In six studies, laser led to a reduction in sensory impairment and improvement of the physiological function of the sensory nerves. In these articles, lasers (Diode, GaAlAs, He-Ne) had wavelength range 660-860Â nm, radiation power 20-250Â mW, energy density 0.45-70Â J/cm(2). The intervention sessions range was 6-21 times and patient follow-up was 0-6Â months. According to the results of these studies, low-level laser therapy can improve sensory function in patients with peripheral somatosensory neuropathy, although little research have not been done, laser treatment regimens are varied and do not recommend a specific treatment protocol. It seems it requires more research to sum up better, particularly in relation to diabetes. Adult;Carpal Tunnel Syndrome;Diabetes Mellitus;Follow-Up Studies;Humans;Lasers;Low-Level Light Therapy;Peripheral Nervous System Diseases;Sample Size;Time Factors;Treatment Outcome;Wounds and Injuries

Proposed Mechanisms of Photobiomodulation or Low-Level Light Therapy. Photobiomodulation (PBM) also known as low-level laser (or light) therapy (LLLT), has been known for almost 50 years but still has not gained widespread acceptance, largely due to uncertainty about the molecular, cellular, and tissular mechanisms of action. However, in recent years, much knowledge has been gained in this area, which will be summarized in this review. One of the most important chromophores is cytochrome c oxidase (unit IV in the mitochondrial respiratory chain), which contains both heme and copper centers and absorbs light into the near-infra-red region. The leading hypothesis is that the photons dissociate inhibitory nitric oxide from the enzyme, leading to an increase in electron transport, mitochondrial membrane potential and ATP production. Another hypothesis concerns light-sensitive ion channels that can be activated allowing calcium to enter the cell. After the initial photon absorption events, numerous signaling pathways are activated via reactive oxygen species, cyclic AMP, NO and Ca2+, leading to activation of transcription factors. These transcription factors can lead to increased expression of genes related to protein synthesis, cell migration and proliferation, anti-inflammatory signaling, anti-apoptotic proteins, antioxidant enzymes. Stem cells and progenitor cells appear to be particularly susceptible to LLLT.

The Effect of Diode Laser on Planktonic Enterococcus faecalis in Infected Root Canals in an Ex Vivo Model. OBJECTIVE: This study examined the bactericidal effect of diode laser irradiation against intracanal Enterococcus faecalis. METHODS AND MATERIALS: m total of 128 extracted single-rooted and single-canal teeth were treated with ProTaper instruments (Dentsply Maillefer, Ballaigues, Switzerland). A total of 120 root canals were inoculated with E. faecalis for 21 days, and the samples were randomly divided into five groups: Group 1 (nâ€‰=â€‰24) samples were irrigated with only saline solution (positive controls); Group 2 (nâ€‰=â€‰24) was treated with only 5.25% sodium hypochlorite; Group 3 (nâ€‰=â€‰24) was irrigated with saline solutions activated by diode laser; Group 4 (nâ€‰=â€‰24) was treated with 5.25% sodium hypochlorite activated by diode laser; and Group 5 (nâ€‰=â€‰24) was irrigated with saline solution with methylene blue dye activated by the

diode laser Fox (Sweden & Martina, Padova, Italy); additionally, eight teeth were not contaminated and their canals were irrigated with saline solution and used as a negative control. The Uro-Quick system was used to determine the microbial residual charge. The data were analyzed using Pearson's chi-square test (pâ€‰<â€‰0.001). RESULTS: A statistically significant reduction in bacterial count was observed in Group 2 and Group 4 (pâ€‰<â€‰0.001). There were no statistically significant differences among the other groups (pâ€‰>â€‰0.001). CONCLUSIONS: Evidence indicates that the diode laser was not more effective than sodium hypochlorite in reducing free bacteria. Sodium Hypochlorite Bacterial Load;Dental Pulp Cavity;Enterococcus faecalis;Gram-Positive Bacterial Infections;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Reference Values;Root Canal Therapy;Sensitivity and Specificity;Sodium Hypochlorite;Tooth Extraction

Er:YAG Laser Irradiation Induces Behavioral Changes in V. harveyi. OBJECTIVE: Laser technologies have many different applications in medical, agricultural, and industrial fields. Studies have shown several effects of laser energy on different bacterial species, in a wide variety of settings. Recent reports have found that one of the unique features of bacteria is their ability to communicate among themselves (quorum sensing). We sought to investigate whether low-energy laser irradiation affects bacterial behavior, which is regulated by quorum sensing. METHODS: Laser irradiations were performed using Er:YAG laser (2940â€‰nm wavelength) at output powers of 0.5, 1.5, 2.5, and 4â€‰W on wild-type Vibrio harveyi. Bioluminescence, motility, and biofilm forming capability were assessed on the bacteria after irradiation. RESULTS: After irradiation of bacteria, positive dose/output power dependencies were found in the bioluminescence omitted from tested experimental groups. Motility of colonies on semi-solid media was inhibited as irradiation output power was increased. However, after irradiation, biomass analysis of biofilm samples showed negligible differences between the irradiated samples and controls. CONCLUSIONS: Results indicate the impact of low-energy laser irradiation on bacterial behavior such as quorum sensing and motility, without affecting bacterial growth patterns. Lasers, Solid-State;Vibrio

Intrapulpal Temperature Increase During Er:YAG Laser-Aided Debonding of Ceramic Brackets. OBJECTIVE: The purpose of this study was to evaluate the temperature changes in the pulp chamber while using a newly introduced application of Er:YAG laser to debond ceramic brackets in a study model with a pulpal circulation with and without thermocycled samples. BACKGROUND DATA: An esthetic alternative to stainless steel brackets, ceramic brackets have been proposed. However, because of their low fracture resistance and high bond strengths, ceramic brackets can cause a problem when they are being removed using conventional techniques. MATERIALS AND METHODS: Experimental Groups A and B were established for samples with or without thermocycling. The same 20 maxillary central incisor and 20 premolar teeth were used in both groups. Pulpal blood microcirculation was simulated using an apparatus described in a previous study. Monocrystalline brackets were bonded by using Transbond XT. In Group A, brackets were debonded using the Er:YAG laser (600â€‰mJ, 2â€‰Hz, long pulse, and no air or water spray) after being stored in distilled water for 24â€‰h. In Group B, brackets were debonded using the same laser system as that used in Group A after being stored in distilled water for 24â€‰h and then thermocycled for a total of 5000 cycles between 5Â°C and 55Â°C. The laser irradiation duration and intrapulpal temperature changes were measured. RESULTS: In Group B, the intrapulpal temperature increase of the central incisors was significantly higher than that of the premolar teeth. In the central incisor and premolar teeth groups, there were no statistically significant difference between Groups A and B (pâ€‰>â€‰0.05). A positive correlation was found between laser irradiation duration and temperature increase (pâ€‰<â€‰0.01). CONCLUSIONS: The use of Er:YAG laser is an effective method for debonding the monocrystalline ceramic brackets. This method can be used safely under the consideration of intrapulpal temperature changes. Confidence Intervals;Dental Debonding;Dental Pulp;Hot

Temperature;Humans;In Vitro Techniques;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Orthodontic Brackets;Risk Factors;Tooth Extraction

Analysis of the variation in low-level laser energy density on the crushed sciatic nerves of rats: a morphological, quantitative, and morphometric study. The objective of this study was to evaluate three energy densities of low-level laser therapy (LLLT, GaAlAs, 780Â nm, 40Â mW, 0.04Â cm(2)) for the treatment of lesions to peripheral nerves using the sciatic nerve of rats injured via crushing model (15Â kgf, 5.2Â MPa). Thirty Wistar rats (â™,, 200-250Â g) were divided into five groups (nâ€‰=â€‰6): C-control, not injured, and irradiated; L0-injured nerve without irradiation; L4-injured nerve irradiated with LLLT 4Â J/cm(2) (0.16Â J); L10-injured nerve irradiated with LLLT 10Â J/cm(2) (0.4Â J); and L50-injured nerve irradiated with LLLT 50Â J/cm(2) (2Â J). The animals were sacrificed 2Â weeks after the injury via perfusion with glutaraldehyde (2.5%, 0.1Â M sodium cacodylate buffer). The nerve tissue was embedded in historesin, cut (3Â Î¼m), mounted on slides, and stained (Sudan black and neutral red). The morphological and quantitative analysis (myelin and blood capillary densities) and morphometric parameters (maximum and minimum diameters of nerve fibers, axon diameter, G-ratio, myelin sheath thickness) were assessed using the ImageJ software. ANOVA (parametric) or Kruskal-Wallis (nonparametric) tests were used for the statistical analysis. Groups L0, L4, L10, and L50 exhibited diminished values of all the quantitative and morphometric parameters in comparison to the control group. The morphological, quantitative, and morphometric data revealed improvement after injury in groups L4, L10, and L50 (irradiated groups) compared to the injured-only group (L0); the best results, in general, were observed for the L10 group after 15Â days of nerve injury. Animals;Capillaries;Low-Level Light Therapy;Male;Myelin Sheath;Nerve Crush;Rats, Wistar;Sciatic Nerve;Sciatic Neuropathy

The photobiomodulation effect of higher-fluence 808-nm laser therapy with a flat-top handpiece on the wound healing of the earthworm Dendrobaena veneta: a brief report.

New Treatments for Hair Loss. The treatment of hair loss is an important part of clinical dermatology given the prevalence of the problem and great impact on patients' quality of life. Many new treatments have been introduced in recent years. This review summarizes the main ones in 4 groups: a) For androgenetic alopecia, we discuss new excipients for oral minoxidil, dutasteride, and finasteride as well as new forms of topical application; prostaglandin agonists and antagonists; low-level laser therapy; and regenerative medicine with Wnt signaling activators and stem cell therapy. b) For alopecia areata, Janus kinase inhibitors are reviewed. c) For frontal fibrosing alopecia, we discuss the use of antiandrogens and, for some patients, pioglitazone. d) Finally, we mention new robotic devices for hair transplant procedures and techniques for optimal follicular unit extraction. Alopecia;Humans

Clinical Differences in Autofluorescence Between Viable and Nonvital Bone: A Case Report With Histopathologic Evaluation Performed on Medication-Related Osteonecrosis of the Jaws. Medication-related osteonecrosis of the jaws (MRONJ) is an adverse side effect of several drug therapies, including bisphosphonates (BPs). Osteonecrosis of the jaw specifically related to BP therapy is usually referred to using the acronym BRONJ. However, no consensus has yet been reached regarding the most appropriate management of BRONJ. The greatest success rates have been recorded with surgical removal of necrotic bone. In particular, erbium:yttrium-aluminum-garnet (Er:YAG) laser-assisted surgery has shown significantly better results than conventional surgical approaches. According to a position paper reported by the American Association of Oral and Maxillofacial Surgeons in 2007, the identification of necrotic bone margins during osteonecrosis removal can be very difficult. In 2015, a review of treatment perspectives for MRONJ reported that both surgical debridement and resection cannot be standardized owing to the lack of guidance to define the necrotic margins. Recently, the use of autofluorescence (AF) of the bone as a possible

suitable guide to visualize necrotic bone during surgical debridement or resection was proposed. It seems that vital bone could be highlighted by its very strong AF. In contrast, necrotic bone loses AF and, thus, appears much darker. The molecular sources of the phenomenon of AF are the specific amino acids of the collagen molecules that show AF when irradiated by ultraviolet or blue light. The use of AF as an intraoperative diagnostic tool is entirely new in the management of MRONJ, although it has been used for several years in other fields (eg, intervertebral disc surgery). The aim of the present report was to describe a case of mandibular BRONJ treated with a new surgical approach performed with an Er:YAG laser and guided by AF. The histopathologic evaluation of the removed hypofluorescent bone block and hyperfluorescent surrounding bone has also been reported in detail. Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Female;Fluorescence;Humans;Low-Level Light Therapy;Surgical Flaps;Tomography, X-Ray Computed

Long-Pulsed 1064-nm Nd:YAG Laser for the Treatment of Onychomycosis. OBJECTIVE: The aim of this study is to evaluate the efficacy of long-pulsed 1064-nm Nd:YAG laser in penetrating tissue and targeting the fungal overgrowth in the nail plate. BACKGROUND: Onychomycosis is the most frequent nail disorder. Current treatments include oral and topical antifungal agents, photodynamic therapy, and surgical approaches such as mechanical, chemical, or surgical nail avulsion. Moreover, the use of lasers to treat nail diseases has been approved in the United States by the Food and Drug Administration (FDA). Wide literature has been produced to assess the effectiveness of these devices, but, because the opposing results emerging from current studies, more data are still needed on the long-lasting efficacy and safety of this procedure. METHODS: Twenty consecutive, unselected patients were enrolled in the study and treated, at intervals of 1 week, for a total of four sessions, using a long-pulsed 1064-nm Nd:YAG laser. In each session, three passages across each nail plate were performed with 1-min pause between each passage. A special lens for dermatoscopy, connected to a digital camera, was used for dermoscopic images. RESULTS: In fourteen patients (70%; 12F; 3M), excellent results were obtained with an important reduction of chromonychia, onycholysis, opacity, longitudinal striae, and jagged proximal edge. Better results were observed in severe cases in the 2-month follow-up visit. CONCLUSIONS: Data for treating nail onychomycosis with laser and light therapy seem to be positive. The promising results of our study identify long-pulsed 1064-nm Nd:YAG laser as a possible alternative option for the treatment of onychomycosis. However, increasing subject data, improving study methodology, and output parameters may become an important next step of study in the treatment of nail onychomycosis. Adult;Aged;Cohort Studies;Dermoscopy;Female;Follow-Up Studies;Foot Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Patient Satisfaction;Severity of Illness Index;Treatment Outcome;Young Adult

Are MIQE Guidelines Being Adhered to in qPCR Investigations in Photobiomodulation Experiments? Humans;Practice Guidelines as Topic;Real-Time Polymerase Chain Reaction;Reproducibility of Results;Research Design;Sensitivity and Specificity

The Effect of Photobiomodulation on the Sea Urchin Paracentrotus lividus (Echinodermata) Using Higher-Fluence on Fertilization, Embryogenesis, and Larval Development: An In Vitro Study. OBJECTIVE: The aim of this study was to investigate the photobiomodulation (PBM) effect of the 808â€‰nm diode laser irradiation on spermatozoa, eggs, fertilized eggs, embryos, and larvae of Paracentrotus lividus, using two different power settings. BACKGROUND DATA: Studies have shown the possible use of PBM in artificial insemination. These have shown the potential effect of low-power laser irradiation on spermatozoa, while there are few studies on the effect of laser photonic energy on oocytes and almost no reports on the influence of lasers in embryogenesis. METHODS: P. lividus gametes, zygotes, embryos, and larvae were irradiated using the 808â€‰nm diode laser (fluence 64â€‰J/cm(2) using 1 W or 192â€‰J/cm(2) with 3 W) with a flat-top hand-piece delivery,

compared to a control without laser irradiation (0â€‰J/cm(2)-0 W). The fertilization rate and the early developmental stages were investigated. RESULTS: The fertilization ability was not affected by the sperm/egg irradiation. At the gastrula stage, no significant differences were observed compared with the control samples. In the late pluteus stage, there were no differences in the developmental percentage observed between the control and the treated samples (1 W), with the exception of larvae from gastrulae and larvae, which were irradiated at 3 W. CONCLUSIONS: This study has demonstrated that both the 64â€‰J/cm(2)-1 W and the 192â€‰J/cm(2)-3 W do not induce morphological damage on the irradiated P. lividus gametes whose zygotes generate normal embryos and larvae. Our data therefore support the assumption to use higher fluence in preliminary studies on in vitro fertilization. Tocopherols Animals;Embryonic Development;Fertilization;Larva;Male;Sea Urchins;Spermatozoa;Tocopherols

Personalizing Photobiomodulation Therapy. Humans;Low-Level Light Therapy;Precision Medicine

Does photobiomodulation therapy is better than cryotherapy in muscle recovery after a high-intensity exercise? A randomized, double-blind, placebo-controlled clinical trial. This study aimed to determine the effectiveness of photobiomodulation therapy (PBMT) and cryotherapy, in isolated and combined forms, as muscle recovery techniques after muscle fatigue-inducing protocol. Forty volunteers were randomly divided into five groups: a placebo group (PG); a PBMT group (PBMT); a cryotherapy group (CG); a cryotherapy-PBMT group (CPG); and a PBMT-cryotherapy group (PCG). All subjects performed four sessions at 24-h intervals, during which they submitted to isometric assessment (MVC) and blood collection in the pre-exercise period, and 5 and 60Â min post-exercise, while the muscle fatigue induction protocol occurred after the pre-exercise collections. In the remaining sessions performed 24, 48, and 72Â h later, only blood collections and MVCs were performed. A single treatment with PBMT and/or cryotherapy was applied after only 2Â min of completing the post-5-min MVC test at the first session. In the intragroup comparison, it was found that exercise led to a significant decrease (pâ€‰<â€‰0.05) in the production of MVC in all groups. Comparing the results of MVCs between groups, we observed significant increases in the MVC capacity of the PBMT, CPG, and PCG volunteers in comparison with both PG and CG (pâ€‰<â€‰0.05). We observed a significant decrease in the concentrations of the biochemical markers of oxidative damage (TBARS and PC) in all groups and muscle damage (creatine kinase-CK) in the PBMT, PCG, and CPG compared with the PG (pâ€‰<â€‰0.01). The clinical impact of these findings is clear because they demonstrate that the use of phototherapy is more effective than the use of cryotherapy for muscle recovery, additionally cryotherapy decreases PBMT efficacy. Placebos;Proteins;Thiobarbituric Acid Reactive Substances;Creatine Kinase Adult;Creatine Kinase;Cryotherapy;Double-Blind Method;Exercise;Humans;Lipid Peroxidation;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Oxidation-Reduction;Placebos;Protein Carbonylation;Proteins;Thiobarbituric Acid Reactive Substances;Young Adult

Effectiveness of low-level laser therapy on pain intensity, pressure pain threshold, and SF-MPQ indexes of women with myofascial pain. Women with temporomandibular disorders (TMD) frequently report pain areas in body regions. This process is associated with central sensitization phenomena, present in chronic pain. The low-level laser therapy (LLLT) has been reported as a therapeutic option for the painful TMD treatment. The aim of this study was to analyze the effect of LLLT on pain intensity (visual analogue scale, VAS), pain sensitivity in orofacial and corporal points (pressure pain threshold, PPT), and on Short Form-McGill Pain Questionnaire (SF-MPQ) indexes of women with myofascial pain (subtype of muscle TMD). Ninety-one women (18-60Â years) were included in the study, among which 61 were diagnosed with myofascial pain (Research Diagnostic

Criteria for Temporomandibular Disorder-Ia and Ib) and were divided into laser (nâ€‰=â€‰31) and placebo group (nâ€‰=â€‰30), and 30 were controls. The LLLT was applied at pre-established points, twice a week, eight sessions (780Â nm; masseter and anterior temporalâ€‰=â€‰5Â J/cm(2), 20Â mW, 10Â s; TMJ areaâ€‰=â€‰7.5Â J/cm(2), 30Â mW, 10Â s). Pain intensity, pain sensitivity, and the SF-MPQ indexes were measured at the baseline, during laser sessions, and 30Â days after treatment. For intra-group comparisons, the Friedman test was performed, and for inter-group, the Mann-Whitney test. Increased pain sensitivity was found in women with myofascial pain when compared to controls (pâ€‰<â€‰0.05). There was a reduction in pain intensity for both groups after LLLT. The LLLT did not change the PPT for any group (pâ€‰>â€‰0.05). Active laser and placebo reduced the indexes of sensory, total pain, and VAS, maintaining the results after 30Â days; there was a reduction in the affective pain rating index for both groups, with no maintenance after 30Â days for placebo, and the present pain intensity decreased in the laser group and did not change in the placebo after LLLT. In conclusion, the LLLT active or placebo are effective in reducing the overall subjective perception of myofascial pain (VAS and SF-MPQ indexes); however, they have no effectiveness in reducing the pain sensitivity in orofacial and corporal points (PPT increase).
Adult;Female;Humans;Low-Level Light Therapy;Middle Aged;Myofascial Pain Syndromes;Pain Threshold;Pressure;Surveys and Questionnaires;Temporomandibular Joint Disorders;Treatment Outcome;Visual Analog Scale

Evaluation of Low Level Laser Therapy on Pain Perception Following Orthodontic Elastomeric Separation: A Randomized Controlled Trial. INTRODUCTION: Periodontal pain caused by elastomeric separators is a very common problem in the commencement of orthodontic treatment. Previous studies have shown good results in reducing this pain by Low Level Laser Therapy (LLLT) and different protocols of application have been suggested in the literature. AIM: This trial aimed to evaluate LLLT on managing orthodontic pain caused by elastomeric separators and to compare single versus double irradiation in possible pain reduction. MATERIALS AND METHODS: A clinical randomized compound (parallel-group and split-mouth design) trial was conducted on 36 patients between 12 and 26 years of age. Elastomeric separators were placed at the mesial and distal surfaces of the first molars in one jaw (upper or lower) for each patient and in only one side of the mouth (the other side served as the placebo side). The trial had two groups: the first group received single irradiation of LLLT [Gallium Aluminum Arsenide (GaAlAs): 830 nm, 4J/cm(2), 100mW] immediately after separators insertion, where as the second group received double irradiation immediately after separators insertion and after 24hours. All patients were instructed to rate the level of pain at 1, 6, 24, 48, 96 hours on a Visual Analog Scale (VAS). The student 't' tests, repeated measures ANOVA and LSD post-hoc tests were employed. RESULTS: LLLT was successful in reducing post-separation pain when the experimental side was compared to the placebo side at all assessment times in each group ($p<0.05$). There were no statistically significant differences between single and double irradiation groups in terms of pain reduction ($p>0.05$). CONCLUSION: GaAlAs LLLT application reduced early orthodontic pain caused by elastomeric separators by single or double irradiation.

A Low-Level Carbon Dioxide Laser Promotes Fibroblast Proliferation and Migration through Activation of Akt, ERK, and JNK. BACKGROUND: Low-level laser therapy (LLLT) with various types of lasers promotes fibroblast proliferation and migration during the process of wound healing. Although LLLT with a carbon dioxide (CO_2) laser was also reported to promote wound healing, the underlying mechanisms at the cellular level have not been previously described. Herein, we investigated the effect of LLLT with a CO_2 laser on fibroblast proliferation and migration. MATERIALS AND METHODS: Cultured human dermal fibroblasts were prepared. MTS and cell migration assays were performed with fibroblasts after LLLT with a CO_2 laser at various doses (0.1, 0.5, 1.0, 2.0, or 5.0 J/cm2) to observe the effects of LLLT with a CO_2 laser on the proliferation and migration of fibroblasts. The

non-irradiated group served as the control. Moreover, western blot analysis was performed using fibroblasts after LLLT with a CO2 laser to analyze changes in the activities of Akt, extracellular signal-regulated kinase (ERK), and Jun N-terminal kinase (JNK), which are signaling molecules associated with cell proliferation and migration. Finally, the MTS assay, a cell migration assay, and western blot analysis were performed using fibroblasts treated with inhibitors of Akt, ERK, or JNK before LLLT with a CO2 laser. RESULTS: In MTS and cell migration assays, fibroblast proliferation and migration were promoted after LLLT with a CO2 laser at 1.0 J/cm2. Western blot analysis revealed that Akt, ERK, and JNK activities were promoted in fibroblasts after LLLT with a CO2 laser at 1.0 J/cm2. Moreover, inhibition of Akt, ERK, or JNK significantly blocked fibroblast proliferation and migration. CONCLUSIONS: These findings suggested that LLLT with a CO2 laser would accelerate wound healing by promoting the proliferation and migration of fibroblasts. Activation of Akt, ERK, and JNK was essential for CO2 laser-induced proliferation and migration of fibroblasts. Carbon Dioxide;AKT1 protein, human;Proto-Oncogene Proteins c-akt;Extracellular Signal-Regulated MAP Kinases;MAP Kinase Kinase 4 Carbon Dioxide;Cell Movement;Cell Proliferation;Extracellular Signal-Regulated MAP Kinases;Fibroblasts;Humans;Lasers, Gas;Low-Level Light Therapy;MAP Kinase Kinase 4;Proto-Oncogene Proteins c-akt;Signal Transduction;Skin

Effects of low-level laser irradiation on human blood lymphocytes in vitro. Low-level laser irradiation (LLLI) has various effects on cultured human lymphocytes in vitro, but little is known about such effects in whole blood. This study investigated whether LLLI affected lymphocyte count in human whole blood in vitro. A total number of 130 blood samples were collected from apparently healthy adult patients through venipuncture into tubes containing EDTA. Each sample was divided into two equal aliquots to be used as a non-irradiated control sample and an irradiated sample. The irradiated aliquot was subjected to laser wavelengths of 405, 589, and 780Â nm with different fluences of 36, 54, 72, and 90Â J/cm(2), at a fixed irradiance of 30Â mW/cm(2). A paired student t test was used to compare between non-irradiated and irradiated samples. The lymphocyte counts were measured using a computerized hematology analyzer and showed a significant (Pâ€‰<â€‰0.02) maximum increase (1.6%) at a fluence of 72Â J/cm(2) when compared with non-irradiated samples. This increase in lymphocyte count upon irradiation was confirmed by flow cytometry. At a wavelength of 589Â nm and fluence of 72Â J/cm(2), irradiation of whole blood samples showed a significant increase in CD45 lymphocytes and natural killer (NK) (CD16, CD56) cells, but no significant changes in CD3 T lymphocytes, T-suppressor (CD3, CD8) cells, T-helper (CD3, CD4) cells, and CD19 B lymphocytes when compared with their non-irradiated counterparts. Our results clearly demonstrate that NK cell count is altered by irradiation, which ultimately affects the whole lymphocyte count significantly. Adult;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Lymphocyte Count;Lymphocyte Subsets;Lymphocytes;Male

Gingival crevicular fluid periostin levels in chronic periodontitis patients following nonsurgical periodontal treatment with low-level laser therapy. OBJECTIVE: Periostin is a matricellular protein highly expressed in periosteum, periodontal ligament and is essential for tissue integrity and maturation. It plays a role in collagen fibrillogenesis and is downregulated in periodontal disease. Biostimulation utilizing low-level laser therapy (LLLT) influences periodontal ligament fibroblast proliferation. This study was conducted with the objective of estimating periostin levels in chronic periodontitis (CP) patients following LLLT as an adjunct to root surface debridement (RSD). MATERIALS AND METHODS: Thirty periodontally healthy participants (Group I) and sixty CP participants were recruited. Based on the therapeutic intervention, CP patients were allocated to either RSD (Group II) or to RSD with LLLT (Group III) group. Clinical parameters and gingival crevicular fluid (GCF) periostin levels were assessed at the baseline and at the 3(rd) month. RESULTS: Periostin levels were significantly lower in CP patients when compared to healthy individuals at the baseline (P

< 0.01). Following nonsurgical periodontal treatment (NSPT), periostin levels significantly increased in both Group II and III, when compared to baseline values (P < 0.001). Comparison of mean periostin levels between both the treatment groups showed a significant increase in LLLT group than RSD at the 3(rd) month (P < 0.05). CONCLUSION: Within the limitations of the present study, LLLT application was found to have additional benefits over RSD with respect to clinical periodontal parameters and GCF periostin levels. Moreover, periostin may be used as a possible biomarker to evaluate the outcome following NSPT.

[ĐžPTIMIZATION OF TREATMENT OF THE PATIENTS, SUFFERING NEUROPATHICALLY-Đ†NFECTED FORM OF THE DIABETIC FOOT SYNDROME, USING THE IODINE PREPARATIONS AND LOW-INTENSIVE LASER IRRADIATION]. The changes in antibiotic sensitivity of the purulent-necrotic processes agents under the low-intensive laser irradiation impact were studied in experimental part of the investigation. There were 156 patients, suffering neuropathically-infected form of the diabetic foot syndrome, examined and treated, in 41 of them the iodine deficiency was revealed. Durable regional intaarterial infusion, low-intensive laser irradiation and preparations of iodine in a daily dose of 200 mcg were applied. High efficacy of the antibacterial therapy photomodification was proved, it have permitted to improve the results of treatment, to refuse from disabling operations in majority of the patients, to secure the foot bearing function. While the iodine deficiency presence the results of treatment are improved due to application of the iodine preparations. Anti-Bacterial Agents;Iodine Aged;Anti-Bacterial Agents;Diabetic Foot;Disease Management;Drug Resistance, Bacterial;Female;Humans;Iodine;Low-Level Light Therapy;Male;Middle Aged;Necrosis;Pseudomonas Infections;Pseudomonas aeruginosa;Staphylococcal Infections;Staphylococcus aureus

[MUSCLE FATIGUE: FACTORS OF DEVELOPMENT AND WAYS OF CORRECTION]. The data regarding the analysis of the physiological and biochemical mechanisms of muscle fatigue and ways to prevent it are summarized. The effect of the most common endogenous and exogenous antioxidants in the biochemical processes in muscle fatigue was analyzed. It is shown that biocompatible, non-toxic water-soluble C(60) fullerenes, which possess powerful antioxidative properties, promise great prospects in the correction of skeletal muscle fatigue caused by the destructive action of free radicals. Antioxidants;Fullerenes;Reactive Oxygen Species;Allopurinol;fullerene C60;Acetylcysteine Acetylcysteine;Allopurinol;Antioxidants;Fullerenes;Humans;Low-Level Light Therapy;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Oxidative Stress;Reactive Oxygen Species

Transcranial infrared laser stimulation improves rule-based, but not information-integration, category learning in humans. This is the first randomized, controlled study comparing the cognitive effects of transcranial laser stimulation on category learning tasks. Transcranial infrared laser stimulation is a new non-invasive form of brain stimulation that shows promise for wide-ranging experimental and neuropsychological applications. It involves using infrared laser to enhance cerebral oxygenation and energy metabolism through upregulation of the respiratory enzyme cytochrome oxidase, the primary infrared photon acceptor in cells. Previous research found that transcranial infrared laser stimulation aimed at the prefrontal cortex can improve sustained attention, short-term memory, and executive function. In this study, we directly investigated the influence of transcranial infrared laser stimulation on two neurobiologically dissociable systems of category learning: a prefrontal cortex mediated reflective system that learns categories using explicit rules, and a striatally mediated reflexive learning system that forms gradual stimulus-response associations. Participants (n=118) received either active infrared laser to the lateral prefrontal cortex or sham (placebo) stimulation, and then learned one of two category structures-a rule-based structure optimally learned by the reflective system, or an information-integration structure optimally learned by the reflexive system. We found that prefrontal rule-based learning was substantially improved following transcranial infrared laser

stimulation as compared to placebo (treatment X block interaction: F(1, 298)=5.117, p=0.024), while information-integration learning did not show significant group differences (treatment X block interaction: F(1, 288)=1.633, p=0.202). These results highlight the exciting potential of transcranial infrared laser stimulation for cognitive enhancement and provide insight into the neurobiological underpinnings of category learning. Adolescent;Adult;Female;Humans;Infrared Rays;Learning;Low-Level Light Therapy;Male;Neuropsychological Tests;Young Adult

Multimodal vaginal toning for bladder symptoms and quality of life in stress urinary incontinence. INTRODUCTION AND HYPOTHESIS: Treatment options for women with stress urinary incontinence (SUI) have limitations. We hypothesized that multimodal vaginal toning therapy would improve bladder symptoms and quality of life in women with postpartum SUI and sexual function complaints. METHODS: Patients self-administered 24 sessions of multimodal vaginal toning therapy lasting 10Â min each over 50Â days. Outcomes included 1-h pad weight test, Urogenital Distress Inventory Short Form (UDI-6), Incontinence Impact Questionnaire-Short Form (IIQ-7), Female Sexual Distress Scale-Revised 2005 (FSDS-R), Female Sexual Function Index (FSFI), pelvic floor muscle strength, patient satisfaction, and adverse events. RESULTS: Of the 55 patients enrolled (safety population), 48 completed the study per-protocol (PP population). A total of 38 (79%) patients had a positive 1-h pad weight test at baseline. In this group, urine leakage was moderate or severe in 82% of patients at baseline, but in only 18% after treatment. Treatment success was 84%, defined as >50% improvement in pad weight relative to baseline. In the PP population, mean UDI-6 score improved by 50% (pâ€‰<â€‰0.001) and IIQ-7 score improved by 69% (pâ€‰<â€‰0.001). Sexual function quality of life improved by 54% for FSDS-R and 15% for FSFI (both pâ€‰<â€‰0.001). Pelvic floor muscle strength significantly improved (pâ€‰<â€‰0.001). Patient satisfaction with therapy was reported in 83% of patients. In the safety population, 2 (3.6%) adverse events were reported-1 urinary tract infection and 1 report of discomfort due to excessive warmth. CONCLUSIONS: Multimodal vaginal toning therapy yields clinically meaningful improvements in bladder symptoms, pelvic floor muscle strength, and quality of life in women with SUI. Adult;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Middle Aged;Muscle Strength;Patient Satisfaction;Pelvic Floor;Prospective Studies;Quality of Life;Resistance Training;Sexual Dysfunction, Physiological;Treatment Outcome;Urinary Bladder;Urinary Incontinence, Stress;Vagina;Vibration

Clinical Outcomes and Complications Associated with Fractional Lasers: A Review of 730 Patients. BACKGROUND: Fractional lasers were introduced to provide increased safety, while maintaining high efficacy and patient satisfaction. Patients with virtually all Fitzpatrick skin types could be safely treated using a wide spectrum of wavelengths and a broad array of skin conditions, and aging could be addressed. Although safety studies have been reported for ablative CO(2) and erbium lasers, surprisingly few data are available on adverse events and complications associated with fractional lasers. OBJECTIVE: We report the frequency of adverse events, skin improvement and complications in a broad range of skin types using a standardized protocol that can be safely tailored to the patient's presenting complaints by varying the laser wavelength and number of treatments. MATERIALS AND METHODS: The medical records of 730 patients (>90% females, age ranged from 50.5. to 59.9Â years.) who had been treated at FACES+ Aesthetic Facility were reviewed. Patients were followed from 1 to 10Â months and were reviewed to determine the frequency of complications, as well as their frequency, type, cause, treatment and resolution thereof. Patients were categorized by Fitzpatrick skin type (I-IV) to determine whether skin type was related to the frequency of complications. Improvement in skin condition (wrinkles, nasolabial folds and pigment) was rated by a technician before and after treatment using a Likert scale, 0-5, with 0 being no change and 5 being the most improvement. RESULTS: Seven hundred thirty patients underwent procedures using fractional lasers in our center. Procedures were carried out with 3 different laser wavelengths,

depending on the condition(s) treated (wrinkling vs. pigmentation issues, etc.) and the patients' desired length of downtime. The fractional Fraxel 1927-nm laser was used in 224 patients [Fitzpatrick skin type I (2.2%), II (38.4%), III (46.0%), IV (12.5%)]; the fractional Fraxel 1550-nm laser was used in 334 [type I (4.5%), II (31.9%), III (50.0%), IV (13.3%)], and the fractional Fraxel CO(2) laser was used in 172 [type 1 (4.7%), II (49.7%), III (41.5%), IV (4.1%)]. The Fraxel CO(2) laser showed greater improvement in wrinkles and naso-labial fold (pÂ <Â 0.001). The greatest improvement in pigmentation was seen with the Fraxel 1927-nm laser (pÂ <Â 0.001). Adverse events and complications occurred in 31 of 730 patients (4.2%). There was no significant difference in the rate of complications among the three treatments (pÂ =Â 0.26). Complications were generally minor, and all resolved completely with treatment. Complications occurred in 4.0% of patients having the fractional Fraxel 1927-nm laser, 3.3% of patients having the fractional Fraxel 1550Â nm and 6.4% of patients having the fractional Fraxel CO(2) laser. Complications included 5 herpes simplex virus breakouts, 13 acne eruptions, 1 abrasion, 1 bacterial infection, 9 dermatitis, 1 drug eruption, 4 prolonged erythema, 1 hyperpigmentation, 1 increased swelling and 1 telangiectasia. There was no significant relationship between Fitzpatrick skin type and incidence of complications (pÂ =Â 0.37). CONCLUSIONS: Fractional lasers in general have reduced complication rates, while maintaining high degrees of patient satisfaction. Since their inception in early 2004, our clinic has utilized fractional lasers to treat patients from a variety of ethnic backgrounds and diverse skin types with an overall complication rate of 4.2%, all of which resolved. Comprehensive care of patients with facial aging is not limited to surgery alone and should include these types of strategies to appropriately and safely address photo-damage and photo-aging. LEVEL OF EVIDENCE IV: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 .
Cosmetic Techniques;Databases,
Factual;Edema;Erythema;Esthetics;Female;Humans;Hyperpigmentation;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Patient Selection;Retrospective Studies;Risk Assessment;Skin Aging;Treatment Outcome

Current Treatments for Breast Cancer-Related Lymphoedema: A Systematic Review. Background and objective: Breast cancer-related lymphoedema (BCRL) is a disabling complication with long term impact on quality on life after breast cancer treatment. Its management remains a major challenge for patients and health care professionals; the goal of this overview was to summarize effects of different treatment strategies for patients with BCRL. Methods: A thorough search was undertaken to allow a systematic review or meta-analysis of treatments for BCRL. Two investigators independently selected studies and abstracted the data. Results: Combined physical therapy (CPT) with different combinations of surgery, oral pharmaceuticals, low-level laser therapy, weight reduction, mesenchymal stem cell therapy, kinesio tex taping, and acupuncture might be effective in reducing lymphoedema, but exercise demonstrated no obvious benefit. The results of direct comparisons showed CPT might be more effective than standard physiotherapy (ST). Manual lymphatic drainage (MLD) may not offer additional benefits to ST for swelling reduction, but could facilitate compression bandaging. MLD seemed to have similar effects with self-administered simple lymphatic drainage (SLD) or using an intermittent pneumatic compression pump (IPC). IPC might also not be associated with additional effectiveness for CPT. Efficacy of stem cell therapy vs. compression sleeve or CPT, as well as the effects of daflon and coumarin could not be established. Conclusion: Although many treatments for BCRL might reduce lymphoedema volume, their effects were not well established. The quality of many of the original studies in the included reviews was not optimal, so that in future randomized control trials are a high priority.

Can Low Level Laser Therapy Benefit Bone Regeneration in Localized Maxillary Cystic Defects? - A Prospective Randomized Control Trial. AIM: The aim of the study was to evaluate the effect of Low-Level Laser Therapy (LLLT) on bone formation in cystic defects following cyst enucleation. PATIENTS AND METHODS: The sample was composed of sixteen patients with enucleated maxillary bony cystic lesions. With an age range from 20 - 44 grouped as eight Laser and eight Control patients. Laser group was subjected to low intensity diode laser immediately after surgery and then for three times per week for two weeks using a therapeutic laser irradiation. Group B (control group): patients were not subjected laser therapy. RESULTS: The predictor variable was exposure of bone defect to LLLT or none. The outcome variable was bone density changes measured by digital radiographs at day 1 and days 90 postoperatively. Descriptive and bivariate statistics were computed. There were no statistically significant differences between the 2 groups for the bone density at day 1. There was a statistically significant difference in bone density changes in each group at day 90: Significant at P â‰¤ 0.05. After adjusting for differences in day 1 for bone density, the estimated mean change in bone density changes at day 90 was significantly larger for Laser compared with control. CONCLUSION: The results of this study suggested that LLLT can enhance bone healing in maxillary cystic defects. This can serve as an adjunct method in preventing possible delayed healing and pathological fractures This also will be helpful for more researchers in early loading in case of dental implants to accelerate osseointegration.

Photodynamic inactivation of oral paracoccidioidomycosis affecting woman with systemic lupus erythematosus: An unusual case report. Paracoccidioidomycosis (PCM) is a systemic disease caused by the dimorphic fungus Paracocdioides brasiliensis. The infection primarily reaches the lungs by the inhalation of fungi spores and later can disseminate to other organs causing secondary oral lesions. Systemic lupus erythematosus (SLE), on the other hand, is an autoimmune chronic inflammatory disease that affects various organ systems, including skin and oral cavity. Here we report a 39-year-old female patient bearing SLE and presenting an ulcerated lesion on the hard palate extending to the superior alveolar ridge, diagnosed as PCM. Itraconazole 200mg was prescribed and photodynamic therapy (PDT) was also instituted in a way to help dealing with the PCM infection while assisting such an immunocompromised patient to heal. PDT consisted of topically placing toluidine blue dye at 37.5mg/L for 5min, followed by low-level laser irradiation (660nm; 100J/cm(2); 40mW of power; 100s per point). Forty days after beginning the treatment, the patient showed total regression of the oral lesion and absence of painful symptoms. The serologic test was performed again after six months of therapy and was negative; the patient continues to be followed periodically. Antifungal Agents;Photosensitizing Agents;Tolonium Chloride;Itraconazole Adult;Antifungal Agents;Combined Modality Therapy;Female;Humans;Immunocompromised Host;Itraconazole;Lupus Erythematosus, Systemic;Paracoccidioidomycosis;Photochemotherapy;Photosensitizing Agents;Tolonium Chloride

Influence of low-level laser therapy on the healing process of autogenous bone block grafts in the jaws of systemically nicotine-modified rats: A histomorphometric study. OBJECTIVE: To analyze the influence of low-level laser therapy (LLLT) on the bone healing process of autogenous bone block grafts installed in nicotine systemically modified rats. METHODS: Seventy-two rats (Wistar) were randomly assigned into 4 groups (n=18). SS-BG: saline application+bone graft. SS-BG/LLLT: saline application+bone graft+LLLT. NIC-BG: nicotine application+bone graft. NIC-BG/LLLT: nicotine application+bone graft+LLLT. After 30days of application of solutions, all animals received autogenous bone block graft in the jaw, with the donation from the parietal bone's calvarial area. Treatment with LLLT was in bed-graft interface, after accommodation of the graft. The animals in each group were sacrificed at 7, 14, and 28days after graft surgery. RESULTS: The histologic analyses of NIC-BG group depicted a delay of osteogenic activity in the recipient bed-graft interface and the irradiation of tissue

with LLLT provided better bone healing. The histometric analysis revealed that SS-BG/LLLT and NIC-BG/LLLT groups showed increased bone formation compared to BG-SS and NIC-BG groups, after 14days (SS-BG 24.94%Â±13.06% versus SS-BG/LLLT 27.53%Â±19.07% and NIC-BG 14.27%Â±2.22% versus NIC-BG/LLLT 24.37%Â±11.93%) and 28days (SS-BG 50.31%Â±2.69% versus SS-BG/LLLT 58 19%Â±12.32% and NIC-BG 36.89%Â±8.40% versus NIC-BG/LLLT 45.81%Â±6.03%). CONCLUSION: Nicotine harms bone formation in the bed-graft interface and LLLT action can mitigate this.
Nicotine Animals;Bone Regeneration;Bone Transplantation;Connective Tissue;Low-Level Light Therapy;Male;Mandible;Nicotine;Osteogenesis;Rats;Rats, Wistar;Time Factors;Wound Healing

Non-pharmacological interventions for alleviating pain during orthodontic treatment. BACKGROUND: Pain is prevalent during orthodontics, particularly during the early stages of treatment. To ensure patient comfort and compliance during treatment, the prevention or management of pain is of major importance. While pharmacological means are the first line of treatment for alleviation of orthodontic pain, a range of non-pharmacological approaches have been proposed recently as viable alternatives. OBJECTIVES: To assess the effects of non-pharmacological interventions to alleviate pain associated with orthodontic treatment. SEARCH METHODS: Cochrane Oral Health's Information Specialist searched the following databases: Cochrane Oral Health's Trials Register (to 6 October 2016), the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library, 2016, Issue 9), MEDLINE Ovid (1946 to 6 October 2016), Embase Ovid (1980 to 6 October 2016) and EThOS (to 6 October 2016). We searched ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform for ongoing trials. No restrictions were placed on the language or date of publication when searching the electronic databases. SELECTION CRITERIA: Randomised controlled trials (RCTs) comparing a non-pharmacological orthodontic pain intervention to a placebo, no intervention or another non-pharmacological pain intervention were eligible for inclusion. We included any type of orthodontic treatment but excluded trials involving the use of pre-emptive analgesia or pain relief following orthognathic (jaw) surgery or dental extractions in combination with orthodontic treatment. We excluded split-mouth trials (in which each participant receives two or more treatments, each to a separate section of the mouth) and cross-over trials. DATA COLLECTION AND ANALYSIS: At least two review authors independently assessed risk of bias and extracted data. We used the random-effects model and expressed results as mean differences (MD) with 95% confidence intervals (CI). We investigated heterogeneity with reference to both clinical and methodological factors. MAIN RESULTS: We included 14 RCTs that randomised 931 participants. Interventions assessed included: low-level laser therapy (LLLT) (4 studies); vibratory devices (5 studies); chewing adjuncts (3 studies); brain wave music or cognitive behavioural therapy (1 study) and post-treatment communication in the form of a text message (1 study). Twelve studies involved self-report assessment of pain on a continuous scale and two studies used questionnaires to assess the nature, intensity and location of pain.We combined data from two studies involving 118 participants, which provided low-quality evidence that LLLT reduced pain at 24 hours by 20.27 mm (95% CI -24.50 to -16.04, P < 0.001; IÂ² = 0%). LLLT also appeared to reduce pain at six hours, three days and seven days.Results for the other comparisons assessed are inconclusive as the quality of the evidence was very low. Vibratory devices were assessed in five studies (272 participants), four of which were at high risk of bias and one unclear. Chewing adjuncts (chewing gum or a bite wafer) were evaluated in three studies (181 participants); two studies were at high risk of bias and one was unclear. Brain wave music and cognitive behavioural therapy were evaluated in one trial (36 participants) assessed at unclear risk of bias. Post-treatment text messaging (39 participants) was evaluated in one study assessed at high risk of bias.Adverse effects were not measured in any of the studies. AUTHORS' CONCLUSIONS: Overall, the results are inconclusive. Although available evidence suggests laser irradiation may help reduce pain during orthodontic treatment in the short term, this

evidence is of low quality and therefore we cannot rely on the findings. Evidence for other non-pharmacological interventions is either very low quality or entirely lacking. Further prospective research is required to address the lack of reliable evidence concerning the effectiveness of a range of non-pharmacological interventions to manage orthodontic pain. Future studies should use prolonged follow-up and should measure costs and possible harms. Chewing Gum Adolescent;Adult;Chewing Gum;Cognitive Behavioral Therapy;Humans;Low-Level Light Therapy;Music Therapy;Orthodontics;Pain Management;Pain Measurement;Patient Satisfaction;Quality of Life;Randomized Controlled Trials as Topic;Text Messaging;Time Factors;Vibration

Transcranial Low-Level Laser (Light) Therapy for Brain Injury. BACKGROUND: Low-level laser therapy (LLLT) or photobiomodulation (PBM) is a possible treatment for brain injury, including traumatic brain injury (TBI). METHODS: We review the fundamental mechanisms at the cellular and molecular level and the effects on the brain are discussed. There are several contributing processes that have been proposed to lead to the beneficial effects of PBM in treating TBI such as stimulation of neurogenesis, a decrease in inflammation, and neuroprotection. Both animal and clinical trials for ischemic stroke are outlined. A number of articles have shown how transcranial LLLT (tLLLT) is effective at increasing memory, learning, and the overall neurological performance in rodent models with TBI. RESULTS: Our laboratory has conducted three different studies on the effects of tLLLT on mice with TBI. The first studied pulsed against continuous laser irradiation, finding that 10â€‰Hz pulsed was the best. The second compared four different wavelengths, discovering only 660 and 810â€‰nm to have any effectiveness, whereas 732 and 980â€‰nm did not. The third looked at varying regimens of daily laser treatments (1, 3, and 14 days) and found that 14 laser applications was excessive. We also review several studies of the effects of tLLLT on neuroprogenitor cells, brain-derived neurotrophic factor and synaptogenesis, immediate early response knockout mice, and tLLLT in combination therapy with metabolic inhibitors. CONCLUSIONS: Finally, some clinical studies in TBI patients are covered. Adult;Aged;Aged, 80 and over;Animals;Brain Injuries;Humans;Low-Level Light Therapy;Mice;Middle Aged;Stroke

Photobiomodulation Triple Treatment in Peripheral Nerve Injury: Nerve and Muscle Response. BACKGROUND: Muscle preservation or decrease in muscle degeneration and progressive atrophy are major challenges in patients with severe peripheral nerve injury (PNI). Considerable interest exists in the potential therapeutic value of laser phototherapy (photobiomodulation) for restoring denervated muscle atrophy and for enhancing regeneration of severely injured peripheral nerves. As previously published, the laser phototherapy has a protective and immediate effect in PNI. Laser phototherapy in the early stages of muscle atrophy may preserve the denervated muscle by maintaining creatinine kinase (CK) activity and the amount of acetylcholine receptor (AChR). OBJECTIVE AND METHODS: In the present study, the effectiveness of triple treatment laser phototherapy, namely, applied simultaneously at three areas: injured area of the peripheral nerve, corresponding segments of the spinal cord, and corresponding denervated muscle (triple treatment), was evaluated for the treatment of incomplete PNI in rats with the ultimate goal of achieving improved limb function. RESULTS: Forty-five days after the sciatic nerve insult, all rats regained normal walking (functional sciatic index values returned to baseline); however, the long laser irradiation (7â€‰min) group presented the fastest recovery as opposed to short laser irradiation (3â€‰min). A histological evaluation of the nerves revealed that long laser irradiation led to a higher amount of neuronal fibers that were larger than 4â€‰Î¼m (543â€‰Â±â€‰76.8, pâ€‰<â€‰0.01) than short irradiation (283â€‰Â±â€‰35.36). A histological evaluation of muscular atrophy showed that long laser irradiation evolved with significantly less muscle atrophy (8.06%â€‰Â±â€‰1.23%, pâ€‰<â€‰0.05) than short irradiation (24.44%â€‰Â±â€‰7.26%). CONCLUSIONS: The present study and our

previous investigations showed that the laser phototherapy increases biochemical activity and improves morphological recovery in muscle and, thus, could have direct therapeutic applications on muscle, especially during progressive atrophy resulting from PNI. Animals;Female;Low-Level Light Therapy;Muscle, Skeletal;Muscular Atrophy;Peripheral Nerve Injuries;Rats;Rats, Wistar

Transcranial, Red/Near-Infrared Light-Emitting Diode Therapy to Improve Cognition in Chronic Traumatic Brain Injury. We review the general topic of traumatic brain injury (TBI) and our research utilizing transcranial photobiomodulation (tPBM) to improve cognition in chronic TBI using red/near-infrared (NIR) light-emitting diodes (LEDs) to deliver light to the head. tPBM improves mitochondrial function increasing oxygen consumption, production of adenosine triphosphate (ATP), and improving cellular energy stores. Nitric oxide is released from the cells increasing regional blood flow in the brain. Review of published studies: In our previously published study, 11 chronic TBI patients with closed-head TBI caused by different accidents (motor vehicle accident, sports-related, improvised explosive device blast injury) and exhibiting long-lasting cognitive dysfunction received 18 outpatient treatments (Monday, Wednesday, Friday for 6 weeks) starting at 10 months to 8 years post-TBI. LED therapy is nonthermal, painless, and noninvasive. An LED-based device classified as nonsignificant risk (FDA cleared) was used. Each LED cluster head (5.35â€‰cm diameter, 500â€‰mW, 22.2â€‰mW/cm(2)) was applied for 9â€‰min 45â€‰sec (13â€‰J/cm(2)) using 11 locations on the scalp: midline from front-to-back hairline and bilaterally on frontal, parietal, and temporal areas. Testing was performed before and after transcranial LED (tLED; at 1 week, 1 month, and at 2 months after the 18th treatment) and showed significant improvements in executive function and verbal memory. There were also fewer post-traumatic stress disorder (PTSD) symptoms reported. Ongoing studies: Ongoing, current studies involve TBI patients who have been treated with tLED using either 26â€‰J/cm(2) per LED location on the head or treated with intranasal only (iLED) using red (633â€‰nm) and NIR (810â€‰nm) diodes placed into the nostrils. The NIR iLED is hypothesized to deliver photons to the hippocampus, and the red 633â€‰nm iLED is believed to increase melatonin. Results have been similar to the previously published tLED study. Actigraphy sleep data showed increased time asleep (on average one additional hour per night) after the 18th tLED or iLED treatment. LED treatments may be performed in the home. Sham-controlled studies with veterans who have cognitive dysfunction from Gulf War Illness, blast TBI, and TBI/PTSD are currently ongoing. Brain Injuries, Traumatic;Brain Injury, Chronic;Cognition Disorders;Humans;Low-Level Light Therapy

Optimization and characterization of the endogenous production of protoporphyrin IX in a yeast model. The availability of reproducible, convenient, and inexpensive model organisms able to generate predictable levels of endogenous porphyrins, including protoporphyrin IX (PpIX), is essential in photomedicine research. Saccharomyces cerevisiae produces endogenous PpIX and was used as a model organism for this study with the aim to maximize endogenous PpIX fluorescence intensity. It was found that PpIX fluorescence was significantly enhanced by administration of 5-aminolevulinic acid (ALA) and 2,2?-bipyridyl. Fluorescence intensity and spectroscopy of PpIX produced endogenously were measured in diluted yeast solutions under various conditions. The optimal protocol was: 5 ?? ? M ALA and 1 mM 2,2?-bipyridyl administered synchronously at 32Â°C. After 3 h, PpIX in yeast demonstrated similar steady-state and time-resolved spectroscopy as that of PpIX in DMSO. Moreover, under hypoxic conditions, the reciprocal lifetime of PpIX delayed fluorescence measured in real time was correlated to the partial pressure of oxygen (pO 2) measured concomitantly with a commercially available pO 2 probe. These data show that yeast can, in optimal conditions, reproducibly generate PpIX. This is of interest in various fields such as photodiagnosis, photodynamic therapy, and photobiomodulation. Use of this model organism focuses on essential mechanisms, without the complexity of a multicellular organism.

Protoporphyrins;Aminolevulinic Acid;protoporphyrin IX;Glucose;Oxygen Aminolevulinic Acid;Glucose;Models, Biological;Oxygen;Protoporphyrins;Saccharomyces cerevisiae;Spectrometry, Fluorescence
Effect of speech-language therapy after low-level laser therapy in patients with TMD: a descriptive study. Increased pain and/or discomfort during chewing, speaking, and swallowing have been commonly reported by patients with Temporomandibular Dysfunction (TMD). Speech-language pathology therapy (orofacial myofunctional therapy - OMT) has been proposed as part of the treatment for this condition; however, it is a modality that should be introduced when the TMD context and the pain are not accentuated, so that they do not prevent or hinder the performance of exercises. The aim of this study was to analyze the effect of OMT on the treatment of patients with TMD, according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), after analgesia with low-level laser therapy (LLLT), regarding orofacial myofunctional conditions (OMC) and the perception of TMD symptoms. Five patients aged 50 to 61 years were evaluated 30 days after completion of LLLT. An experienced speech-language pathologist conducted, pre- and post-OMT, the application of the ProDTM Multi-questionnaire - to investigate the self-perception of TMD symptomatology, and the Orofacial Myofunctional Evaluation with Scores (OMES) clinical examination - to confirm the orofacial myofunctional conditions. OMC presented increased OMT scores, indicating an increase in myofunctional orofacial balance. According to the patients' perception, TMD signs and symptoms were relieved after the application of OMT. According to the self-perception of the treated patients, introduction of OMT after LLLT analgesia promoted a balance of the orofacial functions of the sample studied, as well as a decrease in the remaining TMD signs and symptoms. Facial Muscles;Female;Humans;Language Therapy;Low-Level Light Therapy;Masseter Muscle;Middle Aged;Myofunctional Therapy;Speech Therapy;Surveys and Questionnaires;Temporal Muscle;Temporomandibular Joint Disorders
Effect of different types of therapeutic trauma on vitiligo lesions. New treatment modalities for vitiligo acting by changing certain cytokines and metalloproteinases are newly emerging. The aim of this work is to To assess the efficacy of trichloroacetic acid (TCA) chemical peel, dermapen, and fractional CO(2) laser in treatment of stable non-segmental vitiligo and to detect their effects on IL-17 and MMP-9 levels. Thirty patients with stable vitiligo were recruited in a randomized controlled study. They were randomly categorized into three equal groups. Group 1: TCA peel, Group 2: dermapen machine, and Group 3: Fractional CO(2) laser. Skin biopsies were taken from treated areas and from control areas for which MMP-9 and IL-17 tissue levels were measured using ELISA. The 30 vitiligo patients had low basal tissue MMP-9 levels and high baseline IL-17 tissue levels. As regards the three different used modalities, all of them caused rise in MMP-9 as well as IL-17 levels and almost their levels were much more elevated with repetition of the previously mentioned traumatic procedures. TCA 25% peel proved to be the most effective modality both clinically and laboratory and it can be used prior or with other conventional therapies in the treatment of vitiligo. Caustics;Interleukin-17;Trichloroacetic Acid;MMP9 protein, human;Matrix Metalloproteinase 9 Administration, Cutaneous;Adolescent;Adult;Biopsy;Caustics;Chemexfoliation;Cosmetic Techniques;Egypt;Female;Humans;Interleukin-17;Lasers, Gas;Low-Level Light Therapy;Male;Matrix Metalloproteinase 9;Middle Aged;Miniaturization;Needles;Skin;Skin Pigmentation;Time Factors;Treatment Outcome;Trichloroacetic Acid;Vitiligo;Young Adult
Non-ablative radiofrequency associated or not with low-level laser therapy on the treatment of facial wrinkles in adult women: A randomized single-blind clinical trial. OBJECTIVES: The objective of this study was to evaluate the effects of Non-ablative Radiofrequency (RF) associated or not with low-level laser therapy (LLLT) on aspect of facial wrinkles among adult women. METHODS: Forty-six participants were randomized into three groups: Control Group (CG, n = 15), RF Group (RG, n = 16),

and RF and LLLT Group (RLG, n = 15). Every participant was evaluated on baseline (T0), after eight weeks (T8) and eight weeks after the completion of treatment (follow-up). They were photographed in order to classify nasolabial folds and periorbital wrinkles (Modified Fitzpatrick Wrinkle Scale and Fitzpatrick Wrinkle Classification System, respectively) and improvement on appearance (Global Aesthetic Improvement Scale). Photograph analyses were performed by 3 blinded evaluators. RESULTS: Classification of nasolabial and periorbital wrinkles did not show any significant difference between groups. Aesthetic appearance indicated a significant improvement for nasolabial folds on the right side of face immediately after treatment (p = 0.018) and follow-up (p = 0.029) comparison. RG presented better results than CG on T8 (p = 0.041, ES = -0.49) and on follow-up (p = 0.041, ES = -0.49) and better than RLG on T8 (p = 0.041, ES = -0.49). RLG presented better results than CG on follow-up (p = 0.007, ES = -0.37). CONCLUSION: Nasolabial folds and periorbital wrinkles did not change throughout the study; however, some aesthetic improvement was observed. LLLT did not potentiate RF treatment. Adult;Combined Modality Therapy;Esthetics;Eye;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Nasolabial Fold;Photography;Radiofrequency Therapy;Rhytidoplasty;Single-Blind Method;Skin Aging

Editorial. Cosmetic Techniques;Humans;Low-Level Light Therapy;Ultrasonic Therapy

Effect of low-level laser therapy on bisphosphonate-treated osteoblasts. BACKGROUND: This study investigates the effect of alendronate-treated osteoblasts, as well as the effect of low-level laser therapy (LLLT) on the alendronate-treated osteoblasts. Bisphosphonate decreases the osteoblastic activity. Various treatment modalities are used to enhance the bisphosphonate-treated osteoblasts; however, there were no cell culture studies conducted using a low-level laser. METHODS: Human fetal osteoblastic (hFOB 1.19) cells were treated with 50Â Î¼M alendronate. Then, they were irradiated with a 1.2Â J/cm(2) low-level Ga-Al-As laser (Î»â€‰=â€‰808â€‰Â±â€‰3Â nm, 80Â mW, and 80Â mA; spot size, 1Â cm(2); NDLux, Seoul, Korea). The cell survivability was measured with the MTT assay. The three cytokines of osteoblasts, receptor activator of nuclear factor ÎºB ligand (RANKL), osteoprotegerin (OPG), and macrophage colony-stimulating factor (M-CSF) were analyzed. RESULTS: In the cells treated with alendronate at concentrations of 50Â Î¼M and higher, cell survivability significantly decreased after 48Â h (pâ€‰<â€‰0.05). After the applications of low-level laser on alendronate-treated cells, cell survivability significantly increased at 72Â h (pâ€‰<â€‰0.05). The expressions of OPG, RANKL, and M-CSF have decreased via the alendronate. The RANKL and M-CSF expressions have increased, but the OPG was not significantly affected by the LLLT. CONCLUSIONS: The LLLT does not affect the OPG expression in the hFOB cell line, but it may increase the RANKL and M-CSF expressions, thereby resulting in positive effects on osteoclastogenesis and bone remodeling.

Photobiomodulation reduces drusen volume and improves visual acuity and contrast sensitivity in dry age-related macular degeneration. PURPOSE: To evaluate the efficacy of photobiomodulation (PBM) treatment for patients with dry age-related macular degeneration (AMD). METHODS: Assessments on 42 eyes with dry AMD (age related eye disease study (AREDS) 2-4) were conducted. Multiwavelength light emitting diode (LED) light comprising of yellow (590Â nm), red (670Â nm) and near-infrared (790Â nm) bandwidths was applied to subjects' eyes for a treatment course of 3Â weeks. Outcome measures were changes in best-corrected visual acuity (BCVA), contrast sensitivity (CS), drusen volume and central drusen thickness. RESULTS: Significant improvement in mean BCVA of 5.90 letters (pÂ <Â 0.001) was seen on completion of the 3-week treatment and 5.14 letters (pÂ <Â 0.001) after 3Â months. Contrast sensitivity improved significantly (log unit improvement of 0.11 (pÂ =Â 0.02) at 3Â weeks and 3Â months (log unit improvement of 0.16 (pÂ =Â 0.02) at three cycles per degree. Drusen volume decreased by 0.024Â mm(3) (pÂ <Â 0.001) and central drusen thickness was significantly reduced by a mean of 3.78Â Î¼m (pÂ <Â 0.001), while overall central retinal thickness and retinal volume remained stable. CONCLUSION: This is the first

study demonstrating improvements in functional and anatomical outcomes in dry AMD subjects with PBM therapy. These findings corroborate an earlier pilot study that looked at functional outcomeÂ measures. The addition of anatomical evidence contributes to theÂ basis for further development of a non-invasive PBM treatment for dry AMD. Aged;Aged, 80 and over;Contrast Sensitivity;Female;Follow-Up Studies;Humans;Laser Therapy;Macular Degeneration;Male;Pilot Projects;Retina;Retinal Drusen;Retrospective Studies;Tomography, Optical Coherence;Treatment Outcome;Visual Acuity
Photobiomodulation therapy: management of mucosal necrosis of the oropharynx in previously treated head and neck cancer patients. Necrosis of the oral mucosa following head and neck cancer radiation therapy presents considerable clinical management challenges. We report three cases of symptomatic persisting oral ulcerations where the addition of photobiomodulation therapy resulted in a rapid resolution of the oral lesions and in patient symptoms. These cases suggest that photobiomodulation may represent an adjunct to care of these difficult to manage complications in oncology. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Necrosis;Oral Ulcer;Oropharynx;Radiation Injuries
Photobiomodulation or low-level laser therapy. Animals;Humans;Low-Level Light Therapy;Mice;Rats
Laser Photobiomodulation for a Complex Patient with Severe Hydroxyurea-Induced Oral Ulcerations. Patients affected by polycythemia vera (PV), a myeloproliferative neoplasm characterized by an elevated red blood cell mass, are at high risk of vascular and thrombotic complications. Conventional therapeutic options aim at reducing vascular and thrombotic risk; low-dose aspirin and phlebotomy are first-line recommendations, for patients at low risk of thrombotic events, whereas cytoreductive therapy, usually hydroxyurea (HU) or interferon alpha, is recommended for high-risk patients. In the present study, we report the case of a patient with persistent oral ulcerations, possibly related to long-lasting HU treatment, firstly treated with topic and systemic corticosteroids and then more effectively with the addition of low-level laser therapy. Laser photobiomodulation has achieved pain control and has contributed to the healing of oral ulcers without any adverse effect; this has permitted a reduction in the dose of systemic corticosteroids and the suspension of the use of the topic ones, due to the long-term stability of oral health, even after the interruption of low-level laser therapy sessions.
Noninvasive red and near-infrared wavelength-induced photobiomodulation: promoting impaired cutaneous wound healing. The innumerable intricacies associated with chronic wounds have made the development of new painless, noninvasive, biophysical therapeutic interventions as the focus of current biomedical research. Red and near-infrared light-induced photobiomodulation therapy appears to emerge as a promising drug-free approach for promoting wound healing, reduction in inflammation, pain and restoration of function owing to penetration power in conjunction with their ability to positively modulate the biochemical and molecular responses. This review will describe the physical properties of red and near-infrared light and their interaction with skin and highlight their efficacy of wound repair and regeneration. Near-infrared (800-830Â nm) was found to be the most effective and widely studied wavelength range followed by red (630-680Â nm) and 904Â nm superpulsed light exhibiting beneficial photobiomodulatory effects on impaired dermal wound healing. Animals;Color;Color Therapy;Humans;Intense Pulsed Light Therapy;Light;Phototherapy;Skin;Skin Physiological Phenomena;Wound Healing
Photobiomodulation therapy in breast cancer-related lymphedema: a randomized placebo-controlled trial. BACKGROUND: The aim of our study was to examine the effects of photobiomodulation therapy (PBMT) in the treatment of breast cancer-related lymphedema using a compactly designed treatment regime consisting of eight therapy sessions in combination with a cluster laser device

covering a total area size of 78.54Â cmÂ² over the axillary. METHODS: Forty patients with unilateral lymphedema were enrolled in this double-blind, placebo-controlled trial in order to evaluate effects of PBMT on lymphedema-related pain, quality of life, grip strength and limb volume difference. Subjects received irradiation for ten minutes per session using a cluster laser covering a beam area of 78.54Â cmÂ². The applied energy was 384 Joules resulting in an energy density of 4.89Â J/cmÂ². RESULTS: Post-treatment, a 50% reduction in median pain scores and an increase in mean quality of life were observed. Mean grip strength was persistently higher after eight sessions of PBMT compared with pretreatment; however, no statistically significant intergroup differences (PÂ >Â 0.05) were found over the time course. CONCLUSION: PBMT using a compactly designed treatment regime in combination with a cluster laser device did not significantly improve quality of life, pain scores, grip strength and limb volume over the time course. Aged;Arm;Axilla;Breast Neoplasms;Female;Hand Strength;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Lymph Node Excision;Lymphedema;Middle Aged;Organ Size;Pain;Quality of Life;Sentinel Lymph Node Biopsy

The RESOLVE Trial for people with chronic low back pain: protocol for a randomised clinical trial. INTRODUCTION: Low back pain is the leading worldwide cause of disability, and results in significant personal hardship. Most available treatments, when tested in high-quality randomised, controlled trials, achieve only modest improvements in pain, at best. Recently, treatments that target central nervous system function have been developed and tested in small studies. Combining treatments that target central nervous system function with traditional treatments directed towards functioning of the back is a promising approach that has yet to be tested in adequately powered, prospectively registered, clinical trials. The RESOLVE trial will be the first high-quality assessment of two treatment programs that combine central nervous system-directed and traditional interventions in order to improve chronic low back pain. AIM: To compare the effectiveness of two treatment programs that combine central nervous system-directed and traditional interventions at reducing pain intensity at 18 weeks post randomisation in a randomised clinical trial of people with chronic low back pain. DESIGN: Two-group, randomised, clinical trial with blinding of participants and assessors. PARTICIPANTS AND SETTING: Two hundred and seventy-five participants with chronic low back pain that has persisted longer than 3 months and no specific spinal pathology will be recruited from the community and primary care in Sydney, Australia. INTERVENTIONS: Both of the interventions contain treatments that target central nervous system function combined with treatments directed towards functioning of the back. Adherence to the intervention will be monitored using an individual treatment diary and adverse events recorded through passive capture. Participants are informed prior to providing informed consent that some of the treatments are not active. Blinding is maintained by not disclosing any further information. Complete disclosure of the contents of the intervention has been made with the UNSW HREC (HC15357) and an embargoed project registration has been made on the Open Science Framework to meet the Declaration of Helsinki requirement for transparent reporting of trial methods a priori. INTERVENTION A: Participants randomised to Intervention A will receive a 12-session treatment program delivered as 60-minute sessions, scheduled approximately weekly, over a period of 12 to 18 weeks. All treatment sessions are one-on-one. The program includes a home treatment component of 30minutes, five times per week. The intervention comprises discussion of the participant's low back pain experience, graded sensory training, graded motor imagery training and graded, precision-focused and feedback-enriched, functional movement training. Treatment progression is determined by participant proficiency, with mandatory advancement at set time points with respect to a standard protocol. INTERVENTION B: Participants randomised to Intervention B will receive a 12-session treatment program of the same duration and structure as Intervention A. The intervention comprises discussion of the participant's low back pain experience, transcranial direct current stimulation to the motor and pre-frontal

cortices, cranial electrical stimulation, and low-intensity laser therapy and pulsed electromagnetic energy to the area of greatest pain. Treatment is delivered according to published recommendations and progressed with respect to a standard protocol. MEASUREMENTS: The primary outcome is pain intensity at 18 weeks post randomisation. Secondary outcomes will include disability, depression, pain catastrophising, kinesiophobia, beliefs about back pain, pain self-efficacy, quality of life, healthcare resource use, and treatment credibility. Assessment will occur at baseline and at 18, 26 and 52 weeks after randomisation. Treatment credibility will be assessed at baseline and 2 weeks after randomisation only. ANALYSIS: A statistician blinded to group status will analyse the data by intention-to-treat using linear mixed models with random intercepts. Linear contrasts will be constructed to compare the adjusted mean change (continuous variables) in outcome from baseline to each time point between intervention A and intervention B. This will provide effect estimates and 95% confidence intervals for any difference between the interventions. SIGNIFICANCE: Preliminary data suggest that combining treatments that target central nervous system function with traditional interventions is a promising approach to chronic low back pain treatment. In the context of modest effects on pain intensity from most available treatments, this approach may lead to improved clinical outcomes for people with chronic low back pain. The trial will determine which, if either, of two treatment programs that combine central nervous system-directed and traditional interventions is more effective at reducing pain intensity in a chronic low back pain cohort. Central nervous system-directed interventions constitute a completely new treatment paradigm for chronic low back pain management. The results have the potential to be far reaching and change current physiotherapy management of chronic low back pain in Australia and internationally.
Adult;Australia;Chronic Pain;Clinical Protocols;Female;Humans;Low Back Pain;Pain Measurement;Physical Therapy Modalities;Randomized Controlled Trials as Topic

Low-Level Laser Therapy for Reducing the Hip, Waist, and Upper Abdomen Circumference of Individuals with Obesity. OBJECTIVE: To assess the effectiveness of low-level laser therapy (LLLT) for reducing hip, thigh, and abdomen circumference of individuals with body-mass index (BMI) between 30 and 40â€‰kg/m(2). BACKGROUND: Previous studies demonstrated the effectiveness of LLLT for reducing body circumference in the hips, thighs, and abdomen of nonobese individuals with a BMI <30â€‰kg/m(2). METHODS: In this randomized, double-blind sham-controlled study, obese, but otherwise healthy, individuals were randomized to undergo 30-min LLLT (nâ€‰=â€‰28) or sham treatments (nâ€‰=â€‰25) three times weekly for 4 weeks. Body measurements were obtained after 2 and 4 weeks of treatment and 2 weeks post-treatment (ClinicalTrials.gov Identifier: NCT01821352). RESULTS: After 4 weeks, 20 LLLT-treated subjects (71.43%) achieved â‰¥7.2â€‰cm decrease in combined measurements versus three sham-treated subjects (12%; pâ€‰<â€‰0.00005). The mean (standard deviation) decrease in combined measurement for LLLT-treated subjects was 10.52 (7.59) cm (pâ€‰<â€‰0.0001 vs. baseline) versus 1.80 (3.20) cm for sham-treated subjects. Among subjects with a combined â‰¥7.2â€‰cm decrease, the mean total decrease 2 weeks post-treatment was 15.21â€‰cm. There were no adverse events. CONCLUSIONS: Based on these results, the device was cleared by the U.S. Food and Drug Administration as a noninvasive esthetic treatment for reduction of circumference of hips, waist, and upper abdomen when applied to individuals with a BMI between 30 and 40â€‰kg/m(2).
Abdomen;Adolescent;Adult;Aged;Female;Hip;Humans;Low-Level Light Therapy;Male;Middle Aged;Obesity;Waist Circumference

Preoperative low level laser therapy in dogs undergoing tibial plateau levelling osteotomy: A blinded, prospective, randomized clinical trial. OBJECTIVES: To evaluate the influence of preoperative low-level laser therapy (LLLT) on therapeutic outcomes of dogs undergoing tibial plateau levelling osteotomy (TPLO). METHODS: Healthy dogs undergoing TPLO were randomly assigned to receive

either a single preoperative LLLT treatment (800-900 nm dual wavelength, 6 W, 3.5 J/cm(2), 100 cm(2) area) or a sham treatment. Lameness assessment and response to manipulation, as well as force plate analysis, were performed preoperatively, then again at 24 hours, two weeks, and eight weeks postoperatively. Radiographic signs of healing of the osteo-tomy were assessed at eight weeks postoperatively. RESULTS: Twenty-seven dogs (27 stifles) were included and no major complications occurred. At eight weeks postoperatively, a significant difference in peak vertical force analysis was noted between the LLLT (39.6% Â± 4.7%) and sham groups (28.9% Â± 2.6%), (pÂ <0.01 Time, p <0.01 L). There were no significant differences noted between groups for all other parameters. The age of dogs in the LLLT group (6.6 Â± 1.6 years) was greater than that for the sham group (4.5 Â± 2.0, p <0.01). Although not significant, a greater proportion of LLLT dogs (5/8) had healed at the eight-week time point than in the sham group (3/12) despite the age difference (p = 0.11) Clinical significance: The results of this study demonstrate that improved peak vertical force could be related to the preoperative use of LLLT for dogs undergoing TPLO at eight weeks postoperatively. The use of LLLT may improve postoperative return to function following canine osteotomies and its use is recommended. Animals;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Dog Diseases;Dogs;Female;Low-Level Light Therapy;Male;Osteotomy;Prospective Studies;Single-Blind Method;Stifle;Tibia;Treatment Outcome

Excimer Light Treatment for Idiopathic Guttate Hypomelanosis: A Pilot Study. BACKGROUND: Idiopathic guttate hypomelanosis (IGH) is a commonly acquired benign leukoderma characterized by multiple discrete, hypo- or depigmented macules often on extremities that can be aesthetically undesirable for patients. This is the first study using excimer laser for treatment. OBJECTIVE: To determine the effectiveness of excimer laser for repigmentation of idiopathic guttate hypomelanosis. METHODS AND MATERIALS: In this longitudinal, split-body controlled, single-blinded pilot study, 6 patients were treated with excimer laser for 12 weeks using the vitiligo protocol. Effectiveness was graded by the blinded observer scale through photographic comparisons at the end of the study. Participants also graded their progress at intervals during the study. A descriptive trend analysis and an ANOVA model were used to determine outcomes. RESULTS: Lesions that received the excimer treatment had significantly higher repigmentation by the end of the study compared with baseline and untreated lesions. CONCLUSION: Excimer laser treatments are already considered to be a safe modality for a variety of skin conditions. This study suggests that excimer is an effective treatment option with acceptable cosmetic outcomes for IGH.
Adult;Female;Humans;Hypopigmentation;Lasers, Excimer;Longitudinal Studies;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Photography;Pigmentation;Single-Blind Method

In vivo experimental model of orthotopic dental pulp regeneration under the influence of photobiomodulation therapy. Animals;Dental Pulp;Low-Level Light Therapy;Male;Models, Theoretical;Rats;Rats, Wistar;Regeneration

Laser Photobiomodulation in Neuroscience: From Bench to Bedside. Animals;Brain Injuries;Humans;Low-Level Light Therapy;Peripheral Nerve Injuries

Beneficial effect of low-level laser therapy in acute lung injury after i-I/R is dependent on the secretion of IL-10 and independent of the TLR/MyD88 signaling. The use of low-level laser for lung inflammation treatment has been evidenced in animal studies as well as clinical trials. The laser action mechanism seems to involve downregulation of neutrophil chemoattractants and transcription factors. Innate immune responses against microorganisms may be mediated by toll-like receptors (TLR). Intestinal ischemia and reperfusion (i-I/R) lead to bacterial product translocation, such as endotoxin, which consequently activates TLRs leading to intestinal and lung inflammation after gut trauma. Thus, the target of this study was to investigate the role of TLR activation in the laser (660Â nm, 30Â mW, 67.5Â J/cm(2), 0.375Â mW/cm(2), 5.4Â J, 180Â s, and spot size with 0.08Â cm(2))

effect applied in contact with the skin on axillary lymph node in lung inflammation induced by i-I/R through a signaling adaptor protein known as myeloid differentiation factor 88 (MyD88). It is a quantitative, experimental, and laboratory research using the C57Bl/6 and MyD88(-/-) mice (nâ€‰=â€‰6 mice for experimental group). Statistical differences were evaluated by ANOVA and the Tukey-Kramer multiple comparisons test to determine differences among groups. In order to understand how the absence of MyD88 can interfere in the laser effect on lung inflammation, MyD88(-/-) mice were treated or not with laser and subjected to occlusion of the superior mesenteric artery (45Â min) followed by intestinal reperfusion (4Â h). In summary, the laser decreased the MPO activity and the lung vascular permeability, thickened the alveolar septa, reduced both the edema and the alveolar hemorrhage, as well as significantly decreased neutrophils infiltration in MyD88-deficient mice as well in wild-type mice. It noted a downregulation in chemokine IL-8 production as well as a cytokine IL-10 upregulation in these animals. The results also evidenced that in absence of IL-10, the laser effect is reversed. Based on these results, we suggest that the beneficial effect of laser in acute lung injury after i-I/R is dependent on the secretion of IL-10 and independent of the TLR/MyD88 signaling. Interleukin-8;Myeloid Differentiation Factor 88;RNA, Messenger;Toll-Like Receptors;Intercellular Adhesion Molecule-1;Interleukin-10;Peroxidase;Plicamycin Acute Lung Injury;Animals;Gene Expression Regulation;Inflammation;Intercellular Adhesion Molecule-1;Interleukin-10;Interleukin-8;Intestines;Low-Level Light Therapy;Lung;Mice, Inbred C57BL;Microvessels;Myeloid Differentiation Factor 88;Peroxidase;Plicamycin;RNA, Messenger;Reperfusion Injury;Signal Transduction;Toll-Like Receptors

Efficacy of low level laser therapy in the treatment of burning mouth syndrome: A systematic review. BACKGROUND: Burning mouth syndrome (BMS) is a chronic pain condition with indefinite cure, predominantly affecting post-menopausal women. The aim of this study was to systematically review the efficacy of low level laser therapy in the treatment of burning mouth syndrome (BMS). METHODS: PubMed, Embase and Scopus were searched from date of inception till and including October 2016 using various combinations of the following keywords: burning mouth syndrome, BMS, stomatodynia, laser therapy, laser treatment and phototherapy. The inclusion criteria were: Prospective, retrospective and case series studies. Letter to editors, reviews, experimental studies, studies that were not published in English, theses, monographs, and abstracts presented in scientific events were excluded. Due to heterogeneity of data no statistical analyses were performed. RESULTS: Ten clinical studies fulfilled the eligibility criteria, five of which were randomized clinical trials. In these studies, the laser wavelengths, power output and duration of irradiation ranged between 630-980nm, 20-300mW, 10s-15min, respectively. Most of studies reported laser to be an effective therapy strategy for management of BMS. CONCLUSION: Majority of the studies showed that laser therapy seemed to be effective in reducing pain in BMS patients. However, due to the varied methodologies and substantial variations in laser parameters among these studies, more clinical trials are required to ascertain the efficacy of laser for treating BMS. Burning Mouth Syndrome;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Pain

Energy-Based Facial Rejuvenation: Advances in Diagnosis and Treatment. IMPORTANCE: The market for nonsurgical, energy-based facial rejuvenation techniques has increased exponentially since lasers were first used for skin rejuvenation in 1983. Advances in this area have led to a wide range of products that require the modern facial plastic surgeon to have a large repertoire of knowledge. OBJECTIVE: To serve as a guide for current trends in the development of technology, applications, and outcomes of laser and laser-related technology over the past 5 years. EVIDENCE REVIEW: We performed a review of PubMed from January 1, 2011, to March 1, 2016, and focused on randomized clinical trials, meta-analyses, systematic reviews, and clinical practice guidelines including case control, case studies and case reports when necessary, and included 14 articles we deemed

landmark articles before 2011. FINDINGS: Three broad categories of technology are leading non-energy-based rejuvenation technology: lasers, light therapy, and non-laser-based thermal tightening devices. Laser light therapy has continued to diversify with the use of ablative and nonablative resurfacing technologies, fractionated lasers, and their combined use. Light therapy has developed for use in combination with other technologies or stand alone. Finally, thermally based nonlaser skin-tightening devices, such as radiofrequency (RF) and intense focused ultrasonography (IFUS), are evolving technologies that have changed rapidly over the past 5 years. CONCLUSIONS AND RELEVANCE: Improvements in safety and efficacy for energy-based treatment have expanded the patient base considering these therapies viable options. With a wide variety of options, the modern facial plastic surgeon can have a frank discussion with the patient regarding nonsurgical techniques that were never before available. Many of these patients can now derive benefit from treatments requiring significantly less downtime than before while the clinician can augment the treatment to maximize benefit to fit the patient's time schedule. Equipment Design;Humans;Low-Level Light Therapy;Phototherapy;Rejuvenation;Skin Aging;Treatment Outcome

Re: Chow, misleading negative conclusions on LLLT efficacy in an updated review of physical modalities in neck pain treatment. Humans;Low-Level Light Therapy;Neck;Neck Pain;Pain Management;Physical Therapy Modalities;Treatment Outcome

Misleading negative conclusions on the efficacy of low-level laser therapy (LLLT) for neck pain. Humans;Low-Level Light Therapy;Neck Pain

Possible Role of Sildenafil Citrate in the Recurrence of Neovascularization in Laser-regressed Aggressive Posterior ROP. BACKGROUND: Systemic diseases and their treatment influence aggressive posterior retinopathy of prematurity. CASE CHARACTERISTICS: A premature infant with aggressive posterior retinopathy of prematurity underwent laser treatment with a favourable outcome. She was started on oral sidenafil citrate for pulmonary hypertension. Ten days later she developed neovascularization within the lasered retina. INTERVENTION/OUTCOME: Considering the possible role of sildenafil in this unusual development, the drug was withdrawn resulting in regression of the neovascularization. MESSAGE: The clinician should be aware of this retinal adverse effect of sildanefil in neonates with aggressive posterior retinopathy of prematurity. Vasodilator Agents;Sildenafil Citrate Female;Humans;Infant, Newborn;Infant, Premature;Light Coagulation;Low-Level Light Therapy;Retinopathy of Prematurity;Sildenafil Citrate;Vasodilator Agents

Radiological and biochemical effects (CTX-II, MMP-3, 8, and 13) of low-level laser therapy (LLLT) in chronic osteoarthritis in Al-Kharj, Saudi Arabia. Inflammation of synovial membrane and degeneration of articular cartilage in osteoarthritis (OA) lead to major changes in joint space width (JSW) and biochemical components such as collagen-II telopeptide (CTX-II) and matrix metallo protineases (MMP-3, 8, and 13). Low-level laser therapy (LLLT) is thought to have an analgesic effect as well as biomodulatory effect on microcirculation and cartilage regeneration in animal studies. The objective of this study was to examine the analgesic and biochemical effect of LLLT in patients with knee osteoarthritis. Subjects (nâ€‰=â€‰34) who fulfilled the selection criteria were randomly divided into active group (nâ€‰=â€‰17) and placebo group. Subjects in active group were irradiated laser with the frequency of 3Â days per week for 4Â weeks with the specific parameters on 8 different points on the joint at 1.5Â J per point for 60Â s for 8 points for a total dose of 12Â J in a skin contact method. The placebo group was treated with the same probe with minimum emission of energy. Visual analog scale for pain intensity, joint space width, collagen-II telopeptide, and matrix metallo protinease-3, 8, and 13 was measured before treatment and at 4 and 8Â weeks following treatment. Data are analyzed with mean values and standard deviation with pâ€‰<â€‰0.05. Baseline values of all outcome measures show insignificant difference (pâ€‰>â€‰0.05) in both groups which shows homogeneity. After 4- and 8-week treatment, active laser group shows more

significant difference (pâ€‰<â€‰0.001) in all the parameters than the placebo laser group (pâ€‰>â€‰0.05). Our results show that low-level laser therapy was more efficient in reducing pain and improving cartilage thickness through biochemical changes. Collagen Type II;Peptide Fragments;Placebos;collagen II C-telopeptide;Matrix Metalloproteinases Aged;Animals;Chronic Disease;Collagen Type II;Demography;Female;Humans;Knee Joint;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Peptide Fragments;Placebos;Saudi Arabia

Laser photobiomodulation (830 and 660Â nm) in mast cells, VEGF, FGF, and CD34 of the musculocutaneous flap in rats submitted to nicotine. The aim of this study was to investigate the effect of laser photobiomodulation (PBM) on the viability of the transverse rectus abdominis musculocutaneous (TRAM) flap in rats subjected to the action of nicotine. We evaluated 60 albino Wistar rats, divided into six groups of ten animals. Group 1 (saline) underwent the surgical technique to obtain a TRAM flap; group 2 (laser 830Â nm) underwent the surgical technique and was irradiated with a laser 830Â nm; group 3 (laser 660Â nm) underwent the surgical technique and was irradiated with a laser 660Â nm; group 4 was treated with nicotine subcutaneously (2Â mg/kg/2Ã— /day/4Â weeks) and underwent surgery; group 5 (nicotineâ€‰+â€‰laser 830Â nm) was exposed to nicotine, underwent the surgical technique, and was irradiated with a laser 830Â nm; group 6 (nicotineâ€‰+â€‰laser 660Â nm) was exposed to nicotine, underwent the surgical technique, and was irradiated with a laser 660Â nm. The application of PBM occurred immediately after surgery and on the two following days. The percentage of necrosis was assessed using the AxioVisionÂ® software. The number of mast cells (toluidine blue staining) was evaluated, and immunohistochemistry was performed to detect vascular endothelial growth factor expression (anti-VEGF-A), fibroblasts (anti-basic FGF), and neoformed vessels (anti-CD34). PBM with a wavelength of 830Â nm increased the viability of the TRAM flap, with a smaller area of necrosis, increased number of mast cells, and higher expression of VEGF and CD34. PBM increases the viability of musculocutaneous flaps treated with to nicotine. Antigens, CD34;Vascular Endothelial Growth Factor A;Fibroblast Growth Factors;Nicotine Animals;Antigens, CD34;Fibroblast Growth Factors;Lasers;Low-Level Light Therapy;Male;Mast Cells;Myocutaneous Flap;Necrosis;Neovascularization, Physiologic;Nicotine;Rats, Wistar;Rectus Abdominis;Surgical Flaps;Vascular Endothelial Growth Factor A

Efficacy of Noninvasive Stellate Ganglion Blockade Performed Using Physical Agent Modalities in Patients with Sympathetic Hyperactivity-Associated Disorders: A Systematic Review and Meta-Analysis. BACKGROUND: Stellate ganglion blockade (SGB) is mainly used to relieve symptoms of neuropathic pain in conditions such as complex regional pain syndrome and has several potential complications. Noninvasive SGB performed using physical agent modalities (PAMs), such as light irradiation and electrical stimulation, can be clinically used as an alternative to conventional invasive SGB. However, its application protocols vary and its clinical efficacy remains controversial. This study investigated the use of noninvasive SGB for managing neuropathic pain or other disorders associated with sympathetic hyperactivity. MATERIALS AND METHODS: We performed a comprehensive search of the following online databases: Medline, PubMed, Excerpta Medica Database, Cochrane Library Database, Ovid MEDLINE, Europe PubMed Central, EBSCOhost Research Databases, CINAHL, ProQuest Research Library, Physiotherapy Evidence Database, WorldWideScience, BIOSIS, and Google Scholar. We identified and included quasi-randomized or randomized controlled trials reporting the efficacy of SGB performed using therapeutic ultrasound, transcutaneous electrical nerve stimulation, light irradiation using low-level laser therapy, or xenon light or linearly polarized near-infrared light irradiation near or over the stellate ganglion region in treating complex regional pain syndrome or disorders requiring sympatholytic management. The included articles were subjected to a meta-analysis and risk of bias assessment. RESULTS: Nine randomized and four quasi-randomized

controlled trials were included. Eleven trials had good methodological quality with a Physiotherapy Evidence Database (PEDro) score of â‰¥6, whereas the remaining two trials had a PEDro score of <6. The meta-analysis results revealed that the efficacy of noninvasive SGB on 100-mm visual analog pain score is higher than that of a placebo or active control (weighted mean difference, -21.59 mm; 95% CI, -34.25, -8.94; p = 0.0008). CONCLUSIONS: Noninvasive SGB performed using PAMs effectively relieves pain of various etiologies, making it a valuable addition to the contemporary pain management armamentarium. However, this evidence is limited by the potential risk of bias. Autonomic Nerve Block;Clinical Trials as Topic;Electric Stimulation Therapy;Neuralgia;Phototherapy;Stellate Ganglion

Laser toning for melasma: A single-centre experience with 38â€…970 cases. Melasma is a common pigmentation in Asian women. Lasers have been used to lighten melasma, although with variable outcomes and complications. In Asia, laser toning is a common technique used to safely lighten melasma. However, no large studies have been performed to validate efficacy. In our study, we demonstrate that in 38â€…970 Asian women, at least 35â€…890 patients (92.1%) had noticeable to excellent improvement in their melasma. Adult;Aged;Asian People;Facial Dermatoses;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Photography;Treatment Outcome

Comparative study of dual-pulsed 1064 nm Q-switched Nd:YAG laser and single-pulsed 1064 nm Q-switched Nd:YAG laser by using zebrafish model and prospective split-face analysis of facial melasma. BACKGROUND: Recently dual-pulsed low-fluence 1064-nm Q-switched Nd:YAG (QSNY) laser has been developed for reducing complication during melasma treatment. OBJECTIVE: Comparison of the efficacy and safety between dual-pulsed mode and single-pulsed mode for the treatment of melasma. MATERIALS AND METHODS: In preclinical study, adult zebrafish were irradiated with dual-pulsed and single-pulsed mode. Changes of melanophore and cell death were assessed. In split-face clinical study, dual-pulsed and single-pulsed mode were irradiated on the left and right side of the face, respectively. L* value, clinical digital photos, modified Melasma Area and Severity Index (MASI) scores, and side effects were measured. RESULTS: As compared to single-pulsed mode and dual-pulsed mode with longer intervals, zebrafish melanophore was cleared quickly at dual-pulsed mode with 80-Î¼sec interval and 0.3 J/cm(2) fluence. Dual-pulsed mode showed the least regeneration of melanophore at 4 weeks after irradiation and no cell death was observed with 80-Î¼sec interval. Both pulse modes improved melasma significantly but modified MASI score and L* value were not significantly different between each other. Lesser pain and shorter duration of post-laser erythema were observed with dual-pulsed mode. CONCLUSION: Dual-pulsed mode was as effective as single-pulsed mode for the treatment of melasma and revealed less side effects. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum Adult;Aluminum;Animals;Asian People;Cell Death;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Neodymium;Patient Satisfaction;Prospective Studies;Yttrium;Zebrafish

Strength training prior to muscle injury potentiates low-level laser therapy (LLLT)-induced muscle regeneration. We evaluated whether strength training (ST) performed prior to skeletal muscle cryolesion would act as a preconditioning, improving skeletal muscle regeneration and responsiveness to low-level laser therapy (LLLT). Wistar rats were randomly assigned into non-exercised (NE), NE plus muscle lesion (NEâ€‰+â€‰LE), NEâ€‰+â€‰LE plus LLLT (NEâ€‰+â€‰LEâ€‰+â€‰LLLT), strength training (ST), STâ€‰+â€‰LE, and STâ€‰+â€‰LEâ€‰+â€‰LLLT. The animals performed 10Â weeks of ST (climbing ladder; 3Ã— week; 80% overload). Forty-eight hours after the last ST session, tibialis anterior (TA) cryolesion was induced and LLLT (InGaAlP, 660Â nm, 0.035Â W, 4.9Â J/cm(2)/point, 3 points, spot light 0.028Â cm(2), 14Â J/cm(2)) initiated and conducted daily for 14 consecutive days. The difference between

intergroups was assessed using Student's t test and intragroups by two-way analysis of variance. Cryolesion induced massive muscle degeneration associated with inflammatory infiltrate. Prior ST improved skeletal regeneration 14-days after cryolesion and potentiated the regenerative response to LLLT. Cryolesion induced increased TNF-Î± levels in both NEâ€‰+â€‰LE and STâ€‰+â€‰LE groups. Both isolated ST and LLLT reduced TNF-Î± to control group levels; however, prior ST potentiated LLLT response. Both isolated ST and LLLT increased IL-10 levels with no additional effect. In contrast, increased TA IL-6 levels were restricted to ST and STâ€‰+â€‰LEâ€‰+â€‰LLLT groups. TA myogenin mRNA levels were not changed by neither prior ST or STâ€‰+â€‰LLLT. Both prior ST and LLLT therapies increased MyoD mRNA levels and, interestingly, combined therapies potentiated this response. Myf5 mRNA levels were increased only in ST groups. Taken together, our data provides evidences for prior ST potentiating LLLT efficacy in promoting skeletal muscle regeneration. Cytokines;Muscle Proteins;RNA, Messenger Animals;Cytokines;Low-Level Light Therapy;Male;Models, Biological;Muscle Proteins;Muscle, Skeletal;Physical Conditioning, Animal;RNA, Messenger;Rats, Wistar;Regeneration;Wound Healing

Effects of different fluences of low-level laser therapy in an experimental model of spinal cord injury in rats. The aim of this study was to evaluate the in vivo response of different fluences of low-level laser therapy (LLLT) on the area of the injury, inflammatory markers, and functional recovery using an experimental model of traumatic spinal cord injury (SCI). Thirty two rats were randomly divided into four experimental groups: control group (CG), laser-treated group 500Â J/cm(2) (L-500), laser-treated group 750Â J/cm(2) (L-750), and laser-treated group 1000Â J/cm(2) (L-1000). SCI was performed by an impactor equipment (between the ninth and tenth thoracic vertebrae), with a pressure of 150Â kdyn. Afterwards, the injured region was irradiated daily for seven consecutive sessions, using an 808-nm laser, at the respective fluence of each experimental groups. Motor function and tactile sensitivity were performed on days 1 and 7 post-surgery. Animals were euthanized on the eighth day after injury, and the samples were retrieved for histological and immunohistochemistry analyses. Functional evaluation and tactile sensitivity were improved after LLLT, at the higher fluence. Additionally, LLLT, at 750 and 1000Â J/cm(2), reduces the lesion volume and modulates the inflammatory process with decrease of CD-68 protein expression. These results suggest that LLLT at higher doses was effective in promoting functional recovery and modulating inflammatory process in the spinal cord of rats after SCI. Animals;Disease Models, Animal;Female;Immunohistochemistry;Low-Level Light Therapy;Motor Activity;Rats, Wistar;Recovery of Function;Spinal Cord;Spinal Cord Injuries;Touch

Erratum to: Effects of low-level laser therapy applied before or after plyometric exercise on muscle damage markers: randomized, double-blind, placebo-controlled trial.

Low-level light treatment ameliorates immune thrombocytopenia. Immune thrombocytopenia (ITP) is an immune-mediated acquired bleeding disorder characterized by abnormally low platelet counts. We reported here the ability of low-level light treatment (LLLT) to alleviate ITP in mice. The treatment is based on noninvasive whole body illumination 30â€‰min a day for a few consecutive days by near infrared light (830â€‰nm) transmitted by an array of light-emitting diodes (LEDs). LLLT significantly lifted the nadir of platelet counts and restored tail bleeding time when applied to two passive ITP models induced by anti-CD41 antibody. The anti-platelet antibody hindered megakaryocyte differentiation from the progenitors, impaired proplatelet and platelet formation, and induced apoptosis of platelets. These adverse effects of anti-CD41 antibody were all mitigated by LLLT to varying degrees, owing to its ability to enhance mitochondrial biogenesis and activity in megakaryocytes and preserve mitochondrial functions in platelets in the presence of the antibody. The observations argue not only for contribution of mitochondrial stress to the pathology of ITP, but also clinical potentials of LLLT as a safe, simple, and cost-effective modality of ITP.

Animals;Apoptosis;Cell Differentiation;Low-Level Light Therapy;Megakaryocytes;Mice, Inbred C57BL;Platelet Count;Thrombocytopenia;Thrombopoiesis

The Diagnosis and Treatment of Peripheral Lymphedema: 2016 Consensus Document of the International Society of Lymphology. This International Society of Lymphology (ISL) Consensus Document is the latest revision of the 1995 Document for the evaluation and management of peripheral lymphedema (1). It is based upon modifications: [A] suggested and published following the 1997 XVI International Congress of Lymphology (ICL) in Madrid, Spain (2), discussed at the 1999 XVII ICL in Chennai, India (3), and considered/ confirmed at the 2000 (ISL) Executive Committee meeting in Hinterzarten, Germany (4); [B] derived from integration of discussions and written comments obtained during and following the 2001 XVIII ICL in Genoa, Italy as modified at the 2003 ISL Executive Committee meeting in Cordoba, Argentina (5); [C] suggested from comments, criticisms, and rebuttals as published in the December 2004 issue of Lymphology (6); [D] discussed in both the 2005 XX ICL in Salvador, Brazil and the 2007 XXI ICL in Shanghai, China and modified at the 2008 Executive Committee meeting in Naples, Italy (7,8);[E] modified from discussions and written comments from the 2009 XXII ICL in Sydney, Australia, the 2011 XXIII ICL in MalmÃ¶, Sweden, the 2012 Executive Committee Meetings (9),and [F] from discussions at the 2013 XXIV ICL in Rome, Italy, and the 2015 XXV ICL in San Francisco, USA, as well as multiple written comments and feedback from Executive Committee and other ISL members during the 2016 drafting. The document attempts to amalgamate the broad spectrum of protocols and practices advocated worldwide for the diagnosis and treatment of peripheral lymphedema into a coordinated proclamation representing a â€œConsensusâ€• of the international community based on various levels of evidence. The document is not meant to override individual clinical considerations for complex patients nor to stifle progress. It is also not meant to be a legal formulation from which variations define medical malpractice. The Society understands that in some clinics the method of treatment derives from national standards while in others access to medical equipment and supplies is limited; therefore the suggested treatments might be impractical. Adaptability and inclusiveness does come at the price that members can rightly be critical of what they see as vagueness or imprecision in definitions, qualifiers in the choice of words (e.g., the use of â€œmay... perhaps... unclearâ€•, etc.) and mentions (albeit without endorsement) of treatment options supported by limited hard data. Most members are frustrated by the reality that NO treatment method has really undergone a satisfactory meta-analysis (let alone rigorous, randomized, stratified, long-term, controlled study). With this understanding, the absence of definitive answers and optimally conducted clinical trials, and with emerging technologies and new approaches and discoveries on the horizon, some degree of uncertainty, ambiguity, and flexibility along with dissatisfaction with current lymphedema evaluation and management is appropriate and to be expected. We continue to struggle to keep the document concise while balancing the need for depth and details. With these considerations in mind, we believe that this 2016 version presents a Consensus that embraces the entire ISL membership, rises above national standards, identifies and stimulates promising areas for future research, and represents the best judgment of the ISL membership on how to approach patients with peripheral lymphedema in the light of currently available evidence. Therefore, the document has been, and should continue to be, challenged and debated in the pages of Lymphology (e.g., as Letters to the Editor) and ideally will remain a continued focal point for robust discussion at local, national and international conferences in lymphology and related disciplines. We further anticipate as experience evolves and new ideas and technologies emerge that this â€œliving documentâ€• will undergo further periodic revision and refinement as the practice and conceptual foundations of medicine and specifically lymphology change and advance. Anti-Bacterial Agents;Antiparasitic Agents;Diuretics Aftercare;Anti-Bacterial Agents;Antiparasitic Agents;Compression Bandages;Consensus;Cytoreduction Surgical Procedures;Diuretics;Elephantiasis,

Filarial;Hot Temperature;Humans;Immunotherapy;Lipectomy;Low-Level Light Therapy;Lymph Nodes;Lymphedema;Manual Lymphatic Drainage;Mesotherapy;Microsurgery;Molecular Targeted Therapy;Physical Therapy Modalities;Severity of Illness Index;Societies, Medical;Surgical Procedures, Operative

Comparative Study of the Physiotherapeutic and Drug Protocol and Low-Level Laser Irradiation in the Treatment of Pain Associated with Temporomandibular Dysfunction. BACKGROUND: The temporomandibular joint (TMJ) is a structure of the craniofacial complex affected by neurological diseases. Orthopedic and musculoskeletal changes can also cause temporomandibular disorders (TMD) and pain. Low-level laser (LLL) therapy has been studied in the treatment of temporomandibular jaw (TMJ) dysfunction, and controversial results were obtained. OBJECTIVE: The objective of this work was comparing the physiotherapeutic and drug protocol (PDP) to LLL therapy in the treatment of pain associated with TMD. METHODS: A sample of 60 female patients, 20-50 years of age, TMD triggering agents (stress, parafunctional habits) controlled, was randomly divided into three groups, group 1 (G1)-LLL (780â€‰nm laser, dose of 35.0â€‰J/cm(2), for 20â€‰sec, thrice a week, for 4 weeks); group 2 (G2)-PDP (hot packs thrice a day, morning, afternoon, and evening, for 15â€‰min, exercise of opening and closing the mouth, twice a day, myorelaxing and anti-inflammatory drug administration); and group 3 (G3)-Placebo (450â€‰nm halogen lamp, Max LD Gnatus, light curing unit). RESULTS: Patients were evaluated every return appointment for the presence (P) or absence (A) of pain for 4 weeks and results were statistically analyzed. First week: 60% of G1, 100% G2, and 70% of G3-related pain. Second week: 55% of G1, 15% of G2, and 100% of G3-related pain. Third week: 10% of G1, 15% of G2, and 85% of G3-related pain. Last week: 0% of G1, 0% of G2, and 100% of G3-related pain. CONCLUSIONS: Based on obtained data, we concluded that, compared to PDP, LLL treatment is effective to control pain associated with TMD. Adult;Female;Humans;Low-Level Light Therapy;Middle Aged;Pain Management;Temporomandibular Joint Disorders

Low-level laser therapy as an adjunct to conventional therapy in the treatment of diabetic foot ulcers. Foot ulcers are serious complications of diabetes mellitus (DM) and are known to be resistant to conventional treatment. This study was conducted to evaluate the efficacy of low-level laser therapy (LLLT) for the treatment of diabetic foot ulcers in a tertiary care centre (Department of Surgery, Mahatma Gandhi Memorial Medical College and Maharaja Yashwantrao Hospital, A.B. Road, Indore). A total of 30 patients with type 2 DM having Meggitt-Wagner grade I foot ulcers of more than 6Â weeks duration with negative culture were studied. Patients were randomized into two groups of 15 each. Patients in study group received LLLT (660â€‰Â±â€‰20Â nm, 3Â J/cm(2)) along with conventional therapy and those in control group were treated with conventional therapy alone. The primary outcome measure was the absolute and relative wound size reduction at 2Â weeks compared to the baseline parameter. Percentage ulcer area reduction was 37â€‰Â±â€‰9% in the LLLT group and 15â€‰Â±â€‰5.4% in the control group (pâ€‰<â€‰0.001). For âˆ¼75% of wounds of the treatment group, wound area reduction of 30-50% was observed. In contrast, for the control group, âˆ¼80% of wounds showed a wound area reduction of <20% on day 15. Further, the wounds with initial wound area 1000-2000Â mm(2) seems to have better final outcome than the groups with larger areas. The treated groups showed higher amount of granulation than the control group. The results suggest that LLLT is beneficial as an adjunct to conventional therapy in the treatment of diabetic foot ulcers. Blood Glucose Adult;Aged;Blood Glucose;Case-Control Studies;Demography;Diabetes Mellitus, Type 2;Diabetic Foot;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Wound Healing

Effects of low-level laser therapy on burning mouth syndrome. To investigate low-level laser therapy (LLLT) applied to treat burning mouth syndrome (BMS). This prospective, comparative,

partially blinded, single-centre, clinical trial of GaAlAs Laser, with 815 nm wavelength, included 44 BMS patients divided randomly into three groups: Group I (n = 16): GaAlAs laser 815 nm wavelength, 1 W output power, continuous emissions, 4 s, 4 J and fluence rate 133Â·3 J cm(-2) ; Group II (n = 16): GaAlAs infrared laser, 815 nm wavelength, 1 W output power, continuous emissions, 6 s, 6 J and fluence rate 200 J cm(-2) ; Group III (n = 12) placebo group, sham laser. All groups received a weekly dose for 4 weeks. Pain intensity was recorded using a 10-cm visual analogue scale; patients responded to the oral health impact profile (OHIP-14), xerostomia severity test and the hospital anxiety-depression scale (HAD). These assessments were performed at baseline, 2 and 4 weeks. LLLT decreased pain intensity and improved OHIP-14 scores significantly from baseline to 2 weeks in groups I and II compared with the placebo group. No statistically significant differences were found from 2 to 4 weeks. Overall improvements in visual analogue scale (VAS) scores from baseline to the end of treatment were as follows: Group I 15Â·7%; Group II 15Â·6%; Group III placebo 7Â·3%. LLLT application reduces symptoms slightly in BMS patients. Adult;Aged;Aged, 80 and over;Burning Mouth Syndrome;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Radiation Dosage;Spain;Treatment Outcome;Visual Analog Scale;Xerostomia

The effect of photobiomodulation on chemotherapy-induced peripheral neuropathy: A randomized, sham-controlled clinical trial. BACKGROUND: Chemotherapy-induced peripheral neuropathy (CIPN) is a common side effect of cancer therapy with few efficacious treatments. METHODS: We enrolled 70 patients with CIPN in a randomized, double-blinded, sham-controlled, cross-over trial to determine if photobiomodulation (PBM)Â±physiotherapy reduced the symptoms of neuropathy compared to sham treatment. At the conclusion of follow-up, sham-arm patients could cross-over into a third arm combining PBM and physiotherapy to determine if multimodal treatment had additive effects. Treatment included 30minute sessions 3-times weekly for 6weeks using either PBM or sham therapy. Neuropathy was assessed using the modified total neuropathy score (mTNS) at initiation and 4, 8, and 16weeks after initiating treatment. RESULTS: Sham-treated patients experienced no significant change in mTNS scores at any point during the primary analysis. PBM patients experienced significant reduction in mTNS scores at all time points. Mean changes in mTNS score (and corresponding percent drop from baseline) for sham and PBM-group patients respectively were -0.1 (-0.7%) and -4.2 (-32.4%) at 4weeks ($p<0.001$), 0.2 (0.0%) and -6.8 (-52.6%) at 8weeks ($p<0.001$), and 0.0 (0.1%) and -5.0 (-38.8%) at 16weeks ($p<0.001$). Patients who crossed over into the PBM/PT-group experienced similar results to those treated primarily; changes in mTNS score from baseline were -5.5 (-40.6%) 4weeks ($p<0.001$), -6.9 (-50.9%) at 8weeks ($p<0.001$), and -4.9 (-35.9%) at 16weeks ($p<0.001$). The addition of physiotherapy did not improve outcomes over PBM alone. CONCLUSION AND RELEVANCE: Among patients with CIPN, PBM produced significant reduction in neuropathy symptoms. Antineoplastic Agents Aged;Aged, 80 and over;Antineoplastic Agents;Cross-Over Studies;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Middle Aged;Neoplasms;Peripheral Nervous System Diseases;Physical Therapy Modalities;Prospective Studies;Severity of Illness Index;Treatment Outcome

Photobiomodulation in human muscle tissue: an advantage in sports performance? Photobiomodulation (PBM) describes the use of red or near-infrared (NIR) light to stimulate, heal, and regenerate damaged tissue. Both preconditioning (light delivered to muscles before exercise) and PBM applied after exercise can increase sports performance in athletes. This review covers the effects of PBM on human muscle tissue in clinical trials in volunteers related to sports performance and in athletes. The parameters used were categorized into those with positive effects or no effects on muscle performance and recovery. Randomized controlled trials and case-control studies in both healthy trained and untrained participants, and elite athletes were retrieved from MEDLINE up to

2016. Performance metrics included fatigue, number of repetitions, torque, hypertrophy; measures of muscle damage and recovery such as creatine kinase and delayed onset muscle soreness. Searches retrieved 533 studies, of which 46 were included in the review (n = 1045 participants). Studies used single laser probes, cluster of laser diodes, LED clusters, mixed clusters (lasers and LEDs), and flexible LED arrays. Both red, NIR, and red/NIR mixtures were used. PBM can increase muscle mass gained after training, and decrease inflammation and oxidative stress in muscle biopsies. We raise the question of whether PBM should be permitted in athletic competition by international regulatory authorities. Athletes;Athletic Performance;Double-Blind Method;Humans;Inflammation;Low-Level Light Therapy;Muscle Fatigue;Muscle, Skeletal;Oxidative Stress;Randomized Controlled Trials as Topic

Effects of light-emitting diode irradiation on the osteogenesis of human umbilical cord mesenchymal stem cells in vitro. The aim of this study was to examine the effects of light-emitting diode (LED) photobiomodulation therapy on the proliferation and differentiation of human umbilical cord mesenchymal stem cells (hUMSCs) cultured in osteogenic differentiation medium. HUMSCs were irradiated with an LED light at 620â€‰nm and 2â€‰J/cm(2) and monitored for cell proliferation and osteogenic differentiation activity. The experiment involved four groups of cells: the control group; the osteogenic group (osteo group); the LED group; the osteogenicâ€‰+â€‰LED group (LEDâ€‰+â€‰osteo group). HUMSC proliferation was detected by performing a3-(4,5-dimethylthiazol-2yl)-2,5 diphenyltetrazolium bromide(MTT) assay. Osteogenic activity was evaluated by performing alkaline phosphatase (ALP) and Von Kossa staining, and osteopontin (OPN) gene mRNA expression was evaluated byreverse transcription polymerase chain reaction (RT-PCR). The hUMSCs in the LEDâ€‰+â€‰osteo group exhibited a significantly higher proliferation rate than the other subgroups. Additionally, there were greater numbers of ALP-positive cells and Von Kossa nodules in the LEDâ€‰+â€‰osteo group. OPN mRNA expression in the LEDâ€‰+â€‰osteo group was higher than other subgroups. In conclusion, low levels of LED light at a wavelength of 620â€‰nm enhance the proliferation and osteogenic differentiation of hUMSCs during a long culture period. Osteopontin;Alkaline Phosphatase Alkaline Phosphatase;Cell Differentiation;Cell Proliferation;Gene Expression;Humans;Lasers, Semiconductor;Light;Mesenchymal Stem Cells;Osteogenesis;Osteopontin;Umbilical Cord

The behavioural and neuroprotective outcomes when 670nm and 810nm near infrared light are applied together in MPTP-treated mice. We have shown previously that when applied separately, 670nm and 810nm near infrared light (NIr) reduces behavioural deficits and offers neuroprotection in a MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) mouse model of Parkinson's disease. Here, we explored the beneficial outcomes when these NIr wavelengths were applied both together, either concurrently (at the same time) or sequentially (one after the other). Mice received MPTP injections (total of 50mg/kg) and had extracranial application of 670nm and/or 810nm NIr. Behavioural activity was tested with an open-field test and brains were processed for tyrosine hydroxylase immunohistochemistry and stereology. Our results showed that when 670nm and 810nm NIr were applied both together and sequentially, there was a greater overall beneficial outcome - increased locomotor activity and number of tyrosine hydroxylase immunoreactive cells in the substantia nigra pars compacta - than when they were applied either separately, or in particular, both together and concurrently. In summary, our findings have important implications for future use of NIr therapy in humans, that there are some combinations of wavelengths that provide more beneficial outcome than others. Neuroprotective Agents;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Tyrosine 3-Monooxygenase 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Animals;Disease Models, Animal;Dopaminergic Neurons;Light;Low-Level Light

Therapy;Mice, Inbred BALB C;Neuroprotective Agents;Parkinsonian Disorders;Substantia Nigra;Tyrosine 3-Monooxygenase

Low-level laser therapy effectiveness in accelerating orthodontic tooth movement: A randomized controlled clinical trial. OBJECTIVE: To evaluate the effectiveness of low-level laser therapy (LLLT) in accelerating orthodontic tooth movement of crowded maxillary incisors. MATERIALS AND METHODS: This two-arm, parallel-group, randomized controlled trial involved 26 patients with severe to extreme maxillary incisors irregularity according to Little's irregularity index, indicating two first premolars extraction. Patients were randomly assigned to either the laser group or the control group (13 each). Following premolars extraction, orthodontic treatment with fixed appliances was initiated for both groups. Immediately after insertion of the first archwire, patients in the laser group received a LLL dose from an 830-nm wavelength Ga-Al-As semiconductor laser device with energy of 2 J/point. The laser was applied to each maxillary incisor's root at four points (two buccal, two palatal). Application was repeated on days 3, 7, 14, and then every 15 days starting from the second month until the end of the leveling and alignment stage. Alignment progress was evaluated on the study casts taken before inserting the first archwire (T0), after 1 month of treatment commencement (T1), after 2 months (T2), and at the end of the leveling and alignment stage (T3). The outcome measures were the overall time needed for leveling and alignment and the leveling and alignment improvement percentage. RESULTS: A statistically significant difference was found between the two groups in the overall treatment time ($P < .001$) and the leveling and alignment improvement percentage at T1 ($P = .004$) and T2; ($P = .001$). CONCLUSION: LLLT is an effective method for accelerating orthodontic tooth movement. Adolescent;Humans;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Malocclusion;Time Factors;Tooth Movement Techniques;Tooth Root;Young Adult

Low-level Laser Therapy: A Review of Its Applications in the Management of Oral Mucosal Disorders. Due to its analgesic, anti-inflammatory, and biostimulating effects, low-level laser therapy (LLLT) has been widely used for oral disorders, such as oral lichen planus (OLP), xerostomia, recurrent aphthous stomatitis (RAS), herpes labialis, burning mouth syndrome (BMS), and oral mucositis (OM). The research team for the present study has reviewed the literature on the subject, with an emphasis on the applicability of LLLT in general and of its various clinical protocols for the management of those oral disorders. In lesions such as the ones occurring in OM, RAS, herpes labialis, and OLP, the course of wound healing and the pain have been shown to decrease, with a few, or most often, no adverse side effects. The literature shows that LLLT can also be effective in reducing symptoms in patients with BMS. For the treatment of hyposalivation and xerostomia, the use of LLLT has been described in the literature, but no consensus has resulted. Very few controlled clinical studies with well-established therapeutic protocols have occurred, except for OM, for which LLLT has been widely researched. Although information on the use of the laser for some lesions has already been consolidated, further research is needed, especially randomized, controlled clinical trials with long-term follow-up. Those studies will allow the safe use of LLLT, permitting the creation of care protocols for the management of oral disorders. Burning Mouth Syndrome;Herpes Labialis;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Mouth Diseases;Randomized Controlled Trials as Topic;Stomatitis;Stomatitis, Herpetic;Treatment Outcome;Xerostomia

Low-level laser irradiation modulates brain-derived neurotrophic factor mRNA transcription through calcium-dependent activation of the ERK/CREB pathway. Low-level laser (LLL) irradiation has been reported to promote neuronal differentiation, but the mechanism remains unclear. Brain-derived neurotrophic factor (BDNF) has been confirmed to be one of the most important neurotrophic factors because it is critical for the differentiation and survival of neurons during development. Thus, this study aimed to investigate the effects of LLL irradiation on Bdnf messenger RNA (mRNA) transcription and the molecular pathway involved in LLL-induced Bdnf mRNA

transcription in cultured dorsal root ganglion neurons (DRGNs) using Ca(2+) imaging, pharmacological detections, RNA interference, immunocytochemistry assay, Western blot, and qPCR analysis. We show here that LLL induced increases in the [Ca(2+)] (i) level, Bdnf mRNA transcription, cAMP-response element-binding protein (CREB) phosphorylation, and extracellular signal-regulated kinase (ERK) phosphorylation, mediated by Ca(2+) release via inositol triphosphate receptor (IP3R)-sensitive calcium (Ca(2+)) stores. Blockade of Ca(2+) increase suppressed Bdnf mRNA transcription, CREB phosphorylation, and ERK phosphorylation. Downregulation of phosphorylated (p)-CREB reduced Bdnf mRNA transcription triggered by LLL. Furthermore, blockade of ERK using PD98059 inhibitor reduced p-CREB and Bdnf mRNA transcription induced by LLL. Taken together, these findings establish the Ca(2+)-ERK-CREB cascade as a potential signaling pathway involved in LLL-induced Bdnf mRNA transcription. To our knowledge, this is the first report of the mechanisms of Ca(2+)-dependent Bdnf mRNA transcription triggered by LLL. These findings may help further explore the complex molecular signaling networks in LLL-triggered nerve regeneration in vivo and may also provide experimental evidence for the development of LLL for clinical applications. Brain-Derived Neurotrophic Factor;Cyclic AMP Response Element-Binding Protein;RNA, Messenger;Inositol 1,4,5-Trisphosphate;Extracellular Signal-Regulated MAP Kinases;Calcium Animals;Brain-Derived Neurotrophic Factor;Calcium;Cell Survival;Cells, Cultured;Cyclic AMP Response Element-Binding Protein;Enzyme Activation;Extracellular Signal-Regulated MAP Kinases;Inositol 1,4,5-Trisphosphate;Low-Level Light Therapy;Models, Biological;Neurogenesis;Neurons;RNA, Messenger;Rats, Sprague-Dawley;Signal Transduction;Transcription, Genetic

Photobiomodulation with Pulsed and Continuous Wave Near-Infrared Laser (810 nm, Al-Ga-As) Augments Dermal Wound Healing in Immunosuppressed Rats. Chronic non-healing cutaneous wounds are often vulnerable in one or more repair phases that prevent normal healing and pose challenges to the use of conventional wound care modalities. In immunosuppressed subject, the sequential stages of healing get hampered, which may be the consequences of dysregulated or stagnant wound inflammation. Photobiomodulation (PBM) or low-level laser (light) therapy (LLLT) emerges as a promising drug-free, non-invasive biophysical approach for promoting wound healing, reduction of inflammation, pain and restoration of functions. The present study was therefore undertaken to evaluate the photobiomodulatory effects of 810 nm diode laser (40 mW/cm2; 22.6 J/cm2) with pulsed (10 and 100 Hz, 50% duty cycle) and continuous wave on full-thickness excision-type dermal wound healing in hydrocortisone-induced immunosuppressed rats. Results clearly delineated that 810 nm PBM at 10 Hz was more effective over continuous and 100 Hz frequency in accelerating wound healing by attenuating the pro-inflammatory markers (NF-kB, TNF-Î±), augmenting wound contraction (Î±-SM actin), enhancing cellular proliferation, ECM deposition, neovascularization (HIF-1Î±, VEGF), re-epithelialization along with up-regulated protein expression of FGFR-1, Fibronectin, HSP-90 and TGF-Î²2 as compared to the non-irradiated controls. Additionally, 810 nm laser irradiation significantly increased CCO activity and cellular ATP contents. Overall, the findings from this study might broaden the current biological mechanism that could be responsible for photobiomodulatory effect mediated through pulsed NIR 810 nm laser (10 Hz) for promoting dermal wound healing in immunosuppressed subjects. Biomarkers;Tumor Necrosis Factor-alpha;Adenosine Triphosphate;Matrix Metalloproteinases Adenosine Triphosphate;Animals;Biomarkers;Biopsy;Immunocompromised Host;Laser Therapy;Lasers;Matrix Metalloproteinases;Rats;Skin;Tumor Necrosis Factor-alpha;Wound Healing

Influence of gold nanoparticles on wound healing treatment in rat model: Photobiomodulation therapy. BACKGROUND AND OBJECTIVE: The aim of this study is to investigate the effect of gold nanoparticles (AuNPs) in photobiomodulation therapy (PBMT) on wound healing process. MATERIALS AND METHODS: AuNPs are synthesized by Q-switched Nd:YAG laser ablation technique. Cutaneous

wound are induced on 45 Sprague Dawley rats on its dorsal part and then randomly divided into three groups. One group serves as non-treatment group (GC) and another two groups are subjected to AuNPs with and without PBMT. About 808â€‰nm diode laser with output power of 100â€‰mW is used as a light source for PBMT. The treatment was carried out daily with exposure duration of 50â€‰seconds and total fluence of 5â€‰J/cm(2) . Wound area is monitored for 9 consecutive days using a digital camera, and histological examination is performed at 3rd, 6th, and 9th day through hematoxylin and eosin stain as well as Masson's trichrome stain. RESULTS: The group of rats subjected to AuNPs with PBMT shows significantly accelerated wound closure compared to other groups. Histological results indicate that AuNPs and PBMT group is more effective in stimulating angiogenesis and triggers inflammatory response at early stage. CONCLUSION: The application of AuNPs in PBMT has potential to accelerate wound healing due to enhanced epithelialization, collagen deposition and fast vascularization. Lasers Surg. Med. 49:380-386, 2017. Â© 2016 Wiley Periodicals, Inc. Gold Animals;Disease Models, Animal;Gold;Lasers, Solid-State;Low-Level Light Therapy;Nanoparticles;Rats;Rats, Sprague-Dawley;Wound Healing;Wounds, Penetrating

Maximal oxygen uptake and exercise tolerance are improved in rats with heart failure subjected to low-level laser therapy associated with resistance training. Exercise tolerance and maximal oxygen uptake (VO(2max)) are reduced in heart failure (HF). The influence of combined resistance training (RT) and low-level laser therapy (LLLT) on exercise tolerance and VO(2max) in HF has not yet been explored. The aim of this study was to evaluate the influence of combined RT and LLLT on VO(2max) and exercise tolerance in rats with HF induced by myocardial infarction (MI). Rats were allocated to sedentary sham (Sed-Sham, nâ€‰=â€‰12), sedentary heart failure (Sed-HF, nâ€‰=â€‰9), RT heart failure (RT-HF, nâ€‰=â€‰7) and RT associated with LLLT heart failure (RTâ€‰+â€‰LLLT-HF, nâ€‰=â€‰7) groups. After MI or sham surgery, rats underwent a RT and LLLT protocol (applied immediately after RT) for 8Â weeks. VO(2max) and exercise tolerance were evaluated at the end of protocol. HF rats subjected to LLLT combined with RT showed higher VO(2basal) (41Â %), VO(2max) (40Â %), VO(2reserve) (39Â %), run distance (46Â %), time to exhaustion (30Â %) and maximal velocity (22Â %) compared with HF rats that underwent RT alone. LLLT associated with RT improved oxygen uptake and exercise tolerance compared with RT alone in HF rats. Oxygen Animals;Body Weight;Cardiomegaly;Exercise Tolerance;Heart Failure;Hemodynamics;Humans;Liver;Low-Level Light Therapy;Lung;Male;Myocardial Infarction;Oxygen;Physical Conditioning, Animal;Rats, Wistar;Resistance Training

Role of Low-Level Laser Therapy as an Adjunct to Initial Periodontal Treatment in Type 2 Diabetic Patients: A Split-Mouth, Randomized, Controlled Clinical Trial. OBJECTIVE: In this split-mouth clinical trial, we evaluated the clinical benefits of low-level laser therapy (LLLT) as an adjunct to nonsurgical periodontal treatment in patients with type 2 diabetes mellitus (DM). BACKGROUND DATA: The impaired wound healing seen in diabetic patients may affect the results of periodontal treatment and may require an additional approach. MATERIALS AND METHODS: In total, 22 chronic periodontitis patients with type 2 DM were included. Applying a split-mouth design, two quadrants were treated with only scaling and root planing (SRP) as the control and those in the other two were treated with SRP + LLLT as the test sites in each patient. An 808â€‰nm GaAlAs diode laser was performed in the test sites at the energy density of 4.46â€‰J/cm(2) on days 1, 2, and 7 after SRP. Plaque index (PI), probing depth (PD), bleeding on probing (BOP), and clinical attachment level were measured at baseline and again at 1 and 3 months after treatment. Deep periodontal pockets (PD â‰¥4â€‰mm) were evaluated separately. RESULTS: Test sites showed significant improvement in PI and BOP in deep pockets at the 1-month follow-up period (pâ€‰<â€‰0.001 and <0.001, respectively), whereas no difference was found between the control and the test sites in other periodontal parameters. CONCLUSIONS: LLLT during periodontal treatment offered minimal short-

term additional benefit in deep pocket healing in patients with type 2 DM. Adult;Chronic Periodontitis;Combined Modality Therapy;Debridement;Dental Plaque Index;Dental Scaling;Diabetes Mellitus, Type 2;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Safety;Prospective Studies;Reference Values;Risk Assessment;Statistics, Nonparametric;Treatment Outcome

Cellular and biomolecular comparison of a novel, dual-pulsed Q-switched 1064 nm Nd:YAG laser with conventional Q-switched 1064 nm Nd:YAG laser. Collagen Type III;Inflammation Mediators Animals;Collagen Type III;Guinea Pigs;Humans;Inflammation Mediators;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin

Combined therapy using low level laser and chitosan-policaju hydrogel for wound healing. We have evaluated the effect of POLI-CHI hydrogel based on policaju (POLI) from cashew tree (Anacardium occidentale L.) gum and chitosan (CHI), associated or not with Low level laser therapy (LLLT), in wound healing. Sixty male Wistar rats were assigned into four groups: POLI-CHI hydrogel (H); LLLT (L); POLI-CHI with LLLT (HL) and saline control (C). Macroscopic evaluations were carried out using clinical observations and area measurements, as well as microscopic analysis by histological criteria. H and HL presented more esthetical scar tissue and larger wound contraction compared to C. Histopathological analyzes showed: stronger presence of fibrin-leukocyte crust in L and HL at day 3; stronger collagen presence in H, L and HL; weak presence of focal necrosis at 7 and 14days in H; weak neutrophilic exudate in H, L and HL; regression of the vascular neoformation at 7days in H, and modulation of the same in L and HL. These results demonstrated that POLI-CHI contributed to more efficient healing process and modulation of the inflammation; furthermore, the combined use with LLLT subtle potentiated this process. Hydrogel, Polyethylene Glycol Dimethacrylate;Chitosan Anacardium;Animals;Chitosan;Combined Modality Therapy;Hydrogel, Polyethylene Glycol Dimethacrylate;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Mechanistic Insights into Pathological Changes in the Diabetic Retina: Implications for Targeting Diabetic Retinopathy. Increasing evidence points to inflammation as one of the key players in diabetes-mediating adverse effects to the neuronal and vascular components of the retina. Sustained inflammation induces biochemical and molecular changes, ultimately contributing to retinal complications and vision loss in diabetic retinopathy. In this review, we describe changes involving metabolic abnormalities secondary to hyperglycemia, oxidative stress, and activation of transcription factors, together with neuroglial alterations in the diabetic retina. Changes in biochemical pathways and how they promote pathophysiologic developments involving proinflammatory cytokines, chemokines, and adhesion molecules are discussed. Inflammation-mediated leukostasis, retinal ischemia, and neovascularization and their contribution to pathological and clinical stages leading to vision loss in diabetic retinopathy (DR) are highlighted. In addition, potential treatment strategies involving fibrates, connexins, neuroprotectants, photobiomodulation, and anti-inflammatory agents against the development and progression of DR lesions are reviewed. The importance of appropriate animal models for testing novel strategies against DR lesions is discussed; in particular, a novel nonhuman primate model of DR and the suitability of rodent models are weighed. The purpose of this review is to highlight our current understanding of the pathogenesis of DR and to summarize recent advances using novel approaches or targets to investigate and inhibit the retinopathy. Animals;Diabetic Retinopathy;Humans;Low-Level Light Therapy;Mitochondria;Molecular Targeted Therapy;Oxidative Stress;Retina

IMPACT OF LASER THERAPY ON THE PROLIFERATION OF VARIOUS CULTURED CELLS. The purpose of our study was to establish the laser effects on the epithelial tissue and immune metabolism. The research was conducted on human leukemic mature T cells (Jurkat cells) (DSMZ-Deutshe Sammulung von Mikroorganismen und Zellkulturen (Germany)) and MDCK cell line (Lugar Laboratory, Tbilisi,

Georgia). Cells were radiated by Laser device "ĐžĐŸĐ¢ĐžĐ”Đ•Đ•"- Đ•Đ›Đ¡Đ¢-01 (power 5 W) 3 -7 days (4 minutes per day). With the aim to model oxidative stress-induced apoptosis, 30% hydrogen peroxide (H2O2) (Sigma) is added to Jurkat cells, in doses 25 and 50Î¼M [4, 5]; and MDCK cells, in doses 400 and 800 Î¼M [19] added to incubation suspension with subsequent incubation for 24, 48 and 72 hrs. Control group is represented by intact Jurkat and MDCK cells. MTT test was used to assess the cells' proliferation activity (viability). Statistical analyses of the obtained results were performed by SPSS (version 10.0) program package. Our research results show that effects of laser therapy on proliferation of cell cultures depend on the type of cells and incubation conditions. Laser irradiation revealed equal efficacy in both types of the intact cells and increased their viability in time-dependent manner. Jurkat cells turned out to be more susceptible to oxidative stress. Laser therapy only slightly improved their viability at moderate intensity of oxidative stress and proved to be ineffective in strong oxidative stress conditions. The MDCK cells appeared to be more sustainable to oxidative stress; significant changes in these cells viability were observed only when high doses of hydrogen peroxide were added to their incubation medium. Thus, laser therapy was effective for these cells incubated in both regimens of oxidative stress. Our research results prove the efficacy of laser therapy use during periodontitis with the aim to recover epithelium in the oral cavity and to modulate immune metabolism in the patient's body. Animals;Cell Proliferation;Cell Survival;Dogs;Epithelial Cells;Humans;Jurkat Cells;Low-Level Light Therapy;Madin Darby Canine Kidney Cells;Oxidative Stress;T-Lymphocytes

Beneficial Effects of Applying Low-Level Laser Therapy to Surgical Wounds After Bariatric Surgery. BACKGROUND: Bariatric surgery is a successful method for weight loss in cases of morbid obesity; however, as an invasive procedure, surgical complications may occur. Low-level laser therapy (LLLT) has been increasingly used due to its effectiveness in controlling the inflammatory response, accelerating tissue repair, and reducing pain. The objective of this study was to investigate photobiomodulation effects after bariatric surgery and determine the laser actions during the inflammatory process, wound healing (clinical observation), and analgesia. METHODS: This study was a randomized, placebo-controlled, clinical trial in which 85 patients underwent Roux en-Y gastric bypass (RYGB) by conventional techniques (i.e., open surgery). Patients were divided into two groups and were irradiated with LLLT at 10 different points through the surgical scar in three sessions of applications: the laser group (laser-on) consisted of 43 patients who received the CW diode laser (MMOptics), while the placebo group (laser-off) consisted of 42 patients who were treated by the same protocol but with a disabled laser. Temperature was measured by a digital thermometer in both groups, and pain was evaluated using the visual analogue scale for pain. Biochemical analysis and digital images were used to document and evaluate the inflammatory response as well as tissue repair process at the surgical wound site. RESULTS: Patients in the laser group demonstrated diminished wound temperature as erythrocyte sedimentation rate (ESR) compared with the placebo group, indicating better inflammatory process control as well as improved wound healing and reduced pain. CONCLUSIONS: LLLT applied with the described protocol led to a decrease by biochemical markers and wound temperature compared with the placebo, which indicated that LLLT was able to control the inflammatory process; in addition, seroma and pain were reduced and cicatrization was improved by this preventive procedure. Adult;Body Mass Index;Cicatrix;Female;Gastric Bypass;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Obesity, Morbid;Pain, Postoperative;Postoperative Care;Reference Values;Surgical Wound;Treatment Outcome;Wound Healing

Special Issue on Stem Cells and Photobiomodulation Therapy.
Forecasting;Humans;Low-Level Light Therapy;Periodicals as Topic;Regeneration;Stem Cell Transplantation;Stem Cells

Photobiomodulation Therapy: Communicating with Stem Cells for Regeneration?
Forecasting;Humans;Low-Level Light Therapy;Regeneration;Stem Cell Transplantation;Stem Cells

Photobiomodulation Therapy Promotes Expansion of Epithelial Colony Forming Units.
OBJECTIVE: This preliminary study examines the effects of low-dose light therapy, also called Photobiomodulation (PBM) therapy, on epithelial colony forming units (eCFUs) in epithelial cells from skin and mucosa to assess their potential to contribute to tissue regeneration. Also, preliminary comparison of basic PBM parameters such as wavelengths, light sources, and dose were evaluated in promoting eCFUs. BACKGROUND DATA: Regenerative medicine is at the brink of exploiting the tremendous potential offered by advances in stem cell biology. The two distinct aspects for utilization of stem cells, either resident (endogenous) or transplanted (exogenous), rely on cells amenable to expansion and being directed toward mature, functional tissues. Despite major progress in fundamental understanding of stem cell pluripotency, there remain fundamental challenges in applying these insights into clinical practice. METHODS: PBM treatments with various devices, wavelengths, and doses were used on two epithelial cell lines and colony forming assays were performed. RESULTS: This study noted a dose-dependent effect of 810â€‰nm laser on increasing eCFUs, either in terms of size or numbers. Comparisons of different wavelengths and light sources noted better efficacy of collimated and coherent lasers compared to LEDs and broad-band light. CONCLUSIONS: PBM therapy promotes expansion of eCFUs that represent progenitors and stem cell populations capable of contributing to tissue repair and regeneration. Further exploration of the precise mechanisms would allow optimization of PBM clinical protocols to harness the regenerative potential of stem cells for wound healing and other clinical regenerative applications. Cell Proliferation;Cells, Cultured;Epithelial Cells;Humans;Low-Level Light Therapy;Regeneration;Sampling Studies;Sensitivity and Specificity;Skin;Stem Cells;Wound Healing

A Novel De novo Mutation of the SASH1 Gene in a Chinese Family with Multiple Lentigines.
SASH1 protein, human;Tumor Suppressor Proteins Adult;Asian People;DNA Mutational Analysis;Female;Genetic Predisposition to Disease;Heredity;Heterozygote;Humans;LEOPARD Syndrome;Lasers, Solid-State;Low-Level Light Therapy;Male;Mutation, Missense;Pedigree;Phenotype;Treatment Outcome;Tumor Suppressor Proteins

The Effectiveness of Low-Level Light Therapy in Attenuating Vocal Fatigue. OBJECTIVES: Low-level light therapy (LLLT) is effective in reducing inflammation, promoting wound healing, and preventing tissue damage, but has not yet been studied in the treatment of voice disorders. The objective of this study was to investigate the possible effectiveness of LLLT in attenuating symptoms of vocal fatigue created by a vocal loading task as measured by acoustic, aerodynamic, and self-reported vocal effort. METHODS: In a randomized, prospective study, 16 vocally healthy adults divided into four groups underwent a 1-hour vocal loading procedure, followed by infrared wavelength LLLT (828â€‰nm), red wavelength LLLT (628â€‰nm), heat, or no heat-light (control) treatment targeting the laryngeal region of the ventral neck surface. Phonation threshold pressure (PTP), relative fundamental frequency (RFF), and the inability to produce soft voice (IPSV) self-perceptual rating scale were recorded (1) at baseline, (2) immediately after vocal loading, (3) after treatment, and (4) 1 hour after treatment. RESULTS: Vocal loading significantly increased PTP and IPSV and decreased onset and offset RFFs, consistent with a shift toward vocal dysfunction. Red light significantly normalized the combination of PTP, IPSV, and RFF measures compared to other conditions. CONCLUSIONS: RFF is sensitive to a vocal loading task in conjunction with PTP and IPSV, and red LLLT may have a normalizing effect on objective and subjective measures of vocal fatigue. The results of this study lay the groundwork and rationale for future research to optimize LLLT wavelength combinations and overall dose.
Acoustics;Adult;Boston;Female;Humans;Larynx;Low-Level Light Therapy;Male;Prospective

Studies;Recovery of Function;Self Report;Signal Processing, Computer-Assisted;Speech Acoustics;Speech Perception;Speech Production Measurement;Time Factors;Treatment Outcome;Voice Disorders;Voice Quality;Young Adult

2-Year Assessment of Tissue Biostimulation With Low-Level Laser on the Outcomes of Connective Tissue Graft in the Treatment of Single Gingival Recession: A Randomized Clinical Trial. BACKGROUND: Periodontal wound healing has been accelerated by different low-level laser therapy (LLLT) protocols. However, just a few studies have evaluated use of this therapy adjunctive to periodontal plastic surgery procedures. The present study shows 2-year results of a connective tissue graft (CTG) associated with LLLT in the treatment of gingival recession (GR) defects. METHODS: Forty patients presenting Miller Class I and II GRs were previously treated by CTG (control group; n = 20) or CTG + LLLT (test group; n = 20). A diode laser (aluminum-gallium-arsenide, 660 nm) was applied to test sites immediately after surgery and every other day for 14 days (total of eight applications). After a follow-up of 2 years, clinical and esthetic evaluations were performed in 36 patients. RESULTS: Mean percentage of root coverage was 93.43% for the test group and 92.32% for the control group (P = 0.55). Complete root coverage was 79% (n = 15) for the test group and 76% (n = 13) for the control group (n = 13) (P = 0.80). Both groups showed esthetics maintenance after 2 years. CONCLUSION: Within the limitations of this study, results indicate that LLLT showed no additional benefit in the long term when associated with a CTG in the treatment of Miller Class I and II GRs.
Adult;Combined Modality Therapy;Connective Tissue;Double-Blind Method;Female;Gingival Recession;Gingivoplasty;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Wound Healing

In Vitro Photodynamic Effect of Phycocyanin against Breast Cancer Cells. C-phycocyanin, a natural blue-colored pigment-protein complex was explored as a novel photosensitizer for use in low-level laser therapy under 625-nm laser illumination. C-phycocyanin produced singlet oxygen radicals and the level of reactive oxygen species (ROS) were raised in extended time of treatment. It did not exhibit any visible toxic effect in the absence of light. Under 625-nm laser irradiation, c-phycocyanin generated cytotoxic stress through ROS induction, which killed MDA-MB-231 breast cancer cells depending on concentrations. Different fluorescent staining of laser-treated cells explored apoptotic cell death characteristics like the shrinking of cells, cytoplasmic condensation, nuclei cleavage, and the formation of apoptotic bodies. In conclusion, phycocyanin is a non-toxic fluorescent pigment that can be used in low-level light therapy. Photosensitizing Agents;Reactive Oxygen Species;Phycocyanin Apoptosis;Breast Neoplasms;Cell Line, Tumor;Cell Shape;Cell Survival;Dose-Response Relationship, Drug;Female;Humans;Low-Level Light Therapy;Photosensitizing Agents;Phycocyanin;Reactive Oxygen Species

Laser Acupuncture Treatment Improves Pain and Functional Status in Patients with Subacromial Impingement Syndrome: A Randomized, Double-Blind, Sham-Controlled Study. OBJECTIVE: The present study aims to determine the effect of laser acupuncture in patients with subacromial impingement syndrome (SAIS). DESIGN: Randomized, double-blind, sham-controlled study. SETTING: Physical medicine and rehabilitation outpatient clinic. SUBJECTS: A total 73 patients with SAIS were randomly assigned into a treatment group (nâ€‰=â€‰36) and a control group (nâ€‰=â€‰37). METHODS: The treatment group received laser acupuncture, and the control group received sham laser acupuncture. Eleven acupuncture points (GB 21, LI 4, LI 11, LI 14, LI 15, LI 16, SI 9, SI 10, SI 11, TE 14, and TE 15) were irradiated using a gallium-aluminium-arsenide continuous wave diode-laser, with a wavelength of 850â€‰nm and a power output of 100â€‰mV. The laser acupuncture treatment at each acupuncture point was administered at 4 joules/cm 2 (total dose = 40 joules). All patients were also treated with a hot pack. The patients were assessed at baseline and after 15 sessions of laser treatment. Pain severity and doctor's and patient's global assessments were measured via visual

analog scale (VAS). Range of motion (ROM) and functional status were measured using a digital inclinometer and the Shoulder Pain Disability Index, respectively. RESULTS: Statistically significant improvements were observed in all parameters in the treatment group. All parameters of pain and functional status in the treatment group were significantly better than those in the control group at week 3. CONCLUSIONS: To the best of our knowledge, this is the first study that investigates the effect of laser acupuncture in SAIS. The positive results of the present study should lead to further laser acupuncture studies with combinations of different acupuncture points, at different wavelengths, and with long-term follow-up periods. Acupuncture Analgesia;Adolescent;Adult;Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Placebo Effect;Recovery of Function;Shoulder Impingement Syndrome;Shoulder Pain;Treatment Outcome;Young Adult

Reply to Stausholm etÂ al.'s letter to the editor regarding our published study entitled, "Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis". Humans;Low-Level Light Therapy;Osteoarthritis, Knee

Methodological flaws in meta-analysis of low-level laser therapy in knee osteoarthritis: A letter to the editor. Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Pain Measurement

Low-level laser therapy for beta amyloid toxicity in rat hippocampus. Beta amyloid (AÎ²) is well accepted to play a central role in the pathogenesis of Alzheimer's disease (AD). The present work evaluated the therapeutic effects of low-level laser irradiation (LLI) on AÎ²-induced neurotoxicity in rat hippocampus. AÎ² 1-42 was injected bilaterally to the hippocampus CA1 region of adult male rats, and 2-minute daily LLI treatment was applied transcranially after AÎ² injection for 5 consecutive days. LLI treatment suppressed AÎ²-induced hippocampal neurodegeneration and long-term spatial and recognition memory impairments. Molecular studies revealed that LLI treatment: (1) restored mitochondrial dynamics, by altering fission and fusion protein levels thereby suppressing AÎ²-induced extensive fragmentation; (2) suppressed AÎ²-induced collapse of mitochondrial membrane potential; (3) reduced oxidized mitochondrial DNA and excessive mitophagy; (4) facilitated mitochondrial homeostasis via modulation of the Bcl-2-associated X protein/B-cell lymphoma 2 ratio and of mitochondrial antioxidant expression; (5) promoted cytochrome c oxidase activity and adenosine triphosphate synthesis; (6) suppressed AÎ²-induced glucose-6-phosphate dehydrogenase and nicotinamide adenine dinucleotide phosphate oxidase activity; (7) enhanced the total antioxidant capacity of hippocampal CA1 neurons, whereas reduced the oxidative damage; and (8) suppressed AÎ²-induced reactive gliosis, inflammation, and tau hyperphosphorylation. Although development of AD treatments has focused on reducing cerebral AÎ² levels, by the time the clinical diagnosis of AD or mild cognitive impairment is made, the brain is likely to have already been exposed to years of elevated AÎ² levels with dire consequences for multiple cellular pathways. By alleviating a broad spectrum of AÎ²-induced pathology that includes mitochondrial dysfunction, oxidative stress, neuroinflammation, neuronal apoptosis, and tau pathology, LLI could represent a new promising therapeutic strategy for AD. Amyloid beta-Peptides;Peptide Fragments Alzheimer Disease;Amyloid beta-Peptides;Animals;Apoptosis;CA1 Region, Hippocampal;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mitochondrial Dynamics;Neurons;Oxidative Stress;Peptide Fragments;Rats, Sprague-Dawley;Recognition, Psychology;Spatial Memory;Tauopathies

Low level light therapy and tattoos: A case report. BACKGROUND AND PURPOSE: Physical therapists (PTs) frequently provide neuromusculoskeletal treatment for patients who incidentally may have one or more tattoos. Low level light therapy (LLLT) is one of the modalities commonly used by physical therapists to decrease pain and facilitate healing. CASE DESCRIPTION: This case report describes a 22 year old man who was given LLLT to address his complaints of musculoskeletal pain.

OUTCOMES: Blistering of the skin was documented over the LLLT application site, a black tattoo. DISCUSSION: The blisters, which formed after the LLLT treatment were most likely caused by the inadvertent and unexpected heating of the iron oxides and/or the metal salts in the tattoo's black pigment. PTs should exercise caution when applying LLLT in the presence of dark tattoos. Blister;Humans;Low-Level Light Therapy;Male;Musculoskeletal Pain;Tattooing;Young Adult

Effects of Low-Level Laser Therapy in Orthodontic Patients on Immediate Inflammatory Response After Mini-Implants Insertion: A Preliminary Report. BACKGROUND: The primary stability of a mini-implant is crucial to treatment sequence since most orthodontic mini-implant failures occur at an early stage. Irritation or inflammation of peri-implant tissues has been related to decreasing mini-implant success. PURPOSE: This study evaluates the effect of low-level laser therapy on initial inflammation after orthodontic mini-implants installation. METHODS: Ten volunteers received two mini-implants (1.3â€‰mm diameter, 7â€‰mm length). One mini-implant was inserted on each side of the maxilla following manufacturer recommendation. On the right side, low-level laser therapy (LLLT) was applied (diode laser 660â€‰nm, 40 mW, 1â€‰min, 2.4â€‰J of total energy). Peri-implant crevicular fluid (PGF) was obtained after 24â€‰h (T1), 48â€‰h (T2), and 72â€‰h (T3) to identify levels of interleukin (IL)-6 and IL-8 around mini-implants and around upper first premolars. RESULTS: An increase in interleukin levels was observed for both groups, compared to upper first premolar. PGF around nonirradiated mini-implants showed higher levels of IL-8. Levels of IL-6 24â€‰h after mini-implant insertion were higher for laser group. CONCLUSIONS: LLLT modulates the initial inflammation after the insertion of mini-implant, possibly increasing the mini-implant success prognostic and decreasing patient discomfort. Dental Implants;Interleukin-6;Interleukin-8 Adult;Dental Implants;Female;Humans;Interleukin-6;Interleukin-8;Low-Level Light Therapy;Male

Low-level laser therapy associated to a resistance training protocol on bone tissue in diabetic rats. OBJECTIVE: The present study aimed to evaluate the in vivo response of a resistance training and low-level laser therapy (LLLT) on tibias and femurs of rats with diabetes mellitus (DM). MATERIALS AND METHODS: Forty male Wistar rats were randomly distributed into four experimental groups: control group (CG), diabetic group (DG), diabetic trained group (TG) and diabetic trained and laser irradiated group (TLG). DM was induced by streptozotocin (STZ) and after two weeks laser and resistance training started, performed for 24 sessions, during eight weeks. At the end of the experiment, animals were euthanized and tibias and femurs were removed for analysis. Histological, histomorphometrical, immunohistochemistry and mechanical analyses were performed. RESULTS: Trained groups, with or without laser irradiation, showed increased cortical area, bone density and biomechanical properties. The immunohistochemical analysis revealed that TG and TLG demonstrated an increased RUNX2 expression. RANK-L immunoexpression was similar for all experimental groups. CONCLUSION: In conclusion, it can be suggested that the resistance exercise program stimulated bone metabolism, culminating in increased cortical tibial area, bone mineral content, bone mineral density and biomechanical properties. Furthermore, the association of physical exercises and LLLT produced higher values for bone mineral content and stiffness. Consequently, these data highlight the potential of physical exercise in the management of bone loss due to DM and the possible extra osteogenic stimulus offered by lasertherapy. Further long-term studies should be carried out to provide additional information. Blood Glucose;RANK Ligand;Streptozocin Animals;Blood Glucose;Bone Density;Bone Diseases, Metabolic;Densitometry;Diabetes Mellitus;Diabetes Mellitus, Experimental;Femur;Immunohistochemistry;Low-Level Light Therapy;Male;RANK Ligand;Random Allocation;Rats, Wistar;Reference Values;Reproducibility of Results;Resistance Training;Streptozocin;Tibia;Time Factors;Treatment Outcome

Photobiomodulation by Infrared Diode Laser: Effects on Intracellular Calcium Concentration and Nitric Oxide Production of Paramecium. In Paramecium, cilia beating is correlated to intracellular

calcium concentration ([Ca(2+)]i) and nitric oxide (NO) synthesis. Recent findings affirm that photobiomodulation (PBM) can transiently increase the [Ca(2+)]i in mammalian cells. In this study, we investigated the effect of both 808 and 980 nm diode laser irradiated with flat-top hand-piece on [Ca(2+)]i and NO production of Paramecium primaurelia, to provide basic information for the development of new therapeutic approaches. In the experiments, the laser power in CW varied (0.1; 0.5; 1; and 1.5 W) to generate the following respective fluences: 6.4; 32; 64; and 96 J cm(-2) . The 6.4 J cm(-2) did not induce PBM if irradiated by both 808 and 980 nm diode laser. Conversely, the 32 J cm(-2) fluence had no effect on Paramecium cells if irradiated by the 808 nm laser, while if irradiated by the 980 nm laser induced increment in swimming speed (suggesting an effect on the [Ca(2+)]i, NO production, similar to the 64 J cm(-2) with the 808 nm wavelength). The more evident discordance occurred with the 96 J cm(-2) fluence, which had the more efficient effect on PBM among the parameters if irradiated with the 808 nm laser and killed the Paramecium cells if irradiated by the 980 nm laser. Lastly, the 980 nm and 64 or 96 J cm(-2) were the only parameters to induce a release of stored calcium. Nitric Oxide;Calcium Calcium;Infrared Rays;Intracellular Fluid;Lasers, Semiconductor;Nitric Oxide;Paramecium;Photobiology

Low-level laser therapy stimulates bone metabolism and inhibits root resorption during tooth movement in a rodent model. This study evaluated the biological effects of low-level laser therapy (LLLT) on bone remodeling, tooth displacement and root resorption, occurred during the orthodontic tooth movement. Upper first molars of a total of sixty-eight male rats were subjected to orthodontic tooth movement and euthanized on days 3, 6, 9, 14 and 21 days and divided as negative control, control and LLLT group. Tooth displacement and histomorphometric analysis were performed in all animals; scanning electron microscopy analysis was done on days 3, 6 and 9, as well as the immunohistochemistry analysis of RANKL/OPG and TRAP markers. Volumetric changes in alveolar bone were analyzed using MicroCT images on days 14 and 21. LLLT influenced bone resorption by increasing the number of TRAP-positive osteoclasts and the RANKL expression at the compression side. This resulted in less alveolar bone and hyalinization areas on days 6, 9 and 14. LLLT also induced less bone volume and density, facilitating significant acceleration of tooth movement and potential reduction in root resorption besides stimulating bone formation at the tension side by enhancing OPG expression, increasing trabecular thickness and bone volume on day 21. Taken together, our results indicate that LLLT can stimulate bone remodeling reducing root resorption in a rat model. LLLT improves tooth movement via bone formation and bone resorption in a rat model. RANK Ligand Animals;Bone Remodeling;Low-Level Light Therapy;Male;Molar;Osteoclasts;RANK Ligand;Rats;Root Resorption;Tooth Movement Techniques

Precision Nanomedicine Using Dual PET and MR Temperature Imaging-Guided Photothermal Therapy. Imaging-based techniques have enabled the direct integration of noninvasive imaging with minimally invasive interventions such as photothermal therapy (PTT) to improve the precision of treatment. METHODS: We investigated the feasibility of PTT for ovarian cancer under the guidance of PET and MR temperature imaging using copper sulfide nanoparticles (CuS NPs). The tumor distribution of the CuS NPs after systemic administration was assessed using highly sensitive, quantifiable PET imaging. Two wavelengths of near-infrared (NIR) lasers-808 and 980 nm-were tested for PTT using noninvasive MR temperature imaging real-time monitoring. RESULTS: The in vivo studies revealed that the 980-nm NIR laser had better photothermal effects than the 808-nm NIR laser. These results were in accord with the histologic findings. In vivo PTT using CuS NPs combined with 980-nm laser irradiation achieved significant tumor ablation compared with no treatment control in both subcutaneous ($P = 0.007$) and orthotopic ($P < 0.001$) models of ovarian cancer with regard to the percentage of necrotic damage. CONCLUSION: Our results indicate that real-time monitoring of the accuracy of PTT is a promising approach for future clinical translation of this emerging thermal ablation technique.

Copper Radioisotopes;Radiopharmaceuticals;Copper Animals;Cell Line, Tumor;Copper;Copper Radioisotopes;Female;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Magnetic Resonance Imaging;Metal Nanoparticles;Mice;Mice, Nude;Multimodal Imaging;Ovarian Neoplasms;Positron-Emission Tomography;Precision Medicine;Radiopharmaceuticals;Thermography

A review on laser and light-based therapies for alopecia areata. Alopecia areata is a form of non-scarring alopecia that results from a hyperactive immune response of T cells against hair follicles. Many patients with visible hair loss experience psychological and emotional distress, as a result of their cosmetic disfigurement, and frequently seek treatment. However, existing treatment methods, such as corticosteroids, topical irritants, sensitizing agents, immunosuppressants, and psoralen plus ultraviolet light A, may result in various adverse effects and often lack efficacy. Laser and light treatments offer a safe and effective alternative. This review aims to provide clinicians with a comprehensive summary of laser and light-based modalities used for the treatment of alopecia areata. Currently, the excimer laser is the most widely studied device and has shown positive results thus far. However, the development of future randomized controlled clinical trials will help determine the appropriate treatment protocols necessary, in order to achieve superior clinical outcomes. Alopecia Areata;Cosmetic Techniques;Hair Follicle;Humans;Lasers;Lasers, Excimer;Low-Level Light Therapy;Phototherapy

[The effect of continuous low-intensity laser irradiation of the red spectrum on the changes in the functional activity and speed of NADPH-oxidase response of human peripheral blood neutrophils]. Registration of the changes in the functional metabolic status of neutrophils under the influence of low-intensity laser radiation (LILR) can be useful for the choice of the exposure parameters in the studies designed to evaluate immunotropic effects. Such investigations, in their turn, are very promising in clinical terms since their results can be used to optimize the laser therapy techniques. The objective of the present study was to evaluate the degranulation potential of neutrophils and the intensity of their NADPH-oxidase reaction in response to the exposure to laser radiation as exemplified by the release of lysosomal granules in vitro. The source of radiation was the LASMIK device operated in the continuous mode at the following parameters: wavelength 635 nm, power density 0.12 mW/cm2, exposure time 10, 30, 90, 120, 150 s in the case of the automatic timer control and 100 s in the case of manual shutdown. It was shown that the maximum lysosomal activity and release of lysosomal granules took place at a 90-10 s exposure and a wavelength of 635 nm with the appearance of a plateau within 120 and 150 s after the onset of irradiation. In the case of a shorter exposure of neutrophil granulocytes to LILR (10 and 30 s) no pronounced effect was observed. It means that low-intensity laser radiation of the red spectrum with a wavelength of 635 nm is a physical stimulus reinforcing exocytosis of lysosomal granules by neutrophils in vitro. The reliable changes of NADPH-oxidase activity of neutrophil granulocytes isolated from donor peripheral blood are recorded at an optimum exposure time of 90-100 s. It is concluded that the laser therapy techniques, at least those designed to regulate neutrophils should be applied with the optimum exposure time of 90-100 s. NADPH Oxidases Cells, Cultured;Humans;Lasers;Lysosomes;NADPH Oxidases;Neutrophils;Young Adult

[The application of intravascular laser irradiation of blood for the correction of the immune disturbances in patients presenting with chronic endometritis]. The objective of the present study was to elucidate the specific features of the immune disturbances in patients presenting with chronic endometritis and to correct them with the help of the application of low-intensity intravascular laser radiation of blood in the combination with the standard treatment. PATIENTS AND METHODS: The study included 30 women of the reproductive age with the verified diagnosis of chronic endometritis at the stage of partial remission. The patients were divided into two groups. The patients of group 1 (control) were treated by pharmacotherapy alone while those in the main group

(group 2) were given standard therapy supplemented by intravascular laser irradiation of blood in the form of daily 25 min sessions during a 7 day period with the use of the Â«MulattoÂ» device having the output power of 2 MW at a wavelength of 0.63 microns. In addition, the third group of comparison was formed to which age-matched healthy women were recruited. The levels of cytokines, components of the complement, and immunoglobulins were determined in blood plasma, vaginal and cervical washouts using solid-phase enzyme immunoassay. RESULTS: The more reliable correction of the immune disturbances was achieved with the use of low-intensive laser irradiation of blood in comparison with medicamental therapy alone as appears from the analysis of the indicators of the immune status at the systemic and local levels (anti-inflammatory and regulatory cytokines, components and regulators of the system of complement, immunoglobulins). CONCLUSION: Supplementation of the standard treatment of chronic endometritis by a course of intravascular low-intensive laser irradiation of blood allows to increase its effectiveness and thereby improve the quality of life of the patients. Cytokines Adolescent;Adult;Blood;Cytokines;Endometritis;Endometrium;Female;Humans;Laser Therapy

Endodontic procedures for retreatment of periapical lesions. BACKGROUND: When primary root canal therapy fails, periapical lesions can be retreated with or without surgery. Root canal retreatment is a non-surgical procedure that involves removal of root canal filling materials from the tooth, followed by cleaning, shaping and obturating of the canals. Root-end resection is a surgical procedure that involves exposure of the periapical lesion through an osteotomy, surgical removal of the lesion, removal of part of the root-end tip, disinfection and, commonly, retrograde sealing or filling of the apical portion of the remaining root canal. This review updates one published in 2008. OBJECTIVES: To assess effects of surgical and non-surgical therapy for retreatment of teeth with apical periodontitis.To assess effects of surgical root-end resection under various conditions, for example, when different materials, devices or techniques are used. SEARCH METHODS: We searched the following electronic databases: the Cochrane Oral Health Trials Register (to 10 February 2016), the Cochrane Central Register of Controlled Trials (CENTRAL; 2016, Issue 1), MEDLINE Ovid (1946 to 10 February 2016) and Embase Ovid (1980 to 10 February 2016). We searched the US National Registry of Clinical Trials (ClinicalTrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform for ongoing trials (to 10 February 2016). We placed no restrictions regarding language and publication date. We handsearched the reference lists of the studies retrieved and key journals in the field of endodontics. SELECTION CRITERIA: We included randomised controlled trials (RCTs) involving people with periapical pathosis. Studies could compare surgery versus non-surgical treatment or could compare different types of surgery. Outcome measures were healing of the periapical lesion assessed after one-year follow-up or longer; postoperative pain and discomfort; and adverse effects such as tooth loss, mobility, soft tissue recession, abscess, infection, neurological damage or loss of root sealing material evaluated through radiographs. DATA COLLECTION AND ANALYSIS: Two review authors independently extracted data from included studies and assessed their risk of bias. We contacted study authors to obtain missing information. We combined results of trials assessing comparable outcomes using the fixed-effect model, with risk ratios (RRs) for dichotomous outcomes and mean differences (MDs) for continuous outcomes, and 95% confidence intervals (CIs). We used generic inverse variance for split-mouth studies. MAIN RESULTS: We included 20 RCTs. Two trials at high risk of bias assessed surgery versus a non-surgical approach: root-end resection with root-end filling versus root canal retreatment. The other 18 trials evaluated different surgical protocols: cone beam computed tomography (CBCT) versus periapical radiography for preoperative assessment (one study at high risk of bias); antibiotic prophylaxis versus placebo (one study at unclear risk); different magnification devices (loupes, surgical microscope, endoscope) (two studies at high risk); types of incision (papilla base incision, sulcular incision) (one

study at high risk and one at unclear risk); ultrasonic devices versus handpiece burs (one study at high risk); types of root-end filling material (glass ionomer cement, amalgam, intermediate restorative material (IRM), mineral trioxide aggregate (MTA), gutta-percha (GP), super-ethoxy benzoic acid (EBA)) (five studies at high risk of bias, one at unclear risk and one at low risk); grafting versus no grafting (three studies at high risk and one at unclear risk); and low energy level laser therapy versus placebo (irradiation without laser activation) versus control (no use of the laser device) (one study at high risk).There was no clear evidence of superiority of the surgical or non-surgical approach for healing at one-year follow-up (RR 1.15, 95% CI 0.97 to 1.35; two RCTs, 126 participants) or at four- or 10-year follow-up (one RCT, 82 to 95 participants), although the evidence is very low quality. More participants in the surgically treated group reported pain in the first week after treatment (RR 3.34, 95% CI 2.05 to 5.43; one RCT, 87 participants; low quality evidence).In terms of surgical protocols, there was some inconclusive evidence that ultrasonic devices for root-end preparation may improve healing one year after retreatment, when compared with the traditional bur (RR 1.14, 95% CI 1.00 to 1.30; one RCT, 290 participants; low quality evidence).There was evidence of better healing when root-ends were filled with MTA than when they were treated by smoothing of orthograde GP root filling, after one-year follow-up (RR 1.60, 95% CI 1.14 to 2.24; one RCT, 46 participants; low quality evidence).There was no evidence that using CBCT rather than radiography for preoperative evaluation was advantageous for healing (RR 1.02, 95% CI 0.70 to 1.47; one RCT, 39 participants; very low quality evidence), nor that any magnification device affected healing more than any other (loupes versus endoscope at one year: RR 1.05, 95% CI 0.92 to 1.20; microscope versus endoscope at two years: RR 1.01, 95% CI 0.89 to 1.15; one RCT, 70 participants, low quality evidence).There was no evidence that antibiotic prophylaxis reduced incidence of postoperative infection (RR 0.49, 95% CI 0.09 to 2.64; one RCT, 250 participants; low quality evidence).There was some evidence that using a papilla base incision (PBI) may be beneficial for preservation of the interdental papilla compared with complete papilla mobilisation (one RCT (split-mouth), 12 participants/24 sites; very low quality evidence). There was no evidence of less pain in the PBI group at day 1 post surgery (one RCT, 38 participants; very low quality evidence).There was evidence that adjunctive use of a gel of plasma rich in growth factors reduced postoperative pain compared with no grafting (measured on visual analogue scale: one day postoperative MD -51.60 mm, 95% CI -63.43 to -39.77; one RCT, 36 participants; low quality evidence).There was no evidence that use of low energy level laser therapy (LLLT) prevented postoperative pain (very low quality evidence). AUTHORS' CONCLUSIONS: Available evidence does not provide clinicians with reliable guidelines for treating periapical lesions. Further research is necessary to understand the effects of surgical versus non-surgical approaches, and to determine which surgical procedures provide the best results for periapical lesion healing and postoperative quality of life. Future studies should use standardised techniques and success criteria, precisely defined outcomes and the participant as the unit of analysis. Humans;Periapical Periodontitis;Randomized Controlled Trials as Topic;Retreatment;Root Canal Therapy

PRACTICE STATEMENT Scope of Practice of the Registered Nurse in Light Based (Laser) Therapies Nursing Practice Statement NP 64 - Developed: 5/92 - Revised: 4/04,5/16. Humans;Low-Level Light Therapy;Nurses;Ohio;Practice Patterns, Nurses'

Three consecutive days of application of LED therapy is necessary to inhibit experimentally induced root resorption in rats: a microtomographic study. Previous studies have suggested that phototherapy may modulate orthodontic tooth movement and the incidence of root resorption. We aimed to identify a minimal dose-response relationship to LED therapy with regard to orthodontic tooth movement (OTM) and root resorption in rats. Forty-eight male Wistar rats were divided into six groups with equal and random distribution: control (C) no intervention; three daily LED irradiation (CLED); submitted only to OTM (RR); OTM and LED irradiation on the first day (LED1); OTM and two

LED irradiation on the first and second days (LED2); and OTM and three LED irradiation on the first, second, and third days (LED3). Orthodontic appliance was installed in groups RR, LED1, LED2, and LED3 to promote OTM. Animals from groups CLED, LED1, LED2, and LED3 received LED therapy (940Â nm, 4Â J, 4Â J/cm2) according to each group of treatment. After 7Â days, all the animals were sacrificed. The jaws were fixed and scanned with microtomography (micro-CT). The micro-CT images were reconstructed on 2D and 3D models. These models were used to identify and measure root resorption number and dimensions (diameter, depth, and volume). The distance between the first and second molars was used to verify tooth displacement. The results showed that LED3 group had significantly lower number of root resorption. The root resorption dimensions (diameter and depth) had no significant differences among the experimental groups. LED3 group had significant tooth displacement in relation to C and CLED groups. In conclusion, three daily LED therapy doses are required to inhibit root resorption after appliance of orthodontic forces.
Animals;Inflammation;Male;Orthodontic Appliances;Phototherapy;Rats, Wistar;Root Resorption;Tooth Movement Techniques;X-Ray Microtomography

Photobiomodulation of Dental Derived Mesenchymal Stem Cells: A Systematic Review.
OBJECTIVE: This study aimed to conduct a systematic review of the literature published from 2000 to August 2015, to investigate the effect of photobiomodulation (PBM) therapy on dentoalveolar-derived mesenchymal stem cells (ddMSCs), assessing whether a clear conclusion can be reached from the data presented. BACKGROUND DATA: Systematic reviews provide the best evidence on the effectiveness of a procedure and permit investigation of factors that may influence the performance of a method. To the best of our knowledge, no previous systematic review has evaluated the effects of PBM only on ddMSCs. METHODS: The search was conducted in PubMed /MEDLINE(Â®), Scopus and Web of Science databases, and reported according to the Preferred Reporting Items for Systematic Reviews and Metaanalyses (PRISMA Statement). Original research articles investigating the effects of PBM therapy on ddMSCs, published from 2000 to August 2015, were retrieved and used for this review according to the following eligibility criteria: evaluating PBM therapy, assessing stem cells of dentoalveolar origin, published in English, dealing with cells characterized as stem cells, and using light that did not need external chromophores. RESULTS: From the initial 3467 potentially relevant articles identified, 6 were excluded because they were duplicates, and 3453 were considered ineligible based on the inclusion criteria. Therefore, eight articles remained, and these were fully analyzed in order to closely check exclusion criteria items. Only one of them was excluded because the cultured cells studied were not characterized as stem cells. Finally, seven articles served as the basis for this systematic review. CONCLUSIONS: PBM therapy has no deleterious effects on ddMSCs. Although no other clear conclusion was obtained because of the scarce number of publications, the results of these studies are pointing to an important tendency of PBM therapy to improve ddMSCs' viability and proliferation. Cell Proliferation;Dental Pulp;Female;Humans;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Regeneration;Sensitivity and Specificity

Low-Level Laser Therapy to the Bone Marrow Reduces Scarring and Improves Heart Function Post-Acute Myocardial Infarction in the Pig. OBJECTIVE: Cell therapy for myocardial repair is one of the most intensely investigated strategies for treating acute myocardial infarction (MI). The aim of the present study was to determine whether low-level laser therapy (LLLT) application to stem cells in the bone marrow (BM) could affect the infarcted porcine heart and reduce scarring following MI. METHODS: MI was induced in farm pigs by percutaneous balloon inflation in the left coronary artery for 90â€‰min. Laser was applied to the tibia and iliac bones 30â€‰min, and 2 and 7 days post-induction of MI. Pigs were euthanized 90 days post-MI. The extent of scarring was analyzed by histology and MRI, and heart function was analyzed by echocardiography. RESULTS: The number of c-kit+ cells (stem cells) in the circulating blood of the laser-treated (LT) pigs was 2.62- and 2.4-fold

higher than in the non-laser-treated (NLT) pigs 24 and 48â€‰h post-MI, respectively. The infarct size [% of scar tissue out of the left ventricle (LV) volume as measured from histology] in the LT pigs was 3.2â€‰Â±â€‰0.82%, significantly lower, 68% (pâ€‰<â€‰0.05), than that (16.6â€‰Â±â€‰3.7%) in the NLT pigs. The mean density of small blood vessels in the infarcted area was significantly higher [6.5-fold (pâ€‰<â€‰0.025)], in the LT pigs than in the NLT ones. Echocardiography (ECHO) analysis for heart function revealed the left ventricular ejection fraction in the LT pigs to be significantly higher than in the NLT ones. CONCLUSIONS: LLLT application to BM in the porcine model for MI caused a significant reduction in scarring, enhanced angiogenesis and functional improvement both in the acute and long term phase post-MI. Animals;Biopsy, Needle;Bone Marrow;Cell Proliferation;Cicatrix;Disease Models, Animal;Heart Function Tests;Immunohistochemistry;Low-Level Light Therapy;Magnetic Resonance Imaging;Myocardial Infarction;Myocardium;Random Allocation;Reference Values;Swine;Treatment Outcome;Ventricular Remodeling

A comparative study of pulsed dye laser versus long pulsed Nd:YAG laser treatment in recalcitrant viral warts. BACKGROUND: Viral warts are common infectious skin disease induced by human papillomavirus (HPV). But the treatment of recalcitrant warts is still challenging. OBJECTIVE: In this study, we compared the effectiveness of pulsed dye laser (PDL) and long pulsed Nd:YAG (LPNY) laser in the treatment of recalcitrant viral warts. METHODS: We retrospectively analyzed the medical records of patients with recalcitrant warts treated with laser therapy between January 2013 and February 2016. RESULTS: Seventy-two patients with recalcitrant warts were evaluated. Thirty-nine patients were treated with pulsed dye laser and thirty-three patients were treated with LPNY laser. The following parameters were used: PDL (spot size, 7â€‰mm; pulse duration, 1.5â€‰ms; and fluence, 10-14Â J/cm(2)) and LPNY (spot size, 5â€‰mm; pulse duration, 20â€‰ms; and fluence, 240-300Â J/cm(2)). Complete clearance of two patients (5.1%) in PDL group, and three patients (9.1%) in LPNY group were observed without significant side effects. The patients who achieved at least 50% improvement from baseline were 20 (51.3%) in PDL and 22 (66.7%) in LPNY, respectively. CONCLUSION: This research is meaningful because we compared the effectiveness of the PDL and LPNY in the recalcitrant warts. Both PDL and LPNY laser could be used as a safe and alternative treatment for recalcitrant warts. Adolescent;Adult;Aged;Child;Child, Preschool;Erythema;Female;Hemorrhagic Disorders;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Recurrence;Retrospective Studies;Treatment Outcome;Warts;Young Adult

Influence of a Magnetic Field and Laser Therapy on the Quality of Mandibular Bone During Distraction Osteogenesis in Rabbits. PURPOSE: This study evaluated the use of low-level laser therapy (LLLT) and exposure to a magnetic field (MF) during distraction osteogenesis. MATERIALS AND METHODS: The sample consisted of 18 rabbits divided into 3 groups of 6 animals each: control, MF exposure (briefly, magnetized gold-coated washers were placed next to the distractor device), and LLLT exposure (830Â nm applied every 48Â hours over 4 points [dose, 5Â J/cm(2)] during the consolidation period). The same distraction osteogenesis protocol was used in all 3 groups (0.5Â mm every 12Â hours for 1Â week). RESULTS: Quantitative microscopic analysis of sections stained with hematoxylin and eosin showed a statistically significant difference in the amount of newly formed bone in the MF group compared with the LLLT group (PÂ = .006). The number of cells with more than 3 argyrophilic nucleolar organizer regions also was significantly different between the LLLT and control groups (PÂ = .038). CONCLUSION: Distraction osteogenesis effectively promoted bone lengthening. The LLLT group exhibited a larger amount of newly formed bone and a larger number of osteoblasts in the cell division phase, but the difference was not statistically relevant compared with the control group. Animals;Female;Infrared Rays;Low-Level Light Therapy;Magnetic Fields;Mandible;Osteogenesis;Osteogenesis, Distraction;Outcome Assessment, Health Care;Rabbits

Postinflammatory hyperpigmentation associated with treatment of solar lentigines using a Q-Switched 532-nm Nd: YAG laser: a multicenter survey. PURPOSE: To characterize the risk factors of Korean patients for postinflammatory hyperpigmentation (PIH) during treatment of solar lentigines using a Q-switched 532-nm Nd: YAG (QS 532 NY) laser. MATERIALS AND METHODS: The present retrospective multicenter study was conducted at the dermatology clinics of five tertiary hospitals in Korea. Between October 2007 and January 2013, 516 patients were enrolled and reviewed for clinical features and factors associated with PIH. RESULTS: The overall incidence of PIH was 20.3%. We demonstrated that patients with erythematous lentigines presented with PIH more frequently compared with those without erythematous lentigines. Among several coexisting conditions, facial diffuse dyschromia was significantly associated with PIH. Furthermore, PIH occurred more frequently in patients with invisible pores and velvety skin. However, age, sex, Fitzpatrick skin's phototype and season of treatment showed little association with PIH. CONCLUSIONS: When a QS 532 NY laser is used to treat individuals with erythematous lentigines, invisible pores and velvety skin, and facial diffuse dyschromia, clinicians should be cautious and consider preventive measures. Adolescent;Adult;Aged;Aged, 80 and over;Asian People;Female;Humans;Hyperpigmentation;Incidence;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Male;Middle Aged;Republic of Korea;Retrospective Studies;Surveys and Questionnaires;Tertiary Care Centers;Young Adult

Odontogenic differentiation and biomineralization potential of dental pulp stem cells inside Mg-based bioceramic scaffolds under low-level laser treatment. This study aimed to investigate the potential of low-level laser irradiation (LLLI) to promote odontogenic differentiation and biomineralization by dental pulp stem cells (DPSCs) seeded inside bioceramic scaffolds. Mg-based, Zn-doped bioceramic scaffolds, synthesized by the sol-gel technique, were spotted with DPSCs and exposed to LLLI at 660Â nm with maximum output power of 140Â mw at fluencies (a) 2 and 4Â J/cm(2) to evaluate cell viability/proliferation by the MTT assay and (b) 4Â J/cm(2) to evaluate cell differentiation, using real-time PCR (expression of odontogenic markers) and a p-nitrophenylphosphate (pNPP)-based assay for alkaline phosphatase (ALP) activity measurement. Scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis were used for structural/chemical characterization of the regenerated tissues. Exposure of the DPSCs/scaffold complexes to the proposed LLLI scheme was associated with statistically significant increase of odontogenesis-related markers (bone morphogenetic protein 2 (BMP-2): 22.4-fold, dentin sialophosphoprotein (DSPP): 28.4-fold, Osterix: 18.5-fold, and Runt-related transcription factor 2 (Runx2): 3.4-fold). ALP activity was significantly increased at 3 and 7Â days inside the irradiated compared to that in the non-irradiated SC/DPSC complexes, but gradually decreased until 14Â days. Newly formed Ca-P tissue was formed on the SC/DPSC complexes after 28Â days of culture that attained the characteristics of bioapatite. Overall, LLLI treatment proved to be beneficial for odontogenic differentiation and biomineralization of DPSCs inside the bioceramic scaffolds, making this therapeutic modality promising for targeted dentin engineering. Core Binding Factor Alpha 1 Subunit;Alkaline Phosphatase;Magnesium Alkaline Phosphatase;Calcification, Physiologic;Cell Adhesion;Cell Differentiation;Cell Proliferation;Cell Shape;Cell Survival;Cells, Cultured;Ceramics;Core Binding Factor Alpha 1 Subunit;Dental Pulp;Humans;Low-Level Light Therapy;Magnesium;Odontogenesis;Real-Time Polymerase Chain Reaction;Stem Cells;Tissue Scaffolds

Evaluation of Serum Reaction to Low-Intensity Laser Exposure by Its Solid Phase Structure. The effects of various modes of low-intensity laser exposure on the sera of healthy subjects and patients are studied. It is shown by the cuneiform dehydration method that the serum structure is liable to change in response to certain modes of low-intensity laser exposure. The structure of patients' sera is

more sensitive to low-intensity laser exposure. Case-Control Studies;Chronic Disease;Colitis;Desiccation;Gastritis;Humans;Low-Level Light Therapy;Microscopy;Phase Transition;Serum
The enhancing effect of a laser photochemotherapy with cisplatin or zolendronic acid in primary human osteoblasts and osteosarcoma cells in vitro. BACKGROUND: Photodynamic therapies (PDT) have become increasingly popular in the adjuvant treatment of different tumour entities. Chemotherapeutic agents, such as cisplatin may be used in combination with low-level laser therapy (LLLT) as laser photochemotherapy. The aim of this study was to investigate the effect of LLLT on cell bioviability of normal and malignant bone cells under chemotherapeutic conditions with either cisplatin or zolendronic acid in vitro. METHODS: Primary human osteoblasts (HOB) and an osteosarcoma cell line (Saos-2) were treated with different concentrations of zolendronic acid or cisplatin and irradiated twice with a diode laser (wavelength 670 nm, 120 s, energy outputs of 100mW/cm(2) , continuous wave mode). Cell viability was tested by XTT-assay and via histomorphological analysis. RESULTS: LLLT alone increased bioviability for both cell lines. LLLT lowered HOB viability at the three highest concentrations of cisplatin and zolendronic acid. For Saos-2, LLLT reduced cell viability at every concentration of cisplatin. In cases of incubation with zolendronic acid, similar to osteoblasts, LLLT lowered cell viability at the highest concentration only. CONCLUSIONS: Based on the conditions of this study, laser photochemotherapy may be able to raise the cytotoxicity of cisplatin and zolendronic acid in benign and malignant bone cells. This could be of interest in the development of new therapeutic treatment modalities against neoplastic bone diseases like osteosarcoma. Antineoplastic Agents;Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid;Cisplatin Antineoplastic Agents;Bone Density Conservation Agents;Bone Neoplasms;Cell Line, Tumor;Cell Proliferation;Cell Shape;Cell Survival;Cisplatin;Diphosphonates;Dose-Response Relationship, Drug;Humans;Imidazoles;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteosarcoma;Zoledronic Acid
Low-level laser therapy (904nm) can increase collagen and reduce oxidative and nitrosative stress in diabetic wounded mouse skin. BACKGROUND AND OBJECTIVE: Over the last decade we have seen an increased interest in the use of Low-Level Laser Therapy (LLLT) in diseases that involve increased oxidative stress. It is well established that hyperglycemia in diabetes elicits a rise in reactive oxygen species (ROS) production but the effect of LLLT remains unclear. This study aimed to investigate whether LLLT was able to improve oxidative/nitrosative stress parameters in the wound healing process in diabetic mice. STUDY DESIGN/MATERIALS AND METHODS: Twenty male mice were divided into four groups: non-irradiated control (NIC), irradiated control (IC), non-irradiated and diabetic (NID), irradiated and diabetic (ID). Diabetes was induced by administration of streptozotocin. Wounds were created 120days after the induction of diabetes in groups IC and ID and these groups were irradiated daily for 5days (superpulsed 904nm laser, average power 40mW, 60s). All animals were sacrificed 1day after the last irradiation and histology, collagen amount, catalase activity, nitrite and thiobarbituric acid reactive substances (TBARS) were measured. RESULTS: Histology showed that collagen fibers were more organized in IC and ID when compared to NID group, and significant differences in collagen content were found in group ID versus NID. Catalase activity was higher in IC group compared to other groups ($p<0.001$). TBARS levels were higher in IC versus NIC, but were lower in ID versus NID ($p<0.001$). Nitrite was lower in both irradiated groups versus the respective non-irradiated groups ($p<0.001$). CONCLUSIONS: Delayed wound healing in diabetes is still a challenge in clinical practice with high social costs. The increased production of collagen and decreased oxidative and nitrosative stress suggests that LLLT may be a viable therapeutic alternative in diabetic wound healing. Animals;Low-Level Light Therapy;Mice;Nitrosation;Oxidative Stress;Skin

Use of low level laser therapy to control neuropathic pain: A systematic review. Neuropathic pain can be defined as pain initiated or caused by a primary lesion or dysfunction in the central or peripheral nervous system. The low level laser therapy (LLLT) has gained great prominence as a treatment in this type of pain; however, the application parameters are still controversial in the literature. This study aimed to review the literature on the use of LLLT in neuropathic pain with the goal of establishing a "therapeutic window" for the effective use of this treatment. We analyzed 14 articles, 10 in experimental animals and 4 in humans. The results are presented in three tables, the first being for comparison of the studies' application parameters, the second showing the average and median parameters experimental studies and third showing the clinical studies embodiment. The experimental studies revealed better results for LLLT and infrared laser powers above 70mW. Clinical studies are inconclusive as to the application parameters, due to the discrepancy; however all demonstrate the effectiveness of LLLT. According to the data presented, it was concluded that LLLT has positive effects on the control of analgesia for neuropathic pain, but further studies with high scientific rigor are needed in order to define treatment protocols that optimize the action LLLT in neuropathic pain. Humans;Low-Level Light Therapy;Neuralgia

Dye-conjugated single-walled carbon nanotubes induce photothermal therapy under the guidance of near-infrared imaging. Recently, photothermal therapy (PTT) has become viewed as an ideal auxiliary therapeutic treatment for cancers. However, the development of safe, convenient, and highly effective photothermal agents remains a great challenge. In this study, we prepared single-walled carbon nanotubes (SWNTs) for PTT against breast tumors under the guidance of infrared fluorescent cyanines. Tumors were accurately located using near-infrared imaging (NIR) and then exposed to laser irradiation. Both the inÂ vivo and inÂ vitro results showed that the SWNTs have high stability and low cytotoxicity. Introducing polyethylene glycol into our nanoparticles increased the blood-circulation time. Our inÂ vivo results further showed that Cy5.5-conjugated SWNTs mediated PTT, resulting in efficient tumor suppression in mice under the guidance of near-infrared imaging. Due to the small amount of absorption at 808-nm, Cy5.5 increased the efficiency of PTT. Breast tumors significantly shrunk after irradiation under the 808-nm near-infrared laser. The treated mice developed scabs, but otherwise recovered after 15 days, and their physical conditions restored gradually. These data indicate that our unique photothermal-responsive SWNT-Cy5.5-based theranostic agent can serve as a promising candidate for PTT. CY5.5 cyanine dye;Carbocyanines;Contrast Media;Fluorescent Dyes;Nanotubes, Carbon Animals;Breast Neoplasms;Carbocyanines;Contrast Media;Female;Fluorescent Dyes;Humans;Infrared Rays;Low-Level Light Therapy;MCF-7 Cells;Mice, Inbred BALB C;Mice, Nude;Nanomedicine;Nanotubes, Carbon;Optical Imaging;Time Factors;Tissue Distribution;Tumor Burden

Combined effects of electromagnetic field and low-level laser increase proliferation and alter the morphology of human adipose tissue-derived mesenchymal stem cells. In recent years, electromagnetic field (EMF) and low-level laser (LLL) have been found to affect various biological processes, the growth and proliferation of cells, and especially that of stem cells. The aim of this study was to investigate the effects of EMF and LLL on proliferation of human adipose tissue-derived mesenchymal stem cells (hAT-MSCs) and thus to examine the impact of these therapeutic physical modalities on stem cell engraftment. hAT-MSCs were isolated from subcutaneous adipose tissue of six persons ranging in age from 21 to 56Â years. EMF was applied for a period of 7Â days, once a day for 30Â min, via a magnetic cushion surface at a frequency of 50Â Hz and an intensity of 3Â mT. LLL was applied also for 7Â days, once a day for 5Â min, at radiation energies of 3Â J/cm(2), with a wavelength of 808Â nm, power output of 200Â mW, and power density of 0.2Â W/cm(2). Nonexposed cells (control) were cultivated under the same culture conditions. Seven days after treatment, the cells were examined for cell viability, proliferation, and morphology. We found that

after 7Â days, the number of EMF-treated hAT-MSCs was significantly higher than the number of the untreated cells, LLL-treated hAT-MSCs were more numerous than EMF-treated cells, and hAT-MSCs that were treated with the combination of EMF and LLL were the most numerous. EMF and/or LLL treatment did not significantly affect hAT-MSC viability by itself. Changes in cell morphology were also observed, in terms of an increase in cell surface area and fractal dimension in hAT-MSCs treated with EMF and the combination of EMF and LLL. In conclusion, EMF and/or LLL treatment accelerated the proliferation of hAT-MSCs without compromising their viability, and therefore, they may be used in stem cell tissue engineering. Adipose Tissue;Adult;Cell Differentiation;Cell Proliferation;Cell Shape;Cell Size;Cell Survival;Cells, Cultured;Electromagnetic Fields;Fractals;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Middle Aged;Young Adult

Photobiomodulation of human adipose-derived stem cells using 810nm and 980nm lasers operates via different mechanisms of action. Photobiomodulation (PBM) using red or near-infrared (NIR) light has been used to stimulate the proliferation and differentiation of adipose-derived stem cells. The use of NIR wavelengths such as 810nm is reasonably well accepted to stimulate mitochondrial activity and ATP production via absorption of photons by cytochrome c oxidase. However, the mechanism of action of 980nm is less well understood. Here we study the effects of both wavelengths (810nm and 980nm) on adipose-derived stem cells in vitro. Both wavelengths showed a biphasic dose response, but 810nm had a peak dose response at 3J/cm(2) for stimulation of proliferation at 24h, while the peak dose for 980nm was 10-100 times lower at 0.03 or 0.3J/cm(2). Moreover, 980nm (but not 810nm) increased cytosolic calcium while decreasing mitochondrial calcium. The effects of 980nm could be blocked by calcium channel blockers (capsazepine for TRPV1 and SKF96365 for TRPC channels), which had no effect on 810nm. To test the hypothesis that the chromophore for 980nm was intracellular water, which could possibly form a microscopic temperature gradient upon laser irradiation, we added cold medium (4Â°C) during the light exposure, or pre-incubated the cells at 42Â°C, both of which abrogated the effect of 980nm but not 810nm. We conclude that 980nm affects temperature-gated calcium ion channels, while 810nm largely affects mitochondrial cytochrome c oxidase. Calcium Channel Blockers;Calcium Channels;Electron Transport Complex IV;Calcium Adipocytes;Calcium;Calcium Channel Blockers;Calcium Channels;Cell Line;Cell Proliferation;Cytosol;Electron Transport Complex IV;Humans;Infrared Rays;Lasers;Low-Level Light Therapy;Mitochondria;Photons;Stem Cells

Photobiomodulation by laser therapy rescued auditory neuropathy induced by ouabain. Auditory neuropathy is a hearing disorder caused by impaired auditory nerve function. The lack of information about the pathophysiology of this disease limits early diagnosis and further treatment. Laser therapy is a novel approach to enhance nerve growth or induce axonal regeneration. We induced auditory neural degeneration sparing the sensory epithelium with local ouabain application in an animal model and observed the rescue effect of photobiomodulation (PBM), showing recovered auditory function and favorable histologic outcome. Hearing was evaluated using the auditory brainstem response (ABR) and distortion product otoacoustic emission (DPOAE). Seven days after ouabain application, the animals were sacrificed to evaluate the morphological changes. DPOAE change was not observed in all groups after ouabain application indicating no changes of outer hair cell function. Ouabain application increased the ABR thresholds increase, while the use of ouabain plus laser produced lower threshold compared to the ouabain group. Hematoxylin and Eosin staining of cochlea mid-modiolar sections in animals treated with ouabain showed damaged spiral ganglion cells, neurofilaments, and post synaptic puncta. Ouabain plus laser group showed higher number of spiral ganglion cells, higher density of neurofilaments, and higher number post synaptic puncta counts compared with ouabain application group. Short-term application of ouabain caused spiral ganglion cell damage while sparing the inner and outer hair cells in gerbils. Photobiomodulation

alleviated the hearing loss caused by ouabain induced auditory neuropathy. The results indicate the possible role of photobiomodulation therapy for inner ear diseases accompanied by spiral ganglion degeneration. Ouabain Animals;Cell Count;Evoked Potentials, Auditory, Brain Stem;Female;Gerbillinae;Hearing Loss, Central;Low-Level Light Therapy;Nerve Fibers;Neurons;Ouabain;Spiral Ganglion;Synapses

Clinical comparison of salicylic acid peel and LED-Laser phototherapy for the treatment of Acne vulgaris in teenagers. Acne vulgaris treatments usually cause sensitivity, teratogenicity and bacterial resistance. Investigations of other therapeutic techniques, such as phototherapy, are highly relevant. Thus, we compared the effectiveness of two Acne vulgaris treatments in adolescents: peeling with salicylic acid (SA) and phototherapy. Teens were randomly divided into: group I, treatment with SA peels (10%) and group II, treatment with phototherapy (blue LED and red laser lights). Photographs were taken before and after ten sessions of each treatment, carried out weekly, and compared. To compare the differences between the treatments, the Student t-test was used. P values < 0.05 were considered significant. Both techniques are effective therapies for the treatment of acne in teenagers since the number of comedones, papules and pustules decreased significantly at the end of the session. However, when the two treatments were compared, phototherapy showed a significant difference in reducing the number of pustules. The combined use of red and blue lights due to their anti-inflammatory and wound-healing properties is a more efficient alternative for treating Acne vulgaris in relation to SA and proves more reliable and without side effects, improving the adolescents' skin health. Keratolytic Agents;Salicylic Acid Acne Vulgaris;Adolescent;Chemexfoliation;Color;Female;Humans;Keratolytic Agents;Lasers, Semiconductor;Longitudinal Studies;Low-Level Light Therapy;Male;Salicylic Acid;Treatment Outcome

Efficacy and safety of mascara dyeing as an adjunct to Alexandrite and Nd:YAG laser applications for removing thin and white-colored facial and axillary hair. INTRODUCTION: There is no satisfactory and efficient method for long-term removal of white-colored and thin hair. METHODS: We conducted a randomised clinical trial of hirsute patients with excessive white and/or thin hair on the face and/or axilla. In Group I (n: 16), the facial hair on one side of the face was painted with a black eyelash mascara immediately before Nd:YAG laser and the other half was only treated by Nd:YAG. In Group II (n: 20), the axillary hair on one side was painted with the mascara before the Alexandrite laser with the other side being only treated by Alexandrite. RESULTS: The terminal hair counts on the painted facial and axillary sides were significantly lower than those on the control sides throughout the study except for the first month. The decrease in the terminal hair count was significant from the beginning of treatment to the second and sixth months on the painted and control facial sides and to the first and sixth months on the axillary sides. CONCLUSION: Hair coloring with black eyelash mascara is a simple, efficient and safe adjunct to Alexandrite and Nd:YAG laser applications to enhance their clinical efficacy in eliminating white and thin facial or axillary hair. Cosmetics Adolescent;Adult;Axilla;Cosmetic Techniques;Cosmetics;Double-Blind Method;Face;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Young Adult

Decrowding of lower anterior segment with and without photobiomodulation: a single center, randomized clinical trial. The aim of this study was to evaluate the effect of low-level light therapy using light-emitting diodes (LEDs) on the speed of tooth movements that were required for the leveling and aligning of the lower anterior segment during non-extraction orthodontic treatment. The sample was comprised of patients (nâ€‰=â€‰40) with lower anterior crowding who were treated with self-ligating orthodontic brackets and a standardized wire sequence. A test group of patients (nâ€‰=â€‰20) who were treated with extraoral infrared light therapy for 20Â min daily with at least 80Â % compliance was compared to a control group (nâ€‰=â€‰20). The date of the first arch wire placement was recorded as T1, and the date of the completion of the lower anterior

segment decrowding was recorded as T2. A final impression was also taken at T2. The time between T1 and T2 was significantly reduced by 22Â % in the test group compared to the control group (68.3 vs. 87.8Â days, respectively, pâ€‰<â€‰0.043). The use of photobiomodulation for 20Â min daily at a wavelength of 850Â nm might reduce the time required to resolve lower anterior crowding. This trial and its protocol were not registered on a publicly accessible registry. Case-Control Studies;Humans;Low-Level Light Therapy;Malocclusion;Orthodontic Brackets;Orthodontic Wires;Young Adult

Near-infrared light treatment reduces astrogliosis in MPTP-treated monkeys. We have reported previously that intracranial application of near-infrared light (NIr) reduces clinical signs and offers neuroprotection in a subacute MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) monkey model of Parkinson's disease. In this study, we explored whether NIr reduces the gliosis in this animal model. Sections of midbrain (containing the substantia nigra pars compacta; SNc) and striatum were processed for glial fibrillary acidic protein (to label astrocytes; GFAP) and ionised calcium-binding adaptor molecule 1 (to label microglia; IBA1) immunohistochemistry. Cell counts were undertaken using stereology, and cell body sizes were measured using ImageJ. Our results showed that NIr treatment reduced dramatically (~75Â %) MPTP-induced astrogliosis in both the SNc and striatum. Among microglia, however, NIr had a more limited impact in both nuclei; although there was a reduction in overall cell size, there were no changes in the number of microglia in the MPTP-treated monkeys after NIr treatment. In summary, we showed that NIr treatment influenced the glial response, particularly that of the astrocytes, in our monkey MPTP model of Parkinson's disease. Our findings raise the possibility of glial cells as a future therapeutic target using NIr. AIF1 protein, human;Calcium-Binding Proteins;DNA-Binding Proteins;Glial Fibrillary Acidic Protein;Microfilament Proteins;Neurotoxins;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Analysis of Variance;Animals;Calcium-Binding Proteins;Corpus Striatum;DNA-Binding Proteins;Disease Models, Animal;Female;Glial Fibrillary Acidic Protein;Gliosis;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Macaca fascicularis;Male;Microfilament Proteins;Neuroglia;Neurotoxins;Substantia Nigra

Effect of gallium aluminium arsenide diode laser therapy on Porphyromonas gingivalis in chronic periodontitis: a randomized controlled trial. OBJECTIVES: The aim of this randomized, controlled trial was to evaluate the effects of 685-nm gallium aluminium arsenide (GaAlAs) diode laser therapy (1.6Â JÂ cm(-2)) as an adjunct to scaling and root planing in the treatment of chronic periodontitis. METHODS: Thirty-two patients aged 35-60Â years old who had chronic periodontitis met the eligibility criteria. They were randomly assigned to two equal groups: scaling and root planing were performed in the SRP group, while scaling, root planing and laser irradiation of periodontal pockets were performed in the SRP + DL group. Subgingival plaque samples were subjected to polymerase chain reaction (PCR) to detect P.Â gingivalis-colonized sites, and common clinical indices were evaluated before and 2Â months after treatment. Clinical examination included gingival index (GI), plaque index (PI), probing depth (PD), clinical attachment level (CAL) and gingival bleeding index (GBI), all of which were recorded. RESULTS: Data from 30 patients [19 women and 11 men; mean age, 48.4 (5.4) years old] were analysed. There were statistically significant improvements in GI, PD, CAL and GBI for the SRP + DL group compared to SRP group but no significant difference in PI between the groups. Additionally, the percentage of P.Â gingivalis-positive sites in the SRP + DL group decreased from 80% (12/15) to 20% (3/15) after laser irradiation (PÂ <Â 0.05). No significant changes were noted in the SRP group. CONCLUSION: GaAlAs diode laser irradiation of diseased periodontal pockets at 685Â nm and 1.6Â JÂ cm(-2) seemed to be an effective adjuvant to mechanical instrumentation to treat chronic periodontitis. Chronic Periodontitis;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Porphyromonas gingivalis

Isolated and combined effects of photobiomodulation therapy, topical nonsteroidal anti-inflammatory drugs, and physical activity in the treatment of osteoarthritis induced by papain. Osteoarthritis (OA) is a chronic inflammatory disease and is characterized as a degenerative process. This study aimed to evaluate and compare the effects of a topical nonsteroidal anti-inflammatory drug (NSAID), physical activity, and photobiomodulation therapy (PBMT) applied alone and/or in combination between them in an experimental model of knee OA. OA was induced by injection of papain in the knees of rats. After 21 days, the animals started to be treated with the above treatment. Histological analysis shows that the experimental model of OA induction causes morphological changes consistent with the disease, and among treatments, the PBMT is the most effective for reducing these changes. Moreover, the results demonstrate that PBMT and NSAID reduce the total number of cells in the inflammatory infiltrate ($p<0.05$) and PBMT was the most effective for reducing the activity of myeloperoxidase ($p<0.05$). Finally, we observed that both NSAID and PBMT were effective for reducing the gene expression of MMP-3 ($p<0.05$), but in relation to the gene expression of MMP-13, PBMT was the most effective treatment ($p<0.05$). The results of this study indicate that PBMT is the most effective therapy in stopping disease progression, and improving inflammatory conditions observed in OA. Anti-Inflammatory Agents, Non-Steroidal;Papain;Matrix Metalloproteinases, Secreted Animals;Anti-Inflammatory Agents, Non-Steroidal;Disease Models, Animal;Exercise Therapy;Low-Level Light Therapy;Male;Matrix Metalloproteinases, Secreted;Osteoarthritis;Papain;Rats;Rats, Wistar;Stifle;Swimming

Shining light on the head: Photobiomodulation for brain disorders. Photobiomodulation (PBM) describes the use of red or near-infrared light to stimulate, heal, regenerate, and protect tissue that has either been injured, is degenerating, or else is at risk of dying. One of the organ systems of the human body that is most necessary to life, and whose optimum functioning is most worried about by humankind in general, is the brain. The brain suffers from many different disorders that can be classified into three broad groupings: traumatic events (stroke, traumatic brain injury, and global ischemia), degenerative diseases (dementia, Alzheimer's and Parkinson's), and psychiatric disorders (depression, anxiety, post traumatic stress disorder). There is some evidence that all these seemingly diverse conditions can be beneficially affected by applying light to the head. There is even the possibility that PBM could be used for cognitive enhancement in normal healthy people. In this transcranial PBM (tPBM) application, near-infrared (NIR) light is often applied to the forehead because of the better penetration (no hair, longer wavelength). Some workers have used lasers, but recently the introduction of inexpensive light emitting diode (LED) arrays has allowed the development of light emitting helmets or "brain caps". This review will cover the mechanisms of action of photobiomodulation to the brain, and summarize some of the key pre-clinical studies and clinical trials that have been undertaken for diverse brain disorders.

Comparative Evaluation of Er:Cr:YSGG, Diode Laser and Alvogyl in the Management of Alveolar Osteitis: A Prospective Randomized Clinical Study. INTRODUCTION: Alveolar osteitis (AO) is a well-known complication following tooth extraction. Plethora of literature is available regarding its treatment modalities signifying that none of the treatment is as effective as any another treatment. LASER on the other hand, has been used to promote soft tissue healing. MATERIAL AND METHOD: In order to evaluate the effects of laser on healing of AO we undertook a randomized clinical trial. In the trial, sixty patients diagnosed with AO were randomly divided into three groups viz: alvogyl, diode laser and Er:Cr:YSGG laser (erbium chromium yttrium scandium gallium garnet). RESULTS: On analyzing the results, diode laser at 1.0 W power settings (energy: 20-25Â J/cm(2)) in non-contact, continuous mode was found to be the most effective for both pain relief and healing improvement. CONCLUSION: The diode laser is an acceptable and effective non-dressing treatment modality for alveolar osteitis, which is the most common painful complication following extraction.

Effect of Diode Laser on Healing of Tooth Extraction Socket: An Experimental Study in Rabbits. OBJECTIVES: To evaluate the effect of low-level laser therapy on healing of extracted tooth socket of healthy rabbits. DESIGN: The sample of this study was 20 male rabbits of 2-2.5Â kg weight with age range of 8-12Â months. Right and left lower first premolar teeth were extracted. The extraction sockets of lower right first premolar were irradiated with 0.9Â W gallium-aluminum-arsenide (GaAlAs) diode laser for 5Â min, immediately after extraction and then every 72Â h for the next 12Â days. The extraction socket of left side were not exposed to laser and served as a control. The animals were sacrificed after 7, 14, 30 and 45Â days and the experimental and control sockets were removed from the harvested mandibles and prepared for haematoxylin and eosin staining and Masson's stain. The prepared slides were examined under light microscope for histological and histomorphometric examination. RESULTS: The histological examination showed that diode laser-treated sockets demonstrated early formed new bone with faster maturation of primary bone to secondary bone as compared to non-treated control sockets. Histomorphometric analysis revealed a statistically significant increase in the density and volume of trabecular bone in laser-treated sockets than control sockets. CONCLUSION: Diode laser application to tooth extraction socket has a positive effect on bone formation.

Analgesic Effect of Photobiomodulation on Bothrops Moojeni Venom-Induced Hyperalgesia: A Mechanism Dependent on Neuronal Inhibition, Cytokines and Kinin Receptors Modulation. BACKGROUND: Envenoming induced by Bothrops snakebites is characterized by drastic local tissue damage that involves an intense inflammatory reaction and local hyperalgesia which are not neutralized by conventional antivenom treatment. Herein, the effectiveness of photobiomodulation to reduce inflammatory hyperalgesia induced by Bothrops moojeni venom (Bmv), as well as the mechanisms involved was investigated. METHODOLOGY/PRINCIPAL FINDINGS: Bmv (1 Î¼g) was injected through the intraplantar route in the right hind paw of mice. Mechanical hyperalgesia and allodynia were evaluated by von Frey filaments at different time points after venom injection. Low level laser therapy (LLLT) was applied at the site of Bmv injection at wavelength of red 685 nm with energy density of 2.2 J/cm2 at 30 min and 3 h after venom inoculation. Neuronal activation in the dorsal horn spinal cord was determined by immunohistochemistry of Fos protein and the mRNA expression of IL-6, TNF-Î±, IL-10, B1 and B2 kinin receptors were evaluated by Real time-PCR 6 h after venom injection. Photobiomodulation reversed Bmv-induced mechanical hyperalgesia and allodynia and decreased Fos expression, induced by Bmv as well as the mRNA levels of IL-6, TNF-Î± and B1 and B2 kinin receptors. Finally, an increase on IL-10, was observed following LLLT. CONCLUSION/SIGNIFICANCE: These data demonstrate that LLLT interferes with mechanisms involved in nociception and hyperalgesia and modulates Bmv-induced nociceptive signal. The use of photobiomodulation in reducing local pain induced by Bothropic venoms should be considered as a novel therapeutic tool for the treatment of local symptoms induced after bothropic snakebites. Analgesics;Cytokines;Interleukin-6;Kinins;Snake Venoms;Tumor Necrosis Factor-alpha;Interleukin-10 Analgesics;Animals;Bothrops;Cytokines;Female;Humans;Hyperalgesia;Interleukin-10;Interleukin-6;Kinins;Low-Level Light Therapy;Male;Mice;Neurons;Snake Bites;Snake Venoms;Tumor Necrosis Factor-alpha

Low Intensity laser therapy in patients with burning mouth syndrome: a randomized, placebo-controlled study. The aim of this study was to assess the effectiveness of low intensity laser therapy in patients with Burning Mouth Syndrome (BMS). Thirty BMS subjects were randomized into two groups - Laser (LG) and Placebo (CG). Seven patients dropped out, leaving 13 patients in LG and 10 patients in CG. Each patient received 4 irradiations (laser or placebo) twice a week, for two consecutive weeks (blinded to the type of irradiation received). Infrared laser (AsGaAl) irradiations were applied to the affected mucosa in scanning mode, wavelength of 790 nm, output power of 20

mW and fluence of 6 J/cm2. A visual analogue scale (VAS) was used to assess the therapeutic effect before and after each irradiation, and at all the control time periods: 7, 14, 30, 60 and 90 days after the last irradiation. One researcher delivered irradiation and another recorded the results. Both researchers were blinded, the first to the results, and the second to the type of radiation applied. The results were categorized according to the percentage of symptom level variation, and showed a statistically better response in LG in only two categories of the control checkpoints (p=0.02; Fisher's Exact Test). According to the protocol used in this study, low intensity laser therapy is as beneficial to patients with BMS as placebo treatment, indicating a great emotional component of involvement in BMS symptomatology. Nevertheless, there were positive results in some statistical analyses, thus encouraging further research in BMS laser therapy with other irradiation parameters. Adult;Aged;Aged, 80 and over;Burning Mouth Syndrome;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Placebo Effect;Radiation Dosage;Time Factors;Treatment Outcome;Visual Analog Scale

Spondylosis in a green moray eel, Gymnothorax funebris (Ranzani 1839), with swim bladder hyperinflation. Air Sacs;Animals;Eels;Fish Diseases;Low-Level Light Therapy;Spondylosis

Photobiomodulation therapy in the modulation of inflammatory mediators and bradykinin receptors in an experimental model of acute osteoarthritis. The objective of this study was to evaluate the effects of photobiomodulation therapy (PBMT) on inflammatory indicators, i.e., inflammatory mediators (TNF-Î± and CINC-1), and pain characterized by hyperalgesia and B1 and B2 receptor activation at 6, 24, and 48Â h after papain-induced osteoarthritis (OA) in rats. Fifty-four rats were subjected to hyperalgesia evaluations and then divided randomly into three groups-a control group and two groups OA and OA PBMT group by using laser parameters at wavelength (808Â nm), output power (50Â mW), energy per point (4 Joules), power density (1.78Â W/cm(2)), laser beam (0.028Â cm(2)), and energy density (144Â J/cm(2))-the induction of osteoarthritis was then performed with 20-Î¼l injections of a 4Â % papain solution dissolved in 10Â Î¼l of saline solution, to which 10Â Î¼l of cysteine solution (0.03Â M). The statistical analysis was performed using two-way ANOVA with Bonferroni's post hoc test for comparisons between the 6, 24, and 48Â h and team points within each group, and between the control, injury, and PBMT groups, and pâ€‰<â€‰0.05 was considered to indicate a significant difference. The hyperalgesia was evaluated at 6, 24, and 48Â h after the injury. PBMT at a wavelength of 808Â nm and doses of 4Â J, administered afterward, promotes increase at the threshold of pressure stimulus at 6, 24, and 48Â h after application and promote cytokine attenuation levels (TNF and CINC-1) and bradykinin receptor (B1 and B2) along the experimental period. We conclude that photobiomodulation therapy was able to promote the reduction of proinflammatory cytokines such as TNF-Î± and CINC-1, to reduce the gene and protein expression of the bradykinin receptor (B1 and B2), as well as increasing the stimulus response threshold of pressure in an experimental model of acute osteoarthritis. Chemokine CXCL1;Cxcl1 protein, rat;Inflammation Mediators;RNA, Messenger;Receptors, Bradykinin;Tumor Necrosis Factor-alpha Acute Disease;Animals;Chemokine CXCL1;Disease Models, Animal;Enzyme-Linked Immunosorbent Assay;Extremities;Gene Expression Regulation;Hyperalgesia;Inflammation Mediators;Low-Level Light Therapy;Male;Osteoarthritis;RNA, Messenger;Rats, Wistar;Real-Time Polymerase Chain Reaction;Receptors, Bradykinin;Tumor Necrosis Factor-alpha

Effects of photobiomodulation therapy, pharmacological therapy, and physical exercise as single and/or combined treatment on the inflammatory response induced by experimental osteoarthritis. Osteoarthritis (OA) triggers increased levels of inflammatory markers, including prostaglandin (PG) E(2) and proinflammatory cytokines. The elevation of cytokine levels is closely associated with increased articular tissue degeneration. Thus, the use of combination therapies may presumably be

able to enhance the effects on the modulation of inflammatory markers. The present study aimed to evaluate and compare the effects of photobiomodulation therapy (PBMT), physical exercise, and topical nonsteroidal anti-inflammatory drug (NSAID) use on the inflammatory process after they were applied either alone or in different combinations. OA was induced by intra-articular papain injection in the knee of rats. After 21Â days, the animals began treatment with a topical NSAID and/or with physical exercise and/or PBMT. Treatments were performed three times a week for eight consecutive weeks, totaling 24 therapy sessions. Analysis of real-time polymerase chain reaction (RT-PCR) gene expression; interleukin (IL)-1Î², IL-6, and tumor necrosis factor alpha (TNF-Î±) protein expression; and PGE(2) levels by enzyme-linked immunosorbent assay (ELISA) was conducted. Our results showed that PBMT alone and Exerc + PBMT significantly reduced IL-1Î² gene expression (pâ€‰<â€‰0.05) while no treatment changed both IL-6 and TNF-Î± gene expression. Treatment with NSAID alone, PBMT alone, Exerc + PBMT, and NSAID + PBMT reduced IL-1Î² protein expression (pâ€‰<â€‰0.05). All therapies significantly reduced IL-6 and TNF-Î± protein expression (pâ€‰<â€‰0.05) compared with the OA group. Similarly, all therapies, except Exerc, reduced the levels of PGE(2) (pâ€‰<â€‰0.05) compared with the OA group. The results from the present study indicate that treatment with PBMT is more effective in modulating the inflammatory process underlying OA when compared with the other therapies tested. Anti-Inflammatory Agents, Non-Steroidal;Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Dinoprostone Animals;Anti-Inflammatory Agents, Non-Steroidal;Combined Modality Therapy;Dinoprostone;Disease Models, Animal;Enzyme-Linked Immunosorbent Assay;Gene Expression Regulation;Humans;Inflammation;Interleukin-1beta;Interleukin-6;Knee Joint;Low-Level Light Therapy;Male;Osteoarthritis;Physical Conditioning, Animal;Rats, Wistar;Real-Time Polymerase Chain Reaction;Tumor Necrosis Factor-alpha

A randomized clinical trial comparing the efficacy of bite wafer and low level laser therapy in reducing pain following initial arch wire placement. Background and aims: This study aimed to evaluate the efficacy of ibuprofen, bite wafer and low power red and infrared lasers in orthodontic pain management. Subjects and methods: One hundred subjects were randomly assigned to 5 groups of 20 each. The patients in each group received one of the following treatments after the placement of fixed orthodontic appliances: 1. placebo medication, 2. ibuprofen, 3. bite wafer, 4. irradiation from a low level red laser (LLRL; 660 nm, 200 mW, 1 J/point, 6 points), 5. irradiation from a low level infrared laser (LLIL; 810 nm, 200 mW, 1 J/point, 6 points). A Visual Analogue Scale (VAS) was used to record pain intensity while chewing, biting, fitting front teeth, and fitting back teeth at 2 hours, 6 hours, bedtime, 24 hours, 2 days, 3 days and 7 days following arch wire placement. Results: Significant between-group differences were found in pain at chewing, biting, fitting front teeth and fitting back teeth at all time points ($p<0.001$). Generally, VAS scores in the LLIL, ibuprofen and bite wafer groups were close to each other and significantly lower than those in the LLRL and control groups ($p<0.05$), which showed comparable pain level at most intervals. The infrared laser group (LLIL) showed significantly lower pain than all other groups at some points over the experiment ($p<0.05$). Conclusions: A single irradiation from a low level infrared laser proved to be the best strategy for orthodontic pain control. Alternatively, chewing on a bite wafer could be recommended. These methods should be considered as suitable alternatives for ibuprofen in orthodontic patients.

Management of recurrent aphthous ulcers using low-level lasers: A systematic review. BACKGROUND AND OBJECTIVE: The exact etiology of recurrent aphthous ulcers (RAS) is unknown. The management of RAS is not always straightforward. The aim of this review is to critically analyze and summarize the clinical literature focusing on the management of aphthous ulcers using low-level lasers. MATERIALS AND METHODS: The Medline (PubMed), Web of Knowledge (ISI), Cochrane Central Register of Controlled Trials (CENTRAL) and Embase databases were searched electronically for studies published in last 20 years (1995-2015) using the keywords "recurrent aphthous stomatitis,"

"aphthous ulcers," and "laser." RESULTS: A total of 85 articles were found during the initial search; 76 studies were excluded for not fulfilling the criteria whereas nine studies were deemed suitable for this review. Among the included studies, two articles were case reports and seven were randomized clinical trials. Study design, sample size, type of intervention and control of each study were critically analyzed and summarized according to the CONSORT protocol. In majority of the patients, immediate pain relief and accelerated ulcer healing was observed following irradiation with lasers. CONCLUSIONS: Although various types of lasers have succeeded in providing immediate pain relief to patients, carbon dioxide (CO(2)) lasers have the unique advantage of requiring a short exposure time (5-10s). In order to ascertain the efficacy of laser for treating ulcers in the clinical setting, more clinical trials are required. Adult;Chronic Pain;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Randomized Controlled Trials as Topic;Stomatitis, Aphthous;Time Factors

Low-power laser irradiation in salivary glands reduces glycemia in streptozotocin-induced diabetic female rats. Low-power laser irradiation (LPLI) has been extensively employed to modulate inflammation in vitro and in vivo. Previous reports from our group indicated that LPLI might regulate glycemia in diabetic animals. Diabetes results in chronic hyperglycemia and therefore chronic inflammation by upregulation of inflammatory markers such as the high mobility group box 1 (HMGB1) protein. Thus this study aimed to analyze the LPLI effects upon blood glucose levels, plasma insulin and HMGB1 concentrations in a diabetes experimental rat model. Streptozotocin-induced diabetic rats were irradiated in the salivary glands area with a diode laser applied at 660Â nm, 70Â mW, 20Â J/cm(2) , 22.4Â J, with a spot area of 0.028Â cm(2) and its effects were evaluated. LPLI significantly reduced diabetic rat hyperglycemia, without changing insulin or HMGB1 plasma levels, but possibly by ameliorating the insulin resistance in these animals. These findings suggest that LPLI might have a systemic effect, but more studies are necessary to better understand its mechanisms. Fasting blood glucose measured by peroxidase-glucose oxidase (PGO) method (A), showing a reduction of diabetic animals glycemia after LPLI. LPLI probably reduced the hyperglycemia in diabetes by improving the insulin resistance in these animals (B). C nÂ =Â 10, CL nÂ =Â 10, D nÂ =Â 7 and DL nÂ =Â 8. Data are expressed as mean Â± SD; * P <Â 0.05 vs. respective control group; # PÂ <Â 0.05 vs. D group. Blood Glucose;HMGB1 Protein;Hbp1 protein, rat;Insulin;Streptozocin Animals;Blood Glucose;Diabetes Mellitus, Experimental;Female;HMGB1 Protein;Insulin;Insulin Resistance;Low-Level Light Therapy;Rats;Salivary Glands;Streptozocin

Evaluation of the improvement effect of laser acupuncture biostimulation in asthmatic children by exhaled inflammatory biomarker level of nitric oxide. Variable therapy of asthma is not sufficient yet to achieve good asthma control. Therapy decision requires serial investigations. Low-level laser acupuncture is a suitable non-invasive modality of complementary medicine. The exhaled breath condensate (EBC) is easy and useful to evaluate the efficacy of drugs or novel therapy. This study aimed to evaluate the effectiveness of low-level laser biostimulation of acupuncture points on asthma improvement in children. Forty-eight asthmatic children were subdivided into case (laser) group, which received 12 direct contact low-power laser acupuncture sessions (three sessions/week) on specific traditional Chinese acupuncture points for bronchial asthma, and control asthmatic group, which received sham laser acupuncture on the same acupoints and number of sessions of the case (laser) group. Low-power Multichannel Aculas-AM laser (grade II) of wave length 780Â nm, output power 800Â mw, and beam spot size 0.1Â cm(2) with continuous mode was used. Eighteen acupoints were stimulated for 2Â min, giving energy of 9.6Â J/cm(2)/acupoint. The total session time was 3Â min. Both groups were evaluated pre- and post-laser acupuncture intervention by recording levels of asthma control, pulmonary function, and EBC nitric oxide. In the case (laser) group, 91.7Â % of patients experienced an improvement in the level of asthma control versus 25Â % in the control group (pâ€‰<â€‰0.001). This was associated with a significant decrease of the breath condensate

FENO concentration (pâ€‰<â€‰0.001) and significant increase of spirometry parameters (pâ€‰<â€‰0.001) in the case (laser) group. Application of laser acupuncture treatment given with conventional therapy can effectively improve bronchial asthma more than prescription of medications alone could. Adrenal Cortex Hormones;Biomarkers;Inflammation Mediators;Nitric Oxide Acupuncture Therapy;Adrenal Cortex Hormones;Asthma;Biomarkers;Breath Tests;Case-Control Studies;Child;Demography;Exhalation;Female;Forced Expiratory Volume;Humans;Inflammation Mediators;Low-Level Light Therapy;Male;Nitric Oxide;Spirometry;Treatment Outcome;Vital Capacity

A randomized, open-label pilot of the combination of low-level laser therapy and lorcaserin for weight loss. BACKGROUND: Obesity is a significant public health problem and innovative treatments are needed. The purpose of this pilot study was to assess the preliminary efficacy and safety of a combined treatment of low-level laser therapy (LLLT) and lorcaserin on weight loss, health quality of life (QOL) measures, and cardiovascular risk factors. METHODS: Forty-five overweight and obese adult participants with a body mass index (BMI) >26.9 and <40 were randomized to receive LLLT, lorcaserin, or a combination of the two therapies. All study participants received treatment for 3Â months and were followed for 3Â months post-treatment. Participants were recruited from June 2014 through September 2014. RESULTS: The majority of the 44 participants accrued to this study were female (84Â %) with an average age of 43.9Â years (range 22 to 64Â years). Most participants (93Â % LLLT alone, 87Â % LLLTâ€‰+â€‰lorcaserin) completed at least 80Â % of the LLLT treatments. From baseline to end of treatment, significant reductions in waist circumference were noted for each treatment group (-2.3â€‰Â±â€‰4.1Â cm, -6.0â€‰Â±â€‰7.3Â cm, and -4.0â€‰Â±â€‰5.5Â cm for LLLT, lorcaserin and combination respectively); however, the reduction in body weight was only significant in those receiving lorcaserin and combination treatment (-0.4â€‰Â±â€‰1.5Â kg, -1.3â€‰Â±â€‰1.2Â kg and -1.3â€‰Â±â€‰1.3Â kg). No significant differences were noted between the groups. Self-reported satisfaction was higher in the lorcaserin versus the LLLT group. CONCLUSION: This small pilot demonstrates that when combined with behavioral intervention, Lorcaserin and LLLT may be effective components of a comprehensive approach to the treatment of overweight and obesity in the clinical setting. Further studies with larger sample size and longer duration of treatment and follow-up are needed to further address efficacy. TRIAL REGISTRY INFORMATION: Trial registration: NCT02129608. Registered June 15, 2014.

Wound-Healing potential of Sebastiania hispida (Mart.) Pax (Euphorbiaceae) ointment compared to low power laser in rats. Impaired wound healing represents a serious complication in some pathologies and the use of plant extracts has proved to improve tissue repair. The objectives of this study were to evaluate the healing potential of the ointment of Sebastiana hispida compared with Aluminum-Gallium Indium-Phosphide Laser (InGaAlP) in surgically induced wounds in rats and to perform the phytochemical analysis. The phytochemical analysis was performed in the classic way and also by HPLC. A controlled study was developed with 80 rats (200-250 g) in which a linear excision was performed in the dorsal region after shaving, measuring 2 cm Ã— 1 cm (epidermis and dermis) exposing the muscle fascia. The rats were randomly divided into four groups of twenty animals each. The experimental groups (n = 5) were G1 (Saline); G2 (crude methanol plant extract 2% + Carbopol Gel 98%); G3 (crude methanol plant extract 2% + lanolin/vaseline) and G4 (laser). The incision healing processes were monitored during 3, 7, 14 and until 21 days after excision. The histologic parameters evaluated were Collagen fiber types, microscopic examination and neovascularization. There was a significant increase in the deposition of collagen fibers, as evidenced by a better organized epithelial tissue, keratinized and showing greater proliferation of new blood vessels in the inflammatory phase in the group treated with both the extract and laser. The results were correlated to the phenolic derivatives found after qualitative and quantitative analysis. These compounds were considered

responsible for the healing process. The topical treatment with S. hispida leaves, in the two different formulations, was more effective than the application of the laser (Ingan ALP) 660 nm in the model used. Ointments;Plant Extracts Animals;Euphorbiaceae;Low-Level Light Therapy;Male;Ointments;Phytotherapy;Plant Extracts;Plant Leaves;Rats;Rats, Wistar;Wound Healing;Wounds, Penetrating

A randomized placebo-blind study of the effect of low power laser on pain caused by irreversible pulpitis. This randomized placebo-blind study aimed to evaluate the effect of laser phototherapy (LPT) on pain caused by symptomatic irreversible pulpitis (SIP). Sixty patients diagnosed with SIP were randomly assigned to treatment groups (nâ€‰=â€‰15): G1 (control), G2 (laser placebo-sham irradiation), G3 (laser irradiation at 780Â nm, 40Â mW, 4Â J/cm(2)), and G4 (laser irradiation at 780Â nm, 40Â mW, 40Â J/cm(2)). Spontaneous pain was recorded using a VAS score before (T0), immediately after (T1), and 15Â min after treatment (T2). Local anesthetics failure during emergency endodontic treatment was also assessed. There was no pain difference in T1 and T2 between the experimental laser groups (G3 and G4) and the placebo group (G2). The 4-J/cm(2) (G3) irradiation resulted in significant increase in the local anesthetics failure in lower jar teeth. This effect could be suggested as consequence of the LPT improvement in local circulation and vasodilatation that would result in the increase of local anesthetic agent absorption. The application of 780-nm diode laser irradiation, at 4 and 40Â J/cm(2), showed no effect in reducing the pain in SIP in comparison to the placebo group. The fluence of 4Â J/cm(2) showed a negative effect in local anesthetics, resulting in significant increase of complimentary local anesthesia during emergency endodontic treatment. This work provides evidence of the consequence of LPT application on teeth with symptomatic irreversible pulpitis. LPT should be avoided in teeth with pain due to irreversible pulpitis. Anesthetics, Local Adult;Anesthetics, Local;Double-Blind Method;Female;Humans;Lasers;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Pulpitis;Tooth

Low-level laser therapy with helium-neon laser improved viability of osteoporotic bone marrow-derived mesenchymal stem cells from ovariectomy-induced osteoporotic rats. The purpose of this study was to evaluate the influences of heliumâ€“neon (Heâ€“Ne) and infrared (IR) lasers on the viability and proliferation rate of healthy and ovariectomy-induced osteoporotic (OVX) bone marrow mesenchymal stem cells (BMMSCs) in vitro. MSCs harvested from the BM of healthy and OVX rats were culture expanded. Heâ€“Ne and IR lasers were applied three times at energy densities of 0.6, 1.2, and 2.4??J/cm2 for BMMSCs. BMMSCs viability and proliferation rate were evaluated by MTT assay on days 2, 4, 6, 14, and 21. The results showed that healthy BMMSCs responded optimally to 0.6??J/cm2 using an IR laser after three times of laser radiation. Moreover, it was found that OVX-BMMSCs responded optimally to 0.6??J/cm2 with Heâ€“Ne laser and one-time laser radiation. It is concluded that the low-level laser therapy (LLLT) effect depends on the physiological state of the BMMSCs, type of the laser, wavelength, and number of laser sessions. The biostimulation efficiency of LLLT also depends on the delivered energy density. LLLT can enhance the viability and proliferation rate of healthy and especially osteoporotic autologous BMMSCs, which could be very useful in regenerative medicine.

Safety and efficacy of a novel diffractive lens array using a picosecond 755â€‰nm alexandrite laser for treatment of wrinkles. INTRODUCTION: Picosecond lasers have been reported to be effective for removal of tattoo pigment. This prospective study evaluated the efficacy and safety of the treatment of peri-oral and -ocular wrinkles using a novel diffractive lens array coupled with a picosecond 755â€‰nm alexandrite laser. METHODS: Forty female subjects presenting with wrinkles from photodamage were enrolled in an IRB approved study. Subjects received four picosecond diffractive lens array treatments to the full face at 1 month intervals. Six subjects were biopsied (two subjects at 1 month, two subjects at 3 months, and two subjects at 6 months). Digital photographic

images were taken at 1, 3, and 6 months post-final treatment visits. Images were graded by blinded physicians for fine lines/wrinkles, erythema, dyschromia, and global improvement. Data on discomfort level, satisfaction, and side effects were recorded. RESULTS: Overall blinded physician rated global improvement ranged from improved to much improved at 1-, 3-, and 6-month time points. At baseline the average Fitzpatrick wrinkle score was 5.48. At the 6-month follow-up the average score was 3.47. The overall average change in score from pre-treatment to post-treatment was 1.97. Subject self-assessment at 6 months indicated that 90% of subjects were extremely or satisfied with their results. Unanticipated adverse events were absent with anticipated post-treatment erythema lasting for just several hours. CONCLUSIONS: A novel diffractive lens array used with a picosecond 755â€‰nm alexandrite laser for treatment of wrinkles is highly effective and safe for wrinkles and other signs of photoaging. Lasers Surg. Med. 49:40-44, 2017. Â© 2016 The Authors. Lasers in Surgery and Medicine Published by Wiley Periodicals, Inc.
Adult;Esthetics;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Risk Assessment;Single-Blind Method;Skin Aging;Treatment Outcome

Effects of diode laser (980Â nm) on orthodontic tooth movement and interleukin 6 levels in gingival crevicular fluid in female subjects. The aim of this study was to evaluate the effects of low-level laser irradiation on the rate of orthodontic tooth movement (OTM) and the interleukin-6 (IL-6) concentration in gingival crevicular fluid (GCF) during orthodontic treatment. In this randomized split-mouth double blind clinical trial, 11 female patients aged 14 to 25Â years (mean 19â€‰Â±â€‰4.21Â year), who required canine retraction following four first premolars extraction, were selected. The GaAlAs laser diode laser (A.R.C. Laser GmbH, NÃ¼rnberg, Germany) (980Â nm, 100Â mW, 5.6Â J/cm(2), three points from the buccal side and three from lingual side of the tooth, 56Â s, running in continuous mode) was used for canine retraction in only one maxillary quadrant (LG). The irradiation time for each cervical and middle third of the tooth was 10Â s, and 8Â s for the apical third of the tooth. The other maxillary quadrant served as the control group (CG) using the laser pseudo-application in this side. The laser irradiation was applied on days 0, 7, 14, 21, and 28 of each month during the canine retraction phase. Canine retraction was done using closed coil spring with 150Â g force on rectangular wires after the alignment and leveling. This study was done in 11Â months. Dental casts were made at different time points during the treatment, and the amount of tooth movement was measured. To evaluate the levels of IL-6, GCF samples were collected from the distal side of the maxillary canine teeth on both quadrants at the beginning of the trial, the end of aligning phase, and on day 21 of each month during canine retraction. Although the mean rate of canine retraction was higher in the LG (0.013) than the CG (0.012) and there was definitely a tendency for more canine retraction in the LLLI, but the results failed to show any significant difference between the mean rate of canine retraction of both groups (Pâ€‰=â€‰0.068). A paired t test showed that there was no significant difference in the mean concentration of IL-6 at various stages of the treatment between the groups during canine distalization (Pâ€‰>â€‰0.05). Therefore, conclusive evidence could not be provided to support the efficacy of the diode laser (980Â nm) in accelerating OTM in female subject. Interleukin-6 Adolescent;Adult;Double-Blind Method;Female;Germany;Gingival Crevicular Fluid;Humans;Interleukin-6;Lasers, Semiconductor;Tooth Movement Techniques;Young Adult

Low-level laser therapy and Calendula officinalis in repairing diabetic foot ulcers. OBJECTIVE: To evaluate the effects of low-level laser therapy isolated and associated with Calendula officinalis oil in treating diabetic foot ulcers. METHOD: An experimental, randomized, controlled, prospective, interventional clinical case study using a quantitative approach. The sample consisted of 32 diabetic patients of both genders. Participants were randomly divided into four groups. Doppler Ultrasound

evaluation of the Ankle-Brachial Index, brief pain inventory and analog pain scale were performed at baseline and after 30 days. RESULTS: Reduced pain was observed in the Low-level laser therapy and Low-level laser therapy associated with Essential Fatty Acids groups (p<0.01). Regarding the Ankle-Brachial Index and Doppler Ultrasound, all groups remained stable. By analyzing lesion area reduction, Low-level laser therapy associated with Essential fatty acids group showed a significance of p=0.0032, and the Low-level laser therapy group showed p=0.0428. CONCLUSION: Low-level laser therapy, performed alone or associated with the Calendula officinalis oil was effective in relieving pain and accelerating the tissue repair process of diabetic foot. OBJETIVO: Avaliar os efeitos da Terapia a Laser de Baixa Intensidade isolada e associada ao Ã³leo de Calendula officinalis no reparo de Ãºlceras em pÃ© diabÃ©tico. MÃ‰TODO: Estudo de caso clÃ-nico, experimental, controlado, randomizado, prospectivo, intervencional, de carÃ¡ter quantitativo. A amostra foi composta de 32 pacientes diabÃ©ticos, de ambos os gÃªneros. Os participantes foram distribuÃ-dos aleatoriamente em quatro grupos. Ultrassom Doppler, avaliaÃ§Ã£o do Ã•ndice Tornozelo-Braquial, InventÃ¡rio breve de dor e escala de dor analÃ³gica foram realizados no inÃ-cio e apÃ³s 30 dias. RESULTADOS: Houve reduÃ§Ã£o da dor nos grupos Terapia a Laser de Baixa Intensidade e Terapia a Laser de Baixa intensidade associada aos Ã•cidos Graxos Essenciais, com p<0,01. Quanto ao Ã•ndice Tornozelo-Braquial e Ultrassom Doppler, todos os grupos mantiveram-se estÃ¡veis. Na anÃ¡lise da reduÃ§Ã£o de Ã¡rea da lesÃ£o, o grupo Terapia a Laser de Baixa Intensidade associada aos Ã•cidos Graxos Essenciais apresentou uma significÃ¢ncia p=0,0032, e o grupo Terapia a Laser de Baixa Intensidade, p=0,0428. CONCLUSÃƒO: A Terapia a Laser de Baixa Intensidade, realizada tanto isoladamente quanto associada ao Ã³leo de Calendula officinalis, foi eficaz no alÃ-vio da dor e na aceleraÃ§Ã£o do processo de reparo tecidual de pÃ© diabÃ©tico. Plant Oils Adult;Aged;Calendula;Combined Modality Therapy;Diabetic Foot;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Phytotherapy;Plant Oils;Prospective Studies;Wound Healing

Effects of low-level laser therapy and epidermal growth factor on the activities of gingival fibroblasts obtained from young or elderly individuals. This study evaluated the effects of low-level laser therapy (LLLT) and epidermal growth factor (EGF) on fibroblasts obtained from young and elderly individuals. Gingival fibroblasts from young (Y) and elderly (E) individuals were seeded in wells of 24-well plates with Dulbecco's modified Eagle's medium (DMEM) containing 10Â % of fetal bovine serum (FBS). After 24Â h, the cells were irradiated (LASERTable-InGaAsP-780â€‰Â±â€‰3Â nm, 25Â mW, 3Â J/cm(2)) or exposed to EGF (100Â Î¼M). After 72Â h, cells were evaluated for viability, migration, collagen and vascular endothelial growth factor (VEGF) synthesis, and gene expression of growth factors. Data were analyzed by Kruskal-Wallis and Mann-Whitney tests (Î±â€‰=â€‰5Â %). Y and E fibroblasts irradiated with laser or exposed to EGF showed increased viability and collagen synthesis. Enhanced cell migration was observed for Y fibroblasts after both treatments, whereas only the LLLT stimulated migration of E cells. VEGF synthesis was higher for Y and E cells exposed to EGF, while this synthesis was reduced when E fibroblasts were irradiated. Increased gene expression of VEGF was observed only for Y and E fibroblasts treated with LLLT. Regardless of a patient's age, the LLLT and EGF applications can biostimulate gingival fibroblast functions involved in tissue repair. Vascular Endothelial Growth Factor A;Collagen Adolescent;Adult;Aged;Animals;Cell Movement;Cell Survival;Cells, Cultured;Collagen;Fibroblasts;Gene Expression Regulation;Gingiva;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Vascular Endothelial Growth Factor A;Young Adult

Gene expression profiling reveals aryl hydrocarbon receptor as a possible target for photobiomodulation when using blue light. Photobiomodulation (PBM) with blue light induces a biphasic dose response curve in proliferation of immortalized human keratinocytes (HaCaT), with a maximum anti-proliferative effect reached with 30min (41.4â€‰J/cm2). The aim of this study was to test the photobiomodulatory effect of 41.4â€‰J/cm2 blue light irradiation on ROS production,

apoptosis and gene expression at different time points after irradiation of HaCaT cells in vitro and assess its safety. ROS concentration was increased 30â€‰min after irradiation. However, already 1â€‰h after irradiation, cells were able to reduce ROS and balance the concentration to a normal level. The sudden increase in ROS did not damage the cells, which was demonstrated with FACS analysis where HaCaT cells did not show any sign of apoptosis after blue light irradiation. Furthermore, a time course could be seen in gene expression analysis after blue light, with an early response of stimulated genes already 1â€‰h after blue light irradiation, leading to the discovery of the aryl hydrocarbon receptor as possible target for blue light irradiation.

Medication-Related Osteonecrosis of Jaws: A Low-Level Laser Therapy and Antimicrobial Photodynamic Therapy Case Approach. Medication-related osteonecrosis of the jaws (MRONJ) can be considered an inability of the alveolar bone to respond to an injury, which frequently leads to severe local and systemic complications. Once the problem is installed, dentist must use all therapeutic approaches recommended. This manuscript reports a successful management of MRONJ handled with antibiotics, conservative debridement, low-level laser therapy (LLLT), and photodynamic therapy (PDT) up to 12 months. As healing of MRONJ may be very slow, combined therapeutic approaches are required. Besides the recommended conventional treatment protocol, LLLT and PDT are important tools to contribute to healing and improvement of patient's quality of life.

Skin photorejuvenation effects of light-emitting diodes (LEDs): a comparative study of yellow and red LEDs inÂ vitro and inÂ vivo. BACKGROUND: Red-coloured light-emitting diodes (LEDs) can improve skin photorejuvenation and regeneration by increasing cellular metabolic activity. AIM: To evaluate the effectiveness of visible LEDs with specific wavelengths for skin photorejuvenation inÂ vitro and inÂ vivo. METHODS: Normal human dermal fibroblasts (HDFs) from neonatal foreskin were cultured and irradiated inÂ vitro by LEDs at different wavelengths (410-850Â nm) and doses (0-10Â J/cm(2)). In vivo experiments were performed on the skin of hairless mice. Expression of collagen (COL) and matrix metalloproteinases (MMPs) was evaluated by semi-quantitative reverse transcription PCR (semi-qRT-PCR), western blotting and a procollagen type I C-peptide enzyme immunoassay (EIA). Haematoxylin and eosin and Masson trichrome stains were performed to evaluate histological changes. RESULTS: In HDFs, COL I was upregulated and MMP-1 was downregulated in response to LED irradiation at 595Â Â±Â 2 and 630Â Â±Â 8Â nm. In the EIA, a peak result was achieved at a dose of 5Â J/cm(2) with LED at 595Â Â±Â 2Â nm. In vivo, COL I synthesis was upregulated in a dose-dependent manner to both 595 and 630Â nm LED irradiation, and this effect was prolonged to 21Â days after a single irradiation with a dose of 100Â J/cm(2) . These histological changes were consistent with the results of semi-qRT-PCR and western blots. CONCLUSION: Specific LED treatment with 595Â Â±Â 2 and 630Â Â±Â 8Â nm irradiation was able to modulate COL and MMPs in skin, with the effects persisting for at least 21Â days after irradiation. These findings suggest that yellow and red LEDs might be useful tools for skin photorejuvenation. Fibrillar Collagens;Procollagen;Matrix Metalloproteinases Animals;Cell Survival;Dermis;Female;Fibrillar Collagens;Fibroblasts;Humans;Low-Level Light Therapy;Matrix Metalloproteinases;Mice;Mice, Hairless;Procollagen

Calcium Pyrophosphate Dihydrate Crystal Deposition Disease Simulating Osteoarthrosis of the Knee: A Case Report. OBJECTIVE: The purpose of this case report is to describe a case where calcium pyrophosphate dehydrate crystal deposition disease (CPPD) simulated osteoarthritis of the knee. CLINICAL FEATURES: A 78-year-old woman had a 2-week history of severe right knee pain accompanied by mild swelling. The onset was sudden and did not involve a history of trauma or previous injury to the right knee. Inspection and palpation revealed pain along the medial joint line and marked difficulty ambulating. Results of Lachman's test, anterior drawer test, and posterior sag sign were negative upon orthopedic assessment. Diagnostic imaging was performed and showed

degenerative changes with diffuse calcification of the fibrocartilage and hyaline articular cartilage within the knee joint and the medial collateral ligament consistent with the appearance of CPPD crystal deposition. INTERVENTION AND OUTCOME: Low-level laser therapy was performed to the affected medial joint line of the knee, and knee stabilization exercises were given. Lower Extremity Function Scale changed from 34% to 60% after 4 weeks of care. CONCLUSION: Although knee osteoarthritis is much more common than knee CPPD, it is important to consider both diagnoses in elderly patients who present with unilateral knee pain. Diagnosis should be based on clinical presentation, history, and radiographic or histological means to ensure accuracy and proper diagnosis.

Engineering A11 Minibody-Conjugated, Polypeptide-Based Gold Nanoshells for Prostate Stem Cell Antigen (PSCA)-Targeted Photothermal Therapy. Currently, there is no curative treatment for advanced metastatic prostate cancer, and options, such as chemotherapy, are often nonspecific, harming healthy cells and resulting in severe side effects. Attaching targeting ligands to agents used in anticancer therapies has been shown to improve efficacy and reduce nonspecific toxicity. Furthermore, the use of triggered therapies can enable spatial and temporal control over the treatment. Here, we combined an engineered prostate cancer-specific targeting ligand, the A11 minibody, with a novel photothermal therapy agent, polypeptide-based gold nanoshells, which generate heat in response to near-infrared light. We show that the A11 minibody strongly binds to the prostate stem cell antigen that is overexpressed on the surface of metastatic prostate cancer cells. Compared to nonconjugated gold nanoshells, our A11 minibody-conjugated gold nanoshell exhibited significant laser-induced, localized killing of prostate cancer cells in vitro. In addition, we improved upon a comprehensive heat transfer mathematical model that was previously developed by our laboratory. By relaxing some of the assumptions of our earlier model, we were able to generate more accurate predictions for this particular study. Our experimental and theoretical results demonstrate the potential of our novel minibody-conjugated gold nanoshells for metastatic prostate cancer therapy. Antigens, Neoplasm;GPI-Linked Proteins;Immunoglobulins;Neoplasm Proteins;PSCA protein, human;Gold Antigens, Neoplasm;Cell Line, Tumor;Cell Survival;Convection;GPI-Linked Proteins;Gold;Humans;Hyperthermia, Induced;Immunoglobulins;Infrared Rays;Low-Level Light Therapy;Male;Models, Biological;Models, Theoretical;Molecular Targeted Therapy;Nanoshells;Neoplasm Proteins;Phototherapy;Prostatic Neoplasms;Surface Plasmon Resonance

Comparative study of shock wave therapy and Laser therapy effect in elimination of symptoms among patients with myofascial pain syndrome in upper trapezius. BACKGROUND: The aim of this study is to compare the effects of laser therapy and shock wave therapy for symptoms treatment among patients with MPS in the upper trapezius muscle. MATERIALS AND METHODS: In a clinical trial study, 46 patients were selected based on the clinical criteria and physiathrist diagnosis. Subjects were randomized into two groups as follows: Twenty individuals were assigned to exercise-medication-laser therapy group, and 26 to exercise-medication-shock wave therapy group. The pain was assessed based on visual analog scale (VAS), neck disability index (NDI), and SPADI in three stages: Before treatment, subsequently after treatment, and a month after treatment. RESULTS: One man and 19 women, age group of 45.3 Â± 7.7 years, were assigned into laser therapy group. Two men and 24 women, average age group of 42.3 Â± 10.4 were assigned into shock wave therapy group. A significant difference was found among our study groups before treatment and after starting treatment for VAS, NDI, and SPDI indices, that is, two methods of treatments were effective ($P < 0.001$). However, among these two treatment methods, laser therapy provided higher effect on VAS and NDI as compared to the radial shock wave method ($P < 0.05$) in 2 weeks from starting the treatment (consequent to treatment). CONCLUSION: According to this study results, we can conclude

that shock wave and laser therapy results on similar effect in long-term for relieve of pain and eliminating symptoms in patients with myofascial but laser provides a faster optimal results.

Photobiomodulation therapy in the management of chronic oral graft-versus-host disease. AIM: Patients treated with allogeneic hematopoietic stem cell transplantation (HSCT) may experience oral complications associated with chronic graft-versus-host disease (cGVHD). These complications may significantly affect quality of life, even many years post-HSCT. Current treatment options for oral cGVHD are limited and often include steroid or other immunomodulatory medications, which may not adequately control the oral condition. A non-immunosuppressive intervention for symptomatic relief in oral cGVHD would thus be a welcome addition to the treatment paradigm. MATERIALS AND METHODS: We report seven cases of oral cGVHD that were treated with photobiomodulation therapy (PBM), previously known as low-level laser therapy (LLLT). Patients underwent at least two PBM treatments per week in addition to local treatment with steroids, and if on systemic therapies, these were either unchanged or dosage was reduced during the period of PBM therapy. Follow-up data is presented for 4Â weeks of treatment. RESULTS: Oral pain, sensitivity, and dry mouth improved in most patients. These findings suggest PBM therapy may represent an additional approach for management of oral cGVHD, and suggest that controlled studies should be conducted to confirm the efficacy and safety of PBM therapy in oral cGVHD and to determine optimal PBM therapy protocols. Adolescent;Adult;Aged;Chronic Disease;Female;Graft vs Host Disease;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Male;Middle Aged;Transplantation Conditioning;Transplantation, Homologous

Effects of low-level laser therapy applied before or after plyometric exercise on muscle damage markers: randomized, double-blind, placebo-controlled trial. Promising effects of phototherapy on markers of exercise-induced muscle damage has been already demonstrated in constant load or isokinetic protocols. However, its effects on more functional situations, such as plyometric exercises, and when is the best moment to apply this treatment (pre- or post-exercise) remain unclear. Therefore, the purpose of this study was to investigate the effect of low-level laser therapy (LLLT) before or after plyometric exercise on quadriceps muscle damage markers. A randomized, double-blinded, placebo-controlled trial was conducted with 24 healthy men, 12 at pre-exercise treatment group and 12 at post-exercise treatment group. Placebo and LLLT (810Â nm, 200Â mW per diode, 6Â J per diode, 240Â J per leg) were randomly applied on right/left knee extensor muscles of each volunteer before/after a plyometric exercise protocol. Muscular echo intensity (ultrasonography images), soreness (visual analogue scale -Â VAS), and strength impairment (maximal voluntary contraction -Â MVC) were assessed at baseline, 24, 48, and 72Â h post-exercise. Legs treated with LLLT before or after exercise presented significantly smaller increments of echo intensity (values up to 1Â %) compared to placebo treatments (increased up to âˆ¼7Â %). No significant treatment effect was found for VAS and MVC, although a trend toward better results on LLLT legs have been found for VAS (mean values up to 30Â % lesser than placebo leg). In conclusion, LLLT applied before or after plyometric exercise reduces the muscle echo intensity response and possibly attenuates the muscle soreness. However, these positive results were not observed on strength impairment. Biomarkers Adolescent;Adult;Biomarkers;Double-Blind Method;Exercise;Humans;Leg;Low-Level Light Therapy;Male;Muscle Fatigue;Plyometric Exercise;Quadriceps Muscle;Young Adult

Low-level laser therapy: Case-control study in dogs with sterile pyogranulomatous pododermatitis. AIM: Low-level laser therapy (LLLT) is a therapeutic photobiostimulation with properties in reducing swelling, inflammation, and promoting tissue healing. The objective of this pilot study was to evaluate LLLT in sterile pyogranulomatous pododermatitis in five dogs. MATERIALS AND METHODS: In each dog, one lesion was designated as the control (treated with a 0.0584% hydrocortisone aceponate spray), and one or more other lesions were treated with a gallium aluminum arsenide-laser, daily for

5 days. Lesions were scored before treatment (D0), at the end (D4), 16 days after the last laser treatment (D20), and after 2 months (D65). RESULTS: Comparing the treated lesion group with the control lesion group, the clinical score was similar at D0, whereas there was a statistically significant difference at D4 and D20; in the treated group over time, there was a statistically significant improvement between D0, D4, and D20. Lesion recurrence was absent in more than 50% of the treated lesions at D65. No adverse reactions were reported. CONCLUSION: Given the positive results of this first clinical study, it would be interesting to extend the study to confirm the validity of this type of therapy in sterile pyogranulomatous pododermatitis in the dog.

Photobiomodulation (blue and green light) encourages osteoblastic-differentiation of human adipose-derived stem cells: role of intracellular calcium and light-gated ion channels. Human adipose-derived stem cells (hASCs) have the potential to differentiate into several different cell types including osteoblasts. Photobiomodulation (PBM) or low level laser therapy (LLLT) using red or near-infrared wavelengths has been reported to have effects on both proliferation and osteogenic differentiation of stem cells. We examined the effects of delivering four different wavelengths (420â€‰nm, 540â€‰nm, 660â€‰nm, 810â€‰nm) at the same dose (3â€‰J/cm(2)) five times (every two days) on hASCs cultured in osteogenic medium over three weeks. We measured expression of the following transcription factors by RT-PCR: RUNX2, osterix, and the osteoblast protein, osteocalcin. The 420â€‰nm and 540â€‰nm wavelengths were more effective in stimulating osteoblast differentiation compared to 660â€‰nm and 810â€‰nm. Intracellular calcium was higher after 420â€‰nm and 540â€‰nm, and could be inhibited by capsazepine and SKF96365, which also inhibited osteogenic differentiation. We hypothesize that activation of light-gated calcium ion channels by blue and green light could explain our results. Antigens, Differentiation;Ion Channels;Calcium Adipose Tissue;Antigens, Differentiation;Calcium;Cell Differentiation;Humans;Ion Channel Gating;Ion Channels;Lasers;Light;Osteoblasts;Stem Cells

Analysis of photobiomodulation associated or not with platelet-rich plasma on repair of muscle tissue by Raman spectroscopy. Treatment of muscle injuries usually results in the interruption of sports practice; thus, studies aimed at accelerating the return to activity, with proper tissue repair, are important. Therefore, this study aimed to evaluate the effects of photobiomodulation (PBM), associated or not with platelet-rich plasma (PRP), on the treatment of muscle injury. Thirty-five animals were used and divided into five groups (nâ€‰=â€‰7): control (C), control lesion (CL), lesion treated with low-level laser therapy (LLLT) (LLt), lesion treated with PRP (LP), and lesion treated with both techniques, LLLT and PRP (LLtP). Muscle injury was induced by stretching the gastrocnemius muscle, and the animals in the LLtP and LP groups received the application of PRP immediately following the injury. The LLLT was applied daily for 7Â days. The animals were euthanized 7Â days after the injury. Analysis of the NADH/NAD ratio and collagen was performed by Raman spectroscopy; in addition to which, histological analysis of the gastrocnemius muscle was performed. The LLtP group demonstrated a reduction in the area of injury, regenerating cells and a healthy appearance of muscle fibers. The Raman analyses showed a reduction in the NADH/NAD ratio in the CL group, demonstrating oxidative stress, and the collagen presented a reduction in the CL and LLt groups, when compared with the C group. It is concluded that either PBM or PRP, and the association of both, was able to reduce the oxidative stress promoted by injury and modulate collagen production at the site of the injury. Furthermore, although both treatments individually were effective for repairing the damage caused by muscle injury, the association of both demonstrated a better histological aspect. Collagen Animals;Collagen;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxidative Stress;Platelet-Rich Plasma;Rats;Rats, Wistar;Spectrum Analysis, Raman;Wound Healing

Low-intensity laser (660Â nm) on sternotomy healing in patients who underwent coronary artery bypass graft: a randomized, double-blind study. The aim of this study was to analyze the healing effects of low-level laser therapy (LLLT) on the longitudinal sternotomy incisions of patients who underwent coronary artery bypass graft (CABG). The volunteers were randomized into three groups of equal size (nâ€‰=â€‰30): control, placebo, and laser (Î»â€‰=â€‰660Â nm and spatial average energy fluency [SAEF]â€‰=â€‰1.06Â J/cm(2)). The patients in the laser group underwent irradiation on postoperative days 2, 4, 6, and 8, and their sternotomy incisions were photographed immediately after the surgery and 8Â days later for analysis. Three researchers who were blinded to the patient treatment groups analyzed the incision photographs to assess hyperemia and wound closure on the day of hospital discharge (eighth postoperative day). The sternotomy incisions in the LLLT group demonstrated less hyperemia, incisional bleeding, and dehiscence (pâ€‰â‰¤â€‰0.005).
Aged;Coronary Artery Bypass;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Sternotomy;Wound Healing

Effect of low-level laser therapy on angiogenesis and matrix metalloproteinase-2 immunoexpression in wound repair. Low-level laser therapy (LLLT) induces anti-inflammatory and angiogenic activities in wound healing. However, the mechanism of action and optimal parameters require further clarification. In this study, we investigated the effects of LLLT on wound healing matrix metalloproteinase (MMP)-2 immunoexpression and angiogenic processes. Twenty female Wistar rats were randomly divided into four groups (nâ€‰=â€‰5) according to the treatments as follows. CG7 and CG14 were control groups at days 7 and 14, respectively, which received physiological saline (0.9Â % NaCl daily). LG7 and LG14 were laser therapy groups at days 7 and 14, respectively, which received two (LG7) or four (LG14) LLLT applications (40Â mW; 660Â nm; 4Â J/cm(2)). A dorsal skin sample in the wound area (measuring 2Â cm(2)) was removed after the experimental period, and then the animals were euthanized. The specimens were processed for qualitative and quantitative histological analyses and measurement of MMP-2 expression in the dermis and epidermis. A persistent crust and moderate number of inflammatory cells were found in CG7 and CG14 groups. In the LG14 group, wounds demonstrated complete re-epithelization at the remodeling phase. Angiogenesis and MMP-2 expression were higher in LLLT-treated groups, particularly the LG14 group, which correlated according to the Spearman correlation test. LLLT improves wound healing by enhancing neocollagenesis, increasing the amount of new vessels formed in the tissue (neoangiogenesis), and modulating MMP-2 expression. Epidermal overexpression of MMP-2 was correlated to angiogenic processes. Matrix Metalloproteinase 2
Animals;Dermis;Epidermis;Female;Immunohistochemistry;Low-Level Light Therapy;Matrix Metalloproteinase 2;Neovascularization, Physiologic;Rats, Wistar;Wound Healing

The chemokines secretion and the oxidative stress are targets of low-level laser therapy in allergic lung inflammation. Recent studies show that low-level laser therapy (LLLT) has an important anti-inflammatory action in acute lung inflammation. The present work explored if laser therapy is able to antagonize eosinophils and allergic inflammation induced by oxidative stress in Balb/c mice. Forty-eight hours after challenge, the leukocyte counting, ROS and nitrite/nitrate level, RANTES, CCL3, CCL8 as well as eotaxins were measured in the bronchoalveolar lavage fluid (BALF) of laser-treated mice or not. Into the lung, some chemokines receptors, the iNOS activity and mRNA expression, and the activities of superoxide dismutase (SOD), catalase, gluthatione, NADPH oxidase activities and thiobarbituric acid reactive species (T-Bars) were measured. Laser-treated allergic mice presented reduction of both the ICAM-1 and eosinophil in the lungs. RANTES, CCL8, CCL3 and eotaxins were reduced in BALF of laser-treated allergic mice. In allergic mice lung LLLT decreased the CCR1 and CCR3 and restored the oxidative stress balance as well. Laser decreased the lipidic peroxidation in allergic mice lung as much as increased SOD, GPx and GR. It shows that LLLT on allergic lung inflammation

involves leukocyte-attractant chemokines and endogenous antioxidant. Based on results, LLLT may ultimately become a non- invasive option in allergic lung disease treatment. The top figure illustrates the laser decreasing the eosinophils migration into BALF and the bottom figure shows the laser upregulating the expression of heme-oxygenase (anti-oxidant enzyme) in lung tissue anti-oxidant. Chemokines Animals;Asthma;Chemokines;Inflammation;Low-Level Light Therapy;Lung;Mice;Mice, Inbred BALB C;Oxidative Stress
Photobiomodulation therapy reduces apoptotic factors and increases glutathione levels in a neuropathic pain model. Neuropathic pain (NP) is caused by damage to the nervous system due to reactive oxygen spices (ROS) increase, antioxidants reduction, ATP production imbalance, and induction of apoptosis. In this investigation, we applied low-level laser 660Â nm (photobiomodulation therapy) as a new strategy to modulate pain. In order to study the effects of photobiomodulation therapy (660Â nm) on NP, chronic constriction injury (CCI) model was selected. Low-level laser of 660Â nm was used for 2Â weeks. Thermal and mechanical hyperalgesia were measured before and after surgery on days 7 and 14, respectively. Paw withdrawal thresholds were also evaluated. Expression of p2x3, Bax, and bcl2 protein was measured by western blotting. The amount of glutathione (GSH) was measured in the spinal cord by continuous spectrophotometric rate determination method. The results are presented as meanâ€‰Â±â€‰SD. Statistical analysis of data was carried out using SPSS 21. CCI decreased the pain threshold, 2-week photobiomodulation therapy significantly increased mechanical and thermal threshold, decreased P2X3 expression (pâ€‰<â€‰0.001), and increased bcl2 expression (pâ€‰<â€‰0.01), but it was not effective on the Bax expression. We speculated that although photobiomodulation therapy increased ROS generation, it increased antioxidants such as GSH. Increase in bcl2 is another mitochondrial protection mechanism for cell survival and that pain relief and decrease in P2X3 expression confirm it. Glutathione Animals;Glutathione;Low-Level Light Therapy;Neuralgia;Pain Management;Pain Threshold;Rats;Single-Blind Method;Spinal Cord
Low-level laser therapy reduces the fatigue index in the ankle plantar flexors of healthy subjects. Low-level laser therapy (LLLT) has been suggested as a resource capable of increasing resistance to fatigue and enhancing muscle performance through its metabolic and photochemical effects. This study evaluated the immediate effects of the application of LLLT on neuromuscular performance of the plantar ankle flexors in healthy subjects through a fatigue-induced protocol. This is a randomized controlled clinical trial, attended by 60 young and physically active volunteers of both genders. The subjects were randomly assigned into three groups, control, placebo, and laser, and underwent a preliminary evaluation of the isokinetic performance of plantar flexors and electromyographic activity of the soleus muscle to ensure homogeneity between groups. After the application of the respective intervention protocols, participants were induced to fatigue by performing 100 isokinetic concentric contractions of ankle plantar flexors at a speed of 90Â°/s. The dynamometric fatigue index (DFI) and median frequency were recorded during the fatigue protocol for comparison between groups. The group receiving the laser application showed significantly lower dynamometric fatigue index (pâ€‰=â€‰0.036) when compared to control and placebo groups. In relation to the median frequency during the fatigue test, there was a decrease in all groups, however with no differences between them. We suggest that LLLT being applied prior to exercise can reduce the fatigue index in the ankle plantar flexors of healthy subjects. Adult;Ankle;Exercise;Female;Foot;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Young Adult
Increase in the nitric oxide release without changes in cell viability of macrophages after laser therapy with 660 and 808Â nm lasers. The aim of this study was to evaluate the influence of low-level laser therapy (LLLT) with different parameters and wavelengths on nitric oxide (NO) release and cell viability. Irradiation was performed with Ga-Al-As laser, continuous mode and wavelengths of 660

and 808Â nm at different energy and power densities. For each wavelength, powers of 30, 50, and 100Â mW and times of 10, 30, and 60Â s were used. NO release was measured using Griess reaction, and cell viability was evaluated by mitochondrial reduction of bromide 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) to formazan. LLLT promoted statistically significant changes in NO release and MTT value only at the wavelength of 660Â nm (pâ€‰<â€‰0.05). LLLT also promoted an increase in the NO release and cell viability when the energy densities 64 (pâ€‰=â€‰0.04) and 214Â J/cm(2) (pâ€‰=â€‰0.012), respectively, were used. LLLT has a significant impact on NO release without affecting cell viability, but the significance of these findings in the inflammatory response needs to be further studied. Nitric Oxide Cell Survival;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Macrophages;Nitric Oxide

Photobiomodulation reduces abdominal adipose tissue inflammatory infiltrate of diet-induced obese and hyperglycemic mice. Systemic inflammation is closely related to the development of insulin resistance and type-2 diabetes, since the activation of pro-inflammatory pathways leads to inhibition of insulin signaling. Although photobiomodulation (PBM) has proven beneficial effects on the treatment of inflammatory disorders, the phototherapeutic approach to manage the chronic inflammatory component of obesity and hyperglycemia had never been explored. In this work, obese and hyperglycemic mice are treated with PBM, and their body mass, glycemia and inflammatory infiltrate of abdominal adipose tissue are evaluated. During four weeks, irradiated animals are exposed to six irradiation sessions using an 843Â nm LED (5.7Â JÂ cm(-2) at 19Â mWÂ cm(-2) per session). Non-irradiated control animals display inflammatory areas almost five times greater than the treated group (pÂ <Â 0.001). This result on inflammatory infiltrate may have caused impacts on the significant lower blood glucose level from irradiated animals (pÂ =Â 0.04), twenty-four hours after the last irradiation session. PBM on obese and hyperglycemic mice reduced five times the areas of inflammatory infiltrate within abdominal adipose tissue (a, b), whereas dense inflammatory regions were a common finding amidst non-irradiated animals (c). The asterisks on (c) correspond to the inflammatory infiltrate permeating adipocytes. Abdominal Fat;Animals;Diet;Hyperglycemia;Inflammation;Insulin Resistance;Mice;Mice, Obese;Obesity;Phototherapy

A critical overview of the current myofascial pain literature - July 2016. The overview of the myofascial pain literature includes a wide variety of basic and clinical studies, ranging from assessing muscle activation patterns to the impact of platelet-rich plasma injections. Contributions to the literature once again came from all corners of the world, such as Australia, Belgium, Brazil, Germany, Greece, Iran, Italy, Japan, Korea, the Netherlands, Norway, Poland, Spain, Taiwan, Turkey, and the USA. A total of 30 papers are included in this overview. Acupuncture Therapy;Athletic Tape;Headache;Humans;Low Back Pain;Low-Level Light Therapy;Musculoskeletal Manipulations;Myofascial Pain Syndromes;Needles;Osteoarthritis;Pain Management;Range of Motion, Articular;Spinal Diseases;Trigger Points;Ultrasonic Therapy;Whiplash Injuries

RelA-Mediated BECN1 Expression Is Required for Reactive Oxygen Species-Induced Autophagy in Oral Cancer Cells Exposed to Low-Power Laser Irradiation. Low-power laser irradiation (LPLI) is a non-invasive and safe method for cancer treatment that alters a variety of physiological processes in the cells. Autophagy can play either a cytoprotective role or a detrimental role in cancer cells exposed to stress. The detailed mechanisms of autophagy and its role on cytotoxicity in oral cancer cells exposed to LPLI remain unclear. In this study, we showed that LPLI at 810 nm with energy density 60 J/cm2 increased the number of microtubule associated protein 1 light chain 3 (MAP1LC3) puncta and increased autophagic flux in oral cancer cells. Moreover, reactive oxygen species (ROS) production was induced, which increased RelA transcriptional activity and beclin 1 (BECN1) expression in oral cancer cells irradiated with LPLI. Furthermore, ROS scavenger or knockdown of RelA diminished LPLI-

induced BECN1 expression and MAP1LC3-II conversion. In addition, pharmacological and genetic ablation of autophagy significantly enhanced the effects of LPLI-induced apoptosis in oral cancer cells. These results suggest that autophagy may be a resistant mechanism for LPLI-induced apoptosis in oral cancer cells. BECN1 protein, human;Beclin-1;NF-kappa B;RELA protein, human;Reactive Oxygen Species;Transcription Factor RelA Autophagy;Beclin-1;Humans;Low-Level Light Therapy;Mouth Neoplasms;NF-kappa B;Reactive Oxygen Species;Transcription Factor RelA

Nonconventional Use of Flash-Lamp Pulsed-Dye Laser in Dermatology. Flash-lamp pulsed-dye laser (FPDL) is a nonablative technology, typically used in vascular malformation therapy due to its specificity for hemoglobin. FPDL treatments were performed in a large group of patients with persistent and/or recalcitrant different dermatological lesions with cutaneous microvessel involvement. In particular, 149 patients (73 males and 76 females) were treated. They were affected by the following dermatological disorders: angiokeratoma circumscriptum, genital and extragenital viral warts, striae rubrae, basal cell carcinoma, Kaposi's sarcoma, angiolymphoid hyperplasia, and Jessner-Kanof disease. They all underwent various laser sessions. 89 patients (59.7%) achieved excellent clearance, 32 patients (21.4%) achieved good-moderate clearance, 19 patients (12.7%) obtained slight clearance, and 9 subjects (6.1%) had low or no removal of their lesion. In all cases, FPDL was found to be a safe and effective treatment for the abovementioned dermatological lesions in which skin microvessels play a role in pathogenesis or development. Further and single-indication studies, however, are required to assess a standardized and reproducible method for applying this technology to "off-label" indications. Adolescent;Adult;Aged;Child;Female;Humans;Lasers, Dye;Lighting;Low-Level Light Therapy;Male;Middle Aged;Skin Diseases, Vascular;Treatment Outcome;Young Adult

Low-power laser therapy for carpal tunnel syndrome: effective optical power. Low-power laser therapy has been used for the non-surgical treatment of mild to moderate carpal tunnel syndrome, although its efficacy has been a long-standing controversy. The laser parameters in low-power laser therapy are closely related to the laser effect on human tissue. To evaluate the efficacy of low-power laser therapy, laser parameters should be accurately measured and controlled, which has been ignored in previous clinical trials. Here, we report the measurement of the effective optical power of low-power laser therapy for carpal tunnel syndrome. By monitoring the backside reflection and scattering laser power from human skin at the wrist, the effective laser power can be inferred. Using clinical measurements from 30 cases, we found that the effective laser power differed significantly among cases, with the measured laser reflection coefficient ranging from 1.8% to 54%. The reflection coefficient for 36.7% of these 30 cases was in the range of 10-20%, but for 16.7% of cases, it was higher than 40%. Consequently, monitoring the effective optical power during laser irradiation is necessary for the laser therapy of carpal tunnel syndrome.

Editorial. Cosmetic Techniques;Esthetics;Humans;Low-Level Light Therapy;Radiofrequency Therapy

Low-Level Laser Therapy and Cryotherapy as Mono- and Adjunctive Therapies for Achilles Tendinopathy in Rats. BACKGROUND AND OBJECTIVE: Low-level laser therapy (LLLT) and cryotherapy are widely used treatments in the acute phase of tendon injury. The aim of this study was to investigate the interaction of these two treatments on tendon inflammation and mechanical properties. MATERIALS AND METHODS: Six groups of six Wistar rats were used in this study. The Achilles tendons of the healthy control group were not subjected to injury or treatment. The tendons of the injured nontreated group (ING) were injured, but not treated. The remaining four groups were injured and subjected to LLLT, cryotherapy, LLLT first/cryotherapy, or cryotherapy first/LLLT. All treatments were performed at 1â€‰h post-trauma. Inflammatory mediators, tendon histology, and biomechanical properties were assessed at 24â€‰h post-trauma by comparing the treatment groups

with the ING. RESULTS: In all treatment groups, the inflammatory process shifted in an anti-inflammatory direction compared with the ING. Significant alterations in cytokine expression were found in only the LLLT group (â†“IL-1Î²) and the combined intervention groups (â†“IL-1Î², â†“TNF-Î±, â†‘IL-6). It was also found that cryotherapy followed by LLLT was the only treatment that significantly (pâ€‰<â€‰0.05) improved the biomechanical parameters of force (N) and displacement (mm) at the tendon rupture and corresponded with the best histological scores of all of the treatment groups. CONCLUSIONS: Our results demonstrate that cryotherapy in combination with LLLT can produce an anti-inflammatory "add-on" effect. The order of therapy administration seems essential, as superior histology and biomechanical results were found in the cryotherapy first/LLLT group.
Achilles Tendon;Animals;Cryotherapy;Low-Level Light Therapy;Rats;Rats, Wistar;Tendinopathy

Low-Level Laser Irradiation Precondition for Cardiac Regenerative Therapy. OBJECTIVE: The purpose of this article was to review the molecular mechanisms of low-level laser irradiation (LLLI) preconditioning for heart cell therapy. BACKGROUND DATA: Stem cell transplantation appears to offer a better alternative to cardiac regenerative therapy. Previous studies have confirmed that the application of LLLI plays a positive role in regulating stem cell proliferation and in remodeling the hostile milieu of infarcted myocardium. Greater understanding of LLLI's underlying mechanisms would be helpful in translating cell transplantation therapy into the clinic. METHODS: Studies investigating LLLI preconditioning for cardiac regenerative therapy published up to 2015 were retrieved from library sources and Pubmed databases. RESULTS: LLLI preconditioning stimulates proliferation and differentiation of stem cells through activation of cell proliferation signaling pathways and alteration of microRNA expression. It also could stimulate paracrine secretion of stem cells and alter cardiac cytokine expression in infarcted myocardium. CONCLUSIONS: LLLI preconditioning provides a promising approach to maximize the efficacy of cardiac cell-based therapy. Although many studies have reported possible molecular mechanisms involved in LLLI preconditioning, the exact mechanisms are still not clearly understood. Cell Differentiation;Cell Proliferation;Cells, Cultured;Female;Humans;Ischemic Preconditioning, Myocardial;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Muscle Cells;Myocardial Infarction;Regeneration;Ventricular Remodeling

Regulation of RANKL-Induced Osteoclastogenesis by 635-nm Light-Emitting Diode Irradiation Via HSP27 in Bone Marrow-Derived Macrophages. OBJECTIVE: This study was designed to investigate the effect of 635-nm irradiation from a light-emitting diode (LED) on osteoclastogenesis in receptor activator of nuclear factor kappa-B (NF-ÎºB) ligand (RANKL)-stimulated mouse bone marrow-derived macrophages (BMMs). We determined whether 635-nm irradiation modulated the RANKL-induced osteoclastic signaling pathway in heat shock protein-27 (HSP27)-silenced cells and analyzed the functional cross talk between these factors in osteoclastic differentiation and activation. BACKGROUND: HSP27, a member of the small HSP family, regulates oxidative stress. Clinical reports suggest that low-level laser therapy or LED therapy (LEDT) could be an effective alternative treatment for osteolytic bone disease. METHODS: In control or HSP27-siRNA-treated BMMs, the effects of LED irradiation with 635â€‰nm and 5â€‰mW/cm(2) on RANKL-induced osteoclastic differentiation and activity were assessed by measuring tartrate-resistant acid phosphatase (TRAP) and resorption pit formation. Quantitative real-time polymerase chain reaction and western blot assays were carried out to assess the mRNA expression of osteoclastogenesis-related genes and phosphorylation of c-Jun-N-terminal kinase (JNK), extracellular signal-regulated kinase 1/2 (ERK1/2), AKT, and p38, respectively. Intracellular reactive oxygen species (ROS) generation was measured using the 2',7'-dichlorodihydrofluorescein diacetate (H(2)DCF-DA) detection method. RESULTS: The 635-nm irradiation treatment significantly increased HSP27 expression and decreased intracellular ROS generation, as well as p38 and AKT phosphorylation, leading to reductions in the expression of c-fos,

NFATc1, and DC-STAMP and TRAP activation and osteoclastic bone resorption in RANKL-induced BMMs. However, in HSP27-silenced BMMs, no change was observed. CONCLUSIONS: Thus, 635-nm irradiation modulates RANKL-induced osteoclastogenesis via HSP27 in BMMs. Thus, HSP27 may play a role in regulating the osteoclastic response to LEDT. RANK Ligand;RNA, Small Interfering;Tnfsf11 protein, mouse Animals;Blotting, Western;Bone Resorption;Cells, Cultured;Disease Models, Animal;Gene Expression Regulation;Low-Level Light Therapy;Macrophages;Male;Mice;Mice, Inbred BALB C;Osteoclasts;Osteogenesis;RANK Ligand;RNA, Small Interfering;Random Allocation;Real-Time Polymerase Chain Reaction;Sensitivity and Specificity

Effect of photobiomodulation on ischemia/reperfusion-induced renal damage in diabetic rats. This study was designed to investigate the possible effect of photobiomodulation (PBM) on renal damage induced by ischemia reperfusion (IR) in diabetic rats. Twenty streptozotocin-induced diabetic rats were randomly distributed into two groups, containing ten rats each: IR group (G1) and IR + PBM group (G2). After the right nephrectomy, the ischemia was produced in the left kidney for 30Â min, followed by the reperfusion for 24Â h. Then, a 685-nm laser diode with an output power of 15Â mW (spot sizeâ€‰=â€‰0.28Â cm(2) and energy densityâ€‰=â€‰3.2Â J/cm(2)) was employed. PBM was carried out by irradiating the rats over six points on the skin over the left kidney region three times, i.e., immediately after skin suturing and 1 and 2Â h after initiating reperfusion for 6Â min. At the end of reperfusion period, the rats were anesthetized, and blood samples were collected and used for the estimation of renal function (blood urea nitrogen (BUN) and creatinine). Then, the left kidney was harvested for histological and biochemical examination. The serum levels of BUN and creatinine were significantly higher in G1 compared to G2 (Pâ€‰<â€‰0.05). G1 had higher renal malondialdehyde (MDA) levels compared to G2 (Pâ€‰<â€‰0.05). Renal IR in diabetic rats (G1) resulted in a significant decrease in renal tissue glutathione (GSH) (Pâ€‰<â€‰0.05) when compared to laser-treated rats (G2). A significant restoration was observed in the levels of superoxide dismutase (SOD) (Pâ€‰<â€‰0.05) and catalase (CAT) (Pâ€‰<â€‰0.05) in G2 as compared to G1. The levels of nitric oxide (NO) were increased in G1 in comparison to G2 (Pâ€‰<â€‰0.05). The myeloperoxidase (MPO) activity was significantly higher in the renal tissue of G1 than that of G2 (Pâ€‰<â€‰0.05). In addition, specimens from the G1 had a significantly greater histological injury than those from the G2 (Pâ€‰<â€‰0.05). The results of present investigation revealed that PBM attenuated kidney damage induced by renal IR in diabetic rats. Nitric Oxide;Malondialdehyde;Catalase;Peroxidase;Superoxide Dismutase;Glutathione Acute Kidney Injury;Animals;Catalase;Diabetes Mellitus, Experimental;Glutathione;Kidney Function Tests;Low-Level Light Therapy;Male;Malondialdehyde;Nitric Oxide;Peroxidase;Rats;Rats, Wistar;Reperfusion Injury;Superoxide Dismutase

Photobiomodulation therapy on collagen type I and III, vascular endothelial growth factor, and metalloproteinase in experimentally induced tendinopathy in aged rats. This study investigates the effect of photobiomodulation therapy (PBMT) on collagen type I and III, matrix metalloproteinase (MMP), and vascular endothelial growth factor (VEGF) in experimentally induced tendinopathy in female aged rats. Tendinopathy was induced by the Achilles tendoncollagenase peritendinous. Forty-two Wistar rats (Norvegicus albinus) were used; groups consisted of 36 aged animals (18Â months old; mean body weight, 517.7â€‰Â±â€‰27.54Â g) and 6 adult animals (12Â weeks old; mean body weight, 266Â±â€‰19.30Â g). The animals were divided into three groups: control, aged tendinopathy, and aged tendinopathy PBMT; the aged groups were subdivided based on time to euthanasia: 7, 14, and 21Â days. PBMT involved a gallium-arsenide-aluminum laser (Theralaser, DMCÂ®) with active medium operating at wavelength 830â€‰Â±â€‰10Â nm, 50Â mW power, 0.028Â cm(2) laser beam, 107Â J/cm(2) energy density, 1.8Â W/cm(2) power density, and an energy of 3Â J per point. The laser was applied by direct contact with the left Achilles tendon during 60Â s

per point at a frequency of three times per week, until the euthanasia date (7, 14, and 21Â days). VEGF, MMP-3, and MMP-9 were analyzed by immunohistochemistry, and collagen type I and III by Sirius red. PBMT increased the deposition of collagen type I and III in a gradual manner, with significant differences relative to the group aged tendonitis (pâ€‰<â€‰0.001), and in relation to VEGF (pâ€‰<â€‰0.001); decreased expression of MMP-3 and 9 were observed in group aged tendinopathy (pâ€‰<â€‰0.001). PBMT, therefore, increased the production of collagen type I and III, downregulated the expression of MMP-3 and MMP-9, and upregulated that of VEGF, with age and age-induced hormonal deficiency. Collagen Type I;Collagen Type II;Vascular Endothelial Growth Factor A;MMP3 protein, human;Matrix Metalloproteinase 3;Matrix Metalloproteinase 9 Achilles Tendon;Animals;Collagen Type I;Collagen Type II;Disease Models, Animal;Female;Lasers, Semiconductor;Low-Level Light Therapy;Matrix Metalloproteinase 3;Matrix Metalloproteinase 9;Rats;Rats, Wistar;Tendinopathy;Vascular Endothelial Growth Factor A

Photobiomodulation therapy (PBMT) and/or cryotherapy in skeletal muscle restitution, what is better? A randomized, double-blinded, placebo-controlled clinical trial. Cryotherapy for post-exercise recovery remains widely used despite the lack of quality evidence. Photobiomodulation therapy (PBMT) studies (with both low-level laser therapy and light-emitting diode therapy) have demonstrated positive scientific evidence to suggest its use. The study aims to evaluate PBMT and cryotherapy as a single or combined treatment on skeletal muscle recovery after eccentric contractions of knee extensors. Fifty healthy male volunteers were recruited and randomized into five groups (PBMT, cryotherapy, cryotherapy + PBMT, PMBT + cryotherapy, or placebo) for a randomized, double-blinded, placebo-controlled trial that evaluated exercise performance (maximum voluntary contraction (MVC)), delayed onset muscle soreness (DOMS), and muscle damage (creatine kinase (CK)). Assessments were performed at baseline; immediately after; and at 1, 24, 48, 72, and 96Â h. Comparator treatments was performed 3Â min after exercise and repeated at 24, 48, and 72Â h. PBMT was applied employing a cordless, portable GameDay(â„¢) device (combination of 905Â nm super-pulsed laser and 875- and 640-nm light-emitting diodes (LEDs); manufactured byÂ Multi Radiance Medical(â„¢), Solon - OH, USA), and cryotherapy by flexible rubber ice packs. PBMT alone was optimal for post-exercise recovery with improved MVC, decreased DOMS, and CK activity (pâ€‰<â€‰0.05) from 24 to 96Â h compared to placebo, cryotherapy, and cryotherapy + PBMT. In the PBMT + cryotherapy group, the effect of PBMT was decreased (pâ€‰>â€‰0.05) but demonstrated significant improvement in MVC, decreased DOMS, and CK activity (pâ€‰<â€‰0.05). Cryotherapy as single treatment and cryotherapy + PBMT were similar to placebo (pâ€‰>â€‰0.05). We conclude that PBMT used as single treatment is the best modality for enhancement of post-exercise restitution, leading to complete recovery to baseline levels from 24Â h after high-intensity eccentric contractions. Creatine Kinase Adolescent;Adult;Creatine Kinase;Cryotherapy;Double-Blind Method;Exercise;Humans;Knee Joint;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;Young Adult

An 808-nm Diode Laser with a Flat-Top Handpiece Positively Photobiomodulates Mitochondria Activities. OBJECTIVE: Photobiomodulation is proposed as a non-linear process. Only the action of light at a low intensity and fluence is assumed to have stimulation on cells; whereas a higher light intensity and fluence generates negative effects, exhausting the cell's energy reserve as a consequence of a too strong stimulation. In our work, we detected the photobiomodulatory effect of an 808-nm higher-fluence diode laser [64â€‰J/cm(2)-1â€‰W, continuous wave (CW)] irradiated by a flat-top handpiece on mitochondria activities, such as oxygen consumption, activity of mitochondria complexes I, II, III, and IV, and cytochrome c as well as ATP synthesis. MATERIALS AND METHODS: The experiments are performed by standard procedure on mitochondria purified from bovine liver. RESULTS: Our higher-fluence diode laser positively photobiomodulates the mitochondria oxygen

consumption, the activity of the complexes III and IV, and the ATP production, with a P/Oâ€‰=â€‰2.6. The other activities are not influenced. CONCLUSION: Our data show for the first time that even the higher fluences (64â€‰J/cm(2)-1â€‰W), similar to the low fluences, can photobiostimulate the mitochondria respiratory chain without uncoupling them and can induce an increment in the ATP production. These results suggest that the negative effects of higher fluences observed to date are not unequivocally due to higher fluence per se but might be a consequence of the irradiation carried by handpieces with a Gaussian profile. Adenosine Triphosphate Adenosine Triphosphate;Animals;Cattle;Cells, Cultured;Equipment Design;Lasers, Semiconductor;Liver;Low-Level Light Therapy;Mitochondria;Oxygen Consumption;Paramecium;Sensitivity and Specificity

Preventing, identifying, and managing cosmetic procedure complications, part 2: lasers and chemical peels. Part 1 of this series highlighted some of the potential complications that have been associated with soft tissue augmentation and botulinum toxin injections. In part 2, tips for how dermatology residents may prevent, identify, and manage complications from lasers and chemical peels for optimal patient outcomes are provided. Chemexfoliation;Cicatrix;Cosmetic Techniques;Dermatology;Humans;Internship and Residency;Low-Level Light Therapy

A Critical Assessment of the Evidence for Low-Level Laser Therapy in the Treatment of Hair Loss. BACKGROUND: Low-level laser therapy (LLLT) is currently in use to stimulate hair growth and is quickly gaining in popularity due to the ease of use and absence of side effects. In 2015 alone, the number of LLLT devices with the Food and Drug Administration clearance has doubled. OBJECTIVE: To consolidate evidence and establish which data are still required for the widespread acceptance of LLLT for hair loss therapy. METHODS AND MATERIALS: A thorough search of the PubMed database was conducted to obtain studies investigating LLLT for androgenetic alopecia in men and women. RESULTS: Nine trials were identified for comb and helmet/cap devices, five of which were randomized controlled trials. Data comparison across LLLT trials and with traditional hair loss therapy (minoxidil, finasteride) was not straight forward because there was a lack of visual evidence, sample sizes were low, and there were large variations in study duration and efficacy measurements. CONCLUSION: There are a number of unanswered questions about the optimum treatment regimen, including maintenance treatment and the long-term consequences of LLLT use. Moving forward, protocols should be standardized across trials. Moreover, it is recommended that future trials include visual evidence and trial duration be expanded to 12 months. Alopecia;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Treatment Outcome

Comparison of the Efficiency of Rose Bengal and Methylene Blue as Photosensitizers in Photodynamic Therapy Techniques for Enterococcus faecalis Inactivation. OBJECTIVE AND BACKGROUND: The aim of this in vitro study was to compare the efficiency of a photodynamic therapy (PDT) technique employing rose bengal (RB) and methylene blue (MB) as photosensitizers (PSs) to reduce the viability of Enterococcus faecalis, a well-known pathogen found in root canal systems. Currently, in several clinical applications, including in the field of endodontics, MB is employed in association with a red laser source for the photoinactivation of pathogenic bacteria. METHODS: In this study, MB was used at 0.01% (31.2â€‰mol/L) in association with a red (660â€‰nm) laser as the excitation source in the MB group (MBG). Alternatively, the same test was performed with RB (25â€‰mol/L) that was associated with a green (532â€‰nm) light laser source in the RB group (RBG). A saline solution (0.9%) was used in the control group. The colony-forming units per milliliter (CFU/mL) were calculated after 24â€‰h of incubation at 37Â°C, and the statistical analysis was performed using ANOVA. RESULTS: The results showed a significant reduction in the CFU/mL in the RBG group (0.12â€‰Ã—â€‰10(8)) compared with the control (2.82â€‰Ã—â€‰10(8)) and MBG groups (2.66â€‰Ã—â€‰10(8)). For

the concentration and laser intensity employed in the experiments, the MBG group repeatedly showed no significant reduction in bacterial counts compared with the control. Therefore, the best result regarding the reduction of E. faecalis viable cells was obtained with RB as the PS. CONCLUSIONS: PDT may be improved if RB is used in association with a green light laser source for the inactivation of E. faecalis. Photosensitizing Agents;Rose Bengal;Methylene Blue Enterococcus faecalis;Methylene Blue;Microbial Viability;Photochemotherapy;Photosensitizing Agents;Rose Bengal

Treatment of pediatric pyogenic granuloma in a functionally and cosmetically sensitive area with the 1064nm ND:Yag laser. There has been increasing interest in minimally invasive approaches to treat pyogenic granulomas. We report successful treatment of a pyogenic granuloma in a pediatric patient on a functionally and cosmetically sensitive area using the 1064nm Nd:YAG laser. Child;Female;Granuloma, Pyogenic;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nipples

Effects of low-level laser therapy on bone healing of critical-size defects treated with bovine bone graft. OBJECTIVE: To histomorphometrically analyze the effect of low-level laser therapy (LLLT) on bone formation process in surgically created critical-size defects (CSDs) treated with bovine bone graft (BBG) and its influence over particles' resorption of BBG. METHODS: A 10-mm diameter CSD was surgically created in the calvaria of 64 male rats, which were distributed into 4 experimental groups: the C group (control), only blood clot; the LLLT group, LLLT (GaAlAs, 660nm) and blood clot; the BBG group, CSD filled with BBG; the BBG/LLLT group, LLLT and CSD filled with BBG. Animals were euthanized at either 30 or 60days post-operation. A histological analysis was performed. Additionally, the percentage of newly formed bone area (NFBA) and remaining particles areas (RPA) of BBG were histometrically evaluated and data statistically analyzed. RESULTS: The LLLT (5.82Â±2.05; 7.34Â±1.01) group presented significantly greater NFBA when compared to the C group (1.61Â±0.30; 5.59Â±0.94) at 30 and 60days post-operation ($p<0.05$). The BBG/LLLT group (7.39Â±1.45; 9.44Â±2.36) presented significantly greater NFBA than the BBG group (3.85Â±1.56; 8.02Â±0.63) at 30 and 60days postoperation ($p<0.05$). There was no significant difference in the mean percentage of implanted material RPA between the BBG and the BBG/LLLT groups. CONCLUSIONS: LLLT can improve bone formation process in CSD filled or not with BBG in rat calvaria, but it is not able to accelerate particles resorption of this material in the interior of bone defect. Animals;Bone Transplantation;Cattle;Low-Level Light Therapy;Male;Osteogenesis;Rats;Skull

Fractional resurfacing in the Asian patient: Current state of the art. BACKGROUND AND OBJECTIVE: Fractionated photothermolysis (FP) has revolutionized modern laser technology. By creating selective columns of microthermal damage, fractionated devices allows for greater treatment depths to be achieved without the prolonged downtime and risk of complications seen in traditional fully ablative laser resurfacing. Fractional resurfacing is a proven method to treat a variety of cutaneous conditions. In the Caucasian patient, a wide range of devices and treatment settings can be utilized safely and effectively. However, ethnic skin requires special consideration due to its unique pigmentary characteristics and clinical presentations. In this review article, we detail the current indications and strategies to optimize results and mitigate complications when utilizing fractional resurfacing for the Asian patient. METHODS: A review of the MEDLINE English literature was conducted on fractionated laser devices studied in the Asian population. Articles included describe non-ablative devices including fractionated erbium glass, thulium fiber, diode, and radiofrequency devices; and ablative devices including fractionated carbon dioxide (CO(2)) laser, erbium yttrium aluminum garnet and yttrium scandium gallium garnet (YSGG) laser. These data were integrated with the expert opinion of the authors. CONCLUSION: Taking into account the unique characteristics and cosmetic concerns of the Asian population, fractional resurfacing can be considered a safe and effective option for the treatment of atrophic and hypertrophic scarring, and

photorejuvenation in ethnic skin types. Select cases of melasma may be treated with fractionated non-ablative devices, but utilized with caution. The predominant complication associated with fractional resurfacing for these conditions is post-inflammatory hyperpigmentation (PIH) and rebound worsening of melasma. A greater number of treatments at lower density settings and wider treatment intervals typically produce the lowest risks of PIH without compromising treatment efficacy. Lasers Surg. Med. 49:45-59, 2017. Â© 2016 Wiley Periodicals, Inc. Acne Vulgaris;Asian People;Cicatrix, Hypertrophic;Esthetics;Female;Follow-Up Studies;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Rejuvenation;Severity of Illness Index;Skin Aging;Skin Diseases;Treatment Outcome

Comparison of the effectiveness of two fluences using long-pulsed Nd:YAG laser in the treatment of striae distensae. Histological and morphometric evaluation. Striae distensae are common undesirable skin lesions of significant aesthetic concern. To compare the efficacy of two fluences (75 and 100Â J/cm(2)) of long-pulsed Nd:YAG laser in the treatment of striae. Forty-five patients (Fitzpatrick skin types III-V) aged between 11 and 36Â years with striae (23 patients with rubra type and 22 with alba type) were enrolled in the study. Each stria was divided into three equal sections, whereby the outer sections were treated with long-pulsed 1064Â nm Nd:YAG laser, at a fluence of 75 or 100Â J/cm(2), and fixed laser settings of 5Â mm spot size and 15Â ms pulse duration. The middle section was an untreated control. All subjects received four treatments at 3Â weeks interval. Three 2-mm punch biopsies were taken from six subjects, all of the same stria, one before treatment and the other two from the outer sections, 3Â months after the last session. Paraffin-embedded skin sections were subjected to histological and quantitative morphometric studies for collagen and elastic fibres. Results were assessed clinically through photographic evaluation and were considered satisfactory for both doctors and patients. A significant improvement in appearance of striae alba using 100Â J/cm(2) was found while striae rubra improved more with 75Â J/cm(2). Histologically, collagen and elastin fibres increased in posttreatment samples. A satisfactory improvement in striae distensae lesions was seen through clinical and histological evaluation. Thus, long-pulsed Nd:YAG laser is a safe and effective module of laser treatment for these common skin lesions. Collagen;Elastin Adolescent;Adult;Collagen;Elastin;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin;Striae Distensae;Young Adult

Generalized eczematous reaction after fractional carbon dioxide laser therapy for tattoo allergy. Allergic tattoo reactions form a therapeutically difficult entity. Treatment with conventional quality-switched lasers does not completely remove the allergenic particles and may lead to generalized hypersensitivity reactions. Recently, ablative fractional laser therapy was introduced as a treatment for allergic tattoo removal. We present two cases of allergic reactions to red tattoo ink treated with 10,600-nm fractional CO(2) laser. At the end of treatment, almost complete removal of red ink accompanied by a significant reduction of symptoms was observed in the first patient, whereas the second patient developed an acute generalized eczematous reaction after five treatments. These findings confirm that ablative fractional laser therapy is capable of significant removal of tattoo ink in an allergic tattoo reaction. However, it implies a risk of generalized hypersensitivity reactions. To our knowledge, this is the first case of a generalized hypersensitivity reaction following treatment of tattoo allergy with the fractional CO(2) laser.
Adolescent;Adult;Female;Humans;Hypersensitivity;Lasers, Gas;Low-Level Light Therapy;Tattooing

Light-emitting diode therapy in exercise-trained mice increases muscle performance, cytochrome c oxidase activity, ATP and cell proliferation [J. Biophotonics 8, No. 9, 740-754 (2015)]. In the article by C. Ferraresi et al. (DOI: http://dx.doi.org/10.1002/jbio.201400087), published in J. Biophotonics 8, 740-754 (2015), a statement regarding the approval of some data the authors used is incorrect. This erratum is published to rectify this.

Evaluation of low-level laser at auriculotherapy points to reduce postoperative pain in inferior third molar surgery: study protocol for a randomized controlled trial. BACKGROUND: A comfortable postoperative return to daily activities has increased the need to control inflammation after third molar surgery. Anti-inflammatory drugs and analgesics are not exempt from adverse effects such as allergies and chronic gastritis, and they are not without cost. The association between low-level laser and auricular acupuncture can be an alternative when conventional drugs are contraindicated. Among its advantages, we can mention the low risk of side effects, low cost and simplicity of application. The objective of this study is to evaluate the efficiency of low-level laser at auriculotherapy points in reducing postoperative pain in lower third molar surgery. METHODS/DESIGN: Ninety bilateral, symmetrical lower third molar surgeries will be performed in 45 healthy patients. Each patient will be their own control, through a split-mouth crossover study. One side of the mouth will be randomly chosen and, immediately after surgery, will be treated with low-level laser. After 21 days, the contralateral side will be operated on with low-level laser simulation used postoperatively. This regimen (laser application or not) will be repeated at 24 and 48 h after surgery. All patients will be requested to take analgesics (acetaminophen) if they have pain, i.e. in case of pain. Neither the surgeon nor the patients will know the assigned treatment. The primary variable will be postoperative pain assessed using a Visual Analog Scale, and the secondary variables will be trismus, edema, local temperature, dysphagia, presence of infection and painkiller ingestion. These variables will be assessed at baseline, 24 h, 48 h and 7 days after surgery. Blood samples for systemic inflammatory cytokine (TNF-Î±, IL-1, IL-6 and IL-8) analysis will be assessed at baseline and 24 h after surgery. DISCUSSION: Some authors believe that using a wavelength of 633 to 670 nm is a good option for laser therapy in the field of acupuncture. This wavelength can penetrate biological tissue to a depth of about 3 mm. However, for auriculotherapy points, the stimulus (mustard seeds, needles 1 to 2.5 mm) does not penetrate so deeply. For this reason, we chose a laser wavelength of 660 nm (red wavelength). TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT02657174 , registered on 11 January 2016. Analgesics, Non-Narcotic;Biomarkers;Cytokines;Inflammation Mediators Adolescent;Adult;Analgesics, Non-Narcotic;Auriculotherapy;Biomarkers;Brazil;Clinical Protocols;Cross-Over Studies;Cytokines;Double-Blind Method;Female;Humans;Inflammation Mediators;Low-Level Light Therapy;Male;Molar, Third;Pain Measurement;Pain, Postoperative;Research Design;Time Factors;Tooth Extraction;Toothache;Treatment Outcome;Young Adult

The effects of photobiomodulation therapy on Staphylococcus aureus infected surgical wounds in diabetic rats. A microbiological, histopathological, and biomechanical study. PURPOSE: To evaluate the effects of photobiomodulation therapy (PBMT) at 685 nm on diabetic wound healing in rats suffering from bacterial infection induced by Staphylococcus aureus (S. aureus). METHODS: Thirty streptozotocin-induced diabetic rats were allocated into two groups: control and PBMT. A 4-cm full-thickness linear-incision was made on the dorsal midline and was contaminated with S. aureus. The wounds in the PBMT group were irradiated daily for 5 consecutive days, starting 3 days after the induction and always in the mornings. RESULTS: The result revealed that PBMT resulted in a significant decrease in S. aureus CFU in the PBMT group in comparison to the control group ($P<0.05$). The length of wounds, in the 2nd and 3rd weeks, in the PBMT group were significantly shorter compared to the control group ($P<0.05$). PBMT caused a significant increase in the histological parameters in comparison to the control group ($P<0.05$). Moreover, PBMT significantly increased the breaking strength of the surgical scars produced in the skin of the PBMT group when compared to the control group ($P<0.05$). CONCLUSION: Photobiomodulation therapy may be useful in the management of wound infection through a significant bacterial growth inhibition and an acceleration of wound healing process. Animals;Diabetes Mellitus, Experimental;Disease Models,

Animal;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Staphylococcal Infections;Staphylococcus aureus;Surgical Wound Infection;Wound Healing
Laser therapy in wound healing associated with diabetes mellitus - Review. OBJECTIVE: To determine the most effective parameter in healing wounds related to diabetes mellitus, as well as the most widely used type of laser. METHODOLOGY: consisted of bibliographic searching the databases Bireme, SciELO, PubMed/Medline and Lilacs by using the keywords related to the topic. Were selected from these keywords, papers discussing the use of laser on wounds associated with diabetes, published in the period 2005-2014, in Portuguese or English. RESULTS: After analyzing the research, 12 studies consistent with the theme were selected. CONCLUSION: Based on this review, the studies that showed more satisfactory results in healing diabetic wounds were those who applied energy densities in the range of 3-5 J/cm2, power densities equal to or below 0.2 W/cm2 and continuous emission. The He-Ne laser with a wavelength of 632.8 nm was used more often. Animals;Diabetes Mellitus;Diabetic Foot;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Male;Reproducibility of Results;Treatment Outcome;Wound Healing
Experimental tooth movement and photobiomodulation on bone remodeling in rats. Photobiomodulation (PBM) is a therapy induced by a specific type of laser that affects biologic systems through non-thermal ways. The study of its basic mechanism has gained interest since little is known about the causes of the different effects of this treatment. In the present study, we investigated the action of the PBM application rate changes in the peri-implant tissues in rats subjected to tooth movement in different periods. Wistar rats (Â±250Â g) received an apparatus in the region of the central incisors superiors tightly (70Â g) or not, and they were also subjected to one or three PBM sessions. After 7 or 14Â days, the rats were subjected to euthanasia and the jaws were dissected and processed for histology. For analysis, serial sections were made that were stained by Picrosirius Red for analysis of collagen fibers, Masson's trichrome for newly formed bone scan, and Hematoxylin-Eosin for quantification of osteoblasts. PBM applied in one or three sessions increased the population of osteoblasts. Still, the application of three sessions of PBM increased the density of collagen fibers and new bone formation compared to the controls. An increase was observed in the interincisal distance in irradiated groups with three PBM sessions and the application of force for both 7 or 14Â days. These findings suggest that PBM can contribute positively to the orthodontic movement. So the laser therapy can be used as an adjunct procedure to be performed concurrently for orthodontic treatment in the dental clinic. Collagen Animals;Bone Remodeling;Collagen;Low-Level Light Therapy;Male;Osteoblasts;Osteoclasts;Rats;Rats, Wistar;Tooth Migration
Pre-Exercise Infrared Low-Level Laser Therapy (810â€‰nm) in Skeletal Muscle Performance and Postexercise Recovery in Humans, What Is the Optimal Dose? A Randomized, Double-Blind, Placebo-Controlled Clinical Trial. AIM: This study aimed to evaluate the medium-term effects of low-level laser therapy (LLLT or photobiomodulation) in postexercise skeletal muscle recovery and performance enhancement and to identify the optimal dose of 810â€‰nm LLLT. MATERIALS AND METHODS: A randomized, double-blind, placebo-controlled trial was performed, with voluntary participation of 28 high-level soccer athletes. We analyzed maximum voluntary contraction (MVC), delayed onset muscle soreness (DOMS), creatine kinase (CK) activity, and interleukin-6 (IL-6) expression. The assessments were performed before exercise protocols, after 1â€‰min, and 1, 24, 48, 72, and 96â€‰h after the end of eccentric exercise protocol used to induce fatigue. LLLT was applied before eccentric exercise protocol with a cluster with five diodes, and dose of 10, 30, or 50â€‰J (200â€‰mW and 810â€‰nm) in six sites of quadriceps. RESULTS: LLLT increased (pâ€‰<â€‰0.05) MVC from immediately after exercise to 24â€‰h with 50â€‰J dose, and from 24

to 96â€‰h with 10â€‰J dose. Both 10â€‰J then 50â€‰J dose decreased (pâ€‰<â€‰0.05) CK and IL-6 with better results in favor of 50â€‰J dose. However, LLLT had no effect in decreasing DOMS. No differences (pâ€‰>â€‰0.05) were found for 30â€‰J dose in any of the outcomes measured. CONCLUSIONS: Pre-exercise LLLT, mainly with 50â€‰J dose, significantly increases performance and improves biochemical markers related to skeletal muscle damage and inflammation.
Adolescent;Double-Blind Method;Humans;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal

The effects of photobiomodulation and low-amplitude high-frequency vibration on bone healing process: a comparative study. This study aimed at investigating the effects of photobiomodulation (PBM) and low-amplitude high-frequency (LAHF) whole body mechanical vibration on bone fracture healing process when metallic plates are implanted in rats' femurs. Forty male rats weighing between 250 and 350Â g, 12Â weeks old, were employed in this study. A transverse critical size defect (CSD) was made in their right femurs that were fixed by stainless steel plates. After the surgery, the rats were divided equally into four groups: low-level laser therapy group (GaAlAs laser, 830Â nm, 40Â mW, 4Â J/cm(2), 0.35Â cm beam diameter, LLLT), whole body vibration group (60Â Hz, 0.1Â mm amplitude, 1.5Â g, WBV), a combination of laser and vibration group (LV), and the control group (C). Each group was divided into two subgroups based on sacrifice dates. The rats were sacrificed at intervals of 3 and 6Â weeks after the surgery to extract their right femurs for radiography and biomechanical and histological analyses, and the results were analyzed using standard statistical methods. Radiographic analyses showed greater callus formation in the LLLT and WBV groups than in control group at both 3 (Pâ€‰<â€‰0.05 and Pâ€‰<â€‰0.001, respectively) and 6Â weeks after surgery (Pâ€‰<â€‰0.05 and Pâ€‰<â€‰0.05, respectively). Histological evaluations showed a higher amount of new bone formation and better maturity in the LLLT and WBV groups than the control groups at 3 and 6Â weeks after surgery. Biomechanical tests showed that the maximum force at fracture in the LLLT (Pâ€‰<â€‰0.05 in 3Â weeks and Pâ€‰<â€‰0.05 in 6Â weeks) and WBV (Pâ€‰<â€‰0.001 in 3Â weeks and Pâ€‰<â€‰0.05 in 6Â weeks) groups was greater than that in the control groups at both time intervals. But a combination of laser and vibration therapy, LV, did not show a positive interaction on bone fracture healing process. The biostimulation effects of PBM or LLLT and of low-amplitude high-frequency WBV both had a positive impact on bone healing process, for critical size defects in the presence of a stainless steel implant. But their combination, i.e., low-level laser therapy and low-amplitude high-frequency whole body vibration (LV), interestingly did not accelerate the fractured bone healing process.
Animals;Femur;Fracture Healing;Fractures, Bone;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Vibration

Ultra-structural effects of different low-level lasers on normal cultured human melanocytes: an in vitro comparative study. The aim of this study was to investigate the effects of the different types of low-level laser therapy (LLLT) on the ultra-structure and number of melanosomes in normal cultured human melanocytes. Specific effects of various types of LLLT on the ultra-structure of melanosomes have not yet been reported. Melanocytes were exposed to LLLT at an energy level of 2.0Â J/cm(2), using a blue (457Â nm), red (635Â nm), or ultraviolet (UV) (355Â nm) laser. After 72Â h of irradiation, the melanocytes were fixed in 2.5Â % glutaraldehyde (pH 7.2) phosphate buffer for 8Â h and analyzed by transmission electron microscopy. Four developmental stages (I to IV) of melanosomes were observed, and their numbers were counted manually. The percentage of stages I, II, III, and IV melanosomes was 12.8, 14.2, 22.6, and 50.3Â %, respectively, in the control (sham light). However, the melanosome percentages were 41.2, 5.4, 8.2, and 24.2Â % in stages I, II, III, and IV, respectively, in the blue laser-treated group; 58.4, 6.1, 9.3, and 26.2Â % for stages I, II, III, and IV, respectively, in the red laser-treated group; and 31.3, 11.1, 16.5, and 41.1Â % for stages I, II, III, and

IV, respectively, in the UV laser-treated group. The present data show that the amount of stage I is significantly higher (Pâ€‰<â€‰0.0001) in the LLLT-treated cells compared to the control, which indicates significant stimulation of melanogenesis. The red laser was more effective than the other lasers. Moreover, the effects of LLLT on the ultra-structure of melanosomes need to be studied in a larger number of subject groups. Humans;Low-Level Light Therapy;Melanocytes;Melanosomes;Microscopy, Electron, Transmission

Enhancement of methane gas sensing characteristics of graphene oxide sensor by heat treatment and laser irradiation. The present study uses a rapid, easy and practical method for cost-effective fabrication of a methane gas sensor. The sensor was made by drop-casting a graphene oxide suspension onto an interdigital circuit surface. The electrical conductivity and gas-sensing characteristics of the sensor were determined and then heat treatment and in situ laser irradiation were applied to improve the device conductivity and gas sensitivity. Real-time monitoring of the evolution of the device current as a function of heat treatment time revealed significant changes in the conductance of the graphene oxide sensor. The use of low power laser irradiation enhanced both the electrical conductivity and sensing response of the graphene oxide sensor.

The effectiveness of low-level laser on postoperative pain and edema in secondary palatal operation. OBJECTIVE: The postoperative period after palatal surgery is usually very painful, requiring the use of pain-relieving drugs. Hence, the aim of this study was to evaluate the efficacy of Low-level laser therapy (LLLT) in post-operative pain control and edema after secondary palatal operations. METHODS: A randomized double blinded clinical study on 20 children undergoing secondary palatal operations between 2013 and 2015 was done. Patients were randomly divided on two groups 10 patients each. In one group patients received local application of therapeutic laser immediately after surgery while patients received nothing in the control group. The mean age was 5.22 yearsÂ Â±Â 2.53 SD in the laser group and 6.42 yearsÂ Â±Â 0.76 in the control group. Postoperative pain was assessed by using visual analog scale scores and by recording the need of analgesics. The degree of postoperative edema was also recorded. RESULTS: The pain scale showed significantly less postoperative pain in the laser group than in the control group from the first day (P-valueÂ =Â 0.006) to the 6th day (P-valueÂ =Â 0.014). The number of postoperative analgesic doses needed were significantly less in the laser group in the second and third days (P-valueÂ =Â 0.014). The postoperative edema was significantly higher in the control group from the 2nd (P-valueÂ =Â 0.004) to the 7th (P-valueÂ =Â 0.014) postoperative days. CONCLUSIONS: Preliminary results showed that low-level laser therapy is effective in the reduction of postoperative pain and edema, and minimizing the need of analgesic medication after secondary palatal operations. Analgesics Adult;Analgesics;Child;Child, Preschool;Double-Blind Method;Edema;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Palate

Photobiomodulation (Laser and LED) on Sternotomy Healing in Hyperglycemic and Normoglycemic Patients Who Underwent Coronary Bypass Surgery with Internal Mammary Artery Grafts: A Randomized, Double-Blind Study with Follow-Up. BACKGROUND AND OBJECTIVE: This study aimed at analyzing the healing effects of low-level laser therapy (LLLT) (Î»620â€‰nm, 6â€‰J/cm(2)) and light-emitting diode (LED) therapy (Î»640â€‰nm, 6â€‰J/cm(2)) on the longitudinal sternotomy incisions of hyperglycemic and normoglycemic patients who underwent coronary artery bypass grafting (CABG). MATERIALS AND METHODS: 120 volunteers were electively submitted to CABG and were randomly allocated into four different groups of equal size (nâ€‰=â€‰30): control, placebo, laser (Î» of 640â€‰nm and spatial average energy fluency [SAEF] of 1.06â€‰J/cm(2)), and LED (Î» of 660â€‰Â±â€‰20â€‰nm and SAEF of 0.24â€‰J/cm(2)). Laser and LED groups were irradiated from the second to eighth day postsurgery, and sternotomy incision was photographically registered. Then, participants were also separated into hyperglycemic and normoglycemic groups, according to their

fasting blood glucose test before surgery. Three researchers blindly analyzed the incision photographs to determine hyperemia and wound closure at the first day of hospital discharge (eighth postoperative day). RESULTS: LLLT and LED groups had similarly less hyperemia and less incision bleeding or dehiscence (pâ€‰â‰¤â€‰0.005) and the outcomes were also analogous between hyperglycemic and normoglycemic patients, which indicates no difference observed in an intragroup analysis (pâ€‰â‰¥â€‰0.05). CONCLUSIONS: With the present therapy parameters, it may be assumed that both coherent light (laser) and non-coherent light (LED) are effective in promoting sternotomy and healing acceleration, which are evident on the eighth day postsurgery. Adolescent;Adult;Aged;Double-Blind Method;Female;Follow-Up Studies;Humans;Internal Mammary-Coronary Artery Anastomosis;Laser Therapy;Light;Low-Level Light Therapy;Male;Middle Aged;Sternotomy;Wound Healing

Effect of Low-Level Laser Therapy on Relapse of Rotated Teeth: A Systematic Review of Human and Animal Study. OBJECTIVE AND BACKGROUND: Low-level laser therapy (LLLT) has been used to reduce the relapse of orthodontically rotated teeth. However, controversial conclusions have been drawn by different authors. This review aimed to evaluate the efficacy of LLLT on relapse of corrected tooth rotations systematically by overall search of available studies and scientific assessment. METHODS: A comprehensive electronic search was performed through PubMed, MEDLINE, EMBASE, Web of Science, CENTRAL, PRL, and WHO ICTRP up to November 2015 with no language limitation. This systematic review was carried out according to Cochrane Handbook and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. Risk of bias assessment was undertaken according to Cochrane Handbook for Systematic Reviews of Interventions. Two review authors conducted the work of search, selection, and quality assessment independently in duplicate. RESULTS: Out of 112 studies, two animal experiments and one human study were included. Degree and percentage of relapse of rotated teeth were compared between control and LLLT group. CONCLUSIONS: According to the results of our systematic review, the effect of LLLT on relapse of corrected tooth rotations is related to energy density. Namely, low energy density seems to promote relapse, while high energy density might alleviate the relapse. Since available investigations are limited, more well-designed randomized controlled trials involving humans are needed to get more clinically significant conclusions. Animals;Humans;Low-Level Light Therapy;Recurrence;Rotation;Tooth Diseases

Effect of LED photobiomodulation on fluorescent light induced changes in cellular ATPases and Cytochrome c oxidase activity in Wistar rat. BACKGROUND: Fluorescent light exposure at night alters cellular enzyme activities resulting in health defects. Studies have demonstrated that light emitting diode photobiomodulation enhances cellular enzyme activities. OBJECTIVE: The objectives of this study are to evaluate the effects of fluorescent light induced changes in cellular enzymes and to assess the protective role of pre exposure to 670Â nm LED in rat model. METHODS: Male Wistar albino rats were divided into 10 groups of 6 animals each based on duration of exposure (1, 15, and 30Â days) and exposure regimen (cage control, exposure to fluorescent light [1800Â lx], LED preexposure followed by fluorescent light exposure and only LED exposure). Na(+)-K(+) ATPase, Ca(2+) ATPase, and cytochrome c oxidase of the brain, heart, kidney, liver, and skeletal muscle were assayed. RESULTS: Animals of the fluorescent light exposure group showed a significant reduction in Na(+)-K(+) ATPase and Ca(2+) ATPase activities in 1 and 15Â days and their increase in animals of 30-day group in most of the regions studied. Cytochrome c oxidase showed increase in their level at all the time points assessed in most of the tissues. LED light preexposure showed a significant enhancement in the degree of increase in the enzyme activities in almost all the tissues and at all the time points assessed. CONCLUSIONS: This study demonstrates the protective effect of 670Â nm LED pre exposure on cellular enzymes against fluorescent light induced change. Electron Transport

Complex IV;Calcium-Transporting ATPases;Sodium-Potassium-Exchanging ATPase Animals;Calcium-Transporting ATPases;Electron Transport Complex IV;Light;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Sodium-Potassium-Exchanging ATPase;Time Factors
[Aesthetic reconstruction strategy for postburn facial scar and its clinical effect]. OBJECTIVE: To explore the aesthetic reconstruction strategy for postburn facial scar and its clinical effect. METHODS: Three hundred and forty-two patients with postburn facial scars were hospitalized from January 2000 to December 2015. Local expanded flap or deltopectoral expanded flap was used for reconstruction according to the location and size of the facial scar. The forehead expanded flap could be chosen for the scar in dorsum nasi or inferior eyelid. The local expanded flap was chosen when the scar width was smaller than 5 cm in cheek, chin, and marginal mandible region. The expanded deltopectoral flap was chosen when the scar width was larger than 5 cm in cheek, chin, and marginal mandible region or the scar contracture was too serious to cause displacement of lips, nose, or eyelid, and the wound width was larger than 5 cm after release. The facial scars of 82 patients, with size ranged from 6.0 cmÃ—2.5 cm to 15.0 cmÃ—10.0 cm, were reconstructed with expanded local flaps. The facial scars of 260 patients, with size ranged from 8.0 cmÃ—7.0 cm to 38.0 cmÃ—13.0 cm, were reconstructed with expanded deltopectoral flaps. After expansion of 2 to 6 months, the facial scars were excised and completely released first of all. The transfer way of local flap and size of deltopectoral flap with pedicle were designed according to the size and shape of the wound. Three weeks after transfer of deltopectoral flap, flap delay procedure was conducted. One week later, the pedicle was severed from the flap to reconstruct the remaining scar. Anti-scar medicine, laser therapy, and elasticized fabric were used postoperatively on the scars in both donor and recipient sites. RESULTS: During the postoperative follow-up for 3 to 12 months, the flaps of 40 out of 82 cases reconstructed with expanded local flaps were in good color and texture. Before 2008, mild scar hyperplasia was observed in the incision of 19 patients; with application of laser after 2008, the number of patients with scar hyperplasia was decreased. During the postoperative follow-up for 3 to 12 months, the flaps of 90 out of 260 cases reconstructed with expanded deltopectoral flaps were in good color and texture. The expander was exposed from the incision in 15 patients, while it did not affect the later treatment. Nine unilateral flaps showed poor blood circulation at the distal end, and they were healed after dressing change. In the early phase, necrosis was observed in one flap after transfer, and it was healed after transplantation of free skin graft. Scar hyperplasia was observed in the chest donor site of one patient, and it was improved after laser therapy. CONCLUSIONS: Postburn facial scar could be reconstructed with local or deltopectoral flaps, following the principle of similarity. The expansion could increase the size of the flaps, reduce the thickness of the flaps, and lower the donor site damage. Adult;Cicatrix;Esthetics;Face;Female;Humans;Low-Level Light Therapy;Male;Necrosis;Plastic Surgery Procedures;Skin;Skin Transplantation;Surgical Flaps;Surgical Wound
Red LED photobiomodulation reduces pain hypersensitivity and improves sensorimotor function following mild T10 hemicontusion spinal cord injury. BACKGROUND: The development of hypersensitivity following spinal cord injury can result in incurable persistent neuropathic pain. Our objective was to examine the effect of red light therapy on the development of hypersensitivity and sensorimotor function, as well as on microglia/macrophage subpopulations following spinal cord injury. METHODS: Wistar rats were treated (or sham treated) daily for 30Â min with an LED red (670Â nm) light source (35Â mW/cm(2)), transcutaneously applied to the dorsal surface, following a mild T10 hemicontusion injury (or sham injury). The development of hypersensitivity was assessed and sensorimotor function established using locomotor recovery and electrophysiology of dorsal column pathways. Immunohistochemistry and TUNEL were performed to examine cellular changes in the spinal cord. RESULTS: We demonstrate that red light penetrates through the entire rat spinal cord

and significantly reduces signs of hypersensitivity following a mild T10 hemicontusion spinal cord injury. This is accompanied with improved dorsal column pathway functional integrity and locomotor recovery. The functional improvements were preceded by a significant reduction of dying (TUNEL(+)) cells and activated microglia/macrophages (ED1(+)) in the spinal cord. The remaining activated microglia/macrophages were predominantly of the anti-inflammatory/wound-healing subpopulation (Arginase1(+)ED1(+)) which were expressed early, and up to sevenfold greater than that found in sham-treated animals. CONCLUSIONS: These findings demonstrate that a simple yet inexpensive treatment regime of red light reduces the development of hypersensitivity along with sensorimotor improvements following spinal cord injury and may therefore offer new hope for a currently treatment-resistant pain condition. Antigens, CD;Ectodysplasins Animals;Antigens, CD;Body Weight;Color;Disease Models, Animal;Ectodysplasins;Functional Laterality;Gait Disorders, Neurologic;Locomotion;Low-Level Light Therapy;Macrophages;Male;Microglia;Neural Conduction;Neuralgia;Pain Threshold;Rats;Rats, Wistar;Spinal Cord;Spinal Cord Injuries

Reduction in postpartum weight with laser acupuncture: A randomized control trial. BACKGROUND: Gestational weight gain and weight retention at 1 year after delivery are associated with long-term obesity. We aimed to investigate the effect of laser acupuncture therapy on postpartum weight control. METHODS: We randomly assigned 66 subjects with postpartum weight retention to a laser acupuncture group and control group. The subjects were treated at acupoints including the stomach and hunger points of the ear, ST25, ST28, ST40, SP15, CV9, and SP6 by using verum or sham laser acupuncture over 5 sessions per week. After 12 treatment sessions, the differences in the body mass index (BMI), body fat percentage (BFP), and waist-to-buttocks ratio (WBR) of the patients were analyzed and compared between the laser acupuncture and control groups via analysis of variance, chi-square tests, and stepwise regression tests. RESULTS: The characteristics of the patients did not significantly differ between the laser acupuncture and control groups. Analysis of repeated measures data between the laser acupuncture and control groups indicated the presence of significant differences in postpartum BMI (Pâ€Š<â€Š0.001) and BFP (Pâ€Š<â€Š0.001); however, no significant difference was observed for WBR (Pâ€Š=â€Š0.09). CONCLUSION: Laser acupuncture reduces postpartum weight retention by improving BMI and BFP, but does not impact the WBR following short-term treatment. Acupuncture Therapy;Adult;Body Mass Index;Female;Humans;Low-Level Light Therapy;Obesity;Postpartum Period;Pregnancy;Prenatal Care;Single-Blind Method;Treatment Outcome

Effects of low-level laser therapy on stem cells from human exfoliated deciduous teeth. OBJECTIVE: This study aimed to evaluate the influence of different laser therapy energy densities on SHED viability and proliferation. MATERIAL AND METHODS: SHED were irradiated according to the groups: I (1.2 J/cm2 - 0.5 mW - 10 s), II (2.5 J/cm2 - 10 mW - 10 s), III (3.7 J/cm2 - 15 mW - 10 s), IV (5.0 J/cm2 - 20 mW - 10 s), V (6.2 J/cm2 - 25 mW - 10 s), and VI (not irradiated - control group). Cell viability was assessed 6 and 24 h after irradiation measuring the mitochondrial activity and using the Crystal Violet assay. Cell proliferation was assessed after 24, 48, and 72 h of irradiation by SRB assay. RESULTS: MTT assay demonstrated differences from 6 to 24 hours after irradiation. After 24 h, groups I and IV showed higher absorbance values than those of control group. Crystal Violet assay showed statistically differences in the absorbance rate from 6 to 24 h after irradiation for groups III and VI. At 24 h after irradiation, Group III absorbance rate was greater than that of groups I, II, and IV. Group VI absorbance rate was greater than that of groups I and IV. SRB assay showed that the group I had higher rates than those of groups II, III, V, and VI, at 24 h after irradiation. After 48 h, group I exhibited the greatest cell proliferation rate followed by groups III, V, and VI. After 72 h, group III exhibited the lowest cell proliferation rate than those of groups II, IV, and V. CONCLUSIONS: The Low-Level Laser Therapy energy densities used in this study did not cause loss of cell viability and

stimulated SHED proliferation within the parameters described in this study. Formazans;Rhodamines;Tetrazolium Salts;MTT formazan;lissamine rhodamine B Analysis of Variance;Cell Proliferation;Cell Survival;Cells, Cultured;Formazans;Humans;Low-Level Light Therapy;Radiation Dosage;Reproducibility of Results;Rhodamines;Stem Cells;Tetrazolium Salts;Time Factors;Tooth Exfoliation;Tooth, Deciduous

Low Level Laser Therapy to Reduce Recurrent Oral Ulcers in BehÃ§et's Disease. BehÃ§et's disease (BD) is a chronic, relapsing multisystemic vascular condition. BehÃ§et's disease was described by Hulusi BehÃ§et in 1937. This rare multisystem relapsing-remitting inflammatory disease is poorly understood but is thought to be an autoimmune inflammatory vasculitic process in a genetically predisposed population. Diagnosis of BehÃ§et's disease is based on International Criteria of BehÃ§et's Disease (ICBD). The present paper describes a case report of BehÃ§et's syndrome where aphthous stomatitis was treated with low level laser therapy.

Congenital Plaque-type Glomuvenous Malformation: 11 Years of Follow-up and Response to Treatment With the Combined Pulsed-Dye and Neodymium:Yttrium-Aluminum-Garnet Laser. Diseases in Twins;Esthetics;Follow-Up Studies;Glomus Tumor;Humans;Infant, Newborn;Infant, Premature;Infant, Premature, Diseases;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Shoulder;Skin Neoplasms

Pulpal response following photo-biomodulation with a 904-nm diode laser: a double-blind clinical study. The aim of this study was to evaluate pulpal responses in healthy human teeth to photo-biomodulation therapy (PBMT) with 904-nm GaAs diode laser. The study followed a double-blind split mouth design, with a randomly selected maxillary first premolar acting as a sham-irradiated control tooth, and the contralateral tooth receiving active laser treatment. Two coded but otherwise identical laser probes (Irradiaâ„¢, SpectraMedics Ltd., NC, USA) were used to deliver the sham (placebo) and laser radiation, with both the operator and patient unaware of each probe's identity. The selection of teeth for sham or laser irradiation was randomised for each treatment. Pulpal responses were assessed using electric pulp testing (EPT), 2Â min prior to exposure, and immediately after laser irradiation (60Â s, 30Â mW average power, 25Â Hz pulse frequency, 3.6Â J/cm(2)). Treatment effects were analysed using the Wilcoxon-signed rank test. A total of 30 participants provided written informed consent. Majority of the participants (66.7Â %) demonstrated an analgesic effect following PBMT (elevated EPT scores); however, nine participants (30Â %) reported the lower EPT scores than the control. Both the treatment effects (stimulation and analgesia) were significant compared to the placebo. In most individuals, PBMT of healthy teeth with a 904-nm GaAs diode laser can induce analgesia, as witnessed by elevated EPT scores. A converse effect can occur in a minority of subjects. Arsenicals;gallium arsenide;Gallium Adult;Arsenicals;Bicuspid;Dental Pulp;Double-Blind Method;Female;Gallium;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain;Pain Measurement

Improvement of erythema dyschromicum perstans using a combination of the 1,550-nm erbium-doped fractionated laser and topical tacrolimus ointment. BACKGROUND AND OBJECTIVE: Erythema dyschromicum perstans (EDP) is a cosmetically distressing, acquired pigmentary disorder of unknown etiology for which few successful therapies exist. Herein, we present the successful use of non-ablative fractional photothermolysis in combination with topical tacrolimus ointment. STUDY DESIGN/PATIENTS AND METHODS: A 35-year-old female with biopsy-confirmed EDP underwent a series of fractionated non-ablative treatment sessions utilizing the 1,550â€‰nm erbium-doped fiber laser in combination with topical tacrolimus ointment over a period of 5 months. RESULTS: The patient's EDP improved by greater than 75% and results were maintained at the 8-month follow-up visit. CONCLUSION: The combination of non-ablative fractional photothermolysis and topical tacrolimus ointment is a potential safe and effective therapeutic option for erythema dyschromicum

perstans. Additional prospective, comparative studies are warranted. Lasers Surg. Med. 49:60-62, 2017. Â© 2016 Wiley Periodicals, Inc. Tacrolimus Administration, Topical;Adult;Biopsy, Needle;Combined Modality Therapy;Erythema;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers, Solid-State;Lichenoid Eruptions;Low-Level Light Therapy;Patient Satisfaction;Severity of Illness Index;Tacrolimus;Treatment Outcome

New approach in the treatment of refractory vitiligo: CO(2) laser combined with betamethasone and salicylic acid solution. The aim of this study is to evaluate the use of fractional carbon dioxide laser (CO(2)) with betamethasone and salicylic acid solution in the treatment of patients with refractory vitiligo in hands. Each hand of the patient was randomly assigned to one of two groups: lesion treated with fractional carbon dioxide laser associated with betamethasone and salicylic acid solution administration or lesion treated only with betamethasone and salicylic acid solution. We conclude that combined treatment with fractional carbon dioxide laser and betamethasone associated with salicylic acid solution could effectively and safely be used in the treatment of refractory vitiligo. Drug Combinations;Glucocorticoids;Pharmaceutical Solutions;Betamethasone;Salicylic Acid Adult;Betamethasone;Brazil;Combined Modality Therapy;Drug Combinations;Glucocorticoids;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Pharmaceutical Solutions;Salicylic Acid;Skin Pigmentation;Treatment Outcome;Vitiligo;Young Adult

Low-level laser therapy induces an upregulation of collagen gene expression during the initial process of bone healing: a microarray analysis. This study investigates the histological modifications produced by low level laser therapy (LLLT) on the first day of bone repair, as well as evaluates the LLLT effects on collagen expression on the site of a fracture. Twenty Wistar rats were distributed into a control group (CG) and a laser group (LG). Laser irradiation of Ga-Al-As laser 830 nm, 30 mW, 94 s, 2.8 J was performed in five sessions. Animals were euthanized on day 5 postsurgery. Histopathological analysis showed that LLLT was able to increase deposition of granulation tissue and newly formed bone at the site of the injury. In addition, picrosirius analysis showed that collagen fiber organization in the LG was enhanced compared to CG. Microarray analysis demonstrated that LLLT produced an upregulation type I collagen (COL-I). Immunohistochemical analysis revealed that the subjects that were treated presented a higher immunoexpression of COL-I. Our findings indicated that LLLT improves bone healing by producing a significant increase in the expression of collagen genes. Collagen Animals;Bone and Bones;Collagen;Low-Level Light Therapy;Microarray Analysis;Rats;Rats, Wistar;Up-Regulation;Wound Healing

Simultaneous bilateral laser therapy accelerates recovery after noise-induced hearing loss in a rat model. Noise-induced hearing loss is a common type of hearing loss. The effects of laser therapy have been investigated from various perspectives, including in wound healing, inflammation reduction, and nerve regeneration, as well as in hearing research. A promising feature of the laser is its capability to penetrate soft tissue; depending on the wavelength, laser energy can penetrate into the deepest part of the body without damaging non-target soft tissues. Based on this idea, we developed bilateral transtympanic laser therapy, which uses simultaneous laser irradiation in both ears, and evaluated the effects of bilateral laser therapy on cochlear damage caused by noise overexposure. Thus, the purpose of this research was to assess the benefits of simultaneous bilateral laser therapy compared with unilateral laser therapy and a control. Eighteen Sprague-Dawley rats were exposed to narrow-band noise at 115 dB SPL for 6 h. Multiple auditory brainstem responses were measured after each laser irradiation, and cochlear hair cells were counted after the 15th such irradiation. The penetration depth of the 808 nm laser was also measured after sacrifice. Approximately 5% of the laser energy reached the contralateral cochlea. Both bilateral and unilateral laser therapy decreased the hearing threshold after noise overstimulation in the rat model. The

bilateral laser therapy group showed faster functional recovery at all tested frequencies compared with the unilateral laser therapy group. However, there was no difference in the endpoint ABR results or final hair cell survival, which was analyzed histologically.

Fluorescence Dye Loaded Nano-graphene for Multimodal Imaging Guided Photothermal Therapy. Photoacoustic imaging (PA) has emerged as a novel and noninvasive imaging modality owing to its high spatial resolution and high soft tissue contrast. Herein, we loaded a near-infrared (NIR) fluorescence dye (CySCOOH) onto the surface of PEGylated graphene oxide (GO) via Ï€-Ï€ stacking to increase the NIR absorbance of GO. The PA imaging proved that PEGylated GO-CysCOOH (GO-PEG-CysCOOH) significantly enhances the PA signal in the tumor site compared with free GO-PEG. We then utilized the strong optical absorbance of GO-PEG-CySCOOH in the NIR region for in vivo photothermal therapy, achieving efficient tumor ablation after intravenous injection of GO-PEG-CySCOOH and low-power laser irradiation on the tumor. Our results indicate that this graphene-based nanocomposite can be developed as a promising contrast agent for PA imaging and a thermal agent for imaging guided photothermal therapy.

An Integrated Nanotechnology-Enabled Transbronchial Image-Guided Intervention Strategy for Peripheral Lung Cancer. Early detection and efficient treatment modality of early-stage peripheral lung cancer is essential. Current nonsurgical treatments for peripheral lung cancer show critical limitations associated with various complications, requiring alternative minimally invasive therapeutics. Porphysome nanoparticle-enabled fluorescence-guided transbronchial photothermal therapy (PTT) of peripheral lung cancer was developed and demonstrated in preclinical animal models. Systemically administered porphysomes accumulated in lung tumors with significantly enhanced disease-to-normal tissue contrast, as confirmed in three subtypes of orthotopic human lung cancer xenografts (A549, H460, and H520) in mice and in an orthotopic VX2 tumor in rabbits. An in-house prototype fluorescence bronchoscope demonstrated the capability of porphysomes for in vivo imaging of lung tumors in the mucosal/submucosal layers, providing real-time fluorescence guidance for transbronchial PTT. Porphysomes also enhanced the efficacy of transbronchial PTT significantly and resulted in selective and efficient tumor tissue ablation in the rabbit model. A clinically used cylindrical diffuser fiber successfully achieved tumor-specific thermal ablation, showing promising evidence for the clinical translation of this novel platform to impact upon nonsurgical treatment of early-stage peripheral lung cancer. Cancer Res; 76(19); 5870-80. Â©2016 AACR. Animals;Bronchoscopy;Fluorescence;Humans;Low-Level Light Therapy;Lung Neoplasms;Mice;Nanoparticles;Neoplasm Transplantation;Phantoms, Imaging;Rabbits;Transplantation, Heterologous

Treatment of nevus depigmentosus using the 308-nm excimer laser: A retrospective study of 14 patients. Adolescent;Child;Child, Preschool;Female;Follow-Up Studies;Humans;Hypopigmentation;Infant;Lasers, Excimer;Low-Level Light Therapy;Male;Nevus, Pigmented;Retrospective Studies;Sampling Studies;Skin Neoplasms;Treatment Outcome;Young Adult

Early application of low-level laser may reduce the incidence of postherpetic neuralgia (PHN). BACKGROUND: Postherpetic neuralgia (PHN) is difficult to treat, and currently there are no available treatments that effectively reduce its incidence. Low-level laser therapy (LLLT) has been proposed for indirect virus deactivation in treating recurrent herpes simplex infections. OBJECTIVE: This study seeks to investigate whether LLLT could reduce the incidence of PHN. METHODS: We retrospectively reviewed the incidence of PHN at the first, third, and sixth months after rash outbreak in 3 groups: the acute group of patients who received LLLT during the first 5Â days; the subacute group of patients who received LLLT during days 6 to 14 of the eruption; and the control group of patients who did not receive LLLT. RESULTS: There were 48, 48, and 154 patients in the acute, subacute, and control groups, respectively. After adjusting for confounding factors, including age, sex, and use of

famciclovir, the incidence of PHN was significantly lower in the acute group versus the control group after 1 month (odds ratio [OR] 0.21, P = .006, 95% confidence interval [CI] 0.068-0.632), 3 months (OR 0.112, P = .038, 95% CI 0.014-0.886), and 6 months (OR 0.123, P = .021, 95% CI 0-0.606). The subacute group only had a lower incidence (OR 0.187, PÂ =Â .032, 95% CI 0.041-0.865) after 3Â months when compared with the control group. LIMITATIONS: This is a retrospective study lacking double-blind randomization, and the placebo effect may be a major concern. Lack of standardized and prospective evaluation measures is also a limitation of this study. CONCLUSION: Applying LLLT within the first 5Â days of herpes zoster eruption significantly reduced the incidence of PHN. LLLT may have the potential to prevent PHN, but further well-designed randomized controlled trials are required. 2-Aminopurine;Famciclovir 2-Aminopurine;Adult;Case-Control Studies;Famciclovir;Female;Follow-Up Studies;Herpes Zoster;Humans;Logistic Models;Low-Level Light Therapy;Male;Middle Aged;Neuralgia, Postherpetic;Pain Measurement;Prognosis;Reference Values;Retrospective Studies;Risk Assessment;Severity of Illness Index;Time Factors;Treatment Outcome

The use of low-level light therapy in supportive care for patients with breast cancer: review of the literature. Breast cancer is the most common cancer in women worldwide, with an incidence of 1.7 million in 2012. Breast cancer and its treatments can bring along serious side effects such as fatigue, skin toxicity, lymphedema, pain, nausea, etc. These can substantially affect the patients' quality of life. Therefore, supportive care for breast cancer patients is an essential mainstay in the treatment. Low-level light therapy (LLLT) also named photobiomodulation therapy (PBMT) has proven its efficiency in general medicine for already more than 40Â years. It is a noninvasive treatment option used to stimulate wound healing and reduce inflammation, edema, and pain. LLLT is used in different medical settings ranging from dermatology, physiotherapy, and neurology to dentistry. Since the last twenty years, LLLT is becoming a new treatment modality in supportive care for breast cancer. For this review, all existing literature concerning the use of LLLT for breast cancer was used to provide evidence in the following domains: oral mucositis (OM), radiodermatitis (RD), lymphedema, chemotherapy-induced peripheral neuropathy (CIPN), and osteonecrosis of the jaw (ONJ). The findings of this review suggest that LLLT is a promising option for the management of breast cancer treatment-related side effects. However, it still remains important to define appropriate treatment and irradiation parameters for each condition in order to ensure the effectiveness of LLLT. Breast Neoplasms;Clinical Trials as Topic;Female;Humans;Low-Level Light Therapy;Lymphedema;Radiodermatitis;Stomatitis

Facial Rejuvenation: 40th Anniversary Review. For decades, devices and peels have been used for facial rejuvenation and the treatment of skin damage. In recent years, new laser systems have been developed, including fractionated ablative and non-ablative lasers which, while not as effective as the traditional laser resurfacing, can provide nice results with reduced side effects. While fractionated hybrid systems, picosecond lasers, and daylight photodynamic therapy have all been rolled out for clinicians to assess their efficacy, future technology, including TRASER (total reflection amplification of spontaneous emission of radiation) technology, should be just around the corner. These technologies offer new potential applications, efficacy, and recovery periods. Semin Cutan Med Surg 35(supp6):S122-S124. Face;Humans;Low-Level Light Therapy;Photochemotherapy;Rejuvenation;Skin Aging

Treatment of Oral Lesions in Dystrophic Epidermolysis Bullosa: A Case Series of Cord Blood Platelet Gel and Low-level Laser Therapy. Gels Adolescent;Adult;Blood Platelets;Child;Combined Modality Therapy;Epidermolysis Bullosa Dystrophica;Female;Fetal Blood;Gels;Humans;Low-Level Light Therapy;Male;Mouth Diseases;Mouth Mucosa;Pilot Projects;Prospective Studies;Remission Induction;Time Factors;Treatment Outcome;Young Adult

Peri-implant osseointegration after low-level laser therapy: micro-computed tomography and resonance frequency analysis in an animal model. The purpose of the present study is to evaluate the effects of low-level laser therapy on the osseointegration process by comparing resonance frequency analysis measurements performed at implant placement and after 30Â days and micro-computed tomography images in irradiated vs nonirradiated rabbits. Fourteen male New Zealand rabbits were randomly divided into two groups of seven animals each, one control group (nonirradiated animals) and one experimental group that received low-level laser therapy (Thera LaseÂ®, aluminum-gallium-arsenide laser diode, 10Â J per spot, two spots per session, seven sessions,â€‰830Â nm, 50Â mW, CW, Ã˜ 0.0028Â cm(2)). The mandibular left incisor was surgically extracted in all animals, and one osseointegrated implant was placed immediately afterward (3.25Ã¸â€‰Ã—â€‰11.5Â mm; NanoTite, BIOMET 3i). Resonance frequency analysis was performed with the OsstellÂ® device at implant placement and at 30Â days (immediately before euthanasia). Micro-computed tomography analyses were then conducted using a high-resolution scanner (SkyScan 1172 X-ray Micro-CT) to evaluate the amount of newly formed bone around the implants. Irradiated animals showed significantly higher implant stability quotients at 30Â days (64.286â€‰Â±â€‰1.596; 95Â % confidence interval (CI) 60.808-67.764) than controls (56.357â€‰Â±â€‰1.596; 95Â %CI 52.879-59.835) (Pâ€‰=â€‰.000). The percentage of newly formed bone around the implants was also significantly higher in irradiated animals (75.523â€‰Â±â€‰8.510; 95Â %CI 61.893-89.155) than in controls (55.012â€‰Â±â€‰19.840; 95Â %CI 41.380-68.643) (Pâ€‰=â€‰.027). Laser therapy, based on the irradiation protocol used in this study, was able to provide greater implant stability and increase the volume of peri-implant newly formed bone, indicating that laser irradiation effected an improvement in the osseointegration process. Animals;Dental Implantation, Endosseous;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Osseointegration;Rabbits;Random Allocation;X-Ray Microtomography

The effect of low-level laser therapy on non-surgical periodontal treatment: a randomized controlled, single-blind, split-mouth clinical trial. The purpose of this split-mouth, single-blind, controlled clinical study was to evaluate the impact of low-level laser therapy (LLLT) as an adjunct to non-surgical treatment of chronic periodontitis. Twenty-five systemically healthy and non-smoking adults with chronic periodontitis who had at least two bilateral premolar teeth with probing pocket depth (PPD) of 7â€‰â‰¥â€‰xâ€‰â‰¥â€‰5Â mm were included in the study. In the periodontal examination of these patients, PPD, gingival index (GI), plaque index (PI), clinical attachment level (CAL), and bleeding on probing (BOP) were recorded at the baseline, first, third, and sixth months after treatment. Gingival crevicular fluid (GCF) samples were taken at the baseline, first week, and first month after treatment. The collected GCF samples were analyzed using the MAGPIXâ„¢ system with a Bio-Plex Proâ„¢ Human Cytokine 27-plex kit. After non-surgical periodontal treatment, LLLT with an energy density of 7.64Â J/cm(2) was performed four times: immediately after scaling and root planning (SRP) and on the first, third, and seventh day after treatment. In the first month, PPD levels were significantly (pâ€‰<â€‰0.05) lower in the SRPâ€‰+â€‰LLLT group than in the SRP group. At the third and sixth months, CAL, PPD, and GI were significantly (pâ€‰<â€‰0.05) lower in the SRPâ€‰+â€‰LLLT group than in the SRP group. Differences in GCF cytokines levels among the group were not statistically significant. Within the limitations of this study, it is indicated that LLLT as an adjunct to non-surgical periodontal treatment has a positive impact on clinical parameters. Adult;Chronic Periodontitis;Dental Plaque Index;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Root Planing;Single-Blind Method

Treatment of infraorbital dark circles using 694-nm fractional Q-switched ruby laser. The objective of this study was to evaluate the efficacy and safety of using a 694-nm fractional Q-switched

ruby laser to treat infraorbital dark circles. Thirty women with infraorbital dark circles (predominant color: dark/brown) participated in this open-labeled study. The participants received eight sessions of 694-nm fractional Q-switched ruby laser treatment using a fluence of 3.0-3.5Â J/cm(2), at an interval of 7Â days. The melanin deposition in the lesional skin was observed in vivo using reflectance confocal microscopy (RCM). The morphological changes were evaluated using a global evaluation, an overall self-assessment, and a Mexameter. Twenty-eight of the 30 patients showed global improvements that they rated as excellent or good. Twenty-six patients rated their overall satisfaction as excellent or good. The melanin index indicated a substantial decrease from 240.44 (baseline) to 194.56 (Pâ€‰<â€‰0.05). The RCM results showed a dramatic decrease in melanin deposition in the upper dermis. The adverse effects were minimal. The characteristic finding of dark/brown infraorbital dark circles is caused by increased melanin deposition in the upper dermis. The treatment of these infraorbital dark circles using a 694-nm fractional QSR laser is safe and effective. Melanins Adult;China;Eye;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Middle Aged;Patient Satisfaction

Low intensity lasers differently induce primary human osteoblast proliferation and differentiation. Among various compounds used in research and clinic for degenerative bone diseases, low level laser therapy (LLLT), comprising low level lasers (LLL) and light emitting diodes (LEDs), has been investigated regarding its effects on bone metabolism. They have specific wavelengths but in general act as a cellular biomodulator, and as a therapeutic agent, rebalancing and normalizing their activity. However, they are not standardized yet, since their parameters of use are relevant for the effects and mechanisms of action. Therefore, the aim of this study was to compare the influence of two spectrums of LLL and LED phototherapy, at the same energy densities (10 and 50J/cm(2)), on human osteoblasts proliferation and differentiation. The involvement of ERK signaling on proliferation was also investigated by evaluating its activation during proliferation under different phototherapies by western blotting and CFSE-based osteoblast proliferation was measured in a presence or absence of the ERK-specific inhibitor. Osteogenic differentiation was evaluated through in vitro mineralization and gene expression of type I collagen (COL1A1) and osteonectin (SPARC) by Real Time- PCR. Increases in viable cells and proliferation were obtained after irradiation, regardless of LLLT type. However, only red at 10J/cm(2) and infrared at both doses, but not LED, induced ERK1/2 activation. In the presence of ERK inhibitor, the LLL-induced proliferation was prevented. In addition, while COL1A1 gene expression was upregulated by red laser, SPARC does so by infrared stimulation. However, LED, at both doses, increased both COL1A1 and SPARC expression. All LLLT increased mineralization, dependent on the dose and time. Thus, LLL and LED differently modulated the metabolism of human osteoblasts, increasing proliferation by mechanism dependent or not of ERK signaling activation and osteogenic differentiation markers. Biomarkers;Collagen Type I;Osteonectin Biomarkers;Calcification, Physiologic;Cell Differentiation;Cell Proliferation;Cell Survival;Collagen Type I;Humans;Low-Level Light Therapy;MAP Kinase Signaling System;Osteoblasts;Osteogenesis;Osteonectin

Dermal Remodeling of Burn Scar by Fractional CO2 Laser. BACKGROUND: Ablative CO2 fractional lasers have recently been introduced for burn scar treatment because of pronounced clinical outcomes with fewer treatment sessions than nonablative fractional laser. OBJECTIVE: This study was conducted to observe clinical as well as histologic changes of burn scars after treatment with CO2 fractional laser. MATERIALS AND METHODS: Eleven patients (one female and 10 males, aged 31-59Â years) with skin phototypes III to V with burn scars received 10 sessions of fractional CO2 laser treatments (UltraPulse(Â®) Encore; Lumenis, Santa Clara, CA, USA) over an average 5-week interval. Two passes were performed using the following parameters: deep FX mode, 12.5-30Â mJ, with a density setting of 5-10Â %. Clinical evaluations by three blinded dermatologists were obtained at

baseline and at 6Â months after the final treatment via photographs using the Vancouver scar scale (VSS). Skin biopsies were done on four patients before and after treatment. RESULTS: All patients showed clinical improvement in their scars with significant decrease in VSS. Histologic findings showed the changes in the upper dermis with newly formed dermal papilla. This characteristic upper dermis change was presented as improvement in surface smoothness and skin tension clinically. Postinflammatory hyperpigmentation and itching sensation were the most common adverse effects. CONCLUSION: Burn scar treatment by fractional CO2 laser is effective by forming new collagen fibers mainly in the upper dermis. LEVEL OF EVIDENCE IV: This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266 . Adult;Biopsy, Needle;Burns;Cicatrix;Cohort Studies;Female;Follow-Up Studies;Humans;Immunohistochemistry;Injury Severity Score;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Regeneration;Risk Assessment;Time Factors;Treatment Outcome;Wound Healing

The effects of low-level laser irradiation on breast tumor in mice and the expression of Let-7a, miR-155, miR-21, miR125, and miR376b. Low-level laser therapy (LLLT) is a form of photon therapy which can be a non-invasive therapeutic procedure in cancer therapy using low-intensity light in the range of 450-800Â nm. One of the main functional features of laser therapy is the photobiostimulation effects of low-level lasers on various biological systems including altering DNA synthesis and modifying gene expression, and stopping cellular proliferation. This study investigated the effects of LLLT on mice mammary tumor and the expression of Let-7a, miR155, miR21, miR125, and miR376b in the plasma and tumor samples. Sixteen mice were equally divided into four groups including control, and blue, green, and red lasers at wavelengths of 405, 532, and 632Â nm, respectively. Weber Medical Applied Laser irradiation was carried out with a low power of 1-3Â mW and a series of 10 treatments at three times a week after tumor establishment. Tumor volume was weekly measured by a digital vernier caliper, and qRT-PCR assays were performed to accomplish the study. Depending on the number of groups and the p value of the Kolmogorov-Smirnov test of normality, a t test, a one-way ANOVA, or a non-parametric test was used for data analyses, and pâ€‰<â€‰0.05 was considered to be statistically significant. The average tumor volume was significantly less in the treated blue group than the control group on at days 21, 28, and 35 after cancerous cell injection. Our data also showed an increase of Let-7a and miR125a expression and a decrease of miR155, miR21, and miR376b expression after LLLT with the blue laser both the plasma and tumor samples compared to other groups. It seems that the non-invasive nature of laser bio-stimulation can make LLLT an attractive alternative therapeutic tool. MIRN-21 microRNA, mouse;MicroRNAs;Mirn128 microRNA, mouse;Mirn155 microRNA, mouse Animals;Breast Neoplasms;Cell Proliferation;Gene Expression;Low-Level Light Therapy;Mice;MicroRNAs

Single treatment of low-risk basal cell carcinomas with pulsed dye laser-mediated photodynamic therapy (PDL-PDT) compared with photodynamic therapy (PDT): A controlled, investigator-blinded, intra-individual prospective study. BACKGROUND AND OBJECTIVE: To compare a single treatment of PDL-PDT with PDT for BCCs in terms of efficacy, aesthetic outcome, and pain in patients with multiple BCCs. STUDY DESIGN/MATERIALS AND METHODS: A prospective, controlled, intra-individual, investigator-blinded study was conducted on 15 patients with 62 BCCs. The BCCs on an individual patient were divided into two similarly-sized groups, and treated with PDT (630nm LED light source, fluence rate=30mW/cm(2), total dose of 150J/cm(2)) and 585 nm-PDL-PDT (spot size=7mm, fluence=10J/cm(2), pulse duration=10ms, 10% overlap, three passes, and cooling). Primary outcomes were complete BCC regression at months 3 and 12. Secondary outcomes were pain immediately after treatment, and aesthetic outcome evaluated by a blinded investigator. RESULTS:

No significant difference was found in the therapeutic effect between the two treatments (P=0.285). Complete regression of BCCs at 3-months follow-up occurred in 79% of the PDT treated area and 74% of the PDL-PDT area. At month 12, complete regression using PDT was 75% (95% confidence interval (CI) 0.55-0.89) compared to 59% (95% CI 0.41-0.75) for the PDL-PDT treated areas. Both treatments had low mean pain scores: 1.7 for PDT and 2.6 for PDL-PDT (P=0.049) and the aesthetic appearance was similar (P=0.763). CONCLUSION: A single treatment with three passes of PDL-PDT is effective in clearing BCCs, but the recurrence rate is higher than in case of conventional PDT. PDL-PDT is associated with low treatment related pain, has similar cosmetic advantages as PDT but it requires less treatment time. Radiation-Sensitizing Agents Aged;Cancer Pain;Carcinoma, Basal Cell;Combined Modality Therapy;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Prospective Studies;Radiation-Sensitizing Agents;Single-Blind Method;Skin Neoplasms;Treatment Outcome

Comparison of Light Penetration of Continuous Wave 810â€‰nm and Superpulsed 904â€‰nm Wavelength Light in Anesthetized Rats. OBJECTIVE: The purpose of this study was to investigate light transmission of continuous wave (CW) 810â€‰nm wavelength light and 904â€‰nm wavelength superpulsed light through skin and gastrocnemius muscle and skin only using an anesthetized Sprague-Dawley rat model. MATERIALS AND METHODS: The hair was shaved from the left thigh region of the anesthetized rats and a detector, which measured fluence rate, was placed either in the fascial plane deep into the muscle or below the dermis. The laser probe was placed in contact with the surface of the skin and measurements were taken for 4, 5, 10, 15, and 20â€‰min depending on the experiment. RESULTS: The initial fluence rate measurements through the muscle and skin demonstrated that if the 904â€‰nm wavelength superpulsed laser was turned on for a minimum of 15â€‰min, there was no increase in light penetration over time. With appropriate warm-up periods, both lasers had stable output powers, which were reflected in stable fluence rate measurements over 4â€‰min. The percentages of light transmission (fluence rate) through muscle and skin were 7.42% (810â€‰nm wavelength) and 4.01% (904â€‰nm wavelength) and through skin were 24.63% (810â€‰nm wavelength) and 19.94% (904â€‰nm wavelength). These data prove that transmission of CW 810â€‰nm wavelength light through muscle and skin and skin alone is greater than transmission of superpulsed 904â€‰nm wavelength light. CONCLUSIONS: It has been previously reported that superpulsing 904â€‰nm wavelength light increased depth of penetration over time due to photobleaching. Based on our data, the observed increase in light penetration over time was due to an insufficient warm-up period of the superpulsed laser. Animals;Equipment Design;Equipment Safety;Lasers;Low-Level Light Therapy;Male;Models, Animal;Muscle, Skeletal;Rats;Rats, Sprague-Dawley;Skin;Thigh;Time Factors;Wound Healing

Effects of low-level laser therapy on autogenous bone graft stabilized with a new heterologous fibrin sealant. Autogenous bone grafts are used to repair bone defects, and the stabilization is needed for bone regeneration. Laser photobiomodulation is a modality of treatment in clinical practice for tissue regeneration, and it has therapeutic effects as an anti-inflammatory, analgesic and modulating cellular activity. The aim of the present study was to evaluate the effects of low-level laser therapy (LLLT) on an autogenous bone graft integration process stabilized with a new heterologous fibrin sealant. Forty rats were divided into two groups: Autogenous Fibrin Graft (AFG, n=20), in which a 5mm dome osteotomy was conducted in the right parietal bone and the graft was adhered to the left side using fibrin sealant; and Autogenous Fibrin Graft Laser (AFGL, n=20), which was subjected to the same procedures as AFG with the addition of LLLT. The treatment was performed immediately following surgery and then three times a week until euthanasia, using an 830nm laser (30mW, 6J/cm(2), 0.116cm(2), 258.6mW/cm(2), 2.9J). Five animals from each group were euthanized at 10, 20, 30 and 40days postoperative, and the samples were submitted to histomorphological and

histomorphometric analysis. Partial bone regeneration occurred, with new bone tissue integrating the graft to the recipient bed and small areas of connective tissue. Comparative analysis of the groups at the same intervals revealed minor interfaces in group AFGL, with statistically significant differences ($p<0.05$) at all of the analyzed intervals (10days $p=0.0087$, 20days $p=0.0012$, 30days $p<0.0001$, 40days $p=0.0142$). In conclusion, low-level laser therapy stimulated bone regeneration and accelerated the process of integration of autogenous bone grafts. Fibrin Tissue Adhesive Animals;Bone Diseases;Bone Regeneration;Bone Transplantation;Bone and Bones;Fibrin Tissue Adhesive;Low-Level Light Therapy;Male;Rats;Rats, Wistar

Characterization of Macrophage/Microglial Activation and Effect of Photobiomodulation in the Spared Nerve Injury Model of Neuropathic Pain. OBJECTIVE: Neuropathic pain is common and debilitating with limited effective treatments. Macrophage/microglial activation along ascending somatosensory pathways following peripheral nerve injury facilitates neuropathic pain. However, polarization of macrophages/microglia in neuropathic pain is not well understood. Photobiomodulation treatment has been used to decrease neuropathic pain, has anti-inflammatory effects in spinal injury and wound healing models, and modulates microglial polarization in vitro. Our aim was to characterize macrophage/microglia response after peripheral nerve injury and modulate the response with photobiomodulation. METHODS: Adult male Sprague-Dawley rats were randomly assigned to sham (Nâ€‰=â€‰13), spared nerve injury (Nâ€‰=â€‰13), or injuryâ€‰+â€‰photobiomodulation treatment groups (Nâ€‰=â€‰7). Mechanical hypersensitivity was assessed with electronic von Frey. Photobiomodulation (980â€‰nm) was applied to affected hind paw (output power 1 W, 20 s, 41cm above skin, power density 43.25â€‰mW/cm 2 , dose 20 J), dorsal root ganglia (output power 4.5W, 19s, in skin contact, power density 43.25â€‰mW/cm 2 , dose 85.5 J), and spinal cord regions (output power 1.5 W, 19s, in skin contact, power density 43.25â€‰mW/cm 2 , dose 28.5 J) every other day from day 7-30 post-operatively. Immunohistochemistry characterized macrophage/microglial activation. RESULTS: Injured groups demonstrated mechanical hypersensitivity 1-30 days post-operatively. Photobiomodulation-treated animals began to recover after two treatments; at day 26, mechanical sensitivity reached baseline. Peripheral nerve injury caused region-specific macrophages/microglia activation along spinothalamic and dorsal-column medial lemniscus pathways. A pro-inflammatory microglial marker was expressed in the spinal cord of injured rats compared to photobiomodulation-treated and sham group. Photobiomodulation-treated dorsal root ganglion macrophages expressed anti-inflammatory markers. CONCLUSION: Photobiomodulation effectively reduced mechanical hypersensitivity, potentially through modulating macrophage/microglial activation to an anti-inflammatory phenotype. Animals;Disease Models, Animal;Low-Level Light Therapy;Macrophage Activation;Macrophages;Male;Microglia;Neuralgia;Organ Sparing Treatments;Pain Measurement;Peripheral Nerve Injuries;Rats;Rats, Sprague-Dawley;Treatment Outcome

Clinically atypical nevi following diode laser therapy. Biopsy, Needle;Follow-Up Studies;Hair Removal;Humans;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Nevus, Pigmented;Risk Assessment;Skin Neoplasms;Thorax

Photo-biomodulatory response of low-power laser irradiation on burn tissue repair in mice. The present work reports the photo-biomodulatory effect of red (632.8Â nm) and near infrared (785 and 830Â nm) lasers on burn injury in Swiss albino mice. Animals were induced with a 15-mm full thickness burn injury and irradiated with various fluences (1, 2, 3, 4, and 6Â J/cm(2)) of each laser wavelength under study having a constant fluence rate (8.49Â mW/cm(2)). The size of the injury following treatment was monitored by capturing the wound images at regular time intervals until complete healing. Morphometric assessment indicated that the group treated with 3-J/cm(2) fluence of 830Â nm had a profound effect on healing as compared to untreated controls and various fluences

of other wavelengths under study. Histopathological assessment of wound repair on treatment with an optimum fluence (3Â J/cm(2)) of 830Â nm performed on days 2, 6, 12, and 18 post-wounding resulted in enhanced wound repair with migration of fibroblasts, deposition of collagen, and neovascularization as compared to untreated controls. The findings of the present study have clearly demonstrated that a single exposure of 3-J/cm(2) fluence at 830-nm enhanced burn wound healing progression in mice, which is equivalent to 5Â % povidone iodine treatment (reference standard), applied on a daily basis till complete healing. Collagen Animals;Burns;Collagen;Female;Low-Level Light Therapy;Male;Mice;Wound Healing

Wound healing efficacy of a 660-nm diode laser in a rat incisional wound model. This study aimed to elucidate the optimum usage parameters of low reactive-level laser therapy (LLLT) in a rat incisional wound model. In Sprague-Dawley rats, surgical wounds of 15-mm length were made in the dorsal thoracic region. They were divided into groups to receive 660-nm diode laser irradiation 24Â h after surgery at an energy density of 0 (control), 1, 5, or 10Â J/cm(2). Tissue sections collected on postoperative day 3 were stained with hematoxylin-eosin and an antibody for ED1 to determine the number of macrophages around the wound. Samples collected on day 7 were stained with hematoxylin-eosin and observed via polarized light microscopy to measure the area occupied by collagen fibers around the wound; day 7 skin specimens were also subjected to mechanical testing to evaluate tensile strength. On postoperative day 3, the numbers of macrophages around the wound were significantly lower in the groups receiving 1 and 5Â J/cm(2) irradiation, compared to the control and 10Â J/cm(2) irradiation groups (pâ€‰<â€‰0.01). The area occupied by collagen fibers in day 7 was largest in 5Â J/cm(2) group, followed by 1Â J/cm(2) group, although this difference was not significant. The day 7 tensile test demonstrated significantly greater rupture strength in healing tissues from 1 and 5Â J/cm(2) irradiation groups, compared to the control group (pâ€‰<â€‰0.05). Thus, LLLT with a 660-nm diode laser with energy density of 1 and 5Â J/cm(2) enhanced wound healing in a rat incisional wound model. However, a higher radiation energy density yielded no significant enhancement. Animals;Disease Models, Animal;Lasers, Semiconductor;Macrophages;Male;Rats, Sprague-Dawley;Skin;Tensile Strength;Wound Healing

Effectiveness of low-level laser on carpal tunnel syndrome: A meta-analysis of previously reported randomized trials. BACKGROUND: Low-level laser therapy (LLLT) has been applied in the treatment of carpal tunnel syndrome (CTS) for an extended period of time without definitive consensus on its effectiveness. This meta-analysis was conducted to evaluate the effectiveness of low-level laser in the treatment of mild to moderate CTS using a Cochrane systematic review. METHODS: We conducted electronic searches of PubMed (1966-2015.10), Medline (1966-2015.10), Embase (1980-2015.10), and ScienceDirect (1985-2015.10), using the terms "carpal tunnel syndrome" and "laser" according to the Cochrane Collaboration guidelines. Relevant journals or conference proceedings were searched manually to identify studies that might have been missed in the database search. Only randomized clinical trials were included, and the quality assessments were performed according to the Cochrane systematic review method. The data extraction and analyses from the included studies were conducted independently by 2 reviewers. The results were expressed as the mean difference (MD) with 95% confidence intervals (CI) for the continuous outcomes. RESULTS: Seven randomized clinical trials met the inclusion criteria; there were 270 wrists in the laser group and 261 wrists in the control group. High heterogeneity existed when the analysis was conducted. Hand grip (at 12 weeks) was stronger in the LLLT group than in the control group (MDâ€Š=â€Š2.04; 95% CI: 0.08-3.99; Pâ€Š=â€Š0.04; Iâ€Š=â€Š62%), and there was better improvement in the visual analog scale (VAS) (at 12 weeks) in the LLLT group (MDâ€Š=â€Š0.97; 95% CI: 0.84-1.11; Pâ€Š<â€Š0.01; Iâ€Š=â€Š0%). The sensory nerve action potential (SNAP) (at 12 weeks) was better in the LLLT group (MDâ€Š=â€Š1.08; 95% CI: 0.44-1.73; Pâ€Š=â€Š0.001; Iâ€Š=â€Š0%). However, 1 included study was

weighted at >95% in the calculation of these 3 parameters. There were no statistically significant differences in the other parameters between the 2 groups. CONCLUSION: This study revealed that low-level laser improve hand grip, VAS, and SNAP after 3 months of follow-up for mild to moderate CTS. More high-quality studies using the same laser intervention protocol are needed to confirm the effects of low-level laser in the treatment of CTS. Carpal Tunnel Syndrome;Female;Hand Strength;Humans;Low-Level Light Therapy;Male;Pain Measurement;Prognosis;Randomized Controlled Trials as Topic;Risk Assessment;Severity of Illness Index;Treatment Outcome

Polychromatic light-induced osteogenic activity in 2D and 3D cultures. Photobiomodulation (PBM) has been applied to manipulate cellular responses by using monochromatic light in different wavelengths from ultraviolet (UV) to infrared (IR) region. Until now, an effective wavelength has not been revealed to induce proliferation and/or differentiation of cells. Therefore, in the presented study, we decided to use a specially designed plasma arc light source providing wavelengths between 590 and 1500Â nm in order to investigate its biomodulatory effects on chitosan scaffold-supported three-dimensional (3D) cell cultures. For comparison, two-dimensional (2D) cell cultures were also carried out in tissue-culture polystyrene dishes (TCPS). The results showed that light-induced temperature rise did not affect cells when the distance between the light source and the cells was 10Â cm and the frequency of administration was daily. Moreover, light was applied for 5 and 10Â min to the cells in TCPS and in chitosan scaffold groups, respectively. Cell culture studies under static conditions indicated that polychromatic light significantly stimulated bone nodule formation via the prolonged cell survival and stimulated differentiation of MC3T3-E1 preosteoblastic cells in both TCPS and chitosan scaffold groups. In conclusion, specially designed plasma arc light source used in this study induces formation of bone tissue and so, this light source is proposed as an appropriate system for in vitro bone tissue engineering applications. Statistical analyses were performed with one-way ANOVA by using GraphPad Instat software and standard deviations were calculated by using data of three parallel samples for each group. Alkaline Phosphatase Alkaline Phosphatase;Animals;Cell Culture Techniques;Cell Line;Cell Survival;Gene Expression Regulation;Light;Mice;Osteoblasts;Osteogenesis;Real-Time Polymerase Chain Reaction;Staining and Labeling

Low-light-level therapy as a treatment for minimal hepatic encephalopathy: behavioural and brain assessment. Minimal hepatic encephalopathy (MHE) has been shown to affect daily functioning, quality of life, driving and overall mortality. However, little is known about treating or diagnosing early impairments involved in MHE. We studied one of its precipitating factors, portal hypertension. The purpose was to evaluate an enhancement in neuronal metabolism through low-light-level therapy (LLLT) and whether this therapy has effects on behavioural task acquisition. Rats were trained to perform a stimulus-response task using the Morris water maze. Three groups of animals were used: a SHAM (sham-operated) group (nâ€‰=â€‰7), a portal hypertension (PH) group (nâ€‰=â€‰7) and a PH + LLLT group (nâ€‰=â€‰7). The triple portal vein ligation method was used to create an animal model of the early developmental phase of HE, and then the animals were exposed to 670â€‰+â€‰10Â nm LED light at a dose of 9Â J/cm(2) once a day for 7Â days. The metabolic activity of the brains was studied with cytochrome c oxidase histochemistry. There were differences in behavioural performance, with an improvement in the PH + LLLT group. Energetic brain metabolism revealed significant differences between the groups in all the brain structures analysed, except the anterodorsal thalamus. At the same time, in different brain networks, the PH group showed a more complicated relationship among the structures, while the SHAM and PH + LLLT groups had similar patterns. In this study, we provide the first preliminary insights into the validity of LLLT as a possible intervention to improve memory under minimal hepatic encephalopathy conditions. Electron Transport Complex IV Animals;Behavior, Animal;Brain;Disease Models, Animal;Electron

Transport Complex IV;Hepatic Encephalopathy;Low-Level Light Therapy;Male;Portal Pressure;Rats, Wistar;Reaction Time

Optogenetic and chemogenetic strategies for sustained inhibition of pain. Spatially targeted, genetically-specific strategies for sustained inhibition of nociceptors may help transform pain science and clinical management. Previous optogenetic strategies to inhibit pain have required constant illumination, and chemogenetic approaches in the periphery have not been shown to inhibit pain. Here, we show that the step-function inhibitory channelrhodopsin, SwiChR, can be used to persistently inhibit pain for long periods of time through infrequent transdermally delivered light pulses, reducing required light exposure by >98% and resolving a long-standing limitation in optogenetic inhibition. We demonstrate that the viral expression of the hM4D receptor in small-diameter primary afferent nociceptor enables chemogenetic inhibition of mechanical and thermal nociception thresholds. Finally, we develop optoPAIN, an optogenetic platform to non-invasively assess changes in pain sensitivity, and use this technique to examine pharmacological and chemogenetic inhibition of pain. Channelrhodopsins;Clozapine;clozapine N-oxide Animals;Cells, Cultured;Channelrhodopsins;Clozapine;Combined Modality Therapy;Disease Models, Animal;Low-Level Light Therapy;Mice;Nociception;Optogenetics;Pain

A single-blind, dose escalation, phase I study of high-fluence light-emitting diode-red light (LED-RL) on human skin: study protocol for a randomized controlled trial. BACKGROUND: Skin fibrosis is involved in a variety of pathologic conditions ranging from scar formation secondary to surgery or trauma to immune-mediated processes. Skin fibrosis is a significant international health problem with an estimated incidence of greater than 100 million people affected per year worldwide with few effective treatment options available. Preliminary in vitro data generated by our research group suggests that red light can function as a stand-alone treatment for skin fibrosis. To our knowledge, no prior clinical trials have been performed to determine the safety of high-fluence (dose) light-emitting diode-red light (LED-RL) phototherapy. The goal of this study is to evaluate the safety of LED-RL fluences from 160Â J/cm(2) up to 640Â J/cm(2) in healthy subjects. METHODS/DESIGN: This is a single-blind, dose escalation, randomized controlled, phase I study to evaluate the safety of high-fluence LED-RL on human skin. The protocol for dose escalation requires subjects be enrolled sequentially in groups of five. Within each group, three subjects will be randomized to LED-RL phototherapy and two subjects randomized to mock therapy. Subjects in group 1 randomized to LED-RL phototherapy will receive the maximum recommended starting dose (160Â J/cm(2)). LED-RL dose will be escalated in subsequent groups (320Â J/cm(2), 480Â J/cm(2) and 640Â J/cm(2)). The maximally tolerated dose (MTD) is defined as the dose level below the dose producing unacceptable but reversible toxicity and is considered to be the upper limit of subject tolerance. After either a MTD has been established, or the study endpoint of 640Â J/cm(2) has been achieved, an additional 27 LED-RL phototherapy subjects (for a total of 30) and 18 mock therapy subjects (for a total of 20) (determined randomly) will be enrolled. Each subject will receive a total of nine procedures, three times per week for three consecutive weeks. DISCUSSION: This study may provide important safety information on the effects of high-fluence LED-RL phototherapy on human skin and help facilitate future phase II studies to evaluate the efficacy of high-fluence LED-RL as a potential noninvasive, safe, portable, at-home therapy for treatment of skin fibrosis. TRIAL REGISTRATION: ClinicalTrials.gov NCT02630303 . Registered on 9 December 2015. California;Clinical Protocols;Dose-Response Relationship, Radiation;Healthy Volunteers;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Prospective Studies;Research Design;Skin;Time Factors;Treatment Outcome

Interplay between up-regulation of cytochrome-c-oxidase and hemoglobin oxygenation induced by near-infrared laser. Photobiomodulation, also known as low-level laser/light therapy (LLLT), refers to the use of red-to-near-infrared light to stimulate cellular functions for physiological or

clinical benefits. The mechanism of LLLT is assumed to rely on photon absorption by cytochrome c oxidase (CCO), the terminal enzyme in the mitochondrial respiratory chain that catalyzes the reduction of oxygen for energy metabolism. In this study, we used broadband near-infrared spectroscopy (NIRS) to measure the LLLT-induced changes in CCO and hemoglobin concentrations in human forearms in vivo. Eleven healthy participants were administered with 1064-nm laser and placebo treatments on their right forearms. The spectroscopic data were analyzed and fitted with wavelength-dependent, modified Beer-Lambert Law. We found that LLLT induced significant increases of CCO concentration (Î”[CCO]) and oxygenated hemoglobin concentration (Î”[HbO]) on the treated site as the laser energy dose accumulated over time. A strong linear interplay between Î”[CCO] and Î”[HbO] was observed for the first time during LLLT, indicating a hemodynamic response of oxygen supply and blood volume closely coupled to the up-regulation of CCO induced by photobiomodulation. These results demonstrate the tremendous potential of broadband NIRS as a non-invasive, in vivo means to study mechanisms of photobiomodulation and perform treatment evaluations of LLLT. Oxyhemoglobins;Electron Transport Complex IV Adult;Electron Transport Complex IV;Energy Metabolism;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Oxyhemoglobins;Spectroscopy, Near-Infrared;Up-Regulation;Young Adult

[Research and Design of a Blue and Green Light Emitting Diode Phototherapy System Based on Fly Eye Lens for Jaundice]. Light emitting diode(LED)can be used in the treatment of jaundice.Blue and green LED irradiation affected with the newborn is currently considered the most effective treatment of the jaundice in the world.A jaundice phototherapy system with blue and green LED as light source utilizing fly eye lens array was built to achieve uniform illumination in the present study.AMC7150 chip was used to build the constant current drive module,and AT89C52 MCU and LCD12864 LCD screen were used to build the human-computer interaction module.Based on national particular phototherapy equipment requirements(YY0669-2008)for the safety,we designed and implemented a phototherapy system which spot area was 250mmÃ—500mm,blue light irradiance reached 2mW/cm2,green light irradiance reached 1.5mW/cm2,and the uniformity of light was over 90%.Compared with the traditional system,the new one designed in this study has better therapeutic effect,higher biological safety,easier to achieve man-machine interaction,and more economical and convenient. Animals;Color;Drosophila;Equipment Design;Humans;Infant, Newborn;Jaundice;Lens, Crystalline;Light;Male;Phototherapy

Laser Therapy Inhibits Tumor Growth in Mice by Promoting Immune Surveillance and Vessel Normalization. Laser therapy, recently renamed as photobiomodulation, stands as a promising supportive treatment for oral mucositis induced by oncological therapies. However, its mechanisms of action and, more importantly, its safety in cancer patients, are still unclear. Here we explored the anti-cancer effect of 3 laser protocols, set at the most commonly used wavelengths, in B16F10 melanoma and oral carcinogenesis mouse models. While laser light increased cell metabolism in cultured cells, the in vivo outcome was reduced tumor progression. This striking, unexpected result, was paralleled by the recruitment of immune cells, in particular T lymphocytes and dendritic cells, which secreted type I interferons. Laser light also reduced the number of highly angiogenic macrophages within the tumor mass and promoted vessel normalization, an emerging strategy to control tumor progression. Collectively, these results set photobiomodulation as a safety procedure in oncological patients and open the way to its innovative use for cancer therapy. Interferons Animals;Cell Line, Tumor;Cell Proliferation;Cell Transformation, Neoplastic;Disease Models, Animal;Female;Humans;Immunologic Surveillance;Interferons;Laser Therapy;Lymphocytes, Tumor-Infiltrating;Melanoma, Experimental;Mice;Mice, Knockout;Neoplasm Invasiveness;Neoplasms;Neovascularization, Pathologic;Tumor Burden

Effect of low-level laser irradiation on proliferation of human dental mesenchymal stem cells; a systemic review. CONTEXT: Identification of factors that enhance the proliferation of human dental mesenchymal stem cells (DMSCs) is vital to facilitate tissue regeneration. The role of low-level laser irradiation (LLLI) on proliferation of human DMSCs has not been well established. OBJECTIVE: To assess the effect of LLLI on proliferation of human DMSCs when applied in-vitro. DATA SOURCES: Electronic search of literature was conducted (2000-2016) on PubMed, Web of Science, and Scopus databases. Search terms included low-level light therapy, low-level laser irradiation, low-level light irradiation, LLLT, humans, adolescent, adult, cells, cultured, periodontal ligament, dental pulp, stem cells, dental pulp stem cells, mesenchymal stem cells, periodontal ligament stem cell, deciduous teeth, cell proliferation, adult stem cells, radiation, and proliferation. RESULTS: The literature search identified 165 studies with 6 being eligible for inclusion; all used diode lasers; 5 studies used InGaAIP diode lasers; 4 used 660nm, and the other two applied 810nm or 980nm wavelength LLLI. The distance between the DMSCs and the laser spot ranged between 0.5mm to 2mm. The time intervals of cell proliferation analysis ranged from 0h to 7days after LLLI. After 660nm LLLI, an increase in the DMSC's proliferation was reported [DMSCs extracted from dental pulp of deciduous teeth (two irradiations, 3J/cm(2), 20mW was more effective than 40mW), adult teeth (two irradiations, 0.5 and 1.0J/cm(2), 30mW), and from adult periodontal ligament (two irradiations, 1.0J/cm(2) was more effective than 0.5J/cm(2), 30mW)]. Similarly, an increase in the proliferation of DMSCs extracted from dental pulp of adult teeth was reported after 810nm LLLI (7 irradiations in 7days, 0.1 and 0.2J/cm(2), 60mW) or 980nm LLLI (single irradiation, 3J/cm(2), 100mW). However, 660nm LLLI in one study did not increase the proliferation of DMSCs (single irradiation, energy densities of 0.05, 0.30, 7, and 42J/cm(2), 28mW). CONCLUSION: There is limited evidence that in-vitro LLLI (660/810/980nm, with energy densities of 0.1-3J/cm(2)) increases the proliferation of DMSCs. Considering the limited evidence and their method heterogeneity it is difficult to reach a firm conclusion. Further research is necessary to identify the optimal characteristics of the LLLI setting (wave length, energy density, power output, frequency/duration of irradiations, distance between the cells and the laser spot/probe) to increase proliferation of DMSCs, and assess its impact on replicative senescence, as well as determine feasibility of the use in the clinical setting. Humans;Cell Proliferation;Databases, Factual;Dentin;Lasers, Semiconductor;Mesenchymal Stem Cells

Side effects from intense pulsed light: Importance of skin pigmentation, fluence level and ultraviolet radiation-A randomized controlled trial. BACKGROUND AND OBJECTIVE: Intense pulsed light (IPL) is a mainstream treatment for hair removal. Side effects after IPL are known, but risk factors remain to be investigated. The objective of this study was to assess the contribution of skin pigmentation, fluence level, and ultraviolet radiation (UVR) on IPL-induced side effects. METHODS: The study was a blinded, randomized intra-individual controlled trial including 16 healthy subjects with Fitzpatrick Skin Types (FST) II-V. Three test areas were each divided into four sites, randomized to a single IPL exposure of 22, 34, 46â€‰J/cm(2) or triple stacking of 46â€‰J/cm(2) . Areas were subsequently randomized to no UVR or single solar-simulated UVR exposure of 3 Standard Erythema Dose at 30â€‰minutes or 24â€‰hours after IPL. Each area had a corresponding control, resulting in 15 treatment sites. Follow-up visits were scheduled up to 4 weeks after IPL. Outcome measures were: (i) blinded clinical skin reactions; (ii) objectively measured erythema and pigmentation; (iii) pain measured by visual analog scale (VAS); (iv) histology (H&E, Fontana-Masson); and (v) mRNA-expression of p53. RESULTS: Fifteen subjects with FST II-IV completed the protocol. IPL induced a wide range of skin reactions, including erythema (87% of subjects), purpura (27%), blisters (20%), edema (13%), crusting (13%), hyper- (60%), and hypopigmentation (20%). Darker skin pigmentation and increasing IPL fluence were determinants for IPL-induced side effects (Pâ€‰â‰¤â€‰0.002), while a single exposure of UVR did not exacerbate side effects (Pâ€‰â‰¥â€‰0.180). Clinical

findings were confirmed objectively by reflectance spectrometry and qualitatively by histological changes in skin architecture, inflammatory infiltration, and pigmentation. Marker of cellular DNA damage, that is, p53, did not increase after IPL (Pâ€‰â‰¥â€‰0.24). CONCLUSIONS: Skin pigmentation and IPL fluence are major determinants of side effects after IPL exposure, while a single exposure to three SED of UVR at 30â€‰minutes or 24â€‰hours after IPL, does not amplify such side effects. Lasers Surg. Med. 49:88-96, 2017. Â© 2016 Wiley Periodicals, Inc.
Adolescent;Adult;Biopsy, Needle;Blister;Dose-Response Relationship, Radiation;Edema;Erythema;Female;Hair Removal;Healthy Volunteers;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Pain Measurement;Prospective Studies;Radiation Dosage;Risk Assessment;Single-Blind Method;Skin Pigmentation;Ultraviolet Rays;Young Adult

Genitourinary syndrome of menopause: anÂ overview of clinical manifestations, pathophysiology, etiology, evaluation, andÂ management. Genitourinary syndrome of menopause, a new term for a condition more renowned as atrophic vaginitis, is a hypoestrogenic condition with external genital, urological, and sexual implications that affects >50% of postmenopausal women. Due to sexual embarrassment and the sensitive nature of discussing symptoms, genitourinary syndrome of menopause is greatly underdiagnosed. The most up-to-date literature pertaining to clinical manifestations, pathophysiology, etiology, evaluation, and management of genitourinary syndrome of menopause is comprehensively reviewed. Early detection and individually tailored pharmacologic (eg, estrogen therapy, selective estrogen receptor modulator, synthetic steroid, oxytocin, and dehydroepiandrosterone) and/or nonpharmacologic (eg, laser therapies, moisturizers and lubricants, homeopathic remedies, and lifestyle modifications) treatment is paramount for not only improving quality of life but also for preventing exacerbation of symptoms in women with this condition.
Lubricants;Oxytocics;Selective Estrogen Receptor Modulators;Dehydroepiandrosterone;Oxytocin
Atrophic Vaginitis;Dehydroepiandrosterone;Dyspareunia;Estrogen Replacement Therapy;Female;Humans;Life Style;Low-Level Light Therapy;Lubricants;Menopause;Oxytocics;Oxytocin;Quality of Life;Selective Estrogen Receptor Modulators;Syndrome;Urinary Incontinence;Vulvar Diseases

The effects of two different low level laser therapies in the treatment of patients with chronic low back pain: A double-blinded randomized clinical trial. OBJECTIVE: The purpose of this study was to compare the effectiveness of two different laser therapy regimens on pain, lumbar range of motions (ROM) and functional capacity in patients with chronic low back pain (CLBP). METHODS: Forty nine patients with CLBP were randomly assigned into two groups. Group 1 (n= 20) received hot-pack + laser therapy 1 (wavelength of 850 nm Gallium-Aluminum-Arsenide (Ga-Al-As) laser); group 2 (n= 29) received hot-pack + laser therapy 2 (wavelength of 650 nm Helyum-Neon (He-Ne), 785 ve 980 nm Gal-Al-As combined plaque laser) for 15 sessions. Pain severity, patient's and physician's global assessments were evaluated with visual analogue scale (VAS). Modified Schober test, right and left lateral flexion measurements were done. Modified Oswestry Disability Questionnaire (MODQ) was used for evaluation of functional disability. Measurements were done before and after the treatment. RESULTS: After treatment there were statistically significant improvements in pain severity, patient's and physician's global assessment, ROM and MODQ scores in both groups (P< 0.05). After the treatment there were statistically significant differences between the groups in lateral flexion measurements and MODQ scores (P< 0.05) except in pain severity, Modified Schober test, patient's and physician's global assessments (P> 0.05) in favor of those patients who received combined plaque laser therapy (group 2). CONCLUSION: Laser therapy applied with combined He-Ne and Ga-Al-As provides more improvements in lateral flexion measurements and disability of the patients, however no superiority of the two different laser devices to one another were detected on pain severity.

Adult;Aged;Chronic Pain;Combined Modality Therapy;Exercise Therapy;Female;Hot Temperature;Humans;Lasers, Gas;Lasers, Semiconductor;Low Back Pain;Low-Level Light Therapy;Lumbosacral Region;Male;Middle Aged;Pain Measurement;Range of Motion, Articular;Surveys and Questionnaires;Treatment Outcome;Visual Analog Scale

Evaluation of light-emitting diode (LED-835 NM) application over human gingival fibroblast: an in vitro study. Since the laser and photomodulation were discovered over 50 years, they have been used for many applications in medicine and in dentistry also. In particular, light-emitting diodes therapy (LT) achieved a great success in medical treatment and photo-therapy. In the decades, LT has been used for several therapeutic purposes. Many beneficial effects have been demonstrated in vitro and in vivo, including antibacterial, antiviral, antitumor, cell differentiation, immune potentiating and tissue repair activities. Beneficial effects of LT have also been observed in clinical settings. Although there are lots of cell culture studies in low-level laser therapy, there are only a few cell culture studies in LT that have similar characteristics. The aim of this study was to investigate the effects of LT on primary human gingival fibroblast cells (HGF) on elastin (ELN) gene activation using Real Time PCR. ELN gene activation is directly connected with elastin protein production and HGF functionality. Human gingival tissue biopsies were obtained from three healthy patients during tooth extraction. The gingival specimens were fragmented with a scalpel and transferred in culture dishes containing DulbeccoÂ's modified Eagle medium supplemented with 20% fetal calf serum (FBS) and antibiotics, i.e. penicillin 100U/ml and streptomycin 100Î¼g/ml. Cells were incubated in a humidified atmosphere of 5% CO2 at 37C. The medium was changed the next day and twice a week. After 15 days, the samples of gingival tissue were removed from the culture dishes. Cells were harvested after an additional 24 h incubation. Human gingival fibroblasts at the second passage were seeded on multiple 6-well plates. The cells stimulation was performed with a light-emitting diodes (LEDs) medical device type E-Light. The LED irradiation seems to be directly correlated with the elastin (ELN) gene activation. Interestingly, ELN gene expression in the cultured human gingival fibroblasts seems to be inversely related to the patientsÂ' age; in fact, its expression tends to decrease with aging. In summary, the result of the present study shows that LED irradiation promoted ELN gene expression more in elderly than in younger adults. Cells, Cultured;Fibroblasts;Gene Expression Regulation;Gingiva;Humans;Phototherapy

Low-level laser therapy and invisible removal aligners. It seems that Low Level Laser Therapy (LLLT) stimulates orthodontic tooth movements, increasing the alveolar bone turnover. The aim of this study is to evaluate how LLLT can influence the orthodontic treatment with invisible removal aligner. A sample of 21 subjects was divided into two groups, a laser group (10 patients) and a control group (11 patients). All subjects were instructed to wear each aligner 12 hours a day for 2 weeks. Laser external bio-stimulation was given in the laser group every second week. The laser group successfully finished the treatment, while at 3rd Â– 5th aligner the control group did not finish the treatment. Laser treatment seemed to be better than treatment without laser. LLLT combined with aligners is able to favour, in 12 hours, the same tooth movement obtained by wearing the aligner 22 hours a day, according to the traditional protocol. This aspect could be useful for those patients who prefer not to use the aligners during the day. LLLT makes invisible removal aligner treatment more comfortable also because during the day the patients have to wear the aligners less hours than the treatment without laser. Alveolar Process;Bone Remodeling;Humans;Low-Level Light Therapy;Time Factors;Tooth Movement Techniques

Effects of laser biostimulation on the epithelial tissue for keratinized layer differentiation: an in vitro study. Gingival augmentation techniques proposed in the international literature do not exclude a surgical component, which determines consequent post-surgical discomfort and results are not always predictable. In recent years, the introduction of laser biostimulation has led to a less invasive

approach, particularly in the treatment of periodontally compromised patients, limiting the surgical phase to seriously compromised cases, with regeneration techniques for the restoration of a correct periodontal tissue anatomy. The aim of this in vitro study is to establish the validity of laser biostimulation in order to develop the epithelial keratinized layer of the tissue by stimulating fibroblasts-keratinocytes organotypic cultures and fibroblasts and keratinocytes mono-cultures. We created two groups (test and control), each one composed of 3 fibroblast cultures, 3 keratinocyte cultures and 3 organotypic cultures. We performed laser irradiation of test group with Wiser Doctor Smile Lambda, Flat Top Handpiece, at 50 J/cm2 of fluency with one application every 40 h for a total of 5 applications. Forty-eight h after the last laser application, we investigated the presence and amount of keratins 5 and 8 with citofluorymetric and western blotting analyses. Analyses showed an increase in keratin synthesis in test group cultures, showing a remarkable increase in production of keratin 8 in co-cultures test. Laser biostimulation can considerably enhance keratin synthesis when applied with high energy doses and repeated applications to keratinocytes-fibroblasts co-cultures. Cell Culture Techniques;Cell Differentiation;Cells, Cultured;Epithelium;Fibroblasts;Gingiva;Humans;Keratinocytes;Low-Level Light Therapy

Coupling of transient near infrared photonic with magnetic nanoparticle for potential dissipation-free biomedical application in brain. Combined treatment strategies based on magnetic nanoparticles (MNPs) with near infrared ray (NIR) biophotonic possess tremendous potential for non-invasive therapeutic approach. Nonetheless, investigations in this direction have been limited to peripheral body region and little is known about the potential biomedical application of this approach for brain. Here we report that transient NIR exposure is dissipation-free and has no adverse effect on the viability and plasticity of major brain cells in the presence or absence superparamagnetic nanoparticles. The 808â€‰nm NIR laser module with thermocouple was employed for functional studies upon NIR exposure to brain cells. Magnetic nanoparticles were characterized using transmission electron microscopy (TEM), X-ray diffraction (XRD), dynamic laser scattering (DLS), and vibrating sample magnetometer (VSM). Brain cells viability and plasticity were analyzed using electric cell-substrate impedance sensing system, cytotoxicity evaluation, and confocal microscopy. When efficacious non-invasive photobiomodulation and neuro-therapeutical targeting and monitoring to brain remain a formidable task, the discovery of this dissipation-free, transient NIR photonic approach for brain cells possesses remarkable potential to add new dimension. Magnetite Nanoparticles Astrocytes;Brain Diseases;Cell Line, Tumor;Cell Survival;Electron Spin Resonance Spectroscopy;Humans;Magnetite Nanoparticles;Particle Size;Spectrophotometry, Infrared

Noninvasive low-level laser therapy for thrombocytopenia. Thrombocytopenia is a common hematologic disorder that is managed primarily by platelet transfusions. We report here that noninvasive whole-body illumination with a special near-infrared laser cures acute thrombocytopenia triggered by Î³-irradiation within 2 weeks in mice, as opposed to a 5-week recovery time required in controls. The low-level laser (LLL) also greatly accelerated platelet regeneration in the presence of anti-CD41 antibody that binds and depletes platelets, and prevented a severe drop in platelet count caused by a common chemotherapeutic drug. Mechanistically, LLL stimulated mitochondrial biogenesis specifically in megakaryocytes owing to polyploidy of the cells. LLL also protected megakaryocytes from mitochondrial injury and apoptosis under stress. The multifaceted effects of LLL on mitochondria bolstered megakaryocyte maturation; facilitated elongation, branching, and formation of proplatelets; and doubled the number of platelets generated from individual megakaryocytes in mice. LLL-mediated platelet biogenesis depended on megakaryopoiesis and was inversely correlated with platelet counts, which kept platelet biogenesis in check and effectively averted thrombosis even after repeated uses, in sharp contrast to all current agents that stimulate the differentiation of megakaryocyte progenitors from hematopoietic stem cells independently of

platelet counts. This safe, drug-free, donor-independent modality represents a paradigm shift in the prophylaxis and treatment of thrombocytopenia. Antigens, CD34 Animals;Antigens, CD34;Blood Platelets;Cells, Cultured;Flow Cytometry;Humans;Low-Level Light Therapy;Megakaryocytes;Mice;Mice, Inbred C57BL;Mice, Mutant Strains;Thrombocytopenia;Thrombopoiesis

Evaluation of the effects of the low-level laser therapy on swelling, pain, and trismus after removal of impacted lower third molar. BACKGROUND: In current study we aimed to examine the effect of a low-level laser therapy on the pain, mouth opening and swelling of patients whose impacted 3rd molar tooth was extracted in addition measurement volumetrically to the edema with 3dMD face system. METHODS: It was surveyed 15 patients who had bilateral symmetric lower 3rd molars. Surgical sides of patients were randomly separated into two groups: the study group and the control group. It was applied extra oral low-level laser therapy (LLLT, 0.3Â W, 40Â s, 4Â J/cm(2)) to the study group (nâ€‰=â€‰15) after the surgical operation and on the 2nd day. Only routine postoperative recommendation (ice application) was made in the control (nâ€‰=â€‰15) group. The maximum mouth opening, pain level and facial swelling evaluated. 3dMD FaceÂ® (3dMD, Atlanta, GA) Photogrammetric System was used to evaluate volumetric changes of the swelling. RESULTS: There was no statistically significant difference in the edema and interincisal opening between the groups and the pain level in the laser group was significantly lower than in the control group on the 7(th) postoperative day. CONCLUSIONS: Although there were decreasing trismus, swelling, and pain level, with this LLLT, there was significant difference only in the 7th day pain level in the laser group compared with the control group. Adolescent;Adult;Case-Control Studies;Female;Humans;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain Measurement;Pain, Postoperative;Patient Satisfaction;Radiography, Panoramic;Risk Assessment;Sampling Studies;Statistics, Nonparametric;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Trismus;Young Adult

High-frequency pulsed low-level diode laser therapy accelerates wound healing of tooth extraction socket: An in vivo study. BACKGROUND AND OBJECTIVE: This study aimed to evaluate the effects of high-frequency pulsed (HiFP) low-level laser therapy (LLLT) on early wound healing of tooth extraction sockets in rats. STUDY DESIGN/MATERIALS AND METHODS: Bilateral maxillary first molars were extracted from 6-week-old Sprague-Dawley rats. Sockets on the right were treated by HiFP low-level diode laser irradiation (904-910â€‰nm); the left sides served as unirradiated controls. LLLT (0.28â€‰W, 30â€‰kHz, 200-ns pulse, 0.6% duty cycle, 61.2â€‰J/cm(2) total power density) was employed immediately after extraction and every 24 hours thereafter. The maxillae including the sockets were resected 3 or 7 days after extraction. Soft-tissue healing was evaluated on days 0, 3, and 7. The bone mineral content (BMC), bone volume (BV), and bone mineral density (BMD) of the extraction sockets were evaluated by microcomputed tomography, and histomorphometric analysis was carried out on day 7. Real-time PCR analysis of osteogenic marker expression and immunohistochemical detection of proliferating cell nuclear antigen (PCNA)-positive cells were performed on day 3. RESULTS: Compared with control sites, the un-epithelialized areas of the extracted sites were significantly reduced by irradiation (Pâ€‰=â€‰0.04), and the BMC, BV, and BMD of laser-treated sites were significantly increased (Pâ€‰=â€‰0.004, 0.006, and 0.009, respectively). On day 7, the mean height of newly formed immature woven bone was higher in laser-treated sites (Pâ€‰=â€‰0.24). On day 3, laser-treated sites showed significantly higher osteocalcin mRNA expression (Pâ€‰=â€‰0.04) and PCNA-positive cell numbers (Pâ€‰=â€‰0.01). CONCLUSION: HiFP low-level diode laser irradiation enhanced soft- and hard-tissue healing of tooth extraction sockets. Lasers Surg. Med. 48:955-964, 2016. Â© 2016 Wiley Periodicals, Inc.

Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Tooth Extraction;Tooth Socket;Treatment Outcome;Wound Healing

Angiogenic Synergistic Effect of Adipose-Derived Stromal Cell Spheroids with Low-Level Light Therapy in a Model of Acute Skin Flap Ischemia. Human adipose-derived mesenchymal stem cells (hASCs) are an attractive cell source for tissue engineering. However, one obstacle to this approach is that the transplanted hASC population can decline rapidly in the recipient tissue. The aim of this study was to investigate the effects of low-level light therapy (LLLT) on transplanted spheroid hASCs in skin flaps of mice. hASCs were cultured in monolayers or spheroids. LLLT, hASCs, spheroids and spheroids transplanted with LLLT were applied to the skin flaps. Healing of the skin flaps was assessed by gross evaluation and by hematoxylin and eosin staining and elastin van Gieson staining. Compared with the spheroid group, skin flap healing was enhanced in the spheroid + LLLT group, including the neovascularization and regeneration of skin appendages. The survival of hASCs was enhanced by decreased apoptosis of hASCs in the skin flaps of the spheroid + LLLT group. The secretion of growth factors was stimulated in the spheroid + LLLT group compared with the ASC and spheroid groups. These data suggest that LLLT was an effective biostimulator of spheroid hASCs in the skin flaps, enhancing the survival of hASCs and stimulating the secretion of growth factors. Angiogenesis Inducing Agents;Intercellular Signaling Peptides and Proteins Adipose Tissue;Angiogenesis Inducing Agents;Animals;Apoptosis;Cell Differentiation;Cell Survival;Cells, Cultured;Disease Models, Animal;Endothelial Cells;Epithelial Cells;Humans;Intercellular Signaling Peptides and Proteins;Ischemia;Low-Level Light Therapy;Mice;Neovascularization, Physiologic;Skin;Spheroids, Cellular;Stem Cell Transplantation;Stromal Cells;Tissue Scaffolds

Local adjunct effect of antimicrobial photodynamic therapy for the treatment of chronic periodontitis in type 2 diabetics: split-mouth double-blind randomized controlled clinical trial. Diabetes has become a global epidemic. Its complications can have a significant impact on quality of life, longevity, and public health costs. The presence of diabetes might impair the prognosis of periodontal treatments due to its negative influence on wound healing. Antimicrobial photodynamic therapy (aPDT) is a local approach that can promote bacterial decontamination in periodontal pockets. The aim of this study was to investigate the local effect of adjunct aPDT to ultrasonic periodontal debridement (UPD) and compare it to UD only for the treatment of chronic periodontitis in type 2 diabetic patients. Twenty type 2 diabetic patients with moderate to severe generalized chronic periodontitis were selected. Two periodontal pockets with probing depth (PD) and clinical attachment level (CAL) â‰¥5Â mm received UPD only (UPD group) or UPD plus adjunct aPDT (UPDâ€‰+â€‰aPDT group). Periodontal clinical measures were collected and compared at baseline and 30, 90, and 180Â days. After 180Â days of follow-up, there were statistically significant reductions in PD from 5.75â€‰Â±â€‰0.91 to 3.47â€‰Â±â€‰0.97Â mm in the UPD group and from 6.15â€‰Â±â€‰1.27 to 3.71â€‰Â±â€‰1.63Â mm in the UPDâ€‰+â€‰aPDT group. However, intergroup analysis did not reveal statistically significant differences in any of the evaluated clinical parameters (pâ€‰>â€‰0.05). The adjunct application of aPDT to UPD did not present additional benefits for the treatment of chronic periodontitis in type 2 diabetic patients. The ClinicalTrials.gov identifier of the present study is NCT02627534. Anti-Infective Agents Anti-Infective Agents;Chronic Disease;Chronic Periodontitis;Combined Modality Therapy;Diabetes Mellitus, Type 2;Double-Blind Method;Female;Humans;Male;Middle Aged;Photochemotherapy

Treatment of female stress urinary incontinence with Erbium-YAG laser in non-ablative mode. OBJECTIVE: To evaluate the efficacy of laser photothermal therapy in a group of Chilean women with SUI. MATERIAL AND METHODS: Longitudinal prospective study based on 42 women with mild-to-severe SUI, intervened with non ablative Er:YAG laser, between July 2014 and October 2015, in Santiago, Chile. The therapy efficacy was evaluated through the difference between every patient's

scores obtained, before and after treatment, with the International Consultation on Incontinence Questionnaire - Urinary Incontinence Short Form (ICIQ-SF), at a confidence level of 95%. Also, the patient satisfaction with treatment was reported through an ordinal scale. RESULTS: ICIQ-SF median score was 11 before treatment and 3 after 6 months, with a significant difference per patient ($p<0.001$). 78.6% (n=33) reported improvement and 38.1% (n=16), a complete healing of SUI at follow up. 66.7% (n=28) reported high satisfaction and 81.8% (n=27) of sexually active women, also reported improvement of sexual gratification. Only mild pain during the procedure was reported as adverse effect. CONCLUSIONS: Based on this short-term pilot study, non-ablative Er:YAG laser procedure seems to be a safe and efficacious alternative for patients with SUI. Further controlled studies will help to validate the use of non-ablative Er:YAG for treatment of SUI.
Adult;Aged;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Treatment Outcome;Urinary Incontinence, Stress

Transcranial low-level infrared laser irradiation ameliorates depression induced by reserpine in rats. Transcranial low-level infrared laser is a modality of therapy based on the principle of photons delivered in a non-invasive manner through the skull for the treatment of some neurological conditions such as psychological disorders, traumatic brain injuries, and neurodegenerative diseases among others. In the present study, effects of low-level infrared laser irradiation with different radiation powers (80, 200, and 400Â mW, continuous wave) were investigated on normal animals subjected to forced swimming test (FST). Results indicated that there are changes in FST parameters in animals irradiated with laser; the lowest dose provoked a significant increase in animal activity (swimming and climbing) and a significant decrease in animal's immobility, while the highest laser dose resulted in a complete inverse action by significantly increasing animal immobility and significantly decreasing animal activity with respect to control animals. The lowest dose (80Â mW) of transcranial laser irradiation has then utilized on animals injected with a chronic dose of reserpine (0.2Â mg/kg i.p. for 14Â days) served as an animal model of depression. Laser irradiation has successfully ameliorated depression induced by reserpine as indicated by FST parameters and electrocorticography (ECoG) spectral analysis in irradiated animals. The findings of the present study emphasized the beneficial effects of low-level infrared laser irradiation on normal and healthy animals. Additionally, it indicated the potential antidepressant activity of the low dose of infrared laser irradiation. Reserpine Animals;Behavior, Animal;Brain;Depression;Disease Models, Animal;Electroencephalography;Infrared Rays;Low-Level Light Therapy;Male;Phototherapy;Rats;Reserpine;Swimming

Evaluation of Patient Perceptions After Vestibuloplasty Procedure: A Comparison of Diode Laser and Scalpel Techniques. INTRODUCTION: Inadequate vestibular depth results in poor plaque control owing to an insufficient width of keratinized gingiva. Vestibuloplasty provides the necessary vestibular depth and can be performed either with a scalpel, electrocautery or lasers. AIM: To evaluate the patient perceptions related to pain and discomfort on the 1(st), 3(rd) and the 7(th) day post vestibuloplasty and also assess the healing outcomes related to the treatment of inadequate vestibular depth either with the diode laser or the scalpel. MATERIALS AND METHODS: Twenty patients who had inadequate vestibular depth and required vestibuloplasty were assigned randomly to undergo the procedure either with the scalpel or the laser. The data obtained was analysed for intergroup comparison with an independent paired t-test and intragroup comparison was determined by a paired t-test. RESULTS: Intragroup comparison within the laser group for VAS scores of pain and discomfort within all the reported days exhibited a significant difference ($p<0.05$). Inter group comparison revealed that the patients in the laser group had lower VAS cores for pain and discomfort compared to the scalpel group ($p<0.05$). Analysis of the three pointer scale for healing revealed that the patients in the laser group exhibited better healing outcomes on the 1(st), 3(rd) and the 7(th) day

compared to the scalpel group. CONCLUSION: Observations from the study highlight the opinion that laser can be a safe and effective alternative to traditional vestibuloplasty performed with the scalpel.

Efficacy of low-level laser therapy in accelerating tooth movement, preventing relapse and managing acute pain during orthodontic treatment in humans: a systematic review. BACKGROUND: Recently low-level laser therapy (LLLT) has been proposed to improve orthodontic treatment. The aims of this systematic review were to investigate the scientific evidence to support applications of LLLT: (a) to accelerate tooth movement, (b) to prevent orthodontic relapse and (c) to modulate acute pain, during treatment with fixed appliances in children and young adults. METHODS: To ensure a systematic literature approach, this systematic review was conducted to Goodman's four step model. Three databases were searched (Medline, Cochrane Controlled Clinical Trials Register and Scitation), using predetermined search terms. The quality of evidence was rated according to the GRADE system. RESULTS: The search identified 244 articles, 16 of which fulfilled the inclusion criteria: three on acceleration of tooth movement by LLLT and 13 on LLLT modulation of acute pain. No study on LLLT for prevention of relapse was identified. The selected studies reported promising results for LLLT; elevated acceleration of tooth movement and lower pain scores, than controls. With respect to method, there were wide variations in type of laser techniques. CONCLUSIONS: The quality of evidence supporting LLLT to accelerate orthodontic tooth movement is very low and low with respect to modulate acute pain. No studies met the inclusion criteria for evaluating LLLT to limit relapse. The results highlight the need for high quality research, with consistency in study design, to determine whether LLLT can enhance fixed appliance treatment in children and young adults. Acute Pain;Adolescent;Child;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Recurrence;Tooth Movement Techniques;Young Adult

Multifractional microablative laser combined with spacially modulated ablative (SMA) technology for facial skin rejuvenation. BACKGROUND AND OBJECTIVE: Due to the increasing demand for aesthetic procedures, especially facial aesthetic surgery, a new laser technology has been developed for facial skin rejuvenation and wrinkle treatment. The aim of this study was to objectively and subjectively assess the clinical efficacy and safety of Erbium:YAG laser combined with Spatially Modulated Ablation (Er:YAGâ€‰+â€‰SMA) on facial skin rejuvenation. STUDY DESIGN/MATERIALS AND METHODS: Patients with Fitzpatrick skin type's I-IV were prospectively included. Inclusion criteria consisted of having wrinkles and irregular skin texture. All patients underwent two Er:YAGâ€‰+â€‰SMA sessions (1 month apart) to stimulate tissue regeneration. Er:YAG laser emits wavelength at 2,940â€‰nm and when combined with SMA, a resonance effect is produced in the dermis to promote tissue regeneration. Facial skin elasticity and firmness were objectively assessed by Cutometer at baseline and month 6 (M6). Aesthetic improvement was qualitatively assessed using digital photographs. Patient satisfaction with regard to their facial appearance was self-assessed using the validated FACE-Q scale and the patient-perceived age VAS scale at baseline, M1, and M6. Side effects were investigated after each session. RESULTS: Thirty-four patients were included, 50% (18 patients) had Fitzpatrick skin type III and 41% (14 patients) were smokers. Skin elasticity indices were significantly improved: from 0.335â€‰Â±â€‰0.015 at baseline to 0.387â€‰Â±â€‰0.021 at M6 (Pâ€‰=â€‰0.05*) for R5 (net elasticity). Skin firmness was assessed through R7 (biological elasticity) and R6 (viscoelastic ratio) at baseline and M6: a significant increase from 0.235â€‰Â±â€‰0.01 to 0.2709â€‰Â±â€‰0.009 (Pâ€‰<â€‰0.03**) and decrease from 0.486â€‰Â±â€‰0.022 to 0.3918â€‰Â±â€‰0.023 (Pâ€‰<â€‰0.006***) were respectively observed. A negative value for R6 corresponded to an improved skin condition. The FACE-Q scores were significantly increased from 39.4â€‰Â±â€‰6.7 at baseline to 45.4â€‰Â±â€‰9.1 at M1 (Pâ€‰<â€‰0.006***) and 50.4â€‰Â±â€‰9.8 at M6 (Pâ€‰<â€‰0.0001***), reflecting wrinkle reduction and enhanced rejuvenation. According to the age appraisal VAS scale, results showed that

patients felt younger by -2.92 years at M1 (Pâ€‰<â€‰0.0001***) and -4.13 years (Pâ€‰<â€‰0.0001***) at M6. No adverse reaction was reported. CONCLUSION: The Er:YAGâ€‰+â€‰SMA technology offers an effective and safe treatment alternative for facial skin rejuvenation. It reduces the recovery time compared to conventional lasers such as carbon dioxide laser. Lasers Surg. Med. 49:78-83, 2017. Â© 2016 Wiley Periodicals, Inc. Aged;Cohort Studies;Combined Modality Therapy;Esthetics;Humans;Laser Therapy;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Risk Assessment;Skin Aging;Treatment Outcome

Effect of low-level laser therapy on pain and perineal healing after episiotomy: A triple-blind randomized controlled trial. BACKGROUND AND OBJECTIVE: Episiotomy is associated with perineal pain and healing complications. The low-level laser therapy (LLLT) reduces pain and inflammation and stimulates the healing process. This study aimed to assess the effect of LLLT on pain and perineal healing after an episiotomy. DESIGN/MATERIALS AND METHODS: A randomized, triple-blind, parallel clinical trial with 54 postpartum women who had a spontaneous birth with a right mediolateral episiotomy. The women were randomized into two groups: the experimental group (applications of LLLT nâ€‰=â€‰29) or the placebo group (simulated LLLT applications nâ€‰=â€‰25). Three sessions of real or sham irradiation were performed at 6-10 hours after normal birth, and the 2nd and 3rd applications were performed at 20-24 hours and 40-48 hours after the first session, respectively. Perineal pain was recorded using a Numeric Scale ranging from 0 to 10 (0â€‰=â€‰absence and 10â€‰=â€‰worst pain). Perineal healing was assessed using the redness, oedema, ecchymosis, discharge, and approximation (REEDA) scale. Both groups were assessed four times: in each of the three LLLT sessions and at 7-10 days after normal birth. The groups were compared using the Student's t, Mann-Whitney, and Chi-square tests. RESULTS: There was no significant difference between the groups regarding perineal healing after LLLT. The perineal pain scores were statistically higher in the experimental group in the first assessment and after the third LLLT. There was no significant difference between the groups related to the perineal pain scores 7-10 days after normal birth. CONCLUSION: The use of LLLT does not provide any benefit for treating postpartum perineal trauma using these specific protocol and parameters. Lasers Surg. Med. 49:181-188, 2017. Â© 2016 Wiley Periodicals, Inc.
Adolescent;Adult;Episiotomy;Female;Humans;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative;Perineum;Wound Healing;Young Adult

Effect of diode low-level lasers on fibroblasts derived from human periodontal tissue: a systematic review of in vitro studies. This study aimed to systematically assess the parameter-specific effects of the diode low-level laser on human gingival fibroblasts (HGFs) and human periodontal ligament fibroblasts (HPDLFs). An extensive search was performed in major electronic databases including PubMed (1997), EMBASE (1947) and Web of Science (1956) and supplemented by hand search of reference lists and relevant laser journals for cell culture studies investigating the effect of diode low-level lasers on HGFs and HPDLFs published from January 1995 to December 2015. A total of 21 studies were included after screening 324 independent records, amongst which eight targeted HPDLFs and 13 focussed on HGFs. The diode low-level laser showed positive effects on promoting fibroblast proliferation and osteogenic differentiation and modulating cellular inflammation via changes in gene expression and the release of growth factors, bone-remodelling markers or inflammatory mediators in a parameter-dependent manner. Repeated irradiations with wavelengths in the red and near-infrared range and at an energy density below 16Â J/cm(2) elicited favourable responses. However, considerable variations and weaknesses in the study designs and laser protocols limited the interstudy comparison and clinical transition. Current evidence showed that diode low-level lasers with adequate parameters stimulated the proliferation and modulated the inflammation

of fibroblasts derived from human periodontal tissue. However, further in vitro studies with better designs and more appropriate study models and laser parameters are anticipated to provide sound evidence for clinical studies and practice. Cell Differentiation;Cell Proliferation;Cells, Cultured;Fibroblasts;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Periodontal Ligament;Treatment Outcome

Effectiveness of Single Session of Low-Level Laser Therapy with a 940â€‰nm Wavelength Diode Laser on Pain, Swelling, and Trismus After Impacted Third Molar Surgery. INTRODUCTION: In low-level laser therapy (LLLT), applications are generally performed in repetitive sessions using wavelengths of around 800â€‰nm, at which the depth of penetration of laser is greater. The present study aimed to investigate the effects of LLLT with a 940â€‰nm diode laser, which was performed extraorally on all the primarily and secondarily affected areas immediately after surgery in a single session, on pain, swelling, and trismus that occurred after impacted tooth extraction. MATERIALS AND METHODS: Thirty-five outpatients with similarly impacted lower third molars on both sides were selected. The teeth of patients were removed in two separate operations. Postoperatively, the patients received laser therapy with energy of 4â€‰J/cm(2) on one side and no laser energy was applied to the other side (placebo side). Swelling, trismus, and subjective assessment of pain on a visual analog scale were evaluated and compared between the laser-treated and placebo sides. RESULTS: There was no statistically significant difference in pain, swelling, or trismus between the sides (Mann-Whitney U test pâ€‰>â€‰0.05). However, according to the clinical outcomes, swelling and trismus were less in the laser-treated side than in the placebo side. CONCLUSIONS: A single-session LLLT that would be applied with a diode laser immediately after impacted tooth extraction might help patients to be less affected by postoperative trismus and swelling. Adolescent;Adult;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain Measurement;Pain, Postoperative;Single-Blind Method;Tooth, Impacted;Treatment Outcome;Trismus

Photobiomodulation: Implications for Anesthesia and Pain Relief. OBJECTIVE: This review examines the evidence of neural inhibition as a mechanism underlying pain relief and anesthetic effect of photobiomodulation (PBM). BACKGROUND: PBM for pain relief has also been used for more than 30 years; however, the mechanism of its effectiveness has not been well understood. METHODS: We review electrophysiological studies in humans and animal models and cell culture studies to examine neural responses to PBM. RESULTS: Evidence shows that PBM can inhibit nerve function in vivo, in situ, ex vivo, and in culture. Animal studies using noxious stimuli indicate nociceptor-specific inhibition with other studies providing direct evidence of local conduction block, leading to inhibited translation of pain centrally. Evidence of PBM-disrupted neuronal physiology affecting axonal flow, cytoskeleton organization, and decreased ATP is also presented. PBM changes are reversible with no side effects or nerve damage. CONCLUSIONS: This review provides strong evidence in neuroscience identifying inhibition of neural function as a mechanism for the clinical application of PBM in pain and anesthesia. Anesthesia, Conduction;Animals;Cells, Cultured;Humans;Low-Level Light Therapy;Pain

Proliferation, migration, and expression of oral-mucosal-healing-related genes by oral fibroblasts receiving low-level laser therapy after inflammatory cytokines challenge. BACKGROUND AND OBJECTIVES: Increased expression of inflammatory cytokines in the oral cavity has been related to the etiopathogenesis of oral mucositis and to delayed oral mucosal repair. Low-level laser therapy (LLLT) stimulates proliferation and migration of gingival fibroblasts, but the effects of specific inflammatory cytokines on oral mucosal cells and the modulation of these effects by LLLT have not been fully investigated. Therefore, this study investigated the effects of LLLT on oral fibroblasts after being challenged by oral-mucositis-related inflammatory cytokines. METHODS: Human gingival fibroblasts

were seeded in plain culture medium (DMEM) containing 10% fetal bovine serum (FBS) for 24â€‰hours. Then, cells were kept in contact with inflammatory cytokines (TNF-Î±, IL-1Î², IL-6, and IL-8) in serum-free DMEM for 24â€‰hours. After this period, cells were subjected to LLLT with a diode laser device (LaserTABLE, InGaAsP, 780â€‰nm, 25â€‰mW) delivering energy doses from 0.5 to 3â€‰J/cm(2) . Irradiation was repeated for 3 consecutive days. Twenty-four hours after the last irradiation, cell migration (wound-healing and transwell migration assays), cell proliferation (BrdU), gene expression of COL-I and growth factors (real-time PCR), and synthesis of COL-I (Sirius Red assay) and VEGF (ELISA) were assessed. Data were subjected to two-way ANOVA and Tukey's tests or Kruskall-Walis and Mann-Whitney tests (Pâ€‰<â€‰0.05). RESULTS: The inflammatory cytokines decreased the migration capacity of gingival fibroblasts. However, a statistically significant difference was observed only for IL-6, detected by transwell assay, where 30% less cells migrated through the pores (Pâ€‰<â€‰0.05) and IL-8, with an increased wound area (116%; Pâ€‰<â€‰0.05), detected by the wound healing method. Cell proliferation was not affected by contact with cytokines, while growth factors and COL-I expression (approximately 80%; Pâ€‰<â€‰0.05), as well as VEGF synthesis (approximately 20%; Pâ€‰<â€‰0.05), were decreased after contact to all tested cytokines. The opposite was seen for total collagen synthesis. LLLT promoted an acceleration of fibroblast migration (30%; Pâ€‰<â€‰0.05) and proliferation (112%; Pâ€‰<â€‰0.05) when delivering 0.5â€‰J/cm(2) to the cells previously in contact with the inflammatory cytokines. Gene expression of VEGF (approximately 30%; Pâ€‰<â€‰0.05), and EGF (17%; Pâ€‰<â€‰0.05), was stimulated by LLLT after contact with TNF-Î± and IL-6. CONCLUSION: LLLT can counteract the negative effects of high concentrations of inflammatory cytokines, especially IL-6 and IL-8 on gingival fibroblast functions directly related to the wound-healing process. Lasers Surg. Med. 48:1006-1014, 2016. Â© 2016 Wiley Periodicals, Inc. Biomarkers;Cytokines Adult;Biomarkers;Cell Movement;Cell Proliferation;Cytokines;Fibroblasts;Gene Expression Regulation;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mouth Mucosa;Stomatitis;Wound Healing

[Impact of low level laser therapy on skin blood flow]. The aim of this study was to objectively assess the impact of low level laser therapy on skin blood flow, in terms of two of its components - the flow and trophic and therapeutic effect. MATERIAL AND METHODS: Nineteen children aged 3-15 years have been included in the study (seven boys and twelve girls) with a diagnosis of meningomyelocele in the lumbosacral area. In nine of them (47.3%) bedsores were found in the area of paresis location. Studies of skin blood flow were performed using xenon 133 clearance in the Department of Nuclear Medicine of the Children's Memorial Health Institute. Xenon 133 radioisotope in saline with intrinsic activity 74 MBq in 1 ml was used as the marker. Laser application was performed immediately prior to the application of the marker with a tag shower 60 mW probe, emitting 680 nm red light with surface power density of 0.5 J/cm2. RESULTS: Within the tested children the laser application resulted in a significantly increased skin blood flow. Average results in tested group before LLLT are 7.47 ml/100 g/min, after LLLT 11.08 ml/100 g/min. CONCLUSIONS: 1. LLLT significantly increases the perfusion of the skin. 2. The effect of the increased perfusion as the result of laserotherapy in the most evident in children with skin trophic abnormalities. 3. Results confirmed by clinical observation indicate, that perfusion increase in relation to LLLT takes place with participation of trophic component of skin blood circulation. Adolescent;Blood Flow Velocity;Child;Child, Preschool;Female;Hemodynamics;Humans;Low-Level Light Therapy;Male;Meningomyelocele;Skin Diseases

The Effectiveness of Low-Level Laser Therapy in Patients with Drug-Induced Hyposalivation: A Pilot Study. OBJECTIVE: The aim of this study was to compare switched on and switched off (sham) low-level laser therapy (LLLT) in the treatment of drug-induced hyposalivation. BACKGROUND DATA: Hyposalivation is decreased salivary flow rate most frequently present in patients who take a lot of

medication, suffer from SjÃ¶gren's syndrome, or were irradiated. Available therapies provide only short-term relief. MATERIALS AND METHODS: Forty-three participants (40 females and 3 males, average age 72.3â€‰Â±â€‰8.9) participated in the study. Before therapy or after therapy, every participant fulfilled quality-of-life assessment scale (OHIP-CRO14). Unstimulated and stimulated salivary flow rates were measured before and after treatment. The LLLT was performed by the use of gallium-aluminum-arsenide (GaAlAs) laser (830â€‰nm) on parotid, submandibular, and sublingual glands every day except during weekends for 14 days. RESULTS: Significant difference in unstimulated salivary flow rate after the treatment was found in the study group (pâ€‰=â€‰0.002) compared with the sham group. No significant difference in stimulated salivary flow rate after treatment was found in the laser group (pâ€‰=â€‰0.626) nor in the sham laser group (pâ€‰=â€‰0.233). No significant difference in patient's quality-of-life score was found after both treatments. CONCLUSIONS: The results of this study showed that the LLLT increased unstimulated salivary flow rate significantly. However, stimulated salivary flow rate did not increase significantly after the LLLT. In patients who underwent sham laser therapy, neither unstimulated nor stimulated salivary flow rate increased significantly. Aged;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pilot Projects;Quality of Life;Treatment Outcome;Xerostomia

Laser phototherapy improves early stage of cutaneous wound healing of rats under hyperlipidic diet. The aim of this study was to evaluate the influence of laser photobiomodulation in cutaneous healing of rats under a hyperlipidic diet. Forty-eight Wistar Albinus rats, weaned, received standard diet (SD) or hyperlipidic diet (HD) for 20Â weeks. The groups were divided into SD rats and HD rats, SD-irradiated rats (LSD), and HD-irradiated rats (LHD). Standard cutaneous wound (1Â cm(2)) was created on the dorsum of each rat. The irradiation started immediately after surgery and every 48Â h for 7 or 14Â days (Î»660Â nm, 40Â mW, 6Â J/cm(2), Ï• 0,04Â cm(2), CW), when they were killed under deep anesthesia. The specimens were removed, routinely processed, stained with hematoxylin/eosin (H/E), and evaluated by light microscopy. Rats fed with hyperlipidic diet had greater intensity in the inflammatory process and prolonged hyperemia. At day 7, the intensity of inflammation was reduced in LSD and LHD groups when compared to their control groups, SD (pâ€‰=â€‰0.002) and HD (pâ€‰=â€‰0.02). There was an increase in fibroblast proliferation and collagen deposition, especially in the LHD group. At day 14, the HD group presented more intensive hyperemia than the SD group. It can be concluded that the hyperlipidic diet modified the inflammation pattern in wound healing and that laser light has a positive biomodulative effect on the healing process only in early stages. Animals;Cell Proliferation;Diet, High-Fat;Female;Intra-Abdominal Fat;Low-Level Light Therapy;Male;Rats, Wistar;Skin;Wound Healing

Modifying effect of intravenous laser therapy on the protein expression of arginase and epidermal growth factor receptor in type 2 diabetic patients. The epidermal growth factor receptor (EGFR) signaling pathway may be involved in cell activation and may influence the neuronal microenvironment, microglia activation, and production of proinflammatory cytokines. Arginase and nitric oxide synthase (NOS) both use L-arginine as a common substrate. Decreasing the arginase expression may increase L-arginine consumption by NOS and increase nitric oxide (NO) synthesis. Intravenous laser blood irradiation (ILBI) is an effective systemic treatment for different pathologies including diabetes mellitus. Previous studies have shown that low-level laser therapy can have an effect on the release of certain cytokines and growth factors. The aim of this study was to evaluate the effects of ILBI on the expression of arginase and epidermal growth factor receptor in type 2 diabetic patients. We used 630Â nm red laser light, 1.5Â mW, continuous mode, intravenously for 30Â min in 13 type 2 diabetic patients and compared their blood samples using the flow cytometry technique, before and after ILBI. The difference between the percentage of cells before and after therapy was analyzed using repeated-measures ANOVA, and the relationship between EGFR and

arginase expression in blood and tissue was evaluated by calculating the Pearson correlation coefficient. We found a significant decrease in the expression of both arginase- and EGFR-positive cells after laser therapy (Pâ€‰<â€‰0.01). In conclusion, laser therapy may have a beneficial effect for diabetic patients via decreasing arginase expression and activation of the NOS/NO pathway which increases NO production and vasodilation, and decreasing EGFR expression which may reduce neuroinflammation and its secondary damages. EGFR protein, human;ErbB Receptors;Arginase Arginase;Diabetes Mellitus, Type 2;ErbB Receptors;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Vasodilation

Photobiomodulation: An Accepted Therapeutic Modality? Humans;Low-Level Light Therapy;Periodicals as Topic;Publishing

Effects of a higher dose of near-infrared light on clinical signs and neuroprotection in a monkey model of Parkinson's disease. We have reported previously that intracranial application of near-infrared light (NIr) - when delivered at the lower doses of 25J and 35J - reduces clinical signs and offers neuroprotection in a subacute MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) monkey model of Parkinson's disease. In this study, we explored whether a higher NIr dose (125J) generated beneficial effects in the same MPTP monkey model (n=15). We implanted an NIr (670nm) optical fibre device within a midline region of the midbrain in macaque monkeys, close to the substantia nigra of both sides. MPTP injections (1.8-2.1mg/kg) were made over a five day period, during which time the NIr device was turned on and left on continuously throughout the ensuing three week survival period. Monkeys were evaluated clinically and their brains processed for immunohistochemistry and stereology. Our results showed that the higher NIr dose did not have any toxic impact on cells at the midbrain implant site. Further, this NIr dose resulted in a higher number of nigral tyrosine hydroxylase immunoreactive cells when compared to the MPTP group. However, the higher NIr dose monkeys showed little evidence for an increase in mean clinical score, number of nigral Nissl-stained cells and density of striatal tyrosine hydroxylase terminations. In summary, the higher NIr dose of 125J was not as beneficial to MPTP-treated monkeys as compared to the lower doses of 25J and 35J, boding well for strategies of NIr dose delivery and device energy consumption in a future clinical trial. 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Dopamine 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Animals;Disease Models, Animal;Dopamine;Dopaminergic Neurons;Dose-Response Relationship, Radiation;Haplorhini;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Macaca;Mesencephalon;Neostriatum;Neuroprotection;Parkinson Disease;Parkinsonian Disorders;Phototherapy;Substantia Nigra

Laser-activated transforming growth factor-Î²1 induces human Î²-defensin 2: implications for laser therapies for periodontitis and peri-implantitis. BACKGROUND: There is increasing popularity of high-power lasers for surgical debridement and antimicrobial therapy in the management of peri-implantitis and periodontal therapy. Removal of the noxious foci would naturally promote tissue healing directly. However, there are also anecdotal reports of better healing around routine high-power laser procedures. The precise mechanisms mediating these effects remain to be fully elucidated. This work examines these low-dose laser bystander effects on oral human epithelial and fibroblasts, particularly focusing on the role of human Î²-defensin 2 (HBD-2 or DEFB4A), a potent factor capable of antimicrobial effects and promoting wound healing. MATERIAL AND METHODS: Laser treatments were performed using a near-infrared laser (810 nm diode) at low doses. Normal human oral keratinocytes and fibroblast cells were used and HBD-2 mRNA and protein expression was assessed with real time polymerase chain reaction, western blotting and immunostaining. Role of transforming growth factor (TGF)-Î²1 signaling in this process was dissected using pathway-specific small molecule inhibitors. RESULTS: We observed laser treatments robustly induced HBD-2 expression in an oral fibroblast cell line compared to a keratinocyte cell line. Low-dose laser treatments results in

activation of the TGF-Î²1 pathway that mediated HBD-2 expression. The two arms of TGF-Î²1 signaling, Smad and non-Smad are involved in laser-mediated HBD-2 expression. CONCLUSIONS: Laser-activated TGF-Î²1 signaling and induced expression of HBD-2, both of which are individually capable of promoting healing in tissues adjacent to high-power surgical laser applications. Moreover, the use of low-dose laser therapy itself can provide additional therapeutic benefits for effective clinical management of periodontal or peri-implant disease. DEFB4A protein, human;Transforming Growth Factor beta1;beta-Defensins Blotting, Western;Fibroblasts;Humans;Keratinocytes;Low-Level Light Therapy;Peri-Implantitis;Periodontitis;Real-Time Polymerase Chain Reaction;Transforming Growth Factor beta1;beta-Defensins

Cell lineage responses to photobiomodulation therapy. Photobiomodulation (PBM) therapy has been noted to promote cell proliferation and growth in many different cell types shown both in vitro and in vivo. Currently, treatment regimens are used in the clinic for a variety of ailments, including wound healing. However, most protocols treat an anatomical site without considering individual cell types constituting the target tissues. This study investigates the maximal dose threshold for oral keratinocyte and fibroblast cell types treated with near-infrared laser therapy. We observed keratinocytes have increased sensitivity to laser irradiances (>0.047 W/cm(2) , 300Â sec, 14.2Â J/cm(2)) compared to the fibroblast cells (>0.057 W/cm(2) , 300Â sec, 15.1 J/cm(2)) (pÂ <Â 0.0001). Laser treatments were noted to generate increased reactive oxygen species (ROS) levels in keratinocytes compared to fibroblasts that appeared to inversely correlate with higher basal catalase expression. To validate these observations, melatonin was used to treat keratinocytes to induce catalase activity (pÂ <Â 0.0001). Increased melatonin-induced catalase levels were noted to significantly improve keratinocyte survival to phototoxic laser doses. These observations suggest that clinical laser dosing should account for differential effects of lasers on individual cell types to improve safety and clinical efficacy of PBM therapy. Reactive Oxygen Species Cell Lineage;Cells, Cultured;Dose-Response Relationship, Radiation;Fibroblasts;Humans;Keratinocytes;Low-Level Light Therapy;Reactive Oxygen Species;Wound Healing

Low-Level Laser Therapy (904 nm) Counteracts Motor Deficit of Mice Hind Limb following Skeletal Muscle Injury Caused by Snakebite-Mimicking Intramuscular Venom Injection. Myotoxins present in Bothrops venom disrupt the sarcolemma of muscle fibers leading to the release of sarcoplasmic proteins and loss of muscle homeostasis. Myonecrosis and tissue anoxia induced by vascularization impairment can lead to amputation or motor functional deficit. The objective of this study was to investigate the dynamic behavior of motor function in mice subjected to injection of Bothrops jararacussu venom (Bjssu) and exposed to low-level laser therapy (LLLT). Male Swiss mice received Bjssu injection (830 Î¼g/kg) into the medial portion of the right gastrocnemius muscle. Three hours later the injected region was irradiated with diode semiconductor Gallium Arsenide (GaAs- 904 nm, 4 J/cmÂ²) laser following by irradiation at 24, 48 and 72 hours. Saline injection (0.9% NaCl) was used as control. Gait analysis was performed 24 hours before Bjssu injection and at every period post-Bjssu using CatWalk method. Data from spatiotemporal parameters Stand, Maximum Intensity, Swing, Swing Speed, Stride Length and Step Cycle were considered. The period of 3 hours post venom-induced injury was considered critical for all parameters evaluated in the right hindlimb. Differences ($p<0.05$) were concentrated in venom and venom + placebo laser groups during the 3 hours post-injury period, in which the values of stand of most animals were null. After this period, the gait characteristics were re-established for all parameters. The venom + laser group kept the values at 3 hours post-Bjssu equal to that at 24 hours before Bjssu injection indicating that the GaAs laser therapy improved spatially and temporally gait parameters at the critical injury period caused by Bjssu. This is the first study to analyze with cutting edge technology the gait functional deficits caused by snake envenoming and gait gains produced by GaAs laser irradiation. In this sense, the study fills a

gap on the field of motor function after laser treatment following snake envenoming. Crotalid Venoms Animals;Bothrops;Crotalid Venoms;Gait;Hindlimb;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Recovery of Function;Snake Bites

Low-level Light Therapy for Treatment of Diabetic Foot Ulcer: A Review of Clinical Experiences. BACKGROUND: Diabetic foot ulcers (DFU) represent a significant complication of diabetes mellitus (DM). DFU affect one in four patients with DM and treatments of DFU are limited and challenging. The management of DFU remains a significant healthcare and socioeconomic burden ($245 billion). There is a wide range of advanced therapies for DFU, but these are costly and have demonstrated only minimal efficacy in limited published studies. An emerging treatment modality to improve DFU and optimize wound healing is the use of low-level light therapy (LLLT). LLLT involves the use of light in the form of low-level or low-power laser or light emitting diodes to alter biochemical pathways, which may result in changes to cell shape, cell migration, and cell signaling.
 OBJECTIVE: To review published clinical experiences (case series and case reports) using LLLT for treatment of DFU, and provide evidence-based recommendations and future directions on the potential of LLLT as a therapeutic modality for DFU.
 METHODS AND MATERIALS: On January 16, 2016 we searched the published literature using databases: PubMed, EMBASE, CINAHL, and Web of Science with key terms: "diabetic foot" AND ("low level laser therapy" OR "low level light therapy" OR "LLLT" OR "light emitting diode" OR "phototherapy" OR "laser").
 RESULTS: After screening of titles, abstracts and/or full-text, 7 original articles were suitable in our review. Our review contains 5 case series and 2 case reports that evaluated LLLT for treatment of DFU, and all reviewed studies have shown positive improvement of DFU using LLLT with no adverse events, albeit with limitations that may be minimized with future RCTs.
 CONCLUSIONS: LLLT is an emerging and promising treatment modality to current alternatives that are costly and have shown limited success. Based upon the published evidence, we envision additional research may allow for stronger recommendation with LLLT for treatment of DFU.

 J Drugs Dermatol. 2016;15(7):843-848. Diabetes Mellitus;Diabetic Foot;Humans;Low-Level Light Therapy;Treatment Outcome

Effects of Superpulsed, Low-Level Laser Therapy on Neurosensory Recovery of the Inferior Alveolar Nerve. OBJECTIVE: The purpose of this investigation was to evaluate the therapeutic efficacy of superpulsed, low-level laser therapy (SLLLT) on neurosensory recovery of the inferior alveolar nerve (IAN) after oral surgical injury. BACKGROUND DATA: A survey of the literature reveals the uncertainty of outcomes for the surgical management of IAN injury and the efficacy of low-level laser therapy in the treatment of IAN injury. METHODS: In this study, the authors report the results for SLLLT in 57 patients affected by paresthesia of the lip, chin, gingival, and buccal regions. Each patient was subjected to 10 laser treatments, once a week, with a GaAs diode laser. Clinical neurosensory tests (soft touch, 2-point discrimination, pin prick, thermal test) and the visual analogue scale were used before every treatment to evaluate the extent of neurosensory recovery. RESULTS: The authors' results demonstrate that 83.3% of the patients had a significant neurosensory recovery, as evident in the objective and subjective tests. CONCLUSION: The results reported in this study indicate that SLLLT has the potential to improve neurosensory recovery in patients with IAN paresthesia. Adult;Chin;Female;Humans;Low-Level Light Therapy;Male;Mandibular Nerve;Middle Aged;Oral Surgical Procedures;Recovery of Function;Sensation;Trigeminal Nerve Injuries

Novel use of non-ablative fractional photothermolysis for cafÃ©-au-lait macules in darker skin types. IMPORTANCE: The removal of cafÃ©-au-lait macules (CALMs) in patients with darker skin phototypes poses a significant challenge due to limited available therapeutic options and increased risk of adverse effects, including permanent scarring and further dyspigmentation. Herein, we demonstrate the novel use of non-ablative fractional photothermolysis for the safe removal of CALMs in individuals with Fitzpatrick skin type (FST) IV-V. OBSERVATIONS: Retrospective analysis of four patients (FST IV-V)

with CALMs revealed that three of these patients had greater than 50% clearance after multiple treatment sessions with the non-ablative fractional 1,550-nm erbium-doped fiber laser. CONCLUSIONS AND RELEVANCE: This report demonstrates the utility and safety of non-ablative fractional resurfacing in the treatment of CALMs in darker skin phototypes. Lasers Surg. Med. 49:84-87, 2017. Â© 2016 Wiley Periodicals, Inc. Adult;Cafe-au-Lait Spots;Cohort Studies;Esthetics;Facial Dermatoses;Female;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Retrospective Studies;Risk Assessment;Skin Pigmentation;Treatment Outcome;Young Adult

A Six-week Low-level Laser Therapy Protocol is Effective for Reducing Waist, Hip, Thigh, and Upper Abdomen Circumference. OBJECTIVE: The efficacy of low-level laser therapy for noninvasive body contouring has been previously demonstrated in clinical trials leading to its market clearance. Subjects achieved these beneficial effects following three weekly low-level laser therapy treatments for two weeks. The objective of this study was to determine if the same aesthetic benefit can be achieved following one weekly low-level laser therapy treatment for six weeks. SETTING: Two private dermatology practices. PARTICIPANTS: Healthy adults with a body mass index of 25 to 40kg/m(2) (N=54). MEASUREMENTS: Subjects underwent one weekly low-level laser therapy procedure for six consecutive weeks using a device consisting of six 17mW, 635nm red diodes. Waist, hip, thigh, and upper abdomen circumference were measured weekly. Study success criteria was a 4.5-inch mean decrease in combined body circumference. RESULTS: The mean decrease in combined circumference reduction at six weeks was 5.4 inches (p<0.001), and most subjects (72.2%) achieved a â‰¥4.5-inch decrease. Most subjects (81.0%) were Satisfied (27%) or Very Satisfied (54%) with the aesthetic results they achieved. There were no adverse events. CONCLUSION: One weekly low-level laser therapy treatment for six weeks is clinically effective for reducing waist, hip, thigh, and upper abdomen circumference and may be more effective than the previous two-week treatment protocol. ClinicalTrials.gov Identifier: NCT02109107.

Acute LED irradiation does not change the anaerobic capacity and time to exhaustion during a high-intensity running effort: a double-blind, crossover, and placebo-controlled study : Effects of LED irradiation on anaerobic capacity and performance in running. The purpose of this study was to investigate the acute effects of photobiomodulation therapy using cluster light-emitting diodes (LEDT; 104 diodes) (wavelength 660 and 850Â nm; energy density 1.5 and 4.5Â J/cm(2); energy 60Â J at each point; total energy delivered 600Â J) on alternative maximal accumulated oxygen deficit (MAODALT) and time to exhaustion, during a high-intensity running effort. Fifteen moderately active and healthy males (age 25.1â€‰Â±â€‰4.4Â years) underwent a graded exercise test and two supramaximal exhaustive efforts at 115Â % of the intensity associated with maximal oxygen uptake performed after acute LEDT or placebo irradiation in a double-blind, crossover, and placebo-controlled study design. The MAODALT was assumed as the sum of both oxygen equivalents estimated from the glycolytic and phosphagen metabolism pathways during each supramaximal effort. For the statistical analysis, a paired t test was used to determine differences between the treatments. The significance level was assumed as 95Â %. In addition, a qualitative analysis was used to determine the magnitude of differences between groups. No significant differences were found for the values of oxygen equivalents from each energetic metabolism (Pâ€‰â‰¥â€‰0.28), for MAODALT values between the LEDT and placebo conditions (Pâ€‰â‰¥â€‰0.27), or for time to exhaustion (Pâ€‰=â€‰0.80), except for the respiratory exchange ratio (Pâ€‰=â€‰0.01). The magnitude-based inference of effect size reported only a possibly negative effect of photobiomodulation on MAODALT when expressed in units relative to body mass and on the glycolysis pathway (26Â %). In summary, LEDT after a high-intensity running effort did not alter the MAODALT, metabolic energy pathways, or high-intensity running performance. Placebos Adult;Anaerobiosis;Cross-Over Studies;Double-Blind

Method;Humans;Lasers;Male;Muscle Fatigue;Oxygen Consumption;Physical Exertion;Placebos;Running;Time Factors

Low-level laser therapy (LLLT) does not reduce subcutaneous adipose tissue by local adipocyte injury but rather by modulation of systemic lipid metabolism. Low-level laser (light) therapy (LLLT) has been applied recently to body contouring. However the mechanism of LLLT-induced reduction of subcutaneous adipose tissue thickness has not been elucidated and proposed hypotheses are highly controversial. Non-obese volunteers were subject to 650nm LLLT therapy. Each patient received 6 treatments 2-3 days apart to one side of the abdomen. The contralateral side was left untreated and served as control. Subjects' abdominal adipose tissue thickness was measured by ultrasound imaging at baseline and 2 weeks post-treatment. Our study is to the best of our knowledge, the largest split-abdomen study employing subcutaneous abdominal fat imaging. We could not show a statistically significant reduction of abdominal subcutaneous adipose tissue by LLLT therapy. Paradoxically when the measurements of the loss of fat thickness on treated side was corrected for change in thickness on non treated side, we have observed that in 8 out of 17 patients LLLT increased adipose tissue thickness. In two patients severe side effect occurred as a result of treatment: one patient developed ulceration within appendectomy scar, the other over the posterior superior iliac spine. The paradoxical net increase in subcutaneous fat thickness observed in some of our patients is a rationale against liquefactive and transitory pore models of LLLT-induced adipose tissue reduction. LLLT devices with laser diode panels applied directly on the skin are not as safe as devices with treatment panels separated from the patient's skin.
Abdomen;Adipocytes;Adult;Anthropometry;Female;Humans;Lipid Metabolism;Low-Level Light Therapy;Male;Middle Aged;Subcutaneous Fat;Subcutaneous Fat, Abdominal;Young Adult

Efficacy of antimicrobial photodynamic therapy as an adjuvant in periodontal treatment in Down syndrome patients. Down syndrome (DS) has characteristics that include mental retardation, a characteristic phenotype, congenital heart defects, immune disorders, and increased risk of periodontal disease (PD). Antimicrobial photodynamic therapy (aPDT) is the combined use of photosensitizers associated with low-level laser (LLL) and oxygen, leading to singlet oxygen formation, which contributes to the antibacterial activity of the phagocytes, killing bacteria. The objective of this study was to evaluate the efficacy of aPDT as an adjuvant to conventional periodontal treatment of PD in DS patients. A double-blinded, controlled, randomized, split-mouth study was conducted. A total of 13 DS subjects who were 18Â years or older and who presented at least one tooth in each quadrant of the mouth with probing pocket depth (PPD) equal to or greater than 5Â mm were included. The patients were evaluated at three different times: at the baseline, PPD were obtained. After 1Â week, conventional scaling and root planing (SRP) was performed, and two randomly selected quadrants also received aPDT. One month after SRP, all the patients were reevaluated. Periodontal conditions were improved among all the participants. The PDT-with-SRP group presented a nonsignificant reduction in PPD (meanâ€‰=â€‰1.27Â mm, medianâ€‰=â€‰1.17Â mm) relative to that of the SRP group (meanâ€‰=â€‰1.00Â mm, medianâ€‰=â€‰0.95Â mm). Changes over time were compared using the Wilcoxon test. A significant reduction in median PPD was observed in both groups (pâ€‰=â€‰0.001). Both types of periodontal treatment, with and without PDT, were similarly effective and were associated with good clinical response. Anti-Bacterial Agents;Photosensitizing Agents Adult;Anti-Bacterial Agents;Dental Scaling;Double-Blind Method;Down Syndrome;Female;Humans;Male;Periodontal Diseases;Photochemotherapy;Photosensitizing Agents;Root Planing

Low-Level Laser Irradiation Improves Depression-Like Behaviors in Mice. Major depressive disorder (MDD) is one of the leading forms of psychiatric disorders, characterized by aversion to mobility, neurotransmitter deficiency, and energy metabolic decline. Low-level laser therapy (LLLT)

has been investigated in a variety of neurodegenerative disorders associated with mitochondrial dysfunction and functional impairments. The goal of this study was to examine the effect of LLLT on depression-like behaviors and to explore the potential mechanism by detecting mitochondrial function following LLLT. Depression models in space restriction mice and Abelson helper integration site-1 (Ahi1) knockout (KO) mice were employed in this work. Our results revealed that LLLT effectively improved depression-like behaviors, in the two depression mice models, by decreasing immobility duration in behavioral despair tests. In addition, ATP biosynthesis and the level of mitochondrial complex IV expression and activity were significantly elevated in prefrontal cortex (PFC) following LLLT. Intriguingly, LLLT has no effects on ATP content and mitochondrial complex I-IV levels in other tested brain regions, hippocampus and hypothalamus. As a whole, these findings shed light on a novel strategy of transcranial LLLT on depression improvement by ameliorating neurotransmitter abnormalities and promoting mitochondrial function in PFC. The present work provides concrete groundwork for further investigation of LLLT for depression treatment. Adaptor Proteins, Vesicular Transport;Ahi1 protein, mouse;Neurotransmitter Agents;Proto-Oncogene Proteins;Adenosine Triphosphate;Electron Transport Complex IV Adaptor Proteins, Vesicular Transport;Adenosine Triphosphate;Animals;Behavior, Animal;Depression;Electron Transport Complex IV;Low-Level Light Therapy;Mice, Inbred ICR;Mice, Knockout;Mitochondria;Neurotransmitter Agents;Phenotype;Prefrontal Cortex;Proto-Oncogene Proteins;Restraint, Physical;Stress, Psychological

Illuminating current pitfalls in optimal photobiomodulation device development and assessment for treating hair loss. Alopecia;Humans;United States

Thermographic and clinical evaluation of 808-nm laser photobiomodulation effects after third molar extraction. BACKGROUND: A randomized, blind, controlled clinical study was conducted with a convenience sample of 24 patients to evaluate the effectiveness of an aluminum gallium arsenide (AlGaAs) infrared laser 808 nm after third molar extraction by the use of infrared thermography technique. METHODS: Patients were divided into four groups: erupted third molars were extracted from the patients in Group I and Group II, and impacted third molars were extracted from the patients in Group III and Group IV. Group I and Group III received mock laser therapy in which the device was powered off, and Group II and Group IV were exposed to laser light. Postoperative clinical parameters related to the third molar extraction were evaluated; these parameters included pain, trismus and edema. Circulatory patterns were also evaluated by infrared thermography that exhibited local temperature coefficient at different postoperative periods. RESULTS: A slight improvement was observed for swelling, pain and trismus in patients who received laser irradiation, although the differences were not statistically significant ($P>0.05$). Laser therapy had a significant influence on the local circulation in the area near the temporomandibular joint, as determined by infrared thermography ($P<0.05$). CONCLUSIONS: Laser therapy was able to change the local circulation, although it did not significantly influence swelling, pain or trismus during the postoperative period. Adolescent;Adult;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain, Postoperative;Postoperative Complications;Single-Blind Method;Thermography;Tooth Extraction;Tooth, Impacted;Trismus;Young Adult

Low-level laser therapy versus 5% amlexanox: a comparison of treatment effects in a cohort of minor aphthous ulcers patients-a commentary. Aminopyridines;amlexanox Aminopyridines;Humans;Low-Level Light Therapy;Pain Measurement;Recurrence;Stomatitis, Aphthous

What is the best moment to apply phototherapy when associated to a strength training program? A randomized, double-blinded, placebo-controlled trial : Phototherapy in association to strength

training. The effects of phototherapy (or photobiomodulation therapy) with low-level laser therapy (LLLT) and/or light-emitting diodes (LEDs) on human performance improvement have been widely studied. Few studies have examined its effect on muscular training and no studies have explored the necessary moment of phototherapy irradiations (i.e., before and/or after training sessions). The aim of this study was to determine the optimal moment to apply phototherapy irradiation when used in association with strength training. Forty-eight male volunteers (age between 18 to 35Â years old) completed all procedures in this study. Volunteers performed the strength training protocol where either a phototherapy and/or placebo before and/or after each training session was performed using cluster probes with four laser diodes of 905Â nm, four LEDs of 875Â nm, and four LEDs of 640Â nm-manufactured by Multi Radiance Medicalâ„¢. The training protocol duration was 12Â weeks with assessments of peak torque reached in maximum voluntary contraction test (MVC), load in 1-repetition maximum test (1-RM) and thigh circumference (perimetry) at larger cross-sectional area (CSA) at baseline, 4Â weeks, 8Â weeks, and 12Â weeks. Volunteers from group treated with phototherapy before and placebo after training sessions showed significant (pâ€‰<â€‰0.05) changes in MVC and 1-RM tests for both exercises (leg extension and leg press) when compared to other groups. With an apparent lack of side effects and safety due to no thermal damage to the tissue, we conclude that the application of phototherapy yields enhanced strength gains when it is applied before exercise. The application may have additional beneficial value in post-injury rehabilitation where strength improvements are needed. Adolescent;Adult;Double-Blind Method;Exercise;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Strength;Phototherapy;Resistance Training;Treatment Outcome;Young Adult

Laser biostimulation of wound healing: bioimpedance measurements support histology. Laser biostimulation in medicine has become widespread supporting the idea of therapeutic effects of photobiomodulation in biological tissues. The aim of this study was to investigate the biostimulation effect of laser irradiation on healing of cutaneous skin wounds, in vivo, by means of bioimpedance measurements and histological examinations. Cutaneous skin wounds on rats were subjected to 635Â nm diode laser irradiations at two energy densities of 1 and 3Â J/cm(2) separately. Changes in the electrical properties of the wound sites were examined with multi-frequency electrical impedance measurements performed on the 3rd, 7th, 10th, and 14th days following the wounding. Tissue samples were both morphologically and histologically examined to determine the relationship between electrical properties and structure of tissues during healing. Laser irradiations of both energy densities stimulated the wound healing process. In particular, laser irradiation of lower energy density had more evidence especially for the first days of healing process. On the 7th day of healing, 3Â J/cm(2) laser-irradiated tissues had significantly smaller wound areas compared to non-irradiated wounds (pâ€‰<â€‰0.05). The electrical impedance results supported the idea of laser biostimulation on healing of cutaneous skin wounds. Thus, bioimpedance measurements may be considered as a non-invasive supplementary method for following the healing process of laser-irradiated tissues. Animals;Electric Impedance;Epidermis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Therapeutic effects of 10-HzPulsed wave lasers in rat depression model: A comparison between near-infrared and red wavelengths. BACKGROUND AND OBJECTIVE: The application of transcranial low-level light/laser therapy (tLLLT) in the range of red to near-infrared (NIR) spectrum for psychological disorders is a new area that is attracting growing interest in recent years. The photomodulation effects of NIR and red coherent lights on the activity of cytochrome c oxidase in neuronal cells of brain have been recently introduced. This study, therefore, sought to compare the therapeutic effects of 10-Hz pulsed wave NIR (810â€‰nm) laser with red (630â€‰nm) laser using the same delivered energy density and Citalopram in rat chronic mild stress (CMS) model of

depression and anxiety. MATERIALS AND METHODS: CMS procedures (for 4 weeks) were used to induce stress. GaAlAs diode laser with red and NIR wavelengths on 10-Hz pulsed wave (50% duty cycle) were used to perform tLLLT treatment for three weeks. An energy density of about 1.2â€‰J/cm-(2) per each session was delivered through a light spot with a diameter of 3-mm to the prefrontal cortex for both wavelengths. Citalopram (10â€‰mg/kg, Intraperitoneal) was administered for twenty-one consecutive days to the drug group. RESULTS: The findings of the present study showed an increase in swimming and decrease in immobility time, for both NIR laser and Citalopram groups compared to the stress group in forced swimming test. Anxiety-like behaviors showed insignificant decrease in all treatment groups in elevated plus maze test. The induction of stress significantly increased serum cortisol levels and treatments with both red laser and Citalopram decreased it. Hyperglycemia induced by CMS returned to normal levels in all treatment groups. The assessment of body weight also showed a significant increase in NIR laser group compared to the stress group by the end of the experiment. CONCLUSIONS: This study showed that non-invasive tLLLT using 10-Hz pulsed NIR laser light was as effective as Citalopram and more effective than red laser in the treatment of depressive-like behaviors and may help improve tLLLT as an alternative non-pharmacological treatments of psychological disorders such as depression. Lasers Surg. Med. 48:695-705, 2016. Â© 2016 Wiley Periodicals, Inc. Antidepressive Agents, Second-Generation;Citalopram Animals;Antidepressive Agents, Second-Generation;Anxiety;Citalopram;Combined Modality Therapy;Depression;Lasers, Semiconductor;Light;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Treatment Outcome

Effectiveness of biologic methods of inhibiting orthodontic tooth movement in animal studies. INTRODUCTION: A number of biologic methods leading to decreased rates of orthodontic tooth movement (OTM) can be found in the recent literature. The aim of this systematic review was to provide an overview of biologic methods and their effects on OTM inhibition. METHODS: An electronic search was performed up to January 2016. Two researchers independently selected the studies (kappa index, 0.8) using the selection criteria established in the PRISMA statement. The methodologic quality of the articles was assessed objectively according to the Methodological Index for Non-Randomized Studies scale. RESULTS: We retrieved 861 articles in the initial electronic search, and 57 were finally analyzed. Three biologic techniques were identified as reducing the rate of OTM: chemical methods, low-level laser therapy, and gene therapy. When the experimental objective was to slow down OTM, pharmacologic modulation was the most frequently described method (53 articles). Rats were the most frequent model (38 of 57 articles), followed by mice (9 of 57), rabbits (4 of 57), guinea pigs (2 of 57), dogs (2 of 57), cats (1 of 57), and monkeys (1 of 57). The sample sizes seldom exceeded 25 subjects per group (6 of 57 articles). The application protocols, quality, and effectiveness of the different biologic methods in reducing OTM varied widely. CONCLUSIONS: OTM inhibition was experimentally tested with various biologic methods that were notably effective at bench scale, although their clinical applicability to humans was rarely tested further. Rigorous randomized clinical trials are therefore needed to allow the orthodontist to improve the effect of translating them from bench to clinic. Animals;Drug Therapy;Genetic Therapy;Low-Level Light Therapy;Tooth Movement Techniques;Treatment Outcome

Low Level Light Therapy with Light-Emitting Diodes for the Aging Face. Low level light therapy (LLLT) with light-emitting diodes (LEDs) is emerging from the mists of black magic as a solid medico-scientific modality, with a substantial buildup of corroborative bodies of evidence for its efficacy and elucidation of the modes of action. Reports are appearing from many different specialties; however, of particular interest to plastic surgeons treating the aging face is the proven action of LED-LLLT on skin cells in both the epidermis and dermis and enhanced blood flow. Thus, LED-LLLT is a safe and

effective stand-alone therapy for patients who are prepared to wait until the final effect is perceived. Biophysical Phenomena;Face;Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

Efficacy of Low-Level Laser Therapy in Relieving Nipple Pain in Breastfeeding Women: A Triple-Blind, Randomized, Controlled Trial. Pain accruing from nipple lesions caused by inadequate latching by the baby is a common complaint among breastfeeding women and an important obstacle to successful breastfeeding. Nipple pain occurs during the first days after delivery and is considered one of the main causes for early weaning. To investigate the efficacy of low-level laser therapy as a treatment for nipple pain due to breastfeeding. A triple-blind, randomized, clinical study. A university-affiliated hospital in SÃ£o Paulo, Brazil. Fifty-nine women with nipple lesions at the time of their admission. Thirty women (intervention group) received three sessions of laser therapy (InGaAIP laser, 660Â nanometer, 40Â milliwatts of power, 5Â Joules per square centimeter of energy density for 5 seconds each, total energy = 0.6 Joules) in the region of the nipples at three different points in time (0Â hour, 24Â hours, and 48Â hours after diagnosis of nipple lesion). Twenty-nine women with similar clinical conditions were randomly assigned to the control group. Self-reported pain was recorded before and after laser therapy using a visual analogue scale. The intervention group experienced a decrease of 2.0Â centimeters in intensity of pain (pÂ =Â .016) 24Â hours after the first intervention and also presented lower levels of pain compared with the control group. Low-level laser therapy was considered effective for treating nipple lesions in breastfeeding women with pain, providing relief and prolonging exclusive breastfeeding. More clinical trials with different laser dosimetry and parameters are necessary to optimize laser therapy protocols for breastfeeding women. Adult;Breast Diseases;Breast Feeding;Female;Humans;Low-Level Light Therapy;Nipples;Pain Management;Pain Measurement;Pain Threshold;Treatment Outcome;Young Adult

[Effect of LLLI on Secretion of ALP and Intracellular Calcium Concentration in Osteoblasts under Mechanical Stress]. In order to reveal the mechanism of LLLI accelerating teeth moving, we investigated the changes of alkaline phosphatase and intracellular calcium concentration when osteoblasts under stress were subjected low-level-laser-irradiation (LLLI). MG-63 cells were divided into four groups: control group, stress group, LLLI group and LLLI-stress group. Osteoblasts were subjected to the mechanical stress by a four-point bending system at 0.5 Hz and 3 000 Î¼strain. The secretions of ALP of each group are measured by spectrophotometer. In the second part, MG-63 cells were divided into two groups: stress group and LLLI-stress group. We checked intracellular calcium concentration via FCM and fluorescent indicator fluo-3/AM at 0, 5, 15, 30 and 60 min under stress. LLLI- stress group will receive LLLI for 1 min after stress. Compared to a control group, increased ALP secretions were observed in the other three groups. But ALP secretions in LLLI-stress group were lower than stress group and LLLI group. THE changing curve of intracellular calcium concentration in laser-stress groups is gentle instead of â€œjumpingâ€• in stress group. Proper stress, LLLI and combined application of these two can increase the secretions of ALP in osteoblasts compared to the control group. But the secretions of ALP decreased when combined application of stress and LLLI compared to using alone. LLLI can regulate the changing rhythm of concentration of the intracellular calcium to promote proliferation of MG-63 cell under stress, which means LLLI can reduce the bone-formation of osteoblasts under stress. Alkaline Phosphatase;Calcium Alkaline Phosphatase;Calcium;Cell Proliferation;Cytoplasm;Osteoblasts;Stress, Mechanical

Low level laser therapy for breastfeeding problems. Breast and nipple pain, nipple damage and mastitis are common reasons given by women for their early cessation of breastfeeding. There are a limited number of effective therapies available to support healing of damaged nipples during lactation. Low level laser therapy is a painless treatment, which appears to accelerate wound healing and ease pain. We present two case studies, which demonstrate the use of low level laser therapy in

clinical practice. Adult;Breast Diseases;Breast Feeding;Female;Humans;Low-Level Light Therapy;Nipples;Pain Management;Pain Measurement;Treatment Outcome

Identifying Dosage Effect of Light-Emitting Diode Therapy on Muscular Fatigue in Quadriceps. Hemmings, TJ, Kendall, KL, and Dobson, JL. Identifying dosage effect of light-emitting diode therapy on muscular fatigue in quadriceps. J Strength Cond Res 31(2): 395-402, 2017-The purpose of this study was to compare the effects of various dosages of light-emitting diode therapy (LEDT) on muscle fatigue while performing a single-leg extension to exhaustion. A total of 34 recreationally resistance-trained athletes between the ages of 18 and 26 participated in 4 trials. Each trial included pre-exercise/postexercise blood lactate measurements and 2 sets of 3 maximal voluntary isometric contractions (MVICs), followed by LEDT on 6 points across the superficial quadriceps. Each randomized trial consisted of a placebo, 30, 60, or 120 seconds on each point on the quadriceps. Three minutes after LEDT, the participants performed an eccentric leg extension with 120% of MVIC until fatigue. There was significant increase in the number of repetitions performed between the placebo treatment and 60 seconds ($p = 0.023$), as well as placebo and 120 seconds ($p = 0.004$) of irradiation on each point. There were no significant differences in blood lactate levels between any of the 4 trials. In conclusion, LEDT had a positive effect on performance when irradiating 6 points on the superficial quadriceps for 60 and 120 seconds before an eccentric leg extension. Lactic Acid Adolescent;Adult;Athletes;Double-Blind Method;Exercise;Female;Humans;Isometric Contraction;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Quadriceps Muscle;Young Adult

The efficacy and safety of subcision using CO(2) gas combined with fractional laser for acne scars: Clinical and microscopic evaluation. BACKGROUND: Various modalities have been used to treat acne scars. CO(2) fractional laser is an effective and commonly used treatment. CO(2) gas injection into the dermis by needle with high pressure can cause fibrotic collagen breakage, producing the effects of subcision. CO(2) also stimulates collagen synthesis by increasing neovascularization and releasing oxygen. OBJECTIVE: This study evaluated the efficacy and the safety of the combined treatment with CO(2) gas subcision and CO(2) fractional laser for acne scars. METHODS AND MATERIALS: Fourteen patients with acne scars were treated with three sessions of CO(2) gas subcision at 2-week intervals and two sessions of fractional laser at 4-week interval. The clinical improvement was assessed using a 4-point scale. For histologic analysis, punch biopsy was performed before and after treatment in 10 patients. RESULTS: All patients experienced clinical improvements. Excellent, marked, moderate, and mild response was achieved in 1 (7%), 8 (57%), 4 (29%), and 1 patient (7%), respectively. Histologic evaluation of the biopsy specimens showed increased dermal collagen with dermal thickening and elastic fiber straightening in the reticular dermis after the treatment. CONCLUSION: The combination therapy with CO(2) gas subcision and fractional laser was satisfactory and safe for treating acne scars. Abbreviation and acronym: CO(2): Carbon dioxide GAS: Global assessment scale H&E: hematoxylin and eosin; SD: standard deviation. Acne Vulgaris;Asian People;Cicatrix;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Treatment Outcome

Effects of neodymium-yttrium-aluminum garnet (Nd:YAG) pulsed high-intensity laser therapy on full thickness wound healing in an experimental animal model. OBJECTIVE: Wound healing can be aided by the use of low- and medium-intensity lasers. The use of pulsed neodymium-doped yttrium aluminum garnet (Nd:YAG) high-intensity laser therapy (HILT) with a 1064-nm wavelength laser provides deeper and more efficient penetration into tissue as it is being less absorbed by chromophores in tissue, e.g., hemoglobin, melanin, and water, thereby enhancing the wound-healing process. In this study, we examined the effect of HILT on wound healing with a Q-switched pulsed Nd:YAG laser in an animal model. DESIGN: Sixty SKH1 hairless male mice (seven weeks old) were randomly divided into four groups according to the amount of laser fluence: control, group 1 (0.8

J/cm(2)), group 2 (1.6 J/cm(2)), and group 3 (2.0 J/cm(2)). Laser treatment was provided to groups 1, 2, and 3 with a 1064-nm Q-switched Nd:YAG laser. Histological analysis was performed with hematoxylin and eosin staining, Masson's Trichrome staining, and Ki-67 staining. RESULTS: Statistically significant increases in the accumulation of collagen fibers, thickness of granulation tissue, and numbers of fibroblasts were observed in group 2 (treated with 1.6 J/cm(2)) as compared with the control (no laser treatment), group 1 (treated with 0.8 J/cm(2)), and group 3 (treated with 2.0 J/cm(2)). CONCLUSION: Nd:YAG HILT stimulated fibroblast proliferation and increased extracellular matrix production. We expect that this therapy could accelerate the wound-healing process. Collagen Animals;Collagen;Fibroblasts;Granulation Tissue;Lasers, Solid-State;Low-Level Light Therapy;Male;Mice;Mice, Hairless;Models, Animal;Random Allocation;Wound Healing

Single-center experience with potassium titanyl phosphate (KTP) laser for superficial cutaneous vascular lesions in face. BACKGROUND AND OBJECTIVES: Superficial cutaneous vascular lesions (SCVLs) are quite common. Several types of lasers have been used to treat these lesions; however, there are no dedicated treatment guidelines and few studies in the literature addressed their treatment. AIMS: In this paper, we aimed to report our clinical experience with potassium titanyl phosphate (KTP) laser treatment on different types of facial SCVLs including telangiectasia, spider angioma, and erythema. METHODS: Data were retrospectively collected from 146 patients with SCVLs, who had been treated with the 532-nm wavelength laser at our outpatient dermatology clinic. Treatment responses were graded as four groups: clearance (> 75% improvement compared with the previous session), marked improvement (50-75%), partial improvement (25-50%), and no response (< 25%). RESULTS: The rate of clearance plus marked improvement (favorable outcome) was 66.1% for telangiectasia group, 93.5% for spider angioma group, and 26.7% for erythema group. Mean number of treatments was 2.9 Â± 1.4 for telangiectasia group, 1.4 Â± 0.8 for spider angioma group, and 2.9 Â± 1.7 for facial erythema group. Only minimal adverse effects related to treatment procedure were detected in 5 out of 146 (3.4%) patients. CONCLUSIONS: Our results demonstrated that KTP laser might be a safe and effective laser modality for SCVLs, which may be associated with physiological problems due to cosmetic concerns. Adult;Cosmetic Techniques;Erythema;Female;Hemangioma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Telangiectasis

Long-term results in low-fluence 1064-nm Q-Switched Nd:YAG laser for melasma: Is it effective? OBJECTIVE: This study assessed the safety and clinical efficacy of a low-fluence 1064-nm Q-switched neodymium-doped:yttrium aluminum garnet (QS-Nd:YAG) laser in the treatment of patients with melasma. METHODS: The study evaluated 34 melasma patients treated at a single institution using a 1064-nm QS-Nd:YAG laser. The laser parameters were 6 mm spot size and 2.5 J/cm(2) fluence with multiple passes for 6-10 (median 8) sessions at 2-week intervals. Outcomes were evaluated using photography, the modified Melasma Area and Severity Index (mMASI) score, and patient satisfaction interviews after the last treatment and 1 year after the last treatment. RESULTS: After the low-fluence 1064-nm QS-Nd:YAG laser treatments, the mean mMASI score decreased from 6.7 Â± 3.3 to 3.2 Â± 1.6 ($P < 0.01$). After treatment completion, 20 of 34 patients (58.8%) rated themselves as having at least a 50% reduction in melasma severity. One year after the last treatment, recurrence was observed in 20 patients (58.8%) and the mean mMASI score increased from 3.2 Â± 1.6 to 5.8 Â± 1.9 in all patients. CONCLUSION: The recurrence of low-fluence 1064-nm QS-Nd:YAG laser rates in melasma was high when the long-term results were considered. This result may be attributed to certain patient and treatment-related factors. Adult;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Photography;Recurrence;Severity of Illness Index;Time Factors;Treatment Outcome

The Histopathological Investigation of Red and Blue Light Emitting Diode on Treating Skin Wounds in Japanese Big-Ear White Rabbit. The biological effects of different wavelengths of light emitting diode (LED) light tend to vary from each other. Research into use of photobiomodulation for treatment of skin wounds and the underlying mechanisms has been largely lacking. We explored the histopathological basis of the therapeutic effect of photobiomodulation and the relation between duration of exposure and photobiomodulation effect of different wavelengths of LED in a Japanese big-ear white rabbit skin-wound model. Skin wound model was established in 16 rabbits (three wounds per rabbit: one served as control, the other two wounds were irradiated by red and blue LED lights, respectively). Rabbits were then divided into 2 equal groups based on the duration of exposure to LED lights (15 and 30 min/exposure). The number of wounds that showed healing and the percentage of healed wound area were recorded. Histopathological examination and skin expression levels of fibroblast growth factor (FGF), epidermal growth factor (EGF), endothelial marker (CD31), proliferating cell nuclear antigen (Ki67) and macrophagocyte (CD68) infiltration, and the proliferation of skin collagen fibers was assessed. On days 16 and 17 of irradiation, the healing rates in red (15 min and 30 min) and blue (15 min and 30 min) groups were 50%, 37.5%, 25% and 37.5%, respectively, while the healing rate in the control group was 12.5%. The percentage healed area in the red light groups was significantly higher than those in other groups. Collagen fiber and skin thickness were significantly increased in both red light groups; expression of EGF, FGF, CD31 and Ki67 in the red light groups was significantly higher than those in other groups; the expression of FGF in red (30 min) group was not significantly different from that in the blue light and control groups. The effect of blue light on wound healing was poorer than that of red light. Red light appeared to hasten wound healing by promoting fibrous tissue, epidermal and endothelial cell proliferation. An increase in the exposure time to 30 min did not confer any additional benefit in both red and blue light groups. This study provides a theoretical basis for the potential therapeutic application of LED light in clinical settings.
Antigens, CD;Antigens, Differentiation, Myelomonocytic;CD68 antigen, human;Ki-67 Antigen;Platelet Endothelial Cell Adhesion Molecule-1;Fibroblast Growth Factors;Epidermal Growth Factor;Collagen
Animals;Antigens, CD;Antigens, Differentiation, Myelomonocytic;Collagen;Epidermal Growth Factor;Female;Fibroblast Growth Factors;Ki-67 Antigen;Male;Phototherapy;Platelet Endothelial Cell Adhesion Molecule-1;Rabbits;Re-Epithelialization;Skin

[The application of electrolaser myostimulation and laserophoresis of biologically active compounds in sports medicine (a review)]. This scientific review highlights peculiarities of the delivery of laser radiation to the tissues of the athlete's body by means of laser electrophoresis of biologically active substances and the possibilities for electrolaser myostimulation. The main features of electrical myostimulation based on the application of laser-generated radiation are described. The authors emphasize the necessity of taking into account the neurophysiological dependence of active and passive contractile muscular activity during training. They provide the scientifically grounded rationale for the combined use of coherent laser radiation and electrical stimulation. The list of scientific papers that confirm the effectiveness of the method being considered is presented. The authors compare this method with other techniques for the induced ion transfer. The beneficial influence of laserphoresis of succinic and hyaluronic acids on the athlete's body is reported with special reference to alleviating the pain syndrome. A number of phyto-extracts used for the purpose of laser electrophoresis are characterized. The authors demonstrate the application of the optional versions of this technique in various sports during the training and competition periods.
Electric Stimulation Therapy;Electrochemotherapy;Humans;Low-Level Light Therapy;Sports Medicine

A pilot study for triple combination therapy with a low-fluence 1064â€‰nm Q-switched Nd:YAG laser, hydroquinone cream and oral tranexamic acid for recalcitrant Riehl's Melanosis.
BACKGROUND: Riehl's melanosis presents as a diffuse gray-brown to black hyperpigmentation

around face. The treatment of this disease is challenging and quite limited despite patients' excessive psychological stresses. OBJECTIVE: In this prospective pilot study, we evaluated the efficacy and safety for a novel combination therapy based on low-fluence Q-switched 1064â€‰nm Nd:YAG laser, hydroquinone cream and oral tranexamic acid for recalcitrant Riehl's melanosis. METHODS: Totally eight patients with Riehl's melanosis who had failed improvements previously received multiple sessions (10-18 times) of combination treatment regimen. The primary endpoint was clinical score by the physician and the secondary endpoints were clinical score by the patients, instrumental analysis using melanin and erythema values, and histopathological score. RESULTS: Among eight patients, three received "Almost clear" grade, the other five patients received "Marked improvement" grade at final visits. No serious adverse events and post-treatment downtime was observed. Mean Melanin and Erythema Indexes also showed significant decreases compared with baseline. Histopathologic examination confirmed a significantly greater reduction of melanin content in melanophages. CONCLUSION: This combination method can be a viable option for Asian patients having Riehl's melanosis with high risk of post-inflammatory hyperpigmentation, maintaining low-dose laser irradiation. Hydroquinones;Melanins;Tranexamic Acid;hydroquinone Administration, Cutaneous;Administration, Oral;Adult;Combined Modality Therapy;Erythema;Facial Dermatoses;Female;Humans;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Melanosis;Middle Aged;Pilot Projects;Prospective Studies;Severity of Illness Index;Skin;Tranexamic Acid

Photo-enhancement of macrophage phagocytic activity via Rac1-mediated signaling pathway: Implications for bacterial infection. Phagocytosis and the subsequent destruction of invading pathogens by macrophages are indispensable steps in host immune responses to microbial infections. Low-power laser irradiation (LPLI) has been found to exert photobiological effects on immune responses, but the signaling mechanisms underlying this photobiomodulation of phagocytosis remains largely unknown. Here, we demonstrated for the first time that LPLI enhanced the phagocytic activity of macrophages by stimulating the activation of Rac1. The overexpression of constitutively activated Rac1 clearly enhanced LPLI-induced phagocytosis, whereas the overexpression of dominant negative Rac1 exerted the opposite effect. The phosphorylation of cofilin was involved in the effects of LPLI on phagocytosis, which was regulated by the membrane translocation and activation of Rac1. Furthermore, the photoactivation of Rac1 was dependent on the Src/PI3K/Vav1 pathway. The inhibition of the Src/PI3K pathway significantly suppressed LPLI-induced actin polymerization and phagocytosis enhancement. Additionally, LPLI-treated mice exhibited increased survival and a decreased organ bacterial load when challenged with Listeria monocytogenes, indicating that LPLI enhanced macrophage phagocytosis in vivo. These findings highlight the important roles of the Src/PI3K/Vav1/Rac1/cofilin pathway in regulating macrophage phagocytosis and provide a potential strategy for treating phagocytic deficiency via LPLI. Actins;Neuropeptides;Rac1 protein, mouse;rac1 GTP-Binding Protein Actins;Animals;Cell Line;Cell Membrane;Listeria monocytogenes;Low-Level Light Therapy;Macrophages;Male;Mice;Mice, Inbred BALB C;Neuropeptides;Phagocytosis;Protein Multimerization;Protein Structure, Quaternary;Protein Transport;Signal Transduction;rac1 GTP-Binding Protein

Comparison of two power densities on the healing of palatal wounds after connective tissue graft removal: randomized clinical trial. Connective tissue graft (CTG), which is considered to be among the best techniques for treating gingival recession, has presented stable long-term results. However, this technique causes morbidity and discomfort in the palatine region due to graft removal at that site. A previous study reports that photobiomodulation (PBM) using a dosage of 15Â J/cm(2) may improve wound healing and the patient's postoperative comfort. However, no other studies in the literature provide the best application dosage or comparisons between protocols for this

purpose. The aim of this study is to compare two power densities of PBM on the wound-healing process of the donor palatine area after CTG removal. In this study, 51 patients presenting buccal gingival recession were randomized into one of the following groups: group 1: CTG procedure for root coverage and PBM application at the donor site using a 60Â J/cm(2) dose; group 2: CTG and PBM application using a 30Â J/cm(2) dose; or group 3: CTG and sham application. The evaluated parameters were the wound remaining area (WRA), scar and tissue colorimetry (TC), tissue thickness (TT), and postoperative discomfort (D), evaluated at baseline and 7, 14, 45, 60, and 90Â days after surgery. Group 1 presented statistically significant smaller wounds at day 7 (pâ€‰>â€‰0.05). None of the patients presented scars at the operated area, and all of the patients reported mild discomfort, with low consumption of analgesic pills. We concluded that the protocol of 60Â J/cm(2) provided faster wound healing 7Â days after removing the connective tissue graft for root coverage. TRIAL REGISTRATION: ClinicalTrial.org (NCT02580357) https://clinicaltrials.gov/ct2/show/NCT02580357 . Adult;Aged;Calorimetry;Cicatrix;Connective Tissue;Female;Humans;Male;Middle Aged;Palate;Phototherapy;Postoperative Care;Wound Healing;Young Adult

Photobiomodulatory effects of superpulsed 904nm laser therapy on bioenergetics status in burn wound healing. Burn wounds exhibit impaired healing as the progression through the normal sequential stages of tissue repair gets hampered by epidermal barrier disruption, compromised blood circulation, abrogated defence mechanism, pathologic inflammation, and septicemia. Our earlier results reported that superpulsed 904nm LLLT enhanced healing and attenuated inflammatory response in burn wounds. The present study investigated the effect of superpulsed 904nm LLLT (200ns pulse width; 100Hz; 0.7mW mean output power; 0.4mW/cm(2) average irradiance) on biochemical and molecular markers pertaining to bioenergetics and redox homeostasis on full-thickness burn wounds in experimental rats. Results indicated that superpulsed laser irradiation for 7days post-wounding propelled the cellular milieu towards aerobic energy metabolism as evidenced by significantly enhanced activities of key energy regulatory enzymes viz. HK, PFK, CS and G6PD, whereas LDH showed reduced activity as compared to the non-irradiated controls. LLLT showed a significant increased CCO activity and ATP level. Moreover, LLLT also regulated redox homeostasis as evidenced by enhanced NADPH levels and decreased NADP/NADPH ratio. Western blot analysis demonstrated that LLLT produced an up-regulation of GLUT1, pAMPKÎ± and down-regulation of glycogen synthase1 (GS1). Our findings suggest that superpulsed 904nm LLLT augments burn wound healing by enhancing intracellular energy contents through modulation of aerobic metabolism for maximum energy output. Bioenergetic activation and maintenance of redox homeostasis could be one of the noteworthy mechanisms responsible for the beneficial NIR photobiomodulatory effect mediated through superpulsed 904nm LLLT in burn wound healing. NADP;Adenosine Triphosphate Adenosine Triphosphate;Animals;Burns;Energy Metabolism;Low-Level Light Therapy;Male;NADP;Rats;Rats, Sprague-Dawley;Wound Healing

Photobiomodulation rescues the cochlea from noise-induced hearing loss via upregulating nuclear factor ÎºB expression in rats. Photobiomodulation (PBM) is a noninvasive treatment that can be neuroprotective, although the underlying mechanisms remain unclear. In the present study, we assessed the mechanism of PBM as a novel treatment for noise-induced hearing loss, focusing on the nuclear factor (NF)-ÎºB signaling pathway. Sprague-Dawley rats were exposed to 1-octave band noise centered at 4kHz for 5h (121dB). After noise exposure, their right ears were irradiated with an 808nm diode laser beam at an output power density of 165mW/cm(2) for 30min a day for 5 consecutive days. Measurement of the auditory brainstem response revealed an accelerated recovery of auditory function in the groups treated with PBM compared with the non-treatment group at 4, 7, and 14 days after noise exposure. Immunofluorescent image analysis for inducible nitric oxide synthase and cleaved caspase-3 showed lesser immunoreactivities in outer hair cells in the PBM group compared

with the non-treatment group. However, immunofluorescent image analysis for NF-ÎºB, an upstream protein of inducible nitric oxide synthase, revealed greater activation in the PBM group compared with the naÃ¯ve and non-treatment groups. Western blot analysis for NF-ÎºB also showed stronger activation in the cochlear tissues in the PBM group compared with the naÃ¯ve and non-treatment groups ($p<0.01$, each). These data suggest that PBM activates NF-ÎºB to induce protection against inducible nitric oxide synthase-triggered oxidative stress and caspase-3-mediated apoptosis that occur following noise-induced hearing loss. NF-kappa B;Nitric Oxide Synthase Type II;Nos2 protein, rat;Proto-Oncogene Proteins c-akt;Caspase 3 Animals;Apoptosis;Caspase 3;Cochlea;Evoked Potentials, Auditory, Brain Stem;Hearing Loss, Noise-Induced;Low-Level Light Therapy;Male;NF-kappa B;Nitric Oxide Synthase Type II;Phosphorylation;Proto-Oncogene Proteins c-akt;Rats;Rats, Sprague-Dawley;Up-Regulation

Current advances in orthodontic pain. Orthodontic pain is an inflammatory pain that is initiated by orthodontic force-induced vascular occlusion followed by a cascade of inflammatory responses, including vascular changes, the recruitment of inflammatory and immune cells, and the release of neurogenic and pro-inflammatory mediators. Ultimately, endogenous analgesic mechanisms check the inflammatory response and the sensation of pain subsides. The orthodontic pain signal, once received by periodontal sensory endings, reaches the sensory cortex for pain perception through three-order neurons: the trigeminal neuron at the trigeminal ganglia, the trigeminal nucleus caudalis at the medulla oblongata and the ventroposterior nucleus at the thalamus. Many brain areas participate in the emotion, cognition and memory of orthodontic pain, including the insular cortex, amygdala, hippocampus, locus coeruleus and hypothalamus. A built-in analgesic neural pathway-periaqueductal grey and dorsal raphe-has an important role in alleviating orthodontic pain. Currently, several treatment modalities have been applied for the relief of orthodontic pain, including pharmacological, mechanical and behavioural approaches and low-level laser therapy. The effectiveness of nonsteroidal anti-inflammatory drugs for pain relief has been validated, but its effects on tooth movement are controversial. However, more studies are needed to verify the effectiveness of other modalities. Furthermore, gene therapy is a novel, viable and promising modality for alleviating orthodontic pain in the future. Analgesics Analgesics;Low-Level Light Therapy;Neurons;Pain;Pain Management;Tooth Movement Techniques

Editorial. Evidence-Based Medicine;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus, Pigmented;Skin Neoplasms

Case Report of Photodynamic Therapy in the Treatment of Dental Caries on Primary Teeth. INTRODUCTION: The partial removal of dental caries aiming to maintain the integrity of the pulp has been considered the therapy of choice in the treatment of deep carious lesions, as long as certain principles of diagnosis are respected. Dentists are always looking for techniques to remove the decayed tissue with biosafety, what provides more comfort to the patient especially when it comes to children. Photodynamic therapy (PDT) is an antimicrobial treatment. PapacÃ¡rieMblue is a modification of the regular PapacÃ¡rie, with a photosensitizer added to it. CASE REPORT: PapacÃ¡rieMblue was used in a patient who had deep carious lesions in a primary molar. After 5 minutes of application, the soft and infected tissues were removed from the side walls of the cavity and, after, PDT was held in the pulp wall with red laser (660 nm), energy of 30 J, output power of 100 mW and 5 minutes of exposure time. This caused a reduction in the amount of dental tissue removed, what favored the prognosis of the dental element. After a period of 3 months, a control of the case was done and we discovered that the tooth that received the PDT was not painful and the x-ray showed an absence of lesions in the furcation. CONCLUSION: PDT with PapacÃ¡rieMblue has been effective in the removal of a deep carious lesion that had a risk of pulp exposure.

Effect of Laser Therapy on Chronic Osteoarthritis of the Knee in Older Subjects. INTRODUCTION: Osteoarthritis (OA) is a common degenerative joint disease particularly in older subjects. It is usually associated with pain, restricted range of motion, muscle weakness, difficulties in daily living activities and impaired quality of life. To determine the effects of adding two different intensities of low-level laser therapy (LLLT) to exercise training program on pain severity, joint stiffness, physical function, isometric muscle strength, range of motion of the knee, and quality of life in older subjects with knee OA. METHODS: Patients were randomly assigned into three groups. They received 16 sessions, 2 sessions/week for 8 weeks. Group-I: 18 patients were treated with a laser dose of 6 J/cm(2) with a total dose of 48 J. Group-II: 18 patients were treated with a laser dose of 3 J/cm(2) with a total dose of 27 J. Group-III: 15 patients were treated with laser without emission as a placebo. All patients received same exercise training program including stretching and strengthening exercises. Patients were evaluated before and after intervention by visual analogue scale (VAS), the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index for quality of life, handheld dynamometer and universal goniometer. RESULTS: T test revealed that there was a significant reduction in VAS and pain intensity, an increase in isometric muscle strength and range of motion of the knee as well as increase in physical functional ability in three treatment groups. Also analysis of variance (ANOVA) proved significant differences among them and the post hoc tests (LSD) test showed the best improvements for patients of the first group. CONCLUSION: It can be concluded that addition of LLLT to exercise training program is more effective than exercise training alone in the treatment of older patients with chronic knee OA and the rate of improvement may be dose dependent, as with 6 J/cm(2) or 3 J/cm(2).

High Power Laser for Treatment of Achilles Tendinosis - a Single Blind Randomized Placebo Controlled Clinical Study. INTRODUCTION: Pain in the Achilles tendon during loading is a very common condition. Conservative treatments, such as low level laser therapy (LLLT) have been reported to give varying results. Recently, a new laser treatment technique, high power laser treatment (HPLT) (Swiss DynaLaserÂ®), was introduced in Scandinavia, but has not, to our knowledge, been systematically tested before. The objective of this study was to evaluate the effects of HPLT compared to placebo HPLT in rated pain and assessed pain threshold in patients with chronic Achilles tendinosis. METHODS: The study was a randomized, single blind, placebo controlled trial. Patients were randomized to receive 6 treatments of either HPLT or placebo HPLT during a period of 3-4 weeks with a follow up period of 8-12 weeks. Outcome measures were rated pain according to questions of the Foot and Ankle Outcome Score (FAOS, Swedish version LK1.0) and assessment of electro-cutaneous stimulated pain threshold and matched pain (PainMatcher). RESULTS: The results of the study demonstrated significant changes of assessments within groups, that were more pronounced towards lower levels of rated pain in the HPLT group than in the placebo HPLT group. The between group difference were significant in four of nine questions regarding loading activities of the FAOS subscale. Assessed pain thresholds were found increased in the HPLT group, as compared to the placebo HPLT group. At individual level, the results varied. CONCLUSION: The results indicate that HPLT may provide a future option for treatment of Achilles tendinosis related pain, but further studies are warranted.

Low Level Laser Therapy Versus Pharmacotherapy in Improving Myofascial Pain Disorder Syndrome. INTRODUCTION: Temporomandibular disorders (TMD) lead to masticatory muscle pain, jaw movement disability and limitation in mouth opening. Pain is the chief complaint in 90% of the TMD patients which leads to disability and severe socioeconomic costs. The purpose of this study was to evaluate the therapeutic effects of low level laser therapy (LLLT) compared to pharmacotherapy with NSAIDs (naproxen) in myofascial pain disorder syndrome (MPDS). METHODS: In this randomized controlled clinical trial, 40 MPDS patients were divided into two groups. One group received

naproxen 500 mg bid for 3 weeks as treatment modality and also had placebo laser sessions. The other group received active laser (diode 810 nm CW) as treatment and placebo drug. Pain intensity was measured by visual analogue scale (VAS) and maximum painless mouth opening was also measured as a functional index every session and at 2 months follow up. Data was collected and analyzed with SPSS software. Independent t test was used to analyze the data. A $P < 0.05$ was considered significant. RESULTS: Low level laser caused significant reduction in pain intensity ($P < 0.05$) and a significant increase in mouth opening. In naproxen group neither pain intensity nor maximum mouth opening had significant improvement. Pain relief, in subjective VAS was observed in third session in LLLT group, but did not occur in naproxen group. Maximum mouth opening increased significantly in laser group compared to the naproxen group from the eighth session. CONCLUSION: Treatment with LLLT caused a significant improvement in mouth opening and pain intensity in patients with MPDS. Similar improvement was not observed in naproxen group.

Effects of Neodymium-Doped Yttrium Aluminium Garnet (Nd:YAG) Laser Irradiation on Bone Metabolism During Tooth Movement. INTRODUCTION: The aim of this study is to evaluate the effects of low-level neodymium-doped yttrium aluminium garnet (Nd:YAG) laser irradiation on orthodontic tooth movement and histological examination. METHODS: Eleven male Wistar rats (aged 10 weeks) were included. To produce experimental tooth movement in rats, 10 g force was applied to maxillary first molars with nickel titanium closed coil springs. Right molars were irradiated with Nd:YAG laser on days 0, 1, 2, 3, 7, 10, 14, 17, 21 and 24, while un-irradiated left molars were used as control. Distance between mesial side of second molar and distal side of first molar was measured on Î¼CT image during tooth movement and the rats were sacrificed 4 weeks after the initiation of tooth movement. RESULTS: The amount of tooth movement was significantly greater in the irradiation group (0.20 Â± 0.06) than in the control group (0.14 Â± 0.03) during the first week ($P < 0.05$). However, no statistically significant difference was found afterwards. There was a tendency of higher tartrate-resistant acid phosphatase (TRAP)-positive nuclei count in the pressure zones of the laser irradiation group, but it was not statistically significant. In immuno-histological examination, expressions of alkaline phosphatase (ALP) and receptor activator of nuclear factor kappa-B ligand (RANKL) were higher at the pressure site of the laser irradiation group than the control group, whereas there was no difference in osteoprotegerin (OPG) expression. CONCLUSION: The results suggest that low-level Nd:YAG laser may stimulate osteoclast and osteoblast activation and accelerate bone metabolism during tooth movement.

The Effect of One Session Low Level Laser Therapy of Extracted Follicular Units on the Outcome of Hair Transplantation. INTRODUCTION: Photobiostimulation with low level laser (LLL) has been used in medicine for a long time and its effects have been shown in many diseases. Some studies have evaluated the effect of LLL on androgenic alopecia. One of the most important limitations of the use of LLL in the treatment of alopecia is the requirement for multiple sessions, which is hardly accepted by patients. This study was conducted to evaluate the effect of the irradiation of extracted follicular hair units by LLL on the outcome of hair transplantation. METHODS: We enrolled 10 patients with androgenic alopecia and after screening tests for infections and other diseases, we extracted hair follicular units. The hair units were divided in two groups. One group was irradiated by LLL 20 minutes before transplantation (660 nm, 80 Hz, 100 mW) and the other one was used as control. The containing plates were labeled as A and B and sent to the operation room. The surgeon was unaware of the therapy assigned to the plates and transplanted them randomly on the right or left side of the head. One hundred follicular units on each sides of the scalp were transplanted symmetrically. The follicles on both sides were evaluated at 3 and 6 months of transplantation for hair growth rate by another physician, blinded to the treatment assigned to each side. RESULTS: Ten patient with androgenic alopecia and mean (SD) age of 31.5 (6.6) years (range 25-45 years) completed the study.

All patients had 100% hair growth at 3 and 6 months follow-up except one who had hair growth of 20% at three months of transplantation, which changed to 100% at sixth months. There was no significant difference between the groups regarding hair growth (P > 0.8). CONCLUSION: One session of LLL irradiation has no significant effect on the outcome of transplanted hair follicles. Studies with larger sample size are needed to draw a definite conclusion.

Evaluation of the Effects of Intravenous and Percutaneous Low Level Laser Therapy in the Management of Shoulder Myofascial Pain Syndrome. INTRODUCTION: Myofascial pain syndrome (MPS) treatment is challenging with a high recurrence rate and still lacks a clear treatment frame. Therefore research on new, more efficient and long lasting effect treatment modalities is necessary. This study looked at the effects of intravenous laser therapy (IVL) and percutaneous low level laser (PLLL) in the management of shoulder MPS. METHODS: In this randomized controlled trial, 30 patients fulfilling inclusion criteria were randomly equally allocated to 3 groups, control, IVL and PLLL. Control group received 12 sessions of placebo low level laser, IVL group received 12 sessions of IVL therapy, and PLLL group received 12 sessions of PLLL therapy. All patients were trained for better body posture, body mechanics, gentle massage of trigger points, stretching exercises of affected muscle (trapezius), and received 10 mg of oral nortriptyline regimen every night for 3 months. Outcomes included pain severity, functional disability, and quality of life. Patients were assessed using Numeric Rating Scale (NRS), Pain Disability Index (PDI), and Short Form Health Survey (SF-12). Data collected were analyzed using analysis of variance (ANOVA), Mann-Whitney and t tests. RESULTS: The mean of PDI and maximum pain intensity during day and night significantly reduced in both PLLL and IVL groups compared to control group. Although pain severity and PDI reduction was more pronounced in IVL group compared to PLLL group, the differences were not statistically significant. Also, quality of life statistically significantly improved in both IVL and PLLL groups compared to control group was more, and although higher in IVL group, the difference was not statistically significant when compared to PLLL group. No side effects were observed in the intervention groups. CONCLUSION: Intravenous laser and PLLL therapy had a positive effect on pain severity and PDI reduction, and quality of life in this study. Also no adverse event was recorded. Thus, intravenous lasers and PLLL therapy seem to be effective complementary modalities in managing patients with shoulder MPS.

Treatment of hesitation marks on the forearm by the pinhole method. Scars from self-inflicted wounds, referred to as "hesitation marks," are usually linear, flat, poorly oriented, white in color, and often located on the forearm. Many patients do not undergo treatment for these due to limited available modalities. The aim of this study was to evaluate the efficacy and safety of the pinhole method using a 10,600Â nm carbon dioxide (CO2) laser for treating hesitation marks on the forearm. We conducted a retrospective chart review of patients with hesitation marks treated by the pinhole method from March 2010 to April 2014. Eleven patients with hesitation marks (mean age 37.8Â years; range, 23-67Â years) were treated with the pinhole method over the 4-year study period. Subjects were treated via the pinhole method in one to six treatment sessions at 4- to 8-week intervals. Two blinded observers evaluated photographs taken at baseline and 3Â months after the final treatment and assessed improvement using a quartile grading scale. Compared with baseline, there was mild to moderate improvement in all patients (mean score 3.0). The patient satisfaction survey revealed a mean improvement score of 2.82. The pinhole method using a CO2 laser may be an effective treatment option in patients with hesitation marks on the forearm.
Adult;Aged;Cicatrix;Female;Forearm;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Retrospective Studies;Self Mutilation;Treatment Outcome

Cerebral Perfusion Enhancing Interventions: A New Strategy for the Prevention of Alzheimer Dementia. Cardiovascular and cerebrovascular diseases are major risk factors in the

development of cognitive impairment and Alzheimer's disease (AD). These cardio-cerebral disorders promote a variety of vascular risk factors which in the presence of advancing age are prone to markedly reduce cerebral perfusion and create a neuronal energy crisis. Long-term hypoperfusion of the brain evolves mainly from cardiac structural pathology and brain vascular insufficiency. Brain hypoperfusion in the elderly is strongly associated with the development of mild cognitive impairment (MCI) and both conditions are presumed to be precursors of Alzheimer dementia. A therapeutic target to prevent or treat MCI and consequently reduce the incidence of AD aims to elevate cerebral perfusion using novel pharmacological agents. As reviewed here, the experimental pharmaca include the use of Rho kinase inhibitors, neurometabolic energy boosters, sirtuins and vascular growth factors. In addition, a compelling new technique in laser medicine called photobiomodulation is reviewed. Photobiomodulation is based on the use of low level laser therapy to stimulate mitochondrial energy production non-invasively in nerve cells. The use of novel pharmaca and photobiomodulation may become important tools in the treatment or prevention of cognitive decline that can lead to dementia. Adult;Aged;Alzheimer Disease;Animals;Cerebrovascular Circulation;Cerebrovascular Disorders;Cognitive Dysfunction;Humans;Laser Therapy;Middle Aged;Young Adult

Erythroplasia of Queyrat treated by laser and light modalities: a systematic review. Erythroplasia of Queyrat (EOQ) is a squamous cell carcinoma in situ most commonly located on the glans penis or prepuce. EOQ accounts for roughly 10Â % of all penile malignancies and may lead to invasive squamous cell carcinoma. Standard therapy includes local excision, partial or total penectomy, cryotherapy, and topical cytotoxic agents. Treatment of EOQ has proven to be challenging due to low response rates and recurrence. In addition, radical procedures can significantly affect sexual function and quality of life. Alternative laser treatments and photodynamic therapy (PDT) offer promising results for treating EOQ. A systemic review of the literature was performed for articles discussing laser and light therapy for EOQ. Among the patients treated with the CO(2) laser, 81.4Â % of cases had complete remission after one session of treatment. Patients treated with PDT presented with more variable results, where 62.5Â % of those treated with methyl aminolevulinate photodynamic therapy (MAL-PDT) achieved complete remission. Aminolevulinic acid (ALA-PDT) treatment showed a similar rate of remission at 58.3Â %. One study utilized the Nd:YAG laser, which resulted in a recurrence of the lesion in four of the five patients treated. Of the methods reviewed, the CO(2) laser offered the most promising results with a cosmetically excellent prognosis. Further studies with larger power and longer follow-up times are needed to determine the optimal treatment regimen for this penile malignancy. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Aminolevulinic Acid;Carcinoma, Squamous Cell;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Neoplasm Recurrence, Local;Penile Neoplasms;Photochemotherapy;Photosensitizing Agents;Quality of Life

Invisalign Treatment Accelerated by Photobiomodulation. Adult;Female;Humans;Low-Level Light Therapy;Malocclusion, Angle Class I;Open Bite;Patient Care Planning;Time Factors;Tooth Movement Techniques

Acceleration Update. Humans;Low-Level Light Therapy;Orthognathic Surgical Procedures;Osteotomy;Time Factors;Tooth;Tooth Movement Techniques;Vibration

Exploring the effects of low-level laser therapy on fibroblasts and tumor cells following gamma radiation exposure. Ionizing radiation (IR) induces DNA damage and low-level laser therapy (LLLT) has been investigated to prevent or repair detrimental outcomes resulting from IR exposure. Few in vitro studies, however, explore the biological mechanisms underlying those LLLT benefits. Thus, in this work, fibroblasts and tumor cells are submitted to IR with doses of 2.5Â Gy and 10Â Gy. After twenty-four-h, the cells are exposed to LLLT with fluences of 30Â JÂ cm(-2) , 90Â JÂ cm(-2) , and

150Â JÂ cm(-2) . Cellular viability, cell cycle phases, cell proliferation index and senescence are evaluated on days 1 and 4 after LLLT irradiation. For fibroblasts, LLLT promotes - in a fluence-dependent manner - increments in cell viability and proliferation, while a reduction in the senescence was observed. Regarding tumor cells, no influences of LLLT on cell viability are noticed. Whereas LLLT enhances cell populations in S and G(2) /M cell cycle phases for both cellular lines, a decrease in proliferation and increase in senescence was verified only for tumor cells. Putting together, the results suggest that fibroblasts and tumor cells present different responses to LLLT following exposure to gamma-radiation, and these promising results should stimulate further investigations. Senescence of tumor cells and fibroblasts on the 4(th) day after ionizing radiation (IR) and low-level laser therapy (LLLT) exposures. The number of senescent cells increased significantly for tumor cells (a) while for fibroblasts no increment was observed (b). The blue collor indicates senescence activity. Cell Cycle;Cell Line, Tumor;Cell Proliferation;Cell Survival;Cellular Senescence;Fibroblasts;Gamma Rays;Humans;Low-Level Light Therapy;Radiation Exposure

Treatment of port wine stains using Pulsed Dye Laser, Erbium YAG Laser, and topical rapamycin (sirolimus)-A randomized controlled trial. BACKGROUND AND OBJECTIVE: Pulsed Dye Laser (PDL) is currently the gold standard treatment for port wine stains (PWS), although the degree of lesion blanching is variable and often unpredictable. This appears to be due to reformation and reperfusion of blood vessels. Rapamycin has shown potential as an antiangiogenic agent and may prevent the revascularization after PDL treatment. The objective of this study was to evaluate the efficacy of adjuvant use of (commercially available) topical rapamycin after PDL treatment in patients with PWS. MATERIALS AND METHODS: We conducted a prospective, intra-patient, randomized controlled trial. Four treatment areas of 1â€‰cm(2) were created in each PWS. PDL-only treatment was compared to the following three treatments: PDLâ€‰+â€‰rapamycin, PDLâ€‰+â€‰Erbium YAG laser ablation of the stratum corneumâ€‰+â€‰rapamycin, and rapamycin monotherapy. We also compared PDLâ€‰+â€‰Erbium YAGâ€‰+â€‰rapamycin with PDLâ€‰+â€‰rapamycin. The primary endpoint was the percentage clearance assessed colorimetrically at 6 months follow-up. Secondary outcomes were photographic evaluation by an expert panel, patient satisfaction, treatment related pain, and safety. RESULTS: Fourteen patients completed the treatment protocol. The highest percentage clearance was achieved with PDL-only treatment (mean [SD] 16% [34]), but there were no statistically significant differences between treatments. The best photographic evaluation and highest patient satisfaction were also achieved with PDL-only treatment, but only the difference between PDL-only and rapamycin monotherapy was statistically significant. The treatment related pain was well tolerated. Application-site pruritus was a frequent occurring adverse event. Allergic contact dermatitis to rapamycin occurred in one patient. There were no serious adverse events. CONCLUSION: Topical application of the commercially available solution of rapamycin (Rapamune(Â®) 0.1%) as an adjuvant to PDL treatment does not appear to improve PWS blanching. Lasers Surg. Med. 49:104-109, 2017. Â© 2016 Wiley Periodicals, Inc. Sirolimus Academic Medical Centers;Administration, Topical;Adolescent;Adult;Biopsy, Needle;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Netherlands;Port-Wine Stain;Prospective Studies;Sirolimus;Statistics, Nonparametric;Treatment Outcome;Young Adult

Repigmentation of poliosis in a patient with segmental vitiligo. Melanins;Prednisolone;Tacrolimus Administration, Oral;Administration, Topical;Adult;Combined Modality Therapy;Eyebrows;Eyelids;Humans;Hypopigmentation;Low-Level Light Therapy;Male;Melanins;Prednisolone;Recovery of Function;Tacrolimus;Treatment Outcome;Vitiligo

The Role of Matrix Metalloproteinases in Diabetic Wound Healing in relation to Photobiomodulation. The integration of several cellular responses initiates the process of wound healing. Matrix

Metalloproteinases (MMPs) play an integral role in wound healing. Their main function is degradation, by removal of damaged extracellular matrix (ECM) during the inflammatory phase, breakdown of the capillary basement membrane for angiogenesis and cell migration during the proliferation phase, and contraction and remodelling of tissue in the remodelling phase. For effective healing to occur, all wounds require a certain amount of these enzymes, which on the contrary could be very damaging at high concentrations causing excessive degradation and impaired wound healing. The imbalance in MMPs may increase the chronicity of a wound, a familiar problem seen in diabetic patients. The association of diabetes with impaired wound healing and other vascular complications is a serious public health issue. These may eventually lead to chronic foot ulcers and amputation. Low intensity laser irradiation (LILI) or photobiomodulation (PBM) is known to stimulate several wound healing processes; however, its role in matrix proteins and diabetic wound healing has not been fully investigated. This review focuses on the role of MMPs in diabetic wound healing and their interaction in PBM. Matrix Metalloproteinases Basement Membrane;Cell Movement;Cell Proliferation;Diabetes Complications;Diabetes Mellitus;Extracellular Matrix;Humans;Low-Level Light Therapy;Matrix Metalloproteinases;Wound Healing;Wounds and Injuries

Effects of low-level laser therapy, electroacupuncture, and radiofrequency on the pigmentation and skin tone of adult women. [Purpose] In this study, the effects of low-level laser therapy (LLLT), electroacupuncture (EA), and radiofrequency (RF), which are used in physical therapy, on the pigmentation and skin tone of adult women's faces were investigated to provide basic data for skin interventions. [Subjects and Methods] Thirty adult females were assigned to either an LLLT group (n=10), an EA group (n=10), or an RF group (n=10). The intervention was performed in two 15-minute sessions per week for six weeks. Subjects' skin tone and pigmentation were observed before and after the intervention. [Results] The EA group showed significant reductions in pigmentation in the left and right eye rims, as well as in the left cheek. The RF group showed significant post-intervention reductions in pigmentation under the left eye, as well as in the left and right eye rims and the left cheek. The LLLT group showed significant increases in skin tone in the forehead and both eye rims. The RF group showed significant increases in skin tone under both eyes. [Conclusion] The application of LLLT, EA, and RF had positive effects on pigmentation and skin tone of adult women's faces.

Photobiomodulation delays the onset of skeletal muscle fatigue in a dose-dependent manner. Photobiomodulation (PBM) therapy has been implicated as an effective ergogenic aid to delay the onset of muscle fatigue. The purpose of this study was to examine the dose-response ergogenic properties of PBM therapy and its ability to prolong time to task failure by enhancing muscle activity and delaying the onset of muscle fatigue using a static positioning task. Nine participants (24.3â€‰Â±â€‰4.9Â years) received three doses of near-infrared (NIR) light therapy randomly on three separate sessions (sham, 240, and 480Â J). For the positioning task, participants held a 30Â % one-repetition maximum (1-RM) load using the index finger until volitional fatigue. Surface electromyography (sEMG) of the first dorsal interosseous muscle was recorded for the length of the positioning task. Outcomes included time to task failure (TTF), muscle fatigue, movement accuracy, motor output variability, and muscle activity (sEMG). The 240-J dose significantly extended TTF by 26Â % (pâ€‰=â€‰0.032) compared with the sham dose. TTF for the 240-J dose was strongly associated with a decrease in muscle fatigue (R (2)â€‰=â€‰0.54, pâ€‰=â€‰0.024). Our findings show that a 240-J dose of NIR light therapy is efficacious in delaying the onset and extent of muscle fatigue during submaximal isometric positioning tasks. Our findings suggest that NIR light therapy may be used as an ergogenic aid during functional tasks or post-injury rehabilitation. Adult;Cross-Over Studies;Double-Blind Method;Electromyography;Female;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal

Effects of low-level laser therapy (LLLT 808Â nm) on lower limb spastic muscle activity in chronic stroke patients. A cerebrovascular accident (CVA) may affect basic motor functions, including spasticity that may be present in the upper extremity and/or the lower extremity, post-stroke. Spasticity causes pain, muscle force reduction, and decreases the time to onset of muscle fatigue. Several therapeutic resources have been employed to treat CVA to promote functional recovery. The clinical use of low-level laser therapy (LLLT) for rehabilitation of muscular disorders has provided better muscle responses. Thus, the aim of this study was to evaluate the effect of the application of LLLT in spastic muscles in patients with spasticity post-CVA. A double-blind clinical trial was conducted with 15 volunteer stroke patients who presented with post-stroke spasticity. Both males and females were treated; the average age was 51.5â€‰Â±â€‰11.8Â years old; the participants entered the study ranging from 11 to 48Â months post-stroke onset. The patients participated in three consecutive phases (control, placebo, and real LLLT), in which all tests of isometric endurance of their hemiparetic lower limb were performed. LLLT (diode laser, 100Â mW 808Â nm, beam spot area 0.0314Â cm(2), 127.39Â J/cm(2)/point, 40Â s) was applied before isometric endurance. After the real LLLT intervention, we observed significant reduction in the visual analogue scale for pain intensity (pâ€‰=â€‰0.0038), increased time to onset of muscle fatigue (pâ€‰=â€‰0.0063), and increased torque peak (pâ€‰=â€‰0.0076), but no significant change in the root mean square (RMS) value (electric signal in the motor unit during contraction, as obtained with surface electromyography). Our results suggest that the application of LLLT may contribute to increased recruitment of muscle fibers and, hence, to increase the onset time of the spastic muscle fatigue, reducing pain intensity in stroke patients with spasticity, as has been observed in healthy subjects and athletes.
Adult;Aged;Chronic Disease;Cross-Over Studies;Cross-Sectional Studies;Double-Blind Method;Electromyography;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Lower Extremity;Male;Muscle Fatigue;Muscle Spasticity;Muscle, Skeletal;Recovery of Function;Stroke

Effect of the transdermal low-level laser therapy on endothelial function. The effect of low-level laser therapy (LLLT) on the cardiovascular system is not fully established. Since the endothelium is an important endocrine element, establishing the mechanisms of LLLT action is an important issue.The aim of the study was to evaluate the effect of transdermal LLLT on endothelial function.In this study, healthy volunteers (nâ€‰=â€‰40, ageâ€‰=â€‰20-40Â years) were enrolled. Nâ€‰=â€‰30 (14 female, 16 male, mean age 30â€‰Â±â€‰5Â years) constituted the laser-irradiated group (LG). The remaining 10 subjects (6 women, 4 men, mean age 28â€‰Â±â€‰5Â years) constituted the control group (CG). Participants were subjected to LLLT once a day for three consecutive days. Blood for biochemical assessments was drawn before the first irradiation and 24 h after the last session. In the LG, transdermal illumination of radial artery was conducted (a semiconductor laser Î»â€‰=â€‰808Â nm, irradiation 50Â mW, energy density 1.6Â W/cm(2) and a dose 20Â J/day, a total dose of 60Â J). Biochemical parameters (reflecting angiogenesis: vascular endothelial growth factor (VEGF), fibroblast growth factor (FGF), angiostatin; antioxidative status: glutathione (GSH) and the nitric oxide metabolic pathway: symmetric dimethylarginine (SDMA), asymmetric dimethylarginine (ADMA) and L-arginine) were assessed. In the LG, a significant increase in GSH levels and considerable decrease in angiostatin concentration following the LLLT were observed. No significant differences in levels of the VEGF, FGF, SDMA, ADMA were observed.LLLT modifies vascular endothelial function by increasing its antioxidant and angiogenic potential. We found no significant differences in levels of the nitric oxide pathway metabolites within 24Â h following the LLLT irradiation. Vascular Endothelial Growth Factor A;Nitric Oxide;symmetric dimethylarginine;Fibroblast Growth Factors;N,N-dimethylarginine;Angiostatins;Arginine;Glutathione
Adult;Angiostatins;Arginine;Female;Fibroblast Growth Factors;Glutathione;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nitric Oxide;Vascular Endothelial Growth Factor A

The role of photobiomodulation on gene expression of cell adhesion molecules in diabetic wounded fibroblasts in vitro. Cell adhesion molecules (CAMs) are cell surface glycoproteins that facilitate cell-cell contacts and adhesion with the extracellular matrix (ECM). Cellular adhesion is affected by various disease conditions, such as diabetes mellitus (DM) and inflammation. Photobiomodulation (PBM) stimulates biological processes and expression of these cellular molecules. The aim of this experimental work was to demonstrate the role of PBM at 830nm on CAMs in diabetic wounded fibroblast cells. Isolated human skin fibroblast cells were used. Normal (N-) and diabetic wounded (DW-) cells were irradiated with a continuous wave diode laser at 830nm with an energy density of 5J/cm(2). Real time reverse transcriptase polymerase chain reaction (RT-PCR) was used to determine the relative gene expression of 39 CAMs 48h post-irradiation. Normalized expression levels from irradiated cells were calculated relative to non-irradiated control cells according to the 2^(-Î”Î”Ct) method. Thirty-one genes were significantly regulated in N-cells (28 were genes up-regulated and three genes down-regulated), and 22 genes in DW-cells (five genes were up-regulated and 17 genes down-regulated). PBM induced a stimulatory effect on various CAMs namely cadherins, integrins, selectins and immunoglobulins, and hence may be used as a complementary therapy in advancing treatment of non-healing diabetic ulcers. The regulation of CAMs as well as evaluating the role of PBM on the molecular effects of these genes may expand knowledge and prompt further research into the cellular mechanisms in diabetic wound healing that may lead to valuable clinical outcomes. Cell Adhesion Molecules Adult;Cell Adhesion Molecules;Cells, Cultured;Diabetes Mellitus, Type 2;Fibroblasts;Gene Expression;Humans;Lasers, Semiconductor;Real-Time Polymerase Chain Reaction

Low-Level Laser Therapy to the Bone Marrow Ameliorates Neurodegenerative Disease Progression in a Mouse Model of Alzheimer's Disease: A Minireview. OBJECTIVE: This communication reviews the ability of low-level laser therapy (LLLT) to stimulate mesenchymal stem cells (MSCs) in autologous bone marrow (BM) to enhance the capacity of MSCs to infiltrate the brain, clear Î²-amyloid, and improve cognition. BACKGROUND: We recently reported that LLLT applied to the BM enhanced the proliferation of MSCs and their mobilization toward the ischemic heart region, suggesting a possible application of this approach in regenerative medicine and neurodegenerative diseases. It was also shown that circulating monocytes can infiltrate the brain and reduce brain amyloid load in an Alzheimer's disease (AD) mouse model. METHODS AND RESULTS: MSCs from wild-type mice stimulated with LLLT demonstrated an increased ability to maturate toward a monocyte lineage and to increase phagocytosis of soluble AÎ² in vitro. Furthermore, weekly LLLT for 2 months to the BM, starting at 4 months of age (progressive stage of the disease in these 5XFAD transgenic male mice), improved memory and spatial learning, compared to a sham-treated AD mouse model. Histology revealed a significant reduction in AÎ² brain burden in the laser-treated mice compared to the nonlaser-treated ones. CONCLUSIONS: The application of LLLT to the BM is suggested as a therapeutic approach in progressive stages of AD, and its potential role in mediating MSC therapy in brain amyloidogenic disease is implied. Alzheimer Disease;Animals;Bone Marrow Cells;Disease Progression;Low-Level Light Therapy;Mice;Neurodegenerative Diseases

Dosimetry for photobiomodulation therapy: response to Sommers et al.

Photobiomodulation Therapy Decreases Oxidative Stress in the Lung Tissue after Formaldehyde Exposure: Role of Oxidant/Antioxidant Enzymes. Formaldehyde is ubiquitous pollutant that induces oxidative stress in the lung. Several lung diseases have been associated with oxidative stress and their control is necessary. Photobiomodulation therapy (PBMT) has been highlighted as a promissory treatment, but its mechanisms need to be better investigated. Our objective was to evaluate the effects of PBMT on the oxidative stress generated by FA exposure. Male Wistar rats were submitted to FA exposure of 1% or vehicle (3 days) and treated or not with PBMT (1 and 5â€‰h after each FA exposure). Rats treated only with laser were used as control. Twenty-four hours after

the last FA exposure, we analyzed the effects of PBMT on the generation of nitrites and hydrogen peroxide, oxidative burst, glutathione reductase, peroxidase, S-transferase enzyme activities, the gene expression of nitric oxide, cyclooxygenase, superoxide dismutase, the catalase enzyme, and heme oxygenase-1. PBMT reduced the generation of nitrites and hydrogen peroxide and increased oxidative burst in the lung cells. A decreased level of oxidant enzymes was observed which were concomitantly related to an increased level of antioxidants. This study provides new information about the antioxidant mechanisms of PBMT in the lung and might constitute an important tool for lung disease treatment. Antioxidants;Nitrites;Formaldehyde;Nitric Oxide;Hydrogen Peroxide;Catalase;Peroxidase;Heme Oxygenase-1;Prostaglandin-Endoperoxide Synthases;Superoxide Dismutase;Glutathione Reductase Animals;Antioxidants;Catalase;Formaldehyde;Glutathione Reductase;Heme Oxygenase-1;Hydrogen Peroxide;Low-Level Light Therapy;Lung;Male;Nitric Oxide;Nitrites;Oxidative Stress;Peroxidase;Prostaglandin-Endoperoxide Synthases;Rats;Rats, Wistar;Respiratory Burst;Superoxide Dismutase

Effectiveness of physical therapy treatment of clearly defined subacromial pain: a systematic review of randomised controlled trials. AIM: To summarise the current evidence regarding the effectiveness of physical therapy on pain, function and range of motion in individuals with subacromial pain syndrome (SAPS). DESIGN: Systematic review. DATA SOURCES: PubMed, Web of Science, CINAHL, Cochrane, Embase, Lilacs, Ibecs and Scielo databases. ELIGIBILITY CRITERIA FOR SELECTING STUDIES: Randomised controlled trials (RCTs) investigating physical therapy modalities for SAPS on pain, function/disability or range of motion were included. RESULTS: 64 high-quality RCTs were included. Exercise therapy provided high evidence of being as effective as surgery intervention and better than no treatment or placebo treatment to improve pain, function and range of motion in the short, mid and long terms. The combination of mobilisation and exercises provided high evidence to decrease pain and improve function in the short term. There is limited evidence for improvements on the outcomes with the isolated application of manual therapy. High level of evidence was synthesised regarding the lack of beneficial effects of physical resources such as low-level laser, ultrasound and pulsed electromagnetic field (PEMF) on pain, function or range of motion in the treatment of SAPS. There is limited evidence for microwave diathermy and transcutaneous electrical nerve stimulation. There is moderate evidence to no benefits with taping in the short term. Effects of diacutaneous fibrolysis and acupuncture are not well established yet. CONCLUSIONS: Exercise therapy should be the first-line treatment to improve pain, function and range of motion. The addition of mobilisations to exercises may accelerate reduction of pain in the short term. Low-level laser therapy, PEMF and taping should not be recommended. Acupuncture Therapy;Diathermy;Electric Stimulation Therapy;Exercise Therapy;Humans;Musculoskeletal Manipulations;Outcome Assessment, Health Care;Pain Management;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Range of Motion, Articular;Shoulder Pain

Electrotherapy modalities for rotator cuff disease. BACKGROUND: Management of rotator cuff disease may include use of electrotherapy modalities (also known as electrophysical agents), which aim to reduce pain and improve function via an increase in energy (electrical, sound, light, or thermal) into the body. Examples include therapeutic ultrasound, low-level laser therapy (LLLT), transcutaneous electrical nerve stimulation (TENS), and pulsed electromagnetic field therapy (PEMF). These modalities are usually delivered as components of a physical therapy intervention. This review is one of a series of reviews that form an update of the Cochrane review, 'Physiotherapy interventions for shoulder pain'. OBJECTIVES: To synthesise available evidence regarding the benefits and harms of electrotherapy modalities for the treatment of people with rotator cuff disease. SEARCH METHODS: We searched the Cochrane Central Register of Controlled Trials (CENTRAL; 2015, Issue 3), Ovid MEDLINE (January 1966 to March 2015), Ovid EMBASE (January 1980 to March 2015), CINAHL

Plus (EBSCOhost, January 1937 to March 2015), ClinicalTrials.gov and the WHO ICTRP clinical trials registries up to March 2015, unrestricted by language, and reviewed the reference lists of review articles and retrieved trials, to identify potentially relevant trials. SELECTION CRITERIA: We included randomised controlled trials (RCTs) and quasi-randomised trials, including adults with rotator cuff disease (e.g. subacromial impingement syndrome, rotator cuff tendinitis, calcific tendinitis), and comparing any electrotherapy modality with placebo, no intervention, a different electrotherapy modality or any other intervention (e.g. glucocorticoid injection). Trials investigating whether electrotherapy modalities were more effective than placebo or no treatment, or were an effective addition to another physical therapy intervention (e.g. manual therapy or exercise) were the main comparisons of interest. Main outcomes of interest were overall pain, function, pain on motion, patient-reported global assessment of treatment success, quality of life and the number of participants experiencing adverse events. DATA COLLECTION AND ANALYSIS: Two review authors independently selected trials for inclusion, extracted the data, performed a risk of bias assessment and assessed the quality of the body of evidence for the main outcomes using the GRADE approach. MAIN RESULTS: We included 47 trials (2388 participants). Most trials (n = 43) included participants with rotator cuff disease without calcification (four trials included people with calcific tendinitis). Sixteen (34%) trials investigated the effect of an electrotherapy modality delivered in isolation. Only 23% were rated at low risk of allocation bias, and 49% were rated at low risk of both performance and detection bias (for self-reported outcomes). The trials were heterogeneous in terms of population, intervention and comparator, so none of the data could be combined in a meta-analysis.In one trial (61 participants; low quality evidence), pulsed therapeutic ultrasound (three to five times a week for six weeks) was compared with placebo (inactive ultrasound therapy) for calcific tendinitis. At six weeks, the mean reduction in overall pain with placebo was -6.3 points on a 52-point scale, and -14.9 points with ultrasound (MD -8.60 points, 95% CI -13.48 to -3.72 points; absolute risk difference 17%, 7% to 26% more). Mean improvement in function with placebo was 3.7 points on a 100-point scale, and 17.8 points with ultrasound (mean difference (MD) 14.10 points, 95% confidence interval (CI) 5.39 to 22.81 points; absolute risk difference 14%, 5% to 23% more). Ninety-one per cent (29/32) of participants reported treatment success with ultrasound compared with 52% (15/29) of participants receiving placebo (risk ratio (RR) 1.75, 95% CI 1.21 to 2.53; absolute risk difference 39%, 18% to 60% more). Mean improvement in quality of life with placebo was 0.40 points on a 10-point scale, and 2.60 points with ultrasound (MD 2.20 points, 95% CI 0.91 points to 3.49 points; absolute risk difference 22%, 9% to 35% more). Between-group differences were not important at nine months. No participant reported adverse events.Therapeutic ultrasound produced no clinically important additional benefits when combined with other physical therapy interventions (eight clinically heterogeneous trials, low quality evidence). We are uncertain whether there are differences in patient-important outcomes between ultrasound and other active interventions (manual therapy, acupuncture, glucocorticoid injection, glucocorticoid injection plus oral tolmetin sodium, or exercise) because the quality of evidence is very low. Two placebo-controlled trials reported results favouring LLLT up to three weeks (low quality evidence), however combining LLLT with other physical therapy interventions produced few additional benefits (10 clinically heterogeneous trials, low quality evidence). We are uncertain whether transcutaneous electrical nerve stimulation (TENS) is more or less effective than glucocorticoid injection with respect to pain, function, global treatment success and active range of motion because of the very low quality evidence from a single trial. In other single, small trials, no clinically important benefits of pulsed electromagnetic field therapy (PEMF), microcurrent electrical stimulation (MENS), acetic acid iontophoresis and microwave diathermy were observed (low or very low quality evidence).No adverse events of therapeutic ultrasound, LLLT, TENS or microwave diathermy were reported by any participants. Adverse events were not measured in any trials investigating the effects of PEMF, MENS or acetic acid iontophoresis. AUTHORS'

CONCLUSIONS: Based on low quality evidence, therapeutic ultrasound may have short-term benefits over placebo in people with calcific tendinitis, and LLLT may have short-term benefits over placebo in people with rotator cuff disease. Further high quality placebo-controlled trials are needed to confirm these results. In contrast, based on low quality evidence, PEMF may not provide clinically relevant benefits over placebo, and therapeutic ultrasound, LLLT and PEMF may not provide additional benefits when combined with other physical therapy interventions. We are uncertain whether TENS is superior to placebo, and whether any electrotherapy modality provides benefits over other active interventions (e.g. glucocorticoid injection) because of the very low quality of the evidence. Practitioners should communicate the uncertainty of these effects and consider other approaches or combinations of treatment. Further trials of electrotherapy modalities for rotator cuff disease should be based upon a strong rationale and consideration of whether or not they would alter the conclusions of this review. Adult;Diathermy;Electric Stimulation Therapy;Humans;Magnetic Field Therapy;Middle Aged;Muscular Diseases;Randomized Controlled Trials as Topic;Rotator Cuff;Shoulder Pain;Transcutaneous Electric Nerve Stimulation;Ultrasonic Therapy

Pulsed dye laser in the treatment of psoriatic nails: a controlled study. Adolescent;Adult;Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Nail Diseases;Psoriasis

Nd:YAG laser radiation (1.064Â nm) accelerates differentiation of osteoblasts to osteocytes on smooth and rough titanium surfaces inÂ vitro. BACKGROUND: A number of studies revealed beneficial effects of low-level laser therapy (LLLT) regarding cell proliferation and differentiation. AIM: To investigate the effect of Nd:YAG (1.064Â nm) laser radiation in the proliferation and differentiation potential of MG-63 osteoblast-like cells. Additionally, the effects of the surface configurations were to be evaluated. MATERIAL AND METHODS: MG-63 osteoblast cells were cultured on different surfaces: plastic tissue culture, smooth (polished) titanium-PT and rough titanium-SLA. The effects of both titanium surfaces and low-level laser therapy (LLLT) on cell adhesion were evaluated by the gene expression of molecules involved in cell proliferation and differentiation. In addition, scanning electron microscopy (SEM) and MTT proliferation assays were used to examine cell morphology and proliferation, respectively. RESULTS: Compared to smooth (PT) surfaces, SLA surfaces favoured MG-63 cell differentiation. Following the application of Nd:YAG laser irradiation, cells yielded statistically significantly improved differentiation on both smooth and SLA surfaces compared with non-irradiated surfaces. CONCLUSIONS: The findings of this present study suggest that both surface morphology and Nd:YAG laser irradiation influence the proliferation and differentiation potential of MG-63 cells. Titanium Cell Adhesion;Cell Differentiation;Cell Proliferation;Cells, Cultured;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Osteoblasts;Surface Properties;Titanium

Clinical Assessment of the Efficiency of Low Level Laser Therapy in the Treatment of Oral Lichen Planus. BACKGROUND: Oral lichen planus (OLP) is a chronic inflammatory disease of the oral mucosa of uncertain etiology. AIM: To evaluate the effect of using low level laser therapy (LLLT (970 nm Siro laser Advance) for the treatment of symptomatic (OLP). SUBJECTS AND METHODS: The present study was conducted on ten patients suffering from persistent oral lichen planus (OLP). Patients were treated with diode laser (970nm) for the symptomatic relief of pain and burning sensation. The patients were assessed before, during and after the completion of the laser treatment which was done twice weekly for two successive months with maximum of ten sessions. The assessment was performed using visual analogue scale (VAS) and clinical investigation for each patient. RESULTS: Detailed significant reduction in lesion size and showed complete remission of burning sensation and pain. No reported complications or therapy side effects were observed in any

of the treated patients. CONCLUSION: Diode laser therapy seems to be an effective adjunctive treatment modality for relieving pain and clinical symptoms of OLP.

A Comparative Evaluation of Low-Level Laser and Topical Steroid Therapies for the Treatment of Erosive-Atrophic Lichen Planus. BACKGROUND: Oral lichen planus (OLP) is a chronic inflammatory disease that causes bilateral white striations, papules, or plaques on the buccal mucosa, tongue, and gingivae. Erythema, erosions, and blisters may or may not be present. Several empirical therapies have been used in the treatment of (OLP). OBJECTIVE: To evaluate the effect of low level laser therapy (LLLT) versus topical steroids for the treatment of erosive-atrophic lichen planus. SUBJECTS AND METHODS: Twenty-four patients with erosive-atrophic (OLP) were categorized into two groups. In the first group patients were treated with 970 nm diode laser irradiation, while, in the second group patients used topical corticosteroids (0.1% triamcinolone acetonide orabase). The gender, medical history and pain score were recorded. The pain score was measured before and after treatment by visual analogue scale (VAS). RESULTS: Steroid-treated group (0.1% triamcinolone acetonide orabase) show reduced pain score than laser group. CONCLUSION: Topical steroids are more effective than LLLT. LLLT may be used as an alternative treatment for symptomatic OLP when steroids are contraindicated.

Skin healing and collagen changes of rats after fractional erbium:yttrium aluminum garnet laser: observation by reflectance confocal microscopy with confirmed histological evidence. The fractional erbium:yttrium aluminum garnet (Er:YAG) laser is widely applied. Microstructural changes after laser treatment have been observed with histopathology. Epidermal and dermal microstructures have also been analyzed using reflectance confocal microscopy (RCM). However, no studies have compared these two types of microstructural changes in the same subject at multiple time points after irradiation, and it is unclear if these two types of changes are consistent. We use RCM to observe the effect of different laser energies on skin healing and collagen changes in the skin of Sprague-Dawley rats that had been irradiated by fractional Er:YAG lasering at different energies. RCM was used to observe skin healing and detect collagen changes at different time points. Collagen changes were observed using hematoxylin and eosin (H&E) staining and quantitatively analyzed by western blot. RCM showed that, irrespective of laser energy, microscopic treatment zones (MTZs) were larger at 1Â day after irradiation. The MTZs then reduced in size from 3 to 7Â days after irradiation. The higher the energy, the larger the MTZ area. The amount of collagen also increased with time from 1Â day to 8Â weeks. However, the increase in the collagen amount on both RCM and H&E staining was not influenced by the laser energy. Western blotting confirmed that the amount of type I and type III collagens increased over time, but there were no significant differences between the different energy groups (pâ€‰>â€‰0.05). In conclusion, RCM is a reliable technique for observing and evaluating skin healing and collagen expression after laser irradiation. yttrium-aluminum-garnet;Yttrium;Erbium;Collagen;Aluminum
Aluminum;Animals;Collagen;Epidermis;Erbium;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Confocal;Rats;Rats, Sprague-Dawley;Skin;Wound Healing;Yttrium

Low-level phototherapy to improve exercise capacity and muscle performance: a systematic review and meta-analysis. The aim of this study was to evaluate the effectiveness of pre-exercise low-level phototherapy (Light-Emitting Diode therapy [LEDtherapy] or Light Amplification by Stimulate Emission of Radiation therapy [LASERtherapy]) in increasing exercise capacity and muscle performance of people undergoing exercise when compared to placebo treatment. Randomized controlled trials and crossover studies were sought on CENTRAL, MEDLINE, EMBASE, SciELO, PEDro and LILACS from its inception up to February 2015. References lists of included studies were sought for additional relevant research. Two authors independently extracted data on study design, treatment parameters, exercise capacity (number of repetitions, time to exhaustion, blood lactate

concentration and lactate dehydrogenase activity) and muscle performance (torque, power and strength) using an structured table. Agreement should be reached by consensus or by a third reviewer. Sixteen studies involving 297 participants were included. Improvement of number of repetitions (mean difference [MD] [95Â % confidence interval]â€‰=â€‰3.51 repetitions [0.65-6.37]; Pâ€‰=â€‰0.02), delay in time to exhaustion (MDâ€‰=â€‰4.01Â s [2.10-5.91]; Pâ€‰<â€‰0.0001), reduction in lactate levels (MDâ€‰=â€‰0.34Â mmol/L [0.19-0.48]; Pâ€‰<â€‰0.00001) and increased peak torque (MDâ€‰=â€‰21.51Â Nm [10.01-33.01]; Pâ€‰<â€‰0.00001) were observed when LASERtherapy was applied. LEDtherapy meta-analyses were performed with two studies and retrieved no between-group statistically significant difference in power, lactate levels or time to exhaustion. Although our results suggest that LASERtherapy is effective in improving skeletal muscle exercise capacity, the quality of the current evidence is limited. Lactic Acid Exercise;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle, Skeletal;Randomized Controlled Trials as Topic

Effects of photobiomodulation therapy (PBMT) on bovine sperm function. Fertilization rates and subsequent embryo development rely on sperm factors related to semen quality and viability. Photobiomodulation therapy (PBMT) is based on emission of electromagnetic waves of a laser optical system that interact with cells and tissues resulting in biological effects. This interaction is mediated by photoacceptors that absorb the electromagnetic energy. Effects are dependent of irradiation parameters, target cell type, and species. In sperm, PBMT improves several features like motility and viability, affecting sperm aerobic metabolism and energy production. The aim of this study was to investigate, under same conditions, how different output powers (5, 7.5, and 10Â mW) and time of irradiation (5 and 10Â min) of laser (He-Ne laser, 633Â nm) may affect frozen/thawed bovine sperm functions. Results showed significant effects depending on power while using 10Â min of irradiation on motility parameters and mitochondrial potential. However, no effect was observed using 5Â min of irradiation, regardless of power applied. In conclusion, PBMT is effective to modulate bovine sperm function. The effectiveness is dependent on the interaction between power applied and duration of irradiation, showing that these two parameters simultaneously influence sperm function. In this context, when using the same fluency and energy with different combinations of power and time of exposure, we observed distinct effects, revealing that biological effects should be also based on simple parameters rather than only composite parameters such as fluency, irradiance and energy. Laser irradiation of frozen/thawed bovine semen led to an increase on mitochondrial function and motility parameters that could potentially improve fertility rates. Animals;Cattle;Cell Survival;Low-Level Light Therapy;Male;Semen Analysis;Semen Preservation;Sperm Motility;Spermatozoa

Effect of pre-exercise phototherapy applied with different cluster probe sizes on elbow flexor muscle fatigue. Phototherapy has been used for reducing muscle fatigue. In view of the various types of phototherapy cluster probes available in the market, the purpose of this study was to compare the effects of a similar phototherapy dosage with two different cluster probes on elbow flexor muscle fatigue: small cluster probe (SCâ€‰=â€‰9 diodes; 7.5Â cm(2)) vs. large cluster probe (LCâ€‰=â€‰33 diodes; 30.2Â cm(2)). Ten physically active male aged 18-35Â years participate in a randomized, crossover, double-blind, placebo-controlled trial, which each participant was submitted to the same testing protocol in four sessions (separated by at least 48Â h) with different treatments: LC-phototherapy, SC-phototherapy, LC-placebo, and SC-placebo. The elbow flexion maximal isometric voluntary contraction (MIVC) was performed before and after a fatigue protocol (60Â % of MIVC until exhaustion). Electromyography (EMG) of the biceps brachii muscle was collected during all testing procedure. Phototherapy with dose of 60Â J per muscle [LC: 33 diodesâ€‰=â€‰5 lasers (850Â nm), 12 LEDs (670Â nm), 8 LEDs (880Â nm), and 8 LEDs (950Â nm); SC: 9 diodesâ€‰=â€‰5 lasers

(850Â nm) and 4 LEDs (670Â nm)] or placebo applications occurred before fatigue protocol. Two-way ANOVA (treatment and time factors) and one-way ANOVA were used, followed by LSD post hoc. Time to exhaustion was significantly higher in active LC (15Â %; pâ€‰=â€‰0.031) and SC (14Â %; pâ€‰=â€‰0.038) in comparison with their respective placebo treatments, without differences between LC and SC (pâ€‰>â€‰0.05) or between placebo conditions (pâ€‰>â€‰0.05). This larger exercise tolerance in phototherapy conditions was not accompanied by a higher decrement in the volunteers' maximal strength capacity (11-15Â %; pâ€‰>â€‰0.05 for all). EMG signals presented no difference between the four condition tested here. In both large and small cluster probes (according parameters tested in this study) led to reduced fatigue in elbow flexor muscles, without difference between them. Adolescent;Adult;Arm;Cross-Over Studies;Double-Blind Method;Elbow;Electromyography;Exercise Tolerance;Humans;Male;Muscle Fatigue;Muscle, Skeletal;Phototherapy;Range of Motion, Articular;Young Adult

Low-level laser therapy for treatment of chemotherapy-induced oral mucositis in childhood: a randomized double-blind controlled study. The aim of this study was to verify if low-level laser therapy could be useful to reduce chemotherapy-related oral mucositis grading and pain in childhood undergoing chemotherapy. A randomized double-blind clinical trial was carried out. Patients from 3 to 18Â years of age undergoing cancer therapy and presenting OM grade 2 or more were eligible for this study. Patients were randomly divided in two groups: group A received laser therapy from the day of OM diagnosis and other 3 consecutive days (830Â nm wavelength, power 150Â mW, spot size 1Â cm(2), 30Â s per cm(2), energy density 4.5Â J/cm(2)); group B received sham therapy (placebo) with the same timing. Two blind clinicians performed OM scoring and pain evaluation at day 1 (immediately before the beginning of laser treatment-T0), day 4 (after finishing laser therapy cycle-T1) and at day 7 (T2) as follow-up. A total of 123 patients were included in the study. Group A was composed of 62 children while group B is 61; in both groups, there was a progressive reduction in grade of OM, and at day 7, not every mucosal lesion disappeared. The difference in the decline of OM grading between the two groups resulted not statistically significant (pâ€‰=â€‰0.07). A statistically significant difference in pain reduction between two groups both at T1 and at T2 (pâ€‰<â€‰0.005) was observed. This study demonstrated the efficacy of LLLT in reducing pain due to chemotherapy-induced oral mucositis in children, while no significant benefit was noted in reducing OM grade. Adolescent;Child;Child, Preschool;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain;Pain Measurement;Stomatitis

Transcranial Laser Stimulation as Neuroenhancement for Attention Bias Modification in Adults with Elevated Depression Symptoms. BACKGROUND: Low-level light therapy (LLLT) with transcranial laser is a non-invasive form of neuroenhancement shown to regulate neuronal metabolism and cognition. Attention bias modification (ABM) is a cognitive intervention designed to improve depression by decreasing negative attentional bias, but to date its efficacy has been inconclusive. Adjunctive neuroenhancement to augment clinical effectiveness has shown promise, particularly for individuals who respond positively to the primary intervention. OBJECTIVE/HYPOTHESIS: This randomized, sham-controlled proof-of-principle study is the first to test the hypothesis that augmentative LLLT will improve the effects of ABM among adults with elevated symptoms of depression. METHODS: Fifty-one adult participants with elevated symptoms of depression received ABM before and after laser stimulation and were randomized to one of three conditions: right forehead, left forehead, or sham. Participants repeated LLLT two days later and were assessed for depression symptoms one and two weeks later. RESULTS: A significant three-way interaction between LLLT condition, ABM response, and time indicated that right LLLT led to greater symptom improvement among participants whose attention was responsive to ABM (i.e., attention was directed away from negative stimuli). Minimal change in depression was observed in the left and

sham LLLT. CONCLUSIONS: The beneficial effects of ABM on depression symptoms may be enhanced when paired with adjunctive interventions such as right prefrontal LLLT; however, cognitive response to ABM likely moderates the impact of neuroenhancement. The results suggest that larger clinical trials examining the efficacy of using photoneuromodulation to augment cognitive training are warranted. Adolescent;Attention;Attentional Bias;Depression;Depressive Disorder;Female;Humans;Low-Level Light Therapy;Male;Neuropsychological Tests;Treatment Outcome;Young Adult

The Effectiveness of Physical Agents for Lower-Limb Soft Tissue Injuries: A Systematic Review. Study Design Systematic review. Background Soft tissue injuries to the lower limb bring a substantial health and economic burden to society. Physical agents are commonly used to treat these injuries. However, the effectiveness of many such physical agents is not clearly established in the literature. Objective To evaluate the effectiveness and safety of physical agents for soft tissue injuries of the lower limb. Methods We searched 5 databases from 1990 to 2015 for randomized controlled trials (RCTs), cohort studies, and case-control studies. Paired reviewers independently screened the retrieved literature and appraised relevant studies using the Scottish Intercollegiate Guidelines Network criteria. Studies with a high risk of bias were excluded. We synthesized low-risk-of-bias studies according to principles of best-evidence synthesis. Results We screened 10261 articles. Of 43 RCTs identified, 20 had a high risk of bias and were excluded from the analysis, and 23 RCTs had a low risk of bias and were included in the analysis. The available higher-quality evidence suggests that patients with persistent plantar fasciitis may benefit from ultrasound or foot orthoses, while those with persistent midportion Achilles tendinopathy may benefit from shockwave therapy. However, the current evidence does not support the use of shockwave therapy for recent plantar fasciitis, low-Dye taping for persistent plantar fasciitis, low-level laser therapy for recent ankle sprains, or splints for persistent midportion Achilles tendinopathy. Finally, evidence on the effectiveness of the following interventions is not established in the current literature: (1) shockwave therapy for persistent plantar fasciitis, (2) cryotherapy or assistive devices for recent ankle sprains, (3) braces for persistent midportion Achilles tendinopathy, and (4) taping or electric muscle stimulation for patellofemoral pain syndrome. Conclusion Almost half the identified RCTs that evaluated the effectiveness of physical agents for the management of lower-limb soft tissue injuries had a high risk of bias. High-quality RCTs are still needed to assess the effectiveness of physical agents for managing the broad range of lower-limb soft tissue injuries. The effectiveness of most interventions remains unclear. Level of Evidence Therapy, 1a. Protocol registered July 10, 2014 with PROSPERO (CRD42014010621). J Orthop Sports Phys Ther 2016;46(7):523-554. Epub 6 Jun 2016. doi:10.2519/jospt.2016.6521. Child;Humans;Lower Extremity;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Soft Tissue Injuries

[Preventing cardiovascular risk in miners]. The article presents results concerning usage of intravenous laser radiation of blood in miners with cardiovascular diseases. After cardiovascular state assessment, the miners at high cardiovascular risk were subjected to prophylactic procedures with traditional medical treatment added by intravenous laser therapy. Findings are anti-arrhythmic, antihypertensive, antiatherogenic and anti-aggregation effects of complex treatment with intravenous laser radiation of blood in miners at high cardiovascular risk and its subsequent decrease due to treatment. Adult;Cardiovascular Diseases;Cardiovascular System;Humans;Low-Level Light Therapy;Male;Middle Aged;Miners;Mining;Occupational Diseases;Occupational Exposure;Treatment Outcome

Low-intensity laser phototherapy enhances the proliferation of dental pulp stem cells under nutritional deficiency. Dental trauma in immature permanent teeth can damage pulp vascularization, which leads to necrosis and cessation of apexogenesis. Studies on tissue engineering

using stem cells from human exfoliated deciduous teeth (SHEDs) have yielded promising results. Laser phototherapy (LPT) is able to influence the proliferation and differentiation of these cells, which could improve tissue engineering. SHEDs (eighth passage) were seeded into 96-well culture plates (103 cells/well) and were grown in culture medium supplemented with 15% defined fetal bovine serum (FBS) for 12 h. After determining the appropriate nutrition deficiency status (5% FBS), the cells were assigned into four groups: 1) G1 - 15% FBS (positive control); 2) G2 - 5% FBS (negative control); 3) G3 - 5% FBS+LPT 3 J/cm2; and 4) G4 - 5% FBS+LPT 5 J/cm2. For the LPT groups, two laser irradiations at 6 h intervals were performed using a continuous wave InGaAlP diode laser (660 nm, with a spot size of 0.028 cm2, 10 mW) in punctual and contact mode. Cell viability was assessed via an MTT reduction assay immediately after the second laser irradiation (0 h) and 24, 48, and 72 h later. We found that G3 and G4 presented a significantly higher cell growth rate when compared with G2 ($p < 0.01$). Moreover, G4 exhibited a similar cell growth rate as G1 throughout the entire experiment ($p > 0.05$). These findings indicate that LPT with 5 J/cm2 can enhance the growth of SHEDs during situations of nutritional deficiency. Therefore, LPT could be a valuable adjunct treatment in tissue engineering when using stem cells derived from the dental pulp of primary teeth. Culture Media Analysis of Variance;Animals;Cattle;Cell Proliferation;Cell Survival;Cells, Cultured;Culture Media;Dental Pulp;Humans;Low-Level Light Therapy;Malnutrition;Radiometry;Reproducibility of Results;Stem Cells;Time Factors;Tissue Engineering;Tooth, Deciduous

Low level laser therapy associated with a strength training program on muscle performance in elderly women: a randomized double blind control study. The aging process leads to a gradual loss of muscle mass and muscle performance, leading to a higher functional dependence. Within this context, many studies have demonstrated the benefits of a combination of physical exercise and low level laser therapy (LLLT) as an intervention that enhances muscle performance in young people and athletes. The aim of this study was to evaluate the effects of combination of LLLT and strength training on muscle performance in elderly women. For this, a hundred elderly women were screened, and 48 met all inclusion criteria to participate in this double-blind placebo-controlled trial. Volunteers were divided in three groups: control (CGâ€‰=â€‰15), strength training associated with placebo LLLT (TGâ€‰=â€‰17), and strength training associated with active LLLT (808Â nm, 100Â mW, 7Â J) (TLGâ€‰=â€‰16). The strength training consisted of knee flexion-extension performed with 80Â % of 1-repetition maximum (1-RM) during 8Â weeks. Several outcomes related to muscle performance were analyzed through the 6-min walk test (6-MWT), isokinetic dynamometry, surface electromyography (SEMG), lactate concentration, and 1-RM. The results revealed that a higher work (pâ€‰=â€‰0.0162), peak torque (pâ€‰=â€‰0.0309), and power (pâ€‰=â€‰0.0223) were observed in TLG compared to CG. Furthermore, both trained groups increased the 1-RM load (TG vs CG: pâ€‰=â€‰0.0067 and TLG vs CG: pâ€‰<â€‰0.0001) and decreased the lactate concentration in the third minute after isokinetic protocol (CG vs TLG: pâ€‰=â€‰0.0289 and CG vs TG: pâ€‰=â€‰0.0085). No difference in 6-MWT and in fatigue levels were observed among the groups. The present findings suggested that LLLT in combination with strength training was able to improve muscle performance in elderly people. Lactic Acid Aged;Double-Blind Method;Electromyography;Exercise;Female;Humans;Lactic Acid;Low-Level Light Therapy;Middle Aged;Muscle, Skeletal;Resistance Training;Torque

Evaluation of low-level laser therapy on skeletal muscle ischemia-reperfusion in streptozotocin-induced diabetic rats by assaying biochemical markers and histological changes. The purpose of the present study was to assess the effects of low-level laser therapy (LLLT) on skeletal muscle ischemia-reperfusion (IR) injuries in streptozotocin-induced diabetic rats. Twenty male Wistar rats were randomly assigned into two experimental groups, as follows: the diabetic IR group (G1, nâ€‰=â€‰10) and the diabetic IR + LLLT group (G2, nâ€‰=â€‰10). Ischemia was induced in

anesthetized rats from the right femoral artery clipping for 2Â h, followed by a reperfusion for 24Â h. Then, the laser irradiation (K30 handheld probe, AZOR, Technica, Russia, 650Â nm, 30Â mW, surface areaâ€‰=â€‰1Â cm(2), energy densityâ€‰=â€‰1.8Â J/cm(2)) was carried out by irradiating the rats over a unique point on the skin over the middle region of the right gastrocnemius muscle belly three times (every 8Â h), starting after initiating the reperfusion for 3Â min. At the end of the reperfusion period, rats were anaesthetized and blood samples were collected and used for the estimation of pO2, pCO2, pH, HCO3, serum creatine phosphokinase (CPK), and lactate dehydrogenase (LDH). Subsequently, the right gastrocnemius muscle samples were taken for wet/dry weight ratio assessment and histological/biochemical examination. The pO2, pCO2, HCO3, and pH levels were similar for both groups (Pâ€‰>â€‰0.05). The serum LDH and CPK levels were significantly lower (Pâ€‰<â€‰0.05) for G2 compared to G1. In comparison to G1, tissue malondialdehyde level in G2 was significantly decreased (Pâ€‰<â€‰0.05). In G2, superoxide dismutase activity was significantly increased compared to G1 (Pâ€‰<â€‰0.05). Unlike G2, a significant decrease in the activity of catalase was observed in G1 (Pâ€‰<â€‰0.05). The wet/dry ratio in G1 was significantly higher than that of G2 (Pâ€‰<â€‰0.05). Histological examination confirmed that the extent of muscle changes in G1 was higher than G2 (Pâ€‰<â€‰0.05). Finally, according to this study, LLLT has a beneficial effect on the IR muscle injury treatment in the diabetic rats. Therefore, we suggest that further research needs to be conducted using different laser parameters and examining response over a longer period of tissue recovery. Biomarkers;Malondialdehyde;Streptozocin;L-Lactate Dehydrogenase;Catalase Animals;Biomarkers;Catalase;Diabetes Mellitus, Experimental;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Malondialdehyde;Muscle, Skeletal;Rats;Rats, Wistar;Reperfusion Injury;Streptozocin

Acute effects of low-level laser therapy irradiation on blood lactate and muscle fatigue perception in hospitalized patients with heart failure-a pilot study. The objective of the present study is to evaluate the acute effects of low-level laser therapy (LLLT) on functional capacity, perceived exertion, and blood lactate in hospitalized patients with heart failure (HF). Patients diagnosed with systolic HF (left ventricular ejection fraction <45Â %) were randomized and allocated prospectively into two groups: placebo LLLT group (nâ€‰=â€‰10)-subjects who were submitted to placebo laser and active LLLT group (nâ€‰=â€‰10)-subjects who were submitted to active laser. The 6-min walk test (6MWT) was performed, and blood lactate was determined at rest (before LLLT application and 6MWT), immediately after the exercise test (time 0) and recovery (3, 6, and 30Â min). A multi-diode LLLT cluster probe (DMC, SÃ£o Carlos, Brazil) was used. Both groups increased 6MWT distance after active or placebo LLLT application compared to baseline values (pâ€‰=â€‰0.03 and pâ€‰=â€‰0.01, respectively); however, no difference was observed during intergroup comparison. The active LLLT group showed a significant reduction in the perceived exertion Borg (PEB) scale compared to the placebo LLLT group (pâ€‰=â€‰0.006). In addition, the group that received active LLLT showed no statistically significant difference for the blood lactate level through the times analyzed. The placebo LLLT group demonstrated a significant increase in blood lactate between the rest and recovery phase (pâ€‰<â€‰0.05). Acute effects of LLLT irradiation on skeletal musculature were not able to improve the functional capacity of hospitalized patients with HF, although it may favorably modulate blood lactate metabolism and reduce perceived muscle fatigue. Lactates Adult;Aged;Double-Blind Method;Exercise Test;Female;Heart Failure;Hospitalization;Humans;Lactates;Low-Level Light Therapy;Male;Middle Aged;Muscle Fatigue;Muscle, Skeletal;Pilot Projects

Erythrocyte sedimentation rate of human blood exposed to low-level laser. This study is designed to investigate in vitro low-level laser (LLL) effects on rheological parameter, erythrocyte sedimentation rate (ESR), of human blood. The interaction mechanism between LLL radiation and

blood is unclear. Therefore, research addresses the effects of LLL irradiation on human blood and this is essential to understanding how laser radiation interacts with biological cells and tissues. The blood samples were collected through venipuncture into EDTA-containing tubes as an anticoagulant. Each sample was divided into two equal aliquots to be used as a non-irradiated sample (control) and an irradiated sample. The aliquot was subjected to doses of 36, 54, 72 and 90Â J/cm(2) with wavelengths of 405, 589 and 780Â nm, with a radiation source at a fixed power density of 30Â mW/cm(2). The ESR and red blood cell count and volume are measured after laser irradiation and compared with the non-irradiated samples. The maximum reduction in ESR is observed with radiation dose 72Â J/cm(2) delivered with a 405-nm wavelength laser beam. Moreover, no hemolysis is observed under these irradiation conditions. In a separate protocol, ESR of separated RBCs re-suspended in irradiated plasma (7.6â€‰Â±â€‰2.3Â mm/h) is found to be significantly lower (by 51Â %) than their counterpart re-suspended in non-irradiated plasma (15.0â€‰Â±â€‰3.7Â mm/h). These results indicate that ESR reduction is mainly due to the effects of LLL on the plasma composition that ultimately affect whole blood ESR. Blood Sedimentation;Erythrocytes;Hemolysis;Humans;Low-Level Light Therapy

A prospective, split-face, double-blinded, randomized study of the efficacy and safety of a fractional 1064-nm Q-switched Nd:YAG laser for photoaging-associated mottled pigmentation in Asian skin. BACKGROUND: Laser toning using low-fluence 1064-nm Q-switched neodymium-doped yttrium aluminum laser (QSNY) has gained popularity in the treatment of photoaging-associated mottled pigmentation (PMP). However, hypopigmentation or lack of efficacy has been reported depending on the fluences used. OBJECTIVE: To compare a novel fractional 1064-nm QSNY with conventional 1064-nm QSNY for the treatment of photoaging-associated mottled pigmentary lesions except epidermal lesions of lentigines and freckles through a randomized, split-face, double-blind study. MATERIALS AND METHODS: Thirteen Asian women were treated every week for 6 weeks with fractional 1064-nm QSNY on one side of the face and conventional 1064-nm QSNY on the other side. We evaluated the pigmentation area and severity index (PSI), melanin index, erythema index, and the patient's global assessment of improvement. RESULTS: At three months post-treatment, the PSI score improved compared with baseline, by 14.48% on the conventional 1064-nm QSNY side and 21.81% on the fractional 1064-nm QSNY side. Both groups showed improvements in the melanin index. CONCLUSION: Both fractional 1064-nm QSNY and strictly low-fluence conventional 1064-nm QSNY are moderately effective against PMP and other photoaging signs. Fractional laser toning shows better subjective outcomes than conventional toning. Adult;Asian People;Combined Modality Therapy;Double-Blind Method;Epidermolysis Bullosa Simplex;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Patient Satisfaction;Prospective Studies;Sunlight;Treatment Outcome

Low-Level Laser Therapy May Have Cancer Fighting Role. Humans;Low-Level Light Therapy;Neoplasms;Postoperative Complications;Quality of Life

Mesenchymal Stem Cells Synergize with 635, 532, and 405â€‰nm Laser Wavelengths in Renal Fibrosis: A Pilot Study. OBJECTIVE: To address whether a single treatment of one of three visible light wavelengths, 635, 532, and 405â€‰nm (constant wave, energy density 2.9â€‰J/m(2)), could affect the hallmarks of established renal fibrosis and whether these wavelengths could facilitate mesenchymal stem cell (MSC) beneficence. BACKGROUND DATA: Chronic kidney disease is a global health problem with only 20% receiving care worldwide. Kidneys with compromised function have ongoing inflammation, including increased oxidative stress and apoptosis, peritubular capillary loss, tubular atrophy, and tubulointerstitial fibrosis. Promising studies have highlighted the significant potential of MSC-based strategies to mitigate fibrosis; however, reversal of established fibrosis has been problematic, suggesting that methods to potentiate MSC effects require further development.

Laser treatments at visible wavelengths have been reported to enhance mitochondrial potential and available cellular ATP, facilitate proliferation, and inhibit apoptosis. We hypothesized that laser-delivered energy might provide wavelength-specific effects in the fibrotic kidney and enhance MSC responses. MATERIALS AND METHODS: Renal fibrosis, established in C57BL6 mice following 21 days of unilateral ureter obstruction (UUO), was treated with one of three wavelengths alone or with autologous MSC. Mitochondrial activity, cell proliferation, apoptosis, and cytokines were measured 24â€‰h later. RESULTS: Wavelengths 405, 532, and 635â€‰nm all significantly synergized with MSC to enhance mitochondrial activity and reduce apoptosis. Proliferative activity was observed in the renal cortices following combined treatment with the 532â€‰nm laser and MSC; endothelial proliferation increased in response to the 635â€‰nm laser alone and to the combined effects of MSC and the 405â€‰nm wavelength. Reductions of transforming growth factor-Î² were observed with 532â€‰nm alone and when combined with MSC. CONCLUSIONS: Specific wavelengths of laser energy appear to induce different responses in renal fibrotic tissue. These findings support further study in the development of a customized laser therapy program of combined wavelengths to optimize MSC effects in the treatment of renal fibrosis. Animals;Apoptosis;Biopsy, Needle;Disease Models, Animal;Fibrosis;Fluorescent Antibody Technique;Immunohistochemistry;Kidney Diseases;Lasers;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Inbred C57BL;Pilot Projects;Random Allocation;Reference Values;Regeneration;Transplantation, Autologous

Light-Emitting Diode Irradiation (640â€‰nm) Regulates Keratinocyte Migration and Cytoskeletal Reorganization Via Hypoxia-Inducible Factor-1Î±. OBJECTIVE: The objective of this study was to determine the effect of light-emitting diode (LED) irradiation on the migration and proliferation of keratinocytes. BACKGROUND DATA: Keratinocytes play a key role in re-epithelialization during wound healing; it is speculated that low-level LED therapy might improve keratinocyte migration and proliferation. MATERIALS AND METHODS: Human keratinocyte cells (HKCs) were isolated from child or adult foreskins and irradiated with LED light with a wavelength of 640â€‰nm and a dosage of 12 or 24â€‰J/cm(2). Cell motility, migration, and proliferation were examined using live cell imaging, scratch assay, and a colorimetric cell counting assay, respectively. Hypoxia-inducible factor-1Î± (HIF-1Î±) protein levels were analyzed by using Western blotting. Filamentous actin (F-actin) was stained by phalloidin. YC-1 [3-(5-hydroxymethyl-2-furyl)-1-benzylindazole] was used as an HIF-1 inhibitor, and CoCl2 (cobalt chloride) and DMOG (dimethyloxaloyl glycine) are HIF-1Î± activators. RESULTS: LED irradiation significantly promoted cell motility and migration, but did not significantly influence cell proliferation in HKCs. Furthermore, LED irradiation resulted in a reorganization of cellular F-actin and a dramatic upregulation of HIF-1Î± expression. Suppression of HIF-1Î± using the compound YC-1 prevented reorganization of the actin cytoskeleton following LED irradiation, suggesting that the effect of LED irradiation on the cytoskeleton is mediated through HIF-1Î±. Conversely, chemical activation of HIF-1Î± via DMOG or CoCl2 resulted in a reorganization of F-actin. CONCLUSIONS: LED irradiation may increase keratinocyte migration via HIF-1Î±-dependent cytoskeletal reorganization. Hypoxia-Inducible Factor 1, alpha Subunit;Indazoles;dimethyloxallyl glycine;Cobalt;cobaltous chloride;Glycine Adult;Blotting, Western;Cell Movement;Cell Proliferation;Child;Cobalt;Cytoskeleton;Foreskin;Glycine;Humans;Hypoxia-Inducible Factor 1, alpha Subunit;Indazoles;Keratinocytes;Low-Level Light Therapy;Male;Up-Regulation

Low-level laser therapy stimulates the oxidative burst in human neutrophils and increases their fungicidal capacity. Low-level laser therapy (LLLT) is known to enhance mitochondrial electron transfer and ATP production; thus, this study asked whether LLLT could stimulate the oxidative burst in human neutrophils (PMN) and improve their ability to kill microorganisms. Blood from healthy human subjects was collected and PMN were isolated from the samples. PMN were treated in vitro

with 660Â nm or 780Â nm CW laser light at 40Â mW power and increasing energies up to 19.2Â J and were subsequently incubated with Candida albicans cells. Generation of hydroxyl radicals, hypochlorite anions and superoxide anions by PMN were checked using fluorescent probes and chemiluminescence assays; a microbicidal activity assay against C. albicans was also performed. LLLT excited PMN to a higher functional profile, which was translated as superior production of reactive oxygen species (ROS) and increased fungicidal capacity. The most efficacious energy was 19.2Â J and, interestingly, the 660Â nm light was even more efficacious than 780Â nm at increasing the respiratory burst of PMN and the fungicidal capacity. Human neutrophils (PMN) were stimulated in vitro with 660Â nm or 780Â nm CW laser light at 40Â mW of power and a total energy of 19.2Â J. Low-level laser therapy (LLLT) excited PMN to a higher functional profile, which was translated as a superior production of reactive oxygen species (ROS) such as hydroxyl radicals (HO(â€¢)) and hypochlorite anions (ClO(-)) (Figure) and increased fungicidal capacity against Candida albicans cells. Reactive Oxygen Species Candida albicans;Humans;Low-Level Light Therapy;Neutrophils;Reactive Oxygen Species;Respiratory Burst

Evaluation of laser phototherapy (Î» 780 nm) after dental replantation in rats.
BACKGROUND/AIM: Tooth replantation is the treatment of choice in cases of avulsion although the outcomes are variable. The teeth can be lost due to external root resorption. The aim of this study was to histologically assess of the effect of laser phototherapy (Î»780 nm) on replanted teeth in rats. MATERIAL AND METHODS: Sixty Wistar Albinus rats had their maxillary right incisors extracted and were then divided into four groups: G1-absence of storage medium; G2-milk as storage medium; G3-milk as storage medium followed by a laser irradiation of the root surfaces and entrance of the alveolus (Î» = 780 nm; P = 70 mW; CW; DE = 21 J/cm(2)); G4-milk as storage medium, laser irradiation as in G3 before replantation. After this procedure, laser irradiation was performed on the buccal and palatal mucosa (8.4 J/cm(2) per session) every 48 h for 15 days. The animals were euthanized 15, 30, and 60 days after replantation. RESULTS: The histological results showed that after 15 days, G4 exhibited intense chronic inflammation with the presence of clastic cells and moderate external inflammatory root resorption ($P < 0.05$) when compared with G3, in which these outcomes were not observed. At the 30th day, G1, G2, and G4 showed chronic inflammation varying from discrete to moderate, as well as intense external inflammatory root resorption. G3 remained without any inflammation and external inflammatory root resorption up to the 60th day. CONCLUSIONS: The use of laser phototherapy on the root surface and at the entrance of the alveolus prior to replantation had a positive biomodulative effect on alveolar repair after tooth replantation in rats. Animals;Low-Level Light Therapy;Rats;Rats, Wistar;Root Resorption;Tooth Replantation;Tooth Root

Clinical effects of photodynamic and low-level laser therapies as an adjunct to scaling and root planing of chronic periodontitis: A split-mouth randomized controlled clinical trial.
BACKGROUND: There are limited clinical experiments addressing the effects of photodynamic therapy (PDT) and low-level laser therapy (LLLT) as an adjunct to conventional scaling and root planing (SRP) alone. AIM: The aim of this clinical trial was to evaluate the clinical effects of adjunctive use of PDT, combination of PDT with LLLT as adjunct to conventional SRP alone in the treatment of chronic periodontitis. MATERIALS AND METHODS: In a single-centered randomized and controlled clinical trial, 24 patients (15 males and 9 females) with untreated chronic periodontitis were randomly assigned in a split-mouth design into three treatment groups which included Group I: SRP only, Group II: SRP and PDT (1% methylene blue [MB] solution), and Group III: SRP, PDT, and LLLT. Clinical parameters such as plaque index, gingival index, modified sulcular bleeding index, probing depth (PD), and clinical attachment level (CAL) were measured at baseline, 1, 3, and 6 months after therapy. RESULTS: Within each group, significant improvements ($P < 0.001$) were found for all variables in 6-month follow-up compared with baseline. The improvement in clinical parameters was significantly

greater in Group III compared to Group I and Group II. The mean PD (mm) reduction from baseline to 6 months in Group I was 2.50 Â± 0.54, Group II was 2.57 Â± 0.53, and Group III was 3.14 Â± 0.50. The mean CAL (mm) gain from baseline to 6 months in Group I was 2.63 Â± 0.47, Group II was 2.55 Â± 0.44, and Group III was 3.07 Â± 0.55. CONCLUSION: In patients with chronic periodontitis, a combination of a single application of PDT (using a 980 nm laser and MB) and LLLT provide additional benefit to SRP in terms of clinical parameters 6 months following the intervention. Adolescent;Adult;Chronic Periodontitis;Dental Scaling;Female;Humans;India;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Root Planing;Treatment Outcome

Effect of low-level laser therapy after rapid maxillary expansion: a clinical investigation. To evaluate the effectiveness low-level laser therapy (LLLT) on the repair of the mid palatal suture, after rapid maxillary expansion (RME). A single-operator, randomized single-blind placebo-controlled study was performed at the Orthodontic Department at the Dental Hospital of Bellvitge. Barcelona University, Hospitalet de Llobregat, Spain. Thirty-nine children (range 6-12Â years old), completed RME and were randomized to receive active LLLT (nâ€‰=â€‰20) or placebo (nâ€‰=â€‰19). The laser parameters and dose were 660Â nm, 100Â mW, CW, InGaAlP laser, illuminated area 0.26Â cm(2), 332Â mW/cm(2), 60Â s to four points along midpalatal suture, and 30Â s to a point each side of the suture. A total of seven applications were made on days 1, 7, 14, 28, 42, 56, and 70 of the retention phase RME. A cone beam computed tomography (CBCT) scan was carried out on the day of the first laser treatment, and at day 75, a second CBCT scan was performed. Two radiologists synchronized the slices of two scans to be assessed. Pâ€‰=â€‰0.05 was considered to be statistically significant. At day 75 of the suture, the irradiated patients presented a greater percentage of approximate zones in the anterior (pâ€‰=â€‰0.008) and posterior (pâ€‰=â€‰0.001) superior suture-and less approximation in the posterior superior suture (pâ€‰=â€‰0.040)-than the placebo group. LLLT appears to stimulate the repair process during retention phase after RME. Child;Cone-Beam Computed Tomography;Female;Humans;Low-Level Light Therapy;Male;Maxilla;Palatal Expansion Technique;Palate;Single-Blind Method

Low-Level Laser Therapy (780â€‰nm) on VEGF Modulation at Partially Injured Achilles Tendon. OBJECTIVE: The aim of this study was to analyze the modulatory effects of near infrared (780â€‰nm) low-level laser therapy (LLLT) on the presence of the vascular endothelial growth factor (VEGF) in the partially injured Achilles tendons of rats. BACKGROUND: LLLT stimulates the healing process for Achilles tendon injuries, although the extent of the modulatory effect of LLLT on the VEGF levels found in the injured tendons remains unclear. METHODS: Sixty-five male Wistar rats were distributed in the following seven groups: LASER 1, 3, and 7 (10 partially injured Achilles tendons in each group, which were treated with LLLT for 1, 3, and 7 days, respectively); Sham 1, 3, and 7 (same injury, with simulated LLLT); Control group containing the five remaining animals and in which no procedures were performed. LLLT was applied once a day for 10â€‰sec, with a mean power of 70â€‰mW and fluency of 17.5â€‰J/cm(2). After euthanasia, all of the Achilles tendons were surgically removed and the VEGF levels were analyzed using immunohistochemistry. RESULTS: The VEGF levels remained close to normal (pâ€‰>â€‰0.05) when comparing the experimental groups (LASER and Sham: 1, 3, and 7) with the Control group. CONCLUSION: LLLT did not stimulate the expression of VEGF in the treated Achilles tendons. Vascular Endothelial Growth Factor A Achilles Tendon;Animals;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Tendon Injuries;Vascular Endothelial Growth Factor A

The Effect of Combined Pulsed Wave Low-Level Laser Therapy and Human Bone Marrow Mesenchymal Stem Cell-Conditioned Medium on Open Skin Wound Healing in Diabetic Rats. OBJECTIVE: The nobility of this scientific study was to investigate the combined effects of pulsed wave low-level laser therapy (PWLLLT) and human bone marrow mesenchymal stem cell-conditioned

medium (hBM-MSC-CM) on the biomechanical parameters of wounds in an experimental model for diabetes mellitus (DM). BACKGROUND DATA: PWLLLT exhibited biostimulatory effects on wounds in diabetic animals. Secretomes can be administered into wounds by the use of BM-MSC-CM. MATERIALS AND METHODS: Type I DM was induced in rats by streptozotocin (STZ). Two wounds were made on proximal and distal parts in the dorsal region of each rat. Rats were divided into four groups. The first group was considered as the control group. The second group received hBM-MSC-CM. The third group received PWLLLT. The fourth group received hBM-MSC-CM+LASER. hBM-MSC-CM was administrated twice intraperitoneally. The proximal wounds in the third and fourth groups were treated with a pulsed laser by 890â€‰nm wavelength, 80â€‰Hz frequency, and 0.2â€‰J/cm(2) energy densities. On the 15th day, a standard sample from each healing wound was submitted for biomechanical examination. The data were analyzed by analysis of variance test. RESULTS: PWLLLT and hBM-MSC-CM, alone or in combination, significantly increased biomechanical parameters within the healing wounds. However, PWLLLT was statistically more effective compared with the hBM-MSC-CM. In the third and fourth groups, the numbers of wound closures were significantly enhanced in proximal part, contrary to the control ones. CONCLUSIONS: It was magnificently attained that PWLLLT significantly accelerated the wound healing process in the experimental model for STZ-induced type I DM rats. Culture Media, Conditioned Animals;Bone Marrow Cells;Culture Media, Conditioned;Diabetes Mellitus, Experimental;Disease Models, Animal;Flow Cytometry;Humans;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Wound Healing

Hemoporfin Photodynamic Therapy for Port-Wine Stain: A Randomized Controlled Trial. BACKGROUND AND OBJECTIVES: Photodynamic therapy (PDT) has shown potentially beneficial results in treating port-wine stain, but its benefit-risk profile remains undefined. This study aimed to evaluate the efficacy and safety of PDT conducted with hemoporfin and a 532 nm continuous wave laser to treat port-wine stain clinically. PATIENTS AND METHODS: This randomized clinical trial was conducted in eight hospitals in China. Participants were adolescent and adult patients (age range: 14-65 years old) with port-wine stain. During stage 1 (day 1 to week 8) all patients were randomized at a 3:1 ratio to treatment (532 nm laser irradiation (96-120 J/cm2) with hemoporfin (5mg/kg; PDT-hemoporfin, n = 330)) or placebo groups (irradiation with placebo (PDT-placebo, n = 110)); during stage 2 (week 8 to 16) patients in both groups were offered treatment. Clinician-evaluators, who were blind to the study, classified each case on the following four-level scale according to assessment of before and after standardized pictures of the lesion area: no improvement: <20%; some improvement: 20-59%; great improvement: 60-89%; or nearly completely resolved: â‰¥90%. The primary efficacy endpoint was proportion of patients achieving at least some improvement at week 8. The secondary efficacy endpoints were proportion of patients achieving nearly completely resolved or at least great improvement at week 8, proportion of patients achieving early completely resolved, at least great improvement, or at least some improvement at week 16, and the corresponding satisfaction of the investigators and the patients (designated as 'excellent', 'good', 'moderate', or 'ineffective') at weeks 8 and 16. RESULTS: Compared to the PDT-placebo group, the PDT-hemoporfin group showed a significantly higher proportion of patients that achieved at least some improvement (89.7% [n = 295; 95% CI, 85.9%-92.5%] vs. 24.5% [n = 27; 95% CI, 17.4%-33.3%]) at week 8 (P < 0.0001) and higher improvements for all secondary efficacy endpoints. Treatment reactions occurred in 99.5% (n = 731; 95% CI, 98.7%-99.8%) of the PDT-hemoporfin treatments (n = 735). Hyperpigmentation occurred in 22.9 per 100 patient-treatments (n = 168; 95% CI, 20.0-26.0) in the PDT-hemoporfin treated patients. CONCLUSIONS: Hemoporfin-mediated PDT is an effective and safe treatment option for adolescent and adult patients with port-wine stain. TRIAL REGISTRATION: Chinese Clinical Trial Registry ChiCTR-TRC-08000213. Hematoporphyrins;Photosensitizing Agents;hematoporphyrin monomethyl ether Adolescent;Adult;Aged;China;Double-Blind

Method;Female;Hematoporphyrins;Humans;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Port-Wine Stain;Treatment Outcome;Young Adult

Interventions for female pattern hair loss. BACKGROUND: Female pattern hair loss (FPHL), or androgenic alopecia, is the most common type of hair loss affecting women. It is characterised by progressive shortening of the duration of the growth phase of the hair with successive hair cycles, and progressive follicular miniaturisation with conversion of terminal to vellus hair follicles (terminal hairs are thicker and longer, while vellus hairs are soft, fine, and short). The frontal hair line may or may not be preserved. Hair loss can have a serious psychological impact on women. OBJECTIVES: To determine the efficacy and safety of the available options for the treatment of female pattern hair loss in women. SEARCH METHODS: We updated our searches of the following databases to July 2015: the Cochrane Skin Group Specialised Register, CENTRAL in the Cochrane Library (2015, Issue 6), MEDLINE (from 1946), EMBASE (from 1974), PsycINFO (from 1872), AMED (from 1985), LILACS (from 1982), PubMed (from 1947), and Web of Science (from 1945). We also searched five trial registries and checked the reference lists of included and excluded studies. SELECTION CRITERIA: We included randomised controlled trials that assessed the efficacy of interventions for FPHL in women. DATA COLLECTION AND ANALYSIS: Two review authors independently assessed trial quality, extracted data and carried out analyses. MAIN RESULTS: We included 47 trials, with 5290 participants, of which 25 trials were new to this update. Only five trials were at 'low risk of bias', 26 were at 'unclear risk', and 16 were at 'high risk of bias'.The included trials evaluated a wide range of interventions, and 17 studies evaluated minoxidil. Pooled data from six studies indicated that a greater proportion of participants (157/593) treated with minoxidil (2% and one study with 1%) reported a moderate to marked increase in their hair regrowth when compared with placebo (77/555) (risk ratio (RR) = 1.93, 95% confidence interval (CI) 1.51 to 2.47; moderate quality evidence). These results were confirmed by the investigator-rated assessments in seven studies with 1181 participants (RR 2.35, 95% CI 1.68 to 3.28; moderate quality evidence). Only one study reported on quality of life (QoL) (260 participants), albeit inadequately (low quality evidence). There was an important increase of 13.18 in total hair count per cmÂ² in the minoxidil group compared to the placebo group (95% CI 10.92 to 15.44; low quality evidence) in eight studies (1242 participants). There were 40/407 adverse events in the twice daily minoxidil 2% group versus 28/320 in the placebo group (RR 1.24, 95% CI 0.82 to 1.87; low quality evidence). There was also no statistically significant difference in adverse events between any of the individual concentrations against placebo.Four studies (1006 participants) evaluated minoxidil 2% versus 5%. In one study, 25/57 participants in the minoxidil 2% group experienced moderate to greatly increased hair regrowth versus 22/56 in the 5% group (RR 1.12, 95% CI 0.72 to 1.73). In another study, 209 participants experienced no difference based on a visual analogue scale (P = 0.062; low quality evidence). The assessments of the investigators based on three studies (586 participants) were in agreement with these findings (moderate quality evidence). One study assessed QoL (209 participants) and reported limited data (low quality evidence). Four trials (1006 participants) did not show a difference in number of adverse events between the two concentrations (RR 1.02, 95% CI 0.91 to 1.20; low quality evidence). Both concentrations did not show a difference in increase in total hair count at end of study in three trials with 631 participants (mean difference (MD) -2.12, 95% CI -5.47 to 1.23; low quality evidence).Three studies investigated finasteride 1 mg compared to placebo. In the finasteride group 30/67 participants experienced improvement compared to 33/70 in the placebo group (RR 0.95, 95% CI 0.66 to 1.37; low quality evidence). This was consistent with the investigators' assessments (RR 0.77, 95% CI 0.31 to 1.90; low quality evidence). QoL was not assessed. Only one study addressed adverse events (137 participants) (RR 1.03, 95% CI 0.45 to 2.34; low quality evidence). In two studies (219 participants) there was no clinically meaningful difference in change of hair count, whilst one study (12 participants) favoured finasteride (low quality evidence).Two studies

(141 participants) evaluated low-level laser comb therapy compared to a sham device. According to the participants, the low-level laser comb was not more effective than the sham device (RR 1.54, 95% CI 0.96 to 2.49; and RR 1.18, 95% CI 0.74 to 1.89; moderate quality evidence). However, there was a difference in favour of low-level laser comb for change from baseline in hair count (MD 17.40, 95% CI 9.74 to 25.06; and MD 17.60, 95% CI 11.97 to 23.23; low quality evidence). These studies did not assess QoL and did not report adverse events per treatment arm and only in a generic way (low quality evidence). Low-level laser therapy against sham comparisons in two separate studies also showed an increase in total hair count but with limited further data.Single studies addressed the other comparisons and provided limited evidence of either the efficacy or safety of these interventions, or were unlikely to be examined in future trials. AUTHORS' CONCLUSIONS: Although there was a predominance of included studies at unclear to high risk of bias, there was evidence to support the efficacy and safety of topical minoxidil in the treatment of FPHL (mainly moderate to low quality evidence). Furthermore, there was no difference in effect between the minoxidil 2% and 5% with the quality of evidence rated moderate to low for most outcomes. Finasteride was no more effective than placebo (low quality evidence). There were inconsistent results in the studies that evaluated laser devices (moderate to low quality evidence), but there was an improvement in total hair count measured from baseline.Further randomised controlled trials of other widely-used treatments, such as spironolactone, finasteride (different dosages), dutasteride, cyproterone acetate, and laser-based therapy are needed. Finasteride;Minoxidil Alopecia;Drug Administration Schedule;Female;Finasteride;Hair;Humans;Low-Level Light Therapy;Minoxidil;Randomized Controlled Trials as Topic

Low-level infrared laser modulates muscle repair and chromosome stabilization genes in myoblasts. Infrared laser therapy is used for skeletal muscle repair based on its biostimulative effect on satellite cells. However, shortening of telomere length limits regenerative potential in satellite cells, which occurs after each cell division cycle. Also, laser therapy could be more effective on non-physiologic tissues. This study evaluated low-level infrared laser exposure effects on mRNA expression from muscle injury repair and telomere stabilization genes in myoblasts in normal and stressful conditions. Laser fluences were those used in clinical protocols. C2C12 myoblast cultures were exposed to low-level infrared laser (10, 35, and 70Â J/cm(2)) in standard or normal (10Â %) and reduced (2Â %) fetal bovine serum concentrations; total RNA was extracted for mRNA expression evaluation from muscle injury repair (MyoD and Pax7) and chromosome stabilization (TRF1 and TRF2) genes by real time quantitative polymerization chain reaction. Data show that low-level infrared laser increases the expression of MyoD and Pax7 in 10Â J/cm(2) fluence, TRF1 expression in all fluences, and TRF2 expression in 70Â J/cm(2) fluence in both 10 and 2Â % fetal bovine serum. Low-level infrared laser increases mRNA expression from genes related to muscle repair and telomere stabilization in myoblasts in standard or normal and stressful conditions. PAX7 Transcription Factor;PAX7 protein, human;RNA, Messenger Humans;Low-Level Light Therapy;Muscle, Skeletal;Myoblasts;PAX7 Transcription Factor;RNA, Messenger;Regeneration

Cognitive enhancement by transcranial laser stimulation and acute aerobic exercise. This is the first randomized, controlled study comparing the cognitive effects of transcranial laser stimulation and acute aerobic exercise on the same cognitive tasks. We examined whether transcranial infrared laser stimulation of the prefrontal cortex, acute high-intensity aerobic exercise, or the combination may enhance performance in sustained attention and working memory tasks. Sixty healthy young adults were randomly assigned to one of the following four treatments: (1) low-level laser therapy (LLLT) with infrared laser to two forehead sites while seated (total 8Â min, 1064Â nm continuous wave, 250Â mW/cm(2), 60Â J/cm(2) per site of 13.6Â cm(2)); (2) acute exercise (EX) of high-intensity (total 20Â min, with 10-min treadmill running at 85-90Â % VO2max); (3) combined treatment (LLLT +

EX); or (4) sham control (CON). Participants were tested for prefrontal measures of sustained attention with the psychomotor vigilance task (PVT) and working memory with the delayed match-to-sample task (DMS) before and after the treatments. As compared to CON, both LLLT and EX reduced reaction time in the PVT [F(1.56)â€‰=â€‰4.134, pâ€‰=â€‰0.01, Î· (2) â€‰=â€‰0.181] and increased the number of correct responses in the DMS [F(1.56)â€‰=â€‰4.690, pâ€‰=â€‰0.005, Î· (2) â€‰=â€‰0.201], demonstrating a significant enhancing effect of LLLT and EX on cognitive performance. LLLT + EX effects were similar but showed no significantly greater improvement on PVT and DMS than LLLT or EX alone. The transcranial infrared laser stimulation and acute aerobic exercise treatments were similarly effective for cognitive enhancement, suggesting that they augment prefrontal cognitive functions similarly.
Adolescent;Adult;Attention;Cognition;Exercise;Exercise Test;Female;Humans;Low-Level Light Therapy;Male;Memory;Running;Young Adult

Short-term effects of high-intensity laser therapy, manual therapy, and Kinesio taping in patients with subacromial impingement syndrome. Subacromial impingement syndrome (SAIS) is a major contributing factor of shoulder pain; and treatment approaches (KinesioÂ® taping [KT], Exercise [EX], manual therapy [MT], and high-intensity laser therapy [HILT]) have been developed to treat the pain. The key objective of this study was to compare the effects of KT, MT, and HILT on the pain, the range of motion (ROM), and the functioning in patients with SAIS. Seventy patients with SAIS were randomly divided into four groups based on the treatment(s) each group received [EX (nâ€‰=â€‰15), KTâ€‰+â€‰EX (nâ€‰=â€‰20), MTâ€‰+â€‰KTâ€‰+â€‰EX (nâ€‰=â€‰16), and MTâ€‰+â€‰KTâ€‰+â€‰HILTâ€‰+â€‰EX (nâ€‰=â€‰19)]. All the patients were assessed before and at the end of the treatment (15th day). The main outcome assessments included the evaluation of severity of pain by visual analogue scale (VAS) and shoulder flexion, abduction, and external rotation ROM measurements by a universal goniometry. Shoulder pain and disability index (SPADI) was used to measure pain and disability associated with shoulder pathology. Statistically significant differences were found in the treatment results of all parameters in MTâ€‰+â€‰KTâ€‰+â€‰EX and HILTâ€‰+â€‰MTâ€‰+â€‰KTâ€‰+â€‰EX groups (pâ€‰<â€‰0.05). When the means of ROM and SPADI results of three groups were compared, statistically significant differences were found between all the groups (pâ€‰<â€‰0.05). These differences were significant especially between the groups MTâ€‰+â€‰KTâ€‰+â€‰EX and KTâ€‰+â€‰EX (pâ€‰<â€‰0.05) and HILTâ€‰+â€‰MTâ€‰+â€‰KTâ€‰+â€‰EX and KTâ€‰+â€‰EX (pâ€‰<â€‰0.05). HILT and MT were found to be more effective in minimizing pain and disability and increasing ROM in patients with SAIS. Further studies with follow-up periods are required to determine the advantages of these treatments conclusively. Adult;Athletic Tape;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Musculoskeletal Manipulations;Pain Management;Pain Measurement;Physical Therapy Modalities;Range of Motion, Articular;Shoulder Impingement Syndrome;Shoulder Pain;Treatment Outcome

Effectiveness of an aquatic exercise program and low-level laser therapy on articular cartilage in an experimental model of osteoarthritis in rats. OBJECTIVE: The aim of this study was to evaluate the effects of an aquatic exercise program and low-level laser therapy (LLLT) (associated or not) on degenerative modifications and inflammatory mediators on the articular cartilage using an experimental model of knee OA. METHOD: Forty male Wistar rats were divided into 4 groups: knee OA - without treatment (OA); OA plus exercise program group (OAE); OA plus LLLT (OAL); OA plus exercise program associated with LLLT (OAEL). Trained rats performed a water-jumping program carrying a load equivalent to 50-80 % of their body mass strapped to their chest. The laser irradiation was used either as the only method or after the exercise training had been performed, at 2 points contact mode (medial and lateral side of the left joint). The treatments started 4 weeks after the

surgery, 3 days/week for 8 weeks. RESULTS: The results revealed that all treated groups (irradiated or not) exhibited a better pattern of tissue organization, with less fibrillation and irregularities along the articular surface and improved chondrocytes organization. Also, a lower cellular density and structural damage (OARSI score) and higher thickness values were observed in all treated groups. Additionally, OAE and OAEL showed a reduced expression in IL-1Î² and caspase-3 as compared with OA. Furthermore, a statistically lower MMP-13 expression was only observed in OAEL as compared with OA. CONCLUSION: These results suggest that aquatic exercise program and LLLT were effective in preventing cartilage degeneration. Also, physical exercise program presented anti-inflammatory effects in the knees in OA rats. Caspase 3;Matrix Metalloproteinase 3 Animals;Cartilage, Articular;Caspase 3;Cell Count;Chondrocytes;Combined Modality Therapy;Disease Models, Animal;Immunohistochemistry;Low-Level Light Therapy;Male;Matrix Metalloproteinase 3;Osteoarthritis;Physical Conditioning, Animal;Rats, Wistar;Treatment Outcome

Intravitreal aflibercept for rubeosis iridis secondary to proliferative diabetic retinopathy. The purpose of this article is to report a case with rubeosis iridis treated by intravitreal aflibercept. A 61-year-old man had iris neovascularization and scanty vitreous hemorrhage secondary to proliferative diabetic retinopathy in the right eye. Neither neovascularization of angle nor elevation of intraocular pressure was found. Single intravitreal aflibercept 2 mg injection was performed. Rubeosis iridis disappeared on the next day. Scattered retinal laser photocoagulation was added 1 week later. There was no recurrence after 3-month follow-up. Aflibercept may serve as another anti-vascular endothelial growth factor (anti-VEGF) for treating rubeosis iridis. Recombinant Fusion Proteins;Vascular Endothelial Growth Factor A;aflibercept;Receptors, Vascular Endothelial Growth Factor Diabetic Retinopathy;Humans;Intravitreal Injections;Iris;Low-Level Light Therapy;Male;Middle Aged;Neovascularization, Pathologic;Receptors, Vascular Endothelial Growth Factor;Recombinant Fusion Proteins;Vascular Endothelial Growth Factor A;Vitreous Hemorrhage

[The influence of low-intensity laser radiation on the functional activity of neutrophils in the patients presenting with community-acquired pneumonia]. AIM: The objective of the present study was to elucidate the influence of low-intensity laser radiation on the results of the nitroblue tetrazolium (NBT) test in the patients presenting with community-acquired pneumonia. PATIENTS AND METHODS: A total of 100 patients with community-acquired pneumonia were available for the examination of whom 70 were treated with intravenous low-intensity laser irradiation of blood (ILIB) by means of the ILIB-405 technique during 7 days. The functional activity of neutrophils was estimated from their ability to reduce nitroblue tetrazolium in both spontaneous and stimulated NBT-tests. RESULTS: The analysis of the data obtained in the study has demonstrated the significant improvement of the results of the NBT tests in the group of patients receiving the ILIB treatments regardless of whether its content was originally elevated or reduced. CONCLUSION: The inclusion of intravenous low-intensity laser irradiation of blood in the combined treatment of the patients with community-acquired pneumonia appreciably promotes normalization of the bactericidal activity of neutrophils. Adult;Aged;Communicable Diseases;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neutrophils;Pneumonia

Combined vitamin C sonophoresis and neodymium-doped yttrium aluminum garnet (NdYAG) laser for facial hyperpigmentation: An outcome observation study in Asian patients. BACKGROUND: The neodymium-doped yttrium aluminum garnet (NdYAG) laser therapy has been a popular technique for facial rejuvenation but certain adverse effects like post-inflammatory hyperpigmentation are issues of concern to Asian patients. AIMS: To assess the outcome following combined treatment with vitamin C sonophoresis and NdYAG laser, in selected cases of facial hyperpigmentation. METHODS: Twenty three women with dyschromia or melasma who had undergone five sessions of Q-switched NdYAG laser therapy followed by transdermal delivery of vitamin C via sonophoresis were selected after a

retrospective review of case records. The objective and subjective clinical outcomes and the side effects, including erythema, scaling, pruritus, dryness and post-inflammatory hyperpigmentation were evaluated. RESULTS: In both objective or subjective outcomes, 91.3% (21/23) of the patients showed an excellent or better outcome, while 8.7% (2/23) showed no change. A majority of the patients (73.9%, 17/23) experienced no post-inflammatory hyperpigmentation or had slight post-inflammatory hyperpigmentation which quickly resolved within 1 week. Only one (4.3%) patient had extreme post-inflammatory hyperpigmentation which lasted for over a month. LIMITATIONS: This was a retrospective study without a control group; a comparative study with a control group (patients treated with the laser alone, without vitamin C sonopheresis) is needed to determine the difference in the outcome. CONCLUSION: The use of vitamin C sonophoresis along with NdYAG laser may reduce the incidence of adverse effects in Asian patients. Patients experienced obvious improvement in hyperpigmentation and had lower chances of experiencing extreme or severe post-inflammatory hyperpigmentation. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum;Ascorbic Acid Adult;Aluminum;Ascorbic Acid;Asian People;Face;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Neodymium;Retrospective Studies;Treatment Outcome;Young Adult;Yttrium

Low-level laser therapy for chronic non-specific low back pain: a meta-analysis of randomised controlled trials. OBJECTIVE: The efficacy of low-level laser treatment (LLLT) for chronic back pain remains controversial due to insufficient trial data. We aimed to conduct an updated review to determine if LLLT (including laser acupuncture) has specific benefits in chronic non-specific low back pain (CNLBP). METHODS: Electronic databases were searched for randomised trials using sham controls and blinded assessment examining the intervention of LLLT in adults with CNLBP. Primary outcomes were pain and global assessment of improvement with up to short-term follow-up. Secondary outcomes were disability, range of back movement, and adverse effects. A random effects meta-analysis was conducted. Subgroup analyses were based on laser dose, duration of baseline pain, and whether or not laser therapy used an acupuncture approach. RESULTS: 15 studies were selected involving 1039 participants. At immediate and short-term follow-up there was significant pain reduction of up to WMD (weighted mean difference) -1.40â€…cm (95% CI -1.91 to -0.88 cm) in favour of laser treatment, occurring in trials using at least 3â€…Joules (J) per point, with baseline pain <30â€…months and in non-acupuncture LLLT trials. Global assessment showed a risk ratio of 2.16 (95% CI 1.61 to 2.90) in favour of laser treatment in the same groups only at immediate follow-up. CONCLUSIONS: We demonstrated moderate quality of evidence (GRADE) to support a clinically important benefit in LLLT for CNLBP in the short term, which was only seen following higher laser dose interventions and in participants with a shorter duration of back pain. Rigorously blinded trials using appropriate laser dosage would provide greater certainty around this conclusion. Acupuncture Therapy;Adult;Aged;Chronic Pain;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Randomized Controlled Trials as Topic;Treatment Outcome

Effect of Low-Power Laser (LPL) and Light-Emitting Diode (LED) on Inflammatory Response in Burn Wound Healing. The aim of the study was to investigate the biochemical and molecular changes in the process of epidermal healing of burn injuries after therapeutic treatment with low-power laser (LPL) and light-emitting diode (LED). Rats were divided into six groups: skin without injury (Sham), burn wounds (BWs), BWâ€‰+â€‰660-nm LPL, BWâ€‰+â€‰904-nm LPL, BWâ€‰+â€‰632-nm LED, and BWâ€‰+â€‰850-nm LED. The burn wound model was performed using a 100Â Â°C copper plate, with 10Â s of contact in the skin. The irradiations started 24Â h after the lesion and were performed daily for 7Â days. The burn wound groups showed an increase in the superoxide production, dichlorofluorescein, nitrites, and high protein oxidative damage. The activities of glutathione peroxidase and catalase were also increased, and a significant reduction in glutathione

levels was observed compared to the control group. However, treatments with 660-nm LPL and 850-nm LED promoted protection against to oxidative stress, and similar results were also observed in the IL-6 and pERK1/2 expression. Taken together, these results suggest that LPL 660Â nm and LED 850Â nm appear reduced in the inflammatory response and oxidative stress parameters, thus decreasing dermal necrosis and increasing granulation tissue formation, in fact accelerating the repair of burn wounds. Animals;Burns;Granulation Tissue;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Necrosis;Oxidative Stress;Rats;Skin;Wound Healing

LOW-INTENSITY/HIGH-DENSITY SUBTHRESHOLD DIODE MICROPULSE LASER FOR CENTRAL SEROUS CHORIORETINOPATHY. PURPOSE: To review the results of low-intensity/high-density subthreshold micropulse laser (SDM) for treatment of central serous chorioretinopathy. METHOD: The records of all patients treated in a retinal subspecialty practice with SDM for central serous chorioretinopathy were reviewed. RESULTS: Eleven consecutive eyes of 11 patients treated between October 2011 and April 2014 were identified for study, 9 men and 2 women, aged 30 to 55 (mean = 46). Symptom duration before treatment ranged 1 month to 7 months (mean = 3.6 months) and after treatment with SDM laser, follow-up ranged 1 month to 45 months (mean = 14). Preoperative visual acuities ranged 20/20 to 20/100 (mean = 20/37) and postoperative visual acuities were 20/15 to 20/40 (mean = 20/24) (P = 0.01, paired t-test). Maximum retinal thickness ranged 314 Î¼m to 893 Î¼m (mean = 508) preoperatively and 222 Î¼m to 365 Î¼m (mean = 250) postoperatively for an average 258 Î¼m reduction in retinal thickness (P = 0.002, paired t-test). Subretinal fluid was eliminated in all eyes by 3 months after treatment (mean = 1.3 months). The number of SDM laser spot applications ranged 295 to 1431 per treatment session (mean = 772). One eye required retreatment, but for a new leakage locus 4 months after initial treatment. There were no adverse treatment effects. CONCLUSION: An SDM laser seems to be safe and effective for the treatment of central serous chorioretinopathy. As advocated in the literature, a higher treatment density and larger treatment area, as reported in this article, may improve clinical results. Adult;Central Serous Chorioretinopathy;Female;Fluorescein Angiography;Humans;Laser Coagulation;Lasers;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Tomography, Optical Coherence;Visual Acuity

Role of worry in patients with chronic tinnitus and sensorineural hearing loss: a preliminary study. Tinnitus-related distress appears to be more strongly associated with multiple psychological factors than with any perceptual properties of tinnitus. Prior studies have not investigated the role of worry in tinnitus sufferers. Worry is a dispositional cognitive trait that involves a pervasive, non-specific, future-oriented proneness to fretting, which can foster negative affective states and catastrophic thinking about a specific trouble when the trouble is actual and present. We examined the relationship between worry and self-perceived anxiety and depressive symptoms and handicap in 54 outpatients with chronic tinnitus and sensorineural hearing loss who had been previously recruited for a randomized double-blind study on the efficacy of transmeatal low-level laser therapy for tinnitus. We measured the current anxiety and depressive symptoms with the State-Trait Anxiety Inventory Form Y-1/Self-evaluation Depression Scale, the handicap with the Tinnitus Handicap Inventory, and the proneness to worry with the Penn State Worry Questionnaire. For the psychoacoustic tinnitus measures, we considered the loudness match and the minimum masking level. We found that tinnitus-related anxiety and depressive symptoms and handicap were significantly associated with proneness to worry (linear regression models, pÂ <Â 0.01), whereas no associations were found with the psychoacoustic measures. This suggests the usefulness of worry assessment when managing chronic tinnitus in clinical practice. Early therapeutic interventions for reducing proneness to worry may facilitate better adaptation to tinnitus.

Adult;Anxiety;Audiometry, Pure-Tone;Chronic Disease;Depression;Female;Hearing Loss, Sensorineural;Humans;Male;Middle Aged;Psychoacoustics;Psychophysiologic Disorders;Tinnitus

Delivery of light to the skin through ablated conduits. BACKGROUND AND OBJECTIVES: Non-invasive laser skin treatment modalities are generally designed to protect the epidermis by cooling and limiting the laser energy deposition in accordance with skin type. We explore a treatment modality that uses a 2,940â€‰nm Er:YAG laser with high tissue absorption to ablate an array of channels through the epidermis and upper dermis, and then deliver laser energy from a 1,320â€‰nm Nd:YAG laser with lower tissue absorption through the ablated channels. Treatment through ablated conduits offers a unique capability to deliver laser radiation to a deeper level in the dermis or beyond the dermis and the delivered energy to be deposited in a nearly uniform distribution. The ablated channels represent a relatively small surface and volume fraction of the epidermis and upper dermis, and heal very fast. A pilot study was performed to explore the benefits of treatments through ablated conduits for skin tightening, cellulite, and acne scarring. MATERIALS AND METHODS: A custom-built laser from Cynosure Inc. was designed to deliver to the epidermis up to 3â€‰J/cm(2) at 2,940â€‰nm from an Er:YAG laser followed in less than 10â€‰ms by up to 20â€‰J/cm(2) at 1,320â€‰nm from a Nd:YAG laser. Both laser sources were delivered to the skin through a diffractive lens array. The spatial intensity modulation created by the diffractive lens array on the skin surface consisted of a low energy density background that did not damage the epidermis and a superimposed array of much higher energy density regions where the Er:YAG laser ablated the channels, and most of the 1,320â€‰nm laser energy was delivered through the channels. Various fluence combinations of the ablative and non-ablative lasers were tested on ex vivo human skin samples to evaluate tissue effects and parameters for a clinical test. A limited clinical study was performed to evaluate tissue response and healing effects. RESULTS: Histology confirmed the presence of ablative channels through the epidermis and upper dermis as well as the absence of epidermal damage apart from the channels. Three days posttreatment there was complete skin healing with no evidence of channel ablation or coagulation in the skin biopsies. Limited clinical testing for facial treatments showed mild improvement for acne scarring and skin laxity. CONCLUSIONS: Laser skin treatment through ablated conduits can be performed safely with fast subsequent healing of the channels ablated through the skin. Further refinement of the treatment parameters and variation of the wavelength of the non-ablative laser source may bring improved treatment efficacy. Lasers Surg. Med. 49:69-77, 2017. Â© 2016 Wiley Periodicals, Inc. Acne Vulgaris;Biopsy, Needle;Cicatrix;Epidermis;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Risk Assessment;Skin Aging;Skin Diseases;Treatment Outcome

Low-Level Laser for Mitigation of Low Salivary Flow Rate in Head and Neck Cancer Patients Undergoing Radiochemotherapy: A Prospective Longitudinal Study. OBJECTIVE: The present study aimed to assess the impact of low-level laser (LLL) on low salivary flow rate in patients undergoing radiochemotherapy (RT-CT) for head and neck cancer. BACKGROUND DATA: LLL has shown efficiency in preventing hyposalivation in patients under different pathological conditions, including those undergoing RT-CT. METHODS: During all RT-CT, 17 patients received laser therapy and 10 received clinical care only. An Indium-Gallium-Aluminum-Phosphorus diode laser was punctually used for intraoral (660â€‰nm, 40 mW, 10â€‰J/cm(2), illuminated area 0.04â€‰cm(2), 10â€‰sec) and extraoral irradiation (780â€‰nm, 15 mW, 3.8â€‰J/cm(2), illuminated area 0.04â€‰cm(2), 10â€‰sec), three times a week and on alternate days, for a total of 21 sessions. Unstimulated salivary flow rate was assessed before the first RT session (N0), at the 15th RT session (N15), at the last RT session (Nf), and at 30 (N30) and 90 days after the end of the oncologic treatment (N90). RESULTS: At N15, Nf, and N30, patients treated with LLL showed significantly higher averages of

salivary flow rate when compared with patients receiving clinical care only. CONCLUSIONS: LLL seems to be an efficient tool for mitigation of salivary hypofunction in patients undergoing RT for head and neck cancer. Adult;Aged;Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Longitudinal Studies;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome;Xerostomia

In vitro and in vivo brain-targeting chemo-photothermal therapy using graphene oxide conjugated with transferrin for Gliomas. Current therapies for treating malignant glioma exhibit low therapeutic efficiency because of strong systemic side effects and poor transport across the blood brain barrier (BBB). Herein, we combined targeted chemo-photothermal glioma therapy with a novel multifunctional drug delivery system to overcome these issues. Drug carrier transferrin-conjugated PEGylated nanoscale graphene oxide (TPG) was successfully synthesized and characterized. When loaded on the proposed TPG-based drug delivery (TPGD) system, the anticancer drug doxorubicin could pass through the BBB and improve drug accumulation both in vitro and in vivo. TPGD was found to perform dual functions in chemotherapy and photothermal therapy. Targeted TPGD combination therapy showed higher rates of glioma cell death and prolonged survival of glioma-bearing rats compared with single doxorubicin or PGD therapy. In conclusion, we developed a potential nanoscale drug delivery system for combined therapy of glioma that can effectively decrease side effects and improve therapeutic effects. Antineoplastic Agents;Transferrin;Polyethylene Glycols;Graphite;Doxorubicin Animals;Antineoplastic Agents;Biological Transport;Blood-Brain Barrier;Brain Neoplasms;Cell Line, Tumor;Combined Modality Therapy;Doxorubicin;Drug Delivery Systems;Glioma;Graphite;Low-Level Light Therapy;Male;Nanostructures;Polyethylene Glycols;Rats;Transferrin

Evaluation of 660Â nm LED light irradiation on the strategies for treating experimental periodontal intrabony defects. This study aims to investigate the therapeutic value of 660Â nm light-emitting diode (LED) light irradiation on the strategies for treating experimental periodontal intrabony defects in vivo. Large-sized periodontal intrabony defects were created bilaterally on the mesial aspect of the maxillary second molars of 48 Sprague-Dawley rats, and the rats were equally divided into four treatment groups with primary wound intention (nâ€‰=â€‰6/treatment/time point), including open flap debridement alone (OD), barrier membrane alone (MB), xenograft alone (BG), and xenograft plus barrier membrane (MG). Each group received daily 0 or 10Â J/cm(2) LED light irradiation. The animals were sacrificed after 1 or 4Â weeks. The treatment outcome was evaluated by gross observation of wound dehiscence and healing, micro-CT imaging for osteogenesis, and histological assessments for inflammatory cell infiltration and periodontal reattachment. With LED light irradiation, the extent of wound dehiscence was reduced, wound closure was accelerated, epithelial downgrowth was prevented, inflammation was reduced, and periodontal reattachment was promoted in all treatment strategies. Significant reduction of inflammation with LED light irradiation was noted at 1Â week in the groups BG and MG (pâ€‰<â€‰0.05). Osteogenesis was significantly promoted only in the group OD at both time points (pâ€‰<â€‰0.05). Our study showed that 660Â nm LED light accelerates mucoperiosteal flap healing and periodontal reattachment. However, the enhancement of osteogenesis appeared to be limited while simultaneously treating with a barrier membrane or xenograft. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteogenesis;Periodontal Diseases;Rats;Rats, Sprague-Dawley;Wound Healing

Efficacy and safety of 1550-nm fractional laser in the treatment of acne scars in Chinese patients: A split-face comparative study. OBJECTIVE: To evaluate the efficacy and side effects of 1550-nm fractional Er:Glass laser in treating atrophic acne scar. MATERIALS AND METHODS: Thirty Chinese patients aged 18-65 with atrophic acne scars on both cheeks received a split-face treatment, one side with four sessions of treatment with fractional 1550-nm Er:Glass laser at 20-day interval and the

other with topical asiaticoside cream application three times daily as control. Clinical response and side effects were evaluated by a dermatologist three weeks after each treatment and again 12 weeks after the last laser treatment. In addition, self-evaluation of satisfaction by the patients was done at the end of treatment. RESULTS: The study found that mean scores decrease after treatment was 5.65 Â± 4.34 for the treated side and 1.23 Â± 3.41 for the control side. The improvement in acne scars after the fractional Er:Glass laser 1550-nm treatment was more significant than the control side (p = 0.0001). The side effects were mainly local skin irritation and erythema, which disappeared within one week. CONCLUSION: The research results show that the fractional 1550-nm Er:Glass laser is an effective and safe treatment device for atrophic acne scars. Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

Split-face comparison between single-band and dual-band pulsed light technology for treatment of photodamage. BACKGROUND: Intense pulsed light (IPL) has a well-recognized role in the treatment of photodamaged skin. OBJECTIVE: To assess the safety and efficacy of a novel single-band IPL handpiece versus dual-band IPL handpiece in the treatment of photodamage. STUDY DESIGN/MATERIALS AND METHODS: This was a prospective, single-center split-face study with 20 enrolled participants. Three treatments, 21 days apart, were administered to the subjects and follow-up was performed for 20 weeks. The left side of the face was treated with the single-band handpiece. The right side of the face was treated with the dual-band handpiece. Blinded investigators assessed the subjects' skin texture, pigmented components of photodamage, and presence of telangiectasia both before and after treatment, utilizing a five-point scale. RESULTS: Pigmented components of photodamage, skin texture, and presence of telangiectasias on the left and right side of the face were improved at the end of treatment. At 20-week follow-up, the side treated with single-band handpiece showed improvement in telangiectasia and pigmentation that was statistically superior to the contralateral side treated with the dual-band handpiece. Both devices equally improved textural changes. No adverse effects were noted with either device. CONCLUSION: Both single-band and dual-band IPL technology are safe and effective in the treatment of photodamaged facial skin. IPL treatment with a single-band handpiece yielded results comparable or superior to dual-band technology. Facial Dermatoses;Female;Humans;Hyperpigmentation;Intense Pulsed Light Therapy;Low-Level Light Therapy;Male;Phototherapy;Prospective Studies;Rejuvenation;Sunlight;Treatment Outcome

Visible Red Light Emitting Diode Photobiomodulation for Skin Fibrosis: Key Molecular Pathways. Skin fibrosis, also known as skin scarring, is an important global health problem that affects an estimated 100 million persons per year worldwide. Current therapies are associated with significant side effects and even with combination therapy, progression, and recurrence is common. Our goal is to review the available published data available on light-emitting diode-generated (LED) red light phototherapy for treatment of skin fibrosis. A search of the published literature from 1 January 2000 to present on the effects of visible red light on skin fibrosis, and related pathways was performed in January 2016. A search of PubMed and EMBASE was completed using specific keywords and MeSH terms. "Fibrosis" OR "skin fibrosis" OR "collagen" was combined with ("light emitting diode," "LED," "laser," or "red light"). The articles that were original research studies investigating the use of visible red light to treat skin fibrosis or related pathways were selected for inclusion. Our systematic search returned a total of 1376 articles. Duplicate articles were removed resulting in 1189 unique articles, and 133 non-English articles were excluded. From these articles, we identified six articles related to LED effects on skin fibrosis and dermal fibroblasts. We augmented our discussion with additional in vitro data on related pathways. LED phototherapy is an emerging therapeutic modality for treatment of skin fibrosis. There is a growing body of evidence demonstrating that visible LED light, especially in

the red spectrum, is capable of modulating key cellular characteristic associated with skin fibrosis. We anticipate that as the understanding of LED-RL's biochemical mechanisms and clinical effects continue to advance, additional therapeutic targets in related pathways may emerge. We believe that the use of LED-RL, in combination with existing and new therapies, has the potential to alter the current treatment paradigm of skin fibrosis. There is a current lack of clinical trials investigating the efficacy of LED-RL to treat skin fibrosis. Randomized clinical trials are needed to demonstrate visible red light's clinical efficacy on different types of skin fibrosis.

Double phase treatment with flashlamp-pumped pulsed-dye laser and long pulsed Nd:YAG laser for resistant port wine stains in adults. Preliminary reports. BACKGROUND: Flashlamp-pumped pulsed (FLPP) dye laser still represents the standard treatment for the majority of port wine stains (PWSs), but the results on thick PWSs remain unpredictable, and many of these lesions fail to completely respond. Our aim was to report on the results obtained on unresponsive PWSs to standard laser treatments, by using a double phase laser treatment strategy using two laser passes in the same session. METHODS: Eleven adult patients with facial PWS resistant to dye laser were enrolled. Laser sessions were scheduled every 8 weeks, and each of them consisting of two laser passes. In phase one, two different laser wavelengths (595 nm and 1064 nm) were delivered consecutively to each affected area. In the second phase, the PWS was treated using a pulse stacking technique with the 1064 nm Nd:YAG. RESULTS: One patient was lost to follow-up. Among the remaining ten, 5 (50%) patients showed an excellent improvement (>75%), 3 (30%) patients showed a good improvement (51-75%), and 2 (20%) patients had no or minimal improvement (0-25%). CONCLUSIONS: Our results suggest that the combination of different wavelengths in the same session can be helpful for PWSs resistant to standard laser treatments. However, in most patients two treatment phases were necessary. Adult;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Prospective Studies;Treatment Outcome

High fluence light emitting diode-generated red light modulates characteristics associated with skin fibrosis. Skin fibrosis, often referred to as skin scarring, is a significant international health problem with limited treatment options. The hallmarks of skin fibrosis are increased fibroblast proliferation, collagen production, and migration speed. Recently published clinical observations indicate that visible red light may improve skin fibrosis. In this study we hypothesize that high-fluence light-emitting diode-generated red light (HF-LED-RL) modulates the key cellular features of skin fibrosis by decreasing cellular proliferation, collagen production, and migration speed of human skin fibroblasts. Herein, we demonstrate that HF-LED-RL increases reactive oxygen species (ROS) generation for up to 4Â hours, inhibits fibroblast proliferation without increasing apoptosis, inhibits collagen production, and inhibits migration speed through modulation of the phosphoinositide 3-kinase (PI3K)/Akt pathway. We demonstrate that HF-LED-RL is capable of inhibiting the unifying cellular processes involved in skin fibrosis including fibroblast proliferation, collagen production, and migration speed. These findings suggest that HF-LED-RL may represent a new approach to treat skin fibrosis. LED advantages include low cost, portability, and ease of use. Further characterizing the photobiomodulatory effects of HF-LED-RL on fibroblasts and investigating the anti-fibrotic effects of HF-LED-RL in human subjects may provide new insight into the utility of this therapeutic approach for skin fibrosis. Collagen;Phosphatidylinositol 3-Kinases Cell Proliferation;Cells, Cultured;Collagen;Fibroblasts;Fibrosis;Humans;Light;Low-Level Light Therapy;Phosphatidylinositol 3-Kinases;Skin

The effects of low level laser therapy on Staphylococcus aureus infected third-degree burns in diabetic rats. PURPOSE: To characterize the effects of low-level laser (LLL) on third-degree burn wounds which were infected with Staphylococcus aureus (S. aureus) in diabetic rats. METHODS:

Thirty streptozotocin-induced diabetic rats were divided into two groups: the control and the LLL groups. Third-degree burns were induced using a heated metal rod, and then, were contaminated with S. aureus. The wounds in the LLL group were irradiated with a LLL (685nm) daily for five consecutive days, starting three days after the induction. The wound area was measured at 3, 5, 8, 14 and 21 days after burning. At the end of trial, the skin samples were harvested. RESULTS: Reduction in wound areas in the LLL and control groups were significantly different only on the 21st day ($p<0.05$). The mean bacterial numbers in the LLL group were significantly lower ($p<0.05$) than those in the control group. The number of macrophages, new blood vessels, fibroblast, and elevated collagen deposition in the LLL group significantly increased compared to the control group ($p<0.05$). The mean breaking strength of scars in the control group was significantly lower ($p<0.05$) than that of the LLL group. CONCLUSION: The low-level laser improved the healing of S. aureus third-degree burn infections in diabetic rats. Animals;Burns;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Random Allocation;Rats, Wistar;Reproducibility of Results;Staphylococcal Infections;Staphylococcus aureus;Time Factors;Treatment Outcome;Wound Healing

Craniofacial Wound Healing with Photobiomodulation Therapy: New Insights and Current Challenges. The fundamental pathophysiologic response for the survival of all organisms is the process of wound healing. Inadequate or lack of healing constitutes the etiopathologic basis of many oral and systemic diseases. Among the numerous efforts to promote wound healing, biophotonics therapies have shown much promise. Advances in photonic technologies and a better understanding of light-tissue interactions, from parallel biophotonics fields such as in vivo optical imaging and optogenetics, are spearheading their popularity in biology and medicine. Use of high-dose lasers and light devices in dermatology, ophthalmology, oncology, and dentistry are now popular for specific clinical applications, such as surgery, skin rejuvenation, ocular and soft tissue recontouring, and antitumor and antimicrobial photodynamic therapy. However, a less well-known clinical application is the therapeutic use of low-dose biophotonics termed photobiomodulation (PBM) therapy, which is aimed at alleviating pain and inflammation, modulating immune responses, and promoting wound healing and tissue regeneration. Despite significant volumes of scientific literature from clinical and laboratory studies noting the phenomenological evidence for this innovative therapy, limited mechanistic insights have prevented rigorous and reproducible PBM clinical protocols. This article briefly reviews current evidence and focuses on gaps in knowledge to identify potential paths forward for clinical translation with PBM therapy with an emphasis on craniofacial wound healing. PBM offers a novel opportunity to examine fundamental nonvisual photobiological processes as well as develop innovative clinical therapies, thereby presenting an opportunity for a paradigm shift from conventional restorative/prosthetic approaches to regenerative modalities in clinical dentistry. Dentistry;Face;Facial Injuries;Humans;Low-Level Light Therapy;Skull;Wound Healing

Efficacy of Anti-Inflammatory and Analgesic of Superpulsed Low Level Laser Therapy After Impacted Mandibular Third Molars Extractions. The purpose of this study was to evaluate anti-inflammatory and analgesic efficacy of superpulsed low level laser therapy (SLLLT) after bilateral extraction of impacted mandibular third molars. Many studies in the literature show the anti-inflammatory and analgesic efficacy of laser therapy after oral surgery.The authors report the preliminary results of 25 patients who underwent bilateral extraction of mandibular eighths included in a single surgery. This is a split-mouth study, a site was randomized chosen to be treated with SLLLT at T0, 24â€Šhours and 48â€Šhours with a GaAs laser diode, whereas the other surgical site was evaluated as control. The suture was removed at 7 days and healing was controlled at 14 days. During the sessions were monitored and recorded the pain, using visual analog scale, and oedema with the visual analog scale and cephalometric measurements of cutaneous points (TR-GO, GO-CA, GO-SP, GO-PO). Each patient received only antibiotic prophylaxis and analgesic therapy as needed.Results

indicate that in the treated site SLLLT determines a reduction in pain and swelling statistically significant compared with the control site (Pâ€Š<â€Š0.05). The authors found that the effectiveness of laser therapy is in the first 5 days after surgery, showing a significant reduction of pain and swelling in the treated site than the control site.This study suggests that the SLLLT has a potential in reducing the postoperative discomfort after impacted third molar extractions, due to a reduction in postoperative pain and swelling. Superpulsed low level laser therapy has no side effects and is well tolerated by patients. It also seems to have a role in reducing the intake of drugs. Adult;Analgesia;Edema;Female;Humans;Inflammation;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain Measurement;Pain, Postoperative;Tooth Extraction;Tooth, Impacted

Assessment of Efficacy of the 595-nm Pulsed Dye Laser in the Treatment of Facial Port-Wine Stains in Indian Patients. BACKGROUND: Pulsed dye lasers have revolutionized treatment of port-wine stains (PWS). The authors' previous study with a 585-nm/0.45-millisecond pulsed dye laser (PDL) showed 25% to 75% improvement in 60% of facial PWS. METHODS: The authors analyzed data on facial PWS treated with a 595-nm tunable PDL in Indian patients. Response was assessed subjectively on a scale of -1 to 5 (Investigator Global Assessment) by comparing pretreatment and posttreatment photographs. Patients' perception of change in PWS was also noted on a visual analog scale from 0 to 10 (Patient Global Assessment). Side effects were recorded. RESULTS: A total of 74 flat and 24 hypertrophic PWS in skin Types IV and V with a median lesion size of 56 cm and 102 cm, respectively, and color ranging from pink to purple were treated. They underwent a mean of 7.3 and 8.5 sessions (range: 4-10 session), respectively. A mean lightening of 54% in flat and 40% in hypertrophic PWS was observed. After 10 treatments, 46.6% of flat PWS cases showed >75% lightening and an equal number had 25% to 75% improvement. A >75% improvement was observed in 12.5% of hypertrophic PWS with 75% of cases showing between 25% to 75% improvement. No significant side effects were noted. CONCLUSION: The 595-nm tunable PDL produced moderate response with no significant side effects. Adolescent;Adult;Asian People;Child;Facial Dermatoses;Female;Humans;India;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Photography;Port-Wine Stain;Retrospective Studies;Treatment Outcome

Editorial. Cosmetic Techniques;Humans;Laser Therapy;Lasers, Dye;Low-Level Light Therapy

Effect of Low Level Laser Therapy on Pain Reduction After Midpalatal Expansion in Rats. OBJECTIVES: The purpose of this experimental study was to evaluate the efficacy of low level laser therapy (LLLT) for pain reduction after midpalatal expansion in rats. MATERIALS AND METHODS: Sixty male Sprague six-week old rats weighing 180Â±10g were divided into seven groups (two experimental groups of 24 rats and one control group of 12 rats). The experimental groups were subjected to expansion with or without LLLT. The health status of each rat was monitored starting seven days prior to the experiment and evaluated by regular body weight monitoring during the study period. Diode laser with 810nm wavelength and 100 mw output power was used. Laser therapy and body weight monitoring were performed on days 0, 2, 4, 6, 8, 10, 12 and 14. The data were analyzed by One-way repeated measures ANOVA. RESULTS: The body weight of the experimental groups significantly decreased in the first two days because of the pain and difficult nutrition with the new appliance. Within the next two days, the body weight of all rats increased but this increase was significantly higher in the irradiated compared to the non-irradiated group. This significant improvement continued until day 14 and then between days 14 and 30 the rats gained weight similarly in the irradiated and control groups. CONCLUSION: The study results showed that laser irradiated group continued to gain weight easier than the control group. This may be due to more efficient pain control due to laser irradiation after midpalatal expansion.

Laser acupuncture as an adjunctive therapy for spastic cerebral palsy in children. Laser acupuncture is widely used as an alternative line of treatment in several chronic pediatric diseases. To investigate whether biostimulation by low-level laser on acupuncture points adds a clinical benefit to conventional physiotherapy in hemiplegic spastic cerebral palsy (CP) children. Forty spastic hemiplegic cerebral palsy children by age 1-4Â years were chosen from the pediatric outpatient clinic of the National Institute of Laser Enhanced Sciences (NILES), Cairo University, and Menofyia University hospitals. They were randomly divided into control and study groups; 20 children each. Both groups received physiotherapy for 3Â months, while only the study group also received laser acupuncture (low-level laser 650Â nm with 50Â mW power was applied at each acupoint for 30Â s giving an energy density of 1.8Â J/cm(2)). Preassessment and postassessment of muscle tone, the range of motion (ROM), and gross motor function measurements (GMFMs) were obtained, and the results were statistically analyzed. Comparison between posttreatment measures for the control vs. study groups showed significant difference in muscle tone (wrist flexors and plantar flexors) in favor of the study group, while range of motion showed no significant differences. GMFM showed no significant difference in total score while there was a significant difference in goal total score (sum of % scores for each dimension identified as goal area divided by number of goal areas) in favor of the study group. Laser acupuncture has a beneficial effect on reducing spasticity in spastic cerebral palsy and may be helpful in improving their movement. Acupuncture Points;Acupuncture Therapy;Cerebral Palsy;Child, Preschool;Combined Modality Therapy;Female;Humans;Infant;Low-Level Light Therapy;Male;Muscle Spasticity;Physical Therapy Modalities;Range of Motion, Articular

Low-level laser therapy stimulates tissue repair and reduces the extracellular matrix degradation in rats with induced arthritis in the temporomandibular joint. The objective of this study was to characterize morphological and biochemistry action of low-level laser therapy (LLLT) on induced arthritis in the temporomandibular joint (TMJ) of rats. Twenty-four male Wistar rats were randomly divided into groups with 12 animals each: (AG) group with arthritis induced in the left TMJ and (LG) group with arthritis induced in the left TMJ and treated with LLLT (830Â nm, 30Â mW, 3 J/cm(2)). Right TMJs in the AG group were used as noninjected control group (CG). Arthritis was induced by intra-articular injection of 50Â Î¼l Complete Freund's Adjuvant (CFA) and LLLT began 1Â week after arthritis induction. Histopathological analysis was performed using sections stained with hematoxylin-eosin, Toluidine Blue, and picrosirius. Biochemical analysis was determined by the total concentration of sulfated glycosaminoglycans (GAGs) and evaluation of matrix metalloproteinases (MMP-2 and MMP-9). Statistical analysis was performed using paired and unpaired t tests, with pâ€‰<â€‰0.05. Compared to AG, LG had minor histopathological changes in the TMJ, smaller thickness of the articular disc in the anterior (pâ€‰<â€‰0.0001), middle (pâ€‰<â€‰0.0001) and posterior regions (pâ€‰<â€‰0.0001), high birefringence of collagen fibers in the anterior (pâ€‰<â€‰0.0001), middle (pâ€‰<â€‰0.0001) and posterior regions (pâ€‰<â€‰0.0001) on the articular disc, and statistically lower activity of MMP-2 latent (pâ€‰<â€‰0.0001), MMP-2 active (Pâ€‰=â€‰0.02), MMP-9 latent (pâ€‰<â€‰0.0001), and MMP-9 active (pâ€‰<â€‰0.0001). These results suggest that LLLT can increase the remodeling and enhancing tissue repair in TMJ with induced arthritis. Glycosaminoglycans;Freund's Adjuvant;Matrix Metalloproteinases Animals;Arthritis;Disease Models, Animal;Extracellular Matrix;Freund's Adjuvant;Glycosaminoglycans;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Random Allocation;Rats;Rats, Wistar;Temporomandibular Joint;Wound Healing

Effect of photobiomodulation on endothelial cell exposed to Bothrops jararaca venom. Bleeding is a common feature in envenoming caused by Bothrops snake venom due to extensive damage to capillaries and venules, producing alterations in capillary endothelial cell morphology. It has been demonstrated, in vivo, that photobiomodulation (PBM) decreases hemorrhage after venom

inoculation; however, the mechanism is unknown. Thus, the objective was to investigate the effects of PBM on a murine endothelial cell line (tEnd) exposed to Bothrops jararaca venom (BjV). Cells were exposed to BjV and irradiated once with either 660- or 780-nm wavelength laser light at energy densities of 4 and 5Â J/cm(2), respectively, and irradiation time of 10Â s. Cell integrity was analyzed by crystal violet and cell viability/mitochondrial metabolism by MTT assay. The release of lactic dehydrogenase (LDH) was quantified as a measure of cell damage. In addition, cytokine IL1-Î² levels were measured in the supernatant. PBM at 660 and 780Â nm wavelength was able to increase cellular viability and decrease the release of LDH and the loss of cellular integrity. In addition, the concentration of pro-inflammatory cytokine IL1-Î² was reduced after PBM by both wavelengths. The data reported herein indicates that irradiation with red or near-infrared laser resulted in protection on endothelial cells after exposure to Bothrops venom and could be, at least in part, a reasonable explanation by the beneficial effects of PBM inhibiting the local effects induced by Bothrops venoms, in vivo. Crotalid Venoms;Interleukin-1beta Animals;Bothrops;Cell Survival;Crotalid Venoms;Endothelial Cells;Hemorrhage;Interleukin-1beta;Low-Level Light Therapy;Mice

Effects of low-level laser therapy combined with toluidine blue on polysaccharides and biofilm of Streptococcus mutans. The aim of this study was to evaluate the effect of a low-level laser therapy in combination with toluidine blue on polysaccharides and biofilm of Streptococcus mutans. S. mutans biofilms were formed on acrylic resin blocks. These biofilms were exposed eight times/day to 10Â % sucrose, and two times/day, they were subjected to one of the following treatments: G1, 0.9Â % NaCl as a negative control; G2, 0.12Â % chlorhexidine digluconate (CHX) as a positive antibacterial control; and G3 and G4 antimicrobial photodynamic therapy (aPDT) combined with toluidine blue using dosages of 320 and 640Â J/cm(2), respectively. The experiment was performed in triplicate. The biofilm formed on each block was collected for determination of the viable bacteria and concentration of insoluble extracellular polysaccharides (IEPS) and intracellular polysaccharides (IPS). CHX and aPDT treatments were able to inhibit bacterial growth in comparison with negative control (pâ€‰<â€‰0.05). The aPDT treatment reduced the number of viable bacteria formed in the S. mutans biofilm, in a dose-dependent manner (pâ€‰<â€‰0.05). The concentration of IEPS and IPS in the biofilms formed in presence of aPDT did not differ each other or in comparison to CHX (pâ€‰>â€‰0.05). The results suggest that low-level laser therapy presents effects on biofilm bacteria viability and in polysaccharides concentration. Anti-Bacterial Agents;Polysaccharides;Tolonium Chloride;chlorhexidine gluconate;Chlorhexidine Anti-Bacterial Agents;Biofilms;Chlorhexidine;Humans;Low-Level Light Therapy;Microbial Viability;Photochemotherapy;Polysaccharides;Streptococcus mutans;Tolonium Chloride

Effect of low-level laser therapy on wound healing after depigmentation procedure: A clinical study. AIM: The aim of the present study is to evaluate and compare the effects of low-level laser therapy (LLLT) on wound healing after depigmentation procedure. MATERIALS AND METHODS: In this study, 12 patients with bilateral melanin hyperpigmentation were treated with surgical stripping using a blade. After completion of the surgical process and bleeding stasis, any of the symmetrical surgical sites was randomly assigned for LLLT (test site) using a defocused diode laser at 1 mm distance for 5 min. After every laser exposure, the surgical site was coated with plaque disclosing solution (erythrosine) on the 3(rd), 7(th), and 15(th) day. A photograph of the surgical site was taken using a Digital SLR Camera, which was placed at 30 cm distance at 55 mm zoom, 1/100 shutter speed, f 14 aperture size, and ISO 4000 with a ring flash. The area of the stained parts of the photographs was evaluated using image analysis software. RESULTS: At day 3, test site showed 1.26 Â± 0.23 mm(2) and control site showed 1.45 Â± 0.21 mm(2) stain uptake by the tissue which was statistically significant. At day 7 and day 15, the test sites exhibited 1.24 Â± 0.30 mm(2) and 1.12 Â± 0.25 mm(2) stain uptake, whereas the control site showed 1.37 Â± 25 mm(2) and 1.29 Â± 0.28 mm(2) staining,

respectively, which were not statistically significant. CONCLUSION: Within the limitations of this study, the findings revealed that LLLT promotes wound healing after depigmentation procedure until the 3(rd) day. On the 7(th) and 15(th) day, the difference in healing was not statistically significant.

Effect of irradiation with different laser wavelengths on oxidative stress of non-hepatectomized rats. PURPOSE: To assess the effect of two laser wavelengths, either separate or combined, on intact rat livers. METHOD: Nineteen male Wistar rats (200-300 g) were submitted to laser irradiation at 5 different sites on the liver surface.Wavelengths 660 and 780 nm were used, with a dose of irradiation of 60 J/cm2/site.The animals were divided into the groups:control (C) and animals irradiated with 660 nm laser (L1), with 780 nm laser (L2) or withboth wavelengths (L3).Mitochondrial function, mitochondrial swelling, and hepatocellular malondialdehyde (MDA) levels were determined.Data were analyzed by the Mann-Whitney test, with the level of significance set at 5%. RESULTS: There was a reduction of ADP-activated respiration (state 3) in group L1 compared to group C (p=0.0016), whereas the values of group L2 were similar to control.Group L3 also showed a reduction of state 3 (p=0.0159).There was a reduction of RCR in group L1 compared to control (p=0.0001) and to group L2 (p=0.0040).Mitochondrial swelling only differed between group L3 and control (p=0.0286).There was a increase in MDA levels in group L3 compared to control (p=0.0476) and to group L2 (p=0.0286) and in group L1 compared to group L2 (p=0.0132). CONCLUSION: Although laser irradiation reduced mitochondrial function,it did not interfere with the hepatocellular energy status. Malondialdehyde Animals;Dose-Response Relationship, Radiation;Lasers, Semiconductor;Liver;Low-Level Light Therapy;Male;Malondialdehyde;Mitochondria, Liver;Mitochondrial Swelling;Oxidative Stress;Radiation Dosage;Rats, Wistar;Spectrophotometry;Time Factors

830 nm light-emitting diode (led) phototherapy significantly reduced return-to-play in injured university athletes: a pilot study. BACKGROUND AND AIMS: For any committed athlete, getting back to conditioning and participation post-injury (return to play [RTP]) needs to be as swift as possible. The effects of near-infrared light-emitting diode (LED) therapy on pain control, blood flow enhancement and relaxation of muscle spasm (all aspects in the treatment of musculoskeletal injury) have attracted attention. The present pilot study was undertaken to assess the role of 830 nm LED phototherapy in safely accelerating RTP in injured university athletes. SUBJECTS AND METHODS: Over a 15-month period, a total of 395 injuries including sprains, strains, ligament damage, tendonitis and contusions were treated with 1,669 sessions of 830 nm LED phototherapy (mean of 4.3 treatments per injury, range 2 - 6). Efficacy was measured with pain attenuation on a visual analog scale (VAS) and the RTP period compared with historically-based anticipated RTP with conventional therapeutic intervention. RESULTS: A full set of treatment sessions and follow-up data was able to be recorded in 65 informed and consenting subjects who achieved pain relief on the VAS of up to 6 points in from 2-6 sessions. The average LED-mediated RTP in the 65 subjects was significantly shorter at 9.6 days, compared with the mean anticipated RTP of 19.23 days (p = 0.0066, paired two-tailed Student's t-test). A subjective satisfaction survey was carried out among the 112 students with injuries incurred from January to May, 2015. Eighty-eight (78.5%) were either very satisfied or satisfied, and only 8 (7.2%) were dissatisfied. CONCLUSIONS: For any motivated athlete, RTP may be the most important factor postinjury based on the resolution of pain and inflammation and repair to tissue trauma. 830 nm LED phototherapy significantly and safely reduced the RTP in dedicated university athletes over a wide range of injuries with no adverse events. One limitation of the present study was the subjective nature of the assessments, and the lack of any control groups. However, further controlled studies are warranted to enable confirmation and generalization of the very good results in the present study.

Low-level laser therapy for the prevention of low salivary flow rate after radiotherapy and chemotherapy in patients with head and neck cancer. OBJECTIVE: To determine whether low-level laser therapy can prevent salivary hypofunction after radiotherapy and chemotherapy in head and neck cancer patients. MATERIALS AND METHODS: We evaluated 23 head and neck cancer patients, of whom 13 received laser therapy and 10 received clinical care only. An InGaAlP laser was used intra-orally (at 660 nm and 40 mW) at a mean dose of 10.0 J/cm(2) and extra-orally (at 780 nm and 15 mW) at a mean dose of 3.7 J/cm(2), three times per week, on alternate days. Stimulated and unstimulated sialometry tests were performed before the first radiotherapy and chemotherapy sessions (N0) and at 30 days after the end of treatment (N30). RESULTS: At N30, the mean salivary flow rates were significantly higher among the laser therapy patients than among the patients who received clinical care only, in the stimulated and unstimulated sialometry tests ($p = 0.0131$ and $p = 0.0143$, respectively). CONCLUSION: Low-level laser therapy, administered concomitantly with radiotherapy and chemotherapy, appears to mitigate treatment-induced salivary hypofunction in patients with head and neck cancer.

Photobiomodulation of the dorsal root ganglion for the treatment of low back pain: A pilot study. BACKGROUND AND OBJECTIVE: Chronic low back pain is a worldwide public health issue with high socioeconomic impact. The aim of this study was to determine the efficacy of laser irradiation of the dorsal root ganglion of the second lumbar spinal nerve for chronic axial low back pain compared to lidocaine injection and radiofrequency treatment. STUDY DESIGN/MATERIALS AND METHODS: Twenty-eight patients were randomly divided into three treatment groups: lidocaine injection, radiofrequency, or laser. The second intervertebral foramen between the second and third lumbar vertebrae was accessed by percutaneous needle puncture bilaterally, guided by fluoroscopy. In the local anesthetic group, injection of 1â€‰ml lidocaine without epinephrine was applied through a 20-gauge (G20) Quincke tip spinal needle inserted in the second lumbar intervertebral foramen. In the radiofrequency group, the probe (150â€‰mm long with a 5â€‰mm active tip) was directed through a G20 needle placed in the second lumbar intervertebral foramen and neuromodulation was done with a radiofrequency of Cosman G4Â® in pulses of 20â€‰ms with wash-out period of 480â€‰ms, for 300â€‰seconds at 42Â°C. A single treatment was used. In the laser treatment group, a continuous wave, 808â€‰nm wavelength diode laser (Photon Lase IIIÂ® DCM, Brazil), with an output power of 100â€‰mW was used for a single treatment. An 18 gauge needle was placed in the second lumbar intervertebral foramen guided by fluoroscopy. Light was delivered through a 600â€‰Âµm optical fiber placed in the G18 needle. The tip of the fiber extended 5â€‰mm beyond the tip of the needle in the second lumbar intervertebral foramen. The beam spot size was 0.003â€‰cm(2) , irradianceâ€‰=â€‰35W/cm(2) , exposure timeâ€‰=â€‰84â€‰seconds, energy densityâ€‰=â€‰2800J/cm(2) , total energy was 8.4â€‰J. The low back pain score was assessed by the visual analog scale (VAS) and Pain Relief Scale (PRS) pre, post procedure and in 1 month follow up. Temperature was measured using a digital thermometer. RESULTS: All patients in the local anesthetic and laser treatment groups reported a pain reduction of at least 50% immediately post-procedure and 10 out of 11 patients in the radiofrequency group reported a pain reduction of at least 50%. At 1 month post-treatment, the laser treatment group had the greatest number of patients who reported more than 50% pain relief based on PRS (7 out of 10 patients) while only 2 out of 7 patients and 3 out of 11 patients in the lidocaine and radiofrequency treatment groups respectively reported more than a 50% pain relief. CONCLUSION: Laser irradiation caused an immediate decrease in low back pain post-procedure similar to pain reduction caused by lidocaine injection. Both lidocaine injection and laser irradiation were more effective than radiofrequency treatment for immediate and longer term (1 month post-treatment) chronic back pain. Lasers Surg. Med. 48:653-659, 2016. Â© 2016 Wiley Periodicals, Inc. Anesthetics, Local;Lidocaine Adult;Aged;Aged, 80 and

over;Anesthetics, Local;Chronic Pain;Female;Follow-Up Studies;Ganglia, Spinal;Humans;Injections, Spinal;Lasers, Semiconductor;Lidocaine;Low Back Pain;Low-Level Light Therapy;Lumbar Vertebrae;Male;Middle Aged;Pain Measurement;Pilot Projects;Prospective Studies;Radiofrequency Therapy;Treatment Outcome

Low Level Laser Therapy in the Treatment of Intra-Osseous Defect- A Case Report. Low level laser has been documented in literature to promote wound healing by reducing postoperative inflammation, oedema and reduces pain. This case report demonstrates the safe and positive outcome of LLLT in conjunction with demineralised bone matrix of bovine origin in the surgical treatment of a periodontal infrabony defect. After surgical defect debridement, low level semiconductor diode laser (GaAlAr) was delivered for 5 minutes to the inner margins of flap in contact mode and the defect was irradiated with LLLT in a non-contact mode for 10 minutes. Demineralised bone matrix graft was used as a bone grafting material. Repeat irradiation was done for the next 5 days on the outer buccal and lingual flap surfaces. A CAL gain of 4 mm and 37% bone fill was noted radiographically at end of 12 months. LLLT can be used as an adjunct to periodontal regeneration.

Three hundred and eight nanometer excimer light therapy for alopecia universalis that is resistant to other treatments: A clinical study of 11 patients. Three hundred and eight nanometer excimer light therapy has recently been reported to be effective against patchy alopecia areata (AA) in several clinical studies. However, these studies only included a few patients with severe forms of AA, and all of them exhibited poor outcomes. We further investigated the use of excimer light as a therapeutic option for cases of alopecia universalis (AU) that are resistant to other treatments. Eleven treatment-resistant AU patients were treated with a 308-nm excimer light at 2-week intervals for more than 16 sessions. Four patients achieved good responses and two patients exhibited poor responses. Three patients had Japanese skin type 1 and all of them achieved good responses. The radiation dose was increased until the patients exhibited marked erythema. The patients with Japanese skin type 3 who achieved good responses exhibited strong pigmentation at the irradiated sites. In conclusion, 308-nm excimer light therapy has significant effects on some AU patients who are resistant to other treatments and may be an alternative therapeutic option for AU. During the treatment of AU, high doses of radiation should be administrated until a strong inflammatory skin reaction is seen.
Adult;Aged;Alopecia;Erythema;Female;Humans;Hyperpigmentation;Japan;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Treatment Outcome;Young Adult

Theoretical and practical aspects relating to the photothermal therapy of tumors of the retina and choroid: A review. Photothermal treatment of tumors of the retina and choroid such as retinoblastomas, malignant melanomas, benign tumors as well as of vascular malformations can be performed by using laser radiation. A number of basic physical laws have to be taken into account in this procedure. Of particular importance thereby are: Arrhenius' law to approximate the kinetics of protein denaturation and photocoagulation, furthermore the electromagnetic radiation field, the distribution of both radiant and thermal energy induced in tumors and vascular structures, the influence of the wavelength and laser pulse duration (exposure time), as well as of the optical properties of the tissue. Strict confinement of the extent of the photothermal damage is critical since such pathological entities are frequently located close to the macula or optic nerve head.The conditions for tumor destruction are best fulfilled when using radiation in the near-infrared range of the electromagnetic spectrum such as that emitted from the diode (810 nm) and the Nd: YAG (1064 nm) laser, because of the good optical penetration properties of these radiations in tissue. Short wavelength sources of radiation, such as the argon ion (488, 514 nm) or the freqeuency-doubled Nd: YAG (532 nm) laser are less well suited for the irradiation of large vascular structures due to their poor penetration depths. However, for vascular formations with a small thickness (1 mm or less),

short wavelength sources appear to be the most appropriate choice. Optical coupling of radiant energy to the eye by means of indirect ophthalmoscopic systems or positive contact lenses is furthermore of importance. Strong positive lenses may lead to severe constrictions of the laser beam within the anterior segment, that leads to high irradiance increasing the probability for structures to be damaged; with negative contact lenses, such as the -64 D Goldmann type lens, this danger is largely absent. Choroid Neoplasms;Hemangioma;Lasers, Solid-State;Low-Level Light Therapy;Neovascularization, Pathologic;Phototherapy;Protein Denaturation;Retinal Neoplasms

Polypeptide-Based Gold Nanoshells for Photothermal Therapy. Targeted killing of cancer cells by engineered nanoparticles holds great promise for noninvasive photothermal therapy applications. We present the design and generation of a novel class of gold nanoshells with cores composed of self-assembled block copolypeptide vesicles with photothermal properties. Specifically, poly(L-lysine)(60)-block-poly(L-leucine)(20) (K(60)L(20)) block copolypeptide vesicles coated with a thin layer of gold demonstrate enhanced absorption of light due to surface plasmon resonance (SPR) in the near-infrared range. We show that the polypeptide-based K(60)L(20) gold nanoshells have low toxicity in the absence of laser exposure, significant heat generation upon exposure to near-infrared light, and, as a result, localized cytotoxicity within the region of laser irradiation in vitro. To gain a better understanding of our gold nanoshells in the context of photothermal therapy, we developed a comprehensive mathematical model for heat transfer and experimentally validated this model by predicting the temperature as a function of time and position in our experimental setup. This model can be used to predict which parameters of our gold nanoshells can be manipulated to improve heat generation for tumor destruction. To our knowledge, our results represent the first ever use of block copolypeptide vesicles as the core material of gold nanoshells. Peptides;Gold Cell Line, Tumor;Convection;Gold;Humans;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Male;Models, Biological;Models, Theoretical;Molecular Targeted Therapy;Nanoshells;Peptides;Phototherapy;Prostatic Neoplasms;Surface Plasmon Resonance

Effect of laser photobiomodulation on the periodontal repair process of replanted teeth. BACKGROUND/AIM: Tooth replantation is the optimal treatment in cases of avulsion. However, its success is limited due to the occurrence of external root resorption. The aim of this study was to assess the effect of laser photobiomodulation (LPBM) at Î»808 nm and Î»660 nm and of storage media on the periodontal repair process of replanted teeth in rats. MATERIAL AND METHODS: Sixty maxillary right incisors were extracted from sixty Wistar rats and randomly assigned to six groups (n = 10). Groups consisted of 10 teeth stored in paper napkins (PN), whole milk (WM), and soy milk (SM), for 45 min; and PNL, WML and SML, in which teeth were stored in the same storage media, but the root surface and the alveolus were treated with LPBM at Î»808 nm before replantation, and the buccal and palatal mucosa of the alveolus were treated with LPBM at Î»660 nm after replantation. Five rats from each group were euthanized after 15 or 30 days. The right hemimaxilla including the replanted incisor was removed and processed for histomorphometric analysis to assess root resorption areas, replacement root resorption, perimeter with ankylosis and periodontal repair, and areas of type I and III collagen deposition, using the ImageJ 1.50b software. Data were analyzed statistically by anova followed by Tukey's multiple comparison test (Î± = 5%). RESULTS: WM and SM showed smaller root resorption areas and higher collagen deposition in both experimental periods, and SM showed the largest perimeter of periodontal repair. LPBM reduced the occurrence of root resorption only in the PNL group, both at 15 and 30 days, and increased the perimeter of periodontal repair in all groups at 30 days. There was higher collagen deposition in the irradiated groups regardless of the experimental period. CONCLUSIONS: The LPBM protocol at Î»808 nm and Î»660 nm as well as whole milk and soy milk favored the periodontal repair process of replanted teeth in rats.

Animals;Incisor;Laser Therapy;Periodontal Ligament;Rats;Rats, Wistar;Root Resorption;Tooth Replantation;Tooth Root
Comments on "light-emitting diode therapy (ledt) before matches prevents increase in creatine kinase with a light dose response in volleyball players". Creatine Kinase Creatine Kinase;Humans;Muscle Fatigue;Muscle, Skeletal;Volleyball
Efficacy of 694-nm fractional Q-switched ruby laser (QSRL) combined with sonophoresis on levorotatory vitamin C for treatment of melasma in Chinese patients. Melasma is a common acquired and distressing pigmentary disorder presenting to dermatology clinics. It is notably difficult to cure and has a tendency to relapse. The efficacy of classical Q-switched laser in treatment of melasma remains controversial. This study aims to investigate the efficacy and safety of 694-nm fractional QSRL combined with sonophoresis on levorotatory vitamin C for the treatment of melasma patients. Twenty-six patients with melasma were enrolled. Each patient received four to six fractional QSRL treatments at pulse energies of 2.5 to 4Â J/cm(2) combined with sonophoresis on levorotatory vitamin C at 2-week intervals. The severity and the area of melasma were assessed by two investigators using the melasma area and severity index (MASI). Side effects were documented. Mean MASI score decreased from 15.51â€‰Â±â€‰3.00 before treatment to 10.02â€‰Â±â€‰4.39 3Â months after the final treatment (Pâ€‰<â€‰0.01). Side effects were few and transient. High-density coverage fractional QSRL combined with sonophoresis on levorotatory vitamin C is safe and effective for the treatment of melasma in Chinese patients. Ascorbic Acid Adult;Ascorbic Acid;Asian People;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Ultrasonic Therapy
CO2 laser surface treatment of failed dental implants for re-implantation: an animal study. The aim of the present study was to evaluate the success rate of failed implants re-implanted after surface treatment with CO2 laser. Despite the widespread use of dental implants, there are many incidents of failures. It is believed that lasers can be applied to decontaminate the implant surface without damaging the implant. Ten dental implants that had failed for various reasons other than fracture or surface abrasion were subjected to CO2 laser surface treatment and randomly placed in the maxillae of dogs. Three failed implants were also placed as the negative controls after irrigation with saline solution without laser surface treatment. The stability of the implants was evaluated by the use of the Periotest values (PTVs) on the first day after surgery and at 1, 3, and 6Â months post-operatively. The mean PTVs of treated implants increased at the first month interval, indicating a decrease in implant stability due to inflammation followed by healing of the tissue. At 3 and 6Â months, the mean PTVs decreased compared to the 1-month interval (Pâ€‰<â€‰0.05), indicating improved implant stability. The mean PTVs increased in the negative control group compared to baseline (Pâ€‰<â€‰0.05). Independent t-test showed that the mean PTVs of treated implants were significantly lower than control group at 3 and 6Â months after implant placement (Pâ€‰<â€‰0.05). Based on the PTVs, re-implantation of failed implants in Jack Russell Terrier dogs after CO2 laser surface debridement is associated with a high success rate in terms of implant stability. Animals;Dental Implantation, Endosseous;Dental Prosthesis Retention;Dogs;Lasers, Gas;Low-Level Light Therapy;Male;Maxilla;Osseointegration;Random Allocation;Wound Healing
Low-level laser therapy in 3D cell culture model using gingival fibroblasts. Besides extensive data about the effects of low-level laser therapy (LLLT) on different cell types, so far, these results were obtained from monolayer cell culture models, which have limitations in terms of cell morphology and phenotype expression. Therefore, for better in vitro evaluation of the effects of LLLT, this study was performed with a 3D cell culture model, where gingival fibroblasts were seeded in collagen matrix. Cells isolated from a healthy patient were seeded in wells of 24-well plates with culture medium

(DMEM) supplemented with 10Â % fetal bovine serum and collagen type I solution. After 5Â days, a serum-free DMEM was added to the matrices with cells that were subjected or not to three consecutive irradiations of LLLT by means of the LaserTABLE diode device (780Â nm, 25Â mW) at 0.5, 1.5, and 3Â J/cm(2). Twenty-four hours after the last irradiation, cell viability and morphology as well as gene expression of growth factors were assessed. Histological evaluation of matrices demonstrated uniform distribution and morphology of gingival fibroblasts within the collagen matrix. LLLT at 3Â J/cm(2) increased gingival fibroblast viability. Enhanced gene expression of hCOL-I and hEGF was observed for 0.5Â J/cm(2), while no significant changes were detected for the other irradiation densities tested. In conclusion, LLLT promoted biostimulation of gingival fibroblasts seeded in a 3D cell culture model, demonstrating that this model can be applied for phototherapy studies and that LLLT could penetrate the collagen matrix to increase cell functions related to tissue repair. Cell Culture Techniques;Cell Survival;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy

A randomized side-by-side study comparing alexandrite laser at different pulse durations for port wine stains. BACKGROUND AND OBJECTIVES: Pulsed dye laser (PDL) represents the gold-standard treatment for port wine stains (PWS). However, approximately 20% of patients are poor responders and yield unsatisfactory end-results. The Alexandrite (Alex) laser may be a therapeutic alternative for selected PWS subgroups, but optimal laser parameters are not known. The aim of this study was to assess clinical PWS clearance and safety of Alex laser at a range of pulse durations. MATERIALS AND METHODS: Sixteen individuals (14 previously PDL-treated) with deep red (nâ€‰=â€‰4), purple macular (nâ€‰=â€‰5) and purple hypertrophic (nâ€‰=â€‰7) PWS were included. Four side-by-side test areas were marked within each lesion. Three test areas were randomized to Alex laser at pulse durations of 3, 5, or 10â€‰ms (8â€‰mm spot, DCD 60/40), while the fourth was untreated. The lowest effective fluence to create purpura within the entire test spot was titrated and applied to intervention areas. Standardized clinical photographs were taken prior to, immediately after laser exposure and at 6-8 weeks follow up. Clinical PWS clearance and laser-related side effects were assessed using clinical photos. RESULTS: Alex laser at 3, 5, and 10â€‰ms pulse durations demonstrated significant clearance compared to untreated controls (Pâ€‰<â€‰0.001). Three milli second pulse duration exhibited improved clearance versus 5â€‰ms (Pâ€‰=â€‰0.016) and 10â€‰ms (Pâ€‰=â€‰0.004), while no difference between five and 10â€‰ms was shown (Pâ€‰=â€‰0.063). Though not significant, good responders (>50% clearance) were more likely to have purple hypertrophic PWS (5/7) compared to purple macular (2/5) and deep red lesions (1/4). Eight laser-exposed test areas (17%) developed hypopigmented atrophic scarring. Side effects tended to be more frequently observed with 5â€‰ms (nâ€‰=â€‰4) and 10â€‰ms (nâ€‰=â€‰3) versus 3â€‰ms pulse duration (nâ€‰=â€‰1). Correspondingly, 3â€‰ms was associated with a superior (nâ€‰=â€‰6) or comparable (nâ€‰=â€‰10) overall cosmetic appearance for all individuals. CONCLUSION: Alex laser at 3â€‰ms pulse duration offers superior clinical clearance and safety compared to 5 and 10â€‰ms, and seems best suited for purple hypertrophic PWS. Treatment should be restricted to experienced personnel due to a particularly narrow therapeutic window. Lasers Surg. Med. 49:97-103, 2017. Â© 2016 Wiley Periodicals, Inc. Adolescent;Adult;Aged;Biopsy, Needle;Denmark;Dose-Response Relationship, Radiation;Female;Follow-Up Studies;Hospitals, University;Humans;Immunohistochemistry;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Prospective Studies;Radiation Dosage;Severity of Illness Index;Time Factors;Treatment Outcome;Young Adult

["The patient can be reassured that henceforth she will no longer have to shave "]. Female;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Recurrence

Photobiomodulation for the management of radiation dermatitis: the DERMIS trial, a pilot study of MLS(Â®) laser therapy in breast cancer patients. PURPOSE: The aim of this study was to assess

the effectiveness and acceptability of photobiomodulation using MLS(Â®) laser therapy (LT) in the management of acute radiation dermatitis (RD). METHODS: We compared two successive groups of breast cancer patients undergoing identical radiotherapy regimens post-lumpectomy. Both groups received our standard skin care but the second group received six additional LT sessions (beam area 19.635Â cm(2), 0.168Â W/cm(2), 4Â J/cm(2)), starting at fraction 20 of radiotherapy (control and LT group, Nâ€‰=â€‰41 and 38, respectively). The clinical outcomes were the severity of RD (using the Radiation Therapy Oncology Group [RTOG] criteria and the Radiotherapy-Induced Skin Reaction Assessment Scale [RISRAS]) and dermatology-specific quality of life (Skindex-16) before the start of LT and at the end of radiotherapy. Secondary outcomes were patients' ratings of skin care or LT (pleasantness, soothing effect, and global satisfaction). RESULTS: Skin toxicity was equivalent between the groups before the start of LT but significantly differed at the end of radiotherapy, with an aggravation in the control but not in the LT group (e.g., 29 versus 3Â % of RTOG grade 2 RD, respectively, Pâ€‰<â€‰0.005). We found no significant group differences with respect to quality of life. However, the RISRAS subjective score decreased in the LT group only, implying a decreased impact of RD on patients' quality of life. Finally, patients' ratings were significantly higher for LT than for standard care. CONCLUSIONS: These findings suggest that LT might be effective to manage acute RD and warrant further research. CLINICAL TRIAL NUMBER: NCT01932073. https://clinicaltrials.gov/ct2/show/NCT01932073 . Breast Neoplasms;Female;Humans;Laser Therapy;Low-Level Light Therapy;Middle Aged;Pilot Projects;Radiodermatitis;Radiotherapy Dosage;Radiotherapy, Adjuvant

Errata: Transcranial low-level laser therapy (810 nm) temporarily inhibits peripheral nociception: photoneuromodulation of glutamate receptors, prostatic acid phophatase, and adenosine triphosphate. [This corrects the article DOI: 10.1117/1.NPh.3.1.015003.].

Low-level laser therapy as a treatment for androgenetic alopecia. BACKGROUND AND OBJECTIVES: Androgenetic alopecia (AGA) affects 50% of males by age 50 and 50% of females by age 80. Recently, the use of low-level laser therapy (LLLT) has been proposed as a treatment for hair loss and to stimulate hair regrowth in AGA. This paper aims to review the existing research studies to determine whether LLLT is an effective therapy for AGA based on objective measurements and patient satisfaction. STUDY DESIGN: A systematic literature review was done to identify articles on Medline, Google Scholar, and Embase that were published between January 1960 and November 2015. All search hits were screened by two reviewers and examined for relevant abstracts and titles. Articles were divided based on study design and assessed for risk of bias. RESULTS: Eleven studies were evaluated, which investigated a total of 680 patients, consisting of 444 males and 236 females. Nine out of 11 studies assessing hair count/hair density found statistically significant improvements in both males and females following LLLT treatment. Additionally, hair thickness and tensile strength significantly improved in two out of four studies. Patient satisfaction was investigated in five studies, and was overall positive, though not as profound as the objective outcomes. CONCLUSION: The majority of studies covered in this review found an overall improvement in hair regrowth, thickness, and patient satisfaction following LLLT therapy. Although we should be cautious when interpreting these findings, LLLT therapy seems to be a promising monotherapy for AGA and may serve as an effective alternative for individuals unwilling to use medical therapy or undergo surgical options. Lasers Surg. Med. 49:27-39, 2017. Â© 2016 Wiley Periodicals, Inc. Adult;Alopecia;Esthetics;Female;Hair;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Treatment Outcome;Young Adult

The new heterologous fibrin sealant in combination with low-level laser therapy (LLLT) in the repair of the buccal branch of the facial nerve. This study aimed to evaluate the effects of low-level laser therapy (LLLT) in the repair of the buccal branch of the facial nerve with two surgical techniques: end-

to-end epineural suture and coaptation with heterologous fibrin sealant. Forty-two male Wistar rats were randomly divided into five groups: control group (CG) in which the buccal branch of the facial nerve was collected without injury; (2) experimental group with suture (EGS) and experimental group with fibrin (EGF): The buccal branch of the facial nerve was transected on both sides of the face. End-to-end suture was performed on the right side and fibrin sealant on the left side; (3) Experimental group with suture and laser (EGSL) and experimental group with fibrin and laser (EGFL). All animals underwent the same surgical procedures in the EGS and EGF groups, in combination with the application of LLLT (wavelength of 830Â nm, 30Â mW optical power output of potency, and energy density of 6Â J/cm(2)). The animals of the five groups were euthanized at 5Â weeks post-surgery and 10Â weeks post-surgery. Axonal sprouting was observed in the distal stump of the facial nerve in all experimental groups. The observed morphology was similar to the fibers of the control group, with a predominance of myelinated fibers. In the final period of the experiment, the EGSL presented the closest results to the CG, in all variables measured, except in the axon area. Both surgical techniques analyzed were effective in the treatment of peripheral nerve injuries, where the use of fibrin sealant allowed the manipulation of the nerve stumps without trauma. LLLT exhibited satisfactory results on facial nerve regeneration, being therefore a useful technique to stimulate axonal regeneration process. Fibrin Tissue Adhesive Animals;Facial Nerve;Fibrin Tissue Adhesive;Low-Level Light Therapy;Male;Nerve Regeneration;Random Allocation;Rats;Rats, Wistar;Wound Healing

Effect of Red-to-Near Infrared Light on the Reaction of Isolated Cytochrome c Oxidase with Cytochrome c. OBJECTIVE: Our primary hypothesis was that red-to-near infrared (R-NIR) irradiation would have an effect on the kinetics parameters of the reaction of cytochrome c with isolated cytochrome c oxidase (CCO), and that the magnitude and direction of these changes could be interpreted in the context of the reaction schemes proposed by other authors. New values for the milimolar extinction coefficients of cytochrome c were also determined. BACKGROUND DATA: Definitive answers to the fundamental processes involved in red-to-near infrared photobiomodulation (R-NIR-PBM) have not been obtained. The consensus is that the electron transport chain enzyme CCO is the target for R-NIR-PBM. This work was undertaken to explore the effect of R-NIR on the activity of isolated CCO. METHODS: Scans for cytochrome c were obtained in both reduced and oxidized states, and values for the extinction coefficients were calculated. Activity assays were performed by following the oxidation state of cytochrome c at 550 or 415â€‰nm. R-NIR effects on CCO activity were evaluated by pre-irradiating the enzyme at 670 or 830â€‰nm, or by irradiating the reaction mixture with 660â€‰nm light. RESULTS: Milimolar extinction coefficients (L(-1) cm(-1)) were: É›(550red)â€‰=â€‰29.1â€‰Â±â€‰0.4, É›(550ox)â€‰=â€‰8.60â€‰Â±â€‰0.15, É›(415red)â€‰=â€‰140â€‰Â±â€‰2, and É›(415ox)â€‰=â€‰89.0â€‰Â±â€‰1.1. Reduced-oxidized extinction coefficients were: Î´É›(550red-ox)â€‰=â€‰20.5â€‰Â±â€‰0.2, and Î´É›(415red-ox)â€‰=â€‰51.0â€‰Â±â€‰2.0. The second order rate constants k' for irradiated CCO did not show a statistically significant difference from controls. CONCLUSIONS: The oxidation of cytochrome c by isolated CCO has not been shown to be affected by R-NIR irradiation, whether applied prior to or concurrently with the enzymatic assays. This lack of effect by R-NIR calls into question the CCO activity model of R-NIR photobiomodulation. Cytochromes c;Electron Transport Complex IV Cytochromes c;Electron Transport Complex IV;Infrared Rays;Oxidation-Reduction

Comparative study among three different phototherapy protocols to treat chemotherapy-induced oral mucositis in hamsters. In this study, clinical, biochemical and histological analysis were used to compare different phototherapies, including LED, low and high-power laser (HPL) for the treatment of chemotherapy (CT)-induced oral mucositis (OM). One-hundred-fifty hamsters were divided into five groups: C: control; CH: CT/OM induction; L: CT/OM induction and treatment with LED (635 nm,

1.2 J), HL: CT/OM induction and treatment with HPL (808 nm, 10 J), LL: CT/OM induction and treatment with low-level laser therapy (LLLT) (660 nm, 1.2 J). OM was induced by scratches performed on check pouch mucosa after two injections of 5-Fluorouracil. The experiment lasted 10 days and OM was analyzed by specific clinical scales on days 5, 7 and 10. The animals were euthanized and the cheek pouch mucosa removed for biochemical (TNF-Î± concentration) and histological (light microscopy) analysis. After statistical analysis, the authors' results showed LED and LLLT therapies were efficient treatments for OM, decreasing TNF-Î± concentration on day 7 ($p < 0.05$) and completely healing the mucosa on day 10. HPL showed no interference in final healing of OM. According to the methodology used and the results obtained in the present study, LLLT and LED therapies were the best choices to decrease the severity of OM, accelerating tissue repair and decreasing the inflammatory process. Clinical evaluation of OM in Groups CH, LL, L and HL and their respective arrangement of phototherapy treatments at different time intervals (5, 7 and 10 days).
Antineoplastic Agents;Tumor Necrosis Factor-alpha Animals;Antineoplastic Agents;Cricetinae;Laser Therapy;Low-Level Light Therapy;Phototherapy;Stomatitis;Tumor Necrosis Factor-alpha

Photo-thermal therapy of bladder cancer with Anti-EGFR antibody conjugated gold nanoparticles. The aim of this study was to enhance the effectiveness of photo thermal therapy (PTT) in the targeting of superficial bladder cancers using a green light laser in conjunction with gold nanoparticles (GNPs) conjugated to antibody fragments (anti-EGFR). GNPs conjugated with anti-EGFR-antibody fragments were used as probes in the targeting of tumor cells and then exposed to a green laser (532nm), resulting in the production of sufficient thermal energy to kill urothelial carcinomas both in vitro and in vivo. Nanoparticles conjugated with antibody fragments are capable of damaging cancer cells even at relatively very low energy levels, while non-conjugated nanoparticles would require an energy level of 3 times under the same conditions. The lower energy required by the nanoparticles allows this method to destroy cancerous cells while preserving normal cells when applied in vivo. Nanoparticles conjugated with antibody fragments (anti-EGFR) require less than half the energy of non-conjugated nanoparticles to kill cancer cells. In an orthotopic bladder cancer model, the group treated using PTT presented significant differences in tumor development.
Antibodies;Immunoglobulin Fragments;Nanoconjugates;Gold;ErbB Receptors Animals;Antibodies;Cell Line, Tumor;ErbB Receptors;Gold;Humans;Immunoglobulin Fragments;Low-Level Light Therapy;Metal Nanoparticles;Mice;Mice, Inbred C3H;Nanoconjugates;Nanotechnology;Urinary Bladder Neoplasms

In Vitro Behavior of Osteoblasts on Zirconia After Different Intensities of Erbium, Chromium-Doped: Yttrium, Scandium, Gallium, and Garnet-Laser Irradiation. OBJECTIVE: This study investigated the osteoblastic behavior to yttrium-stabilized tetragonal zirconia polycrystal (Y-TZP) surface after different intensities of erbium, chromium-doped:yttrium, scandium, gallium, and garnet (Er,Cr:YSGG) laser irradiation treatment. MATERIALS AND METHODS: Y-TZP blocks were randomized divided into 4 groups to Er,Cr:YSGG laser irradiation: group G1â€Š=â€Šcontrol (no laser irradiation); group G2â€Š=â€Š1.5 W; group G3â€Š=â€Š3.0 W; group G4â€Š=â€Š5.0 W, with air-water irrigation. The irradiated surface roughness (Sa and Ra) topography was evaluated. MC3T3-E1 osteoblast cells were cultured and seeded onto the treated surfaces at a plate density of 1 Ã— 10 cells/mL. At the third and seventh days cell proliferation was measured by the colorimetric assay methods. The specimens were prepared to scanning electron microscope to observe adhesion and morphology of cells. RESULTS: MTT assay showed adhesion and proliferation of MC3T3-E1 cells in all groups. Compared with group G1 (control), the group G2 had a proliferation 1.4% higher (Pâ€Š>â€Š0.05), the group G3 had a proliferation 3.1% higher (Pâ€Š<â€Š0.05) and group G4 had a proliferation 4.5% higher (Pâ€Š<â€Š0.01). After 7 days there was no difference among the groups (ANOVA, Newman-Keuls).

CONCLUSIONS: Er,Cr:YSGG laser irradiation may have contributed to the greater and earlier cell spreading that was observed with the Y-TZP without alterations on surface topography. Chromium;Yttrium;Erbium;Zirconium;Gallium;zirconium oxide;Scandium Chromium;Dose-Response Relationship, Drug;Erbium;Gallium;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Osteoblasts;Scandium;Surface Properties;Yttrium;Zirconium

Photobiomodulation devices for hair regrowth and wound healing: a therapy full of promise but a literature full of confusion. Photobiomodulation is reported to positively influence hair regrowth, wound healing, skin rejuvenation and psoriasis. Despite rapid translation of this science to commercial therapeutic solutions, significant gaps in our understanding of the underlying processes remain. The aim of this review was to seek greater clarity and rationality specifically for the selection of optical parameters for studies on hair regrowth and wound healing. Our investigation of 90 reports published between 1985 and 2015 revealed major inconsistencies in optical parameters selected for clinical applications. Moreover, poorly understood photoreceptors expressed in skin such as cytochrome c oxidase, cryptochromes, opsins etc. may trigger different molecular mechanisms. All this could explain the plethora of reported physiological effects of light. To derive parameters for optimal clinical efficacy of photobiomodulation, we recommend a more rational approach to underpin clinical studies, with research on molecular targets and pathways using well-defined biological model systems to enable translation of optical parameters from in vitro to in vivo. Furthermore, special attention needs to be paid when conducting studies for hair regrowth, aiming for double-blind, placebo-controlled randomized clinical trials as the gold standard for quantifying hair growth. Hair Follicle;Humans;Low-Level Light Therapy;Photoreceptor Cells;Skin Diseases;Translational Research, Biomedical;Wound Healing

Photomodulation of the osteoclastogenic potential of oral squamous carcinoma cells. The treatment for oral cancer usually involves surgical excision followed by chemotherapy and/or radiotherapy. The combination of these therapies generally promotes a serious inflammation of the mucosa of the digestive tract, denominated mucositis, which compromises continuity of treatment. Photobiomodulation (PBM) therapy has been used successfully to reduce the oral mucositis, however there is still some controversy regarding the effects of this therapy on unintentionally irradiated tumor cells that may remain after cancer treatment. The aim of this study was to analyze the effect of PBM therapy (using parameters for mucositis) on the modulation of osteoclastogenic potential of a cell line derived from human lingual squamous cell carcinoma (SCC9). Previously irradiated SCC9 cells were co-cultured with human osteoclast precursors. Co-cultures performed with non-irradiated SCC9 cells served as control. After 7, 14 and 21 days the co-cultures were evaluated for the tartrate-resistant acid phosphatase (TRAP) activity, an osteoclastogenic marker. Additionally, the monocultures of SCC9 cells (non-irradiated and irradiated) were analyzed for cell viability/proliferation and for the expression of IL-11 and PTHrP. The irradiation of SCC9 cells with PBM with an energy density of 4Â J/cm(2) decreased the pro-osteoclastogenic potential of those cells. This may represent a potential useful side effect of PBM therapy. PBM (using recommended parameters for mucositis treatment) decreases the osteoclastogenic potential of oral squamous carcinoma cells. Carcinoma, Squamous Cell;Cell Line, Tumor;Cell Proliferation;Epithelial Cells;Humans;Mouth Neoplasms;Osteogenesis;Phototherapy

Effects of Light-Emitting Diode Therapy on Muscle Hypertrophy, Gene Expression, Performance, Damage, and Delayed-Onset Muscle Soreness: Case-control Study with a Pair of Identical Twins. OBJECTIVE: The aim of this study was to verify how a pair of monozygotic twins would respond to light-emitting diode therapy (LEDT) or placebo combined with a strength-training program during 12 weeks. DESIGN: This case-control study enrolled a pair of male monozygotic twins, allocated

randomly to LEDT or placebo therapies. Light-emitting diode therapy or placebo was applied from a flexible light-emitting diode array (Î» = 850 nm, total energy = 75 J, t = 15 seconds) to both quadriceps femoris muscles of each twin immediately after each strength training session (3 times/wk for 12 weeks) consisting of leg press and leg extension exercises with load of 80% and 50% of the 1-repetition maximum test, respectively. Muscle biopsies, magnetic resonance imaging, maximal load, and fatigue resistance tests were conducted before and after the training program to assess gene expression, muscle hypertrophy and performance, respectively. Creatine kinase levels in blood and visual analog scale assessed muscle damage and delayed-onset muscle soreness, respectively, during the training program. RESULTS: Compared with placebo, LEDT increased the maximal load in exercise and reduced fatigue, creatine kinase, and visual analog scale. Gene expression analyses showed decreases in markers of inflammation (interleukin 1Î²) and muscle atrophy (myostatin) with LEDT. Protein synthesis (mammalian target of rapamycin) and oxidative stress defense (SOD2 [mitochondrial superoxide dismutase]) were up-regulated with LEDT, together with increases in thigh muscle hypertrophy. CONCLUSIONS: Light-emitting diode therapy can be useful to reduce muscle damage, pain, and atrophy, as well as to increase muscle mass, recovery, and athletic performance in rehabilitation programs and sports medicine. Interleukin-1beta;MSTN protein, human;Myostatin;Superoxide Dismutase;superoxide dismutase 2;TOR Serine-Threonine Kinases;Creatine Kinase Case-Control Studies;Creatine Kinase;Exercise;Exercise Tolerance;Humans;Hypertrophy;Interleukin-1beta;Low-Level Light Therapy;Male;Muscle Fatigue;Myalgia;Myostatin;Quadriceps Muscle;Resistance Training;Superoxide Dismutase;TOR Serine-Threonine Kinases;Thigh;Twins, Monozygotic;Up-Regulation;Young Adult

Effect of Photobiomodulation on Transforming Growth Factor-Î²1, Platelet-Derived Growth Factor-BB, and Interleukin-8 Release in Palatal Wounds After Free Gingival Graft Harvesting: A Randomized Clinical Study. OBJECTIVE: This study evaluated the impact of photobiomodulation (PBM) on the healing of the donor palatal area following free gingival graft (FGG) harvesting by examining changes in transforming growth factor (TGF)-Î²1, platelet-derived growth factor (PDGF)-BB, and interleukin (IL)-8 levels in palatal wound fluid (PWF). MATERIAL AND METHODS: Thirty patients were selected and randomly assigned to receive PBM (laser group) or PBM sham (sham group) in the palatine area after FGG harvesting. A neodymium-doped yttrium aluminum garnet (Nd:YAG) laser (1064â€‰nm) was applied to the test sites immediately after surgery and every 24â€‰h thereafter for 4 days. PWF was collected on Days 7 and 12, and PWF TGF-Î²1, PDGF-BB, and IL-8 levels were analyzed by enzyme-linked immunosorbent assays (ELISA). RESULTS: PWF TGF-Î²1, PDGF-BB, and IL-8 levels were significantly lower on Day 12 than on Day 7 for both groups. PWF TGF-Î²1, PDGF-BB, and IL-8 levels of the laser group were significantly higher than those of sham group on Day 7 (pâ€‰<â€‰0.05). PWF TGF-Î²1 levels were also significantly higher in laser group than in the sham group on Day 12; however, differences in PDGF-BB and IL-8 levels between groups on Day 12 were statistically nonsignificant. CONCLUSIONS: Observed increases in PWF TGF-Î²1, PDGF-BB, and IL-8 levels suggest that PBM may accelerate wound healing by stimulating production of selected mediators. Interleukin-8;Proto-Oncogene Proteins c-sis;Transforming Growth Factor beta1;Becaplermin Adolescent;Adult;Becaplermin;Double-Blind Method;Female;Gingiva;Humans;Interleukin-8;Lasers, Solid-State;Male;Palate;Proto-Oncogene Proteins c-sis;Transforming Growth Factor beta1;Treatment Outcome;Wound Healing

Effects of oral motor exercises and laser therapy on chronic temporomandibular disorders: a randomized study with follow-up. This study investigated the efficacy of combining low-level laser therapy (LLLT) with oral motor exercises (OM-exercises) for rehabilitation of patients with chronic temporomandibular disorders (TMDs). Eighty-two patients with chronic TMD and 20 healthy subjects (control group) participated in the study. Patients were randomly assigned to treatment

groups: GI (LLLTâ€‰+â€‰OM exercises), GII (orofacial myofunctional therapy-OMT-which contains pain relief strategies and OM-exercises), and GIII (LLLT placeboâ€‰+â€‰OM-exercises) and GIV (LLLT). LLLT (AsGaAl; 780-nm wavelength; average power of 60Â mW, 40Â s, and 60â€‰Â±â€‰1.0Â J/cmÂ²) was used to promote analgesia, while OM-exercises were used to reestablish the orofacial functions. Evaluations at baseline (T1), after treatment immediate (T2), and at follow-up (T3) were muscle and joint tenderness to palpation, TMD severity, and orofacial myofunctional status. There was a significant improvement in outcome measures in all treated groups with stability at follow-up (Friedman test, Pâ€‰<â€‰0.05), but GIV did not show difference in orofacial functions after LLLT (Pâ€‰>â€‰0.05). Intergroup comparisons showed that all treated groups had no difference in tenderness to palpation of temporal muscle compared to GC at follow-up (Kruskal-Wallis test, Pâ€‰<â€‰0.01). Moreover, GI, GII, and GIII showed no difference from GC in orofacial functional condition (T2 and T3) while they differed significantly from GIV (Pâ€‰<â€‰0.01). In conclusion, LLLT combined with OM-exercises was more effective in promoting TMD rehabilitation than LLLT alone was. Similar treatment results were verified with the OMT protocol. Adult;Exercise Therapy;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Management;Pain Measurement;Temporomandibular Joint Disorders;Treatment Outcome

Using low level laser therapy to reduce early postoperative airway obstruction following modified Hogan's flap. INTRODUCTION AND OBJECTIVE: The most common postoperative complications of velopharyngeal insufficiency surgery are postoperative bleeding and airway obstruction or obstructive sleep apnoea. Consequently, the aim of this study was to evaluate the effect of low level laser therapy (LLLT) during the first postoperative days in children undergoing superiorly based pharyngeal flap (SBF) surgery. MATERIALS AND METHODS: A randomized double blind clinical study on 30 children divided on two groups 15 patients each, who underwent SBF. LLLT was used in a group and the other was a control group. The study was conducted in academic tertiary care medical centres between 2013 and 2015. The degree of edema, oxygen saturation, occurrence of obstructive sleep apnoea (OSA) and steroid administration were recorded. RESULTS: The mean of the average oxygen saturation was significantly less in the control group in the 1st and 2nd day as compared to the laser group. The need for oxygen and the incidence of OSA in the first 3 days were significantly higher in the control group as compared to the laser group. The degree of edema showed no significant difference in the first day but was significantly higher in the control group in the 2nd and 3rd days. Hence, the need of steroids was significantly higher in the control group in the first 3 days. CONCLUSIONS: Preliminary results showed that low level laser therapy is effective in reducing the incidence of early postoperative airway obstruction after SBF operations. Airway Obstruction;Child;Child, Preschool;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Otorhinolaryngologic Surgical Procedures;Postoperative Complications;Surgical Flaps;Time Factors;Velopharyngeal Insufficiency

Immediate skin responses to laser and light treatments: Warning endpoints: How to avoid side effects. Lasers are versatile, commonly used treatment tools in dermatology. While it is tempting to follow manufacturer's guidelines or other "recipes" for laser treatment, this approach alone can be a recipe for disaster. Specific and immediate skin responses or endpoints exist and are clinically useful because they correlate with underlying mechanisms that are either desirable (ie, therapeutic), undesirable (ie, warning signs of injury or side effects), or incidental. The observation of clinical endpoints is a safe and reliable guide for appropriate treatment. This article presents the warning endpoints during specific dermatologic laser treatments, and the accompanying article presents the therapeutic endpoints, their underlying mechanisms, and the utility of these endpoints. Education, Medical, Continuing;Female;Humans;Low-Level Light Therapy;Male;Patient

Safety;Phototherapy;Primary Prevention;Prognosis;Risk Assessment;Skin Diseases;Treatment Outcome

Nutritional deprivation and LPS exposure as feasible methods for induction of cellular - A methodology to validate for vitro photobiomodulation studies. Previous studies have demonstrated that high biostimulation takes place when cells under stress are subjected to phototherapy by laser or light-emitting-diode (LED) devices. Several studies selected nutritional deprivation by reducing the concentration of fetal bovine serum (FBS) in the culture medium or the exposure of cultured cells to lipopolysaccharide (LPS) as an in vitro cellular stress condition. However, there are no data certifying that these stimuli cause stressful conditions for cultured cells. This investigation assessed the induction of cellular stress by decreasing the concentration of FBS or adding LPS to culture medium. Odontoblast-like cells (MDPC-23) were cultured in complete culture medium (DMEM) containing 10% FBS. After a 12-hour incubation period, the DMEM was replaced by fresh medium containing 10% FBS (control), low concentrations of FBS (0, 0.2, 0.5, 2, or 5%) or LPS from Escherichia coli (10Î¼g/ml). After an additional 12-hour incubation, cell viability, total cell-counting, total protein production, and gene expression of heat shock protein 70 (HSP70) were assessed. Data were statistically analyzed by ANOVA complemented by the Tukey test, with 5% considered significant. Cell viability was negatively affected only for 0% FBS, while reduced viable cell numbers and total protein production were detected for FBS concentrations lower than 2%. Higher HSP70 gene expression was also observed for FBS concentrations lower than 2% and for cells exposed to LPS. The nutritional deprivation model with culture medium lower than 2% of FBS can be safely used to induce cellular stress for in vitro photobiomodulation studies. Culture Media;HSP70 Heat-Shock Proteins;Lipopolysaccharides Animals;Cell Line, Transformed;Culture Media;HSP70 Heat-Shock Proteins;Lipopolysaccharides;Nutritional Status

Red and Infrared Low-Level Laser Therapy Prior to Injury with or without Administration after Injury Modulate Oxidative Stress during the Muscle Repair Process. INTRODUCTION: Muscle injury is common among athletes and amateur practitioners of sports. Following an injury, the production of reactive oxygen species (ROS) occurs, which can harm healthy muscle fibers (secondary damage) and delay the repair process. Low-level laser therapy (LLLT) administered prior to or following an injury has demonstrated positive and protective effects on muscle repair, but the combination of both administration times together has not been clarified. AIM: To evaluate the effect of LLLT (660 nm and 780 nm, 10 J/cmÂ², 40 mW, 3.2 J) prior to injury with or without the administration after injury on oxidative stress during the muscle repair process. METHODS: Wistar rats were divided into following groups: control; muscle injury alone; LLLT 660 nm + injury; LLLT 780 nm + injury; LLLT 660 nm before and after injury; and LLLT 780 nm before and after injury. The rats were euthanized on days 1, 3 and 7 following cryoinjury of the tibialis anterior (TA) muscle, which was then removed for analysis. RESULTS: Lipid peroxidation decreased in the 660+injury group after one day. Moreover, red and infrared LLLT employed at both administration times induced a decrease in lipid peroxidation after seven days. CAT activity was altered by LLLT in all periods evaluated, with a decrease after one day in the 780+injury+780 group and after seven days in the 780+injury group as well as an increase in the 780+injury and 780+injury+780 groups after three days. Furthermore, increases in GPx and SOD activity were found after seven days in the 780+injury+780 group. CONCLUSION: The administration of red and infrared laser therapy at different times positively modulates the activity of antioxidant enzymes and reduces stress markers during the muscle repair process.
Antioxidants;Catalase;Glutathione Peroxidase;Superoxide Dismutase;Oxygen Animals;Antioxidants;Catalase;Glutathione Peroxidase;Infrared Rays;Lipid Peroxidation;Low-Level Light Therapy;Muscle, Skeletal;Oxidative Stress;Oxygen;Rats;Rats, Wistar;Regeneration;Superoxide Dismutase;Wound Healing

Short- and Medium-Term Effects of Low-Level Laser Therapy on Periodontal Status in Lingual Orthodontic Patients. OBJECTIVE: The purpose of this study was to evaluate the short- and medium-term effects of low-level laser therapy (LLLT) applied in repeated doses in adults with a healthy periodontium treated by lingual orthodontic appliances. BACKGROUND DATA: Plaque accumulation, in combination with difficulty in removing it in lingual orthodontic patients, can cause gingival inflammation. METHODS: Twelve orthodontic patients scheduled for fixed lingual orthodontic treatment were selected. Clinical measurements [visible plaque index (VPI), bleeding on probing (BOP), and probing depth (PD), and collection of gingival crevicular fluid (GCF)], which was used to measure the levels of interleukin-1beta (IL-1Î²) and tumor necrosis factor alpha (TNF-Î±), was performed before bonding the lingual device, and at the short-term (1, 2, 3 months) and medium-term (12 months) follow-up appointments. For each patient, quadrant 1 or 2 was randomly chosen for irradiation by a diode laser (Î»â€‰=â€‰670â€‰nm, 190â€‰mW, 6.05â€‰W/cm(2), 60â€‰sec/ tooth) (Laser Group) and the contralateral quadrant was used as the Control Group. RESULTS: In both studied groups, a slight worsening of the periodontal condition was observed, which was evident at the 3rd month follow-up and which was mainly at the lingual side in the Control Group. The levels of IL-1Î² in the GCF were significantly increased in the Control Group compared with the Laser Group at the 2nd and 3rd months after bonding. At the 12th month follow-up, an improvement of the inflammation was observed in both groups in the study. CONCLUSIONS: LLLT showed short-term effects by preventing a substantial increase in IL-1Î² levels. At medium-term follow-up, LLLT diminished VPI, BOP, and PD scores. Interleukin-1beta;Tumor Necrosis Factor-alpha Adult;Dental Plaque Index;Female;Gingiva;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontic Appliances;Periodontal Index;Treatment Outcome;Tumor Necrosis Factor-alpha

Low-Level Laser and Light-Emitting Diode Therapy for Pain Control in Hyperglycemic and Normoglycemic Patients Who Underwent Coronary Bypass Surgery with Internal Mammary Artery Grafts: A Randomized, Double-Blind Study with Follow-Up. OBJECTIVE: This study aimed to evaluate the efficacy of low-level laser therapy (LLLT) and light-emitting diodes (LEDs) for reducing pain in hyperglycemic and normoglycemic patients who underwent coronary artery bypass surgery with internal mammary artery grafts. METHODS: This study was conducted on 120 volunteers who underwent elective coronary artery bypass graft (CABG) surgery. The volunteers were randomly allocated to four different groups of equal size (nâ€‰=â€‰30): control, placebo, LLLT [Î»â€‰=â€‰640â€‰nm and spatial average energy fluence (SAEF)â€‰=â€‰1.06â€‰J/cm(2)], and LED (Î»â€‰=â€‰660â€‰Â±â€‰20â€‰nm and SAEFâ€‰=â€‰0.24â€‰J/cm(2)). Participants were also divided into hyperglycemic and normoglycemic subgroups, according to their fasting blood glucose test result before surgery. The outcome assessed was pain during coughing by a visual analog scale (VAS) and the McGill Pain Questionnaire. RESULTS: The patients were followed for 1 month after the surgery. The LLLT and LED groups showed a greater decrease in pain, with similar results, as indicated by both the VAS and the McGill questionnaire (pâ€‰â‰¤â€‰0.05), on the 6th and 8th postoperative day compared with the placebo and control groups. The outcomes were also similar between hyperglycemic and normoglycemic patients. One month after the surgery, almost no individual reported pain during coughing. CONCLUSIONS: LLLT and LED had similar analgesic effects in hyperglycemic and normoglycemic patients, better than placebo and control groups.
Coronary Artery Bypass;Double-Blind Method;Female;Humans;Hyperglycemia;Internal Mammary-Coronary Artery Anastomosis;Low-Level Light Therapy;Male;Middle Aged;Pain Management;Pain Measurement;Pain, Postoperative;Sternotomy

Non-invasive brain stimulation to promote alertness and awareness in chronic patients with disorders of consciousness: Low-level, near-infrared laser stimulation vs. focused shock wave therapy.

PURPOSE: In order to promote alertness and awareness in patients with severe disorders of consciousness (DOC) frontal near infrared laser stimulation (N-LT) or transcranial focused shock wave therapy (F-SWT) might be an option. The study compared both techniques in severe chronic DOC patients. METHODS: Sixteen DOC patients were allocated to two groups (A and B). A three week baseline either followed a frontal N-LT (0,1â€ŠmJ/mm2, 10â€Šmin per session), five times a week over four weeks (group A), or a F-SWT (0,1â€ŠmJ/mm2, 4000 stimuli per session) three times a week over four weeks (group B). The primary variable was the revised Coma Recovery Scale (r-CRS, 0-23), blindly assessed. RESULTS: Both groups improved in the r-CRS over time, but revealed no differences between groups. One patient of group B had a focal seizure in the third therapy week. One patient with akinetic mutism improved most and three patients with global hypoxia did not improve at all. CONCLUSIONS: Both options might be an option to increase alertness and awareness of chronic DOC patients. An akinetic mutism seems to be a positive and severe cerebral hypoxia a negative predictor. Epileptic seizures are a potential unwanted side effect. More clinical studies are warranted. Adult;Aged;Consciousness Disorders;Extracorporeal Shockwave Therapy;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method

Low-Level Laser Therapy Promoted Aggressive Proliferation and Angiogenesis Through Decreasing of Transforming Growth Factor-Î²1 and Increasing of Akt/Hypoxia Inducible Factor-1Î± in Anaplastic Thyroid Cancer. OBJECTIVE: We assessed the cause of increased tumor after low-level laser therapy (LLLT) by histological analysis. BACKGROUND DATA: LLLT is a nonthermal phototherapy used in several medical applications, including wound healing, reduction of pain, and amelioration of oral mucositis. We discovered by accident that LLLT increased tumor size while testing a photodynamic therapy (PDT) model for the treatment of thyroid cancer. Although therapeutic effects of LLLT on cancer or dysplastic cells have been studied, LLLT has been recently reported to stimulate the aggressiveness of the tumor. METHODS: The anaplastic thyroid cancer cell line FRO was injected into thyroid glands of nude mice orthotopically and then laser irradiation was performed with 0, 15, and 30â€‰J/cm(2) (100â€‰mW/cm(2)) on the thyroid after 10 days. The tumor volume was measured for 4 weeks and the thyroid tissues underwent histological analysis. We observed that proliferation of FRO cells and macrophage infiltration was increased with energy delivery to the thyroid glands. We also assessed overproliferated FRO cells using an immunohistochemical staining with hypoxia inducible factor 1Î± (HIF-1Î±), p-Akt, vascular endothelial growth factor (VEGF), and transforming growth factor Î²1 (TGF-Î²1). RESULTS: HIF-1Î± and p-Akt were elevated after LLLT, which suggested that the phosphorylation of Akt by LLLT led to the activation of HIF-1Î±. Moreover, TGF-Î²1 expression was decreased after LLLT, which led to loss of cell cycle regulation. CONCLUSIONS: In conclusion, LLLT led to a decrease in TGF-Î²1 and increase of p-Akt/HIF-1Î± which resulted to overproliferation and angiogenesis of anaplastic thyroid carcinoma (ATC). Therefore, we suggest that LLLT can influence cancer aggressiveness associated with TGF-Î²1 and Akt/HIF-1Î± cascades in some poorly differentiated head and neck cancers. Hypoxia-Inducible Factor 1, alpha Subunit;Transforming Growth Factor beta1;Proto-Oncogene Proteins c-akt Animals;Cell Line, Tumor;Cell Proliferation;Hypoxia-Inducible Factor 1, alpha Subunit;Low-Level Light Therapy;Mice;Mice, Nude;Neovascularization, Pathologic;Proto-Oncogene Proteins c-akt;Thyroid Carcinoma, Anaplastic;Transforming Growth Factor beta1

Low level laser therapy accelerates bone healing in spinal cord injured rats. Bone loss occurs rapidly and consistently after the occurrence of a spinal cord injury (SCI), leading to a decrease in bone mineral density (BMD) and a higher risk of fractures. In this context, the stimulatory effects of low level laser therapy (LLLT) also known as photobiomodulation (PBM) have been highlighted, mainly due to its osteogenic potential. The aim of the present study was to evaluate the effects of LLLT on bone healing using an experimental model of tibial bone defect in SCI rats. Twenty-four

female Wistar rats were randomly divided into 3 groups: Sham group (SG), SCI control group (SC) and SCI laser treated group (SL). Two weeks after the induction of the SCI, animals were submitted to surgery to induce a tibial bone defect. Treatment was performed 3days a week, for 2weeks, at a single point over the area of the injury, using an 808nm laser (30mW, 100J/cm(2); 0.028cm(2), 1.7W/cmÂ², 2.8J). The results of the histological and morphometric evaluation demonstrated that the SL group showed a larger amount of newly formed bone compared to the SC group. Moreover, a significant immunoexpression of runt-related transcription factor 2 (RUNX2) was observed in the SL group. There was no statistical difference in the biomechanical evaluation. In conclusion, the results suggest that LLLT accelerated the process of bone repair in rats with complete SCI. Animals;Female;Fracture Healing;Locomotion;Low-Level Light Therapy;Rats;Rats, Wistar;Spinal Cord Injuries

The microsecond 1064 nm Nd:YAG laser as an adjunct to improving surgical scars following Mohs micrographic surgery. BACKGROUND: Scarring following skin surgery is an unavoidable certainty. Scars resulting from Mohs Micrographic Surgery (MMS) can cause both cosmetic and functional problems. Various lasers have been used to treat scars, but the role of the microsecond pulsed 1064 nanometer neodymium-doped yttrium aluminum garnet (1064 nm Nd:YAG) in treating surgical scars is not well-defined. OBJECTIVE: We aim to examine the clinical application of the 1064 nm Nd:YAG laser in improving surgical scars. METHODS: Ten patients who were unhappy with cosmetic or functional outcomes of their surgical scars following MMS were treated with 1-3 sessions of the 1064 nm Nd:YAG laser to improve their scars. Therapy completion was determined by patient satisfaction with the appearance of their scars and/or resolution of any contractures that formed following surgery. RESULTS: All ten patients were pleased with the improved appearance of their scars. Four patients saw complete resolution of an ectropion or eclabium that formed secondary to scar contractures from MMS. The side effects of laser treatments were limited to 1-2 hours of erythema, and there were no incidences of adverse effects or recurrence of contractures. CONCLUSION: Our clinical experience with the 1064 nm Nd:YAG laser provides promising data on improving appearance of and functionality from post-surgical scars. Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Male;Mohs Surgery;Treatment Outcome

Bioproduction of gold nanoparticles for photothermal therapy. BACKGROUND: Photothermal response of plasmonic nanomaterials can be utilized for a number of therapeutic applications such as the ablation of solid tumors. METHODS & RESULTS: Gold nanoparticles were prepared using different methods. After optimization, we applied an aqueous plant extract as the reducing and capping agent of gold and maximized the near-infrared absorption (650-900 nm). Resultant nanoparticles showed good biocompatibility when tested in vitro in human keratinocytes and yeast Saccharomyces cerevisiae. Gold nanoparticles were easily activated by controlled temperature with an ultrasonic water bath and application of a pulsed laser. CONCLUSION: These gold nanoparticles can be synthesized with reproducibility, modified with seemingly limitless chemical functional groups, with adequate controlled optical properties for laser phototherapy of tumors and targeted drug delivery. Gold Gold;Hot Temperature;Humans;Keratinocytes;Lasers;Microscopy, Electron;Nanoparticles;Phototherapy;Saccharomyces cerevisiae;Ultrasonic Waves

Effect of Photobiomodulation on Mesenchymal Stem Cells. OBJECTIVE: The purpose of this study was to review available literature about the effect of photobiomodulation (PBM) on mesenchymal stem cells (MSCs). BACKGROUND DATA: The effects of coherent and noncoherent light sources such as low-level lasers and light-emitting diodes (LEDs) on cells and tissues, known as PBM, form the basis of photomedicine. This treatment technique effects cell function, proliferation, and migration, and plays an important role in tissue regeneration. Stem cells have been found to be helpful elements in

tissue regeneration, and the combination of stem cell therapy and laser therapy appears to positively affect treatment results. MATERIALS AND METHODS: An electronic search in PubMed was conducted of publications from the previous 12 years. English language articles related to the subject were found using selected key words. The full texts of potentially suitable articles were assessed according to inclusion and exclusion criteria. RESULTS: After evaluation, 30 articles were deemed relevant according to the inclusion criteria. The energy density of the laser was 0.7-9â€‰J/cm(2). The power used for visible light was 30-110â€‰mW and that used for infrared light was 50-800â€‰mW. Nearly all studies showed that low-level laser therapy had a positive effect on cell proliferation. Similar outcomes were found for LED; however, some studies suggest that the laser alone is not effective, and should be used as an adjunct tool. CONCLUSIONS: PBM has positive effects on MSCs. This review concluded that doses of 0.7-4â€‰J/cm(2) and wavelengths of 600-700â€‰nm are appropriate for light therapy. The results were dependent upon different parameters; therefore, optimization of parameters used in light therapy to obtain favorable results is required to provide more accurate comparison. Animals;Cell Proliferation;Cells, Cultured;Dogs;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice;Radiation Dosage;Wound Healing

Possible alternative therapies for oral lichen planus cases refractory to steroid therapies. Oral lichen planus (OLP) is a chronic inflammatory disorder with a multifactorial etiopathogenesis. Immune dysregulation plays a critical role in the development and progression of this disease. Patients' lives may be affected by pain caused by atrophic-erosive lesions. Given the obscure etiology, treatment is usually symptomatic. Topical steroids remain the mainstay of management. However, their therapeutic benefits are not always evident. There are substantial data on the possible therapeutic strategies that are effective in OLP cases refractory to steroids. This review provides an overview of theÂ current approaches for the management of steroid-refractory OLP. The miscellaneous treatment regimens include tacrolimus, pimecrolimus, thalidomide, low-level laser therapy, photodynamic therapy, and surgical excision. Some results obtained from these studies were promising. However, further studies, especially randomized controlled trials with strict inclusion and exclusion criteria and larger sample sizes, are required for the evaluation of the long-term safety and efficacy of these therapies. Immunosuppressive Agents;Steroids Humans;Immunosuppressive Agents;Lichen Planus, Oral;Low-Level Light Therapy;Oral Surgical Procedures;Photochemotherapy;Steroids

The effect of He-Ne and Ga-Al-As lasers on the healing of oral mucosa in diabetic mice. Delayed wound healing is one of the complications of diabetes mellitus. Low-level laser therapy (LLLT) has been used to accelerate wound healing however the effect of LLLT on the hard palate wound healing in streptozotocin-induced diabetic (STZ-D) mice has not yet been characterized. This study aims to determine the effect of LLLT (He-Ne and Ga-Al-As laser) on the process of wound healing in the hard palate among diabetic and non-diabetic mice. 90 adult male mice were divided into six groups. Type 1 diabetes mellitus was induced in three groups by means of injection of STZ. Of these, one group was irradiated with He-Ne laser (DH group), one with Ga-Al-As laser (DG group) and one did not undergo any LLLT (DC group). The remaining groups were non-diabetic which were allotted to laser therapy with He-Ne laser (NH group) or with Ga-Al-As laser (NG group) or no LLLT (NC group). Five animals from each group were killed on the third, seventh, and fourteenth days after surgery, and biopsies were made for histological analysis. On the 3rd and 7th days after the surgery, the number of polymorphonuclear (PMN) cells in NH, DH, NG, and DG groups was significantly lower than that of the control groups. On the 3rd, 7th and 14th days, the fibroblasts and new blood vessel counts and collagen fibers in diabetic laser treated groups (DG and DH) were significantly higher compared to that of NC, DC, NH and NG groups. On the 7th and 14th days, the fibroblasts and new blood vessel counts and collagen fibers in NH, DH, NG, and DG groups were also significantly higher than that of

the control groups, and the fibroblast and new blood vessel counts and collagen density fibers in NH and DH groups were higher than that of the NG and DG groups. LLLT with He-Ne laser compared to Ga-Al-As laser has a positive healing effect on hard palate gingival wounds in STZ-D mice. Animals;Diabetes Mellitus, Experimental;Lasers;Male;Mice;Mouth Mucosa;Wound Healing

Light-emitting diode therapy (LEDT) improves functional capacity in rats with heart failure. The syndrome of heart failure (HF) promotes central and peripheral dysfunctions that result in functional capacity decrease, leading to fatigue, dyspnea, and exercise intolerance. The use of light-emitting diode therapy (LEDT) has shown good results reducing fatigue and exercise intolerance, when applied on skeletal muscles before or after exercises. Thereby, the aim of this study was to compare the effects of LEDT on functional capacity, aerobic power, and hemodynamic function in HF rats. Male Wistar rats (230-260Â g) were randomly allocated into three experimental groups: Sham (nâ€‰=â€‰6), Control-HF (nâ€‰=â€‰4), and LEDT-HF (nâ€‰=â€‰6). The animals were subjected to an exercise performance test (ET) with gas analysis coupled in a metabolic chamber for rats performed two times (6 and 14Â weeks after myocardial infarction). On the day after the baseline aerobic capacity test, the animals were submitted during 8Â weeks to the phototherapy protocol, five times/week, 60Â s of irradiation, 6Â J delivered per muscle group. Statistical analysis was performed by one- and two-way ANOVAs with repeated measures and Student-Newman-Keuls post hoc tests (pâ€‰â‰¤â€‰0.05). Comparing the percentage difference (Î”) between baseline and the final ET, there was no significant difference for the VO2max variable considering all groups. However, Sham and LEDT-HF groups showed higher relative values than the Control-HF group, respectively, for distance covered (27.7 and 32.5Â %), time of exercise test (17.7 and 20.5Â %), and speed (13.6 and 12.2Â %). In conclusion, LEDT was able to increase the functional capacity evaluated by distance covered, time, and speed of exercise in rats with HF. Animals;Exercise Test;Exercise Tolerance;Heart Failure;Low-Level Light Therapy;Male;Muscle, Skeletal;Physical Conditioning, Animal;Random Allocation;Rats;Rats, Wistar

Effects of Low-Level Laser Therapy Applied Before Treadmill Training on Recovery of Injured Skeletal Muscle in Wistar Rats. OBJECTIVE: The aim of this study was to analyze the effects of low-level laser therapy (LLLT) when associated with treadmill training on the recovery of skeletal muscle, during two periods of rest after muscle injury in rats. BACKGROUND DATA: Because of photostimulation, LLLT has been presented as an alternative for accelerating the tissue healing process. MATERIALS AND METHODS: Forty rats were divided into two groups (A and B) containing four subgroups each: GC (Control Group)-cryolesion untreated; EG (Exercise Group)-cryolesion treated with physical exercise; LG (Laser Group)-cryolesion treated with laser; ELG (Exercise and Laser Group)-cryolesion treated with laser and physical exercise. The right tibialis anterior (TA) of the middle belly was injured by a cooling iron bar (cryoinjury). Group A remained at rest for 3 days, whereas Group B remained at rest for 7 days. The laser parameters utilized were 780â€‰nm with 15â€‰mW average optical power and spot size of 0.04 cm(2) applied during 10â€‰sec, leading to 0.152â€‰J and 3.8â€‰J/cm(2). Treadmill training with and without laser application was performed during 5 days, with each session lasting for 12â€‰min at a velocity of 17â€‰m/min. Subsequently, the TA muscle was removed for a histological and morphometric analysis. RESULTS: The damaged area was significantly smaller for the ELG at both periods of rest, 3 and 7 days, respectively (4.4â€‰Â±â€‰0.42% and 3.5â€‰Â±â€‰0.14%, pâ€‰<â€‰0.05), when compared with the LG (18.6â€‰Â±â€‰0.64% and 7.5â€‰Â±â€‰0.13%), the EG (21â€‰Â±â€‰0.26% and 8.7â€‰Â±â€‰0.32%), and the CG (23.9â€‰Â±â€‰0.37% and 21.4â€‰Â±â€‰0.38%). In addition, the number of blood vessels were significantly higher for the ELG at both periods of rest, 3 and 7 days, respectively (71.2â€‰Â±â€‰13.51 and 104.5â€‰Â±â€‰11.78, pâ€‰<â€‰0.05), when compared with the LG (60.6â€‰Â±â€‰11.25 and 93.5â€‰Â±â€‰16.87), the EG

(51.6â€‰Â±â€‰7.3 and 93.8â€‰Â±â€‰15.1) and the CG (34.4â€‰Â±â€‰2.54 and 65.7â€‰Â±â€‰14.1). CONCLUSIONS: The LLLT applied before the physical exercise on the treadmill stimulated the angiogenesis and accelerated the process of muscle recovery. Animals;Low-Level Light Therapy;Male;Muscle, Skeletal;Physical Conditioning, Animal;Rats;Rats, Wistar;Recovery of Function;Rest;Wound Healing

Photobiomodulation Protects and Promotes Differentiation of C2C12 Myoblast Cells Exposed to Snake Venom. BACKGROUND: Snakebites is a neglected disease and in Brazil is considered a serious health problem, with the majority of the snakebites caused by the genus Bothrops. Antivenom therapy and other first-aid treatments do not reverse local myonecrose which is the main sequel caused by the envenomation. Several studies have shown the effectiveness of low level laser (LLL) therapy in reducing local myonecrosis induced by Bothropic venoms, however the mechanism involved in this effect is unknown. In this in vitro study, we aimed to analyze the effect of LLL irradiation against cytotoxicity induced by Bothrops jararacussu venom on myoblast C2C12 cells. METHODOLOGY: C2C12 were utilized as a model target and were incubated with B. jararacussu venom (12.5 Î¼g/mL) and immediately irradiated with LLL at wavelength of red 685 nm or infrared 830 nm with energy density of 2.0, 4.6 and 7.0 J/cm2. Effects of LLL on cellular responses of venom-induced cytotoxicity were examined, including cell viability, measurement of cell damage and intra and extracellular ATP levels, expression of myogenic regulatory factors, as well as cellular differentiation. RESULTS: In non-irradiated cells, the venom caused a decrease in cell viability and a massive release of LDH and CK levels indicating myonecrosis. Infrared and red laser at all energy densities were able to considerably decrease venom-induced cytotoxicity. Laser irradiation induced myoblasts to differentiate into myotubes and this effect was accompanied by up regulation of MyoD and specially myogenin. Moreover, LLL was able to reduce the extracellular while increased the intracellular ATP content after venom exposure. In addition, no difference in the intensity of cytotoxicity was shown by non-irradiated and irradiated venom. CONCLUSION: LLL irradiation caused a protective effect on C2C12 cells against the cytotoxicity caused by B. jararacussu venom and promotes differentiation of these cells by up regulation of myogenic factors. A modulatory effect of ATP synthesis may be suggested as a possible mechanism mediating cytoprotection observed under laser irradiation. Protective Agents;Snake Venoms;Adenosine Triphosphate Adenosine Triphosphate;Animals;Apoptosis;Blotting, Western;Bothrops;Cell Differentiation;Cell Proliferation;Cells, Cultured;Immunoenzyme Techniques;Low-Level Light Therapy;Mice;Myoblasts;Protective Agents;Snake Venoms

Effects of Photobiomodulation and Mesenchymal Stem Cells on Articular Cartilage Defects in a Rabbit Model. OBJECTIVE: The aim of this study was to evaluate the effectiveness of the application of cultured autologous bone marrow mesenchymal stem cells (BMSCs) with scaffold and low-level laser therapy (LLLT) on the repair of articular cartilage defects in rabbits. BACKGROUND DATA: For healing of the articular cartilage defects, although positive effects of BMSCs and LLLT have been demonstrated, their combination effect is still unknown; therefore, we investigated combining these two techniques has a synergistic effect. MATERIALS AND METHODS: After bone marrow aspiration from 10 rabbits, BMSCs were isolated, cultured in monolayer, suspended on a type I collagen scaffold and then implanted onto a full-thickness osteochondral defect (4â€‰mm in diameter), artificially made on the patellar groove of both knees in the same rabbits. Then a knee was selected randomly in each rabbit as the experimental group, and subjected to Ga-Al-As (810â€‰nm) laser irradiation with energy density of 4â€‰J/cm(2) every other day for 3 weeks. As the control group, the other knee did not receive LLLT. After this period, animals were euthanized and osteochondral defects were evaluated by histomorphometric methods. RESULTS: No significant difference in new cartilage formation and inflammation was found between the groups ($p > 0.05$). However, there was

significantly more new bone formation in the experimental group ($p < 0.05$). CONCLUSIONS: In terms of our research, although better healing in osteochondral defects was seen when combining BMSCs and LLLT compared with the use of BMSCs alone, this improvement was predominantly caused by new bone formation rather than new cartilage formation. Analysis of Variance;Animals;Biopsy, Needle;Bone Marrow Cells;Bone Marrow Transplantation;Cartilage, Articular;Cells, Cultured;Disease Models, Animal;Immunohistochemistry;Knee Joint;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Rabbits;Random Allocation;Regeneration;Treatment Outcome

Effects of low-level laser therapy on bone regeneration of the midpalatal suture after rapid maxillary expansion. This study evaluated the effect of low-level laser therapy (LLLT) on bone regeneration at the midpalatal suture (MPS) after rapid maxillary expansion (RME), using cone beam computed tomography. Fourteen 8-14-year-old patients with transverse maxillary deficiency underwent RME with a Hyrax-type expander activated with one full turn after installation and two half turn daily activations until achieving overcorrection. Patients were randomly assigned to either a control group (RME alone, nâ€‰=â€‰4) or an experimental group (nâ€‰=â€‰10) in which RME was followed by 12 LLLT sessions (GaAlAs, pâ€‰=â€‰70Â mW, Î»â€‰=â€‰780Â nm, Ã˜â€‰=â€‰0.04Â cm(2)). Two tomographic images of the MPS were obtained-T0, after disjunction and T1, after 4Â months. Bone regeneration was evaluated by measuring the optical density (OD) on the tomographic images using InVivo Dental 5.0 software. Data were analyzed by the paired Student's t test (Î±â€‰=â€‰0.05Â %). A statistically significant difference between T0 and T1 OD values was observed in the laser-treated group (pâ€‰=â€‰0.00), but this difference was not significant in the control group (pâ€‰=â€‰0.20). Intergroup comparison of OD values at T1 revealed higher OD in the laser-treated group (pâ€‰=â€‰0.05). In conclusion, LLLT had a positive influence on bone regeneration of the midpalatal suture by accelerating the repair process. Adolescent;Bone Regeneration;Cone-Beam Computed Tomography;Female;Humans;Low-Level Light Therapy;Male;Palatal Expansion Technique;Palate

Titanium scaffold osteogenesis in healthy and osteoporotic rats is improved by the use of low-level laser therapy (GaAlAs). The present study aimed to assess the effects of low-level laser therapy (GaAlAs) on the bone repair process within titanium scaffolds in the femurs of healthy and osteoporotic rats. Fifty-six rats were divided into four groups: group Sh: SHAM animals that received scaffolds; group LSh: SHAM animals that received scaffolds and were subjected to laser therapy; group OV: ovarietomized (OVX) animals that received scaffolds; and group LOV: OVX animals that received scaffolds and were subjected to laser therapy. Thirty days following ovariectomy or sham surgery, scaffolds were implanted in the left femurs of all animals in the study. Immediately after opening the surgical site, the inner part of the surgical cavity was stimulated with low-level laser (GaAlAs). In addition to this procedure, the laser group was also subjected to sessions of low-level laser therapy (LLLT) at 48-h intervals, with the first session performed immediately after surgery. The rats were sacrificed at 2 and 6Â weeks, time in which femur fragments were submitted for histological and histomorphometric examination, and skin tissue above the scaffold was submitted to histological analysis. At the end of the study, greater bone formation was observed in the animals submitted to LLLT. At 2 and 6Â weeks, statistically significant differences were observed between LSh and Sh groups (pâ€‰=â€‰0.009 and 0.0001) and LOV and OV (pâ€‰=â€‰0.0001 and 0.0001), respectively. No statistical difference was observed when assessing the estrogen variable. On the basis of our methodology and results, we conclude that LLLT improves and accelerates bone repair within titanium scaffolds in both ovariectomized and healthy rats, when compared to animals not subjected to radiation. Titanium Animals;Female;Femur;Low-Level Light

Therapy;Osteogenesis;Ovariectomy;Random Allocation;Rats;Rats, Wistar;Tissue Scaffolds;Titanium;Wound Healing

Effect of Er,Cr:YSGG laser on the surface of composite restoratives during in-office tooth bleaching. The aim of this in vitro study was to investigate the effect of Er,Cr:YSGG laser on the surface roughness and microhardness of various composite restoratives during in-office tooth bleaching. Five highly viscous composite restoratives and three flowable composite restoratives were investigated. Thirty cylindrical specimens of each material were made using Teflon molds. The specimens of each composite were randomly divided into three groups (nâ€‰=â€‰10). Group 1 specimens did not receive bleaching treatment, group 2 received a conventional in-office bleaching treatment, and group 3 received a laser-assisted in-office bleaching treatment using an Er,Cr:YSGG laser. Two-way ANOVA was used to determine significant interactions between materials and bleaching methods. One-way ANOVA and Tukey's post hoc test were used to compare the mean surface microhardness and roughness between materials for each treatment group (aâ€‰=â€‰0.05). Îžhere were no significant differences in surface microhardness between the two bleached experimental groups for all the tested composites (pâ€‰>â€‰0.05). The reduction of surface microhardness after bleaching procedures ranged from 0.72 to 16.93Â % for the specimens received conventional treatment and from 1.30 to 11.51Â % for those received laser-assisted treatment. Moreover, there were no significant differences in Ra values between the experimental groups (pâ€‰>â€‰0.05) in all cases. The increase of surface roughness after the bleaching treatments was negligible and was between 0.43 and 4.78Â %. The use of Er,Cr:YSGG laser during in-office tooth bleaching treatment did not affect the surface microhardness and roughness of the tested composite restorative materials. Composite Resins;Dental Materials;flowable hybrid composite Composite Resins;Dental Materials;Lasers, Solid-State;Low-Level Light Therapy;Surface Properties;Tooth Bleaching

Light-Emitting Diode Phototherapy Reduces Nocifensive Behavior Induced by Thermal and Chemical Noxious Stimuli in Mice: Evidence for the Involvement of Capsaicin-Sensitive Central Afferent Fibers. Low-intensity phototherapy using light fonts, like light-emitting diode (LED), in the red to infrared spectrum is a promising alternative for the treatment of pain. However, the underlying mechanisms by which LED phototherapy reduces acute pain are not yet well understood. This study investigated the analgesic effect of multisource LED phototherapy on the acute nocifensive behavior of mice induced by thermal and chemical noxious stimuli. The involvement of central afferent C fibers sensitive to capsaicin in this effect was also investigated. Mice exposed to multisource LED (output power 234, 390, or 780Â mW and power density 10.4, 17.3, and 34.6Â mW/cm(2), respectively, from 10 to 30Â min of stimulation with a wavelength of 890Â nm) showed rapid and significant reductions in formalin- and acetic acid-induced nocifensive behavior. This effect gradually reduced but remained significant for up to 7Â h after LED treatment in the last model used. Moreover, LED (390Â mW, 17.3Â mW/cm(2)/20Â min) irradiation also reduced nocifensive behavior in mice due to chemical [endogenous (i.e., glutamate, prostaglandins, and bradykinin) or exogenous (i.e., formalin, acetic acid, TRPs and ASIC agonist, and protein kinase A and C activators)] and thermal (hot plate test) stimuli. Finally, ablating central afferent C fibers abolished LED analgesia. These experimental results indicate that LED phototherapy reduces the acute painful behavior of animals caused by chemical and thermal stimuli and that LED analgesia depends on the integrity of central afferent C fibers sensitive to capsaicin. These findings provide new information regarding the underlying mechanism by which LED phototherapy reduces acute pain. Thus, LED phototherapy may be an important tool for the management of acute pain. Acid Sensing Ion Channels;Transient Receptor Potential Channels;Formaldehyde;Protein Kinase C;Adenylyl Cyclases;Acetic Acid;Capsaicin Acetic Acid;Acid Sensing Ion Channels;Adenylyl Cyclases;Afferent Pathways;Analgesia;Animals;Behavior,

Animal;Capsaicin;Edema;Female;Formaldehyde;Hot Temperature;Light;Mice;Phototherapy;Protein Kinase C;Reflex;Transient Receptor Potential Channels

An in vitro method to test the safety and efficacy of low-level laser therapy (LLLT) in the healing of a canine skin model. BACKGROUND: Low-level laser therapy (LLLT) has been used clinically as a treatment modality for a variety of medical conditions including wound-healing processes. It is an attractive and emerging method to enhance wound healing and improve clinical outcomes both in human and veterinary medicine. Despite the fact that the use of LLLT continues to gain in popularity, there is no universally accepted theory that defends all its cellular effects and beneficial biological processes in tissue repair. The present study was designed to evaluate the effect of LLLT on cellular migration and proliferation of cultured canine epidermal keratinocytes (CPEK) in an in vitro wound healing model. RESULTS: Keratinocyte migration and proliferation were assessed using a scratch migration assay and a proliferation assay, respectively. Fifteen independent replicates were performed for each assay. Canine epidermal keratinocyte cells exposed to LLLT with 0.1, 0.2, and 1.2 J/cm(2) migrated significantly more rapidly ($p < 0.03$) and showed significantly higher rates of proliferation ($p < 0.0001$) compared to non-irradiated cells cultured in the same medium and cells exposed to the higher energy dose of 10 J/cm(2). Irradiation with 10 J/cm(2) was characterized by decreased cellular migration and proliferation. These results revealed that LLLT has a measurable, dose-dependent effect on two different aspects of keratinocyte biology in vitro. CONCLUSION: In this in vitro wound-healing model, LLLT increased cellular migration and proliferation at doses of 0.1, 0.2, and 1.2 J/cm(2) while exposure to 10 J/cm(2) decreased cellular migration and proliferation. These data suggest that the beneficial effects of LLLT in vivo may be due, in part, to effects on keratinocyte behavior. Animals;Cell Movement;Cell Proliferation;Cells, Cultured;Dogs;Keratinocytes;Low-Level Light Therapy;Single-Blind Method;Skin;Wound Healing

Is Low-Level Laser Therapy Effective in the Management of Pain and Swelling After Mandibular Third Molar Surgery? PURPOSE: This study evaluated the effect of low-level laser therapy (LLLT) on decreasing pain and swelling after removal of impacted third molars. PATIENTS AND METHODS: This randomized, double-blinded, split-mouth study included patients presenting 2 symmetrically impacted mandibular third molars. In each participant, one side was randomly assigned to laser treatment and the other side received placebo. LLLT was performed by intraoral application of a 660-nm laser (200Â mW, 6Â J per point at 4 points) followed by extraoral application of an 810-nm laser (200Â mW, 6Â J per point at 3 points). Irradiation at the 810-nm wavelength was repeated on days 2 and 4 after surgery. On the control side, the treatment protocol was similar to the experimental side, but with laser simulation. The main outcomes were the degree of pain during the next 7Â days and the edema coefficients on days 2, 4, and 7 after surgery. Data were analyzed using generalized linear models to determine the effect of group and time on pain level and edema coefficients. RESULTS: The final sample consisted of 40 patients. Pain level was significantly lower in the laser than in the placebo side at all time points during the experiment ($P < .05$). Swelling was significantly lower in the laser than in the placebo group on days 2, 4, and 7 after surgery ($P < .05$). CONCLUSION: LLLT proved effective in decreasing the intensity of pain and swelling after removal of impacted third molars and can be recommended to alleviate patients' symptoms after surgery. Double-Blind Method;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain Management;Pain Measurement;Pain, Postoperative;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Young Adult

Photobiomodulation Therapy Improves Performance and Accelerates Recovery of High-Level Rugby Players in Field Test: A Randomized, Crossover, Double-Blind, Placebo-Controlled Clinical Study. Pinto, HD, Vanin, AA, Miranda, EF, Tomazoni, SS, Johnson, DS, Albuquerque-Pontes, GM, de Oliveira Aleixo Junior, I, Grandinetti, VdS, Casalechi, HL, de Tarso Camillo de Carvalho, P, and Pinto Leal Junior.

Photobiomodulation therapy improves performance and accelerates recovery of high-level rugby players in field test: A randomized, crossover, double-blind, placebo-controlled clinical study. J Strength Cond Res 30(12): 3329-3338, 2016-Although growing evidence supports the use of photobiomodulation therapy (PBMT) for performance and recovery enhancement, there have only been laboratory-controlled studies. Therefore, the aim of this study was to analyze the effects of PBMT in performance and recovery of high-level rugby players during an anaerobic field test. Twelve male high-level rugby athletes were recruited in this randomized, crossover, double-blinded, placebo-controlled trial. No interventions were performed before the Bangsbo sprint test (BST) at familiarization phase (week 1); at weeks 2 and 3, pre-exercise PBMT or placebo were randomly applied to each athlete. Photobiomodulation therapy irradiation was performed at 17 sites of each lower limb, employing a cluster with 12 diodes (4 laser diodes of 905 nm, 4 light emitting diodes [LEDs] of 875 nm, and 4 LEDs of 640 nm, 30 J per site, manufactured by Multi Radiance Medical). Average time of sprints, best time of sprints, and fatigue index were obtained from BST. Blood lactate levels were assessed at baseline, and at 3, 10, 30, and 60 minutes after BST. Athletes' perceived fatigue was also assessed through a questionnaire. Photobiomodulation therapy significantly (p â‰¤ 0.05) improved the average time of sprints and fatigue index in BST. Photobiomodulation therapy significantly decreased percentage of change in blood lactate levels (p â‰¤ 0.05) and perceived fatigue (p â‰¤ 0.05). Pre-exercise PBMT with the combination of super-pulsed laser (low-level laser), red LEDs, and infrared LEDs can enhance performance and accelerate recovery of high-level rugby players in field test. This opens a new avenue for wide use of PBMT in real clinical practice in sports settings. Lactic Acid Adult;Athletic Performance;Cross-Over Studies;Double-Blind Method;Fatigue;Football;Humans;Lactic Acid;Low-Level Light Therapy;Lower Extremity;Male;Muscle Fatigue;Muscle, Skeletal;Physical Exertion;Recovery of Function;Running;Young Adult

Managing chronic oedema in a patient with arterial disease and leg ulceration. Treating lymphoedema in patients with critical arterial disease can be contraindicated. This case study describes current methods of managing lymphoedema in a patient with arterial disease and leg ulcers. The patient, a 65-year-old male, had paraplegia and lower-limb lymphoedema with leg ulceration for 18 years, as well as arterial disease. The patient was referred to the lymphoedema/vascular service in 2013. Duplex ultrasound indicated superficial femoral occlusion. The arterial disease was treated with an angiogram and angioplasty, and when the blood supply was improved, the lymphoedema was treated. Emphasis was placed on self-care and reducing the need for community nurse involvement. Selfcare included compression bandaging, use of FarrowWrap, low-level light therapy, and ulcer dressings. Outcomes were measured using a telemedicine software programme. The patient's lymphoedema was reduced, leg ulcers healed, and quality of life transformed. Arterial Occlusive Diseases;Chronic Disease;Humans;Leg Ulcer;Lymphedema;Male;Middle Aged;Wound Healing

The effect of laser and botulinum toxin in the treatment of myofascial pain and mouth opening: A randomized clinical trial. This study conducted a randomized clinical trial in 15 patients, who sought care at the Dental Clinic of the University of Passo Fundo, in order to compare the use of low-level laser and botulinum toxin in the treatment of myofascial pain and whether they alter the mouth opening of patients with temporomandibular disorder. The patients were divided into two groups: the Laser group received low-level GaAlAs laser, 100mW of power at a wavelength of 830nm in continuous light emission; and the Toxin group received 30U of botulinum toxin type A (BTX-A) in the first session, and 15U after fifteen days. The assessments were performed by measuring pain with Visual Analogue Scale (VAS), and mouth opening with a digital caliper. Data were submitted to Student's t test at 5% significance level. Regarding pain symptoms, the results indicate that groups treated with laser and toxin registered 7U in VAS, at day 5 the scores were 4.75 and 4.86U,

respectively. The laser worked faster (day 12) at 2.75U, and the group treated with BTX-A registered 2.86U at day 30. Both therapies investigated were effective in reducing pain, but the effect of low-level laser was faster than the use of BTX-A. Both treatments showed no statistically significant improvement in mouth opening. Botulinum Toxins Adult;Botulinum Toxins;Female;Humans;Lasers;Male;Myofascial Pain Syndromes;Trismus

Light emitting diode mediated photobiomodulation therapy improves orthodontic tooth movement and miniscrew stability: A randomized controlled clinical trial. BACKGROUND AND OBJECTIVES: The aim of this study was to evaluate the effects of light-emitting diode-mediated-photobiomodulation therapy (LPT) on the stability of miniscrews, rate of orthodontic tooth movement, and interleukin-1Î² levels in gingival and peri-implant crevicular fluid. MATERIALS AND METHODS: This study was a double blind, randomized placebo/control matched pairs clinical trial to test the efficacy of LPT. This split-mouth design study consisted of 20 patients (13 girls, 7 boys). The eligibility criteria included patients who had extraction of maxillary first premolars. Mini-screws were placed between maxillary first molars and second premolars on both sides as anchorage units. LPT was applied with an energy density of 20â€‰mW/cm(2) over a period of 21 successive days (20 minutes per day) over the movement of canine teeth on the test side and using a pseudo application on the placebo side. The main outcome of this study was to assess effect of LPT on the rate of orthodontic tooth movement. The secondary outcomes were measuring stability of miniscrews and interleukin-1Î² levels in gingival and peri-implant crevicular fluid after LPT. Randomization was accomplished with random LPT application side selection by coin toss. Measurements were made by blinding clinicians. Blinding of the patients was achieved using the same LPT device on both sides but irradiating only one side. For statistical comparison, paired samples t-test and one-way analysis of variance (ANOVA) were used at Pâ€‰<â€‰0.05 level. RESULTS: Miniscrew stability was similar between control and LPT groups at baseline (T0) and the 1st month (T1). However, miniscrew stability was significantly increased in the LPT group in 2nd (T2) and 3rd (T3) months. Comparison of tooth movement during three different time intervals (T1-T0, T2-T1, and T3-T2) revealed that statistically significantly increased in every time intervals after LPT. No statistically significant change was detected in the IL-1Î² levels between groups. CONCLUSION: LPT had the potential of accelerating orthodontic tooth movement and had a positive effect on miniscrew stability. Lasers Surg. Med. 48:936-943, 2016. Â© 2016 Wiley Periodicals, Inc. Biomarkers;Interleukin-1beta Adolescent;Biomarkers;Bone Screws;Double-Blind Method;Female;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Outcome Assessment, Health Care;Tooth Movement Techniques;Young Adult

Treatment of oral mucositis due to chemotherapy. INTRODUCTION: The management of oral mucositis is a challenge, due to its complex biological nature. Over the last 10 years, different strategies have been developed for the management of oral mucositis caused by chemotherapy in cancer patients. MATERIAL AND METHODS: An exhaustive search was made of the PubMed-Medline, Cochrane Library and Scopus databases, crossing the key words "oral mucositis", "prevention" and "treatment" with the terms "chemotherapy" and "radiotherapy" by means of the boolean operators "AND" and "NOT". A total of 268 articles were obtained, of which 96 met the inclusion criteria. RESULTS: Several interventions for the prevention of oral mucositis, such as oral hygiene protocols, amifostine, benzidamine, calcium phosphate, cryotherapy and iseganan, among others, were found to yield only limited benefits. Other studies have reported a decrease in the appearance and severity of mucositis with the use of cytoprotectors (sucralfate, oral glutamine, hyaluronic acid), growth factors, topical polyvinylpyrrolidone, and low power laser irradiation. CONCLUSIONS: Very few interventions of confirmed efficacy are available for the management of oral mucositis due to chemotherapy. However, according to the reviewed literature, the use of palifermin, cryotherapy and

low power laser offers benefits, reducing the incidence and severity of oral mucositis - though further studies are needed to confirm the results obtained. KEY WORDS: Chemotherapy-Induced Oral Mucositis Treatment.

Immediate pain relief effect of low level laser therapy for sports injuries: Randomized, double-blind placebo clinical trial. OBJECTIVES: To determine the immediate pain relief effect of low-level laser therapy on sports injuries in athletes and degree of pain relief by the therapy. DESIGN: Double-blind, randomized, comparative clinical study. METHODS: Participants were 32 college athletes with motion pain at a defined site. Participants were randomized into two groups in which the tested or placebo laser therapy was administered to determine pain intensity from painful action before and after laser irradiation, using the Modified Numerical Rating Scale. The post-therapeutic Modified Numerical Rating Scale score was subtracted from the pre-therapeutic Modified Numerical Rating Scale score to determine pain intensity difference, and the rate of pain intensity difference to pre-therapeutic Modified Numerical Rating Scale was calculated as pain relief rate. RESULTS: Low-level laser therapy was effective in 75% of the laser group, whereas it was not effective in the placebo group, indicating a significant difference in favor of the laser group ($p<0.001$). Pain relief rate was significantly higher in the laser group than in the placebo group (36.94% vs. 8.20%, respectively, $p<0.001$), with the difference in pain relief rate being 28.74%. CONCLUSIONS: Low-level laser therapy provided an immediate pain relief effect, reducing pain by 28.74%. It was effective for pain relief in 75% of participants. Adult;Athletic Injuries;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain Management;Pain Measurement;Treatment Outcome;Young Adult

[Pathogenetic effects of low-intensity laser therapy for chronic obstructive pulmonary disease]. AIM: To study the impact of low-intensity laser therapy (LILT) on typical pathological processes of impairments in platelet aggregation and microcirculation (MC) in patients with chronic obstructive pulmonary disease (COPD). MATERIALS AND METHODS: A photo optical aggregatometric method was used to investigate platelet aggregation function in patients with COPD and MC was estimated by laser Doppler flowmetry over time. RESULTS: There were muitidirectional changes in platelet aggregation function with a predominance of hyperaggregation, as well as a significant improvement in aggregation indicators during LILT; the latter was shown to have a correcting impact on MC disorders in patients with COPD in the presence of the spastic and stagnant-stasic types of MC, which were prevalent in the majority of patients. CONCLUSION: Laser therapy used in the combination treatment of patients with COPD promotes correction of the typical pathological processes. Aged;Combined Modality Therapy;Female;Humans;Laser-Doppler Flowmetry;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Outcome Assessment, Health Care;Platelet Aggregation;Pulmonary Disease, Chronic Obstructive

Bisphosphonate-related osteonecrosis of the jaw: a review of the potential efficacy of low-level laser therapy. Osteonecrosis of the jaw (ONJ) resulting from administration of bisphosphonates (BP) or denosumab is a rare but severe complication in cancer patients. Complete remission depends on the stage of ONJ; it can be estimated in the range of 20-30Â %. Low-level laser therapy (LLLT) is a logical additional option, as it has been recognized effective for the management of chemotherapy and/or radiotherapy-induced mucositis. LLLT irradiation has anti-inflammatory actions and thus can help to control pain, as well as biostimulating properties with favorable actions on bacterial control and wound healing. We review the results of seven published studies of LLLT in BP-associated ONJ. LLLT results in an overall response rate of 55Â % superior to that observed in controls (30Â %). Our review suggests that there might be an advantage to add LLLT to the "classical" management of ONJ. This therapy is easy to administer and is not associated with any known side effects. Further research is needed to remove any doubt of protection or enhancement of carcinogenic processes. We believe that prospective well-controlled studies of LLLT in ONJ are warranted. If the positive results are

confirmed, it would represent a great improvement for the quality of life of many patients. Bisphosphonate-Associated Osteonecrosis of the Jaw;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Quality of Life

Efficacy of laser therapy in the management of bisphosphonate-related osteonecrosis of the jaw (BRONJ): a systematic review. Bisphosphonate-related osteonecrosis of the jaw is a well-known potential side effect of long-term bisphosphonate therapy; the primary objective of the treatment should be to improve patient quality of life through pain and infection management, to prevent the development of new lesions, and to slow disease progression. In recent years, the use of laser for bisphosphonate-related osteonecrosis of the jaw has become more widespread, due to its use of administration and widely reported beneficial effects on tissue healing. The present systematic review of the literature sought to elucidate whether low-level laser therapy has positive effects on the treatment of bisphosphonate-related osteonecrosis of the jaw. We conducted a systematic search of the PubMed, EMBASE, and Cochrane Library electronic databases, with no restrictions on language or year of publication. Search strategies were formulated using keywords and Boolean operators. The electronic search strategy retrieved 55 records. From 55 articles, 16 were selected for full-text review, and of these, 10 were ultimately included for data analysis in this review. Our findings show that treatment modalities including laser were associated with superior outcomes in terms of cure or improvement of bisphosphonate-related osteonecrosis of the jaw lesions as compared with conventional surgical and/or conservative drug therapy. It can be concluded that combined treatment with antibiotics, minimally invasive surgery (including Er:YAG laser surgery), and low-level laser therapy in the early stages of the disease should be the gold standard for bisphosphonate-related osteonecrosis of the jaw management. Anti-Bacterial Agents Anti-Bacterial Agents;Bisphosphonate-Associated Osteonecrosis of the Jaw;Combined Modality Therapy;Conservative Treatment;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Quality of Life

Morphology, proliferation, and gene expression of gingival fibroblasts on Laser-Lok, titanium, and zirconia surfaces. Soft tissue seal plays a critical role in long-term success of dental implants, and the effects of implant surface treatments such as laser ablation have been a topic of particular interest in this respect. Considering the existing controversy regarding soft tissue behavior in contact with implant surfaces, this study sought to assess the morphology, proliferation, and gene expression of human gingival fibroblasts (HGFs) on different abutment surfaces. In this in vitro, experimental study, HGFs were cultured on 45 discs (Laser-Lok, titanium, and zirconia). Cell morphology, proliferation rate, and interleukin 10 (IL-10), tumor necrosis factor alpha (TNFÎ±), fibronectin, and integrin gene expressions were assessed by electron microscopy, methyl thiazol tetrazolium (MTT) assay, and real-time polymerase chain reaction (PCR), respectively. Data were analyzed using ANOVA and the Kruskal-Wallis H test. Fibroblast attachment was noted in all the three groups. Spindle-shaped cells with pseudopod-like processes were more frequently seen in the Laser-Lok group. Cell proliferation was significantly higher in the Laser-Lok group compared to those in the other groups (Pâ€‰=â€‰0.0002). Significant differences were found in the expression of IL-10, TNFÎ±, fibronectin, and integrin genes among the groups (Pâ€‰<â€‰0.01). Within the limitations of this study, HGFs on Laser-Lok surfaces had a more mature morphology and greater proliferation and differentiation as compared to those on zirconia and titanium surfaces. This indicates better attachment of these cells to laser-modified surfaces, creating a more efficient soft tissue seal around dental implants. Dental Implants;FN1 protein, human;Fibronectins;Zirconium;Titanium;zirconium oxide Cell Proliferation;Cells, Cultured;Dental Implants;Fibroblasts;Fibronectins;Gene Expression;Gingiva;Humans;Low-Level Light Therapy;Real-Time Polymerase Chain Reaction;Surface Properties;Titanium;Zirconium

Are Passive Physical Modalities Effective for the Management of Common Soft Tissue Injuries of the Elbow?: A Systematic Review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. OBJECTIVE: To evaluate the effectiveness of passive physical modalities for the management of soft tissue injuries of the elbow. METHODS: We systematically searched MEDLINE, EMBASE, CINAHL, PsycINFO, and Cochrane Central Register of Controlled Trials from 1990 to 2015. Studies meeting our selection criteria were eligible for critical appraisal. Random pairs of independent reviewers critically appraised eligible studies using the Scottish Intercollegiate Guidelines Network criteria. We included studies with a low risk of bias in our best evidence synthesis. RESULTS: We screened 6618 articles; 21 were eligible for critical appraisal and 9 (reporting on 8 randomized controlled trials) had a low risk of bias. All randomized controlled trials with a low risk of bias focused on lateral epicondylitis. We found that adding transcutaneous electrical nerve stimulation to primary care does not improve the outcome of patients with lateral epicondylitis. We found inconclusive evidence for the effectiveness of: (1) an elbow brace for managing lateral epicondylitis of variable duration; and (2) shockwave therapy or low-level laser therapy for persistent lateral epicondylitis. DISCUSSION: Our review suggests that transcutaneous electrical nerve stimulation provides no added benefit to patients with lateral epicondylitis. The effectiveness of an elbow brace, shockwave therapy, or low-level laser therapy for the treatment of lateral epicondylitis is inconclusive. We found little evidence to inform the use of passive physical modalities for the management of elbow soft tissue injuries. Disease Management;Humans;Physical Therapy Modalities;Soft Tissue Injuries;Systematic Reviews as Topic;Tennis Elbow;Elbow Injuries

Efficiency of low-level laser therapy within induced dental movement: A systematic review and meta-analysis. The low level laser is widely used in Dentistry, in particular, to decrease pain and increase the speed of tooth movement. This study was to perform a systematic literature search to investigate the effectiveness of low level laser and low energy density therapy of the induced tooth movement. This research was performed following the PRISMA instructions and was registered in the PROSPERO. The articles were searched in six electronic databases, with no date and language restriction. Only randomized clinical trials were selected. Articles that did not use the extraction of first premolars as orthodontic planning were excluded, as well as articles using high energy density laser therapy. The articles were assessed for risk of bias and individual quality. The results were analyzed using meta-analysis, using randomized effect. The initial sample consisted of 161 articles. Six articles remained eligible for qualitative analysis and five for quantitative analysis. According to the individual quality, most articles were classified as high quality. Three articles detected statistically significant differences in induced movement by comparing the orthodontic movement between the experimental and control groups. For the maxilla, there was a statistically significant influence of the laser in three months and, for the mandible, in one month. It may be concluded that there is no evidence that laser therapy can accelerate the induced tooth movement. Humans;Low-Level Light Therapy;Tooth Movement Techniques

The effectiveness of 1,064-nm long-pulsed Nd:YAG laser in the treatment of severe onychomycosis. INTRODUCTION: Severe onychomycosis in the elderly is a common condition and generally difficult to treat. Long-pulsed Nd:YAG (LPNY) laser has been found to be useful in the treatment of onychomycosis. We sought to evaluate the effectiveness of 1,064-nm LPNY laser in the treatment of severe onychomycosis. MATERIALS AND METHODS: Forty nails in 13 patients with severe onychomycosis were divided into two groups. Each group received eight treatment sessions at one-week intervals with 1,064-nm LPNY laser. Parameters for group A were 0.3 ms pulse duration, 5 mm spot size, 16 J/cm(2) fluence, and 10 Hz frequency, and those for group B were 0.6 ms, 2 mm, 225 J/cm(2), and 5 Hz. Clinical and mycological clearance were evaluated at 12 and 24 weeks after initial treatment. RESULTS: Clinical improvements at 12 and 24 weeks presented 47.6 and 57.1% in group A,

and 26.3 and 36.8% in group B. In the treated nails with clinical improvement, mycological positive rates at 24 weeks were approximately 40% in both groups. DISCUSSION: The treatment of onychomycosis using 1,064-nm LPNY laser were incomplete in clinical and mycological improvement, and it could imply a lot of potential recurrence. We suggest that 1,064-nm LPNY laser for severe onychomycosis should need additional or combined therapy with other therapeutic options. Adult;Female;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nails;Onychomycosis;Patient Satisfaction;Treatment Outcome

Pre-odontoblast proliferation induced by near-infrared laser stimulation. OBJECTIVE: Laser therapy is known to stimulate cell proliferation and differentiation, an effect called "biostimulation". Although many clinical applications of laser therapy take advantage from such positive effect, the underlying molecular mechanisms are not fully understood. The aim of this work was to investigate the effect of near-infrared laser stimulation on rat pre-odontoblast cells (MDPC-23 cells) and the molecular mechanism/s involved. MATERIALS AND METHODS: MDPC-23 cells were stimulated with a near-infrared (980 nm) laser source with different energy settings (1-50 J, corresponding to 0.65-32.47 J/cm2) and cell proliferation was evaluated by manual count. ERK 1/2 pathway activation was evaluated by Western blot analysis. RESULTS: 1-10 J stimulation (corresponding to 0.65-6.5 J/cm2) significantly increase MDPC-23 cell proliferation and such effect seems to be mediated by ERK 1/2 signalling pathway activation, showing a key role of ERK 1/2 pathway in mediating the proliferative response induced by laser stimulation. CONCLUSIONS: Near infrared laser stimulation with low energies (1-10 J) is able to increase cell proliferation through ERK 1/2 signalling pathway activation. At the same time, higher energy stimulation (25-50 J) induces an initial toxic effect, probably activating pro-apoptotic signalling molecules, downstream ERK 1/2 kinase. Such results foster the application of this therapeutic approach in different clinical settings in which a regenerative tissue response is needed. Animals;Cell Differentiation;Cell Line;Cell Proliferation;Low-Level Light Therapy;MAP Kinase Signaling System;Odontoblasts;Rats

Clinical Efficacy of Fluoride Varnish and Low-Level Laser Radiation in Treating Dentin Hypersensitivity. The objective of this study was to compare the efficacy of fluoride varnish (Fluorniz(r)) and irradiation with a gallium-arsenide-aluminum diode laser in the treatment of cervical dentin hypersensitivity. Cervical dentin hypersensitivity (CDH) is a painful condition that is highly prevalent in the world's adult population, with one in six patients presenting this symptom. Eighty-six teeth were divided into two groups: Group 1, teeth treated with Fluorniz; Group 2, teeth irradiated with a GaAlAs laser at a 4 J/cm2 dose. The two treatments were applied to the buccal cervical region in four sessions, at intervals of 72 to 96 h. The response of the patient to tactile and thermal-evaporative stimuli was rated on a visual analog scale. The results showed a reduction of hypersensitivity in response to tactile and thermal-evaporative stimulation at the end of treatment in both groups. In conclusion, short-term treatment with Fluorniz was found to be more effective than low-level laser radiation in reducing cervical dentin hypersensitivity. Fluorides Dentin Sensitivity;Fluorides;Humans;Low-Level Light Therapy

Control of hair growth using long-pulsed alexandrite laser is an efficient and cost effective therapy for patients suffering from recurrent pilonidal disease. Pilonidal sinus (PNS) and its surgical management have a profound impact on hospital resources in terms of finances and productive man-hours. Surgical treatment has been the mainstay of treatment of both acute and chronic pilonidal sinus but recurrence is common. The control of hair growth in the sinus region plays an important role in preventing recurrence. Here, we discuss our experience of treating 19 patients suffering from recurrent pilonidal sinus with laser depilation and its long-term cost effectiveness. This is a retrospective study on patients who had recurrence of pilonidal sinus following multiple surgical treatments. They were treated using long-pulsed alexandrite laser for depilation in the sinus area, an

outpatient procedure. Their clinical characteristics and outcomes were then evaluated. There was a significant reduction in hair density after laser treatment (pâ€‰<â€‰0.001). The disease-free period after laser treatment was significantly longer than that one after surgical treatment (pâ€‰<â€‰0.001). The average cost of repeated surgical treatment per disease-free month was significantly higher than that of laser treatmentÂ (pâ€‰<â€‰0.001). Evidence suggests the role of natal cleft hair growth in the evolution of the pilonidal disease; therefore, control of hair growth should be considered as an adjunct to the initial treatment via surgery. Compared to surgical treatment of recurrences, laser depilation is an efficient and cost-effective method of preventing recurrence and reducing morbidity and loss of man-hours. We suggest that laser depilation of the pilonidal sinus should be funded by clinical commissioning groups. alexandrite;Beryllium Adolescent;Adult;Beryllium;Child;Child, Preschool;Chronic Disease;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pilonidal Sinus;Recurrence;Retrospective Studies;Young Adult

Light-emitting diode therapy reduces persistent inflammatory pain: Role of interleukin 10 and antioxidant enzymes. BACKGROUND: During the last decades, the use of light-emitting diode therapy (LEDT) has increased significantly for the treatment of wound healing, analgesia and inflammatory processes. Nevertheless, scientific data on the mechanisms responsible for the therapeutic effect of LEDT are still insufficient. Thus, this study investigated the analgesic, anti-inflammatory and anti-oxidative effect of LEDT in the model of chronic inflammatory hyperalgesia. EXPERIMENTAL PROCEDURES: Mice injected with Complete Freund's Adjuvant (CFA) underwent behavioral, i.e. mechanical and hot hyperalgesia; determination of cytokine levels (tumor necrosis factor-alpha (TNF-Î±), interleukin-1 beta (IL-1Î²), IL-10), oxidative stress markers (protein carbonyls and thiobarbituric acid reactive species (TBARS)) and antioxidant enzymes (catalase (CAT) and superoxide dismutase (SOD)). Additionally, mice were pretreated with either naloxone or fucoidin and mechanical hyperalgesia was assessed. RESULTS: LEDT inhibited mechanical and thermal hyperalgesia induced by CFA injection. LEDT did not reduce paw edema, neither influenced the levels of TNF-Î± and IL1-Î²; although it increased the levels of IL-10. LEDT significantly prevented TBARS increase in both acute and chronic phases post-CFA injection; whereas protein carbonyl levels were reduced only in the acute phase. LEDT induced an increase in both SOD and CAT activity, with effects observable in the acute but not in the chronic. And finally, pre-administration of naloxone or fucoidin prevented LEDT analgesic effect. CONCLUSIONS: These data contribute to the understanding of the neurobiological mechanisms involved in the therapeutic effect of LEDT as well as provides additional support for its use in the treatment of painful conditions of inflammatory etiology. Antioxidants;IL10 protein, mouse;IL1B protein, mouse;Interleukin-1beta;Thiobarbituric Acid Reactive Substances;Tumor Necrosis Factor-alpha;Interleukin-10;Freund's Adjuvant;Catalase;Superoxide Dismutase Animals;Antioxidants;Catalase;Disease Models, Animal;Freund's Adjuvant;Hot Temperature;Hyperalgesia;Inflammation;Interleukin-10;Interleukin-1beta;Male;Mice;Oxidative Stress;Pain;Pain Management;Phototherapy;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances;Touch;Treatment Outcome;Tumor Necrosis Factor-alpha

Editorial. Acne Vulgaris;Combined Modality Therapy;Hyperpigmentation;Low-Level Light Therapy;Rejuvenation;Skin

The Efficacy and Safety of Fractional COâ,, Laser Combined with Topical Type A Botulinum Toxin for Facial Rejuvenation: A Randomized Controlled Split-Face Study. OBJECTIVE: We evaluated synergistic efficacy and safety of combined topical application of Botulinum Toxin Type A (BTX-A) with fractional CO2 laser for facial rejuvenation. METHODS: Twenty female subjects were included for this split-face comparative study. One side of each subject's cheek was treated with fractional CO2 plus saline solution, and the other side was treated with fractional CO2 laser plus topical application of

BTX-A. Patients received one session of treatment and evaluations were done at baseline, one, four, and twelve weeks after treatment. The outcome assessments included subjective satisfaction scale; blinded clinical assessment; and the biophysical parameters of roughness, elasticity, skin hydration, transepidermal water loss (TEWL), and the erythema and melanin index. RESULTS: BTX-A combined with fractional CO2 laser sides showed higher physician's global assessment score, subject satisfaction score, roughness, skin hydration, and skin elasticity compared to that of fractional CO2 plus saline solution side at 12 weeks after treatment. TEWL and erythema and melanin index showed no significant differences between two sides at baseline, one, four, and twelve weeks after treatment. CONCLUSION: Topical application of BTX-A could enhance the rejuvenation effect of fractional CO2 laser. Melanins;Botulinum Toxins, Type A Administration, Topical;Adult;Botulinum Toxins, Type A;Cosmetic Techniques;Elasticity;Erythema;Face;Female;Humans;Low-Level Light Therapy;Melanins;Middle Aged;Pilot Projects;Skin;Water Loss, Insensible

An ex vivo study of photobiostimulation in the treatment of skin pathologies. Photodynamic therapy (PDT) and low level laser therapy (LLLT) may mutually improve the outcomes on the healing process of chronic wounds and other skin pathologies, through processes known to stimulate the proliferation of dermal cellular structures, as well as antimicrobial application. This study proposes the use of nanoemulsion containing aluminium phthalocyanine chloride (ClAlPc) as photosensitizer (PS), to establish the most appropriate protocol for photostimulation in human skin biopsies, associated to type I collagen and elastin production. The combined effect of PS and light (diode laser at 670Â nm) at three different doses is compared to the effect of light itself at doses of 70, 140 and 700Â mJÂ Ä‹Â cm(-2) , 7 and 14 days after irradiation. Histological analysis reveals the increase in collagen and elastin, higher than 20%, 14 days after treatment with PS and light at 140Â mJÂ Ä‹Â cm(-2) . Higher doses of light promote an inhibitory effect, leading to tissue degradation. In addition, the expression levels of the enzymes MMP-2 and MMP-9 (Gelatinases A and B - participant in various processes including tumoral progression and wound healing) are detected by gelatin zymography, reinforcing the efficacy of the combined treatment with PS and light at the intermediate dose. Collagen Type I;Photosensitizing Agents;Elastin;MMP2 protein, human;Matrix Metalloproteinase 2;MMP9 protein, human;Matrix Metalloproteinase 9 Collagen Type I;Elastin;Humans;In Vitro Techniques;Low-Level Light Therapy;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Photochemotherapy;Photosensitizing Agents;Skin;Wound Healing

Repeated transcranial low-level laser therapy for traumatic brain injury in mice: biphasic dose response and long-term treatment outcome. We previously showed that near-infrared laser photobiomodulation (PBM) (810Â nm, CW, 18Â J/cm(2) , 25Â mW/cm(2)) delivered to the mouse daily for 3-days after a controlled cortical impact traumatic brain injury (TBI) gave a significant improvement in neurological/cognitive function. However the same parameters delivered 14X daily gave significantly less benefit. This biphasic dose response intrigued us, and we decided to follow the mice that received 3X or 14X laser treatments out to 56-days post-TBI. We found the 14X group showed worse neurological function than the no-treatment TBI group at 2-weeks, but started to improve steadily during the next 6-weeks, and by 56-days were significantly better than the no-treatment TBI mice, but still worse than the 3X mice. A marker of activated glial cells (GFAP) was significantly increased in the brain regions (compared to both untreated TBI and 3X groups) at 4-weeks in the 14X group, but the GFAP had fallen to low levels in both 3X and 14X groups by 8-weeks. We conclude that an excessive number of laser-treatments delivered to mice can temporarily inhibit the process of brain repair stimulated by tPBM, but then the inhibitory effect ceases, and brain repair can resume. The mechanism may be temporary induction of reactive gliosis. Glial Fibrillary Acidic Protein;glial fibrillary astrocytic protein, mouse Animals;Brain;Brain Injuries, Traumatic;Dose-

Response Relationship, Radiation;Glial Fibrillary Acidic Protein;Low-Level Light Therapy;Mice;Treatment Outcome

Review of transcranial photobiomodulation for major depressive disorder: targeting brain metabolism, inflammation, oxidative stress, and neurogenesis. We examined the use of near-infrared and red radiation (photobiomodulation, PBM) for treating major depressive disorder (MDD). While still experimental, preliminary data on the use of PBM for brain disorders are promising. PBM is low-cost with potential for wide dissemination; further research on PBM is sorely needed. We found clinical and preclinical studies via PubMed search (2015), using the following keywords: "near-infrared radiation," "NIR," "low-level light therapy," "low-level laser therapy," or "LLLT" plus "depression." We chose clinically focused studies and excluded studies involving near-infrared spectroscopy. In addition, we used PubMed to find articles that examine the link between PBM and relevant biological processes including metabolism, inflammation, oxidative stress, and neurogenesis. Studies suggest the processes aforementioned are potentially effective targets for PBM to treat depression. There is also clinical preliminary evidence suggesting the efficacy of PBM in treating MDD, and comorbid anxiety disorders, suicidal ideation, and traumatic brain injury. Based on the data collected to date, PBM appears to be a promising treatment for depression that is safe and well-tolerated. However, large randomized controlled trials are still needed to establish the safety and effectiveness of this new treatment for MDD.

Photobiomodulation on human annulus fibrosus cells during the intervertebral disk degeneration: extracellular matrix-modifying enzymes. Destruction of extracellular matrix (ECM) leads to degeneration of the intervertebral disk (IVD), which is a major contributor to many spine disorders. IVD degeneration is induced by pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-Î±) and interleukin-1 beta (IL-1Î²), which are secreted by immune cells, including macrophages and neutrophils. The cytokines modulate ECM-modifying enzymes such as matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs) in human annulus fibrosus (AF) cells. The resulting imbalance in catabolic and anabolic enzymes can cause generalized back, neck, and low back pain (LBP). Photobiomodulation (PBM) is known to regulate inflammatory responses and wound healing. The aim of this study was to mimic the degenerative IVD microenvironment, and to investigate the effect of a variety of PBM conditions (wavelength: 635, 525, and 470 nm; energy density: 16, 32, and 64 J/cm(2)) on the production of ECM-modifying-enzymes by AF cells under degenerative conditions induced by macrophage-conditioned medium (MCM), which contains pro-inflammatory cytokines such as TNF-Î± and IL-Î² secreted by macrophage during the development of intervertebral disk inflammation. We showed that the MCM-stimulated AF cells express imbalanced ratios of TIMPs (TIMP-1 and TIMP-2) and MMPs (MMP-1 and MMP-3). PBM selectively modulated the production of ECM-modifying enzymes in AF cells. These results suggest that PBM can be a therapeutic tool for degenerative IVD disorders. Cytokines;Interleukin-1beta;TIMP1 protein, human;TIMP2 protein, human;Tissue Inhibitor of Metalloproteinase-1;Tumor Necrosis Factor-alpha;Tissue Inhibitor of Metalloproteinase-2;MMP3 protein, human;Matrix Metalloproteinase 3;MMP1 protein, human;Matrix Metalloproteinase 1 Annulus Fibrosus;Cells, Cultured;Cytokines;Extracellular Matrix;Humans;Interleukin-1beta;Intervertebral Disc Degeneration;Macrophages;Matrix Metalloproteinase 1;Matrix Metalloproteinase 3;Tissue Inhibitor of Metalloproteinase-1;Tissue Inhibitor of Metalloproteinase-2;Tumor Necrosis Factor-alpha

Management of neck pain and associated disorders: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. PURPOSE: To develop an evidence-based guideline for the management of grades I-III neck pain and associated disorders (NAD). METHODS: This guideline is based on recent systematic reviews of high-quality studies. A multidisciplinary expert panel considered the evidence of effectiveness, safety, cost-effectiveness,

societal and ethical values, and patient experiences (obtained from qualitative research) when formulating recommendations. Target audience includes clinicians; target population is adults with grades I-III NAD <6Â months duration. RECOMMENDATION 1: Clinicians should rule out major structural or other pathologies as the cause of NAD. Once major pathology has been ruled out, clinicians should classify NAD as grade I, II, or III. RECOMMENDATION 2: Clinicians should assess prognostic factors for delayed recovery from NAD. RECOMMENDATION 3: Clinicians should educate and reassure patients about the benign and self-limited nature of the typical course of NAD grades I-III and the importance of maintaining activity and movement. Patients with worsening symptoms and those who develop new physical or psychological symptoms should be referred to a physician for further evaluation at any time during their care. RECOMMENDATION 4: For NAD grades I-II â‰¤3Â months duration, clinicians may consider structured patient education in combination with: range of motion exercise, multimodal care (range of motion exercise with manipulation or mobilization), or muscle relaxants. In view of evidence of no effectiveness, clinicians should not offer structured patient education alone, strain-counterstrain therapy, relaxation massage, cervical collar, electroacupuncture, electrotherapy, or clinic-based heat. RECOMMENDATION 5: For NAD grades I-II >3Â months duration, clinicians may consider structured patient education in combination with: range of motion and strengthening exercises, qigong, yoga, multimodal care (exercise with manipulation or mobilization), clinical massage, low-level laser therapy, or non-steroidal anti-inflammatory drugs. In view of evidence of no effectiveness, clinicians should not offer strengthening exercises alone, strain-counterstrain therapy, relaxation massage, relaxation therapy for pain or disability, electrotherapy, shortwave diathermy, clinic-based heat, electroacupuncture, or botulinum toxin injections. RECOMMENDATION 6: For NAD grade III â‰¤3Â months duration, clinicians may consider supervised strengthening exercises in addition to structured patient education. In view of evidence of no effectiveness, clinicians should not offer structured patient education alone, cervical collar, low-level laser therapy, or traction. RECOMMENDATION 7: For NAD grade III >3Â months duration, clinicians should not offer a cervical collar. Patients who continue to experience neurological signs and disability more than 3Â months after injury should be referred to a physician for investigation and management. RECOMMENDATION 8: Clinicians should reassess the patient at every visit to determine if additional care is necessary, the condition is worsening, or the patient has recovered. Patients reporting significant recovery should be discharged. Anti-Inflammatory Agents, Non-Steroidal Anti-Inflammatory Agents, Non-Steroidal;Cost-Benefit Analysis;Exercise Therapy;Humans;Low-Level Light Therapy;Massage;Neck Pain;Ontario;Physical Examination;Range of Motion, Articular;Relaxation Therapy;Yoga

Low-level laser therapy modulates pro-inflammatory cytokines after partial tenotomy. Tendon injuries give rise to substantial morbidity, and current understanding of the mechanisms involved in tendon injury and repair is limited. This lesion remains a clinical issue because the injury site becomes a region with a high incidence of recurrent rupture and has drawn the attention of researchers. We already demonstrated that low-level laser therapy (LLLT) stimulates the synthesis and organization of collagen I, MMP-9, and MMP-2 and improved the gait recovery of the treated animals. The aim of this study was to evaluate the effects of LLLT in the nitric oxide and cytokines profile during the inflammatory and remodeling phases. Adult male rats were divided into the following groups: G1--intact, G2-- injured, G3--injuredâ€‰+â€‰LLLT (4 J/cm(2) continuous), G4--injuredâ€‰+â€‰LLLT (4 J/cm(2)-20 Hz--pulsed laser). According to the analysis, the animals were euthanized on different dates (1, 4, 8, or 15 days after injury). ELISA assay of TNF-Î±, IL-1Î², IL-10, and TGF-Î² was performed. Western blotting of isoform of nitric oxide synthase (i-NOS) and nitric oxide dosage experiments was conducted. Our results showed that the pulsed LLLT seems to exert an anti-inflammatory effect over injured tendons, with reduction of the release of proinflammatory cytokines, such as TNF-Î± and the

decrease in the i-NOS activity. Thanks to the pain reduction and the facilitation of movement, there was a stimulation in the TGF-Î² and IL-1Î² release. In conclusion, we believe that pulsed LLLT worked effectively as a therapy to reestablish the tendon integrity after rupture. Collagen Type I;Cytokines;Nitric Oxide;Nitric Oxide Synthase Type II;Nos2 protein, rat Animals;Collagen Type I;Cytokines;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nitric Oxide;Nitric Oxide Synthase Type II;Rats;Rats, Wistar;Tendon Injuries;Tendons;Tenotomy;Treatment Outcome;Wound Healing

808-nm laser therapy with a flat-top handpiece photobiomodulates mitochondria activities of Paramecium primaurelia (Protozoa). Photobiomodulation is proposed as a non-linear process, and only low-level laser therapy (LLLT) is assumed to stimulate exposed cells, whereas high powered laser and fluences can cause negative effects, exhausting the cell's energy reserve as a consequence of excessive photon-based stimulation. In our work, we investigated and compared the effects of 808-nm diode laser (CW) with a new flat-top handpiece. To this purpose, we tested the photobiomodulation effects of 1 and 3 J/cm(2) fluence, both generated by 100 mW or 1 W of laser power and of 64 J/cm(2) of fluence generated by 100 mW, 1 W, 1.5 W or 2 W, as expressed through oxygen consumption and ATP synthesis of Paramecium. Data collected indicates the incremental consumption of oxygen through irradiation with 3 J/cm(2)-100 mW or 64 J/cm(2)-1 W correlates with an increase in Paramecium ATP synthesis. The Paramecium respiration was inhibited by fluences 64 J/cm(2)-100 mW or 64 J/cm(2)-2 W and was followed by a decrease in the endogenous ATP concentration. The 1 J/cm(2)-100 mW or 1 W and 3 J/cm(2)-1 W did not affect mitochondrial activity. The results show that the fluence of 64 J/cm(2)-1 W more than the 3 J/cm(2)-100 mW causes greater efficiency in Paramecium mitochondria respiratory chain activity. Our results suggest that thanks to flat-top handpiece we used, high fluences by high-powered laser have to be reconsidered as an effective and non-invasive therapy. Possible associated benefits of deeper tissue penetration would increase treatment effectiveness and reduced irradiation time. Adenosine Triphosphate Adenosine Triphosphate;Humans;Lasers, Semiconductor;Mitochondria;Oxygen Consumption;Paramecium

Combined effects of low-level laser therapy and human bone marrow mesenchymal stem cell conditioned medium on viability of human dermal fibroblasts cultured in a high-glucose medium. Low-level laser therapy (LLLT) exhibited biostimulatory effects on fibroblasts viability. Secretomes can be administered to culture mediums by using bone marrow mesenchymal stem cells conditioned medium (BM-MSCs CM). This study investigated the combined effects of LLLT and human bone marrow mesenchymal stem cell conditioned medium (hBM-MSCs CM) on the cellular viability of human dermal fibroblasts (HDFs), which was cultured in a high-glucose (HG) concentration medium. The HDFs were cultured either in a concentration of physiologic (normal) glucose (NG; 5.5 mM/l) or in HG media (15 mM/l) for 4 days. LLLT was performed with a continuous-wave helium-neon laser (632.8 nm, power density of 0.00185 W/cm(2) and energy densities of 0.5, 1, and 2 J/cm(2)). About 10% of hBM-MSCs CM was added to the HG HDF culture medium. The viability of HDFs was evaluated using dimethylthiazol-diphenyltetrazolium bromide (MTT) assay. A significantly higher cell viability was observed when laser of either 0.5 or 1 J/cm(2) was used to treat HG HDFs, compared to the control groups. The cellular viability of HG-treated HDFs was significantly lower compared to the LLLTâ€‰+â€‰HG HDFs, hBM-MSCs CM-treated HG HDFs, and LLLTâ€‰+â€‰hBM-MSCs CM-treated HG HDFs. In conclusion, hBM-MSCs CM or LLLT alone increased the survival of HG HDFs cells. However, the combination of hBM-MSCs CM and LLLT improved these results in comparison to the conditioned medium. Culture Media, Conditioned;Glucose Cell Proliferation;Cell Survival;Cells, Cultured;Culture Media, Conditioned;Fibroblasts;Glucose;Humans;Lasers, Gas;Low-Level Light Therapy;Mesenchymal Stem Cells

Treatment of primary cutaneous amyloidosis with laser: a review of the literature. Primary cutaneous amyloidosis (PCA) is a condition characterized by tissue deposition of misfolded proteins. PCA can present in different forms, namely macular, lichen, and nodular amyloidosis. These lesions can be of cosmetic concern and are difficult to treat. Many therapeutic modalities have been suggested for the treatment of PCA, with variable efficacy, including topical and systemic medications, phototherapy, electrodessication, dermabrasion, cryosurgery, and lasers. Over the past decade, several studies have reported successful treatment of PCA with different types of lasers; however, a review of these studies has never been reported in the dermatologic literature. The aim of this study was to review the efficacy and safety of lasers in the treatment of PCA. A search of the National Library of Medicine's PubMed Database was performed. Studies were considered for inclusion based on their relevance, and specific data were extracted from all included studies. Eleven studies, comprising 64 patients, were included in this review. Significant improvements were observed in macular and lichen amyloidosis patients treated with carbon dioxide laser in two studies, while a number of case series and case reports showed good results with other types of laser in the treatment of PCA. This review was limited by the lack of large double-blinded randomized controlled trials and the overall small sample size. Laser treatment is a promising option in the treatment of PCA. Future randomized controlled trials are needed to compare the efficacy of different types of lasers and to select the best parameters for different types of PCA. Amyloidosis, Familial;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Skin Diseases, Genetic;United States

Efficacy of fractional CO2 laser in treatment of atrophic scar of cutaneous leishmaniasis. Cutaneous leishmaniasis is an endemic disease in Iran. Unfortunately, it can lead to unsightly atrophic scars with limited treatment options. Fractional CO2 laser is accepted for treatment of atrophic acne scars and recently has been used to treat cutaneous leishmaniasis, so we planned to use fractional CO2 laser on leishmaniasis scar. We conducted this study on 60 leishmaniasis scars on the face of 40 patients. The lesions were treated by a fractional CO2 laser with beam size of 120 Î¼m, with energy of 50-90 mJ, and 50-100 spots/cm(2) density with two passes in three monthly sessions. Evaluation was done in the first and second months after the first treatment and 3 and 6 months after the last treatment. Digital photography was performed at each visit. Assessment of improvement rate by patient and physician was rated separately as follows: no improvement (0%), mild (<25%), moderate (25-50%), good (51-75%), and excellent (76-100%). Based on patients' opinion, in the first and second follow-up, 48.3 and 90% of them reported moderate to excellent healing, respectively (pâ€‰<â€‰0.001). In 3 and 6 months follow-up after the end of the experiment, most of the patients (88.3 and 95%, respectively) reported moderate to excellent healing of scars. Based on two observers' opinion, healing in the first follow-up in most of the patients (65%) was mild to moderate and 33% were reported as having no healing. In the second follow-up, only 5% of the patients were reported with no healing and 60% were reported as having moderate healing (pâ€‰<â€‰0.001). In 3 and 6 months follow-up, most of the patients (95 and 96.6%) were reported as having moderate to excellent healing (pâ€‰=â€‰<0.001). Our results underlined the high efficacy of fractional CO2 laser for leishmaniasis scar. No significant adverse effects were noted. Adolescent;Adult;Child;Cicatrix;Face;Female;Humans;Laser Therapy;Lasers, Gas;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Male;Middle Aged;Skin;Treatment Outcome;Young Adult

Low-level laser therapy/photobiomodulation in the management of side effects of chemoradiation therapy in head and neck cancer: part 2: proposed applications and treatment protocols. PURPOSE: There is a large body of evidence supporting the efficacy of low-level laser therapy (LLLT), more recently termed photobiomodulation (PBM) for the management of oral mucositis (OM) in patients undergoing radiotherapy for head and neck cancer (HNC). Recent advances in PBM

technology, together with a better understanding of mechanisms involved and dosimetric parameters may lead to the management of a broader range of complications associated with HNC treatment. This could enhance patient adherence to cancer therapy, and improve quality of life and treatment outcomes. The mechanisms of action, dosimetric, and safety considerations for PBM have been reviewed in part 1. Part 2 discusses the head and neck treatment side effects for which PBM may prove to be effective. In addition, PBM parameters for each of these complications are suggested and future research directions are discussed. METHODS: Narrative review and presentation of PBM parameters are based on current evidence and expert opinion. RESULTS: PBM may have potential applications in the management of a broad range of side effects of (chemo)radiation therapy (CRT) in patients being treated for HNC. For OM management, optimal PBM parameters identified were as follows: wavelength, typically between 633 and 685Â nm or 780-830Â nm; energy density, laser or light-emitting diode (LED) output between 10 and 150Â mW; dose, 2-3Â J (J/cm(2)), and no more than 6Â J/cm(2) on the tissue surface treated; treatment schedule, two to three times a week up to daily; emission type, pulsed (<100Â Hz); and route of delivery, intraorally and/or transcutaneously. To facilitate further studies, we propose potentially effective PBM parameters for prophylactic and therapeutic use in supportive care for dermatitis, dysphagia, dry mouth, dysgeusia, trismus, necrosis, lymphedema, and voice/speech alterations. CONCLUSION: PBM may have a role in supportive care for a broad range of complications associated with the treatment of HNC with CRT. The suggested PBM irradiation and dosimetric parameters, which are potentially effective for these complications, are intended to provide guidance for well-designed future studies. It is imperative that such studies include elucidating the effects of PBM on oncology treatment outcomes.
Chemoradiotherapy;Clinical Protocols;Drug-Related Side Effects and Adverse Reactions;Head and Neck Neoplasms;Humans;Low-Level Light Therapy

Low level laser therapy/photobiomodulation in the management of side effects of chemoradiation therapy in head and neck cancer: part 1: mechanisms of action, dosimetric, and safety considerations. PURPOSE: There is a large body of evidence supporting the efficacy of low level laser therapy (LLLT), more recently termed photobiomodulation (PBM), for the management of oral mucositis (OM) in patients undergoing radiotherapy for head and neck cancer (HNC). Recent advances in PBM technology, together with a better understanding of mechanisms involved, may expand the applications for PBM in the management of other complications associated with HNC treatment. This article (part 1) describes PBM mechanisms of action, dosimetry, and safety aspects and, in doing so, provides a basis for a companion paper (part 2) which describes the potential breadth of potential applications of PBM in the management of side-effects of (chemo)radiation therapy in patients being treated for HNC and proposes PBM parameters. METHODS: This study is a narrative non-systematic review. RESULTS: We review PBM mechanisms of action and dosimetric considerations. Virtually, all conditions modulated by PBM (e.g., ulceration, inflammation, lymphedema, pain, fibrosis, neurological and muscular injury) are thought to be involved in the pathogenesis of (chemo)radiation therapy-induced complications in patients treated for HNC. The impact of PBM on tumor behavior and tumor response to treatment has been insufficiently studied. In vitro studies assessing the effect of PBM on tumor cells report conflicting results, perhaps attributable to inconsistencies of PBM power and dose. Nonetheless, the biological bases for the broad clinical activities ascribed to PBM have also been noted to be similar to those activities and pathways associated with negative tumor behaviors and impeded response to treatment. While there are no anecdotal descriptions of poor tumor outcomes in patients treated with PBM, confirming its neutrality with respect to cancer responsiveness is a critical priority. CONCLUSION: Based on its therapeutic effects, PBM may have utility in a broad range of oral, oropharyngeal, facial, and neck complications of HNC treatment. Although evidence suggests that PBM using LLLT is safe in HNC patients, more research is imperative

and vigilance remains warranted to detect any potential adverse effects of PBM on cancer treatment outcomes and survival. Chemoradiotherapy;Drug-Related Side Effects and Adverse Reactions;Head and Neck Neoplasms;Humans;Low-Level Light Therapy

Low-level laser therapy attenuates the acute inflammatory response induced by muscle traumatic injury. The purpose of this work was to investigate the effect of early and long-term low-level laser therapy (LLLT) on oxidative stress and inflammatory biomarkers after acute-traumatic muscle injury in Wistar rats. Animals were randomly divided into the following four groups: control group (CG), muscle injury group (IG), CGâ€‰+â€‰LLLT, and IGâ€‰+â€‰LLLT: laser treatment with doses of 3 and 5Â J/cm(2). Muscle traumatic injury was induced by a single-impact blunt trauma in the rat gastrocnemius. Irradiation for 3 or 5Â J/cm(2) was initiated 2, 12, and 24â€‰h after muscle trauma induction, and the treatment was continued for five consecutive days. All the oxidant markers investigated. namely thiobarbituric acid-reactive substance, carbonyl, superoxide dismutase, glutathione peroxidase, and catalase, were increased as soon as 2â€‰h after muscle injury and remained increased up to 24â€‰h. These alterations were prevented by LLLT at a 3Â J/cm(2) dose given 2â€‰h after the trauma. Similarly, LLLT prevented the trauma-induced proinflammatory state characterized by IL-6 and IL-10. In parallel, trauma-induced reduction in BDNF and VEGF, vascular remodeling and fiber-proliferating markers, was prevented by laser irradiation. In order to test whether the preventive effect of LLLT was also reflected in muscle functionality, we tested the locomotor activity, by measuring distance traveled and the number of rearings in the open field test. LLLT was effective in recovering the normal locomotion, indicating that the irradiation induced biostimulatory effects that accelerated or resolved the acute inflammatory response as well as the oxidant state elicited by the muscle trauma. Biomarkers;Brain-Derived Neurotrophic Factor;IL10 protein, human;Thiobarbituric Acid Reactive Substances;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Interleukin-10;Catalase;Glutathione Peroxidase;Superoxide Dismutase Animals;Biomarkers;Brain-Derived Neurotrophic Factor;Catalase;Glutathione Peroxidase;Humans;Inflammation;Interleukin-10;Low-Level Light Therapy;Muscle, Skeletal;Oxidative Stress;Rats;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances;Vascular Endothelial Growth Factor A;Wound Healing

Is paradoxical hair growth caused by low-level radiant exposure by home-use laser and intense pulsed light devices? INTRODUCTION AND OBJECTIVES: This qualitative review of paradoxical hair growth, following professional treatments reviews, clarifies whether low fluence is the most probable cause of unwanted hair regrowth after at home light-based treatments. MATERIALS AND METHODS: The proposed causes of unexpected hair regrowth are examined, and our scientific understanding of absorption and scattering of light in turbid tissue is reviewed. Published reports of paradoxical hair growth are assessed. RESULTS: Early laser hair removal studies failed to record the occurrence of hair induction despite the significant numbers of subjects treated. Neither published paradoxical hair growth studies following home-based laser or intense pulsed light (IPL) hair removal treatments, nor randomised or controlled studies documenting paradoxical hair growth following professional treatments could be found. Several authors directly proposed inflammatory response to be the primary cause of hair growth induction. CONCLUSIONS: It is unlikely that hair regrowth several centimetres or more away from the irradiated tissue can be attributed to the laser or IPL used. In many cases of paradoxical hair growth, other causes may be responsible for the unexpected hair growth. The primary cause of instances of 'true' paradoxical hair growth is probably limited to darker phototypes with one or more other characteristics including polycystic ovarian syndrome or other androgen hormonal irregularities following high energy treatments with the corresponding inflammatory sequelae. Female;Hair Follicle;Hair Removal;Humans;Hypertrichosis;Low-Level Light Therapy;Male;Risk Assessment;Risk Factors

A Feasibility Study Evaluating Extraoral Photobiomodulation Therapy for Prevention of Mucositis in Pediatric Hematopoietic Cell Transplantation. OBJECTIVE: The objective of this study was to determine the feasibility, safety, and tolerability of providing extraoral photobiomodulation therapy (PBT) for prevention of oral mucositis (OM) in pediatric hematopoietic cell transplantation (HCT). BACKGROUND DATA: OM is a frequent complication in pediatric HCT. METHODS: Patients 4-21 years of age scheduled for myeloablative HCT were eligible to participate. PBT was delivered using a THOR Model LX2M with a 69 Diode LED Cluster Probe (34 Ã— 660 nm 10 mW, 35 Ã— 850 nm 30 mW; 1390 mW total power output) at an irradiance of 50 mW/cm(2). Daily treatment exposed six sites (right, left, and midline face and neck) for 60 sec each, for a total dose of 3.0 J/cm(2). Treatment was initiated on the 1st day of conditioning, through day +20. OM assessments were completed at baseline then daily, from day -1 through day +20. Feasibility assessment included both qualitative and quantitative measures and outcomes from patients and providers. RESULTS: Thirteen patients with a median age of 15 years (range, 4.8-21.6) were consented and enrolled, and completed the protocol. The incidence of severe OM [World Health Organization (WHO) Grade â‰¥3] was 77%, with a median duration of 4 days (range, 1-14). Of 355 attempted PBT administrations, there were six refusals, and the mean proportion of days with data submitted was 96.2% [95% confidence interval (CI): 78.5-97.2%]. The 10 trained nurses all reported that the device was accessible, maneuverable, and lightweight, and that training was effective. There was no reported toxicity attributed to the PBT. CONCLUSIONS: Daily delivery of external PBT and completion of OM evaluations is feasible in children undergoing HCT. Adolescent;Child;Child, Preschool;Feasibility Studies;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Pilot Projects;Stomatitis;Treatment Outcome;Young Adult

Prevention of Thyroidectomy Scars in Asian Adults With Low-Level Light Therapy. BACKGROUND: Abnormal wound-healing after thyroidectomy with a resulting scar is a common dermatologic consultation. Despite many medical and surgical approaches, prevention of postoperative scars is challenging. OBJECTIVE: This study validated the efficacy and safety of low-level light therapy (LLLT) using an 830/590 nm light-emitting diode (LED)-based device for prevention of thyroidectomy scars. METHODS AND MATERIALS: Thirty-five patients with linear surgical suture lines after thyroidectomy were treated with 830/590 nm LED-LLLT. Daily application of 60 J/cm (11 minutes) for 1 week starting on postoperative day 1 was followed by treatment 3 times per week for 3 additional weeks. The control group (n = 15) remained untreated. Scar-prevention effects were evaluated 1 and 3 months after thyroidectomy with colorimetric evaluation using a tristimulus-color analyzer. The Vancouver Scar Scale (VSS) score, global assessment, and a subjective satisfaction score (range: 1-4) were also determined. RESULTS: Lightness (L*) and chrome values (a*) decreased significantly at the 3-month follow-up visit in the treatment group compared with those of controls. The average VSS and GAS scores were lower in the treatment group, whereas the subjective score was not significantly different. CONCLUSION: Light-emitting diode based LLLT treatment suppressed the formation of scars after thyroidectomy and could be safely used without noticeable adverse effects. Asian People;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Thyroidectomy;Treatment Outcome

Efficacy of Low-Level Laser Therapy in the Management of Postoperative Pain in Children After Primary Teeth Extraction: A Randomized Clinical Trial. OBJECTIVE: This study evaluated the effect of low-level laser therapy (LLLT) on postoperative pain in children undergoing primary molar extraction. MATERIALS AND METHODS: This randomized, controlled-crossover, double-blind clinical trial was conducted with 37 children requiring bilateral extraction of primary molars. In one tooth (LLLT group), a GaAlAs diode laser (wavelength, 810 nm; continuous mode, output power 0.3 W; 180 sec, 4 J/cm(2)) was applied intraorally 1 cm from the target tissue immediately following extraction.

In the contralateral tooth (control group), the hand piece was applied, but without laser activation. Children and parents rated postoperative pain on the first three evenings following extraction using, respectively, the Wong-Baker FACES(Â®) Pain Rating Scale (PRS) and the Visual Analogue Scale (VAS). Parents also reported if their children received analgesics. Data were analyzed using Ï‡(2) and Mann-Whitney U tests. RESULTS: Mean VAS scores were higher for the control group than for the LLLT group on the first and second evenings, and PRS scores were higher for the control group than for the laser group on the first evening, but the differences were not statistically significant ($p > 0.05$). More analgesics were given to children in the control group on the first evening; however, both groups received equal amounts on the next two evenings ($p > 0.05$). CONCLUSIONS: Within the limitations of this study, LLLT application following primary molar extraction was not found to affect postoperative pain in children. Analgesics Analgesics;Child;Cross-Over Studies;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Pain, Postoperative;Tooth Extraction;Tooth, Deciduous
[Photothermolysis for acne control]. Acne Vulgaris;Adolescent;Adult;Humans;Hyperthermia, Induced;Lasers, Semiconductor;Low-Level Light Therapy;Sebaceous Glands
Management of uveal tract melanoma: A comprehensive review. Uveal tract melanoma is the most common primary intraocular malignancy in adults, accounting for about 5-10% of all the melanomas. Since there are no lymphatic vessels in the eye, uveal melanoma can only spread hematogenously leading to liver metastasis. A wide variety of treatment modalities are available for its management, leading to dilemma in selecting the appropriate therapy. This article reviews the diagnostic and therapeutic modalities available and thus, can help to individualize the treatment plan for each patient. Adult;Biopsy, Fine-Needle;Brachytherapy;Eye;Eye Enucleation;Fluorescein Angiography;Humans;Liver Neoplasms;Low-Level Light Therapy;Melanoma;Neoplasm Staging;Precision Medicine;Prognosis;Proton Therapy;Tomography, X-Ray Computed;Ultrasonography;Uveal Neoplasms
In Vitro Mean Red Blood Cell Volume Change Induced by Diode Pump Solid State Low-Level Laser of 405â€‰nm. OBJECTIVE: This study was conducted to investigate the effects of low-level laser (LLL) doses on human red blood cell volume. The effects of exposure to a diode pump solid state (DPSS) (Î»â€‰=â€‰405â€‰nm) laser were observed. BACKGROUND DATA: The response of human blood to LLL irradiation gives important information about the mechanism of interaction of laser light with living organisms. Materials and methods Blood samples were collected into ethylenediaminetetraacetic acid (EDTA)-containing tubes, and each sample was divided into two equal aliquots, one to serve as control and the other for irradiation. The aliquot was subjected to laser irradiation for 20, 30, 40, or 50â€‰min at a fixed power density of 0.03â€‰W/cm(2). Mean cell volume (MCV) and red blood cell (RBC) counts were measured immediately after irradiation using a computerized hemtoanalyzer. RESULTS: Significant decrease in RBC volume (pâ€‰<â€‰0.05, pâ€‰<â€‰0.0001, pâ€‰<â€‰0.0001, and pâ€‰<â€‰0.05, respectively) was induced with variation in laser doses.The highest response was observed with an exposure time of 40â€‰min. This result was reproduced in RBCs suspended in a buffered NaCl solution. In contrast to this finding, laser-induced RBC volume change was completely abolished by suspending RBCs in a solution containing a higher concentration of EDTA. CONCLUSIONS: It was suggested that LLL can reduce RBC volume possibly because of the increased free intracellular Ca(+2) concentrations, which activate Ca(+2)-dependent K(+) channels with consequent K(+) ion efflux and cell shrinkage. Blood Cell Count;Dose-Response Relationship, Radiation;Erythrocytes;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy

The dark art of light measurement: accurate radiometry for low-level light therapy. Lasers and light-emitting diodes are used for a range of biomedical applications with many studies reporting their beneficial effects. However, three main concerns exist regarding much of the low-level light therapy (LLLT) or photobiomodulation literature; (1) incomplete, inaccurate and unverified irradiation parameters, (2) miscalculation of 'dose,' and (3) the misuse of appropriate light property terminology. The aim of this systematic review was to assess where, and to what extent, these inadequacies exist and to provide an overview of 'best practice' in light measurement methods and importance of correct light measurement. A review of recent relevant literature was performed in PubMed using the terms LLLT and photobiomodulation (March 2014-March 2015) to investigate the contemporary information available in LLLT and photobiomodulation literature in terms of reporting light properties and irradiation parameters. A total of 74 articles formed the basis of this systematic review. Although most articles reported beneficial effects following LLLT, the majority contained no information in terms of how light was measured (73%) and relied on manufacturer-stated values. For all papers reviewed, missing information for specific light parameters included wavelength (3%), light source type (8%), power (41%), pulse frequency (52%), beam area (40%), irradiance (43%), exposure time (16%), radiant energy (74%) and fluence (16%). Frequent use of incorrect terminology was also observed within the reviewed literature. A poor understanding of photophysics is evident as a significant number of papers neglected to report or misreported important radiometric data. These errors affect repeatability and reliability of studies shared between scientists, manufacturers and clinicians and could degrade efficacy of patient treatments. Researchers need a physicist or appropriately skilled engineer on the team, and manuscript reviewers should reject papers that do not report beam measurement methods and all ten key parameters: wavelength, power, irradiation time, beam area (at the skin or culture surface; this is not necessarily the same size as the aperture), radiant energy, radiant exposure, pulse parameters, number of treatments, interval between treatments and anatomical location. Inclusion of these parameters will improve the information available to compare and contrast study outcomes and improve repeatability, reliability of studies.
Humans;Lasers, Semiconductor;Low-Level Light Therapy;Radiation Dosage;Radiometry;Reproducibility of Results;Skin

Evaluation of the effects of pulsed wave LLLT on tibial diaphysis in two rat models of experimental osteoporosis, as examined by stereological and real-time PCR gene expression analyses. Osteoporosis (OP) and osteoporotic fracture are major public health issues for society; the burden for the affected individual is also high. Previous studies have shown that pulsed wave low-level laser therapy (PW LLLT) has osteogenic effects. This study intended to evaluate the impacts of PW LLLT on the cortical bone of osteoporotic rats' tibias in two experimental models, ovariectomized and dexamethasone-treated. We divided the rats into four ovariectomized induced OP (OVX-d) and four dexamethasone-treated (glucocorticoid-induced OP, GIOP) groups. A healthy (H) group of rats was considered for baseline evaluations. At 14 weeks following ovariectomy, we subdivided the OVX-d rats into the following groups: (i) control which had OP, (ii) OVX-d rats treated with alendronate (1 mg/kg), (iii) OVX-d rats treated with LLLT, and (iv) OVX-d rats treated with alendronate and PW LLLT. The remaining rats received dexamethasone over a 5-week period and were also subdivided into four groups: (i) control rats treated with intramuscular (i.m.) injections of distilled water (vehicle), (ii) rats treated with subcutaneous alendronate injections (1 mg/kg), (iii) laser-treated rats, and (iv) rats simultaneously treated with laser and alendronate. The rats received alendronate for 30 days and underwent PW LLLT (890 nm, 80 Hz, 0.972 J/cm(2)) three times per week during 8 weeks. Then, the right tibias were extracted and underwent a stereological analysis of histological parameters and real-time polymerase chain reaction (RT-PCR). A significant increase in cortical bone volume (mm(3)) existed in all study groups compared to the healthy rats. There were significant decreases in

trabecular bone volume (mm(3)) in all study groups compared to the group of healthy rats. The control rats with OP and rats from the vehicle group showed significantly increased osteoclast numbers compared to most other groups. Alendronate significantly decreased osteoclast numbers in osteoporotic rats. Concurrent treatments (compounded by PW LLLT and alendronate) produce the same effect on osteoporotic bone. Bone Density Conservation Agents;Alendronate Alendronate;Animals;Bone Density Conservation Agents;Bone Regeneration;Diaphyses;Female;Humans;Low-Level Light Therapy;Male;Osteogenesis;Osteoporosis;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Tibia;Transcriptome

Effect of low-level laser therapy on tooth sensitivity induced by in-office bleaching. This study aimed to investigate the effect of low-level laser therapy (LLLT) on tooth sensitivity induced by in-office bleaching. Sixty-six patients enrolled in this randomized clinical trial. Following the in-office procedure with 40% hydrogen peroxide, the participants were randomly divided into three groups. The patients in group 1 received irradiation from a low-level red laser (LLRL; 660 nm, 200 mW, 15 s, 12 J/cm(2)), whereas participants in group 2 were subjected to a low-level infrared laser (LLIL; 810 nm) under similar conditions as in group 1. In group 3 (placebo), the laser treatment was the same as that in groups 1 and 2, but without energy output. The degree of tooth sensitivity was recorded at 1, 24, and 48 h after bleaching using a visual analog scale (VAS). The change in tooth shade was measured 30 days after tooth whitening. The intensity of tooth sensitivity was not significantly different between groups at 1 h after bleaching (pâ€‰>â€‰0.05). At 24 h after therapy, pain level was significantly lower in the LLIL group compared to the LLRL and placebo groups (pâ€‰<â€‰0.05). At 48 h after bleaching, VAS scores in the LLIL and LLRL groups were comparable to each other (pâ€‰>â€‰0.05) and both were significantly lower than that of the placebo group (pâ€‰<â€‰0.05). There was no significant difference in the efficacy of tooth whitening among groups (pâ€‰>â€‰0.05). LLLT with an infrared diode laser could be recommended as a suitable strategy to reduce the intensity of tooth sensitivity after in-office bleaching. Tooth Bleaching Agents;Hydrogen Peroxide Adult;Dentin Sensitivity;Double-Blind Method;Female;Humans;Hydrogen Peroxide;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain Measurement;Tooth;Tooth Bleaching;Tooth Bleaching Agents;Treatment Outcome;Young Adult

Low level laser therapy in non-surgical management of osteoradionecrosis of the jaws. Aged;Antibiotic Prophylaxis;Carcinoma;Combined Modality Therapy;Humans;Low-Level Light Therapy;Male;Mandible;Mandibular Diseases;Oropharyngeal Neoplasms;Osteoradionecrosis;Radiotherapy;Tongue Neoplasms

The use of lasers in cutaneous sarcoid: Is there a role? Sarcoid is a granulomatous disease that can affect the skin solely or as part of a systemic involvement. Cutaneous lesions of sarcoid may be difficult to treat and lasers are rarely used. In this article we report our case series and review the literature on the use of lasers in cutaneous sarcoid. Female;Humans;Low-Level Light Therapy;Male;Sarcoidosis;Skin;Skin Diseases

Fractional 532-nm Q-switched Nd:YAG laser: One of the safest novel treatment modality to treat cafÃ©-au-lait macules. CafÃ©-au-lait macules (CALMs) are benign epidermal basilar hyperpigmentations that can be found in an isolated form or in association with neurocutaneous syndromes. Frequency-doubled Q-switched neodymium-doped yttrium aluminum garnet laser (532-nm QSNYL) does not penetrate deeply into the skin and is therefore suitable for epidermal pigmented lesion. Fractional photothermolysis (FP) targets only very small areas of the skin, without injuring adjacent areas of healthy, normal skin. Herein, we report a case of CALMs successfully treated with fractional 532-nm QSNYL. By applying FP to 532-nm QSNYL, we could treat CALMs safely with less

downtime as compared to conventional laser treatments and expect more energy delivery for each microscopic hole, thereby allowing higher response rate.
Cheek;Child;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome

The effect of low-level helium-neon laser on oral wound healing. BACKGROUND: The effectiveness of low power lasers on incisional wound healing, because of conflicting results of previous studies, is uncertain. Therefore, the aim of this study was to evaluate the effects of low-level helium-neon (He-Ne) laser irradiation on wound healing in rat's oral mucosa. MATERIALS AND METHODS: Sixty-four standardized incisions were carried out on the buccal mucosa of 32 male Wistar divided into four groups of eight animals each. Each rat received two incisions on the opposite sides of the buccal mucosa by a steel scalpel. On the right side (test side), a He-Ne laser (632 nm) was employed on the incision for 40 s. Laser radiation was used just in 1(st) day, 1(st) and 2(nd) day, 1(st) and 3(rd) day, and continuous 3 days in groups of A, B, C, and D of rats, respectively. The left side (control side) did not receive any laser. Histological processing and hematoxylin and eosin staining were done on tissue samples after 5 days. Wilcoxon and Kruskal-Wallis tests were used for statistical analysis. RESULTS: Histological analysis showed that the tissue healing after continuous 3 days on the laser irradiated side was better than the control side, but there was no difference between the two sides in each groups ($P > 0.05$). CONCLUSION: This study showed that He-Ne laser had no beneficial effects on incisional oral wound healing particularly in 5 days after laser therapy. Future research in the field of laser effects on oral wound healing in human is recommended.

Retraction of: Effects of Photobiomodulation Therapy on Patients with Primary Open Angle Glaucoma: A Pilot Study (DOI: 10.1089/pho.2015.3944).

Parameter Reproducibility in Photobiomodulation. Clinical Studies as Topic;Humans;Low-Level Light Therapy;Quality Control;Reproducibility of Results

Photobiomodulation for the treatment of retinal diseases: a review. Photobiomodulation (PBM), also known as low level laser therapy, has recently risen to the attention of the ophthalmology community as a promising new approach to treat a variety of retinal conditions including age-related macular degeneration, retinopathy of prematurity, diabetic retinopathy, Leber's hereditary optic neuropathy, amblyopia, methanol-induced retinal damage, and possibly others. This review evaluates the existing research pertaining to PBM applications in the retina, with a focus on the mechanisms of action and clinical outcomes. All available literature until April 2015 was reviewed using PubMed and the following keywords: "photobiomodulation AND retina", "low level light therapy AND retina", "low level laser therapy AND retina", and "FR/NIR therapy AND retina". In addition, the relevant references listed within the papers identified through PubMed were incorporated. The literature supports the conclusion that the low-cost and non-invasive nature of PBM, coupled with the first promising clinical reports and the numerous preclinical-studies in animal models, make PBM well-poised to become an important player in the treatment of a wide range of retinal disorders. Nevertheless, large-scale clinical trials will be necessary to establish the PBM therapeutic ranges for the various retinal diseases, as well as to gain a deeper understanding of its mechanisms of action.

Safety of a picosecond laser with diffractive lens array (DLA) in the treatment of Fitzpatrick skin types IV to VI: A retrospective review. BACKGROUND: Laser therapy in patients with skin of color is associated with an increased rate of complications. The 755-nm picosecond laser with the diffractive lens array (DLA) has been used for the treatment of scars, striae, and rejuvenation. By delivering high energy to focused areas, the DLA minimizes complications. OBJECTIVE: This study explores the adverse events associated with treatment with the 755-nm picosecond laser with DLA in individuals with Fitzpatrick skin type IV to VI. METHOD: A retrospective chart review of patients treated with the 755-nm picosecond laser with DLA with a standardized spot size of 6 mm, fluence of 0.71 J/cm(2), and

pulse width of 750 to 850 picoseconds was performed. Standard clinical photographs were obtained before treatment and at follow-up. Treatment sites were assessed for dyspigmentation, erythema, edema, and herpetic lesions. RESULTS: A total of 56 patients with Fitzpatrick skin type IV to VI, atrophic and hypertrophic scars, and pigmented lesions or striae were included. Ten patients (17.9%) were lost to follow-up. Transient adverse events, most commonly erythema and hyperpigmentation, were reported after therapy; these resolved in all cases. LIMITATIONS: Retrospective design is a limitation. CONCLUSION: The 755-nm picosecond laser with the DLA device may be a safe therapeutic alternative for unwanted scars, pigmented lesions, and striae in patients with skin of color.
Acne Vulgaris;Adult;Aged;Cicatrix;Cohort Studies;Esthetics;Female;Follow-Up Studies;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Safety;Retrospective Studies;Skin Pigmentation;Treatment Outcome

Nonablative Fractional Laser Resurfacing for Acne Scarring in Patients With Fitzpatrick Skin Phototypes IV-VI. BACKGROUND: There is a paucity of studies investigating laser resurfacing in Fitzpatrick skin phototypes (SPT) IV to VI. OBJECTIVE: To assess the efficacy and safety of fractional nonablative laser resurfacing in the treatment of acne scarring in patients with SPT IV to VI. METHODS AND MATERIALS: The authors conducted a randomized, investigator-blinded and rater-blinded, split-face comparative study of adults with SPT IV to VI and facial acne scars treated with 2 different density settings and the same fluence. RESULTS: Quantitative global scarring grading system (QGSGS) scores were significantly improved from baseline at 16 and 24 weeks ($p = .0277$). Improvements in QGSGS scores after higher and lower density treatments were statistically similar ($p = .96$). The live-blinded dermatologist, the blinded dermatologist photoraters, and the patients rated scars as being significantly more improved by visual analog scale at weeks 16 and 24 compared with baseline ($p < .001$) for both treatment densities. Five of 7 and 3 of 7 patients in the higher and lower density group, respectively, experienced mild or moderate hyperpigmentation as an investigator observed site reaction. CONCLUSION: The nonablative 1550-nm fractional laser is safe and efficacious in treating acne scaring in Fitzpatrick skin types IV to VI. Self-limited postinflammatory hyperpigmentation was a common occurrence, especially with higher treatment densities.
Acne Vulgaris;Cicatrix;Cosmetic Techniques;Double-Blind Method;Facial Dermatoses;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain;Severity of Illness Index;Skin Pigmentation

Using Pre-Exercise Photobiomodulation Therapy Combining Super-Pulsed Lasers and Light-Emitting Diodes to Improve Performance in Progressive Cardiopulmonary Exercise Tests. CONTEXT: Skeletal muscle fatigue and exercise performance are novel areas of research and clinical application in the photobiomodulation field, and positive outcomes have been reported in several studies; however, the optimal measures have not been fully established. OBJECTIVE: To assess the acute effect of photobiomodulation therapy (PBMT) combining superpulsed lasers (low-level laser therapy) and light-emitting diodes (LEDs) on muscle performance during a progressive cardiopulmonary treadmill exercise test. DESIGN: Crossover study. SETTING: Laboratory. PATIENTS OR OTHER PARTICIPANTS: Twenty untrained male volunteers (age = 26.0 Â± 6.0 years, height = 175.0 Â± 10.0 cm, mass = 74.8 Â± 10.9 kg). INTERVENTION(S): Participants received PBMT with either combined superpulsed lasers and LED (active PBMT) or placebo at session 1 and the other treatment at session 2. All participants completed a cardiopulmonary test on a treadmill after each treatment. For active PBMT, we performed the irradiation at 17 sites on each lower limb (9 on the quadriceps, 6 on the hamstrings, and 2 on the gastrocnemius muscles), using a cluster with 12 diodes (four 905-nm superpulsed laser diodes with an average power of 0.3125 mW, peak power of 12.5 W for each diode, and frequency of 250 Hz; four 875-nm infrared LED diodes with an average power of 17.5 mW; and four 640-nm red LED diodes with an average power of 15 mW) and delivering a dose of 30 J per site.

MAIN OUTCOME MEASURE(S): Distance covered, time until exhaustion, pulmonary ventilation, and dyspnea score. RESULTS: The distance covered (1.96 Â± 0.30 versus 1.84 Â± 0.40 km, t19 = 2.119, P < .001) and time until exhaustion on the cardiopulmonary test (780.2 Â± 91.0 versus 742.1 Â± 94.0 seconds, t19 = 3.028, P < .001) was greater after active PBMT than after placebo. Pulmonary ventilation was greater (76.4 Â± 21.9 versus 74.3 Â± 19.8 L/min, t19 = 0.180, P = .004) and the score for dyspnea was lower (3.0 [interquartile range = 0.5-9.0] versus 4.0 [0.0-9.0], U = 184.000, P < .001) after active PBMT than after placebo. CONCLUSIONS: The combination of lasers and LEDs increased the time, distance, and pulmonary ventilation and decreased the score of dyspnea during a cardiopulmonary test. Adult;Cross-Over Studies;Double-Blind Method;Exercise Test;Exercise Tolerance;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Pulmonary Ventilation;Young Adult

Reversible control of current across lipid membranes by local heating. Lipid membranes are almost impermeable for charged molecules and ions that can pass the membrane barrier only with the help of specialized transport proteins. Here, we report how temperature manipulation at the nanoscale can be employed to reversibly control the electrical resistance and the amount of current that flows through a bilayer membrane with pA resolution. For this experiment, heating is achieved by irradiating gold nanoparticles that are attached to the bilayer membrane with laser light at their plasmon resonance frequency. We found that controlling the temperature on the nanoscale renders it possible to reproducibly regulate the current across a phospholipid membrane and the membrane of living cells in absence of any ion channels. Lipid Bilayers;Gold Cell Line;Electric Impedance;Gold;Hot Temperature;Humans;Lipid Bilayers;Low-Level Light Therapy;Membranes;Nanoparticles

Translational medicine in the field of ablative fractional laser (AFXL)-assisted drug delivery: A critical review from basics to current clinical status. BACKGROUND: Ablative fractional lasers enhance uptake of topical therapeutics and the concept of fractional laser-assisted drug delivery has now been taken into clinical practice. OBJECTIVES: We systematically reviewed preclinical data and clinical evidence for fractional lasers to enhance drug uptake and improve clinical efficacy. METHODS: We searched PubMed and Embase databases; 34 articles met the inclusion criteria. Studies were categorized into experimental preclinical studies and clinical trials, the latter graded according to level of evidence. RESULTS: All preclinical trials (n = 16) documented enhanced topical drug uptake into skin after ablative fractional laser treatment. Clinical evidence encompassed 18 studies, of which 9 were randomized controlled trials and 2 were controlled trials, examining neoplastic lesions, photodamaged skin, scars, onychomycosis, and topical anesthetics. The highest level of evidence was reached for actinic keratoses treated with methylaminolevulinate for photodynamic therapy (level IB, 5 randomized controlled trials), substantiating superior and long-lasting efficacy versus conventional photodynamic therapy. No adverse events were reported, but ablative fractional laser-assisted drug delivery implies risks of systemic drug absorption, especially when performed over large skin areas. CONCLUSIONS: Fractional laser-assisted drug delivery is beneficial in enhancing preclinical and clinical outcomes for certain skin conditions. Anesthetics;Dermatologic Agents;Aminolevulinic Acid Administration, Cutaneous;Aminolevulinic Acid;Anesthetics;Animals;Cicatrix;Controlled Clinical Trials as Topic;Dermatologic Agents;Disease Models, Animal;Drug Delivery Systems;Evidence-Based Medicine;Female;Follow-Up Studies;Forecasting;Humans;Low-Level Light Therapy;Male;Onychomycosis;Patient Safety;Photochemotherapy;Quality Improvement;Randomized Controlled Trials as Topic;Skin Diseases;Skin Neoplasms;Swine;Translational Research, Biomedical;Treatment Outcome

The effectiveness of low-level laser therapy as an adjunct to non-surgical periodontal treatment: a meta-analysis. BACKGROUND AND OBJECTIVES: Although low-level laser therapy (LLLT) has been

demonstrated to have a biomodulatory effect on periodontal tissue, no systematic review has exclusively addressed its effectiveness as an adjunct to non-surgical periodontal treatment. This study aimed to evaluate whether an additional benefit exists for the application of LLLT compared with scaling and root planing (SRP) alone. MATERIAL AND METHODS: An extensive search was conducted in the Cochrane Library (Issue 8, 2015), PubMed (1997) and EMBASE (1947) before August 2015 for randomized controlled trials (RCTs). The bias risk was assessed with the Cochrane tool for risk of bias evaluation. A meta-analysis was performed using REVMAN 5.3. RESULTS: After independent screening of 354 initial records, eight publications (seven RCTs) were included. However, six were rated as 'having a high risk of bias' as a result of major methodological weakness in 'allocation concealment' and 'blinding of key personnel'. Meta-analysis showed that LLLT-mediated SRP demonstrated significant short-term benefits over SRP monotherapy in the improvement of the probing pocket depth ($p = 0.0009$ at 1 mo; $p = 0.03$ at 2 mo) and the level of interleukin-1Î² in the gingival crevicular fluid ($p = 0.01$ at 1 mo). Nevertheless, LLLT failed to show significant additional intermediate-term (3 and 6 mo) effects in terms of clinical parameters and alveolar bone density. CONCLUSION: These findings indicated that LLLT showed only short-term additional benefits after conventional SRP. Its long-term effects remain unclear due to substantial methodological weaknesses and an insufficient number of current studies. Future RCTs with better designs and longer follow-up periods are required to assess the effectiveness of LLLT as an adjunctive treatment strategy in patients with periodontal disease. Combined Modality Therapy;Dental Scaling;Humans;Low-Level Light Therapy;Periodontitis;Root Planing

Role of low-level laser therapy on the cardiac remodeling after myocardial infarction: A systematic review of experimental studies. AIMS: We systematically reviewed the role of low-level laser therapy (LLLT) in cardiac remodeling after myocardial infarction. MAIN METHODS: Literatures were systematically searched in several electronic databases. We included only studies with a well-standardized coronary occlusion model in vivo LLLT application. KEY FINDINGS: After screening, 14 studies were eligible for review. The study heterogeneity was described in terms of rationality, gender, irradiation parameters, treatment numbers and moment of LLLT application. Three studies showed a null role of LLLT on infarct size, and only one study found positive LLLT effects on the cardiac performance. The cardioprotective role of LLLT was mediated by anti-inflammatory, pro-angiogenic and anti-oxidant actions. SIGNIFICANCE: The reduction in infarct size is a major finding. The LLLT cardioprotection may be mediated by several molecular and cellular mechanisms. Although these results are exciting, there are many limitations that must be resolved before LLLT clinical trials. Animals;Humans;Laser Therapy;Low-Level Light Therapy;Myocardial Infarction;Ventricular Remodeling

Use of 308 nm excimer laser for the treatment of chronic hand and foot eczema. BACKGROUND: Chronic hand and foot eczema (CHFE), a prevalent debilitating disorder affecting approximately 15% of the population, presents a socioeconomic and psychosocial burden for patients and often follows a chronic course, refractory to conventional therapies. Thus, a large need exists for more effective therapeutics; the excimer laser (308 nm) is effective for some inflammatory skin diseases, but its efficacy has not been evaluated for CHFE. METHODS: The study is a retrospective chart review conducted on 30 patients with recalcitrant CHFE (19 with hand involvement, four with foot involvement, and seven with both) treated twice weekly with excimer laser (308 nm) single wavelength ultraviolet (UV)B radiation between January 2013 and December 2014. RESULTS: Improvements in clinical scores included a 69% reduction in average physician's global assessment (PGA) scores (from 2.77 at baseline to 0.87 after treatment, $P < 0.0001$) with a parallel reduction in average modified total lesion/symptom scores of 70% (from 10.2 to 3.1, $P < 0.0001$). Only mild sunburn-like reactions were observed. CONCLUSION: This report evaluates excimer laser for patients

with refractory CHFE and shows excellent and sustained efficacy for this treatment. Compared to other UV therapies, excimer laser offers lower cumulative doses of UV radiation by targeting specific areas. This effective treatment should be considered alone or in combination with other established or newer therapies. Adolescent;Adult;Aged;Child;Chronic Disease;Cohort Studies;Eczema;Female;Follow-Up Studies;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Retrospective Studies;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome;Young Adult

Clinical Management Protocol for Dental Implants Inserted in Patients with Active Lichen Planus. PURPOSE: To propose a treatment protocol for management of implant candidates suffering from active lichen planus. MATERIALS AND METHODS: Twenty-three patients who were diagnosed with active lichen planus were referred to a dental practice seeking dental implants. Patients received dental implants using open flap technique and sequential osteotomy. After a healing time of 6 weeks, implants were put into occlusal contact using interim prostheses. Of the 55 inserted implants, 42 failed after a short clinical service time (7 to 11 weeks). Failed implants were surgically removed, and osteotomy sites were carefully cleaned using manual curettes and scrubbing of osteotomy walls. CD4/CD8 cell count and gingival biopsies were collected from the surgical sites. Patients were put on an ascending dose (5 mg/10 days) of oral corticosteroids until a daily dose of 20 mg/day was achieved and maintained for 2 weeks. All patients received ten sessions of low-energy soft tissue laser irradiation at the implant insertion sites to assess soft tissue healing through improving blood circulation, reduction of inflammation, and sterilization of the osteotomy region. After approximately 8 weeks, a new set of 42 implants was placed, and definitive restorations were cemented using early loading technique. Marginal bone levels around inserted implants were periodically evaluated every 3 months using digital periapical radiographs (Î± = 0.05). RESULTS: Primary blood tests revealed a high CD8 cell count, while soft tissue biopsies revealed infiltration of inflammatory cells at the epithelium soft tissue interface of the examined tissue. Repetition of immunological investigations after administration of the oral corticosteroids and soft tissue laser irradiation revealed reduction of CD8 cell counts and disappearance of inflammatory cell infiltration of the examined soft tissue biopsy. Patients reported marked improvement of the oral mucosa after treatment. All implants (n = 42) were functional after 3 years of clinical observation. There was an initial reduction in marginal bone level after 3 months from insertion time, after which it remained constant during the following observation periods. CONCLUSION: Active lichen planus should be managed with oral corticosteroids and soft tissue laser irradiation before insertion of dental implants. Dental Implants;Glucocorticoids Aged;CD8-Positive T-Lymphocytes;Dental Implants;Dental Prosthesis, Implant-Supported;Female;Glucocorticoids;Humans;Immediate Dental Implant Loading;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged

Low-level laser therapy to recovery testicular degeneration in rams: effects on seminal characteristics, scrotal temperature, plasma testosterone concentration, and testes histopathology. The aim of this study was to investigate the efficiency of low-level laser therapy (LLLT) to recovery testicular degeneration in rams. In the first study, rams were induced to testicular degeneration by scrotal insulation, and then, they were treated using LLLT at 28Â J/cm(2) (INS28) or 56Â J/cm(2) (INS56) energy densities. Sperm kinetics, morphology, and membranes integrity as well as proportion of lumen area in seminiferous tubule were assessed. In the second study, rams were submitted or not to scrotal insulation and treated or not by the best protocol of LLLT defined by experiment 1 (INS28). In this study were evaluated sperm kinetics, morphology, membranes integrity, ROS production, and DNA integrity. Testosterone serum concentration and proportion of lumen area in seminiferous tubule were also analyzed. Insulation was effective in promoting sperm injuries in both experiments. Biostimulatory effect was observed in experiment 1: INS28 presented smaller proportion of lumen

area (Pâ€‰=â€‰0.0001) and less degeneration degree (Pâ€‰=â€‰0.0002). However, in experiment 2, there was no difference between the groups (Pâ€‰=â€‰0.17). In addition, LLLT did not improve sperm quality, and there was a decreasing for total and progressive motility (Pâ€‰=â€‰0.02) and integrity of sperm membranes (Pâ€‰=â€‰0.01) in LLLT-treated groups. Moreover, testosterone concentration was not improved by LLLT (Pâ€‰=â€‰0.37). Stimulation of aerobic phosphorylation by LLLT may have led to a deregulated increase in ROS leading to sperm damages. Thus, LLLT at energy of 28Â J/cm(2) (808Â nm of wavelength and 30Â mW of power output) can induce sperm damages and increase the quantity of cells in seminiferous tubule in rams. Testosterone Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Scrotum;Sheep, Domestic;Sperm Motility;Spermatozoa;Testicular Diseases;Testis;Testosterone

Comparative effects of low-level laser therapy pre- and post-injury on mRNA expression of MyoD, myogenin, and IL-6 during the skeletal muscle repair. This study analyzed the effect of pre-injury and post-injury irradiation with low-level laser therapy (LLLT) on the mRNA expression of myogenic regulatory factors and interleukin 6 (IL-6) during the skeletal muscle repair. Male rats were divided into six groups: control group, sham group, LLLT group, injury group; pre-injury LLLT group, and post-injury LLLT group. LLLT was performed with a diode laser (wavelength 780 nm; output power 40 mW' and total energy 3.2 J). Cryoinjury was induced by two applications of a metal probe cooled in liquid nitrogen directly onto the belly of the tibialis anterior (TA) muscle. After euthanasia, the TA muscle was removed for the isolation of total RNA and analysis of MyoD, myogenin, and IL-6 using real-time quantitative PCR. Significant increases were found in the expression of MyoD mRNA at 3 and 7 days as well as the expression of myogenin mRNA at 14 days in the post-injury LLLT group in comparison to injury group. A significant reduction was found in the expression of IL-6 mRNA at 3 and 7 days in the pre-injury LLLT and post-injury LLLT groups. A significant increase in IL-6 mRNA was found at 14 days in the post-injury LLLT group in comparison to the injury group. LLLT administered following muscle injury modulates the mRNA expression of MyoD and myogenin. Moreover, the both forms of LLLT administration were able to modulate the mRNA expression of IL-6 during the muscle repair process. Interleukin-6;MyoD Protein;Myog protein, rat;Myogenin;RNA, Messenger Animals;Interleukin-6;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Myogenin;RNA, Messenger;Rats;Rats, Wistar;Regeneration;Wound Healing

S100a8/NF-ÎºB signal pathway is involved in the 800-nm diode laser-induced skin collagen remodeling. The 800-nm diode laser is widely used for hair removal and also promotes collagen synthesis, but the molecular mechanism by which dermis responses to the thermal damage induced by the 800-nm diode laser is still unclear. Ten 2-month-old mice were irradiated with the 800-nm diode laser at 20, 40, and 60 J/cm(2), respectively. Skin samples were taken for PCR, Western blot analysis, and histological study at day 3 or 30 after laser irradiation. The expression of S100a8 and its two receptors (advanced glycosylation end product-specific receptor, RAGE and toll-like receptor 4, TRL4) was upregulated at day 3 after laser treatments. P-p65 levels were also elevated, causing the increase of cytokine (tumor necrosis factor, TNF-Î± and interleukin 6, IL-6) and MMPs (MMP1a, MMP9). At day 30, PCR and Western blot analysis showed significant increase of type I and III procollagen in the dermis treated with laser. Importantly, skin structure was markedly improved in the laser-irradiated skin compared with the control. Thus, it seemed that S100a8 upregulation triggered NF-ÎºB signal pathway through RAGE and TLR4, responding to laser-induced dermis wound healing. The involvement of the NF-ÎºB pathway in MMP gene transcription promoted the turnover of collagen in the skin, accelerating new collagen synthesis. Calgranulin A;Interleukin-6;NF-kappa B;S100a8 protein, mouse;Tumor Necrosis Factor-alpha;Collagen;Matrix Metalloproteinase 13;Mmp13 protein, mouse;Matrix Metalloproteinase 2;Mmp2 protein, mouse Animals;Calgranulin A;Collagen;Cosmetic Techniques;Female;Gene Expression;Interleukin-6;Lasers, Semiconductor;Low-

Level Light Therapy;Matrix Metalloproteinase 13;Matrix Metalloproteinase 2;Mice;NF-kappa B;Signal Transduction;Skin;Skin Aging;Tumor Necrosis Factor-alpha;Up-Regulation

Pulsed dye laser treatment of capillary malformations in infants at 2-weekly versus 3-monthly intervals, reducing the need for general anaesthesia. Capillary malformations (CM) cause significant psychosocial complications. Pulsed dye laser (PDL) treatment at 6-12-weekly intervals under general anaesthesia (GA) commencing in infants at 6 months of age remains the standard of care in order to achieve maximal improvement prior to school age. The safety of repeated GA in children is controversial. Shortening the time between treatments increases the number that can be delivered prior to 6 months of age, thus reducing the number of subsequent treatments needed under GA. We investigated the safety and effectiveness of more frequent PDL treatment of CM in infancy via a pilot, prospective patient-controlled study of 10 patients. Using 595 nm (Vbeam) PDL, the entire CM was treated initially, then half the CM randomly allocated to 2-weekly and half to 3-monthly intervals for two further treatments. Photographs of the CM taken 3 months after treatment completion were evaluated by an independent, blinded dermatologist. Nine infants completed the study. Three infants (33%) had more improvement on the 2-weekly treated side and four (44%) had more improvement on the 3-monthly treated side. Two patients (22%) showed no difference between sides. Treatments were well tolerated without complications. We conclude that 2-weekly PDL treatments of CM in infants aged under 6 months is effective and well tolerated without adverse effects. Our preliminary data suggest a possible superior efficacy with 3-monthly treatment intervals; however, larger studies are warranted for stronger evidence. More frequent non-GA treatment of CM in infants should be further investigated to decrease the risk of repeated GA exposure in young children. Anesthesia, General;Female;Humans;Infant;Infant, Newborn;Lasers, Dye;Low-Level Light Therapy;Male;Pilot Projects;Port-Wine Stain;Prospective Studies;Time Factors

Low-level laser therapy affects osseointegration in titanium implants: resonance frequency, removal torque, and histomorphometric analysis in rabbits. OBJECTIVES: The purpose of this study was to investigate the effects of low-level laser therapy (LLLT) with a diode gallium-aluminum-arsenide (Ga-Al-As) low-level laser device on the healing and attachment of titanium implants in bone. MATERIALS AND METHODS: Thirteen New Zealand white male rabbits weighing 3.0Â±0.5 kg were used for this study. Dental titanium implants (3.75 mm in diameter and 8.5 mm in length, US II RBM plus fixture; Osstem, Seoul, Korea) were implanted into both femurs of each rabbit. The rabbits were randomly divided into a LLLT group and a control group. The LLLT was initiated immediately after surgery and then repeated daily for 7 consecutive days in the LLLT group. Six weeks and 12 weeks after implantation, we evaluated and compared the osseointegration of the LLLT group and control group, using histomorphometric analysis, removal torque testing, and resonance frequency analysis (RFA). The results were statistically significant when the level of probability was 0.05 or less based on a non-parametric Mann-Whitney U-test. RESULTS: The implant survival rate was about 96%. Histologically and histomorphometrically, we observed that the titanium implants were more strongly attached in LLLT group than in control group. However, there was no significant difference between the LLLT group and control group in removal torque or RFA. CONCLUSION: Histologically, LLLT might promote cell-level osseointegration of titanium implants, but there was no statistically significant effects.

A novel low-power laser-mediated transfer of foreign molecules into cells. Efficiently introducing molecules such as chemical drugs, proteins, or nucleic acids into cells is a central technique in cell and molecular biology, gene therapy and regenerative medicine. The cell membrane is a critical barrier for this purpose. While many approaches exist, some of which are applicable to single cells that researchers specify under microscopy, no reliable and efficient technique has been invented. In this study, cells were cultured on a coverslip that had been coated with carbon by vapor deposition, and a laser beam was focused on a small local spot beneath a single cell under microscopy. The absorbed

energy of the laser beam by the carbon made a pore only in the cell membrane that was attached to the carbon coat, which resulted in an efficient introduction. An inexpensive and lower-power laser could be used for this method, and the introduction efficiency was 100% without any loss of cell viability. This new technique will provide a powerful tool not only to research but also to many applied fields. Coated Materials, Biocompatible;FM1 43;Fluorescent Dyes;Pyridinium Compounds;Quaternary Ammonium Compounds;Carbon Animals;Biological Transport;COS Cells;Carbon;Cell Membrane;Cell Membrane Permeability;Chlorocebus aethiops;Coated Materials, Biocompatible;Dictyostelium;Fluorescent Dyes;Lasers;Low-Level Light Therapy;Plasmids;Pyridinium Compounds;Quaternary Ammonium Compounds;Single-Cell Analysis

Engineering Multi-Walled Carbon Nanotube Therapeutic Bionanofluids to Selectively Target Papillary Thyroid Cancer Cells. BACKGROUND: The incidence of papillary thyroid carcinoma (PTC) has risen steadily over the past few decades as well as the recurrence rates. It has been proposed that targeted ablative physical therapy could be a therapeutic modality in thyroid cancer. Targeted bio-affinity functionalized multi-walled carbon nanotubes (BioNanofluid) act locally, to efficiently convert external light energy to heat thereby specifically killing cancer cells. This may represent a promising new cancer therapeutic modality, advancing beyond conventional laser ablation and other nanoparticle approaches. METHODS: Thyroid Stimulating Hormone Receptor (TSHR) was selected as a target for PTC cells, due to its wide expression. Either TSHR antibodies or Thyrogen or purified TSH (Thyrotropin) were chemically conjugated to our functionalized Bionanofluid. A diode laser system (532 nm) was used to illuminate a PTC cell line for set exposure times. Cell death was assessed using Trypan Blue staining. RESULTS: TSHR-targeted BioNanofluids were capable of selectively ablating BCPAP, a TSHR-positive PTC cell line, while not TSHR-null NSC-34 cells. We determined that a 2:1 BCPAP cell:Î±-TSHR-BioNanofluid conjugate ratio and a 30 second laser exposure killed approximately 60% of the BCPAP cells, while 65% and >70% of cells were ablated using Thyrotropin- and Thyrogen-BioNanofluid conjugates, respectively. Furthermore, minimal non-targeted killing was observed using selective controls. CONCLUSION: A BioNanofluid platform offering a potential therapeutic path for papillary thyroid cancer has been investigated, with our in vitro results suggesting the development of a potent and rapid method of selective cancer cell killing. Therefore, BioNanofluid treatment emphasizes the need for new technology to treat patients with local recurrence and metastatic disease who are currently undergoing either re-operative neck explorations, repeated administration of radioactive iodine and as a last resort external beam radiation or chemotherapy, with fewer side effects and improved quality of life. Antibodies, Neoplasm;Nanotubes, Carbon;Neoplasm Proteins;Receptors, Thyrotropin;Thyrotropin Alfa Animals;Antibodies, Neoplasm;Carcinoma;Carcinoma, Papillary;Cell Line, Tumor;Drug Delivery Systems;Humans;Low-Level Light Therapy;Nanotubes, Carbon;Neoplasm Proteins;Receptors, Thyrotropin;Thyroid Cancer, Papillary;Thyroid Neoplasms;Thyrotropin Alfa

Magnetite nanocluster@poly(dopamine)-PEG@ indocyanine green nanobead with magnetic field-targeting enhanced MR imaging and photothermal therapy in vivo. Multifunctional nanomaterials with the magnetic resonance imaging (MRI) guided tumor photothermal ablation ability have been extensively applied in biomedical research as one of the most exciting and challenging strategies for cancer treatment. Nevertheless, most of these nanomaterials still suffer from low accumulation in tumor tissues and insufficient photothermal ablation of tumors so far. Here, we report a novel approach to overcome these limitations using a core-shell magnetite nanocluster@poly(dopamine)-PEG@ICG nanobead compositing of magnetite nanocluster core with coating of poly(dopamine), then further conjugating with polyethylene glycol (PEG) and adsorbing indocyanine green (ICG) on the surface. The adsorbed ICG in the nanobead displays a higher photostability and photothermal conversion ability than free ICG, as well as additional photothermal

effect rather than magnetite nanocluster and poly(dopamine), which endow the nanobead with enhanced photothermal killing efficiency against cancer cells under near-infrared (NIR) laser irritation. Furthermore, it is proved that these nanobeads have excellent biocompatibility, T2-weighted MR imaging and magnetic field targeting ability. By applying an external magnetic field (MF) focused on the targeted tumor, a magnetic targeting mediated enhanced accumulation is observed at tumor site as proved by a darker T2-weighted MR image. Utilizing the magnetic targeting strategy, enhanced photothermal tumor ablation was achieved under laser irradiation in vivo, which is reflected by the degree of tumor tissue damage and tumor growth delay. Therefore, this nanobead integrates the abilities of magnetic field-targeting, MR imaging and photothermal cancer therapy, and might be a promising theranostic platform for tumor treatment. Indoles;Magnetite Nanoparticles;Polymers;polydopamine;Polyethylene Glycols;Indocyanine Green Animals;Cell Survival;Hep G2 Cells;Humans;Indocyanine Green;Indoles;Liver Neoplasms;Low-Level Light Therapy;Magnetic Fields;Magnetic Resonance Imaging;Magnetite Nanoparticles;Male;Mice;Mice, Inbred BALB C;Mice, Nude;Microscopy, Electron, Transmission;NIH 3T3 Cells;Phototherapy;Polyethylene Glycols;Polymers;Spectroscopy, Fourier Transform Infrared;Xenograft Model Antitumor Assays

Clinical Evaluation of Low Level Diode Laser Application For Primary Teeth Pulpotomy. INTRODUCTION: Inspite of latest advances in the materials and techniques practiced for the treatment of pulpally infected teeth with better reported success rate, still the question arises for safety and effectiveness of these medicaments. AIM: The objective of the present study was to compare the effectiveness of the Low Level Laser Therapy to Mineral Trioxide Aggregate (MTA) when used for pulpotomy in vital human primary molars. MATERIALS AND METHODS: The sample consisted of 40 primary molars from 29 children aged four to seven years. The teeth were selected based on clinical, radiographic criteria and randomly allocated to two groups. All the 40 primary molars were subjected to standard pulpotomy procedure, where in 20 molars received MTA (Group I) and 20 molars received LLLT (Group II) pulpotomy. Children were recalled at 3, 6 and 12 months intervals and pulpotomised molars were examined clinically and radiographically. Data was analysed using chi-square test. RESULTS: MTA showed 94.7% success rate at all the three intervals, where as LLLT showed a success of 95% at three months, which decreased gradually to 85% at six months and 80% at 12 months. Intergroup comparisons were not significant. CONCLUSION: Low level laser therapy can be considered for primary teeth pulpotomy and its success is comparable to MTA pulpotomy technique.

"Quantum Leap" in Photobiomodulation Therapy Ushers in a New Generation of Light-Based Treatments for Cancer and Other Complex Diseases: Perspective and Mini-Review. OBJECTIVE: Set within the context of the 2015 International Year of Light and Light-Based Technologies,and of a growing and aging world population with ever-rising healthcare needs, this perspective and mini-review focuses on photobiomodulation (PBM) therapy as an emerging, cost-effective, treatment option for cancer (i.e., solid tumors) and other complex diseases, particularly, of the eye (e.g., age-related macular degeneration, diabetic retinopathy, glaucoma, retinitis pigmentosa) and the central nervous system (e.g., Alzheimer's and Parkinson's disease). BACKGROUND DATA: Over the last decades, primary and secondary mechanisms of PBM have been revealed. These include oxygen-dependent and oxygen-independent structural and functional action pathways. Signal and target characteristics determine biological outcome, which is optimal (or even positive) only within a given set of parameters. METHODS: This study was a perspective and nonsystematic literature mini-review. RESULTS: Studies support what we describe as a paradigm shift or "quantum leap" in the understanding and use of light and its interaction with water and other relevant photo-cceptors to restore physiologic function. CONCLUSIONS: Based on existing evidence, it is argued that PBM

therapy can raise the standard of care and improve the quality of life of patients for a fraction of the cost of many current approaches. PBM therapy can, therefore,benefit large, vulnerable population groups, including the elderly and the poor, whilehaving a major impact on medical practice and public finances. Water Central Nervous System Diseases;Eye Diseases;Humans;Light;Low-Level Light Therapy;Neoplasms;Water

Pre-conditioning with transcranial low-level light therapy reduces neuroinflammation and protects blood-brain barrier after focal cerebral ischemia in mice. PURPOSE: Transcranial low-level light therapy (LLLT) has gained interest as a non-invasive, inexpensive and safe method of modulating neurological and psychological functions in recent years. This study was designed to examine the preventive effects of LLLT via visible light source against cerebral ischemia at the behavioral, structural and neurochemical levels. METHODS: The mice received LLLT twice a day for 2 days prior to photothrombotic cortical ischemia. RESULTS: LLLT significantly reduced infarct size and edema and improved neurological and motor function 24 h after ischemic injury. In addition, LLLT markedly inhibited Iba-1- and GFAP-positive cells, which was accompanied by a reduction in the expression of inflammatory mediators and inhibition of MAPK activation and NF-ÎºB translocation in the ischemic cortex. Concomitantly, LLLT significantly attenuated leukocyte accumulation and infiltration into the infarct perifocal region. LLLT also prevented BBB disruption after ischemic events, as indicated by a reduction of Evans blue leakage and water content. These findings were corroborated by immunofluorescence staining of the tight junction-related proteins in the ischemic cortex in response to LLLT. CONCLUSIONS: Non-invasive intervention of LLLT in ischemic brain injury may provide a significant functional benefit with an underlying mechanism possibly being suppression of neuroinflammation and reduction of BBB disruption. Aif1 protein, mouse;Calcium-Binding Proteins;Cytokines;Microfilament Proteins Analysis of Variance;Animals;Blood-Brain Barrier;Brain Edema;Brain Infarction;Brain Ischemia;Calcium-Binding Proteins;Cytokines;Encephalitis;Gene Expression Regulation;Intracranial Thrombosis;Ischemic Preconditioning;Leukocytes;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Microfilament Proteins;Motor Activity;Neurologic Examination;Neutrophil Infiltration

Cell viability, reactive oxygen species, apoptosis, and necrosis in myoblast cultures exposed to low-level infrared laser. Low-level infrared laser is considered safe and effective for treatment of muscle injuries. However, the mechanism involved on beneficial effects of laser therapy are not understood. The aim was to evaluate cell viability, reactive oxygen species, apoptosis, and necrosis in myoblast cultures exposed to low-level infrared laser at therapeutic fluences. C2C12 myoblast cultures at different (2 and 10Â %) fetal bovine serum (FBS) concentrations were exposed to low-level infrared laser (808Â nm, 100Â mW) at different fluences (10, 35, and 70Â J/cm(2)) and evaluated after 24, 48, and 72Â h. Cell viability was evaluated by WST-1 assay; reactive oxygen species (ROS), apoptosis, and necrosis were evaluated by flow cytometry. Cell viability was decreased atthe lowest FBS concentration. Laser exposure increased the cell viability in myoblast cultures at 2Â % FBS after 48 and 72Â h, but no significant increase in ROS was observed. Apoptosis was decreased at the higher fluence and necrosis was increased at lower fluence in myoblast cultures after 24Â h of laser exposure at 2Â % FBS. No laser-induced alterations were obtained at 10Â % FBS. Results show that level of reactive oxygen species is not altered, at least to those evaluated in this study, but low-level infrared laser exposure affects cell viability, apoptosis, and necrosis in myoblast cultures depending on laser fluence and physiologic conditions of cells. Reactive Oxygen Species Animals;Apoptosis;Cattle;Cell Survival;Low-Level Light Therapy;Myoblasts;Necrosis;Reactive Oxygen Species

Red and infrared laser therapy inhibits in vitro growth of major bacterial species that commonly colonize skin ulcers. Low-level laser therapy (LLLT) is used in chronic wounds due to its healing

effects. However, bacterial species may colonize these wounds and the optimal parameters for effective bacterial inhibition are not clear. The aim of this study was to analyze the effect of LLLT on bacterial growth in vitro. Bacterial strains including Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa were suspended in saline solution at a concentration of 10(3) cells/ml and exposed to laser irradiation at wavelengths of 660, 830, and 904 nm at fluences of 0 (control), 3, 6, 12, 18, and 24 J/cm(2). An aliquot of the irradiated suspension was spread on the surface of petri plates and incubated at 37 Â°C for quantification of colony-forming unit after 24, 48, and 72 h. Laser irradiation inhibited the growth of S. aureus at all wavelengths and fluences higher than 12 J/cm(2), showing a strong correlation between increase in fluence and bacterial inhibition. However, for P. aeruginosa, LLLT inhibited growth at all wavelengths only at a fluence of 24 J/cm(2). E. coli had similar growth inhibition at a wavelength of 830 nm at fluences of 3, 6, 12, and 24 J/cm(2). At wavelengths of 660 and 904 nm, growth inhibition was only observed at fluences of 12 and 18 J/cm(2), respectively. LLLT inhibited bacterial growth at all wavelengths, for a maximum of 72 h after irradiation, indicating a correlation between bacterial species, fluence, and wavelength. Escherichia coli;Humans;Infrared Rays;Low-Level Light Therapy;Pseudomonas aeruginosa;Skin Ulcer;Staphylococcus aureus;Wound Healing

Evaluation of low-level laser therapy in the treatment of masticatory muscles spasticity in children with cerebral palsy. Spasticity is a motor disorder frequently present in individuals with cerebral palsy (CP). This study aimed to evaluate the effect of low-level laser therapy (LLLT) on the spasticity of the masseter and anterior temporal muscle fibers in children with CP over three weeks of intermittent laser exposures. The bite force (BF) of the masticatory muscles and the amplitude of mouth opening were evaluated before and after laser irradiation in 30 children with CP. Both sides of the masseter and temporalis muscles were irradiated with low-intensity diode laser pulses of 808-nm wavelength six times over three consecutive weeks. During the subsequent three weeks of postlaser exposures, although no laser treatment was applied, the evaluation parameters were measured and recorded. A significant improvement in the amplitude of mouth opening and a decrease in the BF were observed in the weeks following LLLT ($P<0.05$). However, by the sixth week post-LLLT, the BF and the amplitude of mouth opening reverted to values equivalent to those obtained before the first application of LLLT. Our investigation revealed low-level energy exposures from a 808-nm diode laser to be an effective short-term therapeutic tool. This method increased the amplitude of mouth opening and decreased the muscle tonus of children with spastic CP over a time course of three weeks of intermittent laser applications. Adolescent;Bite Force;Cerebral Palsy;Child;Female;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Masticatory Muscles;Muscle Spasticity;Range of Motion, Articular

New Diagnostic and Therapeutic Approaches for Preventing the Progression of Diabetic Retinopathy. Diabetic retinopathy (DR) is a severe sight-threatening complication of diabetes mellitus. Retinal laser photocoagulation, antivascular endothelial growth factors, steroid therapy, and pars plana vitrectomy are now used extensively to treat advanced stages of diabetic retinopathy. Currently, diagnostic devices like ultrawide field fundus fluorescein angiography and the improvement of optical coherence tomography have provided quicker and more precise diagnosis of early diabetic retinopathy. Thus, treatment protocols have been modified accordingly. Various types of lasers, including the subthreshold micropulse laser and RPE-targeting laser, and selective targeted photocoagulation may be future alternatives to conventional retinal photocoagulation, with fewer complications. The new developed intravitreal medications and implants have provided more therapeutic options, with promising results. Vascular Endothelial Growth Factor A;Triamcinolone Acetonide Diabetic Retinopathy;Disease Progression;Early Diagnosis;Fluorescein Angiography;Humans;Low-Level Light

Therapy;Tomography, Optical Coherence;Triamcinolone Acetonide;Vascular Endothelial Growth Factor A

Minimally Invasive Techniques to Accelerate the Orthodontic Tooth Movement: A Systematic Review of Animal Studies. OBJECTIVE: To evaluate various noninvasive and minimally invasive procedures for the enhancement of orthodontic tooth movement in animals. MATERIALS AND METHODS: Literature was searched using NCBI (PubMed, PubMed Central, and PubMed Health), MedPilot (Medline, Catalogue ZB MED, Catalogue Medicine Health, and Excerpta Medica Database (EMBASE)), and Google Scholar from January 2009 till 31 December 2014. We included original articles related to noninvasive and minimally invasive procedures to enhance orthodontic tooth movement in animals. Extraction of data and quality assessments were carried out by two observers independently. RESULTS: The total number of hits was 9195 out of which just 11 fulfilled the inclusion criteria. Nine articles were good and 5 articles were moderate in quality. Low level laser therapy (LLLT) was among the most common noninvasive techniques whereas flapless corticision using various instruments was among the commonest minimally invasive procedures to enhance velocity of tooth movement. CONCLUSIONS: LLLT, low intensity pulsed ultrasound (LIPUS), mechanical vibration, and flapless corticision are emerging noninvasive and minimally invasive techniques which need further researches to establish protocols to use them clinically with conviction.
Animals;Disease Models, Animal;Minimally Invasive Surgical Procedures;Rats;Tooth Movement Techniques

Improvement of hyperpigmentation within a plexiform neurofibroma after treatment with Q-switched neodymium:yttrium-aluminium-garnet laser. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum Aluminum;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Neodymium;Neurofibroma, Plexiform;Treatment Outcome;Young Adult;Yttrium

Near-infrared light (670Â nm) reduces MPTP-induced parkinsonism within a broad therapeutic time window. We have shown previously that near-infrared light (NIr), when applied at the same time as a parkinsonian insult (e.g. 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine; MPTP), reduces behavioural deficits and offers neuroprotection. Here, we explored whether the timing of NIr intervention-either before, at the same time or after the MPTP insult-was important. Mice received MPTP injections (total of 50Â mg/kg) and, at various stages in relation to these injections, extracranial application of NIr. Locomotor activity was tested with an open-field test, and brains were processed for immunohistochemistry. Our results showed that regardless of when NIr was applied in relation to MPTP insult, behavioural impairment was reduced by a similar magnitude. The beneficial effect of NIr was fast-acting (within minutes) and long-lasting (for several days). There were more dopaminergic cells in the NIr-treated MPTP groups than in the MPTP group; there was no clear indication that a particular combination of NIr treatment and MPTP injection resulted in a higher cell number. In summary, irrespective of whether it was applied before, at the same time as or after MPTP insult, NIr reduced both behavioural and structural measures of damage by a similar magnitude. There was a broad therapeutic time window of NIr application in relation to the stage of toxic insult, and the NIr was fast-acting and long-lasting. Animals;Behavior, Animal;Disease Models, Animal;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Male;Mice;Mice, Inbred BALB C;Motor Activity;Phototherapy;Spectroscopy, Near-Infrared;Time Factors

Adjunctive 830 nm light-emitting diode therapy can improve the results following aesthetic procedures. BACKGROUND: Aggressive, or even minimally aggressive, aesthetic interventions are almost inevitably followed by such events as discomfort, erythema, edema and hematoma formation which could lengthen patient downtime and represent a major problem to the surgeon. Recently, low level light therapy with light-emitting diodes (LED-LLLT) at 830 nm has attracted

attention in wound healing indications for its anti-inflammatory effects and control of erythema, edema and bruising. RATIONALE: The wavelength of 830 nm offers deep penetration into living biological tissue, including bone. A new-generation of 830 nm LEDs, based on those developed in the NASA Space Medicine Laboratory, has enabled the construction of planar array-based LED-LLLT systems with clinically useful irradiances. Irradiation with 830 nm energy has been shown in vitro and in vivo to increase the action potential of epidermal and dermal cells significantly. The response of the inflammatory stage cells is enhanced both in terms of function and trophic factor release, and fibroblasts demonstrate superior collagenesis and elastinogenesis. CONCLUSIONS: A growing body of clinical evidence is showing that applying 830 nm LED-LLLT as soon as possible post-procedure, both invasive and noninvasive, successfully hastens the resolution of sequelae associated with patient downtime in addition to significantly speeding up frank wound healing. This article reviews that evidence, and attempts to show that 830 nm LED-LLLT delivers swift resolution of postoperative sequelae, minimizes downtime and enhances patient satisfaction.

Therapeutic antioxidant and anti-inflammatory effects of laser acupuncture on patients with rheumatoid arthritis. BACKGROUND AND OBJECTIVE: The laser acupuncture has many potential therapeutic effects. Currently, they are not evaluated for their therapeutic effects on rheumatoid arthritis (RA) patients. The aim of this study was to investigate the effects of laser acupuncture on the oxidative and antioxidative markers, as well as the inflammatory markers and disease activity of RA patients. DESIGN/MATERIALS AND METHODS: The study was conducted on 30 RA patients and 20 healthy subjects. The patients were subjected to laser acupuncture (904â€‰nm, 100â€‰mW power output, 1 minute irradiation time, beam area of 1â€‰cm(2) , total energy per point 6â€‰J, energy density 6â€‰J/â€‰cm(2) , irradiance 0.1â€‰W/cm(2) , frequency 10000â€‰Hz, duty-cycle 100%) for 3 days/week for duration of 4 weeks. The acupuncture points of exposure were LI4, TE5, LI 11, DU 14, LIV3, SP6, GB34, and S36. The levels of oxidative and antioxidant markers were determined by spectrophotometric methods whereas the inflammatory markers were determined by ELISA methods. Lastly, using DAS28 scores the disease activity was assessed. RESULTS: After laser acupuncture, the study group revealed significantly increased plasma superoxide dismutase (SOD), glutathione reductase (GR), catalase activities, blood glutathione (GSH), and plasma ATP concentrations, compared to those before treatment (Pâ€‰<â€‰0.0005). Moreover, the results revealed significantly reduced plasma malondialdehyde (MDA), serum nitrate and nitrite, serum C-reactive protein (CRP), plasma interleukin-6 (IL-6) levels and significantly reduced glutathione peroxidase (GPx) activity and erythrocyte sedimentation rate (ESR) in laser exposed patients, compared to those before treatment (Pâ€‰<â€‰0.0005). The RA patients subjected to laser acupuncture showed highly significant reduction in disease activity (Pâ€‰<â€‰0.0005) based on DAS28 score. CONCLUSION: Our study results confirmed the effectiveness of laser acupuncture in alleviating oxidative stress and inflammation, improving antioxidant and energy metabolic status, while also suppressing the disease activity in RA patients. Laser acupuncture is a promising treatment modality to reduce the pain and suffering of RA patients because of its efficiency in inhibiting most of the main factors involved in the pathogenesis of this disease. Lasers Surg. Med. 48:490-497, 2016. Â© 2016 Wiley Periodicals, Inc. Antioxidants;Biomarkers Acupuncture Therapy;Adult;Antioxidants;Arthritis, Rheumatoid;Biomarkers;Case-Control Studies;Enzyme-Linked Immunosorbent Assay;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Oxidative Stress;Spectrophotometry;Treatment Outcome

Fractional carbon-dioxide (CO2) laser-assisted topical therapy for the treatment of onychomycosis. BACKGROUND: Inability of topical medications to penetrate via nail plate brings a great challenge to clinicians in treating onychomycosis. Furthermore, oral medications are not appropriate for all patients because of drug interactions, adverse effects, and contraindications. OBJECTIVE: We sought

to evaluate the clinical efficacy of fractional carbon-dioxide laser-assisted topical therapy for onychomycosis. METHODS: In total, 75 patients with 356 onychomycotic nails confirmed by mycologic examination were included in this study. All the affected nails received 3 sessions of laser therapy at 4-week intervals and once-daily application of terbinafine cream for 3 months. RESULTS: In all, 94.66% and 92% of the treated patients were potassium hydroxide and culture negative, respectively, after 3 months of treatment. However, only 84% and 80% were potassium hydroxide and culture negative, respectively, at 6 months of follow-up. Using Scoring Clinical Index for Onychomycosis electronic calculator, 73.33% of the patients scored higher than 6 and 26.66% of the patients scored 6 or less. Those who scored more than 6 were evaluated clinically and 98.18% of them showed response to treatment at 3 months and 78.18% of them at 6 months of follow-up. LIMITATION: Lack of control group and short duration of follow-up are limitations. CONCLUSIONS: Fractional carbon-dioxide laser therapy combined with topical antifungal was found to be effective in the treatment of onychomycosis. However, randomized clinical studies are needed before it can be widely used in clinics. Antifungal Agents Administration, Topical;Adult;Aged;Antifungal Agents;Cohort Studies;Combined Modality Therapy;Female;Follow-Up Studies;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Prospective Studies;Severity of Illness Index;Treatment Outcome

A randomized pilot study to assess the safety and the value of low-level laser therapy versus clonazepam in patients with burning mouth syndrome. Comparison between low-level laser therapy (LLLT) and clonazepam for treating burning mouth syndrome (BMS) patients has never been documented; the aim of this study was to assess the effects of LLLT photobiomodulation versus medical therapy with clonazepam on BMS. Thirty-three patients (25 female, 8 male, mean ageâ€‰=â€‰67.12) were randomly allocated to two different groups: the first one (group A, 18 patients) underwent two laser irradiation sessions weekly for 5 weeks, whereas the second one (group B, 15 patients) received topical clonazepam therapy [half a tablet (2 mg) in the mouth without swallowing for 3 min, three times a day for 21 days]. LLLT was delivered with a continuous wave 980-nm aluminum gallium arsenide (AlGaAs) diode laser and the output of 300 mW, delivering a Fluence of 10 J/cm(2), using a "spot technique," with an average power density of about 1 W/cm(2). The laser probe was held perpendicularly at a distance of about 2 mm from the mucosa. Visual analogue scale (VAS), McGill Pain Questionnaire, present pain intensity (PPI), and Oral Health Impact Profile (OHIP-49) assessed sensation of pain. Hospital Anxiety and Depression Scale and Geriatric Depression Scale assessed levels of anxiety and depression. Twelve weeks after the end of treatment, patients treated with LLLT experienced a decrease in pain sensation reported for all the parameters analyzed: VAS (Pâ€‰=â€‰0.004), McGill Pain Questionnaire (Pâ€‰=â€‰0.002), PPI (Pâ€‰=â€‰0.002), and OHIP-49 (Pâ€‰=â€‰0.010). The group treated with clonazepam had less favorable results for VAS (Pâ€‰=â€‰0.33), McGill Pain Questionnaire (Pâ€‰=â€‰0.005), PPI (Pâ€‰=â€‰0.013), and OHIP-49 (Pâ€‰=â€‰0.25). Levels of anxiety and depression did not change statistically in any groups (Pâ€‰>â€‰0.05). Comparing the two groups, LLLT appeared to be superior in improving pain perception, but statistically only at 8 weeks after the end of the protocol proposed (Pâ€‰=â€‰0.026). Based on this preliminary trial, LLLT is capable of reducing the symptoms of patients with BMS with a constant and long-lasting effect, experienced since the end of the first applications. Clonazepam Aged;Burning Mouth Syndrome;Clonazepam;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Light-emitting diode therapy increases collagen deposition during the repair process of skeletal muscle. This study analyzed the effects of light-emitting diode (LED) therapy on the morphology of muscle tissue as well as collagen remodeling and matrix metalloproteinase 2 (MMP-2) activity in

the skeletal muscle of rats following acute injury. Wistar rats were divided into four groups: (1) control, (2) sham, (3) untreated cryoinjury, and (4) cryoinjury treated with LED. Cryoinjury was induced by two applications of a metal probe cooled in liquid nitrogen directly onto the belly of the tibialis anterior muscle. For treatment, the LED equipment (wavelength 850 nm, output power 30 mW, and total energy 3.2 J) was used daily. The study periods were 1, 3, and 7 days after cryoinjury. Morphological aspects were evaluated through hematoxylin-eosin staining. The amount of collagen fibers was evaluated using Picro Sirius Red staining under polarized light. The gelatinase activity of MMP-2 was evaluated using zymography. The results showed significant reductions in inflammatory infiltrate after 3 days and an increased number of immature muscle fibers after 7 days. Furthermore, treatment induced a reduction in the gelatinolytic activity of MMP-2 after 1, 3, and 7 days in comparison to the untreated injury groups and increased the collagen deposition after 3 and 7 days in the treated groups. LED therapy at 850 nm induced a significant reduction in inflammation, decreased MMP-2 activity, and increased the amount of immature muscle and collagen fibers during the muscle repair process following acute injury. Collagen;Matrix Metalloproteinase 2;Mmp2 protein, rat Animals;Collagen;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Muscle, Skeletal;Rats, Wistar;Wound Healing

Effects of low-level laser therapy on performance, inflammatory markers, and muscle damage in young water polo athletes: a double-blind, randomized, placebo-controlled study. This study aimed to evaluate the effects of 5 days of 810-nm low-level laser therapy (LLLT) intervention on inflammatory and muscle damage markers and performance in young water polo players. Twenty young male water polo players participated in the study, which was designed as a randomized, double-blinded, placebo-controlled trial. Active LLLT or an identical placebo LLLT were delivered to eight points on the adductor muscle region immediately after each training day. Performance was measured by a 200-m maximal swimming (P200) and a 30-s crossbar jump test (30CJ) which was performed every day before training, and blood samples were drawn pre and post the final LLLT intervention to measure interleukins (IL) and muscle damage markers. There was no significant change in the P200 exercise in the LLLT group compared with the placebo group but there was a moderate improvement in the 30CJ (8.7â€‰Â±â€‰2.6 %). IL-1Î² and tumor necrosis factor-alpha presented increased (Pâ€‰<â€‰0.016) concentration within group 48 h after the last LLLT intervention compared to pre, 0, and 24 h, but did not differ between groups. IL-10 increased over time in the placebo group and reached a moderate effect compared to the LLLT group. The creatine kinase decreased significantly (Pâ€‰=â€‰0.049) over the time within the LLLT treatment group, but there was no significant change in lactate dehydrogenase (Pâ€‰=â€‰0.150). In conclusion, LLLT resulted in a non-significant, but small to moderate effect on inflammatory and muscle damage markers and a moderate effect on performance in water polo players. In addition, the lack of positive results could be due to the small area covered by irradiation and this should be considered in future studies. Biomarkers;IL1B protein, human;Interleukin-1beta;TNF protein, human;Tumor Necrosis Factor-alpha;Interleukin-10;L-Lactate Dehydrogenase;Creatine Kinase Adolescent;Athletes;Biomarkers;Creatine Kinase;Double-Blind Method;Humans;Interleukin-10;Interleukin-1beta;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Motor Skills;Muscle, Skeletal;Swimming;Treatment Outcome;Tumor Necrosis Factor-alpha

Ultraviolet B Phototherapy for Psoriasis: Review of Practical Guidelines. Psoriasis is an inflammatory skin condition that affects approximately 2Â % of people worldwide. Topical treatments, systemic treatments, biologic agents, and phototherapy are all treatment options for psoriasis. Ultraviolet (UV)Â B phototherapy is most appropriate for patients with >10Â % affected body surface area who have not responded to topical treatments. This review outlines the use, dosage, safety, and efficacy of narrowband UVB (NB-UVB) and targeted phototherapy. NB-UVB and

excimer laser are effective treatment options for psoriasis; they are administered two to three times weekly until clearance followed by maintenance treatment before discontinuation. Long-term data on NB-UVB indicate that it has a good safety profile. NB-UVB is commonly used with adjunctive topical treatments such as emollients, calcipotriene, cortico-steroids, retinoids, and tar. NB-UVB can be used in selected patients with traditional systemic agents such as methotrexate, mycophenolate mofetil, and cyclosporine, although the duration of the combined treatment should be kept to a minimum and patients need to be closely monitored. Acitretin can be safely used with phototherapy, but robust data on the combination use of biologic agents or phosphodiesterase inhibitors with phototherapy are lacking. Dermatologic Agents;IL17A protein, human;Interleukin-17;Keratolytic Agents;Phosphodiesterase Inhibitors;TNF protein, human;Tumor Necrosis Factor-alpha;Acitretin;Methotrexate Acitretin;Administration, Topical;Combined Modality Therapy;Contraindications;Dermatologic Agents;Dose-Response Relationship, Radiation;Humans;Interleukin-17;Keratolytic Agents;Lasers, Excimer;Low-Level Light Therapy;Methotrexate;PUVA Therapy;Phosphodiesterase Inhibitors;Practice Guidelines as Topic;Psoriasis;Skin;Tumor Necrosis Factor-alpha;Ultraviolet Therapy

Effects of neuromuscular electrical stimulation and low-level laser therapy on neuromuscular parameters and health status in elderly women with knee osteoarthritis: A randomized trial. OBJECTIVE: To determine the effects of neuromuscular electrical stimulation and low-level laser therapy on neuromuscular parameters and health status in elderly subjects with knee osteoarthritis. DESIGN: A randomized evaluator-blinded clinical trial. SUBJECTS: Forty-five elderly women with knee osteoarthritis. METHODS: Subjects were randomized into 1 of the following 3 intervention groups: electrical stimulation group (18-32 min pulsed current, stimulation frequency 80 Hz, pulse duration 400 Î¼s, stimulation intensity 40% of maximal isometric voluntary contraction), laser group (dose 4-6 J per point, 6 points at the knee joint) or combined group (electrical stimulation plus laser therapy). The outcomes included muscle thickness and anatomical cross-sectional area (ultrasonography), knee extensors' electrical activity (electromyography), torque (dynamometry) and health status (Western Ontario and McMaster Universities Osteoarthritis Index). All groups underwent a 4-week control period (without intervention) followed by an 8-week intervention period. RESULTS: Muscle thickness and anatomical cross-sectional area increased in the electrical stimulation and combined groups. All groups presented similar improvements in torque, electrical activity and health status. CONCLUSION: Electrical stimulation alone or in combination with laser therapy generated positive effects on all evaluated parameters. Laser therapy increased health status and electrical activity, but had no effect on muscle mass. Aged;Anthropometry;Combined Modality Therapy;Electric Stimulation Therapy;Electromyography;Female;Health Status;Humans;Isometric Contraction;Knee Joint;Low-Level Light Therapy;Middle Aged;Muscle, Skeletal;Osteoarthritis, Knee;Severity of Illness Index;Single-Blind Method;Torque

Choosing between intraoral or extraoral, red or infrared laser irradiation after impacted third molar extraction. BACKGROUND AND OBJECTIVE: Swelling and trismus are complications experienced by nearly all subjects after undergoing oral surgery for the removal of impacted teeth. The main purpose of this paper was to compare the effects of photobiomodulation therapy (PBMT) at two different wavelengths applied intra-orally and extra-orally on facial swelling and trismus in the postoperative period following the extraction of impacted mandibular third molars. STUDY DESIGN/MATERIALS AND METHODS: Sixty subjects were randomly divided into five groups, taking into account the type of laser therapy applied after surgery (intraoral or extraoral irradiation with 660â€‰nm laser; intraoral or extraoral irradiation with 808â€‰nm; and sham irradiation). Two and seven days after the surgery, two blinded evaluators measured the subjects' faces (swelling), and mouth opening (trismus). RESULTS: There was a statistically significant interaction between the

irradiation site and wavelength (swelling and trismus were smaller if the red laser was applied intra-orally or if infrared laser was applied extra-orally). The intra-group analyses showed that 808â€‰nm laser applied extra-orally favored reductions in postoperative facial swelling and trismus, although the inter-group comparisons revealed no statistically significant differences. CONCLUSION: Besides energy parameters, the combination of irradiation site and wavelength drive the results of phototherapy after the removal of impacted teeth. Lasers Surg. Med. 48:511-518, 2016. Â© 2016 Wiley Periodicals, Inc. Adult;Double-Blind Method;Edema;Female;Follow-Up Studies;Humans;Infrared Rays;Low-Level Light Therapy;Male;Molar, Third;Mouth Diseases;Postoperative Care;Postoperative Complications;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Trismus

Low-level laser therapy versus 5% amlexanox: a comparison of treatment effects in a cohort of patients with minor aphthous ulcers. OBJECTIVE: The aim of the study was to compare the treatment effects of 5% amlexanox and low-level laser therapy (LLLT) in a cohort of patients who experienced minor aphthous stomatitis. STUDY DESIGN: A clinical trial was performed between 2012 and 2014 on 50 participants having minor aphthous ulcers. Group A participants were treated with amlexanox oral paste (lexanox 5% oral paste), and group B participants were treated with LLLT. Pain scores and sizes of ulcers were measured on the first, third, and seventh days of treatment in both groups. Data were analyzed using paired t test and independent t test. RESULTS: No significant difference was observed between the two groups with respect to pain level on the first and seventh days of treatment. CONCLUSIONS: Both amlexanox and LLLT were equally effective in relieving pain associated with minor aphthous stomatitis. Both groups showed significant reduction in ulcer sizes and in pain scores. Aminopyridines;Anti-Allergic Agents;amlexanox Adolescent;Adult;Aminopyridines;Anti-Allergic Agents;Female;Humans;India;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Stomatitis, Aphthous;Treatment Outcome

Effects of low level laser therapy on the prognosis of split-thickness skin graft in type 3 burn of diabetic patients: a case series. Significant populations in burn centers are diabetic burn patients. Healing process in these patients is more difficult due to diabetes complications. The gold standard treatment for patients with grade 3 burn ulcer is split-thickness skin grafting (STSG), but in the diabetic patients, the rate of graft failure and amputation is high due to impaired tissue perfusion. The technique of low level laser therapy (LLLT) improves tissue perfusion and fibroblast proliferation, increases collagen synthesis, and accelerates wound healing. The purpose of this case report is introducing a new therapeutic method for accelerating healing with better prognosis in these patients. The protocols and informed consent were reviewed according to the Medical Ethics, Board of Shahid Beheshti Medical Sciences (IR.SBMU.RAM.REC.13940.363). Diabetic type 2 patients with 13 grade 3 burn ulcers, candidate for amputation, were enrolled in the study. We used a 650-nm red laser light, 2 J/Cm for the bed of the ulcer and an 810-nm infrared laser light 6 J/Cm(2) for the margins along with intravenous laser therapy with a 660-nm red light, before and after STSG for treating grade 3 burn ulcers in 13 diabetic ulcers. The results of this study showed complete healing in the last 8 weeks for all patients who were candidates for amputation. In this case series, we present 13 cases of diabetic ulcer with type 3 burn wound, candidate for amputation, who healed completely using LLLT and STSG. This is the first time that these two techniques are combined for treatment of burn ulcer in diabetic patients. Using LLLT with STSG might be a promising treatment for burn victims especially diabetic patients. Adult;Burns;Diabetes Mellitus, Type 2;Female;Humans;Leg Ulcer;Low-Level Light Therapy;Male;Middle Aged;Prognosis;Skin Transplantation;Wound Healing

Photobiomodulation regulates cytokine release and new blood vessel formation during oral wound healing in rats. The aim of the present study was to evaluate the effects of photobiomodulation (PBM) on cytokine levels and angiogenesis during oral wound healing. Ulcers were made on the

dorsum of the tongue in 48 Wistar rats. Irradiation with an indium-gallium-aluminum-phosphide (InGaAlP) laser (660 nm; output power, 40 mW; spot size, 0.04 cm(2)) was performed once a day on two points of the ulcer for 14 days. Two different energy densities were used: 4 J/cm(2) (energy per point 0.16 J, total energy 0.32 J) and 20 J/cm(2) (energy per point 0.8 J, total energy 1.6 J). Tissue levels of interleukin (IL)-1Î² and tumor necrosis factor (TNF)-Î± were investigated by enzyme-linked immunosorbent assay (ELISA). Image analysis of CD31-immunostained sections was used to investigate microvessel density (MVD). PBM increased the tissue levels of IL-1Î² at the early stage of oral wound healing (pâ€‰<â€‰0.01) and increased the tissue levels of TNF-Î± during all stages of oral wound healing (pâ€‰<â€‰0.05). PBM at a dose of 4 J/cm(2) produced more significant results regarding cytokine modulation and was associated with higher MVD at day 5. Collectively, these findings indicate that cytokine modulation and increased angiogenesis are among the basic mechanisms whereby PBM improves oral wound repair. Cytokines
Animals;Cytokines;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microvessels;Neovascularization, Physiologic;Oral Ulcer;Rats;Rats, Wistar;Tongue;Wound Healing

Is there a protocol in experimental skin wounds in rats using low-level diode laser therapy (LLDLT) combining or not red and infrared wavelengths? Systematic review. A systematic review addressing experiments with healing of skin wounds in rats using LLDLT with different active means seeking to identify a pattern in adjustments such as laser wavelength, power and fluency and analysing wound healing parameters, such as wound area, presence of fibroblasts, angiogenesis, leukocyte infiltration, epithelial coverage and antibacterial effect. It was perceived that a protocol does not exist in view of the wide variation in the use of power (9 to 500 mW) and fluency (1 to 60 J/cm2); however, between the different wavelengths, the highlight was the combined use of red and infrared wavelengths showing better results than when used alone.
Animals;Fibroblasts;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Skin;Systematic Reviews as Topic;Wound Healing

Effects of hair removal alexandrite laser on biometric parameters of the skin. The effects of alexandrite laser (AL) on skin parameters such as melanin content, skin layer depth, elasticity, and density have not been investigated through biometric methods. We aim to assess the effect of AL on the skin parameters through biometric devices to determine whether it has positive effects on treated region. In this pretest-posttest study, we recruited patients who attended Laser Clinic of Skin and Stem Cell Research Center, Tehran University of Medical Sciences, Tehran, Iran, from January through December 2014. Patients had to be free of any dermatologic conditions and lesion at the site of treatment or any contraindication to laser therapy. Baseline measurements were performed and patients received four sessions of AL therapy (spot size, 12 mm; fluence, 12 J/cm(2); and pulse width, 5 Hz) with 4-week intervals. Four weeks after the last treatment session, the same parameters were assessed that included skin color, transepidermal water loss (TEWL), dermis and epidermis density and depth (through skin ultrasonography), melanin content, erythema intensity, and skin elasticity. Biometric parameters of 33 patients (27 females [81.8%]), with mean (SD) age of 35.7 (9.5)â€‰years were evaluated. The mean percent changes of skin parameters were as follows: skin color, 5.88% through Visioface and by 56.8% through Colorimeter devices (became lighter); melanin content, -15.95%; TEWL, -2.96%; elasticity, +14.88%; dermis depth -19.01%; and dermis density, +1580.11% (Pâ€‰<â€‰0.001 for changes in each parameter). AL could decrease melanin content of the skin and make the skin thinner while it could increase elasticity and density of epidermis and dermis, which might indicate increased collagen content of skin.
Adult;Elasticity;Erythema;Female;Hair Removal;Humans;Iran;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Radiation Injuries;Skin;Skin Pigmentation;Treatment Outcome

Minimally invasive, non-ablative Er:YAG laser treatment of stress urinary incontinence in women--a pilot study. The study presents an assessment of mechanism of action and a pilot clinical study of efficacy and safety of the Er:YAG laser for the treatment of stress urinary incontinence (SUI). The subject of this study is a treatment of SUI with a 2940 nm Er:YAG laser, operating in a special SMOOTH mode designed to increase temperature of the vaginal mucosa up to maximally 60-65 Â°C without ablating the epidermis. Numerical modelling of the temperature distribution within mucosa tissue following an irradiation with the SMOOTH mode Er:YAG laser was performed in order to determine the appropriate range of laser parameters. The laser treatment parameters were further confirmed by measuring in vivo temperatures of the vaginal mucosa using a thermal camera. To investigate the clinical efficacy and safety of the SMOOTH mode Er:YAG laser SUI treatment, a pilot clinical study was performed. The study recruited 31 female patients suffering from SUI. Follow-ups were scheduled at 1, 2, and 6 months post treatment. ICIQ-UI questionnaires were collected as a primary trial endpoint. Secondary endpoints included perineometry and residual urine volume measurements at baseline and all follow-ups. Thermal camera measurements have shown the optimal increase in temperature of the vaginal mucosa following treatment of SUI with a SMOOTH mode Er:YAG laser. Primary endpoint, the change in ICIQ-UI score, showed clinically relevant and statistically significant improvement after all follow-ups compared to baseline scores. There was also improvement in the secondary endpoints. Only mild and transient adverse events and no serious adverse events were reported. The results indicate that non-ablative Er:YAG laser therapy is a promising minimally invasive non-surgical option for treating women with SUI symptoms. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Pilot Projects;Treatment Outcome;Urinary Incontinence, Stress

The effect of low-level laser therapy on oxidative stress and functional fitness in aged rats subjected to swimming: an aerobic exercise. The aim of the present study was to determine whether low-level laser therapy (LLLT) in conjunction with aerobic training interferes with oxidative stress, thereby influencing the performance of old rats participating in swimming. Thirty Wistar rats (Norvegicus albinus) (24 aged and six young) were tested. The older animals were randomly divided into aged-control, aged-exercise, aged-LLLT, aged-LLLT/exercise, and young-control. Aerobic capacity (VO2max(0.75)) was analyzed before and after the training period. The exercise groups were trained for 6Â weeks, and the LLLT was applied at 808Â nm and 4Â J energy. The rats were euthanized, and muscle tissue was collected to analyze the index of lipid peroxidation thiobarbituric acid reactive substances (TBARS), glutathione (GSH), superoxide dismutase (SOD), and catalase (CAT) activities. VO2 (0.75)max values in the aged-LLLT/exercise group were significantly higher from those in the baseline older group ($p < 0.01$) and the LLLT and exercise group ($p < 0.05$). The results indicate that the activities of CAT, SOD, and GPx were higher and statistically significant ($p < 0.05$) in the LLLT/exercise group than those in the LLLT and exercise groups. Young animals presented lesser and statistically significant activities of antioxidant enzymes compared to the aged group. The LLLT/exercise group and the LLLT and exercise group could also mitigate the concentration of TBARS (pâ€‰>â€‰0.05). Laser therapy in conjunction with aerobic training may reduce oxidative stress, as well as increase VO2 (0.75)max, indicating that an aerobic exercise such as swimming increases speed and improves performance in aged animals treated with LLLT. Antioxidants;Thiobarbituric Acid Reactive Substances;Superoxide Dismutase Aging;Animals;Antioxidants;Lipid Peroxidation;Low-Level Light Therapy;Muscle, Skeletal;Oxidative Stress;Physical Conditioning, Animal;Rats;Rats, Wistar;Superoxide Dismutase;Swimming;Thiobarbituric Acid Reactive Substances

Low-level laser irradiation effect on endothelial cells under conditions of hyperglycemia. Diabetes mellitus is considered to be a very serious lifestyle disease leading to cardiovascular complications and impaired wound healing observed in the diabetic foot syndrome. Chronic

hyperglycemia is the source of the endothelial activation. The inflammatory process in diabetes is associated with the secretion of inflammatory cytokines by endothelial cells, e.g., tumor necrosis factor-alpha (TNF-Î±) and interleukin 6 (IL-6). The method of phototherapy using laser beam of low power (LLLT-low-level laser therapy) effectively supports the conventional treatment of diabetic vascular complications such as diabetic foot syndrome. The aim of our study was to evaluate the effect of low-power laser irradiation at two wavelengths (635 and 830Â nm) on the secretion of inflammatory factors (TNF-Î± and IL-6) by the endothelial cell culture-HUVEC line (human umbilical vein endothelial cell)-under conditions of hyperglycemia. It is considered that adverse effects of hyperglycemia on vascular endothelial cells may be corrected by the action of LLLT, especially with the wavelength of 830Â nm. It leads to the reduction of TNF-Î± concentration in the supernatant and enhancement of cell proliferation. Endothelial cells play an important role in the pathogenesis of diabetes; however, a small number of studies evaluate an impact of LLLT on these cells under conditions of hyperglycemia. Further work on this subject is warranted. Cytokines;IL6 protein, human;Interleukin-6;Tumor Necrosis Factor-alpha Cell Line;Cell Proliferation;Cytokines;Endothelial Cells;Humans;Hyperglycemia;Interleukin-6;Low-Level Light Therapy;Tumor Necrosis Factor-alpha;Umbilical Veins

Comparison of clinical efficacy and complications between Q-switched alexandrite laser and Q-switched Nd:YAG laser on nevus of Ota: a systematic review and meta-analysis. Although the application of Q-switched lasers on nevus of Ota (OTA) is well demonstrated, debates about clinical option between Q-switched alexandrite laser (QSA) and Q-switched Nd:YAG laser (QSNY) still remain. This systematic review and meta-analysis estimated the overall successful rate of OTA pigment clearance and complication rate of QSA and QSNY and evaluated which laser could produce a better result. English articles evaluating pigment clearance and complications of QSA and/or QSNY on OTA were screened through predetermined inclusion and exclusion criteria and analyzed. The successful rate of pigment clearance and complication rate of QSA and QSNY were respectively calculated using a random-effects or fixed-effects model, depending on the heterogeneity of the included studies. The successful rate and complication rate of QSA and QSNY were compared statistically. Of the 140 articles searched, 13 met inclusion criteria. Totally, 2153 OTA patients treated by QSA and 316 patients treated by QSNY were analyzed. In QSA and QSNY groups, respectively, the successful rate of OTA pigment clearance was 48.3% (95% confidence interval (CI) 19.9-76.8%) and 41% (95% CI 9.7-72.2%), while the complication rate was 8.0% (95% CI 3.9-12.2%) and 13.4% (95% CI 7.7-19.0%). When compared with QSNY, QSA had a significantly higher successful rate (Pâ€‰=â€‰0.017), and a lower complication rate (Pâ€‰=â€‰0.000). According to this review, QSA may surpass QSNY in treatment for OTA as it had a superior successful rate of pigment clearance and a lower complication rate than QSNY did. Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus of Ota;Skin Neoplasms;Treatment Outcome

Effect of size, concentration, and type of spherical gold nanoparticles on heat evolution following laser irradiation using tissue-simulating phantoms. Photothermal therapy has recently gained a considerable attention particularly after the revolution of nanomaterials and nanotechnology. The aim of the present study is to assess the optimal photothermal response through investigating some effective parameters of spherical gold nanoparticles (AuNPs), e.g., type, size, and concentration, as a preclinical study for efficient photothermal treatment. Tissue-simulating phantoms based on agar and water media incorporated with two different types of AuNPs, spherical Au particles capped with citrate or spherical Au core-silica shell NPs, were built. Heat evolution for each NP type was recorded in the phantom matrix with different particle sizes at various concentrations following exposure to low laser power (irradiance 35 mW/cm(2)) and emitting at Î»â€‰=â€‰532 nm. Our results demonstrated that AuNPs capped with citrate recorded higher temperature elevations than those

capped with silica shell. Particles with smaller sizes produced more heating effect than those having larger sizes. Also, higher temperatures were recorded at a critical concentration of NPs. Exponential decay constants based on theoretical calculations demonstrated that laser attenuation increases with the continuous increase of particle size and concentration. Gold;Silicon Dioxide Gold;Hot Temperature;Humans;Lasers;Lasers, Semiconductor;Low-Level Light Therapy;Metal Nanoparticles;Particle Size;Phantoms, Imaging;Silicon Dioxide

Imaging-guided photoacoustic drug release and synergistic chemo-photoacoustic therapy with paclitaxel-containing nanoparticles. Here, a novel triggered drug release modality was developed for oncotherapy. Paclitaxel (PTX), perfluorohexane (PFH) and gold nanorods (AuNRs) loaded nanoparticles (PTX-PAnP) were synthesized. Folic acid (FA) conjugated PTX-PAnP (PTX-PAnP-FA) could be selectively taken into folate receptor-overexpressed tumor cells. Upon pulsed laser irradiation, the PTX-PAnP-FA could be rapidly destructed because of the PFH vaporization, resulting in fast drug release, which induced apoptosis of cancer cells efficiently. Stimulated fragmentation of the PTX-PAnP-FA nanoparticles can facilitate multiple mechanisms such as bubble implosion, shockwave generation, and sonoporation that further enhance the therapeutic efficiency. The in vivo therapy study further confirmed this new approach resulted in efficient tumor suppression. The results demonstrate a unique drug release mechanism based on photoacoustic effect. It provides an all-in-one platform for photoacoustic image-guided drug release and synergistic chemo-photoacoustic therapy. Antineoplastic Agents, Phytogenic;Fluorocarbons;Gold;Folic Acid;perflexane;Paclitaxel Animals;Antineoplastic Agents, Phytogenic;Drug Delivery Systems;Female;Fluorocarbons;Folic Acid;Gold;HeLa Cells;Humans;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;NIH 3T3 Cells;Nanoparticles;Nanotubes;Neoplasms;Paclitaxel;Photoacoustic Techniques;Volatilization

Nanotubes-Embedded Indocyanine Green-Hyaluronic Acid Nanoparticles for Photoacoustic-Imaging-Guided Phototherapy. Phototherapy is a light-triggered treatment for tumor ablation and growth inhibition via photodynamic therapy (PDT) and photothermal therapy (PTT). Despite extensive studies in this area, a major challenge is the lack of selective and effective phototherapy agents that can specifically accumulate in tumors to reach a therapeutic concentration. Although recent attempts have produced photosensitizers complexed with photothermal nanomaterials, the tedious preparation steps and poor tumor efficiency of therapy still hampers the broad utilization of these nanocarriers. Herein, we developed a CD44 targeted photoacoustic (PA) nanophototherapy agent by conjugating Indocyanine Green (ICG) to hyaluronic acid nanoparticles (HANPs) encapsulated with single-walled carbon nanotubes (SWCNTs), resulting in a theranostic nanocomplex of ICG-HANP/SWCNTs (IHANPT). We fully characterized its physical features as well as PA imaging and photothermal and photodynamic therapy properties in vitro and in vivo. Systemic delivery of IHANPT theranostic nanoparticles led to the accumulation of the targeted nanoparticles in tumors in a human cancer xenograft model in nude mice. PA imaging confirmed targeted delivery of the IHANPT nanoparticles into tumors (T/M ratio = 5.19 Â± 0.3). The effect of phototherapy was demonstrated by low-power laser irradiation (808 nm, 0.8 W/cm(2)) to induce efficient photodynamic effect from ICG dye. The photothermal effect from the ICG and SWCNTs rapidly raised the tumor temperature to 55.4 Â± 1.8 Â°C. As the result, significant tumor growth inhibition and marked induction of tumor cell death and necrosis were observed in the tumors in the tumors. There were no apparent systemic and local toxic effects found in the mice. The dynamic thermal stability of IHANPT was studied to ensure that PTT does not affect ICG-dependent PDT in phototherapy. Therefore, our results highlight imaging property and therapeutic effect of the novel IHANPT theranostic nanoparticle for CD44 targeted and PA image-guided dual PTT and PDT cancer therapy. Hyaluronan Receptors;Nanotubes, Carbon;Hyaluronic Acid;Indocyanine Green Animals;Humans;Hyaluronan Receptors;Hyaluronic

Acid;Indocyanine Green;Mice;Nanoparticles;Nanotubes, Carbon;Neoplasms;Photoacoustic Techniques;Phototherapy;Xenograft Model Antitumor Assays

The Use of Low Level Laser Therapy (LLLT) For Musculoskeletal Pain. Pain is the most common reason for physician consultation in the United States. One out of three Americans is affected by chronic pain annually. The number one reason for missed work or school days is musculoskeletal pain. Currently accepted therapies consist of non-steroidal anti-inflammatory drugs, steroid injections, opiate pain medications and surgery, each of which carries their own specific risk profiles. What is needed are effective treatments for pain which have an acceptably low risk-profile. For over forty years, low level laser (light) therapy (LLLT) and LED (light emitting diode) therapy (also known as photobiomodulation) has been shown to reduce inflammation and edema, induce analgesia, and promote healing in a range of musculoskeletal pathologies. The purpose of this paper is to review the use of LLLT for pain, the biochemical mechanisms of action, the dose response curves, and how LLLT may be employed by orthopedic surgeons to improve outcomes and reduce adverse events. With the predicted epidemic of chronic pain in developed countries, it is imperative to validate cost-effective and safe techniques for managing painful conditions which would allow people to live active and productive lives. Moreover the acceptance of LLLT (which is currently being used by many specialties around the world) into the armamentarium of the American health care provider would allow for additional treatment options for patients. A new cost-effective therapy for pain could elevate quality of life while reducing financial strains.

Comparative effects of two different doses of low-level laser therapy on wound healing third-degree burns in rats. Burns are injuries caused by direct or indirect contact to chemical, physical, or biological agents. Low-level laser therapy (LLLT) is a promising treatment since it is low-cost, non-invasive, and induces cell proliferation. This study aimed to investigate the effects of LLLT (660 nm) at two different fluences (12.5 J/cm(2) and 25 J/cm(2)) per point of application on third-degree burns in rats. Thirty rats (Wistar) divided into GC, GL12.5, and GL25 were used in the study, and submitted to burn injury through a soldering iron at 150Â°C, pressed on their back for 10 s. LLLT was applied immediately, and 2, 4, 6, and 8 days after wound induction. Histological analysis revealed a decreased inflammatory infiltrate in the group treated with 25 J/cm(2) , and intense inflammatory infiltrate in the control group and in the group treated with 12.5 J/cm(2) . The immunostaining of COX-2 was more intense in the control groups and in the group treated with 12.5 J/cm(2) than in the group treated with 25 J/cm(2) . Conversely, VEGF immunomarking was more expressive in the group treated with 25 J/cm(2) than it was in the other two groups. Therefore, our findings suggest that the use of 25 J/cm(2) and 1 J of energy was more effective in stimulating the cellular processes involved in tissue repair on third-degree burns in rats by reducing the inflammatory phase, and stimulating angiogenesis, thus restoring the local microcirculation which is essential for cell migration.
Animals;Burns;Disease Models, Animal;Humans;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

[The application of laser therapy for the medical rehabilitation of the children presenting with chronic osteomyelitis]. The objective of the present study was to develop a scientifically sound rationale for the application of infrared laser radiation (IRLR) either separately or in the combination with fluctuation magnetic therapy in the medical rehabilitation of the children presenting with chronic hematogenous osteomyelitis. Another objective was to evaluate the clinical effectiveness of this therapeutic modality. Two achieve these goals, the clinical observations and special research studies were conducted in two directions with the participation of 95 patients at the age varying from 1 to 15 years. The study has demonstrated the effectiveness of the inclusion of IRLR in the medical rehabilitation program for the children with chronic hematogenous osteomyelitis in different periods of the disease. It was shown that the transcutaneous infrared irradiation of the affected area during

the exacerbation of chronic osteomyelitis had a well apparent immunostimulatory effect and reduced the activity of the inflammatory process. The application of IRLR in combination with fluctuation magnetic therapy during the period of partial remission, had a more pronounced influence on the microcirculation and stimulated the regenerative and trophic processes.
Adolescent;Child;Child, Preschool;Female;Humans;Infant;Infrared Rays;Low-Level Light Therapy;Male;Osteomyelitis

Could the biological robustness of low level laser therapy (Photobiomodulation) impact its use in the management of mucositis in head and neck cancer patients. Low level laser therapy (LLLT) has been noted to be effective in mitigating the development of oral mucositis among patients being treated with chemoradiation for cancers of the head and neck. To explain the biological basis for this observation we performed a comprehensive literature search. Our investigation identified a substantial number of LLLT-activated pathways that have been strongly associated with negative tumor outcomes including proliferation, invasion, angiogenesis, metastases and cancer-treatment resistance. In light of these findings, we suggest an investigational strategy to assure that LLLT's anti-mucositis efficacy is independent of its possible potential to enhance threatening tumor behaviors. Included are appropriate pre-clinical modeling, short- and long-term follow-up of LLLT-treated patients, and the requirement for consistency of LLLT parameters.
Chemoradiotherapy;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Radiation Injuries;Signal Transduction;Stomatitis;Treatment Outcome

Neuroprotective Effects Against POCD by Photobiomodulation: Evidence from Assembly/Disassembly of the Cytoskeleton. Postoperative cognitive dysfunction (POCD) is a decline in memory following anaesthesia and surgery in elderly patients. While often reversible, it consumes medical resources, compromises patient well-being, and possibly accelerates progression into Alzheimer's disease. Anesthetics have been implicated in POCD, as has neuroinflammation, as indicated by cytokine inflammatory markers. Photobiomodulation (PBM) is an effective treatment for a number of conditions, including inflammation. PBM also has a direct effect on microtubule disassembly in neurons with the formation of small, reversible varicosities, which cause neural blockade and alleviation of pain symptoms. This mimics endogenously formed varicosities that are neuroprotective against damage, toxins, and the formation of larger, destructive varicosities and focal swellings. It is proposed that PBM may be effective as a preconditioning treatment against POCD; similar to the PBM treatment, protective and abscopal effects that have been demonstrated in experimental models of macular degeneration, neurological, and cardiac conditions.

Photobiomodulation in Wound Healing: What Are We Not Considering?
Humans;Low-Level Light Therapy;Wound Healing

Lower energy and pulse stacking. A safer alternative for skin tightening using fractional CO2 laser. PURPOSE: To evaluate the effect of different energies and stacking in skin shrinkage. METHODS: Three decreasing settings of a fractional CO2 laser were applied to the abdomen of Twenty five Wistar rats divided into three groups. Group I (n=5) was histologically evaluated for microthermal zones dimensions. Groups II and III (n=10 each) were macroscopic evaluated with freeware ImageJ for area contraction immediately and after 30 and 60 days. RESULTS: No statistical significance was found within microthermal zone histological dimensions (Group I) in all settings studied. (Ablation depth: 76.90 to 97.18Âμm; Coagulation depth: 186.01 to 219.84 Âμm). In Group II, macroscopic evaluation showed that all settings cause significant immediate skin contraction. The highest setting cause significant more intense tightening effect initially, contracting skin area from 258.65 to 179.09 mm2. The same pattern was observed in Group III. At 30 and 60 days, the lowest setting significantly sustained contraction. CONCLUSION: Lower fractional CO2 laser energies associated to pulse stacking could cause consistent and long lasting tissue contraction in rats. Animals;Dose

Fractionation, Radiation;Elastic Tissue;Laser Coagulation;Lasers, Gas;Low-Level Light Therapy;Male;Muscle Tonus;Rats, Wistar;Skin;Skin Aging;Time Factors

Successful Treatment of Segmental Vitiligo in Children with the Combination of 1-mm Minigrafts and Phototherapy. BACKGROUND: Minigrafts using a 1-mm biopsy punch (1-mm minigrafts) are being increasingly used to treat vitiligo. However, there have been few reports of the use of 1-mm minigrafts in pediatric patients. OBJECTIVE: To examine the effectiveness of combination therapy with 1-mm minigrafts and phototherapy in children with segmental vitiligo. METHODS: Minigrafts were placed in 13 patients aged â‰¤16 years with segmental vitiligo. Following surgery, 11 patients underwent irradiation with excimer laser light and 2 with narrow-band ultraviolet B light. RESULTS: A mean repigmentation of 81.6% was obtained. A particularly high mean repigmentation of 87.9% was seen in patients aged â‰¤12 years, indicating greater efficacy in these patients than in patients aged â‰¥13 years (mean, 67.5%). Although a transient cobblestone appearance occurred as an adverse effect, it improved over time. CONCLUSIONS: Combined treatment of segmental vitiligo with 1-mm minigrafts and phototherapy can be performed safely and is highly effective in young patients. Adolescent;Age Factors;Child;Combined Modality Therapy;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Retrospective Studies;Skin Transplantation;Treatment Outcome;Ultraviolet Therapy;Vitiligo

A review of the quality of life following pulsed dye laser treatment for erythemotelangiectatic rosacea. Rosacea is a chronic condition, affecting up to 10% of the population. It has a negative impact on patients' quality of life (QOL), leading to loss of self-confidence, emotional distress and withdrawal from normal societal interactions. Erythemotelangiectatic (ET) rosacea is a frequent reason for consultation and difficult to treat, as vascular signs such as flushing, erythema and telangiectasia often persist despite medical therapy. Several studies have demonstrated objective improvements in vascular signs following pulsed dye laser (PDL) treatment, but very few have investigated improvement in QOL. We reviewed the current literature to find evidence for the effect of PDL on QOL in ET rosacea. Erythema;Flushing;Humans;Lasers, Dye;Low-Level Light Therapy;Quality of Life;Rosacea;Telangiectasis

Novel technique to treat melasma in Chinese: The combination of 2940-nm fractional Er:YAG and 1064-nm Q-switched Nd:YAG laser. Melasma is one of the most common pigmented lesions in Chinese women. Although topical therapies are the mainstay treatment, lasers are being used increasingly to treat pigmented lesions. Laser treatment of melasma is however still controversial. This is because lasers have not been able to produce complete clearance of melasma and recurrence rates are high. Laser treatments also cause complications such as hypopigmentation and post-inflammatory hyperpigmentation. In this article, we report on a novel technique using a combination of fractional 2940-nm Er:YAG and 1064-nm Q-switched Nd:YAG lasers. We achieved a rapid improvement in two cases of melasma in Chinese type III skin. The improvement was seen rapidly within a month of treatment. Follow-up at 6 months showed sustained results with no complications. This novel technique is able to safely confer excellent and sustained clearance within a short treatment time. Adult;Asian People;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged

Transcranial low-level laser therapy (810Â nm) temporarily inhibits peripheral nociception: photoneuromodulation of glutamate receptors, prostatic acid phophatase, and adenosine triphosphate. Photobiomodulation or low-level light therapy has been shown to attenuate both acute and chronic pain, but the mechanism of action is not well understood. In most cases, the light is applied to the painful area, but in the present study we applied light to the head. We found that transcranial laser therapy (TLT) applied to mouse head with specific parameters (810Â nm laser, [Formula: see text], 7.2 or [Formula: see text]) decreased the reaction to pain in the foot evoked

either by pressure (von Frey filaments), cold, or inflammation (formalin injection) or in the tail (evoked by heat). The pain threshold increasing is maximum around 2Â h after TLT, remains up to 6Â h, and is finished 24Â h after TLT. The mechanisms were investigated by quantification of adenosine triphosphate (ATP), immunofluorescence, and hematoxylin and eosin (H&E) staining of brain tissues. TLT increased ATP and prostatic acid phosphatase (an endogenous analgesic) and reduced the amount of glutamate receptor (mediating a neurotransmitter responsible for conducting nociceptive information). There was no change in the concentration of tubulin, a constituent of the cytoskeleton, and the H&E staining revealed no tissue damage. This is the first study to show inhibition of peripheral pain due to photobiomodulation of the central nervous system.

Low-level laser therapy for the treatment of superficial thrombophlebitis after chemotherapy in breast cancer patients: a case study. [Purpose] We report the case of a breast cancer patient with superficial thrombophlebitis treated with low-level laser therapy. [Case] The patient was a 66-year-old women who developed superficial thrombophlebitis in the left upper limb after chemotherapy. She was administered 6 sessions of low-level laser therapy. [Result] Her pain score decreased by 8 points. Her scores on the Patient and Observer scar Assessment Scale decreased by 18 points for the observer portion and by 26 points for the patient portion. [Conclusion] Low-level laser therapy is effective for the reduction of pain and the size of scar tissue in patients with superficial thrombophlebitis.

Positive effects of low level laser therapy (LLLT) on Bouchard's and Heberden's osteoarthritis. BACKGROUND AND OBJECTIVE: Osteoarthritis (OA) is a common chronic disorder. While research usually focuses on OA of the large joints, OA of the hand receives relatively little attention resulting in a lack of a therapeutic gold standard. Low level laser therapy (LLLT)/photobiomodulation therapy has been successfully used to treat a variety of medical conditions. Nevertheless, its merits in the treatment of (hand) OA remain controversial. The aim of the present study was to examine the longitudinal effect of LLLT on the three major hand OA symptoms-pain, swelling, reduced joint mobility-in patients suffering from Bouchard's and Heberden's OA. STUDY DESIGN/MATERIALS AND METHODS: Thirty-four patients (32 females) aged 61.21â€‰Â±â€‰2.13 years were administered 5-10 LLLT sessions to 85 joints (47 proximal and 38 distal interphalangeal joints). Therapy took place twice a week. Pain (Visual Analogue Scale), ring size (perimeter in mm), and range of motion (extension/flexion) were measured at baseline and after five treatments for all patients, and additionally after seven sessions and 8 weeks after treatment ended for patients who received more than five and seven treatments, respectively. Eighteen patients (37 joints) received only five treatments, 10 patients (29 joints) were administered seven treatments, and six patients (19 joints) were administered 10 LLLT sessions. RESULTS: LLLT significantly reduced pain and ring size and increased range of motion after five and seven treatments (all P'sâ€‰<â€‰0.001). The effects were very large (all Î·(2) 'sâ€‰>â€‰0.14). No further significant change occurred between 7 and 10 treatments. The effects achieved after seven sessions persisted for 8 weeks. CONCLUSIONS: LLLT is a safe, non-invasive, efficient and efficacious means to reduce pain and swelling and to increase joint mobility in patients suffering from Heberden's and Bourchard's OA. Further randomized controlled studies are needed to examine medium- to long-term effects as well as the ideal LLLT parameters. Lasers Surg. Med. 48:498-504, 2016. Â© 2016 Wiley Periodicals, Inc.
Adult;Aged;Female;Follow-Up Studies;Hand Joints;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis;Pain Measurement;Range of Motion, Articular;Treatment Outcome

Additive enhancement of wound healing in diabetic mice by low level light and topical CoQ10. Diabetes, a highly prevalent disease that affects 9.3% of Americans, often leads to severe complications and slow wound healing. Preclinical studies have suggested that low level light therapy

(LLLT) can accelerate wound healing in diabetic subjects, but significant improvements must be made to overcome the absence of persuasive evidence for its clinical use. We demonstrate here that LLLT can be combined with topical Coenzyme Q10 (CoQ10) to heal wounds in diabetic mice significantly faster than LLLT alone, CoQ10 alone, or controls. LLLT followed by topical CoQ10 enhanced wound healing by 68~103% in diabetic mice in the first week and more than 24% in the second week compared with untreated controls. All wounds were fully healed in two weeks following the dual treatment, in contrast to only 50% wounds or a fewer being fully healed for single or sham treatment. The accelerated healing was corroborated by at least 50% higher hydroxyproline levels, and tripling cell proliferation rates in LLLT and CoQ10 treated wounds over controls. The beneficial effects on wound healing were probably attributed to additive enhancement of ATP production by LLLT and CoQ10 treatment. The combination of LLLT and topical CoQ10 is safe and convenient, and merits further clinical study. Ubiquinone;coenzyme Q10 Administration, Topical;Animals;Diabetes Complications;Diabetes Mellitus, Experimental;Male;Mice;Phototherapy;Ubiquinone;Wound Healing

Investigation of the Comparative Effects of Red and Infrared Laser Therapy on Skeletal Muscle Repair in Diabetic Rats. OBJECTIVE: The aim of this study was to evaluate the in vivo response of 2 different laser wavelengths (red and infrared) on skeletal muscle repair process in diabetic rats. DESIGN: Forty Wistar rats were randomly divided into 4 experimental groups: basal control-nondiabetic and muscle-injured animals without treatment (BC); diabetic muscle-injured without treatment (DC); diabetic muscle-injured, treated with red laser (DCR) and infrared laser (DCIR). The injured region was irradiated daily for 7 consecutive days, starting immediately after the injury using a red (660 nm) and an infrared (808 nm) laser. RESULTS: The histological results demonstrated in both treated groups (red and infrared wavelengths) a modulation of the inflammatory process and a better tissue organization located in the site of the injury. However, only infrared light significantly reduced the injured area and increased MyoD and myogenin protein expression. Moreover, both red and infrared light increased the expression of the proangiogenic vascular endothelial growth factor and reduced the cyclooxygenase 2 protein expression. CONCLUSION: These results suggest that low-level laser therapy was efficient in promoting skeletal muscle repair in diabetic rats. However, the effect of infrared wavelength was more pronounced by reducing the area of the injury and modulating the expression proteins related to the repair. MyoD Protein;Myog protein, rat;Myogenin;Vascular Endothelial Growth Factor A;Cyclooxygenase 2;Ptgs2 protein, rat Animals;Cyclooxygenase 2;Diabetes Mellitus, Experimental;Infrared Rays;Laser Therapy;Low-Level Light Therapy;Muscle, Skeletal;MyoD Protein;Myogenin;Rats;Treatment Outcome;Vascular Endothelial Growth Factor A

Minimal energy eMatrix treatment combined with elure application for an expedited response in the treatment of hyperpigmentation and overall facial skin rejuvenation: A case report series. In order to minimize the side effects of the eMatrix Sublative Rejuvenation procedure, the low-energy setting was employed; and to increase the efficacy of this procedure, elure anti-pigment topical was applied immediately after the eMatrix procedure. This combination resulted in significant improvement in facial pigmentation and global rejuvenation with minimal side effects. Aged;Cosmetic Techniques;Face;Female;Humans;Hyperpigmentation;Low-Level Light Therapy;Middle Aged;Rejuvenation;Skin;Skin Aging

OBJECTIVES: Low back pain is common, and many pharmacological and nonpharmacological therapies are available. This review examines the evidence on the comparative benefits and harms of noninvasive treatments for low back pain. DATA SOURCES: A prior systematic review (searches through October 2008), electronic databases (Ovid MEDLINE(Â®) and the Cochrane Libraries, January 2008 to April 2015), reference lists, and clinical trials registries. REVIEW METHODS: Using predefined criteria, we selected systematic reviews of randomized trials of pharmacological treatments (acetaminophen, nonsteroidal anti-inflammatory drugs [NSAIDs], opioids, skeletal muscle relaxants,

benzodiazepines, antidepressants, antiseizure medications, and systemic corticosteroids) and nonpharmacological treatments (psychological therapies, multidisciplinary rehabilitation, spinal manipulation, acupuncture, massage, exercise and related therapies, and various physical modalities) for nonradicular or radicular low back pain that addressed effectiveness or harms versus placebo, no treatment, usual care, a sham therapy, an inactive therapy, or another active therapy. We also included randomized trials that were not in systematic reviews. The quality of included studies was assessed, data were extracted, and results were summarized qualitatively based on the totality of the evidence. RESULTS: Of the 2,545 citations identified at the title and abstract level, a total of 156 publications were included. Most trials enrolled patients with pain symptoms of at least moderate intensity (e.g., >5 on a 0- to 10-point numeric rating scale for pain). Across interventions, pain intensity was the most commonly reported outcome, followed by back-specific function. When present, observed benefits for pain were generally in the small (5 to 10 points on a 0- to 100-point visual analog scale or 0.5 to 1.0 points on a 0- to 10-point numeric rating scale) to moderate (10 to 20 points) range. Effects on function were generally smaller than effects on pain; in some cases, there were positive effects on pain but no effects on function, and fewer studies measured function than pain. Benefits were mostly measured at short-term followup. For acute low back pain, evidence suggested that NSAIDs (strength of evidence [SOE]: low to moderate), skeletal muscle relaxants (SOE: moderate), opioids (SOE: low), exercise (SOE: low), and superficial heat (SOE: moderate) are more effective than placebo, no intervention, or usual care, and that acetaminophen (SOE: low) and systemic corticosteroids (SOE: low) are no more effective than placebo. For chronic low back pain, effective therapies versus placebo, sham, no treatment, usual care, or wait list are NSAIDs, opioids, tramadol, duloxetine, multidisciplinary rehabilitation, acupuncture, and exercise (SOE: moderate) and benzodiazepines, psychological therapies, massage, yoga, tai chi, and low-level laser therapy (SOE: low); spinal manipulation was as effective as other active interventions (SOE: moderate). Few trials evaluated the effectiveness of treatments for radicular low back pain, but the available evidence found that benzodiazepines, corticosteroids, traction, and spinal manipulation were not effective or were associated with small effects (SOE: low). Relatively few trials directly compared the effectiveness of different medications or different nonpharmacological therapies, or compared pharmacological versus nonpharmacological therapies, and they generally found no clear differences in effects. Pharmacological therapies were associated with increased risk of adverse events versus placebo (SOE: low to moderate). Trials were not designed or powered to detect serious harms from pharmacological therapies. Although rates appeared to be low and there was not an increased risk of serious harms versus placebo, this does not rule out significant risk from some treatments. For nonpharmacological therapies, assessment of harms was suboptimal, but serious harms appeared to be rare (SOE: low). CONCLUSIONS: A number of pharmacological and nonpharmacological noninvasive treatments for low back pain are associated with small to moderate, primarily short-term effects on pain versus placebo, sham, wait list, or no treatment. Effects on function were generally smaller than effects on pain. More research is needed to understand optimal selection of treatments, effective combinations and sequencing of treatments, effectiveness of treatments for radicular low back pain, and effectiveness on outcomes other than pain and function.

Treatment of striae distensae with needling therapy versus CO2 fractional laser. BACKGROUND AND OBJECTIVES: Striae are atrophic dermal scars with overlying epidermal atrophy causing cosmetic concern. This study assesses and compares the efficacy and safety of needling therapy versus CO2 fractional laser in treatment of striae. METHODS: Twenty Egyptian female patients with striae in the abdomen and lower limbs were involved in the study. The patients were treated with needling therapy and CO2 laser every 1 month for 3 sessions. Follow-up by digital photography and skin biopsy was conducted at baseline and 6 months after treatment. Clinical improvement was assessed by

comparing photographs and patient's satisfaction before and after treatment. RESULTS: Nine of 10 (90%) needle-treated patients showed improvement. Among them, 3 (30%) had good, 4 (40%) had fair, and 2 (20%) had poor improvements; however, 1 (10%) did not show any improvement after the treatment. In CO2-laser treated patients, 5 of 10 (50%) of the patients showed clinical improvement; 1 (10%) were good, 3 (30%) were fair, and 1 (10%) were poor; however, 5 (50%) did not show improvement. CONCLUSION: The results support the use of microneedle therapy over CO2 lasers for striae treatment. Adult;Cosmetic Techniques;Egypt;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Needles;Patient Satisfaction;Skin;Striae Distensae

Savior of post-blepharoepicanthoplasty scarring: Novel use of a low-fluence 1064-nm Q-switched Nd:YAG laser. Blepharoplasty with medial epicanthoplasty is popular in Asia. However, known complications include scarring, which can take the form of hypertrophic scars or keloids. Treatments for scars include pressure dressing, silicone gels, retinoic acids, radiotherapy, cryotherapy, triamcinolone injections, and surgical revision. These methods, however, have variable outcomes. Recently, there is an interest in post-surgical scar remodeling with lasers. Although the 1064-nm Q-switched Nd:YAG is primarily a pigment laser, it has recently been shown to be effective for treating scars. In the management of post-blepharoepicanthoplasty scarring, this is certainly unheard of. In this paper, we present a novel technique of treating a patient with post-blepharoepicanthoplasty hypertrophic scarring with a low-fluence 1064-nm Q-switched Nd:YAG laser. Adult;Asian People;Cicatrix, Hypertrophic;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy

Safety and efficacy of hybrid energy and trifractional technologies in the treatment of acne scars: An open-label clinical trial. INTRODUCTION: This study determines the safety and efficacy of a novel device--Surgen that utilizes hybrid energy (HE) technology and trifractional (TF) technology in the treatment of acne scars in Filipino patients. METHODS: Open-label clinical trial on eight subjects who underwent 4 weekly HE treatments followed by 2 TF treatments spaced 3 weeks apart. Efficacy was evaluated by dermatologists' (investigator and two blinded dermatologists) and patients' assessment and grading of post-treatment digital photographs. Subjects also reported level of satisfaction and comfort. Adverse events were recorded. RESULTS: Dermatologists' grading of acne scars improvement--58.3% of subjects showed slight to moderate improvement, 8.3% showed marked improvement, and 33.3% was graded as unchanged after HE treatments. After 2 additional TF treatments grades improved further, with 37.5% showing mild to moderate improvement, 37.5% showing marked improvement, and 25% graded as unchanged. Dermatologist's scoring using the global acne scoring system resulted in improvement of 75% of patients after 4 HE sessions and 100% after TF treatments. Subjects' grading showed a similar trend: 75% of subjects reported that they were satisfied and 25% slightly satisfied after the complete protocol. CONCLUSION: A treatment protocol combining HE and TF technology is safe, effective, and comfortable in the treatment of acne scars. Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Single-Blind Method

Transcranial laser stimulation improves human cerebral oxygenation. BACKGROUND AND OBJECTIVE: Transcranial laser stimulation of the brain with near-infrared light is a novel form of non-invasive photobiomodulation or low-level laser therapy (LLLT) that has shown therapeutic potential in a variety of neurological and psychological conditions. Understanding of its neurophysiological effects is essential for mechanistic study and treatment evaluation. This study investigated how transcranial laser stimulation influences cerebral hemodynamics and oxygenation in the human brain in vivo using functional near-infrared spectroscopy (fNIRS). MATERIALS AND METHODS: Two separate experiments were conducted in which 1,064-nm laser stimulation was administered at (1) the center and (2) the right side of the forehead, respectively. The laser emitted at a power of 3.4â€‰W and in an area of

13.6â€‰cm2, corresponding to 0.25â€‰W/cm2 irradiance. Stimulation duration was 10 minutes. Nine healthy male and female human participants of any ethnic background, in an age range of 18-40 years old were included in each experiment. RESULTS: In both experiments, transcranial laser stimulation induced an increase of oxygenated hemoglobin concentration (Î”[HbO2]) and a decrease of deoxygenated hemoglobin concentration (Î”[Hb]) in both cerebral hemispheres. Improvements in cerebral oxygenation were indicated by a significant increase of differential hemoglobin concentration (Î”[HbD]â€‰=â€‰Î”[HbO2]â€‰-â€‰Î”[Hb]). These effects increased in a dose-dependent manner over time during laser stimulation (10 minutes) and persisted after laser stimulation (6 minutes). The total hemoglobin concentration (Î”[HbT]â€‰=â€‰Î”[HbO2]â€‰+â€‰Î”[Hb]) remained nearly unchanged in most cases. CONCLUSION: Near-infrared laser stimulation applied to the forehead can transcranially improve cerebral oxygenation in healthy humans. Biomarkers;Hemoglobins;Oxygen Adolescent;Adult;Biomarkers;Brain;Female;Healthy Volunteers;Hemodynamics;Hemoglobins;Humans;Low-Level Light Therapy;Male;Oxygen;Spectroscopy, Near-Infrared;Young Adult

Tuning the mitochondrial rotary motor with light. Skin surface temperature has been proposed as an in vivo clinical biomarker for monitoring the detrimental effect of biostimulatory laser applications. In some cases, such as wound healing and cosmetic applications, the target of the irradiation is the skin surface. In other cases, the light has to reach deeper tissues, for instance, during the irradiation of internal body organs. Prerequisite for reproducible biostimulatory effects is that the light intensity surpasses a minimum threshold. Because of the loss of light intensity caused by absorption and scattering, targeting deeper tissues always implies that the intensity at the skin surface will be much higher than that at the target site. Derived from laboratory experiments which showed that virtually the same light which produces biostimulatory effects in cells in vitro and tissues in vivo is instrumental in reducing the viscous friction in nanoconfined systems, we arrive to a new understanding of the effect of biostimulatory levels of light on mitochondria. One immediate result is insight into strategies which promise to maximize the biostimulatory effect and minimize potential phototoxic effects during treatment of deeper tissues. Such optimization strategies are also promising for experimental and therapeutic in vitro applications, in particular in combination with cell-friendly microenvironments.

Long-Distance Orthodontic Treatment with Adjunctive Light Therapy. Dental Alloys;titanium nickelide;Stainless Steel;Nickel;Titanium Adolescent;Child;Combined Modality Therapy;Dental Alloys;Female;Humans;Low-Level Light Therapy;Malocclusion, Angle Class I;Malocclusion, Angle Class II;Nickel;Orthodontic Brackets;Orthodontic Retainers;Orthodontic Wires;Overbite;Stainless Steel;Titanium;Tooth Movement Techniques

Randomized controlled trial of the efficacy and safety of self-adhesive low-level light therapy in women with primary dysmenorrhea. OBJECTIVE: To evaluate the efficacy and safety of low-level light therapy in women with primary dysmenorrhea. METHOD: A multicenter prospective, randomized, double-blind, placebo-controlled clinical trial including patients 18-35 years of age with primary dysmenorrhea was undertaken at two university hospitals in South Korea between October 2011 and September 2012. Patients were randomized using a computer-generated sequence to receive low-level light therapy using the Color DNA-WSF device or to receive placebo treatment with a dummy device. The severity of menstrual pain, assessed using a visual analog scale, was the primary outcome and was evaluated at baseline and during every menstrual cycle for 3 months following treatment. Patients who received more than one application of treatment (with a Color DNA-WSF or placebo device) were included in analyses. Patients and investigators were masked to the treatment assignments. RESULTS: Overall, 44 patients were assigned to each group. At the final study visit, the

reduction in scores using a visual analog scale was significantly greater in patients who received low-level light therapy (n=41; 4.34Â±2.22) than among those in the control group (n=38; 1.79Â±1.73; P<0.001 when adjusted for age) No serious adverse events occurred. CONCLUSION: Low-level light therapy could be an effective, safe treatment modality for women with primary dysmenorrhea. Clinical Trials.gov: NCT02026206. Adhesiveness;Adolescent;Adult;Double-Blind Method;Dysmenorrhea;Female;Hospitals, University;Humans;Low-Level Light Therapy;Pain Measurement;Prospective Studies;Republic of Korea;Treatment Outcome;Young Adult

Same strategy for pitfalls of radiotherapy in different anatomical districts. Oral mucositis (OM) and radiodermatitis (RD) are serious side effects of radiotherapy (RT), often leading to its suspension, need for analgesics, and enteral/parenteral nutrition. Laser therapy is becoming a recommended treatment option. This prospective study aimed at demonstrating the beneficial effect of class IV laser therapy (HPLT) on RT-induced OM, an off-label use of HPLT to treat RD in breast cancer patients. Fifty-three cancer patients, during/after RT and/or chemotherapy (CT), affected by OM, were treated with HPLT during four consecutive days (970â€‰Â±â€‰15 nm, 5 W (50 %), 35-6000 Hz, 240 s). Assessment of OM (Grading Objective Scale, WHO-SCALE), pain (visual analogue scale, VAS), functional ability, subjective parameters, and site/severity of OM were recorded over time. Similarly, 27 breast cancer patients affected by RD were treated by HPLT and monitored over time for grade, discomfort, itching, and bleeding. Progressive improvement of WHO-SCALE from day 7 on, and of VAS from day 2 on (pâ€‰<â€‰0.000) was registered. All patients' functional capacity improved on day 4 (pâ€‰<â€‰0.05). All subjective parameters improved on day 14 (pâ€‰<â€‰0.001) except for voice, which improved on day 21 (pâ€‰<â€‰0.000). Ulcerations' dimension and erythema's severity significantly decreased in all sites examined (pâ€‰<â€‰0.05). Similarly, HPLT proved to be beneficial in managing RD for all the parameters considered (pâ€‰<â€‰0.002). Regardless of OM grade/site and of kind/site of tumor, HPLT proved to be effective in healing OM as well as RD. In both cases, effective treatment can improve life quality through a safe, easy, innovative approach. Therefore, HPLT may become an integral part of everyday practice in the management of RT adverse effects. Aged;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Pain;Prospective Studies;Quality of Life;Radiodermatitis;Stomatitis;Treatment Outcome

LLLT for the management of patients with ankylosing spondylitis. This study aimed to compare the effectiveness of the combined low-level laser therapy (LLLT) and passive stretching with combined placebo LLLT laser and the same passive stretching exercises in patients suffering from Î‘nkylosing spondylitis. Forty-eight patients suffering from Î‘nkylosing spondylitis participated in the study and were randomized into two groups. Group A (nâ€‰=â€‰24) was treated with a Î»â€‰=â€‰820 Ga-Al-As laser CW, with power intensityâ€‰=â€‰60 mW/cm(2), energy per point in each sessionâ€‰=â€‰4.5 J, total energy per sessionâ€‰=â€‰27.0 J, in contact with specific points technique, plus passive stretching exercises. Group B (nâ€‰=â€‰24), received placebo laser plus the same passive stretching exercises. Both groups received 12 sessions of laser or placebo within 8 weeks; two sessions per week (weeks 1-4) and one session per week (weeks 5-8). Pain and function scales were completed before the treatment, at the end of the fourth and eighth week of treatment, and 8 weeks after the end of treatment (follow-up). Group A revealed a significant improvement after 8 weeks of treatment in all pain and function scales. At 8-week follow-up, the improvement remained only for the pain, while for all other function outcomes the differences were not statistically significant. The results suggested that after an 8-week treatment and after a follow-up, the combination of LLLT and passive stretching exercises decreased pain more effectively than placebo LLLT along with the same passive stretching exercises in patients with Î‘nkylosing spondylitis. Future studies are needed to establish the relative and absolute effectiveness of the above protocol.

Adult;Arthralgia;Combined Modality Therapy;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Stretching Exercises;Spondylitis, Ankylosing;Treatment Outcome

The long-term effect of 1550 nm erbium:glass fractional laser in acne vulgaris. We evaluated the short-term and long-term effects of the 1550 nm erbium:glass (Er:glass) fractional laser in the treatment of facial acne vulgaris. Forty-five (9 male and 36 female) acne patients were treated 4 times at 4-week intervals with the following parameters: 169 spot density and 15-30 mJ/cm(2) fluence. There was no control group. The laser spots were adjustable (maximum overlap: 20%) according to the treatment area, and delivered in rows in order to cover all the face. Clinical photographs were taken. The IGA scores and lesion counts were performed for each treatment. Their current state was obtained by phone call follow-up to determine the long-term effect and photographs were offered by themselves or taken in hospital. After four treatments, all patients had an obvious reduction of lesion counts and IGA score and the peak lesion counts decreased to 67.7% after the initial four treatment sessions. For long-term effect, 8 patients lost follow-up, hence 37 patients were followed-up. 8 patients were 2-year follow up, 27 at the 1-year follow-up, and all patients at the half-year follow-up. The mean percent reduction was 72% at the half-year follow-up, 79 at the 1-year follow-up and 75% at the 2-year follow-up. Side effects and complications were limited to transient erythema and edema, and few patients suffered from transient acne flare-ups and sensitivity. All patients responded that their skin was less prone to oiliness. In conclusion, acne can be successfully treated by 1550 nm Er:glass fractional laser, with few side effects and prolonged acne clearing. Acne Vulgaris;Adult;Face;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin;Treatment Outcome;Young Adult

Mitochondrial dependent oxidative stress in cell culture induced by laser radiation at 1265 nm. Photodynamic therapy is the main technique applied for surface carcinoma treatment. This technique employs singlet oxygen generated via a laser excited photosensitizer as a main damaging agent. However, prolonged sensitivity to intensive light, relatively low tissue penetration by activating light the cost of photosensitizer (PS) administration can limit photodynamic therapy applications. Early was reported singlet oxygen generation without photosensitizer induced by a laser irradiation at the wavelength of 1250-1270 nm. Here, we study the dynamics of oxidative stress, DNA damage, changes of mitochondrial potential, and mitochondrial mass induced by a laser at 1265 nm have been studied in HCT-116 and CHO-K cells. Laser irradiation of HCT-116 and CHO-K cells has induced a dose-dependent cell death via increasing intracellular reactive oxygen species (ROS) concentration, increase of DNA damage, decrease of mitochondrial potential, and reduced glutathione. It has been shown that, along with singlet oxygen generation, the increase of the intracellular ROS concentration induced by mitochondrial damage contributes to the damaging effect of the laser irradiation at 1265 nm. Singlet Oxygen;Glutathione Animals;CHO Cells;Cell Death;Cricetinae;Cricetulus;DNA Damage;Glutathione;HCT116 Cells;Humans;Lasers;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mitochondria;Oxidation-Reduction;Oxidative Stress;Photochemotherapy;Singlet Oxygen

Low-intensity red and infrared lasers affect mRNA expression of DNA nucleotide excision repair in skin and muscle tissue. Lasers emit light beams with specific characteristics, in which wavelength, frequency, power, fluence, and emission mode properties determine the photophysical, photochemical, and photobiological responses. Low-intensity lasers could induce free radical generation in biological tissues and cause alterations in macromolecules, such as DNA. Thus, the aim of this work was to evaluate excision repair cross-complementing group 1 (ERCC1) and excision repair cross-complementing group 2 (ERCC2) messenger RNA (mRNA) expression in biological tissues exposed to low-intensity lasers. Wistar rat (nâ€‰=â€‰28, 4 for each group) skin and muscle were exposed to low-intensity red (660 nm) and near-infrared (880 nm) lasers at different fluences (25, 50,

and 100 J/cm(2)), and samples of these tissues were withdrawn for RNA extraction, cDNA synthesis, and gene expression evaluation by quantitative polymerase chain reaction. Laser exposure was in continuous wave and power of 100 mW. Data show that ERCC1 and ERCC2 mRNA expressions decrease in skin (pâ€‰<â€‰0.001) exposed to near-infrared laser, but increase in muscle tissue (pâ€‰<â€‰0.001). ERCC1 mRNA expression does not alter (pâ€‰>â€‰0.05), but ERCC2 mRNA expression decreases in skin (pâ€‰<â€‰0.001) and increases in muscle tissue (pâ€‰<â€‰0.001) exposed to red laser. Our results show that ERCC1 and ERCC2 mRNA expression is differently altered in skin and muscle tissue exposed to low-intensity lasers depending on wavelengths and fluences used in therapeutic protocols. RNA, Messenger;Xeroderma Pigmentosum Group D Protein;DNA Repair Enzymes;ERCC1 protein, rat Animals;DNA Repair;DNA Repair Enzymes;Gene Expression;Infrared Rays;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Skin;Xeroderma Pigmentosum Group D Protein

Effects of non-ablative fractional erbium glass laser treatment on gene regulation in human three-dimensional skin models. Clinical experiences with non-ablative fractional erbium glass laser therapy have demonstrated promising results for dermal remodelling and for the indications of striae, surgical scars and acne scars. So far, molecular effects on human skin following treatment with these laser systems have not been elucidated. Our aim was to investigate laser-induced effects on skin morphology and to analyse molecular effects on gene regulation. Therefore, human three-dimensional (3D) organotypic skin models were irradiated with non-ablative fractional erbium glass laser systems enabling qRT-PCR, microarray and histological studies at same and different time points. A decreased mRNA expression of matrix metalloproteinases (MMPs) 3 and 9 was observed 3 days after treatment. MMP3 also remained downregulated on protein level, whereas the expression of other MMPs like MMP9 was recovered or even upregulated 5 days after irradiation. Inflammatory gene regulatory responses measured by the expression of chemokine (C-X-C motif) ligands (CXCL1, 2, 5, 6) and interleukin expression (IL8) were predominantly reduced. Epidermal differentiation markers such as loricrin, filaggrin-1 and filaggrin-2 were upregulated by both tested laser optics, indicating a potential epidermal involvement. These effects were also shown on protein level in the immunofluorescence analysis. This novel standardised laser-treated human 3D skin model proves useful for monitoring time-dependent ex vivo effects of various laser systems on gene expression and human skin morphology. Our study reveals erbium glass laser-induced regulations of MMP and interleukin expression. We speculate that these alterations on gene expression level could play a role for dermal remodelling, anti-inflammatory effects and increased epidermal differentiation. Our finding may have implications for further understanding of the molecular mechanism of erbium glass laser-induced effects on human skin. Cicatrix;Filaggrin Proteins;Gene Expression;Gene Expression Regulation;Humans;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Skin;Tissue Culture Techniques

Short-term effects of extremely low-frequency pulsed electromagnetic field and pulsed low-level laser therapy on rabbit model of corneal alkali burn. This study was conducted to investigate the effect of combining extremely low frequency-pulsed electromagnetic field (ELF-PEMF) and low-level laser therapy (LLLT) on alkali-burned rabbit corneas. Fifty alkali-burned corneas of 50 rabbits were categorized into five groups: ELF-PEMF therapy with 2Â mT intensity (ELF 2) for 2Â h daily; LLLT for 30Â min twice daily; combined ELF-PEMF and LLLT (ELFÂ +Â LLLT); medical therapy (MT); and control (i.e., no treatment). Clinical examination and digital photography of the corneas were performed on days 0, 2, 7, and 14. After euthanizing the rabbits, the affected eyes were evaluated by histopathology. The clinical and histopathologic results were compared between the groups. On days 7 and 14, no significant difference in the corneal defect area was evident between the ELF, LLLT, ELFÂ +Â LLLT, and MT groups. Excluding the controls, none of the study groups demonstrated a

significant corneal neovascularization in both routine histopathology and immunohistochemistry for CD31. Keratocyte loss was significantly higher in the MT group than in the ELF, LLLT, and ELFÂ +Â LLLT groups. Moderate to severe stromal inflammation in the LLLT group was comparable with that in the MT group and was significantly lower than that in the other groups. In conclusion, combining LLLT and ELF was not superior to ELF alone or LLLT alone in healing corneal alkali burns. However, given the lower intensity of corneal inflammation and the lower rate of keratocytes loss with LLLT, this treatment may be superior to other proposed treatment modalities for healing alkali-burned corneas. Alkalies Alkalies;Animals;Burns, Chemical;Corneal Injuries;Disease Models, Animal;Eye Burns;Female;Low-Level Light Therapy;Magnetic Field Therapy;Rabbits

Turning On Lights to Stop Neurodegeneration: The Potential of Near Infrared Light Therapy in Alzheimer's and Parkinson's Disease. Alzheimer's and Parkinson's disease are the two most common neurodegenerative disorders. They develop after a progressive death of many neurons in the brain. Although therapies are available to treat the signs and symptoms of both diseases, the progression of neuronal death remains relentless, and it has proved difficult to slow or stop. Hence, there is a need to develop neuroprotective or disease-modifying treatments that stabilize this degeneration. Red to infrared light therapy (Î» = 600-1070 nm), and in particular light in the near infrared (NIr) range, is emerging as a safe and effective therapy that is capable of arresting neuronal death. Previous studies have used NIr to treat tissue stressed by hypoxia, toxic insult, genetic mutation and mitochondrial dysfunction with much success. Here we propose NIr therapy as a neuroprotective or disease-modifying treatment for Alzheimer's and Parkinson's patients.

Cryolipolysis versus laser lipolysis on adolescent abdominal adiposity. BACKGROUND: Noninvasive body contouring is one of the fastest growing segments of the cosmetic aesthetic industry. There is increased public demand for procedures with fewer side effects and shorter recovery times. Cryolipolysis and Laser lipolysis have been used as treatments for localized body contouring. OBJECTIVE: To compare the effect of Cryolipolysis versus Laser lipolysis on adolescent's abdominal adiposity. DESIGN: Randomized, controlled trial. SUBJECTS: Forty-five obese adolescents of both sexes ranged in age from 13 to 16 years participated in this study were to be categorized into three groups of equal number (each group 15 subjects) randomly selected from population. METHODS: Participants were randomly assigned to three groups. Group A was received (Cryolipolysis and diet), Group B was received (Laser lipolysis and diet), Group C was received (only diet) all groups were observed for 8 weeks. Weight and height scale for (change in weight), tape measurement for (waist-hip ratio), skinfold caliper, and MRI. RESULTS: There was no significant difference between three groups post-treatment in BMI and body weight P-value were (0.2, 0.42, 0.67), respectively. There was a significant improvement for Cryolipolysis group in waist-hip ratio, Suprailiac skin fold, and subcutaneous adipose tissue than other groups P-value (0.001). CONCLUSIONS: Cryolipolysis has a favorable effect than Laser lipolysis in the reduction of waist-hip ratio, skin folds at Suprailiac level and subcutaneous adipose tissue (SAT), there is no significant difference between them in the reduction of BMI and body weight. All groups did not have an effect on VAT. Adolescent;Combined Modality Therapy;Cryosurgery;Female;Humans;Lipectomy;Low-Level Light Therapy;Male;Obesity, Abdominal;Pediatric Obesity;Single-Blind Method;Subcutaneous Fat, Abdominal;Treatment Outcome

Pre-conditioning with near infrared photobiomodulation reduces inflammatory cytokines and markers of oxidative stress in cochlear hair cells. Hearing loss is a serious occupational health problem worldwide. Noise, aminoglycoside antibiotics and chemotherapeutic drugs induce hearing loss through changes in metabolic functions resulting in sensory cell death in the cochlea. Metabolic sequelae from noise exposure increase production of nitric oxide (NO) and Reactive Oxygen Species (ROS) contributing to higher levels of oxidative stress beyond the physiologic threshold levels of

intracellular repair. Photobiomodulation (PBM) therapy is a light treatment involving endogenous chromophores commonly used to reduce inflammation and promote tissue repair. Near infrared light (NIR) from Light Emitting Diodes (LED) at 810 nm wavelength were used as a biochemical modulator of cytokine response in cultured HEI-OC1 auditory cells placed under oxidative stress. Results reported here show that NIR PBM at 810 nm, 30Â mW/cm(2) , 100 seconds, 1.0 J, 3 J/cm(2) altered mitochondrial metabolism and oxidative stress response for up to 24 hours post treatment. We report a decrease of inflammatory cytokines and stress levels resulting from NIR applied to HEI-OC1 auditory cells before treatment with gentamicin or lipopolysaccharide. These results show that cells pretreated with NIR exhibit reduction of proinflammatory markers that correlate with inhibition of mitochondrial superoxide, ROS and NO in response to continuous oxidative stress challenges. Non-invasive biomolecular down regulation of proinflammatory intracellular metabolic pathways and suppression of oxidative stress via NIR may have the potential to develop novel therapeutic approaches to address noise exposure and ototoxic compounds associated with hearing loss. Cytokines;Reactive Oxygen Species;Nitric Oxide Animals;Cell Death;Cell Line;Cytokines;Hair Cells, Auditory;Hearing Loss, Noise-Induced;Humans;Inflammation;Infrared Rays;Mice;Nitric Oxide;Oxidative Stress;Reactive Oxygen Species

Bisphosphonate-related osteonecrosis of the jaws: Report of a case using conservative protocol. Bisphosphonates have been the first-line treatment option for osteometabolic diseases, such as osteoporosis, hypercalcaemia in malignant bone diseases, and in bone metastasis. It is possible to observe a growing number of cases of osteonecrosis of the jaws in patients using this medication, called bisphosphonate-related osteonecrosis of the jaws. The purpose of this study was to report a conservative treatment for bisphosphonate-related osteonecrosis of the jaws--Stage 2, using antibacterial solution and low-level laser therapy. At the end of the treatment, the patient presented improvement of the lesion with the healing of the mucosa. The literature still lacks successful definite protocols, thus the present case may contribute with another option for conservative management for bisphosphonate-related osteonecrosis of the jaws. More research is necessary in order to develop a good protocol management for bisphosphonate-related osteonecrosis of the jaws. Bisphosphonate-Associated Osteonecrosis of the Jaw;Combined Modality Therapy;Female;Humans;Middle Aged

Induction of melasma by 1064-nm Q-switched neodymium:yttrium-aluminum-garnet laser therapy for acquired bilateral nevus of Ota-like macules (Hori nevus): A study on related factors in the Chinese population. Laser treatment has emerged as a common treatment modality for acquired bilateral nevus of Ota-like macules (ABNOM). To identify the ratio of melasma induction and exacerbation before and after laser therapy for ABNOM and to observe the risk factors related to the induction and exacerbation of melasma by laser therapy, we analyzed related factors of 1268 adult Chinese patients who underwent 1064-nm Q-switched neodymium:yttrium-aluminum-garnet (Nd:YAG) laser (QNYL) treatment using case series and case-control studies. Overall, 24.0% of the ABNOM patients had mixed melasma. Among the ABNOM patients without melasma, after laser therapy the development of melasma was more frequently noted in patients older than 35 years ($P < 0.0001$), as well in patients whose ABNOM was less than 10 cm(2) ($P = 0.027$), ABNOM were light (similar to yellow-brown) in color ($P = 0.021$) and skin types were closer to type IV ($P < 0.0001$). New melasma lesions also appeared most frequently in the zygomatic region ($P < 0.0001$). Among the ABNOM patients with melasma, 89.5% experienced worsening of their melasma, irrespective of their related factors above. We concluded that the risk of inducing melasma is great after 1064-nm QNYL treatment in ABNOM patients, and particularly in the patients with both ABNOM and melasma. ABNOM patients should be treated as early as possible and before the age of 35 years.

Adolescent;Adult;Case-Control Studies;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Nevus of Ota;Young Adult

Duality of Iron Oxide Nanoparticles in Cancer Therapy: Amplification of Heating Efficiency by Magnetic Hyperthermia and Photothermal Bimodal Treatment. The pursuit of innovative, multifunctional, more efficient, and safer treatments is a major challenge in preclinical nanoparticle-mediated thermotherapeutic research. Here, we report that iron oxide nanoparticles have the dual capacity to act as both magnetic and photothermal agents. We further explore every key aspect of this magnetophotothermal approach, choosing iron oxide nanocubes for their high efficiency for the magnetic hyperthermia modality itself. In aqueous suspension, the nanocubes' exposure to both: an alternating magnetic field and near-infrared laser irradiation (808 nm), defined as the DUAL-mode, amplifies the heating effect 2- to 5-fold by comparison with magnetic stimulation alone, yielding unprecedented heating powers (specific loss powers) up to 5000 W/g. In cancer cells, the laser excitation restores the optimal efficiency of magnetic hyperthermia, otherwise inhibited by intracellular confinement, resulting in a remarkable heating efficiency in the DUAL-mode (up to 15-fold amplification), with respect to the magnetophotothermal mode. As a consequence, the dual action yielded complete apoptosis-mediated cell death. In solid tumors in vivo, single-mode treatments (magnetic or laser hyperthermia) reduced tumor growth, while DUAL-mode treatment resulted in complete tumor regression, mediated by heat-induced tumoral cell apoptosis and massive denaturation of the collagen fibers, and a long-lasting thermal efficiency over repeated treatments. Ferric Compounds;ferric oxide Apoptosis;Cell Line, Tumor;Ferric Compounds;Hot Temperature;Humans;Hyperthermia, Induced;Low-Level Light Therapy;Magnetic Fields;Metal Nanoparticles;Photochemotherapy

Intraoral photobiomodulation-induced orthodontic tooth alignment: a preliminary study. BACKGROUND: Numerous strategies have been proposed to decrease orthodontic treatment time. Photobiomodulation (PBM) has previously been demonstrated to assist in this objective. The aim of this study was to test if intraoral PBM increases the rate of tooth alignment and reduces the time required to resolve anterior dental crowding. METHODS: Nineteen orthodontic subjects with Class I or Class II malocclusion and Little's Irregularity Index (LII) â‰¥ 3 mm were selected from a pool of applicants, providing 28 total arches. No cases required extraction. The test group (N = 11, 18 arches, 10 upper, 8 lower) received daily PBM treatment with an intraoral LED device (OrthoPulseâ„¢, Biolux Research Ltd.) during orthodontic treatment, while the control group (N = 8, 10 arches, 3 upper, 7 lower) received only orthodontic treatment. The PBM device exposed the buccal side of the gums to near-infrared light with a continuous 850-nm wavelength, generating an average daily energy density of 9.5 J/cm(2). LII was measured at the start (T0) of orthodontic treatment until alignment was reached (T1, where LII â‰¤ 1 mm). The control group was mostly bonded with 0.018-in slot self-ligating SPEED brackets (Hespeler Orthodontics, Cambridge, ON. Canada), while conventionally-ligating Ormco Mini-Diamond twins were used on the PBM group (Ormco, Glendora, Calif. USA). Both groups progressed through alignment with NiTi arch-wires from 0.014-in through to 0.018-in (Ormco), with identical arch-wire changes. The rate of anterior alignment, in LII mm/week, and total treatment time was collected for both groups. Cox proportional hazards models were used to compare groups and while considering age, sex, ethnicity, arch and degree of crowding. RESULTS: The mean alignment rate for the PBM group was significantly higher than that of the control group, with an LII change rate of 1.27 mm/week (SD 0.53, 95 % CI Â± 0.26) versus 0.44 mm/week (SD 0.20, 95 % CI Â± 0.12), respectively (p = 0.0002). The treatment time to alignment was significantly smaller for the PBM group, which achieved alignment in 48 days (SD 39, 95 % CI Â± 39), while the control group took 104 days (SD 55, 95 % CI Â±19, p = 0.0053) on average. These results demonstrated that intraoral PBM increased the average rate of tooth movement by 2.9-fold, resulting in a 54 % average

decrease in alignment duration versus control. The average PBM compliance to daily treatments was 93 % during alignment. CONCLUSIONS: Under the limitations of this study, the findings suggest that intraoral PBM could be used to decrease anterior alignment treatment time, which could consequently decrease full orthodontic treatment time. However, due to its limitations, further research in the form of a large, randomized trial is needed. TRIAL REGISTRATION: ClinicalTrials.gov NCT02267837 . Registered 10 October 2014. Humans;Malocclusion;Orthodontic Brackets;Orthodontic Wires;Phototherapy;Radiation Dosage;Time Factors;Tooth Movement Techniques

Effect of Pulsed Wave Low-Level Laser Therapy on Tibial Complete Osteotomy Model of Fracture Healing With an Intramedullary Fixation. BACKGROUND: Fractures pose a major worldwide challenge to public health, causing tremendous disability for the society and families. According to recent studies, many in vivo and in vitro experiments have shown the positive effects of PW LLLT on osseous tissue. OBJECTIVES: The aim of this study was to evaluate the outcome of infrared pulsed wave low-level laser therapy (PW LLLT) on the fracture healing process in a complete tibial osteotomy in a rat model, which was stabilized by an intramedullary pin. MATERIALS AND METHODS: This experimental study was conducted at Shahid Beheshti University of Medical Sciences in Tehran, Iran. We performed complete tibial osteotomies in the right tibias for the population of 15 female rats. The rats were divided randomly into three different groups: I) Control rats with untreated bone defects; II) Rats irradiated by a 0.972 J/cm(2) PW LLLT; and III) Rats irradiated by a 1.5 J/cm(2) PW LLLT. The right tibias were collected six weeks following the surgery and a three-point bending test was performed to gather results. Immediately after biomechanical examination, the fractured bones were prepared for histological examinations. Slides were examined using stereological method. RESULTS: PW LLLT significantly caused an increase in maximum force (N) of biomechanical repair properties for osteotomized tibias in the first and second laser groups (30.0 Â± 15.9 and 32.4 Â± 13.8 respectively) compared to the control group (8.6 Â± 4.5) LSD test, P = 0.019, P = 0.011 respectively). There was a significant increase in the osteoblast count of the first and second laser groups (0.53 Â± 0.06, 0.41 Â± 0.06 respectively) compared to control group (0.31 Â± 0.04) (LSD test, P = 0001, P = 0.007 respectively). CONCLUSIONS: This study confirmed the efficacy of PW LLLT on biomechanical strength, trabecular bone volume, callus volume, and osteoblast number of repairing callus in a complete tibial osteotomy animal model at a relatively late stage of the bone healing process.

Tenogenic induction of equine mesenchymal stem cells by means of growth factors and low-level laser technology. Tendons regenerate poorly due to a dense extracellular matrix and low cellularity. Cellular therapies aim to improve tendon repair using mesenchymal stem cells and tenocytes; however, a current limitation is the low proliferative potential of tenocytes in cases of severe trauma. The purpose of this study was to develop a method useful in veterinary medicine to improve the differentiation of Peripheral Blood equine mesenchymal stem cells (PB-MSCs) into tenocytes. PB-MSCs were used to study the effects of the addition of some growth factors (GFs) as TGFÎ²3 (transforming growth factor), EGF2 (Epidermal growth factor), bFGF2 (Fibroblast growth factor) and IGF-1 (insulin-like growth factor) in presence or without Low Level Laser Technology (LLLT) on the mRNA expression levels of genes important in the tenogenic induction as Early Growth Response Protein-1 (EGR1), Tenascin (TNC) and Decorin (DCN). The singular addition of GFs did not show any influence on the mRNA expression of tenogenic genes whereas the specific combinations that arrested cell proliferation in favour of differentiation were the following: bFGF2Â +Â TGFÎ²3 and bFGF2Â +Â TGFÎ²3Â +Â LLLT. Indeed, the supplement of bFGF2 and TGFÎ²3 significantly upregulated the expression of Early Growth Response Protein-1 and Decorin, while the use of LLLT induced a significant increase of Tenascin C levels. In conclusion, the present study might furnish significant suggestions for developing an efficient approach for tenocyte induction since the external

administration of bFGF2 and TGFÎ²3, along with LLLT, influences the differentiation of PB-MSCs towards the tenogenic fate. Decorin;Early Growth Response Protein 1;Extracellular Matrix Proteins;Intercellular Signaling Peptides and Proteins Animals;Cell Differentiation;Cell Proliferation;Cells, Cultured;Decorin;Early Growth Response Protein 1;Extracellular Matrix Proteins;Gene Expression Regulation;Horses;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mesenchymal Stem Cells;Tendon Injuries;Tendons
Supraphysiologic glucocorticoid administration increased biomechanical bone strength of rats' vertebral body. The aim of this study is to assess the effects of different glucocorticoid administration protocols on biomechanical properties of the first lumbar vertebral body in rats. We divided 40 male rats into the following groups: control, dexamethasone (7 mg/week), dexamethasone (0.7 mg/week), methylprednisolone (7 mg/kg/week), methylprednisolone (5 mg/kg twice weekly), dexamethasone (7 mg/kg three times per week), dexamethasone (0.7 mg/kg three times per week, and low-level laser treated rats. Lumbar vertebrae in rats were exposed to the pulsed laser. We conducted a biomechanical test to examine the mechanical properties of vertebral body in rats' lumbar bone. Supraphysiologic glucocorticoid administration protocols did not impair the biomechanical properties of rats' vertebral bodies compared to control and laser-treated rats. Supraphysiologic glucocorticoid administration caused an anabolic effect on the vertebral bodies.
The use of low-level laser therapy for controlling the gag reflex in children during intraoral radiography. The current literature suggests that low-level laser stimulation of the PC 6 acupuncture points may prevent gagging. This study aimed to determine if low-level laser therapy (LLLT) can reduce the gag reflex in children undergoing intraoral maxillary radiography. This randomized, controlled, double-blind clinical trial was conducted with 25 children with moderate-to-very severe gag reflexes who required bilateral periapical radiographic examination of the maxillary molar region. Children's anxiety levels were initially evaluated using Corah's Dental Anxiety Scale (DAS) to identify any possible relationship between gagging and anxiety. A control radiograph was taken of one randomly selected side in each patient after simulated laser application so that the patient was blinded to the experimental conditions (control group). Laser stimulation was then performed for the experimental side. A laser probe was placed on the Pericardium 6 (PC 6) acupuncture point on each wrist, and laser energy was delivered for 14 s (300 mW, energy density 4 J/cm(2)) at a distance of 1 cm from the target tissue. Following laser stimulation, the experimental radiograph was taken (experimental group). Gagging responses were measured using the Gagging Severity Criteria for each group. Data were analyzed using Spearman's rho correlations and Mann-Whitney U tests. Both mean and median gagging scores were higher in the control group than in the experimental group. Patients who were unable to tolerate the intraoral control radiography were able to tolerate the procedure after LLLT. Differences between gagging scores of the control and experimental groups were statistically significant (Pâ€‰=â€‰.000). There was no significant correlation between gagging severity and anxiety score (Pâ€‰>â€‰.05). A negative correlation was found between age and gagging score in the control group (Pâ€‰Ë,â€‰.05). Within the limitations of this study, LLLT of the PC 6 acupuncture points appears to be a useful technique for controlling the gag reflex in children during maxillary radiography. Acupuncture Points;Child;Double-Blind Method;Female;Gagging;Humans;Low-Level Light Therapy;Male;Molar;Radiography;Reflex
Lack of clinical evidence on low-level laser therapy (LLLT) on dental titanium implant: a systematic review. Low-level laser therapy (LLLT) has proved to have biostimulating effects on tissues over which they are applied, therefore accelerating the healing process. Most studies in implantology were focused on a reduction of the duration of osseointegration. There exist few articles analyzing the potential effects of these therapies on the osseointegration of titanium dental implants. The aim of this study was to assess the effect of LLLT on the interaction between the bone and the titanium

dental implant and the methodological quality of the studies. We conducted an electronic search in PubMed, ISI Web, and Cochrane Library. From 37 references obtained, only 14 articles met the inclusion criteria. The analysis of the studies shows that most of the experiments were performed in animals, which have a high risk of bias from the methodological point of view. Only two studies were conducted in human bone under different conditions. Several protocols for the use of low-power laser and different types of laser for all studies analyzed were used. Although animal studies have shown a positive effect on osseointegration of titanium implants, it can be concluded that it is necessary to improve and define a unique protocol to offer a more conclusive result by meta-analysis. Dental Implants;Titanium Animals;Dental Implants;Evidence-Based Dentistry;Humans;Low-Level Light Therapy;Titanium

Osteogenic differentiation and gene expression of dental pulp stem cells under low-level laser irradiation: a good promise for tissue engineering. The effects of low-level laser therapy (LLLT) has been the focus of recent studies as being assumed responsible for promoting photostimulatory and photobiomodulatory effects in vivo and in vitro, increasing cell metabolism, improving cell regeneration and invoking an anti-inflammatory response. A positive effect of LLLT on the bone proliferation of some cell types has been observed, but little is known about its effect on dental pulp stem cells (DPSCs). Here, we accurately describe the technical procedure to isolate mesenchymal DPSCs, and assay their osteogenic capacity when irradiated with an LLLT source. These preliminary results show that LLLT irradiation influences the in vitro proliferation of DPSCs and increases the expression of essential proteins for bone formation, although it is necessary to carry out further experiments on other cell types and to uniform the methodological designs. Core Binding Factor Alpha 1 Subunit;RUNX2 protein, human;Sp7 Transcription Factor;SP7 protein, human;Transcription Factors Cell Differentiation;Cells, Cultured;Core Binding Factor Alpha 1 Subunit;Dental Pulp;Humans;Low-Level Light Therapy;Osteogenesis;Sp7 Transcription Factor;Stem Cells;Tissue Engineering;Transcription Factors

Effect of low-level laser therapy as an adjuvant in the treatment of periodontitis induced in rats subjected to 5-fluorouracil chemotherapy. BACKGROUND AND OBJECTIVE: This study aimed to assess the effect of multiple sessions of a low-level laser therapy (LLLT) adjuvant to scaling and root planing (SRP) on the treatment of experimental periodontitis (EP) in rats treated with 5-fluorouracil (5-FU). MATERIAL AND METHODS: A total of 120 rats were divided into five groups: no treatment (NT); treatment with 5-FU (60 and 40 mg/kg) and no local periodontal treatment (5FU); treatment with 5-FU and SRP (5FU-SRP); treatment with 5-FU, SRP and one LLLT session (660 nm; 0.035 W; 4.2 J; 120 s) (5FU-SRP-1LLLT); and treatment with 5-FU, SRP and four LLLT sessions (0, 24, 48 and 72 h) (5FU-SRP-4LLLT). EP was induced in the mandibular molars through ligature placement. The alveolar bone loss (ABL) area in the furcation region was analysed histometrically. TRAP, proliferating cell nuclear antigen, RANKL, osteoprotegerin and activated caspase-3 patterns were analysed by immunolabeling. Prostaglandin E2 was quantified using an ELISA, and tumour necrosis factor Î± and interleukin-6 were assessed using the multiplex method. The prevalence rates of Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, Prevotella nigrescens, Prevotella intermedia and Fusobacterium nucleatum were assessed using the PCR method. The data were subjected to statistical analysis (Î± = 5%). RESULTS: 5FU, 5FU-SRP and 5FU-SRP-1LLLT treatment groups showed higher ABL compared with the NT group ($p < 0.05$), whereas the 5FU-SRP-4LLLT group showed lower ABL compared with the 5FU group on day 7 and decreased RANKL immunolabeling ($p < 0.05$). CONCLUSION: Treatment with 5-FU worsened EP, and multiple LLLT sessions adjuvant to SRP seemed to improve periodontitis in rats subjected to 5-FU chemotherapy. Interleukin-6;Osteoprotegerin;RANK Ligand;Tnfrsf11b protein, rat;Tumor Necrosis Factor-alpha;Caspase 3;Dinoprostone;Fluorouracil Alveolar Bone Loss;Animals;Bacteria;Caspase 3;Combined Modality

Therapy;Dental Scaling;Dinoprostone;Drug Therapy;Fluorouracil;Inflammation;Interleukin-6;Low-Level Light Therapy;Male;Mandible;Molar;Osteoprotegerin;Periodontitis;RANK Ligand;Rats;Rats, Wistar;Root Planing;Tumor Necrosis Factor-alpha

A systematic review of low-level light therapy for treatment of diabetic foot ulcer. Diabetes mellitus (DM) is a significant international health concern affecting more than 387 million individuals. A diabetic person has a 25% lifetime risk of developing a diabetic foot ulcer (DFU), leading to limb amputation in up to one in six DFU patients. Low-level light therapy (LLLT) uses low-power lasers or light-emitting diodes to alter cellular function and molecular pathways, and may be a promising treatment for DFU. The goal of this systematic review is to examine whether the clinical use of LLLT is effective in the healing of DFU at 12 and 20 weeks in comparison with the standard of care, and to provide evidence-based recommendation and future clinical guidelines for the treatment of DFU using LLLT. On September 30, 2015, we searched PubMed, EMBASE, CINAHL, and Web of Science databases using the following terms: "diabetic foot" AND "low level light therapy," OR "light emitting diode," OR "phototherapy," OR "laser." The relevant articles that met the following criteria were selected for inclusion: randomized control trials (RCTs) that investigated the use of LLLT for treatment of DFU. Four RCTs involving 131 participants were suitable for inclusion based upon our criteria. The clinical trials used sham irriadiation, low dose, or nontherapeutic LLLT as placebo or control in comparison to LLLT. The endpoints included ulcer size and time to complete healing with follow-up ranging from 2 to 16 weeks. Each article was assigned a level of evidence (LOE) and graded according to the Oxford Center for Evidence-based Medicine Levels of Evidence Grades of Recommendation criteria. Limitations of reviewed RCTs include a small sample size (Nâ€‰<â€‰100), unclear allocation concealment, lack of screening phase to exclude rapid healers, unclear inclusion/exclusion criteria, short (<30 days) follow-up period, and unclear treatment settings (wavelength and treatment time). However, all reviewed RCTs demonstrated therapeutic outcomes with no adverse events using LLLT for treatment of DFU. This systematic review reports that LLLT has significant potential to become a portable, minimally invasive, easy-to-use, and cost effective modality for treatment of DFU. To enthusiastically recommend LLLT for treatment of DFU, additional studies with comparable laser parameters, screening period to exclude rapid healers, larger sample sizes and longer follow-up periods are required. We envision future stringent RCTs may validate LLLT for treatment of DFU. Systematic review registration number: PROSPERO CRD42015029825. Amputation, Surgical;Cost-Benefit Analysis;Diabetic Foot;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Treatment Outcome;Wound Healing

Infrared and skin: Friend or foe. In the last decade, it has been proposed that the sun's IR-A wavelengths might be deleterious to human skin and that sunscreens, in addition to their desired effect to protect against UV-B and UV-A, should also protect against IR-A (and perhaps even visible light). Several studies showed that NIR may damage skin collagen content via an increase inMMP-1 activity in the same manner as is known for UVR. Unfortunately, the artificial NIR light sources used in such studies were not representative of the solar irradiance. Yet, little has been said about the other side of the coin. This article will focus on key information suggesting that IR-A may be more beneficial than deleterious when the skin is exposed to the appropriate irradiance/dose of IR-A radiation similar to daily sun exposure received by people in real life.IR-A might even precondition the skin--a process called photo prevention--from an evolutionary standpoint since exposure to early morning IR-A wavelengths in sunlight may ready the skin for the coming mid-day deleterious UVR. Consequently IR-A appears to be the solution, not the problem. It does more good than bad for the skin. It is essentially a question of intensity and how we can learn from the sun. Â© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license

(http://creativecommons.org/licenses/by-nc-nd/4.0/). Matrix Metalloproteinase 1 Humans;Infrared Rays;Light;Matrix Metalloproteinase 1;Oxidative Stress;Skin;Skin Aging;Temperature

Histological Assessment of a Combined Low-Level Laser/Light-Emitting Diode Therapy (685â€‰nm/470â€‰nm) for Sutured Skin Incisions in a Porcine Model: A Short Report. OBJECTIVE: The aim of our study was to evaluate, from a histological point of view, the effect of photobiomodulation (PBM) with combined low-level laser therapy (LLLT)/light- emitting diode (LED) on porcine skin wound healing. BACKGROUND DATA: Most LLLT/LED wound healing studies have been performed on various types of rat models, with their inherent limitations. Minipigs are evolutionary and physiologically closer to humans than rats. MATERIALS AND METHODS: With the animals under general anesthesia, one full-thickness skin incision was performed on the back of each minipig (nâ€‰=â€‰10) and immediately closed using simple interrupted percutaneous sutures. The minipigs were randomly allocated into two groups: a PBM-treated group (LLLT Î»â€‰=â€‰685â€‰nm, LED Î»â€‰=â€‰470â€‰nm, both light sources producing power densities at 0.008â€‰W/cm2; each light source delivering total daily doses of 3.36â€‰J/cm2) and a sham-irradiated control group. Half of the animals in each group were killed on postoperative day 3, and the other half were killed on the postoperative day 7, and samples were removed for histological examination. RESULTS: Combined red and blue PBM accelerated the process of re-epithelization and formation of cross-linked collagen fibers compared with sham irradiated control wounds. CONCLUSIONS: Our results demonstrate that the current dose of combined red and blue PBM improves the healing of sutured skin incisions in minipigs. Animals;Female;Low-Level Light Therapy;Skin;Swine;Swine, Miniature;Wound Healing

Safety assessment of trans-tympanic photobiomodulation. We evaluated functional and morphological changes after trans-tympanic laser application using several different powers of photobiomodulation (PBM). The left (L) ears of 17 rats were irradiated for 30 min daily over 14 days using a power density of 909.1 (group A, 5040 J), 1136.4 (group B, 6300 J), and 1363.6 (group C, 7560 J) mW/cm(2). The right (N) ears served as controls. The safety of PBM was determined by endoscopic findings, auditory brainstem response (ABR) thresholds, and histological images of hair cells using confocal microscopy, and light microscopic images of the external auditory canal (EAC) and tympanic membrane (TM). Endoscopic findings revealed severe inflammation in the TM of C group; no other group showed damage in the TM. No significant difference in ABR threshold was found in the PBM-treated groups (excluding the group with TM damage). Confocal microscopy showed no histological difference between the AL and AN, or BL and BN groups. However, light microscopy showed more prominent edema, inflammation, and vascular congestion in the TM of BL ears. This study found a dose-response relationship between laser power parameters and TM changes. These results will be useful for defining future allowance criteria for trans-tympanic laser therapies. Animals;Ear Canal;Evoked Potentials, Auditory, Brain Stem;Low-Level Light Therapy;Male;Rats;Safety;Tympanic Membrane

Anti-inflammatory effect of laser acupuncture in ST36 (Zusanli) acupoint in mouse paw edema. Low-level laser therapy (LLLT) in acupuncture is a low-power laser applied to acupoints for providing luminous energy, capable to produce photobiological induction that results in biochemical, bioelectric, and bioenergetic effects. ST36 (Zusanli) is a point of acupuncture commonly used for treatment of several pathological alterations, such as inflammation, acute pain, and gastrointestinal disorders. In this study, we evaluated the anti-inflammatory effect of LLLT (830 nm, 4 J/cm(2)) in ST36 acupoint through the model of carrageenan-induced paw edema in mice and the possible mechanisms involved. Female Swiss mice were treated with LLLT in ST36 before the paw edema induction, which was measured by means of a digital micrometer and the temperature through a high-resolution digital thermograph. After this, the levels of reactive oxygen species (ROS), lipid

hydroperoxides (LOOH), and reduced glutathione (GSH) were quantified. In another set of experiments, the paw edema was induced by bradykinin, histamine, and prostaglandin E2 (PGE2). LLLT in ST36 acupoint significantly inhibited the edema formation for 4 h after the carrageenan injection and reduced the paw temperature in 10 %. Furthermore, LLLT also reduced the levels of ROS (55 %) and LOOH (50 %) but, however, did not alter the GSH levels. LLLT in ST36 reduced the paw edema induced by bradykinin (30 min, 6 %, 60 min, 7 %), histamine (30 min, 11 %), and PGE2 (90 min, 10 %, 120 min, 16 %). In conclusion, these results prove that LLLT in ST36 acupoint produces a relevant anti-inflammatory effect, reducing edema, temperature, and free radicals levels in mice paw. Lipid Peroxides;Reactive Oxygen Species;Histamine;Carrageenan;Glutathione;Dinoprostone;Bradykinin Acupuncture Points;Animals;Bradykinin;Carrageenan;Dinoprostone;Edema;Female;Glutathione;Histamine;Inflammation;Lipid Peroxides;Low-Level Light Therapy;Mice;Reactive Oxygen Species

Analysis of Low Intensity Laser Therapy as adjuvant to Photodynamic Therapy in Nonmelanoma Skin Cancer. The combination of Low Intensity Laser Therapy and Photodynamic Therapy constitutes a minimal invasive and highly selective alternative for the treatment of skin tumors. Photodynamic effectiveness, specially the absence of recurrence, highly depends on the type of tumor, as well as on several parameters such as those related with the optical source. Therefore it is important to have predictive tools to provide an appropriate treatment planning. This work proposes the use of a complex predictive model that includes a three-dimensional meshing of the considered tumor geometry and the optical propagation therein by a three-dimensional Monte Carlo method. The proposed tool is applied to three different types of skin tumors, squamous cell carcinoma, nodular and infiltrative basal cell carcinomas. The estimated volume of treatment, depending on the tumor type and source parameters, allows an appropriate treatment planning in order to avoid undesirable tumor recurrence. Carcinoma, Basal Cell;Carcinoma, Squamous Cell;Humans;Laser Therapy;Monte Carlo Method;Neoadjuvant Therapy;Neoplasm Recurrence, Local;Optical Phenomena;Photochemotherapy;Skin Neoplasms;Tumor Burden

Treatment for neuropathic pain and chronic inflammation using LASER in animal models. The ST36 (Zusanli) acupuncture point is used to treat inflammatory processes, pain and gastrointestinal disturbs. For this reason, the aim of the present study was to evaluate the antinociceptive effect of Low-level Laser Treatment (LLLT) on ST36 acupoint using models of chronic nociception and inflammation. Male Swiss mice were treated with LLLT on ST36 30 minutes before the mechanical allodynia (von Frey) performed on the partial sciatic nerve ligation (PSNL) method and Complete Freund's Adjuvant (CFA). The results demonstrated that application of LLLT on ST36 inhibited the mechanical allodynia response induced by PSNL and CFA, with total reversion at 30 minutes after application. Long-term treatment of animals with LLLT on the same acupoint, once a day, also reduced the PNSL and CFA-induced mechanical allodynia response during 8 days of treatment. As conclusion, the results demonstrated that photonic stimulus on ST36 with LLLT produces antinociceptive effect in chronic models of nociception and inflammation. These findings suggest that LLLT may constitute an important therapeutic alternative to control chronic pain. Freund's Adjuvant Animals;Chronic Pain;Disease Models, Animal;Freund's Adjuvant;Hyperalgesia;Inflammation;Male;Mice;Neuralgia

Rhodamine intense pulsed light versus conventional intense pulsed light for facial telangiectasias. Facial telangiectasias represent the major aesthetic alterations of several chronic inflammatory disorders arising on facial skin. We herein report on relevant clinical results of a new subtype of intense pulsed light treatments, the so-called rhodamine intense pulsed light (r-IPL), in comparison with conventional IPL (c-IPL) treatments on forty-five patients affected by facial telangiectasias. The aim of this study is to determinate whether r-IPL represents an effective and safe treatment for the

most common superficial vascular alterations and could be advised as a first choice therapy for facial telangiectasias. Rhodamines Adolescent;Adult;Aged;Child;Cosmetic Techniques;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Rhodamines;Skin;Telangiectasis;Young Adult

Extensive angiokeratoma circumscriptum - successful treatment with 595-nm variable-pulse pulsed dye laser and 755-nm long-pulse pulsed alexandrite laser. Angiokeratomas are rare vascular mucocutaneous lesions characterized by small-vessel ectasias in the upper dermis with reactive epidermal changes. Angiokeratoma circumscriptum (AC) is the rarest among the five types in the current classification of angiokeratoma. We present a case of an extensive AC in 19-year-old women with Fitzpatrick skin type I of the left lower extremity, characterized by a significant morphological heterogeneity of the lesions, intermittent bleeding, and negative psychological impact. Histopathological examination after deep biopsy was consistent with that of angiokeratoma. The association with metabolic diseases (Fabry disease) was excluded by ophthalmological, biochemical, and genetic examinations. Nuclear magnetic resonance imaging has not detected deep vascular hyperplasia pathognomic for verrucous hemangioma. The combined treatment with 595-nm variable-pulse pulsed dye laser (VPPDL) and 755-nm long-pulse pulsed alexandrite laser (LPPAL) with dynamic cooling device led to significant removal of the pathological vascular tissue of AC. Only a slight degree of secondary reactions (dyspigmentations and texture changes) occurred. No recurrence was observed after postoperative interval of 9 months. We recommend VPPDL and LPPAL for the treatment of extensive AC. Angiokeratoma;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Lower Extremity;Skin Neoplasms;Young Adult

Successful treatment of isolated venous malformation with 1444-nm fiberoptic Nd-YAG laser. Two patients with isolated venous malformations on the face were treated with fiberoptic Nd-YAG laser (Lutronic laser company, South Korea). After nerve block anesthesia, the laser tip was pushed into the lesions either through a hole made by a 16 gauge needle or directly by inserting and triggering the laser tip few millimeters away from the lesions. The laser tip was pushed from one or few directions and moved back and forth, while triggering, in a fan pattern to cover the whole lesion. The procedure was continued till complete flattening of the lesions. The parameters used were pulse rate = 30 hertz, pulse energy = 300 mJoules, power = 6.0 watt, and total energy used for the first patient was 1000 Joules and for the second patient was 800 joules. RESULTS: The lesions flattened completely after whole tissue coagulation. Moderate redness disappeared in the first 48 hours. No persistent discoloration and no sign of cutaneous burning appeared after the procedures. No antibiotic or analgesic was prescribed after the procedure. The patients were followed for more than 2 years with no recurrence and good cosmetic results. CONCLUSION: The fiberoptic Nd-YAG laser can be used as an effective procedure for venous malformations. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Vascular Malformations;Young Adult

Follow-up of melanocytic nevi after depilation techniques. Female;Follow-Up Studies;Hair Removal;Humans;Low-Level Light Therapy;Nevus, Pigmented;Skin Neoplasms

Pulsed dye laser versus long-pulsed Nd:YAG laser in the treatment of hypertrophic scars and keloid: A comparative randomized split-scar trial. INTRODUCTION: Keloids and hypertrophic scars are benign fibrous growths that occur after trauma or wounding of the skin and present a major therapeutic problem. OBJECTIVE: The purpose of this study is to evaluate and compare the effectiveness of pulsed dye laser (PDL) versus Nd:YAG laser in hypertrophic scar and keloid. METHODS: Twenty patients with hypertrophic scars and keloid were included in this prospective, randomized, split-scar study. Half of each scar was randomized to treatment with a 595-nm PDL and the contralateral half with the 1064-nm Nd:YAG. Each patient received 6 laser treatment sessions at 1-month intervals. The scars were evaluated at baseline and one month after the last laser session

using the Vancouver scar scale (VSS). RESULTS: One month after the last laser treatment, final total VSS analysis of treated sites by PDL and long-pulsed Nd:YAG laser revealed significant improvements ($p < 0.001$), whereas the average percentage of improvement in the total VSS was 55.14% for PDL and 65.44% for Nd:YAG laser. However, there were no statistically significant differences between PDL- and long-pulsed Nd:YAG laser-treated sites for total VSS ($p = 0.074$). LIMITATIONS: This was a single-center non-controlled trial, which included a small number of patients and subjective outcome measures. CONCLUSION: PDL and long-pulsed Nd:YAG laser treatments for keloid and hypertrophic scar provide significant improvement with insignificant difference between both modalities. Cicatrix;Female;Humans;Keloid;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Severity of Illness Index

The use of lasers in Becker's naevus: An evidence-based review. Becker's naevus is a hamartoma that often appears during puberty. Clinically this presents with a pigmented and often hairy patch most often on the shoulders. Treatment has always been challenging and lasers are often used with mixed results. This article reviews the evidence of all the laser treatments used in Becker's naevus and analyses the findings from the published studies and trials. Female;Humans;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nevus;Skin Neoplasms;Treatment Outcome

Effects of the Low-Level Laser Therapy (LLLT) in the process of healing diabetic foot ulcers. PURPOSE: To evaluate the effects of the low-level laser therapy applying Laser on the tissue repair in ulcer carriers due to diabetes. METHODS: Sixteen type II diabetic patients, ulcer carriers in the lower limbs, participated in the research from which eight were in the control group and eight were submitted to the low-level laser therapy with a pulsed wave form, visible ray, wave length of 632.8 nm, 30 mW peak power, (Laser - HTM). The application time was of 80 (4J/cm2) seconds. The application was punctual without contact (approximately 1mm of distance), the pen being held in a perpendicular position related to the wound, in equidistant points. There were 12 appointments, of which three were done weekly in alternated days. Photograph records and an application of the brief inventory of pain were done before and after 30 days of follow-up. RESULTS: There was a significant decrease in the size of the wound when compared to the control group ($p<0.05$). The pain was also reported as having an intense improvement in the treated group. CONCLUSION: The low-level laser treatment seems to be an efficient method, viable, painless and of low costs concerning the tissue repair ulcers in a diabetic foot. Sodium Chloride Diabetes Mellitus, Type 2;Diabetic Foot;Foot Ulcer;Humans;Low-Level Light Therapy;Pain Measurement;Sodium Chloride;Wound Healing

The low-level laser on acute myositis in rats. PURPOSE: To analyze the effects of the low-level laser therapy in the acute myositis induced in rats. METHODS: Twelve rats were subjected to bilateral ovariectomy for inducing osteoporosis. After surgery, they were divided into two groups: Ovariectomy-control group (G1, n=6), receiving 0.5 ml distilled water by gavage for 30 days, and Ovariectomy plus mastruz group (G2, n=6), receiving 0.5 ml of the hydroalcoholic extract of mastruz at 10% concentration (50mg) daily, for the same period. Then, the blood of the animals was collected for further biochemical analysis (liver function) and tibia and liver were removed for histological and histomorphometric analyses. RESULTS: In the MT group there was a statistic significant decrease in the number of inflammatory cells, related to the MI group ($p<0.05$), increase in the fibroblastic proliferation, when compared to groups C and MI related to MT group ($p<0.01$) and statistic significant edema regression ($p=0.0400$) in the MT group CONCLUSION: The low-level laser therapy was efficient in the reduction of the inflammatory process, increase of the fibroblastic proliferation and the reduction of the edema. Acute Disease;Animals;Edema;Fibroblasts;Lasers,

Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Muscle, Skeletal;Myositis;Radiation Dosage;Random Allocation;Rats, Wistar

Action of AlGaInP laser and high frequency generator in cutaneous wound healing. A comparative study. PURPOSE: To evaluate in a macroscopic, histological and histomorphometric manner the healing process of cutaneous wounds in mice. METHODS: The sample consisted of 40 male mice and was divided in four groups: 1st group (control, n=10), 2nd group (High Frequency Generator - HF, the maximum amplitude range, 120s, n=10), 3rd group (AlGaInP Laser 660 nm, 30mW power, 5 J/cm2, applying scan mode, 120s, n=10) and 4thgroup (AlGaInP Laser 660 nm, 30 mW power, 8 J/cm2, applying scan mode, n=10). The surgical incision was made with an 8 mm diameter punch perpendicularly to the back of the animal. The statistical analysis was achieved by the statistical test One Way Anova post hoc Tukey Test and significance at $p<0.05$ in GraphPad Prism program. RESULTS: It was observed that in the acute phase the AlGaInP Laser at 5 J/cm2 provided a greater stimulus to healing, and both lasers were effective in the remodeling phase. CONCLUSION: The AlGaInP lasers from 5 J/cm2 to 8 J/cm2 showed better biomodulatory results in the acute and remodeling phases respectively, however, the HF was less effective than the laser, providing significant benefits only in the acute phase of tissue repair. Ozone Analysis of Variance;Animals;Fibroblasts;Inflammation;Low-Level Light Therapy;Male;Mice;Models, Animal;Ozone;Radiation Dosage;Random Allocation;Skin;Time Factors;Wound Healing

Clinical and biochemical comparison of guided tissue regeneration versus guided tissue regeneration plus low-level laser therapy in the treatment of class II furcation defects: A clinical study. OBJECTIVE: The present study was aimed to compare the clinical and biochemical effectiveness of guided tissue regeneration (GTR) alone and combined with low-level laser therapy (LLLT) application in the treatment of furcation II periodontal defects, over a period of 6 months. MATERIAL AND METHODS: Thirty-three furcation defects were included in the study. Seventeen of these defects were treated with GTR plus LLLT, and sixteen of them were treated with GTR alone. Probing pocket depth (PPD), clinical attachment level (CAL), horizontal probing depth (HPD), and alkaline phosphatase (ALP) and osteocalcin (OC) levels in the gingival crevicular fluid (GCF) were recorded at baseline and at postoperative 3rd and 6th months. RESULTS: Healing was uneventful in all cases. At the 3rd and 6th months, both treatment modalities-GTR and GTR plus LLLT--showed improved PPD, CAL, and HPD values compared to their baseline values. ALP and OC levels in GCF increased after the treatment in both groups ($p < 0.05$). When compared the two groups, at the 6th month, PPD, CAL, HPD, and ALP values showed significantly more improvement in laser group than non-laser group ($p < 0.05$). CONCLUSIONS: The results of this study showed that both treatments led to significantly favorable clinical improvements in furcation periodontal defects. LLLT plus GTR may be a more effective treatment modality compared to GTR alone. Osteocalcin;Alkaline Phosphatase Adult;Alkaline Phosphatase;Combined Modality Therapy;Female;Furcation Defects;Gingival Crevicular Fluid;Guided Tissue Regeneration;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteocalcin;Prospective Studies;Wound Healing

Combination treatment of low-fluence Q-switched Nd:YAG laser and oral tranexamic acid for post-inflammatory hyperpigmentation due to allergic contact dermatitis to henna hair dye. A 64-year-old female presented with facial hyperpigmentation. She had dyed her hair monthly with pure henna powder for the past seven months. After patch tests, the patient was diagnosed as post-inflammatory hyperpigmentastion due to allergic contact dermatitis to pure henna that has rarely been reported. The patient underwent Q-switched Nd:YAG laser treatment and was treated with oral tranexamic acid for 10 weeks. The hyperpigmentation on her forehead demonstrated substantial improvement. Antifibrinolytic Agents;Coloring Agents;Hair Dyes;Naphthoquinones;Tranexamic Acid;lawsone Antifibrinolytic Agents;Coloring Agents;Combined Modality Therapy;Cosmetic Techniques;Dermatitis,

Allergic Contact;Female;Hair Dyes;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Naphthoquinones;Tranexamic Acid
A retrospective study on the clinical efficacy of the intense pulsed light source for photodamage and skin rejuvenation. OBJECTIVE: The objective of this retrospective review is to investigate the long-term effect of skin rejuvenation by the intense pulsed light (IPL) source for the treatment of photoaging. METHODS: From 5300 clinical cases that our department has treated with the IPL, the first 2534 were chosen for this study. Each patient received a minimum of 3 IPL treatments during this time-many were yearly treatments. Clinical photographs were taken on a yearly basis for up to 12 years and sent to a blinded independent panel to study the effects of continuous IPL treatments. RESULTS: Results showed that the effective rate for the IPL was between 88.24% and 96.45%. CONCLUSIONS: IPL therapy is an effective treatment for photoaging and can truly have an effect on reversing the signs of photodamage on skin. Facial Dermatoses;Humans;Hyperpigmentation;Intense Pulsed Light Therapy;Low-Level Light Therapy;Phototherapy;Rejuvenation;Retrospective Studies;Sunlight;Treatment Outcome
Green laser light irradiation enhances differentiation and matrix mineralization of osteogenic cells. BACKGROUND AND OBJECTIVE: Low level laser therapy (LLLT) in both infrared and visible light is a therapeutic tool ever more proposed in clinical practice in different fields. The effect of near infrared LLLT has been described in a growing number of scientific publications related to bone tissue healing, both in vitro and in vivo. More recently, green visible light using potassium-titanyl-phosphate KTiOPO4 (KTP, 532 nm) laser has been proposed in dermatology, urology, oral and maxillofacial surgery but has never been tested on bone tissue. The aim of the present work was to perform a preliminary in vitro study to analyze the effects of KTP laser, on the osteogenic differentiation of bone marrow stromal cells (BMSCs). MATERIALS AND METHODS: Using a power meter the first step of this study aimed to evaluate the real power emitted by the KTP laser device and the amount of energy absorbed by culture medium and plastic in order to calculate the appropriate irradiation parameters for cultured cells. Primary bone marrow stromal cells prepared from C57BL/6 mice were cultured and induced to differentiate in the osteogenic lineage in the presence or in the absence of KTP LLLT at a fluence of 4 J/cm(2) three times a week. Specific staining of the cells and the extracellular matrix, microscopic analysis as well as quantitative RT-PCR were used to assess cell proliferation and differentiation. RESULTS: We show here that KTP LLLT enhances the osteogenic differentiation of bone marrow stromal cells and the mineralization of their extracellular matrix. CONCLUSION: Our results highlight that this LLLT experimental protocol with green light (KTP, 532 nm) at 4 J/cm(2) has a positive effect on the osteogenic differentiation of murine bone marrow stromal cells. These preliminary results could be used as a basis to further investigate the effect of this KTP laser protocol on bone tissue engineering models in vivo and in vitro. Phosphates;Osteocalcin;potassium titanylphosphate;Titanium Animals;Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Light;Mesenchymal Stem Cells;Mice;Mice, Inbred C57BL;Osteoblasts;Osteocalcin;Osteogenesis;Phosphates;Titanium
Comparison of the Effects of Low-Level Laser Therapy and Ozone Therapy on Bone Healing: ERRATUM.
Targeted phototherapy. BACKGROUND: Targeted phototherapy is a new form of phototherapy which has many advantages and disadvantages over conventional phototherapy. This article reviews the different technologies and outlines recommendations based on current evidence. METHODS: A literature search was performed on targeted phototherapy to collect data. Relevant literature published till March 2014 was obtained from PubMed, EMBASE, and the Cochrane Library. Keywords like "targeted phototherapy", "excimer laser", "excimer lamp", "Nonchromatic ultraviolet light", "vitiligo", and "psoriasis", were used for literature search. All systematic reviews, meta-analysis,

national guidelines, randomized controlled trials (RCT), prospective open label studies and retrospective case series in English were reviewed. RESULTS: Three hundred and forty studies were evaluated, 24 of which fulfilled the criteria for inclusion in the guidelines. CONCLUSIONS AND RECOMMENDATIONS: All forms of targeted phototherapy are useful in vitiligo. Good responses were seen in localized involvement, resistant lesions and in children in whom their use is more accepted and convenient (Level of evidence 2+, Grade of recommendation B). Similarly it is useful in psoriasis, either alone or in combination with drugs, even in resistant forms such as palmoplantar psoriasis. In view of expense and practical application, their use is limited to resistant lesions and localized disease. (Level of evidence 2+, Grade of recommendation B). But in other conditions there is no convincing evidence for its use. (Level of evidence 3+, Grade of recommendation C). Female;Humans;Low-Level Light Therapy;Male;Phototherapy;Practice Guidelines as Topic;Prognosis;Prospective Studies;Psoriasis;Randomized Controlled Trials as Topic;Retrospective Studies;Treatment Outcome;Ultraviolet Therapy;Vitiligo

ENDOBRONCHIAL PHOTODYNAMIC THERAPY UNDER FLUORESCENCE CONTROL: PHOTODYNAMIC THERANOSTICS. One of the disadvantages of photodynamic therapy is impossibility to specify the method according to biological features of malignant tumor such as a degree of blood supply, accumulation of photosensibilizator in tumorous tissue, proliferative activity and etc. The authors aimed to develop a mode of individualization of endobronchial photodynamic therapy of central non-small cell carcinoma of lung and assessment of method efficacy. The suggested method is based on fluorescent diagnostics of degree of accumulation of photosensibilizator in timorous tissue and the rate of its expenditure in process of performing of photodynamic therapy. There was made a comparison of parameters of methods and results of photodynamic therapy in 2 randomized groups. Each group consisted of 45 patients. The research method was applied in the main group and the standard method was used in the comparison group. It was found that the research method allowed significant reduction of duration of irradiation compared with conventional method (at the average from 690Â±65sec to 470Â±45sec, p=0,02), though the treatment results were the same. The suggested method allowed separation of group of patients with absence of fluorescence of timorous tissue. Performance of photodynamic therapy is unreasonable for these patients. Photosensitizing Agents Bronchoscopy;Carcinoma, Non-Small-Cell Lung;Female;Humans;Low-Level Light Therapy;Lung;Lung Neoplasms;Male;Middle Aged;Neoplasm Staging;Optical Imaging;Photochemotherapy;Photosensitizing Agents;Theranostic Nanomedicine;Treatment Outcome

[Alterations of physiological rhythms in neurodegenerative disorders: problems and prospects of light therapy]. This review provides an outline of circadian disorders associated with neurodegenerative diseases of the brain in the elderly, including Alzheimer's (AD) and Parkinson's diseases (PD). Since light is one of the most powerful environmental cues synchronizing physiological rhythms, exposure to bright light is often used to treat sleep disorders, behavior of patients with severe dementia, gait, and other functions disordered in CNS pathologies. Photobiomodulation effects of the low-energy laser and LED radiation is also considered as a potential tool for the rehabilitation of patients with various pathologies. It yielded positive results in the treatment of both PD and AD. An external factor that can exacerbate a course of neurodegenerative diseases is light pollution. Irrational artificial lighting can cause jet lag, affect visual and cognitive functions. The review also summarizes the current understanding of fractal dynamics of physiological rhythms in healthy subjects (including brain activity) and their reduced complexity in pathological conditions. The loss of multiscale complexity of brain electrical activity has been documented for patients with AD, PD, epilepsy, and schizophrenia. It is thought to reflect fundamental changes in the regulation of the body's circadian rhythms. Recently, M.V Zueva proposed and theoretically substantiated the

hypothesis that allows taking another look at the prospects for the use of light stimulation. It is expected that the use of stimuli with fractal structure can help to restore the retina and brainâ€™s functions in neurodegenerative diseases by reactivation of neuronal plasticity and be an innovative method for the treatment of neurodegenerative disorders. Aged;Brain;Circadian Rhythm;Humans;Neurodegenerative Diseases;Phototherapy;Treatment Outcome

[CLINICâ€”Đ•XPERIMENTAL INVESTIGATION OF IMPACT OF LOWâ€”INTENSIVE LASER IRRADIATION ON COURSE OF PURULENTâ€”INFLAMMATORY PROCESSES, CAUSED BY STAPHYLOCOCCUS AUREUS]. Inspected 112 patients, found out of intussusception of intestine (II) in 79 (70.5%) boys and 33 (29.5%) girls. Developed algorithm of complex pathogenetically grounded inspection, individual approach, on the stages of inspection and treatment for the improvement of diagnostics and treatment of children concerning II. Determination of nosotropic features of clinic of II for children, clinical and echographic signs, that enabled differentiation of the state of circulation of bowel wall, considerably extended possibilities of conservative treatment even at presence of clinical manifestations of II in terms over 18 â€” 24 hours. Expedient deep study of problems of purchased II diagnostics by pediatricians, family doctors Anti-Bacterial Agents Aged;Amputation, Surgical;Anti-Bacterial Agents;Diabetes Mellitus, Type 2;Diabetic Foot;Female;Humans;Lasers;Length of Stay;Low-Level Light Therapy;Male;Middle Aged;Staphylococcal Infections;Staphylococcus aureus;Treatment Outcome;Wound Healing

Fractional CO2 Laser for Vulvovaginal Atrophy. OBJECTIVE: To evaluate the short term efficacy and safety of Fractional CO2 laser for the treatment of vulvovaginal atrophy. MATERIAL AND METHOD: From March 2015 to October 2015, 112 menopausal women were recruited. All women with VVA were treated by using Fractional CO2 laser; power 30 watts, 1-3 stacks with 360Â° vaginal probe for 3 consecutive times, 4 weeks apart. Before laser treatment, the subjective measurement of VVA symptoms was evaluated by using a questionnaire and the objective measurements were evaluated by using pH paper and VMI. Visual analog pain-score was used to scaling their discomfort during and immediately after each treatment. At 3 months after the last procedure, the subjective and objective measurements were re-assessed. Any short-term and long-term adverse events were recorded. Statistical analysis was performed by using SPSS program with p-value <0.05. RESULTS: The median of pre-screening VVA symptom score was 4 and the most bothersome symptom was the â€œfeeling of dryness around vulvarâ€•. There was a significant reduction of the score after laser treatment. The average percentage of pretreatment VMI was 34.7Â±16.1% and at one and three months after complete laser course, it was significantly increased with the mean change of 25.0Â±12.2% and 34.8Â±15.5%, respectively. For the vaginal pH, the average pH before treatment was 7.5Â±1.0 and the average decrement after 3 months was 0.9Â±1.3 with statistical significance, p-value <0.01. There were no serious complications and all were satisfied with the treatment. CONCLUSION: Fractional CO2 laser could ameliorate the VVA symptoms with at least 3 months of long lasting improvement of vaginal health with safety.
Adult;Atrophy;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Menopause;Middle Aged;Personal Satisfaction;Treatment Outcome;Vagina;Vaginal Diseases;Vulva

Dermatologic care of the transgender patient. Literature is limited regarding the medical and cosmetic dermatologic issues pertinent to transgender patients and the reasons why 19 transgender individuals seek care from dermatologists. Clinical management of this population has historically been limited to 20 mental health providers, endocrinologists, and select surgeons with expertise in sex reassignment surgery. The impact of hormonal 21 therapy on transgender skin has been well documented in endocrinology journals, but is underrepresented in dermatology 22 literature. Hormonal therapy leads to drastic skin alterations, impacting sebum production, hair growth, and acne, all of which may 23 become a dermatologic concern for the transgender patient.

Dermatologists may also be consulted regarding issues such as 24 permanent hair removal, androgenic alopecia, or scar revision following breast reduction surgery or genital reassignment surgery. 25 The purpose of this review is to provide relevant information for use by all dermatology providers who care for transgender 26 patients or patients undergoing transition. Androgen Antagonists;Androgens;Dermal Fillers;Estrogens;Ornithine Decarboxylase Inhibitors;Silicones;Eflornithine Acne Vulgaris;Alopecia;Androgen Antagonists;Androgens;Cicatrix;Dermal Fillers;Dermatology;Eflornithine;Estrogens;Female;Hair Removal;Humans;Low-Level Light Therapy;Male;Ornithine Decarboxylase Inhibitors;Postoperative Care;Sex Reassignment Procedures;Silicones;Transgender Persons

Photobiomodulation reduces oral mucositis by modulating NF-kB. The aim of this study was to evaluate NF-kB during 5-fluorouracil (FU)-induced oral mucositis and ascertain whether photobiomodulation (PBM), as a preventive and/or therapeutic modality, influences this transcription factor. Ninety-six male golden Syrian hamsters were allocated into four groups: control (no treatment); PBM therapeutic, PBM preventive, and PBM combined. Animals received an injection of 5-FU on days 0 and 2. On days 3 and 4, the buccal mucosa was scratched. Irradiation was carried out using a 660-nm, 40-mW diode laser at 6â€‰â€‰J/cm(2) during 6â€‰â€‰s/point, 0.24â€‰â€‰J/point, for a total dose of 1.44â€‰â€‰J/day of application. Animals were euthanized on days 0, 5, 10, and 15 (n=6). Buccal mucosa was removed for protein quantification by Western blot. Clinical analysis revealed that PBM groups exhibited less mucositis than controls on day 10. Control animals exhibited lower levels of NF-kB during mucositis development and healing. The preventive and combined protocols were associated with higher NF-kB levels at day 5; however, the therapeutic group had higher levels at days 10 and 15. These findings suggest that the preventive and/or therapeutic PBM protocols reduced the severity of oral mucositis by activating the NF-kB pathway. Antimetabolites, Antineoplastic;NF-kappa B;Fluorouracil Animals;Antimetabolites, Antineoplastic;Blotting, Western;Cricetinae;Drug Administration Schedule;Fluorouracil;Laser Therapy;Lasers;Male;Mesocricetus;NF-kappa B;Phototherapy;Protein Multimerization;Stomatitis;Wound Healing

An evaluation of the effect of pulsed wave low-level laser therapy on the biomechanical properties of the vertebral body in two experimental osteoporosis rat models. Osteoporosis (OP) increases vertebral fragility as a result of the biomechanical effects of diminished bone structure and composition. This study has aimed to assess the effects of pulsed wave low-level laser therapy (PW LLLT) on cancellous bone strength of an ovariectomized (OVX-d) experimental rat model and a glucocorticoid-induced OP (GIOP) experimental rat model. There were four OVX-d groups and four dexamethasone-treated groups. A group of healthy rats was used for baseline evaluations. The OVX-d rats were further subdivided into the following groups: control rats with OP, OVX-d rats that received alendronate, OVX-d rats treated with PW LLLT, and OVX-d rats treated with alendronate and PW LLLT. The remaining rats received dexamethasone and were divided into four groups: control, alendronate-treated rats, laser-treated rats, and laser-treated rats with concomitant administration of alendronate. PW LLLT (890 nm, 80 Hz, 0.972 J/cm(2)) was performed on the spinal processes of the T12, L1, L2, and L3 vertebras. We extracted the L1 vertebrae and submitted them to a mechanical compression test. Biomechanical test findings showed positive effects of the PW LLLT and alendronate administration on increasing bending stiffness and maximum force of the osteoporotic bones compared to the healthy group. However, laser treatment of OVA-d rats significantly increased stress high load compared to OVA-d control rats. PW LLLT preserved the cancellous (trabecular) bone of vertebra against the detrimental effects of OV-induced OP on bone strength in rats compared to control OV rats. Glucocorticoids;Alendronate Alendronate;Animals;Biomechanical

Phenomena;Female;Glucocorticoids;Low-Level Light Therapy;Male;Mechanical Phenomena;Osteoporosis;Ovariectomy;Rats;Rats, Sprague-Dawley;Spine

Effect of a single dose of low-level laser therapy on spontaneous and chewing pain caused by elastomeric separators. INTRODUCTION: The aim of this study was to see the effect of a single dose of low-level laser therapy on spontaneous and chewing pain after the placement of elastomeric separators. METHODS: Eighty-eight patients were randomly selected for this single-blind study. Elastomeric separators were placed mesial and distal to the permanent first molars in all quadrants. Both arches were divided into experimental and control sides. The experimental sides were treated with low-level laser therapy on 3 points on the buccal mucosa for 20Â seconds each, with a 940-nm gallium-aluminum-arsenic diode laser on continuous mode and power set at 200Â mW. The other side received placebo laser therapy without turning on the laser. A numeric rating scale was used to assess the intensity of spontaneous and chewing pain for the next 7Â days. The independent sample t test and repeated-measures analysis of variance with the post hoc Tukey test was used to analyze the results. RESULTS: Significant differences were found in spontaneous and chewing pain among both groups (PÂ <0.05). CONCLUSIONS: A single dose of low-level laser therapy can be an efficient modality to reduce the postoperative pain associated with the placement of elastomeric separators. Elastomers;Placebos Adolescent;Adult;Elastomers;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mastication;Molar;Mouth Mucosa;Orthodontic Appliances;Pain;Pain Measurement;Placebos;Single-Blind Method;Young Adult

Assessment of circular wound healing in rats after exposure to 808-nm laser pulses during specific healing phases. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT), is an important application modality for the advancement of wound healing processes. In this study, histological and morphometric analyses have been made to understand and compare effects of high-power 808-nm pulses on circular skin wounds among groups irradiated immediately after wounding and groups irradiated at specific stages of the healing period. STUDY DESIGN: Experimental groups were as follows: Laser Therapy (LT) was received as three sessions of laser irradiation (6.38â€‰J/cm2, 1.276â€‰W/cm2, 808â€‰nm) immediately after wounding (Inflammatory group, nâ€‰=â€‰12), 24 hours post-wounding (Proliferative group, nâ€‰=â€‰12), and 72 hours post-wounding (Remodeling group, nâ€‰=â€‰12); the Control group (nâ€‰=â€‰12) received no irradiation. Histological analyses were performed on the 3rd, 7th, and 14th days post-wounding. RESULTS: Mean wound diameters were 5â€‰mm for all groups. On Day 7, wound diameters were measured as 2.99â€‰Â±â€‰0.17, 2.95â€‰Â±â€‰0.3, 2.52â€‰Â±â€‰0.11, and 2.41â€‰Â±â€‰0.34â€‰mm for the Control, Inflammatory, Proliferative, and Remodeling groups, respectively. At 2 weeks post-wounding, dermal tissue in the Inflammatory and Proliferative groups closed superficially, while 1.30â€‰Â±â€‰0.1â€‰mm and 1.30â€‰Â±â€‰0.06â€‰mm openings remained in the Control and Remodeling groups, respectively. Mean wound healing rates (WHR) for all treatment groups were found to differ significantly from the control group (Pâ€‰<â€‰0.05). Upon comparing the Proliferative group with the other treatment groups, a significant difference was found. However, no significant difference was found between the Inflammatory and Remodeling groups, with the former having a slightly higher mean value. CONCLUSION: Histological and morphometric results showed that high-power, low-energy application has the best effect when first applied 24 hours post-wounding (late inflammatory, early proliferative stage) as demonstrated by increases in granulation tissue, fibroblasts and collagen deposition, which lead to faster rates of wound contraction and thus accelerated healing. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Skin;Wound Healing

Minocycline-Induced Postsclerotherapy Pigmentation Successfully Treated With a Picosecond Alexandrite Laser. Anti-Bacterial Agents;Minocycline Adult;Anti-Bacterial

Agents;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Minocycline;Pigmentation Disorders;Sclerotherapy

COST-EFFECTIVENESS OF RADIOFREQUENCY ABLATION VERSUS LASER FOR VARICOSE VEINS. OBJECTIVES: Although the clinical benefits of endovenous thermal ablation are widely recognized, few studies have evaluated the health economic implications of different treatments. This study compares 6-month clinical outcomes and cost-effectiveness of endovenous laser ablation (EVLA) compared with radiofrequency ablation (RFA) in the setting of a randomized clinical trial. METHODS: Patients with symptomatic primary varicose veins were randomized to EVLA or RFA and followed up for 6 months to evaluate clinical improvements, health related quality of life (HRQOL) and cost-effectiveness. RESULTS: A total of 131 patients were randomized, of which 110 attended 6-month follow-up (EVLA n = 54; RFA n = 56). Improvements in quality of life (AVVQ and SF-12v2) and Venous Clinical Severity Scores (VCSS) achieved at 6 weeks were maintained at 6 months, with no significant difference detected between treatment groups. There were no differences in treatment failure rates. There were small differences in favor of EVLA in terms of costs and 6-month HRQOL but these were not statistically significant. However, RFA is associated with less pain at up to 10 days. CONCLUSIONS: EVLA and RFA result in comparable and significant gains in quality of life and clinical improvements at 6 months, compared with baseline values. EVLA is more likely to be cost-effective than RFA but absolute differences in costs and HRQOL are small. Adult;Aged;Cost-Benefit Analysis;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Models, Economic;Patient Satisfaction;Quality of Life;Treatment Outcome;Varicose Veins

Anti-inflammatory and lymphangiogenetic effects of low-level laser therapy on lymphedema in an experimental mouse tail model. The aim of the present study was to investigate the therapeutic mechanism of low-level laser therapy (LLLT) in the mouse tail lymphedema model. Six-week-old female mice were classified into the laser treatment group, sham treatment group, and surgical control group (10 mice per group). LLLT was administered daily for 10 min from the surgical day to 11 days (12 times). Macrophage activation and lymphatic vessel regeneration were evaluated through immunohistochemical staining with anti-F4/80 and anti-LYVE-1 antibodies, respectively, at 12 days post-procedure. Quantitative real-time polymerase chain reaction (qPCR) was performed to measure messenger RNA (mRNA) expression of vascular endothelial growth factor A, B, C, R1, R2, and R3 (VEGF-A, VEGF-B, VEGF-C, VEGFR1, VEGFR2, and VEGFR3) at 12 days post-procedure. Student's t and one-way ANOVA tests were performed for statistical analyses. Significance was defined as pâ€‰<â€‰0.05. The thickness of the tail rapidly increased until 6 days in the laser and sham groups. The mice in the laser group showed a significantly decreased thickness compared with the sham group at 10 and 12 days. Immunohistochemistry assay revealed that LLLT reduced inflammation and induced new lymphatic vessel growth. qPCR showed that expressions of VEGFR3 were (pâ€‰=â€‰0.002) increased in the laser group. These results suggest that LLLT has anti-inflammatory and lymphangiogenetic effects for the management of lymphedema. RNA, Messenger;Vascular Endothelial Growth Factor A;Receptors, Vascular Endothelial Growth Factor Animals;Disease Models, Animal;Female;Gene Expression Regulation;Inflammation;Low-Level Light Therapy;Lymphangiogenesis;Lymphatic Vessels;Lymphedema;Macrophage Activation;Mice;RNA, Messenger;Receptors, Vascular Endothelial Growth Factor;Regeneration;Vascular Endothelial Growth Factor A

Effects of photobiomodulation on the fatigue level in elderly women: an isokinetic dynamometry evaluation. Aging is responsible by a series of morphological and functional modifications that lead to a decline of muscle function, particularly in females. Muscle tissue in elderly people is more susceptible to fatigue and, consequently, to an increased inability to maintain strength and motor control. In this context, therapeutic approaches able of attenuating muscle fatigue have been

investigated. Among these, the photobiomodulation demonstrate positive results to interacts with biological tissues, promoting the increase in cell energy production. Thus, the aim of this study was to investigate the effects of photobiomodulation (808 nm, 250 J/cm(2), 100 mW, 7 J each point) in the fatigue level and muscle performance in elderly women. Thirty subjects entered a crossover randomized double-blinded placebo-controlled trial. Photobiomodulation was delivered on the rectus femoris muscle of the dominant limb immediately before the fatigue protocol. In both sessions, peripheral muscle fatigue was analyzed by surface electromyography (EMG) and blood lactate analysis. Muscle performance was evaluated using an isokinetic dynamometer. The results showed that photobiomodulation was able of reducing muscle fatigue by a significant increase of electromyographic fatigue index (EFI) (pâ€‰=â€‰0.047) and decreasing significantly lactate concentration 6 min after the performance of the fatigue protocol (pâ€‰=â€‰0. 0006) compared the placebo laser session. However, the photobiomodulation was not able of increasing muscle performance measured by the isokinetic dynamometer. Thus, it can be conclude that the photobiomodulation was effective in reducing fatigue levels. However, no effects of photobiomodulation on muscle performance was observed. Lactic Acid Aged;Cross-Over Studies;Double-Blind Method;Electromyography;Female;Humans;Kinetics;Lactic Acid;Low-Level Light Therapy;Middle Aged;Muscle Fatigue;Quadriceps Muscle

Long-term low-level laser therapy promotes an increase in maximal oxygen uptake and exercise performance in a dose-dependent manner in Wistar rats. The use of low-level laser therapy (LLLT) represents a new intervention modality that has been explored to enhance exercise performance. The aim of this study was to evaluate the influence of LLLT (GaAlAs-850 nm) at different doses on VO2max and on exercise performance in rats. Male Wistar rats were divided into three groups: "placebo" rats (P-LLLT, nâ€‰=â€‰10), rats at a dose of 0.315 J per treatment point of LLLT (8.7 J/cm(2)-LLLT, nâ€‰=â€‰10), and rats at a dose of 2.205 J per treatment point of LLLT (61.2 J/cm(2)-LLLT, nâ€‰=â€‰10). The LLLT was applied bilaterally at the biceps femoris, gluteus, lateral and medial gastrocnemius, iliopsoas, and adductor longus muscles. One spot in each muscle belly was applied, with a sum of 12 spots in each rat, once a day, for 10 days. All animals performed the maximal exercise test (ET) at a metabolic treadmill for rats, with simultaneous gas analysis. The distance covered was measured during ET, before and after the conclusion of the LLLT protocol. The data were compared by a repeated measures two-way ANOVA followed by the Student-Newman-Keuls post hoc tests (pâ€‰<â€‰.05). The 61.2 J/cm(2)-LLLT group increased VO2basal (~40 %), VO2max (~24 %), VCO2max (~17 %), and distance covered (~34 %) after LLLT application on the skeletal muscle. No significant results were found comparing before and after conditions for the studied variables considering P-LLLT and 8.7 J/cm(2)-LLLT groups. The LLLT promoted in a dose-dependent manner an increase in oxygen consumption uptake and a performance increment of male Wistar rats. Oxygen Animals;Biological Transport;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxygen;Physical Conditioning, Animal;Rats;Rats, Wistar

Controlling the temperature of bones using pulsed CO2 lasers: observations and mathematical modeling. Temperature of porcine bone specimens are investigated by aiming a pulsed CO2 laser beam at the bone-air surface. This method of controlling temperature is believed to be flexible in medical applications as it avoids the uses of thermal devices, which are often cumbersome and generate rather larger temperature variations with time. The control of temperature using this method is modeled by the heat-conduction equation. In this investigation, it is assumed that the energy delivered by the CO2 laser is confined within a very thin surface layer of roughly 9 Î¼m. It is shown that temperature can be maintained at a steady temperature using a CO2 laser and we demonstrate that the method can be adapted to be used in tandem with another laser beam. This

method to control the temperature is believed to be useful in de-contamination of bone during the implantation treatment, in bone augmentation when using natural or synthetic materials and in low-level laser therapy.

Are manual therapies, passive physical modalities, or acupuncture effective for the management of patients with whiplash-associated disorders or neck pain and associated disorders? An update of the Bone and Joint Decade Task Force on Neck Pain and Its Associated Disorders by the OPTIMa collaboration. BACKGROUND CONTEXT: In 2008, the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders (Neck Pain Task Force) found limited evidence on the effectiveness of manual therapies, passive physical modalities, or acupuncture for the management of whiplash-associated disorders (WAD) or neck pain and associated disorders (NAD). PURPOSE: This review aimed to update the findings of the Neck Pain Task Force, which examined the effectiveness of manual therapies, passive physical modalities, and acupuncture for the management of WAD or NAD. STUDY DESIGN/SETTING: This is a systematic review and best evidence synthesis. SAMPLE: The sample includes randomized controlled trials, cohort studies, and case-control studies comparing manual therapies, passive physical modalities, or acupuncture with other interventions, placebo or sham, or no intervention. OUTCOME MEASURES: The outcome measures were self-rated or functional recovery, pain intensity, health-related quality of life, psychological outcomes, or adverse events. METHODS: We systematically searched five databases from 2000 to 2014. Random pairs of independent reviewers critically appraised eligible studies using the Scottish Intercollegiate Guidelines Network criteria. Studies with a low risk of bias were stratified by the intervention's stage of development (exploratory vs. evaluation) and synthesized following best evidence synthesis principles. Funding was provided by the Ministry of Finance. RESULTS: We screened 8,551 citations, and 38 studies were relevant and 22 had a low risk of bias. Evidence from seven exploratory studies suggests that (1) for recent but not persistent NAD grades I-II, thoracic manipulation offers short-term benefits; (2) for persistent NAD grades I-II, technical parameters of cervical mobilization (eg, direction or site of manual contact) do not impact outcomes, whereas one session of cervical manipulation is similar to Kinesio Taping; and (3) for NAD grades I-II, strain-counterstrain treatment is no better than placebo. Evidence from 15 evaluation studies suggests that (1) for recent NAD grades I-II, cervical and thoracic manipulation provides no additional benefit to high-dose supervised exercises, and Swedish or clinical massage adds benefit to self-care advice; (2) for persistent NAD grades I-II, home-based cupping massage has similar outcomes to home-based muscle relaxation, low-level laser therapy (LLLT) does not offer benefits, Western acupuncture provides similar outcomes to non-penetrating placebo electroacupuncture, and needle acupuncture provides similar outcomes to sham-penetrating acupuncture; (3) for WAD grades I-II, needle electroacupuncture offers similar outcomes as simulated electroacupuncture; and (4) for recent NAD grades III, a semi-rigid cervical collar with rest and graded strengthening exercises lead to similar outcomes, and LLLT does not offer benefits. CONCLUSIONS: Our review adds new evidence to the Neck Pain Task Force and suggests that mobilization, manipulation, and clinical massage are effective interventions for the management of neck pain. It also suggests that electroacupuncture, strain-counterstrain, relaxation massage, and some passive physical modalities (heat, cold, diathermy, hydrotherapy, and ultrasound) are not effective and should not be used to manage neck pain. Acupuncture Therapy;Adult;Exercise Therapy;Humans;Manipulation, Spinal;Neck Pain;Quality of Life;Self Care;Whiplash Injuries

Monochromatic Infrared Photo Energy Versus Low Level Laser Therapy in Chronic Low Back Pain. INTRODUCTION: Low back pain (LBP) is the most common musculoskeletal disease. Monochromatic infrared photo energy (MIPE) and low level laser therapy (LLLT) are light modalities used to reduce pain and increase blood flow. The aim of this study was to compare the effects of the MIPE and LLLT

in reducing functional disability and pain as well as improving lumbar range of motion (ROM) in patients with chronic LBP. METHODS: Seventy participants with LBP completed the program and were randomly assigned into 2 groups. Group 1 (n = 35) received MIPE and therapeutic exercises. Group 2 (n = 35) received LLLT and therapeutic exercises. Both groups received 2 visits per week for 6 weeks. Outcome measures were functional rating index (FRI), visual analogue scale (VAS) and modified-modified Schober test at baseline and after 6 weeks. RESULTS: There were statistically significant improvements in functional disability, pain and lumbar ROM ($P < .05$) in each group. However, no significant differences were recorded between the groups ($P > .05$). CONCLUSION: Therefore, MIPE and LLLT may play a role in treating chronic LBP and there are no differences between the two modalities in improving functional disability, pain and lumbar ROM in patients with chronic LBP.

Low-level laser therapy ameliorates disease progression in a mouse model of multiple sclerosis. Multiple sclerosis (MS) is an autoimmune demyelinating inflammatory disease characterized by recurrent episodes of T cell-mediated immune attack on central nervous system (CNS) myelin, leading to axon damage and progressive disability. The existing therapies for MS are only partially effective and are associated with undesirable side effects. Low-level laser therapy (LLLT) has been clinically used to treat inflammation, and to induce tissue healing and repair processes. However, there are no reports about the effects and mechanisms of LLLT in experimental autoimmune encephalomyelitis (EAE), an established model of MS. Here, we report the effects and underlying mechanisms of action of LLLT (AlGaInP, 660â€‰nm and GaAs, 904â€‰nm) irradiated on the spinal cord during EAE development. EAE was induced in female C57BL/6 mice by immunization with MOG35-55 peptide emulsified in complete Freund's adjuvant. Our results showed that LLLT consistently reduced the clinical score of EAE and delayed the disease onset, and also prevented weight loss induced by immunization. Furthermore, these beneficial effects of LLLT seem to be associated with the down-regulation of NO levels in the CNS, although the treatment with LLLT failed to inhibit lipid peroxidation and restore antioxidant defense during EAE. Finally, histological analysis showed that LLLT blocked neuroinflammation through a reduction of inflammatory cells in the CNS, especially lymphocytes, as well as preventing demyelination in the spinal cord after EAE induction. Together, our results suggest the use of LLLT as a therapeutic application during autoimmune neuroinflammatory responses, such as MS. Antioxidants;Cytokines;Inflammation Mediators;Nitric Oxide Animals;Antioxidants;Central Nervous System;Cytokines;Demyelinating Diseases;Disease Models, Animal;Disease Progression;Encephalomyelitis, Autoimmune, Experimental;Female;Inflammation Mediators;Lipid Peroxidation;Low-Level Light Therapy;Lymphoid Tissue;Mice;Multiple Sclerosis;Nitric Oxide;Oxidation-Reduction;Oxidative Stress

The effect of low-intensity laser therapy (LILT) on cutaneous wound healing and pain relief in rats. [Purpose] This study examined the impact of low-intensity laser therapy on wound healing and pain control using a rat cutaneous wound model. [Subjects and Methods] Twenty-four adult male Sprague-Dawley rats (between 220-240â€…g, 7 weeks) were used in this study. The rats were anesthetized and a circular fragment of skin was removed from the dorsal region of the back by a punch with an 8-mm diameter. The animals were randomly divided into 6 groups, Groups C 1, C 3, and C 5, control groups, received no laser treatment. Groups T 1, T 3, and T 5 received laser treatment for 20â€…min per day for 1, 3 and 5 days, respectively. Lumbar spine and dorsal skin were extracted and processed using western blot analysis. [Results] Periodical observation showed increases in NGF expression on the skin, and decreases in c-fos expression by the spinal cord in the treatment groups compared to the control group. [Conclusion] The present findings suggest that low-intensity laser therapy could be used as an effective therapy for wound healing and pain relief, and could be further used as a clinical approach for treating cutaneous wounds.

Efficacy of a single dose of low-level laser therapy in reducing pain, swelling, and trismus following third molar extraction surgery. The clinical efficacy of low-level laser therapy (LLLT) for the reduction of pain, swelling, and trismus following the surgical extraction of third molars was evaluated. Mandibular third molars, with similar radiographic positions on two distinct sections, were extracted from 22 patients. Immediately after extraction from the randomly selected right or left side, LLLT was applied (study group). The same extraction procedure was performed 21 days later on the other third molar, without the application of LLLT (control group). LLLT was applied at 10 points: four intraoral in close proximity to the socket and six extraoral along the masseter muscle. Pain intensity was assessed using a visual analogue scale, swelling was measured as the distance from the tragus to the median base of the mentum, and trismus was assessed by the extent of mouth opening. Data were collected at four time points: before surgery, immediately after surgery, 48h postoperatively, and 7 days postoperatively. Compared with the control group, the study group showed significant reductions in pain, swelling, and trismus at 48h and 7 days postoperatively. In conclusion, a single dose of LLLT was effective at reducing the postoperative discomforts (pain, swelling, and trismus) associated with third molar extraction surgery.
Adolescent;Adult;Cross-Over Studies;Edema;Female;Humans;Low-Level Light Therapy;Male;Mandible;Molar, Third;Pain Measurement;Pain, Postoperative;Tooth, Impacted;Treatment Outcome;Trismus

Low level laser therapy and hair regrowth: an evidence-based review. Despite the current treatment options for different types of alopecia, there is a need for more effective management options. Recently, low-level laser therapy (LLLT) was evaluated for stimulating hair growth. Here, we reviewed the current evidence on the LLLT effects with an evidence-based approach, focusing more on randomized controlled studies by critically evaluating them. In order to investigate whether in individuals presenting with hair loss (male pattern hair loss (MPHL), female pattern hair loss (FPHL), alopecia areata (AA), and chemotherapy-induced alopecia (CIA)) LLLT is effective for hair regrowth, several databases including PubMed, Google Scholar, Medline, Embase, and Cochrane Database were searched using the following keywords: Alopecia, Hair loss, Hair growth, Low level laser therapy, Low level light therapy, Low energy laser irradiation, and Photobiomodulation. From the searches, 21 relevant studies were summarized in this review including 2 in vitro, 7 animal, and 12 clinical studies. Among clinical studies, only five were randomized controlled trials (RCTs), which evaluated LLLT effect on male and female pattern hair loss. The RCTs were critically appraised using the created checklist according to the Critical Appraisal for Therapy Articles Worksheet created by the Center of Evidence-Based Medicine, Oxford. The results demonstrated that all the performed RCTs have moderate to high quality of evidence. However, only one out of five studies performed intention-to-treat analysis, and only another study reported the method of randomization and subsequent concealment of allocation clearly; all other studies did not include this very important information in their reports. None of these studies reported the treatment effect of factors such as number needed to treat. Based on this review on all the available evidence about effect of LLLT in alopecia, we found that the FDA-cleared LLLT devices are both safe and effective in patients with MPHL and FPHL who did not respond or were not tolerant to standard treatments. Future randomized controlled trials of LLLT are strongly encouraged to be conducted and reported according to the Consolidated Standards of Reporting Trials (CONSORT) statement to facilitate analysis and comparison.
Alopecia;Animals;Evidence-Based Medicine;Hair;Humans;Low-Level Light Therapy;Safety

Low-Intensity Laser Irradiation at 636â€‰nm Induces Increased Viability and Proliferation in Isolated Lung Cancer Stem Cells. OBJECTIVE: The purpose of this in vitro study was to evaluate the effects of low-intensity laser irradiation (LILI) on isolated lung cancer stem cells (CSCs) after several time intervals, using a wavelength of 636â€‰nm and fluences between 5 and 20â€‰J/cm(2).

BACKGROUND DATA: LILI has been proven to have a biomodulatory effect on various diseased conditions. A number of studies have been conducted on CSCs. METHODS: Lung CSCs were isolated from lung cancer cells (A549), using cell surface marker CD 133. Isolated lung CSCs were divided into four groups: group 1 consisted of control cells receiving no irradiation; groups 2, 3, and 4 were exposed to laser irradiation at fluences of 5, 10, and 20â€‰J/cm(2), respectively. LILI was performed using a 636â€‰nm diode laser with a power output of Â±85â€‰mW. Cellular responses were evaluated after 24, 48, or 72â€‰h, and included cell morphology, viability, and proliferation. RESULTS: Cellular morphology indicated an increase in cell density caused by cell proliferation over time. Biostimulatory effects were achieved in lung CSCs when examining viability and proliferation. CONCLUSIONS: It should, therefore, be noted that a low wavelength of 636â€‰nm at various fluences induces biostimulation, which may have detrimental effects when using LILI as a form of regeneration. Analysis of Variance;Cell Proliferation;Cell Survival;Fluorescent Antibody Technique;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Lung Neoplasms;Neoplastic Stem Cells;Reference Values;Sampling Studies;Tumor Cells, Cultured

Clinical results of endovenous LASER ablation (EVLA) using low linear endovenous energy density (LEED) combined with high ligation for great saphenous varicose veins. PURPOSE: This study was designed to analyze the efficacy and complications in endovenous LASER ablation (EVLA) with 1470Â nm diode lasers using low linear endovenous energy density (LEED) combined with high ligation for varicose veins of the great saphenous vein (GSV). METHODS: One hundred and sixteen limbs of 102 patients were analyzed using 6Â W with 2Â mm/s constant pullback speed delivered by 30Â J/cm LEED. The SFJ was ligated with a small inguinal incision. The complications and status of the GSV were checked at 1 and 6Â months postoperatively. RESULTS: The occlusion rates for the GSV were 98 (84.5Â %) at 1Â month and 116 (100Â %) at 6Â months, postoperatively. The rate of partial occlusion was higher in males than in females (pÂ =Â 0.004). There were 2 DVT, 27 feelings of the cord (23.3Â %), and 36 numbness at the knee area (31.0Â %) at 1Â month, and 3 feelings of the cord (3.4Â %) and 6 numbness of the knee (8.6Â %) at 6Â months postoperatively. The diameter and depth of the GSV did not affect the rates of feeling of the cord or numbness (pÂ =Â 0.728, 0.208, 0.247, 0.884, respectively). CONCLUSION: EVLA with a 1470-nm diode laser using low LEED combined with high ligation for the GSV has lower complication rates and higher occlusion rates of GSV. Adult;Female;Humans;Laser Therapy;Ligation;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Varicose Veins

Effectiveness of Sonic, Ultrasonic, and Photon-Induced Photoacoustic Streaming Activation of NaOCl on Filling Material Removal Following Retreatment in Oval Canal Anatomy. OBJECTIVE: This study aimed to assess the effectiveness of sonic, ultrasonic and laser [photon-induced photoacoustic streaming (PIPS)] irrigation activation in removing filling remnants from oval root canals after standard canal retreatment procedures with the ProTaper universal rotary retreatment system. METHODS: Twenty-eight maxillary first premolars were instrumented with ProTaper NiTi rotary instruments and obturated with gutta-percha and AH Plus sealer using the continuous wave of condensation technique. After storage at 37Â°C and 100% humidity for 1 week, the specimens were retreated with the ProTaper universal retreatment system for the removal of filling material. Teeth were then randomly assigned into four groups (nâ€‰=â€‰7): group 1, positive control; group 2, retreated with sonic irrigation; group 3, retreated with ultrasonic irrigation; and group 4, retreated with laser irradiation. The specimens were scanned using micro-CT before instrumentation, after obturation and mechanical retreatment, and after additional activation procedures. The percentage volume of the filling remnants was measured. Specimens were split longitudinally after micro-CT scan, canal walls were examined using scanning electron microscopy (SEM), and the amount of residual filling material was scored. RESULTS: The filling materials' removal efficacy in the three

experimental groups was higher than that of the control group (pâ€‰<â€‰0.05), whereas filling materials ranging from 1.46â€‰Â±â€‰0.30 to 2.21â€‰Â±â€‰0.46â€‰mm(3) remained in the canal in all three experimental groups. Additionally, there was a significantly greater reduction in the amount of filling remnants in the PIPS group than in the sonic and ultrasonic groups (both pâ€‰<â€‰0.05), and significantly greater reduction in the ultrasonic group than the sonic group (pâ€‰<â€‰0.05). CONCLUSIONS: Activation of NaOCl with PIPS showed significantly better performance than sonic and ultrasonic techniques in removing the filling remnants following mechanical retreatment of oval root canals. The ultrasonic technique also performed better than the sonic technique. However, none of the additional activation procedures was able to completely eliminate the filling remnants. Root Canal Filling Materials;Gutta-Percha Gutta-Percha;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Filling Materials;Root Canal Obturation;Root Canal Preparation;Tissue Culture Techniques;Ultrasonic Waves;X-Ray Microtomography

Photobiomodulation in promoting wound healing: a review. Despite diverse methods being applied to induce wound healing, many wounds remain recalcitrant to all treatments. Photobiomodulation involves inducing wound healing by illuminating wounds with light emitting diodes or lasers. While used on different animal models, in vitro, and clinically, wound healing is induced by many different wavelengths and powers with no optimal set of parameters yet being identified. While data suggest that simultaneous multiple wavelength illumination is more efficacious than single wavelengths, the optimal single and multiple wavelengths must be better defined to induce more reliable and extensive healing of different wound types. This review focuses on studies in which specific wavelengths induce wound healing and on their mechanisms of action. Anti-Bacterial Agents Animals;Anti-Bacterial Agents;Gene Expression Regulation;Humans;Light;Low-Level Light Therapy;Neuroprotection;Wound Healing

Effects of Photobiomodulation Therapy on Patients with Primary Open Angle Glaucoma: A Pilot Study. OBJECTIVE: The purpose of this work was to study the safety of photobiomodulation therapy in patients with primary open angle glaucoma (POAG). BACKGROUND DATA: Therapeutic options for POAG focus on lowering the intraocular pressure (IOP) but cannot stop disease progression to irreversible damages. METHODS: The study was designed as a controlled, single-blinded, interventional case series (38 patients; 63 eyes). Low-level laser therapy was performed once or twice per week using a continuous wave (CW) diode laser (780â€‰nm; 10â€‰mW; 292â€‰Hz modulation; 3â€‰mm(2) beam spot). The limbus area was circularly irradiated for 30â€‰sec (0.3â€‰W/cm(2); 10â€‰J/cm(2)) at a 1â€‰cm distance. Additional parts of the bulbus were irradiated for 90â€‰sec (30â€‰J/cm(2)) pointing the beam toward retinal areas corresponding to defective visual fields. A control group of 10 patients (20 eyes) received mock treatment. Visual acuity was assessed using Snellen projection optotypes. IOP was determined by applanation tonometry. Visual fields were determined by kinetic Goldmann perimetry. Multifocal visual evoked potential (M-VEP) was recorded in 15 patients (30 eyes). RESULTS: Poor visual acuity (â‰¤ 20/25), initially found in 24 of 63 eyes (38.1%), improved in 17 (70.8%) eyes and did not change in 7 eyes (29.2%). Mean IOP dropped from 24.9â€‰Â±â€‰14.9 to 15.0â€‰Â±â€‰6.5â€‰mm Hg (-39.7%, pâ€‰<â€‰0.001). Visual fields were either fully restored, improved by at least 10 degrees, or remained unchanged in 32, 29, and 2 of 63 eyes (51%, 46%, and 3%), respectively. Mean M-VEP latency was reduced by 13.5â€‰msec (-8%, pâ€‰<â€‰0.001); mean amplitude increased by +677â€‰nV (+14%, pâ€‰<â€‰0.001). Adverse effects were not observed. No changes were noted in control eyes. CONCLUSIONS: This first small series of cases indicated that photobiomodulation might be a safe approach to lower IOP and to improve visual acuity and fields in eyes with POAG.

Comparison of 532 nm Potassium Titanyl Phosphate Laser and 595 nm Pulsed Dye Laser in the Treatment of Erythematous Surgical Scars: A Randomized, Controlled, Open-Label Study. BACKGROUND: The pulsed dye laser (PDL) has long been used for treatment of erythematous and hypertrophic scars. Its effectiveness has been attributed in large part to its vascular-specificity. The vascular-specific potassium titanyl phosphate (KTP) laser has also been reported to be clinically effective for scars, but has not been compared to the PDL. OBJECTIVE: To compare the safety and clinical efficacy of a 532-nm KTP laser versus a 595-nm PDL in improving the appearance of erythematous surgical scars. METHODS: Twenty patients with matched bilateral erythematous surgical scars or a single linear erythematous scar measuring longer than 5 cm were enrolled in the study. Single scars were divided into equal halves with each half randomized to receive 3 successive treatments at 6-week intervals with either a 532-nm KTP laser (Excel V; Brisbane, CA) or a 595-nm PDL (Cynergy; Cynosure Inc., Chelmsford, MA) at equivalent laser parameters. Bilateral matched scars were similarly randomized to receive three 532-nm KTP or 595-nm PDL treatments. Clinical efficacy was evaluated 12 weeks after the third (final) laser treatment by independent, blinded photographic scar assessments. Secondary evaluations included final investigator and subject treatment/satisfaction assessments, Vancouver scar scale (VSS) scores, subject scar symptoms, intraoperative pain scores, and incidence of side effects. RESULTS: Clinical improvement of erythematous surgical scars was observed with both 532-nm KTP and 595-nm PDL systems. No statistically significant differences between the 2 treatment arms were noted in the independent, blinded photographic scar assessments, investigator and subject treatment/satisfaction assessments, subject scar symptoms, and intraoperative pain scores. The KTP arm produced statistically significant improvement for the vascularity component of the VSS only. Side effects were limited to mild treatment discomfort and minimal transient post-treatment erythema and purpura. No vesiculation, infection, scarring or other adverse events were experienced. Subject satisfaction surveys mirrored the observed clinical effects. CONCLUSION: The-532 nm KTP laser is comparable in efficacy and safety to the 595-nm PDL laser in the treatment of erythematous surgical scars.
Adult;Aged;Cicatrix;Erythema;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications

Effects of pre-radiation exposure to LLLT of normal and malignant cells. PURPOSE: Low-level laser therapy (LLLT) efficacy for the prevention of cancer treatment-induced oral mucositis (OM) has been amply described. However, potential protection of malignant cells remains a legitimate concern for clinicians. We tested LLLT-induced protection from ionizing radiation killing in both malignant and normal cells. METHODS: We treated six groups each of normal human lymphoblasts (TK6) and human leukemia cells (HL60) with He-Ne LLLT (632.8Â nm, 35Â mW, CW, 1Â cm(2), 35Â mW/cm(2) for 3-343Â s, 0.1-12Â J/cm(2)) prior to exposure to ionizing radiation (IR). Cells were then incubated and counted daily to determine their survival. Optimization of IR dose and incubation time was established prior to testing the effect of LLLT. RESULTS: Growth curves for both cell lines showed significant declines after exposure to 50-200Â cGy IR when compared to controls. Pre-radiation exposure to LLLT (4.0Â J/cm(2)) followed by 1-h incubation blocked this decline in TK6 but not in HL60 cells. The latter cells were sensitized to the killing effects of IR in a dose-dependent manner. CONCLUSION: This study shows that pre-IR LLLT treatment results in a differential response of normal vs. malignant cells, suggesting that LLLT does not confer protection and may even sensitize cancer cells to IR killing. Cell Line;Cell Survival;Dose-Response Relationship, Radiation;HL-60 Cells;Humans;Laser Therapy;Leukemia;Low-Level Light Therapy;Lymphocytes;Stomatitis

The effectiveness of low-level laser therapy for nonspecific chronic low back pain: a systematic review and meta-analysis. BACKGROUND: In recent decades, low-level laser therapy (LLLT) has been widely used to relieve pain caused by different musculoskeletal disorders. Though widely used, its

reported therapeutic outcomes are varied and conflicting. Results similarly conflict regarding its usage in patients with nonspecific chronic low back pain (NSCLBP). This study investigated the efficacy of low-level laser therapy (LLLT) for the treatment of NSCLBP by a systematic literature search with meta-analyses on selected studies. METHOD: MEDLINE, EMBASE, ISI Web of Science and Cochrane Library were systematically searched from January 2000 to November 2014. Included studies were randomized controlled trials (RCTs) written in English that compared LLLT with placebo treatment in NSCLBP patients. The efficacy effect size was estimated by the weighted mean difference (WMD). Standard random-effects meta-analysis was used, and inconsistency was evaluated by the I-squared index (I(2)). RESULTS: Of 221 studies, seven RCTs (one triple-blind, four double-blind, one single-blind, one not mentioning blinding, totaling 394 patients) met the criteria for inclusion. Based on five studies, the WMD in visual analog scale (VAS) pain outcome score after treatment was significantly lower in the LLLT group compared with placebo (WMDâ€‰=â€‰-13.57 [95 % CI =â€‰-17.42, -9.72], I(2)â€‰= 0 %). No significant treatment effect was identified for disability scores or spinal range of motion outcomes. CONCLUSIONS: Our findings indicate that LLLT is an effective method for relieving pain in NSCLBP patients. However, there is still a lack of evidence supporting its effect on function.
Chronic Pain;Humans;Low Back Pain;Low-Level Light Therapy

Pressure ulcers: treatment. INTRODUCTION: Unrelieved pressure or friction of the skin, particularly over bony prominences, can lead to pressure ulcers in up to one third of people in hospitals or community care, and one fifth of nursing home residents. Pressure ulcers are more likely in people with reduced mobility and poor skin condition, such as older people or those with vascular disease. METHODS AND OUTCOMES: We conducted a systematic overview, aiming to answer the following clinical question: What are the effects of treatments in people with pressure ulcers? We searched: Medline, Embase, The Cochrane Library, and other important databases up to January 2014 (Clinical Evidence overviews are updated periodically; please check our website for the most up-to-date version of this overview). RESULTS: At this update, searching of electronic databases retrieved 307 studies. After deduplication and removal of conference abstracts, 203 records were screened for inclusion in the overview. Appraisal of titles and abstracts led to the exclusion of 163 studies and the further review of 40 full publications. Of the 40 full articles evaluated, seven systematic reviews and two RCTs were added at this update. We performed a GRADE evaluation for 15 PICO combinations. CONCLUSIONS: In this systematic overview, we categorised the efficacy for 15 interventions based on information about the effectiveness and safety of air-fluidised supports, alternating-pressure surfaces (including mattresses), debridement, dressings, electrotherapy, hyperbaric oxygen, low-air-loss beds, low-level laser therapy, low-tech constant-low-pressure supports, nutritional supplements, seat cushions, surgery, therapeutic ultrasound, topical negative pressure, and topical phenytoin.

Achilles Tendon Vascularization of Proximal, Medial, and Distal Portion Before and After Partial Lesion in Rats Treated with Phototherapy. BACKGROUND: The Achilles tendon is one of the tendons most commonly injured by microtraumas and overuse during sports practice. This tendon is especially fragile because of the low blood supply in its central part. Nevertheless, the literature does not offer enough scientific support to explain the composition and vascular dynamic of animal tendons, despite the relevance of being able to observe if the animal tendon undergoes the same processes of vascularization in different regions, as occurs in humans. METHODS: We used 28 rats weighing 280â€‰Â±â€‰20â€‰g, which were divided into four groups with seven animals each (control, sham, 830â€‰nm, 660â€‰nm). The laser parameters were: power output 60â€‰mW for both lasers, 40â€‰J/cm(2) of energy density, total energy 1.1â€‰J, power density 2.14â€‰W/cm(2), and application time 18.6â€‰sec. This study evaluated the vascular constitution of healthy and injured calcaneous tendons. The tendons of each animal were processed to be embedded in Paraplast and, after that, they were divided into three parts: proximal, medial, and distal. Afterwards, they were cut

in slices of 6â€‰Î¼m were made, then they were stained with hematoxylin and eosin. Using an ocular lens reticulated with magnificationâ€‰Ã—â€‰400, we analyzed the number and the area density of the blood vessels using morphometric methods. Data were analyzed with the Shapiro-Wilk test, followed by Tukey, considering p as <0.05. RESULTS: The area density and the number of blood vessels in the proximal part were 36% and 42%, respectively, of the values found in the medial part. The distal part had 64% more vessels and 52.8% more area density ($p < 0.05$) than the medial part. CONCLUSIONS: Low-level laser therapy (LLLT) had no effect on the studied parameters. The vascularization of rat tendon is similar to that of humans, which contributes to the studies of therapies that have been applied in humans. Achilles Tendon;Animals;Low-Level Light Therapy;Rats

Evaluation of acute effect of light-emitting diode (LED) phototherapy on muscle deoxygenation and pulmonary oxygen uptake kinetics in patients with diabetes mellitus: study protocol for a randomized controlled trial. BACKGROUND: Type 2 diabetes mellitus (DM) is responsible for a significant reduction in the quality of life due to its negative impact on functional capacity. Cardiopulmonary fitness impairment in DM patients has been associated with limited tissue oxygenation. Phototherapy is widely utilized to treat several disorders due to expected light-tissue interaction. This type of therapy may help to improve muscular oxygenation, thereby increasing aerobic fitness and functional capacity. METHODS/DESIGN: This study is a randomized, double-blind, placebo-controlled crossover trial approved by the Ethics Committee of the Federal University of SÃ£o Carlos and registered at ClinicalTrials.gov. Four separate tests will be performed to evaluate the acute effect of phototherapy. All participants will receive both interventions in random order: light-emitting diode therapy (LEDT) and placebo, with a minimum 14-day interval between sessions (washout period). Immediately after the intervention, participants will perform moderate constant workload cycling exercise corresponding to 80 % of the pulmonary oxygen uptake [Formula: see text] during the gas exchange threshold (GET). LEDT will be administered with a multidiode cluster probe (50 GaAlA LEDs, 850 Î·m, 75 mW each diode, and 3 J per point) before each exercise session. Pulmonary oxygen uptake, muscle oxygenation, heart rate, and arterial pressure will be measured using a computerized metabolic cart, a near-infrared spectrometer, an electrocardiogram, and a photoplethysmography system, respectively. DISCUSSION: The main objective of this study is to evaluate the acute effects of muscular pre-conditioning using LED phototherapy on pulmonary oxygen uptake, muscle oxygenation, heart rate, and arterial pressure dynamics during dynamic moderate exercise. We hypothesize that phototherapy may be beneficial to optimize aerobic fitness in the DM population. Data will be published after the study is completed. TRIAL REGISTRATION: Registered at ClinicalTrials.gov under trial number NCT01889784 (date of registration 5 June 2013). Oxygen Adult;Arterial Pressure;Brazil;Clinical Protocols;Cross-Over Studies;Diabetes Mellitus, Type 2;Double-Blind Method;Electrocardiography;Exercise Test;Exercise Tolerance;Female;Heart Rate;Humans;Kinetics;Lasers, Semiconductor;Low-Level Light Therapy;Lung;Male;Middle Aged;Muscle, Skeletal;Oxygen;Oxygen Consumption;Photoplethysmography;Recovery of Function;Research Design;Spectroscopy, Near-Infrared;Treatment Outcome

Low intensity 635â€‰nm diode laser irradiation inhibits fibroblast-myofibroblast transition reducing TRPC1 channel expression/activity: New perspectives for tissue fibrosis treatment. BACKGROUND AND OBJECTIVE: Low-level laser therapy (LLLT) or photobiomodulation therapy is emerging as a promising new therapeutic option for fibrosis in different damaged and/or diseased organs. However, the anti-fibrotic potential of this treatment needs to be elucidated and the cellular and molecular targets of the laser clarified. Here, we investigated the effects of a low intensity 635â€‰Â±â€‰5â€‰nm diode laser irradiation on fibroblast-myofibroblast transition, a key event in the onset of fibrosis, and elucidated some of the underlying molecular mechanisms. MATERIALS AND

METHODS: NIH/3T3 fibroblasts were cultured in a low serum medium in the presence of transforming growth factor (TGF)-Î²1 and irradiated with a 635â€‰Â±â€‰5â€‰nm diode laser (continuous wave, 89â€‰mW, 0.3â€‰J/cm(2)). Fibroblast-myofibroblast differentiation was assayed by morphological, biochemical, and electrophysiological approaches. Expression of matrix metalloproteinase (MMP)-2 and MMP-9 and of Tissue inhibitor of MMPs, namely TIMP-1 and TIMP-2, after laser exposure was also evaluated by confocal immunofluorescence analyses. Moreover, the effect of the diode laser on transient receptor potential canonical channel (TRPC) 1/stretch-activated channel (SAC) expression and activity and on TGF-Î²1/Smad3 signaling was investigated. RESULTS: Diode laser treatment inhibited TGF-Î²1-induced fibroblast-myofibroblast transition as judged by reduction of stress fibers formation, Î±-smooth muscle actin (sma) and type-1 collagen expression and by changes in electrophysiological properties such as resting membrane potential, cell capacitance and inwardly rectifying K(+) currents. In addition, the irradiation up-regulated the expression of MMP-2 and MMP-9 and downregulated that of TIMP-1 and TIMP-2 in TGF-Î²1-treated cells. This laser effect was shown to involve TRPC1/SAC channel functionality. Finally, diode laser stimulation and TRPC1 functionality negatively affected fibroblast-myofibroblast transition by interfering with TGF-Î²1 signaling, namely reducing the expression of Smad3, the TGF-Î²1 downstream signaling molecule. CONCLUSION: Low intensity irradiation with 635â€‰Â±â€‰5â€‰nm diode laser inhibited TGF-Î²1/Smad3-mediated fibroblast-myofibroblast transition and this effect involved the modulation of TRPC1 ion channels. These data contribute to support the potential anti-fibrotic effect of LLLT and may offer further informations for considering this therapy as a promising therapeutic tool for the treatment of tissue fibrosis. Biomarkers;TRPC Cation Channels;transient receptor potential cation channel, subfamily C, member 1 Animals;Biomarkers;Blotting, Western;Cell Differentiation;Cells, Cultured;Fibroblasts;Fibrosis;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Myofibroblasts;NIH 3T3 Cells;Patch-Clamp Techniques;TRPC Cation Channels

Effects of a Low-Intensity Laser on Dental Implant Osseointegration: Removal Torque and Resonance Frequency Analysis in Rabbits. The objective of this study was to investigate how a low-intensity laser affects the stability and reverse torque resistance of dental implants installed in the tibia of rabbits. Thirty rabbits received 60 dental implants with the same design and surface treatment, one in each proximal metaphysis of the tibia. Three groups were prepared (n = 10 animals each): conventional osseointegration without treatment (control group), surgical sites irradiated with a laser beam emitted in the visible range of 680 nm (Lg1 group), surgical sites irradiated with a laser beam with a wavelength in the infrared range of 830 nm (Lg2 group). Ten irradiation sessions were performed 48 hours apart; the first session was during the immediate postoperative period. Irradiation energy density was 4 J/cm(2) per point in 2 points on each side of the tibias. The resonance frequency and removal torque values were measured at 2 time points after the implantations (3 and 6 weeks). Both laser groups (Lg1 and Lg2) presented a significant difference between resonance frequency analysis values at the baseline and the values obtained after 3 and 6 weeks ($P > .05$). Although the removal torque values of all groups increased after 6 weeks ($P < .05$), both laser groups presented greater mean values than those of the control group ($P < .01$). Photobiomodulation using laser irradiation with wavelengths of 680 and 830 nm had a better degree of bone integration than the control group after 6 weeks of observation time. Dental Implants;Titanium Animals;Dental Implantation, Endosseous;Dental Implants;Osseointegration;Rabbits;Resonance Frequency Analysis;Surface Properties;Tibia;Titanium;Torque

Effect of low-level laser therapy (808 nm) on skeletal muscle after endurance exercise training in rats. BACKGROUND: Low-level laser therapy (LLLT) has been demonstrated to be effective in optimizing skeletal muscle performance in animal experiments and in clinical trials. However, little is known

about the effects of LLLT on muscle recovery after endurance training. OBJECTIVE: This study evaluates the effects of low-level laser therapy (LLLT) applied after an endurance training protocol on biochemical markers and morphology of skeletal muscle in rats. METHOD: Wistar rats were divided into control group (CG), trained group (TG), and trained and laser irradiated group (TLG). The endurance training was performed on a treadmill, 1 h/day, 5 days/wk, for 8 wk at 60% of the maximal speed reached during the maximal effort test (Tmax) and laser irradiation was applied after training. RESULTS: Both trained groups showed significant increase in speed compared to the CG. The TLG demonstrated a significantly reduced lactate level, increased tibialis anterior (TA) fiber cross-section area, and decreased TA fiber density. Myogenin expression was higher in soleus and TA muscles in both trained groups. In addition, LLLT produced myogenin downregulation in the TA muscle of trained animals. CONCLUSION: These results suggest that LLLT could be an effective therapeutic approach for stimulating recovery during an endurance exercise protocol. Animals;Exercise Therapy;Low-Level Light Therapy;Muscle, Skeletal;Rats;Rats, Wistar;Regeneration

Intra-oral low level laser therapy in chronic maxillary sinusitis: A new and effective recommended technique. BACKGROUND: Chronic sinusitis is one of the most common chronic diseases involving different age groups. Because the nature and etiology of chronic sinusitis are not completely known, there is not any standard treatment for this disease. It has been suggested that low-level laser can be used in treating chronic sinusitis but there are limited studies about its usage. In this research, intra-oral radiation of low-level laser has been described and implemented for the first time. Suggested hypotheses about the efficacy of this type of radiation (intra-oral) in treating chronic maxillary sinusitis includes this fact that the depth of maxilla's vestibule is also the floor of maxillary sinus and sinus discharges collect in this area because of gravity effect. Therefore, with considering suitable radiation angle, this area gets the most benefits of laser's anti-inflammatory effects. MATERIAL AND METHODS: In this study, 20 patients with chronic maxillary sinusitis were included. They were assessed before and after treatment. Treatment plan was performed in 8 sessions every other days using low-level diode laser with 810 nm. Snot-22 questionnaire and rhinomanometry were used for evaluating patients. Changes of signs and symptoms were recorded in questionnaire every session and 6 months after treatment. Friedman and Wilcoxon tests were used for data analyses. In this study, P value < 0.05 was considered statistically significant. RESULTS: All variables and all symptoms of patients were improved using intra-oral low-level laser and this improvement was statistically significant (P value<0.05). There was also significant decrease in nasal airway resistance and significant increase in air flow (P value<0.05). Six month after treatment completion, there was no significant difference between the results of completion and the results of 8th treatment session (P value< 0.05). CONCLUSIONS: Using intra-oral low-level laser is a suitable way to treat patients with chronic maxillary sinusitis. KEY WORDS: Chronic sinusitis, maxillary sinusitis, low-level laser.

Applications of Light Amplification by Stimulated Emission of Radiation (Lasers) for Restorative Dentistry. Light amplification by stimulated emission of radiation (laser) has been used widely in a range of biomedical and dental applications in recent years. In the field of restorative dentistry, various kinds of lasers have been developed for diagnostic (e.g. caries detection) and operative applications (e.g. tooth ablation, cavity preparation, restorations, bleaching). The main benefits for laser applications are patient comfort, pain relief and better results for specific applications. Major concerns for using dental lasers frequently are high cost, need for specialized training and sensitivity of the technique, thereby compromising its usefulness particularly in developing countries. The main aim of this paper is to evaluate and summarize the applications of lasers in restorative dentistry, including a comparison of the applications of lasers for major restorative dental procedures and conventional clinical approaches. A remarkable increase in the use of lasers for dental application is expected in the near future. Acrylic Resins;Composite Dental Resin;Composite

Resins;Polyurethanes Acrylic Resins;Composite Resins;Dental Caries;Dental Prosthesis;Dentin Sensitivity;Endodontics;Humans;Low-Level Light Therapy;Polyurethanes;Pulpotomy;Tooth Bleaching
Biophysical Approaches for Oral Wound Healing: Emphasis on Photobiomodulation. Significance: Oral wounds can lead to significant pain and discomfort as well as affect overall general health due to poor diet and inadequate nutrition. Besides many biological and pharmaceutical methods being investigated, there is growing interest in exploring various biophysical devices that utilize electric, magnetic, ultrasound, pressure, and light energy. Recent Advances: Significant insight into mechanisms of these biophysical devices could provide a clear rationale for their clinical use. Preclinical studies are essential precursors in determining physiological mechanisms and elucidation of causal pathways. This will lead to development of safe and effective therapeutic protocols for clinical wound management. Critical Issues: Identification of precise events initiated by biophysical devices, specifically photobiomodulation-the major focus of this review, offers promising avenues in improving oral wound management. The primary phase responses initiated by the interventions that distinctly contribute to the therapeutic response must be clearly delineated from secondary phase responses. The latter events are a consequence of the wound healing process and must not be confused with causal mechanisms. Future Direction: Clinical adoption of these biophysical devices needs robust and efficacious protocols that can be developed by well-designed preclinical and clinical studies. Elucidation of the precise molecular mechanisms of these biophysical approaches could determine optimization of their applications for predictive oral wound care.
Effect of Low-Level Laser Therapy on Orthodontic Tooth Movement: A Clinical Investigation. OBJECTIVES: One major drawback of orthodontic treatment is its long duration due to slow tooth movement and the pain at the onset of treatment following application of forces. There is controversy regarding the efficacy of laser for decreasing the treatment time and pain of orthodontic treatment. The purpose of this study was to investigate the effect of low level diode laser on the rate of orthodontic tooth movement and the associated pain. MATERIALS AND METHODS: In this double blind randomized controlled clinical trial, 12 orthodontic patients referring to Shahid Beheshti School of Dentistry for first premolar extraction were randomly selected and allocated to gallium aluminum-arsenide laser (GA-AL-AS diode laser, 880 nm, 100 mW, 5 j/cm(2), 8 points, 80 seconds, continuous mode) or control group. The patients initially underwent leveling and alignment using the sectional system. Force (150 gr) was applied to each canine tooth via sectional closing loops. The loops were activated every month. The rate of tooth movement and pain were monitored over the treatment period and recorded on days 1, 3, 7, 30, 33, 37, 60, 63 and 67. Two-way ANOVA was used for comparison of groups. RESULTS: There was no significant difference in terms of tooth movement and pain scores between the irradiated and non-irradiated sides at any time point (P>0.05). CONCLUSION: Although laser enhanced orthodontic tooth movement in the upper jaw, we failed to provide solid evidence to support the efficacy of laser for expediting tooth movement or reducing the associated pain.
The effect of light-emitting diode phototherapy on rate of orthodontic tooth movement: A split mouth, controlled clinical trial.
Effect of low-energy laser irradiation and antioxidant supplementation on cell apoptosis during skeletal muscle post-injury regeneration in pigs. The aim of this study was to evaluate the effect of low-energy laser irradiation, coenzyme Q10 and vitamin E supplementation on the apoptosis of macrophages and muscle precursor cells during skeletal muscle regeneration after bupivacaine-induced injury. The experiment was conducted on 75 gilts, divided into 5 experimental groups: I--control, II--low-energy laser irradiation, III--coenzyme Q10, IV--coenzyme Q10 and vitamin E, V--vitamin E. Muscle necrosis was induced by injection of 0.5% bupivacaine hydrochloride. The animals were euthanized on subsequent days after injury. Samples were formalin fixed and processed

routinely for histopathology. Apoptosis was detected using the TUNEL method. The obtained results indicate that low-energy laser irradiation has a beneficial effect on macrophages and muscle precursor cell activity during muscle post-injury regeneration and protects these cells against apoptosis. Vitamin E has a slightly lower protective effect, limited mainly to the macrophages. Coenzyme Q10 co-supplemented with vitamin E increases the activity of macrophages and muscle precursor cells, myotube and young muscle formation. Importantly, muscle precursor cells seem to be more sensitive to apoptosis than macrophages in the environment of regenerating damaged muscle. Antioxidants;Ubiquinone;Vitamin E;coenzyme Q10;Bupivacaine Animals;Antioxidants;Apoptosis;Bupivacaine;Dose-Response Relationship, Radiation;Drug Therapy, Combination;Female;Lasers;Muscle, Skeletal;Muscular Diseases;Swine;Swine Diseases;Ubiquinone;Vitamin E

Lasers and Intense Pulsed Light Hidradenitis Suppurativa. Lasers and intense pulsed light (IPL) treatment are useful for the treatment of hidradenitis suppurativa (HS). Carbon dioxide lasers are used for cutting or vaporization of the affected area. It is a effective therapy for the management of severe and recalcitrant HS with persistent sinus tract and scarring, and can be performed under local anesthesia. HS has a follicular pathogenesis. Lasers and IPL targeting the hair have been found useful in treating HS by reducing the numbers of hairs in areas with HS. The methods have few side effects, but the studies are preliminary and need to be repeated. Cicatrix;Hair Removal;Hidradenitis Suppurativa;Humans;Intense Pulsed Light Therapy;Laser Therapy;Lasers, Gas;Low-Level Light Therapy

Randomized Controlled Trials for the Treatment of Hidradenitis Suppurativa. Hidradenitis suppurativa (HS) is a chronic, inflammatory, recurrent, debilitating skin disease. Several treatment modalities are available, but most of them lack high-quality evidence. A systematic search was performed to identify all randomized controlled trials for the treatment of HS in order to review and evaluate the evidence. Recommendations for future randomized controlled trials include using validated scores, inclusion of patient rated outcomes, and thorough report of side effects. Evidence for long-term treatment and benefit/risk ratio of available treatment modalities is needed in order to enhance evidence-based treatment in daily clinical practice. Combining surgery with antiinflammatory treatment warrants further investigation. Anti-Bacterial Agents;Dermatologic Agents;Hormones;Ethinyl Estradiol-Norgestrel Combination;Infliximab Anti-Bacterial Agents;Dermatologic Agents;Dermatologic Surgical Procedures;Ethinyl Estradiol-Norgestrel Combination;Hidradenitis Suppurativa;Hormones;Humans;Infliximab;Intense Pulsed Light Therapy;Laser Therapy;Low-Level Light Therapy;Outcome Assessment, Health Care;Randomized Controlled Trials as Topic

Intracranial application of near-infrared light in a hemi-parkinsonian rat model: the impact on behavior and cell survival. OBJECT The authors of this study used a newly developed intracranial optical fiber device to deliver near-infrared light (NIr) to the midbrain of 6-hydroxydopamine (6-OHDA)-lesioned rats, a model of Parkinson's disease. The authors explored whether NIr had any impact on apomorphine-induced turning behavior and whether it was neuroprotective. METHODS Two NIr powers (333 nW and 0.16 mW), modes of delivery (pulse and continuous), and total doses (634 mJ and 304 J) were tested, together with the feasibility of a midbrain implant site, one considered for later use in primates. Following a striatal 6-OHDA injection, the NIr optical fiber device was implanted surgically into the midline midbrain area of Wistar rats. Animals were tested for apomorphine-induced rotations, and then, 23 days later, their brains were aldehyde fixed for routine immunohistochemical analysis. RESULTS The results showed that there was no evidence of tissue toxicity by NIr in the midbrain. After 6-OHDA lesion, regardless of mode of delivery or total dose, NIr reduced apomorphine-induced rotations at the stronger, but not at the weaker, power. The authors

found that neuroprotection, as assessed by tyrosine hydroxylase expression in midbrain dopaminergic cells, could account for some, but not all, of the observed behavioral improvements; the groups that were associated with fewer rotations did not all necessarily have a greater number of surviving cells. There may have been other "symptomatic" elements contributing to behavioral improvements in these rats. CONCLUSIONS In summary, when delivered at the appropriate power, delivery mode, and dosage, NIr treatment provided both improved behavior and neuroprotection in 6-OHDA-lesioned rats. Dopamine Agonists;Oxidopamine;Tyrosine 3-Monooxygenase;Apomorphine Animals;Apomorphine;Cell Survival;Dopamine Agonists;Dopaminergic Neurons;Dose-Response Relationship, Radiation;Feasibility Studies;Immunohistochemistry;Low-Level Light Therapy;Male;Mesencephalon;Movement;Optical Fibers;Oxidopamine;Parkinsonian Disorders;Phototherapy;Prostheses and Implants;Rats, Wistar;Tyrosine 3-Monooxygenase

Photobiomodulation and eccentric exercise for Achilles tendinopathy: a randomized controlled trial. BACKGROUND: The common regime of eccentric exercise in use for Achilles tendinopathy is somewhat arduous and compliance issues can arise. This is the first study to investigate the effectiveness of a regime of fewer exercise sessions combined with photobiomodulation for the treatment of Achilles tendinopathy. METHODS: A double blind randomized controlled trial and intention-to-treat analysis were performed. Eighty participants, 18-65Â years with Achilles tendinopathy and symptoms for longer than 3Â months, were included in the trial. Participants randomized into one of four groups; 1 (Placebo + Ex Regime 1) or 2 (Laser + Ex Regime 1) or 3 (Placebo + Ex Regime 2) or 4 (Laser + Ex Regime 2). The primary outcome measure was the Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaire. Outcomes were collected at baseline, week 4 and week 12. RESULTS: Sixteen participants were lost to follow-up at 12Â weeks, 4 of which due to adverse reactions. As per intention to treat, missing data were imputed, 80 participants were included in the final analysis. For VISA-A at 12Â weeks, group 4 achieved significant gains over the other 3 groups: group 1 (18.5 [9.1, 27.9]), group 2 (10.4 [1.5, 19.2]), group 3 (11.3 [3.0, 19.6]). There was a moderate effect size in favour of exercise twice per week (7.2 [-1.8, 16.2], ES .7). CONCLUSIONS: Twice-daily exercise sessions are not necessary as equivalent results can be obtained with two exercise sessions per week. The addition of photobiomodulation as adjunct to exercise can bring added benefit. Achilles Tendon;Adolescent;Adult;Aged;Double-Blind Method;Exercise Therapy;Female;Humans;Light;Low-Level Light Therapy;Male;Middle Aged;Sports;Tendinopathy;Treatment Outcome;Young Adult

Photobiomodulation and Lasers. Photobiomodulation is discussed to be a noninvasive method to accelerate orthodontic tooth movement. The stimulatory effect of low-level laser therapy is well known and includes enhancement in tissue growth and tissue regeneration, resolvement of inflammation and pain. In recent research projects, the effect of laser therapy was tested regarding the stimulatory effect on bone remodeling with the potential to influence the tooth movement rate. The results are divers. The effect of laser regarding the reduction of the postadjustment pain could be proved, but not all authors describe the acceleration of tooth movement. Depending on the protocol, low-level laser therapy with low dosage increases the amount of tooth movement while high dosage seems to result in inhibitory effects. In conclusion, future studies are necessary to find the right protocol delivering beneficial results regarding the influence on bone remodeling and tooth movement to implement this therapy in daily orthodontic routine. Bone Remodeling;Humans;Low-Level Light Therapy;Pain;Tooth Movement Techniques

Nonsurgical Methods for the Acceleration of the Orthodontic Tooth Movement. While acceleration of the orthodontic tooth movement by surgical techniques has been shown to be effective for decades, noninvasive and nonsurgical methods have always been preferred by both the

clinicians and the patients. These techniques have ranged from application of biological molecules to innovative technologies such as resonance vibration, cyclic forces, light electrical currents, magnetic field forces, low-intensity laser irradiation and low-level light therapy. Endogenously produced biologicals have been tested based on their roles in the turnover of alveolar bone in response to orthodontic tooth movement as well as during wound healing. The premise behind this approach is that these exogenously applied compounds will mimic their counterparts produced in vivo. Meanwhile, technologies tested so far target these pathways for the acceleration of the orthodontic tooth movement. All these approaches have shown favorable outcomes with varying success. This chapter presents the current knowledge and a discussion over their limitations with an emphasis on the mechanism of action for each technique. Intercellular Signaling Peptides and Proteins Bone Remodeling;Humans;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Phototherapy;Physical Stimulation;Technology, Dental;Time Factors;Tooth Movement Techniques

Effects of low level laser therapy on inflammatory and angiogenic gene expression during the process of bone healing: A microarray analysis. The process of bone healing as well as the expression of inflammatory and angiogenic genes after low level laser therapy (LLLT) were investigated in an experimental model of bone defects. Sixty Wistar rats were distributed into control group and laser group (830nm, 30mW, 2,8J, 94seg). Histopathological analysis showed that LLLT was able to modulate the inflammatory process in the area of the bone defect and also to produce an earlier deposition of granulation tissue and newly formed bone tissue. Microarray analysis demonstrated that LLLT produced an up-regulation of the genes related to the inflammatory process (MMD, PTGIR, PTGS2, Ptger2, IL1, 1IL6, IL8, IL18) and the angiogenic genes (FGF14, FGF2, ANGPT2, ANGPT4 and PDGFD) at 36h and 3days, followed by the decrease of the gene expression on day 7. Immunohistochemical analysis revealed that the subjects that were treated presented a higher expression of COX-2 at 36h after surgery and an increased VEGF expression on days 3 and 7 after surgery. Our findings indicate that LLLT was efficient on accelerating the development of newly formed bone probably by modulating the inflammatory and angiogenic gene expression as well as COX2 and VEGF immunoexpression during the initial phase of bone healing. Cytokines;Ptgir protein, rat;Receptors, Epoprostenol;Receptors, Prostaglandin;Vascular Endothelial Growth Factor A;Cyclooxygenase 2 Animals;Bone Diseases;Bone Regeneration;Bone and Bones;Cyclooxygenase 2;Cytokines;Gene Expression Regulation;Low-Level Light Therapy;Male;Microarray Analysis;Rats;Rats, Wistar;Receptors, Epoprostenol;Receptors, Prostaglandin;Up-Regulation;Vascular Endothelial Growth Factor A

[The influence of the low-frequency laser radiation on microcirculatory disorders in the patients presenting with chronic viral hepatitis]. AIM: The objective of the present study was to elucidate the character of microcirculatory disorders in the patients presenting with chronic viral hepatitis and to evaluate the possibilities for the correction of the associated disorders with the use of laser irradiation. Material and methods. All the patients were divided into three groups. Group 1 was comprised of 30 patients who were treated by means of traditional medicamental therapy alone; they served as controls. Group 2 consisted of 45 patients treated by intravenous laser irradiation in addition to traditional medicamental therapy. The patients of group 3 (n=45) received a course of laser skin treatment. The state of microcirculation was assessed by the laser Doppler flowmetry (LDF) technique with the help of a LAKK-02 apparatus (<<Lazma>> Research and Manufacturing Complex, Moscow, Russia). RESULTS: The study has demonstrated heterogeneity of the types of microcirculation with the statistically significant increase in the frequency of its pathological cases. All the patients treated with the use of low-intensity laser therapy exhibited a significant improvement of the blood flow characteristics regardless of the initial hemodynamic type of microcirculation.

CONCLUSION: It is concluded that the application of laser irradiation as a component of the combined treatment of the patients presenting with chronic viral hepatitis facilitates correction of microcirculatory disorders. Adult;Female;Hepatitis;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged

Differentiation Potential of Adipose-Derived Stem Cells When Cocultured with Smooth Muscle Cells, and the Role of Low-Intensity Laser Irradiation. OBJECTIVE: The aim of the study was to investigate the differentiation potential of adipose-derived stem cells (ADSCs) when cocultured with smooth muscle cells (SMCs), and to determine the role of low-intensity laser irradiation (LILI). BACKGROUND DATA: ADSCs isolated from adipose tissue are isolated with ease and in large amounts. SMCs constitute most parts of the intestinal, urinary, reproductive, and cardiovascular systems. LILI has been found to have positive effects on different cell types, including ADSCs. METHODS: The study used ADSCs (Stempro Adipose Derived Stem Cells-R7788-115) and SMCs (SKU-T-1 American Type Culture Collection HTB-114) cell lines. These cell lines were cocultured in a 1:1 ratio with and without growth factors and then exposed to LILI using 636â€‰nm at 5â€‰J/cm(2). RESULTS: Cell viability and proliferation increased significantly in the cocultured groups that were exposed to LILI alone, as well as in combination with growth factors. Further, there was a significant decrease in the expression of stem cell markers with a concomitant increase in SMC markers. CONCLUSIONS: These results suggest that ADSCs have the ability to differentiate into SMCs when cocultured with SMCs, whereas LILI potentially augments the differentiation potential and need. This further highlights the significant role that LILI has to offer ADSC therapy in regenerative medicine. Adipocytes;Adipose Tissue;Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Coculture Techniques;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Myocytes, Smooth Muscle;Role;Sensitivity and Specificity

Evaluation of Low-Level Laser Therapy in TMD Patients. Light amplification by stimulated emission of radiation (laser) is one of the most recent treatment modalities in dentistry. Low-level laser therapy (LLLT) is suggested to have biostimulating and analgesic effects through direct irradiation without causing thermal response. There are few studies that have investigated the efficacy of laser therapy in temporomandibular disorders (TMD), especially in reduced mouth opening. The case report here evaluates performance of LLLT with a diode laser for temporomandibular clicking and postoperative findings were evaluated in two cases of TMD patients. First patient had a history of limited mouth opening and pain in temporomandibular joint (TMJ) region since nine months. Second patient's main complaint was his restricted mouth opening, which was progressed in one year. LLLT was performed with a 685â€‰nm red probed diode laser that has an energy density of 6.2â€‰J/cm(2), three times a week for one month, and application time was 30 seconds (685â€‰nm, 25â€‰mW, 30â€‰s, 0.02â€‰Hz, and 6.2â€‰J/cm(2)) (BTL-2000, Portative Laser Therapy Device). The treatment protocol was decided according to the literature. One year later patients were evaluated and there were no changes. This application suggested that LLLT is an appropriate treatment for TMD related pain and limited mouth opening and should be considered as an alternative to other methods.

Phototherapy for Vitiligo: Skin Phototypes are Important. Asian People;Female;Humans;Low-Level Light Therapy;Male;PUVA Therapy;Photochemotherapy;Vitiligo

Decreased Bone Volume and Bone Mineral Density in the Tibial Trabecular Bone Is Associated with Per2 Gene by 405 nm Laser Stimulation. Low-level laser therapy/treatment (LLLT) using a minimally invasive laser needle system (MILNS) might enhance bone formation and suppress bone resorption. In this study, the use of 405 nm LLLT led to decreases in bone volume and bone mineral density (BMD) of tibial trabecular bone in wild-type (WT) and Per2 knockout (KO) mice. Bone volume and bone mineral density of tibial trabecular bone was decreased by 405 nm LLLT in Per2 KO

compared to WT mice at two and four weeks. To determine the reduction in tibial bone, mRNA expressions of alkaline phosphatase (ALP) and Per2 were investigated at four weeks after 405 nm laser stimulation using MILNS. ALP gene expression was significantly reduced in the LLLT-stimulated right tibial bone of WT and Per2 KO mice compared to the non-irradiated left tibia ($p < 0.001$). Per2 mRNA expression in WT mice was significantly reduced in the LLLT-stimulated right tibial bone compared to the non-irradiated left tibia ($p < 0.001$). To identify the decrease in tibial bone mediated by the Per2 gene, levels of runt-related transcription factor 2 (Runx2) and ALP mRNAs were determined in non-irradiated WT and Per2 KO mice. These results demonstrated significant downregulation of Runx2 and ALP mRNA levels in Per2 KO mice ($p < 0.001$). Therefore, the reduction in tibial trabecular bone resulting from 405 nm LLLT using MILNS might be associated with Per2 gene expression. Per2 protein, mouse;Period Circadian Proteins Animals;Bone Density;Bone and Bones;Gene Expression Regulation;Low-Level Light Therapy;Male;Mice;Mice, Knockout;Models, Animal;Period Circadian Proteins;Tibia;X-Ray Microtomography

Evaluation of the Proliferative Effects Induced by Low-Level Laser Therapy in Bone Marrow Stem Cell Culture. OBJECTIVE: The objective of this study was to evaluate the effect of laser irradiation on dog bone marrow stem cells. BACKGROUND DATA: Low doses of low-level red laser positively affect the viability of mesenchymal stem cells, and also increase proliferation. METHODS: Low-level laser (wavelength, 660â€‰nm; power output, 50â€‰mW), was applied to dog bone marrow stem cell cultures (DBMSC). The energy densities delivered varied from 1 to 12J/cm(2). The effect of the laser irradiation was evaluated on cell proliferation measured with the MTT colorimetric test, cell cycle phase, and on lipidic peroxidation (free radical production). RESULTS: The results indicate that laser irradiation to DBMSC did not change the morphology of the cells, but significantly increased their viability and the number of cells at the G2/M phase with 6, 10, and 12â€‰J/cm(2). On the other hand, malonaldehyde production was significantly enhanced with 8â€‰J/cm(2). CONCLUSIONS: The parameters used to irradiate DBMSC increased significantly proliferation without producing high levels of reactive oxygen species (ROS). Animals;Cell Proliferation;Cells, Cultured;Dogs;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells

Non-surgical adjunctive interventions for accelerating tooth movement in patients undergoing fixed orthodontic treatment. BACKGROUND: Accelerating the rate of tooth movement may help to reduce the duration of orthodontic treatment and associated unwanted effects including root resorption and enamel demineralisation. Several methods, including surgical and non-surgical adjuncts, have been advocated to accelerate the rate of tooth movement. Non-surgical techniques include low-intensity laser irradiation, resonance vibration, pulsed electromagnetic fields, electrical currents and pharmacological approaches. OBJECTIVES: To assess the effect of non-surgical adjunctive interventions on the rate of orthodontic tooth movement and the overall duration of treatment. SEARCH METHODS: We searched the following databases on 25 November 2014: the Cochrane Oral Health Group's Trials Register (November 2014), the Cochrane Central Register of Controlled Trials (CENTRAL; The Cochrane Library 2014, Issue 10), MEDLINE via OVID (1946 to November 2014), EMBASE via OVID (1980 to November 2014), LILACS via BIREME (1980 to November 2014), metaRegister of Controlled Trials (November 2014), the US National Institutes of Health Trials Register (ClinicalTrials.gov; November 2014) and the WHO International Clinical Trials Registry Platform (November 2014). We checked the reference lists of all trials identified for further studies. There were no restrictions regarding language or date of publication in the searches of the electronic databases. SELECTION CRITERIA: We included randomised controlled trials (RCTs) of people receiving orthodontic treatment using fixed appliances along with non-surgical adjunctive interventions to accelerate tooth movement. We excluded non-parallel design studies (for example, split-mouth) as we regarded them as inappropriate for assessment of the effects of this type of intervention. DATA

COLLECTION AND ANALYSIS: Two review authors were responsible for study selection, risk of bias assessment and data extraction; they carried out these tasks independently. Any disagreements were resolved by discussion amongst the review team to reach consensus. The review authors contacted the corresponding authors of trials to obtain missing information and data to allow calculation of mean differences (MD), 95% confidence intervals (CI) or risk ratios (RR) when these were not reported. MAIN RESULTS: We included two studies in this review, which were both assessed as being at high risk of bias. The two studies, involving a total of 111 participants, compared the use of Tooth Masseuse and OrthoAccel with conventional treatment mechanics during orthodontic alignment and canine retraction phases, respectively. Both studies included objective assessment of the amount or rate of tooth movement, but we were not able to meta-analyse this data as they used different outcome measurements at different stages of the orthodontic treatment process. One study measured subjective evaluation of pain and discomfort and the other evaluated adverse effects. The studies did not directly report either the duration of orthodontic treatment or the number of visits during active treatment.Using the Tooth Masseuse with 111 Hz at 0.06 Newtons (N) for 20 minutes daily resulted in greater reduction in irregularity in the lower incisor region over 10 weeks, assessed using Little's Irregularity Index (LII) with a mean difference (MD) of 0.6 mm (95% confidence interval (CI) -0.94 to 2.34) when compared to the control group. Pain and discomfort increased at six to eight hours after arch wire placement and after seven days, with minimal difference between the intervention and control groups. No statistical tests were provided for either variable and the differences between the two groups were not clinically important.Using OrthoAccel with 30 Hz at 0.25 N for 20 minutes daily produced a higher rate of maxillary canine distalisation in comparison to the control group (MD 0.37 mm/month; 95% CI -0.07 to 0.81; P = 0.05). Whilst this difference suggested 50% faster tooth movement using the vibrational appliance, the absolute differences were marginal and deemed clinically unimportant. Similar levels of non-serious adverse effects were reported in the intervention and control groups with a risk ratio of 0.96 (95% CI 0.32 to 2.85).Overall, the quality of the evidence was very low and therefore we cannot rely on the findings. AUTHORS' CONCLUSIONS: There is very little clinical research concerning the effectiveness of non-surgical interventions to accelerate orthodontic treatment. The available evidence is of very low quality and so it is not possible to determine if there is a positive effect of non-surgical adjunctive interventions to accelerate tooth movement. Although there have been claims that there may be a positive effect of light vibrational forces, results of the current studies do not reach either statistical or clinical significance. Further well-designed and rigorous RCTs with longer follow-up periods are required to determine whether non-surgical interventions may result in a clinically important reduction in the duration of orthodontic treatment, without any adverse effects.

Adolescent;Child;Cuspid;Female;Humans;Male;Pain Measurement;Randomized Controlled Trials as Topic;Time Factors;Tooth Movement Techniques;Vibration;Young Adult

Low Level Laser Therapy Reduces the Development of Lung Inflammation Induced by Formaldehyde Exposure. Lung diseases constitute an important public health problem and its growing level of concern has led to efforts for the development of new therapies, particularly for the control of lung inflammation. Low Level Laser Therapy (LLLT) has been highlighted as a non-invasive therapy with few side effects, but its mechanisms need to be better understood and explored. Considering that pollution causes several harmful effects on human health, including lung inflammation, in this study, we have used formaldehyde (FA), an environmental and occupational pollutant, for the induction of neutrophilic lung inflammation. Our objective was to investigate the local and systemic effects of LLLT after FA exposure. Male Wistar rats were exposed to FA (1%) or vehicle (distillated water) during 3 consecutive days and treated or not with LLLT (1 and 5 hours after each FA exposure). Non-manipulated rats were used as control. 24 h after the last FA exposure, we analyzed the local and

systemic effects of LLLT. The treatment with LLLT reduced the development of neutrophilic lung inflammation induced by FA, as observed by the reduced number of leukocytes, mast cells degranulated, and a decreased myeloperoxidase activity in the lung. Moreover, LLLT also reduced the microvascular lung permeability in the parenchyma and the intrapulmonary bronchi. Alterations on the profile of inflammatory cytokines were evidenced by the reduced levels of IL-6 and TNF-Î± and the elevated levels of IL-10 in the lung. Together, our results showed that LLLT abolishes FA-induced neutrophilic lung inflammation by a reduction of the inflammatory cytokines and mast cell degranulation. This study may provide important information about the mechanisms of LLLT in lung inflammation induced by a pollutant. Interleukin-6;Tumor Necrosis Factor-alpha;Formaldehyde Animals;Bone Marrow Cells;Bronchoalveolar Lavage Fluid;Cell Degranulation;Formaldehyde;Gene Expression Regulation;Interleukin-6;Low-Level Light Therapy;Lung;Male;Mast Cells;Microvessels;Neutrophils;Permeability;Pneumonia;Rats, Wistar;Respiratory Hypersensitivity;Tumor Necrosis Factor-alpha

The use of radiofrequency in combination with lasers for acne scars. Acne Vulgaris;Cicatrix;Combined Modality Therapy;Humans;Low-Level Light Therapy;Radiofrequency Therapy

A noninvasive approach to off-face skin laxity and tightening: a review of the literature. Off-face skin scales tailored to each anatomical site can measure laxity and tightening of the neck, chest, arms, hands, abdomen, buttocks, and medial thighs. Although surgery may be indicated for major weight loss patients, other noninvasive modalities may be considered including: CO2 laser, bipolar radiofrequency, monopolar radiofrequency, microfocused ultrasound, and combination therapies. We provide a review of the literature for each modality and relevance to the off-face anatomical sites. Cosmetic Techniques;Extremities;Humans;Lasers;Neck;Skin

Effect of low-level phototherapy on delayed onset muscle soreness: a systematic review and meta-analysis. To determine the effectiveness of low-level phototherapy (i.e. light-emitting diode therapy [LEDtherapy] or light amplification by stimulated emission of radiation therapy [LASERtherapy]) on pain, skeletal muscle injury (creatine kinase [CK] levels and edema) and skeletal muscle function (range of movement and strength) in people undergoing an exercise protocol. (Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, PEDro, SciELO and LILACS up to May 2014), we included randomized controlled trials, quasi-randomized controlled trials and crossover studies in which study participants were allocated to receive either low-level phototherapy or placebo treatment. Phototherapy should have been applied in a single treatment session, either before or after an exercise protocol. We identified 15 studies involving 317 participants. Meta-analyses were limited by substantial heterogeneity. Compared to the placebo group, reduction in CK levels was only observed when LASERtherapy was applied before an exercise protocol (standardized mean differenceâ€‰=â€‰-0.66; 95Â % Clâ€‰=â€‰-1.30, -0.02). No between-group difference in edema, range of movement and strength were detected when phototherapy was applied before or after exercise. Evidence from this review suggests that low-level phototherapy may not have substantial effect in the treatment of skeletal muscle injury and pain caused by exercise. Definitive conclusions are limited due to the small number of included studies in each meta-analysis, disparities across the included studies and small sample sizes.
Exercise;Humans;Myalgia;Phototherapy;Treatment Outcome

Hemosiderin Hyperpigmentation: Successful Treatment With Q-Switched 755-nm Laser Therapy. Hemosiderin Aged;Anemia, Iron-Deficiency;Extravasation of Diagnostic and Therapeutic Materials;Female;Hemosiderin;Humans;Hyperpigmentation;Infusions, Intravenous;Lasers, Solid-State;Low-Level Light Therapy

Analysis of the healing process of the wounds occurring in rats using laser therapy in association with hydrocolloid. PURPOSE: To evaluate wound healing in rats by using low-level laser therapy (LLLT) associated with hydrocolloid occlusive dressing. METHODS: Forty male, adult, Wistar rats were used, distributed into four groups: LG (received 2 J/cmÂ² of laser therapy); HG (treated with hydrocolloid); LHG (treated with 2 J/cmÂ² of laser therapy and hydrocolloid); and the CG (treated with 1 mL of 0.9% saline). The wound was evaluated at pre-determined periods 3rd and 7th days, considering the macroscopic and histological parameters (inflammatory cells, capillary neoformation, fibroblasts, collagen formation and reepithelialization). RESULTS: The LG group at seven days showed increased collagen formation, the LHG group at 3 days showed mild collagen formation. The HG group and the CG at 7 days showed complete reepithelialization. CONCLUSION: Low-level laser therapy as well as the hydrocolloid dressing have favored the wound-healing process in rats. Collagen Animals;Bandages, Hydrocolloid;Collagen;Combined Modality Therapy;Fibroblasts;Lasers, Semiconductor;Low-Level Light Therapy;Male;Occlusive Dressings;Random Allocation;Rats, Wistar;Reproducibility of Results;Time Factors;Treatment Outcome;Wound Healing

Improvement of bone repair in diabetic rats subjected to Æ›780 nm low-level laser therapy. PURPOSE: To investigate the effect of low-level laser therapy on bone healing in diabetic rats. METHODS: Bone cavities (19 mm diameter) were performed in the femur of 72 alloxan-induced diabetic rats, which were assigned into four groups: CTR (non-diabetic control), DBT (diabetic) CTRL (non-diabetic irradiated) and DBTL (diabetic irradiated). Low-level laser therapy was performed every 48 h for seven days. Animals were euthanized at seven, 18 and 30 days. Alkaline phosphatase serum levels and bone repair were analyzed. RESULTS: Low-level laser therapy significantly increased alkaline phosphatase in at seven and 18 days ($p<0.001$), and improved bone healing at seven ($p<0.01$), 18 ($p<0.05$) and 30 ($p<0.01$) in diabetic animals. In addition, bone healing in irradiated diabetic group was statistically similar to control group at 30 days ($p>0.05$). CONCLUSION: Low-level laser therapy increased the serum levels of alkaline phosphatase and improved bone healing in alloxan-induced diabetic rats. Alloxan;Alkaline Phosphatase Alkaline Phosphatase;Alloxan;Animals;Bone Regeneration;Diabetes Mellitus, Experimental;Fracture Healing;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteitis;Rats, Wistar;Reproducibility of Results;Time Factors;Treatment Outcome

Cost-effectiveness of low-level laser therapy (LLLT) in head and neck cancer patients receiving concurrent chemoradiation. BACKGROUND: Oral mucositis is a major event increasing treatment costs of head and neck squamous cell carcinoma (HNSCC) patients treated with chemoradiation (CRT). This study was designed to estimate the cost-effectiveness of low-level laser therapy (LLLT) to prevent oral mucositis in HNSCC patients receiving CRT. METHODS: From June 2007 to December 2010, 94 patients with HNSCC of nasopharynx, oropharynx, and hypopharynx entered a prospective, randomized, double blind, placebo-controlled, phase III trial. CRT consisted of conventional radiotherapy (RT: 70.2 Gy, 1.8 Gy/d, 5 times/wk)+concurrent cisplatin (100mg/m2) every 3 weeks. An InGaAlP (660 nm-100 mW-4J/cm2) laser diode was used for LLLT. RESULTS: From the perspective of Brazil's public health care system (SUS), total costs were higher in Placebo Group (PG) than Laser Group (LG) for opioid use (LG=US$ 9.08, PG=US$ 44.28), gastrostomy feeding (LG=US$ 50.50, PG=US$ 129.86), and hospitalization (PG=US$ 77.03). In LG, the cost was higher for laser therapy only (US$ 1880.57). The total incremental cost associated with the use of LLLT was US$ 1689.00 per patient. The incremental cost-effectiveness ratio (ICER) was US$ 4961.37 per grade 3-4 OM case prevented compared to no treatment. CONCLUSIONS: Our results indicate that morbidity was lower in the Laser Group and that LLLT was more cost-effective than placebo up to a threshold of at least US$ 5000 per mucositis case prevented. CLINICAL TRIAL INFORMATION: NCT01439724. Aged;Brazil;Carcinoma, Squamous Cell;Chemoradiotherapy;Cost-Benefit Analysis;Double-Blind

Method;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Mucositis;Prospective Studies;Treatment Outcome
Low Level Laser Therapy: A Panacea for oral maladies. To review the applications of low level laser therapy on various soft and hard oral tissues. A variety of therapeutic effects of Low Level Laser Therapy have been reported on a broad range of disorders. It has been found amenably practical in dental applications including soft as well as hard tissues of the oral cavity. LLLT has been found to be efficient in acceleration of wound healing, enhanced remodelling and bone repair, regeneration of neural cells following injury, pain attenuation, endorphin release stimulation and modulation of immune system. The aforementioned biological processes induced by Low level lasers have been effectively applied in treating various pathological conditions in the oral cavity. With is article, we attempt to review the possible application of Low Laser Therapy in the field of dentistry.
Efficacy of low level laser therapy on painful diabetic peripheral neuropathy. BACKGROUND & AIMS: Diabetic peripheral neuropathy (DPN) accounts for most common complications of T2DM. Painful DPN is associated with functional limitation & poor quality of life. Therefore, objective of the study is to find the effect of low level laser therapy on painful diabetic peripheral neuropathy (DPN) in type 2 diabetes mellitus (T2DM) Materials & methods: The study design is pre-post observational design. After obtaining ethical clearance and informed consent, 19 T2DM subjects were screened and confirmed for peripheral neuropathy in an outpatient setting with biochemical parameter, pain scale and Michigan Neuropathy Screening Instrument (MNSI). Low Level Laser therapy was irradiated through scanning mode with dosage of 3.1J/cm(2) on the plantar and dorsum of the foot and 3.4j/cm(2) with contact method for 10days and all subjects were reassessed at the end of the 10 day. Descriptive statistics and paired' test was used to analyze the pre-post finding within the group. Level of significance was set at p<0.05 RESULTS: The result analysis showed significant reduction in Pain using VAS scale (6.47 Â± 0.84 to 1.21 Â± 0.78 (p<0.001), MNSI (5.52 Â± 1.26 to 2.71 Â± 0.97 (reduction in Vibration perception threshold (32.68 Â± 6.08 to 24.84 Â± 4.29 (<0.001) and a significant increase in the temperature from baseline to post intervention (30.01 Â± 2.11 to 31.75 Â± 1.03 (p<0. 001). CONCLUSION: In the present study, Low level laser therapy was found to be effective in type 2 DM with peripheral neuropathy.
LLLT for Female Infertility: No Longer Just a Dream.
Commentary on Q-Switched 660-nm Versus 532-nm Nd: YAG Laser for the Treatment for Facial Lentigines in Asian Patients. Asian People;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy
Q-Switched 660-nm Versus 532-nm Nd: YAG Laser for the Treatment for Facial Lentigines in Asian Patients: A Prospective, Randomized, Double-Blinded, Split-Face Comparison Pilot Study. BACKGROUND: Q-switched (QS) 532-nm lasers are widely used to treat solar lentigines. OBJECTIVE: To compare the efficacy and safety of 660-nm and 532-nm QS neodymium-doped yttrium aluminum garnet (Nd:YAG) lasers in the treatment for lentigines in Asians. MATERIALS AND METHODS: The halves of each face (randomly chosen) of 8 Korean Fitzpatrick Skin Type III-IV women with facial solar lentigines were treated with either 660-nm or 532-nm lasers. Pigmentation was measured objectively using a profilometric skin analysis tool and subjectively using the pigmentation area and severity index (PSI) score, global assessment of the aesthetic improvement scale (GAIS), and a patient satisfaction score at Weeks 4 and 8. RESULTS: Seven patients completed the study. No significant differences were found in the PSI, GAIS, patient satisfaction score, and melanin average score between the lasers. The melanin average level was significantly reduced by the 660-nm laser but not the 532-nm laser at Week 8 compared with the baseline. CONCLUSION: Both 660-nm and 532-nm QS Nd:YAG lasers effectively reduce pigmentation for up to 8 weeks with high patient satisfaction. The new 660-nm laser therefore increases the treatment options for lentigines in Asian skin.

Adult;Asian People;Double-Blind Method;Female;Humans;Lasers, Solid-State;Lentigo;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pilot Projects;Prospective Studies;Treatment Outcome

Laser-mediated Photodynamic Therapy: An Alternative Treatment for Actinic Keratosis? Photodynamic therapy (PDT) with light emitting diode (LED) illumination is a frequently used treatment modality for actinic keratosis (AK) with excellent cosmetic outcome. A major disadvantage, however, is the high pain score. Pulsed dye laser (PDL) illumination has been suggested, but the long-term efficacy of this treatment is unknown. In this split-face study we prospectively treated 61 patients with AK, with both LED-PDT and PDL-PDT. The mean change in the number of lesions between the end of follow-up and start of therapy was -4.25 (95% confidence interval (95% CI) -5.07; -3.43) for LED-PDT and -3.88 (95% CI -4,76; -2.99) for PDL-PDT, with a non-significant difference (p = 0.258) of -0.46 (95% CI -1.28; 0.35). The percentage decrease from baseline in the total number of AK was 55.8% and 47.8%, respectively, at 12-month follow-up. Visual analogue scale pain score was lower after PDL (mean 2.64) compared with LED illumination (mean 6.47). These findings indicate that PDL-PDT is an effective alternative illumination source fo. Photosensitizing Agents;methyl 5-aminolevulinate;Aminolevulinic Acid Aged;Aged, 80 and over;Aminolevulinic Acid;Female;Humans;Keratosis, Actinic;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Patient Preference;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Remission Induction;Severity of Illness Index;Time Factors;Treatment Outcome

NIR-Laser-Switched In Vivo Smart Nanocapsules for Synergic Photothermal and Chemotherapy of Tumors. In vivo MEO2 MA@MEO2 MA-co-OEGMA-CuS-DOX (G-CuS-DOX) nanocapsules increase the temperature of tumors from room temperature to 57 Â°C due to the photothermal effect under irradiation from a 915-nm laser. When the temperature exceeds 42 Â°C, photothermal therapy of G-CuS-DOX is switched on. Simultaneously, higher temperatures (>LCST, 42 Â°C) induce volume shrinkage of G-CuS-DOX in vivo, leading to the controllable release of the anticancer drug DOX. If the NIR laser is switched off, both therapy effects are interrupted immediately. Antineoplastic Agents;Nanocapsules;Water;Doxorubicin Animals;Antineoplastic Agents;Carcinoma, Hepatocellular;Cell Line, Tumor;Cell Survival;Combined Modality Therapy;Doxorubicin;Humans;Hydrophobic and Hydrophilic Interactions;Hyperthermia, Induced;Liver Neoplasms;Low-Level Light Therapy;Mice;Nanocapsules;Neoplasm Transplantation;Tumor Burden;Water

Outcome of low level lasers versus ultrasonic therapy in de Quervain's tenosynovitis. BACKGROUND: de Quervain's tenosynovitis is an inflammation of abductor pollicis longus (APL) and extensor pollicis brevis (EPB) muscle tendon sheaths at the level of radial styloid process. Its conservative management includes nonsteroidal anti-inflammatory drugs, wrist and thumb immobilization, ultrasonic therapy (US Th.) and low level laser therapy (LLLT). Literature is scanty on comparative efficacy of US Th. and LLLT for its management. This prospective study evaluates outcome of US Th. versus LLLT in de Quervain's disease. MATERIALS AND METHODS: Thirty patients clinically diagnosed de Quervains tenosynovitis were included in the study and randomly assigned to two groups. The average age was 36 years (range: 21-45 years). One group was given LLLT and the other US Th. for a total of 7 exposures on alternate days. The clinical criteria used were Finkelstein's test, tenderness over radial styloid (Ritchie's tenderness scale), grip strength, pain (visual analog scale [VAS]) and radiological criteria was ultrasonographic assessment of change in thickness of APL and EPB tendon sheath. They were measured before commencement and at the end of seven sessions of therapy, as per standard procedure. RESULTS: Significant improvement was seen within both groups in the following outcome measures assessed: Ritchie's tenderness scale, grip strength and VAS. Finkelstein's test was not significantly improved in either groups. Ultrasonographic measurement of

tendon sheath diameters, the mediolateral (ML), and anteroposterior (AP) diameters was not found to be significantly different in the US Th. group and the laser therapy group after treatment. On comparing both the groups, no statistically significant difference was found. However, looking at the mean values, the grip strength and VAS showed better improvement in the US Th. group as compared to the laser therapy group.

SPECT Perfusion Imaging Demonstrates Improvement of Traumatic Brain Injury With Transcranial Near-infrared Laser Phototherapy. Traumatic brain injury (TBI) is a growing health concern affecting civilians and military personnel. Near-infrared (NIR) light has shown benefits in animal models and human trials for stroke and in animal models for TBI. Diodes emitting low-level NIR often have lacked therapeutic efficacy, perhaps failing to deliver sufficient radiant energy to the necessary depth. In this case report, a patient with moderate TBI documented in anatomical magnetic resonance imaging (MRI) and perfusion single-photon emission computed tomography (SPECT) received 20 NIR treatments in the course of 2 mo using a high-power NIR laser. Symptoms were monitored by clinical examination and a novel patient diary system specifically designed for this patient population. Clinical application of these levels of infrared energy for this patient with TBI yielded highly favorable outcomes with decreased depression, anxiety, headache, and insomnia, whereas cognition and quality of life improved. Neurological function appeared to improve based on changes in the SPECT by quantitative analysis. NIR in the power range of 10-15 W at 810 and 980 nm can safely and effectively treat chronic symptoms of TBI. Brain;Brain Injuries;Gait;Humans;Low-Level Light Therapy;Male;Perfusion Imaging;Speech;Tomography, Emission-Computed, Single-Photon

Angiokeratoma of Fordyce response to long pulsed Nd:YAG laser treatment. Angiokeratoma of Fordyce can be easily diagnosed by their typical erythra and cured by varied therapeutic methods including surgery, electrocoagulation, cryotherapy, or various laser systems. Which are the optimal therapeutic methods? There are no consentaneous opinions in the reported articles. We present our characteristic treatment with the application of long pulsed neodymium-dopedyttrium-aluminum-garne (lpNd:YAG) laser in the treatment of angiokeratoma of Fordyce. A 1064 nm lpNd:YAG laser (spot size: 5 mm/7 mm, energy:90-130 J/cm(2) , and pulse duration: 10-20 ms.) was used to treat the patient's lesions. The desirable clinical endpoint of the treatment was lesions shrunk and turned pallor immediately after the irradiation. The treatment interval was at least 8 weeks. Of the 11 patients, 9 of them were cured and 2 of them were improved. The mean treatment sessions were 2.2 times. None of them had a scar formation and any other side effects. All of them were satisfied with the treatment results. We conclude that angiokeratoma of Fordyce responded well to lpNd:YAG laser treatment. It provided a simple, rapid, and no bleeding treatment in treating Angiokeratoma of Fordyce. Adult;Aged;Angiokeratoma;Female;Genital Neoplasms, Male;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Remission Induction;Skin Neoplasms;Time Factors;Treatment Outcome;Vulvar Neoplasms

Cutaneous Collagenous Vasculopathy: A Rare Form of Microangiopathy Successfully Treated with a Combination of Multiplex Laser and Optimized Pulsed Light with a Review of the Literature. Cutaneous collagenous vasculopathy (CCV) is a rare idiopathic microangiopathy of the cutaneous vasculature characterized histologically by the presence of dilated small blood vessels with flat endothelial cells and thickened walls containing hyaline material in the upper dermis. We report an elderly patient presenting with an extensive form of CCV involving the trunk, upper and lower limbs. She was treated with Multiplex PDL 595-nm/Nd:YAG 1,064-nm laser and optimized pulsed light. This approach, which has never been reported for CCV so far, resulted in a striking and almost complete clearance of the widespread lesions. We here review our knowledge about CCV and therapeutic

options available with a survey of the literature. Aged;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Diseases, Vascular;Telangiectasis

The influence of laser radiation on human osteoblasts cultured on nanostructured composite substrates. BACKGROUND AND AIMS: Carbon-based nanomaterials such as carbon nanotubes, graphene oxide and graphene have been explored by researchers as well as the industry. Graphene is a new nanomaterial which has commercial and scientific advantages. Laser therapy has proven highly useful in biomedicine, with the use of different laser types and energies for distinct purposes. The low level laser therapy (LLLT) can have anti-inflammatory, analgesic and biostimulant effects. Recent research has shown that laser radiation has different effects on osteoblasts. The aim of this study was to identify the influence of laser radiation on human osteoblastic cells cultured on nanostructured composite substrates. MATERIALS AND METHODS: Four types of substrates were created using colloidal suspensions of nanostructured composites in PBS at a concentration of 30 Î¼g/ml. We used human osteoblasts isolated from patella bone pieces harvested during arthroplasty. Irradiation of osteoblasts cultured on nanostructured composite substrates was made with a semiconductor laser model BTL-10 having a wavelength of 830 nm. The proliferation activity of osteoblast cells was assessed using the MTT assay. After laser irradiation procedure the viability and proliferation of osteoblast cells were analyzed using fluorescein diacetate (FDA) staining. RESULTS: The osteoblast cells viability and proliferation were evaluated with MTT assay at 30 minutes, 24 hours, 5 days and 10 days after laser irradiation. In the first 30 minutes there were no significant differences between the irradiated and non-irradiated cells. At 24 hours after laser irradiation procedure a significant increase of MTT values in case of irradiated osteoblasts cultivated on nanostructured hydroxyapatite, nanostructured hydroxyapatite with gold nanoparticles and 1.6% and 3.15% graphenes composites substrates was observed. A more marked proliferation rate was observed after 10 days of irradiation for irradiated osteoblasts seeded on nanostructured hydroxyapatite with gold nanoparticles and graphenes containing substrate. Using FDA staining we obtained very similar results with MTT test. CONCLUSIONS: The association between the 830 nm laser irradiation of osteoblasts and their long-term cultivation of the nanostructured composite substrates induces the cell proliferation and differentiation and therefore it will be a useful alternative for bone regeneration therapy.

Topical tranexamic acid as an adjuvant treatment in melasma: Side-by-side comparison clinical study. BACKGROUND: Tranexamic acid (TNA) is a novel therapeutic agent for hyperpigmented skin disorders. The efficacy and safety of topical TNA in patients with melasma has not been heretofore studied. The main objective of this study is to evaluate the efficacy and safety of topical TNA combined with intense pulsed light (IPL) treatment in Asians with melasma. METHODS: A randomized, split-face (internally controlled) study was conducted in 15 women who received four monthly sessions of IPL to both sides of the face. Topical TNA or vehicle was applied to a randomly assigned side during and after IPL treatment. Patients were followed up for 12 weeks after completing the IPL treatments. Baseline and follow-up melanin index (MI; measured by MexameterÂ®, Courage and Khazaka, Cologne, Germany) and modified melasma area and severity index (mMASI) scores were determined. RESULTS: Thirteen subjects completed the study without serious adverse events. MI and mMASI decreased significantly from baseline to 12 weeks after the last IPL treatment on the topical TNA side but not on the vehicle side. The efficacy of topical TNA in preventing rebound pigmentation after IPL treatment was also statistically significant. CONCLUSION: Topical TNA can be considered an effective and safe adjuvant to conventional treatment for melasma. Tranexamic Acid Administration, Topical;Adult;Asian People;Combined Modality Therapy;Face;Female;Humans;Low-Level Light Therapy;Melanosis;Middle Aged;Tranexamic Acid;Treatment Outcome

Efficacy and Safety of 308-nm Monochromatic Excimer Lamp Versus Other Phototherapy Devices for Vitiligo: A Systematic Review with Meta-Analysis. BACKGROUND: Various phototherapy methods are used to treat vitiligo; however, the recent emergence of new devices has heightened debate concerning the best treatment method. OBJECTIVE: We aimed to systematically review and meta-analyze published data comparing the efficacy and adverse effects of monochromatic excimer lamps versus excimer laser and narrowband ultraviolet B (NB-UVB) in treating vitiligo. METHODS: A systematic search of PubMed, EMBASE, LILACS, Cochrane Central Register of Controlled Trials (CENTRAL), and clinical trials registries identified randomized controlled trials that included vitiligo patients, regardless of age, sex, or study language. We evaluated studies comparing excimer lamps with excimer laser or NB-UVB phototherapy. RESULTS: The review included six studies (411 patients, 764 lesions). No study found significantly different efficacy between excimer lamps and excimer laser using the outcomes of â‰¥50% repigmentation [risk ratio (RR) = 0.97, 95% confidence interval (CI) 0.84-1.11] and â‰¥75% repigmentation (RR = 0.96, 95% CI 0.71-1.30). Likewise, no study found significant differences between excimer lamps and NB-UVB (RR = 1.14, 95% CI 0.88-1.48 for â‰¥50% repigmentation; RR = 1.81, 95% CI 0.11-29.52 for â‰¥75% repigmentation). Adverse effects were mild, including pruritus, burning sensation, and dryness, none of which interrupted treatment. CONCLUSIONS: To our knowledge, this is the first systematic review of the efficacy and safety of excimer lamp treatment for vitiligo. Excimer lamps, excimer laser, and NB-UVB are all safe and effective in repigmentation of vitiligo lesions. Safety, effectiveness, and cost are considerations when choosing treatment. PROSPERO REGISTRATION NUMBER: CRD42014015237.
Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Phototherapy;Randomized Controlled Trials as Topic;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo

Photobiomodulation with 660-nm and 780-nm laser on activated J774 macrophage-like cells: Effect on M1 inflammatory markers. M1 profile macrophages exert a major influence on initial tissue repair process. Few days after the occurrence of injury, macrophages in the injured region exhibit a M2 profile, attenuate the effects of the M1 population, and stimulate the reconstruction of the damaged tissue. The different effects of macrophages in the healing process suggest that these cells could be the target of therapeutic interventions. Photobiomodulation has been used to accelerate tissue repair, but little is known regarding its effect on macrophages. In the present study, J774 macrophages were activated to simulate the M1 profile and irradiated with two different sets of laser parameters (780 nm, 70 mW, 2.6J/cm(2), 1.5s and 660 nm, 15 mW, 7.5 J/cm(2), 20s). IL-6, TNF-Î±, iNOS and COX-2 gene and protein expression were analyzed by RT-qPCR and ELISA. Both lasers were able to reduce TNF-Î± and iNOS expression, and TNF-Î± and COX-2 production, although the parameters used for 780 nm laser provided an additional decrease. 660 nm laser parameters resulted in an up-regulation of IL-6 expression and production. These findings imply a distinct, time-dependent modulation by the two different sets of laser parameters, suggesting that the best modulation may involve more than one combination of parameters. Interleukin-6;RNA, Messenger;Tumor Necrosis Factor-alpha;Nitric Oxide Synthase Type II;Ptgs2 protein, mouse;Cyclooxygenase 2
Animals;Cell Line;Cyclooxygenase 2;Interleukin-6;Lasers;Macrophages;Mice;Mice, Inbred BALB C;Nitric Oxide Synthase Type II;RNA, Messenger;Tumor Necrosis Factor-alpha

Efficacy of the ND:YAG laser therapy on EBV and HSV1 contamination in periodontal pockets.
AIM: The aim of this retrospective multicenter study was to verify the efficacy of Nd:YAG laser in the treatment of periodontal pockets infected by Epstein-Barr Virus (EBV) and Herpes Simplex Virus 1 (HSV1). METHODS: Subgingival plaque samples of 291 Italian periodontal patients were analyzed by Real Time PCR to evaluate the frequency of both viruses before and after Nd:YAG laser-assisted periodontal treatment. RESULTS: Before treatment, EBV and HSV1 were observed in 29.9% and in 3.8% of periodontal patients respectively, while co-infection with both viruses was detected in 1.7%

of cases. Periodontal Nd:YAG laser treatment ("Periodontal Biological Laser-Assisted Therapy", PERIOBLAST) produced statistical significant benefits, especially in EBV periodontal infection: 78.2% of EBV positive patients became EBV-negative following treatment. CONCLUSIONS: Results of this preliminary study highlight that EBV is found in periodontal pockets more frequently than HSV1, supporting the theory of the potential role of EBV in the onset and progression of periodontal disease. Moreover, our data showed that Nd:YAG laser-assisted periodontal treatment (Perioblast) is also effective in case of viral infection, validating evidences that it represents a successful alternative approach to traditional periodontal protocols. Dental Plaque;Gingiva;Herpesvirus 1, Human;Herpesvirus 4, Human;Humans;Italy;Lasers, Solid-State;Low-Level Light Therapy;Periodontal Pocket;Periodontics;Real-Time Polymerase Chain Reaction;Reproducibility of Results;Retrospective Studies

Congenital hypertrichosis universalis in Mexican female twins. Child;Diseases in Twins;Female;Follow-Up Studies;Genetic Diseases, X-Linked;Genetic Predisposition to Disease;Humans;Hypertrichosis;Low-Level Light Therapy;Mexico;Pedigree;Severity of Illness Index;Twins, Monozygotic

[Laser therapy in pressure ulcers: evaluation by the Pressure Ulcer Scale for Healing and Nursing Outcomes Classification]. OBJECTIVE: To describe the pressure ulcer healing process in critically ill patients treated with conventional dressing therapy plus low-intensity laser therapy evaluated by the Pressure Ulcer Scale for Healing (PUSH) and the result of Wound Healing: Secondary Intention, according to the Nursing Outcomes Classification (NOC). METHOD: Case report study according to nursing process conducted with an Intensive Care Unit patient. Data were collected with an instrument containing the PUSH and the result of the NOC. In the analysis we used descriptive statistics, considering the scores obtained on the instrument. RESULTS: A reduction in the size of lesions of 7cm to 1.5cm of length and 6cm to 1.1cm width, in addition to the increase of epithelial tissue and granulation, decreased secretion and odor. CONCLUSION: There was improvement in the healing process of the lesion treated with adjuvant therapy and the use of NOC allowed a more detailed and accurate assessment than the PUSH. Humans;Laser Therapy;Male;Middle Aged;Nursing Process;Pressure Ulcer;Treatment Outcome;Wound Healing

Bone regeneration by low-level laser therapy and low-intensity pulsed ultrasound therapy in the rabbit calvarium. OBJECTIVE: We evaluated the efficacy of low-level laser therapy (LLLT) and low-intensity pulsed ultrasound (LIPUS), alone and in combination, in triggering new bone formation. STUDY DESIGN: Sixteen New Zealand white rabbits were given two calvarial defects by using a 6-mm trephine bur, then divided into four treatment groups: control, LLLT, LIPUS, and LLLT+LIPUS. The LLLT and LIPUS groups were treated three times a week for two weeks. The LLLT+LIPUS group received each treatment on the same day, 12h apart, three days a week for two weeks. The animals were sacrificed after three weeks. RESULTS: LLLT and LIPUS, alone and in combination, enhanced new bone formation in comparison to the untreated controls after three weeks ($P<0.05$); the combined therapy did not produce an additive effect. CONCLUSIONS: Our results demonstrate the efficacy of LLLT or LIPUS in triggering bone regeneration. Therapeutic dose and duration requires further study. Animals;Bone Regeneration;Low-Level Light Therapy;Rabbits;Skull;Ultrasonic Therapy;Wound Healing;X-Ray Microtomography

Comparison of Low-Level Laser Therapy versus Ozone Therapy in the Treatment of Oral Lichen Planus. BACKGROUND: The treatment options for oral lichen planus (OLP) are numerous and include topical and systemic agents. Intralesional and systemic corticosteroids are used; however, the therapeutic results are often disappointing. OBJECTIVE: To compare the influence of ozone, laser, and topical corticosteroid therapies in the treatment of OLP. METHODS: One hundred twenty adult patients with â‰¤3 cm atrophic-erosive biopsy-proven OLPs in the tongue or buccal mucosa were

recruited into the study. They were randomly assigned, by preoperative envelope drawing, to be treated with low-level laser therapy (LLLT group), ozone therapy (ozonated group), and topical corticosteroid therapy (positive control group). A placebo treatment containing base ointment without the active corticosteroid component was administered to patients in the negative control group. Response rate scores were determined on the basis of changes in the appearance score and pain score of the lesions between baseline and after each treatment. RESULTS: The study subjects consisted of 56 male and 64 female OLP patients with a combined mean age of 42.6Â±8.3 years (range, 28~55 years). No statistically significant difference was detected in clinical severity among the groups. The sign scores decreased in almost all scoring groups; however, statistically significant improvement was found in the ozonated and corticosteroid-treated groups. Symptom improvement was achieved after treatment with LLLT, ozone, and corticosteroid ($p<0.05$). The efficacy indices were significantly higher in the ozonated and corticosteroid-treated groups. CONCLUSION: Ozone and corticosteroid therapies were more effective than 808-nm LLLT in the treatment of OLP.

Bone healing after low-level laser application in extraction sockets grafted with allograft material and covered with a resorbable collagen dressing: a pilot histological evaluation. BACKGROUND: Our aim was to determine whether low level laser therapy (LLLT) can decrease the time between extraction/socket graft and implant placement, by evaluating histological changes in sockets grafted with a particulate allograft material and treated with LLLT. METHODS: Thirty patients had a socket grafted with a particulate allograft material (MinerOss) covered with a resorbable collagen wound dressing. The patients were then randomly divided into two equal groups (nâ€‰=â€‰15): test group receiving postoperative LLLT treatment, and control group without postoperative laser treatment. The assessment of bone formation was carried out in both groups at well-determined time intervals after surgery by histostomorphometric analysis. RESULTS: The histological results of the site treated with LLLT for 21Â days, harvested at 60Â days after grafting showed abundant new bone formation without any sign of inflammation. The same results were obtained in the control group not before 120Â days post-surgery. CONCLUSIONS: It can be concluded that LLLT photobiomodulation can reduce the healing time after grafting the extraction socket. Histological evidence suggests that new bone formation in the sockets appeared within 60Â days after LLLT treatment compared to a minimum of 120Â days in the control group. Bone Substitutes;Dental Implants;MinerOss;Collagen Bandages;Bone Substitutes;Collagen;Dental Implants;Humans;Osteogenesis;Tooth Extraction;Tooth Socket;Wound Healing

Effects of low-intensity non-coherent light therapy on the inflammatory process in the calcaneal tendon of ovariectomized rats. The aim of this experimental study was to investigate the effects of low-intensity light-emitting diode (LED) phototherapy on the inflammatory process in the calcaneal tendon of ovariectomized rats (OVX) through the involvement of the inflammatory mediators interleukin (IL)-6, IL-10, and tumor necrosis factor-alpha (TNF-Î±). Thirty-five female Wistar rats were divided into 4 groups: 3 groups of OVX rats totaling 30 rats (untreated OVX rats [OVX injury group], treated OVX rats [OVX LED group], and control OVX rats; subgroups existed based on the sampling times, which were 3, 7, and 14Â days) and 1 group of non-OVX rats (not OVX; nâ€‰=â€‰5). Tendon injury was induced by trauma using a 208-g mass placed at 20Â cm from the right tendon of each animal with energy of 0.70Â J. The animals were treated 12Â h after tendonitis with LED therapy and every 48Â h thereafter until euthanasia (at 3, 7, or 14Â days). The tendons were dissected and stored in liquid nitrogen at -196Â Â°C, thawed only at the time of immunoenzymatic testing (ELISA). Groups treated with LED showed a decrease in the number of pro-inflammatory cells, IL-6, and TNF-Î± ($p<0.05$), and an increase in IL-10 (pâ€‰<â€‰0.05) when compared to the not OVX group (pâ€‰<â€‰0.05). It was concluded that low-intensity LED treatment using the parameters and wavelength of 945Â nm in the time periods studied reduced the release of IL-6 and TNF-Î± and

increased the release of IL-10, thereby improving the inflammatory response in OVX rats. Cytokines Achilles Tendon;Animals;Cytokines;Female;Inflammation;Low-Level Light Therapy;Ovariectomy;Rats;Rats, Wistar

Effect of Nd:YAG Low Level Laser Therapy on Human Gingival Fibroblasts. Aim. To evaluate the effect of Low Level Laser Therapy (LLLT) on human gingival fibroblasts in terms of proliferation and growth factors' secretion (EGF, bFGF, and VEGF). Materials and Methods. Primary cultures of keratinized mucosa fibroblasts were irradiated by a Nd:YAG laser 1064â€‰nm with the following energy densities: 2.6â€‰J/cm(2), 5.3â€‰J/cm(2), 7.9â€‰J/cm(2), and 15.8â€‰J/cm(2). Controls were not irradiated. Cultures were examined for cell proliferation and growth factors' secretion after 24, 48, and 72 hours. All experimental procedures were performed in duplicate. Data were analyzed by Student's t-test ($p < 0.05$). Results. All laser-irradiation doses applied promoted a higher cell proliferation at 48 hours in a dose-response relationship compared to controls. This difference reached statistical significance for the cultures receiving 15.8â€‰J/cm(2) ($p = 0.03$). Regarding EGF, all laser irradiation doses applied promoted a higher secretion at 48 hours in a reverse dose-response pattern compared to controls. This difference reached statistical significance for the cultures receiving 2.6â€‰J/cm(2) ($p = 0.04$). EGF levels at the other time points, bFGF, and VEGF showed a random variation between the groups. Conclusion. Within the limits of this study, LLLT (Nd:YAG) may induce gingival fibroblasts' proliferation and upregulate the secretion of EGF. Further studies are needed to confirm these results.

Effect of low-level laser therapy on irradiated parotid glands--study in mice. The objective of this study was to evaluate the effect of low-level laser therapy (LLLT) on radiotherapy-induced morphological changes and caspase-3 immunodetection in parotids of mice. Forty-one Swiss mice were divided into control, radiotherapy, 2- and 4-J laser groups. The experimental groups were exposed to ionizing radiation in a single session of 10 Gy. In the laser groups, a GaAlAs laser (830 nm, 100 mW, 0.028â€‰â€‰cm2, 3.57â€‰â€‰W/cm2) was used on the region corresponding to the parotid glands, with 2-J energy (20 s, 71â€‰â€‰J/cm2) or 4 J (40 s, 135â€‰â€‰J/cm2) per point. LLLT was performed immediately before and 24 h after radiotherapy. One point was applied in each parotid gland. The animals were euthanized 48 h or 7 days after radiotherapy and parotid glands were dissected for morphological analysis and immunodetection of caspase-3. There was no significant difference between groups in the immunodetection of caspase-3, but the laser groups had a lower percentage compared to the radiotherapy group. LLLT promoted the preservation of acinar structure, reduced the occurrence of vacuolation, and stimulated parotid gland vascularization. Of the two LLLT protocols, the one using 4 J of energy showed better results. Caspase 3 Animals;Caspase 3;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Mice;Parotid Gland;Radiation Dosage;Radiotherapy, Conformal;Treatment Outcome

Pilot study on the efficacy of combined intraoral and extraoral low-level laser therapy for prevention of oral mucositis in pediatric patients undergoing hematopoietic stem cell transplantation. OBJECTIVE AND BACKGROUND DATA: Studies suggest that intraoral low-level laser therapy (LLLT) can ameliorate oral mucositis in adult patients receiving high-dose chemotherapy. The objective of this study was to evaluate the use of a combined protocol of intraoral and extraoral LLLT in children undergoing hematopoietic stem cell transplantation (HSCT). METHODS: Twelve children undergoing HSCT were treated four times a week with a combined protocol of intraoral and extraoral LLLT, for a mean duration of 22 days. Clinical and functional mucositis scores were assessed using the National Cancer Institute Common Terminology Criteria for Adverse Events (NCI-CTCAE). These scores were compared with a matched retrospective control group of 12 children who did not receive LLLT during HSCT. RESULTS: Clinical mucositis scores were significantly lower in the LLLT group than in the control group (pâ€‰=â€‰0.004). Incidence of ulcerative oral mucositis was also significantly lower in the

LLLT group (pâ€‰=â€‰0.027). Functional limitation associated with diet/swallowing was less severe in the LLLT group; however, this was not statistically significant. CONCLUSIONS: This study indicates that a combined protocol of intraoral and extraoral application of LLLT can reduce the severity of oral mucositis in pediatric patients undergoing HSCT. Randomized double-blind clinical trials with a larger number of subjects are needed to further test such combined protocols.
Adolescent;Child;Child, Preschool;Female;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Male;Mucositis;Pilot Projects

Effect of excimer laser treatment on vitiliginous areas with leukotrichia after confirmation by dermoscopy. BACKGROUND: Leukotrichia is clinically common in patients with vitiligo, and dermoscopy is useful for finding white vellus hair. The use of phototherapy in the repigmentation of vitiliginous areas with leukotrichia is usually difficult because of a deficient melanocyte reservoir. OBJECTIVES: We sought to evaluate the effect of leukotrichia on the clinical outcomes of excimer laser treatment. METHODS: We treated 77 patients with vitiligo using excimer laser therapy. Vitiligo is classified into two types: segmental vitiligo (SV) and nonsegmental vitiligo (NSV). Before starting the treatment, we confirmed the leukotrichia of vitiliginous lesions by dermoscopy and then treated the areas once weekly for 24 weeks. At the beginning and 24 weeks later, we took clinical pictures and graded the repigmentation from 1 to 4. Grades 1 and 2 were defined as a poor response and grades 3 and 4 as a good response. RESULTS: Thirty-one of 77 patients with vitiligo had SV. Among those with SV, 24 (77.4%) had leukotrichia, and these patients showed a poor response compared to those without leukotrichia (P = 0.272). Three of 24 patients with SV and leukotrichia showed a good response. Among the 46 patients with NSV, 18 (39.1%) had leukotrichia and showed a poor response. Twenty-eight (60.9%) of the 46 patients with NSV without leukotrichia showed a good response in contrast to those with leukotrichia (P < 0.01). Comparison of the response to the excimer laser treatment, regardless of vitiligo type, showed that leukotrichia was a significant negative factor in the repigmentation of vitiliginous areas (P < 0.01). CONCLUSION: Excimer laser therapy was satisfactory in patients with vitiligo, including SV. Confirming the presence of leukotrichia in patients with vitiligo before excimer laser treatment would be helpful in predicting the response to treatment.
Adolescent;Adult;Age Factors;Cohort Studies;Dermoscopy;Esthetics;Female;Follow-Up Studies;Hair Color;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders;Retrospective Studies;Risk Assessment;Severity of Illness Index;Sex Factors;Treatment Outcome;Vitiligo;Young Adult

Atomic force microscopy investigation of the interaction of low-level laser irradiation of collagen thin films in correlation with fibroblast response. Low-level red laser (LLRL)-tissue interactions have a wide range of medical applications and are garnering increased attention. Although the positive effects of low-level laser therapy (LLLT) have frequently been reported and enhanced collagen accumulation has been identified as one of the most important mechanisms involved, little is known about LLRL-collagen interactions. In this study, we aimed to investigate the influence of LLRL irradiation on collagen, in correlation with fibroblast response. Atomic force microscopy (AFM) and fluorescence spectroscopy were used to characterize surfaces and identify conformational changes in collagen before and after LLRL irradiation. Irradiated and non-irradiated collagen thin films were used as culturing substrates to investigate fibroblast response with fluorescence microscopy. The results demonstrated that LLRL induced small alterations in fluorescence emission and had a negligible effect on the topography of collagen thin films. However, fibroblasts cultured on LLRL-irradiated collagen thin films responded to LRLL. The results of this study show for the first time the effect of LLRL irradiation on pure collagen. Although irradiation did not affect the nanotopography of collagen, it influenced cell behavior. The role of collagen appears to be crucial in the LLLT mechanism, and our

results demonstrated that LLRL directly affects collagen and indirectly affects cell behavior. Collagen Cell Line;Collagen;Fibroblasts;Humans;Lasers;Microscopy, Atomic Force
Early results of low-level laser application for masticatory muscle pain: a double-blind randomized clinical study. BACKGROUND: To evaluate the effect of Low Level Laser (LLL) application at the points of greatest pain in patients with chronic masticatory muscle pain. METHODS: A total number of 30 (21 women, 9 men, with a mean age of 39.2) were selected after the diagnosis of MPDS according to the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD). The patients were randomly divided into three groups; laser group I (nâ€‰=â€‰10); patients received the LLL at the point of greatest pain, laser group II (nâ€‰=â€‰10); patients received LLL at pre-established points in the effected muscles and placebo group (nâ€‰=â€‰10). LLL and placebo were applied three times per week, for a total of 12 sessions. Mandibular mobility was examined, masticator muscles tenderness were assessed and PPT values were obtained. Subjective pain levels were evaluated using VAS. The measurements performed before the treatment and after the completion of the therapy. Descriptive statistics (mean, standard deviation, and frequency) Student's t-test, Mann-Whitney U-test and paired-sample t-tests were used for analysis. RESULTS: In both laser groups, there was a statically significant reduction in PPT values of the muscles, number of muscles without any pain on palpation increased significantly, mandibular movements' ranges were improved. Laser group I demonstrated statistically better results than the Laser group II in all of the measured values. Plasebo group did not show any statistically difference in any of the measured values. CONCLUSIONS: LLLT can be accepted as an alternative treatment modality in the management of masticatory muscle pain and direct irradiation seems to effect better. TRIAL REGISTRATION: Current Controlled Trials ISRCTN31085 , Date of registration 28/08/20145. Adult;Double-Blind Method;Female;Humans;Laser Therapy;Male;Masticatory Muscles;Pain Management;Temporomandibular Joint Disorders
Periodontal Treatment Elevates Carotid Wall Shear Stress in the Medium Term. Periodontal disease is associated with endothelial dysfunction of the brachial artery and hemodynamic alterations of the common carotid artery. Periodontal therapy improves endothelial function. It is not known if it is able also to improve the hemodynamics of the carotid artery. The aim of the current study was to evaluate the efficacy of 2 different periodontal treatments on carotid hemodynamics: scaling and root planing (SRP) alone or together with low-level laser therapy (LLLT). Forty patients were recruited and randomly treated with SRP (n = 20) or SRP + LLLT (n = 20). Periodontal indices (plaque, gingival, and probing depth indices) were measured before and 5 months after treatment. Blood viscosity, common carotid wall shear stress, circumferential wall tension, and Peterson elastic modulus were evaluated before, soon after and 5 months after treatment. It was found that the periodontal indices improved in both groups, but significantly more so for SRP + LLLT than for SRP (decrease in gingival index 69.3% versus 45.4%, respectively, P = 0.04). In the SRP + LLLT group, after a transient reduction by 5% immediately after therapy, shear stress increased by 11% after 5 months. In SRP only group, however, shear stress variations were less marked. No significant changes were found for the other hemodynamic parameters in either of the groups. Periodontal disease treatment by SRP + LLLT can therefore be said to improve common carotid wall shear stress. This suggests a possible mechanism by which the treatment of periodontal disease has beneficial effects on the cardiovascular system. Carotid Arteries;Dental Scaling;Female;Hemodynamics;Humans;Male;Middle Aged;Root Planing;Stress, Mechanical;Time Factors
Treatment of recurrent aphthous stomatitis by laser therapy: A systematic review of the literature. BACKGROUND/AIM: Recurrent aphthous stomatitis (RAS) is defined as multifactor immunologic inflammatory lesions in the oral cavity, characterized by painful, recurrent single/multiple, shallow, round or ovoid ulcerations of mucosal tissues. To date, a considerable number of RAS treatment protocols have been suggested, but since the etiology of RAS is idiopathic, these treatment options

have symptomatic rather than curative or preventive effect. Recently, it has been suggested that laser therapy could be successfully used as an efficient treatment approach in therapy of RAS. Therefore, the aim of this review was to estimate the effects of laser therapy in treatment of RAS analyzing results of clinical studies published in peer reviewed journals. METHODS: The studies published until 31 December 2013 were obtained from the Medline/PubMed, Science Direct and Cochrane Library of the Cochrane Collaboration (CENTRAL) online databases, using following search terms and key words: "laser" AND "recurrent aphthous stomatitis", "laser" AND "aphthous", and "laser" AND "aphthae". In total 4 original research articles met the all required inclusion/exclusion criteria, and were used for this review. The main outcome measures assessed were: a reduction of pain associated with RAS and a reduction in episode duration (faster RAS healing). RESULTS: The assessed literature demonstrates the benefits of laser therapy mainly due to immediate analgesia and ability to speed up a RAS healing process. CONCLUSION: Even thoughthe assessed literature suggests beneficial outcomes of laser therapy in treatment of RAS, these results should be interpreted with caution. The issues related to the study designs and different sets of laser irradiation parameters of a limited number of available studies with the same treatment outcomes prevent us from making definite conclusions. Humans;Low-Level Light Therapy;Stomatitis, Aphthous

Osteonecrosis of the jaw (ONJ): diagnosis and management in 2015. Osteonecrosis of the jaw (ONJ) has been associated with the use of aminobisphosphonates and denosumab. The vast majority (>90%) of cases occur in the oncology patient population receiving high doses of intravenous bisphosphonates or subcutaneous denosumab. The incidence of ONJ in the osteoporosis patient population is very low and is estimated at 1-90 per 100,000 patient-years of exposure. In the oncology patient population the incidence appears to be related to dose and duration of exposure, and prevalence has been estimated to be as high as 18.6%. A number of risk factors in addition to antiresorptive therapy have been identified. These include the presence of periodontal disease, oral surgical procedures with extractions or implants, radiation therapy, chemotherapy, diabetes, glucocorticoid use, and smoking. Antiangiogenic agents appear to contribute to the risk of ONJ, however, data at this time are limited and further evidence is required prior to confirming a causal relationship. ONJ may be prevented with optimization of oral hygiene, the use of oral antimicrobial mouth rinses, as well as systemic antibiotic therapy. Individuals not responding to conservative management or in the advanced stages of ONJ may be considered for surgery, as data over the past several years have demonstrated surgical success in this patient population. Case reports have indicated that teriparatide may enhance healing. A number of experimental therapies are being evaluated and include the use of bone marrow stem cell intralesional transplantation, local application of platelet-derived growth factor, hyperbaric oxygen, tissue grafting, and low-level laser therapy. This paper summarizes the current research as well as the international consensus on the diagnosis and management of ONJ. Biomedical Research;Bisphosphonate-Associated Osteonecrosis of the Jaw;Disease Management;Humans;Risk Factors;Severity of Illness Index

Laser Phototherapy (660â€‰nm) Can Be Beneficial for Reducing Gingival Inflammation in Prosthodontics. Among the new technologies developed, low power lasers have enabled new approaches to provide conservative treatment. Low power lasers act at cellular level, resulting in reduced pain, modulating inflammation, and improved tissue healing. Clinical application of the low power laser requires specific knowledge concerning laser interaction with biological tissue so that the correct irradiation protocol can be established. The present case report describes the clinical steps involved in an indirect composite resin restoration performed in a 31-year-old patient, in whom low power laser was used for soft tissue biomodulation. Laser therapy was applied with a semiconductor laser 660â€‰nm, spot size of 0.028â€‰cm(2), energy density of 35.7â€‰J/cm(2), mean power of 100â€‰mW, and energy per point as 1â€‰J, in contact mode, on a total of 2 points (mesial and

distal), totaling 2â€‰J of energy. The therapy with low power laser can contribute positively to the success of an indirect restorative treatment.

PEGylated Cu3BiS3 hollow nanospheres as a new photothermal agent for 980 nm-laser-driven photothermochemotherapy and a contrast agent for X-ray computed tomography imaging. Developing multifunctional near-infrared (NIR) light-driven photothermal agents is in high demand for efficient cancer therapy. Herein, PEGylated Cu3BiS3 hollow nanospheres (HNSs) with an average diameter of 80 nm were synthesized through a facile ethylene glycol-mediated solvothermal route. The obtained PEGylated Cu3BiS3 HNSs exhibited strong NIR optical absorption with a large molar extinction coefficient of 4.1 Ã— 10(9) cm(-1) M(-1) at 980 nm. Under the irradiation of a 980 nm laser with a safe power density of 0.72 W cm(-2), Cu3BiS3 HNSs produced significant photothermal heating with a photothermal transduction efficiency of 27.5%. The Cu3BiS3 HNSs also showed a good antitumoral drug doxorubicin (DOX) loading capacity and pH- and NIR-responsive DOX release behaviors. At a low dosage of 10 Î¼g mL(-1), HeLa cells could be efficiently killed through a synergistic effect of chemo- and photothermo-therapy respectively based on the DOX release and the photothermal effect of Cu3BiS3 HNSs. In addition, Cu3BiS3 HNSs displayed a good X-ray computed tomography (CT) imaging capability. Furthermore, Cu3BiS3 HNSs could be used for efficient in vivo photothermochemotherapy and X-ray CT imaging of mice bearing melanoma skin cancer. This multifunctional theranostic nanomaterial shows potential promise for cancer therapy. Contrast Media;Drug Carriers;Sulfides;Copper;Doxorubicin;Bismuth Animals;Bismuth;Contrast Media;Copper;Doxorubicin;Drug Carriers;Hyperthermia, Induced;Low-Level Light Therapy;Melanoma;Mice;Nanoparticles;Sulfides;Tomography, X-Ray Computed

Photobiomodulation Suppresses Alpha-Synuclein-Induced Toxicity in an AAV-Based Rat Genetic Model of Parkinson's Disease. Converging lines of evidence indicate that near-infrared light treatment, also known as photobiomodulation (PBM), may exert beneficial effects and protect against cellular toxicity and degeneration in several animal models of human pathologies, including neurodegenerative disorders. In the present study, we report that chronic PMB treatment mitigates dopaminergic loss induced by unilateral overexpression of human Î±-synuclein (Î±-syn) in the substantia nigra of an AAV-based rat genetic model of Parkinson's disease (PD). In this model, daily exposure of both sides of the rat's head to 808-nm near-infrared light for 28 consecutive days alleviated Î±-syn-induced motor impairment, as assessed using the cylinder test. This treatment also significantly reduced dopaminergic neuronal loss in the injected substantia nigra and preserved dopaminergic fibers in the ipsilateral striatum. These beneficial effects were sustained for at least 6 weeks after discontinuing the treatment. Together, our data point to PBM as a possible therapeutic strategy for the treatment of PD and other related synucleinopathies. Animals;Corpus Striatum;Disease Models, Animal;Dopaminergic Neurons;Female;Low-Level Light Therapy;Parkinson Disease;Rats;Rats, Sprague-Dawley;Substantia Nigra

The clinical efficacy of laser assisted modified Widman flap: A randomized split mouth clinical trial. OBJECTIVE: The objective of the study was to compare the clinical efficacy of use of a diode laser (DL) (810 nm) as an adjunct to modified Widman flap (MWF) surgery to that of MWF alone. MATERIALS AND METHODS: Twenty-five patients between the ages of 20 and 50 years with generalized chronic periodontitis were selected for the study. Control sites (Group A) were randomly selected to receive an MWF, and the contralateral test sites (Group B) received MWF in conjunction with low-level laser therapy. The energy density of 4 J/cmÂ² was applied to the gingival surface after periodontal treatment. The study tooth/site was treated along with any additional teeth in the quadrant in which the site was located if needed. Randomization was done using a coin flip. The DL was used to de-epithelialize the inner part of the periodontal flap and photo-biostimulate the surgical area. Plaque index (PI), papillary bleeding index (PBI), probing depth (PD), and clinical attachment level (CAL)

scores were recorded at baseline and at 6 and 9 months. STATISTICAL ANALYSIS: Data were expressed as the mean Â± standard deviation. Statistical analyzes were performed using paired Student's t-testfor intragroup comparisons and unpaired Student's t-test for intergroup comparisons. RESULTS: No significant difference was observed in PI scores between the two groups at baseline, 6 and 9 months. PBI scores were significantly lower in Group B versus Group A at 6 months ($P < 0.01$). However, no significant difference was observed between the two groups in PBI scores at the end of 9 months. PD reduction in Group B versus Group A was statistically significant at the end of 9 months ($P < 0.01$). Gains in CAL were significantly greater in Group B versus Group A at 6 and 9 months. CONCLUSION: The use of an 810 nm DL provided additional benefits to MWF surgery in terms of clinical parameters. Adult;Female;Humans;Lasers, Semiconductor;Male;Mouth;Oral Surgical Procedures;Periodontitis;Surgical Flaps;Young Adult

Effects of low-dose light-emitting-diode therapy in combination with water bath for atopic dermatitis in NC/Nga mice. BACKGROUND: Light-emitting diode (LED) phototherapy and water bath therapy have beneficial effect on atopic dermatitis (AD)-like skin disease. However, not all current treatments work well and alternative therapies are need. The contribution of combination therapy with low-dose 850 nm LED and water bath was investigated on dermatophagoides farina (Df)-induced dermatitis in NC/Nga mice. METHODS: Low-dose LED (10, 15, and 20 J/cm(2)) irradiation, water bath (36 Â± 1Â°C) were administered separately and together to the Df-induced NC/Nga mice in acrylic jar once a day for 2 weeks. RESULTS: Combined therapy with low-dose LED therapy and water bath therapy significantly ameliorated the development of AD-like skin lesions. These effects were correlated with the suppression of total IgE, NO, histamine, and Th2-mediated immune responses. Furthermore, combination therapy significantly reduced the infiltration of inflammatory cells and the induction of thymic stromal lymphopoietin (TSLP) in the skin lesions. The beneficial therapeutic effects of this combination therapy might regulate by the inhibition of various immunological responses including Th2-mediated immune responses, inflammatory mediators such as IgE, histamine, and NO, as well as inflammatory cells. CONCLUSIONS: The combination therapy of LED and water bath might be used as an efficacious, safe, and steroid-free alternative therapeutic strategy for the treatment of AD. Cytokines;Nitric Oxide;Immunoglobulin E;Thymic Stromal Lymphopoietin;TSLP protein, mouse Animals;Baths;Cytokines;Dermatitis, Atopic;Immunoglobulin E;Male;Mice;Nitric Oxide;Phototherapy;Th2 Cells;Thymic Stromal Lymphopoietin

Pityriasis Alba--Common Disease, Enigmatic Entity: Up-to-Date Review of the Literature. Pityriasis alba (PA) is a skin disorder that affects children and adolescents. Although it is common worldwide, its incidence is markedly higher in darker skin phototypes. Its characteristic features include an extended, multistage course and spontaneous remissions and recurrences. Preceded by erythematous changes, patches of hypopigmented skin of up to a few centimeters in diameter appear on the upper body. Pruritus may accompany it. Even though its etiology is unknown, possible reported triggering factors include sunlight, beauty treatments, and microorganisms, among others. Calcineurin inhibitors play the most crucial role in PA pharmacotherapy. PA often coexists with atopic dermatitis and is considered one of its milder forms. Dermatologic Agents;Immunosuppressive Agents Administration, Cutaneous;Adolescent;Age Factors;Biopsy, Needle;Child;Child, Preschool;Chronic Disease;Dermatologic Agents;Disease Progression;Female;Humans;Immunohistochemistry;Immunosuppressive Agents;Low-Level Light Therapy;Male;Pityriasis;Prognosis;Risk Assessment;Severity of Illness Index;Sex Factors;Treatment Outcome

Adjunctive Application of Antimicrobial Photodynamic Therapy in Nonsurgical Periodontal Treatment: A Review of Literature. Periodontal disease is caused by dental plaque biofilms, and the removal

of these biofilms from the root surface of teeth plays a central part in its treatment. The conventional treatment for periodontal disease fails to remove periodontal infection in a subset of cases, such as those with complicated root morphology. Adjunctive antimicrobial photodynamic therapy (aPDT) has been proposed as an additional treatment for this infectious disease. Many periodontal pathogenic bacteria are susceptible to low-power lasers in the presence of dyes, such as methylene blue, toluidine blue O, malachite green, and indocyanine green. aPDT uses these light-activated photosensitizer that is incorporated selectively by bacteria and absorbs a low-power laser/light with an appropriate wavelength to induce singlet oxygen and free radicals, which are toxic to bacteria. While this technique has been evaluated by many clinical studies, some systematic reviews and meta-analyses have reported controversial results about the benefits of aPDT for periodontal treatment. In the light of these previous reports, the aim of this review is to provide comprehensive information about aPDT and help extend knowledge of advanced laser therapy. Anti-Bacterial Agents;Photosensitizing Agents Animals;Anti-Bacterial Agents;Biofilms;Dental Plaque;Humans;Low-Level Light Therapy;Periodontal Diseases;Photochemotherapy;Photosensitizing Agents;Rats

Common Blepharitis Related to Phthiriasis Palpebrarum: Argon Laser Phototherapy. A 42-year-old woman was admitted to Mersin University, Department of Ophthalmology Clinic with itching and burning sensation of the right eye for 3 weeks. In her slit-lamp examination, nits and lice, attached to the upper and lower eyelashes of her right eye, were observed. Lice and nits were destroyed by argon laser phototherapy and were removed with the help of a fine forceps thereafter. Argon laser phototherapy is a quick, effective, and safe treatment modality for phthiriasis palpebrarum. Argon Adult;Animals;Argon;Blepharitis;Eyelashes;Female;Humans;Lice Infestations;Low-Level Light Therapy;Phthirus;Pruritus

Laser and light-based treatment options for hidradenitis suppurativa. Hidradenitis suppurativa (HS) is a chronic inflammatory disease that commonly develops painful, deep dermal abscesses and chronic, draining sinus tracts. Classically, pharmacologic and surgical therapies have been effective for reducing lesion activity and inflammation, but provide only modest success in the prevention of future recurrences and disease progression. Adjunctive therapies, such as laser and light-based therapies, have become more commonly used in the management of HS. These therapies work to reduce the occurrence of painful HS flare-ups by decreasing the number of hair follicles, sebaceous glands, and bacteria in affected areas, and by ablatively debulking chronic lesions. The best results are seen when treatment is individualized, taking disease severity into consideration when selecting specific energy-based approaches. This article will discuss various light-based therapies and the evidence supporting their use in the management of HS. Adult;Combined Modality Therapy;Female;Follow-Up Studies;Hidradenitis Suppurativa;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Male;Pain Measurement;Recurrence;Risk Assessment;Severity of Illness Index;Treatment Outcome;Wound Healing;Young Adult

The Radiological and Stereological Analysis of the Effect of Low-Level Laser Therapy on the Mandibular Midline Distraction Osteogenesis. OBJECTIVE: The aim of this study was to evaluate the effect of low level laser therapy (LLLT) on bone mineral density by using high-resolution computerized tomography (HR-CT) and stereology in patients subjected to mandibular midline distraction. METHODS: Nine patients between the ages of 13 and 16 years with mandibular transverse deficiency (>5 mm) were evaluated. Mandibular midline distraction osteogenesis was performed for all the patients. The patients were divided into 2 groups: the control group (n = 4) and the laser group (n = 5). GaAlAs, 830 nm wavelength, power of 40 mW, energy of 8.4 J/cm2 dose per spot, was directly applied from 2 points on the mandibular midline. The laser was applied in 8 treatment sessions at 48-hour intervals. Bone mineral density and volume of the newly formed bone

were analyzed using HR-CT and stereological methods. RESULTS: A higher bone mineral density rate was found in the laser group (P < 0.05). A higher newly formed immature bone rate was found in the control group (P < 0.001). These findings suggest that more mature bone may also have a greater mineral organization than that of immature newly formed bone, which is shown by HR-CT and stereological results. CONCLUSIONS: The retention period can be shortened and mineralization may be increased by using LLLT in mandibular distraction osteogenesis. Adolescent;Alveolar Process;Bone Density;Calcification, Physiologic;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Osteogenesis;Osteogenesis, Distraction;Pain Measurement;Pain, Postoperative;Radiation Dosage;Tomography, X-Ray Computed

The influence of low-level laser irradiation on spinal cord injuries following ischemia-reperfusion in rats. PURPOSE: To investigate if low level laser therapy (LLLT) can decrease spinal cord injuries after temporary induced spinal cord ischemia-reperfusion in rats because of its anti-inflammatory effects. METHODS: Forty eight rats were randomized into two study groups of 24 rats each. In group I, ischemic-reperfusion (I-R) injury was induced without any treatment. Group II, was irradiated four times about 20 minutes for the following three days. The lesion site directly was irradiated transcutaneously to the spinal direction with 810 nm diode laser with output power of 150 mW. Functional recovery, immunohistochemical and histopathological changes were assessed. RESULTS: The average functional recovery scores of group II were significantly higher than that the score of group I (2.86 Â± 0.68, vs 1.38 Â± 0.09; p<0.05). Histopathologic evaluations in group II were showed a mild changes in compare with group I, that suggested this group survived from I-R consequences. Moreover, as seen from TUNEL results, LLLT also protected neurons from I-R-induced apoptosis in rats. CONCLUSION: Low level laser therapy was be able to minimize the damage to the rat spinal cord of reperfusion-induced injury. Animals;Immunohistochemistry;In Situ Nick-End Labeling;Lasers, Semiconductor;Low-Level Light Therapy;Male;Random Allocation;Rats, Wistar;Reperfusion Injury;Reproducibility of Results;Spinal Cord;Spinal Cord Injuries;Spinal Cord Ischemia;Time Factors;Treatment Outcome

Comparison of the Effect of Low-Level Laser and Phenytoin Therapy on Skin Wound Healing in Rats. INTRODUCTION: Different modalities have been used to achieve better results in wound healing among which are laser and pharmacological agents. To our knowledge, there is no investigation to compare phenytoin and laser together. In this study, we aimed to evaluate laser and phenytoin efficacy and compare their effect on wound healing. METHODS: We used 60 rats. The animals were divided into 4 groups, 15 rats in each and each group was subdivided into 3 subgroups for which postoperative evaluation was performed on days 3, 7, and 14. After general anesthesia and back hair shaving of each rat, an excisional wound was made. The wounds in group 2 were treated with 1% phenytoin cream. In group 3, the wounds were irradiated with diode laser. The wounds of group 4 were treated with both phenytoin cream and laser administration. The animals of group 1 served as control. For histopathological evaluation, hematoxylin and eosin staining was used. Polymorphonuclear leucocytes (PMNs), re-epithelization, fibroblasts, new vessels and collagen were evaluated. RESULTS: Faster reduction in polymorphonuclear cells after 7 and 14 days and more collagen fibers on the third day in laser treated group was statistically significant (P < .05) .The result for the phenytoin treated group were not better than control group. When both laser and phenytoin were used samples showed more collagen fibers on the third day, which was statistically significant (P < .05). CONCLUSION: It seems that low level laser is effective in skin wound healing and have better results than phenytoin application.

Transcranial Near-Infrared Laser Therapy for Stroke: How to Recover from Futility in the NEST-3 Clinical Trial. Development of drugs and devices for the treatment of stroke is not exempt from current translational research standards, which include Stroke Treatment Academic Industry

Roundtable (STAIR) criteria and RIGOR guidelines. Near-infrared laser therapy (NILT) was developed to treat stroke in an era when STAIR criteria were not adhered to, thus NILT was not optimized in multiple species, nor was it optimized for efficacy across barriers in translational animal models before proceeding to expensive and extensive clinical trials. Moreover, the majority of rodent studies did not adhere to RIGOR guidelines. This ultimately led to failure in the NeuroThera Effectiveness and Safety Trial-3. Because NILT remains a promising therapeutic approach to treat stroke, we designed a systematic study to determine laser light penetration profiles across the skull of four different species with increasing skull thickness: mouse, rat, rabbit, and human.Our study demonstrates that NILT differentially penetrates the skulls. There is especially extensive attenuation of light energy penetration across the human calvaria, compared with animal skulls, which suggests that the power density setting used in stroke clinical trials may not have optimally stimulated neuroprotection and repair pathways. The results of our study suggest that NILT cannot be sufficiently optimized in "small" animals and directly translated to humans because of significant variances of skull thickness and penetration characteristics across species. NILT neuroprotection should be further studied using a research design that endeavors to incorporate human skull characteristics (thickness) into the development plan to increase the probability of success in stroke victims. Adenosine Triphosphate;Electron Transport Complex IV Adenosine Triphosphate;Animals;Disease Models, Animal;Electron Transport Complex IV;Humans;In Vitro Techniques;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Mitochondria;Organ Size;Rabbits;Rats;Rats, Sprague-Dawley;Skull;Stroke;Tomography, X-Ray Computed

Near-infrared light is neuroprotective in a monkey model of Parkinson disease. OBJECTIVE: To examine whether near-infrared light (NIr) treatment reduces clinical signs and/or offers neuroprotection in a subacute 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) monkey model of Parkinson disease. METHODS: We implanted an optical fiber device that delivered NIr (670 nm) to the midbrain of macaque monkeys, close to the substantia nigra of both sides. MPTP injections (1.5-2.1mg/kg) were made over a 5- to 7-day period, during which time the NIr device was turned on. This was then followed by a 3-week survival period. Monkeys were evaluated clinically (eg, posture, bradykinesia) and behaviorally (open field test), and their brains were processed for immunohistochemistry and stereology. RESULTS: All monkeys in the MPTP group developed severe clinical and behavioral impairment (mean clinical scores = 21-34; n = 11). By contrast, the MPTP-NIr group developed much less clinical and behavioral impairment (n = 9); some monkeys developed moderate clinical signs (mean scores = 11-15; n = 3), whereas the majority--quite remarkably--developed few clinical signs (mean scores = 1-6; n = 6). The monkeys that developed moderate clinical signs had hematic fluid in their optical fibers at postmortem, presumably limiting NIr exposure and overall clinical improvement. NIr was not toxic to brain tissue and offered neuroprotection to dopaminergic cells and their terminations against MPTP insult, particularly in animals that developed few clinical signs. INTERPRETATION: Our findings indicate NIr to be an effective therapeutic agent in a primate model of the disease and create the template for translation into clinical trials. Neurotoxins;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Animals;Behavior, Animal;Disease Models, Animal;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Macaca fascicularis;Male;Mesencephalon;Neurotoxins;Optical Fibers

Cloacal reconstruction after a complex treatment of perineal haemangioma in a variant of PELVIS syndrome. BACKGROUND: PELVIS is an acronym defining the association of perineal hemangioma, malformations of external genitalia, lipomyelomeningocele, vesicorenal abnormalities, imperforate anus and skin tag. Eleven cases have been reported according to the Orphanet data. Acronyms of LUMBAR and SACRAL syndrome have been used and most probably represent a spectrum of the same entity. Very little is known about the success and timing of cloacal

reconstruction after the treatment of hemangioma. We present a variant of PELVIS syndrome and discuss the possibilities and optimal timing of surgical reconstruction. CASE PRESENTATION: Female infant was born with persistent cloaca and multiple hemangiomas of genitals, perineal area and left thigh. Colostomy was performed after birth. In order to treat hemangioma and to make the reconstruction of cloaca possible, corticosteroid treatment orally and multiple laser treatments were performed alternating Nd:YAG laser and pulsed dye laser therapy. Cystoscopy confirmed hemangiomatosis in the mucosa of the common channel, bladder neck and septate vagina. Oral propranolol treatment was started at the age of 18 months and continued for 1 year. It induced rapid improvement of hemangiomas. Two more pulsed dye laser treatments were performed to remove residuals of hemangiomas from the perineum and genital area. Posterior sagital reconstruction by separation of the rectum, mobilization of urogenital sinus and vaginal reconstruction was performed with no major bleeding at the age of 4 years. Postoperatively, after a period of progressive rectal dilatation colostomy was closed. Girl is now 6 years old, dry day and night without residual urine and normal upper tracts. Rectal calibration is normal, fecal continence is still to be evaluated but constipation is easily manageable. CT of the spine and the perineum showed sacral dysplasia and spina bifida with lumbo-sacral lipoma and tethering of terminal filum without neurological deterioration at the moment but requiring close neurological monitoring. CONCLUSIONS: Large perineal hemangiomas are commonly associated with extracutaneous abnormalities. Successful reconstructive surgery is possible after significant reduction of hemangioma by complex treatment.
Antineoplastic Agents, Hormonal;Prednisolone Antineoplastic Agents, Hormonal;Anus, Imperforate;Combined Modality Therapy;Female;Genital Diseases, Female;Hemangioma;Humans;Infant;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Perineum;Prednisolone;Rectum;Syndrome;Thigh;Urogenital Abnormalities;Vagina

Low-Level Laser Therapy in the Management of Mucositis and Dermatitis Induced by Cancer Therapy.
Chemoradiotherapy;Dermatitis;Humans;Low-Level Light Therapy;Mucositis;Neoplasms

The Effect of Low-Level Laser Therapy on the Healing of Open Wounds in Dogs. OBJECTIVE: To evaluate the effects of low-level laser therapy (LLLT) on acute, full-thickness wound healing in dogs. STUDY DESIGN: Randomized block (dog); historical control. ANIMALS: Adult male Beagles (n = 10). METHODS: Two 2 Ã— 2 cm(2) wounds were surgically created bilaterally on the trunk of each dog. Each side was randomized to receive LLLT (laser, LAS) or standard-of-care management (control, CON), 3 times weekly for 32 days. The LLLT consisted of a dual diode laser (7.5 mW/diode) at 635 nm and total energy density of 1.125 J/cm(2). Wound planimetry was performed on the caudal wounds, from which percent contraction and percent epithelialization were calculated. Histologic features were evaluated at 7 time points from cranial wound biopsies. Experimental data were also compared to wounds from a historical female control cohort (historical control, HCON). RESULTS: There was no difference between LAS and CON wounds for all parameters, including histology. The HCON wounds had significantly greater contraction and epithelialization compared to LAS and CON wounds. The LAS and CON wounds had significantly less inflammation than HCON wounds early in wound healing, but inflammation was significantly greater in LAS and CON wounds by day 21. Fibroblast infiltration and collagen deposition were significantly less in LAS and CON wounds than HCON wounds. CONCLUSION: There are no apparent beneficial effects of LLLT on the healing of acute wounds in healthy dogs using this LLLT protocol. Gender may influence wound healing in intact dogs.
Animals;Dogs;Lasers, Semiconductor;Low-Level Light Therapy;Male;Random Allocation;Wound Healing

The effect of low-level diode laser therapy on early differentiation of osteoblast via BMP-2/TGF-Î²1 and its receptors. OBJECTIVES: The objective of this study was to determine the effect of LLDL therapy on the gene expression of osteoblast markers of growth and differentiation. MATERIALS AND

METHODS: The MG-63 cell line was exposed to diode laser (ezLase) of 940 nm at 1-1.5 W and 3-4 J, and gene expressions (Runx-2, alkaline phosphatase [ALP], type I collagen [Col-I], osterix [OSX], osteocalcin [OSC], osteoprotegerin [OPG], bone morphogenetic protein [BMP]-2 and -7, transforming growth factor-Î²1 [TGF-Î²1], and TGF-Î² receptors [TGF-Î² R1, TGF-Î² R2; TGF-Î² R3]) were evaluated by quantitative RT-PCR. RESULTS: LLDL treatment stimulated the expression of osteoblast differentiation markers ALP, Col-I, Runx-2, and OSX in relation to the doses applied ($P < 0.05$), but no changes were detected in OSC, OPG, or BMP-7 at any study dose. This effect may be mediated by TGF-Î²1 and BMP-2, given that the treatment increased their expression and that of TGF-Î² receptors R1, R2, and R3 ($P < 0.001$). CONCLUSION: These results suggest that the biostimulatory effect of laser therapy on osteoblasts may be attributable to the release of autocrine factors in response to the irradiation. A clinical trial is warranted to test its therapeutic usefulness in bone tissue regeneration and to define a treatment protocol. BMP2 protein, human;Bone Morphogenetic Protein 2;Bone Morphogenetic Protein 7;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Osteoprotegerin;RUNX2 protein, human;Receptors, Transforming Growth Factor beta;Sp7 Transcription Factor;Transforming Growth Factor beta1;Osteocalcin;Alkaline Phosphatase Alkaline Phosphatase;Bone Morphogenetic Protein 2;Bone Morphogenetic Protein 7;Cell Differentiation;Cell Line;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Gene Expression;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteocalcin;Osteoprotegerin;Receptors, Transforming Growth Factor beta;Sp7 Transcription Factor;Transforming Growth Factor beta1

Effect of single-dose low-level helium-neon laser irradiation on orthodontic pain: a split-mouth single-blind placebo-controlled randomized clinical trial. BACKGROUND: Pain is the most common complication of orthodontic treatment. Low-level laser therapy (LLLT) has been suggested as a new analgesic treatment free of the adverse effects of analgesic medications. However, it is not studied thoroughly, and the available studies are quite controversial. Moreover, helium neon (He-Ne) laser has not been assessed before. METHODS: This split-mouth placebo-controlled randomized clinical trial was performed on 16 male and 14 female orthodontic patients requiring bilateral upper canine retraction. The study was performed at a private clinic in Sari, Iran, in 2014. It was single blind: patients, orthodontist, and personnel were blinded of the allocations, but the laser operator (periodontist) was not blinded. Once canine retractor was activated, a randomly selected maxillary quarter received a single dose of He-Ne laser irradiation (632.8 nm, 10 mw, 6 j/cm(2) density). The other quarter served as the placebo side, treated by the same device but powered off. In the first, second, fourth, and seventh days, blinded patients rated their pain sensed on each side at home using visual analog scale (VAS) questionnaires. There was no harm identified during or after the study. Pain changes were analyzed using two- and one-way repeated-measures ANOVA, Bonferroni, and t-test ($Î± = 0.01$, $Î² > 0.99$). This trial was not registered. It was self-funded by the authors. RESULTS: Sixteen males and 11 females remained in the study (aged 12-21). Average pain scores sensed in all 4 intervals on control and laser sides were 4.06 Â± 2.85 and 2.35 Â± 1.77, respectively (t-test $P < 0.0001$). One-way ANOVA showed significant pain declines over time, in each group ($P < 0.0001$). Two-way ANOVA showed significant effects for LLLT ($P < 0.0001$) and time ($P = <0.0001$). CONCLUSIONS: Single-dose He-Ne laser therapy might reduce orthodontic pain caused by retracting maxillary canines. Dental Alloys;Placebos;Stainless Steel Adolescent;Child;Cuspid;Dental Alloys;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Maxilla;Orthodontic Brackets;Orthodontic Wires;Pain;Pain Measurement;Placebos;Single-Blind Method;Stainless Steel;Tooth Movement Techniques;Young Adult

Low-intensity red and infrared laser effects at high fluences on Escherichia coli cultures. Semiconductor laser devices are readily available and practical radiation sources providing wavelength tenability and high monochromaticity. Low-intensity red and near-infrared lasers are

considered safe for use in clinical applications. However, adverse effects can occur via free radical generation, and the biological effects of these lasers from unusually high fluences or high doses have not yet been evaluated. Here, we evaluated the survival, filamentation induction and morphology of Escherichia coli cells deficient in repair of oxidative DNA lesions when exposed to low-intensity red and infrared lasers at unusually high fluences. Cultures of wild-type (AB1157), endonuclease III-deficient (JW1625-1), and endonuclease IV-deficient (JW2146-1) E. coli, in exponential and stationary growth phases, were exposed to red and infrared lasers (0, 250, 500, and 1000 J/cm2) to evaluate their survival rates, filamentation phenotype induction and cell morphologies. The results showed that low-intensity red and infrared lasers at high fluences are lethal, induce a filamentation phenotype, and alter the morphology of the E. coli cells. Low-intensity red and infrared lasers have potential to induce adverse effects on cells, whether used at unusually high fluences, or at high doses. Hence, there is a need to reinforce the importance of accurate dosimetry in therapeutic protocols.
DNA, Bacterial DNA Damage;DNA, Bacterial;Escherichia coli;Infrared Rays;Low-Level Light Therapy

Low-level red laser therapy alters effects of ultraviolet C radiation on Escherichia coli cells. Low-level lasers are used at low power densities and doses according to clinical protocols supplied with laser devices or based on professional practice. Although use of these lasers is increasing in many countries, the molecular mechanisms involved in effects of low-level lasers, mainly on DNA, are controversial. In this study, we evaluated the effects of low-level red lasers on survival, filamentation, and morphology of Escherichia colicells that were exposed to ultraviolet C (UVC) radiation. Exponential and stationary wild-type and uvrA-deficientE. coli cells were exposed to a low-level red laser and in sequence to UVC radiation. Bacterial survival was evaluated to determine the laser protection factor (ratio between the number of viable cells after exposure to the red laser and UVC and the number of viable cells after exposure to UVC). Bacterial filaments were counted to obtain the percentage of filamentation. Area-perimeter ratios were calculated for evaluation of cellular morphology. Experiments were carried out in duplicate and the results are reported as the means of three independent assays. Pre-exposure to a red laser protected wild-type and uvrA-deficient E. coli cells against the lethal effect of UVC radiation, and increased the percentage of filamentation and the area-perimeter ratio, depending on UVC fluence and physiological conditions in the cells. Therapeutic, low-level red laser radiation can induce DNA lesions at a sub-lethal level. Consequences to cells and tissues should be considered when clinical protocols based on this laser are carried out.
DNA, Bacterial DNA Damage;DNA, Bacterial;Escherichia coli;Low-Level Light Therapy;Ultraviolet Rays

Efficacy of low-level laser therapy associated to orthoses for patients with carpal tunnel syndrome: A randomized single-blinded controlled trial. OBJECTIVE: Compare the efficacy of orthoses and patient education with and without the addition to Low-Level Laser Therapy (LLLT - 660 nm, 30 mW, a continuous regime and bean area of 0.06 cm2). The laser irradiation was delivered with the fluency of 10J/cm2 in patients with mild and moderate Carpal Tunnel Syndrome (CTS). METHODS: 48 patients were randomized and 30 finished the protocol (a sample loss of 37.5%), 90% female and 10% males. Randomization was applied to allocate the patients in each one of the groups, with association or not to LLLT (group orthoses or LLLT and orthoses). All of them were submitted to ergonomic home orientations. The short-term symptoms and function outcome were assessed through: Boston Carpal Tunnel Questionnaire (BCTQ) - Severity of Symptoms (SS) Functional Score (FS). Pain (VAS), Semmes-Weinstein monofilaments, 2PD and pinch strength was used for characterization of the sample. Most of the participants were women, over 4th decade enrolled on heavy hand duties occupations, right-handed, 66.7% affected on dominant hand, without alterations in sensory median nerve thresholds or pinch strength. RESULTS: Both groups showed a reduction of total BCTQ score and its subdomains

after six weeks, with significant difference ($p < 0.05$), comparing to baseline. No significant difference was found between groups. A Minimal clinical change was observed after the intervention in 92.3% of participants for BCTQ subdomain severity of symptoms at individual comparison for LLLT and orthoses group and 76.5% for the orthoses group, demonstrating clinical relevance. Effect size Cohen's index was moderate for the severity of symptoms. CONCLUSION: LLLT in association to orthoses and ergonomic orientation seems to be effective in short-term symptoms relieve for patients with mild and moderate CTS. Carpal Tunnel Syndrome;Conservative Treatment;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Education as Topic;Single-Blind Method;Splints;Visual Analog Scale

Combination treatment with excimer laser and narrowband UVB light in vitiligo patients. BACKGROUND: For the treatment of vitiligo, narrowband UVB (NBUVB) light is considered the most effective for nonsegmental vitiligo, while excimer laser treatment is commonly used for localized vitiligo. However, treatment areas may potentially be missed with excimer laser treatment. OBJECTIVE: We aimed to evaluate the effect of combinational treatment with NBUVB light and excimer laser on vitiligo. METHODS: All patients were first treated with NBUVB; excimer laser was then applied in conjunction with NBUVB phototherapy due to a slow response or no further improvement with continuous NBUVB treatment alone. To minimize adverse effects, a fixed dose of NBUVB was administered, and the dose of excimer laser was increased based on patient response. RESULTS: Among 80 patients, 54 patients showed responses after combination with excimer laser; however, 26 patients (32.5%) showed no remarkable change after combination therapy. Of the 26 patients who showed no further response, 12 patients (46.1%) presented with vitiligo on the acral areas, which are known to the least responsive sites. CONCLUSION: Our study suggests that combined treatment of NBUVB and excimer laser in vitiligo may enhance the treatment response without remarkable side effects, therefore might also increase the compliance of the patients to the treatment. Adult;Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Ultraviolet Rays;Vitiligo

Effect of low-level laser therapy on orthodontic tooth movement into bone-grafted alveolar defects. INTRODUCTION: The objective of this study was to investigate the effect of low-level laser therapy (LLLT) on the rate of orthodontic tooth movement (OTM) into bone-grafted alveolar defects based on different healing states. METHODS: Ten male beagles were randomly allocated to 3 groups: group C, OTM alone as a control; group G, OTM into the grafted defects; group GL, OTM into the grafted defects with LLLT. The maxillary second premolars were protracted into the defects for 6 weeks, immediately (G-0 and GL-0) and at 2 weeks (G-2 and GL-2) after surgery. The defects were irradiated with a diode laser (dose, 4.5 J/cm(2)) every other day for 2 weeks. The rates of OTM and alveolar bone apposition, and maturational states of the defects were analyzed by histomorphometry, microcomputed tomography, and histology. RESULTS: The total amounts of OTM and new bone apposition rates were decreased by LLLT, with increased bone mineral density and trabecular maturation in the defects. Group GL-2 had the slowest movement with root resorption in relation to less woven bone in the hypermatured defect. CONCLUSIONS: LLLT significantly decreased the rate of OTM into the bone-grafted surgical defects by accelerating defect healing and maturation, particularly when the start of postoperative OTM was delayed. Bone Substitutes;Fluorescent Dyes Alveolar Process;Animals;Bone Density;Bone Matrix;Bone Regeneration;Bone Remodeling;Bone Substitutes;Bone Transplantation;Dogs;Fluorescent Dyes;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxillary Diseases;Osteogenesis;Random Allocation;Tooth Movement Techniques;Tooth Socket;X-Ray Microtomography

Near-Infrared Photobiomodulation in Retinal Injury and Disease. Evidence is growing that exposure of tissue to low energy photon irradiation in the far-red (FR) to near-infrared (NIR) range of

the spectrum, collectively termed "photobiomodulation" (PBM) can restore the function of damaged mitochondria, upregulate the production of cytoprotective factors and prevent apoptotic cell death. PBM has been applied clinically in the treatment of soft tissue injuries and acceleration of wound healing for more than 40 years. Recent studies have demonstrated that FR/NIR photons penetrate diseased tissues including the retina. The therapeutic effects of PBM have been hypothesized to result from intracellular signaling pathways triggered when FR/NIR photons are absorbed by the mitochondrial photoacceptor molecule, cytochrome c oxidase, culminating in improved mitochondrial energy metabolism, increased cytoprotective factor production and cell survival. Investigations in rodent models of methanol-induced ocular toxicity, light damage, retinitis pigmentosa and age-related macular degeneration have demonstrated the PBM attenuates photoreceptor cell death, protects retinal function and exerts anti-inflammatory actions. Electron Transport Complex IV;Methanol Animals;Cell Survival;Disease Models, Animal;Electron Transport Complex IV;Electroretinography;Energy Metabolism;Humans;Infrared Rays;Methanol;Mice;Mitochondria;Photons;Photoreceptor Cells, Vertebrate;Phototherapy;Rats;Retina;Retinal Diseases

Photobiomodulation Mitigates Diabetes-Induced Retinopathy by Direct and Indirect Mechanisms: Evidence from Intervention Studies in Pigmented Mice. OBJECTIVE: Daily application of far-red light from the onset of diabetes mitigated diabetes-induced abnormalities in retinas of albino rats. Here, we test the hypothesis that photobiomodulation (PBM) is effective in diabetic, pigmented mice, even when delayed until weeks after onset of diabetes. Direct and indirect effects of PBM on the retina also were studied. METHODS: Diabetes was induced in C57Bl/6J mice using streptozotocin. Some diabetics were exposed to PBM therapy (4 min/day; 670 nm) daily. In one study, mice were diabetic for 4 weeks before initiation of PBM for an additional 10 weeks. Retinal oxidative stress, inflammation, and retinal function were measured. In some mice, heads were covered with a lead shield during PBM to prevent direct illumination of the eye, or animals were treated with an inhibitor of heme oxygenase-1. In a second study, PBM was initiated immediately after onset of diabetes, and administered daily for 2 months. These mice were examined using manganese-enhanced MRI to assess effects of PBM on transretinal calcium channel function in vivo. RESULTS: PBM intervention improved diabetes-induced changes in superoxide generation, leukostasis, expression of ICAM-1, and visual performance. PBM acted in part remotely from the retina because the beneficial effects were achieved even with the head shielded from the light therapy, and because leukocyte-mediated cytotoxicity of retinal endothelial cells was less in diabetics treated with PBM. SnPP+PBM significantly reduced iNOS expression compared to PBM alone, but significantly exacerbated leukostasis. In study 2, PBM largely mitigated diabetes-induced retinal calcium channel dysfunction in all retinal layers. CONCLUSIONS: PBM induces retinal protection against abnormalities induced by diabetes in pigmented animals, and even as an intervention. Beneficial effects on the retina likely are mediated by both direct and indirect mechanisms. PBM is a novel non-pharmacologic treatment strategy to inhibit early changes of diabetic retinopathy. Calcium Channels;Metalloporphyrins;Protoporphyrins;tin protoporphyrin IX;Heme Oxygenase-1 Animals;Calcium Channels;Diabetic Retinopathy;Heme Oxygenase-1;Low-Level Light Therapy;Male;Metalloporphyrins;Mice;Mice, Inbred C57BL;Neurons;Pigmentation;Protoporphyrins;Retina

Bioactive glass plus laser phototherapy as promise candidates for dentine hypersensitivity treatment. Treatments for dentine hypersensitivity (DH) may produce positive effects, though do not have lasting results. We investigated the reparative potential of stem cells derived from deciduous teeth (SHEDs) in response to components delivered from substances used in the treatment of the DH, associated or not to laser phototherapy (LPT), to stimulate dentine formation. SHEDs were submitted

to substances delivered from a laboratorial P-rich bioactive glass [57SiO(2) -26CaO-17P(2) O(5) (wt %)] or a commercially available desensitizer (GlumaÂ® Desensitizer), associated (or not) to LPT (InGAlP diode laser, 660 nm, 0.028 cm(2) , 20 mW, 5 J/cm(2) , 7 s, contact mode). Biomaterial characterization was performed by X-ray diffraction, scanning electron microscopy and the particle size was evaluated by dynamic light scattering. SHEDs proliferation and differentiation were analyzed by MTT and Alizarin Red staining, respectively. The conditioned media used in these tests were evaluated regarding their pH and the ionic concentration changes due to ions leached from the bioactive glass (BG). BG majority presented a non-crystalline solid structure and mixed particle sizes characterized by the agglomeration of nanoparticles. Cultures treated with BG alone or in association to LPT showed improved cell growth in relation to Gluma(Â®) (pâ€‰<â€‰0.05). Gluma(Â®) was cytotoxic in all tested conditions, regardless irradiated or not. BG associated to LPT induced intense mineral matrix formation. In conclusion, BG releases ionic dissolution products able to promote SHEDs differentiation. BG associated to LPT improves SHEDs proliferation and differentiation in vitro, and may be a promise therapeutic approach for the DH treatment. Â© 2015 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 105B: 107-116, 2017. Bioglass Ceramics;Dentin Sensitivity;Female;Humans;Low-Level Light Therapy;Male;Materials Testing;Particle Size;Stem Cells;Tooth, Deciduous

Effect of low-intensity laser treatment on pain after extraction of impacted mandibular third molars: a randomised, controlled, clinical trial. Extraction of impacted third molars is painful, so we have evaluated whether low-intensity laser could reduce the pain. Sixty patients were randomly allocated to five groups that were treated with laser immediately after extraction. Postoperative pain was evaluated after two and seven days. The Shapiro-Wilk test was used to assess whether the distribution was normal, and as it was skewed, the Kruskal-Wallis test, ANOVA and the Student-Newman-Keuls test for multiple comparisons were used to compare the groups. The Wilcoxon test was used for comparisons of pain (measured by visual analogue scale (VAS) and numerical rating scale (NRS) 101 between the second and seventh postoperative days). Probabilities of less than 0.05 were accepted as significant. We conclude that a single session of low intensity laser had no significant effect on the amount of pain under the conditions investigated. Humans;Laser Therapy;Lasers;Mandible;Molar, Third;Pain Measurement;Pain, Postoperative;Tooth Extraction;Tooth, Impacted

Does addition of low-level laser therapy (LLLT) in conservative care of knee arthritis successfully postpone the need for joint replacement? The current study evaluates whether the addition of low-level laser therapy into standard conventional physical therapy in elderly with bilateral symptomatic tri-compartmental knee arthritis can successfully postpone the need for joint replacement surgery. A prospective randomized cohort study of 100 consecutive unselected elderly patients with bilateral symptomatic knee arthritis with each knee randomized to receive either treatment protocol A consisting of conventional physical therapy or protocol B which is the same as protocol A with added low-level laser therapy. The mean follow-up was 6 years. Treatment failure was defined as breakthrough pain which necessitated joint replacement surgery. After a follow-up of 6 years, patients clearly benefited from treatment with protocol B as only one knee needed joint replacement surgery, while nine patients treated with protocol A needed surgery (pâ€‰<â€‰0.05). We conclude low-level laser therapy should be incorporated into standard conservative treatment protocol for symptomatic knee arthritis. Aged;Clinical Protocols;Cohort Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Physical Therapy Modalities;Prospective Studies;Time Factors

[EFFICACY OF SURGICAL TREATMENT OF VARICOSE DISEASE, DEPENDING ON ADSORPTION-RHEOLOGIC PROPERTIES OF BLOOD]. Physico-chemical adsorption-rheological properties of

venous blood in patients, suffering varicose disease of the lower extremities, and their impact on efficacy of various methods of surgical treatment were studied. Conduction of endovasal laser coagulation in combination with crossectomy have promoted enhancement of operative treatment efficacy in patients in initial terms of observation (in 1 week), in 1 month a complete occlusion of the vein was noted more rarely. Efficacy of a small--power laser ablation with irradiation power of 10 W and less in 4 weeks postoperatively is higher, than of surgical treatment with a laser irradiation power 15 W. In a varicose disease of the lower extremities there were observed the raising of the blood volume toughness, superficial relaxation and superficial stress on background of reduction of the toughness--elasticity module, superficial toughness and superficial elasticity. Crossectomy conduction did not influence the integral dynamics of adsorption--rheological properties of venous blood, but in 1 month after endovasal laser coagulation a normalization of physicchemical parameters of blood was noted. Application of laser irradiation of the 10 W power and less promotes inhibition of the relaxation properties of venous blood; a prognostic meaning owes initial value of the blood volume toughness. Adult;Angioplasty, Laser;Female;Hemorheology;Humans;Laser Coagulation;Low-Level Light Therapy;Lower Extremity;Male;Middle Aged;Saphenous Vein;Treatment Outcome;Varicose Veins

Adjunctive Non-Surgical Therapy of Inflamed Periodontal Pockets During Maintenance Therapy Using Diode Laser: A Randomized Clinical Trial. BACKGROUND: Numerous studies have documented the clinical outcomes of laser therapy for untreated periodontitis, but very few have reported on lasers treating inflamed pockets during maintenance therapy. The aim of this study is to compare the effectiveness of scaling and root planing (SRP) plus the adjunctive use of diode laser therapy to SRP alone on changes in the clinical parameters of disease and on the gingival crevicular fluid (GCF) inflammatory mediator interleukin-1Î² (IL-1Î²) in patients receiving regular periodontal maintenance therapy. METHODS: This single-masked and randomized, controlled, prospective study includes 22 patients receiving regular periodontal maintenance therapy who had one or more periodontal sites with a probing depth (PD) â‰¥ 5 mm with bleeding on probing (BOP). Fifty-six sites were treated with SRP and adjunctive laser therapy (SRP + L). Fifty-eight sites were treated with SRP alone. Clinical parameters, including PD, clinical attachment level (CAL), and BOP, and GCF IL-1Î² levels were measured immediately before treatment (baseline) and 3 months after treatment. RESULTS: Sites treated with SRP + L and SRP alone resulted in statistically significant reductions in PD and BOP and gains in CAL. These changes were not significantly different between the two therapies. Similarly, differences in GCF IL-1Î² levels between SRP + L and SRP alone were not statistically significant. CONCLUSION: In periodontal maintenance patients, SRP + L did not enhance clinical outcomes compared to SRP alone in the treatment of inflamed sites with â‰¥ 5 mm PD. Interleukin-1beta Aged;Aged, 80 and over;Combined Modality Therapy;Dental Scaling;Female;Follow-Up Studies;Gingival Crevicular Fluid;Gingival Hemorrhage;Humans;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Pocket;Periodontitis;Prospective Studies;Root Planing;Single-Blind Method;Treatment Outcome

Effects of low-level laser therapy on the expression of osteogenic genes during the initial stages of bone healing in rats: a microarray analysis. This study evaluated the morphological changes produced by LLLT on the initial stages of bone healing and also studied the pathways that stimulate the expression of genes related to bone cell proliferation and differentiation. One hundred Wistar rats were divided into control and treated groups. Noncritical size bone defects were surgically created at the upper third of the tibia. Laser irradiation (Ga-Al-As laser 830Â nm, 30Â mW, 94Â s, 2.8Â J) was performed for 1, 2, 3, 5, and 7 sessions. Histopathology revealed that treated animals produced increased amount of newly formed bone at the site of the injury. Moreover, microarray analysis evidenced that LLLT produced a significant increase in the expression TGF-Î², BMP, FGF, and

RUNX-2 that could stimulate osteoblast proliferation and differentiation, which may be related to improving the deposition of newly formed bone at the site of the injury. Thus, it is possible to conclude that LLLT improves bone healing by producing a significant increase in the expression of osteogenic genes. Animals;Bone Regeneration;Low-Level Light Therapy;Male;Oligonucleotide Array Sequence Analysis;Osteogenesis;Rats;Rats, Wistar;Tibia;Wound Healing

A comparative study of red and blue light-emitting diodes and low-level laser in regeneration of the transected sciatic nerve after an end to end neurorrhaphy in rabbits. This study aimed at evaluating the effects of red and blue light-emitting diodes (LED) and low-level laser (LLL) on the regeneration of the transected sciatic nerve after an end-to-end neurorrhaphy in rabbits. Forty healthy mature male New Zealand rabbits were randomly assigned into four experimental groups: control, LLL (680 nm), red LED (650 nm), and blue LED (450 nm). All animals underwent the right sciatic nerve neurotmesis injury under general anesthesia and end-to-end anastomosis. The phototherapy was initiated on the first postoperative day and lasted for 14 consecutive days at the same time of the day. On the 30th day post-surgery, the animals whose sciatic nerves were harvested for histopathological analysis were euthanized. The nerves were analyzed and quantified the following findings: Schwann cells, large myelinic axons, and neurons. In the LLL group, as compared to other groups, an increase in the number of all analyzed aspects was observed with significance level (Pâ€‰<â€‰0.05). This finding suggests that postoperative LLL irradiation was able to accelerate and potentialize the peripheral nerve regeneration process in rabbits within 14 days of irradiation. Animals;Color;Light;Low-Level Light Therapy;Male;Nerve Regeneration;Neurosurgical Procedures;Postoperative Period;Rabbits;Sciatic Nerve;Semiconductors

Prevention of abdominal adhesions and healing skin after peritoniectomy using low level laser. BACKGROUND: Adhesions commonly occur after abdominal surgery and can cause bowel obstruction, chronic abdominal pain, and infertility. Their prevention remains a challenge. OBJECTIVES: To evaluate the effects of the application of low-level lasers on the prevention of adhesions and scarring of the skin after peritoniectomia. METHOD: Twenty-four New Zealand breed male rabbits, approximately 2 months of age, were randomly divided into 3 groups (nâ€‰=â€‰8): GC-control group not subjected to laser, GL1-group with laser application at a dose of 0.2â€‰J, and GL2-group with laser application at a dose of 3.6â€‰J. All animals received a longitudinal midline incision and a bilateral resection of the peritoneal fragment, measuring 3â€‰Ã—â€‰1â€‰cm(2) . The animals received a laser treatment of one application every 24 hours, beginning at the time of surgery and lasting for a period of 4 days. After 14 days post-surgery, the animals were killed and adhesion formation was evaluated qualitatively and quantitatively by means of a laparotomy shaped inverted "U", which allowed for the verification of the broad wall of the abdominal cavity and organs. Differences were considered significant at Pâ€‰<â€‰0.05. RESULTS: The adhesion formation was observed in 100% of the rabbits from groups GC and GL1, as compared to 37.5% of the rabbits from group GL2 (Pâ€‰<â€‰0.01). The evaluation of the vascularization and tenacity of adhesions among the groups showed no significant difference. In groups CG and GL1, 72% and 83% of adhesions were verified between visceras, respectively whereas in GL2 occurred among abdominal wall. The tensile strength of the skin between the groups was not significant (Pâ€‰=â€‰0.3106). The resistance of abdominal wall segments without skin he resistance of skin segments between groups GL2 and GC were higher than in GL1 (Pâ€‰=â€‰0.01). CONCLUSION: Low-level LASER is effective in preventing intra-abdominal adhesions in rabbits without compromising strength and healing of the abdominal wall. Abdominal Wall;Animals;Cicatrix;Low-Level Light Therapy;Male;Peritoneal Diseases;Peritoneum;Postoperative Complications;Rabbits;Random Allocation;Tissue Adhesions;Wound Healing

Phototherapy-Induced Antitumor Immunity: Long-Term Tumor Suppression Effects via Photoinactivation of Respiratory Chain Oxidase-Triggered Superoxide Anion Burst. AIMS: Our previous studies have demonstrated that as a mitochondria-targeting cancer phototherapy, high-fluence, low-power laser irradiation (HF-LPLI) results in oxidative damage that induces tumor cell apoptosis. In this study, we focused on the immunological effects of HF-LPLI phototherapy and explored its antitumor immune regulatory mechanism. RESULTS: We found not only that HF-LPLI treatment induced tumor cell apoptosis but also that HF-LPLI-treated apoptotic tumor cells activated macrophages. Due to mitochondrial superoxide anion burst after HF-LPLI treatment, tumor cells displayed a high level of phosphatidylserine oxidation, which mediated the recognition and uptake by macrophages with the subsequent secretion of cytokines and generation of cytotoxic T lymphocytes. In addition, in vivo results showed that HF-LPLI treatment caused leukocyte infiltration into the tumor and efficaciously inhibited tumor growth in an EMT6 tumor model. These phenomena were absent in the respiration-deficient EMT6 tumor model, implying that the HF-LPLI-elicited immunological effects were dependent on the mitochondrial superoxide anion burst. INNOVATION: In this study, for the first time, we show that HF-LPLI mediates tumor-killing effects via targeting photoinactivation of respiratory chain oxidase to trigger a superoxide anion burst, leading to a high level of oxidatively modified moieties, which contributes to the phenotypic changes in macrophages and mediates the antitumor immune response. CONCLUSION: Our results suggest that HF-LPLI may be an effective cancer treatment modality that both eradicates the treated primary tumors and induces an antitumor immune response via photoinactivation of respiratory chain oxidase to trigger superoxide anion burst. Cytokines;Reactive Oxygen Species;Superoxides;NADPH Oxidases;superoxide-forming enzyme Animals;Apoptosis;Cell Line, Tumor;Cell Survival;Cytokines;Disease Models, Animal;Electron Transport;Female;Humans;Low-Level Light Therapy;Macrophage Activation;Macrophages;Mice;Mitochondria;NADPH Oxidases;Neoplasms;Oxidation-Reduction;Phototherapy;Reactive Oxygen Species;Superoxides;T-Lymphocytes, Cytotoxic;Tumor Burden;Xenograft Model Antitumor Assays

Photomechanical effect on Type I collagen using pulsed diode laser. BACKGROUND: As the most abundant protein in human tissues, the use of collagen is essential in the fields of biological science and medicine. OBJECTIVE: The aim of this study is to investigate the mechanical effect of pulsed laser irradiation on collagen tissue. METHODS: With various laser parameters such as peak power, pulse width, and repetition rate, the induced stresses on samples were measured and analyzed. Monte Carlo simulation was performed to investigate the effect of laser parameters on the collagen sample. RESULTS: The results indicated that the magnitude of mechanical stress could be controlled by various laser parameters. CONCLUSIONS: This study can be used in biostimulation for therapy and mechanoreceptor stimulation for tactile application. Collagen Type I Animals;Collagen Type I;Fishes;Lasers, Semiconductor;Low-Level Light Therapy;Monte Carlo Method;Stress, Mechanical

The effects of low-intensity He-Ne laser irradiation on erythrocyte metabolism. Low-intensity laser irradiation (LILI) can improve the deformability of red blood cells (RBCs). It might be due to the LILI effects on adenosine triphosphate (ATP) level. However, ATP content may not be a valid surrogate marker for RBC deformability. The LILI effects on RBC glycolysis were studied in this paper. Hypertonic RBCs were used in this study. After 5 min irradiation with low-intensity He-Ne laser irradiation (LHNL) at 632.8 nm and 4.4 mW/cm(2), the concentration of intracellular glucose and the activities of phosphofructokinase (PFK) and glyceraldehyde-3-phosphate dehydrogenase (GAPDH) were measured, respectively. There was no significant change in intracellular glucose concentration. The activity of PFK decreased significantly, but the activity of GAPDH increased significantly. In hypertonic RBCs, LHNL irradiation may decrease the activity of energy-consuming enzymes, but increases the activity of energy-generating enzymes in glycolysis, to improve the RBC deformability.

Adenosine Triphosphate;Glyceraldehyde-3-Phosphate Dehydrogenases;Phosphofructokinases;Glucose Adenosine Triphosphate;Dose-Response Relationship, Radiation;Erythrocyte Deformability;Erythrocytes;Glucose;Glyceraldehyde-3-Phosphate Dehydrogenases;Glycolysis;Humans;Lasers, Gas;Male;Phosphofructokinases

Correction: Human Tubal-Derived Mesenchymal Stromal Cells Associated with Low Level Laser Therapy Significantly Reduces Cigarette Smoke-Induced COPD in C57BL/6 mice.

The effect of Laser and taping on pain, functional status and quality of life in patients with fibromyalgia syndrome: A placebo- randomized controlled clinical trial. BACKGROUND: Conservative treatments have been proved to be effective to control pain and optimize function in fibromyalgia, however there is need for scientific evidence to make better clinical application across various physiotherapy applications. OBJECTIVE: The aim of this study was to investigate the effects of Laser and taping applications on pain, flexibility, anxiety, depression, functional status and quality of life in patients with fibromyalgia syndrome. METHODS: Forty-five female patients with fibromyalgia syndrome were included to the study and randomly allocated into three treatment groups; Laser (n= 15), placebo Laser (n= 15), and taping applications (n= 15). Visual analogue scale for pain intensity, trunk flexibility, Fibromyalgia Impact Questionnaire for functional status, Short Form 36 Questionnaire for quality of life and health status, and Beck Depression Inventory for anxiety level were evaluated before and after three weeks interventions. RESULTS: There were decreased pain severity in activity (p= 0.028), anxiety level (p= 0.01) and improved general health status, quality of life (p= 0.01) found at Laser group, whereas there were increased trunk flexibility, flexion (p= 0.03), extension (p= 0.02) found at taping group. After interventions, there were decreased pain severity for whole groups at night for Laser group (p= 0.04), placebo Laser group (p= 0.001), taping group (p= 0.01) and improved functional status found for Laser group (p= 0.001), placebo Laser group (p= 0.001), taping group (p= 0.01). CONCLUSIONS: Kinesiotape application had a similar effect on parameters in FMS patient, so this method could be preferred instead of Laser application for rehabilitation program. Adult;Bandages;Exercise Therapy;Female;Fibromyalgia;Humans;Low-Level Light Therapy;Middle Aged;Quality of Life;Surveys and Questionnaires;Visual Analog Scale

Study of somesthesis according to change in pulse diode laser parameters. Laser can precisely deliver quantitative energy to a desired region in a non-contact way. Since it can stimulate regions and minutely control parameters such as the intensity, duration and frequency of stimulus, laser is often used for the areas such as low power laser treatment and clinical physiology. This study proposes simulation using pulse diode laser with reliable output and identifies laser parameters that can present a variety of somesthesis. It is found that typically, as frequency and energy increase, the ratio of feeling senses increases, and dominant sense moves from the sense of heat through tactile sense to pain. This study will be baseline data for studies of the sense of heat, tactile sense and pain, contribute to studying neurophysiology sector and be applied to basic clinical research. Adult;Equipment Design;Female;Hot Temperature;Humans;Lasers, Semiconductor;Male;Pain;Thermosensing;Touch;Young Adult

Effects of low-level laser irradiation on proliferation and functional protein expression in human RPE cells. Low-level laser irradiation (LLLI) modulates a set of biological effects in many cell types such as fibroblasts, keratinocytes, and stem cells. However, no study to date has reported the effects of LLLI on retinal pigment epithelia (RPE) cells. The aim of this study was to investigate whether LLLI could enhance the proliferation of RPE cells and increase the expression of RPE functional genes/proteins. Human ARPE-19 cells were seeded overnight and treated with 8 J/cm(2) of LLLI. Cell proliferation was measured by CCK8 assay and cell cycle distribution was evaluated by FACS. The transcription of cell cycle-specific genes and RPE functional genes was quantified by RT-PCR.

Moreover, the expression of ZO-1 and CRALBP were evaluated by immunostaining. A dose of 8 J/cm(2) of LLLI significantly increased proliferation and promoted cell cycle progression while upregulating the transcription of CDK4 and CCND1 and decreasing the transcription of CDKN2A, CDKN2C, and CDKN1B in human ARPE-19 cells. Additionally, LLLI enhanced the expression of ZO-1 and CRALBP in human ARPE-19 cells. In conclusion, LLLI could enhance the proliferative ability of human ARPE-19 cells by modulating cyclin D1, CDK4, and a group of cyclin-dependent kinase inhibitors. It also could increase the expression of RPE-specific proteins. Thus, LLLI may be a potential approach for the treatment of RPE degenerative diseases. Proteins Cell Line;Cell Proliferation;Dose-Response Relationship, Radiation;Gene Expression Regulation;Humans;Lasers;Proteins;Retinal Pigment Epithelium

Can low-level laser therapy (LLLT) associated with an aerobic plus resistance training change the cardiometabolic risk in obese women? A placebo-controlled clinical trial. INTRODUCTION: Obesity is one of the most important link factors to coronary artery disease development mainly due to the pro-inflammatory and pro-thrombotic states favoring atherosclerosis progression. The LLLT acts in the cellular metabolism and it is highly effective to improve inflammation. The same occur in response to different kinds of exercise. However, we have not known the associate effects using LLLT therapies with aerobic plus resistance training as strategy specifically with target at human obesity control and its comorbidities. OBJECTIVE: Investigate the effects of the LLLT associated with aerobic plus resistance training on cardiometabolic risk factors in obese women. METHODOLOGY: Women aged 20-40 years (BMI â‰¥ 30 kg/m(2)), were divided into 2 groups: Phototherapy (PHOTO) and Placebo. They were trained aerobic plus resistance exercises (in a concurrent mode), 1h, 3 times/week during 16 weeks. Phototherapy was applied after each exercise session for 16 min, with infrared laser, wavelength 808 nm, continuous output, power 100 mW, and energy delivery 50 J. The body composition was measured with bioimpedance. Inflammatory mark concentrations were measured using a commercially available multiplex. RESULTS: LLLT associated with aerobic plus resistance training was effective in decrease neck (P=0.0003) and waist circumferences (P=0.02); percentual of fat (P=0.04); visceral fat area (P=0.02); HOMA-IR (P=0.0009); Leptin (P=0.03) and ICAM (P=0.03). Also, the reduction in leptin (P=0.008) and ICAM-1 (0, 05) was much more expressive in the phototherapy group in comparison to placebo group when analyzed by delta values. CONCLUSION: LLLT associated with concurrent exercise (aerobic plus resistance training) potentiates the exercise effects of decreasing the cardiometabolic risk factors in obese woman. These results suggest the LLLT associated with exercises as a new therapeutic tool in the control of obesity and its comorbidities for obese people, targeting to optimize the strategies to control the cardiometabolic risk factors in these populations. Blood Glucose;Insulin;Leptin;Intercellular Adhesion Molecule-1 Adult;Blood Glucose;Body Mass Index;Double-Blind Method;Enzyme-Linked Immunosorbent Assay;Exercise;Female;Humans;Insulin;Intercellular Adhesion Molecule-1;Lasers;Leptin;Low-Level Light Therapy;Obesity;Placebo Effect;Young Adult

Red Light Modulates Ultraviolet-Induced Gene Expression in the Epidermis of Hairless Mice. OBJECTIVE: The purpose of this study was to investigate whether low-level light therapy (LLLT) was capable of modulating expression of ultraviolet (UV) light-responsive genes in vivo. MATERIALS AND METHODS: The effects of 670â€‰nm light-emitting diode (LED) array irradiation were investigated in a hairless SHK-1 mouse epidermis model. Mice were given a single dose of UVA/UVB light, or three doses of red light (670â€‰nm @ 8â€‰mW/cm(2) x 312â€‰sec, 2.5â€‰J/cm(2) per session) spread over 24â€‰h along with combinations of pre- and post-UV treatment with red light. Levels of 14â€‰UV-responsive mRNAs were quantified 24â€‰h after UV irradiation by real-time quantitative reverse transcription polymerase chain reaction (qRT-PCR). RESULTS: The transcription of mRNAs encoding for cluster of differentiation molecule 11b (CD11b) (pâ€‰<â€‰0.05) and interferon (IFN)-Î³

(pâ€‰<â€‰0.012) increased after irradiation with red light alone, whereas expression level of cyclooxygenase (COX)-2 (pâ€‰<â€‰0.02) was downregulated. Genes unresponsive to UV did not change their expression levels after exposure to red light either. Pretreatment with red light significantly modified response of Fos to UV exposure (pâ€‰<â€‰0.01). A synergy of UV and post-treatment with red light in reducing the transcription levels of CD11b (pâ€‰<â€‰0.05) and inducible nitric oxide synthase (iNOS) (pâ€‰<â€‰0.05) was observed. CONCLUSIONS: This is an initial observation that in mouse red light LLLT more often than not causes opposite gene expression changes or reduces those caused by moderate UVA-UVB irradiation. Oncogene Proteins v-fos Animals;Epidermis;Female;Gene Expression;Low-Level Light Therapy;Mice;Mice, Hairless;Oncogene Proteins v-fos;Ultraviolet Rays

Chemical and morphological changes in human dentin after Er:YAGlaser irradiation: EDS and SEM analysis. Sixty samples of human dentin were divided into six groups (nâ€‰=â€‰10) and were irradiated with Er:YAG laser at 100 mJ-19.9 J/cm(2), 150 mJ-29.8 J/cm(2), 100 mJ-35.3 J/cm(2), 150 mJ-53.0 J/cm(2), 200 mJ-70.7 J/cm(2), and 250 mJ-88.5 J/cm(2), respectively, at 7 Hz under a water spray. The atomic percentages of carbon, oxygen, magnesium, calcium, and phosphorus and the Ca-to-P molar ratio on the dentin were determined by energy dispersive X-ray spectroscopy. The morphological changes were observed using scanning electron microscopy. A paired t-test was used in statistical analysis before and after irradiation, and a one-way ANOVA was performed (Pâ€‰â‰¤â€‰0.05). The atomic percent of C tended to decrease in all of the groups after irradiation with statistically significant differences, O and Mg increased with significant differences in all of the groups, and the Ca-to-P molar ratio increased in groups IV, V, and VI, with statistically significant differences between groups II and VI. All the irradiated samples showed morphological changes. Major changes in the chemical composition of dentin were observed in trace elements. A significant increase in the Ca-to-P ratio was observed in the higher energy density groups. Morphological changes included loss of smear layer with exposed dentinal tubules. The changes produced by the different energy densities employed could have clinical implications, additional studies are required to clarify them. Elements;Phosphorus;Carbon;Magnesium;Oxygen;Calcium Calcium;Carbon;Dentin;Elements;Humans;Lasers, Solid-State;Low-Level Light Therapy;Magnesium;Microscopy, Electron, Scanning;Oxygen;Phosphorus;Smear Layer;Spectrometry, X-Ray Emission;Surface Properties

Selective cytotoxic effects of low-power laser irradiation on human oral cancer cells. BACKGROUND AND OBJECTIVES: Low-power laser irradiation (LPLI) is known to regulate cell proliferation and migration in clinical use. Recent studies have shown that LPLI induces cell death in some certain types of cancer cell lines. However, the cytotoxic selectivity of LPLI for cancer cells is not fully understood. The aim of this study was to compare the cytotoxic effects of LPLI in both human oral cancer OC2 cells and normal human gingival fibroblast (HGF) cells. MATERIALS AND METHODS: LPLI at 810â€‰nm with an energy density from 10 to 60â€‰J/cm(2) was used to irradiate human oral cancer OC2 cells and normal HGF cells. RESULTS: We found that LPLI significantly diminished cell viability of human oral cancer OC2 cells due to cell cycle arrest at the G1 phase and the induction of cell death but that it had no or little effects on cell cycle progression and death in normal HGF cells. Moreover, the production of reactive oxygen species (ROS) and the loss of mitochondrial membrane potential (MMP) were elevated in human oral cancer OC2 cells compared with the un-irradiated cells. In contrast, these effects remained unchanged in normal HGF cells after exposure to LPLI. LPLI also induced apoptosis in caspase-3 dependent manner in human oral cancer OC2 cells, a mode of action that could be mediated by ROS and mitochondrial damage. CONCLUSION: Our findings imply LPLI might be a potential therapy for oral cancers. Apoptosis;Cell Proliferation;Cell

Survival;Fibroblasts;Gingiva;Humans;Low-Level Light Therapy;Mouth Neoplasms;Tumor Cells, Cultured

Histologic and Resonance Frequency Analysis of Peri-Implant Bone Healing After Low-Level Laser Therapy: An In Vivo Study. PURPOSE: To evaluate the effects of low-level laser therapy (LLLT) on peri-implant bone regeneration by means of resonance frequency analysis and histologic analysis of bone-to-implant contact (BIC). MATERIALS AND METHODS: Thirty-two male New Zealand rabbits were randomly divided into four groups of eight animals each, one control group (nonirradiated animals) and three experimental groups that received LLLT (group E5 = 5 J per session; group E10 = 10 J per session; group E20 = 20 J per session). The mandibular left incisor was surgically extracted in all animals, and a nanoparticle-treated-surface osseointegrated implant was placed immediately afterward. The experimental groups were irradiated with aluminum-gallium-arsenide laser diode every 48 hours over a 13-day period for a total of seven sessions. Implant stability quotients (ISQs) were measured at the time of implant placement and 30 days after the last LLLT session. The animals were then euthanized and dissected, and histologic slides of the implant region were obtained for BIC evaluation. RESULTS: Significant differences in ISQ were detected between groups before and after LLLT, with group E20 showing significantly higher values than controls. The percentage of BIC was also significantly higher in group E20 than in control animals. CONCLUSION: Laser therapy at a dose of 20 J per treatment session, based on the irradiation protocol used in this study, was able to significantly increase ISQ values and BIC after implant placement, indicating that laser irradiation effected an improvement in peri-implant bone healing. Dental Implants Animals;Bone-Implant Interface;Dental Implantation, Endosseous;Dental Implants;Dental Prosthesis Design;Dental Prosthesis Retention;Lasers, Solid-State;Low-Level Light Therapy;Male;Mandible;Nanoparticles;Osseointegration;Osteogenesis;Rabbits;Random Allocation;Surface Properties;Tooth Socket;Vibration

Effects of light-emitting diode irradiation on RANKL-induced osteoclastogenesis. BACKGROUND AND OBJECTIVE: Bone homeostasis is maintained by a balance between osteoblastic bone formation and osteoclastic bone resorption, where intracellular reactive oxygen species (ROS) are crucial mediators of osteoclastogenesis. Recently, low-level light therapy (LLLT), a form of laser medicine used in various clinical fields, was shown to alleviate oxidative stress by scavenging intracellular ROS. The present study aimed to investigate the impact of 635â€‰nm irradiation from a light-emitting diode (LED) on osteoclastogenesis from receptor activator of nuclear factor kappa-B (NF-ÎºB) ligand (RANKL)-stimulated mouse bone marrow-derived macrophages (BMMs). STUDY DESIGN/MATERIALS AND METHODS: The effects of LED irradiation on osteoclastogenesis were assessed in tartrate-resistant acid phosphatase (TRAP), 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT), cell viability, and resorption pit formation, respectively. Quantitative real-time polymerase chain reaction (qPCR) and Western blot analyses were also performed to assess mRNA expression of osteoclastogenesis-related genes and phosphorylation of extracellular signal-regulated kinase 1/2 (ERK 1/2), p38, and c-Jun-N-terminal kinase (JNK). NF-ÎºB activity was assayed by luciferase reporter assay and Intracellular ROS generation was investigated by the 2',7'-dichlorodihydrofluorescein diacetate (H2 DCF-DA) detection method. RESULTS: LED irradiation significantly inhibited RANKL-mediated osteoclast differentiation from BMMs and mRNA expression of TRAP, osteoclast-associated immunoglobulin-like receptor (OSCAR), and dendrocyte-expressed seven-transmembrane protein (DC-STAMP). Exposure to LED light likewise significantly decreased RANKL-facilitated NF-ÎºB activity, p38 and ERK phosphorylation and intracellular ROS generation, and increased gene expression of nuclear factor E2-related factor 2 (Nrf2). CONCLUSIONS: Taken together, the results presented herein show that LED irradiation downregulates osteoclastogenesis by reducing ROS production. Therefore, LED irradiation/LLLT might be useful as an alternative, conservative approach to osteoporosis

management. RANK Ligand Animals;Bone Resorption;Cell Culture Techniques;Cell Differentiation;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Osteoclasts;RANK Ligand
Lasers in Implant Dentistry, Part 2. Dental Implants Dental Implantation, Endosseous;Dental Implants;Gingivectomy;Humans;Laser Therapy;Low-Level Light Therapy;Peri-Implantitis;Stomatitis
Evolution of Comprehensive Care, Part 4. Direct Restorations. Composite Resins;Dental Materials;Dentin-Bonding Agents;Pulp Capping and Pulpectomy Agents Acid Etching, Dental;Composite Resins;Comprehensive Dental Care;Dental Bonding;Dental Caries;Dental Materials;Dental Pulp Capping;Dental Pulp Exposure;Dental Restoration, Permanent;Dentin;Dentin-Bonding Agents;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Matrix Bands;Pulp Capping and Pulpectomy Agents
Treatment of Minocycline-Induced Cutaneous Pigmentation With the Picosecond Alexandrite (755-nm) Laser. Anti-Bacterial Agents;Minocycline Aged;Anti-Bacterial Agents;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Minocycline;Pigmentation Disorders
Low level laser therapy reduces acute lung inflammation without impairing lung function. Acute lung injury is a condition characterized by exacerbate inflammatory reaction in distal airways and lung dysfunction. Here we investigate the treatment of acute lung injury (ALI) by low level laser therapy (LLLT), an effective therapy used for the treatment of patients with inflammatory disorders or traumatic injuries, due to its ability to reduce inflammation and promote tissue regeneration. However, studies in internal viscera remains unclear. C57BL/6 mice were treated with intratracheal lipopolysaccharide (LPS) (5Â mg/kg) or phosphate buffer saline (PBS). Six hours after instillation, two groups were irradiated with laser at 660 nm and radiant exposure of 10 J/cm(2) . Intratracheal LPS inoculation induced a marked increase in the number of inflammatory cells in perivascular and alveolar spaces. There was also an increase in the expression and secretion of cytokines (TNF-Î±, IL-1Î², IL-6,) and chemokine (MCP-1). The LLLT application induced a significant decrease in both inflammatory cells influx and inflammatory mediators secretion. These effects did not affect lung mechanical properties, since no change was observed in tissue resistance or elastance. In conclusion LLLT is able to reduce inflammatory reaction in lungs exposed to LPS without affecting the pulmonary function and recovery. Chemokines;Cytokines Acute Lung Injury;Animals;Chemokines;Cytokines;Inflammation;Low-Level Light Therapy;Lung;Mice;Mice, Inbred C57BL
Micro-computed tomography and histomorphometric analysis of human alveolar bone repair induced by laser phototherapy: a pilot study. Immediate dental implant placement in the molar region is critical, because of the high amount of bone loss and the discrepancy between alveolar crest thickness and the implant platform. Laser phototherapy (LPT) improves bone repair. The aim of this study was to evaluate the human alveolar bone repair 40 days after molar extraction in patients submitted to LPT. Twenty patients were selected for this randomized controlled clinical trial; 10 underwent LPT (laser group) with a GaAlAs diode laser (808 nm, 100 mW, 0.04 cm(2), 75 J/cm(2), 30s per point, 3 J per point, at five points). The control group patients (n=10) were not irradiated. Forty days later, the tissue formed inside the sockets was analyzed by micro-computed tomography and histomorphometry. Data from the two groups were compared with Student's t-test and Pearson's correlation test. The relative bone volume was significantly higher in the laser group (P<0.0001). The control group showed negative correlations (P<0.01) between number and thickness, and between number and separation of trabeculae, and a positive correlation between thickness and separation of trabeculae. The laser group showed a significant negative correlation between the number and thickness of trabeculae (P<0.01). The results suggest that LPT is able to accelerate alveolar bone

repair after molar extraction, leading to a more homogeneous trabecular configuration represented by thin and close trabeculae. Adult;Alveolar Process;Bone Regeneration;Dental Implants, Single-Tooth;Female;Humans;Immediate Dental Implant Loading;Low-Level Light Therapy;Male;Molar;Pilot Projects;Radiography, Panoramic;Tooth Extraction;Tooth Socket;Wound Healing;X-Ray Microtomography

Use of a 660-nm Laser to Aid in the Healing of Necrotic Alveolar Mucosa Caused by Extruded Sodium Hypochlorite: A Case Report. The extrusion of sodium hypochlorite through the apical foramen is an accident that can occur during the flushing procedure in endodontic treatment. The symptomatology is immediate and intense, and there is a long period before the tissues return to normal. Low-level laser therapy might be useful as an adjunctive treatment for damaged soft tissues because of its anti-inflammatory and analgesic effects, which may reduce edema and prevent infection. In this clinical case, the accidental leakage of 1% sodium hypochlorite during the preparation of the root canal of a maxillary right central incisor is reported. This leakage caused immediate and intense pain and edema formation and resulted in an extensive necrotic area in the alveolar mucosa adjacent to the root of the treated tooth. The conventional treatment protocol was combined with low-level laser therapy. Clinical and radiographic examinations after 7 months revealed complete repair of the necrotic area with no paresthesia and further indicated the integrity of the apical region of the tooth where the extrusion of sodium hypochlorite occurred. The combination of low-level laser therapy with a conventional treatment protocol in this case of the extrusion of 1% sodium hypochlorite resulted in the healing of the wounds. Disinfectants;Sodium Hypochlorite Disinfectants;Female;Humans;Low-Level Light Therapy;Middle Aged;Mouth Mucosa;Necrosis;Radiography, Dental;Root Canal Preparation;Sodium Hypochlorite;Treatment Outcome

Pulsed dye laser versus long pulsed Nd:YAG laser in the treatment of angiokeratoma of Fordyce: A randomized, comparative, observer-blinded study. BACKGROUND: Angiokeratoma of Fordyce is typically asymptomatic, blue-to-red papules with a scaly surface located on the scrotum, shaft of penis or labia majora. They can be treated with some locally destructive treatment modalities such as excision, electrocoagulation, cryotherapy and laser. OBJECTIVES: To compare the effects of the pulsed dye laser versus long pulsed Nd:YAG laser in the treatment of angiokeratoma of Fordyce. METHODS: Twenty tow patients with angiokeratoma of Fordyce were included in this study. All participants received three sessions of pulsed dye laser on the selected side or part of lesional area and long pulsed Nd:YAG laser on the other side or part of lesional area. Two dermatologists independently evaluated the photographs of the baseline and two-month follow-up after last session using a grade system in which treatment response was categorized into six grades. RESULTS: Both PDL and long pulsed Nd:YAG laser revealed statistically significant improvements in angiokeratoma of fordyce. Comparatively, there was a statistical difference between them (overall mean improvement with PDL, 61.8%, versus Nd:YAG, 77.63%; pâ€‰<â€‰0.005). CONCLUSIONS: Both PDL and 1064-nm Nd:YAG laser are effective and safe in the treatment of angiokeratoma of Fordyce with better response in Nd:YAG laser than pulsed dye laser. Adult;Angiokeratoma;Double-Blind Method;Female;Genital Neoplasms, Female;Genital Neoplasms, Male;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin Neoplasms;Young Adult

Effect of low-level laser therapy (904 nm) and static stretching in patients with knee osteoarthritis: a protocol of randomised controlled trial. BACKGROUND: Osteoarthritis (OA) is a highly prevalent and disabling disease. It is estimated that by 2030 the prevalence of symptomatic OA could reach 30Â % of the population above 60Â years. This randomised controlled trial will investigate the effect of low-level laser therapy (LLLT) and static stretching exercises, as monotherapy and in combination, on pain, quality of life, function, mobility, knee range of motion (KROM) and hamstring shortening in

participants with knee OA. METHODS: This study will involve 145 people aged 50-75 years with symptomatic-radiographic knee OA. It will consist of two types of treatments: Low-level laser therapy (LLLT) and stretching exercises. The patients will be randomly allocated to five groups LLLTACTIVE+Stretch, LLLTPLACEBO+Stretch, Stretch, LLLT and Control (nâ€‰=â€‰29 each). Treatment frequency will be three sessions/week for all active groups. LLLT will involve the use of a Gallium-Arsenide laser (904 nm, 40 milliwatts, 3 J/point, 27 J/knee) over 24 sessions for the monotherapy group and 9 sessions for the LLLT+Stretch groups. Stretching will consist of seven exercises completed over 24 sessions. The control group will receive a booklet. Participants will be treated for 2Â months (Stretch, LLLT and Control groups) or 3Â months (LLLTâ€‰+â€‰Stretch groups). Participants and the outcome assessor will be blind to treatment allocation throughout the study. The primary outcome is pain measured by Visual Analogue Scale. Secondary outcomes include quality of life assessed by Western Ontario and McMaster Universities Arthritis Index, function by Lequesne Algofunctional Index, mobility by Timed Up and Go Test, KROM by goniometry of knee flexion and hamstring shortening by popliteal angle. The statistical method will follow the principles of per-protocol analysis. DISCUSSION: Although exercise therapy is considered an effective treatment in patients with knee osteoarthritis, the knowledge of which exercise modalities would be the most appropriate for this population is lacking. LLLT has been used as resource to increase the effects of physical therapy. However, the specific dose and treatment frequency need to be better defined. The findings from this randomised controlled trial will provide evidence of the efficacy or otherwise, of LLLT and stretching exercises in the management of knee OA symptoms. TRIAL REGISTRATION: NCT01738737 Â at ClinicalTrials.gov. Aged;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Stretching Exercises;Osteoarthritis, Knee;Pain Measurement;Single-Blind Method;Treatment Outcome

The relative antimicrobial effect of blue 405 nm LED and blue 405 nm laser on methicillin-resistant Staphylococcus aureus in vitro. It has long been argued that light from a laser diode is superior to light from a light-emitting diode (LED) in terms of its effect on biological tissues. In order to shed light on this ongoing debate, we compared the antimicrobial effect of light emitted from a 405-nm LED with that of a 405-nm laser on methicillin-resistant Staphylococcus aureus (MRSA) at comparable fluences. We cultured 5â€‰Ã—â€‰10(6) CFU/ml MRSA on tryptic soy agar and then irradiated culture plates once, twice, or thrice with either LED or laser light using 40, 54, 81, or 121 J/cm(2) fluence at 15-, 30-, or 240-min time interval between irradiation. Cultures were incubated immediately after irradiation at 37 Â°C for 24 h before imaging and counting remnant bacterial colonies. Regardless of the device used, LED or laser, irradiation at each fluence resulted in statistically significant bacterial growth suppression compared to non-irradiated controls (pâ€‰<â€‰0.0001). The antimicrobial effect of both light sources, LED and laser, was not statistically different at each fluence in 35 of the 36 experimental trials. Bacterial growth suppression achieved with either source of light increased with repeated irradiation, particularly at the 15- or 30-min treatment time interval. Thus, we conclude that the antimicrobial effect of 405-nm laser and 405-nm LED on MRSA is similar; neither has a superior antimicrobial effect when compared to the other. Bacterial Load;Lasers;Methicillin-Resistant Staphylococcus aureus;Semiconductors;Time Factors

Efficacy of low-level laser therapy for the treatment of burning mouth syndrome: a randomized, controlled trial. The aim of the present study was to assess the effect of low-level laser therapy (LLLT) in the treatment of burning mouth syndrome (BMS). A diode laser was used in 78 BMS patients who were randomly assigned into four groups: IR1W, n = 20 (830 nm, 100 mW, 5 J, 176 J/cm2, 50 s, LLLT weekly sessions, 10 sessions); IR3W, n = 20 (830 nm, 100 mW, 5 J, 176 J/cm2, 50 s, three LLLT weekly sessions, 9 sessions); red laser, n = 19 (685 nm, 35 mW, 2 J, 72 J/cm2, 58 s, three LLLT weekly sessions, 9 sessions); and control-group (CG), n = 19. Symptoms were assessed at the end of the

treatment and eight weeks later; quality of life related to oral health was assessed using the Oral Health Impact Profile (OHIP-14). Statistical analysis was carried out using repeated measures analysis of variance followed by the posthoc Tukey test. There was significant reduction of the symptoms in all groups at the end of the treatment, which was maintained in the follow-up. The scores of the IR1W and IR3W laser groups differed significantly from those of the CG. There was also a decrease in the OHIP-14 scores in the four groups. The IR3W laser group scores differed significantly from those of the CG. LLLT reduces the symptoms of BMS and may be an alternative therapeutic strategy for the relief of symptoms in patients with BMS. Aged;Burning Mouth Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement

Monochromatic excimer light versus combination of topical steroid with vitamin D3 analogue in the treatment of nonsegmental vitiligo: a randomized blinded comparative study. Vitiligo is a difficult disease to treat, socially stigmatizing its patients. Monochromatic excimer light (MEL) was developed for use in dermatology and adapted for the treatment of vitiligo. Comparing the efficacy of MEL versus topical combination therapy of vitamin D3 analogue and steroid in the treatment of nonsegmental vitiligo. Forty-four patients with localized and stable nonsegmental vitiligo participated in the present study. In each patient, two lesions were selected and divided randomly into two groups, group A was treated with daily topical combination of calcipotriol and betamethasone and group B was treated with biweekly sessions of MEL for 3 months. Efficacy based on repigmentation percentages were blindly evaluated by two independent physicians and patient's satisfaction. There was significant improvement in both treatment modalities at the end of the study, but without significant differences in both groups. There was a significant difference between both groups regarding the onset of repigmentation (p-valueâ€‰<â€‰0.05), whereas group B showed early sign of repigmentation in first 4 weeks of treatment in 16 patients versus 7 patients in group A. Both treatment modalities offered encouraging results and both are promising lines for the treatment of vitiligo. Dermatologic Agents;Drug Combinations;Glucocorticoids;calcipotriene;Betamethasone;Calcitriol Administration, Cutaneous;Adolescent;Adult;Betamethasone;Calcitriol;Child;Combined Modality Therapy;Dermatologic Agents;Drug Combinations;Egypt;Female;Glucocorticoids;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Time Factors;Treatment Outcome;Vitiligo;Young Adult

In vitro study on the safety of near infrared laser therapy in its potential application as postmastectomy lymphedema treatment. Clinical studies demonstrated the effectiveness of laser therapy in the management of postmastectomy lymphedema, a discomforting disease that can arise after surgery/radiotherapy and gets progressively worse and chronic. However, safety issues restrict the possibility to treat cancer patients with laser therapy, since the effects of laser radiation on cancer cell behavior are not completely known and the possibility of activating postmastectomy residual cancer cells must be considered. This paper reports the results of an in vitro study aimed to investigate the effect of a class IV, dual-wavelength (808 nm and 905 nm), NIR laser system on the behavior of two human breast adenocarcinoma cell lines (namely, MCF7 and MDA-MB361 cell lines), using human dermal fibroblasts as normal control. Cell viability, proliferation, apoptosis, cell cycle and ability to form colonies were analyzed in order to perform a cell-based safety testing of the laser treatment in view of its potential application in the management of postmastectomy lymphedema. The results showed that, limited to the laser source, treatment conditions and experimental models used, laser radiation did not significantly affect the behavior of human breast adenocarcinoma cells, including their clonogenic efficiency. Although these results do not show any significant laser-induced modification of cancer cell behavior, further studies are needed to assess the possibility of safely applying NIR laser therapy for the management of postmastectomy lymphedema.

Apoptosis;Breast Cancer Lymphedema;Breast Neoplasms;Cell Line, Tumor;Cell Proliferation;Cell Survival;Female;Fibroblasts;Humans;Laser Therapy;Low-Level Light Therapy;MCF-7 Cells;Mastectomy

Male Body Contouring. Men are increasingly turning to dermatologists and plastic surgeons to request procedures that correct or enhance physical features. With the advent of this emerging new patient population, alterations in preexisting aesthetic techniques, gender-specific uses of existing devices and overall approaches need to be revisited and adapted to obtain results that are suitable for the male patient. Recently, body contouring has become one of the most sought out procedures by men. Although the majority of clinical studies involving body contouring esthetics are performed with female patients, gains from such studies can be extrapolated to men. Body contouring can be broadly classified as non-invasive or invasive, depending on the modality used. Non-invasive contouring is most frequently performed with devices that target subcutaneous adipose with focused electrical or thermal energy, including low-level laser, cryolipolysis, ultrasonography, and radiofrequency. Invasive body contouring modalities useful for male body contouring include liposuction, pectoral and abdominal wall etching, jawline fillers, synthetic deoxycholic acid injections, and solid silicone implants. The purpose of this review is to bring attention to the unique aspects, strategies, and modalities used in aesthetic body contouring for the male patient. Silicones;Deoxycholic Acid Body Fat Distribution;Cosmetic Techniques;Cryosurgery;Deoxycholic Acid;Humans;Lipectomy;Low-Level Light Therapy;Male;Prostheses and Implants;Radiofrequency Therapy;Silicones;Subcutaneous Fat;Ultrasonic Therapy

Emerging Therapies for Androgenetic Alopecia. Androgenetic alopecia is the progressive miniaturization of the scalp's terminal follicles in aging men. Over 40% of Caucasian men develop hair loss by the age of 40. Despite its prevalence, there are only two FDA approved medications to treat the condition. Recognizing the unmet need, new medical, procedural, and surgical treatments are being adopted to combat progressive hair loss. This review examines emerging hair loss treatments including medical therapies that the target prostaglandins, low level light therapy, platelet rich plasma injections, and robotic hair transplantation. Prostaglandins;Dinoprost;Prostaglandin D2 Alopecia;Dinoprost;Hair Follicle;Humans;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Prostaglandin D2;Prostaglandins;Robotic Surgical Procedures

Effect of Different Contact Materials on Approximal Caries Detection by Laser Fluorescence and Light-Emitting Diode Devices. OBJECTIVE: The aim of this in vitro study was to investigate the influence of the adjacent tooth surface on pen type laser fluorescence (LFpen) and light-emitting diode (LED) device readings in detecting approximal caries lesions in permanent teeth. BACKGROUND DATA: Early detection of noncavitated dental caries is important, because disease progression can be easily halted at this stage with certain applications, such as fluoride therapy, antibacterial therapy, dietary changes, or low-intensity laser irradiation. MATERIALS AND METHODS: A total of 87 permanent molars with 156 approximal surfaces were assessed with LED- and LF-based devices in contact with sound tooth surfaces (the control group) as well as approximal amalgam, composite, zirconia, and full ceramic restorations. All teeth were assessed once by one trained examiner. After the LF and LED assessments, the teeth were histologically evaluated using stereomicroscopy as the gold standard. The sensitivity, specificity, accuracy, and area under the receiver operating characteristics (ROC) curve were calculated according to the appropriate thresholds (T1, sound surface or enamel caries; T2, dentin caries). RESULTS: For the LFpen device, higher sensitivity and accuracy was found when the adjacent surface was sound at the T1 threshold and no significant differences were found among accuracy at the T2 threshold. For the LED-based device, no significant differences were found among sensitivities at the T1 threshold. At the T2 threshold, specificity was higher when the adjacent tooth had a zirconia restoration. CONCLUSIONS: It was found that both devices could be used effectively for evaluating approximal surfaces with adjacent restored teeth, regardless of the different kinds of

restorative materials. Dental Materials Dental Caries;Dental Enamel;Dental Materials;Dentin;Fluorescence;Humans;Optical Imaging;ROC Curve;Surface Properties
Post-Treatment Apical Periodontitis Successfully Treated with Antimicrobial Photodynamic Therapy Via Sinus Tract and Laser Phototherapy: Report of Two Cases. OBJECTIVE: The purpose of this study was to report the application of antimicrobial photodynamic therapy (aPDT) via sinus tract associated with laser phototherapy (LPT) in conservative treatment of a late failure of endodontic retreatment in two clinical cases of post-treatment apical periodontitis. BACKGROUND DATA: Post-treatment apical periodontitis is a microbiological matter, because infection is present in almost all cases associated with this condition, even in teeth with apparently adequate root canal treatments. Infection is usually located within the root canal system, but in a few cases it may spread to the periradicular tissues. Many biofilms are susceptible to aPDT, particularly in dental disease. In the present two cases reports, aPDT was applied via sinus tract. METHODS: In the two clinical cases, endodontic retreatment was unsuccessful, with the presence of a persistent swelling sinus tract, despite the standard quality of the endodontic retreatment. Before any surgical intervention, a noninvasive aPDT via sinus tract was performed. The photosensitizer methylene blue (0.01%) was inserted through the entrance of the sinus tract. Laser irradiation was performed perpendicularly (660â€‰nm, 40â€‰mW, 90â€‰J/cm(2), 63â€‰sec/point) directly over the entrance of the sinus tract. LPT (808â€‰nm, 100â€‰mW, 210â€‰J/cm(2), 59â€‰sec/ point) was applied after each aPDT session. Seven (case 1) and 10 (case 2) successive aPDT applications were performed followed by LPT. RESULTS: The 18 month follow-up after treatment revealed control of the swelling sinus tract and diminishing of persistent apical periodontitis. The treatment succeeded, avoiding both surgical interventions and antimicrobial prescription. CONCLUSIONS: The protocol of aPDT associated with LPT applied via sinus tract was revealed to be efficient for clinical infection control, and was found to be safe and conservative. Anti-Infective Agents Aged;Anti-Infective Agents;Female;Humans;Maxillary Sinus;Periapical Periodontitis;Photochemotherapy
Treatments for traumatic brain injury with emphasis on transcranial near-infrared laser phototherapy. Traumatic brain injury (TBI) is a growing health concern affecting civilians and military personnel. In this review, treatments for the chronic TBI patient are discussed, including pharmaceuticals, nutraceuticals, cognitive therapy, and hyperbaric oxygen therapy. All available literature suggests a marginal benefit with prolonged treatment courses. An emerging modality of treatment is near-infrared (NIR) light, which has benefit in animal models of stroke, spinal cord injury, optic nerve injury, and TBI, and in human trials for stroke and TBI. The extant literature is confounded by variable degrees of efficacy and a bewildering array of treatment parameters. Some data indicate that diodes emitting low-level NIR energy often have failed to demonstrate therapeutic efficacy, perhaps due to failing to deliver sufficient radiant energy to the necessary depth. As part of this review, we present a retrospective case series using high-power NIR laser phototherapy with a Class IV laser to treat TBI. We demonstrate greater clinical efficacy with higher fluence, in contrast to the bimodal model of efficacy previously proposed. In ten patients with chronic TBI (average time since injury 9.3 years) given ten treatments over the course of 2 months using a high-power NIR laser (13.2 W/0.89 cm(2) at 810 nm or 9 W/0.89 cm(2) at 810 nm and 980 nm), symptoms of headache, sleep disturbance, cognition, mood dysregulation, anxiety, and irritability improved. Symptoms were monitored by depression scales and a novel patient diary system specifically designed for this study. NIR light in the power range of 10-15 W at 810 nm and 980 nm can safely and effectively treat chronic symptoms of TBI. The clinical benefit and effects of infrared phototherapy on mitochondrial function and secondary molecular events are discussed in the context of adequate radiant energy penetration.
Can combined use of low-level lasers and hyaluronic acid injections prolong the longevity of degenerative knee joints? BACKGROUND: This study evaluated whether half-yearly hyaluronic

acid injection together with low-level laser therapy in addition to standard conventional physical therapy can successfully postpone the need for joint replacement surgery in elderly patients with bilateral symptomatic tricompartmental knee arthritis. METHODS: In this prospective, double-blind, placebo-controlled study, 70 consecutive unselected elderly patients with bilateral tricompartmental knee arthritis were assigned at random to either one of two conservative treatment protocols to either one of the painful knees. Protocol A consisted of conventional physical therapy plus a sham light source plus saline injection, and protocol B consisted of protocol A with addition of half-yearly hyaluronic acid injection as well as low-level laser treatment instead of using saline and a sham light source. Treatment failure was defined as breakthrough pain necessitating joint replacement. RESULTS: Among the 140 painful knees treated with either protocol A or protocol B, only one of the 70 painful knees treated by protocol B required joint replacement, whereas 15 of the 70 painful knees treated by protocol A needed joint replacement surgery (P<0.05). CONCLUSION: We conclude that half-yearly hyaluronic acid injections together with low-level laser therapy should be incorporated into the standard conservative treatment protocol for symptomatic knee arthritis, because it may prolong the longevity of the knee joint without the need for joint replacement.
Viscosupplements;Hyaluronic Acid Aged;Aged, 80 and over;Combined Modality Therapy;Double-Blind Method;Female;Humans;Hyaluronic Acid;Injections, Intra-Articular;Low-Level Light Therapy;Male;Osteoarthritis, Knee;Prospective Studies;Severity of Illness Index;Viscosupplements

[Mucosal tolerance and low level laser therapy: Is the delegation to radiation technicians possible?]. Mucositis remains a frequent complication of radiotherapy. Low level laser applications are used to accelerate the healing process. This technique is used routinely in our centre. It is performed by delegation by radiotherapists. The conditions of this delegation of tasks are addressed here.
Allied Health Personnel;Delegation, Professional;Humans;Low-Level Light Therapy;Mucous Membrane;Radiation Tolerance;Radionuclide Imaging;Stomatitis

Effect of low-level laser irradiation on proliferation and viability of human dental pulp stem cells. A positive effect of low-level laser irradiation (LLLI) on the proliferation of some cell types has been observed, but little is known about its effect on dental pulp stem cells (DPSCs). The aim of this study was to identify the lowest energy density able to promote the proliferation of DPSCs and to maintain cell viability. Human DPSCs were isolated from two healthy third molars. In the third passage, the cells were irradiated or not (control) with an InGaAlP diode laser at 0 and 48 h using two different energy densities (0.5 and 1.0 J/cmÂ²). Cell proliferation and viability and mitochondrial activity were evaluated at intervals of 24, 48, 72, and 96 h after the first laser application. Apoptosis- and cell cycle-related events were analyzed by flow cytometry. The group irradiated with an energy density of 1.0 J/cmÂ² exhibited an increase of cell proliferation, with a statistically significant difference (pâ€‰<â€‰0.05) compared to the control group at 72 and 96 h. No significant changes in cell viability were observed throughout the experiment. The distribution of cells in the cell cycle phases was consistent with proliferating cells in all three groups. We concluded that LLLI, particularly a dose of 1.0 J/cmÂ², contributed to the growth of DPSCs and maintenance of its viability. This fact indicates this therapy to be an important future tool for tissue engineering and regenerative medicine involving stem cells. Cell Proliferation;Cell Survival;Dental Pulp;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Stem Cells;Time Factors;Tissue Engineering

Cutaneous and Mucosal Manifestations of Hereditary Hemorrhagic Telangiectasia Treated With Pulsed Dye Laser. Adult;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Telangiectasia, Hereditary Hemorrhagic

Analysis of Radiomodulatory Effect of Low-Level Laser Irradiation by Clonogenic Survival Assay. OBJECTIVE: The aim of this study was to investigate the radiomoulatory effects of low-level laser irradiation (LLLI) in normal and cancer cells exposed to ionizing X-ray radiation on clonogenic survival

assay. BACKGROUND DATA: LLLI does have radioprotective effects on normal tissue. LLLI can reduce the incidence of mucocutaneous complications of ionizing radiation. Few in vitro studies reported adaptive responses for LLLI to ionizing radiation in normal and cancer cells, particularly with respect to clonogenic cell survival assay. METHODS: Normal NIH 3T3 cells and cancer HeLa cells were irradiated with 685 and 830â€‰nm LLLI at different energy densities prior to ionizing X-ray radiation. The survival fraction was determined after ionizing radiation (0, 2, 4, and 6â€‰Gy). The values of the linear (Î±) and quadratic (Î²) parameters were calculated based on the clonogenic survival curves. RESULTS: Clonogenic radiation survival assay showed that the application of LLLI at 685â€‰nm prior to ionizing radiation could significantly inhibit clonogenic growth of HeLa cells compared with unirradiated HeLa cells. LLLI could also significantly increase the Î± parameter of the linear quadratic (LQ) model. In contrast, application of LLLI at 830â€‰nm could significantly protect NIH 3T3 cells against radiation and decreased Î± parameter. CONCLUSIONS: This study suggests that various physical parameters of LLLI can be diverse adaptive responses to ionizing radiation on normal and cancer cells. Cell Line, Tumor;Cell Survival;Dose-Response Relationship, Radiation;Humans;Radiation, Ionizing

A Comparative Study of the Effectiveness of Immediate Versus Delayed Photobiomodulation Therapy in Reducing the Severity of Postoperative Inflammatory Complications. OBJECTIVE: The aim of this study was to compare the immediate versus the delayed application of photobiomodulation (PBM) therapy following odontectomy of horizontally impacted mandibular third molars, and assess which application method is more effective at reducing postoperative complications. BACKGROUND DATA: Surgical removal of horizontally impacted mandibular third molars is a common surgical procedure, usually associated with postoperative complications such as pain, swelling, and trismus. Several attempts have been made to minimize these complications. One such method is the use of PBM therapy. METHODS: Eighty patients with horizontally impacted mandibular third molars with no inferior alveolar canal approximation were recruited for this study. They were divided into two groups. The immediate group received PBM therapy immediately after surgery and on the 3rd day postoperatively. Subjects in the delayed group received PBM therapy on the 2nd and 4th days postoperatively. All subjects received 2â€‰min of treatment using a 4â€‰W laser beam, during which 171â€‰J were delivered via a 2.8â€‰cm(2) spot size. RESULTS: Clinical and statistical results showed a significant reduction in pain, trismus, and swelling in the immediate PBM therapy group compared with the delayed PBM therapy group. CONCLUSIONS: Immediate PBM therapy is more effective than delayed PBM therapy in minimizing the complications associated with mandibular third molar removal surgery. Adolescent;Adult;Edema;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Postoperative Complications;Prospective Studies;Tooth Extraction;Trismus;Young Adult

Visual Diagnosis: Newborn With a Facial Vascular Birthmark. Anticonvulsants;oxcarbamazepine;Carbamazepine Anticonvulsants;Carbamazepine;Humans;Infant, Newborn;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Port-Wine Stain;Seizures;Sturge-Weber Syndrome

An open label pilot study of supraerythemogenic excimer laser in combination with clobetasol spray and calcitriol ointment for the treatment of generalized plaque psoriasis. A common therapeutic modality for psoriasis includes the combination of phototherapy with topical treatments. The recent development of targeted phototherapy with the excimer laser and spray formulations for topical treatments has increased the efficacy and convenience of these combinational therapies. Herein, we aim to assess the efficacy of a novel combination of therapies using the 308â€‰nm excimer laser, clobetasol propionate spray and calcitriol ointment for the treatment of moderate to severe generalized psoriasis. In this 12-week study, patients with moderate to severe psoriasis received

twice weekly treatments with a 308-nm excimer laser combined with clobetasol proprionate twice daily for a month followed by calcitriol ointment twice daily for the next month. Of the 30 patients enrolled, 83% of patients (25/30) achieved PASI-75 [65-94%, 95% confidence interval (CI)] at week 12. For PGA, there was an estimated decrease of 3.6 points (3.1-4.1, 95% CI, pâ€‰<â€‰0.0005) by week 12. In conclusion, the combination of excimer laser with alternating clobetasol and calcitriol application has shown to be a promising combination of therapies for the treatment of moderate to severe generalized psoriasis. Further evaluation may be conducted with a larger study inclusive of control groups and head-to-head comparisons against topical steroid and UVB therapy as monotherapies. Calcium Channel Agonists;Glucocorticoids;Ointments;Clobetasol;Calcitriol Administration, Topical;Adult;Calcitriol;Calcium Channel Agonists;Chemistry, Pharmaceutical;Clobetasol;Combined Modality Therapy;Drug Therapy, Combination;Female;Glucocorticoids;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Nebulizers and Vaporizers;Ointments;Pilot Projects;Psoriasis

The effects of laser treatment in tendinopathy: a systematic review. Tendons have as main function transmit forces from the muscle to the bones. Tendinopathy is an inflammatory process that occurs in and around the tendon, when these are affected by some injury. Low level laser therapy consists in a local application of a monochromatic, coherent and short wavelength light. Its use began in 60's and since then several benefits for tendon injuries have been reported. The objective of this study is to collect the most recent studies about the use of laser on the tendinopathy treatment. We performed searches on the following electronic databases PubMed, Medline, CAPES journals portal and LILACS. After the analysis, we selected three articles that showed that the use of low-level laser therapy, compared to placebo, is effective in treatment of tendinopathy. Despite the need for more studies about this theme, the low-level laser therapy demonstrates consistent results in the treatment of tendinopathy.

Human Tubal-Derived Mesenchymal Stromal Cells Associated with Low Level Laser Therapy Significantly Reduces Cigarette Smoke-Induced COPD in C57BL/6 mice. Cigarette smoke-induced chronic obstructive pulmonary disease is a very debilitating disease, with a very high prevalence worldwide, which results in a expressive economic and social burden. Therefore, new therapeutic approaches to treat these patients are of unquestionable relevance. The use of mesenchymal stromal cells (MSCs) is an innovative and yet accessible approach for pulmonary acute and chronic diseases, mainly due to its important immunoregulatory, anti-fibrogenic, anti-apoptotic and pro-angiogenic. Besides, the use of adjuvant therapies, whose aim is to boost or synergize with their function should be tested. Low level laser (LLL) therapy is a relatively new and promising approach, with very low cost, no invasiveness and no side effects. Here, we aimed to study the effectiveness of human tube derived MSCs (htMSCs) cell therapy associated with a 30mW/3J-660 nm LLL irradiation in experimental cigarette smoke-induced chronic obstructive pulmonary disease. Thus, C57BL/6 mice were exposed to cigarette smoke for 75 days (twice a day) and all experiments were performed on day 76. Experimental groups receive htMSCS either intraperitoneally or intranasally and/or LLL irradiation either alone or in association. We show that co-therapy greatly reduces lung inflammation, lowering the cellular infiltrate and pro-inflammatory cytokine secretion (IL-1Î², IL-6, TNF-Î± and KC), which were followed by decreased mucus production, collagen accumulation and tissue damage. These findings seemed to be secondary to the reduction of both NF-ÎºB and NF-AT activation in lung tissues with a concomitant increase in IL-10. In summary, our data suggests that the concomitant use of MSCs + LLLT may be a promising therapeutic approach for lung inflammatory diseases as COPD. Interleukin-1beta;Interleukin-6;NF-kappa B;NFATC Transcription Factors;Smoke;Tumor Necrosis Factor-alpha Adult;Animals;Bronchoalveolar Lavage Fluid;Cells, Cultured;Female;Humans;Interleukin-1beta;Interleukin-6;Low-Level Light

Therapy;Lung;Mesenchymal Stem Cells;Mice;Mice, Inbred C57BL;Middle Aged;NF-kappa B;NFATC Transcription Factors;Pneumonia;Pulmonary Disease, Chronic Obstructive;Smoke;Smoking;Nicotiana;Tumor Necrosis Factor-alpha
Photobiomodulation with 670 nm light increased phagocytosis in human retinal pigment epithelial cells. PURPOSE: Photobiomodulation is the treatment with light in the far-red to near-infrared region of the spectrum and has been reported to have beneficial effects in various animal models of disease, including an age-related macular degeneration (AMD) mouse model. Previous reports have suggested that phagocytosis is reduced by age-related increased oxidative stress in AMD. Therefore, we investigated whether photobiomodulation improves phagocytosis caused by oxidative stress in the human retinal pigment epithelial (ARPE-19) cell line. METHODS: ARPE-19 cells and human primary retinal pigment epithelium (hRPE) cells were incubated and irradiated with near-infrared light (670 nm LED light, 2,500 lx, twice a day, 250 s/per time) for 4 d. Next, hydrogen peroxide (H2O2) and photoreceptor outer segments (POS) labeled using a pH-sensitive fluorescent dye were added to the cell culture, and phagocytosis was evaluated by measuring the fluorescence intensity. Furthermore, cell death was observed by double staining with Hoechst33342 and propidium iodide after photobiomodulation. CM-H2DCFDA, JC-1 dye, and CCK-8 were added to the cell culture to investigate the reactive oxygen species (ROS) production, mitochondrial membrane potential, and cell viability, respectively. We also investigated the expression of phagocytosis-related proteins, such as focal adhesion kinase (FAK) and Mer tyrosine kinase (MerTK). RESULTS: Oxidative stress inhibited phagocytosis, and photobiomodulation increased the oxidative stress-induced hypoactivity of phagocytosis in ARPE-19 cells and hRPE cells. Furthermore, H2O2 and photobiomodulation did not affect cell death in this experimental condition. Photobiomodulation reduced ROS production but did not affect cell viability or mitochondrial membrane potential. The expression of phosphorylated MerTK increased, but phosphorylated FAK was not affected by photobiomodulation. CONCLUSIONS: These findings indicate that near-infrared light photobiomodulation (670 nm) may be a noninvasive, inexpensive, and easy adjunctive therapy to help inhibit the development of ocular diseases induced by the activation of phagocytosis. Proto-Oncogene Proteins;Reactive Oxygen Species;MERTK protein, human;Receptor Protein-Tyrosine Kinases;c-Mer Tyrosine Kinase;Focal Adhesion Kinase 1;PTK2 protein, human Animals;Cell Line;Focal Adhesion Kinase 1;Humans;Infrared Rays;Macular Degeneration;Membrane Potential, Mitochondrial;Mice;Oxidative Stress;Phagocytosis;Phototherapy;Proto-Oncogene Proteins;Reactive Oxygen Species;Receptor Protein-Tyrosine Kinases;Retinal Pigment Epithelium;Swine;c-Mer Tyrosine Kinase
A Novel Treatment of Herpes Zoster Pain With Pulsed Laser Irradiation. Aged;Female;Herpes Zoster;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neuralgia, Postherpetic;Pain
Does low level laser therapy relieve the pain caused by the placement of the orthodontic separators?--A meta-analysis. OBJECTIVE: Pain caused by orthodontic treatment can affect patient's compliance and even force them to terminate treatments. The aim of this meta-analysis is to evaluate of the analgesic effect of low level laser therapy (LLLT) after placement of the orthodontic separators. METHODS: Five databases: PubMed, Embase, Cochrane library, China Biology Medicine disc (SinoMed CBM), China National Knowledge Infrastructure (CNKI) were searched for all the appropriate studies in June, 2014. Two reviewers screened the research results under our inclusion criteria and evaluated the risk of bias independently. Then the data of the included studies was extracted for quantitative analysis by the Review Manager 5.1 software. RESULTS: Six studies were included in our meta-analysis finally. Comparing to the placebo group, the LLLT has good analgesic effect at 6Â h, 1d, 2d, 3d after placement of separators which is of statistical significance. While at 2Â h, 4d, 5d after the placement, the results tend to support LLLT, but not statistically significant. CONCLUSION: Based on

current included studies, LLLT can reduce the pain caused by the placement of separators effectively. However, because of the high heterogeneity, well designed RCTs are required in the future.
Analgesia;Humans;Low-Level Light Therapy;Orthodontic Retainers;Pain;Pain Measurement

Photobiostimulation effect on diabetic wound at different power density of near infrared laser.
The photobiostimulation effects of near infrared 808 nm diode laser irradiance on diabetic wound were investigated. 120 rats were induced with diabetes by streptozotocin injection. Full thickness punch wounds of 6mm diameter were created on the dorsal part of the rats. All rats were randomly distributed into four groups; one group served as control group, whereas three groups were stimulated daily with unchanged energy density dose of 5 J/cm(2) with different power density, which were 0.1 W/cm(2), 0.2 W/cm(2) and 0.3 W/cm(2) with different exposure duration of 50s, 25s and 17s, respectively. Ten rats from each group were sacrificed on day 3, 6 and 9, respectively. Skin tissues were removed for histological purpose. The contraction of wound was found optimized after exposure with 0.1 W/cm(2). Based on the histological evidence, laser therapy has shown able to promote wound repair through enhanced epithelialization and collagen fiber synthesis. Generally, irradiated groups were advanced in terms of healing than non-irradiated group.
Animals;Diabetes Mellitus, Experimental;Epidermis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats, Sprague-Dawley;Treatment Outcome;Wound Healing

LASER versus electromagnetic field in treatment of hemarthrosis in children with hemophilia.
Children with hemophilia usually have recurrent joint bleeding that leads to joint damage, loss of range of motion, and restriction of mobility, therefore affecting the quality of life in these children. The purpose of this study was to compare the effects of low-level laser therapy (LLLT) to that of pulsed electromagnetic field (PEMF) in treatment of hemarthrosis in children with hemophilia. Thirty boys with hemophilia A with ages ranging from 9 to 13Â years were selected and assigned randomly, using sealed envelopes, into two equal intervention groups. The study group I received the traditional physical therapy program in addition to LLLT, whereas the study group II received the same physical therapy program given to the study group I in addition to PEMF. Both groups received the treatment sessions three times per week for three successive months. Pain, laboratory investigations, swelling, and range of motion (ROM) of the affected knee joint, in addition to physical fitness were evaluated before, at the end of the sixth week and at 12Â weeks of the treatment program. Laser group showed significant improvement in all measured variables after the sixth week of treatment when compared with PEMF. By 12Â weeks of treatment, there was a significant improvement in pain, ROM, ESR and leucocytes levels in laser group compared with PEMF, while there was no significant difference in knee circumferences and the 6-min walk test (6MWT) between both groups. Both groups showed significant improvement at 12Â weeks of treatment compared with that at 6Â weeks. Both LLLT and PEMF are effective modalities in reducing pain, swelling, increasing ROM and improving physical fitness. Twelve weeks of treatment of both modalities demonstrated significant improvement than 6Â weeks of treatment. Laser therapy induced significant improvement than electromagnetic therapy in treatment of hemarthrosis-related problems in children with hemophilia.
Adolescent;Child;Electromagnetic Fields;Hemarthrosis;Hemophilia A;Humans;Lasers;Male;Treatment Outcome

The effectiveness of passive physical modalities for the management of soft tissue injuries and neuropathies of the wrist and hand: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. OBJECTIVE: The purpose of this systematic review was to determine the effectiveness of passive physical modalities compared to other interventions, placebo/sham interventions, or no intervention in improving self-rated recovery, functional recovery, clinical outcomes and/or administrative outcomes (eg, time of disability benefits) in adults and/or children with soft tissue injuries and neuropathies of the wrist and hand. METHODS: We

systematically searched MEDLINE, EMBASE, PsycINFO, and the Cochrane Central Register of Controlled Trials, accessed through Ovid Technologies, Inc, and CINAHL Plus with Full Text, accessed through EBSCO host, from 1990 to 2015. Our search strategies combined controlled vocabulary relevant to each database (eg, MeSH for MEDLINE) and text words relevant to our research question and the inclusion criteria. Randomized controlled trials, cohort studies, and case-control studies were eligible. Random pairs of independent reviewers screened studies for relevance and critically appraised relevant studies using the Scottish Intercollegiate Guidelines Network criteria. Studies with low risk of bias were synthesized following best evidence synthesis principles. RESULTS: We screened 6618 articles and critically appraised 11 studies. Of those, 7 had low risk of bias: 5 addressed carpal tunnel syndrome (CTS) and 2 addressed de Quervain disease. We found evidence that various types of night splints lead to similar outcomes for the management of CTS. The evidence suggests that a night wrist splint is less effective than surgery in the short term but not in the long term. Furthermore, a night wrist splint and needle electroacupuncture lead to similar outcomes immediately postintervention. Finally, low-level laser therapy and placebo low-level laser therapy lead to similar outcomes. The evidence suggests that kinesio tape or a thumb spica cast offers short-term benefit for the management of de Quervain disease. Our search did not identify any low risk of bias studies examining the effectiveness of passive physical modalities for the management of other soft tissue injuries or neuropathies of the wrist and hand. CONCLUSIONS: Different night orthoses provided similar outcomes for CTS. Night orthoses offer similar outcomes to electroacupuncture but are less effective than surgery in the short term. This review suggests that kinesio tape or a thumb spica cast may offer short-term benefit for the management of de Quervain disease.
Accidents, Traffic;Adult;Carpal Tunnel Syndrome;Child;Cooperative Behavior;Evidence-Based Medicine;Female;Hand Injuries;Humans;Low-Level Light Therapy;Male;Ontario;Orthotic Devices;Physical Therapy Modalities;Practice Guidelines as Topic;Soft Tissue Injuries;Systematic Reviews as Topic;Ultrasonic Therapy;Wrist Injuries

Sub ablative Er: YAG laser irradiation on surface roughness of eroded dental enamel. OBJECTIVE: This study evaluated the effects of Er:YAG laser irradiation applied at varying pulse repetition rate on the surface roughness of eroded enamel. METHODS: Bovine enamel slabs (nâ€‰=â€‰10) were embedded in polyester resin, ground, and polished. To erosive challenges, specimens were immersed two times per day in 20mL of concentrated orange juice (pHâ€‰=â€‰3.84) under agitation, during a two-day period. Specimens were randomly assigned to irradiation with the Er:YAG laser (focused mode, pulse energy of 60 mJ and energy density of 3.79 J/cm(2)) operating at 1, 2, 3, or 4 Hz. The control group was left nonirradiated. Surface roughness measurements were recorded post erosion-like formation and further erosive episodes by a profilometer and observed through atomic force microscopy (AFM). RESULTS: Analysis of variance revealed that the control group showed the lowest surface roughness, while laser-irradiated substrates did not differ from each other following post erosion-like lesion formation. According to analysis of covariance, at further erosive episodes, the control group demonstrated lower surface roughness (Pâ€‰>â€‰0.05), than any of the irradiated groups (Pâ€‰<â€‰0.05). CONCLUSIONS: The pulse repetition rate of the Er:YAG laser did not affect roughness of dental enamel eroded. The AFM images showed that the specimens irradiated by the Er:YAG laser at 1 Hz presented a less rough surface than those irradiated at 2, 3, and 4 Hz.
Animals;Cattle;Dental Enamel;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Atomic Force;Surface Properties

Efficacy of physical therapy for the treatment of lateral epicondylitis: a meta-analysis. BACKGROUND: Physical therapy for the treatment of lateral epicondylitis (LE) often comprises movement therapies, extracorporeal shockwave therapy (ECSWT), low level laser therapy (LLLT), low frequency electrical stimulation or pulsed electromagnetic fields. Still, only ECSWT and LLLT have

been meta-analytically researched. METHODS: PUBMED, EMBASE and Cochrane database were systematically searched for randomized controlled trials (RCTs). Methodological quality of each study was rated with an adapted version of the Scottish Intercollegiate Guidelines Network (SIGN) checklist. Pain reduction (the difference between treatment and control groups at the end of trials) and pain relief (the change in pain from baseline to the end of trials) were calculated with mean differences (MD) and 95%-Confidence intervals (95 % CI). RESULTS: One thousand one hundred thirty eight studies were identified. One thousand seventy of those did not meet inclusion criteria. After full articles were retrieved 16 studies met inclusion criteria and 12 studies reported comparable outcome variables. Analyses were conducted for overall pain relief, pain relief during maximum handgrip strength tests, and maximum handgrip strength. There were not enough studies to conduct an analysis of physical function or other outcome variables. CONCLUSIONS: Differences between treatment and control groups were larger than differences between treatments. Control group gains were 50 to 66% as high as treatment group gains. Still, only treatment groups with their combination of therapy specific and non-therapy specific factors reliably met criteria for clinical relevance. Results are discussed with respect to stability and their potential meaning for the use of non-therapy specific agents to optimize patients' gain. Electric Stimulation Therapy;Female;Hand Strength;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male;Pain Measurement;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Tennis Elbow;Treatment Outcome
Editorial. Catheter Ablation;Cosmetic Techniques;Humans;Low-Level Light Therapy;Melanosis;Photochemotherapy;Ultrasonic Therapy
Depressed scar after filler injection successfully treated with pneumatic needleless injector and radiofrequency device. Fillers are known to be associated with a number of side effects, one of the most severe being skin necrosis. The most vulnerable areas are those that are supplied by a single arterial branch; for example, the glabellar and nasolabial folds are susceptible. In this study, we report good cosmetic outcomes were produced by utilizing the pneumatic needleless injector and radiofrequency device to treat depressed scars that occurred after necrosis following filler injection. Initially, applying light-emitting diode treatment and following through with the two devices appears to have synergistic effects for scar remodeling when dealing with treatment of depressed scars with irregular borders. Dermal Fillers Adult;Catheter Ablation;Cicatrix;Combined Modality Therapy;Cosmetic Techniques;Dermal Fillers;Equipment Design;Esthetics;Female;Humans;Injections, Intradermal;Low-Level Light Therapy;Microinjections;Necrosis;Rejuvenation;Remission Induction;Skin;Skin Aging;Time Factors;Treatment Outcome
The effects of combined low level laser therapy and mesenchymal stem cells on bone regeneration in rabbit calvarial defects. OBJECTIVE: This study evaluated the effect of Low Level Laser Therapy (LLLT) and Mesenchymal Stem Cells (MSCs) on bone regeneration. BACKGROUND DATA: Although several studies evaluated the effects of MSCs and LLLT, there is little information available regarding in vivo application of LLLT in conjunction with MSCs. METHODS: Forty-eight circular bone defects (6mm in diameter) were prepared in the calvaria of 12 New-Zealand white rabbits. The defects of each animal were randomly assigned to 4 groups: (C) no treatment; (L) applying LLLT; (SC) filled with MSCs; (SCL) application of both MSCs and LLLT. LLL was applied on alternate days at wavelength of 810 nm, power density of 0.2 W/cm(2) and a fluency of 4 J/cm(2) using a Gallium-Aluminum-Arsenide (GaAlAs) diode laser. The animals were sacrificed after 3 weeks and then histological samples were evaluated to determine the amount of new bone formation and the remaining scaffold and inflammation. RESULTS: The histological evaluation showed a statistically significant increase in new bone formation of LLLT group relative to the control and the other two experimental groups ($p<0.05$). There was no significant difference in bone formation of the control group compared to experimental

groups filled with MSCs. Laser irradiation had no significant effect on resorption of the scaffold material. In addition, inflammation was significantly reduced in LLLT group compared to the control defects and the other two experimental groups. CONCLUSION: Low level laser therapy could be effective in bone regeneration but there is no evidence of a synergistic effect when applied in conjunction with MSCs. Animals;Autografts;Bone Regeneration;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Rabbits;Skull;Tissue Scaffolds

Laser Therapy After Repair of the Distal Half of the Median Nerve; a Comparative Study. BACKGROUND: Nerve injuries resulting from major or minor trauma often cause some disabilities for patients. Neurotmesis, characterized by complete anatomical rupture of the nerve, is the most severe form of the injury which will not recover without reconstructive surgery and nowadays such neural damages are improved by microsurgical procedures. Some studies have used low power laser for nerve cell growth in order to improve the rehabilitation results of peripheral nerves. Low power laser can complement the reformation of postsurgical nerve injuries. OBJECTIVES: The current study aimed to assess the effects of laser therapy after repair of median nerve rupture in the distal third of the forearm and to compare the results with that of the standard method. PATIENTS AND METHODS: The current study was a case-control clinical trial of 36 patients with volar surface rupture of the distal third of forearm admitted to the emergency ward of Hazrat-e-Fatemeh Hospital within 72 hours of injury, they had anesthesia in the first, second, and third fingers as a result of Median Nerve Injury. Patients were divided into two groups. The first group included subjects treated with standard methods and the second group included those treated with low power laser therapy (LT) along with the standard method. The same surgeon operated the subjects in the two groups. The second group underwent 10 sessions of LT every other day. Clinical Examination, Electromyography and Nerve Conduction Velocity (NCV) were done after six months and the results were compared. RESULTS: In the two -point discrimination- test, there was no significant difference between the two groups in the thumbs but a significant improvement was observed in the index finger of the LT group. Improvement of muscular examinations such as opposition and thumb abduction supported the usage of laser in the second group. Regarding electromyography and NCV, significant statistical difference was observed in the motor part of the laser group and, to a great extent, was compatible with the physical examinations. CONCLUSIONS: Accordingly, laser therapy in our protocol seemed to affect some of the nerve growth parameters, mostly on motor rather than sensory fibers.

[The influence of intravenous laser irradiation of the blood on the dynamics of leptin levels and the quality of life of the patients presenting with rheumatoid arthritis]. AIM: The objective of the present study was to estimate the influence of intravenous laser irradiation of the blood on the dynamics of leptin levels and the quality of life of the patients presenting with rheumatoid arthritis. MATERIAL AND METHODS: A total of 132 patients at the age varying from 18 to 65 (mean 52.9 Â± 11.3) years presenting with rheumatoid arthritis (RA) were available for the examination. The diagnosis of RA was based on the results of clinical, laboratory, and instrumental studies in accordance with the criteria of the American College of Rheumatology and European League Against Rheumatism (ACR/EULAR) dated 2010. The patients were divided into two groups. The control group was comprised of the patients who received the traditional medicamental treatment alone (n = 30) while the study group consisted of the patients given a course of intravenous laser irradiation of the blood in addition to the traditional medicamental treatment (n = 102).The course of intravenous laser therapy was performed with the use of a Matrix-VLOK apparatus ("Matrix", Russia) by means of the VLOK + UBI procedure. Each course consisted of 10 sessions per patient without a break for the weekend. RESULTS: The data obtained indicate that the patients with rheumatoid arthritis had the increased plasma leptin level suggesting the development of the inflammatory process. Moreover,

the quality of the patients' life was deteriorated. CONCLUSION: The results of this study demonstrate that the combined treatment by means of low-intensity laser irradiation is accompanied by the normalization of the plasma leptin level, suppression of the inflammatory process, and a significant improvement of the quality of life of the patients suffering from rheumatoid arthritis. Leptin Adolescent;Adult;Aged;Arthritis, Rheumatoid;Female;Humans;Leptin;Low-Level Light Therapy;Male;Middle Aged;Quality of Life

Pulsed dye laser in treatment of steroid-induced atrophy. BACKGROUND: One of the important and distressing cutaneous side effects of steroid therapy is skin atrophy, which has no definite and effective treatment. To the best of our knowledge, laser therapy for steroid-induced atrophic scars has not been investigated to date. OBJECTIVE: The aim of this study was to evaluate the efficacy and safety of pulsed dye laser in the treatment of steroid-induced atrophic scars. METHODS: In this pilot study, 15 patients with at least one atrophic patch were treated with the 585-nm pulsed dye laser at 4-week interval sessions until achieving complete improvement or until patient were lost to follow-up. Clinical outcome was assessed via standard photographic method before each treatment session and after the final visit. An independent dermatologist evaluated the photographs. RESULT: All of the patients (13 females and two males) with 25-59Â years of age experienced some degree of improvement, except one patient who withdrew from the treatment after three sessions. The treatment was well tolerated. CONCLUSION: The results of our study indicated that pulsed dye laser therapy could be employed as a new method in the treatment of steroid-induced atrophic scars. Pulsed dye laser might affect the lesions through inducing collagen deposition and production of more superficial dermal elastin as well as less unidirectional collagen in clusters. Adrenal Cortex Hormones Adrenal Cortex Hormones;Adult;Atrophy;Cicatrix;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Skin

Wearable and Implantable Mechanical Energy Harvesters for Self-Powered Biomedical Systems. In this issue of ACS Nano, Tang et al. investigate the ability of a triboelectric nanogenerator (TENG) to self-power a low-level laser cure system for osteogenesis by studying the efficiency of a bone remodeling laser treatment that is powered by a skin-patch-like TENG instead of a battery. We outline this field by highlighting the motivations for self-powered biomedical systems and by discussing recent progress in nanogenerators. We note the overlap between biomedical devices and TENGs and their dawning synergy, and we highlight key prospects for future developments. Biomedical systems should be more autonomous. This advance could improve their body integration and fields of action, leading to new medical diagnostics and treatments. However, future self-powered biomedical systems will need to be more flexible, biocompatible, and biodegradable. These advances hold the promise of enabling new smart autonomous biomedical systems and contributing significantly to the Internet of Things. Animals;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Osteoblasts;Osteogenesis

Traumatic Brain Injury: A Major Medical Problem That Could Be Treated Using Transcranial, Red/Near-Infrared LED Photobiomodulation. Brain Injuries, Traumatic;Cognition;Humans;Inflammation;Low-Level Light Therapy;Sleep

A successful helium-neon laser and topical tacrolimus combination therapy in one child with vitiligo. Immunosuppressive Agents;Tacrolimus Administration, Cutaneous;Animals;Cell Differentiation;Cell Line;Cell Movement;Cell Proliferation;Combined Modality Therapy;Humans;Immunosuppressive Agents;Infant;Lasers, Gas;Low-Level Light Therapy;Male;Melanocytes;Mice;Skin Pigmentation;Tacrolimus;Treatment Outcome;Vitiligo

Biolite: A Patented Ultra-Low-Level Laser-Therapy Device for Treating Musculoskeletal Pain and Associated Impairments. After an excursus on state-of-the-art knowledge for low-level laser therapy (LLLT), Biolite, a patented ultra-low-level laser therapy device used to treat musculoskeletal

pain and associated impairments, is presented. The application protocols include short stimulation of sequences of acupuncture points. The observed effects seem, however, to be far from those that might be expected after acupuncture. The primary effect seems more likely to be an extracellular soft-tissue matrix reaction. The development of the technique, the studies performed, and the evidence collected over > 10 years suggest that specifically modulated laser light can interact with human tissues at light fluences well under those previously considered as being capable of having any effect. Musculoskeletal pain very often becomes an autonomous dysfunction that is independent of the original injury and that can be effectively treated using specific peripheral acupuncture-like stimulation. Because such acupuncture is capable of reducing motor control "interferences" from noxious stimuli, it can improve motor control performance, thereby reducing the risk of falls in the elderly individuals. The proposal of acupuncture-derived protocols to be applied by Western physiotherapists using an ultra-low-level laser therapy device is a further "bridge" between two different, and sometimes very different, clinical worlds to better serve our patients.
Biolite;Carbon Acupuncture Points;Acupuncture Therapy;Carbon;Humans;Low-Level Light Therapy;Musculoskeletal Pain

Low Reactive Level Laser Therapy for Mesenchymal Stromal Cells Therapies. Low reactive level laser therapy (LLLT) is mainly focused on the activation of intracellular or extracellular chromophore and the initiation of cellular signaling by using low power lasers. Over the past forty years, it was realized that the laser therapy had the potential to improve wound healing and reduce pain and inflammation. In recent years, the term LLLT has become widely recognized in the field of regenerative medicine. In this review, we will describe the mechanisms of action of LLLT at a cellular level and introduce the application to mesenchymal stem cells and mesenchymal stromal cells (MSCs) therapies. Finally, our recent research results that LLLT enhanced the MSCs differentiation to osteoblast will also be described.

Pain reduced by low-level laser therapy during use of orthodontic separators in early mixed dentition. OBJECTIVE: The purpose of this work was to investigate whether low-level laser therapy (LLLT) applied at a defined distance from the gingiva has a pain-reducing effect in young patients undergoing orthodontic separation during the early mixed-dentition stage. MATERIALS AND METHODS: A total of 40 children in early mixed dentition (mean age 8.05 years) who required separation of molars were included. The study comprised a group of 20 patients whose treatment included laser application on the day of separation and a control group of 20 patients not receiving LLLT. All patients recorded their maximum pain intensities on the day of separation (day 1) and on the following 4 days. RESULTS: Compared to the control group, pain perception was significantly reduced (pâ€‰<â€‰0.05) in the LLLT group on day 1 and continued to be reduced on day 2. Equivalent pain levels were recorded in both groups on days 3-5. CONCLUSION: Given our findings of a pain-reducing effect in young patients undergoing orthodontic separation during the early mixed-dentition stage, LLLT is an interesting alternative option of providing analgesia even in very young patients.
Child;Dentition, Mixed;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Malocclusion;Orthodontic Appliances;Pain Management;Pain Measurement;Tooth Movement Techniques;Treatment Outcome

Facial multinucleate cell angiohistiocytoma: long-term remission with 585Â nm pulsed dye laser.
Facial Dermatoses;Female;Histiocytoma, Benign Fibrous;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Treatment Outcome

Intense pulsed light, near infrared pulsed light, and fractional laser combination therapy for skin rejuvenation in Asian subjects: a prospective multi-center study in China. Ablative skin rejuvenation therapies have limitations for Asian people, including post-inflammatory hyperpigmentation and long down time. Non-ablative lasers are safer but have limited efficacy. This

study is to investigate the safety and efficacy of a combination therapy consisting of intense pulsed light (IPL), near infrared (NIR) light, and fractional erbium YAG (Er:YAG) laser for skin rejuvenation in Asian people. This study recruited 113 subjects from six sites in China. Subjects were randomly assigned to a full-face group, who received combination therapy, and split-face groups, in which one half of the face received combination therapy and the other half received IPL monotherapy. Each subject received five treatment sessions during a period of 90 days. Subjects were followed up at 1 and 3 months post last treatment. Three months after last treatment, the full-face group (nâ€‰=â€‰57) had a global improvement rate of 29 % and 29 % for wrinkles, 32 % for skin texture, 33 % for pigment spots, 28 % for pore size, respectively. For patients in the split-face groups (nâ€‰=â€‰54), monotherapy side had a global improvement rate of 23 % and 20 % for wrinkles, 27 % for skin texture, 25 % for pigment spots, 25 % for pore size, respectively. Both combination therapy and monotherapy resulted in significant improvements at the follow-up visits compared to baseline (Pâ€‰<â€‰0.001). Combination therapy showed significantly greater improvements compared to monotherapy at two follow-up visits (Pâ€‰<â€‰0.05). Combination therapy is a safe and more effective strategy than IPL monotherapy for skin rejuvenation in Asian people.
Adult;Aged;Asian People;China;Cosmetic Techniques;Face;Female;Humans;Intense Pulsed Light Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Rejuvenation;Skin;Skin Aging;Treatment Outcome

Photodynamic Therapy for Actinic Keratoses: A Randomized Prospective Non-sponsored Cost-effectiveness Study of Daylight-mediated Treatment Compared with Light-emitting Diode Treatment. Daylight-mediated photodynamic therapy (DL-PDT) is considered as effective as conventional PDT using artificial light (light-emitting diode (LED)-PDT) for treatment of actinic keratoses (AK). This randomized prospective non-sponsored study assessed the cost-effectiveness of DL-PDT compared with LED-PDT. Seventy patients with 210 AKs were randomized to DL-PDT or LED-PDT groups. Effectiveness was assessed at 6 months. The costs included societal costs and private costs, including the time patients spent in treatment. Results are presented as incremental cost-effectiveness ratio (ICER). The total costs per patient were significantly lower for DL-PDT (â,¬132) compared with LED-PDT (â,¬170), giving a cost saving of â,¬38 (p = 0.022). The estimated probabilities for patients' complete response were 0.429 for DL-PDT and 0.686 for LED-PDT; a difference in probability of being healed of 0.257. ICER showed a monetary gain of â,¬147 per unit of effectiveness lost. DL-PDT is less costly and less effective than LED-PDT. In terms of cost-effectiveness analysis, DL-PDT provides lower value for money compared with LED-PDT. Aged;Aged, 80 and over;Cost Savings;Cost-Benefit Analysis;Female;Health Care Costs;Heliotherapy;Humans;Keratosis, Actinic;Male;Middle Aged;Photochemotherapy;Prospective Studies;Time Factors;Treatment Outcome

The protozoan, Paramecium primaurelia, as a non-sentient model to test laser light irradiation: The effects of an 808nm infrared laser diode on cellular respiration. Photobiomodulation (PBM) has been used in clinical practice for more than 40 years. Unfortunately, conflicting literature has led to the labelling of PBM as a complementary or alternative medicine approach. However, past and ongoing clinical and research studies by reputable investigators have re-established the merits of PBM as a genuine medical therapy, and the technique has, in the last decade, seen an exponential increase in the numbers of clinical instruments available, and their applications. This resurgence has led to a clear need for appropriate experimental models to test the burgeoning laser technology being developed for medical applications. In this context, an ethical model that employs the protozoan, Paramecium primaurelia, is proposed. We studied the possibility of using the measure of oxygen consumption to test PBM by irradiation with an infrared or near-infrared laser. The results show that an 808nm infrared laser diode (1W; 64J/cmÂ²) affects cellular respiration in P. primaurelia, inducing, in the irradiated cells, a significantly (p < 0.05) increased oxygen consumption of about 40%.

Our findings indicate that Paramecium can be an excellent tool in biological assays involving infrared and near-infrared PBM, as it combines the advantages of in vivo results with the practicality of in vitro testing. This test represents a fast, inexpensive and straightforward assay, which offers an alternative to both traditional in vivo testing and more expensive mammalian cellular cultures. Animal Testing Alternatives;Cell Respiration;Lasers, Semiconductor;Lactuca;Low-Level Light Therapy;Oxygen Consumption;Paramecium

Aerobic exercise training and low-level laser therapy modulate inflammatory response and degenerative process in an experimental model of knee osteoarthritis in rats. OBJECTIVE: The aim of this study was to evaluate the effects of an aerobic exercise training and low-level laser therapy (LLLT) (associated or not) on degenerative modifications and inflammatory mediators on the articular cartilage using an experimental model of knee OA. MATERIAL AND METHODS: Fifty male Wistar rats were randomly divided into five groups: control group (CG); knee OA control group (OAC); OA plus exercise training group (OAT); OA plus LLLT group (OAL); OA plus exercise training associated with LLLT group (OATL). The exercise training (treadmill; 16 m/min; 50 min/day) and the laser irradiation (two points-medial and lateral side of the left joint; 24 sessions) started 4 weeks after the surgery, 3 days/week for 8 weeks. RESULTS: The results showed that all treated groups showed (irradiated or not) a better pattern of tissue organization, with less fibrillation and irregularities along the articular surface and chondrocytes organization, a lower degenerative process measured by OARSI score and higher thickness values. Additionally, all treated group showed a reduced expression in IL-1Î², caspase-3 and MMP-13 compared to OAC. Moreover, a lower caspase-3 expression was observed in OATL compared to OAL and OAT. CONCLUSION: These results suggest that exercise training and LLLT were effective in preventing cartilage degeneration and modulating inflammatory process induced by knee OA. IL1B protein, rat;Interleukin-1beta;Casp3 protein, rat;Caspase 3;Matrix Metalloproteinase 13;Mmp13 protein, rat Animals;Anterior Cruciate Ligament Injuries;Cartilage, Articular;Caspase 3;Chondrocytes;Disease Models, Animal;Immunohistochemistry;Interleukin-1beta;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Osteoarthritis, Knee;Physical Conditioning, Animal;Rats;Rats, Wistar;Stifle

[Nonablative fractional lasers: Acne scars and other indications]. Nonablative photothermolysis has become an established technique in laser dermatology. It is mainly used for restructuring dermal connective tissue in order to treat, for example, acne scars or solar elastosis. It is also applied to the treatment of melasma and other benign cutaneous pigment disorders. This article discusses various indications in light of published observations and with regard to practical considerations. Acne Vulgaris;Cicatrix;Cosmetic Techniques;Dose Fractionation, Radiation;Evidence-Based Medicine;Humans;Low-Level Light Therapy;Pigmentation Disorders;Striae Distensae;Treatment Outcome

Interventions for prevention of herpes simplex labialis (cold sores on the lips). BACKGROUND: Herpes simplex labialis (HSL), also known as cold sores, is a common disease of the lips caused by the herpes simplex virus, which is found throughout the world. It presents as a painful vesicular eruption, forming unsightly crusts, which cause cosmetic disfigurement and psychosocial distress. There is no cure available, and it recurs periodically. OBJECTIVES: To assess the effects of interventions for the prevention of HSL in people of all ages. SEARCH METHODS: We searched the following databases up to 19 May 2015: the Cochrane Skin Group Specialised Register, the Oral Health Group Specialised Register, CENTRAL in the Cochrane Library (Issue 4, 2015), MEDLINE (from 1946), EMBASE (from 1974), LILACS (from 1982), the China National Knowledge Infrastructure (CNKI) database, Airiti Library, and 5 trial registers. To identify further references to relevant randomised controlled trials, we scanned the bibliographies of included studies and published reviews, and we also contacted the original researchers of our included studies. SELECTION CRITERIA: Randomised controlled trials (RCTs)

of interventions for preventing HSL in immunocompetent people. DATA COLLECTION AND ANALYSIS: Two authors independently selected trials, extracted data, and assessed the risk of bias. A third author was available for resolving differences of opinion. MAIN RESULTS: This review included 32 RCTs, with a total of 2640 immunocompetent participants, covering 19 treatments. The quality of the body of evidence was low to moderate for most outcomes, but was very low for a few outcomes. Our primary outcomes were 'Incidence of HSL' and 'Adverse effects during use of the preventative intervention'.The evidence for short-term (â‰¤ 1 month) use of oral aciclovir in preventing recurrent HSL was inconsistent across the doses used in the studies: 2 RCTs showed low quality evidence for a reduced recurrence of HSL with aciclovir 400 mg twice daily (risk ratio (RR) 0.26, 95% confidence interval (CI) 0.13 to 0.51; n = 177), while 1 RCT testing aciclovir 800 mg twice daily and 2 RCTs testing 200 mg 5 times daily found no similar preventive effects (RR 1.08, 95% CI 0.62 to 1.87; n = 237; moderate quality evidence and RR 0.46, 95% CI 0.20 to 1.07; n = 66; low quality evidence, respectively). The direction of intervention effect was unrelated to the risk of bias. The evidence from 1 RCT for the effect of short-term use of valaciclovir in reducing recurrence of HSL by clinical evaluation was uncertain (RR 0.55, 95% CI 0.23 to 1.28; n = 125; moderate quality evidence), as was the evidence from 1 RCT testing short-term use of famciclovir.Long-term (> 1 month) use of oral antiviral agents reduced the recurrence of HSL. There was low quality evidence from 1 RCT that long-term use of oral aciclovir reduced clinical recurrences (1.80 versus 0.85 episodes per participant per a 4-month period, P = 0.009) and virological recurrence (1.40 versus 0.40 episodes per participant per a 4-month period, P = 0.003). One RCT found long-term use of valaciclovir effective in reducing the incidence of HSL (with a decrease of 0.09 episodes per participant per month; n = 95). One RCT found that a long-term suppressive regimen of valaciclovir had a lower incidence of HSL than an episodic regimen of valciclovir (difference in means (MD) -0.10 episodes per participant per month, 95% CI -0.16 to -0.05; n = 120).These trials found no increase in adverse events associated with the use of oral antiviral agents (moderate quality evidence).There was no evidence to show that short-term use of topical antiviral agents prevented recurrent HSL. There was moderate quality evidence from 2 RCTs that topical aciclovir 5% cream probably has little effect on preventing recurrence of HSL (pooled RR 0.91, 95% CI 0.48 to 1.72; n = 271). There was moderate quality evidence from a single RCT that topical foscarnet 3% cream has little effect in preventing HSL (RR 1.08, 95% CI 0.82 to 1.40; n = 295).The efficacy of long-term use of topical aciclovir cream was uncertain. One RCT found significantly fewer research-diagnosed recurrences of HSL when on aciclovir cream treatment than on placebo (P < 0.05), but found no significant differences in the mean number of participant-reported recurrences between the 2 groups (P â‰¥ 0.05). One RCT found no preventive effect of topical application of 1,5-pentanediol gel for 26 weeks (P > 0.05). Another RCT found that the group who used 2-hydroxypropyl-Î²-cyclo dextrin 20% gel for 6 months had significantly more recurrences than the placebo group (P = 0.003).These studies found no increase in adverse events related to the use of topical antiviral agents.Two RCTs found that the application of sunscreen significantly prevented recurrent HSL induced by experimental ultraviolet light (pooled RR 0.07, 95% CI 0.01 to 0.33; n = 111), but another RCT found that sunscreen did not prevent HSL induced by sunlight (RR 1.13, 95% CI 0.25 to 5.06; n = 51). These RCTs did not report adverse events.There were very few data suggesting that thymopentin, low-level laser therapy, and hypnotherapy are effective in preventing recurrent HSL, with one to two RCTs for each intervention. We failed to find any evidence of efficacy for lysine, LongoVitalÂ® supplementation, gamma globulin, herpes simplex virus (HSV) type I subunit vaccine, and yellow fever vaccine in preventing HSL. There were no consistent data supporting the efficacy of levamisole and interferon, which were also associated with an increased risk of adverse effects such as fever. AUTHORS' CONCLUSIONS: The current evidence demonstrates that long-term use of oral antiviral agents can prevent HSL, but the clinical benefit is small. We did not find evidence of an increased risk of adverse events. On the other hand, the evidence on topical antiviral agents and

other interventions either showed no efficacy or could not confirm their efficacy in preventing HSL. Antiviral Agents Antiviral Agents;Herpes Labialis;Humans;Randomized Controlled Trials as Topic;Recurrence;Secondary Prevention

Low-level laser therapy prevents severe oral mucositis in patients submitted to hematopoietic stem cell transplantation: a randomized clinical trial. PURPOSE: The purpose of this study is to evaluate the effectiveness of low-level laser therapy for the prevention of oral mucositis in patients undergoing hematopoietic stem cell transplantation. METHODS: This is a randomized, parallel, superiority trial including 35 patients divided into the following: laser (nâ€‰=â€‰17) and sham (nâ€‰=â€‰18). The variables assessed were oral mucositis (grade 2 of the World Health Organization oral toxicity scale), severe oral mucositis (grade 3 or 4), and pain (according to a visual analogue scale). In the laser group, a InGaAlP laser, wavelength of 650 nm, power 100 mW, energy per point of 2 J, time 20 s by point, extremity fiber optic 0.028 cm(2), and energy density 70 J/cm(2), was used, applied the first day of conditioning until D + 5, while the sham group received simulated laser over the same period. RESULTS: No statistically significant difference was found in the incidence of oral mucositis (pâ€‰=â€‰0.146). Severe mucositis was found in 40% of the patients (14/35), 3 in the intervention group (17.65%) and 11 in the sham group (61.11%) (pâ€‰=â€‰0.015). The cumulative probability of survival with respect to the development of severe oral mucositis was >0.6 for the intervention group and 0 for the control group (pâ€‰=â€‰0.0397). On the day on which pain was considered the worst, patients in the sham group were more likely to classify their pain as severe compared to those in the laser group (pâ€‰=â€‰0.041). CONCLUSION: Low-level laser therapy proved effective for the prevention of severe oral mucositis and intense oral pain in patients submitted to hematopoietic stem cell transplantation. Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Male;Stomatitis;Transplantation Conditioning

Treatment of venous lesions of the lips and perioral area with a long-pulsed Nd:YAG laser. The conventional treatments for venous lesions of the lip have been excision, cryotherapy, infrared coagulation, and sclerotherapy. We report the use of a long-pulsed Nd:YAG laser in 31 consecutive patients. At a mean follow up of 12 months (6 weeks to 3 years), 27 (87%) had no evidence of recurrence and one had a small contracted scar. The treatment is effective for both small and large lesions, and operation or other ablative techniques are no longer indicated, or considerably less relevant. Humans;Laser Therapy;Lasers, Solid-State;Lip;Lip Diseases;Low-Level Light Therapy;Sclerotherapy;Veins

Evaluating the effect of laser irradiation on bone regeneration in midpalatal suture concurrent to rapid palatal expansion in rats. BACKGROUND: Rapid palatal expansion is one of the most important orthopedic treatments that correct the dental and palatal constriction. Stability of the changes partly depend on the rapidity of new bone formation in affected sutures after expansion. The purpose of this study was to investigate the effect of laser irradiation on the healing of midpalatal suture concurrent to the expansion of midpalatal suture in rats. MATERIALS AND METHODS: A total of 78 male Sprague rats in seven groups were evaluated: A control group of six rats without any treatments and three experimental groups of 24 which underwent palatal expansion for different time periods (7, 14, and 30 days), and each divided into two groups of with and without laser irradiation. Laser therapy was done by gallium-aluminum-arsenide diode laser with 810 nm wavelength and 4 J/cm(2) irradiation in days 0, 2, 4, 6, 8, 10, 12, 14 in 4 points (1 labial and 3 palatal points). After sacrificing, the sections were evaluated by histomorphometric and quantitative analysis and results were statistically investigated by independent samples t-test. RESULTS: The results in 7 days, 14 days, and 30 days show that laser therapy can increase the rate of osteogenesis in palatal suture during rapid palatal expansion but the differences in 7 days groups were not significant (P = 0.117) while in 14 days groups (P = 0.032) and 30 days groups were significant (P = 0.001). Most of

effectiveness of low-power laser was seen between 14 and 30 days while the laser therapy was stopped. CONCLUSION: These findings suggest that low-level laser irradiation can increase and accelerate bone regeneration in the midpalatal suture after rapid palatal expansion, hence, reduce retention time.

[Not Available]. Acne Vulgaris;Cosmetic Techniques;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy

Medication-Related Osteonecrosis of the Jaw: An Autofluorescence-Guided Surgical Approach Performed with Er:YAG Laser. OBJECTIVE: The aim of this study was to propose an autofluorescence (AF)-guided surgical approach performed with Er:YAG laser and Nd:YAG low-level laser therapy (LLLT). BACKGROUND DATA: Medication-related osteonecrosis of the jaw (MRONJ) therapy remains an unresolved problem. The proposed conservative and surgical treatment regimens are associated with contradictory success rates. However, the increased experience with MRONJ management suggests that surgical therapy can halt disease progression, and can allow a histology-based diagnosis of osteonecrosis. Surgical approach with Er:YAG laser is associated with significantly better results compared with medical treatment and traditional surgical approaches. One of the difficulties encountered during surgical removal of a MRONJ is the precise individuation of necrotic bone margins. PATIENT AND METHODS: A case of Stage III maxillary osteonecrosis treated with a new surgical approach is presented. RESULTS: After 7 months of follow-up, complete mucosal healing was evident, and the patient was free of symptoms. Such a technique allowed a highly accurate and minimally invasive approach through the selective ablation of the non-/hypofluorescent areas. CONCLUSIONS: Taking into account the advantages of laser therapy and the possible effectiveness of AF in highlighting surgical margins, this approach would probably achieve excellent outcomes. Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Maxillary Osteotomy

Comparison of Nd:YAG Laser and Surgical Stripping for Treatment of Gingival Hyperpigmentation: A Clinical Trial. OBJECTIVE: The objective of this study is to evaluate and compare surgical stripping and neodymium-doped: yttrium, aluminum garnet (Nd:YAG) laser techniques for gingival depigmentation and to evaluate their effect on repigmentation. BACKGROUND DATA: Gingival depigmentation is often associated with repigmentation. Recurrence of pigmentation differs according to different treatment modalities. MATERIALS AND METHODS: In this study, 40 maxillary sites from 20 patients presenting bilateral melanin gingival hyperpigmentation were selected. Contralateral quadrants in the maxilla were randomly assigned to receive Nd:YAG laser at 3 W, 30â€‰mJ per pulse, with contact mode, and with a handpiece with a 300â€‰Î¼m diameter optic fiber and surgical stripping. Plaque index, Dummett Oral Pigmentation Index (DOPI), Hedin melanin index, size of pigmented area, time interval and extent of repigmentation, time taken for each of the procedures, assessment of pain, intraoperative bleeding index, and patient preference were compared from baseline to 6 months. RESULTS: Comparison between Nd:YAG laser and surgical stripping group for plaque index, DOPI, Hedin index, size of pigmented area, time interval, and extent of repigmentation, at 6 months was statistically nonsignificant. Intergroup comparison for time taken, pain, and patient preference was statistically significant. Intragroup comparison for Nd:YAG laser and surgical stripping at 6 months for DOPI, Hedin index, and size of pigmented area was statistically significant. CONCLUSIONS: From the present study it can be concluded that Nd:YAG laser can be used as an alternative technique for gingival depigmentation. However, surgical stripping continues to remain as a cost-effective procedure. Adolescent;Adult;Female;Gingival Diseases;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Treatment Outcome;Young Adult

Laser Therapy in the Treatment of Paresthesia: A Retrospective Study of 125 Clinical Cases. OBJECTIVE: The aim of this retrospective study was to evaluate the effectiveness of laser therapy for acceleration and recovery of nerve sensitivity after orthognathic or minor oral surgeries, by analysis of clinical records of patients treated at the Special Laboratory of Lasers in Dentistry (LELO, School of Dentistry, University of SÃ£o Paulo), throughout the period 2007-2013. BACKGROUND DATA: Nerve tissue lesions may occur during various dental and routine surgical procedures, resulting in paresthesia. Laser therapy has been shown to be able to accelerate and enhance the regeneration of the affected nerve tissue; however, there are few studies in the literature that evaluate the effects of treatment with low-power laser on neural changes after orthognathic or minor oral surgeries. METHODS: A total of 125 clinical records were included, and the data on gender, age, origin of the lesion, nerve, interval between surgery and onset of laser therapy, frequency of laser irradiation (one or two times per week), final evolution, and if there was a need to change the irradiation protocol, were all recorded. These data were related to the recovery of sensitivity in the affected nerve area. Descriptive analyses and modeling for analysis of categorical data (Î±=5%) were performed. RESULTS: The results from both analyses showed that the recovery of sensitivity was correlated with patient age (p=0.015) and interval between surgery and onset of laser therapy (p=0.002). CONCLUSIONS: Within the limits of this retrospective study, it was found that low- power laser therapy with beam emission band in the infrared spectrum (808â€‰nm) can positively affect the recovery of sensitivity after orthognathic or minor oral surgeries. Adolescent;Adult;Aged;Aged, 80 and over;Cross-Sectional Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Oral Surgical Procedures;Paresthesia;Postoperative Complications;Retrospective Studies;Treatment Outcome;Young Adult

The Effects of Er:YAG, Nd:YAG, and Ho:YAG Laser Surface Treatments to Acrylic Resin Denture Bases on the Tensile Bond Strength of Silicone-Based Resilient Liners. OBJECTIVE: The present study was to assess the effect of surface treatments of Er:YAG, Nd:YAG, and Ho:YAG lasers on the tensile bond strength of a silicone-based resilient liner to an acrylic denture in an in vitro setting. METHODS: Experimental dumbbell-shaped specimens (75â€‰mm) were produced by combining two acrylate pieces fabricated from heat-polymerized acrylic resin (36â€‰mm) with 3â€‰mm of Molloplast(Â®)-B filling between them. The specimens (n=200) were randomly divided in half for thermocycling, and each 100 specimen set was randomized into five groups (n=20) with different surface treatments: control (no surface treatment), sandblasting, Er:YAG laser, Nd:YAG laser, and Ho:YAG laser. A tensile bond strength test was performed. The effect of the laser surface treatments was examined with scanning electron microscopy. RESULTS: Only the Er:YAG laser increased the tensile bond strength compared with the other treatments. The other laser groups showed lower bond strengths. The Ho:YAG laser resulted in considerably reduced tensile bond strength. The scanning electron microscopy images showed that applying laser surface treatments modified the surface of the denture base resin. CONCLUSIONS: There was not an overall improvement with the use of the studied laser modalities in the adhesion quality of resilient denture liner to acrylic resin, although Er:YAG laser showed a potential to improve their adhesion. These laser modalities need to be subjected to further studies to determine optimal setup for use in prosthodontics. Acrylic Resins;Biocompatible Materials;Dimethylpolysiloxanes;MDX 4-4210;Silicone Elastomers Acrylic Resins;Biocompatible Materials;Dental Bonding;Dental Etching;Denture Liners;Dimethylpolysiloxanes;Lasers, Solid-State;Low-Level Light Therapy;Silicone Elastomers;Tensile Strength

Serial Ultrasound Findings After Laser Ablation for Benign Breast Lesions on Long-Term Follow-Up: Implications for Evaluation of Procedural Success. OBJECTIVE: The purpose if this study was to describe the follow-up ultrasound (US) findings of percutaneous US-guided laser ablation for small benign breast lesions, and to define the procedural success. BACKGROUND DATA: There are limited

reports on follow-up imaging after laser ablation, because the ablated tumors were generally resected by surgery. MATERIALS AND METHODS: US-guided laser ablation was performed on 19 benign breast lesions in 10 patients. The median size of the lesions was 7.8â€‰mm (range, 3-11â€‰mm). The lesions were diagnosed as image-pathology concordant benign by US-guided core biopsy. After ablation, we performed follow-up US with an interval of 3-12 months; the median follow-up period was 32 months (range, 30-36 months). We evaluated the morphologic and size changes by using serial follow-up US. RESULTS: US findings of the 13 cases followed within the first 6 months after ablation showed hypoechoic lesions having inner hyperechogenicity with or without a hypoechoic center. The size of these lesions during this period increased in comparison with the initial lesion size, and then decreased or became stable on serial follow-up US. On the last follow-up US examination, in 14 cases (73.6%), the lesions were invisible, 4 cases (21.1%) showed scar changes, and 1 case (5.3%) showed a hypoechoic remnant lesion. CONCLUSIONS: US findings within 6 months after laser ablation showed mixed echoic lesions with increased size, followed by gradual decrease in size. Therefore, the success of laser ablation may be evaluated by checking the changes in the lesions by comparing the size of the lesions with the first follow-up US within 6 months and not the original tumor. Adult;Breast Neoplasms;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Time Factors;Treatment Outcome;Ultrasonography, Interventional

Dental Adhesion to Erbium-Lased Tooth Structure: A Review of the Literature. OBJECTIVE: The aim of the present study was to conduct a review of the literature about adhesion on erbium laser prepared cavities, related to the specific conditions of the irradiated dentin substrate and the effects on bond strength values. BACKGROUND DATA: Advances in adhesive restorative techniques significantly influenced modern restorative dentistry. The concept of "minimally invasive dentistry" aims to perform more conservative treatment of cavities in which the removal of sound dentin is no longer necessary. This approach, which relies on the concept of adhesion of restorative materials to the mineralized dental tissues, is considered to be a contemporary outcome in dentistry. Similarly, laser technology in restorative dentistry opened new possibilities and strategies as alternatives to conventional treatment. Considering the clinical aspects of the use of erbium lasers for caries removal, cavity preparations, and substrate conditioning, treatment with lasers can be considered to be an efficient technique with wide acceptance by patients. METHODS: Computerized and manual searches were conducted for studies through 2015 that addressed the topic. RESULTS: According to the literature, there is no defined standard protocol concerning the information that articles must provide, making a definitive protocol very difficult to establish. Data varied from the type of adhesive and resin composite used, substrate, and parameters (power, energy density, pulse duration, irradiation time, distance, cooling system) to the bond strength test methodology used. CONCLUSIONS: Further studies are necessary in order to define a standard protocol with positive results and higher bond strength values when using erbium lasers. Detailed information concerning laser parameters should be implemented. Also, longitudinal clinical studies should be developed in the search for new parameters that behave favorably in the irradiated substrate. Dental Bonding;Dental Etching;Humans;Lasers, Solid-State;Low-Level Light Therapy

Evidence-Based Medicine Turned Upside Down. Evidence-Based Medicine;Humans;Low-Level Light Therapy

Radiodensitometric Assessment of the Effect of Pulsed Electromagnetic Field Stimulation Versus Low Intensity Laser Irradiation on Mandibular Fracture Repair: A Preliminary Clinical Trial. PURPOSE: Closed reduction of mandibular fractures usually entails a relatively long period of immobilization, with the subsequent delay of rehabilitation. Therefore, shorter immobilization period with various approaches to protect or enhance bone healing have been investigated. The aim of this study was to

analyze the effects of pulsed electromagnetic field (PEMF) and low intensity laser irradiation (LILI) on the fracture healing process, through radiodensitometric assessment of the bone callus. PATIENTS AND METHODS: Eighteen patients with mandibular fractures at the tooth bearing area participated in this prospective study. They were treated by closed reduction using maxillo-mandibular fixation (MMF) and were consecutively assigned into 1 of 3 groups. In group A, the fracture sites were exposed to PEMF for 2Â h daily for 12Â days. In group B, the fracture sites were exposed to LILI on the tenth and twelfth postoperative days (2 sessions of 6Â min per day 2Â h apart). The fracture sites in group C acted as controls. MMF was maintained for 2Â weeks in group A and 4Â weeks in groups B and C. The bone fracture healing was evaluated clinically by investigating the union of the fractured segments and radiographically using computerized densitometry. The union of the fractured segments was tested by manual manipulation and the occlusion was assessed upon removal of MMF. Standardized digital panoramic radiographs were performed for each patient, immediately postoperatively as well as at 2 and 4Â weeks. The digital images were manipulated using the IDRISI software. A rectangular area of 10Â Ã—Â 15Â mm was drawn along the center of the fracture line. The obtained densitometry values were expressed in gray levels from 0 to 256. The collected data were then tabulated and statistically analyzed. RESULTS: After releasing the MMF, the bimanual mobility test of the fractured segments in all patients showed stability of the segments. The preinjury occlusion was maintained in all patients. The postoperative radiographs of all patients revealed good bony alignment of the bony segments. In all groups, comparison between the study intervals with respect to both means and changes percentages of the bone density values showed insignificant differences. At 2nd postoperative week, the mean bone density at the fracture sites decreased by 4.74, 6.6 and 27.89Â % in groups A, B and C respectively. The period from the 2nd to the 4th postoperative weeks showed increase in the bone density by 1.49, 1.95 and 14.12Â % in groups A, B and C respectively. Insignificant difference was found between the means of bone densities of group A and B throughout the study intervals. On the other hand, both groups showed insignificant difference with group C immediately postoperative and significant increase in bone density at the 2nd and 4th postoperative weeks. CONCLUSIONS: Short period immobilization of mandibular fractures for 2Â weeks supplemented with PEMF is recommended. Further studies are needed to evaluate the efficacy of LILI as a supplement to reduce the mandibular fracture immobilization period.

Management of Temporomandibular Disorders with Low Level Laser Therapy. PURPOSE: To evaluate the efficacy of low level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMD) in relation to pain intensity, tender points, joint sounds and jaw movements. MATERIALS AND METHODS: Twenty patients received 6 sessions of LLLT (3 times a week for 2Â weeks) with semiconductive diode laser (gallium arsenide; 904Â nm, 0.6Â W, 60Â s, 4Â J/cm(2)). Pain intensity, number of tender points, joint sounds and active range of motion were assessed before and immediately after each session and after 1, 2Â weeks, 1, 3 and 6Â months. RESULTS: Statistically significant results were achieved in all study parameters. CONCLUSION: LLLT promoted satisfactory results in reducing the pain intensity, number of tender points, joint sounds and improvement in the range of jaw motion. Hence it is an effective and efficient treatment method for TMDs.

Photobiomodulation and bone healing in diabetic rats: evaluation of bone response using a tibial defect experimental model. Diabetes mellitus (DM) leads to a delay in bone healing. Thus, some therapeutic approaches have been used to accelerate the process of bone repair such as photobiomodulation (PBM). Therefore, the present study aimed to evaluate the effects of PBM, in different fluences, in bone repair in an experimental model of tibial bone defects in diabetic rats. Sixty-four Wistar rats were submitted to a surgical procedure to perform bone defect and distributed in four groups: diabetic control group (DCG), diabetic laser group 30 J/cm(2) (L30), diabetic laser

group 60 J/cm(2) (L60), and diabetic laser group 120 J/cm(2) (L120). A 808 nm Ga-Al-As (DMC Equipment, SÃ£o Carlos, SP, Brazil) laser, 100 mW; 0.028 cm(2); 3.57 W/cm(2); 30, 60, and 120 J/cm(2); 0.84, 1.68, and 3.36 J; 8, 16, and 33 s was used. Animals were euthanized 15 and 30 days after the surgery. Histological, morphometric, immunohistochemistry, and biomechanical analyses were performed. In the histological and morphometric evaluation, all laser-treated groups showed a better histological pattern and a higher amount of newly formed bone compared to DCG. An intense RUNX2 immunoexpression was observed in the laser-treated groups, 15 days after the surgery. Receptor activator of nuclear factor Îº-Î² ligand (RANK-L) immunohistochemistry analysis showed a significant decrease in the immunoreactivity for L30 and L120, 30 days after surgery. There was no statistical difference in the biomechanical analysis among the groups. In conclusion, PBM, in all fluences used, showed an osteogenic potential in bone healing of diabetic rats.
Animals;Bone Diseases;Bone Regeneration;Diabetes Mellitus, Experimental;Laser Therapy;Lasers, Semiconductor;Male;Rats;Rats, Wistar;Tibia

Epigenetic Modifications and Accumulation of DNA Double-Strand Breaks in Oral Lichen Planus Lesions Presenting Poor Response to Therapy. Epigenetics refers to changes in cell characteristics that occur independently of modifications to the deoxyribonucleic acid (DNA) sequence. Alterations mediated by epigenetic mechanisms are important factors in cancer progression. Although an exciting prospect, the identification of early epigenetic markers associated with clinical outcome in premalignant and malignant disorders remains elusive. We examined alterations in chromatin acetylation in oral lichen planus (OLP) with distinct clinical behavior and compared the alterations to the levels of DNA double-strand breaks (DSBs). We analyzed 42 OLP patients, who had different responses to therapy, for acetyl-histone H3 at lys9 (H3K9ac), which is associated with enhanced transcription and nuclear decondensation, and the presence of DSBs, as determined by accumulation of phosphorylated Î³H2AX foci. Patients with high levels of H3K9ac acetylation failed to respond to therapy or experienced disease recurrence shortly after therapy. Similar to H3K9ac, patients who responded poorly to therapy had increased accumulation of DNA DSB, indicating genomic instability. These findings suggest that histone modifications occur in OLP, and H3K9ac and Î³H2AX histones may serve as epigenetic markers for OLP recurrence.
Glucocorticoids;Histones;Clobetasol Administration, Topical;Clobetasol;DNA Breaks, Double-Stranded;Epigenesis, Genetic;Female;Follow-Up Studies;Glucocorticoids;Histones;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Phosphorylation;Prognosis;Single-Blind Method;Time Factors;Young Adult

Nanoparticles for inhibition of in vitro tumour angiogenesis: synergistic actions of ligand function and laser irradiation. Careful design of nanoparticles plays a crucial role in their biomedical applications. It not only defines the stability of nanoparticles in a biological medium but also programs their biological functionality and specific interactions with cells. Here, an inorganic nanoparticulate system engineered to have a dual role as anti-angiogenic and hyperthermic agent is presented. The inorganic rod-shaped core is designed to strongly absorb near-infrared laser irradiation through the surface plasmon resonance and convert it into localized heat, while a peptide coating acts as an anti-angiogenic drug, altogether inhibiting vascular growth. The synergistic dual action provides an improved inhibition of the in vitro tumour angiogenesis, offering new possibilities for the development of nano-engineered anti-angiogenic drugs for therapies. Angiogenesis Inhibitors;Ligands Angiogenesis Inhibitors;Biological Phenomena;Cell Proliferation;Humans;Hyperthermia, Induced;Ligands;Low-Level Light Therapy;Nanoparticles;Surface Plasmon Resonance

The potential of phototherapy to reduce body fat, insulin resistance and "metabolic inflexibility" related to obesity in women undergoing weight loss treatment. BACKGROUND AND OBJECTIVE:

The metabolic flexibility is often impaired in diseases associated with obesity, and many studies are based on the hypothesis that dysfunction in peripheral tissues such as skeletal muscle, liver and adipose tissue represent the etiology of development of metabolic inflexibility. Experimental evidence shows that the use of phototherapy combined with exercise was effective in controlling the lipid profile, reducing the mass of adipose tissue, suggesting increased metabolic activity and changes in lipid metabolism. However, we found few data in the literature involving the use of phototherapy in association to physical training in the obese population. Thus, our objective was to evaluate the effects of exercise training (aerobic plus resistance exercises) plus phototherapy (laser, 808â€‰nm) on metabolic profile and adiponectinemia in obese women. STUDY DESIGN/MATERIALS AND METHODS: Sixty-four obese women (BMI 30-40â€‰kg/m2 , age between 20 and 40 years old) were randomly assigned in two groups: Exercise Training plus SHAM group (ET-SHAM, nâ€‰=â€‰32) and Exercise Training plus Phototherapy group (ET-PHOTO, nâ€‰=â€‰32). The treatment consisted in physical exercise intervention and the individual application of phototherapy immediately after the end of the training session. However, in the ET-SHAM group the device was turned off simulating the phototherapy application (placebo effect). The study protocol lasted for 20 weeks and comprised of three weekly sessions of aerobic plus resistance training and application of phototherapy (when applicable). The body composition and metabolic parameters were assessed (HOMA, adiponectin, insulin, glucose). RESULTS: Comparing the magnitude of effects between groups (ET-PHOTO vs. ET-SHAM), we observed that physical training plus phototherapy was more effective than physical training in reducing the delta of percentage of fat mass (%; -5.60â€‰Â±â€‰1.59 vs. -4.33â€‰Â±â€‰1.5; Pâ€‰<â€‰0.04); fat mass (kg; -11.26â€‰Â±â€‰2.82 vs. -5.80â€‰Â±â€‰2.82; Pâ€‰<â€‰0.0002); HOMA-IR index (-38.08â€‰Â±â€‰9.23 vs. -20.91â€‰Â±â€‰14.42; Pâ€‰<â€‰0.0001). In addition, we observed an increase in delta (%) of total skeletal muscle mass (kg; 0.60â€‰Â±â€‰1.09 vs. -1.38â€‰Â±â€‰1.70; Pâ€‰<â€‰0.003), adiponectin concentration (ng/ml; 1.08 (0.04-3.62) vs. -0.42 (-3.15 to 2.26); Pâ€‰<â€‰0.03) in the same comparison. CONCLUSION: Our results demonstrated for the first time that phototherapy enhances the physical exercise effects in obese women undergoing weight loss treatment promoting significant changes in inflexibility metabolic profile. Adiponectin;Biomarkers;Blood Glucose Adiponectin;Adiposity;Adult;Biomarkers;Blood Glucose;Body Mass Index;Combined Modality Therapy;Exercise Therapy;Female;Humans;Insulin Resistance;Obesity;Phototherapy;Treatment Outcome;Weight Loss

The effect of light emitting diode phototherapy on rate of orthodontic tooth movement: a split mouth, controlled clinical trial. OBJECTIVE: Increasing the rate of orthodontic tooth movement (OTM) can reduce risks such as periodontal disease and caries. TRIAL DESIGN: This split-mouth randomized controlled clinical trial investigated whether light emitting diode (LED) phototherapy could accelerate the rate of OTM. SETTING: The study was conducted at the Graduate Orthodontics Clinic at the University of Toronto, Faculty of Dentistry. PARTICIPANTS AND METHODS: 17 dental arches from 11 orthodontic participants with bilaterally symmetrical extraction of premolars were included. During space closure of single tooth extraction sites, LED phototherapy was applied to one side of the dental arch for a specified time and the contralateral side acted as the control. Space closure was measured immediately prior to, during and later in space closure. RESULTS: All participants were compliant with LED application. Our results revealed no significant changes in the rate of OTM with LED phototherapy over 3â€Šmonths of extraction space closure. CONCLUSIONS: Our findings were contrary to previous findings of the effect of laser phototherapy on regulating the rate of OTM. Further investigations are warranted to analyse whether the duration or method of LED delivery would have an effect on the rate of OTM. Toronto. This trial was registered at clinicaltrials.gov (NCT01490385).

Extracorporeal shock wave therapy (ESWT) for the treatment of cellulite--A current metaanalysis. BACKGROUND: The aim of this metaanalysis was to investigate the effectiveness of extracorporeal shock wave therapy (ESWT) in cellulite. METHODS: Electronic databases (such as Ovid MEDLINE, Scopus and Ovid) as well as reference lists of the available studies were evaluated in June 2015 by two expert examiners. Assessment of each study's methodological quality was performed with the help of the published quality index tool by Downs and Black. RESULTS: This metanalysis included a total of eleven clinical trials on the effects of ESWT on cellulite with a total of 297 included females. Among the eleven clinical trials five randomized controlled trials on ESWT in cellulite with a total number of 123 females have been published so far. Both, focused as well as radial ESWT devices have been found effective in treating cellulite so far. Typically, one or two sessions per week and six to eight sessions overall were studied in the published clinical trials. Overall, outcome parameters mainly focused on digital standardized photographs, circumference measurements and specific ultrasound examinations. Reporting quality showed substantial heterogenity from 22 to 82 points with a mean of 57 points. DISCUSSION: This metanalysis identified eleven published clinical studies on ESWT in cellulite with five randomized-controlled trials among them. There is growing evidence that both, radial as well as focused ESWT and the combination of both are able to improve the degree of cellulite. Typically, six to eight treatments once or twice a week have been studied. Long-term follow-up data beyond one year are lacking as well as details on potential combination therapies in cellulite such as with low level laser therapy (LLLT), cryolipolysis and others. Adipose Tissue;Combined Modality Therapy;Female;High-Energy Shock Waves;Humans;Obesity

Light therapy modulates serotonin levels and blood flow in women with headache. A preliminary study. In this study, we looked at the possible effects of low-level laser therapy (LLLT) on blood flow velocity, and serotonin (5-HT) and cholinesterase levels in patients with chronic headache associated with temporomandibular disorders (TMD). LLLT has been clinically applied over the past years with positive results in analgesia and without the report of any side effects. The understanding of biological mechanisms of action may improve clinical results and facilitate its indication. Ten patients presenting headache associated with TMD completed the study. An 830-nm infrared diode laser with power of 100â€‰mW, exposure time of 34â€‰s, and energy of 3.4â€‰J was applied on the tender points of masseter and temporal muscle. Blood flow velocity was determined via ultrasound Doppler velocimetry before and after laser irradiation. The whole blood 5-HT and cholinesterase levels were evaluated three days before, immediately, and three days after laser irradiation. Pain score after treatment decreased to a score of 5.8 corresponding to 64% of pain reduction (Pâ€‰<â€‰0.05). LLLT promoted a decrease in the blood flow velocity (Pâ€‰<â€‰0.05). In addition, the 5-HT levels were significantly increased three days after LLLT (Pâ€‰<â€‰0.05). The cholinesterase levels remained unchanged at the analyzed time points (Pâ€‰>â€‰0.05). Our findings indicated that LLLT regulates blood flow in the temporal artery after irradiation and might control 5-HT levels in patients suffering with tension-type headache associated to TMD contributing to pain relief. Serotonin;Cholinesterases Adult;Blood Flow Velocity;Cholinesterases;Female;Headache;Humans;Middle Aged;Pain;Phototherapy;Regional Blood Flow;Serotonin;Severity of Illness Index;Temporomandibular Joint Disorders;Treatment Outcome;Young Adult

The effect of laser therapy on the expression of osteocalcin and osteopontin after tooth extraction in rats treated with zoledronate and dexamethasone. PURPOSE: Laser therapy has been used for the prevention and management of medication-related ostenecrosis of the jaw (MRONJ). The aim of this paper was to investigate the action of laser therapy on extraction socket healing in rats in conditions at risk for MRONJ, evaluating the expression of markers of bone metabolism. METHODS: Thirty male Sprague-Dawley rats were divided in four groups: control group (C, nâ€‰=â€‰5), laser

group (L, nâ€‰=â€‰5), treatment group (T, nâ€‰=â€‰10), and treatment plus laser group (Tâ€‰+â€‰L, nâ€‰=â€‰10). Rats of group T and Tâ€‰+â€‰L received zoledronate 0.1 mg/kg and dexamethasone 1 mg/kg every 2 days for 10 weeks. Rats of group C and L were infused with vehicle. After 9 weeks, the left maxillary molars were extracted in all rats. Rats of groups L and Tâ€‰+â€‰L received laser therapy (Nd:YAG, 1064 nm, 1.25 W, 15 Hz, 5 min, 14.37 J/cm(2)) in the socket area at days 0, 2, 4, and 6 after surgery. Western blot analysis was performed to evaluate the alveolar expression of osteopontin (OPN) and osteocalcin (OCN) 8 days after extraction. RESULTS: Rats of groups L and Tâ€‰+â€‰L showed a significant higher expression of OCN compared to rats of groups C and T (+348 and +400 %, respectively; Pâ€‰=â€‰0.013 and Pâ€‰=â€‰0.002, respectively). The expression of OPN did not show significant differences among the different groups. CONCLUSIONS: Our findings suggest that laser irradiation after tooth extraction can promote osteoblast differentiation, as demonstrated by the higher expression of OCN. Thus, laser irradiation could be considered a way to improve socket healing in conditions at risk for MRONJ development. Anti-Inflammatory Agents;Bone Density Conservation Agents;Diphosphonates;Imidazoles;Osteocalcin;Osteopontin;Zoledronic Acid;Dexamethasone Animals;Anti-Inflammatory Agents;Bone Density Conservation Agents;Combined Modality Therapy;Dexamethasone;Diphosphonates;Imidazoles;Low-Level Light Therapy;Male;Osteocalcin;Osteonecrosis;Osteopontin;Rats;Rats, Sprague-Dawley;Tooth Extraction;Tooth Socket;Wound Healing;Zoledronic Acid

Acupuncture for knee pain: is there no more room for further research? Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Efficacy of the long-pulsed 1064-nm neodymium:yttrium-aluminum-garnet laser (LPND) (rejuvenation mode) in the treatment of papulopustular rosacea (PPR): A pilot study of clinical outcomes and patient satisfaction in 30 cases. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum;Doxycycline Adult;Aluminum;Cohort Studies;Doxycycline;Female;Follow-Up Studies;Humans;Korea;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neodymium;Patient Satisfaction;Pilot Projects;Rejuvenation;Retrospective Studies;Risk Assessment;Rosacea;Treatment Outcome;Young Adult;Yttrium

Effect of Low-Level Laser Therapy on Human Adipose-Derived Stem Cells: In Vitro and In Vivo Studies. BACKGROUND: Low-level laser therapy (LLLT) continues to receive much attention in many clinical fields. Also, LLLT has been used to enhance the proliferation of various cell lines, including stem cells. This study investigated the effect of LLLT on human adipose-derived stem cells (ADSCs) through in vitro and in vivo studies. METHODS: Low-level laser irradiation of cultured ADSCs was performed using a 830 nm Ga-Al-As (gallium-aluminum-arsenide) laser. Then, proliferation of ADSCs was quantified by a cell counting kit-8. In the in vivo study, irradiated ADSCs or non-irradiated ADSCs were transplanted, and then, low-level laser irradiation of each rat was performed as per the protocol. Cell viability was quantified by immunofluorescent staining using the human mitochondria antibody. RESULTS: In the in vitro study, the laser-irradiated groups showed an increase in absorbance compared to the control group. Also, in the in vivo study, there was a significant increase in the number of human ADSCs in the laser-irradiated groups compared to the control group ($p < 0.001$). CONCLUSIONS: Our study showed that LLLT could enhance the proliferation and viability of ADSCs. The ADSCs enhanced by LLLT could be applied in various clinical fields. With the use of LLLT, the proliferation and viability of various cells can be enhanced, besides ADSCs. NO LEVEL ASSIGNED: This journal requires that authors assign a level of evidence to each submission to which Evidence-Based Medicine rankings are applicable. This excludes Review Articles, Book Reviews, and manuscripts that concern Basic Science, Animal Studies, Cadaver Studies, and Experimental Studies. For a full

description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors http://www.springer.com/00266 . Adipocytes;Adipose Tissue;Analysis of Variance;Animals;Cell Proliferation;Cell Survival;Cells, Cultured;Disease Models, Animal;Female;Fluorescent Antibody Technique;Humans;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Sprague-Dawley;Sensitivity and Specificity;Stem Cell Transplantation;Stem Cells

Complex decongestive physical therapy and low-level laser therapy for the treatment of pediatric congenital lymphedema: a case report. [Purpose] We report the case of a pediatric patient with congenital lymphedema treated with complex decongestive physical therapy and low-level laser therapy. [Subjects and Methods] The patient was a 2â€…year-old girl who had lymphedema in the left upper limb since birth. Complex decongestive physical therapy and low-level laser therapy were administered for 7 sessions. [Results] The circumferences of the middle of the forearm, elbow joint, wrist, and hand of the left upper limb decreased 0.5, 3, 0.5, and 2â€…cm, respectively. The moisture content of the left upper limb decreased 70â€…mL (6.66%), while moisture ratio increased by 0.007%. [Conclusion] Complex decongestive physical therapy and low-level laser therapy are effective for reducing lymphedema in pediatric patients.

Anti-inflammatory and analgesic effects of low-level laser therapy on the postoperative healing process. [Purpose] This study aimed to evaluate the anti-inflammatory and analgesic effects of intraoral application of low-level laser therapy (660â€…nm) to control pain, swelling and interincisal opening following the extraction of mandibular third molars. [Subjects and Methods] Ten patients underwent removal of lower third molars using the same surgical protocol and pharmacological approach. In the postoperative period, all patients received four consecutive daily sessions of low-level laser therapy, beginning 24 hours after the surgery. Intraoral applications using the diode laser with 660â€…nm wavelength in the continuous scan mode were performed covering the entire surgical area, which was divided into four quadrants, each of 1â€…cm(2) area at a distance of 1â€…cm. The energy applied at each point was 5â€…J/cm(2) during 8 seconds. [Results] The swelling and interincisal opening returned to normal 24 hours after the first low-level laser therapy application (Friedman test). Moreover, the pain intensity was reduced on the third postoperative day, according to the Friedman test. [Conclusion] Low-level laser therapy (660â€…nm), at the dosimetry used in this study, was effective in reducing postoperative pain and swelling following oral surgery.

Multifunctional magnetic-hollow gold nanospheres for bimodal cancer cell imaging and photothermal therapy. Multifunctional nanocomposites combining imaging and therapeutic functions have great potential for cancer diagnosis and therapy. In this work, we developed a novel theranostic agent based on hollow gold nanospheres (HGNs) and superparamagnetic iron oxide nanoparticles (SPIO). Taking advantage of the excellent magnetic properties of SPIO and strong near-infrared (NIR) absorption property of HGNs, such nanocomposites were applied to targeted magnetic resonance imaging (MRI) and photoacoustic imaging (PAI) of cancer cells. In vitro results demonstrated they displayed significant contrast enhancement for T2-weighted MRI and strong PAI signal enhancement. Simultaneously, the nanocomposites exhibited a high photothermal effect under the irradiation of the near-infrared laser and can be used as efficient photothermal therapy (PTT) agents for selective killing of cancer cells. All these results indicated that such nanocomposites combined with MRI-PAI and PTT functionality can have great potential for effective cancer diagnosis and therapy. Contrast Media;Magnetite Nanoparticles;Gold Contrast Media;Gold;HeLa Cells;Humans;Low-Level Light Therapy;MCF-7 Cells;Magnetic Resonance Imaging;Magnetite Nanoparticles;Nanocomposites;Nanospheres;Neoplasms;Particle Size;Photoacoustic Techniques

Efficacy of diode laser (810 and 940 nm) for facial skin tightening. BACKGROUND: Laser treatment has been introduced for facial skin tightening. However, no prior study has used a diode laser to treat facial skin laxity. AIMS: To evaluate the efficacy and safety of a 810- and 940-nm diode

laser (MeDioStarNeXT) for treating facial skin laxity. METHODS: Thirty patients, with facial skin laxity grading scale II-IV, were enrolled in this study. Each patient underwent four sessions with a 810- and 940-nm diode laser (MeDioStarNeXT) treatment over 3-week intervals. Improvement in the laxity of facial skin was evaluated using a Cutometer MPA 580, spectrophotometer, and a grading scale. RESULTS: Significant improvement was observed with the Cutometer F3 and R7 parameters at 1 and 3 months after complete treatment, respectively. Physician assessment showed significant improvement in the laxity scale at 1 and 6 months after treatment. Approximately 10% of the patients reported mild pain or minor adverse events. Ninety-eight percent of the patients were satisfied with the treatments. CONCLUSION: Treatment with a diode laser (810 and 940 nm) is safe and may be effective for facial skin tightening. Maintenance treatment is necessary to sustain the effect of treatment. Adult;Cosmetic Techniques;Face;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain;Patient Satisfaction;Skin Aging;Treatment Outcome;Young Adult

A low-fluence 1064-nm Q-switched neodymium-doped yttrium aluminium garnet laser for the treatment of cafÃ©-au-lait macules. BACKGROUND: CafÃ©-au-lait macules (CALMs) are a common pigmentary disorder. Although a variety of laser modalities have been used to treat CALMs, their efficacies vary and dyspigmentation may develop. OBJECTIVE: We evaluated the clinical efficacy and safety of a low-fluence 1064-nm Q-switched neodymium-doped yttrium aluminium garnet (Nd:YAG) laser for the treatment of CALMs. METHODS: In a preliminary investigation, 6 patients underwent a split-lesion comparative study with 532- and 1064-nm Q-switched Nd:YAG laser treatment. In total, 32 patients with 39 CALMs were enrolled in a subsequent prospective trial to evaluate the treatment with a low-fluence 1064-nm Q-switched Nd:YAG laser. RESULTS: In the preliminary study, the 1064-nm treatment group had a more favorable response and a shorter recovery time. In a subsequent prospective trial of a 1064-nm laser, 74.4% of the lesions showed a clinical response with clearance of â‰¥50.0%. The treatment regimen was well tolerated; 15.4% of patients experienced adverse events. LIMITATIONS: The study participants were followed for 6 months, and there were no relevant treatment controls in the prospective trial group. CONCLUSION: Low-fluence 1064-nm Q-switched Nd:YAG laser therapy afforded good clinical improvement for treating CALMs. yttrium-aluminum-garnet;Yttrium;Aluminum Adolescent;Adult;Aluminum;Cafe-au-Lait Spots;Child;Child, Preschool;Cohort Studies;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Prospective Studies;Risk Assessment;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome;Young Adult;Yttrium

Comparison of the Effects of Low-Level Laser Therapy and Ozone Therapy on Bone Healing. This study aims to compare the effect of low-level laser therapy (LLLT) and ozone therapy on the bone healing. Thirty-six adult male Wistar albino rats were used for this study. Monocortical defects were shaped in right femur of all rats. Defects were filled with nano-hydroxyapatite graft. The animals were divided into 3 groups and each group was than divided into 2 subgroups. Then, LLLT with a diode laser was applied to the first group (G1), ozone therapy was applied to the second group (G2), and no treatment was applied to the third group as a control group (G3). Animals were sacrificed after 4th and 8th weeks and the sections were examined to evaluate the density of the inflammation, the formation of connective tissue, the osteogenic potential, and osteocalcin activity. As a result, there were no significant differences among the groups of 4 weeks in terms of new bone formation. In the immunohistochemical assessment, the number of osteocalcin-positive cells was higher in the laser group compared to the other group of 4 weeks; this difference was statistically significant in the LLLT and ozone groups (Pâ€Š<â€Š0.05). Histomorphometric assessment showed that the new bone areas were higher in the LLLT and ozone groups; furthermore, there was a statistically significant difference

in the LLLT in comparison with the control group at 8th week (Pâ€Š<â€Š0.05). At the same time immunohistochemical assessment showed that osteocalcin-positive cells were considerably higher in G2 than G1 at 8th week (Pâ€Š<â€Š0.05). The findings of this study may be the result of differences in the number of treatment sessions. Further studies are therefore needed to determine the optimal treatment modality. Bone Substitutes;Osteocalcin;Ozone;Durapatite Animals;Bone Diseases;Bone Substitutes;Combined Modality Therapy;Connective Tissue;Durapatite;Femur;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoblasts;Osteocalcin;Osteogenesis;Ozone;Rats;Rats, Wistar;Time Factors;Wound Healing

The methodology flaws in Hinman's acupuncture clinical trial, Part III: Sample size calculation. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Application of a 980-nanometer diode laser in neuroendoscopy: a case series. OBJECTIVE: Ventricular neuroendoscopy represents an important advance in the treatment of hydrocephalus. High-power (surgical) Nd:YAG laser and low-level laser therapy (using 685-nm-wavelength diode laser) have been used in conjunction with neuroendoscopy with favorable results. This study evaluated the use of surgical 980-nm-wavelength diode laser for the neuroendoscopic treatment of ventricular diseases. METHODS: Nine patients underwent a neuroendoscopic procedure with 980-nm diode laser. Complications and follow-up were recorded. RESULTS: Three in-hospital postoperative complications were recorded (1 intraventricular hemorrhage and 2 meningitis cases). The remaining 6 patients had symptom improvement after endoscopic surgery and were discharged from the hospital within 24-48 hours after surgery. Patients were followed for an average of 14 months: 1 patient developed meningitis and another died suddenly at home. The other patients did well and were asymptomatic until the last follow-up consultation. CONCLUSIONS: The 980-nm diode laser is considered an important therapeutic tool for endoscopic neurological surgeries. This study showed its application in different ventricular diseases. Adolescent;Adult;Aged;Cerebral Ventricles;Female;Follow-Up Studies;Humans;Hydrocephalus;Laser Therapy;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Magnetic Resonance Imaging;Male;Middle Aged;Neuroendoscopes;Neuroendoscopy;Neuroimaging;Neurosurgical Procedures;Postoperative Complications;Young Adult

Implantable Self-Powered Low-Level Laser Cure System for Mouse Embryonic Osteoblasts' Proliferation and Differentiation. Bone remodeling or orthodontic treatment is usually a long-term process. It is highly desirable to speed up the process for effective medical treatment. In this work, a self-powered low-level laser cure system for osteogenesis is developed using the power generated by the triboelectric nanogenerator. It is found that the system significantly accelerated the mouse embryonic osteoblasts' proliferation and differentiation, which is essential for bone and tooth healing. The system is further demonstrated to be driven by a living creature's motions, such as human walking or a mouse's breathing, suggesting its practical use as a portable or implantable clinical cure for bone remodeling or orthodontic treatment. Animals;Cell Differentiation;Cell Line;Cell Proliferation;Electric Power Supplies;Embryo, Mammalian;Humans;Infrared Rays;Low-Level Light Therapy;Mice;Nanostructures;Osteoblasts;Osteogenesis

Photoactivation of TAZ via Akt/GSK3Î² signaling pathway promotes osteogenic differentiation. Osteogenesis disorder is involved in osteoporosis and other related bone diseases, in which osteogenic differentiation is essential. Osteogenic differentiation is a complicated process regulated by intricate signal transduction networks. It has been reported that low-power laser irradiation (LPLI) has an osteogenic potential by promoting osteoblast differentiation. However, the molecular mechanisms remain to be understood. In this study, we reveal a novel mechanism that

Akt/GSK3Î²/TAZ (transcriptional co-activator with PDZ-binding motif) signaling pathway plays a crucial role in LPLI-enhanced osteoblast differentiation. Photomodulation by LPLI activated Akt/GSK3Î² pathway which inhibited TAZ phosphorylation, leading to the increase of TAZ protein level and nuclear aggregation. Meanwhile, knockdown of TAZ suppressed osteogenic differentiation promoted by LPLI. Further study showed that LPLI promoted the interaction between TAZ and core-binding factor 1 (Cbfa1), up-regulating the transcription of osteopontin (OPN) and osteocalcin (OCN) and the activity of alkaline phosphatase (ALP). However, inhibition of Akt/GSK3Î² pathway reversed the effects of TAZ on osteogenic differentiation induced by LPLI. Taken together, for the first time, we report that LPLI promotes osteoblast differentiation via TAZ activation dependent on Akt/GSK3Î² signaling pathway. Adaptor Proteins, Signal Transducing;Core Binding Factor Alpha 1 Subunit;Runx2 protein, mouse;Trans-Activators;Wwtr1 protein, mouse;beta Catenin;Osteocalcin;Osteopontin;Glycogen Synthase Kinase 3 beta;Gsk3b protein, mouse;Proto-Oncogene Proteins c-akt;Glycogen Synthase Kinase 3 Adaptor Proteins, Signal Transducing;Animals;Blotting, Western;Cell Differentiation;Cell Line;Core Binding Factor Alpha 1 Subunit;Gene Expression;Glycogen Synthase Kinase 3;Glycogen Synthase Kinase 3 beta;Lasers, Semiconductor;Mice, Inbred C3H;Microscopy, Confocal;Osteocalcin;Osteogenesis;Osteopontin;Phosphorylation;Protein Binding;Proto-Oncogene Proteins c-akt;RNA Interference;Reverse Transcriptase Polymerase Chain Reaction;Signal Transduction;Time Factors;Trans-Activators;beta Catenin

Effect of low-level laser therapy on lung injury induced by hindlimb ischemia/reperfusion in rats. To investigate the effect of low-level laser therapy (LLLT 650Â nm) on the lung remote organ injury induced by hindlimb ischemia/reperfusion (I/R). The experiments were performed on 50 healthy mature male Wistar rats weighing mean 230â€‰Â±â€‰20Â g. The rats were randomly allocated into five equal groups as follows: normal group (animals nonmanipulated), sham group (operated with no ischemia), laser group (animals nonmanipulated and irradiated with laser), I/R group, and I/R + LLLT group. Rats were prepared for sterile surgery, and then, right hindlimbs were subjected to I/R induced by the femoral artery occlusion for duration of 120Â min, followed by a 60-min reperfusion. The LLLT (K30 handheld probe, AZOR, Technica, Russia, 650Â nm, 30Â mW, surface areaâ€‰=â€‰1Â cm(2), 60Â S/cm(2), energy densityâ€‰=â€‰1.8Â J/cm(2)) was carried out by irradiating the rats over a unique point on the skin over the right upper bronchus for 5 and 15Â min after initiating reperfusion for 3Â min. At the end of the trial, rats were euthanized under deep anesthesia and the right lung tissues were removed. Myeloperoxidase (MPO) and superoxide dismutase (SOD) activities and nitric oxide (NO), malondialdehyde (MDA), and glutathione (GSH) levels were measured in the lung tissues. The tissue samples were further examined histopathologically under light microscopy. It was found that I/R elevated MPO activity, MDA, and NO levels accompanied by a reduction in SOD activities and GSH levels (Pâ€‰<â€‰0.05). LLLT restored MDA and NO levels, MPO and SOD activity, GSH levels, and lung injury scores (Pâ€‰<â€‰0.05). In light of these findings, the LLLT has alleviated the lung tissue injuries after skeletal muscle I/R in this experimental model. Nitric Oxide;Malondialdehyde;Peroxidase;Superoxide Dismutase;Glutathione Animals;Glutathione;Hindlimb;Low-Level Light Therapy;Lung;Lung Injury;Male;Malondialdehyde;Muscle, Skeletal;Nitric Oxide;Peroxidase;Rats, Wistar;Reperfusion Injury;Superoxide Dismutase

CD44v6 Monoclonal Antibody-Conjugated Gold Nanostars for Targeted Photoacoustic Imaging and Plasmonic Photothermal Therapy of Gastric Cancer Stem-like Cells. Developing safe and effective nanoprobes for targeted imaging and selective therapy of gastric cancer stem cells (GCSCs) has become one of the most promising anticancer strategies. Herein, gold nanostars-based PEGylated multifunctional nanoprobes were prepared with conjugated CD44v6 monoclonal antibodies (CD44v6-

GNS) as the targeting ligands. It was observed that the prepared nanoprobes had high affinity towards GCSC spheroid colonies and destroyed them completely with a low power density upon near-infrared (NIR) laser treatment (790 nm, 1.5 W/cm(2), 5 min) in vitro experiment. Orthotopic and subcutaneous xenografted nude mice models of human gastric cancer were established. Subsequently, biodistribution and photothermal therapeutic effects after being intravenously injected with the prepared nanoprobes were assessed. Photoacoustic imaging revealed that CD44v6-GNS nanoprobes could target the gastric cancer vascular system actively at 4 h post-injection, while the probes inhibited tumor growth remarkably upon NIR laser irradiation, and even extended survivability of the gastric cancer-bearing mice. The CD44v6-GNS nanoprobes exhibited great potential for applications of gastric cancer targeted imaging and photothermal therapy in the near future. Antibodies, Monoclonal;CD44v6 antigen;Hyaluronan Receptors;Gold Animals;Antibodies, Monoclonal;Disease Models, Animal;Drug Delivery Systems;Gold;Humans;Hyaluronan Receptors;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Mice, Nude;Nanoparticles;Optical Imaging;Photoacoustic Techniques;Stomach Neoplasms;Survival Analysis;Theranostic Nanomedicine;Treatment Outcome

Combined effect of photobiomodulation with a matrix metalloproteinase inhibitor on the rate of relapse in rats. OBJECTIVE: To investigate combined effect of photobiomodulation with a matrix metalloproteinase (MMP) inhibitor on the relapse rate in relation to MMP expression in rats. MATERIALS AND METHODS: Fifty-two rats were divided into four groups according to the treatment modality: control group, irradiation group, doxycycline group, and irradiation with doxycycline group. During a relapse period of 5 days after orthodontic movement, maxillary central incisors were treated by low-level laser therapy (LLLT) as a photobiomodulation and/or doxycycline as a synthetic MMP inhibitor. Relapse rate was evaluated in association with MMP expression at the gene and protein levels. RESULTS: Relapse rates were increased by LLLT (1.57-fold) and decreased by doxycycline (0.83-fold) compared with the control, showing positive correlation with the levels of expression for all MMPs in the periodontal ligament (PDL). LLLT concomitant with doxycycline administration resulted in no significant differences of relapse rate and MMP expression from the control. CONCLUSIONS: The combined effect of photobiomodulation with an MMP inhibitor around the relapsing teeth proved to be antagonistic to PDL remodeling activity during relapse. This study suggests a basis for developing a novel biologic procedure targeting the MMP-dependent PDL remodeling to control the relapse rate. Matrix Metalloproteinase Inhibitors;Doxycycline Animals;Doxycycline;Low-Level Light Therapy;Matrix Metalloproteinase Inhibitors;Periodontal Ligament;Rats;Recurrence;Tooth Movement Techniques

Efficacy of Laser Activated Irrigation on Apically Extruded Debris with Different Preparation Systems. OBJECTIVE: The aim of this study was to evaluate apical extrusion of debris in canals prepared with three nickel-titanium (NiTi) rotary file systems [Twisted File Adaptive (TFA), SybronEndo, Orange, CA], Reciproc [(RP), VDW, Munich, Germany], and Revo-S [(RS), MicroMega, BesanÃ§on, France] and two irrigation [conventional needle (CNI) and laser-activated (LAI)] techniques. BACKGROUND DATA: Although previous studies have evaluated the amount of apically extruded debris by various instrumentation and irrigation methods, none of them have investigated the effect of LAI during the root canal preparation on debris extrusion. METHODS: Ninety extracted single-rooted human mandibular premolars with straight canals were randomly assigned to six groups (n=15) according to the file and irrigation protocols used: (1) TFA and LAI group, (2) RP and LAI group, (3) RS and LAI group, (4) TFA and CNI group, (5) RP and CNI group, and (6) RS and CNI group. Debris extruded from the apical foramen during root canal preparation was collected into preweighed Eppendorf tubes. The weight of the dry extruded debris was established by subtracting the preinstrumentation and postinstrumentation weight of the Eppendorf tubes for each group. Data were analyzed using the

Kruskal Wallis and Mann Whitney U tests with Bonferroni correction to compare groups. RESULTS: LAI groups extruded more debris than CNI groups ($p<0.05$). However, no statistically significant differences were observed among the file groups when each irrigation method was evaluated separately ($p>0.017$). CONCLUSIONS: Within the limitations of this study, it can be concluded that the agitation method, such as LAI, had a significant effect on the amount of extrusion. Root Canal Irrigants Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Irrigants;Root Canal Preparation;Tissue Culture Techniques;Tooth Apex

Effects of Bleaching Agents Combined with Regular and Whitening Toothpastes on Surface Roughness and Mineral Content of Enamel. OBJECTIVE: The purpose of this study was to evaluate surface roughness and changes in the composition of enamel submitted to different bleaching protocols and toothbrushing with regular and whitening toothpastes. BACKGROUND DATA: Bleaching treatment could promote morphological and chemical changes in enamel surface. METHODS: Enamel blocks were randomized into nine groups (n=10) according to the bleaching treatment (no bleaching, control group; 6% hydrogen peroxide, HP; or 10% carbamide peroxide, CP) and toothpaste used (placebo, PL; regular, R; or whitening dentifrice, W). Bleaching was performed according to manufacturers' instructions and all groups were submitted to 30,000 cycles of simulated toothbrushing with toothpaste (PL, R, or W). Mineral content evaluation and enamel roughness were evaluated initially (T1), after bleaching (T2), and after toothbrushing (T3), using an energy-dispersive micro X-ray fluorescence spectrometer and profilometry, respectively. Data were statistically analyzed with two way ANOVA, Tukey, and Dunnett tests (5%). RESULTS: Enamel surface roughness was influenced by bleaching and toothbrushing. Surface roughness increased for the groups that brushed with the placebo dentifrice (CP+PL, HP+PL, C+PL) and for the control group that brushed with whitening dentifrice (C+W). Enamel Ca/P ratio decreased after bleaching, but toothbrushing, regardless of the dentifrice used, did not reduce the enamel mineral content. CONCLUSIONS: The bleaching treatment resulted in a decrease of enamel mineral content, but the studied dentifrices did not contribute to surface mineral loss. Dentifrices;Tooth Bleaching Agents Dental Enamel;Dentifrices;Humans;Low-Level Light Therapy;Surface Properties;Tissue Culture Techniques;Tooth Bleaching;Tooth Bleaching Agents;Tooth Calcification;Toothbrushing

Evaluation of pH Levels and Surface Roughness After Bleaching and Abrasion Tests of Eight Commercial Products. OBJECTIVE: This in vitro study evaluated the effect of different bleaching protocols and the variation of pH levels of bleaching gels regarding roughness and wear of bovine enamel, after in-office bleaching protocols and brushing. MATERIALS AND METHODS: Ninety fragments were randomly divided into nine groups: C, control; WHP15, 35% hydrogen peroxide (HP) (Whiteness HP, FGM) three gel applications of 15â€‰min each, three sessions with 1 week intervals; WHP45, 35% HP (Whiteness HP) one application/45â€‰min, three sessions with 1 week intervals; LPS, 35% HP (Lase Peroxide, DMC) plus hybrid light (HL) [light-emitting diode (LED)/diode laser], four applications/7â€‰min 30â€‰sec (6â€‰min of HL activation), one session; LPSII, 25% HP (Lase Peroxide II, DMC) plus HL, four applications/7â€‰min 30â€‰sec (6â€‰min of HL activation), one session; LPL, 15% HP (Lase Peroxide Light, DMC) four applications/7â€‰min 30â€‰sec (6â€‰min of HL activation), one session; WO, 35% HP (Whitegold Office, Dentsply) three applications/15â€‰min, three sessions with 1 week intervals; WBC40, 35% HP (Whiteness HP Blue Calcium, FGM) one application/40â€‰min, three sessions with 1 week intervals; and WBC50, 20% HP (Whiteness HP Blue Calcium) one application/50â€‰min, three sessions with 1 week intervals. The median pH values were determined utilizing a pH meter during the initial and final gel applications. A rugosimeter was utilized to evaluate the surface roughness (Ra) before and after bleaching and brushing (100,000 strokes), and the surface wear after brushing. RESULTS: For the results of the pH values, there was a decrease in the pH levels from the initial to the final bleaching time, except for

the WBC50. The WO and WBC40 groups exhibited higher pH values. For the results of roughness and wear, there was an increase in surface roughness and wear among the groups. CONCLUSIONS: The pH values tended to decrease from the initial to the final bleaching. After tooth brushing, bleaching procedures with lower pH products provided a significant increase in enamel wear and surface roughness. Gels;Tooth Bleaching Agents;Hydrogen Peroxide Animals;Cattle;Dental Enamel;Gels;Hydrogen Peroxide;Lasers, Semiconductor;Low-Level Light Therapy;Surface Properties;Tissue Culture Techniques;Tooth Bleaching;Tooth Bleaching Agents

Achieving Dental Analgesia with the Erbium Chromium Yttrium Scandium Gallium Garnet Laser (2780â€‰nm): A Protocol for Painless Conservative Treatment. OBJECTIVE: The aim of this research is to evaluate those techniques and optimal parameters of Erbium Chromium Yttrium Scandium Gallium Garnet (Er,Cr:YSGG) laser use in delivering predictable painless (or with very limited discomfort) restorative cavity preparation without the aid of injected local anesthesia. MATERIAL AND METHODS: This study was conducted on 30 patients (26 adults and 4 youth 9-16 years old; average age, 37) treated in a private practice. For each patient, a single cavity was prepared using the Er,Cr:YSGG laser (2780â€‰nm). An Electric Pulp Tester (EPT) was used to monitor the changes in pulp sensibility threshold. The patient experience was tested before and after the treatment using a modified Visual Analogue Scale (VAS) and Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) to evaluate pain and anxiety. RESULTS: Pain analysis indicated that 80% of patients (24 out of 30) felt no pain and no discomfort, or only a very slight sensation. None of the 30 patients requested anesthesia. EPT was found to be unreliable in evaluating pulpal pain threshold levels. A tendency was noted wherein greater discomfort was felt by anxious patients. On average, the older the patient, the less discomfort was felt. The factors that have a greater tendency to promote discomfort were: posterior teeth, greater caries depth, greater use of higher power levels and ablation time. CONCLUSIONS: Using the Er,Cr:YSGG laser, it was possible to avoid local anesthesia during cavity preparation with a bur. The treatment was effective in a high number of cases (80%), leading to reduction in the anxiety frequently associated with dental care. Adolescent;Adult;Analgesia;Child;Dental Cavity Preparation;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain;Young Adult

The Impact of Low-Level Laser Therapy on Oral Mucositis and Quality of Life in Patients Undergoing Hematopoietic Stem Cell Transplantation Using the Oral Health Impact Profile and the Functional Assessment of Cancer Therapy-Bone Marrow Transplantation Questionnaires. OBJECTIVE: The aim of this study was to assess the impact of low-level laser therapy (LLLT) on oral mucositis (OM) and quality of life (QoL) of hematopoietic stem cell transplantation (HSCT) patients. BACKGROUND DATA: OM related to high-dose chemotherapy is often associated with increased risk of mortality and impaired QoL in HSCT patients. LLLT has shown promising effects in the prevention and treatment of chemotherapy-induced OM. There is a dearth of literature focused on subjective aspects involving OM and QoL in patients receiving LLLT. METHODS: Thirty-nine patients were randomly assigned to two groups: control (n=19) and laser (n=20). LLLT was performed from the 1st day of the conditioning regimen until day 7 post-HSCT (D+7). OM severity was evaluated in all patients [World Health Organization (WHO) scale]. A blinded observer collected subjective outcomes from patients on admission (AD), D+7 and at discharge (DC). QoL was assessed using the Oral Health Impact Profile (OHIP-14) and the Functional Assessment of Cancer Therapy-Bone Marrow Transplantation (FACT-BMT) questionnaires. Statistical analyses included descriptive, bivariate and multivariate (generalized estimating equation) tests. RESULTS: The overall FACT-BMT (p=0.074) and OHIP-14 (p=0.749) scores were not associated with the use of laser therapy. Both instruments showed a deterioration in QoL for the whole sample on D+7. The laser group presented less severe OM than the control group (p<0.001). CONCLUSIONS: LLLT did not influence the oral and general health-related QoL of patients

undergoing HSCT, although it was clinically effective in reducing the severity of chemotherapy-induced OM. Adolescent;Adult;Double-Blind Method;Female;Hematopoietic Stem Cell Transplantation;Humans;Leukemia;Low-Level Light Therapy;Lymphoma;Male;Middle Aged;Oral Health;Quality of Life;Stomatitis;Surveys and Questionnaires;Young Adult

Effect of Nd:YAG (1064-nm) and Diode Laser (980-nm) EDTA Agitation on Root Dentin Ultrastructure Properties. OBJECTIVE: The purpose of this study was to analyze the effects of agitation of 17% ethylenediaminetetraacetic acid (EDTA) with 1064â€‰nm Nd:YAG and 980â€‰nm diode laser on root dentin microhardness and superficial roughness (with confocal laser scanning microscopy [CLSM]). BACKGROUND DATA: Root canal irrigants are used in an attempt to minimize the negative effects of smear layer. MATERIALS AND METHODS: Twenty-five bovine roots were sectioned longitudinally and divided into five groups (n=10 each): (1) deionized water, (2) 17% EDTA, (3) 17% EDTA with 60â€‰sec manual agitation, (4) 17% EDTA with 50â€‰sec diode laser (2 W) agitation, and (5) 17% EDTA with 50â€‰sec Nd:YAG (1.5 W) laser agitation. Microhardness and superficial roughness values were calculated before and after the procedures at the cervical, middle, and apical root thirds. Microhardness was statistically analyzed using two way ANOVA, paired t test, and Tukey's tests (Î±=0.05). Roughness was statistically analyzed using Kruskal-Wallis, paired t test, and Student-Newman-Keuls tests (Î±=0.05%). RESULTS: Statistically significant differences in microhardness and roughness were observed between the deionized water group and others. EDTA with 1064â€‰nm Nd:YAG or 980â€‰nm diode laser presented the lowest microhardness and the highest roughness values and was significantly different from EDTA with manual agitation and EDTA only ($p<0.05$). However, there were no differences in microhardness or dentin roughness between the root thirds ($p>0.05$). CLSM analysis showed that the control samples exhibited smoother surfaces than that of the EDTA groups. CONCLUSIONS: Nd:YAG 1064â€‰nm and 980-nm diode laser EDTA agitation caused greater reduction in microhardness and increased roughness of root dentin than EDTA only or EDTA with manual agitation. Root Canal Irrigants;Edetic Acid Animals;Cattle;Edetic Acid;Hardness;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Irrigants;Tissue Culture Techniques;Tooth Root

Stimulation of Cellular Proliferation and Migration: Is It a Viable Measure of Photobiomodulation? Cell Movement;Cell Proliferation;Humans;Low-Level Light Therapy

Low-level laser therapy effects on pain perception related to the use of orthodontic elastomeric separators. INTRODUCTION: Some patients refer to pre-banding orthodontic separation as a painful orthodontic procedure. Low-level laser therapy (LLLT) has been reported to have local analgesic effect. OBJECTIVE: The aim of this single-blind study was to investigate the perception of pain caused by orthodontic elastomeric separators with and without a single LLLT application (6J). METHODS: The sample comprised 79 individuals aged between 13 and 34 years old at orthodontic treatment onset. Elastomeric separators were placed in first maxillary molars at mesial and distal surfaces and kept in place for three days. The volunteers scored pain intensity on a visual analogue scale (VAS) after 6 and 12 hours, and after the first, second and third days. One third of patients received laser applications, whereas another third received placebo applications and the remaining ones were controls. Applications were performed in a split-mouth design. Thus, three groups (laser, placebo and control) were assessed. RESULTS: No differences were found among groups considering pain perception in all periods observed. CONCLUSION: The use of a single-dose of LLLT did not cause significant reduction in orthodontic pain perception. Overall pain perception due to orthodontic separator placement varied widely and was usually mild. Elastomers;Placebos Adolescent;Adult;Elastomers;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Orthodontic Appliance Design;Orthodontic Appliances;Pain Measurement;Pain Perception;Placebos;Single-Blind Method;Tooth Movement Techniques;Young Adult

The effect of low-level laser therapy (LLLT) applied prior to muscle injury. AIM: To evaluate the effect of LLLT (780â€‰nm; 10â€‰J/cm(2) , 40â€‰mW, 3.2â€‰J) prior to injury on the morphological analysis, collagen deposition, and activity of matrix metalloproteinase-2 (MMP-2). METHODS: Wistar rats were divided into groups: control; sham; only LLLT; only muscle injury and LLLTâ€‰+â€‰injury. The rats were euthanized at 1, 3, and 7 days following cryoinjury to muscle that was removed for analysis. RESULTS: LLLT applied prior to muscle injury led to a reduction in myonecrosis and inflammatory cells, an increase of blood vessels and immature muscle fibers. An increase in MMP-2 activity and a decrease in collagen deposition were also found, with a better collagen organization and distribution. CONCLUSION: LLLT applied immediately prior to injury had positive effects during the muscle regeneration process. Therefore, this resource may have considerable therapeutic value, especially for athletes who practice sports in which there is a constant risk of muscle injury. Lasers Surg. Med. 47:571-578, 2015. Â© 2015 Wiley Periodicals, Inc.

Cellulite treatment: a comprehensive literature review. An effective and long-term treatment of cellulite has not been well established. To our knowledge, no review has analyzed the whole range of treatments for this condition. We conducted a review of inÂ vivo studies on humans adopting the key words "cellulite" and "treatment." The studies were included according to eligibility criteria. We performed an analysis to estimate the overall effect of cellulite treatments from clinical studies. Medline library was screened up to December 2014 to identify eligible studies. We included 73 original studies in the present review. All of them were clinical studies, in most of them, only women were recruited. Above the studies searched up, 66 tested the effectiveness of an exclusive treatment performed without the association to other procedures: 11 topical agents, 10 shock-wave therapy, 10 radio frequency, eight laser therapy, five oral therapy, four manual massage therapy, three carbon dioxide therapy, two compressive therapy, two infrared therapy, one dermabrasion, and 11 devices that use an association of multiple treatments. Seven papers tested a combination of two or more treatments. The mean difference of clinical morphologic features and ultrastructural changes between the treated group and the controlled showed significant heterogeneity between studies. It is still difficult to indicate an exclusive and effective single treatment for this condition. Our analysis purposed to obtain a complete overview of the available treatments in cellulite reduction. Dermatologic Agents Adipose Tissue;Administration, Cutaneous;Buttocks;Compression Bandages;Cosmetic Techniques;Dermabrasion;Dermatologic Agents;Female;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Massage;Thigh

Granulomatous Rosacea and Periorificial Dermatitis: Controversies and Review of Management and Treatment. Granulomatous rosacea and periorificial dermatitis are common skin conditions affecting the face. This article examines the historical origin, causes, clinical presentation, and management strategies for these entities. Adrenal Cortex Hormones;Anti-Bacterial Agents;Dermatologic Agents;Dicarboxylic Acids;Toothpastes;Metronidazole;azelaic acid;Benzoyl Peroxide Adrenal Cortex Hormones;Anti-Bacterial Agents;Benzoyl Peroxide;Dermatitis, Perioral;Dermatologic Agents;Dicarboxylic Acids;Facial Dermatoses;Humans;Lasers, Dye;Low-Level Light Therapy;Metronidazole;Photochemotherapy;Rosacea;Skin;Toothpastes;Ultraviolet Rays

Photobiomodulation with low-level diode laser promotes osteoblast migration in an in vitro micro wound model. Laser photobiomodulation can improve bone healing, but well-defined treatment parameters are lacking. Saos-2 human osteoblast-like cells were subjected to an in vitro scratch-wound healing assay and irradiated by a 915-nm gallium-aluminum-arsenide diode laser for 0, 48, 96, and 144 s using doses of, respectively, 0, 5, 10, and 15 J/cm(2) . Wound area was measured after 4, 24, 48, and 72 h. Cell viability, DNA content, gene expression, and release of bone-related proteins were evaluated after 24, 48, and 72 h. Laser significantly improved wound healing compared with nonirradiated controls. Cells treated with laser doses of 5 and 10 J/cm(2) reached wound closure

after 72 h, followed by 15 J/cm(2) after 96 h. With the cell proliferation inhibitor Mitomycin C, the doses of 10 and 15 J/cm(2) maintained an improved wound healing compared with controls. Laser increased collagen type 1 gene expression with higher doses inducing a longer-lasting effect, whereas transforming growth factor-beta 1 showed comparable or decreased levels in irradiated versus nonirradiated groups, with no effect on protein release. This study demonstrated that laser photobiomodulation at 915 nm promoted wound healing mainly through stimulation of cell migration and collagen deposition by osteoblasts. Cell Line;Cell Movement;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Models, Biological;Osteoblasts;Wound Healing

Assessment of feasibility and efficacy of Class IV laser therapy for postoperative pain relief in off-pump coronary artery bypass surgery patients: A pilot study. BACKGROUND: Laser therapy, for its established analgesic properties with minimal side effects, has been used for the treatment of chronic pain. However, it has not been used for the treatment of acute postoperative pain. This pilot study was designed to assess the feasibility and efficacy of Class IV laser on postoperative pain relief following off-pump coronary artery bypass graft (OPCABG) surgery, as a component of multimodal analgesia (MMA) technique. METHODS: This open observational prospective study comprised of 100 adult patients (84 male, 16 female) who underwent OPCABG through sternotomy. For postoperative analgesia, they were subjected to laser therapy subjected to laser therapy in addition to the standard institutional pain management protocol comprising of IV infusion/bolus of tramadol and paracetamol and fentanyl bolus as rescue analgesic. Pain intensity was measured by Verbal Rating Scale (VRS). The laser therapy was scheduled as once a day regime for three consecutive postoperative days (PODs) starting on POD 1, 30 min following tracheal extubation. The subsequent laser applications were also scheduled at the same time of the day as on day 1 if VRS was â‰¥5. 10 W Class IV laser was applied over 150 cmÂ² sternal wound area for 150 s. VRS was used to assess pain severity and was recorded for statistical analysis using Friedman Test. RESULTS: The mean (standard deviation [SD]) VRS of all the 100 patients just before application of the first dose of laser was 7.31 (0.94) while on MMT; the same fell to 4.0 (1.279) and 3.40 (2.697) at 1 h and 24 h respectively following first dose of laser. The change of VRS over first 24 h among all the 100 patients was statistically significant (P = 0.000). Laser was re-applied in 40 patients whose VRS was â‰¥5 (mean [SD] - 6.38 [0.868]) at 24th h. After receiving the 2nd dose of laser the VRS scores fell significantly (P = 0.000) and became 0 at 54th h. No patients required 3rd dose of the laser. No patient required rescue analgesic while on laser therapy. CONCLUSION: Class IV laser can be an effective technique for postoperative analgesia following OPCABG surgery through sternotomy when included as a component of MMA technique. Analgesics, Non-Narcotic;Analgesics, Opioid Analgesics, Non-Narcotic;Analgesics, Opioid;Combined Modality Therapy;Coronary Artery Bypass, Off-Pump;Feasibility Studies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain, Postoperative;Pilot Projects;Prospective Studies;Treatment Outcome

Phototherapy on the Treatment of Burning Mouth Syndrome: A Prospective Analysis of 20 Cases. The aim of this study was to report the effect of laser phototherapy (LPT) on the treatment of burning mouth syndrome (BMS). This prospective clinical study reports on preliminary outcomes of twenty volunteers diagnosed with BMS who have undergone the conventional treatment prior to laser phototherapy. LPT consisted of weekly sessions of LPT (660Â nm), for a period of 10Â weeks. The laser protocol consisted of the following parameters: 40Â mW, 10Â JÂ cm(2) and 0.4Â J per point, irradiation time of 10Â s. In all sessions, the burning intensity was evaluated with a 10Â cm Visual Analogue Scale (VAS). The burning intensity evaluation by VAS was performed immediately before and after each LPT session. Nonparametric test of Wilcoxon was used for statistical analysis, considering a significance level of 5%. All volunteers reported reduced burning intensity in all sessions when compared to the previous one and reduction in VAS scores by up to 49% in the last clinical

session when compared to the first session. When only the VAS baseline of the first session was compared with the consecutive sessions, there was a statistically significant reduction in VAS scores in almost all sessions. The LPT may be an alternative treatment for the relief of oral burning symptoms in patients with BMS. Aged;Burning Mouth Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies

Long-term evaluation of ink clearance in tattoos with different color intensity using the 1064-nm Q-switched Nd:YAG laser. OBJECTIVE: The aim of the study was to evaluate the efficacy of tattoo removal treatments using the 1064-nm Q-switched (QS) Nd:YAG laser. BACKGROUND DATA: Today, QS lasers appear to be the most common, effective, and safest methods to treat unwanted markings. MATERIAL AND METHODS: A total of 64 patients with 75 unwanted tattoos were enrolled in the study. Tattoo clearance was evaluated according to the color intensity - concentration of pigment: group I (34) - black; group II (41) - gray. Consideration included methods of tattooing and tattoo techniques. RESULTS: In group I, after the first treatment session the median of clearance was 30% (10-50%), while in group II, the median was 50% (40-70%). After the second treatment session, median in group I increased to 40% (30-50%). Median of group II increased to 70% (50-80%). The highest number of treatment in group I was 7. After that, the median grew to 75%, while the highest amount of treatment in group II was 5 and a median of 90% was achieved. CONCLUSIONS: Effects were dependent upon the amount of ink deposited in the tissue. Old amateur tattoos and tattoos containing small quantities of ink (technique: shading and lines) demonstrated the quickest and the most efficacious results. Tattoos with large quantities of ink, obtained by filling, required the greatest number of treatment sessions. The final outcome in tattoo clearing can only be assessed following treatment completion, which may in some cases take 2-3 years. Presumably, in some cases, complete clearance is impossible. Adolescent;Adult;Humans;Ink;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Tattooing;Treatment Outcome

Evaluation of the use of low-level laser therapy in pain control in orthodontic patients: A randomized split-mouth clinical trial. OBJECTIVE: To evaluate the effect of using low-level laser therapy (LLLT) to control pain and discomfort during orthodontic treatment. MATERIALS AND METHODS: A randomized, split-mouth clinical trial was conducted with 30 volunteers in need of orthodontic treatment, of both genders, aged between 18 and 40 years, who were randomly divided into two groups. One hemiarch was considered the exposed group (EG) and the other, the placebo group (PG). Both groups had elastic separators placed mesially and distally to the first molars of the two hemiarches at different times. The EG received an AlGaAs diode LLLT (810 nm, 100 mW, 2J/cm(2)) application for 15 seconds per point (interdental papilla at the mesial, distal, and near the root apex) immediately after separator placement on the maxillary right side. The PG also had elastics placed around the maxillary right molars, but received only simulated LLLT application. The elastics were left in place for 5 days, and after a waiting period of 1 week, they were inserted on the left side in both groups; however, the order of laser application was changed. While the separator remained in place, the patient marked his degree of perceived discomfort on a Visual Analog Scale (VAS) at 5 minutes (T0), 24 hours (T1), and 120 hours (T2), after LLLT application. RESULTS: A statistically significant difference was observed ($P < .005$) in reducing discomfort in the exposed group compared with the placebo group. This reduction of discomfort in the EG was observed at all time intervals. CONCLUSIONS: A sincle AlGaAs diode LLLT application may be indicated for the control or reduction of pain in the early stages of orthodontic treatment.
Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Mouth;Orthodontics, Corrective;Pain Management;Pain Measurement;Tooth Movement Techniques;Young Adult

A critical overview of the current myofascial pain literature - July 2015. The current overview includes thirty articles published in the recent past about myofascial pain, trigger points (TrPs) and

related topics. In the Basic Research section, several interesting new studies are reviewed addressing the presence of TrPs in patients with low back pain, episodic migraine, or following a meniscectomy. An animal study of the impact of laser fluency opens the door to future studies regarding optimal dosage of low-level laser therapy in the treatment of individuals with TrPs. Six papers focus on TrP dry needling (DN), two on manual therapies, and two on injection therapy. On of the injection papers discusses the occurrence of a cardiac tamponade, which is a very rare potential complication of invasive needling therapies that can easily be avoided with proper needling techniques. Several review studies and other clinical studies conclude this overview.

Effect of 808Â nm Diode Laser on Swimming Behavior, Food Vacuole Formation and Endogenous ATP Production of Paramecium primaurelia (Protozoa). Photobiomodulation (PBM) has been used in clinical practice for more than 40Â years. To clarify the mechanisms of action of PBM at cellular and organism levels, we investigated its effect on Paramecium primaurelia (Protozoa) irradiated by an 808Â nm infrared diode laser with a flat-top handpiece (1Â W in CW). Our results led to the conclusion that: (1) the 808Â nm laser stimulates the P.Â primaurelia without a thermal effect, (2) the laser effect is demonstrated by an increase in swimming speed and in food vacuole formation, (3) the laser treatment affects endogenous adenosine triphosphate (ATP) production in a positive way, (4) the effects of irradiation dose suggest an optimum exposure time of 50Â s (64Â JÂ cm(-2) of fluence) to stimulate the Paramecium cells; irradiation of 25Â s shows no effect or only mild effects and irradiation up to 100Â s does not increase the effect observed with 50Â s of treatment, (5) the increment of endogenous ATP concentration highlights the positive photobiomodulating effect of the 808Â nm laser and the optimal irradiation conditions by the flat-top handpiece. Adenosine Triphosphate Adenosine Triphosphate;Gene Expression Regulation;Lasers, Semiconductor;Paramecium;Phagosomes;Swimming;Vacuoles

Efficacy of different methods used for dry socket management: A systematic review.
BACKGROUND: Dry socket is one of the most common complications occurring after the extraction of a permanent tooth, but in spite of its high incidence there is not an established treatment for this condition. OBJECTIVES: Analyze the efficacy of different methods used in the management of dry socket regarding results of pain's relief and alveolar mucosa healing compared to conventional surgical treatment of curettage and saline irrigation. MATERIAL AND METHODS: A Cochrane and PubMed-MEDLINE database search was conducted with the search terms "dry socket", "post-extraction complications", "alvogyl", "alveolar osteitis" and "fibrynolitic alveolitis", individually and next, using the Boolean operator "AND". The inclusion criteria were: clinical studies including at least 10 patients, articles published from 2004 to 2014 written in English. The exclusion criteria were case reports and nonhuman studies. RESULTS: 11 publications were selected from a total of 627. Three of the 11 were excluded after reading the full text. The final review included 8 articles: 3 prospective studies, 2 retrospective studies and 3 clinical trials. They were stratified according to their level of scientific evidence using the SORT criteria (Strenght of Recommendation Taxonomy). CONCLUSIONS: All treatments included in the review have the aim to relief patient's pain and promote alveolar mucosa healing in dry socket. Given the heterogeneity of interventions and the type of measurement scale, the results are difficult to compare. Curettage and irrigation should be carried out in dry socket, as well as another therapy such as LLLT, zinc oxide eugenol or plasma rich in growth factors, which are the ones that show better results in pain remission and alveolar mucosa healing. Assessment alveolar bone esposure must be a factor to consider in future research. Taking into account the scientific quality of the articles evaluated, a level B recommendation is given for therapeutic interventions proposed for the treatment of dry socket. Dry Socket;Humans;Pain Management;Treatment Outcome

Radiation induced oral mucositis: a review of current literature on prevention and management. Oral mucositis (OM) is a major limiting acute side effect of radiotherapy for head and neck cancer. The spectrum of problems associated with mucositis includes oral pain, odynophagia, reduced oral intake, and secondary infections. Incidence of mucositis is increased with addition of concurrent chemotherapy as well as altered fractionation schedules. This leads to treatment interruption and suboptimal disease control. Hence, prevention as well as timely management of OM is necessary for optimum tumor control. We reviewed the English literature with key words "Radiation induced mucositis, Mucositis, Oral Mucositis" to find relevant articles describing incidence, pathophysiology, prophylaxis, and treatment of oral mucositis. Prevention and treatment of OM is an active area of research. Maintenance of oral hygiene is an important part in prevention of OM. A battery of agents including normal saline and alkali (soda bicarbonate) mouth washes, low level laser therapy, and benzydamine (non-steroidal analgesic and anti-inflammatory) have effectiveness in the prevention and treatment of radiation induced oral mucositis. Chlorhexidine mouth gargles are recommended for prevention of chemotherapy induced oral mucositis but is not recommended for radiotherapy associated mucositis. Treatment of co-existing infection is also important and both topical (povidone iodine) and systemic anti fungals should be used judiciously. Radiation induced oral mucositis is a common problem limiting the efficacy of radiation by increasing treatment breaks. Adequate prophylaxis and treatment may limit the severity of radiation mucositis and improve compliance to radiation which may translate in better disease control and survival. Head and Neck Neoplasms;Humans;Radiation Injuries;Stomatitis

Low level laser therapy may reduce risk of oral mucositis. DATA SOURCES: Medline, Embase, Cochrane Central Register of Controlled Trials (CENTRAL), CINHAL, Web of Science, Scopus, LILACS, Conference proceedings of the International Society of Paediatric Oncology, American Society of Clinical Oncology, American Society of Hematology, American Society of Pediatric Hematology and Oncology, and Multinational Association of Supportive Care in Cancer and the reference lists of identified studies. STUDY SELECTION: Two reviewers independently selected studies for inclusion with randomised controlled trials (RCTs) and quasi-RCTs being considered. DATA EXTRACTION AND SYNTHESIS: Data were extracted using a specifically developed form and study quality was assessed using the Cochrane risk of bias tool. Dichotomous outcomes data were synthesised using the risk ratio (RR) and 95% confidence interval (CI). Continuous outcomes measured using different scales were synthesised using the standardised mean difference (SMD) while those using the same scale were synthesised using the weighted mean difference (WMD). RESULTS: Eighteen RCTs involving 1144 patients were included. Four trials were considered to be at low risk of bias across all domains. Prophylactic LLLT reduced the overall risk of severe mucositis (risk ratio (RR) 0.37, 95% confidence interval (CI) 0.20 to 0.67; Pâ€Š=â€Š0.001). Compared to placebo/no therapy LLLT also reduced the following outcomes; severe mucositis at the time of anticipated maximal mucositis RR = 0.34, (95% CI; 0.20 to 0.59); overall mean grade of mucositis SMD -1.49, (95% CI; -2.02 to -0.95); duration of severe mucositis WMD -5.32, 95% (CI; -9.45 to -1.19) and incidence of severe pain (RR 0.26, 95% CI; 0.18 to 0.37). CONCLUSIONS: Prophylactic LLLT reduced severe mucositis and pain in patients with cancer and HSCT recipients. Future research should identify the optimal characteristics of LLLT and determine feasibility in the clinical setting. Humans;Low-Level Light Therapy;Stomatitis

Effects of low-level laser therapy on osteoblastic bone formation and relapse in an experimental rapid maxillary expansion model. AIMS AND OBJECTIVES: The aim of this study was to investigate the effects of low-level laser therapy (LLLT) on osteoblastic bone formation and relapse during expansion of rat palatal sutures. MATERIALS AND METHODS: Thirty-two Wistar rats were randomly allocated into two groups of 16 rats each. In the first group, LLLT was applied 4 days after expansion commenced. Seven days after expansion, retainers were applied for 10 days. The second group was

similarly treated, with the exception of laser therapy. All rats were sacrificed on day 7 (n = 1) (the end of the expansion period; laser group (LG) 1 [LLLT 1] and control group (CG) 1 [control 1]) and day 17 (n = 8) (the end of the retention period; LG 2 [LLLT 2] and CG 2 [control 2]) for histological assessment. RESULTS: The LLLT 1 group had significantly higher numbers of osteoclasts than did the control 1 group (P = 0.036). No significant between-group difference in osteoblast cell or capillary numbers was evident when day 7 and 17 data were compared. CONCLUSION: Histologically, LLLT stimulated bone formation, as revealed by analysis after the retention period. LLLT during expansion may accelerate bone healing. Animals;Humans;Laser Therapy;Low-Level Light Therapy;Male;Molar;Osteoblasts;Osteoclasts;Osteogenesis;Palatal Expansion Technique;Palate;Random Allocation;Rats;Rats, Wistar;Recurrence

Quality of life related to oral mucositis of patients undergoing haematopoietic stem cell transplantation and receiving specialised oral care with low-level laser therapy: a prospective observational study. Oral mucositis is a painful condition that occurs in 80% of patients who undergo haematopoietic stem cell transplantation (HSCT). Our objective was to determine the impact of mucositis on quality of life (QoL) of patients subjected to HSCT treated with low-level laser therapy (LLLT). Patients were evaluated: (1) on the first day of treatment; (2) 5Â days after autologous or 8Â days after allogeneic transplantation; (3) once bone marrow had integrated; and (4) 30Â days after discharge. Clinical evaluation was performed using the World Health Organization criteria; oral health QoL was measured using the Oral Health Impact Profile (OHIP-14); and mucositis symptoms with the Patient-Reported Oral Mucositis Symptom (PROMS) scale. The higher the score, the lower the patient's QoL. The OHIP-14 responses showed that at DÂ +Â 5/DÂ +Â 8, all domains had the highest scores, while at times 1 and 4, the scores were lower. In the PROMS scale, all domains scored worst at time 2, and the differences between the scores at the four times were statistically significant. The study has shown that QoL improves over time in patients undergoing LLLT therapy for mucositis prevention. Adolescent;Adult;Aged;Child;Child, Preschool;Female;Hematologic Neoplasms;Hematopoietic Stem Cell Transplantation;Hospitalization;Humans;Infant;Infant, Newborn;Low-Level Light Therapy;Male;Middle Aged;Oral Health;Prospective Studies;Quality of Life;Stomatitis;Young Adult

Low-Level Laser Therapy (LLLT) in Dystrophin-Deficient Muscle Cells: Effects on Regeneration Capacity, Inflammation Response and Oxidative Stress. The present study evaluated low-level laser therapy (LLLT) effects on some physiological pathways that may lead to muscle damage or regeneration capacity in dystrophin-deficient muscle cells of mdx mice, the experimental model of Duchenne muscular dystrophy (DMD). Primary cultures of mdx skeletal muscle cells were irradiated only one time with laser and analyzed after 24 and 48 hours. The LLLT parameter used was 830 nm wavelengths at 5 J/cmÂ² fluence. The following groups were set up: Ctrl (untreated C57BL/10 primary muscle cells), mdx (untreated mdx primary muscle cells), mdx LA 24 (mdx primary muscle cells - LLLT irradiated and analyzed after 24 h), and mdx LA 48 (mdx primary muscle cells - LLLT irradiated and analyzed after 48 h). The mdx LA 24 and mdx LA 48 groups showed significant increase in cell proliferation, higher diameter in muscle cells and decreased MyoD levels compared to the mdx group. The mdx LA 48 group showed significant increase in Myosin Heavy Chain levels compared to the untreated mdx and mdx LA 24 groups. The mdx LA 24 and mdx LA 48 groups showed significant increase in [Ca2+]i. The mdx group showed significant increase in H2O2 production and 4-HNE levels compared to the Ctrl group and LLLT treatment reduced this increase. GSH levels and GPx, GR and SOD activities increased in the mdx group. Laser treatment reduced the GSH levels and GR and SOD activities in dystrophic muscle cells. The mdx group showed significant increase in the TNF-Î± and NF-ÎºB levels, which in turn was reduced by the LLLT treatment. Together, these results suggest that the laser treatment improved regenerative capacity and decreased inflammatory response and oxidative

stress in dystrophic muscle cells, indicating that LLLT could be a helpful alternative therapy to be associated with other treatment for dystrophinopathies. Dystrophin;NF-kappa B;Tumor Necrosis Factor-alpha;Hydrogen Peroxide;Myosin Heavy Chains;Calcium Animals;Calcium;Cells, Cultured;Dystrophin;Hydrogen Peroxide;Inflammation;Lasers, Solid-State;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Mice, Inbred mdx;Muscle, Skeletal;Muscular Dystrophy, Duchenne;Myosin Heavy Chains;NF-kappa B;Oxidative Stress;Regeneration;Tumor Necrosis Factor-alpha

Pre-exercise low-level laser therapy improves performance and levels of oxidative stress markers in mdx mice subjected to muscle fatigue by high-intensity exercise. This study was designed to determine if the levels of oxidative stress markers are influenced by low-level laser therapy (LLLT) in mdx mice subjected to high-intensity exercise training on an electric treadmill. We used 21 C57BL/10ScSn-Dmdmdx/J mice and 7 C57BL/10ScSn mice, all aged 4Â weeks. The mice were divided into four groups: a positive control group of normal, wild-type mice (WT); a negative control group of untreated mdx mice; a group of mdx mice that underwent forced high-intensity exercise on a treadmill (mdx fatigue); and another group of mdx mice with the same characteristics that were treated with LLLT at a single point on the gastrocnemius muscle of the hind paw and underwent forced high-intensity exercise on a treadmill. The mdx mice treated with LLLT showed significantly lower levels of creatine kinase (CK) and oxidative stress than mdx mice that underwent forced high-intensity exercise on a treadmill. The activities of the antioxidant enzyme superoxide dismutase (SOD) were higher in control mdx mice than in WT mice. LLLT also significantly reduced the level of this marker. LLLT had a beneficial effect also on the skeletal muscle performance of mdx mice. However, the single application of LLLT and the dose parameters used in this study were not able to change the morphology of a dystrophic muscle. Biomarkers;Superoxide Dismutase;Creatine Kinase Animals;Biomarkers;Creatine Kinase;Exercise Test;Low-Level Light Therapy;Mice, Inbred C57BL;Mice, Inbred mdx;Muscle Fatigue;Muscle, Skeletal;Oxidative Stress;Physical Conditioning, Animal;Protein Carbonylation;Superoxide Dismutase

Ultrasmall Chitosan-Genipin Nanocarriers Fabricated from Reverse Microemulsion Process for Tumor Photothermal Therapy in Mice. Nanocarriers play an important role in improving the photo- and thermal-stability of photosensitizers to gain better pharmacokinetics behavior in tumor photothermal therapy. Herein, PEGylated chitosan (CG-PEG; PEG: polyethylene glycol) nanoparticles with ultrasmall size (âˆ¼5 nm) were prepared through a water-in-oil reverse microemulsion method using genipin as a cross-linker. Particle size and zeta-potential can be tuned by varying the molar ratio between chitosan amino groups and genipin. CG-PEG-ICG (ICG: indocyanine green) nanoparticles were fabricated by adding ICG to CG-PEG aqueous solution through a self-assembly method via electrostatic interaction. The resultant CG-PEG-ICG nanoparticles exhibited improved photo- and thermal-stability, good biocompatibility, and low toxicity. When irradiated with a laser, the cells incubated with CG-PEG-ICG nanoparticles showed very low cell viability (15%), indicating the CG-PEG-ICG nanoparticles possess high in vitro photothermal toxicity. Moreover, the CG-PEG nanocarriers can significantly alter the biodistribution and prolong the retention time of ICG in the mice body after intravenous injection. In vivo photothermal study of tumors injected with CG-PEG-ICG nanoparticles containing ICG at a concentration greater than 100 Î¼gÂ·mL(-1) (100 Î¼L) induced irreversible tissue damage. The growth of U87 tumors was dramatically inhibited by CG-PEG-ICG nanoparticles, demonstrating that the CG-PEG nanoparticles may act as potential ICG nanocarriers for effective in vivo tumor photothermal therapy. Drug Carriers;Iridoids;Photosensitizing Agents;Chitosan;genipin Animals;Cell Line, Tumor;Cell Proliferation;Chitosan;Drug Carriers;Iridoids;Low-Level Light Therapy;Mice;Nanoparticles;Neoplasms, Experimental;Particle Size;Photosensitizing Agents

Enhancement of Ischemic Wound Healing by Spheroid Grafting of Human Adipose-Derived Stem Cells Treated with Low-Level Light Irradiation. We investigated whether low-level light irradiation prior to transplantation of adipose-derived stromal cell (ASC) spheroids in an animal skin wound model stimulated angiogenesis and tissue regeneration to improve functional recovery of skin tissue. The spheroid, composed of hASCs, was irradiated with low-level light and expressed angiogenic factors, including vascular endothelial growth factor (VEGF), basic fibroblast growth factor (FGF), and hepatocyte growth factor (HGF). Immunochemical staining analysis revealed that the spheroid of the hASCs was CD31+, KDR+, and CD34+. On the other hand, monolayer-cultured hASCs were negative for these markers. PBS, human adipose tissue-derived stromal cells, and the ASC spheroid were transplanted into a wound bed in athymic mice to evaluate the therapeutic effects of the ASC spheroid in vivo. The ASC spheroid transplanted into the wound bed differentiated into endothelial cells and remained differentiated. The density of vascular formations increased as a result of the angiogenic factors released by the wound bed and enhanced tissue regeneration at the lesion site. These results indicate that the transplantation of the ASC spheroid significantly improved functional recovery relative to both ASC transplantation and PBS treatment. These findings suggest that transplantation of an ASC spheroid treated with low-level light may be an effective form of stem cell therapy for treatment of a wound bed. HGF protein, human;VEGFA protein, human;Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2;Hepatocyte Growth Factor Adipose Tissue;Animals;Cells, Cultured;Disease Models, Animal;Fibroblast Growth Factor 2;Hepatocyte Growth Factor;Humans;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mice;Skin;Spheroids, Cellular;Vascular Endothelial Growth Factor A;Wound Healing

Can intractable discogenic back pain be managed by low-level laser therapy without recourse to operative intervention? OBJECTIVE: The aim of the study reported here was to investigate the possible clinical role of low-level laser therapy (LLLT) in discogenic back pain patients who failed to respond to a conventional physical therapy program to avoid recourse to operative intervention. METHODS: The paper reports on the long-term mean 5-year prospective follow-up of a patient cohort of 50 unselected patients visiting our tertiary referral pain center for discogenic back pain who had had a single-level lesion documented by magnetic resonance imaging followed by subsequent discography to confirm the affected disc being the pain generator. All of the patients who entered the study had failed response to a combination of nonsteroidal anti-inflammatory agents and had had not less than 3 months of conventional physical therapy. LLLT, at a wavelength of 810 nm wavelength emitted from a GaAIAs semiconductor laser device with 5.4 J per point and a power density of 20 mW/cm(2), was employed. The treatment regimen consisted of three sessions of treatment per week for 12 consecutive weeks. RESULTS: All but one patient had significant improvement in their Oswestry Disability Index score, from a mean of 50% score to a mean of 10% score, at the end of treatment at 12 weeks. In addition, surprisingly, the improvement was found maintained at follow-up assessments 1 year and 5 years later. The one patient among the 50 patients who failed to respond eventually required surgery, while the others did not require surgery. CONCLUSION: We conclude that LLLT is a viable option in the conservative treatment of discogenic back pain, with a positive clinical result of more than 90% efficacy, not only in the short-term but also in the long-term, with lasting benefits.

[Comments on "Acupuncture for chronic knee pain: a randomized clinical trial" from Journal of the American Medical Association]. The development of TCM acupuncture represents a internationalized and modern trend. A recent study with the title of "Acupuncture for chronic knee pain: a randomized clinical trial" published in Journal of the American Medical Association on October 1st, 2014, which raised doubts on acupuncture efficacy as well as traditional manipulation and acupoint theory, makes some negative impact and challenges on the development of acupuncture. From the view of future development of acupuncture, the potential influence of this research on

acupuncture development is proposed, and by combining acupuncture theory, some discussions and doubts on the research design and outcome explanations are made. Additionally, enlightenments of this research on further clinical research are summarized. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Aflibercept: A Review of Its Use in Diabetic Macular Oedema. Aflibercept (Eylea(Â®)) is an anti-vascular endothelial growth factor agent indicated for intravitreal use in the treatment of diabetic macular oedema. In patients with diabetic macular oedema, significantly greater improvements from baseline to week 52 in visual acuity were seen with intravitreal aflibercept versus macular laser photocoagulation in the phase III VISTA-DME and VIVID-DME trials, and versus intravitreal bevacizumab or ranibizumab in those with worse visual acuity at baseline (i.e. Early Treatment Diabetic Retinopathy Study letter score of <69) in the phase III PROTOCOL-T trial. Intravitreal aflibercept was generally well tolerated in patients with diabetic macular oedema. In conclusion, intravitreal aflibercept is an important new treatment for diabetic macular oedema. Recombinant Fusion Proteins;aflibercept;Bevacizumab;Receptors, Vascular Endothelial Growth Factor;Ranibizumab Bevacizumab;Diabetic Retinopathy;Humans;Low-Level Light Therapy;Macular Edema;Ranibizumab;Receptors, Vascular Endothelial Growth Factor;Recombinant Fusion Proteins

This edition of the Journal starts off with a wonderful review. Introduction. Cosmetic Techniques;Humans;Laser Therapy;Low-Level Light Therapy

Comparative study between excimer light and topical antioxidant versus excimer light alone for treatment of vitiligo. BACKGROUND: Vitiligo is an acquired idiopathic cutaneous disease characterized by pearly white patches of variable shapes and sizes. Various medical and surgical therapeutic options have been proposed to achieve repigmentation; phototherapy is one of the most efficient options. Topical therapies have been a mainstay of vitiligo treatment, with or without phototherapy. AIM OF THE WORK: To compare the efficacy of combined topical antioxidant hydrogel and excimer light versus excimer light alone in treating vitiligo. PATIENTS AND METHODS: Thirty patients were included in this comparative, prospective, randomized study. For each patient, at least 2-4 vitiliginous macules were randomly selected and treated while an untreated vitiliginous macule served as control. Lesions were divided into two groups: Group A received combination therapy of daily topical antioxidant plus excimer light, while Group B received only excimer light. Lesions were treated twice a week for a maximum of 24 sessions. Initial fluencies were adjusted individually according to the minimal erythema dose in vitiliginous skin. Efficacy based on repigmentation percentages were blindly evaluated by two independent physicians. RESULTS: Group A lesions showed significant efficacy than group B ($p < 0.001$), specially on treating UV-sensitive lesions with no side effects. CONCLUSION: Topical antioxidant and excimer light represents a valuable, effective therapy for localized vitiligo. Antioxidants;Drug Combinations;Vitiskin hydrogel;Pantothenic Acid;Copper;Superoxide Dismutase;Zinc;Vitamin B 12 Administration, Cutaneous;Adolescent;Adult;Antioxidants;Child;Child, Preschool;Combined Modality Therapy;Copper;Drug Combinations;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Pantothenic Acid;Prospective Studies;Single-Blind Method;Skin Pigmentation;Superoxide Dismutase;Vitamin B 12;Vitiligo;Young Adult;Zinc

Laser and energy-based devices' complications in dermatology. Laser dermatology is an ever-expanding part of the specialty used extensively for both aesthetic and medical conditions. Advances in laser technology have led to an expansion in the number of devices available, with as a consequence an increase in the total number of complications. Fortunately, the current technology has improved greatly which adds to the safety profile of such devices; nevertheless, thorough knowledge of laser complications and how to avoid them is paramount for any practitioner who uses

such technology. Ablation Techniques;Acne Vulgaris;Blister;Cicatrix;Dermatology;Erythema;Humans;Hyperpigmentation;Hypertrichosis;Hypopigmentation;Laser Therapy;Low-Level Light Therapy;Purpura;Skin Diseases;Skin Diseases, Infectious;Urticaria

Evaluation of wavelength-dependent hair growth effects on low-level laser therapy: an experimental animal study. In this study, we aimed to investigate the wavelength-dependent effects of hair growth on the shaven backs of Sprague-Dawley rats using laser diodes with wavelengths of 632, 670, 785, and 830Â nm. Each wavelength was selected by choosing four peak wavelengths from an action spectrum in the range 580 to 860Â nm. The laser treatment was performed on alternating days over a 2-week period. The energy density was set to 1.27Â J/cm(2) for the first four treatments and 1.91Â J/cm(2) for the last four treatments. At the end of the experiment, both photographic and histological examinations were performed to evaluate the effect of laser wavelength on hair growth. Overall, the results indicated that low-level laser therapy (LLLT) with a 830-nm wavelength resulted in greater stimulation of hair growth than the other wavelengths examined and 785Â nm also showed a significant effect on hair growth. Animals;Hair;Hair Follicle;Lasers, Semiconductor;Low-Level Light Therapy;Male;Organ Size;Rats, Sprague-Dawley;Skin

Two-year follow-up of low-level laser therapy for elderly with painful adhesive capsulitis of the shoulder. INTRODUCTION: This paper reports on the medium-term mean 2-year prospective follow-up of a patient cohort of 35 unselected elderly patients with mean age of 65 years who visited our tertiary referral pain center for painful adhesive capsulitis of the shoulder managed with low-level laser therapy (LLLT). MATERIALS AND METHODS: All patients in this prospective cohort study had documentation of the diagnosis by contrast-enhanced magnetic resonance imaging before study entry and all had failed to respond to a combination of conventional physical therapy and nonsteroidal anti-inflammatory medications for not fewer than 4 weeks. LLLT, at a wavelength of 810 nm emitted from a GaAlAs semiconductor laser device with 5.4 J per point and a power density of 20 mW/cm(2), was employed to irradiate six predetermined anatomic points and two acupuncture points. The treatment regimen consisted of three sessions of treatment per week for 8 consecutive weeks. Each treatment session lasted 180 seconds. Serial clinical assessment was undertaken using the Constant-Murley shoulder score. RESULTS: A total of 50 painful shoulder joints were treated, as a number of elderly presented with bilateral symptoms. All but four painful shoulders showed significant improvement in Constant-Murley shoulder score at the end of 8-weeks' LLLT treatment and, surprisingly, the improvement was found maintained at follow-up assessments at 1 year and 2 years. CONCLUSION: We conclude that LLLT is a viable option in the conservative treatment of shoulder pain arising from adhesive capsulitis of the shoulder in the elderly, with a positive clinical result of more than 90% and with clinical efficacy both in the short-term and the medium-term.

Effect of 830-nm laser phototherapy on olfactory neuronal ensheathing cells grown in vitro on novel bioscaffolds. BACKGROUND: The purpose of this study was to analyze olfactory ensheathing cell (OEC) proliferation and growth on Biosilicate and collagen bioscaffolds, and to determine whether the application of laser phototherapy would result in increased OEC proliferation on the scaffolds. The use of bioscaffolds is considered a promising strategy in a number of clinical applications where tissue healing is suboptimal. As in vitro OEC growth is a slow process, laser phototherapy could be useful to stimulate proliferation on bioscaffolds. METHODS: OEC cells were seeded on the Biosilicate and collagen scaffolds. Seeded scaffolds were irradiated with a single exposure of 830-nm laser. Nonirradiated seeded scaffolds acted as negative controls. Cell proliferation was assessed 7 days after irradiation. RESULTS: OECs were successfully grown on discs composed of a glass-ceramic and collagen composite. Laser irradiation produced a 32.7% decrease and a 13.2% increase in OEC proliferation on glass-ceramic discs and on collagen scaffolds, respectively, compared with controls.

Laser phototherapy resulted in a reduction in cell growth on the Biosilicate scaffolds and an increase in cell proliferation on collagen scaffolds. CONCLUSIONS: These results were probably due to the nature of the materials. Future research combining laser phototherapy and glass-ceramic scaffolds should take into account possible interactions of the laser with matrix compounds.
Silicates;Collagen Animals;Cell Line;Cell Proliferation;Collagen;Low-Level Light Therapy;Mice;Microscopy, Electron, Scanning;Olfactory Receptor Neurons;Silicates;Stem Cells;Tissue Engineering;Tissue Scaffolds

Effects of exercise training and photobiomodulation therapy (EXTRAPHOTO) on pain in women with fibromyalgia and temporomandibular disorder: study protocol for a randomized controlled trial. BACKGROUND: Fibromyalgia (FM) is a syndrome most prevalent in women, in whom it is characterized mainly by chronic pain. An important issue is that many patients with FM are reported to have temporomandibular dysfunction (TMD), and the coexistence of these pathologies generates a clinical outcome of high complexity. The literature is unclear regarding an effective therapy for reducing pain in patients with both comorbidities. Exercise training and phototherapy (low-level laser therapy with light-emitting diode) are two of the approaches used to treat pain. Thus, the aim of this study is to assess the potential role of exercise training plus phototherapy in reducing chronic pain in women with FM and TMD. A further aim is to determine whether the interventions can improve quality of life and modulate endogenous serotonin. METHODS/DESIGN: A randomized controlled clinical trial will be conducted. It will involve 60 women â‰¥ 35 years of age with a diagnosis of FM and TMD. After recruitment, patients will be randomly allocated to one of four groups: a control group (no intervention), a group that will receive a phototherapy intervention (PHO), a group that will be prescribed muscle-stretching, aerobic, and facial exercises (EXT), or a group that will receive phototherapy plus exercise interventions (PHO + EXT). The trial will last 10 weeks, and the following outcomes will be evaluated on two separate occasions (baseline and within 24 h after the last day of the protocol). Pain intensity will be analyzed using a visual analogue scale and the McGill Pain Questionnaire, and pain thresholds will be punctuated using a digital algometer. FM symptoms will be assessed using the Fibromyalgia Impact Questionnaire, and quality of life will be determined with the 36-item Short Form Health Survey. Serotonin levels will be evaluated in salivary samples using a competitive enzyme-linked immunosorbent assay. DISCUSSION: This is the first randomized controlled trial in which the role of phototherapy, exercise training, and a combination of these interventions will be evaluated for chronic pain in patients with FM and TMD. The results will offer valuable clinical evidence for objective assessment of the potential benefits and risks of procedures. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: NCT02279225. Registered 27 October 2014.
Biomarkers;Serotonin Adult;Biomarkers;Brazil;Clinical Protocols;Combined Modality Therapy;Equipment Design;Exercise Therapy;Female;Fibromyalgia;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Quality of Life;Research Design;Saliva;Serotonin;Surveys and Questionnaires;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome

Effects of Therapeutic Physical Agents on Achilles Tendon Microcirculation. STUDY DESIGN: Controlled laboratory study. OBJECTIVES: To measure Achilles tendon microcirculation (total hemoglobin [THb] and oxygen saturation [StO2]) before and after the application of a physical agent in asymptomatic participants, and to compare differences between application location and physical agent dosage. BACKGROUND: Tendon microcirculation can be altered by superficial heating or cryotherapy. METHODS: Fifty-one healthy adults (median age, 22 years; range, 20-34 years) were recruited and randomly assigned into 1 of 4 groups. Participants in each group received an intervention consisting of 1 of the following 4 physical agents: ultrasound (n = 12), interferential current (n = 14), low-level laser (n = 11), or vibration massage (n = 14). In each group, the selected

intervention was applied at 2 different doses (ultrasound, 0.8 or 1.2 W/cm(2); laser, 5.4 or 18 J) or target locations (vibration and electrostimulation, calf muscle or Achilles tendon). For each participant, each dose or target location was randomly applied to 1 randomly selected lower leg (each leg receiving only 1 of the 2 options). RESULTS: The StO2 values significantly increased after ultrasound at both doses (P<.008), and the THb value significantly increased for the higher dose only (P<.008). Both THb and StO2 values also significantly increased in response to vibration massage targeting the Achilles tendon (P<.008), and these values were greater than those resulting from the vibration massage applied to the calf muscle (P = .003 and .002, respectively). No significant THb and StO2 differences were found after the application of interferential current or low-level laser. CONCLUSION: Tendon microcirculation increases after ultrasound and vibration massage intervention concentrated on the Achilles tendon. These modalities may be considered for the purpose of temporarily increasing microcirculation in the tendon. Achilles Tendon;Adult;Electric Stimulation Therapy;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Microcirculation;Random Allocation;Ultrasonic Therapy;Vibration;Young Adult

Low-level laser therapy improves bone formation: stereology findings for osteoporosis in rat model. Low-level laser therapy (LLLT) benefits bone metabolism, but its use needs to be standardized. We evaluated the effects of LLLT on bone defects in calvaria of ovariectomized rats. Stereology was used to calculate tissue repair volume (V tr), density of trabecular bone volume (Vv t), total volume of newly formed trabecular bone (Vtot), and the area occupied by collagen fibers (A C). Fifty-four Wistar rats were submitted to bilateral ovariectomy, and bone defects were created in calvaria after 150Â days. The animals were divided into nine groups (nâ€‰=â€‰6), and 24Â h after defects, the treatment started with a 780-nm low-intensity GaAlAs laser: G1, G2, and G3 received 3 sessions of 0, 20, and 30Â J/cm(2) respectively; G4, G5, and G6 received 6 sessions of 0, 20, and 30Â J/cm(2), respectively; and G7, G8, and G9 received 12 sessions of 0, 20, and 30Â J/cm(2), respectively. A normal distribution was found for all of the data. The test used to verify the normality was the Kolmogorov-Smirnov (KS, pâ€‰>â€‰0.05). The one-way ANOVA followed by Tukey's post hoc test was used for data processing. A difference of pâ€‰<â€‰0.05 was considered statistically significant. Groups G2 and G1 showed significance for V tr ,â€‰Vv t ,â€‰Vtot, and (A C). Results were significant for (Vv t) and (Vtot) between G3 and G1. There were no significant results between G5 and G4 as well as between G8 and G7. Groups G6 and G4 results showed statistical difference for V tr ,â€‰Vv t ,â€‰Vtot, and (A C). Groups G9 and G7 showed significance for V tr ,â€‰Vv t ,â€‰Vtot, and (A C). In conclusion, there was new bone formation in the groups that received 20 and 30Â J/cm(2) when compared to control groups, but over time, the dose of 30Â J/cm(2) showed better stereological parameters when compared to 20Â J/cm(2). Animals;Female;Humans;Low-Level Light Therapy;Osteogenesis;Osteoporosis;Rats, Wistar;Skull

[The influence of low-intensity laser irradiation of blood on the lactoferrin level in the patients presenting with community-acquired pneumonia]. The objective of the present study was to estimate the influence of low-intensity laser irradiation of blood on the levels of lactoferrin in the patients presenting with community-acquired pneumonia. MATERIALS AND METHODS: All the patients were divided into two groups. Those comprising the control group received only medicamental therapy. The standard treatment of the patients in the second group was supplemented by intravenous laser irradiation of blood (IVLIB-405 technique). Each irradiation session performed in a continuous mode lasted 5-7 minutes, with the total treatment course consisting of 7 daily procedures. Lactoferrin was determined before and after the treatment by the enzyme immunoassay with the use of "Lactoferrin Strip" kits ("Vektor-Best- Yug" JSC, Russia). RESULTS: Analysis of the results of the study revealed a significant decrease in the blood lactoferrin level down to the normal range in the patients treated with the use of laser therapy. CONCLUSION:

The application of intravenous laser irradiation of blood for the combined treatment of the patients with community-acquired pneumonia was accompanied by normalization of the blood lactoferrin level and the improvement of the clinical course of the disease. Lactoferrin
Adult;Aged;Community-Acquired Infections;Female;Humans;Lactoferrin;Lasers;Low-Level Light Therapy;Male;Middle Aged;Pneumonia

New insight in the treatment of refractory melasma: Laser Q-switched Nd: YAG non-ablative fractionated followed by intense pulsed light. The purpose of our study was to verify the results of the association of Q-switched Nd: YAG non-ablative fractionated with intense pulsed light, in order to treat patients with refractory melasma. The combination of these two devices seems to be the best treatment to combat hyperpigmentation produced by melasma, with low occurrence of side effects, which may be justified by the selective photothermolysis at subcellular level.
Adult;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Comparison of quality of facial scars after single low-level laser therapy and combined low-level with high-level (PDL 595 nm) laser therapy. The main goal of our study was to compare the quality of resulting facials scar 12 weeks after single and combined laser therapy. Forty-one children from age 1.5 to 5 years with facial scars after injury participated in the study. Thirty-one underwent laser therapy, 14 were treated using single low-level laser therapy (670 nm, fluence 3-5 J/cm(-2)), and 17 underwent combined high-level laser therapy with non-ablative pulsed dye laser (PDL; 595 nm, spot size 7 mm, delay 0.45 ms or 1.5 ms, fluence 9-11 J/cm(-2) , cryogen spray/delay 20/30 ms) and low-level laser therapy. The control group consisted of 10 untreated children. Before treatment and at week 4, 8, and, 12 the scars were evaluated using the POSAS questionnaire. A statistically significant improvement in scars (between ratings before treatment and 4 weeks after therapy, before treatment and 8 weeks after therapy and before treatment and 12 weeks after therapy) was observed in all parameters in both treatment groups (pâ€‰<â€‰0.0001). For the HLLT+LLLT group the most significant enhancement in the quality of scars was found for all items and at all evaluations, except pigmentation and pliability. There was no improvement observed in quality of facial scars in the control group. Child, Preschool;Cicatrix;Color;Combined Modality Therapy;Face;Female;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Patient Outcome Assessment;Pliability;Prospective Studies;Surveys and Questionnaires;Treatment Outcome

Molecular pathway of near-infrared laser phototoxicity involves ATF-4 orchestrated ER stress.
High power lasers are used extensively in medicine while lower power applications are popular for optical imaging, optogenetics, skin rejuvenation and a therapeutic modality termed photobiomodulation (PBM). This study addresses the therapeutic dose limits, biological safety and molecular pathway of near-infrared (NIR) laser phototoxicity. Increased erythema and tissue damage were noted in mice skin and cytotoxicity in cell cultures at phototoxic laser doses involving generation of reactive oxygen species (ROS) coupled with a rise in surface temperature (>45â€‰Â°C). NIR laser phototoxicity results from Activating Transcription Factor-4 (ATF-4) mediated endoplasmic reticulum stress and autophagy. Neutralizations of heat or ROS and overexpressing ATF-4 were noted to rescue NIR laser phototoxicity. Further, NIR laser mediated phototoxicity was noted to be non-genotoxic and non-mutagenic. This study outlines the mechanism of NIR laser phototoxicity and the utility of monitoring surface temperature and ATF4 expression as potential biomarkers to develop safe and effective clinical applications. Reactive Oxygen Species;Activating Transcription Factor 4
Activating Transcription Factor 4;Animals;Apoptosis;Cell Line;DNA Damage;Endoplasmic Reticulum Stress;Hot Temperature;Humans;Lasers;Mice;Reactive Oxygen Species;Reproducibility of Results;Signal Transduction;Skin;Skin Temperature

Can low-level laser therapy when associated to exercise decrease adipocyte area? Obesity affects approximately 20% of the world population, and exercise is the primary non-pharmacological therapy. The combined use of exercise and low-level laser therapy (LLLT) may potentiate the effects promoted by exercise. The objective of this study was to investigate the effects of exercise in combination with phototherapy on adipocyte area, activity of the enzyme citrate synthase and muscle morphological analysis. We used 64 Wistar rats, which were divided into eight groups with 8 rats each: sedentary chow-diet (SC); sedentary chow-diet plus laser therapy (SCL), exercised chow-diet (EC); exercised chow-diet plus laser therapy (ECL); sedentary high-fat diet (SH); sedentary high-fat diet plus laser therapy (SHL); exercised high-fat diet (EH); exercised high-fat diet, laser therapy (EHL). The animals were submitted to a program of swimming training for 90min/5 times per week for 8weeks and LLLT (GA-Al-AS, 830nm) at a dose of 4.7J/point and a total energy of 9.4J/animal, with duration of 47s, which was applied to both gastrocnemius muscles after exercise. We conclude that the combined use of exercise and phototherapy increases the activity of the enzyme citrate synthase and decreases the white adipocyte area epididymal, retroperitoneal and visceral in obese rats, enhancing the effects of exercise. Adipocytes;Animals;Citrate (si)-Synthase;Enzyme Activation;Low-Level Light Therapy;Male;Muscle, Skeletal;Physical Conditioning, Animal;Rats;Rats, Wistar

Clinical assessment of the therapeutic effect of low-level laser therapy on chronic recurrent aphthous stomatitis. The aim of this study was to clinically assess the therapeutic effect of low-level laser therapy (LLLT) on chronic recurrent aphthous stomatitis (RAS) using a protocol we developed especially for the purpose. The study included 180 patients: group 1 (the study group) - 90 patients who received LLLT using a laser operating in the red spectrum (658Â nm; in a non-contact mode; power output P = 27 mW; frequency f(1) = 5.8Â Hz, f(2) - continuous waveform; time T = 1.14Â min; dosage of 2 J/cm(2) once daily); group 2 (controls) - 90 patients who received pharmacotherapy (Granofurin and solcoseryl given twice daily). The indices we assessed were pain intensity, erythema dynamics and epithelization time. Pain was completely managed in 55.6% of group 1 patients one day after therapy began, while it took three days to alleviate pain for 11.1% of the patients in group 2. The erythema was managed entirely in 24.4% of group 1 patients after the first session, while it did not change in any of the group 2 patients. Pain intensity and erythema had similar dynamics for both groups. In 5Â days, 75.6% of group 1 patients showed complete epithelization, while in group 2 the process was completed in only 37.8% of patients. As a whole, the results we obtained using LLLT to treat chronic RAS were better than those obtained in the group receiving pharmacotherapy. Pain and inflammation were very effectively managed with LLLT with the parameters we used and epithelization was considerably accelerated.

Q-switched Nd:YAG laser treatment for labial lentigines associated with Peutz-Jeghers syndrome. BACKGROUND AND OBJECTIVE: Labial lentigines associated with Peutz-Jeghers syndrome are cosmetically disfiguring and distressful. Although multiple treatment modalities including Q-switched ruby laser and Q-switched alexandrite laser have been proposed, experience with Q-switched Nd:YAG laser has been lacking. This study aimed to retrospectively evaluate the efficacy and safety of Q-switched Nd:YAG laser (532 nm) for labial lentigines in Peutz-Jeghers syndrome. PATIENTS AND METHODS: Demographic and clinical data of 11 patients diagnosed with Peutz-Jeghers syndrome were analyzed. A quartile grading system was used. All patients were treated with a Q-switched Nd:YAG laser system with the following parameters: wavelength 532 nm; spot size 3 mm; pulse duration 5-20 ns; fluence 1.8-2.2 J/cm(2) . RESULTS: After two to six (mean 3.6) treatment sessions, an average grade of 3.73 was achieved. Eight patients (72.7 %) showed an excellent response with more than 75 % lesion clearance. Three patients (27.3 %) showed a good response. Repeated treatments led to improved clearance of labial lentigines. Age, gender, and Fitzpatrick skin type were

not statistically associated with efficacy grades after the first treatment session. Neither recurrence in treated areas nor significant complications were observed. CONCLUSIONS: Q-switched Nd:YAG laser provides an effective and safe treatment option for labial lentigines associated with Peutz-Jeghers syndrome. Adolescent;Adult;Female;Humans;Lasers, Solid-State;Lip Diseases;Low-Level Light Therapy;Male;Peutz-Jeghers Syndrome;Treatment Outcome;Young Adult

Improving executive function using transcranial infrared laser stimulation. Transcranial infrared laser stimulation is a new non-invasive form of low-level light therapy that may have a wide range of neuropsychological applications. It entails using low-power and high-energy-density infrared light from lasers to increase metabolic energy. Preclinical work showed that this intervention can increase cortical metabolic energy, thereby improving frontal cortex-based memory function in rats. Barrett and Gonzalez-Lima (2013, Neuroscience, 230, 13) discovered that transcranial laser stimulation can enhance sustained attention and short-term memory in humans. We extend this line of work to executive function. Specifically, we ask whether transcranial laser stimulation enhances performance in the Wisconsin Card Sorting Task that is considered the gold standard of executive function and is compromised in normal ageing and a number of neuropsychological disorders. We used a laser of a specific wavelength (1,064Â nm) that photostimulates cytochrome oxidase - the enzyme catalysing oxygen consumption for metabolic energy production. Increased cytochrome oxidase activity is considered the primary mechanism of action of this intervention. Participants who received laser treatment made fewer errors and showed improved set-shifting ability relative to placebo controls. These results suggest that transcranial laser stimulation improves executive function and may have exciting potential for treating or preventing deficits resulting from neuropsychological disorders or normal ageing. Adolescent;Dose-Response Relationship, Radiation;Electroencephalography;Executive Function;Female;Frontal Lobe;Humans;Low-Level Light Therapy;Male;Neuropsychological Tests;Prefrontal Cortex;Single-Blind Method;Young Adult

Low-level laser therapy alleviates mechanical and cold allodynia induced by oxaliplatin administration in rats. PURPOSE: Cold and mechanical allodynia caused by oxaliplatin-induced acute peripheral neuropathy frequently occur after drug infusion. Low-level laser therapy (LLLT) has been used to improve pain symptoms associated with various conditions and may have potential as a therapy for oxaliplatin-induced allodynia. The purpose of the present study was to investigate the antiallodynic effect of LLLT in an oxaliplatin-treated animal model by assessing sensory behavioral responses, levels of nerve growth factor (NGF), and transient receptor potential M8 (TRPM8) in dorsal root ganglia (DRG) neurons, as well as substance P (SP) in the spinal dorsal horn. METHODS: Adult male Sprague-Dawley rats each received a total of four doses of oxaliplatin (4 mg/kg, i.p.), injected at 3-day intervals. Following oxaliplatin administration, LLLT (7.5 J/cm(2)) was applied for 12 consecutive days to the skin surface directly above sites where the sciatic nerve is distributed. Behavioral assessments were then performed, followed by immunoassays for NGF, TRPM8, and SP proteins. RESULTS: LLLT relieved both cold and mechanical allodynia induced by oxaliplatin in rats. Oxaliplatin-related increases in protein levels of NGF and TRPM8 in DRG and SP in the dorsal horn were also reduced after LLLT. CONCLUSION: The findings of this study support LLLT as a potential treatment for oxaliplatin-induced neuropathy. Moreover, our findings suggest that SP, TRPM8, and NGF proteins in the superficial dorsal horn and DRG may be involved in an antiallodynic effect for LLLT. Antineoplastic Agents;Organoplatinum Compounds;Oxaliplatin Animals;Antineoplastic Agents;Cold Temperature;Disease Models, Animal;Hyperalgesia;Low-Level Light Therapy;Male;Organoplatinum Compounds;Oxaliplatin;Peripheral Nervous System Diseases;Rats;Rats, Sprague-Dawley

The methodology flaws in Hinman's acupuncture clinical trial, Part II: Zelen design and effectiveness dilutions. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Comparative evaluation of low-level laser and systemic steroid therapy in adjuvant-enhanced arthritis of rat temporomandibular joint: A histological study. BACKGROUND: Low-level laser therapy (LLLT) has shown a promising effect in ameliorating symptoms of rheumatoid arthritis (RA). The aim of this investigation was to compare the early and late anti-inflammatory effects of LLLT and betamethasone in RA. MATERIALS AND METHODS: In this animal experimental study, after inducing a model of RA in temporomandibular joint (TMJ) of 37 Wistar rats using adjuvant injection, they were randomly distributed into three experimental groups of 12 animals each: (1) LLLT group; (2) steroid group which received a single dose of betamethasone systemically; and (3) positive control group, which did not receive any treatment. One rat served as the negative control. Half of the animals in all the experimental groups were sacrificed on the 21(st) day after RA induction (early phase), and the other half were sacrificed 2 weeks later (late phase). Then, the severity of TMJ inflammation was assessed histologically in each group on a semi-quantitative scale. Kruskal-Wallis and Mann-Whitney tests were used to compare differences (Î± = 0.05). RESULTS: The LLLT and steroid groups showed significantly (P < 0.05) lower inflammation mean scores in both early (5.66 [Â±1.86] and 1.66 [Â±1.21], respectively) and late phases of evaluation (1.16 [Â±1.47] and 6.50 [Â±1.04], respectively) compared to positive control group in early and late stages of assessment (11.66 [Â±3.50] and 8.66 [Â±1.36], respectively). However, the best results (P < 0.005) were achieved in early phase of the steroid group as well as late phase of the LLLT group. CONCLUSION: Within limitations of this study, it may be concluded that LLLT method has a long-term promising effect on reducing inflammation severity of TMJ similar to betamethasone in earlier stages.

Influence of low-level laser therapy on vertical jump in sedentary individuals. OBJECTIVE: To investigate the effects of low intensity laser (660nm), on the surae triceps muscle fatigue and power, during vertical jump in sedentary individuals, in addition to delayed onset muscle soreness. METHODS: We included 22 sedentary volunteers in the study, who were divided into three groups: G1 (n=8) without performing low intensity laser (control); G2 (n=7) subjected to 6 days of low intensity laser applications; and G3 (n=7) subjected to 10 days of low intensity laser applications. All subjects were evaluated by means of six evaluations of vertical jumps lasting 60 seconds each. In G2 and G3, laser applications in eight points, uniformly distributed directly to the skin in the region of the triceps surae were performed. Another variable analyzed was the delayed onset muscle soreness using the Visual Analog Scale of Pain. RESULTS: There was no significant difference in fatigue and mechanical power. In the evaluation of delayed onset muscle soreness, there was significant difference, being the first evaluation higher than the others. CONCLUSION: The low intensity laser on the triceps surae, in sedentary individuals, had no significant effects on the variables evaluated. Adult;Analysis of Variance;Exercise;Female;Humans;Low-Level Light Therapy;Male;Motor Activity;Muscle Fatigue;Muscle Strength;Muscle, Skeletal;Myalgia;Pain Measurement;Reference Values;Reproducibility of Results;Sedentary Behavior;Time Factors;Young Adult

Semilunar Coronally Advanced Flap with or without Low Level Laser Therapy in Treatment of Human Maxillary Multiple Adjacent Facial Gingival Recessions: A Clinical Study. PURPOSE: Semilunar coronally advanced flap (SCAF) and its modifications or adjuncts have been proposed in the literature for root coverage. Low level laser therapy (LLLT) has been shown to enhance wound healing. The aim of this split-mouth randomized controlled clinical trial was to assess the effects of LLLT application with respect to root coverage after SCAF procedure for the treatment of human maxillary multiple adjacent facial gingival recessions. MATERIALS AND METHODS: Ten subjects with bilateral multiple adjacent maxillary facial gingival recession defects (Miller I and II) were included in this study (20 in

test, 20 in control group). A diode laser (810â€‰nm) at 0.3â€‰watts was applied to test sites during and 1 week after surgery for 10â€‰seconds. Comparisons of the surgical sites were made with clinical measurements. RESULTS: Statistically significant differences were observed between test and control sites in the change in gingival recession depth, gingival recession width, clinical attachment level, and width of the keratinized tissue measurements after 6 months (pâ€‰=â€‰0.003, pâ€‰=â€‰0.001, pâ€‰=â€‰0.006, and pâ€‰=<â€‰0.001, respectively). The test group presented significantly greater complete root coverage (Nâ€‰=â€‰18/20, 90%) compared with the control group (Nâ€‰=â€‰6/20, 30%) at 6 months post-operatively. CONCLUSION: Within the confines of this study, the results depicted that a Low Level Laser Technique application may enhance the predictability of SCAF procedure. Further long-term studies with more sample sizes are needed for a stronger evidence base. CLINICAL SIGNIFICANCE: Gingival recessions are commonly encountered in dentistry and pose an esthetic concern. Minimal gingival recessions can be treated by a Semilunar Coronally Advanced Flap (SCAF), but the predictability and stability of the outcomes are quiet questionable. In the present report, a Low Level Laser Technique (LLLT) application adjunct to SCAF depicted a significant improvement in the predictability and stability of root coverage outcomes (for a period of 6 months) compared with as achieved by SCAF alone. From this report, it can be stated that LLLT may be effectively used in a day to day practice for enhancing the root coverage outcomes of SCAF. Gingival Recession;Humans;Low-Level Light Therapy;Maxilla

Evaluation of the effect of low level laser therapy toothbrush in treatment of dentin hypersensitivity. INTRODUCTION: Dentin hypersensitivity is one of the most common complications that affect patients after periodontal therapy. Recently low level laser therapy has been introduced as a new treatment modality and has produced beneficial results. The purpose of this study is to evaluate the effect of low level laser therapy toothbrushes in reduction of dentin hypersensitivity. METHODS: In this pilot interventional controlled clinical trial, 40 patients suffering from dentin hypersensitivity were selected using simple randomization. Half of the patients were given laser toothbrushes and the other half was given non-laser sensodyne toothbrushes. Primary dentin hypersensitivity was recorded by visual analogue scale (VAS) score and ice spray. Then dentin hypersensitivity was measured right after the treatment as well az in the intervals of 1 month and 2 months after initiation of the study. Data were compared using Statistical Package for the Social Sciences (SPSS) software and Analysis of variance (ANOVA) paired T test. RESULTS: The results of this study showed that there was a significant difference in each of the two kinds of tooth brushes separately for all time intervals ($P < 0.001$). Also the effect of the type of toothbrush was investigated using before treatment VAS with covariance analyses. P values for immediately, 1 month and 2 months after treatment were calculated to be 0.078, 0.02, 0.01 respectfully. Also the effect of the toothbrush type was significant in the manner that laser toothbrushes reduce dentin hypersensitivity more than ordinary toothbrushes ($P< 0.05$). CONCLUSION: Both sensodyne and laser tooth brushes improve dentin hypersensitivity, although the laser toothbrush led to better results in short.

The effect of low-level laser therapy on human leukemic cells. INTRODUCTION: Laser phototherapy is used for the treatment of chemotherapy-induced oral mucositis in patients with leukemia, although there are limited data supporting the safety of this method. This study aimed to evaluate the effect of different doses of low-level laser on proliferation of acute myeloid leukemia (AML) cell line (KG-1a) in vitro. METHODS: A plastic flask containing 5,000,000 KG-1a cultured cells was provided by Iran Pasteur Institute. KG-1a cell line has been produced from the bone marrow aspirate of a 59-year-old white male with acute myelogenous leukemia. Upon completion of the proliferation steps of KG-1a cell line, 7Ã—10(4) cells were placed in 96-well tissue culture plates. All the surrounding wells were filled with Wright-Giemsa stain in order to prevent laser from scattering to the neighboring wells. In total, 28 plates were prepared using this method. After a forty-eight

hours incubation period, irradiation was performed in continuous mode with an infrared laser of 810nm wavelength. After 24 hours, cells cultures were exposed to one, two, or three applications of laser irradiation. Irradiation exposures were performed at energy densities of 5, 10, and 20 J/cm(2) . Each experiment included 18 replicates for each application of laser and 6 replicates of negative/untreated controls. For experiments with two and three repeated exposures, the irradiation applications were separated by 48 hours. All the culture plates were incubated for seven days. Cell proliferation was evaluated using the MTT (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide) assay after seven days. Spectroscopy (620nm) was used to determine the optical density (OD) of both irradiated and control samples. RESULTS: Significant increase in cell proliferation was seen only after two exposures at energy density of 20J/cm2 (P=0.021). CONCLUSION: Although LLLT is commonly used to treat radiotherapy- or chemotherapy- induced mucositis, as long as further studies demonstrate that different wavelengths and doses of laser phototherapy are safe and effective in treatment of mucositis, clinicians should remain cautious regarding the use of this treatment modality to treat patients with malignancies.

The role of low-level laser in periodontal surgeries. Treatment protocols with low-level Laser (also called 'soft laser therapy) have been used in health care systems for more than three decades. Bearing in mind the suitable sub-cellular absorption and the cellular-vascular impacts, low-level laser may be a treatment of choice for soft tissues. Low-level lasers have played crucial and colorful roles in performing periodontal surgeries. Their anti-inflammatory and painless effects have been variously reported in in-vitro studies. In this present review article, searches have been made in Pub Med, Google Scholar, and Science Direct, focusing on the studies which included low-level lasers, flap-periodontal surgeries, gingivectomy, and periodontal graft. The present study has sought to review the cellular impacts of low-level lasers and its role on reducing pain and inflammation following soft tissue surgical treatments.

The thermal impact of phototherapy with concurrent super-pulsed lasers and red and infrared LEDs on human skin. From the very first reports describing the method of action of phototherapy, the effects have been considered to be the result of photochemical and photophysical interactions between the absorbed photons and tissue and not related to secondary changes in tissue or skin temperature. However, thermal effects have been recently reported in dark pigmented skin when irradiated with single wavelengths of 810 and 904Â nm of low-level laser therapy (LLLT) devices even with doses that do not exceed those recommended by the World Association of Laser Therapy (WALT). The aim of this study was to evaluate the thermal impact during the concurrent use of pulsed red and infrared LEDs and super-pulsed lasers when applied to light, medium, and dark pigmented human skin with doses typically seen in clinical practice. The study evaluated the skin temperature of 42 healthy volunteers (males and females 18Â years or older, who presented different pigmentations, stratified according to Von Luschan's chromatic scale) via the use of a thermographic camera. Active irradiation was performed with using the multi-diode phototherapy cluster containing four 905-nm super-pulsed laser diodes (frequency set to 250Â Hz), four 875-nm infrared-emitting diodes, and four 640-nm LEDs (manufactured by Multi Radiance Medicalâ„¢, Solon, OH, USA). Each of the four doses were tested on each subject: placebo, 0Â J (60Â s); 10Â J (76Â s); 30Â J (228Â s); and 50Â J (380Â s). Data were collected during the last 5Â s of each dose of irradiation and continued for 1Â min after the end of each irradiation. No significant skin temperature increases were observed among the different skin color groups (pâ€‰>â€‰0.05), age groups (pâ€‰>â€‰0.05), or gender groups (pâ€‰>â€‰0.05). Our results indicate that the concurrent use of super-pulsed lasers and pulsed red and infrared LEDs can be utilized in patients with all types of skin pigmentation without concern over safety or excessive tissue heating. Additionally, the doses and device utilized in present study have demonstrated positive outcomes in prior clinical trials. Therefore, it can be concluded that the effects

seen by the concurrent use of multiple wavelengths and light sources were the result of desirable photobiomodulation effect and not related to thermal influence.
Adult;Aged;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Skin Pigmentation;Skin Temperature

[New approaches in surgical treatment of acute paraproctitis]. The results of treatment of 77 patients, ageing 18-71 yrs old, for an acute paraproctitis in 2010-2014 yrs were analyzed. A preventive puncture-flush enzymosanation of purulent foci, using immobilized bacterial proteinases (imozimase), metrogyl P in conjunction with low-intensive laser irradiation have permitted to conduct the optimal preoperative preparation of patients, to improve their state, to reduce the local inflammatory reactions intensity significantly. Enzymes, Immobilized;Metronidazole Acute Disease;Adolescent;Adult;Aged;Drainage;Enzymes, Immobilized;Female;Humans;Low-Level Light Therapy;Male;Metronidazole;Middle Aged;Preoperative Care;Proctitis;Punctures;Rectum

The effect of red, green and blue lasers on healing of oral wounds in diabetic rats. BACKGROUND AND OBJECTIVE: Many studies have demonstrated that low-level laser therapy (LLLT) can improve wound healing in non-diabetic and diabetic animals. We compared the effects of red, green, and blue lasers in terms of accelerating oral wound healing in diabetic rats. MATERIAL AND METHODS: Diabetes was successfully induced in 32 male Wistar rats using intraperitoneal injection of Streptozotocin (150 mg/kg). After intraperitoneal injection of the anesthetic agent, a full-thickness oral wound (10 mm Ã— 2 mm) was created aseptically with a scalpel on hard palate of the diabetic rats. The study was performed using red (630 nm), green (532 nm), and blue (425 nm) lasers and a control group. We used an energy density of 2J/cm2 and a treatment schedule of 3 times/week for 10 days. The area of wounds was measured and recorded on a chart for all rats. On the 10th day, the samples were then sacrificed and a full-thickness sample of wound area was prepared for pathological study. RESULTS: We observed a significant difference ($p<0.001$) in the mean slope values of wound healing between treatment and control groups. Moreover, the mean slope of wound healing differed significantly between red laser and two other lasers - blue and green ($p<0.001$). The mean slopes of wound healing were not significantly different between blue laser and green laser ($p=0.777$). CONCLUSION: The results of the present study provide evidence that wound healing is slower in control rats compared to the treatment groups. Moreover, the findings suggest that wound healing occurs faster with red laser compared to blue and green lasers. Streptozocin Animals;Diabetes Mellitus, Experimental;Lasers;Male;Mouth Mucosa;Rats;Rats, Wistar;Streptozocin;Wound Healing

Evaluation of the effect of low-level diode laser therapy applied during the bone consolidation period following mandibular distraction osteogenesis in the human. The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) on new bone formation obtained by distraction osteogenesis in the early consolidation period. Ten selected patients with bilateral mandibular retrusion seen at the Nasser Institute Hospital, Egypt between June 2009 and June 2012 underwent this clinical trial; seven were female and three were male, and their mean age was 31Â±5.1 years. The left mandible of each patient was assigned to group A (n=10) and the right mandible to group B (n=10); mandibular distraction osteogenesis was performed on both sides and then LLLT was used in group B only. The amounts of bone acquired were compared according to their radiographic density on digital panoramic radiographs after 6, 12, 24, and 54 days of consolidation. Statistically significant differences in bone density were found between the two groups. Group B showed bone consolidation and growth differences on day 6 ($P=0.402$), day 12 ($P=0.006$), day 24 ($P=0.021$), and day 54 ($P=0.028$). The use of LLLT on distracted bone was found to increase the quality and quantity of bone and to shorten the consolidation period, allowing early removal of the distractor and resulting in decreased morbidity and relapse. Adult;Bone Regeneration;Female;Humans;Lasers,

Semiconductor;Low-Level Light Therapy;Male;Mandible;Osteogenesis, Distraction;Radiography, Panoramic;Treatment Outcome

Low-level laser therapy on bone repair: is there any effect outside the irradiated field? The biological effects of local therapy with laser on bone repair have been well demonstrated; however, this possible effect on bone repair outside the irradiated field has not been evaluated. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) (Î»â€‰=â€‰830Â nm) on repair of surgical bone defects outside the irradiated field, in rats. Sixty Wistar rats were submitted to osteotomy on the left femur and randomly separated into four groups (nâ€‰=â€‰15): group I, control, bone defect only; group II, laser applied on the right femur (distant dose); group III, laser applied locally on the bone defect and also on the right femur (local and distant doses); and group IV, laser applied locally on the left femur (local dose). Laser groups received applications within a 48-h interval in one point per session of density energy (DE)â€‰=â€‰210Â J/cm(2), Pâ€‰=â€‰50Â mW, tâ€‰=â€‰120Â s, and beam diameter of 0.028Â cm. Five animals of each group were euthanized 7, 15, and 21Â days after surgery. Histologic analysis in all groups showed new bone formation in the region of interest (ROI) at 7Â days. After 15Â days, bone remodeling with a decrease of bone neoformation in the marrow area was observed in all groups. After 21Â days, advanced bone remodeling with new bone mostly located in the cortical area was observed. The histomorphometric analysis showed at 7Â days a significant increase of bone formation in groups III and IV compared to groups I and II. At days 15 and 21, histomorphometric analysis showed no significant differences between them. Laser therapy presented a positive local biostimulative effect in the early stage of bone healing, but the LLLT effect was not observed a long distance from the evaluated area. Animals;Bone Regeneration;Bone and Bones;Femur;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats, Wistar;Wound Healing

Phototherapeutic Effect of Low-Level Laser on Thyroid Gland of Gamma-Irradiated Rats. One inescapable feature of life on the earth is exposure to ionizing radiation. The thyroid gland is one of the most sensitive organs to gamma-radiation and endocrine disrupters. Low-level laser therapy (LLLT) has been used to stimulate tissue repair, and reduce inflammation. The aim of this study was to gauge the value of using Helium-Neon laser to repair the damaged tissues of thyroid gland after gamma-irradiation. Albino rats were used in this study (144 rats), divided into control, gamma, laser, and gamma plus laser-irradiated groups, each group was divided into six subgroups according to time of treatment (total six sessions). Rats were irradiated once with gamma radiation (6 Gy), and an external dose of laser (Wavelength 632.8 nm, 12 mW, CW, Illuminated area 5.73 cm(2), 2.1 mW cm(-2) 120 s, 1.4 J, 0.252 J cm(-2)) twice weekly localized on thyroid region of the neck, for a total of six sessions. Animals were sacrificed after each session. Analysis included thyroid function, oxidative stress markers, liver function and blood picture. Results revealed improvement in thyroid function, liver function and antioxidant levels, and the blood cells count after LLLT. Animals;Gamma Rays;Low-Level Light Therapy;Male;Phototherapy;Rats;Rats, Wistar;Thyroid Gland

Anetoderma treated with combined 595-nm pulsed-dye laser and 1550-nm non-ablative fractionated laser. Anetoderma is a skin disorder characterized by a focal loss of dermal elastic tissue whereby patients present with soft, depressible lesions. We postulated that a series of combination treatment using the 595-nm pulsed dye laser (PDL) and the 1550-nm non-ablative fractionated laser (NAFL) would improve the anetoderma lesions. Our patient with biopsy proven anetoderma received 3 treatments with a combination of 595-nm PDL and 1550-nm NAFL spaced 3 weeks apart. Skin biopsies were performed at baseline and immediately prior to the third treatment. Stains for hematoxylin and eosin and Verhoeff Van Gieson (VVG) were performed. Improvement in lesion color, texture, and overall appearance was noted after the second treatment and continued following the third treatment. Post-treatment VVG staining demonstrated an increase in dermal elastin fibers and a

decrease in elastin fiber fragmentation. Thus, the combination of 595-nm PDL and 1550-nm NAFL should be considered as a treatment modality for anetoderma. Elastin Anetoderma;Elastin;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Young Adult

Influence of postoperative low-level laser therapy on the osseointegration of self-tapping implants in the posterior maxilla: a 6-week split-mouth clinical study. BACKGROUND/AIM: Low-level laser therapy (LLLT) has been proven to stimulate bone repair, affecting cellular proliferation, differentiation and adhesion, and has shown a potential to reduce the healing time following implant placement. The aim of this clinical study was to investigate the influence of postoperative LLLT osseointegration and early success of self-tapping implants placed into low-density bone. METHODS: Following the split-mouth design, self-tapping implants n = 44) were inserted in the posterior maxilla of 12 patients. One jaw side randomly received LLLT (test group), while the other side was placebo (control group). For LLLT, a 637 nm gallium-aluminum-arsenide (GaAlAs) laser (Medicolaser 637, Technoline, Belgrade, Serbia) with an output power of 40 mW and continuous wave was used. Low-level laser treatment was performed immediately after the surgery and then repeated every day in the following 7 days. The total irradiation dose per treatment was 6.26 J/cm2 per implant. The study outcomes were: implant stability, alkaline-phosphatase (ALP) activity and early implant success rate. The follow-up took 6 weeks. RESULTS: Irradiated implants achieved a higher stability compared with controls during the entire follow-up and the difference reached significance in the 5th postoperative week (paired t-test, p = 0.030). The difference in ALP activity between the groups was insignificant in any observation point (paired t-test, p > 0.05). The early implant success rate was 100%, regardless of LLLT usage. CONCLUSION: LLLT applied daily during the first postoperative week expressed no significant influence on the osseointegration of self-tapping implants placed into low density bone of the posterior maxilla. Placement of self-tapping macro-designed implants into low density bone could be a predictable therapeutic procedure with a high early success rate regardless of LLLT usage. Dental Implants Aged;Dental Implantation, Endosseous;Dental Implants;Dental Prosthesis Design;Female;Humans;Low-Level Light Therapy;Male;Maxilla;Middle Aged;Postoperative Care

Low-level laser therapy (LLLT) associated with aerobic plus resistance training to improve inflammatory biomarkers in obese adults. Recently, investigations suggest the benefits of low-level laser (light) therapy (LLLT) in noninvasive treatment of cellulite, improvement of body countering, and control of lipid profile. However, the underlying key mechanism for such potential effects associated to aerobic plus resistance training to reduce body fat and inflammatory process, related to obesity in women still unclear. The purpose of the present investigation was to evaluate the effects of combined therapy of LLLT and aerobic plus resistance training in inflammatory profile and body composition of obese women. For this study, it involved 40 obese women with age of 20-40Â years. Inclusion criteria were primary obesity and body mass index (BMI) greater than 30Â kg/m(2) and less than 40Â kg/m(2). The voluntaries were allocated in two different groups: phototherapy group and SHAM group. The interventions consisted on physical exercise training and application of phototherapy (808 nm), immediately after the physical exercise, with special designed device. Proinflammatory/anti-inflammatory adipokines were measured. It was showed that LLLT associated to physical exercise is more effective than physical exercise alone to increase adiponectin concentration, an anti-inflammatory adipokine. Also, it showed reduced values of neck circumference (cm), insulin concentration (Î¼U/ml), and interleukin-6 (pg/ml) in LLLT group. In conclusion, phototherapy can be an important tool in the obesity, mostly considering its potential effects associated to exercise training in attenuating inflammation in women, being these results applicable in the clinical practices to control related risk associated to obesity. ADIPOQ protein, human;Adiponectin;Biomarkers;IL6 protein, human;Inflammation Mediators;Insulin;Interleukin-6;Lipids Adiponectin;Adipose Tissue;Adult;Biomarkers;Body Mass Index;Combined Modality

Therapy;Female;Humans;Inflammation Mediators;Insulin;Interleukin-6;Lasers, Semiconductor;Lipids;Low-Level Light Therapy;Obesity;Resistance Training;Treatment Outcome;Weight Loss;Young Adult

Current indications of low-level laser therapy in plastic surgery: a review. OBJECTIVE: The aim of this comprehensive review is assess the relevant indications of LLLT in plastic surgery. BACKGROUND DATA: Low-level laser therapy (LLLT) is a safe adjunct treatment for a myriad indications such as pain, musculoskeletal disorders, or oral mucositis in cancer patients. METHODS: A systematic literature review was performed using the automated computerized PubMed search, with the key words low-level laser therapy and plastic surgery. In vivo and in vitro comparative studies conducted in humans or animals were included. A total of 113 articles were retrieved for screening, and 40 articles were analyzed for data extraction: 28 on animals and 12 on humans. RESULTS: Thirteen studies on animals showed that LLLT had efficacy in the improvement of flap survival. LLLT on a single spot over the pedicle area of the flap or near the base of the flap seemed to be superior to multi-irradiation. Also, LLLT seemed to improve chronic burn scars in humans, and acute wound healing in animals. CONCLUSIONS: On the contrary, LLLT cannot be considered as a valid therapeutic option for venous ulcers. The published studies on alopecia did not show that LLLT had efficacy for this indication, and on skin aging only two studies are reported showing that LLLT globally improved aging of skin. No side effects have been reported. More comparative studies are needed to validate and widen the medical indications of LLLT in plastic surgery. Animals;Humans;Low-Level Light Therapy;Plastic Surgery Procedures

Blue Laser Inhibits Bacterial Growth of Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa. OBJECTIVE: The purpose of this study was to analyze the influence of blue laser on bacterial growth of the main species that usually colonize cutaneous ulcers, as well as its effect over time following irradiation. BACKGROUND DATA: The use of blue laser has been described as an adjuvant therapeutic method to inhibit bacterial growth, but there is no consensus about the best parameters to be used. METHODS: Strains of Staphylococcus aureus ATCC 25923, Pseudomonas aeruginosa ATCC 27853, and Escherichia coli ATCC 25922 were suspended in saline solution at a concentration of 1.5Ã—10(3) colony forming units (CFU)/mL. Next, 300â€‰Î¼L of this suspension was transferred to a microtitulation plate and exposed to a single blue laser irradiation (450â€‰nm) at fluences of 0 (control), 3, 6, 12, 18, and 24â€‰J/cm(2). Each suspension was spread over the surface of a Petri plate before being incubated at 37Â°C, and counts of CFU were determined after 24 and 48â€‰h. RESULTS: Blue laser inhibited the growth of S. aureus and P. aeruginosa at fluences >6â€‰J/cm(2). On the other hand, E. coli was inhibited at all fluences tested, except at 24â€‰J/cm(2). CONCLUSIONS: Blue laser light was capable of inhibiting bacterial growth at low fluences over time, thus presenting no time-dependent effect. Escherichia coli;Lasers, Semiconductor;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus

Flash-lamp pulsed-dye laser treatment of keloids: results of an observational study. OBJECTIVE: Flash lamp pulsed dye laser (FPDL) was used in a selected group of patients with hypertrophic scars and keloids. Objective of the study was to assess the efficacy on a large number of cases. BACKGROUND DATA: FPDL is a nonablative technology, typically used in vascular malformation therapy because of its specificity for hemoglobin. METHODS: A total of 59 patients (33 males and 26 females, mean age 37.5 years) affected by hypertrophic postsurgical scars and keloids, underwent from four to six treatment sessions with a flash lamp pumped pulsed dye laser. Clinical follow-up was performed 6 months after the last treatment. Results were judged by blind observers. RESULTS: A total of 29 patients out of 59 (49.1%) achieved excellent clearance, 15 patients (25.4%) achieved good to moderate clearance, and 12 patients (20.4%) obtained slight improvement. Only three subjects (5%) had little or no removal of their lesion. Treatment was well tolerated with minor and transient

side effects. CONCLUSIONS: FPDL is known as a safe and effective treatment for different dermatological lesions in which skin microvessels play a key role in pathogenesis or development. This laser was effective when applied to hypertrophic scars and keloids. Further studies in a larger set of patients, however, are required to assess a standardized and reproducible method for treating these lesions. Adult;Cicatrix, Hypertrophic;Female;Humans;Keloid;Lasers, Dye;Low-Level Light Therapy;Male;Treatment Outcome

Chemical and Morphological Changes of Primary Teeth Irradiated with Nd:YAG Laser: An Ex Vivo Long-Term Analysis. OBJECTIVE: The aim of this study was to assess any long-term chemical and morphological Nd:YAG laser modifications on irradiated primary enamel. BACKGROUND DATA: Previous studies on irradiated primary human enamel employed methodologies that evaluated the short-term effects only. METHODS: One hundred and eighty-six irradiated (with and/or without fluoride) primary enamel teeth from high-caries-risk children, which were exfoliated over a 1-year period, were collected, and the sample surface area was submitted for scanning electron microscopy (SEM), Fourier transform infrared (FTIR) spectroscopy, and X-ray energy-dispersive spectrometry (EDS). The subsurface was analyzed by Knoop microhardness and light microscopy (LM). Data were analyzed by one way ANOVA and Tukey tests (Î±=0.05) and Kruskall-Wallis and Tukey tests (Î±=0.05). RESULTS: FTIR analysis revealed a higher concentration of phosphate and carbonate in the irradiated (0.987Â±0.064) and lower concentration in the control groups (1.477Â±0.310). SEM analysis showed that the control samples exhibited a slightly smoother surface than the irradiated groups. The EDS analysis did not show any differences in the amount of calcium, phosphorus, or fluoride among the groups. The microhardness analysis revealed that sealant (249.86Â±7.15) and laser irradiation (262.44Â±22.69) led to higher hardness values than the negative control group (128.35Â±25.19). LM indicated significantly reduced caries formation in the laser (5.35Â±5.38%) and the laser plus acidulated phosphate fluoride (APF) groups (10.35Â±0.88%) compared with the negative control group (72.56Â±12.86%). CONCLUSIONS: Even with the limitations of the present study, these results suggest that Nd:YAG irradiation clinically modified the chemical composition of the enamel surface regardless of fluoride concentration, which successfully inhibited demineralization of primary tooth enamel over a 1-year period without significant morphological changes. Acidulated Phosphate Fluoride Acidulated Phosphate Fluoride;Child;Dental Caries;Dental Enamel;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Tooth, Deciduous

Healing of diabetic ulcers using photobiomodulation. Diabetic Foot;Humans;Low-Level Light Therapy;Wound Healing

A comparative study of the effects of different low-level lasers on the proliferation, viability, and migration of human melanocytes in vitro. The aim of this study was to investigate the effects of different low-level laser therapies (LLLTs) of various wavelengths and energies on normal cultured human melanocytes. Various studies have shown the effects of LLLs on various types of cultured cells. Presently, little is known about the biological effects of LLLTs on melanocytes. Melanocytes were exposed to LLLT at 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, or 5.0Â J/cm(2) using a blue (457Â nm), red (635Â nm), or ultraviolet (UV) (355Â nm) laser. Melanocyte viability, proliferation, and migration were monitored at 72Â h after irradiation. The blue (Pâ€‰<â€‰0.001) and red (Pâ€‰<â€‰0.001 and Pâ€‰<â€‰0.01) lasers significantly enhanced viability at 0.5 to 2.0Â J/cm(2), whereas the UV laser (Pâ€‰<â€‰0.001) could significantly enhance viability only at 0.5 and 1.0Â J/cm(2) compared with controls. The blue and red lasers also significantly enhanced the proliferation of the melanocytes at 0.5 to 2.0Â J/cm(2) (Pâ€‰<â€‰0.001), and the UV laser significantly enhanced proliferation at 0.5 to 1.5Â J/cm(2) (Pâ€‰<â€‰0.001 and Pâ€‰<â€‰0.01) compared with controls. The blue laser significantly enhanced melanocyte migration at 0.5 to 4.0Â J/cm(2) (Pâ€‰<â€‰0.001 to Pâ€‰<â€‰0.05), but the red (Pâ€‰<â€‰0.001 and Pâ€‰<â€‰0.01) and UV (Pâ€‰<â€‰0.001 to

Pâ€‰<â€‰0.05) lasers could significantly enhance such migration at 0.5 to 1.0Â J/cm(2) and 0.5 to 2.0Â J/cm(2), respectively, compared with controls. LLLT at low energy densities is able to significantly increase melanocyte viability, proliferation, and migration in vitro, and at higher energy densities, it gives non-stimulatory results. Additionally, the blue laser was the best among the three lasers. These findings might have potential application in vitiligo treatment in future. Cell Movement;Cell Proliferation;Cell Survival;Cells, Cultured;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Melanocytes;Regenerative Medicine;Vitiligo

The "at-home LLLT" in temporo-mandibular disorders pain control: a pilot study. OBJECTIVES: The Temporo-Mandibular Disorders (TMD) are a set of dysfunctional patterns concerning the temporo-mandibular joints (TMJ) and the masticatory muscles; its main symptom is pain, probably caused by inflammatory changes in the synovial membrane, alterations in the bone marrow of the mandibular condyle and impingement and compression. The aim of this preliminary study was to investigate the effectiveness in the TMD pain reduction of a new laser device recently proposed by the commerce that, due to its reduced dimensions and to be a class I laser according the ANSI classification, may be used at home by the patient himself. MATERIAL AND METHODS: Twenty-four patients with TMD were randomly selected: the inclusion criteria for the sample was the diagnosis of mono- or bi-lateral TMD, with acute pain restricted to the joint area, associated with the absence of any muscle tenderness during palpation. The patients were randomly assigned to two groups: Group 1 (12 patients): patients receiving real LLLT (experimental group). Group 2 (12 patients): patients receiving inactive laser (placebo group). The treatment was performed once a day for two weeks with an 808 nm diode laser by the patient himself with irradiation of the cutaneous zone corresponding to the TMJ for 15 minutes each side. Each patient was instructed to express its pain in a visual analogue scale (VAS) making a perpendicular line between the two extremes representing the felt pain level. Statistical analysis was realized with GraphPad Instat Software, where $P<0.05$ was considered significant and $P<0.01$ very significant. RESULTS: The patient's pain evaluation was expressed in the two study groups before the treatment, 1 week and two weeks after the treatment. The differences between the two groups result extremely significant with $p<0.0001$ for the comparison of VAS value after 1 and 2 weeks. CONCLUSION: This study, even if it may be considered such a pilot study, investigated a new way to control the pain in the temporo-mandibular diseases by an at home self administered laser device. RESULTS are encouraging but they will have to be confirmed by greater studies.

Efficacy of LLLT in swelling and pain control after the extraction of lower impacted third molars. INTRODUCTION AND AIM: Low Level Laser Therapy (LLLT) can facilitate wound healing stimulating a more rapid resolution and an earlier start for the proliferation phase. The purpose of this study is to evaluate the effects of LLLT on postoperative pain and oedema following the removal of impacted lower third molars. MATERIALS AND METHODS: Fifty-nine patients, who were to undergo surgical removal of their lower third molars, were studied. Patients were randomly allocated to one of three groups: 17 patients LLLT + traditional drug treatment17 patients traditional drug treatment as control group25 patients treated with LLLT only on one side+traditional drug treatment. The laser we have used for this study is a diode laser, GaAs, which delivers both in the infrared band at the wavelength of 910 nanometers (pulsed and superpulsed source), and in the visible (continuous source) at the wavelength of 650 nanometers (red). LLLT was performed just after the intervention and approximately 12 hours after surgery delivering 240 J in 15 minutes with theoretical fluence values of 480 J/cm(2) and 31 J/cm(2) for every minute of irradiation. We considered and signed with a label constant landmarks on both sides of the face of each patient; measurements were taken: before the surgery, after the surgery right after the 1st laser treatment, after approximately 24 hours after the 2(nd) laser treatment. RESULTS: We collected all the values of the oedema measurements and the

VAS reports and performed a statistical analysis by means One-way Analysis of Variance (ANOVA) test: for the evaluated values (X, Y, Z) an extremely significant difference was found with p values of 0.003 for Y at the first evaluation (pre-12 hours) and less than 0.001 for the other evaluations. A significant result was obtained for VAS recorded at hospital discharge (p<0.0001). CONCLUSIONS: This study demonstrates that LLLT is effective on postoperative pain and oedema accelerating healing time and reducing patients distress.

History of the World Federation of Societies for Laser Medicine and Surgery (WFSLMS) and its Non-Profit Organization (NPO-WFSLMS): Part 2: 2(nd) WFSLMS Meeting (2009) to the present. BACKGROUND: The first part of this historical overview, (see Laser Therapy, 2014; 23: 89-95), took the reader from the conception of the WFSLMS to its inception at the inaugural meeting in Tokyo, 2005 and events up to the 2009 2(nd) WFSLMS in Tokyo when the author was the congress president. The previous article also dealt with the necessity for founding a non-profit organization, NPO-WFSLMS, to handle the commercial and social responsibilities of the WFSLMS. For details, please refer to that previous article. Meetings: The 2(nd) WFSLMS congress was successfully held in 2009 in Japan, under the presidency of Professor Krishna Rau. The third WFSLMS meeting was planned for Paris in 2013 together with the 20(th) ISLSM congress under the Meeting Presidency of Dr Jean Abitbol, while the 19(th) ISLSM was to be held in Korea in 2011 under the Meeting Presidency of Prof. Jin-Wang Kim. Unforseen problems beyond the control of the organizers forced the cancellation of both the 19(th) and 20(th) meetings of the ISLSM, the latter also being the location of the planned third WFSLMS congress in Paris, but with the cooperation of the organizers of the 5(th) congress of the International Phototherapy Association (IPTA) the 3(rd) WFSLMS meeting was held in Lithuania, again under the presidency of Prof Rau concurrently with the 20(th) ISLSM, at which much was debated regarding the future course of NPO-WFSLMS and WFSLMS. The venue of the 2015 21(st) ISLSM Congress was set as Indore, India, and the 4(th) WFSLMS meeting was allocated to Florence, Italy, in tandem with the 22(nd) ISLSM congress. PROJECTS: In the interim, NPO-WFSLMS effectively managed laser education programs in Japan for developing country doctors, and also handled the donation of laser systems to Vietnam and Thailand, the latter being under the auspices of the Greek Medical Laser Association, together with associated education programs. The laser-based Blood Saving Campaign (BSaC) has been actively promoted in Asian countries up to the present, designed to minimize the need for transfusions and prevent intraoperative blood loss through the hemostatic properties of surgical lasers, bloodless minimally-invasive treatment with photodynamic therapy (PDT) and noninvasive LLLT. THE FUTURE: The WFSLMS will make more active overtures to solidify the inter-society cooperation among as many of the major laser societies as possible, both national and international. There are problems to be faced and overcome, but in a mood of cautious optimism, NPO-WFSLMS will work with WFSLMS and ISLSM towards this very worthwhile goal.

Low-level laser therapy and exercise for patients with shoulder disorders in physiotherapy practice (a systematic review protocol). BACKGROUND: Low-level laser therapy is one of the adjunct treatments of choice with exercise therapy for shoulder rehabilitation in physiotherapy clinical practices. Although previous reviews have found little use of low-level laser therapy, there are recent trials whose findings are yet to be systematically reviewed. METHODS: We plan to do a systematic review to assess the effects of low-level laser therapy with exercise and exercise alone in participants who are 18Â years and above, with a clinical or radiological diagnosis of various shoulder pathologies. We will search CENTRAL, MEDLINE, CINAHL, PEDro, Science Direct, Scopus and Physiotherapy Choices regardless of publication status. We will hand search for subject-specific journals (PhotoMedicine and Laser Surgery, Lasers in Surgery and Medicine and Journals of Lasers in Medical Science) and conference proceedings of World Association for Laser Therapy. Two review authors will independently screen, select studies, extract data and assess the risk of bias based on a priori criteria.

Disagreements between review authors will be resolved either through discussion or consultation with a third review author. If there are at least two clinically homogeneous studies, we will perform meta-analysis. DISCUSSION: The findings will shed more light on the benefit of low-level laser therapy as an adjunct treatment to exercise in the management of shoulder disorders. The findings may also inform decision makers in the review and development of guidelines for shoulder rehabilitation in physiotherapy practices. SYSTEMATIC REVIEW REGISTRATION: PROSPERO CRD42014013691. Clinical Protocols;Exercise;Exercise Therapy;Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Research Design;Shoulder;Systematic Reviews as Topic

532 nm Low-Power Laser Irradiation Facilitates the Migration of GABAergic Neural Stem/Progenitor Cells in Mouse Neocortex. BACKGROUND AND OBJECTIVE: Accumulating evidence has shown that low-power laser irradiation (LLI) affects cell proliferation and survival, but little is known about LLI effects on neural stem/progenitor cells (NSPCs). Here we investigate whether transcranial 532 nm LLI affects NSPCs in adult murine neocortex and in neurospheres from embryonic mice. STUDY DESIGN/MATERIALS AND METHODS: We applied 532 nm LLI (Nd:YVO4, CW, 60 mW) on neocortical surface via cranium in adult mice and on cultured cells from embryonic mouse brains in vitro to investigate the proliferation and migration of NSPCs and Akt expression using immunohistochemical assays and Western blotting techniques. RESULTS: In vivo experiments demonstrated that 532 nm LLI significantly facilitated the migration of GABAergic NSPCs that were induced to proliferate in layer 1 by mild ischemia. In vitro experiments using GABAergic NSPCs derived from embryonic day 14 ganglionic eminence demonstrated that 532 nm LLI for 60 min promoted the migration of GAD67-immunopositive NSPCs with a significant increase of Akt expression. Meanwhile, the LLI induced proliferation, but not migration, of NSPCs that give rise to excitatory neurons. CONCLUSION: It is concluded that 532 nm LLI promoted the migration of GABAergic NSPCs into deeper layers of the neocortex in vivo by elevating Akt expression. Proto-Oncogene Proteins c-akt Animals;Cell Movement;Cell Proliferation;Cells, Cultured;GABAergic Neurons;Gene Expression Regulation;Low-Level Light Therapy;Mice;Neocortex;Neural Stem Cells;Proto-Oncogene Proteins c-akt

Effect of low-level laser irradiation on the rate and short-term stability of rotational tooth movement in dogs. INTRODUCTION: Low-level laser therapy (LLLT) has many biostimulative effects such as acceleration of mesiodistal orthodontic tooth movement. However, its effects on the extent and short-term stability of rotational tooth movement have not been researched. The purpose of this study was to investigate the effect of low-level laser irradiation during rotational tooth movement on the rate of movement and the amount of relapse in dogs. METHODS: In this interventional study, fixed orthodontic appliances were used to rotate both mandibular lateral incisors in 8 dogs. Sixteen teeth were divided into 2 groups: the experimental group with LLLT during orthodontic force application, and a control group with orthodontic couple force application only. In the first group, the gallium-aluminum-arsenide diode laser (810 nm, 200 mw, 10 seconds, 2 J/session, 32 J/cm(2)/point) was emitted on 2 points at the buccal side of the roots on days 0, 1, 2, 3, 4, 7, 14, 21, and 28 during 4 weeks of movement, and the amount of relapse was then observed for 3 months. The extent of rotational movement was measured on dental casts, and the statistical analysis was carried out with t tests. RESULTS: There was no significant difference between the LLLT group and the control group on the amount of rotational tooth movement (P = 0.66). The mean percentages of relapse after 1 week, 1 month, and 3 months were 33.02%, 53.44%, and 60.64% in the LLLT group and 54.22%, 68.74%, and 73.92% in the control group, respectively. This demonstrates significant differences between these groups at all studied times (P â‰¤0.05). This difference was greatest in the first week and then decreased until the end of the third month. The greatest percentage of relapse in both groups was registered in the first week after tooth movement. CONCLUSIONS: The total energy dose of the laser used in this study could not accelerate rotational tooth movement, but it did effectively reduce the

relapse tendency in teeth rotated by orthodontic movements. Animals;Dogs;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Male;Radiation Dosage;Recurrence;Rotation;Stress, Mechanical;Time Factors;Tooth Movement Techniques

Evaluation of gene expression SAP5, LIP9, and PLB2 of Candida albicans biofilms after photodynamic inactivation. With the increasing number of strains of Candida ssp. resistant to antifungal agents, the accomplishment of researches that evaluate the effects of new therapeutic methods, like photodynamic inactivation (PDI), becomes important and necessary. Thus, the objective of this study was to verify the effects of the PDI on Candida albicans biofilms, evaluating their effects on the expression of the gene hydrolytic enzymes aspartyl proteinase (SAP5), lipase (LIP9), and phospholipase (PLB2). Clinical strains of C. albicans (nâ€‰=â€‰9) isolated from patient bearers of the virus HIV and a pattern strain ATCC 18804 were used. The quantification of gene expression was related to the production of hydrolytic enzymes using the quantitative polymerase chain reaction (qPCR) assay. For PDI, we used laser-aluminum-gallium arsenide low power (red visible, 660Â nm) as a light source and the methylene blue at 300Â Î¼M as a photosensitizer. We assessed two experimental groups for each strain: (a) PDI: sensitization with methylene blue and laser irradiation and (b) control: without sensitization with methylene blue and light absence. The PDI decreased gene expression in 60Â % of samples for gene SAP5 and 50Â % of the samples decreased expression of LIP9 and PLB2. When we compared the expression profile for of each gene between the treated and control group, a decrease in all gene expression was observed, however no statistically significant difference (Tukey's test/pâ€‰=â€‰0.12). It could be concluded that PDI (photosensitization with methylene blue followed by low-level laser irradiation) showed a slight reduction on the expression of hydrolytic enzymes of C. albicans, without statistical significance. Antifungal Agents;Biomarkers;Fungal Proteins;Photosensitizing Agents;Lipase;Lysophospholipase;Aspartic Acid Endopeptidases;SAP5 protein, Candida albicans;Methylene Blue Antifungal Agents;Aspartic Acid Endopeptidases;Biofilms;Biomarkers;Candida;Candida albicans;Fungal Proteins;Gene Expression;Genes, Fungal;Humans;Lasers, Semiconductor;Lipase;Lysophospholipase;Methylene Blue;Microbial Sensitivity Tests;Photochemotherapy;Photosensitizing Agents;Transcriptome

Tooth extractions in high-risk patients under bisphosphonate therapy and previously affected with osteonecrosis of the jaws: surgical protocol supported by low-level laser therapy. Trauma during dental surgery is a predisposing factor for medication-related osteonecrosis of the jaws (MRONJ). There are no specific guidelines for the management of dental extractions in patients under bisphosphonate therapy (BPT). The authors proposed in 2013 a successful protocol for tooth extractions in patients under BPT supported by Nd:YAG low-level laser therapy (LLLT). The aim of this study was to validate the safety and efficacy of this protocol reporting the data related to its application in a particular category of patients under BPT at high risk for MRONJ and who were previously affected with MRONJ. Eighty-two tooth extractions were performed in 36 patients previously affected with MRONJ. Antibiotic treatment was administered 3 days before and 2 weeks after tooth extractions. Patients were additionally treated with Nd:YAG LLLT, 5 applications of 1 minute each. Patients were evaluated 3 days and once a week for 2 months after the extractions and every time they received LLLT. In a total of 82 extractions, minimal bone exposure was observed in 2 cases, treated with Er:YAG laser vaporization and then completely healed. The data confirmed that laser biostimulation is a reliable technique that can be considered in the surgical protocol for patients under BPT. Bone Density Conservation Agents;Diphosphonates Aged;Aged, 80 and over;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Tooth Extraction

Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis. OBJECTIVE: To investigate the efficacy of low-level laser therapy (LLLT) treatment

of knee osteoarthritis (KOA) by a systematic literature search with meta-analyses on selected studies. DESIGN: MEDLINE, EMBASE, ISI Web of Science and Cochrane Library were systematically searched from January 2000 to November 2014. Included studies were randomized controlled trials (RCTs) written in English that compared LLLT (at least eight treatment sessions) with sham laser in KOA patients. The efficacy effective size was estimated by the standardized mean difference (SMD). Standard fixed or random-effects meta-analysis was used, and inconsistency was evaluated by the I-squared index (I(2)). RESULTS: Of 612 studies, nine RCTs (seven double-blind, two single-blind, totaling 518 patients) met the criteria for inclusion. Based on seven studies, the SMD in visual analog scale (VAS) pain score right after therapy (RAT) (within 2 weeks after the therapy) was not significantly different between LLLT and control (SMDÂ =Â -0.28 [95% CIÂ =Â -0.66, 0.10], I(2)Â =Â 66%). No significant difference was identified in studies conforming to the World Association of Laser Therapy (WALT) recommendations (four studies) or on the basis of OA severity. There was no significant difference in the delayed response (12 weeks after end of therapy) between LLLT and control in VAS pain (five studies). Similarly, there was no evidence of LLLT effectiveness based on Western Ontario and McMaster Universities Arthritis Index (WOMAC) pain, stiffness or function outcomes (five and three studies had outcome data right after and 12 weeks after therapy respectively). CONCLUSION: Our findings indicate that the best available current evidence does not support the effectiveness of LLLT as a therapy for patients with KOA. Humans;Low-Level Light Therapy;Osteoarthritis, Knee;Treatment Outcome

Adipose-derived stromal cell cluster with light therapy enhance angiogenesis and skin wound healing in mice. Human adipose-derived mesenchymal stem cells (hASCs) are attractive cell source for skin tissue engineering. The aim of this study was to investigate the effects of low-level light therapy (LLLT) on transplanted cluster hASC in a skin wound animal model. The hASCs were cultured in monolayer or clusters. The LLLT, hASCs, hASC clusters, and hASC clusters transplantation with LLLT (clusterÂ +Â LLLT) were applied to the wound bed in athymic mice. Wound healing was assessed by gross evaluation and by hematoxylin and eosin staining, and elastin van gieson histochemistry. The survival, differentiation, and secretion of vascular endothelial growth factor (VEGF), basic fibroblast growth factor (FGF), and hepatocyte growth factor (HGF) of the cluster ASC were evaluated by immunohistochemistry and Western blotting. The clusterÂ +Â LLLT group enhanced the wound healing, including neovascularization and regeneration of skin appendages, compared with the cluster group. The secretion of growth factors was stimulated in the clusterÂ +Â LLLT group compared with the ASCs and cluster group. These data suggest that LLLT is an effective biostimulator of cluster hASCs in wound healing that enhances the survival of hASCs and stimulates the secretion of growth factors in the wound bed. Angiogenic Proteins Adipose Tissue;Angiogenic Proteins;Animals;Cell Differentiation;Cell Survival;Endothelial Cells;Epidermal Cells;Epidermis;Humans;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Inbred BALB C;Mice, Nude;Neovascularization, Physiologic;Phototherapy;Skin;Tissue Engineering;Wound Healing

Trials needed to identify best management of iatrogenic inferior alveolar and lingual nerve injuries. DATA SOURCES: The Cochrane Oral Health Group's Trials Register, Cochrane Central Register of Controlled Trials (CENTRAL), Medline and Embase databases were searched with no language or date restrictions. STUDY SELECTION: Three reviewers independently selected studies. Randomised controlled trials (RCTs) involving interventions to treat patients with neurosensory defect of the inferior alveolar or lingual nerve or both as a sequela of iatrogenic injury were considered. DATA EXTRACTION AND SYNTHESIS: Standard Cochrane methodological procedures were followed. RESULTS: Two studies considered at high risk of bias, reporting data from 26 analysed patients were included. Both studies investigated the effectiveness of low-level laser treatment compared to placebo laser therapy on inferior alveolar sensory deficit as a result of iatrogenic injury. Two studies

assessed as at high risk of bias, reporting data from 26 analysed participants were included in this review. The age range of participants was from 17 to 55 years. Both trials investigated the effectiveness of low-level laser treatment compared to placebo laser therapy on inferior alveolar sensory deficit as a result of iatrogenic injury.Patient-reported altered sensation was partially reported in one study and fully reported in another. Following treatment with laser therapy, there was some evidence of an improvement in the subjective assessment of neurosensory deficit in the lip and chin areas compared to placebo, though the estimates were imprecise: a difference in mean change in neurosensory deficit of the chin of 8.40 cm (95% confidence interval (CI) 3.67 to 13.13) and a difference in mean change in neurosensory deficit of the lip of 21.79 cm (95% CI 5.29 to 38.29). The overall quality of the evidence for this outcome was very low. No studies reported on the effects of the intervention on the remaining primary outcomes of pain, difficulty eating, speaking or taste. No studies reported on quality of life or adverse events. CONCLUSIONS: There is clearly a need for randomised controlled clinical trials to investigate the effectiveness of surgical, medical and psychological interventions for iatrogenic inferior alveolar and lingual nerve injuries. Primary outcomes of this research should include: patient-focused morbidity measures including altered sensation and pain, pain, quantitative sensory testing and the effects of delayed treatment. Humans;Iatrogenic Disease;Lingual Nerve Injuries;Low-Level Light Therapy;Somatosensory Disorders;Trigeminal Nerve Injuries

Little evidence for the use of diode lasers as an adjunct to non-surgical periodontal therapy. DATA SOURCES: Medline, PubMed, the Cochrane Central Register of Controlled Trials (CENTRAL) and Embase databases. STUDY SELECTION: Randomised controlled trials (RCTs) using thermal diode lasers as an adjunct to non-surgical conventional periodontal initial therapy conducted in patients â‰¥18 years old written in English or Dutch were considered. DATA EXTRACTION AND SYNTHESIS: Study assessment data extraction and quality assessment was carried out independently by two reviewers. The main outcome variables were probing pocket depth (PPD) and clinical attachment loss (CAL), but plaque scores (PS), bleeding scores (BS) and the Gingival Index (GI) were also considered. Meta-analysis was carried out using a random effects model. RESULTS: Nine studies involving 247 patients were included. Seven studies were of split mouth design and two were parallel group studies. The study designs showed considerable heterogeneity and follow up ranged from six weeks to six months. Meta-analysis found no significant effect on PPD, CAL and PS. There was however a significant effect for GI and BS favouring adjunctive use of the diode laser. CONCLUSIONS: The collective evidence regarding adjunctive use of the diode laser with SRP indicates that the combined treatment provides an effect comparable to that of SRP alone. With respect to BS the results showed a small but significant effect favouring the diode laser, however, the clinical relevance of this difference remains uncertainStandard . This systematic review questions the adjunctive use of diode laser with traditional mechanical modalities of periodontal therapy in patients with periodontitis. The strength of the recommendation for the adjunctive use of the diode laser is considered to be 'moderate' for changes in PPD and CAL. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontitis

Tissue responses to postoperative laser therapy in diabetic rats submitted to excisional wounds. In a previous study about low-level laser therapy biomodulation on a full-thickness burn model we showed that single and fractionated dose regimens increased wound healing and leukocyte influx similarly when compared with untreated control. In order to verify if this finding would be similar in an impaired wound model, we investigated the effect of single and multiple irradiations on wound closure rate, type of inflammatory infiltrate, myofibroblasts, collagen deposition, and optical retardation of collagen in diabetic rats. Female Wistar rats in the same estrous cycle had diabetes induced with streptozotocin and an 8-mm excisional wound performed with a punch. The

experimental groups were: control group--untreated ulcer; single-dose group--ulcer submitted to single dose of diode laser therapy (Î» = 660 Â± 2 nm; P = 30 mW; energy density: 4 J/cm2) and fractionated-dose group--ulcer submitted to 1 J/cm2 laser therapy on Days 1, 3, 8, and 10. The ulcers were photographed on the experimental days and after euthanasia tissue samples were routinely processed for histological and immunohistochemistry analyses. Independently of the energy density, laser therapy accelerated wound closure by approximately 40% in the first three days in comparison to the control group. Laser therapy increased acute inflammatory infiltrate until Day 3. Both laser groups exhibited more myofibroblasts and better collagen organization than the control group. The findings demonstrate that low-level laser therapy in the immediate postoperative period can enhance the tissue repair process in a diabetes model. Similar effects were achieved with laser therapy applied a single time with an energy density of 4 J/cm2 and applied four times with an energy density of 1 J/cm2. The application of laser therapy in the inflammatory phase was the most important factor to the enhancement of the tissue repair process. Actins;Collagen Actins;Animals;Collagen;Diabetes Mellitus, Experimental;Disease Models, Animal;Female;Granulation Tissue;Immunohistochemistry;Inflammation;Laser Therapy;Myofibroblasts;Neutrophil Infiltration;Rats;Wound Healing;Wounds and Injuries

Stellate Ganglion Block, Compared With Xenon Light Irradiation, Is a More Effective Treatment of Neurosensory Deficits Resulting From Orthognathic Surgery, as Measured by Current Perception Threshold. PURPOSE: The aim of this study was to evaluate the relative effectiveness of stellate ganglion blockade (SGB) versus xenon light irradiation (XLI) for the treatment of neurosensory deficits resulting from orthognathic surgery as determined by a comparison of prospective measurements of electrical current perception thresholds (CPTs) and ranged CPTs (R-CPTs). MATERIALS AND METHODS: CPT and R-CPT in the mental foramen area were measured during electrical stimulation at 98 different sites on the body in patients who had undergone orthognathic surgery. After surgery, patients were assigned to the SGB group or the XLI group. CPT and R-CPT of the 2 groups were measured at stimulation frequencies of 2,000, 250, and 5 Hz before surgery, 1 week after surgery, and after 10 treatment sessions. Furthermore, the influence of surgical factors, such as genioplasty and a surgically exposed inferior alveolar nerve (IAN), was examined in the 2 groups. RESULTS: Patients' CPT and R-CPT values indicated a considerable amount of sensory disturbance in most cases after surgery. The change in magnitude of all CPT and R-CPT values for the SGB group decreased considerably compared with that for the XLI group after treatment. There was no correlation between CPT or R-CPT values and surgical factors (eg, genioplasty and exposure of the IAN). CONCLUSION: SGB of the IAN could be an effective method for treating neurosensory deficits after orthognathic surgery on the IAN. Anesthetics, Local;Mepivacaine Adolescent;Adult;Anesthetics, Local;Electric Stimulation;Female;Follow-Up Studies;Genioplasty;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Mandibular Nerve;Maxilla;Mepivacaine;Middle Aged;Nerve Block;Nerve Fibers, Myelinated;Orthognathic Surgical Procedures;Osteotomy, Le Fort;Osteotomy, Sagittal Split Ramus;Postoperative Complications;Prospective Studies;Sensory Thresholds;Somatosensory Disorders;Stellate Ganglion;Young Adult

[Low-intensity laser radiation applied in occupational pathology]. The authors present results of treatment including laser radiation in patients with various occupational diseases. Evidence is that low-intensity laser radiation appears effective in occupational pathology. The treatment is based on blood circulation improvement. Blood Circulation;Humans;Low-Level Light Therapy;Occupational Diseases

Photothermal ablation of human lung cancer by low-power near-infrared laser and topical injection of indocyanine green. The present study was designed to evaluate the efficacy of photothermal

ablation therapy for lung cancer by low-power near-infrared laser and topical injection of indocyanine green (ICG). In vitro study 1: an 808 nm laser with 250 mW was irradiated for 10 minutes using different dilutions of ICG and the temporal thermal effect was monitored. ICG (1 mL of 0.5 g/L) was heated to a temperature of >30Â°C from the base temperature by laser irradiation. In vitro study 2: the cytotoxic effect of hyperthermia on human lung cancer cells was examined in different temperature and time settings. Cell viability was quantified by both an MTS assay and reculturing. Fatal conditions evaluated by reculturing were as follows: thermal treatment at 55Â°C for 5 minutes, 53Â°C for 10 minutes, and 51Â°C for 15 minutes. The MTS assay study suggested that thermal treatment at 59Â°C for 5 minutes and 57Â°C for 20 minutes showed a severe cytotoxic effect. In vivo study: nude mouse subcutaneous NCI-H460 human lung cancer xenograft models were used for the study. Saline or 0.5 g/L of ICG was injected topically into the tumor (n=3/group). Tumors were irradiated with a laser at 500 mW for 10 minutes. Although the tumor diameter reached 1 cm within 24 days after treatment in all 3 mice using saline/laser, tumor sizes were gradually reduced in all 3 mice using the ICG/laser. In 2 of the 3 mice using ICG/laser, tumors had disappeared macroscopically. The efficacy of the photothermal ablation therapy by low-power near-infrared laser and a topical injection of ICG was clarified using a mouse subcutaneous a lung cancer xenograft model.
Coloring Agents;Photosensitizing Agents;Indocyanine Green
Adenocarcinoma;Animals;Carcinoma, Large Cell;Cell Line, Tumor;Coloring Agents;Humans;Hyperthermia, Induced;In Vitro Techniques;Indocyanine Green;Low-Level Light Therapy;Lung Neoplasms;Male;Mice;Mice, Nude;Photosensitizing Agents;Xenograft Model Antitumor Assays

In vitro exposure to very low-level laser modifies expression level of extracellular matrix protein RNAs and mitochondria dynamics in mouse embryonic fibroblasts. BACKGROUND: Low-level lasers working at 633 or 670Â nm and emitting extremely low power densities (Ultra Low Level Lasers - ULLL) exert an overall effect of photobiostimulation on cellular metabolism and energy balance. In previous studies, it was demonstrated that ULLL pulsed emission mode regulates neurite elongation in vitro and exerts protective action against oxidative stress. METHODS: In this study the action of ULLL supplied in both pulsed and continuous mode vs continuous LLL on fibroblast cultures (Mouse Embryonic Fibroblast-MEF) was tested, focusing on mitochondria network and the expression level of mRNA encoding for proteins involved in the cell-matrix adhesion. RESULTS: It was shown that ULLL at 670Â nm, at extremely low average power output (0.21Â mW/ cm(2)) and dose (4.3Â mJ/ cm(2)), when dispensed in pulsed mode (PW), but not in continuous mode (CW) supplied at both at very low (0.21Â mW/cm(2)) and low levels (500Â mW/cm(2)), modifies mitochondria network dynamics, as well as expression level of mRNA encoding for selective matrix proteins in MEF, e.g. collagen type 1Î±1 and integrin Î±5. CONCLUSIONS: We suggest that pulsatility, but not energy density, is crucial in regulating expression level of collagen I and integrin Î±5 in fibroblasts by ULLL. Integrin alpha5;RNA, Messenger;Collagen Animals;Collagen;Extracellular Matrix;Fibroblasts;Integrin alpha5;Lasers;Light;Low-Level Light Therapy;Mice;Mitochondria;Oxidative Stress;RNA, Messenger

Laser phototherapy enhances mesenchymal stem cells survival in response to the dental adhesives. BACKGROUND: We investigated the influence of laser phototherapy (LPT) on the survival of human mesenchymal stem cells (MSCs) submitted to substances leached from dental adhesives. METHOD: MSCs were isolated and characterized. Oral mucosa fibroblasts and osteoblast-like cells were used as comparative controls. Cultured medium conditioned with two adhesive systems was applied to the cultures. Cell monolayers were exposed or not to LPT. Laser irradiations were performed using a red laser (GaAlAs, 780â€‰nm, 0.04â€‰cm(2), 40â€‰mW, 1â€‰W/cm(2), 0.4â€‰J, 10 seconds, 1 point, 10â€‰J/cm(2)). After 24â€‰h, cell viability was assessed by the 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyl tetrazolium bromide reduction assay. Data were statistically compared by ANOVA

followed by Tukey's test (P < 0.05). RESULTS: Different cell types showed different viabilities in response to the same materials. Substances leached from adhesives were less cytotoxic to MSCs than to other cell types. Substances leached from Clearfil SE Bond were highly cytotoxic to all cell types tested, except to the MSCs when applied polymerized and in association with LPT. LPT was unable to significantly increase the cell viability of fibroblasts and osteoblast-like cells submitted to the dental adhesives. CONCLUSION: LPT enhances mesenchymal stem cells survival in response to substances leached from dental adhesives. Dental Cements Cell Survival;Cells, Cultured;Dental Cements;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Tooth, Deciduous

Laser supported reduction of specific microorganisms in the periodontal pocket with the aid of an Er,Cr:YSGG laser: a pilot study. OBJECTIVE: The aim of this study was to evaluate the effectiveness of a radial firing tip of an Er,Cr:YSGG laser as an adjunct to a nonsurgical periodontal treatment. METHODS: Twelve patients with chronic or aggressive periodontitis were treated by conventional periodontal treatment using ultrasonic devices and hand instruments and, additionally, in two quadrants with an Er,Cr:YSGG laser. A new radial firing tip (RFPT 14-5, Biolase) was used with 1.5â€‰W, 30â€‰Hz, 11% air, 20% water, and pulse duration 140â€‰Î¼s. Microbiological smears were taken before treatment, one day after lasing, and three and six months after lasing. Pocket depths of all periodontal sites were measured before and six months after treatment. RESULTS: The total bacterial load of Prevotella intermedia, Tannerella forsythia, Treponema denticola, Fusobacterium nucleatum, Porphyromonas gingivalis, and Aggregatibacter actinomycetemcomitans inside the pocket was reduced significantly throughout the whole examination time. Greater pocket depth reductions were observed in all groups. There was a slight higher reduction of pocket depth in the lased group after six months. CONCLUSIONS: These results support the thesis that Er,Cr:YSGG laser supported periodontal treatment leads to a significant reduction of periopathogenes and thereby helps the maintenance of periodontal health. Bacterial Load;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Periodontal Pocket;Pilot Projects

Low-level laser therapy in the treatment of recurrent aphthous ulcers: a systematic review. Recurrent aphthous ulcers (RAUs) are the most common lesion found in the oral cavity. There is no definitive cure for RAUs and current treatments are aimed at minimizing symptoms. Since low-level laser therapy (LLLT) modulates inflammatory responses, and promotes pain reduction and cellular biostimulation, LLLT can be suggested as an alternative treatment for RAUs. The literature concerning the potential of LLLT in the treatment of RAUs was evaluated. A systematic literature review identified 22 publications, of which only 2 studies were adopted. The eligibility criteria consisted of randomized controlled trials (RCTs). Both RCTs achieved significant results concerning LLLT and pain-level reductions and reduced healing times. Despite the variance in irradiation conditions applied in both studies, very similar wavelengths were adopted. There is accordingly strong evidence that wavelength plays an important role in RAU treatment. Taking into account the different parameters applied by selected RCTs, it is not possible to suggest that a specific protocol should be used. However, in light of the significant results found in both studies, LLLT can be suggested as an alternative for RAU treatment. Additional RCTs should be performed in order to reach a clinical protocol and better understand the application of LLLT in RAU treatment. Animals;Humans;Laser Therapy;Low-Level Light Therapy;Mouth;Randomized Controlled Trials as Topic;Recurrence;Stomatitis, Aphthous

[The analysis of dynamics of oxidative modification of proteinsin the blood sera of the patients presenting with secondary osteoarthrosis associated with rheumatoid arthritis and treated by laser therapy]. OBJECTIVE: To evaluate the indicators of oxidative modification of proteins (OMP) in the patients presenting with secondary osteoarthrosis associated with rheumatoid arthritis (RA) and

to determine their dynamics under the influence of the combined treatment with the use of low-intensity laser irradiation (LILI). MATERIAL AND METHODS: A total of 50 patients with RA associated with secondary osteoarthritis and 25 healthy subjects were enrolled in this study. The patients of one study sub-group (n = 25) were given combined therapy with the use of LLLI, those in the second sub-group (n = 25) received only drug therapy. We made use of the VAS and DAS 28 scales to estimate dynamics of pain and compared serum OMP in the patients and healthy subjects. RESULTS: The analyses of the data obtained demonstrated the increased OMP in the patients with RA in comparison with the healthy subjects. The patients of sub-group 1 experienced a significant decrease in the clinical parameters of pain based on the VAS and DAS 28 scales accompanied by the marked reduction of OMP. In sub-group 2, the patients also exhibited the statistically significant dynamics of these indicators, but it was less pronounced than in sub-group 2. CONCLUSION: The patients presenting with rheumatoid arthritis are characterized by the elevated level of protein oxidative modification, a marker of oxidative stress. LILI introduced in the combined treatment of the patients with RA not only increases the anti-inflammatory and analgesic effects but also has the antioxidant properties. Blood Proteins Adult;Aged;Arthritis, Rheumatoid;Blood Proteins;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis;Oxidation-Reduction;Protein Processing, Post-Translational

Editorial: fractional resurfacing. Cosmetic Techniques;Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

Insight in the chemistry of laser-activated dental bleaching. The use of optical radiation for the activation of bleaching products has not yet been completely elucidated. Laser light is suggested to enhance the oxidizing effect of hydrogen peroxide. Different methods of enhancing hydrogen peroxide based bleaching are possible. They can be classified into six groups: alkaline pH environment, thermal enhancement and photothermal effect, photooxidation effect and direct photobleaching, photolysis effect and photodissociation, Fenton reaction and photocatalysis, and photodynamic effect. Oxidants;Tooth Bleaching Agents;Hydrogen Peroxide Animals;Dental Enamel;Humans;Hydrogen Peroxide;Lasers, Solid-State;Low-Level Light Therapy;Oxidants;Tooth Bleaching;Tooth Bleaching Agents

A rare case of cutaneous collagenous vasculopathy. Cutaneous collagenous vasculopathy is a rare microangiopathy first described by Salama and Rosenthal in 2000. Several cases have been reported to date, describing distinct histological findings of thick hyaline collagenous blood vessel walls in the superficial dermis. Clinical confusion can arise with generalised essential telangiectasia. We report a case occurring in a 76-year-old woman who presented with a 2-year history of a telangiectatic rash progressing from her knees upwards. The diagnosis was confirmed on skin biopsy and treatment with pulsed dye laser was later initiated at the patient's request. Collagen Aged;Biopsy, Needle;Blood Vessels;Chronic Disease;Collagen;Diagnosis, Differential;Disease Progression;Exanthema;Female;Humans;Immunohistochemistry;Low-Level Light Therapy;Rare Diseases;Skin Diseases, Vascular;Telangiectasis;Treatment Outcome;United Kingdom

Periodontal and peri-implant wound healing following laser therapy. Laser irradiation has numerous favorable characteristics, such as ablation or vaporization, hemostasis, biostimulation (photobiomodulation) and microbial inhibition and destruction, which induce various beneficial therapeutic effects and biological responses. Therefore, the use of lasers is considered effective and suitable for treating a variety of inflammatory and infectious oral conditions. The CO2 , neodymium-doped yttrium-aluminium-garnet (Nd:YAG) and diode lasers have mainly been used for periodontal soft-tissue management. With development of the erbium-doped yttrium-aluminium-garnet (Er:YAG) and erbium, chromium-doped yttrium-scandium-gallium-garnet (Er,Cr:YSGG) lasers, which can be applied not only on soft tissues but also on dental hard tissues, the application of lasers dramatically

expanded from periodontal soft-tissue management to hard-tissue treatment. Currently, various periodontal tissues (such as gingiva, tooth roots and bone tissue), as well as titanium implant surfaces, can be treated with lasers, and a variety of dental laser systems are being employed for the management of periodontal and peri-implant diseases. In periodontics, mechanical therapy has conventionally been the mainstream of treatment; however, complete bacterial eradication and/or optimal wound healing may not be necessarily achieved with conventional mechanical therapy alone. Consequently, in addition to chemotherapy consisting of antibiotics and anti-inflammatory agents, phototherapy using lasers and light-emitting diodes has been gradually integrated with mechanical therapy to enhance subsequent wound healing by achieving thorough debridement, decontamination and tissue stimulation. With increasing evidence of benefits, therapies with low- and high-level lasers play an important role in wound healing/tissue regeneration in the treatment of periodontal and peri-implant diseases. This article discusses the outcomes of laser therapy in soft-tissue management, periodontal nonsurgical and surgical treatment, osseous surgery and peri-implant treatment, focusing on postoperative wound healing of periodontal and peri-implant tissues, based on scientific evidence from currently available basic and clinical studies, as well as on case reports.
Animals;Bacterial Infections;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Peri-Implantitis;Periodontal Diseases;Regeneration;Treatment Outcome;Wound Healing

The effects of low-level laser therapy on condylar growth with a mandibular advancement appliance in rats. OBJECTIVE: The aim of this study was to evaluate the effects of low-level laser therapy (LLLT) on condylar growth with a mandibular advancement appliance in rats. BACKGROUND DATA: Researchers studied new methods such as laser, for mandibular condyle growth stimulation and acceleration with or without functional appliances in experimental animals, but the specific mechanism and laser energy density values for condylar biostimulation and bone cell activities are still unknown. METHODS: Forty-eight 8-week-old male Wistar albino rats weighing between 260 and 280â€‰g were randomly divided into four groups. Group I was the control group; group II was the mandibular advancement appliance group; group III was the 8â€‰J/cm(2) (0.25â€‰W, 20â€‰sec) laser irradiation with mandibular advancement appliance group; and group IV was the 10â€‰J/cm(2) (0.25â€‰W, 25â€‰sec) laser irradiation with mandibular advancement appliance group. Experimental rats in groups III and IV were stimulated with a low-level laser in the temporomandibular joint region bilaterally 15 times over 30 days. Morphological changes in the mandible were evaluated with lateral radiographs before and after the study with selected linear and angular measurements. Pearson correlation test, Friedman, Kruskal-Wallis, and Mann-Whitney U tests were used for statistical analysis. RESULTS: According the lateral radiograph results, the growth of mandibles in the experimental groups was significantly more than that of the control group ($p<0.05$). Group III also showed greater mandibular growth than the other groups ($p<0.05$). CONCLUSIONS: We concluded that an intraoral appliance with LLLT, including chosen parameters, can stimulate condylar growth and increase mandibular advancement. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandibular Advancement;Mandibular Condyle;Orthodontic Appliances;Rats;Rats, Wistar

Surface roughness and bond strength of zirconia posts to a resin cement after various surface pretreatments. OBJECTIVE: The purpose of this study was to investigate the influence of post surface conditioning methods on the surface roughness and microtensile bond strength (Î¼TBS) of zirconia posts to a resin cement. BACKGROUND DATA: Debonding at the post-adhesive interface is a major problem for zirconia posts. METHODS: A total of 25 zirconia posts (n=5) were prepared as follows: untreated (control, group C), airborne-particle abraded (group AA), silica coated (group SC), Nd:YAG laser irradiated (group N), and Er:YAG laser irradiated (group E). Prior to application of a dual-cured resin cement on the posts, roughness values of the post surfaces were detected with a

profilometer. Specimens were then sectioned to obtain rectangular sticks for Î¼TBS. After sticks were stored in distilled water at 37Â°C for 24â€‰h, Î¼TBS values were determined in a universal testing machine at a crosshead speed of 1â€‰mm/min until failure. Furthermore, scanning electron microscopic (SEM) analysis was performed for one specimen of each group to evaluate the post surface morphology. One-way ANOVA and post-hoc comparison tests (Î±=0.05) were performed on all data. RESULTS: All surface treatment groups demonstrated significant higher Î¼TBS values than the control group ($p<0.001$). The highest mean force value was observed in group SC. In addition, similar bond strength results were detected between group SC and group E ($p=0.669$). None of treatment groups resulted in significant improvement in roughness values of the post ($p<0.05$), except group N. CONCLUSIONS: All surface treatments were found to be effective methods to achieve a durable bond between zirconia posts to resin cement. Dental Materials;Resin Cements;Zirconium;zirconium oxide Dental Bonding;Dental Etching;Dental Materials;Lasers, Solid-State;Low-Level Light Therapy;Resin Cements;Surface Properties;Tensile Strength;Zirconium

Visible red and infrared light alters gene expression in human marrow stromal fibroblast cells. OBJECTIVES: This study tested whether or not gene expression in human marrow stromal fibroblast (MSF) cells depends on light wavelength and energy density. MATERIALS AND METHODS: Primary cultures of isolated human bone marrow stem cells (hBMSC) were exposed to visible red (VR, 633 nm) and infrared (IR, 830 nm) radiation wavelengths from a light emitting diode (LED) over a range of energy densities (0.5, 1.0, 1.5, and 2.0 Joules/cm2) Cultured cells were assayed for cell proliferation, osteogenic potential, adipogenesis, mRNA and protein content. mRNA was analyzed by microarray and compared among different wavelengths and energy densities. Mesenchymal and epithelial cell responses were compared to determine whether responses were cell type specific. Protein array analysis was used to further analyze key pathways identified by microarrays. RESULT: Different wavelengths and energy densities produced unique sets of genes identified by microarray analysis. Pathway analysis pointed to TGF-beta 1 in the visible red and Akt 1 in the infrared wavelengths as key pathways to study. TGF-beta protein arrays suggested switching from canonical to non-canonical TGF-beta pathways with increases to longer IR wavelengths. Microarrays suggest RANKL and MMP 10 followed IR energy density dose-response curves. Epithelial and mesenchymal cells respond differently to stimulation by light suggesting cell type-specific response is possible. CONCLUSIONS: These studies demonstrate differential gene expression with different wavelengths, energy densities and cell types. These differences in gene expression have the potential to be exploited for therapeutic purposes and can help explain contradictory results in the literature when wavelengths, energy densities and cell types differ. RANK Ligand;RNA, Messenger;TNFSF11 protein, human;Transforming Growth Factor beta;AKT1 protein, human;Proto-Oncogene Proteins c-akt;MMP10 protein, human;Matrix Metalloproteinase 10 Adipogenesis;Cell Culture Techniques;Cell Line;Cell Proliferation;Cells, Cultured;Color;Dose-Response Relationship, Radiation;Epithelial Cells;Fibroblasts;Gene Expression;Gene Expression Profiling;Humans;Infrared Rays;Keratinocytes;Light;Matrix Metalloproteinase 10;Mesenchymal Stem Cells;Microarray Analysis;Osteogenesis;Proto-Oncogene Proteins c-akt;RANK Ligand;RNA, Messenger;Radiation Dosage;Signal Transduction;Transforming Growth Factor beta

Effects of laser irradiation at different wavelengths (660, 810, 980, and 1064Â nm) on transient receptor potential melastatin channels in an animal model of wound healing. The aim of the present study was to compare the effectiveness of four different laser wavelengths used for low-level laser therapy(LLLT) on healing of mucositis in an animal model of wound healing, by investigating expression of transient receptor potential melastatin(TRPM) ion channels. Forty-five rats were intraperitoneally injected with 100Â mg/kg 5-fluorouracil on day 1 and 65Â mg/kg on day 3. Superficial scratching on left cheek pouch mucosa was performed on days 3 and 5. After ulcerative

mucositis was clinically detected, LLLT was started (660Â nm, HELBO; 810Â nm, Fotona-XD; 980Â nm, ARC-Fox; and 1064Â nm, Fidelis-Plus3) at 8Â J/cm(2)/day from days 1 to 4. Oval excisional biopsy was performed at the wound site, and expression of TRPM2 to TRPM8 was evaluated. Student's t test was used for evaluation of significance of TRPM gene expression according to "0" value (Î±â€‰=â€‰0.05). In 980-nm group, TRPM4, TRPM6, and TRPM7 were significantly higher than in the control group (pâ€‰<â€‰0.005). In 660, 810, and 1064Â nm groups, only TRPM6 was significantly higher than in control group (pâ€‰<â€‰0.005). There were no significant differences between control and sham groups (pâ€‰>â€‰0.05). These findings suggest that expression of TRPM6 gene was significantly affected by irradiation with lasers at different wavelengths, whereas the TRPM4 and TRPM7 genes were only expressed in the 980-nm diode laser group. TRPM6 gene was highly expressed during LLLT, which may lead to accelerated wound healing and tissue repair. In contrast, there was some evidence that the 980-nm diode laser caused increased expression of TRPM4, TRPM6, and TRPM7 which are responsible for stimulation of Ca(2+) and Mg(2+) metabolism, as well as apoptotic pathways of controlled cell death. TRPM Cation Channels;Trpm2 protein, rat;Magnesium;Calcium Animals;Apoptosis;Calcium;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Magnesium;Male;Mouth Mucosa;Rats, Wistar;TRPM Cation Channels;Wound Healing

Phototherapy improves wound healing in rats subjected to high-fat diet. This study aimed to compare the phototherapy effects on wound healing in rats submitted to normal and high-fat diets. Thirty-six rats received normal lipidic diet (NL) and 36 high lipidic (HL) diet for 45Â days. The nutritional status was measured by body mass, blood glucose, total cholesterol, and triglycerides levels. Four experimental groups were performed according light (L) therapy applied "on" or "off" (660Â nm, 100Â mW, 70Â J/cm(2), 2Â J) on 1.5-mm-punched dorsum skin wounds as NLL+, NLL-, HLL+, and HLL-. The wound healing rate (WHR) and oxidative stress markers were analyzed on 2nd, 7th, and 14th days. Despite no difference among body mass, the HL rats presented higher blood glucose, total cholesterol, and triglycerides levels than NL rats. Respectively, on the 2nd and 14th days, the HLL+ group presented the highest WHRs (0.38â€‰Â±â€‰0.16/0.97â€‰Â±â€‰0.02) among all groups, while the HLL- (-0.002â€‰Â±â€‰0.12/0.81â€‰Â±â€‰12.1) the lowest WHRs. Hydroxyproline level was lower in HLL- (6.41â€‰Â±â€‰1.09Â Î¼g/mg) than HLL+ (7.71â€‰Â±â€‰0.61Â Î¼g/mg) and also NLL+ (9.33â€‰Â±â€‰0.84Â Î¼g/mg). HLL+ presented oxidative stress markers similar to normal control group (NLL-) during follow up and highest antioxidant defense on 7th day. The results showed phototherapy accelerated the cutaneous wound healing by modulating oxidative stress in rats with metabolic disorders under a high-fat diet. Collagen;Glutathione Animals;Collagen;Diet, High-Fat;Glutathione;Lasers, Semiconductor;Low-Level Light Therapy;Male;Metabolic Diseases;Oxidative Stress;Rats, Wistar;Re-Epithelialization

Assessment of different energy delivery settings in laser and LED phototherapies in the inflammatory process of rat's TMJ induced by carrageenan. Temporomandibular disorders (TMDs) are mostly inflammatory conditions widespread in the population. Previous studies have shown positive effects of either laser or light-emitting diode (LED) phototherapies on treating TMDs, but their action and mechanism in the inflammatory infiltrate of the temporomandibular joint are still poorly understood. The aim of this study was to assess, through histological analysis, the effectiveness of using laser light (Î» 780Â nm, 70Â mW, continous wave (CW), 10Â J) and LED (Î» 850â€‰Â±â€‰10Â nm, 100Â mW, CW, 10Â J) on the inflammation of the temporomandibular joint of rats induced by carrageenan. Forty-five animals were divided into three groups with five animals each according to the experimental times of 2, 3, and 7Â days: inflammation, inflammation+laser phototherapy, and inflammation+LED phototherapy. The first irradiation was performed 24Â h after induction with an interval of 48Â h between sessions. After animal death, specimens were processed and stained with

hematoxylin-eosin (HE) and picrosirius. Then, the samples were examined histologically. Data were statistically analyzed. The inflammation group showed mild to moderate chronic inflammatory infiltrate between bone trabecules of the condyle. Over the time course of the study in the laser group, the region of the condyle presented mild chronic inflammation and intense vascularization. In the LED group, the condyle showed aspects of normality and absence of inflammation in some specimens. In all the time points, the laser-irradiated groups showed greater amount of collagen deposition in the condyle (pâ€‰=â€‰0.04) and in the disc (pâ€‰=â€‰0.03) when compared to the inflammation and LED groups, respectively. Laser- and LED-treated groups demonstrate a smaller number of layers of the synovial membrane when compared to the non-irradiated groups. It was concluded that, in general, laser and LED phototherapies resulted in a reduction of inflammatory infiltrate in the temporomandibular joint of rat. Carrageenan;Collagen Animals;Carrageenan;Collagen;Inflammation;Lasers;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Rats, Wistar;Temporomandibular Joint

Real-time local experimental monitoring of the bleaching process. OBJECTIVE: The purpose of this article was to investigate a new setup for tooth bleaching and monitoring of the same process in real time, so to prevent overbleaching and related sideeffects of the bleaching procedure. BACKGROUND DATA: So far, known bleaching procedures cannot simultaneously monitor and perform the bleaching process or provide any local control over bleaching. MATERIALS AND METHODS: The experimental setup was developed at the Institute of Physics, Zagreb. The setup consists of a camera, a controller, and optical fibers. The bleaching was performed with 25% hydrogen peroxide activated by ultraviolet light diodes, and the light for monitoring was emitted by white light diodes. The collected light was analyzed using a red-green-blue (RGB) index. A K-type thermocouple was used for temperature measurements. Pastilles made from hydroxylapatite powder as well as human teeth served as experimental objects. RESULTS: Optimal bleaching time substantially varied among differently stained specimens. To reach reference color (A1, Chromascop shade guide), measured as an RGB index, bleaching time for pastilles ranged from 8 to >20â€‰min, whereas for teeth it ranged from 3.5 to >20â€‰min. The reflected light intensity of each R, G, and B component at the end of bleaching process (after 20â€‰min) had increased up to 56% of the baseline intensity. CONCLUSIONS: The presented experimental setup provides essential information about when to stop the bleaching process to achieve the desired optical results so that the bleaching process can be completely responsive to the characteristics of every individual, leading to more satisfying results. Curing Lights, Dental;Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Tissue Culture Techniques;Tooth Bleaching

Clinical evaluation of the Er,Cr:YSGG Laser therapy in the treatment of denture-related traumatic ulcerations: a randomized controlled clinical study. OBJECTIVE: The aim of this study was to evaluate the efficacy of Er,Cr:YSGG laser irradiation in reducing pain and on healing rate of traumatic ulcerations (TU) during a 2-week period after placement of new complete dentures. BACKGROUND DATA: Denture-related TU are painful, and result in patient discomfort. Lasers are used in the treatment of different kinds of mucosal lesions; however, there are no published data available concerning the clinical outcome of the use of laser therapy in the treatment of TU. MATERIALS AND METHODS: Thirty edentulous patients with newly fabricated complete dentures who subsequently developed one or more pairs of TU participated in this study. For each patient, ulcerations were randomly assigned to the test and control groups. In the test group, ulcerations were irradiated with Er,Cr:YSGG laser. In the control group, the same laser without laser emission was used. Pain was assessed with a visual analog scale (VAS). Healing of ulcerations (HU) was graded by a clinician. RESULTS: In the test group, laser irradiation provided significantly reduced pain immediately after treatment, and provided a significant healing effect 1 day after treatment, and these effects were

maintained throughout the study. In the control group, baseline VAS scores were not statistically significant at baseline and 1 day after treatment, and HU scores were statistically significant 3, 7, and 14 days after treatment. Intergroup comparisons revealed that the differences in VAS and HU scores were statistically significant for all time periods after treatment, except for day 14. CONCLUSIONS: Based on these findings, it may be concluded that Er,Cr:YSGG laser is effective in the treatment of TU. Aged;Dentures;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Oral Ulcer

Low-level light/laser therapy versus photobiomodulation therapy. Humans;Low-Level Light Therapy;Terminology as Topic

A sweet polydopamine nanoplatform for synergistic combination of targeted chemo-photothermal therapy. Inspired by sweet or sugar-coated bullets that are used for medications in clinics and the structure and function of biological melanin, a novel kind of sweet polydopamine nanoparticles and their anticancer drug doxorubicin loaded counterparts are prepared, which integrate an active targeting function, photothermal therapy, and chemotherapy into one polymeric nanocarrier. The oxidative polymerization of lactosylated dopamine and/or with dopamine are performed under mild conditions and the resulting sweet nanoparticles are thoroughly characterized. When exposed to an 808 nm continuous-wave diode laser, the magnitude of temperature elevation not only increases with the concentration of nanoparticles, but can also be tuned by the laser power density. The nanoparticles possess strong near infrared light absorption, high photothermal conversion efficiency, and good photostability. The nanoparticles present tunable binding with RCA120 lectin and a targeting effect to HepG2 cells, confirmed by dynamic light scattering, turbidity analysis, MTT assay, and flow cytometry. Importantly, the sweet nanoparticles give the lowest IC50 value of 11.67 Î¼g mL(-1) for chemo-photothermal therapy compared with 43.19 Î¼g mL(-1) for single chemotherapy and 67.38 Î¼g mL(-1) for photothermal therapy alone, demonstrating a good synergistic effect for the combination therapy. Antibiotics, Antineoplastic;Drug Carriers;Indoles;Melanins;Polymers;polydopamine;Doxorubicin;Lactose Antibiotics, Antineoplastic;Cell Survival;Combined Modality Therapy;Doxorubicin;Drug Carriers;Drug Compounding;HeLa Cells;Hep G2 Cells;Humans;Indoles;Lactose;Light;Low-Level Light Therapy;Melanins;Polymers

Home-use devices in aesthetic dermatology. The world of aesthetic medicine is increasingly a consumer-driven market with a wide variety of home-use devices from which the consumer can choose for treating hair removal, hair loss, acne, facial rejuvenation, and other dermatologic conditions. Where these devices fit in the physician practice and consumer routine can be confusing, as scientific studies may be weak or lacking. The specifications, price, ease-of-use, maintenance, and technology can differ greatly between devices. Thus, the physician and consumer need to define exp. Acne Vulgaris;Alopecia;Cosmetic Techniques;Direct-to-Consumer Advertising;Hair Removal;Humans;Laser Therapy;Phototherapy;Skin Aging

Effect of low-level laser therapy on chemoradiotherapy-induced oral mucositis and salivary inflammatory mediators in head and neck cancer patients. BACKGROUND AND OBJECTIVE: Oral mucositis (OM) is considered a painful and debilitating side effect in patients receiving head and neck cancer treatment. Low-level laser therapy (LLLT) proved to be effective to prevent and treat chemoradiotherapy-induced OM. The aim of this study was to evaluate the effect of LLLT in the severity of OM in patients with head and neck cancer and on the release of salivary inflammatory mediators. Clinical (score of OM severity) and biochemical parameters (concentration of inflammatory mediators, growth factors, and enzymes in saliva) were used. MATERIALS AND METHODS: Thirty patients were randomized into two groups: control and laser. LLLT was performed three times a week in the laser group, while control group received sham irradiation. OM severity was

assessed according to the World Health Organization (WHO) and National Cancer Institute (NCI) scales. Pro-inflammatory and anti-inflammatory cytokines (TNF-Î±, IL-6, IL-1Î², IL-10, TGF-Î²), growth factors (EGF, FGF, VEGF), and metalloproteinases (MMP2/TIMP2, MMP9/TIMP2) concentrations were assessed using ELISA test. Saliva samples were collected on admission, and at the 7th, 21st, and 35th sessions of radiotherapy. RESULTS: The laser group showed a reduction in the severity of OM, which coursed with significantly diminished salivary concentration of EGF and VEGF in the 7th radiotherapy session and of IL-6 and FGF in the 35th. There was a trend for reduced levels of IL-1Î², TNF-Î±, IL-10, TGF-Î², MMP2/TIMP2, MMP9/TIMP2 in the laser group compared to the control, however, no statistically significant differences were found. CONCLUSIONS: These findings demonstrated that LLLT was effective in reducing the severity of chemoradiotherapy-induced OM and was associated with the reduction of inflammation and repair. Cytokines;Vascular Endothelial Growth Factor A;Epidermal Growth Factor;Metalloproteases Carcinoma, Squamous Cell;Chemoradiotherapy;Cytokines;Double-Blind Method;Epidermal Growth Factor;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Metalloproteases;Middle Aged;Saliva;Severity of Illness Index;Stomatitis;Vascular Endothelial Growth Factor A

Inhibitory effects of low-level laser therapy on skin-flap survival in a rat model. BACKGROUND: Although several studies have demonstrated the effects of low-level laser therapy (LLLT) on skin flap viability, the role of higher doses has been poorly investigated. OBJECTIVE: To investigate the inhibitory effect of the LLLT (Î»=670 nm) on the viability of random skin flaps in a rat model using an irradiation energy of 2.79 J at each point. METHODS: Sixteen Wistar rats were randomly assigned into two groups: sham laser irradiation (n=8); and active laser irradiation (n=8). Animals in the active laser irradiation group were irradiated with a 670 nm diode laser with an energy of 2.79 J/point, a power output 30 mW, a beam area of 0.028 cm(2), an energy density of 100 J/cm(2), an irradiance of 1.07 W/cm(2) for 93 s/point. Irradiation was performed in 12 points in the cranial skin flap portion. The total energy irradiated on the tissue was 33.48 J. The necrotic area was evaluated on postoperative day 7. RESULTS: The sham laser irradiation group presented a mean (Â± SD) necrotic area of 47.96Â±3.81%, whereas the active laser irradiation group presented 62.24Â±7.28%. There was a significant difference in skin-flap necrosis areas between groups (P=0.0002). CONCLUSION: LLLT (Î»=670 nm) increased the necrotic area of random skin flaps in rats when irradiated with an energy of 2.79 J (100 J/cm(2)).

Guideline for the prevention of oral and oropharyngeal mucositis in children receiving treatment for cancer or undergoing haematopoietic stem cell transplantation. PURPOSE: To develop an evidence-based clinical practice guideline for the prevention of oral mucositis in children (0-18â€…years) receiving treatment for cancer or undergoing haematopoietic stem cell transplantation (HSCT). METHODS: The Mucositis Prevention Guideline Development Group was interdisciplinary and included internationally recognised experts in paediatric mucositis. For the evidence review, we included randomised controlled trials (RCTs) conducted in either children or adults evaluating the following interventions selected according to prespecified criteria: cryotherapy, low level light therapy (LLLT) and keratinocyte growth factor (KGF). We also examined RCTs of any intervention conducted in children. For all systematic reviews, we synthesised the occurrence of severe oral mucositis. The Grades of Recommendation, Assessment, Development and Evaluation approach was used to describe quality of evidence and strength of recommendations. RESULTS: We suggest cryotherapy or LLLT may be offered to cooperative children receiving chemotherapy or HSCT conditioning with regimens associated with a high rate of mucositis. We also suggest KGF may be offered to children receiving HSCT conditioning with regimens associated with a high rate of severe mucositis. However, KGF use merits caution as there is a lack of efficacy and toxicity data in children, and a lack of long-term follow-up data in paediatric cancers. No other interventions were

recommended for oral mucositis prevention in children. CONCLUSIONS: All three specific interventions evaluated in this clinical practice guideline were associated with a weak recommendation for use. There may be important organisational and cost barriers to the adoption of LLLT and KGF. Considerations for implementation and key research gaps are highlighted. Fibroblast Growth Factor 7 Adolescent;Child;Child, Preschool;Cryotherapy;Fibroblast Growth Factor 7;Hematopoietic Stem Cell Transplantation;Humans;Infant;Mucositis;Neoplasms;Pharyngeal Diseases;Phototherapy;Practice Guidelines as Topic;Stomatitis

A prospective study comparing ultrapulse CO2 laser and trichloroacetic acid in treatment of Xanthelasma palpebrarum. BACKGROUND: Xanthelasma Palpebrarum is a type of xanthoma which presents as cosmetic concern. OBJECTIVE: To compare the efficacy of 30% TCA and UpCO2 laser in XP. METHODS AND MATERIALS: Fifty patients with XP were categorized clinically into three groups. Patients in each group were alternately allocated to 30% TCA (Group A) and laser (Group B). TCA was applied weekly (maximum: 12 sessions), and laser sessions were given monthly (maximum: three sessions). The primary outcome measures were total patients cured, the number of sessions, and mean VAS at the end of treatment. The secondary outcome measures were total duration of treatment, side effects, and recurrence in follow-up (6 months) ($P < 0.05$ significant). RESULTS: In Group A, 14 of 25 and in Group B, 25 of 25 patients achieved complete cure ($P < 0.05$). The mean VAS was lower for Group A (patient: 4.56 vs. 5.36; physician: 4.64 vs. 5.44) [$P < 0.05$] with significant difference only for group III patients. Mean number of sessions was less with laser group (1.56 vs. 9.74), except in group I. There was no significant difference in pigmentary changes and recurrence. CONCLUSION: For clinically mild lesions, both TCA and laser are good options, but laser is a better option for severe lesions. Recurrence is a concern with both modalities. Trichloroacetic Acid Adult;Aged;Eyelids;Female;Humans;Hypopigmentation;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Compliance;Prospective Studies;Recurrence;Skin Diseases;Trichloroacetic Acid;Xanthomatosis

Photoactivation of Dok1/ERK/PPARÎ³ signaling axis inhibits excessive lipolysis in insulin-resistant adipocytes. Insulin resistance is a hallmark of the metabolic syndrome and type 2 diabetes. Increased plasma FFA level is an important cause of obesity-associated insulin resistance. Over-activated ERK is closely related with FFA release from adipose tissues in patients with type 2 diabetes. Nevertheless, there are no effective strategies to lower plasma FFA level. Low-power laser irradiation (LPLI) has been reported to regulate multiple biological processes. However, whether LPLI could ameliorate metabolic disorders and the molecular mechanisms involved remain unknown. In this study, we first demonstrated that LPLI suppresses excessive lipolysis of insulin-resistant adipocytes by activating tyrosine kinases-1(Dok1)/ERK/PPARÎ³ pathway. Our data showed that LPLI inhibits ERK phosphorylation through the activation of Dok1, resulting in decreased phospho-PPARÎ³ level. Non-phosphorylated PPARÎ³ maintains in nucleus to promote the expression of adipogenic genes, reversing excessive lipolysis in insulin-resistant adipocytes. In summary, the present research highlights the important roles of Dok1/ERK/PPARÎ³ pathway in lowering FFA release from adipocytes, and our research extends the knowledge of the biological effects induced by LPLI. DNA-Binding Proteins;Dok1 protein, mouse;Fatty Acids, Nonesterified;PPAR gamma;Phosphoproteins;RNA, Small Interfering;RNA-Binding Proteins;Triglycerides;Extracellular Signal-Regulated MAP Kinases 3T3-L1 Cells;Adipocytes;Animals;DNA-Binding Proteins;Extracellular Signal-Regulated MAP Kinases;Fatty Acids, Nonesterified;Insulin Resistance;Lasers;Lipolysis;Mice;PPAR gamma;Phosphoproteins;RNA Interference;RNA, Small Interfering;RNA-Binding Proteins;Signal Transduction;Transcription, Genetic;Triglycerides

Comparative study on efficacy and safety of 1550 nm Er:Glass fractional laser and fractional radiofrequency microneedle device for facial atrophic acne scar. BACKGROUND: The 1550 nm

Er:Glass fractional laser is widely used for the treatment of atrophic acne scar. A novel fractional radiofrequency microneedle device has recently emerged as an alternative for treating acne scars. OBJECTIVES: To evaluate the clinical efficacy and safety of a Er:Glass fractional laser and fractional radiofrequency microneedle device in the treatment of facial atrophic acne scars and to assess the difference between the treatment modalities depending on facial compartment. METHODS: A total of 40 patients were equally randomized into two groups. Each group of 20 patients received three treatments at 4-week interval using Er:Glass fractional laser or fractional radiofrequency microneedle device. RESULTS: Scar severity scores (ECCA grading scale) improved by a mean of 25.0% and 18.6% in groups A and B, respectively (both $P < 0.01$). The difference in the degree of improvement was not statistically significant between the groups after three sessions of treatment. There were no significant side effects. CONCLUSION: Atrophic acne scars improved in both groups without significant side effects. Additionally, the fractional laser was a more effective treatment option for acne scars, but the fractional radiofrequency microneedle device offered good adherence and short downtime. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Needles;Treatment Outcome;Young Adult

Optogenetic control of insulin secretion by pancreatic Î²-cells in vitro and in vivo. The present study assessed the ability of optogenetics techniques to provide a better understanding of the control of insulin secretion, particularly regarding pancreatic Î²-cell function in homeostasis and pathological conditions such as diabetes mellitus (DM). We used optogenetics to investigate whether insulin secretion and blood glucose homeostasis could be controlled by regulating intracellular calcium ion concentrations ([Ca(2+)]i) in a mouse pancreatic Î²-cell line (MIN6) transfected with the optogenetic protein channelrhodopsin-2 (ChR2). The ChR2-transfected MIN6 (ChR2-MIN6) cells secreted insulin following irradiation with a laser (470â€‰nm). The increase in [Ca(2+)]i was accompanied by elevated levels of messenger RNAs that encode calcium/calmodulin-dependent protein kinase II delta and adenylate cyclase 1. ChR2-MIN6 cells suspended in matrigel were inoculated into streptozotocin-induced diabetic mice that were then subjected to a glucose tolerance test. Laser irradiation of these mice caused a significant decrease in blood glucose, and the irradiated implanted cells expressed insulin. These findings demonstrate the power of optogenetics to precisely and efficiently controlled insulin secretion by pancreatic Î²-cells 'on demand', in contrast to techniques using growth factors or chemical inducers. Optogenetic technology shows great promise for understanding the mechanisms of glucose homeostasis and for developing treatments for metabolic diseases such as DM. Blood Glucose;Channelrhodopsins;Insulin;Streptozocin;Calcium-Calmodulin-Dependent Protein Kinase Type 2;Camk2d protein, mouse;Adenylyl Cyclases;adenylyl cyclase 1;Calcium Adenylyl Cyclases;Animals;Blood Glucose;Calcium;Calcium-Calmodulin-Dependent Protein Kinase Type 2;Cells, Cultured;Channelrhodopsins;Diabetes Mellitus, Experimental;Insulin;Insulin Secretion;Insulin-Secreting Cells;Low-Level Light Therapy;Mice;Optogenetics;Streptozocin

Antimicrobial photodynamic effect to treat residual pockets in periodontal patients: a randomized controlled clinical trial. AIM: A randomized controlled clinical trial was designed to evaluate the efficacy of the photodynamic therapy (PDT) in the treatment of residual pockets of chronic periodontitis patients. MATERIAL AND METHODS: Thirty-four patients with at least four residual periodontal pockets undergoing maintenance care were included and randomly assigned to test group (PDT, nÂ =Â 18) or control group (sham procedure, nÂ =Â 16). The intervention was performed at baseline, 3, 6 and 12Â months. Clinical parameters such as pocket probing depth (PPD), clinical attachment level (CAL), bleeding on probing (BoP) and plaque index (PI) were measured before intervention and after 3, 6 and 12Â months. Subgingival samples were obtained at baseline, and after 7Â days, 3, 6 and 12Â months to quantify Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, Treponema denticola and Tannerella forsythia by real-time polimerase chain reaction

(PCR). RESULTS: All clinical variables showed significant improvement during the study, but there was no significant difference between test and control groups. The microbiological analyses showed no differences between groups at any time during the study. CONCLUSION: Within the limits of this clinical trial and considering the laser and photosensitizer protocol used, PDT failed to demonstrate additional clinical and bacteriological benefits in residual pockets treatment. Photosensitizing Agents;Methylene Blue Adult;Aged;Aggregatibacter actinomycetemcomitans;Bacterial Load;Bacteroides;Chronic Periodontitis;Dental Plaque;Dental Plaque Index;Female;Follow-Up Studies;Gingiva;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Methylene Blue;Middle Aged;Pain Measurement;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Photochemotherapy;Photosensitizing Agents;Porphyromonas gingivalis;Treatment Outcome;Treponema denticola

Reply to comments on: â€œEfficacy of low-level laser therapy in the management of orthodontic pain: a systematic review and meta-analysisâ€•. Humans;Low-Level Light Therapy;Orthodontics, Corrective;Pain

Effectiveness of low-fluence and short-pulse intense pulsed light in the treatment of melasma: A randomized study. BACKGROUND: Various treatment protocols for melasma have been suggested in the literature, but the efficacy and safety of treatment varies according to the report. OBJECTIVE: To investigate the selective photothermolytic effect of fluence-dependent intense pulsed light (IPL) in the treatment of melasma. METHODS: Twenty Korean adults with melasma were enrolled, randomly assigned to two groups and treated at fluences of 10 or 13 J/cm(2) of IPL weekly over 6 weeks. Subjects were evaluated at baseline and weekly during the 6 weeks of treatment and at 3 weeks following the final treatment. Melanin and erythema indices were scored using a spectrophotometer. RESULTS: The modified Melasma Area Severity Index (MASI) score of 20 patients at inclusion was 11.6 (Â± 0.9). Both 10J and 13J IPL treatment groups had decreased modified MASI scores from 2 weeks onward at statistically significant levels. Both 10J and 13J IPL treatment groups showed decreased melanin indices with statistically significant differences from 3 weeks onward. The effect of IPL on melasma was slightly greater in patients treated with 13J of IPL than in those treated with 10J over the entire duration of the study. The erythema index was transiently increased in weeks 1-3, but after 4 weeks it decreased to sub-baseline levels. CONCLUSION: We suggest that a low-fluence IPL protocol could provide more effective treatment for melasma with minimal side effects in Asian skin. Adult;Asian People;Erythema;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Severity of Illness Index

Inflammatory morphea mimicking an acquired port-wine stain initially treated with pulsed-dye laser. The early inflammatory lesions of morphea may present with erythema or violaceous patches and plaques before evolving into areas of sclerosis. They have been misdiagnosed as acquired port-wine stains (PWSs). We report a previously well 7-year-old Chinese girl presenting with early facial morphea mimicking an acquired PWS with unusual histologic features of perineural inflammation. The presence of cutaneous perineural inflammation may be seen in a small percentage of cases of morphea and appears to be a feature of early inflammatory morphea. We report this case to highlight the importance in recognizing this entity and summarize the reported cases of inflammatory morphea mimicking acquired PWSs. Child;China;Cosmetic Techniques;Diagnosis, Differential;Erythema;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Scleroderma, Localized

Removal of a toothpick penetrated into foot by Er:YAG laser ablation. Although rare, foot injuries caused by toothpicks can result in serious complications such as severe pain, local inflammation and infection in several days, and a delayed granulamatous foreign-body reaction in weeks or months. For this reason they should be removed from the tissue in the early phase. Here,

we report case of penetration injury caused by a toothpick treated using Er: YAG laser ablation.
Child;Foreign Bodies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male

Treatment of periorbital syringoma by the pinhole method using a carbon dioxide laser in 29 Asian patients. BACKGROUND: Pinhole method has been used to treat various types of scars and dermal tumors by making multiple small holes in target tissues of the deep dermis using an ablative 10,600-nm carbon dioxide (CO2) laser. OBJECTIVES: We prospectively investigated the efficacy and safety of using a CO2 laser to treat periorbital syringomas via the pinhole method. METHODS: A total of 29 patients with periorbital syringomas were treated with two sessions of CO2 laser treatment using the pinhole method at two-month intervals. Laser fluences were delivered under the following settings: pulse duration of 200 Î¼s, frequency of 50 Hz, on time of 0.04, and an off time of 0.01. RESULTS: Among the 29 patients, 13 patients (44.8%) presented with small discrete papular syringomas, 10 (34.5%) had plaque-type lesions, and six (20.7%) had mixed lesions. Evaluation of the clinical results at 2 months after the second treatment session revealed marked clinical improvement (51-75%) in 10 of the 29 patients (34.5%), moderate clinical improvement (26-50%) in eight (27.6%), near-total improvement (â‰¥ 75%) in seven (24.1%), and minimal improvement (0-25%) in four patients (13.8%). CONCLUSIONS: Our observations indicated that application of the pinhole method using a CO2 laser exerts positive therapeutic effects in Asian patients with periorbital syringomas.
Adult;Asian People;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Prospective Studies;Sweat Gland Neoplasms;Syringoma

A split-face comparison of facial hair removal with the long-pulsed alexandrite laser and intense pulsed light system. BACKGROUND: Undesirable hair growth presents a significant problem for many patients. Photoepilation has become a very popular procedure in esthetic and cosmetic practice. Among the systems used are the long-pulsed alexandrite laser (755 nm) (ALX) and intense pulsed light (IPL). OBJECTIVE: To compare the safety and efficacy of long-pulsed ALX and IPL for hair removal. PATIENTS AND METHODS: This comparative study was carried out in the outpatient Department of Dermatology and Venereology, Al-Sadir Teaching Hospital, Al Najaf City during the period from June 2009 to July 2010. Thirty-five patients were included; thirty of them completed the study. They received six treatment sessions with the ALX on the left side of the face and IPL on the right side of face with 4-week intervals between sessions. Response to treatment on both sides of the face was assessed at 1, 3, and 6 treatment sessions. Hair-free intervals and patient's satisfaction were recorded in each visit. RESULTS: After six treatment sessions, IPL-treated sides showed longer median hair-free intervals compared with ALX-treated sides. Reduction in hair counts was significantly larger on the IPL compared with that on the ALX-treated sides at 1, 3, and 6 sessions. Three patients (10%) developed postinflammatory hyperpigmentation, one of them on the left side and the others on the right side. It was more severe on the right side and both the patients were of skin type IV. Slight stinging and burning sensation at time of the treatment were recorded in all patients. All reported side effects were transient and tolerated by the patients except postinflammatory hyperpigmentation which persisted and was decreasing gradually toward the end of the study. CONCLUSIONS: The results of this study suggested that IPL is more effective in reducing excessive facial hair growth, with longer hair-free intervals and greater patient satisfaction than the ALX.
Adolescent;Adult;Combined Modality Therapy;Cosmetic Techniques;Face;Female;Hair Removal;Hirsutism;Humans;Intense Pulsed Light Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Young Adult

Improving the ability to eliminate wounds and pressure ulcers. Pressure ulcers can be initiated by as little as 2 hours of constant pressure on the ski, that blocks blood circulation causing the skin and underlying tissues to die, leading to an open wound that never heals, but continues to grow in diameter and depth, and frequently jeopardizes patients' lives. Despite the application of many

diverse techniques, pressure ulcers remain exceptionally difficult to heal because many ulcer elimination techniques have minimal effects, and although other techniques may appear to be effective, the evidence supporting their efficacy is weak. However, increasing evidence indicates that other techniques, such as the application of platelet-rich plasma, vacuum assisted closure, electrical stimulation, and hyperbaric oxygen therapy are effective and should be substituted for the older techniques. This review describes different standard and novel techniques that have been tested for eliminating pressure ulcers and discusses the relative efficacy of these techniques. Anti-Infective Agents;Platelet-Derived Growth Factor;Transforming Growth Factor beta1;platelet-derived growth factor A Administration, Topical;Anti-Infective Agents;Bandages;Chronic Disease;Debridement;Electric Stimulation;Evidence-Based Medicine;Humans;Hyperbaric Oxygenation;Low-Level Light Therapy;Negative-Pressure Wound Therapy;Platelet-Derived Growth Factor;Platelet-Rich Plasma;Pressure Ulcer;Transforming Growth Factor beta1;Treatment Outcome;Wound Healing;Wounds and Injuries

The effectiveness of low-level diode laser therapy on orthodontic pain management: a systematic review and meta-analysis. To assess the effectiveness of diode low-level laser therapy (LLLT) for orthodontic pain control, a systematic and extensive electronic search for randomised controlled trials (RCTs) investigating the effects of diode LLLT on orthodontic pain prior to November 2014 was performed using the Cochrane Library (Issue 9, 2014), PubMed (1997), EMBASE (1947) and Web of Science (1956). The Cochrane tool for risk of bias evaluation was used to assess the bias risk in the chosen data. A meta-analysis was conducted using RevMan 5.3. Of the 186 results, 14 RCTs, with a total of 659 participants from 11 countries, were included. Except for three studies assessed as having a 'moderate risk of bias', the RCTs were rated as having a 'high risk of bias'. The methodological weaknesses were mainly due to 'blinding' and 'allocation concealment'. The meta-analysis showed that diode LLLT significantly reduced orthodontic pain by 39 % in comparison with placebo groups (Pâ€‰=â€‰0.02). Diode LLLT was shown to significantly reduce the maximum pain intensity among parallel-design studies (Pâ€‰=â€‰0.003 versus placebo groups; Pâ€‰=â€‰0.000 versus control groups). However, no significant effects were shown for split-mouth-design studies (Pâ€‰=â€‰0.38 versus placebo groups). It was concluded that the use of diode LLLT for orthodontic pain appears promising. However, due to methodological weaknesses, there was insufficient evidence to support or refute LLLT's effectiveness. RCTs with better designs and appropriate sample power are required to provide stronger evidence for diode LLLT's clinical applications. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain;Pain Management;Randomized Controlled Trials as Topic;Tooth Diseases

Study on the selection of laser wavelengths in the intravascular low-level laser irradiation therapy. According to the absorption spectra of blood and hemoglobin, a photon-bond energy formula is established using physical methods and the effects on hemoglobin of low-level laser at different wavelengths are analyzed. The results show that lasers with the peak wavelengths of 200âˆ¼240, 275, and 342 nm in the whole blood absorption spectra curve are easy to destroy protein molecules and then lead to hemoglobin lose biological activity. While lasers with wavelengths longer than 800 nm will reduce the oxygen carrying capacity of blood, only lasers with wavelengths between 630 and 670 nm have the best efficacy. Hemoglobins;Oxygen Hemoglobins;Humans;Low-Level Light Therapy;Oxygen

The methodology flaws in Hinman's acupuncture clinical trial, part I: design and results interpretation. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Low-level laser therapy for prevention of noise-induced hearing loss in rats. Noninvasive low-level laser therapy (LLLT) is neuroprotective, but the mechanism of this effect is not fully understood. In this study, the use of LLLT as a novel treatment for noise-induced hearing loss (NIHL) is

investigated. Sprague-Dawley rats were exposed to intense noise and their right ears were irradiated with an 808nm diode laser at an output power density of 110 or 165mW/cm(2) for a 30min period for 5 consecutive days. Measurement of the auditory brainstem response revealed an accelerated recovery of auditory function in the groups treated with LLLT compared with the non-treatment group at days 2, 4, 7 and 14 after noise exposure. Morphological observations also revealed a significantly higher outer hair cell survival rate in the LLLT groups. Immunohistochemical analyses for inducible nitric oxide synthase (iNOS) and cleaved caspase-3 were used to examine oxidative stress and apoptosis. Strong immunoreactivities were observed in the inner ear tissues of the non-treatment group, whereas these signals were decreased in the LLLT group at 165mW/cm(2) power density. Our findings suggest that LLLT has cytoprotective effects against NIHL via the inhibition of iNOS expression and apoptosis. Nitric Oxide Synthase Type II;Caspase 3 Animals;Apoptosis;Caspase 3;Evoked Potentials, Auditory, Brain Stem;Hair Cells, Auditory, Outer;Hearing Loss;Low-Level Light Therapy;Male;Nitric Oxide Synthase Type II;Noise;Oxidative Stress;Rats, Sprague-Dawley

Ocular adverse effects after facial cosmetic procedures: a review of case reports. To review indexed literature concerning adverse ocular effects of the most common aesthetic facial procedures (light-emitting therapy, dermal fillers injection, and botulinum toxin). Literature search using three online databases - PubMed, SciELO, and Capes - selecting case reports, series of cases and reviews, with no language restriction, published in a period of the last twenty years (1995-2015). After reviewing 48 case reports and most recent reviews, the authors found the most common ocular adverse effects of dermal fillers were related to vascular occlusion; light-emitting therapy was associated with pigmented tissue damage leading to anterior uveitis and iris atrophy, and ptosis presented the higher relative risk associated with botulinum toxin. Even though ocular adverse effects are not very frequent, some of them can lead to permanent ocular dysfunction and visual impairment. Professionals involved in cosmetic procedures should be aware of the risks. Dermal Fillers;Hyaluronic Acid;Botulinum Toxins, Type A Botulinum Toxins, Type A;Cosmetic Techniques;Dermal Fillers;Eye Diseases;Face;Humans;Hyaluronic Acid;Lasers;Low-Level Light Therapy;Pigmentation Disorders;Skin Aging

Effect of femtosecond laser treatment on the shear bond strength of a metal bracket to prepared porcelain surface. OBJECTIVE: The aim of this study was to investigate the effects of femtosecond laser treatment (Group FS) on the shear bond strength (SBS) of a metal bracket to prepared porcelain surface, and to compare it with other surface treatment techniques [50â€‰Î¼m Al2O3 sandblasting (Group SB), 9.6% hydrofluoric acid gel (Group HF), and neodymium-doped yttrium aluminium garnet (Nd:YAG laser) (Group NY)]. BACKGROUND DATA: Because of the increasing number of adult patients in current orthodontic practice, achieving sufficient bond strength of composite resin to porcelain restorations without bond failure during the treatment is a challenge for orthodontists. METHODS: In total, 80 glazed feldspathic porcelain samples were prepared and randomly assigned to four groups of 20. Treated surfaces were treated with a silane agent. Brackets were bonded to porcelain samples. The specimens were stored in distilled water for 24â€‰h and then thermocycled for 500 cycles between 5Â° and 55Â°C. The SBS of the brackets was tested with a universal testing machine at a crosshead speed of 1â€‰mm/min, until bonding failure occurred. The data were analyzed statistically using analysis of variance (ANOVA) and Tamhane multiple comparisons tests. The results of ANOVA indicated that the SBS values varied according to the surface treatment method ($p<0.001$). RESULTS: Results of the Tamhane post-hoc tests indicated that the bond strength in Group NY (5.11Â±1.53) was significantly lower than the other groups ($p<0.05$). There were no statistically significant differences among Groups SB (9.07Â±3.76), HF (9.09Â±3.51), and FS (11.58Â±4.16) ($p=0.28$). CONCLUSIONS: The results of this study showed that FS treatment produced

high SBS of the processes assessed; therefore, it appears to be an effective method for bonding orthodontic metal brackets to prepared porcelain surfaces. Dental Porcelain Dental Bonding;Dental Etching;Dental Porcelain;Lasers, Solid-State;Low-Level Light Therapy;Orthodontic Brackets;Shear Strength

Use of low-power laser to assist the healing of traumatic wounds in rats. PURPOSE: To investigate the morphological aspects of the healing of traumatic wounds in rats using low-power laser. METHODS: Twenty four non isogenic, young adult male Wistar rats (Rattus norvegicus) weighing between 200 and 300 g was used. The animals were randomly distributed into two groups: Control (GC) and Laser (GL), with 12 animals each. After shaving, anesthesia was performed in the dorsal region and then a surgical procedure using a scalpel was carried out to make the traumatic wound. GL received five sessions of laser therapy in consecutive days using the following laser parameters: wavelength 660 nm, power 100 mW, dose 10 J/cm2. The wounds were evaluated through measurement of the area and depth of the wound (MW) and histological analysis (HA). RESULTS: When comparing the GC with the GL in MW there was a difference in area ($p<0.001$) and depth ($p=0.003$) measurement of the wounds in GL. The laser group presented more epithelization than GC ($p=0.03$). The other histological parameters were similar. CONCLUSION: The healing of wounds in rats was improved with the use of the laser. Animals;Dose-Response Relationship, Radiation;Fibroblasts;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Random Allocation;Rats, Wistar;Reproducibility of Results;Skin;Time Factors;Treatment Outcome;Wound Healing;Wounds and Injuries

Red and NIR light dosimetry in the human deep brain. Photobiomodulation (PBM) appears promising to treat the hallmarks of Parkinson's Disease (PD) in cellular or animal models. We measured light propagation in different areas of PD-relevant deep brain tissue during transcranial, transsphenoidal illumination (at 671 and 808Â nm) of a cadaver head and modeled optical parameters of human brain tissue using Monte-Carlo simulations. Gray matter, white matter, cerebrospinal fluid, ventricles, thalamus, pons, cerebellum and skull bone were processed into a mesh of the skull (158Â Ã—Â 201Â Ã—Â 211 voxels; voxel side length: 1Â mm). Optical parameters were optimized from simulated and measured fluence rate distributions. The estimated Î¼eff for the different tissues was in all cases larger at 671 than at 808Â nm, making latter a better choice for light delivery in the deep brain. Absolute values were comparable to those found in the literature or slightly smaller. The effective attenuation in the ventricles was considerably larger than literature values. Optimization yields a new set of optical parameters better reproducing the experimental data. A combination of PBM via the sphenoid sinus and oral cavity could be beneficial. A 20-fold higher efficiency of light delivery to the deep brain was achieved with ventricular instead of transcranial illumination. Our study demonstrates that it is possible to illuminate deep brain tissues transcranially, transsphenoidally and via different application routes. This opens therapeutic options for sufferers of PD or other cerebral diseases necessitating light therapy. Brain;Computer Simulation;Female;Head;Humans;Light;Middle Aged;Monte Carlo Method;Optics and Photonics;Parkinson Disease;Phototherapy;Radiometry;Skull;Spectroscopy, Near-Infrared

The effect of low-level laser irradiation on sperm motility, and integrity of the plasma membrane and acrosome in cryopreserved bovine sperm. BACKGROUND AND OBJECTIVE: Freezing changes sperm integrity remarkably. Cryopreservation involves cooling, freezing, and thawing and all these contribute to structural damage in sperm, resulting in reduced fertility potential. Low-level laser irradiation (LLLI) could increase energy supply to the cell and cause reactive oxygen species reduction (ROS), contributing to the restoration of oxygen consumption and adenosine triphosphate synthesis (ATP) in the mitochondria. Our goal was to analyze the effects of low-level laser irradiation on sperm motility and integrity of the plasma membrane and acrosome in cryopreserved bovine sperm. STUDY

DESIGN/MATERIALS AND METHODS: We analyzed 09 samples of bull semen (Bos taurus indicus), divided into three groups: a control group without laser irradiation, a 4J group subjected to a laser irradiation dose of 4 joules, and a 6J group subjected to dose of 6 joules. Samples were divided for the analysis of cell viability and acrosomal membrane integrity using flow cytometry; another portion was used for motion analysis. Irradiation was performed in petri dishes of 30 mm containing 3 ml of semen by an aluminum gallium indium phosphide laser diode with a wavelength of 660 nm, 30 mW power, and energy of 4 and 6 joules for 80 and 120 seconds respectively. Subsequently, the irradiated and control semen samples were subjected to cryopreservation and analyzed by flow cytometry (7AAD and FITC-PSA) using the ISAS--Integrated Semen Analysis System. RESULTS: Flow cytometry showed an increase in the percentage of live sperm cells and acrosome integrity in relation to control cells when subjected to irradiation of low-power laser in two different doses of 4 and 6 joules ($p < 0.05$). In the analysis of straightness, percentage of cell movement, and motility, a dose of 4 joules was more effective ($p < 0.05$). CONCLUSION: We conclude that LLLI may exert beneficial effects in the preservation of live sperm. A dose of 4 joules prior to cryopreservation was more effective than a dose of 6 joules in preserving sperm motility. Acrosome;Animals;Cattle;Cell Membrane;Cell Survival;Cryopreservation;Flow Cytometry;Lasers;Male;Semen Preservation;Sperm Motility

Treatment of vitiligo patients by excimer laser improves patients' quality of life. BACKGROUND: Vitiligo can negatively affect patients' quality of life (QoL). Assessment of QoL provides relevant information about treatment benefits. OBJECTIVES: To examine the effects of excimer laser treatment on vitiligo patients' QoL and to identify overall patient satisfaction. The literature review failed to show any study concerning the same field. METHODS: A total of 134 vitiligo patients (with 386 lesions) were studied. The Dermatology Life Quality Index (DLQI) was used to assess the effect of excimer laser treatment on patients' QoL. A visual analogue scale (VAS) was used to rate patients' overall life satisfaction and disturbance. RESULTS: Excimer laser treatment significantly improved QoL in vitiligo patients, with improvement observed in five of six DLQI domains. Treatment-induced changes in the VAS score showed a significant decline in life disturbance and improvement in life satisfaction. Multivariate analysis revealed that sex and treatment duration were independent factors influencing treatment outcomes. CONCLUSIONS: Treatment of vitiligo with excimer laser can positively influence patients' QoL. Patients with multiple focal lesions should be treated by excimer laser even if some lesions may not show significant clinical improvement. Adolescent;Adult;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Quality of Life;Saudi Arabia;Treatment Outcome;Vitiligo;Young Adult

Successful treatment of refractory Hailey-Hailey disease with a 595-nm pulsed dye laser: a series of 7 cases. Adult;Aged;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Patient Acceptance of Health Care;Pemphigus, Benign Familial;Remission Induction

Prevention and management of lymphedema after breast cancer treatment. Lymphedema of the arm after breast cancer treatment continues to challenge clinicians worldwide. In this review, we examine the main modalities, both nonsurgical and surgical, to prevent and treat this as yet incurable condition. Arm;Axilla;Breast Neoplasms;Compression Bandages;Female;Humans;Lipectomy;Low-Level Light Therapy;Lymphedema;Physical Therapy Modalities

Quantitative analysis of transcranial and intraparenchymal light penetration in human cadaver brain tissue. BACKGROUND AND OBJECTIVE: Photobiomodulation (PBM) also known as low-level light therapy has been used successfully for the treatment of injury and disease of the nervous system. The use of PBM to treat injury and diseases of the brain requires an in-depth understanding of light propagation through tissues including scalp, skull, meninges, and brain. This study investigated the light penetration gradients in the human cadaver brain using a Transcranial Laser System with a

30â€‰mm diameter beam of 808â€‰nm wavelength light. In addition, the wavelength-dependence of light scatter and absorbance in intraparenchymal brain tissue using 660, 808, and 940â€‰nm wavelengths was investigated. STUDY DESIGN/MATERIAL AND METHODS: Intact human cadaver heads (nâ€‰=â€‰8) were obtained for measurement of light propagation through the scalp/skull/meninges and into brain tissue. The cadaver heads were sectioned in either the transverse or mid-sagittal. The sectioned head was mounted into a cranial fixture with an 808â€‰nm wavelength laser system illuminating the head from beneath with either pulsed-wave (PW) or continuous-wave (CW) laser light. A linear array of nine isotropic optical fibers on a 5â€‰mm pitch was inserted into the brain tissue along the optical axis of the beam. Light collected from each fiber was delivered to a multichannel power meter. As the array was lowered into the tissue, the power from each probe was recorded at 5â€‰mm increments until the inner aspect of the dura mater was reached. Intraparenchymal light penetration measurements were made by delivering a series of wavelengths (660, 808, and 940â€‰nm) through a separate optical fiber within the array, which was offset from the array line by 5â€‰mm. Local light penetration was determined and compared across the selected wavelengths. RESULTS: Unfixed cadaver brains provide good anatomical localization and reliable measurements of light scatter and penetration in the CNS tissues. Transcranial application of 808â€‰nm wavelength light penetrated the scalp, skull, meninges, and brain to a depth of approximately 40â€‰mm with an effective attenuation coefficient for the system of 2.22â€‰cm(-1) . No differences were observed in the results between the PW and CW laser light. The intraparenchymal studies demonstrated less absorption and scattering for the 808â€‰nm wavelength light compared to the 660 or 940â€‰nm wavelengths. CONCLUSIONS: Transcranial light measurements of unfixed human cadaver brains allowed for determinations of light penetration variables. While unfixed human cadaver studies do not reflect all the conditions seen in the living condition, comparisons of light scatter and penetration and estimates of fluence levels can be used to establish further clinical dosing. The 808â€‰nm wavelength light demonstrated superior CNS tissue penetration. Aged;Aged, 80 and over;Brain;Cadaver;Humans;Lasers;Low-Level Light Therapy;Spectroscopy, Near-Infrared

Low-Level Laser Therapy at 635Â nm for Treatment of Chronic Plantar Fasciitis: A Placebo-Controlled, Randomized Study. Plantar fasciitis affects nearly 1 million persons in the United States at any one time. Conservative therapies have been reported to successfully treat 90% of plantar fasciitis cases; however, for the remaining cases, only invasive therapeutic solutions remain. This investigation studied newly emerging technology, low-level laser therapy. From September 2011 to June 2013, 69 subjects were enrolled in a placebo-controlled, randomized, double-blind, multicenter study that evaluated the clinical utility of low-level laser therapy for the treatment of unilateral chronic fasciitis. The volunteer participants were treated twice a week for 3 weeks for a total of 6 treatments and were evaluated at 5 separate time points: before the procedure and at weeks 1, 2, 3, 6, and 8. The pain rating was recorded using a visual analog scale, with 0 representing "no pain" and 100 representing "worst pain." Additionally, Doppler ultrasonography was performed on the plantar fascia to measure the fascial thickness before and after treatment. Study participants also completed the Foot Function Index. At the final follow-up visit, the group participants demonstrated a mean improvement in heel pain with a visualÂ analog scale score of 29.6 Â± 24.9 compared with the placebo subjects, who reported a mean improvement of 5.4 Â± 16.0, a statistically significant difference (pÂ <Â .001). Although additional studies are warranted, these data have demonstrated that low-level laser therapy is a promising treatment of plantar fasciitis.
Adult;Aged;Chronic Disease;Double-Blind Method;Fasciitis, Plantar;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Patient Satisfaction;Reference Values;Severity of Illness Index;Treatment Outcome;Ultrasonography, Doppler

Effects of Nd:YAG laser irradiation for minimizing edema and pain after sinus lift surgery: randomized controlled clinical trial. OBJECTIVE: The aim of the present study was to evaluate the effectiveness of neodymium-doped yttrium aluminum garnet (Nd:YAG) laser used for low-level laser therapy (LLLT) on pain, oral health-related quality of life (OHRQoL), and swelling after sinus lift procedure. MATERIALS AND METHODS: Ten healthy patients, requiring bilateral direct sinus lift surgery, were included in this prospective, randomized study. The treatment sides were randomly assigned to LLLT or control groups. The experimental side received 8â€‰J/cm(2) of energy density, a wavelength of 1064â€‰nm, for 60â€‰sec, and 0.5â€‰W laser immediately after surgery. Swelling, pain perception, and OHRQoL were evaluated at different time intervals. The data were analyzed by the one way ANOVA. RESULTS: Evaluations of postoperative pain, OHRQoL, and swelling were made. We observed that the swelling and the OHRQoL in the Nd:YAG group were significantly improved when compared with the control group on the 3rd day after surgery ($p<0.05$). The pain levels after surgery was almost the same for both groups, without statistically significant differences ($p>0.05$). There were no statistically significant differences between groups with regard to any of the parameters evaluated on the 7th day. CONCLUSIONS: The results demonstrate that the 1064â€‰nm Nd:YAG laser was effective in improving OHRQoL and reducing swelling after sinus lift surgery. Within the limitations of this study, we concluded that the 1064â€‰nm Nd:YAG laser has beneficial effects on swelling and OHRQoL, making it suitable for LLLT. Edema;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Maxillary Sinus;Middle Aged;Pain, Postoperative;Prospective Studies

Comparison of low level laser and arginine-calcium carbonate alone or combination in the treatment of dentin hypersensitivity: a randomized split-mouth clinical study. OBJECTIVE: This study aimed to compare the efficacy of low-level laser (LLL) and desensitizing paste (DP) containing 8% arginine-calcium carbonate, in the treatment of dentin hypersensitivity (DH) and also to determine whether their combined application would improve the efficacy of the treatment. BACKGROUND DATA: There are various options for the treatment of DH; however, superiority of one method over others alone has not been currently demonstrated. MATERIALS AND METHODS: Twenty-one patients with 156 teeth affected by DH were included in the study. Selected teeth were randomly divided into five groups: LLL, DP, laser followed by DP (LLL+DP), DP followed by laser (DP+LLL) applied to one of the quadrants, and a control group, consisting of a randomly selected additional tooth in one of the quadrants. Teeth were irradiated by the 685â€‰nm diode laser treatment with 25â€‰mW at 9â€‰Hz for 100sec at 1â€‰cm(2) area (2J/cm(2)) in interrupted mode. Pain response to evaporative stimulus was quantified on a visual analogue scale (VAS) over a 90-day period. RESULTS: All four treatment groups experienced significant and persistent decrease in the mean VAS score immediately post-treatment until the end of the study, whereas the placebo group had high VAS scores throughout the study. On day 90, percent reduction in VAS scores was 72% for LLL, 65.4% for DP, 54.6% for LLL+DP, and 69.6% for DP+LLL, whereas the placebo group showed an increase of 7.8%. CONCLUSIONS: The application of either LLL or DP containing 8% arginine-calcium carbonate appears to be effective in decreasing DH. However, their combined use does not improve the efficacy beyond what is attainable with either treatment alone. Dentin Desensitizing Agents;Arginine;Calcium Carbonate Adult;Arginine;Calcium Carbonate;Combined Modality Therapy;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

Effect of low-level laser therapy on mesenchymal stem cell proliferation: a systematic review. Low-level laser therapy (LLLT) has been used in several in vitro experiments in order to stimulate cell proliferation. Cells such as fibroblasts, keratinocytes, lymphocytes, and osteoblasts have shown increased proliferation when submitted to laser irradiation, although little is known about the effects

of LLLT on stem cells. This study aims to assess, through a systematic literature review, the effects of LLLT on the in vitro proliferation of mesenchymal stem cells. Using six different terms, we conducted an electronic search in PubMed/Medline database for articles published in the last twelve years. From 463 references obtained, only 19 papers met the search criteria and were included in this review. The analysis of the papers showed a concentration of experiments using LLLT on stem cells derived from bone marrow, dental pulp, periodontal ligament, and adipose tissue. Several protocols were used to irradiate the cells, with variations on wavelength, power density, radiation time, and state of light polarization. Most studies demonstrated an increase in the proliferation rate of the irradiated cells. It can be concluded that the laser therapy positively influences the in vitro proliferation of stem cells studied, being necessary to carry out further experiments on other cell types and to uniform the methodological designs. Animals;Cell Proliferation;Cells, Cultured;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice

Preparation of nasoseptal flap in trans-sphenoidal surgery using 2-Î¼ thulium laser: technical note. OBJECTIVE: The purpose of this study was to assess the feasibility of the use of the 2Î¼-thulium laser in harvesting nasal septal flaps. BACKGROUND DATA: Nasal septal flaps are routinely performed in almost every trans-sphenoidal surgery. The preservation of the arterial vasculature is a mainstay of the procedure. However, the margins of the flap should be sufficiently healthy to regenerate faster, reducing the risk of possible complications. MATERIALS AND METHODS: Eight patients underwent trans-sphenoidal surgery and removal of pituitary adenomas. Reparation of the defect was performed with the positioning of a rotational vascularized nasal-septal flap. The flaps were harvested with the aid of the 2Î¼-thulium laser. Every patient was then monitored for 6 months through seriated endoscopic endonasal controls. RESULTS: There were no complications related to the use of the laser, either intraoperatively, or postoperatively. The operative timing did not significantly differ from that of traditional techniques. CONCLUSIONS: The use of the 2Î¼-thulium laser for the harvesting of nasal septal vascularized flaps can be considered safe and feasible. The limited number of treated patients could be considered as the only restriction to the study. A larger study might have uncovered possible instrumentation-related complications, which were not observed in the present study. Thulium Adenoma;Cohort Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nasal Septum;Natural Orifice Endoscopic Surgery;Pituitary Neoplasms;Surgical Flaps;Thulium

[Comparison of the effect of laser and magnetic therapy for pain level and the range of motion of the spine of people with osteoarthritis lower back]. Increased expression of degenerative disease of the lumbar spine is an onerous task, which reduces the efficiency of the activity and life of many populations. It is the most common cause of medical visits. In 95% of cases the cause of complaints is a destructive process in the course of degenerative intervertebral disc called a lumbar disc herniation. Protrusion of the nucleus pulposus causes severe pain and impaired muscle tone, often more chronic and difficult to master. Successful treatment of lumbar disc herniation constitutes a serious interdisciplinary problem. It is important to properly planned and carried out physiotherapy. Based on the number of non-invasive methods, to reduce muscle tension, mute pain and alleviation of inflammation. It is the treatment safe, effective, and at the same time, which is their big advantage, readily available and cheap. It is worth noting that not every method has the same efficiency. The question that the methods are effective in relieving pain and helping to effectively increase the range of motion led to a comparison of two methods - Low Level Laser Therapy (LLLT) and pulsating magnetic field therapy. AIM: The aim of the study was to compare the efficacy of LLLT and pulsating magnetic field therapy in combating pain and increase range of motion of the spine of people with degenerative spine disease of the lower back. MATERIALS AND METHODS: 120 patients with diagnose lumbar disc herniation whit no nerve roots symptoms. Patients were divided into two Groups: A and

B. Group A of 60 patients were subjected to laser therapy (Î»=820nm, P=400mW, Ed=6-12 J/cmÂ²) and the second Group B of 60 patients too, to pulsating magnetic fields procedures (5mT, 30 Hz, 15 minutes). Every patient before rehabilitation started and right after it has finished has undergone examination. Subjective pain assessment was carried out using a modified Laitinen questionnaire and Visual Analogue Scale of Pain intensity. Spine mobility was evaluated whit the Schober test and the Fingertip-to-floor-test. The obtained results were subjects to statistical analysis. RESULTS: Research shows that both low energy laser and pulsating magnetic field physical attributes are effective methods for the treatment of pain and restricted mobility of the spine caused by disc herniation. Careful analysis emphasizes greater efficiency laser for pain. In contrast, a statistically greater improvement in global mobility of the spine, as well as flexion and extension of the lumbar recorded in group B, where the applied pulsating magnetic field. CONCLUSIONS: Both laser and magnet therapy reduces pain and improves mobility of the spine of people with degenerative spine disease of the lower back. Comparison of the effectiveness of both methods showed a greater analgesic effect of laser treatment, and greater mobility of the spine was observed under the influence of pulsating magnetic field therapy. Aged;Female;Humans;Low Back Pain;Low-Level Light Therapy;Lumbar Vertebrae;Magnetic Field Therapy;Male;Middle Aged;Osteoarthritis, Spine;Range of Motion, Articular;Treatment Outcome

Mechanical properties and polymerization shrinkage of composite resins light-cured using two different lasers. OBJECTIVE: The purpose of the present study was to investigate the usefulness of 457 and 473â€‰nm lasers for the curing of composite resins during the restoration of damaged tooth cavity. BACKGROUND DATA: Monochromaticity and coherence are attractive features of laser compared with most other light sources. Better polymerization of composite resins can be expected. MATERIALS AND METHODS: Eight composite resins were light cured using these two lasers and a light-emitting diode (LED) light-curing unit (LCU). To evaluate the degrees of polymerization achieved, polymerization shrinkage and flexural and compressive properties were measured and compared. RESULTS: Polymerization shrinkage values by 457 and 473â€‰nm laser, and LED ranged from 10.9 to 26.8, from 13.2 to 26.1, and from 11.5 to 26.3â€‰Î¼m, respectively. The values by 457â€‰nm laser was significantly different from those by 473 and LED LCU ($p<0.05$). However, there was no statistical difference between values by 473 and LED LCU. Before immersion in distilled water, flexural strength (FS) and compressive modulus (CM) of the specimens were inconsistently influenced by LCUs. On the other hand, flexural modulus (FM) and compressive strength (CS) were not significantly different for the three LCUs ($p>0.05$). For the tested LCUs, no specific LCU could consistently achieve highest strength and modulus from the specimens tested. CONCLUSIONS: Two lasers (457 and 473â€‰nm) can polymerize composite resins to the level that LED LCU can achieve despite inconsistent trends of polymerization shrinkage and flexural and compressive properties of the tested specimens. Composite Resins Composite Resins;Curing Lights, Dental;Low-Level Light Therapy;Polymerization

Treatments for shoulder impingement syndrome: a PRISMA systematic review and network meta-analysis. Many treatments for shoulder impingement syndrome (SIS) are available in clinical practice; some of which have already been compared with other treatments by various investigators. However, a comprehensive treatment comparison is lacking. Several widely used electronic databases were searched for eligible studies. The outcome measurements were the pain score and the Constant-Murley score (CMS). Direct comparisons were performed using the conventional pair-wise meta-analysis method, while a network meta-analysis based on the Bayesian model was used to calculate the results of all potentially possible comparisons and rank probabilities. Included in the meta-analysis procedure were 33 randomized controlled trials involving 2300 patients. Good agreement was demonstrated between the results of the pair-wise meta-analyses and the network

meta-analyses. Regarding nonoperative treatments, with respect to the pain score, combined treatments composed of exercise and other therapies tended to yield better effects than single-intervention therapies. Localized drug injections that were combined with exercise showed better treatment effects than any other treatments, whereas worse effects were observed when such injections were used alone. Regarding the CMS, most combined treatments based on exercise also demonstrated better effects than exercise alone. Regarding surgical treatments, according to the pain score and the CMS, arthroscopic subacromial decompression (ASD) together with treatments derived from it, such as ASD combined with radiofrequency and arthroscopic bursectomy, showed better effects than open subacromial decompression (OSD) and OSD combined with the injection of platelet-leukocyte gel. Exercise therapy also demonstrated good performance. Results for inconsistency, sensitivity analysis, and meta-regression all supported the robustness and reliability of these network meta-analyses. Exercise and other exercise-based therapies, such as kinesio taping, specific exercises, and acupuncture, are ideal treatments for patients at an early stage of SIS. However, low-level laser therapy and the localized injection of nonsteroidal anti-inflammatory drugs are not recommended. For patients who have a long-term disease course, operative treatments may be considered, with standard ASD surgery preferred over arthroscopic bursectomy and the open surgical technique for subacromial decompression. Notwithstanding, the choice of surgery should be made cautiously because similar outcomes may also be achieved by the implementation of exercise therapy.
Adrenal Cortex Hormones Acupuncture Therapy;Adrenal Cortex Hormones;Arthroscopy;Combined Modality Therapy;Decompression, Surgical;Exercise Therapy;Humans;Pain Measurement;Shoulder Impingement Syndrome;Treatment Outcome;Ultrasonic Therapy

Treatment of melasma in men with low-fluence Q-switched neodymium-doped yttrium-aluminum-garnet laser versus combined laser and glycolic acid peeling. BACKGROUND: Low-fluence Q-switched neodymium-doped yttrium-aluminum-garnet 1,064-nm laser (LFQS) and glycolic acid (GA) peeling have been reported as a treatment option for melasma. However, there are limited data on their efficacy in men. OBJECTIVE: To compare the efficacy and safety of LFQS monotherapy with combined LFQS and 30% GA peeling in male patients with melasma. MATERIALS AND METHODS: Fifteen males with mixed type melasma were randomized to receive 5 weekly sessions of LFQS on one side of the face and LFQS plus 30% GA peeling on the contralateral side and were followed for 12 weeks. Twelve patients completed the protocol. RESULTS: Mean relative lightness index (RL*I) of the combined treatment side was lowered throughout the study period, with the maximal improvement of 52.3% reduction at the fourth week follow-up ($p = .023$). Patient self-assessment was favorable in the combined treatment. However, the mean RL*I increased at 8 and 12 weeks of follow-up. One subject (8.3%) developed guttate hypopigmentation, which did not resolve by the 12-week follow-up. CONCLUSION: Low-fluence Q-switched neodymium-doped yttrium-aluminum-garnet 1,064-nm laser combined with GA peeling temporarily reduced melasma in men, but the incidence of side effects does not justify the short-lived benefits of this procedure. This technique requires further study.
Glycolates;Keratolytic Agents;glycolic acid Administration, Cutaneous;Adult;Aged;Combined Modality Therapy;Follow-Up Studies;Glycolates;Humans;Keratolytic Agents;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Single-Blind Method;Time Factors;Treatment Outcome

Evaluation of low-level laser therapy, platelet-rich plasma, and their combination on the healing of Achilles tendon in rabbits. Tendon repair is still one of the challenges for rehabilitation. Various treatments for tendon injuries have been used in recent decade. This study was established to investigate the effects of low-level laser therapy (LLLT), platelet-rich plasma (PRP) treatment alone, and using combined method on the healing of Achilles tendon in rabbits. Seventy-two healthy mature

male white New Zealand rabbits were divided randomly into four groups of 18 animals each: control: partial tenotomy with no treatment, only 1 mL normal saline was injected on days 1, 8, and 15 at the site of splitting; PRP: partial tenotomy with PRP treatment on days 1, 8, and 15 at the site of splitting; LLLT: partial tenotomy with LLLT (K30 hand-held probe, AZOR, Technica, Russia, 650 nm, 30 mW, surface areaâ€‰=â€‰1 cm(2), 60 S/cm(2), energy densityâ€‰=â€‰1.8 J/cm(2)) for 15 consecutive days; LLLTâ€‰+â€‰PRP: partial tenotomy with LLLTâ€‰+â€‰PRP. At the end of trial, the rabbits were euthanatized and tendon specimens were harvested and were submitted for histopathological evaluation, hydroxyproline levels, and biomechanical measurement. The Tukey post hoc test was performed. The results for these parameters showed that PRP or LLLT alone has significant advantages over untreated animals (Pâ€‰<â€‰0.05). Furthermore, it was found that the combined treatment with PRP and LLLT is even more efficient. There was no significant difference (Pâ€‰>â€‰0.05) between the two groups of LLLT and PRP. However, the treatments combining PRP and LLLT showed significant results in comparison of PRP or LLLT alone (Pâ€‰<â€‰0.05). Our results demonstrate that the healing time of injured tendon decreases by using the two therapies combined. Achilles Tendon;Animals;Biomechanical Phenomena;Combined Modality Therapy;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Rabbits;Tendon Injuries;Treatment Outcome;Wound Healing

Interstitial photoacoustic sensor for the measurement of tissue temperature during interstitial laser phototherapy. Photothermal therapy is an effective means to induce tumor cell death, since tumor tissue is more sensitive to temperature increases than normal tissue. Biological responses depend on tissue temperature; target tissue temperature needs to be precisely measured and controlled to achieve desired thermal effects. In this work, a unique photoacoustic (PA) sensor is proposed for temperature measurement during interstitial laser phototherapy. A continuous-wave laser light and a pulsed laser light, for photothermal irradiation and photoacoustic temperature measurement, respectively, were delivered to the target tissue through a fiber coupler. During laser irradiation, the PA amplitude was measured. The GrÃ¼neisen parameter and the bioheat equation were used to determine the temperature in strategic positions in the target tissue. Our results demonstrate that the interstitial PA amplitude is a linear function of temperature in the range of 22 to 55 Â°C, as confirmed by thermocouple measurement. Furthermore, by choosing appropriate laser parameters, the maximum temperature surrounding the active diffuse fiber tip in tissue can be controlled in the range of 41 to 55 Â°C. Thus, this sensor could potentially be used for fast, accurate, and convenient three-dimensional temperature measurement, and for real-time feedback and control of interstitial laser phototherapy in cancer treatment. Biosensing Techniques;Humans;Low-Level Light Therapy;Neoplasms;Photoacoustic Techniques;Spectrum Analysis;Temperature;Thermometers

High Final Energy of Low-Level Gallium Arsenide Laser Therapy Enhances Skeletal Muscle Recovery without a Positive Effect on Collagen Remodeling. The aim of this study was to evaluate the effects of a Gallium Arsenide (GaAs) laser, using a high final energy of 4.8Â J, during muscle regeneration after cryoinjury. Thirty Wistar rats were divided into three groups: Control (C, nÂ =Â 10); Injured (I, nÂ =Â 10) and Injured and laser treated (Injured/LLLT, nÂ =Â 10). The cryoinjury was induced in the central region of the tibialis anterior muscle (TA). The applications of the laser (904Â nm, 50Â mW average power) were initiated 24Â h after injury, at energy density of 69Â JÂ cm(-1) for 48Â s, for 5Â days, to two points of the lesion. Twenty-four hours after the final application, the TA muscle was removed and frozen in liquid nitrogen to assess the general muscle morphology and the gene expression of TNF-Î±, TGF-Î², MyoD, and Myogenin. The Injured/LLLT group presented a higher number of regenerating fibers and fewer degenerating fibers (PÂ <Â 0.05) without changes in the collagen remodeling. In addition, the Injured/LLLT group presented a significant decrease in the expression of TNF-Î± and myogenin compared to the injured group (PÂ <Â 0.05). The results suggest

that the GaAs laser, using a high final energy after cryoinjury, promotes muscle recovery without changing the collagen remodeling in the muscle extracellular matrix. Arsenicals;gallium arsenide;Collagen;Gallium Animals;Arsenicals;Collagen;Gallium;Laser Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar

Effect of MLS(Â®) laser therapy with different dose regimes for the treatment of experimentally induced tendinopathy in sheep: pilot study. OBJECTIVE: The aim of this preliminary study was to investigate the effect of Multiwave Locked System (MLS(Â®)), a particular model of low-level laser, in the acute phase of collagenase-induced tendon lesions in six adult sheep randomly assigned to two groups. BACKGROUND DATA: Tendon injuries are common among human athletes and in sport horses, require a long recovery time, and have a high risk of relapse. Many traditional treatments are not able to repair the injured tendon tissue correctly. In recent years, the use of low-level laser therapy (LLLT) produced interesting results in inflammatory modulation in different musculoskeletal disorders. METHODS: Group 1 received 10 treatments of MLS laser therapy at a fluence of 5â€‰J/cm(2) on the left hindlimb. Group 2 received 10 treatments of MLS laser therapy at a fluence of 2.5â€‰J/cm(2) on the left hindlimb. In every subject in both groups, the right hindlimb was considered as the control leg. RESULTS: Clinical follow-up and ultrasonography examinations were performed during the postoperative period, and histological examinations were performed at day 30 after the first application of laser therapy. In particular, results from histological examinations indicate that both treatments induced a statistically significant cell number decrease, although only in the second group did the values return to normal. Moreover, the MLS laser therapy dose of 2.5â€‰J/cm(2) (group 2) caused a significant decrease of vessel area. CONCLUSIONS: In this study, clinical and histological evaluation demonstrated that a therapeutic dose <5â€‰J/cm(2) furnished an anti-inflammatory effect, and induced a decrease of fibroblasts and vessel area. Overall, our results suggest that MLS laser therapy was effective in improving collagen fiber organization in the deep digital flexor tendon. Animals;Female;Low-Level Light Therapy;Pilot Projects;Sheep;Tendinopathy;Tendons

Histomorphometric assessment of the influence of low-level laser therapy on peri-implant tissue healing in the rabbit mandible. OBJECTIVE: The purpose of this study was to demonstrate the effect of low-level laser therapy (LLLT) on the peri-implant bone healing process in the rabbit mandible. BACKGROUND DATA: LLLT has been shown to accelerate tissue repair and osseointegration of implants placed into the rabbit tibia. However, the beneficial effects of LLLT have never been tested in the rabbit mandible, which would more closely mimic the human situation. MATERIALS AND METHODS: Twenty-four male New Zealand rabbits were randomly divided into four groups of six animals each. All animals had their left mandibular incisors extracted, followed by immediate insertion of a titanium dental implant in the fresh socket. Three groups received LLLT [aluminum-gallium-arsenide (AlGaAs), Î»=830nm, 50â€‰mW, continuous wave (CW)] at three different energy densities per treatment session (E-5, 5â€‰J/cm(2); E-10, 10â€‰J/cm(2); and E-20, 20â€‰J/cm(2)). Irradiation was performed every 48â€‰h for 13 days, totaling seven sessions. One group received sham treatment (controls). Histological sections were obtained from each of the 24 mandibles dissected, without first decalcifying the specimens, and were stained with hematoxylin and eosin and Picrosirius red for histomorphometric evaluation. Bone-to-implant contact (BIC), bone formation area, and collagen fiber area were assessed by light microscopy. RESULTS: Significant differences were found between group E-20 and all other groups ($p<0.05$). Histomorphometric evaluation showed significantly higher BIC and significantly more collagen fibers in group E-20. CONCLUSIONS: Photobiostimulation with LLLT at an energy density of 20â€‰J/cm(2) per session had a significant positive effect on new bone formation around dental implants inserted in the rabbit mandible. Animals;Low-Level Light Therapy;Male;Mandible;Osteogenesis;Rabbits;Wound Healing

Low-level red laser improves healing of second-degree burn when applied during proliferative phase. The aim of this study was to investigate the effects of low-level red laser on tissue repair in rats submitted to second-degree burn, evaluating if the timing of laser treatment influences the healing process. The animals had their backs shaved and divided as follows: control group (nâ€‰=â€‰12)-rats burned and not irradiated, early laser group (nâ€‰=â€‰12)-rats burned and irradiated from day 1 after injury for five consecutive days, and late laser group (nâ€‰=â€‰14)-rats burned and irradiated from day 4 after injury for five consecutive days. Laser irradiation was according to a clinical protocol (20Â J/cm(2), 100Â mW, continuous wave emission mode, 660Â nm) as recommended by the laser device manufacturer. Half of the animals were sacrificed 10Â days after burn, and the other animals were sacrificed 21Â days after burn. The late laser group accelerated wound contraction 10 and 21Â days after burn. The late laser group accelerated reepithelialization 18Â days after burn. The late laser group increases the granulation tissue 10 and 21Â days after burn. Both irradiated groups increased type III collagen expression and TGF-Î² 21Â days after burn. Both irradiated groups increased macrophage and myofibroblast numbers 10Â days after burn and decreased 21Â days after. Low-level red laser exposure contributes to the process of tissue repair of second-degree burns, but the intervention during proliferative phase is crucial in the final outcome of the repair process. Collagen Type I;Collagen Type III;Transforming Growth Factor beta Animals;Burns;Cell Proliferation;Collagen Type I;Collagen Type III;Granulation Tissue;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Re-Epithelialization;Transforming Growth Factor beta;Treatment Outcome

Ultrasonic delivery of silica-gold nanoshells for photothermolysis of sebaceous glands in humans: Nanotechnology from the bench to clinic. Recent advances in nanotechnology have provided numerous opportunities to transform medical therapies for the treatment of diseases including cancer, atherosclerosis, and thrombosis. Here, we report, through in vitro studies and in vivo human pilot clinical studies, the use of inert, inorganic silica-gold nanoshells for the treatment of a widely prevalent and researched, yet poorly treated disease of acne. We use ~150nm silica-gold nanoshells, tuned to absorb near-IR light and near-IR laser irradiation to thermally disrupt overactive sebaceous glands in the skin which define the etiology of acne-related problems. Low-frequency ultrasound was used to facilitate deep glandular penetration of the nanoshells. Upon delivery of the nanoshells into the follicles and glands, followed by wiping of superficial nanoshells from skin surface and exposure of skin to near-infrared laser, nanoshells localized in the follicles absorb light, get heated, and induce focal thermolysis of sebaceous glands. Pilot human clinical studies confirmed the efficacy of ultrasonically-delivered silica-gold nanoshells in inducing photothermal disruption of sebaceous glands without damaging collateral skin. Gold;Silicon Dioxide Acne Vulgaris;Animals;Gold;Humans;Infrared Rays;Low-Level Light Therapy;Nanomedicine;Nanoshells;Nanotechnology;Sebaceous Glands;Silicon Dioxide;Swine;Ultrasonics

Acupuncture treatment for chronic knee pain: study by Hinman et al underestimates acupuncture efficacy. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Advances in laser dentistry: expanding beyond periodontal care. Dental Care;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Periodontal Diseases;Periodontal Pocket;Root Canal Preparation;Stomatitis;Stomatitis, Aphthous;Stomatitis, Herpetic;Therapeutic Irrigation

Can long-term alopecia occur after appropriate pulsed-dye laser therapy in hair-bearing sites? Pediatric dermatologists weigh in. BACKGROUND: The risk of long-term alopecia after pulsed-dye laser (PDL) therapy is unknown. To identify how many practitioners treat hair-bearing sites with

PDL and how commonly long-term alopecia occurs, the authors queried pediatric dermatologists about their experiences using this modality. METHODS: A survey was designed to evaluate the frequency of and factors contributing to long-term alopecia after PDL treatment of port-wine stains (PWS). "Long-term" was defined as no sign of hair regrowth after several years of nontreatment. The survey was administered to attendees at the 2014 Society for Pediatric Dermatology biannual meeting. RESULTS: Sixty-four pediatric dermatologists completed the survey, 50 of whom had experience using PDL. Of these physicians, 86% have used PDL to treat PWS of the eyebrow and 80% have treated PWS of the scalp. Over one-quarter of respondents (25.5%) using PDL on hair-bearing areas had at least 1 of their patients develop long-term alopecia after PDL treatment. The incidence of long-term alopecia after PDL treatment in the surveyed population was 1.5% to 2.6%. CONCLUSION: The occurrence of long-term alopecia at hair-bearing sites after treatment with PDL may be greater than previously thought. Because the majority of physicians using PDL treat hair-bearing areas, prospective studies are needed to more accurately determine the risk of long-term alopecia and the factors that contribute to it. Alopecia;Child;Dermatology;Eyebrows;Health Care Surveys;Humans;Incidence;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Risk Factors;Scalp

Current indications for low level laser treatment in maxillofacial surgery: a review. Low level laser treatment (LLLT) is currently being used for various disorders, but with no convincing scientific evidence. Most recently we have noticed an increase in published randomised controlled trials (RCTs) that have focused on its applications in wound healing, scarring, disorders of the temporomandibular joint (TMJ), oral mucositis, and dental pain. Our aim therefore was to assess the scientific evidence about its current efficacy in maxillofacial surgery. We reviewed PubMed from January 2003 to January 2013 using the key phrase "low level laser treatment". Our inclusion criterion was intervention studies in humans of more than 10 patients. We excluded animal studies and papers in languages other than English, French, and German. We found 45 papers that we screened independently. The resulting full texts were scrutinised by two authors who awarded a maximum of 5 points using the Jadad scale for assessing the quality of RCT, and extracted the data according to sample size, variables of LLLT, the authors' conclusions, and the significance of the result. LLLT seems to be effective for the treatment of oral mucositis after treatment for head and neck cancer. However, it cannot yet be considered a valid treatment for disorders of the TMJ. It seems to improve gingival healing, and myofacial and dental pain. Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mouth Diseases;Oral Surgical Procedures;Pain;Stomatitis

Efficacy of surgical and non-surgical interventions on accelerating orthodontic tooth movement: a systematic review. PURPOSE: To conduct a systematic review of randomised controlled trials (RCTs) evaluating the effect of surgical and non-surgical procedures on the acceleration of orthodontic tooth movement (OTM) as an adjunct to orthodontic therapy (OT) in order to estimate the efficacy of these procedures and the benefit of their use in everyday orthodontic practice. MATERIALS AND METHODS: Literature search was performed on PubMed, Scopus, Web of Science and Cochrane databases up to July 2014. Inclusion criteria were: (1) RCTs; (2) orthodontic therapy on permanent dentition; (3) application of adjunctive surgical or non-surgical procedures for accelerating OTM; (4) measurement of tooth movement. The primary outcome measure was tooth movement expressed as cumulative tooth movement (CTM), rate of tooth movement (RTM) or time of tooth movement (TTM). Pain and discomfort, periodontal health, anchorage loss, bone and root changes, and undesired tooth movement were evaluated as secondary outcomes. RESULTS: Literature research identified 184 studies. After screening of titles, abstracts and full-text studies, fifteen fulfilled the inclusion criteria and were included in this review. Six of the included studies investigated the effect of corticotomies, one of interseptal bone reduction, four of lowlevel laser therapy (LLLT),

three of intraoral/extraoral devices releasing extracorporeal shock waves (ESWT), pulsed electromagnetic field (PEMF) and electrical current, respectively, and one of injected substances (relaxin) as an adjunct to OT. Three studies resulted of high methodological quality, six of medium, and six of low quality. Interseptal bone reduction was reported to increase RTM during the first 2 months (P = 0.002) and CTM at 3 months (P = 0.003). Studies investigating corticotomy reported significantly increased RTM (up to 2.3 times) during the first months after intervention, whereas results on TTM and CTM were quite controversial ranging from non-significant to highly significant (up to three times of TTM increase). The heterogeneity between studies investigating corticotomy could not allow for quantitative synthesis of the findings. Out of four studies investigating LLLT three reported positive effect on OT. Due to inadequate statistical analysis of data from original articles, results could not be summarised in meta-analyses. Effects of both electrical current devices and PEMF devices on CTM were reported to be larger on the experimental sides than on the control sides (P < 0.001). The other interventions were reported to be of no statistical or clinical relevance. CONCLUSIONS: In the short term, corticotomy can accelerate OTM whereas long-term effects are questionable, thus no firm conclusions can be made on its efficacy and benefit of clinical use. There is some evidence that LLLT can slightly accelerate OTM but this result is not significant and the effect estimated is not clinically relevant. The very limited research-based evidence suggesting beneficial effects of interseptal bone reduction, electrical current and PEMF on OTM does not allow for solid conclusions. More high quality clinical research is required in order to estimate the efficacy of adjunctive interventions on accelerating OTM and their potential clinical use. Relaxin Electric Stimulation Therapy;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Osteotomy;Relaxin;Time Factors;Tooth Movement Techniques

Photoactivation of Akt1/GSK3Î² Isoform-Specific Signaling Axis Promotes Pancreatic Î²-Cell Regeneration. Promotion of insulin-secreting Î²-cell regeneration in patients with diabetes is a promising approach for diabetes therapy, which can contribute to rescue the uncontrolled hyperglycemia. Low-power laser irradiation (LPLI) has been demonstrated to regulate multiple physiological processes both in vitro and in vivo through activation of various signaling pathways. In the present study, we showed that LPLI promoted Î²-cell replication and cell cycle progression through activation of Akt1/GSK3Î² isoform-specific signaling axis. Inhibition of PI3-K/Akt or GSK3 with specific inhibitors dramatically reduced or increased LPLI-induced Î²-cell replication, revealing Akt/GSK3 signaling axis was involved in Î²-cell replication and survival upon LPLI treatment. Furthermore, the results of shRNA-mediated knock down of Akt/GSK3 isoforms revealed that Akt1/GSK3Î² isoform-specific signaling axis regulated Î²-cell replication and survival in response to LPLI, but not Akt2/GSK3Î±. The mechanism by which LPLI promoted Î²-cell replication through Akt1/GSK3Î² signaling axis involved activation of Î²-catenin and down-regulation of p21. Taken together, these observations suggest that Akt1/GSK3Î² isoform signaling axis play a key role in Î²-cell replication and survival induced by LPLI. Moreover, our findings suggest that activation of Akt1/GSK3Î² isoform signaling axis by LPLI may provide guidance in practical applications for Î²-cell regenerative therapies. Isoenzymes;Akt1 protein, rat;Glycogen Synthase Kinase 3 beta;Gsk3b protein, rat;Proto-Oncogene Proteins c-akt;Glycogen Synthase Kinase 3 Animals;Cell Cycle;Cell Proliferation;Glycogen Synthase Kinase 3;Glycogen Synthase Kinase 3 beta;Insulin-Secreting Cells;Isoenzymes;Low-Level Light Therapy;Male;Proto-Oncogene Proteins c-akt;Rats;Regeneration;Signal Transduction

Biomodulation of Inflammatory Cytokines Related to Oral Mucositis by Low-Level Laser Therapy. This study evaluated the effects of LLLT on the expression of inflammatory cytokines related to the development of oral mucositis by gingival fibroblasts. Primary gingival fibroblasts were seeded on 24-well plates (10(5) cells/well) for 24 h. Fresh serum-free culture medium (DMEM) was then added, and

cells were placed in contact with LPS (Escherichia coli, 1 Î¼g mL(-1)), followed by LLLT irradiation (LaserTABLE-InGaAsP diode prototype-780 nm, 25 mW) delivering 0, 0.5, 1.5 or 3 J cm(-2)Â². Cells without contact with LPS were also irradiated with the same energy densities. Gene expression of TNF-Î±, IL-1Î², IL-6 and IL-8 was evaluated by Real-Time PCR, and protein synthesis of these cytokines was determined by enzyme-linked immunosorbent (ELISA) assay. Data were statistically analyzed by the Kruskal-Wallis test, complemented by the Mann-Whitney test ($P < 0.05$). LPS treatment increased the gene expression and protein synthesis of TNF-Î±, IL-6 and IL-8, while the expression of IL-1Î² was not affected. For LPS-treated groups, LLLT promoted significant decreases in the expression of TNF-Î±, IL-6, and IL-8 at 1.5 J cm(-2) and 3 J cm(-2). These results demonstrate that LLLT promoted a beneficial biomodulatory effect on the expression of inflammatory cytokines related to oral mucositis by human gingival fibroblasts. Cytokines;Inflammation Mediators Cytokines;Humans;Inflammation Mediators;Lasers;Stomatitis

Assessment of the effect of laser irradiations at different wavelengths (660, 810, 980, and 1064 nm) on autophagy in a rat model of mucositis. It is known that high-dose radiation has an effect on tissue healing, but tissue healing does not occur when low dose radiation is applied. To clarify this issue, we compare the treatment success of low dose radiation with programmed cell death mechanisms on wounded tissue. In this study, we aimed to investigate the interactions of low and high-dose radiation using an autophagic mechanism. We included 35 adult Wistar-Albino rats in this study. All animals were injected with 100 mg/kg of 5-fluorouracil (5-FU) on the first day and 65 mg/kg of 5-FU on the third day. The tips of 18-gauge needles were used to develop a superficial scratching on the left cheek pouch mucosa by dragging in a linear movement on third and fifth days. After mucositis formation was clinically detected, animals were divided into five groups (nâ€‰=â€‰7). Different wavelengths of laser irradiations (1064 nm, Fidelis Plus, Fotona, Slovenia; 980 nm, FOX laser, A.R.C., Germany; 810 nm, Fotona XD, Fotona, Slovenia; 660 nm, HELBO, Medizintechnik GmbH, Wels, Austria) were performed on four groups once daily for 4 days. The laser irradiation was not performed on the control group. To get the tissue from the left cheek at the end of fourth day from all animals, oval excisional biopsy was performed. Molecular analysis assessments of pathological and normal tissue taken were performed. For this purpose, the expression analysis of autophagy genes was performed. The results were evaluated by normalization and statistics analysis. We found that Ulk1, Beclin1, and Atg5 expression levels were increased in the rats when the Nd:YAG laser was applied. This increase showed that a 1064-nm laser is needed to activate the autophagic mechanism. However, in the diode applications, we found that Beclin1, Atg10, Atg5, and Atg7 expressions numerically decreased. Atg5 is responsible for the elongation of autophagosome. Becn1 is a control gene in the control mechanism of autophagy. The reduction of the expression of these genes leads us to think that it may depend on the effect of drug (5-FU) used to form model. Expressions of therapeutic genes increase to ensure hemostasis, but in our study, expressions were found to decrease. More detailed studies are needed. Animals;Autophagy;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Mouth Mucosa;Mucositis;Rats;Rats, Wistar;Treatment Outcome

[The influence of pulsed low-intensity laser radiation of the red (635 nm) and infrared (904 nm) spectra on the human mesenchymal stem cells in vitro]. INTRODUCTION: Mesenchymal stem cells (MSC) have for a long time been an object of investigation with a view to elucidating the prospects for their application in clinical medicine and cosmetology. One of the approaches to the non-specific regulation of the activity of these cells at the stage of preliminary in vitro combination is the treatment with low-intensity laser radiation (LILR). The objective of the present study was to evaluate the possibility of using pulsed LILR of the infrared and red spectra for this purpose. MATERIAL AND METHODS: We used the 4th passage adhesive MSC cultures based at the umbilical

tissue of a donor who gave the informed consent to participate in the study. The source of illumination was a Lazmik-VLOK laser therapeutic apparatus (RU No RZN 2014/1410 dated 06.02.2014) with the matrix laser infrared radiation heads (wavelength 904 nm, light pulse length 108 ns, frequency 1500 Hz). The apparatus was operated either in the multi-frequency Lazmik regime [Moskvin S.V., 2014] with mean power density 0.05 and 0.14 mW/cm2 and the red spectrum (wavelength 635 nm, light pulse length 144 ns, frequency 1500 Hz) or in the multi-frequency Lazmik regime [Moskvin S.V., 2014] with mean power density 0.03 and 0.12. The exposition was 5 min in both regimes. CONCLUSION: The study has demonstrated that neither the morphological structure nor the viability of mesenchymal stem cells changed under the influence of energy and time parameters used in experiments. The number of cells was shown to slightly increase in comparison with control. The most pronounced effect was documented after illumination with pulse infrared (904 nm) LILR in the multi-frequency Lazmik regime. The maximum effect was observed during a period between days 1 and 3 of cultivation. Cell Culture Techniques;Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Humans;Infrared Rays;Low-Level Light Therapy;Mesenchymal Stem Cells;Time Factors

[Potentiation of the effect of peloid balneotherapy during the treatment of non-specific pains in the lower back]. The natural factors of the "Kluchi" resort are successfully used for the medical rehabilitation of the patients suffering from nonspecific pain in the lower back for a long time. The present comprehensive study of the painful psychovegetative status and the level of blood serotonin included 78 patients presenting with lumbar dorsopathy. After the course of the treatment based at the "Kluchi" health resort, the most significant improvement in the patient's condition was documented in the case of the combination of peloid balneotherapy with magnetic laser therapy and application of efthidermum MPE to the lumbar region. Anti-Inflammatory Agents;Ointments Administration, Cutaneous;Adult;Aged;Anti-Inflammatory Agents;Combined Modality Therapy;Female;Health Resorts;Humans;Low Back Pain;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Mud Therapy;Ointments;Pain Measurement;Russia

[The combined application of enhanced external counterpulsation for the rehabilitation of the patients presenting with coronary heart disease]. We have studied the influence of enhanced external counterpulsation (EECP) applied in the combination with gaseous carbon dioxide baths and infrared laser therapy on the dynamics of clinical and functional abnormalities in the patients presenting with coronary heart disease (CHD) including those after surgical myocardial revascularization. The study was conducted on 40 patients of whom 20 suffered from chronic coronary heart disease and FC II-III angina of effort and the remaining 20 ones presented with coronary artery disease following myocardial revascularization (including 5 patients six months after coronary bypass grafting (CBG) and 15 ones three months after translumbar angioplasty (TLAP) in the combination with stenting of the coronary arteries). The study demonstrated that EECP in the combination with gaseous carbon dioxide baths and infrared laser therapy produced anti-ischemic and antianginal effects, stimulated myocardial contractility, contributed to economization of the cardiac activity, increased exercise tolerance, myocardial and coronary reserves. These changes resulted in the improvement of both the psychological status and the quality of life of the patients. Carbon Dioxide Carbon Dioxide;Combined Modality Therapy;Counterpulsation;Echocardiography;Electrocardiography, Ambulatory;Heart Rate;Humans;Low-Level Light Therapy;Male;Middle Aged;Myocardial Ischemia;Prospective Studies;Treatment Outcome;Walking

Multiple sequential light and laser sources to activate aminolevulinic acid in the treatment of photodamage: A retrospective study. INTRODUCTION: The aim of this study was to retrospectively evaluate photodynamic therapy (PDT) with aminolevulinic acid (ALA) for cutaneous

photorejuvenation using blue light sequentially with red light, pulsed-dye laser (PDL), and/or intense pulsed light (IPL). MATERIALS AND METHODS: Ninety-six patients (121 treatments) had photodamage treated with field-directed ALA-PDT from 2001 to 2010 in this single-center study. Treatments were performed with blue light + PDL, blue light + IPL, blue light + PDL + IPL, or blue light + red light + PDL + IPL. Outcome measures were obtained via telephone questionnaire and graded on a four-point scale. RESULTS: There were no significant differences in patient-reported improvement in photodamage, overall skin quality, and postprocedure adverse events between treatment arms. However, number of patients in the blue light + red light + PDL + IPL group was markedly smaller (n = 2) than that in the other groups (n = 14-46). DISCUSSION: Although results showed a trend toward greater efficacy with similar tolerability using multiple, sequential light and laser sources with ALA-PDT for photorejuvenation, the potential for recall bias and widely disparate number of patients between treatment groups and follow-up times between patients severely limit this retrospective study. Nevertheless, despite these major statistical flaws, the results may provide valuable information regarding the safety of multiple modalities with PDT of photodamage in a single session. Aminolevulinic Acid Aminolevulinic Acid;Cosmetic Techniques;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Photochemotherapy;Rejuvenation;Retrospective Studies;Skin Aging

Light-emitting diode therapy (LEDT) before matches prevents increase in creatine kinase with a light dose response in volleyball players. Low-level laser (light) therapy (LLLT) has been applied over skeletal muscles before intense exercise (muscular pre-conditioning) in order to reduce fatigue and muscle damage (measured by creatine kinase, CK) in clinical trials. However, previous exercise protocols do not exactly simulate the real muscle demand required in sports. For this reason, the aim of this randomized and double-blind placebo-controlled trial was to investigate whether light-emitting diode therapy (LEDT) applied over the quadriceps femoris muscles, hamstrings, and triceps surae of volleyball players before official matches could prevent muscle damage (CK) with a dose response, establishing a therapeutic window. A professional male volleyball team (12 athletes) was enrolled in this study, and LEDT was applied before 4 matches during a national championship. LEDT used an array of 200 light-emitting diodes (LEDs) arranged in 25 clusters of 4 infrared LEDs (850â€‰Â±â€‰20 nm; 130 mW) and 25 clusters of 4 red LEDs (630â€‰Â±â€‰10 nm; 80 mW). Athletes were randomized to receive one of four different total doses over each muscle group in a double-blind protocol: 105 J (20 s), 210 J (40 s), 315 J (60 s), and placebo (no light for 30 s). CK in blood was assessed 1 h before and 24 h after each match. LEDT at 210 J avoided significant increases in CK (+10 %; Pâ€‰=â€‰0.993) as well as 315 J (+31 %, Pâ€‰=â€‰0.407). Placebo (0 J) allowed a significant increase in CK (+53 %; Pâ€‰=â€‰0.012) as well as LEDT at 105 J (+59 %; Pâ€‰=â€‰0.001). LEDT prevented significant increases of CK in blood in athletes when applied before official matches with a light dose response of 210-315 J, suggesting athletes might consider applying LEDT before competition. Creatine Kinase Adolescent;Adult;Creatine Kinase;Double-Blind Method;Exercise;Humans;Light;Low-Level Light Therapy;Male;Muscle, Skeletal;Quadriceps Muscle;Volleyball;Young Adult

Influence of laser photobiomodulation (GaAlAs) on salivary flow rate and histomorphometry of the submandibular glands of hypothyroid rats. The aim of this study was to analyze the influence of laser photobiomodulation in salivary flow, weight, and histomorphometry of the submandibular glands of hypothyroid rats. Fifty-six male Wistar albino rats were divided in euthyroid group and hypothyroid group, treated with propylthiouracil (PTU) to induce hypothyroidism. Each group was divided into control (without laser) and laser groups (GaAlAs): Î»660 nm (40 mW), Î»780 nm (40 mW), and Î»780 nm (70 mW). The laser application on the submandibular gland occurred after 2 weeks of PTU treatment and repeatedly during 2 weeks every 48 h. The rats were anesthetized,

tracheostomized, and the evaluation of the salivary flow rate (Î¼L/min/100 g body weight) was made by the weight of the saliva collected for 15 min from the first drop. After the animals' death, the glands were dissected and processed for histological analysis. There was an evident reduction of the salivary flow of hypothyroid rats in all groups in comparison to euthyroid group (Mann-Whitney test, pâ€‰<â€‰0.05). No significant difference was found in the salivary flow of rats that received laser photobiomodulation compared with their control groups. Histological analysis revealed a decrease in the parenchyma of the salivary glands of hypothyroid rats, but the laser was not able to reverse this process. Hypothyroid rats irradiated or not with laser showed acini and acinar cells with significantly smaller areas than euthyroid groups. The laser photobiomodulation protocol used was not able to change salivary flow or reverse the acinar atrophy process in the submandibular glands of hypothyroid rats. Animals;Hypothyroidism;Lasers, Semiconductor;Low-Level Light Therapy;Male;Organ Size;Rats;Rats, Wistar;Saliva;Submandibular Gland

Photobiomodulation in oral medicine: a review. Photobiomodulation (PBM) or low-level laser therapy (LLLT) in dentistry is an evolving science, with an increasing number of controlled clinical studies exploring its potential as a treatment modality. The present study provides an outline of the biologic mechanism of PBM and summarizes the findings of clinical studies of PBM for specific applications in oral medicine. Controversies and drawbacks associated with PBM, which require further research, are also identified. Current literature reports the potential of PBM in various applications in oral medicine. Furthermore, well-documented research confirms its efficacy in certain conditions, such as oral mucositis, recurrent herpes simplex infection, and burning mouth syndrome. The absence of any reported adverse effects is an advantage over conventional therapeutic modalities. While PBM has proved to be effective for some specific applications, it is not a panacea. The paucity in standardized studies, coupled with ambiguity over the laser parameters, has limited its credibility as a therapeutic modality. Burning Mouth Syndrome;Dentistry;Humans;Low-Level Light Therapy;Oral Medicine;Stomatitis

Can we treat knee osteoarthritis with photomedicine? Humans;Low-Level Light Therapy;Osteoarthritis, Knee

Effects of low-level laser therapy on changes in inflammation and in the activity of osteoblasts in the expanded premaxillary suture in an ovariectomized rat model. BACKGROUND AND OBJECTIVE: Osteoporosis is a progressive systemic skeletal disease characterized by reduced bone mass/density and microarchitectural deterioration of bone tissue. Bone formation initially exceeds bone resorption, but by the third decade, such formation is reversed, resulting in a net loss of bone mass. This resorption, in turn, increases bone fragility and susceptibility to fracture. This study aimed to evaluate the effects of low-level laser therapy (LLLT) on bone regeneration in the expanded premaxillary suture in an ovariectomized rat model. METHODS: Thirty-two 12-week-old female Wistar albino rats were used in the experiment. All of the animals underwent ovariectomy 3 months before the experiment. Expansion appliances were affixed to the maxillary incisors for the expansion of premaxillary sutures. The premaxillary sutures of the laser group were exposed to 5â€‰J/cm(2) laser energy, and no treatment was performed for the controls. All the rats in both groups were euthanized on either the 7th day (n=8) [end of expansion period; Laser Group 1(LG1) and Control Group 1 (CG1)] or the 17th day (n=8) [end of retention period; Laser Group 2 (LG2) and Control Group 2 (CG2)], respectively, for histological assessment. RESULTS: Histological findings indicated that the LG1 group showed a significantly higher number of osteoblasts than did the CG1 group (p=0.028). The CG1 and CG2 groups showed a significantly higher number of osteoclasts than did the LG1 and LG2 groups, respectively (p=0.005), (p=0.032). The LG2 group exhibited a capillary increase similar to that of the other groups, without statistically significant differences. CONCLUSIONS: On the basis of our methodology and results, we conclude that low-level laser associated with rapid maxillary expansion

influences bone regeneration in sutures, thereby accelerating healing, even in ovariectomized rats. We found that LLLT decreased osteoclastic activity in the ovariectomized rats. Therefore, preventing osteoporosis necessitates further investigations to clarify the effect of LLLT on postmenopausal patients. Animals;Female;Inflammation;Low-Level Light Therapy;Osteoblasts;Ovariectomy;Palatal Expansion Technique;Rats;Rats, Wistar

Low-level laser therapy modulates musculoskeletal loss in a skin burn model in rats. PURPOSE: To investigate the effectiveness of low-level laser therapy (LLLT) on gastrocnemius muscle morphology and Myod immunoexpression in a model of dorsal burn in rats. METHODS: Sixteen male Wistar rats were distributed into two groups: control group (CG): rats submitted to scald burn injury without treatment and laser treated group (LG): rats submitted to scald burn injury and treated with laser therapy. Fourteen days post-surgery, gastrocnemius muscle was evaluated being the specimens stained with HE and morphometric data was evaluated. MyoD expression was assessed by immunohistochemistry. RESULTS: The results showed that laser treated animals presented more organized tissue morphology compared to the non-treated animals, with a higher number of nucleus in the fibers. Also, the cross sectional area of the fibers and the MyoD immunoexpression in the laser treated groups was higher. CONCLUSION: Low-level laser therapy had positive effects on gastrocnemius muscle, improving tissue muscle morphology, increasing cross sectional area and MyoD immunoexpression. MyoD Protein Animals;Burns;Cell Count;Disease Models, Animal;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle Fibers, Skeletal;Muscle, Skeletal;MyoD Protein;Rats, Wistar;Reproducibility of Results;Skin;Time Factors;Treatment Outcome

Effect of low-level laser therapy in an experimental model of osteoarthritis in rats evaluated through Raman spectroscopy. OBJECTIVE: This work aimed to investigate the biochemical changes associated with low-level laser therapy (LLLT) using 660 and 780â€‰nm, on a well-established experimental model of osteoarthritis (OA) in the knees of rats with induced collagenase, using histomorphometry and Raman spectroscopy. MATERIALS AND METHODS: Thirty-six Wistar rats were divided into four groups: control (GCON, n=9), collagenase without treatment (GCOL, n=9), collagenase with LLLT 660â€‰nm treatment (G660, n=8), and collagenase with LLLT 780â€‰nm treatment (G780, n=10). LLLT protocol was: 30â€‰mW power output, 10â€‰sec irradiation time, 0.04â€‰cm(2) spot size, 0.3â€‰J energy, 0.75â€‰W/cm(2) irradiance, and 7.5â€‰J/cm(2) fluence per session per day, during 14 days. Then, knees were withdrawn and submitted to histomorphometry and Raman spectroscopy analysis. Principal components analysis (PCA) and Mahalanobis distance were employed to characterize the spectral findings. RESULTS: Histomorphometry revealed a significant increase in the amount of collagen III for the group irradiated with 660â€‰nm. The Raman bands at 1247, 1273, and 1453â€‰cm(-1) (from principal component score PC2), attributed to collagen type II, and 1460â€‰cm(-1) (from PC3), attributed to collagen type III, suggested that the LLLT causes acceleration in cellular activity, especially on the cells that repair cartilage, accelerating the breakdown of cartilage destroyed by collagenase and stimulating the fibroblast to synthesize repairing collagen III. CONCLUSIONS: LLLT accelerated the initial breakdown of cartilage destroyed by collagenase and stimulated the fibroblast to synthesize the repairing collagen III, suggesting a beneficial effect of LLLT on OA. Collagenases Animals;Collagenases;Low-Level Light Therapy;Osteoarthritis;Rats;Rats, Wistar;Spectrum Analysis, Raman

[Laser speckle-based method for binocular vision recovery in diploptic treatment of concomitant strabismus]. OBJECTIVE: to investigate the effectiveness of the method of "dissociation" for concomitant strabismus treatment, which involves laser speckles and polaroid separation of visual fields. MATERIAL AND METHODS: A total of 40 patients with different types of concomitant strabismus and the average age of 9.8 years were enrolled. The treatment method implies the use of

the Forbis device with polaroid separation of visual fields and low-energy helium-neon laser speckle patterns (green and red, 0.53 pm and 0.65 pm correspondingly). Binocular vision recovery was performed in the conditions of alternating exertion and relaxation of accommodation obtained through plus and minus spherical lenses. CONCLUSIONS: The method ensures an increase in the number of individuals capable of stereopsis from 31.2-44.4% (conventional treatment) to 54.4% as well as widening of the range of tolerated plus/minus spherical lenses, in which the binocular fusion is retained at the same degree of convergence. Accommodation, Ocular;Child;Depth Perception;Diagnostic Techniques, Ophthalmological;Female;Humans;Low-Level Light Therapy;Male;Photic Stimulation;Strabismus;Treatment Outcome;Vision, Binocular;Visual Acuity

Low Level Laser Therapy for chronic knee joint pain patients. BACKGROUND AND AIMS: Chronic knee joint pain is one of the most frequent complaints which is seen in the outpatient clinic in our medical institute. In previous studies we have reported the benefits of low level laser therapy (LLLT) for chronic pain in the shoulder joints, elbow, hand, finger and the lower back. The present study is a report on the effects of LLLT for chronic knee joint pain. MATERIALS AND METHODS: Over the past 5 years, 35 subjects visited the outpatient clinic with complaints of chronic knee joint pain caused by the knee osteoarthritis-induced degenerative meniscal tear. They received low level laser therapy. A 1000 mW semi-conductor laser device was used to deliver 20.1 J/cm(2) per point in continuous wave at 830nm, and four points were irradiated per session (1 treatment) twice a week for 4 weeks. RESULTS: A visual analogue scale (VAS) was used to determine the effects of LLLT for the chronic pain and after the end of the treatment regimen a significant improvement was observed ($p<0.001$). After treatment, no significant differences were observed in the knee joint range of motion. Discussions with the patients revealed that it was important for them to learn how to avoid postures that would cause them knee pain in everyday life in order to have continuous benefits from the treatment. CONCLUSION: The present study demonstrated that 830 nm LLLT was an effective form of treatment for chronic knee pain caused by knee osteoarthritis. Patients were advised to undertake training involving gentle flexion and extension of the knee.

The effect of LLLT on bone metabolism in children with severe cerebral palsy (a secondary publication). BACKGROUND AND AIMS: It is said that the average frequency of bone fracture in hospitalized children with severe cerebral palsy (unable to remain seated) is 1% (0.2 to 2.0%). Cerebral palsy patients' bones are known to be vulnerable to fracture, and refractory bone atrophy may be observed. However, the effect of low level laser therapy (LLLT) on bone density or bone metabolism has not been fully investigated. In recent years, tests for bone density or bone metabolism markers have become available. MATERIAL AND METHODS: In this study, we evaluated changes in bone density and bone metabolism markers in 4 children with severe cerebral palsy who underwent LLLT for an average of 22 days. RESULTS: B-ALP, a marker of ossification, increased 1 month after the start of irradiation in 3 of the 4 subjects and returned to a level close to the pre-irradiation level 2 months after the start of irradiation. In the remaining subjects in whom B-ALP failed to increase, B-ALP had been low before irradiation. Urinary N-terminal telopeptide (NTx) levels, a marker of bone resorption, decreased in 3 of the 4 subjects after the start of irradiation and remained low even 10 months later. Serum NTx levels tended to decrease in 3 of the 4 subjects. The levels of serum NTx/Crea, Deoxy-Pyridinoline (DPd) and DPd/Crea (DPd/Crea) also decreased in 3 of the 4 subjects. Transient decreases in intact parathyroid hormone (PTH) levels were observed in all 4 cases. Changes were particularly apparent in 2 cases: one with high NTx levels, which showed enhanced bone resorption, and one with high PTH levels, probably due to a vitamin D (VitD) deficiency. Although the metacarpal bone density measured by DIP was found to be lower than in normal children, there were no changes due to LLLT. CONCLUSION: These results suggest that LLLT has a positive influence on bone metabolism in that it temporarily increases bone formation and

suppresses bone resorption while also tending to improve secondary hyperparathyroidism caused by VitD deficiency. Enhanced bone resorption in the case with high NTx levels was noteworthy, together with marked changes in the case with high PTH levels due to VitD deficiency. These positive influences on bone metabolism merit attention as potential new indications of LLLT.

Laser treatment of periocular skin conditions. Advances in laser technology in recent decades have increased the options for the treatment of dermatologic conditions of the eye and eyelid. Benign tumors can be laser-ablated with relative ease, and vascular and melanocytic lesions can be precisely targeted with modern lasers. In this contribution, we review treatment of periocular pigmented lesions, including melanocytic nevi and nevus of Ota; vascular lesions including telangiectasias, port wine stains, and infantile hemangiomas; hair removal; eyeliner tattoo removal; laser ablation of common benign periocular tumors, such as syringomas, xanthelasma, milia, and seborrheic keratoses; and laser resurfacing. The recent advent of fractionated laser technology has resulted in dramatically decreased healing times for periocular skin resurfacing and fewer adverse effects. Fractionated laser resurfacing has now nearly supplanted traditional full-field laser resurfacing, and safe treatment of rhytides on the thin skin of the eyelids is possible. Proper eye protection is, of course, essential when using lasers near the eye. Patient preparation, safety precautions, and risks--intraocular and extraocular--are discussed herein. As laser technology continues to advance, we are sure to see improvements in current treatments, as well as development of new applications of cutaneous lasers. Eye;Eyelid Neoplasms;Facial Dermatoses;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Risk Assessment;Skin Diseases;Skin Neoplasms;Treatment Outcome

Low level laser therapy against radiation induced oral mucositis in elderly head and neck cancer patients-a randomized placebo controlled trial. OBJECTIVES: Radiotherapy (RT) is treatment of choice for Elderly Head and Neck Cancer (HNC) patients. Oral mucositis (OM) during RT affects patient's routine oral activities and overall health. Low Level Laser Therapy (LLLT) provided some promising results against cancer therapy induced OM in children and adults. No study specifically evaluated effects of LLLT against RT induced OM in elderly HNC patients until date, hence we did this study. MATERIAL AND METHODS: This double blinded study randomized 46 elderly HNC patients scheduled for RT [Dosage=66 Gray (2 Gy/fraction), 5 fractions/week, total 33 fractions for 6.5 weeks], into laser (22) and placebo (24) groups. Laser group patients received LLLT [Helium-Neon, Î»=632.8 nm, power density=0.024 W/cm(2), dosage=3.0 J/point at six anatomical sites bilaterally i.e. 12 locations, total dose/session=36 J, beam aperture diameter=0.6 mm, beam spot size=1 cm(2), irradiated area diameter=1 cm(2), irradiation time/point=125 s, 5 sessions/week, non-contact method-distance between probe and irradiated tissues <1 cm, whereas placebo group did not receive laser. OM grades (RTOG/EORTC Scale), oral pain, weight loss, need for morphine analgesics and tube feeding, and RT break were recorded by a blinded assessor. Descriptive statistics and repeated measures ANOVA were used for analysis keeping $p<0.05$. RESULTS: Significant reduction in the incidence and duration of severe OM ($p=0.016$) and severe pain ($p=0.023$) and weight loss ($p=0.004$) was observed in laser than placebo group. No difference was found for enteral feeding use ($p=0.667$) between two groups. CONCLUSIONS: LLLT decreased the severity of OM and oral pain in elderly HNC patients. Also, lesser weight loss, morphine analgesic use and radiation break happened in laser group. Aged;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Placebo Effect;Radiation Injuries;Stomatitis

Laser therapy reduces gelatinolytic activity in the rat trigeminal ganglion during temporomandibular joint inflammation. OBJECTIVES: To investigate whether low-level laser therapy (LLLT) alters the expression and activity of MMP-2 and MMP-9 in the trigeminal ganglion (TG) during different stages of temporomandibular joint (TMJ) inflammation in rats. It also evaluated whether LLLT modifies

mechanical allodynia and orofacial hyperalgesia. MATERIALS AND METHODS: Wistar rats (Â±250Â g) were divided into groups that received saline (SAL) or complete Freund's adjuvant (CFA, 50Â Î¼l) in the TMJ, and that later underwent LLLT (20Â JÂ cm(-2)) at their TMJ or not (groups SAL, SALÂ +Â LLLT, CFA, and CFAÂ +Â LLLT). LLLT was applied on days 3, 5, 7, and 9 after SAL or CFA. Mechanical allodynia was evaluated on days 1, 3, 5, 7, and 10; orofacial hyperalgesia was assessed on day 10. Gelatin zymography and in situ zymography aided quantification of MMPs in the TG. RESULTS: Low-level laser therapy abolished the reduction in the mechanical orofacial threshold and the increase in orofacial rubbing during the orofacial formalin test induced by CFA. LLLT also decreased the CFA-induced rise in the levels of MMP-9 and MMP-2 as well as the gelatinolytic activity in the TG. CONCLUSION: Low-level laser therapy could constitute an adjuvant therapy to treat temporomandibular disorders and prevent inflammation-induced alterations in the levels of MMP-2 and MMP-9 and in the gelatinolytic activity in TGs. Sodium Chloride;Gelatin;Freund's Adjuvant;Collagenases;Matrix Metalloproteinase 2;Mmp2 protein, rat;Matrix Metalloproteinase 9 Animals;Arthritis, Experimental;Collagenases;Facial Pain;Freund's Adjuvant;Gelatin;Hyperalgesia;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Rats;Rats, Wistar;Sodium Chloride;Temporomandibular Joint;Temporomandibular Joint Disorders;Trigeminal Ganglion

Did human hairlessness allow natural photobiomodulation 2 million years ago and enable photobiomodulation therapy today? This can explain the rapid expansion of our genus's brain. Present hypotheses to explain human hairlessness appear to be inadequate because hairlessness is not accompanied by any immediate benefit. A new, testable, hypothesis is advanced to explain our hairlessness based on photobiomodulation research, also known as low-level light therapy. This shows that red and near infrared radiation has a very beneficial effect on superficial tissues, including the brain. Random mutation/s resulting in complete hairlessness allowed early humans to receive daily doses of red and near infrared radiation at sunset. Photobiomodulation research shows this has a twofold effect: it results in increased mitochondrial respiratory chain activity with consequent ATP 'extrasynthesis' in all superficial tissues, including the brain. It also advantageously affects the expression of over 100 genes through the activation of transcription factor NFkB which results in cerebral metabolic and haemodynamic enhancement. It is also possible that melanin can supply electrons to the respiratory chain resulting in ATP extrasynthesis. These effects would start automatically as soon as hairlessness occurred resulting in a selective sweep of the mutation/s involved. This was followed by the very rapid brain evolution of the last 2 my which, it is suggested, was due to intelligence-led evolution based initially on the increased energy and adeptness of the newly hairless individuals. Biological Evolution;Brain;Hair;Humans;Light;Low-Level Light Therapy;Models, Biological

Near infrared light mitigates cerebellar pathology in transgenic mouse models of dementia. We previously reported that Alzheimer-related pathology in cerebral cortex of APP/PS1 and K3 tau transgenic mouse strains is mitigated by near infrared light (NIr). Here, we extend these observations to the cerebellum. One month of NIr treatment mitigated the deposition of Î²-amyloid in cerebellar cortex of APP/PS1 mice, and the formation of neurofibrillary tangles, the hyperphosphorylation of tau, the damage caused by oxidative stress and the downregulation of cytochrome oxidase expression by Purkinje cells in the cerebellar cortex of K3 mice. These findings show the ability of NIr to mitigate degeneration in many - probably all - regions of the mouse brain. Amyloid beta-Protein Precursor;Presenilin-1;tau Proteins Amyloid beta-Protein Precursor;Animals;Cerebellum;Dementia;Disease Models, Animal;Infrared Rays;Low-Level Light Therapy;Mice, Transgenic;Mitochondria;Oxidative Stress;Plaque, Amyloid;Presenilin-1;tau Proteins

Time response of increases in ATP and muscle resistance to fatigue after low-level laser (light) therapy (LLLT) in mice. Recently, low-level laser (light) therapy has been used to increase muscle performance in intense exercises. However, there is a lack of understanding of the time response of muscles to light therapy. The first purpose of this study was to determine the time response for light-emitting diode therapy (LEDT)-mediated increase in adenosine triphosphate (ATP) in the soleus and gastrocnemius muscles in mice. Second purpose was to test whether LEDT can increase the resistance of muscles to fatigue during intense exercise. Fifty male Balb/c mice were randomly allocated into two equal groups: LEDT-ATP and LEDT-fatigue. Both groups were subdivided into five equal subgroups: LEDT-sham, LEDT-5 min, LEDT-3 h, LEDT-6 h, and LEDT-24 h. Each subgroup was analyzed for muscle ATP content or fatigue at specified time after LEDT. The fatigue test was performed by mice repeatedly climbing an inclined ladder bearing a load of 150 % of body weight until exhaustion. LEDT used a cluster of LEDs with 20 red (630â€‰Â±â€‰10 nm, 25 mW) and 20 infrared (850â€‰Â±â€‰20 nm, 50 mW) delivering 80 mW/cm(2) for 90 s (7.2 J/cm(2)) applied to legs, gluteus, and lower back muscles. LEDT-6 h was the subgroup with the highest ATP content in soleus and gastrocnemius compared to all subgroups (Pâ€‰<â€‰0.001). In addition, mice in LEDT-6 h group performed more repetitions in the fatigue test (Pâ€‰<â€‰0.001) compared to all subgroups: LEDT-sham and LEDT-5 min (~600 %), LEDT-3 h (~200 %), and LEDT-24 h (~300 %). A high correlation between the fatigue test repetitions and the ATP content in soleus (râ€‰=â€‰0.84) and gastrocnemius (râ€‰=â€‰0.94) muscles was observed. LEDT increased ATP content in muscles and fatigue resistance in mice with a peak at 6 h. Although the time response in mice and humans is not the same, athletes might consider applying LEDT at 6 h before competition. Adenosine Triphosphate Adenosine Triphosphate;Animals;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Muscle Fatigue;Muscle, Skeletal;Physical Exertion

Modulating Heat Shock Proteins 70 and 90 Expression by Low Power Laser Irradiation (635nm and 780nm) in Jurkat E6.1 T-lymphocyte Leukemia Cell Line. INTRODUCTION: Heat shock proteins (HSPs) are molecular chaperones involved in protein folding, stability and turnover, and due to their role in cancer progression, the effect of low power laser irradiation (LPLI) on the expression of HSP70 and HSP90 in Jurkat E6.1 T-lymphocyte leukemia (JELT) cell line was investigated in vitro. METHODS: JETL cells were irradiated with LPLI at 635nm and 780m wavelengths (energy density 9.174 J/cm(2)), and assessed for the expression of HSP70 and HSP90 by flow cytometry after 24, 48 and 72 incubation time periods (ITPs). RESULTS: At 24 hours ITP post-irradiation, control cultures showed that 10.7% of cells expressed HSP70, while LPLI cultures at 635nm and 780nm manifested a higher expression (32.1and 21.3%, respectively), and the difference was significant (P â‰¤ 0.05). However, at 48 hours ITP, the three means were decreased but approximated (5.6, 4.9 and 6.2%, respectively), while at 72 hours ITP, they were markedly increased (45.2, 76.5 and 66.7%, respectively). In contrast, HSP90 responded differently to LPLI. At 24 hours ITP, control cultures and 780nm cultures showed a similar expression (55.9 and 55.9%, respectively), but both means were significantly higher than that of 635nm cultures (24.0%). No such difference was observed at 48 hours ITP, and at 72 hours ITP, control cultures and 635nm cultures shared approximated means (31.7 and 35.6%, respectively); but both means were significantly higher than the observed mean in 780nm cultures (15.2%). CONCLUSION: The results highlighted that HSP70 and HSP90 expression responded differently to LPLI in JETL cells; an observation that may pave the way for further investigations in malignant cells.

Laser irradiation on growth of trichophyton rubrum: an in vitro study. INTRODUCTION: Trichophyton rubrum is one of the most common species of dermatophytes which affects superficial keratinous tissue. It is not especially virulent but it can be responsible for considerable morbidity. Although there are different therapeutic modalities to treat fungal infections, clinicians are searching for alternative treatment because of the various side effects of the present therapeutic methods. As a

new procedure, Laser therapy has brought on many advantages in clinical management of dermatophytes. Possible inhibitory potential of laser irradiation on fungal colonies was investigated invitro in this study. METHODS: A total of 240 fungal plates of standard size of trichophyton rubrum colonies that had been cultured from the lesions of different patients at the mycology laboratory, were selected. Each fungal plate was assigned as control or experimental group. Experimental plates were irradiated by a laser system (low power laser or different wavelength of high power laser). The effects of different laser wavelengths and energies on isolated colonies were assessed. After laser irradiation, final size of colonies was measured on the first, the 7th and the 14th day after laser irradiation. RESULTS: Although low power laser irradiation did not have any inhibitory effect on fungal growth, the Q-Switched Neodymium-Doped Yttrium Aluminium Garnet (Nd:YAG) laser 532nm at 8j/cm(2), Q-Switched Nd:YAG laser 1064nm at 4j/cm(2) to 8j/cm(2) and Pulsed dye laser 595nm at 8j/cm(2) to 14j/cm(2) significantly inhibited growth of trichophyton rubrum in vitro. CONCLUSION: Q-Switched Nd:YAG 532nm at 8j/cm(2), Q-Switched Nd:YAG laser 1064nm at 4j/cm(2) to 8j/cm(2) and pulsed dye laser (PDL) 595nm at 8j/cm(2) to 14j/cm(2) can be effective to suppress trichophyton rubrum growth.

The intravenous laser blood irradiation in chronic pain and fibromyalgia. Intravenous laser blood irradiation was first introduced into therapy by the Soviet scientists EN.Meschalkin and VS.Sergiewski in 1981. Originally this method was developed for the treatment of cardiovascular diseases. Improvement of rheologic properties of the blood as well as improvement of microcirculation and reduction of the area of infarction has been proved. Further, reduction of dysrhythmia and sudden cardiac death was achieved. At first, only the Helium-Neon laser (632.8 nm) was used in this therapy. For that, a power of 1-3mW and a period of exposure of 20-60 minutes were applied. The treatments were carried out once or twice a day up to ten appointments in all1. In the years after, many, and for the most part Russian studies showed that helium-neon laser had various effects on many organs and on the hematologic and immunologic system. The studies were published mainly in Russian which were little known in the West because of decades of political separation, and were regarded with disapproval. Besides clinical research and application for patients, the cell biological basis was developed by the Estonian cell biologist Tiina Karu at the same time. An abstract is to be found in her work "The Science of Low-Power Laser-Therapy"

Tooth movement alterations by different low level laser protocols: a literature review. Low-Level Laser Therapy (LLLT) provides several benefits for patients receiving orthodontic treatment. According to some literatures, Orthodontic Tooth Movement (OTM) can be enhanced but some investigators have reported contradictory results. This article reviews the literature regarding the different aspects of the use of LLLT on OTM and its alterations. The general data regarding the study design, sample size, wavelength (nm), power (mW), and duration were extracted and recorded independently. Electronic databases of PubMed and ScienceDirect from January 2009 to August 2014 were searched. Also Google Scholar and grey literature was searched for relevant references. Some investigators found that the amount of tooth movement in the Low-Energy Laser Irradiation (LELI) group was significantly greater than in the nonirradiation group by the end of the experimental period. Low-level laser irradiation accelerates the bone remodeling process by stimulating osteoblastic and osteoclastic cell proliferation and function during orthodontic tooth movement. But some researchers have reported that no statistical differences in the mean rate of tooth movement were noted between low energy and high energy experimental sides and their controls. Some evidence shows that low-level laser irradiation accelerates the bone remodeling process and some evidence shows that LLLT has not effect on OTM. In some investigations no statistical differences in the mean rate of tooth movement can be seen between low energy and high energy experimental sides and their controls. It has been shown by authors that laser irradiation can reduce the amount of

OTM and a clinical usage for the inhibitory role of low level laser irradiation is enforcing the anchorage unit.

Bisphenol a promotes cell survival following oxidative DNA damage in mouse fibroblasts. Bisphenol A (BPA) is a biologically active industrial chemical used in production of consumer products. BPA has become a target of intense public scrutiny following concerns about its association with human diseases such as obesity, diabetes, reproductive disorders, and cancer. Recent studies link BPA with the generation of reactive oxygen species, and base excision repair (BER) is responsible for removing oxidatively induced DNA lesions. Yet, the relationship between BPA and BER has yet to be examined. Further, the ubiquitous nature of BPA allows continuous exposure of the human genome concurrent with the normal endogenous and exogenous insults to the genome, and this co-exposure may impact the DNA damage response and repair. To determine the effect of BPA exposure on base excision repair of oxidatively induced DNA damage, cells compromised in double-strand break repair were treated with BPA alone or co-exposed with either potassium bromate (KBrO3) or laser irradiation as oxidative damaging agents. In experiments with KBrO3, co-treatment with BPA partially reversed the KBrO3-induced cytotoxicity observed in these cells, and this was coincident with an increase in guanine base lesions in genomic DNA. The improvement in cell survival and the increase in oxidatively induced DNA base lesions were reminiscent of previous results with alkyl adenine DNA glycosylase-deficient cells, suggesting that BPA may prevent initiation of repair of oxidized base lesions. With laser irradiation-induced DNA damage, treatment with BPA suppressed DNA repair as revealed by several indicators. These results are consistent with the hypothesis that BPA can induce a suppression of oxidized base lesion DNA repair by the base excision repair pathway. Benzhydryl Compounds;Bromates;Phenols;potassium bromate;Guanine;DNA;bisphenol A Animals;Benzhydryl Compounds;Bromates;Cell Line;Cell Survival;DNA;DNA Damage;DNA Repair;Fibroblasts;Guanine;Low-Level Light Therapy;Mice;Oxidative Stress;Phenols

Photomodulation of proliferation and differentiation of stem cells by the visible and infrared light. OBJECTIVE: The aim of this article is to review experimental studies of visible and infrared light irradiation of human and animal stem cells (SCs) in vitro and in vivo to assess photobiomodulation effects on their proliferation and differentiation. BACKGROUND DATA: The clinical application of light irradiation remains controversial, primarily because of the complexity of the rational choice of irradiation parameters. In laboratories, the theoretical justification underlying the choice of irradiation parameters also remains a challenge. METHODS: A systematic review was completed of original research articles that investigated the effects of light irradiation on human and animal SCs in vitro and in vivo (to June 2014). Relevant articles were sourced from PubMed and MEDLINE(Â®). The search terms were laser (light) therapy (irradiation), stem cells, and phototherapy, stem cells. RESULTS: The analysis revealed the importance of cell type when choosing the cell irradiation parameters. The influence of wavelength on the SC proliferation rate seemed to be nonsignificant. The high values of increased proliferation or differentiation were obtained using high power density, low energy density, and short exposure time. SC exposure to light without inducers did not lead to their differentiation. The maximum differentiation was achieved using irradiation parameters different from the ones needed to achieve the maximum proliferation of the same cells. CONCLUSIONS: Increased power density and reduced energy density were needed to increase the SC response. Based on the analysis, we have presented a graph of the cell response to generalized photostimulus, and introduced the concepts of "photostress" and "photoshock" to describe the stages of this response. Cell Differentiation;Cell Proliferation;In Vitro Techniques;Infrared Rays;Light;Stem Cells

Modulation of extracellular ATP content of mast cells and DRG neurons by irradiation: studies on underlying mechanism of low-level-laser therapy. Low-level-laser therapy (LLLT) is an effective

complementary treatment, especially for anti-inflammation and wound healing in which dermis or mucus mast cells (MCs) are involved. In periphery, MCs crosstalk with neurons via purinergic signals and participate in various physiological and pathophysiological processes. Whether extracellular ATP, an important purine in purinergic signaling, of MCs and neurons could be modulated by irradiation remains unknown. In this study, effects of red-laser irradiation on extracellular ATP content of MCs and dorsal root ganglia (DRG) neurons were investigated and underlying mechanisms were explored in vitro. Our results show that irradiation led to elevation of extracellular ATP level in the human mast cell line HMC-1 in a dose-dependent manner, which was accompanied by elevation of intracellular ATP content, an indicator for ATP synthesis, together with [Ca(2+)]i elevation, a trigger signal for exocytotic ATP release. In contrast to MCs, irradiation attenuated the extracellular ATP content of neurons, which could be abolished by ARL 67156, a nonspecific ecto-ATPases inhibitor. Our results suggest that irradiation potentiates extracellular ATP of MCs by promoting ATP synthesis and release and attenuates extracellular ATP of neurons by upregulating ecto-ATPase activity. The opposite responses of these two cell types indicate complex mechanisms underlying LLLT. Adenosine Triphosphate Adenosine Triphosphate;Animals;Cell Line;Ganglia, Spinal;Humans;Laser Therapy;Male;Mast Cells;Neurons;Rats;Rats, Sprague-Dawley;Skin

Regulation of lipid production by light-emitting diodes in human sebocytes. Light-emitting diodes (LED) have been used to treat acne vulgaris. However, the efficacy of LED on sebaceous lipid production in vitro has not been examined. This study investigated the efficacy of 415 nm blue light and 630 nm red light on lipid production in human sebocytes. When applied to human primary sebocytes, 415 nm blue light suppressed cell proliferation. Based on a lipogenesis study using Oil Red O, Nile red staining, and thin-layered chromatography, 630 nm red light strongly downregulated lipid production in sebocytes. These results suggest that 415 nm blue light and 630 nm red light influence lipid production in human sebocytes and have beneficial effects on acne by suppressing sebum production. Lipids Acne Vulgaris;Cell Proliferation;Cells, Cultured;Chromatography, Thin Layer;Humans;Lasers, Semiconductor;Lipids;Lipogenesis;Low-Level Light Therapy;Primary Cell Culture;Sebaceous Glands;Sebum

Low-level laser therapy as an antimicrobial and antibiofilm technology and its relevance to wound healing. The biostimulative effect of low-level laser therapy (LLLT) in tissues has been noted in reference to the treatment of various diseases but little information exists on its effectiveness on chronic wounds and biofilm. The scope of this review was to identify literature reporting on LLLT alone, without photodynamic agents, as an antimicrobial/antibiofilm technology and determine its effects on wound healing. Overall the beneficial effects of LLLT in promoting wound healing in animal and human studies has been demonstrated. However, the lack of credible studies using reproducible models and light dosimetry restricts the analysis of current data. Efforts must be addressed to standardize phototherapy procedures as well as to develop suitable in vitro and in vivo biofilm models to test LLLT efficacy in promoting biofilm eradication and wound healing. Animals;Bacteria;Biofilms;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Wound Healing;Wound Infection

The influence of low-level laser therapy with alendronate irrigation on healing of bone defects in rats. The aim of this study was to investigate the effects of alendronate (Aln) irrigation with low-level laser therapy (LLLT) on the healing of bone defects in rats. Sixty Wistar rats weighing 250 to 300 g were randomly divided into three groups of 20 animals each: (1) control group, (2) Aln group, and (3) Aln with LLLT group. The distal epiphysis of all rats was perforated with a surgical bone drill. Twenty rats served as control. The bone defects of 40 rats received local alendronate sodium trihydrate irrigation (1 mg/ml) at the time of surgery. LLLT was applied to the bone defects of 20 rats immediately after Aln irrigation, and repeated on days 2, 4, 6, and 8 with a total dose of 10 J/cm(2) (2 J/cm(2)â€‰Ã—

â€‰5). Continuous wave of GaAlAs laser (808 nm) was used with a power density of 0.1 W/cm(2). Laser energy was applied for 20 s (0.1 Wâ€‰Ã—â€‰20 s/1 cm(2)) per session. Control group, Aln group, and Aln with LLLT group rats were sacrificed at days 10 and 20 to compare the bone healing of each group histologically. There were significant differences between the three groups regarding union, substantia spongiosa, cortex formation, and in sum of histologic scores on days 10 and 20 (Pâ€‰<â€‰0.0001). Our findings demonstrated that Aln has a more positive effect with LLLT on bone healing in rats. It was concluded that combining LLLT (808 nm laser at 10 J/cm(2)) with Aln irrigation has a beneficial effect in bone repair. It was demonstrated experimentally that Aln irrigation during the surgery had a significant effect to enhance bone formation, and LLLT significantly potentiated the osseous healing effects of Aln on bone defects. This administration method is able to minimize the dose of Aln in order to avoid both systemic and local adverse effects as well as the local injection times during the bone healing process. Bone Density Conservation Agents;Alendronate Alendronate;Animals;Bone Density Conservation Agents;Bone Regeneration;Chemoradiotherapy;Femur;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Rats;Rats, Wistar;Therapeutic Irrigation;Wound Healing

Organic light emitting diode improves diabetic cutaneous wound healing in rats. A major complication for diabetic patients is chronic wounds due to impaired wound healing. It is well documented that visible red wavelengths can accelerate wound healing in diabetic animal models and patients. In vitro and in vivo diabetic models were used to investigate the effects of organic light emitting diode (OLED) irradiation on cellular function and cutaneous wound healing. Human dermal fibroblasts were cultured in hyperglycemic medium (glucose concentration 180â€‰mM) and irradiated with an OLED (623â€‰nm wavelength peak, range from 560 to 770â€‰nm, power density 7 or 10â€‰mW/cm2 at 0.2, 1, or 5â€‰J/cm2). The OLED significantly increased total adenosine triphosphate concentration, metabolic activity, and cell proliferation compared with untreated controls in most parameters tested. For the in vivo experiment, OLED and laser (635â€‰Â±â€‰5â€‰nm wavelength) treatments (10â€‰mW/cm2 , 5â€‰J/cm2 daily for a total of seven consecutive days) for cutaneous wound healing were compared using a genetic, diabetic rat model. Both treatments had significantly higher percentage of wound closure on day 6 postinjury and higher total histological scores on day 13 postinjury compared with control. No statistical difference was found between the two treatments. OLED irradiation significantly increased fibroblast growth factor-2 expression at 36-hour postinjury and enhanced macrophage activation during initial stages of wound healing. In conclusion, the OLED and laser had comparative effects on enhancing diabetic wound healing. Animals;Cell Proliferation;Diabetes Mellitus, Experimental;Fibroblasts;Immunohistochemistry;Laser Therapy;Light;Low-Level Light Therapy;Male;Rats;Rats, Zucker;Skin;Skin Ulcer;Wound Healing

Properties of the tibialis anterior muscle after treatment with laser therapy and natural latex protein following sciatic nerve crush. INTRODUCTION: In this study we evaluated the characteristics of the tibialis anterior muscle after sciatic nerve crush and treatment with low-level laser therapy (LLLT) or the protein from natural latex (P1). METHODS: We studied the following 6 groups of male Wistar rats: control (CG); exposed nerve (EG); injured nerve (IG); injured nerve with LLLT (LG); injured nerve with P1 (PG); and injured nerve with P1 and LLLT (LPG). RESULTS: After 4 weeks, muscle morphology showed improvement in the treated groups; after 8 weeks, the treated groups resembled controls, especially the PG. Morphometry revealed muscle fiber atrophy after nerve injury, with time-dependent recovery. Histochemical analysis revealed increased intermediate fiber area. The PG was more similar to controls with NADH staining, whereas the LPG more closely resembled controls with SDH staining. CONCLUSION: Treatment using only P1 proved most efficient, revealing a negative

interaction between P1 and LLLT. Latex Animals;Hevea;Laser Therapy;Latex;Low-Level Light Therapy;Male;Nerve Crush;Rats;Rats, Wistar;Sciatic Neuropathy;Treatment Outcome

Oral mucositis in pediatric patients undergoing hematopoietic stem cell transplantation: clinical outcomes in a context of specialized oral care using low-level laser therapy. OM is a painful inflammatory condition of the oral mucosa, derived from the toxic effects of chemotherapy and radiotherapy. High OM severity is frequently present in HSCT pediatric patients, who exhibit multiple painful ulcers that limit their mastication and swallowing, leading to poor nutritional status. Few studies have demonstrated OM clinical outcomes in young patients undergoing HSCT. Feasibility of oral care and LLLT on OM prophylaxis and treatment is also poorly discussed. The aim of this study was to describe a specialized oral care protocol that included LLLT for pediatric patients undergoing transplantation and to demonstrate the clinical outcomes after OM prevention and treatment. Data from OM-related morbidity were collected from 51 HSCT pediatric patients treated daily with LLLT, followed by standard oral care protocols. All the patients, even infants and young children, accepted the daily oral care and LLLT well. The majority (80.0%) only exhibited erythema in the oral mucosa, and the maximum OM degree was WHO II. Patients who had undergone autologous and HLA-haploidentical transplants showed OM with the lowest severity. The frequency of total body irradiation and methotrexate prescriptions was higher in adolescents when compared with infants (pÂ =Â 0.044), and adolescents also exhibited OM more severely than infants and young children. We found that good clinical outcomes were obtained using this therapy, mainly in regard to the control of OM severity and pain reduction in the oral cavity. Specialized oral care, including LLLT, is feasible and affordable for HSCT pediatric patients, although some adaptation in the patient's oral hygiene routine must be adopted with help from parents/companions and clinical staff. Administration, Oral;Adolescent;Case-Control Studies;Child;Child, Preschool;Female;Hematopoietic Stem Cell Transplantation;Humans;Infant;Inflammation;Laser Therapy;Lasers;Low-Level Light Therapy;Male;Oral Hygiene;Stomatitis;Transplantation Conditioning;Treatment Outcome

Low-level laser therapy to the mouse femur enhances the fungicidal response of neutrophils against Paracoccidioides brasiliensis. Neutrophils (PMN) play a central role in host defense against the neglected fungal infection paracoccidioidomycosis (PCM), which is caused by the dimorphic fungus Paracoccidioides brasiliensis (Pb). PCM is of major importance, especially in Latin America, and its treatment relies on the use of antifungal drugs. However, the course of treatment is lengthy, leading to side effects and even development of fungal resistance. The goal of the study was to use low-level laser therapy (LLLT) to stimulate PMN to fight Pb in vivo. Swiss mice with subcutaneous air pouches were inoculated with a virulent strain of Pb or fungal cell wall components (Zymosan), and then received LLLT (780 nm; 50 mW; 12.5 J/cm2; 30 seconds per point, giving a total energy of 0.5 J per point) on alternate days at two points on each hind leg. The aim was to reach the bone marrow in the femur with light. Non-irradiated animals were used as controls. The number and viability of the PMN that migrated to the inoculation site was assessed, as well as their ability to synthesize proteins, produce reactive oxygen species (ROS) and their fungicidal activity. The highly pure PMN populations obtained after 10 days of infection were also subsequently cultured in the presence of Pb for trials of protein production, evaluation of mitochondrial activity, ROS production and quantification of viable fungi growth. PMN from mice that received LLLT were more active metabolically, had higher fungicidal activity against Pb in vivo and also in vitro. The kinetics of neutrophil protein production also correlated with a more activated state. LLLT may be a safe and non-invasive approach to deal with PCM infection. Reactive Oxygen Species Animals;Bone Marrow;Female;Femur;Low-Level Light Therapy;Mice;Mitochondria;Neutrophils;Paracoccidioides;Paracoccidioidomycosis;Reactive Oxygen Species

Repair of surgical bone defects grafted with hydroxylapatite + Î²-TCP and irradiated with Î»=850 nm LED light. The treatment of bone loss due to different etiologic factors is difficult and many techniques aim to improve the repair, including a wide range of biomaterials and recently, photobioengineering. This work aimed to assess by histological analysis the repair of bone defects grafted with biphasic synthetic micro-granular HA + Î²-TCP associated with LED phototherapy. Forty rats were divided into 4 groups (Clot, LED, Biomaterial and LED + Biomaterial) each subdivided into 2 subgroups according to the time of animal death (15 and 30 days). Surgical bone defects were prepared on the femur of each animal with a trephine drill. In animals of the Clot group the defect was filled only by blood clot, in the LED group the defect filled with the clot was further irradiated. In the animals of Biomaterial and LED + Biomaterial groups the defect was filled by biomaterial and the last one was further irradiated (Î» = 850 Â± 10 nm, 150 mW, Î¦ ~ 0.5 cm2, 20 J/cm2 - session, 140 J/cm2- treatment) at 48-h intervals for 2 weeks. Following animal death, samples were taken and analyzed by light microscopy. Using the degree of maturation of the bone by assessment of the deposition/organization of the basophilic lines in the newly formed bone tissue, the LED + Biomaterial group was the one in a more advanced stage of bone repair process at the end of the experiment. It may be concluded that the use of LED phototherapy was effective in positively modulating the process of bone repair of bone defects in the femur of rats submitted or not to biomaterial grafting. Biocompatible Materials;Bone Substitutes;Calcium Phosphates;beta-tricalcium phosphate;Durapatite Animals;Biocompatible Materials;Bone Substitutes;Calcium Phosphates;Durapatite;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibia;Wound Healing
Effect of low-level laser therapy (LLLT) on peripheral nerve regeneration using fibrin glue derived from snake venom. OBJECTIVES: The purpose of this study was to assess whether the adhesive permits the collateral repair of axons originating from a vagus nerve to the interior of a sural nerve graft, and whether low-level laser therapy (LLLT) assists in the regeneration process. MATERIALS AND METHODS: Study sample consisted of 32 rats randomly separated into three groups: Control Group (CG; n=8), from which the intact sural nerve was collected; Experimental Group (EG; n=12), in which one of the ends of the sural nerve graft was coapted to the vagus nerve using the fibrin glue; and Experimental Group Laser (EGL; n=12), in which the animals underwent the same procedures as those in EG with the addition of LLLT. Ten weeks after surgery, the animals were euthanized. Morphological analysis by means of optical and electron microscopy, and morphometry of the regenerated fibers were employed to evaluate the results. RESULTS: Collateral regeneration of axons was observed from the vagus nerve to the interior of the autologous graft in EG and EGL, and in CG all dimensions measured were greater and presented a significant difference in relation to EG and EGL, except for the area and thickness of the myelin sheath, that showed significant difference only in relation to the EG. CONCLUSIONS: The present study demonstrated that the fibrin glue makes axonal regeneration feasible and is an efficient method to recover injured peripheral nerves, and the use of low-level laser therapy enhances nerve regeneration. Fibrin Tissue Adhesive;Snake Venoms Animals;Fibrin Tissue Adhesive;Low-Level Light Therapy;Male;Microsurgery;Nerve Regeneration;Peripheral Nerves;Rats;Rats, Wistar;Regeneration;Snake Venoms;Sural Nerve;Vagus Nerve;Wound Healing
Treating chronic knee pain with acupuncture--reply. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
Treating chronic knee pain with acupuncture. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
Treating chronic knee pain with acupuncture. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
Treating chronic knee pain with acupuncture. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Treating chronic knee pain with acupuncture. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
Treating chronic knee pain with acupuncture. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
Non-invasive subcutaneous fat reduction: a review. The risks, financial costs and lengthy downtime associated with surgical procedures for fat reduction have led to the development of a number of non-invasive techniques. Non-invasive body contouring now represents the fastest growing area of aesthetic medicine. There are currently four leading non-invasive techniques for reducing localized subcutaneous adipose tissue: low-level laser therapy (LLLT), cryolipolysis, radio frequency (RF) and high-intensity focused ultrasound (HIFU). To review and compare leading techniques and clinical outcomes of non-invasive subcutaneous fat reduction. The terms 'non-invasive', 'low-level laser', 'cryolipolysis', 'ultrasound' and 'radio frequency' were combined with 'lipolysis', 'fat reduction' or 'body contour' during separate searches in the PubMed database. We identified 31 studies (27 prospective clinical studies and four retrospective chart reviews) with a total of 2937 patients that had been treated with LLLT (n = 1114), cryolipolysis (n = 706), HIFU (n = 843) or RF (n = 116) or other techniques (n = 158) for fat reduction or body contouring. A majority of these patients experienced significant and satisfying results without any serious adverse effects. The studies investigating these devices have all varied in treatment regimen, body locations, follow-up times or outcome operationalization. Each technique differs in offered advantages and severity of adverse effects. However, multiple non-invasive devices are safe and effective for circumferential reduction in local fat tissue by 2 cm or more across the abdomen, hips and thighs. Results are consistent and reproducible for each device and none are associated with any serious or permanent adverse effects. Cryotherapy;Humans;Lipectomy;Low-Level Light Therapy;Patient Satisfaction;Subcutaneous Fat;Ultrasonic Therapy
Comparison of the effect of low level laser therapy with alvogyl on the management of alveolar osteitis. BACKGROUND: This study investigated the efficacy of low level laser therapy (LLLT) for managing alveolar osteitis (AO). MATERIAL AND METHODS: Sixty patients with alveolar osteitis of mandibular third molars were randomly divided into three groups. In group 1, socket irrigation was followed by alvogyl placement, and the treatment was repeated 48 hours later. In group 2, socket was irradiated with a low power red laser for 3 consecutive days (200 mW, 30 seconds on each of the buccal and lingual surfaces and 30 seconds at the middle of the socket, 6 J per area). The subjects in group 3 underwent treatment with a low power infrared laser with the same parameters as group 2. A visual analogue scale (VAS) was used to record the degree of pain at the morning (T0, before intervention) and at 6 (T1) and 12 (T2) hours later for 3 days. RESULTS: Pain was significantly lower in the alvogyl group than the other groups at T1 and T2 points on day 1 and at T0 and T1 points on day 2 ($p<0.05$). At T2 point on day 2 and on day 3, VAS became significantly lower in the red laser group compared to the other groups ($p<0.05$). The infrared laser was not more efficacious than the other groups at any of the treatment intervals, but it reduced VAS to an acceptable level. CONCLUSIONS: LLLT displayed good results in this study for treatment of alveolar osteitis and should be further investigated as an alternative to alvogyl for AO management. Drug Combinations;Hydrocarbons, Iodinated;Oils, Volatile;butyl aminobenzoate, eugenol, iodoform, spearmint oil drug combinations;para-Aminobenzoates;Eugenol Adult;Aged;Drug Combinations;Dry Socket;Eugenol;Female;Humans;Hydrocarbons, Iodinated;Low-Level Light Therapy;Male;Middle Aged;Oils, Volatile;Prospective Studies;Young Adult;para-Aminobenzoates
Drug discovery for alopecia: gone today, hair tomorrow. INTRODUCTION: Hair loss or alopecia affects the majority of the population at some time in their life, and increasingly, sufferers are demanding treatment. Three main types of alopecia (androgenic [AGA], areata [AA] and

chemotherapy-induced [CIA]) are very different, and have their own laboratory models and separate drug-discovery efforts. AREAS COVERED: In this article, the authors review the biology of hair, hair follicle (HF) cycling, stem cells and signaling pathways. AGA, due to dihydrotesterone, is treated by 5-Î± reductase inhibitors, androgen receptor blockers and ATP-sensitive potassium channel-openers. AA, which involves attack by CD8(+)NK group 2D-positive (NKG2D(+)) T cells, is treated with immunosuppressives, biologics and JAK inhibitors. Meanwhile, CIA is treated by apoptosis inhibitors, cytokines and topical immunotherapy. EXPERT OPINION: The desire to treat alopecia with an easy topical preparation is expected to grow with time, particularly with an increasing aging population. The discovery of epidermal stem cells in the HF has given new life to the search for a cure for baldness. Drug discovery efforts are being increasingly centered on these stem cells, boosting the hair cycle and reversing miniaturization of HF. Better understanding of the molecular mechanisms underlying the immune attack in AA will yield new drugs. New discoveries in HF neogenesis and low-level light therapy will undoubtedly have a role to play. Pharmaceutical Preparations Administration, Topical;Alopecia;Animals;Drug Discovery;Hair;Hair Follicle;Humans;Immunotherapy;Pharmaceutical Preparations;Stem Cells

Laser acupuncture for treating musculoskeletal pain: a systematic review with meta-analysis. Laser acupuncture has been studied extensively over several decades to establish evidence-based clinical practice. This systematic review aims to evaluate the effects of laser acupuncture on pain and functional outcomes when it is used to treat musculoskeletal disorders and to update existing evidence with data from recent randomized controlled trials (RCTs). A computer-based literature search of the databases MEDLINE, AMED, EMBASE, CINAHL, SPORTSDiscus, Cochrane Library, PubMed, Current Contents Connect, Web of Science, and SCOPUS was used to identify RCTs comparing between laser acupuncture and control interventions. A meta-analysis was performed by calculating the standardized mean differences and 95% confidence intervals, to evaluate the effect of laser acupuncture on pain and functional outcomes. Included studies were assessed in terms of their methodological quality and appropriateness of laser parameters. Forty-nine RCTs met the inclusion criteria. Two-thirds (31/49) of these studies reported positive effects, were of high methodological quality, and reported the dosage adequately. Negative or inconclusive studies commonly failed to demonstrate these features. For all diagnostic subgroups, positive effects for both pain and functional outcomes were more consistently seen at long-term follow-up rather than immediately after treatment. Moderate-quality evidence supports the effectiveness of laser acupuncture in managing musculoskeletal pain when applied in an appropriate treatment dosage; however, the positive effects are seen only at long-term follow-up and not immediately after the cessation of treatment. Acupuncture Points;Acupuncture Therapy;Humans;Low-Level Light Therapy;Musculoskeletal Pain;Randomized Controlled Trials as Topic

Prevention of skin flap necrosis by use of adipose-derived stromal cells with light-emitting diode phototherapy. BACKGROUND AIMS: The aim of this study was to investigate the effects of low-level light therapy (LLLT) on transplanted human adipose-derived mesenchymal stromal cells (ASCs) in the skin flap of mice. METHODS: LLLT, ASC transplantation and ASC transplantation with LLLT (ASCÂ + LLLT) were applied to the skin flap. Immunostaining and Western blot analysis were performed to evaluate cell survival and differentiation and secretion of vascular endothelial growth factor and basic fibroblast growth factor by the ASCs. Vascular regeneration was assessed by means of immunostaining in addition to hematoxylin and eosin staining. In the ASCÂ + LLLT group, the survival of ASCs was increased as the result of the decreased apoptosis of ASCs. RESULTS: The secretion of growth factors was higher in this group as compared with ASCs alone. ASCs contributed to tissue regeneration through vascular cell differentiation and secretion of angiogenic growth factors. The ASCÂ + LLLT group displayed improved treatment efficacy including neovascularization and tissue

regeneration compared with ASCs alone. Transplanting ASCs to ischemic skin flaps improved therapeutic efficacy for ischemia treatment as the result of enhanced cell survival and paracrine effects. CONCLUSIONS: These data suggest that LLLT is an effective biostimulator of ASCs in vascular regeneration, which enhances the survival of ASCs and stimulates the secretion of growth factors in skin flaps. Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2 Adipocytes;Adipose Tissue;Animals;Cell Differentiation;Cell- and Tissue-Based Therapy;Cells, Cultured;Disease Models, Animal;Fibroblast Growth Factor 2;Humans;Ischemia;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Inbred BALB C;Necrosis;Neovascularization, Physiologic;Skin;Surgical Flaps;Vascular Endothelial Growth Factor A;Wound Healing

Protective effect of 940â€‰nm laser on gamma-irradiated mice. OBJECTIVE: The purpose of this study was to investigate the radioprotective features of 940â€‰nm laser on the life span of mice, and absolute counts of blood cells and their proportions in gamma-irradiated mice. BACKGROUND DATA: An important feature of laser light is activation of mitotic division and differentiation of cells, which may be useful in activation of hematopoiesis in gamma-irradiated organisms. MATERIALS AND METHODS: Mice were randomly assigned to 11 groups according to the type(s) of influence. Generally, mice were irradiated in three different ways: with laser at different fluences, with gamma irradiation, or by combination of laser at different fluences and gamma irradiation in a different order. Mice were treated with 940â€‰nm laser at 3, 12, or 18â€‰J/cm(2) and/or a lethal dose of gamma irradiation (8.7â€‰Gy). Each group was randomly subdivided into two subgroups, in which the life span of the mice and blood cell counts (on 12th and 45th day after gamma irradiation) were analyzed. RESULTS: Laser (940â€‰nm) at a fluence of 3â€‰J/cm(2) significantly prolonged the life span of gamma-irradiated mice ($p<0.05$). In the same group, counts of white blood cells, lymphocytes, and neutrophils were higher on day 12 than in the gamma group. On day 45 after gamma irradiation, some signs of hematopoiesis repair were found in blood. There were no significant differences in counts of erythrocytes, monocytes, neutrophils, or the proportion of neutrophils between this group and the control group. CONCLUSIONS: In summary, 940â€‰nm laser at a fluence of 3â€‰J/cm(2) demonstrates radioprotective features in an experiment with lethally irradiated mice. Mechanisms responsible for this effect will be investigated in further studies. Animals;Blood Cell Count;Female;Gamma Rays;Lasers, Semiconductor;Longevity;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Random Allocation

Comparison of Nd:YAG and diode laser irradiation during intracoronal bleaching with sodium perborate: color and Raman spectroscopy analysis. OBJECTIVE: The aim of this study was to evaluate the color and enamel structure changes after intracoronal bleaching with sodium perborate under neodymium:yttrium-aluminum-garnet (Nd:YAG) and diode laser irradiation. BACKGROUND DATA: Although some studies investigated the efficacy of laser irradiation during intracoronal bleaching, no study has been conducted to investigate the changes in both color and enamel structure during intracoronal bleaching with laser irradiation. METHODS: Thirty-six extracted mandibular incisors were used. The root canals were prepared and filled with AH Plus and gutta-percha. Baseline color values and Raman spectra were obtained from all samples. The samples were randomly divided into three groups as follows: group 1, intracoronal bleaching with sodium perborate plus NdYAG laser irradiation; group 2, intracoronal bleaching with sodium perborate plus diode laser irradiation; and group 3, intracoronal bleaching with sodium perborate without any laser irradiation. Following the bleaching procedures, the final baseline color values and Raman spectra were obtained. The baseline and final values were statistically analyzed. Statistical analyses were performed with SPSS 18.0 software using Anova and the Kruskal-Wallis test. RESULTS: There was a significant difference between the Nd:YAG laser and control groups ($p<0.05$). There was no significant difference

between the diode laser group and the control group, or the diode laser group and the Nd:YAG laser group. There was no significant difference among all groups in terms of Raman relative intensity (RRI) and fluorescence intensity (FI) percentage values (p>0.05). CONCLUSIONS: Laser application, especially Nd:YAG laser irradiation, was able to increase the efficacy of intracoronal bleaching with sodium perborate. Laser irradiation significantly increased the bleaching efficacy without any changes in the enamel surface structure. Borates;sodium perborate Borates;Dental Enamel;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Spectrum Analysis, Raman;Tissue Culture Techniques;Tooth Bleaching

Influence of cavity preparation with Er,Cr:YSGG laser and restorative materials on in situ secondary caries development. OBJECTIVE: The aim of this study was to evaluate the influence of cavity preparation and restorative materials containing fluorides in the prevention of secondary caries lesion development in situ. METHODS: A total of 120 blocks obtained from human teeth were divided into two groups and standardized cavities were prepared using diamond burs (DB) or Er,Cr:YSGG-laser [20â€‰Hz, 4.0W, 55% water, 65% air (LA)]. They were divided into three subgroups according to the restorative material (n=20): glass-ionomer cement (GI), resin modified glass-ionomer (RM) or composite resin (CR). Blocks were fixed in palatal intra-oral appliances worn in situ by 20 human volunteers, who dropped 20% sucrose solution eight times daily. After 21 days, blocks were removed and restorations were cross-sectioned to evaluate microhardness [Knoop hardness number (KHN)] underneath enamel surface from 30 to 200â€‰Î¼m. Factors "cavity preparation," "restorative materials," and "depth" were evaluated by three way ANOVA, followed by Tukey test (p<0.05). RESULTS: The results showed lower microhardness in cavities prepared with DB than in cavities prepared with LA. At 30â€‰Î¼m, there were no statistical significant differences with regard to "cavity preparation" or "restorative materials" factors. In depth evaluation, the enamel microhardness progressively increased as a function of depth for the GI groups. In the groups prepared with LA at 60â€‰Î¼m/90â€‰Î¼m, there were no significant differences between GI and RM materials, whose microhardnesses were significantly higher than that of CR. CONCLUSIONS: Cavity preparation using Er,Cr:YSGG laser increases caries resistance of enamel walls, and reduce caries lesion depth development regardless of fluoride presence in the restorative material. CR showed higher caries lesion development than GI, and RM showed intermediate results. Composite Resins;Glass Ionomer Cements Composite Resins;Dental Caries;Dental Cavity Preparation;Glass Ionomer Cements;Humans;Lasers, Solid-State;Low-Level Light Therapy;Tissue Culture Techniques

Photobiomodulation therapy in skeletal muscle: from exercise performance to muscular dystrophies. Exercise;Humans;Low-Level Light Therapy;Muscle, Skeletal;Muscular Dystrophies

Phototherapy with LED light modulates healing processes in an in vitro scratch-wound model using 3 different cell types. BACKGROUND: An effective way of modulating wound healing processes, including proliferation and apoptosis, is low-level light therapy. Because of several disadvantages of lasers, light-emitting diodes (LEDs) could be more feasible light sources. OBJECTIVE: To evaluate and compare the effects of blue and red light from LEDs on different cell types in an in vitro scratch-wound model. METHODS: Monolayers of C2C12 myoblasts, NIH/3T3 fibroblasts, and BICR10 keratinocytes were injured by mechanical scraping. Cells were illuminated on 5 consecutive days for 10 minutes by LED at 470 or 630 nm. Effects of light on in vitro wound healing were evaluated by analyzing time to closure, proliferation, apoptosis, and necrosis rates. RESULTS: Illumination substantially affected cell viability and cell growth. Blue light strongly decreased proliferation and augmented apoptosis in all 3 cell types and increased necrosis rates in C2C12 and NIH/3T3 cells. In contrast, red light did not alter apoptosis in either cell type but promoted proliferation in all 3 cell types with significant effects in C2C12 and NIH/3T3 cells and shortened time to closure in all 3 cell

types. CONCLUSION: Light-emitting diode light illumination could be a therapeutic option and positively affect wound healing processes. By choosing appropriate wavelengths, variable effects can be achieved. Animals;Apoptosis;Cell Line;Cell Proliferation;Keratinocytes;Light;Low-Level Light Therapy;Mice;Muscle Cells;NIH 3T3 Cells;Necrosis;Time Factors;Wound Healing

Effect of various lasers on the bond strength of two zirconia ceramics. OBJECTIVE: The purpose of this study was to compare and evaluate the effects of various laser systems on surface roughness and shear bond strengths of zirconia ceramics. MATERIAL AND METHODS: Seventy-two ceramic discs (10â€‰mmÃ—2â€‰mm) obtained from two sintered zirconia ceramics (Zirkonzahn, Zirkonzahn Prettau(Â®)) were divided into two groups (n=36) according to the computer-aided design (CAD)-computer-aided manufacturing (CAM) technique and then further divided into three groups (n=12). Each group was treated with one of the following: (1) femtosecond (FS), (2) Nd:YAG (NY), and (3) Er:YAG (EY) lasers. After laser irradiation, a scanning electron micrograph (SEM) was taken at 500Ã— magnification for qualitative examination. Following surface roughness measurement by profilometry, resin cement (Rely X U200) was bonded to the ceramic specimens using Teflon tubes (3â€‰mm height, 4â€‰mm diameter). Specimens were stored in distilled water at 37Â°C for 24â€‰h and then thermal cycled for 5000 cycles. A shear bond strength (MPa) test was performed using a universal testing machine at a crosshead speed of 1â€‰mm/min. Data were analyzed by two way analysis of variance (ANOVA) and Tukey honest significant difference (HSD) tests for pairwise comparisons among groups (p=0.05). RESULTS: MPa and roughness were significantly affected by laser type ($p<0.001$), and there was no significant interaction between the two zircon ceramics. The group irradiated with FS laser had significantly higher ($p<0.05$) roughness and MPa mean values than those of the other groups. No significant difference was found between the groups irradiated with NY and EY laser ($p>0.05$). In the SEM, the surfaces of the FS group were rougher than those of the NY and EY groups. NY and EY surfaces were nearly smooth. CONCLUSIONS: FS laser is an effective surface treatment for roughening surfaces of zirconia ceramics. Furthermore, it reveals the highest MPa. Dental Materials;Zirconium;zirconium oxide Ceramics;Dental Bonding;Dental Materials;Dental Stress Analysis;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Shear Strength;Surface Properties;Zirconium

Monochromatic Infrared Photo Energy versus Low Level Laser Therapy in Patients with Knee Osteoarthritis. INTRODUCTION: Knee osteoarthritis (KO) is the most common joint disease for which there is no optimal treatment. Monochromatic infrared photo energy (MIPE) is a relatively new light modality used to reduce pain and increase circulation. Low Level Laser Therapy (LLLT) is another light modality used to reduce pain in KO. METHODS: The aim of this study was to compare the effects of the MIPE and LLLT in improving pain and function in KO. Sixty participants with KO completed the program and were randomly assigned into two groups. Group 1 (experimental, n=30) received MIPE and exercises. Group 2 (control, n=30) received LLLT and exercises. Both groups received two visits per week for six weeks. Outcome included pain intensity measured on a visual analogue scale and physical function measured with the lower extremity functional scale, before and after the 12 therapy sessions (6 weeks after the start of the intervention). RESULTS: There were statistically significant improvements in pain intensity and lower extremity functional scale scores ($p<0.05$) in each group. However, no significant differences were recorded between the groups ($p>0.05$). CONCLUSION: Therefore, MIPE and LLLT reduce pain and improve function in KO; however, there are no differences between the two modalities in reducing pain and increasing physical function in KO.

Effect of low level laser therapy on proliferation and differentiation of the cells contributing in bone regeneration. INTRODUCTION: Low level laser therapy (LLLT) also known as photobiomodulation, is a treatment that uses low-level lasers or light-emitting diodes (LEDs) to change cellular function and is a clinically well accepted tool in regenerative medicine and dentistry.

Considering the variety of laser, exposure, cells and study types, the exact effects of low level laser therapy seems to be unclear. The aim of this study was to review the data published in the field of the effects of low level laser therapy on proliferation and differentiation of the cells contributing in bone regeneration. METHODS: To access relevant articles, an electronic search in PubMed was conducted from 2001 to April 2014. English language published papers on low level laser therapy were found using the selected keywords .The full texts of potentially suitable articles were obtained for final assessment according to the exclusion and inclusion criteria. RESULTS: 240 articles were found from 2001 to April 2014. Following the initial screening of titles and abstracts as well as the final screening of full texts, 22 articles completely fulfilled the inclusion criteria of this study. Wavelength used in LLLT irradiation varied between 600 to 1000 nm with an energy density of 0.04-60J/cm(2) . Although almost all studies agreed on getting positive effects from LLLT, some had opposing results. CONCLUSION: Low level laser with low-energy density range appears to exert a biostimulatory effect on bone tissue, enhance osteoblastic proliferation and differentiation on cell lines used in in vitro studies. Despite the fact that many researches have been recently done on the effects of LLLT on different cell lines, without knowing the precise mechanism and effects, we are not able to offer a clinical treatment protocol. This paper is a beginning to help further progress and extend practical use of LLLT in future.

Application of Low-Level Laser Therapy Following Coronary Artery Bypass Grafting (CABG) Surgery. INTRODUCTION: An attack of acute myocardial infarction (MI) poses the threat of great damage to cardiac tissue. Operative therapeutic modalities such as coronary artery bypass grafting (CABG) may enhance myocardial perfusion in high-grade coronary vasculature occlusions. It has been shown previously that Low-Level Laser Therapy (LLLT) significantly reduces infarct size following induction of myocardial infarction in rats and dogs. The aim of this study was to investigate the effects of LLLT on cardiac tissue healing markers following grafting operations for coronary vessel occlusion. METHODS: Thirty-two cases having each two or three coronary vessel occlusions (2VD/3VD) underwent low-level laser therapy post-CABG, and 28 patients who did not undergo laser therapy were studied as a control group. Diode laser (810 nm, 500 mW) was used as LLLT protocol for 3 successive days post-CABG. Repeated measurements of blood cell count (CBC) and cardiac damage markers (CPK, CPK-MB, LDH) attained before CABG and during the 5 days of LLLT post-operatively, taken at one and 12 hours after daily laser irradiation. RESULTS: In a comparison of the mean levels of the control and laser group, the variables were statistically different on 5(th) day after intervention for WBC, Neutrophil and Lymphocyte counts and WBC and lymphocyte changes. A statistically significant difference was seen in changes of CPK, CPK-mb and LDH over time $P<0.001$. CONCLUSION: It is concluded that low-level laser irradiation after CABG surgery could decrease cardiac cellular damage and help accelerate the repair of cardiac tissue post-operatively. This may lower post-operative disability as well as bed rest period in these patients.

Low-level laser therapy attenuates the myeloperoxidase activity and inflammatory mediator generation in lung inflammation induced by gut ischemia and reperfusion: a dose-response study. INTRODUCTION: Intestinal ischemia and reperfusion (i-I/R) is an insult associated with acute respiratory distress syndrome (ARDS). Herein we evaluate the dose-response effect of low-level laser therapy (LLLT) on lung inflammation induced by i-I/R. METHODS: Mice were subjected to mesenteric artery occlusion (45 min) and killed after clamp release and intestinal reperfusion (2h). Increasing doses (1, 3, 5 and 7,5 J/cm(2)) of laser irradiation (660 nm) was carried out on the mice skin over the upper bronchus for 5 min after initiating reperfusion. Neutrophils activation was determined by myeloperoxidase (MPO) activity. The mRNA expression and protein concentration of inflammatory mediators IL-1Î², IL-6, TNF and IL-10 in lung were measured by RT-PCR and ELISA, respectively. RESULTS: With exception of 1J/cm(2), LLLT reduced MPO activity as well as IL-1Î² levels in the lungs

from inflamed mice. LLLT was also markedly effective in reducing both IL-6 and TNF expression and levels in the lungs from mice submitted to i-I/R in all laser doses studied. Otherwise, LLLT significantly increased the protein levels of IL-10 in inflamed mice by i-I/R; however only in the dose of 1J/cm(2). CONCLUSION: We conclude that the LLLT is able to control the neutrophils activation and proinflammatorycytokines release into the lungs in a model of i-I/R in mice.

Biological effects of low level laser therapy. The use of low level laser to reduce pain, inflammation and edema, to promote wound, deeper tissues and nerves healing, and to prevent tissue damage has been known for almost forty years since the invention of lasers. This review will cover some of the proposed cellular mechanisms responsible for the effect of visible light on mammalian cells, including cytochrome c oxidase (with absorption peaks in the Near Infrared (NIR)). Mitochondria are thought to be a likely site for the initial effects of light, leading to increased ATP production, modulation of reactive oxygen species, and induction of transcription factors. These effects in turn lead to increased cell proliferation and migration (particularly by fibroblasts).

Promotion of neural sprouting using low-level green light-emitting diode phototherapy. We irradiated neuroblastoma SH-SY5Y cell line with low-level light-emitting diode (LED) illumination at a visible wavelength of 520 nm (green) and intensity of 100 mWâˆ•cm2. We captured and analyzed the cell morphology before LED treatment, immediately after, and 12 and 24 h after treatment. Our study demonstrated that LED illumination increases the amount of sprouting dendrites in comparison to the control untreated cells. This treatment also resulted in more elongated cells after treatment in comparison to the control cells and higher levels of expression of a differentiation related gene. This result is a good indication that the proposed method could serve in phototherapy treatment for increasing sprouting and enhancing neural network formation. Animals;Cell Line, Tumor;Light;Lighting;Models, Biological;Neurites;Neurons;Phototherapy

Treatment of multiple trichilemmomas with the pinhole method using a carbon dioxide laser in a patient with Cowden syndrome. Adult;Biopsy;Female;Hair Diseases;Hair Follicle;Hamartoma Syndrome, Multiple;Humans;Lasers, Gas;Low-Level Light Therapy;Skin Neoplasms;Treatment Outcome

Treatment of dilated pores with 1410-nm fractional erbium-doped fiber laser. Dilated pores can be an early sign of skin aging and are a significant cosmetic concern. The 1410-nm wavelength is optimal for superficial dermal treatments up to 650 Î¼m deep. The aim of the present study was to evaluate the clinical effectiveness and safety of the fractional erbium-doped fiber 1410-nm laser in the treatment of dilated pores. Fifteen patients with dilated facial pores underwent three laser treatments at 3-week intervals. Posttreatment skin responses and side effects were assessed at treatment and follow-up visits by study physicians. Clinical effectiveness of treatment was assessed by both study physicians and patients 3 months after the final laser treatment using a quartile grading scale. Histological examination was performed using biopsy samples taken at baseline (pretreatment) and 3 months after the last treatment. This study showed that greater than 51 % improvement in dilated pores was demonstrated in 14 of 15 patients after three sessions of laser treatments. Improvements in skin texture, tone, and smoothness were reported in all patients. Treatment was well tolerated in all patients, with no unanticipated side effects. This study demonstrates that the 1410-nm fractional erbium fiber laser is effective and safe for treatment of dilated facial pores in Fitzpatrick skin types III-IV. Erbium Adult;Erbium;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Skin Aging;Skin Diseases;Treatment Outcome

The action of pre-exerciseÂ low-level laser therapy (LLLT) on the expression of IL-6 and TNF-Î± proteins and on the functional fitness of elderly rats subjected to aerobic training. The aim of the present study was to determine whether low-level laser therapy (LLLT), when used in conjunction with aerobic training, interferes with the expression of inflammatory markers IL-6 and TNF-Î±, thereby

influencing the performance of old rats participating in swimming. A total of 30 Wistar rats (Rattus norvegicus albinus) were used for this study: 24 aged rats, and 6 young rats. The older animals were randomly divided into four groups designated as follows: aged-control, aged-exercise, aged-LLLT, aged-LLLT/exercise group, and young-control animals. Aerobic capacity (VO2max) was analyzed before and after training period. The aged-exercise and aged-LLLT/exercise groups were trained for 6 weeks. LLLT laser was applied before each training session with 808 nm and 4 J of energy to the indicated groups throughout training. The rats were euthanized, and muscle tissue and serum were collected for muscle cross-sectional area and IL-6 and TNF-Î± protein analysis. In VO2 showed statistical difference between young- and aged-control groups (used as baseline) (pâ€‰<â€‰0.05). The same difference can be observed in the young control group compared with all intervention groups (exercise, LLLT and LLLTâ€‰+â€‰exercise). In comparison with the aged-control group, a difference was observed only for comparison with the exercise group (pâ€‰<â€‰0.05), and exercise associated with LLLT group (pâ€‰<â€‰0.001). Levels of IL-6 and TNF-Î± for the aged-exercise and the aged-LLLT/exercise groups were significantly decreased compared to the aged-control group (pâ€‰<â€‰0.05). Analysis of the transverse section of the gastrocnemius muscle showed a significant difference between the aged-exercise and aged-LLLT/exercise groups (pâ€‰<â€‰0.001). These results suggest that laser therapy in conjunction with aerobic training may provide a therapeutic approach for reducing the inflammatory markers (IL-6 and TNF-Î±), however, LLLT without exercise was not able to improve physical performance of aged rats. Interleukin-6;Tumor Necrosis Factor-alpha Animals;Gene Expression;Interleukin-6;Low-Level Light Therapy;Male;Muscle, Skeletal;Organ Size;Physical Conditioning, Animal;Rats;Rats, Wistar;Swimming;Tumor Necrosis Factor-alpha

Low-fluence 585 nm Q-switched Nd:YAG laser: a novel laser treatment for post-acne erythema. BACKGROUND: Persistent post-acne erythema is one of the most common aesthetic sequelae to arise after active acne resolves. The treatment remains challenging due to lack of effective laser modalities. OBJECTIVES: To evaluate the safety and efficacy of a low-fluence 585â€‰nm Q-switched Nd:YAG laser for the treatment of post-acne erythema. MATERIALS & METHODS: Twenty-five patients with post-acne erythema were treated with a low-fluence Q-switched Nd:YAG laser using the 585â€‰nm Gold Toningâ„¢ handpiece (5â€‰mm spot size, 5-10â€‰ns, 0.30-0.55â€‰J/cm(2) , 2-4 passes) for three sessions at 2-week intervals. Erythema lesion (macules) count, inflammatory acne (papules, pustules) count, erythema index, degree of post-acne erythema and overall improvement in post-acne erythema and acne scar were assessed at baseline, every 2 weeks and 6 weeks after the last treatment. Subjective degrees of satisfaction were also evaluated. Adverse events were recorded and pain was scored using a visual analog scale (VAS). RESULTS: At 6 weeks after 3 sessions of laser treatment, all patients demonstrated clinical improvement. Erythema lesion counts decreased by 20.1% (versus baseline) after the first treatment (Pâ€‰=â€‰0.004), by 32.7% after the second treatment, by 46.5% at 2 weeks after the third treatment and by 58.7% at the 6-week follow-up (all Pâ€‰<â€‰0.001). Significant improvements were also noted in erythema indices (22.29â€‰Â±â€‰2.4 to 17.51â€‰Â±â€‰1.8) and mean post-acne erythema scores after the first treatment (both Pâ€‰<â€‰0.001). The mean scores of independent physician assessments were 4.04â€‰Â±â€‰0.9 in term of the improvement of post-acne erythema and 3.44â€‰Â±â€‰0.9 in the improvement of scarring. In addition, we could observe a significant decrease in inflammatory acne lesion counts after two laser treatments with a decrease in mean lesion counts by 67% at the 6-week follow-up. Treatment was well-tolerated and adverse effects were limited to transient erythema and edema at treatment sites. CONCLUSIONS: Low-fluence 585â€‰nm Q-switched Nd:YAG laser treatment is safe and effective for the treatment of post-acne erythema with minimal discomfort and quantifiable improvement in the appearance of early acne scarring and inflammatory

acne. Acne Vulgaris;Adolescent;Adult;Erythema;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Prospective Studies;Treatment Outcome;Young Adult
Analysis of laser therapy and assessment methods in the rehabilitation of temporomandibular disorder: a systematic review of the literature. The aim of the present study was to perform a systematic review of the literature on the effects of low-level laser therapy in the treatment of TMD, and to analyze the use of different assessment tools. [Subjects and Methods] Searches were carried out of the BIREME, MEDLINE, PubMed and SciELO electronic databases by two independent researchers for papers published in English and Portuguese using the terms: "temporomandibular joint laser therapy" and "TMJ laser treatment". [Results] Following the application of the eligibility criteria, 11 papers were selected for in-depth analysis. The papers analyzed exhibited considerable methodological differences, especially with regard to the number of sessions, anatomic site and duration of low-level laser therapy irradiation, as well as irradiation parameters, diagnostic criteria and assessment tools. [Conclusion] Further studies are needed, especially randomized clinical trials, to establish the exact dose and ideal parameters for low-level laser therapy and define the best assessment tools in this promising field of research that may benefit individuals with signs and symptoms of TMD.
Phototherapy for the treatment of vitiligo in Asian children. Vitiligo is a common acquired progressive depigmenting condition that can have devastating psychological effects in dark-skinned patients. We performed a retrospective review of patients younger than 16 years of age with a clinical diagnosis of vitiligo treated using phototherapy at the National Skin Center, Singapore, over a 5-year period. Seventy-one Asian patients ages 5 to 15 years when they underwent phototherapy were identified. There was a higher proportion of Indian patients in our cohort than in the population. The duration of disease ranged from 2Â months to 12Â years. More than half of the patients had generalized vitiligo and more than one-third had segmental vitiligo. Patients with generalized vitiligo had a better response than those with segmental vitiligo. Reported response rates were highest for narrowband ultraviolet B (UVB) phototherapy, followed by targeted phototherapy combining ultraviolet A1 (UVA1) and UVB; 308-nm excimer lamp phototherapy and paint psoralen-UVA photochemotherapy had marginally lower reported response rates. The duration of treatment ranged from 3 to 40Â months and the total number of treatments ranged from 20 to 209 sessions. Reported side effects were mild and included itching, scaling, erythema, pain, sunburn, blistering, and phototoxicity. We consider phototherapy to be a safe and efficacious modality for the treatment of vitiligo in Asian children. Ficusin Adolescent;Asian People;Child;Child, Preschool;Cohort Studies;Databases, Factual;Female;Ficusin;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;PUVA Therapy;Photochemotherapy;Phototherapy;Retrospective Studies;Risk Assessment;Singapore;Time Factors;Treatment Outcome;Vitiligo
The effects of low-level laser therapy on orthodontically induced root resorption. The aim of this study was to evaluate the preventive and/or reparative effects of low-level laser therapy (LLLT) on orthodontically induced inflammatory root resorption (OIIRR) in rats. Thirty rats were divided into four groups (short-term control (SC), short-term laser (SL), long-term control (LC), long-term laser (LL)). In all groups, the left first molar was moved mesially for 11 days. At the end of this period, the rats in groups SC and SL were killed in order to observe the resorption lacunas and to evaluate whether LLLT had any positive effect on root resorption. The groups LC and LL were remained for a healing period of 14 days in order to observe spontaneous repair of the resorption areas and investigate whether LLLT had reparative effects on root resorption. A Ga-Al-As diode laser (Doris, CTL-1106MX, Warsaw, Poland) with a wavelength of 820 nm was used. In SL group, the first molars were irradiated with the dose of 4.8 J/cm2 (50 mW, 12 s, 0.6 J) on every other day during force application.

In LL group, the irradiation period was started on the day of appliance removal and the first molars were irradiated with the dose of 4.8 J/cm2 on every other day for the next 14 days. LLLT significantly increased the number of osteoblasts and fibroblasts, and inflammatory response in SL group in comparison with SC group (Pâ€‰=â€‰.001). The amount of resorption did not represent any difference between the two groups (Pâ€‰=â€‰.16). In LL group, LLLT significantly increased the number of fibroblasts and decreased the amount of resorption in comparison with LC group (Pâ€‰=â€‰.001; Pâ€‰=â€‰.02). Both parameters indicating the reparative and the resorptive processes were found to be increased by LLLT applied during orthodontic force load. LLLT applied after termination of the orthodontic force significantly alleyed resorption and enhanced/accelerated the healing of OIIRR. LLLT has significant reparative effects on OIIRR while it is not possible to say that it definitely has a preventive effect. Osteoprotegerin;RANK Ligand Animals;Cell Count;Immunohistochemistry;Low-Level Light Therapy;Male;Orthodontics;Osteoclasts;Osteoprotegerin;RANK Ligand;Rats, Wistar;Root Resorption;Time Factors

A novel 1565 nm non-ablative fractional device for stretch marks: A preliminary report. BACKGROUND: Striae Distensae (SD) is a very common dermatologic condition. We evaluated the effectiveness and safety of a novel non-ablative fractional 1565 nm laser (ResurFX) on the appearance of SD. MATERIALS AND METHODS: Twelve Caucasian subjects with various stages of SD received three non-ablative laser treatments. Each treatment consisted of two different laser settings, in order to achieve a demarcated dense impact together with a diffused deep impact. Three months after the last treatment, SD improvement was assessed by blinded and non-blinded reviewers using clinical images and 3D image analyses. RESULTS: Good clinical improvement (between 51% and 75%) was observed in all patients. Most patients showed improvement of > 50% in the volume of depressions and in lesion color (91.7% and 83.3% of patients, respectively). The average pain during treatment was generally defined as tolerable and the average downtime was 4 days. Transient erythema and severe edema were noted immediately after the procedure, but long-lasting or severe adverse effects were not observed. All patients noted a good improvement and were satisfied with the treatment and the results. CONCLUSIONS: The treatment with the 1565 nm ResurFX laser resulted in improved pigmentation, volume, and textural appearance of SD. Adolescent;Adult;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Patient Satisfaction;Striae Distensae;Young Adult

What is the clinical effectiveness and cost-effectiveness of conservative interventions for tendinopathy? An overview of systematic reviews of clinical effectiveness and systematic review of economic evaluations. BACKGROUND: Lateral elbow tendinopathy (LET) is a common complaint causing characteristic pain in the lateral elbow and upper forearm, and tenderness of the forearm extensor muscles. It is thought to be an overuse injury and can have a major impact on the patient's social and professional life. The condition is challenging to treat and prone to recurrent episodes. The average duration of a typical episode ranges from 6 to 24 months, with most (89%) reporting recovery by 1 year. OBJECTIVES: This systematic review aims to summarise the evidence concerning the clinical effectiveness and cost-effectiveness of conservative interventions for LET. DATA SOURCES: A comprehensive search was conducted from database inception to 2012 in a range of databases including MEDLINE, EMBASE and Cochrane Databases. METHODS AND OUTCOMES: We conducted an overview of systematic reviews to summarise the current evidence concerning the clinical effectiveness and a systematic review for the cost-effectiveness of conservative interventions for LET. We identified additional randomised controlled trials (RCTs) that could contribute further evidence to existing systematic reviews. We searched MEDLINE, EMBASE, Allied and Complementary Medicine Database, Cumulative Index to Nursing and Allied Health Literature, Web of Science, The Cochrane

Library and other important databases from inception to January 2013. RESULTS: A total of 29 systematic reviews published since 2003 matched our inclusion criteria. These were quality appraised using the Assessment of Multiple Systematic Reviews (AMSTAR) checklist; five were considered high quality and evaluated using a Grading of Recommendations, Assessment, Development and Evaluation approach. A total of 36 RCTs were identified that were not included in a systematic review and 29 RCTs were identified that had only been evaluated in an included systematic review of intermediate/low quality. These were then mapped to existing systematic reviews where further evidence could provide updates. Two economic evaluations were identified. LIMITATIONS: The summary of findings from the review was based only on high-quality evidence (scoring of >â€‰5 AMSTAR). Other limitations were that identified RCTs were not quality appraised and dichotomous outcomes were also not considered. Economic evaluations took effectiveness estimates from trials that had small sample sizes leading to uncertainty surrounding the effect sizes reported. This, in turn, led to uncertainty of the reported cost-effectiveness and, as such, no robust recommendations could be made in this respect. CONCLUSIONS: Clinical effectiveness evidence from the high-quality systematic reviews identified in this overview continues to suggest uncertainty as to the effectiveness of many conservative interventions for the treatment of LET. Although new RCT evidence has been identified with either placebo or active controls, there is uncertainty as to the size of effects reported within them because of the small sample size. Conclusions regarding cost-effectiveness are also unclear. We consider that, although updated or new systematic reviews may also be of value, the primary focus of future work should be on conducting large-scale, good-quality clinical trials using a core set of outcome measures (for defined time points) and appropriate follow-up. Subgroup analysis of existing RCT data may be beneficial to ascertain whether or not certain patient groups are more likely to respond to treatments. STUDY REGISTRATION: This study is registered as PROSPERO CRD42013003593. FUNDING: The National Institute for Health Research Health Technology Assessment programme. Glucocorticoids;Sclerosing Solutions;Hyaluronic Acid;Botulinum Toxins Botulinum Toxins;Cost-Benefit Analysis;Elbow Joint;Glucocorticoids;Humans;Hyaluronic Acid;Low-Level Light Therapy;Models, Econometric;Pain Management;Physical Therapy Modalities;Quality of Life;Randomized Controlled Trials as Topic;Sclerosing Solutions;Tendinopathy;Time Factors;Ultrasonic Therapy

Effect of low-level laser on healing of temporomandibular joint osteoarthritis in rats. OBJECTIVE: Temporomandibular disorders (TMD) are clinical conditions characterized by pain and sounds of the temporomandibular joint (TMJ). This study was designed to assess the effect of low-level laser therapy (LLLT) on healing of osteoarthritis in rats with TMD. MATERIALS AND METHODS: Thirty-two male Wistar rats (250-200 g) were housed in standard plastic cages. After injection of Complete Freund's adjuvant into the TMJ, rats were randomly divided into two groups of 16 (case and control) and anesthetized; then osteoarthritis was induced via intraarticular injection of 50 ÂµI of Complete Freund's adjuvant; into the bilateral TMJs. In the case group, LLLT was done transcutaneously for 10 minutes daily, starting the day after the confirmation of osteoarthritis. Exposure was performed for 10 minutes at the right side of the TMJ with 880 nm low-level laser with 100 mW power and a probe diameter of 0.8 mm. Control rats were not treated with laser. RESULTS: After three days of treatment the grade of cartilage defects, number of inflammatory cells, angiogenesis, number of cell layers and arthritis in rats in the case group were not significantly different compared with controls (P>0.05). After seven days, the grade of cartilage defects, number of inflammatory cells, number of cell layers, and arthritis in the case group improved compared to controls (P<0.05); angiogenesis in both groups was similar. CONCLUSION: Treatment of TMD with LLLT after 7 days of irradiation with a wavelength of 880 nm was associated with a greater improvement compared to the control group.

Early non-ablative fractional laser improves the appearance of punch biopsy scars - a clinical report. Biopsy;Cicatrix;Humans;Low-Level Light Therapy;Skin

Effect of low-level laser therapy on dental root cementum remodeling in rats. OBJECTIVE: To investigate the amount of the cementum layer formed over the rat's dental root surfaces by daily application of low-level laser therapy (LLLT) for 2 weeks. METHODS: Twelve female Sprague-Dawley (SD) rats were divided into two groups: six rats received daily LLLT (Ga-Al-As, 830 nm), and six rats received no treatment (control). The treatment lasted 2 weeks. In vivo Micro-CT imaging analyzed the root's hard tissue volumetric changes. The cementum thickness was evaluated histologically. RESULTS: Total cementum thicknesses in the LLLT group increased significantly (p = 0.015) compared to the control group. This significant increase in the cementum thickness, verified histologically, was not detectable during in vivo Micro-CT imaging, which showed no significant difference between the groups regarding the root hard tissues volumetric changes over the 2-week evaluation period. CONCLUSION: Two weeks of daily application of LLLT significantly increased rat's dental root cementum thickness as determined histologically. However, in vivo Micro-CT imaging failed to accurately reveal this cementum growth as it was not possible to differentiate dentinal changes. Animals;Cementogenesis;Dental Cementum;Female;Image Processing, Computer-Assisted;Lasers, Semiconductor;Low-Level Light Therapy;Models, Animal;Radiation Dosage;Random Allocation;Rats;Rats, Sprague-Dawley;Time Factors;Tooth Apex;Tooth Root;X-Ray Microtomography

Morphometric and high resolution scanning electron microscopy analysis of low-level laser therapy and latex protein (Hevea brasiliensis) administration following a crush injury of the sciatic nerve in rats. This study evaluated the effect of low-level laser therapy (LLLT; 15 J/cm(2)) and a latex protein (F1) on a crush injury of the sciatic (ischiadicus) nerve. Seventy-two rats (male, 250 g) were divided into 6 groups: CG, control; EG, exposed nerve; IG, injured nerve without treatment; LG, injured nerve with LLLT; HG, injured nerve with F1; and LHG, injured nerve with LLLT and F1. After 4 or 8 weeks, the animals were euthanized and samples of the sciatic nerve were collected for morphometric and high-resolution scanning electron microscopy (HRSEM) analysis. After 4 weeks, the morphometry revealed improvements in the treated animals, and the HG appeared to be the most similar to the CG; after 8 weeks, the injured groups showed improvements compared to the previous period, and the results of the treatment groups were more similar to one another. At HRSEM after 4 weeks, the treated groups were similar and showed improvement compared to the IG; after 8 weeks, the LHG and HG had the best results. In conclusion, the treatments resulted in improvement after the nerve injury, and this recovery was time-dependent. In addition, the use of the F1 resulted in the best morphometric and ultrastructural findings. Latex;Plant Preparations;Plant Proteins Animals;Hevea;Latex;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Nerve Crush;Phytotherapy;Plant Preparations;Plant Proteins;Rats;Rats, Wistar;Recovery of Function;Sciatic Nerve;Sciatic Neuropathy;Time Factors

Vector analysis of low to moderate astigmatism with small incision lenticule extraction (SMILE): results of a 1-year follow-up. BACKGROUND: To evaluate the refractive outcomes for the correction of low to moderate astigmatism up to 1 year following small incision lenticule extraction (SMILE) surgery. METHODS: This retrospective study enrolled 98 eyes from 98 patients who underwent SMILE surgery for the correction of myopia and astigmatism. Only right eyes were included in this study to avoid the bias of orientation errors. The vector method was used to analyze the outcomes of astigmatism at 1 month, 6 months and 12 months after the procedure, including the double-angle plots, correction index (CI), index of success (IOS), angle of error (AofE) and magnitude of error (MofE). The effectiveness, safety, stability and predictability were also investigated during the 12-month follow-up. RESULTS: The preoperative cylinder ranged from -2.75 D to -0.25 D (average of -0.90Â±0.68 D), and the mean postoperative cylinder values were -0.24Â±0.29 D, -0.24Â±0.29 D,

and -0.20Â±0.27 D at 1 month, 6 months, and 12 months, respectively. The mean astigmatism in vector form was -0.14 DÃ—27.19Â° at 1 month, -0.13 DÃ—27.29Â° at 6 months, and -0.10 DÃ—28.63Â° at 12 months after surgery. The CI was 1.00Â±0.32 and IOS was 0.29Â±0.44 at the 12-month follow-up. Significant negative correlations were found between the CI and absolute target induced astigmatism (TIA) value, and positive correlations were found between the IOS and absolute AofE value (P<0.05). The MofE was limited within Â±1.00 D at the 12-month follow-up. Fifty-six eyes (57.1%) gained one line in corrected distance visual acuity (CDVA) and five eyes (5.1%) gained two lines. There were no significant differences observed in the refractive outcomes among time points. CONCLUSIONS: SMILE surgery was effective and safe in correcting low to moderate astigmatism, and stable refractive outcomes were observed at the long-term follow-up. The undercorrection of astigmatism could possibly be influenced by attempted astigmatism correction preoperatively, the axis rotation during the surgery or wound healing postoperatively. This study suggested that nomograms should be adjusted in correcting astigmatism with SMILE surgery. Adolescent;Adult;Astigmatism;Female;Humans;Low-Level Light Therapy;Male;Myopia;Refractive Surgical Procedures;Retrospective Studies;Young Adult

Low-cost home-use light-emitting-diode phototherapy as an alternative to conventional methods. BACKGROUND: The aim of our study was to evaluate whether a portable, light-weight, light-emitting-diode phototherapy unit designed for home use is as effective as conventional blue-light fluorescent phototherapy (CFP) for treating hyperbilirubinemia in neonates. METHODS: A total of 50 patients were recruited sequentially for treatment using CFP (n = 25) and the home-type phototherapy unit (n = 25). RESULTS: The average rate of decrease in bilirubin levels was 0.17 Â± 0.02 and 0.20 Â± 0.01 mg/dL/hours at the end of 24 hours in the groups receiving phototherapy by CFP and home-type phototherapy units, respectively. There was no statistically significant difference in the rate of the decrease in bilirubin levels between the groups (p = 0.104). CONCLUSIONS: It has been shown that the home-type phototherapy unit is as effective as CFP units in the treatment of neonatal hyperbilirubinemia and has the potential to become a standard of care for treatment of jaundiced neonates. Bilirubin Bilirubin;Costs and Cost Analysis;Female;Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Light;Male;Phototherapy;Time Factors;Treatment Outcome;Turkey

Low-level laser irradiation modulates cell viability and creatine kinase activity in C2C12 muscle cells during the differentiation process. Low-level laser irradiation (LLLI) is increasingly used to treat musculoskeletal disorders, with satisfactory results described in the literature. Skeletal muscle satellite cells play a key role in muscle regeneration. The aim of the present study was to evaluate the effect of LLLI on cell viability, creatine kinase (CK) activity, and the expression of myogenic regulatory factors in C2C12 myoblasts during the differentiation process. C2C12 cells were cultured in Dulbecco's modified Eagle's medium (DMEM) containing 2% horse serum and submitted to irradiation with GaAlAs diode laser (wavelength, 780 nm; output power, 10 mW; energy density, 5 J/cm2). Cell viability and the expression of myogenic regulatory factors were assessed 24, 48, and 72 h after irradiation by 3-(4,5-dimethylthiazol-2-yl)-2,5,-diphenyltetrazolium bromide (MTT) assay and quantitative real-time polymerase chain reaction (RT-qPCR), respectively. CK activity was analyzed at 24 and 72 h. An increase in cell viability was found in the laser group in comparison to the control group at all evaluation times. CK activity was significantly increased in the laser group at 72 h. Myogenin messenger RNA (mRNA) demonstrated a tendency toward an increase in the laser group, but the difference in comparison to the control group was non-significant. In conclusion, LLLI was able to modulate cell viability and CK activity in C2C12 myoblasts during the differentiation process. MyoD Protein;Myogenin;RNA, Messenger;Creatine Kinase Animals;Cell Differentiation;Cell Survival;Cells, Cultured;Creatine Kinase;Gene Expression Regulation;Low-Level Light Therapy;Mice;MyoD Protein;Myoblasts;Myogenin;Phosphorylation;RNA, Messenger

Evaluation of the effects of LLLT on biomechanical properties of tibial diaphysis in two rat models of experimental osteoporosis by a three point bending test. Osteoporosis (OP) is a disease which causes bone loss and fractures, leading to severe pain and deformity. This study has aimed to assess the effects of pulsed wave low-level laser therapy (PW LLLT) on cortical bone in two experimental models of OP in rats. There were four ovariectomized (OVX-d) groups and four dexamethasone-treated groups. The healthy group were considered for baseline evaluations. At 14Â weeks following ovariectomy, the OVX-d rats were further subdivided into the following: control rats with OP, OVX-d rats that received alendronate (1Â mg/kg), OVX-d rats treated with LLLT, and OVX-d rats treated with alendronate and LLLT. The remaining rats received dexamethasone for 5Â weeks and were divided into four groups: control, alendronate-treated rats (1Â mg/kg), laser-treated rats, and laser-treated rats with concomitant administration of alendronate. The rats received alendronate for 30Â days. LLLT (890Â nm, 80Â Hz, 0.972Â J/cm(2)) was performed on the tibias three times per week for 8Â weeks. After 8Â weeks, tibias were extracted and submitted to a three-point bending test. PW LLLT did not increase the biomechanical parameters of osteoporotic bones compared to controls and healthy rats. PW LLLT associated with alendronate treatment significantly increased stress high load in OVX-d rats compared to the healthy group. PW LLLT at the current study parameters failed to cause beneficial biomechanical effects in the examined osteoporotic cortical bones. PW LLLT associated with alendronate treatment produced a more remarkable effect on bone strength in the ovariectomized induced OP rat model. Bone Density Conservation Agents;Alendronate Alendronate;Animals;Biomechanical Phenomena;Bone Density Conservation Agents;Chemoradiotherapy;Diaphyses;Female;Humans;Low-Level Light Therapy;Male;Osteoporosis;Rats;Rats, Wistar;Tibia

Immediate effects of low-intensity laser (808 nm) on fatigue and strength of spastic muscle. The cerebrovascular accident (CVA), high-impact disease II, affects the basic functions of the limbs, leading to changes of sensory, language, and motor functions. The search for resources that minimize the damage caused by this disease grows every day. The clinical use of low-intensity laser therapy (LILT) has provided major breakthroughs in the treatment of muscular disorders and prevention of muscle fatigue. Thus, the objective of the present study is to analyze the answers and immediate adaptations of the rectus femoris and vastus medialis of spastic hemiparetic patients, facing the increase in peak torque and triggering muscle fatigue, after application of LILT. Double-blind clinical trials were conducted with 15 volunteers post-CVA with spasticity, of both genders, between 40 and 80 years old. To this end, the volunteers went through three consecutive stages of rating (control, placebo, and laser). All performed tests of isometric contraction on the patient's hemiparetic side. Significant differences were observed with regard to the increase in muscle performance (pâ€‰=â€‰0.0043) and the reduction in blood lactate concentration (pâ€‰<â€‰0.0001) of the post-LILT muscles. The LILT (diode laser, l100 mW 808 nm, 4.77 J/cm(2)/point, 40 s/AP) can be employed during and after spastic muscle-strengthening exercises, contributing to the improvement of motor function of the patient. After application of LILT, we found increased torque as well as decreased in lactate level in patients with spasticity. Lactic Acid Adult;Aged;Aged, 80 and over;Cross-Sectional Studies;Double-Blind Method;Female;Humans;Lactic Acid;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Muscle Spasticity;Muscle Strength;Quadriceps Muscle;Stroke

Clinical, biochemical and histological study of the effect of antimicrobial photodynamic therapy on oral mucositis induced by 5-fluorouracil in hamsters. Oral mucositis (OM) is a debilitating side effect of chemotherapy, which can be relieved by phototherapy. Antimicrobial photodynamic therapy (aPDT) may be used for the treatment of OM, when infection is present. However, there are no studies showing that aPDT affects tissue repair process when used in the treatment of lesions caused

by OM. This work aims to evaluate the effect of aPDT in healing OM induced by 5-Fluorouracil (5-FU). Two hundred forty-five hamsters were divided into two groups, control (C) and experimental, which were subdivided into 4 subgroups (Ch, ChP, ChL, aPDT). C group received only the vehicle of chemotherapy and anesthesia, whereas all animals of the experimental groups received anesthesia and chemotherapy agent 5-FU to induce OM. Ch group received no OM treatment; ChP group received an application of methylene blue (MB) 0.01%; ChL received irradiation with low-power-laser (LPL-660 nm/120 J /cm(2)/40 mW/4.4 J per point); and aPDT received MB and LPL irradiation. OM Clinical severity were daily assessed by a blinded examiner. The animals were sacrificed after 5, 7 and 10 days of experiment and their oral mucosa were removed for biochemical (enzymatic activity of SOD and catalase) and histological analyzes (light microscopy). After statistical analysis was performed, results showed that aPDT reduced the severity of OM on the tenth day of the experiment, when compared to the initial OM score ($p < 0.05$), as well as increased keratinization with organized collagen deposition in the lamina propria. In conclusion, aPDT can be safely used in animals with infected OM because it does not affect lesion-repairing processes. Anti-Infective Agents;Antineoplastic Agents;Photosensitizing Agents;Methylene Blue;Fluorouracil Animals;Anti-Infective Agents;Antineoplastic Agents;Cricetinae;Female;Fluorouracil;Low-Level Light Therapy;Methylene Blue;Photochemotherapy;Photosensitizing Agents;Severity of Illness Index;Stomatitis

Measuring the dynamics of cyclic adenosine monophosphate level in living cells induced by low-level laser irradiation using bioluminescence resonance energy transfer. Several studies demonstrated that the cyclic adenosine monophosphate (cAMP), an important second messenger, is involved in the mechanism of low-level laser irradiation (LLLI) treatment. However, most of these studies obtained the cAMP level in cell culture extracts or supernatant. In this study, the cAMP level in living cells was measured with bioluminescence resonance energy transfer (BRET). The effect of LLLI on cAMP level in living cells with adenosine receptors blocked was explored to identify the role of adenosine receptors in LLLI. The results showed that LLLI increased the cAMP level. Moreover, the rise of cAMP level was light dose dependent but wavelength independent for 658-, 785-, and 830-nm laser light. The results also exhibited that the adenosine receptors, a class of G protein-coupled receptor (GPCR), modulated the increase of cAMP level induced by LLLI. The cAMP level increased more significantly when the A3 adenosine receptors (A3R) were blocked by A3R antagonist compared with A1 adenosine receptor or A2a adenosine receptor blocked in HEK293T cells after LLLI, which was in good agreement with the adenosine receptorsâ€™ expressions. All these results suggested that measuring the cAMP level with BRET could be a useful technique to study the role of GPCRs in living cells under LLLI. Receptors, Purinergic P1;Cyclic AMP Cyclic AMP;Energy Transfer;HEK293 Cells;Humans;Lasers;Light;Luminescence;Microscopy, Confocal;Microscopy, Fluorescence;Receptors, Purinergic P1;Temperature

Effects of tissue water content on the propagation of laser light during low-level laser therapy. This work reports that the laser fluence rate inside porcine skin varied notably with the change of tissue water content under the same laser irradiation conditions. The laser fluence rate inside skin tissue samples with varying water content was measured using an optical fiber sensor, while the target was irradiated either by a low-level 635 or 830 nm laser (50 mW/cm2). It was demonstrated that the distribution of laser fluence rate inside the target is strongly affected by tissue water content and its profile is determined by the water content dependency of optical properties at the laser wavelength. Water Animals;Lasers;Light;Low-Level Light Therapy;Male;Models, Theoretical;Optical Fibers;Optics and Photonics;Skin;Swine;Water;Wound Healing

Effect of low-level laser therapy in the treatment of cochlear tinnitus: a double-blind, placebo-controlled study. Many treatments for chronic tinnitus have been attempted, but the condition

remains difficult to cure, especially in the case of cochlear tinnitus. We conducted a prospective, double-blind, placebo-controlled study to assess the effect of low-dose laser therapy on chronic cochlear tinnitus. Our study population was made up of 66 patients-33 who received active laser treatment (case group) and 33 who received inactive dummy treatment (control group). Patients in the laser group received 5 mV with a wavelength of 650 nm for 20 minutes a day, 5 days a week, for 4 weeks. The controls followed the same schedule, but they were "treated" with an inactive device. The degree of tinnitus was evaluated before and after treatment in each group in three ways: (1) the Tinnitus Severity Index (TSI), (2) a subjective 10-point self-assessment scale for tinnitus loudness, and (3) the Tinnitus Evaluation Test (TET). At study's end, we found no statistically significant differences between the case and control groups in the number of patients who experienced a reduction in TSI values ($p = 0.589$) or a reduction in subjective self-assessment scores ($p = 0.475$). Nor did we find any significant reductions in the loudness ($p = 0.665$) and frequency ($p = 0.396$) of tinnitus as determined by the TET. We conclude that 5-mV laser therapy with a wavelength of 650 nm is no better than placebo for improving hearing thresholds overall or for treating tinnitus with regard to age, sex, environmental noise level, and the duration of tinnitus. Adult;Aged;Aged, 80 and over;Audiometry, Pure-Tone;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Quality of Life;Severity of Illness Index;Tinnitus;Treatment Outcome;Young Adult

Oral mucositis prevention and management by therapeutic laser in head and neck cancers. INTRODUCTION: Oral mucositis is considered a severe complication in cancer patients receiving radiotherapy or chemotherapy for head and neck cancer. The aim of this review study was to assess the effect of low level laser therapy for prevention and management of oral mucositis in cancer patients. METHODS: The electronic databases searched included Pubmed, ISI Web of Knowledge and Google scholar with keywords as "oral mucositis", "low level laser therapy" from 2000 to 2013. RESULTS: The results of most studies showed that photobiomodulation (PBM) reduced the severity of mucositis. Also, it can delay the appearance of severe mucositis. CONCLUSION: Low level laser therapy is a safe approach for management and prevention of oral mucositis.

Conservative treatment of carpal tunnel syndrome: comparison between laser therapy and Fascial Manipulation(Â®). The etiopathogenesis of Carpal Tunnel Syndrome (CTS) is multifactorial and most cases are classified as idiopathic (Thurston 2013). A randomized controlled trial was performed to compare the effectiveness of Fascial Manipulation(Â®) (FM) and Low-Level Laser Therapy (LLLT) for CTS. This prospective trial included 42 patients (70 hands with symptoms) with clinical and electroneuromyographic diagnosis of CTS. The patients were randomly assigned to receive multiple sessions of FM or multiple session of LLLT. The Visual Analogic Scale (VAS) and Boston Carpal Tunnel Questionnaire (BCTQ) were performed at baseline, end of treatment and after three months. The group that received FM showed a significant reduction in subjective pain perception and an increased function assessed by BCTQ at the end of the treatment and follow-up. The group that received LLLT showed an improvement in the BCTQ at the end of the treatment but the improvement level was not sustained at the three month follow-up. FM is a valid alternative treatment for CTS. Adult;Aged;Carpal Tunnel Syndrome;Female;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Prospective Studies;Recovery of Function;Severity of Illness Index;Therapy, Soft Tissue;Trigger Points

Low-pulse energy Q-switched Nd:YAG laser treatment for hair-dye-induced Riehl's melanosis. Riehl's melanosis, a form of dermatitis characterized by reticulate pigmentation, typically presents as a gray-brown to black hyperpigmentation on the face and neck. Among the various etiologic factors suggested, photoallergic reaction and pigmented contact dermatitis resulting from exposure to drugs, coal tar dyes, optical whitener, or other ingredients found in cosmetics are believed to be the major

contributing factors in this disease. The histopathological features of Riehl's melanosis mainly consist of pigmentary incontinence along with infiltration of numerous dermal melanophages and lymphohistiocytes.1,2 Additionally, notable clinical improvements in the treatment of this condition have been reported for intense pulsed light (IPL) therapy, in comparison to long-term topical application of bleaching agents.2 Here, we report the cases of two Asian patients treated with a low-pulse energy 1,064-nm Q-switched (QS) Nd:YAG laser for hair dye-induced Riehl's melanosis on the face and neck. In conclusion, we observed that Riehl's melanosis on the face and neck was effectively and safely treated with a low-pulse energy 1,064-nm QS Nd:YAG laser. We suggest that this method can be used in Asian patients with Riehl's melanosis at risk of postinflammatory hyperpigmentation from excessive light or laser energy delivery. Hair Dyes Asian People;Cosmetic Techniques;Female;Hair Dyes;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged

Hailey-Hailey disease improved by fractional CO2 laser. Hailey-Hailey disease (HHD), also known as benign familial pemphigus, is an autosomal dominant skin condition that affects the adhesion of epidermal keratinocytes. Although the initial manifestation of flaccid vesicles on erythematous or normal skin in flexure sites frequently goes unnoticed, large, macerated, exudative plaques of superficial erosions with crusting are observed at the time of diagnosis. There is no specific treatment for HHD, and most cases are symptomatically supported. However, infrared laser ablation has been somewhat helpful. We present a case successfully treated with fractional CO2 laser showing a long-term favourable outcome and no adverse effects. Thus, this modality could be an alternative to full ablation for this condition. Adult;Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Pemphigus, Benign Familial

[Efficacy of pulsed-dye laser on residual red lesions of cutaneous leishmaniasis]. BACKGROUND: Cutaneous leishmaniasis caused by LeishmaniaÂ tropica can leave troublesome and unsightly lesions. Treatment of these scars remains difficult. Pulsed-dye laser (PDL) is one therapeutic approach that may improve the clinical appearance of erythematosus lesions. The purpose of this retrospective study was to evaluate the effectiveness of PDL on the residual red lesions of erythematous facial leishmaniasis in three patients. PATIENTS AND METHODS: Case no.Â 1: a 14-year-old girl presented an ulcerative and erythematous nodular lesion on her left cheek. One month after treatment, an erythematous lesion measuring 3Â cm persisted on the patient's cheek, without atrophy or hyperpigmentation. PDL 595nm was used at the following settings: duration: 3ms; spot size: 7mm; energy: 8Â j/cm(2). Case no.Â 2: a 43-year-old woman presented an erythematous papular lesion on her right cheek. Following treatment, a 4-cm hypertrophic, red telangiectasic lesion remained. PDL 595nm was used with the following settings: pulse duration: 3Â ms; spot-size: 10mm; energy: 8Â j/cm(2). Case no.Â 3: a 60-year-old woman presented an erythematous papular lesion on her cheek. After treatment, an infiltrated erythematous macule with surface telangiectasia measuring 3.5cm remained. PDL 595nm was also given using the following settings: pulse duration: 3Â ms; spot size: 10mm; energy: 8Â j/cm(2). All three patients underwent three sessions of PDL. The erythematous and telangiectasic lesions showed improvement after the initial session and had completely disappeared after the third session. Post-laser purpura subsided within around 10Â days. Therapeutic response was assessed clinically by comparing photographs taken before and after treatment and follow-up lasted 12Â months. DISCUSSION: Cutaneous leishmaniasis caused by L.Â tropica is endemo-epidemic in Morocco. A number of treatments are available for red residual lesions but thanks to its effect on erythematous and vascular lesions, PDL has been shown to provide the most reproducibly good results and is the laser method of choice for this type of scar. A recent study of the dermoscopic features of DL identified the presence of vascular patterns in 100% of cases in this infection, which may account for the efficacy of PDL. PDL results in selective thermolysis that

destroys small vessels. Our study showed improvement with PDL regarding scar size, pliability, erythema and texture. Further larger-scale studies could better determine the place of PDL in treating the sequelae of cutaneous leishmaniasis.
Adolescent;Adult;Erythema;Female;Humans;Lasers, Dye;Leishmaniasis, Cutaneous;Low-Level Light Therapy;Middle Aged;Morocco;Skin Ulcer

InGaP 670-nm laser therapy combined with a hydroalcoholic extract of Solidago chilensis Meyen in burn injuries. Therapies that accelerate the healing of burn injuries, improving the quality of life of the patient and reducing the cost of treatment are important. This study evaluated the effects of InGaP 670-nm laser therapy combined with a hydroalcoholic extract of Solidago chilensis leaves on burn wound healing in rats. Seventy-two rats were divided randomly into four groups: control untreated (C), treated with InGaP 670-nm laser with power density of 0.41 W/cm(2) and energy density of 4.93 J/cm(2) (L), treated with S. chilensis extract (S) and treated with S. chilensis extract and laser (LS). Second-degree burns were produced on the back of the animals with metal plate. Wound samples were collected on days 7, 14 and 21 of treatment for structural analysis, morphometry and Western blotting to quantify the expression of transforming growth factor beta 1 (TGF-Î²1) and vascular endothelial growth factor (VEGF). The results showed that InGaP laser irradiation at 670 nm alone and combined with extract of S. chilensis promoted significant tissue repair responses in this experimental model, increasing the number of fibroblasts, collagen fibres and newly formed blood vessels throughout the experimental period and decreasing the number of granulocytes in burn wounds of second degree in all treated groups. Exclusive treatment of burn wounds with the hydroalcoholic extract of S. chilensis provided similar quantitative results to those seen in the untreated group throughout the experimental period. Therefore, it was observed in the L and LS groups different responses in the expression of TGF-Î²1 and VEGF. The application of 670-nm laser alone or combined with the extract of S. chilensis promoted favourable responses in tissue repair of second-degree burns in this experimental model. Pancreatitis-Associated Proteins;Plant Extracts;REG3A protein, human;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A Animals;Burns;Combined Modality Therapy;Fibroblasts;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Pancreatitis-Associated Proteins;Plant Extracts;Rats, Wistar;Skin;Solidago;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;Wound Healing

Effect of different temporary crown materials and surface roughening methods on the shear bond strengths of orthodontic brackets. OBJECTIVE: The aim of this study was to evaluate the effect of different temporary crown materials (TCMs) and surface roughening methods on the shear bond strength (SBS) of orthodontic brackets. BACKGROUND DATA: TCMs are widely used during orthodontic treatment in teeth in need of prosthetic treatment, to prevent damage to the final restoration. However, there is no consensus considering the best method for roughening of the surface of TCMs. METHODS: Five different TCMs [Dentalon Plus-(D), Basworth Trim II-(B), Voco Structure Premium-(V), 3M ESPE Protempt 4-(P), and Revotek LC-(R)] were used in this study. Different surface roughening methods (37% phosphoric acid, sandblasting, and Er:YAG laser) were employed in three subgroups (n=20). The SBS test was used to assess the durability of all groups. Scanning electron microscopy (SEM) analysis was performed on a representative specimen in each group. RESULTS: The highest mean SBS value was observed in group V, followed by groups D and P, regardless of the surface treatment. The lowest SBS values were observed in group B. The laser-irradiated groups had higher SBS values than the sandblasted and acid-etched groups. Furthermore, a significant difference in SBS values was observed between the laser-irradiated group V and all other groups ($p<0.005$). CONCLUSIONS: The effects of the chemical nature of TCMs on the SBS values appeared to be clinically negligible, whereas the type of surface treatments had a significant influence

on bond strengths. Er:YAG laser irradiation caused a significant increase in bond strength between the TCMs and orthodontic brackets. Crowns;Dental Bonding;Dental Etching;Dental Stress Analysis;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Orthodontic Brackets;Shear Strength;Surface Properties

Evaluation of light-emitting diodes (LED) effect on skin biology (in vitro study). BACKGROUND: Interest in anti-aging approaches has grown significantly in recent years. The most popular are the non invasive methods to decrease the signs of aging. One such method is LED-based therapy. METHODS: This study investigated the potential of two different wavelengths, 590 nm and 630 nm, combined or not, in the photobiomodulation of proteins involved in the slowdown of the skin aging. RESULTS: These in vitro results on cell viability, cell shape, and mitochondrial function support and build on previous studies suggested that LED treatment is safe. Regarding its biological functions, our data indicated that the combination of two different wavelengths acted in synergy to enhance the impact of each irradiation alone. Combined, the LED wavelengths could improve in vitro the cell shape, the cell proliferation, and the level of major proteins involved in the healing process. CONCLUSION: These benefits may lead to reinforcement of the skin organization and structure. This hypothesis will be checked in future clinical studies. Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Equipment Design;Equipment Failure Analysis;Humans;Keratinocytes;Light;Lighting;Radiation Dosage;Semiconductors;Skin;Skin Physiological Phenomena

Effect of low-level laser therapy on bone repair: a randomized controlled experimental study. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on bone repair in femoral fractures. Sixty adult Wistar rats were randomly assigned into one of two groups: group A (ostectomy + LLLT) or group B (ostectomy + sham laser). An experimental model of complete bone fracture was surgically created by removing a 2-mm fragment from the middle third of the femoral shaft. Data were analyzed on days 8, 13, and 18 after the fracture (subgroups 1, 2, and 3). Samples were assessed for changes in inflammatory infiltration; trabecular bone matrix, periosteal, and new bone formations; and changes in the expression of particular osteogenic-related proteins (osteocalcin, osteopontin, and osteonectin). Microscopic analysis revealed a significant decrease in inflammatory infiltration, intense trabecular bone matrix and periosteal formation, and an increase in newly formed bone after laser irradiation. We also found an increase in the expression of bone matrix proteins with LLLT, with a significant difference measured for osteocalcin in the LLLT group at day 8 (pâ€‰=â€‰0.007). We show that LLLT plays an important role in augmenting bone tissue formation, which is relevant to fracture healing. LLLT may therefore be indicated as an adjunct therapeutic tool in clinical practice for the treatment or recovery of nonunion injuries. Osteocalcin Animals;Femur;Fracture Healing;Fractures, Bone;Low-Level Light Therapy;Male;Osteocalcin;Osteogenesis;Random Allocation;Rats;Rats, Wistar

Acupuncture for chronic knee pain: a randomised clinical trial. Authors' reply. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Effect of low-level laser therapy (685Â nm, 3Â J/cm(2)) on functional recovery of the sciatic nerve in rats following crushing lesion. Previous studies have shown that low-level laser therapy (LLLT) promotes posttraumatic nerve regeneration. The objective of the present study was to assess the efficacy of 685-nm LLLT at the dosage of 3 J/cm(2) in the functional recovery of the sciatic nerve in rats following crushing injury. The left sciatic nerves of 20 male Wistar rats were subjected to controlled crush injury by a hemostatic tweezers, and the rats were randomly allocated into two experimental groups as follows: control group and laser group. Laser irradiation (685 nm wavelength; 15 mW, CW, 3 J/cm(2), spot of 0.028 cm(2)) was started on the postsurgical first day, above the site of injury, and was continued for 21 consecutive days. Functional recovery was evaluated at 3 weeks

postoperatively by measuring the sciatic functional index (SFI) and sciatic static index (SSI) at weekly intervals. The treated rats showed improvement in motion pattern. The SFI and SSI results were significant when comparing two groups on the 14th and 21st postoperative days (pâ€‰<â€‰0.05). There were intra-group differences detected in laser group in different periods (pâ€‰<â€‰0.05). Low-level laser irradiation, with the parameters used in the present study, accelerated and improved sciatic nerve function in rats after crushing injury. Animals;Low-Level Light Therapy;Male;Nerve Crush;Nerve Regeneration;Peripheral Nerve Injuries;Rats;Rats, Wistar;Recovery of Function;Sciatic Nerve

Histomorphometric evaluation of the effects of various diode lasers and force levels on orthodontic mini screw stability. OBJECTIVE: The purpose of this study was to evaluate the effects of different laser dose and force levels on the stability of orthodontic mini screws used for anchorage, by histomorphometric analyses. BACKGROUND DATA: Low-level laser therapy speeds up blood flow, improves the mechanism of the revitalization processes, reduces the risk of infection, boosts metabolic activities, and accelerates the healing of the damaged tissue. Although there are many research studies about low-level laser therapy applications in a variety of areas, no investigations were found concerning mini screw stability using various laser dose levels with different force level applications. METHODS: Seventeen New Zealand white rabbits were used. A total of 68 cylindrical, self-drilling orthodontic mini screws were threaded at the fibula. Experimental subjects were divided into six groups; force application was not performed in the first three groups, whereas 150 g of force was applied via nickel-titanium closed-coil springs placed between two mini screws in the other three groups. Measurements of the initial torque values (10 Ncm) were manipulated by a digital portable torque gauge. Various low-level laser doses were applied to the groups during the postoperative 10 days. After 4 weeks, bone-to-implant contact and cortical bone thickness were histomorphometrically analyzed. RESULTS: In the 150 g force plus 20 J/cm(2) dosage group, the highest bone-to-implant contact values were observed. ($p<0.05$) There were no statistically significant correlations between cortical bone thickness and bone-to-implant contact values; on the other hand, no significant difference was found among the same groups in terms of cortical bone thickness values ($p>0.05$). CONCLUSIONS: Low-level laser therapy was noticed to induce the mini screw-bone contact area. Low-level laser therapy may be a supplementary treatment method to increase the stability of the orthodontic mini screw. titanium nickelide;Nickel;Titanium Animals;Dental Stress Analysis;Fibula;Implants, Experimental;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nickel;Orthodontic Anchorage Procedures;Rabbits;Titanium;Torque

Closure of chronic non healing ankle ulcer with low level laser therapy in a patient presenting with thalassemia intermedia: Case report. In this single case study, the possible effect of low-level laser therapy (LLLT) was explored in the form of light emitting diodes on a chronic non-healing wound of 6 months duration in an 18-year-old male patient suffering from thalassemia intermedia. After irradiation, with LLLT dosage of 17.3 J/cm(2) for 8 min for 2 weeks duration followed by proliferative dosage of 8.65-4.33 J/cm(2) for 4 min from 3(rd) week to 6(th) week for 2 min along with antibiotics vancomycin (15 mg/kg) and a combination of amoxicillin and clavulanic acid (1 g). Proliferation of healthy granulation tissue was observed with decrease in score of pressure ulcer scale with complete re-epithelialization eventually LLLT irradiation could be a novel method of treatment for chronic non-healing wound in a thalassemia intermedia patient and an useful adjunct to standard care of treatment of pressure ulcers. It is postulated that LED irradiation augments wound healing with an early closure and no recurrence at the irradiated site even after follow up of 6 months.

A rapid tattoo removal technique using a combination of pulsed Er:YAG and Q-Switched Nd:YAG in a split lesion protocol. BACKGROUND: Tattoo removal has evolved over the years and though Q-switched laser is the 'workhorse' laser, it invariably requires multiple sittings, which are dependent on

numerous factors, including the skin colour, location of the tattoo, age of the tattoo, colour of pigment used, associated fibrosis and the kind of tattoo treated. Though ablative lasers, both pulsed CO2 and Er:YAG, have been used for recalcitrant tattoos, very few studies have been done comparing them with pigment-specific lasers. Our study was based on the premise that ablating the epidermis overlying the tattoo pigment with Er:YAG could help in gaining better access to the pigment which would enable the Q-switched laser to work effectively with less beam scattering. OBJECTIVE: A study of rapid tattoo removal (RTR) technique using a combination of pulsed Er:YAG and Q-Switched Nd:YAG in a split lesion protocol. MATERIALS AND METHODS: This prospective study was undertaken during 2010-13 at a laser Clinic in the Maulana Azad Medical College, New Delhi. A total of 10 patients were recruited, 5 of amateur tattoo and 5 of professional tattoo. After informed consent each tattoo was arbitrarily 'split' into two parts. One part was treated with QS Nd:YAG laser(1064 nm) and the other part with Er:YAG laser immediately followed by the QS Nd:YAG. The laser treatments were repeated at 6-week intervals until the tattoo pigment had cleared. On the combination side in subsequent sittings only the QS Nd:YAG was used, to minimize repetitive ablation. To ensure consistency in the intervention methods a trained dermatologist who was independent of the treatment delivery randomly rated 10% of the procedures. RESULTS: The mean improvement achieved by the Q-switched laser (2.93) was less than the combination laser (3.85) side ($p = 0.001$) and needed more sessions (3.8 vs. 1.6; $p = 0.001$). There was a statistically significant difference in the improvement on the combination side till the second session. On the combination side patients required a maximum of 2 sessions, while the Q-switched laser required 3-5 sessions for appreciable lightening. CONCLUSION: From our study it was concluded that use of a pulsed ablative laser may help in rapid removal of tattoos in conjunction with QS lasers with minimal side effects and can be used as a RTR. Cosmetic Techniques;Humans;Lasers, Solid-State;Low-Level Light Therapy;Prospective Studies;Tattooing

Verruca vulgaris: novel treatment with a 1064 nm Nd:YAG laser. BACKGROUND: Verruca Vulgaris (VV) is common benign neoplasm. However, it can present a therapeutic challenge. Previous studies have suggested that the Nd-YAG laser may be beneficial in the management of warts. OBJECTIVE: To determine the effectiveness and safety of a novel 100 microsecond pulsed 1064 nm Nd:YAG laser for the treatment of VV. METHOD: A total of 25 adult subjects with a total of 63 hand verrucae were enrolled in the clinical trial to receive treatment with a low-energy (200 mjoule) 1064 nm Nd:YAG laser (PinPointe, NuvoLase, Inc.). Each subject was eligible for 3 treatments administered at monthly intervals. All verrucae were measured before each treatment session and at 6 months after the final treatment. RESULTS: A complete response was seen in 19 subjects and in 41 verrucae. A complete response was defined as complete absence of verruca with the presence of normal skin dermatoglyphics. All other lesions showed at least partial response. A partial response was defined as a 50% or greater reduction in verruca size. No adverse events were noted. CONCLUSION: Low-energy 1064 nm Nd: YAG laser treatment may be a promising, safe, and effective therapeutic modality for the treatment of VV. However, more treatment sessions may be needed for complete clearance and increased efficacy in some subjects. Adult;Cosmetic Techniques;Female;Hand;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Warts

Treatment of atrophic facial acne scars with fractional Er:Yag laser. BACKGROUND: Acne scars are often a permanent disfiguring sequel of acne vulgaris. Although many treatment modalities are available, they are often non satisfactory for all patients. OBJECTIVE: To determine the effectiveness and safety of fractional 1540 nm erbium_glass laser treatment of facial acne scars in Iraqi patients. PATIENTS AND METHODS: Twenty one patients were enrolled in this prospective clinical study. Three sessions of the 1540 nm erbium glass laser were applied at 2-week intervals. The patients were

assessed at 1, 3, and 6 months after the last session. The effect of treatment was assessed by objective (Sharquie scoring system for grading acne scarring and visual analog scale) and subjective (patient satisfaction) methods. RESULTS: Two patients were defaulted. Eleven patients (57.9%) showed improvement from moderate to mild grade, and no grade changes were detected in eight patients (42.1%). The mean score of the visual analog scale prior to treatment was 8.61 Â± 0.86 and decreased to 6.15 Â± 1.28 (P = 0.037). Ten patients were satisfied to varying degrees. No significant side effects were noted. CONCLUSION: Non-ablative fractional 1540 nm erbium glass laser is an effective and safe method to treat acne scars and represent good alternative for patients who cannot use the ablative methods because of its longer downtime. Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Severity of Illness Index

Muscular pre-conditioning using light-emitting diode therapy (LEDT) for high-intensity exercise: a randomized double-blind placebo-controlled trial with a single elite runner. Recently, low-level laser (light) therapy (LLLT) has been used to improve muscle performance. This study aimed to evaluate the effectiveness of near-infrared light-emitting diode therapy (LEDT) and its mechanisms of action to improve muscle performance in an elite athlete. The kinetics of oxygen uptake (VO2), blood and urine markers of muscle damage (creatine kinase--CK and alanine), and fatigue (lactate) were analyzed. Additionally, some metabolic parameters were assessed in urine using proton nuclear magnetic resonance spectroscopy ((1)H NMR). A LED cluster with 50 LEDs (Î»â€‰=â€‰850â€‰nm; 50â€‰mW 15â€‰s; 37.5â€‰J) was applied on legs, arms and trunk muscles of a single runner athlete 5â€‰min before a high-intense constant workload running exercise on treadmill. The athlete received either Placebo-1-LEDT; Placebo-2-LEDT; or Effective-LEDT in a randomized double-blind placebo-controlled trial with washout period of 7â€‰d between each test. LEDT improved the speed of the muscular VO2 adaptation (âˆ¼-9â€‰s), decreased O2 deficit (âˆ¼-10â€‰L), increased the VO2 from the slow component phase (âˆ¼+348â€‰ml min(-1)), and increased the time limit of exercise (âˆ¼+589â€‰s). LEDT decreased blood and urine markers of muscle damage and fatigue (CK, alanine and lactate levels). The results suggest that a muscular pre-conditioning regimen using LEDT before intense exercises could modulate metabolic and renal function to achieve better performance. Biomarkers;Lactic Acid;Creatine Kinase;Alanine Adult;Alanine;Biomarkers;Creatine Kinase;Double-Blind Method;Humans;Kinetics;Lactic Acid;Light;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Oxygen Consumption;Physical Endurance;Proton Magnetic Resonance Spectroscopy;Running;Time Factors

Hormonal profile and efficacy of long pulse Nd-YAG laser in treatment of hirsutism. BACKGROUND: Hormones, particularly androgens play a vital role in hair growth, differentiation and distribution. Hirsutism is a common entity among Nepalese population with skin types III, IV and V. Long pulsed lasers are commonly used for hair removal. METHODS: This is a prospective analytical study done in Dhulikhel Hospital Kathmandu University Hospital, Kavre, Nepal from November 2010 to November 2011. Patients were first subjected to hormonal evaluation. Androgens, their tropic hormones, insulin resistance markers and endocrine components were measured and compared. Subjects were then categorized into two groups according to androgen levels: group A (n=30) with significantly high androgen (total testosterone and dehydroepiandrosterone sulfate) or elevated luteinizing hormone: follicle stimulating hormone ratio, consistent with Polycystic Ovarian Syndrome (PCOS) and group B (n=30). Adrenal tumour was ruled out in all patients. All patients received long pulse Nd-YAG laser (50J/cmÂ²; 50 msec pulse duration) therapy at four weeks interval to achieve at least 50% hair reduction. RESULTS: Among group A patients, average 8.1 treatment sessions were required for substantial hair reduction, whereas, average 5.7 sessions produced similar results in group B patients (p-value <0.05). CONCLUSIONS: Patients with high androgen level and elevated LH:

FSH ratio requires more treatment sessions for hair removal with long pulsed ND-YAG laser than patients with normal or low hormone level. Androgens;Gonadotropins, Pituitary;Testosterone Adolescent;Adult;Androgens;Female;Gonadotropins, Pituitary;Hair Removal;Hirsutism;Humans;Insulin Resistance;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Nepal;Prospective Studies;Testosterone;Young Adult

Vascular regeneration effect of adipose-derived stem cells with light-emitting diode phototherapy in ischemic tissue. The objective of this study was to investigate the effects on the vascular regeneration of adipose-derived stem cells (ASCs) by using red light-emitting diode (LED) irradiation in ischemic hind limbs. Low-level light therapy (LLLT) has been shown to enhance proliferation and cytokine secretion of a number of cells. ASCs are an attractive cell source for vascular tissue engineering. This approach is hindered because transplanted ASCs decline rapidly in the recipient tissue. Ischemic hind limbs were treated with LLLT from an LED array (660Â nm) at an irradiance of 50Â mW/cm(2) and a radiant exposure of 30Â J/cm(2). LLLT, ASC transplantation, and ASC transplantation with LLLT (ASC + LLLT) were applied to ischemic limbs, and cell survival and differentiation, and secretion of vascular endothelial growth factor and basic fibroblast growth factor of the ASCs were evaluated by immunostaining and Western blot analyses. Vascular regeneration was assessed by immunostaining and hematoxylin and eosin staining. In the ASC + LLLT group, the survival of ASCs was increased due to the decreased apoptosis of ASCs. The secretion of growth factors was stimulated in this group compared with ASCs alone. The ASC + LLLT group displayed improved treatment efficacy including neovascularization and tissue regeneration compared with ASCs alone. In particular, quantitative analysis of laser Doppler blood perfusion image ratio showed that blood perfusion was enhanced significantly (pâ€‰<â€‰0.05) by ASC + LLLT treatment. These data suggest that LLLT is an effective biostimulator of ASCs in vascular regeneration, which enhances the survival of ASCs and stimulates the secretion of growth factors in ischemic limbs. VEGFA protein, human;Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2 Adipocytes;Cell Differentiation;Cell Survival;Fibroblast Growth Factor 2;Humans;Ischemia;Laser-Doppler Flowmetry;Low-Level Light Therapy;Neovascularization, Pathologic;Perfusion;Phototherapy;Regeneration;Stem Cells;Tissue Engineering;Vascular Endothelial Growth Factor A;Wound Healing

Combination of low level light therapy and nitrosyl-cobinamide accelerates wound healing. Low level light therapy (LLLT) has numerous therapeutic benefits, including improving wound healing, but the precise mechanisms involved are not well established; in particular, the underlying role of cytochrome C oxidase (C-ox) as the primary photoacceptor and the associated biochemical mechanisms still require further investigation. We previously showed the nitric oxide (NO) donating drug nitrosyl-cobinamide (NO-Cbi) enhances wound healing through a cGMP/cGMP-dependent protein kinase/ERK1/2 mechanism. Here, we show that the combination of LLLT and NO-Cbi markedly improves wound healing compared to either treatment alone. LLLT-enhanced wound healing proceeded through an electron transport chain-C-ox-dependent mechanism with a reduction of reactive oxygen species and increased adenosine triphosphate production. C-ox was validated as the primary photoacceptor by three observations: increased oxygen consumption, reduced wound healing in the presence of sodium azide, and disassociation of cyanide, a known C-ox ligand, following LLLT. We conclude that LLLT and NO-Cbi accelerate wound healing through two independent mechanisms, the electron transport chain-C-ox pathway and cGMP signaling, respectively, with both resulting in ERK1/2 activation. Cobamides;Cyanides;Reactive Oxygen Species;cobinamide;Nitric Oxide;Adenosine Triphosphate;Sodium Azide;Electron Transport Complex IV;Extracellular Signal-Regulated MAP Kinases;Cyclic GMP;Nitrogen Adenosine Triphosphate;Cell Line, Tumor;Cell Proliferation;Cobamides;Cyanides;Cyclic GMP;Electron Transport;Electron Transport Complex

IV;Extracellular Signal-Regulated MAP Kinases;Hot Temperature;Humans;Light;Low-Level Light Therapy;Nitric Oxide;Nitrogen;Oxygen Consumption;Photochemistry;Reactive Oxygen Species;Signal Transduction;Sodium Azide;Wound Healing

Laser treatment and its implications for photodamaged skin and actinic keratosis. Treatment of widespread actinic keratoses (AKs) and extensive photodamage is a challenge. One of the treatment options is laser therapy, whereby physicians have the option of using ablative lasers (CO2 and Erbium Yttrium Aluminium Garnet) or nonablative fractional laser systems. With ablative laser systems, the superficial layers of the skin are ablated, including epidermal and superficial dermal actinic damage. Re-epithelialization occurs from uninvolved skin and keratinocytes from follicles. When using a CO2 laser, additional cosmetic improvements are a result of removal and tightening of the photodamaged collagen in the superficial dermis. The most important risks of this treatment are scarring and dyspigmentation. These risks are lessened when using fractional lasers, which produce small columns of ablation or coagulation in the skin, leaving the surrounding skin intact. This treatment may be combined with topical agents. Existing evidence suggests that both ablative laser resurfacing and fractional laser treatments are effective in reducing AKs and photodamage. Although these treatment modalities are widely used and clinical experiences are positive, large comparative studies are remarkably scarce. Still, laser resurfacing has a place in the (field) treatment of widespread AKs and extensive photodamage. Ablation Techniques;Cosmetic Techniques;Humans;Keratosis, Actinic;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Skin Aging;Ultraviolet Rays

The Effects of Low-Level Laser Therapy on Pain Associated With Tendinopathy: A Critically Appraised Topic. CLINICAL SCENARIO: Tendinopathies plague many active individuals, causing pain and reducing sport activity by decreasing range of motion and strength. There are many modalities that have been used to treat pain associated with chronic inflammation, such as ultrasound, moist heat packs, and electrical stimulation. Low-level laser therapy (LLLT) is one such modality. Potential benefits of managing pain associated with tendinopathies have been investigated using LLLT. Cellular respiration and metabolism are thought to be increased by LLLT acting on the mitochondrial cytochromes. The effects LLLT may have on cellular activity could increase blood flow to progress the healing process by reducing the pain-spasm cycle. The purpose of this critically appraised topic is to identify the clinical effectiveness of LLLT on pain associated with tendinopathy and to identify the parameters used to achieve statistically and clinically relevant pain outcomes. FOCUSED CLINICAL QUESTIon: What is the effect of LLLT on pain associated with tendinopathy? CLINICAL BOTTOM LINE: Although LLLT significantly decreases pain from baseline, its use may be no better than placebo or traditional treatments such as ultrasound, moist heat packs, electrical stimulation, or therapeutic exercise to reduce pain associated with tendinopathy. Total accumulated joules across the treatment sessions may need to be taken into account as a parameter. Evidence-Based Medicine;Low-Level Light Therapy;Musculoskeletal Pain;Tendinopathy

Effects of low level laser treatment on the survival of axotomized retinal ganglion cells in adult Hamsters. Injury to axons close to the neuronal bodies in the mammalian central nervous system causes a large proportion of parenting neurons to degenerate. It is known that optic nerve transection close to the eye in rodents leads to a loss of about half of retinal ganglion cells in 1 week and about 90% in 2 weeks. Using low level laser treatment in the present study, we demonstrated that treatment with helium-neon (660 nm) laser with 15 mW power could delay retinal ganglion cell death after optic nerve axotomy in adult hamsters. The effect was most apparent in the first week with a short period of treatment time (5 minutes) in which 65-66% of retinal ganglion cells survived the optic nerve axotomy whereas 45-47% of retinal ganglion cells did so in optic nerve axotomy controls. We also found that single dose and early commencement of laser irradiation were

important in protecting retinal ganglion cells following optic nerve axotomy. These findings thus convincingly show that appropriate laser treatment may be neuroprotective to retinal ganglion cells.

Low level light therapy modulates inflammatory mediators secreted by human annulus fibrosus cells during intervertebral disc degeneration in vitro. Intervertebral disc degeneration (IVD) is one of the important causes of low back pain and is associated with inflammation induced by interaction between macrophages and the human annulus fibrosus (AF) cells. Low-level light therapy (LLLT) has been widely known to regulate inflammatory reaction. However, the effect of LLLT on macrophage-mediated inflammation in the AF cells has not been studied till date. The aim of this study is to mimic the inflammatory microenvironment and to investigate the anti-inflammatory effect of LLLT at a range of wavelengths (405, 532 and 650Â nm) on the AF treated with macrophage-like THP-1 cells conditioned medium (MCM) containing proinflammatory cytokines and chemokines (interleukin-1beta, tumor necrosis factor-alpha, interleukin-6 and 8). We observed that AF cells exposed to MCM secrete significantly higher concentrations of IL-6, IL-8, IL-1Î² and TNF-Î±. LLLT markedly inhibited secretion of IL-6 at 405Â nm in a time-dependent manner. Level of IL-8 was significantly decreased at all wavelengths in a time-dependent manner. We showed that MCM can induce the inflammatory microenvironment in AF cells and LLLT selectively suppressed IL-6 and 8 levels. The results indicate that LLLT is a potential method of IVD treatment and provide insights into further investigation of its anti-inflammation effect on IVD. Culture Media, Conditioned;IL6 protein, human;Interleukin-1beta;Interleukin-6;Interleukin-8;Tumor Necrosis Factor-alpha Cell Line;Culture Media, Conditioned;Fibroblasts;Humans;Inflammation;Interleukin-1beta;Interleukin-6;Interleukin-8;Intervertebral Disc;Intervertebral Disc Degeneration;Low-Level Light Therapy;Macrophages;Time Factors;Tumor Necrosis Factor-alpha

Paramecium: a promising non-animal bioassay to study the effect of 808 nm infrared diode laser photobiomodulation. OBJECTIVE: Photobiostimulation and photobiomodulation (PBM) are terms applied to the manipulation of cellular behavior using low intensity light sources, which works on the principle of inducing a biological response through energy transfer. The aim of this investigation was to identify a laboratory assay to test the effect of an infrared diode laser light (808 nm) on cell fission rate. MATERIALS AND METHODS: Sixty cells of Paramecium primaurelia were divided in two groups of 30. The first group (test group) was irradiated, at a temperature of 24Â°C, for 50 sec by a 808 nm diode laser with a flat top handpiece [1 cm of spot diameter, 1 W in continuous wave (CW), 50 sec irradiation time, 64 J/cm(2) of fluence]. The second group (control group) received no laser irradiation. All cells were transferred onto a depression slide, fed, and incubated in a moist chamber at a temperature of 24Â°C. The cells were exposed and monitored for 10 consecutive fission rates. Changes in temperature and pH were also evaluated. RESULTS: The exposed cells had a fission rate rhythm faster than the control cells, showing a binary fission significantly ($p<0.05$) shorter than unexposed cells. No significant effects of laser irradiation on pH and temperature of Paramecium's lettuce infusion medium were observed. CONCLUSIONS: The 808 nm infrared diode laser light, at the irradiation parameters used in our work, results in a precocious fission rate in P. primaurelia cells, probably through an increase in metabolic activity, secondary to an energy transfer. Biological Assay;Energy Transfer;Lasers, Semiconductor;Low-Level Light Therapy;Paramecium

Pre-conditioning with low-level laser (light) therapy: light before the storm. Pre-conditioning by ischemia, hyperthermia, hypothermia, hyperbaric oxygen (and numerous other modalities) is a rapidly growing area of investigation that is used in pathological conditions where tissue damage may be expected. The damage caused by surgery, heart attack, or stroke can be mitigated by pre-treating the local or distant tissue with low levels of a stress-inducing stimulus, that can induce a protective response against subsequent major damage. Low-level laser (light) therapy (LLLT) has been used for nearly 50 years to enhance tissue healing and to relieve pain, inflammation and swelling. The photons

are absorbed in cytochrome(c) oxidase (unit four in the mitochondrial respiratory chain), and this enzyme activation increases electron transport, respiration, oxygen consumption and ATP production. A complex signaling cascade is initiated leading to activation of transcription factors and up- and down-regulation of numerous genes. Recently it has become apparent that LLLT can also be effective if delivered to normal cells or tissue before the actual insult or trauma, in a pre-conditioning mode. Muscles are protected, nerves feel less pain, and LLLT can protect against a subsequent heart attack. These examples point the way to wider use of LLLT as a pre-conditioning modality to prevent pain and increase healing after surgical/medical procedures and possibly to increase athletic performance.
[Acupuncture with needles or lasers without clinically relevant effect on knee osteoarthritis]. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male
[Effect of low -level laser therapy and exercise in reducing the symptoms of disease in patients with osteoarthritis of the knee]. INTRODUCTION: Osteoarthritis is the most common disease of the joints contributing to the failure of movement. The disease mostly affects the older part of the population, and is associated with suffering and reduced quality of life. Knee osteoarthritis contributes to joint dysfunction of varying severity. These are common causes of chronic ailments limiting physical activity, which may even complicate the performance of activities of daily living. Low-level laser therapy is thought to have an analgesic effect, as well as a biomodulatory effect on the microcirculation. The aim of this study was to evaluate the effectiveness of low- -level laser therapy on pain relief and functional improvement in patients with osteoarthritis of the knee. The effects of laser therapy alone and in combination with exercise were compared. MATERIALS AND METHODS: 40 patients of mean age 65 years with knee osteoarthritis of both sexes were divided into two groups. Laser alone was used in group I (n = 20) and laser combined with kinesistherapy was used in group II (n = 20). All patients received the same dose of laser radiation, which was 3.0 J/cmÂ², 10 Hz, 400 mW. In both groups a series of 10 treatments was performed daily. VAS, ranges of motion in the knee joint, and the strength of the quadriceps and biceps femoris muscles were used as the criteria of pain assessment in both groups. All measurements were taken before and after treatment. RESULTS: Significant pain reduction: I (p = 0.00009, R = 0.68); II (p = 0.00002, R = 0.86), increased range of flexion in the knee: I (p = 0.000001, R = 0.90); II (p = 0.00002, R = 0.85), increased range of extension in the knee: I (p = 0.042, R = 0.87); II (p = 0.0004, R = 0.9) and increased strength of the quadriceps femoris muscle: I (p = 0.03, R = 0.77); II (p = 0.0002, R = 0.9) and the biceps femoris muscle: I (p = 0.04, R = 0.80); II (p = 0.0007, R = 0.91) were found in both groups after treatment. With the exception of flexion of the knee (p = 0.027; r = 0.17), there were no statistically significant differences in other analysed parameters between the use of laser alone and laser therapy combined with exercise. CONCLUSION: The use of laser in knee osteoarthritis reduces pain and improves the functional status of the patient. Laser therapy combined with kinesistherapy produces better therapeutic effects, and effectively improves the functional status of knee osteoarthritis. Exercise therapy applied in a series of 10 treatments is too short to significantly improve the functional status of the patient. Aged;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Quadriceps Muscle;Range of Motion, Articular;Treatment Outcome
[[ENDOTHELIAL DYSFUNCTION AND ITS LOW-LEVEL LASER THERAPY CORRECTION IN PATIENTS WITH CHRONIC VIRAL HEPATITIS]. The aim of the work to study the influence of the low-intensive laser therapy on the endothelium function in chronic virus hepatitis patients. RESEARCH METHODS: All patients have been divided into three groups: In the first (control) group (30 persons) the traditiona medicamentous therapy was used only, the patients of the experimental 11 group (45 person) alongside with complex medicamentous therapy received the course of intravenous laser therapy and

Ill group of patients (45 person) received a rate complex medicamental and laser (cutaneous) therapy. RESULTS: Medicamentous therapy of patients chronic virus hepatites is not accompanied by authentic improvement of the maintenance in plasma of blood NOx, and inclusion in a complex of medical actions of laser therapy promotes authentic improvement of parameters in plasma of blood NOx. THE CONCLUSION: Various methods of laser therapy improve NO--producing function endothelium, improve a functionacondition of vascular endothelium. Nitric Oxide Adult;Chronic Disease;Endothelium, Vascular;Female;Hepatitis, Viral, Human;Humans;Low-Level Light Therapy;Male;Middle Aged;Nitric Oxide

[REGIONAL LASER THERAPY IN TREATMENT OF PATIENTS WITH STRANGULATED VENTRAL HERNIA]. An analysis of treatment was made of 265 patients with strangulated hernia of the anterior abdominal wall. The patients were divided into main group (n = 138) and control group n = 127). Nonstrain and conventional methods of hernioplasty and low-intensive laser radiation (LILR) were used for the patients of the first group. LILR wasn't applied in the control group. The studied groups were statistically comparable on the basis of main disease, sex and age. Computed thermography was used in addition to standard methods of diagnostics in order to dentify the wound complications in postoperative period. The application of low-intensive laser radiation for patients of main group allowed reducing the rate of development of local infectious complications in the area of plasty as compared with control group from 15.7 and 53.4% to 8.9 and 32.8% ($p < 0.05$); terms of drainage of postoperative wound decreasing from 8.1 Â± 1.0 to 4.2 Â± 1.0 days and hospital stay shortening from 11.6 Â± 1.0 to 6.2 Â± 1.0 days ($p < 0.05$). The intensity of pain syndrome and rate of complications declined from 38.1 to 17% in control group. There wasn't any recurrence in the main group. Prosthetic methods of plasty and application of LILR significantly improve the immediate and long-term results in case of strangulated hernia of anterior abdominal wall. This rate would approach the results of treatment in planned surgery. Computed thermography allowed well-timed revealing of wound complications and forecasting the course of postoperative period. Abdominal Wall;Female;Hernia, Ventral;Herniorrhaphy;Humans;Laparoscopy;Length of Stay;Low-Level Light Therapy;Male;Middle Aged;Postoperative Period;Surgical Wound Infection;Tomography, X-Ray Computed;Torsion Abnormality;Treatment Outcome

[Correction of an inflammatory process with an interleukin-1 inhibitor in the combination treatment of secondary osteoarthritis in the presence of comorbid condition]. AIM: To enhance the efficiency of treatment in patients with secondary osteoarthritis (ĐžĐ•) in the presence of comorbid condition, by using an interleukin-1 inhibitor (IL-1i) and laser therapy (LT). SUBJECTS AND METHODS: A total of 248 patients aged 38 to 65 years with RA and secondary OA who had predominantly Stage II in accordance with the Disease Activity Score 28 (DAS28) were examined. According to the received therapy, the patients were divided into 4 groups: 1) IL-1i + LT + mrthotrexate (MT); 2) IL-1i + MT; 3) LT + MT; 4) MT. The efficiency of treatment was evaluated from changes in the KOOS (Knee injury and Osteoarthritis Outcome Score), DAS 28, IL-1, and cartilage oligomeric matrix protein (COMP) 6 months later. RESULTS: There were statistically significant functional improvements in KOOS and DAS28 in Groups 1 and 2 patients with secondary OA in RA. Clinical efficacy was confirmed by positive changes in serum IL-1 and COMP levels. CONCLUSION: Incorporation of an IL-1i into a therapy regimen for secondary OA in RA patients during basic therapy could not only improve the functional status of patients, but also decrease activity of the underlying disease according to the DAS 28. Anthraquinones;Anti-Inflammatory Agents;Cartilage Oligomeric Matrix Protein;Interleukin-1;diacerein;Methotrexate Adult;Aged;Anthraquinones;Anti-Inflammatory Agents;Arthritis, Rheumatoid;Cartilage Oligomeric Matrix Protein;Combined Modality Therapy;Comorbidity;Female;Humans;Interleukin-1;Low-Level Light

Therapy;Male;Methotrexate;Middle Aged;Osteoarthritis;Outcome Assessment, Health Care;Severity of Illness Index

Rehabilitative Paradigms after Experimental Brain Injury: Relevance to Human Neurotrauma.
The goal of this chapter is to describe four relatively non-invasive rehabilitative paradigms that may have clinical relevance following brain injury. Specifically, the benefits and limitations of environmental enrichment, exercise, low-level laser therapy, and constraint-induced movement therapy will be discussed. Timing issues (e.g., best time to initiate treatment as well as duration of treatment) and the advantage of adjunct therapies (i.e., can they further improve functional outcome) will also be discussed. Overall, the literature suggests that each of the aforementioned therapies confer significant behavioral improvement after experimental brain trauma. Hence, we propose that they should be considered for implementation in clinical rehabilitation.

Comparison of the effects of carboxytherapy and radiofrequency on skin rejuvenation.
BACKGROUND: Carboxytherapy (CA) refers to the cutaneous and subcutaneous administration of CO(2) for therapeutic purposes. Radiofrequency (RF) is a method that uses electric current for heating layers of the skin. Both techniques are indicated for the treatment of skin laxity. OBJECTIVE: The aim of this study was to compare the effects of CA and RF on human skin. METHODS: After eight patients underwent abdominoplasty, each of them received a single treatment of CA and a single treatment of RF on the right and left infra-umbilical regions, respectively. In the infra-umbilical region, CA was performed on the right and RF was performed on the left side. Untreated skin was used as a control. The sample collection period lasted 120 days. CA was administered at a velocity of 40 mL/min, and the total quantity of CO(2) infused was approximately 20 mL. RF was carried out at a temperature higher than 40Â°C on the epidermis for 5 min. RESULTS: CA and RF led to collagen remodeling; however, this result was more evident and lasted longer with RF. With CA an increase in elastic fibers was observed, whereas with RF no alteration was observed. CONCLUSION: Our results suggest that RF is more efficient than CA in stimulating collagen synthesis. Collagen
Abdominoplasty;Adult;Collagen;Cosmetic Techniques;Humans;Lasers, Gas;Low-Level Light Therapy;Patient Satisfaction;Pulsed Radiofrequency Treatment;Rejuvenation;Skin Aging

Treatment of early-stage erythematotelangiectatic rosacea with a Q-switched 595-nm Nd:YAG laser.
Erythematotelangiectatic rosacea presents as persistent erythema and telangiectasia with frequent flushing and blushing on the facial and extrafacial skin. Additionally, papulopustular rosacea shows acneiform papules, pustules, and nodules with persistent plaque-form edema. Despite garnering only grade-C or -D level recommendations, a 585-nm or 595-nm flashlamp-pumped pulsed-dye laser can be considered as an effective therapeutic modality for the treatment of rosacea in patients who are refractory to topical and/or systemic treatments. In this report, treatment with a Q-switched 595-nm neodymium-doped yttrium aluminum garnet (Nd:YAG) laser with low non-purpuragenic fluence proved to be safe and effective in treating early-stage erythematotelangiectatic rosacea in two female Korean patients. Laser treatment for rosacea was delivered with the settings of pulse energy of 0.4-0.5 J/cm(2), pulse duration of 5-10 ns, 5-mm spot size, 5 Hz, and 500 shots. Additionally, we found that remarkable therapeutic effects were achieved for both rosacea and melasma by combining Q-switched quick pulse-to-pulse 1,064-nm Nd:YAG and Q-switched 595-nm Nd:YAG laser treatments, which required only the changing of handpieces equipped with solid dye. In conclusion, we suggest that treatment with a Q-switched 595-nm Nd:YAG laser with low fluence may provide an additional therapeutic option for treating early-stage erythematotelangiectatic rosacea.
Adult;Asian People;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Rosacea

Carbon dioxide laser plus topical 5-fluorouracil: a new combination therapeutic modality for acral vitiligo. BACKGROUND: Acral vitiligo (AV) is resistant to treatment. AIM: To evaluate efficacy and

safety of combining carbon dioxide (CO2) laser and 5-fluorouracil (5FU) in treating AV. METHODS: This study included 68 adult patients with AV. After randomly assigning patients into 3 groups, patients in group I were treated using 5FU, group II were treated using CO2 laser, and group III were treated using CO2 laser followed by 5FU for a maximum period of 5 months. The lesions were then evaluated both qualitatively and quantitatively. RESULTS: Almost half (49.8%) of the lesions in group III achieved G4, and 6.1% of lesions achieved G3 re-pigmentation. This response was statistically significantly higher than that in the other two groups. This was not achieved in periungual areas in the hands and feet. The pain was tolerable during sessions or at sites of 5FU application. Transient hyperpigmentation, brownish spot on nail plates, itching, and infection were temporary side effects; however, Koebnerization was not detected. CONCLUSION: We concluded that prior use of CO2 laser skin ablation, followed by 5FU application for AV is a safe and tolerable technique that improves the outcome and increases patient compliance. Antimetabolites;Fluorouracil Adult;Antimetabolites;Combined Modality Therapy;Female;Fluorouracil;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Skin Cream;Vitiligo

Striae after topical corticosteroid: Treatment with nonablative fractional laser 1540nm. Striae distensae are atrophic dermal scars associated with psychosocial stress. Several treatments have been used but there is no gold standard until now. Fractional photothermolysis has been described as a successful and safe method to treat scars. In this description, we report 4 patients (Fitzpatrick phototype IV) who developed striae distensae after long-term use of topical corticosteroids and were successfully treated with fractional nonablative 1540 nm Erbium: glass laser. Adrenal Cortex Hormones Administration, Cutaneous;Adrenal Cortex Hormones;Cosmetic Techniques;Humans;Lasers, Solid-State;Low-Level Light Therapy;Striae Distensae

Efficacy of 595nm pulsed dye laser therapy for Mibelli angiokeratoma. OBJECTIVE: To retrospectively study the clinical efficacy of 595nm pulsed dye laser therapy for Mibelli angiokeratoma. METHODS: 50 cases of Mibelli angiokeratoma, from 10 to 41 year-oldï¼Œwere treated with the 595nm pulsed dye laser. The parameters were as follows: a wavelength of 595 nm, pulse duration of 10ms, spot size of 7 mm and energy fluency of 12.0-13.5 J/cm(2). The treatments were repeated at intervals of 4-6 weeks until the lesion was cleared, or the parents discontinued the treatment. Detailed demographics and the assessment of the degree of lesion clearance were statistically analyzed through SASS18.0. RESULTS: All the 50 patients were treated 1-4 times. The total rate of significant improvement was 80%, and the rate of full recovery was 30%. We failed to find statistical significance between genders, or the size and color of lesions, which might be due to limited sample size. The most common adverse effects after treatment were purpura and edema, which usually lasted for 12 h to several days. Temporary pigment alterations were not common. Other side effects such as scar or skin texture change were not observed. CONCLUSION: Our experience confirmed the clinical efficacy and safety of the 595 nm pulse dye laser in the treatment of Mibelli angiokeratoma. Adolescent;Adult;Angiokeratoma;Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Retrospective Studies;Skin Neoplasms;Young Adult

Combined intense pulsed light and Er:YAG laser treatment of congenital melanocytic nevus. Congenital melanocytic nevi (CMN) are benign nevomelanocytic proliferations that are present at birth. CMN are commonly classified according to their size and the management of CMN is diverse, including excision, dermabrasion and laser treatment. Several studies have shown the effectiveness of laser therapy for CMN in cosmetically sensitive and anatomically critical areas. In the present case, combination treatment with intense pulsed light (IPL) and erbium:yttrium-aluminum-garnet (Er:YAG) laser was used, and its effectiveness was evaluated. A 56-year-old man with a CMN on the left malar area was treated with combined IPL and Er:YAG laser treatment once monthly. After ten sessions of treatment, the lesion showed improvement leaving only a grayish hue. Thus, we report a case of CMN

on face that was successfully treated with combined IPL and Er:YAG laser treatment. Cosmetic Techniques;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus, Pigmented

The clinical use of regenerative therapy in COPD. Regenerative or stem cell therapy is an emerging field of treatment based on stimulation of endogenous resident stem cells or administration of exogenous stem cells to treat diseases or injury and to replace malfunctioning or damaged tissues. Current evidence suggests that in the lung, these cells may participate in tissue homeostasis and regeneration after injury. Animal and human studies have demonstrated that tissue-specific stem cells and bone marrow-derived cells contribute to lung tissue regeneration and protection, and thus administration of exogenous stem/progenitor cells or humoral factors responsible for the activation of endogenous stem/progenitor cells may be a potent next-generation therapy for chronic obstructive pulmonary disease. The use of bone marrow-derived stem cells could allow repairing and regenerate the damaged tissue present in chronic obstructive pulmonary disease by means of their engraftment into the lung. Another approach could be the stimulation of resident stem cells by means of humoral factors or photobiostimulation. Animals;Humans;Low-Level Light Therapy;Lung;Pulmonary Disease, Chronic Obstructive;Recovery of Function;Regeneration;Regenerative Medicine;Stem Cell Transplantation;Treatment Outcome

Treatment of port wine stains with pulsed dye laser: a retrospective study of 848 cases in Shandong Province, People's Republic of China. BACKGROUND: Currently, 595 nm pulsed dye laser (PDL) therapy is offered as one of the effective treatments of port wine stains (PWSs). However, the efficacy of PDL differs in different populations. OBJECTIVE: The purpose of the study was to investigate the efficacy, and related factors, of 595 nm PDL in the treatment of PWSs in Chinese patients with skin type III to IV. METHODS: A total of 848 cases that were treated with PDL were enrolled and analyzed in this study. An independent dermatologist evaluated these lesions according to the before and after photographs. RESULTS: The response rate (RR) of all the 848 PWS patients was 69.9%, within which the cure rate was 6.3%. The patients aged â‰¤1 year had the highest RR (93.9%), whereas those treated after age 50 reacted the worst (RR =25%). We analyzed the anatomical distribution of the lesion and found that the temporal region had the highest lesion clearance (RR =75.3%), while the extremities had the lowest clearance (RR =44.5%). Compared with the patients whose lesion size was larger than 80 cm(2), the patients with small lesion size, of 0-20 cm(2), had better clinical effect (RR =73.8% vs 53.2%). The reactions of the patients with hyperplastic lesion were worse than those with red patches (RR =36.4% vs 71.7%). As well, increasing treatment numbers could achieve higher clearance rates (P=0.005). CONCLUSION: The PDL had a relatively high RR but a low clearance rate in Chinese patients with PWS, although the earlier the intervention, the better was the efficacy. The response of PDL was, not only related to the anatomical area, but also, to the lesion size, type of lesion (ie, the presence of existing hyperplastic lesions), and the number of treatment, all of which are essential for the evaluation of therapeutic effect and acquisition of patients consent before treatment. Adolescent;Adult;Child;Child, Preschool;China;Female;Humans;Infant;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Retrospective Studies;Young Adult

Effect of low-level laser therapy on adolescents with temporomandibular disorder: a blind randomized controlled pilot study. PURPOSE: The aim of this pilot study was to evaluate the effect of low-level laser therapy on pain, mandibular movements, and occlusal contacts in adolescents and young adults with temporomandibular disorder. MATERIALS AND METHODS: Individuals aged 14 to 23 years were evaluated. The Research Diagnostic Criteria for Temporomandibular Disorders were used for the diagnosis of temporomandibular disorders. Pain was assessed with a visual analog scale. Occlusal contacts were recorded using the T-Scan III program

(Tekscan, Boston, MA). The participants were randomly allocated to 2 groups: active or placebo laser treatment. The laser parameters were as follows: wavelength of 780 nm, energy density of 33.5 J/cm(2), power of 50 mW, power density of 1.67 W/cm(2), and 20-second exposure time. The Kolmogorov-Smirnov test was used to determine the normality of the data distribution. The paired t test was used for the comparisons of the pretreatment and post-treatment results. The SPSS program for Windows (version 15.0; SPSS, Chicago, IL) was used for all analyses, with the level of significance set at 5% (P < .05). RESULTS: No statistically significant differences between groups were found for the right and left anterior temporal muscles (PÂ = .3801 and PÂ = .5595, respectively), superior masseter muscles (PÂ = .087 and PÂ =Â .1969, respectively), medial masseter muscles (PÂ = .2241 and PÂ = .076, respectively), or inferior masseter muscles (PÂ = .5589 and PÂ = .3268, respectively) after treatment. CONCLUSIONS: No statistically significant differences were found regarding pain, mandibular range of motion,Â or the distribution of occlusal contacts after treatment with low-level laser therapy. These preliminary results need to be verified in a larger sample of patients to confirm the lack of response to low-level laser therapy. Placebos Adolescent;Dental Occlusion;Facial Pain;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Muscle Fatigue;Myalgia;Pain Measurement;Placebos;Radiotherapy Dosage;Range of Motion, Articular;Single-Blind Method;Sound;Temporal Muscle;Temporomandibular Joint Disorders;Temporomandibular Joint Dysfunction Syndrome;Visual Analog Scale;Young Adult

A NASA discovery has current applications in orthopaedics. Low-level laser therapy (LLLT) has been actively used for nearly 40 yr, during which time it has been known to reduce pain, inflammation, and edema. It also has the ability to promote healing of wounds, including deep tissues and nerves, and prevent tissue damage through cell death. Much of the landmark research was done by the National Aeronautics and Space Administration (NASA), and these studies provided a springboard for many additional basic science studies. Few current clinical studies in orthopaedics have been performed, yet only in the past few years have basic science studies outlined the mechanisms of the effect of LLLT on the cell and subsequently the organism. This article reviews the basic science of LLLT, gives a historical perspective, and explains how it works, exposes the controversies and complications, and shows the new immediately applicable information in orthopaedics.

Acupuncture for knee osteoarthritis: study by Hinman et al represents missed opportunities. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

[The prospects for the development of regenerative physical therapy]. The review is concerned with the investigations into the influence of physiotherapeutic factors on the regeneration of the muscular, nervous, bone, and epidermal tissues; also, it analyses the publications pertaining to the influence of low-intensive physiotherapeutic modalities on the migration rate, proliferative activity, and differentiation of stem cells as well as physiological stability and viability of these cells following their transplantation. The currently available data give evidence of the possibility in principle of the combined application of physiotherapeutic factors and cellular technologies in regenerative medicine and the prospects opening for the development of the new direction of research in modern biomedicine, namely regenerative physical therapy. The importance of interdisciplinary basic and clinical investigations in this direction becomes especially evident in the light of the recent achievements and rapid progress in the development of modern regenerative medicine. Cell Differentiation;Cell Movement;Electromagnetic Fields;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Stem Cell Transplantation;Stem Cells

New pharmacotherapy for the treatment of onychomycosis: an update. INTRODUCTION: Onychomycosis is an infection of the nail plate that is an important priority area for the development of antifungal drugs. The high incidence of relapse and reinfection often makes onychomycosis a

chronic condition. The current gold standard is oral therapy, but the development of effective topical agents remains a priority as they have fewer systemic interactions. AREAS COVERED: This review summarizes development of antifungals from early phase development through Phase III clinical trials for onychomycosis. The oral molecules in development are azole molecules. Topical drugs in development include azoles, allylamines, benzoxaboroles and nanoemulsions. Photosensitizers for photodynamic therapy and new laser systems are also emerging therapeutic options. There is a diverse array of antifungal drugs in the early phases of development. EXPERT OPINION: The goals of onychomycosis therapy are a mycological cure and a normal appearing nail. The recent development of topical antifungals has been successful at improving the nail permeation and efficacy. The diversification of molecular targets is the next primary goal of antifungal development. Incomplete treatment of onychomycosis provides an environment conducive to the development of antifungal resistance. New topical agents and device-based therapies expand the therapeutic options. Combination therapy using multiple drug classes may improve the overall efficacy of antifungal treatment in onychomycosis. Antifungal Agents;Photosensitizing Agents Administration, Oral;Administration, Topical;Animals;Antifungal Agents;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Onychomycosis;Photochemotherapy;Photosensitizing Agents

Are interventions for accelerating orthodontic tooth movement effective? DATA SOURCES: Pubmed, Embase, Sciences Citation Index, Cochrane Central Register of Controlled Trials (CENTRAL) and grey literature database of SIGLE were searched from January 1, 1990 to August 20, 2011 with no language restrictions. STUDY SELECTION: Randomised controlled trials (RCTs) or quasi-RCTs in which the participants were healthy and received additional interventions to conventional orthodontic treatment for accelerating tooth movements were included. Subjects with defects in oral and maxillofacial regions (ie, cleft lip/palate), dental pathologies and medical conditions were excluded. DATA EXTRACTION AND SYNTHESIS: Studies were selected by two independent reviewers and disagreements were resolved by discussion with a third reviewer. The primary outcomes included accumulative moved distance (AMD) or movement rate (MR) and time required to move the tooth to its destination. Secondary outcomes were pain improvement, anchorage loss, periodontal health, orthodontic caries, pulp vitality and root resorption. The reviewers performed statistical pooling, where possible, according to a priori criteria on the basis of comparability of patient type, treatments and outcomes measured and risk of bias. The reviewers tested for heterogeneity, publication bias and sensitivity. A quality assessment test was conducted to evaluate the method used to measure AMD. RESULTS: The authors selected seven RCTs and two quasi-RCTs, which included a total of 101 patients with an age range of 12-26.3 years. Eight studies compared four intervention methods to no intervention group (control group). From them, four studies assessed low laser therapy (LLL), two evaluated corticotomy (CC), one assessed electrical current therapy (EC) and one evaluated pulsed electromagnetic field (PEF). Another study compared dentoalveolar distraction (DAD) vs periodontal distraction (PDD).Quality assessment scores showed that only two studies were of high quality, five studies were of medium quality, while two studies were of low quality. All studies, except one, compared left and right sides of the same participant (split mouth design), and measured the AMD.The method for measuring AMD was reliable in three studies, relatively reliable in one study and unreliable in four studies. The authors only performed pooled AMD mean meta-analysis for the LLL studies. The meta-analysis showed pooled mean AMD of 0.32 (95% confidence interval (CI), 20.04, 0.68), 0.76 (95% CI, 20.14, 1.65), and 0.73 (95% CI, 20.68, 2.14) for one month, two months and three months, respectively. Two LLL studies showed no differences regarding periodontal health and two LLL studies showed no differences in root resorption between LLL intervention and control groups. Compared to control group, one study reported that CS had significantly higher MR and another study showed that CS exhibited larger AMD for one month, two months, three months and four

months. Two studies revealed that CS did not show any difference in the periodontal health status. One study reported the EC showed significantly larger AMD for one month, whereas another study reported that PEF induced larger AMD for five + 0.6 months. DAD showed faster MR and less anchorage loss compared to PDD. Teeth remained vital in both DAD and PDD interventions and one out of six cases presented root resorption in the PDD group. CONCLUSIONS: Among the five interventions corticotomy is effective and safe to accelerate orthodontic tooth movement, low-level laser therapy was unable to accelerate orthodontic tooth movement. The level of evidence does not support whether electrical current and pulsed electromagnetic fields are effective in accelerating orthodontic tooth movement and dentoalveolar or periodontal distraction is promising in accelerating orthodontic tooth movement. Humans;Tooth Movement Techniques

Accelerating orthodontic tooth movement using surgical and non-surgical approaches. DATA SOURCES: Pubmed, Embase, Google scholar beta and the Cochrane Databases. STUDY SELECTION: Randomised controlled trials (RCTs) and controlled clinical trials (CCTs) reporting on results or treatment parameters related to accelerated orthodontic tooth movement were considered. DATA EXTRACTION AND SYNTHESIS: Data abstraction and quality assessment using the Cochrane risk of bias tool were carried out independently by two reviewers. A meta-analysis and narrative synthesis was presented. RESULTS: Eighteen studies (342 patients) were included. Eight involved low intensity laser, seven corticotomy, and interseptal bone reduction, pulsed electromagnetic fields and photobiomodulation were each investigated by a single trial. Twelve RCTs and six CCTs were included. Two RCTs were considered to be at low risk of bias, five at unclear risk and five at high risk of bias. Three CCTS were at high risk of bias and three at unclear risk. Two studies on corticotomy and two on low intensity laser were combined in a random effects model. Higher canine retraction rate was evident with corticotomy during the first month of therapy (WMD=0.73; 95% CI: 0.28, 1.19, $p<0.01$) and with low intensity laser (WMD=0.42mm/month; 95% CI: 0.26, 0.57, $p<0.001$) in a period longer than three months. The quality of evidence supporting the interventions is moderate for laser therapy and low for corticotomy intervention. CONCLUSIONS: There is some evidence that low intensity laser therapy and corticotomy are effective, whereas the evidence is weak for interseptal bone reduction and very weak for photobiomodulation and pulsed electromagnetic fields. Overall, the results should be interpreted with caution given the small number of studies, allied to limited quality and heterogeneity of the included studies. Further research is required in this field with additional attention to application protocols, adverse effects and cost-benefit analysis.
Bone and Bones;Cost-Benefit Analysis;Humans;Low-Level Light Therapy;Tooth Movement Techniques

A review of the aesthetic treatment of abdominal subcutaneous adipose tissue: background, implications, and therapeutic options. BACKGROUND: The demand for aesthetic body sculpting procedures has expanded precipitously in recent years. Subcutaneous adipose tissue (SAT) deposits of the central abdomen are especially common areas of concern for both males and females. OBJECTIVE: To review the available literature regarding the underlying pathophysiology of subcutaneous fat accumulation in the abdominal area and available treatment options. METHODS: A MEDLINE and Google Scholar search was performed accordingly. RESULTS: The preferential accumulation of SAT in the central abdomen is attributable to the reduced lipolytic sensitivity of its adipocytes. A number of therapeutic options are available for the treatment of central abdominal adiposity. Cryolipolysis, high-intensity focused ultrasound, nonthermal ultrasound, radiofrequency, and injection adipolysis lead to adipocyte destruction through multiple different mechanisms. Nonablative modalities such as injection lipolysis mobilize fat stores from viable adipocytes, although its effects may be curtailed in obese patients. Liposuction through tumescent technique, however, mechanically extricates SAT. CONCLUSION: Although tumescent liposuction remains the gold standard for SAT removal, less invasive ablative and nonablative options for targeting localized

deposits of adipose tissue now permeate the aesthetic marketplace. Limited results associated with these modalities mandate multiple sessions or combination treatment paradigms. Deoxycholic Acid Adipocytes;Animals;Body Weight;Cryotherapy;Deoxycholic Acid;High-Intensity Focused Ultrasound Ablation;Humans;Lipectomy;Lipolysis;Low-Level Light Therapy;Radiofrequency Therapy;Subcutaneous Fat, Abdominal

Effects of phototherapy on muscle activity and pain in individuals with temporomandibular disorder: a study protocol for a randomized controlled trial. BACKGROUND: According to the International Association for the Study of Pain (IASP), the term temporomandibular disorder (TMD) regards a subgroup of orofacial pain, the symptoms of which include pain or discomfort in the temporomandibular joint, ears, masticatory muscles and neck on one or both sides, as well as joint sounds, limited mandibular movements or mandibular deviation and difficulties chewing. Phototherapy, such as low-level laser therapy (LLLT) and light-emitting diode (LED) therapy, is one of the resources used to treatment muscle pain. Thus, there is a need to investigate therapeutic resources that combine different wavelengths as well as different light sources (LLLT and LED) in the same apparatus. The aim of the proposed study is to evaluate the effects of four different doses of phototherapy on pain, activity of the masticatory muscles (masseter and bilateral anterior temporal) and joint mobility in individuals with temporomandibular disorder. A further aim is to determine the cumulative effect 24 and 48 hours after a single session. METHODS/DESIGN: A placebo-controlled, double-blind, randomized, clinical trial will be carried out involving 72 women between 18 and 40 years of age with a diagnosis of myogenous TMD. The participants will then be randomly allocated to four groups totaling 18 individuals per group. Three groups will be submitted to a single session of phototherapy with different light sources, and one group will receive placebo therapy: Group A (2.62 Joules); Group B (5.24 Joules); Group C (7.86 Joules); and Group D (0 Joules). The following assessment tools will be administered on four separate occasions (baseline and immediately after, 24 h after and 48 h after phototherapy). Pain intensity will be assessed using the visual analog scale for pain, while pain thresholds will be determined using algometer, and electromyographic (EMG) analysis on the masseter and anterior temporal muscles. DISCUSSION: The study will contribute to the practice of the evidence-based use of phototherapy in individuals with a myogenous TMD. Data will be published after the study is completed. TRIAL REGISTRATION: This study is registered with the Brazilian Registry of Clinical Trials, NCT02018770, date of registration: 7 December 2013. Adolescent;Adult;Biomechanical Phenomena;Brazil;Clinical Protocols;Double-Blind Method;Electromyography;Facial Pain;Female;Humans;Low-Level Light Therapy;Masseter Muscle;Pain Measurement;Pain Threshold;Range of Motion, Articular;Research Design;Temporal Muscle;Temporomandibular Joint;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome;Young Adult

In vitro assessment of the acid resistance of demineralized enamel irradiated with Er, Cr:YSGG and Nd:YAG lasers. PURPOSE: This study's purpose was to evaluate the acid resistance of demineralized enamel irradiated with high-intensity lasers. METHODS: Enamel fragments were demineralized and treated as follows (N=10): Group 1-no treatment; Group 2-five percent sodium fluoride (NaF) varnish; Group 3-Er, Cr:YSGG laser (8.92 J/cm2, 0.5 W, 20 Hz, 30 seconds); Group 4-NaF and Er, Cr:YSGG laser; Group 5-Er, Cr:YSGG laser and NaF; Group 6-Nd:YAG laser (84.9 J/cm2, 0.5 W, 10 Hz, 30 seconds); Group 7-NaF and Nd:YAG laser; and Group 8-Nd:YAG laser and NaF. The samples were subjected to pH-cycling and assessed by microhardness (analysis of variance; Î± equals five percent) at different depths from the outer enamel surface. Samples were observed using polarized light microscopy (PLM) and scanning electron microscopy (SEM). RESULTS: There were no significant differences among the experimental groups in any of the subsurface layers evaluated. PLM observation revealed that the extent of demineralization of the irradiated samples was similar to the

samples for Group 1 (control). SEM observation showed that irradiated surfaces were ablated and presented areas of melting. CONCLUSIONS: Laser irradiation, with or without applying five percent sodium fluoride, was not capable of increasing the enamel white spot lesions' acid resistance. Acids;Cariostatic Agents;Fluorides, Topical;Sodium Fluoride Acids;Animals;Cariostatic Agents;Cattle;Dental Enamel;Fluorides, Topical;Hardness;Hydrogen-Ion Concentration;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Microscopy, Polarization;Sodium Fluoride;Tooth Demineralization;Tooth Remineralization

Lasers for nevi: a review. A nevus is described as a benign, often pigmented, skin growth that can be congenital or acquired. Different types of nevi are located at different depths within the skin. Traditional treatments for nevi include topical treatments, dermabrasion, and excision, which are generally ineffective, invasive, and often result in scars and dyspigmentation. Lately, laser therapy has been used as an alternative. Based on the theory of selective photothermolysis, melanin can be specifically targeted, minimizing adverse effects and increasing effectiveness of laser treatments. Several types of lasers and lights have been studied for this purpose without a concise agreement as to which is the best. In general, quality-switched lasers are preferred for the treatment of pigmented lesions. However, there is controversy about this therapy because certain nevi may have malignant potential. This article serves as a comprehensive review of available laser treatments for nevi and discusses the appropriate measures that should be taken before and after laser therapy. Based on the reviewed literature, laser treatment has generally been proven to be a safe and effective therapy for nevi with minimal side effects. Cicatrix;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus;Skin;Skin Neoplasms

Contradictory effects of hypercholesterolemia and diabetes mellitus on the progression of abdominal aortic aneurysm. Animals;Aortic Aneurysm, Abdominal;Atherosclerosis;Diabetes Mellitus, Type 2;Disease Progression;Humans;Hypercholesterolemia;Low-Level Light Therapy;Mice;Risk Factors

Effect of low-level laser therapy in reducing dentinal hypersensitivity and pain following periodontal flap surgery. OBJECTIVE: This randomized controlled double-blinded split mouth study sought to compare the levels of dentinal hypersensitivity (DH) and pain after 660â€‰nm laser irradiation in test and control sites following periodontal flap surgery. BACKGROUND DATA: Dentinal hypersensitivity and pain are the two main causes of discomfort after periodontal flap surgery. The analgesic and desensitising property of low-level lasers can be used to reduce postoperative complications following periodontal flap surgery. MATERIALS AND METHODS: Thirty patients were enrolled in this study. Periodontal flap surgery was performed on 60 sites. The test site was randomly determined for laser irradiation, and was irradiated by a sweeping motion of 660â€‰nm laser (25â€‰mW, 4.5â€‰J) for 3â€‰min for 3 consecutive days. The control site served as a placebo. Although the laser was used in a similar motion in the control sites, it was not activated postoperatively. A visual analogue scale (VAS) and verbal rating scale (VRS) for pain and DH were recorded for both sites in each patient, on the 1st, 3rd, 5th, and 7th days following flap surgery. RESULTS: There was statistically significant decrease in both DH and pain in the laser-irradiated site on the 7th day following periodontal flap surgery, as compared with the control site ($p<0.05$). CONCLUSIONS: Postoperative DH and pain following periodontal surgery can be reduced by using low-level laser therapy. Adult;Chronic Periodontitis;Dentin Sensitivity;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Surgical Flaps;Treatment Outcome

Use of low-level laser therapy (808â€‰nm) to muscle fatigue resistance: a randomized double-blind crossover trial. OBJECTIVE: The purpose of this study was to investigate whether low-level laser (light) therapy (LLLT) can provide fatigue resistance via maximum repetitions (RM) with an isokinetic

dynamometer, and decrease electromyography fatigue index (EFI). BACKGROUND DATA: LLLT has been used to increase muscle performance when applied before or after intense exercises. MATERIALS AND METHODS: This study was a randomized, double-blind, crossover trial with placebo. Seven young men (21Â±3 years of age) who were clinically healthy, were allocated into two groups: active laser (LLLT) and placebo laser (Placebo). Both groups were assessed at baseline, at one training session, and at the end of this study. Baseline and final assessments recorded the number of RM of knee flexion-extensions using an isokinetic dynamometer at 60 degrees/sec in conjunction with EFI recorded by median frequency. The training sessions consisted of three sets of 20 RM of knee flexion-extensions using an isokinetic dynamometer at 60 degrees/sec plus LLLT (808â€‰nm, 100â€‰mW, 4â€‰J), or placebo, applied to quadriceps femoris muscles between sets, and after the last series of this exercise. After 1 week (washout period), all volunteers were exchanged among groups and then all assessments were repeated. RESULTS: LLLT group increased RM (52%; p=0.002) with a small EFI for the vastus medialis (p=0.004) and rectus femoris (p=0.004). CONCLUSIONS: These results suggest an increased muscle fatigue resistance when LLLT is applied during rest intervals, and after the last series of intense exercises. Cross-Over Studies;Double-Blind Method;Electromyography;Humans;Knee Joint;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Young Adult

The Use of Low-Level Energy Laser Radiation in Basic and Clinical Research. Laser radiation has specific attributes: monochromaticity, high coherence and polarization. These properties result in the extensive use of lasers in medicine. Laser devices can be assigned into three basic groups by means of their level of energy: high, medium and low energy. All of these types of radiation are used in medicine. However, the most commonly used, in basic science and clinical studies, is low-energy radiation. Molecular effects of low energy laser irradiation on cells are generally described as "fotobiostimulation" and "fotobiomodulation". These phenomena consequently lead to attempts to exploit this kind of radiation as aÂ treatment method (low-level laser therapy-LLLT). Areas in which LLLT is used are: regenerative medicine (for healing wounds and ulcers); aesthetic medicine (to improve appearance of scars); dentistry (to accelerate healing of implants); physiotherapy (to reduce chronic pain syndromes), orthopedics (in bone healing) and cardiology (as aÂ prevention of restenosis after percutaneous coronary intervention). This paper discusses the medical applications of LLLT which are used in daily clinical practice as well as those used in basic science.

Efficacy of low-level laser therapy in the treatment of TMDs: a meta-analysis of 14 randomised controlled trials. This study was designed to evaluate the efficacy of low-level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMDs). We searched electronic databases and references lists of relevant articles, retrieved all of the published randomised controlled trials in regard to these issues and then performed a meta-analysis. Fourteen highly qualified RCTs reporting on a total of 454 patients, which evaluated the effectiveness of LLLT for patients suffering from TMDs were retrieved. The results indicated that LLLT was not better than placebo in reducing chronic TMD pain (weighted mean differenceÂ = -19Â·39; 95% confidence intervalÂ =Â -40Â·80-2Â·03; PÂ < 0Â·00001; I(2) Â =Â 99%). However, the LLLT provided significant better functional outcomes in terms ofÂ maximum active vertical opening (MAVO) (weighted mean differenceÂ =Â 4Â·18; 95% confidence intervalÂ =Â 0Â·73-7Â·63; PÂ =Â 0Â·006; I(2) Â =Â 73%), maximum passive vertical opening (MPVO) (weighted mean differenceÂ =Â 6Â·73; 95% confidence intervalÂ =Â 01Â·34-12Â·13; PÂ =Â 0Â·06; I(2) Â =Â 73%), protrusion excursion (PE) (weighted mean differenceÂ =Â 1Â·81; 95% confidence intervalÂ =Â 0Â·79-2Â·83; PÂ =Â 0Â·59; I(2) Â =Â 0%) and right lateral excursion (RLE) (weighted mean difference = 2Â·86; 95% confidence intervalÂ =Â 1Â·27-4Â·45; PÂ =Â 0Â·01; I(2) Â =Â 73%). The results of our meta-analysis have provided the best evidence on the efficacy of LLLT in the treatment of TMDs. This study indicates that using LLLT has limited efficacy in reducing pain in patients with

TMDs. However, LLLT can significantly improve the functional outcomes of patients with TMDs. Chronic Pain;Humans;Low-Level Light Therapy;Muscle, Skeletal;Randomized Controlled Trials as Topic;Range of Motion, Articular;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome

Lightening up Light Therapy: Activation of Retrograde Signaling Pathway by Photobiomodulation. Photobiomodulation utilizes monochromatic (or quasimonochromatic) light in the electromagnetic region of 600âˆ¼1000 nm for the treatment of soft tissues in a nondestructive and nonthermal mode. It is conceivable that photobiomodulation is based upon the ability of the light to alter cell metabolism as it is absorbed by general hemoproteins and cytochrome c oxidase (COX) in particular. Recently it has been suggested radiation of visible and infrared (IR) activates retrograde signaling pathway from mitochondria to nucleus. In this review, the role of COX in the photobiomodulation will be discussed. Further a possible role of water as a photoreceptor will be suggested.

Penile anesthesia in Post SSRI Sexual Dysfunction (PSSD) responds to low-power laser irradiation: a case study and hypothesis about the role of transient receptor potential (TRP) ion channels. Treatment of paroxetine-induced penile anesthesia in Post SSRI Sexual Dysfunction (PSSD) by Low-power Laser Irradiation (LPLI) is unknown in medical literature. The aim of the current article is to report partial efficacy of LPLI for paroxetine-induced persistent penile anesthesia. We report on a male patient who presented with a history of reversible loss of smell, taste and skin sensitivity occurring within a week after start of 20mg/day paroxetine-hemihydrate for a depressive period. Concurrently, patient suffered from penile anesthesia, scrotum hypesthesia, anejaculation and erectile difficulties with normal sexual desire. During 2.5 years of paroxetine treatment and throughout 2 years after paroxetine discontinuation, genital and sexual complaints persisted. Penile anesthesia was treated by LPLI with single and multi diode pulsed laser probes. After 20 LPLI-treatment sessions of 15min each, patient reported partial return of penile touch and temperature sensation. Clinical improvement of glans penis sensitivity was reported to 20% and 40%, compared to pre-paroxetine treatment penile sensitivity during erect and flaccid states, respectively. However, anejaculation and erectile difficulties remained unchanged. Briefly, in the current patient with early onset of PSSD, LPLI treatment reduced paroxetine-induced penile anesthesia. It is hypothesized that SSRI treatment induces disturbances of transient receptor potential (TRP) ion channels of mechano-, thermo- and chemosensitive nerve endings and receptors resulting in the penile anesthesia in PSSD. It is further hypothesized that there are two types of PSSD, one of which occurs soon after the start of SSRI treatment. Transient Receptor Potential Channels;Paroxetine Adult;Humans;Low-Level Light Therapy;Male;Paroxetine;Penis;Sexual Dysfunction, Physiological;Transient Receptor Potential Channels

A new model of in vitro fungal biofilms formed on human nail fragments allows reliable testing of laser and light therapies against onychomycosis. Onychomycoses represent approximately 50 % of all nail diseases worldwide. In warmer and more humid countries like Brazil, the incidence of onychomycoses caused by non-dermatophyte molds (NDM, including Fusarium spp.) or yeasts (including Candida albicans) has been increasing. Traditional antifungal treatments used for the dermatophyte-borne disease are less effective against onychomycoses caused by NDM. Although some laser and light treatments have demonstrated clinical efficacy against onychomycosis, their US Food and Drug Administration (FDA) approval as "first-line" therapy is pending, partly due to the lack of well-demonstrated fungicidal activity in a reliable in vitro model. Here, we describe a reliable new in vitro model to determine the fungicidal activity of laser and light therapies against onychomycosis caused by Fusarium oxysporum and C. albicans. Biofilms formed in vitro on sterile human nail fragments were treated with 1064 nm neodymium-doped yttrium aluminum garnet laser (Nd:YAG), 420 nm intense pulsed light (IPL) IPL 420, followed by Nd:YAG, or near-infrared light ((NIR) 700-1400

nm). Light and laser antibiofilm effects were evaluated using cell viability assay and scanning electron microscopy (SEM). All treatments were highly effective against C. albicans and F. oxysporum biofilms, resulting in decreases in cell viability of 45-60 % for C. albicans and 92-100 % for F. oxysporum. The model described here yielded fungicidal activities that matched more closely to those observed in the clinic, when compared to published in vitro models for laser and light therapies. Thus, our model might represent an important tool for the initial testing, validation, and "fine-tuning" of laser and light therapies against onychomycosis. Adult;Biofilms;Candida albicans;Female;Fusarium;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microbial Viability;Models, Biological;Onychomycosis;Phototherapy

The effect of different doses of near infrared light on dopaminergic cell survival and gliosis in MPTP-treated mice. We have used the MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) mouse model to explore whether (i) the neuroprotective effect of near infrared light (NIr) treatment in the SNc is dose-dependent and (ii) the relationship between tyrosine hydroxylase (TH)+ terminal density and glial cells in the caudate-putamen complex (CPu). Mice received MPTP injections (50 mg/kg) and 2 J/cm2 NIr dose with either 2 d or 7 d survival period. In another series, with a longer 14 d survival period, mice had a stronger MPTP regime (100 mg/kg) and either 2 J/cm2 or 4 J/cm2 NIr dose. Brains were processed for routine immunohistochemistry and cell counts were made using stereology. Our findings were that in the 2 d series, no change in SNc TH+ cell number was evident after any treatment. In the 7 d series however, MPTP insult resulted in âˆ¼45% reduction in TH+ cell number; after NIr (2 J/cm2) treatment, many cells were protected from the toxic insult. In the 14 d series, MPTP induced a similar reduction in TH+ cell number. NIr mitigated the loss of TH+ cells, but only at the higher dose of 4 J/cm2; the lower dose of 2 J/cm2 had no neuroprotective effect in this series. The higher dose of NIr, unlike the lower dose, also mitigated the MPTP- induced increase in CPu astrocytes after 14 d; these changes were independent of TH+ terminal density, of which, did not vary across the different experimental groups. In summary, we showed that neuroprotection by NIr irradiation in MPTP-treated mice was dose-dependent; with increasing MPTP toxicity, higher doses of NIr were required to protect cells and reduce astrogliosis. Nerve Tissue Proteins;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Tyrosine 3-Monooxygenase 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Animals;Astrocytes;Caudate Nucleus;Cell Count;Cell Survival;Dopaminergic Neurons;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Gliosis;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Male;Mice;Mice, Inbred BALB C;Nerve Tissue Proteins;Parkinsonian Disorders;Pars Compacta;Putamen;Tyrosine 3-Monooxygenase

Effects of a low-level diode laser on oral keratinocytes, oral fibroblasts, endothelial cells and osteoblasts incubated with bisphosphonates: An in vitro study. Bisphosphonate-associated osteonecrosis of the jaw may have multiple causes, including altered bone remodeling, angiogenesis inhibition and impact of bisphosphonate on the soft tissues. Successful treatment is difficult. As a positive effect of low-level laser application on wound healing is well known, an in vitro study was designed to analyze the effect of low-level laser (280 mW, 670 nm) treatment on keratinocytes, fibroblasts, endothelial cells and osteoblasts treated with clodronate, ibandronate, pamidronate or zoledronate. Pure irradiation had a positive effect on cell viability, whereas bisphosphonate treatment had a negative impact. Viability was significantly increased in cells treated with bisphosphonates and sequel irradiation. There was no effect when the bisphosphonate medium was irradiated. The revealed effect of laser stimulation on cell viability is not due to an inactivation of the bisphosphonates. These results may support the idea of low-level laser therapy as a supportive therapy in patients receiving bisphosphonates to prevent and treat bisphosphonate-associated osteonecrosis of the jaw.

Ablative therapies for central airway obstruction. Central airway obstruction (CAO) is seen in malignant and nonmalignant airway disorders and can lead to significant morbidity and mortality. Endobronchial ablative therapies are used in conjunction with mechanical debridement to achieve hemostasis and restore airway patency. These therapies can be classified into modalities with immediate or delayed effect. Therapies with immediate effect include heat therapies (such as electrocautery, argon plasma coagulation, and laser) and cryorecanalization using a cryoprobe for tissue extraction. These modalities can be used in severe CAO for immediate relief of obstruction. Therapies with delayed effect include cryotherapy, brachytherapy, and photodynamic therapy. These modalities should not be used for acutely symptomatic CAO, and typically require follow-up bronchoscopy for removal of debris from the airway. Multimodality approach typically leads to better outcomes. Ablation Techniques;Airway Management;Airway Obstruction;Brachytherapy;Bronchoscopy;Cryotherapy;Electrocoagulation;Humans;Low-Level Light Therapy;Photochemotherapy

810nm near-infrared light offers neuroprotection and improves locomotor activity in MPTP-treated mice. We explored whether 810nm near-infrared light (NIr) offered neuroprotection and/or improvement in locomotor activity in an acute 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)-treated mouse model of Parkinson's disease. Mice received MPTP and 810nm NIr treatments, or not, and were tested for locomotive activity in an open-field test. Thereafter, brains were aldehyde-fixed and processed for tyrosine hydroxylase immunohistochemistry. Our results showed that MPTP-treated mice that were irradiated with 810nm NIr had both greater locomotor activity (âˆ¼40%) and number of dopaminergic cells (âˆ¼20%) than those that were not. In summary, 810nm (as with 670nm) NIr offered neuroprotection and improved locomotor activity in MPTP-treated mice. Tyrosine 3-Monooxygenase Animals;Cell Count;Dopaminergic Neurons;Infrared Rays;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Motor Activity;Parkinsonian Disorders;Pars Compacta;Tyrosine 3-Monooxygenase

Low-level light therapy potentiates NPe6-mediated photodynamic therapy in a human osteosarcoma cell line via increased ATP. BACKGROUND: Low-level light therapy (LLLT) is used to stimulate healing, reduce pain and inflammation, and preserve tissue from dying. LLLT has been shown to protect cells in culture from dying after various cytotoxic insults, and LLLT is known to increase the cellular ATP content. Previous studies have demonstrated that maintaining a sufficiently high ATP level is necessary for the efficient induction and execution of apoptosis steps after photodynamic therapy (PDT). METHODS: We asked whether LLLT would protect cells from cytotoxicity due to PDT, or conversely whether LLLT would enhance the efficacy of PDT mediated by mono-l-aspartyl chlorin(e6) (NPe6). Increased ATP could lead to enhanced cell uptake of NPe6 by the energy dependent process of endocytosis, and also to more efficient apoptosis. In this study, human osteosarcoma cell line MG-63 was subjected to 1.5J/cm(2) of 810nm near infrared radiation (NIR) followed by addition of 10Î¼M NPe6 and after 2h incubation by 1.5J/cm(2) of 652nm red light for PDT. RESULTS: PDT combined with LLLT led to higher cell death and increased intracellular reactive oxygen species compared to PDT alone. The uptake of NPe6 was moderately increased by LLLT, and cellular ATP was increased. The mitochondrial respiratory chain inhibitor antimycin A abrogated the LLLT-induced increase in cytotoxicity. CONCLUSIONS: Taken together, these results demonstrate that LLLT potentiates NPe6-mediated PDT via increased ATP synthesis and is a potentially promising strategy that could be applied in clinical PDT. Photosensitizing Agents;Porphyrins;Adenosine Triphosphate;Talaporfin Adenosine Triphosphate;Apoptosis;Cell Line, Tumor;Cell Survival;Combined Modality Therapy;Humans;Low-Level Light Therapy;Osteosarcoma;Photochemotherapy;Photosensitizing Agents;Porphyrins;Treatment Outcome

Introduction to therapeutic lasers in a rehabilitation setting. Laser therapy, or photobiostimulation, is becoming a popular modality in the animal rehabilitation setting. It is used widely for the treatment of pain reduction, reduction of inflammation, and wound care and healing. Applications in the rehabilitation setting include postoperative cases, osteoarthritis, treatment of pain of a known origin, soft tissue injuries, and wounds. Animals;Cats;Dogs;Low-Level Light Therapy;Wound Healing;Wounds and Injuries

Low-level laser therapy attenuates LPS-induced rats mastitis by inhibiting polymorphonuclear neutrophil adhesion. The aim of this study was to investigate the effects of low-level laser therapy (LLLT) on a rat model of lipopolysaccharide (LPS)-induced mastitis and its underlying molecular mechanisms. The rat model of mastitis was induced by inoculation of LPS through the canals of the mammary gland. The results showed that LPS-induced secretion of IL-1Î² and IL-8 significantly decreased after LLLT (650 nm, 2.5 mW, 30 mW/cm(2)). LLLT also inhibited intercellular adhesion molecule-1 (ICAM-1) expression and attenuated the LPS-induced decrease of the expression of CD62L and increase of the expression of CD11b. Moreover, LLLT also suppressed LPS-induced polymorphonuclear neutrophils (PMNs) entering the alveoli of the mammary gland. The number of PMNs in the mammary alveolus and the myeloperoxidase (MPO) activity were decreased after LLLT. These results suggested that LLLT therapy is beneficial in decreasing the somatic cell count and improving milk nutritional quality in cows with an intramammary infection. CD11b Antigen;DNA Primers;Interleukin-1beta;Interleukin-8;Lipopolysaccharides;Platelet Endothelial Cell Adhesion Molecule-1;Intercellular Adhesion Molecule-1;L-Selectin Analysis of Variance;Animals;CD11b Antigen;DNA Primers;Enzyme-Linked Immunosorbent Assay;Female;Flow Cytometry;Gene Expression Regulation;Intercellular Adhesion Molecule-1;Interleukin-1beta;Interleukin-8;L-Selectin;Lipopolysaccharides;Low-Level Light Therapy;Mastitis;Neutrophils;Platelet Endothelial Cell Adhesion Molecule-1;Rats;Rats, Wistar

The efficacy of low-level laser therapy for shoulder tendinopathy: a systematic review and meta-analysis of randomized controlled trials. BACKGROUND AND PURPOSE: Low-level laser therapy (LLLT) is proposed as a treatment for tendinopathies. This is the first systematic review focusing solely on LLLT treatment effects in shoulder tendinopathy. METHODS: A systematic review with meta-analysis and primary outcome measures pain relief on 100-mm visual analogue scale (VAS) and relative risk for global improvement. Two independent assessors rated the included studies according to the PEDro scale. Intervention quality assessments were performed of LLLT dosage and treatment procedures according to World Association for Laser Therapy guidelines. The included trials were sub-grouped by intervention quality and use of other physiotherapy interventions. RESULTS: Seventeen randomized controlled trials (RCTs) met the inclusion criteria, and 13 RCTs were of high and 4 RCTs of moderate methodological quality. Significant and clinically important pain relief was found with weighted mean differences (WMD) over placebo, for LLLT as monotherapy at 20.41 mm (95% CI: 12.38 to 28.44) and as adjunct to exercise therapy at 16.00 mm (95% CI: 11.88 to 20.12). The WMD when LLLT was used in a multimodal physiotherapy treatment regime reached statistical significance over placebo at 12.80 (95% CI: 1.67-23.94) mm pain reduction on VAS. Relative risks for global improvement were statistically significant at 1.96 (95% CI: 1.25-3.08) and 1.51 (95% CI: 1.12-2.03), for laser as monotherapy or adjunctive in a physiotherapy regime, respectively. Secondary outcome measures of shoulder function were only significantly in favour of LLLT when used as monotherapy. Trials performed with inadequate laser doses were ineffective across all outcome measures. CONCLUSION: This review shows that optimal LLLT can offer clinically relevant pain relief and initiate a more rapid course of improvement, both alone and in combination with physiotherapy interventions. Our findings challenge the conclusions in previous multimodal shoulder reviews of physiotherapy and their lack of intervention quality assessments. Humans;Low-Level Light

Therapy;Pain Measurement;Randomized Controlled Trials as Topic;Shoulder Joint;Tendinopathy;Treatment Outcome

A split-face treatment of adult colloid milium using a non-ablative, 1550-nm, erbium-glass fractional laser. Biopsy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Skin;Skin Diseases

Low-level laser (light) therapy increases mitochondrial membrane potential and ATP synthesis in C2C12 myotubes with a peak response at 3-6 h. Low-level laser (light) therapy has been used before exercise to increase muscle performance in both experimental animals and in humans. However, uncertainty exists concerning the optimum time to apply the light before exercise. The mechanism of action is thought to be stimulation of mitochondrial respiration in muscles, and to increase adenosine triphosphate (ATP) needed to perform exercise. The goal of this study was to investigate the time course of the increases in mitochondrial membrane potential (MMP) and ATP in myotubes formed from C2C12 mouse muscle cells and exposed to light-emitting diode therapy (LEDT). LEDT employed a cluster of LEDs with 20 red (630 Â± 10 nm, 25 mW) and 20 near-infrared (850 Â± 10 nm, 50 mW) delivering 28 mW cm(2) for 90 s (2.5 J cm(2)) with analysis at 5 min, 3 h, 6 h and 24 h post-LEDT. LEDT-6 h had the highest MMP, followed by LEDT-3 h, LEDT-24 h, LEDT-5 min and Control with significant differences. The same order (6 h > 3 h > 24 h > 5 min > Control) was found for ATP with significant differences. A good correlation was found (r = 0.89) between MMP and ATP. These data suggest an optimum time window of 3-6 h for LEDT stimulate muscle cells. Adenosine Triphosphate Adenosine Triphosphate;Animals;Cell Line;Infrared Rays;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice;Mitochondria;Muscle Fibers, Skeletal;Time Factors

Dark circles: etiology and management options. Given their multifactorial nature and the fact that individual patients may have more than a single underlying cause, cosmetic practitioners should be well versed in a number of potential treatment options encompassing all facets of under-eye dark circles. New therapeutic options are also forthcoming. Longer-lasting HA fillers, wavelength tunable laser devices, and topicals speeding up healing and enhancing results after fractionated laser therapy will all serve to make the future of dark circle treatment unabatedly bright. Dermatologic Agents;Prostaglandins F, Synthetic;Viscosupplements;Vitamins;Hyaluronic Acid Adipose Tissue;Cosmetic Techniques;Dermatologic Agents;Eyelids;Humans;Hyaluronic Acid;Hyperpigmentation;Lipodystrophy;Low-Level Light Therapy;Orbit;Phototherapy;Prostaglandins F, Synthetic;Skin;Ultrasonic Therapy;Viscosupplements;Vitamins

Effectiveness of Er:YAG laser-aided fiberotomy and low-level laser therapy in alleviating relapse of rotated incisors. INTRODUCTION: In this study, we compared the effectiveness of laser-aided circumferential supracrestal fiberotomy (CSF) and low-level laser therapy (LLLT) with conventional CSF in reducing relapse of corrected rotations. METHODS: The study included 24 patients who were at the finishing stage of orthodontic treatment and had at least 1 maxillary incisor with 30Â° to 70Â° of rotation before starting therapy. The subjects were divided into 4 groups by treatment: conventional CSF, Er:YAG laser-aided CSF, LLLT, and control. After alginate impressions were taken, the archwire was sectioned from the experimental incisors, and they were allowed to relapse. The second impression was taken 1Â month later, and the degree and percentage of relapse were calculated in photographs taken from the dental models. Gingival recession, pocket depth, and pain were also measured in the CSF groups. RESULTS: The mean percentages of relapse were 9.7% in the conventional CSF, 12.7% in the Er:YAG laser-aided CSF, 11.7% in the LLLT, and 27.8% in the control groups. Relapse was significantly greater in the control than the experimental groups (PÂ <0.05), which were not statistically different from each other. The changes in sulcus depth and gingival recession were small and not significantly different among the CSF groups (PÂ >0.05), but pain

intensity was greater in subjects who underwent conventional CSF (PÂ =Â 0.003). CONCLUSIONS: Er:YAG laser-aided CSF proved to be an effective alternative to conventional CSF in reducing rotational relapse. LLLT with excessively high energy density was also as effective as the CSF procedures in alleviating relapse, at least in the short term. Adolescent;Adult;Connective Tissue;Female;Gingival Recession;Humans;Image Processing, Computer-Assisted;Incisor;Laser Therapy;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Malocclusion;Maxilla;Pain Measurement;Pain, Postoperative;Periodontal Ligament;Periodontal Pocket;Photography, Dental;Recurrence;Rotation;Tooth Movement Techniques;Treatment Outcome;Visual Analog Scale;Young Adult

[Current approaches for early detection and treatment of medication-related osteonecrosis of jaw]. Owing to the increased life expectancy, the incidence of rheumatoid disorders and oncologic cases with bone metastasis has dramatically increased. Despite the beneficial effects of the applied antiresorptive and antiangiogenic drugs (e.g. bisphosphonates), serious side effects such as jaw osteonecrosis may also develop. The aim of the authors was to summarize present knowledge about the possibilities of prevention and treatment in medication-related osteonecrosis of the jaw. Based on literature data, currently used detection methods for medication-related osteonecrosis of the jaw (including their advantages and limitations) are summarized. In addition, novel trends of surgical and adjuvant therapeutic approaches are also reviewed. The authors conclude that possibilities of prevention and efficacy of therapeutic interventions in this disorder are still limited possibly due to an incomplete knowledge of the underlying pathomechanism. An interdisciplinary cooperation for prevention and attentive monitoring in order to decrease the incidence of iatrogenic oral and maxillofacial complications seems to be particularly important. Analgesics;Anti-Bacterial Agents;Biomarkers;Bone Density Conservation Agents;Teriparatide;Ozone;alpha-Tocopherol;Pentoxifylline Analgesics;Anti-Bacterial Agents;Biomarkers;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Bone Neoplasms;Debridement;Early Diagnosis;Humans;Laser Therapy;Low-Level Light Therapy;Ozone;Pentoxifylline;Practice Guidelines as Topic;Risk Assessment;Risk Factors;Saliva;Severity of Illness Index;Teriparatide;alpha-Tocopherol

Therapeutic laser in veterinary medicine. Laser therapy is an increasingly studied modality that can be a valuable tool for veterinary practitioners. Mechanisms of action have been studied and identified for the reduction of pain and inflammation and healing of tissue. Understanding the basics of light penetration into tissue allows evaluation of the correct dosage to deliver for the appropriate condition, and for a particular patient based on physical properties. New applications are being studied for some of the most challenging health conditions and this field will continue to grow. Additional clinical studies are still needed and collaboration is encouraged for all practitioners using this technology. Animals;Laser Therapy;Physical Therapy Modalities;Veterinary Medicine

Effect of low-level laser therapy on pain and swelling in women with breast cancer-related lymphedema: a systematic review and meta-analysis. PURPOSE: This study aims to examine literature on effectiveness of low-level laser therapy (LLLT) in reducing limb volume and pain in adults with breast cancer-related lymphedema (BCRL). METHODS: PubMed, PEDro, CINAHL, and Cochrane databases were searched using (lymphedema OR edema OR swelling) AND (breast cancer OR mastectomy) AND (laser OR low-level laser therapy OR LLLT OR cold laser). Intervention studies or meta-analyses reporting LLLT for BCRL were included in the search. Pooled effect sizes (ES) and 95 % confidence intervals (CI) were calculated for volume and pain. No limitations were placed on length of follow-up, publication year, or language. Final search was conducted on October 16, 2014. RESULTS: Nine studies met criteria for inclusion. Within-group pooled ES for volume (six studies) was -0.52 (-0.78, -0.25), representing a 75.7-ml reduction in limb volume after LLLT. Between-group pooled ES for

volume (four studies) was -0.62 (-0.97, -0.28), representing a 90.9-ml greater reduction in volume with treatment including LLLT versus not including LLLT. Within-group pooled ES for pain reduction (three studies) was -0.62 (-1.06, -0.19), pain reduction of 13.5 mm (0-100 mm VAS). Between-group pooled ES for pain reduction (two studies) was non-significant at -1.21 (-4.51, 2.10). CONCLUSION: Moderate-strength evidence supports LLLT in the management of BCRL, with clinically relevant within-group reductions in volume and pain immediately after conclusion of LLLT treatments. Greater reductions in volume were found with the use of LLLT than in treatments without it. IMPLICATIONS FOR CANCER SURVIVORS: LLLT confers clinically meaningful reductions in arm volume and pain in women with BCRL. Adult;Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Pain;Pain Management;Survivors;Treatment Outcome

Increased cell proliferation and differential protein expression induced by low-level Er:YAG laser irradiation in human gingival fibroblasts: proteomic analysis. Erbium-doped yttrium aluminum garnet (Er:YAG) laser treatment has demonstrated favorable wound healing effect after periodontal therapy. One of the reasons may be the positive biological effect of the low-level laser on the irradiated tissues, although the mechanism remains unclear. The aim of this study was to investigate the effect of low-level Er:YAG laser irradiation on cell proliferation and laser-induced differential expression of proteins in human gingival fibroblasts (HGFs) by proteomic analysis. In the first experiment, HGFs were exposed to low-level Er:YAG laser irradiation and the laser-induced cell proliferation and damage were evaluated on day 3. In the second experiment, proteomic analysis was performed on day 1 after irradiation. The peptides prepared from HGFs were analyzed by a hybrid ion trap-Fourier transform mass spectrometer, Mascot search engine, and UniProtKB database. A significant increase in cell proliferation without cell damage after irradiation was observed. Among the total identified 377 proteins, 59 proteins, including galectin-7, which was associated with the process of wound healing, were upregulated and 15 proteins were downregulated in laser-treated HGFs. In the third experiment, the increase in messenger RNA (mRNA) and protein expression of galectin-7 in the irradiated HGFs was validated by various analytical techniques. In addition, the effect of recombinant human galectin-7 on the modulation of HGFs proliferation was confirmed. The results indicate that low-level Er:YAG laser irradiation can promote HGF proliferation and induce a significant change in protein expression and the upregulation of galectin-7 expression may partly contribute to the increase in cell proliferation. Galectins;LGALS7 protein, human;Proteome Cell Proliferation;Cells, Cultured;Fibroblasts;Galectins;Gene Expression;Gingiva;Humans;Lasers, Solid-State;Low-Level Light Therapy;Periodontitis;Proteome;Proteomics

The effects of Er:YAG on the treatment of peri-implantitis: a meta-analysis of randomized controlled trials. The clinical effectiveness of the erbium-doped yttrium-aluminum-garnet (Er:YAG) laser in patients with peri-implantitis remains unclear. The aim of this meta-analysis was to investigate the efficacy and safety of Er:YAG laser (ERL) compared to subgingival mechanical debridement (SMD) for the treatment of peri-implantitis. A systematic electronic literature search was conducted to identify randomized clinical trials (RCTs), followed by a manual search. Results were expressed as weighted mean differences (WMDs) with accompanying 95 % confidence intervals (CIs). The primary outcome measurements were changes in clinical attachment level (CAL) and probing depth (PD). Secondary outcome measurements included changes in gingival recession (GR). The meta-analysis was performed with fixed-effect or random-effect model according to the heterogeneity assessed by I (2) test. Visual asymmetry inspection of the funnel plot, Egger's regression test, and the trim-and-fill method were used to investigate publication bias. At 6 months, significant difference in PD reduction (pâ€‰=â€‰0.018) was observed for Er:YAG laser compared to SMD treatment, while no significant differences were detected in CAL gain and GR change; at 12 months, no significant difference was observed for any investigated outcome. The findings of this meta-analysis suggest that use of the

Er:YAG laser as alternative to SMD could potentially provide short-time additional benefits, while there is no evidence of long-time superior effectiveness. As all included studies were not at low risk of bias, and only four studies were included in the meta-analysis, future long-term and well-designed RCTs reporting clinical and microbiological outcomes, considering the cost/effectiveness ratio, and having a high methodological quality are needed to clarify the effectiveness of Er:YAG laser. Humans;Lasers, Solid-State;Low-Level Light Therapy;Peri-Implantitis;Randomized Controlled Trials as Topic;Treatment Outcome

Laser vaccine adjuvants. History, progress, and potential. Immunologic adjuvants are essential for current vaccines to maximize their efficacy. Unfortunately, few have been found to be sufficiently effective and safe for regulatory authorities to permit their use in vaccines for humans and none have been approved for use with intradermal vaccines. The development of new adjuvants with the potential to be both efficacious and safe constitutes a significant need in modern vaccine practice. The use of non-damaging laser light represents a markedly different approach to enhancing immune responses to a vaccine antigen, particularly with intradermal vaccination. This approach, which was initially explored in Russia and further developed in the US, appears to significantly improve responses to both prophylactic and therapeutic vaccines administered to the laser-exposed tissue, particularly the skin. Although different types of lasers have been used for this purpose and the precise molecular mechanism(s) of action remain unknown, several approaches appear to modulate dendritic cell trafficking and/or activation at the irradiation site via the release of specific signaling molecules from epithelial cells. The most recent study, performed by the authors of this review, utilized a continuous wave near-infrared laser that may open the path for the development of a safe, effective, low-cost, simple-to-use laser vaccine adjuvant that could be used in lieu of conventional adjuvants, particularly with intradermal vaccines. In this review, we summarize the initial Russian studies that have given rise to this approach and comment upon recent advances in the use of non-tissue damaging lasers as novel physical adjuvants for vaccines. Adjuvants, Immunologic;Vaccines Adjuvants, Immunologic;Dendritic Cells;Epithelial Cells;Humans;Low-Level Light Therapy;Russia;United States;Vaccines

Effect of low-level laser therapy on muscle adaptation to knee extensor eccentric training. PURPOSE: Eccentric training has been popularized for physical conditioning and prevention/rehabilitation of musculoskeletal disorders, especially due to the expressive responses in terms of muscular strength gain. In view of evidence that low-level laser therapy (LLLT) is able to increase exercise performance and accelerate post-exercise recovery, the aim of this study was to verify the effect of LLLT on hypertrophy and strengthening of knee extensor muscles submitted to eccentric training. METHOD: Thirty healthy male subjects were randomized into three groups: Control Group (CG), Training Group (TG) and Training + LLLT Group (TLG). CG received no intervention, while TG and TLG were engaged on an 8-week knee extensor isokinetic eccentric training program. Only subjects from TLG were treated with LLLT (wavelength = 810 nm; power output = 200 mW; total dosage = 240 J) before each training session. Knee extensor muscle thickness and peak torque were assessed through ultrasonography and isokinetic dynamometry, respectively. RESULTS: CG presented no changes in any variable throughout the study, while eccentric training led to significant increases in muscle thickness and peak torque in TG and TLG. Subjects from TLG reached significantly higher percent changes compared to subjects from TG for sum of muscles' thicknesses (15.4 vs. 9.4%), isometric peak torque (20.5 vs. 13.7%), and eccentric peak torque (32.2 vs. 20.0%). CONCLUSION: LLLT applied before eccentric training sessions seems to improve the hypertrophic response and muscular strength gain in healthy subjects. Adaptation, Physiological;Adult;Humans;Knee;Low-Level Light Therapy;Male;Muscle Contraction;Muscle, Skeletal;Myalgia;Resistance Training;Torque

Water-soluble nickel-bis(dithiolene) complexes as photothermal agents. The remarkable photothermal properties of pegylated nickel-bis(dithiolene) complexes in water can induce cell death under laser irradiation in the near infrared (NIR) region. Organometallic Compounds;Sulfhydryl Compounds;Water;Nickel Cell Death;Cell Line, Tumor;Dose-Response Relationship, Drug;Humans;Lasers;Low-Level Light Therapy;Molecular Structure;Nickel;Organometallic Compounds;Photochemical Processes;Solubility;Structure-Activity Relationship;Sulfhydryl Compounds;Temperature;Water

Significant alleviation of Darier's disease with fractional CO2 laser. Darier's disease (DD) is a dominantly inherited genodermatosis with highly variable expression. It is characterized by symmetrical hyperkeratotic papules affecting seborrheic areas and extremities. The existence of unsightly lesions could lead to discomfort and social handicap. Conventional treatment consists of topical and systemic steroids and/or retinoids alleviating DD. Ablative lasers also have been used to treat these conditions with variable results and side effects. To the best of our knowledge, fractional CO2 laser has never been used to treat DD. We present a case of a 36-year-old woman with verrucous and hyperkeratotic plaques of the forehead significantly improved after two sessions of fractional CO2 laser treatment. Neither scars nor pigmentary disorders were noted. Adult;Cosmetic Techniques;Darier Disease;Female;Forehead;Humans;Lasers, Gas;Low-Level Light Therapy

Acne vulgaris and light-based therapies. Acne vulgaris is a common condition which remains challenging to treat in some cases. Laser and light-based therapies offer an alternative to medical therapies with the advantage of high compliance and relatively low side-effect profile. Light-based therapies in acne exert their effects through photochemical, photothermal, or a combination of both mechanisms. This article explains the mode of action for each light-based modality and examines the current evidence in this field. Phosphates;potassium titanylphosphate;Titanium Acne Vulgaris;Humans;Infrared Rays;Lasers, Dye;Low-Level Light Therapy;Phosphates;Photochemotherapy;Phototherapy;Titanium;Ultraviolet Rays

Retreatment using a dual mode of low-fluence Q-switched and long-pulse Nd:YAG laser in patients with melasma aggravation after previous therapy. BACKGROUND: Aggravated melasma after treatment is vulnerable to stimulation, can easily deteriorate, and may be distressing without proper management. OBJECTIVE: To retrospectively assess the effectiveness and safety of combination therapy using low-fluence Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser (QSNY) and long-pulse Nd:YAG laser (LPNY) (dual toning) in patients with rebound melasma. MATERIALS AND METHODS: A total of 30 patients with aggravated melasma after previous therapy who were treated with dual toning were enrolled. A total of 10 sessions were conducted at 1-week intervals, followed by maintenance treatment. The results were evaluated using the modified Melasma Area and Severity Index (mMASI) and the physician's global assessment (PGA) before and 2 months after completing the 10 treatment sessions. RESULTS: The baseline mMASI was 10.48 Â± 3.64, which significantly decreased to 3.22 Â± 1.45 2 months after completing the 10 treatment sessions ($p < 0.001$). Twenty-four patients (80%) had PGA grade 4 (76-100% improvement) and 6 patients (20%) had PGA grade 3 (51-75% improvement). CONCLUSION: Dual toning may be a safe and effective salvage treatment for patients with aggravated melasma after previous treatment. LPNY may stabilize melasma activity to prevent rebound hyperpigmentation via dermal remodeling. Adult;Asian People;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction;Retreatment;Retrospective Studies

Treatment of fibroelastolytic papulosis with fractionated carbon dioxide laser. Fibroelastolytic papulosis (FEP) is an acquired elastic tissue disorder that presents as white-to-yellow papules and plaques usually occurring on the neck. Although the lesions are often asymptomatic, their appearance may be distressing to patients. FEP has been treated with topical tretinoin in one case

report (1). Other reports have not mentioned treatment for this rare disorder (1-6). We present a case of FEP successfully treated with a fractionated carbon dioxide (CO2) laser. Aged;Connective Tissue Diseases;Cosmetic Techniques;Elastic Tissue;Female;Humans;Lasers, Gas;Low-Level Light Therapy

Use of physical therapy in a dog with bilateral severe plantigrade stance. A 3.5 yr old spayed female Staffordshire terrier weighing 25.5 kg was presented with a 7 wk history of bilateral plantigrade stance in the pelvic limbs directly following an ovariohysterectomy procedure. Upon presentation, the dog had bilateral atrophy of the distal pelvic limb muscles, enlarged popliteal lymph nodes, and ulcerative wounds on the dorsa of her rear paws. Orthopedic examination revealed intact calcaneal tendons bilaterally and neurologic examination localized the lesion to the distal sciatic nerve. A diagnosis of compressive and stretch neuropathy was made affecting the distal sciatic nerve branches. Physical therapy modalities included neuromuscular electrical stimulation, ultrasound, and low-level laser therapy. Other therapeutic modalities included the use of orthotics and progressive wound care. The dog had increased muscle mass, return of segmental reflexes, return of nociception, and the ability to walk on pelvic limbs with higher carriage of the hock 15 mo following presentation. The use of custom orthotics greatly increased the quality of life and other physical therapy modalities may have improved the prognosis in this dog with severe bilateral plantigrade stance due to neuropathy. Animals;Dog Diseases;Dogs;Electric Stimulation;Female;Foot Orthoses;Low-Level Light Therapy;Peripheral Nerve Injuries;Physical Therapy Modalities;Sciatic Neuropathy;Ultrasonic Therapy

Non-surgical treatment of lateral epicondylitis: a systematic review of randomized controlled trials. BACKGROUND: Non-surgical approaches to treatment of lateral epicondylitis are numerous. The aim of this systematic review is to examine randomized, controlled trials of these treatments. METHODS: Numerous databases were systematically searched from earliest records to February 2013. Search terms included "lateral epicondylitis," "lateral elbow pain," "tennis elbow," "lateral epicondylalgia," and "elbow tendinopathy" combined with "randomized controlled trial." Two reviewers examined the literature for eligibility via article abstract and full text. RESULTS: Fifty-eight articles met eligibility criteria: (1) a target population of patients with symptoms of lateral epicondylitis; (2) evaluation of treatment of lateral epicondylitis with the following non-surgical techniques: corticosteroid injection, injection technique, iontophoresis, botulinum toxin A injection, prolotherapy, platelet-rich plasma or autologous blood injection, bracing, physical therapy, shockwave therapy, or laser therapy; and (3) a randomized controlled trial design. Lateral epicondylitis is a condition that is usually self-limited. There may be a short-term pain relief advantage found with the application of corticosteroids, but no demonstrable long-term pain relief. Injection of botulinum toxin A and prolotherapy are superior to placebo but not to corticosteroids, and botulinum toxin A is likely to produce concomitant extensor weakness. Platelet-rich plasma or autologous blood injections have been found to be both more and less effective than corticosteroid injections. Non-invasive treatment methods such as bracing, physical therapy, and extracorporeal shockwave therapy do not appear to provide definitive benefit regarding pain relief. Some studies of low-level laser therapy show superiority to placebo whereas others do not. CONCLUSIONS: There are multiple randomized controlled trials for non-surgical management of lateral epicondylitis, but the existing literature does not provide conclusive evidence that there is one preferred method of non-surgical treatment for this condition. Lateral epicondylitis is a condition that is usually self-limited, resolving over a 12- to 18-month period without treatment. LEVEL OF EVIDENCE: Therapeutic Level II. See Instructions to Authors for a complete description of level of evidence.

Diagnosis and management of osteonecrosis of the jaw: a systematic review and international consensus. This work provides a systematic review of the literature from January 2003 to April

2014 pertaining to the incidence, pathophysiology, diagnosis, and treatment of osteonecrosis of the jaw (ONJ), and offers recommendations for its management based on multidisciplinary international consensus. ONJ is associated with oncology-dose parenteral antiresorptive therapy of bisphosphonates (BP) and denosumab (Dmab). The incidence of ONJ is greatest in the oncology patient population (1% to 15%), where high doses of these medications are used at frequent intervals. In the osteoporosis patient population, the incidence of ONJ is estimated at 0.001% to 0.01%, marginally higher than the incidence in the general population (<0.001%). New insights into the pathophysiology of ONJ include antiresorptive effects of BPs and Dmab, effects of BPs on gamma delta T-cells and on monocyte and macrophage function, as well as the role of local bacterial infection, inflammation, and necrosis. Advances in imaging include the use of cone beam computerized tomography assessing cortical and cancellous architecture with lower radiation exposure, magnetic resonance imaging, bone scanning, and positron emission tomography, although plain films often suffice. Other risk factors for ONJ include glucocorticoid use, maxillary or mandibular bone surgery, poor oral hygiene, chronic inflammation, diabetes mellitus, ill-fitting dentures, as well as other drugs, including antiangiogenic agents. Prevention strategies for ONJ include elimination or stabilization of oral disease prior to initiation of antiresorptive agents, as well as maintenance of good oral hygiene. In those patients at high risk for the development of ONJ, including cancer patients receiving high-dose BP or Dmab therapy, consideration should be given to withholding antiresorptive therapy following extensive oral surgery until the surgical site heals with mature mucosal coverage. Management of ONJ is based on the stage of the disease, size of the lesions, and the presence of contributing drug therapy and comorbidity. Conservative therapy includes topical antibiotic oral rinses and systemic antibiotic therapy. Localized surgical debridement is indicated in advanced nonresponsive disease and has been successful. Early data have suggested enhanced osseous wound healing with teriparatide in those without contraindications for its use. Experimental therapy includes bone marrow stem cell intralesional transplantation, low-level laser therapy, local platelet-derived growth factor application, hyperbaric oxygen, and tissue grafting. Antibodies, Monoclonal, Humanized;Diphosphonates;Receptors, Antigen, T-Cell, gamma-delta;Denosumab Antibodies, Monoclonal, Humanized;Bacterial Infections;Bisphosphonate-Associated Osteonecrosis of the Jaw;Cone-Beam Computed Tomography;Consensus;Denosumab;Diphosphonates;Humans;Macrophages;Mandible;Monocytes;Osteoporosis;Receptors, Antigen, T-Cell, gamma-delta;Risk Factors;T-Lymphocytes

Low-fluence Q-switched Nd: YAG 1064-nm laser and intense pulsed light for the treatment of melasma. BACKGROUND: Low-fluence Q-switched Nd:YAG 1064Â nm laser (LFQS) and intense pulsed light (IPL) have been shown to be effective in the treatment of melasma. LFQS can target deeper pigment, while IPL can target a wide range of cutaneous structures. However, there is limited information on efficacy and side-effects of the combined treatment. OBJECTIVE: To compare the efficacy and safety of combined LFQS and IPL therapy with LFQS monotherapy in the treatment of melasma. METHODS: Twenty female patients with mixed-type melasma on both cheeks were treated with LFQS on full face for five sessions at 1-week intervals. One side of the face was randomly assigned to receive additional three sessions of IPL treatments at 2-week intervals. Patients were evaluated 12Â weeks after the last treatment. Outcome measures include the assessment by colorimeter and calculated as relative lightness index (R*LI), modified Melasma Area and Severity Index (mMASI), patient satisfaction and adverse effects. RESULTS: Eighteen patients completed the study. Both sides of the face showed significant improvement of R*LI and mMASI. A more rapid improvement of R*LI and mMASI was observed on combined side. At the end of treatment, 55% improvement and 37% improvement of R*LI was observed on combined side and monotherapy side respectively. The overall patients' satisfaction was in favour of the combined side. Recurrence

occurred on both sides but there was still a significant decrease compared to baseline. No serious side effect was noted. CONCLUSION: The combination of LFQS and IPL results in faster clearance of melasma and is more effective than LFQS alone for melasma treatment. However, recurrence is still inevitable. Female;Humans;Intense Pulsed Light Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction;Treatment Outcome

Autologous bone-marrow stem cells stimulation reverses post-ischemic-reperfusion kidney injury in rats. BACKGROUND/AIMS: Low-level laser therapy (LLLT) has been found to modulate biological activity. The aim of the present study was to investigate the possible beneficial effects of LLLT application to stem cells in the bone marrow (BM), on the kidneys of rats that had undergone acute ischemia-reperfusion injury (IRI). METHODS: Injury to the kidneys was induced by the excision of the left kidney and 60 min of IRI to the right kidney in each rat. Rats were then divided randomly into 2 groups: non-laser-treated and laser-treated. LLLT was applied to the BM 10 min and 24 h post-IRI and rats were sacrificed 4 days post-IRI. Blood was collected before the sacrifice and the kidney processed for histology. RESULTS: Histological evaluation of kidney sections revealed the restored structural integrity of the renal tubules, and a significant reduction of 66% of pathological score in the laser-treated rats as compared to the non-laser-treated ones. C-kit positive cell density in kidneys post-IRI and laser-treatment was ($p = 0.05$) 2.4-fold higher compared to that of the non-laser treated group. Creatinine, blood urea nitrogen, and cystatin-C levels were significantly 55, 48, and 25% lower respectively in the laser-treated rats as compared to non-treated ones. CONCLUSION: LLLT application to the BM causes induction of stem cells, which subsequently migrate and home in on the injured kidney. Consequently, a significant reduction in pathological features and improved kidney function post-IRI are evident. The results demonstrate a novel approach in cell-based therapy for acute ischemic injured kidneys. Cystatin C;Creatinine;Proto-Oncogene Proteins c-kit Acute Kidney Injury;Animals;Blood Urea Nitrogen;Bone Marrow Cells;Creatinine;Cystatin C;Kidney;Kidney Tubules;Low-Level Light Therapy;Mesenchymal Stem Cells;Proto-Oncogene Proteins c-kit;Rats;Rats, Wistar;Reperfusion Injury

Low-level laser irradiation promotes the proliferation and maturation of keratinocytes during epithelial wound repair. Low-level laser therapy (LLLT) has been extensively employed to improve epithelial wound healing, though the exact response of epithelium maturation and stratification after LLLT is unknown. Thus, this study aimed to assess the in vitro growth and differentiation of keratinocytes (KCs) and in vivo wound healing response when treated with LLLT. Human KCs (HaCaT cells) showed an enhanced proliferation with all the employed laser energy densities (3, 6 and 12Â J/cm(2) , 660Â nm, 100Â mW), together with an increased expression of Cyclin D1. Moreover, the immunoexpression of proteins related to epithelial proliferation and maturation (p63, CK10, CK14) all indicated a faster maturation of the migrating KCs in the LLLT-treated wounds. In that way, an improved epithelial healing was promoted by LLLT with the employed parameters; this improvement was confirmed by changes in the expression of several proteins related to epithelial proliferation and maturation. Immunofluorescent expression of cytokeratin 10 (red) and Cyclin D1 (green) in (A) Control keratinocytes and (B) Low-level laser irradiated cells. Blue color illustrates the nuclei of the cells (DAPI staining). Keratins Animals;Cell Differentiation;Cell Line;Cell Movement;Cell Proliferation;Epithelium;Female;Humans;Keratinocytes;Keratins;Low-Level Light Therapy;Rats;Rats, Wistar;Wound Healing

Combination of CO2 and Q-switched Nd:YAG lasers is more effective than Q-switched Nd:YAG laser alone for eyebrow tattoo removal. BACKGROUND: The eyebrow tattoo removal using Q-switched lasers is usually prolonged. Other modalities may be required to enhance the efficacy and shorten the treatment course. OBJECTIVE: To compare the efficacy of Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser alone versus combination of Q-switched Nd:YAG and

Ultrapulse CO2 lasers for eyebrow tattoo removal after a single session. PATIENTS AND METHODS: After local anesthesia, the right eyebrow of 20 patients was treated with Ultrapulse CO2 laser with the parameters of 4 J/cm(2) and 3.2 J/cm(2) for the first and the second passes. Both eyebrows were then treated with 1064-nm and 532-nm Q-switched Nd:YAG laser. The spot size and pulse duration were 3 mm and 5 nanoseconds for both wavelengths, and the fluence was 7 J/cm(2) for 1064 nm and 3 J/cm (2) for 532 nm. RESULTS: The side treated with combination of Q-switched Nd:YAG and CO2 lasers improved 75-100% in 6 of 20 patients versus only 1 of 20 in the side treated with Q-switched Nd:YAG alone. Similarly, the right side in 13 of 20 patients showed more than 50% improvement with combination therapy versus the left side (the monotherapy side), where only 6 of 20 cases showed more than 50% improvement. The Mann-Whitney test was 2.85 for the right side and 1.95 for the left side (P value = 0.007). CONCLUSION: Using Ultra pulse CO2 laser enhances the efficacy of Q-switched Nd:YAG laser in eyebrow tattoo removal. Adult;Cosmetic Techniques;Eyebrows;Female;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Tattooing

Arrest of progression of pre-induced abdominal aortic aneurysm in apolipoprotein E-deficient mice by low level laser phototherapy. BACKGROUND AND OBJECTIVES: Using non-invasive, high-frequency ultrasonography (HF-u/s), we showed that low-level laser phototherapy (LLL) inhibits de-novo formation of abdominal aortic aneurysms (AAA) in apolipoprotein-E-deficient (Apo-E(-/-)) mice. The current study tests the effect of LLL on the progression of pre-induced AAA. STUDY DESIGN/MATERIAL AND METHODS: AAA was induced in Apo-E(-/-) mice (age 16-20 weeks) by subcutaneous infusion of angiotensin-II using osmotic minipumps (1000â€‰ng/kg/minutes, 4 weeks). HF-u/s (40 MHz, 0.01 mm resolution, Vevo-770, VisualSonics) was used to measure the maximum cross-sectional-diameter (MCD) of the suprarenal abdominal aorta, the anterior wall displacement (AWD), and radial wall velocity (RWV). The aortas of mice that developed >35% dilatation at 2 weeks over baseline were exposed retroperitoneally and treated with LLL (780 nm, 2.2 J/cm(2), 9 minutes) or sham-operated. HF-u/s was repeated at 4 weeks, the mice sacrificed by perfusion fixation, and the aortas excised for histopathology. RESULTS: Of all mice with >35% MCD expansion of the suprarenal aorta at 2 weeks, 7(58%) of 12 non-treated, but only 1(7%) of 14 LLL, had increased MCD(> 1 SD) at 4 weeks (P < 0.009 by Fisher's Exact Test [FET]). The mean change in MCD from 2-4 weeks was also markedly reduced in the LLL-treated mice (control vs. LLL, 0.24 Â± 0.25 vs. -0.06 Â± 0.39 mm, P = 0.029 by unpaired t-test). Similar results were obtained when limiting the analysis to animals with â‰¥ 50% expansion at 2 weeks. The deterioration in AWD from 2-4 weeks in non-treated controls was not observed in LLL-treated animals (Î”AWD: control, 0.03 Â± 0.05 mm, P < 0.036 vs. LLL, 0.00 Â± 0.05, P = 0.91 by paired t-test). By the modified Daugherty classification, we found significantly fewer severe aneurysms at 4 weeks in the LLL-treated animals versus control (3 of 10 vs. 9 of 11, P = 0.03 by FET). CONCLUSIONS: LLL not only prevents de novo development of AAA, but, from this study, also arrests further progression of pre-induced AAA and its associated deterioration in the biomechanical integrity of the aortic wall in Apo-E(-/-) mice. Apolipoproteins E;Angiotensin II Angiotensin II;Animals;Aortic Aneurysm, Abdominal;Apolipoproteins E;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred C57BL

Combined therapeutic effects of low power laser (980nm) and CoQ10 on Neuropathic Pain in adult male rat. BACKGROUND: Neuropathic pain (NP) is one of the most suffering medical conditions that often fail to respond to certain pain therapy. Although its exact etiology is still unknown the role of reactive oxygen species (ROS) and oxidative stress were explored by many researchers. Neuropathies either central or peripheral lead to painful condition as well as social and economic isolation, thus various therapies were used to treat or reduce the pain. Laser therapy and antioxidant drugs have separately considered as treatment for NP, but the combination of them have not been

used yet. In order to study the combination effects of Low Level Laser Therapy (LLLT) and Coenzyme Q10 (CoQ10) the present study was designed. METHODS: Sixty adult male rats (230-320g) were used in this experimental study that divided into six groups (n=10). Chronic constriction injury (CCI) was used to induce neuropathic pain. The CoQ10 or vehicle, a low level laser of 980nm was used for two consecutive weeks. Thermal and mechanical paw withdrawal thresholds were assessed before and after surgery on 7(th) and 14(th) days. RESULTS: As we expected CCI decreased the pain threshold, whereas CoQ10 administration for two weeks increased mechanical and thermal threshold. The same results obtained for laser therapy using the CCI animals. Combination of laser 980nm with CoQ10 also showed significant differences in CCI animals. CONCLUSION: Based on our findings the combination of CoQ10 with LLLT showed better effects than each one alone. In this regard we believe that there might be cellular and molecular synergism in simultaneous use of CoQ10 and LLLT on pain relief.

This month's edition of the Journal begins with four fascinating studies. Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Nanoparticles;Onychomycosis;Port-Wine Stain;Warts

Healing effects and superoxide dismutase activity of diode/Ga-As lasers in a rabbit model of osteoarthritis. BACKGROUND/AIM: Osteoarthritis is a major cause of pain and disability in joints. The present study investigated the effects of differences of wavelengths and continuous versus pulsed delivery modes of low-level laser therapy (LLT) in a rabbit model of osteoarthritis. Comparison of the healing effects and superoxide dismutase (SOD) activity between therapy using diode and Ga-As lasers was our primary interest. MATERIALS AND METHODS: Simple continuous wave (808-nm diode) and super-pulsed wave (904-nm Ga-As) lasers were used. Osteoarthritis was induced by injecting hydrogen peroxide into the articular spaces of the right stifle in rabbits. The rabbits were randomly assigned to four groups: normal control without osteoarthritis induction (G1), osteoarthritis-induction group without treatment (G2), osteoarthritis induction with diode irradiation (G3), and osteoarthritis induction with Ga-As irradiation (G4). Laser irradiation was applied transcutaneously for 5 min every day for over four weeks, starting the first day after confirmation of induction of osteoarthritis. The induction of osteoarthritis and effects of LLT were evaluated by biochemistry, computed tomography, and histological analyses. RESULTS: The SOD activity in G3 and G4 rabbits at two and four weeks after laser irradiation was significantly higher than that of G1 animals ($p<0.05$). However, there was no significant difference between G3 and G4 animals. Moreover, there were significant differences at two and four weeks between the control and osteoarthritis-induction groups, but no significant difference between G3 and G4 in the computed tomographic analyses and histological findings. CONCLUSION: These results indicate that diode and Ga-As lasers are similarly effective in healing and inducing SOD activity for LLT applications in a rabbit model of OA. Superoxide Dismutase Animals;Disease Models, Animal;Enzyme Activation;Laser Therapy;Lasers;Male;Osteoarthritis;Rabbits;Stifle;Superoxide Dismutase;Tomography, X-Ray Computed;Wound Healing

Near-infrared light therapy to attenuate strength loss after strenuous resistance exercise. CONTEXT: Near-infrared (NIR) light therapy is purported to act as an ergogenic aid by enhancing the contractile function of skeletal muscle. Improving muscle function is a new avenue for research in the area of laser therapy; however, very few researchers have examined the ergogenic effects of NIR light therapy and the influence it may have on the recovery process during rehabilitation. OBJECTIVE: To evaluate the ergogenic effect of NIR light therapy on skeletal muscle function. DESIGN: Crossover study. SETTING: Controlled laboratory. PATIENTS OR OTHER PARTICIPANTS: Thirty-nine healthy men (n = 21) and women (n = 18; age = 20.0 Â± 0.2 years, height = 169 Â± 2 cm, mass = 68.4 Â± 1.8 kg, body mass index = 23.8 Â± 0.4 kg/m(2)). INTERVENTION(S): Each participant received active and sham treatments on the biceps brachii muscle on 2 separate days. The order of treatment was randomized.

A class 4 laser with a cumulative dose of 360 J was used for the active treatment. After receiving the treatment on each day, participants completed an elbow-flexion resistance-exercise protocol. MAIN OUTCOME MEASURE(S): The dependent variables were elbow range of motion, muscle point tenderness, and strength (peak torque). Analysis of variance with repeated measures was used to assess changes in these measures between treatments at baseline and at follow-up, 48 hours postexercise. Additionally, immediate strength loss postexercise was compared between treatments using a paired t test. RESULTS: Preexercise to postexercise strength loss for the active laser treatment, although small, was less than with the sham treatment (P = .05). CONCLUSIONS: Applied to skeletal muscle before resistance exercise, NIR light therapy effectively attenuated strength loss. Therefore, NIR light therapy may be a beneficial, noninvasive modality for improving muscle function during rehabilitation after musculoskeletal injury. However, future studies using higher treatment doses are warranted. Adolescent;Arm;Cross-Over Studies;Double-Blind Method;Elbow;Exercise;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Strength;Muscle, Skeletal;Phototherapy;Range of Motion, Articular;Resistance Training;Torque;Young Adult

Noninvasive and alternative management of chronic low back pain (efficacy and outcomes). OBJECTIVES: The goal of this article is to provide a thorough literature review of available noninvasive and alternative treatment options for chronic low back pain. In particular, the efficacy of each therapy is evaluated and pertinent outcomes are described. MATERIALS AND METHODS: A comprehensive search for available literature was done through PubMed and Cochrane data base for topics discussed in this paper. RESULTS: Relevant current and past references were reviewed and presented to reflect the efficacy of each therapy and related outcomes. CONCLUSIONS: There are a wide variety of noninvasive and alternative therapies for the treatment of chronic low back pain. Those with the strongest evidence in the literature for good efficacy and outcomes include exercise therapy with supervised physical therapy, multidisciplinary biopsychosocial rehabilitation, and acupuncture. Therapies with fair evidence or moderately supported by literature include yoga, back schools, thermal modalities, acupressure, and cognitive-behavioral therapy. Those therapies with poor evidence or little to no literature support include manipulation, transcutaneous electrical nerve stimulation, low-level laser therapy, reflexology, biofeedback, progressive relaxation, hypnosis, and aromatherapy. Providers delivering care for patients with chronic low back pain must carefully evaluate these available treatment options related to their efficacy or lack thereof as well as relevant outcomes. Complementary Therapies;Humans;Low Back Pain

Effectiveness of passive physical modalities for shoulder pain: systematic review by the Ontario protocol for traffic injury management collaboration. BACKGROUND: Shoulder pain is a common musculoskeletal condition in the general population. Passive physical modalities are commonly used to treat shoulder pain. However, previous systematic reviews reported conflicting results. PURPOSE: The aim of this study was to evaluate the effectiveness of passive physical modalities for the management of soft tissue injuries of the shoulder. DATA SOURCES: MEDLINE, EMBASE, CINAHL, PsycINFO, and the Cochrane Central Register of Controlled Trials were searched from January 1, 1990, to April 18, 2013. STUDY SELECTION: Randomized controlled trials (RCTs) and cohort and case-control studies were eligible. Random pairs of independent reviewers screened 1,470 of 1,760 retrieved articles after removing 290 duplicates. Twenty-two articles were eligible for critical appraisal. Eligible studies were critically appraised using the Scottish Intercollegiate Guidelines Network criteria. Of those, 11 studies had a low risk of bias. DATA EXTRACTION: The lead author extracted data from low risk of bias studies and built evidence tables. A second reviewer independently checked the extracted data. DATA SYNTHESIS: The findings of studies with a low risk of bias were synthesized according to principles of best evidence synthesis. Pretensioned tape, ultrasound, and interferential current were

found to be noneffective for managing shoulder pain. However, diathermy and corticosteroid injections led to similar outcomes. Low-level laser therapy provided short-term pain reduction for subacromial impingement syndrome. Extracorporeal shock-wave therapy was not effective for subacromial impingement syndrome but provided benefits for persistent shoulder calcific tendinitis. LIMITATIONS: Non-English studies were excluded. CONCLUSIONS: Most passive physical modalities do not benefit patients with subacromial impingement syndrome. However, low-level laser therapy is more effective than placebo or ultrasound for subacromial impingement syndrome. Similarly, shock-wave therapy is more effective than sham therapy for persistent shoulder calcific tendinitis. Humans;Physical Therapy Modalities;Recovery of Function;Shoulder Impingement Syndrome;Shoulder Injuries;Shoulder Pain;Soft Tissue Injuries;Systematic Reviews as Topic;Treatment Outcome

The fluence effects of low-level laser therapy on inflammation, fibroblast-like synoviocytes, and synovial apoptosis in rats with adjuvant-induced arthritis. OBJECTIVE: The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) operating at low and high fluences on joint inflammation, fibroblast-like synoviocytes (FLS), and synovial apoptosis in rats with adjuvant-induced arthritis. BACKGROUND DATA: Rheumatoid arthritis (RA) is characterized by pronounced inflammation and FLS proliferation within affected joints. Certain data indicate that LLLT is effective in patients with inflammation caused by RA; however, the fluence effects of LLLT on synovium are unclear. METHODS: Monoarthritis was induced in adult male Sprague-Dawley rats (250-300â€‰g) via intraarticular injection of complete Freund's adjuvant (CFA) into the tibiotarsal joint. Animals were irradiated 72â€‰h after CFA administration with a 780â€‰nm GaAlAs laser at 4.5â€‰J/cm2 (30 mW, 30â€‰sec/spot) and 72â€‰J/cm2 (80 mW, 180â€‰sec/spot) daily for 10 days. After LLLT, the animals were euthanized and their arthritic ankles were collected for histopathological analysis, immunoassays of tumor necrosis factor (TNF)-Î±, matrix metallopeptidase (MMP)3 and 5B5, and terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) assays. RESULTS: LLLT at a fluence of 4.5â€‰J/cm2 significantly reduced infiltration of inflammatory cells and expressions of TNF-Î±-, MMP3- and 5B5-like immunoreactivities, as well as resulting in more TUNEL-positive apoptotic cells in the synovium. No significant changes were observed in these biochemicals and inflammation in arthritic animals treated with 72â€‰J/cm2. CONCLUSIONS: LLLT with low fluence is highly effective in reducing inflammation to sites of injury by decreasing the numbers of FLS, inflammatory cells, and mediators in the CFA-induced arthritic model. These data will be of value in designing clinical trials of LLLT for RA. Animals;Apoptosis;Arthritis, Experimental;Fibroblasts;Immunohistochemistry;In Situ Nick-End Labeling;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Synovial Membrane

Pulsed versus continuous wave low-level light therapy on osteoarticular signs and symptoms in limited scleroderma (CREST syndrome): a case report. Limited cutaneous systemic sclerosis (lcSSc) was formerly known as CREST syndrome in reference to the associated clinical features: calcinosis, Raynaud's phenomenon, esophageal dysfunction, sclerodactyly, and telangiectasias. The transforming growth factor beta has been identified as a major player in the pathogenic process, where low-level light therapy (LLLT) has been shown to modulate this cytokine superfamily. This case study was conducted to assess the efficacy of 940 nm using millisecond pulsing and continuous wave (CW) modes on osteoarticular signs and symptoms associated with lcSSc. The patient was treated two to three times a week for 13 weeks using a sequential pulsing mode on one elbow and a CW mode on the other. Efficacy assessments included inflammation, symptoms, pain, health scales, patient satisfaction, clinical global impression, and adverse effects monitoring. Considerable functional and morphologic improvements were observed after LLLT, with the best results seen with the pulsing mode. No adverse effects were noted. Pulsed LLLT represents a treatment alternative for

osteoarticular signs and symptoms in limited scleroderma (CREST syndrome). Adult;CREST Syndrome;Female;Humans;Lasers;Patient Satisfaction;Phototherapy;Skin Temperature

Verruca plana as a complication of CO2 laser treatment: a case report. Carbon dioxide (CO2) laser treatment is a common therapeutic modality for many dermatologic conditions. It uses a high energy, infrared beam of light, which selectively targets water-containing tissue resulting in controlled ablative resurfacing. This modality, however, can manifest significant cosmetic side effects. Here we report a case of verruca plana manifesting as a response to CO2 laser treatment. A 74-year-old female with recent Mohs surgery for a basal cell carcinoma, presented for full-face-fractionated CO2 treatment to address her surgical scars in addition to treating her mild diffuse actinic damage. Six weeks post treatment, the patient developed erythematous thin plaques over the areas that had been treated. Histology was consistent with verruca plana. Lesions showed mild improvement with topical tretinoin. Verruca plana are benign and typically self-limited; however, they can present a significant cosmetic burden to patients and are an important complication to consider when performing elective cosmetic procedures. Aged;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Warts

Morphological alterations of periodontal pocket epithelium following Nd:YAG laser irradiation. OBJECTIVE: The purpose of this in vivo study was to examine morphologic alterations in the periodontal pocket epithelium with presence or absence of clinical inflammation following the use of the Neodymium: Yttrium-Aluminum-Garnet (Nd:YAG) laser irradiation. BACKGROUND DATA: Subgingival Nd:YAG laser irradiation has been proposed as an alternative technique for treatment of chronic periodontitis. Several published studies have reported the clinical outcomes of such treatment. METHODS: Twenty patients, diagnosed with moderate chronic periodontitis, were selected for the study. A total of 32 sites was identified and divided into a control (n=18) and laser-treated test groups (n=14). Probing depth (PD) and bleeding on probing (BOP) were recorded for all sites. Test sites were irradiated with an Nd:YAG laser using parameters of 2â€‰W, 200â€‰mJ pulse energy, and 10â€‰pps delivered through a 320â€‰Î¼m diameter tip. Total laser treatment time ranged from 1 to 2â€‰min. Following treatment, all specimens were harvested via biopsy and processed for scanning electron microscopy (SEM) and histologic examination. RESULTS: Control group specimens, depending upon initial PD, exhibited either a relatively smooth and intact epithelium with little desquamation (PDâ‰¤3â€‰mm), or increasing degrees of epithelial desquamation and leukocytic infiltration at a PD of â‰¥4â€‰mm. In the laser-treated test group, the specimens with PDâ‰¤3â€‰mm that were BOP negative (-) exhibited a thin layer of epithelium that was disrupted. In the specimens with initial PD of â‰¥4â€‰mm, complete removal of the epithelium whose extent and degree were increasing, was observed in the inflamed portion, while epithelium remained in the uninflamed portion. CONCLUSIONS: The SEM and histologic findings demonstrated the feasibility of ablating pocket epithelium with an Nd:YAG laser irradiation using parameters of 2â€‰W of power (200â€‰mJ, 10â€‰pps). Furthermore, the presence or absence of clinical inflammation appeared to have an impact on the degree of laser-mediated epithelial ablation. Aged;Case-Control Studies;Chronic Periodontitis;Epithelium;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Middle Aged;Periodontal Index;Periodontal Pocket;Treatment Outcome

Phototherapy promotes healing of cutaneous wounds in undernourished rats. BACKGROUND: Various studies have shown that phototherapy promotes the healing of cutaneous wounds. OBJECTIVE: To investigate the effect of phototherapy on healing of cutaneous wounds in nourished and undernourished rats. METHODS: Forty rats, 20 nourished plus 20 others rendered marasmus with undernourishment, were assigned to four equal groups: nourished sham, nourished Light Emitting Diode treated, undernourished sham and undernourished Light Emitting Diode treated. In the two

treated groups, two 8-mm punch wounds made on the dorsum of each rat were irradiated three times per week with 3 J/cm2 sq cm of combined 660 and 890 nm light; wounds in the other groups were not irradiated. Wounds were evaluated with digital photography and image analysis, either on day 7 or day 14, with biopsies obtained on day 14 for histological studies. RESULTS: Undernourishment retarded the mean healing rate of the undernourished sham wounds ($p < 0.01$), but not the undernourished Light emission diode treated wounds, which healed significantly faster ($p < 0.001$) and as fast as the two nourished groups. Histological analysis showed a smaller percentage of collagen in the undernourished sham group compared with the three other groups, thus confirming our photographic image analysis data. CONCLUSION: Phototherapy reverses the adverse healing effects of undernourishment. Similar beneficial effects may be achieved in patients with poor nutritional status. Serum Albumin;Collagen Animals;Biopsy;Collagen;Dose-Response Relationship, Radiation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nutritional Status;Rats, Wistar;Reproducibility of Results;Serum Albumin;Skin;Skin Ulcer;Time Factors;Treatment Outcome;Wound Healing

The effects of CO2 laser with or without nanohydroxyapatite paste in the occlusion of dentinal tubules. The aim of this study was to evaluate a new treatment modality for the occlusion of dentinal tubules (DTs) via the combination of 10.6 Âμm carbon dioxide (CO2) laser and nanoparticle hydroxyapatite paste (n-HAp). Forty-six sound human molars were used in the current experiment. Ten of the molars were used to assess the temperature elevation during lasing. Thirty were evaluated for dentinal permeability test, subdivided into 3 groups: the control group (C), laser only (L-), and laser plus n-HAp (L+). Six samples, two per group, were used for surface and cross section morphology, evaluated through scanning electron microscope (SEM). The temperature measurement results showed that the maximum temperature increase was 3.2 Â°C. Morphologically groups (L-) and (L+) presented narrower DTs, and almost a complete occlusion of the dentinal tubules for group (L+) was found. The Kruskal-Wallis nonparametric test for permeability test data showed statistical differences between the groups ($P < 0.05$). For intergroup comparison all groups were statistically different from each other, with group (L+) showing significant less dye penetration than the control group. We concluded that CO2 laser in moderate power density combined with n-HAp seems to be a good treatment modality for reducing the permeability of dentin. Durapatite Dentin;Dentin Permeability;Durapatite;Humans;Lasers, Gas;Low-Level Light Therapy;Molar;Nanoparticles

Novel strategies to fight Candida species infection. In recent years, there has been a significant increase in the incidence of human fungal infections. The increase in cases of infection caused by Candida species, and the consequent excessive use of antimicrobials, has favored the emergence of resistance to conventional antifungal agents over the past decades. Consequently, Candida infections morbidity and mortality are also increasing. Therefore, new approaches are needed to improve the outcome of patients suffering from Candida infections, because it seems unlikely that the established standard treatments will drastically lower the morbidity of mucocutaneous Candida infections and the high mortality associated with invasive candidiasis. This review aims to present the last advances in the traditional antifungal therapy, and present an overview of novel strategies that are being explored for the treatment of Candida infections, with a special focus on combined antifungal agents, antifungal therapies with alternative compounds (plant extracts and essential oils), adjuvant immunotherapy, photodynamic therapy and laser therapy. Candidiasis;Drug Therapy, Combination;Humans;Immunotherapy;Laser Therapy;Photochemotherapy

The low level laser therapy (LLLT) operating in 660Â nm reduce gene expression of inflammatory mediators in the experimental model of collagenase-induced rat tendinitis. Tendinopathy is a common disease with a variety of treatments and therapies. Laser therapy appears as an alternative treatment. Here, we investigate the effects of laser irradiation in an experimental model of tendinitis

induced by collagenase injection on rats' Achilles tendon, verifying its action in important inflammatory markers. Male Wistar rats were used and divided into five groups: control saline (C), non-treated tendinitis (NT) and tendinitis treated with sodium diclofenac (D) or laser (1Â J) and (3Â J). The tendinitis was induced by collagenase (100Â Î¼g/tendon) on the Achilles tendon, which was removed for further analyses. The gene expression for COX-2; TNF-Î±; IL-6; and IL-10 (RT-PCR) was measured. The laser irradiation (660Â nm, 100Â mW, 3Â J) used in the treatment of the tendinitis induced by collagenase in Achilles tendon in rats was effective in the reduction of important pro-inflammatory markers such as IL-6 and TNF-Î±, becoming a promising tool for the treatment of tendon diseases. Anti-Inflammatory Agents, Non-Steroidal;Interleukin-6;Tumor Necrosis Factor-alpha;Interleukin-10;Diclofenac;Cyclooxygenase 2;Ptgs2 protein, rat;Collagenases Achilles Tendon;Animals;Anti-Inflammatory Agents, Non-Steroidal;Collagenases;Cyclooxygenase 2;Diclofenac;Disease Models, Animal;Gene Expression;Interleukin-10;Interleukin-6;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tendinopathy;Tumor Necrosis Factor-alpha

Theranostic probe for simultaneous in vivo photoacoustic imaging and confined photothermolysis by pulsed laser at 1064 nm in 4T1 breast cancer model. Here, we report that polyethylene glycol (PEG)-coated copper(II) sulfide nanoparticles (PEG-CuS NPs) with their peak absorption tuned to 1064 nm could be used both as a contrast agent for photoacoustic tomographic imaging of mouse tumor vasculature and as a mediator for confined photothermolysis of tumor cells in an orthotopic syngeneic 4T1 breast tumor model. PEG-CuS NPs showed stronger photoacoustic signal than hollow gold nanospheres and single-wall carbon nanotubes at 1064 nm. MicroPET imaging of 4T1 tumor-bearing mice showed a gradual accumulation of the NPs in the tumor over time. About 6.5% of injected dose were taken up in each gram of tumor tissue at 24 h after intravenous injection of (64)Cu-labeled PEG-CuS NPs. For both photoacoustic imaging and therapeutic studies, nanosecond (ns)-pulsed laser was delivered with Q-switched Nd:YAG at a wavelength of 1064 nm. Unlike conventional photothermal ablation therapy mediated by continuous wave laser with which heat could spread to the surrounding normal tissue, interaction of CuS NPs with short pulsed laser deliver heat rapidly to the treatment volume keeping the thermal damage confined to the target tissues. Our data demonstrated that it is possible to use a single-compartment nanoplatform to achieve both photoacoustic tomography and highly selective tumor destruction at 1064 nm in small animals. Contrast Media;Sulfides;Copper Animals;Breast Neoplasms;Cell Line, Tumor;Contrast Media;Copper;Elasticity Imaging Techniques;Low-Level Light Therapy;Metal Nanoparticles;Mice;Mice, Inbred BALB C;Photoacoustic Techniques;Reproducibility of Results;Sensitivity and Specificity;Sulfides;Treatment Outcome

Light-emitting diode therapy in exercise-trained mice increases muscle performance, cytochrome c oxidase activity, ATP and cell proliferation. Light-emitting diode therapy (LEDT) applied over the leg, gluteus and lower-back muscles of mice using a LED cluster (630Â nm and 850Â nm, 80Â mW/cm(2) , 7.2Â J/cm(2)) increased muscle performance (repetitive climbing of a ladder carrying a water-filled tube attached to the tail), ATP and mitochondrial metabolism; oxidative stress and proliferative myocyte markers in mice subjected to acute and progressive strength training. Six bi-daily training sessions LEDT-After and LEDT-Before-After regimens more than doubled muscle performance and increased ATP more than tenfold. The effectiveness of LEDT on improving muscle performance and recovery suggest applicability for high performance sports and in training programs. Positioning of the mice and light-emitting diode therapy (LEDT) applied on mouse legs, gluteus and lower-back muscles without contact. Biomarkers;Adenosine Triphosphate;Glycogen;Catalase;Electron Transport Complex IV Adenosine Triphosphate;Animals;Biomarkers;Catalase;Cell Proliferation;Electron Transport Complex IV;Glycogen;Lipid Peroxidation;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Muscle

Strength;Muscles;Oxidative Stress;Physical Conditioning, Animal;Protein Carbonylation;Weight-Bearing
Effect of GaAlAs low-level laser therapy on the healing of human palate mucosa after connective tissue graft harvesting: randomized clinical trial. Among the available techniques to treat gingival recession, connective tissue graft (CTG) presents more foreseeability and better results in the long term. However, this technique causes morbidity and discomfort in the palatine region due to graft removal at that site. The aim of this clinical trial was to evaluate the influence of low-level laser therapy (LLLT) on the healing of the donor palatine area after CTG. Thirty-two patients presenting buccal gingival recession were selected and randomly assigned to receive LLLT irradiation (test group) or LLLT sham (control group) in the palatine area after connective graft removal. A diode laser (AsGaAl, 660Â nm) was applied to test the sites immediately after surgery and every other day for 7Â days. The evaluated parameters were wound remaining area (WRA), scar and tissue colorimetry (TC), tissue thickness (TT), and postoperative discomfort (D). These parameters were evaluated at baseline and 7, 14, 45, 60, and 90Â days after surgery. Two-way repeated measures ANOVA was used for analysis. The test group presented statistically significant smaller wounds at days 14 and 45. None of the patients presented a scar at the operated area, and colorimetry analysis revealed that there was no statistically significant difference between groups (pâ€‰>â€‰0.05). Patients reported mild to moderate discomfort, with low consumption of analgesic pills. We concluded that LLLT irradiation can accelerate wound healing on palatine mucosa after connective tissue removal for root coverage techniques (ClinicalTrial.org NCT02239042). Adult;Aged;Cicatrix;Colorimetry;Connective Tissue;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Palate;Postoperative Care;Wound Healing;Young Adult
Low-level laser therapy on bone repair of rat tibiae exposed to ionizing radiation. OBJECTIVE: The purpose of this study was to evaluate the effects of low-level laser therapy (LLLT) on the repair of rat tibiae exposed to ionizing radiation (IR). BACKGROUND DATA: IR causes structural changes that delay bone tissue repair. Properly dosed, LLLT improves the bone repair process. METHODS: Seventy-two healthy Wistar rats were distributed into the following groups: Group I, sham control; Group II, LLLT; Group III, IR; and Group IV, IR and LLLT. Groups III and IV received a single dose (30 Gy) of gamma radiation and underwent surgery 28 days later. A noncritical sized bone defect (diameter 2.5â€‰mm) was surgically created in all groups. Groups II and IV received three applications of postsurgical LLLT (GaAlAs, 808â€‰nm, 100â€‰mW, 0.028â€‰cm(2), 3.57 W/cm(2), 20â€‰sec, 2â€‰J,â‰…71.4â€‰J/cm(2)) on alternate days. Histomorphometry was assessed following digital image analysis. RESULTS: The samples were evaluated on days 7, 14, and 21 after surgery; the IR protocol resulted in a significant reduction ($p<0.018$) in bone formation in Group III compared with Group I. Significant increases ($p<0.006$) in newly formed bone were noted in Group IV compared with Group III. No significant differences were observed between Group I and Group IV. CONCLUSIONS: LLLT increased the newly formed bone area during the initial phase of the tibiae repair process in rats exposed to IR. Animals;Bone Regeneration;Lasers, Semiconductor;Low-Level Light Therapy;Male;Radiation Dosage;Radiation Injuries;Radiation, Ionizing;Rats;Rats, Wistar;Tibia
Treatment of keratosis pilaris with 810-nm diode laser: a randomized clinical trial. IMPORTANCE: Keratosis pilaris (KP) is a common skin disorder of follicular prominence and erythema that typically affects the proximal extremities, can be disfiguring, and is often resistant to treatment. Shorter-wavelength vascular lasers have been used to reduce the associated erythema but not the textural irregularity. OBJECTIVE: To determine whether the longer-wavelength 810-nm diode laser may be effective for treatment of KP, particularly the associated skin roughness/bumpiness and textural irregularity. DESIGN, SETTING, AND PARTICIPANTS: We performed a split-body, rater-blinded, parallel-group, balanced (1:1), placebo-controlled randomized clinical trial at a dermatology

outpatient practice of an urban academic medical center from March 1 to October 1, 2011. We included all patients diagnosed as having KP on both arms and Fitzpatrick skin types I through III. Of the 26 patients who underwent screening, 23 met our enrollment criteria. Of these, 18 patients completed the study, 3 were lost to or unavailable for follow-up, and 2 withdrew owing to inflammatory hyperpigmentation after the laser treatment. INTERVENTIONS: Patients were randomized to receive laser treatment on the right or left arm. Each patient received treatment with the 810-nm pulsed diode laser to the arm randomized to be the treatment site. Treatments were repeated twice, for a total of 3 treatment visits spaced 4 to 5 weeks apart. MAIN OUTCOMES AND MEASURES: The primary outcome measure was the difference in disease severity score, including redness and roughness/bumpiness, with each graded on a scale of 0 (least severe) to 3 (most severe), between the treated and control sites. Two blinded dermatologists rated the sites at 12 weeks after the initial visit. RESULTS: At follow-up, the median redness score reported by the 2 blinded raters for the treatment and control sides was 2.0 (interquartile range [IQR], 1-2; Pâ€‰=â€‰.11). The median roughness/bumpiness score was 1.0 (IQR, 1-2) for the treatment sides and 2.0 (IQR, 1-2) for the control sides, a difference of 1 (Pâ€‰=â€‰.004). The median overall score combining erythema and roughness/bumpiness was 3.0 (IQR, 2-4) for the treatment sides and 4.0 (IQR, 3-5) for the control sides, a difference of 1 (Pâ€‰=â€‰.005). CONCLUSIONS AND RELEVANCE: Three treatments with the 810-nm diode laser may induce significant improvements in skin texture and roughness/bumpiness in KP patients with Fitzpatrick skin types I through III, but baseline erythema is not improved. Complete treatment of erythema and texture in KP may require diode laser treatment combined with other laser or medical modalities that address redness. TRIAL REGISTRATION: clinicaltrials.gov Identifier: NCT01281644. Abnormalities, Multiple;Adolescent;Adult;Aged;Darier Disease;Equipment Design;Eyebrows;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Single-Blind Method;Treatment Outcome;Young Adult

Low intensity laser for reducing pain from anesthetic palatal injection. OBJECTIVE: The aim of this study was to evaluate the effectiveness of pain reduction techniques for palatal injection, namely, low intensity laser therapy (LILT), topical anesthesia, pressure, and light touch. BACKGROUND DATA: Previous evidence indicates that LILT may prevent pain from palatal injection. However, no clinical trials evaluating this clinical question have been performed. METHODS: A double-blind clinical trial was conducted using 80 healthy volunteers, 18-25 years of age. The subjects were randomly allocated into four groups with 10 females and 10 males each group. Pain reduction techniques were administered at an injection point that was 10â€‰mm from the margin of the palatal gingiva of the upper left first molar according to the following groups: (1) a 790â€‰nm 30â€‰mW continuous wave with a 0.13â€‰cm2 focal spot at an applied energy of 3.6â€‰J and fluence of 27.69â€‰J/cm2, (2) 20% benzocaine, (3) pressure, and (4) light touch as the control. Then, 2% lidocaine with 1:100,000 epinephrine was injected using a 27-gauge needle with a pressure and volume control intraligamentary syringe. All subjects recorded pain on a 10â€‰cm visual analog scale (VAS). RESULTS: The pain score in the LILT group was <50â€‰mm. The median of pain scores of the LILT, 20% benzocaine, pressure, and light touch groups were 11, 23, 27, and 31â€‰mm, respectively. There was no statistically significant difference in VAS among the groups, using Kruskal-Wallis test (p=0.385). CONCLUSIONS: No statistically significant differences in pain scores were noted among low intensity laser, 20% benzocaine, pressure, and light touch. Anesthetics, Local;Benzocaine Adolescent;Adult;Anesthetics, Local;Benzocaine;Double-Blind Method;Female;Healthy Volunteers;Humans;Injections;Low-Level Light Therapy;Male;Pain Management;Pain Measurement;Palate;Pressure;Touch;Treatment Outcome

Morphological aspects and Cox-2 expression after exposure to 780-nm laser therapy in injured skeletal muscle: an in vivo study. BACKGROUND: The effectiveness of low-level laser therapy in muscle regeneration is still not well known. OBJECTIVE: To investigate the effects of laser irradiation during muscle healing. METHOD: For this purpose, 63 rats were distributed to 3 groups: non-irradiated control group (CG); group irradiated at 10 J/cm(2) (G10); and group irradiated at 50 J/cm(2) (G50). Each group was divided into 3 different subgroups (n=7), and on days 7, 14 and 21 post-injury the rats were sacrificed. RESULTS: Seven days post-surgery, the CG showed destroyed zones and extensive myofibrillar degeneration. For both treated groups, the necrosis area was smaller compared to the CG. On day 14 post-injury, treated groups demonstrated better tissue organization, with newly formed muscle fibers compared to the CG. On the 21(st) day, the irradiated groups showed similar patterns of tissue repair, with improved muscle structure at the site of the injury, resembling uninjured muscle tissue organization. Regarding collagen deposition, the G10 showed an increase in collagen synthesis. In the last period evaluated, both treated groups showed statistically higher values in comparison with the CG. Furthermore, laser irradiation at 10 J/cm(2) produced a down-regulation of cyclooxygenase 2 (Cox-2) immunoexpression on day 7 post-injury. Moreover, Cox-2 immunoexpression was decreased in both treated groups on day 14. CONCLUSIONS: Laser therapy at both fluencies stimulated muscle repair through the formation of new muscle fiber, increase in collagen synthesis, and down-regulation of Cox-2 expression. Cyclooxygenase 2 Animals;Cyclooxygenase 2;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Regeneration;Wounds and Injuries

Low-level laser therapy for androgenic alopecia.

A new standard of Efficacy for Low Level Laser Therapy (LLLT) in Pain Attenuation in Japan (a secondary publication). The assessment of the efficacy of low level laser therapy (LLLT) for pain attenuation varies among institutions, all having their own method of assessment with no common standards. At the author's institution in the beginning, the patients were asked how they assessed their pain relief immediately after the treatment. They were to choose from excellent, good, fair, no change and poor. The overall efficacy rate was calculated by the numbers of patients scoring excellent and good, expressed as a percentage of the total number of patients. However, a large number of institutions have utilized the Visual Analogue Scale (VAS) or the Pain Relief Score (PRS) for the assessment of treatment; but even then, the evaluation could not be considered uniform. Therefore, the standardization of the efficacy rate was continuously discussed among the practitioners of LLLT, dating back to the 9(th) annual meeting of the Japan Laser Therapy Association (JaLTA) in 1997. It took four years (including the 1997 meeting) until finally an agreement was reached and a new standard of efficacy was presented at the 12(th) JaLTA meeting in 2000, based on the PRS. The new standard defined excellent as pain reduction in any treatment session from 10 to 0 or 1, good as reduction from 10 to 2âˆ¼5, fair as reduction from 10 to 6âˆ¼8, no change as a reduction from 10 to 9âˆ¼10 and poor was defined as exacerbation of pain from 10 to 11 or greater. Efficacy rate was calculated by the number of patients scoring excellent and good expressed as a percentage of the total number of patients. For the purpose of reference, the VAS was to be used for patients receiving the treatment for the first time.

Low level light therapy by LED of different wavelength induces angiogenesis and improves ischemic wound healing. BACKGROUND AND OBJECTIVE: Low-level light therapy (LLLT) has been revealed as a potential means to improve wound healing. So far, most studies are being performed with irradiation in the red to near-infrared spectra. Recently, we showed that blue light (470 nm) can significantly influence biological systems such as nitric oxide (NO) metabolism and is able to release NO from nitrosyl-hemoglobin or mitochondrial protein complexes. Therefore, the aim of this study was to evaluate and compare the therapeutic value of blue or red light emitting diodes (LEDs) on

wound healing in an ischemia disturbed rodent flap model. STUDY DESIGN/MATERIALS AND METHODS: An abdominal flap was rendered ischemic by ligation of one epigastric bundle and subjected to LED illumination with a wavelength of 470 nm (blue, n = 8) or 629 nm (red, n = 8) each at 50 mW/cm(2) and compared to a non-treated control group (n = 8). Illumination was performed for 10 minutes on five consecutive days. RESULTS: LED therapy with both wavelengths significantly increased angiogenesis in the sub-epidermal layer and intramuscularly (panniculus carnosus muscle) which was associated with significantly improved tissue perfusion 7 days after the ischemic insult. Accordingly, tissue necrosis was significantly reduced and shrinkage significantly less pronounced in the LED-treated groups of both wavelengths. CONCLUSIONS: LED treatment of ischemia challenged tissue improved early wound healing by enhancing angiogenesis irrespective of the wavelength thus delineating this noninvasive means as a potential, cost effective tool in complicated wounds. Abdomen;Animals;Disease Models, Animal;Ischemia;Ligation;Male;Neovascularization, Physiologic;Phototherapy;Rats;Rats, Sprague-Dawley;Surgical Flaps;Wound Healing

Low-level laser therapy associated with high intensity resistance training on cardiac autonomic control of heart rate and skeletal muscle remodeling in wistar rats. BACKGROUND AND OBJECTIVE: Phototherapy plus dynamic exercise can enhance physical performance and improve health. The aim of our study was to evaluate the effect of low-level laser therapy (LLLT) associated with high intensity resistance training (HIT) on cardiac autonomic and muscle metabolic responses in rats. STUDY DESIGN/MATERIALS AND METHODS: Forty Wistar rats were randomized into 4 groups: sedentary control (CG), HIT, LLLT and HIT + LLLT. HIT was performed 3 times/week for 8 weeks with loads attached to the tail of the animal. The load was gradually increased by 10% of body mass until reaching a maximal overload. For LLLT, irradiation parameters applied to the tibialis anterior (TA) muscle were as follows: infrared laser (780 nm), power of 15 mW for 10 seconds, leading to an irradiance of 37.5 mW/cm(2), energy of 0.15 J per point and fluency of 3.8 J/cm(2). Blood lactate (BL), matrix metalloproteinase gelatinase A (MMP(-2)) gene expression and heart rate variability (HRV) indices were performed. RESULTS: BL significantly increased after 8-weeks for HIT, LLLT and HIT + LLLT groups. However, peak lactate when normalized by maximal load was significantly reduced for both HIT and HIT + LLLT groups ($P<0.05$). MMP-2 in the active form was significantly increased after HIT, LLLT and HIT + LLLT compared tom the CG ($P<0.05$). There was a significant reduction in low frequency [LF (ms(2))] and increase in high frequency [HF (un)] and HF (ms(2))] for the HIT, LLLT and HITâ€‰+â€‰LLLT groups compared with the CG ($P < 0.05$). However, the LF/HF ratio was further reduced in the LLLT and HIT + LLLT groups compared to the CG and HIT group ($P < 0.05$). CONCLUSION: These results provide evidence for the positive benefits of LLLT and HIT with respect to enhanced muscle metabolic and cardiac autonomic function in Wistar rats. Lactic Acid;Matrix Metalloproteinase 2 Animals;Body Mass Index;Heart Rate;Lactic Acid;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Muscle Strength;Muscle, Skeletal;Rats;Rats, Wistar;Resistance Training

Connective tissue graft associated or not with low laser therapy to treat gingival recession: randomized clinical trial. BACKGROUND: To evaluate the treatment of gingival recession with a connective tissue graft (CTG) alone or in combination with low-level laser therapy (CTGÂ +Â L). METHODS: Forty patients presenting 40 Miller Class I and II gingival recessions were included. The defects were randomly assigned to receive either CTG (nÂ =Â 20) or CTGÂ +Â L (nÂ =Â 20). A diode laser (660Â nm) was applied to the testÂ sites immediately after surgery and every other day for 7Â days (eight applications). RESULTS: The mean percentage of root coverage was 91.9% for the test group and 89.48% for the control group after 6Â months (pÂ >Â 0.05). The test group presented more complete root coverage (nÂ =Â 13, 65%) than the control group (nÂ =Â 7, 35%) (pÂ =Â 0.04). Dentine sensitivity decreased significantly after 6Â months in both groups (pÂ <Â 0.001). The two groups

showed improvement in aesthetics at the end of treatment. CONCLUSIONS: Low-level laser therapy may increase the percentage of complete root coverage when associated with CTG. Adult;Bicuspid;Combined Modality Therapy;Connective Tissue;Cuspid;Dental Plaque Index;Dentin Sensitivity;Double-Blind Method;Esthetics, Dental;Female;Follow-Up Studies;Gingiva;Gingival Recession;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Tooth Root;Treatment Outcome

The safe delivery of fractional ablative carbon dioxide laser treatment for acne scars in Asian patients receiving oral isotretinoin. BACKGROUND: Because acne scarring is associated with substantially reduced quality of life, early initiation of effective treatment is desirable. In previous reports, isotretinoin treatment was associated with increased scarring after cosmetic procedures, such as laser treatment, dermabrasion, and chemical peeling. OBJECTIVE: To evaluate wound healing after ablative carbon dioxide (CO2) fractional resurfacing for acne scarring conducted during and/or within 1 to 3 months of oral isotretinoin treatment. MATERIALS AND METHODS: The records of 20 patients with facial acne scars were included in this retrospective study. All patients were receiving isotretinoin treatment or had completed it within the previous 1 to 3 months. All patients received full-face fractional ablative CO2 laser treatment. Follow-up was for at least 6 months to evaluate side effects. RESULTS: All patients showed normal reepithelialization and were satisfied with the results of the laser treatments. All adverse events were minor, and there were no hypertrophic scars or keloids. CONCLUSION: Ablative CO2 fractional laser treatment for acne scarring seems to be safe regardless of isotretinoin use (10-60 mg/d). The authors' findings contribute to the discussion of whether oral isotretinoin treatment impairs wound healing after ablative laser treatment. Dermatologic Agents;Carbon Dioxide;Isotretinoin Acne Vulgaris;Administration, Oral;Adolescent;Adult;Carbon Dioxide;Cicatrix;Dermatologic Agents;Female;Humans;Isotretinoin;Lasers, Gas;Low-Level Light Therapy;Male;Republic of Korea;Retrospective Studies;Treatment Outcome

Autologous proliferative therapies in recalcitrant lateral epicondylitis. OBJECTIVE: This study investigates the clinical effects of autologous conditioned plasma (ACP) injections and low-level laser application as therapy options for chronic lateral epicondylitis. DESIGN: A total of 52 patients with chronic lateral epicondylitis were evaluated in this study; 26 of these patients received three ACP injections and the control group, with 26 patients, received 12 laser applications, with standardized physical therapy for all patients afterward. Control examinations took place before treatment, after 2 and 6 mos, and in the 1 yr final follow-up. The control examination included the visual analog scale for pain and Disabilities of the Arm, Shoulder and Hand outcome measure scores. RESULTS: The analysis at final follow-up after 1 yr showed that both treatment options resulted in successful therapy outcome for the patients. In total, 63.5 % were successfully treated. Successful treatment was defined as more than 30% improvement in the visual analog score and more than 10.2 points in the Disabilities of the Arm, Shoulder and Hand score. Both groups showed a significant improvement in time response. CONCLUSIONS: This study demonstrates the beneficial effects of autologous proliferative therapies in the treatment of lateral epicondylitis. The data show that laser application and ACP therapy lead to a clinical improvement in epicondylopathia. Especially the new treatment with ACP can be highlighted as an alternative and as an easy-to-apply therapy option for clinical practice. Adult;Cell Proliferation;Chronic Disease;Confidence Intervals;Female;Follow-Up Studies;Germany;Humans;Injections, Subcutaneous;Low-Level Light Therapy;Male;Middle Aged;Multivariate Analysis;Pain Measurement;Platelet-Rich Plasma;Prospective Studies;Range of Motion, Articular;Recurrence;Reference Values;Risk Assessment;Tennis Elbow;Time Factors;Transplantation, Autologous;Treatment Outcome

Recurrent Labial Herpes Simplex in Pediatric Dentistry: Low-level Laser Therapy as a Treatment Option. Recurrent labial herpes simplex is a pathology of viral origin that is frequently observed in children. The signs and symptoms are uncomfortable and, in many cases, the efficacy of treatment is unproven. However, several studies have demonstrated good results from the use of low-level laser therapy (LLLT), primarily due to acceleration of the healing process and pain relief, which make it a promising resource for use with this pathology. This paper describes a clinical case of a 7-year-old patient affected by this pathology and the therapeutic resolution proposed. How to cite this article: Stona P, da Silva Viana E, dos Santos Pires L, Weber JBB, Kramer PF. Recurrent Labial Herpes Simplex in Pediatric Dentistry: Low-level Laser Therapy as a Treatment Option. Int J Clin Pediatr Dent 2014;7(2):140-143.

Alternative approach to the management of postoperative pain after pediatric surgical procedures. AIM: This paper reports two clinical cases in which the application of low-level laser therapy (LLLT) enhanced the postoperative symptoms after pediatric surgical procedures. BACKGROUND: The uses of novel technologies allow more comfort to the patients and ensure a rapid procedure, and LLLT application has shown a positive effect in the prevention of discomfort after invasive procedures. CASE DESCRIPTION: Low-level laser therapy protocol was applied after surgical removal of supernumerary tooth and frenectomy resulting in less swallow and pain with no need of medication intake. CONCLUSION: The laser application was well accepted by both children and parents and showed a clinical efficiency in the follow-up examinations beyond the satisfactory quality of wound healing. CLINICAL SIGNIFICANCE: The LLLT approach is an excellent adjuvant therapy resource for delivery an optimal postoperative after surgical procedures in children. How to cite this article: Paschoal M, Souza J, Santos-Pinto L, Pansani C. Alternative Approach to the Management of Postoperative Pain after Pediatric Surgical Procedures. Int J Clin Pediatr Dent 2014;7(2):125-129.

Effect of laser (Î» 660Â nm) and LED (Î» 630Â nm) photobiomodulation on formocresol-induced oral ulcers: a clinical and histological study on rodents. The aim of this study was to evaluate, clinically and histologically, the influence of laser and LED photobiomodulation in the healing of formocresol-induced oral mucosa ulcers of rats. We used 60 Wistar rats in which oral ulcers were induced on the gingiva of the lower incisors. Forty-eight hours after inducing the ulcers, the animals were divided into three groups: laser, LED, and untreated. Animals from the laser group received irradiation with GaAlAs, 660 nm, CW, 40 mW, Ï† 4 mm(2), 4.8 J/cm(2). Animals from the LED group received irradiation with InGaAlP, 630 nm, 150 mW, 4.8 J/cm(2), 0.8 cm spot. Forty-eight hours after oral ulcer induction, both irradiations were applied in a punctuate manner in the center of the ulcer at 48-h interval until the end of the experimental period. The animals were killed at 3, 5, 7, and 11 days after day 0. The results of the clinical evaluation showed that the laser and LED phototherapies were able to accelerate the healing of formocresol-induced oral ulcers, which occurred first in the laser group (ANOVA, pâ€‰<â€‰0.05). Histologically, there was a slight variation between LED and laser therapy; therefore, the laser group proved to be effective in accelerating wound healing, especially at 5 days, whereas the LED group was more effective at the end of the experimental period. It was concluded that laser and LED photobiomodulation were effective in accelerating the healing of formocresol-induced oral ulcers in both clinical and histological aspects. Formocresols;formocresol;Collagen Animals;Collagen;Formocresols;Low-Level Light Therapy;Male;Oral Ulcer;Rats, Wistar;Wound Healing

Effects of 915 nm GaAs diode laser on mitochondria of human dermal fibroblasts: analysis with confocal microscopy. Low-level laser therapy (LLLT) is widely used in tissue regeneration and pain therapy. Mitochondria are supposed to be one of the main cellular targets, due to the presence of cytochrome C oxidase as photo-acceptor. Laser stimulation could influence mitochondria metabolism affecting mainly transmembrane mitochondrial potential (Î”Ïˆm). The aim of our study is

to evaluate "in vitro" the early mitochondrial response after irradiation with a 915 GaAs laser. Since some evidences suggest that cellular response to LLLT can be differently modulated by the mode of irradiation, we would like to evaluate whether there are changes in the mitochondrial potential linked to the use of the laser treatments applied with continuous wave (CW) in respect to those applied with pulsed wave (PW). In this study, we analyzed effects of irradiation with a 915-nm GaAs diode laser on human dermal fibroblast. We compared effects of irradiation applied with either CW or PW at different fluences 45-15-5 J/cm(2) on Î”Ïˆm. Laser scanning microscopy (LSM) was used in living cells to detect ROS (reactive oxygen species) using calcein AM and real-time changes of and Î”Ïˆm following distribution of the potentiometric probe tetramethylrhodamine methyl ester (TMRM). At higher doses (45-15 J/cm(2)), fibroblasts showed a dose-dependent decrement of Î”Ïˆm in either the modalities employed, with higher amplitudes in CW-treated cells. This behavior is transient and not followed by any sign of toxicity, even if reactive oxygen species generation was observed. At 5 J/cm(2), CW irradiation determined a little decrease (5%) of the baseline level of Î”Ïˆm, while opposite behavior was shown when cells were irradiated with PW, with a 10% increment. Our results suggest that different responses observed at cellular level with low doses of irradiation, could be at the basis of efficacy of LLLT in clinical application, performed with PW rather than CW modalities. Reactive Oxygen Species Cell Shape;Cells, Cultured;Fibroblasts;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Microscopy, Confocal;Mitochondria;Oxidative Stress;Reactive Oxygen Species;Wound Healing

[Importance of modern treatment procedures for infected and colonized wounds in dermatology]. In the coming years increasing numbers of patients with chronic ulcers and tumor wounds are to be expected, both of which are typically multifaceted diseases requiring complex and increasingly long-term ambulatory therapy. Therefore, in recent years special medical emphasis has been placed on efficacious therapies with good tolerability and also suitability regarding feasibility for outpatient treatment. Some of these methods, such as cold plasma therapy, extracorporeal shock wave therapy (ESWT), water-filtered infrared therapy (wIRA), electrostimulation (ES) and low level laser therapy (LLLT) have a good chance of success when applied as an adjuvant method in the multimodal treatment concept for patients with recalcitrant wounds. All of these methods have at least indirect antimicrobial properties which can be advantageous in cases of microbial infiltration of wounds. As for all other methods for treating recalcitrant wounds, the promising application of the aforementioned methods requires great expertise in wound healing together with a broad and continuous interdisciplinary diagnostics and therapy (wound center). Dermatology;Electric Stimulation Therapy;High-Intensity Focused Ultrasound Ablation;Humans;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Skin;Skin Diseases, Bacterial;Wound Healing;Wound Infection

Systematic literature review: influence of low-level laser on orthodontic movement and pain control in humans. OBJECTIVE: The purpose of this study was to systematically review the literature to check the influence of low-level laser (LLL) on orthodontic movement and pain control in humans, and what dose ranges are effective for pain control and increased speed of orthodontic movement. METHODS: Computerized and manual searches were conducted up to January 4, 2014 for clinical studies that addressed these objectives. The selection criteria required that these studies (1) be prospective controlled clinical trials (CCT) and randomized clinical trials (RCT); (2) only use LLL in both infrared and visible red wavelengths, a laser with emission of constant wave; (3) have all main parameters of dose described, or at least conditions for calculation of the energy, in Joules; and (4) be published in Portuguese, English, or Spanish and be meta-analyses. RESULTS: Seven studies met the eligibility criteria for orthodontic movement/LLL and 11 studies met the inclusion criteria for analgesia/LLL, totaling 18 prospective randomized studies that were selected for detailed analysis.

The most common and effective energy input was the interval of 0.2-2.2â€‰J per point/2-8â€‰J per tooth at a frequency of application 1-5 days per month to accelerate the orthodontic movement. For pain control, the recommended energy per points varied from 1-2â€‰J when only one tooth was irradiated to 0.5-2.25â€‰J per point when all teeth in the dental arch were irradiated. CONCLUSIONS: LLL seems to have a demonstrated efficacy, but further studies are warranted to determine the best protocols with regard to energy and frequency. Humans;Low-Level Light Therapy;Pain Management;Tooth Movement Techniques

Dental movement acceleration: Literature review by an alternative scientific evidence method. The aim of this study was to analyze the majority of publications using effective methods to speed up orthodontic treatment and determine which publications carry high evidence-based value. The literature published in Pubmed from 1984 to 2013 was reviewed, in addition to well-known reports that were not classified under this database. To facilitate evidence-based decision making, guidelines such as the Consolidation Standards of Reporting Trials, Preferred Reporting items for systematic Reviews and Meta-analyses, and Transparent Reporting of Evaluations with Non-randomized Designs check list were used. The studies were initially divided into three groups: local application of cell mediators, physical stimuli, and techniques that took advantage of the regional acceleration phenomena. The articles were classified according to their level of evidence using an alternative method for orthodontic scientific article classification. 1a: Systematic Reviews (SR) of randomized clinical trials (RCTs), 1b: Individual RCT, 2a: SR of cohort studies, 2b: Individual cohort study, controlled clinical trials and low quality RCT, 3a: SR of case-control studies, 3b: Individual case-control study, low quality cohort study and short time following split mouth designs. 4: Case-series, low quality case-control study and non-systematic review, and 5: Expert opinion. The highest level of evidence for each group was: (1) local application of cell mediators: the highest level of evidence corresponds to a 3B level in Prostaglandins and Vitamin D; (2) physical stimuli: vibratory forces and low level laser irradiation have evidence level 2b, Electrical current is classified as 3b evidence-based level, Pulsed Electromagnetic Field is placed on the 4(th) level on the evidence scale; and (3) regional acceleration phenomena related techniques: for corticotomy the majority of the reports belong to level 4. Piezocision, dentoalveolar distraction, alveocentesis, monocortical tooth dislocation and ligament distraction technique, only had case series or single report cases (4(th) level of evidence). Surgery first and periodontal distraction have 1 study at level 2b and corticision one report at level 5. Multiple orthodontic acceleration reports on humans were identified by an alternative evidence level scale, which is a simple and accurate way of determining which techniques are better and have a higher rate of effectiveness. The highest level of evidence for a specific procedure to accelerate orthodontic dental movement up to October 2013 was surgery first followed by low level laser application, corticotomy and periodontal distraction located on level 2, recommendation grade b from this proposed scientific evidence-based scale.

A retrospective chart review of the clinical efficacy of Nd:YAG 1064-nm laser for toenail onychomycosis. Cosmetic improvement in nail appearance is a great concern to patients with onychomycosis. Although oral and topical treatments for onychomycosis can potentially eradicate the infection, unsightly nails may remain despite negative mycology. Laser-based devices have been approved for the temporary clearance of nails with onychomycosis, thus providing a means of improving the aesthetic appearance of the nails. A retrospective chart review of patients treated with a Nd:YAG 1064-nm laser and debridement for onychomycosis, and terbinafine 1% cream for associated tinea pedis, between July 2012 and February 2014 was performed to ascertain the proportion of patients who achieved clinical outcomes. A temporary improvement in the appearance of the target nail was observed in 78% of patients and the affected area of the nail plate was reduced by at least 50% from baseline in 46% of patients. It appears that patients whose great toenails are

potentially infected with non-dermatophyte molds may particularly benefit from laser therapy. Higher clinical outcome rates were observed with administration of four or more treatments, but additional observations and/or studies are needed to optimize the regimen of laser therapy to improve the cosmetic appearance of infected nails. Naphthalenes;Terbinafine Administration, Topical;Adult;Debridement;Female;Foot Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Naphthalenes;Onychomycosis;Retrospective Studies;Terbinafine;Treatment Outcome

Low-level laser therapy during postnatal development modulates degeneration and enhances regeneration processes in the hindlimb muscles of dystrophic mice. OBJECTIVE: The aim of the present study was to determine whether low-level laser therapy (LLLT) at early stages postpartum could affect regeneration and degenerative processes in skeletal muscles of the dystrophic mdx mouse. BACKGROUND DATA: LLLT has been found to modulate various biological processes. It was previously shown that LLLT can markedly promote the process of skeletal muscle regeneration and angiogenesis, as well as reduce apoptosis in skeletal muscle fibers in culture. METHODS AND RESULTS: Eight newborn mdx mice were used. Ga-Al-As diode laser (810â€‰nm) was applied at a power density of10 mW/cm(2) to the surface (area of 0.0255â€‰cm(2)) of hindlimb muscle for 120â€‰sec (fluence of 1.2 J/cm(2)) once a week for 4 consecutive weeks, commencing 1 week post-birth. The contralateral leg served as an untreated (sham) control. Mice were euthanized 2 days following the last laser application, and the muscles were processed for histology. Histological sections were scored for degenerative muscle foci. Statistical analysis revealed a score of 2.91Â±0.17 in the control, untreated group, which was significantly higher ($p<0.001$) than the value in the laser-treated group (1.56Â±0.49), indicating less degenerative foci in the laser-treated muscles. Histology also indicated regeneration (numerous myotubes) in the laser-treated mice, and no regeneration in the non-laser-treated mice. CONCLUSIONS: The results indicate that LLLT applied to mdx mice during postnatal development may have a significant beneficial effect in the induction of regenerative capacity and reduction of degenerative muscle foci in these mice, with possible direct clinical relevance. Animals;Apoptosis;Hindlimb;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred mdx;Muscle, Skeletal;Neovascularization, Physiologic;Regeneration

[Optimization of surgical treatment of patients with restrained herhia of the abdominal wall]. The aim of work was to improve the results of treatment of patients with strangulated ventral hernias by prostheses of the abdominal wall using mesh implants and laser therapy. A detailed analysis and evaluation of the comparative of traditional methods and prosthetic plastics with infringement inguinal, umbilical, femoral and postoperative ventral hernias was performed on huge clinical material. The studies confirm that the integrated approach in treating patients with this pathology helps to improve the results of surgical treatment, reduction of postoperative complications, time of rehabilitation of patients and recurrence of herniation in comparison with traditional ways of hernioplasty. Abdominal Wall;Adult;Combined Modality Therapy;Female;Hernia, Ventral;Herniorrhaphy;Humans;Intestinal Obstruction;Intraoperative Care;Low-Level Light Therapy;Male;Middle Aged;Postoperative Care;Postoperative Complications;Retrospective Studies;Secondary Prevention;Surgical Mesh;Treatment Outcome

New treatment alternatives in the ulnar neuropathy at the elbow: ultrasound and low-level laser therapy. Ulnar nerve entrapment at the elbow (UNE) is the second most common entrapment neuropathy of the arm. Conservative treatment is the treatment of choice in mild to moderate cases. Elbow splints and avoiding flexion of the involved elbow constitute majority of the conservative treatment; indeed, there is no other non-invasive treatment modality. The aim of this study was to investigate the efficacy of ultrasound (US) and low-level laser therapy (LLLT) in the treatment of UNE to provide an alternative conservative treatment method. A randomized single-blind study was

carried out in 32 patients diagnosed with UNE. Short-segment conduction study (SSCS) was performed for the localization of the entrapment site. Patients were randomized into US treatment (frequency of 1 MHz, intensity of 1.5 W/cm(2), continuous mode) and LLLT (0.8 J/cm(2) with 905 nm wavelength), both applied five times a week for 2 weeks. Assessments were performed at baseline, at the end of the treatment, and at the first and third months by visual analog scale, hand grip strength, semmes weinstein monofilament test, latency change at SSCS, and patient satisfaction scale. Both treatment groups had significant improvements on clinical and electrophysiological parameters ($p < 0.05$) at first month with no statistically significant difference between them. Improvements in all parameters were sustained at the third month for the US group, while only changes in grip strength and latency were significant for the LLLT group at third month. The present study demonstrated that both US and LLLT provided improvements in clinical and electrophysiological parameters and have a satisfying short-term effectiveness in the treatment of UNE. Adult;Cubital Tunnel Syndrome;Evoked Potentials, Motor;Female;Follow-Up Studies;Hand Strength;Humans;Low-Level Light Therapy;Male;Middle Aged;Neural Conduction;Patient Satisfaction;Single-Blind Method;Ultrasonography;Visual Analog Scale

[The application of chromo- and laserotherapy for the treatment of the patients presenting with chronic obstructive pulmonary disease and concomitant arterial hypertension]. This article gives evidence of the effectiveness of chromo- and laser therapy (using infrared and green wavelenth radiation) in combination with basal pharmacotherapy in the patients presenting with combined pathology. The analysis of the data obtained indicates that the proposed approach makes it possible to accelerate normalization of the clinical characteristics, reduce arterial pressure, improve the parameters of external respiration, and increase the duration of remission periods. Adult;Aged;Color Therapy;Female;Humans;Hypertension;Low-Level Light Therapy;Male;Middle Aged;Pulmonary Disease, Chronic Obstructive;Remission Induction

Randomized split-face controlled study to evaluate 1550-nm fractionated erbium glass laser for treatment of acne vulgaris--an image analysis evaluation. BACKGROUND: Novel and promising results in acne treatment with infrared lasers have been reported. The 1,550-nm erbium glass laser is one of the infrared lasers that may be useful in the treatment of acne. OBJECTIVE: The aim of this study was to evaluate the efficacy of an erbium glass laser in treatment of active acne and to study the effect of this type of laser on sebaceous glands. PATIENTS AND METHODS: Twenty-four patients with active acne lesions were treated using 1,550-nm (30-40 mJ) fractional erbium glass laser. Every patient received 4 sessions with a 2-week interval. Follow-up was done every 3 months for 1 year. The image analyzer computer system was used to measure the sebaceous gland size. RESULTS: A significant reduction ($p < .0001$) in the mean count of lesions was observed after treatment and in the follow-up period. A significant reduction in the size of sebaceous glands was also evident after laser treatment. CONCLUSION: Treatment of active acne with the 1,550-nm erbium glass laser is effective. Papules, pustules, and nodules all respond well to therapy. The sebaceous gland size decreased significantly, which accounts for the long remission period. Erbium Acne Vulgaris;Adolescent;Adult;Erbium;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Sebaceous Glands

Phototherapy in ELBW newborns: does it work? Is it safe? The evidence from randomized clinical trials. Phototherapy is assumed to be both effective and safe for extremely low-birth-weight infants. Our objective was to critically assess the relevant evidence from randomized trials. In the decades-old Collaborative Phototherapy Trial, phototherapy reduced serum bilirubin but not neurodevelopmental impairments. In the recent and larger Neonatal Network Trial, aggressive phototherapy compared to conservative phototherapy reduced both peak serum bilirubin (7.0 vs. 9.8mg/dL) and profound impairment at 18-22 months adjusted age (relative risk = 0.68). However,

both trials suggested that phototherapy increased deaths among the smallest infants. Conservative Bayesian analyses of ventilator-treated infants under 751g birth weight in the Network trial identified a 99% probability of increased deaths and 99% probability of reduced profound impairment with aggressive phototherapy. Potential strategies to optimize the risk/benefit ratio in achieving low serum bilirubin levels, e.g., use of lowered irradiance levels, light-emitting diode phototherapy units, cycled phototherapy, and/or porphyrin compounds, deserve rigorous evaluation. Bilirubin Bayes Theorem;Bilirubin;Birth Weight;Developmental Disabilities;Follow-Up Studies;Gestational Age;Humans;Hyperbilirubinemia, Neonatal;Infant;Infant Mortality;Infant, Extremely Low Birth Weight;Infant, Newborn;Infant, Premature;Infant, Premature, Diseases;Nervous System;Nervous System Diseases;Phototherapy;Randomized Controlled Trials as Topic;Risk Assessment;Treatment Outcome

[Contemporary approach to diagnosis and treatment of impacted teeth]. BACKGROUND: Goal of the research was to study occurrence frequency of impacted teeth, to develop rational methods of diagnostics and treatment of denotalveolar and facial anomalies caused by impacted teeth. PATIENTS AND METHODS: From 1989 for 2013 period of time 7172 patients with dentoalveolar anomalies, referred to our clinic for the orthodontic help were surveyed. RESULTS: At 899 (12.53 +/- 0.39%) patients it is revealed 1405 impacted teeth, from them on the maxilla--623, on mandible--752 teeth. The most widespread impacted teeth on the maxilla were canines, on the mandible--the second premolars and the third molars. Treatment of impacted teeth by stimulation of their eruption by low-frequency ultrasound with a frequency of fluctuations of 26.5 kHz, intensity of 1 W/cm, with an amplitude of 40-60 microns and wave of 0.012 m long, daily or within 1 days, with period of 3-10 seconds with the course of treatment averaging 1-5 procedures, until a tooth eruption is carried out. CONCLUSION: The way of stimulation developed by us for late erupted impacted permanent teeth on the basis of application physiologic for an organism low-frequency ultrasound promotes increase of efficiency and reduction of treatment terms of dentoalveolar and facial anomalies. The received positive results allow to recommend this method for adoption in orthodontic practice. Adolescent;Azerbaijan;Child;Comparative Effectiveness Research;Female;Humans;Jaw;Low-Level Light Therapy;Male;Physical Stimulation;Prevalence;Radiography, Panoramic;Tooth, Impacted;Treatment Outcome

Blue or red: which intravascular laser light has more effects in diabetic patients? The effects of intravascular laser irradiation of blood (ILIB), with 405 and 632.8Â nm on serum blood sugar (BS) level, were comparatively studied. Twenty-four diabetic type 2 patients received 14 sessions of ILIB with blue and red lights. BS was measured before and after therapy. Serum BS decreased highly significant after ILIB with both red and blue lights (pâ€‰<â€‰0.0001), but we did not find significant difference between red and blue lights. The ILIB effect would be of benefit in the clinical treatment of diabetic type 2 patients, irrespective of lasers (blue or red lights) that are used. Blood Glucose Aged;Blood Glucose;Diabetes Mellitus, Type 2;Female;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged

Effects of intravascular low-level laser therapy during coronary intervention on selected growth factors levels. OBJECTIVE: The objective of this study was to evaluate the effect of intravascular low-level laser therapy (LLLT) on selected growth factor levels in subjects undergoing percutaneous coronary interventions (PCI). BACKGROUND DATA: Restenosis remains the main problem with the long-term efficacy of PCI, and growth factors are postulated to play a crucial role in the restenosis cascade. MATERIALS AND METHODS: In a randomized prospective study, an 808â€‰nm LLLT (100â€‰mW/cm2, continuous wave laser, 9â€‰J/cm2, illuminated area 1.6-2.5â€‰cm2) was delivered intracoronarily to patients during PCI. Fifty-two patients underwent irradiation with laser light, and 49 constituted the control group. In all individuals, serum levels of insulin-like growth

factor-1 (IGF-1), vascular endothelial growth factor (VEGF), transforming growth factor-Î²1 (TGF-Î²1), and fibroblast growth factor-2 (FGF-2) were measured before angioplasty, then 6 and 12â€‰h and 1 month after the procedure. In all patients, a control angiography was performed 6 months later. RESULTS: There were no significant differences in IGF-1 and VEGF levels between the groups. While evaluating FGF-2, we observed its significantly lower levels in the irradiated patients during each examination. There was a significant increase in TGF-Î²1 level in control group after 12â€‰h of observation. In the irradiated individuals, control angiography revealed smaller late lumen loss and smaller late lumen loss index as compared with the control group. The restenosis rate was 15.0% in the treated group, and 32.4% in the control group, respectively. CONCLUSIONS: LLLT decreases levels of TGF-Î²1 and FGF-2 in patients undergoing coronary intervention, which may explain smaller neointima formation. Biomarkers;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2;Insulin-Like Growth Factor I Biomarkers;Coronary Angiography;Coronary Disease;Female;Fibroblast Growth Factor 2;Humans;Insulin-Like Growth Factor I;Low-Level Light Therapy;Male;Middle Aged;Percutaneous Coronary Intervention;Prospective Studies;Transforming Growth Factor beta1;Treatment Outcome;Vascular Endothelial Growth Factor A

Effect of low-level laser therapy on radiotherapy-induced hyposalivation and xerostomia: a pilot study. OBJECTIVE: The present pilot study aimed to assess the effect of low-level laser therapy (LLLT) on hyposalivation and xerostomia as a consequence of head and neck radiotherapy. BACKGROUND DATA: The benefits of LLLT in salivary flow have been shown; however, there are no studies investigating its effects on patients who have already undergone radiotherapy and present hyposalivation and xerostomia as a sequela. METHODS: Twenty-three patients with a history of head and neck malignancy, who were treated by fractioned teletherapy (dosimetry ranging from 45 to 70â€‰Gy) in the cervicofacial region were selected. They all presented with xerostomia and severe hyposalivation. Patients were randomly distributed into a laser group (n=12) and a control group (n=11). A GaAlAs laser (830â€‰nm, 100â€‰mW, illuminated area 0.028â€‰cm2, 3.57â€‰W/cm2, 20â€‰sec, 2.0â€‰J, 71â€‰J/cm2) was used punctually in the major salivary glands, twice a week for 6 weeks, with a 12 session total. Stimulated and unstimulated salivary flow rate (SFR) were assessed, as well as the xerostomia and quality of life related to oral health (QLROH). RESULTS: The analysis did not show any significant difference between the groups with regards to the SFR and xerostomia, and the QLROH. However, at the end of the treatment, the xerostomia and the QLROH showed significant improvement in both groups compared with assessments performed at baseline, highlighting the importance of advice given to the irradiated patients, and their follow-up. CONCLUSIONS: With the parameters used, LLLT was not able to increase SFR or decrease xerostomia. The results may be associated with the late effects of radiotherapy on glandular structure, such as fibrosis and acinar atrophy. Adult;Aged;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Radiation Injuries;Salivary Glands;Salivation;Treatment Outcome;Xerostomia

Musculoskeletal Atrophy in an Experimental Model of Knee Osteoarthritis: The Effects of Exercise Training and Low-Level Laser Therapy. OBJECTIVE: The aim of this study was to evaluate the effects of an exercise training protocol and low-level laser therapy (and the association of both treatments) on musculoskeletal atrophy using an experimental model of knee osteoarthritis (OA). DESIGN: Fifty male Wistar rats were randomly divided into five groups: control group, knee OA control group, OA plus exercise training group, OA plus low-level laser therapy group, and OA plus exercise training associated with low-level laser therapy group. The exercise training and the laser irradiation started 4 wks after the surgery, 3 days per week for 8 wks. The exercise was performed at a speed of 16 m/min, 3 days per week, 50 mins per day, for 8 wks. Laser irradiation was applied at two points of the left knee joint (medial and lateral), for 24 sessions. RESULTS: The results showed

that both trained groups (irradiated or not) presented a significant increase in the muscle cross-sectional area and a decrease in muscle fiber density compared with the knee OA control group. Moreover, both trained and laser-irradiated groups demonstrated decreased muscle-specific ring-finger protein 1 and atrogin-1 immunoexpression. CONCLUSIONS: These results suggest that exercise training and low-level laser therapy were effective in preventing musculoskeletal alterations related to atrophy caused by the degenerative process induced by knee OA. Muscle Proteins;Fbxo32 protein, mouse;Polycomb Repressive Complex 1;Ring1 protein, rat;SKP Cullin F-Box Protein Ligases;Ubiquitin-Protein Ligases Animals;Cell Nucleus;Combined Modality Therapy;Immunohistochemistry;Low-Level Light Therapy;Male;Microscopy;Models, Animal;Muscle Fibers, Skeletal;Muscle Proteins;Muscle, Skeletal;Muscular Atrophy;Osteoarthritis, Knee;Physical Conditioning, Animal;Polycomb Repressive Complex 1;Random Allocation;Rats, Wistar;SKP Cullin F-Box Protein Ligases;Ubiquitin-Protein Ligases

Scleroderma and evidence based non-pharmaceutical treatment modalities for digital ulcers: a systematic review. OBJECTIVE: Digital ulcers are difficult to heal, increasing the chance of infection, gangrene, amputation and limited functional use of hands. They are a complication in scleroderma or systematic sclerosis (SSc) and occur in approximately 50% of patients. This is a systematic review of the evidence supporting the use of non-pharmaceutical therapeutic modalities and their effectiveness to facilitate the healing of chronic digital ulcers in patients with scleroderma. METHOD: A comprehensive review of computerised databases from 2000-2013: PubMed/MEDLINE, CINAHL, Pedro, OT Seeker, OT Search, OVID, and Proquest as well as manual review of other resources was completed using the following search terms scleroderma or systemic sclerosis and/or digital ulcers, specific modalities (low level laser therapy, electrical stimulation, intermittent compression, ultrasound, vitamin E, myofascial release, wound dressings, iontophoresis, negative pressure therapy, and exercise), chronic wounds, and wound care. English language studies, from 2000 to January 2013, which used therapeutic modalities to facilitate healing of digital ulcers and use healing of the digital ulcer as an outcome measure were reviewed. RESULTS: Of the 403 identified articles, only 11 studies addressed non-pharmaceutical treatment modalities to facilitate healing for digital ulcers. Exercise had no direct effect on healing ulcers. The following studies were positive but have limitations in design and sample size:: hyperbaric oxygen therapy (n=2), negative pressure therapy (n=1), intermittent compression (n=27) and acoustic pressure wound healing (n=1). Vitamin E gel showed a significant difference compared to a control group (n=27). Iontophoresis studies have shown that the modality increases blood flow but the results in five different studies are mixed and the application and intensity were inconsistent. CONCLUSION: No one modality was proven to be the most effective. Larger efficacy studies on treating digital ulcers are needed in order to develop appropriate care guidelines to improve outcomes, promote function and lower health-care costs. Compression Bandages;Evidence-Based Medicine;Finger Injuries;Humans;Hyperbaric Oxygenation;Negative-Pressure Wound Therapy;Scleroderma, Systemic;Ulcer;Wound Healing

Transcranial low-level laser therapy enhances learning, memory, and neuroprogenitor cells after traumatic brain injury in mice. The use of transcranial low-level laser (light) therapy (tLLLT) to treat stroke and traumatic brain injury (TBI) is attracting increasing attention. We previously showed that LLLT using an 810-nm laser 4 h after controlled cortical impact (CCI)-TBI in mice could significantly improve the neurological severity score, decrease lesion volume, and reduce Fluoro-Jade staining for degenerating neurons. We obtained some evidence for neurogenesis in the region of the lesion. We now tested the hypothesis that tLLLT can improve performance on the Morris water maze (MWM, learning, and memory) and increase neurogenesis in the hippocampus and subventricular zone (SVZ) after CCI-TBI in mice. One and (to a greater extent) three daily laser treatments commencing 4-h post-TBI improved neurological performance as measured by wire grip and motion

test especially at 3 and 4 weeks post-TBI. Improvements in visible and hidden platform latency and probe tests in MWM were seen at 4 weeks. Caspase-3 expression was lower in the lesion region at 4 days post-TBI. Double-stained BrdU-NeuN (neuroprogenitor cells) was increased in the dentate gyrus and SVZ. Increases in double-cortin (DCX) and TUJ-1 were also seen. Our study results suggest that tLLLT may improve TBI both by reducing cell death in the lesion and by stimulating neurogenesis.
DNA-Binding Proteins;Dcx protein, mouse;Doublecortin Protein;Fluoresceins;Nerve Tissue Proteins;NeuN protein, mouse;Nuclear Proteins;Tubulin;fluoro jade;Casp3 protein, mouse;Caspase 3 Animals;Behavior, Animal;Brain Injuries;Caspase 3;DNA-Binding Proteins;Doublecortin Protein;Fluoresceins;Hippocampus;Low-Level Light Therapy;Male;Maze Learning;Memory;Mice;Mice, Inbred BALB C;Microscopy, Fluorescence;Nerve Tissue Proteins;Neurogenesis;Neurons;Nuclear Proteins;Tubulin

Effects of laser vs ultrasound on bone healing after distraction osteogenesis: A histomorphometric analysis. OBJECTIVE: To assess the effects of low-level laser irradiation vs ultrasound irradiation on bone healing after distraction osteogenesis. MATERIALS AND METHODS: Distraction osteogenesis was performed with rapid maxillary expansion devices (Hyrax-Morelli, Sorocaba, SÃ£o Paulo Brazil) in 24 rabbits (Oryctolagus cuniculus). After a 2-day latency period, the distraction devices were activated for 10 days at a rate of 1 mm/d. Four groups of six animals were treated as follows: (1) control, (2) laser irradiation on the right side, (3) ultrasound irradiation on the right side, and (4) laser irradiation on the right side and ultrasound on the left side. Histomorphometric analysis was used to assess the bone healing area. Analysis of variance was used to perform the statistical analyses. RESULTS: The influence of low-intensity laser associated with ultrasound irradiation on bone healing was statistically significant. The analyses showed the greatest amount of bone healing in the jaws of animals in group 4, which received treatment with both ultrasound and laser. CONCLUSION: This study concluded that bone healing is accelerated with the application of laser irradiation. The greatest effects were observed with combined ultrasound and laser treatment.
Animals;Bone Marrow;Bone Matrix;Bone Regeneration;Cancellous Bone;Image Processing, Computer-Assisted;Low-Level Light Therapy;Male;Maxilla;Microscopy;Osteoblasts;Osteocytes;Osteogenesis;Osteogenesis, Distraction;Palatal Expansion Technique;Rabbits;Time Factors;Ultrasonic Therapy;Wound Healing

The influence of low-level laser on orthodontic relapse in rats. SUMMARY OBJECTIVES: This study evaluated the effect of low-level laser therapy (LLLT) on the tendency of rat molars to relapse following orthodontic tooth movement (OTM). MATERIAL AND METHODS: Maxillary rat molars were moved mesially for 10 days. Animals were randomly assigned to group I (non-irradiated) or II (irradiation with LLLT). Appliances were removed, and the molars allowed to relapse for 1, 3, 5, 7, 14, or 21 days; rats in group II received LLLT according to a protocol. Bone density of periapical alveolar bone was measured using radiographs and Digora software. Dental supporting structures were examined histologically with haematoxylin and eosin and tartrate-resistant acid phosphatase. RESULTS: In both groups, first molar relapse was rapid 1 day after the end of active treatment; by 21 days percentage relapse was measured as 86.11 per cent in group I, and 72.22 per cent in group II. Osteoclast number was highest at the end of active OTM, and thereafter successively decreased during the relapse phase in both groups. Decrease in number, and redistribution of osteoclasts occurred more rapidly in the non-irradiated than the LLLT group. Whilst molar relapse was generally less and osteoclast numbers generally higher in group II compared to group I, the differences were not significant. There was no significant difference in bone density between the two groups. CONCLUSIONS: These results indicate that LLLT may reduce the relapse tendency, possibly due in part to bone formation in previous tension areas, and to redistribution of osteoclasts following removal of orthodontic force. The role of LLLT in the prevention of orthodontic relapse requires further study.

Isoenzymes;Acid Phosphatase;Tartrate-Resistant Acid Phosphatase Acid Phosphatase;Animals;Bone Density;Isoenzymes;Low-Level Light Therapy;Male;Molar;Osteoclasts;Osteogenesis;Rats, Wistar;Recurrence;Tartrate-Resistant Acid Phosphatase;Tooth Movement Techniques

Low-level laser therapy improves peri-implant bone formation: resonance frequency, electron microscopy, and stereology findings in a rabbit model. Previous studies have reported positive effects of low-level laser therapy (LLLT) on bone healing. This study evaluated the effects of LLLT on peri-implant healing in vivo. Thirty-two rabbits had their mandibular left incisors removed, followed by immediate insertion of a dental implant into the fresh socket. Animals were assigned randomly to four groups: control (non-irradiated) or LLLT at three different doses per session: 5J/cm(2), 10J/cm(2), and 20J/cm(2). A GaAlAs laser (830nm, 50mW) was applied every 48h for 13 days, starting immediately after surgery. The implant stability quotient (ISQ) was measured using resonance frequency analysis upon implant insertion and immediately after death, 30 days after the last application. Tissues were prepared for scanning electron microscopy (SEM) and stereology. Variables measured were bone-implant contact (BIC) and bone neoformation within implant threads at three different sites. The results showed better ISQ for the 20J/cm(2) group (P=0.003). BIC values were significantly higher (P<0.05) in the 20J/cm(2) group, on both SEM and stereology. Bone area values were better in the 10J/cm(2) (P=0.036) and 20J/cm(2) (P=0.016) groups compared to the control group. Under these conditions, LLLT enhanced peri-implant bone repair, improving stability, BIC, and bone neoformation. The findings support and suggest parameters for the design of clinical trials using LLLT after implant placement. Dental Implants Animals;Dental Implantation, Endosseous;Dental Implants;Low-Level Light Therapy;Male;Mandible;Microscopy, Electron, Scanning;Osteogenesis;Rabbits;Tooth Socket;Wound Healing

Different doses of low-level laser irradiation modulate the in vitro response of osteoblast-like cells. Because osteoblasts play a key role in bone remodeling and the influence of low-level laser therapy on this process is not clear, Saos-2 human osteoblast-like cells were irradiated by a gallium-aluminum-arsenide diode laser (915 nm) for 10, 48, 96, 193, and 482 s using doses 1, 5, 10, 20, and 50 J/cm2, respectively. A control group was not irradiated. Morphology, viability, and cytotoxicity analyses were carried out after 1 hr, 1 day, and 3 days. Deoxyribose nucleic acid (DNA) content and release of vascular endothelial growth factor (VEGF), receptor activator of nuclear factor kappa B ligand (RANKL), and osteoprotegerin (OPG) were evaluated. Viability was modulated by laser irradiation in a dose-dependent manner, with 10 J/cm2 inducing a biostimulatory response and 20 to 50 J/cm2 determining a bioinhibitory and cytotoxic effect. Accordingly, DNA content was generally increased for the 10 J/cm2 dose and decreased for the 50 J/cm2 dose. A rapid and transitory trend toward increased RANKL/OPG ratio and a tendency toward a delayed increase in VEGF release for doses of 1 to 10 J/cm2 was found. Further investigations using the biostimulatory dose of 10 J/cm2 emerged from this study are needed to establish the ideal treatment regimens in the laboratory as well as in clinical practice. DNA;L-Lactate Dehydrogenase Cell Line;Cell Shape;Cell Survival;DNA;Dose-Response Relationship, Radiation;Humans;L-Lactate Dehydrogenase;Lasers, Semiconductor;Microscopy, Fluorescence;Osteoblasts

Implantable photonic devices for improved medical treatments. An evolving area of biomedical research is related to the creation of implantable units that provide various possibilities for imaging, measurement, and the monitoring of a wide range of diseases and intrabody phototherapy. The units can be autonomic or built-in in some kind of clinically applicable implants. Because of specific working conditions in the live body, such implants must have a number of features requiring further development. This topic can cause wide interest among developers of optical, mechanical, and electronic solutions in biomedicine. We introduce preliminary clinical trials obtained with an

implantable pill and devices that we have developed. The pill and devices are capable of applying in-body phototherapy, low-level laser therapy, blue light (450 nm) for sterilization, and controlled injection of chemicals. The pill is also capable of communicating with an external control box, including the transmission of images from inside the patientâ€™s body. In this work, our pill was utilized for illumination of the sinus-carotid zone in dog and red light influence on arterial pressure and heart rate was demonstrated. Intrabody liver tissue laser ablation and nanoparticle-assisted laser ablation was investigated. Sterilization effect of intrabody blue light illumination was applied during a maxillofacial phlegmon treatment. Animals;Cellulitis;Dogs;Endoscopy;Liver;Optics and Photonics;Oral Surgical Procedures;Phototherapy;Prostheses and Implants;Rabbits;Sterilization;Wound Healing

Facial rejuvenation: combining cosmeceuticals with cosmetic procedures. Cosmetic patients are looking for a more youthful appearance without spending a lot of money, feeling any pain, or experiencing any postprocedure downtime. New cosmeceutical therapies can be used adjuvant to chemical peels, lasers, and injectables, making antiaging regimens less painful and requiring less postprocedural healing time. Adjunctive agents can be used to enhance chemical peels and decrease postinflammatory hyperpigmentation (PIH). Topical retinoids used prior to ablative laser treatments can aid in faster postprocedure healing and reepithelialization. Cosmeceuticals that contain both antioxidants and anti-inflammatories can help reduce postprocedure inflammation. Acetyl hexapeptide-3 is an effective topical agent for decreasing wrinkles and can be used as an adjunct to intramuscular botulinum neurotoxin, which may reduce the number of injections needed. Topical hyaluronic acid also would help patients who are averse to needles or are just starting to get wrinkles and are looking for noninvasive therapy. This article reviews combinations of cosmeceuticals with cosmetic procedures that dermatologists may want to consider discussing with their cosmetic patients. Dermatologic Agents Combined Modality Therapy;Cosmetic Techniques;Dermatologic Agents;Humans;Low-Level Light Therapy;Rejuvenation;Skin Aging

Thermographic monitoring of wound healing and oral health-related quality of life in patients treated with laser (aPDT) after impacted mandibular third molar removal. The objective of this study was to assess the impact of low-level laser therapy on wound swelling, wound temperature changes, and oral health-related quality of life (OHRQoL) after surgical removal of impacted lower third molars. Forty patients with impacted lower third molars requiring surgical removal participated in this study; all were Pell-Gregory class IIB or IIC. The patients were divided randomly into two groups for post-extraction therapy. One group received antimicrobial photodynamic therapy (aPDT) and the other received no additional therapy (placebo group). Temperature measurements were done using an infrared thermographic camera on days 3 and 7 postoperative. OHRQoL was assessed in both groups on day 7 using the Oral Health Impact Profile questionnaire translated into Croatian (OHIP-14-CRO). Prior to surgical treatment, there was no difference in patient characteristics between the two groups. A significantly lower temperature and less wound swelling were recorded on day 3 postoperative in the aPDT group compared to the control group ($P<0.001$). Participants in the aPDT group also had significantly lower OHIP-14-CRO summary scores ($P<0.01$). The present study showed beneficial effects of the aPDT modality of low-level laser therapy: postoperative wound swelling was reduced and wound temperature decreased, and OHRQoL was better through the 7-day postoperative period in comparison to the placebo group. Adult;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Molar, Third;Postoperative Complications;Quality of Life;Thermography;Tooth, Impacted;Treatment Outcome;Wound Healing

The effects of transcranial LED therapy (TCLT) on cerebral blood flow in the elderly women. During aging processes, there is a range of functional changes, where we can highlight the disease related to the central nervous system, such as Alzheimer disease and others forms of dementia. This

study investigated the effects of transcranial light emitting diode (LED) on cerebral blood flow in healthy elderly women analyzed by transcranial Doppler ultrasound (TCD) of the right and left middle cerebral artery and basilar artery. Twenty-five noninstitutionalized elderly women (mean age 72 years old), with a cognitive status >24, were assessed using transcranial Doppler ultrasound on two separate occasions: pre-irradiation and post-transcranial LED therapy (TCLT). Prior to this, they answered two questionnaires: the perceived stress scale and the general health questionnaire. TCLT (627 nm, 70 mW/cm(2), 10 J/cm(2)) was performed at four points of the frontal and parietal region for 30 s each, totaling 120 s two times per week for 4 weeks. Paired t-test results showed that there was a significant improvement after TCLT with increase in the systolic and diastolic velocity of the left middle cerebral artery (25 and 30%, respectively) and basilar artery (up to 17 and 25%), as well as a decrease in the pulsatility index and resistance index values of the three cerebral arteries analyzed (pâ€‰<â€‰0.05). TCD parameters showed improvement in the blood flow on the arteries analyzed. TCLT promoted a blood and vasomotor behavior of the basilar and middle cerebral arteries in healthy elderly women. Aged;Aged, 80 and over;Blood Flow Velocity;Brain;Cerebrovascular Circulation;Female;Humans;Low-Level Light Therapy;Middle Aged;Middle Cerebral Artery;Reference Values;Ultrasonography, Doppler, Transcranial

Low power laser stimulation of the bone consolidation in tibial fractures of rats: a radiologic and histopathological analysis. The objective of this study is to analyze the effectiveness of low power laser irradiation in the bone consolidation of tibial fractures in rats. An experimental, comparative, prospective study with control group was designed. Twenty Wistar rats were grouped into control (nâ€‰=â€‰10) and experimental groups (nâ€‰=â€‰10). A tibial fracture, with a mechanical drill, was inflicted in all rats. The experimental group received ten days of low power arsenide-gallium laser irradiation of 850 nm (KLD, Sao Paulo, Brasil)-100 mW, 8 J/cm(2), 64 s. Before and after the laser treatment, a radiologic analysis was carried out in both groups, in which the rats were graded from 0 to IV according the Montoya scale of bone consolidation. Also, we histopathologically analyzed the bone to estimate the proliferation of fibroblasts, bone matrix, and angiogÃ©nesis with a microscopy, which were graded as I (thin layer of fibroblasts and osteoid matrix), II (thick layer of fibroblasts and osteoid matrix), or III (thick layer of fibroblasts and osteoid matrix and new blood vessels). Radiologic data showed that the experimental group had a higher bone consolidation of Montoya scale after ten days of laser irradiation compared to control group (Pâ€‰<â€‰0.004). Histopathologic data showed more fibroblasts and angiogenesis presence in the group receiving laser irradiation, compared to control group (Pâ€‰<â€‰.002). The low power laser radiation therapy may expedite the bone repair after tibial fractures in rats, according to radiologic and histopathologic analysis. Animals;Fibroblasts;Fracture Healing;Low-Level Light Therapy;Male;Prospective Studies;Radiography;Rats;Rats, Wistar;Tibia;Tibial Fractures;Treatment Outcome

Effects of light-emitting diode (LED) therapy on skeletal muscle ischemia reperfusion in rats. Low-level laser therapy has been shown to decrease ischemia-reperfusion injuries in the skeletal muscle by induction of synthesis of antioxidants and other cytoprotective proteins. Recently, the light-emitting diode (LED) has been used instead of laser for the treatment of various diseases because of its low operational cost compared to the use of a laser. The objective of this work was to analyze the effects of LED therapy at 904 nm on skeletal muscle ischemia-reperfusion injury in rats. Thirty healthy male Wistar rats were allocated into three groups of ten rats each as follows: normal (N), ischemia-reperfusion (IR), and ischemia-reperfusionâ€‰+â€‰LED (IRâ€‰+â€‰LED) therapy. Ischemia was induced by right femoral artery clipping for 2 h followed by 2 h of reperfusion. The IRâ€‰+â€‰LED group received LED irradiation on the right gastrocnemius muscle (4 J/cm(2)) immediately and 1 h following blood supply occlusion for 10 min. At the end of trial, the animals were

euthanized and the right gastrocnemius muscles were submitted to histological and histochemical analysis. The extent of muscle damage in the IRâ€‰+â€‰LED group was significantly lower than that in the IR group (Pâ€‰<â€‰0.05). In comparison with other groups, tissue malondialdehyde (MDA) levels in the IR group were significantly increased (Pâ€‰<â€‰0.05). The muscle tissue glutathione (GSH), superoxide dismutases (SOD), and catalase (CAT) levels in the IR group were significantly lower than those in the subjects in other groups. From the histological and histochemical perspective, the LED therapy has alleviated the metabolic injuries in the skeletal muscle ischemia reperfusion in this experimental model. Antioxidants;Malondialdehyde;Catalase;Superoxide Dismutase;Glutathione Animals;Antioxidants;Body Weight;Catalase;Cell Membrane;Femoral Artery;Glutathione;Inflammation;Low-Level Light Therapy;Male;Malondialdehyde;Muscle, Skeletal;Rats;Rats, Wistar;Reperfusion Injury;Superoxide Dismutase

Acupuncture does not improve chronic knee pain, study finds. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Electrotherapy modalities for adhesive capsulitis (frozen shoulder). BACKGROUND: Adhesive capsulitis (also termed frozen shoulder) is a common condition characterised by spontaneous onset of pain, progressive restriction of movement of the shoulder and disability that restricts activities of daily living, work and leisure. Electrotherapy modalities, which aim to reduce pain and improve function via an increase in energy (electrical, sound, light, thermal) into the body, are often delivered as components of a physical therapy intervention. This review is one in a series of reviews which form an update of the Cochrane review 'Physiotherapy interventions for shoulder pain'. OBJECTIVES: To synthesise the available evidence regarding the benefits and harms of electrotherapy modalities, delivered alone or in combination with other interventions, for the treatment of adhesive capsulitis. SEARCH METHODS: We searched CENTRAL, MEDLINE, EMBASE, CINAHL Plus and the ClinicalTrials.gov and World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) clinical trials registries up to May 2014, unrestricted by language, and reviewed the reference lists of review articles and retrieved trials to identify any other potentially relevant trials. SELECTION CRITERIA: We included randomised controlled trials (RCTs) and controlled clinical trials using a quasi-randomised method of allocation that included adults with adhesive capsulitis and compared any electrotherapy modality to placebo, no treatment, a different electrotherapy modality, or any other intervention. The two main questions of the review focused on whether electrotherapy modalities are effective compared to placebo or no treatment, or if they are an effective adjunct to manual therapy or exercise (or both). The main outcomes of interest were participant-reported pain relief of 30% or greater, overall pain, function, global assessment of treatment success, active shoulder abduction, quality of life, and the number of participants experiencing any adverse event. DATA COLLECTION AND ANALYSIS: Two review authors independently selected trials for inclusion, extracted the data, performed a risk of bias assessment, and assessed the quality of the body of evidence for the main outcomes using the GRADE approach. MAIN RESULTS: Nineteen trials (1249 participants) were included in the review. Four trials reported using an adequate method of allocation concealment and six trials blinded participants and personnel. Only two electrotherapy modalities (low-level laser therapy (LLLT) and pulsed electromagnetic field therapy (PEMF)) have been compared to placebo. No trial has compared an electrotherapy modality plus manual therapy and exercise to manual therapy and exercise alone. The two main questions of the review were investigated in nine trials.Low quality evidence from one trial (40 participants) indicated that LLLT for six days may result in improvement at six days. Eighty per cent (16/20) of participants reported treatment success with LLLT compared with 10% (2/20) of participants receiving placebo (risk ratio (RR) 8.00, 95% confidence interval (CI) 2.11 to 30.34; absolute risk difference 70%, 95% CI 48% to 92%). No participants in either group reported adverse events.We were uncertain whether PEMF for two weeks improved pain or function more

than placebo at two weeks because of the very low quality evidence from one trial (32 participants). Seventy-five per cent (15/20) of participants reported pain relief of 30% or more with PEMF compared with 0% (0/12) of participants receiving placebo (RR 19.19, 95% CI 1.25 to 294.21; absolute risk difference 75%, 95% CI 53% to 97%). Fifty-five per cent (11/20) of participants reported total recovery of joint function with PEMF compared with 0% (0/12) of participants receiving placebo (RR 14.24, 95% CI 0.91 to 221.75; absolute risk difference 55%, 95% CI 31 to 79).Moderate quality evidence from one trial (63 participants) indicated that LLLT plus exercise for eight weeks probably results in greater improvement when measured at the fourth week of treatment, but a similar number of adverse events, compared with placebo plus exercise. The mean pain score at four weeks was 51 points with placebo plus exercise, while with LLLT plus exercise the mean pain score was 32 points on a 100 point scale (mean difference (MD) 19 points, 95% CI 15 to 23; absolute risk difference 19%, 95% CI 15% to 23%). The mean function impairment score was 48 points with placebo plus exercise, while with LLLT plus exercise the mean function impairment score was 36 points on a 100 point scale (MD 12 points, 95% CI 6 to 18; absolute risk difference 12%, 95% CI 6 to 18). Mean active abduction was 70 degrees with placebo plus exercise, while with LLLT plus exercise mean active abduction was 79 degrees (MD 9 degrees, 95% CI 2 to 16; absolute risk difference 5%, 95% CI 1% to 9%). No participants in either group reported adverse events. LLLT's benefits on function were maintained at four months.Based on very low quality evidence from six trials, we were uncertain whether therapeutic ultrasound, PEMF, continuous short wave diathermy, Iodex phonophoresis, a combination of Iodex iontophoresis with continuous short wave diathermy, or a combination of therapeutic ultrasound with transcutaneous electrical nerve stimulation (TENS) were effective adjuncts to exercise. Based on low or very low quality evidence from 12 trials, we were uncertain whether a diverse range of electrotherapy modalities (delivered alone or in combination with manual therapy, exercise, or other active interventions) were more or less effective than other active interventions (for example glucocorticoid injection). AUTHORS' CONCLUSIONS: Based upon low quality evidence from one trial, LLLT for six days may be more effective than placebo in terms of global treatment success at six days. Based upon moderate quality evidence from one trial, LLLT plus exercise for eight weeks may be more effective than exercise alone in terms of pain up to four weeks, and function up to four months. It is unclear whether PEMF is more or less effective than placebo, or whether other electrotherapy modalities are an effective adjunct to exercise. Further high quality randomised controlled trials are needed to establish the benefits and harms of physical therapy interventions (that comprise electrotherapy modalities, manual therapy and exercise, and are reflective of clinical practice) compared to interventions with evidence of benefit (for example glucocorticoid injection or arthrographic joint distension). Adult;Bursitis;Electric Stimulation Therapy;Humans;Randomized Controlled Trials as Topic;Shoulder Pain

Minimal clinically important difference: defining what really matters to patients. Acupuncture Therapy;Chronic Pain;Female;Humans;Low-Level Light Therapy;Male

Acupuncture for chronic knee pain: a randomized clinical trial. IMPORTANCE: There is debate about benefits of acupuncture for knee pain. OBJECTIVE: To determine the efficacy of laser and needle acupuncture for chronic knee pain. DESIGN, SETTING, AND PARTICIPANTS: Zelen-design clinical trial (randomization occurred before informed consent), in Victoria, Australia (February 2010-December 2012). Community volunteers (282 patients aged â‰¥50 years with chronic knee pain) were treated by family physician acupuncturists. INTERVENTIONS: No acupuncture (control group, nâ€‰=â€‰71) and needle (nâ€‰=â€‰70), laser (nâ€‰=â€‰71), and sham laser (nâ€‰=â€‰70) acupuncture. Treatments were delivered for 12 weeks. Participants and acupuncturists were blinded to laser and sham laser acupuncture. Control participants were unaware of the trial. MAIN OUTCOMES AND MEASURES: Primary outcomes were average knee pain (numeric rating scale, 0 [no

pain] to 10 [worst pain possible]; minimal clinically important difference [MCID], 1.8 units) and physical function (Western Ontario and McMaster Universities Osteoarthritis Index, 0 [no difficulty] to 68 [extreme difficulty]; MCID, 6 units) at 12 weeks. Secondary outcomes included other pain and function measures, quality of life, global change, and 1-year follow-up. Analyses were by intention-to-treat using multiple imputation for missing outcome data. RESULTS: At 12 weeks and 1 year, 26 (9%) and 50 (18%) participants were lost to follow-up, respectively. Analyses showed neither needle nor laser acupuncture significantly improved pain (mean difference; -0.4 units; 95% CI, -1.2 to 0.4, and -0.1; 95% CI, -0.9 to 0.7, respectively) or function (-1.7; 95% CI, -6.1 to 2.6, and 0.5; 95% CI, -3.4 to 4.4, respectively) compared with sham at 12 weeks. Compared with control, needle and laser acupuncture resulted in modest improvements in pain (-1.1; 95% CI, -1.8 to -0.4, and -0.8; 95% CI, -1.5 to -0.1, respectively) at 12 weeks, but not at 1 year. Needle acupuncture resulted in modest improvement in function compared with control at 12 weeks (-3.9; 95% CI, -7.7 to -0.2) but was not significantly different from sham (-1.7; 95% CI, -6.1 to 2.6) and was not maintained at 1 year. There were no differences for most secondary outcomes and no serious adverse events. CONCLUSIONS AND RELEVANCE: In patients older than 50 years with moderate or severe chronic knee pain, neither laser nor needle acupuncture conferred benefit over sham for pain or function. Our findings do not support acupuncture for these patients. TRIAL REGISTRATION: anzctr.org.au Identifier: ACTRN12609001001280. Analgesics Acupuncture Therapy;Aged;Analgesics;Chronic Pain;Female;Humans;Knee;Low-Level Light Therapy;Male;Middle Aged;Surveys and Questionnaires;Treatment Outcome

Effect of three different protocols of low-level laser therapy on thyroid hormone production after dental implant placement in an experimental rabbit model. OBJECTIVE: The purpose of this study was to assess the systemic effects of low-level laser therapy (LLLT) on thyroid gland function and, consequently, calcium regulation - as measured by serum triiodothyronine (T3), thyroxine (T4), and free calcium levels - when administered after dental implant placement in a rabbit model. BACKGROUND DATA: Protocols for the use of laser therapy in several clinical procedures are currently under investigation, as not all of the actions and systemic effects of laser irradiation have been clearly established. MATERIALS AND METHODS: Forty male adult New Zealand rabbits were distributed across five groups of eight animals each: two control groups (C-I and C-II) of unirradiated animals, and three experimental groups (E-5, E-10, and E-20), each exposed to a distinct dose of gallium-aluminum-arsenide (GaAlAs) laser [Î»=830â€‰nm, 50â€‰mW, continuous wave (CW)] every 48â€‰h for a total of seven sessions. The total dose per session was 5â€‰J/cm(2) in E-5, 10â€‰J/cm(2) in E-10, and 20â€‰J/cm(2) in E-20. Animals in C-II and all experimental groups underwent surgical extraction of the mandibular left incisor followed by immediate placement of an osseointegrated implant (Nanotite(Â®), Biomet 3i(â„¢)) into the socket. Animals in group C-I served as an absolute control for T3, T4, and calcium measurements. The level of significance was set at 5% (pâ‰¤0.05). RESULTS: ANOVA with Tukey's post-hoc test revealed significant differences in T3 and calcium levels among experimental groups, as well as significant within-group differences in T3, T4, and calcium levels over time. CONCLUSIONS: Although not reaching abnormal values, LLLT applied to the mandible influenced thyroid function in this model. Dental Implants;Thyroid Hormones;Triiodothyronine;Thyroxine;Calcium Animals;Calcium;Dental Implants;Immediate Dental Implant Loading;Incisor;Low-Level Light Therapy;Male;Mandible;Models, Animal;Rabbits;Thyroid Gland;Thyroid Hormones;Thyroxine;Triiodothyronine

Effects of neuromuscular electrical stimulation and low-level laser therapy on the muscle architecture and functional capacity in elderly patients with knee osteoarthritis: a randomized controlled trial. OBJECTIVES: To determine the effects of low-level laser therapy in combination with neuromuscular electrical stimulation on the muscle architecture and functional capacity of elderly patients with knee

osteoarthritis. DESIGN: A randomized, evaluator-blinded clinical trial with sequential allocation of patients to three different treatment groups. SETTING: Exercise Research Laboratory. SUBJECTS: A total of 45 elderly females with knee osteoarthritis, 2-4 osteoarthritis degrees, aged 66-75â€‰years. INTERVENTION: Participants were randomized into one of the following three intervention groups: electrical stimulation group (18-32 minutes of pulsed current, stimulation frequency of 80â€‰Hz, pulse duration of 200 Î¼s and stimulation intensity fixed near the maximal tolerated), laser group (low-level laser therapy dose of 4-6 J per point, six points at the knee joint) or combined group (electrical stimulation and low-level laser therapy). All groups underwent a four-week control period (without intervention) followed by an eight-week intervention period. MAIN MEASURES: The muscle thickness, pennation angle and fascicle length were assessed by ultrasonography, and the functional capacity was assessed using the 6-minute walk test and the Timed Up and Go Test. RESULTS: After intervention, only the electrical stimulation and combined groups exhibited significant increases in the muscle thickness (27%-29%) and pennation angle (24%-34%) values. The three groups exhibited increased performance on the walk test (5%-9%). However, no significant differences in terms of functional improvements were observed between the groups. CONCLUSIONS: Neuromuscular electrical stimulation reduced the deleterious effects of osteoarthritis on the quadriceps structure. Low-level laser therapy did not potentiate the effects of electrical stimulation on the evaluated parameters. Aged;Combined Modality Therapy;Electric Stimulation Therapy;Exercise Test;Female;Humans;Low-Level Light Therapy;Muscle, Skeletal;Osteoarthritis, Knee;Single-Blind Method

A case of solitary angiokeratoma successfully treated with a 1064-nm long-pulsed Nd:YAG laser. Angiokeratomas are vascular malformations that are clinically or histologically verrucous, with superficial vessels just beneath the epidermis. Solitary angiokeratomas occur most commonly as a small, warty, black papule on the lower extremities. Various therapeutic methods, including laser, electrocoagulation, excision, and cryotherapy, may be used for their treatment. A 13-year-old girl presented to the laser clinic for the treatment of her lesions that were present for two months. A 1064-nm long-pulsed Nd:YAG (yttrium aluminium garnet) laser was used to treat the patient's lesions. We performed two laser treatment sessions at a 4-week interval. We saw the patient 1 month after the last treatment session and obtained successful cosmetically acceptable results. No recurrence was observed over a follow-up period of 3 months. Long-pulsed Nd:YAG laser is more effective for the treatment of hyperkeratotic angiokeratomas due to deeper skin penetration of laser. Long-pulsed Nd:YAG laser is an effective and safe therapeutic option for the treatment of solitary angiokeratomas. Adolescent;Angiokeratoma;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Skin Neoplasms

Biophotonic effect of diode laser irradiance on tensile strength of diabetic rats. Low-energy laser irradiance at certain wavelengths is able to stimulate the tissue bio-reaction and enhance the healing process. Collagen deposition is one of the important aspects in healing process because it can increase the strength of the skin. This study was designed to examine the biophotonic effect of irradiance on collagen production of diabetic wound in rat model. The tensile strength of skin was employed as a parameter to describe the wound. Diabetic rat models were induced by streptozotocin via intravenous injection. Skin-breaking strength was measured using an Instron tensile test machine. The experimental animals were treated with 808-nm diode laser at two different powers-0.1 and 0.5 W/cm(2)-and 30, 60, and 120 s for each session. The tensile strength was optimized after treated with high-power diode laser. The photostimulation effect was revealed by accelerated healing process and enhanced tensile strength of wound. Laser photostimulation on tensile strength in diabetic wound suggests that such therapy facilitates collagen production in diabetic wound healing.

Streptozocin;Collagen Animals;Collagen;Diabetes Mellitus, Experimental;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Streptozocin;Tensile Strength;Wound Healing

Low-level laser therapy for orthodontic pain: a systematic review. This review aimed to evaluate the clinical outcome of different lasers management on orthodontic pain. Cochrane Library (Issue 7, 2014) and MEDLINE (1966-2014.7) were searched to collect randomized controlled trials on lasers for orthodontic pain. Studies meeting the inclusion criteria were systematically evaluated. The Cochrane Collaboration tools RevMan5.1.7 and GRADEpro 3.6 were used in this systematic review and meta-analysis. As a result, 11 randomized controlled trials (RCTs) studying on low-level laser therapy (LLLT) for orthodontic pain control were included. Meta-analysis and risk of bias assessment were implemented using RevMan5.1.7, and level of evidence assessments was measured by GRADEpro 3.6. In the outcome of the score of the most painful day, the comparison of laser versus placebo (pain associated with tooth movement) demonstrated that LLLT reduced the pain score significantly compared with placebo groups (MDâ€‰=â€‰-4.39, 95% CI range -5.9--2.88, Pâ€‰<â€‰0.00001). In the same way, the most painful day was significantly brought forward in laser versus control group (MDâ€‰=â€‰-0.42, 95% CI range -0.74--0.10, Pâ€‰=â€‰0.009). Furthermore, the outcome of the end of pain day showed a trend of pain termination earlier in laser versus control and placebo groups, but without statistical significance (MDâ€‰=â€‰-1.37, 95% CI range -3.37-0.64, Pâ€‰=â€‰0.18 and MDâ€‰=â€‰-1.04, 95% CI range -4.22-2.15, Pâ€‰=â€‰0.52). However, for the reason of downgrade factors, all the GRADE level of evidences of eight comparisons for three outcomes showed a very low quality. Therefore, for the methodological shortcomings and risk of bias of RCTs included, insufficient evidence was submitted to judge whether LLLT was effective in relieving orthodontic pain. Further and more perfect researches should be done in order to recommend LLLT as a routine method for orthodontic pain. Placebos Adolescent;Adult;Child;Female;Humans;Lasers;Low-Level Light Therapy;Male;Pain;Pain Management;Placebos;Young Adult

Comparison of different dentin pretreatment protocols on the bond strength of glass fiber post using self-etching adhesive. INTRODUCTION: This study compared the influence of different irrigants with and without ultrasound or laser irradiation on the bond strength of glass fiber posts using a self-etching adhesive in a supplementary dentin pretreatment. METHODS: Ninety bovine incisor roots were divided into 3 groups according to the irrigant tested: 2% chlorhexidine (CHX) (n = 30); 2.5% sodium hypochlorite (NaOCl) (n = 30), and saline solution (control) (n = 30). Each group was randomly divided into 3 subgroups according to the supplementary dentin pretreatment: ultrasound, Nd:YAG laser, and nonsupplemented (control). A self-etching adhesive system (Futurabond DC; VOCO GmbH, Cuxhaven, Germany) was used, and the glass fiber posts were cemented with dual-cure epoxy-based luting agent (Bifix QM, VOCO GmbH). All roots were sectioned transversely, and the push-out test was performed. Failure mode analysis was also evaluated. RESULTS: Bond strength decreased significantly after the use of 2.5% NaOCl in all root thirds ($P < .05$). CHX showed no difference in the mean bond strength value compared with saline solution ($P > .05$). The supplementary dentin pretreatment using the Nd:YAG laser or ultrasound did not improve the bond strength values for both NaOCl and CHX ($P > .05$). Moreover, the apical third exhibited the lowest mean bond strength values ($P < .05$). Analysis indicated that the predominant failure mode was the mixed type. CONCLUSIONS: Regardless of the irrigant used, the supplementary dentin pretreatment with ultrasound or laser irradiation showed no improvement in bond strength. Also, the use of NaOCl decreased the bond strength of glass fiber posts using a self-etching adhesive system, whereas CHX preserved it. Dentin-Bonding Agents;Resin Cements;Root Canal Irrigants;fiberglass;Sodium Chloride;Sodium Hypochlorite;Chlorhexidine Animals;Cattle;Chlorhexidine;Dental Bonding;Dental Cavity Preparation;Dental Pulp Cavity;Dentin;Dentin-Bonding Agents;Endodontics;Glass;Incisor;Low-Level

Light Therapy;Post and Core Technique;Resin Cements;Root Canal Irrigants;Sodium Chloride;Sodium Hypochlorite;Tooth Root;Ultrasonic Waves

Low-energy laser irradiation promotes cellular damage in glucocorticoid-resistant multiple myeloma cells. Glucocorticoids Apoptosis;Cell Line, Tumor;Drug Resistance, Neoplasm;Glucocorticoids;Humans;Lasers;Multiple Myeloma

Low-level laser therapy as an alternative for pulpotomy in human primary teeth. This study aimed to evaluate the effects of low-level laser therapy (LLLT) on pulpal response of primary teeth. Twenty mandibular primary molars were randomly divided into the following groups: group I Buckley's formocresol (diluted at 1:5), group II calcium hydroxide, group III LLLTâ€‰+â€‰zinc oxide/eugenol, and group IV LLLTâ€‰+â€‰calcium hydroxide. LLLT parameters were set at 660-nm wavelength, 10-mW power output, and 2.5 J/cm(2) energy density for 10 s in continuous mode (InGaAlP laser, Twin LaserÂ®, MMOptics, Sao Carlos, Sao Paulo, Brazil). The teeth were extracted at the regular exfoliation period. The dentin-pulp complex was graded by an established histopathological score system. Statistical analysis was performed by Kruskal-Wallis and chi-square test. The histopathological assessment revealed statistically significant differences among groups (Pâ€‰<â€‰0.05). The lowest degree of pulpal inflammation was present in LLLTâ€‰+â€‰calcium hydroxide (Pâ€‰=â€‰0.0296). Calcium hydroxide showed the highest rate of hard tissue barrier (Pâ€‰=â€‰0.0033), odontoblastic layer (Pâ€‰=â€‰0.0033), and dense collagen fibers (Pâ€‰=â€‰0.0095). On the other hand, formocresol showed the highest incidence of internal resorption (Pâ€‰=â€‰0.0142). Based on this study, low-level laser therapy preceding the use of calcium hydroxide exhibited satisfactory results on pulp tissue healing. However, further clinical studies on human teeth with long-term follow-up are needed to test the low-level laser therapy efficacy. Child;Dental Caries;Dental Cavity Preparation;Dental Pulp;Female;Humans;Low-Level Light Therapy;Male;Molar;Pulpotomy;Tooth, Deciduous;Treatment Outcome

Synergic effects of ultrasound and laser on the pain relief in women with hand osteoarthritis. Patients with pain avoid movements, leading to a gradual impairment of their physical condition and functionality. In this context, the use of ultrasound (US) and low-level laser therapy (LLLT) show promising results for nonpharmacological and noninvasive treatment. The aim of this study was evaluated the synergistic effects of the US and the LLLT (new prototype) with or without therapeutic exercises (TE) on pain and grip strength in women with hand osteoarthritis. Forty-five women with hand osteoarthritis, aged 60 to 80 years, were randomly assigned to one of three groups, but 43 women successfully completed the full study. The three groups were as follows: (i) the placebo group which did not perform TE, but the prototype without emitting electromagnetic or mechanical waves was applied (nâ€‰=â€‰11); (ii) the US + LLLT group which carried out only the prototype (nâ€‰=â€‰13); and (iii) the TE + US + LLLT group which performed TE before the prototype is applied (nâ€‰=â€‰13). The parameters of US were frequency 1 MHz; 1.0 W/cm(2) intensity, pulsed mode 1:1 (duty cycle 50%). Regarding laser, the output power of the each laser was fixed at 100 mW leading to an energy value of 18 J per laser. Five points were irradiated per hand, during 3 min per point and 15 min per session. The prototype was applied after therapeutic exercises. The treatments are done once a week for 3 months. Grip strength and pressure pain thresholds (PPT) were measured. Grip strength did not differ significantly for any of the groups (pâ€‰â‰¥â€‰0.05). The average PPT between baseline and 3 months shows significant decrease of the pain sensitivity for both the US + LLLT group (âˆ†â€‰=â€‰30â€‰Â±â€‰19 N, pË,0.001) and the TE + US + LLLT group (âˆ†â€‰=â€‰32â€‰Â±â€‰13 N, pâ€‰<â€‰0.001). However, there were no significant differences in average PPT for placebo group (âˆ†â€‰=â€‰-0.3â€‰Â±â€‰9 N). There was no placebo effect. The new prototype that combines US and LLLT reduced pain in women with hand osteoarthritis. Aged;Aged, 80 and over;Electromagnetic Radiation;Exercise

Therapy;Female;Hand;Hand Strength;High-Energy Shock Waves;Humans;Low-Level Light Therapy;Middle Aged;Osteoarthritis;Pain Management;Pain Threshold;Placebo Effect;Ultrasonic Therapy

The effect of low-level laser on postoperative pain after tibial fracture surgery: a double-blind controlled randomized clinical trial. BACKGROUND: Postoperative pain is a common complication that can lead to serious morbidities and delayed recovery. OBJECTIVES: The aim of this study was to investigate the effect of low-level laser therapy on acute pain after tibial fracture surgery. PATIENTS AND METHODS: In this randomized clinical trial, 54 patients who were candidate for tibial fracture surgery were allocated randomly to two groups, namely, control and laser therapy. Both groups had the same type of surgery and technique of spinal anesthesia. Patients in laser group were treated with the combination of two lasers (GaALAs, 808 nm; and GaALInP, 650 nm) at the end of the surgery while control group received laser in turn-off mode with the same duration as laser group. Patients were evaluated for pain intensity according to the visual analogue scale (VAS) and the amount of analgesic use during 24 hours after surgery. RESULTS: Laser group experienced less pain intensity in comparison with control group at second, fourth, eighth, 12(th), and 24(th) hours after surgery (P Value < 0.05). In addition, the amount of consumed opioid in laser group was significantly less than the control group (51.62 Â± 29.52 and 89.28 Â± 35.54 mg, respectively; P Value, 0.008). CONCLUSIONS: Low Level Laser Therapy is a proper method to reduce postoperative pain because it is painless, safe, and noninvasive and is easily accepted by patients.

Photobiostimulation reduces edema formation induced in mice by Lys-49 phospholipases A2 isolated from Bothrops moojeni venom. The prominent local myotoxic effects induced by Bothrops snake venom are due, in part, to myotoxins. This effect is not neutralized by antivenom, which is the main therapy for victims of snakebite. Two basic myotoxins named MjTX-I and MjTX-II were isolated from Bothrops moojeni venom. Both myotoxins have a Lys-49 phospholipase A2 structure devoid of enzymatic activity, but are highly myonecrotic and edema-inducing. In this study, we analyzed the effect of a low-level laser (LLL) at 685 nm, an energy density of 2.2 J cm(-2), and the irradiation time of 15 s, and a light emitting diode (LED) at 635 or 945 nm at energy densities of 4 and 3.8 J cm(-2), and irradiation times of 41 and 38 s, respectively, applied 30 min and 3 h after edema formation in mice caused by MjTX-I or MjTX-II. MjTX-I or MjTX-II caused a significant edema formation in envenomed paws. LLL and LED irradiation significantly reduced the edema formation by both myotoxins from 1 up to 6 hours after the injection. Both LLL and LEDs were similar in reducing the edema formation induced by myotoxins. The combined photobiostimulation with antivenom had the same effect in reducing edema as treatment with the LLL or LEDs alone. In conclusion, the results of this study indicate that photobiostimulation could be used in association with antivenom therapy for treatment of local effects of Bothrops species venom. Venoms;myotoxin II, Bothrops moojeni;Phospholipases A Animals;Bothrops;Edema;Low-Level Light Therapy;Male;Mice;Phospholipases A;Venoms

Second messengers mediating the proliferation and collagen synthesis of tenocytes induced by low-level laser irradiation. For decades, low-level laser therapy (LLLT) has widespread applications in tendon-related injuries. Although the therapeutic effect of LLLT could be explained by photostimulation of target tissue and cells, how tenocytes sense photonic energy and convert them into cascades of cellular and molecular events is still not well understood. This study was designed to elucidate the effects of LLLT on cell proliferation and collagen synthesis by examining the associated second messengers including ATP, Ca(2+), and nitric oxide using rat Achilles tenocytes. Moreover, proliferating cell nuclear antigen (PCNA) and transforming growth factor-Î²1 (TGF-Î²1) related to cell proliferation and matrix metabolism were also studied. The results showed that 904 nm GaAs laser of 1 J/cm(2) could significantly increase the MTT activity and collagen synthesis of tenocytes. Second

messengers including ATP and intracellular Ca2+ were increased after laser treatment. Quantitative PCR analysis of tenocytes treated with laser revealed up-regulated expression of PCNA, type I collagen, and TGF-Î²1. Besides, laser-induced TGF-Î²1 expression was significantly inhibited by extracellular signal-regulated kinase (ERK) specific inhibitor (PD98059). The findings suggested that LLLT stimulated ATP production and increased intracellular calcium concentration. Directly or indirectly via production of TGF-Î²1, these second messengers mediated the proliferation of tenocytes and synthesis of collagen. Collagen Type I;Enzyme Inhibitors;Transforming Growth Factor beta1;Nitric Oxide;Adenosine Triphosphate;Collagen;Extracellular Signal-Regulated MAP Kinases;Calcium Achilles Tendon;Adenosine Triphosphate;Animals;Calcium;Cell Proliferation;Collagen;Collagen Type I;Enzyme Inhibitors;Extracellular Signal-Regulated MAP Kinases;Low-Level Light Therapy;Nitric Oxide;Rats;Rats, Sprague-Dawley;Second Messenger Systems;Tendon Injuries;Transforming Growth Factor beta1

Effect of LLLT on endothelial cells culture. Growth factors as vascular endothelial growth factor (VEGF), produced by the endothelial cells, take an essential part in pathological and physiological angiogenesis. The possibility of angiogenesis modulation by application of laser radiation may contribute to the improvement of its use in this process. Thus, the aim of the study was to investigate the influence of low-level laser therapy (LLLT) on the proliferation of endothelial cells, secretion of VEGF-A and presence of soluble VEGF receptors (sVEGFR-1 and sVEGFR-2) in the medium after in vitro culture. Isolated human umbilical vein endothelial cells (HUVECs) were irradiated using a diode laser at a wavelength of 635 nm and power density of 1,875 mW/cm(2). Depending on radiation energy density, the experiment was conducted in four groups: I 0 J/cm(2) (control group), II 2 J/cm(2), III 4 J/cm(2), and IV 8 J/cm(2). The use of laser radiation wavelength of 635 nm, was associated with a statistically significant increase in proliferation of endothelial cells (pâ€‰=â€‰0.0041). Moreover, at 635-nm wavelength, all doses of radiation significantly reduced the concentration of sVEGFR-1 (pâ€‰=â€‰0.0197). VEGFA protein, human;Vascular Endothelial Growth Factor A;KDR protein, human;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2 Cell Culture Techniques;Cell Proliferation;Endothelial Cells;Endothelium, Vascular;Human Umbilical Vein Endothelial Cells;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Neovascularization, Physiologic;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-1;Vascular Endothelial Growth Factor Receptor-2

[Successful treatment of a professional tattoo with the R20 method]. A 54-year-old man presented for the removal of a professional tattoo on the right upper arm. We initiated a comparative treatment with a q-switched 694-nm Ruby laser (TattooStarÂ® Effect, AsclepionÂ® Lasertechnologies, Jena, Germany, Spot: 4 mm, Fluence: 4 J/cm(2)) using the so-called R20-method. The tattoo was divided into three equal parts and was treated with up to three passes in one session at intervals of 20 min. After 3 sessions, which were conducted at intervals of 4 weeks, the areas that had been treated with multiple passes per session showed a significantly stronger fading compared to the area that had been treated with single passes. The patient reported a slight, transient blistering in the area that had been treated with three passes. Nevertheless, we did not observe any scarring or other irreversible complications. Our observation demonstrates the efficacy of the R20-method for the laser-removal of tattoos. Humans;Low-Level Light Therapy;Male;Middle Aged;Skin;Tattooing;Treatment Outcome

The effect of dosage on the efficiency of LLLT in new bone formation at the expanded suture in rats. The aim of this study was to investigate the effect that dosage has on the efficiency of low-level laser therapy (LLLT) in bone formation in a rat study model. Twenty-eight rats were divided into four groups as only expansion (OE), expansionâ€‰+â€‰low dose (0.15 J) (LD), expansionâ€‰+â€‰medium dose (0.65 J) (MD), and expansionâ€‰+â€‰high dose (198 J) (HD)

laser therapy groups. The midpalatal suture was expanded during 5 days. Afterwards, irradiations were started and performed with an 820 nm, continuous wave, Ga-Al-As diode laser (Doris, CTL-1106MX, Warsaw, Poland). At the end of experiment, the premaxillae of the animals were dissected. The sections were transferred into PC environment and analyzed by using Image Analysis program. Number of osteoblasts, osteoclasts, fibroblasts, vessels, transforming growth factor beta (TGF-Î²) expression, and new bone formation were evaluated with this program. Amount of expansion did not show any difference among the groups. All parameters except the number of osteoclasts were increased in all lased groups while that parameter was significantly decreased. Vessels, TGF-Î² expression, and new bone formation were mostly increased in LD group followed by HD group. Among the lased groups, a significant difference was observed only for the amount of new bone formation, which was between the LD and the MD groups. On the other hand, the difference in this parameter was insignificant between OE and MD groups. Low-level laser therapy with both 5 and 6,300 J/cm(2) doses was found to be significantly effective, while the 20 J/cm(2) dose did not show a significant effect in increasing new bone formation. This finding reveals that the efficiency of the therapy is affected by the dosage. Transforming Growth Factor beta Animals;Bone and Bones;Dose-Response Relationship, Radiation;Fibroblasts;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxilla;Models, Animal;Osteoblasts;Osteoclasts;Osteogenesis;Palatal Expansion Technique;Rats;Rats, Wistar;Transforming Growth Factor beta

Efficacy of low-level laser therapy on hair regrowth in dogs with noninflammatory alopecia: a pilot study. BACKGROUND: Canine noninflammatory alopecia (CNA) is a heterogeneous group of skin diseases with different underlying pathogenesis. The therapeutic approach is challenging, and new options for treatment are desirable. HYPOTHESIS/OBJECTIVES: To test the clinical efficacy of low-level laser therapy (LLLT) on hair regrowth in CNA. ANIMALS: Seven dogs of different ages, breeds and genders with a clinical and histopathological diagnosis of noninflammatory alopecia. METHODS: Each dog was treated twice weekly for a maximum of 2 months with a therapeutic laser producing the following three different wavelengths emerging simultaneously from 21 foci: 13 Ã— 16 mW, 470 nm; 4 Ã— 50 mW, 685 nm; and 4 Ã— 200 mW, 830 nm. The fluence given was 3 J/cm(2) , frequency 5 Hz, amplitude of the irradiated area was 25 cm(2) and application time was 1.34 min. A predetermined alopecic area was left untreated and served as a control area. From one dog, post-treatment biopsies of treated and untreated sites were obtained for histological evaluation of hair density and the percentage of haired and nonhaired follicles. RESULTS: At the end of the study, coat regrowth was greatly improved in six of seven animals and improved in one of seven. By morphometry, the area occupied by hair follicles was 18% in the treated sample and 11% in the untreated one (11%); haired follicles were (per area) 93% in the treated sample and only 9% in the control sample. CONCLUSIONS AND CLINICAL IMPORTANCE: Our clinical and histological data document promising effects of LLLT on hair regrowth in CNA. Further studies investigating the biological mechanism underlying the effect of LLLT on hair follicle cycling are warranted. Alopecia;Animals;Dog Diseases;Dogs;Female;Hair;Hair Follicle;Low-Level Light Therapy;Male;Pilot Projects

Absorption of monochromatic and narrow band radiation in the visible and near IR by both mitochondrial and non-mitochondrial photoacceptors results in photobiomodulation. In addition to the major functions performed by in the cell, mitochondria play a major role in cell-light interaction. Accordingly it is generally accepted that mitochondria are crucial in cell photobiomodulation; however a variety of biomolecules themselves proved to be targets of light irradiation. We describe whether and how mitochondria can interact with monochromatic and narrow band radiation in the red and near IR optical regions with dissection of both structural and functional effects likely leading to photobiostimulation. Moreover we also report that a variety of biomolecules localized in mitochondria and/or in other cell compartments including cytochrome c

oxidase, some proteins, nucleic acids and adenine nucleotides are light sensitive with major modifications in their biochemistry. All together the reported investigations show that the elucidation of the mechanism of the light interaction with biological targets still remains to be completed, this needing further research, however the light sensitivity of a variety of molecules strongly suggests that photobiomodulation could be used in both in photomedicine and in biotechnology. Electron Transport Complex IV Absorption, Radiation;Animals;Electron Transport Complex IV;Humans;Infrared Rays;Mitochondria

Effects of low-intensity laser therapy on the rate of orthodontic tooth movement: A clinical trial. BACKGROUND: Low-intensity laser therapy (LILT) can be utilized for different treatments in the field of orthodontics and dentofacial orthopedics. The aim of the present study was to evaluate the efficacy of LILT on (1) the rate of canine movement during canine retraction phase and (2) evaluate the radiographic changes occurring during LILT around the irradiated area. MATERIALS AND METHODS: A total of 10 patients of both genders were included for this study. One quadrant of the upper arch was considered control group (CG) and received mechanical activation of the canine teeth with 150 g. The opposite quadrant received the same mechanical activation and was also irradiated with a diode emitting light (gallium-arsenide laser) at 904 nm, for 10 s at 12 mW, at 4.2 J/cm(2). Laser application was done on 1(st) day, 3(rd), 7(th), 14(th), 21(th), 28(th), 35(th), 42(nd), 49(th), 56(th) day respectively during the canine retraction phase. Distance was measured on 1(st) day, 35(th) day and 63(rd) day and appliance activation was done on 1(st) and 35(th) day. Results were analyzed using t-test with the significance level set at $P < 0.01$. RESULTS: Mean value obtained from 1(st) to 63(rd) day was 3.30 Â± 2.36 mm for CG and 3.53 Â± 2.30 mm for laser group (LG). CONCLUSION: There was no statistically significant difference in the rate of tooth movement during canine retraction between the LG and the CG. There was no evidence of any pathologic changes in the radiograph following LILT.

Ablative fractional photothermolysis in the treatment of scar contractures of the wrists and forearms: a retrospective data analysis. Adult;Aged;Cicatrix;Contracture;Female;Follow-Up Studies;Forearm;Humans;Low-Level Light Therapy;Male;Middle Aged;Range of Motion, Articular;Retrospective Studies;Sampling Studies;Treatment Outcome;Wrist Joint

Core-shell-shell nanorods for controlled release of silver that can serve as a nanoheater for photothermal treatment on bacteria. A novel bactericidal material comprising rod-shaped core-shell-shell Au-Ag-Au nanorods is constructed as a nanoheater in the near-infrared (NIR) region. The outer Au shell melts under laser irradiation and results in exposure of the inner Ag shell, facilitating the controlled release of the antibacterial Ag shell/layer or Ag(+). This results in the Au-Ag-Au nanorods having a favorable bactericidal ability as it combines the features of physical photothermal ablation sterilization of the outer Au shell and the antibacterial effect of the inner Ag shell or Ag(+) to the surrounding bacteria. The sterilizing ability of Au-Ag-Au nanorods is investigated with Escherichia coli O157:H7 as a model bacterial strain. Under low-power NIR laser irradiation (785 nm, 50 mW cm(-2)), the Au-Ag-Au nanoheater exhibits a higher photothermal conversion efficiency (with a solution temperature of 44Â°C) with respect to that for the Au-Ag nanorods (39Â°C). Meanwhile, a much improved stability with respect to Au-Ag nanorods is observed, i.e., 16 successive days of monitoring reveal virtually no change in the ultraviolet-visible spectrum of Au-Ag-Au nanorods, while a significant drop in absorption along with a 92 nm red shift of Localized Surface Plasmon Resonance is recorded for the Au-Ag nanorods. This brings an increasing bactericidal efficiency and long-term stability for the Au-Ag-Au nanorods. At a dosage of 10 Î¼g ml(-1), a killing rate of 100% is reached for the E. coli O157:H7 cells under 20 min of irradiation. The use of Au-Ag-Au nanorods avoids the abuse of broad-spectrum antibiotics and reduces the damage of tissues by alleviating the toxicity of silver under controlled release and by the use of low-power laser irradiation. These features could make the bimetallic core-shell-shell nanorods a favorable nanoheater for in vivo biomedical applications.

Anti-Bacterial Agents;Delayed-Action Preparations;Nanocapsules;Silver Absorption, Physicochemical;Anti-Bacterial Agents;Cell Survival;Delayed-Action Preparations;Diffusion;Escherichia coli O157;Hot Temperature;Nanocapsules;Nanopores;Nanotubes;Particle Size;Porosity;Silver;Sterilization
[Chronobiological approach to the treatment of patients with erectile dysfunction using a combination of local negative pressure and laser illumination]. It is shown that the synchronization of energetic, spectral, frequency, and temporal parameters of technique with biorhythms of physiological processes in the organ, which is target of impact, and in the human body as a whole, allows to significantly improve efficiency, and achieve stable and reproducible results of treatment. The article presents the results of study including 62 patients with vasculogenic ED. The study design included the randomization of patients into 3 groups depending on the complex of the therapy with the use of combined techniques, including negative pressure and laser illumination (LLNP) as a part of combined therapy and as monotherapy. Significant increase in the peak flow velocity after a course of treatment was observed in all three groups of patients. Improvement in erectile function was observed in all groups; according to IIEF score, erectile function has increased by 22.3 +/- 0.05% in group 1, by 34 +/- 1.5% in the group 2, and by 19 +/- 1.7% in the group 3, indicating the best results of treatment in the group receiving combined therapy. Combination of LLNP with the administration of PDE5 inhibitors significantly increases the effectiveness of treatment of vasculogenic ED due to the influence of physical factors on the stabilization of hemodynamics in the main arteries of the penis. After a course of therapy, increase in systemic vascular elasticity by 39.8 +/- 1.5% was also noted. The efficiency of the LLNP methodology in the treatment of patients with vasculogenic ED is demonstrated. The best results were obtained in the group of patients treated with combined therapy, including the use of LLNP and PDE-5 inhibitor. Adult;Erectile Dysfunction;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodicity;Physical Therapy Modalities;Vacuum
Hemodynamic effect of laser therapy in spontaneously hypertensive rats. Systemic arterial hypertension (SAH) is considered to be the greatest risk factor for the development of neuro-cardiovascular pathologies, thus constituting a severe Public Health issue in the world. The Low-Level Laser Therapy (LLLT), or laser therapy, activates components of the cellular structure, therefore converting luminous energy into photochemical energy and leading to biophysical and biochemical reactions in the mitochondrial respiratory chain. The LLLT promotes cellular and tissue photobiomodulation by means of changes in metabolism, leading to molecular, cellular and systemic changes. The objective of this study was to analyze the action of low-level laser in the hemodynamic modulation of spontaneously hypertensive rats, in the long term. Animals (n = 16) were randomly divided into the Laser Group (n = 8), which received three weekly LLLT irradiations for seven weeks, and into the Sham Group (n = 8), which received three weekly simulations of laser for seven weeks, accounting for 21 applications in each group. After seven weeks, animals were cannulated by the implantation of a catheter in the left carotid artery. On the following day, the systemic arterial pressure was recorded. The Laser Group showed reduced levels of mean blood pressure, with statistically significant reduction (169 Â± 4 mmHg* vs. 182 Â± 4 mmHg from the Sham Group) and reduced levels of diastolic pressure (143 Â± 4 mmHg* vs. 157 Â± 3 mmHg from the Sham Group), revealing a 13 and 14 mmHg decrease, respectively. Besides, there was a concomitant important decline in heart rate (312 Â± 14 bpm vs. 361 Â± 13 bpm from the Sham Group). Therefore, laser therapy was able to produce hemodynamic changes, thus reducing pressure levels in spontaneously hypertensive rats. Animals;Heart Rate;Hemodynamics;Hypertension;Lasers, Semiconductor;Low-Level Light Therapy;Male;Prospective Studies;Random Allocation;Rats, Inbred SHR;Reference Values;Reproducibility of Results;Time Factors;Treatment Outcome

Superpulsed (Ga-As, 904 nm) low-level laser therapy (LLLT) attenuates inflammatory response and enhances healing of burn wounds. Low-level laser therapy (LLLT) using superpulsed near-infrared light can penetrate deeper in the injured tissue and could allow non-pharmacological treatment for chronic wound healing. This study investigated the effects of superpulsed laser (Ga-As 904 nm, 200 ns pulse width; 100 Hz; 0.7 mW mean output power; 0.4 mW/cm(2) average irradiance; 0.2 J/cm(2) total fluence) on the healing of burn wounds in rats, and further explored the probable associated mechanisms of action. Irradiated group exhibited enhanced DNA, total protein, hydroxyproline and hexosamine contents compared to the control and silver sulfadiazine (reference care) treated groups. LLLT exhibited decreased TNF-Î± level and NF-kB, and up-regulated protein levels of VEGF, FGFR-1, HSP-60, HSP-90, HIF-1Î± and matrix metalloproteinases-2 and 9 compared to the controls. In conclusion, LLLT using superpulsed 904 nm laser reduced the inflammatory response and was able to enhance cellular proliferation, collagen deposition and wound contraction in the repair process of burn wounds. Photomicrographs showing no, absence inflammation and faster wound contraction in LLLT superpulsed (904 nm) laser treated burn wounds as compared to the non-irradiated control and silver sulfadiazine (SSD) ointment (reference care) treated wounds. Anti-Infective Agents, Local;Tumor Necrosis Factor-alpha;Matrix Metalloproteinase 2;Mmp2 protein, rat;Matrix Metalloproteinase 9;Mmp9 protein, rat;Silver Sulfadiazine Animals;Anti-Infective Agents, Local;Blotting, Western;Burns;Disease Models, Animal;Inflammation;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Photomicrography;Random Allocation;Rats, Sprague-Dawley;Silver Sulfadiazine;Skin;Treatment Outcome;Tumor Necrosis Factor-alpha;Wound Healing

Roles of reinforced nerve conduits and low-level laser phototherapy for long gap peripheral nerve repair.

Photobiomodulation with light-emitting diodes improves sperm motility in men with asthenozoospermia. Sperm motility is an important parameter of male fertility and depends on energy consumption. Photobiomodulation with light-emitting diode (LED) is known to stimulate respiratory chain in mitochondria of different mammalian cells. The aim of this research was to evaluate the effect of photobiomodulation with LED on sperm motility in infertile men with impaired sperm motility-asthenozoospermia. Thirty consecutive men with asthenozoospermia and normal sperm count who visited the infertility clinic of University Medial Centre Ljubljana between September 2011 and February 2012 were included in the study. Semen sample of each man was divided into five parts: one served as a non-treated (native) control and four parts were irradiated with LED of different wavelengths: (1) 850 nm, (2) 625, 660 and 850 nm, (3) 470 nm and (4) 625, 660 and 470 nm. The percentage of motile sperm and kinematic parameters were measured using a Sperm Class Analyser system following the WHO recommendations. In the non-treated semen samples, the average ratio of rapidly progressive sperms was 12% and of immotile sperm 73%. Treating with LED significantly increased the proportion of rapidly progressive sperm (mean differences were as follows: 2.83 (1.39-4.28), 3.33 (1.61-5.05), 4.50 (3.00-5.99) and 3.83 (2.31-5.36) for groups 1-4, respectively) and significantly decreased the ratio of immotile sperm (the mean differences and 95% CI were as follows: 3.50 (1.30-5.70), 4.33 (2.15-6.51), 5.83 (3.81-7.86) and 5.50 (2.98-8.02) for groups 1-4, respectively). All differences were highly statistically significant. This finding confirmed that photobiomodulation using LED improved the sperm motility in asthenozoospermia regardless of the wavelength.
Animals;Asthenozoospermia;Humans;Light;Low-Level Light Therapy;Male;Sperm Motility;Treatment Outcome

Bimetallic nanoparticles: Preparation, properties, and biomedical applications. Many studies of non-supported bimetallic nanoparticle (BMNP) dispersions, stabilized by ligands or polymers, and

copolymers, were started only about 10 years ago. Several preparative procedures have been proposed, and full characterizations on BMNPs have been approved. Studies on BMNPs received huge attention from both scientific and technological communities because most of the NPs' catalytic activity depends on their structural aspects. In this study, we focus on the preparation, properties, and bio-application of BMNPs and introduction of the recent advance in these NPs. Anti-Bacterial Agents;Cetrimonium Compounds;Photosensitizing Agents;Plant Extracts;Silver;Palladium;Gold;Ascorbic Acid;Cetrimonium Anti-Bacterial Agents;Ascorbic Acid;Catalysis;Cetrimonium;Cetrimonium Compounds;Gold;Humans;Low-Level Light Therapy;Meliaceae;Metal Nanoparticles;Oxidation-Reduction;Palladium;Photosensitizing Agents;Plant Extracts;Silver

A Meta-analysis of Clinical Effects of Low-level Laser Therapy on Temporomandibular Joint Pain. [Purpose] Temporomandibular joint (TMJ) pain is a symptom of TMJ disease. Low-level laser therapy (LLLT) is often used in the clinical treatment of TMJ pain. The aim of this study was to review the effective parameters of LLLT for TMJ pain. [Methods] This study was a systematic review in which electronic databases were searched for the period of January 2005 to January 2010. We selected reports of randomized controlled trials and calculated the effect size (ES) of the pain relief to evaluate the effect of LLLT. [Results] Seven reports are found to meet the inclusion criteria and discussed. Based on the calculation results, the pooled ES was -0.6, indicating a moderate effect of pain relief. In addition, the dosages and treatments with wavelengths of 780 and 830â€…nm can cause moderate and large pain relief effects. [Conclusion] Use of LLLT on the masticatory muscle or joint capsule for TMJ pain had a moderate analgesic effect. The optimal parameters for LLLT to treat TMJ pain have not been confirmed. However, our results can be a vital clinical reference for clinical physicians in treatment of patients with TMJ pain.

Low-level laser therapy on skeletal muscle inflammation: evaluation of irradiation parameters. We evaluated the effect of different irradiation parameters in low-level laser therapy (LLLT) for treating inflammation induced in the gastrocnemius muscle of rats through cytokines concentration in systemic blood and analysis of muscle tissue. We used continuous (830 and 980 nm) and pulsed illuminations (830 nm). Animals were divided into five groups per wavelength (10, 20, 30, 40, and 50 mW), and a control group. LLLT was applied during 5 days with a constant irradiation time and area. TNF-Î±, IL-1Î², IL-2, and IL-6 cytokines were quantified by ELISA. Inflammatory cells were counted using microscopy. Identical methodology was used with pulsed illumination. Average power (40 mW) and duty cycle were kept constant (80%) at five frequencies (5, 25, 50, 100, and 200 Hz). For continuous irradiation, treatment effects occurred for all doses, with a reduction of TNF-Î±, IL-1Î², and IL-6 cytokines and inflammatory cells. Continuous irradiation at 830 nm was more effective, a result explained by the action spectrum of cytochrome c oxidase (CCO). Best results were obtained for 40 mW, with data suggesting a biphasic dose response. Pulsed wave irradiation was only effective for higher frequencies, a result that might be related to the rate constants of the CCO internal electron transfer process. Cytokines Animals;Cytokines;Inflammation;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar

Is there a place for lasers in periodontal therapy? This article aims to provide an overview on the clinical applications of lasers in periodontics. Humans;Laser Therapy;Low-Level Light Therapy;Periodontal Diseases

Effect of prophylactic low level laser therapy on oral mucositis: a systematic review and meta-analysis. BACKGROUND: Objective was to determine whether prophylactic low level laser therapy (LLLT) reduces the risk of severe mucositis as compared to placebo or no therapy. METHODS: MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials were searched until February 2014 for randomized controlled trials (RCTs) comparing prophylactic LLLT with placebo or no therapy

in patients with cancer or undergoing hematopoietic stem cell transplantation (HSCT). All analyses used random effects models. RESULTS: Eighteen RCTs (1144 patients) were included. Prophylactic LLLT reduced the overall risk of severe mucositis (risk ratio (RR) 0.37, 95% confidence interval (CI) 0.20 to 0.67; P = 0.001). LLLT also reduced the following outcomes when compared to placebo/no therapy: severe mucositis at the time of anticipated maximal mucositis (RR 0.34, 95% CI 0.20 to 0.59), overall mean grade of mucositis (standardized mean difference -1.49, 95% CI -2.02 to -0.95), duration of severe mucositis (weighted mean difference -5.32, 95% CI -9.45 to -1.19) and incidence of severe pain (RR 0.26, 95% CI 0.18 to 0.37). CONCLUSION: Prophylactic LLLT reduced severe mucositis and pain in patients with cancer and HSCT recipients. Future research should identify the optimal characteristics of LLLT and determine feasibility in the clinical setting. Hematopoietic Stem Cell Transplantation;Humans;Low-Level Light Therapy;Stomatitis

Onychomycosis: 1064-nm Nd:YAG q-switch laser treatment. BACKGROUND: Laser Treatment of onychomycosis is a quick and easy method without complications. AIM: Laser therapy is efficient for the Treatment of onychomycosis. MATERIAL & METHODS: One hundred and twenty patients with a KOH (+) confirmed clinical diagnosis of onychomycosis were included in this study, all of the patients were treated in a single sesiÃ³n with a 1064-nm neodymium-doped yttrium-aluminum garnet (Nd:YAG) q-switch laser. RESULTS: There was a 100% clinical response rate within the 9Â month follow-up period with no side effects. CONCLUSIÃ“N: This method is proposed as a novel and safe method for the treatment of this ungual pathology. yttrium-aluminum-garnet;Yttrium;Aluminum Adolescent;Adult;Aged;Aluminum;Child;Female;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Treatment Outcome;Young Adult;Yttrium

Evaluation of the effect of fractional CO2 laser on histopathological picture and TGF-Î²1 expression in hypertrophic scar. BACKGROUND AND AIMS: Hypertrophic scar is a form of abnormal wound healing process in which tissue repair regulating mechanism is disrupted. Transforming growth factor Î²1 has a particular importance in the fibrotic scarring response. Treatment of hypertrophic scar included many chemical, physical, and surgical options. Fractional CO2 laser devices have gained acceptance as a way for managing hypertrophic scar. Aims of this study are: (a) to determine the clinical and histopathological effects of fractional CO2 laser on hypertrophic scar, (b) to evaluate the expression pattern of transforming growth factor-Î²1 (TGF-Î²1) as an important fibrogenic factor before and 6Â months after fractional CO2 laser treatment. PATIENTS AND METHODS: Forty patients of hypertrophic scar were selected, each patient was treated by four sessions with 1Â month apart with fractional CO2 laser. Vancouver Scar Scale (VSS) was used to assess the patients before and after laser treatment. Skin biopsy was taken from eight cases before and 3Â months after four fractional CO2 laser sessions and four normal skin control biopsies. All were assessed by hematoxylin-eosin (H&E), Masson's trichrome, Van Gieson and immunohistochemical (IHC) staining with TGF-Î²1. The epidermal thickness was assessed before and after treatment by image analyzing system software. RESULTS: There was statistically significant difference in VSS before and after fractional CO2 laser (PÂ >Â 0.001). The epidermal thickness showed significant increase after laser treatment (PÂ >Â 0.001), and there was also thinning in stratum corneum and replacement of the irregular collagen bands with organized new collagen fibrils as demonstrated by H&E and the other special stains. The study also showed significant decrease in TGF-Î²1 expression after laser therapy (PÂ =Â 0.008). CONCLUSION: Fractional CO2 laser could be considered as a good way for hypertrophic scar management. It normalizes dermal collagen as imaged by histopathological picture and the change in TGF-Î²1 expression. Transforming Growth Factor beta1;Collagen Adolescent;Adult;Child;Cicatrix, Hypertrophic;Collagen;Erythema;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Skin;Skin Pigmentation;Transforming Growth Factor beta1;Young Adult

Low-level laser therapy for traumatic brain injury in mice increases brain derived neurotrophic factor (BDNF) and synaptogenesis. Transcranial low-level laser (light) therapy (LLLT) is a new non-invasive approach to treating a range of brain disorders including traumatic brain injury (TBI). We (and others) have shown that applying near-infrared light to the head of animals that have suffered TBI produces improvement in neurological functioning, lessens the size of the brain lesion, reduces neuroinflammation, and stimulates the formation of new neurons. In the present study we used a controlled cortical impact TBI in mice and treated the mice either once (4 h post-TBI, 1-laser), or three daily applications (3-laser) with 810 nm CW laser 36 J/cm(2) at 50 mW/cm(2). Similar to previous studies, the neurological severity score improved in laser-treated mice compared to untreated TBI mice at day 14 and continued to further improve at days 21 and 28 with 3-laser being better than 1-laser. Mice were sacrificed at days 7 and 28 and brains removed for immunofluorescence analysis. Brain-derived neurotrophic factor (BDNF) was significantly upregulated by laser treatment in the dentate gyrus of the hippocampus (DG) and the subventricular zone (SVZ) but not in the perilesional cortex (lesion) at day 7 but not at day 28. Synapsin-1 (a marker for synaptogenesis, the formation of new connections between existing neurons) was significantly upregulated in lesion and SVZ but not DG, at 28 days but not 7 days. The data suggest that the benefit of LLLT to the brain is partly mediated by stimulation of BDNF production, which may in turn encourage synaptogenesis. Moreover the pleiotropic benefits of BDNF in the brain suggest LLLT may have wider applications to neurodegenerative and psychiatric disorders. Neurological Severity Score (NSS) for TBI mice. Brain-Derived Neurotrophic Factor;Synapsins Animals;Brain Injuries;Brain-Derived Neurotrophic Factor;Dentate Gyrus;Disease Models, Animal;Fluorescent Antibody Technique;Lateral Ventricles;Low-Level Light Therapy;Male;Mice, Inbred BALB C;Severity of Illness Index;Synapses;Synapsins;Treatment Outcome

Effects of low level laser therapy on attachment, proliferation, and gene expression of VEGF and VEGF receptor 2 of adipocyte-derived mesenchymal stem cells cultivated under nutritional deficiency. Low-level laser therapy (LLLT) has been shown to increase the proliferation of several cell types. We evaluated the effects of LLLT on adhesion, proliferation, and gene expression of vascular endothelial growth factor (VEGF) and type 2 receptor of VEGF (VEGFR2) at mesenchymal stem cells (MSCs) from human (hMSCs) and rat (rMSCs) adipose tissues on nutritional deficiencies. A dose-response curve was performed with cells treated with laser Ga-Al-As (660 nm, 30 mW) at energy of 0.7 to 9 J. Cell adhesion and proliferation were quantified 20, 40, and 60 min after LLLT and 24, 72, and 120 h after cultivation. Gene expression was verified by RT-PCR after 2 h of LLLT. A minor nutritional support caused a significant decrease in proliferation and adhesion of hMSCs and rMSCs. However, at the lowest LLLT dose (0.7 J), we observed a higher proliferation in hMSCs at standard condition shortly after irradiation (24 h). Adhesion was higher in hMSCs cultivated in controlled conditions at higher LLLT doses (3 and 9 J), and rMSCs show a reduction in the adhesion on 1.5 to 9 J. On nutritional deprivation, a 9 J dose was shown to reduce proliferation with 24 h and adhesion to all culture times in rMSCs. VEGF and VEGFR2 were increased after LLLT in both cell types. However, hMSCs under nutritional deprivation showed higher expression of VEGF and its receptor after irradiation with other laser doses. In conclusion, LLLT on human and rat MSCs might upregulate VEGF messenger RNA (mRNA) expression and modulate cell adhesion and proliferation distinctively. Culture Media;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2 Adipocytes;Animals;Cell Adhesion;Cell Proliferation;Cells, Cultured;Culture Media;Gene Expression;Humans;Low-Level Light Therapy;Mesenchymal Stem Cells;Rats;Up-Regulation;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2

Low-level laser therapy as a treatment for chronic pain.

Use of low-level laser therapy as monotherapy or concomitant therapy for male and female androgenetic alopecia. BACKGROUND: Androgenetic alopecia (AGA) is the most common form of hair loss in men and in women. Currently, minoxidil and finasteride are the treatments with the highest levels of medical evidence, but patients who exhibit intolerance or poor response to these treatments are in need of additional treatment modalities. OBJECTIVE: The aim was to evaluate the efficacy and safety of low-level laser therapy (LLLT) for AGA, either as monotherapy or as concomitant therapy with minoxidil or finasteride, in an office-based setting. MATERIALS AND METHODS: Retrospective observational study of male and female patients with AGA, treated with the 655 nm-HairMax Laser Comb(Â®), in an office-based setting. Efficacy was assessed with global photographic imaging. RESULTS: Of 32 patients (21 female, 11 male), 8 showed significant, 20 moderate, and 4 no improvement. Improvement was seen both with monotherapy and with concomitant therapy. Improvement was observed as early as 3 months and was sustained up to a maximum observation time of 24 months. No adverse reactions were reported. CONCLUSIONS: LLLT represents a potentially effective treatment for both male and female AGA, either as monotherapy or concomitant therapy. Combination treatments with minoxidil, finasteride, and LLLT may act synergistic to enhance hair growth.

Fluence-dependent effects of low-level laser therapy in myofascial trigger spots on modulation of biochemicals associated with pain in a rabbit model. Evidence strongly supports that low-level laser therapy (LLLT) is an effective physical modality for the treatment of pain associated with myofascial trigger points (MTrP). However, the effect of laser fluence (energy intensity in J/cm(2)) on biochemical regulation related to pain is unclear. To better understand the biochemical mechanisms modulated by high- and low-fluence LLLT at myofascial trigger spots (MTrSs; similar to human MTrPs) in skeletal muscles of rabbits, the levels of Î²-endorphin (Î²-ep), substance P (SP), tumor necrosis factor-Î± (TNF-Î±), and cyclooxygenase-2 (COX-2) were investigated in this study. New Zealand rabbits (2.5-3.0 kg in weight) were used in this study. High-fluence LLLT (27 J/cm(2)), low-fluence LLLT (4.5 J/cm(2)), or sham operations were applied on MTrSs of biceps femoris of rabbits for five sessions (one session per day). Effects of LLLT at two different fluences on biceps femoris, dorsal root ganglion (DRG), and serum were determined by Î²-ep, SP, TNF-Î±, and COX-2 immunoassays. LLLT irradiation with fluences of 4.5 and 27 J/cm(2) at MTrSs can significantly reduce SP level in DRG. LLLT with lower fluence of 4.5 J/cm(2) exerted lower levels of TNF-Î± and COX-2 expression in laser-treated muscle, but LLLT with higher fluence of 27 J/cm(2) elevated the levels of Î²-ep in serum, DRG, and muscle. This study demonstrated fluence-dependent biochemical effects of LLLT in an animal model on management of myofascial pain. The findings can contribute to the development of dosage guideline for LLLT for treating MTrP-induced pain. Tumor Necrosis Factor-alpha;Substance P;beta-Endorphin;Cyclooxygenase 2 Animals;Cyclooxygenase 2;Facial Pain;Ganglia, Spinal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;Rabbits;Substance P;Treatment Outcome;Tumor Necrosis Factor-alpha;beta-Endorphin

Specific features of early stage of the wound healing process occurring against the background of photodynamic therapy using fotoditazin photosensitizer-amphiphilic polymer complexes. There is a growing demand on the studies of the wound healing potentials of photodynamic therapy. Here we analyze the effects of Fotoditazin, an e6 chlorine derivative, and its complexes with amphiphilic polymers, on the early stage of wound healing in a rat model. A skin excision wound model with prevented contraction was developed in male albino rats divided into eight groups according to the treatment mode. All animals received injections of one of the studied compositions into their wound beds and underwent low-intensity laser irradiation or stayed un-irradiated. The clinical monitoring and histological examination of the wounds were performed. It has been found that all the Fotoditazin formulations have significant effects on the early stage of wound healing. The

superposition of the inflammation and regeneration was the main difference between groups. The aqueous solution of Fotoditazin alone induced a significant capillary hemorrhage, while its combinations with amphiphilic polymers did not. The best clinical and morphological results were obtained for the Fotoditazin-Pluronic F127 composition. Compositions of Fotoditazin and amphiphilic polymers, especially Pluronic F127, probably, have a great potential for therapy of wounds. Their effects can be attributed to the increased regeneration and suppressed reactions changes at the early stages of repair. Chlorophyllides;Photosensitizing Agents;Polymers;Porphyrins;phytochlorin Animals;Chlorophyllides;Photochemotherapy;Photosensitizing Agents;Polymers;Porphyrins;Rats;Wound Healing

Linear scarring following treatment with a 595-nm pulsed dye laser. Pulsed dye laser (PDL) treatment is well established and has been reported to be safe and effective in the management of superficial hemangiomas, port-wine stains, and other vascular lesions. Although hyperpigmentation is quite common, other side effects such as hypopigmentation, ulceration, hemorrhaging, atrophic scarring, and hypertrophic scarring are rare. We report the case of a 42-year-old woman who developed atrophic scarring of the nasal alae following cosmetic PDL treatment. Patients receiving PDL treatment should be warned about the risk for the development of scarring. Dermatologic Agents;Hyaluronic Acid Adult;Cicatrix;Dermatologic Agents;Female;Humans;Hyaluronic Acid;Lasers;Low-Level Light Therapy;Nasolabial Fold;Telangiectasis;Treatment Outcome

[Effect of intravenous laser irradiation on some blood biochemical indicators in the acute stage of lacunar infarcts]. OBJECTIVE: To investigate the dynamics of lipid metabolism, C-reactive protein (CRP), lipid peroxidation and antioxidant system in lacunar infarction (LI) in chronic cerebral ischemia. MATERIAL AND METHODS: Two groups of patients were studied. The main group included 31 patients who received intravenous laser irradiation of blood (ILIB) with semiconductor laser (wavelength - 0.67 microns, the power output - 3-2 mW) in addition to standard treatment. Patients of the control group (n=22) received only standard treatment. RESULTS: A statistically significant decrease in total cholesterol levels to normal values due to the significant reduction of the content of antiatherogenic fraction of cholesterol (high-density lipoprotein and atherogenic low-density lipoprotein cholesterol) was found in the main group after treatment. The reduction in atherogenic cholesterol fractions in both groups was associated with the decrease in apolipoprotein B level. The level of CRP was higher than normal in the main and control groups of patients before and after treatment, which indicated the risk of vascular diseases in patients with LI. After treatment, superoxide dismutase activity returned to normal values. In patients of the main group, the catalase activity increased while the level of reduced glutathione did not change and lipid peroxidation products remained on the high level. CONCLUSION: Additional antioxidant therapy is needed for these patients. Antioxidants;Lipoproteins, LDL;Picolines;C-Reactive Protein;Catalase;Superoxide Dismutase;6-methyl-2-ethyl-3-hydroxypyridine Aged;Antioxidants;Atherosclerosis;Blood;C-Reactive Protein;Catalase;Female;Humans;Lipid Metabolism;Lipid Peroxidation;Lipoproteins, LDL;Low-Level Light Therapy;Male;Middle Aged;Picolines;Stroke, Lacunar;Superoxide Dismutase

Doxycycline fluorescence-guided Er:YAG laser ablation combined with Nd:YAG/diode laser biostimulation for treating bisphosphonate-related osteonecrosis of the jaw. Laser therapy and fluorescence-guided surgery are highly reliable and predictable methods, but their combination has not been found to yield useful outcomes. We present a new therapeutic approach combining fluorescence-guided Er:YAG laser ablation with Nd:YAG/diode laser biostimulation for bisphosphonate-related osteonecrosis of the jaw (BRONJ). A woman was treated with zoledronic acid for bone metastasis from clear cell renal cell carcinoma and subsequently developed BRONJ in the left jaw. The management protocol included perioperative medical therapy (1% chlorhexidine gel, rifamycin, and doxycycline for 10 preoperative and 7 postoperative days), Er:YAG laser ablation

guided by doxycycline fluorescence in vital bone under UV light, and Nd:YAG/diode laser biostimulation. The lesion regressed from stage 3 to stage 1 and showed nearly complete healing after laser therapy (3 and 23 cycles of ablation and biostimulation, respectively). These preliminary findings suggest the feasibility of the new approach, which isÂ minimally invasive and biostimulative and causes very low morbidity. Bisphosphonate-Associated Osteonecrosis of the Jaw;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Mandibular Diseases;Middle Aged;Radiography, Panoramic;Tomography, X-Ray Computed

Effect of low-level laser therapy on the gene expression of collagen and vascular endothelial growth factor in a culture of fibroblast cells in mice. Low-level laser therapy treatment (LLLT) is widely used in rehabilitation clinics with the aim of accelerating the process of tissue repair; however, the molecular bases of the effect of LLLT have not been fully established. The aim of the present study was to evaluate the influence of the exposure of different doses of LLLT on the expression of collagen genes type I alpha 1 (COL1Î±1) and vascular endothelial growth factor (VEGF) in the fibroblast cells of mice (L929) cultivated in vitro. Fibroblast cells were irradiated with a Gallium-Arsenide laser (904 nm) every 24 h for 2 consecutive days, stored in an oven at 37 Â°C, with 5% CO2 and divided into 3 groups: G1-control group, G2-irradiated at 2 J/cm(2), and G3-irradiated at 3 J/cm(2). After irradiation, the total RNA was extracted and used in the complementary DNA (cDNA) synthesis. The gene expression was analyzed by real-time polymerase chain reaction. The cells irradiated in G2 exhibited a statistically significant growth of 1.78 in the expression of the messenger RNA (mRNA) of the COL1Î±1 gene (pâ€‰=â€‰0.036) in comparison with G1 and G3. As for the VEGF gene, an increase in expression was observed in the two irradiated groups in comparison with the control group. There was an increase in expression in G2 of 2.054 and G3 of 2.562 (pâ€‰=â€‰0.037) for this gene. LLLT (904 nm) had an influence on the expression of the genes COL1Î±1 (2 J/cm(2)) and VEGF (2 e 3 J/cm(2)) in a culture of the fibroblast cells of mice. Collagen Type I;Collagen Type I, alpha 1 Chain;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, mouse Animals;Cell Line;Collagen Type I;Collagen Type I, alpha 1 Chain;Fibroblasts;Gene Expression;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Vascular Endothelial Growth Factor A;Wound Healing

Analysis of Potassium Titanyl Phosphate Laser Settings and Voice Outcomes in the Treatment of Reinke's Edema. OBJECTIVE: Despite increased clinical utility of the 532-nm potassium titanyl phosphate (KTP) laser, no studies have examined outcomes for Reinke's edema (RE) as a function of laser parameters and initial treatment effects. Variability in delivery parameters, fiber-to-tissue distance, and immediate end-tissue effects limits universal application of existing study outcomes. We examine voice outcomes using standardized treatment classification, providing justification for laser parameter selection and immediate tissue effect in clinical use. METHODS: Retrospective review of 9 patients who underwent KTP laser treatment for RE. Demographics, RE severity, laser settings, total laser energy, and immediate tissue effects were correlated with quantified voice outcomes. RESULTS: An average of 157 joules (6-640 J) was delivered over a 0.369-second exposure time (0.1-0.9 seconds). Immediate tissue effects varied from nonablative treatment (type I and type II) to ablation without tissue removal (type III). Overall, Voice Handicap Index-10 (VHI-10) decreased by 8.23; improvement was most pronounced with type II treatments (delta VHI-10=12). No complications were encountered. CONCLUSION: Potassium titanyl phosphate laser can be safely and effectively used to improve voice in RE patients regardless of severity. This is the first study to provide detailed information on laser settings, energy delivery, and treatment effect in RE management; these results may guide clinical use of this modality, especially for novice laser surgeons. Phosphates;potassium titanylphosphate;Titanium Follow-Up Studies;Humans;Laryngeal Edema;Laryngoscopy;Lasers, Solid-State;Low-Level Light Therapy;Phosphates;Titanium;Treatment Outcome;Vocal Cords;Voice Quality

The 1,470-nm bare-fiber diode laser ablation of the great saphenous vein and small saphenous vein at 1-year follow-up using 8-12 W and a mean linear endovenous energy density of 72 J/cm. PURPOSE: To demonstrate 1-year outcomes after low-energy endovenous laser ablation (EVLA) of incompetent saphenous veins with linear endovenous energy density (LEED) of 80 J/cm or lower with the use of a 1,470-nm diode laser. MATERIALS AND METHODS: Incompetent saphenous veins in 236 patients (355 limbs; Clinical/Etiology/Anatomy/Pathophysiology classifications of C2-C4) were treated by EVLA with a bare-tipped 1,470-nm laser with LEED no greater than 80 J/cm (mean, 72.4 J/cm) and laser power of 8-12 W. Patients were evaluated clinically and with duplex ultrasonography at 1 week and 1, 3, 6, and 12 months after EVLA to assess the technical and clinical success and complication rates. RESULTS: In the 355 limbs, the technical success rate was 100%. The great saphenous vein (GSV) remained occluded in all 229 limbs (100%) after 1 week, 202 of 203 limbs (99.5%) after 1 month, 157 of 158 limbs after 3 months (99.3%), all 99 limbs after 6 months (100%), and all 41 limbs after 1 year (100%). The small saphenous vein (SSV) remained occluded in all 103 limbs (100%) after 1 week, all 94 limbs (100%) after 1 month, 68 of 69 limbs (98.5%) after 3 months, 40 of 41 limbs (97.5%) after 6 months, and all 14 limbs after 1 year (100%). Two GSVs and two SSVs were recanalized and underwent repeated EVLA. No major complications occurred, although bruising (21% of cases), pain (15%), and paresthesia (4%) were observed. CONCLUSIONS: Low-energy EVLA with the use of a 1,470-nm laser with LEED of 80 J/cm or lower is an effective, safe, and technically successful option for the treatment of incompetent saphenous veins. Adolescent;Adult;Aged;Aged, 80 and over;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Saphenous Vein;Treatment Outcome;Ultrasonography, Doppler, Duplex;Venous Insufficiency;Young Adult

Fractional CO2 laser is as effective as Q-switched ruby laser for the initial treatment of a traumatic tattoo. BACKGROUND AND OBJECTIVE: Q-switched laser treatments are considered the standard method for removing both regular and traumatic tattoos. Recently, the removal of tattoo ink using ablative fractional lasers has been reported. Ablative fractional CO2 laser and q-switched ruby laser treatments were used in a split-face mode to compare the safety and efficacy of the two types of laser in removing a traumatic tattoo caused by the explosion of a firework. STUDY DESIGN/PATIENTS AND METHODS: A male patient suffering from a traumatic tattoo due to explosive deposits in his entire face was subjected to therapy. A series of eleven treatments were performed. The right side of the face was always treated using an ablative fractional CO2 laser, whereas the left side was treated only using a q-switched ruby laser. RESULTS: After a series of eleven treatments, the patient demonstrated a significant lightening on both sides of his traumatic tattoo, with no clinical difference. After the first six treatments, the patient displayed greater lightening on the right side of his face, whereas after another five treatments, the left side of the patient's face appeared lighter. No side effects were reported. CONCLUSIONS: In the initial stage of removing the traumatic tattoo, the ablative fractional laser treatment appeared to be as effective as the standard ruby laser therapy. However, from the 6th treatment onward, the ruby laser therapy was more effective. Although ablative fractional CO2 lasers have the potential to remove traumatic tattoos, they remain a second-line treatment option. Adult;Cosmetic Techniques;Explosions;Face;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Wounds and Injuries

Lasers in esthetic dentistry: soft tissue photobiomodulation, hard tissue decontamination, and ceramics conditioning. The increasing concern and the search for conservative dental treatments have resulted in the development of several new technologies. Low and high power lasers can be cited as one of these new technologies. Low power lasers act at cellular level leading to pain reduction, modulation of inflammation, and improvement of tissue healing. High power lasers act by increasing temperature and have the potential to promote microbial reduction and ablation of hard

and soft tissues. The clinical application of both low and high power lasers requires specific knowledge concerning laser interaction with biological tissues, so that the correct irradiation protocol can be established. The present case report describes the clinical steps of two metal-ceramic crowns development in a 60-year-old patient. Three different laser wavelengths were applied throughout the treatment with different purposes: Nd:YAG laser (1,064â€‰nm) for dentin decontamination, diode (660â€‰nm) for soft tissue biomodulation, and Er:YAG laser (2,940â€‰nm) for inner ceramic surface conditioning. Lasers were successfully applied in the present case report as coadjutant in the treatment. This coadjutant technology can be a potential tool to assist treatment to reach the final success.

Efficacy of needle irrigation, EndoActivator, and photon-initiated photoacoustic streaming technique on removal of double and triple antibiotic pastes. INTRODUCTION: Photon-induced photoacoustic streaming (PIPS) is a novel technique used for the removal of material on root canal walls, such as bacteria and the smear layer. This study evaluated the efficacy of needle irrigation, the EndoActivator System (Dentsply Tulsa Dental Specialties, Tulsa, OK), and PIPS on the removal of antibiotic pastes from an artificial groove created in a root canal. METHODS: Root canal preparation was performed up to size #40 on 84 extracted single-rooted teeth using ProTaper rotary instruments (Dentsply Maillefer, Ballaigues, Switzerland). The specimens were then split longitudinally, and 2 standardized grooves were prepared in the coronal and apical part of each segment. Double (DAP) and triple antibiotic pastes (TAP) were placed in the grooves for 4 weeks, and the root halves were reassembled. Needle irrigation, the EndoActivator System, and PIPS were used for the removal of DAP and TAP. The root segments were disassembled, and the amount of remaining antibiotic pastes was evaluated under a stereomicroscope at 20Ã— magnification using a 4-grade scoring system. The data were evaluated statistically using Mann-Whitney U tests with a 95% confidence level (P = .05). RESULTS: PIPS removed significantly more antibiotic pastes than the EndoActivator and needle irrigation (P < .001). The EndoActivator was superior to needle irrigation in removing antibiotic pastes (P < .001). There were no statistically significant differences between DAP and TAP and between coronal and apical thirds in their removing from artificially created grooves (P > .05). CONCLUSIONS: PIPS was more effective in removing both DAP and TAP from artificial grooves in root canals than the EndoActivator System and needle irrigation. The EndoActivator was also more effective than needle irrigation. It is difficult to completely remove antibiotic pastes from root canals. Anti-Bacterial Agents;Root Canal Irrigants;Metronidazole;Ciprofloxacin;Minocycline Anti-Bacterial Agents;Ciprofloxacin;Dental Pulp Cavity;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Metronidazole;Minocycline;Needles;Photoacoustic Techniques;Photography;Random Allocation;Root Canal Irrigants;Root Canal Preparation;Surface Properties;Therapeutic Irrigation;Tooth Apex

Severe unexpected adverse effects after permanent eye makeup and their management by Q-switched Nd:YAG laser. Permanent makeup is a cosmetic tattoo that is used to enhance one's appearance, and which has become more popular among middle-aged and elderly women. A couple of benefits seem to be associated with permanent tattoos in the elderly: saving time (wake up with makeup); poor eyesight (difficult to apply makeup); and saving money. On the other hand, cosmetic tattoos bear the same risks as other tattoo procedures. We report on fading and unintended hyperpigmentation after tattooing on eyebrows and eyelids, and discuss the scientific and anatomical background behind the possible cause. Dermatochalasis may be a possible risk factor for excessive unwanted discolorations. Q-switched neodymium-doped yttrium aluminum garnet laser is an appropriate and safe therapeutic tool that can manage such adverse effects. Consumer protection warrants better information and education of the risks of cosmetic tattoos - in particular, for elderly women. Coloring Agents;yttrium-aluminum-garnet;Yttrium;Aluminum

Aged;Aluminum;Coloring Agents;Eyebrows;Eyelids;Female;Humans;Low-Level Light Therapy;Middle Aged;Risk Factors;Tattooing;Treatment Outcome;Yttrium

Platelet rich plasma versus laser therapy in lateral epicondylitis of elbow. BACKGROUND: Platelet rich plasma (PRP) extract has shown to be a general stimulation for repair and currently used widely in various sports injury. A prospective observational study was done to assess the efficacy of autologous PRP injection in lateral epicondylitis of elbow, and compare the result with low level laser therapy. MATERIALS AND METHODS: The trial was conducted at a tertiary care center for a period of 2 years. Eighty-one patients with chronic lateral epicondylitis were divided into two groups. PRP group (n = 39) and laser therapy group (n = 42). The primary analysis included Nirschl pain score, local tenderness, pain on wrist extension, grip strength, elbow swelling were clinically assessed at different interval of followup (minimum followup: 52 weeks) and; clinical and functional outcome evaluated at final followup. The statistical analysis were done. RESULTS: The mean Nirschl pain score decreased significantly from baseline in PRP when compared with low level laser therapy (P â‰¤ 0.05). CONCLUSIONS: Treatment of patients with chronic lateral epicondylitis with PRP extract reduced pain and significantly increased function, exceeding the effect of low level laser therapy on long term followup. Low-level laser therapy is better in the short term period, but on long term followup injection PRP therapy is better than laser therapy in lateral epicondylitis.

Phototherapy 660Â nm for the prevention of radiodermatitis in breast cancer patients receiving radiation therapy: study protocol for a randomized controlled trial. BACKGROUND: Breast neoplasms are the second most common type of cancer worldwide, and radiation therapy is a key component of their treatment. Acute skin reactions are one of the most common side effects of radiation therapy, and prevention of this adverse event has been investigated in several studies. However, a clinically applicable, preventative treatment remains unavailable. It has been demonstrated that application of a low-power laser can promote tissue repair. Therefore, the aim of this trial is to evaluate the effectiveness of an indium gallium aluminum phosphorus (InGaAlP) laser operated at 660Â nm in preventing radiodermatitis in women undergoing adjuvant radiotherapy for breast cancer. METHODS/DESIGN: This is a two-arm, randomized controlled trial. A total of 52 patients undergoing radiotherapy for breast cancer (stages I to III) will be enrolled. Patients will be randomly assigned to an intervention group to receive laser therapy (nâ€‰=â€‰26) or a control group to receive a placebo (nâ€‰=â€‰26). The laser or placebo will be applied five days a week, immediately before each radiotherapy session. Skin reactions will then be graded weekly by a nurse, a radiotherapist, and an oncologist (all of whom will be blinded) using the Common Toxicity Criteria (CTC) developed by the National Cancer Institute and the Acute Radiation Morbidity Scoring Criteria developed by the Radiation Therapy Oncology Group. Patients will also answer a modified visual analogue scale for pain (a self-evaluation questionnaire). Primary and secondary outcomes will be the prevention of radiodermatitis and pain secondary to radiodermatitis, respectively. DISCUSSION: The ideal tool for preventing radiodermatitis is an agent that mediates DNA repair or promotes cell proliferation. Application of a low-power laser has been shown to promote tissue repair by reducing inflammation and inducing collagen synthesis. Moreover, this treatment approach has not been associated with adverse events and is cost-effective. Thus, the results of this ongoing trial may establish whether use of a low-power laser represents an ideal treatment option for the prevention of radiodermatitis. TRIAL REGISTRATION: ClinicalTrials.gov identifier: NCT02003599. Registered on 2 December 2013. Breast Neoplasms;Clinical Protocols;Female;Humans;Low-Level Light Therapy;Phototherapy;Radiodermatitis;Radiotherapy, Adjuvant

Effect of diode laser in the treatment of patients with nonspecific chronic low back pain: a randomized controlled trial. BACKGROUND DATA: Low back pain is a common, highly debilitating condition, whose severity is variable. This study evaluated the efficacy of treatment with Ga-Al-As

diode laser (980â€‰nm) with a large diameter spot (32â€‰cm(2)), in association with exercise therapy, in reducing pain. OBJECTIVE: The present study aimed to evaluate the pain reduction efficacy of treatment with the Ga-Al-As diode laser (980â€‰nm) in combination with exercise therapy, in patients with chronic low back pain (CLBP). METHODS: This study evaluated 100 patients with CLBP (mean age 60 years) who were randomly assigned to two groups. The laser plus exercises group (Laser+EX: 50 patients) received low-level laser therapy (LLLT) with a diode laser, 980â€‰nm, with a specific handpiece [32â€‰cm(2) irradiation spot size, power 20â€‰W in continuous wave (CW), fluence 37.5J/cm(2), total energy per point 1200â€‰J] thrice weekly, and followed a daily exercise schedule for 3 weeks (5 days/week). The exercises group (EX: 50 patients) received placebo laser therapy plus daily exercises. The outcome was evaluated on the visual analogue pain scale (VAS), before and after treatment. RESULTS: At the end of the 3 week period, the Laser+EX group showed a significantly greater decrease in pain than did the EX group. There was a significant difference between the two groups, with average Î” VAS scores of 3.96 (Laser+EX group) and 2.23 (EX group). The Student's t test demonstrated a statistically significant difference between the two groups, at $p<0.001$. CONCLUSIONS: This study demonstrated that the use of diode laser (980â€‰nm) with large diameter spot size, in association with exercise therapy, appears to be effective. Such treatment might be considered a valid therapeutic option within rehabilitation programs for nonspecific CLBP. Adult;Aged;Aged, 80 and over;Chronic Disease;Combined Modality Therapy;Exercise Therapy;Female;Humans;Lasers, Semiconductor;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Treatment Outcome

Combination of LED light and platelet-derived growth factor to accelerate dentoalveolar osteogenesis. AIM: This study aimed to evaluate the adjunctive effect of LED light in platelet-derived growth factor (PDGF)-aided dentoalveolar osteogenesis. MATERIAL AND METHODS: Full-thickness osseous wounds were created on rat maxillae and were either unfilled or filled with poly-(D,L-lactide) and poly-(D,L-lactide-co-glycolide) microspheres encapsulating PDGF. Animals received daily 660 Â± 25 nm LED light irradiation at 0, 10 (LD), or 20 (HD) J/cm(2) , were killed at days 4-28 (n = 6/group/time) and evaluated by microcomputed tomography (micro-CT), histology, and the expressions of osteopontin and tartrate-resistant acid phosphatase (TRAP). RESULTS: Greater osteogenesis was noted in the PDGF-treated defects at day 14. Under the LED light irradiation, osteogenesis was significantly greater in both LD and HD groups of the non-PDGF-treated defects, but only in the LD group of the PDGF-treated defects. No significant differences in osteogenesis among groups were noted at day 28. Greater bone marrow space was noted in the LED light-irradiated specimens, especially in the PDGF-treated defects at both time points. Osteopontin was significantly promoted in the LD group at both time points, and TRAP was significantly promoted in all LED light-irradiated groups at day 28. CONCLUSION: LED light could an adjunct to promote early PDGF-aided dentoalveolar osteogenesis by facilitating the osteoblast-osteoclast coupling. Biocompatible Materials;Drug Carriers;Isoenzymes;Polyesters;Proto-Oncogene Proteins c-sis;Spp1 protein, rat;Osteopontin;Becaplermin;Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid;Acid Phosphatase;Tartrate-Resistant Acid Phosphatase Acid Phosphatase;Animals;Becaplermin;Biocompatible Materials;Bone Density;Bone Marrow;Combined Modality Therapy;Drug Carriers;Isoenzymes;Lactic Acid;Low-Level Light Therapy;Male;Maxillary Diseases;Microspheres;Osteoblasts;Osteoclasts;Osteogenesis;Osteopontin;Polyesters;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer;Proto-Oncogene Proteins c-sis;Random Allocation;Rats;Rats, Sprague-Dawley;Tartrate-Resistant Acid Phosphatase;Time Factors;Tooth Socket;X-Ray Microtomography

Transdentinal cell photobiomodulation using different wavelengths. OBJECTIVE: The aim of this study was to investigate the effects of transdentinal irradiation with different light-emitting diode

(LED) parameters on odontoblast-like cells (MDPC-23). METHODS AND MATERIALS: Human dentin discs (0.2 mm thick) were obtained, and cells were seeded on their pulp surfaces with complete culture medium (Dulbecco modified Eagle medium). Discs were irradiated from the occlusal surfaces with LED at different wavelengths (450, 630, and 840 nm) and energy densities (0, 4, and 25 J/cm(2)). Cell viability (methyltetrazolium assay), alkaline phosphatase activity (ALP), total protein synthesis (TP), and cell morphology (scanning electron microscopy) were evaluated. Gene expression of collagen type I (Col-I) was analyzed by quantitative polymerase chain reaction (PCR). Data were analyzed by the Mann-Whitney test with a 5% significance level. RESULTS: Higher cell viability (21.8%) occurred when the cells were irradiated with 630 nm LED at 25 J/cm(2). Concerning TP, no statistically significant difference was observed between irradiated and control groups. A significant increase in ALP activity was observed for all tested LED parameters, except for 450 nm at 4 J/cm(2). Quantitative PCR showed a higher expression of Col-I by the cells subjected to infrared LED irradiation at 4 J/cm(2). More attached cells were observed on dentin discs subjected to irradiation at 25 J/cm(2) than at 4 J/cm(2). CONCLUSION: The infrared LED irradiation at an energy density of 4 J/cm(2) and red LED at an energy density of 25 J/cm(2) were the most effective parameters for transdentinal photobiomodulation of cultured odontoblast-like cells. Collagen;Alkaline Phosphatase Alkaline Phosphatase;Cell Line;Cell Survival;Collagen;Dentin;Humans;Light;Microscopy, Electron, Scanning;Odontoblasts;Phototherapy;Polymerase Chain Reaction

Low-level laser/light therapy for androgenetic alopecia. Androgenetic alopecia (AGA) is a persistent and pervasive condition that affects men worldwide. Some common treatment options for AGA include hair prosthetics, oral and topical medications, and surgical hair restoration (SHR). Pharmaceutical and SHR treatments are associated with limitations including adverse side effects and significant financial burden. Low-level laser or light (LLL) devices offer alternative treatment options that are not typically associated with adverse side effects or significant costs. There are clinic- and home-based LLL devices. One home-based laser comb device has set a standard for others; however, this device requires time devoted to carefully moving the comb through the hair to allow laser penetration to the scalp. A novel helmet-like LLL device for hair growth has proven effective in preliminary trials and allows for hands-free use. Regardless, there are few clinical trials that have been conducted regarding LLL devices for AGA and results are mixed. Further research is required to establish the true efficacy of these devices for hair growth in comparison to existing alternative therapies. Alopecia;Equipment Design;Humans;Low-Level Light Therapy;Male;Treatment Outcome

Enhanced angiogenic effect of adipose-derived stromal cell spheroid with low-level light therapy in hind limb ischemia mice. The aim of this study was to investigate the effects of low-level laser therapy (LLLT) on transplanted human adipose-derived mesenchymal stem cells (hASCs) spheroid in a hind limb ischemia animal model. LLLT, hASCs spheroid and hASCs spheroid transplantation with LLLT (spheroid + LLLT) were applied to the ischemic hind limbs in athymic mice. The survival, differentiation and secretion of vascular endothelial growth factor (VEGF), basic fibroblast growth factor (FGF), and hepatocyte growth factor (HGF) of the spheroid ASCs were evaluated by immunohistochemistry and western blots. Spheroid + LLLT group had enhanced the tissue regeneration, including angiogenesis, compared with the ASC group. The spheroid ASCs contributed to tissue regeneration via differentiation and secretion of growth factors. In the spheroid + LLLT group, the survival of spheroid hASCs increased with a concomitant decrease in apoptosis of spheroid hASCs in the ischemic hind limb. The secretion of growth factors was stimulated in the spheroid + LLLT group compared with the ASCs and spheroid group. These data suggested that LLLT is an effective biostimulator of spheroid hASCs in tissue regeneration that enhanced the survival of ASCs and stimulated the secretion of growth factors in the ischemic hind limb. Angiogenesis Inducing

Agents;Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2;Hepatocyte Growth Factor Adipocytes;Angiogenesis Inducing Agents;Animals;Apoptosis;Cell Differentiation;Cell Survival;Disease Models, Animal;Fibroblast Growth Factor 2;Hepatocyte Growth Factor;Hindlimb;Ischemia;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mice;Mice, Inbred BALB C;Mice, Nude;Vascular Endothelial Growth Factor A;Wound Healing
Solar urticaria to visible light triggered by light-emitting diode therapy. Female;Humans;Middle Aged;Phototherapy;Rosacea;Urticaria
Does the Implant Surgical Technique Affect the Primary and/or Secondary Stability of Dental Implants? A Systematic Review. Background. A number of surgical techniques for implant site preparation have been advocated to enhance the implant of primary and secondary stability. However, there is insufficient scientific evidence to support the association between the surgical technique and implant stability. Purpose. This review aimed to investigate the influence of different surgical techniques including the undersized drilling, the osteotome, the piezosurgery, the flapless procedure, and the bone stimulation by low-level laser therapy on the primary and/or secondary stability of dental implants. Materials and methods. A search of PubMed, Cochrane Library, and grey literature was performed. The inclusion criteria comprised observational clinical studies and randomized controlled trials (RCTs) conducted in patients who received dental implants for rehabilitation, studies that evaluated the association between the surgical technique and the implant primary and/or secondary stability. The articles selected were carefully read and classified as low, moderate, and high methodological quality and data of interest were tabulated. Results. Eight clinical studies were included then they were classified as moderate or high methodological quality and control of bias. Conclusions. There is a weak evidence suggesting that any of previously mentioned surgical techniques could influence the primary and/or secondary implant stability.
The growth of human scalp hair in females using visible red light laser and LED sources. BACKGROUND AND OBJECTIVES: Low level laser (light) therapy (LLLT) has been demonstrated to promote hair growth in males. A double-blind randomized controlled trial was undertaken to define the safety and physiologic effects of LLLT on females with androgenic alopecia. METHODS: Forty-seven females (18-60 years old, Fitzpatrick I-IV, and Ludwig-Savin Baldness Scale I-2, I-3, I-4, II-1, II-2 baldness patterns) were recruited. A transition zone scalp site was selected; hairs were trimmed to 3â€‰mm height; the area was tattooed and photographed. The active group received a "TOPHAT655" unit containing 21, 5â€‰mW diode lasers (655â€‰Â±â€‰5â€‰nm) and 30 LEDS (655â€‰Â±â€‰20â€‰nm), in a bicycle-helmet like apparatus. The placebo group unit appeared identical, containing incandescent red lights. Patients treated at home every other dayâ€‰Ã—â€‰16 weeks (60 treatments, 67â€‰J/cm(2) irradiance/25â€‰minute treatment, 2.9â€‰J dose), with follow up and photography at 16 weeks. A masked 2.85â€‰cm(2) photographic area was evaluated by another blinded investigator. The primary endpoint was the percent increase in hair counts from baseline. RESULTS: Forty-two patients completed the study (24 active, 18 sham). No adverse events or side effects were reported. Baseline hair counts were 228.2â€‰Â±â€‰133.4 (Nâ€‰=â€‰18) in the sham and 209.6â€‰Â±â€‰118.5 (Nâ€‰=â€‰24) in the active group (Pâ€‰=â€‰0.642). Post Treatment hair counts were 252.1â€‰Â±â€‰143.3 (Nâ€‰=â€‰18) in the sham group and 309.9â€‰Â±â€‰166.6 (Nâ€‰=â€‰24) in the active group (Pâ€‰=â€‰0.235). The change in hair counts over baseline was 23.9â€‰Â±â€‰30.1 (Nâ€‰=â€‰18) in the sham group and 100.3â€‰Â±â€‰53.4 (Nâ€‰=â€‰24) in the active group (Pâ€‰<â€‰0.0001). The percent hair increase over the duration of the study was 11.05â€‰Â±â€‰48.30 (Nâ€‰=â€‰18) for the sham group and 48.07â€‰Â±â€‰17.61 (Nâ€‰=â€‰24) for the active group (Pâ€‰<â€‰0.001). This demonstrates a 37% increase in hair growth in the active treatment group as compared to the placebo group. CONCLUSIONS: LLLT of the scalp at 655â€‰nm significantly improved hair counts in

women with androgenetic alopecia at a rate similar to that observed in males using the same parameters. Adolescent;Adult;Alopecia;Double-Blind Method;Female;Hair;Humans;Low-Level Light Therapy;Middle Aged;Phototherapy;Scalp;Treatment Outcome

Effects of low-level laser therapy on skeletal muscle repair: a systematic review. A review of the literature was performed to demonstrate the most current applicability of low-level laser therapy (LLLT) for the treatment of skeletal muscle injuries, addressing different lasers, irradiation parameters, and treatment results in animal models. Searches were performed in the PubMed/MEDLINE, SCOPUS, and SPIE Digital Library databases for studies published from January 2006 to August 2013 on the use of LLLT for the repair of skeletal muscle in any animal model. All selected articles were critically appraised by two independent raters. Seventeen of the 36 original articles on LLLT and muscle injuries met the inclusion criteria and were critically evaluated. The main effects of LLLT were a reduction in the inflammatory process, the modulation of growth factors and myogenic regulatory factors, and increased angiogenesis. The studies analyzed demonstrate the positive effects of LLLT on the muscle repair process, which are dependent on irradiation and treatment parameters. The findings suggest that LLLT is an excellent therapeutic resource for the treatment of skeletal muscle injuries in the short-term. Animals;Disease Models, Animal;Low-Level Light Therapy;Muscle, Skeletal;Muscular Diseases;Regeneration;Wound Healing

Low-level laser irradiation improves functional recovery and nerve regeneration in sciatic nerve crush rat injury model. The development of noninvasive approaches to facilitate the regeneration of post-traumatic nerve injury is important for clinical rehabilitation. In this study, we investigated the effective dose of noninvasive 808-nm low-level laser therapy (LLLT) on sciatic nerve crush rat injury model. Thirty-six male Sprague Dawley rats were divided into 6 experimental groups: a normal group with or without 808-nm LLLT at 8 J/cm(2) and a sciatic nerve crush injury group with or without 808-nm LLLT at 3, 8 or 15 J/cm(2). Rats were given consecutive transcutaneous LLLT at the crush site and sacrificed 20 days after the crush injury. Functional assessments of nerve regeneration were analyzed using the sciatic functional index (SFI) and hindlimb range of motion (ROM). Nerve regeneration was investigated by measuring the myelin sheath thickness of the sciatic nerve using transmission electron microscopy (TEM) and by analyzing the expression of growth-associated protein 43 (GAP43) in sciatic nerve using western blot and immunofluorescence staining. We found that sciatic-injured rats that were irradiated with LLLT at both 3 and 8 J/cm(2) had significantly improved SFI but that a significant improvement of ROM was only found in rats with LLLT at 8 J/cm(2). Furthermore, the myelin sheath thickness and GAP43 expression levels were significantly enhanced in sciatic nerve-crushed rats receiving 808-nm LLLT at 3 and 8 J/cm(2). Taken together, these results suggest that 808-nm LLLT at a low energy density (3 J/cm(2) and 8 J/cm(2)) is capable of enhancing sciatic nerve regeneration following a crush injury. GAP-43 Protein Animals;GAP-43 Protein;Hindlimb;Infrared Rays;Low-Level Light Therapy;Male;Microscopy, Electron, Transmission;Myelin Sheath;Nerve Crush;Nerve Regeneration;Range of Motion, Articular;Rats;Rats, Sprague-Dawley;Recovery of Function;Sciatic Nerve;Sciatic Neuropathy

Are the mitochondrial respiratory complexes blocked by NO the targets for the laser and LED therapy? Effects of laser (442 and 532 nm) and light-emitting diode (LED) (650 nm) radiation on mitochondrial respiration and mitochondrial electron transport rate (complexes II-III and IV) in the presence of nitric oxide (NO) were investigated. It was found that nitric oxide (300 nM-10 Î¼M) suppresses mitochondrial respiration. Laser irradiation of mitochondria (442 nm, 3 J cm(-2)) partly restored mitochondrial respiration (approximately by 70 %). Irradiation with green laser (532 nm) or red LED (650 nm) in the same dose had no reliable effect. Evaluation of mitochondrial electron transport rate in complexes II-III and IV and effects of nitric oxide demonstrated almost similar sensitivity of complex II-III and IV to NO, with approximately 50 % inhibition at NO concentration of 3

Î¼M. Subsequent laser or LED irradiation (3 J cm(-2)) showed partial recovery of electron transport only in complex IV and only under irradiation with blue light (442 nm). Our results support the hypothesis of the crucial role of cytochrome c oxidase (complex IV) in photoreactivation of mitochondrial respiration suppressed by NO. Nitric Oxide;Electron Transport Complex II;Electron Transport Complex IV;Electron Transport Complex III Animals;Electron Transport Complex II;Electron Transport Complex III;Electron Transport Complex IV;Lasers, Gas;Low-Level Light Therapy;Male;Mitochondria, Liver;Nitric Oxide;Oxygen Consumption;Rats

Light coaxes stem cells to repair teeth. Animals;Dental Pulp;Dentin;Low-Level Light Therapy;Regeneration;Stem Cells

Therapeutic update on hyperhidrosis. Dermatologic Agents Dermatologic Agents;Humans;Hyperhidrosis;Iontophoresis;Low-Level Light Therapy;Sweat Glands

Defining a therapeutic window for laser irradiation (810â€‰nm) applied to the inguinal region to ameliorate diabetes in diabetic mice. OBJECTIVE: The purpose of this study was to determine a therapeutic window of antidiabetic effect by laser irradiating the left inguinal region of diabetic mice (810â€‰nm 20.4 and 40.8â€‰J/cm(2)) for 7 days. BACKGROUND DATA: Irradiation of 810â€‰nm 10.2â€‰J/cm(2) to the left inguinal region of diabetic mice for 7 days significantly decreased blood plasma fructosamine compared with nonirradiated controls. METHODS: Forty-seven diabetic mice were used. Body weight and water intake of the mice were measured daily for 7 days prior to start of treatment (day 0). Mice were irradiated on the left inguinal region with 810â€‰nm laser 20.4â€‰J/cm(2) (n=15) or 40.8â€‰J/cm(2) (n=15) for 7 days, or were not irradiated (control, n=17). Body weight and water intake were measured to day 7. On day 7, mice were fasted for 5â€‰h, anesthetized with sodium pentobarbitone (i.p.), and blood plasma was collected. The blood plasma was assayed for glucose and fructosamine. RESULTS: Water intake was significantly increased on day 7 compared with day 0 for diabetic mice receiving laser treatment. Blood plasma glucose levels on day 7 for diabetic mice irradiated 20.4 and 40.8â€‰J/cm(2) were not significantly different than for nonirradiated controls. The blood plasma fructosamine level of diabetic mice irradiated with 20.4â€‰J/cm(2) was significantly lower than for nonirradiated controls, whereas that for diabetic mice irradiated with 40.8â€‰J/cm(2) was not significantly different than for nonirradiated controls. CONCLUSIONS: Irradiation (810â€‰nm laser 10.2-20.4â€‰J/cm(2)) to the left inguinal region of diabetic mice for 7 days has the potential to ameliorate diabetes, as is shown by decreased blood plasma fructosamine. Blood Glucose;Fructosamine Animals;Blood Glucose;Diabetes Mellitus, Experimental;Drinking;Fructosamine;Inguinal Canal;Low-Level Light Therapy;Mice

Tooth movement in orthodontic treatment with low-level laser therapy: systematic review imprecisions. Animals;Humans;Low-Level Light Therapy;Orthodontics;Tooth Movement Techniques

Low-level light therapy induces mucosal healing in a murine model of dextran-sodium-sulfate induced colitis. OBJECTIVE: The aim of this study was to demonstrate the effect of low-level light therapy (LLLT) in an acute colitis model in mice. BACKGROUND DATA: Low-level light therapy (LLLT) has been shown to be an effective treatment for various inflammatory processes such as oral mucositis and diabetic foot ulcers. METHODS: Colitis was induced by dextran sodium sulfate (DSS) in mice in four blinded controlled studies (validation of model, efficacy study, and two studies for evaluation of optimal dose). LLLT was applied to the colon utilizing a small diameter endoscope with an LED-based light source in several wavelengths (440, 660, and 850â€‰nm at 1â€‰J/cm(2)) and then 850â€‰nm at several doses (1, 0.5, 0.25, and 0.1â€‰J/cm(2)). LLLT was initiated 1 day prior to induction of colitis and went on for the 6 day induction period as well as for the following 3-10 days. Dose was controlled by changing exposure time. Disease activity was scored endoscopically and by histopathological assessment. RESULTS: Statistically significant improvement in disease severity was

observed in the treatment groups compared with the control groups. The three wavelengths used demonstrated efficacy, and a clear dose-response curve was observed for one of the wavelengths (850â€‰nm). On day 11, colonoscopic scoring in the sham-treated mice increased from 7.9Â±1.3 to 12.2Â±2.2, while activity in all treated groups remained stable. CONCLUSIONS: Photobiostimulation with LLLT has a significant positive effect on disease progression in mice with DSS colitis. Dextran Sulfate Animals;Colitis;Dextran Sulfate;Intestinal Mucosa;Low-Level Light Therapy;Mice, Inbred C57BL;Wound Healing

Effects of low-level laser therapy on the serum TGF-Î²1 concentrations in individuals with autoimmune thyroiditis. OBJECTIVE: The objective of this study was to evaluate the serum concentration of transforming growth factor-Î²1 (TGF-Î²1) after low-level laser therapy (LLLT) in patients with hypothyroidism resulting from chronic autoimmune thyroiditis (CAT). BACKGROUND DATA: Certain data indicate that LLLT is effective in patients with hypothyroidism caused by CAT; however, the mechanisms of action of LLLT in thyroid tissue are unknown. Cytokines could play a role in the response to LLLT. METHODS: A randomized, placebo-controlled trial included 43 patients with a history of levothyroxine therapy for CAT-induced hypothyroidism. The patients were randomly assigned to receive either 10 sessions of LLLT (830â€‰nm, 50â€‰mW output power, and 707â€‰J/cm(2) fluence; L group, n=23) or 10 sessions of a placebo treatment (P group, n=20) twice a week. Levothyroxine was maintained at the same dose during the entire study period. TGF-Î²1 was measured both pre-intervention and 30 days post-intervention in both groups. The differences were calculated between the TGF-Î²1 values observed 30 days post-intervention and the pre-intervention TGF-Î²1 values for each group (intragroup). RESULTS: Comparing the differences in TGF-Î²1 levels between the L group (874.9Â±541.7â€‰pg/mL) and the P group (-128.4Â±832.8â€‰pg/mL) revealed that there was a statistically significant increase in TGF-Î²1 levels 30 days post-intervention in group L compared with the placebo group (p=0.0379). CONCLUSIONS: This finding suggested that the significant increase in serum TGF-Î²1 levels in patients with CAT-induced hypothyroidism was associated with the thyroid LLLT procedure. Future studies of the effect of LLLT on TGF-Î²1 gene expression in thyroid tissue are necessary to confirm these findings. Transforming Growth Factor beta1 Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Thyroiditis, Autoimmune;Transforming Growth Factor beta1;Young Adult

Laser treatment for onychomycosis: a review. It has always been difficult to treat onychomycosis due to decrease ability of topical agents to penetrate the nail and reach the affected nail bed. Oral antifungal have shown good response but due to longer duration course it has potential to cause systemic side effects, leading to patient non-adherence and adverse events. Lasers, therefore, have been suggested for the treatment of onychomycosis due to their minimally invasive nature and the potential for requiring fewer treatment sessions. The aim of writing this article is to review a literature regarding treatment of onychomycosis by laser. This article will discuss about all the available laser treatment options for onychomycosis as well as their currently published, peer-reviewed literature. Humans;Low-Level Light Therapy;Onychomycosis

A systematic review and meta-analysis on the efficacy of low-level laser therapy in the management of complication after mandibular third molar surgery. The successful reduction of postoperative discomfort is of great significance. This review aims to evaluate the efficacy of low-level laser therapy (LLLT) for the reduction of complication caused by impacted mandibular third molars extraction. An extensive literature search up to October 2013 for randomized controlled trials (RCTs) was performed through CENTRAL, PubMed, Embase, Medline, and CNKI. Six RCTs in which involves 193 participants are included in the meta-analysis. Among them, three RCTs exhibit a moderate risk of bias, while the other three show a high bias risk. Compared with placebo laser/control group, pain is significantly reduced with LLLT on the first day (mean difference [MD]â€‰=â€‰-2.63, 95% confidence interval

[CI] -4.46 to -0.79, Pâ€‰=â€‰0.005). The superiority of LLLT in pain control persists on the second day (MDâ€‰=â€‰-2.34, 95% CI -4.61 to -0.06, Pâ€‰=â€‰0.04) and the third day (MDâ€‰=â€‰-3.40, 95% CI -4.12 to -2.68, Pâ€‰<â€‰0.00001). Moreover, LLLT reduces an average of 4.94 mm (MDâ€‰=â€‰4.94, 95 % CI 1.53 to 8.34, Pâ€‰=â€‰0.004) of trismus compared with placebo laser irradiation in the first 3 days. On the seventh day, the superiority of LLLT also persists (MDâ€‰=â€‰3.24, 95% CI 0.37 to 6.12, Pâ€‰=â€‰0.03). In the first 3 days after surgery, extraoral irradiation (MDâ€‰=â€‰-0.69, 95% CI -1.30 to -0.08, Pâ€‰=â€‰0.03) and intraoral combined with extraoral irradiation (MDâ€‰=â€‰-0.65, 95% CI -1.15 to -0.15, Pâ€‰=â€‰0.01) reduced facial swelling significantly. On the seventh day, the intraoral combined with extraoral irradiation group (MDâ€‰=â€‰-0.32, 95% CI -0.59 to -0.06, Pâ€‰=â€‰0.02) still showed benefit in relieving facial swelling. However, because of the heterogeneity of intervention and outcomes assessment and risk of bias of included trials, the efficacy is proved with limited evidence. In the future, well-designed RCTs with larger sample size will be required to provide clearer recommendations. Adult;Female;Humans;Low-Level Light Therapy;Mandible;Molar, Third;Pain, Postoperative;Postoperative Complications;Publication Bias;Treatment Outcome;Trismus

[Light irradiator for various chronic pain]. Effects of light upon human tissue are divided into irreversible effects and reversible effects. Irreversible effects can be called as high level laser therapy (HLLT), and reversible effects can be called as low level light therapy (LLLT). Light irradiators for chronic pain act under principle of LLLT. Laser diode, halogen lamp and xenon lamp are used as light sources for light irradiator for various chronic pain. These days, light emitting diode (LED) is used as light source for light irradiator for various kinds of pain. Light irradiators are now divided into portable light weight low power machine and heavy weight, high power machine. In the dental area Nd : YAG laser is using as HLLT tool. But, now there are many reports about Nd : YAG laser used as anesthetic machine. In these reports, topical anesthetic effects of Nd : YAG laser are immediate and with fewer side effects compared with topical anesthetic agents. These effects are explained as LLLT. Halogen lamp and xenon lamp type irradiators were also introduced. MEDILASER SOFT PULSE10, an laser diode type irradiator was withdrawn from the market. Chronic Pain;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy

[Comparative evaluation of effectiveness of the combined immunocorrection in patients suffering severe craniocerebral trauma]. Comparative estimation of clinical efficacy of various immunocorrection schemes for the immune state correction was conducted in 106 patients in conditions ofsevere craniocerebral trauma (SCCT), combined application of immunofan and intravenous laser irradiation of blood (IVLIB). In 32 patients (I group) a standard intensive therapy (SITH) was conducted: in 21 (II group)--immunofan was applied additionally; in 25 (III group)--in addition to SITH IVLIB was conducted; in 28 (IV group)--immunofan solution was infused and sessions of IVLIB (3 - 4 sessions a day) on a background of SITH were conducted. The immunity indices were analyzed on the 1 - 2, 5 - 6-th and 9 -10-th days after trauma. Estimation of the combined therapy efficacy have shown, that in SCCT she renders a significant immunocorrecting effect on the 5 - 6-th days already, on the 9 - 10-th days the immune state parameters were really normalized, reduction of the complications rate by 26% and of lethality by 8.6% was noted. Adjuvants, Immunologic;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Oligopeptides Adjuvants, Immunologic;Adult;B-Lymphocytes;Combined Modality Therapy;Craniocerebral Trauma;Drug Administration Schedule;Female;Humans;Immunity, Cellular;Immunoglobulin A;Immunoglobulin G;Immunoglobulin M;Injections, Intramuscular;Low-Level Light Therapy;Male;Middle Aged;Oligopeptides

Fracture resistance of teeth submitted to several internal bleaching protocols. AIM: The aim of this study was to evaluate the fracture resistance of teeth submitted to several internal bleaching

protocols using 35% hydrogen peroxide (35HP), 37% carbamide peroxide (37CP), 15% hydrogen peroxide with titanium dioxide nanoparticles (15HPTiO2) photoactivated by LED-laser or sodium perborate (SP). MATERIALS AND METHODS: After endodontic treatment, fifty bovine extracted teeth were divided into five groups (n = 10): G1-unbleached; G2-35HP; G3-37CP; G4-15HPTiO2 photoactivated by LED-laser and G5-SP. In the G2 and G4, the bleaching protocol was applied in 4 sessions, with 7 days intervals between each session. In the G3 and G5, the materials were kept in the pulp teeth for 21 days, but replaced every 7 days. After 21 days, the teeth were subjected to compressive load at a cross head speed of 0.5 mm/min, applied at 135Â° to the long axis of the root using an eletromechanical testing machine, until teeth fracture. The data were submitted to ANOVA and Tukey tests (Î± = 5%). RESULTS: The 35HP, 37CP, 15HPTiO2 and SP showed similar fracture resistance teeth reduction ($p > 0.05$). All bleaching treatments reduced the fracture resistance compared to unbleached teeth ($p < 0.05$). CONCLUSION: All bleaching protocols reduced the fracture resistance of endodontically-treated teeth, but there were no differences between each other. CLINICAL SIGNIFICANCE: There are several internal bleaching protocols using hydrogen peroxide in different concentrations and activation methods. This study evaluated its effects on fracture resistance in endodontically-treated teeth. Borates;Peroxides;Photosensitizing Agents;Tooth Bleaching Agents;titanium dioxide;Carbamide Peroxide;Urea;Hydrogen Peroxide;Titanium;sodium perborate Animals;Borates;Carbamide Peroxide;Cattle;Dental Pulp Cavity;Dental Stress Analysis;Hydrogen Peroxide;Low-Level Light Therapy;Materials Testing;Nanoparticles;Peroxides;Photosensitizing Agents;Random Allocation;Root Canal Therapy;Stress, Mechanical;Time Factors;Titanium;Tooth Bleaching;Tooth Bleaching Agents;Tooth Fractures;Urea

Evaluation of the photobiomodulation in L929 cell culture. Low-level laser therapy has become an important tool for bio-modulation process. It can induce stimulatory or inhibitory effects according to cell behavior at specific irradiation. Our objective was to determine L929 cell line response to irradiation at Î» 685 and 830â€‰nm, concentrations of 5 and 10% fetal bovine serum and different energy densities of 0.1, 0.5, 1, 2, 3, 5, 7, 10, 20, and 30â€‰J/cm(2). Thus, cells were plated at 1â€‰Ã—â€‰10(5) cells/mL and irradiated with semiconductor laser As-Ga-Al. Twenty-four hours after irradiation, cells were subjected to MTT, neutral red, crystal violet tests, and cell staining was performed using the kit Alexa Fluor 488 Annexin V-FITC and propidium iodide. Our results showed that low-level laser therapy stimulates effect when the energy density is 5 to 3030â€‰J/cm(2) and inhibits effects on energy density 0.1 to 3â€‰J/cm(2). This inhibitory effect was evidenced by the absence of dead cells labeled, decreased cell density, and by the absorption of neutral red in intact cells. The study also demonstrated that fetal bovine serum, at different concentrations, did not affect response of the cells after irradiation. Animals;Cell Line;Cell Survival;Fibroblasts;Lasers;Light;Mice;Staining and Labeling

Myofascial low back pain treatment. Myofascial pain is a common musculoskeletal problem, with the low back being one of the commonest affected regions. Several treatments have been used for myofascial low back pain through physical therapies, pharmacologic agents, injections, and other such therapies. This review will provide an update based on recently published literature in the field of myofascial low back pain along with a brief description of a sequenced, multidisciplinary treatment protocol called Skilled Hands-on Approach for the Release of myofascia, Articular, Neural and Soft tissue mobilization (SHARANS) protocol. A comprehensive multidisciplinary approach is recommended for the successful management of individuals with myofascial low back pain. Analgesics, Opioid Analgesics, Opioid;Complementary Therapies;Exercise Therapy;Humans;Low Back Pain;Low-Level Light Therapy;Myofascial Pain Syndromes;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Transcutaneous Electric Nerve Stimulation

[The influence of intravenous laser therapy on the endothelial function and the state of microcirculation in the patients presenting with rheumatoid arthritis]. AIM: The objective of the present work was to study effects of low-level laser irradiation on the endothelial function and selected parameters of microcirculation in the patients presenting with rheumatoid arthritis. MATERIAL AND METHODS: This study included 132 patients at the age varying from 18 to 85 years presenting with rheumatoid arthritis. They were divided into 2 groups. The patients of the main group (n = 102) underwent daily intravenous laser blood irradiation during 10 days. The control group was comprised of 30 patients. Laser therapy was performed with the help of a laser therapeutic device Matrix - VLOK ("Matrix", Russia) using alternation of two radiating heads: KI-VLOK-63 (wavelength 0.63 pm, for 15 minutes) and KI-VLOK-365 (wavelength 0.365 microm, for 5 minutes) in the continuous emission regime. The parameters of interest were measured before and after the treatment. The overall duration of intravenous laser irradiation of blood was 10 days without a break for the weekend. RESULTS: The data obtained suggest the improvement of the endothelial function and the microcirculation indices. Adolescent;Adult;Aged;Aged, 80 and over;Arthritis, Rheumatoid;Endothelium, Vascular;Endovascular Procedures;Female;Humans;Laser Therapy;Male;Microcirculation;Middle Aged;Time Factors

Laser-induced hyperthermia of nanoshell mediated vascularized tissue - a numerical study. Laser-induced hyperthermia treatment of tumor in a 2-D axisymmetric tissue embedded with moderate size (100-150Âμm) blood vessels is studied. Laser absorption is enhanced by embedding gold-silica nanoshells in the tumor. Heat transfer in the tissue is modeled using Weinbaum-Jiji bioheat transfer equation. With laser irradiation, the volumetric radiation is accounted in the governing bioheat equation. Radiative information needed in the bioheat equation is calculated using the discrete ordinate method, and the coupled bioheat-radiation equation is solved using the finite volume method. Effects of power density, laser exposure time, beam radius, diameter of blood vessel and volume fractions of nanoshells on temperature spread in the tissue are analyzed. Gold Animals;Gold;Humans;Low-Level Light Therapy;Models, Biological;Nanoshells;Neovascularization, Pathologic

Ultrashort pulsed laser treatment inactivates viruses by inhibiting viral replication and transcription in the host nucleus. Ultrashort pulsed laser irradiation is a new method for virus reduction in pharmaceuticals and blood products. Current evidence suggests that ultrashort pulsed laser irradiation inactivates viruses through an impulsive stimulated Raman scattering process, resulting in aggregation of viral capsid proteins. However, the specific functional defect(s) in viruses inactivated in this manner have not been demonstrated. This information is critical for the optimization and the extension of this treatment platform to other applications. Toward this goal, we investigated whether viral internalization, replication, or gene expression in cells were altered by ultrashort pulsed laser irradiation. Murine Cytomegalovirus (MCMV), an enveloped DNA virus, was used as a model virus. Using electron and fluorescence microscopy, we found that laser-treated MCMV virions successfully internalized in cells, as evidenced by the detection of intracellular virions, which was confirmed by the detection of intracellular viral DNA via PCR. Although the viral DNA itself remained polymerase-amplifiable after laser treatment, no viral replication or gene expression was observed in cells infected with laser-treated virus. These results, along with evidence from previous studies, support a model whereby the laser treatment stabilizes the capsid, which inhibits capsid uncoating within cells. By targeting the mechanical properties of viral capsids, ultrashort pulsed laser treatment represents a unique potential strategy to overcome viral mutational escape, with implications for combatting emerging or drug-resistant pathogens. Capsid Proteins;DNA, Viral;Protein Aggregates 3T3 Cells;Animals;Capsid;Capsid Proteins;Cell Line;DNA, Viral;Gene Expression;Low-Level Light

Therapy;Mice;Mice, Inbred BALB C;Muromegalovirus;Protein Aggregates;Transcription, Genetic;Virus Inactivation;Virus Internalization;Virus Replication

Accelerating tooth movement. Humans;Low-Level Light Therapy;Osteotomy;Phototherapy;Surgical Flaps;Time Factors;Tooth Movement Techniques;Vibration

Neurite growth acceleration of adult Dorsal Root Ganglion neurons illuminated by low-level Light Emitting Diode light at 645 nm. The effect of a 645 nm Light Emitting Diode (LED) light irradiation on the neurite growth velocity of adult Dorsal Root Ganglion (DRG) neurons with peripheral axon injury 4-10 days before plating and without previous injury was investigated. The real amount of light reaching the neurons was calculated by taking into account the optical characteristics of the light source and of media in the light path. The knowledge of these parameters is essential to be able to compare results of the literature and a way to reduce inconsistencies. We found that 4 min irradiation of a mean irradiance of 11.3 mW/cm(2) (corresponding to an actual irradiance reaching the neurons of 83 mW/cm(2)) induced a 1.6-fold neurite growth acceleration on non-injured neurons and on axotomized neurons. Although the axotomized neurons were naturally already in a rapid regeneration process, an enhancement was found to occur while irradiating with the LED light, which may be promising for therapy applications. Dorsal Root Ganglion neurons (A) without previous injury and (B) subjected to a conditioning injury. Animals;Cells, Cultured;Disease Models, Animal;Ganglia, Spinal;Low-Level Light Therapy;Lumbar Vertebrae;Mice;Microscopy;Neurites;Random Allocation;Sciatic Nerve;Sensory Receptor Cells;Spectrum Analysis;Video Recording

Effect of low-level laser therapy on the modulation of the mitochondrial activity of macrophages. BACKGROUND: Macrophages play a major role among the inflammatory cells that invade muscle tissue following an injury. Low-level laser therapy (LLLT) has long been used in clinical practice to accelerate the muscle repair process. However, little is known regarding its effect on macrophages. OBJECTIVE: This study evaluated the effect of LLLT on the mitochondrial activity (MA) of macrophages. METHOD: J774 macrophages were treated with lipopolysaccharide (LPS) and interferon - gamma (IFN-Î³) (activation) for 24 h to simulate an inflammatory process, then irradiated with LLLT using two sets of parameters (780 nm; 70 mW; 3 J/cm2 and 660 nm; 15 mW; 7.5 J/cm2). Non-activated/non-irradiated cells composed the control group. MA was evaluated by the cell mitochondrial activity (MTT) assay (after 1, 3 and 5 days) in three independent experiments. The data were analyzed statistically. RESULTS: After 1 day of culture, activated and 780 nm irradiated macrophages showed lower MA than activated macrophages, but activated and 660 nm irradiated macrophages showed MA similar to activated cells. After 3 days, activated and irradiated (660 nm and 780 nm) macrophages showed greater MA than activated macrophages, and after 5 days, the activated and irradiated (660 nm and 780 nm) macrophages showed similar MA to the activated macrophages. CONCLUSIONS: These results show that 660 nm and 780 nm LLLT can modulate the cellular activation status of macrophages in inflammation, highlighting the importance of this resource and of the correct determination of its parameters in the repair process of skeletal muscle. Cells, Cultured;Low-Level Light Therapy;Macrophages;Mitochondria

Treatment of melasma with mixed parameters of 1,064-nm Q-switched Nd:YAG laser toning and an enhanced effect of ultrasonic application of vitamin C: a split-face study. Melasma is an acquired pigment disorder showing symmetrical hyperpigmentation of the face characterized by light to dark brown patches with indistinct borders on both cheeks. Melasma is prevalent in middle-aged women with harmless hormone imbalances. It is also known as the mask of pregnancy and is prevalent in most child-bearing women. It fluctuates month by month, and yet, there is no promising treatment. The Q-switched neodymium-doped yttrium aluminum garnet (QS-Nd:YAG) laser (1,064-nm

wavelength) was introduced in Asia years ago for both skin toning and treatment of facial pigment. This low-fluence, 1,064-nm QS-Nd: YAG laser also reportedly improved melasma. Adjunctive treatments such as vitamin C iontophoresis or chemical peels were recommended in other reports. The technique using the 1,064-nm QS-Nd:YAG laser for toning and the enhancement of adjunctive treatments need further investigation and long-term follow-up before recommendations for the ideal protocol for melasma treatment can be made. The aim of this study is to evaluate the improvement of melasma using different parameters with the 1,064-nm QS-Nd:YAG laser with ultrasonic application of topical vitamin C. Eight patients, ranging in age from 32 to 45 years (mean 37 years), with long-term melasma were studied. Most of the melasma cases were dermal or mixed-type melasma. The patients had no cosmetic treatment (laser, intense pulsed light, or chemical peel) 1 year prior to the study. The entire face of each patient was treated with the 1,064-nm QS-Nd:YAG laser for four sessions at 1-month intervals. The laser treatment was divided into three parts with different parameters. First, each patient underwent whole face exposure for one pass with an 8-mm spot size at a power of 2.0 J/cm(2). Next, the spot size was shifted to 6 mm at a power of 3.5 J/cm(2) for one full-face pass, and then ended with a 4-mm spot size at 3.2 J/cm(2) for one full-face pass, with multiple passes for the main lesions. The end point was mild erythema and swelling, without petechiae. All patients applied ice packs for 5 min before the adjunctive treatment. We designed a split-face study with or without ultrasonic application of topical vitamin C. Only the right side of the face received ultrasonic melasma application of vitamin C for 15 min after ice packing. The left side of the face was covered with a moisturizing lotion. Objective evaluation was performed with visual analog score. All eight patients completed the 3-month follow-up after the four laser treatments. Statistics showed significant improvement with ultrasonic application of vitamin C compared to laser monotherapy. The improvement was more pronounced during second to fourth sessions. There was no rebound or post-inflammatory hyperpigmentation detected during the 3-month follow-up period. The combination of 1,064-nm QS-Nd:YAG laser treatment with ultrasonic application of topical vitamin C exerted more prompt response of melasma. We recommended this protocol including mixed parameters of 1,064-nm QS-Nd:YAG laser toning method combining with vitamin C ultrasonic application that can yield higher satisfaction for the difficult facial pigmentation problems such as melasma. Ascorbic Acid Administration, Topical;Adult;Ascorbic Acid;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Treatment Outcome

Effectiveness of non-conventional methods for accelerated orthodontic tooth movement: a systematic review and meta-analysis. OBJECTIVES: To assess the available evidence on the effectiveness of accelerated orthodontic tooth movement through surgical and non-surgical approaches in orthodontic patients. METHODS: Randomized controlled trials and controlled clinical trials were identified through electronic and hand searches (last update: March 2014). Orthognathic surgery, distraction osteogenesis, and pharmacological approaches were excluded. Risk of bias was assessed using the Cochrane risk of bias tool. RESULTS: Eighteen trials involving 354 participants were included for qualitative and quantitative synthesis. Eight trials reported on low-intensity laser, one on photobiomodulation, one on pulsed electromagnetic fields, seven on corticotomy, and one on interseptal bone reduction. Two studies on corticotomy and two on low-intensity laser, which had low or unclear risk of bias, were mathematically combined using the random effects model. Higher canine retraction rate was evident with corticotomy during the first month of therapy (WMD=0.73; 95% CI: 0.28, 1.19, $p<0.01$) and with low-intensity laser (WMD=0.42mm/month; 95% CI: 0.26, 0.57, $p<0.001$) in a period longer than 3 months. The quality of evidence supporting the interventions is moderate for laser therapy and low for corticotomy intervention. CONCLUSIONS: There is some evidence that low laser therapy and corticotomy are effective, whereas the evidence is weak for

interseptal bone reduction and very weak for photobiomodulation and pulsed electromagnetic fields. Overall, the results should be interpreted with caution given the small number, quality, and heterogeneity of the included studies. Further research is required in this field with additional attention to application protocols, adverse effects, and cost-benefit analysis. CLINICAL SIGNIFICANCE: From the qualitative and quantitative synthesis of the studies, it could be concluded that there is some evidence that low laser therapy and corticotomy are associated with accelerated orthodontic tooth movement, while further investigation is required before routine application. Humans;Low-Level Light Therapy;Magnetic Field Therapy;Osteotomy;Time Factors;Tooth Movement Techniques

Integral-geometry characterization of photobiomodulation effects on retinal vessel morphology. The morphological characterization of quasi-planar structures represented by gray-scale images is challenging when object identification is sub-optimal due to registration artifacts. We propose two alternative procedures that enhances object identification in the integral-geometry morphological image analysis (MIA) framework. The first variant streamlines the framework by introducing an active contours segmentation process whose time step is recycled as a multi-scale parameter. In the second variant, we used the refined object identification produced in the first variant to perform the standard MIA with exact dilation radius as multi-scale parameter. Using this enhanced MIA we quantify the extent of vaso-obliteration in oxygen-induced retinopathic vascular growth, the preventative effect (by photobiomodulation) of exposure during tissue development to near-infrared light (NIR, 670 nm), and the lack of adverse effects due to exposure to NIR light.

Low-level laser therapy in IL-1Î², COX-2, and PGE2 modulation in partially injured Achilles tendon. This study evaluated IL-1Î², COX-2, and PGE2 modulation in partially injured Achilles tendons treated with low-level laser therapy (LLLT). Sixty-five male Wistar rats were used. Sixty were submitted to a direct injury on Achilles tendon and then distributed into six groups: LASER 1 (a single LLLT application), LASER 3 (three LLLT applications), and LASER 7 (seven LLLT applications) and Sham 1, 3, and 7 (the same injury but LLLT applications were simulated). The five remaining animals were allocated at control group (no procedure performed). LLLT (780 nm) was applied with 70 mW of mean power and 17.5 J/cm(2) of fluency for 10 s, once a day. The tendons were surgically removed and assessed immunohistochemically for IL-1Î², COX-2, and PGE2. In comparisons with control (IL-1Î²: 100.5â€‰Â±â€‰92.5 / COX-2: 180.1â€‰Â±â€‰97.1 / PGE2: 187.8â€‰Â±â€‰128.8) IL-1Î² exhibited (meanâ€‰Â±â€‰SD) near-normal level (pâ€‰>â€‰0.05) at LASER 3 (142.0â€‰Â±â€‰162.4). COX-2 and PGE2 exhibited near-normal levels (pâ€‰>â€‰0.05) at LASER 3 (COX-2: 176.9â€‰Â±â€‰75.4 / PGE2: 297.2â€‰Â±â€‰259.6) and LASER 7 (COX-2: 259.2â€‰Â±â€‰190.4 / PGE2: 587.1â€‰Â±â€‰409.7). LLLT decreased Achilles tendon's inflammatory process. Interleukin-1beta;Cyclooxygenase 2;Ptgs2 protein, rat;Dinoprostone Achilles Tendon;Animals;Cyclooxygenase 2;Dinoprostone;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tendinopathy

Anti-inflammatory effect of 635 nm irradiations on in vitro direct/indirect irradiation model. Low-level laser therapy (LLLT) has been promoted for its beneficial effects on tissue healing and pain relief. As during laser treatment it is possible to irradiate only a small area of the surface body or wound and, correspondingly, of a very small volume of the circulating blood, it is necessary to explain how its photomodification can lead to a wide spectrum of therapeutic effects. To establish the experimental model for indirect irradiation, irradiation with 635Â nm was performed on immortalized human gingival fibroblasts (IGFs) in the presence of Porphyromonas gingivalis lipopolysaccharides (LPS). The irradiated medium was transferred to non-irradiated IGFs which were compared with direct irradiated IGFs. The protein expressions were assessed by Western blot, and prostaglandin E2 (PGE2) was measured using an enzyme-linked immunoassay. Reactive oxygen species (ROS) were

measured by DCF-DA; cytokine profiles were assessed using a human inflammation antibody array. Cyclooxygenase-2 (COX-2) protein expression and PGE2 production were significantly increased in the LPS-treated group and decreased in both direct and indirect irradiated IGFs. Unlike direct irradiated IGFs, ROS level in indirect irradiated IGFs was decreased by time-dependent manners. There were significant differences of released granulocyte colony-stimulating factor (G-CSF), regulated on activated normal T-cell expressed and secreted (RANTES), and I-TAC level observed compared with direct and indirect irradiated IGFs. In addition, in the indirect irradiation group, phosphorylations of C-Raf and Erk1/2 increased significantly compared with the direct irradiation group. Thus, we suggest that not only direct exposure with 635Â nm light, but also indirect exposure with 635Â nm light can inhibit activation of pro-inflammatory mediators and may be clinically useful as an anti-inflammatory tool. CXCL11 protein, human;Chemokine CCL5;Chemokine CXCL11;Culture Media, Conditioned;Cytokines;Inflammation Mediators;Lipopolysaccharides;Reactive Oxygen Species;Granulocyte Colony-Stimulating Factor;Cyclooxygenase 2;Proto-Oncogene Proteins c-raf;MAPK1 protein, human;Mitogen-Activated Protein Kinase 1;Mitogen-Activated Protein Kinase 3;Dinoprostone Cell Culture Techniques;Cell Line;Chemokine CCL5;Chemokine CXCL11;Culture Media, Conditioned;Cyclooxygenase 2;Cytokines;Dinoprostone;Fibroblasts;Gingiva;Granulocyte Colony-Stimulating Factor;Humans;Inflammation;Inflammation Mediators;Lipopolysaccharides;Low-Level Light Therapy;MAP Kinase Signaling System;Mitogen-Activated Protein Kinase 1;Mitogen-Activated Protein Kinase 3;Porphyromonas gingivalis;Proto-Oncogene Proteins c-raf;Reactive Oxygen Species

A gender-based comparison of pain tolerance during pulsed dye laser therapy. BACKGROUND: Cosmetic laser treatments are frequently performed without anesthesia in the clinic setting and there is a need to better understand the factors that may impact patient pain levels during these procedures. There has been prior research suggesting that there are significant gender-based differences in pain experiences with a variety of interventions. AIMS: We sought to examine the influence of gender and specific emotional factors on pain perception during pulsed dye laser treatments. PATIENTS/METHODS: We conducted a questionnaire-based study of 84 adult patients (42 males and 42 females) who underwent facial pulsed dye laser treatments in our clinic for cosmetic purposes. Questionnaires were completed by each patient after his or her initial laser treatment and patients were queried as to their perceived levels of pain during the procedure. Additional information regarding quality of life measures and patient motivation was also collected. RESULTS: Contrary to prior research suggesting lower pain thresholds for women in other clinical or experimental settings, we found no statistically significant differences in mean pain levels reported between patients of each gender. There was a trend toward females being somewhat more likely than males to see the pain of the treatment as justified for an improvement in appearance. CONCLUSIONS: Patient motivation and pain tolerance levels may be similar between genders among patients undergoing non-invasive cosmetic procedures. Clinicians may, therefore, expect patients of either gender to tolerate such treatments equally well. Adult;Aged;Cosmetic Techniques;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Motivation;Pain Threshold;Quality of Life;Sex Factors

Efficacy of low level laser therapy and intramuscular electrical stimulation on myofascial pain syndrome. BACKGROUND: Myofascial pain syndrome (MPS) which is an important cause of musculoskeletal pain has shown a dramatic increase in recent years. OBJECTIVES: We aimed to evaluate the efficacy of intramuscular electrical stimulation therapy (IMS) and low-level-lasertherapy (LLLT) in patients with MPS. METHODS: Patients were randomly divided into three groups. First group were treated with LLLT and stretching exercise. Second group were treated with IMS and stretching exercise. Third group were treated with only stretching exercise. The patients were evaluated

through the pain intensity, pain threshold, cervical joint movement range and the neck disability index parameters. RESULTS: An improvement was found in all parameters for all groups, except for the pain threshold within the control group at the end of the treatment and one month after the treatment. It was found that pain score was significantly lower in Group 1 and 2 at one month after the treatment compared to Group 3. Similarly, it was found that pain threshold score was significantly higher in Group 2 at one month after the treatment compared to Group 3. CONCLUSIONS: In this study we observed that both LLLT and IMS treatments added on to stretching are effective in improving pain parameters in patients with MPS. Adult;Combined Modality Therapy;Electric Stimulation Therapy;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Myofascial Pain Syndromes;Neck;Pain Threshold;Range of Motion, Articular;Treatment Outcome;Young Adult

Clinical analysis of port-wine stain in 130 Chinese patients treated by long-pulsed 1064-nm Nd: YAG laser. BACKGROUND: The long-pulsed 1064-nm Nd: YAG laser is effective for treating port-wine stain (PWS). This study evaluated the efficacy and safety of Nd: YAG laser in treating PWS in Chinese patients. METHODS: A retrospective study of 130 PWS patients treated with long-pulsed 1064-nm Nd: YAG laser from 2009 to 2011. RESULTS: After treatment, 2, 15, 64, and 19 percent of patients experienced < 25%, 25-49%, 50-75%, and > 75% lesion clearance, respectively. Purple lesions showed more significant improvement than pink lesions. The initial response was blistering, dark gray coloration, or light gray coloration, the best improvement occurred in 100% (27/27), 82.5% (52/63), and 72.5% (29/40), respectively. Patients older than 20 years showed the best improvement (37/38, 97.4%), followed by those 10-20 years old (20/24, 83.3%), 1-9 years old (23/29, 79.3%) and less than 1 year old (28/39, 71.8%). Patients with neck lesions had the best outcome (47/48, 97.9%), followed by those with lesions on the face (43/53, 81.2%), extremities (13/18, 72.2%), and trunk (5/11, 45.5%). The common adverse side effects were blistering and pigment changes. CONCLUSIONS: 1064-nm Nd: YAG laser is effective and safe for the treatment of PWS. The efficacy is affected by the age of the patient, the color and location of the lesions, and immediate responses to the laser. Adolescent;Adult;Asian People;Child;Child, Preschool;China;Cosmetic Techniques;Face;Female;Humans;Infant;Infant, Newborn;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neck;Port-Wine Stain;Retrospective Studies;Young Adult

Mn-porphyrin conjugated Au nanoshells encapsulating doxorubicin for potential magnetic resonance imaging and light triggered synergistic therapy of cancer. A theranostic agent was successfully fabricated by the formation of Au nanoshell around poly(lactic acid) nanoparticles entrapping doxorubicin, followed by linking a Mn-porphyrin derivative on the Au shell surface through polyethylene glycol. The resulted agent exhibited excellent colloidal stability and long blood circulation time due to introducing polyethylene glycol. The grafting Mn-porphyrin onto the nanoparticle surface endowed a greatly improved relaxivity (r1 value of 22.18 mM(-1)s(-1) of Mn(3+)), favorable for accurate cancer diagnosing and locating the tumor site to guide the external near infrared (NIR) laser irradiation for photothermal ablation of tumors. The in vitro experiments confirmed that the agent exhibited an efficient photohyperthermia and a light triggered and stepwise release behavior of doxorubicin due to the high NIR light absorption coefficient of Au nanoshell. The in vivo experiments showed that the combination of chemotherapy and photothermal therapy through such theranostic agent offered a synergistically improved therapeutic outcome compared with either therapy alone, making it a promising approach for cancer therapy. Therefore, such theranostic agent can be developed as a smart and promising nanosystemplatform that integrates multiple capabilities for both effective contrast enhanced magnetic resonance imaging and synergistic therapy. Antibiotics, Antineoplastic;Polyesters;Polymers;Porphyrins;Lactic Acid;Polyethylene Glycols;Manganese;Gold;Doxorubicin Animals;Antibiotics, Antineoplastic;Cell

Line, Tumor;Doxorubicin;Gold;Humans;Lactic Acid;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Manganese;Mice;Mice, Nude;Nanoshells;Neoplasms;Polyesters;Polyethylene Glycols;Polymers;Porphyrins;Rats;Rats, Wistar
Effects of low-power light therapy on wound healing: LASER x LED. Several studies demonstrate the benefits of low-power light therapy on wound healing. However, the use of LED as a therapeutic resource remains controversial. There are questions regarding the equality or not of biological effects promoted by LED and LASER. One objective of this review was to determine the biological effects that support the use of LED on wound healing. Another objective was to identify LEDÂ´s parameters for the treatment of wounds. The biological effects and parameters of LED will be compared to those of LASER. Literature was obtained from online databases such as Medline, PubMed, Science Direct and Scielo. The search was restricted to studies published in English and Portuguese from 1992 to 2012. Sixty-eight studies in vitro and in animals were analyzed. LED and LASER promote similar biological effects, such as decrease of inflammatory cells, increased fibroblast proliferation, stimulation of angiogenesis, granulation tissue formation and increased synthesis of collagen. The irradiation parameters are also similar between LED and LASER. The biological effects are dependent on irradiation parameters, mainly wavelength and dose. This review elucidates the importance of defining parameters for the use of light devices. Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Reference Values;Skin;Wound Healing
Finite element analysis of masticatory stress on neoformed bone tissue after distraction osteogenesis and low-level laser therapy: a pilot study. OBJECTIVE: This study aimed to understand the action of masticatory forces on an implant virtually introduced into the sheep mandible after distraction osteogenesis and low-level laser therapy (LLLT) by using finite element analysis. BACKGROUND DATA: Distraction osteogenesis as an alternative for bone reconstruction that may be used in the treatment of deformities. METHODS: Four ewes underwent distraction osteogenis to elongate the left mandibular body by 15â€‰m, and three of them underwent LLLT with the purpose of improving bone properties. After death, animals were scanned by computed tomography and their mandibles were tridimensionally reconstructed by computer programs. The physical properties related to hardness and modulus of elasticity of each animal were obtained from the dissected mandibles, and data were transferred to Femap software for finite element analysis. RESULTS: Animals exposed and not exposed to LLLT irradiation showed remarkably similar values for superficial hardness and modulus of elasticity, without statistically significant difference ($p>0.05$), between the values observed for the cortical bone and the cancellous bone among the groups. The neoformed mandible, after a brief period for bone healing, was able to promote stability for implant placement and proper distribution of masticatory forces. CONCLUSIONS: An implant introduced virtually into the site of bone neoformation did not suffer any micromotions relevant to osteointegration. Furthermore, finite element analysis showed that the neoformed portion of the mandible was able to absorb and distribute masticatory forces throughout its structure, even after a brief period for bone maturation. Animals;Bone Regeneration;Elastic Modulus;Finite Element Analysis;Hardness;Low-Level Light Therapy;Mandible;Mastication;Models, Animal;Osteogenesis, Distraction;Pilot Projects;Sheep, Domestic
Preventing vision loss from advanced age-related macular degeneration. Female;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Retina;Visual Acuity;Visual Fields
Experimental study on the vascular thermal response to visible laser pulses. Port-wine stains (PWSs) are congenital vascular malformations that progressively darken and thicken with age, and laser therapy is the most effective in clinical practice. Using dorsal skin chamber (DSC), this study

evaluated thermal response of blood vessel to a 595-nm pulsed dye laser (PDL) with controlled energy doses and pulse durations. Totally, 32 vessels (30â¯¼300 Î¼m in diameter) are selected from the dorsal skin of the mouse to match those in port-wine stain. The experimental results showed that the thermal response of the blood vessels to laser irradiation can be recognized as coagulation, constriction with diameter decrease, disappearance (complete constriction), hemorrhage, and collagen damage in the order of increasing laser radiant exposure. Blood vessels with small diameter would response poorly and survive from the laser heating because their thermal relaxation time is much shorter than the pulse duration. The optimalradiant exposure is from 10 to 12 J/cm(2) under 6 ms pulse duration without considering the epidermal light absorption. Numerical simulations were also conducted using a 1,000-Î¼m deep Sprague-Dawley (SD) mouse skinfold. The light transportation and heat diffusion in dorsal skin were simulated with the Monte Carlo method and heat transfer equation, while the blood vessel photocoagulation was evaluated by Arrhenius-type kinetic integral. Both experimental observation and numerical simulation supported that hemorrhage is the dominant thermal response, which occurs due to preferential heating of the superior parts of large blood vessels. In clinical practice for 595 nm PDL, the consequent purpura caused by hemorrhage can be used as a treatment end point. Animals;Blood Vessels;Hot Temperature;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Rats;Rats, Sprague-Dawley;Skin

Pre-exposure to low-power diode laser irradiation promotes cytoprotection in the rat retina. The aim of this study was to investigate whether pre-exposure to low-power laser irradiation can provoke an effect on cellular protection in the rat retina. The right eyes of 40 rats were exposed to a 3-mm diode laser beam for 1 min in different light intensities and different experimental sets: group A low power of 60 mW (34.27 J/cm(2) on the retina in consideration of the energy losses along the optical pathway) prior to high power of 80 mW (44.88 J/cm(2) on the retina in consideration of the energy losses along the optical pathway), group B high power, group C low power, group D (the left eyes from the counterpart of group A) and group E (untreated rat eyes) as controls. Morphological retinal change retinas were assessed using light microscopy and/or transmission electron microscopy. Heat shock protein (Hsp) 70 and cleaved caspase 3 protein expression were analyzed by immunohistochemical staining and Western blot. Cellular injury was assessed by terminal deoxynucleotidyl transferase-mediated dUTP nick end-labeling (TUNEL) assay. Hsp 70 expression in the inner plexiform layer and the outer plexiform layer in group A were 73.09â€‰Â±â€‰6.49 and 78.03â€‰Â±â€‰3.05%, respectively, which was significantly higher (Pâ€‰<â€‰0.05) than those observed in group B (59.07â€‰Â±â€‰1.40 and 32.25â€‰Â±â€‰4.26%, respectively). The Hsp70/Î²-actin ratio was 0.49â€‰Â±â€‰0.06 in group C, which was significantly higher (Pâ€‰<â€‰0.05) than that of group B (0.27â€‰Â±â€‰0.04). Cleaved caspase 3 expression in group C both was significantly lower than that observed in group B. TUNEL staining showed that positive cells in the outer nuclear layer and inner nuclear layer in group A were significantly lower than those of group B. Pre-exposure to a 60-mW (34.27 J/cm(2) on the retina) power laser irradiation stimulates a hyperexpression of Hsp70 together with a hypoexpression of cleaved caspase 3 in rat retina, which may suggest a cellular protective effect. Actins;HSP70 Heat-Shock Proteins;Casp3 protein, rat;Caspase 3 Actins;Animals;Caspase 3;Cytoprotection;HSP70 Heat-Shock Proteins;Lasers, Semiconductor;Low-Level Light Therapy;Macular Degeneration;Rats;Rats, Inbred BN;Retina

Functional photobiomodulation. Cells;Gene Expression;Humans;Photobiology;Phototherapy;Signal Transduction;Stress, Physiological

A pilot study of a novel dual--pulsed 1064 nm Q-switched Nd: YAG laser to treat Riehl's melanosis. The treatment of Riehl's melanosis is difficult and challenging. Recently, a low-fluence 1064-nm quality (Q)-switched neodymium: yttrium-aluminum-garnet (Nd: YAG) laser method, referred to as 'laser toning', has been used in the treatment of melasma in Asian countries. We present here a

series of cases of Riehl's melanosis that were treated effectively with a novel Q-switched Nd: YAG laser that was operated as a dual-pulse at half-fluence and 140-Î¼s intervals. Adult;Asian People;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Pilot Projects

The effectiveness of excimer laser on vitiligo treatment in comparison with a combination therapy of Excimer laser and tacrolimus in an Iranian population. OBJECTIVES: Usage of 308-nm excimer laser (EL) is an effective treatment in vitiligo. As genetic predispositions along with type of skin and rate of sun exposure are known factors influencing the treatment outcomes, we tried to evaluate the treatment results of using 308 nm-excimer laser alone in comparison with the combined therapy of EL and topical tacrolimus in Iranian patients with vitiligo. METHODS: We reviewed the medical files of 150 patients with vitiligo who were referred to the Behsima Laser Center between April 2012 and April 2013. Seventy five patients who received combined therapy of 308 nm EL and topical tacrolimus three times a week entered the study. Seventy-five controls with matched characteristics and who received only EL were also selected. The amount of repigmentation was estimated by an expert dermatologist and was classified in 5 ranks. RESULTS: In the case group, 33.3% (n: 25) showed 50-75% repigmentaion and 49.3% (n:37) had more than 75% response to therapy, whereas among the patients in the control group 29.3% (n: 22) showed no repigmentation and only 8% (n: 6) demonstrated more than 75% repigmentation response. The higher efficiency of the combination therapy on repigmentation was statistically significant (P: 0.006). CONCLUSION: Our study shows that Iranian patients with vitiligo who received a combined treatment course with 308-nm EL and tacrolimus 0.1% experienced significantly higher levels of repigmentation in comparison with laser therapy alone. Tacrolimus Administration, Cutaneous;Adult;Combined Modality Therapy;Cosmetic Techniques;Female;Humans;Iran;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Tacrolimus;Vitiligo

Low-level laser therapy supported surgical treatment of bisphosphonate related osteonecrosis of jaws: a retrospective analysis of 11 cases. OBJECTIVE: The aim of this study is to evaluate and report on low-level laser therapy (LLLT) supported medical-surgical treatment outcomes of 11 patients with bisphosphonate related osteonecrosis of the jaws (BRONJ) lesions. BACKGROUND DATA: BRONJ is a severe clinical condition, which adversely affects patients' lives. Even though various treatment modalities have been proposed, the ideal approach still remains to be debated. LLLT stands out among supportive approaches because of its favorable effects on tissue healing. MATERIALS AND METHODS: Eleven patients diagnosed with Stage II or III lesions (American Association of Oral and Maxillofacial Surgeons [AAOMS] classification) were included in the study. All patients received LLLT applications during the postoperative period in addition to medical and surgical treatment. Laser applications covering the entirety of the surgical site were performed with GaAlAs diode laser with the following parameters: 808â€‰nm wavelength, 0.5 W power, continuous wave, noncontact mode at 0.5-1â€‰cm distance from the oral mucosa, spot size 0.28â€‰cm(2) (R=6â€‰mm), for 3â€‰sec per point (10â€‰sec per cm(2)), and energy density of 5â€‰J/cm(2) (energy per point,1.4â€‰J). RESULTS: Elimination of previously recorded symptoms and a stable mucosal closure was achieved in all patients. Primary healing was achieved in seven patients and secondary healing course was observed in four patients. Permanence of obtained positive outcomes was noted in follow-up periods. CONCLUSIONS: Treatment of advanced BRONJ lesions with a combination of antibiotic therapy, surgical removal of the lesion, and consecutive low-level diode laser applications provided favorable results in all patients. In consideration of our findings, it can be assumed that LLLT may serve as a safe and effective adjunct to medical-surgical treatment of BRONJ lesions. Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Wound Healing

Vitiligo nonsurgical treatment: a review of latest treatment researches. Vitiligo is a common depigmenting acquired disorder affecting about 1-2% of the world population, regardless of race, ethnic background, or gender. It is characterized by the appearance of milky white maculae because of a loss of melanocytes. The disfiguring nature of vitiligo causes high psychosocial morbidity. This is especially pronounced in populations with darker skin tone, likely because of the marked contrast. A variety of nonsurgical treatment regimens are currently employed in vitiligo. We reviewed the latest studies carried out on different nonsurgical treatment modalities used in vitiligo. All nonsurgical treatment aid to repigment or depigmentation the skin, however, many of them require a prolonged treatment course and may yield minimal results as well as carry unwanted side effects. There is a need for further research into the causes of vitiligo and into discovering better treatments. Dermatologic Agents Administration, Cutaneous;Combined Modality Therapy;Dermatologic Agents;Humans;Low-Level Light Therapy;PUVA Therapy;Photochemotherapy;Phototherapy;Skin Pigmentation;Treatment Outcome;Vitiligo

Effect of low-level laser therapy on inflammatory mediator release during chemotherapy-induced oral mucositis: a randomized preliminary study. Patients undergoing hematopoietic stem cell transplantation (HSCT) are submitted to a conditioning regimen of high-dose chemotherapy, with or without radiation therapy, which usually results in oral ulcerations and mucosal barrier breakdown. Oral mucositis (OM) is a common and debilitating toxicity side effect of autologous and allogeneic HSCT. The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) on the severity of OM and inflammatory mediator (TNF-Î±, IL-6, IL-1Î², IL-10, TGF-Î², metalloproteinases, and growth factors) levels in saliva and blood of HSCT patients. Thirty patients were randomly assigned to two groups: control (nâ€‰=â€‰15) and laser (nâ€‰=â€‰15). LLLT was applied from the first day of the conditioning regimen until day 7 post-HSCT (Dâ€‰+â€‰7). Saliva and blood were collected from patients on admission (AD), D-1, Dâ€‰+â€‰3, Dâ€‰+â€‰7, and on marrow engraftment day (ME). Clinical results showed less severe OM in the laser group (pâ€‰<â€‰0.05). The LLLT group showed increased matrix metalloproteinase 2 (MMP-2) levels in saliva on Dâ€‰+â€‰7 (pâ€‰=â€‰0.04). Significant differences were also observed for IL-10 on Dâ€‰+â€‰7 and on ME in blood plasma, when compared to the control group (pâ€‰<â€‰0.05). No significant differences were seen in saliva or blood for the other inflammatory mediators investigated. LLLT was clinically effective in reducing the severity of chemotherapy-induced OM in HSCT patients, and its mechanism of action does not seem to be completely linked to the modulation of pro- or anti-inflammatory cytokines, growth factors or matrix metalloproteinases. IL10 protein, human;IL6 protein, human;Inflammation Mediators;Interleukin-6;Myeloablative Agonists;TNF protein, human;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Interleukin-10;MMP2 protein, human;Matrix Metalloproteinase 2 Adult;Female;Hematopoietic Stem Cell Transplantation;Humans;Inflammation Mediators;Interleukin-10;Interleukin-6;Lasers, Semiconductor;Leukemia;Low-Level Light Therapy;Lymphoma;Male;Matrix Metalloproteinase 2;Middle Aged;Myeloablative Agonists;Saliva;Stomatitis;Transforming Growth Factor beta;Transplantation Conditioning;Tumor Necrosis Factor-alpha;Young Adult

Combined central and peripheral stimulation for treatment of chronic tinnitus: a randomized pilot study. BACKGROUND: Tinnitus is a common untreatable condition that originates from central maladaptive plasticity initiated by peripheral injury. Repetitive transcranial magnetic stimulation (rTMS), direct cochlear low-level laser therapy (LLLT), and acupuncture were tried for tinnitus treatment, but the results of these methods were clinically unsatisfactory. OBJECTIVE: This study aimed to test the combined effect of the 3 methods targeting both peripheral and central auditory areas as a new therapeutic strategy for tinnitus. METHODS: For this, 30 patients were randomized to 3 equal groups receiving 3 different interventions: inhibitory rTMS to the left auditory cortex, LLLT (which includes a combination of direct cochlear LLLT and laser acupuncture) to the affected ear(s),

and finally, a combination of rTMS and LLLT. The Tinnitus Handicap Inventory (THI) and Visual Analogue Scale (VAS) were assessed before, immediately after, and at 2 weeks and 4 weeks after 10 consecutive every-other-day sessions for each intervention type. RESULTS: We found that combined stimulation was effective in tinnitus treatment. This effect remained for 4 weeks after the end of the treatment. However, each of rTMS and LLLT alone had no significant effect. Repeated-measures ANOVA showed a significant effect of Time and Time Ã— Intervention interaction for THI and VAS scores. The post hoc t test for different time points per intervention revealed a significant difference between baseline and all postintervention measurements of both THI and VAS for the combination intervention. CONCLUSION: Combined central rTMS and peripheral LLLT is more beneficial as a new method for management of tinnitus rather than these two used separately. Acoustic Stimulation;Acupuncture Therapy;Adult;Chronic Disease;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Tinnitus;Transcranial Magnetic Stimulation;Treatment Outcome

Raman spectroscopic study of the repair of surgical bone defects grafted or not with biphasic synthetic micro-granular HA + Î²-calcium triphosphate irradiated or not with Î»850Â nm LED light. The handling of bone losses due to different etiologic factors is difficult and many techniques are aim to improve repair, including a wide range of biomaterials and, recently, photobioengineering. This work aimed to assess, through Raman spectroscopy, the level of bone mineralization using the intensities of the Raman peaks of both inorganic (~960, ~1,070, and 1,077 cm(-1)) and organic (~1,454 and ~1,666 cm(-1)) contents of bone tissue. Forty rats were divided into four groups each subdivided into two subgroups according to the time of sacrifice (15 and 30 days). Surgical bone defects were made on the femur of each animal with a trephine drill. On animals of group clot, the defect was filled only by blood clot, on group LED, the defect filled with the clot was further irradiated. On animals of groups biomaterial and LED + biomaterial, the defect was filled by biomaterial and the last one was further irradiated (Î»850â€‰Â±â€‰10 nm, 150 mW, Î¦â€‰~â€‰0.5 cm(2), 20 J/cm(2)-session, 140 J/cm(2)-treatment) at 48-h intervals and repeated for 2 weeks. At both 15th and 30th days following sacrifice, samples were taken and analyzed by Raman spectroscopy. At the end of the experimental time, the intensity of hydroxyapatite (HA) (~960 cm(-1)) were higher on group LED + biomaterial and the peaks of both organic content (~1,454 and ~1,666 cm(-1)) and transitional HA (~1,070 and ~1,077 cm(-1)) were lower on the same group. It is concluded that the use of LED phototherapy associated to biomaterial was effective in improving bone healing on bone defects as a result of the increasing deposition of HA measured by Raman spectroscopy. Biocompatible Materials;Polyphosphates;Durapatite;triphosphoric acid;Calcium Animals;Biocompatible Materials;Bone and Bones;Calcium;Durapatite;Light;Low-Level Light Therapy;Male;Phototherapy;Polyphosphates;Rats;Rats, Wistar;Spectrum Analysis, Raman;Wound Healing

The Effect of Low-level Laser Therapy on Trigeminal Neuralgia: A Review of Literature. The effect of low intensity laser radiation in the treatment of acute and chronic pain is now established in many studies. Tri-geminal neuralgia is a pain passes through nerve's branches and its trigger is located in skin or mucosa that could lead to pain with a trigger stimulus. The pain involved branches of trigeminal nerve that sometimes has patients to seek the treatment for several years. Nowadays different treatments are used for relief of pain that most of them cause tolerance and various side effects. This paper reviews and summarizes scientific papers available in English literature publishedin PubMed, Scopus, Science Direct, Inter science, and Iran Medex from 1986 until July 2011 about the effect of these types of lasers on trigeminal neuralgia which is one of the most painful afflictions known. In different studies, the effect of laser therapy has been compared with placebo irradiation or medicinal and surgical treatment modalities. Low-level laser therapy (LLLT) is a treatment strategy

which uses a single wavelength light source. Laser radiation and monochromatic light may alter cell and tissue function. However, in most studies laser therapy was associated with significant reduction in the intensity and frequency of pain compared with other treatment strategies, a few studies revealed that between laser and placebo group there was not any significant difference according to the analgesic effect. Low-level laser therapy could be considered in treatment of trigeminal neuralgia without any side effects.

Effect of low level laser therapy on revascularization of free gingival graft using ultrasound Doppler flowmetry. Low level laser therapy (LLLT) is widely used during the post-operative period to accelerate the healing process. It promotes beneficial biological action on neovascularization with anti-inflammatory and analgesic effects. Two systemically healthy patients with Miller's grade II recession on 33 and 41, respectively, were treated with free gingival graft. After surgery, second patient received LLLT using a 830 nm diode laser, with output power of 0.1 W on the first day half hour following surgery, on the third day, seventh day, and lastly on the ninth day. Both the patients were asked to assess the pain on second, fourth and tenth day using a Numerical Rating Scale and revascularization of the grafted area was assessed using a color Doppler ultrasound imaging on the fourth and the ninth day. Neovascularization was noted in both the patients but the second patient elicited marked increase in vascularity on the fourth as well as the tenth day and drastic reduction in pain on day four, with no change on the tenth day. The results showed that LLLT was an effective adjunctive treatment in promoting reevascularization and pain control during early healing of free gingival graft.

The effect of light-emitting diode and laser on mandibular growth in rats. OBJECTIVE: To evaluate the effect of a light-emitting diode (LED) and/or low-level laser (LLL) with or without the use of anterior bite jumping appliances (also known as functional appliances [FAs]) on mandibular growth in rats. MATERIALS AND METHODS: Thirty-six 8-week-old male Sprague-Dawley rats weighing 200Â g were obtained from Charles River Canada (St. Constant, QC, Canada) and were divided into six groups of six animals each. Groups were as follows: group 1: LLL; group 2: LLL + FA; group 3: LED; group 4: LED + FA; group 5: FA; and group 6: control (no treatment). Mandibular growth was evaluated by histomorphometric and micro computed tomographic (microCT) analyses. RESULTS: The LED and LED + FA groups showed an increase in all condylar tissue parameters compared with other groups. CONCLUSION: The LED-treated groups showed more mandibular growth stimulation compared with the laser groups. Animals;Cartilage, Articular;Chondrocytes;Fibrocartilage;Low-Level Light Therapy;Male;Mandible;Mandibular Condyle;Orthodontic Appliances, Functional;Rats;Rats, Sprague-Dawley;X-Ray Microtomography

[The influence of low-intensity laser irradiation on the loach embryo cells]. The ultrastructural organization of loach embryo cells (Misgurnus fossilis L) at the stage of the first and the tenth embryo divisions was investigated in the control and under the influence of low intensity helium-neon laser irradiation of 5 min exposure. The effect of laser irradiation led to ultrastructural changes in cell organelles, increasing the number and size of mitochondria, and as a result their shape changes. Under the influence of laser irradiation, the activation of cellular digestion processes took place, the number of vacuoles and lysosomes increased. The results explain the possible mechanism laser irradiation impact at the cellular level. Animals;Cell Membrane;Cypriniformes;Dose-Response Relationship, Radiation;Embryo, Nonmammalian;Lasers, Gas;Mitochondria;Mitochondrial Size

The necessity for increased attention to pulsed low-level laser therapy. Animals;Cell Proliferation;Humans;Low-Level Light Therapy;Wound Healing

The long-term effects of red light-emitting diode irradiation on the proliferation and differentiation of osteoblast-like MC3T3-E1 cells. Low level laser therapy (LLLT) affects various biological

processes, and it is said that the non-coherent light of the light-emitting diode (LED) has a similar action. The purpose of this study was to examine the effects of LED light on the proliferation and differentiation of osteoblasts-like MC3T3-E1 cells cultured in osteogenic differentiation medium (ODM) over the long term. Cells were irradiated with red LED light of 630 nm at three doses; 0.5J/cmÂ², 1.5J/cmÂ² or 3.0J/cmÂ² for the cell proliferation activity assay, and at 0.5J/cmÂ² for the osteogenic differentiation activity assay. The former activity was checked by counting the number of viable cells using Trypan blue dye. The latter activity was evaluated by alkaline phosphatase (ALP) staining and examining the mRNA expression of the osteopontin (OPN) gene using real-time quantitative PCR. The number of viable MC3T3-E1 cells showed a tendency to increase after the irradiation at all three energy densities in comparison with a non-irradiation group (control group). In particular, there was a remarkable 3.34-fold increase in the group irradiated with 3.0J/cmÂ² on day 7 after starting the culture. On culture day 15, there was a tendency for the red LED irradiation group (0.5 J/cmÂ²) to exhibit more staining for ALP than the control group, and the expression of OPN was significantly higher in the irradiation group on culture day 16. In conclusion, low level red LED light can enhance MC3T3-E1 cell proliferation and osteogenic differentiation when the cells are cultured for a relatively long time. RNA, Messenger;Spp1 protein, mouse;Osteopontin;Alkaline Phosphatase 3T3 Cells;Alkaline Phosphatase;Animals;Cell Differentiation;Cell Proliferation;Gene Expression;Light;Mice;Osteoblasts;Osteogenesis;Osteopontin;RNA, Messenger

[Burning mouth syndrome: pathogenic and therapeutic concepts]. Burning mouth syndrome (BMS) is a chronic pain condition characterized by pain, burning sensations and dryness within an oral mucosa, without any clinical changes of the latter. It occurs approximately seven times more frequently in women, mostly in perimenopausal age. The psychiatric aspect of BMS is significant: the most frequent co-morbidities are depression and anxiety disorders, and a number of psychotropic drugs play an essential role in its treatment. In the present review, the most important pathogenic and treatment concepts of BMS have been discussed. The BMS may be similar to neuropathic pain and has some related pathogenic elements with fibromyalgia and the restless leg syndrome. In primary BMS, the features of presynaptic dysfunction of dopaminergic neurons and deficiency of endogenous dopamine levels have been demonstrated. Other neurotransmitters such as serotonin, noradrenaline, histamine as well as hormonal and inflammatory factors may also play a role in the pathogenesis of BMS. In the pharmacological treatment of BMS a variety of drugs have been used including benzodiazepines, anticonvulsants, antidepressants and atypical antipsychotic drugs. In the final part of the paper, the possibility of using atypical antipsychotic drug, olanzapine, in the treatment of BMS has been discussed. In the context of the recent studies on this topic, a case of female patient with the BMS lasting more than ten years has been mentioned, in whom the treatment with olanzapine brought about a rapid and significant reduction of symptoms. The probable mechanism of the therapeutic effect of olanzapine in BMS can include its effect on dopaminergic receptors and probably also on histaminergic, noradrenergic and serotonergic ones. Anticonvulsants;Antidepressive Agents;Antipsychotic Agents;Psychotropic Drugs;Tranquilizing Agents Age Factors;Anticonvulsants;Antidepressive Agents;Antipsychotic Agents;Burning Mouth Syndrome;Female;Humans;Low-Level Light Therapy;Male;Nervous System Physiological Phenomena;Premenopause;Psychotropic Drugs;Quality of Life;Risk Factors;Tranquilizing Agents;Women's Health

Excimer UV radiation in dermatology. Ultraviolet B (UVB 290-320 nm) radiation has been used in the treatment of different skin diseases. Light sources with narrowband UVB output spectrum have been developed with the aim of increasing the rates of Â“beneficial to side effectÂ” profile of the treatment. Narrowband UVB phototherapy using fluorescent lamps (TL01, 311∓2nm) has been widely adopted over the past 10 years. Monochromatic Excimer Light (MEL) represents a new

source of narrow-band UVB emitting at 308 nm and guarantees a safe and effective approach to different chronic and recurrent skin diseases thanks to its potent and selective immunosuppressant action. Dermatology;Humans;Lasers, Excimer;Low-Level Light Therapy;Skin Diseases;Treatment Outcome;Ultraviolet Therapy

Simulation of laser propagation through a three-layer human skin model in the spectral range from 1000 to 1900 nm. For understanding the mechanisms of low-level laser/light therapy (LLLT), accurate knowledge of light interaction with tissue is necessary. We present a three-dimensional, multilayer reduced-variance Monte Carlo simulation tool for studying light penetration and absorption in human skin. Local profiles of light penetration and volumetric absorption were calculated for uniform as well as Gaussian profile beams with different spreads over the spectral range from 1000 to 1900 nm. The results showed that lasers within this wavelength range could be used to effectively and safely deliver energy to specific skin layers as well as achieve large penetration depths for treating deep tissues, without causing skin damage. In addition, by changing the beam profile from uniform to Gaussian, the local volumetric dosage could increase as much as three times for otherwise similar lasers. We expect that this tool along with the results presented will aid researchers in selecting wavelength and laser power in LLLT. Absorption, Radiation;Computer Simulation;Humans;Lasers;Low-Level Light Therapy;Models, Biological;Monte Carlo Method;Skin

Low-level laser therapy ameliorates disease progression in a mouse model of Alzheimer's disease. Low-level laser therapy (LLLT) has been used to treat inflammation, tissue healing, and repair processes. We recently reported that LLLT to the bone marrow (BM) led to proliferation of mesenchymal stem cells (MSCs) and their homing in the ischemic heart suggesting its role in regenerative medicine. The aim of the present study was to investigate the ability of LLLT to stimulate MSCs of autologous BM in order to affect neurological behavior and Î²-amyloid burden in progressive stages of Alzheimer's disease (AD) mouse model. MSCs from wild-type mice stimulated with LLLT showed to increase their ability to maturate towards a monocyte lineage and to increase phagocytosis activity towards soluble amyloid beta (AÎ²). Furthermore, weekly LLLT to BM of AD mice for 2 months, starting at 4 months of age (progressive stage of AD), improved cognitive capacity and spatial learning, as compared to sham-treated AD mice. Histology revealed a significant reduction in AÎ² brain burden. Our results suggest the use of LLLT as a therapeutic application in progressive stages of AD and imply its role in mediating MSC therapy in brain amyloidogenic diseases. Amyloid beta-Peptides Alzheimer Disease;Amyloid beta-Peptides;Animals;Cognition;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Mice;Mice, Inbred C57BL;Monocytes;Phagocytosis

Evaluation of the efficacy of LED-laser treatment and control of tooth sensitivity during in-office bleaching procedures. OBJECTIVE: This study determined the efficacy of LED-laser treatment and the control of sensitivity caused by in-office bleaching. BACKGROUND DATA: Auxiliary power sources (halogen light, arc plasma, LED, LED-laser, and laser) are used in in-office teeth bleaching techniques to accelerate the redox reaction of the whitening gel to increase ease of use, to improve comfort and safety, and to decrease the procedure time. METHODS: Sixteen volunteers participated in this randomized, blinded and split-mouth clinical study. The volunteers were divided into two groups: GL, activation with LED; and GLL, activation with LED-laser (300â€‰mW/cm2). The upper and lower arches were bleached in accordance with each treatment. Tooth sensitivity was recorded by a verbal pain scale and the color analysis was evaluated by the VITA scale, up to 6 months after bleaching. Tooth sensitivity and color change were compared between groups at each time period using the Wilcoxon and NcNemar tests. The sensitivity and color within the same group at different periods were analyzed using the Friedman test or Cochran's Q test. RESULTS: The intensity of sensitivity was similar for both groups at different periods, with no statistical difference between them ($p>0.05$).

There were no significant differences in the color change comparing the two techniques ($p>0.05$); however, it was significant within each group at the different evaluation periods between the groups ($p<0.05$). CONCLUSIONS: LED-laser treatment was not able to prevent or reduce the sensitivity of teeth and did not improve the efficacy of bleaching. Adolescent;Dentin Sensitivity;Humans;Low-Level Light Therapy;Time Factors;Tooth Bleaching;Treatment Outcome;Young Adult

Tendinitis, an open avenue for low-level laser therapy. Animals;Female;Humans;Low-Level Light Therapy;Male;Tendinopathy

Amelioration of cardiac function and activation of anti-inflammatory vasoactive peptides expression in the rat myocardium by low level laser therapy. Low-level laser therapy (LLLT) has been used as an anti-inflammatory treatment in several disease conditions, even when inflammation is a secondary consequence, such as in myocardial infarction (MI). However, the mechanism by which LLLT is able to protect the remaining myocardium remains unclear. The present study tested the hypothesis that LLLT reduces inflammation after acute MI in female rats and ameliorates cardiac function. The potential participation of the Renin-Angiotensin System (RAS) and Kallikrein-Kinin System (KKS) vasoactive peptides was also evaluated. LLLT treatment effectively reduced MI size, attenuated the systolic dysfunction after MI, and decreased the myocardial mRNA expression of interleukin-1 beta and interleukin-6 in comparison to the non-irradiated rat tissue. In addition, LLLT treatment increased protein and mRNA levels of the Mas receptor, the mRNA expression of kinin B2 receptors and the circulating levels of plasma kallikrein compared to non-treated post-MI rats. On the other hand, the kinin B1 receptor mRNA expression decreased after LLLT. No significant changes were found in the expression of vascular endothelial growth factor (VEGF) in the myocardial remote area between laser-irradiated and non-irradiated post-MI rats. Capillaries density also remained similar between these two experimental groups. The mRNA expression of the inducible nitric oxide synthase (iNOS) was increased three days after MI, however, this effect was blunted by LLLT. Moreover, endothelial NOS mRNA content increased after LLLT. Plasma nitric oxide metabolites (NOx) concentration was increased three days after MI in non-treated rats and increased even further by LLLT treatment. Our data suggest that LLLT diminishes the acute inflammation in the myocardium, reduces infarct size and attenuates left ventricle dysfunction post-MI and increases vasoactive peptides expression and nitric oxide (NO) generation. Interleukin-1beta;Interleukin-6;Proto-Oncogene Mas;Proto-Oncogene Proteins;Receptor, Bradykinin B1;Receptor, Bradykinin B2;Receptors, G-Protein-Coupled;Vascular Endothelial Growth Factor A;Nitric Oxide;Nitric Oxide Synthase Type II;Peptidyl-Dipeptidase A;Ace2 protein, rat;Angiotensin-Converting Enzyme 2;Kallikreins Angiotensin-Converting Enzyme 2;Animals;Female;Gene Expression Regulation;Heart;Interleukin-1beta;Interleukin-6;Kallikrein-Kinin System;Kallikreins;Low-Level Light Therapy;Myocardial Infarction;Myocardium;Nitric Oxide;Nitric Oxide Synthase Type II;Peptidyl-Dipeptidase A;Proto-Oncogene Mas;Proto-Oncogene Proteins;Rats;Rats, Wistar;Receptor, Bradykinin B1;Receptor, Bradykinin B2;Receptors, G-Protein-Coupled;Renin-Angiotensin System;Vascular Endothelial Growth Factor A

The effect of low level laser therapy on the rate of tooth movement and pain perception during canine retraction. AIMS: This study investigated the effect of an 810 nm gallium-aluminum-arsenide (Ga-Al-As) laser on tooth movement velocity and pain perception during canine retraction in orthodontic patients. METHODS: This single blind study included 20 patients requiring upper first premolar extraction on both sides. One half of the upper arch was irradiated with a GaAlAs laser (810 nm, 200 mW, 10 points, 21.4 J/cm2/point) and the other half served as the placebo group. Irradiation was performed just after loading canine retraction forces and on days 3, 7, 11 15 over the first month. At the 28th day, the coil spring was adjusted and the same protocol was continued. The extension of tooth movement and the degree of mesiodistal inclination of canines were measured on the study

models prepared at 0, 28 and 56 days. The patients were also asked to bite on plastic blocks to examine the degree of pain perceived on canines at both sides. RESULTS: There was no significant difference either in the speed of canine movement or in its degree of mesiodistal inclination between the laser and placebo sides. The pain perception did not differ significantly between the two groups at any of the treatment appointments. CONCLUSION: Low level laser therapy (LLLT), with the parameter settings used in this study, did not affect canine movement velocity and its degree of mesiodistal inclination and did not influence pain perceived by the patients.

Effect of low-level laser on bone defects treated with bovine or autogenous bone grafts: in vivo study in rat calvaria. OBJECTIVE: The purpose of this study was to histologically evaluate the effect of low-level laser (LLL) on the healing of critical size defects (CSD) in rat calvaria, filled with autogenous or inorganic bovine bone grafts. METHODS: Sixty rats were divided into 6 groups (n = 10): C (control-filled with blood clot), LLL (low-level laser-GaAlAs, Î» 780â€‰nm, 100â€‰mW, 210â€‰J/cm(2), Î¦ 0.05â€‰cm(2); 6â€‰J/point), AB (autogenous bone), ABL (autogenous bone + low-level laser), OB (inorganic bovine bone), and OBL (inorganic bovine bone + LLL). MATERIAL AND METHODS: The animals were killed after 30 days. Histological and histometric analyses were performed by light microscopy. Results. The groups irradiated with laser, LLL (47.67% Â± 8.66%), ABL (39.15% Â± 16.72%), and OBL (48.57% Â± 28.22%), presented greater area of new bone formation than groups C (9.96% Â± 4.50%), AB (30.98% Â± 16.59%), and OB (11.36% Â± 7.89%), which were not irradiated. Moreover, they were significantly better than group C (Kruskal-Wallis test followed by Dunn test, $P < 0.05$). CONCLUSION: The laser accelerated the healing of bone defects and the resorption of particles of the graft material. Animals;Bone Transplantation;Cattle;Low-Level Light Therapy;Male;Osteogenesis;Skull;Statistics as Topic;Transplantation, Autologous

Clinical and radiographic outcomes of the use of Low-Level Laser Therapy in vital pulp of primary teeth. AIM: This study aimed to compare the clinical and radiographic effectiveness of Low Level Laser Therapy in vital pulp of human primary teeth. METHODS: Sixty mandibular primary molars of children aged between 5-9 years were assigned into four groups: Diluted Formocresol (FC), Calcium Hydroxide (CH), Low Level Laser Therapy (LLLT) and Calcium Hydroxide preceded by Low Level Laser Therapy (LLLT + CH). The clinical and radiographic evaluations were performed at 6, 12 and 18 post-operative months. RESULTS: All the groups studied were successful in the clinical evaluation over the follow-up period. At 6 months, the radiographic success rate for FC group was 100%, 60% for CH group, 80% for LLLT group and 85.7% for LLLT + CH group. After 12 months, the radiographic success rate was 100% for FC group, 50% for CH group, 80% for LLLT group and 78.6% for LLLT + CH group. At the 18 months follow-up, 100% of the FC group, 66.7% of CH group, 73.3% of the LLLT group and 75% of the LLLT + CH group. CONCLUSION: These findings suggest that Low Level Laser Therapy may be considered as an adjuvant alternative for vital pulp therapy on human primary teeth. Low Level Laser Therapy preceding the use of calcium hydroxide showed satisfactory results. Formocresols;formocresol;Calcium Hydroxide Calcium Hydroxide;Child;Child, Preschool;Dental Pulp;Female;Formocresols;Humans;Low-Level Light Therapy;Male;Molar;Pulpotomy;Tooth, Deciduous;Treatment Outcome

Expression of mPGES-1 and IP mRNA is reduced by LLLT in both subplantar and brain tissues in the model of peripheral inflammation induced by carrageenan. The increase in PGE2 production by microsomal PGE synthase-1 (mPGES-1) in CNS contributes to the severity of the inflammatory and pain responses in the model of edema formation and hyperalgesia induced by carrageenan. PGI2, alike to PGE2, plays an important role in the inflammation. Low-level laser therapy (LLLT) has been used in the treatment of inflammatory pathologies, reducing both pain and the acute inflammatory process. In this work, we studied the effect of LLLT on the expression of both mPGES-1 and IP messenger RNA (mRNA), in either subplantar or total brain tissues obtained from rats submitted to

model of edema formation and hyperalgesia induced by carrageenan administration. The test sample consisted of 30 rats divided into five groups: A1 (control-saline), A2 (carrageenan-0.5 mg/paw), A3 (carrageenan-0.5 mg/pawâ€‰+â€‰LLLT), A4 (carrageenan-1.0 mg/paw), and A5 (carrageenan-1.0 mg/pawâ€‰+â€‰LLLT). The animals from groups A3 and A5 were irradiated 1 h after induction of inflammation by carrageenan injection. Continuous-wave red laser with wavelengths of 660 nm and dose of 7.5 J/cm(2) was used. Six hours after carrageenan-induced inflammation, mPGES-1 and prostacyclin receptor (IP) mRNA expression were significantly increased both in subplantar and brain tissues. LLLT was able to reduce both mPGES-1 and IP mRNA expression in subplantar and brain tissues. We suggest that LLLT is able to reduce both inflammation and hyperalgesia observed in the model of edema formation and hyperalgesia induced by carrageenan, by a mechanism involving the decrease in the expression of both mPGES-1 and IP. RNA, Messenger;Receptors, Prostaglandin;Carrageenan;Intramolecular Oxidoreductases;Prostaglandin-E Synthases Animals;Brain;Carrageenan;Down-Regulation;Edema;Foot;Gene Expression;Hindlimb;Hyperalgesia;Intramolecular Oxidoreductases;Lasers, Semiconductor;Low-Level Light Therapy;Male;Prostaglandin-E Synthases;RNA, Messenger;Rats;Rats, Wistar;Receptors, Prostaglandin

Comparison of pulsed dye laser (PDL) and photodynamic therapy (PDT) for treatment of facial port-wine stain (PWS) birthmarks in pediatric patients. BACKGROUND: Vascular-acting photodynamic therapy (PDT) might be an alternative approach for treating port wine stain (PWS) birthmarks, but the usefulness of PDT for pediatric patients has not been fully investigated. STUDY DESIGN: Medical records of pediatric patients (3-10 years old) with red and purple facial PWS were analyzed. Clinical outcomes after one session of PDL (585 nm, 4.8-6.5 J/cm(2)) and PDT (Hemoporfin - 3.5mg/kg, copper vapour laser - 120 J/cm(2)) were compared. RESULTS: The rate of excellent response in PDT group was significantly higher than that in PDL group (25.0% vs 10.9%). For red lesions there was no significant difference in overall response between PDL and PDT group, but for purple lesions the overall response rate of PDT group was significantly higher than that of PDL group (93.0% vs 75.6%). Lesions located at the forehead, cheek and jaw regions showed better responses to PDT. Incidences of pigmentation and scar formation in PDT group were significantly lower than PDL group (8.3% vs 21.1%). CONCLUSION: This study suggests that PDT is safe and effective for treating facial PWS of childhood patients. Hematoporphyrins;Radiation-Sensitizing Agents;hematoporphyrin monomethyl ether Child;Child, Preschool;Facial Dermatoses;Female;Hematoporphyrins;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Photochemotherapy;Port-Wine Stain;Radiation-Sensitizing Agents;Retrospective Studies;Treatment Outcome

TRPV Channels in Mast Cells as a Target for Low-Level-Laser Therapy. Low-level laser irradiation in the visible as well as infrared range is applied to skin for treatment of various diseases. Here we summarize and discuss effects of laser irradiation on mast cells that leads to degranulation of the cells. This process may contribute to initial steps in the final medical effects. We suggest that activation of TRPV channels in the mast cells forms a basis for the underlying mechanisms and that released ATP and histamine may be putative mediators for therapeutic effects.

Depressed Facial Scars Successfully Treated with Autologous Platelet-Rich Plasma and Light-Emitting Diode Phototherapy at 830 nm.

Pemphigus vulgaris and laser therapy: crucial role of dentists. INTRODUCTION: Pemphigus vulgaris is a relatively rare, chronic, autoimmune vesiculobullous disorder characterized by formation of intraepithelial vesiculae and/or bullae in the skin and mucous membrane. Systemic steroids are considered to be the standard first-line therapy for pemphigus vulgaris. However, for patients unresponsive to standard therapy, the new treatment modalities are being sought. Low-level laser

therapy has been accepted as an alternative or adjunctive treatment modality for many conditions in medicine and dentistry. Therefore, this study was aimed at presenting the effects of low-level laser therapy in the treatment of pemphigus vulgaris and to emphasize the crucial role of dentists in early recognition and diagnosis of pemphigus vulgaris. MATERIAL AND METHODS: The articles published until May 2013 were obtained from the Medline/PubMed online database, using following search terms and key words: "laser therapy" and "pemphigus vulgaris", "low-level laser irradiation" and "pemphigus vulgaris", "lasers" and "pemphigus vulgaris" and "pemphigus vulgaris". RESULTS: Low-level laser therapy could result in immediate and significant analgesia and improved wound healing within the observation period and follow-up. Furthermore, a decrease in patients' discomfort as well as the absence of recurrence of the pemphigus vulgaris lesions has been claimed. CONCLUSION: Even though available literature suggests that low-level laser therapy can be efficiently used in treatment of oral pemphigus vulgaris, either independently or as a part of combined therapy approach, these results should be interpreted with caution since there are no solid evidence-based proofs to provide the guidelines for the treatment of pemphigus vulgaris with low-level laser therapy. Therefore, further long-term randomized controlled clinical studies are necessary in order to give any solid recommendations on the use of low-level laser therapy in the treatment of pemphigus vulgaris. Dentistry;Humans;Low-Level Light Therapy;Mouth Diseases;Pemphigus;Treatment Outcome;Wound Healing

Therapeutic effect of irradiation of magnetic infrared laser on osteoarthritis rat model. Osteoarthritis (OA) is a degenerative joint disease caused by articular cartilage loss. Many complementary and alternative medicines for OA have been reported so far, but the effectiveness is controversial. Previously, we have shown anti-inflammatory effects of low level laser therapy with static magnetic field, magnetic infrared laser (MIL), in various animal models. Therefore, the beneficial effects were examined in OA rat model. Rats were divided by six groups; no treatment controls of sham and OA model, three MIL treatment groups of OA model at 6.65, 2.66 and 1.33 J cm(-2), and Diclofenac group of OA model with 2 mg kg(-1) diclofenac sodium. The OA control exhibited typical symptoms of OA, but 4-week MIL treatment improved the functional movement of knee joint with reduced edematous changes. In addition, cartilage GAGs were detected more in all MIL treatment groups than OA control. It suggests that 4-week MIL irradiation has dose-dependent anti-inflammatory and chondroprotective effects on OA. Histopathological analyses revealed that MIL treatment inhibits the cartilage degradation and enhances chondrocyte proliferation. The fact that MIL has an additional potential for the cartilage formation and no adverse effects can be regarded as great advantages for OA treatment. These suggest that MIL can be useful for OA treatment. Anti-Inflammatory Agents, Non-Steroidal;Diclofenac Animals;Anti-Inflammatory Agents, Non-Steroidal;Cartilage, Articular;Cell Proliferation;Chondrocytes;Diclofenac;Dose-Response Relationship, Radiation;Edema;Female;Infrared Rays;Laser Therapy;Magnetic Fields;Osteoarthritis;Range of Motion, Articular;Rats;Rats, Sprague-Dawley;Tarsal Joints

Effect of pre-irradiation with different doses, wavelengths, and application intervals of low-level laser therapy on cytochrome c oxidase activity in intact skeletal muscle of rats. Modulation of cytochrome c oxidase activity has been pointed as a possible key mechanism for low-level laser therapy (LLLT) in unhealthy biological tissues. But recent studies by our research group with LLLT in healthy muscles before exercise found delayed skeletal muscle fatigue development and improved biochemical status in muscle tissue. Therefore, the aim of this study was to evaluate effects of different LLLT doses and wavelengths in cytochrome c oxidase activity in intact skeletal muscle. In this animal experiment, we irradiated the tibialis anterior muscle of rats with three different LLLT doses (1, 3, and 10 J) and wavelengths (660, 830, and 905 nm) with 50 mW power output. After irradiation, the analyses of cytochrome c oxidase expression by immunohistochemistry were analyzed at 5, 10, 30

min and at 1, 2, 12, and 24 h. Our results show that LLLT increased (pâ€‰<â€‰0.05) cytochrome c oxidase expression mainly with the following wavelengths and doses: 660 nm with 1 J, 830 nm with 3 J, and 905 nm with 1 J at all time points. We conclude that LLLT can increase cytochrome c oxidase activity in intact skeletal muscle and that it contributes to our understanding of how LLLT can enhance performance and protect skeletal muscles against fatigue development and tissue damage. Our findings also lead us to think that the combined use of different wavelengths at the same time can enhance LLLT effects in skeletal muscle performance and other conditions, and it can represent a therapeutic advantage in clinical settings. Electron Transport Complex IV Animals;Dose-Response Relationship, Radiation;Electron Transport Complex IV;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle Fibers, Skeletal;Muscle, Skeletal;Rats, Wistar

Combining neuroprotectants in a model of retinal degeneration: no additive benefit. The central nervous system undergoing degeneration can be stabilized, and in some models can be restored to function, by neuroprotective treatments. Photobiomodulation (PBM) and dietary saffron are distinctive as neuroprotectants in that they upregulate protective mechanisms, without causing measurable tissue damage. This study reports a first attempt to combine the actions of PBM and saffron. Our working hypothesis was that the actions of PBM and saffron in protecting retinal photoreceptors, in a rat light damage model, would be additive. Results confirmed the neuroprotective potential of each used separately, but gave no evidence that their effects are additive. Detailed analysis suggests that there is actually a negative interaction between PBM and saffron when given simultaneously, with a consequent reduction of the neuroprotection. Specific testing will be required to understand the mechanisms involved and to establish whether there is clinical potential in combining neuroprotectants, to improve the quality of life of people affected by retinal pathology, such as age-related macular degeneration, the major cause of blindness and visual impairment in older adults. Neuroprotective Agents Animals;Apoptosis;Combined Modality Therapy;Crocus;Electroretinography;Immunoenzyme Techniques;Light;Neuroprotective Agents;Photoreceptor Cells, Vertebrate;Phytotherapy;Rats;Rats, Sprague-Dawley;Retinal Degeneration

Laser-enhanced cytotoxicity of zoledronic acid and cisplatin on primary human fibroblasts and head and neck squamous cell carcinoma cell line UM-SCC-3. INTRODUCTION: Low-level laser therapy (LLLT) is used in parodontitis treatment in combination with an antimicrobial photosensitizer. The purpose of this study was to investigate the combination of LLLT with cisplatin and zoledronic acid as potential photosensitizer in-vitro. MATERIALS AND METHODS: Primary human fibroblasts (PHF) and head and neck squamous cell carcinoma cells (HNSCC, exactly UM-SCC-3) were treated with different concentrations of zoledronatic acid and cisplatin and irradiated twice with a diode laser (wavelength 670 nm, 2 min). Cell viability was tested by XTT assay and histomorphological analysis with HE staining. RESULTS: LLLT increased bioviability for both cell lines ($p < 0.001$). LLLT lowered PHF viability at the highest concentrations of cisplatin ($p = 0.027$ and $p = 0.005$) and zoledronic acid ($p < 0.001$). For HNSCCs, LLLT reduced cell viability at every concentration of cisplatin (all $p < 0.05$). In cases of incubation with zoledronic acid, similar to fibroblasts, laser therapy lowered cell viability at the highest concentration only ($p < 0.001$). CONCLUSIONS: Within the limits of this study, it can be concluded that LLLT enhances the effect of cisplatin and zoledronic acid in the discussed cells in order to develop new therapeutic options for cysts in the cranio-maxillofacial region and other appropriate indications. Antineoplastic Agents;Coloring Agents;Diphosphonates;Imidazoles;Indicators and Reagents;Photosensitizing Agents;Tetrazolium Salts;Zoledronic Acid;Cisplatin Antineoplastic Agents;Apoptosis;Carcinoma, Squamous Cell;Cell Line, Tumor;Cell Proliferation;Cell Shape;Cell Survival;Cells, Cultured;Cisplatin;Coloring Agents;Diphosphonates;Fibroblasts;Head and Neck

Neoplasms;Humans;Imidazoles;Indicators and Reagents;Lasers, Semiconductor;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Tetrazolium Salts;Zoledronic Acid

Does low-level laser therapy enhance the efficacy of intravenous regional anesthesia? BACKGROUND: The use of intravenous regional anesthesia (IVRA) is limited by pain resulting from the application of tourniquets and postoperative pain. OBJECTIVE: To assess the efficacy of low-level laser therapy added to IVRA for improving pain related to surgical fixation of distal radius fractures. METHODS: The present double-blinded, placebo-controlled, randomized clinical trial involved 48 patients who were undergoing surgical fixation of distal radius fractures. Participants were randomly assigned to either an intervention group (n=24), who received 808 nm laser irradiation as 4 Jâ•„point for 20 s over ipsilateral three nerve roots in the cervical region corresponding to C5-C8 vertebrae, and 808 nm laser irradiation as 0.1 Jâ•„cm2 for 5 min in a tangential scanning mode over the affected extremity; or a control group (n=24), who underwent the same protocol and timing of laser probe application with the laser switched off. Both groups received the same IVRA protocol using 2% lidocaine. RESULTS: The mean visual analogue scale scores were significantly lower in the laser-assisted group than in the lidocaine-only group on all measurements during and after operation (P<0.05). The mean time to the first need for fentanyl administration during the operation was longer in the laser group (P=0.04). The total amount of fentanyl administered to patients was significantly lower in the laser-assisted group (P=0.003). The laser group needed significantly less pethidine for pain relief (P=0.001) and at a later time (P=0.002) compared with the lidocaine-only group. There was no difference between the groups in terms of mean arterial pressure and heart rate. CONCLUSION: The addition of gallium-aluminum-arsenide laser irradiation to intravenous regional anesthesia is safe, and reduces pain during and after the operation. Anesthetics, Local;Lidocaine Adult;Anesthesia, Conduction;Anesthetics, Local;Double-Blind Method;Female;Fracture Fixation;Humans;Lidocaine;Low-Level Light Therapy;Male;Pain;Pain Measurement

[Can persistent toenail fungus be successfully treated with a laser?]. Onychomycosis is a common disease seen in dermatology practice. Most patients with onychomycosis opt for treatment due to the social stigma attached to the unsightly appearance, as well as the pain that can at times make walking difficult. However, in many cases, onychomycosis is resistant to oral antifungal medication, which is the first-line therapy for this disease. In recent years, we have attempted a new treatment method using a long-pulsed 1,064nm Nd :YAG laser (Cutera Inc., Brisbane, CA, USA) in refractory cases with onychomycosis. Using 1) a laser beam with a spot size of 5.0 mm and 2) sequential irradiation at low fluence, we 3) applied the laser to the infected lesions in a motion similar to showering, while maintaining a distance of several centimeters from the skin (Laser Genesis(TM)). Treatment efficacy was assessed using nail turbidity scores on a five-point scale. Improvement in onychomycosis was noted in more than 68.8% of all cases, thus demonstrating the high efficacy of this method. No major adverse reactions were observed during the treatment period. Since its mechanism of action clearly differs from that of antifungal agents, it can be considered a useful treatment option for cases with onychomycosis resistant to antifungal therapy. Future studies should examine "combined therapy" with oral / topical antifungal agents and this laser treatment, which may provide a significant improvement in the level of satisfaction among patients with onychomycosis. Antifungal Agents Aged;Antifungal Agents;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Onychomycosis;Treatment Outcome

Phototherapy in skeletal muscle performance and recovery after exercise: effect of combination of super-pulsed laser and light-emitting diodes. Recent studies with phototherapy have shown positive results in enhancement of performance and improvement of recovery when applied before exercise. However, several factors still remain unknown such as therapeutic windows, optimal

treatment parameters, and effects of combination of different light sources (laser and LEDs). The aim of this study was to evaluate the effects of phototherapy with the combination of different light sources on skeletal muscle performance and post-exercise recovery, and to establish the optimal energy dose. A randomized, double-blinded, placebo-controlled trial with participation of 40 male healthy untrained volunteers was performed. A single phototherapy intervention was performed immediately after pre-exercise (baseline) maximum voluntary contraction (MVC) with a cluster of 12 diodes (4 of 905Â nm lasers-0.3125Â mW each, 4 of 875Â nm LEDs-17.5Â mW each, and 4 of 670Â nm LEDs-15Â mW each- manufactured by Multi Radiance Medicalâ„¢) and dose of 10, 30, and 50Â J or placebo in six sites of quadriceps. MVC, delayed onset muscle soreness (DOMS), and creatine kinase (CK) activity were analyzed. Assessments were performed before, 1Â min, 1, 24, 48, 72, and 96Â h after eccentric exercise protocol employed to induce fatigue. Phototherapy increased (pâ€‰<â€‰0.05) MVC was compared to placebo from immediately after to 96Â h after exercise with 10 or 30Â J doses (better results with 30Â J dose). DOMS was significantly decreased compared to placebo (pâ€‰<â€‰0.05) with 30Â J dose from 24 to 96Â h after exercise, and with 50Â J dose from immediately after to 96Â h after exercise. CK activity was significantly decreased (pâ€‰<â€‰0.05) compared to placebo with all phototherapy doses from 1 to 96Â h after exercise (except for 50Â J dose at 96Â h). Pre-exercise phototherapy with combination of low-level laser and LEDs, mainly with 30Â J dose, significantly increases performance, decreases DOMS, and improves biochemical marker related to skeletal muscle damage. Biomarkers Adult;Biomarkers;Double-Blind Method;Exercise;Humans;Lasers;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Quadriceps Muscle;Time Factors;Young Adult

[Quo vadis laser technology? An update on application to the cornea]. Corneal Diseases;Corneal Surgery, Laser;Forecasting;Humans;Low-Level Light Therapy

Raman ratios on the repair of grafted surgical bone defects irradiated or not with laser (Î»780 nm) or LED (Î»850 nm). This work aimed to assess biochemical changes associated to mineralization and remodeling of bone defects filled with Hydroxyapatite+Beta-Beta-tricalcium phosphate irradiated or not with 2 light sources. Ratios of intensities, band position and bandwidth of selected Raman peaks of collagen and apatites were used. Sixty male Wistar rats were divided into 6 groups subdivided into 2 subgroups (15th and 30th days). A standard surgical defect was created on one femur of each animal. In 3 groups the defects were filled with blood clot (Clot, Clot+Laser and Clot+LED groups) and in the remaining 3 groups the defects were filled with biomaterial (Biomaterial, Biomaterial+Laser and Biomaterial+LED groups). When indicated, the defects were irradiated with either Laser (Î»780 nm, 70 mW, Î¦â^¼0.4 cm(2)) or LED (Î»850Â±10 nm, 150 mW, Î¦â^¼0.5 cm(2)), 20 J/cm(2) each session, at 48 h intervals/2 weeks (140 J/cm(2) treatment). Following sacrifice, bone fragments were analyzed by Raman spectroscopy. Statistical analysis (ANOVA General Linear Model, p<0.05) showed that both grafting and time were the variables that presented significance for the ratios of â^¼1660/â^¼1670 cm(-1) (collagen maturation), â^¼1077/â^¼854 cm(-1) (mineralization), â^¼1077/â^¼1070 cm(-1) (carbonate substitution) and the position of the â^¼960 cm(-1) (bone maturation). At 30th day, the ratios indicated an increased deposition of immature collagen for both Clot and Biomaterial groups. Biomaterial group showed increased collagen maturation. Only collagen deposition was significantly dependent upon irradiation independently of the light source, being the amount of collagen I increased in the Clot group at the end of the experimental time. On the other hand, collagen I deposition was reduced in biomaterial irradiated groups. Raman ratios of selected protein matrix and phosphate and carbonate HA indicated that the use of biphasic synthetic micro-granular HA+Beta-TCP graft improved the repair of bone defects, associated or not with Laser or LED light, because of the increasing deposition of HA. Biocompatible Materials;Calcium

Phosphates;Collagen Type I;beta-tricalcium phosphate;Durapatite Animals;Biocompatible Materials;Blood Coagulation;Bone Diseases;Bone Regeneration;Bone Transplantation;Bone and Bones;Calcium Phosphates;Collagen Type I;Durapatite;Lasers;Light;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Spectrum Analysis, Raman;Time Factors

Photodynamic therapy using chlorophyll-a in the treatment of acne vulgaris: a randomized, single-blind, split-face study. BACKGROUND: Chlorophyll-a is a novel photosensitizer recently tested for the treatment of acne vulgaris. OBJECTIVE: We sought to evaluate the clinical efficacy and safety of chlorophyll-a photodynamic therapy used for acne treatment. METHODS: Subjects with acne on both sides of the face were included. Eight treatment sessions were performed over a 4-week duration. Half of the face was irradiated using a blue and red light-emitting diode after topical application of chlorophyll-lipoid complex. The other half underwent only light-emitting diode phototherapy. The lesion counts and acne severity were assessed by a blinded examiner. Sebum secretion, safety, and histologic changes were also evaluated. RESULTS: In total, 24 subjects completed the study. Facial acne improved on both treated sides. On the chlorophyll-a photodynamic therapy-treated side, there were significant reductions in acne lesion counts, acne severity grades, and sebum levels compared with the side treated with light-emitting diode phototherapy alone. The side effects were tolerable in all the cases. LIMITATIONS: All the subjects were of Asian descent with darker skin types, which may limit the generalizability of the study. A chlorophyll-a arm alone is absent, as is a no-treatment arm. CONCLUSIONS: We suggest that chlorophyll-a photodynamic therapy for the treatment of acne vulgaris can be effective and safe with minimal side effects. Chlorophyll;Chlorophyll A Acne Vulgaris;Adolescent;Adult;Biopsy, Needle;Chlorophyll;Chlorophyll A;Esthetics;Female;Follow-Up Studies;Humans;Immunohistochemistry;Male;Patient Selection;Photochemotherapy;Reference Values;Risk Assessment;Severity of Illness Index;Single-Blind Method;Treatment Outcome;Young Adult

Expression of DNA repair genes in burned skin exposed to low-level red laser. Although red laser lights lie in the region of non-ionizing radiations in the electromagnetic spectrum, there are doubts whether absorption of these radiations causes lesions in the DNA molecule. Our aim was to investigate the expression of the genes involved with base excision and nucleotide excision repair pathways in skin tissue submitted to burn injury and exposed to low-level red laser. Wistar rats were divided as follows: control group-rats burned and not irradiated, laser group-rats burned and irradiated 1 day after injury for five consecutive days, and later laser group-rats injured and treated 4 days after injury for five consecutive days. Irradiation was performed according to a clinical protocol (20 J/cm(2), 100 mW, continuous wave emission mode). The animals were sacrificed on day 10, and scarred tissue samples were withdrawn for total RNA extraction, complementary DNA (cDNA) synthesis, and evaluation of gene expression by quantitative polymerase chain reaction. Low-level red laser exposure (1) reduces the expression of APE1 messenger (mRNA), (2) increases the expression of OGG1 mRNA, (3) reduces the expression of XPC mRNA, and (4) increases the expression of XPA mRNA both in laser and later laser groups. Red laser exposure at therapeutic fluences alters the expression of genes related to base excision and nucleotide excision pathways of DNA repair during wound healing of burned skin. Carrier Proteins;XPC protein, rat;DNA Glycosylases;OGG1 protein, rat;Apex1 protein, rat Animals;Burns;Carrier Proteins;DNA Glycosylases;DNA Repair;DNA-(Apurinic or Apyrimidinic Site) Lyase;Gene Expression Profiling;Lasers;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Wound Healing

Laser technology to manage periodontal disease: a valid concept? Present day dental lasers can create oral environments conducive for periodontal repair. BACKGROUND AND PURPOSE: With the bacterial etiology of periodontitis and the resulting host inflammatory reaction, clinicians continue to search for therapeutic modalities to assist in the non-surgical management of periodontal disease.

Traditional chairside therapies consist of mechanical debridement with manual and/or ultrasonic instrumentation with the objective of removing calculus, biofilm, and endotoxin from tooth root surfaces. Decreasing the microbial stimuli and associated end products decreases the inflammatory reaction and allows the host an opportunity to regenerate tissue through wound healing. The purpose of this article is to examine whether dental lasers, which have been in use for the past 3 decades, may augment traditional non-surgical periodontal therapy. METHODS: Review of research publications related to lasers and non-surgical periodontics with attention focused on systematic studies. CONCLUSIONS: Studies utilizing laser technology may demonstrate positive effects on 1) selectively decreasing the biofilm environment, 2) removing calculus deposits and neutralizing endotoxin, 3) removing sulcular epithelium to assist in reattachment and decreased pocket depth, and 4) biostimulation for enhanced wound healing. Comparisons of studies to determine the difference between lasers and their respective effects on the periodontium are difficult to assess due to a wide variation of laser protocols. Biofilms;Dental Calculus;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Diseases;Periodontal Pocket

Effects of a low level laser on periodontal tissue in hypofunctional teeth. Malocclusions, such as an open bite and high canines, are often encountered in orthodontic practice. Teeth without occlusal stimuli are known as hypofunctional teeth, and numerous atrophic changes have been reported in the periodontal tissue, including reductions in blood vessels in the periodontal ligament (PDL), heavy root resorption, and reduced bone mineral density (BMD) in the alveolar bone. Low Level Laser (LLL) has been shown to have a positive effect on bone formation and the vasculature. Although the recovery of hypofunctional teeth remains unclear, LLL is expected to have a positive influence on periodontal tissue in occlusal hypofunction. The aim of the present study was to elucidate the relationship between LLL and periodontal tissue in occlusal hypofunction. Twenty-four male rats aged 5 weeks were randomly divided into control and hypofunctional groups. An anterior metal cap and bite plate were attached to the maxillary and mandibular incisors in the hypofunctional group to simulate occlusal hypofunction in the molars. LLL irradiation was applied to the maxillary first molar through the gingival sulcus in half of the rats. Rats were divided into four groups; control, control+LLL, hypofunctional, and hypofunctional+LLL. Exposure to LLL irradiation was performed for 3 minutes every other day for 2 weeks. Animals were examined by Micro-CT at 5 and 7 weeks and were subsequently sacrificed. Heads were resected and examined histologically and immunohistologically. The hypofunctional group had obvious stricture of the PDL. However, no significant differences were observed in the PDL and alveolar bone between the hypofunctional+LLL and the control groups. In addition, the expression of basic fibroblast growth factor (bFGF) and vascular endothelial growth factor (VEGF)-positive cells were higher in the hypofunctional + LLL group than in the hypofunctional group. These results indicated that LLL enhanced the production of bFGF and VEGF in the periodontal tissue of hypofunctional teeth. Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2 Animals;Bone Density;Dental Occlusion;Fibroblast Growth Factor 2;Low-Level Light Therapy;Male;Malocclusion;Maxilla;Periodontal Ligament;Periodontium;Rats;Rats, Wistar;Tooth;Vascular Endothelial Growth Factor A;X-Ray Microtomography

Acute effects of low-level laser therapy on physiologic and electromyographic responses to the cardiopulmonary exercise testing in healthy untrained adults. Despite the positive effects of low-level laser therapy (LLLT) on muscle fatigue before exercises using a single muscle group, the acute effects of LLLT on performance in cardiopulmonary exercise testing (CPET) are poorly understood. We aimed to assess the acute effects of LLLT on physiologic and electromyographic responses to the CPET in healthy adults. A randomized, double-blind, placebo-controlled crossover trial was performed with 18 untrained participants (nine males, 22â€‰Â±â€‰2 years). We applied LLLT or placebo on quadriceps and gastrocnemius 10 min before two rapidly incremental CPETs randomly performed in

alternate days on a cycle ergometer. Participants received LLLT using a multidiode cluster, 20 s/site (850 nm, 100 mW/diode, 14 J/site). Physiological responses to the CPET were continuously monitored using a gas analyzer. The electromyographic fatigue threshold (EMGth) was assessed through surface electrodes on vastus lateralis. The root mean square (RMS) was plotted every 5 s against the exercise intensity, and its breakpoint values throughout the CPET was identified as EMGth. Compared to placebo, the LLLT significantly increased peak O2 uptake (V'O2 33â€‰Â±â€‰10 vs. 31â€‰Â±â€‰9 mL/min/kg). We observed a shallower slope of the Î”heart rate/Î”V'O2 during the CPET after LLLT compared to placebo, i.e., increased cardiovascular efficiency (56â€‰Â±â€‰24 vs. 66â€‰Â±â€‰30 bpm/L/min). There were no LLLT-related changes in EMGth. The LLLT acutely increases exercise performance in healthy untrained adults probably due to increased O2 extraction by peripheral muscles without causing a significant impact on muscle fatigue.
Adolescent;Adult;Cardiovascular System;Cross-Over Studies;Double-Blind Method;Electromyography;Exercise;Exercise Test;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Quadriceps Muscle;Young Adult

Role of argon laser as an adjunctive therapy for treatment of resistant infected corneal ulcers. PURPOSE: To evaluate the role of argon laser as an adjunctive therapy in ten patients with resistant infected corneal ulcers with or without hypopyon. METHODS: The study included 20 patients, split into two groups of ten, with resistant infected corneal ulcers with or without hypopyon. One group was considered as the control group and treated with local and systemic specific antimicrobial drugs guided with culture and sensitivity tests. The other group started with the same specific therapy as the control group for 1 week with no obvious improvement and then was further treated with argon laser. The ten patients in the control group included five cases of fungal ulcers, three mixed (fungal and bacterial) ulcers, and two viral ulcers. The ten patients in the other group included three cases of fungal ulcers, three mixed (fungal and viral) ulcers, three viral ulcers, and one bacterial ulcer as proven with microbial culture and sensitivity tests. Eight cases of the control group and seven cases of the other group were associated with hypopyon. Before laser treatment, a drop of benoxinate hydrochloride 0.4% and a single drop of fluorescein sodium 0.25% were instilled. Argon laser irradiation of the affected cornea was performed using an argon 532 nm wavelength (Carl Zeiss LSL 532s AG; Carl Zeiss Meditec AG, Jena, Germany). A spot size of 500 Î¼m, pulse duration of 0.2 seconds, and power of 900 mW were used. All cases were followed up for 3 months after healing was achieved. RESULTS: During the first 4 weeks after laser treatment, all patients showed complete healing of the epithelial defect and resolution of stromal infiltration with no adverse effects. In the control group, four cases needed an amniotic membrane graft due to thinning and the other six cases were healed in a duration that ranged from 3 to 7 weeks. CONCLUSION: Argon laser phototherapy is useful as an adjunctive treatment for resistant infected corneal ulcers. More cases are needed to get more reliable results and to confirm our findings.

Effectiveness of phototherapy incorporated into an exercise program for osteoarthritis of the knee: study protocol for a randomized controlled trial. BACKGROUND: Osteoarthritis is a chronic disease with a multifactor etiology involving changes in bone alignment, cartilage, and other structures necessary to joint stability. There is a need to investigate therapeutic resources that combine different wavelengths as well as different light sources (low-level laser therapy and light-emitting diode therapy) in the same apparatus for the treatment of osteoarthritis. The aim of the proposed study is to analyze the effect of the incorporation of phototherapy into a therapeutic exercise program for individuals with osteoarthritis of the knee. METHODS/DESIGN: A double-blind, controlled, randomized clinical trial will be conducted involving patients with osteoarthritis of the knee. Evaluations will be performed using functional questionnaires before and after the treatment protocols, in a reserved room with only the evaluator and participant present, and no time

constraints placed on the answers or evaluations. The following functional tests will also be performed: stabilometry (balance assessment), dynamometry (muscle strength of gluteus medius and quadriceps), algometry (pain threshold), fleximeter (range of motion), timed up-and-go test (functional mobility), and the functional reach test. The participants will then be allocated to three groups through a randomization process using opaque envelopes: exercise program, exercise programâ€‰+â€‰phototherapy, or exercise programâ€‰+â€‰placebo phototherapy, all of which will last for eight weeks. DISCUSSION: The purpose of this randomized clinical trial is to analyze the effect of the incorporation of phototherapy into a therapeutic exercise program for osteoarthritis of the knee. The study will support the practice based on evidence to the use of phototherapy in individuals with a diagnosis of osteoarthritis of the knee. Data will be published after the study is completed. TRIAL REGISTRATION: The protocol for this study has been submitted to Clinical Trials, registration number NCT02102347, on 29 March 2014. Clinical Protocols;Combined Modality Therapy;Double-Blind Method;Exercise Therapy;Humans;Osteoarthritis, Knee;Phototherapy;Statistics as Topic

Effects of low-level laser therapy on wound healing. OBJECTIVE: To gather and clarify the actual effects of low-level laser therapy on wound healing and its most effective ways of application in human and veterinary medicine. METHODS: We searched original articles published in journals between the years 2000 and 2011, in Spanish, English, French and Portuguese languages, belonging to the following databases: Lilacs, Medline, PubMed and Bireme; Tey should contain the methodological description of the experimental design and parameters used. RESULTS: doses ranging from 3 to 6 J/cm(2) appear to be more effective and doses 10 above J/cm(2) are associated with deleterious effects. The wavelengths ranging from 632.8 to 1000 nm remain as those that provide more satisfactory results in the wound healing process. CONCLUSION: Low-level laser can be safely applied to accelerate the resolution of cutaneous wounds, although this fact is closely related to the election of parameters such as dose, time of exposure and wavelength. Animals;Humans;Low-Level Light Therapy;Wound Healing

Effect of low-level laser therapy on repair of the bone compromised by radiotherapy. Radiotherapy (RDT) is commonly used for cancer treatment, but high doses of ionizing radiation can directly affect healthy tissues. Positive biological effects of low-level laser therapy (LLLT) on bone repair have been demonstrated; however, this effect on surgical defects of bone previously compromised by radiotherapy has not been evaluated. The aim of this study was to investigate the influence of LLLT (Î»â€‰=â€‰830 nm) in femur repair after ionizing radiation. Twenty Wistar rats were divided into four groups: control group (GC, nâ€‰=â€‰5) creation of bone defects (BDs) only; laser group (GL), with BD and LLLT (nâ€‰=â€‰5); radiotherapy group (GR), submitted to RDT and BD (nâ€‰=â€‰5); and radiotherapy and laser group (GRL), submitted to RDT, BD, and LLLT (nâ€‰=â€‰5). GL and GRL received punctual laser application (DEâ€‰=â€‰210 J/cm(2), Pâ€‰=â€‰50 mW, tâ€‰=â€‰120 s, and beam diameter of 0.04 cm(2)) immediately after surgery, with 48-h interval during 7 days. Animals were euthanized at 7 days after surgery, and bone sections were evaluated morphometrically with conventional microscopy. Bone repair was only observed in nonirradiated bone, with significant improvement in GL in comparison to GC. GR and GRL did not present any bone neoformation. The result demonstrated a positive local biostimulative effect of LLLT in normal bone. However, LLLT was not able to revert the bone metabolic damage due to ionizing radiation. Animals;Bone Diseases;Bone and Bones;Lasers;Low-Level Light Therapy;Male;Radiation, Ionizing;Radiotherapy;Rats;Rats, Wistar;Wound Healing

Treatment of angiokeratoma of Mibelli alone or in combination with pulsed dye laser and long-pulsed Nd: YAG laser. Treatment of angiokeratoma of Mibelli is usually challenging because of the location, the pathogenetic condition and the cosmetic requirements. We present our characteristic

treatment with the application of pulsed dye laser PDL and lpNd:YAG laser. All of these lesions were treated by topical anesthesia with Emla. Combined dual PDL-lpNd:YAG (PDL: 595â€‰nm, 5â€‰mm/7â€‰mm, 0.5â€‰ms, 8-10â€‰J/cm(2) ; lpNd:YAG: 3â€‰mm/5â€‰mm, 15â€‰ms, 90-120â€‰J/cm(2)) treatment was used to treat lesions which with moderate to severe hyperkeratosis and hyperplasia. To the maculopapule ones, the energy density of lpNd:YAG might upgrade to 150â€‰J/cm(2) . Singular PDL (595â€‰nm, 5â€‰mm/7â€‰mm, 0.5â€‰ms, 9-12â€‰J/cm(2)) treatment was used to treat lesions which with slight hyperkeratosis and hyperplasia. Continuous airflow cooling was always applied during the laser treatment. The treatment interval was 6-12 weeks. Of the 5 patients, 3 of them were cured and 2 of them were improved. All of them were satisfied with the cosmetic results. We recommended the combined dual PDL-lpNd:YAG laser in treating severe hyperkeratotic and hyperplastic angiokeratoma of Mibelli. It can aid in achieving a desirable outcome whilst also reducing the required treatment sessions. However, most patients felt painful during the operation and experienced a severe long term recovery time after operation. Adult;Angiokeratoma;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain;Skin Neoplasms;Time Factors;Treatment Outcome;Young Adult

Effects of laser treatment on the expression of cytosolic proteins in the synovium of patients with osteoarthritis. BACKGROUND AND OBJECTIVE: Low level laser therapy (LLLT) has been developed for non-invasive treatment of joint diseases. We have previously shown that LLLT influenced synovial protein expression in rheumatoid arthritis (RA). The aim of this study was to assess the effects of laser irradiation on osteoarthritic (OA) synovial protein expression. STUDY DESIGN/MATERIALS AND METHODS: The synovial membrane samples removed from the knees of 6 OA patients were irradiated ex vivo using near infrared diode laser (807-811â€‰nm; 25â€‰J/cm(2)). An untreated sample taken from the same patient served as control. Synovial protein separation and identification were performed by two-dimensional differential gel electrophoresis and mass spectrometry, respectively. RESULTS: Eleven proteins showing altered expression due to laser irradiation were identified. There were three patients whose tissue samples demonstrated a significant increase (Pâ€‰<â€‰0.05) in mitochondrial heat shock 60â€‰kD protein 1 variant 1. The expression of the other proteins (calpain small subunit 1, tubulin alpha-1C and beta 2, vimentin variant 3, annexin A1, annexin A5, cofilin 1, transgelin, and collagen type VI alpha 2 chain precursor) significantly decreased (Pâ€‰<â€‰0.05) compared to the control samples. CONCLUSIONS: A single diode laser irradiation of the synovial samples of patients with osteoarthritis can statistically significantly alter the expression of some proteins in vitro. These findings provide some more evidence for biological efficacy of LLLT treatment, used for osteoarthritis. Proteins Aged;Cytosol;Electrophoresis, Gel, Two-Dimensional;Female;Humans;Low-Level Light Therapy;Male;Mass Spectrometry;Middle Aged;Osteoarthritis, Knee;Proteins;Synovial Membrane

Clinical efficacy of low-level laser therapy on localized canine atopic dermatitis severity score and localized pruritic visual analog score in pedal pruritus due to canine atopic dermatitis. BACKGROUND: Canine atopic dermatitis is a genetically predisposed inflammatory skin disease often requiring multimodal treatment. There is a need to find further low-risk adjunctive therapies. HYPOTHESIS/OBJECTIVES: To evaluate the localized effect of low-level laser therapy (LLLT) on the paws of dogs with atopic dermatitis using a localized canine atopic dermatitis severity score (LCADSS) and owner localized pruritic visual analog score (LPVAS) in comparison to treatment with a placebo. ANIMALS: Thirty client-owned dogs with symmetrical pedal pruritus due to canine atopic dermatitis. METHODS: Dogs were randomly assigned into two groups. In each group, one paw was treated with LLLT and one paw treated with a placebo laser (comparing either both fore- or hindpaws). Treatments were administered at 4 J/cm(2) (area from carpus/tarsus to distal aspect of digit 3) three times per week for the first 2 weeks and two times per week for the second 2 weeks. Scores were assessed for

each paw at weeks 0, 2, 4 and 5. RESULTS: There were no significant differences in LCADSS or LPVAS between LLLT and placebo treatments between weeks 0 and 5 (P = 0.0856 and 0.5017, respectively). However, LCADSS and LPVAS significantly decreased from week 0 at weeks 2, 4 and 5 in both LLLT and placebo groups (P < 0.0001 for all). CONCLUSIONS AND CLINICAL IMPORTANCE: Low-level laser therapy is not an effective localized treatment for pedal pruritus in canine atopic dermatitis. Animals;Dermatitis, Atopic;Dog Diseases;Dogs;Female;Foot Dermatoses;Low-Level Light Therapy;Male;Pruritus;Severity of Illness Index;Treatment Outcome;Visual Analog Scale

Clinical research of holmium laser therapy in extramammary Paget's disease. This study aims to investigate the safety and efficiency of the holmium laser therapy in extramammary Paget's disease. The clinical data of 61 patients was collected since 2002 to 2012, confirmed as non-subcutaneous invasive extramammary Paget's disease by biopsy and underwent surgery. All patients were divided into two groups. Group A included 30 patients who underwent the holmium laser therapy. Group B included 31 patients who underwent the traditional surgical therapy. The clinical data of all patients included preoperative, intraoperative, and postoperative management and follow-up records. Compared with the traditional operation group, the holmium laser group had a shorter operation time and was easier to perform. There were no significant differences between the two groups in cases of intraoperative and postoperative complications, the recurrence-free survival, and the disease-specific survival. But the holmium laser group had a longer recovery time than the traditional operation group in large and deep nidus. Multiple-factor analysis of prognostic parameters of 61 patients confirmed that any of these two methods chosen was not a prognostic parameter for recurrence-free survival. The holmium laser therapy might prove to be a preferable alternative to the traditional operative therapy of extramammary Paget's disease. However, the holmium laser therapy did not demonstrate to have an obvious advantage over traditional operative therapy in the recurrence-free survival and the disease-specific survival. Holmium Aged;Aged, 80 and over;Biopsy;Disease-Free Survival;Female;Holmium;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Paget Disease, Extramammary;Prognosis

The effects of low-intensity laser therapy on hepatic ischemia-reperfusion injury in a rat model. Ischemia-reperfusion (I/R) is a major mechanism of liver injury following hepatic surgery or transplantation. Despite numerous reports on the role and relics of low-intensity laser therapy (LILT) in many organs, the potential effects of LILT on hepatic ischemia-reperfusion have not been explored. This study was aimed to investigate the impresses of LILT applied to the skin following hepatic ischemia and reperfusion. Thirty-six healthy male Wistar rats were allocated into three groups of twelve animals each as follows: Sham, Ischemia-reperfusion (IR), and Ischemia-reperfusion with laser treatment (IR+LILT). Hepatic ischemia was induced by clamping the arterial and portal venous for 45 min. A laser diode (400 mW, 804 nm) was applied to the skin surface at the anatomical site of the liver at a dose of 3 J/cm(2), and the duration of irradiation was selected 120 s with 15-min interval after beginning the reperfusion. Animals were maintained under anesthesia and sacrificed 6 h subsequent reperfusion. Hepatic samples were evaluated for histological assessment and biochemistry analysis. Serum aminotransferase levels, tumor necrosis factor-alpha (TNF-Î±) levels, malondialdehyde (MDA), and glutathione (GSH) levels were significantly lower (Pâ€‰<â€‰0.05) in the irradiated group compared to the I/R group during the 6 h after reperfusion. The number of histopathological changes in the hepatic tissues was significantly lower in the treated group (Pâ€‰<â€‰0.05). These observations suggest that LILT applied in transcutaneous manner effectively improves hepatic injuries after ischemia-reperfusion period in rats. Tumor Necrosis Factor-alpha;Malondialdehyde;Aspartate Aminotransferases;Alanine Transaminase;Glutathione Alanine Transaminase;Animals;Aspartate Aminotransferases;Glutathione;Lipid Peroxidation;Liver;Low-Level

Light Therapy;Male;Malondialdehyde;Rats;Rats, Wistar;Reperfusion Injury;Time Factors;Tumor Necrosis Factor-alpha

The influence of low-level laser therapy on parameters of oxidative stress and DNA damage on muscle and plasma in rats with heart failure. In heart failure (HF), there is an imbalance between the production of reactive oxygen species and the synthesis of antioxidant enzymes, causing damage to the cardiovascular function and increased susceptibility to DNA damage. The aim of this study was to evaluate the influence of low-level laser therapy (LLLT) on parameters of oxidative stress and DNA damage in skeletal muscle and plasma of rats with HF. Wistar rats were allocated into six groups: "placebo" HF rats (P-HF, nâ€‰=â€‰9), "placebo" Sham rats (P-sham, nâ€‰=â€‰8), HF rats at a dose 3 J/cm(2) of LLLT (3 J/cm(2)-HF, nâ€‰=â€‰8), sham rats at a dose 3 J/cm(2) of LLLT (3 J/cm(2)-sham, nâ€‰=â€‰8), HF rats at a dose 21 J/cm(2) of LLLT (21 J/cm(2)-HF, nâ€‰=â€‰8) and sham rats at a dose 21 J/cm(2) of LLLT (21 J/cm(2)-sham, nâ€‰=â€‰8). Animals were submitted to a LLLT protocol for 10 days at the right gastrocnemius muscle. Comparison between groups showed a significant reduction in superoxide dismutase (SOD) activity in the 3 J/cm(2)-HF group (pâ€‰=â€‰0.03) and the 21 J/cm(2)-HF group (pâ€‰=â€‰0.01) compared to the P-HF group. 2',7'-Dihydrodichlorofluorescein (DCFH) oxidation levels showed a decrease when comparing 3 J/cm(2)-sham to P-sham (pâ€‰=â€‰0.02). The DNA damage index had a significant increase either in 21 J/cm(2)-HF or 21 J/cm(2)-sham in comparison to P-HF (pâ€‰=â€‰0.004) and P-sham (pâ€‰=â€‰0.001) and to 3 J/cm(2)-HF (pâ€‰=â€‰0.007) and 3 J/cm(2)-sham (pâ€‰=â€‰0.037), respectively. Based on this, laser therapy appears to reduce SOD activity and DCFH oxidation levels, changing the oxidative balance in the skeletal muscle of HF rats. Otherwise, high doses of LLLT seem to increase DNA damage. 2,7-dihydrodichlorofluorescein diacetate;Antioxidants;Fluoresceins;Reactive Oxygen Species;Glutathione Peroxidase;Superoxide Dismutase Animals;Antioxidants;DNA Damage;Fluoresceins;Glutathione Peroxidase;Heart Failure;Hemodynamics;Inflammation;Lasers;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxidative Stress;Rats;Rats, Wistar;Reactive Oxygen Species;Superoxide Dismutase

Placebo-controlled investigation of low-level laser therapy to treat carpal tunnel syndrome. OBJECTIVE: This study investigated the short-term efficacy of low-level laser therapy (LLLT) in patients with mild to moderate carpal tunnel syndrome (CTS), lasting for <1 year. METHODS: Seventy-nine patients with CTS were included in this double-blind, placebo-controlled study, and randomly divided in two treatment groups: Experimental group (EG), active laser group (40 patients); and control group (CG), placebo (sham) laser group (39 patients). A GaAlAs diode laser [780 nm, 30 mW continuous wave (CW), 0.785 cm(2), 38.2 mW/cm(2)] was applied in contact with four points perpendicularly to the skin over the carpal tunnel area for 90 sec per point (2.7 J, 3.4 J/cm(2)/point). Both groups were treated five times per week, once a day over 2 weeks, followed by 10 treatments every other day for 3 weeks, that is, for a total of 20 treatments. Clinical assessment, including visual analogue scale (VAS) pain rating, Tinel's sign, and median nerve conduction studies (NCSs) were evaluated before, and 3 weeks after, the last LLLT treatment. RESULTS: Significant reduction in pain, reduction in the percentage of patients with a positive Tinel's sign, and shortening of sensory and motor latency time in the NCS examination was observed in the experimental LLLT group (but not in the control group). CONCLUSIONS: This study has observed and documented the statistically significant short-term effects of LLLT on CTS patients in comparison with a placebo group. The results support this conclusion, especially if the LLLT is applied in the earlier stages of CTS, and with mild to moderate cases. Carpal Tunnel Syndrome;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

Effects of low-level laser irradiation on the pathogenicity of Candida albicans: in vitro and in vivo study. OBJECTIVE: The purpose of this study was to evaluate the effects of low-level laser

irradiation (LLLI) on the in vitro growth characteristics and in vivo pathogenicity of Candida albicans in a murine model in the absence of a photosensitizer. BACKGROUND DATA: C. albicans is an opportunistic commensal organism that causes a wide variety of diseases in human beings, ranging from superficial infections to life-threatening invasive candidiasis. The incidence of C. albicans infection is increasing, because of the greater frequency of acquired immunodeficiency conditions. A high recurrence rate has been reported for vulvovaginal and oral candidiasis, despite the best available treatments. Therefore, the search for new treatment modalities seems quite rational. METHODS: Candida culture plates were exposed to common clinical energies of LLLI: 3, 5, 10, and 20 J at 685 nm (BTL Laser 5000, Medicinos Projektai, Czech Republic, Prague, max power output 50 mW) and 3, 5, 10, 30, and 50 J at 830 nm (BTL Laser 5000, Medicinos Projektai, Czech Republic, Prague, max power output 400 mW). RESULTS: Following LLLI with energies >10 J at both 685 and 830 nm wavelengths, statistically significant effects were observed in vitro on the turbidimetric growth kinetics of C. albicans and in vivo on the survival rate of infected mice (p value â‰¤ 0.05). Therefore, this energy could be considered a threshold for clinical investigation. CONCLUSIONS: Translating our data into the clinical setting, it can be proposed that a direct laser-based approach without using a photosensitizing dye can significantly reduce the pathogenicity of Candida albicans. It can also be concluded that laser light at specific wavelengths could be a possible promising novel treatment for superficial and mucocutaneous C. albicans infections. Animals;Candida albicans;Candidiasis;Female;Low-Level Light Therapy;Mice, Inbred BALB C;Radiation Dosage

Cellular effect of low-level laser therapy on the rate and quality of bone formation in mandibular distraction osteogenesis. OBJECTIVE: Therapeutic lasers have been shown to influence bone physiology and repair. The aim of the present investigation was to evaluate the use of a GaAlAs (Î»:810 nm) laser in distraction osteogenesis. BACKGROUND DATA: To reduce problems associated with distraction osteogenesis and shorten the time required for treatment, it is desirable to accelerate the process of bone formation. MATERIALS AND METHODS: Eighteen male rabbits underwent corticotomy of mandibular body, and customized distraction devices were inserted. After a 5-day latency period, the mandibles were lengthened by 0.5 mm/day for 10 days. The rabbits were divided into two groups. A GaAlAs (Î»: 810 nm) laser beam with the parameters power (P), 200 mW; energy density (ED), 3 J/cm(2); time (T), 7.5 sec; power density (PD) 400 mW/cm(2); energy (E) 1.5 J and spot diameter, 0.8 mm was directed medially and laterally in the study group; the control group received no laser treatment. The exposure continued with six more doses every other day. Three rabbits from each of the two groups were euthanized on the 10th, 20th, and 40th days post-distraction (consolidation) period. RESULTS: Both light microscopy and scanning electron microscopic (SEM) analysis showed significant improvement in new bone formation in the study group at the 10th and 20th days compared with the control group, but the difference was more prominent on the 10th day. By the 40th day, there were no significant differences between the two groups. CONCLUSIONS: This study shows that a low-level GaAlAs (Î»:810 nm; P, 200 mW) laser hastens new bone formation only in the early stages of the consolidation period in distraction osteogenesis, and has no significant effect in later stages. Animals;Low-Level Light Therapy;Male;Mandible;Osteogenesis;Osteogenesis, Distraction;Rabbits

Dental laser phototherapy. Humans;Low-Level Light Therapy;Stomatognathic Diseases

Correlation of clinical efficacy and psychosocial impact on vitiligo patients by excimer laser treatment. BACKGROUND AND OBJECTIVES: Vitiligo is a difficult disease to treat. Recently, a 308-nm excimer laser has been shown to be effective in treating vitiligo. In addition, the patients with vitiligo have impairment in their quality of life. The aim of the study was to investigate the clinical efficacy, safety, and psychosocial impact after treating vitiligo with the 308-nm excimer laser. DESIGN AND SETTINGS:

A prospective clinical trial conducted at dermatology clinics of hospitals affiliated with Qassim University, Saudi Arabia, from May 2012 to February 2013. PATIENTS AND METHODS: Forty-eight patients with 105 vitiliginous patches were treated using a 308-nm excimer laser. The treatment was performed twice per week for a maximum of 48 treatments or 100% repigmentation of lesions whichever was achieved first. The assessment of the clinical response and recording of side effects were performed biweekly. RESULTS: Out of 105 lesions in these patients, 63 lesions (60.0%) achieved over 75% repigmentation by laser treatment, 12 lesions (11.4%) showed 51% to 75% repigmentation, 9 lesions (8.6%) showed 26% to 50% repigmentation, and another 9 lesions (8.6%) showed 1% to 25% repigmentation, while 12 lesions (11.4%) showed no repigmentation. The average (+/-standard deviation [SD]) number of sessions needed to achieve repigmentation was 16.8 (8.0), whereas the average (+/-SD) number of sessions needed to realize Grade IV repigmentation was 20.2 (15). The type of repigmentation varied between lesions. Diffuse repigmentation was the most common pattern and occurred in 34 lesions (36.6%). Facial lesions responded better than lesions located elsewhere. Skin type did not play a statistically significant role (P=.07) in the lesions response to treatment. All side effects were mild and disappeared shortly after end of treatment sessions. CONCLUSION: The clinical data indicate that the treatment of vitiligo using the 308-nm excimer laser is effective and safe and improves psychosocial quality of life. Lesion location, duration of disease, and treatment duration are factors affecting the clinical and psychological outcome. Adolescent;Adult;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Quality of Life;Skin Pigmentation;Treatment Outcome;Vitiligo;Young Adult

Effects of low-level laser therapy on joint pain, synovitis, anabolic, and catabolic factors in a progressive osteoarthritis rabbit model. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on short-term and long-term joint pain, synovitis, anabolic, and catabolic factors in the cartilage of a rabbit model with progressive osteoarthritis (OA) induced by anterior cruciate ligament transection (ACLT). A total of 160 New Zealand white rabbits were randomly assigned into two groups (ACLT group and LLLT group). All rabbits received ACLT surgery, and 2-, 4-, 6-, and 8-week treatment after the surgery, with 20 rabbits being tested biweekly over every study period. The LLLT group received LLLT with a helium-neon (He-Ne) laser (830 nm) of 1.5 J/cm(2) three times per week, and the ACLT group received placebo LLLT with the equipment switched off. Long-term and short-term pain was tested via weight-bearing asymmetry; synovitis was assessed histologically; and knee joint cartilage was evaluated by gross morphology, histology, and gene expression analysis of anabolic and catabolic factors. The histological assessment of pain and synovitis showed that at least 6-week intermittent irradiation of LLLT could relief knee pain and control synovium inflammation. Gross morphologic inspection and histological evaluation showed that 6 weeks of LLLT could decrease cartilage damage of medical femoral condyle and 8 weeks of LLLT could decrease cartilage damage of medical and lateral femoral condyles and medical tibial plateau. Gene expression analysis revealed two results: At least 6 weeks of LLLT could decrease production of catabolic factors, for example, interleukin 1Î² (IL-1Î²), inducible nitric oxide synthase (iNOS), and MMP-3, and slow down the loss of anabolic factors, mainly TIMP-1. Eight weeks of LLLT treatment could slow down the loss of collagen II, aggrecan, and anabolic factors, mainly transforming growth factor beta (TGF-Î²). The study suggests that LLLT plays a protective role against cartilage degradation and synovitis in rabbits with progressive OA by virtue of the regulation of catabolic and anabolic factors in the cartilage. Animals;Anterior Cruciate Ligament;Arthralgia;Cartilage;Cartilage, Articular;Chondrocytes;Disease Models, Animal;Disease Progression;Femur;Gene Expression Profiling;Gene Expression Regulation;Knee Joint;Low-Level Light Therapy;Osteoarthritis;Pain Management;Rabbits;Synovitis;Tibia;Weight-Bearing

Efficacy of laser phototherapy in comparison to topical clobetasol for the treatment of oral lichen planus: a randomized controlled trial. Oral lichen planus (OLP) is a relatively common chronic mucocutaneous inflammatory disease and a search for novel therapeutic options has been performed. We sought to compare the efficacy of laser phototherapy (LPT) to topical clobetasol propionate 0.05% for the treatment of atrophic and erosive OLP. Forty-two patients with atrophic/erosive OLP were randomly allocated to two groups: clobetasol group (n=21): application of topical clobetasol propionate gel (0.05%) three times a day; LPT group (n=21): application of laser irradiation using InGaAlP diode laser three times a week. Evaluations were performed once a week during treatment (Days 7, 14, 21, and 30) and in four weeks (Day 60) and eight weeks (Day 90) after treatment. At the end of treatment (Day 30), significant reductions in all variables were found in both groups. The LPT group had a higher percentage of complete lesion resolution. At follow-up periods (Days 60 and 90), the LPT group maintained the clinical pattern seen at Day 30, with no recurrence of the lesions, whereas the clobetasol group exhibited worsening for all variables analyzed. These findings suggest that the LPT proved more effective than topical clobetasol 0.05% for the treatment of OLP. Anti-Inflammatory Agents;Glucocorticoids;Clobetasol Administration, Topical;Adult;Aged;Aged, 80 and over;Anti-Inflammatory Agents;Clobetasol;Female;Glucocorticoids;Humans;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Low-power laser irradiation fails to improve liver regeneration in elderly rats at 48 h after 70 % resection. The liver regeneration is an important clinical issue after major hepatectomies. Unfortunately, many organs (including the liver) exhibit age-related impairments regarding their regenerative capacity. Recent studies found that low-power laser irradiation (LPLI) has a stimulatory effect on the liver regeneration process. However, its effects in elderly remain unknown. Thus, this study aimed to investigate the main molecular mechanisms involved in liver regeneration of partially hepatectomized elderly rats exposed to LPLI. The effects of 15 min of LPLI (wavelength of 632.8 nm; fluence of 0.97 J/cm(2); total energy delivered of 3.6 J) were evaluated in hepatectomized elderly Wistar male rats. Afterwards, through immunoblotting approaches, the protein expression and phosphorylation levels of hepatocyte growth factor (HGF), Met, Akt and Erk 1/2 signaling pathways as well as the proliferating cell nuclear antigen (PCNA) were investigated. It was observed that LPLI was not able to improve liver regeneration in elderly rats as evidenced by the lack of improvement of HGF and PCNA protein expression or phosphorylation levels of Met, Akt and Erk 1/2 in the remnant livers. In sum, this study demonstrated that the main molecular pathway, i.e. HGF/Metâ€‰â†'â€‰Akt and Erk 1/2â€‰â†'â€‰PCNA, involved in the hepatic regeneration process was not improved by LPLI in elderly hepatectomized rats, which in turn rules out LPLI as an adjuvant therapy, as observed in this protocol of liver regeneration evaluation (i.e. at 48 h after 70 % resection), in elderly. Proliferating Cell Nuclear Antigen;Hepatocyte Growth Factor Aging;Animals;Hepatocyte Growth Factor;Liver;Liver Regeneration;Low-Level Light Therapy;MAP Kinase Signaling System;Male;Proliferating Cell Nuclear Antigen;Rats;Rats, Wistar

Comparison of low level laser, ultrasonic therapy and association in joint pain in Wistar rats. INTRODUCTION: Both therapeutic ultrasound as a low level laser therapy are used to control musculoskeletal pain, despite controversy about its effects, yet the literature is poor and also presents conflicting results on possible cumulative effects of techniques association. The aim was to compare the antinociceptive effects of low level laser therapy, therapeutic ultrasound and the association. METHODS: 24 Wistar rats were divided into: GPL--induction of hyperesthesia in the right knee, and untreated; GUS--treated with therapeutic ultrasound (1 MHz, 0.4 W/cm2) GL--low intensity laser (830 nm, 8 J/cm2); GL+US--treated with both techniques. To produce the hyperesthesia 100 Î¼l of 5% formalin solution were injected into the tibiofemoral joint space, which was assessed by von

Frey filament digital before (EV1), 15 (EV2), 30 (EV3) and 60 (EV4) minutes after induction. RESULTS: In comparison within groups, for the withdrawal threshold when the fi lament was applied to the knee, the back to baseline was observed only for GUS. Comparisons between groups were not different in EV3, and GL was higher than GPL. In EV4 the three groups effectively treated were higher than placebo. On withdrawal threshold on the plantar surface, GL showed return to baseline values already in EV3, and GUS and GL+US returned in EV4. Comparing the groups in EV3 there was a significantly lower threshold to compare GPL with GL and GUS ($p < 0.05$), and there was only EV4 differences when comparing GPL with GUS. CONCLUSION: Both modalities showed antinociceptive effects. Animals;Arthralgia;Female;Knee Joint;Low-Level Light Therapy;Rats;Rats, Wistar;Ultrasonic Therapy

Near-infrared low-level laser stimulation of telocytes from human myometrium. Telocytes (TCs) are a brand-new cell type frequently observed in the interstitial space of many organs (see www.telocytes.com). TCs are defined by very long (tens of micrometers) and slender prolongations named telopodes. At their level, dilations-called podoms (~300Â nm), alternate with podomers (80-100Â nm). TCs were identified in a myometrial interstitial cell culture based on morphological criteria and by CD34 and PDGF receptor alpha (PDGFRÎ±) immunopositivity. However, the mechanism(s) of telopodes formation and/or elongation and ramification is not known. We report here the low-level laser stimulation (LLLS) using a 1,064-nm neodymium-doped yttrium aluminum garnet (Nd:YAG) laser (with an output power of 60Â mW) of the telopodal lateral extension (TLE) growth in cell culture. LLLS of TCs determines a higher growth rate of TLE in pregnant myometrium primary cultures (10.3â€‰Â±â€‰1.0Â Î¼m/min) compared to nonpregnant ones (6.6â€‰Â±â€‰0.9Â Î¼m/min). Acute exposure (30Â min) of TCs from pregnant myometrium to 1Â Î¼M mibefradil, a selective inhibitor of T-type calcium channels, determines a significant reduction in the LLLS TLE growth rate (5.7â€‰Â±â€‰0.8Â Î¼m/min) compared to LLLS per se in same type of samples. Meanwhile, chronic exposure (24Â h) completely abolishes the LLLS TLE growth in both nonpregnant and pregnant myometria. The initial direction of TLE growth was modified by LLLS, the angle of deviation being more accentuated in TCs from human pregnant myometrium than in TCs from nonpregnant myometrium. In conclusion, TCs from pregnant myometrium are more susceptible of reacting to LLLS than those from nonpregnant myometrium. Therefore, some implications are emerging for low-level laser therapy (LLLT) in uterine regenerative medicine. Antigens, CD34;Neodymium;Receptor, Platelet-Derived Growth Factor alpha Adult;Antigens, CD34;Biopsy;Female;Humans;Hysterectomy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Myometrium;Neodymium;Pregnancy;Receptor, Platelet-Derived Growth Factor alpha;Telocytes;Uterus

Fat graft, laser COâ,, and platelet-rich-plasma synergy in scars treatment. RATIONALE: Many treatments have been proposed for cosmetic or functional improvement of scars. It is known that fat grafts and laser treatment can have beneficial effects on the remodeling of scar tissue, and platelet-rich plasma (PRP) can be effective during the wound-healing process. We hypothesized that laser and PRP can enhance fat graft survival and the combination would be effective in improving scars appearance. OBJECTIVE: The purpose of this study was to evaluate the efficacy of these combinations in the treatment of atrophic and contractile scars. METHODS AND RESULTS: From 2008-2013, we treated with this combination 64 patients affected by atrophic and contractile scars involving different body parts. At 6 months the patients' overall satisfaction rate was excellent for over 50% of the patients. DISCUSSION: The association of an ablative laser CO2 with PRP and autologous fat graft seems to be a promising and effective therapeutic approach for atrophic and contractile scars. ABBREVIATIONS: PRP platelet-rich plasma, OTI orotracheal intubation, HLLT high level laser therapy,

LLLT low level laser therapy. Adolescent;Adult;Cicatrix;Female;Humans;Laser Therapy;Male;Middle Aged;Platelet-Rich Plasma;Young Adult
Laser therapy in bone repair in rats: analysis of bone optical density. OBJECTIVE: To investigate, by digital radiology, the bone regeneration process in rats submitted to femoral osteotomy and treated with low power laser therapy. METHODS: Forty-five Wistar rats were subjected to transverse osteotomy of the right femur and divided randomly into three experimental groups (n = 15): animals not treated with laser therapy G (C), animals that received laser therapy with Î»: 660nm G (660nm) and animals that received laser therapy with Î»: 830nm G (830nm). Animals were sacrificed after 7, 14 and 21 days. The bone calluses were evaluated by digital X-ray at 65 kVp, 7mA and 0.032 s exposures. RESULTS: The values obtained were submitted to variance analysis (ANOVA) followed by the Tukey-Kramer test. The significance level adopted was 5%. The groups G (C), G (660nm), and G (830nm) at the 7(th) day showed a significant bone development, with p <0.0116; the groups G (C), G (660nm), and G (830nm) at the 14(th) day showed values of p <0.0001; at the 21(st) day,a higher degree of bone repair were observed in group G (830nm), and G (660nm), with p <0.0169. CONCLUSION: Based on the radiographic findings, G (830nm) showed more complete bone regeneration, as shown in the gray shades of the images. Level of Evidence II, Individual Study With Experimental Design.
[The role of local hyperthermia in oncology: applications of a magnetic field, laser radiation, and ultrasound]. This paper reports the principal data on hyperthermia and its role in the modern combined treatment of malignant neoplasms. A brief characteristic of magnetic, laser, and ultrasound hyperthermia is presented. The prospects for the further development of new methods of hyperthermia for the application in oncology. Humans;Hyperthermia, Induced;Low-Level Light Therapy;Magnetic Field Therapy;Neoplasms;Sound
[The role of magnetolaserotherapy in the correction of the adaptive potential of the brain in the children suffering absence seizures]. We have conducted a course of magnetic laser therapy targeted on the vegetative structures at the neck of the children suffering absence seizures in an attempt to optimize the functioning of the non-specific brain structures. The study has demonstrated that such treatment promotes normalization of the components of the orientation response to sound almost to the level observed in the healthy children. The alpha-index returned to the normal value as well. Adolescent;Brain;Child;Epilepsy, Absence;Female;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Male
Low-power fractional COâ,, laser versus low-fluence Q-switch 1,064 nm Nd:YAG laser for treatment of melasma: a randomized, controlled, split-face study. BACKGROUND: Various laser treatments are currently available for melasma but their use remains challenging because of potential side effects. OBJECTIVE: The aim of this randomized controlled study was to compare the efficacy and safety of low-fluence Q-switch 1,064 nm Nd:YAG and low-power fractional CO2 laser using a split-face design. MATERIALS AND METHODS: A total of 40 female patients with symmetric melasma were enrolled to the study and each side of their face was randomly allocated to either low-fluence Q-switch 1,064 nm Nd:YAG or low-power fractional CO2 laser. They were treated every 3 weeks for five consecutive sessions and followed for 2 months after the last treatment session. Response to treatment was assessed using the Melanin Index (MI) score, modified Melasma Area and Severity Index (mMASI) score, and a subjective self-assessment method. RESULTS: At the 2-month follow-up visit, both sides of the face had statistically significant reductions in the MI and mMASI scores compared with the first visit ($p < 0.001$). The differences between the mean MI and mMASI scores at baseline and at 2-month follow-up were compared between the two treatments and results showed that the reduction of MI and mMASI score in the fractional CO2 laser-treated side was significantly more than on the Q-switch 1,064 nm Nd:YAG laser-treated side ($p < 0.001$). There were no significant adverse effects with either of the laser treatments. CONCLUSION: The present study shows that low-

power fractional CO2 laser is safe and effective and can be considered as a valuable approach in the treatment of melasma. Adult;Female;Follow-Up Studies;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Time Factors;Treatment Outcome;Young Adult

Ultra-low power laser stimulation impairs the adhesion of Staphylococcus aureus to primary human cells, and interferes with the expression of staphylococcal pathogenic factors. Lasers are commonly used in several fields of medicine as a complementary therapy for internal medicine, surgery and also diagnostics. The efficacy of ultra-low level laser therapy (ULLLT) at power levels around 0.15 mW/cm(2) has been demonstrated both in in vitro experiments and in the clinical environment. This work used an ULLLT laser source to analyze its efficacy on Staphylococcus aureus adhesion to cells and on its ability to produce pathogenic factors. Laser stimulation succeeded in impairing the binding of S. aureus to primary human cells in culture and in inhibiting the expression of coagulase, one of the main staphylococcal pathogenic factors. The importance of the extracellular matrix (ECM) and the modification of the ECM redox potential in these activities were also evidenced. Bacterial Proteins;Virulence Factors Bacterial Adhesion;Bacterial Proteins;Cell Line;Gene Expression Regulation, Bacterial;Human Umbilical Vein Endothelial Cells;Humans;Lasers;Staphylococcal Infections;Staphylococcus aureus;Virulence Factors

Effects of low-level laser therapy on mitochondrial respiration and nitrosyl complex content. Among the photochemical reactions responsible for therapeutic effects of low-power laser radiation, the photolysis of nitrosyl iron complexes of iron-containing proteins is of primary importance. The purpose of the present study was to compare the effects of blue laser radiation on the respiration rate and photolysis of nitrosyl complexes of iron-sulfur clusters (NO-FeS) in mitochondria, subjected to NO as well as the possibility of NO transfer from NO-FeS to hemoglobin. It was shown that mitochondrial respiration in State 3 (V3) and State 4 (V4), according to Chance, dramatically decreased in the presence of 3 mM NO, but laser radiation (Î»â€‰=â€‰442 nm, 30 J/cm(2)) restored the respiration rates virtually to the initial level. At the same time, electron paramagnetic resonance (EPR) spectra showed that laser irradiation decomposed nitrosyl complexes produced by the addition of NO to mitochondria. EPR signal of nitrosyl complexes of FeS-clusters, formed in the presence of 3 mM NO, was maximal in hypoxic mitochondria, and disappeared in a dose-dependent manner, almost completely at the irradiation dose 120 J/cm(2). EPR measurements showed that the addition of lysed erythrocytes to mitochondria decreased the amount of nitrosyl complexes in iron-sulfur clusters and produced the accumulation of NO-hemoglobin. On the other hand, the addition of lysed erythrocytes to mitochondria, preincubated with nitric oxide, restored mitochondrial respiration rates V3 and V4 to initial levels. We may conclude that there are two possible ways to destroy FeS nitrosyl complexes in mitochondria and recover mitochondrial respiration inhibited by NO: laser irradiation and ample supply of the compounds with high affinity to nitric oxide, including hemoglobin. Hemoglobins;Nitrogen Oxides;Nitric Oxide;dinitrosyl iron complex;Iron;Oxygen Animals;Electron Spin Resonance Spectroscopy;Erythrocytes;Hemoglobins;Iron;Kinetics;Lasers;Low-Level Light Therapy;Male;Mitochondria, Liver;Nitric Oxide;Nitrogen Oxides;Oxygen;Rats;Shock, Septic

The effect of low-level laser therapy (810 nm) on root development of immature permanent teeth in dogs. Traumatic injuries and dental caries can be a big challenge to immature teeth. In these cases, the main purpose of treatment is to maintain the pulp vitality. The purpose of this study was to investigate the effect of low-level laser therapy on accelerating the rate of dentinogenesis in pulpotomy of immature permanent teeth (apexogenesis). Three dogs, 4-6 months old, were used in this study. One jaw in each dog was randomly assigned to laser irradiation group. All selected teeth were pulpotomized with mineral trioxide aggregate (MTA) and restored with amalgam. In the laser group, the Ga-Al-As laser (810 nm, 0.3 W, 4 J/cm(2), 9 s) was used on buccal and lingual gingiva of each tooth in 48 h intervals for 2 weeks. In order to observe the newly formed dentine, tetracycline

was injected on the 1st, 3rd, 7th, and 14th day after the operation. Then, ground sections of teeth were observed under a fluorescence microscope. The data was analyzed with Generalized Estimating Equations (GEE) test. The mean distance between the lines of tetracycline formed on the 1st and 14th day was significantly higher in the laser group (Pâ€‰=â€‰0.005). Within the limitation of this study, irradiation of Ga-Al-As laser (810 nm) can accelerate the rate of dentinogenesis in apexogenesis of immature permanent teeth with MTA in dogs. Aluminum Compounds;Calcium Compounds;Dental Cements;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate;Dental Amalgam Aluminum Compounds;Animals;Calcium Compounds;Combined Modality Therapy;Dental Amalgam;Dental Cements;Dental Pulp;Dentin;Dogs;Drug Combinations;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oxides;Silicates;Tooth Root

"Low-intensity laser therapy effect on the recovery of traumatic spinal cord injury". Scientific advances have been made to optimize the healing process in spinal cord injury. Studies have been developed to obtain effective treatments in controlling the secondary injury that occurs after spinal cord injury, which substantially changes the prognosis. Low-intensity laser therapy (LILT) has been applied in neuroscience due to its anti-inflammatory effects on biological tissue in the repairing process. Few studies have been made associating LILT to the spinal cord injury. The objective of this study was to investigate the effect of the LILT (GaAlAs laser-780 nm) on the locomotor functional recovery, histomorphometric, and histopathological changes of the spinal cord after moderate traumatic injury in rats (spinal cord injury at T9 and T10). Thirty-one adult Wistar rats were used, which were divided into seven groups: control without surgery (nâ€‰=â€‰3), control surgery (nâ€‰=â€‰3), laser 6 h after surgery (nâ€‰=â€‰5), laser 48 h after surgery (nâ€‰=â€‰5), medullar lesion (nâ€‰=â€‰5) without phototherapy, medullar lesionâ€‰+â€‰laser 6 h after surgery (nâ€‰=â€‰5), and medullar lesionâ€‰+â€‰laser 48 h after surgery (nâ€‰=â€‰5). The assessment of the motor function was performed using Basso, Beattie, and Bresnahan (BBB) scale and adapted Sciatic Functional Index (aSFI). The assessment of urinary dysfunction was clinically performed. After 21 days postoperative, the animals were euthanized for histological and histomorphometric analysis of the spinal cord. The results showed faster motor evolution in rats with spinal contusion treated with LILT, maintenance of the effectiveness of the urinary system, and preservation of nerve tissue in the lesion area, with a notorious inflammation control and increased number of nerve cells and connections. In conclusion, positive effects on spinal cord recovery after moderate traumatic spinal cord injury were shown after LILT. Animals;Inflammation;Low-Level Light Therapy;Male;Neuroglia;Neurons;Phototherapy;Rats;Rats, Wistar;Recovery of Function;Spinal Cord Injuries

Indirect application of near infrared light induces neuroprotection in a mouse model of parkinsonism - an abscopal neuroprotective effect. We have previously shown near infrared light (NIr), directed transcranially, mitigates the loss of dopaminergic cells in MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine)-treated mice, a model of parkinsonism. These findings complement others suggesting NIr treatment protects against damage from various insults. However one puzzling feature of NIr treatment is that unilateral exposure can lead to a bilateral healing response, suggesting NIr may have 'indirect' protective effects. We investigated whether remote NIr treatment is neuroprotective by administering different MPTP doses (50-, 75-, 100-mg/kg) to mice and treating with 670-nm light directed specifically at either the head or body. Our results show that, despite no direct irradiation of the damaged tissue, remote NIr treatment produces a significant rescue of tyrosine hydroxylase-positive cells in the substantia nigra pars compacta at the milder MPTP dose of 50-mg/kg (âˆ¼30% increase vs sham-treated MPTP mice, $p<0.05$). However this protection did not appear as robust as that achieved by direct irradiation of the head (âˆ¼50% increase vs sham-treated MPTP mice, $p<0.001$). There was no quantifiable protective effect of NIr at higher MPTP doses,

irrespective of the delivery mode. Astrocyte and microglia cell numbers in substantia nigra pars compacta were not influenced by either mode of NIr treatment. In summary, the findings suggest that treatment of a remote tissue with NIr is sufficient to induce protection of the brain, reminiscent of the 'abscopal effect' sometimes observed in radiation treatment of metastatic cancer. This discovery has implications for the clinical translation of light-based therapies, providing an improved mode of delivery over transcranial irradiation. Neuroprotective Agents;Tyrosine 3-Monooxygenase Animals;Astrocytes;Cell Count;Disease Models, Animal;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Microglia;Neuroprotective Agents;Parkinsonian Disorders;Pars Compacta;Phototherapy;Tyrosine 3-Monooxygenase

Low-level laser therapy effectively prevents secondary brain injury induced by immediate early responsive gene X-1 deficiency. A mild insult to the brain can sometimes trigger secondary brain injury, causing severe postconcussion syndrome, but the underlying mechanism is ill understood. We show here that secondary brain injury occurs consistently in mice lacking immediate early responsive gene X-1 (IEX-1), after a gentle impact to the head, which closely simulates mild traumatic brain injury in humans. The pathologic lesion was characterized by extensive cell death, widespread leukocyte infiltrates, and severe tissue loss. On the contrary, a similar insult did not induce any secondary injury in wild-type mice. Strikingly, noninvasive exposure of the injured head to a low-level laser at 4 hours after injury almost completely prevented the secondary brain injury in IEX-1 knockout mice. The low-level laser therapy (LLLT) suppressed proinflammatory cytokine expression like interleukin (IL)-1Î² and IL-6 but upregulated TNF-Î±. Moreover, although lack of IEX-1 compromised ATP synthesis, LLLT elevated its production in injured brain. The protective effect of LLLT may be ascribed to enhanced ATP production and selective modulation of proinflammatory mediators. This new closed head injury model provides an excellent tool to investigate the pathogenesis of secondary brain injury as well as the mechanism underlying the beneficial effect of LLLT. Cytokines;IEX-1 protein, mouse;Immediate-Early Proteins Animals;Brain Injuries;Cytokines;Genes, Immediate-Early;Head Injuries, Closed;Immediate-Early Proteins;Injury Severity Score;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Mice, Knockout;Neurologic Examination;Secondary Prevention

Adjunctive use of combination of super-pulsed laser and light-emitting diodes phototherapy on nonspecific knee pain: double-blinded randomized placebo-controlled trial. Phototherapy with low-level laser therapy (LLLT) and light-emitting diode therapy (LEDT) has arisen as an interesting alternative to drugs in treatments of musculoskeletal disorders. However, there is a lack of studies investigating the effects of combined use of different wavelengths from different light sources like lasers and light-emitting diodes (LEDs) in skeletal muscle disorders. With this perspective in mind, this study aimed to investigate the effects of phototherapy with combination of different light sources on nonspecific knee pain. It was performed a randomized, placebo-controlled, double-blinded clinical trial. Eighty-six patients rated 30 or greater on the pain visual analogue scale (VAS) were recruited and included in study. Patients of LLLT group received 12 treatments with active phototherapy (with 905 nm super-pulsed laser and 875 and 640 nm LEDs, Manufactured by Multi Radiance Medical, Solon, OH, USA) and conventional treatment (physical therapy or chiropractic care), and patients of placebo group were treated at same way but with placebo phototherapy device. Pain assessments (VAS) were performed at baseline, 4th, 7th, and 10th treatments, after the completion of treatments and at 1-month follow-up visit. Quality of life assessments (SF-36Â®) were performed at baseline, after the completion of treatments and at 1-month follow-up visit. Our results demonstrate that phototherapy significantly decreased pain (pâ€‰<â€‰0.05) from 10th treatment to follow-up assessments and significantly improved (pâ€‰<â€‰0.05) SF-36Â® physical component summary at posttreatments and follow-up assessments compared to placebo. We conclude that combination of super-pulsed laser, red and infrared LEDs is effective to decrease pain and improve quality of life in

patients with knee pain. Double-Blind Method;Female;Humans;Knee Joint;Lasers;Light;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Phototherapy;Quality of Life

Low-level laser therapy prevents prodromal signal complications on saphenectomy post myocardial revascularization. BACKGROUND AND OBJECTIVE: One of the most frequent treatments for ischemic heart disease is myocardial revascularization, often applying the saphenous vein as a coronary graft. However, postoperative complications may occur, such as saphenous dehiscence. According to the literature, low-level laser therapy (LLLT) has been used in the treatment of several inflammatory processes in patients. Recently, its uses have expanded to include LLLT preventive therapy and postoperative treatment. Despite our department's successful application of LLLT in the treatment of saphenectomy incisions, many colleagues are still uncertain as to laser therapy's benefits. Therefore, the study's purpose was to evaluate tissue repair of prodromal surgical incisions after the administration of LLLT. MATERIALS AND METHODS: The pilot study included 14 patients, divided into two groups. Both groups of patients received the traditional treatment; additionally, the Laser Group (n = 7) received diode laser treatment (Î» = 780 nm, fluence = 19 J/cm(2), pulse = 25 mW, time = 30 sec, energy = 0.75 J, irradiance = 625 mW/cm(2), beam spot size 0.04 cm(2)), which was applied on the edges of the saphenectomy incision. The Control Group (n = 7) received conventional treatment exclusively. RESULTS: In the Laser Group: all seven patients showed significant improvement, whereas the Control Group had twice as many complications, including critical rates of incisional dehiscence. CONCLUSIONS: LLLT was valuable in preventing prodromal complications in saphenectomy post myocardial revascularization. Adult;Aged;Aged, 80 and over;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Myocardial Revascularization;Pilot Projects;Postoperative Complications;Saphenous Vein;Wound Healing

Protective effect of light emitting diode phototherapy on fluorescent light induced retinal damage in Wistar strain albino rats. BACKGROUND: Artificial light at night alters retinal physiology. Several studies have shown that light emitting diode phototherapy protects the retina from the damaging effects of acute light exposure. OBJECTIVE: The aim of this study has been to elucidate the protective effects of 670 nm LED light on retinal damage induced by chronic fluorescent light in Wistar rats. METHODS: Male Wistar albino rats were divided into four groups: group 1 were control (CL), group 2, 3 and 4 were exposed to fluorescent light (FL), LED preexposure+fluorescent light exposure (LL) and only LED light exposure (OL) respectively. All animals were maintained in their specific exposure regime for 30 days. Fluorescent light of 1800 lx was exposed between 8 pm to 8 am. Rats were exposed to therapeutic LED light of 670 nm of 9 J/cm2 at 25 mW/cm2 for 6 min duration. Histopathological changes in the retina were studied. RESULTS: Animals of the FL group showed a significant reduction in the outer nuclear layer thickness and cell count in addition to the total thickness of the retina. LL group which were exposed to 670 nm LED prior to exposure to fluorescent light showed a significant decrease in the degree of damage. CONCLUSIONS: 670 nm LED light preexposure is protective to retinal cells against fluorescent light-induced damage. Corticosterone Albinism;Animals;Cell Count;Corticosterone;Fluorescence;Light;Male;Phototherapy;Rats;Rats, Wistar;Retina

Safety of transfoveal subthreshold diode micropulse laser for fovea-involving diabetic macular edema in eyes with good visual acuity. PURPOSE: To determine the safety of transfoveal subthreshold diode micropulse laser for fovea-involving diabetic macular edema. METHODS: The records of all patients treated with transfoveal subthreshold diode micropulse laser for fovea-involving diabetic macular edema in two retina clinics were reviewed. The eligibility included fovea-involving diabetic macular edema by spectral domain optical coherence tomography and pretreatment visual acuity of 20/40 or better. RESULTS: Thirty-nine eyes of 27 patients aged 50 years to 87 years (mean, 69 years)

were included. Postoperative follow-up ranged from 3 months to 36 months (mean, 11 months). Fourteen patients were insulin dependent, and 19 had nonproliferative retinopathy. The preoperative visual acuity was 20/20 (10 eyes), 20/25 (10 eyes), 20/30 (8 eyes), and 20/40 (11 eyes). No eye had evidence of laser-induced macular damage by any imaging means postoperatively. There were no adverse treatment effects. Logarithm of the minimum angle of resolution visual acuity was improved on average of 0.03 units at 4 months to 7 months of follow-up (P = 0.0449, paired t-test) and otherwise stable. The central foveal thickness was improved at 4 months to 7 months (P = 0.05, paired t-test) and 8 months to 12 months, postoperatively (P = 0.04, mixed model accounting). Maximum macular thickness was improved at 4 months to 7 months postoperatively (P = 0.01, paired t-test and mixed model accounting). CONCLUSION: In a small retrospective series, transfoveal subthreshold diode micropulse laser was safe and effective for the treatment of fovea-involving diabetic macular edema in eyes with good preoperative visual acuity that were not the candidates for conventional photocoagulation or intravitreal injection. Further study is warranted.
Aged;Aged, 80 and over;Diabetes Mellitus, Type 1;Diabetes Mellitus, Type 2;Diabetic Retinopathy;Female;Follow-Up Studies;Fovea Centralis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Macular Edema;Male;Middle Aged;Retrospective Studies;Sensory Thresholds;Tomography, Optical Coherence;Visual Acuity

In vitro Therapeutic Effects of Low Level Laser at mRNA Level on the Release of Skin Growth Factors from Fibroblasts in Diabetic Mice. BACKGROUND: Numerous in vitro reports suggest that Low Level Laser Therapy (LLLT) affects cellular processes by biostimulation, however most of them emphasize on using visible light lasers which have low penetration. The aim of this study was to determine the effect of infrared laser light (which is more useful in clinic because of its higher penetration) on secretion of Fibroblast Growth Factor (FGF), Platelet Derived Growth Factor (PDGF) and Vascular Endothelial Growth Factor (VEGF), as important growth factors in wound healing. METHODS: Fibroblasts were extracted from the skin of 7 diabetic and 7 nondiabetic mice and cultured. Cell cultures of experimental group were irradiated with single dose of LLLT (energy density of 1 J/cm (2)) using an 810 nm continuous wave laser and the control group was not irradiated. Secretion of growth factors by skin fibroblasts were quantified through real time poly-merase chain reaction. RESULTS: Diabetic irradiated group showed significant increase in FGF (p = 0.017) expression, although PDGF increased and VEGF decreased in both diabetic and nondiabetic irradiated groups, but these variations were not statistically significant. CONCLUSION: These results suggest that LLLT may play an important role in wound healing by stimulating the fibroblasts.

Low-level laser therapy on tissue repair of partially injured achilles tendon in rats. OBJECTIVE: The aim of this study was to assess the alignment and type of collagen (I and III) in partially injured Achilles tendons of rats treated with low-level laser therapy (LLLT). BACKGROUND: Achilles tendons present high indices of injury and their regeneration process may take a long time. LLLT has been used to accelerate and enhance injured Achilles tendon repair. METHODS: Sixty-five male Wistar rats were distributed into seven groups: LASER 1, 3, and 7 (the rat's Achilles tendons were partially injured and submitted to treatment for 1, 3, or 7 days, respectively); a Sham group 1, 3, and 7 for each of LASER group (same injury, but the LLLT was only simulated), and five remaining animals were allocated to the control group (no procedures were performed). The 780 nm LLLT was applied once a day, with 70 mW of mean power, fluence of 17.5 J/cm(2) for 10 sec. After the rats were euthanized, the tendons were surgically removed and assessed by birefringence technique (collagen alignment) and picrosirius red (collagen I and III). RESULTS: Sham versus LASER analysis did not show differences ($p>0.05$) for collagen alignment. The collagen composition (median) was significantly different ($p<0.05$) for LASER 3 (I: 16.5; III: 83.5) versus Sham 3 (I: 12.5; III: 87.5) and LASER 7 (I: 20.2; III: 79.8) versus Sham 7 (I: 10.2; III: 89.8). LASER groups exhibited a higher percentage of type I collagen and a

lower percentage of type III collagen. CONCLUSIONS: LLLT stimulated collagen I proliferation, improving the injured Achilles tendons' healing process. Collagen Achilles Tendon;Animals;Collagen;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Rupture

Histological analysis of the periodontal ligament and alveolar bone during dental movement in diabetic rats subjected to low-level laser therapy. OBJECTIVE: The purpose of this research was to evaluate the histological changes of the periodontal ligament and alveolar bone during dental movement in diabetic rats subjected to low level laser therapy (LLLT). METHODS: The movement of the upper molar was performed in 60 male Wistar rats divided into four groups (n=15): CTR (control), DBT (diabetic), CTR/LT (irradiated control) and DBT/LT (irradiated diabetic). Diabetes was induced with alloxan (150 mg/kg, i.p.). LLLT was applied with GaAlAs laser at 780 nm (35 J/cm(2)). After 7, 13 and 19 days, the periodontal ligament and alveolar bone were histologically analyzed. RESULTS: The mean of osteoblasts ($p<0.01$) and blood vessels ($p<0.05$) were significantly decreased in DBT compared with CTR at 7 days, whereas the mean of osteoclasts was lower at 7 ($p<0.001$) and 13 days ($p<0.05$). In DBT/LT, only the mean of osteoclasts was lower than in CTR ($p<0.05$) at 7 days, but no difference was observed at 13 and 19 days ($p>0.05$). The collagenization of the periodontal ligament was impaired in DBT, whereas DBT/LLT showed density/disposition of the collagen fibers similar to those observed in CTR. CONCLUSIONS: LLLT improved the periodontal ligament and alveolar bone remodeling activity in diabetic rats during dental movement. Collagen Alveolar Process;Animals;Blood Vessels;Cell Count;Collagen;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Osteoblasts;Osteoclasts;Periodontal Ligament;Rats;Rats, Wistar;Tooth Movement Techniques

A review of laser applications in orthodontics. Laser technique now is widely applied in orthodontic treatment and proved to have many benefits. Soft tissue lasers can be used to perform gingivectomy, frenectomy and surgical exposure of tooth with less bleeding and swelling, improved precision, reduced pain and less wound contraction. Other laser applications include enamel etching and bonding and bracket debonding. Lower level lasers have the potential effects of pain control and accelerating tooth movement. Clinicians must be aware of the safety issues and risks associated with laser and receive proper training before the laser treatment is started. Dental Bonding;Dental Etching;Equipment Safety;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Oral Surgical Procedures;Orthodontic Brackets;Orthodontics

A randomized clinical trial of the effect of low-level laser therapy before composite placement on postoperative sensitivity in class V restorations. This study aimed to investigate the efficacy of low-level laser irradiation when applied just before placement of resin composite on reducing postoperative sensitivity of class V lesions. In this randomized clinical trial, 31 patients with 62 class V cavities were included (two teeth in each participant). The teeth were randomly assigned into laser and placebo groups. After cavity preparation, the teeth in the experimental group were subjected to irradiation from a low-power red laser (630 nm, 28 mW, continuous wave, 60 s, 1.68 J), which was applied for 1 min on the axial wall of the cavity. In the control group, the same procedure was performed but with laser simulation. Then, a self-etch adhesive was applied and the cavities were restored with a microhybrid resin composite. Before treatment and on days 1, 14, and 30 after treatment, tooth sensitivity to a cold stimulus was recorded using a visual analogue scale. Data were analyzed by Friedman and Wilcoxon signed-rank tests (pâ€‰<â€‰0.05). Pain scores after restorative procedures were significantly lower in the laser group compared to the placebo application (pâ€‰<â€‰0.05). Although both groups experienced a significant improvement in pain and discomfort throughout the follow-up periods (pâ€‰<â€‰0.001), the changes in visual analogue scale (VAS) scores between baseline and each follow-up examination were significantly greater in the laser than the placebo group (pâ€‰<â€‰0.05). Low-level laser therapy (LLLT) before placement of

resin composite could be suggested as a suitable approach to reduce postoperative sensitivity in class V restorations. Composite Resins Adolescent;Adult;Aged;Composite Resins;Dental Caries;Dental Cavity Preparation;Dental Restoration, Permanent;Dentin Sensitivity;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Period;Treatment Outcome;Young Adult

Low-level laser therapy for osteonecrotic lesions: effects on osteoblasts treated with zoledronic acid. PURPOSE: Clinical studies have shown that low-level laser therapy (LLLT) can improve local tissue healing of bisphosphonate-induced osteonecrosis of the jaw. However, the effects of laser irradiation on bisphosphonate-treated osteoblasts have not been completely elucidated. METHODS: Human osteoblasts were cultured in plain culture medium (DMEM). After 48 h, plain DMEM was replaced by DMEM with no fetal bovine serum, for a 24-h incubation followed by addition of zoledronic acid (5 Î¼M) for additional 48 h. Cells were subjected to LLLT (InGaAsP; 780â€‰Â±â€‰3 nm; 0.025 W) at 0.5, 1.5, 3, 5, and 7 J/cm(2), three times every 24 h. Cell viability, total protein production, alkaline phosphatase activity (ALP), mineral nodule formation, gene expression of collagen type I and ALP, and cell morphology were evaluated. RESULTS: LLLT at 0.5 J/cm(2) increased cell viability of cultured osteoblasts. ALP activity and gene expression, in addition to mineral nodule formation and Col-I gene expression, were not increased by LLLT. LLLT applied to ZA-treated cells increased Col-I expression at 0.5, 1.5, and 3 J/cm(2) but did not improve any other cell activity assessed. CONCLUSION: LLLT showed limited effects on bisphosphonate-treated osteoblasts. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Diphosphonates;Humans;Imidazoles;Low-Level Light Therapy;Osteoblasts;Tumor Cells, Cultured;Zoledronic Acid

Comparative analysis of low-level laser therapy (660 nm) on inflammatory biomarker expression during the skin wound-repair process in young and aged rats. The wound-healing process plays an essential role in the protective response to epidermal injury by tissue regeneration. In the elderly, skin functions deteriorate as a consequence of morphological and structural changes. This study aimed to evaluate and compare the effect of low-level laser therapy (LLLT) in cutaneous wound healing in young and aged rats. A total of 60 male rats comprising 30 young (Â± 30 days) and 30 aged (Â± 500 days) was used. The animals were divided into four experimental groups and underwent skin wound and/or treatment with LLLT (660 nm, 30 mW, 1.07 W/cm(2), 0.028 cm(2), 72 J/cm(2), and 2 J). Analyses were conducted to verify the effects of LLLT in the tissue repair process, in the gene expression, and protein expression of TNF-Î±, IL-1Î², and IL-10, obtained in skin wound model. Results showed that there were significant differences between the young control group and the aged control group and their respective treated groups (LLLT young and LLLT aged). We conclude that LLLT has shown to be effective in the treatment of skin wounds in young and aged animals at different stages of the tissue repair process, which suggests that different LLLT dosimetry should be considered in treatment of subjects of different ages. Further clinical trials are needed to confirm these findings in clinical settings. Biomarkers;Interleukin-1beta;RNA, Messenger;Tumor Necrosis Factor-alpha;Interleukin-10 Aging;Animals;Biomarkers;Enzyme-Linked Immunosorbent Assay;Gene Expression Regulation;Inflammation;Interleukin-10;Interleukin-1beta;Low-Level Light Therapy;Male;RNA, Messenger;Rats, Wistar;Skin;Tumor Necrosis Factor-alpha;Wound Healing

Low-level laser therapy to treat fibromyalgia. Several clinical treatments have been proposed to manage symptoms of fibromyalgia. Low-level laser therapy (LLLT) may be a useful tool to treat this dysfunction. The aim of this study was to evaluate the effects of LLLT in patients with fibromyalgia. A placebo-controlled, randomized clinical trial was carried out with 20 patients divided randomly into either an LLLT group (nâ€‰=â€‰10) or a placebo group (nâ€‰=â€‰10). The LLLT group was treated with a GaAlAs laser (670Â nm, 4Â J/cm(2) on 18 tender points) three times a week over

4Â weeks. Before and after treatment, patients were evaluated with the Fibromyalgia Impact Questionnaire (FIQ), McGill Pain Questionnaire, and visual analog scale (VAS). Data from the FIQ and McGill questionnaire for the treated and control groups were analyzed by paired t tests, and Wilcoxon tests were used to analyze data from the VAS. After LLLT or sham treatment, the number of tender points was significantly reduced in both groups (LLLT, pâ€‰<â€‰0.0001; placebo, pâ€‰=â€‰0.0001). However, all other fibromyalgia symptoms showed significant improvements after LLLT compared to placebo (FIQ, pâ€‰=â€‰0.0003; McGill, pâ€‰=â€‰0.0078; and VAS, pâ€‰=â€‰0.0020). LLLT provided relief from fibromyalgia symptoms in patients and should be further investigated as a therapeutic tool for management in fibromyalgia. Adult;Aged;Female;Fibromyalgia;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Physical Therapy Modalities

A case of lichen planus pigmentosus that was recalcitrant to topical treatment responding to pigment laser treatment. Lichen planus pigmentosus is a rare variant of lichen planus for which no effective treatment is currently available. Patients usually present with hyperpigmented, dark brown macules on sun-exposed areas or flexural folds. Here we describe a 50-year-old Chinese woman who had biopsy-confirmed lichen planus pigmentosus that was recalcitrant to a variety of topical treatments, but responded to treatment with a pigment laser. Dermatologic Agents Administration, Cutaneous;Biopsy;Dermatologic Agents;Drug Resistance;Female;Humans;Lasers, Solid-State;Lichen Planus;Low-Level Light Therapy;Middle Aged;Skin;Skin Pigmentation;Treatment Outcome

Low level laser therapy reduces acute lung inflammation in a model of pulmonary and extrapulmonary LPS-induced ARDS. The present study aimed to investigate the effects low level laser therapy (LLLT) in a LPS-induced pulmonary and extrapulmonary acute respiratory distress syndrome (ARDS) in BALB/c mice. Laser (830nm laser, 9J/cm(2), 35mW, 80s per point, 3 points per application) was applied in direct contact with skin, 1h after LPS administration. Mice were distributed in control (n=6; PBS), ARDS IT (n=7; LPS orotracheally 10Î¼g/mouse), ARDS IP (n=7; LPS intra-peritoneally 100Î¼g/mouse), ARDS IT+Laser (n=9; LPS intra-tracheally 10Î¼g/mouse), ARDS IP+Laser (n=9; LPS intra-peritoneally 100Î¼g/mouse). Twenty-four hours after last LPS administration, mice were studied for pulmonary inflammation by total and differential cell count in bronchoalveolar lavage (BAL), cytokines (IL-1beta, IL-6, KC and TNF-alpha) levels in BAL fluid and also by quantitative analysis of neutrophils number in the lung parenchyma. LLLT significantly reduced pulmonary and extrapulmonary inflammation in LPS-induced ARDS, as demonstrated by reduced number of total cells ($p<0.001$) and neutrophils ($p<0.001$) in BAL, reduced levels of IL-1beta, IL-6, KC and TNF-alpha in BAL fluid and in serum ($p<0.001$), as well as the number of neutrophils in lung parenchyma ($p<0.001$). LLLT is effective to reduce pulmonary inflammation in both pulmonary and extrapulmonary model of LPS-induced ARDS. Cytokines;Lipopolysaccharides Acute Disease;Animals;Bronchoalveolar Lavage Fluid;Cytokines;Disease Models, Animal;Inflammation;Lipopolysaccharides;Low-Level Light Therapy;Lung;Male;Mice;Mice, Inbred BALB C;Neutrophils;Respiratory Distress Syndrome

Comparative evaluation of the effect of Er:YAG laser and low level laser irradiation combined with CPP-ACPF cream on treatment of enamel caries. OBJECTIVES: This study investigated the effectiveness of low power red and infrared lasers and that of Er:YAG laser, in association with CPP-ACPF cream, on remineralization of white spot lesions. STUDY DESIGN: Fifty intact premolars were immersed in a demineralization solution for 10 weeks to induce caries like lesions and then were divided into five groups. In group 1, the teeth were covered with a CPP-ACPF cream for 3 minutes and then irradiated with a low power red laser (660 nm, 200 mW) for 1 minute through the cream. In group 2, the treatment was the same as that in group 1, but an infrared laser (810 nm, 200 mW) was employed. The specimens in group 3 were irradiated with an Er:YAG laser (100 mJ, 10 Hz) combined

with CPP-ACPF. In group 4, the CPP-ACPF cream was applied for 4 minutes and group 5 was submitted to neither laser nor CPP-ACPF. The micro Vickers hardness was compared at 20, 60 and 100 Âµ from the enamel surface among the groups. RESULTS: The highest microhardness was observed in the low power red and Er:YAG laser groups and the lowest one belonged to the CPP-ACPF alone and control groups. However, no significant difference was found in microhardness of the experimental groups at any of the evaluation depths (p>0.05). CONCLUSIONS: With the laser parameters used in this study, neither the combined application of Er:YAG laser with CPP-ACPF nor the combination of low power lasers with CPP-ACPF provided a significant increase in remineralization of enamel caries. Key words:Low level laser, Er:YAG, laser, enamel caries, CPP-ACP, microhardness, white spot lesion.

Tooth movement in orthodontic treatment systematic review omitted significant articles. Animals;Humans;Low-Level Light Therapy;Orthodontics;Tooth Movement Techniques

Laser phototherapy triggers the production of reactive oxygen species in oral epithelial cells without inducing DNA damage. Laser phototherapy (LPT) is widely used in clinical practice to accelerate healing. Although the use of LPT has advantages, the molecular mechanisms involved in the process of accelerated healing and the safety concerns associated with LPT are still poorly understood. We investigated the physiological effects of LPT irradiation on the production and accumulation of reactive oxygen species (ROS), genomic instability, and deoxyribose nucleic acid (DNA) damage in human epithelial cells. In contrast to a high energy density (20â€‰â€‰J/cmÂ²), laser administered at a low energy density (4â€‰â€‰J/cmÂ²) resulted in the accumulation of ROS. Interestingly, 4â€‰â€‰J/cmÂ² of LPT did not induce DNA damage, genomic instability, or nuclear influx of the BRCA1 DNA damage repair protein, a known genome protective molecule that actively participates in DNA repair. Our results suggest that administration of low energy densities of LPT induces the accumulation of safe levels of ROS, which may explain the accelerated healing results observed in patients. These findings indicate that epithelial cells have an endowed molecular circuitry that responds to LPT by physiologically inducing accumulation of ROS, which triggers accelerated healing. Importantly, our results suggest that low energy densities of LPT can serve as a safe therapy to accelerate epithelial healing. BRCA1 Protein;BRCA1 protein, human;H2AX protein, human;Histones;Reactive Oxygen Species BRCA1 Protein;Cell Line;DNA Breaks, Double-Stranded;DNA Repair;Epithelial Cells;Histones;Humans;Low-Level Light Therapy;Reactive Oxygen Species

Excimer laser in the treatment of mycosis fungoides. BACKGROUND: Mycosis fungoides (MF) is the most common type of cutaneous T-cell lymphoma, which typically presents as a patch or plaque in early-stage disease. Phototherapy including psoralen plus ultraviolet A and ultraviolet B are well-established treatment modalities in management of early-stage MF. Only a limited number of reports have evaluated the efficacy of 308-nm excimer laser in therapy of cutaneous T-cell lymphoma. OBJECTIVE: We sought to evaluate the efficacy of 308-nm excimer laser (XTRAC, PhotoMedex, Montgomeryville, PA) in patients with stage IA to IIA MF. METHODS: We reviewed the clinical and laboratory characteristics of 6 consecutive patients given the diagnosis of refractory MF who underwent treatment with excimer laser. RESULTS: We found that the 308-nm excimer laser is a safe and well-tolerated alternative therapy for early-stage MF. In addition, we were able to delineate criteria to help predict treatment response. Our data showed that 4 (66%) patients achieved clinical improvement (3 complete responses, 1 partial response), 1 had stable disease, and 1 had progressive disease. LIMITATIONS: This was a retrospective study consisting of 6 patients. A prospective study with a larger sample size would be desirable for future studies. CONCLUSION: The use of 308-nm excimer laser in the treatment of stage IA to IIA MF showed clinical and pathological benefit for patients with isolated lesions or lesions in areas that may be difficult to treat because of anatomic location. Adult;Aged;Cohort Studies;Female;Follow-Up Studies;Humans;Lasers,

Excimer;Low-Level Light Therapy;Lymphoma, T-Cell, Cutaneous;Male;Middle Aged;Mycosis Fungoides;Neoplasm Invasiveness;Neoplasm Staging;Retrospective Studies;Skin Neoplasms;Time Factors;Treatment Outcome

Adjunctive use of the diode laser in non-surgical periodontal therapy: exploring the controversy. Despite the controversy regarding clinical efficacy, dental hygienists use the diode laser as an adjunct to non-surgical periodontal therapy. The technique to maximize successful laser therapy outcome is controversial as well. The purpose of this review is to explore the scientific foundation of the controversy surrounding the use of the diode laser as an adjunct to non-surgical periodontal therapy. Further, this paper addresses the weaknesses in study design, the heterogeneity of methodology in the published clinical studies, especially the laser parameters, and how these issues impact the collective clinical and microbial data, and thus conclusions regarding clinical efficacy. Evaluation of the literature identifies possible mechanisms that could contribute to the varied, often conflicting results among laser studies that are the foundation of the controversy surrounding clinical efficacy. These mechanisms include current paradigms of periodontal biofilm behavior, tissue response to laser therapy being dependent on tissue type and health, and that the successful therapeutic treatment window is specific to the target tissue, biofilm composition, laser wavelength, and laser energy delivered. Lastly, this paper discusses laser parameters used in the various clinical studies, and how their diversity contributes to the controversy. Although this review does not establish clinical efficacy, it does reveal the scientific foundation of the controversy and the need for standardized, well designed randomized controlled clinical trials to develop specific guidelines for using the laser as an adjunct to non-surgical periodontal therapy. Using evidence-based laser guidelines would allow dental hygienists to provide more effective non-surgical periodontal care. Chronic Periodontitis;Combined Modality Therapy;Dental Hygienists;Fibroblasts;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Treatment Outcome

Effects of low intensity laser in in vitro bacterial culture and in vivo infected wounds. OBJECTIVE: to compare the effects of low intensity laser therapy on in vitro bacterial growth and in vivo in infected wounds, and to analyze the effectiveness of the AsGa Laser technology in in vivo wound infections. METHODS: in vitro: Staphylococcus aureus were incubated on blood agar plates, half of them being irradiated with 904 nm wavelength laser and dose of 3J/cmÂ² daily for seven days. In vivo: 32 male Wistar rats were divided into control group (uninfected) and Experimental Group (Infected). Half of the animals had their wounds irradiated. RESULTS: in vitro: there was no statistically significant variation between the experimental groups as for the source plates and the derived ones ($p>0.05$). In vivo: there was a significant increase in the deposition of type I and III collagen in the wounds of the infected and irradiated animals when assessed on the fourth day of the experiment ($p=0.034$). CONCLUSION: low-intensity Laser Therapy applied with a wavelength of 904 nm and dose 3J/cmÂ² did not alter the in vitro growth of S. aureus in experimental groups; in vivo, however, it showed significant increase in the deposition of type I and III collagen in the wound of infected and irradiated animals on the fourth day of the experiment.
Animals;Bacteriological Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Staphylococcus aureus;Wound Infection

Up-to-date approach to manage keloids and hypertrophic scars: a useful guide. Keloids and hypertrophic scars occur anywhere from 30 to 90% of patients, and are characterized by pathologically excessive dermal fibrosis and aberrant wound healing. Both entities have different clinical and histochemical characteristics, and unfortunately still represent a great challenge for clinicians due to lack of efficacious treatments. Current advances in molecular biology and genetics reveal new preventive and therapeutical options which represent a hope to manage this highly prevalent, chronic and disabling problem, with long-term beneficial outcomes and improvement of

quality of life. While we wait for these translational clinical products to be marketed, however, it is imperative to know the basics of the currently existing wide array of strategies to deal with excessive scars: from the classical corticotherapy, to the most recent botulinum toxin and lasers. The main aim of this review paper is to offer a useful up-to-date guideline to prevent and treat keloids and hypertrophic scars. Adjuvants, Immunologic;Adrenal Cortex Hormones;Aminoquinolines;Anti-Inflammatory Agents;Antineoplastic Agents;Neuromuscular Agents;ortho-Aminobenzoates;Bleomycin;Interferons;Botulinum Toxins, Type A;tranilast;Imiquimod;Fluorouracil Adjuvants, Immunologic;Adrenal Cortex Hormones;Aminoquinolines;Anti-Inflammatory Agents;Antineoplastic Agents;Bleomycin;Botulinum Toxins, Type A;Cicatrix, Hypertrophic;Cryotherapy;Disease Management;Fluorouracil;Humans;Imiquimod;Injections, Intralesional;Interferons;Keloid;Lasers, Dye;Low-Level Light Therapy;Neuromuscular Agents;ortho-Aminobenzoates

Effects of Light-Emitting Diode Photobiomodulation Therapy and BioOss as Single and Combined Treatment in an Experimental Model of Bone Defect Healing in Rats. The present study assesses histopathologically and histomorphometrically the effects of light-emitting diode (LED) photobiomodulation therapy (LPT) on bone healing in BioOss-filled femoral defects of rats. It has been reported that LPT modulates cellular metabolic processes, leading to an enhanced regenerative potential for biological tissues. Thirty-six male Wistar rats with femoral bone defects were divided into 4 groups: defect group (empty bone defect, without application of LPT), graft group (bone defect filled with BioOss, without application of LPT), (defect+LPT) group (empty bone defect, with application of LPT), and (graft+LPT) group (bone defect filled with BioOss, with application of LPT). An OsseoPulse LED device (wavelength: 618 nm; output power: 20 mW/cm(2)) was initiated 24 hours postsurgery and performed every 24 hours for 7, 14, and 21 days. The LPT-applied and BioOss-filled defects presented a higher amount of new bone formation with trabeculae formation. These defects showed statistically significant lower values of inflammation severity, and fewer remnants of biomaterial were present. Within the limitations of this study, LPT has positive effects on bone healing histopathologically and histomorphometrically for the defects filled with BioOss 3 weeks after the rats' femora injury. Bio-Oss;Minerals Animals;Low-Level Light Therapy;Male;Minerals;Models, Theoretical;Rats;Rats, Wistar

Low-level laser therapy: an experimental design for wound management: a case-controlled study in rabbit model. BACKGROUND: There is a wide array of articles in medical literature for and against the laser effect on wound healing but without discrete effect determination or conclusion. This experimental study aims to evaluate the efficacy of low-level laser therapy on wound healing. MATERIALS AND METHODS: Thirty-four rabbits were randomly enrolled in two groups after creating a full thickness of 3 Ã— 3 cm wound. The intervention group received low density laser exposure (4 J/cm(2)) on days 0, 3 and 6 with diode helium-neon low-intensity laser device (wl = 808 nm) and in control group moist wound dressing applied. Finally, wound-healing process was evaluated by both gross and pathological assessment. RESULTS: Fibrin formation was the same in the two groups (P = 0.4) but epithelialisation was much more in laser group (P = 0.02). Wound inflammation of the laser group was smaller than that of the control groups but statistical significance was not shown (P = 0.09). Although more smooth muscle actin was found in the wounds of the laser group but it was not statistically significant (P = 0.3). Wound diameter showed significant decrease in wound area in laser group (P = 0.003). CONCLUSION: According to our study, it seems that low-level laser therapy accelerates wound healing at least in some phases of healing process. So, we can conclude that our study also shows some hopes for low level laser therapy effect on wound healing at least in animal model.

New LLLT protocol to speed up the bone healing process-histometric and immunohistochemical analysis in rat calvarial bone defect. A new low-level laser therapy (LLLT) protocol is proposed and compared to another previously studied, in animal models, aiming to establish a more practical LLLT protocol. Protocol 1, the same used in other works and based on the clinical LLLT protocol for bone regeneration, consists of punctual transcutaneous applications in the defect region with fluence of 16 J/cm(2) every 48 h for 15 days. Protocol 2, proposed in this work, consists of three sessions: the first application directly on the defect site with fluency of 3.7 J/cm(2), during the surgical procedure, followed by two transcutaneous applications, 48 and 120 h postoperatively. The Thera LaseÂ® (Î»â€‰=â€‰830 nm) was used, and the dosimetry of the first application of protocol 2 was calculated based on in vitro studies. Forty-five male rats were used, in which critical-size bone defects with 8 mm of diameter were surgically created in calvaria. The animals were randomly divided into three groups of 15 animals, named group 1 (protocol 1), group 2 (protocol 2), and control, which was not submitted to laser treatment. After 7, 15, and 45 days, five animals of each group were euthanized, and the pieces of calvarial bone were collected for microscopic and immunohistochemistry for vascular endothelial growth factor (VEGF), osteocalcin (OC), and osteopontin (OP) analysis. Histomorphometry showed that newly formed bone of 15-day samples from group 2 is higher than the control group (pâ€‰<â€‰0.05, ANOVA, Tukey). At 7 days, in the central part of the defect, VEGF expression was the same for all groups, OC was higher for protocol 2, and OP for protocol 1. The results suggest LLLT using the protocol 2 hastened the bone healing process in the early periods after surgery. Spp1 protein, rat;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Osteocalcin;Osteopontin Animals;Bone Regeneration;Low-Level Light Therapy;Male;Osteocalcin;Osteopontin;Rats;Rats, Wistar;Skull;Vascular Endothelial Growth Factor A

Diode lasers: a magical wand to an orthodontic practice. LASER (Light Amplification by Stimulated Emission of Radiation) is a powerful source of light, which has innumerable applications in all the fields of science including medicine and dentistry. It is one such technology that has become a desirable and an inseparable alternative to many traditional surgical procedures being held in the field of dentistry, and orthodontics is no exception. The current article describes the uses of a diode laser as an indispensable tool in an orthodontic office. Biopsy;Humans;Low-Level Light Therapy;Orthodontics;Temporomandibular Joint Disorders

Low level laser therapy for the treatment of diabetic foot ulcers: a critical survey. Diabetic foot ulcers as one of the most common complications of diabetes mellitus are defined as nonhealing or long-lasting chronic skin ulcers in diabetic patients. Multidisciplinary care for the diabetic foot is common, but treatment results are often unsatisfactory. Low level laser therapy (LLLT) on wound areas as well as on acupuncture points, as a noninvasive, pain-free method with minor side effects, has been considered as a possible treatment option for the diabetic foot syndrome. A systematic literature review identified 1764 articles on this topic. Finally, we adopted 22 eligible references; 8 of them were cell studies, 6 were animal studies, and 8 were clinical trials. Cell studies and animal studies gave evidence of cellular migration, viability, and proliferation of fibroblast cells, quicker reepithelization and reformed connective tissue, enhancement of microcirculation, and anti-inflammatory effects by inhibition of prostaglandine, interleukin, and cytokine as well as direct antibacterial effects by induction of reactive oxygen species (ROS). The transferral of these data into clinical medicine is under debate. The majority of clinical studies show a potential benefit of LLLT in wound healing of diabetic ulcers. But there are a lot of aspects in these studies limiting final evidence about the actual output of this kind of treatment method. In summary, all studies give enough evidence to continue research on laser therapy for diabetic ulcers, but clinical trials using human models do not provide sufficient evidence to establish the usefulness of LLLT as an effective tool in

wound care regimes at present. Further well designed research trials are required to determine the true value of LLLT in routine wound care.

Interventions for iatrogenic inferior alveolar and lingual nerve injury. BACKGROUND: Iatrogenic injury of the inferior alveolar or lingual nerve or both is a known complication of oral and maxillofacial surgery procedures. Injury to these two branches of the mandibular division of the trigeminal nerve may result in altered sensation associated with the ipsilateral lower lip or tongue or both and may include anaesthesia, paraesthesia, dysaesthesia, hyperalgesia, allodynia, hypoaesthesia and hyperaesthesia. Injury to the lingual nerve may also affect taste perception on the affected side of the tongue. The vast majority (approximately 90%) of these injuries are temporary in nature and resolve within eight weeks. However, if the injury persists beyond six months it is deemed to be permanent. Surgical, medical and psychological techniques have been used as a treatment for such injuries, though at present there is no consensus on the preferred intervention, or the timing of the intervention. OBJECTIVES: To evaluate the effects of different interventions and timings of interventions to treat iatrogenic injury of the inferior alveolar or lingual nerves. SEARCH METHODS: We searched the following electronic databases: the Cochrane Oral Health Group's Trial Register (to 9 October 2013), the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2013, Issue 9), MEDLINE via OVID (1946 to 9 October 2013) and EMBASE via OVID (1980 to 9 October 2013). No language restrictions were placed on the language or date of publication when searching the electronic databases. SELECTION CRITERIA: Randomised controlled trials (RCTs) involving interventions to treat patients with neurosensory defect of the inferior alveolar or lingual nerve or both as a sequela of iatrogenic injury. DATA COLLECTION AND ANALYSIS: We used the standard methodological procedures expected by The Cochrane Collaboration. We performed data extraction and assessment of the risk of bias independently and in duplicate. We contacted authors to clarify the inclusion criteria of the studies. MAIN RESULTS: Two studies assessed as at high risk of bias, reporting data from 26 analysed participants were included in this review. The age range of participants was from 17 to 55 years. Both trials investigated the effectiveness of low-level laser treatment compared to placebo laser therapy on inferior alveolar sensory deficit as a result of iatrogenic injury.Patient-reported altered sensation was partially reported in one study and fully reported in another. Following treatment with laser therapy, there was some evidence of an improvement in the subjective assessment of neurosensory deficit in the lip and chin areas compared to placebo, though the estimates were imprecise: a difference in mean change in neurosensory deficit of the chin of 8.40 cm (95% confidence interval (CI) 3.67 to 13.13) and a difference in mean change in neurosensory deficit of the lip of 21.79 cm (95% CI 5.29 to 38.29). The overall quality of the evidence for this outcome was very low; the outcome data were fully reported in one small study of 13 patients, with differential drop-out in the control group, and patients suffered only partial loss of sensation. No studies reported on the effects of the intervention on the remaining primary outcomes of pain, difficulty eating or speaking or taste. No studies reported on quality of life or adverse events.The overall quality of the evidence was very low as a result of limitations in the conduct and reporting of the studies, indirectness of the evidence and the imprecision of the results. AUTHORS' CONCLUSIONS: There is clearly a need for randomised controlled clinical trials to investigate the effectiveness of surgical, medical and psychological interventions for iatrogenic inferior alveolar and lingual nerve injuries. Primary outcomes of this research should include: patient-focused morbidity measures including altered sensation and pain, pain, quantitative sensory testing and the effects of delayed treatment. Humans;Iatrogenic Disease;Lingual Nerve Injuries;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Somatosensory Disorders;Time Factors;Trigeminal Nerve Injuries

The effect of low-level laser therapy on knee osteoarthritis: prospective, descriptive study. BACKGROUND: Osteoarthritis (OA) is one of the most common joint disorders in the elderly which could be associated with considerable physical disability. PATIENTS AND METHODS: In a descriptive, prospective study, 33 patients enrolled in the study from which 15 people were excluded due to incomplete course of treatment, leaving the total number of 18 patients with knee osteoarthritis. Gal-Al-As diode laser device was used as a source of low-power laser. Patients were performed laser therapy with a probe of LO7 with a wavelength of 810 nm and 50 mW output power in pulse radiation mode (F = 3,000, peak power = 80 W, Î”t = 200 ns, density = 0.05 W/cm(2), dose = 6 J/cm(2), area = 1 cm(2)) and also a probe of MLO1K with a power output of 30 mW and a wavelength of 890 nm in pulse radiation mode (F = 3,000 Hz, peak power = 50 W, Î”t = 200 ns, density = 0.017 W/cm(2), total dose = 10 J/cm(2)), and were given low-level laser therapy (LLLT) three times a week with a total number of 12 sessions. Data were analyzed using SPSS ver. 15, and the obtained data were reported as mean Â± SD and frequency (%). To analyze the data, repeated measurement and marginal homogeneity approaches were used. RESULTS: In the current study, a significant reduction was observed regarding the nocturnal pain, pain on walking and ascending the steps, knee circumference, distance between the hip and heel, and knee to horizontal hip to heel distance at the end of the treatment course. CONCLUSIONS: In brief, the current study focuses on the fact that LLLT is effective in reducing pain in knee osteoarthritis. Aged;Female;Hip;Humans;Knee Joint;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain;Pain Measurement;Prospective Studies

Effectiveness of the diode laser in the treatment of ligature-induced periodontitis in rats: a histopathological, histometric, and immunohistochemical study. The aim of this study was to evaluate the effects of the use of a high-power gallium-aluminum-arsenide diode laser (GaAlAs; 808 nm, 1 W, 20 s, 20 Hz, 10 J) alone or as adjunctive therapy to scaling and root planing in the treatment of induced periodontitis in rats. Periodontitis was induced by placing a ligature around the mandibular first molar of 60 rats. After 7 days, the ligature was removed and the animals were divided into four groups as follows: C (control), no periodontal treatment; SRP, scaling and root planing (SRP); DL, diode laser (DL) irradiation treatment; and SRP/DL, both SRP and DL irradiation treatment. Five animals from each group were euthanized at 7, 15, and 30 days posttreatment. The effectiveness of the treatments was evaluated in the furcation area using histopathological analysis, histometric analysis of alveolar bone loss (ABL), and immunohistochemical detection of tartrate-resistant acid phosphatase (TRAP), runt-related transcription factor 2 (RUNX2), and osteocalcin (OCN). DL, alone or in combination with adjunctive therapy to SRP in the treatment of experimental periodontitis, resulted in a decreased local inflammatory response. At 7-days posttreatment, the DL and SRP/DL groups had fewer TRAP-positive cells and more RUNX2-positive cells. There was greater OCN immunolabeling in the DL group than in the C and SRP groups at 15 days. There was less ABL in the DL and SRP/DL groups at 15 and 30 days. In conclusion, DL was effective in the treatment of ligature-induced periodontitis in rats, both when used alone and when used as adjunctive therapy to SRP. Core Binding Factor Alpha 1 Subunit;Runx2 protein, rat;Osteocalcin Alveolar Bone Loss;Animals;Combined Modality Therapy;Core Binding Factor Alpha 1 Subunit;Dental Scaling;Lasers, Semiconductor;Ligation;Low-Level Light Therapy;Male;Molar;Osteocalcin;Periodontitis;Rats;Rats, Wistar;Root Planing;Treatment Outcome

Effect of laser phototherapy (Î»660â€‰nm) on type I and III collagen expression during wound healing in hypothyroid rats: an immunohistochemical study in a rodent model. OBJECTIVE: The aim of this study was to assess, immunohistochemically, the impact of hypothyroidism and the effect of laser phototherapy on the expression of type I and III collagen during wound healing. BACKGROUND DATA: Hypothyroidism has been associated with the disruption of the body's

metabolism, including the healing process. Laser phototherapy has been shown to be effective in improving wound healing, but its usefulness on enhancing wound healing under hypothyroid condition remains unknown. MATERIALS AND METHODS: Using general anesthesia, a standard surgical wound (1â€‰cm(2)) was created on the dorsa of 48 Wistar rats divided into four groups of 12 animals each: control euthyroid (EC), euthyroid plus laser (EL), control hypothyroid (HC), and hypothyroid plus laser (HL). The irradiation with laser GaAlAs [Î»660â€‰nm, 40â€‰mW, 1â€‰W/cm(2), continuous wave (CW), Ã¸=0.04â€‰cm(2)] started immediately after surgery and was repeated every other day until end-point of study was reached, and animals were euthanized (i.e., 7 and 14 days). Laser light was applied on four different points (6â€‰J, 150â€‰sec and 150â€‰J/cm(2) per point). Hypothyroidism was induced in rats with propylthiouracil (0.05â€‰g/100â€‰mL) administered orally for 4 weeks and maintained until the end of the experiment. Immunohistochemistry for collagen I and III was performed with EnVision(â„¢) in the specimens removed. RESULTS: Seven days after the surgery EC, EL, and HL groups showed higher immunoexpression of collagen I and lower immunoexpression of collagen III in the newly formed tissue. There was increased immunoexpression of collagen I in EC when compared with HC (p=0.019). The immunoexpression of collagen III was significantly lower in EL than in EC (p=0.047) and HL (p=0.019). No significant difference was found in the experimental period of 14 days among the groups. CONCLUSIONS: Laser light therapy performed with the parameters of this investigation increased immunoexpression of collagen type I during tissue repair, and improved the quality of newly formed tissue in the presence of hypothyroidism. Collagen Type I;Collagen Type III Animals;Collagen Type I;Collagen Type III;Humans;Hypothyroidism;Immunohistochemistry;Low-Level Light Therapy;Rats;Rats, Wistar;Wound Healing

Effects of laser irradiation (670-nm InGaP and 830-nm GaAlAs) on burn of second-degree in rats. This study investigated the effects of 670-nm indium gallium phosphide (InGaP) and 830-nm gallium aluminum arsenide (GaAlAs) laser therapy on second-degree burns induced on the back of Wistar rats. Sixty-three male Wistar rats were anesthetized, and second-degree burns were made on their back. The animals were then divided randomly into three groups: control (C), animals treated with 670-nm InGaP laser (LIn), and animals treated with 830-nm GaAlAs laser (LGa). The wound areas were removed after 2, 6, 10, 14, and 18 days of treatment and submitted to structural and morphometric analysis. The following parameters were studied: total number of granulocytes and fibroblasts, number of newly formed blood vessels, and percentage of birefringent collagen fibers in the repair area. Morphometric analysis showed that different lasers 670-nm InGaP and 830-nm GaAlAs reduced the number of granulocytes and an increase of newly formed vessels in radiated lesions. The 670-nm InGaP laser therapy was more effective in increasing the number of fibroblasts. The different treatments modified the expression of VEGF and TGF-Î²1, when compared with lesions not irradiated. The different types of light sources showed similar effects, improved the healing of second-degree burns and can help for treating this type of injury. Despite the large number of studies with LLTI application in second-degree burns, there is still divergence about the best irradiation parameters to be used. Further studies are needed for developing a protocol effective in treating this type of injury. Pancreatitis-Associated Proteins;Phosphines;REG3A protein, human;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;Indium;Gallium;indium phosphide Animals;Birefringence;Blood Vessels;Burns;Cell Count;Fibroblasts;Gallium;Indium;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pancreatitis-Associated Proteins;Phosphines;Rats, Wistar;Skin;Staining and Labeling;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A

Low-level laser irradiation induces in vitro proliferation of mesenchymal stem cells. OBJECTIVE: To evaluate the effect of low-level laser irradiation on the proliferation and possible nuclear

morphological changes of mouse mesenchymal stem cells. METHODS: Mesenchymal stem cells derived from bone marrow and adipose tissue were submitted to two applications (T0 and T48 hours) of low-level laser irradiation (660 nm; doses of 0.5 and 1.0 J/cm2). The trypan blue assay was used to evaluate cell viability, and growth curves were used to analyze proliferation at zero, 24, 48, and 72 hours. Nuclear alterations were evaluated by staining with DAPI (4'-6-diamidino-2-phenylindole) at 72 hours. RESULTS: Bone marrow-derived mesenchymal stem cells responded to laser therapy in a dose-dependent manner. Higher cell growth was observed when the cells were irradiated with a dose of 1.0 J/cm2, especially after 24 hours ($p<0.01$). Adipose-derived mesenchymal stem cells responded better to a dose of 1.0 J/cm2, but higher cell proliferation was observed after 48 hours ($p<0.05$) and 72 hours ($p<0.01$). Neither nuclear alterations nor a significant change in cell viability was detected in the studied groups. CONCLUSION: Low-level laser irradiation stimulated the proliferation of mouse mesenchymal stem cells without causing nuclear alterations. The biostimulation of mesenchymal stem cells using laser therapy might be an important tool for regenerative therapy and tissue engineering. Adipose Tissue;Animals;Bone Marrow Cells;Cell Proliferation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Mice;Radiation Dosage;Reproducibility of Results;Time Factors

Recurrent aphthous stomatitis and pain management with low-level laser therapy: a randomized controlled trial. OBJECTIVE: The aim of the study was to determine whether low-level laser therapy (LLLT) has an analgesic effect in patients with recurrent aphthous stomatitis (RAS). STUDY DESIGN: A randomized single-blinded placebo-controlled trial was conducted with LLLT (wavelength, 809 nm; power, 60 mW; pulse frequency, 1800 Hz; duration, 80 seconds per treatment; dose, 6.3 J/cm(2)) in 40 patients with RAS. The intervention group was treated with LLLT on 3 occasions, with a 1-day interval. The control group was treated similarly, without any laser power. Pain perception (visual analog scale [VAS] rating) and patients' experience of eating, drinking, and brushing teeth was registered. RESULTS: VAS rating decreased (day 0 until day 2) from 84.7 to 31.5 (LLLT) and from 81.7 to 76.1 (placebo) ($P < .0001$). LLLT also relieved the difficulty of drinking, eating, and brushing teeth. CONCLUSIONS: LLLT reduced the pain and the inconvenience of eating, drinking, and brushing teeth for patients with RAS, compared with placebo. Adult;Female;Humans;Low-Level Light Therapy;Male;Pain Management;Pain Measurement;Recurrence;Single-Blind Method;Stomatitis, Aphthous;Surveys and Questionnaires;Sweden;Treatment Outcome

Use of low level laser therapy for oral lichen planus: report of two cases. Oral Lichen Planus is a chronic inflammatory disease of unknown etiology. Erosive/ ulcerative oral lichen planus is often a painful condition that tends to become malignant, urging appropriate therapy. Laser therapy has recently been suggested as a new treatment option without significant side effects. This article presents two cases of erosive/ ulcerative oral lichen planus, who had not received any treatment before, treated with 630 nm low level laser. Lesion type and pain was recorded before and after treatment. Severity of lesions and pain were reduced after treatment. Low Level Laser Therapy was an effective treatment with no side effects and it may be considered as an alternative therapy for erosive/ulcerative oral lichen planus.

Low-level laser therapy prevents degenerative morphological changes in an experimental model of anterior cruciate ligament transection in rats. The aim of this study was to analyze the effects of low-level laser therapy (LLLT) on the prevention of cartilage damage after the anterior cruciate ligament transection (ACLT) in knees of rats. Thirty male rats (Wistar) were distributed into three groups (n = 10 each): injured control group (CG); injured laser-treated group at 10 J/cm(2) (L10), and injured laser-treated group at 50 J/cm(2) (L50). Laser treatment started immediately after the surgery and it was performed for 15 sessions. An 808 nm laser, at 10 and 50 J/cm(2), was used. To evaluate

the effects of LLLT, the qualitative and semi-quantitative histological, morphometric, and immunohistochemistry analysis were performed. Initial signs of tissue degradation were observed in CG. Interestingly, laser-treated animals presented a better tissue organization, especially at the fluence of 10 J/cm(2). Furthermore, laser phototherapy was able of modulating some of the aspects related to the degenerative process, such as the prevention of proteoglycans loss and the increase in cartilage area. However, LLLT was not able of modulating chondrocytes proliferation and the immunoexpression of markers related to inflammatory process (IL-1 and MMP-13). This study showed that 808 nm laser, at both fluences, prevented features related to the articular degenerative process in the knees of rats after ACLT. Interleukin-1beta;Matrix Metalloproteinase 13 Animals;Anterior Cruciate Ligament;Anterior Cruciate Ligament Injuries;Disease Models, Animal;Immunohistochemistry;Interleukin-1beta;Low-Level Light Therapy;Male;Matrix Metalloproteinase 13;Rats, Wistar

One man's light: mechanistic convergence of photobiomodulation and biological effects. Immunologic Factors Immunologic Factors;Light

[The influence of laser therapy on selected functional parameters of patients with spondyloarthrosis of the lower section of the spine]. Spondyloarthrosis is a quickly growing disease in highly civilized communities. It is one of the most frequent causes for movement limitations and is listed as the main reason for the incapacitation for work among people of the working age. The following symptoms can be observed in patients with spondyloarthrosis: pain, limited spine mobility, increased muscle tone. Chronic pain and the associated limitation of movement underlie the quest for an effective therapy. Using laser therapy as part of physical therapy prompts research into the effectiveness of the measure in patients with spondyloarthrosis. The aim of this study was to evaluate the effectiveness of laser therapy on spondyloarthrosis of the lumbar spine. MATERIAL AND METHODS: 60 patients suffering from chronic low back pain, diagnosed with a lumbar disc herniation with no nerve root symptoms, received laser therapy (820 nm, 400 mW, 6-12 J/cm2. Every patient underwent examinations before and after rehabilitation. Subjective pain assessment was carried out using a modified Laitinen questionnaire and visual analogue scale of pain intensity. Spine mobility was evaluated using Schober's test and the fingertip-to-floor-test. The obtained results were subject to a statistical analysis. RESULTS: Laser therapy was effective in the therapy of lumbar disc herniation. The results of the analysis showed that the intensity and frequency of pain decreased, as well as the use of painkillers. A vast improvement in global spine mobility and lumbosacral flexion and extension could be observed, too. CONCLUSIONS: The study showed a slight analgesic effect and a substantial increase in spine mobility through laser biostimulation. Chronic Pain;Female;Humans;Intervertebral Disc Displacement;Laser Therapy;Low Back Pain;Lumbar Vertebrae;Male;Middle Aged;Movement;Pain Measurement;Range of Motion, Articular;Spondylarthritis;Treatment Outcome

Treatment of dentin hypersensitivity with a low-level laser-emitting toothbrush: double-blind randomised clinical trial of efficacy and safety. Dentin hypersensitivity (DH) is defined as pain derived from exposed dentin in response to chemical, thermal, tactile, or osmotic stimuli that cannot be explained as having arisen from any other dental defect or disease. The aim of this trial was to test the efficacy and the safety of a low-level laser-emitting toothbrush on management of DH. A prospective, double blind, randomised clinical trial was designed; 96 individuals with hypersensitive teeth without caries or fracture were selected as subjects. The subjects were randomly allocated to either the test group with the 635 nm per 6 mW laser-emitting toothbrush, or the control group with the 635 nm per 12.9 Î¼W light-emitting diode (LED) toothbrush. An air blast was applied with a dental air syringe held 3 mm away from the selected tooth and a visual analogue scale (VAS: 0-10) was used to quantify subjective pain. Assessments were completed at a screening visit and after 2-week and 4-

week of using a test/control toothbrush. Results demonstrated that the use of both control and test toothbrushes resulted in decreased discomfort after 4 weeks. In the test group, pain intensity scores decreased from 5.8 Â± 1.2 to 2.3 Â± 1.6, and in the control group, the scores decreased from 6.4 Â± 1.3 to 5.5 Â± 2.0 (P < 0.05). This decrease was significantly greater in the test group. There were no significant adverse events or side effects. It was concluded that the use of the low-level laser emitting toothbrush is a safe and effective treatment option for the management of DH.
Adult;Dentin Sensitivity;Double-Blind Method;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Toothbrushing;Treatment Outcome;Young Adult

Efficacy of pre-exercise low-level laser therapy on isokinetic muscle performance in individuals with type 2 diabetes mellitus: study protocol for a randomized controlled trial. BACKGROUND: Type 2 diabetes, also known non-insulin-dependent diabetes, is the most prevalent type of the disease and involves defects in the secretion and action of insulin. The aim of the proposed study is to evaluate the efficacy of pre-exercise low-level laser therapy (LLLT) on muscle performance of the quadriceps femoris in individuals with type 2 diabetes. METHODS/DESIGN: A double-blind, randomized, controlled clinical trial will be carried out in two treatment phases. In the first phase, quadriceps muscle performance will be evaluated using an isokinetic dynamometer and the levels of creatine kinase and lactate dehydrogenase (biochemical markers of muscle damage) will be determined. The participants will then be allocated to four LLLT groups through a randomization process using opaque envelopes: Group A (4 Joules), Group B (6 Joules), Group C (8 Joules) and Group D (0 Joules; placebo). Following the administration of LLLT, the participants will be submitted to an isokinetic eccentric muscle fatigue protocol involving the quadriceps muscle bilaterally. Muscle performance and biochemical markers of muscle damage will be evaluated again immediately after as well as 24 and 48Â hours after the experimental protocol. One week after the last evaluation the second phase will begin, during which Groups A, B and C will receive the LLLT protocol that achieved the best muscle performance in phase 1 for a period of 4Â weeks. At the end of this period, muscle performance will be evaluated again. The protocol for this study is registered with the World Health Organization under Universal Trial Number U1111-1146-7109. DISCUSSION: The purpose of this randomized clinical trial is to evaluate the efficacy of pre-exercise LLLT on the performance of the quadriceps muscle (peak torque, total muscle work, maximum power and fatigue index - normalized by body mass) in individuals with DM-2. The study will support the practice of evidence-based to the use of LLLT in improving muscle performance in Individuals with DM-2. Data will be published after the study is completed. Biomarkers;L-Lactate Dehydrogenase;Creatine Kinase Biomarkers;Brazil;Clinical Protocols;Creatine Kinase;Diabetes Mellitus, Type 2;Double-Blind Method;Exercise;Humans;L-Lactate Dehydrogenase;Low-Level Light Therapy;Muscle Contraction;Muscle Fatigue;Muscle Strength Dynamometer;Quadriceps Muscle;Research Design;Surveys and Questionnaires;Time Factors;Treatment Outcome

Role of low-intensity laser therapy on naloxone-precipitated morphine withdrawal signs in mice: is nitric oxide a possible candidate mediator? In the present study, the potential involvement of nitric oxide (NO) system in attenuating effects of low-intensity laser therapy (LILT) on naloxone-induced morphine withdrawal signs was evaluated. A hundred mice were rendered morphine-dependent using three escalating doses of morphine sulfate during three consecutive days. After the last dose on day 4, animals were given naloxone HCl (2 mg/kg s.c) to induce withdrawal signs. The effects of LILT (12.5 J/cm(2)) and L-NG-nitroarginine methyl ester (L-NAME) (10, 20, 50, and 100 mg/kg) and their coadministration on escape jump count and stool weight as typical withdrawal signs were assessed. LILT and L-NAME (20, 50, and 100 mg/kg) per se significantly decreased escape jump count and stool weight in morphine-dependent naloxone-treated mice (p < 0.01). Coadministration of

LILT and L-NAME (20, 50, and 100 mg/kg) also reduced escape jump and stool weight ($p < 0.05$) but with no synergetic or additive response. Here, LILT at this fluence may show its maximal effects on NO and therefore no noticeable effects appeared during coadministration use. Moreover, LILT and L-NAME follow the same track of changes in escape jump and stool weight. Conceivably, it seems that LILT acts partly via NO system, but the exact path is still obscure and rather intricate. The precise mechanisms need to be clarified. Nitric Oxide;Naloxone;Morphine;NG-Nitroarginine Methyl Ester Animals;Body Weight;Low-Level Light Therapy;Male;Mice;Morphine;NG-Nitroarginine Methyl Ester;Naloxone;Nitric Oxide;Substance Withdrawal Syndrome

Effect of frequent application of low-level laser therapy on corticotomized tooth movement in dogs: a pilot study. PURPOSE: The purposes of the present study were to evaluate the effects of frequent applications of low-level laser therapy (LLLT) on corticotomy-assisted tooth movement in a beagle dog model and to compare the effects in the mandible and maxilla. MATERIALS AND METHODS: In 4 male beagles, the maxillary and mandibular second premolars were extracted. The third premolars were corticotomized and then protracted from the canines with a continuous force of 200 g. Daily LLLT (using an aluminum gallium indium phosphide [AlGaInP] diode) was applied at the buccal mucosa of the corticotomized premolars on 1 side only. The tooth movement was measured for 8 weeks. Fluorochromes were injected intravenously at the start of the experiment (T0) and after 2 (T2), 4 (T4), and 8 (T8) weeks to evaluate new bone formation on the tension sides. Histomorphometric and immunohistologic evaluations were performed. RESULTS: In the mandible, the movement of the corticotomized premolars in the LLLT plus corticotomy group was less than that in the corticotomy-only group, although the difference was not statistically significant. In the maxilla, no significant differences between the 2 groups were found. Osteoclastic and proliferating cell activities and the amount of new bone formation were greater in the mandibular LLLT plus corticotomy group than in the corticotomy-only group. CONCLUSIONS: The frequent application of LLLT showed no significant effect on the corticotomized tooth movement. Anthraquinones;Fluoresceins;Fluorescent Dyes;Isoenzymes;Proliferating Cell Nuclear Antigen;alizarin;Acid Phosphatase;Tartrate-Resistant Acid Phosphatase;Tetracycline;fluorexon Acid Phosphatase;Alveolar Process;Animals;Anthraquinones;Bicuspid;Bone Resorption;Cell Proliferation;Dogs;Fluoresceins;Fluorescent Dyes;Isoenzymes;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Maxilla;Models, Animal;Orthodontic Wires;Osteoclasts;Osteogenesis;Pilot Projects;Proliferating Cell Nuclear Antigen;Root Resorption;Tartrate-Resistant Acid Phosphatase;Tetracycline;Time Factors;Tooth Movement Techniques

Combined treatment with 578-/511-nm copper bromide laser and light-emitting diodes for post-laser pigmentation: a report of two cases. Postinflammatory hyperpigmentation (PIH) developing after cosmetic procedures such as lasers and chemical peels is always a concern, especially in darker skin types. We report two cases of laser-related PIH of the face successfully treated by combined therapy with 578-/511-nm copper bromide laser and light-emitting diodes (LED). Good cosmetic results were achieved in both patients. The side effects during and after treatment included a mild stinging and redness, but these were resolved within several days without any treatment. Combined 578-/511-nm copper bromide laser with LED provided safe and effective treatment for post-laser pigmentation in Korean patients. Adult;Cosmetic Techniques;Face;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Skin Pigmentation;Treatment Outcome

Re: The effect of increased maximum power output on perioperative and early postoperative outcome in photoselective vaporization of the prostate. Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Prostatic Hyperplasia;Transurethral Resection of Prostate

Efficacy of low-level laser therapy in treatment of recurrent aphthous ulcers - a sham controlled, split mouth follow up study. INTRODUCTION: Apthous ulcers, commonly referred to as canker sores, are the most common ulcerative lesions of the oral mucosa. These are usually painful and are associated with redness, and occasional bleeding from the affected area(s). The aims of treatment are to reduce pain and healing time. AIMS: To assess clinically the efficacy of Low-level laser therapy (LLLT) on recurrent aphthous ulcers for reduction of pain, lesion size, and healing time and to compare the results with those of a sham control group. SETTINGS AND DESIGN: A total of 30 patients who presented with two separate aphthous ulcers were included in the study. Each lesion was randomly allotted to either the active treatment group or the sham control group. MATERIALS AND METHODS: Lesions which were included in the active group were treated with LLLT in a single sitting, which was divided into four sessions. Lesions in the sham control group were subjected to similar treatment without activating the LASER unit. Each patient was evaluated for pain, lesion size, and complete healing at the following intervals; immediately post LLLT and one day, two days, and three days follow up. Statistical Analysis : The Student's t-test was used for statistical evaluation of the data. RESULTS: Complete resolution of the ulcers in the active group was 3.05 Â± 1.10 days as compared to 8.90 Â± 2.45 days in the sham control group. Immediately, post the LLLT application, complete pain relief was observed in 28 of the 30 patients of the active group. CONCLUSION: LLLT was effective in relieving pain and reducing the healing time during the treatment of aphthous ulcers.

Biomechanical properties: effects of low-level laser therapy and BiosilicateÂ® on tibial bone defects in osteopenic rats. PURPOSE: The aim of this study was to investigate the effects of laser therapy and BiosilicateÂ® on the biomechanical properties of bone callus in osteopenic rats. METHODS: Fifty female Wistar rats were equally divided into 5 groups (n=10/group): osteopenic rats with intact tibiae (SC); osteopenic rats with unfilled and untreated tibial bone defects (OC); osteopenic rats whose bone defects were treated with BiosilicateÂ® (B); osteopenic rats whose bone defects were treated with 830-nm laser, at 120 J/cm2 (L120) and osteopenic rats whose bone defects were treated with BiosilicateÂ® and 830-nm laser, at 120 J/cm2 (BL120). Ovariectomy (OVX) was used to induce osteopenia. A non-critical bone defect was created on the tibia of the osteopenic animals 8 weeks after OVX. In BiosilicateÂ® groups, bone defects were completely filled with the biomaterial. For the laser therapy, an 830-nm laser, 120 J/cm2 was used. On day 14 postsurgery, rats were euthanized, and tibiae were removed for biomechanical analysis. RESULTS: Maximal load and energy absorption were higher in groups B and BL120, according to the indentation test. Animals submitted to low-level laser therapy (LLLT) did not show any significant biomechanical improvement, but the association between BiosilicateÂ® and LLLT was shown to be efficient to enhance callus biomechanical properties. Conversely, no differences were found between study groups in the bending test. CONCLUSIONS: BiosilicateÂ® alone or in association with low level laser therapy improves biomechanical properties of tibial bone callus in osteopenic rats. sodium oxide-calcium oxide-silicon dioxide-diphosphorus pentoxide Animals;Combined Modality Therapy;Female;Fracture Healing;Glass;Hardness;Low-Level Light Therapy;Osteoporotic Fractures;Rats;Rats, Wistar;Tibial Fractures;Treatment Outcome;Weight-Bearing

Inflammation and regeneration in the dentin-pulp complex: a double-edged sword. Dental tissue infection and disease result in acute and chronic activation of the innate immune response, which is mediated by molecular and cellular signaling. Different cell types within the dentin-pulp complex are able to detect invading bacteria at all stages of the infection. Indeed, at relatively early disease stages, odontoblasts will respond to bacterial components, and as the disease progresses, core pulpal cells including fibroblasts, stems cells, endothelial cells, and immune cells will become involved. Pattern recognition receptors, such as Toll-like receptors expressed on these cell types, are responsible for detecting bacterial components, and their ligand binding leads to the activation of the nuclear factor-

kappa B and p38 mitogen-activated protein (MAP) kinase intracellular signaling cascades. Subsequent nuclear translocation of the transcription factor subunits from these pathways will lead to proinflammatory mediator expression, including increases in cytokines and chemokines, which trigger host cellular defense mechanisms. The complex molecular signaling will result in the recruitment of immune system cells targeted at combating the invading microbes; however, the trafficking and antibacterial activity of these cells can lead to collateral tissue damage. Recent evidence suggests that if inflammation is resolved relatively low levels of proinflammatory mediators may promote tissue repair, whereas if chronic inflammation ensues repair mechanisms become inhibited. Thus, the effects of mediators are temporal context dependent. Although containment and removal of the infection are keys to enable dental tissue repair, it is feasible that the development of anti-inflammatory and immunomodulatory approaches, based on molecular, epigenetic, and photobiomodulatory technologies, may also be beneficial for future endodontic treatments. Anti-Inflammatory Agents;Inflammation Mediators Anti-Inflammatory Agents;Bacteria;Dental Pulp;Dentin;Humans;Immunomodulation;Inflammation;Inflammation Mediators;Pulpitis;Regeneration;Signal Transduction

Treatment of onychomycosis with a 1,064-nm long-pulsed Nd:YAG laser. BACKGROUND: There are various treatment modalities of onychomycosis. Of these, however, oral antifungal therapies are complicated by potential drug interactions and systemic effects, and the surgical treatment can result in prolonged pain. Therefore, a new, safe and effective therapy is needed that can improve the aesthetic appearance of the nails. OBJECTIVE: The purpose of this study was to evaluate the effect of treatment of onychomycosis with a 1,064-nm long-pulsed Nd:YAG laser. METHODS: 13 patients (31 toenails, 12 fingernails) received five treatment sessions at 4-week intervals with a 1,064-nm long-pulsed Nd:YAG laser. Parameters for each treatment were 6 mm spot size, 5 J/cm(2) fluence, 0.3 ms pulse duration and 5 Hz pulse rate. RESULTS: Of the 13 patients, 8 (61.5%) were women and 5 were men. The mean age of the patients was 62. Of the 43 nails, 4 (9.3%) achieved a complete cure (9.3%), 8 had excellent treatment outcomes (18.6%) and 31 had good treatment outcomes (72%). None of the 13 patients experienced any discomfort except for a mild burning sensation and there were no adverse effects. CONCLUSIONS: Our results demonstrate that the 1,064-nm long-pulsed Nd:YAG laser could be a safe and effective treatment modality in the management of patients with onychomycosis. Adult;Aged;Aged, 80 and over;Female;Foot Dermatoses;Hand Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Patient Satisfaction;Treatment Outcome

Effects of low-level laser therapy on M1-related cytokine expression in monocytes via histone modification. Low-level laser therapy (LLLT) has been used in the treatment of radiotherapy-induced oral mucositis and allergic rhinitis. However, the effects of LLLT on human monocyte polarization into M1 macrophages are unknown. To evaluate the effects of LLLT on M1-related cytokine and chemokine production and elucidate the mechanism, the human monocyte cell line THP-1 was treated with different doses of LLLT. The expression of M1-related cytokines and chemokines (CCL2, CXCL10, and TNF-Î±) was determined by ELISA and real-time PCR. LLLT-associated histone modifications were examined by chromatin immunoprecipitation (ChIP) assays. Mitochondrial involvement in the LLLT-induced M1-related cytokine expression was evaluated by quantitative real-time PCR. Flow cytometry was used to detect the cell surface markers for monocyte polarization. The results showed that LLLT (660â€‰nm) significantly enhanced M1-related cytokine and chemokine expression in mRNA and protein levels. Mitochondrial copy number and mRNA levels of complex I-V protein were increased by LLLT (1â€‰J/cm(2)). Activation of M1 polarization was concomitant with histone modification at TNF-Î± gene locus and IP-10 gene promoter area. This study indicates that LLLT (660â€‰nm) enhanced M1-related cytokine and chemokine expression via

mitochondrial biogenesis and histone modification, which may be a potent immune-enhancing agent for the treatment of allergic diseases. CCL2 protein, human;CXCL10 protein, human;Chemokine CCL2;Chemokine CXCL10;Chemokines;Chromatin;Cytokines;Histones;Tumor Necrosis Factor-alpha Cell Line;Chemokine CCL2;Chemokine CXCL10;Chemokines;Chromatin;Cytokines;Gene Expression Regulation;Histones;Humans;Inflammation;Lasers;Low-Level Light Therapy;Mitochondria;Monocytes;Promoter Regions, Genetic;Tumor Necrosis Factor-alpha

Effects of low-level laser therapy on orthodontic tooth movement and root resorption after artificial socket preservation. BACKGROUND: Low- level laser therapy has been used to stimulate the orthodontic tooth movements (OTM) previously. Furthermore, in the orthodontic treatments accompanying tooth extractions, the adjacent teeth move towards the extraction sites and close the space in some cases. Then, the adjacent tooth movements must be prevented in the treatments requiring space. Laser stimulates and at some doses decelerates tooth movement; it also improves healing process and enhances osteogenesis. Hence, it can prevent movement by osteogenesis adjacent to the tooth. The present study investigated the effects of low-level laser therapy on the OTM and root resorption following artificial socket preservation. MATERIALS AND METHODS: In this experimental animal trial, 16 male albino rabbits were selected with similar characteristics and randomly divided in two groups. Under general anesthesia, an artificial socket, 8 mm in height, was created in the mesial aspect of the first premolars of the rabbits and filled with demineralized freeze dried bone allograft (DFDBA). The first premolars were connected to the incisors using nickel titanium coil springs. In experimental group, gallium-aluminum-arsenide (GaAlAs) laser was irritated mesial to first premolar where artificial socket was created continuously (808 nm). The cycle was 10 days irritation, 14 days rest, 10 days irritation, 14 days rest (Biostimulation mode). Control group was not laser irradiated. All animals were sacrificed after 48 days and the distance between the distal aspect of the first premolars, and the mesial surface of the second premolars was measured with leaf gauge. The specimens underwent histological assessments. Integrity of root and its resorption was observed under microscope calibration. The size of resorption lacunae was calculated in mm(2). Normality of data was proved according to Kolmogorov-Smirnov analysis, and Student's t-test was done. P value less than 0.05 was considered as significant. RESULTS: The mean OTM were 5.68 Â± 1.21 mm in the control group and 6.0 Â± 0.99 mm in the laser irradiated teeth with no statistically significant differences($P > 0.75$). The mean root resorption was 1.61 Â± 0.43 mm(2) and 0.18 Â± 0.07 mm(2) in the control and experimental groups respectively being significantly lower in the laser irradiated teeth ($P < 0.0001$). CONCLUSION: The findings of the present study show that GaAlAs irradiation together with the application of DFDBA led to limited amount of the stimulated OTM. The laser beam irradiation in combination with alloplastic materials used for socket preservation could reduce the degree of root resorption significantly.

Lasers may reduce pain arising from dentin hypersensitivity. Dentin Sensitivity;Humans;Low-Level Light Therapy

Effects of low-level light therapy on facial corticosteroid addiction dermatitis: a retrospective analysis of 170 Asian patients. Adrenal Cortex Hormones Adolescent;Adrenal Cortex Hormones;Adult;Asian People;Drug Eruptions;Facial Dermatoses;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Substance-Related Disorders;Young Adult

Photobiomodulation in the treatment of patients with non-center-involving diabetic macular oedema. PURPOSE: Far-red/near-infrared phototherapy or photobiomodulation (PBM) has recently been reported to be an effective and non-invasive treatment method to inhibit lesions of diabetic retinopathy (DR) in animals. This study investigated the safety and efficacy of PBM in diabetic patients to treat non-center-involving diabetic macular oedema (NCDME). METHODS: This was a non-randomised, consecutive, case series, where 4 patients with type 2 diabetes with NCDME were

treated for 160â€…s per day with PBM for 2-9â€…months. Demographic data including age, sex, HbA1c%, electronic ETDRS visual acuity, and retinal and macular thickness were measured using spectral domain ocular coherence tomography (SD-OCT) before and after treatment. RESULTS: Four eyes of 4 patients were treated, with fellow eyes serving as untreated controls. Daily PBM treatment for only 80â€…s per treatment twice daily caused a significant reduction in focal retinal thickening in all 4 treated eyes. No adverse effects attributable to therapy were noted by the patients or study investigators during the study period. CONCLUSIONS: PBM potentially offers a non-invasive and cost-effective therapeutic option for patients with NCDME. Further studies of this therapeutic option in DR are warranted. Adult;Aged;Case-Control Studies;Diabetic Retinopathy;Humans;Macular Edema;Male;Middle Aged;Phototherapy;Point-of-Care Systems

Does low-level laser therapy decrease swelling and pain resulting from orthognathic surgery? Low-level laser therapy (LLLT) could be an alternative for the treatment of swelling and pain after orthognathic surgery, but there is a paucity of data in the literature on the effects of its use. This study verified the efficacy of an LLLT protocol to reduce swelling and pain after orthognathic surgery. Ten healthy patients who underwent a bilateral sagittal split with Le Fort I osteotomy were randomly selected for this study. The LLLT protocol consisted of intraoral and extraoral application to one side of the face after surgery (irradiated side); application to the other side was simulated (non-irradiated side). The irradiated and non-irradiated sides were compared regarding the swelling coefficient and were assessed for pain using a visual analogue scale. There were no significant differences between the irradiated and non-irradiated sides regarding swelling and pain in the immediate postoperative assessment. Swelling decreased significantly on the irradiated side in the postoperative assessments on days 3, 7, 15, and 30. Self-reported pain was less intense on the irradiated side at the 24-h (1.2 vs. 3.4) and 3-day (0.6 vs. 2.1) assessments, but at 7 days after surgery neither side showed pain. This LLLT protocol can improve the tissue response and reduce the pain and swelling resulting from orthognathic surgery. Adolescent;Adult;Cross-Over Studies;Double-Blind Method;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Orthodontics, Corrective;Orthognathic Surgical Procedures;Osteotomy, Le Fort;Osteotomy, Sagittal Split Ramus;Pain Management;Pain Measurement;Pain, Postoperative;Postoperative Complications;Treatment Outcome

Delayed diagnosis of subacute angle closure glaucoma in patients presenting with headaches. Subacute angle closure glaucoma (SACG) may lead to chronic angle closure glaucoma and irreversible vision loss. Headaches may be the sole presenting symptom. This study characterizes the medical course and symptoms of patients with SACG in whom headache was the major symptom. This retrospective observational study consisted of 30 consecutive patients, suffering from headaches and diagnosed with SACG, collected from the Glaucoma Service at the Ophthalmology Department of Meir Medical Center, Kfar Saba, Israel, a tertiary care referral facility. The primary study outcomes were reasons for referral, number of specialists visited and number of imaging studies performed before diagnosing SACG and headache characteristics. The majority of the patients experienced headaches once or twice a week. Four patients suffered a classic SACG pain involving the eye and frontal or hemicranial area. The mean time from onset of headaches to diagnosis was 2.6Â years. The main reason for referral to the glaucoma clinic was consultation (53Â %), and SACG was suspected by the referring physicians in two patients. Seventy-three percent of the patients were referred to at least three physicians in various medical specialties prior to referral to the glaucoma clinic. Patients usually do not volunteer history regarding headaches and clinicians often do not associate headaches with SACG in the absence of ocular symptoms. SACG should be included in the differential diagnosis in individuals older than 40Â years presenting with late onset of headaches. Such patients should be referred to an ophthalmologist. Adult;Aged;Delayed Diagnosis;Diagnosis,

Differential;Female;Glaucoma, Angle-Closure;Headache;Humans;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies

Augmentation of cognitive brain functions with transcranial lasers.

Combined treatment for Coats' disease: retinal laser photocoagulation combined with intravitreal bevacizumab injection was effective in two cases. BACKGROUND: The exact pathogenetic mechanisms of Coats' disease remain unknown. In this report, we show two cases of Coats' disease that achieved a favorable prognosis with the combined treatment of intravitreal bevacizumab (IVB) injection prior to photocoagulation, although both initially resisted photocoagulation therapy. CASE PRESENTATIONS: Case 1 was a 15-year-old boy with initial visual acuity of 0.4 OD. At the temporal retina, aneurysms and abnormal telangiectatic vessels were observed. Hard exudates and an exudative retinal detachment extended to the fovea. He was diagnosed as having Coats' disease at stage 3A and we performed laser photocoagulation as an initial approach to treat peripheral aneurysms and telangiectatic vessels. After the treatment, the exudative retinal detachment was eased and visual acuity improved to 1.0; however, recurrence occurred after 5 months. The exudative change was resistant against laser photocoagulation therapy and we therefore added IVB as an adjuvant before photocoagulation. Fourteen days after IVB injection phased laser photocoagulation was given to cover the abnormal capillaries, aneurysms and the leakage area spotted in FA. A good prognosis was obtained with decreased exudation and improved visual acuity.Case 2 was an 11-year-old boy with decreased visual acuity of 0.15 OS at the initial visit. Hard exudates, retinal edema and serous retinal detachment were seen at the macula and peripheral retina. Fluorescein angiography revealed telangiectatic capillaries at the temporal retina. Our diagnosis was Coats' disease at stage 3A. Extensive photocoagulation was performed as an initial treatment to the lesion. However, the exudative change was severe and resistant against the photocoagulation treatment. Therefore, we added IVB as an adjuvant before photocoagulation. Exudative change in the retina seemed to be eased 7 days after IVB injection, therefore, phased laser phototherapy was added to cover the abnormal capillaries. After the combination therapy, exudative change was remarkably ameliorated and better visual acuity was achieved. CONCLUSION: Bevacizumab is considered an effective adjuvant for Coats' disease with exudative change resistant to retinal photocoagulation therapy.
Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Bevacizumab
Adolescent;Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Bevacizumab;Child;Combined Modality Therapy;Humans;Intravitreal Injections;Laser Coagulation;Male;Retinal Telangiectasis;Treatment Outcome

Helium-neon laser irradiation promotes the proliferation and migration of human epidermal stem cells in vitro: proposed mechanism for enhanced wound re-epithelialization. OBJECTIVE: The present study was conducted to investigate the effects of helium-neon (He-Ne) laser irradiation on the proliferation, migration, and differentiation of cultured human epidermal stem cells (ESCs). BACKGROUND DATA: A He-Ne laser with a wavelength of 632.8â€‰nm is known to have photobiological effects, and is widely used for accelerating wound healing; however, the cellular mechanisms involved have not been completely understood. METHODS: The ESCs were prepared from human foreskin, and irradiated by using He-Ne laser at 632.8â€‰nm with 2â€‰J/cm(2). The ESC proliferation, migration, and differentiation were examined by using XTT assay, scratch assay, and flow cytometry technology, respectively. The phosphorylation of extracellular signal-regulated kinases (ERK) was analyzed by using Western blotting. RESULTS: He-Ne laser irradiation markedly promoted cell proliferation and migration accompanied by an increase in the phosphorylation of ERK, but did not significantly influence cell differentiation. CONCLUSION: Our data indicated that photostimulation with a He-Ne laser resulted in a significant increase in human ESC proliferation and migration in vitro, which might contribute, at least partially, to accelerated wound re-epithelialization

by low-level laser therapy. Cell Movement;Cell Proliferation;Child;Epidermal Cells;Humans;In Vitro Techniques;Lasers, Gas;Low-Level Light Therapy;Re-Epithelialization;Stem Cells;Wound Healing

Effect of low-level laser on guided tissue regeneration performed with equine bone and membrane in the treatment of intrabony defects: a clinical study. OBJECTIVE: The purpose of the present study was to evaluate the clinical results of guided tissue regeneration (GTR) after the application of equine bone and membrane alone or combined with low-level laser therapy (LLLT) for the treatment of periodontal defects. MATERIALS AND METHODS: This study was an intra-individual longitudinal study of 6 months' duration conducted using a split-mouth and randomized design. In 13 periodontitis patients with bilateral intrabony periodontal defects, while one defect site was treated with GTR plus LLLT (1064â€‰nm, 100â€‰mW, with energy density of 4â€‰J/cm(2)), the contralateral defect site was treated with guided GTR alone. GTR was performed with a combination of equine bone and membrane. LLLT was used both intra- and postoperatively. Clinical probing depth (PPD), clinical attachment level (CAL), clinical gingival recession level (REC), plaque index (PI) score, and sulcus blooding index (SBI) score were recorded at the time of surgery, and at the 3rd and 6th months after operation. RESULTS: The treatment of periodontal intrabony defects with equine bone and membrane in the operation of GTR alone or GTR plus LLLT in combination led to statistically significant PPD reduction, CAL gain, and lower SBI score at the end of the study ($p<0.05$). In addition, between the two groups, GTR plus LLLT resulted in statistically significant lower REC ($p=0.025$), lower SBI ($p=0.008$) score, more reduction of PPD ($p=0.009$) and CAL gain ($p=0.002$) compared with GTR alone at 6th month control. CONCLUSIONS: This study showed that GTR is an effective treatment for periodontal regeneration, and that LLLT may improve the effects of GTR in the treatment of periodontal defects. Adult;Animals;Bone Transplantation;Female;Guided Tissue Regeneration;Horses;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Middle Aged;Periodontitis;Subgingival Curettage

Low-level laser therapy with 810 nm wavelength improves skin wound healing in rats with streptozotocin-induced diabetes. OBJECTIVE: The aim of present study was to evaluate whether low-level laser therapy (LLLT) can reverse the impaired wound healing process in diabetic rats. BACKGROUND DATA: Impaired wound healing in diabetic patients represents a major health problem. Recent studies have indicated that LLLT may improve wound healing in diabetic rats, but the optimal treatment parameters are still unknown. MATERIALS AND METHODS: Male Sprague-Dawley rats (n=21) were randomly divided into three groups: a healthy control group, a diabetic sham-treated group, and a diabetic LLLT-treated group. Diabetes mellitus was then induced by streptozotocin administration to the two diabetic groups. One 4â€‰cm long full thickness skin incision and one full thickness circular excision (diameter=4â€‰mm) were performed on the back of each rat. An infrared 810â€‰nm laser with an output of 30â€‰mW, a power density of 30â€‰mW/cm(2), and a spot size of 1â€‰cm(2) was used to irradiate each wound for 30â€‰sec (daily dose of 0.9â€‰J/cm(2)/wound/day). RESULTS: In diabetic rats, the histology of LLLT-treated excisions revealed a similar healing response to that in nondiabetic controls, with significantly more mature granulation tissue than in the sham-treated diabetic control group. LLLT reduced the loss of tensile strength, and increased the incision wound stiffness significantly compared with sham-irradiated rats, but this did not achieve the same level as in the nondiabetic controls. CONCLUSIONS: Our study demonstrates that infrared LLLT can improve wound healing in diabetic rats. Nevertheless, further research needs to be performed to evaluate the exact underlying mechanism and to further optimize LLLT parameters for clinical use. Streptozocin Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Skin;Streptozocin;Wound Healing

Scientific rigor and strategic vision are the key points for going forward in photomedicine. Attitude of Health Personnel;Low-Level Light Therapy;Phototherapy

Efficacy of red and infrared lasers in treatment of temporomandibular disorders--a double-blind, randomized, parallel clinical trial. AIM: Low-level laser therapy has still not been well established, and it is important to define a standardized protocol for the treatment of temporomandibular disorders (TMDs) using low level laser. There is no consensus on controlled clinical trials concerning the best option for laser therapy with regard to wavelength. The aim of this study was to evaluate the efficacy of red and infrared laser therapy in patients with TMD, using a randomized parallel-group double-blind trial. METHODOLOGY: Each hemiface of 19 subjects was randomized to receive intervention, in a total of 116 sensitive points. Pain was measured at baseline and time intervals of 24 hours, 30 days, 90 days, and 180 days after treatment. Irradiation of 4 J/cm2 in the temporomandibular joints and 8 J/cm(2) in the muscles was used in three sessions. RESULTS: Both treatments had statistically significant results (P<0.001); there was statistical difference between them at 180 days in favor of the infrared laser (P=0.039). There was improvement in 24 hours, which extended up to 180 days in both groups. CONCLUSION: Both lasers are effective in the treatment and remission of TMD symptoms. Adult;Double-Blind Method;Facial Pain;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Statistics, Nonparametric;Temporomandibular Joint Disorders;Young Adult

Low-level laser therapy for management of TMJ osteoarthritis. AIMS: This study investigated the efficacy of low-level laser therapy (LLLT) for the management of temporomandibular joint (TMJ) osteoarthritis. METHODOLOGY: In a double-blind clinical trial, 20 patients with TMJ osteoarthritis were randomly divided into laser and placebo groups. The patients in the laser group received irradiation from an 810 nm low-level laser (Peak power 80 W, average power 50 mW, 1500 Hz, 1 micro s pulse width, 120 seconds, 6 J, 3.4 J/cm(2) per point), which was applied on four points around the TMJs and on painful muscles three times a week for 4 weeks. In the placebo group, the treatment was the same as that in the laser group, but with laser simulation. The patients were evaluated before laser therapy (T1), after 6 (T2) and 12 (T3) laser applications and 1 month after the last application (T4), and the amount of mouth opening and the pain intensity were recorded. RESULTS: No significant differences were found in mouth opening either between the study groups or between the different evaluation times in each group (P>0.05). There was no significant difference in pain symptoms of the masticatory muscles and TMJ between the laser and the placebo groups (P>0.05), but some significant within-group improvements were present for Visual Analogue Scale (VAS) scores of the body of the masseter and TMJ in both groups. CONCLUSIONS: LLLT using the present laser parameters was no more effective than the placebo treatment for reducing pain and improving mouth opening in patients with TMJ osteoarthritis. Adult;Double-Blind Method;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Masticatory Muscles;Middle Aged;Osteoarthritis;Pain Measurement;Range of Motion, Articular;Statistics, Nonparametric;Temporomandibular Joint Disorders

Photobiological effect of low-level laser irradiation in bovine embryo production system. The objectives of this study were to evaluate the effect of low-level laser irradiation (LLLI) on bovine oocyte and granulosa cells metabolism during in vitro maturation (IVM) and further embryo development. Cumulus-oocytes complexes (COCs) were subjected (experimental group) or not (control group) to irradiation with LLLI in a 633-nm wavelength and 1â€‰â€‰J/cm2 fluency. The COCs were evaluated after 30 min, 8, 16, and 24 h of IVM. Cumulus cells were evaluated for cell cycle status, mitochondrial activity, and viability (flow cytometry). Oocytes were assessed for meiotic progression status (nuclear staining), cell cycle genes content [real-time polymerase chain reaction (PCR)], and signal transduction status (western blot). The COCs were also in vitro fertilized, and the

cleavage and blastocyst rates were assessed. Comparisons among groups were statistically performed with 5% significance level. For cumulus cells, a significant increase in mitochondrial membrane potential and the number of cells progressing through the cycle could be observed. Significant increases on cyclin B and cyclin-dependent kinase (CDK4) levels were also observed. Concerning the oocytes, a significantly higher amount of total mitogen-activated protein kinase was found after 8 h of irradiation, followed by a decrease in all cell cycle genes transcripts, exception made for the CDK4. However, no differences were observed in meiotic progression or embryo production. In conclusion, LLLI is an efficient tool to modulate the granulosa cells and oocyte metabolism. Animals;Cattle;Embryo, Mammalian;Female;Gene Expression Profiling;Granulosa Cells;Lasers;Meiosis;Oocytes

Effect of LLLT on autogenous bone grafts in the repair of critical size defects in the calvaria of immunosuppressed rats. The aim of this study was to evaluate the effects of low-level laser therapy (LLLT) on the bone repair of critical size defects (CSDs) filled with autogenous bone in the calvaria of immunosuppressed rats. A 5 mm-diameter CSD was created in the calvaria of 30 rats. The animals were divided into 5 groups (n = 6): Control (C)--the defect was filled with a blood clot; Dexamethasone (D)--dexamethasone treatment, and the defect was filled with a blood clot; Autogenous bone (AB)--dexamethasone treatment, and the defect was filled with autogenous bone; LLLT--dexamethasone treatment, and the defect received LLLT (660 nm; 35 mW; 24.7 J/cm(2)); and AB + LLLT--dexamethasone treatment, and the defect was filled with autogenous bone and received LLLT. All animals were euthanized at 30 postoperative days. Histometric and histological analyses were performed. The new bone area (NBA) was calculated as the percentage of the total area of the original defect. Data were analysed statistically (an analysis of variance and Tukey's test; $P < 0.05$). The AB + LLLT group showed the largest NBA of all groups ($P < 0.05$). The use of LLLT with AB effectively stimulated bone formation in CSDs in the calvaria of immunosuppressed rats. Anti-Inflammatory Agents;Glucocorticoids;Dexamethasone;Collagen Animals;Anti-Inflammatory Agents;Autografts;Blood Coagulation;Bone Diseases;Bone Resorption;Bone Transplantation;Collagen;Connective Tissue;Dexamethasone;Glucocorticoids;Immunocompromised Host;Immunosuppression Therapy;Low-Level Light Therapy;Male;Osteogenesis;Random Allocation;Rats;Rats, Wistar;Skull

Effects of low-level laser therapy on the proliferation and apoptosis of gingival fibroblasts treated with zoledronic acid. Low-level laser therapy (LLLT) has been indicated as an adjuvant therapy for bisphosphonate-induced osteonecrosis. However, the effects of LLLT on bisphosphonate-treated cells are not yet clear. This study evaluated the effects of LLLT on the proliferation and apoptosis of gingival fibroblasts treated with zoledronic acid (ZA). Cells were exposed to ZA at 5Î¼M for 48h. Irradiation was performed using a laser diode prototype (LaserTABLE, InGaAsP; 780nmÂ±3nm, 25mW) at 0.5 or 3J/cm(2), three times every 24h. Cell proliferation and apoptosis were evaluated by fluorescence microscopy. Data were analyzed by Mann-Whitney test at the 5% level of significance. ZA decreased cell proliferation to 47.62% (interquartile range (IQR) 23.80-57.14%; P=0.007) and increased apoptosis of gingival fibroblasts to 27.7% (IQR 20.9-33.4%; P=0.0001). LLLT increased cell proliferation compared with non-irradiated cells, at 0.5J/cm(2) (57.14%, IQR 57.14-71.43%; P=0.003) and at 3J/cm(2) (76.19%, IQR 61.90-76.19%; P=0.0001), but did not increase cell proliferation in ZA-treated cells. Irradiated fibroblasts presented lower apoptosis rates than the ZA-treated cells, but apoptosis was no different in ZA-treated cells compared to those that were ZA-treated and also irradiated. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid Apoptosis;Bone Density Conservation Agents;Cell Line;Cell Proliferation;Diphosphonates;Fibroblasts;Gingiva;Humans;Imidazoles;In Situ Nick-End Labeling;Low-Level Light Therapy;Zoledronic Acid

Developments in low level light therapy (LLLT) for dentistry. OBJECTIVES: Low level light/laser therapy (LLLT) is the direct application of light to stimulate cell responses (photobiomodulation) in order to promote tissue healing, reduce inflammation and induce analgesia. There have been significant studies demonstrating its application and efficacy at many sites within the body and for treatment of a range of musculoskeletal injuries, degenerative diseases and dysfunction, however, its use on oral tissues has, to date, been limited. The purpose of this review is to consider the potential for LLLT in dental and oral applications by providing background information on its mechanism of action and delivery parameters and by drawing parallels with its treatment use in analogous cells and tissues from other sites of the body. METHODS: A literature search on Medline was performed on laser and light treatments in a range of dental/orofacial applications from 2010 to March 2013. The search results were filtered for LLLT relevance. The clinical papers were then arranged to eight broad dental/orofacial categories and reviewed. RESULTS: The initial search returned 2778 results, when filtered this was reduced to 153. 41 were review papers or editorials, 65 clinical and 47 laboratory studies. Of all the publications, 130 reported a positive effect in terms of pain relief, fast healing or other improvement in symptoms or appearance and 23 reported inconclusive or negative outcomes. Direct application of light as a therapeutic intervention within the oral cavity (rather than photodynamic therapies, which utilize photosensitizing solutions) has thus far received minimal attention. Data from the limited studies that have been performed which relate to the oral cavity indicate that LLLT may be a reliable, safe and novel approach to treating a range of oral and dental disorders and in particular for those which there is an unmet clinical need. SIGNIFICANCE: The potential benefits of LLLT that have been demonstrated in many healthcare fields and include improved healing, reduced inflammation and pain control, which suggest considerable potential for its use in oral tissues. Dentistry;Humans;Low-Level Light Therapy

In vitro activity of photoactivated disinfection using a diode laser in infected root canals. OBJECTIVE: To investigate the lethal activity of photoactivated disinfection (PAD) on Enterococcus faecalis (ATCC 29212) and mixed populations of aerobic or anaerobic bacteria in infected root canals using a diode laser after the application of a photosensitizer (PS). MATERIALS AND METHODS: First, the bactericidal activity of a low power diode laser (200 mW) against E. faecalis ATCC 29212 pre-treated with a PS (toluidine blue) for 2 min were examined after different irradiation times (30 s, 60 s and 90 s). The bactericidal activity in the presence of human serum or human serum albumin (HSA) was also examined. Second, root canals were infected with E. faecalis or with mixed aerobic or anaerobic microbial populations for 3 days and then irrigated with 1.5% sodium hypochlorite and exposed to PAD for 60 s. RESULTS: Photosensitization followed by laser irradiation for 60 s was sufficient to kill E. faecalis. Bacteria suspended in human serum (25% v/v) were totally eradicated after 30 s of irradiation. The addition of HSA (25 mg/ml or 50 mg/ml) to bacterial suspensions increased the antimicrobial efficacy of PAD after an irradiation time of 30 s, but no longer. The bactericidal effect of sodium hypochlorite was only enhanced by PAD during the early stages of treatment. PAD did not enhance the activity of sodium hypochlorite against a mixture of anaerobic bacteria. CONCLUSIONS: The bactericidal activity of PAD appears to be enhanced by serum proteins in vitro, but is limited to bacteria present within the root canal. Photosensitizing Agents;Root Canal Irrigants;Serum Albumin;Tolonium Chloride;Sodium Hypochlorite Actinobacteria;Actinomyces;Bacteremia;Bacterial Load;Bifidobacterium;Blood Bactericidal Activity;Dental Pulp Cavity;Disinfection;Enterococcus faecalis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Materials Testing;Peptostreptococcus;Photochemotherapy;Photosensitizing Agents;Root Canal Irrigants;Serum Albumin;Shewanella;Sodium Hypochlorite;Time Factors;Tolonium Chloride

Effects of pre-irradiation of low-level laser therapy with different doses and wavelengths in skeletal muscle performance, fatigue, and skeletal muscle damage induced by tetanic contractions in rats. This study aimed to evaluate the effects of low-level laser therapy (LLLT) immediately before tetanic contractions in skeletal muscle fatigue development and possible tissue damage. Male Wistar rats were divided into two control groups and nine active LLLT groups receiving one of three different laser doses (1, 3, and 10 J) with three different wavelengths (660, 830, and 905 nm) before six tetanic contractions induced by electrical stimulation. Skeletal muscle fatigue development was defined by the percentage (%) of the initial force of each contraction and time until 50 % decay of initial force, while total work was calculated for all six contractions combined. Blood and muscle samples were taken immediately after the sixth contraction. Several LLLT doses showed some positive effects on peak force and time to decay for one or more contractions, but in terms of total work, only 3 J/660 nm and 1 J/905 nm wavelengths prevented significantly ($p < 0.05$) the development of skeletal muscle fatigue. All doses with wavelengths of 905 nm but only the dose of 1 J with 660 nm wavelength decreased creatine kinase (CK) activity ($p < 0.05$). Qualitative assessment of morphology revealed lesser tissue damage in most LLLT-treated groups, with doses of 1-3 J/660 nm and 1, 3, and 10 J/905 nm providing the best results. Optimal doses of LLLT significantly delayed the development skeletal muscle performance and protected skeletal muscle tissue against damage. Our findings also demonstrate that optimal doses are partly wavelength specific and, consequently, must be differentiated to obtain optimal effects on development of skeletal muscle fatigue and tissue preservation. Our findings also lead us to think that the combined use of wavelengths at the same time can represent a therapeutic advantage in clinical settings. Creatine Kinase Animals;Biomechanical Phenomena;Creatine Kinase;Dose-Response Relationship, Radiation;Electric Stimulation;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Rats, Wistar;Tetany

Therapeutic outcomes of low-level laser therapy for closed bone fracture in the human wrist and hand. OBJECTIVE: The therapeutic outcomes of low-level laser therapy (LLLT) on closed bone fractures (CBFs) in the wrist and hand were investigated in this controlled study. BACKGROUND DATA: Animal research has confirmed that LLLT increases osteocyte quantity; however, little research has been conducted to determine the effect of LLLT on the treatment of human bone fractures. METHODS: In this study, the therapeutic outcomes of administering 830â€‰nm LLLT to treat CBFs in the wrist or hand were examined. Fifty patients with CBFs in the wrist and hand, who had not received surgical treatment, were recruited and randomly assigned to two groups. The laser group underwent a treatment program in which 830â€‰nm LLLT (average power 60â€‰mW, peak power 8â€‰W, 10â€‰Hz, 600â€‰sec, and 9.7â€‰J/cm(2) per fracture site) was administered five times per week for 2 weeks. Participants in a placebo group received sham laser treatment. The pain, functional disability, grip strength, and radiographic parameters of the participants were evaluated before and after treatment and at a 2-week follow-up. RESULTS: After treatment and at the follow-up, the laser group exhibited significant changes in all of the parameters compared with the baseline ($p<0.05$). The results of comparing the two groups after treatment and at the follow-up indicated significant between-group differences among all of the parameters ($p<0.05$). CONCLUSIONS: LLLT can relieve pain and improve the healing process of CBFs in the human wrist and hand. Adult;Female;Fractures, Closed;Hand Injuries;Humans;Low-Level Light Therapy;Male;Treatment Outcome;Wrist Injuries

Conservative surgical management of stage I bisphosphonate-related osteonecrosis of the jaw. Purpose. To report the efficacy of conservative surgical treatment for stage I bisphosphonate-related osteonecrosis of the jaw (BRONJ). Materials and Methods. This study reports the clinical outcomes of 63 patients treated for BRONJ stage I (according to Ruggiero's staging system) at the Oral Pathology

and Laser-Assisted Surgery Unit of the University of Parma between January 2004 and January 2011. Surgical interventions were performed, under local analgesia, in patients unresponsive for a period of six months to noninvasive treatments such as cycles of local or systemic antibacterial therapy combined or not to low level laser therapy, ozone therapy, or Hyperbaric Oxygen Therapy. All interventions were performed after the consultation of oncologist or physician. Results. In our experience, conservative surgical treatment is associated with the highest number of BRONJ healed sites in stage I disease. Complete healing was observed in 92.6% of sites surgically treated. Conclusions. This study confirms that treatment of patients affected by minimal bone exposition, (stage I of BRONJ), through conservative surgical strategies, possibly with laser, may result in a high control of the disease in the long term.

KTP laser therapy as an adjunctive to scaling and root planing in treatment of chronic periodontitis. OBJECTIVE: The main goal of periodontal treatment is to control infection and, thereby, curb disease progression. Recent studies have suggested that the use of a laser as an adjunct to scaling and root planing (SRP) might improve the effectiveness of conventional periodontal treatment. The aim of this study was to evaluate and compare the clinical effects of potassium-titanyl-phosphate (KTP) laser therapy in the treatment of chronic periodontitis in combination with traditional SRP. MATERIALS AND METHODS: Twenty-four patients with untreated chronic periodontitis were treated using a split-mouth study design in which each side was randomly treated by SRP alone (control group) or KTP laser (0.8W, time on 50 ms, time off 50 ms, 30 s, 532 nm) followed by SRP (test group). In the distribution of the teeth (total = 124 teeth) in the patients, 106 (86%) were molars and 18 (14%) were premolars. The selected teeth were probed with a pressure-controlled probe, guided by stents. Clinical periodontal parameters including plaque index (PI), bleeding on probing (BOP), probing pocket depth (PPD) and probing attachment level (PAL) were recorded at baseline and at 2 and 12 months following therapy. RESULTS: Statistical analysis demonstrated no differences between groups at baseline for all parameters ($p > 0.05$). BOP and PPD reductions and PAL gains were statistically significant both between baseline and 2 months and between baseline and 12 months in both groups ($p < 0.05$). The test group showed a greater reduction in PPD compared to the control group ($p < 0.05$). In addition, the test group showed a greater probing attachment gain compared to the control group ($p < 0.05$). CONCLUSIONS: In patients with chronic periodontitis, clinical outcomes of conventional periodontal treatment can be improved by using an adjunctive KTP laser. Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Plaque Index;Dental Scaling;Double-Blind Method;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Root Planing;Treatment Outcome

[Contemporary dermatological methods of treating hirsutism]. Hirsutism is a symptom of excessive androgen secretion in women, which in recent years is becoming more common. It is a problem of physical, mental and social background and patients always require application of an appropriate therapy. In addition to medical therapy, there are also other forms of treatment of hirsutism. These include the dermatological treatment using mechanical methods of removing unwanted hair. The aim of this work is to systematize the existing knowledge about treatment of hirsutism and suggest different patterns of treatment. Dermatological treatment is a very important complement to drug therapy. Its use allows for more rapid achievement of an external effect, and thus to improve the patients compliance. Due to the variety of symptoms in patients population therapy should be adapted to the needs of every patient. Electrolysis;Female;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy

[Modern combined technologies for the rehabilitation of the patients presenting with arterial hypertension and its prevention]. The present review describes the modern methods for the

combined treatment and rehabilitation of the patients presenting with arterial hypertension and their influence on the key pathogenetic components of this condition in accordance with the currently accepted theories of its origin and evolution. The discovery of specific molecular and cellular mechanisms of the therapeutic action of certain factors that reflect peculiar and unique character of their inherent physical energy provided a basis for the development of highly effective methods for the treatment and prevention of arterial hypertension and rehabilitation of the patients suffering this disease. The most comprehensive clinical effect is produced by the application of scientifically sound therapeutic systems; exclusion of certain therapeutic physical factors from these modalities results in s significant reduction of their curative effectiveness. Humans;Hypertension;Low-Level Light Therapy;Magnetic Field Therapy;Physical Therapy Modalities;Randomized Controlled Trials as Topic;Reflexotherapy;Treatment Outcome

[The early postoperative rehabilitation of the patients presenting with cholelithiasis and experiencing psychoemotional stress]. Early postoperative rehabilitation of the patients presenting with cholelithiasis and experiencing psychoemotional stress is designed to restore the function of bile secretion, enhance their adaptive capabilities, and normalize the psychovegetative status for the purpose of preventing further progress of the disease and reducing the risk of the development of post-cholecystectomy syndrome. The inclusion of drinking mineral water, magnetic laser therapy, and UHF therapy in the combined rehabilitative treatment of such patients results in the appreciable enhancement of all functional abilities of the body manifest as the significant improvement and normalization of clinical and laboratory characteristics (elimination of clinical symptoms of the disease, improvement of general and biochemycal parameters of peripheral blood). Simultaneously, the adaptive capabilities and the psychovegetative status of the patients improved as apparent from the increased lymphocyte count, normalization of the Kerdo and Hildebrandt indices and indices of stress level, decreased psychoemotional stress, enhancement of physical functioning characteristics. Taken together, these changes account for the high effectiveness of the above procedures of early postoperative rehabilitation of the patients presenting with cholelithiasisand experiencing psychoemotional stress (94.7%). Mineral Waters Cholelithiasis;Combined Modality Therapy;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Microwaves;Mineral Waters;Postcholecystectomy Syndrome;Secondary Prevention;Stress, Psychological;Treatment Outcome

LED light attenuation through human dentin: a first step toward pulp photobiomodulation after cavity preparation. PURPOSE: To evaluate the transdentinal light attenuation of LED at three wavelengths through different dentin thicknesses, simulating cavity preparations of different depths. METHODS: Forty-two dentin discs of three thicknesses (0.2, 0.5 and 1 mm; n = 14) were prepared from the coronal dentin of extracted sound human molars. The discs were illuminated with a LED light at three wavelengths (450+/-10 nm, 630 +/-10 nm and 850 +/-10 nm) to determine light attenuation. Light transmittance was also measured by spectrophotometry. RESULTS: In terms of minimum (0.2 mm) and maximum (1.0 mm) dentin thicknesses, the percentage of light attenuation varied from 49.3% to 69.9% for blue light, 42.9% to 58.5% for red light and 39.3% to 46.8% for infrared. For transmittance values, an increase was observed for all thicknesses according to greater wavelengths, and the largest variation occurred for the 0.2 mm thickness. All three wavelengths were able to pass through the dentin barrier at different thicknesses. Furthermore, the LED power loss and transmittance showed wide variations, depending on dentin thickness and wavelength.
Dental Cavity Preparation;Dental Pulp;Dentin;Humans;Infrared Rays;Light;Phototherapy;Radiation Dosage;Spectrophotometry;Time Factors

The effects of a minimally invasive laser needle system on complete Freund's adjuvant-induced arthritis. The present study aimed to investigate the effects of a minimally invasive laser needle

system (MILNS) on the acute progression of arthritis. Previous studies showed controversial clinical results regarding the effects of low-level laser therapy on arthritis, with the outcomes depending upon stimulation parameters such as laser wavelength and dosage. Based on the positive effects of MILNS on osteoporotic mice, we hypothesized that MILNS could potentially suppress the progression of arthritis owing to its biostimulation effects. Eight C57BL/6 mice with complete Freund's adjuvant (CFA)-induced arthritis were used as acute progression arthritis models and divided into the laser and control groups (n = 4 each). In the laser group, after minimally invasive laser stimulation, laser speckle contrast images (LSCIs) were obtained every 6 h for a total of 108 h. The LSCIs in the control group were obtained without laser stimulation. The effects of MILNS on the acute progression of arthritis were indirectly evaluated by calculating the paw area and the average laser speckle index (LSI) at the arthritis-induced area. Moreover, the macrophage population was estimated in the arthritis-induced area. Compared to the control group, the laser group showed (1) lower relative variations of the paw area, (2) lower average LSI in the arthritis-induced area, and (3) lower macrophage population in the arthritis-induced area. These results indicate that MILNS may suppress the acute progression of CFA-induced arthritis in mice and may thus be used as a potential treatment modality of arthritis in clinics. Freund's Adjuvant Animals;Arthritis;Disease Models, Animal;Disease Progression;Freund's Adjuvant;Lasers;Low-Level Light Therapy;Macrophages;Mice;Mice, Inbred C57BL;Needles;Treatment Outcome

Comparison of laser and diode sources for acceleration of in vitro wound healing by low-level light therapy. Low-level light therapy has been shown to improve in vitro wound healing. However, well-defined parameters of different light sources for this therapy are lacking. The goal of this study was (1) to determine if the wavelengths tested are effective for in vitro wound healing and (2) to compare a laser and a light-emitting diode (LED) source at similar wavelengths. We show four wavelengths, delivered by either a laser or LED array, improved in vitro wound healing in A549, U2OS, and PtK2 cells. Improved wound healing occurred through increased cell migration demonstrated through scratch wound and transwell assays. Cell proliferation was tested by the (3-(4,5-dimethylthiazol-2-yl)-5-(3-car-boxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium) (MTS) assay and was found generally not to be involved in the wound healing process. The laser and LED sources were found to be comparable when equal doses of light were applied. The biological response measured was similar in most cases. We conclude that the laser at 652 (5.57â€‰â€‰mW/cm2, 10.02â€‰â€‰J/cm2) and 806 nm (1.30â€‰â€‰mW/cm2, 2.334â€‰â€‰J/cm2) (full bandwidth 5 nm), and LED at 637 (5.57â€‰â€‰mW/cm2, 10.02â€‰â€‰J/cm2) and 901 nm (1.30â€‰â€‰mW/cm2, 2.334â€‰â€‰J/cm2) (full bandwidth 17 and 69 nm respectively) induce comparable levels of cell migration and wound closure. Animals;Cell Line;Cell Movement;Cell Proliferation;Humans;Lasers;Light;Mice;Phototherapy;Wound Healing

Therapeutic outcome of melasma treatment by dual-wavelength (511 and 578 nm) laser in patients with skin phototypes III-V. BACKGROUND: Recent evidence suggests that vascular abnormalities are involved in the pathogenesis of melasma. Copper bromide (CuBr) laser, which emits dual wavelengths (511 and 578 nm), enabling simultaneous and selective destruction of melanin-containing cells and blood vessels, may be of benefit in the treatment of melasma. AIM: To investigate the efficacy and adverse effects (AEs) of CuBr laser for melasma treatment in patients with skin phototypes III-V. METHODS: We enrolled 24 Thai women with melasma to receive six CuBr laser treatments, 2 weeks apart. Objective (colour measurement) and subjective (clinical evaluation of photographs by three dermatologists blinded to the order of the photographs) assessments were obtained at baseline, after three and six treatments, and at the 3-month follow-up visit. A visual analogue scale (VAS) was used for patient assessment of change at baseline, after six treatments and at the 3-month follow-up. AEs were recorded at every follow-up visit. RESULTS: Of the 24 patients, 20

completed the study. Mean melanin index (MI) showed no statistically significant improvement compared with baseline measurements at any of the follow-up visits. There were significant improvements in clinical evaluation after three treatments (P = 0.00); however, this difference was no longer visible after six treatments. At follow-up 1 week after the end of the full course of six treatments, there was an improvement in VAS (P = 0.02). However, there was no improvement as measured by clinical evaluation or MI. Mild, transient AEs including erythema, burning sensation, scaling, hyperpigmentation and crusting were noted. CONCLUSIONS: CuBr laser did not show effectiveness in improving melasma in patients with skin phototypes III-V.
Adult;Aged;Asian People;Facial Dermatoses;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Melanosis;Middle Aged;Thailand;Young Adult

Evaluating the safety and efficacy of the 1,440-nm laser in the treatment of photodamage in Asian skin. BACKGROUND AND OBJECTIVE: As the demand for diminished procedure-associated downtime continues to increase, nonablative fractional laser resurfacing is becoming a more popular intervention in the progression of photoaging. Patients with pigmented skin and a mild degree of photodamage may be particularly suited for a less intensive laser treatment. In this study, we have evaluated the safety and efficacy of a low energy, low density 1,440-nm fractional laser in the treatment of multiple signs of photoaging including dyspigmentation, wrinkling, tissue laxity, enlarged pores, and skin roughness in Asians. STUDY DESIGN/MATERIALS AND METHODS: Ten Chinese subjects with Fitzpatrick skin types III-V and visible signs of photodamage participated in this study. Patients received four treatments at 2-week intervals with a 1,440-nm diode-based fractional laser. Photographs were taken at baseline, 2 weeks after each of the first three treatments and 4 weeks after the final treatment. Images were evaluated independently by two physicians. Clinical improvement and adverse events were analyzed. Discomfort, heat sensation and overall patient satisfaction associated with the procedure were also quantified. RESULTS: In this prospective single-arm study, signs of photoaging were examined after treatment with the 1,440-nm laser. Here we show that a series of four treatments with this device produced a mild improvement in skin texture, pigmentation, and wrinkling. Changes in pore size and skin laxity failed to reach statistical significance. Immediate after-effects of the procedure included erythema and edema which were transient and left no permanent sequela. A significant proportion of patients reported some degree of discomfort during the procedure despite use of a topical anesthetic. One patient developed a discrete, localized area of post-inflammatory hyperpigmentation which completely resolved by the final follow up visit. CONCLUSION: The low energy, low density nonablative 1,440-nm fractional laser produces a mild improvement in select signs of photodamage after four treatments without any long-term adverse effects. Adult;Asian People;China;Female;Follow-Up Studies;Humans;Hyperpigmentation;Lasers, Semiconductor;Low-Level Light Therapy;Patient Satisfaction;Photography;Prospective Studies;Skin;Skin Aging;Treatment Outcome

Effects of 660- and 980-nm low-level laser therapy on neuropathic pain relief following chronic constriction injury in rat sciatic nerve. Neuropathic pain (NP) is one of the most suffered conditions in medical disciplines. The role of reactive oxygen species (ROS) and oxidative stress in the induction of NP was studied by many researchers. Neuropathies lead to medical, social, and economic isolation of the patient, so various therapies were used to treat or reduce it. During the recent years, low-level laser therapy (LLLT) has been used in certain areas of medicine and rehabilitation. Chronic constriction injury (CCI) is a well-known model for neuropathic pain studies. In order to find the effects of different wavelengths of LLLT on the injured sciatic nerve, the present research was done. Thirty Wistar adult male rats (230-320 g) were used in this study. The animals were randomly divided into three groups (n = 10). To induce neuropathic pain for the sciatic nerve, the CCI technique was used. Low-level laser of 660 and 980 nm was used for two consecutive weeks. Thermal and

mechanical hyperalgesia was done before and after surgery on days 7 and 14, respectively. Paw withdrawal thresholds were also evaluated. CCI decreased the pain threshold, whereas both wavelengths of LLLT for 2 weeks increased mechanical and thermal threshold significantly. A comparison of the mechanical and thermal threshold showed a significant difference between the therapeutic effects of the two groups that received LLLT. Based on our findings, the laser with a 660-nm wavelength had better therapeutic effects than the laser with a 980-nm wavelength, so the former one may be used for clinical application in neuropathic cases; however, it needs more future studies. Reactive Oxygen Species Animals;Constriction;Hyperalgesia;Lasers;Low-Level Light Therapy;Male;Nervous System Diseases;Neuralgia;Pain Management;Pain Threshold;Rats;Rats, Wistar;Reactive Oxygen Species;Sciatic Nerve

Development of the theragnostic optical system for a high-intensity laser therapy (HILT). Recently, high-intensity laser therapy (HILT) has been introduced for muscle disorders, but its efficacy has not been confirmed due to the absence of quantitative assessments and treatment feedback data in real-time. In this clinical study, a theragnostic optical system comprised of a high-intensity laser and a non-invasive optical monitoring system was developed to assess spasticity. To avoid interference between the two different light sources, the therapeutic wavelength for HILT was selected at 808 nm, one of the isosbestic points. The monitoring system based on a near-infrared spectroscopy (NIRS) was utilized for measuring hemoglobin concentrations according to a modified Beer-Lambert's law. The transitory HILT effect was evaluated from patients experiencing spasticity after stroke. Our results showed the proportionate relationship between manual muscle testing grades and the HILT effect on hemiplegic patients. The developed system proved to be useful for the simultaneous assessment and treatment of spasticity, and it holds promise for real-time monitoring of hemoglobin concentrations during laser therapy. Hemoglobins Adult;Aged;Female;Hemiplegia;Hemoglobins;Humans;Light;Low-Level Light Therapy;Male;Middle Aged;Muscle Spasticity;Optical Devices;Optics and Photonics;Pressure;Spectroscopy, Near-Infrared;Stroke

Histological assessment of non-ablative laser stimulation of tissue repair in acellular dermal grafts. AIM: The objective of this study was to compare integration of AlloDermÂ® acellular dermal grafts in animals subjected to non-ablative laser irradiation and animals not exposed to this therapy. METHODS: Standardized AlloDermÂ® fragments measuring 5 mmÂ² were grafted into the subcutaneous tissue overlying the calvaria in 32 Wistar rats. Laser therapy (685 Î·m), at a dose of 4 J/cm2 per session, was applied immediately after surgical intervention and every 48 hours thereafter for a total of four applications. RESULTS: Analysis of histology slides revealed significantly greater edema in the control group. There was no neutrophil infiltration in the laser-irradiated group at any point during the study period, whereas such infiltration was present in control animals at three of the four points of observation. In the laser therapy group, lymphocyte infiltration was observed from day 1, whereas in the control group, it was only apparent from day 3. Vascularization was substantially greater in the control group. In the experimental group, the AlloDermÂ® graft was completely replaced by fibrous tissue. CONCLUSION: These findings suggest that add-on non-ablative laser therapy is an effective stimulator of healing and graft integration after placement of AlloDermÂ® acellular dermal grafts. Alloderm;Collagen Acellular Dermis;Animals;Chemotaxis, Leukocyte;Collagen;Edema;Fibrosis;Graft Survival;Implants, Experimental;Low-Level Light Therapy;Male;Postoperative Complications;Random Allocation;Rats;Rats, Wistar;Skin Transplantation;Skull;Subcutaneous Tissue;Wound Healing

Treatment of onychomycosis using the 1 064 nm Nd:YAG laser: a clinical pilot study. BACKGROUND: Nd:YAG lasers could be a safe and effective treatment modality for onychomycosis, without the side effects of drugs. Long and short-pulsed Nd:YAG lasers were used in this clinical study

in a side-comparison manner without removal of onychomycotic nail material before treatment. PATIENTS AND METHODS: Big toenails of 10 patients were treated twice in a side-comparison manner with the short-pulsed Nd:YAG laser. Fungal cultures were taken and a histological examination was performed before treatment and after 9 months. Two independent investigators rated clearance using the "Onychomycosis Severity Index (OSI)" and standardized photographs at 3-month intervals. RESULTS: OSI-Scores decreased for 3.8 (15 %; p = 0.006), 4.8 (19 %; p = 0.0002) and 2.9 points (12 %; p = 0.04) within 3, 6 and 9 months. The positive culture rate at 9 months was significantly reduced to 35 % (p = 0.0003). Classification of severity of onychomycosis showed no change. The difference between the treatment regimens was not significant. CONCLUSIONS: These results suggest that treatment of onychomycosis with the Nd:YAG laser without removing mycotic nail material can lead to a temporary clinical improvement, a reduction of positive fungal cultures and an improvement of the Onychomycosis Severity Index. The treatment regimen should be optimized to be used as an effective antimycotic monotherapy. Aged;Female;Foot Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Pilot Projects;Treatment Outcome

Tooth movement in orthodontic treatment with low-level laser therapy: a systematic review of human and animal studies. OBJECTIVE: This review attempts to organize the existing published literature regarding tooth movement in orthodontic treatment when low-level laser therapy (LLLT) is applied. BACKGROUND DATA: The literature discusses different methods that have been developed to motivate the remodeling and decrease the duration of orthodontic treatment. The application of LLLT has been introduced to favor the biomechanics of tooth movements. However there is disagreement between authors as to whether LLLT reduces orthodontic treatment time, and the parameters that are used vary. MATERIALS AND METHODS: Studies in humans and animals in which LLLT was applied to increase the dental movement were reviewed. Three reviewers selected the articles. The resulting studies were analyzed according to the parameters used in the application of laser and existing changes clinically and histopathologically. RESULTS: Out of 84 studies, 5 human studies were selected in which canine traction had been performed after removing a premolar, and 11 studies in rats were selected in which first premolar traction was realized. There were statistically significant changes in four human studies and eight animal studies. CONCLUSIONS: Varying the wavelength with a reasonable dose in the target zone leads to obtaining the desired biological effect and achieving a reduction of the orthodontic treatment time, although there are studies that do not demonstrate any benefit according to their values. Animals;Humans;Low-Level Light Therapy;Orthodontics;Rats;Tooth Movement Techniques

Do laser/LED phototherapies influence the outcome of the repair of surgical bone defects grafted with biphasic synthetic microgranular HA + Î²-tricalcium phosphate? A Raman spectroscopy study. The treatment of bone loss is difficult. Many techniques are proposed to improve repair, including biomaterials and, recently, phototherapies. This work studied bone mineralization by Raman spectroscopy assessing intensities of Raman peaks of both inorganic (âˆ¼ 960, âˆ¼ 1,070 cm(-1)) and organic (âˆ¼ 1,454 cm(-1)) contents in animal model. Six groups were studied: clot, laser, light-emitting diode (LED), biomaterial (HA + Î²-tricalcium phosphate), laser + biomaterial, and LED + biomaterial. Defects at right tibia were performed with a drill. When indicated, defects were further irradiated at a 48-h interval during 2 weeks. At the 15th and 30th days, the tibias were withdrawn and analyzed. The âˆ¼ 960-cm(-1) peak was significantly affected by phototherapy on both clot- and biomaterial-filled defects. The âˆ¼ 1,070-cm(-1) peak was affected by both time and the use of the LED light on clot-filled defects. On biomaterial-filled defects, only the use of the laser light significantly influenced the outcome. No significant influence of either the time or the use of the light was detected on clot-filled defects as regards the âˆ¼ 1,454-cm(-1) peak. Raman intensities of both mineral and matrix components indicated that the use of laser and LED phototherapies improved the

repair of bone defects grafted or not with biphasic synthetic microgranular HA + Î²-tricalcium phosphate. Biocompatible Materials;Bone Substitutes;Calcium Phosphates;Minerals;beta-tricalcium phosphate Animals;Biocompatible Materials;Bone Substitutes;Bone and Bones;Calcium Phosphates;Lasers;Light;Low-Level Light Therapy;Male;Minerals;Phototherapy;Rats;Rats, Wistar;Spectrum Analysis, Raman;Tibia;Wound Healing

Studies related to energy based devices. Cosmetic Techniques;Humans;Lasers;Low-Level Light Therapy;Research

Experimental, controversial, and futuristic treatments for chronic tinnitus. BACKGROUND: Because chronic tinnitus is a condition that negatively impacts the quality of life of millions of people worldwide, a safe and effective treatment for tinnitus has been sought for millennia. However, effective treatments for tinnitus are greatly outnumbered by ineffective strategies, medications, devices, and surgeries that continue to be developed and promoted for the condition. PURPOSE: This article describes and critiques experimental, controversial, and potential treatments for chronic tinnitus. The purpose of this review is to provide information that should help patients and clinicians to select tinnitus treatment and management strategies most likely to be effective for each set of symptoms and circumstances. RESEARCH DESIGN: PubMed and MEDLINE databases (National Center for Biotechnology Information, U.S. National Library of Medicine) were searched for the term tinnitus in articles published from 1940 to 2012. Other historical documents and publications were also reviewed as needed for particular topics. STUDY SAMPLE: Studies included in this review were selected to represent a sampling of treatment methodologies that have been used for tinnitus. DATA COLLECTION AND ANALYSIS: Due to the heterogeneity of the studies reviewed, it was not appropriate to perform a meta-analysis. A selective review of the literature was conducted to summarize and critique published research results. RESULTS: Most invasive treatments for tinnitus should be avoided because (1) at best, there is scant evidence that any of these treatments is effective, and (2) the risk to patients for most invasive procedures is much greater than the risk posed by the tinnitus perception. Effective and noninvasive treatments for tinnitus include acoustic therapy (which includes hearing aids and other types of environmental sound enrichment); cognitive-behavioral therapy; psychological counseling; hypnosis; biofeedback; and relaxation training. Over-the-counter or prescription medications may be used as needed to facilitate sleep and to reduce anxiety, depression, or obsessive-compulsiveness. CONCLUSIONS: Patients and clinicians should be especially cautious when considering invasive (and potentially harmful) treatments for tinnitus, which is a non-life-threatening symptom. Unless well-designed clinical trials verify that a tinnitus therapy demonstrates effectiveness above and beyond the placebo effect, consumers should be wary of medications, devices, or procedures promoted as a "cure." Although a true cure for tinnitus has not yet been found, effective and noninvasive tinnitus management strategies are available now. If progress is made to medically (or genetically) treat sensorineural hearing loss in humans, this breakthrough should also help to simultaneously reduce the perception of tinnitus for many patients. Anti-Anxiety Agents;GABA Agonists;Serotonin Uptake Inhibitors Acoustic Stimulation;Anti-Anxiety Agents;Chronic Disease;Cognitive Behavioral Therapy;Databases, Bibliographic;Electric Stimulation Therapy;GABA Agonists;Genetic Therapy;Hearing Aids;Hearing Loss, Sensorineural;Herbal Medicine;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Mind-Body Therapies;Otolaryngology;Selective Serotonin Reuptake Inhibitors;Tinnitus;Treatment Outcome

Evaluating the effect of low-level laser therapy on healing of tentomized Achilles tendon in streptozotocin-induced diabetic rats by light microscopical and gene expression examinations. Tendon healing is impaired in individuals diagnosed with diabetes mellitus (DM). According to research, there is considerable improvement in the healing of surgically tenotomized Achilles tendons

following low-level laser therapy (LLLT) in non-diabetic, healthy animals. This study uses light microscopic (LM) and semi-quantitative reverse transcription PCR (RT-PCR) analyses to evaluate the ability of LLLT in healing Achilles tendons from streptozotocin-induced diabetic (STZ-D) rats. A total of 88 rats were randomly divided into two groups, non-diabetic and diabetic. DM was induced in the rats by injections of STZ. The right Achilles tendons of all rats were tenotomized 1 month after administration of STZ. Laser-treated rats were treated with a helium-neon (He-Ne) laser that had a 632.8-nm wavelength and 7.2-mW average power. Experimental group rats received a daily dose of 0.014 J (energy density, 2.9 J/cm(2)). Control rats did not receive LLLT. Animals were sacrificed on days 5, 10, and 15 post-operatively for semi-quantitative LM and semi-quantitative RT-PCR examinations of transforming growth factor-beta1 (TGF-Î²1) gene expression. The chi-square test showed that LLLT significantly reduced inflammation in non-diabetic rats compared with their non-diabetic controls (pâ€‰=â€‰0.02). LLLT significantly decreased inflammation in diabetic rats on days 5 (pâ€‰=â€‰0.03) and 10 (pâ€‰=â€‰0.02) compared to the corresponding control diabetic rats. According to the student's t test, LLLT significantly increased TGF-Î²1 gene expression in healthy (pâ€‰=â€‰0.000) and diabetic (pâ€‰=â€‰0.000) rats compared to their relevant controls. The He-Ne laser was effective in altering the inflammatory reaction and increasing TGF-Î²1 gene production. Streptozocin Achilles Tendon;Animals;Diabetes Mellitus, Experimental;Gene Expression;Lasers, Gas;Low-Level Light Therapy;Male;Rats;Streptozocin;Transcriptome;Wound Healing

Five-day, low-level laser therapy for sports-related lower extremity periostitis in adult men: a randomized, controlled trial. Periostitis in the lower leg caused by overexercise is a universal problem in athletes and runners. The purpose of this study was to observe the functional improvement of the lower limbs upon rehabilitation low-level laser therapy (LLLT). All medical data were gathered from enrolled adults with sports-related lower leg pain. A total of 54 patients underwent triple-phase bone scans using skeletal nuclear scintigraphy, which confirmed periostitis in their lower limbs. The patients were then randomly divided into two groups: one group received laser therapy (Nâ€‰=â€‰29) and the other group (Nâ€‰=â€‰25) received an equivalent placebo treatment (a drug or physical therapy). Treatment protocol commenced with rehabilitation intervention and LLLT was performed three times daily for 5 days at a dosage of 1.4 J/cm(2). A Likert-type pain scale was used to evaluate the severity of pain. Balance function, including postural stability testing (PST) and limits of stability (LOS), was also performed to evaluate the function outcome. Patients experienced a significant improvement in pain by day 2 or day 5 after starting LLLT, but here was no significant difference in pain scale between the measurements before (baseline) and after LLLT. Comparing the PST, the group differences of dynamic vs. static testings ranged from -18.54 to -50.22 (compared 12, 8, 4, 3, 2, 1 to 0, all pâ€‰<â€‰0.0001), and the PST after LLLT were 3.73 units (pâ€‰=â€‰0.0258) lower than those of before LLLT. Comparing the LOS, the group differences of dynamic vs. static testing were similar to those in PST, and the relationship between LOS and groups only varied with the direction control during dynamic testing in direction at backward/right vs. right (pâ€‰<â€‰0.0001). LLLT had a positive effect on proprioception in patients with lower limb periostitis. Larger, better controlled studies are needed to determine what specific effects LLLT has on the function of proprioception. Adult;Female;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Periostitis;Tibia;Treatment Outcome;Young Adult

The effects of low-level diode laser irradiation on differentiation, antigenic profile, and phagocytic capacity of osteoblast-like cells (MG-63). Previous in vivo and in vitro studies have reported that low-level diode laser therapy induces a biostimulatory effect, such as cell proliferation. The aim of the present study was to evaluate whether the laser irradiation of osteoblast-like cells (MG-63) can modify alkaline phosphatase activity (ALP), antigenic profile, and phagocytic capacity. The MG-63 cell

line was exposed to diode laser (ezLase) of 940 nm at 1-1.5 W/cm(2) and 3-4 J. ALP was evaluated by a spectrophotometric technique and antigenic expression analysis (CD 54, CD80, CD86, HLA-DR), and phagocytic activity was analyzed by flow cytometry. At 24 h, the treated groups showed an increased ALP, and the highest increase versus controls (Pâ€‰=â€‰0.002) was at the dose of 1 W/cm(2) and 3 J; this modulation of the antigenic profile translated into a reduced expression of CD54, CD86, and HLA-DR and a slightly decreased phagocytic capacity with respect to the nonirradiated control group at the different intensities and fluencies assayed. These results demonstrate that laser therapy can exert a biostimulatory effect on osteoblastic cells at different levels, which may be clinically useful in the regeneration of bone tissue. Antigens, CD;Alkaline Phosphatase Alkaline Phosphatase;Antigens, CD;Cell Differentiation;Cell Line, Tumor;Cell Proliferation;Cytophagocytosis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts

Ultrastructure and light microscope analysis of intact skin after a varying number of low level laser irradiations in mice. Low level laser therapy (LLLT) has been used to relieve pain, inflammation, and wound healing processes. Thus, the skin is overexposed to laser and this effect is not completely understood. This study analyzed the effects of the number of laser applications (three, six, and 10) on the intact skin of the masseteric region in mice of strain HRS/J. The animals (n = 30) were equally divided into control (0â€‰J/cm(2)) and irradiated (20â€‰J/cm(2)), and each of these groups was further equally divided according to the number of laser applications (three, six, and 10) and underwent LLLT on alternate days. Samples were analyzed by light microscopy and transmission electron microscope (TEM). The animals receiving applications exhibited open channels more dilated between the keratinocytes and photobiomodulation effect on endothelial cells and fibroblasts by TEM. Under the light microscope after 10 laser applications, the type I collagen decreased ($P < 0.05$) compared to the three and six applications. Under these experimental conditions, all numbers of applications provided photobiomodulatory effect on the epidermis and dermis, without damage. More studies are needed to standardize the energy density and number of applications recommended for laser therapy to have a better cost-benefit ratio associated with treatment. Collagen Type I Animals;Collagen Type I;Low-Level Light Therapy;Mice;Skin;Staining and Labeling

MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. BACKGROUND: Mucositis is a highly significant, and sometimes dose-limiting, toxicity of cancer therapy. The goal of this systematic review was to update the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO) Clinical Practice Guidelines for mucositis. METHODS: A literature search was conducted to identify eligible published articles, based on predefined inclusion/exclusion criteria. Each article was independently reviewed by 2 reviewers. Studies were rated according to the presence of major and minor flaws as per previously published criteria. The body of evidence for each intervention, in each treatment setting, was assigned a level of evidence, based on previously published criteria. Guidelines were developed based on the level of evidence, with 3 possible guideline determinations: recommendation, suggestion, or no guideline possible. RESULTS: The literature search identified 8279 papers, 1032 of which were retrieved for detailed evaluation based on titles and abstracts. Of these, 570 qualified for final inclusion in the systematic reviews. Sixteen new guidelines were developed for or against the use of various interventions in specific treatment settings. In total, the MASCC/ISOO Mucositis Guidelines now include 32 guidelines: 22 for oral mucositis and 10 for gastrointestinal mucositis. This article describes these updated guidelines. CONCLUSIONS: The updated MASCC/ISOO Clinical Practice Guidelines for mucositis will help clinicians provide evidence-based management of mucositis secondary to cancer therapy. Analgesics;Anti-Infective Agents;Anti-Inflammatory Agents;Anti-Ulcer Agents;Antineoplastic Agents;Cytokines;Intercellular Signaling Peptides and Proteins;Protective Agents;Radiation-Protective Agents;Sucralfate;Amifostine Amifostine;Analgesics;Anti-Infective

Agents;Anti-Inflammatory Agents;Anti-Ulcer Agents;Antineoplastic Agents;Cryotherapy;Cytokines;Esophagitis;Evidence-Based Medicine;Humans;Hyperbaric Oxygenation;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mucositis;Neoplasms;Oral Hygiene;Phototherapy;Proctitis;Protective Agents;Radiation-Protective Agents;Radiotherapy;Stomatitis;Sucralfate

Low-level laser effect in patients with neurosensory impairment of mandibular nerve after sagittal split ramus osteotomy. Randomized clinical trial, controlled by placebo. OBJECTIVE: Evaluate the effect on the application of low level laser therapy, in patients that have been previously intervened with a sagittal ramus split osteotomy and present neurosensory impairment due to this surgery, compared with placebo. STUDY DESIGN: This preliminary study is a randomized clinical trial, with an experimental group (n=17) which received laser light and a control group (n=14), placebo. All participants received laser applications, divided after surgery in days 1, 2, 3, 5, 10, 14, 21 and 28. Neurosensory impairment was evaluated clinically with 5 tests; visual analog scale (VAS) for pain and sensitivity, directional and 2 point discrimination, thermal discrimination, each one of them performed before and after surgery on day 1, and 1, 2 and 6 months. Participants and results evaluator were blinded to intervention. Variables were described with absolute frequencies, percentages and medians. Ordinal and dichotomous variables were compared with Mann Whitney's and Fisher's test respectively. RESULTS: RESULTS demonstrate clinical improvement in time, as well as in magnitude of neurosensory return for laser group; VAS for sensitivity reached 5 (normal), 10 participants recovered initial values for 2 point discrimination (62,5%) and 87,5% recovered directional discrimination at 6 months after surgery. General VAS for sensitivity showed 68,75% for laser group, compared with placebo 21,43% (p-value = (0.0095)). Left side sensitivity (VAS) showed 3.25 and 4 medians for placebo and laser at 2 months, respectively (p-value = (0.004)). CONCLUSION: Low-level laser therapy was beneficial for this group of patients on recovery of neurosensory impairment of mandibular nerve, compared to a placebo. Cranial Nerve Diseases;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Mandibular Nerve;Osteotomy, Sagittal Split Ramus;Young Adult

A 12-week treatment with fractional CO2 laser for vulvovaginal atrophy: a pilot study. OBJECTIVE: This pilot study aimed to assess the efficacy and feasibility of fractional CO2 laser in the treatment of vulvovaginal atrophy (VVA) in postmenopausal women. METHODS: VVA symptoms were assessed before and after three applications of laser over 12 weeks in 50 women (age 59.6 Â± 5.8 years) dissatisfied with previous local estrogen therapies. Subjective (visual analog scale) and objective (Vaginal Health Index Score, VHIS) measures were used during the study period to assess VVA. Quality of life was measured by using the SF-12. A subjective scale to evaluate the degree of pain related to the laser application and the degree of difficulty to perform the laser procedure was used. RESULTS: Fractional CO2 laser treatment was effective to improve VVA symptoms (vaginal dryness, vaginal burning, vaginal itching, dyspareunia, dysuria; $p < 0.001$) at 12-week follow-up, as well as the VHIS (13.1 Â± 2.5 at baseline vs. 23.1 Â± 1.9; $p < 0.001$). Both physical and mental scores of quality of life were significantly improved in comparison with baseline ($p < 0.001$). Satisfaction with the laser procedure was reported by 42 women (84%) and a minimal discomfort was experienced at the first laser application, mainly because of the insertion and the movements of the probe. Finally, the technique was very easy to perform in all women starting from the second application at week 4 and no adverse events were recorded during the study period. CONCLUSIONS: A 12-week treatment with the fractional CO2 laser was feasible and induced a significant improvement of VVA symptoms by ameliorating vaginal health in postmenopausal women. Further controlled studies should be performed to confirm the present data and to assess the long-term effects of the laser procedure on vaginal tissues. Atrophy;Dyspareunia;Feasibility Studies;Female;Humans;Lasers, Gas;Low-

Level Light Therapy;Middle Aged;Pilot Projects;Postmenopause;Quality of Life;Treatment Outcome;Vagina;Vaginal Diseases;Vulva;Vulvar Diseases

Ulerythema ophryogenes: updates and insights. Ulerythema ophryogenes is a rare cutaneous atrophic disorder that occasionally is associated with Noonan syndrome, de Lange syndrome, Rubinstein-Taybi syndrome, and cardiofaciocutaneous (CFC) syndrome. Often presenting in pediatric patients, the pathogenesis of ulerythema ophryogenes remains unclear, though several genetic causes have been suggested. Treatment recommendations remain anecdotal, but clearance has been noted as the patient ages. Although topical agents have been the mainstay of therapy, recent advancement in laser intervention for treatment of ulerythema ophryogenes is promising. Anti-Inflammatory Agents;Keratolytic Agents;Triamcinolone Abnormalities, Multiple;Anti-Inflammatory Agents;Child;Darier Disease;De Lange Syndrome;Disease Progression;Ectodermal Dysplasia;Eyebrows;Facies;Failure to Thrive;Heart Defects, Congenital;Humans;Intense Pulsed Light Therapy;Keratolytic Agents;Lasers, Dye;Low-Level Light Therapy;Noonan Syndrome;Rubinstein-Taybi Syndrome;Triamcinolone

Consensus recommendations from the American acne & rosacea society on the management of rosacea, part 4: a status report on physical modalities and devices. The fourth article in this 5-part series reviews physical modalities and devices used to treat cutaneous rosacea based on consensus recommendations from the American Acne & Rosacea Society (AARS) on the management of the common presentations of cutaneous rosacea. The major therapeutic uses of physical modalities and devices, especially laser and light-based systems, are for treatment of telangiectases and persistent facial erythema (background erythema). Phymas, especially rhinophyma, also are treated with physical modalities such as ablative lasers or surgical devices (eg, electrosurgical loop). Appropriately selected and properly used lasers and intense pulsed light (IPL) devices can successfully address specific clinical manifestations of rosacea that exhibit limited or no response to available medical therapies, such as telangiectases and background centrofacial erythema. Rosacea-associated symptoms also may improve. In most cases, treatment will need to be repeated intermittently to sustain improvement. Erythema;Humans;Intense Pulsed Light Therapy;Laser Therapy;Lasers, Dye;Low-Level Light Therapy;Rosacea;Societies, Medical;Telangiectasis

Clinical and scanning electron microscopy evaluation of the Er,Cr:YSGG laser therapy for treating dentine hypersensitivity: short-term, randomised, controlled study. Er,Cr:YSGG laser is a rising treatment option for dentine hypersensitivity (DH). However, there is no data available concerning the scanning electron microscope (SEM) evaluation of the clinical application of Er,Cr:YSGG laser in the treatment of DH. The aim of this study was to evaluate and compare the desensitising and tubule occlusion effects of Er,Cr:YSGG laser with different power settings. Twenty patients (60 teeth) participated in this study. For each patient, teeth were randomised to 3 groups. In groups 1 and 2, patients were treated with Er,Cr:YSGG laser at 0.25 and 0.5 W, respectively. In control group, same laser was applied without laser emission. DH was assessed for all groups with a visual analogue scale (VAS). When compared with the baseline data and control group, in both active treatment groups laser irradiation provided a desensitising effect immediately after treatment ($P < 0.001$). In group 2, VAS scores were significantly lower than group 1. The tubule diameters in the both laser groups were significantly smaller than the control group ($P < 0.01$). When group 1 compared with group 2, group 2 showed significantly smaller tubule diameters ($P < 0.001$). Both 0.25 and 0.5 W laser irradiation were effective for the treatment of DH; however, 0.5 W laser irradiation showed best results for the decrease in VAS scores. The SEM findings of the reduction in number/patency of dentine tubules seem to be related to the clinical findings, which were associated with improvement in treatment efficacy. Yttrium;Erbium;Aluminum Oxide Adolescent;Adult;Aluminum Oxide;Dentin Sensitivity;Erbium;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy,

Electron, Scanning;Middle Aged;Pain Measurement;Patient Satisfaction;Surface Properties;Treatment Outcome;Yttrium

Superpulsed low-level laser therapy protects skeletal muscle of mdx mice against damage, inflammation and morphological changes delaying dystrophy progression. AIM: To evaluate the effects of preventive treatment with low-level laser therapy (LLLT) on progression of dystrophy in mdx mice. METHODS: Ten animals were randomly divided into 2 experimental groups treated with superpulsed LLLT (904 nm, 15 mW, 700 Hz, 1 J) or placebo-LLLT at one point overlying the tibialis anterior muscle (bilaterally) 5 times per week for 14 weeks (from 6th to 20th week of age). Morphological changes, creatine kinase (CK) activity and mRNA gene expression were assessed in animals at 20th week of age. RESULTS: Animals treated with LLLT showed very few morphological changes in skeletal muscle, with less atrophy and fibrosis than animals treated with placebo-LLLT. CK was significantly lower (p=0.0203) in animals treated with LLLT (864.70 U.l-1, SEM 226.10) than placebo (1708.00 U.l-1, SEM 184.60). mRNA gene expression of inflammatory markers was significantly decreased by treatment with LLLT (p<0.05): TNF-Î± (placebo-control=0.51 Âµg/Âµl [SEM 0.12], - LLLT=0.048 Âµg/Âµl [SEM 0.01]), IL-1Î² (placebo-control=2.292 Âµg/Âµl [SEM 0.74], - LLLT=0.12 Âµg/Âµl [SEM 0.03]), IL-6 (placebo-control=3.946 Âµg/Âµl [SEM 0.98], - LLLT=0.854 Âµg/Âµl [SEM 0.33]), IL-10 (placebo-control=1.116 Âµg/Âµl [SEM 0.22], - LLLT=0.352 Âµg/Âµl [SEM 0.15]), and COX-2 (placebo-control=4.984 Âµg/Âµl [SEM 1.18], LLLT=1.470 Âµg/Âµl [SEM 0.73]). CONCLUSION: Irradiation of superpulsed LLLT on successive days five times per week for 14 weeks decreased morphological changes, skeletal muscle damage and inflammation in mdx mice. This indicates that LLLT has potential to decrease progression of Duchenne muscular dystrophy.
Interleukins;Tumor Necrosis Factor-alpha;Ptgs2 protein, mouse;Cyclooxygenase 2;Creatine Kinase
Animals;Creatine Kinase;Cyclooxygenase 2;Disease Progression;Gene Expression;Interleukins;Low-Level Light Therapy;Male;Mice, Inbred mdx;Muscle, Skeletal;Muscular Dystrophy, Duchenne;Tumor Necrosis Factor-alpha

Analysis of early thrombus dynamics in a humanized mouse laser injury model. Platelet aggregation and thrombus formation at the site of injury is a dynamic process that involves the continuous addition of new platelets as well as thrombus rupture. In the early stages of hemostasis (within minutes after vessel injury) this process can be visualized by transfusing fluorescently labeled human platelets and observing their deposition and detachment. These two counterbalancing events help the developing thrombus reach a steady-state morphology, where it is large enough to cover the injured vessel surface but not too large to form a severe thrombotic occlusion. In this study, the spatial and temporal aspects of early stage thrombus dynamics which result from laser-induced injury on arterioles of cremaster muscle in the humanized mouse were visualized using fluorescent microscopy. It was found that rolling platelets show preference for the upstream region while tethering/detaching platelets were primarily found downstream. It was also determined that the platelet deposition rate is relatively steady, whereas the effective thrombus coverage area does not increase at a constant rate. By introducing a new method to graphically represent the real time in vivo physiological shear stress environment, we conclude that the thrombus continuously changes shape by regional growth and decay, and neither dominates in the high shear stress region.
Animals;Blood Platelets;Disease Models, Animal;Humans;Low-Level Light Therapy;Mice;Platelet Aggregation;Thrombosis

Laser-induced osteoblast proliferation is mediated by ROS production. Low-level laser therapy (LLLT) is widely used in regenerative medicine and in dental therapy by virtue of its beneficial effects in a plethora of pathological conditions. In this study, the effect of a 980 nm diode laser on pre-osteoblasts proliferation has been evaluated, along with reactive oxygen species (ROS) production. We hypothesized that ROS were a key factor in LLLT-induced pre-osteoblasts proliferation, as it is

known that ROS can induce the activation of many biological pathways, leading to cell proliferation, differentiation or apoptosis. Murine pre-osteoblasts MC3T3 cells were irradiated with different energy outputs (1-50 J) in the absence or presence of the antioxidant N-Acetyl-L-cysteine (NAC). Laser treatment, in the absence of NAC, was able to induce a fluence-dependent statistically significant increase in ROS generation, while the presence of NAC strongly inhibited it. Cell proliferation, measured after laser stimulation, was significantly increased both at low and higher energy, with a peak at 10 J in the absence of the antioxidant. On the contrary, in the presence of NAC, laser irradiation was not able to induce any cell proliferation, suggesting a crucial role of ROS in this laser-induced cell effect. These results suggest that LLLT may be a useful tool for bone regeneration therapy and an effective range of fluences to be used is indicated. Reactive Oxygen Species Animals;Bone Regeneration;Cell Differentiation;Cell Line;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Osteoblasts;Oxidative Stress;Reactive Oxygen Species

Riehl melanosis treated successfully with Q-switch Nd:YAG laser. Riehl melanosis is a rare cause of skin hyperpigmentation that typically occurs on the face and neck and is characterized by the rapid onset of gray-brown reticular pigmentation. It is theorized to be a pigmented contact dermatitis or a lichenoid immune reaction that may be caused by intrinsic as well as extrinsic factors. Treatment is challenging; laser and intense pulsed light (IPL) therapy is a common treatment for other pigmented skin conditions. IPL has been reported twice for the treatment of Riehl melanosis and we report a case of Riehl melanosis successfully treated with q-switched Nd:YAG after proving recalcitrant to IPL treatment. Aged;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Treatment Outcome

Effect of low level laser therapy on chronic compression of the dorsal root ganglion. Dorsal root ganglia (DRG) are vulnerable to physical injury of the intervertebral foramen, and chronic compression of the DRG (CCD) an result in nerve root damage with persistent morbidity. The purpose of this study was to evaluate the effects of low level laser therapy (LLLT) on the DRG in a CCD model and to determine the mechanisms underlying these effects. CCD rats had L-shaped stainless-steel rods inserted into the fourth and fifth lumbar intervertebral foramen, and the rats were then subjected to 0 or 8 J/cm2 LLLT for 8 consecutive days following CCD surgery. Pain and heat stimuli were applied to test for hyperalgesia following CCD. The levels of TNF-Î±, IL-1Î² and growth-associated protein-43 (GAP-43) messenger RNA (mRNA) expression were measured via real-time PCR, and protein expression levels were analyzed through immunohistochemical analyses. Our data indicate that LLLT significantly decreased the tolerable sensitivity to pain and heat stimuli in the CCD groups. The expression levels of the pro-inflammatory cytokines TNF-Î± and IL-1Î² were increased following CCD, and we found that these increases could be reduced by the application of LLLT. Furthermore, the expression of GAP-43 was enhanced by LLLT. In conclusion, LLLT was able to enhance neural regeneration in rats following CCD and improve rat ambulatory behavior. The therapeutic effects of LLLT on the DRG during CCD may be exerted through suppression of the inflammatory response and induction of neuronal repair genes. These results suggest potential clinical applications for LLLT in the treatment of compression-induced neuronal disorders. GAP-43 Protein;Inflammation Mediators;RNA, Messenger;Tumor Necrosis Factor-alpha Animals;Disease Models, Animal;GAP-43 Protein;Ganglia, Spinal;Gene Expression Regulation;Hyperalgesia;Inflammation Mediators;Low-Level Light Therapy;Male;Nerve Compression Syndromes;RNA, Messenger;Radiography;Rats, Sprague-Dawley;Tumor Necrosis Factor-alpha

Laser therapy and photosensitive medication: a review of the evidence. In the 2009 guidelines from the BMLA, the use of non-essential aesthetic lasers was contraindicated in patients receiving medication that causes whole-body photosensitisation as well as those causing local light sensitisation. Following this and anecdotal advice, many laser centres refuse to treat patients who are

on known photosensitive medication. Therefore, specific patient cohorts that would benefit from laser therapy are being denied because of medications, such as long-term antibiotics for chronic facial acne. This article reviews the published literature on lasers and photosensitive medications, the mechanisms of photosensitivity and the role of laser in its production. The aim is to analyse the available evidence regarding adverse reactions to laser treatment related to photosensitive medication. A PubMed review of published article titles and abstracts was performed using the search term Laser with each of the following terms individually: photosensitive, photosensitiser, photosensitizer, phototoxicity, photoallergy, complications, case-report, tetracycline, minocycline, amiodarone, nitrofurantoin and medication. Four publications were identified, none of which reported any complication in the use of laser in patients taking photosensitising medication. As there are no published accounts of adverse effects of laser in patients with photosensitive medication, we performed a review of the mechanism of photosensitivity by compiling a list of photosensitive medication and the peak wavelength of radiation required to activate the drug. We recommend a national database of drugs and the wavelengths causing photosensitive reactions of each which a laser department can access prior to treatment. Anti-Bacterial Agents;Photosensitizing Agents Acne Vulgaris;Anti-Bacterial Agents;Humans;Low-Level Light Therapy;Photosensitizing Agents;Radiation Tolerance

Irradiation by gallium-aluminum-arsenate diode laser enhances the induction of nitric oxide by Porphyromonas gingivalis in RAW 264.7 cells. BACKGROUND: Low-level laser irradiation promotes cell viability and wound healing in periodontal tissue. However, its effect on periodontal pathogenic bacteria is unknown. The purpose of this study is to investigate the biologic effect of low-level laser irradiation on Porphyromonas gingivalis. METHODS: A murine macrophage cell line (RAW 264.7) was cultured and treated with gallium-aluminum-arsenate (GaAlAs) laser-irradiated P. gingivalis with varying levels of energy fluency. Gene expression of monocyte chemotactic protein-1 (MCP-1), interleukin-6 (IL-6), interferon-Î² (IFN-Î²), and inducible nitric oxide synthase (iNOS) was examined by reverse transcription-polymerase chain reaction. Production of iNOS was determined by Western blot analysis, and nitric oxide (NO) release was assessed using Griess reagent. Flow cytometric analysis was performed to determine the activation of Toll-like receptors (TLRs) in response to P. gingivalis. RESULTS: The laser-irradiated P. gingivalis significantly enhanced messenger RNA and protein levels of iNOS in RAW 264.7. Although the laser irradiation on P. gingivalis did not alter the expression level of MCP-1, IL-6, and IFN-Î², it showed a noticeable effect on NO production in RAW 264.7. Furthermore, the laser-irradiated P. gingivalis accelerated TLR2 activation, but not TLR4 activation. CONCLUSIONS: This study reveals that GaAlAs laser irradiation on P. gingivalis induced iNOS expression at the transcriptional and translation levels and increased NO release in macrophages. Moreover, it is confirmed that this process was mediated specifically by TLR2 activation. These findings suggest that low-level laser irradiation to periodontal pathogenic bacteria could be detrimental to periodontal treatments. Ccl2 protein, mouse;Chemokine CCL2;Interleukin-6;Tlr2 protein, mouse;Tlr4 protein, mouse;Toll-Like Receptor 2;Toll-Like Receptor 4;interleukin-6, mouse;Nitric Oxide;Interferon-beta;Nitric Oxide Synthase Type II;Nos2 protein, mouse Animals;Bacteriological Techniques;CHO Cells;Cell Culture Techniques;Cell Line;Chemokine CCL2;Cricetulus;Interferon-beta;Interleukin-6;Lasers, Semiconductor;Low-Level Light Therapy;Macrophages;Mice;Nitric Oxide;Nitric Oxide Synthase Type II;Porphyromonas gingivalis;Toll-Like Receptor 2;Toll-Like Receptor 4

What is the ideal dose and power output of low-level laser therapy (810 nm) on muscle performance and post-exercise recovery? Study protocol for a double-blind, randomized, placebo-controlled trial. BACKGROUND: Recent studies involving phototherapy applied prior to exercise have demonstrated positive results regarding the attenuation of muscle fatigue and the expression of biochemical

markers associated with recovery. However, a number of factors remain unknown, such as the ideal dose and application parameters, mechanisms of action and long-term effects on muscle recovery. The aims of the proposed project are to evaluate the long-term effects of low-level laser therapy on post-exercise musculoskeletal recovery and identify the best dose andapplication power/irradiation time. DESIGN AND METHODS: A double-blind, randomized, placebo-controlled clinical trial with be conducted. After fulfilling the eligibility criteria, 28 high-performance athletes will be allocated to four groups of seven volunteers each. In phase 1, the laser power will be 200 mW and different doses will be tested: Group A (2 J), Group B (6 J), Group C (10 J) and Group D (0 J). In phase 2, the best dose obtained in phase 1 will be used with the same distribution of the volunteers, but with different powers: Group A (100 mW), Group B (200 mW), Group C (400 mW) and Group D (0 mW). The isokinetic test will be performed based on maximum voluntary contraction prior to the application of the laser and after the eccentric contraction protocol, which will also be performed using the isokinetic dynamometer. The following variables related to physical performance will be analyzed: peak torque/maximum voluntary contraction, delayed onset muscle soreness (algometer), biochemical markers of muscle damage, inflammation and oxidative stress. DISCUSSION: Our intention, is to determine optimal laser therapy application parameters capable of slowing down the physiological muscle fatigue process, reducing injuries or micro-injuries in skeletal muscle stemming from physical exertion and accelerating post-exercise muscle recovery. We believe that, unlike drug therapy, LLLT has a biphasic dose-response pattern. TRIAL REGISTRATION: The protocol for this study is registered with the Protocol Registry System, ClinicalTrials.gov identifier NCT01844271. Biomarkers;Inflammation Mediators Biomarkers;Biomechanical Phenomena;Brazil;Clinical Protocols;Double-Blind Method;Exercise;Humans;Inflammation Mediators;Low-Level Light Therapy;Male;Muscle Contraction;Muscle Fatigue;Muscle, Skeletal;Oxidative Stress;Radiation Dosage;Recovery of Function;Research Design;Time Factors;Treatment Outcome

Emerging evidence on the crystalline water-light interface in ophthalmology and therapeutic implications in photobiomodulation: first communication. OBJECTIVE: The purpose of this study was to present preliminary evidence of the exclusion zone (EZ) and photobiomodulation (PBM) phenomena relating to ophthalmology. BACKGROUND DATA: Water is the main media and fluid found in ocular tissues. Water is also an important photoacceptor and energy storage medium. Eyes are abundantly exposed to environmental radiant energy. Therefore, multiple light-energy-absorption mechanisms may exist, including those associated with the recently discovered fourth phase of water, known as EZ. METHODS: Retrospective analysis of published data indicative of EZ phenomena related, in this first communication, to the retina and optic nerve (ON), using surgical microscopy and diffusion-weighted magnetic resonance imaging (MRI). RESULTS: Images showing removal of the internal limiting membrane (ILM) aided by preservative-free triamcinolone acetonide (TA) during macular hole surgery show continuous whitish lines indicative of water-layer ordering at the interface between collagen matrices and TA crystals. Apparent diffusion coefficient (ADC) results further exhibit an axis parallel to the ON, which may be an ocular expression of the EZ linked to the steady potential of the eye. CONCLUSIONS: Although existing results are still being decoded and analyzed in light of the state of the art studies of light-water interactions, they suggest a new understanding of the eye's bioenergetic environment, which may have deep implications in ocular physiology as well as in the pathophysiology, diagnosis, and treatment of blinding diseases using light-based therapies such as photobiomodulation. Research is needed to confirm the interpretation of these findings and validate potential ophthalmic applications. Water Humans;Light;Ocular Physiological Phenomena;Photobiology;Water

Significant improvements in cognitive performance post-transcranial, red/near-infrared light-emitting diode treatments in chronic, mild traumatic brain injury: open-protocol study. This pilot, open-

protocol study examined whether scalp application of red and near-infrared (NIR) light-emitting diodes (LED) could improve cognition in patients with chronic, mild traumatic brain injury (mTBI). Application of red/NIR light improves mitochondrial function (especially in hypoxic/compromised cells) promoting increased adenosine triphosphate (ATP) important for cellular metabolism. Nitric oxide is released locally, increasing regional cerebral blood flow. LED therapy is noninvasive, painless, and non-thermal (cleared by the United States Food and Drug Administration [FDA], an insignificant risk device). Eleven chronic, mTBI participants (26-62 years of age, 6 males) with nonpenetrating brain injury and persistent cognitive dysfunction were treated for 18 outpatient sessions (Monday, Wednesday, Friday, for 6 weeks), starting at 10 months to 8 years post- mTBI (motor vehicle accident [MVA] or sports-related; and one participant, improvised explosive device [IED] blast injury). Four had a history of multiple concussions. Each LED cluster head (5.35 cm diameter, 500 mW, 22.2 mW/cm(2)) was applied for 10 min to each of 11 scalp placements (13 J/cm(2)). LEDs were placed on the midline from front-to-back hairline; and bilaterally on frontal, parietal, and temporal areas. Neuropsychological testing was performed pre-LED, and at 1 week, and 1 and 2 months after the 18th treatment. A significant linear trend was observed for the effect of LED treatment over time for the Stroop test for Executive Function, Trial 3 inhibition (p=0.004); Stroop, Trial 4 inhibition switching (p=0.003); California Verbal Learning Test (CVLT)-II, Total Trials 1-5 (p=0.003); and CVLT-II, Long Delay Free Recall (p=0.006). Participants reported improved sleep, and fewer post-traumatic stress disorder (PTSD) symptoms, if present. Participants and family reported better ability to perform social, interpersonal, and occupational functions. These open-protocol data suggest that placebo-controlled studies are warranted. Adult;Brain Concussion;Brain Injury, Chronic;Chronic Disease;Cognition;Disability Evaluation;Female;Humans;Infrared Rays;Male;Middle Aged;Neuropsychological Tests;Phototherapy;Pilot Projects;Psychomotor Performance;Stress Disorders, Post-Traumatic;Treatment Outcome;Unconsciousness

Au@Pt nanostructures: a novel photothermal conversion agent for cancer therapy. Due to aspect ratio dependent localized surface plasmon resonance (SPR), gold nanorods (Au NRs) can be tuned to have a strong absorption in the near infrared region (NIR) and convert light to heat energy, which shows promises in cancer photothermal therapy. In this study, we introduced another more efficient NIR photothermal agent, Au nanorods coated with a shell of Pt nanodots (Au@Pt nanostructures). After surface modification with Pt dots, the Au@Pt nanostructure became a more efficient photothermal therapy agent as verified both in vitro and in vivo. To clarify the mechanism, we assessed the interaction between the MDA-MB-231 cells with Au@Pt or Au NRs. Results showed that the slightly higher uptake and the reduced sensitivity of the longitudinal SPR band on the intracellular aggregate state may contribute to the better photothermal efficiency for Au@Pt NRs. The theoretical studies further confirmed that the Au@Pt nanostructure itself exhibited better photothermal efficiency compared to Au NRs. These advantages make the Au@Pt nanostructure a more attractive and effective agent for cancer photothermal therapy than general Au NRs. Platinum;Gold Animals;Cell Line, Tumor;Cell Survival;Gold;Humans;Lasers;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Mice, Nude;Nanostructures;Nanotubes;Neoplasms;Platinum;Surface Plasmon Resonance;Temperature;Transplantation, Heterologous

Efficacy of low-level laser therapy for accelerating tooth movement during orthodontic treatment: a systematic review and meta-analysis. This review aimed to evaluate the efficacy of low-level laser therapy (LLLT) for accelerating tooth movement during orthodontic treatment. An extensive electronic search was conducted by two reviewers. Randomized controlled trials (RCTs) and quasi-RCTs concerning the efficacy of LLLT for accelerating tooth movement during orthodontic treatment were searched in CENTRAL, Medline, PubMed, Embase, China Biology Medicine Disc (CBM), China

National Knowledge Infrastructure (CNKI), and Google Scholar. Six RCTs and three quasi-RCTs, involving 211 patients from six countries, were selected from 173 relevant studies. All nine articles were feasible for the systematic review and meta-analysis, five of which were assessed as moderate risk of bias, while the rest were assessed as high risk of bias. The mean difference and the 95Â % confidence interval (95Â % CI) of accumulative moved distance of teeth were observed among all the researches. The results showed that the LLLT could accelerate orthodontic tooth movement (OTM) in 7Â days (mean difference 0.19, 95Â % CI [0.02, 0.37], pâ€‰=â€‰0.03) and 2Â months (mean difference 1.08, 95Â % CI [0.16, 2.01], pâ€‰=â€‰0.02). Moreover, a relatively lower energy density (5 and 8Â J/cm(2)) was seemingly more effective than 20 and 25Â J/cm(2) and even higher ones. Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Tooth Diseases;Tooth Movement Techniques;Treatment Outcome

Do laser and led phototherapies influence mast cells and myofibroblasts to produce collagen? Laser and LED phototherapies accelerate tissue repair. Mast cells induce the proliferation of fibroblasts and the development of local fibrosis. Increased numbers of myofibroblasts and mast cells are frequently found together in a normal wound repair, suggesting that mediators produced by the mast cells could play a role in the regulation of myofibroblast differentiation and function. The aim of this study was to analyze the involvement of mast cells on the synthesis of collagen and their influence on myofibroblast differentiation in the late phase of tissue repair on wounds treated with LLLT (Î» 660 nm, 10 J/cm(2), 40 mW, 252 s) or LED (Î» 630â€‰Â±â€‰10 nm, 10 J/cm(2), 115 mW, 87 s). A 1â€‰Ã—â€‰1-cm surgical wound was created on the dorsum of 30 rats divided into three groups of ten animals each: control, laser, and LED. The animals of each group were irradiated and sacrificed 7 and 14 days after injury. The statistical analysis was performed using the Mann-Whitney and Spearman correlation tests. Laser light improved the collagen deposition rate along the time points (pâ€‰=â€‰0.22), but when compared to the control groups during the periods studied, the number of mast cells decreased significantly (pâ€‰â‰¤â€‰0.05). With respect to myofibroblasts, the results showed a trend to their reduction. No statistical significances were observed for LED light according to the parameters used in this study. It is concluded that the mast cell and myofibroblast population might participate in the collagen formation of irradiated wounds particularly in relation to laser phototherapy. Collagen Animals;Collagen;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mast Cells;Myofibroblasts;Rats;Rats, Wistar;Wound Healing

The effect of light-emitting diode photobiomodulation on implant stability and biochemical markers in peri-implant crevicular fluid. OBJECTIVE: The purpose of this study was to determine the effect of light-emitting diode photomodulation (LED PBM) on implant osseointegration by measuring implant stability changes by resonance frequency analysis (RFA) and measuring interleukin-1Î² (IL-1Î²), transforming growth factor-Î² (TGF-Î²), prostaglandin-E2 (PGE2), and nitric oxide (NO) levels in peri-implant crevicular fluid (PICF). BACKGROUND DATA: Light therapy modulates various biological events and allows improved wound healing in ischemic and wounded tissues. METHODS: Fifteen patients (8 control, 7 LED) participated in the study. In the LED group, LED device at a wavelength of 626â€‰nm in the near-infrared (NIR) region (treatment array area: 4.80â€‰cm2; average intensity: 38.5â€‰mW/cm2; total power: 185â€‰mW; total energy: 222 J; average density: 46.2â€‰J/cm2) was applied for 20â€‰min over the surgical area during 3 weeks, three times in a week, starting from the operation day. Implant stability quotient (ISQ) values were recorded at the time of operation, and 2, 4, 8, and 12 weeks postoperatively. PICF samples were collected in postoperative weeks 4 and 12 and IL-1Î², TGF-Î², PGE2, and NO levels were evaluated. Clinical indices were recorded around implants in postoperative weeks 4 and 12. RESULTS: In the control group, significant reduction of ISQ values from week 2 to week 12 were demonstrated. In the LED group, baseline ISQ values were maintained during the study and no significant changes were observed. Changes in

biochemical parameters were found to be similar between groups over time. However, in the LED group, a negative correlation was found between PGE2 and ISQ values. CONCLUSIONS: LED application to surgical area has a positive effect on the osseointegration process, and implant stability can be maintained. Biomarkers;Dental Implants Biomarkers;Dental Implants;Female;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Light;Male;Middle Aged;Photobiology

Effects of diode laser therapy and stannous fluoride on dentin resistance under different erosive acid attacks. OBJECTIVE: This in vitro study aimed to evaluate the effect of a low intensity diode laser (Î»=808â€‰nm; 60â€‰J/cm2) associated with stannous fluoride on the inhibition of dentin erosion by assessing percentage of superficial hardness loss (%SHL) and calcium release into the acid solution. MATERIALS AND METHODS: Human root dentin slabs were assigned to eight groups (n=10), according to treatments (control, stannous fluoride, diode laser therapy, and the combination of stannous fluoride and laser therapy), and acid challenge (hydrochloridric or citric acid). All slabs were subjected to a previous 2â€‰h acquired pellicle formation; laser and fluoride treatments were performed according to the groups. Subsequently, the slabs were exposed to erosive challenge (0.01â€‰M hydrochloridric acid or citric acid 1% for 60â€‰sec). Additionally, calcium released into the acid solution during erosive challenge was analyzed by photometric test. Data were analyzed by ANOVA followed by Tukey's test (p<0.05). RESULTS: Mean values (Â±SD) for %SHL of treated groups did not present statistically significant differences, regardless of the erosive challenge. However, in relation to released calcium concentration, groups treated with laser presented statistically significant lower calcium loss under hydrochloridric acid challenge (p<0.001). To groups under citric acid attack, only the combination of treatments (p=0.037) was able to show a protective effect on dentin. CONCLUSIONS: Under the conditions of this study, 808â€‰nm diode laser with or without stannous fluoride could effectively reduce dentin surface loss under both acid exposures. Only calcium concentration analysis was sensitive enough to measure the effects under the tested conditions. Tin Fluorides Dentin;Female;Humans;In Vitro Techniques;Low-Level Light Therapy;Tin Fluorides;Uterine Cervical Erosion

Effect of equal daily doses achieved by different power densities of low-level laser therapy at 635 nm on open skin wound healing in normal and diabetic rats. BACKGROUND AND OBJECTIVE: Despite the fact that the molecular mechanism of low-level laser therapy (LLLT) is not yet known, the exploitation of phototherapy in clinical medicine and surgery is of great interest. The present study investigates the effects of LLLT on open skin wound healing in normal and diabetic rats. MATERIALS AND METHODS: Four round full-thickness skin wounds on dorsum were performed in male adult nondiabetic (n = 24) and diabetic (n = 24) Sprague-Dawley rats. AlGaInP (635 nm, wavelength; 5 J/cm(2), daily dose) was used to deliver power densities of 1, 5, and 15 mW/cm(2) three times daily until euthanasia. RESULTS: PMNL infiltration was lower in the irradiated groups (15 mW/cm(2)). The synthesis and organisation of collagen fibres were consecutively enhanced in the 5 mW/cm(2) and 15 mW/cm(2) groups compared to the others in nondiabetic rats. In the diabetic group the only significant difference was recorded in the ratio PMNL/Ma at 15 mW/cm(2). A significant difference in the number of newly formed capillaries in the irradiated group (5, 15 mW/cm(2)) was recorded on day six after injury compared to the control group. CONCLUSION: LLLT confers a protective effect against excessive inflammatory tissue response; it stimulates neovascularization and the early formation of collagen fibres. Animals;Diabetes Mellitus, Experimental;Humans;Immune System Diseases;Inflammation;Leukocyte Disorders;Low-Level Light Therapy;Male;Phototherapy;Radiation Dosage;Rats;Skin;Wound Healing

Establishment of a small animal tumour model for in vivo studies with low energy laser accelerated particles. BACKGROUND: The long-term aim of developing a laser based acceleration of protons

and ions towards clinical application requires not only substantial technological progress, but also the radiobiological characterization of the resulting ultra-short pulsed particle beams. Recent in vitro data showed similar effects of laser-accelerated versus "conventional" protons on clonogenic cell survival. As the proton energies currently achieved by laser driven acceleration are too low to penetrate standard tumour models on mouse legs, the aim of the present work was to establish a tumour model allowing for the penetration of low energy protons (~ 20 MeV) to further verify their effects in vivo. METHODS: KHT mouse sarcoma cells were injected subcutaneously in the right ear of NMRI (nu/nu) mice and the growing tumours were characterized with respect to growth parameters, histology and radiation response. In parallel, the laser system JETI was prepared for animal experimentation, i.e. a new irradiation setup was implemented and the laser parameters were carefully adjusted. Finally, a proof-of-principle experiment with laser accelerated electrons was performed to validate the tumour model under realistic conditions, i.e. altered environment and horizontal beam delivery. RESULTS: KHT sarcoma on mice ears showed a high take rate and continuous tumour growth after reaching a volume of ~ 5 mm(3). The first irradiation experiment using laser accelerated electrons versus 200 kV X-rays was successfully performed and tumour growth delay was evaluated. Comparable tumour growth delay was found between X-ray and laser accelerated electron irradiation. Moreover, experimental influences, like anaesthesia and positioning at JETI, were found to be negligible. CONCLUSION: A small animal tumour model suitable for the irradiation with low energy particles was established and validated at a laser based particle accelerator. Thus, the translation from in vitro to in vivo experimentation was for the first time realized allowing a broader preclinical validation of radiobiological characteristics and efficacy of laser driven particle accelerators in the future. Ions Animals;Disease Models, Animal;Equipment Design;Female;Ions;Lasers;Low-Level Light Therapy;Male;Mice;Mice, Nude;Neoplasms;Particle Accelerators;Proton Therapy;Radiotherapy Dosage;Tumor Cells, Cultured;X-Rays

Low-level laser therapy (LLLT) reduces the COX-2 mRNA expression in both subplantar and total brain tissues in the model of peripheral inflammation induced by administration of carrageenan. In the classical model of edema formation and hyperalgesia induced by carrageenan administration in rat paw, the increase in prostaglandin E2 (PGE2) production in the central nervous system (CNS) contributes to the severity of the inflammatory and pain responses. Prostaglandins are generated by the cyclooxygenase (COX). There are two distinct COX isoforms, COX-1 and COX-2. In inflammatory tissues, COX-2 is greatly expressed producing proinflammatory prostaglandins (PGs). Low-level laser therapy (LLLT) has been used in the treatment of inflammatory pathologies, reducing both pain and acute inflammatory process. Herein we studied the effect of LLLT on both COX-2 and COX-1 messenger RNA (mRNA) expression in either subplantar or brain tissues taken from rats treated with carrageenan. The experiment was designed as follows: A1 (saline), A2 (carrageenan-0.5 mg/paw), A3 (carrageenan-0.5 mg/paw + LLLT), A4 (carrageenan-1.0 mg/paw), and A5 (carrageenan-1.0 mg/paw + LLLT). Animals from the A3 and A5 groups were irradiated at 1 h after carrageenan administration, using a diode laser with an output power of 30 mW and a wavelength of 660 nm. The laser beam covered an area of 0.785 cm(2), resulting in an energy dosage of 7.5 J/cm(2). Both COX-2 and COX-1 mRNAs were measured by RT-PCR. Six hours after carrageenan administration, COX-2 mRNA expression was significantly increased both in the subplantar (2.2-4.1-fold) and total brain (8.65-13.79-fold) tissues. COX-1 mRNA expression was not changed. LLLT (7.5 J/cm(2)) reduced significantly the COX-2 mRNA expression both in the subplantar (~2.5-fold) and brain (4.84-9.67-fold) tissues. The results show that LLLT is able to reduce COX-2 mRNA expression. It is possible that the mechanism of LLLT decreasing hyperalgesia is also related to its effect in reducing the COX-2 expression in the CNS. Membrane Proteins;RNA, Messenger;Carrageenan;Cyclooxygenase 1;Cyclooxygenase 2;Ptgs1 protein, rat;Ptgs2 protein, rat;Dinoprostone Animals;Brain;Carrageenan;Cyclooxygenase

1;Cyclooxygenase 2;Dinoprostone;Edema;Enzyme Repression;Hyperalgesia;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Membrane Proteins;RNA, Messenger;Rats;Rats, Wistar

Laser phototherapy accelerates oral keratinocyte migration through the modulation of the mammalian target of rapamycin signaling pathway. Keratinocytes play a central role in wound healing by responding to tissue injury through the activation of cellular proliferation and migration. Current clinical evidence suggests that the laser phototherapy (LPT) accelerates wound healing in a variety of oral diseases; however, the molecular mechanisms involved in response to LPT are not fully understood. Oral keratinocytes (NOK-SI) maintained under nutritional-deficit culture medium (2% fetal bovine serum) were irradiated with InGaAlP laser (660 nm; 40 mW; 0.04â€‰â€‰cm2 spot size) in punctual and contact modes. The energy densities used were 4 and 20â€‰â€‰J/cm2 corresponding to 4 and 20 s of exposure times and 0.16 and 0.8 J of energy per point, respectively. Three sessions of irradiations were applied with 6-h intervals. Further, the impact of LPT over cellular migration, proliferation, and activation of the mammalian target of rapamycin (mTOR) pathway, known to play a major role in epithelial migration and wound healing, was analyzed. Compared with control cells, the LPT-treated cells showed accelerated cellular migration without any changes in proliferation. Furthermore, LPT resulted in an increase in the phospho-S6 ribosomal protein, indicating activation of the mTOR signaling pathway. Collectively, these findings suggest that the LPT activates mTOR signaling pathway, promotes epithelial cell migration, and accelerates healing of oral mucosa. Actins;MTOR protein, human;TOR Serine-Threonine Kinases Actins;Analysis of Variance;Cell Movement;Cell Proliferation;Cell Survival;Humans;Keratinocytes;Low-Level Light Therapy;Mouth Mucosa;Polymerization;Signal Transduction;TOR Serine-Threonine Kinases

Low-level laser therapy improves vision in a patient with retinitis pigmentosa. OBJECTIVE: This case report describes the effects of low-level laser therapy (LLLT) in a single patient with retinitis pigmentosa (RP). BACKGROUND DATA: RP is a heritable disorder of the retina, which eventually leads to blindness. No therapy is currently available. METHODS: LLLT was applied using a continuous wave laser diode (780â€‰nm, 10â€‰mW average output at 292â€‰Hz, 50% pulse modulation). The complete retina of eyes was irradiated through the conjunctiva for 40â€‰sec (0.4â€‰J, 0.333â€‰W/cm2) two times per week for 2 weeks (1.6â€‰J). A 55-year-old male patient with advanced RP was treated and followed for 7 years. RESULTS: The patient had complained of nyctalopia and decreasing vision. At first presentation, best visual acuity was 20/50 in each eye. Visual fields were reduced to a central residual of 5 degrees. Tritan-dyschromatopsy was found. Retinal potential was absent in electroretinography. Biomicroscopy showed optic nerve atrophy, and narrow retinal vessels with a typical pattern of retinal pigmentation. After four initial treatments of LLLT, visual acuity increased to 20/20 in each eye. Visual fields normalized except for a mid-peripheral absolute concentric scotoma. Five years after discontinuation of LLLT, a relapse was observed. LLLT was repeated (another four treatments) and restored the initial success. During the next 2 years, 17 additional treatments were performed on an "as needed" basis, to maintain the result. CONCLUSIONS: LLLT was shown to improve and maintain vision in a patient with RP, and may thereby have contributed to slowing down blindness. Humans;Low-Level Light Therapy;Male;Middle Aged;Retinitis Pigmentosa;Treatment Outcome;Vision, Ocular

Low-level laser therapy promotes proliferation and invasion of oral squamous cell carcinoma cells. Low-level laser therapy (LLLT) has been shown to be effective in promoting cell proliferation. There is speculation that the biostimulatory effect of LLLT causes undesirable enhancement of tumor growth in neoplastic diseases since malignant cells are more susceptible to proliferative stimuli. This study evaluated the effects of LLLT on proliferation, invasion, and expression of cyclin D1, E-cadherin, Î²-catenin, and MMP-9 in a tongue squamous carcinoma cell line (SCC25). Cells were irradiated with a diode laser (660 nm) using two energy densities (0.5 and 1.0 J/cm(2)). The proliferative potential was

assessed by cell growth curves and cell cycle analysis, whereas the invasion of cells was evaluated using a Matrigel cell invasion assay. Expression of cyclin D1, E-cadherin, Î²-catenin, and MMP-9 was analyzed by immunofluorescence and flow cytometry and associated with the biological activities studied. LLLT induced significantly the proliferation of SCC25 cells at 1.0 J/cm(2), which was accomplished by an increase in the expression of cyclin D1 and nuclear Î²-catenin. At 1.0 J/cm(2), LLLT significantly reduced E-cadherin and induced MMP-9 expression, promoting SCC25 invasion. The results of this study demonstrated that LLLT exerts a stimulatory effect on proliferation and invasion of SCC25 cells, which was associated with alterations on expression of proteins studied. CCND1 protein, human;Cadherins;beta Catenin;Cyclin D1;Matrix Metalloproteinase 9 Cadherins;Carcinoma, Squamous Cell;Cell Cycle;Cell Line, Tumor;Cell Proliferation;Cyclin D1;Humans;Low-Level Light Therapy;Matrix Metalloproteinase 9;Mouth Neoplasms;Neoplasm Invasiveness;beta Catenin

Low-level laser and local corticosteroid injection in the treatment of subacromial impingement syndrome: a controlled clinical trial. OBJECTIVE: To investigate the effectiveness of low-level laser treatment and local corticosteroid injection in patients with subacromial impingement syndrome. DESIGN: Controlled clinical trial. SETTING: Physical Medicine and Rehabilitation outpatient clinic. SUBJECTS: One hundred thirty-five patients with subacromial impingement syndrome. INTERVENTION: The patients were allocated to three groups: local corticosteroid injection (group I); sham laser treatment (group II); and low-level laser treatment (group III). Low-level laser treatment was performed three times per week for a total of nine sessions. Local corticosteroid injections were administered twice, with an interval of 10 days between each. The patients were assessed at pre-treatment, post-treatment and three and six months after the first visit. MAIN MEASURES: The primary outcome of the study was pain intensity (visual analog scale) during activity and at rest. The secondary outcomes were, shoulder functional status and quality of life measured by the University of California at Los Angeles rating score (UCLA) and Nottingham Health Profile (NHP) scale respectively. RESULTS: Significant differences were observed between groups I and II and between groups II and III regarding pain during activity and at rest scores at all of the visits ($p<0.05$). Nevertheless, significant improvement was observed between groups I and III regarding pain during activity only at post-treatment ($p=0.013$). The UCLA scores were significantly changed in all three study groups at all of the visits ($p<0.05$). CONCLUSION: The effectiveness of low-level laser treatment was similar to that of local corticosteroid injection in patients with subacromial impingement syndrome. We concluded that both low-level laser treatment and corticosteroid injection were more effective than sham laser treatment.

Efficacy of cryotherapy associated with laser therapy for decreasing severity of melphalan-induced oral mucositis during hematological stem-cell transplantation: a prospective clinical study. Melphalan followed by hematopoietic stem-cell transplantation (HSCT) is the standard treatment for multiple myeloma and other hematopoietic neoplasms. However, high doses of melphalan cause severe oral mucositis (OM). The objective was to verify the efficacy of cryotherapy plus laser therapy on reduction of OM severity. HSCT patients undergoing melphalan chemotherapy (n = 71) were randomly divided into two groups according to OM treatment: oral cryotherapy performed with ice chips for 1 h 35 min followed by low-level laser therapy (InGaAlP, 660 nm, 40 mW, 6 J/cm(2)) (n = 54) and laser therapy alone with the same protocol (n = 17). A control group (n = 33) was composed of HSCT patients treated with melphalan who received no specific treatment for OM. OM scores and clinical information were collected from D0 to D + 11. The cryotherapy/laser therapy group showed the lowest OM scores (maximum Grade I) and the lowest mean number of days (8 days) with OM in comparison with the other groups ($p < 0.001$). OM Grades III and IV were present with high frequency only in the control group. The association of cryotherapy with laser therapy was effective in reducing

OM severity in HSCT patients who underwent melphalan conditioning. Melphalan Adolescent;Adult;Aged;Child;Cryotherapy;Female;Hematologic Neoplasms;Hematopoietic Stem Cell Transplantation;Humans;Laser Therapy;Male;Melphalan;Middle Aged;Multiple Myeloma;Prospective Studies;Retrospective Studies;Stomatitis;Time Factors;Treatment Outcome;Young Adult

Benefits of laser phototherapy on nerve repair. Post-traumatic nerve repair represents a major challenge to health sciences. Although there have been great advances in the last few years, it is still necessary to find methods that can effectively enhance nerve regeneration. Laser therapy has been widely investigated as a potential method for nerve repair. Therefore, in this article, a review of the existing literature was undertaken with regard to the effects of low-power laser irradiation on the regeneration of traumatically/surgically injured nerves. The articles were selected using either electronic search engines or manual tracing of the references cited in key papers. In electronic searches, we used the key words as "paresthesia", "laser therapy", "low-power laser and nerve repair", and "laser therapy and nerve repair", considering case reports and clinical studies. According to the findings of the literature, laser therapy accelerates and improves the regeneration of the affected nerve tissues, but there are many conflicting results about laser therapy. This can be attributed to several variables such as wavelength, radiation dose, and type of radiation. All the early in vivo studies assessed in this research were effective in restoring sensitivity. Although these results indicate a potential benefit of the use of lasers on nerve repair, further double-blind controlled clinical trials should be conducted in order to standardize protocols for clinical application. Animals;Humans;Low-Level Light Therapy;Nerve Regeneration;Paresthesia

The efficacy of the in-house light-emitting diode phototherapy equipment compare to conventional phototherapy equipment on the treatment of neonatal hyperbilirubinemia. BACKGROUND: From the empirical study, light-emitting diode (LED) phototherapy is effective for treatment of neonatal hyperbilirubinemia. However commercial LED phototherapy equipment is still expensive. Thus, in-house LED phototherapy equipment has been developed. OBJECTIVE: To compare efficacy between in-house LED to conventional phototherapy equipment in the treatment of neonatal hyperbilirubinemia at Mae Sot Hospital. MATERIAL AND METHOD: This was a randomized controlled trial. Fifty newborns with hyperbilirubinemia were allocated to LED phototherapy group and conventional group. Baseline characteristics were compared and analyzed by descriptive statistics, exact probability and student t-test, and change in serum bilirubin level was analyzed by multilevel regression analysis. RESULTS: There were 25 patients in each of the two groups. The median duration of phototherapy in LED group was 25 hours, whereas the conventional group required 48 hours ($p < 0.001$) and the average serum bilirubin level in LED group decreased more rapidly than in conventional group ($p = 0.007$). Hyperthermia were found in 22 infants from conventional group (88%) compared to 11 infants from LED group (44%) ($p = 0.002$). CONCLUSION: In-house LED phototherapy equipment is more effective than conventional phototherapy in the reduction of serum bilirubin level and occurrence of hyperthermia during treatment is less. Female;Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Male;Phototherapy;Treatment Outcome

Shedding light on a new treatment for diabetic wound healing: a review on phototherapy. Impaired wound healing is a common complication associated with diabetes with complex pathophysiological underlying mechanisms and often necessitates amputation. With the advancement in laser technology, irradiation of these wounds with low-intensity laser irradiation (LILI) or phototherapy, has shown a vast improvement in wound healing. At the correct laser parameters, LILI has shown to increase migration, viability, and proliferation of diabetic cells in vitro; there is a stimulatory effect on the mitochondria with a resulting increase in adenosine triphosphate (ATP). In addition, LILI also has an anti-inflammatory and protective effect on these cells. In light of

the ever present threat of diabetic foot ulcers, infection, and amputation, new improved therapies and the fortification of wound healing research deserves better prioritization. In this review we look at the complications associated with diabetic wound healing and the effect of laser irradiation both in vitro and in vivo in diabetic wound healing. Animals;Diabetes Complications;Humans;Low-Level Light Therapy;Phototherapy;Treatment Outcome;Wound Healing;Wounds and Injuries

Laser doppler myography (LDMi): A novel non-contact measurement method for the muscle activity. BACKGROUND AND AIMS: Electromyography (EMG) is considered the gold-standard for the evaluation of muscle activity. Transversal and dimensional changes of the muscle, during muscle activity, generate vibrational phenomena which can be measured by Laser Doppler Vibrometry (LDVi). There is a relationship between muscle contraction and vibrational activity, therefore, some information on fundamental muscle parameters can be assessed without contact with LDVi. In this paper, we explore the possibility to relate the EMG signal causing the muscle contraction and the vibrational activity also measureable on the muscle. A novel non-contact measurement method - Laser Doppler myography (LDMi) - aiming to measure the vibrational behavior of muscle during contraction, is presented herein. Correlations with some parameters normally measured with EMG are reported. MATERIALS AND METHODS: The proposed method has been compared with standard superficial EMG (sEMG). Signals produced with sEMG and laser Doppler myography have been simultaneously acquired and processed to test correlations on a population of 20 healthy volunteers. Tests have been carried out on the flexor carpi ulnaris and the tibialis anterior muscles (left and right). RESULTS: RESULTS show that it is possible to measure: The timing of muscle activation (max differences: 440 ms), the amplitude of the signals acquired during activation respect to the signals during rest (S/N), the correlation between the S/N of the sEMG and LDMi signals at different levels of force (P> 0.89), and to assess muscle fatigue. CONCLUSIONS: LDMi is a valid measurement technique for the assessment of muscle activity and fatigue. It is a non-contact method and this characteristic could suggest its use together with low level laser therapy pre-, intra- and post-LLLT sessions to evaluate the efficacy and effects of the treatments without the need for invasive electrodes.

Low-level laser irradiation stimulates tenocyte proliferation in association with increased NO synthesis and upregulation of PCNA and cyclins. Low-level laser therapy is commonly used to treat tendinopathy or tendon injury. Tendon healing requires tenocyte migration to the repair site, followed by proliferation and synthesis of the extracellular matrix. There are few evidence to elucidate that low-level laser promote tenocyte proliferation. This study was designed to determine the effect of laser on tenocyte proliferation. Furthermore, the association of this effect with secretion of nitric oxide (NO) and the expressions of proliferating cell nuclear antigen (PCNA) and cyclins D1, E, A, and B1 was investigated. Tenocytes intrinsic to rat Achilles tendon were treated with low-level laser (660 nm). Tenocyte proliferation was evaluated by MTT assay and immunocytochemistry with Ki-67 stain. NO in the conditioned medium was measured by ELISA. Western blot analysis was used to evaluate the protein expressions of PCNA and cyclins D1, E, A, and B1. The results revealed that tenocytes proliferation was enhanced dose dependently by laser. NO secretion was increased after laser treatment. PCNA and cyclins E, A, and B1 were upregulated by laser. In conclusion, low-level laser irradiation stimulates tenocyte proliferation in a process that is mediated by upregulation of NO, PCNA, and cyclins E, A, and B1. Culture Media, Conditioned;Cyclins;Proliferating Cell Nuclear Antigen;Nitric Oxide Achilles Tendon;Animals;Blotting, Western;Cell Proliferation;Culture Media, Conditioned;Cyclins;Immunohistochemistry;Low-Level Light Therapy;Nitric Oxide;Proliferating Cell Nuclear Antigen;Rats, Sprague-Dawley;Up-Regulation;Wound Healing

Low-Level Laser Therapy for the Treatment of Chronic Plantar Fasciitis: A Prospective Study. BACKGROUND: Plantar fasciitis affects nearly 1 million people annually in the United States. Traditional nonoperative management is successful in about 90% of patients, usually within 10

months. Chronic plantar fasciitis develops in about 10% of patients and is a difficult clinical problem to treat. A newly emerging technology, low-level laser therapy (LLLT), has demonstrated promising results for the treatment of acute and chronic pain. METHODS: Thirty patients were administered LLLT and completed 12 months of follow-up. Patients were treated twice a week for 3 weeks for a total of 6 treatments and were evaluated at baseline, 2 weeks post procedure, and 6 and 12 months post procedure. Patients completed the Visual Analog Scale (VAS) and Foot Function Index (FFI) at study follow-up periods. RESULTS: Patients demonstrated a mean improvement in heel pain VAS from 67.8 out of 100 at baseline to 6.9 out of 100 at the 12-month follow-up period. Total FFI score improved from a mean of 106.2 at baseline to 32.3 at 12 months post procedure. CONCLUSION: Although further studies are warranted, this study shows that LLLT is a promising treatment of chronic plantar fasciitis. LEVEL OF EVIDENCE: Level IV, case series.

Effectiveness of occlusal splints and low-level laser therapy on myofascial pain. The present study was designed to evaluate the effects of low-level laser (Nd:YAG) therapy and occlusal splints in patients with signs and symptoms of temporomandibular disorders (TMD) characterized with myofascial pain (MP). A total of 30 patients were selected after being diagnosed with MP according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TDM). The patients were divided into three groups. The first group was occlusal splint (OS) group A (nâ€‰=â€‰10), the second was low-level laser therapy (LLLT) group B (nâ€‰=â€‰10), and the last group C was placebo (nâ€‰=â€‰10). LLLT (1,064 nm, 8 j/cm(2), 250 mW, Fotona) was applied to the patients in the study group once a day for 10 days, for a total of ten sessions. The same parameters and application times were used for placebo group, but the patients were not irradiated. The application was on the trigger points. The patients in the OS group were instructed to wear occlusal splints 12 h/day for 3 weeks. Functional examination was based on RDC/TDM, and pressure pain values were obtained with the Visual Analog Scale. Comparisons were made between the groups before and after the treatment according to Wilcoxon, Mann-Whitney U, and Kruskal-Wallis tests. The pain score values decreased significantly after both LLLT (pâ€‰<â€‰0.05) and occlusal splint therapy (pâ€‰<â€‰0.05) compared to placebo group (pâ€‰<â€‰0.05). There was no significant difference between LLLT and OS groups after treatment (pâ€‰>â€‰0.05). OS and LLLT are effective for decreasing MP. In addition, this particular type of LLLT is as effective as occlusal splint for pain relief. Adult;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Occlusal Splints;Temporomandibular Joint Disorders;Treatment Outcome

[Improved results of the trachea scar stenosis treatment by inclusion in the complex therapy of combined application diprospan and low-intensity infrared laser radiation]. The experience of treating 61 patients over the rumen of stenosis of the trachea was summarizes. To improve the results suggested inclusion complex diprospan treatment in combination with low intensity infrared laser radiation. The advantages of the proposed method of treatment of tracheal stenosis scarring are reduced severity of chronic inflammation, reducing the proliferation of granulation tissue. Drug Combinations;Glucocorticoids;betamethasone dipropionate, betamethasone sodium phosphate drug combination;Betamethasone Betamethasone;Cicatrix;Combined Modality Therapy;Drug Combinations;Glucocorticoids;Humans;Infrared Rays;Low-Level Light Therapy;Tracheal Stenosis

Commentary: treatment and prevention of surgical scars: to bruise or not to bruise is no longer the question, but rather who pays for the treatment. Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Purpura

High-intensity versus low-level laser therapy in the treatment of patients with knee osteoarthritis: a randomized controlled trial. The aim of this randomized controlled study was to compare the effects of low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) on pain relief and functional improvement in patients with knee osteoarthritis (KOA). A total of 53 male patients

participated in this study, with a mean (SD) age of 54.6 (8.49) years. Patients were randomly assigned into three groups and treated with HILT and exercise (HILTâ€‰+â€‰EX), LLLT and exercise (LLLTâ€‰+â€‰EX), and placebo laser plus exercise (PLâ€‰+â€‰EX) in groups 1, 2, and 3, respectively. The outcomes measured were pain level measured by visual analog scale (VAS) and knee function measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Statistical analyses were performed to compare the differences between baseline and posttreatment measurements. The level of statistical significance was set as Pâ€‰<â€‰0.05. The result showed that HILT and LLLT combined with exercise were effective treatment modalities in decreasing the VAS and WOMAC scores after 6 weeks of treatment. HILT combined with exercises was more effective than LLLT combined with exercises, and both treatment modalities were better than exercises alone in the treatment of patients with KOA. Demography;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Treatment Outcome

Low-level laser therapy inhibits bronchoconstriction, Th2 inflammation and airway remodeling in allergic asthma. Low-level laser therapy (LLLT) controls bronchial hyperresponsiveness (BHR) associated with increased RhoA expression as well as pro-inflammatory mediators associated with NF-kB in acute lung inflammation. Herein, we explore if LLLT can reduce both BHR and Th2 cytokines in allergic asthma. Mice were studied for bronchial reactivity and lung inflammation after antigen challenge. BHR was measured through dose-response curves to acetylcholine. Some animals were pretreated with a RhoA inhibitor before the antigen. LLLT (660 nm, 30 mW and 5.4 J) was applied on the skin over the right upper bronchus and two irradiation protocols were used. Reduction of BHR post LLLT coincided with lower RhoA expression in bronchial muscle as well as reduction in eosinophils and eotaxin. LLLT also diminished ICAM expression and Th2 cytokines as well as signal transducer and activator of transduction 6 (STAT6) levels in lungs from challenged mice. Our results demonstrated that LLLT reduced BHR via RhoA and lessened allergic lung inflammation via STAT6. Amides;Cytokines;Enzyme Inhibitors;Pyridines;STAT6 Transcription Factor;Stat6 protein, mouse;Y 27632;Ovalbumin;RhoA protein, mouse;rho GTP-Binding Proteins;rhoA GTP-Binding Protein Airway Remodeling;Amides;Animals;Asthma;Bronchi;Bronchial Hyperreactivity;Bronchoconstriction;Cytokines;Enzyme Inhibitors;Hypersensitivity;Low-Level Light Therapy;Lung;Male;Mice;Mice, Inbred BALB C;Muscle, Smooth;Ovalbumin;Pneumonia;Pyridines;STAT6 Transcription Factor;rho GTP-Binding Proteins;rhoA GTP-Binding Protein

Effects of low intensity laser irradiation during healing of infected skin wounds in the rat. BACKGROUND AND OBJECTIVE: Low intensity laser irradiation remains a controversial treatment for non-healing wounds. This study examines the effect of low intensity light on healing of infected skin wounds in the rat. MATERIALS AND METHODS: Wounds on the rat dorsum were inoculated with Pseudomonas aeruginosa. Wounds were irradiated or sham-irradiated three times weekly from day 1 to 19 using 635-nm or 808-nm diode lasers delivering continuous wave (CW) or intensity modulated (3800 Hz) laser radiation, all at radiant exposures of 1 and 20 J/cm(2). Wound area and bacterial growth on the wound surface were evaluated three times a week. Histological and immunohistochemical analyses were performed at day 8 and 19. RESULTS: Wounds that were irradiated using a wavelength of 635 nm (1 and 20 J/cm(2)) or intensity modulated 808-nm laser light at 20 J/cm(2) were smaller in area at day 19 than the sham-irradiated controls (achieved significance level=0.0105-0.0208) and were similar to controls in respect of bacterial growth. The remaining light protocols had no effect on wound area at day 19 although they increased Staphylococcus aureus growth across the time line compared with controls ($p<0.0001$ to $p<0.004$). CW 808-nm light at 20 J/cm(2) significantly delayed half-heal time. Histological and immunohistochemical analyses supported wound closure findings: improved healing was associated with faster resolution of

inflammation during the acute phase and increased signs of late repair at day 19. Significant inflammation was seen at day 19 in all irradiated groups regardless of radiant exposure, except when using 635 nm at 1 J/cm(2). CONCLUSIONS: Red light improved healing of wounds. Only one 808-nm light protocol enhanced healing; lack of benefit using the remaining 808-nm light protocols may have been due to stimulatory effects of the light on S. aureus growth.

Low-level laser therapy with a wrist splint to treat carpal tunnel syndrome: a double-blinded randomized controlled trial. The efficacy of low-level laser therapy (LLLT) was evaluated in a total of 66 patients with mild to moderate carpal tunnel syndrome (CTS) with a double-blinded randomized controlled study. The patients were randomly assigned into two groups. Group I received 15 sessions of a gallium-aluminum-arsenide laser treatment at a dosage of 18 J per session over the carpal tunnel area with neutral wrist splint. Group II received placebo laser therapy with neutral wrist splint. The patients were evaluated with the following parameters: (1) clinical parameters which consisted of visual analog scale, symptom severity scale, functional status scale, and pinch strength and grip strength before the treatment and at 5- and 12-week follow-ups and (2) electroneurophysiological parameters from nerve conduction study which were evaluated before the treatment and at 12-week follow-up. Fifty nine patients (112 hands: unilateral CTS = 6 hands and bilateral CTS = 106 hands) completed the study. Both groups I and II had n = 56 hands. Improvements were significantly more pronounced in the LLLT-treated group than the placebo group especially for grip strength at 5- and 12-week follow-ups. At 12-week follow-up, distal motor latency of the median nerve was significantly improved in the LLLT group than the placebo group ($p < 0.05$). LLLT therapy, as an alternative for a conservative treatment, is effective for treating mild to moderate CTS patients. It can improve hand grip strength and electroneurophysiological parameter with a carry-over effect up to 3 months after treatment for grip strength of the affected hands. Carpal Tunnel Syndrome;Demography;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Splints;Wrist

Chemotherapy-induced oral mucositis: effect of LED and laser phototherapy treatment protocols. BACKGROUND AND OBJECTIVE: Over the last few decades, many studies have focused on the effect of lasers on the management of oral mucositis in oncologic patients treated with chemotherapy and/or radiotherapy. However, the effect of light-emitting diode (LED) has been poorly studied, and was not compared with that of laser phototherapy (LPT). For this reason, the aim of the present study was to clinically compare the effect of these two therapies on chemotherapy-induced oral mucositis (CIOM) and pain. METHODS: Forty patients with CIOM were divided into two groups: G1, patients treated with LPT; G2, patients treated with LED. The treatment was administered during 10 consecutive days, with exception of weekends. LPT was applied using an InGaAlP laser (660 nm/40 mW/6.6 J cm-(2)/0.24 J per point/0.036 cm(2) of spot size). LED phototherapy was applied using 0.24 J per point/80 mW/630 nm/1 cm(2) of spot size. CIOM was assessed during each session in accordance to the World Health Organization (WHO) score. The patient self-assessed pain was scored on a visual analog scale (VAS). RESULTS: The mean VAS and WHO scores were significantly smaller in the LED group ($p<0.05$). However, both groups required the same number of days to reach score zero for mucositis and pain ($p>0.05$). Moreover, in the group with severe mucositis (score III), there was a lower frequency of patients with complete healing and pain relief, with the exception of analgesia in G2, in which almost all patients were completely relieved from pain. CONCLUSIONS: These findings suggest that LED therapy is more effective than LPT in the treatment of COIM, with the parameters used in the present study. Adult;Female;Humans;Laser Therapy;Male;Middle Aged;Phototherapy;Prospective Studies;Stomatitis

Efficacy and safety of a low-level laser device in the treatment of male and female pattern hair loss: a multicenter, randomized, sham device-controlled, double-blind study. SIGNIFICANCE: Male and

female pattern hair loss are common, chronic dermatologic disorders with limited therapeutic options. In recent years, a number of commercial devices using low-level laser therapy have been promoted, but there have been little peer-reviewed data on their efficacy. OBJECTIVE: To determine whether treatment with a low-level laser device, the US FDA-cleared HairMax LasercombÂ®, increases terminal hair density in both men and women with pattern hair loss. METHODS: Randomized, sham device-controlled, double-blind clinical trials were conducted at multiple institutional and private practices. A total of 146 male and 188 female subjects with pattern hair loss were screened. A total of 128 male and 141 female subjects were randomized to receive either a lasercomb (one of three models) or a sham device in concealed sealed packets, and were treated on the whole scalp three times a week for 26 weeks. Terminal hair density of the target area was evaluated at baseline and at 16- and 26-week follow-ups, and analyzed to determine whether the hypothesis formulated prior to data collection, that lasercomb treatment would increase terminal hair density, was correct. The site investigators and the subjects remained blinded to the type of device they dispensed/received throughout the study. The evaluator of masked digital photographs was blinded to which trial arm the subject belonged. RESULTS: Seventy-eight, 63, 49, and 79 subjects were randomized in four trials of 9-beam lasercomb treatment in female subjects, 12-beam lasercomb treatment in female subjects, 7-beam lasercomb treatment in male subjects, and 9- and 12-beam lasercomb treatment in male subjects, compared with the sham device, respectively. Nineteen female and 25 male subjects were lost to follow-up. Among the remaining 122 female and 103 male subjects in the efficacy analysis, the mean terminal hair count at 26 weeks increased from baseline by 20.2, 20.6, 18.4, 20.9, and 25.7 per cm2 in 9-beam lasercomb-treated female subjects, 12-beam lasercomb-treated female subjects, 7-beam lasercomb-treated male subjects, and 9- and 12-beam lasercomb-treated male subjects, respectively, compared with 2.8 ($p<0.0001$), 3.0 ($p<0.0001$), 1.6 ($p=0.0017$), 9.4 ($p=0.0249$), and 9.4 ($p=0.0028$) in sham-treated subjects (95% confidence interval). The increase in terminal hair density was independent of the age and sex of the subject and the lasercomb model. Additionally, a higher percentage of lasercomb-treated subjects reported overall improvement of hair loss condition and thickness and fullness of hair in self-assessment, compared with sham-treated subjects. No serious adverse events were reported in any subject receiving the lasercomb in any of the four trials. CONCLUSIONS AND RELEVANCE: We observed a statistically significant difference in the increase in terminal hair density between lasercomb- and sham-treated subjects. No serious adverse events were reported. Our results suggest that low-level laser treatment may be an effective option to treat pattern hair loss in both men and women. Additional studies should be considered to determine the long-term effects of low-level laser treatment on hair growth and maintenance, and to optimize laser modality.
Adult;Alopecia;Double-Blind Method;Female;Hair;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies

Low-power laser therapy in chemical-induced oral mucositis: a case study.
Adolescent;Antineoplastic Combined Chemotherapy Protocols;Female;Humans;Low-Level Light Therapy;Stomatitis;Treatment Outcome

The effect of photobiomodulation on root resorption during orthodontic treatment.
Photobiomodulation is used to accelerate tooth movement during orthodontic treatments. The changes in root morphology in a group of orthodontic patients who received photobiomodulation were evaluated using the cone beam computed tomography technique. The device used is called OrthoPulse, which produces low levels of light with a near infrared wavelength of 850 nm and an intensity of 60 mW/cm(2) continuous wave. Twenty orthodontic patients were recruited for these experiments, all with class 1 malocclusion and with Little's Irregularity Index (>2 mm) in either of the arches. Root resorption was detected by measuring changes in tooth length using cone beam

computed tomography. These changes were measured before the orthodontic treatment and use of low-level laser therapy and after finishing the alignment level. Little's Irregularity Index for all the patients was calculated in both the maxilla and mandible and patients were divided into three groups for further analysis, which were then compared to the root resorption measurements. Our results showed that photobiomodulation did not cause root resorption greater than the normal range that is commonly detected in orthodontic treatments. Furthermore, no correlation between Little's Irregularity Index and root resorption was detected.

Cumulative effect of low-level laser therapy and low-intensity pulsed ultrasound on bone repair in rats. Many studies have assessed the effects of either low-level laser therapy (LLLT) or low-intensity pulsed ultrasound (LIPUS) on bone repair; however, an evaluation of the combination of these modalities (LLLT + LIPUS) has not yet been considered. The aim of this study was to demonstrate the effects of LLLT + LIPUS on bone repair. Male Wistar rats (n = 128; four groups of 32) were used; the animals underwent a partial tibial bone osteotomy. One group had the osteotomized limb treated with LLLT, the second group with LIPUS, and the third group with the combined treatment protocols of the LLLT and LIPUS groups; the fourth group received no further treatment (control). Each group was divided into two subgroups for assessment at two different time-points, 14 and 21 days. After the completion of treatment rats were sacrificed and the tibias submitted to a three-point bending test or to histomorphometric analysis. Histological evaluation showed increased bone trabeculae, increased vascularization, and decreased inflammation in the LLLT + LIPUS group. Mechanical evaluation revealed increased biomechanical properties including maximum force, maximum stress, and stiffness, in the LLLT + LIPUS group. Combined LLLT + LIPUS treatment enhanced bone healing both histologically and mechanically, shortening the length of the treatment period, when compared to treatment with LLLT or LIPUS alone. Animals;Low-Level Light Therapy;Male;Osteotomy;Rats;Rats, Wistar;Stress, Mechanical;Tibia;Ultrasonic Therapy;Wound Healing

Gold nanocage-photosensitizer conjugates for dual-modal image-guided enhanced photodynamic therapy. We have demonstrated that gold nanocage-photosensitizer conjugates can enable dual image-guided delivery of photosensitizer and significantly improve the efficacy of photodynamic therapy in a murine model. The photosensitizer, 3-devinyl-3-(1'-hexyloxyethyl)pyropheophorbide (HPPH), was noncovalently entrapped in the poly(ethylene glycol) monolayer coated on the surface of gold nanocages. The conjugate is stable in saline solutions, while incubation in protein rich solutions leads to gradual unloading of the HPPH, which can be monitored optically by fluorescence and photoacoustic imaging. The slow nature of the release in turn results in an increase in accumulation of the drug within implanted tumors due to the passive delivery of gold nanocages. Furthermore, the conjugate is found to generate more therapeutic singlet oxygen and have a lower IC50 value than the free drug alone. Thus the conjugate shows significant suppression of tumor growth as compared to the free drug in vivo. Short-term study showed neither toxicity nor phenotypical changes in mice at therapeutic dose of the conjugates or even at 100-fold higher than therapeutic dose of gold nanocages. Photosensitizing Agents;Gold Animals;Disease Models, Animal;Gold;Humans;Inhibitory Concentration 50;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Nanoparticles;Neoplasms;Optical Imaging;Photoacoustic Techniques;Photochemotherapy;Photosensitizing Agents;Treatment Outcome

Influence of the Î»780nm laser light on the repair of surgical bone defects grafted or not with biphasic synthetic micro-granular hydroxylapatite+Beta-Calcium triphosphate. The treatment of bone loss due to different etiologic factors is difficult and many techniques aim to improve repair, including a wide range of biomaterials and, recently, photobioengineering. This work aimed to assess, through histological analysis The aim of this study was to assess, by light microscopy, the repair of bone

defects grafted or not with biphasic synthetic micro-granular Calcium hydroxyapatite (HA)+Beta-TCP associated or not with Laser phototherapy - LPT (Î»780nm). Forty rats were divided into 4 groups each subdivided into 2 subgroups according to the time of sacrifice (15 and 30days). Surgical bone defects were made on femur of each animal with a trephine drill. On animals of Clot group the defect was filled only by blood clot, on Laser group the defect filled with the clot was further irradiated. On animals of Biomaterial and Laser+Biomaterial groups the defect was filled by biomaterial and the last one was further irradiated (Î»780nm, 70mW, spot sizeâˆ¼0.4cm(2), 20J/cm(2)-session, 140J/cm(2)-treatment) in four points around the defect at 48-h intervals and repeated for 2weeks. At both 15th and 30th days following sacrifice, samples were taken and analyzed by light microscopy. Many similarities were observed histologically between groups on regards bone reabsorption and neoformation, inflammatory infiltrate and collagen deposition. The criterion degree of maturation, marked by the presence of basophilic lines, indicated that the use of LPT associated with HA+Beta TCP graft, resulted in more advanced stage of bone repair at the end of the experiment. Biocompatible Materials;Bone Substitutes;Calcium Phosphates;beta-tricalcium phosphate;Durapatite Animals;Biocompatible Materials;Bone Substitutes;Bone and Bones;Calcium Phosphates;Durapatite;Low-Level Light Therapy;Male;Rats, Wistar;Wound Healing

[Low level laser therapy in inflammatory and infectious oral diseases]. PURPOSE: Low Level Laser Therapy (LLLT) is an increasingly studied technique. The authors of a meta-analysis published in 2012Â had already confirmed the effectiveness of LLLT for radio-induced mucitis. Our purpose was to check its indication for similar pathologies. MATERIAL AND METHODS: The articles were selected with the PubMed engine. The selected terms were "Low Level Laser Therapy", "oral surgery", "oral infection", "oral inflammation", "oral mucosal lesions", "oral mucosal disease", "stomatitis", "aphtous", "Herpes", "oral lichen planus", and "oral ulceration". The analysis was made on the following criteria: assessment criteria, methodological quality, and bias. We estimated the level of proof according to Sackett's modified score. RESULTS: Six articles were selected. Two focused on the effectiveness of LLLT for Herpes simplex virus 1Â oral symptoms. Two focused on the effectiveness of LLLT for oral lichen planus. One focused on the effectiveness of LLLT for recurrent aphthous stomatitis. The last one focused on the usefulness of LLLT to control stomatitis pain in the hand-foot-and-mouth disease. CONCLUSION: All the selected studies were assessed with a Sackett's score of IV. No study presented the required quality standards to recommend the treatment of LLLT for the selected indications. Humans;Infections;Low-Level Light Therapy;Mouth Diseases;Patient Acceptance of Health Care;Stomatitis;Treatment Outcome

The effect of the thermal diode laser (wavelength 808-980 nm) in non-surgical periodontal therapy: a systematic review and meta-analysis. FOCUSED QUESTION: What is the adjunctive effect of a diode laser (DL) following non-surgical periodontal debridement (SRP) during the initial phase of periodontal therapy on the clinical parameters of periodontal inflammation. MATERIAL AND METHODS: The MEDLINE-PubMed, Cochrane-Central Register of Controlled Trials and EMBASE databases were searched up to September 2013. Probing pocket depth (PPD) and clinical attachment loss (CAL) were selected as outcome variables. Also plaque scores (PS), bleeding scores (BS) and the Gingival Index (GI) were considered outcome measures. Data were extracted and a meta-analysis (MA) was performed where appropriate. RESULTS: Independent screening of 416 unique papers resulted in nine eligible publications. The MA evaluating PPD, CAL and PS showed no significant effect. The only significance favouring adjunctive use of the DL was observed for the outcome parameters GI and BS. CONCLUSION: The collective evidence regarding adjunctive use of the DL with SRP indicates that the combined treatment provides an effect comparable to that of SRP alone. That is for PPD and CAL. The body of evidence considering the adjunctive use of the DL is judged to be "moderate" for changes in PPD and CAL. With respect to BS, the results showed a small but significant

effect favouring the DL, however, the clinical relevance of this difference remains a question. This systematic review questions the adjunctive use of DL with traditional mechanical modalities of periodontal therapy in patients with periodontitis. Combined Modality Therapy;Dental Plaque Index;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Attachment Loss;Periodontal Debridement;Periodontal Index;Periodontal Pocket;Periodontitis

Mast cell curve-response in partial Achilles tendon rupture after 830 nm phototherapy. OBJECTIVE: The aim of this study was to quantify mast cells at different time intervals after partial Achilles tendon rupture in rats treated with low-level laser therapy (LLLT). BACKGROUND DATA: There is a high incidence of lesions and ruptures in the Achilles tendon that can take weeks and even months to heal completely. As the mast cells help in the healing repair phase, and LLLT has favorable effects on this tissue repair process, study of this modality on the quantity of mastocytes in the ruptured tendon is relevant. METHODS: Sixty Wistar rats were subjected to partial Achilles' tendon rupture by direct trauma, randomized into 10 groups, and then divided into the group treated with 80 mW aluminum gallium arsenide infrared laser diode, continuous wave, 2.8 W/cm(2) power density, 40 J/cm(2) energy density, and 1.12 J total energy, and the simulation group. Both the groups were subdivided according to the histological assessment period of the sample, either 6 h, 12 h, 24 h, 2 days, or 3 days after the rupture, to quantify the mastocytes in the Achilles' tendon. RESULTS: The group subjected to LLLT presented a greater quantity of mastocytes in the periods of 6 h, 12 h, 24 h, 2 days, and 3 days after rupture, compared with the simulation groups, but differences were detected between the sample assessment periods only in the simulation group. CONCLUSIONS: LLLT was shown to increase the quantity of mastocytes in the assessment periods compared with the simulation groups. Achilles Tendon;Animals;Immunohistochemistry;Low-Level Light Therapy;Male;Mast Cells;Rats;Rats, Wistar;Rupture;Tendon Injuries;Wound Healing

Effects of pre- or post-exercise low-level laser therapy (830 nm) on skeletal muscle fatigue and biochemical markers of recovery in humans: double-blind placebo-controlled trial. OBJECTIVES: The purpose of this study was to investigate the effect of low-level laser therapy (LLLT) before and after exercise on quadriceps muscle performance, and to evaluate the changes in serum lactate and creatine kinase (CK) levels. METHODS: The study was randomized, double blind, and placebo controlled. PATIENTS: A sample of 27 healthy volunteers (male soccer players) were divided into three groups: placebo, pre-fatigue laser, and post-fatigue laser. The experiment was performed in two sessions, with a 1 week interval between them. Subjects performed two sessions of stretching followed by blood collection (measurement of lactate and CK) at baseline and after fatigue of the quadriceps by leg extension. LLLT was applied to the femoral quadriceps muscle using an infrared laser device (830 nm), 0.0028 cm(2) beam area, six 60 mW diodes, energy of 0.6 J per diode (total energy to each limb 25.2 J (50.4 J total), energy density 214.28 J/cm(2), 21.42 W/cm(2) power density, 70 sec per leg. We measured the time to fatigue and number and maximum load (RM) of repetitions tolerated. Number of repetitions and time until fatigue were primary outcomes, secondary outcomes included serum lactate levels (measured before and 5, 10, and 15 min after exercise), and CK levels (measured before and 5 min after exercise). RESULTS: The number of repetitions ($p=0.8965$), RM ($p=0.9915$), and duration of fatigue ($p=0.8424$) were similar among the groups. Post-fatigue laser treatment significantly decreased the serum lactate concentration relative to placebo treatment ($p<0.01$) and also within the group over time (after 5 min vs. after 10 and 15 min, $p<0.05$ both). The CK level was lower in the post-fatigue laser group ($p<0.01$). CONCLUSIONS: Laser application either before or after fatigue reduced the post-fatigue concentrations of serum lactate and CK. The results were more pronounced in the post-fatigue laser group. Lactic Acid;Creatinine Adolescent;Adult;Creatinine;Double-Blind Method;Exercise;Humans;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Quadriceps Muscle;Young Adult

Photobiomodulation and implants: implications for dentistry. The use of dental implants has become a mainstay of rehabilitative and restorative dentistry. With an impressive clinical success rate, there remain a few minor clinical issues with the use of implants such as peri-implant mucositis and peri-implantitis. The use of laser technology with implants has a fascinating breadth of applications, beginning from their precision manufacturing to clinical uses for surgical site preparation, reducing pain and inflammation, and promoting osseointegration and tissue regeneration. This latter aspect is the focus of this review, which outlines various studies of implants and laser therapy in animal models. The use of low level light therapy or photobiomodulation has demonstrated its efficacy in these studies. Besides more research studies to understand its molecular mechanisms, significant efforts are needed to standardize the clinical dosing and delivery protocols for laser therapy to ensure the maximal efficacy and safety of this potent clinical tool for photobiomodulation.

Lack of effectiveness of laser therapy applied to the nerve course and the correspondent medullary roots. OBJECTIVE: To investigate the influence of low intensity laser irradiation on the regeneration of the fibular nerve of rats after crush injury. METHODS: Twenty-five rats were used, divided into three groups: 1) intact nerve, no treatment; 2) crushed nerve, no treatment; 3) crush injury, laser irradiation applied on the medullary region corresponding to the roots of the sciatic nerve and subsequently on the course of the damaged nerve. Laser irradiation was carried out for 14 consecutive days. RESULTS: Animals were evaluated by functional gait analysis with the peroneal functional index and by histomorphometric analysis using the total number of myelinated nerve fibers and their density, total number of Schwann cells, total number of blood vessels and the occupied area, minimum diameter of the fiber diameter and G-quotient. CONCLUSION: According to the statistical analysis there was no significant difference among groups and the authors conclude that low intensity laser irradiation has little or no influence on nerve regeneration and functional recovery. Laboratory investigation .

Prevention or treatment of hypertrophic burn scarring: a review of when and how to treat with the pulsed dye laser. The purpose of this review is to investigate the use of Pulsed Dye Laser (PDL) as a therapeutic tool for hypertrophic burns scarring. The difference between keloids and hypertrophic scars is first described. The review then outlines the progress and assessment of hypertrophic scars for burns patients and the problem of their clinical management. The assessment using both objective and subjective measurements for complete account of hypertrophic scars is explained. The efficacy of PDL for both prevention and treatment is summarised for all hypertrophic scarring and the various laser treatment protocols in previous research is studied. The differentiation between prevention and treatment is discussed in relation to scar duration and the need for prevention rather than treatment is then proposed for intervention using PDL. The paper concludes with recommendations for future research through a prospective randomised, controlled study using 595 nm PDL in the prevention of scars with less than 6 month duration. Burns;Cicatrix, Hypertrophic;Humans;Lasers, Dye;Low-Level Light Therapy

[The influence of low-intensity intravenous laser irradiation of the blood on the endothelial function in the patients presenting with gastroesophageal reflux disease]. The present study included 100 patients presenting with gastroesophageal reflux disease (GERD) including 68 (68%) women and 32 (32%) men. They were divided into 2 groups, with the study group comprised of 70 patients and the control one containing 30 patients. The objective of the study was to estimate the influence of low-intensity intravenous laser irradiation of the blood on the NO-producing function of vascular endothelium in the patients suffering GERD. The results of the study indicate that traditional medicamental therapy of the patients with GERD does not produce a significant improvement of plasma levels of stable nitric oxide metabolites whereas low-intensity intravenous laser irradiation of

the blood results in well apparent normalization of this parameter regardless of its initial value, either high or low. Nitric Oxide Adult;Aged;Endothelium, Vascular;Female;Gastroesophageal Reflux;Humans;Low-Level Light Therapy;Male;Middle Aged;Nitric Oxide

Adhesion between glass fiber posts and resin cement: evaluation of bond strength after various pre-treatments. PURPOSE: To evaluate surface roughness and bond strength of glass fiber posts to a resin cement after various surface treatments. MATERIALS AND METHODS: Sixty individually formed glass fiber posts with a diameter of 1.5 mm and a length of 20 mm were used for this study. They were randomly assigned to six groups of pre-treatment (n = 10/group): Group C, untreated (control); Group SB, sandblasted; Group SC, silica coated; Group HF, hydrofluoric acid-etched; Group N, Nd:YAG laser irradiated; Group E, Er:YAG laser irradiated. Surface roughness of the posts was measured before and after pre-treatment. The posts were then bonded to resin cement and tensile bond strengths were determined in a universal testing machine. For statistical analysis, two-way ANOVA and post-hoc comparison tests (Î± = 0.05) were performed. RESULTS: The highest bond strength value was observed in group HF, followed by group SC. There was a statistically significant difference in bond strength between group C and groups HF, SC and E ($p < 0.001$, $p = 0.002$ and $p = 0.041$, respectively). Posts of group SB and group N showed the highest surface roughness. CONCLUSIONS: The findings of the present study reveal that hydrofluoric acid-etching, silica coating and Er:YAG laser irradiation provided a significant increase in bond strength between glass fiber posts and resin cement. Composite Resins;Dental Cements;Duo-Link;Methacrylates;Resin Cements;Rocatec;Silanes;everStick;fiberglass;methacryloxypropyltrimethoxysilane;Aluminum Oxide;Hydrofluoric Acid Acid Etching, Dental;Air Abrasion, Dental;Aluminum Oxide;Composite Resins;Dental Bonding;Dental Cements;Dental Etching;Dental Stress Analysis;Glass;Humans;Hydrofluoric Acid;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Methacrylates;Microscopy, Electron, Scanning;Post and Core Technique;Resin Cements;Silanes;Stress, Mechanical;Surface Properties;Tensile Strength

Assessment of functional recovery of sciatic nerve in rats submitted to low-level laser therapy with different fluences. An experimental study: laser in functional recovery in rats. Peripheral nerve lesions caused sensory and motor deficits along the distribution of the injured nerve. Numerous researches have been carried out to enhance and/or accelerate the recovery of such lesions. The objective of this study was to assess the functional recovery of sciatic nerve in rats subjected to different fluences of low-level laser therapy (LLLT). Thirty-six animals were randomly divided into four groups: one consisting of sham rats and three others irradiated with progressive fluencies of 10Â J/cm(2), 40Â J/cm(2) and 80Â J/cm(2) of laser AsGaAl (830Â nm) for 21 consecutive days. They were evaluated by the Sciatic Functional Index (SFI) method. The crush injury was performed by using a portable device with dead weight of 5,000Â g whose load was applied for 10Â min. A digital camera was used to record the footprints left on the acrylic track, before surgery and after, on the 7th, 14th, and 21st days. The results also showed that on the 7th day, there was a difference between the groups irradiated with 40Â J/cm(2), when compared with the sham group (pâ€‰<â€‰0.05). On the 14th day the groups irradiated with 40Â J/cm(2) and 80Â J/cm(2) also presented better results when compared with sham, however, on the 21st day, no inter-group difference was found (pâ€‰>â€‰0.05). It was possible to observe that the LLLT at fluency of 40Â J/cm(2) and 80Â J/cm(2) had a positive influence on the acceleration of the functional nerve recovery.

Protein conformational modulation by photons: a mechanism for laser treatment effects. Responsiveness to low-level laser treatment (LLTT) at a wavelength of 450-910 nm has established it as an effective treatment of medical, veterinary and dental chronic pain, chronic inflammation conditions (arthritis and macular degeneration), wound repair, and lymphoedema, yet the mechanisms underlying the effectiveness of LLLT remain unclear. However, there is now sufficient

evidence from recent research to propose an integrated model of LLLT action. The hypothesis presented in this paper is that external applications of photons (through laser at an appropriate dose) modulates the nervous system through an integrated mechanism. This stimulated mechanism involves protein-to-protein interaction, where two or more proteins bind together to facilitate molecular processes, including modification of proteins by members of SUMO (small ubiquitin-related modifier proteins) and also protein phosphorylation and tyrosination. SUMO has been shown to have a role in multiple nuclear and perinuclear targets, including ion channels, and in the maintenance of telomeres and the post-translational modification of genes. The consequence of laser application in treatment, therefore, can be seen as influencing the transmission of neural information via an integrated and rapid modulation of ion channels, achieved through both direct action on photo-acceptors (such as cytochrome c-oxidase) and through indirect modulation via enzymes, including tyrosine hydroxylase (TH), tyrosine kinases and tyrosine kinase receptors. This exogenous action then facilitates an existing photonic biomodulation mechanism within the body, and initiates ion channel modulation both in the periphery and the central nervous system (CNS). Evidence indicates that the ion channel modulation functions predominately through the potassium channels, including two pore leak channels (K2P), which act as signal integrators from the periphery to the cortex. Photonic action also transforms SUMOylation processes at the cell membrane, nucleus and telomeres via signalling processes from the mitochondria (which is the main target of laser absorption) to these targets. Under the hypothesis, these observed biological effects would play a part in the bystander effect, the abscopal effect, and other systemic effects observed with the application of low level laser (LLLT). The implications of the hypothesis are important in that they point to mechanisms that can account for the effectiveness of laser in the treatment and prevention of inflammatory diseases, chronic pain and neurodegenerative disorders. Proteins Lasers;Photons;Protein Conformation;Proteins

Low-level laser therapy suppresses the oxidative stress-induced glucocorticoids resistance in U937 cells: relevance to cytokine secretion and histone deacetylase in alveolar macrophages.

Oxidative stress is present in severe asthma and contributes to the low response to corticoids through the downregulation of histone deacetylase (HDAC) and the increase of cytokines. Low-level laser therapy (LLLT) has been proven to be an anti-inflammatory. Thus, we investigated the laser effect on lipopolysaccharide (LPS)-induced cytokine secretion and HDAC activity in U937 cells under oxidative stress. U937 cells activated with oxidative stress were treated with dexamethasone (dexa) or laser. Cytokines and phosphoinositide 3-kinase (PI3K) were measured by ELISA whilst the HDAC was detected through colorimetric assay. LPS activated- U937 cells cytokines secretion increased with H2O2 (hydrogen peroxide) as well as with TSA (trichostatin). The HDAC activity in activated U937 cells was decreased. LLLT and dexa inhibited the LPS-stimulated U937 cells cytokines, but dexa effect disappeared with H2O2. With TSA, the LLLT was less effective on H2O2/LPS stimulated- U937 cells cytokines. Dexa failed on H2O2/LPS- induced HDAC, while LLLT restored the HDAC and the dexa effect. LLLT plus prostaglandin E2 (PGE2) increased cyclic adenosine monophosphate (cAMP) and potentiated the laser action on oxidative stress-induced cytokine. LLLT reduced the PI3K and its effects on cytokine and HDAC was suppressed with LY294002. In situations of corticoid resistance, LLLT acts decreasing the cytokines and HDAC through the activation of the protein kinase A via the inhibition of PI3K. CXCL8 protein, human;Glucocorticoids;Interleukin-8;Lipopolysaccharides;Tumor Necrosis Factor-alpha;Dexamethasone;Cyclic AMP;Phosphatidylinositol 3-Kinases;Cyclic AMP-Dependent Protein Kinases;Histone Deacetylases Cyclic AMP;Cyclic AMP-Dependent Protein Kinases;Dexamethasone;Drug Resistance;Glucocorticoids;Histone Deacetylases;Humans;Interleukin-8;Lipopolysaccharides;Low-Level Light Therapy;Macrophages, Alveolar;Oxidative Stress;Phosphatidylinositol 3-Kinases;Tumor Necrosis Factor-alpha;U937 Cells

Efficacy of low-level laser therapy applied at acupuncture points in knee osteoarthritis: a randomised double-blind comparative trial. OBJECTIVE: To evaluate the efficacy of low-level laser therapy (LLLT) applied to acupuncture points on the knee joint in combination with exercise and advice in patients with knee osteoarthritis. DESIGN: Randomised, double-blind, comparative clinical trial. PARTICIPANTS: Forty-nine patients with knee osteoarthritis were assigned at random into two groups: active laser group (n=26) and placebo laser group (n=23). INTERVENTION: Using a gallium aluminium arsenide laser device, patients received either active or placebo LLLT at five acupuncture points on the affected knee during nine sessions. OUTCOME MEASURES: Patients were assessed using a visual analogue scale (VAS) and the Saudi Knee Function Scale (SKFS) at baseline, the fifth treatment session, the last treatment session, 6 weeks post intervention and 6 months post intervention. RESULTS: VAS scores showed a significant improvement in the active laser group compared with the placebo laser group at 6 weeks post intervention [mean difference -1.3, 95% confidence interval (CI) of the difference -2.4 to -0.3; P=0.014] and 6 months post intervention (mean difference -1.8, 95% CI of the difference -3.0 to -0.7; P=0.003) using the independent samples test. SKFS scores also showed a significant improvement in the active laser group compared with the placebo laser group at the last treatment session (median difference -15, 95% CI of the difference -27 to -2; P=0.035) and 6 months post intervention (median difference -21, 95% CI of the difference -34 to -7; P=0.006) using the Mann-Whitney U test. CONCLUSIONS: The results demonstrate that short-term application of LLLT to specific acupuncture points in association with exercise and advice is effective in reducing pain and improving quality of life in patients with knee osteoarthritis. Acupuncture Points;Disability Evaluation;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Treatment Outcome

The efficacy of the use of IR laser phototherapy (LPT) on bone defect grafted with biphasic ceramic on rats with iron deficiency anemia: Raman spectroscopy analysis. The aim of this study was to evaluate bone repair in anemic and non-anemic rats submitted or not to laser phototherapy and hydroxyapatite graft. Animals were divided in eight groups of five animals: Clot; Laser; Graft; Graft + Laser; iron deficiency anemia (IDA) + Clot; IDA + Laser; IDA + graft; IDA + graft + Laser. When appropriate irradiation with infrared laser was done during 15 days at a 48-h interval. Animals were killed at day 30; samples were analyzed by Raman spectroscopy. Three shifts were studied and statistically analyzed: ~960, ~1,070, and ~1,454 cm(-1). Graft + laser showed highest ~960 peak was statistically different from all other healthy groups. No statistical difference was found between Clot and IDA + Clot in any shift. The IDA + Graft and IDA + Graft + Laser groups had low mean peak values for shifts ~960, ~1,070, and ~1,454 cm(-1). The results in this study indicate that using hydroxyapatite (HA) and laser irradiation in healthy subjects is favorable to mineral deposition and bone maturation, this being of importance for some groups at risk, such as astronauts. In iron deficiency anemia cases, the use of graft, associated or not to laser irradiation, resulted in low collagen and low carbonate and phosphate HA. Analysis of Variance;Anemia, Iron-Deficiency;Animals;Bone and Bones;Ceramics;Infrared Rays;Lasers;Linear Models;Phototherapy;Rats, Wistar;Spectrum Analysis, Raman;Treatment Outcome

Effect of the clinical application of the diode laser (810 nm) in the treatment of dentine hypersensitivity. BACKGROUND: Dentine hypersensitivity is a common clinical finding with a wide variation in prevalence values. The aim of this study was to evaluate the use of diode laser (810 nm) in the treatment of cervical dentine hypersensitivity. METHODS: Five patients, with at least two sensitive teeth were selected. A total of 14 teeth were included in this trial. By using Visual Analogous Scale the pain of dentine hyper sensitivity was detected and the pre- treatment readings were recorded.The Diode laser (810 nm), was irradiated on (non contact) mode at the cervical region.The samples were divided into two groups according to exposure duration: For Group 1 exposure

duration was 30 seconds and for group 2 exposure duration was one minute.The efficiency of the treatment was assessed at two examination period :15 minutes after first application and 7 days after first application, the degree of sensitivity was determined by using Visual Analogous Scale. RESULTS: The results show significant reduction of pain after 15 minutes of laser application in the group with 30 seconds exposure duration (P = .001), and the pain completely fade away after one week in the same group, while in the group with 1 minute exposure duration the pain completely disappeared (visual analogous scale = (0)) after 15 minutes and one week of laser application (P = 0.001). CONCLUSION: The study concluded that application of diode laser (810 nm) was effective for the reduction of dentine hypersensitivity. Adult;Dentin Sensitivity;Dose-Response Relationship, Radiation;Female;Humans;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain Measurement;Treatment Outcome

An uncommon cause of laser burns: the problem may be the use of gel. Laser hair removal is the most common procedure which is usually performed on patient's demands. Even though they are usually safe and well tolerated, with the widespread use both expected and unexpected side effects can be seen. Recognizing the source of side effects is an important issue for the laser operator. In recent years, a new laser technology has been introduced to aid in pain and other side effects in laser applications. Diode laser systems are produced for this technology. The major disadvantage with this laser is the gel application during procedure. We herein report a women while on her second session for laser hair-removal procedure with a 808-nm diode laser, complicated with an epidermal burn reaction due to accumulated debris on the guide. Gels Adult;Burns;Cosmetic Techniques;Female;Gels;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy

Laser fractional photothermolysis of the skin: numerical simulation of microthermal zones. BACKGROUND: Laser Fractional Photothermolysis (FP) is one of the innovative techniques for skin remodeling and resurfacing. During treatment, the control of the Microscopic Thermal Zones' (MTZs) dimensions versus pulse energy requires detailed knowledge of the various parameters governing the heat transfer process. In this study, a mathematical model is devised to simulate the effect of pulse energy variations on the dimensions of MTZs. METHODS: Two series of simulations for ablative (10.6 Î¼m CO2) and non-ablative (1.550 Î¼m Er:Glass) lasers systems were performed. In each series, simulations were carried for the following pulses energies: 5, 10, 15, 20, 25, 30, 35, and 40 mJ. Results of simulations are validated by histological analysis images of MTZs sections reported in works by Hantash et al. and Bedi et al. RESULTS: MTZs dimensions were compared between histology and those achieved using our simulation model using fusion data technique for both ablative FP and non-ablative FP treatment methods. Depths and widths from simulations are usually deeper (21 Â± 2%) and wider (12 Â± 2%) when compared with histological analysis data. CONCLUSION: When accounting for the shrinkage effect of excision of cutaneous tissues, a good correlation can be established between the simulation and the histological analysis results. Cosmetic Techniques;Dose Fractionation, Radiation;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Skin

A split-face, evaluator-blind randomized study on the early effects of Q-switched Nd:YAG laser versus Er:YAG micropeel in light solar lentigines in Asians. BACKGROUND: Asians are prone to develop epidermal pigmentary lesions as a result of photoaging. Solar lentigines, especially those which are light in color, show somewhat limited response to pigment lasers and intense pulsed light sources. OBJECTIVES: We sought to compare the early effects as well as side effects of Q-switched Nd:YAG and Er:YAG micropeel in treating light solar lentigines in Asians. PATIENT AND METHODS: This was a split-face, evaluator-blind, randomized controlled study. A single session of treatment was performed on Asian patients with light facial lentigines. Q-switched Nd:YAG laser was allocated to one half of the face, and Er:YAG micropeel to the other half. The response to therapy was evaluated by two independent dermatologists with standardized photographs taken 2 weeks and 1 month after the

laser treatment. Patients' satisfaction and preference in treatment were also assessed. RESULTS: Fifteen patients completed the study and were analyzed. A reduction in pigment was observed with both lasers during the study period. The degree of pigment reduction in the Q-switched Nd:YAG treated side of the face was significantly higher than that of the Er:YAG micropeel treated side at 2-week follow-up ($p < 0.001$). The degree of pigment reduction between the Q-switched Nd:YAG-treated side and the Er:YAG micropeel-treated side was similar at 1-month follow-up ($p = 0.110$). CONCLUSION: While there is no perfect therapy for light solar lentigines, a single session of Q-switched Nd:YAG laser and Er:YAG micropeel was shown to reduce pigmentation. The immediate effects (2-week follow-up) were better with the Q-switched Nd:YAG laser but there was no great difference between the two laser types at 1-month follow-up due to the greater degree of post-inflammatory hyperpigmentation following Q-switched Nd:YAG. Both laser types could be applied either singly in turns, or in combination for maximal efficacy in future. Adult;Aged;Aged, 80 and over;Cosmetic Techniques;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Rejuvenation;Republic of Korea;Single-Blind Method;Skin Aging

Luminous fabric devices for wearable low-level light therapy. In this paper, a flexible luminous fabric device was developed and investigated for wearable three-dimensionally fitted low-level light therapy. The fabric device exhibited excellent optical and thermal properties. Its optical power density and operating temperature were stable during usage for 10 hours. In vitro experiments demonstrated a significant increase in collagen production in human fibroblast irradiated by the fabric device, compared with the fibroblast without light irradiation. A series of tests were conducted for the safety of the fabric for human skin contact according to ISO standard ISO 10993-1:2003. The results showed that there was no potential hazard when the luminous fabrics were in direct contact with human skin.

Topical Cyperus rotundus oil: a new therapeutic modality with comparable efficacy to Alexandrite laser photo-epilation. BACKGROUND: Topical Cyperus rotundus oil is an effective and safe method to decrease hair growth. The oil's flavonoids have antiandrogenic activity on androgenic hair. To date, there have been no randomized controlled trials comparing topical C rotundus oil to the available allopathic modalities, such as laser-assisted hair removal. OBJECTIVES: In an open-label pilot study, the author prospectively evaluated the efficacy of C rotundus essential oil, compared with the Alexandrite laser (GentleLase; Candela Laser Corp, Wayland, Massachusetts) and saline, for reducing unwanted axillary hair. METHODS: Eligible participants (n=65) with unwanted axillary hair were assigned randomly to 1 of 3 study groups: topical C rotundus oil (group 1), saline (group 2), and Alexandrite laser (group 3). Sixty patients completed the entire study. Three methods were used to evaluate the results: hair counts, observations of independent professionals, and patient self-assessments. RESULTS: Overall results did not differ significantly between C rotundus oil and the Alexandrite laser ($P>.05$). However, statistically significant differences were noted with respect to decreased growth of white hair ($P<.05$), favoring the oil. This finding was evident by all 3 methods of assessment. No side effects were detected. CONCLUSIONS: Cyperus rotundus essential oil is as effective as the Alexandrite laser for decreasing the growth of axillary hair (both dark and white). LEVEL OF EVIDENCE: 3. Plant Oils Administration, Topical;Adolescent;Adult;Axilla;Cyperus;Female;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Phytotherapy;Pilot Projects;Plant Oils;Prospective Studies;Young Adult

Dystrophic calcification and accentuated localized Argyria after fractionated carbon dioxide laser therapy of hypertrophic scars. IMPORTANCE: Fractionated, ultrapulsed carbon dioxide (CO_2) laser therapy is a powerful tool for the treatment of scars. Common adverse effects of this therapeutic modality have been previously documented. We describe 2 unreported adverse effects of ultrapulsed CO_2 laser treatment of mature scars in a patient previously treated with silver-

impregnated dressings. OBSERVATIONS: A teenage survivor of toxic epidermal necrolysis presented with faint but diffuse dyschromia clinically and histologically consistent with localized argyria secondary to silver-impregnated dressings used years earlier. The patient was subsequently treated with fractionated CO2 for her scarring, but her hyperpigmentation worsened with each treatment. A subsequent biopsy specimen revealed a zone of dystrophic calcification with adjacent pseudo-ochronotic fibers that were not appreciated on biopsy specimens taken before CO2 laser treatment, suggesting unique complications not previously reported. CONCLUSIONS AND RELEVANCE: We present 2 unique complications secondary to ultrapulsed, fractionated CO2 laser treatment in a patient previously treated with silver-impregnated dressings: (1) the appearance of pseudo-ochronotic fibers in areas of worsening pigmentation and (2) evidence of dystrophic calcification limited to columns of fractionated laser ablation. Therefore, a history of argyria or treatment with silver-impregnated dressings should be considered before treatment with fractionated CO2 lasers. Silver Adolescent;Argyria;Bandages;Biopsy, Needle;Calcinosis;Cicatrix, Hypertrophic;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Risk Assessment;Severity of Illness Index;Silver;Stevens-Johnson Syndrome;Treatment Outcome

Methodological shortcomings make conclusion highly sensitive to relevant changes in review protocol. Humans;Low-Level Light Therapy;Neck Pain

The synergy between lasers and adipose tissues surgery in cervicofacial rejuvenation: histopathological aspects. BACKGROUND AND AIMS: Nowadays patients want a long-lasting youthful appearance but through a less invasive approach. Our unique approach, "AdipoLASER reJuvenation (ALJ)", involves a variety of less invasive techniques based on simultaneous laser resurfacing, and lipolysis together with adipose tissue graft and redistribution. Recently, we added to this platelet-rich plasma therapy. We conducted a study aiming to emphasize the histopathological changes occurred following these procedures. PATIENTS AND METHODS: Between 2011-2012, we included 50 patients that were preparing for abdominoplasty (tummy tuck) in which we applied ALJ procedures, in two comparative zones of inferior abdomen. Histological examination varied from 10 days to four months, according to the time of the abdominoplasty. RESULTS: There was a notable histological difference between stimulated and non-stimulated fat graft regarding adipose cells structure and number, neocollagenesis, and dermal matrix remodeling. CONCLUSIONS: The low level laser therapy effect (LLLT) of the fractional CO2 laser combined with the effect of the growth factors derived from activated platelets (PRP) prolonged the life and improved the take of the facial fat graft, increase collagen formation and lead to a better remodeling of the dermal matrix. This unique surgical combination of all four approaches in our ALJ with additional PRP offers a real less invasive but strongly visible - yet natural result - as an alternative to the classic facelift. Adipocytes;Adipose Tissue;Cervix Uteri;Dermis;Extracellular Matrix;Face;Female;Humans;Lasers;Plastic Surgery Procedures;Rejuvenation;Subcutaneous Tissue

Chiropractic management of Bell palsy with low level laser and manipulation: a case report. OBJECTIVE: The purpose of this case report is to describe chiropractic management including the use of cold laser and chiropractic manipulation in the treatment of a patient with Bell palsy. CLINICAL FEATURES: A 40-year-old male patient had a 10-day history of facial paralysis on his left side, including the inability to close his left eye, which also had tearing and a burning sensation. The patient had trouble lifting his left lip and complained of drooling while brushing his teeth. There was no previous history of similar symptoms or a recent infection. Prior treatment had included oral steroids. INTERVENTION AND OUTCOME: The patient was treated with low-level laser therapy and chiropractic manipulation 2 times in 4 days. The laser was applied along the course of the facial nerve for 30 seconds at each point and for 1 minute at the stylomastoid foramen. The laser used was a

GaAs class 4 laser with a wavelength of 910 nm. The patient perceived a 70% to 80% improvement of facial movement after the first treatment. After the second treatment, the patient reported full control of his facial movements. CONCLUSION: A patient with acute facial paralysis appeared to have complete resolution of his symptoms following the application of low-level laser therapy and chiropractic manipulation.

Photobiomodulation with near infrared light mitigates Alzheimer's disease-related pathology in cerebral cortex - evidence from two transgenic mouse models. INTRODUCTION: Previous work has demonstrated the efficacy of irradiating tissue with red to infrared light in mitigating cerebral pathology and degeneration in animal models of stroke, traumatic brain injury, parkinsonism and Alzheimer's disease (AD). Using mouse models, we explored the neuroprotective effect of near infrared light (NIr) treatment, delivered at an age when substantial pathology is already present in the cerebral cortex. METHODS: We studied two mouse models with AD-related pathologies: the K369I tau transgenic model (K3), engineered to develop neurofibrillary tangles, and the APPswe/PSEN1dE9 transgenic model (APP/PS1), engineered to develop amyloid plaques. Mice were treated with NIr 20 times over a four-week period and histochemistry was used to quantify AD-related pathological hallmarks and other markers of cell damage in the neocortex and hippocampus. RESULTS: In the K3 mice, NIr treatment was associated with a reduction in hyperphosphorylated tau, neurofibrillary tangles and oxidative stress markers (4-hydroxynonenal and 8-hydroxy-2'-deoxyguanosine) to near wildtype levels in the neocortex and hippocampus, and with a restoration of expression of the mitochondrial marker cytochrome c oxidase in surviving neurons. In the APP/PS1 mice, NIr treatment was associated with a reduction in the size and number of amyloid-Î² plaques in the neocortex and hippocampus. CONCLUSIONS: Our results, in two transgenic mouse models, suggest that NIr may have potential as an effective, minimally-invasive intervention for mitigating, and even reversing, progressive cerebral degenerations.

Postherpetic neuralgia: case study of class 4 laser therapy intervention. OBJECTIVE: Postherpetic neuralgia (PHN) is a neuropathic sequelae in 8% to 27% of individuals with prior varicella zoster virus infection and herpes zoster resulting in retrograde demyelination, neurotoxic reactive oxygen species levels, and proinflammatory cytokine activation of microglia. Pain management strategies are well documented, but not always effective. Laser therapy has shown utility in nerve injury-related pain disorders and was considered a potentially efficacious intervention. DESIGN: Case report. METHODS: Class 4 therapeutic laser treatment was applied with a dual wavelength GaAlAs (810 nm), GaAl (980 nm) laser, 2 to 4 W, 50% duty cycle, 10 Hz pulse active phase, 2.5 cm diameter aperture, scanning technique with skin contact, 10-minute treatment, 600 to 1200 J total, energy density of 3.5 to 7.1 J/cm average per session, and power density from 0.41 to 0.82 W/cm for 8 treatments. Outcome measures included the Neuropathy Pain Scale Questionnaire as the primary outcome measure, with the Numeric Pain Scale and total area of allodynia touch sensitivity as secondary outcome measurements. RESULTS: The author reports a case of PHN of 15-year duration resistant to prior interventions. Weekly laser therapy treatment over 8 weeks resulted in reduced 0 to 10 Numeric Pain Scale score from 8 to 0, Neuropathy Pain Scale Questionnaire total score from 39 to 4, and allodynia over a 60 cm surface area of the upper trunk and posterior arm totally resolved, with resolution continued at 14-month follow-up. DISCUSSION: Theoretically, laser therapy induced tissue changes in this case occurring at and below the skin surface altering inflammatory and excitatory peripheral mechanisms noted to take place in the PHN patient. Peripheral nociceptor firing must be brought back to normal thresholds to resolve such chronic neuropathic pain and inhibit the possible central sensitization component. Anti-inflammatory cytokines, growth factors, nitric oxide, adenosine triphosphate (ATP), and other mechanisms stimulated by laser therapy as noted in medical literature may be central to the favorable response seen in this patient. Controlled clinical trials of class 4 laser

therapy in the PHN patient population with similar doses would be beneficial to determine if this is an effective treatment option in PHN. Aged;Female;Humans;Low-Level Light Therapy;Neuralgia, Postherpetic;Shoulder Pain;Treatment Outcome
Ultrasound and laser as stand-alone therapies for myofascial trigger points: a randomized, double-blind, placebo-controlled study. BACKGROUND AND PURPOSE: Ultrasound (US) and low-level laser therapy (LLLT) are commonly employed for myofascial trigger points (MTP) despite lack of evidence for usage as stand-alone treatments. The aim of the study was to determine, on MTP of the upper trapezius muscle (uTM), the effects of US and LLLT per se, as delivered in accordance with the procedures reported by surveys about their usage among physiotherapists. METHODS: Design was set as a double-blind, randomized, placebo-controlled study. Sixty participants with at least one active MTP in uTM (28 women and 32 men; mean age 24.5â€‰Â±â€‰1.44â€‰years) were recruited and randomly assigned to one out of five groups: active US (nâ€‰=â€‰12), placebo US (nâ€‰=â€‰12), active LLLT (nâ€‰=â€‰11), placebo LLLT (nâ€‰=â€‰11) and no therapy (control, nâ€‰=â€‰14). The participants and outcome assessor were blinded to the group assignment and therapy delivered. Three outcome measures were assessed at baseline, after a 2-week treatment and 12â€‰weeks after the end of the intervention (follow-up): pressure pain threshold, subjective pain on a numerical rating scale and muscle extensibility performing a cervical lateral flexion. All subjects assigned to the intervention groups were treated five times weekly for overall 10 treatments given. Two-way ANOVA was used to compare differences before and after intervention and among groups at each time-point. RESULTS: After the 2-week intervention, all groups showed pressure pain threshold, numerical rating scale and cervical lateral flexion significant improvements (pâ€‰<â€‰0.05), which were confirmed at the follow-up. When performing multiple comparisons, controls scored significantly less than both the active therapies and placebos, whereas no differences were detected between active therapies and placebos. CONCLUSIONS: Ultrasound and LLLT provided significant improvements in pain and muscle extensibility, which were superior to no therapy but not to placebos, thus raising concerns about the suitability, both economically and ethically, of administering such common physical modalities as stand-alone treatments in active MTP of the uTM. Adult;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Myofascial Pain Syndromes;Outcome Assessment, Health Care;Pain Measurement;Pain Threshold;Physical Therapy Modalities;Treatment Outcome;Ultrasonic Therapy
[Dynamics of autonomic regulation and daily pH-metry in patients with gastroesophageal reflux disease under the influence of low-intensity laser irradiation of blood]. 102 patients with GERD were examined: 70 female (68%) and 32 men (32%). Age of respondents ranged from 20 to 65 years (average of 45.8 Â±8,2). All patients were randomly divided into 2 groups. In the first (control) group (30 people) traditional drug treatment were used according to the standard therapy of GERD (proton pump inhibitors, antacids, prokinetics), patients in the second (main) group (70 people) along with drug therapy has received a course of intravenous laser therapy according to the methods ILIB-405. For intravenous laser treatment Russian apparatus "Matrix-ILIB" ("Matrix", Russia) was used with wavelength 0,405 Î¼m, output power at the end of the main optical path of 1-1.5 mW. Laser blood irradiation was carried out for 15 minutes in the CW mode, the course of treatment was 10 daily treatments with a break on Saturday and Sunday. Conclusions: 1. Intravenous laser irradiation of blood in the complex therapy of patients with gastroesophageal reflux disease improved significantly of HRV due to the alignment of parasympathetic regulation circuit and reducing the activity of sympathetic autonomic regulation, 2. the inclusion of intravenous laser irradiation of blood in the complex therapy of patients with GERD was accompanied by reliable normalization of the indicators of the daily pH-metry of the esophagus in patients with GERD. Adult;Aged;Autonomic

Nervous System;Esophageal pH Monitoring;Esophagus;Female;Gastroesophageal Reflux;Humans;Kinetics;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

[The effect of low-level laser therapy on gastric mucosa microcirculation in patients with gastroesophageal reflux disease]. OBJECTIVE: To study the influence of laser radiation on the parameters of microcirculation in patients with gastroesophageal reflux disease (GERD). MATERIALS AND METHODS: The examined 112 patients with GERD aged 19 to 79 years. 78 patients were given a ten-day course of intravenous laser therapy, which was conducted with the help of the apparatus of laser therapy "matrix-vlok" (produced by "the matrix", Russia) with wavelength 0,405 microns, the radiation power at the output of the main fiber 1-1,5 mW, continuous mode radiation. The studied parameters were determined before and after treatment. RESULTS: The obtained data testify to the improvement of microcirculation in patients with GERD under the influence of laser therapy. Adult;Aged;Female;Gastric Mucosa;Gastroesophageal Reflux;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged;Treatment Outcome;Young Adult

[Assessment of the effectiveness of laser reflexotherapy in combined treatment of patients with chronic acalculous cholecystitis]. AIM: To study effects of laserpuncture in combined treatment of chronic non-calculous cholecystitis on motor function gallbladder, clinical symptoms. MATERIALS AND METHODS: 73 patients of chronic non-calculous cholecystitis were divided in to groups: 35 patients were received treated only by the means of standard therapy (the control group), 38 patients were received a course laserpuncture as part of complex treatment (the study group). RESULTS: Influence laser radiation on acupuncture points was found to induce positive therapeutic effect, such as: decrease the durations of clinical symptoms, correction of motor function gallbladder. CONCLUSION: Laserpuncture is an effective method of non-calculous cholecystitis treatment and can be included in relevant combined schemes. Acalculous Cholecystitis;Adult;Aged;Chronic Disease;Combined Modality Therapy;Female;Gallbladder;Humans;Low-Level Light Therapy;Male;Middle Aged;Reflexotherapy;Treatment Outcome;Ultrasonography;Young Adult

[The pathogenetic substantiation of new therapeutic approach to the treatment of secondary osteoarthritis in patients with rheumatoid arthritis with basis therapy]. The article concerns the efficacy of the use of new therapeutic approach in the therapy of secondary osteoarthritis in patients with rheumatoid arthritis. The dynamic of Cartilage Oligomeric Matrix Protein, activity of the disease on DAS28, cytokine profile was estimated. The analysis of the results showed the advantages of the use of inhibitor of IL-1 combined with laser therapy in the treatment of secondary osteoarthritis in patients with rheumatoid arthritis. Anthraquinones;COMP protein, human;Cartilage Oligomeric Matrix Protein;Interleukin-1;diacerein Aged;Anthraquinones;Arthritis, Rheumatoid;Cartilage Oligomeric Matrix Protein;Combined Modality Therapy;Female;Humans;Interleukin-1;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis;Treatment Outcome

Patient perspectives on low level light therapy and laser therapies for rosacea-associated persistent facial redness. INTRODUCTION: There are no definitive treatments of facial redness for rosacea. All treatments aim to alleviate symptoms. Patients' perspectives of two emerging modalities, Low level light therapy and laser treatments are not well characterized. The purpose is to further understand rosacea patients unmet needs about these modalities, Methods: The publicly accessible, online rosacea forum was accessed at august 2013. Stratified random sampling method has done to identify a 10% sample of total 27,051 posts. The Posts were published in the "Laser and IPL therapy" and "Low level light therapy" forums were qualitatively analyzed. RESULTS: Patients discussed a variety of topics, but most commonly discussed effectiveness (34.2%), treatment education (19.3%), and adverse effects (18%). Relationship with the health care provider (9.9%), cost (8.1%), execution of treatments (8.1%) and convenience of treatments (2.5%) were less commonly discussed, but contributed to patients' decisions about utilizing laser and light therapies. CONCLUSIONS: Online

forums are utilized to fulfill patients' desire for educational, empathic and collaborative relationship. Patients' adherence to laser and light therapies will likely increase if costs are reduced, reduction in redness is consistent with their expectations, and if physicians empower them through education on device choices and managing adverse effects. Facial Dermatoses;Humans;Intense Pulsed Light Therapy;Low-Level Light Therapy;Patient Compliance;Patient Education as Topic;Patient Satisfaction;Physician-Patient Relations;Rosacea;Social Media;Social Support

The Effects of Low Level Laser Therapy on the Expression of Collagen Type I Gene and Proliferation of Human Gingival Fibroblasts (Hgf3-Pi 53): in vitro Study. OBJECTIVE(S): Recent investigations show that both proliferation and secretion of macromolecules by cells can be regulated by low level laser therapy (LLLT). The aim of this study was to determine whether LLLT could induce a bio-stimulatory effects on human gingival fibroblasts (HGF3-PI 53). Therefore, the effect of laser irradiation on human gingival cell proliferation and collagen type I gene expression was studied. MATERIALS AND METHODS: HGF3-PI 53 were cultured in 96-well plate and then irradiated with LLLT gallium-aluminum-arsenide (Ga-Al-As), 810 nm, 50 mW diode laser (energy: 4 J/cm(2)) for three consecutive days. The cell proliferation was measured on days 1, 2 and 3 after irradiation with LLLT using MTT assay. Real time PCR analysis was utilized on day 3 to evaluate the expression of collagen type I gene. Results : Evaluation of cellular proliferation, one day after laser treatment showed no difference compared to control group. But on days 2 and 3, significant increase in proliferation was observed in the irradiated cell populations in comparison to the control group. Treatment of HGF3-PI 53 by laser resulted in a significant increase in collagen I gene expression on 3 day. CONCLUSION: The results demonstrated that LLLT stimulated human gingival fibroblast proliferation as well as collagen type I gene expression in vitro.

Treatment of surgical scars using a 595-nm pulsed dye laser using purpuric and nonpurpuric parameters: a comparative study. BACKGROUND: Many studies have examined laser treatment of scars, but cosmetic results have been variable. Although no studies have examined the effect of purpura on scar improvement using the pulsed dye laser (PDL), many clinicians believe inducing purpura results in better and quicker improvement. OBJECTIVE: To determine whether PDL treatment of fresh surgical scars with purpura-inducing settings improves clinical appearance more than non-purpura-inducing settings or no treatment. METHODS: Twenty-six subjects with surgical scars enrolled in this prospective study. Scars were divided into three equal segments; treatment was randomized: 595-nm PDL with purpuric (1.5Â ms) or nonpurpuric (10Â ms) settings or no treatment. Fluences were adjusted to Fitzpatrick skin type. Scars were treated three times, 1Â month apart, beginning at suture removal. Outcome measures included Vancouver Scar Scale (VSS) and blind clinical ratings. RESULTS: The nonpurpuric condition showed significant improvement on the VSS total score, vascularity, and pliability ratings. The purpuric condition demonstrated a trend for improvement on the VSS total. According to blind observer ratings, all conditions improved, without differences between groups. CONCLUSION: Nonpurpuric settings on the PDL resulted in significant improvements in the appearance of fresh surgical scars for vascularity, pliability, and VSS total scores, although all scar segments improved over time. Cicatrix;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Purpura;Treatment Outcome

Fractionated carbon dioxide laser as a novel, noninvasive treatment approach to burn scar-related nail dystrophy. Burns;Child;Cicatrix;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Nail Diseases

Evaluation of pain, jaw movements, and psychosocial factors in elderly individuals with temporomandibular disorder under laser phototherapy. Few studies have been carried out on the application of laser phototherapy (LPT) for treating painful temporomandibular disorder (TMD) in elderly population that is growing worldwide. The aim of the present study was to evaluate the pain,

jaw movements, and psychosocial factors in ten elderly patients with painful TMD before and after LPT. All patients were evaluated before and after LPT by using the Research Diagnostic Criteria for temporomandibular disorders (RDC/TMD) axes I and II. For pain assessment, a visual analogue scale (VAS) was used. The LPT was carried out with an GaAlAs diode laser (780 nm; spot size 0.04 cm(2)) in punctual and contact mode. Two settings of irradiations were applied as follows: in patients presenting myofascial pain, 10 mW, 5 J/cm(2), 20 s, 0.2 J per application point; and in patients with joint TMD, 70 mW, 105 J/cm(2), 60 s on five points, 4.2 J per point. Two sessions of LPT were carried out per week over four consecutive weeks, in the total of eight sessions. Data was statistically analyzed (pâ€‰<â€‰0.05). Significant pain reduction was found in all patients. There were increase in maximum mouth opening without pain and reduction in muscle pain during right and left lateral excursion. A significant reduction in chronic pain severity (pâ€‰=â€‰0.02) and significant improvements in depression (pâ€‰=â€‰0.038) and nonspecific physical symptoms with pain (pâ€‰=â€‰0.0167) were observed. The present findings indicate that LPT is able to promote pain relief and improvement of jaw movements in elderly patients with TMD, with a positive effect on psychosocial aspects. Aged;Aged, 80 and over;Depression;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Management;Pain Measurement;Recovery of Function;Temporomandibular Joint Disorders;Treatment Outcome

Investigation of low-level laser therapy potentiality on proliferation and differentiation of human osteoblast-like cells in the absence/presence of osteogenic factors. Several studies have shown that low-level laser irradiation (LLLI) has beneficial effects on bone regeneration. The objective of this study was to examine the in vitro effects of LLLI on proliferation and differentiation of a human osteoblast-like cell line (Saos-2 cell line). Cultured cells were exposed to different doses of LLLI with a semiconductor diode laser (659 nm; 10 mW power output). The effects of laser on proliferation were assessed daily up to seven days of culture in cells irradiated once or for three consecutive days with laser doses of 1 or 3 J/cm(2). The obtained results showed that laser stimulation enhances the proliferation potential of Saos-2 cells without changing their telomerase pattern or morphological characteristics. The effects on cell differentiation were assessed after three consecutive laser irradiation treatments in the presence or absence of osteo-inductive factors on day 14. Enhanced secretion of proteins specific for differentiation toward bone as well as calcium deposition and alkaline phosphatase activity were observed in irradiated cells cultured in a medium not supplemented with osteogenic factors. Taken together these findings indicate that laser treatment enhances the in vitro proliferation of Saos-2 cells, and also influences their osteogenic maturation, which suggest it is a helpful application for bone tissue regeneration. Extracellular Matrix Proteins;Osteocalcin Cell Differentiation;Cell Line;Cell Proliferation;Cell Shape;Extracellular Matrix Proteins;Humans;Low-Level Light Therapy;Osteoblasts;Osteocalcin

Low-level laser stimulation on adipose-tissue-derived stem cell treatments for focal cerebral ischemia in rats. This study investigated the effects of large-area irradiation from a low-level laser on the proliferation and differentiation of i-ADSCs in neuronal cells. MTT assays indicated no significant difference between the amount of cells with (LS+) and without (LS-) laser treatment ($P > 0.05$). However, immunofluorescent staining and western blot analysis results indicated a significant increase in the neural stem-cell marker, nestin, following exposure to low-level laser irradiation ($P < 0.05$). Furthermore, stem cell implantation was applied to treat rats suffering from stroke. At 28 days posttreatment, the motor functions of the rats treated using i-ADSCs (LS+) did not differ greatly from those in the sham group and HE-stained brain tissue samples exhibited near-complete recovery with nearly no brain tissue damage. However, the motor functions of the rats treated using i-ADSCs (LS-) remained somewhat dysfunctional and tissue displayed necrotic scarring and voids. The western blot analysis also revealed significant expression of oligo-2 in the rats treated using i-ADSCs (LS+) as well as

in the sham group (P < 0.05). The results demonstrated that low-level laser irradiation exerts a positive effect on the differentiation of i-ADSCs and can be employed to treat rats suffering from ischemic stroke to regain motor functions.

Histological and gene expression analysis of the effects of pulsed low-level laser therapy on wound healing of streptozotocin-induced diabetic rats. Diabetes mellitus (DM) is associated with poor wound healing. Studies have shown accelerated wound healing following pulsed low-level laser therapy (LLLT) in non-diabetic animals. The present study aims to evaluate the effect of pulsed LLLT on wound healing in streptozotocin-induced diabetic (STZ-D) rats. We divided 48 rats into two groups of non-diabetic and diabetic. Type 1 DM was induced in the diabetic rat group by injections of STZ. Two, full-thickness skin incisions were made on the dorsal region of each rat. One month after the STZ injection, wounds of the non-diabetic and diabetic rats were submitted to a pulsed, infrared 890-nm laser with an 80-Hz frequency and 0.2 J/cm(2) for each wound point. Control wounds did not receive LLLT. Animals were sacrificed on days 4, 7, and 15 post-injury for histomorphometry and reverse transcription polymerase chain reaction (RT-PCR) analyses of basic fibroblast growth factor (bFGF) gene expression. Pulsed LLLT significantly increased the numbers of macrophages, fibroblasts, and blood vessel sections compared to the corresponding control groups. Semi-quantitative analysis of bFGF gene expression at 48 h post-injury revealed a significant increase in gene expression in both non-diabetic and diabetic rats following LLLT (the ANOVA test). Pulsed LLLT at 0.2 J/cm(2) accelerated the wound healing process in both non-diabetic and diabetic rats as measured by histological characteristics and semi-quantitative bFGF gene expression. Fibroblast Growth Factor 2;Streptozocin Animals;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Fibroblast Growth Factor 2;Gene Expression Regulation;Low-Level Light Therapy;Male;Rats, Wistar;Streptozocin;Wound Healing

Low level laser therapy (LLLT) in veterinary medicine. Animal Diseases;Animals;Education, Veterinary;Low-Level Light Therapy;Veterinary Medicine

[Potential and limitations of dye laser therapy for capillary malformations]. Capillary malformations (port-wine stains) are observed in less than 1â€‰% of neonates and may occur coincidentally with other vascular and nonvascular malformations. Two thirds of lesions occur in the head and neck area and may have important cosmetic and psychological implications for the patients. Treatment with flashlamp-pumped pulsed dye lasers is still the therapy of choice for capillary malformations and can be applied to infants. If the laser device is used appropriately, the rate of persistent side effects is low. Although laser treatment achieves good clearance in the majority of patients with capillary malformations, complete clearance is rare. New therapeutic options are thus urgently required. Evidence-Based Medicine;Head and Neck Neoplasms;Hemangioma, Capillary;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Treatment Outcome

Autologous platelet rich plasma: topical versus intradermal after fractional ablative carbon dioxide laser treatment of atrophic acne scars. BACKGROUND: A proposal has recently been made regarding the potential adjuvant use of platelet-rich plasma (PRP) with fractional carbon dioxide laser (FCL) for the correction of acne scars. OBJECTIVE: To compare the efficacy and safety of two administration modes of autologous PRP (intradermal injection (ID) and topical application) after FCL with that of FCL alone in the treatment of atrophic acne scars. PATIENTS AND METHODS: Thirty patients were randomly divided into two groups. Both underwent split-face therapy. Group 1 was administered FCL followed by ID PRP on one side and FCL followed by ID saline on the other. In group 2, one cheek was treated with FCL followed by ID PRP, and the other received FCL followed by topical PRP. Each patient received 3Â monthly sessions. The final assessment took place at 6Â months. RESULTS: Combined PRP- and FCL-treated areas had a significantly better response (pÂ =Â .03), fewer side effects, and shorter downtime (pÂ =Â .02) than FCL-treated areas, but there were no significant

differences in ID- and topical PRP-treated areas in degree of response and downtime (pÂ =Â .10); topically treated areas had significantly lower pain scores. CONCLUSION: The current study introduces the combination of topical PRP and FCL as an effective, safe modality in the treatment of atrophic acne scars with shorter downtime than FCL alone and better tolerability than FCL combined with ID PRP. Acne Vulgaris;Adult;Cicatrix;Female;Humans;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Prospective Studies;Treatment Outcome

The energy density of laser light differentially modulates the skin morphological reorganization in a murine model of healing by secondary intention. This study investigates the influence of gallium-arsenide (GaAs) laser photobiostimulation applied with different energy densities on skin wound healing by secondary intention in rats. Three circular wounds, 10 mm in diameter, were made on the dorsolateral region of 21 Wistar rats weighting 282.12 Â± 36.08 g. The animals were equally randomized into three groups: Group SAL, saline solution 0.9%; Group L3, laser GaAs 3 J/cm(2); Group L30, laser GaAs 30 J/cm(2). Analyses of cells, blood vessels, collagen and elastic fibres, glycosaminoglycans and wound contraction were performed on the scar tissue from different wounds every 7 days for 21 days. On day 7, 14 and 21, L3 and L30 showed higher collagen and glycosaminoglycan levels compared to SAL ($P < 0.05$). At day 21, elastic fibres were predominant in L3 and L30 compared to SAL ($P < 0.05$). Type-III collagen fibres were predominant at day 7 in both groups. There was gradual reduction in these fibres and accumulation of type-I collagen over time, especially in L3 and L30 compared with SAL. Elevated density of blood vessels was seen in L30 on days 7 and 14 compared to the other groups ($P < 0.05$). On these same days, there was higher tissue cellularity in L3 compared with SAL ($P < 0.05$). The progression of wound closure during all time points investigated was higher in the L30 group ($P < 0.05$). Both energy densities investigated increased the tissue cellularity, vascular density, collagen and elastic fibres, and glycosaminoglycan synthesis, with the greater benefits for wound closure being found at the density of 30 J/cm(2). Collagen Animals;Collagen;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Wound Healing;Wounds and Injuries

LLLT in combination with non-surgical periodontal therapy in patients with gingival oral lichen planus: a pilot study.

Low level laser therapy (LLLT) as adjuvant in the management of drug induced gingival hyperplasia: a case report.

Effect of low-level laser therapy on dental pain induced by separator force in orthodontic treatment. BACKGROUND: Patients undergoing orthodontic treatment experience varying degrees of pain with separator insertion. A survey of patients' attitude towards orthodontic treatment revealed that pain was the most discouraging factor related to their treatment. Moreover, it was the highest ranking reason for wanting to discontinue care. The purpose of this study was to determine the effect of low-level laser irradiation on dental pain induced by forces from separators in orthodontic treatment. MATERIALS AND METHODS: This study was an experimental clinical trial. Twenty-nine patients were recruited for this research. Low-level laser irradiation was applied on one half of the maxillary and mandibular arches for 5 days. The opposite half of the arches was considered the control group. Laser irradiation was applied for 30 seconds in the alveolar bone between the second premolars, first molars, and second molars. Pain perception was evaluated with a standardized questionnaire that was answered by patients before and after laser irradiation. Data was analyzed by Wilcoxon and Friedman test. P value â‰¤0.05 was considered significant. RESULTS: The highest pain level was reported at day 1 following separator placement and decreased gradually until day 5. At day 4 and 5, the pain intensity was lower in the laser group than in the control group; however, this finding was not statistically significant. At day 1 and 3, the pain intensity was higher in the laser group than in the control group; however, it was not statistically significant. At day 2, the pain intensity was lower in

the laser group than in the control group and was statistically significant. CONCLUSION: Our findings suggest that there is no statistically significant difference in pain by using low-level laser irradiation.

High-level Evidence Exists for Low-level Laser Therapy on Chemoradiotherapy-induced Oral Mucositis in Cancer Survivors.

Effects of low-level laser therapy on orthodontics: rate of tooth movement, pain, and release of RANKL and OPG in GCF. The aim of the study was evaluate tooth movement, receptor activator of nuclear factor KB ligand (RANKL), osteoprotegerin (OPG), and RANKL/OPG ratio in gingival crevicular fluid (GCF) in compression side and pain level during initial orthodontic tooth treatment to determine the efficacy of low-level laser therapy (LLLT). Ten volunteers who required fixed appliance positioned from the upper first premolars to upper first molars were selected. For each patient, the upper first premolar of the quadrant 1 was chosen to be irradiated with a laser diode at 670Â nm, 200Â mW, and 6.37Â W/cm(2), applied on the distal, buccal, and lingual sides during 9Â min on days 0, 1, 2, 3, 4, and 7. The same procedure was applied in the first premolar of the contralateral quadrant inserting the tip but without laser emission. Samples of GCF from the compression side of the upper first premolars to distalize were collected at baseline and after 2, 7, 30, and 45Â days posttreatment for determination of RANKL and OPG by enzyme-linked immunosorbent assay. In addition, tooth movement was assessed by scanning models and pain intensity was assessed using a visual analog scale. There was improvement in the parameters studied (pain, tooth movement, levels of RANKL in GCF, and RANKL/OPG ratio) in the laser group when compared to the control group, although differences were not statistically significant. The accumulated retraction of the upper premolar at 30Â days was higher in the laser group, and this difference was statistically significant between groups. LLLT delivered in repeated doses (six times in the initial 2Â weeks) leads in some extent to a slight orthodontical improvement. Osteoprotegerin;RANK Ligand;TNFRSF11B protein, human;TNFSF11 protein, human Adolescent;Child;Female;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontics;Osteoprotegerin;Pain;Pain Measurement;RANK Ligand;Time Factors;Tooth Movement Techniques

Low-level laser therapy versus ultrasound therapy in the treatment of subacromial impingement syndrome: a randomized clinical trial. OBJECTIVE: The aim of this study was to compare the effectiveness of low-level laser therapy and ultrasound therapy in the treatment of subacromial impingement syndrome. MATERIALS AND METHODS: Thirty one patients with subacromial impingement syndrome were randomly assigned to low-level laser therapy group (n=16) and ultrasound therapy group (n=15). Study participants received 10 treatment sessions of low-level laser therapy or ultrasound therapy over a period of two-consecutive weeks (five days per week). Outcome measures (visual analogue pain scale, Shoulder Pain and Disability Index -SPADI-, patient's satisfactory level and sleep interference score) were assessed before treatment and at the 1st and 3rd months after treatment. All patients were analyzed by the intent-to-treat principle. RESULTS: Mean reduction in VAS pain, SPADI disability and sleep interference scores from baseline to after 1 month, and 3 months of treatment was statistically significant in both groups (P< 0.05). However, there was no significant difference in the mean change in VAS pain, SPADI disability and sleep interference scores between the two groups (P > 0.05). The mean level of patient satisfaction in group 1 at the first and third months after treatment was 72.45 Â± 23.45 mm and 71.50 Â± 16.54 mm, respectively. The mean level of patient satisfaction in group 2 at the first and third months after treatment was 70.38 Â± 21.52 mm and 72.09 Â± 13.42 mm, respectively. There was no significant difference in the mean level of patient satisfaction between the two groups (p > 0.05). CONCLUSIONS: The results suggest that efficacy of both treatments were comparable to each other in regarding reducing pain severity and functional disability in patients with subacromial impingement syndrome. Based on our findings,

we conclude that low-level laser therapy may be considered as an effective alternative to ultrasound based therapy in patients with subacromial impingement syndrome especially ultrasound based therapy is contraindicated. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Range of Motion, Articular;Shoulder Impingement Syndrome;Shoulder Pain;Single-Blind Method;Treatment Outcome;Ultrasonic Therapy

Near-infrared stimulation on globus pallidus and subthalamus. Near-infrared stimulation (NIS) is an emerging technique used to evoke action potentials in nervous systems. Its efficacy of evoking action potentials has been demonstrated in different nerve tissues. However, few studies have been performed using NIS to stimulate the deep brain structures, such as globus pallidus (GP) and subthalamic nucleus (STN). Male Sprague-Dawley rats were randomly divided into GP stimulation group (n=11) and STN stimulation group (n=6). After introducing optrodes stereotaxically into the GP or STN, we stimulated neural tissue for 2 min with continuous near-infrared light of 808 nm while varying the radiant exposure from 40 to 10 mW. The effects were investigated with extracellular recordings and the temperature rises at the stimulation site were also measured. NIS was found to elicit excitatory responses in eight out of 11 cases (73%) and inhibitory responses in three cases in the GP stimulation group, whereas it predominantly evoked inhibitory responses in seven out of eight cases (87.5%) and an excitatory response in one case in STN stimulation group. Only radiation above 20 mW, accompanying temperature increases of more than 2Â°C, elicited a statistically significant neural response ($p<0.05$). The responsiveness to NIS was linearly dependent on the power of radiation exposure. Action Potentials;Animals;Electrophysiology;Equipment Design;Globus Pallidus;Infrared Rays;Lasers;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Subthalamus;Temperature

Effects of phototherapy on cartilage structure and inflammatory markers in an experimental model of osteoarthritis. The aim of this study was to evaluate the effects of laser phototherapy on the degenerative modifications on the articular cartilage after the anterior cruciate ligament transection (ACLT) in the knee of rats. Eighty male rats (Wistar) were distributed into four groups: intact control group (IG), injured control group (CG), injured laser treated group at 10 J/cm(2) (L10), and injured laser treated group at 50 J/cm(2) (L50). Animals were distributed into two subgroups, sacrificed in 5 and 8 weeks postsurgery. The ACLT was used to induce knee osteoarthritis in rats. After 2 weeks postsurgery, laser phototherapy initiated and it was performed for 15 and 30 sessions. The histological findings revealed that laser irradiation, especially at 10 J/cm(2), modulated the progression of the degenerative process, showing a better cartilage structure and lower number of condrocytes compared to the other groups. Laser phototherapy was not able to decrease the degenerative process measured by Mankin score and prevent the increase of cartilage thickness related to the degenerative process. Moreover, it did not have any effect in the biomodulation of the expression of markers IL1Î², tumor necrosis factor-Î±, and metalloprotein-13. Furthermore, laser irradiated animals, at 50 J/cm(2) showed a lower amount of collagen type 1. Collagen Type I;Tumor Necrosis Factor-alpha Analysis of Variance;Animals;Anterior Cruciate Ligament;Cartilage, Articular;Collagen Type I;Disease Models, Animal;Immunohistochemistry;Inflammation;Male;Osteoarthritis;Phototherapy;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha

Effect of low-level laser treatment on cochlea hair-cell recovery after ototoxic hearing loss. The primary cause of hearing loss includes damage to cochlear hair cells. Low-level laser therapy (LLLT) has become a popular treatment for damaged nervous systems. Based on the idea that cochlea hair cells and neural cells are from same developmental origin, the effect of LLLT on hearing loss in animal models is evaluated. Hearing loss animal models were established, and the animals were irradiated by 830-nm diode laser once a day for 10 days. Power density of the laser treatment was 900

mW/cm(2), and the fluence was 162 to 194 J. The tympanic membrane was evaluated after LLLT. Thresholds of auditory brainstem responses were evaluated before treatment, after gentamicin, and after 10 days of LLLT. Quantitative scanning electron microscopic (SEM) observations were done by counting remaining hair cells. Tympanic membranes were intact at the end of the experiment. No adverse tissue reaction was found. On SEM images, LLLT significantly increased the number of hair cells in middle and basal turns. Hearing was significantly improved by laser irradiation. After LLLT treatment, both the hearing threshold and hair-cell count significantly improved.
Gentamicins;Furosemide Animals;Ear Canal;Furosemide;Gentamicins;Hair Cells, Auditory;Hearing Loss, Sensorineural;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Treatment Outcome;Tympanic Membrane

[Opportunity to use the low-level laser therapy in the treatment of the occupational peripheral nervous system diseases (review of literature)]. Occupational diseases of the peripheral nervous system are a wide and heterogeneous group. Until now, the researchers still look for new treatment techniques, because complaints, clinical, instrumental and laboratory findings persist for years even after discontinued occupational exposure to the factors that induced these diseases. The aim of this article is a review of low-intensity laser therapy methods which are used in treatment of various diseases including peripheral nervous system diseases. Humans;Low-Level Light Therapy;Occupational Diseases;Occupational Exposure;Peripheral Nervous System Diseases

[Low-intensity laser radiation in preventive measures]. Results of preventive measures introduction in 524 PC users, 98 jewelry polishers and 64 metallic ship hull assemblers are given. The use of preventive measures, based on low-intensity laser radiation, was shown to prevent development of visual overfatigue and occupational musculoskeletal system diseases.
Adult;Fatigue;Humans;Low-Level Light Therapy;Middle Aged;Musculoskeletal Diseases;Occupational Diseases;Young Adult

In vitro and in vivo optimization of infrared laser treatment for injured peripheral nerves. BACKGROUND AND OBJECTIVE: Repair of peripheral nerve injuries remains a major challenge in restorative medicine. Effective therapies that can be used in conjunction with surgical nerve repair to improve nerve regeneration and functional recovery are being actively investigated. It has been demonstrated by a number of peer reviewed publications that photobiomodulation (PBM) supports nerve regeneration, reinnervation of the denervated muscle, and functional recovery after peripheral nerve injury. However, a key issue in the use of PBM as a treatment for peripheral nerve injury is the lack of parameter optimization for any given wavelength. The objective of this study was to demonstrate that for a selected wavelength effective in vitro dosing parameters could be translated to effective in vivo parameters. MATERIALS AND METHODS: Comparison of infra-red (810 and 980â€‰nm wavelengths) laser treatment parameters for injured peripheral nerves was done beginning with a series of in vitro experiments using primary human fibroblasts and primary rat cortical neurons. The primary rat cortical neurons were used for further optimization of energy density for 980â€‰nm wavelength light using measurement of total neurite length as the bioassay. For these experiments, the parameters included a 1â€‰W output power, power density of 10â€‰mW/cm(2) , and energy densities of 0.01, 0.1, 0.5, 2, 10, 50, 200, 1,000, and 5,000â€‰mJ/cm(2) . For translation of the in vitro data for use in vivo it was necessary to determine the transcutaneous penetration of 980â€‰nm wavelength light to the level of the peroneal nerve. Two anesthetized, male White New Zealand rabbits were used for these experiments. The output power of the laser was set at 1.0 or 4.0â€‰W. Power density measurements were taken at the surface of the skin, sub-dermally, and at the level of the nerve. Laser parameters used in the in vivo studies were calculated based on data from the in vitro studies and the light penetration measurements. For the in vivo experiments, a total of 22 White New Zealand rabbits (2.34-

2.89â€‰kg) were used. Translated dosing parameters were refined in a pilot study using a transection model of the peroneal nerve in rabbits. Output powers of 2 and 4â€‰W were tested. For the final set of in vivo experiments, the same transection nerve injury model was used. An energy density of 10â€‰mW/cm(2) at the level of the peroneal nerve was selected and the laser parameters were further refined. The dosing parameters used were: 1.5â€‰W output power, 43â€‰seconds exposure, 8â€‰cm(2) area and a total energy of 65â€‰J. RESULTS: In vitro, 980â€‰nm wavelength light at 10â€‰mW/cm(2) significantly improved neurite elongation at energy densities between 2 and 200â€‰mJ/cm(2) . In vivo penetration of the infrared light measured in anesthetized rabbits showed that on average, 2.45% of the light applied to the skin reached the depth of the peroneal nerve. The in vivo pilot study data revealed that the 4â€‰W parameters inhibited nerve regeneration while the 2â€‰W parameters significantly improved axonal regrowth. For the final set of experiments, the irradiated group performed significantly better in the toe spread reflex test compared to the control group from week 7 post-injury, and the average length of motor endplates returned to uninjured levels. CONCLUSION: The results of this study demonstrate that treatment parameters can be determined initially using in vitro models and then translated to in vivo research and clinical practice. Furthermore, this study establishes that infrared light with optimized parameters promotes accelerated nerve regeneration and improved functional recovery in a surgically repaired peripheral nerve. Animals;Cells, Cultured;Fibroblasts;Humans;Infrared Rays;Low-Level Light Therapy;Male;Nerve Regeneration;Neurons;Peripheral Nerve Injuries;Peroneal Nerve;Rabbits;Rats;Recovery of Function;Treatment Outcome

Influence of different energy densities of laser phototherapy on oral wound healing. The aim of the present prospective study was to evaluate the impact of laser phototherapy (LPT) on the healing of oral ulcers. Different power densities were used on oral wounds in Wistar rats (n=72) randomly divided into three groups: control (0 J/cm2), 4 J/cm2 laser, and 20 J/cm2 laser. Ulcers (3 mm in diameter) were made on the dorsum of the tongue with a punch. Irradiation with an indium-gallium-aluminum-phosphide laser (660 nm; output power: 40 mW; spot size: 0.04 cm2) was performed once a day in close contact with the ulcer for 14 consecutive days. A statistically significant acceleration in healing time was found with wounds treated with 4 J/cm2 LPT. Moreover, striking differences were found in the ulcer area, healing percentage, degree of reepithelialization, and collagen deposition. The most significant changes occurred after 5 days of irradiation. Based on the conditions employed in the present study, LPT is capable of accelerating the oral mucosa wound-healing process. Moreover, faster and more organized reepithelialization and tissue healing of the oral mucosa were achieved with an energy density of 4 J/cm2 in comparison to 20 J/cm2.
Animals;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mouth Mucosa;Oral Ulcer;Prospective Studies;Rats;Rats, Wistar;Re-Epithelialization

Effect of 940Â nm low-level laser therapy on osteogenesis in vitro. Bone regeneration is essential in medical treatment, such as in surgical bone healing and orthodontics. The aim of this study is to examine the effect of different powers of 940 nm diode low-level laser treatment (LLLT) on osteoblast cells during their proliferation and differentiation stages. A human fetal osteoblast cell line was cultured and treated with LLLT. The cells were divided into experimental groups according to the power delivered and periods of exposure per day for each laser power. The (3-(4,5-dimethylthiazol-2yl)-2,5 diphenyl tetrazolium bromide) (MTT) assay was used to determine cell proliferation. Both alkaline phosphatase and osteocalcin activity assays were assessed for cell differentiation. All treatment groups showed a significant increase in cell proliferation and differentiation compared to the control group. Regarding the exposure time, the subgroups treated with the LLLT for 6 min showed higher proliferation and differentiation rates for the powers delivered, the 300-mW LLLT group significantly increased the amount of cell proliferation. By contrast, the 100 and 200 mW

groups showed significantly greater amounts of cell differentiation. These results suggest that the use of LLLT may play an important role in stimulating osteoblast cells for improved bone formation. Osteocalcin;Alkaline Phosphatase Alkaline Phosphatase;Cell Differentiation;Cell Line;Cell Proliferation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteocalcin;Osteogenesis

Low-level laser therapy and light-emitting diode effects in the secretion of neuropeptides SP and CGRP in rat skin. The phototherapy effects in the skin are related to biomodulation, usually to accelerate wound healing. However, there is no direct proof of the interrelation between the effects of low-level laser therapy (LLLT) and light-emitting diode (LED) in neuropeptide secretion, these substances being prematurely involved in the neurogenic inflammation phase of wound healing. This study therefore focused on investigating LLLT and LED in Calcitonin gene-related peptide (CGRP) and substance P (SP) secretion in healthy rat skin. Forty rats were randomly distributed into five groups with eight rats each: Control Group, Blue LED Group (470 nm, 350 mW power), Red LED Group (660 nm, 350 mW power), Red Laser Group (660 nm, 100 mW power), and Infrared Laser Group (808 nm, 100 mW power) (DMCÂ® Equipamentos Ltda., SÃ£o Carlos, SÃ£o Paulo, Brazil). The skin of the animals in the experimental groups was irradiated using the punctual contact technique, with a total energy of 40 J, single dose, standardized at one point in the dorsal region. After 14 min of irradiation, the skin samples were collected for CGRP and SP quantification using western blot analysis. SP was released in Infrared Laser Group ($p = 0.01$); there was no difference in the CGRP secretion among groups. Infrared (808 nm) LLLT enhances neuropeptide SP secretion in healthy rat skin. Substance P;Calcitonin Gene-Related Peptide Animals;Calcitonin Gene-Related Peptide;Electronics;Low-Level Light Therapy;Male;Rats, Wistar;Skin;Substance P

Expression of genes in normal fibroblast cells (WS1) in response to irradiation at 660nm. Photobiomodulation has been found to increase gene expression and release of various growth factors and cytokines involved in wound healing. Photobiomodulation has been used to treat a wide variety of disorders, and has been found to be beneficial in the treatment of chronic wounds, however the exact underlying mechanism is not well understood. This study aimed to profile 84genes in response to irradiation at 660nm. WS1 human skin fibroblasts were used in gene expression profiling studies in response to irradiation with a 660nm diode laser at a fluence of 5J/cm(2) and power density of 11mW/cm(2). Forty-eight hours post-irradiation, 1Î¼g RNA was reverse transcribed and used in real-time qualitative polymerase chain reaction (qPCR). Genes involved in the extracellular matrix and cell adhesion, inflammatory cytokines and chemokines, growth factors and signal transduction were evaluated. A total of 76genes were regulated by laser irradiation, 43genes were up-regulated while 33genes were down-regulated. Irradiation of WS1 cells at 660nm modulates the expression of genes involved in collagen production, cellular adhesion, remodelling and spreading, the cytoskeleton, inflammatory cytokines and chemokines, growth factors and molecules involved in signal transduction. Cytokines;Collagen Cell Line;Collagen;Cytokines;Extracellular Matrix;Fibroblasts;Gene Expression;Gene Expression Profiling;Humans;Inflammation;Lasers;Oligonucleotide Array Sequence Analysis;Real-Time Polymerase Chain Reaction;Signal Transduction

Effect of 1440-nanometer neodymium:yttrium-aluminum-garnet laser irradiation on pain and neuropeptide reduction: a randomized prospective clinical trial. INTRODUCTION: The purpose of this study was to investigate the efficacy of a 1440-nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser on relieving pain in relation to the levels of inflammatory cytokine and neuropeptides in the root canal exudates of teeth with persistent symptomatic apical periodontitis. METHODS: Forty teeth with persistent symptomatic apical periodontitis were randomly assigned to treatment groups: group L, intracanal irradiation of 1440-nm Nd:YAG laser with a 300-Î¼m-diameter fiberoptic tip in

addition to conventional root canal retreatment, and group C, conventional root canal re-treatment. The degrees of both spontaneous pain and the pain on percussion before and after treatment were recorded, and root canal exudate samples were collected to quantify the associated levels of substance P, calcitonin gene-related peptide (CGRP), and matrix metalloproteinase (MMP)-8 by immunoassay. RESULTS: All of the measured parameters were significantly reduced in group L ($P < .05$), whereas the level of pain on percussion, CGRP, and MMP-8 were significantly reduced in group C ($P < .05$). The 1440-nm Nd:YAG laser had significantly better effect on the relief of pain on percussion and the reduction of substance P, CGRP, and MMP-8 levels. The visual analog scale scores of perceived pain correlated with pain-related neuropeptides and inflammatory cytokine levels in root canal exudates. CONCLUSIONS: The 1440-nm Nd:YAG laser irradiation via fiberoptic tip to the teeth with persistent apical periodontitis provided promising consequences of pain and inflammation modulation. Cytokines;Inflammation Mediators;Neuropeptides;Neurotransmitter Agents;Vasodilator Agents;Substance P;MMP8 protein, human;Matrix Metalloproteinase 8;Calcitonin Gene-Related Peptide Adult;Calcitonin Gene-Related Peptide;Cytokines;Dental Pulp Cavity;Exudates and Transudates;Female;Follow-Up Studies;Humans;Inflammation Mediators;Lasers, Solid-State;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Neuropeptides;Neurotransmitter Agents;Optical Fibers;Pain;Pain Measurement;Percussion;Periapical Periodontitis;Prospective Studies;Retreatment;Substance P;Vasodilator Agents

The effectiveness of low-level laser therapy in accelerating orthodontic tooth movement: a meta-analysis. Low-level laser therapy is claimed to accelerate bone remodeling. The aim of this meta-analysis was to critically appraise current evidence and to determine the effectiveness of low-level laser therapy in accelerating orthodontic tooth movement. PubMed, Web of Knowledge, Embase, CENTRAL, ProQuest Dissertations &Theses, and SIGLE were electronically searched from Jan 1990 to Jun 2013. Article screening, data extraction, assessment of risk of bias and evaluation of evidence quality through GRADE were conducted independently and in duplicate by two reviewer authors. Outcome of interest in this meta-analysis was accumulative moved distance (AMD). Meta-analyses were performed in Comprehensive Meta-Analysis Version 2.2.064 (Biostat, Englewood, NJ, USA). Finally, five studies were included in this meta-analysis. The meta-analysis revealed that the pooled difference in mean (DM) was 0.33 [95 % CI: (0.03-0.64)], 0.76 [95 % CI: (-0.14, 1.65)] and 0.43 [95 % CI: (-0.05, 0.91)] for AMD within 1 month, AMD within 2 months and AMD within 3 months, respectively. However, significant heterogeneities and instability of the pooled results were detected. Moreover, publication bias was found for AMD within 3 months. The subgroup analysis on the wavelength of 780 nm revealed that the pooled DM of AMD were 0.54 (95 % Clâ€‰=â€‰0.18-0.91), 1.11 (95 % Clâ€‰=â€‰0.91-1.31) and 1.25 (95 % Clâ€‰=â€‰0.68-1.82) for 1, 2, and 3 months, respectively. For the output power of 20 mW, the subgroup analysis showed that the pooled DM of AMD was 0.45 (95 % Clâ€‰=â€‰0.26-0.64), 1.11 (95 % Clâ€‰=â€‰0.91-1.31), and 1.25 (95 % Clâ€‰=â€‰0.68-1.82) for 1, 2, and 3 months, respectively. Weak evidence suggests that low-level laser irradiations at the wavelength of 780 nm, at the fluence of 5 J/cm(2) and/or the output power of 20 mW could accelerate orthodontic tooth movement within 2 months and 3 months. However, we cannot determine its effectiveness within 1 month due to potential measurement errors. Humans;Low-Level Light Therapy;Malocclusion;Randomized Controlled Trials as Topic;Tooth Movement Techniques;Treatment Outcome

Photobiomodulation accelerates orthodontic alignment in the early phase of treatment. BACKGROUND: Numerous strategies have been proposed to decrease the treatment time a patient requires in orthodontic treatment. Recently, a number of device-accelerated therapies have emerged in orthodontics. Photobiomodulation is an emerging area of science that has clinical applications in a

number of human biological processes. The aim of this study was to determine if photobiomodulation reduces the treatment time in the alignment phase of orthodontic treatment. METHODS: This multicenter clinical trial was performed on 90 subjects (73 test subjects and 17 controls), and Little's Index of Irregularity (LII) was used as a measure of the rate of change of tooth movement. Subjects requiring orthodontic treatment were recruited into the study, and the LII was measured at regular time intervals. Test subjects used a device which produced near-infrared light with a continuous 850-nm wavelength. The surface of the cheek was irradiated with a power density of 60 mW/cm2 for 20 or 30 min/day or 60 min/week to achieve total energy densities of 72, 108, or 216 J/cm2, respectively. All subjects were fitted with traditional orthodontic brackets and wires. The wire sequences for each site were standardized to an initial round alignment wire (014 NiTi or 016 NiTi) and then advanced through a progression of stiffer arch wires unit alignment occurred (LII<1 mm). RESULTS: The mean LII scores at the start of the clinical trial for the test and control groups were 6.35 and 5.04 mm, respectively. Multi-level mixed effect regression analysis was performed on the data, and the mean rate of change in LII was 0.49 and 1.12 mm/week for the control and test groups, respectively. CONCLUSIONS: Photobiomodulation produced clinically significant changes in the rates of tooth movement as compared to the control group during the alignment phase of orthodontic treatment. Adolescent;Adult;Case-Control Studies;Child;Cohort Studies;Female;Humans;Infrared Rays;Male;Malocclusion, Angle Class I;Orthodontic Brackets;Orthodontic Wires;Phototherapy;Radiation Dosage;Time Factors;Tooth Movement Techniques;Treatment Outcome;Young Adult

Acceleration of tooth movement during orthodontic treatment--a frontier in orthodontics. Nowadays, there is an increased tendency for researches to focus on accelerating methods for tooth movement due to the huge demand for adults for a shorter orthodontic treatment time. Unfortunately, long orthodontic treatment time poses several disadvantages like higher predisposition to caries, gingival recession, and root resorption. This increases the demand to find the best method to increase tooth movement with the least possible disadvantages. The purpose of this study is to view the successful approaches in tooth movement and to highlight the newest technique in tooth movement. A total of 74 articles were reviewed in tooth movement and related discipline from 1959 to 2013. There is a high amount of researches done on the biological method for tooth movement; unfortunately, the majority of them were done on animals. Cytokine, PTH, vitamin D, and RANKL/RANK/OPG show promising results; on the other hand, relaxin does not accelerate tooth movement, but increases the tooth mobility. Low-level laser therapy has shown positive outcome, but further investigation should be done for the best energy and duration to achieve the highest success rate. Surgical approach has the most predictable outcomes but with limited application due to its aggressiveness. Piezocision technique is considered one of the best surgical approaches because it poses good periodontal tissue response and excellent aesthetic outcome. Due to the advantages and disadvantages of each approach, further investigations should be done to determine the best method to accelerate tooth movement. Biological Products Biological Products;Dental Research;Humans;Low-Level Light Therapy;Osteotomy;Piezosurgery;Time Factors;Tooth Movement Techniques;Treatment Outcome

Effects of low-level laser therapy on biceps braquialis muscle fatigue in young women. OBJECTIVE: This study aims to investigate the effects of low-level laser therapy (LLLT) on biceps brachi muscular fatigue in 20 young females. BACKGROUND DATA: Exhausting physical activity leads to muscular fatigue, which could decrease muscular strength, and may cause impairment in motor control and muscle pain. Several biochemical and biophysical resources have been studied in an attempt to accelerate the recovery of muscle fatigue. Among these, LLLT is emphasized. METHODS: Twenty subjects were randomized in one laser group and one placebo group in two sessions of a

crossover design experimental procedure; the second session taking place within 7 days of the first. In the first session, subjects underwent a collection of surface electromyographic (SEMG) data of the biceps brachii muscle, followed by active or placebo LLLT at the same muscle, followed then by another EMG sample of biceps brachii. Blood samples were collected five times during the experimental procedure. Second session procedures were identical to the first, with exception of LLLT, which was the opposite of the first session. The fatigue protocol consisted of 60 sec of elbow flexion-extension movement performed with 75% of one maximum repetition. Blood lactate, EMG fatigue, and the number of elbow flexion-extension repetitions during the fatigue protocol were used to evaluate the effects of laser therapy (808 nm wavelength, 100 mW output power, power density of 35.7 W/cm(2), 70 sec each point and 7 J/point on eight points). RESULTS: No statistical differences were found for eletromyographic fatigue and blood lactate values between groups. Mean numbers of elbow flexion-extension repetitions were 22.6 Â± 7.58 after placebo, and 25.1 Â± 9.89 after active LLLT group, but these differences were not statistically significant (p=0.342). CONCLUSIONS: LLLT had limited effects on delaying muscle fatigue in a young female sample, although a tendency was observed in the active laser group toward showing lower electromyography fatigue of biceps brachii muscle. No intergroup differences were found in the number of muscle contractions and lactate concentration. Lactic Acid Cross-Over Studies;Electromyography;Female;Humans;Lactic Acid;Low-Level Light Therapy;Muscle Fatigue;Muscle, Skeletal;Young Adult

Effects of low level laser therapy on ovalbumin-induced mouse model of allergic rhinitis. Introduction. This study was designed to investigate the effects of low level laser therapy (LLLT) on experimental allergic rhinitis (AR) models induced by ovalbumin. Materials and Methods. AR was induced by 1% ovalbumin in mice. Twenty-four mice were divided into 4 groups: normal, control, low, and high dose irradiation. Low and high dose LLLT were irradiated once a day for 7 days. Total IgE, cytokines concentrations (IL-4 and IFN- Î³), and thymus and activation regulated chemokine (TARC) were measured. Histological changes in the nasal mucosal tissue by laser irradiation were examined. Results. LLLT significantly inhibited total IgE, IL-4, and TARC expression in ovalbumin-induced mice at low dose irradiation. The protein expression level of IL-4 in spleen was inhibited in low dose irradiation significantly. IL-4 expression in EL-4 cells was inhibited in a dose dependent manner. Histological damages of the epithelium in the nasal septum were improved by laser irradiation with marked improvement at low dose irradiation. Conclusion. These results suggest that LLLT might serve as a new therapeutic tool in the treatment of AR with more effectiveness at low dose irradiation. To determine the optimal dose of laser irradiation and action mechanisms of laser therapy, further studies will be needed.

Mitochondrial respiration as a target for neuroprotection and cognitive enhancement. This paper focuses on brain mitochondrial respiration as a therapeutic target for neuroprotection and cognitive enhancement. We propose that improving brain mitochondrial respiration is an important future direction in research and treatment of Alzheimer's disease (AD) and other conditions associated with cognitive impairment and neurodegeneration. The central thesis is that supporting and improving brain mitochondrial respiration constitutes a promising neurotherapeutic principle, with potential applications in AD as well as in a wide variety of neuropsychological conditions. We propose three different interventional approaches to improve brain mitochondrial respiration based on (a) pharmacology, (b) photobiomodulation and (c) nutrition interventions, and provide detailed examples for each type of intervention. First, low-dose USP methylene blue is described as a pharmacological intervention that can successfully increase mitochondrial respiration and result in memory enhancement and neuroprotection. Second, transcranial low-level light/laser therapy with near-infrared light is used to illustrate a photobiomodulation intervention with similar neurometabolic mechanisms of action as low-dose methylene blue. Finally, a nutrition intervention to

improve mitochondrial respiration is proposed by increasing ketone bodies in the diet. The evidence discussed for each intervention supports a fundamental neurotherapeutic strategy based on improving oxidative energy metabolism while at the same time reducing the pro-oxidant tendencies of the nervous system. Targeting brain mitochondrial respiration with these three types of interventions is proposed as part of a holistic neurotherapeutic approach to improve brain energy metabolism and antioxidant defenses. This strategy represents a promising new bioenergetics direction for treatment of AD and other neuropsychological disorders featuring cognitive impairment and neurodegeneration. Ketone Bodies;Methylene Blue Alzheimer Disease;Cognition;Dose-Response Relationship, Drug;Humans;Ketone Bodies;Laser Therapy;Methylene Blue;Mitochondria

Effects of 660 nm low-level laser therapy on muscle healing process after cryolesion. The aim of this study was to evaluate the effects of 660 nm low-level laser therapy (LLLT) on muscle regeneration after cryolesion in rat tibialis anterior muscle. Sixty-three Wistar rats were divided into a control group, 10 J/cm(2) laser-treated group, and 50 J/cm(2) laser-treated group. Each group formed three subgroups (n = 7 per group), and the animals were sacrificed 7, 14, or 21 d after lesion. Histopathological findings revealed a lower inflammatory process in the laser-treated groups after 7 d. After 14 d, irradiated animals at both fluences showed higher granulation tissue, new muscle fibers, and organized muscle structure. After 21 d, full tissue repair was observed in all groups. Moreover, irradiated animals at both fluences showed smaller necrosis area in the first experimental period evaluated. MyoD immunoexpression was observed in both treated groups 7 d postinjury. Myogenin immunoexpression was detected after 7 and 14 d. The higher fluence increased the number of blood vessels after 14 and 21 d. These results suggest that LLLT, at both fluences, positively affects injured skeletal muscle in rats, accelerating the muscle-regeneration process. MyoD Protein;Myogenin Animals;Cold Temperature;Granulation Tissue;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Myogenin;Rats;Rats, Wistar;Wound Healing

Appropriate timing for thyroidectomy scar treatment using a 1,550-nm fractional erbium-glass laser. BACKGROUND: Surgical scarring is a common cosmetic problem that occurs in various surgical fields, including dermatology. Many trials have been conducted to determine how to prevent this distressing scar formation. A 1,550-nm fractional erbium-glass laser has been used to improve the appearance of surgical scars, but an appropriate treatment time has not been established. OBJECTIVES: To determine the appropriate time to apply 1,550-nm fractional erbium-glass laser treatment for thyroidectomy scars. MATERIALS AND METHODS: Korean patients with linear surgical suture lines after thyroidectomy (NÂ =Â 65) were treated using a 1,550-nm fractional erbium-glass laser. Patients were divided into three groups according to postoperative treatment time. Laser treatment was started in 40, 15, and 10 patients 3Â weeks, 3Â months, and 6Â months postoperatively, respectively. Each patient was treated three times at 1-month intervals using the same parameters (14Â mJ, 100 spots/cm(2) , 2 passes). RESULTS: Mean Vancouver Scar Scale scores were significantly lower after laser treatment (pÂ <Â .01), with the greatest difference in the group that began treatment 3Â weeks postoperatively. Global assessment also indicated better cosmetic outcomes in the 3-week postoperative treatment group. CONCLUSION: Early postoperative 1,550-nm fractional erbium-glass laser treatment of thyroidectomy scars is more effective than later treatment. Erbium Adult;Aged;Cicatrix;Erbium;Female;Glass;Humans;Low-Level Light Therapy;Male;Middle Aged;Thyroidectomy;Treatment Outcome

Melasma and low-energy Q-switched laser: treatment assessment by means of in vivo confocal microscopy. Melasma is an acquired disorder of pigmentation for which several therapeutical options are currently available. Among them, low-energy Q-switched Nd:YAG laser (1,064 nm) has been successfully applied in case series although its long-term efficacy has yet to be proven. In vivo

confocal microscopy is a novel imaging technique that permits to explore the skin tissue at a nearly histologic resolution. The aim of our study was to evaluate the laser treatment efficacy by means of confocal microscopy at different time points to elucidate the mechanism of action of the laser and its possible drawbacks. Eight women who presented with melasma on the face were subjected to low-energy Q-switched Nd:YAG laser treatment and then analyzed by means of confocal microscopy. An overall improvement of melasma was noticed clinically and microscopically by means of confocal microscopy. Four cases revealed the presence of dendritic-shaped cells upon confocal microscopy and those patients were the ones presenting with a relapse of the disease. The interpretation of these cells is that they could represent reasonably activated melanocytes. This opens the question whether laser treatment should be modulated to avoid side-effects associated with its use. Confocal microscopy has emerged as an excellent tool for a better understanding of the changes occurring during laser treatment. Adult;Female;Humans;Lasers;Low-Level Light Therapy;Melanosis;Microscopy, Confocal;Treatment Outcome

Comments on "Comparison of the influence of ozone and laser therapies on pain, swelling, and trismus following impacted third-molar surgery". Ozone Edema;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Ozone;Pain, Postoperative;Tooth, Impacted;Trismus

A comparative study of low-fluence 1064-nm Q-switched Nd:YAG laser with or without chemical peeling using Jessner's solution in melasma patients. BACKGROUND: Although low-fluence 1064-nm Q-switched Nd:YAG laser (QSNYL) is widely used for the treatment of melasma, multiple treatments are necessary for clinical improvement. Superficial chemical peeling using Jessner's solution has been used for treatment of melasma conventionally. OBJECTIVES: To evaluate the additional therapeutic effect and adverse effects of Jessner's peel when combined with 1064-nm QSNYL for melasma patients in a double-blind, placebo-controlled design. METHODS: Total of 52 patients were included. Patients who received 10 sessions of 1064-nm QSNYL plus chemical peeling with placebo (group A) in a two-week interval and those who received 10 sessions of 1064-nm QSNYL plus chemical peeling with Jessner's solution (group B) in a two-week interval were analyzed. Responses were evaluated using the Melasma Area and Severity Index (MASI) score, physician's global assessment (PGA) and subjective self-assessment. RESULTS: At 8 weeks, the mean MASI score decreased from 8.68â€‰Â±â€‰4.06 to 8.60â€‰Â±â€‰3.88 in group A and from 8.98â€‰Â±â€‰3.72 to 7.13â€‰Â±â€‰2.57 in group B, showing a significant difference (pâ€‰<â€‰0.001). But at 20 weeks, there was no significant difference on reduction of MASI, self-assessment and PGA between the two groups. No serious adverse effects were reported with the additional Jessner's peeling. CONCLUSION: This study suggests Jessner's peel is a safe and effective method in the early course of treatment for melasma when combined with low-fluence 1064-nm Q-switched Nd:YAG laser. Dermatologic Agents;Drug Combinations;Jessner's solution;Resorcinols;Salicylates;Lactic Acid;Ethanol Administration, Topical;Adult;Chemexfoliation;Combined Modality Therapy;Dermatologic Agents;Double-Blind Method;Drug Combinations;Ethanol;Female;Humans;Lactic Acid;Lasers;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Resorcinols;Salicylates;Treatment Outcome

Efficacy of low-level laser therapy in the management of tinnitus due to noise-induced hearing loss: a double-blind randomized clinical trial. Background. Several remedial modalities for the treatment of tinnitus have been proposed, but an effective standard treatment is still to be confirmed. In the present study, we aimed to evaluate the effect of low-level laser therapy on tinnitus accompanied by noise-induced hearing loss. Methods. This was a double-blind randomized clinical trial on subjects suffering from tinnitus accompanied by noise-induced hearing loss. The study intervention was 20 sessions of low-level laser therapy every other day, 20 minutes each session. Tinnitus was assessed by three methods (visual analog scale, tinnitus handicap inventory, and tinnitus

loudness) at baseline, immediately and 3 months after the intervention. Results. All subjects were male workers with age range of 30-51 years. The mean tinnitus duration was 1.85 Â± 0.78 years. All three measurement methods have shown improved values after laser therapy compared with the placebo both immediately and 3 months after treatment. Laser therapy revealed a U-shaped efficacy throughout the course of follow-up. Nonresponse rate of the intervention was 57% and 70% in the two assessment time points, respectively. Conclusion. This study found low-level laser therapy to be effective in alleviating tinnitus in patients with noise-induced hearing loss, although this effect has faded after 3 months of follow-up. This trial is registered with the Australian New Zealand clinical trials registry with identifier ACTRN12612000455864). Adult;Double-Blind Method;Hearing Loss, Noise-Induced;Humans;Laser Therapy;Male;Middle Aged;Tinnitus

Phototherapy effect on the muscular activity of regular physical activity practitioners. Clinical investigations have demonstrated the effectiveness of phototherapy on the muscle activity. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on the tibialis anterior muscle of regular physical activity practitioners by electromyographic, biomechanical, and biochemical (lactate) analysis. Double-blind controlled clinical trials were conducted with 12 healthy females, regular physical activity practitioners, between 18 and 30 years. The LLLT application (780 nm, 30 mW, 0.81 J/point, beam area of 0.2 cm(2), 27 s, â‰ˆ 29 points) in the tibialis anterior muscle occurred after the delimitation of the points on every 4 cm(2) was held. It was observed that (a) a significant torque increase ($p < 0.05$) post-LLLT compared to the values after placebo therapy at the beginning of resistance exercise, (b) both muscle torque (isokinetic) and median frequency (EMG) showed a faster decay of the signals collected after placebo and laser treatment when compared to control values, (c) no significant change in torque in the strength test of five repetitions, (d) a significant muscle activity decrease ($p < 0.05$) after laser therapy compared to control values, and (e) an increase in lactate levels post-LLLT ($p < 0.05$) after 30 min of exercise. It is concluded that the LLLT increased the muscle torque at the beginning of the exercise and maintained the levels of lactate after resistance exercise. Therefore, the LLLT with the parameters used in this study can be utilized in rehabilitation to improve muscle performance in elite athletes. Lactic Acid Double-Blind Method;Exercise;Female;Humans;Lactic Acid;Motor Activity;Muscle, Skeletal;Phototherapy;Torque

Can osteoarthritis be treated with light? Osteoarthritis is becoming more problematic as the population ages. Recent reports suggest that the benefit of anti-inflammatory drugs is unimpressive and the incidence of side effects is worrying. Low-level laser (light) therapy (LLLT) is an alternative approach with no known side effects and with reports of substantial therapeutic efficacy in osteoarthritis. In this issue of Arthritis Research & Therapy, Alves and colleagues used a rat model of osteoarthritis produced by intra-articular injection of the cartilage-degrading enzyme papain to test 810-nm LLLT. A single application of LLLT produced significant reductions in inflammatory cell infiltration and inflammatory cytokines 24 hours later. A lower laser power was more effective than a higher laser power. However, more work is necessary before the title question can be answered in the affirmative. Cytokines Animals;Arthritis;Cytokines;Gene Expression;Low-Level Light Therapy;Macrophages;Male;Neutrophils

A controlled trial to determine the efficacy of red and near-infrared light treatment in patient satisfaction, reduction of fine lines, wrinkles, skin roughness, and intradermal collagen density increase. OBJECTIVE: The purpose of this study was to investigate the safety and efficacy of two novel light sources for large area and full body application, providing polychromatic, non-thermal photobiomodulation (PBM) for improving skin feeling and appearance. BACKGROUND DATA: For non-thermal photorejuvenation, laser and LED light sources have been demonstrated to be safe and effective. However, lasers and LEDs may offer some disadvantages because of dot-shaped (punctiform) emission characteristics and their narrow spectral bandwidths. Because the action

spectra for tissue regeneration and repair consist of more than one wavelength, we investigated if it is favorable to apply a polychromatic spectrum covering a broader spectral region for skin rejuvenation and repair. MATERIALS AND METHODS: A total of 136 volunteers participated in this prospective, randomized, and controlled study. Of these volunteers, 113 subjects randomly assigned into four treatment groups were treated twice a week with either 611-650 or 570-850 nm polychromatic light (normalized to âˆ¼ 9 J/cm(2) in the range of 611-650 nm) and were compared with controls (n=23). Irradiances and treatment durations varied in all treatment groups. The data collected at baseline and after 30 sessions included blinded evaluations of clinical photography, ultrasonographic collagen density measurements, computerized digital profilometry, and an assessment of patient satisfaction. RESULTS: The treated subjects experienced significantly improved skin complexion and skin feeling, profilometrically assessed skin roughness, and ultrasonographically measured collagen density. The blinded clinical evaluation of photographs confirmed significant improvement in the intervention groups compared with the control. CONCLUSIONS: Broadband polychromatic PBM showed no advantage over the red-light-only spectrum. However, both novel light sources that have not been previously used for PBM have demonstrated efficacy and safety for skin rejuvenation and intradermal collagen increase when compared with controls. Collagen Adult;Aged;Collagen;Cosmetic Techniques;Female;Humans;Immunohistochemistry;Infrared Rays;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Skin;Skin Aging;Ultrasonography

The effectiveness of physiotherapeutic interventions in treatment of frozen shoulder/adhesive capsulitis: a systematic review. BACKGROUND AND OBJECTIVE: Frozen shoulder is a common condition, yet its treatment remains challenging. In this review, the current best evidence for the use of physical therapy interventions (PTI) is evaluated. METHOD: MEDLINE, CINAHL, Cochrane, PEDro, ProQuest, Science Direct, and Sport Discus were searched for studies published in English since 2000. RESULTS: 39 articles describing the PTI were analyzed using Sackett's levels of evidence and were examined for scientific rigor. The PTI were given grades of recommendation that ranged from A to C. CONCLUSIONS: Therapeutic exercises and mobilization are strongly recommended for reducing pain, improving range of motion (ROM) and function in patients with stages 2 and 3 of frozen shoulder. Low-level laser therapy is strongly suggested for pain relief and moderately suggested for improving function but not recommended for improving ROM. Corticosteroid injections can be used for stage 1 frozen shoulder. Acupuncture with therapeutic exercises is moderately recommended for pain relief, improving ROM and function. Electro- therapy can help in providing short-term pain relief. Continuous passive motion is recommended for short-term pain relief but not for improving ROM or function. Deep heat can be used for pain relief and improving ROM. Ultrasound for pain relief, improving ROM or function is not recommended. Bursitis;Exercise Therapy;Humans;Physical Therapy Modalities;Range of Motion, Articular;Treatment Outcome

Scarring of lupus miliaris disseminatus faciei: treatment with a combination of trichloroacetic acid and carbon dioxide laser. We present a case of a 35-year-old man having a 12-month history of multiple reddish-brown papules on the chin, forehead, cheeks, and eyelids. Histopathologic findings revealed epithelioid cell granulomas with central necrosis consistent with a diagnosis of lupus miliaris disseminatus faciei. After 9 months of combined treatment with ethambutol, rifampin, and pyrazinamide, most lesions gradually resolved but remained as severe disfiguring scars. After 10 sessions of treatments with 100% trichloroacetic acid and CO2 laser, the lupus miliaris disseminatus faciei scars have been much improved and the patient has never experienced a recurrence of disease during subsequent years of follow-up. Caustics;Trichloroacetic Acid Adult;Biopsy;Caustics;Cicatrix;Combined Modality Therapy;Facial Dermatoses;Granuloma;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Necrosis;Skin;Treatment Outcome;Trichloroacetic Acid

[Evidence-based physiotherapy]. This article on physiotherapy presents some current evidence stating the strengths and weaknesses of the physiotherapeutic procedures. In the area of physiotherapy empirical data obtained during decades were overtaken by evidence from current studies. The author points out the great problem of physiotherapy, namely the heterogeneity of the applied parameters. Knowledge of current evidence may be very important and helpful for the physicians, but the author proposes, from the practical point of view, that physiotherapeutical procedures based on exprience and used for many years should not be entirely neglected. Nowadays physiotherapy plays an important role in the treament of locomotor diseases but its use is increasing in other fields of medicine, as well. Balneology;Electric Stimulation Therapy;Evidence-Based Medicine;Exercise Therapy;Humans;Hydrotherapy;Iontophoresis;Low-Level Light Therapy;Magnetic Field Therapy;Massage;Musculoskeletal Manipulations;Physical Therapy Modalities;Pulsed Radiofrequency Treatment;Transcutaneous Electric Nerve Stimulation;Ultrasonic Therapy

Low-fluence photodynamic therapy versus ranibizumab for chronic central serous chorioretinopathy: one-year results of a randomized trial. PURPOSE: To compare the efficacy and safety between low-fluence photodynamic therapy (PDT) and the intravitreal ranibizumab in the treatment of chronic central serous chorioretinopathy (CSC). DESIGN: Prospective, randomized, single-center, parallel-arm, controlled trial. PARTICIPANTS: Thirty-four eyes of 32 patients with chronic CSC with >6 months' duration of symptoms or recurrent CSC were randomly placed into the low-fluence PDT group (n = 18) or the ranibizumab group (n = 16). INTERVENTION: The patients underwent a single session of low-fluence PDT or 3 consecutive monthly injections of ranibizumab. Rescue treatment was available from month 3 if the subretinal fluid (SRF) persisted or recurred after primary treatment; low-fluence PDT was given to the ranibizumab group and intravitreal ranibizumab to the low-fluence PDT group. MAIN OUTCOME MEASURES: The primary outcome was the proportion of eyes with complete resolution of SRF without rescue treatment. Secondary outcomes included the mean changes in logarithm of the minimum angle of resolution best-corrected visual acuity (BCVA), central retinal thickness (CRT), and angiographic findings from baseline to 12 months. RESULTS: At month 12, 16 eyes (88.9%) of the low-fluence PDT group maintained complete resolution of SRF without rescue treatment versus 2 eyes (12.5%) in the ranibizumab group (P <0.001). Two eyes (11.1%) in the low-fluence PDT group and 11 eyes (68.8%) in the ranibizumab group met the criteria for rescue treatment (P = 0.001). In the low-fluence PDT group, the mean decrease in CRT from baseline was significantly greater than that in the ranibizumab group until month 6 (P <0.05), but the differences became insignificant thereafter. The improvement in BCVA from baseline was superior in the low-fluence PDT group to that in the ranibizumab group, but the differences were not statistically significant except at month 3 (P = 0.025). On indocyanine green angiography, a significantly greater proportion of the low-fluence PDT group (16 eyes; 88.9%) showed a marked reduction in choroidal hyperpermeability after primary treatment than that of the ranibizumab group (0 eyes; P <0.001). No serious adverse events related to the drugs or procedures were observed. CONCLUSIONS: This study represents the overall superiority of low-fluence PDT compared with intravitreal ranibizumab in the treatment of chronic CSC. Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Coloring Agents;Photosensitizing Agents;Porphyrins;Verteporfin;Indocyanine Green;Ranibizumab Adult;Aged;Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Central Serous Chorioretinopathy;Chronic Disease;Coloring Agents;Double-Blind Method;Female;Fluorescein Angiography;Humans;Indocyanine Green;Intravitreal Injections;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Porphyrins;Prospective Studies;Ranibizumab;Retina;Subretinal Fluid;Tomography, Optical Coherence;Treatment Outcome;Verteporfin;Visual Acuity

New tattoo approaches in dermatology. Tattoos have fascinated mankind for centuries. Although these body marks were once considered to be permanent, technical and scientific progress in recent years has made it possible to remove tattoos by various treatment modalities. Contemporary technology involves the use of nonablative quality-switched lasers, which are considered to be the gold-standard treatment option for the removal of unwanted tattoo ink. Current research in the field of tattoo removal is focused on faster lasers and more effective targeting of tattoo pigment particles including picosecond laser devices, multi-pass treatments, dermal scatter reduction, application of imiquimod, and the use of microencapsulated tattoo ink. Aminoquinolines;Bile Pigments;Imiquimod Aminoquinolines;Animals;Bile Pigments;Cosmetic Techniques;Dermatology;Guinea Pigs;Humans;Hyperpigmentation;Imiquimod;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Skin;Stereotyping;Tattooing;Treatment Outcome

Future directions in cutaneous laser surgery. This article presents an overview of future trends in cutaneous laser therapy and technology. To enhance efficacy and specificity of treatment, new wavelengths directed at both old and new targets are on the horizon. New applications, including the use of lasers to aid in the detection of skin cancers and to enhance drug delivery, are being used and investigated. A trend toward combining different lasers and light sources to optimize results continues. Advancements in at-home devices have been made. Future applications will include waveforms beyond those in the visible light and infrared spectrum, such as microwaves, ultrasound waves, and radiofrequency. Forecasting;Humans;Laser Therapy;Lentigo;Low-Level Light Therapy;Skin Diseases;Skin Neoplasms;Spectroscopy, Near-Infrared

Comparison of a fractional bipolar radiofrequency device and a fractional erbium-doped glass 1,550-nm device for the treatment of atrophic acne scars: a randomized split-face clinical study. BACKGROUND: A fractional erbium-doped glass 1,550-nm and a fractional bipolar radiofrequency (RF) device are effective in the treatment of atrophic acne scars. OBJECTIVE: To compare the clinical effectiveness and side effects of fractional bipolar RF with those of fractional erbium-doped glass in atrophic acne scars treatment. MATERIALS AND METHODS: Twenty Thai subjects with atrophic acne scars received three split-face monthly treatments, one side with fractional bipolar RF and the other with fractional erbium-doped glass. Three independent physicians and patients evaluated improvement in acne scars 4Â weeks after the last treatment. Side effects were also recorded after each treatment. RESULTS: The study found significant improvement in acne scars after treatment with fractional bipolar RF and with a fractional erbium-doped glass device without a statistically significant difference between the two devices. The side effects of both devices were pain, transient facial erythema, and scab formation. The pain score with fractional erbium-doped glass was higher than that with fractional bipolar RF, but duration of scab shedding was shorter. One case had postinflammatory hyperpigmentation on only the side treated with fractional erbium-doped glass. CONCLUSION: Fractional bipolar RF and fractional erbium-doped glass have similar effectiveness for the treatment of atrophic acne scars. Erbium Acne Vulgaris;Adult;Atrophy;Cicatrix;Dose Fractionation, Radiation;Erbium;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

Fox-Fordyce disease treatment with fractional CO2 laser. Female;Fox-Fordyce Disease;Humans;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome;Young Adult

Low-level laser in prevention and treatment of oral mucositis in pediatric patients with acute lymphoblastic leukemia. OBJECTIVE: The aim of this study was to evaluate the influence of low-level laser therapy (LLLT) on the prevention and treatment of oral mucositis (OM) in pediatric cancer patients taking methotrexate. BACKGROUND DATA: OM is a very common, potentially severe side effect, caused by treatment with radiotherapy and chemotherapy for cancer. METHODS: Forty patients with acute lymphoblastic leukemia, who received high doses of methotrexate, were

distributed into two groups. Group A (Preventive Group) was composed of patients who received preventive laser (red-subgroup A1 or infrared-subgroup A2) for 5 days, beginning on the 1st day of infusion. Group B (Treatment Group) was composed of patients who received laser treatment only if they developed post-chemotherapy mucositis (red-subgroup B1 or infrared-subgroup B2). Laser was used at wavelengths of 660 or 830 nm with output 100 mW, power density 3.57 W/cm(2), spot size 0.028 cm(2), energy of 1 J, resulting in an energy density of 35 J/cm(2) for 10 sec in the prophylactic group, and energy of 2 J, resulting in energy density of 70 J/cm(2) for 20 sec in the therapeutic group. RESULTS: The percentage of patients who did not develop OM was higher in Group A (60% vs. 25%). In Group B, 3/20 patients developed grade IV OM (15%), and a significant difference was found between the two subgroups at the end of treatment (p=0.019). CONCLUSIONS: Prophylactic laser produced a better outcome than when patients did not receive any preventive intervention, and red laser (660 nm) was better than infrared (830 nm) in the prevention and treatment of OM. Antimetabolites, Antineoplastic;Methotrexate Adolescent;Antimetabolites, Antineoplastic;Child;Child, Preschool;Humans;Infant;Low-Level Light Therapy;Methotrexate;Precursor Cell Lymphoblastic Leukemia-Lymphoma;Stomatitis;Treatment Outcome

[Morphological and histochemical effects of subthreshold laser therapy on the chorioretinal complex]. A variety of subthreshold laser methods that enable selective and precise treatment of chorioretinal microstructures, thus decreasing the risk of negative changes in retina and choriocapillaries, is used in current ophthalmological practice. This comparative pathomorphological and histochemical study allowed characterizing structural changes and functional activity of chorioretinal cells after application of different subthreshold laser technologies. Animals;Cell Proliferation;Central Serous Chorioretinopathy;Disease Models, Animal;Female;Follow-Up Studies;Histocytochemistry;Low-Level Light Therapy;Male;Rabbits;Retinal Pigment Epithelium

Comparison between Trans-Cranial Electromagnetic Stimulation and Low-Level Laser on Modulation of Trigeminal Neuralgia. [Purpose] To determine which of the transcranial electromagnetic stimulation or low level laser therapy is more effective in the treatment of trigeminal neuralgia of multiple sclerosis patients. [Methods] Thirty multiple sclerosis patients of both sexes participated in this study. The age of the subjects ranged from 40 to 60â€…years and their mean age was (56.4-6.6). Participants were randomly selected from Dental and Neurology Outpatient Clinics at King Khalid Hospital, Najran University, Saudi Arabia. Patients were randomly divided into two equal groups of 15. The Laser group received a low level laser therapy, 830â€…nm wavelength, 10â€…Hz and 15â€…min duration, while the Electromagnetic group received repetitive transcranial electromagnetic stimulation at a frequency of 10â€…Hz, intensity of 50 mA and duration of 20 minutes. Patients were assessed pre and post treatment for degree of pain using a numerical rating scale, maximal oral mouth opening using a digital calibrated caliper, masseter muscle tension using a tensiometer and a compound action potentials of masseter and temporalis muscles. [Results] There were significant improvements after treatment in both groups, with a significant difference between the Electromagnetic and Laser groups, in favor of the Electromagnetic group. [Conclusion] Repetitive transcranial electromagnetic stimulation at 10â€…Hz, 50 mA, and 20 minutes duration is more effective than low level laser therapy at reducing trigeminal pain, increasing maximum oral mouth opening, masseter and temporalis muscle tension in multiple sclerosis patients.

Light-emitting diode phototherapy improves muscle recovery after a damaging exercise. The goal of the present study was to determine the effect of light-emitting diode phototherapy (LEDT) at 630 nm on muscle recovery after a damaging eccentric exercise bout. Seventeen healthy young male volunteers, without previous experience with eccentric exercise, were included in a randomized double-blinded placebo-controlled trial. They were divided into a LEDT (n = 8) and a PLACEBO group (n = 9). To induce muscle damage, subjects performed 30 eccentric contractions with a load of 100 %

of maximal voluntary isometric contraction strength of the elbow flexors of the non-dominant arm. LEDT group subjects received biceps brachii phototherapy (Î» 630 nm; total energy density, 20.4 J/cm2) immediately after the exercise bout. The LEDT in the placebo group was aimed at the muscle, but it remained turned off. Isometric muscle strength, muscle soreness, and elbow range of motion (ROM) were measured before and at 24, 48, 72, and 96 h the after eccentric exercise bout and compared between groups. Our results showed that the muscle soreness, muscle strength loss, and ROM impairments were significantly reduced up to 96 h after a damaging eccentric exercise bout for the LEDT group compared with the PLACEBO group. A single LEDT (630 nm) intervention immediately after a damaging eccentric exercise bout was effective in terms of attenuating the muscle soreness and muscle strength loss and ROM impairments. Placebos Anthropometry;Exercise;Humans;Isometric Contraction;Male;Muscle, Skeletal;Myalgia;Pain Measurement;Phototherapy;Placebos;Range of Motion, Articular;Recovery of Function;Young Adult

Effect of phototherapy (low-level laser therapy and light-emitting diode therapy) on exercise performance and markers of exercise recovery: a systematic review with meta-analysis. Recent studies have explored if phototherapy with low-level laser therapy (LLLT) or narrow-band light-emitting diode therapy (LEDT) can modulate activity-induced skeletal muscle fatigue or subsequently protect against muscle injury. We performed a systematic review with meta-analysis to investigate the effects of phototherapy applied before, during and after exercises. A literature search was performed in Pubmed/Medline database for randomized controlled trials (RCTs) published from 2000 through 2012. Trial quality was assessed with the ten-item PEDro scale. Main outcome measures were selected as: number of repetitions and time until exhaustion for muscle performance, and creatine kinase (CK) activity to evaluate risk for exercise-induced muscle damage. The literature search resulted in 16 RCTs, and three articles were excluded due to poor quality assessment scores. From 13 RCTs with acceptable methodological quality (â‰¥6 of 10 items), 12 RCTs irradiated phototherapy before exercise, and 10 RCTs reported significant improvement for the main outcome measures related to performance. The time until exhaustion increased significantly compared to placebo by 4.12 s (95% CI 1.21-7.02, pâ€‰<â€‰0.005) and the number of repetitions increased by 5.47 (95% CI 2.35-8.59, pâ€‰<â€‰0.0006) after phototherapy. Heterogeneity in trial design and results precluded meta-analyses for biochemical markers, but a quantitative analysis showed positive results in 13 out of 16 comparisons. The most significant and consistent results were found with red or infrared wavelengths and phototherapy application before exercises, power outputs between 50 and 200 mW and doses of 5 and 6 J per point (spot). We conclude that phototherapy (with lasers and LEDs) improves muscular performance and accelerate recovery mainly when applied before exercise. Biomarkers;Placebos;Lactic Acid;C-Reactive Protein;L-Lactate Dehydrogenase;Creatine Kinase Biomarkers;Biomechanical Phenomena;C-Reactive Protein;Creatine Kinase;Exercise;Humans;L-Lactate Dehydrogenase;Lactic Acid;Low-Level Light Therapy;Male;Muscle Contraction;Muscle, Skeletal;Optics and Photonics;Placebos;Randomized Controlled Trials as Topic

Effect of near-infrared light exposure on mitochondrial signaling in C2C12 muscle cells. Near-infrared (NIR) light is a complementary therapy used to treat musculoskeletal injuries but the underlying mechanisms are unclear. Acute NIR light treatment (~800-950 nm; 22.8 J/cm(2)) induced a dose-dependent increase in mitochondrial signaling (AMPK, p38 MAPK) in differentiated muscle cells. Repeated NIR light exposure (4 days) appeared to elevate oxidative stress and increase the upstream mitochondrial regulatory proteins AMPK (3.1-fold), p38 (2.8-fold), PGC-1Î± (19.7%), Sirt1 (26.8%), and reduced RIP140 (23.2%), but downstream mitochondrial regulation/content (Tfam, NRF-1, Sirt3, cytochrome c, ETC subunits) was unaltered. Our data indicates that NIR light alters mitochondrial biogenesis signaling and may represent a mechanistic link to the clinical benefits. Animals;Infrared Rays;Mice;Mitochondria;Mitochondrial Turnover;Muscle Cells;Signal Transduction

A comparative study of low-fluence 1,064 nm Q-Switched Nd:YAG laser with or without chemical peeling using Jessner's solution in melasma patients. BACKGROUND: Although low-fluence 1,064-nm Q-switched Nd:YAG laser (QSNYL) is widely used for the treatment of melasma, multiple treatments are necessary for clinical improvement. Superficial chemical peeling using Jessner's solution has been used for treatment of melasma conventionally. OBJECTIVES: To evaluate the additional therapeutic effect and adverse effects of Jessner's peel when combined with 1,064 nm QSNYL for melasma patients in a double-blind, placebo-controlled design. METHODS: Total of 52 patients were included. Patients who received 10 sessions of 1,064 nm QSNYL plus chemical peeling with placebo (Group A) in a two-week intervals and those who received 10 sessions of 1,064 nm QSNYL plus chemical peeling with Jessner's solution (Group B) in a 2-week intervals were analyzed. Responses were evaluated using the Melasma Area and Severity Index (MASI) score, physician's global assessment (PGA) and subjective self-assessment. RESULTS: At 8 weeks, the mean MASI score decreased from 8.68 Â± 4.06 to 8.60 Â± 3.88 in Group A and from 8.98 Â± 3.72 to 7.13 Â± 2.57 in Group B, showing a significant difference ($p < 0.001$). But at 20 weeks, there was no significant difference on reduction of MASI, self-assessment, and PGA between the two groups. No serious adverse effects were reported with the additional Jessner's peeling. CONCLUSION: This study suggests Jessner's peel is a safe and effective method in the early course of treatment for melasma, when combined with low-fluence 1,064-nm QSNYL. Drug Combinations;Jessner's solution;Resorcinols;Salicylates;Lactic Acid;Ethanol Asian People;Chemexfoliation;Combined Modality Therapy;Double-Blind Method;Drug Combinations;Ethanol;Humans;Lactic Acid;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Patient Satisfaction;Resorcinols;Salicylates

Pulsed dye laser for the treatment of acquired progressive lymphangioma. Adolescent;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Lymphangioma;Shoulder

Improvement in lupus pernio with the successive use of pulsed dye laser and nonablative fractional resurfacing. Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Sarcoidosis

Reply to comments on: "Efficacy of low-level laser therapy in the management of orthodontic pain: a systematic review and meta-analysis".

Evaluation of anti-nociceptive and anti-inflammatory activity of low-level laser therapy on temporomandibular joint inflammation in rodents. The aim of this study was to investigate the analgesic and anti-inflammatory activity of low-level laser therapy (LLLT) on the nociceptive behavioral as well as histomorphological aspects induced by injection of formalin and carrageenan into the rat temporomandibular joint. The 2.5% formalin injection (FRG group) induced behavioral responses characterized by rubbing the orofacial region and flinching the head quickly, which were quantified for 45 min. The pretreatment with systemic administration of diclofenac sodium-DFN group (10 mg/kg i.p.) as well as the irradiation with LLLT infrared (LST group, 780 nm, 70 mW, 30 s, 2.1 J, 52.5 J/cm(2), GaAlAs) significantly reduced the formalin-induced nociceptive responses. The 1% carrageenan injection (CRG group) induced inflammatory responses over the time-course of the study (24 h, and 3 and 7 days) characterized by the presence of intense inflammatory infiltrate rich in neutrophils, scanty areas of liquefactive necrosis and intense interstitial edema, extensive hemorrhagic areas, and enlargement of the joint space on the region. The DFN and LST groups showed an intensity of inflammatory response that was significantly lower than in CRG group over the time-course of the study, especially in the LST group, which showed exuberant granulation tissue with intense vascularization, and deposition of newly formed collagen fibers (3 and 7 days). It was concluded that the LLLT presented an anti-nociceptive and anti-inflammatory response on the inflammation induced in the temporomandibular joint of rodents. Anti-Inflammatory Agents;Formaldehyde;Carrageenan Animals;Anti-Inflammatory

Agents;Carrageenan;Formaldehyde;Inflammation;Low-Level Light Therapy;Male;Pain Measurement;Rats;Rats, Wistar;Temporomandibular Joint
Pediatric cutaneous lupus erythematosus treated with pulsed dye laser. Pulsed dye laser (PDL) has been used in adults to treat refractory cutaneous lupus erythematosus (CLE). We report the first case of CLE in a child successfully treated with PDL. Child;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Treatment Outcome
Effects of laser and ozone therapies on bone healing in the calvarial defects. This study aims to analyze the effect of the low-level laser therapy (LLLT) and ozone therapy on the bone healing of critical size defect (CSD) in rat calvaria. A total of 30 Wistar male rats were used. A 5-mm-diameter trephine bur was used to create CSD on the right side of the parietal bone of each rat calvarium. Once the bone was excised, a synthetic biphasic calcium phosphate graft material was implanted to all the bone defect sites. The animals were randomly divided into 3 groups as follows: the control group (n = 10), which received no LLLT or ozone therapy; the LLLT group (n = 10), which received only LLLT (120 seconds, 3 times a week for 2 weeks); and the ozone therapy group (n = 10) (120 seconds, 3 times a week for 2 weeks). After 1 month, all the rats were killed, and the sections were examined to evaluate the presence of inflammatory infiltrate, connective tissue, and new bone formation areas. Histomorphometric analyses showed that in the LLLT and ozone groups, the new bone areas were significantly higher than in the control group ($P < 0.05$). In the LLLT group, higher new bone areas were found than in the ozone group ($P < 0.05$). This study demonstrated that both ozone and laser therapies had a positive effect on bone formation in rat calvarial defect, compared with the control group; however, ozone therapy was more effective than LLLT (808 nm; 0.1 W; 4 J/cm(2); 0.028 cm(2), continuous wave mode). Bone Substitutes;Ozone Animals;Bone Regeneration;Bone Substitutes;Disease Models, Animal;Low-Level Light Therapy;Male;Ozone;Parietal Bone;Rats;Rats, Wistar;Skull Fractures;Wound Healing
ALSUntangled no. 23: the Rife machine and retroviruses. Amyotrophic Lateral Sclerosis;Humans;Low-Level Light Therapy;Retroviridae
[Use of laser for the prevention and treatment of oral mucositis induced by radiotherapy and chemotherapy for head and neck cancer]. One of the complications of radiotherapy and chemotherapy is oral mucositis. Since the low energy laser is one of the most frequently recommended interventions by authors and international societies, the aim of this study is to review the scientific evidence on the use of lasers as a preventive and therapeutic in oral mucositis associated with treatment of cancer. We performed a literature search in PubMed and The Cochrane Collaboration Library, limiting the search to the last 20 years. We finally included 29 articles that contained 30 studies. Low energy laser phototherapy seems a promising intervention in both the prevention and treatment of oral mucositis associated with cancer treatment. Virtually all studies reviewed showed good results with no adverse effects and reductions in both incidence and severity of mucositis in all types of cancer treatments. Antineoplastic Agents Antineoplastic Agents;Bone Marrow Transplantation;Case-Control Studies;Chemoradiotherapy;Cranial Irradiation;Double-Blind Method;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Prospective Studies;Randomized Controlled Trials as Topic;Stomatitis;Treatment Outcome
Topical antimicrobials for burn infections - an update. The relentless rise in antibiotic resistance among pathogenic bacteria and fungi, coupled with the high susceptibility of burn wounds to infection, and the difficulty of systemically administered antibiotics to reach damaged tissue, taken together have made the development of novel topical antimicrobials for burn infections a fertile area of innovation for researchers and companies. We previously covered the existing patent literature in this area in 2010, but the notable progress made since then, has highlighted the need for an update to bring the reader up to date on recent developments. New patents in the areas of topically applied

antibiotics and agents that can potentiate the action of existing antibiotics may extend their useful lifetime. Developments have also been made in biofilm-disrupting agents. Antimicrobial peptides are nature's way for many life forms to defend themselves against attack by pathogens. Silver has long been known to be a highly active antimicrobial but new inorganic metal derivatives based on bismuth, copper and gallium have emerged. Halogens such as chlorine and iodine can be delivered by novel technologies. A variety of topically applied antimicrobials include chitosan preparations, usnic acid, ceragenins and XF porphyrins. Natural product derived antimicrobials such as tannins and essential oils have also been studied. Novel techniques to deliver reactive oxygen species and nitric oxide in situ have been developed. Light-mediated techniques include photodynamic therapy, ultraviolet irradiation, blue light, low-level laser therapy and titania photocatalysis. Passive immunotherapy employs antibodies against pathogens and their virulence factors. Finally an interesting new area uses therapeutic microorganisms such as phages, probiotic bacteria and protozoa to combat infections. Anti-Infective Agents, Local Anti-Infective Agents, Local;Bacteriophages;Biofilms;Burns;Humans;Immunization, Passive;Patents as Topic;Phototherapy;Probiotics;Wound Infection

Fractional Q-switched 1,064-nm laser for the treatment of photoaged-photodamaged skin. INTRODUCTION: The Q-switched 1064-nm laser is associated with rapid vaporization and thermal expansion stresses leading to skin mechanical damage and is typically used for correction of exogenous and endogenous deep pigmentation. Giving the common place of fractional, infrared-domain milliseconds non-ablative lasers in aesthetic dermatology, a novel non-ablative fractional Q-switched 1,064-nm laser was studied for photoaged skin concerns. MATERIALS AND METHODS: Ten healthy female subjects (Age range: 35-53 years, mean: 44.3) and skin types I-IV were diagnosed with mild-to-moderate facial photo-damage, hyper-pigmentation, telangiectasia, laxity, skin roughness, and actinic keratosis. Subjects were treated with a new non-ablative fractional Q-Switched 1,064-nm Nd: YAG laser (Harmony XL, Alma Lasers Ltd.). Treatments consisted of four sessions at 2-4 week intervals. Follow-up (FU) visits were 1 and 3 months following the final treatment. RESULTS: Utilizing the Glogau scale, six Subjects were graded Type II (means wrinkles in motion), and four Subjects were graded Type III (means wrinkles at rest) at Baseline. At the FU2, 3-month post final treatment, 60% of the subjects were graded with at least a one-point improvement in the overall Glogau global assessment. Between baseline and FU2, Investigator assessments showed the following improvements: Hyperpigmentation 70%, Telangiectasias 80%, Laxity 80%, Tactile Roughness 60%, and actinic keratoses 60%. Pain assessment was reported between 0 and 2 in all treatments (scale 0-10). Of expected side effects, erythema was most common, occasionally being reported as high as a 2(scale 0-10). No unexpected adverse effects were reported. CONCLUSION: The non-ablative fractional Q-Switched 1,064-nm Nd: YAG laser is safe and effective in improving signs of mild-to-moderate photodamage skin irregularities with no downtime, no pain to only minimal pain, and without any adverse side effects. Adult;Cosmetic Techniques;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Rejuvenation;Skin Aging

The use of infrared radiation in the treatment of skin laxity. BACKGROUND: Cosmetic surgery and medicine are extremely interesting fields for a plastic surgeon. Lasers and lights determine ablation, contraction and regenerating stimulus in skin tissues. The aim of this study is to examine the use of infrared lights in treating facial and body skin laxity. METHODS: Between 2007 and 2011, in the Department of Plastic and Reconstructive Surgery at the Hospital San Camillo-Forlanini, 303 patients were enrolled in the study and underwent laser therapy. The laser operates in wavelength from 1100 to 1800 nm. The treated areas are: face, neck, eyebrows, abdomen, legs and buttocks. RESULTS: We have noticed no systemic complications. A case of a patient with a three days lasting erythema on both lower eyelids caused by laser therapy healed without any pharmacological therapy. Neither

hyper- nor hypopigmentation of the skin was found. The satisfaction degree of patients has been: facial, neck and eyebrow lifting "very satisfactory" for 70% of the patients, "satisfactory" for 10%, "unsatisfactory" for 20%; for the other areas it was "very satisfactory" for 40%, "satisfactory" for 20% and "unsatisfactory" for 40%. CONCLUSION: The use of infrared radiation represents a valid alternative to surgical lifting, but cannot replace it. The infrared light technique used has turned out to be useful in contrasting skin laxity of the face and other parts of the body. The absence of scars and surgical risk makes this technique useable for a large number of patients.
Adult;Aged;Aged, 80 and over;Cosmetic Techniques;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Skin Aging

Infrared LED irradiation photobiomodulation of oxidative stress in human dental pulp cells. AIM: To investigate the effect of infrared light-emitting diode (LED) irradiation on the oxidative stress induced in human dental pulp cells (HDPCs) by lipopolysaccharide (LPS). METHODOLOGY: Human dental pulp cells (HDPCs) were harvested from sound primary teeth that were near exfoliation. Cells were seeded (10(5) Â cellsÂ cm(-2)) using Î±-MEM supplemented with 10% FBS and after 24Â h, were placed in contact with LPS (10Â Î¼gÂ mL(-1) of culture medium). Immediately afterwards, HDPCs were subjected to a single irradiation with an infrared LED (855Â nm) delivering different doses of energy (0, 2, 4, 8, 15 or 30Â JÂ cm(-2)). For each dose, there was a control group without LPS application. Twenty-four hours after irradiation, groups were tested for nitric oxide (NO) quantification, cell viability (MTT assay) and qualitative assessment of reactive oxygen species (ROS). Data were submitted to Kruskal-Wallis and Mann-Whitney tests (Î±Â =Â 0.05). RESULTS: Lipopolysaccharide (LPS)-induced stress resulted in significant increase in NO production by HDPC without causing damage to cell respiratory metabolism. Irrespective of energy dose delivered, NO production was significantly reduced when LPS-stressed cells were irradiated with infrared LED (2Â JÂ cm(-2) , PÂ =Â 0.003; 95% CIÂ =Â 5.84-27.71; 4Â JÂ cm(-2) , PÂ = 0.001; 95% CIÂ =Â 7.52-26.39; 8Â JÂ cm(-2) , PÂ =Â 0.0195; 95% CIÂ =Â -2.86-16.01; 15Â JÂ cm(-2) , PÂ =Â 0.0001; 95% CIÂ =Â 12.10-30.96; 30Â JÂ cm(-2) , PÂ =Â 0.007; 95% CIÂ =Â 5.84-24.71). The highest decrease in NO production was observed when 15Â JÂ cm(-2) was delivered to cells. Infrared LED irradiation resulted in a decrease in ROS production, whilst HDPC metabolism was not significantly affected. CONCLUSION: Biomodulation of oxidative stress of HPDC can be achieved by irradiation with a single dose of infrared LED. Within the range investigated, 15Â JÂ cm(-2) resulted in the least production of NO.
Reactive Oxygen Species;Nitric Oxide Cells, Cultured;Dental Pulp;Humans;Infrared Rays;Nitric Oxide;Oxidative Stress;Reactive Oxygen Species

Clinical evaluation of photodynamic therapy efficacy in the treatment of oral leukoplakia. BACKGROUND: The aim of the study was clinical evaluation of photodynamic therapy efficacy in the treatment of oral leukoplakia lesions. METHODS: Twenty-three consecutive patients aged 21-79 were included to the study. In all patients 44 homogeneous, flat leukoplakia lesions were clinically diagnosed and confirmed histopathologically. Photodynamic therapy was performed with the use of Photolon(Â®) photosensitizer, containing 20% Chlorine-e6 and 10% dimethyl sulfoxide and a semiconductor laser, with power up to 300mW and a wavelength of 660nm. Ten illumination sessions were conducted with the use of superficial light energy density of 90J/cm(2). RESULTS: At baseline the mean size of leukoplakia lesion was 6.5Â±5.10cm(2) while after photodynamic therapy 3Â±2.99cm(2). Significant reduction (on average by 53.8%) of leukoplakia lesions sizes was observed after therapy. Twelve (27.27%) lesions had been completely cured, 22 (50%) partially cured, although 10 (22.73%) lasted unchanged. The efficacy of PTD was comparable in women and men irrespective of age. There have been no adverse site effects during therapy noted. CONCLUSIONS: Within the limits of the study it can be concluded that photodynamic therapy with the use of Chlorine-e6 can lead to considerable reduction of oral leukoplakia lesions size thus may be useful in clinical practice.

However there is a need of further studies on larger number of cases and longer follow-up time.
Chlorophyllides;Porphyrins;Radiation-Sensitizing Agents;phytochlorin;Dimethyl Sulfoxide
Adult;Chlorophyllides;Dimethyl Sulfoxide;Female;Humans;Lasers, Semiconductor;Leukoplakia, Oral;Low-Level Light Therapy;Male;Middle Aged;Porphyrins;Radiation-Sensitizing Agents

Effect of the concentration of phenothiazine photosensitizers in antimicrobial photodynamic therapy on bone loss and the immune inflammatory response of induced periodontitis in rats.
BACKGROUND AND OBJECTIVE: Antimicrobial therapy can suppress periodontal pathogens and increase the effectiveness of conventional mechanical treatment. The aim of this study was to assess bone loss and the immune inflammatory response of rats under the influence of two photosensitizing agents (MB and TBO) at two different concentrations in antimicrobial photodynamic therapy (aPDT), used as an adjuvant therapy in the treatment of periodontitis. MATERIAL AND METHODS: Periodontitis was induced in the mandibular first molars of 162 rats. The animals were divided into nine groups: G1 - scaling and root planing (SRP); G2 - SRP plus 100Â Î¼g/mL of methylene blue (MB); G3 - SRP plus 10Â mg/mL of MB; G4 - SRP plus 100Â Î¼g/mL of toluidine blue (TBO); G5 - SRP plus 10Â mg/mL of TBO; G6 - SRP plus 100Â Î¼g/mL of MB and laser; G7 - SRP plus 10Â mg/mL of MB and laser; G8 - SRP plus 100Â Î¼g/mL of TBO and laser; and G9 - SRP plus 10Â mg/mL of TBO and laser. Six animals from each group were euthanized 7, 15, or 30Â d after treatment. Bone loss (BL) in the furcation region was evaluated using histomorphometric and immunohistochemical analyses to detect the receptor activator of nuclear factor-Îšappa B ligand (RANKL), osteoprotegerin (OPG) and tartrate-resistant acid phosphatase (TRAP). RESULTS: There was significantly less BL in animals treated with aPDT using low concentrations of MB and TBO at 7, 15 and 30Â d. Immunohistochemical analysis revealed decreased RANKL and increased OPG in the aPDT groups and decreased TRAP-positive cells in G6 and G8. CONCLUSIONS: aPDT, using low concentrations of MB and TBO, was the most effective adjuvant therapy to SRP, acting indirectly as a downregulator of the molecular mechanisms that control bone resorption in periodontitis.
Isoenzymes;Osteoprotegerin;Phenothiazines;Photosensitizing Agents;RANK Ligand;Tnfrsf11b protein, rat;Tolonium Chloride;Acid Phosphatase;Tartrate-Resistant Acid Phosphatase;phenothiazine;Methylene Blue Acid Phosphatase;Alveolar Bone Loss;Animals;Combined Modality Therapy;Connective Tissue;Dental Scaling;Isoenzymes;Low-Level Light Therapy;Lymphocytes;Male;Methylene Blue;Neutrophils;Osteoclasts;Osteoprotegerin;Periodontitis;Phenothiazines;Photochemotherapy;Photosensitizing Agents;RANK Ligand;Rats;Rats, Wistar;Root Planing;Tartrate-Resistant Acid Phosphatase;Time Factors;Tolonium Chloride

The effect of low-level laser irradiation on muscle tension and hardness compared among three wavelengths. BACKGROUND AND AIMS: It has been reported that low-level laser irradiation (LLLI) can influence muscle tissue by retarding attenuation of muscle tension. Since the efficacy of LLLI on the effects of muscle contraction remains unclear, we examined in an in vivo animal model whether LLLI affects both muscle tension and muscle hardness in a wavelength-dependent manner, using the rat gastrocnemius muscle. MATERIAL AND METHODS: Forty Sprague-Dawley adult rats were used. Under pentobarbital sodium anesthesia, their gastrocnemius muscle and tibial nerve were exteriorized. Diode LLLI systems delivering 3 wavelengths (405, 532, and 808 nm; 100 mW output) were used. Ten sets of tetanus (tetanic contractions) were delivered to the tibial nerve followed by a brief rest or LLLI for 15 s and an additional 7 sets of tetanus with an inter-stimulus interval of 5 min. The muscle tension and muscle hardness were measured with a tension transducer and hardness meter, respectively. RESULTS: 405 nm LLLI did not influence either muscle tension or hardness. 532 nm LLLI significantly improved the maintenance of muscle tension compared with the 808 nm group ($P<0.05$). In contrast, 808 nm LLLI significantly improved the recovery from muscle hardness

compared with the other groups (P<0.05). CONCLUSION: We conclude that LLLI has wavelength-dependent effects on the gastrocnemius muscle and LLLI at appropriate wavelengths and dosimetry offers potential in the treatment to relieve muscle tension or stiffness.

Nanoparticle-emitted light attenuates amyloid-Î²-induced superoxide and inflammation in astrocytes. Alzheimer's disease (AD) is the sixth leading cause of age-related death with no effective intervention yet available. Our previous studies have demonstrated the potential efficacy of Low Level Laser Therapy (LLLT) in AD cell models by mitigating amyloid-Î² peptide (AÎ²)-induced oxidative stress and inflammation. However, the penetration depth of light is still the major challenge for implementing LLLT in animal models and in the clinical settings. In this study, we present the potential of applying Bioluminescence Resonance Energy Transfer to Quantum Dots (BRET-Qdots) as an alternative near infrared (NIR) light source for LLLT. Our results show that BRET-Qdot-emitted NIR suppresses AÎ²-induced oxidative stress and inflammatory responses in primary rat astrocytes. These data provide a proof of concept for a nanomedicine platform for LLLT. FROM THE CLINICAL EDITOR: Low Level Laser Therapy has already been demonstrated to mitigate amyloid-Î² peptide induced oxidative stress and inflammation, a key driver of Alzheimer's disease. The major issue in moving this forward from cell cultures to live animals and potentially to human subjects is light penetration depth. In this novel study, BRET-Qdots were used as an alternative near infrared light source with good efficacy, paving the way to the development of a nanomedicine platform. Amyloid beta-Peptides Alzheimer Disease;Amyloid beta-Peptides;Animals;Astrocytes;Bioluminescence Resonance Energy Transfer Techniques;Humans;Inflammation;Light;Low-Level Light Therapy;Nanomedicine;Nanoparticles;Oxidative Stress;Quantum Dots;Rats

Comparative clinical study of light analgesic effect on temporomandibular disorder (TMD) using red and infrared led therapy. Low-level laser therapy (LLLT) has been widely applied in pain relief in several clinical situations, including temporomandibular disorders (TMD). However, the effects of LED therapy on TMD has not been investigated. This study aims to evaluate the effects of red and infrared LEDs on: (1) tissue temperature in ex vivo and (2) pain relief and mandibular range of motion in patients with TMD. Thirty patients between 18 and 40Â years old were included and randomly assigned to three groups. The two experimental groups were: the red LED (630â€‰Â±â€‰10Â nm) group and the infrared LED (850â€‰Â±â€‰10Â nm) group. The irradiation parameters were 150Â mW, 300Â mW/cm(2), 18Â J/cm(2), and 9Â J/point. The positive control group received an infrared laser (780Â nm) with 70Â mW, 1.7Â W/cm(2), 105Â J/cm(2), and 4.2Â J/point. LED and laser therapies were applied bilaterally to the face for 60Â s/point. Five points were irradiated: three points around the temporomandibular joint (TMJ), one point for the temporalis, and one near the masseter. Eight sessions of phototherapy were performed, twice a week for 4Â weeks. Pain induced by palpating the masseter muscle and mandibular range of motion (maximum oral aperture) were measured at baseline, immediately after treatment, 7Â days after treatment, and 30Â days after treatment. There was an increase in tissue temperature during both the red and the infrared LED irradiation in ex vivo. There was a significant reduction of pain and increase of the maximum oral aperture for all groups (pâ€‰â‰¥â€‰0.05). There was no significant difference in pain scores and maximum oral aperture between groups at baseline or any periods after treatment (pâ€‰â‰¥â€‰0.05). The current study showed that red and infrared LED therapy can be useful in improving outcomes related to pain relief and orofacial function for TMD patients. We conclude that LED devices constitute an attractive alternative for LLLT. Analgesics Adolescent;Adult;Analgesics;Cross-Sectional Studies;Face;Female;Humans;Infrared Rays;Longitudinal Studies;Low-Level Light Therapy;Male;Mandible;Pain Management;Pain Measurement;Phototherapy;Range of Motion, Articular;Single-Blind Method;Temperature;Temporomandibular Joint Disorders;Young Adult

Irradiation with a low-level diode laser induces the developmental endothelial locus-1 gene and reduces proinflammatory cytokines in epithelial cells. We demonstrated previously that low-level diode laser irradiation with an indocyanine green-loaded nanosphere coated with chitosan (ICG-Nano/c) had an antimicrobial effect, and thus could be used for periodontal antimicrobial photodynamic therapy (aPDT). Since little is known about the effects of aPDT on periodontal tissue, we here investigated the effect of low-level laser irradiation, with and without ICG-Nano/c, on cultured epithelial cells. Human oral epithelial cells were irradiated in a repeated pulse mode (duty cycle, 10 %; pulse width, 100 ms; peak power output, 5 W). The expression of the developmental endothelial locus 1 (Del-1), interleukin-6 (IL-6), IL-8, and the intercellular adhesion molecule-1 (ICAM-1) were evaluated in Ca9-22 cells stimulated by laser irradiation and Escherichia coli-derived lipopolysaccharide (LPS). A wound healing assay was carried out on SCC-25 cells irradiated by diode laser with or without ICG-Nano/c. The mRNA expression of Del-1, which is known to have anti-inflammatory activity, was significantly upregulated by laser irradiation ($p < 0.01$). Concurrently, LPS-induced IL-6 and IL-8 expression was significantly suppressed in the LPS + laser group ($p < 0.01$). ICAM-1 expression was significantly higher in the LPS + laser group than in the LPS only or control groups. Finally, compared with the control, the migration of epithelial cells was significantly increased by diode laser irradiation with or without ICG-Nano/c. These results suggest that, in addition to its antimicrobial effect, low-level diode laser irradiation, with or without ICG-Nano/c, can suppress excessive inflammatory responses via a mechanism involving Del-1, and assists in wound healing. Calcium-Binding Proteins;Carrier Proteins;Cell Adhesion Molecules;Cytokines;EDIL3 protein, human;Inflammation Mediators;RNA, Messenger;Intercellular Adhesion Molecule-1;Chitosan;Indocyanine Green Calcium-Binding Proteins;Carrier Proteins;Cell Adhesion Molecules;Cell Line, Tumor;Chitosan;Cytokines;Epithelial Cells;Gingiva;Humans;Indocyanine Green;Inflammation Mediators;Intercellular Adhesion Molecule-1;Lasers, Semiconductor;Low-Level Light Therapy;Nanospheres;Photochemotherapy;RNA, Messenger;Wound Healing

Effect of low-level laser therapy on the post-surgical inflammatory process after third molar removal: study protocol for a double-blind randomized controlled trial. BACKGROUND: Low-level laser therapy (LLLT) has been shown to modulate the inflammatory process without adverse effects , by reducing pain and swelling and promoting the repair of damaged tissues. Because pain, swelling and muscle spasm are complications found in virtually all patients following oral surgery for the removal of impacted teeth, this model has been widely used to evaluate the effects of LLLT on the inflammatory process involving bone and, connective tissue and the muscles involved in mastication. METHODS/DESIGN: After meeting the eligibility criteria, 60 patients treated at a Specialty Dental Center for the removal of impacted lower third molars will be randomly divided into five groups according to the type of laser therapy used at the end of surgery (intraoral irradiation with 660 nm laser; extraoral irradiation with 660 nm laser; intraoral irradiation with 808 nm laser; extraoral irradiation with 808 nm laser and no irradiation). To ensure that patients are blinded to the type of treatment they are receiving, the hand piece of the laser apparatus will be applied both intraorally and extraorally to all participants, but the device will be turned on only at the appropriate time, as determined by the randomization process. At 2 and 7 days after surgery, the patients will be evaluated by three blinded evaluators who will measure of swelling, mouth opening (muscle spasm evaluation) and pain (using two different pain scales). The 14-item Oral Health Impact Profile (OHIP-14) will be used to assess QOL. All data will be analyzed with respect to the normality of distribution using the Shapiro-Wilk test. Statistically significant differences between the experimental groups will be determined using analysis of variance, followed by a suitable post hoc test, when necessary. The significance level will be set at Î± = 0.05. DISCUSSION: The lack of standardization in studies with regard to the samples, methods and LLLT parameters complicates the determination of the actual

effect of laser therapy on this model. The present study aims to provide a randomized, controlled, double-blind trial to compare four different LLLT parameters in relation to the outcomes of pain, swelling and muscle spasm following surgery for the extraction of impacted third molars and evaluate the effects os surgery on patients' quality os life (QOL). TRIAL REGISTRATION: Brazilian Registry of Clinical Trials - Rebec (RBR-6XSB5H). Brazil;Clinical Protocols;Double-Blind Method;Facial Pain;Humans;Inflammation;Low-Level Light Therapy;Masticatory Muscles;Molar, Third;Pain Measurement;Quality of Life;Research Design;Spasm;Surveys and Questionnaires;Time Factors;Tooth Extraction;Treatment Outcome

Analysis of the effect of phototherapy in model with traumatic Achilles tendon injury in rats. The aim of this study was to investigate the effect of low-intensity laser (LILT) infrared (830 nm) therapy in tendon inflammation, tendinitis induced by mechanical trauma in rat Achilles tendon. For this, we used 65 young male Wistar rats, weighing Â± 300 g divided into different groups: C = control (n = 5) and experimental (n = 10/group), with two different times of sacrifice such as treated with L = laser, D = treated with diclofenac, and T = untreated injured. The tendon inflammation was induced by controlled contusion in the medial region of the Achilles tendon of the animals. The treated groups received some kind of intervention every 24 h, all groups were sacrificed on the 7th or 14th day after the trauma. The tendons were dissected, extracted, and sent for analysis. Histological analysis of the L group showed a decrease in the number of inflammatory cells in relation to other groups in both periods studied. The comparative results between the number of inflammatory cells in the control and treated groups at 7 and 14 days showed statistically significant differences. Qualitative analysis findings obtained by the picrosirius red technique under polarized light showed that in 7 days, the T group presented collagen types I and III in the same proportion; group D presented a predominance of type III fibers, while in group L, type I collagen predominated. The 14-day group D showed collagen types I and III in the same proportion, while in group L, there was a predominance of type I fibers. Biomechanical analysis showed that 7-day groups L and C showed similar stiffness and increased breaking strength. The 14-day groups L and C showed greater rupturing strength as well as increased stiffness angle. Group D showed a decrease of maximum traction strength and degree of rigidity. It was concluded that treatment with LIL in the parameters used and the times studied reduces migration of inflammatory cells and improves the quality of repair while reducing the functional limitations. Anti-Inflammatory Agents, Non-Steroidal;Collagen Type I;Diclofenac Achilles Tendon;Animals;Anti-Inflammatory Agents, Non-Steroidal;Biomechanical Phenomena;Collagen Type I;Diclofenac;Low-Level Light Therapy;Male;Rats, Wistar;Tendinopathy;Tendon Injuries;Wound Healing

Comparative analysis of two low-level laser doses on the expression of inflammatory mediators and on neutrophils and macrophages in acute joint inflammation. Synovial membrane inflammation plays an important role in osteoarthritis (OA) pathophysiology. The synovial tissue of patients with initial OA is characterized by mononuclear cell infiltration and the production of pro-inflammatory cytokines and other mediators of joint injury. The study aims to evaluate the effect of low-level laser therapy (LLLT) at doses of 2 and 4 J on joint inflammation in rats induced by papain through histopathological analysis, differential counts of inflammatory cells; gene expression of IL-1Î², IL-6, and IL-10; and TNF-Î± protein expression. Male Wistar rats (20) were randomly divided (5 animals each) into a negative control group, an inflammation injury positive control group, a 2-J LLLT group subjected to injury and treated with 2 J of LLLT, and a 4-J LLLT group subjected to injury and treated with 4 J of LLLT. The animals were subjected to joint inflammation (4 % papain solution) and treated with LLLT. On the day of euthanasia, articular lavage was collected and centrifuged. The supernatant was analyzed for TNF-Î± protein expression by ELISA and IL-1Î², IL-6, and IL-10 mRNA by RT-PCR. The joint tissue was also examined histologically. ANOVA with Tukey's post hoc test was used for comparisons. All data were expressed as means Â± S.D. ($p < 0.05$). Both laser modalities were

efficient in reducing cellular inflammation and decreasing the expression of IL-1Î² and IL-6. However, the 2-J treatment led to more reduction in TNF-Î± than the 4-J treatment. A single application of LLLT with 2 J was more efficient in modulating inflammatory mediators and inflammatory cells. Cytokines;Inflammation Mediators Animals;Cartilage, Articular;Cytokines;Gene Expression;Inflammation Mediators;Lasers, Semiconductor;Leukocyte Count;Low-Level Light Therapy;Macrophages;Male;Neutrophils;Osteoarthritis, Knee;Rats, Wistar

Effect of low-level laser therapy (Î»660 nm) on angiogenesis in wound healing: a immunohistochemical study in a rodent model. The aim of the present investigation was to evaluate the angiogenesis on dorsal cutaneous wounds in a rodent model treated with Î»660 nm laser light. New vessel formation is a multistep process involving vessel sprouting, endothelial cell migration, proliferation and tube formation. Although several in vivo studies have shown that laser phototherapy influences tissue repair, a fully understanding of angiogenesis mechanisms are not yet known. Twenty-four young adult male Wistar rats weighing between 200 and 250 g were used. Under general anesthesia, one excisional wound was created on the dorsum of each animal and they were randomly distributed into two groups: one control and one treated with laser (Î»660 nm, 16 mW, 10 J/cm2). Each group was subdivided into three subgroups according to the animal death timing (2, 4 and 6 days). Laser irradiation started immediately after surgery and was repeated every other day during the experiment and marked with Sirius Red, specific for collagen, and immunomarked with anti-TGF-Î² and anti-von Willebrand factor. Marked sections underwent histological analysis by light microscopy and the mean area of the wound of each animal was calculated and analyzed by ANOVA and Tukey's test (Î±=0.05). Although at some death periods, collagen expression and number of blood vessels on irradiated animals were higher than in the control ones, no significant differences were found at any time in relation to TGF-Î² expression (p>0.05). It was concluded that laser treatment (Î»660 nm) contributed to increase angiogenesis. Animals;Immunohistochemistry;Low-Level Light Therapy;Male;Models, Animal;Neovascularization, Physiologic;Rats;Rats, Wistar;Wound Healing

Effect of laser phototherapy on enzymatic activity of salivary glands of hamsters treated with 5-Fluorouracil. The chemotherapeutic agent 5-Fluorouracil (5-FU) can induce salivary gland hypofunction (SGH); however, previous studies did not reach final conclusions on the influence of this drug on glandular tissue. Thus, the aim of this study was to investigate the effect of 5-FU on submandibular (SMs) and sublingual glands (SLs), as well as, the effect of laser phototherapy (LPT) on SGH induced by 5-FU. Eighty-five hamsters were divided into three groups: control (C), chemotherapy (CT) and laser (L), and the SGH was induced by two injections of 5-FU in groups CT and L. The irradiation was performed using a diode (Î»780 nm/20 mW/5 J cm(-2)/0.2 J and 10 s per point/spot size of 0.04 cm(2)) and applied daily. On the euthanasia day, SMs and SLs were removed and biochemical analyses were carried out. The lactate dehydrogenase activity was increased in group CT when compared with group C for SLs and SMs ($P < 0.05$). In addition, the peroxidase and catalase activities were increased and superoxide dismutase was decreased by 5-FU ($P < 0.05$). However, LPT appears to be a protective mechanism against oxidative stress, tending to alter the activity of these antioxidant enzymes, suggesting LPT as a promising therapy to modulate the 5-FU harmful effect. Antimetabolites, Antineoplastic;Fluorouracil Animals;Antimetabolites, Antineoplastic;Cricetinae;Fluorouracil;Laser Therapy;Mesocricetus;Phototherapy;Salivary Glands

[Medical indications for laser therapy in dermatology]. Laser therapy in dermatology is often associated with cosmetic procedures. However, nowadays laser therapy has become a treatment modality for many dermatological diseases. We present three cases of patients with different dermatological diseases that are highly therapy-resistant. The first case is a 19-year-old man with multiple angiofibromas in the face, who was treated with ablative laser therapy. We also

administered ablative laser therapy to a 64-year-old man with a big tumourous nose due to granuloma faciale, who had already tried multiple treatment options without result. Finally, a 69-year-old woman with extensive neurofibromas in the face, which had been considered untreatable, was successfully treated with ablative laser therapy. We would like to show the extensive therapeutical options of laser therapy for difficult-to-treat dermatological diseases. Aged;Angiofibroma;Facial Neoplasms;Female;Granuloma;Humans;Laser Therapy;Low-Level Light Therapy;Male;Middle Aged;Neurofibromatosis 1;Patient Satisfaction;Skin Diseases;Skin Neoplasms;Treatment Outcome;Young Adult

Onychodystrophy treated using fractional carbon dioxide laser therapy and topical steroids: new treatment options for nail dystrophy. Ointments;Steroids Administration, Topical;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Nail Diseases;Ointments;Steroids

Effect of low level laser therapy in the reduction of oral complications in patients with cancer of the head and neck submitted to radiotherapy. The aim of this study was to assess the effect of low level laser therapy on reducing the occurrence and severity of oral complications in patients with head and neck cancer undergoing radiotherapy. Sixty head and neck cancer outpatients from a cancer hospital receiving radiotherapy were selected and randomly assigned into two groups. The laser group was irradiated with an InGaAlP laser and the control received sham laser. The assessment of complications (oral mucositis, pain) was carried out one week after starting radiotherapy, and at the fifteenth and thirtieth sessions of radiotherapy. All patients from both groups showed some degree of oral mucositis. Better outcomes were observed in the laser group when compared with the control in the follow-up sessions, indicating lower degrees of oral mucositis, pain and higher salivary flow ($p < .05$). These findings support the use of laser therapy as an adjuvant treatment for the control of oral complications. Adult;Aged;Aged, 80 and over;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases;Radiotherapy

Photobiomodulation inside the brain: a novel method of applying near-infrared light intracranially and its impact on dopaminergic cell survival in MPTP-treated mice. OBJECT: Previous experimental studies have documented the neuroprotection of damaged or diseased cells after applying, from outside the brain, near-infrared light (NIr) to the brain by using external light-emitting diodes (LEDs) or laser devices. In the present study, the authors describe an effective and reliable surgical method of applying to the brain, from inside the brain, NIr to the brain. They developed a novel internal surgical device that delivers the NIr to brain regions very close to target damaged or diseased cells. They suggest that this device will be useful in applying NIr within the large human brain, particularly if the target cells have a very deep location. METHODS: An optical fiber linked to an LED or laser device was surgically implanted into the lateral ventricle of BALB/c mice or Sprague-Dawley rats. The authors explored the feasibility of the internal device, measured the NIr signal through living tissue, looked for evidence of toxicity at doses higher than those required for neuroprotection, and confirmed the neuroprotective effect of NIr on dopaminergic cells in the substantia nigra pars compacta (SNc) in an acute 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) model of Parkinson disease in mice. RESULTS: The device was stable in freely moving animals, and the NIr filled the cranial cavity. Measurements showed that the NIr intensity declined as distance from the source increased across the brain (65% per mm) but was detectable up to 10 mm away. At neuroprotective (0.16 mW) and much higher (67 mW) intensities, the NIr caused no observable behavioral deficits, nor was there evidence of tissue necrosis at the fiber tip, where radiation was most intense. Finally, the intracranially delivered NIr protected SNc cells against MPTP insult; there were consistently more dopaminergic cells in MPTP-treated mice irradiated with NIr than in those that were not irradiated. CONCLUSIONS: In summary, the authors showed that NIr can be applied

intracranially, does not have toxic side effects, and is neuroprotective. Animals;Cell Survival;Disease Models, Animal;Dopaminergic Neurons;Feasibility Studies;Infrared Rays;Light;Male;Mice;Mice, Inbred BALB C;Neurosurgical Procedures;Optical Fibers;Parkinsonian Disorders;Phototherapy;Rats;Rats, Sprague-Dawley

[Rehabilitation of patients with urolithiasis after minimally invasive procedures on the kidneys]. Minimally invasive surgeries in patients with urolithiasis are not always successful. Prevention of inflammatory and cicatrical-sclerotic complications in the postoperative period plays an important role. 49 patients with urolithiasis divided into two groups were followed-up. The study group included 25 patients who underwent percutaneous puncture nephrolitholapaxy. The control group consisted of 24 patients with a history of percutaneous puncture nephrolitholapaxy. In postoperative period, active prevention of inflammation and cicatrical-sclerotic complications using drug Longidaza in combination with magnetic-laser therapy was performed in study group. The control group received standard treatment. 6 months after surgery, 1 (4%) patient in the study group had pyeloectasis approximately 2 cm and obstruction of UPJ of operated kidney, which required re-treatment with Longidaza. In the control group, pyeloectasis and violation of passage through the upper urinary tract were recorded in 4 (16.7%) patients. These data allow to recommend a comprehensive prevention of postoperative inflammation and cicatrical-sclerotic complications using Longidaza and magnetic-laser therapy in patients undergoing minimally invasive surgery of the kidney. Hyaluronoglucosaminidase Adult;Combined Modality Therapy;Female;Humans;Hyaluronoglucosaminidase;Lithotripsy;Low-Level Light Therapy;Magnetic Field Therapy;Male;Minimally Invasive Surgical Procedures;Nephrostomy, Percutaneous;Postoperative Complications;Treatment Outcome;Urolithiasis

Effect of low-level laser therapy on allergic asthma in rats. Asthma is a complex chronic inflammatory disease of the airways that involves the activation of many inflammatory and other types of cells. We investigated the effect of low-level laser therapy (LLLT) on allergic asthma in rats and compared its effect with that of the glucocorticoid budesonide. Asthma was induced by challenge and repeated exposure to ovalbumin. Asthmatic rats were then treated with LLLT or budesonide suspension. LLLT at 8 J/cm(2) once daily for 21 days could relieve pathological damage and airway inflammation in asthmatic rats. LLLT could decrease the total numbers of cells and eosinophils in bronchoalveolar lavage fluid. LLLT could reduce levels of IL-4 and increase IFN-Î³ levels in bronchoalveolar lavage fluid and serum, meanwhile reduce serum IgE levels. Flow cytometry assay showed that LLLT can regulate the Th1/Th2 imbalance of asthmatic rats. LLLT had a similar effect to that of budesonide. These findings suggest that the mechanism of LLLT treatment of asthma is by adjustment of Th1/Th2 imbalance. Thus, LLLT could take over some of the effects of budesonide for the treatment of asthma, thereby reducing some of the side effects of budesonide. Interleukin-4;Immunoglobulin E;Interferon-gamma Animals;Asthma;Immunoglobulin E;Interferon-gamma;Interleukin-4;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats, Wistar;Th1 Cells;Th2 Cells;Treatment Outcome

Low Level Laser Therapy (LLLT) for Neck Pain: A Systematic Review and Meta-Regression. PURPOSE: This systematic review update evaluated low level laser therapy (LLLT) for adults with neck pain. METHODS: Computerized searches (root up to Feb 2012) included pain, function/disability, quality of life (QoL) and global perceived effect (GPE). GRADE, effect-sizes, heterogeneity and meta-regression were assessed. RESULTS: Of 17 trials, 10 demonstrated high risk of bias. For chronic neck pain, there was moderate quality evidence (2 trials, 109 participants) supporting LLLT over placebo to improve pain/disability/QoL/GPE up to intermediate-term (IT). For acute radiculopathy, cervical osteoarthritis or acute neck pain, low quality evidence suggested LLLT improves ST pain/function/QoL over a placebo. For chronic myofascial neck pain (5 trials, 188 participants), evidence was conflicting;

a meta-regression of heterogeneous trials suggests super-pulsed LLLT increases the chance of a successful pain outcome. CONCLUSIONS: We found diverse evidence using LLLT for neck pain. LLLT may be beneficial for chronic neck pain/function/QoL. Larger long-term dosage trials are needed.

Use of laser in orthodontics: applications and perspectives. Laser technology got in these years a more and more important role in modern dentistry and, recently, also in orthodontics was proposed the utilization of laser devices. The aim of this work is to describe the utilization of this technology both in soft and hard oral tissues to improve orthodontic treatment. Several cases, with different wavelengths (532, 810, 980, 1064, 2940 and 10600 nm) and in different times of the treatment (before, during and after) are presented. All the cases reported showed, according to the literature, that the use of the laser related to orthodontic treatment offers several advantages when compared with conventional methods. In the soft tissues surgery it allows to reduce or eliminate the use of anesthetic injection, to avoid use of sutures and to bond bracket in dry enamel; associated with orthophosphoric acid, it gives a stronger adhesion of the brackets to the enamel and, in the case of porcelain brackets, it detaches them without damages; at low power (LLLT) it permits to control the pain of the first period after bonding and, by increasing the speed of teeth movement in the bone, reduces the time of the treatment.

830 nm light-emitting diode low level light therapy (LED-LLLT) enhances wound healing: a preliminary study. BACKGROUND AND AIMS: The application of light-emitting diodes in a number of clinical fields is expanding rapidly since the development in the late 1990s of the NASA LED. Wound healing is one field where low level light therapy with LEDs (LED-LLLT) has attracted attention for both accelerating wound healing and controlling sequelae. The present study evaluated LED-LLLT in 5 wounds of various etiologies. SUBJECTS AND METHODS: There were 5 patients with ages ranging from 7 to 54 years, comprising 2 males and 3 females. The study followed 5 wounds, namely 2 acute excoriation wounds; 1 acute/subacute dog bite with infection; 1 subacute post-filler ulcerated wound with necrotic ischemic tissue and secondary infection; and 1 subacute case of edema and infection of the lips with herpes simplex involvement after an illegal cosmetic tattoo operation. All patients were in varying degrees of pain. All wounds were treated with multiple sessions (daily, every other day or twice weekly) using an LED-LLLT system (830 nm, CW, irradiance of 100 mW/cm(2) and fluence of 60 J/cm(2)) till improvement was achieved. RESULTS: Full wound healing and control of infection and discomfort were achieved in all patients, with wound condition-mediated treatment periods ranging from 1 to 8 weeks. No recurrence of the herpes simplex case was seen in a 4-month follow-up. CONCLUSIONS: 830 nm LED-LLLT successfully brought about accelerated healing in wounds of different etiologies and at different stages, and successfully controlled secondary infection. LED-LLLT was easy and pain-free to apply, and was well-tolerated by all patients. The good results warrant the design of controlled studies with a larger patient population.

Effect of low-level laser therapy on blood flow and oxygen- hemoglobin saturation of the foot skin in healthy subjects: a pilot study. BACKGROUND AND AIMS: This study on healthy test subjects intends to show whether one-off Low-Level Laser Therapy (LLLT) has an instant effect on the perfusion or the oxygenation of the skin tissue. These possible instant effects may have an influence on the accelerated wound healing which is often observed after application of LLLT, in addition to the usual postulated effects of LLLT which occur with a time delay normally. STUDY DESIGN/MATERIALS AND METHODS: The study was carried out double-blind and placebo-controlled in two batches of testing. The test subjects received one-off LLLT on a defined area of the arch of the foot. Simultaneously a placebo treatment was carried out on the corresponding contralateral area. In the first batch of tests, the blood flow was measured immediately before and after treatment using thermography and LDI. In the second batch of tests, the blood flow and the oxygen saturation were determined immediately before and after the treatment using an O2C device. RESULTS: No evidence

that the LLLT has a significant instant effect on the circulation or the oxygen saturation could be found. CONCLUSION: No immediate effect of an LLLT on the perfusion or oxygenation situation is to be expected with physiologically normal starting conditions. An additional investigation should be carried out in which either the radiation dose is varied or the starting conditions are pathological (e.g. chronic wounds) in order to rule out immediate effects on circulation or oxygen saturation as the cause of the improved wound healing which is often observed.

Low level laser therapy for sports injuries. BACKGROUND AND AIMS: Our hospital has used LLLT in the treatment of athletes since 1990. We had a good result about LLLT for sports injuries. However, few articles have attempted to evaluate the efficacy of LLLT for sports injuries. The aims of this study was to evaluate the efficacy of LLLT for sports injuries. Materials (Subjects) and Methods: Forty one patients underwent LLLT in our hospital. These patients included 22 men and 19 women with an average age of 38.9 years old. Patients were irradiated by diode laser at points of pain and/or acupuncture points. Patients underwent LLLT a maximum treatment of 10 times (mean 4.1 times). We evaluated the efficacy of LLLT using a Pain relief score (PRS). A score of 2 to 5 after treatment was regarded as very good, 6 to 8 as good, and 9 to 10 as poor. A PRS score of less than 5 was regarded as effective. RESULTS: The rate of effectiveness (PRS of 5 or less) after LLLT was 65.9% (27/41 patients). DISCUSSION: In this study, the resulting rate of effectiveness was 65.9% for all sports injuries. However, we have a high rate of effectiveness for Jumper's knee, tennis elbow and Achilles tendinitis and cases that were irradiated laser by a physician. CONCLUSIONS: LLLT is an effective treatment for sports injuries, particularly jumper's knee, tennis elbow and Achilles tendinitis.

Lung cancer stem cells and low-intensity laser irradiation: a potential future therapy? Lung cancer is notably a significant threat when considering worldwide cancer-related deaths. Despite significant advances in treatment modalities, death rates as a result of cancer relapse remain high. Relapse can occur as a result of metastasis. Cancer stem cells (CSCs) have been implicated as an important contributory factor in the development of metastasis. CSCs have the same characteristics as normal stem cells; that is, they can proliferate indefinitely and are capable of both self-renewal and differentiating into specialized cells. The molecular and cellular characteristics of stem cells and CSCs are coded for by cell-specific genes, which can be analyzed by using molecular assays setting the standard to work from. Low-intensity laser irradiation (LILI) has been applied in the treatment of numerous diseases and pathological conditions. LILI has been shown to stimulate proliferation of cells, capillary growth, and cellular metabolism as observed by adenosine triphosphate activation. It has been shown, by using different dosing levels of LILI, to either stimulate or inhibit cellular functions. One treatment strategy used on cancer cells is photodynamic therapy (PDT), in which cancer cells are treated with a photosensitizer (PS) in combination with laser irradiation. PSs are non-toxic by themselves but, with light activation, cause reactive oxygen species generation, which causes cancer cell death. Cell-specific PSs are being developed for future cancer treatment. In this review, we look at the potential effects of LILI and PDT on lung CSCs. Photosensitizing Agents;Transcription Factors Apoptosis;Humans;Low-Level Light Therapy;Lung Neoplasms;Neoplastic Stem Cells;Photochemotherapy;Photosensitizing Agents;Transcription Factors

Photothermal therapy of tumors in lymph nodes using gold nanorods and near-infrared laser light. Lymph node dissection for regional nodal metastasis is a primary option, but is invasive and associated with adverse effects. The development of non-invasive therapeutic methods in preclinical experiments using mice has been restricted by the small lymph node size and the limited techniques available for non-invasive monitoring of lymph node metastasis. Here, we show that photothermal therapy (PTT) using gold nanorods (GNRs) and near-infrared (NIR) laser light shows potential as a non-invasive treatment for tumors in the proper axillary lymph nodes (proper-ALNs) of MXH10/Mo-lpr/lpr mice, which develop systemic swelling of lymph nodes (up to 13mm in diameter, similar in size to

human lymph nodes). Tumor cells were inoculated into the proper-ALNs to develop a model of metastatic lesions, and any anti-tumor effects of therapy were assessed. We found that GNRs accumulated in the tumor in the proper-ALNs 24h after tail vein injection, and that irradiation with NIR laser light elevated tumor temperature. Furthermore, combining local or systemic delivery of GNRs with NIR irradiation suppressed tumor growth more than irradiation alone. We propose that PTT with GNRs and NIR laser light can serve as a new therapeutic method for lymph node metastasis, as an alternative to lymph node dissection. Gold Animals;Cell Line, Tumor;Gold;Humans;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Lymph Nodes;Lymphatic Metastasis;Mice;Nanotubes

Clinical and usability study to determine the safety and efficacy of the Silk'n Blue Device for the treatment of mild to moderate inflammatory acne vulgaris. INTRODUCTION: Home devices for acne vulgaris have emerged as a way to utilize our current light based technology for the care of our patients suffering from acne vulgaris. MATERIALS AND METHODS: Patient received eight treatments with the Silk'n Blue device over a 4-week period. Follow-up visits were at 1 month and 3 months. RESULTS: Seventeen subjects were entered into this institutional review board (IRB) approved clinical research project. There was a statistically significant decrease in mean acne counts from baseline through the follow-up visits, $p = 0.002$. Percent reduction was also statistically significant, $p = 0.041$. The study also showed that 36.4% of the patients had complete clearance with the study device. 100% of the patients showed full comprehension with the label for the device. There were no adverse events. Photos were captured. DISCUSSION: The Silk'n Blue device has an array of 24 LEDs emitting a spectrum of light in the blue-violet range of light (405-460 nm). Subjects enrolled in this clinical trial clearly were able to understand the labeling for the device. CONCLUSIONS: The Silk'n Blue device is a safe efficacious at home device for the treatment of mild to moderate inflammatory acne vulgaris. Acne Vulgaris;Adult;Aged;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Severity of Illness Index;Ultraviolet Therapy

Photodynamic therapy for polypoidal choroidal vasculopathy. The first effective therapy for exudative macular degeneration (AMD) was Photodynamic Therapy (PDT). Diagnosis of the disease was to a large extent by fluorescein angiography (FA). Distinguishing between the leaky choroidal neovessels (CNV) associated with exudative AMD, and the polypoidal structures associated with Polypoidal Choroidal Vasculopathy (PCV) is not always easy using FA alone. The switch to Indocyanine Green angiography helped to pinpoint PCV, and thus to study the efficacy of photodynamic therapy of this particular form of retinal disease, which is more frequently encountered among pigmented individuals. The results appear to be quite promising, and in the year following treatment only a small fraction of the patients had to be retreated. Alternatively, treating PCV with repeated intravitreal VEGF blocking agents was not as successful as it was in the treatment of wet AMD. However, combining PDT-induced angio-occlusion of the polypoidal lesions with anti-vascular endothelial growth factor therapy was shown to be quite effective, and the combination of PDT with an anti-angiogenic agent as well as a steroid, in a triple therapy, was recently also shown to be a quite promising option. In the present article we review the data on PDT of PCV, including combination therapies and alternative treatments. We also report on similarities and differences between AMD and PCV. Angiogenesis Inhibitors;Photosensitizing Agents Angiogenesis Inhibitors;Choroid Diseases;Combined Modality Therapy;Drug Therapy, Combination;Humans;Low-Level Light Therapy;Macular Degeneration;Photochemotherapy;Photosensitizing Agents

[The role of laser therapy in the combined rehabilitation of the patients presenting with abdominal adhesions]. This article presents a brief description of the applications low-level laser therapy as an instrument for the treatment and early rehabilitation of the patients presenting with abdominal adhesions at the stage of their hospital stay. The data obtained give reason to recommend laser

therapy as a method for the treatment and earlier rehabilitation of the patients with abdominal adhesions. Abdomen;Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Tissue Adhesions;Treatment Outcome
Transcranial application of near-infrared low-level laser can modulate cortical excitability. BACKGROUND AND OBJECTIVE: Near-infrared low-level laser (NIR-LLL) irradiation penetrates scalp and skull and can reach superficial layers of the cerebral cortex. It was shown to improve the outcome of acute stroke in both animal and human studies. In this study we evaluated whether transcranial laser stimulation (TLS) with NIR-LLL can modulate the excitability of the motor cortex (M1) as measured by transcranial magnetic stimulation (TMS). METHODS: TLS was applied for 5â€‰minutes over the representation of the right first dorsal interosseal muscle (FDI) in left primary motor cortex (M1), in 14 healthy subjects. Motor evoked potentials (MEPs) from the FDI, elicited by single-pulse TMS, were measured at baseline and up to 30â€‰minutes after the TLS. RESULTS: The average MEP size was significantly reduced during the first 20â€‰minutes following the TLS. The pattern was present in 10 (71.5%) of the participants. The MEP size reduction correlated negatively with the motor threshold at rest. CONCLUSIONS: TLS with NIR-LLL induced transitory reduction of the excitability of the stimulated cortex. These findings give further insights into the mechanisms of TLS effects in the human cerebral cortex, paving the way for potential applications of TLS in treatment of stroke and in other clinical settings. Adult;Evoked Potentials, Motor;Female;Healthy Volunteers;Humans;Low-Level Light Therapy;Middle Aged;Motor Cortex;Transcranial Magnetic Stimulation
Analgesic Effect of Light-Emitting Diode (LED) Therapy at Wavelengths of 635 and 945Â nm on Bothrops moojeni Venom-Induced Hyperalgesia. Envenoming induced by Bothrops snakes is characterized by drastic local tissue damage involving hemorrhage, myonecrosis and proeminent inflammatory and hyperalgesic response. The most effective treatment is antivenom therapy, which is ineffective in neutralizing the local response. Herein, it was evaluated the effectiveness of light-emitting diode (LED) at wavelengths of 635 and 945Â nm in reducing inflammatory hyperalgesia induced by Bothrops moojeni venom (BmV) in mice, produced by an subplantar injection of BmV (1Â Î¼g). Mechanical hyperalgesia and allodynia were assessed by von Frey filaments at 1, 3, 6 and 24Â h after venom injection. The site of BmV injection (1.2Â cm(2)) was irradiated by LEDs at 30Â min and 3Â h after venom inoculation. Both 635Â nm (110Â mW, fluence of 3.76Â J/cm(2) and 41Â s of irradiation time) and 945Â nm (120Â mW, fluence of 3.8Â J/cm(2) and 38Â s of irradiation time) LED inhibited mechanical allodynia and hyperalgesia of mice alone or in combination with antivenom treatment, even when the symptoms were already present. The effect of phototherapy in reducing local pain induced by BmV should be considered as a novel therapeutic tool for the treatment of local symptoms induced after bothropic snake bites. Analgesics;Antivenins Analgesics;Animals;Antivenins;Bothrops;Hyperalgesia;Low-Level Light Therapy;Mice;Snake Bites
Fox Fordyce disease as a secondary effect of laser hair removal. Fox Fordyce disease (FFD) has been recently described as an adverse effect of laser hair removal. It is an apocrine gland disorder characterized by pruritus and a folliculocentric papular eruption in apocrine sweat gland areas. Different etiologies have been proposed to be the cause of this entity. It has been suggested that a fisical factor could contribute to FFD phatogenesis. We report a new case of FFD after laser hair removal. Adult;Axilla;Female;Fox-Fordyce Disease;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pruritus
Dermatosis Papulosa Nigra and 10,600-nm CO2 laser, a good choice. Dermatosis Papulosa Nigra (DPN) is a common skin condition observed in black people and considered a benign epithelial tumor, and more specifically, a particular topographic form of seborrheic keratosis. We treated five female patients affected by DPN with 10,600-nm CO2 laser. We propose the 10,600-nm CO2 laser as a valid

therapeutic option in patients affected by DPN, since the treatment is well tolerated, causes no major side effects, and is effective and long lasting. Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Racial Groups;Skin Diseases, Papulosquamous
Fractional CO2 lasers for the treatment of atrophic acne scars: a review of the literature. This review examines the efficacy and safety of fractional CO2 lasers for the treatment of atrophic scarring secondary to acne vulgaris. We reviewed 20 papers published between 2008 and 2013 that conducted clinical studies using fractional CO2 lasers to treat atrophic scarring. We discuss the prevalence and pathogenesis of acne scarring, as well as the laser mechanism. The histologic findings are included to highlight the ability of these lasers to induce the collagen reorganization and formation that improves scar appearance. We considered the number of treatments and different laser settings to determine which methods achieve optimal outcomes. We noted unique treatment regimens that yielded superior results. An overview of adverse effects is included to identify the most common ones. We concluded that more studies need to be done using uniform treatment parameters and reporting in order to establish which fractional CO2 laser treatment approaches allow for the greatest scar improvement. Acne Vulgaris;Cicatrix;Cosmetic Techniques;Face;Humans;Lasers, Gas;Low-Level Light Therapy;Prevalence
Intense pulsed light in the treatment of telangiectasias: case report of BehÃ§et's disease with superficial vascular involvement. BehÃ§et's disease (BD) is a chronic systemic inflammatory disorder of unknown etiology with variable clinical manifestations. HLA-B51 allele is the most strongly associated known genetic factor. The mucocutaneous lesions (oral aphthae, genital aphthae, skin lesions such as pseudofolliculitis) constitute the hallmark of the disease, but also gastrointestinal, vascular, central nervous systems, and others may be involved. We report a case of a young man affected with BehÃ§et's disease who presented facial telangiectasias and striae rubra in the inner region of his arms and at the level of his hips, as uncommon minor superficial vascular manifestations of BD. To manage them we have subjected the patient to a cycle of Intense Pulsed Light (IPL) therapy. Our findings showed that the use of IPL is a safe and effective treatment for telangiectasias and striae rubra, also in the complex clinical condition of BehÃ§et's disease. In fact, the treatments were well tolerated, no sign of scarring or hyper/hypopigmentation was reported and we obtained a significant improvement of the lesions in terms of color and size of them. Adult;Behcet Syndrome;Cosmetic Techniques;Humans;Low-Level Light Therapy;Male;Telangiectasis
Dystrophic calcifications after autologous fat injection on face. Autologous fat injection is widely used procedure for various functional and aesthetic purposes. However, it could result in many immediate or delayed complications including dystrophic calcifications. Almost all of the case reports about dystrophic calcification after autologous fat injection were result from the iatrogenic tissue trauma of breast augmentation. This is a report of a 30-year-old patient who developed pathologically proven multiple dystrophic calcifications on the face after autologous fat injection. Adipose Tissue;Adult;Calcinosis;Cosmetic Techniques;Face;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Postoperative Complications;Transplantation, Autologous
Comparison of fractional, nonablative, 1550-nm laser and 595-nm pulsed dye laser for the treatment of facial erythema resulting from acne: a split-face, evaluator-blinded, randomized pilot study. BACKGROUND: Postinflammatory erythema is commonly seen in patients with inflammatory acne. There are no reliable treatment guidelines for acne erythema. OBJECTIVE: We compared the effect and safety of a nonablative, 1550-nm fractional laser and a 595-nm pulsed dye laser (PDL) for the treatment of acne erythema. MATERIALS AND METHODS: Twelve Korean patients with acne erythema were enrolled. Sides of the face were randomized to receive treatment with a fractional laser or a PDL for a total of three treatments at 4-week intervals. The assessment of effectiveness was mean change in mexameter scores, investigator's and patients' clinical assessments. RESULTS:

Statistically significant improvements in baseline acne erythema were observed through an improved erythema index on both treated sides. But, the improvements from each laser treatment were not significantly different. Mean scores of investigator assessments were 3.42 Â± 0.67 in fractional laser-treated sites and 3.33 Â± 0.65 in PDL-treated sites. Patients assessed their improvement as good or excellent in 91.7% of fractional laser-treated sites and 75% of PDL-treated sites. CONCLUSION: Both lasers are effective and safe modalities for the treatment of acne erythema; however, these data suggest better clinical efficacy with the use of a 1550-nm, erbium-glass fractional laser.
Acne Vulgaris;Adult;Erythema;Face;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Pilot Projects;Republic of Korea;Single-Blind Method

Novel post-treatment care after ablative and fractional CO2 laser resurfacing. OBJECTIVE: This study evaluates a topical oxygen emulsion (TOE) to reduce adverse effects after skin rejuvenation with a fully ablative CO2 laser alone and in combination with a fractional ablative CO2 laser. MATERIALS AND METHODS: Patients (n = 100) seeking skin rejuvenation underwent CO2 laser resurfacing. Group A patients (n = 34) received a single deep fractional laser treatment followed by application of Aquaphor immediately after treatment for 24 h and TOE every 6 h for the next 6 days. Group B patients (n = 66) underwent both deep fractional and fully ablative laser resurfacing followed by application of TOE every 6 h for 7 consecutive days. RESULTS: Patients in both groups showed clinical improvement and a 7.1% overall incidence of adverse effects which included milia (5.1% overall) and hyperpigmentation (3.1% overall). For milia, Group A and Group B individual adverse effect rates were 11.8% and 1.5%, respectively; for hyperpigmentation, individual rates were 0.0% and 3.1%, respectively. CONCLUSION: The elimination of petrolatum products in the post-skin care regimen has significantly reduced the incidence of post-procedure complications when compared with the use of TOE, resulting in the lowest incidence of complications in fully ablative or fractional resurfacing published thus far. Dermatologic Agents Adult;Aged;Cosmetic Techniques;Dermatologic Agents;Face;Female;Humans;Hyperpigmentation;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Prospective Studies;Rejuvenation;Skin Aging

Erythema ab igne successfully treated with low fluenced 1,064-nm Q-switched Neodymium-Doped Yttrium Aluminum Garnet laser. Adolescent;Cosmetic Techniques;Erythema;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy

A dystrophic calcinosis cutis case treated with CO2 laser. Calcinosis cutis is the deposition of insoluble calcium salts within cutaneous tissue. It may be divided into four major subtypes: dystrophic, metastatic, idiopathic, and iatrogenic. The most common subtype is dystrophic calcinosis cutis. It can occur as a result of local tissue injury. We herein present a child with dystrophic calcinosis cutis developed following trauma and successfully treated with CO2 laser.
Calcinosis;Child;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Skin Diseases

Treatment of striae distensae using an ablative Erbium: YAG fractional laser versus a 585-nm pulsed-dye laser. Abstract Striae distensae (SD) represent a common disfiguring cutaneous condition characterized by linear reddish smooth bands of atrophic-appearing skin. Most often SD develop in areas of dermal damage produced by stretching. Numerous treatment modalities have been applied with varying success. Novel approaches include treatments with various types of lasers with the flashlamp-pumped pulsed dye laser (PDL; 585 nm) being the most commonly reported. Very recently, fractional photothermolysis has been suggested as an effective method for the treatment of SD. Here, we report on the effect of an ablative Erbium:YAG fractional laser in two cases of axillary SD in comparison with a 585-nm PDL. Adolescent;Cosmetic Techniques;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Striae Distensae;Young Adult

An update on the use of laser technology in skin vaccination. Vaccination via skin often induces stronger immune responses than via muscle. This, in line with potential needle-free, painless delivery,

makes skin a very attractive site for immunization. Yet, despite decades of effort, effective skin delivery is still in its infant stage and safe and potent adjuvants for skin vaccination remain largely undefined. We have shown that laser technologies including both fractional and non-fractional lasers can greatly augment vaccine-induced immune response without incurring any significant local and systemic side effects. Laser illumination at specific settings can accelerate the motility of antigen-presenting cells or trigger release of 'danger' signals stimulating the immune system. Moreover, several other groups including the authors explore laser technologies for needle-free transcutaneous vaccine delivery. As these laser-mediated resurfacing technologies are convenient, safe and cost-effective, their new applications in vaccination warrant clinical studies in the very near future. Vaccines Administration, Cutaneous;Humans;Low-Level Light Therapy;Skin;Vaccination;Vaccines

Low-level laser therapy (810 nm) protects primary cortical neurons against excitotoxicity in vitro. Excitotoxicity describes a pathogenic process whereby death of neurons releases large amounts of the excitatory neurotransmitter glutamate, which then proceeds to activate a set of glutamatergic receptors on neighboring neurons (glutamate, N-methyl-D-aspartate (NMDA), and kainate), opening ion channels leading to an influx of calcium ions producing mitochondrial dysfunction and cell death. Excitotoxicity contributes to brain damage after stroke, traumatic brain injury, and neurodegenerative diseases, and is also involved in spinal cord injury. We tested whether low level laser (light) therapy (LLLT) at 810 nm could protect primary murine cultured cortical neurons against excitotoxicity in vitro produced by addition of glutamate, NMDA or kainate. Although the prevention of cell death was modest but significant, LLLT (3 J/cm(2) delivered at 25 mW/cm(2) over 2 min) gave highly significant benefits in increasing ATP, raising mitochondrial membrane potential, reducing intracellular calcium concentrations, reducing oxidative stress and reducing nitric oxide. The action of LLLT in abrogating excitotoxicity may play a role in explaining its beneficial effects in diverse central nervous system pathologies. Neurotoxins;Reactive Oxygen Species;Nitric Oxide;Adenosine Triphosphate;Calcium Adenosine Triphosphate;Animals;Calcium;Cell Survival;Cerebral Cortex;Cytoplasm;Female;Intracellular Space;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice;Neurons;Neurotoxins;Nitric Oxide;Pregnancy;Reactive Oxygen Species

Biomechanical and biochemical protective effect of low-level laser therapy for Achilles tendinitis. For three decades, low level laser therapy (LLLT) has been used for treatment of tendinitis as well as other musculoskeletal diseases. Nevertheless, the biological mechanisms involved remain not completely understood. In this work, the effects of LLLT and of the widely used nonsteroidal anti-inflammatory drug, diclofenac, have been compared in the case of collagenase-induced Achilles tendinitis. Wistar rats were treated with diclofenac or laser therapy. The tensile behavior of tendons was characterized through successive loading-unloading sequences. The method considered 11 characteristic parameters to describe the mechanical behavior. It was shown that during the acute inflammatory process of the tendon, the mechanical properties were significantly correlated to the high levels of MMP-3, MMP-9 and MMP-13 expression presented in a previous paper (Marcos, R.L., et al., 2012). The treatment by non-steroidal anti-inflammatory drugs such as diclofenac sodium produces a low protective effect and can affect the short-term biochemical and biomechanical properties. On the contrary, it is shown that LLLT exhibits the best results in terms of MMPs reduction and mechanical properties recovery. Thus, LLLT looks to be a promising and consistent treatment for tendinopathies. Matrix Metalloproteinases Achilles Tendon;Animals;Biomechanical Phenomena;Gene Expression Regulation, Enzymologic;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Mechanical Phenomena;Rats;Rats, Wistar;Tendinopathy

Laser therapy in the control of oral mucositis: a meta-analysis. OBJECTIVE: To conduct a systematic review and meta-analysis of the effectiveness of Laser Therapy in the prevention of oral mucositis (OM) in patients undergoing oncotherapy. METHODS: To this systematic review and meta-

analysis a search was performed in MEDLINE, LILACS and Cochrane using the keywords "laser therapy" and "Oral mucositis." The case-control studies included were submitted to odds ratio (OR) analysis, which the cut-off point for statistic calculation was OM grade > 3. We carried out a meta-analysis by BioEstat 5.0, using the Random Effect DerSimonian-Laird statistical analysis. RESULTS: Twelve (studies were included in this systematic review, and the meta-analysis of seven of them showed that LT in patients undergoing oncotherapy is approximately nine times more effective in the prevention of OM grade > 3 than in patients without laser treatment (OR: 9,5281, confidence interval 95% 1,447-52,0354, p=0,0093. CONCLUSION: These data demonstrated significant prophylatic effect of OM grade > 3 in patients undergoing LT. Further studies, with larger sample sizes, are needed for better evaluation of the prophylatic effect of OM grade > 3 by LT. Case-Control Studies;Evidence-Based Medicine;Head and Neck Neoplasms;Hematologic Neoplasms;Humans;Low-Level Light Therapy;Stomatitis

Nanosecond-laser application in intermediate AMD: 12-month results of fundus appearance and macular function. BACKGROUND: A novel, ultra-low energy nanosecond laser (retinal rejuvenation therapy) has been developed with the aim to slow progression of early age-related macular degeneration (AMD). The safety, changes in fundus characteristics and macular function in a cohort of participants with bilateral intermediate AMD are reported. DESIGN: Prospective non-randomised, pilot intervention study. PARTICIPANTS OR SAMPLES: Subjects with bilateral intermediate AMD (nâ€‰=â€‰50, aged 50-75 years). METHODS: Ultra-low energy laser pulses applied in 12 spots around the macula of one eye (0.15-0.45 mJ), using 400 Î¼m diameter spot, 3 nanosecond pulse length, 532â€‰nm wavelength and energy titrated to each patient. MAIN OUTCOME MEASURES: Best corrected visual acuity, drusen area and macular sensitivity (flicker perimetry) at baseline and at 3, 6 and 12 months post-laser. RESULTS: Treatment was painless with no clinically visible lesions. No participant developed choroidal neovascularization, while two with thin central retinal thickness at baseline developed atrophy at 12-month follow up. Drusen area was reduced in 44% of treated eyes and 22% of untreated fellow eyes, with changes in drusen and function not being coincident. Improvement in flicker threshold within the central 3Â° was observed in both the treated and untreated fellow eyes at 3 months post-laser. Of the 11 eyes at greatest risk of progression (flicker defect >15â€‰dB), seven improved sufficiently to be taken out of this high-risk category. CONCLUSIONS: A single unilateral application of nanosecond laser to the macula produced bilateral improvements in macula appearance and function. The nanosecond retinal rejuvenation therapy laser warrants ongoing evaluation as an early intervention for AMD. Aged;Aged, 80 and over;Female;Fluorescein Angiography;Humans;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Pilot Projects;Prognosis;Prospective Studies;Retina;Retinal Drusen;Tomography, Optical Coherence;Visual Acuity;Visual Field Tests;Visual Fields

Effects of low level light irradiation on the migration of mesenchymal stem cells derived from rat bone marrow. Low level light irradiation (LLLI) was found to exert positive effects on various cells in vitro. The aim of this study was to investigate the effect of LLLI on the migration of rat bone marrow mesenchymal stem cells (rbMSCs). Light irradiation was applied at the energy density of 4 J/cm(2) using red (630 nm) and near infrared (NIR, 850 nm) light emitting diodes (LEDs). Wound healing assay showed both red and NIR light irradiation increased cell mobility. Red and NIR light enhanced transmembrane migration of rbMSCs up to 292.9% and 263.6% accordingly. This agreed with enzymatic activities of MMP-2 and MMP-9 enhanced by irradiation. F-actin accumulation and distribution correlated to increased migration in light-irradiated MSCs. Reactive oxygen species production as well as the expression of pFAK and pNF-ÐºB were elevated after red and NIR LLLI. The study demonstrated that red and NIR LLLI increased rbMSCs migration and identified the phosphorylation of FAK and NF-ÐºB as critical steps for the elevated cell migration upon LLLI. NF-

kappa B;Reactive Oxygen Species;Focal Adhesion Protein-Tyrosine Kinases;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Animals;Bone Marrow Cells;Cell Movement;Cell Proliferation;Cells, Cultured;Female;Fluorescent Antibody Technique;Focal Adhesion Protein-Tyrosine Kinases;Light;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Mesenchymal Stem Cells;NF-kappa B;Phosphorylation;Rats, Wistar;Reactive Oxygen Species;Signal Transduction;Spectroscopy, Near-Infrared

A practical comparison of Copper Bromide Laser for the treatment of vascular lesions. The recent rapid growth in demand for aesthetic non-invasive laser treatments such as unwanted skin rejuvenation, removal of age-related vascular blemishes has led to a boom in the medical devices to treat these conditions. Among diverse laser for skin treatment, copper bromide laser is a very effective, safe, and well tolerated treatment for facial telangiectasia at various energy levels and the most important thing of the copper bromide laser device is that the stability of the energy. However there is no evidence about effective copper bromide laser's energy level for the treatment of vascular lesions. We compared energy stability and treatment performance between two energy levels in 2 W and 8 W which commonly use in laser treatment for the vascular lesions. 8 W copper bromide laser was more stable compared than 2 W copper bromide laser. Also, 8 W copper bromide laser was effectively superior to 2 W copper bromide laser in treatment of vascular legion. Consequently, 8 W copper bromide laser treatment for vascular lesion might be more suitable than 2 W copper bromide laser. Bromides;Copper Animals;Bromides;Copper;Humans;Low-Level Light Therapy;Rabbits;Skin;Telangiectasis

[CO2 laser supraglottoplasty for infantile laryngomalacia]. OBJECTIVE: To evaluate the feasibility and safety of CO2 laser supraglottoplasty for severe laryngomalacia in infants. METHODS: From January 2009 to December 2011, 32 infants with severe laryngomalacia were confirmed by electronic laryngoscope and clinical assessment in Shenzhen Children's Hospital. According to the choice made by the parents, 16 children accepted CO2 laser supraglottoplasty (group 1), the others were treated conservatively (group 2). The beginning observation point T0 was defined as the age on the first medicine taking day or the age of surgery. T1, T3, T6 were defined as 1, 3, 6 months following T0. Clinical symptoms included stridor, dyspnea, aspiration, and respiratory infections. The body weight, PSG reports, laryngoscope findings, cure rates of the two groups were compared. RESULTS: The anatomical abnormalities were corrected surgically, and the symptoms ,such as stridor, dyspnea, and aspiration improved rapidly after the operation. The cure rates was higher in group 1 than in group 2 on T1, T3, T6 stage. There were statistically significant differences(Ï‡(2) were 13.9, 28.1, 24.6 respectively; all $P < 0.01$). Children in group 1 gained weight better than in group 2. There was a statistically significant difference in Z scores median on T1, T3, T6 stage (z score were -0.848, -2.940, -4.110; $P < 0.05$, or $P < 0.01$ respectively). The lowest oxygen saturation in group 1 improved one month after the surgery (from average 0.686 Â± 0.106 to 0.901 Â± 0.041). There was a statistically significant difference ($t = -7.876$, $P = 0.001$). Complications included adhesion (1 case) and temporary new-onset aspiration (1 case). CONCLUSIONS: The CO2 laser supraglottoplasty can resolve severe laryngomalacia symptoms including stridor, dyspnea and aspiration. It can reduce the frequency of respiratory infections, and contribute to weight gaining. The CO2 laser supraglottoplasty is effective, of high security and with rare complications. Carbon Dioxide Carbon Dioxide;Glottis;Humans;Infant;Infant, Newborn;Laryngomalacia;Laryngoscopes;Lasers, Gas;Low-Level Light Therapy;Retrospective Studies

Low-level laser therapy decreases renal interstitial fibrosis. Animals;Low-Level Light Therapy;Male;Nephritis, Interstitial

Protective effect of laser phototherapy on acetylcholine receptors and creatine kinase activity in denervated muscle. OBJECTIVE: This study was designed to assess the status of skeletal muscles

after laser treatment during long-term denervation processes, by investigating changes in the level of acetylcholine receptors (AChR) and creatine kinase (CK) activity in the denervated gastrocnemius muscle of the rat. BACKGROUND DATA: Progressive muscle atrophy is common in patients with severe peripheral nerve injury. Denervated muscles can account for significant differences in the extent of AChR and CK activity during the denervation period. MATERIAL AND METHODS: The study was conducted on 96 rats: 48 that received laser treatment and 48 untreated controls. The gastrocnemius muscle was denervated by removing a 10â€‰mm segment of the sciatic nerve. Low power laser irradiation was delivered transcutaneously to the right gastrocnemius muscle (HeNe continuous wave [CW] laser, 632.8â€‰nm, 35â€‰mW, 30â€‰min) for 14 consecutive days. Under general anesthesia, the rats were euthanized at seven time points: day 7 (n=10), day 14 (n=10), day 21 (n=10), day 30 (n=5), day 60 (n=4), day 120 (n=5), and day 210 (n=4), with and without laser treatment, respectively. AChR was quantified by the (125)I-Î±-bungarotoxin. CK activity was measured by a specific spectrophotometric method. RESULTS: Laser treatment had a significant therapeutic effect on the denervated muscle during the first 21 days for AChR and the first 30 days for CK activity. CONCLUSIONS: In the early stages of muscle atrophy, laser phototherapy may preserve the denervated muscle by maintaining CK activity and the amount of AChR.
Bungarotoxins;Receptors, Cholinergic;Creatine Kinase Animals;Bungarotoxins;Creatine Kinase;Low-Level Light Therapy;Male;Muscle Denervation;Muscle, Skeletal;Muscular Atrophy;Rats;Receptors, Cholinergic

Effect of low-level laser therapy (808â€‰nm) in skeletal muscle after resistance exercise training in rats. OBJECTIVE: The aim of this study was to evaluate the effects of 808â€‰nm laser applied after a resistance training protocol, on biochemical markers and the morphology of skeletal muscle in rats. BACKGROUND DATA: Strenuous physical activity results in fatigue and decreased muscle strength, impaired motor control, and muscle pain. Many biochemical and biophysical interventions have been studied in an attempt to accelerate the recovery process of muscle fatigue. Among these, low-level laser therapy (LLLT) has been demonstrated to be effective in increasing skeletal muscle performance in in vivo studies and in clinical trials. However, little is known about the effects of LLLT on muscle performance after resistance training. METHODS: Thirty Wistar rats were randomly divided into three groups: control group (CG), trained group (TG), and trained and laser-irradiated group (TGL). The resistance training program was performed three times per week for 5 weeks, and consisted of a climbing exercise, with weights attached to the tail of the animal. Furthermore, laser irradiation was performed in the middle region of tibialis anterior (TA) muscle of both legs, after the exercise protocol. RESULTS: Analysis demonstrated that TGL demonstrated significantly reduced resting lactate level and decreased muscle glycogen depletion than the animals that were exercised only, and significantly increased the cross-section area of TA muscle fibers compared with thoseo in the other groups. CONCLUSIONS: These results suggest that LLLT could be an effective therapeutic approach in increasing muscle performance during a resistance exercise protocol.
Lactates;Glycogen Animals;Glycogen;Lactates;Low-Level Light Therapy;Male;Muscle, Skeletal;Physical Conditioning, Animal;Random Allocation;Rats;Rats, Wistar

The adjunct therapeutic effect of lasers with medication in the management of orofacial pain: double blind randomized controlled trial. OBJECTIVE: This study aimed to evaluate the efficacy of laser therapy in conjunction with a pharmaceutical approach to alleviate myofascial pain dysfunction syndrome. BACKGROUND DATA: A few clinical studies have evaluated the analgesic effect of laser therapy on orofacial pain, most of which reported controversial results. Myofascial pain dysfunction syndrome (MPDS), trigeminal neuralgia, and atypical facial pain are the most common facial pain. METHODS: A double-blind randomized controlled trial was designed to evaluate the therapeutic effect of GaAs laser (peak power 10 W; pulse frequency 3000 Hz; average power 0.012 W;

wavelength 980â€‰nm; irradiation duration 300 sec; and dose 12.73â€‰J/cm(2)) on the management of common orofacial pain. The laser group (n=30) received 10 sessions of treatment with GaAs laser. The control group (n=30) was treated identically with sham laser. All patients received the appropriate pharmaceutical treatment as well. Visual analog scale (VAS) was recorded for all patients at baseline, and immediately, 2, and 4 months after the final treatment session. The qualitative variables among the groups were compared using the Ï‡(2) test. RESULTS: Both groups demonstrated a significant reduction in pain with the progression of time ($p<0.05$). The difference between the two groups was not significant ($p>0.05$). Whereas laser therapy in the present study failed to show any significance over the control group, the role of covariates such as radiation parameters (wave length, dose) should not be overlooked. CONCLUSIONS: We found no significant level of efficacy for the GaAs laser in the management of common orofacial pain. Further studies are suggested to evaluate the efficacy of other types of lasers with different parameters in the management of orofacial pains. Analgesics, Non-Narcotic;Anti-Anxiety Agents;Antidepressive Agents, Tricyclic;Muscle Relaxants, Central;Carbamazepine Analgesics, Non-Narcotic;Anti-Anxiety Agents;Antidepressive Agents, Tricyclic;Carbamazepine;Case-Control Studies;Combined Modality Therapy;Double-Blind Method;Facial Pain;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Muscle Relaxants, Central;Radiotherapy Dosage;Treatment Outcome

A novel 785-nm laser diode-based system for standardization of cell culture irradiation. OBJECTIVE: The purpose of this study was to develop a novel device that concatenates alignment of infrared lasers and parallel procedure of irradiation. The purpose of this is to seek standardization of in vitro cell irradiation, which allows analysis and credible comparisons between outcomes of different experiments. BACKGROUND DATA: Experimental data obtained from infrared laser therapies have been strongly dependent upon the irradiation setup. Although further optical alignment is difficult to achieve, in contact irradiation it usually occurs. Moreover, these methods eventually use laser in a serial procedure, extending the time to irradiate experimental samples. METHODS: A LASERTable (LT) device was designed to provide similar infrared laser irradiation in 12 wells of a 24 well test plate. It irradiated each well by expanding the laser beam until it covers the well bottom, as occurs with unexpanded irradiation. To evaluate the effectiveness of this device, the spatial distribution of radiation was measured, and the heating of plain culture medium was monitored during the LT operation. The irradiation of LT (up to 25â€‰J/cm(2) - 20â€‰mW/cm(2); 1.250â€‰sec) was assessed on odontoblast-like cells adhered to the bottom of wells containing 1â€‰mL of plain culture medium. Cell morphology and metabolism were also evaluated. RESULTS: Irradiation with LT presented a Gaussian-like profile when the culture medium was not heated >1Â°C. It was also observed that the LT made it 10 times faster to perform the experiment than did serial laser irradiation. In addition, the data of this study revealed that the odontoblast-like cells exposed to low-level laser therapy (LLLT) using the LT presented higher metabolism and normal morphology. CONCLUSIONS: The experimental LASERTable assessed in this study provided parameters for standardization of infrared cell irradiation, minimizing the time spent to irradiate all samples. Therefore, this device is a helpful tool that can be effectively used to evaluate experimental LLLT protocols. Cells, Cultured;Equipment Design;Humans;In Vitro Techniques;Lasers, Semiconductor;Microscopy, Electron, Scanning;Odontoblasts;Temperature

Tissue distribution and efficacy of gold nanorods coupled with laser induced photoplasmonic therapy in ehrlich carcinoma solid tumor model. Gold nanorods (GNR) within tumor microregions are characterized by their ability to absorb near IR light and emit heat in what is called photoplasmonic effect. Yet, the efficacy of nanoparticles is limited due to intratumoral tissue distribution reasons. In addition, distribution of GNRs to normal tissue might result in non specific toxicity. In the current

study, we are assessing the intratumoral and tissue distribution of PEGylated GNRs on the top of its antitumor characteristics when given intravenously or intratumoral to solid tumor bearing mice and coupled with laser photoplasmonic sessions. PEGylated GNRs with a longitudinal size of less than 100 nm were prepared with aspect ratio of 4.6 showing strong surface plasmon absorption at wavelength 800 nm. Pharmacokinetics of GNR after single I.V. administration (0.1 mg/kg) showed very short systemic circulating time (less than 3 h). On the other hand, tissue distribution of I.V. GNR (0.1 mg/kg) to normal animals showed preferential deposition in spleen tissue. Repeated administration of I.V. GNR resulted in preferential accumulation in both liver and spleen tissues. In addition, I.V. administration of GNR to Ehrlich carcinoma tumor bearing mice resulted in similar tissue distribution; tumor accumulation and anti-tumor effect compared to intratumoral administration. In conclusion, the concentration of GNR achieved within tumors microregions after I.V. administration was comparable to I.T. administration and sufficient to elicit tumoral growth arrest when coupled with laser-aided photoplasmonic treatment. Polyethylene Glycols;Gold Administration, Intravenous;Animals;Carcinoma, Ehrlich Tumor;Disease Models, Animal;Female;Gold;Hyperthermia, Induced;Low-Level Light Therapy;Male;Mice;Nanotubes;Polyethylene Glycols;Tissue Distribution;Tumor Burden

Effect of class IV laser therapy on chemotherapy-induced oral mucositis: a clinical and experimental study. Oral mucositis (OM) is a serious and acute side effect in patients with cancer who receive chemotherapy or radiotherapy, often leading to the suspension of therapy and a need for opioid analgesic and enteral/parenteral nutrition, with an effect on patient survival. Among the various interventions proposed in OM management, laser therapy is becoming a recommended treatment option but has limitations due to its heterogeneous laser parameters. Here, we report on our successful clinical experience on the use of class IV laser therapy to treat OM induced by different chemotherapy regimens. To shed light on the mechanisms of action of laser therapy in improving OM resolution, we have developed an animal model of chemotherapy-induced OM, in which we compare the efficacy of the standard low-power laser therapy protocol with an innovative protocol, defined as high-power laser therapy. We show that high-power laser therapy is more effective than low-power laser therapy in improving OM lesion healing, reducing the inflammatory burden, and preserving tissue integrity. In addition, high-power laser therapy has been particularly effective in promoting the formation of new arterioles within the granulation tissue. Our results provide important insights into the mechanism of action of biostimulating laser therapy on OM in vivo and pave a way for clinical experimentation with the use of high-power laser therapy. Antineoplastic Agents Adult;Aged;Aged, 80 and over;Animals;Antineoplastic Agents;Disease Models, Animal;Female;Humans;Laser Therapy;Male;Mice;Middle Aged;Neoplasms;Stomatitis

Phototherapy and nerve injury: focus on muscle response. Preservation of biochemical processes in muscles is a major challenge in patients with severe peripheral nerve injury. In this chapter, we address the effects of laser irradiation and biochemical transformation in muscle, using in vitro and in vivo experimental models. The authors attempt to explain the possible mechanism of laser phototherapy applied on skeletal muscle on the basis of literature review and new results. A detailed knowledge of the evolution of endplates acetylcholine receptors and creatine kinase activity following laser irradiation can help to understand the therapeutic effect of laser phototherapy on muscle. This study showed that the laser phototherapy increases biochemical activity in intact muscle and thus could have direct therapeutic applications on muscle, especially during progressive atrophy resulting from peripheral nerve injury. Animals;Humans;Low-Level Light Therapy;Muscle Denervation;Muscle, Skeletal;Peripheral Nerve Injuries

The time course of action of two neuroprotectants, dietary saffron and photobiomodulation, assessed in the rat retina. BACKGROUND: Dietary saffron and photobiomodulation (low-level

infrared radiation, PBM) are emerging as therapeutically promising protectants for neurodegenerative conditions, such as the retinal dystrophies. In animal models, saffron and PBM, given in limited daily doses, protect retina and brain from toxin- or light-induced stress. This study addresses the rate at which saffron and PBM, given in daily doses, induce neuroprotection, using a light damage model of photoreceptor degeneration in Sprague Dawley (SD) rats. RESULTS: Rats were raised in dim cyclic (12 h 5 lux, 12 h dark) illumination, treated with saffron or PBM for 2-10 d, and then exposed to bright damaging light (1,000 lux for 24 h). After 1 week survival, the retina was assessed for photoreceptor death (using the TUNEL reaction), for surviving photoreceptor damage (thickness of the outer nuclear layer) and for the expression of a stress-related protein GFAP, using immunohistochemistry. Preconditioning the retina with saffron or PBM reduced photoreceptor death, preserved the population of surviving photoreceptors and reduced the upregulation of GFAP in MÃ¼ller cells. At the daily dose of saffron used (1 mg/kg), protection was detectable at 2 d, increasing to 10 d. At the daily dose of PBM used (5 J/cm(2) at 670 nm) protection was detectable at 5 d, increasing to 7-10 d. CONCLUSIONS: The results provide time parameters for exploration of the mechanisms and durability of the protection provided by saffron and PBM.

Minimizing skin cancer surgical scars using ablative fractional Er:YAG laser treatment. BACKGROUND AND OBJECTIVE: Scars from skin cancer surgery on the face can be quite prominent and not easily obscured by makeup. This report evaluates the use of an ablative fractional Er:YAG laser device for minimizing or blending scar lines in two patients who underwent repair of skin cancer defects on the face. METHODS: Two patients underwent surgery to remove facial skin cancer tumors. The resulting scars after reconstruction of these skin cancer defects on the left cheek (Case 1) and right cheek (Case 2) each received 3 treatments with a fractional ablative laser device (ProFractional-XC, Sciton, Inc., Palo Alto, CA). Treatments were spaced about 1 month apart. Topical anesthetic cream applied 1 hour before treatment minimized patient discomfort during the procedure. Treatment depths ranged from 150 to 200 microns, 2 passes were performed, and coverage per pass was typically 22% and then 11% in the coagulation mode. Results were evaluated by digital photography before the initial treatment, approximately 4-5 weeks after each of the 3 treatments, and at approximately 7 months after the surgical procedures. RESULTS: The fractional Er:YAG laser device significantly improved postsurgical scar lines in each patient without significant adverse effects. Prior to the laser sessions, these scars demonstrated hypopigmentation, hyperpigmentation, neovascularization, or diminished pore structures compared to the surrounding skin. These pigmentary, vascular or textural issues were all significantly improved by the fractional ablative Er:YAG laser. CONCLUSION: The ablative fractional laser device of the present report safely minimizes and improves facial scars demonstrating not only textural alterations but also some pigmentary and vascular changes after reconstruction of skin cancer defects. Adult;Carcinoma, Squamous Cell;Cicatrix;Dermatologic Surgical Procedures;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanoma;Middle Aged;Patient Satisfaction;Postoperative Complications;Skin Neoplasms;Treatment Outcome

Efficacy of low level laser therapy on wound healing in patients with chronic diabetic foot ulcers-a randomised control trial. Foot ulcers are serious complications of Diabetes Mellitus (DM) and are known to be resistant to conventional treatment. They may herald severe complications if not treated wisely. Electromagnetic radiations in the form of photons are delivered to the ulcers in laser form to stimulate healing. This study was conducted to evaluate the efficacy of Low Level Laser Therapy (LLLT) in diabetic ulcer healing dynamics. To determine mean percentage reduction of wound area in study and control groups. SETTINGS: KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. STUDY DESIGN: Randomized-Control Study. METHODS: A total of 68 patients with Type 2 DM having Meggitt-Wagner Grade I foot ulcers of atleast more than 4Â weeks duration, less

than 6â€‰Ã—â€‰6Â cm(2) with negative culture were studied. Patients were randomized into two groups of 34 each. Patients in study group received LLLT with conventional therapy and those in control group were treated with conventional therapy alone. Healing or percentage reduction in ulcer area over a period of 15Â days after commencement of treatment was recorded. STATISTICAL ANALYSIS: Unpaired Student T Test and Mann Whitney U test. Mean age of the patients was 50.94Â years in control group and 54.35Â years in study group (pâ€‰=â€‰0.065). There was no significant difference between control and study group with respect to mean FBS and HbA1c levels (pâ€‰>â€‰0.05), suggesting no biochemical differences between two groups. Initial ulcer area was 2608.03Â mm(2) in study group and 2747.17Â mm(2) in control group (pâ€‰=â€‰0.361). Final ulcer area was 1564.79Â mm(2) in study group and 2424.75Â mm(2) in control group (pâ€‰=â€‰0.361). Percentage ulcer area reduction was 40.24â€‰Â±â€‰6.30Â mm(2) in study group and 11.87â€‰Â±â€‰4.28Â mm(2) in control group (pâ€‰<â€‰0.001, Zâ€‰=â€‰7.08). Low Level Laser Therapy is beneficial as an adjunct to conventional therapy in the treatment of diabetic foot ulcers (DFU).

The effects of low intensity laser on clinical and electrophysiological parameters of carpal tunnel syndrome. INTRODUCTION: Carpal Tunnel Syndrome (CTS) is the most common type of entrapment neuropathy. Conservative therapy is usually considered as the first step in the management of CTS. Low Level Laser Therapy (LLLT) is among the new physical modalities, which has shown therapeutic effects in CTS. The aim of the present study was to compare the effects of applying LASER and splinting together with splinting alone in patients with CTS. METHODS: Fifty patients with mild and moderate CTS who met inclusion criteria were included in this study. The disease was confirmed by electrodiagnostic study (EDx) and clinical findings. Patients were randomly divided into 3 groups. Group A received LLLT and splinting. Group B received sham LLLT+ splinting and group C received only splints. Group A received LLLT (50 mw and 880nm with total dose of 6 joule/cm(2)). Clinical and EDx parameters were evaluated before and after treatment (3 weeks and 2 months later). RESULTS: Electrophysiologic parameters and clinical findings including CTS provocative tests, Symptoms severity score (SSS), Functional Severity Score (FSS) and Visual Analogue Score (VAS) were improved in all three groups at 3 weeks and 2 months after treatment. No significant changes were noticed between the three groups regarding clinical and EDX parameters. CONCLUSION: We found no superiority in applying Low Intensity Laser accompanying splinting to traditional treatment which means splinting alone in patients with CTS. However, future studies investigating LLLT with parameters other than the one used in this study may reveal different results in favor of LLLT.

The growth of human scalp hair mediated by visible red light laser and LED sources in males. BACKGROUND AND OBJECTIVES: Low level laser therapy (LLLT) has been used to promote hair growth. A double-blind randomized controlled trial was undertaken to define the safety and physiologic effects of LLLT on males with androgenic alopecia. METHODS: Forty-four males (18-48 yo, Fitzpatrick I-IV, Hamilton-Norwood IIa-V) were recruited. A transition zone scalp site was selected; hairs were trimmed to 3 mm height; the area was tattooed and photographed. The active group received a "TOPHAT655" unit containing 21, 5 mW lasers (655 Â± 5 nm), and 30 LEDS (655 Â± 20 nm), in a bicycle-helmet like apparatus. The placebo group unit appeared identical, containing incandescent red lights. Patients treated at home every other day Ã— 16 weeks (60 treatments, 67.3 J/cm(2) irradiance/25 minute treatment), with follow up and photography at 16 weeks. A masked 2.85 cm(2) photographic area was evaluated by another blinded investigator. The primary endpoint was the percent increase in hair counts from baseline. RESULTS: Forty-one patients completed the study (22 active, 19 placebo). No adverse events or side effects were reported. Baseline hair counts were 162.7 Â± 95.9 (N = 22) in placebo and 142.0 Â± 73.0 (N = 22) and active groups respectively (P = 0.426). Post Treatment hair counts were 162.4 Â± 62.5 (N = 19) and 228.7 Â± 102.8 (N = 22),

respectively (P = 0.0161). A 39% percent hair increase was demonstrated (28.4 Â± 46.2 placebo, N = 19; 67.2 Â± 33.4, active, N = 22) (P = 0.001) Deleting one placebo group subject with a very high baseline count and a very large decrease, resulted in baseline hair counts of 151.1 Â± 81.0 (N = 21) and 142.0 Â± 73.0 (N = 22), respectively (P = 0.680). Post treatment hair counts were 158.2 Â± 61.5 (N = 18) and 228.7 Â± 102.8 (N = 22) (P = 0.011), resulting in a 35% percent increase in hair growth (32.3 Â± 44.2, placebo, N = 18; 67.2 Â± 33.4, active, N = 22) (P = 0.003). CONCLUSIONS: LLLT of the scalp at 655 nm significantly improved hair counts in males with androgenetic alopecia. Adolescent;Adult;Alopecia;Double-Blind Method;Follow-Up Studies;Hair;Humans;Light;Low-Level Light Therapy;Male;Middle Aged;Photography;Scalp;Treatment Outcome;Young Adult

Effect of low-level laser irradiation on osteoblast-like cells cultured on porous hydroxyapatite scaffolds. OBJECTIVE: To determine the effect of laser irradiation at a low dose on human osteoblastlike cells. MATERIALS AND METHODS: 32 porous hydroxyapatite scaffolds currently used for bone tissue engineering were seeded with MG63 cells and irradiated or not with a GaAlAs diode laser (wavelength 915 nm, dose 2 J/cm2) using different power density and exposure duration. RESULTS: After 72-h incubation, cells showed well spread morphology and good adhesion on both laser-treated and untreated scaffolds. Laser irradiation did not interfere in cell viability and proliferation as compared with the non-irradiated controls. CONCLUSION: This study suggests that there is no effect of 915 nm laser irradiation at a dose of 2 J/cm2 on the proliferation rate of MG63 cells. Future investigations are needed to compare different dose and wavelength regimens in order to determine the optimal set of laser parameters for maximum cell yield and safe clinical application. Biocompatible Materials;Bone Substitutes;Durapatite Biocompatible Materials;Biomimetics;Bone Substitutes;Cell Line;Cell Survival;Cells, Cultured;Durapatite;Humans;Lasers;Osteoblasts;Tissue Scaffolds

Lasers and photodynamic therapy in the treatment of onychomycosis: a review of the literature. Onychomycosis is a widespread problem. Oral antifungal medications are currently the gold standard of care, but treatment failure is common and oral therapy is contraindicated in many cases. There is a need for effective treatment without the systemic complications posed by oral therapy. Laser and photodynamic therapy may have the potential to treat onychomycosis locally without adverse systemic effects; some small studies have even reported achieving clinical and mycologic cure. However, there is reason for restraint; these therapies are expensive and time-consuming. Furthermore, they may not be covered by insurance and have not been proven effective with randomized, controlled clinical trials. This paper will review current literature regarding the use of laser and photodynamic therapy as potential treatments for onychomycosis. Antifungal Agents;Naphthalenes;Photosensitizing Agents;Terbinafine Administration, Oral;Antifungal Agents;Clinical Trials as Topic;Combined Modality Therapy;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Naphthalenes;Onychomycosis;Photochemotherapy;Photosensitizing Agents;Terbinafine;Treatment Outcome

A persistent discoloration of the neck sparing the submental area. Humans;Low-Level Light Therapy;Male;Middle Aged;Neck;Photosensitivity Disorders;Pigmentation Disorders

Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Low-level laser (light) therapy (LLLT) is a fast-growing technology used to treat a multitude of conditions that require stimulation of healing, relief of pain and inflammation, and restoration of function. Although skin is naturally exposed to light more than any other organ, it still responds well to red and near-infrared wavelengths. The photons are absorbed by mitochondrial chromophores in skin cells. Consequently, electron transport, adenosine triphosphate nitric oxide release, blood flow, reactive oxygen species increase, and diverse signaling pathways are activated. Stem cells can be activated, allowing increased tissue repair and healing. In dermatology, LLLT has beneficial effects on wrinkles, acne

scars, hypertrophic scars, and healing of burns. LLLT can reduce UV damage both as a treatment and as a prophylactic measure. In pigmentary disorders such as vitiligo, LLLT can increase pigmentation by stimulating melanocyte proliferation and reduce depigmentation by inhibiting autoimmunity. Inflammatory diseases such as psoriasis and acne can also be managed. The noninvasive nature and almost complete absence of side effects encourage further testing in dermatology. Cicatrix;Humans;Low-Level Light Therapy;Rejuvenation;Skin;Wound Healing

Body contouring using 635-nm low level laser therapy. Noninvasive body contouring has become one of the fastest-growing areas of esthetic medicine. Many patients appear to prefer nonsurgical less-invasive procedures owing to the benefits of fewer side effects and shorter recovery times. Increasingly, 635-nm low-level laser therapy (LLLT) has been used in the treatment of a variety of medical conditions and has been shown to improve wound healing, reduce edema, and relieve acute pain. Within the past decade, LLLT has also emerged as a new modality for noninvasive body contouring. Research has shown that LLLT is effective in reducing overall body circumference measurements of specifically treated regions, including the hips, waist, thighs, and upper arms, with recent studies demonstrating the long-term effectiveness of results. The treatment is painless, and there appears to be no adverse events associated with LLLT. The mechanism of action of LLLT in body contouring is believed to stem from photoactivation of cytochrome c oxidase within hypertrophic adipocytes, which, in turn, affects intracellular secondary cascades, resulting in the formation of transitory pores within the adipocytes' membrane. The secondary cascades involved may include, but are not limited to, activation of cytosolic lipase and nitric oxide. Newly formed pores release intracellular lipids, which are further metabolized. Future studies need to fully outline the cellular and systemic effects of LLLT as well as determine optimal treatment protocols. Adipose Tissue;Cosmetic Techniques;Equipment Design;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Obesity;Patient Satisfaction

Photobiomodulation of aqueous interfaces: finding evidence to support the exclusion zone in experimental and clinical studies. OBJECTIVE: To present clinical and experimental evidence of the role of exclusion zone (EZ) water in photobiomodulation. BACKGROUND: Water at the interface of most hydrophilic surfaces forms a solute-free area, or EZ, that can project for hundreds of microns. To date, EZ phenomena had been documented in nafion, resins, and biologic membranes. METHODS: Retrospective analysis of published experimental and clinical data using an infrared pulsed laser device (IPLD). RESULTS: Photo-induced effects on the water dynamics of burned rat tissue monitored by 1H-NMR transverse relaxation times (1/T2) indicate significantly greater structuring of water. A microdensitometry study of T2 weighted tumor heterogeneities from a phase I clinical trial in patients with advanced neoplasias and an algorithm for tumor characterization also shows significantly increased structuring of water associated with biopolymers and macromolecules. CONCLUSIONS: To the best of our knowledge, this is the first known demonstration of the EZ in medicine. Data support the premise that photobiomodulation can increase potential energy in the EZ, which then acts as an energy repository that can selectively supplement cell energy demands. It further suggests EZ structuring may be used as a predicator of anticancer response before measurable tumor volume reduction. Water Algorithms;Animals;Apoptosis;Cheek;Lasers;Magnetic Resonance Spectroscopy;Meningioma;Photobiology;Rats;Retrospective Studies;Surface Properties;Water

Effect of low-level laser irradiation on oxygen free radicals and ventricular remodeling in the infarcted rat heart. OBJECTIVE: The purpose of this study was to assess the effects of low-level laser irradiation (LLLI) on the expression of oxygen free radicals (OFR) and ventricular remodeling (VR) in the model of rat myocardial infarction (RMMI). BACKGROUND DATA: LLLI reduces the infarct size and formation of scar tissue in the rat heart after myocardial infarction (MI). However, the exact mechanism has not been demonstrated so far. METHODS: RMMI was induced by ligating the left

anterior descending coronary artery (LAD). After 3 weeks, LLLI (635â€‰nm, 6â€‰mW laser, 7.64â€‰mW/cm(2), 125â€‰sec, 0.96â€‰J/cm(2)) was applied to the surface of heart directly. Four to six rats were euthanized at 1â€‰h, 24â€‰h, 48â€‰h, 72â€‰h, and 1 week after LLLI, and the infarcted myocardia were excised for the measurement of the activity of superoxide dismutase (SOD) and the content of malondialdehyde (MDA). At the end of 4 weeks after MI, the hearts were harvested for histological analysis. RESULTS: Myocardial SOD activity with LLLI was lower compared with control ($p<0.05$), and myocardial MDA content with LLLI was higher compared with control ($p<0.05$), at all the time points. In all rats, the activity of SOD was down to the minimum and the content of MDA was up to the peak at 48â€‰h after laser irradiation. The infarct size was reduced (35Â±10% vs. 18Â±9%, $p<0.05$), the left ventricular wall thickness was increased (0.31Â±0.03 vs. 0.84Â±0.02â€‰mm, $p<0.05$) and the percentage of collagen fibers in the infarcted area was attenuated (64.34Â±2.20% vs. 30.97Â±2.60%) by LLLI. CONCLUSIONS: LLLI could cause OFR accumulation, reduce infarct size, increase ventricular wall thickness, and attenuate the formation of collagen fibers, suggesting the beneficial effects of LLLI on improvement of VR after MI. Free Radicals;Malondialdehyde;Superoxide Dismutase Animals;Disease Models, Animal;Female;Free Radicals;Malondialdehyde;Myocardial Infarction;Rats;Rats, Sprague-Dawley;Superoxide Dismutase;Survival Rate;Ventricular Remodeling

UVA-1 laser in the treatment of palmoplantar pustular psoriasis. OBJECTIVE: The purpose of this study was to assess the efficacy of monochromatic UVA laser in the treatment of palmoplantar pustular psoriasis (PPP). BACKGROUND DATA: UVA-1 laser (355â€‰nm) has been reported to be safe and effective in the treatment of psoriasis, but the range of potential applications has not been fully explored. METHODS: Thirty-three patients were enrolled in an open prospective study. Patients were treated from two to four times weekly at a fixed dose of 80-140â€‰J/cm(2). Follow-up was 3 months. Clinical remission was observed in all patients who completed the study, with limited side effects (mild post-treatment erythema). CONCLUSIONS: We report for the first time that UVA-1 laser produces a therapeutic response in PPP. Adult;Aged;Female;Foot Dermatoses;Hand Dermatoses;Humans;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Prospective Studies;Psoriasis;Treatment Outcome;Ultraviolet Therapy

Phase III trial of low-level laser therapy to prevent oral mucositis in head and neck cancer patients treated with concurrent chemoradiation. BACKGROUND: Oral mucositis (OM) is a complication of chemoradiotherapy treatment of head and neck squamous cell carcinoma (HNSCC) patients with no effective therapy. This study was designed to assess the efficacy of preventive low-level laser therapy (LLLT) in reducing the incidence of grade 3-4 OM. MATERIAL AND METHODS: From June 2007 to December 2010, 94 HNSCC patients entered a prospective, randomized, double-blind, placebo-controlled phase III trial. Chemoradiotherapy consisted of conventional radiotherapy plus concurrent cisplatin every 3weeks. A diode InGaAlP (660nm-100mW-1J-4J/cm(2)) was used. OM evaluation was performed by WHO and OMAS scales and quality of life by EORTC questionnaires (QLQ). RESULTS: A six-fold decrease in the incidence of grades 3-4 OM was detected in the LLLT group compared to the placebo; (6.4% versus 40.5%). LLLT impacted the incidence of grades 3-4 OM to a relative risk ratio of 0.158 (CI 95% 0.050-0.498). After treatment QLQ-C30 showed, differences favoring LLLT in physical, emotional functioning, fatigue, and pain; while the QLQ-H&N35 showed improvements in LLLT arm for pain, swallowing, and trouble with social eating. CONCLUSION: Preventive LLLT in HNSCC patients receiving chemoradiotherapy is an effective tool for reducing the incidence of grade 3-4 OM. Efficacy data were corroborated by improvements seen in quality of life. Aged;Carcinoma, Squamous Cell;Chemoradiotherapy;Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Quality of Life;Squamous Cell Carcinoma of Head and Neck;Stomatitis

Low-level laser therapy for spinal cord injury in rats: effects of polarization. The effects of laser polarization on the efficacy of near-infrared low-level laser therapy for spinal cord injury (SCI) are presented. Rat spinal cords were injured with a weight-drop device, and the lesion sites were directly irradiated with a linearly polarized 808-nm diode laser positioned either perpendicular or parallel to the spine immediately after the injury and daily for five consecutive days. Functional recovery was assessed daily by an open-field test. Regardless of the polarization direction, functional scores of SCI rats that were treated with the 808-nm laser irradiation were significantly higher than those of SCI alone group (Group 1) from day 5 after injury. The locomotive function of SCI rats irradiated parallel to the spinal column (Group 3) was significantly improved from day 10 after injury, compared to SCI rats treated with the linear polarization perpendicular to the spinal column (Group 2). There were no significant differences in ATP contents in the injured tissue among the three groups. We speculate that the higher efficacy with parallel irradiation is attributable to the deeper light penetration into tissue with anisotropic scattering. Adenosine Triphosphate Adenosine Triphosphate;Analysis of Variance;Animals;Female;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Spinal Cord;Spinal Cord Injuries;Trauma Severity Indices

Effect of low-level laser therapy on the expression of inflammatory mediators and on neutrophils and macrophages in acute joint inflammation. INTRODUCTION: Inflammation of the synovial membrane plays an important role in the pathophysiology of osteoarthritis (OA). The synovial tissue of patients with initial OA is characterized by infiltration of mononuclear cells and production of proinflammatory cytokines and other mediators of joint injury. The objective was to evaluate the effect of low-level laser therapy (LLLT) operating at 50 mW and 100 mW on joint inflammation in rats induced by papain, through histopathological analysis, differential counts of inflammatory cells (macrophages and neutrophils), as well as gene expression of interleukin 1-beta and 6 (IL-1Î² and IL-6), and protein expression of tumor necrosis factor alpha (TNFÎ±). METHODS: Male Wistar rats (n = 60) were randomly divided into four groups of 15 animals, namely: a negative control group; an inflammation injury positive control group; a 50 mW LLLT group, subjected to injury and treated with 50 mW LLLT; and a 100 mW LLLT group, subjected to injury and treated with 100 mW LLLT. The animals were subject to joint inflammation (papain solution, 4%) and then treated with LLLT (808 nm, 4 J, 142.4 J/cm(2), spot size 0.028 for both groups). On the day of euthanasia, articular lavage was collected and immediately centrifuged; the supernatant was saved for analysis of expression of TNFÎ± protein by enzyme-linked immunosorbent assay and expression of IL-1Î² and IL-6 mRNA by real-time polymerase chain reaction. A histologic examination of joint tissue was also performed. For the statistical analysis, analysis of variance with Tukey's post-hoc test was used for comparisons between each group. All data are expressed as mean values and standard deviation, with $P < 0.05$. RESULTS: Laser treatment with 50 mW was more efficient than 100 mW in reducing cellular inflammation, and decreased the expression of IL-1Î² and IL-6. However, the 100 mW treatment led to a higher reduction of TNFÎ± compared with the 50 mW treatment. CONCLUSIONS: LLLT with 50 mW was more efficient in modulating inflammatory mediators (IL-1Î², IL-6) and inflammatory cells (macrophages and neutrophils), which correlated with the histology that showed a reduction in the inflammatory process. Cytokines;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Papain Acute Disease;Animals;Arthritis;Cytokines;Dose-Response Relationship, Radiation;Enzyme-Linked Immunosorbent Assay;Gene Expression;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Knee Joint;Low-Level Light Therapy;Macrophages;Male;Neutrophils;Papain;Random Allocation;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Treatment Outcome;Tumor Necrosis Factor-alpha

Evaluation of low level laser therapy in reducing diabetic polyneuropathy related pain and sensorimotor disorders. Over the past three decades physicians have used light level laser

therapy (LLLT) for the management and the treatment of diabetic peripheral neuropathy and have obtained results that calls for further investigations. This study aimed to investigate the effectiveness of LLLT in treatment of pain symptoms in patients with diabetic polyneuropathy. In this study 60 patients with diabetic peripheral neuropathy were matched based on their sex, age, BMI, type of diabetes, duration of diabetes, and duration of pain, and randomized to case and control groups based on their established scores on the visual analog scale (VAS) and the Toronto clinical scoring system (TCSS). Cases received laser therapy with wavelength of 78 nm and 2.5 j/cm2 two times a week, each time for 5 min, for one month. During the same period, controls received sham laser therapy. Comparing the differences between the two groups' VAS and TCSS mean scores before the intervention with that of the 2 weeks and 4 weeks after the intervention we were able to see a statistically significant difference between the two groups (P<0.05). On the other hand, when we compared their VAS and TCSS mean scores 4 weeks and 2 weeks after the intervention we did not find any statistically significant difference between the two groups. We achieved the same results when we examined cases' and controls' pre and post VAS and TCSS scores independent from each other; no improvement in the assessment based on their 2 and 4 weeks comparisons tests. Laser therapy resulted in improved neuropathy outcomes in diabetic patients who received it relative to the group that received sham therapy, evaluating before and after LLLT assessments. Further studies are needed to test types of lasers, as well as different dosage and exposure levels required in different phase of neuropathic care, so as to obtain reproducible results.
Adolescent;Adult;Aged;Case-Control Studies;Diabetic Neuropathies;Female;Humans;Laser Therapy;Male;Middle Aged;Pain;Prospective Studies

The effect of low-level laser therapy on hearing. One purported use of low-level laser therapy (LLLT) is to promote healing in damaged cells. The effects of LLLT on hearing loss and tinnitus have received some study, but results have been equivocal. The purpose of this study was to determine if LLLT improved hearing, speech understanding, and/or cochlear function in adults with hearing loss. Using a randomized, double-blind, placebo-controlled design, subjects were assigned to a treatment, placebo, or control group. The treatment group was given LLLT, which consisted of shining low-level lasers onto the outer ear, head, and neck. Each laser treatment lasted approximately five minutes. Three treatments were applied within the course of one week. A battery of auditory tests was administered immediately before the first treatment and immediately after the third treatment. The battery consisted of pure-tone audiometry, the Connected Speech Test, and transient-evoked otoacoustic emissions. Data were analyzed by comparing pre- and posttest results. No statistically significant differences were found between groups for any of the auditory tests. Additionally, no clinically significant differences were found in any individual subjects. This trial is registered with ClinicalTrials.gov (NCT01820416).

Nonsurgical therapy for hair loss. This article is an update of the currently available options for medical therapies to treat androgenetic alopecia in men and women. Emerging novel therapeutic modalities with potential for treating these patients are discussed. Because androgenetic alopecia is progressive in nature, stabilization of the process using medical therapy is an important adjunct to any surgical hair-restoration plan. 5-alpha Reductase Inhibitors;Azasteroids;Finasteride;Minoxidil;Dutasteride 5-alpha Reductase Inhibitors;Alopecia;Azasteroids;Combined Modality Therapy;Dutasteride;Female;Finasteride;Humans;Low-Level Light Therapy;Male;Minoxidil;Sex Factors

Phototherapy rash in newborn infants: does it differ between conventional and light emitting diode phototherapy? Data comparing the cutaneous side effects of light emitting diode (LED) phototherapy (LP) and conventional phototherapy (CP) devices in jaundiced newborn infants are very limited. We investigated the incidence and extent of skin eruptions caused by different phototherapy

devices in preterm infants who are more prone to neonatal jaundice. This prospective, randomized controlled trial was conducted in the neonatal intensive care unit (NICU) of Hacettepe University Ihsan Dogramaci Childrens' Hospital in Ankara, Turkey. Preterm infants without skin lesions before and requiring phototherapy in the first week of life were included in the study. The infants were randomly assigned to receive CP or LP and were monitored closely for skin eruptions during phototherapy. Fifty-eight infants were included in the study: 25 (43.1%) received CP while 33 (56.9%) received LP. The duration of phototherapy was similar in the two groups (30.4 Â± 9.6 hours and 31.8 Â± 15.6 hours, respectively). Baseline and control bilirubin levels were similar for the two groups (p = 0.101 and p = 0.105, respectively). The frequency of skin eruptions was 36% in the CP group and 33% in the LP group (p = 0.83). The skin eruptions were macules in 13 (22.4%), papules in 5 (8.6%), and maculopapular rashes in 2 (3.4%) infants.There were no differences in the incidence and extent of skin eruptions in preterm infants who received CP or LP. Bilirubin Bilirubin;Exanthema;Female;Gestational Age;Humans;Incidence;Infant, Newborn;Infant, Premature;Intensive Care, Neonatal;Jaundice, Neonatal;Male;Phototherapy;Prospective Studies

Effects of laser therapy on the proliferation of human periodontal ligament stem cells. Low-level laser irradiation (LLLI) stimulates the proliferation of a variety of cell types. However, very little is known about the effect of laser therapy on dental stem cells. The aim of the present study was to evaluate the effect of LLLI (660 nm, 30 mW) on the proliferation rate of human periodontal ligament stem cells (hPDLSC), obtained from two healthy permanent third molars extracted due to surgical indication. Culture cells were either irradiated or not (control) with an InGaAlP diode laser at 0 and 48 h, using two different energy densities (0.5 J/cmÂ², 16 s and 1.0 J/cmÂ², 33 s). Cell proliferation was evaluated by the Trypan blue exclusion method and by measuring mitochondrial activity using the MTT-based cytotoxicity assay at intervals of 0, 24, 48, and 72 h after the first laser application. An energy density of 1.0 J/cmÂ² improved the cell proliferation in comparison to the other groups (control and laser 0.5 J/cmÂ²) at 48 and 72 h. The group irradiated with 1.0 J/cmÂ² presented significantly higher MTT activity at 48 and 72 h when compared to the energy density of 0.5 J/cmÂ². It can be concluded that LLLI using infrared light and an energy density of 1.0 J/cmÂ² has a positive stimulatory effect on the proliferation of hPDLSC. Adult Stem Cells;Cell Proliferation;Cells, Cultured;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Ligament

Lower-level laser therapy improves neurosensory disorders resulting from bilateral mandibular sagittal split osteotomy: a randomized crossover clinical trial. Bilateral sagittal split osteotomy (BSSO) is a technique commonly used to correct mandibular disproportion but many patients experience hypoaesthesia of the inferior alveolar nerve (IAN). The purpose of this study was to verify the effectiveness of using a low-level laser therapy protocol after BSSO. The 10 patients in our study, who underwent BSSO with Le Fort I osteotomy and had low-level laser therapy on one side of the jaw, were evaluated over a period of 60 days. The data for the treated and non-treated sides were compared post-operatively. At 15, 30 and 60 days after surgery, when sensitivity was recovered on both sides. On the treated side, recovery was faster and was almost complete at the time of the last evaluation. We suggest that this lower-level laser therapy protocol can improve tissue response and accelerate the recovery of neurosensory disorders following BSSO. (NCT01530100). Adolescent;Adult;Bone Plates;Chin;Cross-Over Studies;Dentofacial Deformities;Double-Blind Method;Female;Follow-Up Studies;Humans;Hypesthesia;Lasers, Semiconductor;Low-Level Light Therapy;Mandibular Nerve;Middle Aged;Osteotomy, Le Fort;Osteotomy, Sagittal Split Ramus;Postoperative Complications;Recovery of Function;Sensation;Splints;Touch;Young Adult

Additive effect of propranolol and pulsed dye laser for infantile hemangioma. The combination of propranolol and pulsed dye laser for the treatment of infantile hemangiomas may be superior to either alone. This case report illustrates the additive effect of propranolol and pulsed dye laser for an

infantile hemangioma in a high-risk location. Although thorough clinical trials are needed, combination therapy for infantile hemangiomas may prove to be optimal for efficacy. Propranolol Combined Modality Therapy;Female;Hemangioma, Capillary;Humans;Infant;Infant, Premature;Infant, Premature, Diseases;Lasers, Dye;Low-Level Light Therapy;Neoplastic Syndromes, Hereditary;Propranolol;Remission Induction;Vulvar Neoplasms

Effect of low-level laser therapy (808 nm) on markers of muscle damage: a randomized double-blind placebo-controlled trial. The aim of this randomized double-blind placebo-controlled study was to investigate the effect of low-level laser therapy (LLLT) on markers of muscle damage (creatine kinase (CK) and strength performance) in the biceps brachii. Twenty-two physically active men were randomized into two groups: placebo and laser. All volunteers were submitted to an exercise-induced muscle damage protocol for biceps brachii (biceps curl, 10 sets of 10 repetitions with load of 50% of one-repetition maximum test (1RM)). Active LLLT (808 nm; 100 mW; 35.7 W/cm(2), 357.14 J/cm(2) per point, energy of 1 J per point applied for 10 s on four points of the biceps brachii belly of each arm) or placebo was applied between the sets of the biceps curl exercise. CK activity and maximum strength performance (1RM) were measured before, immediately after, 24, 48, and 72 h after the exercise-induced muscle damage protocol. There was an increase in CK activity after the muscle damage protocol in both groups; however, this increase was attenuated in the laser group compared to the placebo group at 72 h (placebo = 841 vs. laser = 357%; $p < 0.05$). Maximum strength performance was decreased immediately after the muscle damage protocol in both groups ($p < 0.05$), but at 24, 48, and 72 h, and it returned to the baseline level in both groups. In conclusion, the LLLT attenuated CK activity 72 h after the muscle damage protocol but did not have a positive effect on the recovery of strength performance. Biomarkers;Placebos;Creatine Kinase Adult;Biomarkers;Creatine Kinase;Double-Blind Method;Exercise;Humans;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Placebos;Young Adult

Platelet-rich plasma, low-level laser therapy, or their combination promotes periodontal regeneration in fenestration defects: a preliminary in vivo study. BACKGROUND: This study histomorphometrically analyzes the influence of platelet-rich plasma (PRP), low-level laser therapy (LLLT), or their combination on the healing of periodontal fenestration defects (PFDs) in rats. METHODS: PFDs were surgically created in the mandibles of 80 rats. The animals were randomly divided into four groups: 1) C (control) and 2) PRP, defects were filled with blood clot or PRP, respectively; 3) LLLT and 4) PRP/LLLT, defects received laser irradiation, were filled with blood clot or PRP, respectively, and then irradiated again. Animals were euthanized at either 10 or 30 days post-surgery. Percentage of new bone (NB), density of newly formed bone (DNB), new cementum (NC), and extension of remaining defect (ERD) were histomorphometrically evaluated. Data were statistically analyzed (analysis of variance; Tukey test, $P < 0.05$). RESULTS: At 10 days, group PRP presented ERD significantly lower than group C. At 30 days, group PRP presented NB and DNB significantly greater than group C. Groups LLLT, PRP, and PRP/LLLT showed significant NC formation at 30 days, with collagen fibers inserted obliquely or perpendicularly to the root surface. NC formation was not observed in any group C specimen. CONCLUSIONS: LLLT, PRP, or their combination all promoted NC formation with a functional periodontal ligament. The combination PRP/LLLT did not show additional positive effects compared to the use of either therapy alone. Collagen Alveolar Bone Loss;Alveolar Process;Animals;Blood Coagulation;Bone Density;Bone Regeneration;Collagen;Combined Modality Therapy;Dental Cementum;Fibroblasts;Low-Level Light Therapy;Male;Mandibular Diseases;Osteogenesis;Platelet-Rich Plasma;Random Allocation;Rats;Rats, Wistar;Time Factors;Tooth Root

Influence of long-term water storage and thermocycling on shear bond strength of glass-ionomer cement to Er:YAG laser-prepared dentin. PURPOSE: To evaluate the influence of long-term water

storage and thermocycling on the shear bond strength of a glass-ionomer cement to Er:YAG-irradiated and bur-prepared dentin. MATERIALS AND METHODS: Fifteen bovine incisors were selected and the roots removed. Crowns were sectioned into four pieces, resulting in 60 samples that were individually embedded in polyester resin (n = 15) and ground to plane the enamel and expose the dentin. The bonding site was delimited and samples were randomly assigned according to the method of cavity preparation: Er:YAG laser (250 mJ/4 Hz) or high-speed handpiece (diamond bur #2096). Samples were fixed to a metallic device, where glass-ionomer cement (GIC) cylinders were prepared. Subsequently, they were subdivided according to the duration of water storage (WS) and number of thermocycles (TCs) - 24 h WS/no TCs and 6 months WS/12,000 TCs - and subjected to a shear bond strength test (500 N at 0.5 mm/min). RESULTS: The duration of water storage and number of thermocycles tested had no statistically significant effect on the shear bond strength to laser-irradiated dentin ($p > 0.05$). For bur-prepared substrate, the long-term degradation process promoted a decrease in shear bond strength values ($p < 0.05$). CONCLUSION: Long-term water storage and thermocycling did not affect shear bond strength of glass-ionomer cement bonded to Er:YAG laser-prepared dentin. Glass Ionomer Cements;Water;Diamond Animals;Cattle;Dental Bonding;Dental Cavity Preparation;Dental High-Speed Equipment;Dentin;Diamond;Glass Ionomer Cements;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Random Allocation;Shear Strength;Stress, Mechanical;Temperature;Time Factors;Water

The impact of near-infrared light on dopaminergic cell survival in a transgenic mouse model of parkinsonism. We have examined whether near-infrared light (NIr) treatment mitigates oxidative stress and increased expression of hyperphosphorylated tau in a tau transgenic mouse strain (K3) that has a progressive degeneration of dopaminergic cells in the substantia nigra pars compacta (SNc). The brains of wild-type (WT), untreated K3 and NIr-treated K3 mice, aged five months (thus after the onset of parkinsonian signs and neuropathology), were labelled immunohistochemically for the oxidative stress markers 4-hydroxynonenal (4-HNE) and 8-hydroxy-2'-deoxyguanosine (8-OHDG), hyperphosphorylated tau (using the AT8 antibody) and tyrosine hydroxylase (TH). The average intensity and area of 4-HNE, 8-OHDG and AT8 immunoreactivity were measured using the MetaMorph software and THâ•º cell number was estimated using stereology. Our results showed immunoreactivity for 4-HNE, 8-OHDG and AT8 within the SNc was increased in K3 mice compared to WT, and that this increase was mitigated by NIr. Results further showed that THâ•º cell number was lower in K3 mice than in WT, and that this loss was mitigated by NIr. In summary, NIr treatment reduced the oxidative stress caused by the tau transgene in the SNc of K3 mice and saved SNc cells from degeneration. Our results, when taken together with those in other models, strengthen the notion that NIr treatment saves dopaminergic cells in the parkinsonian condition. tau Proteins Animals;Brain;Cell Survival;Disease Models, Animal;Dopaminergic Neurons;Infrared Rays;Low-Level Light Therapy;Mice;Mice, Transgenic;Oxidative Stress;Parkinsonian Disorders;Phosphorylation;tau Proteins

Effects of Low-Level Laser Therapy, 660â€‰nm, in Experimental Septic Arthritis. The effectiveness of low-level laser therapy (LLLT) in the presence of an infectious process has not been well elucidated. The aim of the study was to evaluate the effects of LLLT in an experimental model of septic arthritis. Methods. Twenty-one Wistar rats were divided as follows: control group, no bacteria; placebo group, bacteria were inoculated; Treated group, bacteria were injected and treatment with LLLTwas performed. To assess nociception, a von Frey digital analgesimeter was applied. Synovial fluid was streaked to analyze bacterial growth. The standard strain of S. aureus was inoculated in the right knee. LLLT was performed with 660â€‰nm, 2â€‰J/cm(2), over 10 days. After treatment, the knees were fixed and processed for morphological analysis by light microscopy. Results. It was found that nociception increases in the right knee. There was a lack of results for the seeding of the synovial

fluid. The morphological analysis showed slight recovery areas in the articular cartilage and synovia; however, there was the maintenance of the inflammatory infiltrate. Conclusion. The parameters used were not effective in the nociception reduction, even with the slight tissue recovery due to the maintenance of inflammatory infiltrate, but produced no change in the natural history of resolution of the infectious process.

Lateral epicondylitis: a review of pathology and management. Lateral epicondylitis, or 'tennis elbow', is a common condition that usually affects patients between 35 and 55 years of age. It is generally self-limiting, but in some patients it may continue to cause persistent symptoms, which can be refractory to treatment. This review discusses the mechanism of disease, symptoms and signs, investigations, current management protocols and potential new treatments. Anti-Inflammatory Agents;Nitrates;Botulinum Toxins Acupuncture Analgesia;Administration, Cutaneous;Adult;Anti-Inflammatory Agents;Blood Transfusion, Autologous;Botulinum Toxins;Braces;Catheter Ablation;Chronic Disease;Diagnosis, Differential;Humans;Lithotripsy;Low-Level Light Therapy;Middle Aged;Musculoskeletal Pain;Nitrates;Physical Therapy Modalities;Platelet-Rich Plasma;Range of Motion, Articular;Tennis Elbow

Effect of low-level laser therapy irradiation and Bio-Oss graft material on the osteogenesis process in rabbit calvarium defects: a double blind experimental study. This study aims to assess the effect of low-level laser therapy (LLLT) irradiation and Bio-Oss graft material on the osteogenesis process in the rabbit calvarium defects. Twelve white male New Zealand rabbits were included in this study. Four 8-mm diameter identical defects were prepared on each rabbit's calvarium. One site was left as an untreated control (C), the second site was filled with Bio-Oss (B), the third site was treated with laser irradiation (L), and the fourth site treated with Bio-Oss and laser irradiation (B + L). In the laser group, a diode laser (wavelength 810 nm, output power 300 mW, irradiation mode CW, energy density 4 J/cm2) was applied immediately after surgery and then one other day for the next 20 days. After 4 and 8 weeks, the animals were sacrificed and histological and histomorphometric examinations were performed and the data were subjected to Friedman and repeated measurements ANOVA tests. Significant differences were not found regarding inflammation severity, foreign body reactions, and vitality of newly formed bone on 4th and 8th week after operation. The mean amount of new bone was 15.83 and 18.5% in the controls on the 4th and 8th week; 27.66 and 25.16% in the laser-irradiated group; 35.0 and 41.83% in Bio-Oss and 41.83 and 47.0% in the laser + Bio-Oss treated specimens with significant statistical differences ($p < 0.05$). Application of LLLT in combination with Bio-OssÂ® can promote bone healing. Therefore, LLLT may be clinically beneficial in promoting bone formation in skeletal defects. Bio-Oss;Bone Substitutes;Minerals Animals;Bone Regeneration;Bone Substitutes;Double-Blind Method;Lasers, Semiconductor;Low-Level Light Therapy;Male;Minerals;Rabbits;Skull;Treatment Outcome

Effects of a low-level semiconductor gallium arsenide laser on local pathological alterations induced by Bothrops moojeni snake venom. Antivenom therapy has been ineffective in neutralizing the tissue damage caused by snakebites. Among therapeutic strategies to minimize effects after envenoming, it was hypothesized that a low level laser would reduce complications and reduce the severity of local snake venom effects. In the current study, the effect of a low-level semiconductor gallium arsenide (GaAs) laser on the local pathological alterations induced by B. moojeni snake venom was investigated. The experimental groups consisted of five male mice, each administered either B. moojeni venom (VB), B. moojeni venom + antivenom (VAV), B. moojeni venom + laser (VL), B. moojeni venom + antivenom + laser (VAVL), or sterile saline solution (SSS) alone. Paw oedema was induced by intradermal administration of 0.05 mg kg(-1) of B. moojeni venom and was expressed in mm of directly induced oedema. Mice received by subcutaneous route 0.20 mg kg(-1) of venom for evaluating nociceptive activity and the time (in seconds) spent in licking and biting the injected paw

was taken as an indicator of pain response. Inflammatory infiltration was determined by counting the number of leukocytes present in the gastrocnemius muscle after venom injection (0.10 mg kg(-1)). For histological examination of myonecrosis, venom (0.10 mg kg(-1)) was administered intramuscularly. The site of venom injection was irradiated by the GaAs laser and some animals received antivenom intraperitoneally. The results indicated that GaAs laser irradiation can help in reducing some local effects produced by the B. moojeni venom in mice, stimulating phagocytosis, proliferation of myoblasts and the regeneration of muscle fibers. Antivenins;Arsenicals;Crotalid Venoms;gallium arsenide;Gallium Animals;Antivenins;Arsenicals;Bothrops;Cell Proliferation;Crotalid Venoms;Edema;Gallium;Lasers, Semiconductor;Leukemic Infiltration;Leukocytes;Low-Level Light Therapy;Male;Mice;Muscle Fibers, Skeletal;Muscle, Skeletal;Myoblasts;Necrosis;Phagocytosis;Regeneration

Cancer phototherapy via selective photoinactivation of respiratory chain oxidase to trigger a fatal superoxide anion burst. AIMS: Here, we develop a novel cancer treatment modality using mitochondria-targeting, high-fluence, low-power laser irradiation (HF-LPLI) in mouse tumor models and explore the mechanism of mitochondrial injury by HF-LPLI. RESULTS: We demonstrated that the initial reaction after photon absorption was photosensitization of cytochrome c oxidase (COX), to inhibit enzymatic activity of COX in situ and cause respiratory chain superoxide anion (O2(-â€¢)) burst. We also found that HF-LPLI exerted its main tumor killing effect through mitochondrial O2(-â€¢) burst via electron transport chain (ETC). These phenomena were completely absent in the respiration-deficient cells and COX knockdown cells. With a carefully selected irradiation protocol, HF-LPLI could efficaciously destroy tumors. The inhibition of enzymatic activity of COX and generation of O2(-â€¢) by HF-LPLI in vivo were also detected. INNOVATION: It is the first time that the mechanism involved in the interaction between light and its photoacceptor under HF-LPLI treatment is clarified. Our results clearly indicate that HF-LPLI initiates its effects via targeted COX photoinactivation and that the tumor-killing efficacy is dependent of the subsequent mitochondrial O2(-â€¢) burst via ETC. CONCLUSION: Based on both in vitro and in vivo results, we conclude that HF-LPLI can selectively photoinactivate respiratory chain oxidase to trigger a fatal mitochondrial O2(-â€¢) burst, producing oxidative damage on cancer cells. This study opens up the possibilities of applications of HF-LPLI as a mitochondria-targeting cancer phototherapy. Superoxides;Electron Transport Complex IV Animals;Apoptosis;Cell Line, Tumor;Cell Survival;Electron Transport;Electron Transport Complex IV;Female;Humans;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice;Mice, Inbred BALB C;Mice, Nude;Mitochondria;Neoplasm Transplantation;Superoxides

Effect of low-level laser therapy on metalloproteinase MMP-2 and MMP-9 production and percentage of collagen types I and III in a papain cartilage injury model. Osteoarthritis (OA) resulting from injury or disease is associated with increased levels of several matrix metalloproteinases (MMPs), which degrade all components of the complex extracellular matrix in the cartilage. The objective of this study is to investigate the effect of low-level laser therapy (LLLT) on papain-induced joint damage in rats by histopathology and analysis of metalloproteinase 2 and 9 production. Sixty male Wistar rats were randomly distributed into four groups of 15 animals: (1) non-injury negative control, (2) injury positive control, (3) treated with LLLT at 50 mW, and (4) treated with LLLT at 100 mW. OA was induced in animals using papain (4 % solution) followed by treatment with LLLT. After 7, 14, and 21 days, the animals were euthanized. The articular lavage was collected and centrifuged; then, the supernatant was stored prior to protein analysis by western blot. The material was stained with hematoxylin and eosin for histopathological analysis, and Picrosirius Red was used to estimate the percentage of collagen fibers. To determine normal distribution, ANOVA and Tukey's post hoc test were used for comparison between and within each group at each time period. All data are expressed as mean and standard deviation values, with the null hypothesis

considered as p < 0.05. Both laser groups (50 and 100 mW) were effective in tissue repair, decreasing collagen type III expression and increasing type I expression in all experimental periods; however, LLLT at 50 mW reduced metalloproteinase 9 more than at 100 mW in 21 days. LLLT at 50 mW was more efficient in the modulation of matrix MMPs and tissue repair. Collagen Type I;Collagen Type III;Papain;Matrix Metalloproteinase 2;Mmp2 protein, rat;Matrix Metalloproteinase 9;Mmp9 protein, rat Animals;Blotting, Western;Cartilage, Articular;Collagen Type I;Collagen Type III;Extracellular Matrix;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Papain;Rats;Rats, Wistar;Wound Healing

The effects of low-level laser irradiation on bone tissue in diabetic rats. Diabetes mellitus (DM) leads to a decrease in bone mass and increase the risk of osteoporosis and in this context, many treatments have shown to accelerate bone metabolism. It seems that low-level laser therapy (LLLT) is able of stimulating osteoblast activity and produced increased biomechanical properties. However, its effects on bone in diabetic rats are not fully elucidated. The aim of this study was to evaluate the effects of LLLT on bone formation, immunoexpression of osteogenic factors, biomechanical properties and densitometric parameters in diabetic rats. Thirty male Wistar rats were randomly distributed into three experimental groups: control group, diabetic group, and laser-treated diabetic group. DM was induced by streptozotocin (STZ) and after 1 week laser treatment started. An 830-nm laser was used, performed for 18 sessions, during 6 weeks. At the end of the experiment, animals were euthanized and tibias and femurs were defleshed for analysis. Extensive resorptive areas as a result of osteoclasts activity were noticed in DG when compared to control. Laser-treated animals showed an increased cortical area. The immunohistochemical analysis revealed that LLLT produced an increased RUNX-2 expression compared to other groups. Similar RANK-L immunoexpression was observed for all experimental groups. In addition, laser irradiation produced a statistically increase in fracture force, bone mineral content (BMC) and bone mineral density compared to DG. The results of this study indicate that the STZ model was efficient in inducing DM 1 and producing a decrease in cortical diameter, biomechanical properties and in densitometric variables. In addition, it seems that LLLT stimulated bone metabolism, decreased resorptive areas, increased RUNX-2 expression, cortical area, fracture force, BMD, and BMC. Further studies should be developed to provide additional information concerning the mechanisms of action of laser therapy in diabetic bone in experimental and clinical trials. Blood Glucose;Core Binding Factor Alpha 1 Subunit;RANK Ligand;Streptozocin Animals;Biomechanical Phenomena;Blood Glucose;Body Weight;Bone Density;Core Binding Factor Alpha 1 Subunit;Densitometry;Diabetes Mellitus, Experimental;Femur;Immunohistochemistry;Low-Level Light Therapy;Male;RANK Ligand;Rats, Wistar;Streptozocin;Tibia

Effect of LED-mediated-photobiomodulation therapy on orthodontic tooth movement and root resorption in rats. The aim of this experimental study was to evaluate the effects of light-emitting diode-mediated-photobiomodulation therapy (LPT), on the rate of orthodontic tooth movement (TM) and orthodontically induced root resorption, in rats. Twenty male 12-week-old Wistar rats were separated into two groups (control and LPT) and 50Â cN of force was applied between maxillary left molar and incisor with a coil spring. In the treatment group, LPT was applied with an energy density of 20Â mW/cm(2) over a period of 10 consecutive days directly over the movement of the first molar teeth area. The distance between the teeth was measured with a digital caliper on daysÂ 0 (T0), 10 (T1), and 21 (T2) on dental cast models. The surface area of root resorption lacunae was measured histomorphometrically using digital photomicrographs. Mann-Whitney U and Wilcoxon tests were used for statistical evaluation at pâ€‰<â€‰0.05 level. TM during two different time intervals (T1-T0 and T2-T1) were compared for both groups and a statistically significant difference was found in the LPT group (pâ€‰=â€‰0.016). The TM amount at the first time period (1.31â€‰Â±â€‰0.36Â mm) was significantly higher than the second time

period (0.24â€‰Â±â€‰0.23Â mm) in the LPT group. Statistical analysis showed significant differences between two groups after treatment/observation period (pâ€‰=â€‰0.017). The magnitude of movement in the treatment group was higher (1.55â€‰Â±â€‰0.33Â mm) compared to the control group (1.06â€‰Â±â€‰0.35Â mm). Histomorphometric analysis of root resorption, expressed as a percentage, showed that the average relative root resorption affecting the maxillary molars on the TM side was 0.098â€‰Â±â€‰0.066 in the LPT group and 0.494â€‰Â±â€‰0.224 in the control group. Statistically significant inhibition of root resorption with LPT was determined (pâ€‰<â€‰0.001) on the TM side. The LPT method has the potential of accelerating orthodontic tooth movement and inhibitory effects on orthodontically induced resorptive activity. Animals;Body Weight;Low-Level Light Therapy;Male;Optics and Photonics;Orthodontics;Rats, Wistar;Root Resorption;Tooth Migration

Femtosecond laser-assisted cataract surgery in eyes with a small pupil. PURPOSE: To evaluate the efficacy of different treatment modalities in eyes with small pupils before femtosecond laser-assisted cataract surgery. SETTING: Ruhr University Eye Clinic, Bochum, Germany. DESIGN: Prospective clinical trial. METHODS: Eyes with an intraoperative pupil size smaller than 5.5 mm received sequential treatments to achieve a pupil larger than 5.5 mm in 3 steps: (1) intracameral administration of epinephrine solution, (2) additional viscomydriasis, and (3) implantation of a Malyugin ring pupil expander. When a step enlarged the pupil to at least 5.5 mm, femtosecond laser-assisted cataract surgery with an anterior capsulotomy diameter of at least 4.5 mm and 350 Î¼m nuclear fragmentation grids, ultrasound phacoemulsification, and intraocular lens implantation were performed. Main outcome measures were achieved preoperative pupil size in each sequential treatment group and analysis of intraoperative complications. RESULTS: Of 850 eyes scheduled for cataract surgery, 40 received sequential treatments. To achieve a pupil larger than 5.5 mm, epinephrine was sufficient in 7% of the eyes; additional viscomydriasis was necessary in 25%, and the pupil expander was implanted in 68%. The most frequent comorbidities were pseudoexfoliation of the lens capsule (30.0%) and intraoperative floppy-iris syndrome (12.5%). Tongue-like lesions of the capsulotomies were detected in 5 eyes. CONCLUSIONS: The 3-step treatment allowed the surgeon to increase the efficiency and safety of femtosecond-assisted cataract surgery in eyes with a small preoperative pupil, providing good safety margins at the pupil boundary for the capsulotomy and the softened nuclear volume. Mydriatics;Viscosupplements;Epinephrine Aged;Aged, 80 and over;Anterior Capsule of the Lens;Epinephrine;Female;Humans;Intraoperative Complications;Low-Level Light Therapy;Male;Middle Aged;Mydriatics;Phacoemulsification;Prostheses and Implants;Pupil;Pupil Disorders;Surgery, Computer-Assisted;Tomography, Optical Coherence;Treatment Outcome;Viscosupplements

Effectiveness and safety of femtosecond laser-assisted lens fragmentation and anterior capsulotomy versus the manual technique in cataract surgery. PURPOSE: To evaluate the effectiveness and safety of cataract surgery using femtosecond laser-assisted lens fragmentation and anterior capsulotomy versus manual cataract surgery. SETTING: MaxiVision Eye Hospital, Begumpet, Hyderabad, India. DESIGN: Randomized controlled open-label multisurgeon prospective trial. METHODS: Patients (at least 18 years old) were randomized to femtosecond laser-assisted lens prefragmentation and capsulotomy or manual capsulorhexis and standard phacoemulsification. Measured outcomes were effective phacoemulsification time (EPT), surgeon-assessed ease of phacoemulsification, mean phaco energy, mean phaco time, balanced salt solution volume, capsulotomy precision, and adverse event rates. RESULTS: Fifty-six eyes had the femtosecond laser procedure, and 63 had manual cataract surgery. The mean EPT was significantly lower in the laser group (5.2 seconds Â± 5.7 [SD]) than in the manual group (7.7 Â± 6.0 seconds) (P=.025). There was a significant difference in the mean phaco energy between the 2 groups (13.8% Â± 10.3% in laser

group; 20.3% Â± 8.1% in manual group) (P<.001). There were no significant between-group differences in the ease of phacoemulsification, mean phaco time, or balanced salt solution volume. Laser-assisted capsulotomies were significantly more accurate and precise (intended diameter, circularity, centration) (P<.01). The safety profiles of the procedures were equivalent, with no adverse events at the 1-day follow-up. CONCLUSION: The femtosecond laser platform was effective and safe in cataract surgery, reducing EPT and the mean phaco energy during lens fragmentation and providing precise and reproducible capsulotomies. Anterior Capsule of the Lens;Capsulorhexis;Female;Follow-Up Studies;Humans;Lens Implantation, Intraocular;Low-Level Light Therapy;Male;Middle Aged;Phacoemulsification;Prospective Studies;Tomography, Optical Coherence;Treatment Outcome;Visual Acuity

Femtosecond laser-assisted technique forÂ performing bag-in-the-lens intraocular lensÂ implantation. We describe a technique for femtosecond laser-assisted bag-in-the-lens (BIL) intraocular lens (IOL) implantation. Anterior capsulotomy and lens division into small pieces are performed by the laser. A fluid-filled interface makes it possible to re-dock the laser to the eye for posterior capsulotomy after the eye has been opened for lens aspiration without complications. The integrated optical coherence tomography also visualizes the posterior capsule, allowing a centered central posterior capsulotomy for uncomplicated IOL positioning. In 31 patients, no complications were observed within a 1-month follow-up. Femtosecond laser-assisted cataract surgery facilitated the BIL technique. Aged;Aged, 80 and over;Anterior Capsule of the Lens;Female;Humans;Lens Implantation, Intraocular;Low-Level Light Therapy;Male;Middle Aged;Phacoemulsification;Posterior Capsulotomy;Surgery, Computer-Assisted;Tomography, Optical Coherence;Treatment Outcome;Visual Acuity

Evolution of femtosecond-laser technology for lens-based surgery-continued. Capsulorhexis;Cataract Extraction;Humans;Low-Level Light Therapy;Phacoemulsification;Posterior Capsulotomy;Terminology as Topic

Effects of laser acupuncture on longitudinal bone growth in adolescent rats. Longitudinal bone growth is the results of chondrocyte proliferation and hypertrophy and subsequent endochondral ossification in the growth plate. Recently, laser acupuncture (LA), an intervention to stimulate acupoint with low-level laser irradiation, has been suggested as an intervention to improve the longitudinal bone growth. This study investigated the effects of laser acupuncture on growth, particularly longitudinal bone growth in adolescent male rats. Laser acupuncture was performed once every other day for a total of 9 treatments over 18 days to adolescent male rats. Morphometry of the growth plate, longitudinal bone growth rate, and the protein expression of BMP-2 and IGF-1 in growth plate were observed. The bone growth rate and the heights of growth plates were significantly increased by laser acupuncture. BMP-2 but not IGF-1 immunostaining in growth plate was increased as well. In conclusion, LA promotes longitudinal bone growth in adolescent rats, suggesting that laser acupuncture may be a promising intervention for improving the growth potential for children and adolescents.

Modulating effect of low level-laser therapy on fibrosis in the repair process of the tibialis anterior muscle in rats. The treatment of muscle injuries is a common practice at rehabilitation centers. Low-level laser therapy (LLLT) has demonstrated positive effects regarding the modulation of the inflammatory response, the enhancement of the tissue repair process and the prevention of fibrosis. The aim of the present study was to evaluate the effects of LLLT on morphological aspects of muscle tissue, collagen remodeling and activity of matrix metalloproteinase 2 (MMP-2) in rat skeletal muscle following acute injury. Wistar rats were divided into five groups: (1) control group (nâ€‰=â€‰10), (2) sham group (nâ€‰=â€‰10), (3) LLLT group (nâ€‰=â€‰30), (4) non-treated injury group (nâ€‰=â€‰30) and (5) injuryâ€‰+â€‰LLLT group (nâ€‰=â€‰30). Cryoinjury was performed on

the belly of the tibialis anterior (TA) muscle. LLLT was performed daily with an AlGaAs laser (780Â nm; beam spot of 0.04Â cm(2), output power of 40Â mW, power density of 1Â W/cm(2), energy density of 10Â J/cm(2) and 10-s exposure time). Animals were euthanized at 1, 3 and 7Â days. The TA muscles were removed and weighed. Morphological aspects were evaluated using H & E staining. The amount and distribution of collagen fibers were evaluated by picrosirius staining. Characterization and activity of MMP-2 were evaluated by zymography and Western blot techniques, respectively. The results revealed that LLLT induced a reduction in inflammatory infiltrate and myonecrosis after 1Â day, an increase in the number of blood vessels after 3 and 7Â days as well as an increase in the number of immature muscle fibers and MMP-2 gelatinase activity after 7Â days. In conclusion, LLLT has a positive effect on the inflammatory process, MMP2 activity and collagen organization and distribution in the repair process of rat skeletal muscle. Collagen;Matrix Metalloproteinase 2 Animals;Collagen;Fibrosis;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Muscle, Skeletal;Rats, Wistar;Tibia

Pulsed LLLT improves tendon healing in rats: a biochemical, organizational, and functional evaluation. In the last decades, the tendon injuries have increased substantially. Previous results suggested that low-level laser treatment (LLLT) promotes synthesis of extracellular matrix and improves the functional properties of the tendon. The aim of this study was to evaluate the effects of different protocols of LLLT on partially tenotomized tendons. Adult male rats were divided into the following: G1-intact, G2-injured, G3-injuredâ€‰+â€‰LLLT (4Â J/cm(2) continuous), G4-injuredâ€‰+â€‰LLLT (4Â J/cm(2) at 20Â Hz). G2, G3, and G4 were euthanized 8Â days after injury. G5-injured, G6-injuredâ€‰+â€‰LLLT (4Â J/cm(2) continuous), and G7-injuredâ€‰+â€‰LLL (4Â J/cm(2) at 20Â Hz until the seventh day and 2Â kHz from 8 to 14Â days). G5, G6, and G7 were euthanized on the 15th day. Glycosaminoglycan (GAG) level was quantified by dimethylmethylene blue method and analyzed on agarose gel. Toluidine blue (TB) stain was used to observe metachromasy. CatWalk system was used to evaluate gait recovery. Collagen organization was analyzed by polarization microscopy. The GAG level increased in all transected groups, except G5. In G6 and G7, there was a significant increase in GAG in relation to G5. In G3 and G4, the presence of dermatan sulfate band was more prominent than G2. TB stains showed intense metachromasy in the treated groups. Birefringence analysis showed improvement in collagen organization in G7. The gait was significantly improved in G7. In conclusion, pulsed LLLT leads to increased organization of collagen bundles and improved gait recovery. Glycosaminoglycans Achilles Tendon;Animals;Glycosaminoglycans;Lasers;Low-Level Light Therapy;Male;Microscopy, Polarization;Rats, Wistar;Tendon Injuries;Wound Healing

Low-level laser (light) therapy (LLLT) for treatment of hair loss. OBJECTIVE: Alopecia is a common disorder affecting more than half of the population worldwide. Androgenetic alopecia, the most common type, affects 50% of males over the age of 40 and 75% of females over 65. Only two drugs have been approved so far (minoxidil and finasteride) and hair transplant is the other treatment alternative. This review surveys the evidence for low-level laser therapy (LLLT) applied to the scalp as a treatment for hair loss and discusses possible mechanisms of actions. METHODS AND MATERIALS: Searches of PubMed and Google Scholar were carried out using keywords alopecia, hair loss, LLLT, photobiomodulation. RESULTS: Studies have shown that LLLT stimulated hair growth in mice subjected to chemotherapy-induced alopecia and also in alopecia areata. Controlled clinical trials demonstrated that LLLT stimulated hair growth in both men and women. Among various mechanisms, the main mechanism is hypothesized to be stimulation of epidermal stem cells in the hair follicle bulge and shifting the follicles into anagen phase. CONCLUSION: LLLT for hair growth in both men and women appears to be both safe and effective. The optimum wavelength, coherence and dosimetric parameters remain to be determined.
Alopecia;Animals;Female;Humans;Low-Level Light Therapy;Male;Mice;Treatment Outcome

New bone formation around implants inserted on autologous and xenografts irradiated or not with IR laser light: a histomorphometric study in rabbits. Use of biomaterials and light on bone grafts has been widely reported. This work assessed the influence of low-level laser therapy (LLLT) on bone volume (BV) and bone implant contact (BIC) interface around implants inserted in blocks of bovine or autologous bone grafts (autografts), irradiated or not, in rabbit femurs. Twenty-four adult rabbits were divided in 8 groups: AG: autograft; XG: xenograft; AG/L: autograft + laser; XG/L: xenograft + laser; AG/I: autograft + titanium (Ti) implant; XG/I: xenograft + Ti implant; AG/I/L: autograft + Ti implant + laser; and XG/I/L: xenograft + Ti implant + laser. The animals received the Ti implant after incorporation of the grafts. The laser parameters in the groups AG/L and XG/L were Î»=780 nm, 70 mW, CW, 21.5 J/cm 2 , while in the groups AG/I/L and XG/I/L the following parameters were used: Î»=780 nm, 70 mW, 0.5 cm 2 (spot), 4 J/cm 2 per point (4), 16 J/cm 2 per session, 48 h interval Ã— 12 sessions, CW, contact mode. LLLT was repeated every other day during 2 weeks. To avoid systemic effect, only one limb of each rabbit was double grafted. All animals were sacrificed 9 weeks after implantation. Specimens were routinely stained and histomorphometry carried out. Comparison of non-irradiated and irradiated grafts (AG/L versus AG and XG/L versus XG) showed that irradiation increased significantly BV on both grafts (p=0.05, p=0.001). Comparison between irradiated and non-irradiated grafts (AG/I/L versus AG/I and XG/I/L versus XG/I) showed a significant (p=0.02) increase of the BIC in autografts. The same was seen when xenografts were used, without significant difference. The results of this investigation suggest that the use of LLLT is effective for enhancing new bone formation with consequent increase of bone-implant interface in both autologous grafts and xenografts. Dental Implants;Dental Materials;Titanium Animals;Autografts;Bone Transplantation;Cattle;Dental Implants;Dental Materials;Dental Prosthesis Design;Female;Femur;Heterografts;Low-Level Light Therapy;Organ Size;Osseointegration;Osteogenesis;Rabbits;Radiotherapy Dosage;Titanium

The use of diffuse laser photonic energy and indocyanine green photosensitiser as an adjunct to periodontal therapy. Light-activated chemical therapy - generally known as photodynamic therapy (PDT) - has been developed within medicine, to allow the use of an applied agent (photosensitiser) that could be activated using laser photonic energy, leading to the destruction of target cellular structures. In clinical dentistry, PDT has been utilised within a wide scope of topical application in endodontic, periodontal and oral epithelial pathology where specifically, anti-bacterial action may prove useful. Underlying the complex and multi-factorial aetiology, periodontal disease remains of essentially-bacterial origin and anti-bacterial PDT (aPDT) has been investigated as an adjunctive to other periodontal treatment therapies. Of several topically-applied photosensitisers, one agent, indocyanine green, may be activated using a diode laser wavelength (810 nm) that is commonly-available in clinical dental practice, to provide generalised bacteriocidal effect. Unlike antibiotics and antibacterial mouthwashes, the mode of action appears to be nonspecific to bacterial species and is linked to cell death through a process of oxidative stress. Additionally, indocyanine green has otherwise low toxicity to non-target host tissue and dental restorative materials. This paper explores the background to this therapy, its position within the broader delivery of periodontal treatment and the specific application of indocyanine green in clinical dental practice. Bone Substitutes;Photosensitizing Agents;Reactive Oxygen Species;Indocyanine Green Alveolar Bone Loss;Bone Substitutes;Combined Modality Therapy;Dental Fistula;Energy Transfer;Humans;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Oxidative Stress;Periodontal Diseases;Periodontal Pocket;Photochemotherapy;Photosensitizing Agents;Reactive Oxygen Species;Surgical Flaps

Comparative study of the effects of laser photobiomodulation and extract of Brassica oleracea on skin wounds in wistar rats: A histomorphometric study. The objective of this study was to investigate

the effect of a photobiomodulation laser and Brassica oleracea on tissue morphology in skin wounds. The parameters analyzed were type I and III collagen fibers, and thickness and surface density of the epithelial tissue, as well as how quickly the wound closed. Five skin wounds 12mm in diameter were made on the backs of the animals, which were randomized into four groups (8 animals each). Saline Group: 0.9% saline solution; Ointment Group (extract of Cabbage, B. oleracea, 10% lanolin); Balsam Group (10% glycolic extract of B. oleracea emulsion oil); L60 Group (laser GaAsAl 60J/cm(2)). The applications were made daily during a 20-day treatment, and every 4 days tissue from different wounds was removed. The reduction in the size of the wounds on the 4th, 8th, 12th and 16th days was significantly greater in the treated groups compared to the control group. At all the time points analyzed, there was a greater proportion of collagen in the Balsam and L60 groups ($p<0.05$). There was also a greater proliferation of epithelial cells in the L60 and Balsam groups after 20 days of treatment ($p<0.05$). The healing extract and laser 60j/cm(2) exerted a great effect on collagen proliferation in stimulating scar tissue maturation. Plant Extracts Animals;Brassica;Laser Therapy;Male;Photobiology;Phytotherapy;Plant Extracts;Rats;Rats, Wistar;Wound Healing

Laser vaporization of extravasation type of mucocele of the lower lip with 940-nm diode laser. A 43-year-old male presented with an asymptomatic swelling of the lower labial mucosa. Examination revealed that the tip of maxillary canine was causing trauma on the affected side. A diagnosis of extravasation type of mucocele was established clinically. Vaporization of the mucocele was done with a 940-nm diode laser in contact mode. The lesion healed uneventfully and there has been no recurrence for 3 months. Adult;Follow-Up Studies;Humans;Laser Therapy;Lasers, Semiconductor;Lip Diseases;Low-Level Light Therapy;Male;Mucocele

Low level laser therapy in the treatment of aphthous ulcer. Recurrent aphthous stomatitis (RAS) is one of the most common and painful ulcerative lesions of the oral cavity, but until now no cure has been recognized for it. Two patients diagnosed with minor RAS were treated in a single sitting with low level laser therapy using 940-nm diode laser. The lesions healed completely within 3-4 days and a follow-up for 1 showed no recurrence in these patients. According to the results of this study, low level laser therapy can decrease the healing time, pain intensity, size, and recurrence of the lesion in patients with minor RAS, and hence can be considered the most appropriate treatment modality for minor RAS, with greatest clinical effectiveness. Follow-Up Studies;Humans;Lasers, Semiconductor;Lip Diseases;Low-Level Light Therapy;Mouth Mucosa;Pain Measurement;Recurrence;Stomatitis, Aphthous;Tongue Diseases;Treatment Outcome;Wound Healing

Low-dose transscleral diode laser cyclophotocoagulation (TSCPC) as a potential single treatment for primary open-angle glaucoma (POAG) in Malawi? PURPOSE: To investigate if low-dose 810 nm transscleral cyclophotocoagulation (TSCPC) can be used as single treatment in Malawian glaucoma patients. METHODS: Forty-seven eyes of 28 patients with primary open-angle and pseudoexfoliation glaucoma were treated with TSCPC using 12 spots with 900 mW, 2,000 ms (1.8 J per spot); six spots in the upper half, six in the lower by sparing the 3 and 9 o'clock positions Â±20Â°. Intraocular pressure (IOP) and uncorrected visual acuity (UVA) were measured by an independent examiner preoperatively, on the first postoperative day, after 2 weeks, and after 3 months. RESULTS: Twenty-four (86%) and 18 (64%) of 28 patients (31 of 47 eyes; 66%) completed follow-up at 2 weeks and at 3 months respectively. After a single treatment session, IOP decreased by at least 25 % in 88% (21 of 24) after 2 weeks, and in 50% (nine of 18) of patients after 3 months. Mean IOP was 38.5 mmHg before TSCPC, 23.5 mmHg ($p < 0.001$) after 1 day, 24.5 mmHg ($p < 0.001$) after 2 weeks, and 35.6 mmHg ($p = 0.37$) after 3 months. In three patients, however, IOP increased after 3 months to levels significantly higher than before TSCPC. CONCLUSION: Low-dose TSCPC caused a significant IOP lowering for up to 2 weeks (15 mmHg less from baseline) in most patients. After 3 months, this effect

was stable in 50% of patients; in the other half, IOP nearly returned back to baseline. Adult;Aged;Ciliary Body;Female;Follow-Up Studies;Glaucoma, Open-Angle;Humans;Intraocular Pressure;Lasers, Semiconductor;Low-Level Light Therapy;Malawi;Male;Middle Aged;Prospective Studies;Sclera;Tonometry, Ocular;Visual Acuity

Phototherapy with low-level laser influences the proliferation of endothelial cells and vascular endothelial growth factor and transforming growth factor-beta secretion. The healing process and the angiogenesis associated with it, is a very important but currently poorly understood area. Low level laser therapy (LLLT) has been reported to modulate the process of tissue repair by stimulation of cellular reaction such as migration, proliferation, apoptosis and cellular differentiation. The aim of this work was to evaluate the influence of laser radiation in the range of visible and infrared light on the proliferation of vascular endothelial cells in vitro and the secretion of angiogenic factors: vascular endothelial growth factor (VEGF)-A and transforming growth factor (TGF)-Î². Vascular human endothelial cells (Ecs) were exposed to radiation with laser beam of the wavelengths: 635 nm (1.875 mW/cmÂ²) and 830 nm (3.75 mW/cmÂ²). Depending on the radiation energy density, the experiment was conducted in four groups : I) the control group (no radiation, 0 J/cmÂ²); II) 635 nm - the energy density was 2 J/cmÂ²; III) 635 nm - 4 J/cmÂ²; IV635 nm - 8 J/cmÂ², II) 830 nm - the energy density was 2 J/cmÂ²; III) 830 nm - 4 J/cmÂ²; IV) 830 nm - 8 J/cmÂ². The proliferation and concentration of VEGF-A and TGF-Î² were examined. LLLT with wavelength 635 nm increases endothelial cell proliferation. Significant increase in endothelial cell proliferation and corresponding decrease in VEGF concentration may suggest the role for VEGF in this process. The wavelength of 830 nm was associated with a decrease in TGF-Î² secretion. Neoplasm Proteins;TGFB1 protein, human;Transforming Growth Factor beta1;VEGFA protein, human;Vascular Endothelial Growth Factor A Cell Count;Cell Proliferation;Cells, Cultured;Dose-Response Relationship, Radiation;Down-Regulation;Endothelium, Vascular;Human Umbilical Vein Endothelial Cells;Humans;Infrared Rays;Light;Low-Level Light Therapy;Neoplasm Proteins;Neovascularization, Physiologic;Secretory Pathway;Transforming Growth Factor beta1;Up-Regulation;Vascular Endothelial Growth Factor A;Wound Healing

The effect of low-level laser therapy on the healing of hard palate mucosa and the oxidative stress status of rats. OBJECTIVE: The biostimulation effects of low-level laser therapy (LLLT) have been demonstrated recently. This study investigated the effects of LLLT on palatal mucoperiosteal wound healing and oxidative stress status in rats. MATERIAL AND METHOD: Forty-two male Wistar rats weighing 250-300 g were used in this study. A standardized full-thickness wound was created in the mucoperiosteum of the hard palates of the rats using a 3-mm-diameter biopsy punch. Treatment using a GaAlAs laser at a wavelength of 940 nm and a dose of 10 J/cm(2) was initiated after surgery and repeated on the 2nd, 4th, and 6th days post-surgery. Seven animals from each group were sacrificed on the 7th, 14th, and 21st days after surgery. Total antioxidant status and total oxidative status were measured in serum. RESULTS: The histopathological findings revealed reduced numbers of inflammatory cells on the 7th day, increased mitotic activity of fibroblasts on the 14th and 21st day, and the same degree of collagen synthesis and vascularization on the days 7, 14, and 21 in the LLLT group compared with the control group. No significant differences in total oxidative status and total antioxidant status were observed between the groups. CONCLUSION: LLLT using a GaAlAs laser at a wavelength of 940 nm and a dose of 10 J/cm(2) elicited a positive healing effect on palatal mucoperiosteal wounds likely via the induction of fibroblasts. The oxidative stress status was not affected by LLLT. Antioxidants;Benzothiazoles;Indicators and Reagents;Sulfonic Acids;Collagen Animals;Antioxidants;Benzothiazoles;Biopsy, Needle;Collagen;Epithelium;Fibroblasts;Indicators and Reagents;Keratinocytes;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mitosis;Mouth

Mucosa;Neovascularization, Physiologic;Neutrophils;Oxidative Stress;Palate, Hard;Radiotherapy Dosage;Rats;Rats, Wistar;Sulfonic Acids;Time Factors;Wound Healing

670nm photobiomodulation as a novel protection against retinopathy of prematurity: evidence from oxygen induced retinopathy models. INTRODUCTION: To investigate the validity of using 670nm red light as a preventative treatment for Retinopathy of Prematurity in two animal models of oxygen-induced retinopathy (OIR). MATERIALS AND METHODS: During and post exposure to hyperoxia, C57BL/6J mice or Sprague-Dawley rats were exposed to 670 nm light for 3 minutes a day (9J/cmÂ²). Whole mounted retinas were investigated for evidence of vascular abnormalities, while sections of neural retina were used to quantify levels of cell death using the TUNEL technique. Organs were removed, weighed and independent histopathology examination performed. RESULTS: 670 nm light reduced neovascularisation, vaso-obliteration and abnormal peripheral branching patterns of retinal vessels in OIR. The neural retina was also protected against OIR by 670 nm light exposure. OIR-exposed animals had severe lung pathology, including haemorrhage and oedema, that was significantly reduced in 670 nm+OIR light-exposed animals. There were no significance differences in the organ weights of animals in the 670 nm light-exposed animals, and no adverse effects of exposure to 670 nm light were detected. DISCUSSION: Low levels of exposure to 670 nm light protects against OIR and lung damage associated with exposure to high levels of oxygen, and may prove to be a non-invasive and inexpensive preventative treatment for ROP and chronic lung disease associated with prematurity. Oxygen Animals;Lung;Lung Diseases;Mice;Mice, Inbred C57BL;Neovascularization, Pathologic;Oxygen;Phototherapy;Rats;Rats, Sprague-Dawley;Retina;Retinal Vessels;Retinopathy of Prematurity

532 nm low-power laser irradiation recovers Î³-secretase inhibitor-mediated cell growth suppression and promotes cell proliferation via Akt signaling. BACKGROUND AND OBJECTIVE: The Î³-secretase inhibitor (GSI) has been shown to inhibit expression of amyloid beta (AÎ²), but GSI also has a side effect of reducing cell survival. Since low-power laser irradiation (LLI) has been known to promote cell survival, we examined whether 532 nm LLI can rescue the GSI side effect or not. STUDY DESIGN/MATERIALS AND METHODS: The human-derived glioblastoma cells (A-172) were cultured in 35 mm culture dishes or 96-well plate. The center of dish or selected wells was irradiated with 532 nm laser (Nd:YVO4, CW, 60 mW) for 20, 40 and 60 min, respectively. The irradiated cells were photographed at immediately after, 24 and 48 h later and counted. GSI was supplemented in medium 3 h before LLI. The MTT assay was also used to estimate viable cells at 48 h after irradiation. The expression of phosphorylated Akt (p-Akt) or phosphorylated PTEN (p-PTEN) was examined by immunofluorescent staining and measured by fluorescence intensity using the software (BZ-9000, KEYENCE, Japan). RESULTS: GSI application depressed cell proliferation as well as cell survival compared to control. GSI down-regulated AÎ² but up-regulated p-PTEN and suppressed p-Akt. Application of 532 nm LLI in the presence of GSI significantly recovered the GSI-mediated effects, i.e., LLI could decrease elevated p-PTEN, while increased p-Akt expression with keeping AÎ² suppression. The LLI effects had a dose-dependency. CONCLUSION: We confirmed that GSI potently suppressed intracellular AÎ² and decreased cell survival. We conclude that a combination of GSI application and 532 nm LLI can increase cell proliferation via Akt activation while keeping PTEN and AÎ² suppressed. Oligopeptides;benzyloxycarbonyl-leucyl-leucyl-norleucinal;Adenosine Triphosphate;Proto-Oncogene Proteins c-akt;PTEN Phosphohydrolase;PTEN protein, human;Amyloid Precursor Protein Secretases Adenosine Triphosphate;Amyloid Precursor Protein Secretases;Cell Line, Tumor;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Fluorescent Antibody Technique;Humans;Low-Level Light Therapy;Oligopeptides;PTEN Phosphohydrolase;Phosphorylation;Proto-Oncogene Proteins c-akt;Signal Transduction

LED and laser photobiomodulation in the prevention and treatment of oral mucositis: experimental study in hamsters. PURPOSE: This paper aims to evaluate the effects of laser (660 nm) and light-emitting diode (LED) (670 nm) irradiation in the cheek pouch mucosa of hamsters with oral mucositis (OM) induced by chemotherapy (Che) with 5-fluorouracil (5-FU). MATERIALS AND METHODS: In the preventive groups, the photobiomodulation was started 1 day before the drug administration and was performed every 48 h (Ia, IIa, Ib, and IIb). In the therapeutic groups (IIIa, IIIb, IVa, and IVb), the irradiations were started on the third day after the Che d(0) and was performed every 48 h. In both groups, animals were sacrificed 7 or 14 days after Che. In the positive control groups, the hamsters were subjected to Che but did not receive irradiation, and they were sacrificed in 7 days (Va) or 14 days (Vb). In the negative control groups, no procedures were done and the animals were sacrificed 7 days (Vc) or 14 days (Vd) after the experiment started. RESULTS: The results indicated loss of body mass, xerostomia, and alopecia in the animals subjected to Che and the healing of OM to different degrees after the photobiomodulation treatment. Histologically, the positive control and experimental groups showed inflammation, predominately with lymphocytes and plasma cells, which tended to diminish with time. Epithelial atrophy, hyperemia, fibroblast proliferation, and vascular congestion were also observed at those intervals. CONCLUSIONS: The best results were obtained from the preventive laser and LED photobiomodulation groups; both treatments were effective in diminishing the OM lesions. CLINICAL RELEVANCE: A noninvasive and effective method with sparse side effects of OM would be desirable for use in cancer centers around the world. Animals;Cricetinae;Female;Laser Therapy;Male;Mesocricetus;Models, Animal;Stomatitis

Low-level laser therapy rescues dendrite atrophy via upregulating BDNF expression: implications for Alzheimer's disease. Downregulation of brain-derived neurotrophic factor (BDNF) in the hippocampus occurs early in the progression of Alzheimer's disease (AD). Since BDNF plays a critical role in neuronal survival and dendrite growth, BDNF upregulation may contribute to rescue dendrite atrophy and cell loss in AD. Low-level laser therapy (LLLT) has been demonstrated to regulate neuronal function both in vitro and in vivo. In the present study, we found that LLLT rescued neurons loss and dendritic atrophy via upregulation of BDNF in both AÎ²-treated hippocampal neurons and cultured APP/PS1 mouse hippocampal neurons. Photoactivation of transcription factor CRE-binding protein (CREB) increased both BDNF mRNA and protein expression, since knockdown CREB blocked the effects of LLLT. Furthermore, CREB-regulated transcription was in an ERK-dependent manner. Inhibition of ERK attenuated the DNA-binding efficiency of CREB to BDNF promoter. In addition, dendrite growth was improved after LLLT, characterized by upregulation of Rac1 activity and PSD-95 expression, and the increase in length, branching, and spine density of dendrites in hippocampal neurons. Together, these studies suggest that upregulation of BDNF with LLLT by activation of ERK/CREB pathway can ameliorate AÎ²-induced neurons loss and dendritic atrophy, thus identifying a novel pathway by which LLLT protects against AÎ²-induced neurotoxicity. Our research may provide a feasible therapeutic approach to control the progression of AD. Brain-Derived Neurotrophic Factor Alzheimer Disease;Animals;Apoptosis;Atrophy;Blotting, Western;Brain-Derived Neurotrophic Factor;Cell Line, Tumor;Cell Survival;Chromatin Immunoprecipitation;Dendrites;Disease Models, Animal;Enzyme-Linked Immunosorbent Assay;Humans;Immunohistochemistry;Low-Level Light Therapy;MAP Kinase Signaling System;Mice;Mice, Inbred C57BL;Mice, Transgenic;Reverse Transcriptase Polymerase Chain Reaction;Up-Regulation

Fibrosis inhibition of photobiomodulation promoted regeneration. Animals;Low-Level Light Therapy;Male;Nephritis, Interstitial

Enhancement of monoclonal antibody production in CHO cells by exposure to He-Ne laser radiation. This study tested the effectiveness of laser biostimulation in small-scale cultures in vitro. We investigated the response of recombinant CHO cells, which are used for the production of monoclonal

antibody, to low level laser radiation. The cells were irradiated using a 632.8Â nm He-Ne laser in a continuous wave mode at different energy doses. We incubated the irradiated cells in small batch cultures and assessed their proliferation and productivity at various time intervals. Compared to untreated cells, the irradiated cells showed a significant increase in antibody production. Moreover, the results showed that laser irradiation did not affect viability and slightly enhanced proliferation rate.

Application of a low-level laser therapy and the purified protein from natural latex (Hevea brasiliensis) in the controlled crush injury of the sciatic nerve of rats: a morphological, quantitative, and ultrastructural study. This study analyzed the effects of a low-level laser therapy (LLLT, 15 J/cm(2), 780 nm wavelength) and the natural latex protein (P1, 0.1%) in sciatic nerve after crush injury (15 Kgf, axonotmesis) in rats. Sixty rats (male, 250 g) were allocated into the 6 groups (n = 10): CG-control group; EG-nerve exposed; IG-injured nerve without treatment; LG-crushed nerve treated with LLLT; PG-injured nerve treated with P1; and LPG-injured nerve treated with LLLT and P1. After 4 or 8 weeks, the nerve samples were processed for morphological, histological quantification and ultrastructural analysis. After 4 weeks, the myelin density and morphological characteristics improved in groups LG, PG, and LPG compared to IG. After 8 weeks, PG, and LPG were similar to CG and the capillary density was higher in the LG, PG, and LPG. In the ultrastructural analysis the PG and LPG had characteristics that were similar to the CG. The application of LLLT and/or P1 improved the recovery from the nerve crush injury, and in the long term, the P1 protein was the better treatment used, since only the application of LLLT has not reached the same results, and these treatments applied together did not potentiate the recovery. Latex;Plant Proteins Animals;Hevea;Latex;Low-Level Light Therapy;Male;Nerve Crush;Plant Proteins;Rats;Rats, Wistar;Sciatic Nerve

Protective effect of low-level laser therapy (LLLT) on acute zymosan-induced arthritis. The aim of this study was to evaluate the effect of low-level laser therapy on acute zymosan-induced arthritis, with respect to the laser action on inflammatory cells influx, release of pro-inflammatory mediators, metalloproteinases activity into the joint cavity and the cartilage repair process. Arthritis was induced in male Wistar rats (250-280Â g) by intra-articular injection of zymosan (1Â mg dissolved in 50Â Î¼l of a sterile saline solution) into one rear knee joint. Animals were irradiated immediately, 1 and 2Â h after zymosan administration with a semiconductor laser InGaAlP (660Â nm, 10Â mW, 2.5Â J/cm(2), 10Â s). In the positive control group, animals were injected with the anti-inflammatory drug dexamethasone 1Â h prior to the zymosan administration. Treatment with laser significantly inhibited leukocytes influx, the release of IL-1 and IL-6 and also the activity of metalloproteinase-2 and 9, into the joint cavity. In conclusion, laser therapy was effective in reducing inflammation to sites of injury and inhibit activation of proteases (gelatinase) suggesting less degradation of collagen tissue in experimental model of acute arthritis. Interleukin-1;Interleukin-6;Zymosan;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Animals;Arthritis;Inflammation;Interleukin-1;Interleukin-6;Leukocytes;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Rats, Wistar;Synovial Membrane;Zymosan

Thermal effects of transcranial near-infrared laser irradiation on rabbit cortex. Transcranial near-infrared laser therapy (TLT) improves stroke outcome in animal models. Adequate laser doses are necessary to exert therapeutic effects. However, applying higher laser energy may cause cortical tissue heating and exacerbate stroke injury. The objective of this study is to examine the thermal effect and safety of transcranial near-infrared laser therapy. Diode laser with a wavelength of 808 nm was used to deliver different power densities to the brain cortex of rabbits. Cortical temperature was monitored and measured using a thermal probe during the 2 min transcranial laser irradiation. Neuro-pathological changes were examined with histological staining 24 h after laser treatment. Transcranial laser irradiation for 2 min at cortical power densities of 22.2 and 55.6 mW/cm(2) with

continuous wave (CW) did not increase cortical temperature in rabbits. With the same treatment regime, cortical power density at 111.1 mW/cm(2) increased brain temperature gradually by 0.5 Â°C over the 2 min exposure and returned to baseline values within 1-2 min post-irradiation. Separately, histological staining was evaluated after triple laser exposure of 22.2 mW/cm(2) CW and 111.1 mW/cm(2) pulse wave (PW) and showed normal neural cell morphology. The present study demonstrated that the TLT powers currently utilized in animal stroke studies do not cause cortical tissue heating and histopathological damage. Animals;Body Temperature;Cerebral Cortex;Lasers, Semiconductor;Male;Rabbits

Effects of Laser Irradiation on Pulp Cells Exposed to Bleaching Agents. The aim of this study was to evaluate the effect of low-level laser therapy (LLLT) on odontoblast-like cells exposed to a bleaching agent. Mouse dental papilla cell-23 cells were seeded in wells of 24-well plates. Eight groups were established according to the exposure to the bleaching agent and LLLT (0, 4, 10 and 15Â JÂ cm(-2)). Enamel-dentin disks were adapted to artificial pulp chambers, which were individually placed in wells containing Dulbecco's modified Eagle's medium (DMEM). A bleaching agent (35% hydrogen peroxide [BA35%HP]) was applied on enamel (15Â min) to obtain the extracts (DMEMÂ +Â BA35%HP components diffused through enamel/dentin disks). The extracts were applied (1Â h) to the cells, and then subjected to LLLT. Cell viability (Methyl tetrazolium assay), alkaline phosphatase (ALP) activity, as well as gene expression of ALP, fibronectin (FN) and type I collagen, were evaluated. The bleaching procedures reduced the cell viability, ALP activity and gene expression of dentin proteins. Laser irradiation did not modulate the cell response; except for FN, as LLLT decreased the gene expression of this protein by the cells exposed to the BA35%HP. It can be concluded that BA35%HP decreased the activities of odontoblasts that were not recovered by the irradiation of the damaged cells with low-level laser parameters tested. Bleaching Agents;Tetrazolium Salts Animals;Bleaching Agents;Cell Line;Cell Survival;Dental Pulp;Lasers;Mice;Real-Time Polymerase Chain Reaction;Tetrazolium Salts

Effects of increased low-level diode laser irradiation time on extraction socket healing in rats. In our previous studies, we confirmed that low-level laser therapy (LLLT) with a 980-nm gallium-aluminum-arsenide diode laser was beneficial for the healing of the alveolar bone in rats with systemic disease. However, many factors can affect the biostimulatory effects of LLLT. Thus, we attempted to investigate the effects of irradiation time on the healing of extraction sockets by evaluating the expressions of genes and proteins related to bone healing. The left and right first maxillary molars of 24 rats were extracted. Rats were randomly divided into four groups in which extraction sockets were irradiated for 0, 1, 2, or 5Â min each day for 3 or 7Â days. Specimens containing the sockets were examined using quantitative real-time reverse transcription polymerase chain reaction and western blotting. LLLT increased the expressions of all tested genes, Runx2, collagen type 1, osteocalcin, platelet-derived growth factor-B, and vascular endothelial growth factor, in a time-dependent manner. The highest levels of gene expressions were in the 5-min group after 7Â days. Five minutes of irradiation caused prominent increases of the expression of all tested proteins after both 3 and 7Â days. The expression level of each protein in group 4 was higher by almost twofold compared with group 1 after 7Â days. Laser irradiation for 5Â min caused the highest expressions of genes and proteins related to bone healing. In conclusion, LLLT had positive effects on the early stages of bone healing of extraction sockets in rats, which were irradiation time-dependent. Collagen Type I;Core Binding Factor Alpha 1 Subunit;RNA, Messenger;Vascular Endothelial Growth Factor A;Osteocalcin Animals;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Gene Expression Regulation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteocalcin;RNA, Messenger;Rats, Sprague-Dawley;Time Factors;Tooth Extraction;Tooth Socket;Vascular Endothelial Growth Factor A;Wound Healing

Effects of low-intensity laser therapy over mini-implants success rate in pigs. The success rate of miniscrews when used as temporary orthodontic anchorage is relatively high, but some factors could affect its clinical success such as inflammation around the miniscrew. Low-intensity laser therapy has been widely used for biostimulation of tissue and wound healing specially for its anti-inflammatory effects. The purpose of this study was to evaluate the effect of low-intensity laser therapy over the miniscrew success rate. Five Landrace's pigs received 50 miniscrews on the buccal side of the mandible and on the palate of the maxilla. All the miniscrews were immediately loaded with 250 gf. The laser group were irradiated with a 780-nm diode laser with 70 mWs for 1 min (doseâ€‰=â€‰34 J/cm(2)); the contralateral side was used as the control group. The miniscrews were photographed and analyzed clinically every week to determine their stability and presence of local inflammation. After 3 weeks, histological analysis and fluorescent microscopy were performed to compare the laser and the control side. Clinical results showed a success rate of 60% for the control group and 80% for the laser-treated group. The histological analysis and fluorescent microscopy demonstrated that the laser group had less inflammatory cells than the control group and the bone neoformation around the miniscrew was more intense. Low-intensity laser therapy increased the success rate of orthodontic miniscrews, probably due to anti-inflammatory effect and bone stimulation. Dental Implants Animals;Bone Screws;Dental Implants;Low-Level Light Therapy;Microscopy, Fluorescence;Orthodontics;Sus scrofa;Treatment Outcome;Wound Healing

The use of low-level light therapy in the treatment of androgenetic alopecia and female pattern hair loss. Androgenetic alopecia (AGA) or female pattern hair loss (FPHL) is the most common form of hair loss in men and women. Despite its common occurrence, our understanding of the etiology of AGA and FPHL remains incomplete. As such, traditional therapies demonstrate modest efficacies and new therapies continue to be sought. Low-level light therapy (LLLT) is a relatively new technique used to promote hair growth in both men and women with AGA and FPHL. Currently, there exist several LLLT devices marketed for the treatment of alopecia, which claim to stimulate hair growth; yet marketing these devices only requires that safety, not efficacy, be established. A handful of studies have since investigated the efficacy of LLLT for alopecia with mixed results. These studies suffered from power, confounding and analysis issues which resulted in a high risk of bias in LLLT studies. Due to the paucity of well-conducted randomized controlled trials, the efficacy of LLLT devices remains unclear. Randomized controlled trials of LLLT conducted and reported according to the Consolidated Standards of Reporting Trials (CONSORT) statement would greatly increase the credibility of the evidence and clarify the ambiguity of the effectiveness of LLLT in the treatment of AGA and FPHL. Adult;Alopecia;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

The effect of low-level laser on bone healing in critical size defects treated with or without autogenous bone graft: an experimental study in rat calvaria. OBJECTIVE: The objective of this study was to evaluate the effect of low-level laser (LLL) on bone healing process in surgically created critical size defects in rat calvaria treated with or without autogenous bone graft (AB). MATERIAL AND METHODS: The study was conducted on 40 male rats (Rattusnorvegicus, albinus, Wistar), weighing 250-300 g. For accomplishment of the experimental procedures, the rats were anesthetized with an intramuscular injection of xylazine (0.02 ml/kg) and ketamine hydrochloride (0.4 ml/kg). Acritical size defect with 5-mm diameter was created. The animals were divided into four groups: Group C (Control- filled with blood clot), Group LLL, Group AB (autogenous bone graft), Group AB + LLL (autogenous bone graft and LLL). The animals treated with LLL received applications of LLL at the infrared spectrum wavelength (Î» = 810 nm) and energy density of 6 J/cm(2) per point, 60 s per point, adding up to five points on the entire created defect. The animals were euthanized at 30 days postoperatively. After decalcification, each specimen was longitudinally divided into two blocks, exactly along the center of the original surgical defect, processed and embedded in paraffin.

Longitudinal serial sections with 6-Î¼m thickness were made, initiating from the center of the original surgical defect. The sections were stained with hematoxylin and eosin (HE) for light microscopy analysis for histomorphometric analysis. RESULTS: Group C presented smaller quantity of new bone formation than Groups LLL ($P < 0.01$), AB ($P < 0.01$), and AB + LLL ($P < 0.01$). CONCLUSIONS: Utilization of LLL favored the healing process in rat calvaria. The quantity of new bone formation with use of the LLL was similar to the autogenous bone graft. Animals;Bone Transplantation;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;Skull;Transplantation, Autologous;Wound Healing

Tissue laser biostimulation promotes post-extraction neoangiogenesis in HIV-infected patients. The aim of the study was to assess the rate of neoangiogenesis in extraction wound healing following exposure to biostimulating laser therapy and to analyze the correlation between parameters of neoangiogenesis as reflected by the number and surface area of newly formed blood vessels and clinical parameters such as gender, position of a tooth in the oral cavity, and CD4 lymphocyte count. Twenty-seven patients with confirmed HIV infection were enrolled in the study (6 women, 21 men). Eighty-nine teeth were extracted; 45 sockets were exposed to 6Â J laser radiation (laser parameters were set as follows: wavelength, 820Â nm; output, 200Â mW; dose, 6Â J/cm(2); spot size, 38Â mm(2); continuous radiation) for five consecutive days following tooth extraction, and the remaining extraction wounds were left to heal spontaneously without laser irradiation. Antigen CD34 was assessed by immunohistochemistry as a marker of angiogenesis, and its expression was examined by computer-assisted histomorphometric image analysis. As a result, we report that biostimulating laser therapy in HIV-infected patients of varying degrees of immunodeficiency greatly accelerated post-extraction neoangiogenesis, regardless of the patient's gender, tooth position, number of roots, or number of CD4 lymphocytes in the blood. Application of low-level laser therapy for the treatment of tooth extraction wounds in HIV(+) patients greatly enhanced the formation of new blood vessels, which in turn promoted wound healing. Antigens, CD34 Adult;Antigens, CD34;CD4-Positive T-Lymphocytes;Female;HIV Infections;Humans;Lasers;Low-Level Light Therapy;Male;Middle Aged;Neovascularization, Physiologic;Tooth Extraction;Tooth Socket;Wound Healing

Effect of low-level laser therapy in patients with chronic knee osteoarthritis: a single-blinded randomized clinical study. The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on pain relief and functional performance in patients with chronic knee osteoarthritis (OA). Forty patients with knee OA were randomly assigned into active laser group (nâ€‰=â€‰20) and placebo laser group (nâ€‰=â€‰20). The LLLT device used was a Ga-As diode laser with a power output of 50Â mW, a wavelength of 850Â nm, and a diameter beam of 1Â mm. Eight points were irradiated and received dosage of 6Â J/point for 60Â s, with a total dosage of 48Â J/cm(2) in each session. The placebo group was identical but treated without emission of energy. LLLT was applied two times per week over the period of 4Â weeks. Outcome measurements included pain intensity at rest and at movement on visual analog scale, knee function using Western Ontario McMaster Universities Osteoarthritis Index scale, and ambulation duration. These measurements were collected at baseline and post-intervention. The results showed significant improvements in all assessment parameters in both groups compared to baseline. Active laser group showed significant differences in pain intensity at rest and movement, knee function, and ambulation duration when compared with the placebo group. Therefore, LLLT seemed to be an effective modality for short-term pain relief and function improvement in patients with chronic knee OA. Aged;Chronic Disease;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Management;Treatment Outcome

The use of laser therapy for dental implant surface decontamination: a narrative review of in vitro studies. The aim of this narrative review was to critically evaluate in vitro studies assessing the efficacy of lasers in the bacterial decontamination of titanium implant surfaces. The MEDLINE, Web of

Knowledge and Embase electronic databases were used to search for articles relating to the use of lasers in the bacterial decontamination of titanium specimen surfaces using predetermined search statements. Clinical studies, case reports, case series, review articles and animal models were excluded. Study selection was carried out independently and then cross-checked by two authors through abstract viewing. Eighteen articles were selected for full-text analysis. Erbium-doped yttrium-aluminium-garnet lasers had a wide range of powers capable of inducing bacterial decontamination. While carbon dioxide and gallium-aluminium-arsenide diode lasers demonstrated the ability to produce bacterial decontamination, the bacterial sensitivity to each varied depending on the species involved. There is no concensus on the laser type or settings that are optimal for bacterial decontamination of titanium implant surfaces as studies employ various test specimens, contamination methodologies, irradiation settings and protocols, and outcome measures resulting in limited study comparability. More investigations are required to provide guidelines for the use of laser therapy in the decontamination of implant surfaces. Dental Implants;Titanium Decontamination;Dental Implants;Humans;Inflammation;Laser Therapy;Lasers;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Prostheses and Implants;Titanium

Assessment of changes in mineral components in bone repair after laser therapy and pharmacotherapy by Î¼-EDX: a new potential tool in medical diagnostics. BACKGROUND DATA: Energy-dispersive microspectroscopy X-ray fluorescence (Î¼-EDX) is a non-destructive, multi-element analytical method. This technique is able to quickly perform a qualitative and semiquantitative evaluation of several sorts of samples with minimal or no previous sample preparation. Low-level laser therapy (LLLT) and synthetic calcitonin have been used to promote osteogenesis and to accelerate the repair process in bone lesions. OBJECTIVE: The aim of this study was to evaluate qualitatively and semiquantitatively biochemical changes in the composition of the bone tissue during the repair process in rats by the analytical measurement tool, Î¼-EDX. METHODS: We created a surgical bone defect in 60 Wistar rats with induced osteoporosis treated with calcitonin, LLLT, and a combination of both. The animals were divided into four groups. In groups Ca and CaLa, calcitonin, 2â€‰UI/kg, i.m., was administered on alternate days. LLLT (20â€‰J/cm(2), 10â€‰mW, 830â€‰nm, 6â€‰sec, every 48 hours) was applied to the La and CaLa groups. The experimental times were 7, 14, and 21 days. After euthanasia, the specimens were measured for inorganic chemical compounds with Î¼-EDX. RESULTS AND CONCLUSIONS: This study showed that it was possible to perform qualitative and semiquantitative analysis of inorganic components of biological samples with this technique during the bone repair process using different experimental treatment protocols. CaLa specimens showed the relation between calcium and phosphorus (Ca/P) closest to stoichiometric hydroxyapatite. Bone Density Conservation Agents;Calcitonin Animals;Bone Density;Bone Density Conservation Agents;Bone Regeneration;Calcitonin;Combined Modality Therapy;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Spectrometry, X-Ray Emission;Wound Healing

Capsulotomy or capsulorhexis in femtosecond laser-assisted cataract surgery?
Anterior Capsule of the Lens;Capsulorhexis;Humans;Low-Level Light Therapy;Phacoemulsification;Posterior Capsulotomy

On the way to zero phaco. Corneal Endothelial Cell Loss;Humans;Low-Level Light Therapy;Macular Edema;Phacoemulsification

Low-level laser therapy and vibration therapy for the treatment of localized adiposity and fibrous cellulite. INTRODUCTION: In recent years, there has been an upsurge in the application of low-level laser therapy in various medical diseases. Additionally, vibration therapy is a new and effective measure to prevent muscular atrophy and osteoporosis, along with some general health-related beneficial effects of exercise on skeletal muscles such as improvement of endothelial function and an

increased enzyme capacity of energy metabolism. The aim of this study was to evaluate the application of a 635Â nm and 0.040Â W exit power per multiple diode laser in combination with vibration therapy for the application of non-invasive reduction of circumference in patients with localized adiposity and cellulite. METHODS: The study enrolled men and women (NÂ =Â 33) aged 18-64Â years with localized adiposity or fibrous cellulite. The evaluation parameters were: photographic evaluation, perimetric evaluation, blood tests, ecographic evaluation, histological evaluation, and subjective and objective tests. RESULTS: The results produced were statistically analyzed and resulted in a significant reduction of fat thickness when compared to the measurement prior to the treatment (PÂ <Â 0.0001). Moreover, subjective and objective tests, as well as ecographic and histological evaluations, confirmed the reduction of fat thickness. CONCLUSION: In this study we have demonstrated the safety and efficacy of the combination between low-level laser therapy and vibration therapy for the resolution of localized adiposity and fibrous cellulite.
The evolving paradigm for the treatment of diabetic macular edema. Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Steroids;Ranibizumab Angiogenesis Inhibitors;Antibodies, Monoclonal, Humanized;Diabetic Retinopathy;Humans;Laser Coagulation;Low-Level Light Therapy;Macular Edema;Ranibizumab;Steroids;Vitrectomy
Influence of low-level laser therapy on the rate of orthodontic movement: a literature review. OBJECTIVE: The purpose of this study was to review low-level laser therapy (LLLT) protocols that have been used to date, and to indicate which parameters appear to be most effective to guide future research. BACKGROUND DATA: Studies assessing the influence of LLLT on the rate of orthodontic tooth movement have produced controversial results as a result of methodological differences. METHODS: The MEDLINE(Â®) database (1975-2012) and the Cochrane library (subject 8) were reviewed. Clinical studies and animal experiments written in English and focusing on the effects of LLLT on the rate of orthodontic movement were browsed. Article selection was conducted by one reviewer and checked by a second investigator. RESULTS: A total of 109 articles were identified, of which 14 were selected for detailed analysis. Diode laser was used in all studies with different energies, frequencies, and doses. In animal studies, the most common and effective energy input was 54 J per session daily; in humans, it was 2 J per session on the first days of each month, with 72-96â€‰h intervals. Orthodontic force also influenced orthodontic movement. A force of 10â€‰g/force seems to be indicated for moving molars in rats, versus 150â€‰g for canines in humans. CONCLUSIONS: Most authors report positive effects of the use of LLLT on speed increase of orthodontic tooth movement when compared with control or placebo groups. Diode laser, especially gallium aluminum arsenide, used continuously and in direct contact with the irradiated areas, was the most frequent protocol. Further studies are warranted to determine the best protocols with regard to energy, dose, and intervention schedule. Animals;Humans;Low-Level Light Therapy;Tooth Movement Techniques
[Lipoid necrobiosis in the practical work of a therapist and dermatologist]. This paper deals with the main aspects of etiology and pathogensis, clinical picture and therapy of lipoid necrobiosis. A case of successful treatment of the disease that developed long before clinical and laboratory manifestations of disturbed carbohydrate metabolism is reported. S100 Proteins Biopsy;Caloric Restriction;Dermatology;Diagnosis, Differential;Female;Humans;Hyperbaric Oxygenation;Low-Level Light Therapy;Middle Aged;Necrobiosis Lipoidica;Plasmapheresis;S100 Proteins;Skin;Therapeutics
Evaluation of two protocols for low-level laser application in patients submitted to orthodontic treatment. INTRODUCTION: Different low-level laser (LLL) irradiation protocols have been tested to accelerate orthodontic tooth movement (OTM). Nevertheless, divergent results have been obtained. It was suggested that the stimulatory action of low level laser irradiation occurs during the

proliferation and differentiation stages of bone cellular precursors, but not during later stages. OBJECTIVE: The purpose of this study was to determine the effect of two protocols of LLL irradiation on experimental tooth movement: One with daily irradiations and another with irradiations during the early stages. METHODS: Thirty-six rats were divided into control groups (CG1, CG2, CG3) and irradiated groups (IrG1, IrG2, IrG3) according to the presence of: experimental tooth movement, laser irradiation, type of laser irradiation protocol and date of euthanasia (3th or 8th day of experiment). At the end of experimental periods, a quantitative evaluation of the amount of OTM was made and the reactions of the periodontium were analyzed by describing cellular and tissue reactions and by counting blood vessels. RESULTS: The amount of OTM revealed no significant differences between groups in the same experimental period ($p < 0.05$). Qualitative analysis revealed the strongest resorption activity in irradiated groups after seven days, especially when using the daily irradiation protocol. There was a higher number of blood vessels in irradiated animals than in animals without orthodontic devices and without laser irradiation ($p < 0.05$). CONCLUSION: Moreover, angiogenesis was verified in some of the irradiated groups. The irradiation protocols tested were not able to accelerate OTM and root resorption was observed while they were applied. Analysis of Variance;Animals;Low-Level Light Therapy;Neovascularization, Physiologic;Periodontal Ligament;Rats;Root Resorption;Tooth Movement Techniques

Evaluation of effect of low-level laser therapy on adolescents with temporomandibular disorder: study protocol for a randomized controlled trial. BACKGROUND: A number of problems involving the temporomandibular joint (TMJ) and associated structures can lead to temporomandibular disorder (TMD). The aim of the proposed study is to assess the effect of low-level laser therapy on occlusal contacts, mandibular movements, electromyography activity in the muscles of mastication and pain in adolescents with TMD. METHODS/DESIGN: A randomized, controlled, double-blind, clinical trial will be carried out involving 85 male and female adolescents between 15 and 18 years of age. The research diagnostic criteria for TMD will be used to assess all individuals who agree to participate. All participants will be submitted to a clinical examination and electromyographic analysis of the masseter muscles and anterior bundle of the temporal muscles bilaterally, to determine TMD. Based on the clinical findings, the participants will be classified as having or not having TMD. Those with TMD will be divided into four groups, three of which will receive low-level laser therapy and one of which will receive a placebo treatment. The treatments will involve the TMJ region alone, the masseter and temporal muscles alone, or both these regions together. The data will be submitted to descriptive statistical analysis. The chi-square test and Fisher's exact test will be used to determine associations among the categorical variables. The Student's t test and analysis of variance will be used for the comparison of mean electromyographic signals. Pearson's correlation coefficients will be calculated for the analysis of correlations among the continuous variables. TRIAL REGISTRATION: The protocol for this study has been submitted to Clinical Trials - registration number NCT01846000. Adolescent;Analysis of Variance;Biomechanical Phenomena;Brazil;Chi-Square Distribution;Clinical Protocols;Double-Blind Method;Electromyography;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Mastication;Pain Measurement;Predictive Value of Tests;Research Design;Temporal Muscle;Temporomandibular Joint;Temporomandibular Joint Disorders;Time Factors;Treatment Outcome

Evaluation of corticosterone and IL-1Î², IL-6, IL-10 and TNF-Î± expression after 670-nm laser photobiomodulation in rats. The literature has shown that low-level laser therapy accelerates the repair of cutaneous wounds. However, there is a scarcity of scientific studies that characterise the possible systemic interference of laser photobiomodulation. The aim of this research was to quantitatively evaluate blood corticosterone levels and tissue cytokine expression in cutaneous wounds of rats treated with low-level laser therapy (semiconductor diode AsGaAl, continuous

emission, 9Â mW, 670Â nm, 0.031Â W/cm(2), beam with an output area of 0.28Â cm(2)) and normal controls. A total of 36 male Wistar rats were used and randomly divided into two groups of 18 rats each. A standardised circular 6-mm-diameter wound was made in the dorsal skin region of each rat, and they were euthanised at 1, 6 and 12Â h after cutaneous surgery. The blood was collected, and portions of cutaneous tissue and subcutaneous muscle were removed and cryopreserved. Corticosterone levels in the blood were measured by a radioimmunoassay technique; histological sections were submitted to the ELISA technique for analysis of tissue cytokine expression levels. At 6Â h after surgery, a significant increase in corticosterone and a significant reduction in the levels of IL-1Î² and IL-6 in tissues of irradiated wounds were observed when compared to controls (pâ€‰<â€‰0.05). The levels of TNF-Î± and IL-10 expression were not significantly different between the groups at different time intervals. Thus, this study strongly suggests a systemic and local biomodulation of low-level laser therapy as indicated by the blood levels of corticosterone and the tissue expression of IL-1Î² and IL-6, respectively. Cytokines;Interleukin-1beta;Interleukin-6;Tumor Necrosis Factor-alpha;Interleukin-10;Corticosterone Animals;Corticosterone;Cytokines;Interleukin-10;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha;Wound Healing

A case of CRB1-negative Coats-like retinitis pigmentosa. Retinitis pigmentosa is a heterogeneous group of ocular diseases that causes progressive degeneration of the photoreceptor cells mainly affecting the rods of the peripheral retina. The association between retinitis pigmentosa and exudative retinopathy was first described in 1956 and has been called "Coats-like retinitis pigmentosa." Mutations in the Crumbs homolog 1 (CRB1) gene have been reported as a risk factor for developing Coats-like changes in patients with autosomal recessive retinitis pigmentosa. We report the case of a 15-year-old girl affected by CRB1 gene-negative retinitis pigmentosa and Coats-like exudative vasculopathy who was successfully treated with laser photocoagulation. CRB1 protein, human;Eye Proteins;Membrane Proteins;Nerve Tissue Proteins Adolescent;DNA Mutational Analysis;Eye Proteins;Female;Humans;Low-Level Light Therapy;Membrane Proteins;Mutation;Nerve Tissue Proteins;Retinitis Pigmentosa;Treatment Outcome

Corneal endothelial cell loss and corneal thickness in conventional compared with femtosecond laser-assisted cataract surgery: three-month follow-up. PURPOSE: To quantify changes in endothelial cell counts and corneal thickness measurements in patients having standard phacoemulsification compared with femtosecond laser-assisted cataract removal. SETTING: Ruhr University Eye Clinic, Bochum, Germany. DESIGN: Prospective randomized intraindividual cohort study. METHODS: One eye of each patient had standard phacoemulsification (control group) and the other eye had femtosecond laser-assisted phacoemulsification (study group), both with intraocular lens implantation. Pulsed ultrasound energy was used for phacoemulsification. Noncontact endothelial cell microscopy and corneal pachymetry were performed preoperatively and 1 day, 3 to 4 days, 7 to 10 days, 50 to 60 days, and 90 to 100 days postoperatively. RESULTS: The mean endothelial cell loss was 7.9% Â± 7.8% (SD) 1 week postoperatively and 8.1% Â± 8.1% 3 months postoperatively in the study group and 12.1% Â± 7.3% and 13.7% Â± 8.4%, respectively, in the control group. The mean relative change in corneal thickness from the preoperative values was -0.0% Â± 1.9% at 1 day, 2.8% Â± 1.8% at 1 week, and 3.3% Â± 1.7% at 3 months in the study group and -0.9% Â± 2.3%, 2.4% Â± 1.5%, and 3.2% Â± 1.4%, respectively, in the control group. CONCLUSION: The femtosecond laser did not add to the endothelial damage caused by cataract surgery and might be beneficial in eyes with low preoperative endothelial cell values (eg, cornea guttata cases). Aged;Aged, 80 and over;Cell Count;Cohort Studies;Cornea;Corneal Endothelial Cell Loss;Endothelium, Corneal;Follow-Up Studies;Humans;Lens Implantation, Intraocular;Low-Level Light Therapy;Middle Aged;Phacoemulsification;Postoperative Complications;Prospective Studies;Time Factors

Comparison of the antibacterial effect and smear layer removal using photon-initiated photoacoustic streaming aided irrigation versus a conventional irrigation in single-rooted canals: an in vitro study. OBJECTIVE: The Er:YAG laser with photon-induced photoacoustic streaming (PIPS) technique was reported to be effective in root canal disinfection. This study attempted to further investigate the antibacterial efficacy and smear layer removal ability of PIPS in comparison with conventional syringe irrigation in vitro. METHODS: For antibacterial analysis, 48 single-rooted human teeth were prepared and inoculated with Enterococcus faecalis, and then divided into six groups of eight roots each. The colony-forming units (CFUs) per milliliter were determined after infection as the baseline. Then, the teeth were subjected to either PIPS plus 3% sodium hypochlorite (PIPS+NaOCl) or conventional syringe irrigation with 0.9% saline, 3% NaOCl, 17% ethylenediaminetetraacetic acid (EDTA), 0.2% chlorhexidine gluconate (CHX), or 3% NaOCl alternating with 17% EDTA. The reduction of CFUs in the individual group was determined. Additionally, scanning electron microscopy (SEM) examination of the canal walls for E. faecalis colonization was performed. For comparing the smear removal efficacy, another 48 single-rooted teeth, assigned to different groups as mentioned, were irrigated after mechanical instrumentation. The presence of a smear layer at different levels of the root canal was scored by SEM examination. RESULTS: No significant differences were found in CFU reduction. No bacteria could be observed by SEM in the NaOCl, NaOCl+EDTA, and PIPS+NaOCl groups. The scores of smear layer of the NaOCl+EDTA and PIPS+NaOCl groups were significantly lower than those of the other groups in the coronal and middle third of the root canal. None of the methods can effectively remove smear layer in the apical third. CONCLUSIONS: PIPS system supplied with NaOCl and conventional syringe irrigation with NaOCl+EDTA are comparable in their ability to remove E. faecalis and smear layer in single-rooted canals. Chelating Agents;Root Canal Irrigants;Edetic Acid;Sodium Hypochlorite;chlorhexidine gluconate;Chlorhexidine Bacterial Load;Chelating Agents;Chlorhexidine;Dental Pulp Cavity;Disinfection;Edetic Acid;Enterococcus faecalis;Humans;In Vitro Techniques;Low-Level Light Therapy;Microscopy, Electron, Scanning;Photoacoustic Techniques;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Stem Cells;Therapeutic Irrigation

Morphological analysis of the resin-dentin interface in cavities prepared with Er,Cr:YSGG laser or bur in primary teeth. OBJECTIVE: The purpose of this study was to analyze the resin-dentin interface in cavities prepared with laser or bur in primary teeth. BACKGROUND DATA: Erbium, chromium:yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser was expected to be an alternative cavity preparation method, enhancing surface alterations and producing morphological changes. METHODS: Twenty extracted primary molar teeth were divided to four groups according to one of four cavity preparation and pretreatment regimens: Er,Cr:YSGG laser (G1), Er,Cr:YSGG laser+acid-etching (G2), bur (G3), and bur+acid-etching (G4). After applying composite resin to the cavities, the teeth were sectioned. The resin-dentin interface was analyzed under scanning electron microscopy (SEM) and ion analysis was performed with SEM-energy-dispersive X-ray spectroscopy (EDX) after immersion in ammoniacal silver nitrate solution. RESULTS: In G1 and 2, the surfaces were wavy, and in G3 and 4, the surfaces were smooth. Microcracks were seen in some of the lased cavities. In G1 and 2, dentin tubules were exposed and there was lack of a smear layer. In G3, there were gaps and a smear layer in the resin-dentin interface, but no gaps or smear layer were observed in G4. In G2, the resin tags were increased, and some resin tags were broken in cavities, which were prepared with laser (G1 and 2). CONCLUSIONS: According to the results of this study, acid-etching was recommended after laser preparations, to have a better adhesion. Resins, Synthetic Acid Etching, Dental;Dental Cavity Preparation;Dentin;Humans;Lasers, Solid-State;Low-Level Light Therapy;Resins, Synthetic;Smear Layer;Tensile Strength

Treatment of onychomycosis using a submillisecond 1064-nm neodymium:yttrium-aluminum-garnet laser. BACKGROUND: Laser treatment has emerged as a novel treatment modality for onychomycosis. OBJECTIVE: We sought to determine thermal response and optical effects of a submillisecond neodymium:yttrium-aluminum-garnet (Nd:YAG) 1064-nm laser on common fungal nail pathogens, and the clinical efficacy and safety of the Nd:YAG 1064-nm laser on onychomycotic toenails. METHODS: A 4-part inÂ vitro and inÂ vivo study was conducted using a Nd:YAG 1064-nm laser. The first portion evaluated 3 different nail pathogens in suspension at 7 heat and time exposures. The second and third parts of the study irradiated pure fungal colonies. The final portion involved an inÂ vivo treatment of toenails over 5 treatment sessions. RESULTS: A fungicidal effect for Trichophyton rubrum was seen at 50Â°C after 15 minutes, and for Epidermophyton floccosum at 50Â°C after 10 minutes. Limited growth of Scytalidium was seen at 55Â°C after 5 minutes. No inhibition was observed after laser treatment of fungal colonies or suspensions. InÂ vivo treatment of toenails showed no improvement in Onychomycosis Severity Index score. LIMITATIONS: The Nd:YAG 1064-nm laser was the only laser tested. CONCLUSIONS: Laser treatment of onychomycosis was not related to thermal damage or direct laser effects. InÂ vivo treatment did not result in onychomycosis cure. yttrium-aluminum-garnet;Neodymium;Yttrium;Aluminum Adult;Aged;Aluminum;Cohort Studies;Female;Follow-Up Studies;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Neodymium;Onychomycosis;Pilot Projects;Risk Factors;Sensitivity and Specificity;Treatment Outcome;Trichophyton;Young Adult;Yttrium

In vitro responses of neurofibroma fibroblasts, mast cells and Schwann cells obtained from patients with neurofibromatosis 1 to 308-nm excimer light and/or vitamin D3. Fibroblasts, mast cells and Schwann cells were isolated from neurofibromas of patients with neurofibromatosis 1, and their responses to 308-nm excimer light irradiation and/or vitamin D3 or an analog (tacalcitol; 1,24-dihydroxyvitamin D3) were examined in vitro. Excimer light irradiation (300Â mJ/cm(2)) suppressed the growth of all three cell types. Exposure to 10(-7) Â mol/L of 1Î±,25(OH)2 D3 (VD3) or tacalcitol suppressed the growth of fibroblasts and mast cells, but not Schwann cells. These results suggest that the different neurofibroma cell types show different responses to VD3 . A combination of excimer light irradiation and VD3 is necessary to suppress the growth of neurofibroma cells in vivo. Dermatologic Agents;Dihydroxycholecalciferols;1 alpha,24-dihydroxyvitamin D3 Cells, Cultured;Dermatologic Agents;Dihydroxycholecalciferols;Drug Screening Assays, Antitumor;Fibroblasts;Humans;Lasers, Excimer;Low-Level Light Therapy;Mast Cells;Neurofibromatosis 1;Schwann Cells

Effect of laser and air abrasion pretreatment on the microleakage of a fissure sealant applied with conventional and self etch adhesives. AIM: The purpose of this study was to investigate the effects of different pretreatment protocols along with different bonding agents on the microleakage of a fissure sealant material. METHOD: A total of 144 freshly extracted noncarious human third molars were used The teeth were randomly assigned into three groups with respect to the pretreatment protocol employed: A. Air Abrasion B. Er,Cr:YSGG laser C. No pretreatment (Control). In each group specimens were further subjected to one of the following procedures before application of the sealant: 1. %36 Phosphoric acid-etch (AE) (DeTrey Conditioner 36/Denstply, UK) 2.AE+Prime&Bond NT (Dentsply, UK) 3. Clearfil S3 Bond (Kuraray, Japan) 4. Clearfil SE Bond (Kuraray, Japan). All teeth were sealed with the same fissure sealant material (Conseal F/SDI, Australia). Sealed teeth were further subjected to thermocycling, dye penetration test, sectioning and quantitative image analysis. Statistical evaluation of the microleakage data was performed with two way independent ANOVA and multiple comparisons test at p = 0.05. For qualitative evaluation 2 samples from each group were examined under Scanning Electron Microscopy. RESULTS: Microleakage was

affected by both the type of pretreatment and the subsequent bonding protocols employed ($p < 0.05$). Overall, the highest (Mean = 0.36 mm) and lowest (Mean = 0.06 mm) microleakage values were observed in samples with unpretreated enamel sealed by S3+Conseal F and samples with laser pretreated enamel sealed by Acid Etch+Prime&-Bond+Conseal F protocols, respectively ($p < 0.05$). In the acid-etch group samples pretreated with laser yielded in slightly lower microleakage scores when compared with unpretreated samples and samples pretreated with air abrasion but the statistical significance was not important (p = 0,179). Similarly, when bonding agent is applied following acid-etching procedure, microleakage scores were not affected from pretreatment protocol (p = 0,615) (intact enamel/laser or air-abrasion). For both all-in one and two step self etch adhesive systems, unpretreated samples demonstrated the highest microleakage scores. CONCLUSIONS: For the groups in which bonding agent was utilized, pretreatments did not effected microleakage. Both the tested pretreatment protocols and adhesive procedures had different effects on the sealing properties of Conseal F in permanent tooth enamel. Clearfil SE Bond;Clearfil Tri-S Bond;Coloring Agents;Methacrylates;Phosphoric Acids;Pit and Fissure Sealants;Polymethacrylic Acids;Prime and Bond NT;Resin Cements;Rosaniline Dyes;basic fuchsin;phosphoric acid;Aluminum Oxide Acid Etching, Dental;Aluminum Oxide;Coloring Agents;Dental Bonding;Dental Enamel;Dental Etching;Dental Leakage;Humans;Image Processing, Computer-Assisted;Lasers, Solid-State;Low-Level Light Therapy;Methacrylates;Microscopy, Electron, Scanning;Particle Size;Phosphoric Acids;Pit and Fissure Sealants;Polymethacrylic Acids;Resin Cements;Rosaniline Dyes;Surface Properties;Temperature

The efficiency of root canal disinfection using a diode laser: in vitro study. AIMS: The aim of this study is to verify the disinfection of diode laser, following chemo-mechanical procedures against Enterococcus fecalis. MATERIALS AND METHODS: Crowns of 30 extracted premolar teeth were sectioned at the cemento- enamel junction. The canals were shaped using step-back technique to K-file #40. The teeth were randomly assigned to three groups and placed into nutrient broth containing bacterial suspension of Enterococcus fecalis. Group A received no laser radiation. Specimens of group B and C were treated with diode laser (Sirona) with energy set at 1.5 and 3 W, respectively. After laser irradiation, the teeth were placed in vials, which contained 2 mL of the nutrient broth. The vials were incubated at 37Â°C for 24 h. Grown colonies were identified by standard methods. STATISTICAL ANALYSIS USED: Statistical analysis used was the nonparametric Kruskal-Wallis test, with comparison using the Bonferroni methods of means. RESULTS: Higher mean CFU/mL is recorded in Group A (without laser disinfection) followed by Group B (with 1.5 W laser disinfection) and Group C (with 3 W laser disinfection), respectively. The difference in CFU/mL between the three groups is found to be statistically significant ($P < 0.001$). CONCLUSIONS: The results of this research show that the 980 nm diode laser can eliminate bacteria that has immigrated into dentin, thus being able to increase the success rate in endodontic therapy. Bacterial Load;Bacteriological Techniques;Dental Pulp Cavity;Dentin;Disinfection;Enterococcus faecalis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Radiation Dosage;Root Canal Preparation;Temperature;Time Factors;Treatment Outcome

Anterior chamber flare after femtosecond laser-assisted cataract surgery. PURPOSE: To determine whether postoperative ocular inflammation is less after femtosecond laser-assisted cataract surgery than after conventional phacoemulsification (manual) cataract surgery. SETTING: Private clinic, Launceston, Tasmania, Australia. DESIGN: Prospective consecutive investigator-masked nonrandomized parallel cohort study. METHODS: Consecutive cataract patients who had femtosecond laser-assisted cataract surgery or manual cataract surgery by the same surgeon at a single center were assessed. The primary endpoint was postoperative aqueous flare measured by laser flare photometry at 1 day and 4 weeks. Secondary endpoints included retinal thickness measured by optical coherence tomography and slitlamp examination findings at 4 weeks. RESULTS:

The per-protocol population comprised 176 patients (100 in laser group; 76 in manual group). Postoperative aqueous flare was significantly greater in the manual cataract surgery group at 1 day (P=.0089) and at 4 weeks (P=.003). There was a significant correlation between effective phacoemulsification time and 1-day postoperative aqueous flare (r = 0.35, P<.0001). The increase in outer zone thickness measured by optical coherence tomography was less in the laser group (P=.007). CONCLUSION: Anterior segment inflammation was less after femtosecond laser-assisted cataract surgery than after manual cataract surgery, and this appeared to be due to a reduction in phacoemulsification energy. Adult;Aged;Aged, 80 and over;Anterior Capsule of the Lens;Anterior Chamber;Capsulorhexis;Female;Humans;Inflammation;Low-Level Light Therapy;Male;Middle Aged;Phacoemulsification;Photometry;Postoperative Complications;Prospective Studies;Retina;Tomography, Optical Coherence;Uveitis, Anterior

Time-expanding options in laser corneal refractive surgery. Cornea;Corneal Wavefront Aberration;Female;Humans;Keratomileusis, Laser In Situ;Lasers, Excimer;Low-Level Light Therapy;Male;Myopia;Visual Acuity

Photoacoustic effect measurement in aqueous suspensions of gold nanorods caused by low-frequency and low-power near-infrared pulsing laser irradiation. When aqueous suspensions of gold nanorods are irradiated with a pulsing laser (808Â nm), pressure waves appear even at low frequencies (pulse repetition rate of 25Â kHz). We found that the pressure wave amplitude depends on the dynamics of the phenomenon. For fixed concentration and average laser current intensity, the amplitude of the pressure waves shows a trend of increasing with the pulse slope and the pulse maximum amplitude. We postulate that the detected ultrasonic pressure waves are a sort of shock waves that would be generated at the beginning of each pulse, because the pressure wave amplitude would be the result of the positive interference of all the individual shock waves. Gold Acoustics;Cell Line, Tumor;Cell Survival;Equipment Design;Gold;Humans;Lasers;Light;Low-Level Light Therapy;Metal Nanoparticles;Nanotubes;Pressure;Spectroscopy, Near-Infrared;Ultrasonics

Photobiomodulation induced by 670 nm light ameliorates MOG35-55 induced EAE in female C57BL/6 mice: a role for remediation of nitrosative stress. BACKGROUND: Experimental autoimmune encephalomyelitis (EAE) is the most commonly studied animal model of multiple sclerosis (MS), a chronic autoimmune demyelinating disorder of the central nervous system. Immunomodulatory and immunosuppressive therapies currently approved for the treatment of MS slow disease progression, but do not prevent it. A growing body of evidence suggests additional mechanisms contribute to disease progression. We previously demonstrated the amelioration of myelin oligodendrocyte glycoprotein (MOG)-induced EAE in C57BL/6 mice by 670 nm light-induced photobiomodulation, mediated in part by immune modulation. Numerous other studies demonstrate that near-infrared/far red light is therapeutically active through modulation of nitrosoxidative stress. As nitric oxide has been reported to play diverse roles in EAE/MS, and recent studies suggest that axonal loss and progression of disability in MS is mediated by nitrosoxidative stress, we investigated the effect of 670 nm light treatment on nitrosative stress in MOG-induced EAE. METHODOLOGY: Cell culture experiments demonstrated that 670 nm light-mediated photobiomodulation attenuated antigen-specific nitric oxide production by heterogenous lymphocyte populations isolated from MOG immunized mice. Experiments in the EAE model demonstrated down-regulation of inducible nitric oxide synthase (iNOS) gene expression in the spinal cords of mice with EAE over the course of disease, compared to sham treated animals. Animals receiving 670 nm light treatment also exhibited up-regulation of the Bcl-2 anti-apoptosis gene, an increased Bcl-2:Bax ratio, and reduced apoptosis within the spinal cord of animals over the course of disease. 670 nm light therapy failed to ameliorate MOG-induced EAE in mice deficient in iNOS, confirming a role for remediation of nitrosative stress in the amelioration of MOG-induced EAE by 670 nm mediated photobiomodulation. CONCLUSIONS:

These data indicate that 670 nm light therapy protects against nitrosative stress and apoptosis within the central nervous system, contributing to the clinical effect of 670 nm light therapy previously noted in the EAE model. Myelin-Oligodendrocyte Glycoprotein;Peptide Fragments;Nitric Oxide;Nitric Oxide Synthase Type II;Nos2 protein, mouse Animals;Apoptosis;Encephalomyelitis, Autoimmune, Experimental;Female;Gene Expression Regulation, Enzymologic;Infrared Rays;Mice;Mice, Inbred C57BL;Myelin-Oligodendrocyte Glycoprotein;Nitric Oxide;Nitric Oxide Synthase Type II;Peptide Fragments;Phototherapy;Spinal Cord;Stress, Physiological

Effect of low-level laser therapy on oral keratinocytes exposed to bisphosphonate. Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is a side effect of bisphosphonate therapy. However, its pathophysiology is not yet fully elucidated, and effective treatment of BRONJ remains unclear. The aim of this study is to investigate the effects of alendronate on oral keratinocytes and of low-level laser therapy (LLLT) on alendronate-treated keratinocytes, specifically by evaluating their viability, apoptosis, and wound healing function after irradiation. Oral keratinocyte cells (HaCaT) were exposed to 25Â Î¼M alendronate. Then, laser irradiation was performed with a low-level Ga-Al-As laser (Î»â€‰=â€‰808â€‰Â±â€‰3Â nm, 80Â mW, and 80Â mA; NDLux, Seoul, Korea) using 1.2Â J/cm(2) energy dose. Viability was analyzed using MTT assay. Apoptosis was measured by Hoechst staining, caspase assay. Changes in secretion of IL-8, VEGF, and collagen type I were studied by ELISA and immunofluorescence microscopy. Scratch wound assays were also performed to measure cellular migration. Our results show that alendronate inhibits keratinocyte viability, expression of IL-8, VEGF, and collagen type I which are intimately related to healing events and cell migration while promoting apoptosis. Our results serve to demonstrate the utility of LLLT in partially overcoming the inhibitory effects of this bisphosphonate. From these results, the authors believe that the present study will provide an experimental basis for a fuller explanation of the clinical effects of LLLT as a BRONJ treatment modality. Collagen Type I;Diphosphonates;Interleukin-8;Vascular Endothelial Growth Factor A;Alendronate Alendronate;Apoptosis;Bisphosphonate-Associated Osteonecrosis of the Jaw;Cell Line, Tumor;Cell Movement;Cell Survival;Collagen Type I;Diphosphonates;Humans;Interleukin-8;Keratinocytes;Low-Level Light Therapy;Vascular Endothelial Growth Factor A;Wound Healing

Treatment of nevus of Ota using low fluence Q-switched Nd:YAG laser. BACKGROUND: Nevus of Ota, caused by dermal melanocytosis, is cosmetically troublesome in Asian patients. The destruction of dermal melanocytosis using Q-switched laser systems carries a high risk of postinflammatory hyperpigmentation/hypopigmentation. METHODS: To determine the usefulness, safety, and adverse problems of low fluence 1064Â nm Q-switched Nd:YAG laser in the treatment of nevus of Ota, 19 Korean patients (five male and 14 female; Fitzpatrick skin type IV) who were clinically diagnosed as having nevus of Ota were enrolled in the present study. Low fluence laser treatments were performed with a collimated Q-switched Nd:YAG laser at intervals of twoÂ weeks. The fluence of laser treatments was set at 2.5Â J/cm(2) and adjusted based on patient response to the previous treatment session and sensitivity to pain. Treatment was applied until the lesions showed mild erythema. RESULTS: The mean number of total treatment sessions was 17.1 (range 6-32). Among the 19 patients, 18 reached near total improvement, while one patient failed to reach near total improvement after 11 treatment sessions. The mean fluence of treatment was 2.5Â J/cm(2) (range 2.0-5.0Â J/cm(2)). Five patients complained of delayed eyelid response. Post-therapy hyperpigmentation was observed in one patient. CONCLUSION: Low fluence 1064Â nm Q-switched Nd:YAG laser is an effective modality for the treatment of nevus of Ota with a low incidence of side effects. It is an easy to perform treatment with low downtime.
Adolescent;Adult;Child;Child, Preschool;Erythema;Facial Neoplasms;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light

Therapy;Male;Middle Aged;Nevus of Ota;Pain;Republic of Korea;Retrospective Studies;Skin Neoplasms;Young Adult
An evaluation of potential correlations between pathophysiologic mechanisms, clinical manifestations, and management of rosacea. This article discusses rosacea, a common facial dermatosis of uncertain etiology and recent investigations that have begun to shed considerable light on the sequence of events leading to clinical manifestations of rosacea. The article content is based on a dedicated meeting about rosacea sanctioned by the American Acne & Rosacea Society (AARS) and represents the consensus of the authors and AARS Board of Directors. Dermatologic Agents;Dicarboxylic Acids;Toll-Like Receptor 2;Metronidazole;azelaic acid;Doxycycline Dermatologic Agents;Dicarboxylic Acids;Doxycycline;Humans;Immunity, Innate;Inflammation;Low-Level Light Therapy;Metronidazole;Rosacea;Skin;Telangiectasis;Th1 Cells;Toll-Like Receptor 2;Vasodilation
Light-emitting diode therapy induces analgesia in a mouse model of postoperative pain through activation of peripheral opioid receptors and the L-arginine/nitric oxide pathway. Light-emitting diode therapy (LEDT) has been clinically used as an alternative to low-level laser therapy; nevertheless, the molecular basis for LEDT effects remains unclear. The objective of this study was to evaluate the analgesic effect of LEDT in the mouse plantar incision (PI) model of postoperative pain, as well as to investigate some of the possible mechanisms involved in this effect, i.e., peripheral and central opioid receptors; migration of opioid-containing leukocytes to PI site and the L-arginine/nitric oxide (NO) pathway. To that end, mice were subjected to PI and treated with LEDT (950Â nm, 80Â mW/cm(2), 1 through 13Â J/cm(2)). Mechanical hypersensitivity was assessed as withdrawal frequency percentage to 10 presentations of a 0.4-g von Frey filament. In addition, the animals were pretreated with systemic (i.p.), intra-plantar (i.pl.), or intrathecal injection (i.t) of naloxone (a nonselective opioid receptor antagonist; 1Â mg/kg, i.p.; 5Â Î¼g/right paw or 5Â Î¼g/site, respectively) or a systemic injection of fucoidin (100Â Î¼g/mouse, i.p., an inhibitor of leukocyte rolling through binding to L- and P-selectins). Our results demonstrate, for the first time, that LEDT induced a dose-response analgesic effect in the model of PI in mice. At the dose of 9Â J/cm(2) LEDT presented the most significant results through (1) activation of peripheral opioid receptors which involve, at least partially, the recruitment of opioid-containing leukocytes to the PI site and; (2) activation of the L-arginine/NO pathway. These results extend previous literature data and suggest that LEDT might be useful in the treatment of postoperative pain. Narcotic Antagonists;Receptors, Opioid;Nitric Oxide;Naloxone;Arginine Animals;Arginine;Disease Models, Animal;Dose-Response Relationship, Radiation;Injections, Spinal;Leukocytes;Male;Mice;Naloxone;Narcotic Antagonists;Nitric Oxide;Pain, Postoperative;Phototherapy;Receptors, Opioid
Systemic effects of LLLT on bone repair around PLLA-PGA screws in the rabbit tibia. To evaluate the systemic effects of low level laser therapy (LLLT) on the early stages of bone repair after implantation of poly-L-lactic/polyglycolic acid (PLLA-PGA) screws 24 rabbits were randomly allocated to one of two groups, experiment or control. Each animal underwent implantation of one 5â€‰Ã—â€‰1.5Â mm PLLA-PGA screw in each tibia (right and left). The experiment group received infrared laser irradiation (830Â nm, 4Â J, 100Â mW, 10.1Â s) over the right paw immediately after implantation and every 48Â h thereafter, for a maximum of seven sessions. The control group was not irradiated. Both groups were divided into three subgroups according to the observation period (5, 15, or 30Â days), after which animals were euthanized. The results observed in the left paw of experimental animals were compared with the left paws of control animals. We also compared the right and left paws of experimental animals so as to compare local and potential systemic effects. Bone specimens were analyzed to assess the extent of peri-implant bone formation, quantitative analysis revealed greater bone formation in the left tibia of experimental animals as compared to

controls on 5-day follow-up. Descriptive analysis revealed slightly larger and thicker trabeculae in the irradiated animals at 5Â days post-procedure. There were no significant differences at any other point in time. As used in this study, LLLT had a positive systemic effect on the early stages of bone formation. Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid Animals;Bone Screws;Lactic Acid;Low-Level Light Therapy;Male;Osteogenesis;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer;Rabbits;Tibia;Treatment Outcome

Low level laser therapy increases angiogenesis in a model of ischemic skin flap in rats mediated by VEGF, HIF-1Î± and MMP-2. It is known that low level laser therapy is able to improve skin flap viability by increasing angiogenesis. However, the mechanism for new blood vessel formation is not completely understood. Here, we investigated the effects of 660 nm and 780 nm lasers at fluences of 30 and 40 J/cm(2) on three important mediators activated during angiogenesis. Sixty male Wistar rats were used and randomly divided into five groups with twelve animals each. Groups were distributed as follows: skin flap surgery non-irradiated group as a control; skin flap surgery irradiated with 660 nm laser at a fluence of 30 or 40 J/cm(2) and skin flap surgery irradiated with 780 nm laser at a fluence of 30 or 40 J/cm(2). The random skin flap was performed measuring 10Ã—4 cm, with a plastic sheet interposed between the flap and the donor site. Laser irradiation was performed on 24 points covering the flap and surrounding skin immediately after the surgery and for 7 consecutive days thereafter. Tissues were collected, and the number of vessels, angiogenesis markers (vascular endothelial growth factor, VEGF and hypoxia inducible factor, HIF-1Î±) and a tissue remodeling marker (matrix metalloproteinase, MMP-2) were analyzed. LLLT increased an angiogenesis, HIF-1Î± and VEGF expression and decrease MMP-2 activity. These phenomena were dependent on the fluences, and wavelengths used. In this study we showed that LLLT may improve the healing of skin flaps by enhancing the amount of new vessels formed in the tissue. Both 660 nm and 780 nm lasers were able to modulate VEGF secretion, MMP-2 activity and HIF-1Î± expression in a dose dependent manner. Hif1a protein, rat;Hypoxia-Inducible Factor 1, alpha Subunit;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Matrix Metalloproteinase 2;Mmp2 protein, rat Animals;Hypoxia-Inducible Factor 1, alpha Subunit;Ischemia;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Neovascularization, Physiologic;Rats;Rats, Wistar;Skin;Surgical Flaps;Vascular Endothelial Growth Factor A

Cutaneous lasers and skin camouflage make-up: a useful alternative intervention for periorbital hairy congenital melanocytic naevus. Periorbital congenital melanocytic naevi can be very disfiguring and difficult to treat effectively. Although surgical excision and reconstruction is the most widely accepted treatment strategy, we describe a case in which cutaneous lasers treatment followed by the application of cosmetic skin camouflage make-up provided an alternative solution delivering a good cosmetic improvement. Cosmetics Adolescent;Cosmetic Techniques;Cosmetics;Facial Neoplasms;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Nevus, Pigmented;Skin Neoplasms

The utility of the potassium titanyl phosphate laser in modulating vocal fold scar in a rat model. OBJECTIVES/HYPOTHESIS: We hypothesize that the KTP laser has the potential to augment wound healing in a rat model, and this modality may serve as a therapeutic tool for the management of vocal fold fibrosis. STUDY DESIGN: Prospective, laboratory animal study. METHODS: Rats were subjected to either vocal fold injury Â± KTP laser treatment at low energy to simulate clinically relevant endpoints. In addition, cohorts were subjected to therapeutic KTP laser alone. Endpoints included the analyses of gene expression data related to the acute inflammatory response and extracellular matrix deposition and organization. RESULTS: Therapeutic KTP treatment was associated with an additive effect on inflammatory gene expression in the context of the injured rat vocal fold mucosa. A similar additive effect was observed for matrix metalloproteinase gene expression, similar to data previously

reported in the dermatology literature. However, histologically, the KTP had little effect on established vocal fold fibrosis. CONCLUSIONS: These data are the first to attempt to provide mechanistic insight into the clinical utility of angiolytic lasers for vocal fold scar. Similar to previous data obtained in the skin, it appears that these effects are mediated by MMPs.
Animals;Biopsy, Needle;Cicatrix;Disease Models, Animal;Extracellular Matrix;Immunohistochemistry;Lasers, Solid-State;Low-Level Light Therapy;Male;Random Allocation;Rats;Vocal Cords;Wound Healing

The role of transforming growth factor Î²1 in fractional laser resurfacing with a carbon dioxide laser. The aim of this study was to investigate the role of transforming growth factor Î²1 in mechanisms of cutaneous remodeling induced by fractional carbon dioxide laser treatment. The dorsal skin of Kunming mice was exposed to a single-pass fractional CO2 laser treatment. Biopsies were taken at 1Â h and at 1, 3, 7, 14, 21, 28, and 56Â days after treatment. Transforming growth factor (TGF) Î²1 expression in skin samples was evaluated by ELISA, dermal thickness by hematoxylin-eosin staining, collagen and elastic fibers by Ponceau S and Victoria blue double staining, and types I and III collagens by ELISA. The level of TGF Î²1 in the laser-treated areas of skin was significantly increased compared with that in the control areas on days 1 (pâ€‰<â€‰0.05), 3 (pâ€‰<â€‰0.01), and 7 (pâ€‰<â€‰0.05) and then decreased by day 14 after treatment, at which time it had returned to the baseline level. Dermal thickness and the amount of type I collagen of the skin of the laser-treated areas had increased significantly (pâ€‰<â€‰0.05) compared with that in control areas on days 28 and 56. Fibroblast proliferation showed a positive correlation with TGF Î²1 expression during the early stages (râ€‰=â€‰0.789, pâ€‰<â€‰0.01), and there was a negative correlation between the level of TGF Î²1 and type I collagen in the late stages, after laser treatment (râ€‰=â€‰-0.546, pâ€‰<â€‰0.05). TGF Î²1 appears to be an important factor in fractional laser resurfacing.
Collagen Type I;Transforming Growth Factor beta1 Animals;Cell Proliferation;Collagen Type I;Female;Fibroblasts;Lasers, Gas;Low-Level Light Therapy;Mice;Phototherapy;Skin;Transforming Growth Factor beta1;Wound Healing

[Combined laser therapy of the reactivated form of cytomegalovirus infection of the urogenital tract in the women of reproductive age]. The prevalence of cytomegalovirus infection (CMVI) dictates the necessity of its in-depth investigation in the patients presenting with the signs of chronic inflammatory diseases of sexual organs. The objective of the present study was to estimate the effectiveness of combined laser therapy of inflammatory diseases of the urogenital tract accompanied by the reactivation of CMVI concomitant with other infections. The examination of 158 women presenting with cytomegalovirus infection revealed clinical and laboratory characteristics of the microbiocenosis. These data may be used to improve the effectiveness of diagnostic and therapeutic strategies for such patients. The combined treatment of the patients with the reactivated form of CMVI using josamycin and doxycycline monohydrate in combination with panavir and low-intensity laser irradiation based at the "Matrix-Urolog" laser complex resulted in the favourable outcome of therapy in the majority of the patients. Anti-Bacterial Agents;Antioxidants;Josamycin;Doxycycline;Probucol Adolescent;Adult;Anti-Bacterial Agents;Antioxidants;Cytomegalovirus;Cytomegalovirus Infections;Doxycycline;Female;Female Urogenital Diseases;Humans;Josamycin;Laser Therapy;Probucol

Periodontal effects with self ligating appliances and laser biostimulation. BACKGROUND: Recently, various biostimulation's effects of low energy laser irradiation have been reported. The present study was designed to examine the effects of low-energy laser irradiation on alveolar bone remodelling during orthodontic tooth movement and finally on formation of new keratinized gingiva. MATERIALS AND METHODS: 22 patients and 27 teeth in vestibular mucosal without keratinized gingiva were selected. Every patient was treated with self ligating appliances. In every orthodontic

session the patient was treated with Diode laser biostimulation. At the moment of debonding, 27 teeth involved in the research were evaluated in terms of quality and quantity of attached gingiva. BOP and CAL loss were investigated. RESULTS: EVERY TOOTH CONSIDERED AT THE END OF ORTHODONTIC TREATMENT SHOWED AN ATTACHED GINGIVA AROUND THE CROWN: The average of keratinized gingiva at the end of the study was 3.10 mm and the mean increasing at each month was 0,49 mm. CONCLUSIONS: The combination between self ligating appliances and laser's biostimulation could improve the differentiation of periodontal ligaments stem cells in fibroblasts, able to promote attached gingiva around the crown of the teeth erupted in oral vestibular mucosa.

What is the best treatment to decrease pro-inflammatory cytokine release in acute skeletal muscle injury induced by trauma in rats: low-level laser therapy, diclofenac, or cryotherapy? Currently, treatment of muscle injuries represents a challenge in clinical practice. In acute phase, the most employed therapies are cryotherapy and nonsteroidal anti-inflammatory drugs. In the last years, low-level laser therapy (LLLT) has becoming a promising therapeutic agent; however, its effects are not fully known. The aim of this study was to analyze the effects of sodium diclofenac (topical application), cryotherapy, and LLLT on pro-inflammatory cytokine levels after a controlled model of muscle injury. For such, we performed a single trauma in tibialis anterior muscle of rats. After 1Â h, animals were treated with sodium diclofenac (11.6Â mg/g of solution), cryotherapy (20Â min), or LLLT (904 nm; superpulsed; 700 Hz; 60 mW mean output power; 1.67 W/cm(2); 1, 3, 6 or 9 J; 17, 50, 100 or 150 s). Assessment of interleukin-1Î² and interleukin-6 (IL-1Î² and IL-6) and tumor necrosis factor-alpha (TNF-Î±) levels was performed at 6Â h after trauma employing enzyme-linked immunosorbent assay method. LLLT with 1Â J dose significantly decreased (pâ€‰<â€‰0.05) IL-1Î², IL-6, and TNF-Î± levels compared to non-treated injured group as well as diclofenac and cryotherapy groups. On the other hand, treatment with diclofenac and cryotherapy does not decrease pro-inflammatory cytokine levels compared to the non-treated injured group. Therefore, we can conclude that 904 nm LLLT with 1Â J dose has better effects than topical application of diclofenac or cryotherapy in acute inflammatory phase after muscle trauma. Anti-Inflammatory Agents, Non-Steroidal;Cytokines;Interleukin-6;Tumor Necrosis Factor-alpha;Diclofenac Administration, Topical;Animals;Anti-Inflammatory Agents, Non-Steroidal;Cryotherapy;Cytokines;Diclofenac;Inflammation;Interleukin-6;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats, Wistar;Tumor Necrosis Factor-alpha

850nm light-emitting-diode phototherapy plus low-dose tacrolimus (FK-506) as combination therapy in the treatment of Dermatophagoides farinae-induced atopic dermatitis-like skin lesions in NC/Nga mice. BACKGROUND: Light emitting diode (LED) phototherapy is an effective alternative for the treatment of inflammatory skin disorders. Tacrolimus (FK-506) is a potent immunomodulating agent, which has been used to treat AD. Combination therapy is often used in the treatment of AD to improve therapeutic efficacy or to reduce the dose of each drug. OBJECTIVE: To investigate the therapeutic efficacy of monotherapy with either 850nm LED phototherapy or low-dose FK-506, and combination therapy in Dermatophagoides farina (Df)-induced AD-like skin lesions in NC/Nga mice. METHODS: The Df-induced NC/Nga mice with a clinical score of 7 were used for treatment with LED (10 and 25J/cm(2)) alone, low-dose FK-506 (1mg/kg) or in combination. The synergistic effects of combined therapy were evaluated by dermatitis scores, skin histology, skin barrier function, and immunological parameters, such as IgE, NO, Th2-mediated cytokines and chemokines. RESULTS: Combination therapy with 850nm (25J/cm(2)) LED and low-dose FK-506 showed a significant reduction in the severity of skin lesions. Combined therapy decreased in the serum level of IgE, NO, and in the splenic level of Th2-mediated cytokines and chemokines. Combination therapy significantly also reduced the inflammatory cellular infiltrate into the skin lesions. Moreover, combination therapy led to recovery of skin barrier function in the skin lesions. CONCLUSIONS: The use of combination of

LED phototherapy and low-dose immunosuppressant improved Df-induced AD-like skin lesions in an NC/Nga mouse model by dominantly reducing IgE, NO, suppressing Th2-mediated immune responses, and inhibiting inflammatory cells, as well as improving skin barrier function. Chemokines;Cytokines;Immunosuppressive Agents;Nitric Oxide;Immunoglobulin E;Tacrolimus Animals;Chemokines;Combined Modality Therapy;Cytokines;Dermatitis, Atopic;Dermatophagoides farinae;Humans;Immunoglobulin E;Immunosuppressive Agents;Inflammation;Light;Male;Mice;Nitric Oxide;Phototherapy;Skin;Spleen;Tacrolimus;Th2 Cells

"Oxygen with love" and diode laser treatment decreases comorbidity and avoidable blindness due to retinopathy of prematurity: results achieved in the past 12 years. AIM: To determine whether the "Oxygen with Love" (OWL) and diode laser treatment provided in a neonatal intensive care unit has reduced the risk of avoidable blindness caused by retinopathy of prematurity (ROP) over the past decade. MATERIALS AND METHODS: A prospective observational cohort study was performed, in which 351 infants were examined for ROP. The inclusion conditions were as follows: preterm infants, birthweight <1500Â g or <32 weeks' gestational age, and birth between 1 Jan 2000 to 31 August 2012. From mid-2009, the OWL program was implemented and the ventilation protocols for such infants were amended. We tested whether the incidence of unfavorable structural outcomes of ROP had decreased following these changes. RESULTS: From 2004 to 2012, the survival rates of younger children increased (pÂ <Â 0.003). From 2005 to 2012, laser treatment rather than cryotherapy was applied, and the incidence of unfavorable structural outcomes of ROP fell from 13% to 5.6% (not significant). From 2009 to 2012, the incidence of ROP decreased from 55% to 29% (pÂ <Â 0.002). From 1 August 2009 to 31 August 2012, there was less need for ablative treatment for premature infants, with the rate falling from 11.81% to 3.9% (pÂ <Â 0.03). This improvement was significantly associated with a reduction in the number of days of intubation (pÂ <Â 0.0017), lower rates of sepsis (pÂ <Â 0.003), and improvements in postnatal weight gain (pÂ <Â 0.0002). CONCLUSION: The introduction of the OWL program, together with lower rates of sepsis, improvements in postnatal weight gain, and the use of diode laser treatment, has reduced the incidence of unfavorable structural outcomes of ROP. Oxygen Blindness;Comorbidity;Humans;Infant, Newborn;Lasers, Semiconductor;Low-Level Light Therapy;Oxygen;Prospective Studies;Retinopathy of Prematurity;Treatment Outcome

Laser photobiomodulation as a potential multi-hallmark therapy for age-related macular degeneration. Aging;Humans;Laser Coagulation;Macular Degeneration

Assessing Health-Related Quality of Life with Antimicrobial Photodynamic Therapy (APDT) and Low Level Laser Therapy (LLLT) after Third Molar Removal. INTRODUCTION: The purpose of this study was to evaluate the antimicrobial photodynamic therapy (APDT) and low level laser therapy (LLLT) on wound healing, pain intensity, swelling problems, halitosis and the postoperative usage of analgesics after surgical removal of lower third molars. METHODS: One hundred and fifty patients, randomly divided into three groups were selected (50 per each group). The P1 group received the APDT after a third molar surgery, the P2 group received the LLLT and the C group (control group) was without any additional therapy after surgery. A photoactive substance was applied in the APDT study group before suturing. After 60 seconds the photosensitive substance was thoroughly washed with saline water and the laser light was applied in two intervals (30 seconds each). The irradiation power was 50 mW while the wavelength was 660 nm. The laser therapy in P2 group was performed before suturing and the laser light was applied also in two intervals (90 seconds each), the irradiation power was 90 mW while the wavelength was the same as in the first group - 660 nm. Postoperative follow-ups were scheduled on the third and the seventh day in patients who received laser therapy. RESULTS: The results of the postoperative evaluation showed that there was a statistically significant difference in the postoperative wound healing, pain intensity, swelling problems, halitosis and analgesics intake

between patients in all three groups (p<0.001). The patients that were subjected to APDT (P1) had the least postoperative problems. After the laser therapy (P1 and P2) wound healing was without any complications, opposite from the patients from the C group (p<0.001). Postoperative application of a laser therapy significantly reduced patient's use of analgesics over the observed period of time (p<0.001). CONCLUSION: Both modalities of laser therapy significantly reduced postoperative problems after surgical removal of third lower molars with the best results in both laser groups.

Regulation of miRNA expression by low-level laser therapy (LLLT) and photodynamic therapy (PDT). Applications of laser therapy, including low-level laser therapy (LLLT), phototherapy and photodynamic therapy (PDT), have been proven to be beneficial and relatively less invasive therapeutic modalities for numerous diseases and disease conditions. Using specific types of laser irradiation, specific cellular activities can be induced. Because multiple cellular signaling cascades are simultaneously activated in cells exposed to lasers, understanding the molecular responses within cells will aid in the development of laser therapies. In order to understand in detail the molecular mechanisms of LLLT and PDT-related responses, it will be useful to characterize the specific expression of miRNAs and proteins. Such analyses will provide an important source for new applications of laser therapy, as well as for the development of individualized treatments. Although several miRNAs should be up- or down-regulated upon stimulation by LLLT, phototherapy and PDT, very few published studies address the effect of laser therapy on miRNA expression. In this review, we focus on LLLT, phototherapy and PDT as representative laser therapies and discuss the effects of these therapies on miRNA expression. MicroRNAs Gene Expression Regulation;Low-Level Light Therapy;MicroRNAs;Photochemotherapy;Signal Transduction

Effects of temperature-dependent optical properties on the fluence rate and temperature of biological tissue during low-level laser therapy. The effects of temperature-dependent optical properties on the change of fluence rate and temperature distribution within biological tissues during low-level laser therapy (LLLT) were investigated by experimental and numerical methods. The fluence rate and temperature within a porcine skin were measured in vitro using an optical fiber sensor and a thermocouple, respectively, while irradiating the sample with a continuous wave laser (IPG Laser GmbH, Burbach, Germany, 1,064Â nm, 3.14Â W/cm(2)). The absorption and reduced scattering coefficients of porcine skin were estimated using an inverse adding-doubling algorithm from the total reflectance and transmittance measured with a double-integrating sphere. It was shown that the reduced scattering coefficient of porcine skin decreased significantly as the skin temperature increased within the range of 26-40Â Â°C. To incorporate the temperature dependency of tissue optical properties in the simulation, a mathematical model that adopted coupled equations for fluence rate and bioheat transfer was developed. It was shown that the predicted fluence rate and temperature by the proposed mathematical model agreed closely with the measured values of porcine skin. The calculation of human skin temperature using the developed model revealed that the skin temperature could be significantly underestimated if the temperature dependency of optical properties of human skin were ignored during LLLT simulation. Animals;Equipment Design;Humans;Lasers;Low-Level Light Therapy;Models, Theoretical;Skin Temperature;Swine;Temperature

Neurological and psychological applications of transcranial lasers and LEDs. Transcranial brain stimulation with low-level light/laser therapy (LLLT) is the use of directional low-power and high-fluency monochromatic or quasimonochromatic light from lasers or LEDs in the red-to-near-infrared wavelengths to modulate a neurobiological function or induce a neurotherapeutic effect in a nondestructive and non-thermal manner. The mechanism of action of LLLT is based on photon energy absorption by cytochrome oxidase, the terminal enzyme in the mitochondrial respiratory chain. Cytochrome oxidase has a key role in neuronal physiology, as it serves as an interface between

oxidative energy metabolism and cell survival signaling pathways. Cytochrome oxidase is an ideal target for cognitive enhancement, as its expression reflects the changes in metabolic capacity underlying higher-order brain functions. This review provides an update on new findings on the neurotherapeutic applications of LLLT. The photochemical mechanisms supporting its cognitive-enhancing and brain-stimulatory effects in animal models and humans are discussed. LLLT is a potential non-invasive treatment for cognitive impairment and other deficits associated with chronic neurological conditions, such as large vessel and lacunar hypoperfusion or neurodegeneration. Brain photobiomodulation with LLLT is paralleled by pharmacological effects of low-dose USP methylene blue, a non-photic electron donor with the ability to stimulate cytochrome oxidase activity, redox and free radical processes. Both interventions provide neuroprotection and cognitive enhancement by facilitating mitochondrial respiration, with hormetic dose-response effects and brain region activational specificity. This evidence supports enhancement of mitochondrial respiratory function as a generalizable therapeutic principle relevant to highly adaptable systems that are exquisitely sensitive to energy availability such as the nervous system. Electron Transport Complex IV Brain;Cognition Disorders;Electron Transport Complex IV;Hormesis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Nervous System Diseases;Neurodegenerative Diseases;Oxygen Consumption

Antimicrobial action of minocycline microspheres versus 810-nm diode laser on human dental plaque microcosm biofilms. BACKGROUND: The purpose of this study is to investigate the antimicrobial effects of minocycline hydrochloride microspheres versus infrared light at 810 nm from a diode laser on multispecies oral biofilms in vitro. These biofilms were grown from dental plaque inoculum (oral microcosms) and were obtained from six systemically healthy individuals with generalized chronic periodontitis. METHODS: Multispecies biofilms were derived using supra- and subgingival plaque samples from mesio-buccal aspects of premolars and molars exhibiting probing depths in the 4- to 5-mm range and 1- to 2-mm attachment loss. Biofilms were developed anaerobically on blood agar surfaces in 96-well plates using a growth medium of prereduced, anaerobically sterilized brain-heart infusion with 2% horse serum. Minocycline HCl 1 mg microspheres were applied on biofilms on days 2 and 5 of their development. Biofilms were also exposed on days 2 and 5 of their growth to 810-nm light for 30 seconds using a power of 0.8 W in a continuous-wave mode. The susceptibility of microorganisms to minocycline or infrared light was evaluated by a colony-forming assay and DNA probe analysis at different time points. RESULTS: At all time points of survival assessment, minocycline was more effective (>2 log10 colony-forming unit reduction) than light treatment ($P < 0.002$). Microbial analysis did not reveal susceptibility of certain dental plaque pathogens to light, and it was not possible after treatment with minocycline due to lack of bacterial growth. CONCLUSION: The cumulative action of minocycline microspheres on multispecies oral biofilms in vitro led to enhanced killing of microorganisms, whereas a single exposure of light at 810 nm exhibited minimal and non-selective antimicrobial effects. Anti-Bacterial Agents;Polylactic Acid-Polyglycolic Acid Copolymer;Polyglycolic Acid;Lactic Acid;Minocycline Anti-Bacterial Agents;Bacterial Load;Bacteriological Techniques;Biofilms;Chronic Periodontitis;Dental Plaque;Female;Humans;Lactic Acid;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microspheres;Middle Aged;Minocycline;Periodontal Attachment Loss;Periodontal Pocket;Polyglycolic Acid;Polylactic Acid-Polyglycolic Acid Copolymer

Activated ERK/FOXM1 pathway by low-power laser irradiation inhibits UVB-induced senescence through down-regulating p21 expression. Cellular senescence is a growth-arrest program that limits cell proliferation. Low-power laser irradiation (LPLI) has been demonstrated to promote cell proliferation. However, whether LPLI can inhibit cellular senescence remains unknown. In the present study, to investigate the functional role of LPLI against skin aging, we used ultraviolet radiation b

(UVB) to induce cell senescence. We first report that LPLI can delay UVB-induced cell senescence. The senescence-associated Î²-galactosidase (SA-Î²-Gal) activity and p21 expression, hallmarks of senescent cells, were decreased in the Forkhead box transcription factor FOXM1-dependent manner under treatment with LPLI. The effect of LPLI was further enhanced with an overexpression of FOXM1, and abolished when FOXM1 was knockdown with short hairpin RNA (shRNA). Furthermore, LPLI activated the extracellular regulated protein kinases (ERK) that was upstream of FOXM1. This led to FOXM1 phosphorylation and nuclear translocation. Nuclear translocation enhanced FOXM1 transcriptional activity and promoted its downstream target gene c-Myc expression that could inhibit p21 expression. These findings highlight the protective effects of ERK/FOXM1 pathway against UVB-induced cell senescence, suggesting a potential protecting strategy for treating skin aging by LPLI. Forkhead Box Protein M1;Forkhead Transcription Factors;Foxm1 protein, mouse Adult;Animals;Apoptosis;Cell Proliferation;Cellular Senescence;Fibroblasts;Forkhead Box Protein M1;Forkhead Transcription Factors;Humans;Low-Level Light Therapy;MAP Kinase Signaling System;Mice;NIH 3T3 Cells;Phosphorylation;Skin Aging;Ultraviolet Rays

A pilot randomized trial evaluating low-level laser therapy as an alternative treatment to manual lymphatic drainage for breast cancer-related lymphedema. PURPOSE/OBJECTIVES: To examine the impact of advanced practice nurse (APN)-administered low-level laser therapy (LLLT) as both a stand-alone and complementary treatment for arm volume, symptoms, and quality of life (QOL) in women with breast cancer-related lymphedema. DESIGN: A three-group, pilot, randomized clinical trial. SETTING: A private rehabilitation practice in the southeastern United States. SAMPLE: 46 breast cancer survivors with treatment-related lymphedema. METHODS: Patients were screened for eligibility and then randomized to either manual lymphatic drainage (MLD) for 40 minutes, LLLT for 20 minutes, or 20 minutes of MLD followed by 20 minutes of LLLT. Compression bandaging was applied after each treatment. Data were collected pretreatment, daily, weekly, and at the end of treatment. MAIN RESEARCH VARIABLES: Independent variables consisted of three types of APN-administered lymphedema treatment. Outcome variables included limb volume, extracellular fluid, psychological and physical symptoms, and QOL. FINDINGS: No statistically significant between-group differences were found in volume reduction; however, all groups had clinically and statistically significant reduction in volume. No group differences were noted in psychological and physical symptoms or QOL; however, treatment-related improvements were noted in symptom burden within all groups. Skin improvement was noted in each group that received LLLT. CONCLUSIONS: LLLT with bandaging may offer a time-saving therapeutic option to conventional MLD. Alternatively, compression bandaging alone could account for the demonstrated volume reduction. IMPLICATIONS FOR NURSING: APNs can effectively treat lymphedema. APNs in private healthcare practices can serve as valuable research collaborators. KNOWLEDGE TRANSLATION: Lasers may provide effective, less burdensome treatment for lymphedema. APNs with lymphedema certification can effectively treat this patient population with the use of LLLT. In addition, bioelectrical impedance and tape measurements can be used to assess lymphedema. Aged;Bandages;Breast Neoplasms;Drainage;Female;Humans;Low-Level Light Therapy;Lymphedema;Middle Aged;Musculoskeletal Manipulations;Oncology Nursing;Pilot Projects;Psychological Tests;Quality of Life;Treatment Outcome

Effect of low level laser therapy on dental pulp during orthodontic movement. AIM: To validate the protocol described here to be used in future clinical trials related to the effect of laser therapy on dental pulp. METHODS: Histologically treated samples from eight human healthy premolar teeth obtained from the middle root level were distributed in four groups: group 1 (G1) absolute control; group 2 (G2) only laser irradiation; group 3 (G3) exposed only to orthodontics; and group 4 (G4) treated with orthodontics and laser. Laser treatment was performed at 830 nm wavelength, 100 mW

(energy 80 J/cm(2), 2.2 J), for 22 s in the vestibular surface and 22 s in the palatal surface, 1 mm away from the dental root mucosa. Three staining methods were performed: hematoxylin-eosin (HE), Masson's Trichrome method and Gomori's method. RESULTS: The pulp histology parameters were evaluated and the results classified in to 3 parts: an inflammatory response, soft tissue response (dental pulp) and hard tissue response (dentin and predentin). There was no inflammation (chronic or acute) in any of the evaluated groups. The zones of pulp necrosis were found in one premolar of G3 and in one of G4; in groups G2 and G4 there was higher angiogenesis than in the other two groups. G4 group presented the highest level of vascularization. A reduced nerve density was observed in G3. A G2 specimen showed increased nerve density. A higher rate of calcification was observed in G1 compared to G2. Denticles, either real or false, were observed in G1, G2 and G3. Sclerosis of dentin and focal dentin loss was observed among all the groups. Secondary dentin was present in one sample in G1 and G2. A necrosis zone was found in one sample of G3 and G4. No differences between groups were observed in the odontoblast irregularity layer but the layer was wider in the group treated with laser only. A notable difference was detected in reduction of the cell-free layer between the groups G1 and G4. The findings in pulp tissue favor its adaptative response against dental movement induced by orthodontics. No definitive conclusions may be derived as this is a pilot study. CONCLUSION: The protocol described here was shown to be an effective method to evaluate changes in dental pulp submitted to low level laser in teeth under orthodontic movement.

Does low intensity laser therapy reduce pain and change orofacial myofunctional conditions? Due to its multifactorial pain aspects, combined therapies are required for the the comprehensive management of temporomandibular joint disorders (TMD). Interdisciplinary forms of therapies, such as laser therapy, and health care or medical professionals, such as speech therapists, have been proposed for this comprehensive management. The aims of this study were the following: 1. verify whether low-intensity laser therapy would promote significant pain remission; 2. evaluate whether this changes orofacial myofunctional conditions in the sample, as tested, using the Orofacial Myofunctional Evaluation with Scores (OMES); and 3. evaluate whether or not the pain improvement would remain stable after a 30-day follow-up for pain conditions. The study included 12 female volunteers diagnosed with myofascial pain and ages ranging from 18 to 60 years old, with or without intra-articular TMD, according to axis I of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). Participants were assessed for pain on palpation, using a visual analogue scale (VAS), before treatment (A1), immediately after 30 days of intervention, i.e, after eight sessions of Low Intensity Laser Therapy (LILT) (A2), and 30 days after the end of the treatment with LILT (A3) (follow-up). Comparing the three evaluation times, it was observed that there was a significant decrease in the values of subjective pain to palpation ($p < 0.05$). The initial pain (A1) differed significantly from the A2, but did not differ significantly from A3.
Adolescent;Adult;Deglutition;Facial Pain;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Masseter Muscle;Mastication;Middle Aged;Pain Measurement;Palpation;Range of Motion, Articular;Respiration;Temporal Muscle;Temporomandibular Joint Disorders;Temporomandibular Joint Dysfunction Syndrome;Young Adult

Confocal laser scanning microscopy and optical coherence tomography for the evaluation of the kinetics and quantification of wound healing after fractional laser therapy. BACKGROUND: Information on the course of wound healing after fractional carbon-dioxide laser therapy has so far been gathered by histopathology. Confocal laser scanning microscopy (CLSM) and optical coherence tomography (OCT) allow the visualization of the upper layers of the skin inÂ vivo over time. OBJECTIVE: The aim of this study was to determine whether CLSM and OCT can be used to quantify the kinetics of the dynamic wound-healing process. METHODS: Twenty healthy probands were

treated with fractional carbon-dioxide laser with 8- and 16-W laser power, respectively. Optical follow-ups using CLSM and OCT were performed right after laser application and during the next 3 weeks. RESULTS: Although wound healing seems to be completed after day 7 to 14 clinically, on day 21 in 89.5% of the 8 W-treated areas and in 100% of the 16 W-treated areas subepidermal skin damage was still visible using CLSM and OCT imaging. LIMITATIONS: The maximal penetration depth of CLSM is limited to the papillary dermis, whereas OCT can visualize deeper but with lower resolution. CONCLUSION: InÂ vivo CLSM and OCT are able to visualize changes after fractional laser treatment noninvasively. They allow especially the detection and quantification of substance defects and thereby help to elucidate the therapeutic effects. Adult;Biopsy, Needle;Female;Healthy Volunteers;Humans;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Male;Microscopy, Confocal;Middle Aged;Reference Values;Sampling Studies;Skin;Statistics, Nonparametric;Tomography, Optical Coherence;Wound Healing;Young Adult

Clinical efficacy of the dual-pulsed Q-switched neodymium:yttrium-aluminum-garnet laser: Comparison with conservative mode. The quality (Q)-switched neodymium:yttrium-aluminum-garnet (Nd:YAG) laser is one of the first non-ablative lasers to be used for facial resurfacing and photorejuvenation. Recently, the method of low-fluence Q-switched Nd:YAG lasers known as 'laser toning' has been used for non-ablative skin rejuvenation and for the treatment of melasma in Asian countries. We report our experience of using a novel Q-switched Nd:YAG laser that was operated as a dual pulse at half fluence and 140-Î¼s intervals compared with conservative mode laser. Adult;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Young Adult

The effects of low-level laser therapy on palatal mucoperiosteal wound healing and oxidative stress status in experimental diabetic rats. OBJECTIVE: The biostimulation effects of low-level laser therapy (LLLT) have recently been demonstrated. In this study, we aimed to investigate the effects of LLLT on palatal mucoperiostal wound healing and oxidative stress status in experimental diabetic rats. MATERIALS AND METHODS: Forty-two male Wistar rats that weighed 250-300â€‰g were used in this study. Experimental diabetes was induced in all of the rats using streptozotocin. A standardized full thickness wound was made in the mucoperiosteum of the hard palates of the rats using a 3â€‰mm biopsy punch. The rats were divided into groups: 1 (control group, non- irradiated), and 2 (experimental group, irradiated). Treatment using a GaAlAs laser at a wavelength of 940â€‰nm and at dose of 10â€‰J/cm(2) began after surgery, and was repeated on the 2nd, 4th, and 6th days post-surgery. Seven animals from each group were killed on the 7th, 14th, and 21st day after surgery. Biopsies were performed for the histological analysis and blood samples were collected by cardiac puncture for biochemical analysis. RESULTS: The histopathological findings revealed reduced numbers of inflammatory cells, and increased mitotic activity of fibroblasts, collagen synthesis, and vascularization in rats in group 2. The total oxidative status was significantly decreased in the laser-treated group on the 21st day. CONCLUSIONS: LLLT elicits a positive healing effect on palatal mucoperiostal wounds, and modulates the oxidative status in experimental diabetic rats. Animals;Diabetes Mellitus, Experimental;Low-Level Light Therapy;Male;Mouth Mucosa;Oxidative Stress;Palate;Periosteum;Rats;Rats, Wistar;Wound Healing

Low-power laser irradiation promotes the proliferation and osteogenic differentiation of human periodontal ligament cells via cyclic adenosine monophosphate. Retaining or improving periodontal ligament (PDL) function is crucial for restoring periodontal defects. The aim of this study was to evaluate the physiological effects of low-power laser irradiation (LPLI) on the proliferation and osteogenic differentiation of human PDL (hPDL) cells. Cultured hPDL cells were irradiated (660 nm) daily with doses of 0, 1, 2 or 4 Jâ‹…cm(-2). Cell proliferation was evaluated by the 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay, and the effect of LPLI on osteogenic differentiation was assessed by Alizarin Red S staining and alkaline phosphatase (ALP)

activity. Additionally, osteogenic marker gene expression was confirmed by real-time reverse transcription-polymerase chain reaction (RT-PCR). Our data showed that LPLI at a dose of 2 Jâ‹…cm(-2) significantly promoted hPDL cell proliferation at days 3 and 5. In addition, LPLI at energy doses of 2 and 4 Jâ‹…cm(-2) showed potential osteogenic capacity, as it stimulated ALP activity, calcium deposition, and osteogenic gene expression. We also showed that cyclic adenosine monophosphate (cAMP) is a critical regulator of the LPLI-mediated effects on hPDL cells. This study shows that LPLI can promote the proliferation and osteogenic differentiation of hPDL cells. These results suggest the potential use of LPLI in clinical applications for periodontal tissue regeneration. Adenylyl Cyclase Inhibitors;Anthraquinones;BMP2 protein, human;Bone Morphogenetic Protein 2;Coloring Agents;Core Binding Factor Alpha 1 Subunit;RUNX2 protein, human;Tetrazolium Salts;Thiazoles;Osteocalcin;Alizarin Red S;Cyclic AMP;L-Lactate Dehydrogenase;Alkaline Phosphatase;thiazolyl blue;Adenine;Calcium Adenine;Adenylyl Cyclase Inhibitors;Alkaline Phosphatase;Anthraquinones;Bone Morphogenetic Protein 2;Calcium;Cell Culture Techniques;Cell Differentiation;Cell Line;Cell Proliferation;Coloring Agents;Core Binding Factor Alpha 1 Subunit;Cyclic AMP;Gene Expression;Humans;L-Lactate Dehydrogenase;Lasers, Semiconductor;Low-Level Light Therapy;Osteocalcin;Osteogenesis;Periodontal Ligament;Radiation Dosage;Real-Time Polymerase Chain Reaction;Reverse Transcriptase Polymerase Chain Reaction;Tetrazolium Salts;Thiazoles

Foot orgasm syndrome: a case report in a woman. INTRODUCTION: Spontaneous orgasm triggered from inside the foot has so far not been reported in medical literature. AIMS: The study aims to report orgasmic feelings in the left foot of a woman. METHODS: A woman presented with complaints of undesired orgasmic sensations originating in her left foot. In-depth interview, physical examination, sensory testing, magnetic resonance imaging (MRI-scan), electromyography (EMG), transcutaneous electrical nerve stimulation (TENS), and blockade of the left S1 dorsal root ganglion were performed. MAIN OUTCOME MEASURES: The main outcomes are description of this clinical syndrome, results of TENS application, and S1 dorsal root ganglion blockade. RESULTS: Subtle attenuation of sensory amplitudes of the left suralis, and the left medial and lateral plantar nerve tracts was found at EMG. MRI-scan disclosed no foot abnormalities. TENS at the left metatarso-phalangeal joint-III of the left foot elicited an instant orgasmic sensation that radiated from plantar toward the vagina. TENS applied to the left side of the vagina elicited an orgasm that radiated to the left foot. Diagnostic blockade of the left S1 dorsal root ganglion with 0.8â€‰mL bupivacaine 0.25â€‰mg attenuated the frequency and intensity of orgasmic sensation in the left foot with 50% and 80%, respectively. Additional therapeutic blockade of the same ganglion with 0.8â€‰mL bupivacaine 0.50â€‰mg combined with pulsed radiofrequency treatment resulted in a complete disappearance of the foot-induced orgasmic sensations. CONCLUSION: Foot orgasm syndrome (FOS) is descibed in a woman. Blockade of the left S1 dorsal root ganglion alleviated FOS. It is hypothesized that FOS, occurring 1.5 years after an intensive care emergency, was caused by partial nerve regeneration (axonotmesis), after which afferent (C-fiber) information from a small reinnervated skin area of the left foot and afferent somatic and autonomous (visceral) information from the vagina on at least S1 spinal level is misinterpreted by the brain as being solely information originating from the vagina. Electromyography;Female;Foot;Ganglia, Spinal;Humans;Magnetic Resonance Imaging;Middle Aged;Nerve Block;Orgasm;Syndrome;Transcutaneous Electric Nerve Stimulation

3D viability imaging of tumor phantoms treated with single-walled carbon nanohorns and photothermal therapy. A new image analysis method called the spatial phantom evaluation of cellular thermal response in layers (SPECTRL) is presented for assessing spatial viability response to nanoparticle enhanced photothermal therapy in tissue representative phantoms. Sodium alginate phantoms seeded with MDA-MB-231 breast cancer cells and single-walled nanohorns were laser irradiated with an ytterbium fiber laser at a wavelength of 1064Â nm and irradiance of 3.8Â WÂ cm(-

2) for 10-80Â s. SPECTRL quantitatively assessed and correlated 3D viability with spatiotemporal temperature. Based on this analysis, kill and transition zones increased from 3.7Â mm(3) and 13Â mm(3) respectively to 44.5Â mm(3) and 44.3Â mm(3) as duration was increased from 10 to 80Â s. SPECTRL provides a quantitative tool for measuring precise spatial treatment regions, providing information necessary to tailor therapy protocols. Alginates;Hexuronic Acids;Carbon;Glucuronic Acid Alginates;Carbon;Cell Line, Tumor;Cell Survival;Diagnostic Imaging;Glucuronic Acid;Hexuronic Acids;Humans;Low-Level Light Therapy;Nanostructures;Neoplasms;Phantoms, Imaging;Temperature

The combination treatment using COâ,, laser and photodynamic therapy for HIV seropositive men with intraanal warts. BACKGROUND: We evaluate the effectiveness of combination treatment using photodynamic therapy after carbon dioxide laser in preventing the recurrence of condylomata acuminata for intraanal warts in HIV positive homosexual men. A retrospective survey of 41 patients referred to the STD clinic of the Fourth People's Hospital of Shenzhen for the treatment of intraanal warts among HIV positive homosexual men between Janurary 2009 and September 2011. METHODS: The patients who accepted COâ,, laser monotherapy for the same diagnosis were used as the comparison group. After the confirmation of the diagnosis of HIV infection and intraanal warts, the patients were treated with the combination treatment using PDT with 5-ALA thermal gel immediately after COâ,, laser ablation of the warts. PDT was performed with irradiation of 100 J/cmÂ² at an irradiance of 100-150 mW/cmÂ² with a semiconductor laser, wavelength 635 nm. PDT therapy was repeated twice with 2 weekly intervals. Follow up examinations including an anoscopy every 4 weeks after the latest PDT. RESULTS: After 3 cycles of PDT treatments, 39 cases of anoscopy examination showed no new or recurrent lesions. At the end of the sixth months, recurrence occurred in 12(29%) cases. HPV 11 was present in 6 (50%) of these recurrences. HPV 6/11 or 16/18 remains positive in 19 cases (46.3%) and HPV negative in 22 cases. CONCLUSIONS: The combination treatment with COâ,, laser and PDT is much more effective in reducing the treatment cycles and the time intervals of the whole treatment for intraanal warts in HIV infected people. Photosensitizing Agents;Aminolevulinic Acid Adolescent;Adult;Aminolevulinic Acid;Anus Diseases;Combined Modality Therapy;HIV Seropositivity;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Retrospective Studies;Treatment Outcome;Warts;Young Adult

Photobiomodulation of surgical wound dehiscence in a diabetic individual by low-level laser therapy following median sternotomy. In this single case study, we attempt to outline the possible effect of low-level laser therapy (LLLT) on delayed wound healing and pain in chronic dehiscent sternotomy of a diabetic individual. The methods that were employed to evaluate changes pre and post irradiation were wound photography, wound area measurement, pressure ulcer scale of healing (PUSH), and visual analogue scale (VAS) for pain. After irradiation, proliferation of healthy granulation tissue was observed with decrease in scores of PUSH for sternal dehiscence and VAS for bilateral shoulders and sternal dehiscence. We found that LLLT irradiation could be a novel method of treatment for chronic sternal dehiscence following coronary artery bypass grafting, as it augments wound healing with an early closure of the wound deficit. Hence, this might be translated into an early functional rehabilitation and decreased pain perception of an individual following surgical complication.

Temperature changes in the pulpal chamber and the sealing performance of various methods of direct pulp capping of primary teeth. AIM: To compare changes in pulpal chamber temperature during the visible-light curing of direct pulp capping compounds and various modes of diode laser irradiation without prior placement of a pulp capping compound and the resultant seals. MATERIALS AND METHODS: Pulp exposure holes were made in 100 extracted human primary first molars, which

were randomly assigned to ten equal groups. The holes were sealed by (a= Group 1, 2, 3, 4, 5, 6 and 7) different pulp capping compounds which were cured using various types of visible-light curing units or (b=Group 8, 9 and 10) diode laser irradiation without prior application of a pulp capping compound. Pulpal chamber temperatures were recorded during the procedure, and the resultant seals were examined under a scanning electron microscope. RESULTS: Visible-light curing of the pulp capping compounds and diode laser irradiation at a 0.7 W output power can cause non-injurious temperature rises in the pulpal chamber. At higher output powers of the diode laser, the temperature rises are sufficient to cause thermal injury. The seals were complete when pulp capping compounds were used for direct pulp capping, but were incomplete when laser irradiation without prior placement of a pulp capping compound was used for the identical purpose. CONCLUSION: The visible-light curing of pulp capping compounds is not harmful to vital pulp, and provides an effective seal of the pulp exposure hole. Laser irradiation is not an effective sealant, and can cause thermal injury to vital pulp at high output powers. Dentin-Bonding Agents;Methacrylates;Pulp Capping and Pulpectomy Agents;futurabond NR;Calcium Hydroxide Body Temperature;Calcium Hydroxide;Curing Lights, Dental;Dental Bonding;Dental Pulp Capping;Dental Pulp Cavity;Dental Pulp Exposure;Dentin-Bonding Agents;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Methacrylates;Microscopy, Electron, Scanning;Molar;Pulp Capping and Pulpectomy Agents;Radiation Dosage;Surface Properties;Thermometers;Tooth, Deciduous

Effect of laser phototherapy in the prevention and treatment of chemo-induced mucositis in hamsters. The aim of this study was to investigate the effect of laser phototherapy (LPT) in the prevention and/or treatment of oral mucositis induced by 5-fluorouracil (5-FU; Eurofarma, SÃ£o Paulo, Brazil) in hamsters. Ninety-six hamsters were divided into four groups (n=24): Control (no treatment); Preventive [LPT from day (D) D-5 to D+5]; Therapeutic (LPT from D+5 to D+15); and Combined (preventive plus therapeutic LPT from D-5 to D+15). The animals received an intraperitoneal injection of 5-FU on Days 0 and 2. The pouch mucosa was scratched on Days 3 and 4. The irradiation parameters were: indium-gallium-aluminum-phosphide (InGaAlP) diode laser (MM Optics, SÃ£o Carlos, Brazil) (660 nm), beam area of 0.036 cm2, 40 mW, 1.11 W/cm2, 6.6 J/cm2, power density applied daily of 39.6 J/cm2, in punctual mode (six points and six seconds per point) and contact mode, one application per day. The animals were sacrificed on Days 0, 5, 10 and 15 (n=6) and weighed, and the pouch mucosa was removed for histopathological analysis. Clinical and corresponding histological scores were compared using ANOVA and Tukey's test (pâ‰¤0.05). Similar weight losses ranging from 5% to 10% occurred in all groups. The therapeutic group had significantly lower clinical and histological scores than the other groups at Day 10. This study showed that positive effects on oral mucositis management were obtained only when LPT was applied in the therapeutic protocol (from D+5 to D+15 after chemotherapy). Antimetabolites, Antineoplastic;Fluorouracil Animals;Antimetabolites, Antineoplastic;Cricetinae;Fluorouracil;Low-Level Light Therapy;Male;Random Allocation;Reproducibility of Results;Severity of Illness Index;Stomatitis;Time Factors;Treatment Outcome

Low intensity laser therapy accelerates muscle regeneration in aged rats. BACKGROUND: Elderly people suffer from skeletal muscle disorders that undermine their daily activity and quality of life; some of these problems can be listed as but not limited to: sarcopenia, changes in central and peripheral nervous system, blood hypoperfusion, regenerative changes contributing to atrophy, and muscle weakness. Determination, proliferation and differentiation of satellite cells in the regenerative process are regulated by specific transcription factors, known as myogenic regulatory factors (MRFs). In the elderly, the activation of MRFs is inefficient which hampers the regenerative process. Recent studies found that low intensity laser therapy (LILT) has a stimulatory effect in the muscle regeneration process. However, the effects of this therapy when associated with aging are still

unknown. OBJECTIVE: This study aimed to evaluate the effects of LILT (Î»=830 nm) on the tibialis anterior (TA) muscle of aged rats. SUBJECTS AND METHODS: The total of 56 male Wistar rats formed two population sets: old and young, with 28 animals in each set. Each of these sets were randomly divided into four groups of young rats (3 months of age) with n=7 per group and four groups of aged rats (10 months of age) with n=7 per group. These groups were submitted to cryoinjury + laser irradiation, cryoinjury only, laser irradiation only and the control group (no cryoinjury/no laser irradiation). The laser treatment was performed for 5 consecutive days. The first laser application was done 24 h after the injury (on day 2) and on the seventh day, the TA muscle was dissected and removed under anesthesia. After this the animals were euthanized. Histological analyses with toluidine blue as well as hematoxylin-eosin staining (for counting the blood capillaries) were performed for the lesion areas. In addition, MyoD and VEGF mRNA was assessed by quantitative polymerase chain reaction. RESULTS: The results showed significant elevation ($p<0.05$) in MyoD and VEGF genes expression levels. Moreover, capillary blood count was more prominent in elderly rats in laser irradiated groups when compared to young animals. CONCLUSION: In conclusion, LILT increased the maturation of satellite cells into myoblasts and myotubes, enhancing the regenerative process of aged rats irradiated with laser.

Low-level laser therapy for fat layer reduction: a comprehensive review. BACKGROUND AND OBJECTIVE: Low-level laser (light) therapy (LLLT) is a noninvasive, nonthermal approach to disorders requiring reduction of pain and inflammation and stimulation of healing and tissue regeneration. Within the last decade, LLLT started being investigated as an adjuvant to liposuction, for noninvasive body contouring, reduction of cellulite, and improvement of blood lipid profile. LLLT may also aid autologous fat transfer procedures by enhancing the viability of adipocytes. However the underlying mechanism of actions for such effects still seems to be unclear. It is important, therefore, to understand the potential efficacy and proposed mechanism of actions of this new procedure for fat reduction. MATERIALS AND METHODS: A review of the literature associated with applications of LLLT related to fat layer reduction was performed to evaluate the findings from pre-clinical and clinical studies with respect to the mechanism of action, efficacy, and safety. RESULTS: The studies as of today suggest that LLLT has a potential to be used in fat and cellulite reduction as well as in improvement of blood lipid profile without any significant side effects. One of the main proposed mechanism of actions is based upon production of transient pores in adipocytes, allowing lipids to leak out. Another is through activation of the complement cascade which could cause induction of adipocyte apoptosis and subsequent release of lipids. CONCLUSION: Although the present studies have demonstrated safety and efficacy of LLLT in fat layer reduction, studies demonstrating the efficacy of LLLT as a stand-alone procedure are still inadequate. Moreover, further studies are necessary to identify the mechanism of action. Biomarkers;Triglycerides;Cholesterol Biomarkers;Cholesterol;Cosmetic Techniques;Humans;Lasers, Semiconductor;Lasers, Solid-State;Lipectomy;Low-Level Light Therapy;Overweight;Subcutaneous Fat;Triglycerides

Laser therapy and needling in myofascial trigger point deactivation. The aim of this study was to evaluate different approaches to deactivating myofascial trigger points (MTPs). Twenty-one women with bilateral MTPs in the masseter muscle were randomly divided into three groups: laser therapy, needle treatment and control. Treatment effectiveness was evaluated after four sessions with intervals ranging between 48 and 72 h. Quantitative and qualitative methods were used to measure pain perception/sensation. The Wilcoxon test based on results expressed on a visual analog scale (VAS) demonstrated a significant ($P < 0.05$) decrease in pain only in the laser and needle treatments groups, although a significant increase in the pressure pain threshold was evident only for needling with anesthetic injection ($P = 0.0469$), and laser therapy at a dose of 4 J/cmÂ² ($P = 0.0156$). Based on these results, it was concluded that four sessions of needling with 2% lidocaine injection with

intervals between 48 and 72 h without a vasoconstrictor, or laser therapy at a dose of 4 J/cmÂ², are effective for deactivation of MTPs. Anesthetics, Local;Lidocaine Adult;Anesthetics, Local;Electromyography;Female;Follow-Up Studies;Humans;Injections, Intramuscular;Isometric Contraction;Lidocaine;Low-Level Light Therapy;Masseter Muscle;Middle Aged;Pain Measurement;Pain Perception;Pain Threshold;Radiotherapy Dosage;Range of Motion, Articular;Temporomandibular Joint Dysfunction Syndrome;Trigger Points;Young Adult

Subthreshold laser therapy for diabetic macular edema: metabolic and safety issues. PURPOSE: To review the most important metabolic effects and clinical safety data of subthreshold micropulse diode laser (D-MPL) in diabetic macular edema (DME). METHODS: Review of the literature about the mechanisms of action and role of D-MPL in DME. RESULTS: The MPL treatment does not damage the retina and is selectively absorbed by the retinal pigment epithelium (RPE). MPL stimulates secretion of different protective cytokines by the RPE. No visible laser spots on the retina were noted on any fundus image modality in different studies, and there were no changes of the outer retina integrity. Mean central retinal sensitivity (RS) increased in subthreshold micropulse diode laser group compared to standard ETDRS photocoagulation group. CONCLUSIONS: MPL is a new, promising treatment option in DME, with both infrared and yellow wavelengths using the less aggressive duty cycle (5%) and fixed power parameters. It appears to be safe from morphologic and functional point of view in mild center involving DME. Diabetic Retinopathy;Humans;Low-Level Light Therapy;Macular Edema;Treatment Outcome

Acute effects of light emitting diodes therapy (LEDT) in muscle function during isometric exercise in patients with chronic obstructive pulmonary disease: preliminary results of a randomized controlled trial. Patients with chronic obstructive pulmonary disease (COPD) are susceptible to early muscle fatigue. Light-emitting diodes therapy (LEDT) has been used to minimize muscle fatigue in athletes and healthy subjects. The aim of this study is to investigate the acute effects of LEDT on muscle fatigue and perception of effort in patients with COPD during isometric endurance test of the quadriceps femoris (QF). Ten patients (VEFâ,• 50 Â± 13% of predicted) underwent a single LEDT and sham application, 48 h apart, in a randomized crossover design. The LEDT and sham were applied in three localized areas of the QF (rectus femoris, vastus lateralis, and vastus medialis). Before and after exposure to LEDT and sham, the patients performed an isometric endurance test (60 % of the maximum voluntary isometric contraction), until the limit of tolerance concomitant to surface electromyography recording (median frequency as mean outcome). The slope obtained from linear regression analysis of the median frequency (MF) over endurance time was also used as an endurance index. Endurance time increased significantly after exposure to LEDT (from 26 Â± 2 to 53 Â± 5 s) as compared to sham (from 23 Â± 3 to 30 Â± 4 s) (F = 64, P = 0.0001). A greater decline in MF was observed during isometric endurance test after sham, compared to LEDT (F = 14.6, P = 0.004). The slope of the MF over time was lower post-LEDT compared to post-sham (-0.7 Â± 0.3 vs. -1.5 Â± 0.8; P = 0.004). The dyspnea score corrected for endurance time was lower post-LEDT (P = 0.008) but similar for fatigue both post-LEDT and post-sham. A single application of LEDT minimizes muscle fatigue and increases isometric endurance time. Aged;Exercise;Female;Forced Expiratory Volume;Humans;Male;Middle Aged;Muscle Fatigue;Phototherapy;Physical Endurance;Pulmonary Disease, Chronic Obstructive;Quadriceps Muscle;Vital Capacity

Evaluation of the clinical and antimicrobial effects of the Er:YAG laser or topical gaseous ozone as adjuncts to initial periodontal therapy. OBJECTIVE: The aim of this study was to evaluate the clinical and microbiological results of treatment with the Er:YAG laser and topical gaseous ozone application as adjuncts to initial periodontal therapy in chronic periodontitis (CP) patients. BACKGROUND DATA: Although many studies have evaluated the effectiveness of the Er:YAG laser as an adjunct to initial periodontal therapy, few studies have focused on the use of gaseous ozone as an

adjunct. MATERIALS AND METHODS: Thirty patients with CP were randomly divided into three parallel groups, each composed of 10 individuals with at least four teeth having at least one approximal site with a probing depth (PD) of â‰¥5â€‰mm and a sulcus bleeding index (SBI) â‰¥2 in each quadrant. Groups of patients received: (1) Scaling and root planing (SRP)+Er:YAG laser; (2) SRP+topical gaseous ozone; or (3) SRP alone. The microbiological and clinical parameters were monitored at day 0 and day 90. RESULTS: At the end of the observation period, statistically significant improvements in clinical parameters were observed within each group. Parallel to the clinical changes, all treatments reduced the number of total bacteria and the proportion of obligately anaerobic microorganisms. Although intergroup comparisons of microbiological parameters showed no significant differences, clinical findings, including attachment gain and PD reduction, were found to be statistically significant in favor of the SRP+Er:YAG laser group. CONCLUSIONS: Although statistically nonsignificant, the fact that the obligate anaerobic change was mostly observed in the SRP+Er:YAG laser group, and a similar decrease was noted in the SRP+topical gaseous ozone group, shows that ozone has an antimicrobial effect equivalent to that of the Er:YAG laser. Oxidants, Photochemical;Ozone Adult;Aged;Combined Modality Therapy;Dental Scaling;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Oxidants, Photochemical;Ozone;Periodontal Diseases;Periodontal Pocket

The effects of 1064â€‰nm Nd:YAG laser irradiation under the different treatment conditions for skin rejuvenation: quantitative and histologic analyses. OBJECTIVE: The aim of this study was to estimate heat distributions and evaluate degrees of tissue damages histologically after transmitting therapeutic lasers to find optimum ranges for skin rejuvenation. BACKGROUND DATA: To treat skin aging, many researchers attempted to evaluate treatment effects for the different approaches. The noninvasive skin rejuvenation method was mostly employed to optimize the therapeutic effects by quantifying the laser conditions. However, current approaches produced low reliability for predicting tissue damage. METHODS: We transmitted the 1064â€‰nm Nd:YAG laser into a skin-mimicking phantom and pig skin samples according to the different fluences and spot diameters, and analyzed its internal-external temperatures. For histologic analyses, we also stained pig skin samples with hematoxylin and eosin (H&E) and compared degrees of tissue damage. The spot diameter conditions were classified into 5, 8, and 10â€‰mm, and the fluence conditions were divided into 26, 30, and 36â€‰J/cm(2). In addition, the pulse duration was set to 30â€‰ms. RESULTS: In our experiments, the conditions of a spot diameter of 5â€‰mm with a fluence of 36â€‰J/cm(2) and a spot diameter of 10â€‰mm with a fluence of 26â€‰J/cm(2) yielded the maximum surface temperatures>40Â°C. Regarding histologic evaluations, we also found that the degrees of internal thermal injuries are worsened as spot diameters and fluences increased. CONCLUSIONS: We selected the optimum treatment conditions for skin rejuvenation as being the laser condition of a spot diameter of 5â€‰mm with a fluence of 36â€‰J/cm(2) and a spot diameter of 10â€‰mm with a fluence of 26â€‰J/cm(2). Animals;Body Temperature;Lasers, Solid-State;Low-Level Light Therapy;Rejuvenation;Skin Aging;Swine

Shear bond strength of veneering ceramic to zirconia core after different surface treatments. OBJECTIVE: The aim of this study was to evaluate the effect of different surface treatments: sandblasting, liners, and different laser irradiations on shear bond strength (SBS) of pre-sintered zirconia to veneer ceramic. BACKGROUND DATA: The SBS between veneering porcelain and zirconium oxide (ZrO2) substructure was weak. Various surface treatment methods have been suggested for zirconia to obtain high bond strength to veneering porcelain. There is no study that evaluated the bond strength between veneering porcelain and the different surface treatments on pre-sintered ZrO2 substructure. METHODS: Two hundred specimens with 7â€‰mm diameter and 3â€‰mm height pre-sintered zirconia blocks were fabricated. Specimens were randomly divided into 10 groups

(n=20) according to surface treatments applied. Group C, untreated (Control); Group E, erbium:yttrium-aluminum-garnet (Er:YAG) laser irradiated; Group N, neodymium:yttrium-aluminum-garnet (Nd:YAG) laser irradiated; Group SB, sandblasted; Group L, liner applied; Group NL, Nd:YAG laser irradiated+liner applied; Group EL, Er:YAG laser irradiated+liner applied; Group SN, sandblasted+Nd:YAG laser irradiated; Group SE, sandblasted+Er:YAG laser irradiated; and Group SL, sandblasted+liner applied. The disks were then veneered with veneering porcelain. Before the experiment, specimens were steeped in 37Â°C distilled water for 24â€‰h. All specimens were thermocycled for 5000 cycles between 5Â°C and 55Â°C with a 30 sec dwell time. Shear bond strength test was performed at a crosshead speed of 1â€‰mm/min. The fractured specimens were examined under a stereomicroscope to evaluate the fracture pattern. RESULTS: Surface treatments significantly changing the topography of the yttrium-stabilized tetragonal zirconia (Y-TZP) ceramic according to scanning electron microscopic (SEM) images. The highest mean bond strength value was obtained in Group SE, and the lowest bond strength value was observed in NL group. Bond strength values of the other groups were similar to each other. CONCLUSIONS: This study shows that sandblasting+Er:YAG, sandblasting, Er:YAG+liner, sandblasting+Nd:YAG, and Er:YAG laser treatment on pre-sintered ZrO2 substructure increased the bond strength to veneering porcelain, compared with other surface treatments. After different surface treatments, there was no difference in surface roughness of pre-sintered zirconia to compare after sintering; sintering enhanced the bond strength within the limitations of present study. Dental Alloys;Resin Cements;Dental Porcelain;Zirconium;zirconium oxide Ceramics;Dental Alloys;Dental Porcelain;Dental Veneers;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Microscopy, Electron, Scanning;Resin Cements;Shear Strength;Surface Properties;Zirconium

Effects of biosilicate(Â®) scaffolds and low-level laser therapy on the process of bone healing. OBJECTIVE: This study aimed to investigate the in vivo tissue performance of the association of Biosilicate(Â®) scaffolds and low-level laser therapy (LLLT) in a tibial bone defects model in rats. BACKGROUND DATA: Many studies have been demonstrating the osteogenic potential of Biosilicate and LLLT. However, there is a need to investigate the effects of both treatments for bone consolidation. METHODS: The animals were divided into control group (CG), Biosilicate scaffold group (BG), and Biosilicate scaffolds plus LLLT group (BLG). Animals were euthanized after 15, 30, and 45 days post-injury. RESULTS: The histological analysis revealed that all the experimental groups showed inflammatory infiltrate and granulation tissue, at the area of the defect at day 15. After 30 days, CG still showed granulation tissue and bone ingrowth. Both Biosilicate groups presented newly formed bone and interconected trabeculae. At 45 days, CG showed immature newly formed bone. A more mature newly formed bone was observed in BG and BLG. On day 15, BG demonstrated a statistically higher expression of cyclooxygenase (COX)-2 compared with CG and BLG. No statistically significant difference was observed in COX-2 immunoexpression among the groups at 30 and 45 days. Similar expression of bone morphogenetic protein (BMP)-9 was demonstrated for all experimental groups at 15 and 30 days. At 45 days, the BMP-9 immunoexpression was statistically upregulated in the BLG compared with the CG and BG. No statistically significant difference was observed in the receptor activator of nuclear factor kappa-B ligand (RANKL) immunoexpression among the groups in all periods evaluated. Biosilicate groups presented a decrease in biomechanical properties compared with CG at 30 and 45 days post-surgery. CONCLUSIONS: Our findings suggest that Biosilicate presented osteogenic activity, accelerating bone repair. However, laser therapy was not able to enhance the bioactive properties of the Biosilicate. Biocompatible Materials;Growth Differentiation Factor 2;RANK Ligand;sodium oxide-calcium oxide-silicon dioxide-diphosphorus pentoxide;Cyclooxygenase 2 Animals;Biocompatible Materials;Cyclooxygenase 2;Fracture Healing;Glass;Granulation

Tissue;Growth Differentiation Factor 2;Immunohistochemistry;Low-Level Light Therapy;Male;Osteogenesis;RANK Ligand;Rats;Rats, Wistar;Tibial Fractures;Tissue Scaffolds

Laser biostimulation. Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Lymphocytes;Skin Ulcer;Wound Healing

Er:YAG laser activation of sodium hypochlorite for root canal soft tissue dissolution. BACKGROUND AND OBJECTIVE: The aim of this in vitro study was to investigate the effect of Er:YAG laser irradiation on the ability of sodium hypochlorite (NaOCl) to dissolve soft tissue during endodontic procedures. MATERIALS AND METHODS: Two acrylic glass plates, each containing a semi-canal, were bolted together to form a complete canal. This geometry permitted one semi-canal to be filled with fine liver sausage of bovine origin dyed by methylene blue and the other with NaOCl (4.00-4.99% available chlorine; Sigma-Aldrich Corporation, St. Louis, MA), which was then activated by Er:YAG laser irradiation (KEY Laser 3; KaVo, Biberach, Germany) using a plain-ended fiber tip and a range of output energy and repetition rate. To achieve relatively low output energy from high input energy, the laser beam was attenuated by placing glass slides in the beam path. The resultant images acquired were analyzed using pixel-based analysis. Samples were statistically analyzed (two-way ANOVA, Pâ€‰<â€‰0.05, univariate, bifactorial; IBM SPSS Statistics 19, SPSS Inc., Chicago, IL). RESULTS: Both output energy and repetition rate significantly influenced the tissue dissolution ability of NaOCl (Pâ€‰<â€‰0.05). CONCLUSION: Within the limitations of this in vitro study, we conclude that laser activation of NaOCl at 200â€‰mW output power leads to effective soft tissue dissolution. This finding can be of use to endodontists pursuing effective soft tissue dissolution from their irrigants. Root Canal Irrigants;Sodium Hypochlorite Animals;Cattle;Dental Pulp Cavity;Lasers, Solid-State;Low-Level Light Therapy;Models, Biological;Root Canal Irrigants;Root Canal Therapy;Sodium Hypochlorite

In-vivo occlusal caries prevention by pulsed CO2 -laser and fluoride varnish treatment--a clinical pilot study. BACKGROUND AND OBJECTIVES: High caries prevalence in occlusal pits and fissures warrants novel prevention methods. An 86% reduction in dental enamel smooth surface demineralization in-vivo following short-pulsed 9.6â€‰Âµm-CO(2) -laser irradiation was recently reported. The objective of this study was to conduct a blinded 12-month-pilot clinical trial of occlusal pit and fissure caries inhibition using the same CO(2) -laser irradiation conditions. STUDY DESIGN/MATERIALS AND METHODS: Twenty subjects, average age 14 years, were recruited. At baseline, second molars were randomized into test and control groups, assessed by International Caries Detection & Assessment System (ICDAS-II), SOPROLIFE light-induced fluorescence evaluator in daylight and blue-fluorescence mode and DIAGNOdent. An independent investigator irradiated test molars with a CO(2) -laser, wavelength 9.6â€‰Âµm, pulse-duration 20â€‰Âµs, pulse-repetition-rate 20â€‰Hz, beam diameter 800â€‰Âµm, average fluence 4.5â€‰Â±â€‰0.5â€‰J/cm(2), 20 laser pulses per spot. At 3-, 6- and 12-month recall teeth were assessed by ICDAS, SOPROLIFE and DIAGNOdent. All subjects received fluoride varnish applications at baseline and 6-month recall. RESULTS: All subjects completed the 3-month, 19 the 6-month and 16 the 12-month recall. At all recalls average ICDAS scores had decreased for the test and increased for the control fissures (laser vs. control, 3-month: -0.10â€‰Â±â€‰0.14, 0.30â€‰Â±â€‰0.18, Pâ€‰>â€‰0.05; 6-month: -0.26â€‰Â±â€‰0.13, 0.47â€‰Â±â€‰0.16, Pâ€‰=â€‰0.001; 12-month: -0.31â€‰Â±â€‰0.15, 0.75â€‰Â±â€‰0.17, Pâ€‰<â€‰0.0001; meanâ€‰Â±â€‰SE, unpaired t-test) being statistically significantly different at 6- and 12-month recalls. SOPROLIFE daylight evaluation revealed at 6- and 12-months statistically significant differences in changes between baseline and recall for test and control molars, respectively (laser vs. control, 6-month: 0.22â€‰Â±â€‰0.13, 0.17â€‰Â±â€‰0.09, Pâ€‰=â€‰0.02; 12-month: 0.28â€‰Â±â€‰0.19, 0.25â€‰Â±â€‰0.17, Pâ€‰=â€‰0.03). For SOPROLIFE blue-fluorescence evaluation mean changes in comparison to baseline for the control and

the laser treated teeth were also statistically significant for the 6- and 12-month recall. CONCLUSION: Specific microsecond short-pulsed 9.6â€‰Âµm CO(2) -laser irradiation markedly inhibits caries progression in pits and fissures in comparison to fluoride varnish alone over 12 months. Cariostatic Agents;Fluorides, Topical Adolescent;Cariostatic Agents;Cohort Studies;Combined Modality Therapy;Dental Caries;Dental Occlusion;Female;Fluorides, Topical;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Pilot Projects;Single-Blind Method;Treatment Outcome

The effectiveness of therapeutic class IV (10 W) laser treatment for epicondylitis. BACKGROUND AND OBJECTIVE: Photobiomodulation has been shown to modulate cellular protein production and stimulate tendon healing in a dose-dependent manner. Previous studies have used class IIIb lasers with power outputs of less than 0.5â€‰W. Here we evaluate a dual wavelength (980/810â€‰nm) class IV laser with a power output of 10â€‰W for the purpose of determining the efficacy of class IV laser therapy in alleviating the pain and dysfunction associated with chronic epicondylitis. METHODS: Sixteen subjects volunteered for laser therapy, or an identically appearing sham instrument in a randomized, placebo-controlled, double-blinded clinical trial. Subjects underwent clinical examination (pain, function, strength, and ultrasonic imaging) to confirm chronic tendinopathy of the extensor carpi radialis brevis tendon, followed by eight treatments of 6.6â€‰Â±â€‰1.3â€‰J/cm(2) (laser), or sham over 18 days. Safety precautions to protect against retinal exposure to the laser were followed. The exam protocol was repeated at 0, 3, 6 and 12 months post-treatment. RESULTS: No initial differences were seen between the two groups. In the laser treated group handgrip strength improved by 17â€‰Â±â€‰3%, 52â€‰Â±â€‰7%, and 66â€‰Â±â€‰6% at 3, 6, and 12 months respectively; function improved by 44â€‰Â±â€‰1%, 71â€‰Â±â€‰3%, and 82â€‰Â±â€‰2%, and pain with resistance to extension of the middle finger was reduced by 50â€‰Â±â€‰6%, 93â€‰Â±â€‰4%, and 100â€‰Â±â€‰1% at 3, 6 and 12 months, respectively. In contrast, no changes were seen until 12 months following sham treatment (12 months: strength improved by 13â€‰Â±â€‰2%, function improved by 52â€‰Â±â€‰3%, pain with resistance to extension of the middle finger reduced by 76â€‰Â±â€‰2%). No adverse effects were reported at any time. CONCLUSIONS: These findings suggest that laser therapy using the 10â€‰W class IV instrument is efficacious for the long-term relief of the symptoms associated with chronic epicondylitis. The potential for a rapidly administered, safe and effective treatment warrants further investigation. Adult;Aged;Double-Blind Method;Female;Hand Strength;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain;Recovery of Function;Tendinopathy;Tennis Elbow;Treatment Outcome

Evaluation of the efficacy of low-level light therapy using 1072 nm infrared light for the treatment of herpes simplex labialis. BACKGROUND: Recent research has shown that low-level light therapy (LLLT) using 1072 nm infrared light is effective in reducing the duration of herpes simplex labialis (HSL) episodes and enhancing the healing process. METHODS: This was a prospective, randomized, placebo-controlled, clinical trial to evaluate the efficacy of a 1072 nm light-emitting diode device for the treatment of HSL. In total, 87 patients with recurrent HSL were recruited and randomly divided into two groups. Subjects received a 3-min treatment with either 1072 nm infrared light therapy or placebo (sham) light therapy three times/day for 2 days. The devices used for both groups were identical in appearance and could not be differentiated by volunteers or researchers, and 1072 nm light is invisible to the human eye. The primary endpoint was healing time, which was taken as the time for the HSL lesions to resolve fully and for the underlying skin to become completely re-epithelialized, and the secondary endpoint was lesion crusting. RESULTS: The median time to healing for the active group was 129 h, compared with 177 h for the control group, which was significant (P = 0.01). There was no difference between the two groups for median time to lesion crusting (P = 0.66). CONCLUSIONS: Compared with placebo treatment, the treatment of HSL lesions with 1072 nm

infrared light significantly reduced healing time. Adult;Aged;Female;Herpes Labialis;Humans;Infrared Rays;Male;Middle Aged;Phototherapy;Prospective Studies;Wound Healing;Young Adult

The use of low level laser therapy in the treatment of temporomandibular joint disorders. Review of the literature. INTRODUCTION: The temporomandibular disorders (TMDs) have been identified as the most important cause of pain in the facial region. The low level laser therapy (LLLT) has demonstrated to have an analgesic, anti-inflammatory and biostimulating effects. The LLLT is a noninvasive, quick and safe, non-pharmaceutical intervention that may be beneficial for patients with TMDs. However the clinical efficiency of LLLT in the treatment of this kind of disorders is controversial. OBJECTIVES: Literature review in reference to the use of LLLT in the treatment of TMDs, considering the scientific evidence level of the published studies. MATERIAL AND METHODS: A MEDLINE and COCHRANE database search was made for articles. The keywords used were "temporomandibular disorders" and "low level laser therapy" or "phototherapy" and by means of the Boolean operator "AND". The search provided a bank of 35 articles, and 16 relevant articles were selected to this review. These articles were critically analyzed and classified according to their level of scientific evidence. This analysis produced 3 literature review articles and 13 are clinical trials. The SORT criteria (Strength of Recommendation Taxonomy) was used to classify the articles. RESULTS: Only one article presented an evidence level 1, twelve presented an evidence level 2, and three presented an evidence level 3. According to the principle of evidence-based dentistry, currently there is a scientific evidence level B in favor of using LLLT for treatment of TMDs. DISCUSSION AND CONCLUSIONS: Publications on the use of LLLT for treatment of TMDs are limited making difficult to compare the different studies due to the great variability of the studied variables and the selected laser parameters. The great majority of the studies concluded that the results should be taken with caution due to the methodological limitations. Humans;Low-Level Light Therapy;Temporomandibular Joint Disorders

The Effects of 830 nm Light-Emitting Diode Therapy on Acute Herpes Zoster Ophthalmicus: A Pilot Study. BACKGROUND: Skin lesions and pain are the most distinctive features of herpes zoster. Light-emitting diode (LED) therapy is an effective treatment known for its wound-healing effects. OBJECTIVE: To determine whether the LED treatment affects wound healing and acute pain in acute herpes zoster ophthalmicus. METHODS: We recruited 28 consecutive Korean patients with acute herpes zoster ophthalmicus for the study. In the control group (group A), 14 subjects received oral famcyclovir. In the experimental group (group B), 14 subjects received oral famcyclovir and 830 nm LED phototherapy on days 0, 4, 7, and 10. In order to estimate the time for wound healing, we measured the duration from the vesicle formation to when the lesion crust fell off. The visual analogue scale (VAS) was used for the estimation of pain on days 4, 7, 10, and 14. RESULTS: The mean time required for wound healing was 13.14Â±2.34 days in group B and 15.92Â±2.55 days in group A (p=0.006). From day 4, the mean VAS score showed a greater improvement in group B, compared with group A. A marginal but not statistically significant difference in the VAS scores was observed between the two groups (p=0.095). CONCLUSION: LED treatment for acute herpes zoster ophthalmicus leads to faster wound healing and a lower pain score.

Effects of early and delayed laser application on nerve regeneration. The aim of this study is to analyze the differences between early and delayed use of low-level laser therapy (LLLT) in functional and morphological recovery of the peripheral nerve. Thirty male Wistar rats were divided into three groups after the sciatic nerve was crushed: (1) control group without laser treatment, (2) early group with laser treatment started immediately after surgery and lasted 14 days, and (3) delayed group with laser treatment starting on the postoperative day 7 and lasted until day 21. A 650-nm diode laser (model: DH650-24-3(5), Huanic, China) with an output power of 25 mW exposed

transcutaneously at three equidistant points on the surgical mark corresponding to the crushed nerve. The length of the laser application was calculated as 57 s to satisfy approximately 10 J/cm(2). A Sciatic Functional Index (SFI) was used to evaluate functional improvement in groups at pre- and post-surgery (on days 7, 14, and 21). Compound action potential (CAP) was measured after the sacrifice and histological examination was performed for all groups. SFI results showed that there was no significant difference between groups at different days ($p > 0.05$). On the other hand, the latency of CAP decreased significantly ($p < 0.05$) in the delayed group. Histological examination confirmed that the number of mononuclear cells was lower ($p < 0.05$) in both early and delayed groups. In conclusion, results supported the hypothesis that LLLT could accelerate the rate of recovery of injured peripheral nerves in this animal model. Though both laser groups had positive outcomes, delayed group showed better recovery. Action Potentials;Animals;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nerve Regeneration;Neural Conduction;Rats;Rats, Wistar;Sciatic Nerve;Time Factors

Effect of infrared laser in the prevention and treatment of paresthesia in orthognathic surgery. Orthognathic surgery is the surgical procedure that makes correcting deformities of the bones in the region of the maxilla and mandible a reality in the Brazilian dentistry. However, this type of surgery usually involves paresthesia in the postoperative period, concerning the surgeons who perform them and generating discomfort to patients. This study aimed at evaluating the effect of infrared laser (830 nm) in the prevention and treatment of paresthesias after orthognathic surgery. Six patients underwent orthognathic surgery: the experimental group composed of 4 patients and the control group that did not receive laser therapy composed of 2 patients. The experimental group received laser applications during the transoperative and 12 postoperative sessions. Tests for mechanical (deep and shallow) and thermal (cold) sensitivity were performed in the preoperative and postoperative period (during 12 sessions) in the lip and chin areas by the same operator. The paresthesia was classified into 1, strong; 2, moderate; 3, mild; and 4, absent, through the patient's response to stimuli. The results showed that all patients had no disturbance of sensitivity in the preoperative period, but paresthesia was presented at various levels in the postoperative period. Both groups showed recovery of deep mechanical sensitivity within a shorter time interval compared with the superficial mechanical and thermal sensitivity. However, at the 12th assessment, patients who underwent the laser therapy showed better reduction in the level of paresthesia or even complete regression of this. The laser, therefore, brought benefits to the treatment of paresthesia, accelerating the return of neurosensorial sensitivity.
Adult;Chin;Female;Genioplasty;Humans;Lasers, Semiconductor;Lip Diseases;Low-Level Light Therapy;Male;Mandible;Maxilla;Orthognathic Surgical Procedures;Osteotomy;Osteotomy, Le Fort;Osteotomy, Sagittal Split Ramus;Paresthesia;Postoperative Complications;Thermosensing;Touch;Treatment Outcome;Young Adult

The efficacy of pulsed dye laser treatment for inflammatory skin diseases: a systematic review. BACKGROUND: The position of the pulsed dye laser (PDL) in the treatment of inflammatory skin diseases is still unclear. Evidence-based recommendations are lacking. OBJECTIVES: We sought to systematically review all available literature concerning PDL treatment for inflammatory skin diseases and to propose a recommendation. METHODS: We searched for publications dated between January 1992 and August 2011 in the database PubMed. All studies reporting on PDL treatment for an inflammatory skin disease were obtained and a level of evidence was determined. RESULTS: Literature search revealed 52 articles that could be included in this study. The inflammatory skin diseases treated with PDL consisted of: psoriasis, acne vulgaris, lupus erythematodes, granuloma faciale, sarcoidosis, eczematous lesions, papulopustular rosacea, lichen sclerosis, granuloma annulare, Jessner lymphocytic infiltration of the skin, and reticular erythematous mucinosis. The

efficacy of PDL laser treatment for these inflammatory skin diseases was described and evaluated. LIMITATIONS: Most conclusions formulated are not based on randomized controlled trials. CONCLUSIONS: PDL treatment can be recommended as an effective and safe treatment for localized plaque psoriasis and acne vulgaris (recommendation grade B). For all other described inflammatory skin diseases, PDL seems to be promising, although the level of recommendation did not exceed level C. Acne Vulgaris;Dermatitis;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Lupus Erythematosus, Cutaneous;Lupus Erythematosus, Discoid;Male;Prognosis;Psoriasis;Randomized Controlled Trials as Topic;Risk Assessment;Treatment Outcome

Efficacy of high and low level laser therapy in the treatment of Bell's palsy: a randomized double blind placebo-controlled trial. The aim of the present study was to investigate and compare the effects of high intensity laser therapy (HILT) and low level laser therapy (LLLT) on the treatment of patients with Bell's palsy. Forty-eight patients participated in and completed this study. The mean age was 43 Â± 9.8 years. They were randomly assigned into three groups: HILT group, LLLT group, and exercise group. All patients were treated with facial massage and exercises, but the HILT and LLLT groups received the respective laser therapy. The grade of facial recovery was assessed by the facial disability scale (FDI) and the House-Brackmann scale (HBS). Evaluation was carried out 3 and 6 weeks after treatment for all patients. Laser treatments included eight points on the affected side of the face three times a week for 6 successive weeks. FDI and HBS were used to assess the grade of recovery. The scores of both FDI and HBS were taken before as well as 3 and 6 weeks after treatment. The Friedman test and Wilcoxon signed ranks test were used to compare the FDI and HBS scores within each group. The result showed that both HILT and LLLT significantly improved the recovery of patients with Bell's palsy. Moreover, HILT was the most effective treatment modality compared to LLLT and massage with exercises. Thus, both HILT and LLLT are effective physical therapy modalities for the recovery of patients with Bell's palsy, with HILT showing a slightly greater improvement than LLLT. Adult;Bell Palsy;Double-Blind Method;Exercise Therapy;Female;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Massage;Middle Aged;Treatment Outcome

Photobiomodulation: an enlightened path emerges. Immunologic Factors Immunologic Factors;Low-Level Light Therapy;Phototherapy

Far red/near infrared light treatment promotes femoral artery collateralization in the ischemic hindlimb. Nitric oxide (NO) is a crucial mediator of hindlimb collateralization and angiogenesis. Within tissues there are nitrosyl-heme proteins which have the potential to generate NO under conditions of hypoxia or low pH. Low level irradiation of blood and muscle with light in the far red/near infrared spectrum (670 nm, R/NIR) facilitates NO release. Therefore, we assessed the impact of red light exposure on the stimulation of femoral artery collateralization. Rabbits and mice underwent unilateral resection of the femoral artery and chronic R/NIR treatment. The direct NO scavenger carboxy-PTIO and the nitric oxide synthase (NOS) inhibitor L-NAME were also administered in the presence of R/NIR. DAF fluorescence assessed R/NIR changes in NO levels within endothelial cells. In vitro measures of R/NIR induced angiogenesis were assessed by endothelial cell proliferation and migration. R/NIR significantly increased collateral vessel number which could not be attenuated with L-NAME. R/NIR induced collateralization was abolished with c-PTIO. In vitro, NO production increased in endothelial cells with R/NIR exposure, and this finding was independent of NOS inhibition. Similarly R/NIR induced proliferation and tube formation in a NO dependent manner. Finally, nitrite supplementation accelerated R/NIR collateralization in wild type C57Bl/6 mice. In an eNOS deficient transgenic mouse model, R/NIR restores collateral development. In conclusion, R/NIR increases NO levels independent of NOS activity, and leads to the observed enhancement of hindlimb collateralization. Nitric Oxide Animals;Cell Proliferation;Femoral Artery;Hindlimb;Human

Umbilical Vein Endothelial Cells;Humans;Ischemia;Light;Mice;Mice, Inbred C57BL;Mice, Knockout;Neovascularization, Physiologic;Nitric Oxide;Rabbits

Noninvasive laser therapy for outpatients with chronic inflammatory disorders of cervix. Chronic inflammation of the cervix can develop cervical stenosis with infertility and cervical congestion is related with the cervical cancer. We create a review of main etiological agents and methods of screening and diagnosis. We also make a brief review of modern therapeutic approach. CONCLUSIONS: We follow the utility of LLLT through the following aspects: evolution, indications, results of BabeÅŸ-Papanicolau screening, cytology, clinical aspects. The results of the study will allow the complex system of treatment to be used in a large category of women. We appreciate that the procedure (used in our center also) will decrease the cervical pathology, the morbidity inside the treatment, the mortality through the evolution of cervical cancer. We propose the applicability for outpatients first and then as an integrated treatment method inside hospitals for a wide access. Chronic Disease;Female;Humans;Low-Level Light Therapy;Mass Screening;Outpatients;Treatment Outcome;Uterine Cervical Neoplasms;Uterine Cervicitis;Vaginal Smears

[Steroids, cold, laser and pressure. What "flattens" hypertrophic scars]. Adrenal Cortex Hormones Adrenal Cortex Hormones;Cicatrix, Hypertrophic;Compression Bandages;Cryotherapy;Humans;Low-Level Light Therapy;Practice Guidelines as Topic;Societies, Medical

Effect of low-level laser therapy on types I and III collagen and inflammatory cells in rats with induced third-degree burns. Low-level laser therapy (LLLT) has been increasingly used to accelerate wound healing in third-degree burns. This study investigated the effects of lasers on the tissue repair process of third-degree burns. Burns were produced on the backs of male Wistar rats. The animals were divided into four groups (n = 12): control, injury, LLLT 3 J/cm(2), and LLLT 4 J/cm(2). Each group was further divided into two subgroups; the rats in one subgroup were killed on day 8 and those in the other, on day 16 after injury. The animals in LLLT 3 J/cm(2) and LLLT 4 J/cm(2) were irradiated 1 h after injury, and irradiation was repeated every 48 h. Laser (660 nm, 35 mW) treatment at fluences of 3 and 4 J/cm(2) were used. After killing the rats, tissue fragments from the burnt area were removed for histological analysis. The LLLT-treated groups showed a significant decrease ($p < 0.05$) in the number of inflammatory cells and increased collagen deposition compared to the injury group. Laser irradiation (both 3 and 4 J/cm(2)) resulted in reduction in the inflammatory process and improved collagen deposition, thereby ameliorating the healing of third-degree burns. Collagen Type I;Collagen Type III Animals;Burns;Collagen Type I;Collagen Type III;Disease Models, Animal;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Microscopy, Polarization;Rats;Rats, Wistar;Time Factors;Wound Healing

Long-term safety of low-level laser therapy at different power densities and single or multiple applications to the bone marrow in mice. OBJECTIVE: The purpose of this study was to determine the long-term safety effect of low-level laser therapy (LLLT) to the bone marrow (BM) in mice. BACKGROUND DATA: LLLT has been shown to have a photobiostimulatory effect on various cellular processes and on stem cells. It was recently shown that applying LLLT to BM in rats post-myocardial infarction caused a marked reduction of scar tissue formation in the heart. METHODS: Eighty-three mice were divided into five groups: control sham-treated and laser-treated at measured density of either 4, 10, 18, or 40â€‰mW/cm(2) at the BM level. The laser was applied to the exposed flat medial part of the tibia 8â€‰mm from the knee joint for 100â€‰sec. Mice were monitored for 8 months and then killed, and histopathology was performed on various organs. RESULTS: No histological differences were observed in the liver, kidneys, brain or BM of the laser-treated mice as compared with the sham-treated, control mice. Moreover, no neoplasmic response in the tissues was observed in the laser-treated groups as compared with the control, sham-treated mice. There were

no significant histopathological differences among the same organs under different laser treatment regimes in response to the BM-derived mesenchymal stem cell proliferation following LLLT to the BM. CONCLUSIONS: LLLT applied multiple times either at the optimal dose (which induces photobiostimulation of stem cells in the BM), or at a higher dose (such as five times the optimal dose), does not cause histopathological changes or neoplasmic response in various organs in mice, as examined over a period of 8 months. Animals;Bone Marrow;Dose-Response Relationship, Radiation;Kidney;Liver;Low-Level Light Therapy;Mesenchymal Stem Cells;Mice;Mice, Inbred ICR;Stem Cells

Does phototherapy enhance skeletal muscle contractile function and postexercise recovery? A systematic review. CONTEXT: Recently, researchers have shown that phototherapy administered to skeletal muscle immediately before resistance exercise can enhance contractile function, prevent exercise-induced cell damage, and improve postexercise recovery of strength and function. OBJECTIVE: To critically evaluate original research addressing the ability of phototherapeutic devices, such as lasers and light-emitting diodes (LEDs), to enhance skeletal muscle contractile function, reduce exercise-induced muscle fatigue, and facilitate postexercise recovery. DATA SOURCES: We searched the electronic databases PubMed, SPORTDiscus, Web of Science, Scopus, and Rehabilitation & Physical Medicine without date limitations for the following key words: laser therapy, phototherapy, fatigue, exercise, circulation, microcirculation, and photobiomodulation. STUDY SELECTION: Eligible studies had to be original research published in English as full papers, involve human participants, and receive a minimum score of 7 out of 10 on the Physiotherapy Evidence Database (PEDro) scale. DATA EXTRACTION: Data of interest included elapsed time to fatigue, total number of repetitions to fatigue, total work performed, maximal voluntary isometric contraction (strength), electromyographic activity, and postexercise biomarker levels. We recorded the PEDro scores, beam characteristics, and treatment variables and calculated the therapeutic outcomes and effect sizes for the data sets. DATA SYNTHESIS: In total, 12 randomized controlled trials met the inclusion criteria. However, we excluded data from 2 studies, leaving 32 data sets from 10 studies. Twenty-four of the 32 data sets contained differences between active phototherapy and sham (placebo-control) treatment conditions for the various outcome measures. Exposing skeletal muscle to single-diode and multidiode laser or multidiode LED therapy was shown to positively affect physical performance by delaying the onset of fatigue, reducing the fatigue response, improving postexercise recovery, and protecting cells from exercise-induced damage. CONCLUSIONS: Phototherapy administered before resistance exercise consistently has been found to provide ergogenic and prophylactic benefits to skeletal muscle. Biomarkers Biomarkers;Electromyography;Exercise;Humans;Muscle Contraction;Muscle, Skeletal;Phototherapy

Influence of low-level laser on bone remodeling during induced tooth movement in rats. OBJECTIVE: To analyze the effect of low-level laser on bone remodeling during induced tooth movement in rats. MATERIALS AND METHODS: A diode laser (808 nm, 100 mW, 54 J on an area of 0.0028 cm(2)) was used. The application was continuous, punctual, and with contact. Forty-two 70-day-old Wistar rats had the maxillary left first molar moved using a force level of 25 g. In two experimental subgroups the movement was performed over 7 days and in three subgroups the movement occurred over 14 days. In the 7-day movement subgroups, one subgroup received laser irradiation on day 1 only; the other subgroup received laser irradiation on days 1, 3, and 5. In the 14-day movement subgroups, one subgroup received laser irradiation on day 1 only; the second on days 1, 3, and 5; and the third on days 1, 3, 5, 7, 9, 11, and 13. The control group was also divided into two subgroups, and movement occurred over two different periods of treatment (7 days and 14 days) without laser application; these were used as controls for the respective experimental subgroups. Inter-subgroup comparison was performed with Kruskal-Wallis, followed by Mann-Whitney and

analysis of variance, followed by Tukey tests within the 7- and 14-day subgroups. RESULTS: The subgroup with three laser applications showed significantly greater osteoclastic activity and bone resorption than the other subgroups in the 7-day movement subgroups. CONCLUSIONS: Low-level laser application significantly increased the osteoclastic but not the osteoblastic activity during the initial phases of tooth movement. In addition, the osteoclastic activity was dose-dependent.
Alveolar Bone Loss;Alveolar Process;Analysis of Variance;Animals;Bone Remodeling;Female;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Osteoclasts;Rats;Rats, Wistar;Tooth Movement Techniques

The effect of diode superpulsed low-level laser therapy on experimental orthodontic pain caused by elastomeric separators: a randomized controlled clinical trial. The aim of this study was to evaluate the efficacy of diode superpulsed low-level laser therapy (SLLLT) in reducing experimentally induced orthodontic pain. Overall, 120 subjects (23.01â€‰Â±â€‰1.39 years) were enrolled for a clinical trial. Subjects were randomly assigned to upper (U, Nâ€‰=â€‰60) or lower (L, Nâ€‰=â€‰60) jaw groups. All subjects received 4 elastomeric separators mesial and distal to the upper (U group) or lower (L group) right first molar and bicuspids. Each subject of the U and L groups was randomly assigned to laser (Ul, Nâ€‰=â€‰20 and Ll, Nâ€‰=â€‰20), placebo (Up, Nâ€‰=â€‰20 and Lp, Nâ€‰=â€‰20) or control (Uc, Nâ€‰=â€‰20 and Lc, Nâ€‰=â€‰20) sub-groups. Subjects in laser groups received a single GaAs diode SLLLT application (910 nm, 160 mW, beam diameter of 8 mm, applied for 340 s) immediately after placing orthodontic separators. Placebo groups received a simulated SLLLT and controls did not receive any therapy. All participants compiled a survey on pain duration and a 100-mm visual analogue scale immediately after the separators placement and after 12, 24, 36, 48, 72, and 96 h. Pain intensity of laser groups was significantly lower compared to placebo and control groups (pâ€‰=â€‰0.0001). In the laser group, 70% of subjects felt pain, while in the placebo and control groups all subjects felt pain (pâ€‰=â€‰0.0001). The end of pain occurred earlier in laser compared to placebo and control groups (pâ€‰=â€‰0.021). A single-diode SLLLT application appeared to be effective in reducing the intensity and duration of experimentally induced orthodontic pain and could be used in daily orthodontic practice.
Elastomers;Polymers;elastomeric polymer Analysis of Variance;Elastomers;Female;Humans;Low-Level Light Therapy;Male;Optics and Photonics;Orthodontics;Pain;Pain Measurement;Polymers;Surveys and Questionnaires;Young Adult

The effects of light emitting diode therapy following high intensity exercise. OBJECTIVE: To determine the effects of light emitting diode therapy (LEDT) irradiation on blood lactate concentration ([La]) clearance, peak power output and fatigue index (FI) following high intensity fatiguing exercise. DESIGN: Single-blinded randomised cross-over placebo controlled trial. SETTING: University College Dublin, Institute for Sport and Health, Human performance laboratory. PARTICIPANTS: Eighteen healthy male athletes were recruited from field-based sports (including soccer, hockey and rugby union) and participated in the present study. MAIN OUTCOME MEASURES: Dependent variables were the peak power output elicited during the Wingate Anaerobic Test (WAnT), FI and [La] before and after each exercise. WAnT performance was measured prior to high intensity fatiguing exercise (Yo-Yo IR2), prior to LEDT or placebo, and following LEDT or placebo. [La] was measured at baseline, immediately after the Yo-Yo IR2, and in the 3rd, 9th, and 15thÂ min following LEDT or placebo condition. RESULTS: No significant group by treatment interactions were observed for any outcome measures (PÂ >Â 0.05). CONCLUSION: We conclude that LEDT irradiation applied following high intensity exercise was not effective and has no immediate effect on [La] clearance, peak power and FI, and thus has no significant effect on muscle recovery in athletes at the intensity and irradiation parameters used in the present study. Further research using different parameters is required to determine how LEDT may contribute to post-exercise recovery.

Lactates Cross-Over Studies;Exercise;Exercise Test;Humans;Lactates;Male;Physical Endurance;Single-Blind Method

Effect of low-level laser therapy on the release of interleukin-6 and basic fibroblast growth factor from cultured human skin fibroblasts in normal and high glucose mediums. INTRODUCTION: This study evaluated the effects of low-level laser therapy (LLLT) on human skin fibroblasts (HSFs) that have been cultured in high glucose concentration media. MATERIALS AND METHODS: HSFs were cultured under physiological glucose condition medium, and then cultured in high glucose concentration medium (15 mM/L) for 1 or 2 weeks prior to LLLT. Experimental HSFs were irradiated with three energy densities (0.5, 1, and 2 J/cm(2)) once daily for three consecutive days. Release of interleukin-6 (IL-6) and basic fibroblast growth factor (bFGF) was evaluated using the enzyme-linked immunosorbent assay (ELISA) method. RESULTS: Statistical analysis showed three doses of 0.5 ($p = 0.049$), 1 ($p = 0.027$), and 2 J/cm(2) ($p = 0.004$) stimulated the release of IL-6 in HSFs cultured in high glucose concentration medium compared with that of non-irradiated HSFs that were cultured in the same medium. LLLT with 2 J/cm(2) induced the release of bFGF from HSFs cultured in high glucose concentration medium for 1 or 2 weeks (both $p = 0.04$). CONCLUSION: Our study showed that LLLT stimulated the release of IL-6 and bFGF from HSFs cultured in high glucose concentration medium. LLLT was more effective in releasing IL-6 and bFGF while HSFs which were cultured in physiologic glucose concentration medium during laser irradiation. Culture Media;Interleukins;Fibroblast Growth Factor 2;Glucose Cell Line;Culture Media;Fibroblast Growth Factor 2;Fibroblasts;Glucose;Humans;Interleukins;Low-Level Light Therapy;Skin

Formation of new melasma lesions in the periorbital area following high-fluence, 1064-nm, Q-switched Nd/YAG laser. Although ultraviolet (UV) light or exogenous hormones have been associated with the development or exacerbation of melasma, the use of laser as a treatment modality has not been cited as a factor linked to the development of melasma lesions. It is unclear whether epidermal trauma caused by laser or other treatment can lead to the formation of a new melasma lesion. We report on the formation of new melasma lesions in a patient who was treated for acquired bilateral nevus of Ota-like macules (ABNOM) with a high-fluence 1064 nm Q-switched (QS) neodymium-doped yttrium aluminum garnet (Nd/YAG) laser. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Pigmentation Disorders

The efficacy of autologous platelet-rich plasma combined with erbium fractional laser therapy for facial acne scars or acne. The aim of this study was to evaluate the efficacy of autologous platelet-rich plasma (PRP) combined with erbium fractional laser therapy for facial acne or acne scars. PRP combined with erbium fractional laser therapy was used for the treatment of 22Â patients, including 16 patients who suffered from facial acne scars and 6 patients who suffered from acne scars concomitant with acne. Whole blood (40Â ml) was collected from each patient, and following differential centrifugation, PRP was harvested. After using an erbium fractional laser, we applied PRP to the entire face of every patient. Digital photos were taken before and after the treatment for evaluation by dermatologists and the patients rated the efficacy on a 5-point scale. The erythema was moderate or mild, while its total duration was <3Â days; after receiving the treatment three times, 90.9% of the patients showed an improvement of >50%, and 91% of the patients were satisfied; no acne inflammation was observed after treatment. PRP combined with erbium fractional laser therapy is an effective and safe approach for treating acne scars or acne, with minimal side-effects, and it simultaneously enhanced the recovery of laser-damaged skin. Erbium Acne Vulgaris;Adult;Cicatrix;Erbium;Female;Humans;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Treatment Outcome;Young Adult

[The study of opportunity of aqueous humor filtration increase after nondestructive laser exposure of sclera in the site of pars plana projection (experimental study)]. Increase of scleral water

permeability due to formation of porous structure after exposure of pulsed periodic radiation of erbium-glass optical fiber laser with wave length 1,56 pm was demonstrated in experimental study of cadaver human eyes in vitro and eyes of experimental animals (rabbits) in vivo. Simultaneous complex laser exposure of pars plana and ciliary processes results in summation of morphological changes that provide decrease of aqueous humor secretion, uveal drainage and extension of suprachoroid space. A base for new noninvasive technology of nondestructive laser exposure in glaucoma treatment is established. Animals;Aqueous Humor;Ciliary Body;Glaucoma;Humans;Lasers;Low-Level Light Therapy;Models, Animal;Permeability;Rabbits;Regeneration;Sclera;Time Factors

The efficacy of the use of IR laser phototherapy associated to biphasic ceramic graft and guided bone regeneration on surgical fractures treated with miniplates: a histological and histomorphometric study on rabbits. The aim of the present study was to assess, by light microscopy and histomorphometry, the repair of surgical fractures fixed with internal rigid fixation (IRF) treated or not with IR laser (Î»780 nm, 50 mW, 4 Ã— 4 J/cm(2) = 16 J/cm(2), Ï• = 0.5 cm(2), CW) associated or not to the use of hydroxyapatite and guided bone regeneration. Surgical tibial fractures were created under general anesthesia on 15 rabbits that were divided into 5 groups, maintained on individual cages, at day/night cycle, fed with solid laboratory pelted diet, and had water ad libidum. The fractures in groups II, III, IV, and V were fixed with miniplates. Animals in groups III and V were grafted with hydroxyapatite and GBR technique used. Animals in groups IV and V were irradiated at every other day during two weeks (4 Ã— 4 J/cm(2), 16 J/cm(2) = 112 J/cm(2)). Observation time was that of 30 days. After animal death, specimens were taken, routinely processed to wax, cut and stained with HA and Sirius red, and used for histological assessment. The results of both analyses showed a better bone repair on all irradiated subjects especially when the biomaterial and GBR were used. In conclusion, the results of the present investigation are important clinically as they are suggestive that the association of hydroxyapatite, and laser light resulted in a positive and significant repair of complete tibial fractures treated with miniplates. Bone Substitutes;Durapatite Animals;Bone Plates;Bone Regeneration;Bone Substitutes;Combined Modality Therapy;Disease Models, Animal;Durapatite;Fracture Fixation, Internal;Guided Tissue Regeneration;Infrared Rays;Low-Level Light Therapy;Male;Rabbits;Tibial Fractures

Comparative evaluation of diode laser, stannous fluoride gel, and potassium nitrate gel in the treatment of dentinal hypersensitivity. The aim of the present study was to compare the efficacy of diode laser (DL) with stannous fluoride and potassium nitrate gels in the treatment of dentinal hypersensitivity (DH). Fifty-four subjects, ages 25-45, having 2 adjacent teeth sensitive to air blast stimulation were included. The subjects were divided randomly into 3 groups (n= 18): Group A, subjects treated with DL; Group B, subjects treated with 0.4% stannous fluoride gel; and Group C, subjects treated with 5% potassium nitrate gel. Each group was evaluated at baseline; at weekly intervals for 2 consecutive weeks; and at 1, 3, and 6 months. All 3 groups showed decreases in the DH scores between baseline and 6 months This was more pronounced in Group A at all time intervals. When the 3 groups were compared between baseline and Week 1, there was a statistically significant decrease across all 3 groups between (P = 0.0020). The greatest difference in the DH scores between baseline and Week 1 was in Group A, compared to Groups B and C. The 940 nm DL was not only efficacious, but also brought about improved immediate relief as compared to stannous fluoride and potassium nitrate gels in the reduction of DH. Dentin Desensitizing Agents;Gels;Nitrates;Potassium Compounds;Tin Fluorides;potassium nitrate Adult;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Follow-Up Studies;Gels;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Nitrates;Pain Measurement;Potassium Compounds;Tin Fluorides;Treatment Outcome

Topical laser application enhances enamel fluoride uptake and tribological properties. Topical fluoride treatment prevents dental caries. However, the resulting calcium-fluoride-like deposits are soft and have poor wear resistance; therefore, frequent treatment is required. Lasers quickly heat surfaces and can be made portable and suitable for oral remedies. We examined the morphology, nanohardness, elastic modulus, nanowear, and fluoride uptake of fluoride-treated enamel followed by CO2 laser irradiation for 5 and 10 sec, respectively. We found that laser treatments significantly increased the mechanical properties of the calcium-fluoride-like deposits. The wear resistance of the calcium-fluoride-like deposits improved about 34% after laser irradiation for 5 sec and about 40% following irradiation for 10 sec. We also found that laser treatments increased fluoride uptake by at least 23%. Overall, laser treatment significantly improved fluoride incorporation into dental tissue and the wear resistance of the protective calcium-fluoride layer. Cariostatic Agents;Sodium Fluoride;Calcium Fluoride;Fluorides Calcium Fluoride;Cariostatic Agents;Crystallography;Dental Enamel;Elastic Modulus;Electron Probe Microanalysis;Fluorides;Hardness;Humans;Lasers, Gas;Low-Level Light Therapy;Mechanical Phenomena;Microscopy, Electron, Scanning;Sodium Fluoride;Stress, Mechanical;Time Factors;Tooth Wear

Burning mouth syndrome: a review of recent literature. Burning mouth syndrome (BMS) is a complex chronic disorder of orofacial sensation that is challenging in both diagnosis and treatment. The diagnosis of BMS is primarily one of exclusion, and recently classification of the disorder has been challenged. Although the exact pathophysiology of primary BMS is unknown, there has been a growing body of work to provide insight into the pathogenesis of the disorder over the past few years. Pharmacological treatments recently reported to have some success in BMS include anxiolytics, anticonvulsants, antidepressants, atypical antipsychotics, histamine receptor antagonist, and dopamine agonists. In addition, other therapies and treatments are being considered. This paper reports many of the most recent data related to BMS and its classification, diagnosis, impact on quality of life, pathophysiology, co-morbidities, and pharmacological and non-pharmacological treatments. Anticonvulsants;Antidepressive Agents;Antipsychotic Agents;Dopamine Agonists;Histamine H2 Antagonists;Benzodiazepines Anticonvulsants;Antidepressive Agents;Antipsychotic Agents;Benzodiazepines;Burning Mouth Syndrome;Diagnosis, Differential;Dopamine Agonists;Female;Histamine H2 Antagonists;Humans;Low-Level Light Therapy;Male;Nervous System Physiological Phenomena;Quality of Life;Randomized Controlled Trials as Topic

Laser phototherapy at high energy densities do not stimulate pre-osteoblast growth and differentiation. OBJECTIVE: The aim of this study is to evaluate the effects of red and infrared lasers at high energy densities on pre-osteoblast MC3T3 proliferation and differentiation. BACKGROUND DATA: The acceleration of bone regeneration by low intensity laser irradiation may hold potential benefits in clinical therapy in orthopedics and dentistry. MATERIALS AND METHODS: Cells were irradiated with red (660â€‰nm) and infrared (780â€‰nm) lasers (90 and 150â€‰J/cm2, 40â€‰mW). The control group did not receive irradiation. Cell growth was assessed by a colorimetric test (MTT) (24, 48, 72, 96â€‰h) and cell differentiation was evaluated by alkaline phosphatase (ALP) quantification after growth in osteogenic medium (72, 96â€‰h; 7, 14 days). RESULTS: None of the irradiation groups had an enhancement in cell growth ($p<0.05$). The production of ALP was not influenced by irradiation at any period of time ($p>0.05$). CONCLUSIONS: The low intensity laser stimulated neither cell growth nor the production of alkaline phosphatase. Alkaline Phosphatase Alkaline Phosphatase;Cell Differentiation;Cell Proliferation;Humans;Low-Level Light Therapy;Osteoblasts

Safety, tolerance, and patient satisfaction with noninvasive cryolipolysis. BACKGROUND: Comprehensive assessment of safety, tolerance, and patient satisfaction has not been established

from noninvasive body contouring techniques, such as low-level laser therapy, ultrasound, radiofrequency, and infrared light, for reduction of subcutaneous fat. OBJECTIVE: This multicenter study investigated the clinical outcomes of noninvasive cryolipolysis in European subjects. METHODS: A retrospective study was performed at clinical sites in Belgium and France. Safety was assessed according to reports of side effects. Tolerance was evaluated according to pain scores and patient perception of treatment duration. Clinical outcomes were assessed according to patient surveys, caliper measurements, and assessment of photographs. RESULTS: The investigators treated 518 patients. No significant side effects or adverse events were reported. The procedure was well-tolerated, with 89% of respondents reporting a positive perception of treatment duration and 96% reporting minimal to tolerable discomfort. Survey results demonstrated 73% patient satisfaction and that 82% of patients would recommend the cryolipolysis procedure to a friend. Caliper measurements demonstrated 23% reduction in fat layer thickness at 3Â months. Abdomen, back, and flank treatment sites were most effective, with 86% of subjects showing improvement per investigator assessment. CONCLUSIONS: With proper patient selection, cryolipolysis is a safe, well-tolerated, and effective treatment method for reduction of subcutaneous fat. Abdominal Fat;Adult;Cryotherapy;Female;Humans;Lipectomy;Male;Middle Aged;Patient Satisfaction;Patient Selection;Retrospective Studies

Adverse events of non-ablative fractional laser photothermolysis: a retrospective study of 856 treatments in 362 patients. BACKGROUND: Non-ablative fractional laser photothermolysis (NAFP) has been used effectively in the treatment of photodamaged skin and scars, with short post-operative recovery times; but, studies evaluating its adverse events and complication rates in Asian population have been limited. OBJECTIVE: To determine the frequency and range of adverse events associated with NAFP treatment in Korean patients. MATERIALS AND METHODS: We retrospectively evaluated the outcomes of 754 1550-nm erbium-doped and 102 1927-nm thulium fiber fractional laser treatments in patients with skin phototypes III-IV treated at a single center. Adverse events were identified and tabulated, as were patient demographics and laser parameters. RESULTS: From 856 treatments, there were 43 adverse events (5.0%), the most frequent being prolonged erythema (1.8%), post-inflammatory hyperpigmentation (1.1%) and aggravation of melasma (0.9%). Less frequently observed adverse events included herpes simplex outbreak (0.6%) and acneiform eruption (0.2%). There were no reports of long-term adverse events. CONCLUSION: Non-ablative fractional laser skin treatment has a relatively low complication rate. The adverse events found were temporary and did not result in long-term or severe sequelae such as hypertrophic scarring, atrophic scarring or permanent pigmentary alteration. Adult;Asian People;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Retrospective Studies;Skin;Skin Aging;Skin Diseases

Effects of laser irradiation at different wavelengths (660, 810, 980, and 1,064 nm) on mucositis in an animal model of wound healing. The aim of the present study was to compare the effectiveness of four different laser wavelengths (660, 810, 980, and 1,064 nm) used for low-level laser therapy (LLLT) on the healing of mucositis in an animal model of wound healing by investigating the expression of platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-Î²), and blood-derived fibroblast growth factor (bFGF). Thirty-five male Wistar albino rats with a weight of 250-300 g body mass and 5 months old were used in the study. All animals were intraperitoneally injected with 100 mg/kg of 5-fluorouracil (5-FU) on the first day and 65 mg/kg of 5-FU on the third day. The tip of an 18-gauge needle was used in order to develop a superficial scratching on the left cheek pouch mucosa by dragging twice in a linear movement on third and fifth days. After ulcerative mucositis were clinically detected on the animals' left cheek pouch mucosa, the laser therapy was started. Four different laser wavelengths (660 nm, HELBO, Bredent; 810 nm, Fotona XD, Fotona; 980 nm, ARC Fox; and 1,064 nm, Fidelis Plus 3, Fotona) used for LLLT at ED 8 J/cm(2) daily from the first to

the fourth days. Oval excisional biopsy was taken from the site of the wound, and the expression of PDGF, TGF-Î², and bFGF was evaluated. The obtained data were analyzed by one2-way ANOVA, and then Tukey HSD tests were used for pairwise comparisons among groups (Î±â€‰=â€‰0.05). The one-way ANOVA test indicated that expression values of the growth factors, PDGF and bFGF, were significantly affected by irradiation of different wavelengths of lasers (pâ€‰<â€‰0.001). However, expression value of the TGF-Î² was not affected by irradiation of different wavelengths of lasers (pâ€‰>â€‰0.05). The highest PDGF expression was detected in neodymium-doped yttrium aluminum garnet (Nd:YAG) laser group (pâ€‰<â€‰0.05), and there were no statistically significant differences among the other groups (pâ€‰>â€‰0.05). The highest bFGF expression was detected in 980-nm diode and Nd:YAG laser groups (pâ€‰<â€‰0.05), and there were no statistically significant differences among the other groups (pâ€‰>â€‰0.05). These findings suggest that low-level Nd:YAG and 980-nm diode laser therapy accelerate the wound healing process by changing the expression of PDGF and bFGF genes responsible for the stimulation of the cell proliferation and fibroblast growth. Transforming Growth Factor beta;Fibroblast Growth Factor 2;Neodymium;Fluorouracil Animals;Cell Proliferation;Disease Models, Animal;Fibroblast Growth Factor 2;Fibroblasts;Fluorouracil;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Mouth Mucosa;Mucositis;Neodymium;Rats;Rats, Wistar;Transforming Growth Factor beta;Wound Healing

Comments on: "efficacy of low-level laser therapy in the management of orthodontic pain: a systematic review and meta-analysis". Humans;Low-Level Light Therapy;Orthodontics, Corrective;Pain

Effect of low level laser therapy on orthodontic tooth movement: a review article. Increased duration of fixed orthodontic treatments leads to increased tooth root degeneration, gum inflammation and tooth caries. To decrease the time period of orthodontic treatment, it is essential to facilitate tooth movement or in other words increase the speed of bone remodeling. Use of low level laser therapy is a method for achieving this goal.

Influence of Er,Cr:YSGG laser on CaFâ,, -like products formation because of professional acidulated fluoride or to domestic dentifrice application. This study evaluated the synergy of professional acidulated fluoride gel (APF) or fluoridated dentifrice application combined with Er,Cr:YSGG laser irradiation on the formation of CaF2 -like products (CaF2), in vitro. Thus, 272 bovine enamel slabs were randomly distributed among eight groups: G1: untreated enamel; G2: treated with fluoridated dentifrice (NaF, 1,100 Î¼gF/g); G3: treated with acidulated phosphate fluoride gel (APF, 1.23% F(-)); G4: irradiated with Er,Cr:YSGG laser at 8.5 J/cm(2) ; G5 and G6: combination of pre-irradiation with Er,Cr:YSGG followed by dentifrice or APF application, respectively; G7: combination of dentifrice application followed by Er,Cr:YSGG irradiation; G8: combination of APF application followed by Er,Cr:YSGG irradiation. After treatments, samples were evaluated by scanning electron microscopy, and the content of CaF2 was determined by an ion specific electrode. Both APF and dentifrice application promoted the formation of CaF2 on enamel, whereas Er,Cr:YSGG irradiation promoted an increase of roughness of the enamel, increasing the surface area. Laser irradiation before fluoridated products increased the content of CaF2 formed when compared to groups that APF or dentifrice were applied isolated. However, the content of CaF2 formed when irradiation was performed after APF or dentifrice was not statically significant when compared to the control groups. In conclusion, Er,Cr:YSGG laser increases the formation of CaF2 on enamel when the irradiation is performed before the application of APF or dentifrice. The association of laser with APF is most promissory for caries prevention because of the higher concentration of CaF2 formation and also the chemical changes promoted by laser irradiation demonstrated in literature. Dentifrices;Calcium Fluoride

Animals;Calcium Fluoride;Cattle;Dental Enamel;Dentifrices;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Treatment Outcome

Nontuberculous mycobacterial infection after fractionated CO(2) laser resurfacing. Nontuberculous mycobacteria are increasingly associated with cutaneous infections after cosmetic procedures. Fractionated CO2 resurfacing, a widely used technique for photorejuvenation, has been associated with a more favorable side effect profile than alternative procedures. We describe 2 cases of nontuberculous mycobacterial infection after treatment with a fractionated CO2 laser at a private clinic. Densely distributed erythematous papules and pustules developed within the treated area within 2 weeks of the laser procedure. Diagnosis was confirmed by histologic analysis and culture. Both infections responded to a 4-month course of a multidrug regimen. An environmental investigation of the clinic was performed, but no source of infection was found. The case isolates differed from each other and from isolates obtained from the clinic, suggesting that the infection was acquired by postprocedure exposure. Papules and pustules after fractionated CO2 resurfacing should raise the suspicion of nontuberculous mycobacterial infection. Anti-Bacterial Agents Anti-Bacterial Agents;Cosmetic Techniques;Drug Therapy, Combination;Female;Humans;Low-Level Light Therapy;Middle Aged;Mycobacterium Infections, Nontuberculous;Skin Diseases, Bacterial

Diode laser offers minimal benefit for periodontal therapy. Current evidence indicates that use of diode lasers in the treatment of periodontitis--either as a monotherapy or adjunctive to traditional therapy--offers minimal benefit. Further, subgingival application of the diode laser during nonsurgical periodontal therapy can result in undesired outcomes, even when using manufacturer-recommended parameters. Aged;Bacteria;Curettage;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Periodontitis

Low-level laser (light) therapy (LLLT) on muscle tissue: performance, fatigue and repair benefited by the power of light. The use of low level laser (light) therapy (LLLT) has recently expanded to cover areas of medicine that were not previously thought of as the usual applications such as wound healing and inflammatory orthopedic conditions. One of these novel application areas is LLLT for muscle fatigue and muscle injury. Since it is becoming agreed that mitochondria are the principal photoacceptors present inside cells, and it is known that muscle cells are exceptionally rich in mitochondria, this suggests that LLLT should be highly beneficial in muscle injuries. The ability of LLLT to stimulate stem cells and progenitor cells means that muscle satellite cells may respond well to LLLT and help muscle repair. Furthermore the ability of LLLT to reduce inflammation and lessen oxidative stress is also beneficial in cases of muscle fatigue and injury. This review covers the literature relating to LLLT and muscles in both preclinical animal experiments and human clinical studies. Athletes, people with injured muscles, and patients with Duchenne muscular dystrophy may all benefit.

Cost-effectiveness of the introduction of specialized oral care with laser therapy in hematopoietic stem cell transplantation. Oral mucositis (OM) is one of the side effects of hematopoietic stem cell transplantation (HSCT), resulting in major morbidity. The aim of this study was to determine the cost-effectiveness of the introduction of a specialized oral care program including laser therapy in the care of patients receiving HSCT with regard to morbidity associated with OM. Clinical information was gathered on 167 patients undergoing HSCT and divided according to the presence (nâ€‰=â€‰91) or absence (nâ€‰=â€‰76) of laser therapy and oral care. Cost analysis included daily hospital fees, parenteral nutrition (PN) and prescription of opioids. It was observed that the group without laser therapy (group II) showed a higher frequency of severe degrees of OM (relative riskâ€‰=â€‰16.8, 95% confidence interval -5.8 to 48.9, pâ€‰<â€‰0.001), with a significant association between this severity and the use of PN (pâ€‰=â€‰0.001), prescription of opioids (pâ€‰<â€‰0.001), pain in the oral cavity (pâ€‰=â€‰0.003) and feverâ€‰>â€‰37.8Â°C (pâ€‰=â€‰0.005). Hospitalization costs in this group were up to 30% higher. The introduction of oral care by a multidisciplinary staff including

laser therapy helps reduce morbidity resulting from OM and, consequently, helps minimize hospitalization costs associated with HSCT, even considering therapy costs. Anti-Bacterial Agents;Antifungal Agents;Immunosuppressive Agents;Myeloablative Agonists;Narcotics Adult;Aged;Allografts;Anti-Bacterial Agents;Antibiotic Prophylaxis;Antifungal Agents;Antineoplastic Combined Chemotherapy Protocols;Brazil;Case-Control Studies;Cost-Benefit Analysis;Dentists;Drug Costs;Female;Hematopoietic Stem Cell Transplantation;Hospital Costs;Hospitalization;Humans;Immunocompromised Host;Immunosuppressive Agents;Low-Level Light Therapy;Male;Middle Aged;Myeloablative Agonists;Narcotics;Opportunistic Infections;Oral Hygiene;Parenteral Nutrition;Patient Care Team;Retrospective Studies;Self Care;Stomatitis;Transplantation Conditioning;Transplantation, Autologous

Healing of normal and osteopenic bone with titanium implant and low-level laser therapy (GaAlAs): a histomorphometric study in rats. The study investigates the influence of low-level laser therapy (LLLT) on bone healing in the femur of osteopenic and normal rats with titanium implants. Ovariectomy and control group were randomly submitted to LLLT, which was applied by gallium-aluminum-arsenium (GaAlAs) laser at the surgical site before and after placing the implant, for seven times. Histomorphometric and statistical analysis were performed. Most irradiated groups showed higher values than the nonirradiated groups. The GaAlAs infrared diode laser may improve the osseointegration process in osteopenic and normal bone, particularly based on its effects in the initial phase of bone formation. Bone Substitutes;Titanium Animals;Bone Diseases, Metabolic;Bone Substitutes;Female;Femur;Lasers, Semiconductor;Low-Level Light Therapy;Osseointegration;Osteogenesis;Ovariectomy;Rats;Titanium;Wound Healing

Characteristics of incident geographic atrophy in the complications of age-related macular degeneration prevention trial. OBJECTIVE: To characterize the size, location, conformation, and features of incident geographic atrophy (GA) as detected by annual stereoscopic color photographs and fluorescein angiograms (FAs). DESIGN: Retrospective cohort study within a larger clinical trial. PARTICIPANTS: Patients with bilateral large drusen in whom GA developed during the course of the Complications of Age-related Macular Degeneration Prevention Trial (CAPT). METHODS: Annual stereoscopic color photographs and FAs were reviewed from 114 CAPT patients in whom GA developed in the untreated eye during 5 to 6 years of follow-up. Geographic atrophy was defined according to the Revised GA Criteria for identifying early GA.(23) Color-optimized fundus photographs were viewed concurrently with the FAs during grading. MAIN OUTCOME MEASURES: Size and distance from the fovea of individual GA lesions, number of areas of atrophy, and change in visual acuity (VA) when GA first developed in an eye. RESULTS: At presentation, the median total GA area was 0.26 mm(2) (0.1 disc area). Geographic atrophy presented as a single lesion in 89 (78%) eyes. The median distance from the fovea was 395 Î¼m. Twenty percent of incident GA lesions were subfoveal and an additional 18% were within 250 Î¼m of the foveal center. Development of GA was associated with a mean decrease of 7 letters from the baseline VA level compared with 1 letter among matched early age-related macular degeneration eyes without GA. Geographic atrophy that formed in areas previously occupied by drusenoid pigment epithelial detachments on average were larger (0.53 vs. 0.20 mm(2); P = 0.0001), were more central (50 vs. 500 Î¼m from the center of the fovea; P<0.0001), and were associated with significantly worse visual outcome (20/50 vs. 20/25; P = 0.0003) than GA with other drusen types as precursors. CONCLUSIONS: Incident GA most often appears on color fundus photographs and FAs as a small, singular, parafoveal lesion, although a large minority of lesions are subfoveal or multifocal at initial detection. The characteristics of incident GA vary with precursor drusen types. These data can facilitate design of future clinical trials of therapies for GA. FINANCIAL DISCLOSURE(S): The author(s) have no proprietary or commercial interest in any materials discussed in this article. Aged;Aged, 80 and over;Female;Fluorescein

Angiography;Geographic Atrophy;Humans;Laser Coagulation;Low-Level Light Therapy;Macular Degeneration;Male;Middle Aged;Photography;Retinal Pigment Epithelium;Retrospective Studies;Vision Disorders;Visual Acuity
Assessment of immediate pain relief with laser treatment in recurrent aphthous stomatitis. OBJECTIVES: To compare immediate pain relief, healing time between minor recurrent aphthous ulcers treated with a single session of carbon dioxide (CO2) laser and a placebo. STUDY DESIGN: A prospective clinical study was performed on 25 patients with minor recurrent aphthous stomatitis. Pretreatment pain levels were recorded using a numerical rating scale. Ulcers were randomized to either receive treatment or placebo. Pain levels were assessed immediately after treatment and after 24 h. Healing was assessed on days 3 and 4, and once every 2 days thereafter for 2 weeks. RESULTS: Mean pain scores in the laser group were significantly reduced immediately after treatment (0.68 Â± 0.6) compared with pretreatment (8.48 Â± 0.71; P < .001). In contrast, the placebo group showed little difference in pain scores between pretreatment (8.08 Â± 0.70) and immediately after treatment (7.96 Â± 0.84). In the laser group, significant improvements in healing times were observed (4.08 Â± 0.81 vs. 7.84 Â± 0.90 days; P < .001). CONCLUSION: CO2 laser therapy in recurrent aphthous stomatitis (RAS) provides immediate pain relief sustained over 24 h, along with accelerated healing time. Placebos Adolescent;Adult;Cohort Studies;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Pain;Pain Measurement;Placebos;Prospective Studies;Single-Blind Method;Stomatitis, Aphthous;Time Factors;Treatment Outcome;Wound Healing;Young Adult
808â€‰nm wavelength light induces a dose-dependent alteration in microglial polarization and resultant microglial induced neurite growth. BACKGROUND AND OBJECTIVE: Despite the success of using photobiomodulation (PBM), also known as low level light therapy, in promoting recovery after central nervous system (CNS) injury, the effect of PBM on microglia, the primary mediators of immune and inflammatory response in the CNS, remains unclear. Microglia exhibit a spectrum of responses to injury, with partial or full polarization into pro- and anti-inflammatory phenotypes. Pro-inflammatory (M1 or classically activated) microglia contribute to chronic inflammation and neuronal toxicity, while anti-inflammatory (M2 or alternatively activated) microglia play a role in wound healing and tissue repair; microglia can fall anywhere along this spectrum in response to stimulation. MATERIALS AND METHODS: The effect of PBM on microglial polarization therefore was investigated using colorimetric assays, immunocytochemistry, proteomic profiling and RT-PCR in vitro after exposure of primary microglia or BV2 microglial cell line to PBM of differing energy densities (0.2, 4, 10, and 30â€‰J/cm(2) , 808â€‰nm wavelength, 50â€‰mW output power). RESULTS: PBM has a dose-dependent effect on the spectrum of microglial M1 and M2 polarization. Specifically, PBM with energy densities between 4 and 30â€‰J/cm(2) induced expression of M1 markers in microglia. Markers of the M2 phenotype, including CD206 and TIMP1, were observed at lower energy densities of 0.2-10â€‰J/cm(2) . In addition, co-culture of PBM or control-treated microglia with primary neuronal cultures demonstrated a dose-dependent effect of PBM on microglial-induced neuronal growth and neurite extension. CONCLUSION: These data suggest that the Arndt-Schulz law as applied to PBM for a specific bioassay does not hold true in cells with a spectrum of responses, and that PBM can alter microglial phenotype across this spectrum in a dose-dependent manner. These data are therefore of important relevance to not only therapies in the CNS but also to understanding of PBM effects and mechanisms. Biomarkers;Cytokines Animals;Biomarkers;Cells, Cultured;Cytokines;Dose-Response Relationship, Radiation;Infrared Rays;Low-Level Light Therapy;Microglia;Neurites;Rats;Rats, Sprague-Dawley
Effect of red and near-infrared wavelengths on low-level laser (light) therapy-induced healing of partial-thickness dermal abrasion in mice. Low-level laser (light) therapy (LLLT) promotes wound healing, reduces pain and inflammation, and prevents tissue death. Studies have explored the effects

of various radiant exposures on the effect of LLLT; however, studies of wavelength dependency in in vivo models are less common. In the present study, the healing effects of LLLT mediated by different wavelengths of light in the red and near-infrared (NIR) wavelength regions (635, 730, 810, and 980 nm) delivered at constant fluence (4 J/cm(2)) and fluence rate (10 mW/cm(2)) were evaluated in a mouse model of partial-thickness dermal abrasion. Wavelengths of 635 and 810 nm were found to be effective in promoting the healing of dermal abrasions. However, treatment using 730- and 980-nm wavelengths showed no sign of stimulated healing. Healing was maximally augmented in mice treated with an 810-nm wavelength, as evidenced by significant wound area reduction ($p < 0.05$), enhanced collagen accumulation, and complete re-epithelialization as compared to other wavelengths and non-illuminated controls. Significant acceleration of re-epithelialization and cellular proliferation revealed by immunofluorescence staining for cytokeratin-14 and proliferating cell nuclear antigen ($p < 0.05$) was evident in the 810-nm wavelength compared with other groups. Photobiomodulation mediated by red (635 nm) and NIR (810 nm) light suggests that the biological response of the wound tissue depends on the wavelength employed. The effectiveness of 810-nm wavelength agrees with previous publications and, together with the partial effectiveness of 635 nm and the ineffectiveness of 730 and 980 nm wavelengths, can be explained by the absorption spectrum of cytochrome c oxidase, the candidate mitochondrial chromophore in LLLT. Keratin-14;Proliferating Cell Nuclear Antigen Animals;Cell Proliferation;Disease Models, Animal;Immunohistochemistry;Infrared Rays;Keratin-14;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Optical Phenomena;Proliferating Cell Nuclear Antigen;Re-Epithelialization;Skin;Wound Healing

Which therapy works for melasma in pigmented skin: lasers, peels, or triple combination creams? Glycolates;Keratolytic Agents Chemexfoliation;Female;Glycolates;Humans;Keratolytic Agents;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis

Potential anti-inflammatory effect of low-level laser therapy on the experimental reflux laryngitis: a preliminary study. The most common cause of laryngitis is the laryngopharyngeal reflux disease. The symptoms of laryngitis can be hoarseness, globus, chronic cough, voice fatigue, throat pain, and dysphagia. Low-level laser therapy (LLLT) is beneficial to reduce the pain and inflammatory response without side effects. Therefore, LLLT may be a useful tool for the treatment of laryngitis. This study proposes to analyze the effect of laser therapy in a model of reflux-induced laryngitis. The animals were randomly put into three groups: control--non-intubated; nasogastric intubation--intubated; and nasogastric intubation with laser therapy-intubated treated with 105-J/cm(2) laser irradiation. For the induction of laryngitis, the animals were anesthetized and a nasogastric tube was inserted through the nasopharynx until it reached the stomach, for 1 week. Thereafter, measurement of myeloperoxidase activity and the histopathological procedures were performed. In conclusion, we observed in this study that 105-J/cm(2) infrared laser reduced the influx of neutrophils in rats, and it improved the reparative collagenization of the laryngeal tissues. Fibrillar Collagens;Peroxidase Animals;Disease Models, Animal;Fibrillar Collagens;Humans;Intubation, Gastrointestinal;Laryngitis;Laryngopharyngeal Reflux;Low-Level Light Therapy;Male;Neutrophils;Peroxidase;Rats;Rats, Wistar;Treatment Outcome

[Optimization of an acute destructive cholecystitis treatment using application of mini-laparotomy access, laser irradiation and regional lymphotropic therapy]. Comparative analysis of the treatment results in 120 patients, suffering destructive form of biliary calculous disease (DFBCD) was performed. Depending on operative access and postoperative conservative therapy applied the patients were divided into two groups. In the main group in 58 patients, suffering DFBCD, a minilaparotomy access was applied, using "mini-assistant" apparatus named after M. I. Prudkov and postoperatively--low-intensive laser irradiation and regional lymphotropic therapy. In a comparison

group in 62 patients various laparotomic accesses were used, and a standard postoperative therapy was performed. Normalization of clinical, laboratory and immune indices in the main group were observed in twice earlier than in a control one, and economical together with moral-psychological effect was measured in reduction of the medicines quantity used as well as the patients stationary stay. Anti-Bacterial Agents;Immunoglobulins Adult;Aged;Anti-Bacterial Agents;Catheters, Indwelling;Cholecystectomy, Laparoscopic;Cholecystitis, Acute;Combined Modality Therapy;Female;Humans;Immunoglobulins;Low-Level Light Therapy;Male;Middle Aged;Postoperative Care;Treatment Outcome;Young Adult

Lasers for the treatment of dentin hypersensitivity: a meta-analysis. This systematic review and meta-analysis assessed the efficacy of lasers in reducing dentin hypersensitivity (DH) as compared with placebo or no treatment. Seven electronic databases and a manual search resulted in 2,538 unique publications. After selection, 13 studies were included in the meta-analysis. A CONSORT-based quality assessment revealed that 3 and 10 studies were at low and high risk of bias, respectively. A random-effects model with the generic inverse variance standardized mean difference (SMD) was used because of expected heterogeneity. Meta-analyses of the baseline-end of follow-up changes in pain revealed no differences for Er,Cr:YSSG vs. placebo (SMD = 2.49; 95% CI, -0.25 to 5.22; p = .07) but did reveal differences in favor of lasers for Er:YAG vs. placebo (SMD, 2.65; 95% CI, 1.25 to 4.05; p = .0002), Nd:YAG vs. placebo (SMD, 3.59; 95% CI, 0.49 to 6.69; p = .02), and GaAlAs vs. placebo (SMD, 3.40; 95% CI, 1.93 to 4.87; p < .00001). High and significant heterogeneity was found for all comparisons. In conclusion, Er:YAG, Nd:YAG, and GaAlAs lasers appear to be efficacious in reducing DH. However, given the high heterogeneity of the included studies, future randomized controlled clinical trials are needed to confirm these results. Placebos Dentin Sensitivity;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Pain Measurement;Placebos;Randomized Controlled Trials as Topic;Treatment Outcome

Laser therapy for refractory discoid lupus erythematosus when everything else has failed. BACKGROUND: Discoid lupus erythematosus (DLE) is restricted to the skin, mostly the face, often chronic and disfiguring. Standard medical therapies include topical corticosteroids and antimalarials. This is a retrospective long-term follow-up of refractory DLE treated with different lasers and intense pulsed light (IPL). METHODS AND MATERIALS: Sixteen patients with histologically confirmed DLE participated in this study. Two men and fourteen women, aged 28-69 years, mean age 54 years, were treated at the laser units of the Departments of Dermatology at the University Hospital of Ã–rebro from 2001 and at SkÃ¥ne University Hospital in MalmÃ¶, Sweden from 1999. Several therapies, including first- and second-line treatments and even cryotherapy, had been used without response. Many patients had marked scarring. Pulsed dye laser (PDL) and IPL were used with low fluencies. RESULTS: Of 16 patients, 14 were improved regarding itching, erythema, scaling, scarring and pain. There was no scarring as a side effect of laser therapy or IPL. Two patients were not satisfied: one because of long healing time, and the other because of post inflammatory hyper pigmentation. CONCLUSION: IPL and PDL is a safe adjunctive therapy to conventional treatment of DLE. In the effort to prevent severe scarring and disfigurement it should be used as early as possible. Adult;Aged;Facial Dermatoses;Female;Follow-Up Studies;Humans;Hyperpigmentation;Intense Pulsed Light Therapy;Lasers, Dye;Low-Level Light Therapy;Lupus Erythematosus, Discoid;Male;Middle Aged;Patient Satisfaction;Retrospective Studies;Time Factors

Efficacy of low-level laser therapy on scar tissue. BACKGROUND: Physiotherapy has a very important role in the maintenance of the integumentary system integrity. There is very few evidence in humans. Nevertheless, there are some studies about tissue regeneration using low-level laser therapy (LLLT). AIM: To analyze the effectiveness of LLLT on scar tissue. METHODS: Seventeen volunteers were stratified by age of their scars, and then randomly assigned to an experimental group

(EG) - n = 9 - and a placebo group (PG) - n = 8. Fifteen sessions were conducted to both the groups thrice a week. However, in the PG, the laser device was switched off. Scars' thickness, length, width, macroscopic aspect, pain threshold, pain perception, and itching were measured. RESULTS: After 5 weeks, there were no statistically significant differences in any variable between both the groups. However, analyzing independently each group, EG showed a significant improvement in macroscopic aspect (p = 0.003) using LLLT. Taking into account the scars' age, LLLT showed a tendency to decrease older scars' thickness in EG. CONCLUSION: The intervention with LLLT appears to have a positive effect on the macroscopic scars' appearance, and on old scars' thickness, in the studied sample. However, it cannot be said for sure that LLLT has influence on scar tissue. Adolescent;Adult;Chi-Square Distribution;Cicatrix;Female;Humans;Longitudinal Studies;Low-Level Light Therapy;Male;Pain Measurement;Physical Therapy Modalities;Pilot Projects;Statistics, Nonparametric;Treatment Outcome

A split-face comparison of low-fluence Q-switched Nd: YAG laser plus 1550 nm fractional photothermolysis vs. Q-switched Nd: YAG monotherapy for facial melasma in Asian skin. BACKGROUND: Melasma is a common pigmentary disorder which poses substantial therapeutic challenge. Combined therapy may be beneficial in Asians, where mixed type melasma is dominant. OBJECTIVE: We sought to assess the efficacy and safety of a 1064 nm Q-switched Nd: YAG (1064 QSNY) and a nonablative 1550 nm erbium-doped fractional photothermolysis (NFP) treatment in Asian melasma. METHODS: This was a split face study, in which 26 patients were treated with the 1064 QSNY (6 mm spot size, 1.2-1.4 J/cm(2) fluence) for 10 sessions at 2-week intervals to the entire face, and with the NFP (dynamic mode, pulse energy 6-8 mJ/microthermal zone (MTZ); total density 300 MTZs/cm(2)) for five sessions at 4-week intervals to the experimental side of the face. Efficacy variables were modified Melasma Area and Severity Index (mMASI), the physician's global assessment (PhGA), and patient's subjective global assessment (PGA). Safety was evaluated through the reporting of adverse events. RESULTS: The percentage of subjective improvement was virtually identical on both sides. The mMASI corroborated the patients' subjective estimate, both in terms of the degree of improvement and the lack of difference between the 1064 QSNY + NFP and the 1064 QSNY treated sides. No serious side effects were reported in either side. CONCLUSIONS: Our findings do not support the hypothesis of NFP providing a substantial benefit in treating the melasma when compared with the lone treatment of the 1064 QSNY. Adult;Asian People;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction;Phototherapy;Statistics, Nonparametric;Treatment Outcome

Evaluation of the effect of low level laser on prevention of chemotherapy-induced mucositis. Radiotherapy in the head and neck region and chemotherapy might give rise to oral mucositis which is a severe and painful inflammation. There is no known definite cure for mucositis. A number of studies have attempted to evaluate the effect of low-power laser on radiotherapy- and chemotherapy-induced mucositis. The present study was undertaken to evaluate the effect of low-power laser on the prevention of mucositis, xerostomia and pain as a result of chemotherapy. The subjects in this double-blind randomized controlled study were 24 adult patients who underwent chemotherapy during 2009-2010. The results showed that low-power laser was able to decrease the effect of chemotherapy on oral mucositis, xerostomia and pain in a variety of malignancies (P<0.05). It can be concluded that low-power laser might decrease the intensity of mucositis. Adolescent;Adult;Aged;Cohort Studies;Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain;Stomatitis;Treatment Outcome;Xerostomia;Young Adult

The effectiveness of transmeatal low-power laser stimulation in treating tinnitus. The aim of this study is to examine the effectiveness of transmeatal low-power laser stimulation (TLLS) in treating

tinnitus. This is a prospective, double-blinded, randomized, placebo-controlled trial. Patients with persistent subjective tinnitus as their main symptom were recruited into the study from the outpatient clinics. The recruited patients were randomized into the experimental group or TLLS+ group (patients in this group were prescribed to use TLLS at 5Â mW at 650Â nM wavelength for 20Â min daily and oral betahistine 24Â mg twice per day for a total of 10Â weeks) and the control group or TLLS- group (patients in this group were prescribed with a placebo device to use and oral betahistine 24Â mg twice per day for 10Â weeks). All patients were required to answer two sets of questionnaires: the Tinnitus handicap inventory (THI) and visual analogue scales (VAS) symptoms rating scales, before starting the treatment and at the end of the 10-week treatment period. The total score of the THI questionnaire was further graded into five grades, grade 1 being mild and grade 5 being catastrophic. Wilcoxon-signed ranks test and Mann-Whitney test were used to compare and analyze the THI and VAS scores before and after treatment for each group. Changes with p value of <0.05 were considered as statistically significant. Chi square test was used to analyze the change of parameters in categorical forms (to compare between TLLS+ and TLLS-). Changes with p value of <0.05 were considered as statistically significant. Forty-three patients successfully and diligently completed their treatment. It was noted that using any condition of the device, TLLS+ or TLLS-, patient's tinnitus symptoms improved in terms of THI scores (TLLS+, p valueÂ =Â 0.038; TLLS-, p valueÂ =Â 0.001) or VAS scores with a change of at least one grade (TLLS+, p valueÂ =Â 0.007; TLLS-, p valueÂ =Â 0.002) at p value <0.05 significant level. In contrast when TLLS+ group was compared with TLLS- group, no statistically significant result was obtained. In term of VAS scores, there seems to be no statistically significant improvement in patients' annoyance, sleep disruption, depression, concentration and tinnitus loudness and pitch heard between the two groups. Transmeatal low-power laser stimulation did not demonstrate significant efficacy as a therapeutic measure in treating tinnitus. Vasodilator Agents;Betahistine Administration, Oral;Ambulatory Care;Betahistine;Combined Modality Therapy;Double-Blind Method;Ear Canal;Equipment Design;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Surveys and Questionnaires;Tinnitus;Vasodilator Agents

In vitro cell tests of pancreatic malignant tumor cells by photothermotherapy based on DMSO porous silicon colloids. Dimethyl sulfoxide porous silicon (DMSO-PSi) colloid in which DMSO was used as a surfactant suitable for inhibiting the agglomeration of PSi nanoparticles was prepared for use in cancer photothermotherapy. The photothermal effect of the DMSO-PSi colloid was found to be high enough to destroy cancer cells (T = âˆ¼52 Â°C). The mean particle size of the PSi nanoparticles in the DMSO-PSi colloid was 67 nm, which is low enough to flow through blood vessels without causing a blockage. The DMSO-PSi colloid in combination with an NIR laser resulted in a cell viability of 5.70%, which is a sufficiently high cytotoxic effect. Colloids;Dimethyl Sulfoxide;Silicon Cell Line, Tumor;Cell Survival;Colloids;Dimethyl Sulfoxide;Humans;Hyperthermia, Induced;Lasers, Semiconductor;Low-Level Light Therapy;Nanoparticles;Pancreatic Neoplasms;Particle Size;Porosity;Silicon

Histomorphometrical and radiological comparison of low-level laser therapy effects on distraction osteogenesis: experimental study. Distraction osteogenesis (DO) is the application of traction to the callus formed between bone segments and stimulation of bone formation by creating stress on the callus with this traction. Shorten the duration of DO and increasing the capacity of bone formation is important to prevent the possible complications of DO. For this reason, it was considered that low-level laser therapy (LLLT) may affect positively DO and it can decrease the complication range by shortening the period. Unilateral mandibular distractors were applied on 16 female white New Zealand rabbit to prove this hypothesis with micro CT, plain radiograph and histomorphometric analyses. Eight rabbits were applied LLLT with GaAlAs laser on the distraction area during the

distraction period. On the post-distraction 28th day, four rabbits from study group and four rabbits from control groups were sacrificed. The rest of the rabbits were sacrificed on post-distraction 56th day. As a result of this study, significant positive effects of LLLT on post-distraction 28th day were revealed with all analyses. In histomorphometrical analyses, new bone formation was significantly higher in short-term laser applied group comparing to that of short-term control group (p = 0.029). In both microCT and plain radiograph, the highest radioopacity values were observed in short-term laser group when compared with that of the controls (p = 0.043 and p = 0.025, respectively). Even though LLLT increased the healing capacity on short-term, it was not sufficient on long-term (post-distraction 56th day) healing. LLLT application on distraction period, activate healing on bone so it may decrease DO period. The result of this study should be supported with clinical studies and the most effective laser source, dose and application time should be revealed with experimental and clinical studies. Animals;Disease Models, Animal;Female;Fracture Healing;Lasers, Semiconductor;Low-Level Light Therapy;Mandibular Fractures;Osteogenesis, Distraction;Rabbits;Time Factors;X-Ray Microtomography

The value of Q-switched Nd:YAG laser after patent blue-enhanced lymphaticovenular anastomosis. Coloring Agents;Rosaniline Dyes;sulfan blue Anastomosis, Surgical;Coloring Agents;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Lymphatic Vessels;Lymphedema;Middle Aged;Rosaniline Dyes;Veins

Is it time to consider photobiomodulation as a drug equivalent? Cell Proliferation;Humans;Low-Level Light Therapy;Melanocytes;Mesenchymal Stem Cells;Myocardial Infarction;Nerve Regeneration;Neurons;Parkinson Disease;Vitiligo;Wound Healing

Treating balance disorders by ultra-low-level laser stimulation of acupoints. BACKGROUND: Balance disorders, a widespread problem in the senior population, are very often related to painful musculoskeletal disabilities and/or to degenerative neurologic pathologies. In a previous work, we investigated the beneficial effects of acupuncture such as laser photobiostimulation, regardless of the etiological origin of the balance dysfunction. AIMS: Attention was focused on two individuals showing balance deficits with different etiologies. One healthy control individual was receiving treatment, one healthy control individual did not receive any treatment. Balance performances were measured before and after ultra-low-level laser (ULLL) stimulation as a basis for the design of further investigations. METHODS: Romberg's parameters were measured on a force platform. Of the four tested individuals, one showed dizziness symptoms, one was affected by a mild form of Parkinson's disease, and two showed no dysfunction and were used as controls. RESULTS: It was found that a ULLL stimulation of peripheral Traditional Chinese Medicine (TCM) acupuncture points can be effective, regardless of the pathology. DISCUSSION: A specific clinical analysis of the stability of the beneficial result as a function of homogeneous groups of dysfunctional individuals is needed. Acupuncture Points;Acupuncture Therapy;Biomechanical Phenomena;Dizziness;Female;Humans;Low-Level Light Therapy;Parkinson Disease;Postural Balance

Inhibition of fibroblast proliferation in vitro using red light-emitting diodes. BACKGROUND: Red light is part of the visible light spectrum. The effects of light-emitting diode (LED)-generated red light on human skin are not well-characterized. OBJECTIVE: To study the effect of red LED-generated low-level light therapy (LLLT) on fibroblast proliferation and viability in vitro. METHODS AND MATERIALS: Irradiation of normal human skin fibroblasts using red LED panels was performed in vitro, and modulation of proliferation and viability was quantified using trypan blue dye exclusion assay. RESULTS: Statistically significant decreases in cell proliferation were noted at the following fluences (time): 160 J/cm2 (30 minutes, 34 seconds), 320 J/cm2 (61 minutes, 07 seconds) and 640 J/cm2 (122 minutes, 14 seconds) (Figure 1). Irradiation at the 160- (98.5 Â± 1.2%) and 320-J/cm2 (98.0 Â± 3.1%) doses did not significantly alter viability. CONCLUSION: At certain fluences, red LLLT can effectively

inhibit fibroblast proliferation in vitro without altering viability and holds promise for the treatment of scars and other proliferative skin diseases. Cell Proliferation;Cell Survival;Fibroblasts;Humans;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Skin

Effect of Er:YAG laser pulse duration on shear bond strength of metal brackets bonded to a porcelain surface. OBJECTIVE: The aim of this study was to compare the effect of different Er:YAG laser pulse durations on the shear bond strength (SBS) of metal brackets bonded to porcelain with two different adhesive systems. BACKGROUND DATA: Orthodontic brackets do not bond well to feldspathic porcelain surfaces, using resin cement. Various treatment methods have been suggested for the porcelain surface to improve bond strength. Thus far, no orthodontic study has evaluated the effect of different Er-YAG laser pulse durations on porcelain surfaces with or without sandblasting. METHODS: In the present study, 150 porcelain crowns were assigned to 10 groups differing in adhesive system and surface treatment. In five groups, the adhesive system was RelyX(â„¢) U 200 and in the other five, Transbond XT was used. For each adhesive system, the porcelain surfaces were treated in one of five different ways: sandblasted, Er:YAG laser short pulse (SP), Er:YAG laser super short pulse (SSP), sandblasted+SP, or sandblasted+SSP. The sandblasted group with Transbond XT served as the control. SBS test was conducted for each group. Samples were examined by scanning electron microscopy. ANOVA and independent t test were used for statistical analysis. RESULTS: The control group had increased roughness and the highest SBS. Er:YAG laser application to the sandblasted porcelain flattened the roughness, and the effects of SP and SSP were similar. CONCLUSIONS: Er:YAG laser application did not allow for elimination of the hydrofluoric acid step. RelyX U 200 is a viable alternative to Transbond XT on sandblasted porcelain. RelyX U200;Resin Cements;Transbond XT;Dental Porcelain;Hydrofluoric Acid Acid Etching, Dental;Adhesiveness;Dental Porcelain;Humans;Hydrofluoric Acid;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Orthodontic Brackets;Resin Cements;Shear Strength;Surface Properties

Digital photogrammetry and histomorphometric assessment of the effect of non-coherent light (light-emitting diode) therapy (Î»640 Â± 20 nm) on the repair of third-degree burns in rats. Recent studies have demonstrated the efficacy of coherent light therapy from the red region of the electromagnetic spectrum on the tissue-healing process. This study analysed the effect of non-coherent light therapy (light-emitting diode-LED) with or without silver sulfadiazine (sulpha) on the healing process of third-degree burns. In this study, 72 rats with third-degree burns were randomly divided into six groups (n = 12): Gr1 (control), Gr2 (non-contact LED), Gr3 (contact LED), Gr4 (sulfadiazine), Gr5 (sulfadiazine + non-contact LED) and Gr6 (sulfadiazine + contact LED). The groups treated with LED therapy received treatment every 48 h (Î» = 640 Â± 20 nm, 110 mW, 16 J/cm(2); 41 s with contact and 680 s without contact). The digital photometric and histomorphometric analyses were conducted after the burn occurred. The combination of sulpha and LED (contact or non-contact) improved the healing of burn wounds. These results demonstrate that the combination of silver sulfadiazine with LED therapy (Î» = 640 Â± 20 nm, 4 J/cm(2), without contact) improves healing of third-degree burn wounds, significantly reduces the lesion area and increases the granulation tissue, increases the number of fibroblasts, promotes collagen synthesis and prevents burn infections by accelerating recovery. Anti-Infective Agents, Local;Silver Sulfadiazine Animals;Anti-Infective Agents, Local;Burns;Combined Modality Therapy;Granulation Tissue;Male;Neovascularization, Physiologic;Photogrammetry;Phototherapy;Rats;Rats, Wistar;Silver Sulfadiazine;Time Factors;Wound Healing

Laser treatment of recurrent herpes labialis: a literature review. Recurrent herpes labialis is a worldwide life-long oral health problem that remains unsolved. It affects approximately one third of the world population and causes frequent pain and discomfort episodes, as well as social restriction due to its compromise of esthetic features. In addition, the available antiviral drugs have not been

successful in completely eliminating the virus and its recurrence. Currently, different kinds of laser treatment and different protocols have been proposed for the management of recurrent herpes labialis. Therefore, the aim of the present article was to review the literature regarding the effects of laser irradiation on recurrent herpes labialis and to identify the indications and most successful clinical protocols. The literature was searched with the aim of identifying the effects on healing time, pain relief, duration of viral shedding, viral inactivation, and interval of recurrence. According to the literature, none of the laser treatment modalities is able to completely eliminate the virus and its recurrence. However, laser phototherapy appears to strongly decrease pain and the interval of recurrences without causing any side effects. Photodynamic therapy can be helpful in reducing viral titer in the vesicle phase, and high-power lasers may be useful to drain vesicles. The main advantages of the laser treatment appear to be the absence of side effects and drug interactions, which are especially helpful for older and immunocompromised patients. Although these results indicate a potential beneficial use for lasers in the management of recurrent herpes labialis, they are based on limited published clinical trials and case reports. The literature still lacks double-blind controlled clinical trials verifying these effects and such trials should be the focus of future research. Antiviral Agents;Photosensitizing Agents Animals;Antiviral Agents;Herpes Labialis;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Recurrence

Trans-canal laser irradiation reduces tinnitus perception of salicylate treated rat. The aim of this study was to find out the effect of low-level laser therapy (LLLT) on salicylate-induced tinnitus in the rat model. Fourteen Sprague-Dawley rats (8 weeks; 240-280 gm) were divided into 2 groups (study group, control group). Rats of both groups were treated with 400 mg/kg/day of sodium salicylate for 8 consecutive days. Tinnitus was monitored using GPIAS (Gap Prepulse Inhibition of Acoustic Startle) 2 h after first salicylate treatment, and every 24 h during 9 days of treatment. Rats in laser group were irradiated to each ear with wavelength of 830 nm diode laser (165 mW/cm(2)) for 30 min daily for 8 days. During salicylate treatment, rats of study group irradiated with low level laser showed significantly higher GPIAS values throughout the experiment. Therapeutic effect of LLLT is demonstrated in animal tinnitus model by means of GPIAS. Further experimental studies are needed to find possible mechanisms and better methods to improve LLLT efficacy. Salicylates Animals;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Reflex, Startle;Salicylates;Tinnitus;Treatment Outcome

Randomized clinical trial of CO2 laser pinpoint irradiation technique with/without needling for ice pick acne scars. BACKGROUND: Pinpoint irradiation technique accompanying by needling is an effective treatment for atrophic acne scars as fractional photothermolysis. It often induces microscopic thermal wounds to achieve skin rejuvenation treatment for ice pick acne scars. OBJECTIVE: This study was designed to prospectively evaluate the use of a pinpoint irradiation technique without needling in the treatment of ice pick acne scars. METHODS: Sixty patients with ice pick acne scars were included in this open label pilot study. Pinpoint irradiation technique by CO2 laser without and with needling applied for study and control groups, respectively. RESULTS: There was a statistically insignificant difference in the improvement results between the study and control groups ($p > 0.05$). But there were statistically significant differences in acne scar severity index and qualitative scarring grading system between before and after treatment of both groups ($p < 0.05$). CONCLUSION: Pinpoint irradiation technique by CO2 laser without needling is safe and effective as pinpoint irradiation technique with needling. Clinical improvement was achieved in all 30 patients without adverse effects. Acne Vulgaris;Adult;Case-Control Studies;Chi-Square Distribution;Cicatrix;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Needles;Treatment Outcome

Is low-level laser therapy in relieving neck pain effective? Systematic review and meta-analysis. The aim of this study is to determine the efficacy of low-level laser therapy (LLLT) in reducing acute and chronic neck pain as measured by the visual analog scale (VAS). A systematic search of nine electronic databases was conducted to identify original articles. For study selection, two reviewers independently assessed titles, abstracts, and full text for eligibility. Methodological quality was assessed using the Detsky scale. Data were analyzed using random-effects model in the presence of heterogeneity and fixed-effect model in its absence. Heterogeneity was assessed using Cochran's Q statistic and quantifying I (2). Risk ratios (RR) with 95 % confidence intervals (CI) were reported. Eight randomized controlled trials involving 443 patients met the strict inclusion criteria. Inter-rater reliability for study selection was 92.8 % (95 % CIs 80.9-100 %) and for methodological quality assessment was 83.9 % (95 % CIs 19.4-96.8 %). Five trials included patients with cervical myofascial pain syndrome (CMPS), and three trials included different patient populations. A meta-analysis of five CMPS trials revealed a mean improvement of VAS score of 10.54 with LLLT (95 % CI 0.37-20.71; Heterogeneity I (2)= 65 %, P = 0.02). This systematic review provides inconclusive evidence because of significant between-study heterogeneity and potential risk of bias. The benefit seen in the use of LLLT, although statistically significant, does not constitute the threshold of minimally important clinical difference. Humans;Low-Level Light Therapy;Neck Pain;Pain Management;Treatment Outcome

[Tattoo removal with laser (interview by Dr. Beate Schumacher)]. Adolescent;Adult;Aged;Esthetics;Female;Germany;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Motivation;Retreatment;Tattooing;Treatment Outcome;Young Adult

Testing infrared laser phototherapy (810â€‰nm) to ameliorate diabetes: irradiation on body parts of diabetic mice. BACKGROUND AND OBJECTIVES: Irradiation of left flank of genetic diabetic mice with 660â€‰nm wavelength laser, 100â€‰mW, 20â€‰seconds/day for 7 days did not significantly alter blood plasma glucose compared to nonirradiated controls. Infrared light would provide for a greater amount of photoenergy penetrating the skin and muscle. Genetic diabetic mice were irradiated with 810â€‰nm wavelength laser to test for antidiabetic effect. MATERIALS AND METHODS: Sixty-five diabetic mice were used. Body weight and water intake of mice were measured daily for 7 days prior to start of treatment (Day 0). Mice were irradiated with 810â€‰nm wavelength laser, 50â€‰mW, 40â€‰seconds/day, 7 days on left flank (nâ€‰=â€‰11), mid-upper abdomen (nâ€‰=â€‰14), or left inguinal region (nâ€‰=â€‰14); some mice were not irradiated (control, nâ€‰=â€‰26). Body weight and water intake of mice were measured to Day 7. On Day 7, mice were fasted for 4â€‰hours, anesthetized with sodium pentobarbitone (s.c.) and blood collected by cardiac puncture into EDTA-treated tubes. Blood plasma was assayed for glucose and fructosamine. Blood was collected and assayed from nonirradiated nondiabetic mice (nâ€‰=â€‰12). RESULTS: On Day 7 body weight was significantly lower and water intake significantly higher compared to Day 0 for diabetic mice irradiated on left flank (40.7â€‰Â±â€‰0.5 vs. 42.2â€‰Â±â€‰0.4â€‰g, 28.2â€‰Â±â€‰1.5 vs. 23.4â€‰Â±â€‰1.5â€‰g, respectively); there was no significant change for diabetic mice irradiated on mid-upper abdomen or left inguinal region and also for nonirradiated diabetic mice. On Day 7 blood plasma glucose levels for irradiated diabetic mice were not significantly different to nonirradiated diabetic mice. Blood plasma fructosamine level of diabetic mice irradiated on left inguinal region was significantly lower than for nonirradiated diabetic mice (312â€‰Â±â€‰6 vs. 377â€‰Â±â€‰15â€‰Âµmol/L); for diabetic mice irradiated on left flank or mid-upper abdomen (362â€‰Â±â€‰22, 357â€‰Â±â€‰19â€‰Âµmol/L) it was not significantly different to nonirradiated diabetic mice. CONCLUSION: Irradiation of left inguinal region in diabetic mice with 810â€‰nm laser has potential to ameliorate diabetes as shown by decreased blood plasma fructosamine. Biomarkers;Blood Glucose;Fructosamine Animals;Biomarkers;Blood

Glucose;Diabetes Mellitus, Type 2;Female;Fructosamine;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Mice, Transgenic;Random Allocation;Torso;Treatment Outcome

Effect of low-level laser therapy (LLLT) on acute neural recovery and inflammation-related gene expression after crush injury in rat sciatic nerve. BACKGROUND AND OBJECTIVES: Peripheral nerve function can be debilitated by different kinds of injury. Low-level laser therapy (LLLT) has been used successfully during rehabilitation to stimulate recovery. The aim of this study was to evaluate the effects of LLLT (660â€‰nm, 60â€‰J/cm(2) , 40â€‰mW/cm(2)) on acute sciatic nerve injury. MATERIALS AND METHODS: Thirty Wistar male rats were divided into three groups: (1) Normal, intact nerves; (2) I3d, crushed nerves evaluated on Day-3 post-injury; (3) Iâ€‰+â€‰L3d, crushed nerves submitted to two sessions of LLLT and investigated at 3 days post-injury. Sciatic nerves were removed and processed for gene expression analysis (real-time PCR) of the pro-inflammatory factors TWEAK, Fn14 and TNF-Î± and extracellular matrix remodeling and axonal growth markers, such as TIMP-1, MMP-2, and MMP-9. Zymography was used to determine levels of MMP-2 and MMP-9 activity and Western blotting was used to evaluate TNF-Î± protein content. Shapiro-Wilk and Levene's tests were applied to evaluate data normality and homogeneity, respectively. One-way ANOVA followed by Tukey test was used for statistical analysis with a significance level set at 5%. RESULTS: An increase in TNF-Î± protein level was found in Iâ€‰+â€‰L3 compared to Normal and I3d (Pâ€‰<â€‰0.05). Zymography showed an increase in proMMP-9 activity, in both I3d and Iâ€‰+â€‰L3d groups (Pâ€‰<â€‰0.05). The increase was more evident in Iâ€‰+â€‰L3d (Pâ€‰=â€‰0.02 compared to I3d). Active-MMP-9 isoform activity was increased in Iâ€‰+â€‰L3d compared to Normal and I3d groups (Pâ€‰<â€‰0.05). Furthermore, the activity of active-MMP-2 isoform was increased in I3d and Iâ€‰+â€‰L3 (Pâ€‰<â€‰0.05). An increase in TIMP-1 expression was observed in both I3d and Iâ€‰+â€‰L3d groups (Pâ€‰<â€‰0.05). CONCLUSIONS: The current study showed that LLLT increased MMPs activity, mainly MMP-9, and TNF-Î± protein level during the acute phase of nerve injury, modulating inflammation. Based on these results, it is recommended that LLLT should be started as soon as possible after peripheral nerve injury. Biomarkers Animals;Biomarkers;Blotting, Western;Gene Expression Regulation;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Peripheral Nerve Injuries;Random Allocation;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Recovery of Function;Reverse Transcriptase Polymerase Chain Reaction;Sciatic Nerve;Treatment Outcome

Effect and clinical implications of the low-energy diode laser on bone cell proliferation. Laser is a simple, noninvasive technique that has proven useful for treating damaged tissue. However, its effects on bone regeneration and the mechanisms involved are poorly understood. The objective of this study was to evaluate the effects on MG-63 cell proliferation of application of a pulsed diode laser (Ezlase) of 940 nm at low energy levels. After 24 hr of culture, osteoblasts underwent pulsed laser radiation at 0.5, 1, 1.5, and 2 W and fluences of 1-5 J. A control group was not irradiated. After the treatment, cells were incubated for 24 hr, and cell proliferation was analyzed using a spectrophotometric measure of cell respiration (MTT assay). Results were expressed as percentage proliferation versus controls. At 24-hr culture, cell proliferation was increased in laser-treated cells at intensities of 0.5, 1, and 1.5 W/cm(2) versus controls; the energy density was positively correlated with cell growth, which reached a peak at 3 J and decreased at higher fluences. The use of pulsed low-level laser with low-energy density range thus appears to exert a biostimulatory effect on bone tissue. Although the data on cell proliferation are robust, in-depth investigation is required into the effect of these irradiation doses on other cell parameters. The present findings demonstrate that laser therapy could be highly useful in tissue regeneration in different clinical settings, including nursing, physical therapy, dentistry, and traumatology. Bone and Bones;Cell Line, Tumor;Cell Proliferation;Humans;Low-Level Light Therapy

Hypertrichosis in Becker's nevus: effective low-fluence laser hair removal. Becker's nevus is cosmetically bothersome both due to the hyperpigmentation and due to the hypertrichosis which can accompany it, particularly in males. Laser hair removal can be considered, but the pigmented background of the Becker's nevus makes the treatment more challenging. Fifteen patients with Becker's nevus underwent eight sessions of hair removal with low-fluence high-repetition-rate diode lasers (808-810 nm). All participants experienced significant hair reduction at 6 and 12 months. No adverse events were reported. The study supports the use of low fluence with high-repetition-rate diode laser hair removal as a safe and effective method for the management of hypertrichosis in Becker's nevus. Adolescent;Hair Removal;Humans;Hyperpigmentation;Hypertrichosis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nevus;Prospective Studies;Skin Neoplasms;Time Factors;Treatment Outcome;Young Adult

Low-intensity far-red light inhibits early lesions that contribute to diabetic retinopathy: in vivo and in vitro. PURPOSE: Treatment with light in the far-red to near-infrared region of the spectrum (photobiomodulation [PBM]) has beneficial effects in tissue injury. We investigated the therapeutic efficacy of 670-nm PBM in rodent and cultured cell models of diabetic retinopathy. METHODS: Studies were conducted in streptozotocin-induced diabetic rats and in cultured retinal cells. Diabetes-induced retinal abnormalities were assessed functionally, biochemically, and histologically in vivo and in vitro. RESULTS: We observed beneficial effects of PBM on the neural and vascular elements of retina. Daily 670-nm PBM treatment (6 J/cm(2)) resulted in significant inhibition in the diabetes-induced death of retinal ganglion cells, as well as a 50% improvement of the ERG amplitude (photopic b wave responses) (both $P < 0.01$). To explore the mechanism for these beneficial effects, we examined physiologic and molecular changes related to cell survival, oxidative stress, and inflammation. PBM did not alter cytochrome oxidase activity in the retina or in cultured retinal cells. PBM inhibited diabetes-induced superoxide production and preserved MnSOD expression in vivo. Diabetes significantly increased both leukostasis and expression of ICAM-1, and PBM essentially prevented both of these abnormalities. In cultured retinal cells, 30-mM glucose exposure increased superoxide production, inflammatory biomarker expression, and cell death. PBM inhibited all of these abnormalities. CONCLUSIONS: PBM ameliorated lesions of diabetic retinopathy in vivo and reduced oxidative stress and cell death in vitro. PBM has been documented to have minimal risk. PBM is noninvasive, inexpensive, and easy to administer. We conclude that PBM is a simple adjunct therapy to attenuate the development of diabetic retinopathy. Superoxides;Nitric Oxide;Electron Transport Complex IV Animals;Cell Line;Diabetes Mellitus, Experimental;Diabetic Retinopathy;Disease Models, Animal;Electron Transport Complex IV;Electroretinography;Humans;In Situ Nick-End Labeling;In Vitro Techniques;Leukostasis;Light;Male;Neuroglia;Nitric Oxide;Oxidative Stress;Photoreceptor Cells, Vertebrate;Phototherapy;Rats;Rats, Inbred Lew;Retinal Ganglion Cells;Signal Transduction;Superoxides

Low-level laser therapy can produce increased aggressiveness of dysplastic and oral cancer cell lines by modulation of Akt/mTOR signaling pathway. Low-level laser therapy (LLLT) is a non-thermal phototherapy used in several medical applications, including wound healing, reduction of pain and amelioration of oral mucositis. Nevertheless, the effects of LLLT upon cancer or dysplastic cells have been so far poorly studied. Head and neck cancer patients receiving LLLT for oral mucositis, for example, might have remaining tumor cells that could be stimulated by LLLT. This study demonstrated that LLLT (GaAlAs--660 nm or 780 nm, 40 mW, 2.05, 3.07 or 6.15 J/cmÂ²) can modify oral dysplastic cells (DOK) and oral cancer cells (SCC9 and SCC25) growth by modulating the Akt/mTOR/CyclinD1 signaling pathway; LLLT significantly modified the expression of proteins related to progression and invasion in all the cell lines, and could aggravate oral cancer cellular behavior,

increasing the expression of pAkt, pS6 and Cyclin D1 proteins and producing an aggressive Hsp90 isoform. Apoptosis was detected for SCC25 and was related to pAkt levels. MAS1 protein, human;Proto-Oncogene Mas;Proto-Oncogene Proteins c-akt;TOR Serine-Threonine Kinases Apoptosis;Cell Line, Tumor;Cell Proliferation;Cell Survival;Gene Expression Regulation, Enzymologic;Humans;Low-Level Light Therapy;Mouth Neoplasms;Proto-Oncogene Mas;Proto-Oncogene Proteins c-akt;Signal Transduction;TOR Serine-Threonine Kinases

Low-level light therapy for androgenetic alopecia: a 24-week, randomized, double-blind, sham device-controlled multicenter trial. BACKGROUND: Androgenetic alopecia (AGA) is a common disorder affecting men and women. Finasteride and minoxidil are well-known, effective treatment methods, but patients who exhibit a poor response to these methods have no additional adequate treatment modalities. OBJECTIVE: To evaluate the efficacy and safety of a low-level light therapy (LLLT) device for the treatment of AGA. METHODS: This study was designed as a 24-week, randomized, double-blind, sham device-controlled trial. Forty subjects with AGA were enrolled and scheduled to receive treatment with a helmet-type, home-use LLLT device emitting wavelengths of 630, 650, and 660Â nm or a sham device for 18Â minutes daily. Investigator and subject performed phototrichogram assessment (hair density and thickness) and global assessment of hair regrowth for evaluation. RESULTS: After 24Â weeks of treatment, the LLLT group showed significantly greater hair density than the sham device group. Mean hair diameter improved statistically significantly more in the LLLT group than in the sham device group. Investigator global assessment showed a significant difference between the two groups, but that of the subject did not. No serious adverse reactions were detected. CONCLUSION: LLLT could be an effective treatment for AGA. Adult;Alopecia;Double-Blind Method;Equipment Design;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Effect of post-space treatments on the push-out bond strength and failure modes of glass fibre posts. The aim of this study was to evaluate the effect of different post-space treatments on the push-out bond strength and failure modes of glass fibre posts. Forty mandibular premolar roots were cut and endodontically treated. Post spaces were prepared and roots were divided into four groups. In group 1 distilled water irrigation (control), in group 2 2.25% NaOCl irrigation, in group 3 2.25% NaOCl + 17% EDTA irrigation were done and in group 4 diode laser was applied to the prepared post spaces. Scanning electron microscope (SEM) analysis was made for each group. Fibre posts were then luted with resin cement. Each root was prepared for push-out test. Data were statistically analysed with anova ($P = 0.05$). After push-out test, the failure modes were observed but not statistically analysed. There were statistically significant differences between Group 3 and Group 2 in both regions ($P < 0.05$), also in the middle region of Group 4 and Group 2 ($P < 0.05$). Cervical root segments showed higher bond strengths than middle ones in all groups ($P < 0.05$). The highest bond strength values were obtained from NaOCl/EDTA and the lowest bond strength values were obtained from NaOCl for both regions. Composite Resins;Dental Materials;Resin Cements;Root Canal Irrigants;fiberglass;Edetic Acid;Sodium Hypochlorite Bicuspid;Composite Resins;Dental Bonding;Dental Materials;Dental Prosthesis Design;Dental Pulp Cavity;Dental Stress Analysis;Dentin;Edetic Acid;Glass;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Post and Core Technique;Resin Cements;Root Canal Irrigants;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Stress, Mechanical;Surface Properties;Tooth, Nonvital

Evaluation of microleakage of root canal fillings irradiated with different output powers of erbium, chromium:yttrium-scandium-gallium-garnet laser. This study evaluated the root canal seal achieved by irradiation with an erbium, chromium:yttrium-scandium-gallium-garnet laser, and the optimal output power to remove debris and the smear layer were determined. One hundred

mandibular premolar teeth were prepared and divided into four groups. Group 1 was not lased but was irrigated with 5 mL of 5.25% NaOCl and 5 mL of 17% ethylenediaminetetraacetic acid. Group 2 was irradiated at a panel setting of 1 W, group 3 at 2 W and group 4 at 2.5 W, with a 50% water level and 48% air-cooling level. Root canals were obturated by cold lateral compaction, and apical microleakage was measured using a fluid filtration model. The remaining debris and smear layer were evaluated via scanning electron microscopy. Statistically significant differences were detected between groups. Irradiation at 1 and 2 W using an erbium, chromium:yttrium-scandium-gallium-garnet laser produced a seal superior to that of the other treatments. Root Canal Filling Materials;Root Canal Irrigants;Gutta-Percha;Edetic Acid;Sodium Hypochlorite Dental Leakage;Dental Pulp Cavity;Dentin;Edetic Acid;Gutta-Percha;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Radiotherapy Dosage;Root Canal Filling Materials;Root Canal Irrigants;Root Canal Obturation;Root Canal Preparation;Smear Layer;Sodium Hypochlorite;Tooth Apex

Combination of intense pulsed light and fractional CO(2) laser treatments for patients with acne with inflammatory and scarring lesions. BACKGROUND: Various laser and light sources are been used increasingly in cosmetic dermatology. AIM: To evaluate the efficacy and safety of combination intense pulsed light (IPL) and fractional CO2 laser in treating patients with acne with both inflammatory and scarring lesions. METHODS: In total, 37 Chinese patients with acne with facial inflammatory and scar lesions were treated. Successive sessions of 4-6 IPL treatments followed by 2 sessions of fractional CO2 laser treatments were applied. Effectiveness was determined by the dermatologist's evaluation, patient self-assessment, and devices that measure skin colour, sebum secretion and skin hydration. RESULTS: IPL treatments significantly reduced the inflammatory lesion score and the atrophic scar score compared with baseline. Subsequent fractional CO2 laser treatments further decreased the atrophic scar score. Both scores remained low when patients were followed up at 6 months. Around 90% of the patients experienced significant or moderate overall improvement, and almost 80% patients rated their results as 'excellent' or 'good'. The melanin index (MI), erythema index (EI) and skin sebum level all significantly decreased after IPL treatments, and the EI and sebum level were still low when assessed at the 3-month follow-up, although the MI had increased again. The adverse effects (AEs) of both treatments were transient and bearable. CONCLUSIONS: IPL in combination with fractional CO2 laser was effective in treating patients with acne with both inflammatory lesions and atrophic scars, and the AEs were acceptable.
Acne Vulgaris;Adult;Asian People;China;Cicatrix;Female;Humans;Inflammation;Intense Pulsed Light Therapy;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Young Adult

Clinical evaluation of the efficiency of low-level laser therapy for oral lichen planus: a prospective case series. Oral lichen planus (OLP) is an inflammatory disease that can be painful, mainly in the atrophic and erosive forms. Numerous drugs have been used with dissimilar results, but most treatments are empirical. However, to date, the most commonly employed and useful agents for the treatment of OLP are topical corticosteroids. The study objective was to detail the clinical effectiveness of low-level laser therapy (LLLT) for the management of OLP unresponsive to standard topical therapy. The authors studied a prospective cohort of 30 patients affected by OLP, who received biostimulation with a 980-nm gallium-aluminum-arsenide (GaAIAs) diode laser (DM980, distributed by DMT S.r.l., Via Nobel 33, 20035, Lissone, Italy). Outcome variables, statistically evaluated, were: the size of lesions; visual analogue score of pain and stability of the therapeutic results in the follow-up period. Eighty-two lesions were treated. We reported significant reduction in clinical scores of the treated lesions and in reported pain. No detailed complications or therapy side effects were observed during the study. As previously reported by our group with a preliminary report, this study suggests that LLLT could be a possible treatment choice for patients with

unresponsive symptomatic OLP, also reducing the possible invasiveness correlated with other therapies. Aged;Cohort Studies;Female;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Pain;Prospective Studies;Treatment Outcome
Management of chronic tendon injuries. Chronic tendon injuries present unique management challenges. The assumption that these injuries result from ongoing inflammation has caused physicians to rely on treatments demonstrated to be ineffective in the long term. Nonsteroidal anti-inflammatory drugs should be limited in the treatment of these injuries. Corticosteroid injections should be considered for temporizing pain relief only for rotator cuff tendinopathy. For chronic Achilles tendinopathy (symptoms lasting longer than six weeks), an intense eccentric strengthening program of the gastrocnemius/ soleus complex improved pain and function between 60 and 90 percent in randomized trials. Evidence also supports eccentric exercise as a first-line option for chronic patellar tendon injuries. Other modalities such as prolotherapy, topical nitroglycerin, iontophoresis, phonophoresis, therapeutic ultrasound, extracorporeal shock wave therapy, and low-level laser therapy have less evidence of effectiveness but are reasonable second-line alternatives to surgery for patients who have persistent pain despite appropriate rehabilitative exercise. Anti-Inflammatory Agents Achilles Tendon;Anti-Inflammatory Agents;Chronic Disease;Combined Modality Therapy;Cumulative Trauma Disorders;Exercise Therapy;Humans;Patellar Ligament;Rotator Cuff Injuries;Tendinopathy;Tendon Injuries;Tennis Elbow
Therapeutic ultrasound for carpal tunnel syndrome. BACKGROUND: Therapeutic ultrasound may be offered to people experiencing mild to moderate symptoms of carpal tunnel syndrome (CTS). The effectiveness and duration of benefit of this non-surgical intervention remain unclear. OBJECTIVES: To review the effects of therapeutic ultrasound compared with no treatment, placebo or another non-surgical intervention in people with CTS. SEARCH METHODS: On 27 November 2012, we searched the Cochrane Neuromuscular Disease Group Specialized Register, CENTRAL (2012, Issue 11 in The Cochrane Library), MEDLINE (January 1966 to November 2012), EMBASE (January 1980 to November 2012), CINAHL Plus (January 1937 to November 2012), and AMED (January 1985 to November 2012). SELECTION CRITERIA: Randomised controlled trials (RCTs) comparing any regimen of therapeutic ultrasound with no treatment, a placebo or another non-surgical intervention in people with CTS. DATA COLLECTION AND ANALYSIS: Two review authors independently selected trials for inclusion, extracted data and assessed the risk of bias in the included studies. We calculated risk ratio (RR) and mean difference (MD) with 95% confidence intervals (CIs) for primary and secondary outcomes. We pooled results of clinically homogenous trials in a meta-analysis using a random-effects model, where possible, to provide estimates of the effect. MAIN RESULTS: We included 11 studies including 414 participants in the review. Two trials compared therapeutic ultrasound with placebo, two compared one ultrasound regimen with another, two compared ultrasound with another non-surgical intervention, and six compared ultrasound as part of a multi-component intervention with another non-surgical intervention (for example, exercises and splint). The risk of bias was low in some studies and unclear or high in other studies, with only two reporting that the allocation sequence was concealed and six reporting that participants were blinded. Overall, there is insufficient evidence that one therapeutic ultrasound regimen is more efficacious than another. Only two studies reported the primary outcome of interest, short-term overall improvement (any measure in which patients indicate the intensity of their complaints compared with baseline, for example, global rating of improvement, satisfaction with treatment, within three months post-treatment). One low quality trial with 68 participants found that when compared with placebo, therapeutic ultrasound may increase the chance of experiencing short-term overall improvement at the end of seven weeks treatment (RR 2.36; 95% CI 1.40 to 3.98), although losses to follow-up and failure to adjust for the correlation between wrists in participants with bilateral CTS in this study suggest that this data should be

interpreted with caution. Another low quality trial with 60 participants found that at three months post-treatment therapeutic ultrasound plus splint increased the chance of short-term overall improvement (patient satisfaction) when compared with splint alone (RR 3.02; 95% CI 1.36 to 6.72), but decreased the chance of short-term overall improvement when compared with low-level laser therapy plus splint (RR 0.87; 95% CI 0.57 to 1.33), though participants were not blinded to treatment, it was unclear if the random allocation sequence was adequately concealed, and there was a potential unit of analysis error. Differences between groups receiving different frequencies and intensities of ultrasound, and between ultrasound as part of a multi-component intervention versus other non-surgical interventions, were generally small and not statistically significant for symptoms, function, and neurophysiologic parameters. No studies reported any adverse effects of therapeutic ultrasound, but this outcome was only measured in three studies. More adverse effects data are required before any firm conclusions on the safety of therapeutic ultrasound can be made. AUTHORS' CONCLUSIONS: There is only poor quality evidence from very limited data to suggest that therapeutic ultrasound may be more effective than placebo for either short- or long-term symptom improvement in people with CTS. There is insufficient evidence to support the greater benefit of one type of therapeutic ultrasound regimen over another or to support the use of therapeutic ultrasound as a treatment with greater efficacy compared to other non-surgical interventions for CTS, such as splinting, exercises, and oral drugs. More methodologically rigorous studies are needed to determine the effectiveness and safety of therapeutic ultrasound for CTS. Carpal Tunnel Syndrome;Combined Modality Therapy;Humans;Randomized Controlled Trials as Topic;Time Factors;Treatment Outcome;Ultrasonic Therapy

[Scars and lasers]. Different lasers are used to improve scars in combination with other therapies. The pulsed dye laser is considered to be the gold standard for hypertrophic scars and keloids. Ablative laser treatments are used with atrophic scars. Ablative or non-ablative fractional laser treatments are developing rapidly due to the lower risk of infection and easier follow-up care. Burns;Cicatrix;Cicatrix, Hypertrophic;Humans;Keloid;Laser Therapy;Low-Level Light Therapy;Pigmentation Disorders

Effect of low level laser application at the end of surgery to reduce pain after tonsillectomy in adults. INTRODUCTION: Tonsillectomy is among commonest otorhinolaryngologic surgeries. Many methods have been used to control post surgical pain, but despite it, pain is still one of the problems related to this operation. Recently, due to the non invasiveness of low level lasers, this modality has attracted attention. The purpose of this study is to evaluate the effects of low level laser irradiation at the end of surgery on reduction of pain after tonsillectomy in adults. METHODS: In a clinical trial, 60 adult patients, candidates for tonsillectomy were randomly assigned to two groups, A and B, and both groups were anesthetized similarly by the same technique. At the end of surgery, in the case group, the tonsils' bed were irradiated by infrared laser with 980nm wavelength, 100Hz, 4J/cm(2) from the infra mandibular angle. In the control group, the tonsils' bed had laser therapy with a turned off probe. Following laser treatment, the patients were reversed and extubated and consciousness achieved, pain and odynophagia were assessed at 2, 4, 6, 8, 12 and 24h post surgery based on visual analog scale for pain (VAS) and analgesic consumption. RESULTS: In the laser group frequency of patients with pain sensation in each evaluated hour was lower than in the control group. The amount of pain decrease and analgesic consumption reduction was significantly higher in patients who received laser (P=0.01). CONCLUSION: Based on the results of this study, use of low level lasers is effective in reducing tonsillectomy post surgical pain in adults.

Low level laser therapy for painful joints. Low Level Laser Therapy (LLLT) uses a light source that generates extremely pure light, of a single wavelength(1). The effect is not thermal, but rather related to photochemical reactions in the cells. LLLT was introduced as an alternative non-invasive treatment

for OA about 10 years ago, but its effectiveness is still controversial(2). A Cochrane review of LLLT in osteoarthritis included five trials, and concluded that despite some positive findings, the meta-analysis lacked data on how LLLT effectiveness was affected by the important factors of wavelength, treatment duration of LLLT, dosage, and site of application over nerves instead of joints(1,3,4,5,6,7). A different review(2) addresses some of these issues in a wider range of trials, and is broadly positive, if limited by numbers.

Application of Low level Lasers in Dentistry (Endodontic). Low level lasers, cold or soft lasers: These lasers do not produce thermal effects on tissues and induce photoreactions in cells through light stimulation which is called photobiostimulation. Power of these lasers is usually under 250mW. The main point differentiating low level lasers and high power ones is the activation of photochemical reactions without heat formation. The most important factor to achieve this light characteristic in lasers is not their power, but their power density for each surfa ceunit (i.e cm(2)). Density lower than 670mW/cm(2), can induce the stimulatory effects of low level lasers without thermal effects. Low level lasers (therapeutic) used today as treatment adjunctive devices in medicine and dentistry. Numerous studies have been performed on the applications of low level lasers in patient pain reduction. Mechanisms of pain reduction with therapeutic lasers and their application are expressed, and the studies realized in this field are presented.

Low level laser therapy (AlGaInP) applied at 5J/cm2 reduces the proliferation of Staphylococcus aureus MRSA in infected wounds and intact skin of rats. BACKGROUND: Laser therapy is a low cost, non-invasive procedure with good healing results. Doubts exist as to whether laser therapy action on microorganisms can justify research aimed at investigating its possible effects on bacteria-infected wounds. OBJECTIVE: To assess the effect of low intensity laser on the rate of bacterial contamination in infected wounds in the skin of rats. METHODS: An experimental study using 56 male Wistar rats. The animals were randomly divided into eight groups of seven each. Those in the "infected" groups were infected by Staphylococcus aureus MRSA in the dorsal region. Red laser diode (AlGaInP) 658nm, 5J/cm2 was used to treat the animals in the "treated" groups in scan for 3 consecutive days. Samples were drawn before inoculating bacteria and following laser treatment. For statistical analysis we used the nonparametric Wilcoxon (paired data) method with a significance level of $p < 0.05$. RESULTS: The statistical analysis of median values showed that the groups submitted to laser treatment had low bacterial proliferation. CONCLUSION: The laser (AlGaInP), with a dose of 5J/cm2 in both intact skin and in wounds of rats infected with Staphylococcus aureus MRSA, is shown to reduce bacterial proliferation. Analysis of Variance;Animals;Colony Count, Microbial;Disease Models, Animal;Low-Level Light Therapy;Male;Methicillin-Resistant Staphylococcus aureus;Radiation Dosage;Random Allocation;Rats;Rats, Wistar;Staphylococcal Infections;Statistics, Nonparametric;Wound Healing;Wound Infection

Macro and microscopic analysis of island skin grafts after low-level laser therapy. OBJECTIVE: To observe the effects of low intensity laser therapy in inflammation, wound healing and epithelialization of island skin grafts. METHODS: Twenty rats were subjected to this grafting technique and divided subsequently into two equal groups, one treated with laser and the other control. RESULTS: there was less inflammation, faster healing, epithelialization and keratinization in the laser-treated animals when compared to the untreated. CONCLUSION: Low intensity laser therapy is helpful to island skin grafting. Animals;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Skin;Skin Transplantation;Time Factors;Wound Healing

A multicenter study for a single, three-step laser treatment for cellulite using a 1440-nm Nd:YAG laser, a novel side-firing fiber, and a temperature-sensing cannula. BACKGROUND: Historically, treatments for cellulite have not been able to address all of its physiological components and require multiple sessions. OBJECTIVE: The authors evaluate the safety and efficacy of a single, subdermal

procedure to treat the underlying structure of cellulite. METHODS: Fifty-seven patients underwent a 3-step cellulite treatment with a 1440-nm Nd:YAG laser with a side-firing fiber and temperature-sensing cannula. Efficacy was measured by the ability of blinded evaluators to distinguish baseline photos from those taken at 3 and 6 months posttreatment, as well as their rating of the results on a 5-point, 2-category ordinal photonumeric scale when comparing baseline photos to those taken at 2, 3, and 6 months posttreatment. Patient and physician satisfaction was assessed based on completion of a satisfaction survey at 2, 3, and 6 months posttreatment. Adverse events (AE) were recorded throughout the study. RESULTS: At 6 months posttreatment, blinded evaluators rated at least a 1-point improvement in the appearance of cellulite in 96% of treated sites. Blinded evaluators were also able to correctly identify baseline versus posttreatment photos in 95% of cases. At least 90% of patients and physicians reported satisfaction with the results of treatment throughout 6 months. AE were mild in intensity and transient to treatment. CONCLUSIONS: A single, 3-step, minimally invasive laser treatment using a 1440-nm Nd:YAG laser, side-firing fiber, and temperature-sensing cannula to treat the underlying structure of cellulite proved to be safe and maintained effectiveness at least 6 months posttreatment. LEVEL OF EVIDENCE: 2. Adipose Tissue;Adult;Buttocks;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Obesity;Patient Satisfaction;Prospective Studies;Risk Assessment;Subcutaneous Fat;Thermosensing;Thigh;Treatment Outcome;Young Adult

[Possibilities of magnetic-laser therapy in comprehensive treatment of patients with brain concussion in acute period]. The efficacy of magnetic-laser therapy used according to the method developed by us was studied in patients having the brain concussion (BC) in an acute period. The study was based on the dynamics of values of the evoked vestibular potentials and the disease clinical course. It was shown that following the magnetic-laser therapy in combination with traditional pharmacotherapy in BC acute period, the statistically significant positive changes were registered in the quantitative characteristics of the evoked vestibular brain potentials that correlated with the dynamics of the disease clinical course. The data obtained substantiate the possibility of using the magnetic-laser therapy in patients with a mild craniocereblal injury in an acute period. Acute Disease;Adolescent;Adult;Brain;Brain Concussion;Case-Control Studies;Evoked Potentials;Female;Humans;Lasers;Low-Level Light Therapy;Magnetic Field Therapy;Male;Middle Aged;Monitoring, Physiologic

Nonsurgical antimicrobial photodynamic therapy in moderate vs severe peri-implant defects: a clinical pilot study. OBJECTIVE: Recent review articles have shown that open debridement is more effective in the treatment of peri-implantitis than closed therapy. However, surgery may result in marginal recession and compromise esthetics. The purpose of this study was to assess the efficacy of nonsurgical antimicrobial photodynamic therapy (aPDT) in moderate vs severe defects. METHOD AND MATERIALS: The study encompassed 16 patients with a total of 18 ailing implants. Ten of these implants showed moderate bone loss (< 5 mm; Group 1) and eight implants severe defects (5 through 8 mm; Group 2). All implants received aPDT without surgical intervention. At baseline and 2 weeks, 3 months, and 6 months after therapy, peri-implant health was assessed including sulcus bleeding index (SBI), probing depth (PD), distance from implant shoulder to marginal mucosa (DIM), and clinical attachment level (CAL). Radiographic evaluation of distance from implant to bone (DIB) allowed comparison of peri-implant hard tissues after 6 months. RESULTS: Baseline values for SBI were comparable in both groups. Three months after therapy, in both groups, SBI and CAL decreased significantly. In contrast, after 6 months, CAL and DIB increased significantly in Group 2, not in Group 1. However, DIM-values were not statistically different 6 months after therapy in both groups. CONCLUSION: Within the limits of this 6-month study, nonsurgical aPDT could stop bone resorption in moderate peri-implant defects but not in severe defects. However, marginal tissue recession was not

significantly different in both groups at the end of the study. Therefore, especially in esthetically important sites, surgical treatment of severe peri-implantitis defects seems to remain mandatory. Dental Implants;Phenothiazines;Photosensitizing Agents;phenothiazine;Methylene Blue Alveolar Bone Loss;Alveolar Process;Dental Implants;Disease Progression;Follow-Up Studies;Gingival Recession;Humans;Low-Level Light Therapy;Methylene Blue;Peri-Implantitis;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Phenothiazines;Photochemotherapy;Photosensitizing Agents;Pilot Projects;Radiography;Treatment Outcome

Photobiomodulation preserves behaviour and midbrain dopaminergic cells from MPTP toxicity: evidence from two mouse strains. BACKGROUND: We have shown previously that near-infrared light (NIr) treatment or photobiomodulation neuroprotects dopaminergic cells in substantia nigra pars compacta (SNc) from degeneration induced by 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) in Balb/c albino mice, a well-known model for Parkinson's disease. The present study explores whether NIr treatment offers neuroprotection to these cells in C57BL/6 pigmented mice. In addition, we examine whether NIr influences behavioural activity in both strains after MPTP treatment. We tested for various locomotive parameters in an open-field test, namely velocity, high mobility and immobility. RESULTS: Balb/c (albino) and C57BL/6 (pigmented) mice received injections of MPTP (total of 50 mg/kg) or saline and NIr treatments (or not) over 48 hours. After each injection and/or NIr treatment, the locomotor activity of the mice was tested. After six days survival, brains were processed for TH (tyrosine hydroxylase) immunochemistry and the number of THâ•º cells in the substantia nigra pars compacta (SNc) was estimated using stereology. Results showed higher numbers of THâ•º cells in the MPTP-NIr groups of both strains, compared to the MPTP groups, with the protection greater in the Balb/c mice (30% vs 20%). The behavioural tests revealed strain differences also. For Balb/c mice, the MPTP-NIr group showed greater preservation of locomotor activity than the MPTP group. Behavioural preservation was less evident in the C57BL/6 strain however, with little effect of NIr being recorded in the MPTP-treated cases of this strain. Finally, there were differences between the two strains in terms of NIr penetration across the skin and fur. Our measurements indicated that NIr penetration was considerably less in the pigmented C57BL/6, compared to the albino Balb/c mice. CONCLUSIONS: In summary, our results revealed the neuroprotective benefits of NIr treatment after parkinsonian insult at both cellular and behavioural levels and suggest that Balb/c strain, due to greater penetration of NIr through skin and fur, provides a clearer model of protection than the C57BL/6 strain. Neurotoxins;1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Tyrosine 3-Monooxygenase 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine;Analysis of Variance;Animals;Disease Models, Animal;Dopaminergic Neurons;Exploratory Behavior;Infrared Rays;Low-Level Light Therapy;MPTP Poisoning;Male;Mesencephalon;Mice;Mice, Inbred BALB C;Mice, Inbred C57BL;Motor Activity;Neurotoxins;Species Specificity;Time Factors;Tyrosine 3-Monooxygenase

Low-level laser therapy promotes the osteogenic potential of adipose-derived mesenchymal stem cells seeded on an acellular dermal matrix. This study investigates the feasibility of using an adipose-derived mesenchymal stem cell (ASC)-seeded acellular dermal matrix (ADM) along with low-level laser therapy (LLLT) to repair bone defect in athymic nude mice. Critical-sized calvarial defects were treated either with ADM, ADM/LLLT, ADM/ASCs, or ADM/ASCs/LLLT. In micro-computed tomography scans, the ADM/ASCs and the ADM/ASCs/LLLT groups showed remarkable bone formation after 14 days. Additionally, bone regeneration in the ADM/ASCs/LLLT group was obvious at 28 days, but in the ADM/ASCs group at 56 days. Bone mineral density and bone tissue volume in the ADM/ASCs/LLLT group significantly increased after 7 days, but in the ADM/ASCs group after 14 days. Histological analysis revealed that the defects were repaired in the ADM/ASCs and the ADM/ASCs/LLLT group, while the defects in the ADM and the ADM/LLLT groups exhibited few bone

islands at 28 and 56 days. The successful seeding of ASCs onto ADM was confirmed, and LLLT enhanced the proliferation and the survival of ASCs at 14 days. Our results indicate that ASC-seeded grafts promote bone regeneration, and the application of LLLT on ASC-seeded ADM results in rapid bone formation. The implantation of an ASC-seeded ADM combined with LLLT may be used effectively for bone regeneration. Biomarkers Acellular Dermis;Adipocytes;Animals;Biomarkers;Bone Regeneration;Cell Differentiation;Cells, Cultured;Dogs;Humans;Low-Level Light Therapy;Male;Materials Testing;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Nude;Microscopy, Electron, Scanning;Osteogenesis;Skull;Tissue Engineering;Tissue Scaffolds;X-Ray Microtomography

Raman study of the repair of surgical bone defects grafted with biphasic synthetic microgranular HA + Î²-calcium triphosphate and irradiated or not with Î»780 nm laser. The treatment of bone loss due to different etiologic factors is difficult, and many techniques aim to improve repair, including a wide range of biomaterials and, recently, photobioengineering. This work aimed to assess, through Raman spectroscopy, the level of bone mineralization using the intensities of the Raman peaks of both inorganic (âˆ¼ 960, âˆ¼ 1,070, and âˆ¼ 1,077 cm(-1)) and organic (âˆ¼ 1,454 and âˆ¼ 1,666 cm(-1)) contents of bone tissue. Forty rats were divided into four groups each subdivided into two subgroups according to the time of killing (15 and 30 days). Surgical bone defects were made on femur of each animal with a trephine drill. On animals of group Clot, the defect was filled only by blood clot; on group Laser, the defect filled with the clot was further irradiated. On animals of groups Biomaterial and Laser + Biomaterial, the defect was filled by biomaterial and the last one was further irradiated (Î»780 nm, 70 mW, Î¦ âˆ¼ 0.4 cm(2), 20 J/cm(2) session, 140 J/cm(2) treatment) in four points around the defect at 48-h intervals and repeated for 2 weeks. At both 15th and 30th day following killing, samples were taken and analyzed by Raman spectroscopy. At the end of the experimental time, the intensities of both inorganic and organic contents were higher on group Laser + Biomaterial. It is concluded that the use of laser phototherapy associated to biomaterial was effective in improving bone healing on bone defects as a result of the increasing deposition of calcium hydroxyapatite measured by Raman spectroscopy. Biocompatible Materials;Calcium Phosphates;Calcium, Dietary;Polyphosphates;beta-tricalcium phosphate;Durapatite;triphosphoric acid;Calcium Animals;Biocompatible Materials;Blood Coagulation;Bone Regeneration;Bone and Bones;Calcium;Calcium Phosphates;Calcium, Dietary;Durapatite;Femur;Lasers;Light;Low-Level Light Therapy;Male;Polyphosphates;Rats;Rats, Wistar;Spectrum Analysis, Raman;Tibia;Wound Healing

Effect of low-level laser therapy on odontoblast-like cells exposed to bleaching agent. The aim of the present study was to evaluate the effect of low-level laser therapy (LLLT) on odontoblast-like MDPC-23 cells exposed to carbamide peroxide (CP 0.01%-2.21 Î¼g/mL of H2O2). The cells were seeded in sterile 24-well plates for 72 h. Eight groups were established according to the exposure or not to the bleaching agents and the laser energy doses tested (0, 4, 10, and 15 J/cm(2)). After exposing the cells to 0.01% CP for 1 h, this bleaching solution was replaced by fresh culture medium. The cells were then irradiated (three sections) with a near-infrared diode laser (InGaAsP-780 Â± 3 nm, 40 mW), with intervals of 24 h. The 0.01% CP solution caused statistically significant reductions in cell metabolism and alkaline phosphate (ALP) activity when compared with those of the groups not exposed to the bleaching agent. The LLLT did not modulate cell metabolism; however, the dose of 4 J/cm(2) increased the ALP activity. It was concluded that 0.01% CP reduces the MDPC-23 cell metabolism and ALP activity. The LLLT in the parameters tested did not influence the cell metabolism of the cultured cells; nevertheless, the laser dose of 4 J/cm(2) increases the ALP activity in groups both with and without exposure to the bleaching agent. Bleaching Agents;Peroxides;Carbamide Peroxide;Urea;Hydrogen Peroxide;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bleaching

Agents;Carbamide Peroxide;Cells, Cultured;Hydrogen Peroxide;Low-Level Light Therapy;Mice;Odontoblasts;Peroxides;Urea

Case series of 589 tooth extractions in patients under bisphosphonates therapy. Proposal of a clinical protocol supported by Nd:YAG low-level laser therapy. OBJECTIVE: Trauma during dental surgery is a predisposing factor for bisphosphonates (BP)-related osteonecrosis of the jaws (BRONJ). However, about 40% of cases of BRONJ are not related to dental invasive procedures, being probably associated to endodontic or periodontal infections. Extraction of non-treatable teeth is considered a reliable choice, to improve symptoms and to reduce the risk of BRONJ. Here we report our experience of tooth extractions in patients under oral or intravenous BP therapy. STUDY DESIGN: Two-hundred and seventeen patients (38 males, 179 females; mean age 68.72 Â± 11.26 years, range 30 to 83 years) under BP therapy received 589 tooth extractions at the Unit of Oral Medicine, Pathology and Laser-assisted Surgery of the University of Parma, Italy, between June 2006 and December 2010. Ninety five patients were under BP therapy for oncological disease (multiple myeloma (MM): 23; bone metastases (BM): 72) and 122 patients for non oncological diseases: 119 osteoporosis (OP), 2 rheumatoid arthritis (RA) and 1 Paget's disease (PD). The mean duration of BP was of 35 months. Antibiotic treatment was administered three days before and 2 weeks after tooth extractions. Patients were additionally treated with low level laser therapy (LLLT) through Nd:YAG laser (1064 nm--power 1.25 W; frequency 15 Hz; fibre diameter: 320 Î¼m), 5 application of 1 minute each. Patients were evaluated 3 days and once a week for 2 months after the extractions and every time they received LLLT. Mean follow-up was 15 months (ranging from 4 to 31 months). RESULTS: In a total of 589 extractions (285 mandibular, 304 maxillary) performed, a minimal bone exposure was observed in 5 cases, treated with Er:YAG laser vaporization and than healed. CONCLUSIONS: Our experience supports the hypothesis that the association of antibiotic treatment and LLLT can be effective in preventing ONJ after tooth extractions in patients under BPT. Diphosphonates Adult;Aged;Aged, 80 and over;Bisphosphonate-Associated Osteonecrosis of the Jaw;Clinical Protocols;Dental Care;Diphosphonates;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Postoperative Complications;Tooth Extraction

Potentiated anti-inflammatory effect of combined 780 nm and 660 nm low level laser therapy on the experimental laryngitis. Reflux laryngitis is a common clinic complication of nasogastric intubation (NSGI). Since there is no report concerning the effects of low level laser therapy (LLLT) on reflux laryngitis, this study aimed to analyze the protective effect of single and combined therapies with low level laser at the doses of 2.1J and 2.1+1.2 J with a total irradiation time of 30s and 30+30 s, respectively, on a model of neurogenic reflux laryngitis. NSGI was performed in Wistar rats, assigned into groups: NGI (no treatment), NLT17.5 (single therapy), and NLT17.5/10.0 (combined therapy, applied sequentially). Additional non-intubated and non-irradiated rats were use as controls (CTR). Myeloperoxidase (MPO) activity was assessed by colorimetric method after the intubation period (on days 1, 3, 5, and 7), whereas paraffin-embedded laryngeal specimens were used to carry out histopathological analysis of the inflammatory response, granulation tissue, and collagen deposition 7 days after NSGI. Significant reduction in MPO activity ($p<0.05$) and in the severity of the inflammatory response ($p<0.05$), and improvement in the granulation tissue ($p<0.05$) was observed in NLT17.5/10.0 group. Mast cells count was significantly decreased in NGI and NLT17.5 groups ($p<0.001$), whereas no difference was observed between NLT17.5/10.0 and CTR groups ($p>0.05$). NLT17.5/10.0 group also showed better collagenization pattern, in comparison to NGI and NLT17.5 groups. This study suggests that the combined therapy successfully modulated the inflammatory response and collagenization in experimental model of NSGI-induced neurogenic laryngitis. Anti-Inflammatory Agents;Peroxidase Animals;Anti-Inflammatory Agents;Cell Count;Disease Models, Animal;Laryngitis;Larynx;Low-Level Light Therapy;Male;Mast Cells;Peroxidase;Rats;Rats, Wistar

A pilot study into the effect of low-level laser therapy in patients with chronic rhinosinusitis. Chronic rhinosinusitis (CRS) is a common inflammatory disease of the nose and paranasal sinuses that has a significant impact on patients' quality of life. No study has examined the effectiveness of applying low-level laser therapy (LLLT) locally over the sinuses in patients with CRS. The aim of this study was to evaluate the effect of LLLT in patients with CRS. Fifteen adult patients with CRS participated in this pilot pretest-posttest clinical study. Patients were treated with a 830-nm Ga-Al-As laser in continuous-wave mode at a power output of 30 mW and energy dose of 1 J. Laser irradiation was delivered on six points over each maxillary or frontal sinus with 33 sec irradiation for each point and a total treatment duration of 198 sec for each sinus. Patients were given LLLT three times per week for ten treatment sessions. Patients were asked to score their symptoms in accordance with a four-point scale (0-3), and a total symptom score (TSS) for each patient was calculated. Percentage improvement of TSS was considered as the primary outcome measure. TSS was calculated at baseline (T0), at 2 weeks (T1) and at 4 weeks (T2). The TSS was improved significantly at T1 (39%) and at T2 (46.34%). A large effect size for LLLT was found (Î·p(2) Î·p(2) â€‰=â€‰ 0.63). The therapeutic effect was sustained for a mean of 5 months. This pilot study indicates that LLLT applied for 4 weeks improves symptoms in patients with CRS. Adult;Chronic Disease;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Rhinitis;Sinusitis;Young Adult

Osteoarthritis: physical medicine and rehabilitation--nonpharmacological management. Osteoarthritis (OA) is the most common joint disease, mainly affecting middle-aged and elderly persons. People with OA of the knee or hip experience pain and deconditioning that may lead to disability. Treatment goals include pain control, maximizing functional independence, and improving quality of life within the constraints imposed by both OA and comorbidities. Exercise is a core recommendation in all nonpharmacological guidelines for the management of patients with knee or hip OA; it is supposed to ameliorate pain and maybe function as well. Therapeutic ultrasound, neuromuscular as well as transcutaneous electrostimulation, pulsed magnetic field therapy, low-level laser therapy, thermal agents, acupuncture, and assistive devices such as insoles, canes, and braces can be used additionally in a multimodal therapeutic program. They may positively influence pain and function, mobility, and quality of life in patients suffering from OA of the lower limbs. Activities of Daily Living;Aged;Combined Modality Therapy;Comorbidity;Exercise Therapy;Humans;Middle Aged;Osteoarthritis, Hip;Osteoarthritis, Knee;Physical Therapy Modalities;Quality of Life

Effects of low-level laser therapy on the expression of osteogenic genes related in the initial stages of bone defects in rats. We evaluate the effects of low-level laser therapy (LLLT) on the histological modifications and temporal osteogenic genes expression during the initial phase of bone healing in a model of bone defect in rats. Sixty-four Wistar rats were divided into control and treated groups. Noncritical size bone defects were surgically created at the upper third of the tibia. Laser irradiation (Ga-Al-As laser 830 nm, 30 mW, 0.028â€‰â€‰cmÂ², 1.071â€‰â€‰W/cmÂ², 1 min and 34 s, 2.8 Joules, 100â€‰â€‰J/cmÂ²) was performed for 1, 2, 3, and 5 sessions. Histopathology revealed that treated animals presented higher inflammatory cells recruitment, especially 12 and 36 h postsurgery. Also, a better tissue organization at the site of the injury, with the presence of granulation tissue and new bone formation was observed on days three and five postsurgery in the treated animals. The quantitative real time polymerase chain reaction showed that LLLT produced a significantly increase in mRNA expression of Runx-2, 12 h and three days post-surgery, a significant upregulation of alkaline phosphatase mRNA expression after 36 h and three days post-surgery and a significant increase of osteocalcin mRNA expression after three and five days. We concluded that LLLT modulated the inflammatory process and accelerated bone repair, and this advanced repair pattern in the laser-

treated groups may be related to the higher mRNA expression of genes presented by these animals. Core Binding Factor Alpha 1 Subunit;RNA, Messenger;Runx2 protein, rat;Osteocalcin;Alkaline Phosphatase Alkaline Phosphatase;Analysis of Variance;Animals;Bone Regeneration;Core Binding Factor Alpha 1 Subunit;Histocytochemistry;Low-Level Light Therapy;Male;Osteocalcin;Osteogenesis;RNA, Messenger;Rats;Rats, Wistar;Tibia

Low-level laser therapy enhances the expression of osteogenic factors during bone repair in rats. The aim of this study was to evaluate the effects of low-level laser therapy (LLLT) on bone formation, immunoexpression of osteogenic factors, and biomechanical properties in a tibial bone defect model in rats. Sixty male Wistar rats were distributed into bone defect control group (CG) and laser irradiated group (LG). Animals were euthanized on days 15, 30, and 45 post-injury. The histological and morphometric analysis showed that the treated animals presented no inflammatory infiltrate and a better tissue organization at 15 and 30 days postsurgery. Also, a higher amount of newly formed bone was observed at 15 days postsurgery. No statistically significant difference was observed in cyclooxygenase-2 immunoexpression among the groups at 15, 30, and 45 days in the immunohistochemical analysis. Considering RUNX-2, the immunoexpression was statistically higher in the LG compared to the CG at 45 days. BMP-9 immunoexpression was significantly higher in the LG in comparison to CG at day 30. However, there was no expressivity for this immunomarker, both in the CG and LG, at the day 45 postsurgery. No statistically significant difference was observed in the receptor activator of nuclear factor kappa-B ligand immunoexpression among the groups in all periods evaluated. No statistically significant difference among the groups was observed in the maximal load in any period of time. Our findings indicate that laser therapy improved bone healing by accelerating the development of newly formed bone and activating the osteogenic factors on tibial defects, but the biomechanical properties in LG were not improved. Core Binding Factor Alpha 1 Subunit;Growth Differentiation Factor 2;RANK Ligand;Runx2 protein, rat;Cyclooxygenase 2;Ptgs2 protein, rat Animals;Biomechanical Phenomena;Bone Regeneration;Core Binding Factor Alpha 1 Subunit;Cyclooxygenase 2;Fracture Healing;Growth Differentiation Factor 2;Immunohistochemistry;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoblasts;Osteogenesis;RANK Ligand;Rats;Rats, Wistar;Tibial Fractures;Time Factors

High-frequency low-level diode laser irradiation promotes proliferation and migration of primary cultured human gingival epithelial cells. In periodontal therapy, the use of low-level diode lasers has recently been considered to improve wound healing of the gingival tissue. However, its effects on human gingival epithelial cells (HGECs) remain unknown. The aim of the present study was to examine whether high-frequency low-level diode laser irradiation stimulates key cell responses in wound healing, proliferation and migration, in primary cultured HGECs in vitro. HGECs were derived from seven independent gingival tissue specimens. Cultured HGECs were exposed to a single session of high-frequency (30 kHz) low-level diode laser irradiation with various irradiation time periods (fluence 5.7-56.7 J/cm(2)). After 20-24 h, cell proliferation was evaluated by WST-8 assay and [(3)H]thymidine incorporation assay, and cell migration was monitored by in vitro wound healing assay. Further, phosphorylation of the mitogen-activated protein kinase (MAPK) pathways after irradiation was investigated by Western blotting. The high-frequency low-level irradiation significantly increased cell proliferation and [(3)H]thymidine incorporation at various irradiation time periods. Migration of the irradiated cells was significantly accelerated compared with the nonirradiated control. Further, the low-level diode laser irradiation induced phosphorylation of MAPK/extracellular signal-regulated protein kinase (ERK) at 5, 15, 60, and 120 min after irradiation. Stress-activated protein kinases/c-Jun N-terminal kinase and p38 MAPK remained un-phosphorylated. The results show that high-frequency low-level diode laser irradiation promotes HGEC proliferation and migration in association with the activation of MAPK/ERK, suggesting that laser irradiation may

accelerate gingival wound healing. Tetrazolium Salts;Tritium;Mitogen-Activated Protein Kinases;Thymidine Blotting, Western;Cell Movement;Cell Proliferation;Cells, Cultured;Epithelial Cells;Gingiva;Humans;Lasers, Semiconductor;Mitogen-Activated Protein Kinases;Phosphorylation;Tetrazolium Salts;Thymidine;Tritium;Wound Healing

A double-blind, placebo-controlled randomized trial evaluating the ability of low-level laser therapy to improve the appearance of cellulite. BACKGROUND AND OBJECTIVE: Cellulite is present in 90% of post-adolescent women. Several technologies have been developed for treating cellulite; however, they all involve some degree of massage or mechanical manipulation. The purpose of this study was to assess the effectiveness of a low-level laser light device employing green 532â€‰nm diodes as a stand-alone procedure without massage or mechanical manipulation for improving the appearance of cellulite in the thighs and buttocks. STUDY DESIGN/MATERIALS AND METHODS: This double-blind study randomized subjects to undergo treatment with the LLLT device (Nâ€‰=â€‰34) or sham treatment (Nâ€‰=â€‰34). During a 2-week treatment phase, each subject received three weekly treatment sessions 2-3 days apart. During each session, the front and back of the hips, thighs, and waist were exposed for 15â€‰minutes (30â€‰minutes total). RESULTS: Nineteen subjects in the LLLT group achieved a decrease of one or more stages on the Nurnberger-Muller grading scale (55.88%) versus three subjects (8.82%) in the sham-treated group (Pâ€‰<â€‰0.0001). Two LLLT-treated subjects achieved 2-stage improvements on the Nurnberger-Muller Scale at the 2-week study endpoint and four did at the 6-week follow-up evaluation versus none of the sham-treated subjects at either time point. Subjects treated with LLLT achieved a significant decrease in combined baseline thigh circumference at the 2-week study endpoint and 6-week follow-up evaluation (for each, pâ€‰<â€‰0.0001 vs. baseline) versus no change for sham-treated subjects. LLLT-treated subjects also showed significant decreases in mean baseline body weight (Pâ€‰<â€‰0.0005), BMI (Pâ€‰<â€‰0.001), and percent BSA affected by cellulite (Pâ€‰<â€‰0.0005) versus no change for any parameter among sham-treated subjects. Most LLLT-treated subjects (62.1%) were Very Satisfied or Somewhat Satisfied with the improvement in cellulite they received versus 25.8% of sham-treated subjects. There were no reports of adverse events. CONCLUSIONS: Low-level laser therapy using green 532â€‰nm diodes is safe and effective for improving the appearance of cellulite in the thighs and buttocks. In contrast with other technologies, LLLT is effective as a stand-alone procedure without requiring massage or mechanical manipulation. Future studies will assess the long-term benefits of LLLT for the treatment of cellulite. Adipose Tissue;Adolescent;Adult;Buttocks;Cosmetic Techniques;Double-Blind Method;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Obesity;Patient Satisfaction;Thigh;Treatment Outcome;Young Adult

Comparison of the influence of ozone and laser therapies on pain, swelling, and trismus following impacted third-molar surgery. This study aims to evaluate the efficacy of the ozone and laser application in the management of pain, swelling, and trismus after third-molar surgery. Sixty consecutive patients with asymptomatic impacted mandibular third molars were recruited into the study. Patients were randomized into three treatment groups of 20 patients each: two study groups (group 1â€‰=â€‰low-level laser therapy (LLLT), group 2â€‰=â€‰ozone therapy) and a control group (no-LLLT or ozone therapy). Twenty teeth extractions were performed in each group. Evaluations of postoperative pain, the number of analgesics tablets taken, trismus, swelling, and quality of life (Oral Health Impact Profile-14 questionnaire) were made. The sample consisted of 28 female and 32 male patients, whose total mean age was 23.5â€‰Â±â€‰3.4 (range, 18-25)â€‰years. The pain level and the number of analgesics tablets taken were lower in the ozonated and LLLT applied groups than in the control group. This study showed that ozone and low power laser therapies had a positive effect on the patients' quality of life. Trismus in the LLLT group was

significantly less than in the ozonated and control groups (pâ€‰=â€‰0.033). Ozone application showed no superiority in regards of postoperative swelling; however, LLLT group had significantly lower postoperative swelling. This study demonstrates that ozone and laser therapies are useful for the reduction of postoperative pain and they increase quality of life after third-molar surgery. Although the ozone therapy had no effect on postoperative swelling and trismus after surgical removal of impacted lower third molars, LLLT had a positive effect. Analgesics;Ozone Adolescent;Adult;Analgesics;Edema;Female;Humans;Low-Level Light Therapy;Male;Molar, Third;Ozone;Pain Measurement;Pain, Postoperative;Surveys and Questionnaires;Tooth, Impacted;Trismus

Bone marrow aspirate combined with low-level laser therapy: a new therapeutic approach to enhance bone healing. This study evaluated the influence of bone marrow aspirate (BMA), low-level laser therapy (LLLT) and their combination on bone healing in surgically created critical-size defects (CSDs) in rat calvaria. 40 rats were divided into four groups: C (control), BMA, LLLT and BMA/LLLT. A 5mmdiameter CSD was created in the calvarium of each animal. In Group C, the defect was filled by blood clot only. In Group BMA, the defect was filled with BMA. In groups LLLT and BMA/LLLT, the defect received laser irradiation (InGaAlP laser), was filled with blood clot or BMA respectively, and irradiated again. Animals were euthanized 30 days postoperatively. Histomorphometric and immunohistochemical analyses were performed. Newly formed bone area (NFBA) was calculated as percentage of the total area of the original defect. Proliferating cell nuclear antigen (PCNA), runt-related transcription factor 2 (Runx2) and osteocalcin (OCN) immunohistochemical staining were performed. PCNA-positive, Runx2-positive and OCN-positive cells were quantified. Data were statistically analyzed. Group BMA/LLLT had significantly greater NFBA than groups C, BMA or LLLT. Group BMA presented significantly greater NFBA than control, while group LLLT did not. Group BMA/LLLT presented a significantly higher number of PCNA-positive and OCN-positive cells than any of the other groups. Groups BMA/LLLT and BMA showed a significantly lower number of Runx2-positive cells than groups C or LLLT. The combination of BMA/LLLT yielded significantly greater bone formation in surgically created CSD in rat calvaria when compared to control, or either treatment alone. Animals;Drug Therapy, Combination;Immunohistochemistry;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Rats;Skull;Wound Healing

Synergistic effects of low-level laser and mesenchymal stem cells on functional recovery in rats with crushed sciatic nerves. Transplantation of mesenchymal stem cells (MSCs) has been proposed to exert beneficial effects on peripheral nerve regeneration after a peripheral nerve injury, but the functional recovery in the denervated limb is still limited. In this study, we used low-level laser therapy (LLLT) as an adjunct therapy for MSC transplantation on the functional recovery of crushed sciatic nerve in rats. Peripheral nerve injury was induced in 48 Sprague-Dawley rats by crushing the unilateral sciatic nerve, using a vessel clamp. The animals with crushed injury were randomly divided into four groups: control group, with no treatment; MSC group, treated with MSC alone; LLLT group, treated with LLLT alone; and MSCLLLT group, treated with a combination of MSC and LLLT. The sciatic function index (SFI), vertical activity of locomotion (VA) and ankle angle (AA) of rats were examined for functional assessments after treatment. Electrophysiological, morphological and S100 immunohistochemical studies were also conducted. The MSCLLLT group showed a greater recovery in SFI, VA and AA, with significant difference from MSC, LLLT and control groups (pâ€‰<â€‰0.05). Moreover, markedly enhanced electrophysiological function and expression of S100 immunoreactivity, as well as fewer inflammatory cells and less vacuole formation were also demonstrated after nerve crush injury in the MSCLLLT group when compared with the groups receiving a single treatment (pâ€‰<â€‰0.05). MSC transplantation combined with LLLT could

achieve better results in functional recovery than a conventional treatment of MSC or LLLT alone. LLLT has a synergistic effect in providing greater functional recovery with MSC transplantation after nerve crush injury. Animals;Inflammation;Locomotion;Low-Level Light Therapy;Male;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Nerve Crush;Rats, Sprague-Dawley;Recovery of Function;Sciatic Nerve

Noninvasive treatment of cellulite utilizing an expedited treatment protocol with a dual wavelength laser-suction and massage device. BACKGROUND: Over the past few years, noninvasive devices based on radiofrequency and/or lasers and light sources technologies are being used for the treatment of cellulite. OBJECTIVES: To evaluate the effects of an expedited treatment for cellulite and body measures. METHODS: Fifteen female subjects aged from 20 to 42 years were enrolled. All the subjects underwent three treatment sessions of 30 minutes for each area in three consecutive days. Subjects were evaluated at 7, 30, and 60 post treatment. Outcome measurements included Cellulite Severity Scale (CSS) grading, body mass index (BMI), and thigh circumferences were recorded. Celluqol(Â®) and a satisfaction questionnaire were also applied. RESULTS: At 2 months, improvements in at least one of the four CSS categories were found in 14 of the 15 subjects (93%) while 60% of patients showed improvement in both the number and depth of depressions at follow-up visits. Most of patients (93%) reported that they would get the treatment again. DISCUSSION: This was the first study to examine the effects of this device on cellulite performed over a shortened treatment period. The treatment proved to be safe and effective, representing a new treatment modality that is also time and cost-effective for physicians and patients. Adipose Tissue;Adult;Body Mass Index;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Massage;Patient Satisfaction;Prospective Studies;Thigh

Treatment of infraorbital dark circles in atopic dermatitis with a 2790-nm erbium: yttrium scandium gallium garnet laser: a pilot study. BACKGROUND: Although many Asian atopic patients have orbital darkening symptom and the demand to treat this condition is increasing, little has been reported in the literature on the treatment of infraorbital dark circles in atopic dermatitis. OBJECTIVE: To evaluate the clinical efficacy and safety of 2790-nm erbium:yttrium scandium gallium garnet (Er:YSGG) laser therapy for reducing infraorbital dark circles in atopic dermatitis patients. MATERIALS AND METHODS: Ten Korean patients over 21 year with mild atopic dermatitis and infraorbital dark circles were enrolled in this study. Patients who need active atopic dermatitis treatments are excluded because of the possibility of aggravation after laser treatment. They were treated for dark circles using a 2790-nm Er:YSGG laser. The treatment parameters were 1.8-2.2 J/cmÂ² fluence, 6-mm spot size, and 0.3-ms pulse width with 10% overlap over the infraorbital areas once with a 4-week interval between treatments. Efficacy was assessed with a quartile grading score ranging from 0 to 5 by a blinded investigator, and the patients also documented their degree of satisfaction with the same grading score. All possible side effects were evaluated. RESULTS: The clinical assessment showed 74.5% (2.7) and 72.5% (2.5) improvements, and the patient satisfaction scale scores improved an average of 74% (2.4) and 71.5% (2.3) at 2 months and 4 months after treatment, respectively. There were no severe side effects or aggravation of atopic dermatitis. CONCLUSION: Our study suggests that 2790-nm Er:YSGG laser therapy can be effectively and safely used in the treatment of infraorbital dark circles in atopic dermatitis patients. Adult;Asian People;Cosmetic Techniques;Dermatitis, Atopic;Eye Diseases;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Pilot Projects;Republic of Korea

A split-face comparison of ablative fractional lasers (CO(2) and Er:YAG) in Asian patients; postprocedure erythema, pain and patient's satisfaction. Fractional photothermolysis has become popular in the recent years and is currently widely used for the treatment of scars and for

photo-rejuvenation purposes. The fractional photothermolysis is to thermally alter a 'fraction' of the skin, leaving intervening areas of normal skin untouched, which rapidly repopulate the altered columns of tissue. Fractional photothermolysis is subdivided into non-ablative and ablative fractional resurfacing. Ablative fractional resurfacing uses fractional CO(2) or Er:YAG lasers to create deeper columns of thermal damage.Few studies have compared fractional CO(2) and Er:YAG lasers on scars and cutaneous photodamages by a split trial. In this pilot study, we have compared the effects, down time, postprocedure erythema, pain of CO(2) and Er:YAG fractional lasers using analysis of clinical photographs, dermoscopic findings and patient's rate of satisfaction. Adult;Asian People;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pilot Projects;Rejuvenation;Republic of Korea

Exogenous ochronosis - successful outcome after treatment with Q-switched Nd:YAG laser. BACKGROUND: Exogenous ochronosis (EO), a disfiguring cutaneous complication of topical hydroquinone use, is difficult to treat. There are few reports of successful outcomes following treatment with different modalities. OBJECTIVE: We assessed the results of treatment of EO with the Q-switched Nd:YAG laser. MATERIAL AND METHODS: Patients with histologically-confirmed EO were treated with the Q-switched Nd:YAG laser. RESULTS AND CONCLUSION: Q-switched Nd:YAG laser treatment appears to be effective in reducing the dyschromia of EO. Hydroquinones;hydroquinone Adult;Aged;Asian People;Facial Dermatoses;Female;Humans;Hydroquinones;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Ochronosis

A case of mottled hypopigmentation after low-fluence 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet laser therapy. Melasma is a very difficult pigmented disease to treat with high recurrence rate. Using low-fluence 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet (QSNY) lasers repeatedly for the treatment of melasma is now a common practice in East Asia. However, one of the significant side effects is mottled hypopigmentation that appears as scattered white macules in the middle of melasma lesion. The pathophysiology of these hypopigmentation is yet unknown. The biopsy of the hypopigmented lesion showed decreased melanosome with intact melanocytes, and topical tretinoin may be the effective solution for these types of condition. Female;Humans;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged

Treatment of neck port-wine stain with intense pulsed light in Chinese population. BACKGROUND: Studies of lasers or intense pulsed light (IPL) on facial port wine stain (PWS) were frequently reported. Neck PWS was seldom concerned. OBJECTIVE: This paper was aimed to identify the efficacy and safety of IPL in the treatment of neck PWS in Chinese patients. METHODS: Twenty-nine Chinese patients with neck PWS were enrolled to receive IPL therapy for five sessions at an interval of 4- to 5 weeks. The parameters were set as cut-off filters of 560 nm, single pulse with pulse width of 6 ms and fluence of 20-24 J/cm(2) or double pulse with pulse width of 4.5-5.0 ms, pulse delay of 15-30 ms, and fluence of 18-25 J/cm(2). The efficacy was evaluated using subjective assessment and non-invasive measurement. The adverse effects were recorded. RESULTS: Over 60% patients achieved more than 50% improvement and over 50% participants were very satisfied or satisfied with the treatment. The participants less than 18 years old achieved better efficacy than the participants over 18 years old. The red or purple lesions gained better response to IPL treatment than the pink lesions. Adverse effects were limited. CONCLUSION: IPL is effective in neck PWS of Chinese population. Adverse effects were minimal and acceptable. Adolescent;Adult;Asian People;Child;China;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Neck;Port-Wine Stain

Combination of 595-nm pulsed dye laser, long-pulsed 755-nm alexandrite laser, and microdermabrasion treatment for keratosis pilaris: retrospective analysis of 26 Korean patients. Keratosis pilaris (KP) has beenpresented as small keratotic follicular papules with or without surrounding erythema. Various treatments with laser or light therapy have been used for the management of KP with various clinical outcomes. In the present study, we investigated the efficacy and safety of a combination therapy for KP. A total of 29 anatomical sites with KP in 26 patients were treated using a 595-nm pulsed dye laser (PDL) with nonpurpuragenic fluences, a long-pulsed 755-nm alexandrite laser, and microdermabrasion. Clinical improvement was assessed by comparing preand posttreatment clinical photographs and patient satisfaction rates. Evaluation of the clinical results three months after the treatments showed that 12 of the 29 anatomical sites (41.4%) demonstrated Grade 3 clinical improvement, ten (34.5%) had Grade 2 clinical improvement, four (13.8%) showed Grade 1 improvement, and three (10.3%) showed Grade 4 improvement. We observed that KP lesions improved not only in erythema and skin texture, but also in brownish dyschromias. Potential adverse events were not observed, except prolonged posttherapy scaling. Our observations demonstrate that combination therapy using a 595-nm PDL, a long-pulsed 755-nm alexandrite laser, and microdermabrasion can have a positive therapeutic effect on KP. Adult;Asian People;Combined Modality Therapy;Dermabrasion;Female;Humans;Keratosis;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Republic of Korea;Statistics, Nonparametric;Treatment Outcome

Clinical effects of non-ablative and ablative fractional lasers on various hair disorders: a case series of 17 patients. BACKGROUND AND OBJECTIVES: Both ablative and non-ablative fractional lasers have been applied to various uncommon hair disorders. The purpose of this study was to demonstrate the clinical effects of fractional laser therapy on the course of primary follicular and perifollicular pathologies and subsequent hair regrowth. MATERIALS AND METHODS: A retrospective review of 17 patients with uncommon hair disorders - including ophiasis, autosomal recessive woolly hair/hypotrichosis, various secondary cicatricial alopecias, pubic hypotrichosis, frontal fibrosing alopecia, and perifolliculitis abscedens et suffodiens - was conducted. All patients had been treated with non-ablative and/or ablative fractional laser therapies. RESULTS: The mean clinical improvement score in these 17 patients was 2.2, while the mean patient satisfaction score was 2.5. Of the 17 subjects, 12 (70.6%) demonstrated a clinical response to non-ablative and/or ablative fractional laser treatments, including individuals with ophiasis, autosomal recessive woolly hair/hypotrichosis, secondary cicatricial alopecia (scleroderma and pressure-induced alopecia), frontal fibrosing alopecia, and perifolliculitis abscedens et suffodiens. Conversely, patients with long-standing ophiasis, surgical scar-induced secondary cicatricial alopecia, and pubic hypotrichosis did not respond to fractional laser therapy. CONCLUSION: Our findings demonstrate that the use of non-ablative and/or ablative fractional lasers promoted hair growth in certain cases of uncommon hair disorders without any remarkable side effects. Adolescent;Adult;Aged;Cosmetic Techniques;Female;Hair Diseases;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Retrospective Studies;Young Adult

Effects of pulsed infra-red low level-laser irradiation on mast cells number and degranulation in open skin wound healing of healthy and streptozotocin-induced diabetic rats. INTRODUCTION: Low-level laser therapy (LLLT) has been reported to be capable of changing mast cell numbers and degranulation in experimental wounds. OBJECTIVE: We conducted a study on the influence of pulsed LLLT on mast cells in wounds of non-diabetic and diabetic rats. METHODS: Thirty-six rats were randomly divided into non-diabetic and diabetic groups. Type 1 diabetes milletes (DM) was induced in rats of the diabetic group by administration of streptozotocin (STZ). We inflicted two wounds in each rat. The first wound in both non-diabetic and diabetic groups was treated with an 890-nm laser,

having pulse frequency of 80 Hz and energy density of 0.2 J/cm(2). Mast cell numbers and degranulation of all subgroups were assessed at 4, 7, and 15 days after the infliction of the wounds. RESULTS AND CONCLUSION: According to the paired t-test, the total number of laser-treated mast cells was significantly higher than that of the placebos in the non-diabetic groups on days 4 and 15. The total number of laser-treated mast cells was significantly higher than that of the placebos in the diabetic groups on days 4 and 15. The number of granulated mast cells was significantly higher than that of degranulated mast cells for all laser-treated mast cells and placebo mast cells of the non-diabetic and diabetic groups. Streptozocin Animals;Cell Count;Cell Degranulation;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mast Cells;Random Allocation;Rats;Rats, Wistar;Skin;Streptozocin;Wound Healing

Long-pulsed Nd:YAG laser in the treatment of facial hypertrichosis during topical minoxidil therapy. Hypertrichosis is a well-recognized adverse effect of therapy with either oral or topical minoxidil. We report a case of fronto-temporal hypertrichosis occurring in an 8-year-old girl treated for patchy alopecia areata of the frontal area of the scalp with 2% minoxidil solution. After failure of 5-months minoxidil-discontinuation, hair removal with Nd:YAG laser (1064 nm line) (Smartepil II, Deka) was tested leading to complete resolution within 2 sessions. Vasodilator Agents;Minoxidil Administration, Topical;Alopecia Areata;Child;Female;Hair Removal;Humans;Hypertrichosis;Lasers, Solid-State;Low-Level Light Therapy;Minoxidil;Vasodilator Agents

Wound-healing effects of low-level laser therapy in diabetic rats involve the modulation of MMP-2 and MMP-9 and the redistribution of collagen types I and III. The present study aimed to determine if LLLT restores the balance between mRNA expression of matrix metalloproteinases (MMP-2 and MMP-9) and also the balance between collagen types I and III during the healing process of diabetic wounds. One hundred and twenty male Wistar rats were distributed in Control (untreated non-diabetic rats: UND); Laser (laser treated in non-diabetic rats: LTND); Diabetic (diabetic rats non-laser treated rats: UD); and Diabetic+ Laser (diabetic rats laser treated: DLT) groups. The diabetes model using streptozotocin efficiently induced diabetes, as demonstrated through increased levels of blood glucose. Diode laser (50 mW, 660 nm, 4 J/cm(2), 80 s) was applied a single time after scare induction. Twenty-four hours after LLLT application, rats were euthanized, the scarred areas were collected for MMP-2 and MMP-9 mRNA analysis and also for histological analysis (inflammation and types I and III collagen). The results demonstrated that scare in untreated diabetic rats significantly increased the MMP-2 and MMP-9 expression compared with that in non-diabetic rats ($p < 0.05$), while LLLT significantly reduced MMP-2 and MMP-9 expression compared with that in untreated diabetic rats ($p < 0.05$). To conclude, the results also showed that LLLT was able to alter the expression of MMP-9 as well as accelerate the production of collagen and increase the total percentage of collagen type III in diabetic animals. Collagen Type I;Collagen Type III;RNA, Messenger;Indium;Gallium;Aluminum;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Aluminum;Animals;Collagen Type I;Collagen Type III;Diabetes Mellitus, Experimental;Gallium;Indium;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;RNA, Messenger;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Skin;Wound Healing

The effects of low-level laser irradiation on cellular viability and proliferation of human skin fibroblasts cultured in high glucose mediums. Delayed wound healing is one of the most challenging complications of diabetes mellitus (DM) in clinical medicine. This study has aimed to evaluate the effects of low-level laser therapy (LLLT) on human skin fibroblasts (HSFs) cultured in a high glucose concentration. HSFs were cultured either in a concentration of physiologic glucose (5.5 mM/l) or high glucose media (11.1 and 15 mM/l) for either 1 or 2 weeks after which they were subsequently cultured in either the physiologic glucose or high concentration glucose media during

laser irradiation. LLLT was carried out with a helium-neon (He-Ne) laser unit at energy densities of 0.5, 1, and 2 J/cm(2), and power density of 0.66 mW/cm(2) on 3 consecutive days. HSFs' viability and proliferation rate were evaluated with the dimethylthiazol-diphenyltetrazolium bromide (MTT) assay. The LLLT at densities of 0.5 and 1 J/cm(2) had stimulatory effects on the viability and proliferation rate of HSFs cultured in physiologic glucose (5.5 mM/l) medium compared to their control cultures (p = 0.002 and p = 0.046, respectively). All three doses of 0.5, 1, and 2 J/cm(2) had stimulatory effects on the proliferation rate of HSFs cultured in high glucose concentrations when compared to their control cultures (p = 0.042, p = 0.000, and p = 0.000, respectively). This study showed that HSFs originally cultured for 2 weeks in high glucose concentration followed by culture in physiologic glucose during laser irradiation showed enhanced cell viability and proliferation. Thus, LLLT had a stimulatory effect on these HSFs. Culture Media;Glucose Cell Line;Cell Proliferation;Cell Shape;Cell Survival;Culture Media;Diabetes Complications;Fibroblasts;Glucose;Humans;Lasers, Gas;Low-Level Light Therapy;Models, Biological;Skin;Wound Healing
Therapeutic efficacy of plasmonic photothermal nanoparticles in hamster buccal pouch carcinoma. OBJECTIVES: The objective of this study was to assess the short-term effect of plasmonic photothermal therapy (PPTT) on induced hamster buccal pouch (HBP) carcinoma. STUDY DESIGN: Seventy-six Syrian golden male hamsters were used. The induced HBP carcinomas were directly injected with âˆ¼30Â nm gold nanospheres followed by 15Â min laser exposure (PPTT). RESULTS: PPTT caused rapid growth cessation and dramatic decrease in tumor sizes after 4Â weeks of treatment (PÂ <Â .05) compared to controls. Microscopic and immunohistochemical examination of the tumor biopsies revealed significant differences in the cellular apoptotic index (AI) value and proliferating cell nuclear antigen (PCNA) immunoexpression in PPTT-treated tumor tissue sections compared to controls (PÂ <Â .05). Survival probability of the treated animals was increased compared to controls (PÂ <Â .05). CONCLUSION: PPTT proved to be a successful method for treating superficially located HBP carcinomas. Gold Analysis of Variance;Animals;Apoptosis;Carcinoma, Squamous Cell;Cricetinae;Disease Models, Animal;Gold;Immunohistochemistry;Kaplan-Meier Estimate;Low-Level Light Therapy;Male;Mesocricetus;Metal Nanoparticles;Microscopy, Electron, Transmission;Mouth Neoplasms;Tumor Burden
In regard to de Lima et al. Carcinoma, Squamous Cell;Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Stomatitis
In reply to Olson. Carcinoma, Squamous Cell;Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Stomatitis
Combination treatment of CO2 fractional laser, pulsed dye laser, and triamcinolone acetonide injection for refractory keloid scars on the upper back. Keloids and hypertrophic scars are common lesions, which typically present as a cosmetic concern; however, they also can cause significant pruritus and pain. These lesions pose as a particular therapeutic challenge among clinicians due to a lack of complete knowledge of the formation of keloids and hypertrophic scars. Multiple treatments are widely accepted, yet all have shown limited benefit. In this case, we describe the treatment combination of the Affirm CO2 fractional laser (10 600 nm, Cynosure), Cynergy Pulsed dye laser (585 nm, Cynosure), and triamcinolone acetonide injection for keloids refractory to solitary treatments of triamcinolone acetonide injection and other laser modalities. Anti-Inflammatory Agents;Triamcinolone Acetonide Adult;Anti-Inflammatory Agents;Back;Cicatrix, Hypertrophic;Combined Modality Therapy;Female;Humans;Keloid;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Triamcinolone Acetonide
Clinical outcome of a nonsurgical and surgical treatment protocol in different types of peri-implantitis: a case series. OBJECTIVE: The replacement of missing teeth with dental implants has

been standard practice in dentistry for many years. The success of dental implants depends on many factors, among which the diagnosis, clinical severity, and treatment of peri-implant diseases play a key role. In this prospective case series, the influence of cumulative treatment modalities on peri-implantitis with and without pus formation on clinical outcome was assessed. METHOD AND MATERIALS: During 2010, 28 patients were referred for peri-implantitis treatment. They presented two different types of peri-implant diseases: peri-implantitis with (17 implants) or without pus formation (33 implants). After microbiologic diagnosis, all patients were treated at baseline with full-mouth scaling and root planing. Two months later, further full-mouth scaling and root planing and additional antimicrobial photodynamic therapy (aPDT) was applied. Four months after baseline, patients with pus formation additionally underwent access flap surgery. Active human matrix metalloproteinase-8 (aMMP-8) levels were measured in eluates before and after all treatment modalities and 7 months after baseline. RESULTS: Clinical parameters (probing depth, bleeding on probing) and aMMP-8-levels improved in both groups after treatment and the final examination. In periimplantitis patients without pus formation, all parameters decreased after full-mouth scaling and root planing and the additional aPDT and no surgery was necessary to improve the parameters. In patients with pus formation, the parameters decreased only after access flap surgery. CONCLUSION: The presence of pus influences the clinical outcome of the treatment of peri-implant diseases. Whereas peri-implantitis cases without pus formation can be successfully managed nonsurgically, peri-implantitis with pus formation can be effectively treated after an additional observation time of 3 months postoperatively only with additional flap surgery. Anti-Infective Agents, Local;MMP8 protein, human;Matrix Metalloproteinase 8;chlorhexidine gluconate;Chlorhexidine Anti-Infective Agents, Local;Bacteroides;Chlorhexidine;Clinical Protocols;Dental Scaling;Female;Follow-Up Studies;Fusobacterium nucleatum;Gingival Crevicular Fluid;Gingival Recession;Humans;Low-Level Light Therapy;Male;Matrix Metalloproteinase 8;Middle Aged;Peri-Implantitis;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Photochemotherapy;Porphyromonas gingivalis;Prospective Studies;Root Planing;Suppuration;Surgical Flaps;Treatment Outcome;Treponema denticola
Using blue gel pen to mark freckles during Q-switched laser therapy. Gels Gels;Humans;Low-Level Light Therapy;Melanosis
Penetration of laser light at 808â€‰and 980â€‰nm in bovine tissue samples. OBJECTIVE: The purpose of this study was to compare the penetration of 808 and 980â€‰nm laser light through bovine tissue samples 18-95â€‰mm thick. BACKGROUND DATA: Low-level laser therapy (LLLT) is frequently used to treat musculoskeletal pathologies. Some of the therapeutic targets are several centimeters deep. METHODS: Laser light at 808 and 980â€‰nm (1 W/cm(2)) was projected through bovine tissue samples ranging in thickness from 18 to 95â€‰mm. Power density measurements were taken for each wavelength at the various depths. RESULTS: For 808â€‰nm, 1 mW/cm(2) was achieved at 3.4â€‰cm, but for 980â€‰nm, 1 mW/cm(2) was achieved at only 2.2â€‰cm depth of tissue. CONCLUSIONS: It was determined that 808â€‰nm of light penetrates as much as 54% deeper than 980â€‰nm light in bovine tissue. Animals;Cattle;Lasers;Meat;Software
Effect of the laser and light-emitting diode (LED) phototherapy on midpalatal suture bone formation after rapid maxilla expansion: a Raman spectroscopy analysis. The aim of this study was to analyze the effect of laser or light-emitting diode (LED) phototherapy on the bone formation at the midpalatal suture after rapid maxilla expansion. Twenty young adult male rats were divided into four groups with 8 days of experimental time: group 1, no treatment; group 2, expansion; group 3, expansion and laser irradiation; and group 4, expansion and LED irradiation. In groups 3 and 4, light irradiation was in the first, third, and fifth experimental days. In all groups, the expansion was accomplished with a helicoid 0.020" stainless steel orthodontic spring. A diode laser (Î»780 nm, 70

mW, spot of 0.04 cm(2), t = 257 s, spatial average energy fluence (SAEF) of 18 J/cm(2)) or a LED (Î»850 nm, 150 mW Â± 10 mW, spot of 0.5 cm(2), t = 120 s, SAEF of 18 J/cm(2)) were used. The samples were analyzed by Raman spectroscopy carried out at midpalatal suture and at the cortical area close to the suture. Two Raman shifts were analyzed: âˆ¼ 960 (phosphate hydroxyapatite) and âˆ¼ 1,450 cm(-1) (lipids and protein). Data was submitted to statistical analysis. Significant statistical difference (p â‰¤ 0.05) was found in the hydroxyapatite (CHA) peaks among the expansion group and the expansion and laser or LED groups. The LED group presented higher mean peak values of CHA. No statistical differences were found between the treated groups as for collagen deposition, although LED also presented higher mean peak values. The results of this study using Raman spectral analysis indicate that laser and LED light irradiation improves deposition of CHA in the midpalatal suture after orthopedic expansion. Durapatite Animals;Bone Regeneration;Combined Modality Therapy;Durapatite;Lasers, Semiconductor;Light;Low-Level Light Therapy;Male;Maxilla;Maxillary Diseases;Palatal Expansion Technique;Phototherapy;Rats;Spectrum Analysis, Raman

Neural regeneration in a novel nerve conduit across a large gap of the transected sciatic nerve in rats with low-level laser phototherapy. This study proposes a biodegradable nerve conduit comprising 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) cross-linked gelatin annexed with Î²-tricalcium phosphate (Î²-TCP) ceramic particles (EDC-gelatin-TCP, EGT). For this study, the EGT-implant site in rats was irradiated using 660-nm GaAlAsP laser diodes (50 mW) for trigger point therapy to investigate the use of low-level laser (LLL) stimulation in the regeneration of a 15-mm transected sciatic nerve. Animals were divided into three groups: a control group undergoing autologous nerve graft (autograft); a sham-irradiated group (EGT), and an experimental group undergoing laser stimulation (EGT/LS). Two trigger points on the surgical incision along the sciatic nerve were irradiated transcutaneously for 2 min daily for 10 consecutive days. Twelve weeks after implantation, walking track analysis showed a significantly higher sciatic functional index (SFI; $p < 0.05$) and improved toe spreading development in the autograft and EGT/LS groups, compared to the EGT group. In the electrophysiological measurement, the mean recovery index (peak amplitude and area) of the compound muscle action potential curves in the autograft and EGT/LS groups showed significantly improved functional recovery than in the EGT group ($p < 0.05$). Compared with the EGT group, the autograft and EGT/LS groups showed a reduction in muscular atrophy. Histomorphometric assessments showed that the EGT/LS group had undergone more rapid nerve regeneration than the EGT group. Therefore, motor function, electrophysiological reaction, muscular reinnervation, and histomorphometric assessments demonstrate that LLL therapy can accelerate the repair of a 15-mm transected peripheral nerve in rats after being bridged with the EGT nerve conduit. Biocompatible Materials;Osmium Tetroxide Animals;Autografts;Biocompatible Materials;Electrophysiological Phenomena;Guided Tissue Regeneration;Immunohistochemistry;Low-Level Light Therapy;Muscular Atrophy;Myelin Sheath;Nerve Regeneration;Osmium Tetroxide;Postoperative Care;Prosthesis Implantation;Rats;Rats, Sprague-Dawley;Recovery of Function;Sciatic Nerve

Effect of local irradiation with 630 and 860 nm low-level lasers on tympanic membrane perforation repair in guinea pigs. OBJECTIVE: In this study, we evaluated the effect of low-level lasers on the healing of tympanic membrane perforation, one of the most common otological pathologies. METHODS AND MATERIALS: Twenty-four guinea pigs were randomly assigned to either the experimental or control group. One day after the induction of a 2 mm diameter, centred myringotomy in all animals, the tympanic membranes in the experimental group were irradiated with 630 and 860 nm lasers for 10 days. Two weeks later, histological changes in the membranes were evaluated. RESULTS: Tympanic membrane thickening and inflammatory cell infiltration in the tympanic membranes and surrounding tissues were significantly less in the experimental group (p <

0.001). The distance from the external auditory canal wall to the malleus tip did not differ significantly between the two groups (p = 0.42). CONCLUSION: The results show that the combined application of 630 and 860 nm lasers had a significant effect on the healing of tympanic membrane perforation, and on the prevention of thick fibrotic or atelectatic neomembrane formation.
Animals;Guinea Pigs;Low-Level Light Therapy;Male;Prospective Studies;Treatment Outcome;Tympanic Membrane;Tympanic Membrane Perforation;Wound Healing

Conventional systemic treatments associated with therapeutic sites of local lesions of secondary syphilis in the oral cavity in patients with AIDS. Patients with HIV infection may develop common diseases with atypical clinical features. HIV infection can change the classic clinical course of syphilis and increase the incidence of malignant syphilis. Malignant syphilis is a rare subtype of secondary syphilis that presents special clinical and histological features and has been associated with several processes characterized by variable degrees of immunosuppression. It is necessary to consider the possibility of this entity in the differential diagnoses in HIV-infected patients with cutaneous lesions. The dental surgeon (or oral surgeon) is vital to the medical team for promoting the health and improving the quality of life of syphilis patients. A patient with HIV infection was referred to us for complaints of a white patch on the tongue, stinging and burning sensation on the tongue, loss of taste, and dryness of the mouth. On clinical examination, the patient was found to have a tabetic gait (the Prussian soldier gait) associated with Charcot arthropathy. We also identified bilateral lesions with ulceration and exposure of the tissue that were tender, characterized by discrete necrosis. The treatment that was initiated at that time involved cleaning the area with gauze to remove all the white patches, followed by rinsing with bicarbonate in water (one teaspoon of baking soda dissolved in half a glass of water) four times a day. Additionally, fluconazole (100 mg/day for 7 days) was prescribed. We diagnosed secondary malignant syphilis of approximately 5 days duration. As an adjunctive therapy, we performed low-intensity laser treatment using a GaAsAl (gallium-aluminum arsenide) laser at 790 nm. With this treatment there was progressive resolution of the lesions.
Antifungal Agents;Buffers;Mouthwashes;Sodium Bicarbonate;Fluconazole AIDS-Related Opportunistic Infections;Acquired Immunodeficiency Syndrome;Ageusia;Antifungal Agents;Buffers;Burning Mouth Syndrome;Candidiasis, Oral;Combined Modality Therapy;Fluconazole;Follow-Up Studies;Humans;Immunocompromised Host;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mouthwashes;Sodium Bicarbonate;Syphilis;Syphilis, Cutaneous;Tongue Diseases;Xerostomia;Young Adult

Low-level laser therapy (LLLT) (660nm) alters gene expression during muscle healing in rats. INTRODUCTION: The effects of LLLT were studied during muscle regeneration through gene expression. METHODS: It was evaluated 10 and 50J/cm(2) doses during 7, 14 and 21days post cryoinjury, through histopathological analysis and mRNA MyoD, Myogenin, Vegf and Cox-2 expression. RESULTS: Irradiated groups presented less inflammatory process than control group after 14 and 21days. Cox-2 levels were downregulated in all irradiated groups after 7, 14 and 21days. On day 7, both treated groups had a downregulation of Vegf levels, and an upregulation after 14 and 21days, mainly with 50J/cm(2). The MyoD levels were upregulated with high dose in all periods and with low dose after 21days. Myogenin expression was downregulated in both treated groups after 7days, and was upregulated with 10J/cm(2) after 21days. CONCLUSION: These responses suggest that LLLT can improve the skeletal muscle regeneration through the gene expression stimulation.
MyoD Protein;Myogenin;RNA, Messenger;Vascular Endothelial Growth Factor A;Cyclooxygenase 2 Animals;Cyclooxygenase 2;Gene Expression Regulation;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Myogenin;RNA, Messenger;Rats;Rats, Wistar;Regeneration;Tibia;Time Factors;Vascular Endothelial Growth Factor A

The effects of 780-nm low-level laser therapy on muscle healing process after cryolesion. The objective of this study was to assess the effects of 780-nm low-level laser therapy at different periods of 7, 14 and 21 days after cryolesion, including the dose (10 or 50 J/cm(2)), to promote a better muscle repair evidenced by histopathological and immunohistochemical analyses. Fifty-four male rats were divided into three groups: injured control group (CG)-injured animals without any treatment; injured 780-nm laser-treated group, at 10 J/cm(2) (G10); and injured 780-nm laser-treated group, at 50 J/cm(2) (G50). Each group was divided into three subgroups (n = 6): 7, 14 and 21 days post-injury. Histopathological findings revealed better organised muscle fibres in the G10 and G50 during the periods of 7 and 14 days compared to the CG. The G10 and G50 during the 7 days showed a significant reduction ($p < 0.05$) of lesion area compared to the CG, without differences between groups treated for 14 and 21 days. The G10 showed an increase of the amount of vessels after 14 days compared to the G50, but not in relation to controls. With regard to the immunohistochemical analyses of the MyoD factor, the G10 and G50 during the 7 days showed higher concentrations of immunomarkers than controls. Myogenin immunomarkers were similarly observed at days 7 and 14 in all the three groups analysed, whereas immunomarkers were found in none of the groups after 21 days of laser therapy. The results showed that laser, regardless the applied dose, has positive effects on muscle repair. Biomarkers;MyoD Protein;Myog protein, rat;Myogenin Animals;Biomarkers;Disease Models, Animal;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Myogenin;Rats;Rats, Wistar;Regeneration;Time Factors;Wound Healing

Effect of 830-nm diode laser irradiation on human sperm motility. Sperm motility is known as an effective parameter in male fertility, and it depends on energy consumption. Low-level laser irradiation could increase energy supply to the cell by producing adenosine triphosphate. The purpose of this study is to evaluate how the low-level laser irradiation affects the human sperm motility. Fresh human semen specimens of asthenospermic patients were divided into four equal portions and irradiated by 830-nm GaAlAs laser irradiation with varying doses as: 0 (control), 4, 6 and 10 J/cm(2). At the times of 0, 30, 45 and 60 min following irradiation, sperm motilities are assessed by means of computer-aided sperm analysis in all samples. Two additional tests [HOS and sperm chromatin dispersion (SCD) tests] were also performed on the control and high irradiated groups as well. Sperm motility of the control groups significantly decreased after 30, 45 and 60 min of irradiation, while those of irradiated groups remained constant or slightly increased by passing of time. Significant increases have been observed in doses of 4 and 6 J/cm(2) at the times of 60 and 45 min, respectively. SCD test also revealed a non-significant difference. Our results showed that irradiating human sperms with low-level 830-nm diode laser can improve their progressive motility depending on both laser density and post-exposure time. Adult;Asthenozoospermia;DNA Fragmentation;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osmotic Pressure;Sperm Motility

Low-level light-emitting diode therapy increases mRNA expressions of IL-10 and type I and III collagens on Achilles tendinitis in rats. The present study investigated the effects of low-level light-emitting diode (LED) therapy (880 Â± 10 nm) on interleukin (IL)-10 and type I and III collagen in an experimental model of Achilles tendinitis. Thirty male Wistar rats were separated into six groups (n = 5), three groups in the experimental period of 7 days, control group, tendinitis-induced group, and LED therapy group, and three groups in the experimental period of 14 days, tendinitis group, LED therapy group, and LED group with the therapy starting at the 7th day after tendinitis induction (LEDT delay). Tendinitis was induced in the right Achilles tendon using an intratendinous injection of 100 Î¼L of collagenase. The LED parameters were: optical power of 22 mW, spot area size of 0.5 cm(2), and irradiation time of 170 s, corresponding to 7.5 J/cm(2) of energy density. The therapy was initiated 12

h after the tendinitis induction, with a 48-h interval between irradiations. The IL-10 and type I and III collagen mRNA expression were evaluated by real-time polymerase chain reaction at the 7th and 14th days after tendinitis induction. The results showed that LED irradiation increased IL-10 ($p < 0.001$) in treated group on 7-day experimental period and increased type I and III collagen mRNA expression in both treated groups of 7- and 14-day experimental periods ($p < 0.05$), except by type I collagen mRNA expression in LEDT delay group. LED (880 nm) was effective in increasing mRNA expression of IL-10 and type I and III collagen. Therefore, LED therapy may have potentially therapeutic effects on Achilles tendon injuries. Collagen Type I;Collagen Type III;RNA, Messenger;Interleukin-10 Achilles Tendon;Animals;Collagen Type I;Collagen Type III;Disease Models, Animal;Interleukin-10;Male;Phototherapy;RNA, Messenger;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Tendinopathy;Up-Regulation

In vivo and in vitro analysis of low level light therapy: a useful therapeutic approach for sensitive skin. Sensitive skin is a relatively common dermatologic condition and no optimal treatments have been established so far. Low-level laser/light therapy (LLLT) has been used for its biostimulative effect in various clinical settings. The purpose of this study was to investigate whether low-level laser/light therapy can improve sensitive skin clinically and to evaluate the effects of LLLT on skin in vitro. Twenty-eight patients complaining of sensitive skin were treated with low-level polarized light, and clinical results were evaluated using subjective and objective method. To investigate possible working mechanism of LLLT on skin, cultured human keratinocytes pretreated with nontoxic concentration of sodium lauryl sulfate (SLS) were used. Cytokines released from irritated keratinocytes after LLLT were analyzed. All patients showed subjective and objective improvement after treatment. No adverse effects were reported. The average number of LLLT sessions required to achieve clinical improvement was 9.9, and cumulative dose of LLLT was 71.3 J/cm(2) on the average. Erythema index decreased significantly after LLLT treatment (pâ€‰=â€‰0.017). In vitro assay showed that LLLT significantly reduced the release of VEGF from SLS-pretreated keratinocytes (pâ€‰=â€‰0.021). Our results suggest that LLLT could be a useful and safe treatment modality for sensitive skin, and modification of inflammatory cytokines released from irritated keratinocytes may be considered as one of plausible mechanisms in sensitive skin treated with LLLT. Interleukin-1alpha;Irritants;VEGFA protein, human;Vascular Endothelial Growth Factor A Acne Vulgaris;Adult;Aged;Cells, Cultured;Dermatitis, Atopic;Female;Humans;Interleukin-1alpha;Irritants;Keratinocytes;Low-Level Light Therapy;Male;Middle Aged;Phototherapy;Retrospective Studies;Rosacea;Skin;Vascular Endothelial Growth Factor A;Young Adult

Blue laser irradiation generates intracellular reactive oxygen species in various types of cells. Abstract Objective: The purpose of this study was to measure intracellular reactive oxygen species (ROS) production after laser irradiation in various types of cells. BACKGROUND DATA: ROS are considered to be the key secondary messengers produced by low-level laser therapy (LLLT). Although various mechanisms for the effects of LLLT have been proposed, and intracellular ROS were indicated as the one of the key factors, direct measurement of intracellular ROS of several types of cells after different wavelength lasers irradiation has not been reported. MATERIALS AND METHODS: Various types of cells were used in this study: mouse preadipocytes (3T3-L1), prechondrocytes (ATDC5), myoblasts (C2C12), mesenchymal stromal cells (KUSA-A1), lung cancer cells (LLC), insulinoma cells (MIN6), fibroblasts (NIH-3T3), human cervix adenocarcinoma cells (HeLa), macrophages differentiated from lymphocytes (THP-1) after treatment with phorbol ester, and rat basophilic leukemia cells (RBL-2H3). Cells were irradiated with a blue laser (wavelength: 405â€‰nm), a red laser (wavelength: 664â€‰nm) or a near infrared laser (wavelength: 808â€‰nm) at 100 mW/cm(2) for 60 or 120â€‰sec. Intracellular ROS levels were measured by fluorometric assay using the intracellular ROS probe, CM-H2DCFDA in a flow cytometer. RESULTS: After a blue laser irradiation, intracellular ROS

levels were increased in all types of cells. In contrast, intracellular ROS generation was not observed after irradiation with a red laser or near-infrared laser. CONCLUSIONS: Potential sources of intracellular ROS were excited by blue laser irradiation, resulting in ROS production within cells. Although the low-level intracellular ROS should be generated after a red or a near-infrared laser irradiation, the only high level intracellular ROS were detected by the ROS probe used in this study. As ROS are considered to be key secondary messengers, the specific functional regulation of cells by laser irradiation will be studied in a future study. Reactive Oxygen Species Animals;Cells, Cultured;Dose-Response Relationship, Radiation;Humans;Low-Level Light Therapy;Mice;Rats;Reactive Oxygen Species

The balance between normal and tumor tissues in phototherapy of tissues harboring cancer. Animals;Cell Proliferation;Genomic Instability;Humans;Low-Level Light Therapy;Neoplasms;Telomere

Dermoscopic changes in melanocytic nevi after depilation techniques. Depilation techniques have gain popularity in the last few decades. Nowadays there are available a wide variety of lasers as well as intense pulsed light for depilation. However, little is known about the long-term effects of these procedures when melanocytic nevi are affected by them. We report the cases of three patients where we observed clinical, dermoscopic and histopathological changes secondary to laser therapy and intense pulsed light depilation, respectively. We believe that it is necessary to perform further studies to prove the absence of malignant transformation so that we will be able to set up recommendations in those patients with a personal or family history of malignant melanoma and/or dysplastic nevi. Hair Removal;Humans;Low-Level Light Therapy;Male;Middle Aged;Nevus, Pigmented

Evaluation of low-level laser therapy in rabbit oral mucosa after soft tissue graft application: A pilot study. The aim of the present study was to assess the histopathological effects of low-level laser therapy (LLLT) on healing of the oral mucosa after soft tissue graft operations. The alterations at the end of healing in normal and LLLT-applied oral mucosa were studied in two healthy adult New Zealand white rabbits by taking specimens for light microscopic inspection. There was no adverse event reported in the study and no post-operative complications, such as swelling, bleeding, or edema, were observed in the rabbits. Complete wound healing was faster in the LLLT-applied rabbit. Compared to the normal rabbit oral mucosa, thickening of the stratum corneum (hyperkeratosis) was found in the epithelia of the rabbits. A significant increase in the epithelial thickness was found in the samples of rabbits, suggesting increased scar tissue following the wound repair. Additionally, many mitotic figures were present in the epithelia of the LLLT-applied rabbit, indicating epithelial cell hyperplasia. Long and irregular connective tissue protrusions projecting into the undersurface of the epithelium and mononuclear cell infiltrations were noted in the rabbits. The results suggest that LLLT used for soft tissue operations provides better and faster wound healing and that LLLT enhances epithelization. Animals;Lasers, Solid-State;Low-Level Light Therapy;Mouth Mucosa;Pilot Projects;Rabbits;Wound Healing

Comparative evaluation of the direct analgesic efficacy of selected physiotherapeutic methods in subjects with knee joint degenerative disease - preliminary report. BACKGROUND: The goals of the study were to evaluate the efficacy of two physiotherapeutic procedures: low energy laser therapy and low frequency transcutaneous electric nerve stimulation (TENS) and to compare these modalities with regard to their therapeutic effects in patients with knee osteoarthritis. MATERIAL AND METHODS: Fifty (50) subjects were enrolled into the study and divided into two groups of 25 subjects. Group A received 10 MLS laser therapy sessions with a synchronised laser beam at doses of 12 J per treated site. Group B received ten sessions of low frequency TENS. The procedures were carried out every day for two weeks (5 times a week). All patients completed a personal data questionnaire and underwent an examination of knee joint motion range and circumference.

Subjective pain intensity was assessed using the VAS pain scale and the modified Laitinen questionnaire. RESULTS: An analysis of the results of the treatment demonstrated statistically significant pain reduction in both groups. This improvement was significantly higher in the two-phase laser therapy group vs. the LF-TENS group. No statistically significant improvement was noted in either of the groups regarding the knee joint range of motion. CONCLUSIONS: 1. Synchronised laser beam (MLS) therapy and low-frequency TENS contribute to direct pain relief effects in subjects with knee osteoarthritis. 2. The study confirmed better analgesic effects of two-phase laser therapy vs. LF-TENS. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Osteoarthritis, Knee;Pain Measurement;Physical Therapy Modalities;Range of Motion, Articular;Transcutaneous Electric Nerve Stimulation;Treatment Outcome;Ultrasonic Therapy

Laser acupuncture in patients with temporomandibular dysfunction: a randomized controlled trial. A prospective, double-blind, randomized, and placebo-controlled trial was conducted in patients with chronic temporomandibular disorder (TMD) to check the analgesic efficacy of infrared low-power GaAlAs diode laser applied to acupuncture points. Forty female subjects, ranging in age from 20 to 40 years, with diagnoses of chronic myofascial pain and arthralgia were randomly allocated to two groups: an experimental group (EG) who received the laser acupuncture as adjunct to reversible occlusal splint therapy and a control group (CG) who received a placebo laser associated with occlusal splint therapy. Both approaches were applied once a week for 3 months. Laser acupuncture was defined by the following parameters: 50-mW continuous radiation for 90 s to acupoints ST6, SI19, GB20, GB43, LI4, LR3, NT3, and EX-HN3; defining 4.5-J energy; 1250-W/cm(2) density point; and 112.5-J/cm(2) total density. The outcome measurements included a symptom evolution assessment carried out by checking spontaneous and palpation pain intensity, which was indicated on a visual analog scale (VAS). All evaluations were made by an assessor who was blind to the treatment. The symptom reduction was significant in both groups (EG: VASâ€‰=â€‰0, nâ€‰=â€‰20; CG: VAS between 2 and 4, nâ€‰=â€‰18). The measurements showed significantly faster and lower pain intensity values in the EG (pâ€‰â‰¤â€‰0.002), where there was a higher proportion of patients with remission of symptoms related to the action of laser acupuncture. For patients in whom conservative treatment was adopted, the laser acupuncture is a secure, noninvasive, and effective treatment modality because it improves the chronic pain associated with TMD and has no side effects. Acupuncture Analgesia;Acupuncture Points;Adult;Chronic Disease;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Prospective Studies;Temporomandibular Joint Dysfunction Syndrome;Young Adult

Comparison of a fractional microplasma radio frequency technology and carbon dioxide fractional laser for the treatment of atrophic acne scars: a randomized split-face clinical study. BACKGROUND: No studies have compared fractional microplasma radio frequency (RF) technology with the carbon dioxide fractional laser system (CO2 FS) in the treatment of atrophic acne scars in the same patient. OBJECTIVE: To compare the efficacy and safety of fractional microplasma RF with CO2 FS in the treatment of atrophic acne scars. METHODS AND MATERIALS: Thirty-three Asian patients received three sessions of a randomized split-face treatment of fractional microplasma RF or CO2 FS. RESULTS: Both modalities had a roughly equivalent effect. Ã‰chelle d'Ã‰valuation Clinique Des Cicatrices d'AcnÃ© scores were significantly lower after fractional microplasma RF (from 51.1Â Â±Â 14.2 to 22.3Â Â±Â 8.6, 56.4% improvement) and CO2 FS (from 48.8Â Â±Â 15.1 to 19.9Â Â±Â 7.9, 59.2% improvement) treatments. There was no statistically significant difference between the two therapies. Twelve subjects (36.4%) experienced postinflammatory hyperpigmentation (PIH) after 30 of 99 treatment sessions (30.3%) on the CO2 FS side and no PIH was observed on the fractional microplasma RF sides. CONCLUSION: Both modalities have good effects on treating atrophic scars. PIH was not seen with the fractional microplasma RF, which might make it a

better choice for patients with darker skin. Acne Vulgaris;Adolescent;Atrophy;Cicatrix;Double-Blind Method;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Radio Waves;Young Adult

[Calculation of the dose of low-intensity laser radiation: the need or the harm?]. This study showed that it is highly undesirable to equip the devices for laser therapy with the dose-calculation function. In order to avoid mistakes, the operator should perform a strict sequence of actions as follows: to choose the needed wavelength and operating regime (the laser head block) of the LILR source, to set and measure the radiation power, the time and frequency of treatment, turn on the apparatus, control its operation and switch it off at the scheduled time. Meeting all these requirements eventually ensures obtaining a certain optimal dose density and guarantees that the entire procedure of laser irradiation is performed in a proper way. The equipment of the apparatus with the dose-calculation function is nothing more than a marketing ploy intended to earn extra money that apart from everything else creates additional problems for the customer. Humans;Low-Level Light Therapy;Radiation Dosage

[The influence of intravenous laser therapy on prostaglandin E2 and F2-alpha dynamics and the state of microcirculation in the patients presenting with gastroesophageal reflux disease]. The objective of the present work was to study the influence of low-frequency laser radiation on the levels of prostaglandins E2 and F2-alpha and characteristics of microcirculation in the patients suffering from gastroesophageal reflux disease (GERD). A total of 112 patients at the age from 19 to 79 years presenting with GERD were examined. 78 of them were given the complete 10-day course of intravenous laser therapy based on a Matriks-VLOK ("Matriks", Russia) therapeutic laser set emitting in the continuous mode at a wavelength of 0.405 mcm with the radiation power 1-11.5 mW at the output of the main lightguide. The characteristics of interest were determined before and after the treatment. It was shown that laser irradiation resulted in the elevation of pro-inflammatory prostaglandin levels and the improvement of parameters of microcirculation. Dinoprost;Dinoprostone Adult;Aged;Dinoprost;Dinoprostone;Female;Gastroesophageal Reflux;Humans;Low-Level Light Therapy;Male;Microcirculation;Middle Aged

Comparison of natural course, intravitreal triamcinolone and macular laser photocoagulation for treatment of mild diabetic macular edema. PURPOSE: To assess the natural course of the mild diabetic macular edema(DME) and to compare the visual outcomes with the patients with receiving either macular laser photocoagulation or intravitreal injection of triamcinolone acetonide(IVTA). METHODS: 28 eyes with central macular thickness (CMT) of between 250 to 300Âμm were followed without treatment and 48 eyes with CMT between 300 to 500Âμm had been divided into 3 subgroups according to treatment. We evaluated the best corrected visual acuity (BCVA) and CMT of natural course group and compared the BCVA and CMT of the patients who had been treated with IVTA or macular laser treatment. RESULTS: The eyes with DME between 250 to 300Âμm showed no significant change in BCVA and CMT at 6 month. Among the eyes with DME between 300 to 500Âμm, all 3 subgroups showed no statistically significant change of BCVA at any follow up period and no significant difference was revealed among the subgroups. All subgroups showed significant reduction of CMT after 1 month and maintained until final follow-up and there was no significant difference among subgroups. CONCLUSIONS: Mild DME between 250 to 500Âμm did not show significant worsening of BCVA or macular edema without any specific treatment. Glucocorticoids;Triamcinolone Aged;Diabetic Retinopathy;Female;Glucocorticoids;Humans;Intravitreal Injections;Light Coagulation;Low-Level Light Therapy;Macular Edema;Male;Middle Aged;Tomography, Optical Coherence;Treatment Outcome;Triamcinolone

Effect of combination of 1064 nm Q-switched Nd:YAG and fractional carbon dioxide lasers for treating exogenous ochronosis. We describe three cases of exogenous ochronosis of the malar areas due to long-term application of skin-lightening agents for melasma, effectively treated by combination of Q-switched Nd:YAG and the fractional carbon dioxide lasers. None of these lasers has been reported to be used to effectively treat ochronosis before. The Q-switched Nd:YAG laser is capable of disintegrating dermal ochronotic fibers, thereby facilitating their phagocytosis and elimination via lymphatics. The fractional carbon dioxide laser is believed to assist transepidermal elimination of the onchronotic material. We believe successful treatment of ochronosis is possible when both mechanisms are applied. Aged;Alkaptonuria;Combined Modality Therapy;Female;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Ochronosis

Treatment of facial recalcitrant verruca vulgaris with holmium: YAG laser: an update. OBJECTIVES: To evaluate the effect and safety of the holmium: YAG laser in the treatment of facial recalcitrant verruca vulgaris. METHODS: 42 patients with recalcitrant facial verruca vulgaris (64 warts in all) were enrolled in the study. Warts were treated with holmium: YAG pulsed dye laser with a top energy of 1.2-1.5 J, pulse frequency 10-12 Hertz, average power 10 Watt. Adverse reaction, complication, recurrence and clinical assessment of the lesion were documented with follow-up 6 months. RESULTS: Ages of patients ranged from 16 to 73 years. 62 warts in 42 patients were eliminated by only one treatment session. The average time for wound-healing is 10.3 days. No severe discomfort, bleeding, edema, ulceration and secondary infection developed. No obvious complications were found. Only 4 warts in 3 patients remained mild atrophy scar and 7 warts in 6 patients remained pigment change. These defects became slighter after 6-month follow-up and left no bad effect on aesthetic. Two of the patients encountered recurrence in the treated site follow-up 6 months. CONCLUSIONS: Holmium laser is an effective and safe therapy for recalcitrant verruca vulgaris. It is the choice of treatment for those lesions in cosmetically sensitive areas. Holmium Adolescent;Adult;Aged;Face;Female;Holmium;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Warts;Young Adult

Scar revision by the pinhole method using a 10,600-nm carbon dioxide laser. Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction

[Morphological features of corneal exposure to experimental near infrared emission laser]. Effect of laser radiation with wave length 1,4 microm on exposed cornea of isolated bull eye (in vitro) is studied. Experimental laser coagulator with wave length 1,4 microm based on the semiconductor laser with a fiber radiation output was used in the study. Cornea was exposed at the standardized distance to radiation with different energy settings. Coagulates were morphologically studied, photoregistration and morphometric analysis of obtained images were performed. The depth of radiation absorbtion, type and degree of corneal damage were estimated in the focus and marginal area. The analysis of results shows potential of this laser coagulator to be used for selective effects at different corneal layers. This laser may be applied both for coagulation and therapueutic purposes. Animals;Cattle;Cornea;Corneal Diseases;Disease Models, Animal;Equipment Design;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Acoustic

Stimulation of TRPV1 by Green Laser Light. Low-level laser irradiation of visible light had been introduced as a medical treatment already more than 40 years ago, but its medical application still remains controversial. Laser stimulation of acupuncture points has also been introduced, and mast-cells degranulation has been suggested. Activation of TRPV ion channels may be involved in the degranulation. Here, we investigated whether TRPV1 could serve as candidate for laser-induced mast cell activation. Activation of TRPV1 by capsaicin resulted in degranulation. To investigate the effect of

laser irradiation on TRPV1, we used the Xenopus oocyte as expression and model system. We show that TRPV1 can functionally be expressed in the oocyte by (a) activation by capsaicin (K(1/2) = 1.1â€‰Î¼M), (b) activation by temperatures exceeding 42Â°C, (c) activation by reduced pH (from 7.4 to 6.2), and (d) inhibition by ruthenium red. Red (637â€‰nm) as well as blue (406â€‰nm) light neither affected membrane currents in oocytes nor did it modulate capsaicin-induced current. In contrast, green laser light (532â€‰nm) produced power-dependent activation of TRPV1. In conclusion, we could show that green light is effective at the cellular level to activate TRPV1. To which extend green light is of medical relevance needs further investigation.

Laser therapy in metabolic syndrome-related kidney injury. Metabolic syndrome is characterized by hyperglycemia, hypertension, dyslipidemia and obesity. Diabetes and hypertension are the main causes of chronic end-stage kidney disease in humans. Chronic kidney disease is characterized by kidney inflammation and eventual development of kidney fibrosis. Low-level laser (or light) therapy (LLLT) can be used to relieve pain associated with some inflammatory diseases due to photochemical effects. Despite the known contribution of inflammation to metabolic syndrome and kidney disease, there is scarce information on the potential therapeutic use of LLLT in renal disease. The aim of this randomized, placebo-controlled study was to test the hypothesis that LLLT could modulate chronic kidney injury. Rats with nephropathy, hypertension, hyperlipidemia and type II diabetes (strain ZSF1) were subjected to three different conditions of LLLT or sham treatment for 8 weeks, and then sacrificed 10 weeks later. The main findings of this study are that the LLLT-treated rats had lower blood pressure after treatment and a better preserved glomerular filtration rate with less interstitial fibrosis upon euthanasia at the end of follow-up. This initial proof-of-concept study suggests that LLLT may modulate chronic kidney disease progression, providing a painless, noninvasive, therapeutic strategy, which should be further evaluated. Collagen Animals;Collagen;Fibrosis;Kidney;Laser Therapy;Metabolic Syndrome;Rats;Renal Insufficiency, Chronic

A metabolomic study on the effect of intravascular laser blood irradiation on type 2 diabetic patients. Intravenous laser blood irradiation (ILBI) is widely applied in the treatment of different pathologies including diabetes mellitus. The aim of this study is to evaluate the effects of ILBI on the metabolites of blood in diabetic type 2 patients using metabolomics. We compared blood samples of nine diabetic type 2 patients, using metabolomics, before and after ILBI with blue light laser. The results showed significant decrease in glucose, glucose 6 phosphate, dehydroascorbic acid, R-3-hydroxybutyric acid, L-histidine, and L-alanine and significant increase in L-arginine level in blood and blood sugar in the patients have reduced significantly (pâ€‰<â€‰0.05). This study clearly demonstrated a significant positive effect of ILBI on metabolites of blood in diabetic type 2 patients. These findings support the therapeutic potential of ILBI in diabetic patients. Amino Acids;Blood Glucose;Glucose-6-Phosphate;3-Hydroxybutyric Acid;Dehydroascorbic Acid 3-Hydroxybutyric Acid;Amino Acids;Blood Glucose;Dehydroascorbic Acid;Diabetes Mellitus, Type 2;Endovascular Procedures;Female;Glucose-6-Phosphate;Humans;Least-Squares Analysis;Low-Level Light Therapy;Magnetic Resonance Spectroscopy;Male;Metabolome;Middle Aged

Independent evaluation of low-level laser therapy at 635â€‰nm for non-invasive body contouring of the waist, hips, and thighs. INTRODUCTION: The non-invasive body-contouring segment continues to exhibit uninhibited growth, a trend that has provoked the emergence of numerous body-contouring devices. One particular device, low-level laser therapy at 635â€‰nm (LLLT-635), has exhibited promising clinical results. We performed an independent, physician-led trial to evaluate the utility of LLLT-635â€‰nm for non-invasive body contouring of the waist, hips, and thighs. METHODS: Eighty-six participants were retrospectively assessed at an individual clinic in the United States. A multi-head laser device was administered every-other-day for 2 weeks. Each treatment consisted of

20â€‰minutes of anterior and posterior treatment. Patients received concurrent treatment of the waist, hips, and bilateral thighs. Circumferential measurements were evaluated at baseline and one week following the 2-week treatment administration phase. RESULTS: Compared with baseline, a statistically significant 2.99â€‰in. (7.59â€‰cm) mean loss was observed at the post-procedure evaluation point (Pâ€‰<â€‰0.0001). When analyzed individually, the waist, hips, and thighs each reported a statistically significant reduction of -1.12, -0.769, and -1.17, respectively. Furthermore, linear regression analysis revealed a weak linear dependence (râ€‰=â€‰0.179) between the reported weight and circumference change. CONCLUSION: These data further validate the clinical efficacy and safety of LLLT at 635â€‰nm. Abdomen;Adiposity;Aerospace Medicine;Body Size;Cohort Studies;Cosmetic Techniques;Hip;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Thigh;Treatment Outcome

Lack of adherence to the laser dosage recommendations from the World Association for Laser Therapy in Achilles study. Achilles Tendon;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Tendinopathy

The authors respond. Achilles Tendon;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Tendinopathy

Laser versus ultrasound on bone density recuperation after distraction osteogenesis-a cone-beam computer tomographic analysis. PURPOSE: To assess the effects of low-level laser versus ultrasound irradiation on bone mineral density after distraction osteogenesis using cone-beam computed tomographic analysis in an experimental study. MATERIALS AND METHODS: Distraction osteogenesis was performed with rapid maxillary expansion devices (Hyrax-Morelli, Sorocaba-SÃ£o Paulo-Brazil). After a 2-day latency period, the distraction devices were activated for 10 days at a rate of 1 mm/day. Four groups of 6 animals were distributed as follows: 1) control, 2) laser irradiation on the right side, 3) ultrasound irradiation on the right side, and 4) laser irradiation on the right side and ultrasound on the left side. Cone-beam computed tomography was used to determine bone mineral density by measuring the recovery (percentage). Analysis of variance and the Tukey test (P = .05) were used for statistical analyses. RESULTS: The influences of low-intensity laser and ultrasound irradiation on bone mineral density were statistically significant. The analyses showed greater bone mineral density recuperation in the mandibular side with the ultrasound application. CONCLUSIONS: The results of this study suggest an acceleration of bone mineral density after laser and ultrasound irradiation. Ultrasound irradiation showed the greatest effects and the laser power positively influenced the recuperation of the bone density on the side opposite its application, causing a cross reaction or even exacerbating the inherent action of ultrasound irradiation. Animals;Bone Density;Cone-Beam Computed Tomography;External Fixators;Image Processing, Computer-Assisted;Imaging, Three-Dimensional;Low-Level Light Therapy;Male;Mandible;Osteogenesis, Distraction;Palatal Expansion Technique;Rabbits;Radiation Dosage;Time Factors;Ultrasonic Therapy

[Complex treatment of patients with chronic cerebrovascular insufficiency]. Chronic cerebrovascular insufficiency is the most common manifestation of chronic diseases of the nervous system. Its main causes are hypertension and atherosclerosis. Diseases debut mainly on 5-6th decade of life. The condition prohreiyentnyy, but the degree of progression can be varied--from slow to galloping. Therefore, when studying the effectiveness of treatment programs, in our opinion, it is important to include the medical complex of different methods of reflexology. Acupuncture;Acupuncture Points;Cerebrovascular Disorders;Chronic Disease;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged

[Carpal tunnel syndrome: diagnostics and conservative treatment]. The Carpal tunnel syndrome is the most frequent entrapment neuropaphy of human. The Article is dedicated to diagnostics and conservative treatment this pathology. The early diagnostics and in time fixed treatment prevents the

progress of the disease, raises the quality of life and allows to avoid surgical procedure. Big attention is given acupuncture reflexotherepy and infrared latherotherepy, which use raises the quality of the therapeutic influences. Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal Acupuncture;Acupuncture Points;Adrenal Cortex Hormones;Anti-Inflammatory Agents, Non-Steroidal;Carpal Tunnel Syndrome;Combined Modality Therapy;Diagnosis, Differential;Drug Therapy, Combination;Electromyography;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Reflexotherapy

Low-power laser irradiation suppresses inflammatory response of human adipose-derived stem cells by modulating intracellular cyclic AMP level and NF-ÎºB activity. Mesenchymal stem cell (MSC)-based tissue regeneration is a promising therapeutic strategy for treating damaged tissues. However, the inflammatory microenvironment that exists at a local injury site might restrict reconstruction. Low-power laser irradiation (LPLI) has been widely applied to retard the inflammatory reaction. The purpose of this study was to investigate the anti-inflammatory effect of LPLI on human adipose-derived stem cells (hADSCs) in an inflammatory environment. We showed that the hADSCs expressed Toll-like Receptors (TLR) 1, TLR2, TLR3, TLR4, and TLR6 and that lipopolysaccharide (LPS) significantly induced the production of pro-inflammatory cytokines (Cyclooxygenase-2 (Cox-2), Interleukin-1Î² (IL-1Î²), Interleukin-6 (IL-6), and Interleukin-8 (IL-8)). LPLI markedly inhibited LPS-induced, pro-inflammatory cytokine expression at an optimal dose of 8 J/cmÂ². The inhibitory effect triggered by LPLI might occur through an increase in the intracellular level of cyclic AMP (cAMP), which acts to down-regulate nuclear factor kappa B (NF-ÎºB) transcriptional activity. These data collectively provide insight for further investigations of the potential application of anti-inflammatory treatment followed by stem cell therapy. Interleukin-1beta;Interleukin-6;Interleukin-8;Lipopolysaccharides;NF-kappa B;Cyclic AMP;Cyclooxygenase 2 Adipose Tissue;Cell Line, Tumor;Cyclic AMP;Cyclooxygenase 2;Humans;Interleukin-1beta;Interleukin-6;Interleukin-8;Lipopolysaccharides;Low-Level Light Therapy;NF-kappa B;Stem Cells

Effects of chronic passive smoking on the regeneration of rat femoral defects filled with hydroxyapatite and stimulated by laser therapy. Defects associated with bone mass loss are frequently treated by autogenous bone grafting. However, synthetic biomaterials such as calcium phosphate ceramics can substitute autologous grafts as long as they are biocompatible with bone tissue. In addition, low-level laser therapy (LLLT) is used to enhance bone regeneration by stimulating the local microcirculation and increasing the synthesis of collagen by bone cells. However, bone health is fundamental for osseointegration of the graft and bone repair. In this respect, excessive tobacco consumption can compromise expected outcomes because of its deleterious effects on bone metabolism that predispose to the development of osteoporosis. The objective of this study was to evaluate the regeneration of bone defects implanted with biomaterial and stimulated by LLLT in rats submitted to passive cigarette smoking. Porous hydroxyapatite granules were implanted into critical-size defects induced experimentally in the distal epiphysis of the right femur of 20 female Wistar rats submitted to passive smoking for 8 months in a smoking box. The defect site was irradiated with a gallium-arsenide laser at an intensity of 5.0 J/cm2. The animals were divided into four groups: control (non-smoking) rates submitted (G2) or not (G1) to laser irradiation, and smoking rats submitted (G4) or not (G3) to laser irradiation. The animals were sacrificed 8 weeks after biomaterial implantation. The right femurs were removed for photodocumentation, radiographed, and processed for routine histology. The results showed good radiopacity of the implant site and of the hydroxyapatite granules. Histologically, formation of new trabecular bone was observed adjacent to the hydroxyapatite granules in G1 and G2. In G3 and G4, the granules were surrounded mainly by connective tissue. In conclusion, passive smoking compromised bone neoformation in the defects and the LLLT protocol was not adequate to stimulate local osteogenesis. Bone Substitutes;Tobacco

Smoke Pollution;Durapatite Animals;Bone Substitutes;Disease Models, Animal;Durapatite;Female;Inhalation;Laser Therapy;Osseointegration;Osteoporosis;Rats;Rats, Wistar;Tobacco Smoke Pollution
Light-emitting diode therapy induces analgesia and decreases spinal cord and sciatic nerve tumour necrosis factor-Î± levels after sciatic nerve crush in mice. BACKGROUND: Neuropathic pain is severely debilitating and resistant to pharmacological approaches; therefore, the study of therapies to complement its treatment is especially relevant. In a case report study, light-emitting diode therapy (LEDT) has shown analgesic activity as well as reduced the expression of pro-inflammatory cytokines in a rabbit osteoarthritis model and in calcaneal tendinitis in rats. Although LEDT stimulated morphofunctional recovery after nerve injury in rats, its effect against neuropathic pain has not been tested. METHODS: To that purpose, mice under anaesthesia were subjected to the sciatic nerve crush (SNC) model. On the seventh post-operative day, after determining analgesic dose (energy density in joules), LEDT (950â€‰nm, 80â€‰mW/cm2, 2.5â€‰J/cm2) was irradiated, daily for a period of 15 days, on the skin over the crush site. RESULTS: Compared with the SNC group, LEDT reduced mechanical hypersensitivity but not cold hypersensitivity which is induced by SNC, decreased spinal cord and sciatic nerve levels of tumour necrosis factor alpha (TNF-Î±) but did not alter interleukin (IL)-1Î² and IL-10 levels, and finally, failed to accelerate motor functional recovery and morphological nerve regeneration. CONCLUSION: Taken together, these data provide first-hand evidence of LEDT effectiveness against neuropathic pain induced by SNC, with corresponding decrease of pro-inflammatory cytokine levels, both in the sciatic nerve and in the spinal cord, although at a small analgesic dose, LEDT failed to accelerate nerve regeneration. Analgesics;Tumor Necrosis Factor-alpha Analgesics;Animals;Disease Models, Animal;Lasers, Semiconductor;Male;Mice;Nerve Regeneration;Pain;Pain Management;Recovery of Function;Sciatic Nerve;Spinal Cord;Tumor Necrosis Factor-alpha
Infantile hemangiomas: an update. Infantile hemangioma (IH) is a common vascular tumor of infancy. Although benign, infants with IH can experience complications including ulceration, visual and airway impairment, and residual scarring and disfigurement. It is often challenging for clinicians to predict which tumors are in need of systemic treatment. However, data from various demographic and other studies have revealed further insights into this tumor. This article reviews the identification, evaluation, and management of high-risk IHs, including the indications for treatment and the use of systemic treatments such as corticosteroids, Î²-blockers, and vincristine. Adrenal Cortex Hormones;Interferon-alpha;Vincristine;Propranolol Adrenal Cortex Hormones;Biopsy, Needle;Combined Modality Therapy;Dermatologic Surgical Procedures;Drug Therapy, Combination;Female;Follow-Up Studies;Hemangioma;Humans;Immunohistochemistry;Infant;Interferon-alpha;Low-Level Light Therapy;Male;Propranolol;Risk Assessment;Severity of Illness Index;Skin Neoplasms;Treatment Outcome;Vincristine
Low-level laser reduces the production of TNF-Î±, IFN-Î³, and IL-10 induced by OVA. Delayed, or type IV, hypersensitivity reactions are a useful model to study the effects of new substances on the immune system. In this study, the experimental model of the delayed type hypersensitivity (DTH) reaction to ovalbumin (OVA) was used to evaluate the immunomodulating effects of low-level laser therapy (LLLT), which is used as an adjuvant therapy in medicine, dentistry, and physical therapy because of its potential anti-inflammatory and analgesic effects observed in several studies. The effects of LLLT (Î» 780 nm, 0.06 W/cm(2) of radiation, and fluency of 3.8 J/cm(2)) in reaction to ovalbumin in Balb/C mice were examined after the induction phase of the hypersensitivity reaction. The animals treated with azathioprine (AZA), the animals that received a vehicle instead of ovalbumin, and those not immunized served as controls (nâ€‰=â€‰6 for each group). Footpad

thickness measurements and hematoxylin-eosin histopathological exams were performed. Proliferation tests were also performed (spontaneous, in the presence of concanavalin A and ovalbumin) to determine the production in mononuclear cells cultures of tumor necrosis factor-alpha (TNF-Î±), INF-Î³, and IL-10. In the group of animals irradiated with lasers and in the group treated with AZA, footpad thickness measurements were significantly reduced in comparison to the control group (pâ€‰<â€‰0.05). This reduction was accompanied by a very significant reduction in the density of the inflammatory infiltrate and by a significant reduction in the levels of TNF-Î±, INF-Î³, and IL-10. LLLT radiation was shown to have an immunomodulating effect on DTH to OVA in Balb/C mice. IL10 protein, mouse;Immunosuppressive Agents;Tumor Necrosis Factor-alpha;Interleukin-10;Interferon-gamma;Ovalbumin;Azathioprine Animals;Azathioprine;Hypersensitivity, Delayed;Immunosuppression Therapy;Immunosuppressive Agents;Interferon-gamma;Interleukin-10;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Ovalbumin;Tumor Necrosis Factor-alpha

Laser acupuncture for depression: a randomised double blind controlled trial using low intensity laser intervention. INTRODUCTION: Trials of acupuncture for the treatment of depression have produced mixed results. We examined the effectiveness of laser acupuncture compared with placebo acupuncture for the treatment of major depression. METHODS: A randomised, double blinded, placebo controlled trial was conducted in Sydney, Australia. Participants aged 18-50 years with DSM-IV major depressive disorder were eligible to join the study. Forty-seven participants were randomised to receive laser acupuncture or placebo laser at acupoints LR14, CV14, LR8, HT7 and KI3. The intervention was administered twice a week for 4 weeks and once a week for another four weeks, for a total of 12 sessions. The primary outcome assessed the change in severity of depression using the Hamilton-Depression Rating Scale (HAM-D), and secondary outcomes assessed the change in severity of depression using the Quick Inventory for Depression-Self Reporting (QID-SR), the Quick Inventory for Depression-Clinician (QIDS-CL), with outcomes assessed at eight weeks. The treatment response (greater than 50% improvement in HAM-D) and remission (HAM-D<8) were analysed. RESULTS: At eight weeks participants showed greater improvement in the active laser group on the primary and clinician-rated secondary outcome measures (HAM-D (mean 9.28 (SD 6.55) vs. mean 14.14 (SD 4.78 p<0.001); QIDS-CL (mean 8.12 (SD 6.61 versus 12.68 (mean SD 3.77)) p<0.001). The self-report QIDS-SR scores improved in both groups but did not differ significantly between the groups. In the active laser group, QIDS-SR scores remained significantly lower than baseline at 3 months follow-up. Response rates (active laser, placebo laser) on ITT (intention to treat) analyses were 72.0% and 18.2% (p<0.001), respectively. Remission rates on ITT analyses (active laser, placebo laser) were 56.0% and 4.5% (p<0.001). Transient fatigue was the only adverse effect reported. LIMITATIONS: There was no follow-up for the placebo group at one and 3 months. CONCLUSION: Laser acupuncture showed a clinically and statistically significant benefit with reducing symptoms of depression on objective measures. Placebos Acupuncture Therapy;Adolescent;Adult;Australia;Depressive Disorder, Major;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Placebos;Treatment Outcome;Young Adult

Concomitant use of an infrared fractional laser with low-dose isotretinoin for the treatment of acne and acne scars. BACKGROUND: Acne scarring has lifelong sequelae. Fractional photothermolysis (FP) has been shown to provide fast recovery from acne within a short period, thereby aiding skin rejuvenation. Isotretinoin is a well-known, effective drug for the treatment of severe recalcitrant acne. This study investigated the safety and the efficacy of infrared fractional laser treatment in conjunction with low-dose isotretinoin for the treatment of acne and acne scars. MATERIALS: A 1550 nm Erbium-doped fiber laser was used to treat 35 patients with acne scarring. All the patients had taken isotretinoin (10 mg/day) for more than one month prior to the commencement of the

fractional laser treatment. RESULTS: There was no aggravation of acne scars, hypertrophic scars, or keloids. Most of the patients (33 patients) received reduced microthermal damage zone (MTZ) treatment. Eighty percent of the treated patients (28 patients) demonstrated more than a fair improvement. The total average score on the global acne scarring classification before treatment was 13.5, and the score after treatment was 11.2. CONCLUSION: Acne and acne scars can be treated more effectively by concomitant use of an infrared fractional laser with low-dose isotretinoin with reduced MTZ densities. Most patients showed more than a fair improvement, and there was no aggravation of the scars. Dermatologic Agents;Isotretinoin Acne Vulgaris;Adolescent;Adult;Cicatrix;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Isotretinoin;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Young Adult

Liver regeneration following partial hepatectomy is improved by enhancing the HGF/Met axis and Akt and Erk pathways after low-power laser irradiation in rats. A simple, easy, and safe procedure aiming to improve liver regeneration could be of great clinical benefit in critical situations such as major hepatectomy, trauma, or hemorrhage. Low-power laser irradiation (LPLI) has come into a wide range of use in clinical practice by inducing regeneration in healthy and injured tissues. However, the effect of LPLI on the process of liver regeneration, especially those related to the molecular mechanisms, is not fully understood. Thus, the aim of the present study was to investigate the main molecular mechanisms involved in liver regeneration of partially hepatectomized rats exposed to LPLI. We used Wistar male rats, which had their remaining liver irradiated or not with LPLI (wavelength of 632.8 nm and fluence of 65 mW/cm(2)) for 15 min after a 70% hepatectomy. We subsequently investigated hepatocyte growth factor (HGF), Met, Akt, and Erk 1/2 signaling pathways through protein expression and phosphorylation analyses along with cell proliferation (proliferating cell nuclear antigen (PCNA) and Ki-67) using immunoblotting and histological studies. Our results show that LPLI can improve liver regeneration as shown by increased HGF protein expression and the phosphorylation levels of Met, Akt, and Erk 1/2 accompanied by higher levels of the PCNA and Ki-67 protein in the remnant livers. In summary, our results suggest that LPLI may play a clinical role as a simple, fast, and easy-to-perform strategy in order to enhance the liver regenerative capacity of a small liver remnant after hepatectomy. Ki-67 Antigen;Proliferating Cell Nuclear Antigen;Hepatocyte Growth Factor;Proto-Oncogene Proteins c-met;Proto-Oncogene Proteins c-akt Animals;Hepatectomy;Hepatocyte Growth Factor;Ki-67 Antigen;Liver Regeneration;Low-Level Light Therapy;MAP Kinase Signaling System;Male;Phosphorylation;Proliferating Cell Nuclear Antigen;Proto-Oncogene Proteins c-akt;Proto-Oncogene Proteins c-met;Rats;Rats, Wistar;Signal Transduction

The effect of 810-nm low-level laser therapy on pain caused by orthodontic elastomeric separators. The purpose of this study was to assess the effect of 810-nm (DMC Equipamentos, Sao Carlos, Brazil) continuous wave low-level laser therapy (LLLT) on the pain caused by orthodontic elastomeric separators. Thirty-seven orthodontic patients (12 male and 25 female, aged 11-32Â years, mean ageâ€‰=â€‰24.97Â years) participated in the study, including 20 subjects aged 18Â years or more, and 17 under 18Â years of age. Four elastomeric separators (Dentarum, Springen, Germany) were placed for the first permanent molars (distal and mesial), either for maxillary (22 patients) or mandibular (15 patients) arches; one quadrant was randomly selected and used as a placebo group (received no laser irradiation). After separator placement for each quadrant, patients received 10 doses (2Â J/cm(2), 100Â mW, 20Â s) of laser irradiation on the buccal side (at the cervical third of the roots), for distal and mesial of the second premolars and first permanent molars, as well as distal of second permanent molars (five doses). The same procedure was repeated for the lingual or palatal side (five doses). After 24Â h, patients returned to the clinic and received another 10 doses of laser irradiation on the same quadrant. Postseparation pain level recorded on a 10-cm visual analog scale

for both jaws immediately (hourâ€‰0), and after 6, 24, 30Â h, as well as on daysâ€‰3, 4, 5, 6, and 7. Significant differences in the pain perception (PP) were found between the laser and placebo groups at 6, 24, 30Â h, and dayâ€‰3 of the experiment (Pâ€‰<â€‰0.05). Friedman's test of multiple comparisons revealed significant differences in the PP among various time intervals for laser (chi-squareâ€‰=â€‰173.407, Pâ€‰=â€‰0.000) and placebo (chi-squareâ€‰=â€‰184.712, Pâ€‰=â€‰0.000) groups. In both groups, pain was highest at 6 and 30Â h after placing elastomeric separators. No gender differences were observed in both groups. More pain was recorded in the mandible (Pâ€‰<â€‰0.05) at 24 (laser group) and 30Â h (both groups) after starting the experiment. The PP was significantly higher (Pâ€‰<â€‰0.05) for the group aged 18 years or more, only at daysâ€‰3 [both groups] and 4 [laser group only] of the experiment. The 810-nm continuous wave LLLT significantly reduced the PP in the first 3Â days after orthodontic separation. However, the mean postseparation PP in both groups was low and wide ranges of PP scores were observed. Adolescent;Adult;Child;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Mandible;Maxilla;Orthodontic Appliances;Orthodontics;Treatment Outcome;Young Adult

Laser power loss through polystyrene plates for cell culture. Fibroblast Growth Factors Animals;Fibroblast Growth Factors;Gingiva;Humans;Low-Level Light Therapy;Phototherapy

Low-level laser treatment with near-infrared light increases venous nitric oxide levels acutely: a single-blind, randomized clinical trial of efficacy. OBJECTIVE: The use of near-infrared light in the form of low-level laser therapy (LLLT) has become more popular in the treatment of a variety of conditions where increased peripheral blood flow is desired. The hypothesis behind its working mechanism is its purported ability to generate nitric oxide (NO) in the treated area. We tested the hypothesis that the efficacy of near-infrared light lies in its ability to generate NO at the treatment site. DESIGN: We conducted a single-blind, placebo-controlled, randomized clinical trial to measure NO, by its metabolites nitrite and nitrate, in venous blood draining from tissue receiving LLLT. Fifteen healthy subjects received LLLT to the forearm, and blood samples were taken immediately before treatment; at 1, 5, 15, and 30 mins; as well as 15 mins after the treatment to check for NO content. RESULTS: We found a significant treatment effect ($F = 15.75$, $P = 0.003$). A post hoc test showed that minutes 1, 5, and 15 were different compared with the baseline measures ($P's < 0.05$). The area under the treatment curve was significantly larger than the area under the sham treatment curve ($t = 2.26$, $P = 0.037$). A limitation of this study was that the data were collected from healthy subjects. CONCLUSIONS: LLLT increased NO levels in venous blood draining from the treatment site in healthy subjects. The peak increase in NO occurred 5 mins into the treatment, after which it slowly waned. Further research is necessary to assess NO increases with LLLT in patients with pathologies. Nitrates;Nitrites;Nitric Oxide Adult;Analysis of Variance;Female;Forearm;Humans;Low-Level Light Therapy;Male;Nitrates;Nitric Oxide;Nitrites;Single-Blind Method;Young Adult

Effect of low-level laser therapy on pain levels in patients with temporomandibular disorders: a systematic review. Temporomandibular disorders (TMD) are characterized by the presence of temporomandibular joint (TMJ) and/or masticatory muscle pain and dysfunction. Low-level laser is presented as an adjuvant therapeutic modality for the treatment of TMD, especially when the presence of inflammatory pain is suspected. OBJECTIVE: To systematically review studies that investigated the effect of low level laser therapy (LLLT) on the pain levels in individuals with TMD. MATERIAL AND METHODS: The databases Scopus, embase, ebsco and PubMed were reviewed from January/2003 to October/2010 with the following keywords: laser therapy, low-level laser therapy, temporomandibular joint disorders, temporomandibular joint dysfunction syndrome, temporomandibular joint, temporomandibular, facial pain and arthralgia, with the inclusion criteria for intervention studies in humans. exclusion criteria adopted were intervention studies in animals,

studies that were not written in english, Spanish or Portuguese, theses, monographs, and abstracts presented in scientific events. RESULTS: After a careful review, 14 studies fit the criteria for inclusion, of which, 12 used a placebo group. As for the protocol for laser application, the energy density used ranged from 0.9 to 105 J/cmÂ², while the power density ranged from 9.8 to 500 mW. The number of sessions varied from 1 to 20 and the frequency of applications ranged from daily for 10 days to 1 time per week for 4 weeks. A reduction in pain levels was reported in 13 studies, with 9 of these occurring only in the experimental group, and 4 studies reporting pain relief for both the experimental group and for the placebo. CONCLUSION: Most papers showed that LLLT seemed to be effective in reducing pain from TMD. However, the heterogeneity of the standardization regarding the parameters of laser calls for caution in interpretation of these results. Thus, it is necessary to conduct further research in order to obtain a consensus regarding the best application protocol for pain relief in patients with TMD. Clinical Protocols;Facial Pain;Humans;Low-Level Light Therapy;Pain Measurement;Radiation Dosage;Temporomandibular Joint Disorders;Treatment Outcome

[Advancement in the research of effect of low level laser therapy on wound healing]. Low level laser therapy (LLLT) is a therapeutic method which regulates the biological behavior of cells with light. The effects of LLLT consist of promotion of tissue repair, inhibition of inflammation, and relief of pain by promoting or inhibiting the cell proliferation, increasing or decreasing the release of some bioactive substances. Therefore, LLLT is also known as photomodulation. At present, there are many relevant experimental studies of LLLT abroad, and they are also used clinically. This article reviews the effect of LLLT on wound healing. Humans;Low-Level Light Therapy;Wound Healing

Low-level laser effects on simulated orthodontic tension side periodontal ligament cells. OBJECTIVE: The purpose of this study was to analyze proliferation, inflammation, and osteogenic effects on periodontal ligament (PDL) cells after low-level laser therapy (LLLT) under simulated orthodontic tension conditions. BACKGROUND DATA: Low-level lasers affect fibroblast proliferation and collagen synthesis and reduce inflammation. Few studies have focused on the LLLT changes in the PDL caused by moving teeth. MATERIALS AND METHODS: A human PDL cell line was cultured in a -100â€‰kPa tension incubator. The PDL cells were treated with a 670â€‰nm low-level diode laser, output power of 500â€‰mW (continuous wave modus) for 2.5 or 5â€‰sec, spot area 0.25â€‰cm(2), corresponding to 1.25 and 2.5â€‰J at an energy density of 5 or 10â€‰J/cm(2), respectively. PDL cell viability was assayed by detecting the ability of the cells to cleave tetrazolium salt to formazan dye. Inflammation and osteogenic markers were analyzed by Western blot analysis. RESULTS: PDL cell viablity increased in the experimental group, based on the ability of the cells to cleave tetrazolium salt at day 7 ($p<0.05$). The experimental group showed no difference in PDL cellular morphology compared with the control group. The inflammation markers inducible NO synthase (iNOS), cyclooxygenase (COX)-2 and interleukin (IL)-1 showed stronger expression in 5 and 10â€‰J/cm(2) therapy at days 1 and 5, but decreased in expression at day 7. The osteogenic marker osteocalcin (OC) expression level was significantly higher at day 7 ($p<0.05$) than in the control cells. CONCLUSIONS: LLLT significantly increased PDL cell proliferation, decreased PDL cell inflammation, and increased PDL OC activity under the tension conditions used in this study. Interleukin-1;Osteocalcin;Cyclooxygenase 2 Cell Proliferation;Cell Survival;Cyclooxygenase 2;Humans;Interleukin-1;Low-Level Light Therapy;Osteocalcin;Periodontal Ligament;Tooth Movement Techniques

Photobiomodulation by helium neon and diode lasers in an excisional wound model: A single blinded trial. BACKGROUND: Application of different kinds of lasers in clinical and experimental studies causes photobiomodulation that works at localized cellular and humoral level on various biological systems. Increased numbers of fibroblasts, myofibroblast, and degranulation of mast cells have been the observed benefits post-irradiation. OBJECTIVE: Was to find out the effect of irradiation with

energy densities of 3.38 J/cm(2), 8 J/cm(2), and 18 J/cm(2) on animal tissue (albino wistar rats) in an excisional wound model and to assess changes in biochemical (hydroxyproline) and histopathological levels in excisional wound model. MATERIALS AND METHODS: The animals were divided into 4 groups, which were labeled as L1, diode laser (18 J/cm(2)), L2 Helium-neon (He-Ne, 8 J/cm(2)), L3 diode laser (3.38 J/cm(2)), and sham treatment for control was depicted by C, respectively. Histological and hydroxyproline analysis was performed on 7, 14, 21 days of post-wounding. One-way analysis of variance, ANOVA and Bonferroni's multiple comparison tests were done for tissue hydroxyproline levels. RESULTS: There was no significant increase in the hydroxyproline content ($P < 0.005$) when observed in study group and compared to controls. Whereas significant epithelizations was seen in group treated with He-Ne laser of intensity of 8 J/cm(2). CONCLUSION: The experimental observations suggest that low intensity helium-neon laser of 8 J/cm(2) intensity facilitated photo stimulation by tissue repair, but failed to show significant tissue hydroxyproline levels in excisional wound model.

The effects of minimally invasive laser needle system on suppression of trabecular bone loss induced by skeletal unloading. This study was aimed to evaluate the effects of low-level laser therapy (LLLT) in the treatment of trabecular bone loss induced by skeletal unloading. Twelve mice have taken denervation operation. At 2 weeks after denervation, LLLT (wavelength, 660 nm; energy, 3 J) was applied to the right tibiae of 6 mice (LASER) for 5 days/week over 2 weeks by using a minimally invasive laser needle system (MILNS) which consists of a 100 Î¼m optical fiber in a fine needle (diameter, 130 Î¼m) [corrected]. Structural parameters and histograms of bone mineralization density distribution (BMDD) were obtained before LLLT and at 2 weeks after LLLT. In addition, osteocyte, osteoblast, and osteoclast populations were counted. Two weeks after LLLT, bone volume fraction, trabeculae number, and trabeculae thickness were significantly increased and trabecular separations, trabecular bone pattern factor, and structure model index were significantly decreased in LASER than SHAM (pâ€‰<â€‰0.05). BMDD in LASER was maintained while that in SHAM was shifted to lower mineralization. Osteocyte and osteoblast populations were significantly increased but osteoclast population was significantly decreased in LASER when compared with those in SHAM (pâ€‰<â€‰0.05). The results indicate that LLLT with the MILNS may enhance bone quality and bone homeostasis associated with enhancement of bone formation and suppression of bone resorption. Animals;Bone Density;Bone Resorption;Female;Hindlimb Suspension;Low-Level Light Therapy;Mice;Mice, Inbred ICR;Needles;Optical Fibers;Osteoblasts;Osteoclasts;Osteocytes

The influence of low-intensity laser therapy on bone healing. OBJECTIVE: Low-intensity laser therapy (LILT) is defined to supply direct biostimulative light energy to the cells. While several studies have demonstrated that LILT has stimulating effects on bone cells and can accelerate the repair process of the bone, others reported delayed fracture healing or no effects after LILT. The aim of this article was to review the studies evaluating the biomodulation effects of LILT on bone-derived stem cells. MATERIALS AND METHODS: To access relevant articles, searching in three electronic databases including PubMed, Google Scholar and Science Direct was conducted until April 2012. The key words used were low-level laser, low-intensity laser, low-power laser therapy, stem cell, bone marrow stem cell, bone and osteoblast. The articles that met the eligibility criteria were included in this review of literature. RESULTS: Twenty-five relevant articles (13 in vitro and 12 animal studies) were included. Eleven in vitro studies showed positive results with regard to acceleration of cell proliferation and differentiation. All animal studies showed improved bone healing in sites irradiated with low-intensity laser. CONCLUSION: Based on the results of the reviewed articles, low intensity laser therapy can accelerate bone healing in extraction sites, bone fracture defects and distraction osteogenesis, provided proper parameters were applied.

The efficacy of low-level laser therapy for the treatment of myogenous temporomandibular joint disorder. Low-level laser therapy (LLLT) has been commonly used for the treatment of painful musculoskeletal conditions, but the results of previous studies on this subject are controversial. The aim of this study was to evaluate the efficacy of LLLT in the management of patients with myogenic temporomandibular joint disorders (TMDs). In this randomized, double-blind clinical trial, 20 patients with myogenic TMD were randomly divided into laser and placebo groups. In the laser group, a pulsed 810-nm low-level laser (average power 50Â mW, peak power 80Â W, 1,500Â Hz, 120Â s, 6Â J, and 3.4Â J/cm(2) per point) was used on painful muscles three times a week for 4Â weeks. In the placebo group, the treatment was the same as that in the laser group, but without energy output. The patients were evaluated before laser therapy (T1), after six sessions of laser application (T2), at the end of treatment (T3), and 1Â month after the last application (T4), and the level of pain and the amount of mouth opening were measured. There was a significant increase in mouth opening and a significant reduction of pain symptoms in the laser group (pâ€‰<â€‰0.05). A similar improvement was not observed in the placebo group (pâ€‰>â€‰0.05). Between-group comparisons revealed no significant difference in pain intensity and mouth opening measurement at any of the evaluation time points (pâ€‰>â€‰0.05). LLLT can produce a significant improvement in pain level and mouth opening in patients affected with myogenic TMD. Adult;Female;Humans;Low-Level Light Therapy;Temporomandibular Joint Disorders;Treatment Outcome

Antimicrobial photodynamic therapy using a diode laser with a potential new photosensitizer, indocyanine green-loaded nanospheres, may be effective for the clearance of Porphyromonas gingivalis. BACKGROUND: Antimicrobial photodynamic therapy (aPDT) is a new treatment method for the removal of infectious pathogens using a photosensitizer and light of a specific wavelength, e.g., toluidine blue with a wavelength of about 600Â nm. We explored a new photosensitizer and focused on indocyanine green (ICG), which has high absorption at a wavelength of 800-805Â nm. We investigated the bactericidal effect of PDT on Porphyromonas gingivalis using a new photosensitizer, ICG-loaded nanospheres with an 805Â nm wavelength low-level diode laser irradiation. METHODS: We designed ICG-loaded nanospheres coated with chitosan (ICG-Nano/c) as a photosensitizer. A solution containing Porphyromonas gingivalis (10(8) Â CFU/mL) with or without ICG-Nano/c (or ICG) was prepared and irradiated with a diode laser or without laser irradiation as a negative control. The irradiation settings were 0.5Â W with a duty ratio of 10%, for 3-100Â ms in repeated pulse (RPT) or continuous wave mode. CFU were counted after 7Â d of anaerobic culture. RESULTS: We observed that ICG-Nano/c could adhere to the surface of P.Â gingivalis. When ICG-Nano/c was used for aPDT, irradiation with RPT 100Â ms mode gave the lowest increase in temperature. Laser irradiation with ICG-Nano/c significantly reduced the number of P.Â gingivalis (i.e., approximately 2-log10 bacterial killing). The greatest bactericidal effect was found in the RPT 100Â ms group. However, laser irradiation (RPT 100Â ms) with ICG, as well as without photosensitizer, had no effect on the number of bacteria. CONCLUSIONS: Within the limits of this study, ICG-Nano/c with low-level diode laser (0.5Â W; 805Â nm) irradiation showed an aPDT-like effect, which might be useful for a potential photodynamic periodontal therapy. Anti-Bacterial Agents;Photosensitizing Agents;Chitosan;Indocyanine Green Anti-Bacterial Agents;Bacterial Adhesion;Bacterial Load;Chitosan;Drug Delivery Systems;Humans;Indocyanine Green;Lasers, Semiconductor;Microbial Viability;Microscopy, Electron, Scanning;Microscopy, Fluorescence;Microscopy, Phase-Contrast;Nanospheres;Periodontal Diseases;Photochemotherapy;Photosensitizing Agents;Porphyromonas gingivalis;Radiation Dosage;Temperature

Assessment of the effects of low-level laser therapy on the thyroid vascularization of patients with autoimmune hypothyroidism by color Doppler ultrasound. Background. Chronic autoimmune

thyroiditis (CAT) frequently alters thyroid vascularization, likely as a result of the autoimmune process. Objective. To evaluate the effects of low-level laser therapy (LLLT) on the thyroid vascularization of patients with hypothyroidism induced by CAT using color Doppler ultrasound parameters. Methods. In this randomized clinical trial, 43 patients who underwent levothyroxine replacement for CAT-induced hypothyroidism were randomly assigned to receive either 10 sessions of LLLT (L group, n = 23) or 10 sessions of a placebo treatment (P group, n = 20). Color Doppler ultrasounds were performed before and 30 days after interventions. To verify the vascularity of the thyroid parenchyma, power Doppler was performed. The systolic peak velocity (SPV) and resistance index (RI) in the superior (STA) and inferior thyroid arteries (ITAs) were measured by pulsed Doppler. Results. The frequency of normal vascularization of the thyroid lobes observed in the postintervention power Doppler examination was significantly higher in the L than in the P group (P = 0.023). The pulsed Doppler examination revealed an increase in the SPV of the ITA in the L group compared with the P group (P = 0.016). No significant differences in the SPV of the STA and in the RI were found between the groups. Conclusion. These results suggest that LLLT can ameliorate thyroid parenchyma vascularization and increase the SPV of the ITA of patients with hypothyroidism caused by CAT.

Physical therapy management of knee osteoarthritis in the middle-aged athlete. Osteoarthritis (OA) is prevalent in today's population, including the athletic and recreationally active "middle-aged" population. OA is a degenerative condition of the articular/hyaline cartilage of synovial joints and commonly affects the knee joint. In general, athletic participation does not specifically influence a higher incidence of knee OA in this population; however, traumatic injury to the knee joint poses a definitive risk in developing early-onset OA. The purpose of this article is to review evidence-based nonpharmacological interventions for the conservative management of knee OA. Manual therapy, therapeutic exercise, patient education, and weight management are strongly supported in the literature for conservative treatment of knee OA. Modalities [thermal, electrical stimulation (ES), and low-level laser therapy (LLLT)] and orthotic intervention are moderately supported in the literature as indicated management strategies for knee OA. While many strongly supported conservative interventions have been published, additional research is needed to determine the most effective approach in treating knee OA. Athletes;Humans;Middle Aged;Osteoarthritis, Knee;Physical Therapy Modalities;Treatment Outcome

Influence of low-intensity laser therapy on the stability of orthodontic mini-implants: a study in rabbits. OBJECTIVE: The objective of this study was to assess stability of different orthodontic mini-implants in the tibia of rabbits after low-intensity laser therapy. MATERIAL AND METHODS: Thirty-two mini-implants were assessed, 16 were self-threading (Titanium Fix) and 16 self-perforating (INP). These were inserted into the tibia of rabbits and immediately loaded with a horizontal force of 200g uniting 2 mini-implants in each tibia. Then they were submitted to low-intensity laser therapy for 21 days. Sixteen male New Zealand breed rabbits were used, and divided into 2 groups of 8 animals each as follows: Groups INP and TF. In both groups, mini-implants were submitted to low-intensity laser therapy (right tibia) and their respective controls (left tibia) did not undergo laser therapy. After the animals were killed, blocks of bone tissue containing the mini-implants were removed so as to perform mechanical pull-out tests. RESULTS: There was a statistically significant difference only between Group TF submitted to laser and all the other groups ($P < .05$). CONCLUSIONS: Low-intensity laser was capable of increasing stability of self-threading orthodontic mini-implants. Dental Implants Analysis of Variance;Animals;Dental Implantation, Endosseous;Dental Implants;Low-Level Light Therapy;Male;Orthodontic Anchorage Procedures;Osseointegration;Prosthesis Design;Rabbits;Tibia

Re: thulium laser versus holmium laser transurethral enucleation of the prostate: 18-month follow-up data of a single center. Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Prostatic Hyperplasia

Re: thulium:YAG VapoEnucleation of the prostate in large glands: a prospective comparison using 70- and 120-W 2-Î¼m lasers. Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Prostatic Hyperplasia

Transcranial low-level laser therapy improves neurological performance in traumatic brain injury in mice: effect of treatment repetition regimen. Low-level laser (light) therapy (LLLT) has been clinically applied around the world for a spectrum of disorders requiring healing, regeneration and prevention of tissue death. One area that is attracting growing interest in this scope is the use of transcranial LLLT to treat stroke and traumatic brain injury (TBI). We developed a mouse model of severe TBI induced by controlled cortical impact and explored the effect of different treatment schedules. Adult male BALB/c mice were divided into 3 broad groups (a) sham-TBI sham-treatment, (b) real-TBI sham-treatment, and (c) real-TBI active-treatment. Mice received active-treatment (transcranial LLLT by continuous wave 810 nm laser, 25 mW/cm(2), 18 J/cm(2), spot diameter 1 cm) while sham-treatment was immobilization only, delivered either as a single treatment at 4 hours post TBI, as 3 daily treatments commencing at 4 hours post TBI or as 14 daily treatments. Mice were sacrificed at 0, 4, 7, 14 and 28 days post-TBI for histology or histomorphometry, and injected with bromodeoxyuridine (BrdU) at days 21-27 to allow identification of proliferating cells. Mice with severe TBI treated with 1-laser Tx (and to a greater extent 3-laser Tx) had significant improvements in neurological severity score (NSS), and wire-grip and motion test (WGMT). However 14-laser Tx provided no benefit over TBI-sham control. Mice receiving 1- and 3-laser Tx had smaller lesion size at 28-days (although the size increased over 4 weeks in all TBI-groups) and less Fluoro-Jade staining for degenerating neurons (at 14 days) than in TBI control and 14-laser Tx groups. There were more BrdU-positive cells in the lesion in 1- and 3-laser groups suggesting LLLT may increase neurogenesis. Transcranial NIR laser may provide benefit in cases of acute TBI provided the optimum treatment regimen is employed. Fluoresceins;Fluorescent Dyes;fluoro jade;Bromodeoxyuridine Animals;Behavior, Animal;Brain Injuries;Bromodeoxyuridine;Cell Proliferation;Disease Models, Animal;Fluoresceins;Fluorescent Dyes;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Motor Activity;Neurogenesis;Neurons;Research Design

Phototherapy and resistance training prevent sarcopenia in ovariectomized rats. The aim of this study was to histologically and biochemically analyze the effects of light-emitting diode therapy (LEDT) associated with resistance training to prevent sarcopenia in ovariectomized rats. Forty female Wistar rats (12 months old, 295-330 g) were bilaterally ovariectomized and divided into four groups (nâ€‰=â€‰10 per group): control-sedentary (C), resistance training (T), LEDT-sedentary (L), and LEDT plus resistance training (LT). Trained rats performed a 12-week water-jumping program (3 days per week) carrying a load equivalent to 50-80% of their body mass strapped to their back. Depending on the group protocol, the LED device (850 nm, 100 mW, 120 J/cm(2), spot size 0.5 cm(2)) was used either as the only method or after the resistance training had been performed. The device was used in the single point contact mode (for 10 min). The irradiated region was the center of the greater trochanter of the right femur and the middle third of the rectus femoris muscle was subsequently analyzed histomorphometrically. Significant increases (pâ€‰<â€‰0.05) were noted for the muscle volume of the T (68.1â€‰Â±â€‰19.7%), the L (74.1â€‰Â±â€‰5.1%), and the LT (68.2â€‰Â±â€‰11.5%) groups compared to the C group (60.4â€‰Â±â€‰5.5%). There were also significant increases in the concentrations of IGF-1, IL-1, and TNF-Î± in the muscles of the treated groups (pâ€‰<â€‰0.05). Animals in the LT group showed a significant increase in IL-6 compared to T, L, and C groups (pâ€‰<â€‰0.05). These findings suggest that resistance training and LEDT can

prevent sarcopenia in ovariectomized rats. Inflammation Mediators;Interleukin-1;Interleukin-6;Tumor Necrosis Factor-alpha;Insulin-Like Growth Factor I Animals;Female;Inflammation Mediators;Insulin-Like Growth Factor I;Interleukin-1;Interleukin-6;Low-Level Light Therapy;Muscle, Skeletal;Ovariectomy;Phototherapy;Physical Conditioning, Animal;Rats;Rats, Wistar;Resistance Training;Sarcopenia;Tumor Necrosis Factor-alpha

Low-level laser therapy combined with platelet-rich plasma on the healing calcaneal tendon: a histological study in a rat model. The objective of this study was to investigate the effects of low-level laser therapy (LLLT) treatment alone (Î»â€‰=â€‰660 nm and Î»â€‰=â€‰830 nm) or associated with platelet-rich plasma (PRP). We used 54 male rats divided into six groups, with nine animals each: group 1, partial tenotomy; group 2 (GII), PRP; group 3 (GIII): Î»660â€‰nm; group 4 (GIV), Î»830â€‰nm; group 5 (GV), PRP + Î»660â€‰nm; and group 6 (GVI), PRP + Î»830â€‰nm. The protocol used was power density 0.35 W/cm(2), energy 0.2 J, energy density 7.0 J/cm(2), time 20 s per irradiated point, and number of points 3. Animals in groups GII, GV, and GVI received treatment with PRP, consisting of a single dose of 0.2 mL directly into the surgical site, on top of the tenotomy. Animals were killed on the 13th day post-tenotomy and their tendons were surgically removed for a quantitative analysis using polarization microscopy. The percentages of collagen fibers of types I and III were expressed as mean Â± SD. Higher values of collagen fibers type I were obtained for groups GV and GVI when compared with all other groups (pâ€‰<â€‰0.05), whereas groups GIII and GIV showed no significant difference between them (pâ€‰>â€‰0.05). For collagen type III, a significant difference was observed between GII and all other groups (pâ€‰<â€‰0.5), but no significant difference was found between GIII and GIV and between GV and GVI. Results showed that the deposition of collagen type I was higher when treatment with PRP and LLLT was combined, suggesting a faster regeneration of the tendon. Collagen Type I;Collagen Type III Animals;Calcaneus;Collagen Type I;Collagen Type III;Combined Modality Therapy;Low-Level Light Therapy;Male;Platelet-Rich Plasma;Rats;Rats, Wistar;Tendon Injuries;Tenotomy;Wound Healing

[The effect of time parameters of laser radiation on the efficiency of photodynamic therapy]. Photosensitizing Agents Cell Death;Dose-Response Relationship, Drug;Dose-Response Relationship, Radiation;Erythrocytes;Humans;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Time Factors

Effect of 808Â nm low-level laser therapy in exercise-induced skeletal muscle fatigue in elderly women. Aging process involves several structural changes in muscle tissue which lead to decrease in musculoskeletal function. One of the most common physiological modifications is the increase in fatigability in elderly people, which leads to inability to maintain strength and motor control. In this context, low-level laser therapy (LLLT) has demonstrated positive results in reducing fatigue during physical exercise. Thus, this study aimed to investigate the effects of LLLT on skeletal muscle fatigue in elderly women. Twenty-four subjects divided in two groups entered a crossover randomized triple-blinded placebo-controlled trial. Active LLLT (808Â nm wavelength, 100Â mW, energy 7Â J) or an identical placebo LLLT was delivered on the rectus femoris muscle immediately before a fatigue protocol. Subjects performed a fatigue protocol which consisted of voluntary isotonic contractions of knee flexion-extension performed with a load corresponding to 75Â % of 1-MR (Maximum Repetition) during 60Â s. Surface electromyography (SEMG) signals were recorded from rectus femoris muscle of dominant lower limb to evaluate peripheral fatigability using median frequency analysis of SEMG signal. The number of repetitions of flexion-extension during fatigue protocol was also compared between groups. The values of median frequency were used to calculate the slope coefficient. The results showed no difference in the slope comparing placebo LLLT and active LLLT groups (pâ€‰=â€‰0.293). However, a significant difference was observed in the number of repetitions between groups, after active LLLT, subjects demonstrated significantly higher number

of repetitions (pâ€‰=â€‰0.047). In this study, LLLT was efficient in increasing the mean number of repetitions during knee flexion-extension exercise, although results have not shown delay electromyographic fatigue. Aged;Cross-Over Studies;Double-Blind Method;Electromyography;Exercise;Female;Humans;Low-Level Light Therapy;Middle Aged;Muscle Fatigue;Muscle, Skeletal

Treatment of cosmetic tattoos using carbon dioxide ablative fractional resurfacing in an animal model: a novel method confirmed histopathologically. BACKGROUND: Treating cosmetic tattoos using quality-switched lasers is difficult. OBJECTIVE: We used carbon dioxide ablative fractional resurfacing (CO2 AFR) to remove cosmetic tattoos and examined the pathophysiologic mechanisms involved in this technique in an animal model. METHODS AND MATERIALS: Twelve rats were tattooed on their backs with white and flesh-colored pigments. Half of each tattoo was treated with CO2 AFR (5 sessions at 1-month intervals), and the other half was the untreated control. An independent observer reviewed photographic documentation of clinical response. Serial skin samples obtained at baseline and at various times after laser treatment were evaluated using histologic and immunohistochemical methods. RESULTS: Four rats had excellent responses to laser treatment and eight had good responses. White and flesh-colored tattoos had similar clearance rates and tissue reactions. Histologic analysis showed immediate ablation of tattoo pigments in the microscopic ablation zones. Tattoo pigments in the microscopic coagulation zones migrated to the epidermis and became part of the microscopic exudative necrotic debris appearing on day 2 that was exfoliated after 5Â days. Increased fibronectin expression around the microscopic treatment zones during the extrusion of tattoo pigments indicated that wound healing facilitates this action. CONCLUSION: CO2 AFR successfully removes cosmetic tattoos. Animals;Lasers, Gas;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Tattooing

ST36 laser acupuncture reduces pain-related behavior in rats: involvement of the opioidergic and serotonergic systems. Laser acupuncture is a modality of low-level light therapy used as an alternative to needling for the past three decades. Although it has proved effective for the treatment of various conditions, the mechanisms underlying its effects are not fully understood. To contribute to this understanding, this study was designed to (1) evaluate the antinociceptive effect of ST36 laser acupuncture (830Â nm, 3Â J/cm(2)) in rat models of acute nociception and (2) to investigate the opioidergic and serotonergic systems involvement in this effect. Our results demonstrate that ST36 laser acupuncture inhibited (36â€‰Â±â€‰2Â %) acetic acid-induced abdominal constrictions and both neurogenic (48â€‰Â±â€‰7Â %) and inflammatory (phase IIA 42â€‰Â±â€‰8Â % and phase IIB 83â€‰Â±â€‰6Â %) phases of formalin-induced nociceptive behavior. Moreover, the antinociceptive activity of laser irradiation in the acetic acid test was significantly reversed by preadministration of naloxone (1Â mg/kg, nonselective opioid receptor antagonist), pindolol (1Â mg/kg, subcutaneous; nonselective 5-HT 1A/B receptor antagonist), and ketanserin (1Â mg/kg; selective 5-HT2A receptor antagonist) but not by ondansetron (1Â mg/kg, selective 5-HT3 receptor antagonist). Taken together, our data demonstrate, for the first time, that (1) ST36 laser acupuncture elicited significant antinociceptive effect against acetic acid- and formalin-induced behavior in rats and that (2) this effect is mediated by activation of the opioidergic and serotonergic (5-HT1 and 5-HT2A receptors) systems. Narcotic Antagonists;Opioid Peptides;Serotonin Antagonists;Serotonin Acupuncture Analgesia;Animals;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Narcotic Antagonists;Opioid Peptides;Pain;Pain Management;Rats;Rats, Wistar;Serotonin;Serotonin Antagonists

Pulsed dye laser-resistant port-wine stains: mechanisms of resistance and implications for treatment. Port-wine stains (PWS) are among the most common congenital vascular malformations. Unlike capillary haemangiomas, these lesions do not involute spontaneously but rather become

progressively more disfiguring as the patient ages. While benign in nature, the cosmetic deformity and attendant psychological and emotional distress prompt the majority of those afflicted to seek treatment. The pulsed dye laser (PDL) has long been considered the treatment of choice for these vascular lesions; however, very few patients achieve total clearance with PDL therapy and a significant number of lesions fail to respond at all. In order to address these recalcitrant cases, the mechanisms that contribute to treatment resistance must be understood and novel laser and light therapies must be employed. This review will address what is currently known about lesion-specific characteristics of PDL-resistant PWS as well as discuss current and future treatment options. Angiogenesis Inhibitors Age Factors;Angiogenesis Inhibitors;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Port-Wine Stain;Time Factors;Treatment Outcome

Bisphosphonates and osteonecrosis: an open matter. Osteonecrosis of the Jaw (ONJ) in patients on long-term Bisphosphonate Therapy (BPT) is being reported in the last ten years in the literature with increasing frequency. The therapy for this condition is a real dilemma. Temporary suspension of BPT offers no short term benefits, hyperbaric oxygen has no proven efficiency and therefore is not recommended, intermittent or continuous antibiotic with surgical debridement can be beneficial to palliate the symptoms. Er:YAG laser can be used to eliminate necrotic portions of the bone by partial or total resection of the jaws as an alternative to conventional rotary tools. The high degree of affinity of this wavelength for water and hydroxyapatite means the soft tissue and bone can both be treated. The technique can also be used for conservative interventions by gradually evaporating the part of necrotic bone, getting close to the healthy area. One certain advantage of the Er:YAG laser is its bactericidal and biostimulatory action, inducing the healing of the soft tissues and the bone, quicker than in conventional treatments. In conclusion, from our experience, it is possible to observe that an early conservative surgical approach with Er:YAG laser associated to biostimulation, LLLT (Low Level Laser Therapy), for BRONJ could be considered as more efficacious in comparison to medical therapy or other techniques.

Comparison of the 308-nm excimer laser with the 308-nm excimer lamp in the treatment of vitiligo--a randomized bilateral comparison study. BACKGROUND: Vitiligo is an acquired pigment disorder characterized by areas of depigmented skin resulting from the loss of epidermal melanocytes. Recently, several investigations have documented the benefits of excimer phototherapy (e.g., using the 308-nm excimer laser or the 308-nm excimer lamp) for the treatment of vitiligo. AIM: To compare the effectiveness of the 308-nm excimer laser with the 308-nm excimer lamp in the treatment of vitiligo patients. METHODS: This intervention study was designed as a randomized self-control trial. Fourteen subjects with 48 symmetrical vitiligo lesions were enrolled in this study. One lesion was treated with the 308-nm excimer laser, and its counterpart was treated with the 308-nm excimer lamp. Lesions were treated three times a week with the same dose on both sides for a total of 20 sessions. RESULTS: All of the patients completed the study, and 48 lesions were treated. The two treatments exhibited similar results in terms of repigmentation. CONCLUSIONS: The 308-nm excimer lamp and the 308-nm excimer laser exhibited similar efficacies in treating vitiligo. Adolescent;Adult;Child;Child, Preschool;Female;Humans;In Vitro Techniques;Lasers;Low-Level Light Therapy;Male;Vitiligo

Low-level laser therapy (LLLT) reduces oxidative stress in primary cortical neurons in vitro. Low-level laser (light) therapy (LLLT) involves absorption of photons being in the mitochondria of cells leading to improvement in electron transport, increased mitochondrial membrane potential (MMP), and greater ATP production. Low levels of reactive oxygen species (ROS) are produced by LLLT in normal cells that are beneficial. We exposed primary cultured murine cortical neurons to oxidative stressors: hydrogen peroxide, cobalt chloride and rotenone in the presence or absence of LLLT (3 J/cmÂ², CW, 810 nm wavelength laser, 20 mW/cmÂ²). Cell viability was determined by Prestoblueâ„¢

assay. ROS in mitochondria was detected using Mito-sox, while ROS in cytoplasm was detected with CellRoxâ„¢. MMP was measured with tetramethylrhodamine. In normal neurons LLLT elevated MMP and increased ROS. In oxidatively-stressed cells LLLT increased MMP but reduced high ROS levels and protected cultured cortical neurons from death. Although LLLT increases ROS in normal neurons, it reduces ROS in oxidatively-stressed neurons. In both cases MMP is increased. These data may explain how LLLT can reduce clinical oxidative stress in various lesions while increasing ROS in cells in vitro. Superoxides Animals;Cell Survival;Cerebral Cortex;Cytoplasm;Female;Low-Level Light Therapy;Membrane Potential, Mitochondrial;Mice;Mitochondria;Neurons;Oxidative Stress;Pregnancy;Superoxides

The effect of increased maximum power output on perioperative and early postoperative outcome in photoselective vaporization of the prostate. BACKGROUND AND OBJECTIVE: Preclinical studies suggest an increased vaporization rate and speed of the 532â€‰nm 180-W XPS GreenLight laser (180-W) compared with the 120-W HPS GreenLight laser (120-W) and the 80-W PV GreenLight laser (80-W). To test the clinical relevance of this observation we analyzed intraoperative data and early postoperative results after photoselective vaporization of the prostate (PVP) with the 180-W, 120-W, and 80-W laser. STUDY DESIGN/MATERIALS AND METHODS: A retrospective pair-to-pair comparison was performed including 80 consecutive patients who underwent PVP for the treatment of benign prostate enlargement with the 180-W, 120-W, and 80-W laser. The groups matched concerning age, prostate volume, PSA-value, and preoperative catheterization. Primary study outcome measurement was PSA-value reduction at 3 months; intraoperative data, perioperative complications, and early postoperative functional course were secondary study outcome measurements. RESULTS: Energy application per case (kJ), preoperative prostate volume (kJ/ml) operating time (kJ/minute), and lasing time (kJ/minute) was significantly higher with the 180-W laser. Prevalence of impaired visibility due to bleeding was comparable between the 180-W and the 120-W laser but significantly lower with 80-W. Duration of hospitalization was shorter with the 180-W laser compared to the former laser systems. During the postoperative course of 3 months voiding parameters and micturition symptoms significantly improved in all groups, the incidence of postoperative dysuria was comparable. Postoperative PSA-value reduction was significantly higher after treatment with the 180-W laser. CONCLUSIONS: With the 180-W laser, higher energy application and higher speed of tissue vaporization leads to increased tissue vaporization compared to the former 120-W and 80-W laser systems. Clinical efficacy and perioperative safety are maintained with the higher powered laser. Aged;Aged, 80 and over;Hospitalization;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Prostatic Hyperplasia;Recovery of Function;Retrospective Studies;Time Factors;Transurethral Resection of Prostate;Treatment Outcome

Inhibition of fibroblast proliferation in vitro using low-level infrared light-emitting diodes. BACKGROUND: Scars, including hypertrophic and keloidal-type scars, may occur after burns, trauma, or surgery. Despite several treatment options available for scars, few effective, noninvasive modalities exist. Recently, a few small clinical studies revealed the possible benefit of red and infrared (IR) low-level light therapy (LLLT) in scar treatment. One of the important features of scars is proliferation of dermal fibroblasts, but in vitro data regarding the effects of light-emitting diode (LED)-generated IR light on human skin fibroblasts is lacking. OBJECTIVE: To evaluate the effect of IR LLLT generated using LEDs on fibroblast proliferation and viability in vitro. METHODS AND MATERIALS: Irradiation of normal human skin fibroblasts using IR LED panels was performed in vitro, and modulation of proliferation and viability was quantified using Trypan blue dye exclusion assay. RESULTS: Fluences of 80, 160 and 320Â J/cm(2) resulted in statistically significantly less fibroblast proliferation than in controls, without statistically significantly less cellular viability. CONCLUSION: IR LLLT can effectively inhibit fibroblast proliferation in vitro without altering viability and holds promise

for the treatment of scars. Cell Proliferation;Cell Survival;Cells, Cultured;Fibroblasts;Humans;Infrared Rays;Low-Level Light Therapy

[Motor system physiotherapy of the masticatory organ]. The motor system of the masticatory organ is a complex morphological and functional structure. Its dysfunctions are manifested by various symptoms within the masticatory apparatus and in distant organs. The paper presents a discussion on the physiotherapeutic procedure for the treatment of disorders in the motor system of the masticatory organ. Therapeutic methods are presented, including: massage, trigger point therapy, kinesitherapy, biofeedback, manual therapy, postural re-education, kinesiotaping, physical interventions (TENS, hyaluronidase iontophoresis, ultrasound, laser therapy, and magnetoledotherapy). The paper points out the role of a comprehensive approach to the patient in order to eliminate the cause of disorders, going beyond symptomatic treatment. Exercise Movement Techniques;Exercise Therapy;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Massage;Physical Therapy Modalities;Temporomandibular Joint Disorders;Transcutaneous Electric Nerve Stimulation;Trigger Points

[Endoscopic treatment of chemical burns to the stomach with mucosa ulceration and necrosis]. The prevalence of acute poisoning with caustic substances in Russia is higher than in other countries and is reported by different authors as accounting for 10-32% cases among the patients admitted to acute poisoning treatment centres. Especially unfavorable prognosis is considered for necrotizing burns to the stomach that increase the risk of severe complications leading to disability of patients. The study aimed at improving the treatment of necrotizing chemical burn to the stomach by the infusion of a 5% Mexidole solution into the edges of a burn lesion at different stages of the treatment course. The paper presents the outcomes of patients who sustained chemical burns to the stomach with mucosa ulceration and necrosis, and provides an assessment of early endoscopic treatment effect. Antioxidants;Picolines;emoxypine succinate Adolescent;Adult;Aged;Aged, 80 and over;Antioxidants;Burns, Chemical;Combined Modality Therapy;Gastroscopy;Humans;Length of Stay;Low-Level Light Therapy;Middle Aged;Necrosis;Picolines;Stomach Ulcer;Time Factors;Treatment Outcome;Young Adult

The Cytotoxic Effects of Low Intensity Visible and Infrared Light on Human Breast Cancer (MCF7) cells. A concept of using low intensity light therapy (LILT) as an alternative approach to cancer treatment is at early stages of development; while the therapeutic effects of LILT as a non-invasive treatment modality for localized joint and soft tissue wound healing are widely corroborated. The LEDs-based exposure system was designed and constructed to irradiate the selected cancer and normal cells and evaluate the biological effects induced by light exposures in visible and infrared light range. In this study, human breast cancer (MCF7) cells and human epidermal melanocytes (HEM) cells (control) were exposed to selected far infrared light (3400nm, 3600nm, 3800nm, 3900nm, 4100nm and 4300nm) and visible and near infrared wavelengths (466nm, 585nm, 626nm, 810nm, 850nm and 950nm). The optical intensities of LEDs used for exposures were in the range of 15ÂµW to 30ÂµW. Cellular morphological changes of exposed and sham-exposed cells were evaluated using light microscopy. The cytotoxic effects of these low intensity light exposures on human cancer and normal cell lines were quantitatively determined by Lactate dehydrogenase (LDH) cytotoxic activity and PrestoBlueâ„¢ cell viability assays. Findings reveal that far-infrared exposures were able to reduce cell viability of MCF7 cells as measured by increased LDH release activity and PrestoBlueâ„¢ assays. Further investigation of the effects of light irradiation on different types of cancer cells, study of possible signaling pathways affected by electromagnetic radiation (EMR) and in vivo experimentation are required in order to draw a firm conclusion about the efficacy of low intensity light as an alternative non-invasive cancer treatment.

The role of fluoride in the preventive management of dentin hypersensitivity and root caries. OBJECTIVE: The objectives were to bring light on fluoride to control dentin hypersensitivity (DHS) and prevent root caries. MATERIALS AND METHODS: Search strategy included papers mainly published in PubMed, Medline from October 2000 to October 2011. RESULTS: Fluoride toothpaste shows a fair effect on sensitive teeth when combined with dentin fluid-obstructing agents such as different metal ions, potassium, and oxalates. Fluoride in solution, gel, and varnish give an instant and long-term relief of dentin and bleaching hypersensitivity. Combined with laser technology, a limited additional positive effect is achieved. Prevention of root caries is favored by toothpaste with 5,000 ppm F and by fluoride rinsing with 0.025-0.1 % F solutions, as the application of fluoride gel or fluoride varnish three to four times a year. Fluoride measures with tablets, chewing gum, toothpick, and flossing may be questioned because of unfavorable cost effectiveness ratio. CONCLUSION: Most fluoride preparations in combination with dentin fluid obstruction agents are beneficial to reduce DHS. Prevention of root caries is favorable with higher fluoride concentrations in, e.g., toothpaste. CLINICAL RELEVANCE: Fluoride is an effective agent to control DHS and to prevent root caries particularly when used in higher concentrations. Cariostatic Agents;Dentin Desensitizing Agents;Toothpastes;Fluorides Cariostatic Agents;Dentin Desensitizing Agents;Dentin Sensitivity;Dentinal Fluid;Fluorides;Humans;Low-Level Light Therapy;Root Caries;Toothpastes

Comparison of visual acuity, higher-order aberrations and corneal asphericity after refractive lenticule extraction and wavefront-guided laser-assisted in situ keratomileusis for myopia. AIM: To compare postoperative visual acuity, higher-order aberrations (HOAs) and corneal asphericity after femtosecond lenticule extraction (FLEx) and after wavefront-guided laser-assisted in situ keratomileusis (wfg-LASIK) in myopic eyes. METHODS: We examined 43 eyes of 23 patients undergoing FLEx and 34 eyes of 19 patients undergoing wfg-LASIK to correct myopia. Ocular HOAs were measured by Hartmann-Shack aberrometry and corneal asphericity was measured by a rotating Scheimpflug imaging system before and 3 months after surgery. RESULTS: There was no statistically significant difference in uncorrected ($p=0.66$ Mann-Whitney U-test) or corrected distance visual acuity ($p=0.14$) after two surgical procedures. For a 6-mm pupil, the changes in fourth-order aberrations after FLEx were statistically significantly less than those after wfg-LASIK ($p<0.001$). On the other hand, there were no statistically significant differences in the changes in third-order aberrations ($p=0.24$) and total HOAs ($p=0.13$). Similar results were obtained for a 4-mm pupil. The positive changes in the Q value after FLEx were statistically significantly less than those after wfg-LASIK ($p=0.001$). CONCLUSIONS: In myopic eyes, FLEx induces significantly fewer ocular fourth-order aberrations than wfg-LASIK, possibly because it causes less oblation in the corneal shape, but there was no statistically significant difference in visual acuity or in the induction of third-order aberrations and total HOAs. It is suggested that FLEx is essentially equivalent to wfg-LASIK in terms of visual acuity and total HOA induction, although the characteristics of HOA induction are different. Aberrometry;Adolescent;Adult;Cornea;Corneal Wavefront Aberration;Female;Humans;Keratomileusis, Laser In Situ;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Myopia;Postoperative Period;Retrospective Studies;Surgical Flaps;Visual Acuity;Young Adult

[The application of helium-neon laser radiation for the combined treatment of the patients with atrophic rhinitis]. The objective of the present study was to improve the efficacy of the treatment of the patients presenting with atrophic rhinitis (ozena) of the upper respiratory tract by the application of helium-neon laser radiation. A total of 120 patients aged from 15 to 53 years were treated based at the Department of Otorhinolaryngology, G.G. Kuvatov Republican Clinical Hospital, Ufa. All these patients underwent routine clinical, roentgenological, microbiological, and rheographic examination. The method for the treatment of atrophic rhinitis is described; it includes the

application of helium-neon laser radiation in combination with the administration of the purified preparation of liquid polyvalent Klebsiella bacteriophage. The positive results of the treatment by the proposed method were documented in 90% of the patients. Adolescent;Adult;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Rhinitis, Atrophic;Treatment Outcome;Young Adult

Low-level laser therapy: a standard of supportive care for cancer therapy-induced oral mucositis in head and neck cancer patients? BACKGROUND AND AIMS: Oral mucositis (OM) is still a common and severe acute side-effect of many oncologic treatments, especially in patients treated for head and neck cancer. It may affect quality of life, require supportive care and impact treatment planning and its efficacy. Low-level laser therapy (LLLT) seems to promote pain relief and reduces OM incidence and its severity. It has been recommended for these patients as a treatment option but without any consensus in the LLLT procedure. New recommendations and perspectives for clinical trials will be discussed. Materials (Subjects) and Methods: Step by step, the efficacy of soft laser in the management of iatrogenic oral mucositis has been evaluated during the last two decades. Its effectiveness and level of recommendation got stronger with time. We will report and discuss some major results and the latest recommendations published on this topic. RESULTS: The major clinical results have been reported and analysed last year in a first meta-analysis (1)). 11 randomized placebo-controlled trials were selected with a total of 415 patients treated with chemotherapy and/or radiotherapy for head and neck cancer. The relative risk for developing OM was significantly reduced after LLLT but only for a dose between 1 to 6 Joules per point. Pain, severity and duration of OM grade â‰¥ 2 were also reduced without difference with placebo for possible side-effects. Nine years after the positive results published for patients treated by radiotherapy alone (2)), a new French randomized, multicentric, phase III trial for patients treated with new standard treatment, using LLLT in accordance to recent recommendations is ongoing. Seven centers are specifically established for this trial which should include a hundred patients. CONCLUSIONS: The very encouraging results of LLLT in the prevention and treatment of OM in patients treated by chemotherapy or radiotherapy for advanced head and neck cancer could soon be proposed as a new standard of care, according to the multinational Association of Supportive care in Cancer (MASCC) criteria. Modern lasers are less time consuming and extraoral applicators for a possible use by trained paramedical staff could be helpful to complete clinician practice. A preventive dose of 2 J/cm(2) and a curative dose of 4 J/cm(2) if using a red wavelength lasers are now recommended.

The Proximal Priority Theory: An Updated Technique in Low Level Laser Therapy with an 830 nm GaAlAs Laser. BACKGROUND AND AIMS: The 830 nm GaAlAs diode laser has played an extremely active role in low level laser therapy (LLLT) since the early 1980's. Recently, the author modified his original proximal priority laser technique (PPLT), and the current article set out to explain the improved approach and show scientific evidence for its efficacy. Laser Therapy System: The laser therapy system used was based on the GaAlAs diode (OhLase-3D1, JMLL, Japan), delivering 60 mW in continuous wave at a wavelength of 830 nm in the near infrared with a power density at the tip of the probe head of approximately 1.2 W/cm(2). Proximal Priority Laser Technique: Under the author's PPLT concept, the brain is the control center for the body so every other part of the body is distal to the head. The main blood supply to the head is through the carotid arteries, and the deep penetration of the 830 nm beam applied to the side of the neck can involve and photoactivate the external and internal carotids, increasing the blood supply to the brain and creating a systemic parasympathetic system-mediated whole-body effect. The author has added gentle neck-stretching, trunk-stretching and his distal tissue softening approaches concomitant with the irradiation which enhance treatment efficacy. RESULTS: Real-time fine-plate thermography has revealed whole-body warming as a result of the PPLT, with applications including chronic pain attenuation, female

infertility and functional training of paraplegic cerebral palsy patients. The warming effect had a latency from hours to days, increasing in intensity and latency with subsequent PPLT sessions. Both Doppler flowmetry and SPECT have shown increased cerebral and systemic blood flow following PPLT. CONCLUSIONS: PPLT is easy to deliver and offers tangible results in a large range of conditions, enhancing the efficacy of diode laser LLLT.

The production of VEGF involving MAP kinase activation by low level laser therapy in human granulosa cells. OBJECTIVE: The function of granulosa cells is regulated by various hormones and growth factors. Our aim is to clarify the regulation of vascular endothelial growth factor (VEGF) production via mitogen-activated protein kinase (MAPK) induced by low level laser therapy (LLLT) in human granulosa cells. METHODS: A human granulosa cell line, KGN cells, were cultured and incubated after LLLT (60mW, GaAlAs 830nm). The levels of VEGF in the culture media were determined by an enzyme-linked immunosorbent assay. The activation of MAP kinase in KGN cells was detected by western blot analysis. RESULTS: VEGF production was significantly increased by LLLT in a time-dependent manner. MAP kinase activity was increased by LLLT. In addition it was enhanced by LLLT and follicle-stimulating hormone (FSH) stimulation. CONCLUSIONS: The results suggested that VEGF is induced by LLLT through mechanisms involving MAPK. The increase in VEGF may contribute to neovascularization, which in turn would promote various ovulation phenomena as well as follicular growth.

Effect of laser therapy on skeletal muscle repair process in diabetic rats. Skeletal muscle myopathy is a common source of disability in diabetic patients. This study evaluated whether low-level laser therapy (LLLT) influences the healing morphology of injured skeletal muscle. Sixty-five male Wistar rats were divided as follows: (1) sham; (2) control; (3) diabetic; (4) diabetic sham; (5) nondiabetic cryoinjured submitted to LLLT (LLLT); (6) diabetic cryoinjured submitted to LLLT (D-LLLT); and (7) diabetic cryoinjured non-treated (D). Diabetes was induced with streptozotocin. Anterior tibialis muscle was cryoinjured and received LLLT daily (780Â nm, 5Â J/cm(2), 10Â s per point; 0.2Â J; total treatment, 1.6Â J). Euthanasia occurred on day 1 in groups 1, 2, 3, and 4 and on days 1, 7, and 14 in groups 5, 6, and 7. Muscle samples were processed for H&E and Picrosirius Red and photographed. Leukocytes, myonecrosis, fibrosis, and immature fibers were manually quantified using the ImageJ software. On day 1, all cryoinjured groups were in the inflammatory phase. The D group exhibited more myonecrosis than LLLT group (pâ€‰<â€‰0.05). On day 14, the LLLT group was in the remodeling phase; the D group was still in the proliferative phase, with fibrosis, chronic inflammation, and granulation tissue; and the D-LLLT group was in an intermediary state in relation to the two previous groups. Under polarized light, on day 14, the LLLT and D-LLLT groups had organized collagen bundles in the perimysium, whereas the diabetic groups exhibited fibrosis. LLLT can have a positive effect on the morphology of skeletal muscle during the tissue repair process by enhancing the reorganization of myofibers and the perimysium, reducing fibrosis. Collagen Animals;Collagen;Diabetes Complications;Diabetes Mellitus, Experimental;Disease Models, Animal;Humans;Low-Level Light Therapy;Male;Muscle, Skeletal;Muscular Diseases;Rats;Rats, Wistar;Regeneration;Wound Healing

[Dermocosmetic management of hyperpigmentations]. Hyperpigmentations are very frequent situations that can have considerable impact on the quality of life of affected individuals. However, even if the esthetic prejudice they generate is undeniable, lentigo and melasma are benign conditions that require above all a risk-free management. In addition to the dermatological procedures (peeling, laser, etc.) and the topical drugs available to the dermatologist, there remains significant room for depigmenting dermocosmetic products. These products succeeded to transpose features of the classic pharmaceutical formula invented by Kligman from which they were inspired to the field of dermocosmetics. They comprise activators of epidermal turn-over, skin exfoliants, and active

ingredients that interfere with the different stages of melanogenesis, without having the side effects of hydroquinone whose usage remains limited to the field of prescription drugs. Antioxidants are a particularly interesting addition because they participate in reducing cutaneous inflammation and efficiently complete the action of the other components of a depigmenting formula. It is important to remind the aggravating role that sun exposure has on hyperpigmentations. Therefore, measures of rigorous photoprotection are mandatory. Medical makeup, transitory or definite, is an interesting option for the management of hyperpigmentations. Consequently, depigmenting dermocosmetics, used in monotherapy but - most frequently - in combination with dermatological procedures, can be used in literally all types of hyperpigmentations with an efficacy that is dependent on the specific etiology. They are suited to be part of a treatment program that has to be adapted on a case-by-case basis. Antioxidants;Cosmetics;Keratolytic Agents;Skin Lightening Preparations;Sunscreening Agents Antioxidants;Combined Modality Therapy;Cosmetics;Humans;Hyperpigmentation;Keratolytic Agents;Lentigo;Low-Level Light Therapy;Melanosis;Quality of Life;Skin Lightening Preparations;Sunscreening Agents

[Lasers]. Lasers are a very effective approach for treating many hyperpigmented lesions. They are the gold standard treatment for actinic lentigos and dermal hypermelanocytosis, such as Ota nevus. Becker nevus, hyperpigmented mosaicisms, and lentigines can also be successfully treated with lasers, but they could be less effective and relapses can be observed. However, lasers cannot be proposed for all types of hyperpigmentation. Thus, freckles and cafÃ©-au-lait macules should not be treated as the relapses are nearly constant. Due to its complex pathophysiology, melasma has a special place in hyperpigmented dermatoses. Q-switched lasers (using standard parameters or low fluency) should not be used because of consistent relapses and the high risk of post-inflammatory hyperpigmentation. Paradoxically, targeting the vascular component of the melasma lesion with lasers could have a beneficial effect. However, these results have yet to be confirmed. In all cases, a precise diagnosis of the type of hyperpigmentation is mandatory before any laser treatment, and the limits and the potential side effects of the treatment must be clearly explained to patients. Cafe-au-Lait Spots;Diagnosis, Differential;Humans;Hyperpigmentation;Lasers;Low-Level Light Therapy;Melanosis;Nevus of Ota;Patient Education as Topic;Photosensitivity Disorders;Secondary Prevention;Skin Neoplasms

A comparative pilot study of symptom improvement before and after phototherapy in Korean patients with perennial allergic rhinitis. Although allergic rhinitis is not life threatening, it significantly influences the quality of a patient's life. This study is intended to evaluate the safety and efficacy of phototherapy with low-level energy of a 650 nm laser irradiation system in perennial allergic rhinitis patients. This clinical trial was an open-label, single-center study with 42 perennial allergic rhinitis subjects. Following laser irradiation in the nasal cavity with a laser irradiation system, the efficacy at weeks 1 through 4 was determined. The symptoms were scored with four parameters (nasal obstruction, rhinorrhea, sneezing and itching) before and after illumination of the laser, and the total score was recorded. A survey of Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) was conducted by patients before and after treatment. Following treatment, significant improvement in the clinical symptoms of nasal obstruction ($P < 0.001$), rhinorrhea ($P = 0.005$), sneezing ($P = 0.001$) and itching ($P = 0.003$) was reported by 68% of perennial allergic rhinitis patients. The overall RQLQ scores significantly improved by 45% from the baseline with the treatment after 4 weeks. These results indicate that phototherapy is an effective modality for treating perennial allergic rhinitis and is another option in the steroid-free management of immune-mediated mucosal diseases. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Nasal Obstruction;Pilot Projects;Pruritus;Quality of Life;Republic of Korea;Rhinitis, Allergic, Perennial;Sneezing;Surveys and Questionnaires;Treatment Outcome

Piroxicam and laser phototherapy in the treatment of TMJ arthralgia: a double-blind randomised controlled trial. This study aimed to evaluate the efficacy of piroxicam associated with low-level laser therapy compared with single therapies in 32 patients presenting temporomandibular joint arthralgia in a random and double-blind research design. The sample, divided into laser + piroxicam, laser + placebo piroxicam and placebo laser + piroxicam groups, was submitted to the treatment with infrared laser (830Â nm, 100 mW, 28Â s, 100Â JÂ cm(-2)) at 10 temporomandibular joint and muscle points on each side during four sessions concomitant to take one capsule a day of piroxicam 20Â mg during 10Â days. The treatment was evaluated throughout four sessions and 30Â days follow-up through visual analogue scale (VAS), maximum mouth opening and joint and muscle (temporal and masseter) pain on palpation. The results showed that all the study groups had a significant improvement in the VAS scores (PÂ <Â 0Â·05), and there were no significant group differences. Piroxicam was effective in the reduction of joint and muscle pain on palpation (PÂ <Â 0Â·05) and showed the lowest temporal pain (PÂ =Â 0Â·02) at the 30-day follow-up. The combination of low-level laser therapy and piroxicam was not more effective than single therapies in the treatment of temporomandibular joint arthralgia. The use of piroxicam was more effective in the following 30Â days. Anti-Inflammatory Agents, Non-Steroidal;Piroxicam Adolescent;Adult;Anti-Inflammatory Agents, Non-Steroidal;Arthralgia;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Middle Aged;Pain Measurement;Piroxicam;Range of Motion, Articular;Temporal Muscle;Temporomandibular Joint;Temporomandibular Joint Dysfunction Syndrome;Treatment Outcome;Young Adult

Effect of frequent laser irradiation on orthodontic pain. A single-blind randomized clinical trial. OBJECTIVE: To analyze the effect of low-level laser therapy (LLLT) on perception of pain after separator placement and compare it with perceptions of control and placebo groups using a frequent irradiation protocol. MATERIALS AND METHODS: Eighty-eight patients were randomly allocated to a laser group, a light-emitting diode (LED) placebo group, or a control group. Elastomeric separators were placed on the first molars. In the laser and LED groups, first molars were irradiated for 30 seconds every 12 hours for 1 week using a portable device. Pain was marked on a visual analog scale at predetermined intervals. Repeated measure analysis of variance was performed for statistical analysis. RESULTS: The pain scores of the laser group were significantly lower than those of the control group up to 1 day. The pain scores in the LED group were not significantly different from those of the laser group during the first 6 hours. After that point, the pain scores of the LED group were not significantly different from those of the control. CONCLUSIONS: Frequent LLLT decreased the perception of pain to a nonsignificant level throughout the week after separator placement, compared with pain perception in the placebo and control groups. Therefore, LLLT might be an effective method of reducing orthodontic pain. Elastomers;Placebos Adolescent;Adult;Elastomers;Electrical Equipment and Supplies;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontic Appliance Design;Orthodontic Appliances;Pain;Pain Measurement;Pain Threshold;Placebos;Sex Factors;Single-Blind Method;Young Adult

The influence of different power settings of Nd:YAG laser irradiation, bioglass and combination to the occlusion of dentinal tubules. OBJECTIVE: The purpose of this study was to investigate the influence of bioglass, Nd:YAG laser irradiation and their combination on dentinal tubuli occlusion as a potential dentinal hypersensitivity treatment for cervical dentinal hypersensitivity (CDH). BACKGROUND DATA: CDH affects 8-30% of adults and nearly 85% of perio-treated patients. Various treatment schemes have been applied for treating CDH, among them being fluoride application, laser irradiation, and, recently, bioglass (NovaMin(Â®)). In this in vitro study, we evaluated the efficacy of NovaMin(Â®) paste (NM) (Denshield, Sultan, USA), Nd:YAG laser irradiation (L) at various power

settings, and their combination, on dentinal orifice occlusion (DOO) as potential treatments for CDH. METHODS: Forty-nine human dentin surfaces were organized into seven equal groups: groups A and B received NM followed by L (0.5 and 1â€‰W, respectively); groups C and D received L (0.5 and 1â€‰W, respectively) followed by NM; group E received NM; and groups F and G received L (0.5 and 1â€‰W, respectively). Specimens were evaluated with regard to DOO under environmental scanning electron microscope. RESULTS: Treatment modality significantly affected DOO (p=0.012). Groups B and G scored higher DOO than the rest. By ordinal logistic regression (with boostrap standard errors), the combination of NM followed by 1â€‰W Nd:YAG laser irradiation (group B) significantly (p<0.001) contributed to DOO, compared with groups A, C, D, E, and F. CONCLUSIONS: Under the limitations of this study, Nd:YAG laser irradiation at 1â€‰W, alone or combined with NM, is a superior method for producing DOO, and may lead to an effective treatment modality for CDH. Bioglass;Bone Cements Bone Cements;Ceramics;Dentin Permeability;Dentin Sensitivity;Humans;Lasers, Solid-State;Low-Level Light Therapy;Tooth Cervix

Effect of low-level laser therapy on pain following activation of orthodontic final archwires: a randomized controlled clinical trial. OBJECTIVE: The purpose of this study was to evaluate the efficacy of GaAlAs laser light to reduce pain induced by post-adjustment orthodontic final archwire, compared with a placebo control group, and also to evaluate if there are differences in pain gradient when conventional brackets or self-ligating brackets are used for orthodontic treatment. BACKGROUND DATA: Previous reports indicate that laser therapy is a safe and efficient alternative to alleviate pain caused in the initial stages of treatment, but there are no studies about its efficacy during the last stages of orthodontic treatment. METHODS: The initial sample was 60 orthodontic patients from a private practice, treated by straight wire technique, 30 of them with mini brackets Equilibrium(Â®) (Dentaurum, Ispringen, Germany) and 30 with self-ligation In-Ovation C(Â®) (GAC/Dentsply, Tokyo, Japan) slot 0.022 inch brackets. The archwires used in the final stage of orthodontic treatment were stainless steel 0.019Ã—0.025 inch, slot 0.022 inch in both groups. In a design of divided mouth, the dental arches were randomly assigned to receive one dental arch irradiation with 830â€‰nm 100mW therapeutic laser (Photon Lase II), for 22â€‰sec (2.2â€‰J, 80â€‰J/cm(2)) along the vestibular surface and 22â€‰sec (2.2â€‰J, 80â€‰J/cm(2)) along the palatal surface of the root in the randomly selected arch. The opposite dental arch received placebo treatment, with the laser light off. Pain was evaluated using a visual analog scale (VAS) after 2, 6, and 24â€‰h, and 2, 3, and 7 days of application. RESULTS: The time course of pain showed the same tendency in both groups, reaching a peak 24â€‰h after the archwire activation. The application of laser therapy reduced pain for any period of time up to 7 days (p<0.00001) and for any kind of bracket. CONCLUSIONS: Low intensity laser application reduces pain induced by archwires used during the final stage of orthodontic treatment, without any interference regarding the kind of bracket, as reported by patients. Adult;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Wires;Pain;Pain Measurement;Tooth Movement Techniques;Young Adult

Low-intensity laser irradiation at 660 nm stimulates transcription of genes involved in the electron transport chain. BACKGROUND DATA: Low-intensity laser irradiation (LILI) has been shown to stimulate cellular functions leading to increased adenosine triphosphate (ATP) synthesis. This study was undertaken to evaluate the effect of LILI on genes involved in the mitochondrial electron transport chain (ETC, complexes I-IV) and oxidative phosphorylation (ATP synthase). METHODS: Four human skin fibroblast cell models were used in this study: normal non-irradiated cells were used as controls while wounded, diabetic wounded, and ischemic cells were irradiated. Cells were irradiated with a 660â€‰nm diode laser with a fluence of 5â€‰J/cm(2) and gene expression determined by quantitative real-time reverse transcription (RT) polymerase chain reaction (PCR). RESULTS: LILI upregulated cytochrome c oxidase subunit VIb polypeptide 2 (COX6B2), cytochrome c oxidase subunit

VIc (COX6C), and pyrophosphatase (inorganic) 1 (PPA1) in diabetic wounded cells; COX6C, ATP synthase, H+transporting, mitochondrial Fo complex, subunit B1 (ATP5F1), nicotinamide adenine dinucleotide (NADH) dehydrogenase (ubiquinone) 1 alpha subcomplex, 11 (NDUFA11), and NADH dehydrogenase (ubiquinone) Fe-S protein 7 (NDUFS7) in wounded cells; and ATPase, H+/K+ exchanging, beta polypeptide (ATP4B), and ATP synthase, H+ transporting, mitochondrial Fo complex, subunit C2 (subunit 9) (ATP5G2) in ischemic cells. CONCLUSIONS: LILI at 660â€‰nm stimulates the upregulation of genes coding for subunits of enzymes involved in complexes I and IV and ATP synthase. Electron Transport Complex IV;Mitochondrial Proton-Translocating ATPases;Electron Transport Complex I Adult;Cells, Cultured;Electron Transport Complex I;Electron Transport Complex IV;Fibroblasts;Gene Expression;Gene Expression Profiling;Humans;Low-Level Light Therapy;Mitochondria;Mitochondrial Proton-Translocating ATPases;Transcription, Genetic;Up-Regulation

Establishment of an optimized ex vivo system for artificial root canal infection evaluated by use of sodium hypochlorite and the photodynamic therapy. AIM: To establish a refined model of artificially infected root canals and confirm its suitability as a sensitive ex vivo method to assess the efficacy of disinfecting agents. Disinfection was evaluated using sodium hypochlorite (NaOCl), either blocked or unblocked by sodium thiosulphate, and a recently promoted method of disinfection, the antibacterial photodynamic therapy (PDT). METHODOLOGY: The roots of bovine incisors were sectioned into three parts, the canals of coronal and middle regions were filled with a suspension of Enterococcus faecalis and the apical region with culture medium. After 7 days, coronal sections were disinfected using NaOCl (0.5%, 1.0% and 3.0% for 30, 60 and 600 s) or a system for photoactivated chemotherapy (PACT; Cumdente, TÃ¼bingen, Germany) for antibacterial PDT. Apical sections served as sterile controls and middle sections as bacterial growth controls. In half of the NaOCl-treated specimens, disinfection was arrested. Dentine chips from biopsies at different depths from the central canal towards the periphery were plated and assessed for colony-forming units (CFU). Disinfection was considered biologically relevant if the reduction of CFU was at least three log10 orders of magnitude. RESULTS: Colony-forming units of 10Â³ - 10â•´ in growth controls indicated effective artificial infection. A biologically relevant reduction of CFU was accomplished with unblocked NaOCl, but not after blocking with NaOCl nor with PDT. CONCLUSIONS: The system reliably detected disinfection of the root canal and dentinal tubules and proved suitable for ex vivo testing of root canal disinfection. The effect of NaOCl depended on the duration of impact. Under the present experimental conditions, the antibacterial PDT system did not achieve sufficient disinfection. Chelating Agents;Dental Disinfectants;Photosensitizing Agents;Root Canal Irrigants;Thiosulfates;Tolonium Chloride;Sodium Hypochlorite;sodium thiosulfate Animals;Bacterial Load;Cattle;Chelating Agents;Dental Disinfectants;Dental Pulp Cavity;Dentin;Disinfection;Dose-Response Relationship, Drug;Enterococcus faecalis;Gram-Positive Bacterial Infections;Low-Level Light Therapy;Microscopy, Electron, Scanning;Photochemotherapy;Photosensitizing Agents;Root Canal Irrigants;Sodium Hypochlorite;Thiosulfates;Tissue Culture Techniques;Tolonium Chloride

Mechanisms of action for light therapy: a review of molecular interactions. Five decades after the first documented use of a laser for wound healing, research in light therapy has yet to elucidate the underlying biochemical pathways causing its effects. The aim of this review is to summarize the current research into the biochemical mechanisms of light therapy in order to better direct future studies. The implication of cytochrome c oxidase as the photoacceptor modulating light therapy is reviewed, as are the predominant hypotheses of the biochemical pathways involved in the stimulation of wound healing, cellular proliferation, production of transcription factors and other reported stimulatory effects. Transcription Factors;Electron Transport Complex IV

Animals;Cell Proliferation;Electron Transport Complex IV;Humans;Low-Level Light Therapy;Phototherapy;Transcription Factors;Wound Healing

Effectiveness of low-level laser therapy for patients with carpal tunnel syndrome: design of a randomized single-blinded controlled trial. BACKGROUND: Carpal tunnel syndrome is the most common neuropathy in the upper extremity, resulting from the compression of the median nerve at wrist level. Clinical studies are essentials to present evidence on therapeutic resources use at early restoration on peripheral nerve functionality. Low-level laser therapy has been widely investigated in researches related to nerve regeneration. Therefore, it is suggested that the effect of low-level laser therapy associated with other conservative rehabilitation techniques may positively affect symptoms and overall hand function in compressive neuropathies such as carpal tunnel syndrome. The aim of this study is to evaluate the effectiveness of low-level laser therapy in addition to orthoses therapy and home orientations in patients with carpal tunnel syndrome. METHODS/DESIGN: Patients older than 18 years old will be included, with clinical diagnosis of carpal tunnel syndrome, excluding comorbidies. A physiotherapist will conduct intervention, with a blinding evaluator. Randomization will be applied to allocate the patients in each group: with association or not to low-level laser therapy. All of them will be submitted to orthoses therapy and home orientations. Outcome will be assessed through: pain visual analogic scale, Semmes Weinstein monofilamentsâ„¢ threshold sensibility test, Pinch Gaugeâ„¢, Boston Carpal Tunnel Questionnaire and two point discrimination test. DISCUSSION: This paper describes the design of a randomized controlled trial, which aim to assess the effectiveness of conservative treatment added to low-level laser therapy for patients with carpal tunnel syndrome. TRIAL REGISTRATION: Brazilian Clinical Trials Registry (ReBec) - 75ddtf / Universal Trial Number: U1111-1121-5184. Brazil;Carpal Tunnel Syndrome;Combined Modality Therapy;Equipment Design;Health Knowledge, Attitudes, Practice;Home Care Services;Humans;Low-Level Light Therapy;Orthotic Devices;Pain Measurement;Pain Threshold;Pamphlets;Patient Education as Topic;Physical Therapists;Prospective Studies;Recovery of Function;Research Design;Single-Blind Method;Splints;Surveys and Questionnaires;Time Factors;Treatment Outcome

Transient repetitive exposure to low level light therapy enhances collateral blood vessel growth in the ischemic hindlimb of the tight skin mouse. The tight skin mouse (Tsk(-/+)) is a model of scleroderma characterized by impaired vasoreactivity, increased oxidative stress, attenuated angiogenic response to VEGF and production of the angiogenesis inhibitor angiostatin. Low-level light therapy (LLLT) stimulates angiogenesis in myocardial infarction and chemotherapy-induced mucositis. We hypothesize that repetitive LLLT restores vessel growth in the ischemic hindlimb of Tsk(-/+) mice by attenuating angiostatin and enhancing angiomotin effects in vivo. C57Bl/6J and Tsk(-/+) mice underwent ligation of the femoral artery. Relative blood flow to the foot was measured using a laser Doppler imager. Tsk(-/+) mice received LLLT (670 nm, 50 mW cm(-2), 30 J cm(-2)) for 10 min per day for 14 days. Vascular density was determined using lycopersicom lectin staining. Immunofluorescent labeling, Western blot analysis and immunoprecipitation were used to determine angiostatin and angiomotin expression. Recovery of blood flow to the ischemic limb was reduced in Tsk(-/+) compared with C57Bl/6 mice 2 weeks after surgery. LLLT treatment of Tsk(-/+) mice restored blood flow to levels observed in C57Bl/6 mice. Vascular density was decreased, angiostatin expression was enhanced and angiomotin depressed in the ischemic hindlimb of Tsk(-/+) mice. LLLT treatment reversed these abnormalities. LLLT stimulates angiogenesis by increasing angiomotin and decreasing angiostatin expression in the ischemic hindlimb of Tsk(-/+) mice. Amot protein, mouse;Angiomotins;Intercellular Signaling Peptides and Proteins;Microfilament Proteins;Angiostatins Angiomotins;Angiostatins;Animals;Capillaries;Disease Models, Animal;Femoral Artery;Gene Expression Regulation;Hindlimb;Intercellular Signaling Peptides and

Proteins;Ischemia;Ligation;Light;Male;Mice;Mice, Inbred C57BL;Mice, Transgenic;Microfilament Proteins;Neovascularization, Physiologic;Recovery of Function;Scleroderma, Systemic

Effect of low-level laser therapy on patient reported measures of oral mucositis and quality of life in head and neck cancer patients receiving chemoradiotherapy--a randomized controlled trial. PURPOSE: Chemoradiotherapy (CRT)-induced oral mucositis (OM) adversely affects a patient's oral functions and quality of life (QOL). Low-level laser therapy (LLLT) showed some preventive and curative effects against clinically reported objective measures of OM in few trials including our recently published study. There is dearth of evidence regarding the effects of LLLT on patient's subjective experience of OM and QOL. Hence, we did this study to evaluate the effects of LLLT on a patient's reported measures of OM and QOL in head and neck cancer (HNC) patients receiving CRT. METHODS: This triple blinded study randomized 220 HNC patients scheduled for CRT (three weekly Cisplatinâ€‰+â€‰RTâ€‰=â€‰66 Gray (2 Gy/session), five fractions/week for 6.5 weeks, total 33 fractions) into laser (110) and placebo (110) groups. The laser group received LLLT (Technomed Electronics Advanced Laser Therapy 1000, He-Ne, Î»â€‰=â€‰632.8 nm, power densityâ€‰=â€‰24 mW/cm(2), dosageâ€‰=â€‰3.0 J at each point, total dose/sessionâ€‰=â€‰36-40 J, spot size 1 cm(2), irradiation time/point 125 s) before each radiation session, while the placebo group did not receive laser therapy. Methodology was similar to our recently published study (Gautam et al. Radiother Oncol 104:349-354, 2012). In this part of our study, a blinded assessor collected subjective outcomes of the patient's reported measures of OM using Oral Mucositis Weekly Questionnaire-Head and Neck (OMWQ-HN) and QOL using Functional Assessment of Cancer Treatment-Head and Neck (FACT-HN) Questionnaire. Data were analyzed using repeated measure ANOVA through general linear model. Statistical significance was kept at p <â€‰0.05. RESULTS: Results analysis revealed that OMWQ-HN (Fâ€‰=â€‰12.199, df =â€‰6,1314, pâ€‰<â€‰0.001) and FACT-HN (pâ€‰<â€‰0.05) scores were significantly lower in LLLT than placebo group patients. Also, a significant reduction (pâ€‰<â€‰0.001) in incidence of severe OM, need for opioid analgesics, and total parenteral nutrition was observed. CONCLUSIONS: LLLT was effective in improving the patient's subjective experience of OM and QOL in HNC patients receiving CRT. Analgesics, Opioid Adult;Aged;Analgesics, Opioid;Analysis of Variance;Chemoradiotherapy;Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Linear Models;Low-Level Light Therapy;Male;Middle Aged;Parenteral Nutrition, Total;Quality of Life;Severity of Illness Index;Stomatitis;Surveys and Questionnaires;Treatment Outcome

Low-level laser therapy on MCF-7 cells: a micro-Fourier transform infrared spectroscopy study. Low-level laser therapy (LLLT) is an emerging therapeutic approach for several clinical conditions. The clinical effects induced by LLLT presumably scale from photobiostimulation/photobioinhibition at the cellular level to the molecular level. The detailed mechanism underlying this effect remains unknown. This study quantifies some relevant aspects of LLLT related to molecular and cellular variations. Malignant breast cells (MCF-7) were exposed to spatially filtered light from a He-Ne laser (633 nm) with fluences of 5, 28.8, and 1000â€‰â€‰mJ/cmÂ². The cell viability was evaluated by optical microscopy using the Trypan Blue viability test. The micro-Fourier transform infrared technique was employed to obtain the vibrational spectra of each experimental group (control and irradiated) and identify the relevant biochemical alterations that occurred due to the process. It was observed that the red light influenced the RNA, phosphate, and serine/threonine/tyrosine bands. We found that light can influence cell metabolism depending on the laser fluence. For 5â€‰â€‰mJ/cmÂ², MCF-7 cells suffer bioinhibition with decreased metabolic rates. In contrast, for the 1â€‰â€‰J/cmÂ² laser fluence, cells present biostimulation accompanied by a metabolic rate elevation. Surprisingly, at the intermediate fluence, 28.8â€‰â€‰mJ/cmÂ², the metabolic rate is increased despite the absence of proliferative results. The data were interpreted within the retrograde signaling pathway mechanism

activated with light irradiation. Breast Neoplasms;Female;Humans;Low-Level Light Therapy;MCF-7 Cells;Metabolism;Mitochondria;Models, Biological;Signal Transduction;Spectroscopy, Fourier Transform Infrared;Vibration

Five-year retrospective study of laser-assisted periodontal therapy. This article outlines a five-year retrospective study involving a diode dental laser used on periodontally infected teeth. The present study utilized a specific protocol: scaling and root planing, light ultrasonic scaling, and the use of a diode laser. In 80% of cases, pocket depth of 3 mm or less was maintained. Chronic Periodontitis;Dental Scaling;Follow-Up Studies;Humans;Laser Coagulation;Laser Therapy;Lasers, Semiconductor;Low-Level Light Therapy;Periodontal Pocket;Retrospective Studies;Root Planing;Ultrasonics

Targeted near-IR hybrid magnetic nanoparticles for in vivo cancer therapy and imaging. We report the use of immuno-targeted gold-iron oxide hybrid nanoparticles for laser-assisted therapy and for MRI-based imaging as demonstrated in xenograft colorectal cancer tumor model. Immuno-targeted gold-iron oxide nanoparticles selectively accumulate in SW1222 xenograft tumors as compared to the accumulation in non-antigen-expressing tumor xenografts. Effective photothermal treatment using near-IR laser irradiation (808nm, 5W cm(-2)) application is shown where >65% of the antigen-expressing tumor cells presented corrupt extracellular matrix and cytoplasmic acidophilia suggesting effectiveness of nanoparticle-assisted thermal therapy. Cell killing was confirmed by hematoxylin and eosin (H&E) histological staining where scar-like structure containing collagen bundles was observed in the treatment group. Further, systemically injected HNPs were shown to be effective T2 magnetic resonance (MR) imaging contrast agents, localized and detected at the antigen-expressing xenograft tumors. These findings suggest that the new class of bio-conjugated HNPs exhibits great potential for dual-therapy and diagnostics (theranostics) applications. FROM THE CLINICAL EDITOR: This team reports the successful use of immuno-targeted gold-iron oxide hybrid nanoparticles for both laser-assisted therapy and MRI-based imaging in a xenograft colorectal cancer tumor model, demonstrating strong potentials for dual applications in cancer diagnosis and therapy. Contrast Media;Ferric Compounds;Magnetite Nanoparticles;ferric oxide;Gold Animals;Cell Line, Tumor;Colorectal Neoplasms;Contrast Media;Diagnostic Imaging;Ferric Compounds;Gold;Humans;Low-Level Light Therapy;Magnetic Resonance Imaging;Magnetite Nanoparticles;Mice;Xenograft Model Antitumor Assays

Qualitative comparison of sonic or laser energisation of 4% sodium hypochlorite on an Enterococcus faecalis biofilm grown in vitro. The effectiveness of sonic activation, laser activation and syringe irrigation of 4% sodium hypochlorite in removing an Enterococcus faecalis biofilm was compared. Biofilms were grown in extracted human single rooted teeth using a flow cell apparatus. After 4 weeks' growth, teeth were subjected to each treatment using 4% sodium hypochlorite and radicular dentinal surfaces of the root canals were analysed by scanning electron microscopy. Results showed that sonic activation and syringe irrigation with sodium hypochlorite showed reduced numbers of bacterial cells on the radicular dentine but were not effective in eliminating E. faecalis in the dentinal tubules. Laser activation of sodium hypochlorite resulted in clean dentine walls and undetectable levels of bacteria within dentinal tubules. Qualitatively, sonic or laser activation of 4% NaOCl resulted in greater bacterial reduction compared with syringe irrigation, with laser activation producing the greatest overall reduction. Root Canal Irrigants;Sodium Hypochlorite Biofilms;Colony Count, Microbial;Dental Pulp Cavity;Enterococcus faecalis;Humans;Low-Level Light Therapy;Microscopy, Electron, Scanning;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite;Ultrasonics

Evaluation of orofacial function in temporomandibular disorder patients after low-level laser therapy. OBJECTIVE: To evaluate the effect of low-level laser therapy on occlusal contact area, occlusal pressure and bite force in temporomandibular disorder patients. PATIENTS AND METHOD: Twenty

patients (14 women, six men, mean age 33.1 Â± 3.8 years) diagnosed with myofascial pain according to the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD) participated in the study. Twenty healthy individuals, matched in age and gender, served as a control group. Low-level laser was applied to the mastication muscles three times per week, for a total of 10 sessions. The mandibular mobility range was evaluated. The maximum bite force, occlusal contact area and occlusal pressure were measured bilaterally with a dental pre-scale before and after treatment. All variables were analyzed descriptively. Changes in the masticatory muscle tenderness, mandibular movements, maximum bite force, occlusal contact area and occlusal pressure were compared by paired-sample Student's t-tests. RESULTS: There was a significant increase in the pressure pain threshold of the examined muscles. Mandibular movements were significantly improved in all patients. There was also a significant decrease in pain by palpation after laser exposure. However, no significant change was found in the maximum bite force, occlusal contact area or occlusal pressure after the treatment and also the values after the treatment were still significantly lower than those of the healthy individuals. CONCLUSION: This particular type of LLLT is effective at relieving pain but does not provide physical improvement. Adult;Case-Control Studies;Face;Female;Humans;Low-Level Light Therapy;Male;Mouth;Temporomandibular Joint Disorders

[The rationale for the application of laserophoresis of biologically active compounds]. Laserophoresis is a technique for the transcutaneous administration of biologically active compounds by means of low-intensity laser radiation (LFLR). It is currently regarded as a most promising method for the integrated application of a pharmaceutical substance and a physical factor. At present laserophoresis of various medicinal preparations is successfully used after preliminary experimental studies of their phoretic properties for the treatment of various inflammatory and dystrophic conditions as well as for the prevention of skin ageing. The most important route for the administration of the majority of drug preparations is through the shunts provided by perspiratory glands and hair follicles. Another essential factor determining the potential possibility of drug penetration through the skin is the characteristic of the substance chosen for the administration, such as its molecular weight, chemical structure, conformation, and hydrophilic properties. However, the most likely mechanism underlying the transport of the substance through the glandular cells of perspiratory glands and epithelial cells of hair follicles is pinocytosis, i.e. the process integrating exocytosis and endocytosis. To-day, the majority of the researchers lay emphasis on thermodynamic triggering of Ca2+-dependent processes as the primary mechanism behind the biological action of low-intensity laser radiation. Both exocytosis and endocytosis being the Ca2+-dependent processes, the liberation of Ca2+-ions under the influence of LFLR causes the activation of pinocytosis as a whole. Calcium Administration, Topical;Animals;Calcium;Epithelial Cells;Exocytosis;Hair Follicle;Humans;Low-Level Light Therapy;Pinocytosis;Sweat Glands

[Item 223--Cutaneous angiomas]. Diagnosis, Differential;Embolization, Therapeutic;Facial Neoplasms;Hemangioma;Humans;Infant;Infant, Newborn;Kasabach-Merritt Syndrome;Klippel-Trenaunay-Weber Syndrome;Low-Level Light Therapy;Lymphangioma;Neoplasms, Multiple Primary;Remission, Spontaneous;Risk Factors;Skin Neoplasms;Soft Tissue Neoplasms;Sturge-Weber Syndrome;Telangiectasis;Ulcer;Vascular Malformations

Transcranial infrared laser stimulation produces beneficial cognitive and emotional effects in humans. This is the first controlled study demonstrating the beneficial effects of transcranial laser stimulation on cognitive and emotional functions in humans. Photobiomodulation with red to near-infrared light is a novel intervention shown to regulate neuronal function in cell cultures, animal models, and clinical conditions. Light that intersects with the absorption spectrum of cytochrome oxidase was applied to the forehead of healthy volunteers using the laser diode CG-5000, which maximizes tissue

penetration and has been used in humans for other indications. We tested whether low-level laser stimulation produces beneficial effects on frontal cortex measures of attention, memory and mood. Reaction time in a sustained-attention psychomotor vigilance task (PVT) was significantly improved in the treated (n=20) vs. placebo control (n=20) groups, especially in high novelty-seeking subjects. Performance in a delayed match-to-sample (DMS) memory task showed also a significant improvement in treated vs. control groups as measured by memory retrieval latency and number of correct trials. The Positive and Negative Affect Schedule (PANAS-X), which tracks self-reported positive and negative affective (emotional) states over time, was administered immediately before treatment and 2 weeks after treatment. The PANAS showed that while participants generally reported more positive affective states than negative, overall affect improved significantly in the treated group due to more sustained positive emotional states as compared to the placebo control group. These data imply that transcranial laser stimulation could be used as a non-invasive and efficacious approach to increase brain functions such as those related to cognitive and emotional dimensions. Transcranial infrared laser stimulation has also been proven to be safe and successful at improving neurological outcome in humans in controlled clinical trials of stroke. This innovative approach could lead to the development of non-invasive, performance-enhancing interventions in healthy humans and in those in need of neuropsychological rehabilitation.
Adolescent;Adult;Cognition;Dose-Response Relationship, Radiation;Double-Blind Method;Emotions;Exploratory Behavior;Female;Frontal Lobe;Humans;Infrared Rays;Low-Level Light Therapy;Male;Mental Recall;Neuropsychological Tests;Pigmentation;Psychomotor Performance;Reaction Time;Surveys and Questionnaires;Young Adult

Chlorophyll derivative mediated PDT versus methotrexate: an in vitro study using MCF-7 cells. BACKGROUND: Breast cancer is the most common cause of cancer deaths among women worldwide. Although chemotherapy is a standard method for the treatment of breast cancer, the photodynamic therapy (PDT) is a recent promising modality for cancer diagnosis and treatment. Its major advantages over chemotherapy are better selectivity of tumour tissue destruction and lack of severe local and systemic complications. This work is directed towards evaluation of the efficacy of Photodynamic therapy using chlorophyll derivative (CHL) as a photosensitizer in treatment of breast cancer. It also aims at investigation of the genetic safety of chlorophyll mediated PDT in comparison to the conventional chemotherapy. METHODS: Both methotrexate (MTX) and light activated chlorophyll derivative were used to target MCF-7 breast cancer cell line. Standard karyotyping and alkaline single cell microgel electrophoresis assay (Comet assay) were applied on normal human peripheral blood lymphocytes (HPL) in order to investigate the respective possible mutagenic and genotoxic side effects that might result from application of each therapeutic modality. RESULTS: Results obtained from this study showed that 50% of MCF-7 tumour cell death (LC(50)) was reached by using a concentration of chlorophyll derivative that is 138 times lower than MTX. Moreover, chlorophyll derivative exerted no genetic side effects as compared to MTX that resulted into several types of chromosomal breakages. CONCLUSIONS: Compared to MTX, light activated chlorophyll derivative proved to be a better candidate for breast cancer cell toxicity, referring to its higher efficacy at tumour cells killing, safety to normal cells and simple method of extraction.
Antimetabolites, Antineoplastic;Chlorophyllides;Photosensitizing Agents;chlorophyllin;Methotrexate
Antimetabolites, Antineoplastic;Breast Neoplasms;Cell Survival;Chlorophyllides;Dose-Response Relationship, Drug;Female;Humans;Karyotyping;Lasers, Semiconductor;Low-Level Light Therapy;MCF-7 Cells;Methotrexate;Mutagenicity Tests;Photosensitizing Agents

Photodynamic inactivation of primary human fibroblasts by methylene blue and toluidine blue O. BACKGROUND: An important determinant of the clinical applicability and value of antimicrobial photodynamic inactivation (PDI) is the cytotoxicity of the treatment to human cells. We evaluated the

in vitro cytotoxicity of PDI to primary human fibroblasts using methylene blue (MB) and toluidine blue O (TBO) as the photosensitizers. METHODS: The primary human fibroblasts were exposed to PDI regimes that were used for the inactivation of methicillin-resistant Staphylococcus aureus (MRSA) and multi-drug resistant Escherichia coli (MDR E. coli). Mitochondrial activity subsequent to exposure was evaluated after 24h using the methylthiazoletetrazolium assay and compared to pretreatment values. RESULTS: Mitochondrial activity of primary human fibroblasts was reduced by 27% after exposure to light (163.8 J/cm(2)) and MB (50 Î¼g/ml). At a TBO concentration previously demonstrated to induce 99.91% and 83.2% reduction in a viable count for MRSA and MDR E. coli, respectively, 39.6% of the fibroblasts were photo-inactivated. CONCLUSION: Our findings showed that MB/TBO-PDI did not induce significant cytotoxic effects on human fibroblasts in culture. Photosensitizing Agents;Tolonium Chloride;Methylene Blue Drug Resistance, Multiple, Bacterial;Escherichia coli;Fibroblasts;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Methylene Blue;Mitochondria;Photosensitizing Agents;Tolonium Chloride

Apoptosis of breast cancer cells induced by hypocrellin B under light-emitting diode irradiation. OBJECTIVES: Breast cancer is a common disease which threatens the life of women. To explore an alternative modality for combating breast cancer, a light-emitting diode (LED) that activates hypocrellin B was used in the present study to investigate apoptosis induction in breast cancer MDA-MB-231 cells. MATERIALS AND METHODS: Photocytotoxicity was investigated 24h after photodynamic treatment of hypocrellin B using MTT reduction assay and light microscopy. Apoptosis was observed 6h after photodynamic treatment using flow cytometry with Annexin V/PI staining as well as fluorescent microscopy with Hoechst33258 staining. The ultrastructure of the treated cells was observed using transmission electron microscopy (TEM). RESULTS: Hypocrellin B-induced photocytotoxicity in MDA-MB-231 cells exhibited a dose-dependent manner. The amount of MDA-MB-231 cells attached to the bottom of well decreased significantly after photodynamic treatment of hypocrellin B. Flow cytometry showed that the early and late apoptotic rate of MDA-MB-231 cells increased remarkably up to 17.46% and 32.80%, respectively, after treatment of LED-activated hypocrellin B. In addition, nuclear condensation, fragmentation and chromatin margination, and topical apoptotic body in the treated cells were observed by nuclear staining and TEM. CONCLUSION: Photodynamic action of hypocrellin B irradiated by light-emitting diodes could significantly kill breast cancer cells and induce apoptotic cell death, which suggests LED-activated hypocrellin B is a promising strategy for combating breast cancer. Photosensitizing Agents;Quinones;Perylene;hypocrellin B Apoptosis;Breast Neoplasms;Cell Line, Tumor;Dose-Response Relationship, Drug;Female;Flow Cytometry;Humans;Low-Level Light Therapy;Perylene;Photosensitizing Agents;Quinones

Adverse effects associated with photodynamic therapy (PDT) of port-wine stain (PWS) birthmarks. BACKGROUND: Several Chinese studies suggest that Hemoporfin-mediated photodynamic therapy (PDT) is an alternative treatment for port-wine stain (PWS) birthmarks. OBJECTIVE: To evaluate treatment responses and adverse effects associated with Hemoporfin PDT for the treatment of PWS and their management. METHOD: The medical records of 700 patients who underwent PDT treatment in our center were retrospectively examined. Treatment-related reactions and adverse effects were reviewed. RESULT: Different types of PWS lesions and different individuals showed different immediate responses (e.g. swelling, color change, pain). To certain extents these reactions were a useful indicator of the treatment endpoint. Edema and scabbing were the most common post-treatment responses. Short-term (e.g. blister, eczematous dermatitis, cutaneous photosensitivity) and long-term (e.g. pigmentation change, scar formation) adverse effects were generally caused by the phototoxicity associated with the combination of photosensitizer and light exposure.

CONCLUSION: Although PDT is a safe treatment alternative for PWS birthmarks, treatment parameters must be selected for each individual patient and cutaneous changes must be monitored during light irradiation to minimize the risk of adverse effects. Over estimation of required light dosage or failure to recognize cutaneous changes associated with adverse effects can increase the risk of a poor outcome. Hematoporphyrins;Photosensitizing Agents;hematoporphyrin monomethyl ether China;Hematoporphyrins;Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Photochemotherapy;Photosensitizing Agents;Port-Wine Stain;Retrospective Studies;Skin

Low-level laser therapy in secondary lymphedema after breast cancer: systematic review. Complex physical therapy is the main treatment for the secondary lymphedema after breast cancer. The low-level laser therapy (LLLT) has been used in order to stimulate lymphangiogenesis, encourage lymphatic motility, and reduce lymphostatic fibrosis. However, these factors could also favor the development of recurrence and metastasis. The objective of this study is to discuss the use of LLLT in the treatment of lymphedema after breast cancer. This study utilized a systematic review on the use of LLLT in the treatment of lymphedema after breast cancer. Evaluating quality of articles was conducted through the PEDro scale. Of the 41 articles identified, four were considered to be of high methodological quality (score â‰¥ 5). The low-level laser in the axillary region was performed in all studies. The control group was not similar across studies. The results presented showed that there was a reduction in limb volume in the group subjected to low-power laser when compared with other treatments. No studies have evaluated the risk of metastasis or relapse in the irradiated areas. Because no studies have included the complex physical therapy as the comparison group, we cannot claim that laser treatment is the best efficacy or effectiveness in lymphedema treatment after breast cancer. No studies have evaluated the hypothesis that the LLLT can increase the risk of recurrence or metastasis. Therefore, the questions about the safety of this procedure in cancer patients remain. Aged;Breast Neoplasms;Female;Humans;Lasers;Low-Level Light Therapy;Lymphedema;Middle Aged

Laser therapy and pain-related behavior after injury of the inferior alveolar nerve: possible involvement of neurotrophins. Nerve-related complications have been frequently reported in dental procedures, and a very frequent type of occurrence involves the inferior alveolar nerve (IAN). The nerve injury in humans often results in persistent pain accompanied by allodynia and hyperalgesia. In this investigation, we used an experimental IAN injury in rats, which was induced by a Crile hemostatic clamp, to evaluate the effects of laser therapy on nerve repair. We also studied the nociceptive behavior (von Frey hair test) before and after the injury and the behavioral effects of treatment with laser therapy (emitting a wavelength of 904â€‰nm, output power of 70â€‰Wpk, a spot area of âˆ¼0.1â€‰cmÂ², frequency of 9500â€‰Hz, pulse time 60 ns and an energy density of 6â€‰J/cmÂ²). As neurotrophins are essential for the process of nerve regeneration, we used immunoblotting techniques to preliminarily examine the effects of laser therapy on the expression of nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF). The injured animals treated with laser exhibited an improved nociceptive behavior. In irradiated animals, there was an enhanced expression of NGF (53%) and a decreased BDNF expression (40%) after laser therapy. These results indicate that BDNF plays a locally crucial role in pain-related behavior development after IAN injury, increasing after lesions (in parallel to the installation of pain behavior) and decreasing with laser therapy (in parallel to the improvement of pain behavior). On the other hand, NGF probably contributes to the repair of nerve tissue, in addition to improving the pain-related behavior. Brain-Derived Neurotrophic Factor;Nerve Growth Factors;Nerve Growth Factor Animals;Brain-Derived Neurotrophic Factor;Low-Level Light Therapy;Male;Mandibular Nerve;Nerve Growth Factor;Nerve Growth Factors;Pain;Pain Management;Rats;Rats, Wistar;Trigeminal Nerve Injuries

Port-wine stain laser treatments and novel approaches. BACKGROUND AND OBJECTIVES: Port-wine stains (PWSs) are capillary vascular malformations that are commonly resistant to treatment. Currently, the pulsed dye laser (PDL) is the treatment of choice. Multiple treatments are required and complete blanching after laser irradiation is rarely achieved. We review current therapeutic modalities for PWSs and recent developments for enhanced clearance. STUDY DESIGN/MATERIALS AND METHODS: Relevant literature was reviewed including PDL modifications for improved efficacy, alternative laser devices for treatment-resistant PWSs, and the addition of agents to modulate the wound-healing response after laser irradiation. RESULTS: Although PDL is the treatment of choice for PWSs, increased understanding of interactions between PWSs and PDL has led to improvements in therapeutic outcome in terms of lesion blanching. CONCLUSIONS: Preliminary evidence of combination therapy using antiangiogenic agents after laser irradiation appears promising and could lead to the development of a new standard of care for PWSs. Angiogenesis Inhibitors;Sirolimus Angiogenesis Inhibitors;Combined Modality Therapy;Cryotherapy;Humans;Infant;Laser Therapy;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Photochemotherapy;Port-Wine Stain;Sirolimus;Wound Healing

Evaluation of potassium binoxalate gel and Nd:YAG laser in the management of dentinal hypersensitivity: a split-mouth clinical and ESEM study. Dentinal hypersensitivity is one of the oldest recorded complaints of discomfort to mankind and yet there appears to be no permanent treatment for this clinical condition. This study was designed to evaluate the clinical efficacy of potassium binoxalate gel and neodymium:yttrium-aluminum-garnet (Nd:YAG) laser on dentin hypersensitivity for a period of 9 months. Eighty teeth (20 subjects, 25-55 years old, M = F) were evaluated in a split-mouth design to receive potassium binoxalate (group A, 40 teeth) and Nd:YAG (group B, 40 teeth: 1 W, 10 Hz, and 60 s, irradiated twice). The diameter of output beam was about 300 Î¼m with a distance of 2 mm between laser fiber or tip and tooth surface. The clinical efficacy was evaluated by air-blast test and cold-water test using visual analog scale. Electron microscopy photomicrographs were taken to confirm the results. Analysis was done at baseline; immediately post-treatment; and at 3, 6, 9 months post-treatment. Student's paired and unpaired T tests were used to evaluate the statistical analysis. Both treatment modalities were effective in reducing dentine hypersensitivity. However, Nd:YAG laser was better when intragroup comparison was made at 9 months post-treatment. Nd:YAG lasers is better in long-term treatment (up to 9 months) owing to the melting of dentinal tubules. However, due to depth of penetration of microcrystals, gel was better when ease of the procedure is considered. Nevertheless, both treatment modalities resulted in recurrence. Hence, further studies are needed to discover an agent, which can be considered as a "gold standard". Dentin Desensitizing Agents;Gels;Oxalic Acid Adult;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Gels;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Middle Aged;Oxalic Acid;Time Factors;Tooth

Laser and light-emitting diode effects on pre-osteoblast growth and differentiation. The acceleration of bone regeneration by low-intensity laser irradiation may hold potential benefits in clinical therapy in orthopedics and dentistry. The purpose of this study is to compare the effects of light-emitting diode (LED) and laser on pre-osteoblast MC3T3 proliferation and differentiation. Cells were irradiated with red, infrared, and LED (3 and 5 J/cm(2)). Lasers had a power density of 1 W/cm(2) and irradiation time of 2 and 5 s. LED had a power density of 60 mW/cm(2) and irradiation time of 50 and 83 s. Control group did not receive irradiation. Cell growth was assessed by a colorimetric test (MTT) (24, 48, 72, and 96 h), and cell differentiation was evaluated by alkaline phosphatase (ALP) quantification after growth in osteogenic medium (72 and 96 h and 7 and 14 days). At 24 h, the cell growth was enhanced 3.6 times by LED (5 J/cm(2)), 6.8 times by red laser (3 J/cm(2)), and 10.1 times by red laser (5 J/cm(2)) in relation to control group ($p < 0.05$). At the other periods,

there was no influence of irradiation on cell growth ($p > 0.05$). The production of ALP was not influenced by irradiation at any period of time ($p > 0.05$). Low-intensity laser and LED have similar effects on stimulation of cell growth, but no effect on cell differentiation. Alkaline Phosphatase 3T3 Cells;Alkaline Phosphatase;Animals;Bone Regeneration;Cell Differentiation;Cell Proliferation;Lasers, Semiconductor;Light;Low-Level Light Therapy;Mice;Osteoblasts;Phototherapy

LLLT improves tendon healing through increase of MMP activity and collagen synthesis. The Achilles tendon has a high incidence of rupture, and the healing process leads to a disorganized extracellular matrix (ECM) with a high rate of injury recurrence. To evaluate the effects of different conditions of low-level laser (LLL) application on partially tenotomized tendons, adult male rats were divided into the following groups: G1, intact; G2, injured; G3, injured + LLL therapy (LLLT; 4Â J/cm(2) continuous); G4, injured + LLLT (4Â J/cm(2), 20Â Hz); G5, injured; G6, injured + LLLT (4Â J/cm(2) continuous); and G7, injured + LLLT (4Â J/cm(2), 20Â Hz until the 7th day and 2Â kHz from 8 to 14Â days). G2, G3, and G4 were euthanized 8Â days after injury, and G5, G6, and G7 were euthanized on the 15th day. The quantification of hydroxyproline (HOPro) and non-collagenous protein (NCP), zymography for matrix metalloproteinase (MMP)-2 and MMP-9, and Western blotting (WB) for collagen types I and III were performed. HOPro levels showed a significant decrease in all groups (except G7) when compared with G1. The NCP level increased in all transected groups. WB for collagen type I showed an increase in G4 and G7. For collagen type III, G4 presented a higher value than G2. Zymography for MMP-2 indicated high values in G4 and G7. MMP-9 increased in both treatment groups euthanized at 8Â days, especially in G4. Our results indicate that the pulsed LLLT improved the remodeling of the ECM during the healing process in tendons through activation of MMP-2 and stimulation of collagen synthesis. Collagen Type I;Collagen Type III;Collagen;Matrix Metalloproteinase 2;Mmp2 protein, rat;Matrix Metalloproteinase 9;Mmp9 protein, rat;Hydroxyproline Achilles Tendon;Animals;Collagen;Collagen Type I;Collagen Type III;Disease Models, Animal;Hydroxyproline;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Rats;Rats, Wistar;Rupture;Tendon Injuries;Wound Healing

Effect of photobiomodulation on expression of IL-1Î² in skeletal muscle following acute injury. Muscle repair is regulated by growth factors and cytokines. Low-level laser therapy (LLLT) seems to influence acute inflammation and accelerate skeletal muscle repair. This study verifies the effect of LLLT on the expression of IL-1Î² in the tibialis anterior (TA) muscle of rats following acute injury. Wistar rats (n=35) were allocated into three groups: control (without lesion and LLLT, n=5), injury group (n=15), and injury + LLLT group (n=15). The acute injury was induced by the contact with a cooled metal probe (3 mm in diameter) during 10 s, twice, in the same muscle area. LLLT was used three times a week using the InGaAlP laser (660 nm; beam spot of 0.04 cm(2), output power of 20 mW, power density of 500 mW/cm(2), and energy density of 5 J/cm(2) during 10 s). The animals were analyzed at 1, 7, and 14 days following injury. TA muscles samples were used for obtaining total RNA and performing cDNA synthesis. Real-time polymerase chain reactions were realized using IL-1Î² primer. There was a decrease in IL-1Î² expression after 7 days in LLLT group in comparison with the no treated group. In conclusion, LLLT was able to decrease IL-1Î² expression during the skeletal muscle repair following an acute injury. Interleukin-1beta;RNA, Messenger Animals;Gene Expression;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Wound Healing

Infrared low-level diode laser on inflammatory process modulation in mice: pro- and anti-inflammatory cytokines. To evaluate the modulation of proinflammatory (interleukin-6, IL-6; tumor necrosis factor-Î±, TNF-Î±; and interferon-Î³, IFN-Î³) and anti-inflammatory cytokines (transforming growth factor-Î²1, TGF-Î²1) in the inflammation processes in vivo with low-level laser

action, 50 isogenic mice were randomly distributed into three groups: control (no surgical procedure, nâ€‰=â€‰10), sham (surgical procedure with three standard cutaneous incisions, followed by an abdominal muscle incision and suture, nâ€‰=â€‰20), and laser (same procedure followed by laser exposure, nâ€‰=â€‰20). The sham group was divided into three subgroups: sham I (euthanasia and evaluation, 36Â h after surgical procedure), sham II (euthanasia and evaluation, 60Â h after surgical procedure), and sham III (euthanasia and evaluation, 84Â h after surgical procedure). The laser group was also divided in three subgroups: laser I (a single laser session, 12Â h after surgery), laser II (two laser sessions, 12 and 36Â h after surgery), and laser III (three laser sessions, 12, 36, and 60Â h after surgery). All animals in the laser groups received three points per session of continuous infrared laser (wavelength of 780Â nm, power of 20Â mW, fluency of 10Â J/cm(2), exposure time of 20Â s per point, and energy of 0.4Â J). After euthanasia, spleen mononuclear cells were isolated and cultured for 48Â h. Concentrations of IL-6, TNF-Î±, IFN-Î³, and TGF-Î²1 were obtained by enzyme-linked immunosorbent assay method. There was a significant difference between the IL-6 and TNF-Î± concentrations in the 60-and 84-h evaluations when the laser and sham groups were compared to the control group (pâ€‰<â€‰0.05), except for laser II in the TNF-Î± analysis (pâ€‰>â€‰0.05). The IFN-Î³ concentration analysis showed a significant difference only in sham II when compared to the control group (pâ€‰<â€‰0.05). Thus, there was a modulatory effect of TNF-Î± and IFN-Î³ in the laser group, particularly in the 60-h postoperative evaluation. There was no significant difference between the laser, sham, and control groups for TGF-Î²1 analysis (pâ€‰>â€‰0.05). The low-level laser application decreased the TNF-Î± and IFN-Î³ release in vivo of spleen mononuclear cells in mice, especially after two exposure sessions. However, there was no modulation of the IL-6 and TGF-Î²1 release. Cytokines;Inflammation Mediators;Interleukin-6;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha;Interferon-gamma
Animals;Cytokines;Inflammation;Inflammation Mediators;Infrared Rays;Interferon-gamma;Interleukin-6;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha

Effect of low-level laser therapy on pain, quality of life and sleep in patients with fibromyalgia: study protocol for a double-blinded randomized controlled trial. BACKGROUND: Low-level laser therapy (LLLT) has been widely used as adjuvant strategy for treatment of musculoskeletal disorders. The light-tissue interaction (photobiostimulation) promotes analgesic and anti-inflammatory effects and improves tissue healing, which could justify the recommendation of this therapy for patients with fibromyalgia, leading to an improvement in pain and possibly minimizing social impact related to this disease. The present study proposes to evaluate the effect of LLLT on tender points in patients with fibromyalgia, correlating this outcome with quality of life and sleep. METHODS/DESIGN: One hundred and twenty patients with fibromyalgia will be treated at the Integrated Health Center and the Sleep Laboratory of the Post Graduate Program in Rehabilitation Sciences of the Nove de Julho University located in the city of Sao Paulo, Brazil. After fulfilling the eligibility criteria, a clinical evaluation and assessments of pain and sleep quality will be carried out and self-administered quality of life questionnaires will be applied. The 120 volunteers will be randomly allocated to an intervention group (LLLT, n = 60) or control group (CLLLT, n = 60). Patients from both groups will be treated three times per week for four weeks, totaling twelve sessions. However, only the LLLT group will receive an energy dose of 6 J per tender point. A standardized 50-minute exercise program will be performed after the laser application. The patients will be evaluated regarding the primary outcome (pain) using the following instruments: visual analog scale, McGill Pain Questionnaire and pressure algometry. The secondary outcome (quality of life and sleep) will be assessed with the following instruments: Medical Outcomes Study 36-item Short-Form Health Survey, Fibromyalgia Impact Questionnaire, Berlin Questionnaire, Epworth Sleepiness Scale and polysomnography. ANOVA test with repeated

measurements for the time factor will be performed to test between-groups differences (followed by the Tukey-Kramer post hoc test), and a paired t test will be performed to test within-group differences. The level of significance for the statistical analysis will be set at 5% (P â‰¤ .05). TRIAL REGISTRATION: The protocol for this study is registered with the Brazilian Registry of Clinical Trials - ReBEC (RBR-42gkzt). Brazil;Clinical Protocols;Combined Modality Therapy;Double-Blind Method;Exercise Therapy;Fibromyalgia;Humans;Low-Level Light Therapy;Pain;Pain Measurement;Pain Threshold;Polysomnography;Quality of Life;Research Design;Sleep;Sleep Wake Disorders;Surveys and Questionnaires;Time Factors;Treatment Outcome

Comparison between pulsed ultrasound and low level laser therapy on experimental haemarthrosis. The use of pulsed ultrasound (PUS) and low level laser therapy (LLLT) in patients with haemophilia has been recommended for supportive treatment of acute and chronic phases of haemarthrosis but its role has not been supported by experimental evidence. The purpose of the present study was to evaluate the effect of these modalities on joint swelling, friction and biomechanical parameters of articular cartilage. An experimental rabbit knee haemarthrosis model was used to test the hypothesis that LLLT and PUS favourably impacted on the biotribological and biomechanical properties of cartilage after joint bleeding. To test this, 35 male albino rabbits weighing 1.5-2 kg were used. The left knee of 30 rabbits was injected with 1 mL of fresh autologous blood two times per week for four consecutive weeks to simulate recurrent haemarthrosis; five rabbits served as non-bleeding controls. Ten rabbits were treated with PUS and 10 with LLLT and the remaining 10 were not treated. The treatments were started after 2 days and the treatment duration was planned for 5 days (sessions) in ultrasound and laser groups. A low level Ga-Al-As laser was applied with an 810 nm wavelength, 25 mW power, and 1 J cm(-2) dosage for 200 s duration. The PUS treatment was applied with a duty cycle of 1/9, frequency of 1 MHz, and power of 0.4 W cm(-2) for 150 s. Joint perimeter was measured before the procedure at the beginning of therapies and after cessation of the procedure. Friction and biomechanical parameters were measured immediately after the killing of the animals. The results demonstrate that PUS was more effective in reducing knee joint swelling than LLLT. Moreover, PUS had the unique ability of reducing the joint friction below normal values. However, it was not successful in returning the articular cartilage force and stiffness to normal state. LLLT was more effective in increasing equilibrium force of the articular cartilage than PUS, however, neither therapy normalized this parameter. From these data, we conclude that PUS is more effective than LLLT in reducing joint swelling and articular joint friction after experimental haemarthrosis. Animals;Cartilage, Articular;Disease Models, Animal;Hemarthrosis;Knee Joint;Low-Level Light Therapy;Male;Rabbits;Ultrasonic Therapy

Side effects of common acne treatments. INTRODUCTION: A variety of acne treatments exist, including topical benzoyl peroxide, topical retinoids, topical antibiotics, oral antibiotics, hormonal therapy, isotretinoin, and procedural therapies, such as light and laser therapies. Although each of these treatment modalities confer various benefits for the management of acne, it is important for healthcare providers to be aware of their potential side effects, including ones that are most common and most serious, so that these medications can be prescribed in a safe manner. AREAS COVERED: A systematic literature review was performed to identify publications discussing the side effects of the different treatment modalities used for acne vulgaris. Acne treatments reviewed included benzoyl peroxide gel, topical retinoids, topical antibiotics, oral antibiotics, hormonal therapy, isotretinoin, and light/laser treatments. EXPERT OPINION: A comprehensive overview of acne treatments' side effects is imperative for healthcare professionals and scientists working with and prescribing acne treatments. Side effects to be aware of when prescribing range from local irritation with topical treatments to systemic side effects including liver function abnormalities and teratogenic side effects. The best available options are those that address acne severity while minimizing side effects for the

patient. Consequently, personalized medicine must be strongly emphasized to healthcare providers developing patients' treatment plans. Dermatologic Agents Acne Vulgaris;Dermatologic Agents;Drug Administration Routes;Humans;Low-Level Light Therapy;Patient Selection;Phototherapy;Risk Assessment;Risk Factors;Treatment Outcome

Clinical and biochemical effects of diode laser as an adjunct to nonsurgical treatment of chronic periodontitis: a randomized, controlled clinical trial. The aim of this randomized, parallel, controlled clinical trial was to examine the clinical and biochemical efficacy of diode laser as an adjunct to scaling and root planing (SRP). Thirty chronic periodontitis patients were randomly assigned into two groups to receive SRP alone (control) or SRP followed by diode laser (test). Plaque index, gingival index, bleeding on probing, probing depth, and clinical attachment level were measured at baseline and at 1, 3, and 6 months after treatment. The gingival crevicular fluid levels of interleukin-1Î² (IL-1Î²), interleukin-6 (IL-6), interleukin-8 (IL-8), matrix metalloproteinase-1 (MMP-1), matrix metalloproteinase-8 (MMP-8) and tissue inhibitor matrix metalloproteinase-1 (TIMP-1) were analyzed by enzyme-linked immunosorbent assay. Test group showed significantly a better outcome compared to the control group in full-mouth clinical parameters. MMP-1, MMP-8, and TIMP-1 showed significant differences between groups after treatment compared to baseline ($p < 0.05$). The total amount of IL-1Î², IL-6, MMP-1, MMP-8, and TIMP-1 decreased ($p < 0.05$) and IL-8 increased after treatment in both test and control groups ($p < 0.05$). Diode laser provided significant improvements in clinical parameters and MMP-8 was significantly impacted by the adjunctive laser treatment at first month providing an insight to how lasers can enhance the outcomes of the nonsurgical periodontal therapy. CXCL8 protein, human;IL6 protein, human;Interleukin-1beta;Interleukin-6;Interleukin-8;TIMP1 protein, human;Tissue Inhibitor of Metalloproteinase-1;MMP8 protein, human;Matrix Metalloproteinase 8;MMP1 protein, human;Matrix Metalloproteinase 1 Adult;Chronic Periodontitis;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Interleukin-6;Interleukin-8;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 1;Matrix Metalloproteinase 8;Middle Aged;Radiotherapy, Adjuvant;Root Planing;Time Factors;Tissue Inhibitor of Metalloproteinase-1;Treatment Outcome

Single session of Nd:YAG laser intracanal irradiation neutralizes endotoxin in dental root dentin. Endotoxins released in the dental root by Gram-negative microorganisms can be neutralized by calcium hydroxide, when this medication is applied inside the root canal for at least seven days. However, several clinical situations demand faster root canal decontamination. Thus, for faster endotoxin neutralization, endodontists are seeking additional treatments. The in vitro study tested whether or not intracanal Nd:YAG laser irradiation would be able to neutralize endotoxin within the human dental root canal in a single session. Twenty-four human teeth with one root were mounted between two chambers. After conventional endodontic treatment, root canals were contaminated with Escherichia coli endotoxin. Then they were irradiated or not (controls) in contact mode with an Nd:YAG laser (1.5 W, 15 Hz, 100 mJ and pulse fluency of 124â€‰â€‰J/cm2). The endotoxin activity was measured using the limulus lysate technique and data were statistically compared (pâ‰¤0.05). The concentration of active endotoxin measured in the negative control group was significantly lower than that of the positive control group ($p=0.04$). The concentrations of endotoxin in both irradiated groups were significantly lower than that of the positive control group ($p=0.027$) and similar to that of negative control group ($p=0.20$). A single session of intracanal Nd:YAG laser irradiation is able to neutralize endotoxin in the dental root tissues. Endotoxins;endotoxin, Escherichia coli;Calcium Hydroxide Calcium Hydroxide;Dental Pulp Cavity;Dentin;Endotoxins;Humans;Lasers, Solid-State;Limulus Test;Low-Level Light Therapy;Optical Phenomena;Root Canal Therapy

Utilizing electromagnetic radiation for hair growth: a critical review of phototrichogenesis. Hair loss has a high prevalence in the general population and can have significant medical and

psychological sequelae. Pattern hair loss and alopecia areata represent the major reasons patients present to dermatologists in relation to hair loss. Because conventional treatment options are generally incompletely effective, novel methods for hair grown induction are being developed. The role of using electromagnetic radiation, including low-level laser therapy for the management of hair loss through phototrichogenesis, is reviewed in this article. Alopecia Areata;Electromagnetic Radiation;Hair;Humans;Low-Level Light Therapy;Treatment Outcome

Low level laser therapy for the treatment of temporomandibular disorders: a systematic review of the literature. The authors performed a review of the literature to evaluate the efficacy of low level laser therapy (LLLT) for the treatment of temporomandibular disorders (TMD). Selection criteria included: 1) human subjects, 2) articles written in English, and 3) randomized placebo-controlled trials. Evaluation was performed according to the CONSORT 2010 criteria. A total of 14 articles were included in the review. Studies varied considerably in terms of methodological design, particularly regarding the site of application of the laser beam, the number of applications performed, their duration, the laser beam features (wavelength, frequency, output, dosage), and outcome measures. The outcome of the trials was controversial and not particularly related to any features of the laser beam, to the number of laser applications, and their duration. Based on the results of this review no definitive conclusions can be drawn on the efficacy of LLLT for the treatment of TMD. Many methodological differences among the studies, especially regarding the number and duration of laser applications and characteristics of the laser beam (wavelength, frequency, output), do not allow for standardized guidelines for effective treatment with LLLT. The only indication seems to be that LLLT is probably more effective for the treatment of TMJ disorders, and less effective for the treatment of masticatory muscle disorders. Placebos Humans;Low-Level Light Therapy;Masticatory Muscles;Muscular Diseases;Placebos;Radiotherapy Dosage;Randomized Controlled Trials as Topic;Temporomandibular Joint Disorders;Treatment Outcome

Is low level laser effective for the treatment of orofacial pain?: A systematic review. The aim of this study was to assess the effectiveness of low level laser therapy (LLLT) as a treatment for orofacial pain considering the methodology of the studies. PubMed (1983-2009) and one conference proceeding were searched. Studying quality was assessed using a validated instrument. A high-quality score was defined as high or low. Outcomes were defined as either positive (+), neutral (0), or negative (-). Thirty-three studies met inclusion criteria. The best evidence synthesis method was used to formulate outcome of LLLT for each type of control group. LLLT vs. placebo pooling revealed high-quality trials in three of eight positive studies. In LLLT vs. other active treatment pooling, two high-quality studies out of nine neutral trials were found. Quality of the trial was not significantly associated with neutral results (p=0.05). Only limited evidence indicated that LLLT is more effective than placebo, sham laser, and other active treatments. Placebos Double-Blind Method;Facial Pain;Humans;Low-Level Light Therapy;Placebos;Randomized Controlled Trials as Topic;Single-Blind Method;Temporomandibular Joint Disorders;Treatment Outcome

Low level laser therapy as an adjunctive technique in the management of temporomandibular disorders. The purpose of this study was to assess the effect of low level laser therapy on subjects with intra-articular temporomandibular disorders (IA-TMD), and to quantify and compare severity of signs and symptoms before, during, and after the laser applications. The sample consisted of 45 subjects randomly divided into three groups (G) of 15 subjects each: G-I: 15 individuals with IA-TMD submitted to an energy dose of 52.5 J/cm2; G-II: dose of 105.0 J/cm2; and G-III: placebo group (0 J/cm2). In all groups, the applications were performed on condylar points on the masseter and anterior temporalis muscles. Two weekly sessions were held for five weeks, totaling 10 applications. The assessed variables were: mandibular movements and painful symptoms evoked by muscle palpation. These variables were measured before starting the study, then immediately after the first,

fifth, and tenth laser application, and finally, 32 days after completing the applications. The results showed that there were statistically significant differences for G-I and G-II at the level of 1% between the doses, as well as between assessments. Therefore, it was concluded that the use of low level laser increased the mean mandibular range of motion and reduced painful symptoms in the groups that received effective treatment, which did not occur in the placebo group. Placebos Adult;Facial Pain;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Mandibular Condyle;Masseter Muscle;Middle Aged;Pain Measurement;Palpation;Placebos;Radiotherapy Dosage;Range of Motion, Articular;Symptom Assessment;Temporal Muscle;Temporomandibular Joint Disorders;Treatment Outcome
Technology is here to stay. Cephalometry;Cone-Beam Computed Tomography;Electromyography;Head Movements;Humans;Low-Level Light Therapy;Technology, Dental;Temporomandibular Joint Disorders
Effect of low-level laser therapy on incorporation of block allografts. OBJECTIVE: To assess the effect of low-level laser therapy (LLLT) on the incorporation of deep-frozen block allografts in a rabbit model. BACKGROUND DATA: Studies have shown that LLLT has beneficial effects on tissue repair and new bone formation. METHODS: Bone tissue was harvested from two rabbits, processed by deep-freezing and grafted into the calvaria of 12 animals, which were then randomly allocated into two groups: experimental (L) and control (C). Rabbits in group L were irradiated with an aluminum gallium arsenide diode laser (AlGaAs; wavelength 830 nm, 4 J/cm(2)), applied to four sites on the calvaria, for a total dose of 16 J/cm(2) per session. The total treatment dose after eight sessions was 128 J/cm(2). Animals were euthanized at 35 (n = 6) or 70 days (n = 6) postoperatively. RESULTS: Deep-freeze-processed block allografts followed by LLLT showed incorporation at the graft-host interface, moderate bone remodeling, partial filling of osteocyte lacunae, less inflammatory infiltrate in the early postoperative period, and higher collagen deposition than the control group. CONCLUSION: Optical microscopy and scanning electron microscopy showed that allograft bone processed by deep-freezing plus LLLT is suitable as an alternative for the treatment of bone defects. Use of the deep-freezing method for processing of bone grafts preserves the structural and osteoconductive characteristics of bone tissue. Animals;Bone Transplantation;Humans;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Osteogenesis;Rabbits;Skull;Transplantation, Homologous
Low-level laser therapy for treatment of pain associated with orthodontic elastomeric separator placement: a placebo-controlled randomized double-blind clinical trial. OBJECTIVE: The objective of this study was to evaluate the effectiveness of the use of irradiation with a low-level laser therapy (LLLT), wavelength 830â€‰nm, for treating pain inherent to tooth movement caused by orthodontic devices, simulated by positioning interdental elastomeric separators. METHODS: Sixty orthodontic patients were randomly assigned to two groups: GA (ages 12-25 years; mean 17.1 years) was the control, and GB (ages 12-26 years; mean 17.9 years) the intervention group. All patients received elastomeric separators on the mesial and distal surfaces of one of the lower first molars, and immediately after insertion of the separators received irradiation as randomly indicated. The intervention group (GB) received irradiation with LLLT (aluminum gallium arsenide diode), by a single spot in the region of the radicular apex at a dose of 2â€‰J/cm(2) and application along the radicular axis of the buccal surface with three spots of 1â€‰J/cm(2) (wavelength 830â€‰nm; infrared). Control group (GA) received irradiation with a placebo light in the same way. This was a double-blind study. All the patients received a questionnaire to be filled out at home describing their levels of pain 2, 6, and 24â€‰h and 3 and 5 days after orthodontic separator placement, in situations of relaxed and occluded mouth. RESULTS: The patients in the intervention group (LLLT) had lower mean pain scores in all the measures. The incidence of complete absence of pain (score=0) was significantly

higher the intervention group. CONCLUSIONS: Based on this study, authors concluded that single irradiation with LLLT of wavelength 830â€‰nm efficiently controlled the pain originating from positioning interdental elastomeric separators, to reproduce the painful sensation experienced by patients when fixed orthodontic devices are used. Elastomers Adolescent;Adult;Child;Double-Blind Method;Elastomers;Female;Humans;Low-Level Light Therapy;Male;Orthodontic Appliances;Pain;Pain Measurement;Tooth Movement Techniques;Young Adult

Low-level laser therapy (LLLT) combined with swimming training improved the lipid profile in rats fed with high-fat diet. Obesity and associated dyslipidemia is the fastest growing health problem throughout the world. The combination of exercise and low-level laser therapy (LLLT) could be a new approach to the treatment of obesity and associated disease. In this work, the effects of LLLT associated with exercises on the lipid metabolism in regular and high-fat diet rats were verified. We used 64 rats divided in eight groups with eight rats each, designed: SC, sedentary chow diet; SCL, sedentary chow diet laser, TC, trained chow diet; TCL, trained chow diet laser; SH, sedentary high-fat diet; SHL, sedentary high-fat diet laser; TH, trained high-fat diet; and THL, trained high-fat diet laser. The exercise used was swimming during 8Â weeks/90Â min daily and LLLT (GA-Al-As, 830Â nm) dose of 4.7Â J/point and total energy 9.4Â J per animal, applied to both gastrocnemius muscles after exercise. We analyzed biochemical parameters, percentage of fat, hepatic and muscular glycogen and relative mass of tissue, and weight percentage gain. The statistical test used was ANOVA, with post hoc Tukey-Kramer for multiple analysis between groups, and the significant level was pâ€‰<â€‰0.001, pâ€‰<â€‰0.01, and pâ€‰<â€‰0.05. LLLT decreased the total cholesterol (pâ€‰<â€‰0.05), triglycerides (pâ€‰<â€‰0.01), low-density lipoprotein cholesterol (pâ€‰<â€‰0.05), and relative mass of fat tissue (pâ€‰<â€‰0.05), suggesting increased metabolic activity and altered lipid pathways. The combination of exercise and LLLT increased the benefits of exercise alone. However, LLLT without exercise tended to increase body weight and fat content. LLLT may be a valuable addition to a regimen of diet and exercise for weight reduction and dyslipidemic control. Lipids;Liver Glycogen Animals;Combined Modality Therapy;Diet, High-Fat;Dyslipidemias;Lipid Metabolism;Lipids;Liver Glycogen;Low-Level Light Therapy;Male;Muscle, Skeletal;Obesity;Physical Conditioning, Animal;Rats;Rats, Wistar;Swimming

Simulating light transport through skin for color prediction of port wine stain lesions: a review. A survey of the literature is presented regarding the simulation of port wine stain (PWS) skin color. Knowledge of PWS features, such as the depths and diameters of affected vessels, is essential for informing laser treatment. These may be determined through the inverse application of a skin model. The techniques which have been applied to achieve this are analyzed in detail. Radiative transfer (RT) is found to be the preferred method of simulation. By far the most common approximations to RT are the diffusion approximations, which have been applied successfully in the past and Monte Carlo techniques, which are now the methods of choice. As the requirements for improvement of laser treatment on an individual basis continues, the needs for further work towards accurate estimations of individual optical coefficients and robust, flexible simulation techniques are identified. Melanins Computer Simulation;Humans;Lasers, Dye;Low-Level Light Therapy;Melanins;Models, Biological;Monte Carlo Method;Optical Phenomena;Port-Wine Stain;Skin Pigmentation;Spectrophotometry

CtIP is required to initiate replication-dependent interstrand crosslink repair. DNA interstrand crosslinks (ICLs) are toxic lesions that block the progression of replication and transcription. CtIP is a conserved DNA repair protein that facilitates DNA end resection in the double-strand break (DSB) repair pathway. Here we show that CtIP plays a critical role during initiation of ICL processing in replicating human cells that is distinct from its role in DSB repair. CtIP depletion sensitizes human

cells to ICL inducing agents and significantly impairs the accumulation of DNA damage response proteins RPA, ATR, FANCD2, Î³H2AX, and phosphorylated ATM at sites of laser generated ICLs. In contrast, the appearance of Î³H2AX and phosphorylated ATM at sites of laser generated double strand breaks (DSBs) is CtIP-independent. We present a model in which CtIP functions early in ICL repair in a BRCA1- and FANCM-dependent manner prior to generation of DSB repair intermediates. BRCA1 Protein;BRCA1 protein, human;Carrier Proteins;Fanconi Anemia Complementation Group D2 Protein;H2AX protein, human;Histones;Nuclear Proteins;Endodeoxyribonucleases;RBBP8 protein, human BRCA1 Protein;Carrier Proteins;DNA Breaks, Double-Stranded;DNA Damage;DNA Repair;DNA Replication;Endodeoxyribonucleases;Fanconi Anemia Complementation Group D2 Protein;HEK293 Cells;HeLa Cells;Histones;Humans;Low-Level Light Therapy;Metabolic Networks and Pathways;Nuclear Proteins

Evaluation of low-level laser therapy effectiveness on the pain and masticatory performance of patients with myofascial pain. This study investigated the effect of low-level laser therapy (LLLT) on the masticatory performance (MP), pressure pain threshold (PPT), and pain intensity in patients with myofascial pain. Twenty-one subjects, with myofascial pain according to Research Diagnostic Criteria/temporomandibular dysfunction, were divided into laser group (n = 12) and placebo group (n = 9) to receive laser therapy (active or placebo) two times per week for 4 weeks. The measured variables were: (1) MP by analysis of the geometric mean diameter (GMD) of the chewed particles using Optocal test material, (2) PPT by a pressure algometer, and (3) pain intensity by the visual analog scale (VAS). Measurements of MP and PPT were obtained at three time points: baseline, at the end of treatment with low-level laser and 30 days after (follow-up). VAS was measured at the same times as above and weekly throughout the laser therapy. The Friedman test was used at a significance level of 5% for data analysis. The study was approved by the Ethics Committee of the Federal University of Sergipe (CAAE: 0025.0.107.000-10). A reduction in the GMD of crushed particles ($p < 0.01$) and an increase in PPT ($p < 0.05$) were seen only in the laser group when comparing the baseline and end-of-treatment values. Both groups showed a decrease in pain intensity at the end of treatment. LLLT promoted an improvement in MP and PPT of the masticatory muscles. Adolescent;Adult;Facial Pain;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mastication;Masticatory Muscles;Pain Measurement;Pain Threshold;Temporomandibular Joint Disorders;Young Adult

Regenerative medicine, stem cells, and low-level laser therapy: future directives. Forecasting;Humans;Low-Level Light Therapy;Regenerative Medicine;Stem Cell Research;Stem Cell Transplantation

Low-level laser therapy in pediatric Bell's palsy: case report in a three-year-old child. OBJECTIVES: The objective of this study was to apply low-level laser therapy (LLLT) to accelerate the recovery process of a child patient with Bell's palsy (BP). DESIGN: This was a prospective study. SUBJECT: The subject was a three-year-old boy with a sudden onset of facial asymmetry due to an unknown cause. MATERIALS AND METHODS: The low-level laser source used was a gallium aluminum arsenide semiconductor diode laser device (660 nm and 780 nm). No steroids or other medications were given to the child. The laser beam with a 0.04-cm(2) spot area, and an aperture with approximately 1-mm diameter, was applied in a continuous emission mode in direct contact with the facial area. The duration of a laser session was between 15 and 30 minutes, depending on the chosen points and the area being treated. Light was applied 10 seconds per point on a maximum number of 80 points, when the entire affected (right) side of the face was irradiated, based on the small laser beam spot size. According to the acupuncture literature, this treatment could also be carried out using 10-20 Chinese acupuncture points, located unilaterally on the face. In this case study, more points were used because the entire affected side of the face (a large area) was irradiated instead of

using acupuncture points. OUTCOME MEASURES: The House-Brackmann grading system was used to monitor the evolution of facial nerve motor function. Photographs were taken after every session, always using the same camera and the same magnitude. The three-year-old boy recovered completely from BP after 11 sessions of LLLT. There were 4 sessions a week for the first 2 weeks, and the total treatment time was 3 weeks. RESULTS: The result of this study was the improvement of facial movement and facial symmetry, with complete reestablishment to normality. CONCLUSIONS: LLLT may be an alternative to speed up facial normality in pediatric BP. Acupuncture Points;Bell Palsy;Child, Preschool;Facial Nerve;Humans;Lasers;Low-Level Light Therapy;Male;Treatment Outcome

Low-level laser therapy improves crescentic glomerulonephritis in rats. Low-level laser therapy (LLLT) can reduce inflammation in a variety of clinical conditions, including trauma, postherpetic neuralgia, and rheumatoid arthritis. However, the effect of LLLT on internal organs has not been elucidated. The goal of the present study was to investigate the anti-inflammatory effect of daily external LLLT in an animal model of crescentic glomerulonephritis. Crescentic glomerulonephritis was induced in male Wister Kyoto rats by intravenous injection of antibody for glomerular basement membrane (GBM). The rats were irradiated with a low-reactive level diode laser with an infrared wavelength of 830Â nm from the shaved skin surface once a day for 14Â days (irradiation spot size on the skin surface, 2.27Â cm(2); power intensity, 880Â mW/cm(2); irradiation mode, continuous mode; irradiation time, 250Â s; energy, 500Â J; energy density, 220Â J/cm(2)). After laser irradiation for 14Â days, animals were killed, and the extent of inflammation was evaluated. Expression of gene for inflammatory cytokines including interleukin (IL)-1Î² and tumor necrosis factor alpha (TNF-Î±) was assessed by reverse transcription polymerase chain reaction. Crescent formation in glomeruli and infiltration of macrophages and lymphocytes were assessed by histochemical observation. Injection of anti-GBM antibody induced severe glomerulonephritis with crescent formation. Histological observations indicated that LLLT suppressed crescent formation and infiltration of ED1+ macrophages and CD8+ lymphocytes into the glomeruli. LLLT attenuated the levels of IL-1Î² and TNF-Î± messenger RNA in the renal cortex. Externally directed LLLT suppresses the activity of rat anti-GBM crescentic glomerulonephritis in rats. LLLT has the potential to be used for direct treatment of glomerulonephritis. Autoantibodies;Cytokines;Inflammation Mediators;antiglomerular basement membrane antibody Animals;Anti-Glomerular Basement Membrane Disease;Autoantibodies;CD8-Positive T-Lymphocytes;Cytokines;Disease Models, Animal;Glomerular Basement Membrane;Glomerulonephritis;Inflammation Mediators;Low-Level Light Therapy;Macrophages;Male;Rats;Rats, Inbred WKY

Light-emitting diode photobiomodulation: effect on bone formation in orthopedically expanded suture in rats--early bone changes. The aim of this experimental study was to evaluate histomorphometrically the effects of light-emitting diode (LED) photobiomodulation therapy (LPT) on bone formation in response to expansion of the interpremaxillary suture in rats. Twenty male, 50- to 60-day-old Wistar rats were divided into two equal groups (control and experimental). Both groups were subjected to expansion for 5Â days, and 50Â cN of force was applied to the maxillary incisors with helical spring. An OsseoPulseÂ® LED device, 618-nm wavelength and 20-mW/cm(2) output power irradiation, was applied to the interpremaxillary suture for 10Â days. Bone formation in the sutural area was histomorphometrically evaluated, including the amount of new bone formation (in square micrometers), number of osteoblasts, number of osteoclasts, and number of vessels. Mann-Whitney U test was used for statistical evaluation at pâ€‰<â€‰0.025 level. Significant differences were found between groups for all investigated histomorphometric parameters. New bone formation area (pâ€‰=â€‰0.024, 1.48-fold), number of osteoblasts (pâ€‰<â€‰0.001, 1.59-fold), number of osteoclasts (pâ€‰=â€‰0.004, 1.43-fold), and number of vessels (pâ€‰=â€‰0.007, 1.67-fold)

showed higher values in the experimental group than the control. Bone histomorphometric measurements revealed that bone architecture in the LPT group was improved. The application of LPT can stimulate bone formation in the orthopedically expanded interpremaxillary suture during expansion and the early phase of the retention periods. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxilla;Osteogenesis;Palatal Expansion Technique;Rats;Rats, Wistar

Photothermal cancer therapy via femtosecond-laser-excited FePt nanoparticles. FePt nanoparticles (NPs) have recently been revealed to be significant multifunctional materials for the applications of biomedical imaging, drug delivery and magnetic hyperthermia due to their novel magnetic properties. In this study, a newly discovered photothermal effect activated by the near infrared (NIR) femtosecond laser for FePt NPs was demonstrated. The threshold laser energy to destroy cancer cells was found to be comparable to that of gold nanorods (Au NRs) previously reported. Through the thermal lens technique, it was concluded that the temperature of the FePt NPs can be heated up to a couple of hundreds degree C in picoseconds under laser irradiation due to the excellent photothermal transduction efficiency of FePt NPs. This finding boosts FePt NPs versatility in multifunctional targeted cancer therapy. Platinum;Iron Animals;Cell Line, Tumor;Hyperthermia, Induced;Iron;Low-Level Light Therapy;Mammary Neoplasms, Experimental;Mice;Nanoparticles;Platinum;Radiation Dosage;Treatment Outcome

Side-by-side comparison of photodynamic therapy and pulsed-dye laser treatment of port-wine stain birthmarks. BACKGROUND: Pulsed-dye laser (PDL)-mediated photothermolysis is the current standard treatment for port-wine stain (PWS) birthmarks. Vascular-targeted photodynamic therapy (PDT) might be an alternative for the treatment of PWS. OBJECTIVES: To compare clinical outcomes of PDT and PDL treatment of PWS. METHODS: Two adjacent flat areas of PWS lesions were selected from each of 15 patients (two male and 13 female; age 11-36 years) and randomly assigned to either single-session PDL or PDT. PDL was delivered using a 585-nm pulsed laser. PDT was carried out with a combination of haematoporphyrin monomethyl ether (HMME) and a low-power copper vapour laser (510.6 and 578.2 nm). Clinical outcomes were evaluated colorimetrically and visually during follow-up. RESULTS: A total of nine red PWS lesions and six purple PWS lesions were treated. For red PWS, colorimetric assessment showed that the blanching rates of PDL and PDT at 2 months ranged from -11% to 24% and 22% to 55%, respectively. For purple PWS, blanching rates of PDL and PDT ranged from 8% to 33% and 30% to 45%, respectively. Overall, there was a significant difference between the blanching effect of single-session PDL treatment and a single-session PDT treatment. CONCLUSIONS: This side-by-side comparison demonstrates that PDT is at least as effective as PDL and, in some cases, superior. The true value of PDT for the treatment of PWS deserves further investigation. Hematoporphyrins;hematoporphyrin monomethyl ether Adolescent;Adult;Child;Female;Hematoporphyrin Photoradiation;Hematoporphyrins;Humans;Lasers, Dye;Lasers, Gas;Low-Level Light Therapy;Male;Port-Wine Stain;Treatment Outcome;Young Adult

Low-level laser therapy decreases renal interstitial fibrosis. OBJECTIVE: the purpose of this study was to investigate the effect of low-level laser therapy (LLLT) on chronic kidney disease (CKD) in a model of unilateral ureteral obstruction (UUO). BACKGROUND DATA: Regardless of the etiology, CKD involves progressive widespread tissue fibrosis, tubular atrophy, and loss of kidney function. This process also occurs in kidney allograft. At present, effective therapies for this condition are lacking. We investigated the effects of LLLT on the interstitial fibrosis that occurs after experimental UUO in rats. METHODS: The occluded kidney of half of the 32 Wistar rats that underwent UUO received a single intraoperative dose of LLLT (AlGaAs laser, 780â€‰nm, 22.5â€‰J/cm(2), 30â€‰mW, 0.75â€‰W/cm(2), 30â€‰sec on each of nine points). After 14 days, renal fibrosis was assessed by Sirius red staining under polarized light. Immunohistochemical analyses quantitated the renal tissue

cells that expressed fibroblast (FSP-1) and myofibroblast (Î±-SMA) markers. Reverse transcriptase polymerase chain reaction (RT-PCR) was performed to determine the mRNA expression of interleukin (IL)-6, monocyte chemotactic protein-1 (MCP-1), transforming growth factor (TGF)-Î²1 and Smad3. RESULTS: The UUO and LLLT animals had less fibrosis than the UUO animals, as well having decreased expression inflammatory and pro-fibrotic markers. CONCLUSIONS: For the first time, we showed that LLLT had a protective effect regarding renal interstitial fibrosis. It is conceivable that by attenuating inflammation, LLLT can prevent tubular activation and transdifferentiation, which are the two processes that mainly drive the renal fibrosis of the UUO model. Animals;Biopsy, Needle;Disease Models, Animal;Immunohistochemistry;Kidney Diseases;Low-Level Light Therapy;Male;Nephritis, Interstitial;Rats;Rats, Wistar;Sensitivity and Specificity;Treatment Outcome

Unique photothermal response and sustained photothermal effect of pH-responsive gold-nanoparticle aggregates. Hot gold: The photothermal response upon pulsed laser irradiation is studied for pH-responsive gold-nanoparticle aggregates and compared to that of gold nanorods. The aggregates show a slight red shift in the absorption spectrum and retain the photothermal effect, whereas the nanorods lose the photothermal effect and exhibit a stark blue shift in the absorption. Gold Gold;Hydrogen-Ion Concentration;Light;Low-Level Light Therapy;Metal Nanoparticles;Photochemical Processes;Photons

Low-intensity laser radiation changes amino acid composition of wheat callus tissues. Amino Acid Sequence;Low-Level Light Therapy;Triticum

Subablative Er:YAG laser effect on enamel demineralization. OBJECTIVES: To characterize the cariostatic potential of a low-energy Er:YAG laser treatment. METHODS: Twelve sound premolars were selected. Two 2 Ã— 1 mm windows were created on each tooth and randomly assigned to L(1) and L(2) groups. Three sites in each window were chosen with the middle site as the control and the left and right ones receiving Er:YAG laser treatment of 5.1 J/cm(2) (L(1)) or 2.0 J/cm(2) (L(2)), respectively. The teeth were further subjected to 4-day pH cycling to create caries-like lesions. After mineral quantification using a micro-computed tomography scanner, the preventive effects (Î”ML = mineral loss of the control area minus that of the lased area) of L(1) and L(2) treatments were calculated based on the difference in the gray value of the control and lased sites. RESULTS: Significant inhibitory effects of L(1) and L(2) on enamel demineralization were demonstrated (both p â‰¤ 0.001), with the L(1) treatment having a greater effect (45.2%) than the L(2) treatment (25.2%, p = 0.004). CONCLUSIONS: Subablative low-energy Er:YAG laser irradiation can significantly prevent enamel demineralization potentially through the retardation of enamel diffusion. This study confirmed that high-energy laser treatment, which may damage the peripheral and underlying tissues, may not be needed for caries prevention. Minerals;Acetic Acid Acetic Acid;Bicuspid;Dental Enamel;Diffusion;Humans;Humidity;Hydrogen-Ion Concentration;Image Processing, Computer-Assisted;Lasers, Solid-State;Low-Level Light Therapy;Minerals;Radiation Dosage;Temperature;Tooth Demineralization;Tooth Remineralization;X-Ray Microtomography

Low-level laser therapy using the minimally invasive laser needle system on osteoporotic bone in ovariectomized mice. This study tested the effectiveness of low-level laser therapy (LLLT) in preventing and/or treating osteoporotic trabecular bone. Mice were ovariectomized (OVX) to induce osteoporotic bone loss. The tibiae of eight OVX mice were treated for 5 days each week for 2 weeks by LLLT (660 nm, 3 J) using a minimally invasive laser needle system (MILNS) which is designed to minimize loss of laser energy before reaching bone (LASER group). Another eight mice received a sham treatment (SHAM group). Structural parameters of trabecular bone were measured with in vivo micro-computed tomography images before and after laser treatment. After LLLT for 2 weeks, the percentage reduction (%R) was significantly lower in BV/TV (bone volume fraction) and Tb.N (trabecular number, $p<0.05$ and $p<0.05$) and significant higher in Tb.Sp (trabecular separation) and

SMI (structure model index, p<0.05 and p<0.05) than in the SHAM group. The %R in BV/TV at sites directly treated by LLLT was significantly lower in the LASER group than the SHAM group (p<0.05, p<0.05). These results indicated that LLLT using MILNS may be effective for preventing and/or treating trabecular bone loss and the effect may be site-dependent in the same bone. Animals;Female;Low-Level Light Therapy;Mice;Needles;Osteoporosis;Ovariectomy;Tibia;Time Factors

Effect of soft laser in bone repair after expansion of the midpalatal suture in dogs. INTRODUCTION: The purpose of this research was to study the influence of soft laser treatment on the process of bone repair after expansion of the midpalatal suture. METHODS: The sample for this case-control experimental study was 11 dogs. They were randomly divided into 2 groups, both of which underwent rapid maxillary expansion with a hyrax appliance. The animals in group 1 were also treated with laser therapy. They were killed, and histologic specimens of the palatal suture were prepared. The Student t test was applied for independent data, and the Mann-Whitney test was used for nonparametric data. RESULTS: A significant difference was observed in the quality of the palatal sutures between the animals in groups 1 and 2. The connective tissues of the sutures in the group 1 animals were similar to the original configurations, with more advanced osteogenesis and fibrogenesis, compared with those of group 2. CONCLUSIONS: Soft laser appears to influence the behavior of the repair process, contributing to suture reorganization and palatal bone osteogenesis during and after expansion. Animals;Dogs;Female;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Osteoblasts;Osteogenesis;Palatal Expansion Technique;Palate, Hard;Random Allocation

Potential mechanism for the laser-fluoride effect on enamel demineralization. Laser-induced prevention of dental caries has been studied extensively. However, the cariostatic mechanisms of a combined fluoride-laser treatment are not well-understood. Using micro- computed tomography (micro-CT), we quantified the effect of fluoride and/or Er:YAG laser treatment on enamel demineralization. The mean mineral loss (%/V) for each group was 4,870 Â± 1,434 (fluoride followed by laser treatment), 6,341 Â± 2,204 (laser treatment), 7,669 Â± 2,255 (fluoride treatment), and 10,779 Â± 2,936 (control). The preventive effect of the laser ($p < 0.001$) and fluoride ($p = 0.010$) treatment was statistically significant. Characterized by micro-x-ray diffraction (XRD) analysis, the significant contraction in the a-axis after both laser and combined laser/fluoride treatment was revealed (both $p < 0.05$). In conclusion, subablative low-energy Er:YAG laser irradiation following fluoride treatment may instantaneously transform enamel hydroxyapatite into fluoridated hydroxyapatite to reduce enamel solubility as a preventive treatment for enamel demineralization. Apatites;Cariostatic Agents;Minerals;Durapatite;fluorapatite;Fluorides Apatites;Cariostatic Agents;Crystallography;Dental Enamel;Dental Enamel Solubility;Durapatite;Fluorides;Humans;Hydrogen-Ion Concentration;Lasers, Solid-State;Low-Level Light Therapy;Minerals;Tooth Demineralization;Tooth Remineralization;X-Ray Diffraction;X-Ray Microtomography

Promoting wound healing in minor recurrent aphthous stomatitis by non-thermal, non-ablative CO(2) laser therapy: a pilot study. BACKGROUND AND OBJECTIVE: This randomized controlled clinical trial (RCT) was designed to evaluate the effects of non-thermal, non-ablative CO(2) laser therapy (NACLT) to promote wound healing in minor recurrent aphthous stomatitis (miRAS). STUDY DESIGN/MATERIALS AND METHODS: Ten patients with 20 minor aphthous ulcers completed this study. Each patient had two discrete aphthous ulcers that had developed within 72â€‰h before enrollment. One of the ulcers was randomly allocated to be treated with NACLT and the other one served as placebo. Before laser irradiation, a layer of transparent, non-anesthetic oral gel with high water content was placed on the laser and placebo lesions both. The CO(2) laser device was operated using 1 W power in defocused continuous mode, scanning rapidly over the lesion. The placebo lesion

was irradiated with the same laser, but with an inactive probe. The healing times of the lesions were recorded by a blinded physician. RESULTS: The healing period was significantly shorter in ulcers treated by NACLT than in those treated with placebo (p=0.02). The process was not painful and anesthesia was not required. There were no visible side effects after NACLT and during follow-up periods. CONCLUSIONS: The results of this RCT suggest that single session of NACLT could be used to promote wound healing in minor aphthous ulcers, with no visible side effects.
Adult;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Reference Values;Severity of Illness Index;Stomatitis, Aphthous;Treatment Outcome;Wound Healing;Young Adult

Effect of intravenous low-intensity laser irradiation of the blood on clinical and laboratory parameters of hepatocellular insufficiency. Patients with hepatocellular insufficiency received a course of intravenous laser irradiation of the blood. After the treatment, a positive dynamics of clinical and biochemical indices of the major hepatic syndromes was observed: alleviation of the major clinical symptoms and significant positive changes in biochemical parameters (AST, ALT, bilirubin, alkaline phosphatase, lactate dehydrogenase, and total cholesterol). Administration, Intravenous;Adult;Aged;Blood;Blood Chemical Analysis;Female;Hepatic Insufficiency;Humans;Low-Level Light Therapy;Male;Middle Aged;Statistics, Nonparametric

Commentary: Ablative fractionated CO2 laser treatment of photoaging: a clinical and histologic study.
Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Skin Aging

Ablative fractionated CO2 laser treatment of photoaging: a clinical and histologic study.
BACKGROUND: Ablative fractional photothermolysis (AFP) has been reported to be effective for changes in skin pigmentation and texture associated with photoaging. METHODS: A prospective study for the treatment of photoaging using a fractionated ablative carbon dioxide laser in 10 subjects. Assessment of laser efficacy was made using two modalities: histologic examination of skin biopsies and blinded physician clinical photographic assessment. For the histologic portion of the study, patients were randomized to treatment with the device at settings of pulse durations of 500, 1,000, 1,500, and 1,800Â Î¼s. Depth of injury was assessed based on histologic evaluation of depth of thermal coagulation. For the clinical portion of the study, treatment was administered to the face using a carbon dioxide laser at settings of 30Â W, 500-Î¼m pitch (density of treatment equivalent to ablation of 25% of the skin), and variable pulse duration of 1,000 to 1,500Â Î¼s. RESULTS: The mean score for dyschromia had improved 47.5% (95% confidence interval (CI)Â =Â 44.1-50.9%), for skin texture 56.0% (95% CIÂ =Â 51.9-60.1%), for skin laxity 56.0% (95% CIÂ =Â 51.3-60.7%), for rhytides 52.5% (95% CIÂ =Â 48.3-56.7%) and for overall cosmetic outcome 61.5% (95% CIÂ =Â 56.4%,66.6%) 6Â months after treatment. Histologic data revealed a proportional increase in depth of thermal coagulation at each pulse duration. The mean ablation depth was 283Â Î¼m for a pulse duration of 500Â Î¼s, 375Â Î¼m for 1,000Â Î¼s, 767Â Î¼m for 1,500Â Î¼s, and 1.05Â mm for 1,800Â Î¼s. CONCLUSIONS: We present a histologic analysis documenting the correlation between longer pulse duration and ablation depth using an AFP device. We identified that pulse duration settings up to 1,800Â Î¼s could be used safely with an ablation depth up to 1.1Â mm, correlating with injury into the deep reticular dermis. Aged;Dose Fractionation, Radiation;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Skin;Skin Aging

Assessment of the effect of low-energy diode laser irradiation on gamma irradiated rats' mandibles. OBJECTIVE: The purpose of the present study was to evaluate the biostimulative and regenerative effects of low intensity laser irradiation (LILT) (applied before or after initiation of radiotherapy) on gamma irradiated rats' jaw bones. METHODS: Forty eight male Albino rats were equally divided into two groups: group 1, in which the left side of the mandible was subjected to three successive sessions of laser (LILT) prior to whole body gamma radiation (2Gy/3 fractions/week) and group 2, received

whole body gamma radiation (2Gy/3 fractions/week) prior to three successive sessions of laser applied to left side. The right side of both groups was used as gamma irradiated non-lased control group. Each group was then subdivided into four equal subgroups (a, b, c, d) according to the time of scarification (3, 7, 14, 21 days respectively). Specimens were subjected to histological, histomorphometric and scanning electron microscopic examinations. RESULTS: Thin irregular bone trabeculae and widened marrow spaces were identified in the control group. The lased sides of groups 1 and 2 demonstrated regular, thick and continuous bone trabeculae. Ultrastructurally, collagen fibres of the control group appeared irregularly arranged and more spaced compared to groups 1 and 2. Normal-sized osteocytic lacunae were seen in the lased groups, as compared to the wide lacunar spaces noted in the control group. Histomorphometric analysis showed a significant increase in the area of bone trabeculae, as well as the width of compact bone, for the lased groups. CONCLUSIONS: LILT seemed to attenuate the radiation-related damage in alveolar bones. Analysis of Variance;Animals;Bone Regeneration;Low-Level Light Therapy;Male;Mandible;Microscopy, Electron, Scanning;Osteoradionecrosis;Radiotherapy;Rats

Effectiveness of photoactivated disinfection (PAD) to kill enterococcus faecalis in planktonic solution and in an infected tooth model. OBJECTIVE: The aim of this study was to investigate the effectiveness of photoactivated disinfection (PAD) in killing Enterococcus faecalis (EF) in planktonic solution and in an infected tooth model. METHODS: One hundred and thirty-two glass tubes of EF samples with concentration of 10(14) colony forming units (CFU)/mL and photosensitizer were prepared. Sixteen groups were set up and subjected to diode laser, and then received a radiation energy dose ranging from 0.5 to 5.5â€‰J. The bactericidal effect was measured by the mean CFU of viable EF after irradiation. Sixty single-rooted teeth were selected and contaminated with EF, and then given PAD therapy; 5.25% NaOCl irrigation and saline solution were used to disinfect the root canals. Microbial samples were taken before and after disinfection, and after 72â€‰h recovery, and then the CFU were counted. RESULTS: The bactericidal effect increased linearly with the irradiation energy dose in planktonic solution. For the same irradiation energy dose, the bactericidal effect was greater in group receiving 100â€‰mW than in that receiving 50â€‰mW and exposed to doubled irradiation time ($p<0.05$). No bacterium was detected after irrigation in the NaOCl group in the root canal model, but the recovery of bacteria after 72â€‰h was detected in 11 samples. Bacteria were detected in all the other groups, and PAD was significantly more effective than saline solution in reducing the number of bacterial cells within the root canals ($p<0.05$). CONCLUSIONS: PAD was shown to have bactericidal effect on EF, and the bactericidal effect increased linearly with the irradiation energy dose and was superior using higher output power. PAD could decrease EF in root canals effectively, but was no more effective than 5.25% NaOCl, and PAD is more effective in planktonic solution than in root canals. Root Canal Irrigants;Tolonium Chloride;Sodium Hypochlorite Colony Count, Microbial;Dental Pulp Cavity;Disinfection;Enterococcus faecalis;Humans;Low-Level Light Therapy;Models, Dental;Photochemotherapy;Plankton;Root Canal Irrigants;Root Canal Therapy;Sensitivity and Specificity;Sodium Hypochlorite;Tolonium Chloride

Therapeutic modalities for localized psoriasis: 308-nm UVB excimer laser versus nontargeted phototherapy. UVB phototherapy is an effective treatment modality for psoriasis. For patients with localized plaque-type lesions, 308-nm excimer laser phototherapy offers rapidly delivered, targeted, high UVB doses, while sparing adjacent healthy skin. We aimed to compare the advantages and disadvantages of the 308-nm xenon chloride (XeCl) UVB excimer laser with nontargeted broadband UVB (BB-UVB), narrowband UVB (NB-UVB), and psoralen plus UVA (PUVA) phototherapies. A PubMed search for studies evaluating the efficacy and safety of the laser versus nontargeted phototherapeutic modalities was conducted. Three prospective nonrandomized studies compared NB-UVB with excimer laser phototherapy. No head-to-head studies were found for BB-UVB

or PUVA compared to excimer laser. Both the 308-nm excimer laser and nontargeted phototherapies were found to effectively clear localized psoriasis. Although it is proposed that excimer laser exclusively treats diseased skin with better response rates, split-body trials revealed no differences. Long-term studies are necessary to compare the effects of high-dose excimer laser regimens with nontargeted phototherapies. Humans;Lasers, Excimer;PUVA Therapy;Psoriasis;Treatment Outcome;Ultraviolet Therapy

[The laser in dermatology]. Dermatologic Surgical Procedures;Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases

Low-level laser therapy in meniscal pathology: a double-blinded placebo-controlled trial. We performed a randomized, double-blinded, placebo-controlled study (ISRCTN24203769) to assess the effectiveness of low-level laser therapy (LLLT) in patients with meniscal pathology, including only symptomatic patients with tiny focus of grade 3 attenuation (seen only on 0.7 thickness sequences) or intrasubstance tears with spot of grade 3 signal intensity approaching the articular surface. None of the patients in the study group underwent arthroscopy or new magnetic resonance imaging investigation. Paired-samples t test was used to detect significant changes in subjective knee pain over the experimental period within groups, and ANOVA was used to detect any significant differences between the two groups. Pain was significantly improved for the LLLT group than for the placebo group (Fâ€‰=â€‰154, pâ€‰<â€‰0.0001). Pain scores were significantly better after LLLT. Four (12.5Â %) patients did not respond to LLLT. At baseline, the average Lysholm score was 77â€‰Â±â€‰4.6 for the LLLT group and 77.2â€‰Â±â€‰2.6 for the placebo group (pâ€‰>â€‰0.05). Four weeks after LLLT or placebo therapy, the laser group reported an average Lysholm score of 82.5â€‰Â±â€‰4.6, and the placebo group scored 79.0â€‰Â±â€‰1.9. At 6Â months, the laser group had an average Lysholm score of 82.2â€‰Â±â€‰5.7, and after 1Â year, they scored 81.6â€‰Â±â€‰6.6 (Fâ€‰=â€‰14.82923, pâ€‰=â€‰0.002). Treatment with LLLT was associated with a significant decrease of symptoms compared to the placebo group: it should be considered in patients with meniscal tears who do not wish to undergo surgery. Adult;Double-Blind Method;Female;Humans;Knee Injuries;Lasers, Semiconductor;Low-Level Light Therapy;Male;Menisci, Tibial;Middle Aged;Pain;Tibial Meniscus Injuries

Enhanced wound healing effect of canine adipose-derived mesenchymal stem cells with low-level laser therapy in athymic mice. BACKGROUND: Adipose-derived mesenchymal stem cells (ASCs) are attractive cell source for skin tissue engineering. However, one obstacle to this approach is that the transplanted ASC population can decline rapidly in the recipient tissue. OBJECTIVE: The aim of this study was to investigate the effects of low-level laser therapy (LLLT) on transplanted canine ASCs in a skin wound animal model. METHODS: LLLT, ASC transplantation (ASCs) and ASC transplantation with LLLT (ASCs+LLLT) were applied to the wound bed in athymic mice. Wound healing was assessed by gross evaluation and by hematoxylin and eosin staining. The survival, differentiation and secretion of vascular endothelial growth factor and basic fibroblast growth factor of the ASCs were evaluated by immunohistochemistry and Western blotting. RESULTS: The ASCs and ASCs+LLLT groups stimulated wound closure and histological skin regeneration. The ASCs+LLLT group enhanced the wound healing, including neovascularization and regeneration of skin appendages, compared with the ASCs group. The ASCs contributed skin regeneration via differentiation and secretion of growth factors. In the ASCs+LLLT group, the survival of ASCs was increased by the decreased apoptosis of ASCs in the wound bed. The secretion of growth factors was stimulated in the ASCs+LLLT group compared with the ASCs group. CONCLUSION: These data suggest that LLLT is an effective biostimulator of ASCs in wound healing that enhances the survival of ASCs and stimulates the secretion of growth factors in the wound bed. Ki-67 Antigen;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, mouse;Fibroblast Growth Factor 2;Keratins;Casp3 protein, mouse;Caspase 3 Adipose

Tissue;Animals;Caspase 3;Cell Differentiation;Cell Survival;Dogs;Female;Fibroblast Growth Factor 2;Keratins;Ki-67 Antigen;Low-Level Light Therapy;Mesenchymal Stem Cell Transplantation;Mesenchymal Stem Cells;Mice;Mice, Nude;Skin;Tissue Engineering;Vascular Endothelial Growth Factor A;Wound Healing

Transcranial red and near infrared light transmission in a cadaveric model. BACKGROUND AND OBJECTIVE: Low level light therapy has garnered significant interest within the past decade. The exact molecular mechanisms of how red and near infrared light result in physiologic modulation are not fully understood. Heme moieties and copper within cells are red and near infrared light photoreceptors that induce the mitochondrial respiratory chain component cytochrome C oxidase, resulting in a cascade linked to cytoprotection and cellular metabolism. The copper centers in cytochrome C oxidase have a broad absorption range that peaks around 830 nm. Several in vitro and in vivo animal and human models exist that have demonstrated the benefits of red light and near infrared light for various conditions. Clinical applications for low level light therapy are varied. One study in particular demonstrated improved durable functional outcomes status post-stroke in patients treated with near infrared low level light therapy compared to sham treatment [1]. Despite previous data suggesting the beneficial effect in treating multiple conditions, including stroke, with low level light therapy, limited data exists that measures transmission in a human model. STUDY DESIGN/MATERIALS AND METHODS: To investigate this idea, we measured the transmission of near infrared light energy, using red light for purposes of comparison, through intact cadaver soft tissue, skull bones, and brain using a commercially available LED device at 830 nm and 633 nm. RESULTS: Our results demonstrate that near infrared measurably penetrates soft tissue, bone and brain parenchyma in the formalin preserved cadaveric model, in comparison to negligible red light transmission in the same conditions. CONCLUSION: These findings indicate that near infrared light can penetrate formalin fixed soft tissue, bone and brain and implicate that benefits observed in clinical studies are potentially related to direct action of near infrared light on neural tissue. Heme;Copper;Electron Transport Complex IV Brain;Cadaver;Copper;Electron Transport Complex IV;Heme;Humans;Infrared Rays;Male;Phototherapy;Skull

Clinical effectiveness of diode laser therapy as an adjunct to non-surgical periodontal treatment: a randomized clinical study. BACKGROUND: The aim of this randomized clinical study is to evaluate the effect of a 980-nm diode laser as an adjunct to scaling and root planing (SRP) treatment. METHODS: Thirty-five patients with chronic periodontitis were selected for the split-mouth clinical study. SRP was performed using a sonic device and hand instruments. Quadrants were equally divided between the right and left sides. Teeth were treated with SRP in two control quadrants (control groups [CG]), and the diode laser was used adjunctively with SRP in contralateral quadrants (laser groups [LG]). Diode laser therapy was applied to periodontal pockets on days 1, 3, and 7 after SRP. Baseline data, including approximal plaque index (API), bleeding on probing (BOP), probing depth (PD), and clinical attachment level (CAL), were recorded before the treatment and 6 and 18 weeks after treatment. Changes in PD and CAL were analyzed separately for initially moderate (4 to 6 mm) and deep (7 to 10 mm) pockets. RESULTS: The results were similar for both groups in terms of API, BOP, PD in deep pockets, and CAL. The laser group showed only significant PD gain in moderate pockets during the baseline to 18-week ($P < 0.05$) and 6- to 18- week ($P < 0.05$) periods, whereas no difference was found between LG and CG in the remaining clinical parameters ($P > 0.05$). CONCLUSION: The present study indicates that, compared to SRP alone, multiple adjunctive applications of a 980-nm diode laser with SRP showed PD improvements only in moderate periodontal pockets (4 to 6 mm). Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Plaque Index;Dental Scaling;Female;Follow-Up Studies;Gingival

Hemorrhage;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Periodontal Attachment Loss;Periodontal Index;Periodontal Pocket;Root Planing;Single-Blind Method;Treatment Outcome

Gene expression and release of growth factors during delayed wound healing: a review of studies in diabetic animals and possible combined laser phototherapy and growth factor treatment to enhance healing. OBJECTIVE: The purposes of this study were: to review studies of growth factors in cutaneous wounds of animals with diabetes to identify those factors with altered gene expression and content compared with nondiabetic animals; and to explore which deficiencies of growth factors in diabetic wounds may or may not be improved by laser irradiation. BACKGROUND DATA: Wound healing is compromised in diabetes. Decreased production and/or increased destruction of growth factors may be responsible. Laser irradiation can increase the gene expression and release of certain growth factors by cells. METHODS: Research articles investigating growth factor expression in wounds of nondiabetic and diabetic mice and rats published through September 2011 were retrieved from library sources, PubMed databases, reference lists of articles, and searches of relevant journals. RESULTS: Vascular endothelial growth factor (VEGF), placental growth factor (PlGF), keratinocyte growth factor (KGF), fibroblast growth factor 1 (FGF-1), FGF-2, insulin-like growth factor 1 (IGF-1), IGF-2, transforming growth factor beta (TGF-Î²), and nerve growth factor (NGF) had decreased gene expression and content in early phases of healing for diabetic wounds. Gene expression of KGF, IGF-1, and IGF-2 was delayed, whereas that of FGF-1 and FGF-2 occurred earlier, in diabetic compared with nondiabetic wounds. CONCLUSIONS: Growth factor administration combined with laser irradiation may provide an effective therapy to maximize healing of diabetic wounds. Insulin-Like Growth Factor Binding Proteins;Intercellular Signaling Peptides and Proteins;Vascular Endothelial Growth Factor A Animals;Diabetes Mellitus, Experimental;Down-Regulation;Insulin-Like Growth Factor Binding Proteins;Intercellular Signaling Peptides and Proteins;Low-Level Light Therapy;Mice;Rats;Up-Regulation;Vascular Endothelial Growth Factor A;Wound Healing

[Pilot results of prostatic adenoma treatment with diode laser Medilas D UroBeam in the Ukraine]. Pilot results of prostatic adenoma treatment with diode laser (940 nm) in 94 patients showed high efficacy of laser vaporization of the prostate. The effect was achieved in all the patients in minimal number of complications and in satisfactory tolerance of the surgery. Laser vaporization has some advantages over standard treatment (TUR) and is a method of choice in small and middle-size adenomas. In large adenoma good results were obtained in combination of laser vaporization with bipolar TUR. Aged;Aged, 80 and over;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prostatic Hyperplasia;Ukraine

Effect of Er,Cr:YSGG laser on human dentin fluid flow. The aim of the current investigation was to assess the rate and magnitude of dentin fluid flow of dentinal surfaces irradiated with Er,Cr:YSGG laser. Twenty extracted third molars were sectioned, mounted, and irradiated with Er,Cr:YSGG laser at 3.5 and 4.5 W power settings. Specimens were connected to an automated fluid flow measurement apparatus (Flodec). The rate, magnitude, and direction of dentin fluid flow were recorded at baseline and after irradiation. Nonparametric Wilcoxon signed ranks repeated measure t test revealed a statistically significant reduction in fluid flow for all the power settings. The 4.5-W power output reduced the flow significantly more than the 3.5 W. The samples showed a baseline outward flow followed by inward flow due to irradiation then followed by decreased outward flow. It was concluded that Er,Cr:YSGG laser irradiation at 3.5 and 4.5 W significantly reduced dentinal fluid flow rate. The reduction was directly proportional to power output. Dentin;Dentin Sensitivity;Humans;Hydrodynamics;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Pilot Projects

Effectiveness of low-level laser therapy combined with an exercise program to reduce pain and increase function in adults with shoulder pain: a critically appraised topic. CLINICAL SCENARIO:

Shoulder pain is a common musculoskeletal condition that affects up to 25% of the general population. Shoulder pain can be caused by any number of underlying conditions including Subacromial impingement syndrome, rotator-cuff tendinitis, and biceps tendinitis. Regardless of the specific pathology, pain is generally the number 1 symptom associated with shoulder injuries and can severely affect daily activities and quality of life of patients with these conditions. Two of the primary goals in the treatment of these conditions are reducing pain and increasing shoulder range of motion (ROM). Conservative treatment has traditionally included a therapeutic exercise program targeted at increasing ROM, strengthening the muscles around the joint, proprioceptive training, or some combination of those activities. In addition, these exercise programs have been supplemented with other interventions including nonsteroidal anti-inflammatory drugs, corticosteroid injections, manual therapy, activity modification, and a wide array of therapeutic modalities (eg, cryotherapy, EMS, ultrasound). Recently, low-level laser therapy (LLLT) has been used as an additional modality in the conservative management of patients with shoulder pain. However, the true effectiveness of LLLT in decreasing pain and increasing function in patients with shoulder pain is unclear. FOCUSED CLINICAL QUESTION: Is low-level laser therapy combined with an exercise program more effective than an exercise program alone in the treatment of adults with shoulder pain? Combined Modality Therapy;Evidence-Based Medicine;Exercise Therapy;Humans;Low-Level Light Therapy;Pain Measurement;Shoulder;Shoulder Impingement Syndrome;Shoulder Pain;Treatment Outcome

Activation of nuclear estrogen receptors induced by low-power laser irradiation via PI3-K/Akt signaling cascade. Low-power laser irradiation (LPLI) has been shown to exert promotive effects on cell survival and proliferation through activation of various signaling pathways. Estrogen receptors (ERs, ERÎ±, and ERÎ²) are ligand-activated transcription factors, which regulate target gene expression, promote cell proliferation, and resist apoptosis. However, it is unclear whether LPLI could induce ligand-independent activation of ERs. In the present study, we investigated the subcellular pools, nuclear redistribution, and transcriptional activity of ERs under LPLI (1.2 J/cm(2), 633 nm) treatment using single-molecule fluorescence imaging and dual-luciferase reporter assay. We found that ERs were not only localized to nucleus, but also existed in mitochondria. Moreover, we found that LPLI induced nuclear redistribution and transcriptional activity of ERs in a ligand-independent manner. Our further investigation showed that PI3-K/Akt signaling cascade was involved in LPLI-induced activation of ERs. Wortmannin, a PI3-K inhibitor, or triciribine (API-2), a specific Akt inhibitor, potently suppressed the nuclear redistribution and transcriptional activity of ERs induced by LPLI, revealing that PI3-K/Akt signaling cascade was required for the activation of ERs induced by LPLI. Collectively, we demonstrated the first time that LPLI induced the ligand-independent nuclear redistribution and transcriptional activity of ERs, which were dependent on the activity of PI3-K/Akt. Our findings provide direct evidence for the molecular mechanisms of LPLI-induced transcription factor activation. Androstadienes;Estrogens;Phosphoinositide-3 Kinase Inhibitors;Reactive Oxygen Species;Receptors, Estrogen;Ribonucleosides;triciribine;Proto-Oncogene Proteins c-akt;Wortmannin Androstadienes;Animals;Apoptosis;COS Cells;Cell Nucleus;Cell Proliferation;Chlorocebus aethiops;Estrogens;Gene Expression Regulation, Neoplastic;Hep G2 Cells;Humans;Low-Level Light Therapy;MCF-7 Cells;Mitochondria;Phosphatidylinositol 3-Kinases;Phosphoinositide-3 Kinase Inhibitors;Proto-Oncogene Proteins c-akt;Reactive Oxygen Species;Receptors, Estrogen;Ribonucleosides;Signal Transduction;Wortmannin

A comparative study of temperature elevation on human teeth root surfaces during Nd:YAG laser irradiation in root canals. The purpose of this study was to evaluate the temperatures on the root surfaces during Nd:YAG laser irradiation in root canals using pulse durations of 180 and 320 Î¼s. Thirty extracted human teeth were used in this study. The teeth were enlarged up to ISO 40 (multi-rooted) or up to ISO 60 (single-rooted) by conventional technique using K-files. Then the teeth were

placed into a water bath with a constant temperature of 37 Â°C and then irradiated with an Nd:YAG laser having an output power of 1.5 W, a frequency of 15 Hz, using an optic fiber of 200 Î¼m diameter. The temperature on the root surface was measured by means of attaching thermocouples in three areas (coronal, mesial, and apical regions) of the root canals. The thermographic study showed that the average temperature elevation for both pulse durations on the root surfaces was less than 9 Â°C. There was no significant difference in the observed temperatures in coronal and mesial areas. Though a higher increase of temperature was observed in the apical region when the pulse length of the Nd:YAG laser was 320 Î¼s. The results of the study showed that the temperature rises during Nd:YAG laser irradiation with parameters used in this study minimal to cause damage on bone and periodontal tissues. Moreover, it was suggested that in order to have lower temperature in the apical region, an Nd:YAG laser with a pulse length of 180 Î¼s is preferred than one with a pulse length of 320 Î¼s. Hot Temperature;Humans;Lasers, Solid-State;Low-Level Light Therapy;Root Canal Preparation;Tooth Root

Evaluation of muscle regeneration in aged animals after treatment with low-level laser therapy. BACKGROUND: The aging process and its associated morphophysiological changes trigger a reduction in the regenerative ability of the satellite cells, a reduction of vascular tissue and an increase in the production of fibroblasts, developing a cellular environment unfavorable for muscle regeneration. OBJECTIVE: The aim of this study was to evaluate the effect of low-level laser therapy on the muscle regeneration of old experimental rat models after contusion. METHOD: A total of 25 old rats,18 months old, were divided into three groups: control group (CT) without treatment; injury group (IN) with muscle contusion and without treatment and laser group (LA) with contusion and low-level laser therapy, 830 nm, 30 mW e 4 J/cmÂ². The no invasive contusion was induced in the Tibialis Anterior muscle and the samples were collected after 7 and 21 treatment sessions. The muscle was evaluated by Light Microscopy and Immunoblotting. RESULTS: After 21 days of treatment there was a significant reduction in the areas of inflammation/regeneration of the LA 21 group compared to IN 21 group. The cross-sectional area of the fibers in regeneration was not statistically different between the groups. Molecular analysis showed that the content of MyoD was statistically reduced in the IN 21 group compared to the CT group. The Myogenin content was increased in the IN 21 group compared to the CT group. Ultimately, the content of TGF-Î²1 on the IN 21 group was higher when compared to the CT group. CONCLUSION: Considering the parameters used, the laser therapy demonstrated to be effective for muscle regeneration in old rats, however only through its anti-inflammatory effect. Aftercare;Age Factors;Animals;Contusions;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Regeneration

Collagen production in diabetic wounded fibroblasts in response to low-intensity laser irradiation at 660 nm. BACKGROUND: Collagen type I (Col-I) is a major component of the extracellular matrix and is important in wound healing processes. Several studies have shown that low-intensity laser irradiation (LILI) biostimulates Col-I synthesis both in vitro and in vivo. This study aimed to determine if LILI affects collagen production and related cellular responses in an in vitro diabetic wounded fibroblast model. MATERIALS AND METHODS: This study was performed on isolated human skin fibroblasts. Different cell models (normal and diabetic wounded) were used. Cells were irradiated with 5 J/cm(2) at a wavelength of 660 nm and incubated for 48 or 72 h. Nonirradiated cells (0 J/cm(2)) were used as controls. Cellular viability (Trypan blue exclusion test), morphology (bright-field microscopy), proliferation [VisionBlueâ„¢ quick cell proliferation assay and 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay], and Col-I (enzyme-linked immunoabsorbent assay) were assessed. RESULTS: Diabetic wounded cells irradiated with 5 J/cm(2) at 660 nm showed a significant increase in cell migration, viability, proliferation, and collagen content. CONCLUSIONS: This study shows that LILI stimulates Col-I synthesis in diabetic wound healing in vitro at 660 nm. Collagen

Cell Proliferation;Cells, Cultured;Collagen;Diabetic Foot;Fibroblasts;Humans;Low-Level Light Therapy;Radiation Dosage;Skin;Wound Healing
Helium-neon laser improves skin repair in rabbits. The purpose of this study was to evaluate the influence of helium-neon laser on skin injury in rabbits. For this purpose, 15 New Zealand rabbits underwent bilateral skin damage in leg. Helium-neon laser light, at a fluence of 6â€,Jâˆ•cm2 and wavelength of 632.8â€,nm, was applied on the left legs (laser group). The right leg lesions (control group) served as negative control. All sections were histopathologically analyzed using HE sections. The results showed little infiltration of inflammatory cells, with proliferation of fibroblasts forming a few fibrous connective tissue after 1 week post-injury. The lesion on the 3rd week was characterized by granulation tissue, which formed from proliferated fibrous connective tissue, congested blood vessels and mild mononuclear cell infiltration. On the 5th week, it was observed that debris material surrounded by a thick layer of connective tissue and dense collage, fibroblasts cells present in the dermis covered by a thick epidermal layer represented by keratinized epithelium. Taken together, our results suggest that helium-neon laser is able to improve skin repair in rabbits at early phases of recovery. Helium;Neon Animals;Cell Proliferation;Fibroblasts;Helium;Inflammation;Lasers, Gas;Low-Level Light Therapy;Male;Neon;Neutrophils;Rabbits;Skin;Wound Healing
Non-ablative 1540 fractional laser: how far could it help injection lipolysis and dermal fillers in lower-face rejuvenation? A randomized controlled trial. BACKGROUND: Rejuvenation of the lower face can be challenging and no single modality can accomplish all its complex events. PATIENTS AND METHODS: This 18-month study included 24 female patients with a primary complaint of lower-face aging signs. They were randomly allocated to either Group A, who received injection lipolysis and hyaluronic acid dermal filler, or Group B who in addition received non-ablative 1540 fractional laser. The improvement evaluation score used was the global aesthetic improvement scale (GAIS). Patient's satisfaction level was also recorded. Both were repeated at Months 6, 13 and 18. RESULTS: At all evaluations, laser group showed higher degree of improvement. Interestingly, at short-term evaluation (6 month), there was no significant difference between both groups ($P > 0.05$). However, the laser group improvement in comparison to the other group became significant in the long-term evaluations (13 and 18 months) ($P < 0.05$). CONCLUSION: This study further documents the importance of combination therapy in facial rejuvenation, offering a treatment protocol combining injection lipolysis and hyaluronic acid as an effective, safe, short-term therapeutic option in lower-face rejuvenation. The addition of 1540 non-ablative fractional laser to the protocol offers a higher efficacy with longer-term effects and no adverse events. Hyaluronic Acid Adult;Aged;Combined Modality Therapy;Cosmetic Techniques;Face;Female;Humans;Hyaluronic Acid;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Rejuvenation;Skin Aging
Onychomycosis: modern diagnostic and treatment approaches. The medical term onychomycosis should be understood as chronic infection of the nails caused by a fungus. The most common causative agents are the dermatophytes and Candida species. The less common are certain types of moulds (nondermatophyte moulds or NDMs). In approximately 60-80 % of the cases, onychomycosis is due to dermatophytes. Among dermatophytes, the most often isolated causative pathogen is Trichophyton (T.) rubrum. Other common species are T. interdigitale (formerly T. mentagrophytes), Epidermophyton floccosum, and T. tonsurans. The most significant yeasts causing onychomycosis are Candida albicans and Candida parapsilosis. Predisposing factors for onychomycosis include mainly diseases such as diabetes mellitus, peripheral vascular arterial disease, chronic venous insufficiency, polyneuropathies of diverse etiologies, and immunosuppression, e.g., myeloproliferative diseases (such as lymphoma and paraproteinemia), HIV/AIDS, etc. Other factors facilitating the fungal infection are frequent trauma in professional sportsmen, often accompanied by

excessive perspiration. The diagnostic methods that are often applied in different dermatologic departments and ambulatory units are also different. This precludes the creation of a unified diagnostic algorithm that could be used everywhere as a possible standard. In most of the cases, the method of choice depends on the specialist's individual experience. The therapeutic approach depends mostly on the fungal organism identified by the dermatologist or mycologist. This review hereby includes the conventional as well as the newest and most reliable and modern methods used for the identification of the pathogens causing onychomycosis. Moreover, detailed information is suggested, about the choice of therapeutic scheme in case whether dermatophytes, moulds, or yeasts have been identified as causative agents. A thorough discussion of the schemes and duration of the antifungal therapy in certain groups of patients have been included. Antifungal Agents;DNA, Fungal;Naphthalenes;Itraconazole;Fluconazole;Terbinafine Antifungal Agents;Candidiasis;Combined Modality Therapy;DNA, Fungal;Dermatomycoses;Enzyme-Linked Immunosorbent Assay;Fluconazole;Humans;Itraconazole;Lasers, Solid-State;Low-Level Light Therapy;Naphthalenes;Onychomycosis;Opportunistic Infections;Polymerase Chain Reaction;Risk Factors;Spectrometry, Mass, Matrix-Assisted Laser Desorption-Ionization;Terbinafine;Tinea

Thermodynamic effects of laser irradiation of implants placed in bone: an in vitro study. Lasers have been proposed for various applications involving dental implants, including uncovering implants and treating peri-implantitis. However, the effect of laser irradiation on the implant surface temperature is only partially known. The aim of this pilot study was to determine the effect of irradiation with diode, carbon dioxide, and Er:YAG lasers on the surface temperature of dental implants placed in bone, in vitro. For this study, one dental implant was placed in a bovine rib. A trephine bur was used to create a circumferential defect to simulate peri-implantitis, and thermocouples were placed at the coronal and apical aspect of the implant. The implant was irradiated for 60 s using four different lasers independently and change in temperature as well as time to reach a 10 Â°C increase in temperature were recorded. There was wide variability in results among the lasers and settings. Time for a 10 Â°C increase ranged from 0.9 to over 60 s for the coronal thermocouple and from 18 to over 60 s for the apical thermocouple. Maximum temperature ranged from 5.9 to 70.9 Â°C coronally and from 1.4 to 23.4 Â°C apically. During laser irradiation of dental implants, a surface temperature increase beyond the "critical threshold" of 10 Â°C can be reached after only 18 s. Dental Implants Animals;Cattle;Dental Implants;Hot Temperature;Lasers;Lasers, Gas;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Peri-Implantitis;Pilot Projects;Thermodynamics

Anti-inflammatory effect of low-intensity laser on the healing of third-degree burn wounds in rats. Third-degree burn wounds are considered severe injuries because they destroy all the skin layers and may affect subcutaneous tissues, fasciae, muscles, and bones. To favor the healing process of the injured tissues, it is very useful to diminish the occurrence of the inflammatory process. The present study was aimed at comparing the effect of different energetic densities of AlGaInP laser on the inflammatory process and in the healing of third-degree burn wounds in Wistar rats. This study was approved by the Ethics Committee, in which 36 adult male rats were selected and suffered the induction of third-degree burn injury. These rats were divided as follows: group 1-control (treated with silver sulfadiazine), group 2-received energy density of 3Â J/cm(2), and group 3-received energy density of 6Â J/cm(2). All animals daily received an occlusive bandage with silver sulfadiazine and 8Â % papain. The laser therapy was performed alternatively three times a week. The animals were evaluated on the 3rd, 7th, 14th, and 21st days after the initial lesion and euthanized for the macroscopic, histologic, and morphometric analysis. A higher production of collagen was observed at 7Â days and a greater re-epithelialization at 21Â days in group 3 (6Â J/cm(2)). Furthermore, the latter when compared to the other groups presented macroscopically a better aspect of the scar at

21Â days with more granulation tissue and fibrosis. We conclude that the AlGaInP laser used in dosages of 3 and 6Â J/cm(2) favors the healing of third-degree burn wounds induced in rats. Collagen Animals;Burns;Collagen;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Wound Healing

Targeted phototherapy using 308Â nm Xecl monochromatic excimer laser for psoriasis at difficult to treat sites. Psoriasis is a chronic inflammatory multisystem disease involving skin and joints affecting 1-3Â % of the world population. The 308-nm excimer laser has been recently used in the treatment of psoriasis, especially localized psoriasis of scalp and palm and soles. The objective of the study is to evaluate the therapeutic efficacy and safety of a 308-nm excimer laser for the treatment of scalp and palmoplantar psoriasis. A total of 41 adult patients (25 males and 16 females) were enrolled in this study, of which 26 patients had lesions localized to scalp, and 15 patients had involvement of palm and soles. The mean age was 44.5Â years (range 18-73). And, the mean duration of psoriasis in our patients was 15Â years. They were treated with a 308-nm excimer laser. The initial dose was based on multiples of a predetermined minimal erythema dose, twice weekly for a maximum 12Â weeks. Twenty-two of the 23 patients with scalp psoriasis showed improvement, while one patient showed no change; none experienced worsening of symptoms. The mean minimal erythema dose (MED) was found to be 383Â mJ/cm(2) (range 180-650Â mJ/cm(2)). The cumulative dose of irradiation was 1,841Â mJ/cm(2) (range 600-2,500). The percentage improvement from baseline in PSSI score was 78.57Â %. Side effects were seen in 20 patients (86.96Â %) mainly in the form of erythema. Four patients developed mild relapse at the end of 6Â months after the therapy. In 15 patients with palmoplantar psoriasis, the mean MED was found to be 415Â mJ/cm(2) (range 200-950Â mJ/cm(2)). The cumulative dose of irradiation was 28.4-115.5Â Jâ€‰cm(2) (mean 59.1Â Jâ€‰cm(2)). The mean number of treatments to achieve clearance (equal to 90Â % reduction of PSI score) was 16. Two patients relapsed at the end of 6Â months after the therapy. The 308-nm excimer laser is an effective, safe, easy, and relatively quicker method for the treatment of psoriasis at difficult to treat sites, with good results in a somewhat short time. Adolescent;Adult;Aged;Female;Foot;Hand;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Psoriasis;Scalp;Severity of Illness Index;Treatment Outcome;Young Adult

Helium-neon laser improves bone repair in rabbits: comparison at two anatomic sites. The purpose of this study was to evaluate the influence of helium-neon laser on bone repair of femur and tibia in rabbits. For this purpose, 15 New Zealand rabbits underwent bilateral bone damage (tibia and femur) using a spherical bur. Helium-neon laser light, at a fluency of 6â€,Jâˆ•cm(2) and wavelength of 632.8â€,nm was applied on the left legs (laser group). The right tibia or femur lesions (control group) served as negative control. All sections were histopathologically analyzed using HE sections and the morphometric data from bone tissue and hyaline cartilage were achieved. Histopathological analysis showed regular bone trabeculae covered by osteoblastic cells after 1Â week in the group exposed to laser therapy from femur and tibia indistinctly. After 3Â weeks, the laser group showed new bone formation coming from the bony walls in the femur and tibia as well. On the 5th week, well-defined trabecula undergoing remodeling process was detected for the most intense pattern in tibia only. Morphometric analysis revealed significant statistical differences (pâ€‰<â€‰0.05) in the bone tissue for the laser-exposed group on 1st and 3rd weeks. After 5th week, bone formation was increased to tibia only. Taken together, such findings suggest that helium-neon laser is able to improve bone repair in rabbits being the most pronounced effect in tibia. Animals;Bone Regeneration;Femoral Fractures;Fracture Healing;Lasers, Gas;Low-Level Light Therapy;Male;Rabbits;Tibial Fractures

In vitro bactericidal effect of Nd:YAG laser on Actinomyces israelii. A bactericidal effect has been reported by the use of near-infrared laser light on both Gram-positive and Gram-negative bacteria.

The aim of this study was to evaluate the effect of Nd:YAG laser on Actinomyces israelii, filamentous bacteria causing cervicofacial actinomycosis. Experiments were realized on bacterial cells in saline suspension or streaked on Mueller-Hinton (MH) agar plates with or without India ink. Laser application was performed in Eppendorf tubes with different powers and frequencies for 40Â s; bacterial suspensions were then streaked on agar plates and incubated at 35Â Â°C in proper conditions for 5Â days before colony enumeration. A reduction of colony number variable from 60.13 to 100Â % for powers of 2, 4, and 6Â W at 25-50Â Hz of frequency was observed in comparison with growth control. For agar plates, laser application was performed with different powers at 50Â Hz for 60Â s. A growth inhibition was observed after 5Â days of incubation on MH plates with powers of 6Â W and on MH-ink plates with all applied powers. This preliminary study showed a bactericidal effect caused by Nd:YAG laser application worthy to be evaluated in further experiments in vivo. Actinomyces;Actinomycosis, Cervicofacial;Bacterial Load;Humans;Lasers, Solid-State;Low-Level Light Therapy

Concurrence of emerging developments in photobiomodulation and cancer. Humans;Laser Therapy;Low-Level Light Therapy;Neoplasms;Photobiology;Tumor Microenvironment

Low-level laser therapy of leg ulcer in sickle cell anemia.

Use of low intensity laser treatment in neuropathic pain refractory to clinical treatment in amputation stumps. Debilitating stump pain following amputation surgery is a major problem when it affects the patient's quality of life, often making the patient totally dependent on others for their day-to-day care. Attempts have been made to treat those patients through pharmacological, psychological, and physical therapies, but in many cases these fail to relieve the pain. This article focuses on three patients with chronic, intense, and debilitating stump pain who were previously treated with pain medications, but with little success. These patients underwent nine sessions of low-intensity laser therapy (LILT) to the stump - this is a new treatment that has been used to treat other pain disorders. All patients reported a decrease in the intensity of their pain and increased ability to perform daily living activities during a 4-month follow-up.

Tissue restructuring by energy-based surgical tools. Energy-based noninvasive surgical tools can be used for ablative bio-stimulation (eg, collagen production) or tissue restructuring functions (eg, tightening or lifting) and are the subject of this review. The authors present the various methods and tools for noninvasive cosmetic surgery (ultrasound, radiofrequency, cryolipolysis, and lasers) and present the clinical outcomes of each. They summarize techniques and methods and their indications, physical parameters and tissue target, and consistency. Ablation Techniques;Cosmetic Techniques;Humans;Lipectomy;Low-Level Light Therapy;Radiofrequency Therapy;Skin Aging;Subcutaneous Fat;Ultrasonic Therapy

Five-year retrospective study involving the laser-assisted periodontal therapy. This article outlines a five-year retrospective study involving a diode dental laser used on periodontally infected teeth. The present study utilized a specific protocol: scaling and root planing, light ultrasonic scaling, and the use of a diode laser. In 80% of cases, pocket depth of 3 mm or less was maintained. Dental Scaling;Humans;Low-Level Light Therapy;Periodontal Pocket;Retrospective Studies;Root Planing

Treatment of melasma by low-fluence 1064 nm Q-switched Nd:YAG laser. BACKGROUND: Low-fluence 1064 nm Q-switched Nd:YAG laser has recently been shown to be effective for the melasma treatment. OBJECTIVE: The purpose of this study is to evaluate the clinical efficacy and safety of low-fluence 1064 nm Q-switched Nd:YAG laser treatment of melasma in Asian patients. METHODS: Fifty patients with melasma underwent 15 weeks of weekly treatments, using a Q-switched Nd:YAG laser (RevLiteÂ®; HOYA ConBioÂ®, Freemont, CA, USA) at 1064 nm with an 8-mm spot size, and a fluence of 2.8 J/cm(2). Patients and investigators subjectively evaluated the intensity of pigmentation after

completion of 15 weekly treatments. The objective assessment was also performed with digital photographs and a pigment imaging tool (JanusÂ®, PSI Co., Ltd., KOREA). RESULTS: Both patients and investigators rated the treatment outcome as "good improvement" on average with improvement rate of 50-74%. The pigment imaging technology system also confirmed the improvement of the pigmentation level on all three locations of the face. None of the 50 patients showed any signs of severe side effects during the course of the treatment. CONCLUSION: Low-fluence 1064 nm Q-switched Nd:YAG laser is an effective method to treat melasma without serious side effects in Asian patients. Adult;Asian People;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Treatment Outcome

In vitro evaluation of the effects of different treatment procedures on dentine tubules. OBJECTIVE: The objective of this preliminary study was to evaluate the occluding effect of topical gaseous ozone application and Er:YAG laser on human dentine tubules by scanning electron microscopic (SEM) analysis. METHODS: Twenty-four dentine specimens were divided into three groups. Group I, including specimens treated only with citric acid, served as the control. Group II was treated with Er:YAG (30â€‰Hz 60â€‰mJ, 10â€‰sec), and Group III received only topical gaseous ozone application (10â€‰sec at level 2). Diameters and the number of open dentinal tubules per 100â€‰Î¼m(2) were counted from SEM photomigrophraphs at Ã—2000 magnification. RESULTS: In terms of diameters and numbers of open dentinal tubules per 100â€‰Î¼m(2), both treatment modalities presented significant occlusion. The mean values of the diameters and the number of open dentinal tubules per 100â€‰Î¼m(2) were observed in Group I, Group II, and Group III, in decreasing order. Significant differences were found among the groups in favor of the topical gaseous ozone applied group. CONCLUSIONS: The dentine tubules in both treatment groups were occluded, however more marked occlusion were seen in ozone treated group. Ozone Administration, Topical;Adult;Dentin;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Molar;Ozone;Reference Values;Sensitivity and Specificity;Statistics, Nonparametric;Young Adult

Skin penetration time-profiles for continuous 810â€‰nm and Superpulsed 904â€‰nm lasers in a rat model. OBJECTIVE: The purpose of this study was to investigate the rat skin penetration abilities of two commercially available low-level laser therapy (LLLT) devices during 150â€‰sec of irradiation. BACKGROUND DATA: Effective LLLT irradiation typically lasts from 20â€‰sec up to a few minutes, but the LLLT time-profiles for skin penetration of light energy have not yet been investigated. MATERIALS AND METHODS: Sixty-two skin flaps overlaying rat's gastrocnemius muscles were harvested and immediately irradiated with LLLT devices. Irradiation was performed either with a 810â€‰nm, 200â€‰mW continuous wave laser, or with a 904â€‰nm, 60â€‰mW superpulsed laser, and the amount of penetrating light energy was measured by an optical power meter and registered at seven time points (range, 1-150â€‰sec). RESULTS: With the continuous wave 810â€‰nm laser probe in skin contact, the amount of penetrating light energy was stable at âˆ¼20% (SEMÂ±0.6) of the initial optical output during 150â€‰sec irradiation. However, irradiation with the superpulsed 904â€‰nm, 60â€‰mW laser showed a linear increase in penetrating energy from 38% (SEMÂ±1.4) to 58% (SEMÂ±3.5) during 150â€‰sec of exposure. The skin penetration abilities were significantly different ($p<0.01$) between the two lasers at all measured time points. CONCLUSIONS: LLLT irradiation through rat skin leaves sufficient subdermal light energy to influence pathological processes and tissue repair. The finding that superpulsed 904â€‰nm LLLT light energy penetrates 2-3 easier through the rat skin barrier than 810â€‰nm continuous wave LLLT, corresponds well with results of LLLT dose analyses in systematic reviews of LLLT in musculoskeletal disorders. This may explain why the differentiation between these laser types has been needed in the clinical dosage recommendations of World Association for Laser Therapy. Animals;Equipment

Design;Equipment Safety;Lasers;Low-Level Light Therapy;Male;Models, Animal;Random Allocation;Rats;Rats, Sprague-Dawley;Sensitivity and Specificity;Skin;Time Factors;Wound Healing

Effects of the pulse frequency of low-level laser therapy on the tooth movement speed of rat molars. OBJECTIVE: The purpose of this study was to compare the speed of the orthodontic tooth movement of rat molars under continuous wave (CW) and pulsed wave (PW) low-level laser therapy (LLLT). BACKGROUND DATA: It remains unclear whether LLLT can increase the speed of tooth movement, and no consensus has been established regarding the appropriate parameters and experimental design of LLLT. MATERIALS AND METHODS: Orthodontic movement was induced in 40 rats with 10g coil springs. Rats were randomly assigned to five groups. In Group I, the maxillary left first molars were irradiated with CW by a gallium aluminum arsenide (GaAlAs) diode laser source (830â€‰nm, 180â€‰mW, 3.6â€‰J/cm(2), and 0.9â€‰W/cm(2) for 4â€‰sec at three locations for 3 consecutive days). In Groups II, III, and IV, animals were irradiated with PW at 2, 4, and 8â€‰Hz, respectively (50% duty cycle, average power of 90â€‰mW, 3.6â€‰J/cm(2), and 0.45â€‰W/cm(2) for 8â€‰sec at three locations for 3 consecutive days). Group V served as the control (no irradiation). The movement distance was measured on days 3, 7, and 14. RESULTS: Although there were no significant differences among the irradiation groups, significant differences were found between the control and irradiation groups starting from day 3. CONCLUSIONS: The CW and PW treatments both led to faster orthodontic tooth movement compared with the control group. Animals;Low-Level Light Therapy;Male;Molar;Rats;Tooth Movement Techniques

Retina rejuvenation therapy for diabetic macular edema: a pilot study. PURPOSE: To prospectively investigate the safety and efficacy of a novel frequency-doubled nanosecond-pulsed laser with discontinuous beam energy distribution (2RT, Ellex) for the treatment of diabetic macular edema. METHODS: Twenty-three consecutive patients (38 eyes) with newly diagnosed diabetic macular edema were recruited and assessed with logarithm of the minimum angle of resolution best-corrected visual acuity, central macular thickness measured with optical coherence tomography (OCT/scanning laser ophthalmoscope, OPKO/OTI), microperimetry, fundus photography, and fundus fluorescein angiography. Macular grid treatments were performed with 2RT laser system by 1 operator. Patients were examined with logarithm of the minimum angle of resolution best-corrected visual acuity, central macular thickness, microperimetry, and fundus photography at 3 weeks and 6 weeks and 3 months and 6 months. Fundus fluorescein angiography was repeated at 3 months and 6 months. RESULTS: Six months postoperatively, 17 patients (28 eyes) completed the study. No complications were identified after 2RT therapy. Intraoperative retinal discoloration was observed in 2 cases, fully resolved at 3 months with no permanent anatomical or functional changes. Mean logarithm of the minimum angle of resolution visual acuity improved from 20/44 at baseline to 20/27 at 6 months. The change in best-corrected visual acuity was significant (P = 0.0190). Central macular thickness in the central 1-mm subfield, retinal exudates and vascular leakage decreased in the majority of patients at 6 months (46, 41, and 55%, respectively), although the change from baseline was not statistically significant. Microperimetry confirmed photoreceptor integrity and showed a trend of improvement that correlated with decreased central macular thickness. CONCLUSION: For the first time, we achieved a beneficial effect on diabetic macular edema without the side effects of conventional laser therapy. The efficacy of this system in comparison with standard argon laser photocoagulation and in the treatment of other conditions affecting the retinal pigment epithelium needs further investigation. Aged;Aged, 80 and over;Diabetic Retinopathy;Female;Fluorescein Angiography;Humans;Low-Level Light Therapy;Macula Lutea;Macular Edema;Male;Middle Aged;Pilot Projects;Prospective Studies;Retina;Tomography, Optical Coherence;Treatment Outcome;Visual Acuity;Visual Field Tests

Focus on: lasers. Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Oral Surgical Procedures
The sinergy between lasers and adipose surgery in face and neck rejuvenation: a new approach from personal experience. BACKGROUND AND AIMS: Patients now want a long-lasting youthful appearance but with a minimally-invasive approach. Our unique approach, "AdipoLASER reJuvenation (ALJ)", involves a variety of minimally-invasive laser- and lipolysis-based techniques, and the present study assessed the impact of this ALJ approach. SUBJECTS AND METHODS: From 2008 - 2011, we prospectively enrolled 221 patients into the study. 71 of them, underwent the ALJ approach: 2 reductive techniques via microliposuction and laser-assisted lipolysis (LAL); and 2 regenerative techniques via autologous fat graft and fractional CO2 laser resurfacing. The remaining 150 patients underwent only 1 or 2 of these techniques. Patients were monitored through 1 to 18 months, clinical photography was taken and histological assessments were performed. RESULTS: ignificantly better and long-lasting results were obtained for the complete ALJ approach regarding all aspects of the face, mandible and neck compared with controls. The combination of the regenerative and the reductive approaches delivered on excellent balance, restoring a youthful, natural appearance to the face. CONCLUSIONS: The fractional CO2 laser has both a photodestructive, or HLLT, effect and an LLLT component in the beam periphery. This LLLT effect possibly prolonged the life and improved the take of the fat grafts, with the well-documented HLLT effect inducing swift collagenesis and better remodeling of the dermal matrix. A natural look in depressed areas was thus restored with the combination of fat redistribution and the HLLT/LLLT effect. Microlipolysis and laser-assisted lipolysis (LAL) could at the same time remove those areas of redundant and prolapsed fat while countering skin laxity, and address both jowl formation and submental flaccidity. The unique combination of all four approaches in our "AdipoLASER reJuvenation" proved to be superior to any other lesser approach in both the long- and short term with very little patient downtime, but did not present much more in terms of treatment time and cost to the patient. We believe that the ALJ approach offers a real minimally-invasive alternative to the classic surgical facelift.
Low level laser therapy for patients with cervical disk hernia. BACKGROUND AND AIMS: In previous studies we have reported the benefits of low level laser therapy (LLLT) for chronic shoulder joint pain, elbow, hand and finger pain, and low back pain. The present study is a report on the effects of LLLT for chronic neck pain. MATERIALS AND METHODS: Over a 3 year period, 26 rehabilitation department outpatients with chronic neck pain, diagnosed as being caused by cervical disk hernia, underwent treatment applied to the painful area with a 1000 mW semi-conductor laser device delivering at 830 nm in continuous wave, 20.1 J/cm(2)/point, and three shots were given per session (1 treatment) with twice a week for 4 weeks. RESULTS: 1. A visual analogue scale (VAS) was used to determine the effects of LLLT for chronic pain and after the end of the treatment regimen a significant improvement was observed ($p<0.001$). 2. After treatment, no significant differences in cervical spine range of motion were observed. 3. Discussions with the patients revealed that in order to receive continued benefits from treatment, it was important for them to be taught how to avoid postures that would cause them neck pain in everyday life. CONCLUSION: The present study demonstrates that LLLT was an effective form of treatment for neck and back pain caused by cervical disk hernia, reinforced by postural training.
A study of the influence of low intensity laser therapy on painful temporomandibular disorder patients. A double-blind clinical trial was conducted on 30 female Temporomandibular Disorders (TMD) patients who had pain as a chief complaint. The patients were randomly allocated into three groups based on Low Intensity Laser (LILT) regimes namely 820 nm Gallium Aluminium Arsenide (GaAlAs) laser at energy densities of 21.4J/cm(2), 107 J/cm(2) and placebo laser. Each patient had three LILT treatments in a week. The pressure pain threshold (PPT) of trigger points in masticatory

muscles, unassisted maximum mouth opening without pain (MOSP) and symptom severity index (SSI) were recorded as baseline data and monitored after every treatment. Jaw kinesiology, electromyography (EMG) and pain rating index from McGill pain questionnaire were also recorded as baseline and final results. The analysis of covariance and further analysis showed that the higher energy density laser group had significant increases in PPT and EMG amplitude recorded from voluntary clenching (cEMG) compared with the placebo group at P values 0.0001 and 0.022 respectively. A significantly greater number of patients recovered from myofascial pain and TMJ arthralgia as assessed clinically in the higher energy group compared with the placebo (P value = 0.02 and 0.006 respectively). There was no statistically significant difference in the other parameters of assessment among the groups at a P value 0.05. At a period of 2 to 4 weeks review after LILT, there was an average 52% reduction of pain as assessed by SSI.

Reduction of monocyte chemoattractant protein-1 expression in rheumatoid arthritis rat joints with light-emitting diode phototherapy. BACKGROUND: Rheumatoid arthritis (RA) is a systemic autoimmune disorder that involves inflammation and pain of the joints. Light-Emitting Diode (LED) irradiation is being evaluated for treating RA; however, the mechanism is unclear. Monocyte chemotaxis protein (MCP)-1 is a key chemokine in the inflammatory status of RA, and MCP-1 levels in plasma are described as a marker for joint inflammation in RA. AIM: To understand the mechanism of the anti-inflammatory effect of LED irradiation on RA, the expression of MCP-1 was examined in the knee joints of collagen-induced arthritis (CIA) rats. MATERIALS AND METHODS: The rats were immunized with type II collagen and CIA development was confirmed. CIA rat joints were irradiated with LED energy (3 sessions/week, 2 weeks. 840 nm, 2 J/cm(2)). Total RNA was isolated from the rat knee joint tissues and the MCP-1 mRNA levels were monitored with the reverse transcription polymerase chain reaction (RT-PCR) technique and real-time PCR. MCP-1 production in the rat knee joints was analyzed immunohistochemically. RESULTS: RT-PCR analysis demonstrated that MCP-1 mRNA levels had increased in CIA animals when compared to controls, and LED irradiation significant reduced the gene expression in CIA rats. Real-time PCR analysis confirmed a significant reduction in MCP-1 gene expression. The immunohistochemical analysis demonstrated strong MCP-1 staining in CIA rat joint synovial membrane tissue, and LED irradiation significantly reduced the staining. DISCUSSION: Since MCP-1 has been identified as an important chemokine in the pathogenesis of RA, the reduction of MCP-1 expression would appear to be one of the mechanisms in the reduction of inflammation by LED irradiation. CONCLUSION: LED irradiation reduced RA-related inflammation through the reduction of MCP-1 gene expression in CIA rat knee joint synovial tissue.

Treatment of atrophic facial scars of acne vulgaris by Q-Switched Nd:YAG (Neodymium: Yttrium-Aluminum-Garnet) laser 1064 nm wavelength. BACKGROUND: Q-Switched Nd:YAG laser (1064 nm) is a new modality that was reported to be effective in treatment of acne scars. OBJECTIVE: To evaluate the effectiveness and the safety of this laser in treatment of acne scars. PATIENTS AND METHODS: This case series, descriptive and comparative study was conducted in Al-Najaf Teaching Hospital of Kufa Medical College, Iraq from October 2010 to October 2011. A total of 16 patients having mild to moderate facial acne scars were enrolled; 10 of them completed the study. All patients had Fitzpatrick skin type III. They were divided into two groups A and B and were treated with two different energy fluences: 5 J/cm2 for group (A) and 15 J/cm2 for group (B). Five treatment sessions with 2-week intervals were done for all patients and were followed up for 6 months. The improvement was evaluated by objective and subjective methods. RESULTS: Changes in acne scores in both groups were statistically insignificant after 6 months follow-up. Only two patients were satisfied with the improvement after treatment- one patient from each group. No serious side effects were reported. CONCLUSION: Q-Switched Nd:YAG laser (1064 nm) can be used in treating atrophic

facial scars of acne vulgaris. Acne Vulgaris;Adult;Cicatrix;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male

A split-face comparison of a fractional microneedle radiofrequency device and fractional carbon dioxide laser therapy in acne patients. BACKGROUND: A number of lasers and light-based devices have been reported as promising treatment options for acne vulgaris. OBJECTIVE: To evaluate the efficacy and safety of fractional microneedle radiofrequency (MRF) device treatment compared to CO(2) fractional laser system (FS) for the treatment of acne vulgaris. METHODS: Twenty healthy subjects underwent full-face treatment for acne vulgaris with CO(2) FS and MRF device. For each subject, two passes of CO(2) FS with a pulse energy setting of 80 mJ and a density of 100 spots/cm(2) were used on one side, and two passes of MRF device with a intensity of 8, density of 25 MTZ/cm(2), and a depth of 1.5-2.5 mm were used on the other. Patients were evaluated 3 months postoperatively and were also photographed. RESULTS: Most of the patients improved based on clinical and photographic assessments 3 months after the treatment. No significant differences in physician-measured parameters, patient ratings, or intraoperative pain ratings were found, although downtime was significantly longer for the CO(2) FS treated side. CONCLUSIONS: MRF device and CO(2) FS can be used for acne vulgaris patients and MRF device is more convenient than CO(2) FS because of its short downtime. Acne Vulgaris;Adolescent;Adult;Face;Asia, Eastern;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Patient Satisfaction;Radio Waves;Radiofrequency Therapy;Young Adult

Cancer-related lymphedema risk factors, diagnosis, treatment, and impact: a review. PURPOSE Cancer-related lymphedema (LE) is an incurable condition associated with lymph-involved cancer treatments and is an increasing health, quality of life (QOL), and cost burden on a growing cancer survivor population. This review examines the evidence for causes, risk, prevention, diagnosis, treatment, and impact of this largely unexamined survivorship concern. METHODS PubMed and Medline were searched for cancer-related LE literature published since 1990 in English. The resulting references (N = 726) were evaluated for strength of design, methods, sample size, and recent publication and sorted into categories (ie, causes/prevention, diagnosis, treatment, and QOL). Sixty studies were included. Results Exercise and physical activity and sentinel lymph node biopsy reduce risk, and overweight and obesity increase risk. Evidence that physiotherapy reduces risk and that lymph node status and number of malignant nodes increase risk is less strong. Perometry and bioimpedence emerged as attractive diagnostic technologies, replacing the use of water displacement in clinical practice. Swelling can also be assessed by measuring arm circumference and relying on self-report. Symptoms can be managed, not cured, with complex physical therapy, low-level laser therapy, pharmacotherapy, and surgery. Sequelae of LE negatively affect physical and mental QOL and range in severity. However, the majority of reviewed studies involved patients with breast cancer; therefore, results may not be applicable to all cancers. CONCLUSION Research into causes, prevention, and effect on QOL of LE and information on LE in cancers other than breast is needed. Consensus on definitions and measurement, increased patient and provider awareness of signs and symptoms, and proper and prompt treatment/access, including psychosocial support, are needed to better understand, prevent, and treat LE.
Exercise;Humans;Lymphedema;Neoplasms;Overweight;Risk Factors;Sentinel Lymph Node Biopsy;Survivors

Low-level-laser irradiation induces photorelaxation in coronary arteries and overcomes vasospasm of internal thoracic arteries. BACKGROUND AND OBJECTIVE: As low-level laser irradiation (LLLI) seems to induce vasodilation besides many other known biological effects, LLLI has been increasingly used in therapy of medical conditions with various irradiation parameters. The aim of this study was to investigate the effect of LLLI on photorelaxation of human coronary and internal thoracic arteries

(ITA). MATERIALS AND METHODS: Thirty vessel segments of ITA used for routine coronary artery bypass grafting as well as left anterior descending coronary arteries (LAD) of patients undergoing cardiac transplantation were cut into 4-mm rings stored in a modified Krebs-Henseleit solution and evaluated in a myograph. Both types of vessel segments were irradiated by a semiconductor non-thermal GaAs diode laser operating at a wavelength of 680 nm. After precontraction with thromboxane agonist U44619, respective relaxation responses were evaluated and compared to pharmacological dilatation induced by substance P. RESULTS: Mean pharmacological vasodilation by substance P was 22.6 Â± 3.3%, 12.8 Â± 1.4%, and 20.4 Â± 3.2% in macroscopic healthy LAD, LAD with atheromatous plaque, and ITA, respectively. Average photorelaxation induced by LLLI was 16.5 Â± 2.0%, 1.9 Â± 1.7%, and 6.8 Â± 4.7%, accordingly. Vasodilatatory responses induced either by substance P or administration of LLLI were significantly decreased in LAD with atheromatous plaque ($P < 0.0001$). Vasospasms of ITA segments occurring during experiments could be abandoned when LLLI was administered. CONCLUSION: Macroscopic healthy LAD exposed to LLLI revealed significant photorelaxation. With the administration of LLLI, 73% of the maximal obtainable effect by an endothelium-dependent vasodilator could be reached. Furthermore, LLLI has the potential to overcome vasospasms of ITA. Neurotransmitter Agents;Vasoconstrictor Agents;Substance P 15-Hydroxy-11 alpha,9 alpha-(epoxymethano)prosta-5,13-dienoic Acid;Aged;Coronary Vessels;Female;Humans;In Vitro Techniques;Lasers, Semiconductor;Male;Mammary Arteries;Middle Aged;Neurotransmitter Agents;Substance P;Vasoconstriction;Vasoconstrictor Agents;Vasodilation

Low-level visible light (LLVL) irradiation promotes proliferation of mesenchymal stem cells. Low-level visible light irradiation was found to stimulate proliferation potential of various types of cells in vitro. Stem cells in general are of significance for implantation in regenerative medicine. The aim of the present study was to investigate the effect of low-level light irradiation on the proliferation of mesenchymal stem cells (MSCs). MSCs were isolated from the bone marrow, and light irradiation was applied at energy densities of 2.4, 4.8, and 7.2Â J/cm(2). Illumination of the MSCs resulted in almost twofold increase in cell number as compared to controls. Elevated reactive oxygen species and nitric oxide production was also observed in MSCs cultures following illumination with broadband visible light. The present study clearly demonstrates the ability of broadband visible light illumination to promote proliferation of MSCs in vitro. These results may have an important impact on wound healing. Reactive Oxygen Species;Nitric Oxide Animals;Cell Proliferation;Cells, Cultured;Light;Mesenchymal Stem Cells;Nitric Oxide;Phototherapy;Rats;Reactive Oxygen Species;Wound Healing

Conservative management of midportion Achilles tendinopathy: a mixed methods study, integrating systematic review and clinical reasoning. BACKGROUND: Clinicians manage midportion Achilles tendinopathy (AT) using complex clinical reasoning underpinned by a rapidly developing evidence base. OBJECTIVES: The objectives of the study were to develop an inclusive, accessible review of the literature in combination with an account of expert therapists' related clinical reasoning to guide clinical practice and future research. METHODS: Searches of the electronic databases, PubMed, ISI Web of Science, PEDro, CINAHL, EMBASE, and Google Scholar were conducted for all papers published from inception to November 2011. Reference lists and citing articles were searched for further relevant articles. Inclusion required studies to evaluate the effectiveness of any conservative intervention for midportion AT. Exclusion criteria included in vitro, animal and cadaver studies and tendinopathies in other locations (e.g. patella, supraspinatus). From a total of 3497 identified in the initial search, 47 studies fulfilled the inclusion criteria. Studies were scored according to the PEDro scale, with a score of â‰¥ 8/10 considered of excellent quality, 5-7/10 good, and â‰¤ 4/10 poor. The strength of evidence supporting each treatment modality was then rated as 'strong', 'moderate', 'limited', 'conflicting' or 'no evidence' according to the number and quality of articles supporting that

modality. Additionally, semi-structured interviews were conducted with physiotherapists to explore clinical reasoning related to the use of various interventions with and without an evidence base, and their perceptions of available evidence. RESULTS: Evidence was strong for eccentric loading exercises and extracorporeal shockwave therapy; moderate for splinting/bracing, active rest, low-level laser therapy and concentric exercises (i.e. inferior to eccentric exercise). In-shoe foot orthoses and therapeutic ultrasound had limited evidence. There was conflicting evidence for topical glycerin trinitrate. Taping techniques and soft-tissue mobilization were not yet examined but featured in case studies and in the interview data. Framework analysis of interview transcripts yielded multiple themes relating to physiotherapists' clinical reasoning and perceptions of the evidence, including the difficulty in causing pain while treating the condition and the need to vary research protocols for specific client groups--such as those with the metabolic syndrome as a likely etiological factor. Physiotherapists were commonly applying the modality with the strongest evidence base, eccentric loading exercises. Barriers to research being translated into practice identified included the lack of consistency of outcome measures, excessive stringency of some authoritative reviews and difficulty in accessing primary research reports. The broad inclusion criteria meant some lower quality studies were included in this review. However, this was deliberate to ensure that all available research evidence for the management of midportion AT, and all studies were evaluated using the PEDro scale to compensate for the lack of stringent inclusion criteria. CONCLUSION: Graded evidence combined with qualitative analysis of clinical reasoning produced a novel and clinically applicable guide to conservative management of midportion AT. This guide will be useful to novice clinicians learning how to manage this treatment-resistant condition and to expert clinicians reviewing their evidence-based practice and developing their clinical reasoning. Important areas requiring future research were identified including the effectiveness of orthoses, the effectiveness of manual therapy, etiological factors, optimal application of loading related to stage of presentation and how to optimize protocols for different types of patients such as the older patient with the metabolic syndrome as opposed to the athletically active. Achilles Tendon;Exercise Therapy;Female;Foot Orthoses;Health Care Surveys;Humans;Low-Level Light Therapy;Male;Pain Management;Tendinopathy;Treatment Outcome

The brain-derived neurotrophic factor, nerve growth factor, neurotrophin-3, and induced nitric oxide synthase expressions after low-level laser therapy in an axonotmesis experimental model. BACKGROUND DATA: A robust body of evidence has shown that low-level laser therapy (LLLT) improves peripheral nerve regeneration. However, the biochemical background triggered in this process is not yet fully understood. OBJECTIVE: The purpose of this study was to evaluate the mRNA expression of neurotrophic factors (brain-derived neurotrophic factor [BDNF], nerve growth factor [NGF], and neurotrophin-3, [NT-3]) and also an inflammatory marker (induced nitric oxide synthase [iNOS]) in an axonotmesis experimental model after low-level laser therapy. METHODS: Thirty-six adult male Wistar rats (250-350 g) were subjected to right sciatic nerve crush injury, and 24â€‰h later, the animals in the three different experimental groups (n=18) were irradiated on a daily basis with helium-neon laser (collimated HeNe laser, continuous emission, wavelength: 632.8â€‰nm, power density: 0.5 mW/cm(2), irradiation time: 20â€‰sec, energy density: 10â€‰J/cm(2)) during 7, 14, and 21 consecutive days, respectively. The control group (n=18) underwent the same procedures, but with the equipment turned off. At the end of the experiments, animals were killed with an overdose of anesthesia to remove samples from the sciatic nerve lesion epicenter to determine the mRNA expression of BDNF, NGF, NT-3 and iNOS enzyme. RESULTS: Comparisons between groups showed that HeNe laser increased the mRNA expression of both BDNF and NGF factors after 14 days of LLLT, with peak expression at the 21st day. Increase in NT-3 mRNA expression was not observed. In addition, HeNe laser produced iNOS expression reduction, which played an important role in the

inflammatory process. CONCLUSIONS: The reported data could have a relevant practical value because LLLT is a noninvasive procedure, and have revealed significant increase in neurotrophic factor expressions and inflammatory process reduction, opening the possibility of using LLLT as an important aid to nerve regeneration process. Brain-Derived Neurotrophic Factor;Nerve Growth Factors;Neurotrophin 3;Nerve Growth Factor;Nitric Oxide Synthase Animals;Brain-Derived Neurotrophic Factor;Lasers, Gas;Low-Level Light Therapy;Male;Nerve Growth Factor;Nerve Growth Factors;Nerve Regeneration;Neurotrophin 3;Nitric Oxide Synthase;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Wallerian Degeneration

Low-level laser therapy (808 nm) reduces inflammatory response and oxidative stress in rat tibialis anterior muscle after cryolesion. BACKGROUND AND OBJECTIVE: Muscle regeneration is a complex phenomenon, involving coordinated activation of several cellular responses. During this process, oxidative stress and consequent tissue damage occur with a severity that may depend on the intensity and duration of the inflammatory response. Among the therapeutic approaches to attenuate inflammation and increase tissue repair, low-level laser therapy (LLLT) may be a safe and effective clinical procedure. The aim of this study was to evaluate the effects of LLLT on oxidative/nitrative stress and inflammatory mediators produced during a cryolesion of the tibialis anterior (TA) muscle in rats. MATERIAL AND METHODS: Sixty Wistar rats were randomly divided into three groups (n = 20): control (BC), injured TA muscle without LLLT (IC), injured TA muscle submitted to LLLT (IRI). The injured region was irradiated daily for 4 consecutive days, starting immediately after the lesion using a AlGaAs laser (continuous wave, 808 nm, tip area of 0.00785 cm(2) , power 30 mW, application time 47 seconds, fluence 180 J/cm(2) ; 3.8 mW/cm(2) ; and total energy 1.4 J). The animals were sacrificed on the fourth day after injury. RESULTS: LLLT reduced oxidative and nitrative stress in injured muscle, decreased lipid peroxidation, nitrotyrosine formation and NO production, probably due to reduction in iNOS protein expression. Moreover, LLLT increased SOD gene expression, and decreased the inflammatory response as measured by gene expression of NF-kÎ² and COX-2 and by TNF-Î± and IL-1Î² concentration. CONCLUSION: These results suggest that LLLT could be an effective therapeutic approach to modulate oxidative and nitrative stress and to reduce inflammation in injured muscle. Biomarkers;Inflammation Mediators Animals;Biomarkers;Cold Temperature;Immunoblotting;Inflammation Mediators;Lasers, Semiconductor;Male;Muscle, Skeletal;Oxidative Stress;Random Allocation;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Soft Tissue Injuries;Treatment Outcome;Wound Healing

Efficacy of low-level laser therapy in the management of orthodontic pain: a systematic review and meta-analysis. This review aimed to identify the efficacy of low-level laser therapy (LLLT) in the management of orthodontic pain. This systematic review and meta-analysis was carried out in accordance with Cochrane Handbook and the PRISMA statement. An extensive literature search for RCTs, quasi-RCTs, and CCTs was performed through CENTRAL, PubMed, Embase, Medline, CNKI, and CBM up to October 2011. Risk of bias assessment was performed via referring to the Cochrane tool for risk of bias assessment. Meta-analysis was implemented using Review Manager 5.1. As a result, four RCTs, two quasi-RCTs, and two CCTs were selected from 152 relevant studies, including 641 patients from six countries. The meta-analysis demonstrated that 24% risk of incidence of pain was reduced by LLLT (RRâ€‰=â€‰0.76, 95% CI range 0.63-0.92, Pâ€‰=â€‰0.006). In addition, compared to the control group, LLLT brought forward "the most painful day" (MDâ€‰=â€‰-0.42, 95% CI range -0.74- -0.10, Pâ€‰=â€‰0.009). Furthermore, the LLLT group also implied a trend of earlier end of pain compared with the control group (MDâ€‰=â€‰-1.37, 95% CI range -3.37-0.64, Pâ€‰=â€‰0.18) and the pseudo-laser group (MDâ€‰=â€‰-1.04, 95% CI range -4.22-2.15, Pâ€‰=â€‰0.52). However, because of the methodological shortcomings and risk of bias of included trials, LLLT was proved with limited evidence in delaying pain onset and reducing pain intensity. In the

future, larger and better-designed RCTs will be required to provide clearer recommendations. Clinical Trials as Topic;Humans;Low-Level Light Therapy;Orthodontics, Corrective;Pain;Pain Measurement;Treatment Outcome
Systematic review of laser and other light therapy for the management of oral mucositis in cancer patients. BACKGROUND: The aim of this study was to review the available literature and define clinical practice guidelines for the use of laser and other light therapies for the prevention and treatment of oral mucositis. METHODS: A systematic review was conducted by the Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology. The body of evidence for each intervention, in each cancer treatment setting, was assigned an evidence level. Based on the evidence level, one of the following three guideline determinations was possible: recommendation, suggestion, and no guideline possible. RESULTS: A new recommendation was made for low-level laser (wavelength at 650 nm, power of 40 mW, and each square centimeter treated with the required time to a tissue energy dose of 2 J/cm(2) (2 s/point)) for the prevention of oral mucositis in adult patients receiving hematopoietic stem cell transplantation conditioned with high-dose chemotherapy, with or without total body irradiation. A new suggestion was made for low-level laser (wavelength around 632.8 nm) for the prevention of oral mucositis in patients undergoing radiotherapy, without concomitant chemotherapy, for head and neck cancer. No guideline was possible in other populations and for other light sources due to insufficient evidence. CONCLUSIONS: The increasing evidence in favor of low-level laser therapy allowed for the development of two new guidelines supporting this modality in the populations listed above. Evidence for other populations was also generally encouraging over a range of wavelengths and intensities. However, additional well-designed research is needed to evaluate the efficacy of laser and other light therapies in various cancer treatment settings. Evidence-Based Medicine;Humans;Infrared Rays;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Neoplasms;Phototherapy;Practice Guidelines as Topic;Stomatitis
Ancillary approaches to plasminogen activators. Acute ischemic stroke develops from an interruption in focal cerebral blood flow. In many cases, it is caused by an acute thromboembolism. Although systemic fibrinolytic therapy for acute ischemic stroke has been a significant breakthrough in the management of this disease, additional agents and methods that could improve or restore cerebral flow are necessary. Similarly to findings in acute myocardial infarction, combination pharmacotherapy has the potential to improve current thrombolytic treatment in acute ischemic stroke. In recent years, research efforts were directed toward various combination therapy with pharmacological and nonpharmacological methods. Several trials tested tissue plasminogen activator (t-PA) in combination with antiplateletes and anticoagulants. Combination of t-PA with nonpharmacological agents included sonothrombolysis (amplifying the thrombolytic effect), laser (neuro-recovery), hypothermia (cytoprotection and decreasing brain swelling), and blood flow augmentation (increasing residual flow and recruitment of collateral vessels). This paper will review ongoing clinical trials and safety of these promising combinatory treatments. Anticoagulants;Fibrinolytic Agents;Pipecolic Acids;Platelet Aggregation Inhibitors;Recombinant Proteins;Sulfonamides;Vasodilator Agents;Tyrosine;Arginine;Plasminogen Activators;Tirofiban;argatroban Anticoagulants;Arginine;Brain Ischemia;Cerebral Hemorrhage;Clinical Trials as Topic;Collateral Circulation;Drug Synergism;Drug Therapy, Combination;Fibrinolytic Agents;Humans;Hypothermia, Induced;Low-Level Light Therapy;Pipecolic Acids;Plasminogen Activators;Platelet Aggregation Inhibitors;Prospective Studies;Recombinant Proteins;Sulfonamides;Thrombolytic Therapy;Tirofiban;Tyrosine;Ultrasonic Therapy;Vasodilator Agents

[The influence of ultrahigh-frequency electromagnetic radiation and low-intensity laser radiation on the body core temperature and basal metabolism in rats with systemic inflammation]. The effects of ultrahigh-frequency electromagnetic radiation (UHF EMR) and low-intensity laser irradiation (LILI) on the body and skin temperature, oxygen consumption, production of carbon dioxide and heat release were investigated in the experiments on intact rats and during LPS-induced polyphasic fever. It was found that UHF EMR with the wavelength of 4,9 mm, 5,6 mm or 7,1 mm and LILI with the wavelength of 0.47 microm, 0.67 microm and 0.87 microm caused modulation of basal metabolism and thermal response to systemically administered lipopolysaccharide (LPS). These findings suggest that the most pronounced antipyretic and hypometabolic effects were observed after the treatment with UHF EMR at 7,1 mm and LILI at 470 microm. Lipopolysaccharides Animals;Body Temperature Regulation;Fever;Lipopolysaccharides;Low-Level Light Therapy;Male;Microwaves;Oxygen Consumption;Rats;Skin Temperature

Acne vulgarism treatment using ultra-short laser pulse generated by micro- and nano-ring resonator system. Acne vulgaris is adebilitating dermatologic disease, and is conventionally treated by laser therapy using a microring resonator system. An evolving understanding of laser-tissue interactions involving Propioni bacterium acneproducing porphyrins, and the development of lasers to target the sebaceous glands, has led to the development of an escalating number of laser light for acne treatment. The results show that the full width at half maximum of the proposed laser pulse of 0.15 nm can be generated using a microring resonator system. The power of the laser is 200 W and the wavelength laser is 1,032 nm, which is proposed as a treatment of acne vulgaris diseases. Acne Vulgaris;Humans;Lasers;Light;Low-Level Light Therapy;Sebaceous Glands;Treatment Outcome

Pulsed Nd: YAG laser induces pulpal analgesia: a randomized clinical trial. This double-blind, randomized, clinical trial investigated the effectiveness and underlying mechanism of neural inhibition of pulsed Nd:YAG laser induction of pulpal analgesia compared with 5% EMLA anesthetic cream. Forty-four paired premolars from 44 orthodontic patients requiring bilateral premolar extraction from either dental arch were randomly assigned to the 'Laser plus Sham-EMLA' or 'EMLA plus Sham-Laser' treatment group. Analgesia was tested by an Electric Pulp Tester (EPT) and the cutting of a standardized cavity, which was terminated when participants reported sensitivity, and Visual Analogue Scale (VAS) and numbness were recorded. Statistical analyses were done by paired t test, McNemar's test, and a chi-squared test ($p < 0.05$). Sixty-eight percent of laser- and 59% of EMLA-treated teeth had completed cavities with statistically significant EPT increases above baseline. No significant within-patient differences were found for either group. No laser-treated participants reported numbness. The trial confirmed that the pulsed Nd:YAG laser effectively induced pulpal analgesia, by suppression of intradental nerve responses to electrical and mechanical stimuli. Such a laser provides an alternative for dental pain management (ANZ-Clinical Trial Registry: N12611001099910). Anesthetics, Combined;Anesthetics, Local;Lidocaine, Prilocaine Drug Combination;Prilocaine;Lidocaine Adolescent;Anesthesia, Dental;Anesthesia, Local;Anesthetics, Combined;Anesthetics, Local;Bicuspid;Dental Cavity Preparation;Dental Pulp;Dental Pulp Test;Double-Blind Method;Female;Humans;Lasers, Solid-State;Lidocaine;Lidocaine, Prilocaine Drug Combination;Low-Level Light Therapy;Male;Neural Inhibition;Pain Measurement;Pain Threshold;Prilocaine;Synaptic Transmission;Tooth Extraction

Low-level laser therapy regulates microglial function through Src-mediated signaling pathways: implications for neurodegenerative diseases. BACKGROUND: Activated microglial cells are an important pathological component in brains of patients with neurodegenerative diseases. The purpose of this study was to investigate the effect of He-Ne (632.8â€‰nm, 64.6â€‰mW/cm2) low-level laser therapy (LLLT), a non-damaging physical therapy, on activated microglia, and the subsequent signaling events of LLLT-induced neuroprotective effects and phagocytic responses.

METHODS: To model microglial activation, we treated the microglial BV2 cells with lipopolysaccharide (LPS). For the LLLT-induced neuroprotective study, neuronal cells with activated microglial cells in a Transwellâ„¢ cell-culture system were used. For the phagocytosis study, fluorescence-labeled microspheres were added into the treated microglial cells to confirm the role of LLLT. RESULTS: Our results showed that LLLT (20â€‰J/cm2) could attenuate toll-like receptor (TLR)-mediated proinflammatory responses in microglia, characterized by down-regulation of proinflammatory cytokine expression and nitric oxide (NO) production. LLLT-triggered TLR signaling inhibition was achieved by activating tyrosine kinases Src and Syk, which led to MyD88 tyrosine phosphorylation, thus impairing MyD88-dependent proinflammatory signaling cascade. In addition, we found that Src activation could enhance Rac1 activity and F-actin accumulation that typify microglial phagocytic activity. We also found that Src/PI3K/Akt inhibitors prevented LLLT-stimulated Akt (Ser473 and Thr308) phosphorylation and blocked Rac1 activity and actin-based microglial phagocytosis, indicating the activation of Src/PI3K/Akt/Rac1 signaling pathway. CONCLUSIONS: The present study underlines the importance of Src in suppressing inflammation and enhancing microglial phagocytic function in activated microglia during LLLT stimulation. We have identified a new and important neuroprotective signaling pathway that consists of regulation of microglial phagocytosis and inflammation under LLLT treatment. Our research may provide a feasible therapeutic approach to control the progression of neurodegenerative diseases. Actins;Chromones;Cyclic N-Oxides;Cytokines;Enzyme Inhibitors;Free Radical Scavengers;Imidazoles;LY 290042;Lipopolysaccharides;Morpholines;Myd88 protein, mouse;Myeloid Differentiation Factor 88;Phalloidine;2-phenyl-4,4,5,5-tetramethylimidazoline-1-oxyl-3-oxide;Nitric Oxide;Tyrosine;rac1 GTP-Binding Protein Actins;Analysis of Variance;Animals;Animals, Newborn;Brain;Cells, Cultured;Chromones;Cyclic N-Oxides;Cytokines;Cytotoxicity Tests, Immunologic;Enzyme Inhibitors;Free Radical Scavengers;Gene Expression Regulation;Humans;Imidazoles;Lipopolysaccharides;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Microglia;Microscopy, Confocal;Morpholines;Myeloid Differentiation Factor 88;Neuroblastoma;Nitric Oxide;Phagocytosis;Phalloidine;Proto-Oncogene Proteins pp60(c-src);Signal Transduction;Statistics as Topic;Time Factors;Transfection;Tyrosine;rac1 GTP-Binding Protein

Effects of low-level laser therapy (LLLT) and diclofenac (topical and intramuscular) as single and combined therapy in experimental model of controlled muscle strain in rats. Muscle injuries represent ca 30% of sports injuries and excessive stretching of muscle causes more than 90% of injuries. Currently the most used treatments are nonsteroidal anti-inflammatory drugs (NSAIDs), however, in last years, low-level laser therapy (LLLT) is becoming an interesting therapeutic modality. The aim of this study was to evaluate the effect of single and combined therapies (LLLT, topical application of diclofenac and intramuscular diclofenac) on functional and biochemical aspects in an experimental model of controlled muscle strain in rats. Muscle strain was induced by overloading tibialis anterior muscle of rats. Injured groups received either no treatment, or a single treatment with topical or intramuscular diclofenac (TD and ID), or LLLT (3Â J, 810Â nm, 100Â mW) 1Â h after injury. Walking track analysis was the functional outcome and biochemical analyses included mRNA expression of COX-1 and COX-2 and blood levels of prostaglandin E2 (PGE2). All treatments significantly decreased COX-1 and COX-2 gene expression compared with injury group (PÂ <Â 0.05). However, LLLT showed better effects than TD and ID regarding PGE2 levels and walking track analysis (PÂ <Â 0.05). We can conclude that LLLT has more efficacy than topical and intramuscular diclofenac in treatment of muscle strain injury in acute stage. Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Membrane Proteins;Diclofenac;Cyclooxygenase 1;Cyclooxygenase 2;Ptgs1 protein, rat;Ptgs2 protein, rat;Dinoprostone Animals;Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Combined Modality Therapy;Cyclooxygenase 1;Cyclooxygenase

2;Diclofenac;Dinoprostone;Gene Expression;Injections, Intramuscular;Low-Level Light Therapy;Male;Membrane Proteins;Muscle, Skeletal;Rats;Rats, Wistar;Soft Tissue Injuries;Sprains and Strains

Alexandrite laser for the treatment of port wine stains refractory to pulsed dye laser. BACKGROUND: The 755-nm ms pulsed Alexandrite laser (MSPAL) has been reported to be successfully in the treatment of port wine stains (PWS) that are refractory to pulsed dye laser (PDL). MATERIALS & METHODS: This was a prospective pilot study to assess the degree of improvement after a series of treatments with a MSPAL for hypertrophic, nodular, and macular PWS refractory to PDL. Treatment was administered to the PWS using the 755-nm MSPAL at settings of 3-ms pulse duration, 8- to 12-mm spot, 40 to 60 J/cm(2), and dynamic cooling of 60/40. Patients received a series of two to four treatment session, given at 6- to 8-week intervals. RESULTS: The eight patients in this study had undergone a mean of 25.9 treatment sessions with PDL over 8.8 years. The number of MSPAL sessions required for significant improvement of PWS ranged from two to four (mean 2.6). From before treatment to 2 months after treatment, the mean score decreased from 3.2 to 1.4 for skin color (56.3% mean improvement, 95% confidence interval (CI)=53.2-59.4%), from 2.5 to 1.0 at (60.0% mean improvement, 95% CI=55.9-64.1%) for skin texture, and from 3.2 to 1.3 (59.4% mean improvement, 95% CI=56.2-62.6%) for overall cosmetic outcome (all p<.05). DISCUSSION: In this pilot study, PDL-resistant PWS responded significantly to a series of MSPAL treatments. Given the potential for adverse effects and narrow therapeutic index, treatment with conservative parameters and close observation of tissue response are essential. Adolescent;Adult;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Port-Wine Stain;Prospective Studies;Treatment Outcome

Overview of non-invasive factors (low level laser and low intensity pulsed ultrasound) accelerating tooth movement during orthodontic treatment. The need for orthodontic treatment is increasing all the time. As the treatment is time consuming ranging from a year to several years, any method of reducing the period of treatment and increasing the quality of the tissue will be beneficial to patients. The use of non-invasive techniques such as low level laser therapy and low intensity pulsed ultasound in accelerating orthodontic tooth movement are promising. Thus, this overview study will help to generate more understanding about the background information and the possible applications of them in daily orthodontics, depending on previous literature searching for reviews and original research articles. Humans;Low-Level Light Therapy;Tooth Movement Techniques;Ultrasonic Therapy

Determination of the thermal and physical properties of black tattoo ink using compound analysis. Despite the widespread use of laser therapy in the removal of tattoos, comparatively little is known about its mechanism of action. There is a need for an improved understanding of the composition and thermal properties of the tattoo ink in order that simulations of laser therapy may be better informed and treatment parameters optimised. Scanning electron microscopy and time-of-flight secondary ion mass spectrometry identified that the relative proportions of the constituent compounds of the ink likely to exist in vivo are the following: carbon black pigment (89Â %), carvacrol (5Â %), eugenol (2Â %), hexenol (3Â %) and propylene glycol (1Â %). Chemical compound property tables identify that changes in phase of these compounds lead to a considerable reduction in the density and thermal conductivity of the ink and an increase in its specific heat as temperature increases. These temperature-dependent values of density, thermal conductivity and specific heat are substantially different to the constant values, derived from water or graphite at a fixed temperature, which have been applied in the simulations of laser therapy as previously described in the literature. Accordingly, the thermal properties of black tattoo ink described in this study provide valuable information that may be used to improve simulations of tattoo laser therapy. Coloring

Agents;Cymenes;Hexanols;Monoterpenes;Soot;Eugenol;Propylene Glycol;carvacrol
Color;Coloring Agents;Cymenes;Eugenol;Hexanols;Hot Temperature;Humans;Ink;Low-Level Light Therapy;Microscopy, Electron, Scanning;Monoterpenes;Propylene Glycol;Skin;Soot;Spectrometry, Mass, Secondary Ion;Tattooing

The effect of low level laser therapy on pain reduction after third molar surgery. AIM: The aim of this study was to evaluate the effects of low level laser on the postoperative pain of patients who had to undergo third molar surgery. METHODS: In a randomized clinical setting, 100 patients were assigned to two groups of 50 in each. Every patient underwent surgical removal of one mandibular third molar (with osteotomy). After suturing the flap, the soft laser was applied to every patient. In group I laser radiation was applied by the dental assistant with output power of 100 mW, in continuous mode with sweeping motion, in group II, the laser hand piece was only brought into position without releasing energy, so that no patient knew which group he belonged to. The patient was given a pain evaluation form where they could determine their individual pain level and duration. RESULTS: The statistical tests showed significant difference in pain level between laser and control group (P<0.001) but no significant difference found in pain duration in two groups (P=0.019). CONCLUSION: The result of this study verifies the positive effect of the soft-laser therapy in the postoperative complication after third molar extraction. Adolescent;Adult;Aged;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Molar, Third;Pain, Postoperative;Tooth Extraction;Young Adult

Effects of low-level laser therapy as an adjunct to standard therapy in acute pericoronitis, and its impact on oral health-related quality of life. OBJECTIVE: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) as an adjunct to standard therapy in acute pericoronitis. METHODS: Eighty acute pericoronitis patients were randomly assigned to one of four LLLT groups: (neodymium:yttrium-aluminum garnet [Nd:YAG] 1064-nm: n=20, 8â€‰J/cm2, 0.25â€‰W, 10â€‰Hz, 10â€‰sec; 808-nm diode: n=20, 8â€‰J/cm2, 0.25â€‰W, continuous mode, 10â€‰sec; 660-nm diode: n=20, 8â€‰J/cm2, 0.04â€‰W, continuous mode, 60â€‰sec; or a placebo laser control group: n=20). After standard treatment, LLLT or a placebo laser were applied to the treatment area at a distance of 1â€‰cm from the buccal site. Interincisal opening, pain perception, and oral health-related quality of life (OHRQoL) were evaluated at baseline, 24â€‰h, and 7 days after laser application. The data were analyzed by the one-way ANOVA test. RESULTS: We found that the trismus and the OHRQoL in the Nd:YAG and the 808-nm diode groups were significantly improved when compared with the 660-nm diode and control groups at 24â€‰h (p<0.05). No statistically significant differences were detected on day 7 among the groups with regard to any of the parameters evaluated. CONCLUSIONS: The results demonstrate that both the 1064-nm Nd:YAG and the 808-nm diode lasers were effective in improving trismus and OHRQoL in acute pericoronitis. Taking into account the limitations of this study, we conclude that the 1064-nm Nd:YAG laser has biostimulatory effects and improves OHRQoL, making it suitable for LLLT. Adolescent;Adult;Analysis of Variance;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Oral Health;Pericoronitis;Quality of Life;Reference Values;Risk Assessment;Severity of Illness Index;Treatment Outcome;Young Adult

Investigation of the 1064â€‰nm Q-switched Nd:YAG laser on collagen expression in an animal model. BACKGROUND AND PURPOSE: The objective of this study was to evaluate the changes of collagen expression and its possible molecular mechanism in the rat skin induced by 1064â€‰nm Q-switched Nd:YAG laser treatments. METHODS: The dorsal skin of Sprague-Dawley (SD) rats was irradiated with the 1064â€‰nm laser at fluences of 0, 0.6, 1.5, and 2.5â€‰J/cm2, respectively. Then biochemical analysis was used to quantify hydroxyproline content in the skin. The mRNA expressions of procollagen, matrix metalloproteinases (MMPs), and tissue inhibitors of metalloproteinases

(TIMPs) were analyzed by using reverse transcription-polymerase chain reaction (RT-PCR). The activities of mitogen-activated protein kinase (MAPK) family members were detected by Western blot analysis. RESULTS: The 1064â€‰nm laser treatments led to a marked increase in collagen content in a dose-dependent manner. The expression of types I and III collagen, TIMP1 and TIMP2, in the skin was markedly upregulated, whereas the expression of MMP2 and MMP3 was significantly decreased after laser treatments. Both extracellular signal-related kinase (Erk)1/2 and JNK MAPK pathways were activated by the 1064â€‰nm laser irradiation. CONCLUSIONS: The 1064â€‰nm laser irradiation could markedly increase collagen synthesis and inhibit collagen degradation. The activation of Erk1/2 and JNK MAPK seems to play a role in collagen production in the rat skin, induced by the 1064â€‰nm laser. RNA, Messenger;Tissue Inhibitor of Metalloproteinase-2;Collagen;Matrix Metalloproteinase 2;Hydroxyproline Animals;Blotting, Western;Collagen;Female;Hydroxyproline;Lasers, Solid-State;Low-Level Light Therapy;Matrix Metalloproteinase 2;Models, Animal;RNA, Messenger;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Sensitivity and Specificity;Skin;Tissue Inhibitor of Metalloproteinase-2

Ulceration of mature surgical scars following nonablative fractional photothermolysis associated with intralesional lidocaine injections. Anesthetics, Local;Lidocaine Abdominal Wall;Adult;Anesthetics, Local;Cicatrix;Female;Humans;Injections, Intralesional;Lidocaine;Low-Level Light Therapy;Male;Middle Aged;Skin Ulcer;Young Adult

Photobiomodulation in dentistry. Dentistry;Dentistry, Operative;Forecasting;Humans;Low-Level Light Therapy;Photobiology;Phototherapy

A new treatment protocol using photobiomodulation and muscle/bone/joint recovery techniques having a dramatic effect on a stroke patient's recovery: a new weapon for clinicians. The subject of this case study is a 29-year-old woman who suffered a brainstem stroke. She remained severely dizzy, had a non-functional left hand secondary to weakness, severe spasticity in the right hand, a right lateral sixth nerve palsy and was unable to ambulate on presentation. The stroke occurred 2 years before presentation. The subject had been treated for 21 months at two different stroke rehabilitation centres before presentation. Our stroke protocol includes photobiomodulation administered with the XR3T-1 device and 'muscle/bone/joint/soft tissue' recovery techniques. The patient was seen once a week for 8 weeks and treatment sessions lasted approximately 60 min. The results were dramatic: after 8 weeks of implementation of our protocol, the patient demonstrated positive change in every area of her deficits as determined by improvements in physical examination findings. The gains achieved at 8 weeks have been maintained to this day and she continues to be treated once every 4 weeks. Adult;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Musculoskeletal Manipulations;Stroke;Stroke Rehabilitation;Treatment Outcome

Low-power GaAlAs laser irradiation promotes the proliferation and osteogenic differentiation of stem cells via IGF1 and BMP2. Low-power laser irradiation (LPLI) has been found to induce various biological effects and cellular processes. Also, LPLI has been shown to promote fracture repair. Until now, it has been unclear how LPLI promotes bone formation and fracture healing. The aim of this study was to investigate the potential mechanism of LPLI-mediated enhancement of bone formation using mouse bone marrow mesenchymal stem cells (D1 cells). D1 cells were irradiated daily with a gallium-aluminum-arsenide (GaAlAs) laser at dose of 0, 1, 2, or 4 J/cm(2). The lactate dehydrogenase (LDH) assay showed no cytotoxic effects of LPLI on D1 cells, and instead, LPLI at 4 J/cm(2) significantly promoted D1 cell proliferation. LPLI also enhanced osteogenic differentiation in a dose-dependent manner and moderately increased expression of osteogenic markers. The neutralization experiments indicated that LPLI regulated insulin-like growth factor 1 (IGF1) and bone morphogenetic protein 2 (BMP2) signaling to promote cell proliferation and/or osteogenic differentiation. In conclusion, our study suggests that LPLI may induce IGF1 expression to promote both the proliferation and

osteogenic differentiation of D1 cells, whereas it may induce BMP2 expression primarily to enhance osteogenic differentiation. Bmp2 protein, mouse;Bone Morphogenetic Protein 2;insulin-like growth factor-1, mouse;Insulin-Like Growth Factor I Animals;Bone Marrow Cells;Bone Morphogenetic Protein 2;Cell Differentiation;Cell Proliferation;Cells, Cultured;Gene Expression;Insulin-Like Growth Factor I;Lasers, Semiconductor;Mesenchymal Stem Cells;Mice;Mice, Inbred BALB C;Osteogenesis;Signal Transduction

Influence of the HPA axis on the inflammatory response in cutaneous wounds with the use of 670-nm laser photobiomodulation. This study evaluated the influence of hypothalamic-pituitary-adrenal (HPA) axis in cutaneous wounds subjected to laser biomodulation. A total of 48 rats were divided into two groups: Group I (GI) with 24 adrenalectomized animals and Group II (GII) with 24 non-adrenalectomized animals. Each group was divided into two subgroups: the irradiated subgroup which laser was applied to four points at the edges of the wound (670 nm laser, 9 mW) and control subgroup. Rats in each subgroup were sacrificed at 24 or 72 h. Adrenal glands were only removed from GI rats. Three days after adrenalectomy, a cutaneous wound was made. An immunohistochemical analysis was performed using anti-CD45 and anti-CD8 antibodies. Flow cytometry was used to count T lymphocytes and their subpopulations in blood. Decreases in the number of CD45-positive inflammatory cells and in the total numbers of CD8- and CD45-positive cells were observed in histological sections of adrenalectomized animals subjected to laser biomodulation at 24h. Similar results were observed for distribution of total lymphocytes in blood ($p<0.05$). The action of 670 nm laser does not depend exclusively on HPA axis. It is believed that corticosteroid-promoting enzymes liberated in non-adrenal tissues may influence immune response under the influence of this type of phototherapy. Adrenal Glands;Adrenalectomy;Animals;CD4-Positive T-Lymphocytes;CD8-Positive T-Lymphocytes;Hypothalamo-Hypophyseal System;Inflammation;Laser Therapy;Male;Rats;Rats, Wistar;Skin

Electrophysical therapy for managing diabetic foot ulcers: a systematic review. To systematically assess published reports on the efficacy of electrophysical therapy in the treatment of diabetic foot ulcers, including electrical stimulation, low-level laser therapy, therapeutic ultrasound and electromagnetic therapy. Databases searched included MEDLINE, CINAHL, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL) from 1966 to 2011. Studies reviewed included only randomised controlled trials (RCTs) on treatment with electrophysical modalities compared with sham, conventional treatment or other electrophysical modalities. Information extracted were objective measures of healing and data useful for the calculation of effect size. Eight RCTs were eventually included in the critical appraisal, with a combined total of 325 participants. Five studies were conducted on electrical stimulation, two on phototherapy and one on ultrasound. All studies reported that the experimental group was significantly more favourable than the control or sham group. The pooled estimate of the number of healed ulcers of the three studies on electrical stimulation compared to the control or sham electrical stimulation showed statistical significance [mean difference of 2Â·8 (95% CI = 1Â·5-5Â·5, P = 0Â·002] in favour of electrical stimulation. The results indicated potential benefit of using electrophysical therapy for managing diabetic foot ulcers. However, due to the small number of trials ever conducted, the possibility of any harmful effects cannot be ruled out, and high-quality trials with larger sample sizes are warranted. Adult;Aged;Aged, 80 and over;Diabetic Foot;Electric Stimulation Therapy;Electromagnetic Phenomena;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Randomized Controlled Trials as Topic;Treatment Outcome;Ultrasonic Therapy;Wound Healing

Analysis of the temporal change in biophysical parameters after fractional laser treatments using reflectance confocal microscopy. BACKGROUND: Fractional photothermolysis is a popular treatment option for photorejuvenation. Previous literature studies have demonstrated the clinical

effectiveness of fractional photothermolysis on cutaneous photoaging; however, the associated changes in biophysical properties of the skin following fractional photothermolysis have not been fully elucidated. This study was conducted to investigate the temporal changes in biophysical parameters after fractional laser treatment on Asian skin. MATERIALS AND METHODS: Eleven female subjects underwent a single treatment with an erbium glass fractional laser. Skin roughness, elasticity, transepidermal water loss (TEWL), dermal thickness were evaluated before and immediately after treatment and 3 days, 1 week, 2 weeks, and 4 weeks after treatment. The changes in the dermal papilla were analyzed using a reflectance confocal microscopy (RCM). RESULTS: Skin roughness showed the greatest improvement at the first week and net elasticity was most improved at the second week. TEWL and the percentage of melanized and active dermal papillae (DP) were mostly increased for 3 days. At 4 weeks after treatment, the number of total dermal papillae showed a significant increase compared with pretreatment. CONCLUSION: This is the first study of the characterization and quantification of dermal papilla reflecting the dermal repair process after fractional photothermolysis through an RCM. Adult;Asian People;Biophysical Phenomena;Dermis;Dermoscopy;Elasticity;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Confocal;Rejuvenation;Skin Aging;Treatment Outcome;Water Loss, Insensible;Young Adult

Shining light on nanotechnology to help repair and regeneration. Phototherapy can be used in two completely different but complementary therapeutic applications. While low level laser (or light) therapy (LLLT) uses red or near-infrared light alone to reduce inflammation, pain and stimulate tissue repair and regeneration, photodynamic therapy (PDT) uses the combination of light plus non-toxic dyes (called photosensitizers) to produce reactive oxygen species that can kill infectious microorganisms and cancer cells or destroy unwanted tissue (neo-vascularization in the choroid, atherosclerotic plaques in the arteries). The recent development of nanotechnology applied to medicine (nanomedicine) has opened a new front of advancement in the field of phototherapy and has provided hope for the development of nanoscale drug delivery platforms for effective killing of pathological cells and to promote repair and regeneration. Despite the well-known beneficial effects of phototherapy and nanomaterials in producing the killing of unwanted cells and promoting repair and regeneration, there are few reports that combine all three elements i.e. phototherapy, nanotechnology and, tissue repair and regeneration. However, these areas in all possible binary combinations have been addressed by many workers. The present review aims at highlighting the combined multi-model applications of phototherapy, nanotechnology and, reparative and regeneration medicine and outlines current strategies, future applications and limitations of nanoscale-assisted phototherapy for the management of cancers, microbial infections and other diseases, and to promote tissue repair and regeneration.
Animals;Humans;Nanomedicine;Photochemotherapy;Phototherapy;Regeneration;Regenerative Medicine

Ultra-short laser pulse generated by a microring resonator system for cancer cell treatment. A microring resonator (MRRs) system incorporated with a add/drop filter is proposed in which ultra-short single, multi-temporal, and spatial optical soliton pulses are simulated and used to kill abnormal cells, tumors, and cancer. Chaotic signals are generated by a bright soliton pulse within a nonlinear MRRs system. Gold nanoparticles and ultra-short femtosecond/picosecond laser pulses' interaction holds great interest in laser nanomedicine. By using appropriate soliton input power and MRRs parameters, desired spatial and temporal signals can be generated over the spectrum. Results show that short temporal and spatial solitons pulse with FWHM = 712 fs and FWHM = 17.5 pm could be generated. The add/drop filter system is used to generate the high-capacity, ultra-short soliton pulses

in the range of nanometer/second and picometer/second. Gold Gold;Humans;Lasers;Low-Level Light Therapy;Metal Nanoparticles;Nanomedicine;Neoplasms
Incremental treatments with laser therapy augments good behavioral outcome in the rabbit small clot embolic stroke model. Transcranial near-infrared laser therapy (TLT) improves behavioral outcome in animal stroke models when applied as single treatment within the 24Â h of the stroke onset. It is unknown if the multiple TLT treatments have an added beneficial effect. We aim to determine whether multiple irradiations with TLT would have further improvement in behavioral outcomes in the rabbit small clot embolic stroke model (RSCEM). Using the RSCEM, two and three TLT treatments (7.5-20Â mW/cm(2)) were compared against single laser treatment alone (7.5-10.8Â mW/cm(2)). Two sham irradiation groups were added for the control curves. The double treatment group received TLT at 3 and 5Â h and the triple treatment group at 2, 3, and 4Â h after embolization. Behavioral analysis was conducted 24Â h after embolization using a dichotomized behavioral score. The determination of the effective clot amount (milligrams) that produces neurological deficits in 50Â % of the rabbits (P 50) was used to compare TLT treatments with the sham. The P 50 for double treatment was 5.47â€‰Â±â€‰0.90, with nâ€‰=â€‰39; the corresponding P 50 value for a single treatment was 3.87â€‰Â±â€‰0.73, with nâ€‰=â€‰38; and the corresponding control curve was 3.25â€‰Â±â€‰0.4, nâ€‰=â€‰32. The P 50 for triple treatment was 5.91â€‰Â±â€‰0.49, with nâ€‰=â€‰23; the corresponding P 50 value for a single treatment was 3.09â€‰Â±â€‰0.59, with nâ€‰=â€‰15, and the corresponding control curve was 1.71â€‰Â±â€‰0.26, with nâ€‰=â€‰17. The triple treatment had 91Â % improvement when compared with the single treatment and 245Â % improvement when compared with the sham. The present study suggests that the additional TLT treatments provide further behavioral improvement when given during the acute ischemic stroke phase. Animals;Behavior, Animal;Disease Models, Animal;Infrared Rays;Intracranial Embolism;Low-Level Light Therapy;Male;Rabbits;Stroke;Time Factors
DNA repair gene expression in biological tissues exposed to low-intensity infrared laser. Special properties of laser light have led to its usefulness in many applications in therapy. Excitation of endogenous chromophores in biotissues and generation of free radicals could be involved in its biological effects. DNA lesions induced by free radicals are repaired by base excision repair pathway. In this work, we evaluated the expression of APE1 and OGG1 genes related to repair of DNA lesions induced by free radicals. Skin and muscle tissues of Wistar rats were exposed to low-intensity infrared laser at different fluences and frequencies. After laser exposition of 1 and 24Â h, tissue samples were withdrawn for total RNA extraction, cDNA synthesis, and evaluation of APE1 and OGG1 gene expression by quantitative polymerase chain reaction. Data obtained show that laser radiation alters the expression of APE1 and OGG1 mRNA differently in skin and muscle tissues of Wistar rats depending of the fluence, frequency, and time after exposure. Our study suggests that low-intensity infrared laser affects expression of genes involved in repair of DNA lesions by base excision repair pathway. RNA, Messenger;DNA Glycosylases;OGG1 protein, rat;Apex1 protein, rat Animals;DNA Glycosylases;DNA Repair;DNA-(Apurinic or Apyrimidinic Site) Lyase;Gene Expression;Infrared Rays;Low-Level Light Therapy;Male;Muscles;RNA, Messenger;Rats;Rats, Wistar;Skin
Effects of imiquimod and low-intensity laser (Î»660 nm) in chemically induced oral carcinomas in hamster buccal pouch mucosa. Squamous cell carcinoma (SCC) is the most common neoplasm of the oral cavity. It is aggressive, highly proliferative, and metastatic. This study aimed to evaluate the effect of LLLT and imiquimod on DMBA chemically induced lesions on the oral mucosa of hamsters. SCCs were induced on 25 hamsters. Animals of G1 (control 1) were killed and the presence of tumors confirmed; G2 (control 2) suffered no interventions for additional 4 weeks; animals of G3 (laser

treatment) were irradiated (Î»660 nm, 50 mW, CW, Ã˜=3 mm, 0.07 cm(2), 714.2 mW/cm(2), 133 s, 95 J/cm(2), 6.65 J) at every other day for 4 weeks; animals of G4 (imiquimod treatment) received 5 % imiquimod three times a week for 4 weeks; and animals of G5 (imiquimod and laser treatment) received both treatments for the same period. Samples were taken and underwent histological analysis by light microscopy and were investigated using immunohistochemistry for S-100(+) dendritic cells. In G1, G2, and G3, the evaluations showed malignant tumors and the absence of S-100(+) dendritic cells in the tumor stroma. In G4, 60 % of the animals had no malignant tumors, and S-100(+) dendritic cells were present in the stroma of the tumors as well as dysplasia. In G5, 40 % of the animals presented SCC, with scarce or no S-100(+) dendritic cells. The imiquimod treatment played a direct effect on SCC, demonstrated by the increased number of S-100(+) dendritic cells, which could suggest an important role of immune surveillance against neoplastic proliferation. Furthermore, its association with laser needs to be further investigated. Aminoquinolines;Antineoplastic Agents;9,10-Dimethyl-1,2-benzanthracene;Imiquimod 9,10-Dimethyl-1,2-benzanthracene;Aminoquinolines;Animals;Antineoplastic Agents;Carcinoma, Squamous Cell;Cheek;Combined Modality Therapy;Cricetinae;Imiquimod;Low-Level Light Therapy;Male;Mesocricetus;Mouth Mucosa;Mouth Neoplasms

Low-level laser therapy and sodium diclofenac in acute inflammatory response induced by skeletal muscle trauma: effects in muscle morphology and mRNA gene expression of inflammatory markers. Pharmacological therapy is widely used in the treatment of muscle injuries. On the other hand, low-level laser therapy (LLLT) arises as a promising nonpharmacological treatment. The aim of this study was to analyze the effects of sodium diclofenac (topical application) and LLLT on morphological aspects and gene expression of biochemical inflammatory markers. We performed a single trauma in tibialis anterior muscle of rats. After 1Â h, animals were treated with sodium diclofenac (11.6Â mg g(-1) of solution) or LLLT (810Â nm; continuous mode; 100Â mW; 3.57Â WÂ cm(-2) ; 1, 3 or 9Â J; 10, 30 or 90Â s). Histological analysis and quantification of gene expression (real-time polymerase chain reaction-RT-PCR) of cyclooxygenase 1 and 2 (COX-1 and COX-2) and tumor necrosis factor-alpha (TNF-Î±) were performed at 6, 12 and 24Â h after trauma. LLLT with all doses improved morphological aspects of muscle tissue, showing better results than injury and diclofenac groups. All LLLT doses also decreased (PÂ <Â 0.05) COX-2 compared to injury group at all time points, and to diclofenac group at 24Â h after trauma. In addition, LLLT decreased (PÂ <Â 0.05) TNF-Î± compared both to injury and diclofenac groups at all time points. LLLT mainly with dose of 9Â J is better than topical application of diclofenac in acute inflammation after muscle trauma. Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Membrane Proteins;Tumor Necrosis Factor-alpha;Diclofenac;Cyclooxygenase 1;Cyclooxygenase 2;Ptgs1 protein, rat;Ptgs2 protein, rat Animals;Anti-Inflammatory Agents, Non-Steroidal;Biomarkers;Cyclooxygenase 1;Cyclooxygenase 2;Diclofenac;Gene Expression;Inflammation;Low-Level Light Therapy;Male;Membrane Proteins;Muscle, Skeletal;Rats;Rats, Wistar;Soft Tissue Injuries;Tumor Necrosis Factor-alpha

Low-level laser therapy improves the inflammatory profile of rats with heart failure. Following heart failure (HF), immune activation leads to an imbalance between pro-inflammatory and anti-inflammatory cytokines. Low-level laser therapy (LLLT) has been used as an anti-inflammatory treatment in several disease conditions. However, the effect of LLLT on the skeletal muscle of rats with HF remains unclear. The present report aimed to evaluate the influence of LLLT on the inflammatory profile of rats with HF. The left coronary artery was ligated to induce HF and a sham operation was performed in the control groups. Male Wistar rats (n=49) were assigned to one of six groups: placebo sham rats (P-Sham; n=8), LLLT at a dose of 3 J/cm(2) sham rats (3 J/cm(2)-Sham; n=8), LLLT at a dose of 21 J/cm(2) sham rats (21 J/cm(2)-Sham; n=8), placebo HF rats (P-HF; n=9), LLLT at a dose of 3 J/cm(2) HF rats (3 J/cm(2)-HF; n=8), and LLLT at a dose of 21 J/cm(2) HF rats (21

J/cm(2)-HF; n=8). Four weeks after myocardial infarction or sham surgery, rats were subjected to LLLT (InGaAlP 660 nm, spot size 0.035 cm(2), output power 20 mW, power density 0.571 W/cm(2), energy density 3 or 21 J/cm(2), exposure time 5.25 s and 36.75 s) on the right gastrocnemius for 10 consecutive days. LLLT reduced plasma IL-6 levels (61.3 %; P<0.01), TNF-Î±/IL-10 (61.0 %; P<0.01) and IL-6/IL-10 ratios (77.3 %; P<0.001) and increased IL-10 levels (103 %; P<0.05) in the 21 J/cm(2)-HF group. Moreover, LLLT reduced the TNF-Î± (20.1 % and 21.3 %; both P<0.05) and IL-6 levels (54.3 % and 37.8 %; P<0.01 and P<0.05, respectively) and the IL-6/IL-10 ratio (59.7 % and 42.2 %; P<0.001 and P<0.05, respectively) and increased IL-10 levels (81.0 % and 85.1 %; both P<0.05) and the IL-10/TNF-Î± ratio (171.5 % and 119.8 %; P<0.001 and P<0.05, respectively) in the gastrocnemius in the 3 J/cm(2)-HF and 21 J/cm(2)-HF groups. LLLT showed systemic and skeletal muscle anti-inflammatory effects in rats with HF. Inflammation Mediators;Interleukin-6;Tumor Necrosis Factor-alpha;Interleukin-10 Animals;Heart Failure;Inflammation;Inflammation Mediators;Interleukin-10;Interleukin-6;Low-Level Light Therapy;Male;Muscle, Skeletal;Myocardial Infarction;Rats;Rats, Wistar;Tumor Necrosis Factor-alpha

Low-level lasers as an adjunct in periodontal therapy in patients with diabetes mellitus. BACKGROUND: Diabetes mellitus (DM) increases the risk of periodontitis, and severe periodontitis often coexists with severe DM. The proposed dual pathway of tissue destruction suggests that control of chronic periodontal infection and gingival inflammation is essential for achieving long-term control of DM. The purpose this study is to evaluate the effects of low-level laser therapy (LLLT) by exfoliative cytology in patients with DM and gingival inflammation. SUBJECTS AND METHODS: Three hundred patients were divided in three equal groups: Group 1 consisted of patients with periodontitis and type 1 DM, Group 2 of patients with periodontitis and type 2 DM, and Group 3 of patients with periodontitis (control group). After oral examination, smears were taken from gingival tissue, and afterward all of the patients received oral hygiene instructions, removal of dental plaque, and full-mouth scaling and root planing. A split-mouth design was applied; on the right side of jaws GaAlAs LLLT (670 nm, 5 mW, 14 min/day) (model Mils 94; Optica Laser, Sofia, Bulgaria) was applied for five consecutive days. After the therapy was completed, smears from both sides of jaws were taken. The morphometric analysis was done using the National Institutes of Health Image software program and a model NU2 microscope (Carl Zeiss, Jena, Germany). RESULTS: Investigated parameters were significantly lower after therapy compared with values before therapy. After therapy on the side subjected to LLLT, there was no significantly difference between patients with DM and the control group. CONCLUSIONS: It can be concluded that LLLT as an adjunct in periodontal therapy reduces gingival inflammation in patients with DM and periodontitis. Glycated Hemoglobin A;hemoglobin A1c protein, human Adult;Dental Plaque;Dental Scaling;Diabetes Complications;Diabetes Mellitus, Type 1;Diabetes Mellitus, Type 2;Female;Gingivitis;Glycated Hemoglobin;Humans;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Oral Hygiene;Patient Education as Topic;Periodontitis;Root Planing;Treatment Outcome

Low-level laser therapy in experimental model of collagenase-induced tendinitis in rats: effects in acute and chronic inflammatory phases. A variety of treatments for tendinopathies is currently used or has been trialed. However, in fact, there is a remarkably little evidence that any conventional therapies are effective. In the last years, low-level laser therapy (LLLT) has been showing interesting results in inflammatory modulation in different musculoskeletal disorders, but the optimal parameters and mechanisms behind these effects are not fully understood. The aim of this study is to investigate if the LLLT modulates the acute and chronic phase of collagenase-induced tendinitis in rat by interfering in mRNA expression for matrix metalloproteinases (MMP13 and MMP1), vascular endothelial growth factor (VEGF), and anti-inflammatory mediator (interleukin (IL)-10). For such, tendinitis was induced by collagenase injection in male Wistar rats. Animals were treated with LLLT

(780 nm, potency of 22 mW, 107 mW/cm(2), energy density of 7.5 J/cm(2), and energy delivered of 1.54 J) with different number of treatments in accordance with the inflammatory phase analyzed. LLLT was able to modulate mRNA gene expression of IL-10, VGEF, MMP1, and MMP13 both in acute than in chronic inflammatory phase ($p<0.05$). Our results suggest that LLLT with parameters employed in the present study was able to modulate IL-10, VEGF, MMP1, and MMP13 mRNA gene expression both in acute than in chronic tendon inflammation. However, further studies are needed to establish optimal parameters for LLLT. Inflammation Mediators;RNA, Messenger;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Interleukin-10;Collagenases;Matrix Metalloproteinase 13;Mmp13 protein, rat;MMP1 protein, rat;Matrix Metalloproteinase 1 Acute Disease;Animals;Chronic Disease;Collagenases;Disease Models, Animal;Gene Expression;Inflammation;Inflammation Mediators;Interleukin-10;Low-Level Light Therapy;Male;Matrix Metalloproteinase 1;Matrix Metalloproteinase 13;RNA, Messenger;Rats;Rats, Wistar;Tendinopathy;Vascular Endothelial Growth Factor A

Clinical and functional evaluation of patients with acute low back pain and radiculopathy treated with different energy doses of low level laser therapy. BACKGROUND/AIM: The main clinical phenomena in acute low back pain (LBP) with radiculopathy are pain and neurological disorders. Although some studies show that low level laser therapy (LLLT) has the ability to modulate inflammatory processes and relieve acute pain condition, the laser therapy dose protocol has not been yet completely established. The aim of this study was to investigate the effects of three different energy doses of LLLT in patients with acute LBP and radiculopathy. METHODS: The study included 66 patients with acute LBP and radiculopathy who had been randomly divided into three groups (22 patients each) received three different doses of LLLT. The patients were treated 5 times weekly, for a total of 10 treatments, with the following parameters: wave length 904 nm, frequency 3,000 Hz, average diode power 25 mW; energy dose of 0.1 J per point in the first group, 1 J per point in the second and 4 J per point in the third group; daily treatment time and accumulated energy were 16 s and 0.4 J in the first group, 160 s and 4J in the second group and 640 s and 16 J in the third group, respectively. The parameters of assessment before and after the therapy were: lumbar and leg pain measured by visual analogue scale (VAS), local and general functional changes (Schober test, manual muscle test, straight leg raise test and the modified North American Spine Society-Low Back Pain Outcome Instrument-NASS LBP). RESULTS: Highly significant improvements ($p < 0.01$) were noted in all the groups after LLLT with respect to all the investigated parameters. The VAS scores were significantly lower in all the groups without a difference between the groups ($p > 0,05$). Functional improvements were better in the third group treated with the dose of 4 J per point than in other two groups ($p < 0.05$). CONCLUSIONS: Three different energy doses of LLLT were equally effective in alleviating lumbar and leg pain without side effects, but the dose of 4 J per point seemed to be more effective in improving the activities of daily living and lumbar mobility.
Activities of Daily Living;Acute Pain;Adult;Double-Blind Method;Humans;Low Back Pain;Low-Level Light Therapy;Middle Aged;Pain Measurement;Radiculopathy;Radiotherapy Dosage

Laser and LED phototherapies on angiogenesis. Angiogenesis is a key process for wound healing. There are few reports of LED phototherapy on angiogenesis, mainly in vivo. The aim of the present investigation was to evaluate histologically the angiogenesis on dorsal cutaneous wounds treated with laser (660 and 790 nm) or LEDs (700, 530, and 460 nm) in a rodent model. Twenty-four young adult male Wistar rats weighting between 200 and 250 g were used on the present study. Under general anesthesia, one excisional wound was created on the dorsum of each animal that were then randomly distributed into six groups with four animals each: G0-control; G1-laser Î»660 nm (60 mW, Ï• â^¼2 mm, 10 J/cm(2)); G2-laser Î»790 nm (50 mW, Ï• â^¼2 mm, 10 J/cm(2)); G3-LED Î»700 Â± 20 nm (15 mW, Ï• â^¼16 mm, 10 J/cm(2)); G4-LED Î»530 Â± 20 nm (8 mW, Ï• â^¼16 mm, 10 J/cm(2));

G5-LED Î»460 Â± 20 nm (22 mW, Ï• âˆ¼16 mm, 10 J/cm(2)). Irradiation started immediately after surgery and was repeated every other day for 7 days. Animal death occurred at the eighth day after surgery. The specimens were removed, routinely processed to wax, cut and stained with HE. Angiogenesis was scored by blood vessel counting in the wounded area. Quantitative results showed that green LED (Î»530 Â± 20 nm), red LED (Î»700 Â± 20 nm), Î»790 nm laser and Î»660 nm laser caused significant increased angiogenesis when compared to the control group. It is concluded that both laser and LED light are capable of stimulating angiogenesis in vivo on cutaneous wounds and that coherence was not decisive on the outcome of the treatment. Animals;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Phototherapy;Rats;Rats, Wistar;Skin;Wound Healing

Photobiomodulation by low-power laser irradiation attenuates AÎ²-induced cell apoptosis through the Akt/GSK3Î²/Î²-catenin pathway. Apoptosis induced by amyloid Î² peptide (AÎ²) is thought to associate with the pathogenesis of Alzheimer disease (AD). Accumulating evidence shows that low-power laser irradiation (LPLI) is capable of reducing AÎ²-induced apoptosis. However, the underlying mechanisms remain unclear. In this study, we report a novel molecular mechanism by which LPLI attenuates AÎ²(25-35)-induced apoptosis through the Akt/GSK3Î²/Î²-catenin pathway. We found that Akt activated by LPLI interacted with GSK3Î² and phosphorylated it on Ser9 in the presence of AÎ²(25-35), which resulted in the inhibition of GSK3Î². Furthermore, LPLI increased the nuclear translocation of Î²-catenin and enhanced its T cell factor/lymphocyte enhancer factor-dependent transcriptional activity via the Akt/GSK3Î² pathway to promote cell survival upon treatment with AÎ²(25-35.) Our data demonstrate that LPLI has a prosurvival effect on AÎ²-induced apoptosis and may be an effective therapeutic strategy in treating AD by targeting GSK3Î². Amyloid beta-Peptides;Peptide Fragments;beta Catenin;Serine;Glycogen Synthase Kinase 3 beta;Gsk3b protein, rat;Proto-Oncogene Proteins c-akt;Glycogen Synthase Kinase 3 Amyloid beta-Peptides;Animals;Apoptosis;Cell Nucleus;Cell Survival;Gene Expression Regulation;Glycogen Synthase Kinase 3;Glycogen Synthase Kinase 3 beta;Low-Level Light Therapy;PC12 Cells;Peptide Fragments;Phosphorylation;Photochemical Processes;Protein Transport;Proto-Oncogene Proteins c-akt;Rats;Serine;Signal Transduction;beta Catenin

Prevention and treatment of mice paw edema by near-infrared low-level laser therapy on lymph nodes. Low-level laser therapy (LLLT) has been demonstrated to modulate inflammatory processes and immunological responses. The aim of this work was to investigate the hypothesis that near infrared LLLT (830 nm) over lymph nodes may reduce paw edema and contribute to the modulation of inflammation. The edema was induced by carrageenan inoculation (CGN) into the plantar surface of 100 male mice left hind paw. Animals were divided into five groups: CGN (control), no treatment; Diclo, sodium diclofenac; Paw, LLLT on the paw; Ly, LLLT on the inguinal lymph nodes; and Paw+Ly, LLLT in both paw and lymph nodes, and subdivided according to moment of irradiation: A-1 h and 2 h before CGN, B-1 h and immediately before CGN, C-1 and 2 h after CGN, and D-3.5 and 4.5 h after CGN. The parameters used were: energy=1 J, fluence=35 J/cm(2), power=100 mW during 10 s. Paw volume was measured before and 1 to 6 h after CGN, and myeloperoxidase (MPO) activity was analyzed. Edema prevention was obtained by the irradiation of Paw+Ly at moment A and at Ly at moment B, inhibition of edema formation was achieved by either Paw or Ly at moment C, and edema treatment was obtained by Paw or Ly at moment D ($p<0.05$). MPO activity was significantly reduced on Paw at moment A, Paw and Ly on C, and in all irradiated groups on B and D. Our results suggest that LLLT was able to produce both anti-inflammatory and pro-inflammatory effects depending on to the site and moment of irradiation. Carrageenan;Peroxidase Animals;Carrageenan;Edema;Inflammation;Infrared Rays;Low-Level Light Therapy;Lymph Nodes;Male;Mice;Peroxidase

Low level laser arrests abdominal aortic aneurysm by collagen matrix reinforcement in apolipoprotein E-deficient mice. BACKGROUND AND OBJECTIVES: Recent in vitro studies by our group indicated that low level laser irradiation (LLLI) modifies cellular processes essential to the progression of abdominal aortic aneurysm (AAA). Using high-frequency ultrasonography (HF-u/s) in the angiotensin-II (Ang-II)-infused, apolipoprotein-E-deficient (Apo-E(-/-)) mouse model of AAA, we found that LLLI markedly inhibited aneurysm formation and preserved arterial wall elasticity. We now report, using quantitative histopathology, the likely mechanism underlying the preventative effect of LLLI on aneurysm formation in this model. STUDY DESIGN/MATERIALS AND METHODS: This study was performed on 32 Apo-E(-/-) mice of which 10 were Ang-II-infused and LLL-irradiated (780â€‰nm, 2â€‰J/cm(2) , 9-minutes), 12 were Ang-II-infused but not irradiated, and 10 were saline infused. The aortas were excised at 28d, sectioned at 250â€‰Âµm intervals, and stained with Hâ€‰+â€‰E, Movat-pentachrome and picrosirius-red for histomorphometry, and immunostained with Mac-2 and Î±-actin for detection of macrophages and SMCs, respectively. RESULTS: Transmural disruptions of the aorta occurred with distinct predilection for branch orifices. In the LLLI-treated animals, the frequency of these disruptions was lower (#branches with break points: 17 of 40 vs. 32 of 48, Pâ€‰=â€‰0.023 by Chi-squared), their size smaller (length [mm]: 0.48â€‰Â±â€‰0.26 vs. 0.98â€‰Â±â€‰1.42, Pâ€‰=â€‰0.044 by ANOVA with FPLSD), and the number of Mac-2-positive macrophages in the intramural areas of these disruptions lower than in the non-treated control (#Macrophages/0.01â€‰mm(2) at break points: 11.6â€‰Â±â€‰7.2 vs. 26.0â€‰Â±â€‰15.7, Pâ€‰=â€‰0.016 by Kruskal-Wallis). The average size of the medial SMCs was larger reflecting a heightened synthetic state (SMC size [Âµm(2)]: 463.9â€‰Â±â€‰61.4 vs. 354.9â€‰Â±â€‰71.7, Pâ€‰=â€‰0.001 by ANOVA with FPLSD). Furthermore, at sites of transmural disruption, the %area occupied by collagen of the overall area of attempted repair (%Col/WO) was significantly greater in the LLLI-treated animals versus control (%Col/WO: 41â€‰Â±â€‰13 vs. 32â€‰Â±â€‰16, Pâ€‰=â€‰0.009 by ANOVA with FPLSD). CONCLUSION: Enhanced matrix reinforcement and modification of the inflammatory response at sites of transmural injury are prominent mechanisms by which LLLI reduces AAA progression in this model. Apolipoproteins E;Vasoconstrictor Agents;Angiotensin II;Collagen Adventitia;Analysis of Variance;Angiotensin II;Animals;Aorta, Abdominal;Aortic Aneurysm, Abdominal;Apolipoproteins E;Collagen;Low-Level Light Therapy;Macrophages;Mice;Mice, Inbred C57BL;Mice, Knockout;Myocytes, Smooth Muscle;Vasoconstrictor Agents

Spatial frequency domain imaging of port wine stain biochemical composition in response to laser therapy: a pilot study. BACKGROUND AND OBJECTIVE: Objective methods to assess port wine stain (PWS) response to laser treatment have been the subject of various research efforts for several years. Herein, we present a pilot study using a newly developed, light emitting diode (LED) based spatial frequency domain imaging (SFDI) device to record quantitatively biochemical compositional changes in PWS after laser therapy. STUDY DESIGN/PATIENTS AND METHODS: A SFDI system was used to image before, and after, five PWS treatment sessions [nâ€‰=â€‰4 subjects (one subject was imaged before and after two consecutive laser treatments)]. SFDI derived wide-field optical properties (absorption and scattering) and tissue chromophore concentrations including oxy-hemoglobin (ctO(2) Hb), deoxy-hemoglobin (ctHHb), total hemoglobin (ctTHb), and tissue oxygen saturation (stO(2)) are presented for skin imaged prior to and immediately after laser treatment. The SFDI derived images were analyzed by comparing the above measurements in PWS to those of normal skin and tracking changes immediately after laser exposure. RESULTS: Elevated oxy-hemoglobin (>20%) and tissue oxygen saturation (>5%) were measured in all PWS lesions and compared to values for normal skin prior to treatment. Laser treatment resulted in an increase in deoxy-hemoglobin (>100%), decrease in tissue oxygen saturation (>10%), and reduced scattering

(>15%) in all PWS lesions. One subject was followed before and after two consecutive laser treatments and the overall improvement in PWS lesion blanching was quantitatively assessed by measuring a 45% decrease in dermal blood volume. CONCLUSION: SFDI is a rapid non-contact wide-field optical technique that shows potential as an imaging device that can be used to quantify biochemical compositional changes in PWS after laser therapy. Future work will investigate the potential of SFDI to provide intra-operative guidance for laser therapy of PWS lesions on an individual patient basis. Hemoglobins;Oxyhemoglobins;deoxyhemoglobin;Oxygen Adult;Aged;Child;Diagnostic Imaging;Female;Hemoglobins;Humans;Low-Level Light Therapy;Male;Oxygen;Oxyhemoglobins;Pilot Projects;Port-Wine Stain;Skin

[Does intraoral low-level laser therapy decrease mucositis during head and neck cancer radiotherapy?].

Histometric changes and epidermal FGF9 expression in carbon photoenhancer-assisted Nd:YAG laser treatment. Fibroblast growth factor (FGF)-9 plays an important role in wound healing. However, the effects of non-ablative laser treatment on the expression of FGF9 have not been fully investigated. Non-ablative 1064-nm quasi-long pulsed and Q-switched Nd:YAG laser treatments were delivered to hairless mice with and without a carbon photoenhancer. For histological and immunohistochemical analyses, sections were stained with hematoxylin and eosin as well as FGF9 antibody. Significantly, increased epidermal and dermal thickness was noted in mice treated with carbon photoenhancer-assisted quasi-long pulsed or Q-switched laser treatments compared to those treated without a carbon photoenhancer. Expression of FGF9 was observed in both the epidermis and dermis in all groups of mice during the healing process. Earlier and more pronounced expression of FGF9 was detected in mice treated with carbon photoenhancer-assisted quasi-long pulsed laser therapy. In addition, two peaks of pronounced FGF9 expression were observed, especially in mice that underwent carbon photoenhancer-assisted 1064-nm quasi-long pulsed Nd:YAG laser treatment. A carbon photoenhancer seems to enhance the effect of quasi-long pulsed and Q-switched Nd:YAG laser treatment. In addition, expression of FGF9 may play an important role in the healing process after laser treatments and could contribute to histometric changes. FGF9 protein, human;Fibroblast Growth Factor 9;Snail Family Transcription Factors;Transcription Factors;Carbon Animals;Carbon;Epidermis;Fibroblast Growth Factor 9;Lasers, Solid-State;Low-Level Light Therapy;Mice;Mice, Hairless;Snail Family Transcription Factors;Transcription Factors;Wound Healing

Light therapy: complementary antibacterial treatment of oral biofilm. Conventional antibacterial treatment fails to eradicate biofilms associated with common infections of the oral cavity. Unlike chemical agents, which are less effective than anticipated, owing to diffusion limitations in biofilms, light is more effective on bacteria in biofilm than in suspension. Effectiveness depends also on the type and parameters of the light. We tested the phototoxic effects of non-coherent blue light (wavelengths, 400-500 nm) and CO(2) laser (wavelength, 10.6 Î¼m), which have different mechanisms of action on the oral bacterium Streptoccocus mutans, in biofilm and on tooth enamel. Exposure of S. mutans in biofilm to blue light had a delayed effect on bacterial viability throughout the biofilm and a sustained antibacterial effect on biofilm newly formed by previously irradiated bacteria. A synergistic antibacterial effect between blue light and H(2)O(2) may enhance the phototoxic effect, which involves a photochemical mechanism mediated by reactive oxygen species (ROS) formation. The effect of CO(2) laser irradiation on the viability of S. mutans in biofilm on enamel samples appeared to be higher in the deep layers, due to heating of the enamel surface by the absorbed energy. Biofilms do not interfere with the chemical changes resulting from irradiation, which may increase the enamel's resistance to acid attack. Hydrogen Peroxide Biofilms;Dental Enamel;Dental Plaque;Humans;Hydrogen Peroxide;Lasers, Gas;Low-Level Light Therapy;Microbial Viability;Phototherapy;Streptococcus mutans

Low-level laser therapy (808 nm) contributes to muscle regeneration and prevents fibrosis in rat tibialis anterior muscle after cryolesion. Muscle regeneration is a complex phenomenon, involving replacement of damaged fibers by new muscle fibers. During this process, there is a tendency to form scar tissue or fibrosis by deposition of collagen that could be detrimental to muscle function. New therapies that could regulate fibrosis and favor muscle regeneration would be important for physical therapy. Low-level laser therapy (LLLT) has been studied for clinical treatment of skeletal muscle injuries and disorders, even though the molecular and cellular mechanisms have not yet been clarified. The aim of this study was to evaluate the effects of LLLT on molecular markers involved in muscle fibrosis and regeneration after cryolesion of the tibialis anterior (TA) muscle in rats. Sixty Wistar rats were randomly divided into three groups: control, injured TA muscle without LLLT, injured TA muscle treated with LLLT. The injured region was irradiated daily for four consecutive days, starting immediately after the lesion using an AlGaAs laser (808 nm, 30 mW, 180 J/cm(2); 3.8 W/cm(2), 1.4 J). The animals were sacrificed on the fourth day after injury. LLLT significantly reduced the lesion percentage area in the injured muscle ($p<0.05$), increased mRNA levels of the transcription factors MyoD and myogenin ($p<0.01$) and the pro-angiogenic vascular endothelial growth factor ($p<0.01$). Moreover, LLLT decreased the expression of the profibrotic transforming growth factor TGF-Î² mRNA ($p<0.01$) and reduced type I collagen deposition ($p<0.01$). These results suggest that LLLT could be an effective therapeutic approach for promoting skeletal muscle regeneration while preventing tissue fibrosis after muscle injury. Collagen Type I;MyoD Protein;Myog protein, rat;Myogenin;RNA, Messenger;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat Animals;Collagen Type I;Fibrosis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle, Skeletal;MyoD Protein;Myogenin;RNA, Messenger;Rats;Rats, Wistar;Regeneration;Transforming Growth Factor beta1;Vascular Endothelial Growth Factor A

Low level diode laser accelerates wound healing. The effect of wound illumination time by pulsed diode laser on the wound healing process was studied in this paper. For this purpose, the original electronic drive circuit of a 650-nm wavelength CW diode laser was reconstructed to give pulsed output laser of 50 % duty cycle and 1 MHz pulse repetition frequency. Twenty male mice, 3 months old were used to follow up the laser photobiostimulation effect on the wound healing progress. They were subdivided into two groups and then the wounds were made on the bilateral back sides of each mouse. Two sessions of pulsed laser therapy were carried along 15 days. Each mice group wounds were illuminated by this pulsed laser for 12 or 18 min per session during these 12 days. The results of this study were compared with the results of our previous wound healing therapy study by using the same type of laser. The mice wounds in that study received only 5 min of illumination time therapy in the first and second days of healing process. In this study, we found that the wounds, which were illuminated for 12 min/session healed in about 3 days earlier than those which were illuminated for 18 min/session. Both of them were healed earlier in about 10-11 days than the control group did. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Skin;Wound Healing

Effectiveness of diode laser as adjunctive therapy to scaling root planning in the treatment of chronic periodontitis: a meta-analysis. To investigate whether the adjunctive use of diode laser provides additional benefits to scaling root planning alone in patients with chronic periodontitis, a meta-analysis was conducted according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-analysis statement and the Cochrane Collaboration. A literature search was performed on seven databases, followed by a manual search. Weighted mean differences and 95Â % confidence intervals were calculated for the clinical attachment level, probing depth, and changes in the plaque and gingival indices. The I (2) test was used for interstudy heterogeneity. Visual

asymmetry inspection of the funnel plot, Egger's regression test, and the trim-and-fill method were used to investigate publication bias. All outcomes were evaluated at 6Â months. No significant differences were observed for any investigated outcome of interest. No evidence of heterogeneity or publication bias was detected. These findings suggested that the use of diode laser as an adjunctive therapy to conventional nonsurgical periodontal therapy did not provide additional clinical benefit. However, given that few studies were included in the analysis, and that three of the five included studies had a high risk of bias, the results should be interpreted with caution. Important issues that remain to be clarified include the influence of smoking on clinical outcomes, the effectiveness of adjunctive diode laser on microbiological outcomes, and the occurrence of adverse events. Future long-term well-designed parallel randomized clinical trials are required to assess the effectiveness of the adjunctive use of diode laser, as well as the appropriate dosimetry and laser settings. Chronic Periodontitis;Combined Modality Therapy;Dental Scaling;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Publication Bias;Root Planing;Treatment Outcome

"Ultrathin" DSAEK tissue prepared with a low-pulse energy, high-frequency femtosecond laser. PURPOSE: To evaluate the endothelial cell survival and stromal bed quality when creating deep stromal cuts with a low-pulse energy, high-frequency femtosecond laser to produce "ultrathin" tissue for Descemet stripping automated endothelial keratoplasty. METHODS: Seventeen corneas were used for this study. Five corneas were cut with the laser at a depth of 420 to 500 Î¼m to produce a tissue thickness of approximately â‰¤70 Î¼m. Five corneas served as an uncut comparison group. Vital dye staining and computer digitized planimetry analysis were performed on these corneas. The 7 remaining corneas were cut for scanning electron microscopy evaluation. RESULTS: The mean central posterior stromal thickness of cut corneas was 60.6 Î¼m (range, 43-72 Î¼m). Endothelial cell damage in cut and comparison corneas was 3.92% Â± 2.22% (range, 1.71%-6.51%) and 4.15% Â± 2.64% (range, 1.21%-7.01%), respectively (P = 0.887). Low-magnification (Ã—12) scanning electron microscopy revealed a somewhat irregular-appearing surface with concentric rings peripherally. Qualitative grading of higher magnification (Ã—50) central images resulted in an average score of 2.56 (between smooth and rough). CONCLUSIONS: Ultrathin tissue for Descemet stripping automated endothelial keratoplasty can be safely prepared with minimal endothelial cell damage using a low-pulse energy, high-frequency femtosecond laser; however, the resulting stromal surface quality may not be optimal with this technique. Cell Count;Cell Survival;Cornea;Corneal Pachymetry;Corneal Stroma;Descemet Stripping Endothelial Keratoplasty;Endothelium, Corneal;Humans;Lasers, Excimer;Low-Level Light Therapy;Microscopy, Electron, Scanning

[Low-level laser therapy in the treatment of diabetic ulcers: an evidence problem]. INTRODUCTION: Diabetes Mellitus is the leading cause of lower limb amputation, representing a significant economic cost for health services. The development of diabetic ulcers is a main risk factor for amputations, which have a high mortality rate at five years. The ischemia caused by macrovascular disease is a key pathophysiological factor in the development of ischemic ulcers. Existing treatments are prolonged and associated with high rates of failure and relapse, requiring the combination of multiple therapeutic modalities. Lowlevel laser therapy has been used as an adjuvant therapy for diabetic foot ulcers, since the 1960's, due to its hypothetical stimulating effects over microcirculation and tissue repair. MATERIAL AND METHODS: Identification of published scientific studies through a literature search on PubMed, The Cochrane Library and Cochrane Controlled Trials Register. DISCUSSION AND CONCLUSIONS: Existing evidence is favourable for in vitro cell models, but conflicting in animal models and human populations. There is significant methodological heterogeneity, which may be responsible for discordant results. Guidelines are proposed for future studies in this area, including the detailed characterization of ulcers and the parameters of laser treatment. Well-controlled studies, randomized and double-blind are needed. Accordingly to the

primum non nocere, laser therapy can and should be used as adjunctive therapy in the treatment of diabetic foot, because it isn't invasive, has low costs and is a fast therapy without significant adverse effects. Clinical Trials as Topic;Diabetes Complications;Diabetic Foot;Humans;Low-Level Light Therapy;Skin Ulcer

In vitro assessment of the bactericidal effect of low-power arsenium-gallium (AsGa) laser treatment. The objective of the present study was to perform an in vitro evaluation of the bactericidal action of a low-power arsenium-gallium (AsGa) laser at a wavelength of 904nm and energy density of 6 J/cm(2). Ten petri dishes were seeded with Pseudomonas aeruginosa and another ten with Staphylococcus aureus. The dishes were then randomly divided into four groups with five plates in each group. Two groups were treated with AsGa laser once a day for 5 days, while the other two groups received no treatment. No halo of growth inhibition was found in any of the groups. It was therefore concluded that laser treatment (AsGa, 904nm, 6J/cm(2)) had no bactericidal effect. Lasers, Semiconductor;Low-Level Light Therapy;Pseudomonas aeruginosa;Staphylococcus aureus

Modulation of lipopolysaccharide-induced NF-ÎºB signaling pathway by 635 nm irradiation via heat shock protein 27 in human gingival fibroblast cells. Heat shock protein-27 (HSP27) is a member of the small HSP family which has been linked to the nuclear factor-kappa B (NF-ÎºB) signaling pathway regulating inflammatory responses. Clinical reports have suggested that low-level light therapy/laser irradiation (LLLT) could be an effective alternative treatment to relieve inflammation during bacterial infection associated with periodontal disease. However, it remains unclear how light irradiation can modulate the NF-ÎºB signaling pathway. We examined whether or not 635 nm irradiation could lead to a modulation of the NF-kB signaling pathway in HSP27-silenced cells and analyzed the functional cross-talk between these factors in NF-ÎºB activation. The results showed that 635 nm irradiation led to a decrease in the HSP27 phosphorylation, reactive oxygen species (ROS) generation, I-ÎºB kinase (IKK)/inhibitor of ÎºB (IÎºB)/NF-ÎºB phosphorylation, NF-ÎºB p65 translocation and a subsequent decrease in the COX-1/2 expression and prostaglandin (PGE(2)) release in lipopolysaccharide(LPS)-induced human gingival fibroblast cells (hGFs). However, in HSP27-silenced hGFs, no obvious changes were observed in ROS generation, IKK/IÎºB/NF-ÎºB phosphorylation, NF-ÎºB p65 translocation, nor in COX-1/2 expression, or PGE(2) release. This could be a mechanism by which 635 nm irradiation modulates LPS-induced NF-ÎºB signaling pathway via HSP27 in inflammation. Thus, HSP27 may play a role in regulating the anti-inflammatory response of LLLT. HSP27 Heat-Shock Proteins;Lipopolysaccharides;NF-kappa B;RNA, Small Interfering;Reactive Oxygen Species;Cyclooxygenase 1;Cyclooxygenase 2;PTGS1 protein, human;PTGS2 protein, human;I-kappa B Kinase;Dinoprostone Adult;Cyclooxygenase 1;Cyclooxygenase 2;Dinoprostone;Fibroblasts;Gene Expression Regulation;Gingiva;HSP27 Heat-Shock Proteins;Humans;I-kappa B Kinase;Lasers;Light;Lipopolysaccharides;NF-kappa B;Phosphorylation;Primary Cell Culture;RNA, Small Interfering;Reactive Oxygen Species;Signal Transduction

Effects of intravascular laser irradiation of blood in mitochondria dysfunction and oxidative stress in adults with chronic spinal cord injury. OBJECTIVE: This study investigated the clinical effects of intravascular laser irradiation of blood (ILIB) therapy on oxidative stress and mitochondrial dysfunction in subjects with chronic spinal cord injury (SCI) resulting from trauma. BACKGROUND DATA: Little is known about how ILIB may generate antioxidant defenses in humans, and there is still a lack of randomized, sham-control studies to indicate its influence on different metabolic pathways. METHODS: Twenty-four chronic SCI subjects (assigned to a sham and a study group), and 12 normal subjects were recruited. The study group underwent 1â€‰h daily of ILIB for 15 days over 3 weeks. The sham group underwent ILIB with no laser power. RESULTS: Baseline measurements established higher oxidative stress and mitochondrial dysfunction in the SCI subjects than in the normal subjects. At day 15 of therapy, the study group revealed a significantly higher mitochondrial DNA (mtDNA)

copy number, white blood cell adenosine triphosphate (WBC ATP) synthesis, and total antioxidant capacity (TAC) with significantly reduced malondialdehyde (MDA), than did the sham group. The study group intragroup comparison revealed significantly increased mtDNA copy numbers, WBC ATP synthesis, and TAC, with significantly reduced MDA, compared with its baseline measurements. The sham group intragroup comparisons demonstrated no statistical differences. Low-density lipoprotein (LDL) in the study group was significantly reduced at days 10 and 15, with significantly higher high-density lipoprotein (HDL) at day 45. CONCLUSIONS: Our study results contribute to the knowledge about the effectiveness of ILIB in alleviating oxidative stress and mitochondrial dysfunction in chronic SCI patients. Biomarkers Adult;Aged;Analysis of Variance;Biomarkers;Blood;Chi-Square Distribution;Chronic Disease;Endovascular Procedures;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Mitochondrial Diseases;Oxidative Stress;Prospective Studies;Reference Values;Risk Assessment;Single-Blind Method;Spinal Cord Injuries;Statistics, Nonparametric;Treatment Outcome

Efficacy of minimally invasive nonthermal laser-induced optical breakdown technology for skin rejuvenation. We demonstrate the efficacy of a novel minimally invasive nonthermal skin rejuvenation technique for wrinkle and fine-line reduction based on laser-induced optical breakdown. The optical breakdown caused by tightly focused near-infrared laser pulses creates a grid of intradermal lesions without affecting the epidermis, leading to skin rejuvenation. The pilot in vivo efficacy test performed on five subjects successfully demonstrates wrinkle and fine-line reduction, and improvement of other skin features without pain or any other unpleasant sensations or any social downtime associated with the treatment. The efficacy is evaluated objectively and subjectively by assessing the improvement of wrinkles and/or fine lines or skin texture after the treatment. The treatment is safe without side effects or social downtime, and all test subjects reported that the treatment is "perceptible but not painful." Four out of the five subjects who participated in this pilot study were assessed to have "minor" to "significant" improvements of wrinkles and fine lines by the professional panels. The results of this clinical study are expected to bring a paradigm shift in the present laser- and light-based skin rejuvenation methods by introducing a safe treatment procedure without damaging the epidermis, with no or little social downtime and with an efficacy that might be comparable to ablative techniques. Adult;Humans;Low-Level Light Therapy;Middle Aged;Optical Phenomena;Pilot Projects;Rejuvenation;Skin Aging;Treatment Outcome

A preliminary study to assess the efficacy of a new UVA1 laser for treatment of psoriasis. OBJECTIVE: The aim of the present study was to assess the effectiveness of an UVA1 355â€‰nm laser (Alba 355) for treatment of mild, moderate, and severe psoriasis. BACKGROUND DATA: Psoriasis is an immune-inflammatory and proliferative skin disease. During the past few years, the instrumental treatment by UV radiation has been successfully described, either alone or in combination with topical and/or systemic drug administration to treat several skin-related diseases. MATERIALS AND METHODS: Fourteen patients, aged between 25 and 50 years (37.7Â±2.3 [meanÂ±SEM]), affected by mild-to-severe psoriatic plaques, were included in this study. Patients were treated with a new instrument, laser Alba 355, which administers energy in the UVA1 spectrum. This instrument is based on a 1064 wavelength neodymium-doped yttrium orthovanadate (Nd:YVO4) laser optically pumped using a 808â€‰nm infrared beam able to achieve a third harmonic 355â€‰nm wave delivery. The fluences administered were 80-140â€‰J/cm2 four times a week for a total of up to 12 sessions over selected psoriatic plaques in different areas of the patients' bodies. The patients rated their satisfaction with the outcome of the procedure as 1 not satisfied, 2 quite satisfied, 3 very satisfied. RESULTS: Overall, laser treatment of psoriatic plaques produced a significant improvement in Psoriasis Area and Severity Index (PASI) score (F [3, 55]=57.86; p<0.001). The mean PASI score decreased from a baseline value of 24.5Â±2.9 to a value of 15.6Â±1.9 at 1 week (p<0.001), 9.1Â±1.2

at 2 weeks (p<0.001), and 5.8Â±1.2 at 3 weeks (p<0.001). All the patients were very satisfied with the outcome of procedure. No side effects were observed in this study. CONCLUSIONS: The present study outlines an original approach based on UVA1 355â€‰nm laser therapy for treatment of mild, moderate, and severe psoriasis. In the present study, the high success rate was coupled with safety. Larger clinical trials are needed to definitely support the role of this medical device not only for treatment of psoriasis, but also for other skin-related diseases that share a similar pathophysiology. We speculate that in the near future, the use of this laser will grow in the dermatology clinic. Adult;Analysis of Variance;Cohort Studies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Psoriasis;Risk Assessment;Severity of Illness Index;Treatment Outcome;Ultraviolet Therapy

Effects of large-area irradiated laser phototherapy on peripheral nerve regeneration across a large gap in a biomaterial conduit. This paper proposes a novel biodegradable nerve conduit comprising 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) cross-linked gelatin, annexed with Î²-tricalcium phosphate (TCP) ceramic particles (EDC-Gelatin-TCP, EGT). In this study, the EGT-implant site in rats was irradiated using a large-area 660 nm AlGaInP diode laser (50 mW) to investigate the feasibility of laser stimulation in the regeneration of a 15-mm transected sciatic nerve. The animals were divided into three groups: a sham-irradiated group (EGT/sham); an experimental group undergoing low-level laser (LLL) therapy (EGT/laser); a control group undergoing autologous nerve grafts (autografts). Twelve weeks after implantation, walking track analysis showed a significantly higher sciatic functional index ($p < 0.05$) and improved toe spreading development in the EGT/laser and autograft groups than in the EGT/sham group. In electrophysiological measurement, both the mean peak amplitude and the area under the compound muscle action potential curves in the EGT/laser and autograft groups showed significantly improved functional recovery than the EGT/sham group ($p < 0.05$). Compared with the EGT/sham group, the EGT/laser and autograft groups displayed a reduction in muscular atrophy. Histomorphometric assessments revealed that the EGT/laser group had undergone more rapid nerve regeneration than the EGT/sham group. The laser-treated group also presented greater neural tissue area as well as larger axon diameter and thicker myelin sheath than the tube group without the laser treatment, indicating improved nerve regeneration. Thus, these assessments demonstrate that LLL therapy can accelerate the repair of a transected peripheral nerve in rats after being bridged with EGT conduit. Biocompatible Materials;Calcium Phosphates;beta-tricalcium phosphate;Gelatin;Osmium Tetroxide;Ethyldimethylaminopropyl Carbodiimide Action Potentials;Animals;Biocompatible Materials;Calcium Phosphates;Ethyldimethylaminopropyl Carbodiimide;Gelatin;Guided Tissue Regeneration;Immunohistochemistry;Low-Level Light Therapy;Materials Testing;Muscles;Myelin Sheath;Nerve Regeneration;Organ Size;Osmium Tetroxide;Prosthesis Implantation;Rats;Rats, Sprague-Dawley;Recovery of Function;Sciatic Nerve;Staining and Labeling;Transplantation, Autologous

Effect of the 532nm pulsed KTP laser in the treatment of Reinke's edema. OBJECTIVES/HYPOTHESIS: To evaluate the effect and safety of the 532nm Pulsed Potassium-Titanyl-Phosphate (KTP) laser in the office-based treatment of patients with Reinke's edema using objective and subjective scaled outcome measures. STUDY DESIGN: Case Series. SETTING: Tertiary hospital center. SUBJECTS: Seven adult females undergoing in-office KTP laser treatment for Reinke's edema. METHODS: Participants were studied pre- and posttreatment. Vocal function was evaluated by objective aerodynamic and acoustic analysis. Subjective changes were evaluated using the GRBAS scale, Voice Handicap Index, and videostroboscopy. Histologic effects of the laser were investigated by comparing one patient treated with laser one year prior to excision, one treated with laser just prior to excision, and one control patient who underwent excision without prior laser treatment.

RESULTS: At an average postoperative follow up of 17.8 weeks (range 5-78), maximum phonation time trended toward improvement. The median VHI score decreased from 37 to 26 (p=0.150). There was a reduction in each component of the GRBAS scoring and the median fundamental frequency increased from 162 to 186 (p=0.625). Stroboscopic findings demonstrated an intact posttreatment mucosal wave. Histologic comparison of the tissue effects of laser in three patients demonstrated changes in vocal fold vascularity but no acute or long-term damage to the overlying epithelium. CONCLUSION: Objective and subjective scaled measures suggest that treatment of Reinke's edema in the office with a 532nm KTP laser may result in improved voice. It appears safe with histologic preservation of the vocal fold vibratory epithelium and persistence of mucosal wave. Acoustics;Adult;Aged;Female;Follow-Up Studies;Humans;Laryngeal Edema;Laryngoscopy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Retrospective Studies;Time Factors;Treatment Outcome;Vocal Cords

The effects of low-level laser therapy in a rat model of intestinal ischemia-reperfusion injury. BACKGROUND AND OBJECTIVE: To investigate the effects of low-level laser therapy applied to the serosal surface of the rat jejunum following ischemia and reperfusion. MATERIALS AND METHODS: Ninety-six male Sprague-Dawley rats were assigned to 15 groups and anesthetized. Small intestinal ischemia was induced by clamping the superior mesenteric artery for 60â€‰minutes. A laser diode (70â€‰mW, 650â€‰nm) was applied to the serosal surface of the jejunum at a dose of 0.5â€‰J/cm(2) either immediately before or following initiation of reperfusion. Animals were maintained under anesthesia and sacrificed at 0, 1, and 6â€‰hours following reperfusion. Intestinal, lung, and liver samples were evaluated histologically. RESULTS: Intestinal injury was significantly worse (Pâ€‰<â€‰0.0001) in animals treated with laser and no ischemia-reperfusion injury (IRI) compared to sham. Intestinal injury was significantly worse in animals that underwent IRI and laser treatment at all time points compared to sham (Pâ€‰<â€‰0.001). In animals that underwent IRI, those treated with laser had significantly worse intestinal injury compared to those that did not have laser treatment at 0 (Pâ€‰=â€‰0.0104) and 1 (Pâ€‰=â€‰0.0015)â€‰hour of reperfusion. After 6â€‰hours of reperfusion there was no significant difference in injury between these two groups. Lung injury was significantly decreased following IRI in laser-treatment groups (Pâ€‰<â€‰0.001). CONCLUSIONS: At the dose and parameters used, low-level laser did not protect against intestinal IRI in the acute phase of injury. However, laser did provide protection against distant organ injury. Failure to observe a therapeutic response in the intestine may be due to inappropriate dosing parameters. Furthermore, the model was designed to detect the histologic response within the first 6â€‰hours of injury, whereas the beneficial effects of laser, if they occur, may not be observed until the later phases of healing. The finding of secondary organ protection is important, as lung injury following IRI is a significant source of morbidity and mortality. Animals;Disease Models, Animal;Jejunum;Lasers, Semiconductor;Liver;Low-Level Light Therapy;Lung;Male;Random Allocation;Rats;Rats, Sprague-Dawley;Reperfusion Injury

Low level laser therapy for concurrent chemoradiotherapy induced oral mucositis in head and neck cancer patients - a triple blinded randomized controlled trial. BACKGROUND AND PURPOSE: Oral mucositis (OM) is most cumbersome acute side effect of concurrent chemoradiotherapy (CCRT) for head and neck cancer (HNC). OM associated pain affects oral functions and nutrition of the patient that may result in discontinuity of treatment. Several modalities have been tried to prevent and treat OM, but none proved completely successful until date. We used prophylactic low level laser therapy (LLLT) for the prevention and treatment of CCRT induced OM. MATERIALS AND METHODS: In this triple blinded study, 221 HNC patients scheduled to undergo CCRT (Cisplatin (1, 22, 43 day)+RT=66 Grays (2 Gy/fraction), 33 fractions, 5 fractions/week, for 45 days) were block randomized into laser (n=111) and placebo (n=110) group. Laser group received LLLT (HeNe, Î»=632.8 nm, power-

density=24 mW, dosage=3.0 J/point, total dosage/session=36-40 J, spot-size=1cm(2), 5 sessions/week) while placebo received sham treatment daily prior to radiation. OM (RTOG/EORTC Scale), oral pain (VAS), dysphagia (FIS), weight loss and CCRT break were assessed. Data were analyzed using frequencies and percentage, generalized estimating equations (GEE) and odds ratio. RESULTS: There was significant reduction in incidence of severe OM (F=16.64, df=8876, p<0.0001) and its associated pain (F=25.06, df=8876, p<0.0001), dysphagia (F=20.17, df=8876, p<0.0001) and opioid analgesics use (p<0.0001) in laser than placebo group patients. CONCLUSIONS: LLLT decreased the incidence of CCRT induced severe OM and its associated pain, dysphagia and opioid analgesics use. Adult;Aged;Chemoradiotherapy;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Stomatitis

Low intensity laser therapy speeds wound healing in hemophilia by enhancing platelet procoagulant activity. Our group has previously shown that cutaneous wound healing is delayed and histologically abnormal in a mouse model of hemophilia. Hemostasis is not only required to stop bleeding at the time of wounding, but also produces bioactive substances that promote appropriate inflammatory and proliferative responses during healing. Low intensity laser therapy (LILT) has been reported to enhance impaired wound healing in a variety of animal and human studies. The current studies were conducted to test the hypothesis that LILT can improve healing in a hemophilia B mouse model. Three daily treatments with 12â€‰J/sq cm of 650â€‰nm laser illumination reduced the time to closure of a 3-mm cutaneous punch biopsy wound in the hemophilic mice. All wounds were closed at 13 days in the sham-treated hemophilic mice, compared with 10 days in the LILT-treated hemophilic mice, and 9 days in wild-type mice. While LILT can speed healing by enhancing proliferation of cutaneous cells, we found that an additional mechanism likely contributes to the efficacy of LILT in the hemophilic mice. LILT enhanced the mechanical rigidity and platelet activity of clots formed from human platelet-rich plasma. Illumination of isolated platelets increased the mitochondrial membrane potential and enhanced binding of coagulation factors to the surface of activated platelets. Thus, while LILT can directly promote proliferative responses during healing, it also appears to enhance hemostasis in an animal model with impaired coagulation. These data suggest that trials of LILT as an adjunct to the usual hemostatic therapies in hemophilia are warranted. Animals;Blood Coagulation;Blood Platelets;Disease Models, Animal;Hemophilia B;Hemostasis;Immunohistochemistry;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Signal Transduction;Soft Tissue Injuries;Wound Healing

Low-level laser therapy restores the oxidative stress balance in acute lung injury induced by gut ischemia and reperfusion. It remains unknown if the oxidative stress can be regulated by low-level laser therapy (LLLT) in lung inflammation induced by intestinal reperfusion (i-I/R). A study was developed in which rats were irradiated (660 nm, 30 mW, 5.4 J) on the skin over the bronchus and euthanized 2 h after the initial of intestinal reperfusion. Lung edema and bronchoalveolar lavage fluid neutrophils were measured by the Evans blue extravasation and myeloperoxidase (MPO) activity respectively. Lung histology was used for analyzing the injury score. Reactive oxygen species (ROS) was measured by fluorescence. Both expression intercellular adhesion molecule 1 (ICAM-1) and peroxisome proliferator-activated receptor-y (PPARy) were measured by RT-PCR. The lung immunohistochemical localization of ICAM-1 was visualized as a brown stain. Both lung HSP70 and glutathione protein were evaluated by ELISA. LLLT reduced neatly the edema, neutrophils influx, MPO activity and ICAM-1 mRNA expression. LLLT also reduced the ROS formation and oppositely increased GSH concentration in lung from i-I/R groups. Both HSP70 and PPARy expression also were elevated after laser irradiation. Results indicate that laser effect in attenuating the acute lung inflammation is driven to restore the balance between the pro- and antioxidants mediators rising of PPARy expression and consequently the HSP70 production. HSP70 Heat-Shock Proteins;PPAR gamma;Reactive

Oxygen Species;Intercellular Adhesion Molecule-1;Peroxidase;Glutathione Acute Lung Injury;Animals;Bronchoalveolar Lavage Fluid;Cell Count;Gene Expression Regulation;Glutathione;HSP70 Heat-Shock Proteins;Intercellular Adhesion Molecule-1;Intestinal Mucosa;Intestines;Low-Level Light Therapy;Lung;Male;Neutrophils;Oxidative Stress;PPAR gamma;Peroxidase;Pulmonary Edema;Rats;Rats, Wistar;Reactive Oxygen Species;Reperfusion Injury

A systematic review of the effect of low-level laser therapy in the management of breast cancer-related lymphedema. PURPOSE: The purpose of this study was to review the effect of low-level laser therapy (LLLT) in the management of breast cancer-related lymphedema (BCRL). METHODS: A systematic review of seven databases for clinical trials for LLLT in the management of BCRL published between 1990 and 2011 was performed. RESULTS: A total of eight studies on 230 patients were found. The methodological qualities of the selected studies were assessed with the Physiotherapy Evidence Database scale, and the studies were categorized according to Sackett's levels of evidence. Five studies were graded at evidence level II. Two studies were graded at evidence level III, and the remaining study was graded at evidence level V. CONCLUSIONS: There is moderate to strong evidence for the effectiveness of LLLT for the management of BCRL from five small studies of acceptable methodological quality. A dose of 1-2 J/cm(2) per point applied to several points covering the fibrotic area can reduce limb volume following BCRL. Further well-designed, large-scale studies are required to determine more precisely how effective LLLT may be in BCRL. Breast Neoplasms;Female;Humans;Low-Level Light Therapy;Lymphedema;Treatment Outcome

Management of chronic Achilles tendinopathy. Tendons transmit force between muscles and bones and, when stretched, store elastic energy that contributes to movement.(1) The tendinous portion of the gastrocnemius and soleus muscles merge to form the Achilles tendon, which is the largest and strongest in the body, but one of the most frequently injured.(2,3) Conservative management options for chronic Achilles tendinopathy include eccentric (lengthening) exercises, extracorporeal shockwave therapy (ESWT), topical nitroglycerin, low level laser therapy, orthoses, splints or injections (e.g. corticosteroids, hyperosmolar dextrose, polidocanol, platelet-rich plasma), while a minority of patients require surgery (using open, percutaneous or endoscopic methods).(4-8) Here we assess the management options for patients with chronic Achilles tendinopathy (lasting over 6 weeks). Adrenal Cortex Hormones;Analgesics;Sclerosing Solutions;Polidocanol;Polyethylene Glycols;Nitroglycerin;Glucose Achilles Tendon;Administration, Cutaneous;Adrenal Cortex Hormones;Adult;Analgesics;Blood Transfusion, Autologous;Chronic Disease;Exercise Therapy;Glucose;Humans;Injections, Intramuscular;Low-Level Light Therapy;Middle Aged;Nitroglycerin;Orthotic Devices;Platelet-Rich Plasma;Polidocanol;Polyethylene Glycols;Randomized Controlled Trials as Topic;Sclerosing Solutions;Splints;Tendinopathy;Ultrasonic Therapy;Young Adult

Therapeutic effects of low-level laser therapy after premolar extraction in adolescents: a randomized double-blind clinical trial. OBJECTIVE: The purpose of this study was to evaluate the effect of low-level laser therapy (LLLT) on wound healing process and pain levels after premolar extraction in adolescents. BACKGROUND DATA: The advantage of using LLLT in oral surgeries is the reduction of inflammation and postoperative discomfort; however, the optimal dosing parameters and treatment effects in surgical procedures are inconclusive. METHODS: A double-blind, randomized, controlled clinical trial was conducted with 14 patients who were to undergo surgical removal of premolars. Patients were randomly allocated to the LLLT (test) group and placebo (control) group. Patients in the test group received 5.1â€‰J (60â€‰J/cm(2)) of energy density of a gallium-aluminum-arsenide (GaAlAs) diode laser (wavelength, 830â€‰nm; output power, 0.1â€‰W) at three different points intraorally, 1â€‰cm from the target tissue immediately and at 48 and 72â€‰h after the surgical procedure. For patients in the placebo group, the laser device was applied to the same points without

activating the hand piece. The wound healing process was evaluated by an independent examiner by visual inspection with the support of digital photographs at baseline and 2, 7, and 15 days postoperatively. Patients recorded the degree of pain using the visual analogue scale (VAS). RESULTS: Compared with the placebo group, the test group showed a lower intensity of pain, but this difference was not statistically significant at any time point. The wound healing process was similar in both groups. CONCLUSIONS: Within the limitations of this study, the LLLT parameters used neither increased the wound healing process nor significantly decreased pain intensity after premolar extraction in adolescents. Adolescent;Bicuspid;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain Measurement;Pain, Postoperative;Statistics, Nonparametric;Tooth Extraction;Treatment Outcome;Wound Healing

Laser irradiation affects enzymatic antioxidant system of streptozotocin-induced diabetic rats. The aim of the present study was to analyze the effect of low-power laser irradiation in the antioxidant enzymatic system of submandibular (SMG) and parotid (PG) salivary glands of streptozotocin-induced diabetic rats. The animals were randomly divided into six groups: three diabetic groups (D0, D5, and D20) and three non-diabetic groups (C0, C5, and C20), according to laser dose received (0, 5, and 20 J/cm(2), respectively). Areas of approximately 1 cm(2) were demarcated in the salivary glands (each parotid and both submandibular glands) and after irradiated according to SimÃµes et.al. (Lasers Med Sci 24:202-208, 2009). A diode laser (660 nm/100 mW) was used, with laser beam spot of 0.0177 cm(2). The group treated with 5 J/cm(2) laser dose was subjected to irradiation for 1 min and 4 s (total irradiation time) and the group treated with 20 J/cm(2) laser dose was subjected to irradiation for 4 min and 16 s. Twenty-four hours after irradiation the animals were euthanized and the salivary glands were removed for biochemical analysis. The total antioxidant values (TA), the activity of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase enzymes were determined. SOD and CAT activities, as well as TA were higher in SMG of irradiated diabetic rats. However, in SMG of non-diabetic rats, laser irradiation decreased TA values and led to an increase in the CAT activity. In addition, there was a decrease in the activity of CAT in PG of diabetic and non-diabetic animals after laser irradiation. According to the results of the present study, low-power laser irradiation can affect the enzymatic antioxidant system of salivary glands of streptozotocin-induced diabetic rats. Antioxidants;Blood Glucose;Catalase;Glutathione Peroxidase;Superoxide Dismutase Animals;Antioxidants;Blood Glucose;Catalase;Diabetes Mellitus, Experimental;Female;Glutathione Peroxidase;Low-Level Light Therapy;Parotid Gland;Rats;Rats, Wistar;Submandibular Gland;Superoxide Dismutase

Effective photothermal chemotherapy using doxorubicin-loaded gold nanospheres that target EphB4 receptors in tumors. Photothermal ablation (PTA) is an emerging technique that uses near-infrared (NIR) laser light-generated heat to destroy tumor cells. However, complete tumor eradication by PTA therapy alone is difficult because heterogeneous heat distribution can lead to sublethal thermal dose in some areas of the tumor. Successful PTA therapy requires selective delivery of photothermal conducting nanoparticles to mediate effective PTA of tumor cells, and the ability to combine PTA with other therapy modalities. Here, we synthesized multifunctional doxorubicin (DOX)-loaded hollow gold nanospheres (DOX@HAuNS) that target EphB4, a member of the Eph family of receptor tyrosine kinases overexpressed on the cell membrane of multiple tumors and angiogenic blood vessels. Increased uptake of targeted nanoparticles T-DOX@HAuNS was observed in three EphB4-positive tumors both in vitro and in vivo. In vivo release of DOX from DOX@HAuNS, triggered by NIR laser, was confirmed by dual-radiotracer technique. Treatment with T-DOX@HAuNS followed by NIR laser irradiation resulted in significantly decreased tumor growth when compared with treatments with nontargeted DOX@HAuNS plus laser or HAuNS plus laser. The tumors in 6 of the 8

mice treated with T-DOX@HAuNS plus laser regressed completely with only residual scar tissue by 22 days following injection, and none of the treatment groups experienced a loss in body weight. Together, our findings show that concerted chemo-photothermal therapy with a single nanodevice capable of mediating simultaneous PTA and local drug release may have promise as a new anticancer therapy. Antineoplastic Agents;Drug Carriers;Gold;Doxorubicin;Receptor, EphB4 Animals;Antineoplastic Agents;Doxorubicin;Drug Carriers;Female;Gold;Infrared Rays;Low-Level Light Therapy;Mice;Nanospheres;Neoplasms, Experimental;Receptor, EphB4;Tomography, Emission-Computed, Single-Photon

Low-level laser therapy vs. pulsed electromagnetic field on neonatal rat calvarial osteoblast-like cells. To compare the effects of pulsed electromagnetic field (PEMF) and low-level laser therapy (LLLT) on osteoblast cells in a cell culture model. Fifty thousand neonatal rat calvarial osteoblast-like cells per milliliter were seeded and 0.06 mT PEMF, 0.2 mT PEMF, and LLLT at 808 nm were applied for 24 and 96 h on the cells. To evaluate cellular proliferation and differentiation, specimens were examined for DNA synthesis, alkaline phosphatase (ALP) activity, cell numbers, and viability of the cells. Morphological appearances of the cells were observed using scanning electron microcopy after 24 and 96 h of incubation. At 24 and 96 h, the control group had a higher cell proliferation than 0.06 and 0.2 mT PEMF groups ($p=0.001$). At 96 h, 0.2 mT PEMF group had higher cell proliferation rate than 0.06 mT PEMF and LLLT groups ($p=0.001$). The cell count and cell viability in 0.2 mT PEMF group were higher than the 0.06-mT PEMF and LLLT groups, although these differences were not statistically significant at 96 h ($p>0.05$). At 24 and 96 h, cell viability in the control group was higher than the test groups. Alkaline phosphatase levels of the groups were comparable in both time intervals ($p>0.05$). 0.2 mT PEMF application on osteoblast-like cells led to cell proliferation and differentiation better than 0.06 mT PEMF and LLLT at 808 nm, although a remarkable effect of both PEMF and LLLT could not be detected. The ALP activity of 0.2 and 0.06 mT PEMF and LLLT were comparable. DNA;Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone Regeneration;Cell Differentiation;Cell Proliferation;Cell Survival;Cells, Cultured;DNA;Low-Level Light Therapy;Magnetic Field Therapy;Microscopy, Electron, Scanning;Osteoblasts;Rats;Wound Healing

A rare case of congenital angiokeratoma of the glans penis treated using a 595-nm pulsed dye laser. Angiokeratoma;Child;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Neoplasm Recurrence, Local;Penile Neoplasms;Skin Neoplasms

[Pain treatment with low reactive level laser therapy (LLLT)]. Noninvasive and low reactive level laser (LLLT) is used as one of the light therapies without giving pain to the patient. Therefore, it is used often clinically in pain treatment, orthopedics, plastic surgery, dermatology, and dentistry. In the pain clinic field, it is one of the procedures indispensable to treatment of various pain including postherpetic neuralgia, diabetic neuropathy or myofascial pain. In recent years the mechanism has been gradually elucidated by basic study. The action is on sensory nerve, sympathetic nerve, blood vessel, immunity, inflammation and central nervous system, and is thought to contribute to analgesia. Also, many reports such as action to inhibit "itch", a promotor action of the bone metabolism, and the follicular maturation acceleration action have tested and elucidated these mechanisms, and will add further adaptation that will be new in future. Furthermore, development and downsizing of the free electron laser will promote elucidation of the low response level laser therapy. We expect much in the future of the LLLT. Animals;Blood Circulation;Central Nervous System;Humans;Inflammation;Low-Level Light Therapy;Pain Management;Palliative Care;Sensory Receptor Cells;Sympathetic Nervous System

[Present and future for LLLT in the area of orthopedics]. The biological tissue is irradiated with laser light, and carbonization, incineration, evaporation, blood coagulation, protein denaturation, and photoactivation will arise in order of the strength of the reaction. LLLT is the application of those

photoactivated biological effects. In this paper, effective pain relief, photoactivation effect on chondrocytes, and, PDT (photodynamic therapy) using photosensitizer are introduced. Photosensitizing Agents Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthopedics;Pain Management;Palliative Care;Photochemotherapy;Photosensitizing Agents

[Phototherapy in rehabilitation medicine]. Rehabilitation can be classified into four types: medical, vocational, educational, and social rehabilitation. The goal of medical rehabilitation is to maintain and improve a patient's physical and mental capabilities. Phototherapy is an important means of treatment in rehabilitation medicine and is usually performed with ultraviolet, infrared, or laser light. Among them, laser light has been shown to have various biological effects, such as increasing blood flow, promoting wound healing, reducing inflammation, and improving immune function. Laser therapy is as important a treatment option as exercise therapy in rehabilitation medicine, and is considered to be worth evaluating as a therapeutic means to relieve pain in musculoskeletal disorders, promote healing in peripheral neuropathy, and alleviate muscle spasticity. Facial Paralysis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Management;Palliative Care;Spasm

[Xenon light therapy]. The xenon light, generated by high-intensity electrical stimulation of xenon gas, is used to sterilize wounds, aid tissue repair, and relieve pain as a low-level light therapy. The light produced consists of non-coherent beams of multiple wavelengths in the ultraviolet to infrared spectrum. This broad-band light can be emitted in a continuous wave or pulsed mode, with the wave band chosen and the energy distribution controlled for the purpose. Specifically, wavelengths in the 500-700 nm range are suitable for treating superficial tissue, and wavelengths between 800 and 1,000 nm are suitable for deeper-seated tissues, due to longer optical penetration distances through tissue. One of the most common benefits in the xenon light therapy is considered to be the wide and deep irradiation of optimal rays to living tissue. Research into the use of xenon light for tissue repair and pain reduction is restricted within open-label studies and case reports. The present review expounded the effects of xenon light therapy on the basis of the available evidence in vitro and in vivo studies using a laser beam of single wavelength. Xenon Aged, 80 and over;Humans;Inflammation;Light;Neural Conduction;Pain Management;Phototherapy;Vasodilation;Wound Healing;Xenon

[Low reactive laser therapy]. The type, characteristics and effect of low reactive laser equipment used for pain treatment in Japan are described in this section. Currently, low reactive laser therapy equipments marketed and used in Japan include diode laser therapeutic device with semiconductor as a medium consisting of aluminum, gallium and arsenic. Low reactive laser equipment comes in three models, the first type has a capacity of generating 1,000 mW output, and the second type has a capacity of generating 10 W output. The third type has four channels of output, 60, 100, 140 and 180 mW and we can select one channel out of the four channels. This model is also used as a portable device because of its light weight, and we can carry it to wards and to the outside of the hospital. Semiconductor laser has the capacity of deepest penetration and the effect tends to increase proportionally to the increasing output. Low reactive laser therapy is less invasive and lower incidence of complications. Although low reactive laser therapy might be effective for various pain disorders, the effect is different depending on the type of pain. We should keep in mind that this therapy will not give good pain relief equally in all patients with pain. Animals;Blood Circulation;Humans;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Neural Conduction;Pain;Pain Management;Rats;Wound Healing

A preliminary study of the safety of red light phototherapy of tissues harboring cancer. OBJECTIVE: Red light phototherapy is known to stimulate cell proliferation in wound healing. This

study investigated whether low-level light therapy (LLLT) would promote tumor growth when pre-existing malignancy is present. BACKGROUND DATA: LLLT has been increasingly used for numerous conditions, but its use in cancer patients, including the treatment of lymphedema or various unrelated comorbidities, has been withheld by practitioners because of the fear that LLLT might result in initiation or promotion of metastatic lesions or new primary tumors. There has been little scientific study of oncologic outcomes after use of LLLT in cancer patients. METHODS: A standard SKH mouse nonmelanoma UV-induced skin cancer model was used after visible squamous cell carcinomas were present, to study the effects of LLLT on tumor growth. The red light group (n=8) received automated full body 670â€‰nm LLLT delivered twice a day at 5â€‰J/cm(2) using an LED source. The control group (n=8) was handled similarly, but did not receive LLLT. Measurements on 330 tumors were conducted for 37 consecutive days, while the animals received daily LLLT. RESULTS: Daily tumor measurements demonstrated no measurable effect of LLLT on tumor growth. CONCLUSIONS: This experiment suggests that LLLT at these parameters may be safe even when malignant lesions are present. Further studies on the effects of photoirradiation on neoplasms are warranted. Animals;Carcinoma, Squamous Cell;Cell Proliferation;Disease Models, Animal;Equipment Design;Low-Level Light Therapy;Mice;Radiotherapy Dosage;Skin Neoplasms;Wound Healing

Low-level light therapy improves cortical metabolic capacity and memory retention. Cerebral hypometabolism characterizes mild cognitive impairment and Alzheimer's disease. Low-level light therapy (LLLT) enhances the metabolic capacity of neurons in culture through photostimulation of cytochrome oxidase, the mitochondrial enzyme that catalyzes oxygen consumption in cellular respiration. Growing evidence supports that neuronal metabolic enhancement by LLLT positively impacts neuronal function in vitro and in vivo. Based on its effects on energy metabolism, it is proposed that LLLT will also affect the cerebral cortex in vivo and modulate higher-order cognitive functions such as memory. In vivo effects of LLLT on brain and behavior are poorly characterized. We tested the hypothesis that in vivo LLLT facilitates cortical oxygenation and metabolic energy capacity and thereby improves memory retention. Specifically, we tested this hypothesis in rats using fear extinction memory, a form of memory modulated by prefrontal cortex activation. Effects of LLLT on brain metabolism were determined through measurement of prefrontal cortex oxygen concentration with fluorescent quenching oximetry and by quantitative cytochrome oxidase histochemistry. Experiment 1 verified that LLLT increased the rate of oxygen consumption in the prefrontal cortex in vivo. Experiment 2 showed that LLLT-treated rats had an enhanced extinction memory as compared to controls. Experiment 3 showed that LLLT reduced fear renewal and prevented the reemergence of extinguished conditioned fear responses. Experiment 4 showed that LLLT induced hormetic dose-response effects on the metabolic capacity of the prefrontal cortex. These data suggest that LLLT can enhance cortical metabolic capacity and retention of extinction memories, and implicate LLLT as a novel intervention to improve memory. Animals;Energy Metabolism;Male;Memory;Phototherapy;Prefrontal Cortex;Rats;Retention, Psychology

Low-power laser therapy for repairing acute and chronic-phase bone lesions. To evaluate the therapeutic activity of low-power laser (InGaAlP: 670 nm/30 mW), at doses of 90 J/cm(2), on the process of acute and chronic-phase repair of bone lesions of Wistar rats. Sixty-three adult males were divided into nine groups subjected to bone injury, in order to form the following treatments: T1 (control); T2 (acute-phase); T3 (chronic-phase) which were subdivided into three subgroups (n=7), analyzed on the 9th, 17th and 28th days post-surgery, after a period of daily treatment with laser. The animals with acute-phase treatment presented a more extensive endochondral ossification process. Laser-treated animals showed significant increases in serum alkaline phosphatase levels and had an effect on biomechanical property, resulting in a gradual increase in bone stiffness. Laser therapy aided the bone consolidation process and favored the physiopathologic mechanisms involved

in bone tissue repair, and its effects were more prominent when treatment started during the acute phase of the injury. Alkaline Phosphatase Alkaline Phosphatase;Animals;Bone and Bones;Fractures, Bone;Laser Therapy;Male;Osteogenesis;Osteotomy;Rats;Rats, Wistar

Using Physical Modalities in the Treatment of Venous Leg Ulcers: A 14-year Comparative Clinical Study. Venous ulcers are prevalent, challenging wounds; their incidence is rising with the increasing age of the general population. Physical mo- dalities often are used to help heal these chronic wounds. A prospective study was conducted to investigate the application of high-voltage stimu- lation (HVS), ultrasound therapy (US), low-level laser therapy (LLLT, 810 nm, 65 mW, 4 J/cm2), and compression therapy (CT), with and without surgical intervention; along with standard of care comprising drug therapy (micronized flavonoid fraction in two 500-mg tablets once daily) and wet dressings of 0.9% sodium chloride on venous leg ulcer healing. METHODS: The 305-patient study was conducted between 1994 and 2008 among persons with venous ulcers in 3 facilities in Poland. After surgery involving crossectomy, partial [short] stripping of the greater or short saphenous vein, local phlebectomy, and ligation of insufficient perforators, 4 groups of patients were treated with the standard of care drug/dressing therapy and HVS, US, LLLT, or CT, and 1 group received the drug/dressing ther- apy only. Four non-surgical groups received HVS, US, LLLT, or CT and drug/dressing therapy, and 1 group received drug/dressing therapy only. Changes in wound area and volume were compared among all the groups receiving the various treatments using the Gilman index. In all groups therapy lasted 7 weeks. The computed planimetry method for observation of healing process was used. RESULTS: The Gilman index values at 4 weeks were significantly higher in the compression plus surgery compared with other groups (P = 0.01). After therapy for patients from the CT + surgery group, the Gilman index was 1.18 cm (P â‰¤ 0.001 compared with other groups). The percentage total surface area regression analysis confirmed that compression plus surgery is the most efficient in venous leg ulcer therapy (61.89% reduction after 4 weeks of therapy and 78.19% at the end of study) compared to the other groups (P â‰¤ 0.001). The HVS and US appeared useful only in conservatively treated patients (P < 0.05). The LLLT did not accelerate reduction of the ulceration surface. CONCLUSION: Venous surgery plus compression therapy is the most effi- cient treatment for venous leg ulcers. Compression therapy should be provided to both surgically and conservatively non-surgically treated pa- tients. High-voltage stimulation and ultrasound therapy are useful meth- ods in conservative treatment of venous leg ulcers. For surgically treated patients, these physical modalities are not effective. Low-level laser ther- apy is not an efficient method for treating venous leg ulcers. ï»¿.

Irradiation by light-emitting diode light as an adjunct to facilitate healing of experimental periodontitis in vivo. BACKGROUND AND OBJECTIVE: This study evaluated the biostimulatory effect of 660 nm light-emitting diode (LED) as an adjunct in the treatment of experimental periodontitis. MATERIAL AND METHODS: Ninety-six Sprague-Dawley rats underwent experimental periodontitis by placement of a silk ligature followed with or without additive Porphyromonas gingivalis lipopolysaccharide (Pg-LPS) injection. Irradiation with LED light was performed at varying energy densities of 5, 10 and 15 J/cm2, 1 d after debridement and detoxification. Rats were killed at 3, 7 and 14 d after irradiation with LED light, and the effect of irradiation was evaluated by descriptive histology and quantitative measurements of periodontal bone loss, inflammatory infiltration and cellular proliferation. RESULTS: Reduction of inflammation, accelerated collagen deposition and realignment was noted following irradiation with LED light at densities of 10 and 15 J/cm2, and temporary reduction of periodontal bone loss, as well as bundle bone apposition, was noted at day 3 in rats treated with 10 J/cm2 light. The biomodulatory effect was stronger in sites treated with Pg-LPS injection. In sites without Pg-LPS injection, temporary reduction of inflammation was noted in all LED light-irradiated specimens at day 3. No significant change in cellular proliferation was noted in any

LED light-treated group. CONCLUSIONS: LED light (660 nm) with an energy density of 10 J/cm2 appeared suitable as an adjunct modality for periodontitis by temporarily reducing inflammation, facilitating collagen realignment and bundle bone deposition. Future studies will aim to amplify the biostimulatory effect of LED light by adding a supplementary medium or repeated irradiation. Anti-Infective Agents, Local;Lipopolysaccharides;Collagen;Chlorhexidine Alveolar Bone Loss;Animals;Anti-Infective Agents, Local;Cell Proliferation;Chlorhexidine;Collagen;Connective Tissue;Gingiva;Gingival Hemorrhage;Lasers, Semiconductor;Ligation;Lipopolysaccharides;Low-Level Light Therapy;Male;Osteogenesis;Periodontal Debridement;Periodontal Ligament;Periodontitis;Porphyromonas gingivalis;Radiotherapy Dosage;Rats;Rats, Sprague-Dawley

In vitro wound healing improvement by low-level laser therapy application in cultured gingival fibroblasts. The aim of this study was to determine adequate energy doses using specific parameters of LLLT to produce biostimulatory effects on human gingival fibroblast culture. Cells (3 Ã— 10(4) cells/cm(2)) were seeded on 24-well acrylic plates using plain DMEM supplemented with 10% fetal bovine serum. After 48-hour incubation with 5% CO(2) at 37Â°C, cells were irradiated with a InGaAsP diode laser prototype (LASERTable; 780 Â± 3â€‰nm; 40â€‰mW) with energy doses of 0.5, 1.5, 3, 5, and 7â€‰J/cm(2). Cells were irradiated every 24â€‰h totalizing 3 applications. Twenty-four hours after the last irradiation, cell metabolism was evaluated by the MTT assay and the two most effective doses (0.5 and 3â€‰J/cm(2)) were selected to evaluate the cell number (trypan blue assay) and the cell migration capacity (wound healing assay; transwell migration assay). Data were analyzed by the Kruskal-Wallis and Mann-Whitney nonparametric tests with statistical significance of 5%. Irradiation of the fibroblasts with 0.5 and 3â€‰J/cm(2) resulted in significant increase in cell metabolism compared with the nonrradiated group ($P < 0.05$). Both energy doses promoted significant increase in the cell number as well as in cell migration ($P < 0.05$). These results demonstrate that, under the tested conditions, LLLT promoted biostimulation of fibroblasts in vitro.

Low level laser effect after micro-marsupialization technique in treating ranulas and mucoceles: a case series report. The aim of this preliminary study was to investigate the influence of low level laser therapy (LLLT) in alleviating pain caused by micro-marsupialization and the healing of oral ranulas and selected mucoceles. Eleven patients underwent micro-marsupialization treatment associated with LLLT. The patients were irradiated with a 660-nm continuous wave from an indium-gallium-arsenide-phosphorous (InGaAsP) diode laser, at 100Â mW, with a spot size on the tissue surface of 0.0283Â cm(2) (irradianceâ€‰=â€‰3.53Â W/cm(2)). Irradiation was carried out immediately following micro-marsupialization treatment, as well as at 24, 48, and 72Â h post-micro-marsupialization. All treated oral ranulas and selected mucoceles presented clinical healing. No evidence of recurrence could be identified during a mean of 11.0-month follow-up period. The use of InGaAsP diode lasers, within the parameters tested, appears to present a good alternative treatment to reduce pain and heal oral ranulas and selected mucoceles associated with micro-marsupialization. Adolescent;Adult;Child;Child, Preschool;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mucocele;Ranula;Wound Healing;Young Adult

Effect of low-level laser therapy after extraction of impacted lower third molars. The aim of this study is to evaluate the effectiveness of the low-level laser therapy (LLLT) in the control of pain, swelling, and trismus associated with surgical removal of impacted lower third molars. Thirty patients were randomized into two treatment groups, each with 15 patients-group test (LLLT) and a group control (no-LLLT)-and were told to avoid any analgesics 12 h before the procedure. In group test, the 980-nm diode-laser (G-Laser 25 Galbiati, Italy) was applied, using a 600-Î¼m handpiece, intraorally (lingual and vestibular) at 1 cm from the involved area and extraoral at the insertion point of the masseter muscle immediately after surgery and at 24 h. The group control received only routine management. Parameters used for LLLT were: continuous mode, at 300 mW (0.3 W) for a total of 180

s (60 s Ã— 3) (0.3 W Ã— 180 s=54 J). Group test showed improvement in the interincisal opening and remarkable reduction of trismus, swelling and intensity of pain on the first and the seventh postoperative days. Although LLLT has been reported to prevent swelling and trismus following the removal of impacted third molars, some of these studies reported a positive laser effect while others did not. All references to the use of laser therapy in the postoperative management of third molar surgery employ different methodologies and, in some, explanations as to selection of their respective radiation parameters are not given. This study has demonstrated that LLLT, with these parameters, is useful for the reduction of postoperative discomfort after third-molar surgery. Adolescent;Adult;Edema;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain, Postoperative;Postoperative Complications;Tooth Extraction;Tooth, Impacted;Trismus;Young Adult

[Radio-induced oral and pharyngeal mucositis: management updates]. Mucositis is a major side effect induced by radiotherapy and/or chemotherapy of head and neck cancer. This toxicity impacts patient's quality of life and may compromise optimal treatments. Pathophysiology, risk factors, incidence and consequences of mucositis will be discussed in this review. Its management remains principally supportive (pain medication and nutritional support); however, in recent years several studies have revealed that the use of low level energy laser is particularly useful in the prevention and treatment of chemo- and radio-induced mucositis. Analgesics;Fibroblast Growth Factor 7 Analgesics;Cicatrix;Cost of Illness;Cryotherapy;Enteral Nutrition;Fibroblast Growth Factor 7;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mucositis;Pain;Pharyngeal Diseases;Prevalence;Radiotherapy;Radiotherapy Dosage;Risk Factors;Stomatitis;Ulcer

Mechanical, chemical and laser treatments of the implant surface in the presence of marginal bone loss around implants. PURPOSE: The objective of this review was to summarise current evidence with regard to the decontamination of implant surfaces by mechanical, chemical and physical methods in the presence of marginal bone loss arising from peri-implant infections. MATERIALS AND METHODS: A PubMed search identified studies and publications dealing with 'peri-implantitis', 'treatment', 'surface decontamination', 'laser application' 'air-abrasive treatment' and 'photodynamic therapy'. Only studies in international peer-reviewed journals were selected for further evaluation; case reports were not included. RESULTS: Several therapeutic approaches were identified such as mechanical treatment, antiseptics and air-abrasive treatment, photodynamic treatment, and laser applications. Since treatment of infected surfaces with air-powder +/- citric acid, gauze soaked with saline + citric acid or gauze soaked with chlorhexidine led to similar results in experimental studies, cotton pellets with saline may be adequate for cleaning micro-rough surfaces. Antimicrobial photodynamic therapy can effectively reduce the prevalence of pathogens on implant surfaces, but the clinical benefits remain unknown. The increase in temperature of the implant surface caused by the CO2 laser poses a risk. The Er:YAG laser is considered to possess the best properties for implant surface decontamination. In vivo, no single method of surface decontamination (chemical agents, air abrasives or lasers) was found to be superior. In several animal experiments, thorough cleaning of the infected implant surfaces and implantation of these previously infected devices into freshly prepared sites resulted in re-osseointegration, while currently there are no controlled clinical trials where re-osseointegration has been demonstrated in patients. CONCLUSIONS: For decontamination of the infected implant surfaces, rinsing with saline (or cleaning with cotton pellets soaked with sterile saline) and air-abrasive treatment seem to work. Laser decontamination of the surface does not improve healing results. Non-surgical therapy of implants with peri-implantitis does not lead to successful treatment outcomes. Dental Disinfectants;Dental Implants Alveolar Bone Loss;Dental Disinfectants;Dental Etching;Dental Implants;Disinfection;Humans;Low-Level Light Therapy;Peri-Implantitis;Photochemotherapy;Treatment Outcome

The efficacy of the use of IR laser phototherapy associated to biphasic ceramic graft and guided bone regeneration on surgical fractures treated with wire osteosynthesis: a comparative laser fluorescence and Raman spectral study on rabbits. The aim of the present study was to assess, by Raman spectroscopy and laser fluorescence, the repair of surgical fractures fixed with wire osteosynthesis treated or not with infrared laser (Î»780 nm, 50 mW, 4 Ã— 4 J/cm(2)â€‰=16 J/cm(2), Ï•=0.5 cm(2), CW) associated or not to the use of hydroxyapatite and guided bone regeneration. Surgical tibial fractures were created under general anesthesia on 15 rabbits that were divided into five groups, maintained on individual cages, at day/night cycle, fed with solid laboratory pelted diet, and had water ad libitum. The fractures in groups II, III, IV, and V were fixed with wires. Animals in groups III and V were grafted with hydroxyapatite (HA) and guided bone regeneration (GBR) technique used. Animals in groups IV and V were irradiated at every other day during 2 weeks (4 Ã— 4 J/cm(2), 16 J/cm(2)â€‰=112 J/cm(2)). Observation time was that of 30 days. After animal death, specimens were taken and kept in liquid nitrogen and used for Raman spectroscopy. The Raman results showed basal readings of 1,234.38 Â± 220. Groups WO+B+L showed higher readings (1,680.22 Â± 822) and group WO+B the lowest (501.425 Â± 328). Fluorescence data showed basal readings of 5.83333 Â± 0.7. Groups WO showed higher readings (6.91667 Â± 0.9) and group WO+B+L the lowest (1.66667 Â± 0.5). There were significant differences between groups on both cases ($p<0.05$). Pearson correlation was negative and significant (R (2) â€‰ =â€‰-0.60; $p<0.001$), and it was indicative that, when the Raman peaks of calcium hydroxyapatite (CHA) are increased, the level of fluorescence is reduced. It is concluded that the use of near-infrared lasertherapy associated to HA graft and GBR was effective in improving bone healing on fractured bones as a result of the increasing deposition of CHA measured by Raman spectroscopy and decrease of the organic components as shown by the fluorescence readings. Bone Substitutes;Durapatite Animals;Bone Substitutes;Bone Wires;Ceramics;Durapatite;Fluorescence;Fracture Fixation, Internal;Guided Tissue Regeneration;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Male;Rabbits;Spectrum Analysis, Raman;Tibial Fractures

Low-level laser therapy ameliorates CCl4-induced liver cirrhosis in rats. This study investigated the effects of low-level laser therapy (LLLT) in the liver function, structure and inflammation in a experimental model of carbon tetrachloride (CCl(4))-induced liver cirrhosis. Wistar rats were divided into Control, LLLT, CCl(4) and CCl(4) +LLLT groups. CCl(4) groups received CCl(4) (0.4 g kg(-1); i.p.), three times a week, for 12 weeks. A 830 nm LLLT was performed with a continuous wave, 35 mW, 2.5 J cm(-2) per point, applied to four points of the liver (right and left upper and lower extremities, in the four lobes of the liver) for 2 weeks. Liver structure and inflammation (cirrhotic areas, collagen deposition, inflammation, density of Kupffer and hepatic stellate cells) and function (aspartate aminotransferase, alkaline phosphatase, gamma glutamyltransferase, lactate dehydrogenase, total proteins and globulins) were evaluated. LLLT significantly reduced CCl(4)-increased aspartate aminotransferase ($P < 0.001$), alkaline phosphatase ($P < 0.001$), gamma-glutamyl transferase ($P < 0.001$) and lactate dehydrogenase ($P < 0.01$) activity, as well as total proteins ($P < 0.05$) and globulins ($P < 0.01$). LLLT also reduced the number of cirrhotic areas, the collagen accumulation and the hepatic inflammatory infiltrate. Of note, LLLT reduced CCl(4)-increased number of Kupffer cells ($P < 0.05$) and hepatic stellate cells ($P < 0.05$). We conclude that LLLT presents beneficial effects on liver function and structure in an experimental model of CCl(4)-induced cirrhosis. Collagen;Carbon Tetrachloride;L-Lactate Dehydrogenase;gamma-Glutamyltransferase;Alanine Transaminase;Alkaline Phosphatase Alanine Transaminase;Alkaline Phosphatase;Animals;Carbon Tetrachloride;Cell Count;Collagen;Down-Regulation;Hepatic Stellate Cells;Kupffer Cells;L-Lactate Dehydrogenase;Liver Cirrhosis;Liver Function Tests;Low-Level Light Therapy;Male;Rats;Rats, Wistar;gamma-Glutamyltransferase

[Application of laser therapy in the physiotherapy of patients with multiple sclerosis]. Multiple sclerosis is a chronic disease of the nervous system, which main manifestations are disseminated demyelinated the changes in the central nervous system. The pathogenesis of this disease is still not known, the curative treatment is not possible. In connection with the alleged autoimmune genesis of MS patients are administered immunomodulatory drugs. Patients with multiple sclerosis suffer from a number of symptoms associated with this disease. The aim of this article is to present the main clinical symptoms characteristic of MS and to present biological effects of low-energy lasers used in the treatment of multiple sclerosis. Humans;Low-Level Light Therapy;Multiple Sclerosis;Physical Therapy Modalities

[The effects of multi-mode audio frequency pulse modulating laser together with electrical stimulation on blood pressure and hemorrheology of the spontaneously hypertensive rats]. In order to explore new ways in restraining the ascending blood pressure, this paper reports a research on the effects of multi-mode audio frequency pulse modulating laser irradiation with electrical stimulation on the hemorrheology and blood pressure of the spontaneously hypertensive rats (SHR). Forty male SHR were randomly divided into four groups: Group A (control), Group B (treated with electrical stimulation on stomach 36 point (ST-36)), Group C (treated with low level pulse laser irradiation on Erjian acupuncture point), Group D (low level laser irradiation together with electrical stimulation on Erjian acupuncture point and ST-36). Laser irradiation lasted for 45 min/ day, while electrical stimulation lasted for 30 min/day. After 10 days' treatment, we compared the hemorrheology and blood pressure of the rats in the four groups. The results were that values of hemorrheology in group A and group C were obviously improved compared with those in the other two groups. Meanwhile, the blood pressures in the three treated groups (B, C, and D) were lower than in the control group after the treatment, and the value of the rats in group A was the lowest. In conclusion, the treatment the laser irradiation combined with electrodes stimulation on spontaneously hypertensive rats brought better results of hemorrheology and blood pressure in the tested rats. Acupuncture Points;Animals;Blood Pressure;Blood Viscosity;Electric Stimulation;Electroacupuncture;Hemorheology;Hypertension;Laser Therapy;Male;Rats;Rats, Inbred SHR

Biomechanical effect of one session of low-level laser on the bone-titanium implant interface. Low-level laser (LLL) has been used on peri-implant tissues for accelerating bone formation. However, the effect of one session of LLL in the strength of bone-implant interface during early healing process remains unclear. The present study aims to evaluate the removal torque of titanium implants irradiated with LLL during surgical preparation of implant bed, in comparison to non-irradiation. Sixty-four Wistar rats were used. Half of the animals were included in LLL group, while the other half remained as control. All animals had the tibia prepared with a 2 mm drill, and a titanium implant (2.2 Ã— 4 mm) was inserted. Animals from LLL group were irradiated with laser (gallium aluminum arsenide), with a wavelength of 808 nm, a measured power output of 50 mW, to emit radiation in collimated beams (0.4 cm(2)), for 1 min and 23 s, and an energy density of 11 J/cm(2). Two applications (22 J/cm(2)) were performed immediately after bed preparation for implant installation. Flaps were sutured, and animals from both groups were sacrificed 7, 15, 30, and 45 days after implant installation, when load necessary for removing implant from bone was evaluated by using a torquimeter. In both groups, torque values tended to increase overtime; and at 30 and 45 days periods, values were statistically higher for LLL group in comparison to control (ANOVA test, $p < 0.0001$). Thus, it could be suggested that a single session of irradiation with LLL was beneficial to improve bone-implant interface strength, contributing to the osseointegration process. Dental Implants;Titanium Analysis of Variance;Animals;Biomechanical Phenomena;Dental Implantation, Endosseous;Dental Implants;Low-Level Light Therapy;Models,

Animal;Osseointegration;Osteogenesis;Rats;Rats, Wistar;Surgical Flaps;Tibia;Titanium;Torque;Wound Healing

Er:YAG lasers versus ultrasonic and hand instruments in periodontal therapy: clinical parameters, intracrevicular micro-organism and leukocyte counts. OBJECTIVE: The aim of this study was to compare the clinical parameters and crevicular cell population, particularly leukocyte counts, changes after initial periodontal therapy with different instruments by a chairside laboratory technique, in severe periodontitis patients. BACKGROUND DATA: Although scaling and root planing (SRP) with hand curettes or ultrasonic scalers may alter the subgingival microbial composition and improve clinical parameters, it is known that this effect decreases as the pocket depth (PD) increases. MATERIAL AND METHODS: Thirty systemically healthy subjects with severe chronic periodontitis were randomly assigned to three groups (n=10), and were treated either with hand curettes, ultrasonic scalers, or Er:YAG laser alone. Clinical measurements were made before and 90 days after treatment. A total of four subgingival plaque samples were collected from pockets with a PD 4-6 and â‰¥7â€‰mm and were analyzed with a phase-contrast microscopy for microorganism proportions and leukocyte counts at baseline and 7 and 90 days after treatment. RESULTS: From day 0 to day 90, clinical parameters were significantly improved in all groups ($p<0.01$), but there were no significant differences among groups. Laboratory assessments revealed significant differences in all groups between baseline, day 7, and day 90. However, considering changes from day 7 to day 90, hand curettes were the most successful for maintaining the levels of micro-organisms and leukocytes. CONCLUSIONS: Although Er:YAG lasers are promising in treating periodontitis, the results of this study favor finishing SRP with hand curettes. Moreover, as there is a similar tendency between micro-organism and leukocyte count changes, leukocyte counts may be used as chairside marker to evaluate the efficacy of SRP. Analysis of Variance;Dental Instruments;Dental Plaque;Dental Scaling;Female;Humans;Lasers, Solid-State;Leukocyte Count;Low-Level Light Therapy;Male;Microscopy, Phase-Contrast;Middle Aged;Periodontal Index;Periodontitis;Prospective Studies;Single-Blind Method;Statistics, Nonparametric;Treatment Outcome;Ultrasonics

Assessment of the systemic effects of low-level laser therapy (LLLT) on thyroid hormone function in a rabbit model. The aim of this study was to assess the effects of low-level laser therapy (LLLT) applied to a dental extraction socket on thyroid gland function in a rabbit model, based on serum triiodothyronine and thyroxine levels. Sixteen male New Zealand rabbits were randomly distributed into two groups: a control group (non-irradiated animals) and an experimental group (irradiated animals: one irradiation point in the extraction socket of the lower incisor). Animals in the experimental group were irradiated with an aluminium gallium arsenide diode laser (AlGaAs; wavelength 830 nm, 40 mW, CW laser), for 13 days, every 48 h, at a dose of 6 J/cm(2) per session, resulting in a total dose of 42 J/cm(2). Serum triiodothyronine and thyroxine levels were measured in both groups before extraction and on the last day of observation (day 15). There were no statistically significant differences between the groups in pre- and post-irradiation triiodothyronine and thyroxine values. With the irradiation protocol used in this study, LLLT did not affect thyroid function in rabbits as assessed by circulating serum triiodothyronine and thyroxine levels. Thyroid Hormones;Triiodothyronine;Thyroxine Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Rabbits;Radiation Dosage;Random Allocation;Thyroid Hormones;Thyroxine;Tooth Extraction;Tooth Socket;Triiodothyronine

Short-term effect of low-intensity, pulsed, electromagnetic fields on gait characteristics in older adults with low bone mineral density: a pilot randomized-controlled trial. AIM: To evaluate the short-term effects of a 10-min exposure to low-intensity, pulsed, electromagnetic fields (PEF) on gait characteristics in older adults with low bone mineral density. METHODS: In a single-center, double-blind, randomized-controlled trial, community-dwelling older adults aged â‰¥ 70 years were

randomized (3:2 ratio) to receive a 10-min treatment with PEF (mean intensity 1.5 mW) or placebo. The following gait parameters were assessed at baseline and just after the intervention/placebo with the GAITRite Portable Walkway system: self-selected gait speed (cm/s), stride length (cm), support base (cm) and double support phase (s). RESULTS: In the intervention group (25 patients), both self-selected gait speed and stride length increased significantly from baseline, whereas the double support phase decreased. In the placebo group, all gait parameters except for support base remained unchanged. The mean percent increase (Â± standard deviation) of self-selected gait speed was significantly (P = 0.010) greater in the intervention group (20.1 Â± 15.6) compared with the placebo group (10.5 Â± 13.1), whereas no significant difference in the mean percent variation of the other parameters was found between the two groups. During the intervention, no adverse event was observed. A similar proportion of patients in the two groups reported one fall in the 30 days after the intervention/placebo. CONCLUSIONS: This is the first randomized-controlled trial showing the potential beneficial effects of PEF on gait characteristics in older adults. Further phase III randomized trials are warranted to establish their potential benefits (e.g. fall prevention) on fall-related health outcomes in elderly patients. Placebos Accidental Falls;Aged;Aged, 80 and over;Bone Density;Bone Diseases, Metabolic;Dizziness;Double-Blind Method;Electromagnetic Fields;Female;Gait;Humans;Independent Living;Infrared Rays;Low-Level Light Therapy;Magnetic Field Therapy;Male;Osteoporosis;Pilot Projects;Placebos;Time Factors;Transcutaneous Electric Nerve Stimulation;Treatment Outcome

Effect of laser and LED phototherapies on the healing of cutaneous wound on healthy and iron-deficient Wistar rats and their impact on fibroblastic activity during wound healing. Iron deficiency impairs the formation of hemoglobin, red blood cells, as well the transport of oxygen. The wound healing process involves numerous functions, many of which are dependent on the presence of oxygen. Laser has been shown to improve angiogenesis, increases blood supply, cell proliferation and function. We aimed to study the effect of Î»660 nm laser and Î»700 nm light-emitting diode (LED) on fibroblastic proliferation on cutaneous wounds on iron-deficient rodents. Induction of iron anemia was carried out by feeding 105 newborn rats with a special iron-free diet. A 1 Ã— 1 cm wound was created on the dorsum of each animal that were randomly distributed into seven groups: I, control anemic; II, anemic no treatment; III, anemic+L; IV, anemic+LED; V, healthy no treatment; VI, healthy+laser; VII, healthy+LED (n=15 each). Phototherapy was carried out using either a diode laser (Î»660 nm, 40 mW, 10 J/cm(2)) or a prototype LED device (Î»700 Â± 20 nm, 15 mW, 10 J/cm(2)). Treatment started immediately after surgery and was repeated at 48-h interval during 7, 14, and 21 days. After animal death, specimens were taken, routinely processed, cut, stained with hematoxylin-eosin, and underwent histological analysis and fibroblast counting. Significant difference between healthy and anemic subjects on regards the number of fibroblast between treatments was seen ($p<0.008$, $p<0.001$). On healthy animals, significant higher count was seen when laser was used ($p<0.008$). Anemic subjects irradiated with LED showed significantly higher count ($p<0.001$). It is concluded that the use of LED light caused a significant positive biomodulation of fibroblastic proliferation on anemic animals and laser was more effective on increasing proliferation on non-anemics. Anemia, Iron-Deficiency;Animals;Animals, Newborn;Cell Proliferation;Disease Models, Animal;Fibroblasts;Light;Low-Level Light Therapy;Male;Phototherapy;Rats;Rats, Wistar;Skin;Wound Healing

Effects of low-intensity laser therapy on periodontal tissue remodeling during relapse and retention of orthodontically moved teeth. This study was designed to investigate the effects of low-intensity laser therapy (LILT) on periodontal ligament (PDL) remodeling during relapse and retention after the completion of orthodontic movement. The maxillary central incisors (n = 104) of the 52 rats were randomly divided into five groups according to the treatment modality: baseline control group

without any intervention (n = 8); relapse group without retainer after tooth movement (n = 24); retention group with fixed retainer after tooth movement (n = 24); lased relapse group without retainer after tooth movement and LILT (n = 24); lased retention group with retainer after tooth movement and LILT (n = 24). LILT was daily performed using a gallium-aluminum-arsenide diode laser in a biostimulation mode: wavelength of 780 nm, continuous waves at 70 mW output power, a preset low intensity of 1.75 W/cm(2) in contact mode, resulting in energy dose of 5 J/cm(2) per irradiation for 3 s. The animals were euthanized on days 1, 3, and 7 after removal of the orthodontic appliance. Real-time RT-PCR was performed for quantitative analysis of matrix metalloproteinases mRNA expression. Immunoreactivities of collagen and tissue inhibitor of metalloproteinase were observed on the compression and tension sides. LILT significantly facilitated the expression of five tested MMP mRNAs in both relapse and retention groups. TIMP-1 immunoreactivity was inhibited by LILT in both groups, whereas Col-I immunoreactivity was increased by LILT only in the retention group. These results indicate that LILT would act differently on the stability after orthodontic treatment according to additional retainer wearing or not. LILT when combined with a retainer on the moved teeth may shorten the retention period by accelerating periodontal remodeling in the new tooth position, whereas, LILT on the moved teeth left without any retainer would rather increase the rate of relapse after treatment. Matrix Metalloproteinases Analysis of Variance;Animals;Gene Expression;Immunoenzyme Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Matrix Metalloproteinases;Periodontal Ligament;Photomicrography;Random Allocation;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Recurrence;Statistics, Nonparametric;Tooth Movement Techniques

Analgesic effect of a low-level laser therapy (830 nm) in early orthodontic treatment. The aim of this study was to evaluate the pain sensation that orthodontic patients experience when elastic separators are placed between molars and premolars and to determine the degree of analgesic efficacy of low-level laser therapy (LLLT) compared to a placebo treatment. The study was conducted with 20 volunteers who were fitted with elastic separators between the maxillary molars and premolars. One quadrant was randomly chosen to be irradiated with an 830-nm laser, 100 mW, beam diameter of 7 mm, 250 mW/cm(2) applied for 20 s per point (5 J/cm(2)). Three points were irradiated in the buccal face and three were irradiated in the palate. The same procedure was applied in the contralateral quadrant with a placebo light. A visual analogue scale was used to assess pain 5 min, 6 h, 24 h, 48 h, and 72 h after placement of the separators. Maximum pain occurred 6-24 h after placement of the elastic separators. Pain intensity was significantly lower in the laser-treated quadrant (mean, 7.7 mm) than in the placebo-treated quadrant (mean, 14.14 mm; p = 0.0001). LLLT at these parameters can reduce pain in patients following placement of orthodontic rubber separators. Adolescent;Adult;Analgesia;Analysis of Variance;Female;Humans;Low-Level Light Therapy;Male;Pain Measurement;Tooth Movement Techniques

Journal of Cosmetic and Laser Therapy. Editorial. Cosmetic Techniques;Humans;Low-Level Light Therapy

Transcranial low level laser (light) therapy for traumatic brain injury. We review the use of transcranial low-level laser (light) therapy (LLLT) as a possible treatment for traumatic-brain injury (TBI). The basic mechanisms of LLLT at the cellular and molecular level and its effects on the brain are outlined. Many interacting processes may contribute to the beneficial effects in TBI including neuroprotection, reduction of inflammation and stimulation of neurogenesis. Animal studies and clinical trials of transcranial-LLLT for ischemic stroke are summarized. Several laboratories have shown that LLLT is effective in increasing neurological performance and memory and learning in mouse models of TBI. There have been case report papers that show beneficial effects of transcranial-LLLT in a total of three patients with chronic TBI. Our laboratory has conducted three studies on LLLT

and TBI in mice. One looked at pulsed-vs-continuous wave laser-irradiation and found 10 Hz to be superior. The second looked at four different laser-wavelengths (660, 730, 810, and 980 nm); only 660 and 810 nm were effective. The last looked at different treatment repetition regimens (1, 3 and 14-daily laser-treatments). Animals;Brain Injuries;Humans;Low-Level Light Therapy;Skull;Stroke

Antiphotoaging effects of light-emitting diode irradiation on narrow-band ultraviolet B-exposed cultured human skin cells. BACKGROUND: Antiaging effects of light-emitting diodes (LEDs) have been clinically demonstrated using one or two wavelengths. The mechanism is unclear. OBJECTIVE: To examine direct and indirect photobiomodulation effects of LEDs on narrow-band ultraviolet B (NB-UVB)-induced photoaging using seven different wavelengths alone or in combination. MATERIALS AND METHODS: Four LED wavelengths were chosen based on type I collagen and metalloproteinase (MMP)-1 expression. NB-UVB-irradiated fibroblasts or keratinocytes were irradiated using these four wavelengths. The expression of collagen and MMP-1 in fibroblasts with or without conditioned medium from LED-irradiated keratinocytes and the expression of proinflammatory cytokines in the LED-irradiated keratinocytes were examined. RESULTS: Irradiation with four wavelengths (630, 660, 830, and 850Â nm) significantly increased the number of viable fibroblasts. These four wavelengths also increased type I collagen expression, particularly four combinations (630/830, 660/850, 630/850, and 660/830Â nm). The fibroblasts cultured with the keratinocyte conditioned medium, particularly with a combination of 630/850 or 660/830Â nm, increased collagen levels. Low tumor necrosis factor alpha (TNF-Î±) and high transforming growth factor beta 1 (TGF-Î²1) expression was detected in the LED-irradiated keratinocytes. CONCLUSION: The combination of 630/850- or 660/830-nm irradiation led to better direct and indirect antiphotoaging outcomes than single LED wavelengths in NB-UVB-irradiated cultured normal human skin cells. Collagen Type I;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha;Matrix Metalloproteinase 1 Analysis of Variance;Cell Proliferation;Collagen Type I;Fibroblasts;Humans;Keratinocytes;Matrix Metalloproteinase 1;Phototherapy;Skin Aging;Transforming Growth Factor beta1;Tumor Necrosis Factor-alpha;Ultraviolet Rays

Effects of low-level laser therapy after nerve reconstruction in rat denervated soleus muscle adaptation. BACKGROUND: Peripheral nerve injury (PNI) rehabilitation remains a challenge for physical therapists because PNI effects are very disabling. Low-level laser therapy (LLLT) has been described as a physical resource that is able to influence enzymes called metallopeptidases (MMPs) associated with extracellular matrix (ECM) turnover, thus accelerating neuromuscular recovery after nerve crush injuries. However, the effects of LLLT in the treatment of severe nerve injuries and denervated slow-twitch muscles are still inconclusive. OBJECTIVES: The aim of this study was to evaluate the effects of different wavelengths and energy densities of LLLT irradiation, applied to a severe nerve injury after reconstruction, on denervated slow-twitch skeletal muscle adaptation. METHOD: Rats were submitted to a neurotmesis of the sciatic nerve followed by end-to-end neurorrhaphy. They received transcutaneous LLLT irradiation at the lesion site. The LLLT parameters were: wavelengths--660 or 780 nm; energy densities--10, 60 or 120 J/cmÂ²; power--40 mW; spot--4 mmÂ². Sciatic functional index (SFI), histological, morphometric, and zymographic analyses were performed. One-way ANOVA followed by Tukey's test was used (pâ‰¤0.05). RESULTS: An atrophic pattern of muscle fibers was observed in all injured groups. The MMP activity in the soleus muscle reached normal levels. On the other hand, SFI remained below normality after PNI, indicating incapacity. No difference was found among PNI groups submitted or not to LLLT in any variable. CONCLUSIONS: LLLT applied to the nerve post-reconstruction was ineffective in delaying degenerative changes to the slow-twitch denervated muscles and in functional recovery in rats. New studies on recovery of denervated slow-twitch muscle are necessary to support clinical practice.

Adaptation, Physiological;Animals;Low-Level Light Therapy;Male;Muscle Denervation;Muscle, Skeletal;Peripheral Nerve Injuries;Rats;Rats, Wistar;Recovery of Function

Zymographic and ultrastructural evaluations after low-level laser irradiation on masseter muscle of HRS/J strain mice. Low-level laser therapy (LLLT) has been widely used in the treatment of the stomatognathic system dysfunction; however, its biological effect remains poorly understood. This study evaluated the effect of LLLT (GaAlAs, 780 nm, 20 J/cm(2), 40 mW) on masseter muscle of HRS/J mice after different numbers of laser irradiations (three, six, and ten) for 20 s in alternate days. Three experimental groups were defined according to the number of laser irradiations and three control groups (n=5) were used. On the third day after the last irradiation, all animals were killed and the masseter muscle was removed and processed for the following analysis: (a) transmission electron microscopy, (b) zymography, (c) immunohistochemistry for vascular endothelial growth factor (VEGF) and VEGFR-2. The results showed: (a) with six laser applications, a dilation of T tubules, and sarcoplasmic reticulum cistern, increased pinocytosed vesicles in the endothelium; with ten laser applications, few pinocytic vesicles in the endothelium and condensed mitochondria. (b) Under the conditions of this study, the synthesis of other matrix metalloproteinases was not observed, only the MMP-2 and -9. (c) After ten laser irradiations, immunostaining was observed only for VEGFR-2. We conclude that after six laser applications, ultrastructural changes may facilitate the Ca(+2) transfer to cytosol and increase the fluid transport from one surface to another. The ultrastructural changes and no immunostaining for VEGF with ten applications may decrease the metabolic activity as well as damage the angiogenic process, suggesting that an effective number of laser applications may be less than ten, associating to this therapy a better cost-benefit. Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, mouse;Vascular Endothelial Growth Factor Receptor-2;Matrix Metalloproteinase 2;Mmp2 protein, mouse;Matrix Metalloproteinase 9;Mmp9 protein, mouse Animals;Humans;Low-Level Light Therapy;Male;Masseter Muscle;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Mice;Mice, Hairless;Microscopy, Electron, Transmission;Models, Animal;Temporomandibular Joint Disorders;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2

Effects of laser and LED radiation on mitochondrial respiration in experimental endotoxic shock. Effects of low-level laser therapy (442 and 532 nm) and LED radiation (650 nm) on mitochondrial respiration in experimental endotoxic shock have been studied. A model of experimental endotoxic shock in rats was obtained by intraperitoneal injection of lipopolysaccharide B. It was found that low-level laser therapy and LED radiation dramatically affected the rate of mitochondrial respiration in third and fourth states both in LPS-treated animals and in control experiments. The maximal increase of the mitochondrial respiration rate (of about 40 %) in LPS-treated animals was observed when blue laser was applied at the dose of 6 J/cm(2). Measurements of inner mitochondrial membrane surface potential with fluorescence probe JC-1 in LPS-treated rats showed in approximately 10 % decrease of potential in LPS-treated animals compared to control. Lipopolysaccharides Animals;Disease Models, Animal;Lasers, Gas;Lasers, Solid-State;Light;Lipopolysaccharides;Low-Level Light Therapy;Male;Membrane Potential, Mitochondrial;Mitochondria;Oxygen Consumption;Phototherapy;Rats;Shock, Septic

Near-infrared photobiomodulation in an animal model of traumatic brain injury: improvements at the behavioral and biochemical levels. OBJECTIVE: The purpose of this was to evaluate the neuroprotective effects of near-infrared (NIR) light using an in-vivo rodent model of traumatic brain injury (TBI), controlled cortical impact (CCI), and to characterize changes at the behavioral and biochemical levels. BACKGROUND DATA: NIR upregulates mitochondrial function, and decreases oxidative stress. Mitochondrial oxidative stress and apoptosis are important in TBI. NIR enhanced cell viability and mitochondrial function in previous in-vitro TBI models, supporting potential NIR in-vivo

benefits. METHODS: Sprague-Dawley rats were divided into three groups: severe TBI, sham surgery, and anesthetization only (behavioral response only). Cohorts in each group were administered either no NIR or NIR. They received two 670â€‰nm LED treatments (5â€‰min, 50 mW/cm(2), 15â€‰J/cm(2)) per day for 72â€‰h (chemical analysis) or 10 days (behavioral). During the recovery period, animals were tested for locomotor and behavioral activities using a TruScan device. Frozen brain tissue was obtained at 72â€‰h and evaluated for apoptotic markers and reduced glutathione (GSH) levels. RESULTS: Significant differences were seen in the TBI plus and minus NIR (TBI+/-) and sham plus and minus NIR (S+/-) comparisons for some of the TruScan nose poke parameters. A statistically significant decrease was found in the Bax pro-apoptotic marker attributable to NIR exposure, along with lesser increases in Bcl-2 anti-apoptotic marker and GSH levels. CONCLUSIONS: These results show statistically significant, preclinical outcomes that support the use of NIR treatment after TBI in effecting changes at the behavioral, cellular, and chemical levels. Adaptor Proteins, Signal Transducing;Apoptosis Regulatory Proteins;BAG3 protein, rat;Biomarkers Adaptor Proteins, Signal Transducing;Animals;Apoptosis;Apoptosis Regulatory Proteins;Behavior, Animal;Biomarkers;Brain Injuries;Disease Models, Animal;Infrared Rays;Low-Level Light Therapy;Oxidative Stress;Rats;Rats, Sprague-Dawley

Comparative evaluation of low-level laser and COâ,, laser in treatment of patients with oral lichen planus. A comparative evaluation of low-level laser and CO(2) laser therapies was performed, for the treatment of oral lichen planus (OLP). In a randomized open clinical trial, 28 patients with 57 lesions were randomly assigned to two groups. One group received CO(2) laser therapy, the other received low-level laser therapy (LLLT) for 5 sessions every other day. Participants were examined before the treatment, after 2 weeks, and at 1, 2 and 3 months, to assess the changes in sign and symptom scores. Improvements in size of lesions, in pain and clinical response scores were achieved in both groups. After 3 months, clinical response showed 100% and 85% partial to complete improvement in LLLT and CO(2) laser surgery, respectively. This demonstrates a quick and pronounced beneficial effect in controlling symptoms related to OLP. Both methods may be effective in the treatment of OLP, and can be used as alternative therapy alongside standard treatment modalities. The present study showed that LLLT displayed better results than CO(2) laser therapy as alternative or additional therapy, but further investigations in comparison with standard treatment modalities with a prolonged follow-up period will be necessary to confirm the efficacy of laser therapy in the treatment of OLP. Carbon Dioxide Carbon Dioxide;Female;Humans;Lasers, Gas;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Low-level laser therapy reduces time to ambulation in dogs after hemilaminectomy: a preliminary study. OBJECTIVES: A prospective study to determine if low-level laser therapy and surgery for intervertebral disk herniation encourage ambulation faster than surgery alone. METHODS: Thirty-six dogs with acute paraparesis/paraplegia due to acute intervertebral disk herniation were evaluated and given a modified Frankel score. Dogs with scores 0 to 3 were included in the study. Dogs were assigned to the control group (1) or the laser treatment group (2) based on alternating order of presentation. All dogs underwent surgery for their herniated disk. Dogs in group 2 were treated postoperatively with low-level laser therapy daily for five days, or until they achieved a modified Frankel score of 4. A 5 Ã— 200-mW 810-nm cluster array was used to deliver 25 W/cm(2) to the skin. All dogs were scored daily by the investigators using the modified Frankel scoring system. RESULTS: The time to achieve a modified Frankel score of 4 was significantly lower (P=0.0016) in the low-level laser therapy group (median 3.5 days) than the control group (median 14 days). CLINICAL SIGNIFICANCE: Low-level laser therapy in combination with surgery decreases the time to ambulation in dogs with T3-L3 myelopathy secondary to intervertebral disk herniation. Animals;Dog

Diseases;Dogs;Female;Intervertebral Disc Displacement;Lameness, Animal;Laminectomy;Low-Level Light Therapy;Lumbar Vertebrae;Male;Pain, Postoperative;Prospective Studies;Thoracic Vertebrae;Treatment Outcome
Photobiomodulation: poised from the fringes. Forecasting;Humans;Low-Level Light Therapy;Terminology as Topic
Electrophysiological effects of single point transcutaneous 650 and 808â€‰nm laser irradiation of rat sciatic nerve: a study of relevance for low-level laser therapy and laser acupuncture. OBJECTIVE: The purpose of this study was to evaluate effects of transcutaneous 650 and 808â€‰nm laser irradiation (LI) to a single point overlying rat sciatic nerve; a comparison to four point LI and relevance to the clinical application of low-level laser therapy (LLLT) and laser acupuncture (LA). BACKGROUND DATA: Transcutaneous LI inhibits somatosensory and motor conduction when delivered to four points overlying sciatic nerve; however, effects of the same total energy delivered to a single point over the nerve, equating to laser acupuncture, are undefined. METHODS: Transcutaneous 808â€‰nm, 450â€‰mW, (13.5 or 54â€‰J) continuous wave (cw) mode or 650â€‰nm, 35â€‰mW, (1.1 or 4.4â€‰J), cw LI or sham LI, was applied for 30 or 120â€‰sec to a single point overlying the midpoint of rat sciatic nerve. Somatosensory evoked potentials (SSEPs) and compound muscle action potentials (CMAPs) were then recorded after 10 and 20â€‰min, and after 24 and 48â€‰h. RESULTS: 120â€‰sec of 808â€‰nm LI increased SSEP amplitudes only at 10â€‰min, with no effect of 30 or 120â€‰sec at other time points on SSEPs or on CMAPs. LI 650â€‰nm for 30 or 120â€‰sec did not alter SSEPs or CMAPs at any time point. CONCLUSIONS: Localized transcutaneous 808 LI to a single point overlying sciatic nerve increases SSEP amplitudes when compared with delivery of the same total energy to four points, which causes decreased SSEP amplitudes and conduction block. Therefore, the area and duration of delivery are important, independent variables with implications for clinical delivery of both LLLT and LA. Action Potentials;Acupuncture Therapy;Animals;Electrodes;Electrophysiological Phenomena;Low-Level Light Therapy;Neural Conduction;Random Allocation;Rats;Rats, Sprague-Dawley;Sciatic Nerve
A comparison of the low-level laser versus low intensity pulsed ultrasound on new bone formed through distraction osteogenesis. OBJECTIVE: To assess and compare the effects of low-intensity pulsed ultrasound stimulation (LIPUS) and low-level laser therapy (LLLT) on the bone mineral density (BMD) of bone formed through distraction osteogenesis (DO) using dual energy x-ray absorptiometry (DEXA). BACKGROUND DATA: LIPUS and LLLT are noninvasive supporting treatment concepts used for wound healing. LIPUS has been used to accelerate bone healing through the therapeutic effect arising from piezoelectric and angiogenetic effects on cell membranes. LLLT known as "photobiomodulation" is used in the treatment of soft and hard tissue injuries. METHODS: The study was conducted with 15 New Zealand rabbits randomly divided into three groups of 5 according to treatment, as follows: Group A: DO was performed with no further treatment; Group B: DO was performed followed by 30 mW/cm(2) LIPUS at 1 Mhz for 20 min/day during the distraction period; Group C: DO was performed followed by 25 mW/cm(2) LLLT at 650 nm for 10 min/day during the distraction period. DEXA was used to examine the treated areas prior to surgery and at 30 and 60 days postoperatively. RESULTS: In the control group, the mean BMD values at both 30 and 60 days postoperatively were below the baseline level, whereas they were above at the same time intervals in the LIPUS group. In the LLLT group, the mean BMD value at 30 days postoperatively was below the baseline level, whereas it was above the baseline level at 60 days postoperatively. CONCLUSIONS: LIPUS and LLLT applied during the distraction period accelerated the DO treatment. Absorptiometry, Photon;Animals;Bone Density;Low-Level Light Therapy;Mandible;Osteogenesis;Osteogenesis, Distraction;Osteotomy;Rabbits;Random Allocation;Ultrasonic Therapy;Wound Healing

Fluoride plus CO2 laser against the progression of caries in root dentin. PURPOSE: To evaluate the effect of a 1.23% acidulated phosphate fluoride (APF) gel combined with CO2 laser in protecting carious root dentin against further cariogenic challenges. METHODS: After a 7-day lead-in period, 12 volunteers wore an intraoral palatal device containing four carious root dentin slabs, treated with APF and APF+CO2 or placebo and placebo+CO2. After a 14-day wash-out period, volunteers were crossed-over to the other treatment arm. During both intraoral phases, specimens were submitted to cariogenic challenges and then evaluated for cross-sectional Knoop microhardness. RESULTS: Two-way ANOVA demonstrated that there was significant effect for both main factors: CO2 laser irradiation ($P < 0.0001$) and gel treatment ($P < 0.0001$), and that there was no interaction between them ($P = 0.4706$). Protection of carious root dentin against further cariogenic challenges may be provided by APF fluoride gel and CO2 laser, but no additive benefit was found by combining such strategies. Cariogenic Agents;Gels;Placebos;Acidulated Phosphate Fluoride;Sucrose Acidulated Phosphate Fluoride;Adult;Anatomy, Cross-Sectional;Cariogenic Agents;Cross-Over Studies;Dental Caries Susceptibility;Dentin;Disease Progression;Double-Blind Method;Gels;Hardness;Humans;Lasers, Gas;Low-Level Light Therapy;Placebos;Root Caries;Sucrose;Young Adult

Effect of 635 nm light-emitting diode irradiation on intracellular superoxide anion scavenging independent of the cellular enzymatic antioxidant system. OBJECTIVE: The aim of this study was to examine the reactive oxygen species (ROS) that are dissipated by 635 nm irradiation, and the effect of 635 nm irradiation on ROS scavenging system. BACKGROUND DATA: Intracellular ROS are produced in the form of superoxide anion by either nicotinamide adenine dinucleotide phosphate (NADPH) oxidase or xanthine oxidase in response to a number of stimuli. Low-level light irradiation decreases the intracellular ROS level and has been used in clinical situations for reducing the level of oxidative stress. METHODS: Human epithelial cells were exposed to exogenous and endogenous oxidizing agents that promote the generation of harmful ROS. These were then irradiated with 635 nm LED light, 5 mW/cm(2) for 1 h, 18 J/cm(2) or by 470 nm LED light, also 5 mW/cm(2) for 1 h, 18 J/cm(2) on a 9 cm cell culture dish. After irradiation, the MTT reduction method and malondialdehyde (MDA) colorimetric assay were performed in xanthine/xanthine oxidase (XXO)- or hydrogen peroxide (H(2)O(2))-treated HaCaT cells. The superoxide anion was detected by an electron spin resonance (ESR) spectrometer using 5,5-dimethyl-1-pyrroline-N-oxide (DMPO) as the spin trap and H(2)O(2) was assayed by flow cytometry using 2',7'-dichlorodihydrofluorescein diacetate (H(2)DCF-DA). RESULTS: Irradiation at 635 nm enhanced cell viability in the XXO-treated HaCaT cells. Also, irradiation had a much lesser effect on cell viability in the HaCaT cells treated with exogenous H(2)O(2) as compared with that in cells treated with N-acetyl-L-cysteine. The level of the superoxide anion increased in response to XXO treatment, and then decreased after 635 nm irradiation. Irradiation with 635 nm led to a decrease in superoxide anion and lipid peroxidation levels in the presence or absence of diethyldithiocarbamate. CONCLUSIONS: These results highlight the potential role of 635 nm irradiation in protection against oxidative stress by scavenging superoxide anions. Also, a pathway that is independent of the activities of intracellular enzymatic ROS scavengers, such as superoxide dismutase, glutathione peroxidase and catalase might be involved in its mechanism of action. Reactive Oxygen Species;NAD;Superoxides;Hydrogen Peroxide;Superoxide Dismutase;Xanthine Oxidase;Acetylcysteine Acetylcysteine;Analysis of Variance;Cell Line, Transformed;Cell Survival;Enzyme-Linked Immunosorbent Assay;Flow Cytometry;Humans;Hydrogen Peroxide;Keratinocytes;Light;Lipid Peroxidation;NAD;Oxidative Stress;Reactive Oxygen Species;Spin Trapping;Superoxide Dismutase;Superoxides;Xanthine Oxidase

Efficiency of low-level laser therapy in reducing pain induced by orthodontic forces. OBJECTIVE: The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on reducing post-

adjustment orthodontic pain via evaluation of gingival crevicular fluid (GCF) composition changes at the level of prostaglandin-E(2) (PGE(2)) and visual analogue scale (VAS). BACKGROUND DATA: LLLT has been found to be effective in pain relief. PGE(2) has the greatest impact on the process of pain signals and can be detected in GCF in order to investigate the response of dental and periodontal tissues in a biochemical manner. MATERIALS AND METHODS: Nineteen patients (11 females and 8 males; mean age 13.9 years) were included in this study. Maxillary first molars were banded and then a randomly selected first molar at one side was irradiated (Î»820 nm; continuous wave; output power: 50 mW; focal spot: 0.0314 cm(2); exposure duration: 5 sec; power density: 1.59 W/cm(2); energy dose: 0.25 J; energy density: 7.96 J/cm(2) for each shot), while the molar at the other side was served as placebo control. The GCF was collected from the gingival crevice of each molar to evaluate PGE(2) levels, before band placement, 1 and 24 h after laser irradiation. Pain intensity was analyzed at 5 min, 1 h, and 24 h after band placement by using VAS. RESULTS: Although no difference was found in pain perception at 5 min and 1 h, significant reduction was observed with laser treatment 24 h after application ($p<0.05$). The mean PGE(2) levels were significantly elevated in control group, whereas a gradual decrease occurred in laser group. The difference in PGE(2) levels at both 1 and 24 h were statistically significant between two groups ($p<0.05$). CONCLUSIONS: The significant reductions in both pain intensity and PGE(2) levels revealed that LLLT was efficient in reducing orthodontic post-adjustment pain. Dinoprostone Adolescent;Dinoprostone;Enzyme-Linked Immunosorbent Assay;Female;Gingival Crevicular Fluid;Humans;Low-Level Light Therapy;Male;Orthodontic Appliances;Pain Management;Pain Measurement;Statistics, Nonparametric;Tooth Movement Techniques

Bone healing effects of diode laser (808 nm) on a rat tibial fracture model. Low level laser therapies (LLLT) have analgesic, vasodilatory and anti-inflammatory effects. The present study investigated the effects of LLLT with a diode laser (808 nm) device on the healing of the rat tibial fracture. Forty eight, 8-week-old, male Sprague-Dawley rats were used for this study. After creating the tibial fracture model, the animals were randomly divided into laser and control groups. The animals were euthanized for histopathological and radiological evaluation. The biomechanical strength of the fractures was evaluated using a bending test. The histopathological and radiological evaluations suggested that the laser group developed new bone formations much earlier than those of the control group. The maximum tolerance force of the laser group was significantly higher than that of the control group ($p<0.05$). These findings suggest positive effects of LLLT in accelerating the bone healing process, especially in the early stage of bone formation. Animals;Fracture Healing;Male;Models, Animal;Rats;Rats, Sprague-Dawley;Tibial Fractures

Proinflammatory cytokine levels in saliva in patients with burning mouth syndrome before and after treatment with low-level laser therapy. The aim of this study was to determine the levels of proinflammatory tumor necrosis factor-alpha (TNF-Î±) and interleukin-6 (IL-6) cytokines in whole unstimulated saliva in subjects with burning mouth syndrome (BMS) before and after treatment with low-level laser therapy (LLLT). BMS is characterized by a continuous, painful burning sensation in a clinically normal-appearing oral mucosa. A sample consisting of 40 consecutive subjects was selected on a voluntary basis from the pool of patients who presented for diagnosis and treatment of BMS at the Oral Medicine Unit of the Faculty of Medicine of the University of Rijeka. For determination of salivary levels of TNF-Î± and IL-6, ELISA (Sigma Immunochemicals, St. Louis, MO, USA) was performed to determine the salivary levels of TNF-Î± and IL-6. After 4 weeks of LLLT, the salivary levels of TNF-Î± and IL-6 in the experimental group decreased significantly ($p < 0.001$). There was no significant difference in the experimental group regarding visual analogue scale. Interleukin-6;Tumor Necrosis Factor-alpha Analysis of Variance;Burning Mouth Syndrome;Enzyme-Linked

Immunosorbent Assay;Female;Humans;Interleukin-6;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Saliva;Treatment Outcome;Tumor Necrosis Factor-alpha

Fractional CO2 laser resurfacing for atrophic acne scars: a randomized controlled trial with blinded response evaluation. BACKGROUND: The treatment of acne scars with fractional CO(2) lasers is gaining increasing impact, but has so far not been compared side-by-side to untreated control skin. OBJECTIVE: In a randomized controlled study to examine efficacy and adverse effects of fractional CO(2) laser resurfacing for atrophic acne scars compared to no treatment. METHODS: Patients (nâ€‰=â€‰13) with atrophic acne scars in two intra-individual areas of similar sizes and appearances were randomized to (i) three monthly fractional CO(2) laser treatments (MedArt 610; 12-14 W, 48-56 mJ/pulse, 13% density) and (ii) no treatment. Blinded on-site evaluations were performed by three physicians on 10-point scales. Endpoints were change in scar texture and atrophy, adverse effects, and patient satisfaction. RESULTS: Preoperatively, acne scars appeared with moderate to severe uneven texture (6.15â€‰Â±â€‰1.23) and atrophy (5.72â€‰Â±â€‰1.45) in both interventional and non-interventional control sites, Pâ€‰=â€‰1. Postoperatively, lower scores of scar texture and atrophy were obtained at 1 month (scar texture 4.31â€‰Â±â€‰1.33, Pâ€‰<â€‰0.0001; atrophy 4.08â€‰Â±â€‰1.38, Pâ€‰<â€‰0.0001), at 3 months (scar texture 4.26â€‰Â±â€‰1.97, Pâ€‰<â€‰0.0001; atrophy 3.97â€‰Â±â€‰2.08, Pâ€‰<â€‰0.0001), and at 6 months (scar texture 3.89â€‰Â±â€‰1.7, Pâ€‰<â€‰0.0001; atrophy 3.56â€‰Â±â€‰1.76, Pâ€‰<â€‰0.0001). Patients were satisfied with treatments and evaluated scar texture to be mild or moderately improved. Adverse effects were minor. CONCLUSIONS: In this single-blinded randomized controlled trial we demonstrated that moderate to severe atrophic acne scars can be safely improved by ablative fractional CO(2) laser resurfacing. The use of higher energy levels might have improved the results and possibly also induced significant adverse effects. Acne Vulgaris;Adult;Cicatrix;Facial Dermatoses;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Single-Blind Method;Young Adult

Influence of various laser therapy methods on knee joint pain and function in patients with knee osteoarthritis. BACKGROUND: The aim of the study was to estimate the influence of various laser therapy methods on knee joint pain and function in patients with knee osteoarthritis. MATERIAL AND METHODS: 125 patients were randomly assigned to 4 groups: â€¢ group I received one-wave laser irradiation (wave length 810 nm, dose 8 J/point) â€¢ group II received two-wave MLS laser irradiation (power 1100 mW, frequency 2000 Hz, dose 12.4 J/point) â€¢ group III received a similar regimen of two-wave MLS laser irradiation, but at a dose of 6.6 J per point â€¢ group IV was a placebo group where laser therapy procedures were simulated without actual irradiation. The effectiveness of the therapy was evaluated by means of Lequesne's scale, a modified Laitinen questionnaire and a visual analogue scale (VAS). Statistical analysis utilised non-parametric Wilcoxon's and Mann-Whitney's tests. Calculations were carried out with MedCalc v. 11.6.1.0. RESULTS: Statistically significant improvements in knee joint function and pain relief were seen in all groups (I, II and III). When groups I, II and III were compared, the largest improvement was found in group II (MLS laser, dose 12.4 J/point). The degrees of improvement in groups I and III were similar. CONCLUSIONS: One-wave laser irradiation at a dose of 8 J per point and two-wave laser irradiation with doses of 12.4 J and 6.6 J per point significantly improved knee joint function and relieved knee pain in patients with osteoarthritis. Acute Pain;Adult;Arthralgia;Cartilage, Articular;Dose-Response Relationship, Radiation;Double-Blind Method;Humans;Low-Level Light Therapy;Middle Aged;Osteoarthritis, Knee;Pain Management;Pain Measurement;Radiotherapy Dosage;Range of Motion, Articular;Treatment Outcome

Questions regarding low-level laser therapy article. Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pain;Tooth Movement Techniques

Meta-analysis of pain relief effects by laser irradiation on joint areas. BACKGROUND: Laser therapy has been proposed as a physical therapy for musculoskeletal disorders and has attained popularity because no side effects have been reported after treatment. However, its true effectiveness is still controversial because several clinical trials have reported the ineffectiveness of lasers in treating pain. METHODS: In this systematic review, we investigate the clinical effectiveness of low-level laser therapy (LLLT) on joint pain. Clinical trials on joint pain satisfying the following conditions are included: the laser is irradiated on the joint area, the PEDro scale score is at least 5, and the effectiveness of the trial is measured using a visual analogue scale (VAS). To estimate the overall effectiveness of all included clinical trials, a mean weighted difference in change of pain on VAS was used. RESULTS: MEDLINE is the main source of the literature search. After the literature search, 22 trials related to joint pain were selected. The average methodological quality score of the 22 trials consisting of 1014 patients was 7.96 on the PEDro scale; 11 trials reported positive effects and 11 trials reported negative effects. The mean weighted difference in change of pain on VAS was 13.96 mm (95% CI, 7.24-20.69) in favor of the active LLLT groups. When we only considered the clinical trials in which the energy dose was within the dose range suggested in the review by Bjordal et al. in 2003 and in World Association for Laser Therapy (WALT) dose recommendation, the mean effect sizes were 19.88 and 21.05 mm in favor of the true LLLT groups, respectively. CONCLUSIONS: The review shows that laser therapy on the joint reduces pain in patients. Moreover, when we restrict the energy doses of the laser therapy into the dose window suggested in the previous study, we can expect more reliable pain relief treatments. Arthralgia;Arthritis;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Pain Management;Pain Measurement

Personal Overview of the Application of LLLT in Severely Infertile Japanese Females. BACKGROUND AND AIMS: The rapidly graying population in Japan is being compounded by the rapidly-dropping birth rate. The latter is mostly due to the later ages at which women are giving birth as the marriage age has also been increasing. Giving birth at a later stage is associated with problems for both mother and child, but for older would-be mothers the greatest problem is infertility, sometimes severe. The present article will show how the application of low level laser therapy (LLLT) is a potentially effective treatment for severe infertility. SUBJECTS AND METHODS: Seventy-four females (average age 39.28 yr) with severe infertility in whom assisted reproductive technology (ART) had been unsuccessful (average of 9.13 yr) participated in the first part of a study from October 1996 - April 2000. LLLT was applied (830 nm, CW, GaAlAs 60 mW diode LLLT) in Ohshiro's proximal priority technique (average 21.08 sessions) with or without other ART approaches. Based on successful outcomes, the study was then extended to March 2012, amassing a final total of 701 patients. RESULTS: Pregnancy was achieved in the first part of the trial in 16 patients (21.7% of 74) of whom 11 (68%) achieved successful live delivery. In the extended trial, pregnancy was achieved in 156 (22.3% of 701) with 79 live deliveries (50.1%). CONCLUSIONS: The use of 830 nm LLLT in the proximal priority technique at the parameters used in the present study, on its own or as an adjunct to other techniques, resulted in successful induction of pregnancy in just over 21% of severely infertile females, with a substantial number of these achieving live births. No adverse events were noted in any patient. LLLT is a pain-free and sideeffect free modality which could give hope to the increasing numbers of older females with infertility in Japan and potentially worldwide. Multinational studies are warranted.

Effect of low-level laser treatment on cochlea hair-cell recovery after acute acoustic trauma. We investigated the effect of low-level laser radiation on rescuing hair cells of the cochlea after acute acoustic trauma and hearing loss. Nine rats were exposed to noise. Starting the following day, the left ears (NL ears) of the rats were irradiated at an energy output of 100 to 165 mW/cm(2) for 60 min for 12 days in a row. The right ears (N ears) were considered as the control group. Frequency-specific

hearing levels were measured before the noise exposure and also after the 1st, 3rd to 5th, 8th to 10th and 12th irradiations. After the 12th treatment, hair cells were observed using a scanning electron microscope. Compared to initial hearing levels at all frequencies, thresholds increased markedly after noise exposure. After the 12th irradiation, hearing threshold was significantly lower for the NL ears compared to the N ears. When observed using an electron microscope, the number of hair cells in the middle turn of the NL ears was significantly larger than that of the N ears. Our findings suggest that low-level laser irradiation promotes recovery of hearing thresholds after acute acoustic trauma. Adenosine Triphosphate Adenosine Triphosphate;Animals;Auditory Threshold;Brain Stem;Cochlea;Evoked Potentials, Auditory;Hair Cells, Auditory;Hearing;Hearing Loss, Noise-Induced;Lasers;Male;Microscopy, Electron, Scanning;Mitochondria;Noise;Rats;Rats, Sprague-Dawley;Reproducibility of Results;Signal Processing, Computer-Assisted

Effect of the intravascular low energy laser illumination during percutaneous coronary intervention on the inflammatory process in vascular wall. The angioplasty procedure is associated with a release of numerous factors triggering the local inflammatory reaction in vascular wall and leading thus to the restenosis. In this study, we hypothesize that the low-energy laser irradiation may exert beneficial effect by limiting this process. A group of 101 subjects (75 men and 26 women, mean age: 59.1 Â± 10.3) treated with percutaneous coronary intervention (PCI), were recruited to this study. While 52 patients (40 men and 12 women) were subjected to the intravascular low-energy laser irradiation (Î»=808 nm) of dilated lesion during the PCI, the remaining patients (35 men and 14 women) constituted the control group. The levels of interleukin 1Î², 6 and 10 (IL 1Î², IL 6 and IL 10) were measured immediately before the procedure, and then at the 6th, 12th hour as well as after 1 month following the PCI. Significantly lower levels of IL 1Î² and IL 6 in the irradiated group during each analysis after the procedure were observed. Moreover, significantly lower IL 10 level in irradiated group within 6 and 12 hours after PCI was observed. Irradiation of the lesion with low-energy laser radiation during the PCI procedure results in a decrease in the levels of pro-inflammatory IL 1Î² and IL 6 as well as in an increase in the levels of anti-inflammatory IL 10, which may result in decreased risk for restenosis. IL10 protein, human;IL6 protein, human;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Interleukin-10 Aged;Coronary Restenosis;Female;Humans;Inflammation;Inflammation Mediators;Interleukin-10;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;Middle Aged;Percutaneous Coronary Intervention

Effects of 830 and 670 nm laser on viability of random skin flap in rats. OBJECTIVE: This study aimed to investigate the effect of 830 and 670 nm diode laser on the viability of random skin flaps in rats. BACKGROUND DATA: Low-level laser therapy (LLLT) has been reported to be successful in stimulating the formation of new blood vessels and reducing the inflammatory process after injury. However, the efficiency of such treatment remains uncertain, and there is also some controversy regarding the efficacy of different wavelengths currently on the market. MATERIALS AND METHODS: Thirty Wistar rats were used and divided into three groups, with 10 rats in each. A random skin flap was raised on the dorsum of each animal. Group 1 was the control group, group 2 received 830 nm laser radiations, and group 3 was submitted to 670 nm laser radiation (power density=0.5 mW/cm(2)). The animals underwent laser therapy with 36 J/cm(2) energy density (total energy=2.52 J and 72 sec per session) immediately after surgery and on the 4 subsequent days. The application site of laser radiation was one point at 2.5 cm from the flap's cranial base. The percentage of skin flap necrosis area was calculated on the 7th postoperative day using the paper template method. A skin sample was collected immediately after to determine the vascular endothelial growth factor (VEGF) expression and the epidermal cell proliferation index (KiD67). RESULTS: Statistically significant differences were found among the percentages of necrosis, with higher values observed in group 1 compared with groups 2 and 3. No statistically significant differences were found among these groups

using the paper template method. Group 3 presented the highest mean number of blood vessels expressing VEGF and of cells in the proliferative phase when compared with groups 1 and 2. CONCLUSIONS: LLLT was effective in increasing random skin flap viability in rats. The 670 nm laser presented more satisfactory results than the 830 nm laser. Analysis of Variance;Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Necrosis;Rats;Rats, Wistar;Surgical Flaps;Tissue Survival

Antimicrobial photodynamic therapy in the treatment of oral candidiasis in HIV-infected patients. OBJECTIVE: Antimicrobial photodynamic therapy (aPDT) has been used to combat local infections, and it consists of the combination of a photosensitizer, a light source, and reactive oxygen species (ROS) to kill microbial cells. In this study, we evaluated the effectiveness of aPDT in the treatment of candidiasis in HIV-infected patients. METHODS: Twenty-one patients were divided into three groups. Control group (CG) was treated with the conventional medication for candidiasis (fluconazole 100 mg/day during 14 days). Laser group (LG) was subjected to low-level laser therapy (LLLT), wavelength 660 nm, power of 30 mW, and fluence of 7.5 J/cm(2), in contact with mucosa during 10 sec on the affected point. An aPDT group (aPDTG) was treated with aPDT, that is, combination of a low-power laser and methylene blue 450 Î¼g/mL. Pre-irradiation time was 1 min. Parameters of irradiation were the same ones as for the LG, and patients were single irradiated. Patients were clinically evaluated and culture analysis was performed before, immediately after, and 7, 15, and 30 days after the treatment. RESULTS: Our results showed that fluconazole was effective; however, it did not prevent the return of the candidiasis in short-term. LLLT per se did not show any reduction on Candida spp. aPDT eradicated 100% of the colonies of this fungus and the patients did not show recurrence of candidiasis up to 30 days after the irradiation. CONCLUSIONS: These findings suggest that aPDT is a potential approach to oral candidiasis treatment in HIV-infected patients. Antifungal Agents;Fluconazole AIDS-Related Opportunistic Infections;Adult;Antifungal Agents;Candidiasis, Oral;Female;Fluconazole;Humans;Low-Level Light Therapy;Male;Treatment Outcome

[The effects of low-level laser therapy on xerostomia (mouth dryness)]. INTRODUCTION: Xerostomia is a subjective complaint of mouth/oral dryness, caused by a reduction in normal salivary secretion due to different causes. Even though there are many available treatment modalities to enhance salivary flow, the therapy often remains unsatisfactory. The low-level laser therapy (low-level laser irradiation, photo-biomodulation) has been extensively used as a new, non-invasive approach and advantageous tool for reduction of xerostomia. Therefore, the aim of this study is to give a systematic overview on the effects of low-level laser therapy on xerostomia. MATERIAL AND METHODS: A systematic review of published articles in PubMed database was carried out using keywords: "low-level laser therapy", "xerostomia", "mouth dryness". RESULTS: In all published articles, which were considered adequate for this overview, positive effects of low-level laser therapy were reported. Low-level laser therapy could significantly enhance salivary secretion and improve antimicrobial characteristics of secreted saliva (increased level of secretory immunoglobulin A; sIgA). Furthermore, low-level laser therapy could improve salivary flow and regeneration of salivary duct epithelial cells. CONCLUSION: The current literature suggests that low-level laser therapy can be safely and effectively used as an advanced treatment modality for reduction of xerostomia. Further in vivo, in vitro and clinical studies using different irradiation parameters are suggested to determine the best laser parameters to be used. Humans;Low-Level Light Therapy;Xerostomia

Cellulite - an overview of non-invasive therapy with energy-based systems. Cellulite is one of the most common skin care concerns seen in modern dermatology. The presence of cellulite in the 21(st) century is now considered a major "problem" whose treatment options are varied and numerous, all with hopes of improving the appearance of cellulite and maintaining its response over a period of time. The purpose of this article is to review cellulite, its predisposing factors, its classification, and

some of the more common devices now in use to treat the disorder. Cosmetic Techniques;Dermis;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Massage;Subcutaneous Fat

Complications in lasers, lights, and radiofrequency devices. Lights, lasers, and radiofrequency are unique sources of energy that are increasingly utilized for therapeutic and cosmetic purposes. As the indications for these tools continue to increase and their use expands beyond physicians to aestheticians, physician-extenders, and technicians, the incidence of complications has also risen. It is imperative that operators of these tools be as familiar with the management of potential complications as they are with their usage and indications. This article serves as a review of potential complications encountered with usage of lasers, lights, and radiofrequency devices in dermatology. Cicatrix, Hypertrophic;Cosmetic Techniques;Hair Removal;Humans;Hyperpigmentation;Hyperthermia, Induced;Laser Therapy;Lasers;Low-Level Light Therapy;Phototherapy;Postoperative Complications;Plastic Surgery Procedures;Skin Diseases, Infectious

What is better in TRAM flap survival: LLLT single or multi-irradiation? Low-level laser therapy (LLLT) has been used with the aim of improving vascular perfusion of the skin and musculocutaneous flaps. This study evaluated the effect of LLLT on transverse rectus abdominis musculocutaneous flap (TRAM) viability, vascular angiogenesis, and VEGF release. Eighty-four Wistar rats were randomly divided into seven groups with 12 rats in each group. Group 1 received sham laser treatment; group 2, 3 J/cm(2) at 1 point; group 3, 3 J/cm(2) at 24 points; group 4, 72 J/cm(2) at 1 point; group 5, 6 J/cm(2) at 1 point; group 6, 6 J/cm(2) at 24 points; and group 7, 144 J/cm(2) at 1 point. All experimental groups underwent LLLT immediately after the TRAM operation and on the following 2 days; thus, animals underwent 3 days of treatment. The percentage of skin flap necrosis area was calculated on the fourth postoperative day using the paper template method, and two skin samples were collected using a 1-cm(2) punch to evaluate alpha smooth muscle actin (1A4) and VEGF levels in blood vessels. Significant differences were found in necrosis percentage, and higher values were seen in group 1 than in the other groups. Statistically significant differences were not found among groups 3 to 7 ($p<0.292$). Groups 5 and 7 showed significantly higher VEGF levels compared to other groups. Groups 3 and 5 had an increase in levels of blood vessels compared to other groups. LLLT at energy densities of 6 to 144 J/cm(2) was efficient to increase angiogenesis and VEGF levels and promote viability in TRAM flaps in rats. Actins;Vascular Endothelial Growth Factor A;smooth muscle actin, rat;vascular endothelial growth factor A, rat Actins;Animals;Low-Level Light Therapy;Male;Necrosis;Neovascularization, Physiologic;Rats;Rats, Wistar;Rectus Abdominis;Skin Transplantation;Surgical Flaps;Vascular Endothelial Growth Factor A

Interventions for accelerating orthodontic tooth movement: a systematic review. OBJECTIVE: To evaluate the effectiveness of interventions on accelerating orthodontic tooth movement. MATERIALS AND METHODS: We searched the databases of PubMed, Embase, Science Citation Index, CENTRAL, and SIGLE from January 1990 to August 2011 for randomized or quasi-randomized controlled trials that assessed the effectiveness of interventions on accelerating orthodontic tooth movement. The processes of study search, selection, and quality assessment were conducted independently in duplicate by two review authors. Original outcome data, if possible, underwent statistical pooling by using Review Manager 5. RESULTS: Through a predefined search strategy, we finally included nine eligible studies. Among them, five interventions were studied (ie, low-level laser therapy, corticotomy, electrical current, pulsed electromagnetic fields, and dentoalveolar or periodontal distraction). Six outcomes were evaluated in these studies (ie, accumulative moved distance or movement rate, time required to move tooth to its destination, anchorage loss, periodontal health, pulp vitality, and root resorption). CONCLUSION: Among the five interventions, corticotomy is effective and safe to accelerate orthodontic tooth movement, low-level laser therapy was unable to

accelerate orthodontic tooth movement, current evidence does not reveal whether electrical current and pulsed electromagnetic fields are effective in accelerating orthodontic tooth movement, and dentoalveolar or periodontal distraction is promising in accelerating orthodontic tooth movement but lacks convincing evidence. Comparative Effectiveness Research;Evidence-Based Dentistry;Humans;Randomized Controlled Trials as Topic;Tooth Movement Techniques;Treatment Outcome

Low-level laser in the treatment of patients with hypothyroidism induced by chronic autoimmune thyroiditis: a randomized, placebo-controlled clinical trial. Chronic autoimmune thyroiditis (CAT) is the most common cause of acquired hypothyroidism, which requires lifelong levothyroxine replacement therapy. Currently, no effective therapy is available for CAT. Thus, the objective of this study was to evaluate the efficacy of low-level laser therapy (LLLT) in patients with CAT-induced hypothyroidism by testing thyroid function, thyroid peroxidase antibodies (TPOAb), thyroglobulin antibodies (TgAb), and ultrasonographic echogenicity. A randomized, placebo-controlled trial with a 9-month follow-up was conducted from 2006 to 2009. Forty-three patients with a history of levothyroxine therapy for CAT-induced hypothyroidism were randomly assigned to receive either 10 sessions of LLLT (830 nm, output power of 50 mW, and fluence of 707 J/cm(2); L group, n=23) or 10 sessions of a placebo treatment (P group, n=20). The levothyroxine was suspended 30 days after the LLLT or placebo procedures. Thyroid function was estimated by the levothyroxine dose required to achieve normal concentrations of T3, T4, free-T4 (fT4), and thyrotropin after 9 months of postlevothyroxine withdrawal. Autoimmunity was assessed by measuring the TPOAb and TgAb levels. A quantitative computerized echogenicity analysis was performed pre- and 30 days postintervention. The results showed a significant difference in the mean levothyroxine dose required to treat the hypothyroidism between the L group (38.59 Â± 20.22 Î¼g/day) and the P group (106.88 Â± 22.90 Î¼g/day, P<0.001). Lower TPOAb (P=0.043) and greater echogenicity (P<0.001) were also noted in the L group. No TgAb difference was observed. These findings suggest that LLLT was effective at improving thyroid function, promoting reduced TPOAb-mediated autoimmunity and increasing thyroid echogenicity in patients with CAT hypothyroidism. Autoantibodies;anti-thyroglobulin;thyroid microsomal antibodies;Thyroxine Adult;Autoantibodies;Female;Hashimoto Disease;Humans;Hypothyroidism;Low-Level Light Therapy;Male;Middle Aged;Thyroid Gland;Thyroxine;Ultrasonography

[Low level laser irradiation in the visible spectra induces HeLa cells proliferation]. The aim of this in vitro study was to evaluate the effects of low level laser irradiation on the proliferation of HeLa cells using 405 nm diode laser, 514 nm argon laser, 633 nm He-Ne laser, or 785 nm diode laser, The cells were seeded on 96-well microplates for 24 h in 5% fetal bovine serum containing medium, then irradiated with the laser at dose of 100 and 1 000 J x m(-2), respectively. At the time point of 24, 48, 72 h after irradiation, cell viability was assessed by MTT assay. The results show that 405, 633 and 785 nm laser irradiation induces wavelength-dependent and time-dependent proliferation. 633 nm laser irradiation results in a stimulatory proliferation effect that is most significant, whereas 514 nm laser irradiation produces little increase in cell proliferation. Low level laser irradiation increases cell proliferation in a dose-dependent manner. 1 000 J x m(-2) laser irradiation is more effective in increasing cell proliferation than 100 J x m(-2) laser irradiation using 405 nm diode laser, 633 nm He-Ne laser, or 785 nm diode laser, but not as effective as using 514 nm argon laser. Cell Proliferation;Cell Survival;HeLa Cells;Humans;Lasers;Light

Effects of low-level laser therapy on ROS homeostasis and expression of IGF-1 and TGF-Î²1 in skeletal muscle during the repair process. The aim of the present study was to determine the effects of low-level laser therapy (LLLT) on the homeostasis of reactive oxygen species (ROS) and expression of IGF-1 and TGF-Î²1 in the gastrocnemius muscles of rats following contusion. Muscle regeneration

involves cell proliferation, migration, and differentiation and is regulated by growth factors. A growing body of evidence suggests that LLLT promotes skeletal muscle regeneration and accelerates tissue repair. Adult male Sprague-Dawley rats (n=96) were randomly divided into three groups: control group (no lesion, untreated, n=6), contusion group (n=48), and contusion-plus-LLLT group (n=42). Gallium aluminum arsenide (GaAlAs) laser irradiation (635 nm; beam spot, 0.4 cm(2); output power, 7 mW; power density, 17.5 mW/cm(2); 20 min) was administered to the gastrocnemius contusion for 20 min daily for 10 days. Muscle remodeling was evaluated at 0 h and 1, 2, 3, 7, 14, 21, and 28 days after injury. Hematoxylin and eosin and Van Gieson staining were used to evaluate regeneration and fibrosis; muscle superoxide dismutase (SOD) and malondialdehyde (MDA) were detected via biochemical methods; expression of transforming growth factor beta-1 (TGF-Î²1) and insulin-like growth factor-1 (IGF-1) were investigated via immunohistochemistry. The results showed that LLLT markedly promoted the regeneration of muscle and reduced scar formation. LLLT also significantly enhanced muscle SOD activity and significantly decreased muscle MDA levels 1, 2, and 3 days after injury. LLLT increased the expression of IGF-1 2, 3, and 7 days after injury and decreased the expression of IGF-1 21 and 28 days after injury. LLLT decreased the expression of TGF-Î²1 3 and 28 days after injury but increased expression at 7 and 14 days after injury. Our study showed that LLLT could modulate the homeostasis of ROS and of the growth factors IGF-1 and TGF-Î²1, which are known to play important roles in the repair process. This may constitute a new preventive approach to muscular fibrosis. Reactive Oxygen Species;Transforming Growth Factor beta1;Malondialdehyde;Insulin-Like Growth Factor I;Superoxide Dismutase Animals;Fibrosis;Homeostasis;Insulin-Like Growth Factor I;Lasers, Semiconductor;Low-Level Light Therapy;Male;Malondialdehyde;Muscle, Skeletal;Rats;Rats, Sprague-Dawley;Reactive Oxygen Species;Regeneration;Superoxide Dismutase;Transforming Growth Factor beta1;Wound Healing

Laser therapy of muscle injuries. Low-level lasers are used in general therapy and healing process due to their good photo-bio-stimulation effects. In this paper, the effects of diode laser and Nd:YAG laser on the healing process of practically managed skeletal muscle trauma has been successfully studied. Standard impact trauma was induced by using a specially designed mechanical device. The impacted muscle was left for 3 days for complete development of blunt trauma. After that it was irradiated by five laser sessions for 5 days. Two types of lasers were used; 785-nm diode laser and 1.064-nm Nd:YAG laser, both in continuous and pulsed modes. A special electronic circuit was designed and implemented to modulate the diode laser for this purpose. Tissue samples of crushed skeletal muscle have been dissected from the injured irradiated muscle then bio-chemically analyzed for the regeneration of contractile and collagenous proteins using Lowry assay for protein determination and Reddy and Enwemeka assay for hydroxyproline determination. The results showed that both lasers stimulate the regeneration capability of traumatized skeletal muscle. The diode laser in CW and pulsed modes showed better results than the Nd:YAG in accelerating the preservation of the normal tissue content of collagenous and contractile proteins beside controlling the regeneration of non-functional fibrous tissue. This study proved that the healing achieved by the laser treatment was faster than the control group by 15-20 days. Muscle Proteins Animals;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Muscle Proteins;Muscle, Skeletal;Rats;Regeneration;Wound Healing

Short-term multimodal phototherapy approach in a diabetic ulcer patient. Foot ulcers increase morbidity and mortality in diabetic patients. Due to poor healing factors, surgical wound healing is questionable in diabetic patients. We report a patient with insulin-dependent diabetes mellitus, sensory neuropathy and microangiopathy, who had an infected stump of the right three middle digits and subsequent transmetatarsal amputation. The infected postoperative ulcer was treated with complex phototherapy, including laser and ultraviolet C (UVC) radiations. A total of 23 sessions of

low-intensity laser therapy and UVC irradiation were administered over a five-week period. The infected surgical wound healed completely. During the three-month follow-up period, there was no recurrence of the ulcer, although the patient's metabolic profile remained unstable. Multimodal therapy combining UVC and laser may constitute a useful and side-effect-free alternative treatment modality for the induction of wound healing post metatarsal amputation in patients with unhealed diabetic ulcers. Amputation, Surgical;Diabetes Complications;Diabetes Mellitus, Type 1;Diabetic Foot;Diabetic Neuropathies;Humans;Laser Therapy;Lasers;Male;Metatarsal Bones;Middle Aged;Phototherapy;Postoperative Complications;Time Factors;Ultraviolet Rays;Wound Healing;Wound Infection

Closure of non-healing chronic ulcer in Klippel-Trenaunay syndrome using low-level laser therapy. A 69-year-old man diagnosed with Klippel-Trenaunay syndrome (KTS) reported to the physiotherapy outpatient clinic with the complaint of a non-healing ulcer over the right medial malleolus, for a 6-month duration, that was non-granulating and had moderate pus discharge with foul odour at initial assessment. There was a decrease in scores of the Pressure Ulcer Scale of Healing, a significant increase in granulation tissue, a decrease in the amount of discharge and foul odour along with complete closure of the chronic wound after irradiation with a light-emitting diode (LED). This is a novel case study analysing the possible effect of a helium-neon laser Â and LEDs on non-healing chronic ulcers associated with KTS, where the complete closure of the chronic ulcer that was initially not responsive to standard medical care was observed. Aged;Ankle;Chronic Disease;Humans;Klippel-Trenaunay-Weber Syndrome;Lasers, Semiconductor;Male;Skin Ulcer

Low-level laser therapy for oral mucous membrane pemphigoid. Aged;Aged, 80 and over;Female;Follow-Up Studies;Gingival Diseases;Humans;Low-Level Light Therapy;Male;Pemphigoid, Benign Mucous Membrane;Treatment Outcome

Survival of Dopaminergic Amacrine Cells after Near-Infrared Light Treatment in MPTP-Treated Mice. We examined whether near-infrared light (NIr) treatment (photobiomodulation) saves dopaminergic amacrine cells of the retina in an acute and a chronic 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) mouse model of Parkinson disease. For the acute model, BALB/c mice had MPTP (100â€‰mg/kg) or saline injections over 30 hours, followed by a six-day-survival period. For the chronic model, mice had MPTP (200â€‰mg/kg) or saline injections over five weeks, followed by a three-week-survival period. NIr treatment was applied either at the same time (simultaneous series) or well after (posttreatment series) the MPTP insult. There were four groups within each series: Saline, Saline-NIr, MPTP, and MPTP-NIr. Retinae were processed for tyrosine hydroxylase (TH) immunochemistry, and cell number was analysed. In the MPTP groups, there was a significant reduction in TH(+) cell number compared to the saline controls; this reduction was greater in the acute (~50%) compared to the chronic (~30%) cases. In the MPTP-NIr groups, there were significantly more TH(+) cells than in the MPTP groups of both series (~30%). In summary, we showed that NIr treatment was able to both protect (simultaneous series) and rescue (posttreatment series) TH(+) cells of the retina from parkinsonian insult.

Low-level laser treatment accelerated hair regrowth in a rat model of chemotherapy-induced alopecia (CIA). Chemotherapy-induced alopecia (CIA) is one of the most distressing side effects of antineoplastic chemotherapy for which there is no effective interventional approach. A low-level laser (LLL) device, the HairMax LaserCombÂ®, has been cleared by the FDA to treat androgenetic alopecia. Its effects may be extended to other settings; we have demonstrated that LaserComb treatment induced hair regrowth in a mouse model for alopecia areata. In the current study, we tested whether LLL treatment could promote hair regrowth in a rat model for CIA. Chemotherapy agents cyclophosphamide, etoposide, or a combination of cyclophosphamide and doxorubicin were administered in young rats to induce alopecia, with or without LLL treatment. As expected, 7-10 days

later, all the rats developed full body alopecia. However, rats receiving laser treatment regrew hair 5 days earlier than rats receiving chemotherapy alone or sham laser treatment (with the laser turned off). The accelerated hair regrowth in laser-treated rats was confirmed by histology. In addition, LLL treatment did not provide local protection to subcutaneously injected Shay chloroleukemic cells. Taken together, our results demonstrated that LLL treatment significantly accelerated hair regrowth after CIA without compromising the efficacy of chemotherapy in our rat model. Our results suggest that LLL should be explored for the treatment of CIA in clinical trials because LLL devices for home use (such as the HairMax LaserCombÂ®) provide a user-friendly and noninvasive approach that could be translated to increased patient compliance and improved efficacy. Antineoplastic Agents;Etoposide;Doxorubicin;Cyclophosphamide Alopecia;Animals;Antineoplastic Agents;Cyclophosphamide;Disease Models, Animal;Doxorubicin;Etoposide;Female;Hair;Hair Follicle;Hair Removal;Humans;Low-Level Light Therapy;Male;Mice;Rats;Wound Healing

Treatment of chemical leukoderma using a 308-nm excimer laser. Hair Dyes;Phenylenediamines Facial Dermatoses;Hair Dyes;Humans;Hypopigmentation;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Phenylenediamines

Laser therapy as an effective method for implant surface decontamination: a histomorphometric study in rats. BACKGROUND: To the best of the authors' knowledge, a standard protocol for treating peri-implantitis is not yet established. METHODS: A total of 150 titanium disks with smooth or rough surfaces contaminated with microbial biofilm were implanted subcutaneously in rats after undergoing one of three treatments: 1) low-intensity laser (LIL); 2) antimicrobial photodynamic therapy (aPDT); or 3) toluidine blue O (TBO). Sterile and contaminated disks served as negative (NC) and positive (C) control groups, respectively. After days 7, 28, and 84, tissue inflammation was evaluated microscopically by measuring the density of collagen fibers (degree of fibrosis) and concentration of polymorphonuclear neutrophils. RESULTS: Surface texture did not affect the degree of inflammation, but the area of reactive tissue was significantly greater for rough implants (2.6 Â± 3.7 Ã— 10(6) Âµm(2)) than for smooth ones (1.9 Â± 2.6 Ã— 10(6) Âµm(2); P = 0.0377). Group C presented the lowest and group NC presented the highest degree of fibrosis with significance only after day 7; these groups had the highest and lowest scores, respectively, for degree of inflammation. Group C showed the largest area of reactive tissue (9.11 Â± 2.10 Ã— 10(6) Âµm(2)), but it was not significantly larger than group LIL (P = 0.3031) and group TBO (P = 0.1333). Group aPDT showed the smallest area (4.34 Â± 1.49 Ã— 10(6) Âµm(2)) of reactive tissue among the treatment groups. After day 28, groups LIL, aPDT, TBO, and C resembled group NC in all the studied parameters. CONCLUSION: Group aPDT showed more favorable results in parameter area of reactive tissue than the other methods after day 7, but over longer time periods all methods produced outcomes equivalent to sterile implants. Coloring Agents;Dental Implants;Tolonium Chloride;Titanium Animals;Biofilms;Coloring Agents;Decontamination;Dental Implants;Fibrosis;Low-Level Light Therapy;Male;Peri-Implantitis;Photochemotherapy;Rats;Rats, Wistar;Subcutaneous Tissue;Surface Properties;Titanium;Tolonium Chloride

Adjunctive antimicrobial photodynamic treatment of experimentally induced periodontitis in rats with ovariectomy. BACKGROUND: The aim of this study is to compare antimicrobial photodynamic therapy (aPDT) as an adjunctive therapy to scaling and root planing (SRP) for the treatment of experimentally induced periodontitis in rats with ovariectomy (OVX) that are or are not treated with estrogen replacement. METHODS: A total of 270 female rats were divided into three groups: 1) normal rats; 2) rats with OVX; and 3) rats with OVX with estrogen replacement. Periodontal disease was induced through the introduction of a cotton thread around the mandibular left first molar. After 7 days, the ligature was removed, and the rats were randomly divided into the following treatment groups: 1) SRP plus saline solution; 2) SRP plus low-level laser therapy (LLLT); and 3) SRP

plus toluidine blue O irrigation followed by LLLT. Ten rats from each group were euthanized at days 7, 15, and 30 after dental treatment. Bone loss (BL) in the furcation region was evaluated using histometric and immunohistochemical analyses. RESULTS: aPDT treatment resulted in reduced BL compared with SRP treatment at all time points. Additionally, rats treated with aPDT exhibited reduced numbers of tartrate-resistant acid-phosphatase-positive cells and more proliferating cell nuclear antigen-positive cells in all treatment groups regardless of estrogen status. Whereas rats treated with aPDT showed weak immunoreactivity to the receptor activator of nuclear factor-Îº B ligand at day 7 post-treatment, strong osteoprotegerin immunoreactivity was observed at day 15 post-treatment. CONCLUSION: aPDT is an effective adjunctive therapy for the treatment of periodontitis in rats with OVX that are or are not given estrogen replacement therapy. Interleukin-1;Interleukin-6;Proliferating Cell Nuclear Antigen;RANK Ligand;Tumor Necrosis Factor-alpha Alveolar Bone Loss;Animals;Chemotherapy, Adjuvant;Dental Scaling;Estrogen Replacement Therapy;Female;Interleukin-1;Interleukin-6;Low-Level Light Therapy;Ovariectomy;Periodontitis;Photochemotherapy;Proliferating Cell Nuclear Antigen;RANK Ligand;Rats;Tumor Necrosis Factor-alpha

Treatment of burn scars with the 1,550 nm nonablative fractional Erbium Laser. BACKGROUND: Scarring is a major source of morbidity in patients with burns. Burn scars are difficult to treat and are among the worst scars seen in clinical medicine. Fractional laser resurfacing is a promising treatment option because of its unique wound healing response and depth of penetration. OBJECTIVE: To evaluate the efficacy of nonablative fractional resurfacing as a therapeutic option for extensive cutaneous scarring in burn patients. METHODS: Prospective, single-arm, pilot study. Ten subjects with second and third degree burn scars were treated with five nonablative fractional resurfacing treatments given at 4-week intervals. Three independent investigators evaluated subject outcomes at 3 months post-treatment (primary outcome); patients also provided subjective assessments of improvement (secondary outcome). RESULTS: Nonablative fractional resurfacing resulted in overall improvement in 90% of subjects, as determined by independent investigators; improvements were moderate to excellent in 60%. Ninety percent of subjects had improved skin texture, 80% had improved dyschromia, and 80% had improved hypertrophy/atrophy. Patients' self-reports also revealed moderate to excellent improvements (on average) in burn scar area, and significant improvements in self-esteem at 3 months post-treatment (Pâ€‰=â€‰0.03). LIMITATIONS: Small sample size and lack of control group. CONCLUSIONS: Fractional resurfacing is a promising new treatment modality for burn scars. We should continue to identify novel approaches and management strategies for the spectrum of diverse burn scars so that we can better treat this patient population. Adult;Aged;Burns;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Young Adult

Low-level laser therapy in collagenase-induced Achilles tendinitis in rats: analyses of biochemical and biomechanical aspects. NSAIDs are widely prescribed and used over the years to treat tendon injuries despite its well-known long-term side effects. In the last years several animal and human trials have shown that low-level laser therapy (LLLT) presents modulatory effects on inflammatory markers, however the mechanisms involved are not fully understood. The aim of this study was to evaluate the short-term effects of LLLT or sodium diclofenac treatments on biochemical markers and biomechanical properties of inflamed Achilles tendons. Wistar rats Achilles tendons (n = 6/group) were injected with saline (control) or collagenase at peritendinous area of Achilles tendons. After 1 h animals were treated with two different doses of LLLT (810 nm, 1 and 3 J) at the sites of the injections, or with intramuscular sodium diclofenac. Regarding biochemical analyses, LLLT significantly decreased ($p < 0.05$) COX-2, TNF-Î±, MMP-3, MMP-9, and MMP-13 gene expression, as well as prostaglandin E(2) (PGE(2)) production when compared to collagenase group. Interestingly,

diclofenac treatment only decreased PGE(2) levels. Biomechanical properties were preserved in the laser-treated groups when compared to collagenase and diclofenac groups. We conclude that LLLT was able to reduce tendon inflammation and to preserve tendon resistance and elasticity. Anti-Inflammatory Agents, Non-Steroidal;Tumor Necrosis Factor-alpha;Diclofenac;Cyclooxygenase 2;Collagenases;Matrix Metalloproteinases;Dinoprostone Achilles Tendon;Animals;Anti-Inflammatory Agents, Non-Steroidal;Biochemistry;Biomechanical Phenomena;Collagenases;Cyclooxygenase 2;Diclofenac;Dinoprostone;Inflammation;Low-Level Light Therapy;Male;Matrix Metalloproteinases;Rats;Rats, Wistar;Tendinopathy;Tumor Necrosis Factor-alpha

Argon laser phototherapy in the treatment of refractory fungal keratitis. PURPOSE: To report the beneficial properties of argon laser as an adjunctive therapy in 2 patients with refractory fungal keratitis. METHODS: Case reports and a review of the literature. Two cases of Fusarium keratitis refractory to topical and systemic antifungals were further treated with argon laser. Before laser treatment, the eye was medicated with proparacaine 0.5%, lidocaine 4%, and a single drop of fluorescein sodium 0.25%. Argon laser irradiation of the affected cornea was performed using argon blue-green wavelength (Coherent Ultima 2000; Coherent, Inc). A spot size of 500 Î¼m, pulse duration of 0.10 seconds, and power ranging from 500 to 900 mW were used. RESULTS: During the first week after laser treatment, both patients showed complete resolution of the infiltrates. Two signs were observed during the procedure: a blanching of the corneal stroma and small cavitations that reached the middle stroma. No adverse effects were observed. CONCLUSIONS: Argon laser phototherapy is useful as an adjunctive treatment of refractory fungal keratitis. More cases are needed to validate our findings. Antifungal Agents Adult;Aged, 80 and over;Antifungal Agents;Corneal Ulcer;Drug Resistance, Fungal;Eye Infections, Fungal;Fusariosis;Fusarium;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Visual Acuity

Four methods of evaluation of facial erythema and pigment treated with intense pulsed light or cream. AIM: To evaluate methods of evaluation of patients with mild to moderate facial pigmentation or erythema and compare clinical and photographic grading with instrumental evaluation. METHODS: Of the 24 female subjects treated, 12 were treated with intense pulsed light (IPL) and 12 were treated with daily cream program. Evaluations before and at 16 weeks consisted of: 1. Clinical examination and severity grading by a dermatologist without knowledge of treatment given. 2. Standardised photographs were evaluated by two other dermatologists without knowledge of treatment given. 3. A computer controlled photographic skin analysis systems was used to grade severity of erythema and pigmentation. 4. Subjects were asked to assess their response at the end of a 16-week period, that is, subject self-evaluation. RESULTS: On clinical evaluation of IPL subjects, 12 showed improvement. Of the cream subjects, 11 showed improvement. There was correlation between dermatologist facial examination and the instrumental method. Overall the different assessments showed a slightly greater trend for improvement with IPL treatments for erythema and pigmentation, but no statistical differences were found between the treatments using Student's t-test and Anova analysis of comparative improvement. Cosmetic Techniques;Diagnostic Self Evaluation;Erythema;Face;Female;Humans;Low-Level Light Therapy;Patient Satisfaction;Pigmentation Disorders;Skin Cream

Treatment of acne scarring with fractional CO2 laser. BACKGROUND: Fractional ablative CO(2) laser therapy is based on the theory of fractional photothermolysis. It can be effective in treating acne scars in a less invasive fashion than conventional ablative CO(2) laser therapy. OBJECTIVE: In this clinical study, the safety and efficacy of a novel CO(2) fractional ablative laser was investigated for the treatment of facial atrophic acne scarring in Chinese individuals. MATERIALS AND METHODS: A total of 31 patients (11 females, 20 males, Fitzpatrick skin phototypes III-IV) with facial acne scarring

received three sequential fractional treatments over a 6-month period. Outcome measurements included blinded evaluations of before and after photographs by two physicians at 3 and 12 months after the final treatment. Global improvement was noted as well as any untoward events. RESULTS: At the 12 months follow-up time period, 12.9% of the patients showed excellent improvement in their acne scars, while 38.71% noted good to fair results. The clinical response at the 12-month follow-up visit tended to be better than at the 3-month follow-up visit, but was not statistically significant. Four patients experienced post-treatment and transient PIH but three patients were noted to have prolonged erythema. There was no evidence hypopigmentation or worsening of the scarring in any of the study patients. CONCLUSION: This high-energy pulsed and cool-scanned fractional ablative CO(2) laser system is safe and effective for facial atrophic acne scarring. Improvement in scarring was noted in the majority of patients with minimal discomfort and minimal downtime. Continued improvement over time is also an important clinical finding. Acne Vulgaris;Adolescent;Adult;China;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Young Adult

Effects of low-level laser therapy (LLLT) on bone repair in rats: optical densitometry analysis. The aim of this study was to evaluate the process of bone repair in rats submitted to low-level laser therapy using optical densitometry. A total of 45 rats which underwent femoral osteotomy were randomly distributed into three groups: control (group I) and laser-treated groups using wavelengths in the red (Î», 660-690 nm) and in the infrared (Î», 790-830 nm) spectra (group II and group III, respectively). The animals (five per group) were killed after 7, 14, and 21 days and the femurs were removed for optical densitometry analysis. Optical density showed a significant increase in the degree of mineralization (gray level) in both groups treated with the laser after 7 days. After 14 days, only the group treated with laser therapy in the infrared spectrum showed higher bone density. No differences were observed between groups after 21 days. Such results suggest the positive effect of low-level laser therapy in bone repair is time- and wavelength-dependent. In addition, our results have confirmed that optical densitometry technique can measure bone mineralization status. Animals;Bone Regeneration;Calcification, Physiologic;Densitometry;Femur;Infrared Rays;Low-Level Light Therapy;Male;Osteotomy;Rats;Rats, Wistar

Orofacial granulomatosis treated with low-level laser therapy: a case report. OBJECTIVES: We report a case of orofacial granulomatosis successfully treated with low-level laser therapy (LLLT). STUDY DESIGN: LLLT was delivered through a diode laser device (Lasemar Eufoton, Trieste, Italy) with the use of a 4-cm defocalized lens and power of 1 W. Treatment was administered in sessions of 5 irradiations of 1 minute each, with a 1-minute interval between 2 subsequent irradiations (power density 0.08 W/cm(2); fluence/application: 4.8 J/cm(2); fluence/session: 24 J/cm(2)). Laser therapy was repeated 12 times (3 times per week). RESULTS: After 2 weeks of LLLT applications, the patient reported an improvement of symptomatology as well as a decrease of labial swelling. Complete healing was observed after 1 month. The patient was followed for 2 years. No recurrence of swelling was observed during the follow-up. CONCLUSIONS: Advantages of the LLLT approach include an absence of side effects, analgesic properties (usually reported after first application), and good patient compliance. Granulomatosis, Orofacial;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged

Patterns of Cell Activity in the Subthalamic Region Associated with the Neuroprotective Action of Near-Infrared Light Treatment in MPTP-Treated Mice. We have shown previously that near-infrared light (NIr) treatment or photobiomodulation neuroprotects dopaminergic cells in substantia nigra pars compacta (SNc) from degeneration induced by 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) in mice. The present study explores whether NIr treatment changes the patterns of Fos expression in the subthalamic region, namely, the subthalamic nucleus (STN) and zona

incerta (ZI); both cell groups have abnormally overactive cells in parkinsonian cases. BALB/c mice were treated with MPTP (100-250â€‰mg/kg) or saline either over 30 hours followed by either a two-hour or six-day survival period (acute model) or over five weeks followed by a three-week survival period (chronic model). NIr and MPTP were applied simultaneously. Brains were processed for Fos immunochemistry, and cell number was estimated using stereology. Our major finding was that NIr treatment reduced (30-45%) the increase in Fos(+) cell number evident in the STN and ZI after MPTP insult. This reduction was concurrent with the neuroprotection of dopaminergic SNc cells shown previously and was evident in both MPTP models (except for the 2 hours survival period which showed no changes in cell number). In summary, our results indicated that NIr had long lasting effects on the activity of cells located deep in the brain and had repaired partially the abnormal activity generated by the parkinsonian toxin.

Low-level laser irradiation stimulates tenocyte migration with up-regulation of dynamin II expression. Low-level laser therapy (LLLT) is commonly used to treat sports-related tendinopathy or tendon injury. Tendon healing requires tenocyte migration to the repair site, followed by proliferation and synthesis of the extracellular matrix. This study was designed to determine the effect of laser on tenocyte migration. Furthermore, the correlation between this effect and expression of dynamin 2, a positive regulator of cell motility, was also investigated. Tenocytes intrinsic to rat Achilles tendon were treated with low-level laser (660 nm with energy density at 1.0, 1.5, and 2.0 J/cm(2)). Tenocyte migration was evaluated by an in vitro wound healing model and by transwell filter migration assay. The messenger RNA (mRNA) and protein expressions of dynamin 2 were determined by reverse transcription/real-time polymerase chain reaction (real-time PCR) and Western blot analysis respectively. Immunofluorescence staining was used to evaluate the dynamin 2 expression in tenocytes. Tenocytes with or without laser irradiation was treated with dynasore, a dynamin competitor and then underwent transwell filter migration assay. In vitro wound model revealed that more tenocytes with laser irradiation migrated across the wound border to the cell-free zone. Transwell filter migration assay confirmed that tenocyte migration was enhanced dose-dependently by laser. Real-time PCR and Western-blot analysis demonstrated that mRNA and protein expressions of dynamin 2 were up-regulated by laser irradiation dose-dependently. Confocal microscopy showed that laser enhanced the expression of dynamin 2 in cytoplasm of tenocytes. The stimulation effect of laser on tenocytes migration was suppressed by dynasore. In conclusion, low-level laser irradiation stimulates tenocyte migration in a process that is mediated by up-regulation of dynamin 2, which can be suppressed by dynasore. RNA, Messenger;Dynamin II Animals;Cell Movement;Dose-Response Relationship, Radiation;Dynamin II;Gene Expression Regulation;Lasers;Low-Level Light Therapy;RNA, Messenger;Rats;Rats, Sprague-Dawley;Tendons;Up-Regulation;Wound Healing

Topical application of 5-aminolevulinic acid followed by 595-nm pulsed dye laser irradiation for the treatment of recalcitrant port-wine stains: a primary study. OBJECTIVE: To evaluate the effectiveness and safety of topical application of 5-aminolevulinic acid (ALA) followed by pulsed dye laser (PDL) irradiation for the treatment of recalcitrant port-wine stain (PWS). METHODS: Thirty-five patients (19 females and 16 males) with recalcitrant PWS were treated with topical application of 20% ALA and then irradiated with a 595-nm PDL (energy density of 6.5-9.0 J/cm(2) and pulse duration of 6 or 10 ms) at 6-8 weeks intervals. Clinical improvement of lesions was evaluated by comparing photographs of lesions at baseline and 2 months after the last treatment. RESULTS: Topical ALA spreading followed by irradiation with a 595-nm PDL improved PWS in 21 out of 35 patients who were previously recalcitrant to PDL treatment alone. Side effects were limited to transient erythema, vesicle formation, edema and mild purpura with no obvious subsequent scarring or undesirable pigment changes. CONCLUSION: The topical application of ALA followed by irradiation with a 595-nm PDL is an effective and safe treatment for PWS recalcitrant to PDL therapy alone. Aminolevulinic

Acid Administration, Cutaneous;Adolescent;Adult;Aminolevulinic Acid;Child;Cosmetic Techniques;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Port-Wine Stain;Young Adult

Combined use of fractional CO2 laser and radiofrequency waves to treat acne scars: a pilot study on 15 patients. Fractional laser resurfacing has become an important technique in the management of a number of skin conditions, such as photoaging and scars. A variety of laser wavelengths and delivery systems have been introduced to improve immediate and long-term therapeutic results. The simultaneous emission of CO(2) laser and radiofrequency waves combines epidermal coagulation for a resurfacing effect and dermal denaturization for deeper remodelling. The authors present this new machine together with a preclinical histological study and pilot study on 15 patients suffering from acne scars. Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects

A randomized double blind, vehicle controlled bilateral comparison study of the efficacy and safety of finasteride 0.5% solution in combination with intense pulsed light in the treatment of facial hirsutism. OBJECTIVE: We sought to determine whether topical finasteride can enhance the efficacy of intense pulsed light hair removal. MATERIALS AND METHODS: An intense pulsed light (IPL) treatment with radiofrequency (RF) was performed every four weeks, resulting in up to three sessions, and again at the end of the study - 6 months after the start of the experiment. Each patient also applied either finasteride or placebo solution twice daily to each side of the chin in a double-blinded manner. RESULTS: A total of 77 patients were included in the study. Mean hair density before treatment in finasteride side of the patient's chin was 19.7 Â± 11.7 and in placebo side was 19.1 Â± 11.3. After three sessions of IPL + RF treatment, combined with twice daily application of finasteride and placebo solutions, at the end of 6-month period mean hair density of 8 Â± 6.3 and 9 Â± 5.6 was achieved in finasteride and placebo side respectively. Statistically significant difference was found between finasteride and placebo solution. CONCLUSIONS: We have demonstrated that the addition of finasteride solution to IPL + RF hair removal may result in a more reduction of unwanted facial hair in women when the combination is used for up to 6 months. 5-alpha Reductase Inhibitors;Finasteride 5-alpha Reductase Inhibitors;Adult;Double-Blind Method;Face;Female;Finasteride;Hair Removal;Hirsutism;Humans;Low-Level Light Therapy;Middle Aged;Radio Waves

Safety and efficacy of fractional bipolar radiofrequency treatment in Fitzpatrick skin types V-VI. PURPOSE: To evaluate the safety and efficacy of a bipolar fractionated radiofrequency device for the improvement skin texture, fine lines and wrinkles in the treatment of skin types V through VI. DESIGN: Fifteen subjects, skin types V and VI, between the ages of 40 and 64 were enrolled. Each received three treatments to the full face with fractionated bipolar RF device (Syneron Inc., Irvine, USA) spaced 30 days apart. Patients were evaluated by the study investigator and a blinded investigator at each treatment and 90 days after the last treatment for the treatment safety and efficacy. SUMMARY: A statistically significant improvement in wrinkles, texture and fine lines was noticed in most subjects. Any adverse events in particular post inflammatory hyperpigmentation or hypopigmentation were not seen in any of the patients. CONCLUSION: Our study suggests that the use of this fractionated radiofrequency device is a safe and effective method of skin rejuvenation for skin types V through VI. Adult;Cosmetic Techniques;Face;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Radio Waves;Radiofrequency Therapy;Rejuvenation;Skin Aging

The effects of low-level laser therapy, 670 nm, on epiphyseal growth in rats. The longitudinal growth of long bones is attributed to epiphyseal growth. However, the effects of low-level laser therapy (LLLT) in such structures has still not been studied extensively in the literature. Therefore, the aim of this study was to evaluate the use of LLLT, 670 nm, at three different doses on the epiphyseal growth of the right tibia of rats. Twenty-one Wistar rats, aged four weeks, were subjected to the

application of LLLT, with dosage according to the group (G4: were submitted to the application of 4 J/cm(2); G8: were submitted to the application of 8 J/cm(2); G16: were submitted to the application of 16 J/cm(2)). After completion of protocol they were kept until they were 14 weeks of age and then submitted to a radiological examination (evaluation of limb length) and euthanised. The histological analysis of the growth plates (total thickness and hypertrophic and proliferative zones) was then performed. Comparisons were made with the untreated left tibia. No differences were observed in any of the reviews (radiological and histological), when comparing the right sides (treated) to the left (untreated). It was concluded that the treatment with LLLT within the parameters used caused changes neither in areas of the epiphyseal cartilage nor in the final length of limbs. Animals;Epiphyses;Fracture Healing;Low-Level Light Therapy;Male;Radiography;Rats;Rats, Wistar;Tibia;Tibial Fractures

[Moderate and severe sudden deafness treated with low-energy laser irradiation combined with auricular acupoint sticking]. OBJECTIVE: To test the therapeutic effect on moderate and severe sudden deafness treated with low-energy laser irradiation on acupoint and external auditory canal combined with auricular point sticking (APS) and as compared with electroacupuncture. METHODS: Two hundred and fifty-eight cases of moderate and severe sudden hearing loss were randomly divided into an observation group 1, an observation group 2 and a control group, 86 cases in each group. In three groups, 10% low molecular Dextran 500 mL were used for intravenous infusion. Based on the above treatment, the observation group 1 was treated with low-energy laser irradiation on acupoint and external auditory canal (such as Ermen (TE 21), Tinggong (SI 19) and Tinghui (GB 2)), combined with APS at Gan (liver), Shen (kidney) and Neifenmi (endorine), etc. The observation group 2 was treated with electroacupuncture at the same acupoints as those point irradiation in observation group 1. Fifteen days made one session. The therapeutic effects were evaluated after one and two sessions. RESULTS: After two sessions, The cured rate was 40.7% (35/86) in observation group 1 and 38.4% (33/86) in observation group 2,which were superior to 25.6% (22/86) in control group (both $P < 0.05$). Compared with one session, the therapeutic effects after two sessions were better in two observation groups (both $P < 0.05$), but there was no significant difference between two groups (both $P > 0.05$). In comparison of the improvements of frequency audiometry and auditory function, the two observation groups were better than those in control group ($P < 0.05$, $P < 0.01$), and the improvements after two sessions were better in two observation groups (both $P < 0.01$). CONCLUSION: Both of low-energy laser irradiation on acupoint and external auditory canal combined with APS and electroacupuncture are able to decrease frequency audiometry, improve auditory function, and the therapeutic effects are better with prolongation of treatment time. The clinical efficacy of above two the rapies on moderate and severe sudden deafness is superior remarkably to that of conventional treatment. The therapy of low-energy laser irradiation on acupoint and external auditory canal combined with APS can replace the electroacupuncture therapy in treating moderate and severe sudden deafness. Acupuncture Points;Acupuncture, Ear;Adult;Aged;Combined Modality Therapy;Female;Hearing Loss, Sudden;Humans;Low-Level Light Therapy;Male;Middle Aged

Skin adhesive low-level light therapy for dysmenorrhoea: a randomized, double-blind, placebo-controlled, pilot trial. PURPOSE: The cause of dysmenorrhoea is an abnormal function of smooth muscles in the uterus due to long-term deficient blood supply into smooth muscle tissue. The purpose of this study was to evaluate the effectiveness of skin adhesive low-level light therapy (LLLT) in participants with dysmenorrhoea. METHODS: Thirty-one women were included in this randomized, double-blind, placebo-controlled, pilot trial. Twenty-one women were treated with active LLLT and ten women were treated with placebo one. The therapy was performed in a laboratory room for 20 min a day over a period of 5 days prior to the expected onset of menstruation. The outcome was measured using a visual analog scale (VAS) for each participant's dysmenorrhoeal pain severity. VAS

of each subject was measured every month for 6 months. RESULTS: In the active LLLT group, 16 women reported successful results during their first menstrual cycle just after active LLLT and 5 women had successful results from the second menstrual cycle after active LLLT. The pain reduction rate was 83 % in the active LLLT group, whereas there was only a slight and temporary reduction in pain in the placebo LLLT group. Changes of VAS within 6 months of LLLT showed statistical significance (p = 0.001) over placebo control. CONCLUSIONS: Our study suggests that skin adhesive LLLT on acupuncture points might be an effective, simple and safe non-pharmacological treatment for dysmenorrhoea. Acupuncture Points;Adult;Double-Blind Method;Dysmenorrhea;Female;Humans;Myometrium;Pain Measurement;Phototherapy;Pilot Projects;Young Adult

Complementary and alternative medicine in osteoarthritis. The intent of this focused clinical review is to assess the current literature on a variety of complementary and alternative medicine treatments for osteoarthritis. This review assesses acupuncture techniques, moxibustion, transcutaneous electrical nerve stimulation, low-level laser therapy, and massage. These treatment methods are growing in popularity among the general public. It is important that providers become aware of the existing literature regarding the efficacy of these alternative methods for the treatment of osteoarthritis to adequately respond to the inquiries of our patients. Acupuncture Therapy;Complementary Therapies;Humans;Low-Level Light Therapy;Massage;Moxibustion;Osteoarthritis;Osteoarthritis, Knee;Pain Measurement;Transcutaneous Electric Nerve Stimulation;Treatment Outcome

Surgical Approach and Laser Applications in BRONJ Osteoporotic and Cancer Patients. Bisphosphonates-related Osteonecrosis of the Jaw (BRONJ) has been reported with increasing frequency in literature over last years, but its therapy is still a dilemma. One hundred ninety patients affected by BRONJ were observed between January 2004 and November 2011 and 166 treated sites were subdivided in five groups on the basis of the therapeutical approach (medical or surgical, traditional or laser-assisted approach, with or without Low Level Laser Therapy (LLLT)). Clinical success has been defined for each treatment performed as clinical improvement or complete mucosal healing. Combination of antibiotic therapy, conservative surgery performed with Er:YAG laser and LLLT applications showed best results for cancer and noncancer patients. Nonsurgical approach performed on 69 sites induced an improvement in 35 sites (50.7%) and the complete healing in 19 sites (27.5%), while surgical approach on 97 sites induced an improvement in 84 sites (86.6%) and the complete healing in 78 sites (80.41%). Improvement and healing were recorded in 31 (81.5%) and 27 (71.5%) out of the 38 BRONJ sites treated in noncancer patients and in 88 (68.75%) and in 69 (53.9%) out of the 128 in cancer patients.

Low-level laser therapy for pain relief after episiotomy: a double-blind randomised clinical trial. AIMS AND OBJECTIVES: To evaluate the effectiveness of a low-level laser therapy for pain relief in the perineum following episiotomy during childbirth. BACKGROUND: Laser irradiation is a painless and non-invasive therapy for perineal pain treatment and its effects have been investigated in several studies, with no clear conclusion on its effectiveness. DESIGN: A double-blind randomised controlled clinical trial. METHOD: One hundred and fourteen women who underwent right mediolateral episiotomies during vaginal birth in an in-hospital birthing centre in SÃ£o Paulo, Brazil and reported pain â‰¥ 3 on a numeric scale (0-10) were randomised into three groups of 38 women each: two experimental groups (treated with red and infrared laser) and a control group. The experimental groups were treated with laser applied at three points directly on the episiotomy after suturing in a single session between 6-56 hours postpartum. We used a diode laser with wavelengths of 660 nm (red laser) and 780 nm (infrared laser). The control group participants underwent all laser procedures, excluding the emission of irradiation. The participants and the pain scores evaluator were blinded to

the type of intervention. The perineal pain scores were assessed at three time points: before, immediately after and 30 minutes after low-level laser therapy. RESULTS: The comparison of perineal pain between the three groups showed no significant differences in the three evaluations (p = 0.445), indicating that the results obtained in the groups treated with low-level laser therapy were equivalent to the control group. CONCLUSIONS: Low-level laser therapy did not decrease the intensity of perineal pain reported by women who underwent right mediolateral episiotomy. RELEVANCE TO CLINICAL PRACTICE: The effect of laser in perineal pain relief was not demonstrated in this study. The dosage may not have been sufficient to provide relief from perineal pain after episiotomy during a vaginal birth. Brazil;Double-Blind Method;Episiotomy;Female;Humans;Laser Therapy

The evolution of melasma therapy: targeting melanosomes using low-fluence Q-switched neodymium-doped yttrium aluminium garnet lasers. Melasma is an acquired disorder of pigmentation that commonly affects women with phototypes III-V, and it has a negative impact on the quality of life in affected individuals. It presents clinically as symmetric tan or brown patches on the face, most often involving the forehead, cheeks, perioral region, and periorbital region. On histologic examination, there is increased melanin in the epidermis and/or an increased number of melanosomes in the dermis, with a normal number of highly melanized and dendritic melanocytes. The mainstay of treatment is the use of sunscreen along with topical medications that suppress melanogenesis. Clearance is usually incomplete and recurrences or exacerbations are frequent, probably because of the poor efficacy in clearing dermal melanosomes. Treatment with high-energy pigment-specific lasers, ablative resurfacing lasers, and fractional lasers results in an unacceptably high rate of postinflammatory hyper- and hypopigmentation and rebound melasma. Recently, promising results have been achieved with low-fluence Q-switched neodymium-doped yttrium aluminium garnet laser treatment, which can selectively target dermal melanosomes without producing inflammation or epidermal damage, in all skin phototypes. This article reviews the current treatment modalities for melasma, the rationale for using and the clinical results of combination therapy with low-fluence Q-switched neodymium-doped yttrium aluminium garnet lasers. Sunscreening Agents Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Melanosomes;Skin Pigmentation;Sunscreening Agents

Body contouring: the skinny on noninvasive fat removal. Historically, the approach to body contouring has largely involved invasive procedures, such as liposuction. Recently, several new devices for noninvasive fat removal have received clearance by the Food and Drug Administration for the treatment of focal adiposity. Modalities are aimed primarily at targeting the physical properties of fat that differentiate it from the overlying epidermis and dermis, thus selectively resulting in removal. This review will focus on 3 novel approaches to noninvasive selective destruction of fat. Cryosurgery;High-Intensity Focused Ultrasound Ablation;Humans;Infrared Rays;Lipectomy;Low-Level Light Therapy

Fractionation: past, present, future. The development of fractional photothermolysis is a milestone in the history of laser technology and cutaneous resurfacing. Based on the concept that skin is treated in a fractional manner, where narrow cylinders of tissue are thermally heated and normal adjacent skin is left unaffected, the fractional devices have shown effectiveness in treating a variety of conditions. Since its development, we are becoming more adept at using optimal parameters to induce near carbon dioxide laser benefits with a much more comfortable postoperative period and fewer complications. The future remains bright for fractionated laser devices and with new devices and wavelengths, the applications of this technology continue to grow. Forecasting;Hot Temperature;Humans;Laser Therapy;Lasers, Gas;Low-Level Light Therapy;Rejuvenation;Rhytidoplasty;Skin Aging

The horizon for treating cutaneous vascular lesions. Dermatologists encounter a wide range of cutaneous vascular lesions, including infantile hemangiomas, port-wine stain birthmarks, arteriovenous malformations, venous malformations, Kaposi sarcomas, angiosarcomas, and angiofibromas. Current treatment modalities to reduce these lesions include topical and/or intralesional steroids, laser therapy, surgical resection, and endovascular therapy. However, each method has limitations owing to recurrence, comorbidities, toxicity, or lesion location. Photodynamic therapy, antiangiogenic therapy, and evolving methods of sclerotherapy are promising areas of development that may mitigate limitations of current treatments and offer exciting options for patients and their physicians. Angiogenesis Inhibitors Angiofibroma;Angiogenesis Inhibitors;Arteriovenous Malformations;Hemangioma;Hemangiosarcoma;Humans;Laser Therapy;Low-Level Light Therapy;Photochemotherapy;Port-Wine Stain;Sarcoma, Kaposi;Sclerotherapy;Skin Diseases, Vascular;Skin Neoplasms

Do combined alternating sessions of 1540 nm nonablative fractional laser and percutaneous collagen induction with trichloroacetic acid 20% show better results than each individual modality in the treatment of atrophic acne scars? A randomized controlled trial. BACKGROUND: There have been no well-controlled studies evaluating the efficacy of combining 1540 nm nonablative fractional laser with percutaneous collagen induction (PCI) and trichloroacetic acid (TCA) 20% in the treatment of atrophic acne scars. OBJECTIVE: We hypothesized that combined alternating sessions of both modalities would show better results than each individual modality. METHODS AND MATERIALS: Thirty-nine patients with post acne atrophic scars were included in this study. Patients were randomly equally divided into three groups; group 1 was subjected to six sessions of PCI combined with TCA 20% in the same session, group 2 was subjected to six sessions of 1540 nm fractional laser and group 3 was subjected to combined alternating sessions of the previously mentioned two modalities. RESULTS: Scar severity scores improved by a mean of 59.79% (95% CI 47.38-72.21) ($p < 0.001$) in group 1, a mean of 61.83% (95% CI 54.09-69.56) ($p < 0.001$) in group 2 and a mean of 78.27% (95% CI 74.39-82.15) ($p < 0.001$) in group 3. The difference in the degree of improvement was statistically significant when comparing the three groups using ANOVA test ($p = 0.004$). CONCLUSION: The current work recommends combining 1540 nm nonablative fractional laser in alternation with PCI and TCA 20% in the treatment of atrophic acne scars. Dermatologic Agents;Trichloroacetic Acid Acne Vulgaris;Adult;Cicatrix;Combined Modality Therapy;Cosmetic Techniques;Dermatologic Agents;Female;Humans;Low-Level Light Therapy;Male;Single-Blind Method;Trichloroacetic Acid;Young Adult

Skin-tightening effect of fractional lasers: comparison of non-ablative and ablative fractional lasers in animal models. This experimental study was performed to demonstrate the effects of non-ablative fractional laser (NAFL) and ablative fractional laser (AFL). Twenty male Sprague-Dawley rats were used for the study. Three 2Ã—2-cm-sized squares were tattooed on the abdomen of the animals. Each tattooed square was used for NAFL, AFL and control experiments. The NAFL and AFL treatment were performed with the same total energy of 12,000 mJ cm(-2). The laser treatments consisted of four sessions, with an interval of 3 weeks between sessions. The areas of tattooed skin were serially measured, and skin samples were obtained for histologic examination after 4 months of treatment. NAFL did not cause immediate skin shrinkage, but the size of the NAFL-treated skin was reduced by 4.3% after 4 months. In contrast, AFL caused immediate skin shrinkage (11.5% reduction), and the size was maintained at 9% reduction after 4 months. In histologic examination, the dermal collagen was arranged flat and parallel to the skin surface in the upper dermis, and regenerated collagen fibres were clearly noticed in both NAFL-and AFL-treated skin samples. Immunohistochemical stains showed well-regenerated type I and III collagen fibres. Western blot analysis of skin samples showed that type I/III collagen ratio was not significantly changed after

fractional laser treatment. Electron microscopic studies aimed to evaluate the long-term micro-architecture of the collagen fibrils. AFL treatment reduced D-band periodicity by 5.2% and fibril diameter by 14.8%, although there was no statistically significant difference ($p>0.05$). Fractional laser treatment shrinks the skin surface area and regenerates collagen. The AFL treatment showed more profound skin changes than NAFL. Collagen Animals;Biopsy, Needle;Blotting, Western;Collagen;Disease Models, Animal;Dose Fractionation, Radiation;Epidermis;Immunohistochemistry;Laser Therapy;Low-Level Light Therapy;Male;Microscopy, Electron;Microscopy, Electron, Transmission;Random Allocation;Rats;Rats, Sprague-Dawley;Sensitivity and Specificity;Skin;Skin Aging;Wound Healing

Photoactivation of bone marrow mesenchymal stromal cells with diode laser: effects and mechanisms of action. Mesenchymal stromal cells (MSCs) are a promising cell candidate in tissue engineering and regenerative medicine. Their proliferative potential can be increased by low-level laser irradiation (LLLI), but the mechanisms involved remain to be clarified. With the aim of expanding the therapeutic application of LLLI to MSC therapy, in the present study we investigated the effects of 635 nm diode laser on mouse MSC proliferation and investigated the underlying cellular and molecular mechanisms, focusing the attention on the effects of laser irradiation on Notch-1 signal activation and membrane ion channel modulation. It was found that MSC proliferation was significantly enhanced after laser irradiation, as judged by time lapse videomicroscopy and EdU incorporation. This phenomenon was associated with the up-regulation and activation of Notch-1 pathway, and with increased membrane conductance through voltage-gated K(+) , BK and Kir, channels and T- and L-type Ca(2+) channels. We also showed that MSC proliferation was mainly dependent on Kir channel activity, on the basis that the cell growth and Notch-1 up-regulation were severely decreased by the pre-treatment with the channel inhibitor Ba(2+) (0.5 mM). Interestingly, the channel inhibition was also able to attenuate the stimulatory effects of diode laser on MSCs, thus providing novel evidence to expand our knowledge on the mechanisms of biostimulation after LLLI. In conclusions, our findings suggest that diode laser may be a valid approach for the preconditioning of MSCs in vitro prior cell transplantation. Notch1 protein, mouse;Potassium Channels, Voltage-Gated;Receptor, Notch1;5-ethynyl-2'-deoxyuridine;Deoxyuridine Animals;Bone Marrow Cells;Cell Proliferation;Cell Survival;Deoxyuridine;Electrophysiological Phenomena;Gene Expression Regulation;Lasers, Semiconductor;Mesenchymal Stem Cells;Mice;Patch-Clamp Techniques;Potassium Channels, Voltage-Gated;Receptor, Notch1;Staining and Labeling

Excimer laser therapy for hairline psoriasis: a useful addition to the scalp psoriasis treatment algorithm. Psoriasis is a chronic, inflammatory skin condition with negative impacts both physical and psychological. Scalp psoriasis, especially around the hairline, can cause significant impairment in quality of life due to its visibility. Options for treatment of facial psoriasis, including hairline involvement, are the use of low potency topical steroids, calcineurin inhibitors, and vitamin D analogues. Though the use of excimer laser for scalp psoriasis has been reported, there are no cases or studies specifically examining excimer laser phototherapy for the treatment of hairline psoriasis. We present a case of rapid improvement of hairline psoriasis using a regimen of 308 nm excimer laser with clobetasol spray and recommend an algorithm for the optimal treatment of scalp psoriasis utilizing currently available antipsoriatic therapies. Glucocorticoids;Clobetasol Aged;Algorithms;Clobetasol;Combined Modality Therapy;Female;Follow-Up Studies;Glucocorticoids;Humans;Lasers, Excimer;Psoriasis;Quality of Life;Scalp;Treatment Outcome

Effect of low-level laser therapy (660 nm) on acute inflammation induced by tenotomy of Achilles tendon in rats. In this study, we aimed to analyze the effects of low-level laser therapy (LLLT; 660 nm) on levels of protein expression of inflammatory mediators after cutting Achilles tendon of rats. Thirty Wistar male rats underwent partial incisions of the left Achilles tendon, and were divided into

three groups of 10 animals according to the time of euthanasia after injury: 6, 24 and 72 h. Each group was then divided into control group and LLLT group (treated with 100 mW, 3.57 W cm(-2), 0.028 cm(2), 214 J cm(-2), 6 J, 60 s, single point). In LLLT group, animals were treated once time per day until the time of euthanasia established for each group. The group treated with LLLT showed a significant reduction of IL-1Î² compared with control groups at three time points (6 h: P=0.0401; 24 h: P=0.0015; 72 h: P=0.0463). The analysis of IL-6 showed significant reduction only in the LLLT group at 72 h compared with control group (P=0.0179), whereas IL-10 showed a significant increase in the treated group compared with control group at three experimental times (6 h: P=0.0007; 24 h: P=0.0256; 72 h: P<0.0001). We conclude that LLLT is an important modulator of inflammatory cytokines release after injury in Achilles tendon. Achilles Tendon;Animals;Inflammation;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Tendon Injuries

A new modality for fractional CO2 laser resurfacing for acne scars in Asians. Since fractional photothermolysis was first introduced in 2004, it has become a very popular procedure, especially with more and more ablative fractional laser systems and treatments. Fractional ablative laser has been shown to be very effective; however, it does not reach the efficacy of conventional ablative laser treatments in most instances. In an attempt order to make the fractional CO2 laser treatment more efficacious and safe, we combined both the conventional CO2 laser and the fractional CO2 laser to treat acne scars. We report our experience with this new modality. A total of 44 Chinese patients with facial acne scars and skin type IV were included in this study. Each patient received a minimum of two treatment sessions. For each laser session, both the conventional CO2 laser treatment and the DeepFX laser treatment were focused on treating the scar areas only. Following this technique, the more superficialf ActiveFX fractional CO2 laser was performed to the entire face. The efficacy of the procedure was evaluated 3Â months after the final laser treatment. The improvement in acne scars and the overall skin texture change were assessed by photographic evaluation using the following scales: â‰¤25Â % (mild), 26-50Â % (moderate), 51-75Â % (marked), and >75Â % (excellent). Side effects from this therapy were mild to moderate. Two cases of HSV outbreak were noted; they were treated and resolved without adverse sequelae. Post-laser erythema was resolved within 1Â month in one half of the patients. Prolonged erythema (â‰¤3Â months) was noted in 12(27Â %) cases. Temporary post-inflammatory hyperpigmentation (PIH; â‰¤1Â month) was seen in approximately 50Â % of the patients. PIH (â‰¤3Â months) was noted in four cases (9Â %). Sixty-four percent of the patients (28/44) had an improvement of between 51 and 75Â % after more than two sessions of the combination of laser treatments. The average overall improvement was 52.50Â % (Â±12.25Â %). Three patients achieved improvement of >75Â %. This new modality of ablative conventional CO2 laser therapy with fractional CO2 laser resurfacing was shown to be safe and efficacious in the treatment of acne scars in Asian patients. It did not increase the risk of PIH compared to other reports of laser therapy and PIH. It is the hope that future study with combination therapy will further enhance the clinical results and thus lessen potential adverse events. Acne Vulgaris;Adolescent;Adult;Asian People;Cicatrix;Erythema;Female;Follow-Up Studies;Herpes Simplex;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome;Young Adult

The influence of red laser irradiation timeline on burn healing in rats. Low-level laser therapy (LLLT) promotes biomodulation of wound healing and literature reports that light delivery during the inflammation could play a different role compared with latter phases of the healing process. The objective of this study was to investigate whether single dose of a red laser (Î» = 660 nm) is different from fractionated delivery protocol in full thickness burns. Two lesions were inflicted on the back of 36 rats. In the fractionated dose group (FG), the lesions were irradiated with 1 J/cmÂ² on days 1, 3, 8,

and 10 post-wounding. In the single dose group (SG), the lesions were irradiated with 4 J/cmÂ² on day 1, immediately after injury. Control lesions (CG) received no light and were left to heal spontaneously. Blood flow was measured on days 1, 3, 8, 10, 15, and 21 using laser Doppler flowmetry. Animals were killed on days 3, 8, 10, 15, and 21. Skin specimens were obtained and routinely processed for hematoxylin and eosin. The specimens were evaluated according to differential leukocyte counting and angiogenesis. Statistical analysis was performed, and significance was accepted at $p < 0.05$. Irradiated groups showed a peak of new vessels on day 15 while, for CG, the peak was on day 21. On day 21, FG exhibited a significantly greater number of cumulative neutrophils while SG showed a higher number of mononuclear cells. Our results confirm that both protocols used accelerate angiogenesis and stimulate leukocyte chemotaxis on burn treatment. In addition, this work suggests that a single-dose LLLT accelerates the inflammatory phase of skin repair.
Animals;Burns;Laser-Doppler Flowmetry;Leukocyte Count;Low-Level Light Therapy;Male;Radiation Dosage;Rats;Rats, Wistar;Skin;Wound Healing

Comparison of Red and Infrared Low-level Laser Therapy in the Treatment of Acne Vulgaris. BACKGROUND/PURPOSE: Acne vulgaris is a very prevalent skin disorder and remains a main problem in practice. Recently, phototherapy with various light spectrums for acne has been used. There are some evidences that low-level laser therapy (LLLT) has beneficial effect in the treatment of acne lesions. In this study, two different wavelengths of LLLT (630 and 890 nm) were evaluated in treatment of acne vulgaris. MATERIALS AND METHODS: This study was a single-blind randomized clinical trial. Patients with mild to moderate acne vulgaris and age above 18 years and included were treated with red LLLT (630 nm) and infrared LLLT (890 nm) on the right and left sides of the face respectively, twice in a week for 12 sessions, and clinically assessed at baseline and weeks 2, 4, 6, and 8. RESULTS: Twenty-eight patients were participated in this study. Ten weeks after treatment acne lesion were significantly decreased in the side treated by 630 nm LLLT (27.7Â±12.7 to 6.3Â±1.9) ($P<0.001$), but this decrease was not significant in the site treated by 890 nm LLLT (26.9Â±12.4 to 22.2Â±8.5) ($P>0.05$). CONCLUSION: Red wavelength is safe and effective to be used to treat acne vulgaris by LLLT compared to infrared wavelength.

Effects of neuromuscular electrical stimulation, laser therapy and LED therapy on the masticatory system and the impact on sleep variables in cerebral palsy patients: a randomized, five arms clinical trial. BACKGROUND: Few studies demonstrate effectiveness of therapies for oral rehabilitation of patients with cerebral palsy (CP), given the difficulties in chewing, swallowing and speech, besides the intellectual, sensory and social limitations. Due to upper airway obstruction, they are also vulnerable to sleep disorders. This study aims to assess the sleep variables, through polysomnography, and masticatory dynamics, using electromiography, before and after neuromuscular electrical stimulation, associated or not with low power laser (Gallium Arsenide-Aluminun, =780 nm) and LED (= 660 nm) irradiation in CP patients. METHODS/DESIGN: 50 patients with CP, both gender, aged between 19 and 60 years will be enrolled in this study. The inclusion criteria are: voluntary participation, patient with hemiparesis, quadriparesis or diparetic CP, with ability to understand and respond to verbal commands. The exclusion criteria are: patients undergoing/underwent orthodontic, functional maxillary orthopedic or botulinum toxin treatment. Polysomnographic and surface electromyographic exams on masseter, temporalis and suprahyoid will be carry out in all sample. Questionnaire assessing oral characteristics will be applied. The sample will be divided into 5 treatment groups: Group 1: neuromuscular electrical stimulation; Group 2: laser therapy; Group 3: LED therapy; Group 4: neuromuscular electrical stimulation and laser therapy and Group 5: neuromuscular electrical stimulation and LED therapy. All patients will be treated during 8 consecutive weeks. After treatment, polysomnographic and electromiographic exams will be collected again. DISCUSSION: This paper describes a five arm clinical trial assessing the examination of

sleep quality and masticatory function in patients with CP under non-invasive therapies. TRIAL REGISTRATION: The protocol for this study is registered with the Brazilian Registry of Clinical Trials - ReBEC RBR-994XFS. Adult;Brazil;Cerebral Palsy;Disability Evaluation;Electric Stimulation Therapy;Electromyography;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mastication;Middle Aged;Neuromuscular Junction;Phototherapy;Polysomnography;Recovery of Function;Research Design;Sleep;Stomatognathic System;Surveys and Questionnaires;Time Factors;Treatment Outcome;Young Adult
The low level laser therapy effect on the remodeling of bone extracellular matrix. The low level laser therapy (LLLT) has been used as an option to accelerate the regeneration of bone tissue. In this study, both femurs of male Wistar rats (30 animals) were injured with a drill and the effect of LLLT using a laser diode (100 mW at 660 nm) in the bone matrix on the left paw measured. LLLT effect on the healing bone tissue matrix was evaluated by a combination of immunohistochemical histomorphometry, confocal immunofluorescence microscopy and isolation and characterization of glycosaminoglycans. Histomorphometric analysis showed that LLLT increased bone matrix and showing more organized. Alcian Blue and PAS staining seems to suggest differential glycosaminoglycans and glycoproteins. The data showed increased expression of chondroitin sulfate and hyaluronic acid, after reduction as the LLLT and mature bone, resembling the expression of osteonectin and biglycan. The difference in expression of siblings (DMP-1, OPN and BSP) is in accordance with the repair accelerated bone formation after the application of LLLT as compared with control. The expression of osteonectin and osteocalcin supports their role in bone mineralization protein, indicating that LLLT accelerates this process. The overall data show that LLLT bone changes dynamic array, shortening the time period involved in the bone repair. Dmp1 protein, rat;Extracellular Matrix Proteins;Ibsp protein, rat;Integrin-Binding Sialoprotein;Osteonectin;Phosphoproteins;Osteocalcin;Hyaluronic Acid;Chondroitin Sulfates;Alcian Blue Alcian Blue;Animals;Bone Matrix;Bone Regeneration;Chondroitin Sulfates;Extracellular Matrix Proteins;Femur;Gene Expression;Hyaluronic Acid;Immunohistochemistry;Integrin-Binding Sialoprotein;Lasers;Low-Level Light Therapy;Male;Microscopy, Fluorescence;Osteocalcin;Osteonectin;Periodic Acid-Schiff Reaction;Phosphoproteins;Rats;Rats, Wistar
A novel 0.65 millisecond pulsed 1064 nm laser to treat skin of color without skin cooling or anesthetics. Anesthetics Anesthetics;Axilla;Cold Temperature;Face;Facial Dermatoses;Folliculitis;Hair Removal;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Skin Pigmentation
Effect of low level laser therapy and zoledronate on the viability and ALP activity of Saos-2 cells. A limited number of clinical studies indicate the supportive role of low level laser therapy (LLLT) on medical and/or surgical approaches carried out in treatment modalities for bisphosphonate related necrosis of jaws (BRONJ), the most common side effect of bisphosphonates used to inhibit bone resorption. The purpose of this study was to investigate the effects of LLLT on cell proliferation and alkaline phosphatase (ALP) activity of human osteoblast-like cells (Saos-2) treated with different doses of zoledronate, the most potent bisphosphonate. Saos-2 cells were treated with different concentrations of zoledronate and were irradiated with diode laser (wavelength 808 nm, 10 s, 0.25 or 0.50 W). Cell numbers and ALP activity of the cells were determined. LLLT mildly increased the proliferation rate or ALP activity, while zoledronate reduced both. When applied together, LLLT lessened the detrimental effects of zoledronate and improved cell function and/or proliferation. Based on the results of this study, it was concluded that LLLT has biostimulative effects on Saos-2 cells, even after treatment with zoledronate. LLLT may serve as a useful supportive method for BRONJ

treatment through enhancement of healing by osteoblasts. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid;Alkaline Phosphatase Alkaline Phosphatase;Bone Density Conservation Agents;Cell Count;Cell Culture Techniques;Cell Death;Cell Line, Tumor;Cell Proliferation;Cell Shape;Cell Survival;Diphosphonates;Dose-Response Relationship, Drug;Humans;Imidazoles;Lasers, Semiconductor;Low-Level Light Therapy;Osteoblasts;Radiation Dosage;Zoledronic Acid

[New developments in laser therapy]. Based on the theory of stimulated emission of radiation that was proposed by Albert Einstein in 1916, the first lasers were developed in the 1960s. The first clinical use of laser technology in a German university took place in 1978 in the Department of Dermatology of the Ludwig-Maximilian-University in Munich under the guidance of the former director, Prof. Dr. med. Dr. h.c. mult. Otto Braun-Falco. In the following years, laser technology developed rapidly. Today laser technology is a widely used interdisciplinary therapeutic procedure that has deep clinical and scientific roots in dermatology. There are many conditions in both classic and aesthetic dermatology that are routinely - and sometimes exclusively - treated with lasers. Here we review recent developments in laser medicine. There seems to be a trend to combination procedures. To enhance efficacy, different laser systems are together or lasers are combined with specific topical medications. Forecasting;Humans;Low-Level Light Therapy;Skin Diseases

Suppressive effect of low-level laser therapy on tracheal hyperresponsiveness and lung inflammation in rat subjected to intestinal ischemia and reperfusion. Intestinal ischemia and reperfusion (i-I/R) is an insult associated with acute respiratory distress syndrome (ARDS). It is not known if pro- and anti-inflammatory mediators in ARDS induced by i-I/R can be controlled by low-level laser therapy (LLLT). This study was designed to evaluate the effect of LLLT on tracheal cholinergic reactivity dysfunction and the release of inflammatory mediators from the lung after i-I/R. Anesthetized rats were subjected to superior mesenteric artery occlusion (45Â min) and killed after clamp release and preestablished periods of intestinal reperfusion (30Â min, 2 or 4Â h). The LLLT (660Â nm, 7.5Â J/cm(2)) was carried out by irradiating the rats on the skin over the right upper bronchus for 15 and 30Â min after initiating reperfusion and then euthanizing them 30Â min, 2, or 4Â h later. Lung edema was measured by the Evans blue extravasation technique, and pulmonary neutrophils were determined by myeloperoxidase (MPO) activity. Pulmonary tumor necrosis factor-Î± (TNF-Î±), interleukin-10 (IL-10), intercellular adhesion molecule-1 (ICAM-1), and isoform of NO synthase (iNOS) mRNA expression were analyzed by real-time PCR. TNF-Î±, IL-10, and iNOS proteins in the lung were measured by the enzyme-linked immunoassay technique. LLLT (660Â nm, 7.5Â J/cm(2)) restored the tracheal hyperresponsiveness and hyporesponsiveness in all the periods after intestinal reperfusion. Although LLLT reduced edema and MPO activity, it did not do so in all the postreperfusion periods. It was also observed with the ICAM-1 expression. In addition to reducing both TNF-Î± and iNOS, LLLT increased IL-10 in the lungs of animals subjected to i-I/R. The results indicate that LLLT can control the lung's inflammatory response and the airway reactivity dysfunction by simultaneously reducing both TNF-Î± and iNOS. Inflammation Mediators;Tumor Necrosis Factor-alpha;Intercellular Adhesion Molecule-1;Interleukin-10;Peroxidase;Nitric Oxide Synthase Type II;Nos2 protein, rat Animals;Gene Expression Regulation;Inflammation Mediators;Intercellular Adhesion Molecule-1;Interleukin-10;Intestines;Low-Level Light Therapy;Male;Nitric Oxide Synthase Type II;Peroxidase;Pneumonia;Pulmonary Edema;Rats;Rats, Wistar;Reperfusion;Reperfusion Injury;Trachea;Tumor Necrosis Factor-alpha

Surface roughness and morphologic changes of zirconia following different surface treatments. OBJECTIVE: The aim of this study was to evaluate the roughness and morphology of zirconia after air abrasion and erbium:yttrium-aluminum-garnet (Er:YAG) laser application of different intensities. BACKGROUND DATA: Although surface roughness is important to obtain micromechanical retention,

it is unclear which surface treatment is most appropriate for zirconia. METHODS: Fifty sintered zirconia specimens were divided into five groups (n=10). The following treatments were applied: control, Er:YAG laser irradiation with different energy intensities (200, 300, and 400â€‰mJ), and air abrasion with aluminum oxide (Al(2)O(3)) particles (110â€‰Î¼m). Morphologic changes after surface treatments were examined in microscope analyses. Then, the surface roughness (Ra in Î¼m) of the specimens was evaluated using a surface texture measuring instrument. Roughness data were analyzed using one-way analysis of variance (ANOVA) and Tukey's honestly significant difference (HSD) test (p=0.05). RESULTS: Results of microscope analyses revealed changes in surface morphology after surface treatments, including the formation of rare pits in the 400â€‰mJ laser group and the formation of microretentive grooves in the air abrasion group. According to the results of the statistical analysis, the mean surface roughness value for the air abrasion group was significantly higher than that of the other groups (p<0.001). Except for the air abrasion group, there were no statistically significant differences within other groups (p>0.05). CONCLUSIONS: According to the results of the statistical and microscopic analyses, 400â€‰mJ Er:YAG laser energy or air abrasion can be used to obtain micromechanical retention prior to luting; however, air abrasion is the most effective surface treatment method. Dental Porcelain;Zirconium;Aluminum Oxide;zirconium oxide Air Abrasion, Dental;Aluminum Oxide;Analysis of Variance;Dental Polishing;Dental Porcelain;Dental Stress Analysis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Microscopy, Electron, Scanning;Reference Values;Shear Strength;Surface Properties;Zirconium

Low-level laser therapy induces the expressions of BMP-2, osteocalcin, and TGF-Î²1 in hypoxic-cultured human osteoblasts. The aim of this study was to examine the effect of low-level laser therapy (LLLT) on the cell viability and the expression of hypoxia-inducible factor-1s (HIF-1s), bone morphogenic protein-2 (BMP-2), osteocalcin, type I collagen, transforming growth factor-Î²1 (TGF-Î²1), and Akt in hypoxic-cultured human osteoblasts. Human fetal osteoblast cells (cell line 1.19) were cultured under 1Â % oxygen tension for 72Â h. Cell cultures were divided into two groups. At the experimental side, low-level laser (808Â nm, GaAlAs diode) was applied at 0, 24, and 48Â h. After irradiation, each cell culture was incubated 24Â h more under hypoxia. Total energy was 1.2, 2.4, and 3.6Â J/cm(2), respectively. Non-irradiated cultures served as controls. Comparisons between the two groups were analyzed by t test; a p value <0.05 was considered statistically significant. Hypoxia resulted in a decrease in the expression of type I collagen, osteocalcin, and TGF-Î²1 (pâ€‰<â€‰0.001, pâ€‰<â€‰0.001, and pâ€‰<â€‰0.01, respectively). Cell viability and BMP-2 expression were not decreased by hypoxic condition. On the other hand, LLLT on hypoxic-cultured osteoblast promoted the expression of BMP-2, osteocalcin, and TGF-Î²1 (pâ€‰<â€‰0.05, pâ€‰<â€‰0.01, and pâ€‰<â€‰0.001, respectively). Cell proliferation was also increased time-dependently. However, hypoxia decreased in type I collagen expression (pâ€‰<â€‰0.001), and LLLT did not affect type I collagen expression in hypoxic-cultured osteoblasts. Furthermore, LLLT inhibited HIF-1 and Akt expression in hypoxic conditioned osteoblasts. We concluded that LLLT induces the expression of BMP-2, osteocalcin, and TGF- Î²1 in 1Â % hypoxic-cultured human osteoblasts. ARNT protein, human;BMP2 protein, human;Bone Morphogenetic Protein 2;Collagen Type I;HIF1A protein, human;Hypoxia-Inducible Factor 1, alpha Subunit;Transforming Growth Factor beta1;Osteocalcin;Aryl Hydrocarbon Receptor Nuclear Translocator;Proto-Oncogene Proteins c-akt Aryl Hydrocarbon Receptor Nuclear Translocator;Bone Morphogenetic Protein 2;Cell Hypoxia;Cell Proliferation;Cell Survival;Cells, Cultured;Collagen Type I;Gene Expression Regulation;Humans;Hypoxia-Inducible Factor 1, alpha Subunit;Low-Level Light Therapy;Osteoblasts;Osteocalcin;Proto-Oncogene Proteins c-akt;Transforming Growth Factor beta1

Effectiveness of physiotherapy and GaAlAs laser in the management of temporomandibular joint disorders. OBJECTIVE: Low-level laser therapy (LLLT) is a treatment method commonly used in physiotherapy for musculoskeletal disorders. The aim of this study was to monitor the function of temporomandibular joint (TMJ) and surrounding tissues and compare the objective measurements of the effect of LLLT. BACKGROUND DATA: LLLT has been considered effective in reducing pain and muscular tension; thus improving the quality of patients' lives. MATERIALS AND METHODS: TMJ function was evaluated by cephalometric tracing analysis, orthopantomogram, TMJ tomogram, and computer face-bow record. Interalveolar space between central incisors before and after therapy was measured. Patients evaluated pain on the Visual Analog Scale. LLLT was performed in five treatment sessions (energy density of 15.4 J/cm(2)) by semiconductive GaAlAs laser with an output of 280 mW, emitting radiation wavelength of 830 mm. The laser supplied a spot of ~0.2 cm(2). RESULTS: Baseline comparisons between the healthy patients and patients with low-level laser application show that TMJ pain during function is based on anatomical and function changes in TMJ areas. Significant differences were seen in the posterior and anterior face height. The results comparing healthy and impaired TMJ sagittal condyle paths showed that patients with TMJ pain during function had significantly flatter nonanatomical movement during function. After therapy, the unpleasant feeling was reduced from 27.5 to 4.16 on the pain Visual Analog Scale. The pain had reduced the ability to open the mouth from 34 to 42 mm. CONCLUSIONS: The laser therapy was effective in the improvement of the range of temporomandibular disorders (TMD) and promoted a significant reduction of pain symptoms. Adolescent;Adult;Cephalometry;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Temporomandibular Joint Disorders;Young Adult

Treatment of acne scars by fractional bipolar radiofrequency energy. BACKGROUND/OBJECTIVE: A variety of modalities are available for the treatment of acne scars. This prospective, IRB-approved study evaluates the efficacy and tolerance of fractional bipolar RF energy in the treatment of facial acne scars. METHODS: Healthy subjects (n = 15, 13 females, aged 35.7 Â± 5.6 years [mean Â± SD], skin types I-V) with mild to moderate acne scars received three monthly treatments with a fractional bipolar RF device. Improvement and tolerance were evaluated at each visit, including a 1-month and 3-month follow-up visit. RESULTS: Ten subjects completed the study. Physician-assessed acne scar severity was significantly reduced at 1 month and 3 months. Adverse effects were limited to transient erythema. Dryness, bruising and crusting erosion were limited. Subject-assessed stinging/burning, stinging (alone), tingling, itching and burning were also limited and consistent with each treatment. Subject-assessed fine lines and wrinkles, brightness, tightness, acne scar texture, pigmentation were all improved significantly. Satisfaction was high in 67-92% of subjects. CONCLUSION: Fractional bipolar RF energy is a safe and effective modality for the treatment of acne scars. Acne Vulgaris;Adult;Cicatrix;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Male;Radio Waves;Radiofrequency Therapy

Short-term clinical and osteoimmunological effects of scaling and root planing complemented by simple or repeated laser phototherapy in chronic periodontitis. The aim of this study was to evaluate the clinical, anti-inflammatory, and osteoimmunological benefits of the single (PT) and repeated laser phototherapy (rPT) as an adjunctive treatment of inflamed periodontal tissue. Twenty-seven patients with chronic periodontitis were randomly divided into three groups of nine patients each in order to undergo scaling and root planing (SRP), SRP followed by one session of adjunctive PT (Day 1; SRP + PT), or SRP followed by adjunctive repeated PT five times in 2 weeks (Days 1, 2, 4, 7, and 11; SRP + rPT). For phototherapy session, a diode laser (Î» = 670 nm, 200 mW, 60 s/tooth) was applied into the sulcus. Clinical parameters, including full-mouth plaque score, full-mouth bleeding score, probing pocket depth, and clinical attachment level were recorded. Samples of gingival crevicular fluid (GCF) were taken at baseline, 4, and 8 weeks after treatment. Interleukin 1 beta (IL-

1Î²), tumor necrosis factor alpha (TNF-Î±), receptor activator of nuclear factor Î¹Î' ligand (RANKL), and osteoprotegerin (OPG) levels in the collected GCF were measured. PT used in a single or repeated doses, does not produce a significant reduction in the clinical parameters essayed ($p > 0.05$). Levels of IL-1Î² in GCF were significantly reduced in SRP + PT and SRP + rPT groups compared with the SRP group ($p < 0.05$). However, the SRP + rPT group showed a significant reduction of pro-inflammatory cytokine TNF-Î± and RANKL/OPG ratio at 4 weeks post-treatment compared with the SRP + PT and SRP groups ($p < 0.05$). SRP + PT group also showed a significant reduction in TNF-Î± and RANKL/OPG ratio at 8 weeks post-treatment compared with the SRP group ($p < 0.05$). PT exerts a biostimulative effect on the periodontal tissue. Multiple sessions of PT showed a faster and greater tendency to reduce proinflammatory mediators and RANKL/OPG ratio. Interleukin-1beta;Osteoprotegerin;Receptor Activator of Nuclear Factor-kappa B;Tumor Necrosis Factor-alpha Chronic Periodontitis;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Osteoprotegerin;Receptor Activator of Nuclear Factor-kappa B;Root Planing;Treatment Outcome;Tumor Necrosis Factor-alpha

Physical therapy in the treatment of venous leg ulcers: biophysical mechanisms. ï»¿ï»¿ï»¿ï»¿ï»¿ The present study sought to estimate the hemodynamic effects inside wounds after applying infrared thermography. Clinical results were analyzed to evaluate any correspondence with hemodynamic events occurring inside the wounds. METHODS: Group 1 consisted of 20 patients with venous leg ulcers (12 women, 8 men). Patients from group 1 received 1 high-voltage stimulation (HVS) procedure. Group 2 consisted of 23 patients (16 women, 7 men). Patients from group 2 received 1 ultrasound (US) procedure. Group 3 consisted of 21 patients (13 women, 8 men). Patients from group 3 received 1 low-level laser therapy (LLLT) procedure. Group 4 consisted of 23 patients (15 women, 8 men). Patients from group 4 received 1 compression therapy (CT) procedure. Group 5 consisted of 19 patients (11 women, 8 men). Patients from group 5 received 1 quasi-CT procedure. Infrared thermography was used to monitor arterial hemodynamic effects for each ulcer. Infrared thermography, based on analysis of wound surface temperatures, was used to reflect normal or abnormal arterial circulation in capillaries. The average and maximal temperatures before and after each physical procedure were measured 5, 10, 15, and 30 minutes afterward. RESULTS: The application of HVS and LLLT did not change the temperature inside the wounds. A significant temperature increase was noted after application of US and CT. The quasi-CT induced a thermal effect (only for a few minutes), but was not as intense as the effect of the compression stockings. The measurements showed a prolonged and steady thermal effect. CONCLUSION: The hemodynamic effect (improvement of arterial microcirculation inside the venous leg ulcer) is one of the most significant biophysical mechanisms of healing after clinically efficient compression therapy. Hemodynamic reactions are not basic mechanisms of high voltage stimulation and ultrasound therapy during the healing of venous leg ulcers. Computed thermography is a simple and useful tool to measure hemodynamic effects in wound healing. ï»¿ï»¿ï»¿.

Clinical effectiveness of low-level laser therapy as an adjunct to eccentric exercise for the treatment of Achilles' tendinopathy: a randomized controlled trial. OBJECTIVE: To investigate the effectiveness of low-level laser therapy (LLLT) as an adjunct to a program of eccentric exercises for the treatment of Achilles' tendinopathy. DESIGN: Randomized controlled trial with evaluations at baseline and 4, 12, and 52 weeks. SETTING: Primary care clinic. PARTICIPANTS: Participants with midportion Achilles' tendinopathy were randomly assigned to 2 groups (LLLT n=20: mean age Â± SD, 45.6Â±9.1y; placebo n=20: mean age Â± SD, 46.5Â±6.4y). The 12-week evaluation was completed by 36 participants (90%), and 33 participants (82.5%) completed the 52-week evaluation. INTERVENTION: Both groups of participants performed eccentric exercises over a 3-month period. In addition, they received either an active or placebo application of LLLT 3 times per week for the first 4

weeks; the dose was 3J per point. MAIN OUTCOME MEASURES: The primary outcome was the Victorian Institute of Sport Assessment-Achilles' questionnaire (VISA-A) score at 12 weeks; secondary outcome was a visual analog scale for pain. Outcomes were measured at baseline and 4, 12, and 52 weeks. RESULTS: Baseline characteristics exhibited no differences between groups. At the primary outcome point, there was no statistically significant difference in VISA-A scores between groups (P>.05). The difference in VISA-A scores at the 4-week point significantly favored the placebo group (F(1)=6.411, sum of squares 783.839; P=.016); all other outcome scores showed no significant difference between the groups at any time point. Observers were blinded to groupings. CONCLUSIONS: The clinical effectiveness of adding LLLT to eccentric exercises for the treatment of Achilles' tendinopathy has not been demonstrated using the parameters in this study.
Achilles Tendon;Adult;Combined Modality Therapy;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Single-Blind Method;Surveys and Questionnaires;Tendinopathy

Effective transmission of light for media culture, plates and tubes. The results of many investigations on low-level laser therapy are contradictory and this is due to the large number of illumination parameters as well as the inability to measure the possible effects after irradiation with the necessary objectivity and the fact that the light needs to pass thorough barriers (usually the plastic of the culture dish/plate and culture medium) to reach the cells. In this manner, the objective of this study was to determine the absorption coefficient, penetration depth and effective transmission in materials commonly used in cell cultures. Among the most commonly used wavelengths in low-level laser therapy, the lowest absorption coefficients were reached by DMEM and RPMI (Î± = 0.03 cm(-1)), from 633 to 690 nm, which reach an effective transmission of 93% of incident radiation and penetration depth of 33 cm. Among the solid materials in the same range of the electromagnetic spectrum, the lowest absorption coefficient was obtained for the polystyrene (Petri dish and well plate), with Î± = 1.31 cm(-1), 78% of effective transmission and 0.76 cm of penetration depth. This article also presents a simple equation for estimating the amount of energy that will actually reach the sample. Culture Media;Plastics Culture Media;Light;Plastics;Radiation Dosage;Radiometry;Spectrum Analysis

Effects of a low level laser on the acceleration of wound healing in rabbits. BACKGROUND: Tissue healing is a complex process that involves local and systemic responses. The use of low level laser therapy for wound healing has been shown to be effective in modulating both local and systemic response. AIM: The aim of this study was to accelerate and facilitate wound healing and reduce scar formation and wound contraction of an open wound by a low level laser. MATERIALS #ENTITYSTARTX00026; METHODS: Twenty adult male rabbits, lepus cuniculus demostica, were brought from a Basrah local market and raised under proper management conditions in Basrah Veterinary Medicine College. The age of these rabbits ranged between 8-10 months and their body weight was 1.5-2 Kg. The rabbits were divided into two groups, group I (Control) and group II (Treated). General anesthesia was provided by a mixture of Xylazine and Ketamine at a ratio of 1:0.5m intramuscularly. Selected sites were shaved, cleaned and disinfected. A wound of 4-cm length and 3-cm depth was made on the gluteal region; six hours later, the wound was treated with gallium aluminum and an arsenide diode laser with a power output of 10m at a wavelength of 890nm in pulsed nods, with a frequency of 20 KLTZ. The wound exposure to the laser was once a day at 890 nm wavelength for 5 minutes over a 7-day period. Histopathological study was obtained regarding the wound depth and edge of the skin on the 3(rd), 7(th) and 14(th) days. RESULTS: The histopathological finding of group I at three days postoperative showed hemorrhage with inflammatory cell infiltration, mainly neutrophils as well as congested blood vessels in the gap. At seven days, the gap contained necrotized neutrophils together with hemolysis and granulation tissue under the dermis tissue.

Hemolysis was seen between the muscle fibers. At 14 days, there was irregular fibrous connective tissue proliferation with congested blood vessels seen in the gap with mononuclear cell infiltration. In group II at three days postoperative, severe inflammatory cell infiltration was observed, mainly neutrophils with proliferation of fibroblasts from a few fibrous connective tissues. On the 7(th) day, the main lesion was characterized by severe granulation tissue that consisted of proliferation of fibrous connective tissue and congested blood vessels in the gap of the incision with mononuclear cell infiltration. CONCLUSIONS: The study found that low level laser therapy (II) was effective in open wounds, which showed better regeneration and faster restoration of structural and functional integrity as compared to the control group.

Low-level laser therapy in different stages of rheumatoid arthritis: a histological study. Rheumatoid arthritis (RA) is an autoimmune inflammatory disease of unknown etiology. Treatment of RA is very complex, and in the past years, some studies have investigated the use of low-level laser therapy (LLLT) in treatment of RA. However, it remains unknown if LLLT can modulate early and late stages of RA. With this perspective in mind, we evaluated histological aspects of LLLT effects in different RA progression stages in the knee. It was performed a collagen-induced RA model, and 20 male Wistar rats were divided into 4 experimental groups: a non-injured and non-treated control group, a RA non-treated group, a group treated with LLLT (780Â nm, 22Â mW, 0.10Â W/cm(2), spot area of 0.214Â cm(2), 7.7Â J/cm(2), 75Â s, 1.65Â J per point, continuous mode) from 12th hour after collagen-induced RA, and a group treated with LLLT from 7th day after RA induction with same LLLT parameters. LLLT treatments were performed once per day. All animals were sacrificed at the 14th day from RA induction and articular tissue was collected in order to perform histological analyses related to inflammatory process. We observed that LLLT both at early and late RA progression stages significantly improved mononuclear inflammatory cells, exudate protein, medullary hemorrhage, hyperemia, necrosis, distribution of fibrocartilage, and chondroblasts and osteoblasts compared to RA group (pâ€‰<â€‰0.05). We can conclude that LLLT is able to modulate inflammatory response both in early as well as in late progression stages of RA. Collagen Animals;Arthritis, Rheumatoid;Chondrocytes;Collagen;Disease Models, Animal;Exudates and Transudates;Fibrocartilage;Low-Level Light Therapy;Male;Osteoblasts;Rats;Rats, Wistar

Low-level laser therapy on the treatment of oral and cutaneous pemphigus vulgaris: case report. Pemphigus vulgaris is a chronic autoimmune mucocutaneous disease that initially is manifested by painful intraoral erosions and ulcers which spread to other mucosa and the skin, generally more than 5Â months after oral lesion manifestation. The treatment consists of prednisone alone or in combination with an immunosuppressive agent, and the clinical response is perceived within 2 to 4Â weeks. Low-level laser therapy has been effective in accelerating the healing of injured tissue, thus inducing cell proliferation and increasing ATP, nucleic acid, and collagen synthesis. We reported two cases of pemphigus vulgaris that received systemic treatment associated with low-level laser therapy for oral and cutaneous lesions. We observed prompt analgesic effect in oral lesions and accelerated healing of oral and cutaneous wounds. Therefore, the present report suggests LLLT as a noninvasive technique that should be considered as an adjuvant therapy in oral and skin disorders in patients with PV. Immunosuppressive Agents;Prednisone Adult;Humans;Immunosuppressive Agents;Low-Level Light Therapy;Male;Middle Aged;Mouth Diseases;Mouth Mucosa;Pemphigus;Prednisone;Radiotherapy, Adjuvant;Wound Healing

Combined fractionated CO2 and low-power erbium:YAG laser treatments. This article addresses the use of fractionated CO(2) laser and erbium:YAG laser for facial rejuvenation. Outcomes and limitations of these techniques are discussed, along with a stepwise summary of techniques as they are used in clinical practice. An evaluation of patient satisfaction is presented for a group of patients

who underwent combined fractional CO(2) and erbium:YAG facial resurfacing.
Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Rejuvenation;Skin

Latest innovations for tattoo and permanent makeup removal. The goal of this article is to reveal the latest techniques and advances in laser removal of both amateur and professional tattoos, as well as cosmetic tattoos and permanent makeup. Each pose different challenges to the removing physician, but the goal is always the same: removal without sequelae. The authors' technique is detailed, and discussion of basic principles of light reflection, ink properties, effects of laser energy and heat, and outcomes and complications of tattoo removal are presented. Humans;Low-Level Light Therapy;Tattooing

Treatment of experimental periodontitis in rats using repeated adjunctive antimicrobial photodynamic therapy. The aim of this study was to histologically and histometrically evaluate the influence of repeated adjunctive antimicrobial photodynamic therapy (aPDT) on bone loss (BL) in furcation areas in rats. Periodontitis was induced by placing a ligature around the mandibular molar in 75 rats. The animals were divided into five groups: the SS group was treated with saline solution (SS); the SRP group received scaling and root planing (SRP); the aPDT1 group received SRP as well as toluidine blue (TBO) and low-level laser therapy (LLLT; InGaAlP, 660 nm; 4.94 J/cm(2)/point) postoperatively at 0 h; the aPDT2 group received SRP as well as TBO and LLLT postoperatively at 0, 24, 28, and 72 h; and the aPDT3 group received SRP, TBO, and LLLT postoperatively at 0, 48, 96, and 144 h. The area of BL in the furcation region of the molar was histometrically analyzed. Data were analyzed statistically ($P < 0.05$). Animals treated with a single episode of aPDT showed less BL at days 7 and 30 than those who received only SRP treatment. No significant differences were found among the aPDT groups ($P > 0.05$). Repeated aPDT did not improve BL reduction when compared to a single episode of aPDT. Tolonium Chloride;Sodium Chloride Alveolar Bone Loss;Analysis of Variance;Animals;Dental Scaling;Low-Level Light Therapy;Male;Periodontitis;Rats;Rats, Wistar;Root Planing;Sodium Chloride;Tolonium Chloride

The efficacy of the use of IR laser phototherapy associated to biphasic ceramic graft and guided bone regeneration on surgical fractures treated with miniplates: a Raman spectral study on rabbits.
The aim of the present study was to assess, by Raman spectroscopy, the repair of surgical fractures fixed with internal rigid fixation (IRF) treated or not with IR laser (Î»780Â nm, 50Â mW, 4â€‰Ã—â€‰4Â J/cm(2)â€‰=â€‰16Â J/cm(2), Ï•â€‰=â€‰0.5Â cm(2), CW) associated or not to the use of hydroxyapatite and guided bone regeneration (GBR). Surgical tibial fractures were created under general anesthesia on 15 rabbits that were divided into five groups, maintained on individual cages, at day/night cycle, fed with solid laboratory pelted diet and had water ad libitum. The fractures in groups II, III, IV and V were fixed with miniplates. Animals in groups III and V were grafted with hydroxyapatite and GBR technique used. Animals in groups IV and V were irradiated at every other day during 2Â weeks (4â€‰Ã—â€‰4Â J/cm(2), 16Â J/cm(2)â€‰=â€‰112Â J/cm(2)). Observation time was that of 30Â days. After animal death, specimens were taken and kept in liquid nitrogen and used for Raman spectroscopy. Raman spectroscopy showed significant differences between groups (pâ€‰<â€‰0.001). Basal readings showed mean value of 1,234â€‰Â±â€‰220.1. Group internal rigid fixation + biomaterial + laser showed higher readings (3,521â€‰Â±â€‰2,670) and group internal rigid fixation + biomaterial the lowest (212.2â€‰Â±â€‰119.8). In conclusion, the results of the present investigation are important clinically as spectral analysis of bone component evidenced increased levels of CHA on fractured sites by using the association of laser light to a ceramic graft.
Bone Substitutes;Durapatite Animals;Bone Plates;Bone Regeneration;Bone Substitutes;Ceramics;Durapatite;Fracture Fixation, Internal;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Rabbits;Spectrum Analysis, Raman;Tibial Fractures

Laser-assisted surgery with different wavelengths: a preliminary ex vivo study on thermal increase and histological evaluation. Since the introduction of laser in clinical practice, different wavelengths have been used for oral surgery on the basis of the different characteristics and affinities of each one. The aim of this study was a comparison of different laser wavelengths in relation to both thermal increase and "histological quality" in a model of soft tissue surgery procedures. Thermal evaluation was realized, during laser-assisted surgery excision performed on a bovine tongue, by a thermal camera device to evaluate thermal increase on the surface of the sample and with four thermocouples to evaluate thermal increase on the depth of the specimen; temperature was recorded before starting surgical procedure and at the peak of every excision. The quality of excision, in terms of tissue damage and regularity, was realized by two blind examiners on the basis of established criteria. The highest superficial thermal increase was recorded for Superpulse 5-W CO2 laser, the lowest one for Er:YAG laser. The highest in depth thermal increase was recorded for 5Â W Diode laser, the lowest one for Er:YAG laser. The best quality of incision was obtained with a 3-W CO2 laser and 3-W diode laser; epithelial, stromal, and vascular damages were evaluated with different degrees for all the used wavelengths with the best result, in terms of "tissue respect," for Er:YAG laser. In all the surgical procedures performed, thermal increase was evaluated until the end of the procedure; at remaining tissue level, thermal decrease was evaluable in the few seconds after surgery. The Er:YAG laser was the device with a lower influence on thermal increase; CO2 and diode lasers revealed a good histological quality. Further studies may be necessary to test the reliability of laser devices for the excision of all the types of specimens needing histological evaluation and diagnosis. Animals;Cattle;Epithelial Cells;In Vitro Techniques;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Oral Surgical Procedures;Stromal Cells;Temperature;Tongue

The effects of light on bleaching and tooth sensitivity during in-office vital bleaching: a systematic review and meta-analysis. OBJECTIVE: To evaluate the influence of light on bleaching efficacy and tooth sensitivity during in-office vital bleaching. DATA SOURCES: We performed a literature search using Medline, EMBASE and Cochrane Central up to September 2011. STUDY SELECTION: All randomised controlled trials (RCTs) or quasi-RCTs comparing the light-activated bleaching system with non-activation bleaching system were included. Reports without clinical data concerning bleaching efficacy or tooth sensitivity were excluded. RESULTS: Eleven studies were included in the meta-analysis. A light-activated system produced better immediate bleaching effects than a non-light system when lower concentrations of hydrogen peroxide (15-20% HP) were used (mean difference [MD], -1.78; 95% confidence interval [CI]: [-2.30, -1.26]; P<0.00001). When high concentrations of HP (25-35%) were employed, there was no difference in the immediate bleaching effect (MD, -0.39; 95% CI: [-1.15, 0.37]; P=0.32) or short-term bleaching effect (MD, 0.25; 95% CI: [-0.47, 0.96]; P=0.50) between the light-activated system and the non-light system. However, the light-activated system produced a higher percentage of tooth sensitivity (odds ratio [OR], 3.53; 95% CI: [1.37, 9.10]; P=0.009) than the non-light system during in-office bleaching. CONCLUSIONS: Light increases the risk of tooth sensitivity during in-office bleaching, and light may not improve the bleaching effect when high concentrations of HP (25-35%) are employed. Therefore, dentists should use the light-activated system with great caution or avoid its use altogether. Further rigorous studies are, however, needed to explore the advantages of this light-activated system when lower concentrations of HP (15-20%) are used. Tooth Bleaching Agents;Hydrogen Peroxide Humans;Hydrogen Peroxide;Light;Low-Level Light Therapy;Photobleaching;Randomized Controlled Trials as Topic;Tooth Bleaching;Tooth Bleaching Agents;Toothache

Cyanoacrylate versus laser in the treatment of dentin hypersensitivity: a controlled, randomized, double-masked and non-inferiority clinical trial. BACKGROUND: Dentin hypersensitivity (DH) is a painful, exaggerated response to normal stimuli, such as cold, sweetness, and brushing. The aim of

the present controlled, randomized, double-masked, non-inferiority clinical trial is to evaluate the effectiveness of cyanoacrylate in the treatment of DH when compared to the application of low-intensity laser. METHODS: The study includes 434 sensitive teeth from 62 patients. A total of 216 teeth were treated with laser and 218 with cyanoacrylate. A numeric rating scale was used to record the parameters of pain related to the stimuli at baseline and after the treatment at intervals of 24 hours and 30, 90, and 180 days. RESULTS: Both groups had significant reductions in DH. However, there was no significant difference between the two groups â‰¤6 months. Intragroup analysis showed that the effect of cyanoacrylate obtained at 24 hours remained for 90 days in response to air-jet test and 30 days for cold-spray test. There was a statistically significant difference between all other intragroup comparisons at the time intervals (P <0.001). CONCLUSIONS: It was concluded that cyanoacrylate is as effective as low-intensity laser in reducing DH. In addition, it is a more accessible and low-cost procedure and can be safely used in the treatment of DH. Cyanoacrylates;Tissue Adhesives Adolescent;Adult;Child;Cyanoacrylates;Dentin Sensitivity;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Tissue Adhesives;Treatment Outcome;Young Adult

The effect of an 810-nm diode laser on postoperative pain and tissue response after modified Widman flap surgery: a pilot study in humans. BACKGROUND: The purpose of this single-masked pilot clinical study is to compare the tissue response and postoperative pain after the use of a diode laser (810 nm) (DL) as an adjunct to modified Widman flap (MWF) surgery to that of MWF alone. METHODS: Thirteen patients with generalized severe chronic periodontitis completed the study. Control sites were randomly selected to receive an MWF and the contralateral test sites an MWF in conjunction with a DL. The study tooth/site was treated plus any additional teeth in the quadrant in which the site was located, if needed. Randomization was done using a coin flip. The DL was used to de-epithelialize the inner part of the periodontal flap and photo-biostimulate the surgical area. Pain scale assessment (PS), pain medication consumption (PM), tissue edema (TE), and tissue color (TC) were evaluated 1 week after surgery. RESULTS: Statistically significant differences were seen for TE (P = 0.041), PM (P <0.001), and PS (P <0.001) favoring test sites. TC did not show a statistically significant difference (P = 0.9766). Patients rated the first surgical treatment (test or control; random assignment to first treatment) performed as more painful than the second (P <0.002). CONCLUSION: The use of an 810-nm diode laser provided additional benefits to MWF surgery in terms of less edema and postoperative pain. Analgesics, Non-Narcotic;Ibuprofen Analgesics, Non-Narcotic;Chronic Periodontitis;Color;Combined Modality Therapy;Edema;Female;Humans;Ibuprofen;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Pain, Postoperative;Periodontal Pocket;Pilot Projects;Postoperative Complications;Single-Blind Method;Surgical Flaps;Treatment Outcome;Wound Healing

In vitro evaluation of dentin tubule occlusion by Denshield and Neodymium-doped yttrium-aluminum-garnet laser irradiation. INTRODUCTION: This in vitro study evaluated the efficacy of bioglass (Denshield; Novamin Technology, Alachua, FL) and Neodymium-doped yttrium-aluminum-garnet (Nd:YAG) laser irradiation on dentinal tubuli orifice occlusion (DOO) by comparing samples examined under environmental scanning electron microscope (ESEM) after applying each desensitizing approach separately and in combination. METHODS: Forty-eight human molars were collected, randomly organized in 4 equal groups, and had their cervical dentin exposed. Additionally, in half of the specimens of each experimental group, the smear layer was removed (subgroups A1, B1, C1, and D1). Group A received NovaMin paste treatment for 5 minutes (NM) to the experimental surface. Group B received Nd:YAG laser irradiation (0.5 w, 10 Hz, and 50 mJ) (L). Group C received NM followed by L. Group D was treated with L followed by NM. All specimens were stored for 24 hours

and evaluated for DOO under ESEM by 4 blinded observers. RESULTS: The presence of a smear layer significantly contributed to DOO regardless of the treatment modality (ordinal logistic regression, P < .001). Compared with group A, all other treatments delivered significantly more occluded dentin orifices (P < .001 for groups B and D and P < .05 for group C). A layer formation was observed in subgroups C2 and D2. CONCLUSIONS: Under these experimental conditions, a smear layer was essential for successful DOO. Laser irradiation alone and combined with NovaMin proved superior to NovaMin alone on DOO. This combined approach has the potential to improve the outcome of treatment for cervical dentin hypersensitivity. The biological significance of this newly formed layer needs to be elucidated. Dentin Desensitizing Agents;NovaMin Dentin;Dentin Desensitizing Agents;Dentin Sensitivity;Glass;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Microscopy, Electron, Scanning;Smear Layer;Time Factors;Tooth Cervix

Single treatment of non-melanoma skin cancers using a pulsed-dye laser with stacked pulses. BACKGROUND AND OBJECTIVE: Non-melanoma skin cancers are the most common cause of cancer worldwide. Within this grouping, the most common skin cancer is basal cell carcinoma (BCC) followed by squamous cell carcinoma (SCC). Recent evidence has shown that BCCs can be cleared by a pulsed-dye laser after multiple treatments using a single pass setting. Given the necessity for multiple treatments in the prior studies, we sought to determine whether tumor clearance could instead be achieved using a single treatment of the pulsed-dye laser in a stacked pulse setting. STUDY DESIGN/MATERIALS AND METHODS: Twenty patients with 23 biopsy-proven BCCs and SCCIS that measured 0.4-3 cm in size and located on the trunk and extremities were recruited for this study. The lesions were randomized into three study arms: a control group (no treatment), first treatment group (S1), and second treatment group (S2). The S1 group was treated using a 595 nM pulsed-dye laser (PDL) at pulse energy of 15 J/cm(2), 3-millisecond pulse length, with no dynamic cooling, using a 7-mm spot size with 10% overlap of pulses and two passes. The S2 group was treated using the same 595 nM PDL at 7.5 J/cm(2), 3-millisecond pulse length, with no dynamic cooling, using a 10-mm spot size with 10% overlap of pulses and double stacked pulses. All the treated lesions were treated with a 4 mm margin of clinically normal skin. The lesions were subsequently surgically excised and examined by histopathology. RESULTS: There was no significant difference in the dimensions of the tumors between the three study arms, with a mean area of 94 mm(2) [SEMâ€‰Â±â€‰15.2] for the control group, 88 mm(2) [SEMâ€‰Â±â€‰12.1] for the S1 treatment group, and 105 mm(2) [SEMâ€‰Â±â€‰23.6] for the S2 treatment group. In the control group, there were two out seven lesions with no residual tumors, representing a background tumor clearance rate of approximately 28%. The S1 treatment group had two out of eight lesions with no residual lesion representing a clearance rate of 25%, similar to the background clearance rate. The S2 treatment group had a clearance rate of five out seven lesions, representing a clearance rate of 71%. The two lesions with residual tumors were noted to be beyond the central treatment zone by histopathology and if excluded, results in a clearance rate of 100%. By the Fisher's exact test with a Bonferroni correction, there is a trend towards significance between the S2 treatment group and the control group with a P-value of 0.028. CONCLUSIONS: The results of our pilot study suggest that BCCs and SCCIS can be cleared in a single treatment using a pulsed-laser in a stacked pulse setting. However, given the small sample size of this pilot study, further larger scale studies will be needed to determine statistical significance and long-term recurrence rate and to further validate these findings.
Aged;Aged, 80 and over;Carcinoma, Basal Cell;Carcinoma, Squamous Cell;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Skin Neoplasms

Er:YAG laser versus systemic metronidazole as an adjunct to nonsurgical periodontal therapy: a clinical and microbiological study. OBJECTIVE: The objective of this randomized clinical trial was to describe the clinical and microbiological results obtained by treatment with Er:YAG laser and

systemic metronidazole used as adjuncts to mechanical subgingival debridement in chronic periodontitis. METHODS: Twenty-seven chronic periodontitis (CP) patients were randomly divided into three parallel groups each comprising nine individuals with at least four teeth having at least one approximal site with a probing depth (PD) of â‰¥5â€‰mm and gingival index (GI) of â‰¥2 in each quadrant. Groups of patients received: (1) Scaling and root planing (SRP)+ Er:YAG laser (10â€‰hz, 30â€‰mJ/pulse, 1â€‰min per pocket, apico-coronal direction in parallel paths with 30 degree angle tips, under water irrigation), (2) SRP+ systemic metronidazole, or (3) SRP alone. In all treatment groups, SRP was performed at 1 week intervals in two sessions. The microbiological and clinical effects of the treatments were evaluated after 90 days. RESULTS: At the end of the experimental period, statistically significant improvements in plaque index, GI, PD and attachment level, as well as reductions in the number of total bacteria and proportions of obligately anaerobic microorganisms were observed within each group. Although intergroup comparisons revealed no significant microbiological differences, clinical parameters as attachment gain and PD reduction were found significantly higher in Group 1 compared with the other groups. CONCLUSIONS: Within its limits, this study demonstrated the possibility of better resolution of infection with combined SRP+Er:YAG laser treatment. However, microbiological results failed to demonstrate significant advantages of this combination in comparison with SRP alone or SRP+systemic metronidazole. Metronidazole Administration, Oral;Adult;Aged;Chronic Periodontitis;Combined Modality Therapy;Dental Plaque Index;Dental Scaling;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Metronidazole;Middle Aged;Multivariate Analysis;Periodontal Index;Periodontal Pocket;Risk Assessment;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome

Laser GaAlAs (Î»860 nm) photobiomodulation for the treatment of bisphosphonate-induced osteonecrosis of the jaw. OBJECTIVE: The aim of this article is to report a case of bisphosphonate-induced osteonecrosis (ONJ-BP) of the jaw treated by curettage of the necrotic bone, low-level laser therapy (LLLT), and antibiotic therapy. BACKGROUND DATA: ONJ-BP is characterized by painful ulcerations of the oral mucosa, is prone to bone necrosis that does not heal within 8 weeks after diagnosis, and is often difficult to treat. No definitive standard of care has been established for ONJ-BP. LLLT improves wound healing, relieves pain, and appears to be a promising treatment modality for patients with ONJ-BP. MATERIALS AND METHODS: An 82-year-old man taking intravenous bisphosphonate presented with ONJ-BP after tooth extraction. The patient was treated by LLLT using a GaAlAs diode laser with the following settings: wavelength, 860 nm; 70 mW; continuous wave; and spot size 4 mm(2). An energy density of 4.2 J/cm(2) per point was applied in a punctual contact manner every 48 h for 10 days, in association with antibiotic therapy and curettage of the necrotic bone. Reduction in painful symptoms was reported after the second irradiation session, and tissue healing was complete at the end of the third week following oral curettage. The patient was followed up for 12 months and exhibited good oral healt and quality of life. CONCLUSIONS: The therapeutic protocol used in this study had a positive effect on tissue healing and remission of painful symptoms, resulting in better oral health and quality of life for the patient. Aged, 80 and over;Bisphosphonate-Associated Osteonecrosis of the Jaw;Humans;Jaw Diseases;Lasers, Semiconductor;Low-Level Light Therapy;Male

In vitro analysis of bacterial morphology by atomic force microscopy of low level laser therapy 660, 830 and 904 nm. OBJECTIVE: The objective of this study was to analyze the bacterial morphology by atomic force microscopy (AFM) after the application of low-level laser therapy (LLLT) in in vitro culture of Staphylococcus aureus ATCC 29213. BACKGROUND DATA: Infections caused by S. aureus are among the highest occurring in hospitals and can often colonize pressure ulcers. LLLT is among the methods used to accelerate the healing of ulcers. However, there is no consensus on its effect on bacteria. MATERIALS AND METHODS: After being cultivated and seeded, the cultures were irradiated

using wavelengths of 660, 830, and 904 nm at fluences of 0, 1, 2, 3, 4, 5, and 16 J/cm(2). Viable cells of S. aureus strain were counted after 24 h incubation. To analyze the occurrence of morphological changes, the topographical measurement of bacterial cells was analyzed using the AFM. RESULTS: The overall assessment revealed that the laser irradiation reduced the S. aureus growth using 830 and 904 nm wavelengths; the latter with the greatest inhibition of the colony-forming units (CFU/mL) (331.1Â±38.19 and 137.38Â±21.72). Specifically with 660 nm, the statistical difference occurred only at a fluence of 3 J/cm(2). Topographical analysis showed small changes in morphological conformity of the samples tested. CONCLUSIONS: LLLT reduced the growth of S. aureus with 830 and 904 nm wavelengths, particularly with 904 nm at a fluence of 3 J/cm(2), where the greatest topographical changes of the cell structure occurred. Colony Count, Microbial;Low-Level Light Therapy;Microscopy, Atomic Force;Radiation Dosage;Staphylococcus aureus

Interferential laser therapy in the treatment of shoulder pain and disability from musculoskeletal pathologies: a randomised comparative study. BACKGROUND: Interference is an important feature of the waves. When two or more in phase light waves meet, a new and reinforced wave is generated. Shoulder pain is a common clinical problem and laser is one of the treatments frequently used to relieve it. OBJECTIVE: To test the safety of interferential laser therapy generated by two independent low level lasers and compare its effectiveness with conventional single laser therapy in the reduction of shoulder musculoskeletal pain and associated disability. DESIGN: Randomised and single-blind controlled clinical trial. SETTING: Physiotherapy Unit and Rehabilitation Department of Ramon y Cajal University Hospital (Madrid). PARTICIPANTS: 200 patients with shoulder musculoskeletal pain were randomly assigned in two groups, 100 people each. INTERVENTIONS: Group I, experimental (n=100) received interferential laser, placing two probes opposite each other over the shoulder joint. Group II, control (n=100) received conventional laser therapy, using a single probe along with a second inactive dummy probe. Lasers used were GaAlAs diode (810 nm, 100 mW), in continuous emission. Laser was applied in contact mode through ten sessions, on 5 shoulder points (7 Joules/point) per session. MAIN OUTCOME MEASURES: visual analogue scale (VAS) score and shoulder pain disability index (SPADI), recorded before and after laser treatment. RESULTS: There were no differences between both groups in the reduction of pain, either assessed by VAS scale (median difference=0, 95% CI of the difference = -.6 to .5, p = 0.81) or SPADI index (median difference = .4, 95% CI of the difference = -2.9 to 3.8, p = 0.80), using the Mann-Whitney U-test. Comparison between the scores recorded before and after the treatment, within each group, showed significant differences for VAS during movement (median difference=3, 95% CI of the difference = 2.07 to 4, $p < 0.001$) and SPADI index (median difference=3.5, 95% CI of the difference = 2.67 to 3.85, Wilcoxon test, $p < 0.001$), for both groups. CONCLUSIONS: In this study, the application of two low level lasers in order to generate interference inside the irradiated tissue showed to be a safe therapy. Both interferential and conventional laser therapy reduced shoulder pain and disability. Nevertheless, differences between them were not detected. Future research in this field could include applying this technique with other laser parameters or application forms. Disability Evaluation;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Musculoskeletal Pain;Pain Measurement;Range of Motion, Articular;Shoulder Pain;Single-Blind Method

Dual role of cyclooxygenase-2 during tissue repair induced by low level laser therapy: an intriguing issue. Tissue repair is an excellent example of pathophysiological model for studying the role of cyclooxygenase-2 (COX-2) on eukaryotic cells. It has been established that two COX isoforms are expressed in human tissues: constitutive or induced. COX-1 activity is constitutive, present in nearly all cell types at a constant level; COX-2 activity is normally absent from cells, and when induced, the protein levels increase and decrease in a matter of hours after a single stimulus. Thus, the purpose of this review was to describe the role of COX-2 during tissue repair induced by low level laser therapy

(LLLT) in humans and experimental models. COX-2 expression has been implicated in the onset or the exacerbation of inflammation during tissue repair induced by LLLT in a number of studies, Many studies are conducted to investigate the role of COX-2 during tissue repair induced by LLLT using different experimental protocols and dosages. Therefore, this is an area that warrants investigation, since the estimation of COX-2 expression from using such important techniques in therapeutics with respect to tissue repair will be added to those already established in the literature as a way to improve health status and prevention of side effects. Inflammation Mediators;Cyclooxygenase 1;Cyclooxygenase 2 Animals;Cyclooxygenase 1;Cyclooxygenase 2;Humans;Inflammation;Inflammation Mediators;Low-Level Light Therapy;Rats;Rejuvenation;Wound Healing

Pigmentation above the constitutive level: an indicator of excimer laser radiation-induced erythema in Koreans. Ultraviolet (UV) irradiation induces skin erythema, but it is not clear which factors have the greatest effects on UV sensitivity. Six healthy Korean adult men were enrolled and their melanin index (MI) and increment of erythema index (Î”EI) were measured. In each individual, 12 different sites were selected and 36 spots were irradiated with a single shot of monochromatic excimer laser with a dose of 350 mJ/cm(2) . The sites were categorized into three groups based on the cumulative sun exposure: UZ, unexposed zones; FEZ, frequently exposed zones; and IEZ, intermittently exposed zones. The sun exposure indexes (SEI) were also calculated based on previously described methods. Î”EI, MI and SEI were measured and calculated. The Î”EI of UZ was significantly higher than that of FEZ, but lower than that of IEZ. In general, there was a significant relationship between Î”EI and MI (R(2) = 0.135). However, IEZ did not show significant results. In contrast, there was a stronger relationship between Î”EI and SEI (R(2) = 0.344). Overall, the values were significantly higher for the SEI (0.541 [UZ], 0.281 [IEZ] and 0.228 [FEZ]) than for MI (0.311 [UZ], 0.011 [IEZ] and 0.073 [FEZ]). There were significant site variations in UV sensitivity along with skin pigmentation. In addition, significant differences were observed according to the exposure frequency. The SEI was found to be strongly correlated with UV sensitivity. These results suggest that the induced level of pigmentation above the constitutive level will be a better indicator for UV sensitivity than baseline MI. Melanins Adult;Asian People;Erythema;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Melanins;Middle Aged;Radiation Tolerance;Republic of Korea;Skin Pigmentation;Sunlight

In vitro guidance of dental pulp cells by Nd:YAG laser-irradiated endothelial cells. OBJECTIVE: After endothelial cells were ablated by neodymium:yttrium-aluminum-garnet (Nd:YAG) laser irradiation, we investigated the response of pulp cells by examining the expression of transforming growth factor beta-1 (TGF-Î²1). BACKGROUND DATA: The reaction of stimulated blood vessels is related to the initiation of dentinogenesis. After artificial injury of endothelial cells, pulp cells migrate to the site of the injured endothelial cells. MATERIALS AND METHODS: Rat aortic endothelial cells were cultured in the lower compartment of the experimental assembly, and a pulsed Nd:YAG laser was used to ablate these cells. Pulp cells were fluorescence labeled and cultured in the upper compartment. After 7-14 days of laser irradiation, total RNA was extracted from the cells in the lower chamber, and RT-PCR was performed to examine the expression of TGF-Î²1 and osteocalcin mRNA. TGF-Î²1 was also examined with immunohistochemistry. RESULTS: Seven days after laser irradiation, migrating pulp cells that expressed TGF-Î²1 were observed in the lower compartment, and the expression of TGF-Î²1 mRNA and osteocalcin mRNA was altered. Without laser irradiation, few migrating pulp cells were observed, and the expression of TGF-Î²1 mRNA and osteocalcin mRNA was weak. These results suggested that TGF-Î²1 mRNA expression is detected earlier in pulp cells rather than in endothelial cells following injury to endothelial cells. CONCLUSIONS: Using the Nd:YAG laser as an ablative stimulant, this study model was useful for investigating pulp-endothelial cell

interactions in reparative dentinogenesis. RNA, Messenger;Transforming Growth Factor beta1;yttrium-aluminum-garnet;Osteocalcin;Yttrium;Aluminum Aluminum;Animals;Cell Movement;Cells, Cultured;Dental Pulp;Dentinogenesis;Endothelial Cells;Immunohistochemistry;In Vitro Techniques;Low-Level Light Therapy;Male;Models, Animal;Osteocalcin;RNA, Messenger;Random Allocation;Rats;Rats, Wistar;Reverse Transcriptase Polymerase Chain Reaction;Transforming Growth Factor beta1;Yttrium

Effect of low-level laser therapy on intramembranous and endochondral autogenous bone grafts healing. The aim of this study was to evaluate the healing process of intramembranous (IM) and endochondral (EC) bone grafts under low-level laser therapy (LLLT). Male rabbits underwent onlay autogenous bone grafts (1 cm in diameter) retrieved from the calvaria and iliac crest and fixed on parietal bones, divided into four groups: Calvaria (C), Iliac (I), Calvaria + LLLT (C+L), and Iliac + LLLT (I+L). Animals from C+L and I+L Groups had their grafts exposed to LLLT (AlGaAs-808 nm, CW, 30 mW, 0.028 cmÂ² average laser beam area), 15 s irradiation time (16 J/cmÂ² per point-total of 64 J/cmÂ² per session). After 7, 14, 30, and 60 days, grafts were retrieved and resorption pattern analyzed by means of morphometry and TRAP-positive osteoclasts detection. Differences in the resorption levels of iliac grafts were observed, presenting 40% in I group against 8% in I+L grafts at the 14th day of evaluation ($P < 0.05$). After 30 days, resorption was maintained at 41% in I group, whereas I+L presented 15% in the same period ($P = 0.0591$). No significant differences were noted in the rates of calvaria grafts resorption in all periods. A significant higher number of osteoclasts on the grafts' surface was observed in C+L Group at day 30, in comparison with C group. In I+L Group, prevalence of osteoclasts was marked at day 7 ($P < 0.05$) in comparison to I Group. In general, it was concluded that biomodulative effects of LLLT did not significantly affect healing and resorption processes of autogenous bone grafts from EC and IM origins. Animals;Bone Transplantation;Immunohistochemistry;Low-Level Light Therapy;Male;Microscopy;Pelvic Bones;Rabbits;Skull;Time Factors;Treatment Outcome

Laser-assisted nasal decolonization of Staphylococcus aureus, including methicillin-resistant Staphylococcus aureus. OBJECTIVES: Methicillin-sensitive Staphylococcus aureus (MSSA) and methicillin-resistant S aureus (MRSA) contribute to 25% of nosocomial infections, increasing complications, health care cost, and growing antibiotic resistance. Nasal decolonization (ND) can reduce the staphylococcal infection rate. A new method of laser therapy (LT) MRSA ND was tested. STUDY DESIGN: This is a prospective, nonrandomized study. METHODS: Following institutional review board approvals, 25 patients colonized with MSSA/MRSA were allocated to 4 treatment arms; low-power, dual-wavelength 870-/930-nm laser alone (GR1); low-power, dual-wavelength laser followed by erythromycin (E-mycin) cream (GR2); low-power, dual-wavelength laser followed by peroxide irrigation (GR3); and high-power 940-nm laser alone (GR4). Quantitative cultures were obtained before and after in all arms. Laser therapy was performed via a laser fiber diffuser, delivering 200 to 600 J/cmÂ² to each naris circumferentially. Patient's distribution was 3 in GR1, 14 in GR2, 4 in GR3, and 4 in GR4 (last 10 recruited to GR4). RESULTS: Nasal decolonization for GR1, GR2, GR3, and GR4 was 1 of 3, 13 of 14, 2 of 4, and 4 of 4, respectively. Because LT + E-mycin cleared all first 3 patients of MRSA and MSSA, all remaining patients were treated with LT + Er with over 90% of patients clearing. No adverse events or discomfort were reported. CONCLUSIONS: First human study using LT and topical E-mycin in ND is presented. Laser therapy can eradicate MRSA and potentially resensitization of bacteria to the antimicrobial effect of erythromycin. Although decolonization was maintained at 4 weeks posttreatment, further studies can determine the LT long-term effect. Colony Count, Microbial;Cross Infection;Follow-Up Studies;Humans;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Prospective Studies;Rhinitis;Staphylococcal Infections;Treatment Outcome

Effects of pulsed infra-red low level-laser irradiation on open skin wound healing of healthy and streptozotocin-induced diabetic rats by biomechanical evaluation. Diabetes is one of the most common causes of delayed wound healing. Low-level laser therapy (LLLT) are one of the therapeutic modalities used for the treatment of wounds. The aim of present study is to evaluate the effect of LLLT in experimentally-induced diabetic rats. Two full thickness skin incisions were made on dorsal regions of each rat. The wounds were randomly divided into laser-treated and placebo. Laser-treated wounds of the healthy (non-diabetic) animals were submitted to a pulsed-infrared 890nm laser with an 80Hz frequency and 0.03J/cm(2) for each wound point in the first healthy group and 0.2J/cm(2) in the second healthy group. Laser-treated wounds of the diabetic animals received the same pulsed-infrared laser treatments as the second group for each wound point. On day 15, a sample from each wound was extracted and submitted for tensile strength evaluation. Laser irradiation with 0.03J/cm(2) significantly decreased the maximum load for wound repair in healthy rats (p=0.015). Laser irradiation with 0.2J/cm(2) significantly increased the maximum load in wounds from the healthy control (p=0.021) and diabetic (p<001) groups. Laser treatments with a pulsed infrared laser at 0.2J/cm(2) significantly accelerated wound healing in both healthy and diabetic rats. Animals;Biomechanical Phenomena;Diabetes Mellitus, Experimental;Disease Models, Animal;Low-Level Light Therapy;Rats;Rats, Wistar;Skin;Wound Healing

Low-intensity laser irradiation at 660 nm stimulates cytochrome c oxidase in stressed fibroblast cells. BACKGROUND AND OBJECTIVE: Low-intensity laser irradiation (LILI) has been used to modulate a variety of biological processes, including diabetic wound healing. The mechanism of action is thought to exist primarily with the mitochondria. This study aimed to determine the effect of irradiation on normal, diabetic, and ischemic mitochondrial electron transport chain (ETC) complexes. MATERIALS AND METHODS: Normal, diabetic and ischemic human skin fibroblast mitochondria were irradiated in vitro at a wavelength of 660 nm and a fluence of either 5 or 15 J/cm(2). Non-irradiated mitochondria served as controls. Enzyme activities of mitochondrial complexes I, II, III, and IV were determined immediately post-irradiation. Normal, diabetic, and ischemic cells were irradiated and adenosine triphosphate (ATP) and active mitochondria were determined by luminescence and fluorescent microscopy, respectively. RESULTS: Irradiated diabetic mitochondria at a fluence of 15 J/cm(2) showed a significant decrease in complex III activity (Pâ€‰<â€‰0.05). Normal (Pâ€‰<â€‰0.01) and diabetic (Pâ€‰<â€‰0.05) mitochondria irradiated at either 5 or 15 J/cm(2) showed a significant increase in complex IV activity. ATP results showed a significant increase in irradiated normal cells (5 J/cm(2); Pâ€‰<â€‰0.05) and diabetic cells (15 J/cm(2); Pâ€‰<â€‰0.01). There was a higher accumulation of active mitochondria in irradiated cells than non-irradiated cells. CONCLUSION: Irradiation at 660 nm has the ability to influence mitochondrial enzyme activity, in particular cytochrome c oxidase. This leads to increased mitochondrial activity and ATP synthesis. Biomarkers;Electron Transport Chain Complex Proteins;Adenosine Triphosphate;Electron Transport Complex IV Adenosine Triphosphate;Biomarkers;Cells, Cultured;Diabetes Mellitus;Electron Transport Chain Complex Proteins;Electron Transport Complex IV;Fibroblasts;Humans;Ischemia;Lasers, Semiconductor;Light;Mitochondria;Skin;Stress, Physiological

Limb blood flow after class 4 laser therapy. CONTEXT: Laser therapy is purported to improve blood flow in soft tissues. Modulating circulation would promote healing by controlling postinjury ischemia, hypoxia, edema, and secondary tissue damage. However, no studies have quantified these responses to laser therapy. OBJECTIVE: To determine a therapeutic dose range for laser therapy for increasing blood flow to the forearm. DESIGN: Crossover study. SETTING: Controlled laboratory setting. PATIENTS OR OTHER PARTICIPANTS: Ten healthy, college-aged men (age = 20.80 Â± 2.16 years, height = 177.93 Â± 3.38 cm, weight = 73.64 Â± 9.10 kg) with no current history of injury to the upper extremity or cardiovascular conditions. INTERVENTION(S): A class 4 laser device was used to

treat the biceps brachii muscle. Each grid point was treated for 3 to 4 seconds, for a total of 4 minutes. Each participant received 4 doses of laser therapy: sham, 1 W, 3 W, and 6 W. MAIN OUTCOME MEASURE(S): The dependent variables were changes in blood flow, measured using venous occlusion plethysmography. We used a repeated-measures analysis of variance to analyze changes in blood flow for each dose at 2, 3, and 4 minutes and at 1, 2, 3, 4, and 5 minutes after treatment. The Huynh-Feldt test was conducted to examine differences over time. RESULTS: Compared with baseline, blood flow increased over time with the 3-W treatment ($F(3,9) = 3.468$, $P < .011$) at minute 4 of treatment (2.417 Â± 0.342 versus 2.794 Â± 0.351 mL/min per 100 mL tissue, $P = .032$), and at 1 minute (2.767 Â± 0.358 mL/min per 100 mL tissue, $P < .01$) and 2 minutes (2.657 Â± 0.369 mL/min per 100 mL tissue, $P = .022$) after treatment. The sham, 1-W, and 6-W treatment doses did not change blood flow from baseline at any time point. CONCLUSIONS: Laser therapy at the 3-W (360-J) dose level was an effective treatment modality to increase blood flow in the soft tissues. Adolescent;Adult;Blood Flow Velocity;Forearm;Hemodynamics;Humans;Low-Level Light Therapy;Male;Regional Blood Flow;Treatment Outcome;Young Adult

Decontamination efficacy of photon-initiated photoacoustic streaming (PIPS) of irrigants using low-energy laser settings: an ex vivo study. AIM: To assess ex vivo, the antibacterial effectiveness of photon-initiated photoacoustic streaming (PIPS) of irrigants using an Er:YAG laser equipped with a newly designed, stripped and tapered tip in extracted teeth with infected root canals. METHODOLOGY: One hundred and forty-eight single-rooted extracted teeth were prepared to a size 25, 0.06 taper. The specimens were sterilized, and all teeth except ten (negative control group) were inoculated with Enterococcus faecalis and incubated in a CO(2) chamber at 37 Â°C for 15 days in Eppendorf tubes filled with trypticase soy broth medium changed every 2 days. Infected teeth were then randomly divided into four test groups (n = 32 for each): pulsed erbium/YAG laser at nonablative settings for 30 s with sterile bi-distilled water (Group A) or 5% sodium hypochlorite (NaOCl) (Group B); without laser-activated sterile bi-distilled water irrigation for 30 s (Group C) or 5% NaOCl irrigation for 30 s (Group D); the positive control group received no treatment in infected teeth (n = 10). Colony-forming units (CFUs) were counted from bacteriologic samples taken before (S1) and after treatment (S2). Data were analysed by Kruskal-Wallis and post hoc Dunn's multiple comparison tests. RESULTS: CFU counts were significantly lower in 5% NaOCl groups with or without laser activation than in sterile bi-distilled water without laser activation group ($P < 0.001$). Moreover, there was a significant difference between bi-distilled water groups with or without laser activation ($P < 0.001$). Sodium hypochlorite with laser activation group had the greatest CFU reduction, which was significantly greater than that evident in bi-distilled water groups with or without laser activation ($P < 0.001$). There were no significant differences between 5% NaOCl groups with or without laser activation ($P > 0.05$). None of the four groups generated negative samples predictably. CONCLUSIONS: Under the conditions of this ex vivo study, there were no significant differences in bacterial reduction between the laser and NaOCl or NaOCl alone groups. [Correction added after online publication, 18th April 2012: The following statement has been deleted: 'Thus, the use of a laser did not improve microbial killing over and above use of NaOCl alone.']. Anti-Bacterial Agents;Peroxides;Root Canal Irrigants;Waxes;RC-Prep;Urea;Edetic Acid;Sodium Hypochlorite Anti-Bacterial Agents;Bacterial Load;Dental Pulp Cavity;Disinfection;Edetic Acid;Enterococcus faecalis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Peroxides;Photoacoustic Techniques;Root Canal Irrigants;Root Canal Preparation;Sodium Hypochlorite;Urea;Waxes

Efficacy of low-level laser therapy (LLLT) in oral mucositis: what have we learned from randomized studies and meta-analyses? Female;Follow-Up Studies;Humans;Low-Level Light

Therapy;Male;Mouth Mucosa;Radiation Dosage;Randomized Controlled Trials as Topic;Stomatitis;Treatment Outcome
Letter regarding "management of ear lobule keloids using 980-nm diode laser". Ear Diseases;Ear, External;Female;Humans;Keloid;Lasers, Semiconductor;Low-Level Light Therapy;Male
Effective treatment of etanercept and phototherapy-resistant psoriasis using the excimer laser. Treatment of moderate-to-severe plaque psoriasis often requires the use of phototherapy or systemic therapy, which includes immunosuppressants, retinoids, and biologic agents. Although biologic use is becoming increasingly popular, it is not uncommon for patients to experience treatment failure. We describe a patient who had a suboptimal response to etanercept monotherapy after twelve weeks of induction dosing (50 mg twice weekly), as well as to a combination of etanercept (50 mg once weekly-maintenance dosing) and narrowband ultraviolet B (NB-UVB) phototherapy three times weekly for an additional twelve weeks. Noticeable improvement was noted after the addition of NB-UVB and the patient's promising response to phototherapy influenced further management. Etanercept and NB-UVB were discontinued and the patient was initiated on excimer laser treatments twice weekly. After 4 weeks, the patient had a 75 percent reduction in Psoriasis Area Severity Index (PASI) score and after 7 weeks had over 95 percent clearance of psoriasis. The unique properties of the excimer laser may account for its clinical efficacy in our patient as well as in other cases of recalcitrant psoriasis. We propose that the excimer laser be considered in cases of biologic or conventional phototherapy failure in addition to being a standard treatment option or adjunct for the treatment of psoriasis. Immunoglobulin G;Receptors, Tumor Necrosis Factor;Etanercept Adult;Etanercept;Humans;Immunoglobulin G;Lasers, Excimer;Low-Level Light Therapy;Male;Phototherapy;Psoriasis;Receptors, Tumor Necrosis Factor;Severity of Illness Index;Treatment Outcome
Laser irradiation did not increase the proliferation or the differentiation of stem cells from normal and inflamed dental pulp. OBJECTIVE: Low-level laser therapy (LLLT) has been reported to be responsible for promoting photostimulatory and photobiomodulatory effects in vivo and in vitro, stimulating cell growth, increasing cell metabolism, improving cell regeneration and invoking an anti-inflammatory response. This study was performed in order to investigate whether low-level laser therapy could increase the proliferation and differentiation potentials of hDPSC isolated from healthy dental pulps and from inflamed pulps. DESIGN: Human dental pulp stem cells (hDPSC) were isolated from normal and inflamed dental pulps from different patients. STRO-1-positive cells were isolated and irradiated with a red low-level laser (660 nm) in four different energy fluences (0.05, 0.30, 7 and 42 J/cm(2)); the authors hypothesized that the first three fluences would promote biostimulatory effects, whereas the highest dose would induce antiproliferative effects. The two lower fluences were produced by irradiating the two higher fluences through a dentine disc, which was used to simulate a clinical condition. The proliferation and the cell odonto-osteogenic differentiation competence were compared. RESULTS: No statistically significant differences were observed between the proliferation rates and the relative productions of mineralized nodules compared to the respective controls, either for hDPSC from normal or inflamed dental pulps. CONCLUSIONS: The irradiation with low-level InGaAlP red low-level laser (660 nm) in four different energy fluences (0.05, 0.30, 7 and 42 J/cm(2)) potentiated neither proliferation nor odonto-osteogenic differentiation of hDPSC isolated from patients with normal and inflamed pulps. Adolescent;Adult;Cell Differentiation;Cell Proliferation;Dental Pulp;Dose-Response Relationship, Radiation;Female;Humans;Low-Level Light Therapy;Male;Pulpitis;Statistics, Nonparametric;Stem Cells
Effect of 635nm Low-level Laser Therapy on Upper Arm Circumference Reduction: A Double-blind, Randomized, Sham-controlled Trial. OBJECTIVE: To assess the safety and efficacy of low-level laser therapy as a noninvasive method for reducing upper arm circumference. DESIGN: Randomized,

double-blind study whereby healthy subjects (N=40) with a body mass index of 20 to 35kg/m(2) received three 20-minute low-level laser therapy (N=20) or sham treatments (N=20) each week for two weeks. MEASUREMENTS: Upper arm circumference was measured after three and six treatments and two weeks post-treatment. Primary success criterion was the proportion of subjects achieving a combined reduction in arm circumference of â‰¥1.25cm measured at three equally spaced points between the elbow and the shoulder. Secondary outcomes included total measurement change at each time point and subjective satisfaction ratings. RESULTS: After six treatments, the low-level laser therapy group showed a combined reduction in arm circumference of 3.7cm versus 0.2cm in the sham treatment group ($p<0.0001$). Significantly more subjects in the low-level laser therapy group (N=12; 60%) achieved â‰¥1.5cm total decrease in upper arm circumference versus sham-treated subjects (N=0; 0%) ($p<0.0005$). Low-level laser therapy treatment resulted in a combined reduction in arm circumference of 2.2cm after three treatments and 3.7cm after six treatments (for each, $p<0.0001$) indicating a progressive and cumulative treatment effect. Body mass index remained unchanged for all subjects. A significantly greater number of subjects in the low-level laser therapy treatment group were satisfied with their results ($p<0.05$), believed their upper arm appearance improved ($p<0.0005$), and indicated the results exceeded expectations ($p<0.05$). The treatments were painless and no adverse events were reported. CONCLUSION: Noninvasive low-level laser therapy is safe, painless, and effective in reducing upper arm circumference and is associated with a high degree of subject satisfaction.

Effect of a low-level laser on bone regeneration after rapid maxillary expansion. INTRODUCTION: In this study, we evaluated the effects of a low-level laser on bone regeneration in rapid maxillary expansion procedures. METHODS: Twenty-seven children, aged 8 to 12 years, took part in the experiment, with a mean age of 10.2 years, divided into 2 groups: the laser group (n = 14), in which rapid maxillary expansion was performed in conjunction with laser use, and the no-laser group (n = 13), with rapid maxillary expansion only. The activation protocol of the expansion screw was 1 full turn on the first day and a half turn daily until achieving overcorrection. The laser type used was a laser diode (TWIN Laser; MMOptics, SÃ£o Carlos, Brazil), according to the following protocol: 780 nm wavelength, 40 mW power, and 10 J/cm(2) density at 10 points located around the midpalatal suture. The application stages were 1 (days 1-5 of activation), 2 (at screw locking, on 3 consecutive days), 3, 4, and 5 (7, 14, and 21 days after stage 2). Occlusal radiographs of the maxilla were taken with the aid of an aluminum scale ruler as a densitometry reference at different times: T1 (initial), T2 (day of locking), T3 (3-5 days after T2), T4 (30 days after T3), and T5 (60 days after T4). The radiographs were digitized and submitted to imaging software (Image Tool; UTHSCSA, San Antonio, Tex) to measure the optic density of the previously selected areas. To perform the statistical test, analysis of covariance was used, with the time for the evaluated stage as the covariable. In all tests, a significance level of 5% ($P <0.05$) was adopted. RESULTS: From the evaluation of bone density, the results showed that the laser improved the opening of the midpalatal suture and accelerated the bone regeneration process. CONCLUSIONS: The low-level laser, associated with rapid maxillary expansion, provided efficient opening of the midpalatal suture and influenced the bone regeneration process of the suture, accelerating healing. Absorptiometry, Photon;Bone Density;Bone Regeneration;Child;Cranial Sutures;Female;Follow-Up Studies;Humans;Image Processing, Computer-Assisted;Lasers, Semiconductor;Low-Level Light Therapy;Male;Maxilla;Orthodontic Appliance Design;Palatal Expansion Technique;Palate, Hard;Radiation Dosage;Radiography, Dental, Digital

Screening of CO(2) laser (10.6â€‰Î¼m) parameters for prevention of enamel erosion. OBJECTIVE: The aim of this study was to screen CO(2) laser (10.6â€‰Î¼m) parameters to increase enamel resistance to a continuous-flow erosive challenge. BACKGROUND DATA: A new clinical CO(2) laser providing pulses of hundreds of microseconds, a range known to increase tooth acid-resistance,

has been introduced in the market. METHODS: Different laser parameters were tested in 12 groups (n=20) with varying fluences from 0.1 to 0.9â€‰J/cm(2), pulse durations from 80 to 400â€‰Î¼s and repetition rates from 180 to 700â€‰Hz. Non-lased samples (n=30) served as controls. All samples were eroded by exposure to hydrochloric acid (pH 2.6) under continuous acid flow (60â€‰Î¼L/min). Calcium and phosphate release into acid was monitored colorimetrically at 30â€‰sec intervals up to 5â€‰min and at 1â€‰min intervals up to a total erosion time of 15â€‰min. Scanning electron microscopic (SEM) analysis was performed in lased samples (n=3). Data were statistically analysed by one-way ANOVA ($p<0.05$) and Dunnett's post-hoc tests. RESULTS: Calcium and phosphate release were significantly reduced by a maximum of 20% over time in samples irradiated with 0.4â€‰J/cm(2) (200Î¼s) at 450â€‰Hz. Short-time reduction of calcium loss (â‰¤1.5â€‰min) could be also achieved by irradiation with 0.7â€‰J/cm(2) (300Î¼s) at 200 and 300â€‰Hz. Both parameters revealed surface modification. CONCLUSIONS: A set of CO(2) laser parameters was found that could significantly reduce enamel mineral loss (20%) under in vitro erosive conditions. However, as all parameters also caused surface cracking, they are not recommended for clinical use. Calcium Phosphates;calcium phosphate Analysis of Variance;Animals;Calcium Phosphates;Cattle;Dental Enamel;Dental Enamel Solubility;Dose-Response Relationship, Radiation;Equipment Safety;Incisor;Lasers, Gas;Low-Level Light Therapy;Microscopy, Electron, Scanning;Models, Animal;Reference Values;Risk Factors;Sampling Studies;Time Factors;Tooth Abrasion;Tooth Erosion

Treatment of mild, moderate, and severe onychomycosis using 870- and 930-nm light exposure: some follow-up observations at 270 days. We have previously reported the results of a clinical trial in which the Noveon laser was used to treat onychomycosis. In the 180-day follow-up therein it was noted that positive clinical impact was demonstrable by a clearly measurable decrease in positive fungal culture and a concomitant decrease in positive microscopy with periodic acid-Schiff-stained nail scrapings. Review of 270-day mycological data, which are now available, confirmed that there was further decrease in both measures. Indeed, 38% of the treated population had negative culture and microscopy, qualifying as "mycological cures." These mycological cures occurred in cases categorized as mild, moderate, and even severe disease.
Adolescent;Adult;Aged;Female;Follow-Up Studies;Foot Dermatoses;Humans;Low-Level Light Therapy;Male;Middle Aged;Onychomycosis;Severity of Illness Index;Young Adult

Changes in tissue water and indentation resistance of lymphedematous limbs accompanying low level laser therapy (LLLT) of fibrotic skin. Our goal was to determine effects of low-level-laser-therapy (LLLT) on skin water and tissue indentation resistance (TIR) in patients with arm (N = 38) or leg (N = 38) lymphedema. Skin water was determined from tissue dielectric constant (TDC) measurements and TIR determined from measurements of force resulting from tissue indentations of 3-4 mm. A limb-location with fibrosis was identified by palpation and treated with an LLLT device for one minute at each of five points within a 3 cm2 area. TDC and TIR at these sites and corresponding sites on the contralateral limb were measured prior to LLLT (pre-LLLT), immediately after LLLT (post-LLLT) and after a manual lymphatic drainage (MLD) session (post-MLD). Results, from arms and legs, showed that post-LLLT values of TIR and TDC were significantly less than pre-LLLT. TIR values remained significantly reduced at post-MLD whereas TDC values were not significantly different from pre-LLLT values. On follow-up visit, 17 previously LLLT treated legs were sham treated with an inactive LLLT unit and measurements replicated. A TIR and TDC change-pattern similar to that obtained with the active LLLT was obtained, but sham-related reductions in TIR and TDC immediately post sham-treatment were significantly less than achieved with the prior active LLLT treatment.
Aged;Aged, 80 and over;Body Water;Extremities;Female;Fibrosis;Galvanic Skin Response;Humans;Low-Level Light Therapy;Lymphedema;Male;Middle Aged;Skin

Long-term clinical evaluation of a 800-nm long-pulsed diode laser with a large spot size and vacuum-assisted suction for hair removal. BACKGROUND: The long-pulsed diode (800-810-nm) laser is one of the most commonly used and effective lasers for hair removal. Limitations of currently available devices include a small treatment spot size, treatment-associated pain, and the need for skin cooling. OBJECTIVE: To evaluate the long-term hair reduction capabilities of a long-pulsed diode laser with a large spot size and vacuum assisted suction. METHODS: Thirty-five subjects were enrolled in a prospective, self-controlled, single-center study of axillary hair removal. The study consisted of three treatments using a long-pulsed diode laser with a large spot size and vacuum-assisted suction at 4- to 6-week intervals with follow-up visits 6 and 15 months after the last treatment. Hair clearance was quantified using macro hair-count photographs taken at baseline and at 6- and 15-month follow-up visits. Changes in hair thickness and color, levels of treatment-associated pain, and adverse events were additional study endpoints. RESULTS: There was statistically significant hair clearance at the 6 (54%) and 15-month (42%) follow-up visits. Remaining hairs were thinner and lighter at the 15-month follow-up visit, and the majority of subjects reported feeling up to mild to moderate pain during treatment without the use of pretreatment anesthesia or skin cooling. CONCLUSIONS: A long-pulsed diode laser with a large spot size and vacuum-assisted suction is safe and effective for long-term hair removal. This is the largest prospective study to evaluate long-term hair removal and the first to quantify decreases in hair thickness and darkness with treatment. Adult;Equipment Design;Female;Follow-Up Studies;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Prospective Studies;Suction;Treatment Outcome;Vacuum;Young Adult

LLLT in the Symptomatic Treatment of Oral Lichen Planus.

Acute Suppurative Parotitis Treatment by Diode Laser Combined with ER:YAG Laser. BACKGROUND AND AIM: The diode laser combined with Er:YAG laser is a new treatment modality for acute sialadenitis. A 78-year-old woman with acute suppurative parotitis was treated by traditional probe to the duct orifice with oral antibiotics for 2 weeks. The symptoms and signs did not subside after treatment. The Er:YAG laser was used to reduce severe infection and inflammation and low level laser therapy (LLLT) was applied to relieve pain sensation during incision and drainage. Less scar formation and obstruction was observed after the laser treatments. RESULTS: Purulent secretions from the Stensen duct was noted after milking the parotid gland. The symptoms and signs were significantly relieved after combined laser treatments. The patient experienced no pain during the course of treatment. No recurrence of the symptoms and signs was noted after 1-year follow-up, and the prognosis was very good. CONCLUSION: The hemostatic properties of the diode laser enable better control of the surgical field and faster healing of the wound lesions. The bactericidal effect of Er:YAG lasers has been proved by many researchers, and has been shown to reduce infection and inflammation for better wound healing. The combined laser therapy of diode and Er:YAG lasers is recommended in treating acute sialadenitis.

Low level laser therapy (lllt) for chronic joint pain of the elbow, wrist and fingers. BACKGROUND AND AIMS: In previous studies, we successfully applied Low Level Laser Therapy (LLLT) in patients with non-specific chronic pain of the shoulder joint and lower back. The purpose of the present study was to assess the effectiveness of LLLT for chronic joint pain of the elbow, wrist, and fingers. SUBJECTS AND METHODS: Nine male and 15 female patients with chronic joint pain of the elbow, wrist, or fingers, who were treated at the rehabilitation outpatient clinic at our hospital from April, 2007 to March, 2009 were enrolled in the study. We used a 1000 mW semiconductor laser device. Each tender point and three points around it were irradiated with laser energy. Each point was irradiated twice for 20 s per treatment, giving a total of three minutes for all 4 points. Patients visited the clinic twice a week, and were evaluated after four weeks of treatment. Pain was evaluated with a Visual Analogue Scale (VAS). Statistical analysis of the VAS scores after laser irradiation was

performed with Wilcoxon's signed rank sum test, using SPSS Ver.17. RESULTS: All VAS scores were totaled and statistically analyzed. The average VAS score before irradiation was 59.2Â±12.9, and 33.1Â±12.2 after the irradiation, showing a significant improvement in VAS score ($p<0.001$) after treatment. The treatment effect lasted for about one and a half days in the case of wrist pain, epicondylitis lateralis (tennis elbow), and carpal tunnel syndrome. In other pain entities, it lasted for about three to fifteen hours. No change in the range of motion (ROM) was seen in any of the 24 subjects. CONCLUSION: We concluded that LLLT at the wavelength and parameters used in the present study was effective for chronic pain of the elbow, wrist, and fingers.

Adaptive responses of individual tissue structures of rat gingival mucosa to exposure to low-intensity 890-nm laser irradiation. Adaptive reactions develop in rat gingival mucosa 1 min after single exposure to low-intensity 890-nm laser: the number of mast cells, degree and index of their degranulation, the diameter of blood vessels and their total area considerably increased. These parameters returned to normal after 1 day, while on days 3-7 they were below the control. Adaptation, Physiological;Animals;Cell Degranulation;Female;Gingiva;Lasers;Low-Level Light Therapy;Male;Mast Cells;Mouth Mucosa;Rats

Low-level laser therapy in the prevention and treatment of cancer therapy-induced mucositis: 2012 state of the art based on literature review and meta-analysis. PURPOSE OF REVIEW: To discuss the promising state of the art low-level laser therapy (LLLT) for preventive and therapeutic usage in oral mucositis due to cancer therapy. RECENT FINDINGS: Photomedicine using LLLT is very effective with intraoral and extraoral devices in the management of oral mucositis, based on several studies including randomized control studies. A systematic review identified 33 relevant articles that were subjected to meta-analysis based on which laser parameters in routine practice are being defined. Meta-analysis showed that LLLT reduced risk of oral mucositis with relative risk (RR) 2.45 [confidence interval (CI) 1.85-3.18], reduced duration, severity of oral mucositis and reduced number of days with oral mucositis (4.38 days, Pâ€Š=â€Š0.0009). RR was similar between the red (630-670â€Šnm) and infrared (780-830â€Šnm) LLLT. Pain-relieving effect based on the Cohen scale was at 1.22 (CI 0.19-2.25). SUMMARY: No adverse side effects of LLLT were reported; hence, we recommend red or infrared LLLT with diode output between 10-100â€ŠmW, dose of 2-3â€ŠJ/cm2/cm2 for prophylaxis and 4â€ŠJ/cm2 (maximum limit) for therapeutic effect, application on single spot rather than scanning motion. Lesions must be evaluated by a trained clinician and therapy should be repeated daily or every other day or a minimum of three times per week until resolution. There is moderate-to-strong evidence in favor of LLLT at optimal doses as a well tolerated, relatively inexpensive intervention for cancer therapy-induced oral mucositis. It is envisaged that LLLT will soon become part of routine oral supportive care in cancer. Humans;Laser Therapy;Mucositis;Neoplasms

Effects of low-level laser irradiation on proliferation and osteoblastic differentiation of human mesenchymal stem cells seeded on a three-dimensional biomatrix: in vitro pilot study. Mesenchymal stem cells (MSCs) from bone marrow are a recent source for tissue engineering. Several studies have shown that low-level laser irradiation has numerous biostimulating effects. The purpose of this trial was to evaluate the effects of Nd:Yag laser irradiation on proliferation and differentiation of MSCs induced into the osteoblastic lineage. MSCs were collected from adult human bone marrow, isolated, and cultured in complete medium (Î±-MEM). Subsequently, they were treated with osteogenic medium, seeded in three-dimensional collagen scaffolds, and incubated. We used six scaffolds, equally divided into three groups: two of these were irradiated with Nd:Yag laser at different power levels (15 Hz, 100 mJ, 1.5 W, and one with a power level of 15 Hz, 150 mJ, 2.25 W), and one was left untreated (control group). Evaluations with specific staining were performed at 7 and 14 days. After 7 days, proliferation was significantly increased in scaffolds treated with laser, compared with the control scaffold. After 14 days, however, laser irradiation did not appear to have

any further effect on cell proliferation. As concerns differentiation, an exponential increase was observed after 14 days of laser irradiation, with respect to the control group. However, this was a pilot study with very limited sample size, we conclude, that low-level laser irradiation might lead to a reduction in healing times and potentially reduces risks of failure. Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Humans;Lasers, Solid-State;Mesenchymal Stem Cells;Osteogenesis;Pilot Projects;Staining and Labeling;Statistics, Nonparametric;Tissue Engineering

Intense pulsed light therapy for lupus pernio. Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Remission Induction;Sarcoidosis;Skin Diseases

Experimental study of the effects of low-intensity monochromatic photodiode radiation and antitumor efficiency of cyclophosphamide injected with autoblood. Experimental study of extracorporeal exposure of autoblood to red monochromatic photodiode radiation for improving antitumor efficiency of cyclophosphamide injected with autoblood was carried out on the model of sarcoma 45 cells ectopically transplanted to the lungs. Co-incubation of irradiated autoblood with cyclophosphamide and reinfusion of the blood to animals increased the antitumor efficiency of chemotherapy in animals with tumors. Antineoplastic Agents;Cyclophosphamide Animals;Antineoplastic Agents;Blood Transfusion, Autologous;Combined Modality Therapy;Cyclophosphamide;Infusions, Intravenous;Lasers, Semiconductor;Low-Level Light Therapy;Lung;Male;Neoplasm Transplantation;Photopheresis;Rats;Sarcoma;Tumor Burden

Effect of laser irradiation on adrenoreactivity of pial arterial vessels in rats. Experiments on WKY and SHR rats showed that low-intensity laser irradiation reduced the tone of pial arterial vessels thereby potentiating the subsequent constrictor effect of norepinephrine. Irradiation in the red region of the spectrum produced a more pronounced effect in the blue region. The observed effects were less pronounced in SHR rats compared to normotensive WKY rats. Vasoconstrictor Agents;Norepinephrine Animals;Blood Pressure;Hypertension;Infusions, Intraventricular;Low-Level Light Therapy;Meningeal Arteries;Norepinephrine;Pia Mater;Rats;Rats, Inbred SHR;Rats, Inbred WKY;Vasoconstriction;Vasoconstrictor Agents;Vasodilation

Photobiomodulation of aqueous interfaces as selective rechargeable bio-batteries in complex diseases: personal view. OBJECTIVE: In this personal view, we propose that the modulation of the structure and function of water by light may come to embody a new mechanistic approach for the treatment of complex diseases. BACKGROUND DATA: Long considered an innocuous medium, water has increasingly been found to be a key player in numerous mechanisms, including first-contact events in which cells decide between survival and apoptosis. Consequently, externally applied electromagnetic energy (light) may selectively target the organization of water to steer biological function. METHODS: We survey light-water research with particular emphasis on the quasi-crystalline exclusion zone (EZ), part of the cell's aqueous interface that is just now beginning to be decoded. The current state of research, the technical challenges involved in obtaining evidence in biological systems, and some potential uses and implications of EZ water in medicine are presented. RESULTS: Though existing data have not yet proven the role of EZ water in photobiomodulation, research shows that EZ water can store charge and can later return it in the form of current flow, with as much as 70% of the input charge being readily obtainable. Macroscopic separation of charges can be stable for days to weeks and has unusual electric potential. Water is, thus, an unexpectedly effective charge separation and storage medium. CONCLUSIONS: We propose that the EZ may be selectively targeted in photobiomodulation as an efficient energy reservoir, which cells can use expeditiously to fuel cellular work, triggering signaling pathways and gene expression in the presence of injury-induced redox potentials. Water Animals;Apoptosis;Bioelectric Energy Sources;Cell Survival;Electromagnetic Radiation;Electrophysiological Phenomena;Humans;Photobiology;Water

Ablative potential of four different pulses of Er:YAG lasers and low-speed hand piece. OBJECTIVE: The aim of the study was to evaluate the ablation rate of caries in dentin with fluorescence-feedback controlled Er:YAG, Variable Square Pulse technology (VSPt) based Er:YAG working in different pulse durations, and steel bur. MATERIALS AND METHODS: Sixty human molar teeth with caries in dentin, extracted for periodontal reasons, were selected for this study. All selected teeth were randomly divided into five groups, each containing twelve specimens: (1) group FFC, fluorescence feedback-controlled Er:YAG laser; (2) group SSP (super short pulse: 50â€‰Î¼s); (3) group MSP (medium short pulse; 100â€‰Î¼s); (4) group SP (short pulse; 300â€‰Î¼s); and (5) group SB, steel bur in a slow-speed hand piece. A profilometer was used to determine the volume of the ablated caries in dentin. The clinical and real ablation rates of caries in dentin were calculated. Two specimens from each experimental group were selected randomly and subjected to SEM examination. RESULTS: The volumes of the ablated caries in dentin in the SSP and SB groups were statistically significantly different in comparison with other experimental groups ($p<0.05$). The clinical and real ablation rate of caries in dentin was the highest for the SSP group (0.15Â±0.05 and 0.17Â±0.05â€‰mm(3)/sec, respectively) and statistically significantly different in comparison with the MSP and SB groups ($p<0.05$). The SB and FFC groups revealed a dentin surface with a smear layer and closed dentinal tubules on SEM micrographs. In the SSP, MSP, and SP groups, an irregular surface without a smear layer was found. CONCLUSIONS: Taking into consideration the experimental conditions of the present study, SSP was the most efficient in ablation of caries in dentin, providing a smear layer-free surface with open dentinal tubules. Dental Cavity Preparation;Dental Enamel;Dose-Response Relationship, Radiation;Humans;In Vitro Techniques;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Molar;Sensitivity and Specificity

A comparative study on efficacy of high and low fluence Q-switched Nd:YAG laser and glycolic acid peel in melasma. BACKGROUND: Melasma is acquired symmetric hypermelanosis characterized by light-to-deep brown pigmentation over cheeks, forehead, upper lip, and nose. Treatment of this condition is difficult and associated with high recurrence rates. With the advent of newer therapies, there is interest in the use of glycolic acid peels and Q-switched Nd:YAG laser (QSNYL) in high and low fluence for this disorder. AIMS: To compare the therapeutic efficacy of low fluence QSNYL, high fluence QSNYL, and glycolic acid peel in melasma in three study groups of 25 patients each. METHODS: Seventy-five Indian patients diagnosed as melasma were included. These patients were randomly divided in three groups (Group Aâ€…=â€…25 patients of melasma treated with low-fluence QSNYL at weekly intervals, Group Bâ€…=â€…25 patients of melasma treated with glycolic acid peel at 2 weeks intervals, Group Câ€…=â€…25 patients of melasma treated with high-fluence QSNYL at 2 weeks intervals). Study period and follow-up period was of 12 weeks each. Out of the 75 patients included, 21 patients in Group A, 19 patients in Group B, and 20 patients in Group C completed the study. Response to treatment was assessed using melasma area and severity index score. RESULTS: Significant improvement was recorded in all the three groups. The improvement was statistically highly significant in Group A as compared to Group C ($P<0.005$), significant in Group A as compared to Group B ($P<0.05$), and also in Group B when compared to Group C ($P<0.05$). Low-fluence QSNYL was associated with least side effects. CONCLUSIONS: This study shows the efficacy of low-fluence QSNYL and glycolic acid peel in melasma. These could be an effective treatment options compared to conventional methods for the treatment of melasma. Glycolates;Keratolytic Agents;glycolic acid Adult;Chemexfoliation;Female;Glycolates;Humans;Keratolytic Agents;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Severity of Illness Index;Treatment Outcome;Young Adult

Bond strengths of one-step self-etch adhesives to laser-irradiated and bur-cut dentin after water storage and thermocycling. OBJECTIVE: The objectives of this study were to evaluate the

microtensile bond strength (Î¼TBS) of one-step self-etch adhesive systems to Er:YAG laser-irradiated and bur-cut dentin after water storage and thermocycling. BACKGROUND DATA: The Er:YAG laser is a promising alternative method for cavity preparation; however, no study has compared the effect of laser irradiation and aging procedures on the adhesion of one-step self-etch adhesives to dentin. METHODS: Seventy-two third molars were selected and randomly divided according to cavity preparation method (Er:YAG laser and bur-cut). One-step self-etch adhesive systems (Clearfil S(3) Bond, AdheSE One and Adper Easy One) were used to bond the composite to dentin. Following the adhesive procedure, the specimens were subdivided according to aging conditions (24 h in water control [C], 6 months of water storage [WS] and 10.000 thermocycles [TC]). The Î¼TBS was determined in a universal testing machine. Three-way ANOVA, independent samples t test, and post-hoc comparisons test (Î±=0.05) were performed on all data. RESULTS: There was no statistical difference in Î¼TBS between Er:YAG laser-irradiated and bur-cut dentin (p>0.05). Similarly, no significant difference was found in Î¼TBS between C, WS, and TC specimens (p>0.05). Moreover, Clearfil S(3) Bond presented the highest Î¼TBS to dentin in both laser-irradiated and bur-cut cavity preparation methods. CONCLUSIONS: Neither bur-cut nor Er:YAG laser-irradiated dentin was affected by the aging methods used to simulate degradation of the adhesive interface. Er:YAG laser treatment may be used as an alternative cavity preparation method. Dentin-Bonding Agents;Resin Cements Analysis of Variance;Dental Bonding;Dental Cavity Preparation;Dentin;Dentin-Bonding Agents;Equipment Failure Analysis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Molar;Resin Cements;Sampling Studies;Sensitivity and Specificity;Specimen Handling;Tensile Strength

Modulation of signal-transducing function of neuronal membrane Na+,K+-ATPase by endogenous ouabain and low-power infrared radiation leads to pain relief. Effects of infrared (IR) radiation generated by a low-power Co2-laser on sensory neurons of chick embryos were investigated by organotypic culture method. Low-power IR radiation firstly results in marked neurite suppressing action, probably induced by activation of Na+,K+-ATPase signal-transducing function. A further increase in energy of radiation leads to stimulation of neurite growth. We suggest that this effect is triggered by activation of Na+,K+-ATPase pumping function. Involvement of Na+,K+-ATPase in the control of the transduction process was proved by results obtained after application of ouabain at very low concentrations. Physiological significance of low-power IR radiation and effects of ouabain at nanomolar level was investigated in behavioral experiments (formalin test). It is shown that inflammatory pain induced by injection of formalin is relieved both due to ouabain action and after IR irradiation. Ouabain;Sodium-Potassium-Exchanging ATPase Animals;Chick Embryo;Infrared Rays;Low-Level Light Therapy;Male;Neurons;Ouabain;Pain;Pain Management;Pain Measurement;Patch-Clamp Techniques;Rats;Rats, Wistar;Signal Transduction;Sodium-Potassium-Exchanging ATPase

[The evaluation of exocrinous function of pancreas in patients with chronic pancreatitis]. The article deals with studying the impact of low-intensity laser therapy on the exocrinous function of pancreas in patients with chronic pancreatitis in exacerbation stage. The sample included 49 patients aged from 36 to 69 years. They were allocated on the main (39 patients) and control (10 patients) groups. The patients from the main group received pharmaceutical treatment along with low-intensity laser therapy. The patients from control group received only pharmaceutical treatment. The study demonstrated the positive impact of comprehensive therapy with low-intensity laser therapy added on the exocrinous function of pancreas in patients with chronic pancreatitis. Pancreatic Elastase Adult;Aged;Exocrine Pancreatic Insufficiency;Feces;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pancreas;Pancreatic Elastase;Pancreatitis, Chronic

Infrared low-level diode laser on serum chemokine MCP-1 modulation in mice. The effect of the low-level laser therapy (LLLT) in the modulation of cells related to inflammatory processes has been

widely studied, with different parameters. The objective was to investigate the immediate and cumulative effect of infrared LLLT on chemokine monocyte chemotactic protein-1 (MCP-1) modulation in mice. Fifty-two isogenic mice were distributed in seven groups: control (nâ€‰=â€‰10, no surgical procedure), laser I (nâ€‰=â€‰7, surgical procedure and a single LLLT exposure 12Â h after the surgery), laser II (nâ€‰=â€‰7, surgery followed by two LLLT exposures, 12 and 36Â h after surgery), and laser III (nâ€‰=â€‰7, surgery followed by three LLLT exposures, 12, 36, and 60Â h after surgery). For each group, a sham group (nâ€‰=â€‰21) underwent surgery without laser application. The animals in the laser groups received an infrared diode continuous laser exposure (AsGaAl, 780Â nm wavelength, power of 20Â mW, energy density of 10Â J/cm(2), spot size of 0,04Â cm(2)) on three points (20Â s per point), and a final energy of 0.4Â J. The animals were sacrificed 36Â h (laser I and sham I groups), 60Â h (laser II and sham II), and 84Â h (laser III and sham III groups) after surgery. The MCP-1 concentrations were measured by cytometric bead array. There was no significant difference between the three periods in the sham group (pâ€‰=â€‰0.3). There was a lower concentration of MCP-1 in the laser III group compared to the laser I group (pâ€‰=â€‰0.05). The infrared LLLT showed a cumulative effect in the modulation of chemokine MCP-1 concentration. Three LLLT exposures were necessary to achieve the MCP-1 modulation. Ccl2 protein, mouse;Chemokine CCL2 Animals;Chemokine CCL2;Inflammation;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Skin

The effect of He-Ne and Ga-Al-As laser light on the healing of hard palate mucosa of mice. Low-level laser therapy (LLLT) has been used to accelerate wound healing, yet questions remain concerning its therapeutic applications. This study aimed to compare the healing efficacy of helium-neon (He-Ne) red light (laser) and gallium aluminum arsenide (Ga-Al-As) infrared lasers at two different doses on hard palate wounds. In a randomized controlled study, 75 adult male mice were divided into five groups of 15 each, after undergoing identical surgical procedures; a control group, with no laser irradiation; HD1 and HD2 groups, treated with He-Ne laser (wavelengths 632.8 nm, power 5 mW, and spot size 0.02 cm(2)) at doses of 4 J/cm(2) and 7.5 J/cm(2) respectively; and GD1 and GD2 groups, treated with Ga-Al-As laser (wavelengths 830 nm, peak power 25 mW, and spot size 0.10 cm(2)) at the doses of 4 J/cm(2) and 7.5 J/cm(2), respectively. Five animals from each group were killed on the third, seventh, and 14 days after surgery, and biopsies were made for histological analysis. On the 3rd and 7th day after the surgery, the number of polymorphonuclear cells (PMN) in HD1, HD2, GD1, and GD2 groups was significantly lower than that of the control group. On the 7th and 14th day, the fibroblasts and new blood vessels counts and collagen density fibers in HD1, HD2, GD1, and GD2 groups were also significantly higher than that of the control groups, and the fibroblast counts and collagen density fibers in HD1 and HD2 groups were higher than that of the GD1 and GD2 groups. LLLT with He-Ne laser compared to Ga-Al-As laser has a positive healing effect on hard palate gingival wounds in mice regardless of the radiation dose. Animals;Biopsy;Dose-Response Relationship, Radiation;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Palate, Hard;Random Allocation;Statistics, Nonparametric;Wound Healing

Comparison of the effectiveness of nonablative fractional laser versus ablative fractional laser in thyroidectomy scar prevention: A pilot study. A scar is a mark that remains after the healing of a wound or other morbid processes. In the past, treatment was mainly focused on severe scarring, such as the hypertrophic and burn scars. However, scars from relatively minor wounds can also be stressful. The site of an open thyroidectomy is the anterior neck, a prominently exposed part of the body, where postoperative scarring can cause patients distress. The cosmetic outcome of the scar after thyroidectomy is of particular importance to women, who constitute the majority of patients with thyroid disease. Active prevention is more likely to yield better cosmetic results and would require fewer treatment sessions and less expense than scar revision procedures. Many interventions

have been proposed, but there is yet no universal consensus on optimal treatment. Recently, focus has been made on 'laser scar prevention', where various types of lasers have been used to improve the appearance of scars. The purpose of this study was to improve the appearance of scars, by laser intervention of the wound healing process. In this pilot study, we comparatively examined the effect of non-ablative 1550-nm fractional Er: glass laser and ablative 2940-nm fractional Er: YAG laser on fresh surgical scars of patients with Fitzpatrick skin type III-IV.
Adult;Cicatrix;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Thyroidectomy;Treatment Outcome

Low-level laser therapy enhances the stability of orthodontic mini-implants via bone formation related to BMP-2 expression in a rat model. OBJECTIVE: The aim of this study was to investigate the stimulatory effects of low-level laser therapy (LLLT) on the stability of mini-implants in rat tibiae. BACKGROUND DATA: In adolescent patients, loosening is a notable complication of mini-implants used to provide anchorage in orthodontic treatments. Previously, the stimulatory effects of LLLT on bone formation were reported; here, it was examined whether LLLT enhanced the stability of mini-implants via peri-implant bone formation. MATERIALS AND METHODS: Seventy-eight titanium mini-implants were placed into both tibiae of 6-week-old male rats. The mini-implants in the right tibia were subjected to LLLT of gallium-aluminium-arsenide laser (830 nm) once a day during 7 days, and the mini-implants in the left tibia served as nonirradiated controls. At 7 and 35 days after implantation, the stability of the mini-implants was investigated using the diagnostic tool (Periotest). New bone volume around the mini-implants was measured on days 3, 5, and 7 by in vivo microfocus CT. The gene expression of bone morphogenetic protein (BMP)-2 in bone around the mini-implants was also analyzed using real-time reverse-transcription polymerase chain reaction assays. The data were statistically analyzed using Student's t test. RESULTS: Periotest values were significantly lower (0.79- to 0.65-fold) and the volume of newly formed bone was significantly higher (1.53-fold) in the LLLT group. LLLT also stimulated significant BMP-2 gene expression in peri-implant bone (1.92-fold). CONCLUSIONS: LLLT enhanced the stability of mini-implants placed in rat tibiae and accelerated peri-implant bone formation by increasing the gene expression of BMP-2 in surrounding cells. Bone Morphogenetic Protein 2;Titanium Animals;Bone Morphogenetic Protein 2;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontic Anchorage Procedures;Osseointegration;Osteogenesis;Polymerase Chain Reaction;Prostheses and Implants;Rats;Rats, Inbred F344;Rats, Sprague-Dawley;Tibia;Titanium

[Development of a portable high-power light-emitting diode phototherapy system for neonatal jaundice]. Our group have introduced a portable light emitting diode (LED) phototherapy system for treating neonatal jaundice. The device selects blue narrow-band LED as the light source, driven by MAX5035. The light intensity is linearly adjusted as the alteration of the pulse-width modulation signal, controlled by ATmega16L, and the value can be displayed in LCD12864. The device breaks the bonds of traditional phototherapy, it features small size and can provide an intense irradiance-controlled treatment as it's needed. Equipment Design;Humans;Infant, Newborn;Jaundice, Neonatal;Light;Phototherapy

[Combined skin infection after CO2Â laser treatment]. Acne Vulgaris;Cicatrix;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Middle Aged;Postoperative Complications;Pseudomonas Infections;Pseudomonas aeruginosa;Skin Aging;Skin Diseases, Bacterial;Staphylococcal Skin Infections

Minding the mind in photobiomodulation: it matters! Immunologic Factors Humans;Immunologic Factors;Low-Level Light Therapy;Phototherapy;Treatment Outcome

Effects of low-level laser therapy (GaAs) in an animal model of muscular damage induced by trauma. It has been demonstrated that reactive oxygen species (ROS) formation and oxidative damage

markers are increased after muscle damage. Recent studies have demonstrated that low-level laser therapy (LLLT) modulates many biochemical processes mainly those related to reduction of muscular injures, increment of mitochondrial respiration and ATP synthesis, as well as acceleration of the healing process. The objective of the present investigation was to verify the influence of LLLT in some parameters of muscular injury, oxidative damage, antioxidant activity, and synthesis of collagen after traumatic muscular injury. Adult male Wistar rats were divided randomly into three groups (nâ€‰=â€‰6), namely, sham (uninjured muscle), muscle injury without treatment, and muscle injury with LLLT (GaAs, 904Â nm). Each treated point received 5Â J/cm(2) or 0.5Â J of energy density (12.5Â s) and 2.5Â J per treatment (five regions). LLLT was administered 2, 12, 24, 48, 72, 96, and 120Â h after muscle trauma. The serum creatine kinase activity was used as an index of skeletal muscle injury. Superoxide anion, thiobarbituric acid reactive substance (TBARS) measurement, and superoxide dismutase (SOD) activity were used as indicators of oxidative stress. In order to assess the synthesis of collagen, levels of hydroxyproline were measured. Our results have shown that the model of traumatic injury induces a significant increase in serum creatine kinase activity, hydroxyproline content, superoxide anion production, TBARS level, and activity of SOD compared to control. LLLT accelerated the muscular healing by significantly decreasing superoxide anion production, TBARS levels, the activity of SOD, and hydroxyproline content. The data strongly indicate that increased ROS production and augmented collagen synthesis are elicited by traumatic muscular injury, effects that were significantly decreased by LLLT. Antioxidants;Thiobarbituric Acid Reactive Substances;Collagen;Superoxide Dismutase;Creatine Kinase;Hydroxyproline Animals;Antioxidants;Cell Respiration;Collagen;Creatine Kinase;Disease Models, Animal;Hydroxyproline;Low-Level Light Therapy;Male;Mitochondria;Muscle, Skeletal;Oxidative Stress;Rats;Rats, Wistar;Soft Tissue Injuries;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances

The beneficial effects of adding low level laser to ultrasound and exercise in Iranian women with shoulder tendonitis: a randomized clinical trial. OBJECTIVES: A randomized, double-blind, clinical trial study was conducted with the aim of determining the efficacy of adding laser (830 nm) to ultrasound (US) and exercise for the management of shoulder tendonitis. METHODS: 42 subjects (n=21, in adding laser group and n=21, in US and exercise group) received a course of 10 sessions treatment over one month in the shoulder region. Outcome measures such as Visual Analogue Scale (VAS), Tenderness Severity Scale (TSS), Constant Murley Score (CMS) and Manual Muscle Testing (MMT) were performed before treatment and at the end of 4 weeks treatment. In addition, follow up were performed 2 months after the end of treatment based on the degree of pain improvement. RESULTS: VAS, TSS and CMS improved significantly (P=0.001) in both groups, however the muscle strengths only improved significantly in adding laser group (P< 0.01). CONCLUSION: It seems that both protocols of physical therapy interventions were effective in relieving the signs and symptoms of shoulder tendonitis. Furthermore, adding low level laser therapy (LLLT) to the US and exercise was more efficient in improving the muscle strength in patients with shoulder tendonitis over a period of three months. However, it should be emphasized that, the current results might be due to the effects of laser and exercise instead of laser, us and exercise (as we had no independent group for US). Adult;Arthralgia;Combined Modality Therapy;Disease Management;Double-Blind Method;Exercise Therapy;Female;Follow-Up Studies;Humans;Iran;Low-Level Light Therapy;Middle Aged;Outcome Assessment, Health Care;Pain Measurement;Range of Motion, Articular;Shoulder Joint;Tendinopathy;Treatment Outcome;Ultrasonic Therapy

Is adjuvant laser therapy effective for preventing pain, swelling, and trismus after surgical removal of impacted mandibular third molars? A systematic review and meta-analysis. PURPOSE: To assess the efficacy and safety of low-level laser energy irradiation (LLEI) for decreasing pain, swelling, and

trismus after surgical removal of impacted mandibular third molars (IMTMs). MATERIALS AND METHODS: MEDLINE, EMBASE, and the Central Register of Controlled Trials of the Cochrane Library were searched from their inception, and conference proceedings, cross-references, and gray literature were searched for the last 5 years for randomized and quasi-randomized controlled trials that evaluated the effects of any type of LLEI, compared with active or inactive treatments, in patients undergoing surgical removal of IMTMs. Risk of bias in included studies was assessed by 2 independent evaluators using the Cochrane Risk of Bias tool. A random-effects model meta-analysis was used to estimate the mean difference of trismus between the groups. Heterogeneity was assessed using Cochran Ï‡(2) and I(2). RESULTS: Ten eligible trials were included in this systematic review. The included studies overall had a moderate risk of bias. Because of heterogeneity in the intervention and outcomes assessments, pain and swelling outcomes were only qualitatively summarized and indicated no beneficial effects of LLEI over placebo. Patients receiving LLEI had an average of 4.2 mm (95% confidence interval, 1.2 to 7.2) and 5.2 mm (95% confidence interval, 1.8 to 8.2) less trismus than patients receiving no active treatment on the second and seventh day after the surgery, respectively. CONCLUSIONS: There was no benefit of LLEI on pain or swelling and a moderate benefit on trismus after removal of IMTMs. It is necessary to standardize the intervention and outcomes assessment and to conduct adequately powered, well-designed trials to evaluate the efficacy of LLEI. Edema;Humans;Low-Level Light Therapy;Mandible;Molar, Third;Pain, Postoperative;Postoperative Complications;Radiotherapy, Adjuvant;Safety;Tooth Extraction;Tooth, Impacted;Treatment Outcome;Trismus

Healing process and laser therapy in the superficial periodontium: a histological study. AIM: To evaluate the efficiency of laser therapy in healing, regeneration and repair processes located in the superficial periodontium after gingivectomy procedures. MATERIALS AND METHODS: The study group consisted of 38 patients without any systemic diseases presenting with gingival hypertrophy developed exclusively within the clinical context of gingivitis and/or periodontitis. All patients were included in the study based on their informed consent. All patients required several surgical interventions at the level of the superficial periodontium. Subgroup 1 (17 patients) was treated only through gingivectomy procedures. For subgroup 2 (21 patients), the gingivectomy was associated with laser therapy, applied every day for seven days. Gingival mucosa fragments were taken on day 1 (curative gingivectomy) and on day 21 (clinical control and corrective gingivectomy), and routinely processed for the microscopic exam, using Hematoxylin-Eosin and special stains (trichrome Szekely and Periodic Acid-Schiff). RESULTS AND DISCUSSION: The comparison between the morphological pictures characterizing the healing process associated or not with laser therapy, allowed the identification of some features supporting the benefits of laser therapy. We believe that the decrease in the inflammatory infiltrate located in the lamina propria is the critical morphological trait for the control of a healing process as near to restitutio ad integrum as possible. The diminished number of lymphocytes and macrophages will implicitly determine a lower production of chemical mediators interfering with the sequences of the healing process. CONCLUSIONS: The morphological differences identified at the gingival epithelium level and subjacent lamina propria support the value of laser therapy, stimulating an improved healing of the damaged tissues.
Gingiva;Gingivectomy;Histocytochemistry;Humans;Hypertrophy;Inflammation;Low-Level Light Therapy;Lymphocytes;Macrophages;Mouth Mucosa;Mucous Membrane;Periodontium

Commentary: are all fractional resurfacing devices equal with regard to induction of fibrosis?
Female;Fibrosis;Humans;Low-Level Light Therapy;Male;Pigmentation Disorders

Combination of fractional erbium-glass laser and topical therapy in melasma resistant to triple-combination cream. BACKGROUND: Melasma is a common melanosis often difficult to treat. OBJECTIVE: The aim of this paper was to report on the safety and efficacy of non-ablative fractional

photothermolysis combined with the use of triple-combination cream (TCC) on a large population with melasma resistant (i.e., with no complete/near-complete clearing) to TCC alone. METHODS: Seventy-six patients with resistant melasma underwent a combined treatment protocol. The protocol consisted of a TCC (hydroquinone 4%, retinoic acid 0.03%, hydrocortisone butyrate 0.1%) applied daily for 10 days followed by four laser treatments performed in 3-week intervals with a fractional 1540-nm erbium-glass laser. During these intervals, and for 3 months after the last laser session, TCC was also applied daily following a "pulse-therapy" scheme. Improvement was assessed by the melasma-area-and-severity-index (MASI) score. RESULTS: At 1 month, marked (>75%) and moderate (51-75%) clearing of melasma were observed in 46 of 76 (67.1%) and 12 of 76 (21%) cases, respectively. At 6 months, we noticed a marked improvement in 16 of 76 (21.1%) and no improvement in 33 of 76 (43.4%) patients. CONCLUSION: Our study proposes the combination of NFP/TCC as a useful therapy for patients with melasma resistant to TCC alone, but it shows that its long-term efficacy is limited. Dermatologic Agents;Hydroquinones;Tretinoin;Hydrocortisone;hydroquinone Adult;Combined Modality Therapy;Dermatologic Agents;Female;Humans;Hydrocortisone;Hydroquinones;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Treatment Failure;Treatment Outcome;Tretinoin;Young Adult

MicroRNA-193 pro-proliferation effects for bone mesenchymal stem cells after low-level laser irradiation treatment through inhibitor of growth family, member 5. The enhanced proliferation of mesenchymal stem cells (MSCs) can be helpful for the clinical translation of cell therapy. Low-level laser irradiation (LLLI) has been demonstrated as regulating MSC proliferation. MicroRNAs (miRNAs) are involved in various pathophysiologic processes in stem cells, but the role of miRNAs in the LLLI-based promotion of MSC proliferation remains unclear. We found that the proliferation level and cell cycle-associated genes in MSCs were increased after LLLI treatment in a time-dependent manner. Microarray assays revealed subsets of miRNAs to be differentially regulated, and these dynamic changes were confirmed by quantitative real-time polymerase chain reaction (qRT-PCR) after LLLI. miR-193 was the most highly up-regulated miRNA, and the change in it was related with the proliferation level. Gain-loss function experiments demonstrated that miR-193 could regulate the proliferation of MSCs, including human's and rat's, but could not affect the apoptosis and differentiation level. Blockade of miR-193 repressed the MSC proliferation induced by LLLI. By qRT-PCR, we found that miR-193, in particular, regulated cyclin-dependent kinase 2 (CDK2) expression. Bioinformatic analyses and luciferase reporter assays revealed that inhibitor of growth family, member 5 (ING5) could be the best target of miR-193 to functionally regulate proliferation and CDK2 activity, and the mRNA and protein level of ING5 was regulated by miR-193. Furthermore, the ING5 inhibited by small interfering RNA (siRNA) could up-regulate the proliferation of MSCs and the expression of CDK2. Taken together, these results strongly suggest that miR-193 plays a critical part in MSC proliferation in response to LLLI stimulation, which is potentially amenable to therapeutic manipulation for clinical application. ING5 protein, human;MIRN193 microRNA, human;MicroRNAs;Mirn193 microRNA, rat;RNA, Small Interfering;Transcription Factors;Tumor Suppressor Proteins;Luciferases;Cdk2 protein, rat;Cyclin-Dependent Kinase 2 Animals;Apoptosis;Cell Differentiation;Cell Proliferation;Cells, Cultured;Child;Child, Preschool;Computational Biology;Cyclin-Dependent Kinase 2;Dose-Response Relationship, Radiation;Flow Cytometry;Humans;Immunohistochemistry;Infant;Low-Level Light Therapy;Luciferases;Male;Mesenchymal Stem Cells;MicroRNAs;RNA, Small Interfering;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Time Factors;Transcription Factors;Transfection;Tumor Suppressor Proteins

Efficacy of low-intensity laser therapy in reducing treatment time and orthodontic pain: a clinical investigation. INTRODUCTION: The long duration of orthodontic treatment is a major concern for patients. A noninvasive method of accelerating tooth movement in a physiologic manner is needed. The aim of this study was to evaluate of the efficacy of low-intensity laser therapy in reducing orthodontic treatment duration and pain. METHODS: Twenty patients requiring extraction of first premolars were selected for this study. We used a randomly assigned incomplete block split-mouth design. Individual canine retraction by a nickel-titanium closed-coil spring was studied. The experimental side received infrared radiation from a semiconductor (aluminium gallium arsenide) diode laser with a wavelength of 810 nm. The laser regimen was applied on days 0, 3, 7, and 14 in the first month, and thereafter on every 15th day until complete canine retraction was achieved on the experimental side. Tooth movement was measured on progress models. Each patient's pain response was ranked according to a visual analog scale. RESULTS: An average increase of 30% in the rate of tooth movement was observed with the low-intensity laser therapy. Pain scores on the experimental sides were significantly lower compared with the control sides. CONCLUSIONS: Low-intensity laser therapy is a good option to reduce treatment duration and pain. Dental Alloys;titanium nickelide;Stainless Steel;Nickel;Titanium Adolescent;Bicuspid;Child;Cuspid;Dental Alloys;Dental Arch;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Maxilla;Models, Dental;Nickel;Orthodontic Brackets;Orthodontic Wires;Pain;Pain Measurement;Single-Blind Method;Stainless Steel;Titanium;Tooth Extraction;Tooth Movement Techniques;Tooth Root;Treatment Outcome;Young Adult

Light-induced vasodilation of coronary arteries and its possible clinical implication. BACKGROUND: Low-level laser therapy and light-emitting diodes (LED) are increasingly used in phototherapy. Their therapeutic effects are at least partly mediated by light-induced vasodilation. The aim of this study was to determine the effect of different light sources on coronary arteries. METHODS: Porcine left coronary arteries were cut into 4-mm rings that were irradiated either by a semiconductor nonthermal gallium-arsenide diode laser or a noncoherent athermic red light source both with the same energy density up to 16 J/cm(2). After precontraction with 9, 11-dideoxy-11Î±, 9Î±-epoxymethano-prostaglandin F(2)Î±, respective relaxation responses were evaluated. The role of endothelium as well as intracellular pathways was investigated. RESULTS: Maximum vasodilation after exposure to laser was observed at 10 J/cm(2) (56.8% Â± 1.2%) and decreased to 43.9% Â± 2.8% at 16 J/cm(2) ($p < 0.003$). After adjusting exposure time to achieve equivalent energy densities in the LED group, vessel segments revealed photorelaxation of 52.9% Â± 6.5% and 47.5% Â± 0.6%, respectively. Vasodilations achieved by either light source were comparable at 10 J/cm(2) ($p < 0.574$) and 16 J/cm(2) ($p < 0.322$). Furthermore, vasodilation could be inhibited by administration of 2-(4-carboxyphenyl)-4,4,5,5-tetramethylimidazoline-1-oxyl-3-oxide (nitric oxide scavenger) and 1H-[1,2,4]oxadiazolo[4,3-a]quinoxalin-1-one (guanocyclase inhibitor) but not with L-nitro-arginine methyl ester or deendothelialization. CONCLUSIONS: Vessels exposed to either light source showed a remarkable as well as comparable photorelaxation at definite energy densities. This effect is mediated by an intracellular nitric oxide-dependent mechanism. As LED sources are of small size, simple, and inexpensive build-up, they may be used during routine coronary artery bypass surgery to ease suturing of anastomosis by target vessel vasodilation. Animals;Coronary Vessels;Light;Low-Level Light Therapy;Models, Animal;Phototherapy;Swine;Vasodilation

Green light emitting diodes accelerate wound healing: characterization of the effect and its molecular basis in vitro and in vivo. Because light-emitting diodes (LEDs) are low-coherent, quasimonochromatic, and nonthermal, they are an alternative for low level laser therapy, and have photobiostimulative effects on tissue repair. However, the molecular mechanism(s) are unclear, and potential effects of blue and/or green LEDs on wound healing are still unknown. Here, we

investigated the effects of red (638â€‰nm), blue (456â€‰nm), and green (518â€‰nm) LEDs on wound healing. In an in vivo study, wound sizes in the skin of ob/ob mice were significantly decreased on day 7 following exposure to green LEDs, and complete reepithelialization was accelerated by red and green LEDs compared with the control mice. To better understand the molecular mechanism(s) involved, we investigated the effects of LEDs on human fibroblasts in vitro by measuring mRNA and protein levels of cytokines secreted by fibroblasts during the process of wound healing and on the migration of HaCat keratinocytes. The results suggest that some cytokines are significantly increased by exposure to LEDs, especially leptin, IL-8, and VEGF, but only by green LEDs. The migration of HaCat keratinocytes was significantly promoted by red or green LEDs. In conclusion, we demonstrate that green LEDs promote wound healing by inducing migratory and proliferative mediators, which suggests that not only red LEDs but also green LEDs can be a new powerful therapeutic strategy for wound healing. Interleukin-8 Adolescent;Animals;Color;Humans;Interleukin-8;Keratinocytes;Lasers, Semiconductor;Light;Low-Level Light Therapy;Male;Mice;Phototherapy;Skin;Wound Healing

The effects of different doses of 670 nm diode laser on skin flap survival in rats. PURPOSE: To investigate the effects of different low-level laser therapy (LLLT) doses on random skin flap rats. METHODS: Forty Wistar rats were randomly divided in four groups. The control group (CG) was not irradiated. The experimental groups were irradiated with a diode laser 670 nm with different energies per point: group 2 (G2) with 0.06 J; group 3 (G3) 0.15 J and group 4 (G4) 0.57 J. The three groups were irradiated in 12 equally distributed points in the cranial skin flap portion. They were submitted to the irradiation during the immediate, first and second postoperative days. The necrosis area was evaluated in the seventh postoperative day. RESULTS: The CG shows 49.35% of necrosis area in the skin flap; G2, 39.14%; G3, 47.01% and G4, 29.17% respectively. There was a significantly difference when G4 was compared with CG`s skin flap necrosis area. CONCLUSION: The low-level laser therapy diode 670 nm with 0.57 J energy per point increases the survival in randomic skin flap rats. Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Necrosis;Postoperative Period;Random Allocation;Rats;Rats, Wistar;Reproducibility of Results;Skin;Surgical Flaps;Time Factors;Tissue Survival

Low-level laser on femoral growth plate in rats. PURPOSE: To determine the influence of low-level laser therapy on femoral growth plate in rats. METHODS: Thirty male Wistar rats aged 40 days were divided into two groups, G1 and G2. In G1 the area of the distal growth plate of the right femur was irradiated at one point using GaAlAs laser 830 nm wavelength, output power of 40 mW, at an energy density of 10 J/cm(2). The irradiation was performed daily for a maximum of 21 days. The same procedure was done in G2, but the probe was turned off. Five animals in each group were euthanized on days 7, 14 and 21 and submitted to histomorphometric analysis. RESULTS: In both groups the growth plate was radiographically visible at all moments from both craniocaudal and mediolateral views. On the 21st day percentage of femoral longitudinal length was higher in G2 than G1 compared to basal value while hypertrophic zone chondrocyte numbers were higher in G1 than G2. Calcified cartilage zone was greater in G1 than in G2 at all evaluation moments. Angiogenesis was higher in G1 than in G2 at 14th and 21st days. CONCLUSION: The low-level laser therapy negatively influenced the distal femoral growth plate. Animals;Bone Development;Chondrocytes;Femur;Growth Plate;Low-Level Light Therapy;Male;Models, Animal;Neovascularization, Physiologic;Random Allocation;Rats;Rats, Wistar;Time Factors

Low-level laser therapy influences mouse odontoblast-like cell response in vitro. OBJECTIVE: The purpose of this study was to analyze the influence of two different irradiation times with 85 mW/cm(2) 830 nm laser on the behavior of mouse odontoblast-like cells. BACKGROUND DATA: The use of low-level laser therapy (LLLT) to stimulate pulp tissue is a reality, but few reports relate odontoblastic responses to irradiation in in vitro models. METHODS: Odontoblast-like cells (MDPC-23)

were cultivated and divided into three groups: control/nonirradiated (group 1); or irradiated with 85 mW/cm(2), 830 nm laser for 10 sec (0.8 J/cm(2)) (group 2); or for 50 sec (4.2 J/cm(2)) (group 3) with a wavelength of 830 nm. After 3, 7, and 10 days, it was analyzed: growth curve and cell viability, total protein content, alkaline phosphatase (ALP) activity, calcified nodules detection and quantification, collagen immunolocalization, vascular endothelial growth factor (VEGF) expression, and real-time polymerase chain reaction (PCR) for DMP1 gene. Data were analyzed by Kruskall-Wallis test (Î±=0.05). RESULTS: Cell growth was smaller in group 2 ($p<0.01$), whereas viability was similar in all groups and at all periods. Total protein content and ALP activity increased on the 10th day with 0.8 J/cm(2) ($p<0.01$), as well as the detection and quantification of mineralization nodules ($p<0.05$), collagen, and VEGF expression ($p<0.01$). The expression of DMP1 increased in all groups ($p<0.05$) compared with control at 3 days, except for 0.8 J/cm(2) at 3 days and control at 10 days. CONCLUSIONS: LLLT influenced the behavior of odontoblast-like cells; the shorter time/smallest energy density promoted the expression of odontoblastic phenotype in a more significant way. Vascular Endothelial Growth Factor A Animals;Cell Proliferation;Cell Survival;Cells, Cultured;Enzyme-Linked Immunosorbent Assay;In Vitro Techniques;Low-Level Light Therapy;Mice;Odontoblasts;Radiation Dosage;Random Allocation;Real-Time Polymerase Chain Reaction;Reference Values;Time Factors;Vascular Endothelial Growth Factor A

EFFECT OF LOW-LEVEL LASER (GAAS, 904HM) FOR BONE REPAIR ON FRACTURES IN RATS. OBJECTIVE: To analyze the effects of low-level laser therapy (GaAs, 904 nm) for bone repair on tibial fractures in rats. METHODS: Forty rats were divided into four groups of 10 animals: control group without fracture (CG); fracture group without treatment (EG II); fracture group treated with laser at 10 J/cm(2) (EG III); and fracture group treated with laser at 15 J/cm2 (EG IV). The fracture was produced surgically and the treatment lasted 45 days, done on alternate days. After treatment completion, the rats were sacrificed. The tibias were radiographed and subjected to mechanical three-point flexion tests in order to evaluate the maximum force (N) required to break them. RESULTS: The observed maximum force values (N) were: control group (CG) of 51.5 N Â± 7.9 N; EG II 17.2 N Â± 7.8 N; EG III 16.6 N Â± 12.1 N; and EG IV 30.3 N Â± 7.8 N. There were statistically significant differences between the control group and the experimental groups and also between experimental group IV and the other experimental groups (II and III). Radiographs showed callus formation in all the fractured groups, thus indicating that they had undergone the normal tissue repair process. CONCLUSION: EG IV, which underwent laser therapy with a dosage of 15 J/cm(2), showed the highest maximum force value (N) among the experimental groups, thus demonstrating the influence of higher laser dosage on bone repair.

Split-face comparative study of 1550 nm fractional photothermolysis and trichloroacetic acid 15% chemical peeling for facial melasma in Asian skin. Fractional photothermolysis (FP) therapy and chemical peels have been reported to be effective in patients with recalcitrant melasma. However, there is little information to compare the efficacy of single treatment session in Asian women. The aim of this study was to examine the efficacy, long-lasting outcomes and safety of a single session of 1550-nm erbium-doped FP in Asian patients, compared with trichloroacetic acid (TCA) peel with a medium depth. Eighteen Korean women (Fitzpatrick skin type III or IV) with moderate-to-severe bilateral melasma were randomly treated with a single session of 1550-nm FP on one cheek, and with a 15% TCA peel on the other cheek. Outcome measures included an objective melasma area severity index and subjective patient-rated overall improvement at 4 and 12 weeks after treatment. Melasma lesions were significantly improved 4 weeks after either treatment, but melasma recurred at 12 weeks. Post-inflammatory hyperpigmentation developed in 28% of patients at 4 weeks but resolved in all but one patient by 12 weeks. There was no difference between FP treatment and TCA peeling with respect to any outcome measure. FP laser and TCA peel treatments were equally effective and

safe when used to treat moderate-to-severe melasma, but neither treatment was long-lasting. We suggest that multiple or periodic maintenance treatments and/or supplemental procedures may be required for the successful treatment of melasma in Asian women. Caustics;Trichloroacetic Acid
Adult;Asian People;Caustics;Chemexfoliation;Erythema;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Pain;Patient Satisfaction;Recurrence;Severity of Illness Index;Trichloroacetic Acid;Young Adult

Effect of low-level laser therapy on healing of tenotomized Achilles tendon in streptozotocin-induced diabetic rats. Diabetes mellitus (DM) is associated with musculoskeletal damage. Investigations have indicated that healing of the surgically tenotomized Achilles tendon was considerably augmented following low-level laser therapy (LLLT) in non-diabetic, healthy animals. The aim of the present study was to evaluate the effect of LLLT on the Achilles tendon healing in streptozotocin-induced diabetic (STZ-D) rats via a biomechanical evaluating method. Thirty-three rats were divided into non-diabetic (nâ€‰=â€‰18) and diabetic (nâ€‰=â€‰15) groups. DM was induced in the rats by injections of STZ. The right Achilles tendons of all rats were tenotomized 1Â month after STZ injections. The two experimental groups (nâ€‰=â€‰6 for each group) of non-diabetic rats were irradiated with a helium-neon (He-Ne) laser at 2.9 and 11.5Â J/cm(2) for ten consecutive days. The two experimental groups of diabetic rats (nâ€‰=â€‰5 for each group) were irradiated with a He-Ne laser at 2.9 and 4.3Â J/cm(2) for ten consecutive days. The tendons were submitted to a tensiometric test. Significant improvements in the maximum stress (MS) values (Newton per square millimeter) were found following LLLT at 2.9Â J/cm(2) in both the non-diabetic (pâ€‰=â€‰0.031) and diabetic (pâ€‰=â€‰0.019) experimental groups when compared with their control groups. LLLT at 2.9Â J/cm(2) to the tenotomized Achilles tendons in the non-diabetic and diabetic rats significantly increased the strength and MS of repairing Achilles tendons in our study. Streptozocin
Achilles Tendon;Animals;Biomechanical Phenomena;Diabetes Complications;Diabetes Mellitus, Experimental;Diabetes Mellitus, Type 1;Lasers, Gas;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Streptozocin;Tenotomy;Wound Healing

Effects of LLLT in combination with bisphosphonate on bone healing in critical size defects: a histological and histometric study in rat calvaria. The purpose of this study was to analyze histologically the effect of low-level laser therapy (LLLT) in combination with bisphosphonate on bone healing in surgically created critical size defects (CSD) in rat calvaria. One hundred Wistar female rats sham operated (sham) and ovariectomized (Ovx) were maintained untreated for 1Â month to allow for the development of osteopenia in the Ovx animals. A CSD was made in the calvarium of each rat, and the animals were divided into five groups according to following treatments: (1) sham rats (control), (2) Ovx rats, (3) Ovx rats treated with LLLT, (4) Ovx rats treated with bisphosphonate, and (5) Ovx rats treated with bisphosphonate and LLLT. Groups 4 and 5 were irrigated with 1Â ml of bisphosphonate, and groups 3 and 5 were submitted to LLLT (GaAlAs), 660Â nm, 24Â J, and 0.4285Â W/cm(2) on the CSD. Ten animals of each treatment were killed at 30 and 60Â days. Histomorphometric assessments, using image analysis software, and histological analyses were performed. No defect was completely regenerated with the bone. Histometrically, it can be observed that groups 3 (37.49â€‰Â±â€‰1.94%, 43.11â€‰Â±â€‰2.39%) and 5 (35.05â€‰Â±â€‰1.57%, 41.07â€‰Â±â€‰1.89%) showed a significant bone neoformation when compared to groups 1 (16.81â€‰Â±â€‰1.57%, 27.54â€‰Â±â€‰1.49%), 2 (11.68â€‰Â±â€‰0.98%, 22.51â€‰Â±â€‰1.05%), and 4 (14.62â€‰Â±â€‰1.70%, 25.67â€‰Â±â€‰1.41%) in all experimental periods (Pâ€‰<â€‰0.05). It was possible to conclude that the LLLT associated or not with bisphosphonate treatment was effective for stimulating bone formation in CSD in the calvaria of rats submitted to ovariectomy. Bone Density Conservation Agents;Diphosphonates
Animals;Bone Density Conservation Agents;Bone Diseases, Metabolic;Bone Regeneration;Data

Interpretation, Statistical;Diphosphonates;Female;Image Processing, Computer-Assisted;Low-Level Light Therapy;Ovariectomy;Rats;Rats, Wistar;Skull

Evaluation of low-level laser therapy in patients with acute and chronic temporomandibular disorders. The purpose of this study was to address the following question: among patients with acute or chronic temporomandibular disorders (TMD), does low-level laser therapy (LLLT) reduce pain intensity and improve maximal mouth opening? The sample comprised myogenic TMD patients (according Research Diagnostic Criteria for TMD). Inclusion criteria were: male/female, no age limit, orofacial pain, tender points, limited jaw movements and chewing difficulties. Patients with other TMD subtypes or associated musculoskeletal/rheumatologic disease, missing incisors teeth, LLLT contra-indication, and previous TMD treatment were excluded. According to disease duration, patients were allocated into two groups, acute (<6 months) and chronic TMD (â‰¥ 6 months). For each patient, 12 LLLT sessions were performed (gallium-aluminum-arsenide; Î» = 830 nm, P = 40 mW, CW, ED = 8 J/cm(2)). Pain intensity was recorded using a 10-cm visual analog scale and maximal mouth opening using a digital ruler (both recorded before/after LLLT). The investigators were previously calibrated and blinded to the groups (double-blind study) and level of significance was 5% ($p < 0.05$). Fifty-eight patients met all criteria, 32 (acute TMD), and 26 (chronic TMD). Both groups had a significant pain intensity reduction and maximal mouth opening improvement after LLLT (Wilcoxon test, $p < 0.001$). Between the groups, acute TMD patient had a more significant pain intensity reduction (Mann-Whitney test, $p = 0.002$) and a more significant maximal mouth opening improvement (Mann-Whitney test, $p = 0.011$). Low-level laser therapy can be considered as an alternative physical modality or supplementary approach for management of acute and chronic myogenic temporomandibular disorder; however, patients with acute disease are likely to have a better outcome. Adult;Aged;Aged, 80 and over;Facial Pain;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Statistics, Nonparametric;Temporomandibular Joint Disorders;Treatment Outcome

Evaluation of socket healing in irradiated rats after diode laser exposure (histological and morphometric studies). OBJECTIVE: The purpose of this study is to evaluate the effect of low-level laser therapy (LLLT) in enhancing bone repair in irradiated sockets of albino rats. DESIGN: Thirty male Swiss Albino rats ranging from 120 to 150 g were used in this study. The animals were subjected 6 gray gamma radiations. Three days post irradiation, right and left mandibular first molars were extracted. The sockets of the left sides were irradiated by (GaAIAs) diode laser device immediately after extraction, while the sockets of the right side were not exposed to the laser and served as control. The rats were randomly assigned into three groups (10 rats each) according to the date of sacrifice, 3, 7 and 10 days into groups I, II and III, respectively. The two sides of each mandible were separated. Each group was further subdivided into subgroups A and B (10 specimens each), where A represents the right side of the mandible and B represents the left side. The specimens were stained with hematoxylin and eosin, and Masson's trichrome. RESULTS: LLLT accelerated bone healing, while, radiotherapy induced delay of bone healing along the three experimental groups. This acceleration was assessed histologically by the presence of mature collagen fibre bundles and early new bone formation in the lased groups. Histomorphometric analysis revealed an increase in the area percentage of bone trabeculae in the lased sockets compared to the control ones in group II. This increase was statistically significant ($p = 0.0274$). The increase in the area percentage of bone trabeculae between the lased and control sockets of group III was statistically insignificant ($p = 0.1903$). CONCLUSIONS: In a rat model application of LLLT with a GaAIAs diode laser device can enhance bone healing and mineralisation in sockets subjected to gamma radiation. Animals;Bone Regeneration;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mandible;Rats;Tooth Socket;Wound Healing

Application of low-level laser therapy for noninvasive body contouring. BACKGROUND: Low-level laser therapy (LLLT) is a noninvasive treatment for a wide-assortment of medical ailments. A recent application is for noninvasive body slimming. A Level 1 clinical study was completed and recorded a significant reduction in circumferential measurements across waist, hips, and thighs compared to placebo subjects. Questions remain unanswered to whether the result observed was based upon simple fluid redistribution. The purpose of this retrospective study was to evaluate the efficacy of LLLT for noninvasive body slimming and determine if the loss was attributable to fluid or fat relocation. METHODS: Data from 689 participants were obtained to evaluate the circumferential reduction demonstrated across the treatment site of the waist, hips, and thighs as well as nontreated systemic regions. Patient data were not pre-selected; all reports provided by clinics using LLLT for body contouring were used to evaluate the efficacy of this treatment. Participants received a total of six LLLT treatments across 2-weeks having baseline and post-procedure circumferential measurements recorded. Measurement sites included waist, hips, thighs, arms, knees, neck, and chest. RESULTS: The mean circumferential reduction reported for the waist, hips, and thighs 1 week after the treatment regimen was 3.27 in. ($P < 0.0001$). Furthermore, participants demonstrated an overall mean reduction of 5.17 in. across all measurement points 5.17 in. ($P < 0.0001$). Each anatomical region measured exhibited a significant circumferential reduction. CONCLUSION: These data reveal that the circumferential reduction exhibited following LLLT is not attributable to fluid or fat relocation as all measurement points, including nontreated regions, reported an inch loss. Abdomen;Adult;Body Modification, Non-Therapeutic;Body Weights and Measures;Extremities;Female;Hip;Humans;Low-Level Light Therapy;Male;Middle Aged;Subcutaneous Fat;Thigh

The effect of low level laser on condylar growth during mandibular advancement in rabbits. INTRODUCTION: It has been shown that Low Level Laser (LLL) has a positive effect on bone formation. The aim of this study was to evaluate the effect of low level laser on condylar growth during mandibular advancement in rabbits. MATERIALS AND METHODS: Continuous forward mandibular advancement was performed in fourteen male Albino rabbits with the mean age of 8 weeks and the mean weight of 1.5 Â± 0.5 kg, with acrylic inclined planes. The rabbits were randomly assigned into two groups after 4 weeks. LLL (KLO3: wave length 630 nm) was irradiated at 3 points around the TMJ, through the skin in the first group. The exposure was performed for 3 minutes at each point (a total of 9 minutes) once a day for 3 weeks. The control group was not exposed to any irradiation. The rabbits in both groups were sacrificed after two months and the histological evaluation of TMJ was performed to compare fibrous tissue, cartilage, and new bone formation in condylar region in both groups. Disc displacement was also detected in both groups. Student's t-test, Exact Fisher and Chi square tests were used for the statistical analysis. RESULTS: The formation of fibrous tissue was significantly lower, while bone formation was significantly greater in lased group as compared with control group. The thickness of cartilage did not differ significantly between two groups. CONCLUSION: Irradiation of LLL (KLO3) during mandibular advancement in rabbits, increases bone formation in condylar region, while neither increase in the cartilage thickness nor fibrous tissues was observed. Animals;Lasers;Low-Level Light Therapy;Male;Mandibular Advancement;Mandibular Condyle;Rabbits

Time-dependent effects of low-level laser therapy on the morphology and oxidative response in the skin wound healing in rats. This study aims to investigate the effect of different energy densities provided by low-level laser therapy (LLLT) on the morphology of scar tissue and the oxidative response in the healing of secondary intention skin wounds in rats. Twenty-four male adult Wistar rats were used. Skin wounds were made on the backs of the animals, which were randomized into three groups of eight animals each as follows, 0.9% saline (control); laser GaAsAl 30Â J/cm(2) (L30);

laser GaAsAl 90Â J/cm(2) (L90). The experiment lasted 21Â days. Every 7Â days, the wound contraction index (WCI) was calculated and tissue from different wounds was removed to assess the proportion of cells and blood vessels, collagen maturation index (CMI), thiobarbituric acid reactive substance (TBARS) levels and catalase activity (CAT). On the 7th and 14th days, the WCI and the proportion of cells were significantly higher in groups L30 and L90 compared to the control (pâ€‰<â€‰0.05). At all the time points analyzed, there was a greater proportion of blood vessels and a higher CMI in group L90 compared to the other groups (pâ€‰<â€‰0.05). On the 7th and 14th days, lower TBARS levels and increased CAT activity were found in the L90 group compared to the control (pâ€‰<â€‰0.05). On the 7th day, a moderately negative correlation was found between TBARS levels and WCI, CMI and CAT in all the groups. LLLT may modulate the oxidative status of wounded tissue, constituting a possible mechanism through which the LLLT exerts its effects in the initial phases of tissue repair. Thiobarbituric Acid Reactive Substances;Collagen;Catalase Animals;Blood Vessels;Catalase;Collagen;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Male;Oxidation-Reduction;Rats;Rats, Wistar;Skin;Thiobarbituric Acid Reactive Substances;Time Factors;Wound Healing

Low-level laser therapy alleviates neuropathic pain and promotes function recovery in rats with chronic constriction injury: possible involvements in hypoxia-inducible factor 1Î± (HIF-1Î±). Nerve inflammation plays an important role in the development and progression of neuropathic pain after chronic constrictive injury (CCI). Recent studies have indicated that hypoxia-inducible factor 1Î± (HIF-1Î±) is crucial in inflammation. Low-level laser therapy has been used in treating musculoskeletal pain, but rare data directly support its use for neuropathic pain. We investigated the effects of low-level laser on the accumulation of HIF-1Î±, tumor necrosis factor-Î± (TNF-Î±), and interleukin-1Î² (IL-1Î²) in controlling neuropathic pain, as well as on the activation of vascular endothelial growth factor (VEGF) and nerve growth factor (NGF) in promoting functional recovery in a rat CCI model. CCI was induced by placing four loose ligatures around the sciatic nerve of rats. Treatments of low-level laser (660 nm, 9 J/cm(2)) or sham irradiation (0 J/cm(2)) were performed at the CCI sites for 7 consecutive days. The effects of laser in animals with CCI were determined by measuring the mechanical paw withdrawal threshold, as well as the sciatic, tibial, and peroneal function indices. Histopathological and immunoassay analyses were also performed. Low-level laser therapy significantly improved paw withdrawal threshold and the sciatic, tibial, and peroneal functional indices after CCI. The therapy also significantly reduced the overexpressions of HIF-1Î±, TNF-Î±, and IL-1Î², and increased the amounts of VEGF, NGF, and S100 proteins. In conclusion, a low-level laser could modulate HIF-1Î± activity. Moreover, it may also be used as a novel and clinically applicable therapeutic approach for the improvement of tissue hypoxia/ischemia and inflammation in nerve entrapment neuropathy, as well as for the promotion of nerve regeneration. These findings might lead to a sufficient morphological and functional recovery of the peripheral nerve. Hif1a protein, rat;Hypoxia-Inducible Factor 1, alpha Subunit Animals;Blotting, Western;Constriction;Enzyme-Linked Immunosorbent Assay;Fluorescent Antibody Technique;Hypoxia-Inducible Factor 1, alpha Subunit;Immunohistochemistry;Low-Level Light Therapy;Male;Neuralgia;Rats;Rats, Sprague-Dawley;Recovery of Function;Sciatic Nerve

Effect of low-level laser therapy (LLLT) on orthodontic tooth movement. The aim of this study is to evaluate the effects of low-level laser therapy (LLLT) on (1) the velocity of orthodontic tooth movement and (2) the nitric oxide levels in gingival crevicular fluid (GCF) during orthodontic treatment. The sample consisted of 20 patients (14 girls, six boys) whose maxillary first premolars were extracted and canines distalized. A gallium-aluminum-arsenide (Ga-Al-As) diode laser was applied on the day 0, and the 3rd, 7th, 14th, 21st, and 28th days when the retraction of the maxillary lateral incisors was initiated. The right maxillary lateral incisors composed the study group (the laser

group), whereas the left maxillary lateral incisors served as the control. The teeth in the laser group received a total of ten doses of laser application: five doses from the buccal and five doses from the palatal side (two cervical, one middle, two apical) with an output power of 20 mW and a dose of 0.71 J /cm(2). Gingival crevicular fluid samples were obtained on the above-mentioned days, and the nitric oxide levels were analyzed. Bonferroni and repeated measures variant analysis tests were used for statistical analysis with the significance level set at p â‰¤ 0.05. The application of low-level laser therapy accelerated orthodontic tooth movement significantly; there were no statistically significant changes in the nitric oxide levels of the gingival crevicular fluid during orthodontic treatment. Nitric Oxide Adolescent;Female;Gingival Crevicular Fluid;Humans;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nitric Oxide;Orthodontic Appliances;Periodontal Index;Tooth Movement Techniques

Thulium laser versus holmium laser transurethral enucleation of the prostate: 18-month follow-up data of a single center. OBJECTIVE: To compare the clinical outcomes between thulium laser transurethral enucleation of the prostate (ThuLEP) (70 W) and holmium laser transurethral enucleation of the prostate (HoLEP) (90 W) in a prospective randomized trial with 18 months of follow-up. Both ThuLEP and HoLEP effectively relieve the obstructive symptoms due to benign prostatic hyperplasia (BPH). METHODS: A total of 133 consecutive patients with BPH were randomized to either ThuLEP (n = 71) or HoLEP (n = 62). An energy setting of 70 W and 90 W was used for the thulium and holmium laser in the enucleation procedure, respectively. The mushroom technique was used to fragment the enucleated lobes with the resection loop. The preoperative and postoperative parameters were compared. RESULTS: ThuLEP required a longer operation time (72.4 vs 61.5 minutes, P = .034) but resulted in less blood loss than HoLEP (130.0 vs 166.6 mL, P = .045). The catheterization time was comparable. At 18 months, the lower urinary tract symptom indexes were improved significantly in both groups compared with the baseline values. The International Prostate Symptom Score decreased to 5.2 in the ThuLEP group and 6.2 in the HoLEP group. The quality of life score and peak urinary flow rate were similar between the 2 groups (1.3 vs 1.2 and 23.4 vs 24.2 mL/s) and the postvoid residual urine volume decreased by 82.50% and 81.73% in the ThuLEP and HoLEP groups, respectively. The mean prostate-specific antigen decrease after HoLEP and ThuLEP was 30.43% and 43.36%, respectively. No urethral or bladder neck stricture were found in either group. CONCLUSION: Both ThuLEP (70 W) and HoLEP (90 W) relieve lower urinary tract symptoms equally with high efficacy and safety. ThuLEP was statistically superior to HoLEP in blood loss and inferior to HoLEP in operation time, although the differences were clinically negligible. The mushroom technique could be adequate, without an additional mechanical tissue morcellator. Thulium Aged;Aged, 80 and over;Electrocoagulation;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Prostatic Hyperplasia;Quality of Life;Thulium;Treatment Outcome

Low-power laser irradiation (LPLI) promotes VEGF expression and vascular endothelial cell proliferation through the activation of ERK/Sp1 pathway. Angiogenesis, the growth of new blood vessels from pre-existing vessels, represents an excellent therapeutic target for the treatment of wound healing and cardiovascular disease. Herein, we report that LPLI (low-power laser irradiation) activates ERK/Sp1 (extracellular signal-regulated kinase/specificity protein 1) pathway to promote VEGF expression and vascular endothelial cell proliferation. We demonstrate for the first time that LPLI enhances DNA-binding and transactivation activity of Sp1 on VEGF promoter in vascular endothelial cells. Moreover, Sp1-regulated transcription is in an ERK-dependent manner. Activated ERK by LPLI translocates from cytoplasm to nuclear and leads to increasing interaction with Sp1, triggering a progressive phosphorylation of Sp1 on Thr453 and Thr739, resulting in the upregulation of VEGF expression. Furthermore, selective inhibition of Sp1 by mithramycin-A or shRNA suppresses

the promotion effect of LPLI on cell cycle progression and proliferation, which is also significantly abolished by inhibition of ERK activity. These findings highlight the important roles of ERK/Sp1 pathway in angiogenesis, supplying potential strategy for angiogenesis-related diseases with LPLI treatment. Sp1 Transcription Factor;Vascular Endothelial Growth Factor A;DNA Cell Proliferation;DNA;Endothelial Cells;Enzyme Activation;HEK293 Cells;Human Umbilical Vein Endothelial Cells;Humans;Low-Level Light Therapy;MAP Kinase Signaling System;Neovascularization, Physiologic;Phosphorylation;Promoter Regions, Genetic;Sp1 Transcription Factor;Transcriptional Activation;Up-Regulation;Vascular Endothelial Growth Factor A

Osteoarthritis and rheumatoid arthritis: conservative therapeutic management. Hand therapists need to understand the basic science behind the therapy they carry out and the current evidence to make the best treatment decisions. The purpose of this article was to review current conservative therapeutic management of patients with rheumatoid arthritis (RA) or osteoarthritis (OA) of the hand. Treatment interventions such as orthotics, exercise, joint protection, modalities, and adaptive equipment are discussed from a basic science and evidence-based practice perspective. Activities of Daily Living;Arthritis, Rheumatoid;Cartilage, Articular;Hand;Humans;Low-Level Light Therapy;Orthotic Devices;Osteoarthritis;Patient Education as Topic;Splints;Ultrasonic Therapy

The diode laser in treating ulcerative oral lesions. Humans;Lasers, Semiconductor;Low-Level Light Therapy;Oral Ulcer;Radiotherapy Dosage;Recurrence;Stomatitis, Aphthous;Stomatitis, Herpetic;Wound Healing

Effect of laser phototherapy on the hyalinization following orthodontic tooth movement in rats. OBJECTIVE: We aimed to assess histologic changes after the use of laser phototherapy (LPT) during induced tooth movement with 40â€‰g/F on young adult male rats. BACKGROUND DATA: Hyalinization is a sterile necrosis at the pressure zone of the periodontal ligament observed during the initial stages of the orthodontic movement, and extensive hyaline areas might cause an important delay in the tooth movement. The use of LPT is considered an enhancement factor for bone repair, as it stimulates microcirculation as well as the cellular metabolism. MATERIALS AND METHODS: Thirty animals were divided into two groups (n=15), named according to the time of animal death (7, 13, and 19 days). Half of the animals in each group were subjected to irradiation with infrared (IR) laser (Î»790â€‰nm, round shaped beam, 40â€‰mW, continuous wave (CW), diameter=2â€‰mm (0.0314â€‰cm(2)), 1.273â€‰W/cm(2), time=2Ã—112â€‰sec+1Ã—275â€‰sec (total time 499â€‰sec), 2Ã—142.6/4.48â€‰J+1Ã—350/11â€‰J, 635.2â€‰J/cm(2)/20â€‰J/ session), during orthodontic movement, the other half were used as nonirradiated controls. After animal death, specimens were sectioned, processed, and stained with hematoxylin and eosin (HE) and Sirius Red, and were used for semi-quantitative histologic analysis by light microscopy. Data were statistically analyzed. RESULTS: We demonstrated that LPT positively affected an important aspect of dental movement; the hyalinization. In the present study, we found a significant reduced expression of hyalinization after 19 days. On irradiated subjects, hyalinization was increased at day 7 with significant reduction at day 13. CONCLUSIONS: It is possible to conclude that the use of laser light caused histologic alterations during the orthodontic movement characterized by increased formation of areas of hyalinization at early stages, and late reduction when compared to nonirradiated animals. Alveolar Process;Animals;Disease Models, Animal;Hyalin;Immunohistochemistry;Low-Level Light Therapy;Male;Periodontal Ligament;Photomicrography;Random Allocation;Rats;Rats, Wistar;Reference Values;Tooth Movement Techniques;Treatment Outcome

Biostimulatory effect of low-level laser therapy on keratinocytes in vitro. Epithelial cells play an important role in reparative events. Therefore, therapies that can stimulate the proliferation and metabolism of these cells could accelerate the healing process. To evaluate the effects of low-level laser therapy (LLLT), human keratinocytes were irradiated with an InGaAsP diode laser prototype

(LASERTable; 780 Â± 3 nm; 40 mW) using 0.5, 1.5, 3, 5, and 7 J/cm2 energy doses. Irradiations were done every 24 h totaling three applications. Evaluation of cell metabolism (MTT assay) showed that LLLT with all energy doses promoted an increase of cell metabolism, being more effective for 0.5, 1.5, and 3 J/cm2. The highest cell counts (Trypan blue assay) were observed with 0.5, 3, and 5 J/cm2. No statistically significant difference for total protein (TP) production was observed and cell morphology analysis by scanning electron microscopy revealed that LLLT did not promote morphological alterations on the keratinocytes. Real-time polymerase chain reaction (qPCR) revealed that LLLT also promoted an increase of type I collagen (Col-I) and vascular endothelial growth factor (VEGF) gene expression, especially for 1.5 J/cm2, but no change on fibroblast growth factor-2 (FGF-2) expression was observed. LLLT at energy doses ranging from 0.5 to 3 J/cm2 promoted the most significant biostimulatory effects on cultured keratinocytes. Collagen Type I;Proteins;VEGFA protein, human;Vascular Endothelial Growth Factor A;Fibroblast Growth Factor 2 Cell Proliferation;Cells, Cultured;Collagen Type I;Dose-Response Relationship, Radiation;Fibroblast Growth Factor 2;Gene Expression Regulation;Humans;Keratinocytes;Lasers, Semiconductor;Low-Level Light Therapy;Proteins;Vascular Endothelial Growth Factor A

Occluding effect of Nd:YAG laser and different dentin desensitizing agents on human dentinal tubules in vitro: a scanning electron microscopy investigation. OBJECTIVES: This in vitro study aimed to microscopically evaluate and compare the occluding effect of the Nd:YAG laser and different dentin desensitizing agents on human dentinal tubules. MATERIALS AND METHODS: The Nd:YAG laser (SunLaseâ„¢ 800) and four commercially available and professionally applied dentin desensitizers (GlumaÂ® desensitizer, Tenure QuickÂ®, Quellâ„¢ desensitizer, and VivaSensÂ®) were investigated in this study. Sixty-four extracted intact human molars were used. Each dentin surface was divided by shallow indentation into two halves, one of which was used for treatment and the other of which served as a control. The dentin surfaces were etched to remove any smear plugs and to mimic the open dentinal tubules of sensitive dentin using 0.5 M ethylenediaminetetraacetic acid (pH 7.4) for two minutes (applied with a microbrush) and then rinsed with an air-water syringe for 30 seconds. The laser samples (n=16) were randomly divided into four groups of four samples each. These groups were the step-up technique group, the 14-day group, the one-minute group, and the two-minute group. Forty-eight samples were treated with the four tested desensitizing agents and were randomly divided into four groups (n=12/group). Each group was further subdivided into three subgroups (n=4). Samples of the first subgroup were treated for 14 days, while those of the second subgroup were treated once. Samples of the last subgroup were fractured longitudinally after a single treatment. All of the samples were then examined under a scanning electron microscope. RESULTS: The Nd:YAG laser-irradiated dentin showed reduction or complete obliteration of the dentinal tubule lumen; thus, the treatment modified the original dentinal structure. The lased dentin surface in the two-minute group showed bubble-like changes in the area of the dentinal tubules' orifices. Statistically, the two-minute group was found to have a significantly higher percentage of partially or fully occluded tubules than did the one-minute group. All of the studied desensitizing agents produced occlusion of the dentinal tubules; however, the appearance of the precipitates, the level of coverage, and the degree of dentinal occlusion varied among the tested products. CONCLUSION: Throughout the specified period of this study, occlusion and/or narrowing of the open dentinal tubules have been successfully achieved with both treatment approaches. Calcium Phosphates;Chelating Agents;Composite Resins;Dentin Desensitizing Agents;Methacrylates;Oxalates;Potassium Compounds;VivaSens Liner;amorphous calcium phosphate;gluma desensitizer;potassium fluoride;Edetic Acid;Fluorides;Glutaral Acid Etching, Dental;Calcium Phosphates;Chelating Agents;Composite Resins;Dentin;Dentin Desensitizing Agents;Dentin Sensitivity;Edetic Acid;Fluorides;Glutaral;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials

Testing;Methacrylates;Microscopy, Electron, Scanning;Oxalates;Potassium Compounds;Smear Layer;Time Factors

A histological evaluation of a low-level laser therapy as an adjunct to periodontal therapy in patients with diabetes mellitus. Diabetes mellitus (DM) and chronic periodontitis are common chronic diseases in adults in the world population. DM has a strong influence on the oral cavity and represents a risk factor for gingivitis and periodontitis. Low-level laser therapy (LLLT) has proven effective in the reduction of inflammation and swelling. The aim of the present study was to evaluate the efficacy of LLLT in diabetic periodontitis through histological analysis. A total of 300 diabetics with chronic periodontal disease and teeth indicated for extraction were assigned into six equal groups. In the groups 1 and 4, indicated teeth were extracted before treatment, and in the rest of the groups upon completion of the entire treatment. All patients received oral hygiene instructions and full-mouth conservative periodontal treatment. In groups 3 and 6, LLLT was applied (670 nm, 5 mW, 2 J/cm(2), 16 min, 5 days). Histologic findings of gingival tissue treated with LLLT showed expressed healing, as is evident by the absence of inflammatory cells. Tissue edema could not be seen, and the number of blood vessels was reduced. In the gingival lamina, propria pronounced collagenization and homogenization were present. It can be concluded that LLLT has shown efficacy in the treatment of periodontitis in diabetics. Because of more pronounced alterations of periodontium in diabetics, the use of LLLT is of particular importance. Adult;Diabetes Complications;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontitis;Treatment Outcome

The state of the science of lasers in dentistry. Dental Cavity Preparation;Dental Implantation, Endosseous;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Mouth Neoplasms;Oral Surgical Procedures;Periodontal Diseases;Root Canal Preparation

An overview of clinical and experimental treatment modalities for port wine stains. Port wine stains (PWS) are the most common vascular malformation of the skin, occurring in 0.3% to 0.5% of the population. Noninvasive laser irradiation with flashlamp-pumped pulsed dye lasers (selective photothermolysis) currently comprises the gold standard treatment of PWS; however, the majority of PWS fail to clear completely after selective photothermolysis. In this review, the clinically used PWS treatment modalities (pulsed dye lasers, alexandrite lasers, neodymium:yttrium-aluminum-garnet lasers, and intense pulsed light) and techniques (combination approaches, multiple passes, and epidermal cooling) are discussed. Retrospective analysis of clinical studies published between 1990 and 2011 was performed to determine therapeutic efficacies for each clinically used modality/technique. In addition, factors that have resulted in the high degree of therapeutic recalcitrance are identified, and emerging experimental treatment strategies are addressed, including the use of photodynamic therapy, immunomodulators, angiogenesis inhibitors, hypobaric pressure, and site-specific pharmaco-laser therapy. Angiogenesis Inhibitors;Immunosuppressive Agents Angiogenesis Inhibitors;Humans;Immunosuppressive Agents;Low-Level Light Therapy;Port-Wine Stain

Antitumor immunologically modified carbon nanotubes for photothermal therapy. An immunologically modified nanotube system was developed using an immunoadjuvant, glycated chitosan (GC), as surfactant of single-walled carbon nanotube (SWNTs). This SWNT-GC system not only retained both optical properties of SWNTs and immunological functions of GC, but also could enter cells due to the carrier properties of SWNTs. Cellular SWNTs induced thermal destruction of tumor cells when irradiated by a near-infrared laser and, at the same time, cellular GC could serve both as damage associated molecular pattern molecules (DAMPs) and pathogen associated molecular pattern molecules (PAMPs) to enhance the tumor immunogenicity and enhance the uptake and presentation of tumor antigens, leading to special antitumor response. Using this system and a 980 nm laser, we treated tumors, both in vitro and in vivo, and investigated the induced thermal and immunological effects. Laser + SWNT-GC afford a remarkable efficacy in suppressing tumor growth in

animal cancer models, in many cases resulting in complete tumor regression and long-term survival. Mice successfully treated by Laser + SWNT-GC could establish resistance to tumor rechallenge. This system forms a multifunctional temporal-spatial continuum, which can synergize photothermal and immunological effects. The Laser + SWNT-GC could represent a promising treatment modality to induce systemic antitumor response through a local intervention, while minimizing the adverse side effects. Antineoplastic Agents;Nanotubes, Carbon;Chitosan Animals;Antineoplastic Agents;Cell Line, Tumor;Chitosan;Female;Low-Level Light Therapy;Mammary Neoplasms, Animal;Mice;Mice, Inbred BALB C;Nanotubes, Carbon;Treatment Outcome

Amelioration of experimental autoimmune encephalomyelitis in C57BL/6 mice by photobiomodulation induced by 670 nm light. BACKGROUND: The approved immunomodulatory agents for the treatment of multiple sclerosis (MS) are only partially effective. It is thought that the combination of immunomodulatory and neuroprotective strategies is necessary to prevent or reverse disease progression. Irradiation with far red/near infrared light, termed photobiomodulation, is a therapeutic approach for inflammatory and neurodegenerative diseases. Data suggests that near-infrared light functions through neuroprotective and anti-inflammatory mechanisms. We sought to investigate the clinical effect of photobiomodulation in the Experimental Autoimmune Encephalomyelitis (EAE) model of multiple sclerosis. METHODOLOGY/PRINCIPAL FINDINGS: The clinical effect of photobiomodulation induced by 670 nm light was investigated in the C57BL/6 mouse model of EAE. Disease was induced with myelin oligodendrocyte glycoprotein (MOG) according to standard laboratory protocol. Mice received 670 nm light or no light treatment (sham) administered as suppression and treatment protocols. 670 nm light reduced disease severity with both protocols compared to sham treated mice. Disease amelioration was associated with down-regulation of proinflammatory cytokines (interferon-Î³, tumor necrosis factor-Î±) and up-regulation of anti-inflammatory cytokines (IL-4, IL-10) in vitro and in vivo. CONCLUSION/SIGNIFICANCE: These studies document the therapeutic potential of photobiomodulation with 670 nm light in the EAE model, in part through modulation of the immune response. Cytokines;Inflammation Mediators Animals;Cytokines;Disease Progression;Encephalomyelitis, Autoimmune, Experimental;Female;Inflammation Mediators;Infrared Rays;Light;Mice;Mice, Inbred C57BL;Multiple Sclerosis;Photobiology;Phototherapy;Time Factors

Gold nanomaterials conjugated with indocyanine green for dual-modality photodynamic and photothermal therapy. Light-exposure-mediated higher temperatures that markedly accelerate the degradation of indocyanine green (ICG) in aqueous solutions by thermal decomposition have been a serious medical problem. In this work, we present the example of using gold nanorods (Au NRs) and gold nanoparticles (Au NPs) simultaneously serving as photodynamic and photothermal agents to destroy malignant cells. Au NRs and Au NPs were successfully conjugated with hydrophilic photosensitizer, indocyanine green (ICG), to achieve photodynamic therapy (PDT) and photothermal therapy (PTT). We also demonstrated that Au NRs and Au NPs conjugated with ICG displayed high chemical stability and acted as a promising diagnostic probe. Moreover, the photochemical destruction ability would have a gradually increase depending on different sizes of Au NPs. Due to its stability even via higher temperatures mediated by laser irradiation, the combination of PTT and PDT proved to be efficiently killing cancer cells as compared to PTT or PDT treatment alone and enhanced the effectiveness of photodestruction and was demonstrated to enhance its photostability. As a result, the preparation of Au-based nanomaterials conjugated with ICG as well as their use in biomedical applications is valuable developments in multifunctional nanomaterials. Gold;Indocyanine Green Cell Line, Tumor;Combined Modality Therapy;Gold;Humans;Indocyanine Green;Low-Level Light Therapy;Lung Neoplasms;Nanostructures;Photochemotherapy;Treatment Outcome

Advanced treatment modalities for vitiligo. BACKGROUND: Vitiligo is an acquired multifocal and polygenic dyschromia that affects 1% to 3% of the world and presents as multiple depigmented macules and patches. Traditionally, the treatment of vitiligo has focused on pharmacologic interventions, but nearly half of all treated patients fail to respond successfully. OBJECTIVE: Several advanced techniques exist that can aid dermatologists in treating vitiligo in patients who do not respond favorably to traditional pharmacologic treatments. These advanced interventions include the use of the 308-nm excimer laser, total body depigmentation therapy with monobenzyl ether of hydroquinone, microdermabrasion, micropigmentation, khellin-UVA therapy, and surgical management using miniature punch grafting, suction blister grafting, and epidermal cultures. MATERIALS AND METHODS: This article reviews the current literature on these advanced treatment modalities for vitiligo and provides a practical guide for application of these techniques. RESULTS AND CONCLUSION: Our ability to treat vitiligo may be imperfect, but through appropriate patient selection and careful application of one or more of these advanced therapies, successful treatment of vitiligo, even in patients refractory to treatment, can be achieved. Hydroquinones;Khellin;hydroquinone Dermabrasion;Humans;Hydroquinones;Khellin;Lasers, Excimer;Low-Level Light Therapy;Melanocytes;PUVA Therapy;Patient Selection;Skin Transplantation;Vitiligo

Photobiomodulation enhances nigral dopaminergic cell survival in a chronic MPTP mouse model of Parkinson's disease. We have shown previously that photobiomodulation or near-infrared light (NIr) treatment protects dopaminergic cells of the substantia nigra pars compacta (SNc) in an acute MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) model of Parkinson's disease (PD). In this study, we tested the protective and rescue action of NIr treatment in a chronic MPTP model, developed to resemble more closely the slow progressive degeneration in PD patients. We examined three regions of dopaminergic cells, the SNc, periaqueductal grey matter (PaG) and zona incerta-hypothalamus (ZI-Hyp). BALB/c mice had MPTP or saline injections over five weeks, followed by a three-week survival. NIr treatment was applied either at the same time as (simultaneous series) or after (post-treatment series) the MPTP insult. There were four groups within each series; Saline, Saline-NIr, MPTP and MPTP-NIr. Brains were processed for tyrosine hydroxylase (TH) immunochemistry and cell number was analysed using the optical fractionator method. In the SNc, there was a significant reduction (â‰ˆ 45%) in TH(+) cell number in the MPTP groups compared to the saline controls of both series. In the MPTP-NIr groups of both series, TH(+) cell number was significantly higher (â‰ˆ 25%) than in the MPTP groups, but lower than in the saline controls (â‰ˆ 20%). By contrast in the PaG and ZI-Hyp, there were no significant differences in TH(+) cell number between the MPTP an MPTP-NIr groups of either series. In summary, exposure to NIr either at the same time or well after chronic MPTP insult saved many SNc dopaminergic cells from degeneration. Tyrosine 3-Monooxygenase Analysis of Variance;Animals;Cell Count;Cell Survival;Disease Models, Animal;Dopaminergic Neurons;Infrared Rays;Male;Mice;Mice, Inbred BALB C;Parkinsonian Disorders;Periaqueductal Gray;Substantia Nigra;Subthalamus;Tyrosine 3-Monooxygenase

Photodynamic modulation of wound healing: a review of human and animal studies. OBJECTIVE: The purpose of this study was to review studies of photodynamic therapy (PDT) on wound healing and cells in vitro, to assess the effects of such therapy. BACKGROUND DATA: PDT is used to treat tumors. When activated by light of a specific wavelength, the photosensitizer produces reactive oxygen species (ROS) that kill tumor cells. Low levels of ROS may induce cellular proliferation. METHODS: Research articles investigating PDT on wound healing and cells in vitro published up to August 2010 were retrieved from library sources, PubMed and Medline databases, reference lists of articles, and searches of relevant journals. RESULTS: The studies indicated that use of various photosensitizers combined with laser irradiation led to improved wound outcomes. For most in vitro studies, there was a decrease in cell growth or viability. CONCLUSIONS: PDT improved healing

outcomes in several animal wound models, but mainly had an inhibitory effect on cells in vitro. These findings strongly support PDT for wound healing. Photosensitizing Agents Animals;Cells, Cultured;Cohort Studies;Combined Modality Therapy;Disease Models, Animal;Humans;In Vitro Techniques;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Photochemotherapy;Photosensitizing Agents;Prognosis;Rats;Rats, Inbred Lew;Rats, Sprague-Dawley;Treatment Outcome;Wound Healing;Wounds and Injuries

LED phototherapy improves healing of nipple trauma: a pilot study. OBJECTIVE: The purpose of this study was to evaluate the clinical effectiveness of a LED phototherapy prototype apparatus in the healing of nipple trauma in breastfeeding women. BACKGROUND DATA: There is no scientific evidence of an effective treatment for nipple trauma. METHODS: The experimental group was treated with orientation on nipple care and adequate breastfeeding techniques in addition to active LED phototherapy. The control group was treated with orientation on nipple care and adequate breastfeeding techniques in addition to placebo LED phototherapy. Participants were treated twice a week, for a total of eight sessions. Healing of the nipple lesions was measured by a reduction in their area, and decrease in pain intensity was measured in accordance with an 11-point Pain Intensity Numerical Rating Scale and a standard 7-point patient global impression of change. RESULTS: Statistically significant reductions in measured nipple lesion area ($p<0.001$) were observed for both the experimental and control groups with an increase in the number of treatment sessions. A significant difference between the experimental and control groups was observed for the healing of nipple lesions ($p<0.001$). The pain intensity was significantly reduced only in the experimental group ($p<0.001$). CONCLUSIONS: Preliminary results demonstrated the prototype apparatus for LED phototherapy to be an effective tool in accelerating the healing of nipple trauma. Dermatologic Agents Administration, Topical;Adult;Breast Diseases;Breast Feeding;Dermatitis;Dermatologic Agents;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Nipples;Pain Measurement;Pilot Projects;Risk Assessment;Severity of Illness Index;Skin Care;Statistics, Nonparametric;Wound Healing;Young Adult

Er:YAG laser treatment in supportive periodontal therapy. OBJECTIVE: To assess clinical and microbiological outcomes of an Er:YAG laser in comparison with sonic debridement in the treatment of persistent periodontal pockets in a prospective randomized controlled multicentre study design. MATERIAL AND METHODS: A total of 78 patients in supportive periodontal therapy with two residual pockets were included, 58 were available for the whole follow-up period. Root surfaces were instrumented either with a sonic scaler (Sonicflex(Â®) 2003 L) or with an Er:YAG laser (KEY Laser(Â®) 3). Clinical attachment levels (CAL), Probing depths (PD), Plaque control record (PCR) and Bleeding on probing (BOP) were assessed at baseline, 13 and 26 weeks after treatment. In addition, microbiological analysis was performed employing a DNA diagnostic test kit (micro-IDent(Â®) Plus). RESULTS: Probing depths and CAL were significantly reduced in both groups over time ($p < 0.05$), without significant differences between the groups ($p > 0.05$). BOP frequency values decreased significantly within both groups ($p < 0.05$), with no difference between the laser and the sonic treatment ($p > 0.05$). PCR frequency values did not change during the observation period ($p > 0.05$). Microbiological analysis failed to expose any significant difference based on treatment group or period. CONCLUSION: Employing both sonic and laser treatment procedures during supportive periodontal care, similar clinical and microbiological outcomes can be expected. Bacterial Load;Chronic Periodontitis;Dental Plaque;Female;Follow-Up Studies;Gingival Hemorrhage;Gram-Negative Bacteria;High-Energy Shock Waves;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Debridement;Periodontal Pocket;Prospective Studies;Sonication;Tooth Root;Treatment Outcome

Low-level laser therapy for closed-head traumatic brain injury in mice: effect of different wavelengths. BACKGROUND AND OBJECTIVES: Traumatic brain injury (TBI) affects millions worldwide and is without effective treatment. One area that is attracting growing interest is the use of transcranial low-level laser therapy (LLLT) to treat TBI. The fact that near-infrared light can penetrate into the brain would allow non-invasive treatment to be carried out with a low likelihood of treatment-related adverse events. LLLT may treat TBI by increasing respiration in the mitochondria, causing activation of transcription factors, reducing inflammatory mediators and oxidative stress, and inhibiting apoptosis. STUDY DESIGN/MATERIALS AND METHODS: We tested LLLT in a mouse model of closed-head TBI produced by a controlled weight drop onto the skull. Mice received a single treatment with continuous-wave 665, 730, 810, or 980 nm lasers (36 J/cm(2) delivered at 150 mW/cm(2)) 4-hour post-TBI and were followed up by neurological performance testing for 4 weeks. RESULTS: Mice with moderate-to-severe TBI treated with 665 and 810 nm laser (but not with 730 or 980 nm) had a significant improvement in Neurological Severity Score that increased over the course of the follow-up compared to sham-treated controls. Morphometry of brain sections showed a reduction in small deficits in 665 and 810 nm laser treated mouse brains at 28 days. CONCLUSIONS: The effectiveness of 810 nm agrees with previous publications, and together with the effectiveness of 660 nm and non-effectiveness of 730 and 980 nm can be explained by the absorption spectrum of cytochrome oxidase, the candidate mitochondrial chromophore in transcranial LLLT.
Animals;Area Under Curve;Brain;Brain Injuries;Disease Models, Animal;Head Injuries, Closed;Low-Level Light Therapy;Male;Mice;Mice, Inbred BALB C;Trauma Severity Indices;Treatment Outcome

Effects of a long-pulsed 800-nm diode laser on axillary hyperhidrosis: a randomized controlled half-side comparison study. BACKGROUND: Generally, axillary hyperhidrosis (AH) is treated with antiperspirant agents, botulinum toxin, or local surgery. The effect of laser treatment on sweat secretion in patients with AH has not been investigated. OBJECTIVE: To evaluate the effect of diode laser epilation on the sweat rate of patients with AH. MATERIALS AND METHODS: We performed a randomized half-side controlled trial. Twenty-one patients were treated with 5 cycles of an 800-nm diode laser. Sweat rates were documented using gravimetry and a visual analogue scale. Histologic examination was performed in all patients before and after treatment. RESULTS: A significant reduction in sweat rate was observed on the laser-treated (median 89Â mg/min, range 42-208Â mg/min vs 48Â mg/min, range 17-119Â mg/min; pÂ <Â .001) and the untreated contralateral (median 78Â mg/min, range 25-220Â mg/min vs median 65Â mg/min, range 24-399Â mg/min; pÂ =Â .04) sides, although no significant difference was found between the treated and untreated sides (pÂ =Â .10). CONCLUSION: Although we observed a significant decrease in sweat rate on laser-treated sites, laser epilation was not able to reduce the sweat rate significantly more than on the untreated contralateral side. These results probably indicate a placebo effect rather than a direct therapeutic effect of laser epilation.
Adult;Aged;Axilla;Female;Humans;Hyperhidrosis;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Statistics, Nonparametric;Treatment Outcome

Intrapatient comparison of 308-nm monochromatic excimer light and localized narrow-band UVB phototherapy in the treatment of vitiligo: a randomized controlled trial. BACKGROUND: Limited data are available about the use of 308-nm monochromatic excimer light (MEL) and localized 311-nm narrow-band ultraviolet B (NB-UVB) in the treatment of vitiligo. The aim of this study was to evaluate the efficacy of 308-nm MEL versus localized 311-nm NB-UVB in vitiligo patients. METHODS: Eleven patients participated in this prospective intrapatient placebo-controlled randomized trial. In each patient, 3 lesions were selected and treated with NB-UVB, MEL and placebo during 24 sessions, respectively. Repigmentation was evaluated clinically and by objective surface measurement. RESULTS: Twenty percent of the lesions treated with NB-UVB achieved repigmentation scores above

50%. None of the lesions treated with MEL achieved a repigmentation higher than 50% after 24 sessions. CONCLUSION: Localized 311-nm NB-UVB is effective in the treatment of vitiligo. It should be considered for localized vitiligo as it is easily accessible. In this study the efficacy of localized 311-nm NB-UVB was superior to 308-nm MEL. Adult;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Severity of Illness Index;Skin Pigmentation;Treatment Outcome;Ultraviolet Therapy;Vitiligo;Young Adult

Pulsed dye laser and pulsed dye laser-mediated photodynamic therapy in the treatment of dermatologic disorders. BACKGROUND: The pulsed dye laser (PDL) is used for treating cutaneous vascular disorders. Recent reports have also shown its effectiveness in conditions of other etiologies, although the precise mechanisms of action are unknown. PDL has also been used in photodynamic therapy (PDT) for many dermatologic conditions. We review the broad array of disorders that can be effectively managed using the PDL. OBJECTIVES AND METHODS: A review of the literature on the application of the PDL and PDL-mediated PDT in dermatologic disorders. A literature-based search was performed using PubMed from 1997 to 2010. Search terms included: "pulsed dye laser," "pulsed dye laser photodynamic therapy," and "pulsed dye laser indications." RESULTS: The PDL was initially designed for cutaneous vascular disorders. Recent investigations have demonstrated successful results when treating malignant, inflammatory, viral, and collagenous conditions. Side effects, including pain, purpura, edema, and postinflammatory hyperpigmentation, were mild, well tolerated, and transient. CONCLUSIONS: PDL is accepted as first-line therapy for vascular disorders including port-wine stains, telangiectasias, and hemangiomas. PDL causes selective photothermolysis of dermal vasculature. This mechanism also allows it to be applicable for disorders of other etiologies. Recent studies suggest that the PDL may induce cytokine expression and collagen formation, further increasing its applicability in dermatology. Humans;Lasers, Dye;Low-Level Light Therapy;Photochemotherapy;Skin Diseases

Laser-induced radiation microbeam technology and simultaneous real-time fluorescence imaging in live cells. The use of nano- and microbeam techniques to induce and identify subcellular localized energy deposition within a region of a living cell provides a means to investigate the effects of low radiation doses. Particularly within the nucleus where the propagation and processing of deoxyribonucleic acid (DNA) damage (and repair) in both targeted and nontargeted cells, the latter being able to study cell-cell (bystander) effects. We have pioneered a near infrared (NIR) femtosecond laser microbeam to mimic ionizing radiation through multiphoton absorption within a 3D femtoliter volume of a highly focused Gaussian laser beam. The novel optical microbeam mimics both complex ionizing and UV-radiation-type cell damage including double strand breaks (DSBs). Using the microbeam technology, we have been able to investigate the formation of DNA DSB and subsequent recruitment of repair proteins to the submicrometer size site of damage introduced in viable cells. The use of a phosphorylated H2AX (Î³-H2AX a marker for DSBs, visualized by immunofluorescent staining) and real-time imaging of fluorescently labeling proteins, the dynamics of recruitment of repair proteins in viable mammalian cells can be observed. Here we show the recruitment of ATM, p53 binding protein 1 (53BP1), and RAD51, an integral protein of the homologous recombination process in the DNA repair pathway and Ku-80-GFP involved in the nonhomologous end joining (NHEJ) pathway as exemplar repair process to show differences in the repair kinetics of DNA DSBs. The laser NIR multiphoton microbeam technology shows persistent DSBs at later times post laser irradiation which are indicative of DSBs arising at replication presumably from UV photoproducts or clustered damage containing single strand breaks (SSBs) that are also observed. Effects of the cell cycle may also be investigated in real time. Postirradiation and fixed cells studies show that in G1 cells a fraction of multiphoton laser-induced DSBs is persistent for >6h in addition to those induced at replication demonstrating the broad range of timescales taken to repair

DNA damage. Antigens, Nuclear;Cell Cycle Proteins;DNA-Binding Proteins;H2AX protein, human;Histones;Intracellular Signaling Peptides and Proteins;TP53BP1 protein, human;Tumor Suppressor Proteins;Tumor Suppressor p53-Binding Protein 1;ATM protein, human;Ataxia Telangiectasia Mutated Proteins;Protein Serine-Threonine Kinases;RAD51 protein, human;Rad51 Recombinase;Xrcc6 protein, human;Ku Autoantigen Animals;Antigens, Nuclear;Ataxia Telangiectasia Mutated Proteins;Bystander Effect;Cell Cycle;Cell Cycle Proteins;Cells;DNA Breaks, Double-Stranded;DNA Repair;DNA Replication;DNA-Binding Proteins;Histones;Humans;Intracellular Signaling Peptides and Proteins;Ku Autoantigen;Lasers;Low-Level Light Therapy;Mammals;Microscopy, Fluorescence, Multiphoton;Phosphorylation;Protein Serine-Threonine Kinases;Rad51 Recombinase;Radiation, Ionizing;Spectroscopy, Near-Infrared;Tumor Suppressor Proteins;Tumor Suppressor p53-Binding Protein 1

Therapeutic ultrasound for carpal tunnel syndrome. BACKGROUND: Therapeutic ultrasound may be offered to people experiencing mild to moderate symptoms of carpal tunnel syndrome (CTS). The effectiveness and duration of benefit of this non-surgical intervention remain unclear. OBJECTIVES: To review the effects of therapeutic ultrasound compared with no treatment, placebo or another non-surgical intervention in people with CTS. SEARCH METHODS: We searched the Cochrane Neuromuscular Disease Group Specialized Register (22 February 2011), the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, 2011, Issue 1), MEDLINE (January 1966 to February 2011), EMBASE (January 1980 to February 2011), CINAHL Plus (January 1937 to February 2011), and AMED (January 1985 to February 2011). SELECTION CRITERIA: Randomised controlled trials (RCTs) comparing any regimen of therapeutic ultrasound with no treatment, a placebo or another non-surgical intervention in people with CTS. DATA COLLECTION AND ANALYSIS: Two review authors independently selected trials for inclusion, extracted data and assessed the risk of bias in the included studies. We calculated risk ratio (RR) and mean difference (MD) with 95% confidence intervals (CIs) for primary and secondary outcomes. We pooled results of clinically homogenous trials in a meta-analysis using a random-effects model, where possible, to provide estimates of the effect. MAIN RESULTS: We included 11 studies randomising 443 patients in the review. Two trials compared therapeutic ultrasound with placebo, two compared one ultrasound regimen with another, two compared ultrasound with another non-surgical intervention, and six compared ultrasound as part of a multi-component intervention with another non-surgical intervention (for example, exercises and splint). The risk of bias was low in some studies and unclear or high in other studies, with only three reporting that the allocation sequence was concealed and six reporting that participants were blinded. Overall, there is insufficient evidence that one therapeutic ultrasound regimen is more efficacious than another. Only two studies reported the primary outcome of interest, short-term overall improvement (any measure in which patients indicate the intensity of their complaints compared with baseline, for example, global rating of improvement, satisfaction with treatment, within three months post-treatment). One low quality trial with 68 participants found that when compared with placebo, therapeutic ultrasound may increase the chance of experiencing short-term overall improvement at the end of seven weeks treatment (RR 2.36; 95% CI 1.40 to 3.98), although losses to follow-up in this study suggest that these data should be interpreted with caution. Another low quality trial with 60 participants found that at three months, post-treatment therapeutic ultrasound plus splint increased the chance of short-term overall improvement (patient satisfaction) when compared with splint alone (RR 3.02; 95% CI 1.36 to 6.72), but decreased the chance of short-term overall improvement when compared with low-level laser therapy plus splint (RR 0.87; 95% CI 0.57 to 1.33), though participants were not blinded to treatment and it was unclear if the random allocation sequence was adequately concealed. Differences between groups receiving different frequencies and intensities of ultrasound, and between ultrasound as part of a multi-component

intervention versus other non-surgical interventions, were generally small and not statistically significant for symptoms, function, and neurophysiologic parameters. Only four studies measured adverse effects, none of which identified adverse effects due to therapeutic ultrasound. However, more data on this outcome are required before any firm conclusions on the safety of this intervention can be made. AUTHORS' CONCLUSIONS: There is only poor quality evidence from very limited data to suggest that therapeutic ultrasound may be more effective than placebo for either short- or long-term symptom improvement in people with CTS. There is insufficient evidence to support the greater benefit of one type of therapeutic ultrasound regimen over another or to support the use of therapeutic ultrasound as a treatment with greater efficacy compared to other non-surgical interventions for CTS, such as splinting, exercises, and oral drugs. More methodologically rigorous studies are needed to determine the effectiveness and safety of this intervention for CTS.
Carpal Tunnel Syndrome;Combined Modality Therapy;Humans;Randomized Controlled Trials as Topic;Time Factors;Treatment Outcome;Ultrasonic Therapy

Effectiveness of low-level laser therapy in temporomandibular disorders: a systematic review and meta-analysis. AIM: To assess the scientific evidence on the efficacy of low-level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMD). METHODS: The databases of PubMed, Science Direct, Cochrane Clinical Trials Register, and PEDro were manually and electronically searched up to February 2010. Two independent reviewers screened, extracted, and assessed the quality of the publications. A meta-analysis- was performed to quantify the pooled effect of LLLT on pain and function in patients with chronic TMD. RESULTS: The literature search identified 323 papers without overlap between selected databases, but after the two-phase study selection, only six randomized clinical trials (RCT) were included in the systematic review. The primary outcome of interest was the change in pain from baseline to endpoint. The pooled effect of LLLT on pain, measured through a visual analog scale with a mean difference of 7.77 mm (95% confidence interval [CI]: -2.49 to 18.02), was not statistically significant from placebo. Change from baseline to endpoint of secondary outcomes was 4.04 mm (95% CI 3.06 to 5.02) for mandibular maximum vertical opening; 1.64 mm (95% CI 0.10 to 3.17) for right lateral excursion and 1.90 mm (95% CI: -4.08 to 7.88) for left lateral excursion. CONCLUSION: Currently, there is no evidence to support the effectiveness of LLLT in the treatment of TMD. Facial Pain;Humans;Low-Level Light Therapy;Randomized Controlled Trials as Topic;Range of Motion, Articular;Temporomandibular Joint Disorders;Treatment Outcome

An in vivo histopathological comparison of single and double pulsed modes of a fractionated CO(2) laser. INTRODUCTION: Studies examining the histopathological changes that occur in human skin following fractional laser treatment have been performed mainly in animals or abdominal tissue prior to abdominoplasty. This study looks at the effect of double pulse fractional CO(2) laser compared to single pulse treatments to assess differences in tissue injury in the face and abdomen. METHODS: Twelve healthy subjects randomized into two groups, had two 1â€‰cm(2) areas (infraumbilical and forehead) treated with the fractional CO(2) laser (Deep Fx, Lumenis). Settings used were 15â€‰mJ double pulse, and 30â€‰mJ single pulse, 300â€‰Hz, 10% density and compared to the historic control of 15 patients treated at 15â€‰mJ single pulse [Bailey et al. (2011), Lasers Surg Med 43: 99-107]. Treated sites were biopsied and analyzed with H&E and TUNEL staining to measure width and depth of the microthermal zones (MTZ) of ablation. RESULTS: When comparing 15â€‰mJ double pulse to single pulse there were significant differences both in depth (abdominal skin, Pâ€‰=â€‰0.002 and facial skin, Pâ€‰=â€‰0.001) and width (facial skin, Pâ€‰=â€‰0.0002) of MTZ. When comparing double pulsing at 15â€‰mJ with single pulsing at 30â€‰mJ there were significant differences between MTZ depths in the abdomen (Pâ€‰<â€‰0.01) but not in either the MTZ depth (Pâ€‰=â€‰0.69) or the width in the face (Pâ€‰=â€‰0.502). DISCUSSION: This study

demonstrates the differences between histopathological laser injury patterns in the face compared to the abdomen when single pulsing is used. It also demonstrates that double pulsing at 15â€‰mJ is statistically similar to single pulsing at 30â€‰mJ in the face. We think this could have ramifications for clinical practice where by double pulsing at lower energies may result in better clinical outcomes than increasing energies or using multiple passes at single pulse. Clinical studies needs to be performed to investigate this further. Abdomen;Adult;Aged;Biopsy, Needle;Dermis;Dose Fractionation, Radiation;Dose-Response Relationship, Radiation;Face;Female;Humans;Immunohistochemistry;In Situ Nick-End Labeling;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Radiation Dosage;Reference Values;Risk Assessment;Young Adult

The effect of different pulse durations in the treatment of nail psoriasis with 595-nm pulsed dye laser: a randomized, double-blind, intrapatient left-to-right study. BACKGROUND: Several studies have proven the efficacy of pulsed dye laser (PDL) in the treatment of plaque type psoriasis. However, only two published studies indicate the effectiveness of PDL on nail psoriasis. OBJECTIVE: We sought to study the effect of different pulse durations in the treatment of nail psoriasis with the 595-nm PDL to determine the optimal pulse duration. METHODS: Twenty patients with bilateral fingernail psoriasis were recruited and completed a 6-month trial. PDL was applied on the proximal and lateral nailfolds based on random assignment. Forty nails were treated with 6-millisecond pulse duration and 9 J/cm(2) whereas 39 nails were treated with 0.45-millisecond pulse duration and 6 J/cm(2). Patients were blinded to pulse durations. One blinded dermatologist used the Nail Psoriasis Severity Index (NAPSI) to assess the clinical outcome from pretreatment and posttreatment photographs. Patients were monitored for adverse events. Pain was evaluated after the procedure using a visual analog scale assessed by the patient. RESULTS: After 6 months of first treatment, there was a significant reduction in overall NAPSI, nail matrix NAPSI, and nail bed NAPSI scores from baseline in both groups; however, no significant difference was found between the two pulse duration groups. Side effects were mild including transient petechiae and hyperpigmentation. LIMITATIONS: There was no placebo group. CONCLUSIONS: PDL was found to be an effective and well-tolerated option in the treatment of nail psoriasis. No significant difference in terms of efficacy was found between the longer and shorter pulse duration treatment groups. Adolescent;Adult;Aged;Double-Blind Method;Female;Follow-Up Studies;Humans;Inpatients;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Nail Diseases;Psoriasis;Reference Values;Severity of Illness Index;Thailand;Time Factors;Treatment Outcome;Young Adult

Evaluation of Nd:YAG and Er:YAG irradiation, antibacterial photodynamic therapy and sodium hypochlorite treatment on Enterococcus faecalis biofilms. AIM: To compare the antimicrobial efficacy of two-high power lasers (Nd:YAG and Er:YAG) and two commercial antimicrobial photodynamic therapy (aPDT) systems with that of sodium hypochlorite (NaOCl) action on Enterococcus faecalis biofilms grown on dentine discs. METHODOLOGY: Enterococcus faecalis biofilms were grown on dentine discs in a microtiter plate, incubated for 24 h and subjected to the following treatments: aPDT (Denfotex and Helbo system), Er:YAG laser irradiation (2940 nm, 50 mJ or 100 mJ, 15 Hz, 40 s), Nd:YAG laser irradiation (1064 nm, 2 W, 15 Hz, 40 s) and immersion in 2.5% (w/v) NaOCl for 1, 5, 10 and 30 min. Surviving bacteria were harvested, and the number of CFU per disc was determined by plate counting. RESULTS: Significant reductions (anova, P â‰¤ 0.05) in viable counts were observed for aPDT (Helbo) (2 log(10) reduction), Er:YAG irradiation using 100 mJ pulses (4.3 log(10) reduction) and all NaOCl treatments (>6 log(10) reduction). NaOCl (2.5%) for 5 min effectively eliminated all bacteria. aPDT (Denfotex), Er:YAG irradiation using 50 mJ pulses and Nd:YAG treatment caused a reduction in the viable counts of <1 log(10) unit; these results were not significantly different from the untreated controls. CONCLUSION: Within the limitations of this

particular laboratory set-up, NaOCl was the most effective in E. faecalis biofilm elimination, while Er:YAG laser treatment (100 mJ pulses) also resulted in high reductions in viable counts. The use of both commercial aPDT systems resulted in a weak reduction in the number of E. faecalis cells. Nd:YAG irradiation was the least effective. Anti-Bacterial Agents;Photosensitizing Agents;Root Canal Irrigants;Tolonium Chloride;Sodium Hypochlorite Anti-Bacterial Agents;Bacterial Adhesion;Bacterial Load;Bacteriological Techniques;Biofilms;Biomass;Combined Modality Therapy;Dentin;Enterococcus faecalis;Humans;Lasers, Solid-State;Low-Level Light Therapy;Materials Testing;Microbial Viability;Microscopy, Electron, Scanning;Photochemotherapy;Photosensitizing Agents;Radiation Dosage;Root Canal Irrigants;Sodium Hypochlorite;Time Factors;Tolonium Chloride

Low-level laser irradiation affects the release of basic fibroblast growth factor (bFGF), insulin-like growth factor-I (IGF-I), and receptor of IGF-I (IGFBP3) from osteoblasts. OBJECTIVE: It was the aim of the present study to evaluate whether the laser irradiation of osteoblasts could enhance the release of growth factors including basic fibroblast growth factor (bFGF), insulin-like growth factor-I (IGF-I), and receptor of IGF-I (IGFBP3). BACKGROUND DATA: Low-level laser therapy (LLLT) has been shown to have biostimulatory effects on various cell types by enhancing production of some cytokines and growth factors. MATERIALS AND METHODS: Human mesenchymal stem cells (MSCs) were seeded in osteogenic medium and differentiated into osteoblasts. Three groups were formed: in the first group (single dose group), osteoblasts were irradiated with laser (685â€‰nm, 25â€‰mW, 14.3 mW/cm(2), 140â€‰sec, 2â€‰J/cm(2)) for one time; and in the second group, energy at the same dose was applied for 2 consecutive days (double dose group). The third group was not irradiated with laser and served as the control group. Proliferation, viability, bFGF, IGF-I, and IGFBP3 levels were compared between groups. RESULTS: Both of the irradiated groups revealed higher proliferation, viability, bFGF, IGF-I, and IGFBP3 expressions than did the nonirradiated control group. There was increase in bFGF and IGF-I expressions and decrease in IGFBP3 in the double dose group compared to single dose group. CONCLUSIONS: The results of the present study indicate that LLLT increases the proliferation of osteoblast cells and stimulates the release of bFGF, IGF-I, and IGFBP3 from these cells. The biostimulatory effect of LLLT may be related to the enhanced production of the growth factors. IGFBP3 protein, human;Insulin-Like Growth Factor Binding Protein 3;Fibroblast Growth Factor 2;Insulin-Like Growth Factor I Cell Proliferation;Cell Survival;Cells, Cultured;Dose-Response Relationship, Radiation;Enzyme-Linked Immunosorbent Assay;Fibroblast Growth Factor 2;Humans;Insulin-Like Growth Factor Binding Protein 3;Insulin-Like Growth Factor I;Low-Level Light Therapy;Mesenchymal Stem Cells;Osteoblasts;Radiation Dosage;Sampling Studies;Sensitivity and Specificity;Statistics, Nonparametric

Effects of a therapeutic laser and passive stretching program for treating tendon overuse. OBJECTIVE: This study investigated the effects of a therapeutic laser, passive stretching, and their combined treatment on the strength of Achilles tendons with overuse pathologies. BACKGROUND DATA: Tendinopathy involving overuse is usually treated with exercise and stretching, but there has been no report on the treatment effect of a therapeutic laser combined with passive stretching on managing this condition. Despite the beneficial effect of a therapeutic laser on healing tendons that have had traumatic injury, its effect on degenerative tendons is not known. METHODS: Twenty-five mature Sprague-Dawley (SD) rats were used, with 20 subjected to daily bipedal downhill running for 8 weeks, to induce Achilles overuse, and 5 as normal controls. The exercised rats were divided into four groups: 1, laser treatment; 2, passive stretching; 3, combined laser and stretching; and 4, no treatment, running controls. GaAlAs laser with 660â€‰nm wavelength was applied to both Achilles tendons for 50â€‰sec for Groups 1 and 3. Passive stretching of 20 times/10â€‰sec of maximum ankle plantar flexion was applied to Groups 2 and 3. Treatments were applied after each running session for a a total of 56 treatment sessions. On week 9, the tendons were tested for load-

relaxation, stiffness, and ultimate strength. RESULTS: Stiffness was different (p=0.01), difference in ultimate strength was marginally insignificant (p=0.07), and load-relaxation difference was not significant among groups. Post-hoc analyses revealed that the mean stiffness of all the four exercise groups was lower than the normal control, whereas the ultimate strength from the laser and combined laser and stretching was not different from that of the normal control group, but was higher than that of the passive stretching and no treatment groups. CONCLUSIONS: We conclude that a therapeutic laser and combined laser with passive stretching might slow down the decrease in Achilles tendon strength but would not be able to stop the pathological changes of overuse from developing. Achilles Tendon;Analysis of Variance;Animals;Biomechanical Phenomena;Combined Modality Therapy;Cumulative Trauma Disorders;Disease Models, Animal;Female;Low-Level Light Therapy;Muscle Stretching Exercises;Random Allocation;Rats;Rats, Sprague-Dawley;Recovery of Function;Reference Values;Risk Factors;Tendinopathy;Time Factors;Treatment Outcome

Low-level laser therapy improves visual acuity in adolescent and adult patients with amblyopia. OBJECTIVE: The purpose of this study was to examine the effects of low-level laser therapy (LLLT) on visual acuity in adolescent and adult patients with amblyopia. BACKGROUND DATA: Currently, amblyopia can be treated successfully only in children. METHODS: In this single-blinded, placebo-controlled study, 178 patients (mean age 46.8 years) with amblyopia caused by ametropia (110 eyes) or strabismus (121 eyes) were included. For LLLT, the area of the macula was irradiated through the conjunctiva from 1â€‰cm distance for 30â€‰sec with laser light (780â€‰nm, 292â€‰Hz, 1:1 duty cycle; average power 7.5â€‰mW; spot area 3â€‰mm(2)). The treatment was repeated on average 3.5 times, resulting in a mean total dose of 0.77â€‰J/cm(2). No occlusion was applied, and no additional medication was administered. Best corrected distant visual acuity was determined using Snellen projection optotypes. In 12 patients (12 eyes), the multifocal visual evoked potential (M-VEP) was recorded. A control group of 20 patients (20 eyes) received mock treatment. RESULTS: Visual acuity improved in âˆ¼90% of the eyes treated with LLLT (p<0.001), increasing by three or more lines in 56.2% and 53.6% of the eyes with amblyopia caused by ametropia and strabismus, respectively. The treatment effect was maintained for at least 6 months. The mean M-VEP amplitude increased by 1207â€‰nV (p<0.001) and mean latency was reduced by 7â€‰msec (p=0.14). No changes were noted in the control group. CONCLUSIONS: LLLT led to a significant improvement in visual acuity in adolescent and adult patients with amblyopia caused by ametropia or strabismus. Adolescent;Adult;Age Factors;Aged;Amblyopia;Dose-Response Relationship, Radiation;Evoked Potentials, Visual;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Ophthalmoscopy;Patient Satisfaction;Radiation Dosage;Refractive Errors;Sex Factors;Single-Blind Method;Strabismus;Time Factors;Treatment Outcome;Visual Acuity;Young Adult

Low level laser therapy (LLLT) and World Association for Laser Therapy (WALT) dosage recommendations. Guidelines as Topic;Humans;Low-Level Light Therapy;Musculoskeletal Diseases;Societies, Medical

Effect of adjunctive low level laser therapy (LLLT) on nonsurgical treatment of chronic periodontitis. OBJECTIVE: The aim of this split-mouth, double blinded, short-term, controlled clinical trial was to study the effect of low-level laser therapy (LLLT) as an adjunct to scaling and root planing (SRP) for treatment of chronic periodontitis. BACKGROUND DATA: LLLT is reported to improve the outcome of traditional SRP, but the evidence is still weak. MATERIALS AND METHODS: Sixteen patients with a probing pocket depth (PPD) of 4-6â€‰mm involving at least three teeth in each quadrant were recruited for the study. Afterwards, SRP quadrants were randomly assigned for 10 sessions of LLLT. RESULTS: Results showed that when compared to sites treated with SRP alone, those treated with SRP+LLLT (10 sessions, 830â€‰nm, 100â€‰mW, 3â€‰J per point, 3â€‰J/cm(2)) exhibited greater

reductions in PPD at 5 weeks and 3 months but not at 6 months. Further, SRP+LLLT-treated sites had a statistically significant increase in mean radiographic bone density when comparing 6- and 12-month data and overall from baseline to 12 months. There was a trend to reduce interleukin (IL)-1Î² but the difference between control and laser sites was not statistically significant. CONCLUSIONS: SRP combined with LLLT improved radiographic bone density and short-term PPD reduction in patients with chronic periodontitis, but did not significantly affect either the gingival crevicular fluid of IL-1Î² or the gingival or plaque index. Adult;Bone Density;Chronic Periodontitis;Dental Plaque Index;Dental Scaling;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Radiation Dosage;Radiography;Reference Values;Root Planing;Time Factors;Treatment Outcome;Young Adult

Laser microsurgery in Caenorhabditis elegans. Laser killing of cell nuclei has long been a powerful means of examining the roles of individual cells in C. elegans. Advances in genetics, laser technology, and imaging have further expanded the capabilities and usefulness of laser surgery. Here, we review the implementation and application of currently used methods for target edoptical disruption in C. elegans. Fluorescent Dyes;Photosensitizing Agents;killer red protein, Anthomedusae;Green Fluorescent Proteins Animals;Axotomy;Caenorhabditis elegans;Cell Lineage;Cell Nucleus;Fluorescent Dyes;Green Fluorescent Proteins;Larva;Laser Therapy;Lasers;Low-Level Light Therapy;Microfluidics;Microsurgery;Neurons;Photosensitizing Agents

Chronic gingivitis: the prevalence of periodontopathogens and therapy efficiency. The purpose of this study was to determine the level of gingival inflammation and the prevalence of periodontopathogenic microorganisms in adolescents with chronic gingivitis, as well as to compare the effectiveness of two approaches in gingivitis treatment-basic therapy alone and basic therapy + adjunctive low-level laser therapy (LLLT). After periodontal evaluation, the content of gingival pockets of 140 adolescents with gingivitis was analyzed by multiplex PCR for the presence of P. gingivalis, A. actinomycetemcomitans, T. forsythensis and P. intermedia. Subsequent to bacteria detection, the examinees were divided into two groups with homogenous clinical and microbiological characteristics. Group A was subjected to basic gingivitis therapy, and group B underwent basic therapy along with adjunctive LLLT. A statistically significant difference between the values of plaque-index (PI) and sulcus bleeding index (SBI) before and after therapy was confirmed in both groups ($p<0.001$), though more pronounced in group B. Following therapy, the incidence of periodontopathogenic microorganisms decreased considerably. The best result was obtained in P. gingivalis eradication by combined therapy ($p=0.003$). The presence of periodontopathogens in adolescents with gingivitis should be regarded as a sign for dentists to foster more effective oral health programs. LLLT appears to be beneficial as adjuvant to basic therapy. Adolescent;Bacteria;Child;Chronic Disease;Dental Plaque Index;Female;Gingivitis;Humans;Low-Level Light Therapy;Male;Polymerase Chain Reaction;Prevalence;Treatment Outcome

Effect of low-level laser irradiation on osteoblast proliferation and bone formation. Applications of laser therapy in biostimulation and healing injured tissues are widely described in medical literature. The present study focuses on the effects of laser irradiation on the growth rate and differentiation of human osteoblast-like cells seeded on titanium or zirconia surfaces. Cells were laser irradiated with low therapeutical doses at different intervals and the effects of irradiation were evaluated at each time-point. After 3 hours lasered cells showed an enhanced mitogen activity compared to non-lasered control cells and a higher alkaline phosphatase activity, marker of bone formation. At the same time, the mRNA of RUNX2 and OSTERIX, two genes involved in osteoblast differentiation, showed a clear decrease in lasered cells. This reached the lowest value 6 to 12 hours after irradiation, after which the transcripts started to increase, indicating that the laser treatment did promote the osteogenic potential of growth-induced cells. These results indicate that Low Level

Laser Treatment (LLLT) stimulates osteogenic cell proliferation. Core Binding Factor Alpha 1 Subunit;RUNX2 protein, human;Sp7 Transcription Factor;SP7 protein, human;Transcription Factors Adult;Bone Matrix;Cell Proliferation;Cell Respiration;Cells, Cultured;Core Binding Factor Alpha 1 Subunit;Humans;Low-Level Light Therapy;Middle Aged;Osteoblasts;Osteogenesis;Sp7 Transcription Factor;Transcription Factors

Laser dentistry, current advantages, and limits. Dentistry;Humans;Laser Therapy;Low-Level Light Therapy;Surgery, Oral

Excimer light phototherapy of segmental and non-segmental vitiligo: experience in Taiwan. PURPOSE: To determine the efficacy of excimer light in the treatment vitiligo and to assess parameters affecting therapeutic results. METHODS: This retrospective study analyzed 227 patches of vitiligo in 142 patients. Treatment was performed twice weekly and treatment efficacy was assessed by two independent dermatologists. Patients who received less than 24 treatment sessions were excluded from the analysis of predictive factors for response. RESULTS: Sixty-eight (30.0%) patches achieved more than 50% repigmentation, and 42 (18.5%) achieved more than 75% repigmentation. The mean treatment numbers to achieve any repigmentation and more than 50% repigmentation were 19.41 and 34.93, respectively. Fewer treatment sessions number, segmental lesions and absence of melasma were significant predictors for poor treatment response in multivariate analysis. Lesions on the hands/feet needed the highest dose and scalp lesions needed the highest number of treatment sessions to produce initial repigmentation. CONCLUSIONS: Excimer light is a valuable treatment modality for both segmental and non-segmental vitiligo even in patients who have failed previous treatments. The number of treatment sessions needed to produce initial pigmentation may be higher than 30 for scalp lesions. There is a need to find other combination methods, both medical and surgical, to enhance its therapeutic efficacy. Asian People;Female;Humans;Low-Level Light Therapy;Male;Melanosis;Retrospective Studies;Scalp;Skin Pigmentation;Taiwan;Vitiligo

Low-level laser therapy in patients with complaints of tinnitus: a clinical study. Objective. The objective of the study was to investigate the effectiveness of low-level laser therapy (LLLT) in treating patients who were suffering from long-term complaints of tinnitus with well-understood etiology and who were not responding to conventional therapy in Qatar. Design. This is a prospective clinical study conducted during the period from May 2010 and February 2011. Setting. Audiology Clinic, Outpatient Department, Hamad General Hospital. Subjects and Methods. The study included 65 patients aged 15-76 years with chronic unilateral or bilateral tinnitus with a minimum duration of illness of one year. The investigation included 101 ears of 65 patients. A 5â€‰mW laser with a wavelength of 650â€‰nm was applied transmeatally for 20 minutes once daily for 3 months. The study was based on a face-to-face interview with a designed questionnaire that recorded the diagnosis of patients, clinical evaluation and audiometric test results, and side effects of low-level laser therapy (LLLT) and scored their symptoms loudness on five-point scale every two weeks. A decrease of one scale point regarding the loudness duration and degree of annoyance of tinnitus was accepted to represent an improvement; at the same time, a pure tone audiometric test was carried out and the results recorded. In addition, a record of the side effect was taken. Results. Over half of the patients (56.9%) had some form of improvement in their tinnitus symptoms. Mild improvement was reported in 33.8% of patients, moderate improvement was reported in 16.9%, and full improvement was reported in 6.15%. Of the patients who reported dizzy spells as a symptom of their tinnitus condition, 27.7% reported mild improvement and 16.9% reported full improvement. Common side effects of LLLT were noted among 20% of patients; however, all of them were mild and disappeared within a few days. Conclusion. Low-level laser therapy was found to be useful for treatment of chronic tinnitus.

[Magnetic-laser influence on the system of nitric oxide and contractile activity of smooth muscles of rat aorta under hypertension]. The study was conducted on three groups of rats: Group I

included Wistar rats with normal blood pressure (first control group); group II - rats with genetically determined hypertension (second control group); group Ill - rats with genetically determined hypertension under the influence ofmagnetic-laser power (study group). For the low-intensively magnetic-laser influence (MLI) we have used device MIT-MT, Ukraine, which was designed for the treatment of low-frequency magnetic field using optical flow blue and red ranges of spectrum. The MLI duration was 15 minutes for the blue range, and 25 minutes for the red one. Biochemical studies included the determination of the activity of isoenzymes of NO-synthase: constitutive (cNOS) and inducible (iNOS), the content of free hemoglobin, stable metabolites of NO, namely nitrite - (NO2(-)) and nitrate - (NO3(-)) anions, resistance to acid hemolysis of red blood cells. The contractile activity of smooth muscles of the aorta was measured. We found that magnetic-laser exposure of rats with genetically determined hypertension in the red (630 nm) and blue (470 nm wavelength) optical range even after a single session leads to an increased synthesis of nitric oxide in the blood plasma. Our data sindicate that the most effective in the intensification of endogenous nitric oxide (increase of NO2(-) and reduction of NO3(-)) and endothelium-dependent responses of aorta in rats with genetically determined hypertension was a ten-day course of the magnetic-laser exposure in the optical flow of the blue spectral range. Also, after 10 sessions of magnetic-laser exposure in rats from the above specified spectrum a stabilization of erythrocyte membranes was observed.
Hemoglobins;Nitrates;Nitrites;Nitroprusside;Nitric Oxide;Nitric Oxide Synthase Type II;Nitric Oxide Synthase Type III;Nos3 protein, rat;Acetylcholine
Acetylcholine;Animals;Aorta;Erythrocytes;Hemoglobins;Hemolysis;Hypertension;Lasers;Low-Level Light Therapy;Magnetic Field Therapy;Muscle Contraction;Muscle, Smooth, Vascular;Nitrates;Nitric Oxide;Nitric Oxide Synthase Type II;Nitric Oxide Synthase Type III;Nitrites;Nitroprusside;Organ Culture Techniques;Rats;Rats, Inbred SHR;Rats, Wistar

[Impact of laser therapy on PGE2 level, 24-hour pH-metry changes, and quality of life in patients with gastroesophageal reflux disease]. AIM: To study the impact of low-intensity laser irradiation on 24-hour pH-metry parameters and prostaglandin E2 (PGE2) levels in patients with gastroesophageal reflux disease (GERD). SUBJECTS AND METHODS: One hundred and twelve patients aged 19 to 79 years with GERD were examined. Seventy-eight patients received a 10-day course of continuous intravenous laser therapy using a Matrix VLOK laser therapy apparatus (Matrix, Russia) with a wavelength of 0.405 pm, radiation power at the exit of a main light guide 1-1.5 mW, pulse rate 80 Hz. The indicators under study were determined before and after treatment. RESULTS: After treatment, the intravenous laser therapy group showed a significant increase in PGE2 (1376 +/- 93 pg/ml) to the levels typical of those in healthy individuals and a significant decrease in all esophageal pH-metry parameters; the DeMeester score achieved normal values, and all quality of life (QL) indicators, except for physical function index, significantly improved (10.2 +/- 5.7; $p < 0.05$). CONCLUSION: The findings are suggestive of elevated PGE2 levels and improved QL during laser therapy.
Dinoprostone Adult;Dinoprostone;Esophageal pH Monitoring;Esophagus;Female;Gastroesophageal Reflux;Humans;Low-Level Light Therapy;Male;Middle Aged;Outcome Assessment, Health Care;Patient Preference;Quality of Life;Surveys and Questionnaires

LED (660Â nm) and laser (670Â nm) use on skin flap viability: angiogenesis and mast cells on transition line. Skin flap procedures are commonly used in plastic surgery. Failures can follow, leading to the necrosis of the flap. Therefore, many studies use LLLT to improve flap viability. Currently, the LED has been introduced as an alternative to LLLT. The objective of this study was to evaluate the effect of LLLT and LED on the viability of random skin flaps in rats. Forty-eight rats were divided into four groups, and a random skin flap (10â€‰Ã—â€‰4Â cm) was performed in all animals. Group 1 was the sham group; group 2 was submitted to LLLT 660Â nm, 0.14Â J; group 3 with

LED 630Â nm, 2.49Â J, and group 4 with LLLT 660Â nm, with 2.49Â J. Irradiation was applied after surgery and repeated on the four subsequent days. On the 7th postoperative day, the percentage of flap necrosis was calculated and skin samples were collected from the viable area and from the transition line of the flap to evaluate blood vessels and mast cells. The percentage of necrosis was significantly lower in groups 3 and 4 compared to groups 1 and 2. Concerning blood vessels and mast cell numbers, only the animals in group 3 showed significant increase compared to group 1 in the skin sample of the transition line. LED and LLLT with the same total energies were effective in increasing viability of random skin flaps. LED was more effective in increasing the number of mast cells and blood vessels in the transition line of random skin flaps. Animals;Ischemia;Low-Level Light Therapy;Male;Mast Cells;Necrosis;Neovascularization, Physiologic;Phototherapy;Rats;Rats, Wistar;Surgical Flaps

A review of protocols for 308 nm excimer laser phototherapy in psoriasis. BACKGROUND: 308 nm excimer laser phototherapy is efficacious in the treatment of localized psoriasis. Different approaches regarding dose fluency, number of treatments, and maintenance have been utilized, and there is yet to be a consensus on standard protocol. OBJECTIVE: To characterize treatment parameters for 308 nm excimer laser phototherapy. METHODS: We performed a PubMed search for studies describing excimer laser treatment protocol with particular attention to dosage determination, dose adjustment, dose fluency, number of treatments, and maintenance. RESULTS: Seven prospective studies were found describing the excimer efficacy for psoriasis. All studies determined the initial treatment dose using either the minimal erythema dose (MED) or induration. Fluency ranged from 0.5 MED (low) to 16 MED (high); one study demonstrated that medium to high fluencies yielded better improvement in fewer number of treatments. Fluency adjustments during the course of treatment were important to minimize phototherapy-associated side effects. The use of higher fluencies was reported to result in higher occurrences of blistering. One study implemented a maintenance tapering of dose-frequency phase to better manage psoriasis flare-ups. CONCLUSION: The 308 nm excimer laser is an effective therapy for psoriasis regardless of the method used to determine initial dosage, dose fluency, or number of treatments. As its usage as a targeted monotherapy increases, future trials should consider evaluating and modifying these parameters to determine the most optimal management of localized psoriasis. Based on our reviewed studies, there is no consensus for a single excimer laser therapy protocol and as a result, patient preferences should continue to be an important consideration for phototherapy regimen planning. Humans;Lasers, Excimer;Patient Preference;Phototherapy;Prospective Studies;Psoriasis

Laser biomodulation of normal and neoplastic cells. This study was designed to determine the laser dose for the stimulation, zero-bioactivation, and inhibition of normal and neoplastic cells in vitro. The medical use of laser biomodulation has been occurring for decades in the area of tissue healing and inflammatory conditions. The potential to modulate the regeneration and differentiation of early cellular precursors by laser photons is a valuable endeavor searching for novel and efficient methods. A 35-mW HeNe (632.8-nm) laser and power density of 1.25Â mW/cm(2) was used to irradiate tissue culture dishes seeded with 400 cells/dish of normal cells (CHO, CCL-226, 3Â T3, and HSF) and neoplastic cells (EMT-6 and RIF-1). All cell lines were cultured using DMEM supplemented with 10% and 5% FBS, 2Â mM glutamine and 100Â U pen-strep antibiotic. Irradiation times of 16, 32, 48, 64, 80, 96, 112, 128, 144, and 160 s for three consecutive days to deliver cumulative doses of 60, 120, 180, 240, 300, 360, 420, 480, 540, and 600Â mJ/cm(2) were done, respectively. Cell cultures were stained and colony-forming efficiency was determined. Data analysis was done using Student'sÂ tÂ test, Î±â€‰=â€‰0.05. A trend of stimulation, zero-bioactivation, and inhibition in all cell lines was observed except for CCL-226 which gave a pattern of inhibition, zero-bioactivation, and inhibition. The optimum biostimulatory dose was at 180Â mJ/cm(2) and bioinhibitory doses were

from 420-600Â mJ/cm(2) cumulative doses. This study established the dose-dependency of cell growth to laser treatments, that the extent of cellular proliferation is influenced by the type of cells involved, and the risk when laser irradiation is performed on patients with undiagnosed neoplasms and during pregnancy. On the other hand, the ability of laser irradiation to regulate embryonic fibroblasts and human skin fibroblast in vitro suggests possible laser biomodulatory effects on embryonic and adult stem cells directed for tissue regeneration. Studies on the effects of light treatments exploring different laser parameters for the clonal expansion and differentiation of stem cells are recommended. 3T3 Cells;Animals;CHO Cells;Cell Line;Cell Line, Tumor;Cell Proliferation;Colony-Forming Units Assay;Cricetinae;Cricetulus;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Mice;Pregnancy;Regeneration;Stem Cells;Wound Healing

Laser and intense pulsed light hair removal technologies: from professional to home use. Light-based hair removal (LHR) is one of the fastest growing, nonsurgical aesthetic cosmetic procedures in the United States and Europe. A variety of light sources including lasers, e.g. alexandrite laser (755 nm), pulsed diode lasers (800, 810 nm), Nd:YAG laser (1064 nm) and broad-spectrum intense pulsed light (IPL, 590-1200 nm), are available and used widely for such procedures in dermatological/clinical settings under proper supervision. Patient selection and appropriate fluence settings are managed by professionals to maximize efficacy while minimizing adverse events. In the past 5 years, LHR devices have been sold directly to consumers for treatment in the home. In this review, we outline the principles underlying laser and IPL technologies and undertake an evidence-based assessment of the short- and long-term efficacy of the different devices available to the practising dermatologist and discuss the efficacy and human safety implications of home-use devices.
Esthetics;Female;Hair Removal;Hirsutism;Home Nursing;Humans;Lasers, Solid-State;Low-Level Light Therapy;Phototherapy;Treatment Outcome

Assessment of thermal effects of interstitial laser phototherapy on mammary tumors using proton resonance frequency method. Laser immunotherapy (LIT) uses a synergistic approach to treat cancer systemically through local laser irradiation and immunological stimulation. Currently, LIT utilizes dye-assisted noninvasive laser irradiation to achieve selective photothermal interaction. However, LIT faces difficulties treating deeper tumors or tumors with heavily pigmented overlying skin. To circumvent these barriers, we use interstitial laser irradiation to induce the desired photothermal effects. The purpose of this study is to analyze the thermal effects of interstitial irradiation using proton resonance frequency (PRF). An 805-nm near-infrared laser with an interstitial cylindrical diffuser was used to treat rat mammary tumors. Different power settings (1.0, 1.25, and 1.5 W) were applied with an irradiation duration of 10 min. The temperature distributions of the treated tumors were measured by a 7 T magnetic resonance imager using PRF. We found that temperature distributions in tissue depended on both laser power and time settings, and that variance in tissue composition has a major influence in temperature elevation. The temperature elevations measured during interstitial laser irradiation by PRF and thermocouple were consistent, with some variations due to tissue composition and the positioning of the thermocouple's needle probes. Our results indicated that, for a tissue irradiation of 10 min, the elevation of rat tumor temperature ranged from 8 to 11Â°C for 1 W and 8 to 15Â°C for 1.5 W. This is the first time a 7 T magnetic resonance imager has been used to monitor interstitial laser irradiation via PRF. Our work provides a basic understanding of the photothermal interaction needed to control the thermal damage inside a tumor using interstitial laser treatment. Our work may lead to an optimal protocol for future cancer treatment using interstitial phototherapy in conjunction with immunotherapy.
Protons Animals;Body Temperature;Cattle;Diffusion;Female;Image Processing, Computer-Assisted;Liver;Low-Level Light Therapy;Magnetic Resonance Imaging;Mammary Neoplasms, Experimental;Protons;Rats;Rats, Wistar

Effect of low-level laser therapy on proliferation, differentiation, and adhesion of steroid-treated osteoblasts. There has recently been constant effort to evaluate therapies that may have a positive effect on bone regeneration. However, there are few studies in the literature on the effects of low-level laser therapy (LLLT) involving tissues treated with anabolic steroids. The present study evaluated the effects of LLLT (AsGaAl 780Â nm, 3Â J/cm(2), 10Â mW, beam spot of 0.04Â cm(2), total energy 0.12Â J) on the proliferation, adhesion, and differentiation of osteoblasts cultured in the presence of nandrolone decanoate (ND). The MTT method was employed to evaluate cell proliferation and adhesion. Cell differentiation was evaluated by measuring alkaline phosphatase activity. There was a significant decrease in cell proliferation in the irradiated group treated with 50 Î¼M ND when compared to the control group, after 48Â h. After 72 h, cell proliferation was significantly greater in the control group than in the irradiated groups treated with the steroid at concentrations of 10, 25, and 50 Î¼M. With regard to cell differentiation, alkaline phosphatase activity was significantly higher in the irradiated group treated with 50 Î¼M ND than in the control group, irradiated non-treated group, and irradiated group treated with 25 Î¼M ND. After 60 min of plating, the irradiated non-treated group and irradiated groups treated with the steroid at concentrations of 5, 10, and 25 Î¼M exhibited a significant increase in cell adhesion compared to the control group. LLLT in combination with a high concentration of steroid inhibited cell proliferation, possibly by inducing cell differentiation, while irradiation combined with lower concentrations of the steroid induced an increase in cell adhesion. Nandrolone;Alkaline Phosphatase;Nandrolone Decanoate Alkaline Phosphatase;Animals;Cell Adhesion;Cell Differentiation;Cell Proliferation;Cells, Cultured;Low-Level Light Therapy;Nandrolone;Nandrolone Decanoate;Osteoblasts;Rats

In Vitro effect of low-level laser therapy on typical oral microbial biofilms. The aim of this study was to evaluate the effect of specific parameters of low-level laser therapy (LLLT) on biofilms formed by Streptococcus mutans, Candida albicans or an association of both species. Single and dual-species biofilms--SSB and DSB--were exposed to laser doses of 5, 10 or 20 J/cm(2) from a near infrared InGaAsP diode laser prototype (LASERTable; 780 Â± 3 nm, 0.04 W). After irradiation, the analysis of biobilm viability (MTT assay), biofilm growth (cfu/mL) and cell morphology (SEM) showed that LLLT reduced cell viability as well as the growth of biofilms. The response of S. mutans (SSB) to irradiation was similar for all laser doses and the biofilm growth was dose dependent. However, when associated with C. albicans (DSB), S. mutans was resistant to LLLT. For C. albicans, the association with S. mutans (DSB) caused a significant decrease in biofilm growth in a dose-dependent fashion. The morphology of the microorganisms in the SSB was not altered by LLLT, while the association of microbial species (DSB) promoted a reduction in the formation of C. albicans hyphae. LLLT had an inhibitory effect on the microorganisms, and this capacity can be altered according to the interactions between different microbial species. Coloring Agents;Tetrazolium Salts;Thiazoles;Succinate Dehydrogenase;thiazolyl blue Bacteriological Techniques;Biofilms;Candida albicans;Coloring Agents;Dose-Response Relationship, Radiation;Humans;Hyphae;Lasers, Semiconductor;Low-Level Light Therapy;Materials Testing;Microbial Interactions;Microbial Viability;Microscopy, Electron, Scanning;Mouth;Mycology;Radiation Dosage;Streptococcus mutans;Succinate Dehydrogenase;Temperature;Tetrazolium Salts;Thiazoles;Time Factors

Venous leg ulcers. INTRODUCTION: Leg ulcers usually occur secondary to venous reflux or obstruction, but 20% of people with leg ulcers have arterial disease, with or without venous disorders. Between 1.5 and 3.0/1000 people have active leg ulcers. Prevalence increases with age to about 20/1000 in people aged over 80 years. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of standard treatments, adjuvant treatments, and organisational interventions for venous leg ulcers? What are

the effects of advice about self-help interventions in people receiving usual care for venous leg ulcers? What are the effects of interventions to prevent recurrence of venous leg ulcers? We searched: Medline, Embase, The Cochrane Library, and other important databases up to June 2011 (Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 101 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review we present information relating to the effectiveness and safety of the following interventions: compression bandages and stockings, cultured allogenic (single or bilayer) skin replacement, debriding agents, dressings (cellulose, collagen, film, foam, hyaluronic acid-derived, semi-occlusive alginate), hydrocolloid (occlusive) dressings in the presence of compression, intermittent pneumatic compression, intravenous prostaglandin E1, larval therapy, laser treatment (low-level), leg ulcer clinics, multilayer elastic system, multilayer elastomeric (or non-elastomeric) high-compression regimens or bandages, oral treatments (aspirin, flavonoids, pentoxifylline, rutosides, stanozolol, sulodexide, thromboxane alpha(2) antagonists, zinc), peri-ulcer injection of granulocyte-macrophage colony-stimulating factor, self-help (advice to elevate leg, to keep leg active, to modify diet, to stop smoking, to reduce weight), short-stretch bandages, single-layer non-elastic system, skin grafting, superficial vein surgery, systemic mesoglycan, therapeutic ultrasound, and topical treatments (antimicrobial agents, autologous platelet lysate, calcitonin gene-related peptide plus vasoactive intestinal polypeptide, freeze-dried keratinocyte lysate, mesoglycan, negative pressure, recombinant keratinocyte growth factor, platelet-derived growth factor). Bandages;Debridement;Humans;Leg Ulcer;Low-Level Light Therapy;Occlusive Dressings;Ultrasonic Therapy;Varicose Ulcer;Wound Healing

Laser irradiation effect on Staphylococcus aureus and Pseudomonas aeruginosa biofilms isolated from venous leg ulcer. Chronic wounds, including diabetic foot ulcers, pressure ulcers and venous leg ulcers, represent a significant cause of morbidity in developed countries, predominantly in older patients. The aetiology of these wounds is probably multifactorial, but the role of bacteria in their pathogenesis is still unclear. Moreover, the presence of bacterial biofilms has been considered an important factor responsible for wounds chronicity. We aimed to investigate the laser action as a possible biofilm eradicating strategy, in order to attempt an additional treatment to antibiotic therapy to improve wound healing. In this work, the effect of near-infrared (NIR) laser was evaluated on mono and polymicrobial biofilms produced by two pathogenic bacterial strains, Staphylococcus aureus PECHA10 and Pseudomonas aeruginosa PECHA9, both isolated from a chronic venous leg ulcer. Laser effect was assessed by biomass measurement, colony forming unit count and cell viability assay. It was shown that the laser treatment has not affected the biofilms biomass neither the cell viability, although a small disruptive action was observed in the structure of all biofilms tested. A reduction on cell growth was observed in S. aureus and in polymicrobial biofilms. This work represents an initial in vitro approach to study the influence of NIR laser treatment on bacterial biofilms in order to explain its potentially advantageous effects in the healing process of chronic infected wounds. Biofilms;Colony Count, Microbial;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pseudomonas Infections;Pseudomonas aeruginosa;Staphylococcal Infections;Staphylococcus aureus;Varicose Ulcer;Wound Healing

[A short-term clinical evaluation of periodontal treatment with an Er:YAG laser for patients with chronic periodontitis: a split-mouth controlled study]. OBJECTIVE: To compare the short-term clinical effects following non-surgical periodontal treatment with Er:YAG laser or with combination of ultrasonic subgingival scaling and root planing with hand instrument (SRP) for patients with chronic

periodontitis. METHODS: In the study, 17 patients with chronic periodontitis were randomly treated in a split-mouth design with Er:YAG laser (test group) or a combination of ultrasonic subgingival scaling and root planing with hand instrument (control group). The degree of discomfort experienced during the treatment was graded by the patient using visual analogue scale (VAS) immediately after the completion of test and control treatment procedures. The following clinical parameters were recorded by a calibrated and blinded examiner: plaque index (PLI), bleeding index (BI), probing depth (PD) and attachment loss (AL). RESULTS: The mean VAS score of Er:YAG laser treatment [3 (2, 4.5)] was significantly lower than that of control treatment [5 (4, 6), P=0.013]. Both the groups showed significant reduction of PLI, PD, AL and BI values 2 months and 4 months after treatment. For sites with PDâ‰¥4 mm at baseline, the sites treated with Er:YAG laser demonstrated mean PD change from (5.6Â±1.1) mm to (3.6Â±1.1) mm and to (3.4Â±1.0) mm at the end of 2 months and 4 months respectively and demonstrated mean AL change from (5.1Â±1.5) mm to (3.9Â±1.6) mm and to (3.8Â±1.7) mm at the end of 2 months and 4 months respectively, meanwhile the BI value showed significant decrease, P=0.000; the sites treated with conventional SRP demonstrated mean PD change from (5.6Â±1.1) mm to (3.8Â±1.1) mm and (3.5Â± 1.0) mm at the end of 2 months and 4 months respectively and demonstrated mean AL change from (4.8Â±1.6) mm to (3.8Â±1.6) mm and (3.6Â±1.8) mm at the end of 2 months and 4 months respectively, and the BI value also showed significant improvement. No statistical difference for all clinical parameters were found between the two treatment groups. CONCLUSION: The present results indicate that non-surgical periodontal therapy with Er:YAG laser is safe and effective, and Er:YAG laser therapy could be used for patients who was sensitive to pain. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Attachment Loss;Periodontal Index;Periodontitis;Treatment Outcome

Effects of low level laser therapy on proliferation and neurotrophic factor gene expression of human schwann cells in vitro. Previous studies have been proposed that proliferation and release of certain growth factors by different types of cells can be modulated by low level laser therapy. We aimed to demonstrate the effect of laser irradiation on human schwann cell proliferation and neurotrophic factor gene expression in vitro. Human schwann cells (SCs) were harvested from sural nerve that was obtained from organ donor followed by treatment with an 810 nm, 50 mW diode laser (two different energies: 1 J/cm(2) and 4 J/cm(2)) in three consecutive days. SC proliferation was measured, after first irradiation on days 1, 4 and 7 by the MTT assay. Real time PCR analysis was utilized on days 5 and 20 to evaluate the expression of key genes involved in nerve regeneration consist of NGF, BDNF and GDNF. Evaluation of cellular proliferation following one day after laser treatment revealed significant decrease in cell proliferation compared to control group. However on day 7, significant increase in proliferation was found in both the irradiated groups in comparison with the control group. No significant difference was found between the laser treated groups. Treatment of SCs with laser resulted in significant increase in NGF gene expression on day 20. Difference between two treated groups and control group was not significant for BDNF and GDNF gene expression. Our results demonstrate that low level laser therapy stimulate human schwann cell proliferation and NGF gene expression in vitro. Nerve Growth Factors;RNA, Messenger;Gallium;Aluminum;Arsenic Adult;Aluminum;Arsenic;Cell Proliferation;Gallium;Gene Expression Regulation;Humans;Low-Level Light Therapy;Nerve Growth Factors;RNA, Messenger;Schwann Cells;Young Adult

Treatment modalities of neurosensory deficit after lower third molar surgery: a systematic review. PURPOSE: To conduct a systematic review to answer the clinical question, "What are the available treatment modalities and their outcomes of neurosensory deficit after lower third molar surgery?" MATERIALS AND METHODS: A systematic search, including a computer search of several databases

with specific keywords, a reference search, and a manual search of 3 key maxillofacial journals were performed. Relevant articles were then evaluated and those that fulfilled the 6 predetermined criteria were chosen to enter the final review. The various treatment modalities and their outcomes of neurosensory deficit after lower third molar surgery, in the selected studies in the final review, were analyzed. RESULTS: Ten articles entered the final review. Six treatment modalities of lingual nerve or inferior alveolar nerve deficit after lower third molar surgery were identified. External neurolysis, direct suturing, autogenous vein graft, and a Gore-Tex tube as a conduit were the 4 surgical treatments. Significant improvement after surgical treatment ranged from 25% to 66.7%. Acupuncture and low-level laser therapy were 2 available nonsurgical treatment modalities that were found to have produced significant improvement in sensation after treatment in more than 50% of subjects. There was insufficient information to determine the best timing of treatment of nerve injury after third molar surgery. CONCLUSIONS: Four surgical treatments and 2 nonsurgical treatments were identified in the management of neurosensory disturbance after lower third molar surgery. Most treatments showed an improvement in sensation but the outcomes were variable. Complete recovery was uncommon in all kinds of available treatments. Acupuncture Therapy;Cranial Nerve Diseases;Humans;Low-Level Light Therapy;Mandibular Nerve;Molar, Third;Postoperative Complications;Somatosensory Disorders;Tooth Extraction;Treatment Outcome

Femtosecond laser settings for keratoconic corneas.
Cornea;Humans;Keratoconus;Lasers, Excimer;Low-Level Light Therapy

On the edge. Immunosuppressive Agents
Cryotherapy;Dermabrasion;Female;Humans;Immunosuppressive Agents;Low-Level Light Therapy;Male;Vitiligo

Spectroscopic and histological evaluation of wound healing progression following Low Level Laser Therapy (LLLT). The present study focuses on the evaluation of the effect of He-Ne laser on tissue regeneration by monitoring collagen synthesis in wound granulation tissues in Swiss albino mice using analysis of laser induced fluorescence (LIF) and light microscopy techniques. The spectral analyses of the wound granulation tissues have indicated a dose dependent increase in collagen levels during the post-wounding days. The histological examinations on the other hand have also shown a significant increase in collagen deposition along with the reduced edema, leukocytes, increased granulation tissue, and fibroblast number in the optimal laser dose treated group compared to the non-illuminated controls. Collagen Animals;Biopsy;Collagen;Disease Progression;Equipment Design;Female;Granulation Tissue;Inflammation;Lasers;Low-Level Light Therapy;Male;Mice;Microscopy, Fluorescence;Optics and Photonics;Skin;Spectrophotometry;Wound Healing

Does LED phototherapy influence the repair of bone defects grafted with MTA, bone morphogenetic proteins, and guided bone regeneration? A description of the repair process on rodents. This work carried out a histological analysis on bone defects grafted (MTA) treated or not with LED, BMPs, and membrane (GBR). Benefits of their isolated or combined usage on bone repair were reported, but not their association. Ninety rats were divided into ten groups and each subdivided into three. Defects on G II and I were filled with the blood clot. G II was further LED irradiated. G III and IV were filled with MTA; G IV was further LED irradiated. In GÂ V and VI, the defects were filled with MTA and covered with a membrane (GBR). G VI was further LED irradiated. In G VII and VIII, BMPs were added to the MTA and group VIII was further LED irradiated. In G IX and X, the MTAâ€‰+â€‰BMP graft was covered with a membrane (GBR). G X was further LED irradiated. LED was applied over the defect at 48-h intervals and repeated for 15Â days. Specimens were processed, cut, and stained with H&E and Sirius red and underwent histological analysis. The use of LED light alone dramatically reduced inflammation. However, its use on MTA associated with BMP and/or GBR increased the severity of

the inflammatory reaction. Regarding bone reabsorption, the poorest result was seen when the LED light was associated with the MTAâ€‰+â€‰BMP graft. In the groups Clot and MTAâ€‰+â€‰GBR, no bone reabsorption was detectable. Increased collagen deposition was observed when the LED light was associated with the use of the MTA associated with BMP and/or GBR. Increased new bone formation was observed when the LED light was used alone or associated with the use of MTAâ€‰+â€‰GBR, MTAâ€‰+â€‰BMP, on association of MTAâ€‰+â€‰BMPâ€‰+â€‰GBR and when BMP was added to the MTA. Our results indicate that the use of LED light alone or in association with MTA, MTAâ€‰+â€‰BMP, MTAâ€‰+â€‰GBR, and MTAâ€‰+â€‰BMPâ€‰+â€‰GBR caused less inflammation, and an increase of both collagen deposition and bone deposition as seen on both histological and morphometric analysis. Aluminum Compounds;Bone Morphogenetic Proteins;Bone Substitutes;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate Aluminum Compounds;Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Substitutes;Calcium Compounds;Drug Combinations;Guided Tissue Regeneration;Lasers, Semiconductor;Low-Level Light Therapy;Male;Oxides;Rats;Rats, Wistar;Silicates

Efficacy of low level laser therapy associated with exercises in knee osteoarthritis: a randomized double-blind study. OBJECTIVES: To estimate the effects of low level laser therapy in combination with a programme of exercises on pain, functionality, range of motion, muscular strength and quality of life in patients with osteoarthritis of the knee. DESIGN: A randomized double-blind placebo-controlled trial with sequential allocation of patients to different treatment groups. SETTING: Special Rehabilitation Services. SUBJECTS: Forty participants with knee osteoarthritis, 2-4 osteoarthritis degree, aged between 50 and 75 years and both genders. INTERVENTION: Participants were randomized into one of two groups: the laser group (low level laser therapy dose of 3â€‰J and exercises) or placebo group (placebo laser and exercises). MAIN MEASURES: Pain was assessed using a visual analogue scale (VAS), functionality using the Lequesne questionnaire, range of motion with a universal goniometer, muscular strength using a dynamometer, and activity using the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) questionnaire at three time points: (T1) baseline, (T2) after the end of laser therapy (three weeks) and (T3) the end of the exercises (11 weeks). RESULTS: When comparing groups, significant differences in the activity were also found (Pâ€‰=â€‰0.03). No other significant differences (Pâ€‰>â€‰0.05) were observed in other variables. In intragroup analysis, participants in the laser group had significant improvement, relative to baseline, on pain (Pâ€‰=â€‰0.001), range of motion (Pâ€‰=â€‰0.01), functionality (Pâ€‰=â€‰0.001) and activity (Pâ€‰<â€‰0.001). No significant improvement was seen in the placebo group. CONCLUSION: Our findings suggest that low level laser therapy when associated with exercises is effective in yielding pain relief, function and activity on patients with osteoarthritis of the knees. Aged;Arthrometry, Articular;Double-Blind Method;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Muscle Strength;Muscle Strength Dynamometer;Osteoarthritis, Knee;Pain Measurement;Range of Motion, Articular;Surveys and Questionnaires

Light-emitting diode phototherapy for unconjugated hyperbilirubinaemia in neonates. BACKGROUND: Phototherapy is the mainstay of treatment of neonatal hyperbilirubinaemia. The commonly used light sources for providing phototherapy are special blue fluorescent tubes, compact fluorescent tubes and halogen spotlights. However, light emitting diodes (LEDs) as light sources with high luminous intensity, narrow wavelength band and higher delivered irradiance could make phototherapy more efficacious than the conventional phototherapy units. OBJECTIVES: To evaluate the effect of LED phototherapy as compared to conventional phototherapy in decreasing serum total bilirubin levels and duration of treatment in neonates with unconjugated hyperbilirubinaemia.

SEARCH METHODS: We searched the Cochrane Central Register of Controlled Trials (CENTRAL, The Cochrane Library 2010, Issue 1), MEDLINE (1966 to April 30, 2010) and EMBASE (1988 to July 8, 2009). Handsearches of the proceedings of annual meetings of The European Society for Paediatric Research and The Society for Pediatric Research were conducted through 2010. SELECTION CRITERIA: Randomised or quasi-randomised controlled trials were eligible for inclusion if they enrolled neonates (term and preterm) with unconjugated hyperbilirubinaemia and compared LED phototherapy with other light sources (fluorescent Â tubes, compact fluorescent tubes, halogen spotlight; method of administration: conventional or fibreoptic). DATA COLLECTION AND ANALYSIS: We used the standard methods of The Cochrane Collaboration and its Neonatal Review Group for data collection and analysis. MAIN RESULTS: Six randomised controlled trials met the inclusion criteria for this review. Four studies compared LED and halogen light sources. Two studies compared LED and compact fluorescent light sources. The duration of phototherapy (six studies, 630 neonates) was comparable in LED and non-LED phototherapy groups (mean difference (hours) -0.43, 95% CI -1.91 to 1.05). The rate of decline of serum total bilirubin (STB) (four studies, 511 neonates) was also similar in the two groups (mean difference (mg/dL/hour) 0.01, 95% CI -0.02 to 0.04). Treatment failure, defined as the need of additional phototherapy or exchange blood transfusion (1 study, 272 neonates), was comparable (RR 1.83, 95% CI 0.47 to 7.17). Side effects of phototherapy such as hypothermia (RR 6.41, 95% CI 0.33 to 122.97), hyperthermia (RR 0.61, 95% CI 0.18 to 2.11) and skin rash (RR 1.83, 95% CI 0.17 to 19.96) were rare and occurred with similar frequency in the two groups. AUTHORS' CONCLUSIONS: LED light source phototherapy is efficacious in bringing down levels of serum total bilirubin at rates that are similar to phototherapy with conventional (compact fluorescent lamp (CFL) or halogen) light sources. Further studies are warranted for evaluating efficacy of LED phototherapy in neonates with haemolytic jaundice or in the presence of severe hyperbilirubinaemia (STB â‰¥ 20 mg/dL). Humans;Hyperbilirubinemia, Neonatal;Infant, Newborn;Jaundice, Neonatal;Phototherapy;Randomized Controlled Trials as Topic

Effect of low-level laser therapy in the treatment of burning mouth syndrome: a case series. OBJECTIVE: The aim of this study was evaluate the effect of low-level laser therapy (LLLT) in the treatment of burning mouth syndrome (BMS) patients. BACKGROUND DATA: BMS is a clinical condition characterized by a burning sensation in a morphologically normal oral mucosa, without association with systemic disorders. METHODS: Ten patients with oral burning sensation were included in the study. After careful evaluation of medical history and oral examination, the diagnosis of BMS was established. All patients were submitted to one weekly session of LLLT for 10 weeks. A continuous wavelength of 660â€‰nm, power 40â€‰mW, 20â€‰J/cm(2), 0.8â€‰J/point, with each point irradiated for 10â€‰sec. In all sessions the burning intensity was evaluated with a 10-cm visual analogue scale (VAS), with 0 indicating no symptoms and 10 indicating the worst burning possible. The burning intensity evaluation by VAS was performed immediately before (VAS baseline) and immediately after each LLLT session. The nonparametric Wilcoxon test was used for statistical analysis, considering significance of 5%. RESULTS: All patients reported improvement in all sessions, with reduction in VAS scores by up to 58% in the tenth session. When only the VAS baseline of the first session was compared with the other sessions, there was a statistically significant reduction in VAS scores in the fourth (p=0.03), fifth (p=0.03), sixth (p=0.009), seventh (p=0.003), eighth, ninth, and tenth (all p=0.002) sessions. CONCLUSIONS: LLLT may be an alternative treatment for the relief of oral burning in patients with BMS. Aged;Burning Mouth Syndrome;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Statistics, Nonparametric

Effect of low-level laser therapy on the initial stages of tissue repair: basic principles. Animals;Humans;Low-Level Light Therapy;Wound Healing

[Experiences from general practice. 30 to 50% of patients have a good outcome with the laser (interview by Dr. Beate Schumacher)]. Diagnosis, Differential;Female;Hirsutism;Humans;Lasers, Solid-State;Low-Level Light Therapy;Outcome and Process Assessment, Health Care

[Cosmetic therapy of hirsutism. With laser and electric current against a hairy problem]. Cooperative Behavior;Female;Hair Removal;Hirsutism;Humans;Interdisciplinary Communication;Low-Level Light Therapy;Outcome and Process Assessment, Health Care

GaAs 904-nm laser irradiation improves myofiber mass recovery during regeneration of skeletal muscle previously damaged by crotoxin. This work investigated the effect of gallium arsenide (GaAs) irradiation (power: 5Â mW; intensity: 77.14Â mW/cm(2), spot: 0.07Â cm(2)) on regenerating skeletal muscles damaged by crotoxin (CTX). Male C57Bl6 mice were divided into six groups (nâ€‰=â€‰5 each): control, treated only with laser at doses of 1.5Â J or 3Â J, CTX-injured and, CTX-injured and treated with laser at doses of 1.5Â J or 3Â J. The injured groups received a CTX injection into the tibialis anterior (TA) muscle. After 3Â days, TA muscles were submitted to GaAs irradiation at doses of 1.5 or 3Â J (once a day, during 5Â days) and were killed on the eighth day. Muscle histological sections were stained with hematoxylin and eosin (H&E) in order to determine the myofiber cross-sectional area (CSA), the previously injured muscle area (PIMA) and the area density of connective tissue. The gene expression of MyoD and myogenin was detected by real-time PCR. GaAs laser at a dose of 3Â J, but not 1.5Â J, significantly increased the CSA of regenerating myofibers and reduced the PIMA and the area density of intramuscular connective tissue of CTX-injured muscles. MyoD gene expression increased in the injured group treated with GaAs laser at a dose of 1.5Â J. The CTX-injured, 3-J GaAs laser-treated, and the CTX-injured and treated with 3-J laser groups showed an increase in myogenin gene expression when compared to the control group. Our results suggest that GaAs laser treatment at a dose of 3Â J improves skeletal muscle regeneration by accelerating the recovery of myofiber mass. Myog protein, mouse;Myogenin;Crotoxin Animals;Crotoxin;Gene Expression;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Muscle, Skeletal;Myogenin;Regeneration

Effect of low-level laser therapy on cochlear hair cell recovery after gentamicin-induced ototoxicity. Cochlear hair cells are the sensory receptors of the auditory system. It is well established that antibiotic drugs such as gentamicin can damage hair cells and cause hearing loss. Rescuing hair cells after ototoxic injury is an important issue in hearing recovery. Although many studies have indicated a positive effect of low-level laser therapy (LLLT) on neural cell survival, there has been no study on the effects of LLLT on cochlear hair cells. Therefore, the aim of this study was to elucidate the effects of LLLT on hair cell survival following gentamicin exposure in organotypic cultures of the cochlea of rats. The cochlea cultures were then divided into a control group (nâ€‰=â€‰8), a laser-only group (nâ€‰=â€‰8), a gentamicin-only group (nâ€‰=â€‰8) and a gentamicin plus laser group (nâ€‰=â€‰7). The control cultures were allowed to grow continuously for 11Â days. The laser-only cultures were irradiated with a laser with a wavelength of 810Â nm at 8Â mW/cm(2) for 60Â min per day (0.48Â J/cm(2)) for 6Â days. The gentamicin groups were exposed to 1Â mM gentamicin for 48Â h and allowed to recover (gentamicin-only group) or allowed to recover with daily irradiation (gentamicin plus laser group). The hair cells in all groups were stained with FM1-43 and counted every 3Â days. The number of hair cells was significantly larger in the gentamicin plus laser group than in the gentamicin-only group. The number of hair cells was larger in the laser-only group than in the control group, but the difference did not reach statistical significance. These results suggest that LLLT may promote hair cell survival following gentamicin damage in the cochlea. This is the first study in the literature that has demonstrated the beneficial effect of LLLT on the recovery of cochlear hair cells. Gentamicins Animals;Cell Count;Cell Survival;Gentamicins;Hair Cells, Auditory;Lasers,

Semiconductor;Low-Level Light Therapy;Microscopy, Confocal;Nerve Regeneration;Organ Culture Techniques;Rats;Rats, Sprague-Dawley
Low level laser therapy (830nm) improves bone repair in osteoporotic rats: similar outcomes at two different dosages. BACKGROUND AND OBJECTIVE: The goal of this study was to investigate the effects of low level laser therapy (LLLT) in osteoporotic rats by means of subjective histopathological analysis, deposition of collagen at the site of fracture, biomechanical properties and immunohistochemistry for COX-2, Cbfa-1 and VEGF. MATERIAL AND METHODS: A total of 30 female Wistar rats (12weeks-old, Â±250g) were submitted to ovariectomy (OVX). Eight weeks after the OVX, a tibial bone defect was created in all animals and they were randomly divided into 3 groups (n=10): control bone defect group (CG): bone defects without any treatment; laser 60J/cm(2) group (L60): animals irradiated with LLLT, at 60J/cm(2) and laser 120J/cm(2) group (L120): animals irradiated with LLLT, at 120J/cm(2). RESULTS: In the laser treated groups, at both fluences, a higher amount of newly formed bone was evidenced as well as granulation tissue compared to control. Picrosirius analysis demonstrated that irradiated animals presented a higher deposition of collagen fibers and a better organization of these fibers when compared to other groups, mainly at 120J/cm(2). COX-2, Cbfa-1 or VEGF immunoreactivity was detected in a similar manner either 60J/cm(2) or 120J/cm(2) fluences. However, no differences were shown in the biomechanical analysis. CONCLUSION: Taken together, our results support the notion that LLLT improves bone repair in the tibia of osteoporotic rats as a result of stimulation of the newly formed bone, fibrovascularization and angiogenesis. Biomarkers;Core Binding Factor Alpha 1 Subunit;Vascular Endothelial Growth Factor A;Cyclooxygenase 2 Animals;Biomarkers;Bone Regeneration;Core Binding Factor Alpha 1 Subunit;Cyclooxygenase 2;Dose-Response Relationship, Radiation;Female;Hindlimb;Immunohistochemistry;Low-Level Light Therapy;Osteoporotic Fractures;Ovariectomy;Radiotherapy Dosage;Random Allocation;Rats;Rats, Wistar;Tibia;Treatment Outcome;Vascular Endothelial Growth Factor A
The degree of erythema in melasma lesion is associated with the severity of disease and the response to the low-fluence Q-switched 1064-nm Nd:YAG laser treatment. Melanins Adult;Erythema;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanins;Melanosis;Middle Aged;Severity of Illness Index
Fractional laser resurfacing of acne scarring in patients with Fitzpatrick skin types IV-VI. Antioxidants;Hydroquinones;hydroquinone Acne Vulgaris;Antioxidants;Cicatrix;Humans;Hydroquinones;Hyperpigmentation;Low-Level Light Therapy;Skin Pigmentation
Efficacy and safety of a low-energy double-pass 1450-nm diode laser for the treatment of acne scars. OBJECTIVE: The purpose of this study was to evaluate the efficacy and safety of a 1450-nm diode laser on acne scars in Asian patients. BACKGROUND DATA: Acne and acne scars affect individuals during puberty and adolescence, and decrease their quality of life. METHODS: An open study was performed on 24 Japanese patients (17 female and 7 male, aged 15-44 years) with acne scars on the face treated with five sessions of low-energy double-pass 1450-nm diode laser at 4-week intervals. The mean duration of the acne scars prior to receiving laser therapy was 4.8 years (range 1-9). Clinical evaluation by physicians and with photographs was conducted at baseline, 1 month after the final treatment, and at a 3-month follow-up visit. Topical therapies for acne vulgaris were permitted during the follow-up period. RESULTS: All patients completed the five treatment sessions. Seventy-five percent of the subjects showed at least 30% improvement of acne scars. At the 3-month follow-up evaluation, 92.9% of the subjects with >30% improvement maintained the effectiveness. Vesicle formation and transient hyperpigmentation also occurred in one case. CONCLUSIONS: The 1450-nm diode laser therapy was effective and well-tolerated in patients with acne scars, suggesting that this

may be an appropriate modality for treating facial acne scars. Acne Vulgaris;Adolescent;Adult;Asian People;Cicatrix;Female;Humans;Low-Level Light Therapy;Male;Skin;Treatment Outcome;Young Adult

Low-fluence vs. standard fluence hair removal: a contralateral control non-inferiority study. INTRODUCTION: Laser hair removal at lower fluences, delivered under certain conditions, may retain the efficacy of high-fluence lasers while improving tolerability. We performed a pilot study comparing the efficacy, safety and tolerability of laser hair removal using traditional settings compared to lower fluences, delivered from a larger handpiece and under vacuum. MATERIAL AND METHODS: Fourteen healthy participants underwent 5 axillary hair removal treatments with an 800 nm diode laser at 1-month intervals, with follow-up 1 and 3 months after the 5th treatment. In all patients, one side was treated with standard parameters using a 9Ã—9 mm chilled tip and gel, while the contralateral side was treated using a 22Ã—35 mm vacuum-assisted handpiece at fluences up to 12 J/cm(2). Follow-up assessments were performed after each treatment and at each follow-up visit, and included photography and questionnaires. RESULTS: Eleven participants completed the study and follow-up. All experienced significant hair removal in all treated areas. At the 3-month follow-up visit, the high-fluence and low-fluence treated axillae demonstrated comparable hair reduction. Participants found the lower fluence treatments to be more tolerable. No adverse events were reported. CONCLUSION: Lower fluence diode laser, delivered under conditions of vacuum and using larger spot sizes, can provide significant hair reduction. Adolescent;Adult;Female;Follow-Up Studies;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pilot Projects;Vacuum;Young Adult

Laser treatment of oral mucosa tattoo. The most common oral solitary pigmented lesion is the dental amalgam tattoo. It occurs as a result of colouring of the tissue by alien pigment which was administered intra or subepidermaly either intentionally or accidentally. The most common material used for the colouring of the oral mucosa is amalgam from amalgam fillings and metal particles from prosthetic restorations which are absorbed accidentally. The oral mucosa tattoos are most often found in the area of the marginal gingiva or the buccal mucosa. The metal particles may accidentally reach the area of the oral mucosa during various dentistry interventions. The therapy most often involves surgical intervention with excisional biopsy while in the recent period the low power laser therapy has provided exceptional results. The aim of the paper was to present the successful removal of the oral mucosa tattoo in a single visit.

Treatment of reticulated acropigmentation of Kitamura with Q-switched alexandrite laser. BACKGROUND: Reticulated acropigmentation of Kitamura (RAPK) is a pigmentary disorder of autosomal dominant inheritance, occurring predominantly within the Japanese population, for which no successful treatment has been described. OBJECTIVE: The objective was to describe a 23-year-old Saudi woman with reticulated acropigmentation of Kitamura (RAPK), who was successfully treated with a 75-nm Q-switched alexandrite laser. METHOD: To report a 23-year-old Saudi woman with reticulated acropigmentation of kitamura (RAPK) who was treated with two sessions of the Q-switched alexandrite laser, six weeks apart with no recurrence after two years. RESULTS: Cutaneous pigmentation of reticulated acropigmentation of kitamura (RAPK) almost resolved completely in two laser sessions. Side effects were limited to transient post inflammatory hypopigmentation. CONCLUSION: Cutaneous pigmentation of reticulated acropigmentation of kitamura (RAPK) can be effectively treated by Q-switched alexandrite (755-nm) laser, which shows a promising result, and it can be considered as treatment option, although further studies are required to confirm the effectiveness of this treatment modality with other Q-switched laser; e.g. Q-switched ND:YAG or Q-switch Ruby. Adult;Female;Foot Dermatoses;Hand Dermatoses;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Young Adult

Role of phototherapy in patients with skin of color. Phototherapy has proven to be one of the most versatile and effective treatment options for a variety of inflammatory and pigmentary skin diseases. However, the use of these treatment modalities in patients of color requires some special considerations. The modality chosen, the dosing of the treatment and duration of treatment are all issues to be considered for patients of color treated with ultraviolet phototherapy. In addition, there are some diseases which are more commonly seen in patients of color. These diseases may have better treatment outcomes using newer phototherapeutic options such as the long pulsed Nd:YAG laser or UVA1. As our population in the United States becomes more diverse it would behoove all dermatologists to acquaint themselves with the special circumstances of treating ethnic patients with phototherapy. Black or African American;Dermatitis, Atopic;Hidradenitis Suppurativa;Humans;Lasers, Solid-State;Low-Level Light Therapy;PUVA Therapy;Phototherapy;Psoriasis;Skin Pigmentation;Vitiligo

Formation of fibrosis after nonablative and ablative fractional laser therapy. BACKGROUND: Fractional laser therapy (FLT) has become a widely accepted modality for skin rejuvenation and has also been used in various other skin diseases. OBJECTIVE: To observe long-term histologic effects of nonablative and ablative FLT in the treatment of pigment disorders. METHODS: A randomized controlled observer-blinded study was performed in 18 patients with pigment disorders. Two similar test regions were randomized to receive FLT with intermittent topical bleaching or topical bleaching alone. Patients with ashy dermatosis (AD) and postinflammatory hyperpigmentation (PIH) were treated using nonablative 1,550-nm FLT (15Â mJ/microbeam, 14-20% coverage), whereas patients with Becker's nevus (BN) were treated with ablative 10,600-nm FLT (10Â mJ/microbeam, 35-45% coverage) for three to five sessions. Biopsies were obtained 3Â months after the last treatment. RESULTS: At follow-up, dermal fibrosis was observed in four of eight patients treated using ablative FLT and no patients treated using nonablative FLT (pÂ <Â .05). CONCLUSIONS: Assuming that the dermal response is comparable in AD, PIH, and BN, at the given settings, ablative FLT may induce fibrosis, whereas treatment with nonablative FLT does not. Whether formation of fibrosis has to be regarded as dermal remodeling or a subtle subclinical form of scarring should be investigated in future research. Adult;Biopsy;Female;Fibrosis;Humans;Low-Level Light Therapy;Male;Pigmentation Disorders;Treatment Outcome

Acneiform rash due to epidermal growth factor receptor inhibitors: high-level laser therapy as an innovative approach. Acneiform rash associated with epidermal growth factor receptor inhibitors frequently presents facial manifestations. The treatment modality for such lesions still needs to be elucidated. The aim of this original report was to evaluate the effectiveness of high-level laser therapy in reducing the severity of facial acneiform rash induced by cetuximab, an epidermal growth factor receptor inhibitors. Four patients with metastatic colorectal cancer and two patients with head and neck cancer showing cetuximab-induced facial rash were treated by high-level laser therapy in two 8-min-long consecutive sessions/day over a 4-day treatment. Patients wore protective glasses to prevent eye damage related to laser light. Subsequently, patients were seen once a week for up to 21Â days and after 180Â days. During each day of treatment and each follow-up recall, patients were asked to complete a questionnaire about the onset and progression of their acneiform rash (for a total of eight sessions). Cetuximab-related toxicity and general discomfort visual analogue scales were also recorded in each of these eight sessions in the treated and control areas in each patient. After the fourth session of high-level laser therapy, the patients showed a noteworthy decrease in both cetuximab-related toxicity and visual analogue scales, up to a complete regression of the lesions at the end of the follow-up in all treated areas. The high-level laser therapy was effective in the healing of acneiform rash associated with epidermal growth factor receptor inhibitors with no side effects. Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;ErbB

Receptors;Cetuximab Acneiform Eruptions;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Cetuximab;Colorectal Neoplasms;Drug Eruptions;ErbB Receptors;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy
Physiotherapy in hip and knee osteoarthritis: development of a practice guideline concerning initial assessment, treatment and evaluation. BACKGROUND: An update of a Dutch physiotherapy practice guideline in Hip and Knee Osteoarthritis (HKOA) was made, based on current evidence and best practice. METHODS: A guideline steering committee, comprising 10 expert physiotherapists, selected topics concerning the guideline chapters: initial assessment, treatment and evaluation. With respect to treatment a systematic literature search was performed using various databases, and the evidence was graded (1-4). For the initial assessment and evaluation mainly review papers and textbooks were used. Based on evidence and expert opinion, recommendations were formulated. A first draft of the guideline was reviewed by 17 experts from different professional backgrounds. A second draft was field-tested by 45 physiotherapists. RESULTS: In total 11 topics were selected. For the initial assessment, three recommendations were formulated, pertaining to history taking, red flags, and formulating treatment goals. Concerning treatment, 7 recommendations were formulated; (supervised) exercise therapy, education and self management interventions, a combination of exercise and manual therapy, postoperative exercise therapy and taping of the patella were recommended. Balneotherapy and hydrotherapy in HKOA, and thermotherapy, TENS, and Continuous Passive Motion in knee OA were neither recommended nor discouraged. Massage therapy, ultrasound, electrotherapy, electromagnetic field, Low Level Laser Therapy, preoperative physiotherapy and education could not be recommended. For the evaluation of treatment goals the following measurement instruments were recommended: Lequesne index, Western Ontario and McMaster Universities osteoarthritis index, Hip disability and Osteoarthritis Outcome Score and Knee injury and Osteoarthritis Outcome Score, 6-minute walktest, Timed Up and Go test, Patient Specific Complaint list, Visual Analoge Scale for pain, Intermittent and Constant OsteoArthritis Pain Questionnaire, goniometry, Medical Research Council for strength, handheld dynamometer. CONCLUSIONS: This update of a Dutch physiotherapy practice guideline on HKOA included 11 recommendations on the initial assessment, treatment and evaluation. The implementation of the guideline in clinical practice needs further evaluation. Humans;Osteoarthritis, Hip;Osteoarthritis, Knee;Physical Therapy Modalities
Laser photostimulation (660â€‰nm) of wound healing in diabetic mice is not brought about by ameliorating diabetes. BACKGROUND AND OBJECTIVES: We have used a 660-nm laser diode in genetic diabetic mice to stimulate the healing of wounds covered with a Tegaderm HP dressing that causes a retardation of contraction (splinted wounds). It is possible that the stimulation of healing could be due to possible diabetes-modifying properties of laser light. This has been examined by using the 660â€‰nm laser to irradiate non-wounded diabetic mice with the same dose and at same location as for wounded diabetic mice. MATERIALS AND METHODS: Twenty-two diabetic mice were used and divided into two equal groups. Body weight and water intake of mice were measured daily for 7 days prior to the start of treatment (Day 0). The left flank of mice in the experimental group was irradiated with 660â€‰nm laser, 100â€‰mW, 20â€‰seconds/day, 7 days; for mice in the control group, the left flank was sham-treated with the laser power supply not switched on. Body weight and water intake of mice were measured to Day 14. On Day 14, the mice were fasted for 4â€‰hours, anaesthetized with sodium pentobarbitone (i.p.) and blood collected by cardiac puncture into heparinized tubes. The plasma was assayed for glucose and glycated hemoglobin A1c. RESULTS: There were no significant differences in body weight and water intake over 22 days between mice in the experimental group and control group. On day 14, the mean blood plasma glucose level was not significantly different between the two groups; glycated hemoglobin A1c was not detected in the

samples. CONCLUSION: Irradiation of the left flank in diabetic mice with 660â€‰nm laser system does not have a significant hypoglycemic effect, and the laser-stimulated healing of wounds in diabetic mice is due to cellular and biochemical changes in the immediate wound environment. Blood Glucose Animals;Bandages;Blood Glucose;Body Weight;Drinking;Female;Low-Level Light Therapy;Male;Mice;Mice, Obese;Treatment Outcome;Wound Healing

Effects of dentin surface modifications treated with Er:YAG and Nd:YAG laser irradiation on fibroblast cell adhesion. OBJECTIVE: The purpose of this in vitro study was to evaluate the effect of surface modifications induced by erbium (Er):YAG and neodymium (Nd):YAG laser irradiation on cell adhesion by comparing it to that of conventional methods for surface preparation after root-end resection. BACKGROUND DATA: Many studies have been seeking a favorable method to produce a resected root end with optimal conditions for cell response. However, little improvement has been achieved. This study evaluated the biocompatibilities of resected root surfaces after Er:YAG or Nd:YAG laser irradiation on initial cell adhesion. MATERIALS AND METHODS: Dentin disks were divided into three groups. Group A was left untreated, Group B was treated with Er:YAG laser irradiation (60â€‰mJ/pulse, 10â€‰pps, 60â€‰sec), and Group C with Nd:YAG laser irradiation (60â€‰mJ/pulse, 10â€‰pps, 60â€‰sec). After laser irradiation, the dentin disks were incubated with NIH/3T3 fibroblasts cultured in Dulbecco's modified Eagle's medium. A morphological analysis of the dentin surface and cell adhesion was observed under a scanning electron microscope. Surface roughness was measured using a confocal laser scanning microscope. The statistical analysis was undertaken using ANOVA at a level of significance of 5% ($p<0.05$). RESULTS: Morphological analysis and roughness measurement showed that dentin surfaces treated with Er:YAG laser irradiation were rougher than those in Groups A and C. Group B (Er:YAG) exhibited the greatest number of attached cells among all groups after 12 and 24â€‰h. CONCLUSIONS: Morphological alteration induced by Er:YAG laser irradiation showed a favorable effect on the attachment of fibroblasts to dentin surfaces. Cell Adhesion;Cell Culture Techniques;Cell Shape;Dentin;Fibroblasts;Humans;Imaging, Three-Dimensional;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Confocal;Surface Properties

How to report low-level laser therapy (LLLT)/photomedicine dose and beam parameters in clinical and laboratory studies. BACKGROUND: Dose and beam parameters are critical for successful laser, LED, and other light therapy treatments; however, in our experience, researchers frequently make critical errors and omissions when submitting papers for publication. Journals frequently publish studies with missing data, mathematical errors, and no reported verification of beam parameters. This makes reproducibility impossible, and further confounds an already complex subject. OBJECTIVE: This article is intended to be a reference document for non-physicist researchers conducting low-level laser therapy (LLLT) laboratory studies and clinical trials to help them design and report the beam and dose aspects of their trials. RECOMMENDATIONS: It provides a checklist to help LLLT researchers understand and report all the necessary parameters for a repeatable scientific study. It includes the eight most important beam parameters to report, which are: wavelength, power, irradiation time, beam area at the skin or culture surface (this is not necessarily the same as the aperture size), pulse parameters, anatomical location, number of treatments, and interval between treatments. The three commonly used dose parameters are time, energy, and energy density. In addition, more thorough reporting would include coherence, application technique (contact, projection, scanning, pressure), beam profile, and spectral width, as these may also be considered important. Beam power often decreases as the device warms up and as the device ages; therefore, this should be checked routinely during an experiment/trial. Measurements of beam area and beam power require special instruments and trained technicians to operate them. Power measurements should be taken before, after, and at frequent intervals during research trials. CONCLUSION: Reviewers should insist that the minimum eight most important beam parameters are included, and

authors should take care to measure and record these accurately before, during, and after an experiment or clinical trial. Checklist;Clinical Trials as Topic;Humans;Low-Level Light Therapy;Radiation, Nonionizing;Radiotherapy Dosage;Reference Values;Reproducibility of Results;Research Design
A possible mechanism for treating staphylococcus aureus-induced chronic osteomyelitis in rats using 808-nm light. Animals;Low-Level Light Therapy;Male;Methicillin-Resistant Staphylococcus aureus;Osteomyelitis;Staphylococcal Infections
Low-dose excimer 308-nm laser for treatment of lichen planopilaris. Aged;Female;Humans;Inflammation;Lasers, Excimer;Lichen Planus;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome
Treatment of residual pockets with photodynamic therapy, diode laser, or deep scaling. A randomized, split-mouth controlled clinical trial. The objective of this work was to compare the effects of antimicrobial photodynamic therapy (PDT), diode soft laser therapy (DSL), and thorough deep scaling and root planing (SRP) for treatment of residual pockets. Thirty-two subjects with a history of non-surgical treatment for chronic periodontitis were included. Residual pockets >4Â mm and bleeding upon probing were debrided with an ultrasonic device and then subjected to either PDT, DSL, or SRP. Pocket probing depth (PPD), bleeding on probing (BOP), and gingival recession were monitored over 6Â months. Counts of four microorganisms were determined by direct hybridization with RNA probes. PPD decreased from 5.6â€‰Â±â€‰1.0 to 3.8â€‰Â±â€‰1.1 in 6Â months (pâ€‰<â€‰0.001), and BOP decreased from 100% to 52% (pâ€‰<â€‰0.01). The risk for a site to remain >4Â mm with BOP depended on initial PPD (pâ€‰=â€‰0.036) and was higher if treated with DSL (pâ€‰=â€‰0.034). Frequencies of three microorganisms were significantly lower in PDT- and SRP-treated than in DSL-treated quadrants (pâ€‰=â€‰0.02) after 14Â days, but not at months 2 and 6. All three treatments resulted in a significant clinical improvement. PDT and SRP suppressed Porphyromonas gingivalis, Tannerella forsythia, and Treponema denticola stronger, and resulted in fewer persisting pockets after 6Â months, than DSL application. Adult;Aged;Dental Scaling;Female;Gingival Recession;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Periodontal Pocket;Photochemotherapy;Root Planing
Effects of the combination of low-level laser irradiation and recombinant human bone morphogenetic protein-2 in bone repair. Low-level laser irradiation (LLLI) and recombinant human bone morphogenetic protein type 2 (rhBMP-2) have been used to stimulate bone formation. LLLI stimulates proliferation of osteoblast precursor cells and cell differentiation and rhBMP-2 recruits osteoprogenitor cells to the bone healing area. This in vivo study evaluated the effects of LLLI and rhBMP-2 on the bone healing process in rats. Critical bone defects were created in the parietal bone in 42 animals, and the animals were divided into six treatment groups: (1) laser, (2) 7Â Î¼g of rhBMP-2, (3) laser and 7Â Î¼g of rhBMP-2, (4) 7Â Î¼g of rhBMP-2/monoolein gel, (5) laser and 7Â Î¼g rhBMP-2/monoolein gel, and (6) critical bone defect controls. A gallium-aluminum-arsenide diode laser was used (wavelength 780Â nm, output power 60Â mW, beam area 0.04Â cm(2), irradiation time 80Â s, energy density 120Â J/cm(2), irradiance 1.5Â W/cm(2)). After 15Â days, the calvarial tissues were removed for histomorphometric analysis. Group 3 defects showed higher amounts of newly formed bone (37.89%) than the defects of all the other groups (Pâ€‰<â€‰0.05). The amounts of new bone in defects of groups 1 and 4 were not significantly different from each other (24.00% and 24.75%, respectively), but were significantly different from the amounts in the other groups (Pâ€‰<â€‰0.05). The amounts of new bone in the defects of groups 2 and 5 were not significantly different from each other (31.42% and 31.96%, respectively), but were significantly different from the amounts in the other groups (Pâ€‰<â€‰0.05). Group 6 defects had 14.10% new bone formation, and this was significantly different from the amounts in the other groups (Pâ€‰<â€‰0.05). It can be

concluded that LLLI administered during surgery effectively accelerated healing of critical bone defects filled with pure rhBMP-2, achieving a better result than LLLI alone or the use of rhBMP-2 alone. BMP2 protein, human;Bone Morphogenetic Protein 2;Recombinant Proteins Animals;Bone Morphogenetic Protein 2;Bone Regeneration;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Wistar;Recombinant Proteins;Skull

Current methods employed in the prevention and minimization of surgical scars. BACKGROUND: Postsurgical scars are of significant concern to patients and surgeons. Many studies have focused on different treatment options for established surgical scars. The prevention and minimization of such aberrant healing responses is more likely to yield better outcomes and require less time and expense. OBJECTIVE AND METHOD: A review of the literature on various forms of prophylactic treatments intended to prevent or minimize the development of prominent postsurgical scars was performed using the Pubmed database over a period from 1987 to 2010. Search terms included "scar prevention," "scar minimization," "post-surgical scar management," and "surgical scars." RESULTS: Various over-the-counter topical products commonly used by patients have failed to demonstrate any significant benefits in improving final scar outcomes. Numerous interventions performed around the time of surgery, including botulinum toxin, lasers, and intradermal injectable products, have shown effectiveness in minimizing eventual scar appearance. CONCLUSIONS: Patient education on proper wound care is a simple method of improving the cosmetic appearance of surgical scars. At the other end of the spectrum, our knowledge of the complex mechanisms of wound healing has allowed for the development of new, effective treatment modalities, including lasers, botulinum toxin, cytokines, and stem cells. Dermatologic Agents Administration, Topical;Cicatrix;Dermatologic Agents;Dermatologic Surgical Procedures;Humans;Injections, Intradermal;Low-Level Light Therapy;Wound Healing

Successful treatment of cosmetic mucosal tattoos via Q-switched laser. BACKGROUND: Tattoo removal using Q-switched lasers is well established in the medical literature, but it is not clear how tattoos on mucosal membranes should be treated because of their infrequent presentation. OBJECTIVE: To report successful cosmetic tattoo removal using Q-switched laser irradiation on the oral mucosal surface. MATERIALS AND METHODS: Three men with cosmetic tattoos on the orolabial mucosa of the lower lip sought permanent removal. Each patient received treatments using a Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser to the desired endpoint. RESULTS: Treatment of the affected area with the Nd:YAG laser resulted in clearing of the pigment without scarring. CONCLUSION: Q-switched laser treatment is a safe and very effective means of removing cosmetic mucosal tattoos on the inner lip and should be considered the criterion standard treatment option. Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Mouth Mucosa;Tattooing

Letter: successful treatment of multiple miliary osteomas of the face using an erbium-doped yttrium aluminum garnet laser. Adult;Bone Neoplasms;Facial Neoplasms;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Osteoma

Commentary on treatment of acne scars in Asian Patients using a 2,790-nm fractional yttrium scandium gallium garnet laser. Actins;Vimentin;Transglutaminases Acne Vulgaris;Actins;Animals;Asian People;Cicatrix;Cosmetic Techniques;Debridement;Dermatologic Surgical Procedures;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Phototherapy;Skin;Skin Aging;Transglutaminases;Vimentin

Targeted 307 nm UVB-phototherapy in psoriasis. A pilot study comparing a 307 nm excimer light with topical dithranol. BACKGROUND: Phototherapy is a cornerstone in treatment of moderate-to-severe psoriasis. Narrow-band UVB has been shown to be a potent therapeutic tool. To reduce the potential carcinogenic risk, targeted phototherapy has been developed using excimer lasers or

excimer light devices (ELD). OBJECTIVE: The role of excimer light therapy in practice and modes of action are not completely understood. We wanted to investigate a 307 nm ELD for plaque psoriasis in comparison with topical dithranol therapy twice daily. METHODS: We conducted a pilot trial in 21 adult patients with moderate plaque-type psoriasis. Two target lesions of comparable size and plaque-modified Psoriasis Activity and Severity Index (PSI) scores were selected. Lesion A was treated three times using a newly developed 307 nm ELD. Lesion B was treated twice daily with dithranol ointment. The mean period of treatment was 9 days. Clinical evaluation included PSI scores, safety, time needed to treat, and patient's satisfaction. In addition, fluorescence-remission imaging technique was used for objective evaluation. RESULTS: Both treatments improved the PSI score (mean 3.0 points). The treatments were safe but ELD was more convenient for patients. The time needed to treat the target lesion was significantly shorter with ELD. Targeted UVB therapy normalized NADH fluorescence in lesional skin. CONCLUSIONS: The 307 nm excimer light therapy for plaque type psoriasis was equipotent to twice daily topical dithranol. Efficacy, safety, and convenience suggest that targeted UVB therapy with quasi monochromatic light is a new useful treatment option for patients with limited psoriatic plaques. Dermatologic Agents;Anthralin Administration, Topical;Adult;Aged;Aged, 80 and over;Anthralin;Dermatologic Agents;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Pilot Projects;Psoriasis;Severity of Illness Index;Ultraviolet Therapy

Treatment of experimental periodontal disease with antimicrobial photodynamic therapy in nicotine-modified rats. BACKGROUND: The aim of this study was to compare antimicrobial photodynamic therapy (aPDT) as an adjunctive treatment to scaling and root planing (SRP) for induced periodontitis in nicotine-modified rats. MATERIAL & METHODS: A total of 240 rats were evenly divided into two groups: C - saline solution treatment; N - nicotine treatment. Periodontal disease was induced in both groups at the first mandibular molar. After 7Â days, the ligature was removed. All animals were submitted to SRP and were divided according to the following treatments: SRP - irrigation with saline solution; Toluidine Blue-O (TBO) - irrigation with phenothiazinium dye (100Â Î¼g/ml); LLLT - laser irradiation (660Â nm; 0.03Â W; 4Â J); and aPDT - TBO and laser irradiation. Ten animals in each group/treatment were euthanized at 7, 15 and 30Â days. The histometric and immunohistochemical values were statistically analysed. RESULTS: Intragroup analysis demonstrated that in both groups the aPDT treatment resulted in lower bone loss (BL) when compared to SRP in all experimental periods. Intergroup analysis demonstrated that aPDT treatment resulted in lower BL in Group N than in Group C treated with SRP in all experimental periods. CONCLUSION: Antimicrobial photodynamic therapy was an effective adjunctive treatment to SRP for induced periodontitis in nicotine-modified rats. Immunosuppressive Agents;Osteoprotegerin;Photosensitizing Agents;RANK Ligand;Nicotine Alveolar Bone Loss;Animals;Bacteria;Combined Modality Therapy;Dental Prophylaxis;Disease Models, Animal;Immunohistochemistry;Immunosuppressive Agents;Male;Mandible;Molar;Nicotine;Osteoprotegerin;Periodontitis;Photochemotherapy;Photosensitizing Agents;RANK Ligand;Random Allocation;Rats;Rats, Wistar

Coronally advanced flap adjunct with low intensity laser therapy: a randomized controlled clinical pilot study. AIM: Coronally advanced flap (CAF) technique and its modifications have been proposed in the literature. Low intensity laser therapy (LILT) is shown to increase wound healing. The aim of this split-mouth randomized controlled pilot study was to assess the effects of LILT with respect to root coverage after CAF procedure for the treatment of multiple-recession type defects (MRTD). MATERIAL AND METHODS: Ten patients with symmetrical 74 Miller I and II gingival recessions were included in this study (37 in test, 37 in control group). A diode laser (588Â nm) was applied to test sites before and immediately after surgery, and for 5Â min. daily 7Â days post-operatively. Comparisons of the surgical sites were made with clinical measurements. RESULTS:

Statistically significant differences were observed between test and control sites in the gingival recession depth (GRD), gingival recession width (GRW) and width of the keratinized tissue (WKT) and clinical attachment level (CAL) measurements after 1Â year (pÂ =Â 0.014, pÂ =Â 0.015, pÂ =Â 0.009 and pÂ =Â 0.018 respectively). The test group presented greater complete root coverage (nÂ =Â 7, 70%) compared with the control group (nÂ =Â 3, 30%) after treatment. CONCLUSION: Within the limitations of this study, the results indicated that LILT may improve the predictability of CAF in multiple recessions. Adult;Analysis of Variance;Female;Gingival Recession;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Pilot Projects;Single-Blind Method;Statistics, Nonparametric;Surgical Flaps

Hair removal utilizing the LightSheer Duet HS hand piece and the LightSheer ET: a comparative study of two diode laser systems in Chinese women. OBJECTIVE: To compare the clinical efficacy, safety and pain associated with the use of the LightSheer Duet HS as compared to the original LightSheer ET diode Laser for axillae hair removal in Chinese women. METHODS: Thirty-six Chinese women received three axillae laser hair removal treatments using the LightSheer Duet HS on one side and the LightSheer ET on the other side. Subjects were evaluated for hair removal efficiency. The immediate pain associated with the treatments was noted. RESULTS: At 1 month following the final laser treatment, hair reduction on the LightSheer Duet HS side and on the LightSheer ET side was 81 Â± 13% and 85 Â± 9% respectively. There was no statistical difference. Immediate pain scores at the first session on the LightSheer Duet HS sites and LightSheer ET sites was 5.71 Â± 1.74 and 6.86 Â± 1.80 respectively, which was statistically significant ($p < 0.05$). Following the second and third sessions, immediate pain scores of the LightSheer Duet HS sites were both less than those of the LightSheer ET sites, but the differences were not statistically significant. CONCLUSIONS: The LightSheer Duet HS laser is a safe and effective method of hair removal in Chinese women. Treatment with the LightSheer Duet HS causes less pain. Adult;Asian People;China;Female;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative;Treatment Outcome;Young Adult

Fractional ablative laser skin resurfacing: a review. Ablative laser technology has been in use for many years now. The large side effect profile however has limited its use. Fractional ablative technology is a newer development which combines a lesser side effect profile along with similar efficacy. In this paper we review fractional ablative laser skin resurfacing. Humans;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Skin;Skin Aging

Fractional laser resurfacing. Cosmetic Techniques;Humans;Low-Level Light Therapy

Treatment of Lymphedema Praecox through Low Level Laser Therapy (LLLT). A 15-year-old girl with right lower extremity lymphedema praecox was treated through Low Level Laser Therapy (LLLT), by means of a GaAs and GaAlAs diodes laser-therapy device. Treatment sessions were totally 24, each cycle containing 12 every other day 15-minute sessions, and one month free between the cycles. The treatment was achieved to decrease the edema and no significant increase in circumference of involved leg was found following three months after the course of treatment. Although LLLT can be considered a beneficial treatment for Lymphedema Praecox, any definite statement around its effectiveness needs more studies on more cases.

Prevention of recurrent herpes labialis outbreaks through low-intensity laser therapy: a clinical protocol with 3-year follow-up. Adult;Clinical Protocols;Female;Follow-Up Studies;Herpes Labialis;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Secondary Prevention

Development of a minimally invasive laser needle system: effects on cortical bone of osteoporotic mice. Many studies have shown the positive effects of low-level laser therapy in the treatment of bone disease. However, laser radiation is scattered in the skin surface which reduces the initial

photon density for tissue penetration and consequently the therapeutic efficacy. We developed a minimally invasive laser needle system (MILNS) to avoid laser scattering in tissue and investigated its stimulatory effects in the cortical bone of osteoporotic mice. The MILNS was designed to stimulate cortical bone directly by employing fine hollow needles to guide 100Â Î¼m optical fibers. The study animals comprised 12 mice which were subjected to sciatic denervation of the right hind limb and were randomly divided into two groups, a sham group and a laser group which were treated using the MILNS for 2Â weeks without and with laser irradiation, respectively. In vivo micro-CT images were taken to analyze the structural parameters and bone mineral density. After 2Â weeks of treatment with the MILNS, the relative changes in mean polar moment inertia, cross-section thickness, and periosteal perimeter were significantly higher in the laser group than in the sham group. Moreover, the distribution of bone mineral density index was higher in the laser group. The MILNS was developed as a minimally invasive treatment modality for bone disease and resulted in positive therapeutic efficacy in the cortical bone of osteoporotic mice. Animals;Bone Density;Denervation;Disease Models, Animal;Female;Low-Level Light Therapy;Mice;Mice, Inbred ICR;Osteoporosis;Sciatic Nerve

Light therapy by blue LED improves wound healing in an excision model in rats. BACKGROUND: Low level light therapy (LLLT) is an attractive alternative to enhance wound healing. So far most studies are performed with red or infrared irradiation. However, we recently showed that blue light (470 nm) can significantly influence biological systems, improving perfusion by release of nitric oxide from nitrosyl complexes with haemoglobin in a skin flap model in rats. Here, we compared the effects of blue and red low level light by light-emitting diodes (LEDs) on in vivo wound healing in an excision wound model in rats. METHODS: Circular excision wounds were surgically created on the dorsum of each rat. Excisions on either the left or right side were illuminated post-OP and on five consecutive days for 10 min by LED at 470 nm or 630 nm with an intensity of 50 mW/cm(2),while protecting the contralateral side from exposure. In the control group, neither side was illuminated. On day 7 post-OP, we analysed planimetric and histological parameters, as well as expression of keratin-1, keratin-10 and keratin-17 on mRNA level. RESULTS: Illumination substantially influenced wound healing. Blue light significantly decreased wound size on day 7, which correlated with enhanced epithelialisation. Light also affected mRNA expression. Both wavelengths decreased keratin-1 mRNA on day 7 post-OP, while keratin-10 mRNA level was elevated in both light treated group compared to control. Keratin-17 mRNA was also elevated in the red light group, but was unchanged in the blue light group. CONCLUSION: In contrast to previous studies, we showed that also blue light significantly influences wound healing. Furthermore, our data suggest that light therapy can play an important role in normotrophic wound healing by affecting keratin expression. Illumination would provide an easily applicable, safe and cost-effective treatment of surface wounds. RNA, Messenger;Keratins Animals;Disease Models, Animal;Keratins;Low-Level Light Therapy;Male;Phototherapy;RNA, Messenger;Rats;Rats, Sprague-Dawley;Reverse Transcriptase Polymerase Chain Reaction;Skin;Swine;Wound Healing;Wounds and Injuries

[Linear porokeratosis]. Antineoplastic Agents, Alkylating;Dacarbazine Aged;Antineoplastic Agents, Alkylating;Combined Modality Therapy;Dacarbazine;Female;Foot Diseases;Humans;Immunotherapy, Active;Lasers, Gas;Low-Level Light Therapy;Melanoma;Porokeratosis;Skin Neoplasms;Toes

The relevance of accurate comprehensive treatment parameters in photobiomodulation. Humans;Low-Level Light Therapy;Radiation, Nonionizing;Radiotherapy Dosage

Use of a diode laser in an excisional biopsy of two spoonlike neoformations on the tongue tip. The 810 nm diode laser, due to its high affinity with haemoglobin (elective chromatophore) revealed, by itself, as elective instrument for surgical excision of the tongue, an organ highly vascularized and

sensitive to the laser cutting action. The advantages for its use, with respect to the traditional cold blade surgery, are its haemostatic effect (which avoids to close wounds by stitches) and, not less important, the decontaminant effect of the laser ray, due to either the thermal raising created on cutting line and/or the specific selective action exerted on the bacterial membrane by its wavelength. Finally, the analgesic effect of the diode laser contributes to consider this kind of procedure more comfortable for the patient who often roundly requires its use. Anesthetics, Local;Gels;Lidocaine, Prilocaine Drug Combination;Prilocaine;Lidocaine Anesthetics, Local;Epithelium;Gels;Humans;Hyperplasia;Lasers, Semiconductor;Lidocaine;Lidocaine, Prilocaine Drug Combination;Low-Level Light Therapy;Male;Prilocaine;Tongue Neoplasms

Photomedicine and LLLT Literature Watch. Low-Level Light Therapy;Phototherapy

Vitiligo treatment with monochromatic excimer light and tacrolimus: results of an open randomized controlled study. BACKGROUND DATA: Narrow band ultraviolet B (UVB) is an effective and safe option for the treatment of vitiligo. However, a complete and long-lasting repigmention of vitiligo patches is difficult to achieve. Combined treatments with novel sources of phototherapy and topical agents represent possible new strategies. OBJECTIVE: The purpose of this study was to compare the efficacy of combined tacrolimus and 308-nm excimer light (MEL) vs 308-nm MEL monotherapy in treating vitiligo in a controlled study. METHODS: Fifty-three patients affected by vitiligo were enrolled in this open prospective study. Patients were divided into three groups: Group I included 20 patients treated with MEL 308â€‰nm twice weekly and oral vitamin E; Group II included 20 patients treated with MEL 308â€‰nm twice weekly combined with 0.1% tacrolimus once a day and oral vitamin E; and Group III included 13 patients treated only with oral vitamin E. Efficacy was assessed at the end of 12 weeks based on the percentage of repigmentation. RESULTS: Fifty-two patients completed 12 weeks of treatment. Group I (MEL + vitamin E) showed a moderate repigmentation in 35% of patients, good repigmentation in 30%, excellent repigmentation in 25%, and poor repigmentation in 10%; Group II (MEL + tacrolimus 0.1%+ vitamin E) presented moderate repigmentation in 25% of patients, good repigmentation in 40%, excellent repigmentation in 30%, and poor repigmentation in 5%; Group III (vitamin E) showed moderate repigmentation in 16% and 84% did not show signs of repigmentation. CONCLUSIONS: Our results demonstrate that the combination treatment of 0.1% tacrolimus ointment plus 308-nm MEL and 308-nm MEL monotherapy are effective, safe, and well tolerated for the treatment of vitiligo compared to treatment with vitamin E. Furthermore, this study suggests that an association with topical immunomodulators could enhance the clinical response in vitiligo, especially in more resistant anatomical sites. Immunosuppressive Agents;Ointment Bases;Tacrolimus Administration, Topical;Adolescent;Adult;Combined Modality Therapy;Female;Humans;Immunosuppressive Agents;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Ointment Bases;Tacrolimus;Vitiligo;Young Adult

Early surgical laser-assisted management of bisphosphonate-related osteonecrosis of the jaws (BRONJ): a retrospective analysis of 101 treated sites with long-term follow-up. BACKGROUND DATA: The management of bisphosphonate-related osteonecrosis of the jaws (BRONJ) is still controversial. OBJECTIVE: The purpose of this study was to compare surgical and nonsurgical approaches to the treatment of BRONJ and the possible usefulness of Nd:YAG and Er:YAG lasers. METHODS: One hundred and twenty-eight patients (33 males, 95 females; 52 with diagnosis of multiple myeloma, 53 with diagnosis of bone metastasis, and 23 with diagnosis of osteoporosis) affected by BRONJ were evaluated at the Unit of Oral Pathology and Medicine and Laser-Assisted Surgery of the University of Parma, Italy, between January 2004 and July 2009. Overall number of BRONJ sites was 151, and number of treated sites was 101. In order to assess the efficacy of different treatments, sites were subclassified as follows: Group 1 (G1): 12 sites treated with medical therapy; Group 2 (G2): 27 sites treated with medical therapy associated with low level laser therapy (LLLT);

Group 3 (G3): 17 sites treated with a combination of medical and surgical therapy; Group 4 (G4): 45 sites treated with a combination of medical therapy, surgical (including laser-assisted) therapy, and LLLT. Outcome of treatment was assessed using the staging system proposed by Ruggiero et al. Transition from a higher stage to a lower one for at least 6 months was considered as clinical improvement and suggestive of a successful treatment. RESULTS: Clinical improvement was achieved in 3 out of 12 (25%) BRONJ sites in G1. Sites if G2 with an improvement were 18 out of 27 (66%). Nine out 17 BRONJ sites (53%) in G3 had a transition to a lower stage after treatment. For sites in G4, a clinical improvement was recorded in 40 out of 45 cases (89%). CONCLUSIONS: In our experience, the percentage of success obtained with a combined approach based on medical therapy, surgical (including laser-assisted) therapy, and LLLT (G4) is significantly higher than the percentage of improvement obtained in G1, G2, and G3. Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Neoplasms;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Multiple Myeloma;Osteoporosis

Effects of low-level laser therapy at wavelengths of 660 and 808 nm in experimental model of osteoarthritis. The aim of the present study was to analyze the influence of low-level laser radiation at wavelengths of 660 and 808 nm in an experimental model of osteoarthritis (OA). The sample was composed of 36 male adult Wistar rats divided into three groups (G1, G2 and G3). For the induction of cartilage injury, three injections of 4% papain and 10 Î¼L of a cysteine solution were performed at right knee of the hind leg. Two weeks after the last injection, group G1 was treated with InGaAlP (660 nm, 100 mW, 3.57 W cm(-2), 40 s) and G2 was treated with AsGaAl (808 nm, 100 mW, 3.57 W cm(-2), 40 s) both with energy of 4 J. There were significant differences in the type of squamous epithelium between days 7 and 14 in G2 ($P < 0.05$) and on day 14 between G1 and G2 ($P < 0.05$). Moreover, statistically significant differences were found in the formation of new blood vessels between G1 and G3 on days 7 and 21 as well as between G2 and G3 on day 21. The formation of fibrotic tissue was greater in G3 ($P < 0.05$). In conclusion, laser therapy, especially at a wavelength of 808 nm, stimulated angiogenesis and reduced the formation of fibrosis in an experimental model of OA. Animals;Disease Models, Animal;Laser Therapy;Male;Osteoarthritis;Rats;Rats, Wistar

Infrared (810 nm) low-level laser therapy in experimental model of strain-induced skeletal muscle injury in rats: effects on functional outcomes. Muscle strains are among the most prevalent causes for athletes' absence from sport activities. Low-level laser therapy (LLLT) has recently emerged as a potential contender to nonsteroidal anti-inflammatory drugs in muscle strain treatment. In this work we investigated effects of LLLT and diclofenac on functional outcomes in the acute stage after muscle strain injury in rats. Muscle strain was induced by overloading the tibialis anterior muscle of rats during anesthesia. The injured groups received either no treatment, or a single treatment with diclofenac 30 min prior to injury, or LLLT (810 nm, 100 mW) with doses of 1, 3, 6 or 9 J, at 1 h after injury. Functional outcome measures included a walking index and assessment of electrically induced muscle performance. All treatments (except 9 J LLLT) significantly improved the walking index 12 h postinjury compared with the untreated group. The 3 J group also showed a significantly better walking index than the drug group. All treatments significantly improved muscle performance at 6 and 12 h. LLLT dose of 3 J was as effective as the pharmacological agent in improving functional outcomes in the early phase after a muscle strain injury in rats. Animals;Infrared Rays;Laser Therapy;Muscle, Skeletal;Rats;Wounds and Injuries

Laser irradiation of the semicircular canal: occlusion of the canal or duct. The aim of this study was to evaluate the effects of argon laser irradiation of the semicircular canals using computed tomography (CT) images and to examine the basis for laser treatment for benign paroxysmal positional vertigo (BPPV). CT images of the posterior canal were evaluated postoperatively in a patient with intractable BPPV, in whom the unilateral posterior and lateral semicircular canals were

irradiated with an argon laser. In addition, bootstrap analysis of 20 patients with normal CT findings of the temporal bone was performed and previous experimentally obtained histologic findings were compared. Cross-sections of the posterior canals of 20 patients were found to show no difference in size between the right and left sides. The laser-irradiated posterior canal became narrower than that on the non-irradiated healthy side in our patient. There was a discrepancy between the CT images and experimentally obtained histologic findings that showed complete occlusion of the canal. CT images of a patient with severe vertigo demonstrated that argon laser irradiation to the blue-lined semicircular canals did not occlude the canal of the corresponding areas, while the canal of the guinea pig histologically showed complete obstruction with new bone after irradiation with the same energy (1.5 W, 0.5 s, spot size: around 200 Î¼m in diameter). The patient has been free from vertigo for 16 years. Marked constriction of the semicircular duct corresponding to the irradiated area appeared to be effective in treating intractable BPPV. Aged;Benign Paroxysmal Positional Vertigo;Female;Follow-Up Studies;Humans;Lasers, Gas;Low-Level Light Therapy;Semicircular Canals;Tomography, X-Ray Computed;Vertigo

Effects of low-level laser therapy in combination with physiotherapy in the management of rotator cuff tendinitis. Rotator cuff tendinitis is one of the main causes of shoulder pain. The objective of this study was to evaluate the possible additive effects of low-power laser treatment in combination with conventional physiotherapy endeavors in these patients. A total of 50 patients who were referred to the Physical Medicine and Rehabilitation Clinic with shoulder pain and rotator cuff disorders were selected. Pain severity measured with visual analogue scale (VAS), abduction, and external rotation range of motion in shoulder joint was measured by goniometry, and evaluation of daily functional abilities of patients was measured by shoulder disability questionnaire. Twenty-five of the above patients were randomly assigned into the control group and received only routine physiotherapy. The other 25 patients were assigned into the experimental group and received conventional therapy plus low-level laser therapy (4 J/cm(2) at each point over a maximum of ten painful points of shoulder region for total 5 min duration). The above measurements were assessed at the end of the third week of therapy in each group and the results were analyzed statistically. In both groups, statistically significant improvement was detected in all outcome measures compared to baseline (pâ€‰<â€‰0.05). Comparison between two different groups revealed better results for control of pain (reduction in VAS average) and shoulder disability problems in the experimental group versus the control (3.1â€‰Â±â€‰2.2 vs. 5â€‰Â±â€‰2.6, pâ€‰=â€‰0.029 and 4.4â€‰Â±â€‰3.1 vs. 8.5â€‰Â±â€‰5.1, pâ€‰=â€‰0.031, respectively) after intervention. Positive objective signs also had better results in the experimental group, but the mean range of active abduction (144.92â€‰Â±â€‰31.6 vs. 132.80â€‰Â±â€‰31.3) and external rotation (78.0â€‰Â±â€‰19.5 vs. 76.3â€‰Â±â€‰19.1) had no significant difference between the two groups (pâ€‰=â€‰0.20 and 0.77, respectively). As one of physical modalities, gallium-arsenide low-power laser combined with conventional physiotherapy has superiority over routine physiotherapy from the view of decreasing pain and improving the patient's function, but no additional advantages were detected in increasing shoulder joint range of motion in comparison to other physical agents. Adult;Aged;Combined Modality Therapy;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Physical Therapy Modalities;Range of Motion, Articular;Rotator Cuff;Shoulder Joint;Tendinopathy;Treatment Outcome

Treatment of oral submucous fibrosis with ErCr: YSGG laser. Oral submucous fibrosis (OSMF) is one of the most poorly understood and unsatisfactorily treated diseases. Various medical and surgical treatments have been used but with limited benefits. However, with advent of lasers, oral surgeons are provided with new modality for treating OSMF. This case report highlights the pioneering effort in treating a moderate case of bilateral OSMF with Erbium Chromium Yttrium Scandium Gallium Garnet

(ErCr:YSGG) laser showing promising result during follow-up. Adolescent;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Oral Submucous Fibrosis;Oral Surgical Procedures;Treatment Outcome

The effect of 670-nm low laser therapy on herpes simplex type 1. OBJECTIVE: The purpose of this work was to study the effect of low-level laser therapy (LLLT) on the healing and relapse intervals in patients with recurrent labial herpes simplex infections. BACKGROUND DATA: Several pharmaceuticals are available to reduce symptoms and improbÃ© healing of labial herpes, but only LLLT has been reported to significantly influence the length of the recurrence period. MATERIAL AND METHODS: In an initial study, 232 patients with herpes simplex type 1 virus symptoms were consecutively selected for either LLLT or conventional therapy, including acyclovir cream or tablets. One of the dentists was responsible for the diagnosis, a second dentist for the treatment, and and a third for the evaluation, to allow for a semi-blinded procedure. Patients in the laser group received 670-nm laser irradiation, 40â€‰mW, 1.6â€‰J, 2.04â€‰J/cm(2), 51â€‰mW/cm(2) per blister in the prodromal stage and 4.8â€‰J in the crust and secondarily infected stages, plus 1.2â€‰J at the C2-C3 vertebrae. Patients were monitored daily during the first week to control healing, and monthly for 1 year to check on recurrence. In a consecutive study, 322 patients receiving LLLT were followed during 5 years to observe the period of ocurrences. RESULTS: An obvious effect of LLLT was found for both initial healing and for the length of the recurrence periods. CONCLUSIONS: LLLTof herpes simples virus 1 (HSV-1) appears to be an effective treatment modality without any observed side effects. Antiviral Agents Adolescent;Adult;Antiviral Agents;Female;Herpes Labialis;Herpesvirus 1, Human;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Recurrence;Young Adult

The nuts and bolts of low-level laser (light) therapy. Soon after the discovery of lasers in the 1960s it was realized that laser therapy had the potential to improve wound healing and reduce pain, inflammation and swelling. In recent years the field sometimes known as photobiomodulation has broadened to include light-emitting diodes and other light sources, and the range of wavelengths used now includes many in the red and near infrared. The term "low level laser therapy" or LLLT has become widely recognized and implies the existence of the biphasic dose response or the Arndt-Schulz curve. This review will cover the mechanisms of action of LLLT at a cellular and at a tissular level and will summarize the various light sources and principles of dosimetry that are employed in clinical practice. The range of diseases, injuries, and conditions that can be benefited by LLLT will be summarized with an emphasis on those that have reported randomized controlled clinical trials. Serious life-threatening diseases such as stroke, heart attack, spinal cord injury, and traumatic brain injury may soon be amenable to LLLT therapy. Animals;Humans;Lasers;Light;Low-Level Light Therapy;Radiotherapy Dosage

Effect of quantum therapy on pork quality. In this study the impact of quantum therapy on meat quality of slaughtered pigs was investigated. For this purpose the pigs were treated with different doses of magnet-infrared-laser (MIL) radiation. Animals were divided into four groups according to radiation doses (4096, 512, and 64 Hz, and control without application), which were applied in the lumbar area of musculus longissimus dorsi (loin) at various time intervals prior to the slaughter (14 d, 24 h, and 1 h). Animals were slaughtered and the meat quality was evaluated by determining of pH value (1, 3, and 24 h post slaughter), drip loss, colour, and lactic acid and phosphoric acid amounts. MIL therapy can be used in various fields of veterinary medicine as are surgery and orthopaedics, internal medicine, dentistry, pulmonology, gastroenterology, gynaecology, urology, nephrology, and dermatology. The results achieved showed that MIL radiation used in a short period before slaughter (1 h) can cause a change in the meat quality, as reflected by the non-standard development of pH

values, increases in drip loss, and changes of meat colour. Animals;Color;Hydrogen-Ion Concentration;Low-Level Light Therapy;Meat;Muscle, Skeletal;Swine

Patient responses to Er:YAG laser when used for conservative dentistry. The utilization of laser technology in conservative dentistry offers several advantages compared with traditional instruments, but one of the still unsolved problems is the difficulty in describing and explaining these advantages to patients. The aims of this study were to verify the efficacy of the way patients are informed and to evaluate their satisfaction with laser-assisted treatment. Before treatment, 100 patients were given a brochure that explained the relevant laser-assisted dental procedures, and after dental treatment an 11-item questionnaire was administered to the patients to evaluate their satisfaction with the treatment. Statistical analysis showed high levels of satisfaction for all the questions, especially those regarding the choice between laser therapy and traditional instruments (100%), choosing laser in the future (89%), and recommending it to family and friends (84%). This study may be relevant when determining the overall satisfaction of patients with this new technology. Humans;Lasers, Solid-State;Low-Level Light Therapy;Pamphlets;Patient Satisfaction;Surveys and Questionnaires

Immunocytochemical studies on the effect of 405-nm low-power laser irradiation on human-derived A-172 glioblastoma cells. The application of low-power laser irradiation (LLI) affects the cell cycle and cell proliferation in various kinds of cells. LLI at a wavelength of 808Â nm and a power of 30Â mW has been found to significantly decrease the proliferation rate of cells of the human-derived glioblastoma cell line A-172. To determine if this effect of LLI is specific to 808-nm LLI, the present study was designed to reveal the effects of 405-nm LLI under the same experimental conditions. A-172 glioblastoma cells were cultured in 96-well plates according to the conventional protocol. Two different schedules of 405-nm LLI (27Â mW) were tested: longer periods of 20, 40 and 60Â min and shorter periods of 1, 2, 3, 5, 10 and 15Â min. Cells on a digital image displayed on a computer monitor were counted and the proliferation ratio was determined using MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide) staining. Annexin-V-FLUOS staining and acridine-orange/ethidium-bromide staining were in an immunocytochemical assay to determine if cells were viable or dead (due to apoptosis or necrosis). Cell counting and MTT staining showed that longer 405-nm LLI significantly suppressed the proliferation of A-172 cells at 48Â h after LLI (pâ€‰<â€‰0.05 or pâ€‰<â€‰0.01) and that the effect of LLI tended to be dose-dependent with morphological changes including cell death. At 90Â min after LLI, shorter 405-nm LLI caused necrotic as well as apoptotic cell death, and these effects depended on irradiation time, power and energy density. Detailed analysis revealed that this lethal effect occurred after LLI and was not sustainable. It is concluded that 405-nm LLI has a lethal effect on human-derived glioblastoma A-172 cells, that is different from the suppressive effect without morphological changes induced by 808-nm LLI. Tetrazolium Salts;Thiazoles;thiazolyl blue Apoptosis;Cell Line, Tumor;Cell Survival;Glioblastoma;Humans;Immunohistochemistry;Low-Level Light Therapy;Microscopy, Fluorescence;Necrosis;Tetrazolium Salts;Thiazoles

[Er:YAG laser: tissue interaction and histomorphological characterization]. Authors describe Er:YAG laser interaction with tissues, in particular their histomorphological characteristics to identify a specific clinic area for laser application through the examination of different clinical international trials. This study includes experimental trials about pig and rat skin laser application to know laser Er: YAG capability and limits; investigation is extended to laser application in human soft tissues as mucosa, periosteum and bones, its utility in cutaneous pathologies and in antiageing treatments. Collagen Animals;Bone and Bones;Burns;Cicatrix;Collagen;Dermabrasion;Hot Temperature;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Mouth

Mucosa;Muscles;Nerve Tissue;Pigmentation Disorders;Radiation Injuries, Experimental;Skin;Soft Tissue Injuries
Near infrared transcranial laser therapy applied at various modes to mice following traumatic brain injury significantly reduces long-term neurological deficits. Near-infrared transcranial laser therapy (TLT) has been found to modulate various biological processes including traumatic brain injury (TBI). Following TBI in mice, in this study we assessed the possibility of various near-infrared TLT modes (pulsed versus continuous) in producing a beneficial effect on the long-term neurobehavioral outcome and brain lesions of these mice. TBI was induced by a weight-drop device, and neurobehavioral function was assessed from 1â€‰h to 56 days post-trauma using the Neurological Severity Score (NSS). The extent of recovery is expressed as the difference in NSS (dNSS), the difference between the initial score and that at any other later time point. An 808-nm Ga-Al-As diode laser was employed transcranially 4, 6, or 8â€‰h post-trauma to illuminate the entire cortex of the brain. Mice were divided into several groups of 6-8 mice: one control group that received a sham treatment and experimental groups that received either TLT continuous wave (CW) or pulsed wave (PW) mode transcranially. MRI was taken prior to sacrifice at 56 days post-injury. From 5-28 days post-TBI, the NSS of the laser-treated mice were significantly lower ($p<0.05$) than those of the non-laser-treated control mice. The percentage of surviving mice that demonstrated full recovery at 56 days post-CHI (NSS=0, as in intact mice) was the highest (63%) in the group that had received TLT in the PW mode at 100â€‰Hz. In addition, magnetic resonance imaging (MRI) analysis demonstrated significantly smaller infarct lesion volumes in laser-treated mice compared to controls. Our data suggest that non-invasive TLT of mice post-TBI provides a significant long-term functional neurological benefit, and that the pulsed laser mode at 100â€‰Hz is the preferred mode for such treatment. Animals;Behavior, Animal;Brain Injuries;Hyperthermia, Induced;Infrared Rays;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Recovery of Function
LOW-LEVEL LASER THERAPY AFTER CARPAL TUNNEL RELEASE. OBJECTIVE: Evaluate the post-operative treatment of CTS, using the LLLT. METHOD: We prospectively evaluated 58 patients with CTS, randomly divided into two groups: treatment with LLLT (Group 1) and placebo (Group 2). A 830 nm gallium-aluminum-arsenic laser was used, with a power of 30 mW. RESULTS: There was female predominance in both groups. The mean age of the patients in Group 1 was 44.3 years and in Group 2, 51.9 years. The average duration of disease progression was around two years in both groups. The average time elapsed since discharge from treatment was 3.6 months in both groups, and fewer patients had postoperative complaints in Group 1 than in Group 2. At the end of the treatment, in Group 1, 29.41% of the patients presented electromyographic abnormalities, while in Group 2, 63.64% of the patients had abnormalities, after six months. CONCLUSION: This was an initial study on adjuvant therapy using postoperative LLLT on CTS. The method presented was sufficient for postoperative evaluation of the patients in this study. Patients undergoing LLLT after surgery for CTS were benefited and had better functional outcomes than shown by the control group. The technique was effective and did not have any adverse effects on the patients studied.
Induction of primitive pigment cell differentiation by visible light (helium-neon laser): a photoacceptor-specific response not replicable by UVB irradiation. Solar lights encompass ultraviolet (UV), visible, and infrared spectrum. Most previous studies focused on the harmful UV effects, and the biologic effects of lights at other spectrums remained unclear. Recently, lights at visible region have been used for regenerative purposes. Using the process of vitiligo repigmentation as a research model, we focused on elucidating the pro-differentiation effects induced by visible light. We first showed that helium-neon (He-Ne) laser (632.8 nm) irradiation stimulated differentiation of primitive pigment cells, an effect not replicable by UVB treatment even at high and damaging doses. In addition, significant increases of mitochondrial DNA copy number and the regulatory genes for

mitochondrial biogenesis were induced by He-Ne laser irradiation. Mechanistically, we demonstrated that He-Ne laser initiated mitochondrial retrograde signaling via a Ca(2+)-dependent cascade. The impact on cytochrome c oxidase within the mitochondria is responsible for the efficacy of He-Ne laser in promoting melanoblast differentiation. Taken together, we propose that visible lights from the sun provide important environmental cues for the relatively quiescent stem or primitive cells to differentiate. In addition, our results also indicate that visible light may be used for regenerative medical purposes involving stem cells. Melanins;Neon;Electron Transport Complex IV Animals;Calcium Signaling;Cell Differentiation;Cell Line;Electron Transport Complex IV;Humans;Lasers, Gas;Light;Low-Level Light Therapy;Melanins;Melanocytes;Mice;Mitochondria;Neon;Pigmentation;Ultraviolet Rays;Vitiligo

Comparison of the long-term effectiveness of physiotherapy programs with low-level laser therapy and pulsed magnetic field in patients with carpal tunnel syndrome. PURPOSE: The aim of the study was to compare the long term effects of low - level laser therapy (LLLT) and pulsed magnetic field (PMF) in the rehabilitation of patients with carpal tunnel syndrome (CTS). METHODS: The study included 38 patients with idiopathic CTS, confirmed by electroneurographic (ENG) examination. All patients were randomly assigned to 2 groups: group L (18 patients) treated with LLLT and group M (20 patients) with PMF therapy. Clinical assessment, including day and night pain, the presence of paresthesia, functional tests (Phalen, Tinel, armband tests) and pain severity according to the Visual Analogue Scale (VAS) was conducted before treatment, after the first series of 10 sessions, after a two-week break, after the second series of 10 sessions and six months after the last series. RESULTS: After LLLT a significant reduction of day and night pain was observed at each stage of treatment and 6 months after the last series ($p<0.05$). However, in group M, a significant reduction of both day and night pain was demonstrated only after the second series ($p<0.05$). A reduction of the incidence of Phalen's symptoms were noticed in both groups, however, only in group L the improvement was significant ($p<0.05$). In groups L and M a significant reduction of pain intensity was observed at every stage of treatment ($p<0.05$). CONCLUSIONS: Although after LLL as well as PMF therapy clinical improvement was observed, the most significant differences were registered after the second series and persisted for up to 6 months in both groups. Adult;Aged;Carpal Tunnel Syndrome;Electrophysiology;Female;Humans;Low-Level Light Therapy;Magnetic Fields;Male;Median Nerve;Middle Aged;Neural Conduction;Neurons;Pain Measurement;Physical Therapy Modalities;Time Factors;Treatment Outcome

Combination of 1064-nm Q-switched neodymium: yttrium-aluminum-garnet laser with low fluence and 578-/511-nm copper bromide laser for nipple-areolar hyperpigmentation. Adult;Female;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Nipples

Glomuvenous Malformations (Familial generalized multiple glomangiomas). A 15-year-old boy with a diagnosis of generalized multiple glomangiomas was referred for evaluation and treatment of enlarging and increasingly painful lesions on his right ankle. The patient underwent a series of two treatments with long-pulsed KTP 1064 nm laser that resulted in substantial improvement in appearance and decreased pain. Generalized glomuvenous malformations, or multiple glomangiomas, are the less common presentation of proliferation of glomus cells and may have extracutaneous involvement. Whereas surgical management is often employed and definitive for solitary lesions, interventions such as laser therapy, may be beneficial for improvement of functional impairment and cosmesis as was observed in our patient. Adolescent;Ankle;Biopsy;Glomus Tumor;Headache;Humans;Internal Capsule;Lasers, Dye;Low-Level Light Therapy;Magnetic Resonance Imaging;Male;Neoplasms, Multiple Primary;Neoplastic Syndromes, Hereditary;Skin Neoplasms;Supratentorial Neoplasms

670â€‰nm laser light and EGCG complementarily reduce amyloid-Î² aggregates in human neuroblastoma cells: basis for treatment of Alzheimer's disease? OBJECTIVE: The aim of the present study is to present the results of in vitro experiments with possible relevance in the treatment of Alzheimer's disease (AD). BACKGROUND DATA: Despite intensive research efforts, there is no treatment for AD. One root cause of AD is the extra- and intracellular deposition of amyloid-beta (AÎ²) fibrils in the brain. Recently, it was shown that extracellular AÎ² can enter brain cells, resulting in neurotoxicity. METHODS: After internalization of AÎ²(42) into human neuroblastoma (SH-EP) cells, they were irradiated with moderately intense 670-nm laser light (1000 Wm(-2)) and/or treated with epigallocatechin gallate (EGCG). RESULTS: In irradiated cells, AÎ²(42) aggregate amounts were significantly lower than in nonirradiated cells. Likewise, in EGCG-treated cells, AÎ²(42) aggregate amounts were significantly lower than in non-EGCG-treated cells. Except for the cells simultaneously laden with AÎ²(42) and EGCG, there was a significant increase in cell numbers in response to laser irradiation. EGCG alone had no effect on cell proliferation. Laser irradiation significantly increased ATP levels in AÎ²(42)-free cells, when compared to nonirradiated cells. Laser-induced clearance of AÎ²(42) aggregates occurred at the expense of cellular ATP. CONCLUSIONS: Irradiation with moderate levels of 670-nm light and EGCG supplementation complementarily reduces AÎ² aggregates in SH-EP cells. Transcranial penetration of moderate levels of red to near-infrared (NIR) light has already been amply exploited in the treatment of patients with acute stroke; the blood-brain barrier (BBB) penetration of EGCG has been demonstrated in animals. We hope that our approach will inspire a practical therapy for AD. Amyloid;Antineoplastic Agents;Adenosine Triphosphate;Catechin;epigallocatechin gallate Adenosine Triphosphate;Alzheimer Disease;Amyloid;Antineoplastic Agents;Brain Neoplasms;Catechin;Humans;Low-Level Light Therapy;Microscopy, Fluorescence;Neuroblastoma;Tumor Cells, Cultured;Ultrasonography

Comparison of therapeutic effects between pulsed and continuous wave 810-nm wavelength laser irradiation for traumatic brain injury in mice. BACKGROUND AND OBJECTIVE: Transcranial low-level laser therapy (LLLT) using near-infrared light can efficiently penetrate through the scalp and skull and could allow non-invasive treatment for traumatic brain injury (TBI). In the present study, we compared the therapeutic effect using 810-nm wavelength laser light in continuous and pulsed wave modes in a mouse model of TBI. STUDY DESIGN/MATERIALS AND METHODS: TBI was induced by a controlled cortical-impact device and 4-hours post-TBI 1-group received a sham treatment and 3-groups received a single exposure to transcranial LLLT, either continuous wave or pulsed at 10-Hz or 100-Hz with a 50% duty cycle. An 810-nm Ga-Al-As diode laser delivered a spot with diameter of 1-cm onto the injured head with a power density of 50-mW/cm(2) for 12-minutes giving a fluence of 36-J/cm(2). Neurological severity score (NSS) and body weight were measured up to 4 weeks. Mice were sacrificed at 2, 15 and 28 days post-TBI and the lesion size was histologically analyzed. The quantity of ATP production in the brain tissue was determined immediately after laser irradiation. We examined the role of LLLT on the psychological state of the mice at 1 day and 4 weeks after TBI using tail suspension test and forced swim test. RESULTS: The 810-nm laser pulsed at 10-Hz was the most effective judged by improvement in NSS and body weight although the other laser regimens were also effective. The brain lesion volume of mice treated with 10-Hz pulsed-laser irradiation was significantly lower than control group at 15-days and 4-weeks post-TBI. Moreover, we found an antidepressant effect of LLLT at 4-weeks as shown by forced swim and tail suspension tests. CONCLUSION: The therapeutic effect of LLLT for TBI with an 810-nm laser was more effective at 10-Hz pulse frequency than at CW and 100-Hz. This finding may provide a new insight into biological mechanisms of LLLT. Adenosine Triphosphate Adenosine Triphosphate;Animals;Brain;Brain Injuries;Depression;Laser Therapy;Male;Mice;Mice, Inbred BALB C;Treatment Outcome

Effect of laser phototherapy on wound healing following cerebral ischemia by cryogenic injury. Laser phototherapy emerges as an alternative or auxiliary therapy for acute ischemic stroke, traumatic brain injury, degenerative brain disease, spinal cord injury, and peripheral nerve regeneration, but its effects are still controversial. We have previously found that laser phototherapy immunomodulates the response to focal brain damage. Following direct cortical cryogenic injury the effects of laser phototherapy on inflammation and repair was assessed after cryogenic injury (CI) to the central nervous system (CNS) of rats. The laser phototherapy was carried out with a 780 nm AlGaAs diode laser. The irradiation parameters were: power of 40 mW, beam area of 0.04 cm(2), energy density of 3 J/cm(2) (3s) in two points (0.12 J per point). Two irradiations were performed at 3 h-intervals, in contact mode. Rats (20 non-irradiated - controls and 20 irradiated) were used. The wound healing in the CNS was followed in 6 h, 1, 7 and 14 days after the last irradiation. The size of the lesions, the neuron cell viability percentages and the amount of positive GFAP labeling were statistically compared by ANOVA complemented by Tukey's test ($p<0.05$). The distribution of lymphocytes, leukocytes and macrophages were also analyzed. CI created focal lesions in the cortex represented by necrosis, edema, hemorrhage and inflammatory infiltrate. The most striking findings were: lased lesions showed smaller tissue loss than control lesions in 6 h. During the first 24 h the amount of viable neurons was significantly higher in the lased group. There was a remarkable increase in the amount of GFAP in the control group by 14 days. Moreover, the lesions of irradiated animals had fewer leukocytes and lymphocytes in the first 24 h than controls. Considering the experimental conditions of this study it was concluded that laser phototherapy exerts its effect in wound healing following CI by controlling the brain damage, preventing neuron death and severe astrogliosis that could indicate the possibility of a better clinical outcome. Animals;Brain Ischemia;Cell Survival;Cold Temperature;Leukocytes;Low-Level Light Therapy;Male;Neuroglia;Neurons;Rats;Rats, Wistar;Wound Healing

Low-level laser irradiation, cyclooxygenase-2 (COX-2) expression and necrosis of random skin flaps in rats. Skin flaps are still a matter of concern among surgeons, as failures can occur leading to flap necrosis. However, low-level laser irradiation has been reported as an effective tool to improve the viability of ischemic flaps, yet its mechanisms of action remain unclear. We investigated the effect of low-level laser irradiation on the viability of random skin flaps in rats and determined COX-2 expression in the flap pedicle. The study animals comprised 24 EPM-1 Wistar rats which were randomly allocated into three equal groups. A cranially based dorsal random skin flap measuring 10â€‰Ã—â€‰4Â cm was created in all the animals. In one group, laser irradiation was simulated (sham group), and in the other two groups the animals were irradiated at 12 points with 0.29Â J at 20Â mW (energy density 10.36Â J/cm(2), irradiance 0.71Â W/cm(2)), or with 7.3Â J at 100Â mW (energy density 260.7Â J/cm(2), irradiance 3.57Â W/cm(2)). These procedures were applied to the cranial half of the flap immediately after surgery and were repeated on days 2 and 5 after surgery. The percentage necrotic area was determined on day 7 after surgery by the paper template method. The immunohistochemical expression of COX-2 in the samples was given scores from 0 to 3. The necrotic area was smaller in group irradiated at 7.3Â J compared to sham-treated group and to the group irradiated at 0.29Â J (Pâ€‰<â€‰0.05); there was no difference between the sham-treated group and group irradiated at 0.29Â J. COX-2 expression was lower in the group irradiated at 7.3Â J than in the sham-treated group and the group irradiated at 0.29Â J (Pâ€‰<â€‰0.001). Low-level laser therapy was effective in decreasing random skin flap necrosis in rats using a laser energy of 7.30Â J per point. Laser irradiation also decreased the expression of COX-2 in the flap pedicle. Cyclooxygenase 2;Ptgs2 protein, rat Animals;Cyclooxygenase 2;Immunohistochemistry;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Necrosis;Rats;Rats, Wistar;Skin;Surgical Flaps

Effects of LED phototherapy on bone defects grafted with MTA, bone morphogenetic proteins and guided bone regeneration: a Raman spectroscopic study. We studied peaks of calcium hydroxyapatite (CHA) and protein and lipid CH groups in defects grafted with mineral trioxide aggregate (MTA) treated or not with LED irradiation, bone morphogenetic proteins and guided bone regeneration. A total of 90 rats were divided into ten groups each of which was subdivided into three subgroups (evaluated at 15, 21 and 30Â days after surgery). Defects were irradiated with LED light (wavelength 850â€‰Â±â€‰10Â nm) at 48-h intervals for 15Â days. Raman readings were taken at the surface of the defects. There were no statistically significant differences in the CHA peaks among the nonirradiated defects at any of the experimental time-points. On the other hand, there were significant differences between the defects filled with blood clot and the irradiated defects at all time-points (pâ€‰<â€‰0.001, pâ€‰=â€‰0.02, pâ€‰<â€‰0.001). There were significant differences between the mean peak CHA in nonirradiated defects at all the experimental time-points (pâ€‰<â€‰0.01). The mean peak of the defects filled with blood clot was significantly different from that of the defects filled with MTA (pâ€‰<â€‰0.001). There were significant differences between the defects filled with blood clot and the irradiated defects (pâ€‰<â€‰0.001). The results of this study using Raman spectral analysis indicate that infrared LED light irradiation improves the deposition of CHA in healing bone grafted or not with MTA. Aluminum Compounds;Bone Morphogenetic Proteins;Bone Substitutes;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate;Durapatite Aluminum Compounds;Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Substitutes;Calcium Compounds;Drug Combinations;Durapatite;Guided Tissue Regeneration;Low-Level Light Therapy;Male;Oxides;Rats;Rats, Wistar;Silicates;Spectrum Analysis, Raman

The effect of noncoherent red light irradiation on proliferation and osteogenic differentiation of bone marrow mesenchymal stem cells. Mesenchymal stem cells (MSCs) are promising for use in regenerative medicine. Low-level light irradiation (LLLI) has been shown to modulate various processes in different biological systems. The aim of our study was to investigate the effect of red light emitted from a light-emitting diode (LED) on bone marrow MSCs with or without osteogenic supplements. MSCs both with and without osteogenic supplements were divided into four groups, and each group was irradiated at doses of 0, 1, 2 and 4Â J/cm(2). Cellular proliferation was evaluated using WST-8 and 5-ethynyl-2'-deoxyuridine (EdU) fluorescence staining. The alkaline phosphatase activity, mineralization, and expression of osteoblast master genes (Col1Î±1, Alpl, Bglap and Runx2) were monitored as indicators of MSC differentiation towards osteoblasts. In groups without osteogenic supplements, red light at all doses significantly stimulated cellular proliferation, whereas the osteogenic phenotype of the MSCs was not enhanced. In groups with osteogenic supplements, red light increased alkaline phosphatase activity and mineralized nodule formation, and stimulated the expression of Bglap and Runx2, but decreased cellular proliferation. In conclusion, nonconherent red light can promote proliferation but cannot induce osteogenic differentiation of MSCs in normal media, while it enhances osteogenic differentiation and decreases proliferation of MSCs in media with osteogenic supplements. DNA Primers;RNA, Messenger;Alkaline Phosphatase Alkaline Phosphatase;Animals;Base Sequence;Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Cells, Cultured;DNA Primers;Gene Expression;Light;Mesenchymal Stem Cells;Osteogenesis;RNA, Messenger;Rats

Low-level laser therapy improves repair following complete resection of the sciatic nerve in rats. The aim of this study is to analyze the effects of low-level laser therapy (LLLT) on the regeneration of the sciatic nerve in rats following a complete nerve resection. Male Wistar rats were divided into a control injury group, injury groups irradiated with a 660-nm laser at 10 or 50Â J/cm(2), and injury groups irradiated with an 808-nm laser at 10 or 50Â J/cm(2). Treatment began 24Â h following nerve

resection and continued for 15Â days. Using the sciatic functional index (SFI), we show that the injured animals treated with 660Â nm at 10 and 50Â J/cm(2) had better SFI values compared with the control injury and the 808-nm groups. Animals irradiated with the 808-nm laser at 50Â J/cm(2) show higher values for fiber density than do control animals. In addition, axon and fiber diameters were larger in animals irradiated with 660Â nm at 50Â J/cm(2) compared to the control group. These findings indicate that 660-nm LLLT is able to provide functional gait recovery and leads to increases in fiber diameter following sciatic nerve resection. Animals;Lameness, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nerve Regeneration;Rats;Rats, Wistar;Sciatic Nerve

Use of a fractional ablative 10.6-Î¼m carbon dioxide laser in the treatment of a morphea-related contracture. Dermatologic Agents;Methotrexate Adult;Contracture;Dermatologic Agents;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Methotrexate;Scleroderma, Localized

Low-level diode laser therapy reduces lipopolysaccharide (LPS)-induced bone cell inflammation. In this study, the aim is to investigate the cytologic effects of inflammatory bone cells after in vitro low-level laser therapy (LLLT). A human osteosarcoma cell line (MG63) was cultured, infected with lipopolysaccharide (LPS) and exposed to low-level laser treatment at 5 or 10Â J/cm(2) using a 920Â nm diode laser. MG63 cell attachment was observed under a microscope, and cell viability was quantified by mitochondrial colorimetric assay (MTT). LPS-treated MG63 cells were irradiated with LLLT, and the inflammatory markers iNOS, TNF-Î± and IL-1, were analyzed by reverse transcription polymerase chain reaction (RT-PCR) and Western blot. The data were collected and analyzed by one-way analysis of variance (ANOVA); pâ€‰<â€‰0.05 indicated a statistically significant difference. Low-level laser treatment on MG63 cells increased their ability to attach and survive. After irradiation, the expression levels of iNOS, TNF-Î± and IL-1 in LPS-infected MG63 cells decreased over time (pâ€‰<â€‰0.05). CONCLUSIONS: low-level diode laser treatment increased the MG63 cell proliferative ability and decreased the expression of inflammatory mediators in MG63 cells. Interleukin-1;Lipopolysaccharides;RNA, Messenger;Tumor Necrosis Factor-alpha;NOS2 protein, human;Nitric Oxide Synthase Type II Bone and Bones;Cell Adhesion;Cell Line, Tumor;Cell Survival;Gene Expression;Humans;Inflammation;Interleukin-1;Lasers, Semiconductor;Lipopolysaccharides;Low-Level Light Therapy;Nitric Oxide Synthase Type II;RNA, Messenger;Tumor Necrosis Factor-alpha

High- vs low-power holmium laser lithotripsy: a prospective, randomized study in patients undergoing multitract minipercutaneous nephrolithotomy. OBJECTIVE: To determine the efficacy and safety of high-power holmium: yttrium aluminum-garnet (Ho:YAG) laser lithotripsy for multitract modified minimally invasive percutaneous nephrolithotomy (MPCNL) in the treatment of patients with large staghorn renal calculi. METHODS: A randomized, prospective study was conducted. Two-hundred seventy-three consecutive patients (291 renal units) with large staghorn renal calculi were randomized to undergo multitract MPCNL with 30-W low-power or 70-W high-power Ho:YAG laser lithotripsy. Both groups were compared in terms of perioperative findings and postoperative outcomes, including procedure time, stone-free rate, length of hospital stay, transfusion rates, renal function recovery, and other complications. RESULTS: The average patient age was 49.2 years (range 22-73) and mean stone size was 5.54Â±0.7 cm. The 2 groups had some comparable perioperative findings and outcome, including tracts required per operated renal unit (n), blood loss, postoperative fever, postoperative hospital stay, stone-free rate, and improvement of operated renal function. The operation time in the high-power group was significantly shorter than that in the low-power group (129.20Â±17.2 vs 105.18Â±14.2, P<.01). CONCLUSION: A combination of multitract MPCNL and high-power Ho:YAG laser lithotripsy can greatly decrease the operative time without increasing the intraoperative complications or delaying postoperative renal function recovery when compared with low-power Ho:YAG laser lithotripsy. Adult;Aged;Combined Modality

Therapy;Female;Fever;Humans;Lasers, Solid-State;Lithotripsy, Laser;Low-Level Light Therapy;Male;Middle Aged;Nephrolithiasis;Nephrostomy, Percutaneous;Postoperative Complications;Prospective Studies;Treatment Outcome;Young Adult

Complications in comparing lasers and LED. Comment on Esper MA, Nicolau RA, Arisawa EA (2011) The effect of two phototherapy protocols on pain control in orthodontic procedure--a preliminary clinical study. Lasers Med Sci 26:657-663. Female;Humans;Low-Level Light Therapy;Male;Orthodontics, Corrective;Pain

Low-level light therapy of the eye and brain. Low-level light therapy (LLLT) using red to near-infrared light energy has gained attention in recent years as a new scientific approach with therapeutic applications in ophthalmology, neurology, and psychiatry. The ongoing therapeutic revolution spearheaded by LLLT is largely propelled by progress in the basic science fields of photobiology and bioenergetics. This paper describes the mechanisms of action of LLLT at the molecular, cellular, and nervous tissue levels. Photoneuromodulation of cytochrome oxidase activity is the most important primary mechanism of action of LLLT. Cytochrome oxidase is the primary photoacceptor of light in the red to near-infrared region of the electromagnetic spectrum. It is also a key mitochondrial enzyme for cellular bioenergetics, especially for nerve cells in the retina and the brain. Evidence shows that LLLT can secondarily enhance neural metabolism by regulating mitochondrial function, intraneuronal signaling systems, and redox states. Current knowledge about LLLT dosimetry relevant for its hormetic effects on nervous tissue, including noninvasive in vivo retinal and transcranial effects, is also presented. Recent research is reviewed that supports LLLT potential benefits in retinal disease, stroke, neurotrauma, neurodegeneration, and memory and mood disorders. Since mitochondrial dysfunction plays a key role in neurodegeneration, LLLT has potential significant applications against retinal and brain damage by counteracting the consequences of mitochondrial failure. Upon transcranial delivery in vivo, LLLT induces brain metabolic and antioxidant beneficial effects, as measured by increases in cytochrome oxidase and superoxide dismutase activities. Increases in cerebral blood flow and cognitive functions induced by LLLT have also been observed in humans. Importantly, LLLT given at energy densities that exert beneficial effects does not induce adverse effects. This highlights the value of LLLT as a novel paradigm to treat visual, neurological, and psychological conditions, and supports that neuronal energy metabolism could constitute a major target for neurotherapeutics of the eye and brain.

Treatment of melasma with low fluence, large spot size, 1064-nm Q-switched neodymium-doped yttrium aluminum garnet (Nd:YAG) laser for the treatment of melasma in Fitzpatrick skin types II-IV. Melasma is a common condition affecting over six million American women. Treatment of dermal or combined melasma is difficult and does not respond well to conventional topical therapies. Various light sources have been used recently in the treatment of melasma including fractionated ablative and non-ablative lasers as well as intense pulse light. We report the use of low fluence, large spot size Q-switched, Nd:Yag laser for the treatment of melasma in skin types II-IV. Adult;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Severity of Illness Index;Skin Pigmentation;Treatment Outcome

[Low power laser efficacy in the therapy of inflamed gingive in diabetics with parodontopathy]. BACKGROUND/AIM: There is clear evidence on direct relationship between periodontal disease and diabetes mellitus. Many investigations point out greater prevalence and severity of periodontal disease among diabetic patients. During last decade, low level laser therapy has been used in periodontal therapy. It has biostimulative effect, accelerates wound healing, minimizes pain and swelling, and there is almost no contraindication for its usage. The aim of the paper was to investigate the efficiency of low level laser therapy as adjuvant tool in reduction of gingival inflammation in diabetic patients. METHODS: The study incuded 150 participants divided into three

groups: group I (50 participants with diabetes mellitus type 1 and periodontal disease), group II (50 participants with diabetes mellitus type 2 and periodontal disease), group III (nondiabetic participants with periodontal disease). Gingival health evaluation was done using gingival index LÃ¶e-Silness. Soft and hard deposits were removed, periodontal pockets cleaned and GaA1As low level laser therapy (5 mW) applied five consecutive days. In each patient, low level laser therapy was not applied on the left side of the jaw in order to compare the effects of the applied therapy. After the first, third and fifth therapy and one month after the last visit gingival index was evaluated. Before the first and after the fifth therapy exfoliative cytology of gingiva was done and nuclei areal was analyzed morphometrically. RESULTS: After all investigated periods, gingival index and nuclei areal were significantly decreased comparing to values before the therapy, at both jaw sides ($p < 0.001$). After the 1st, 3rd and 5th therapy, the t-test showed a significantly decreased gingival index at the lased side of jaw comparing to non-lased side. CONCLUSION: Low level laser therapy is efficient in gingival inflammation elimination and can be proposed as an adjuvant tool in basic periodontal therapy of diabetic patients. Adult;Aged;Aged, 80 and over;Diabetes Complications;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Periodontal Diseases;Periodontal Index;Young Adult

[The influence of pulsed infrared laser radiation on the hormone production in the thymus (an experimental study)]. Local irradiation with pulsed (1500 Hz) low-energy infrared laser light of the thymus and thyroid gland region caused well-apparent stimulation of alpha-1-thymosin production in the healthy animals and normalized its level in the stressed ones. Similar stimulation of alpha-1-timosine biosynthesis was observed in an experiment with direct laser irradiation of the cultured HTSC epitheliocytes from the human thymus. Thymosin;Thymalfasin Animals;Cells, Cultured;Humans;Lasers;Low-Level Light Therapy;Male;Rats;Stress, Physiological;Thymalfasin;Thymosin;Thymus Gland

[Method of local treatment of trophic ulcers of venous etiology]. The study is based on the results of local treatment of trophic ulcers of 150 patients with chronic venous insufficiency of the lower extremities. Local treatment is laser treatment and diagnostic unit with a wavelength Î»=0,65 mkm and output power of 30 mW in pulsed mode for 10 minutes 1 times per day for 7-10 days. As an objective criterion for determining the speed and intensity of the healing of trophic ulcers and non-contact fixing their area of applied computer thermography. True healing of ulcers was achieved in all patients during the period from 14 to 28 days. Anti-Infective Agents, Local Anti-Infective Agents, Local;Bacteriological Techniques;Chronic Disease;Combined Modality Therapy;Compressed Air;Female;Humans;Image Processing, Computer-Assisted;Low-Level Light Therapy;Lower Extremity;Male;Middle Aged;Monitoring, Physiologic;Regional Blood Flow;Thermography;Treatment Outcome;Varicose Ulcer;Veins;Venous Insufficiency;Wound Healing

[The use of laser beam irradiation by the acute destructive pancreatitis]. The use of intravenous laser blood irradiation and transcutaneous laserotherpy together with mini-invasive and endoscopic surgical procedures permit to avoid infection of pancreatic lesions in 67.7%. Lethality rate by sterile pancreonecrosis decreased from 24.4 to 5.1%. The complex use of laser, antioxidant and antibacterial therapy decreased the lethality rate by the infected pancreonecrosis from 42.8 to 23.1%. APACHE;Adolescent;Adult;Aged;Aged, 80 and over;Combined Modality Therapy;Endoscopy;Female;Humans;Infections;Laparoscopy;Length of Stay;Low-Level Light Therapy;Male;Middle Aged;Pancreas;Pancreatitis, Acute Necrotizing;Postoperative Complications;Treatment Outcome

[The use of ozone and low-intensive laser irradiation in complex treatment of complicated duodenal ulcer]. The study is based on the examination of 12 patients with perforative duodenal ulcer and 24 patients operated on recurrent bleeding duodenal ulcer. Some component of the immune system,

such as T- and B-lymphocytes rates, immunoglobulin rate and macrophagal activity, were decreased prior the beginning of the complex treatment. Normalisation of humoral and cell immunity was registered on 10-12 days after the beginning of the ozone and low-intensive laser irradiation. Oxidants, Photochemical;Ozone Combined Modality Therapy;Drug Monitoring;Duodenal Ulcer;Gastrointestinal Tract;Humans;Immune System;Immunity;Infusions, Parenteral;Low-Level Light Therapy;Oxidants, Photochemical;Ozone;Peptic Ulcer Hemorrhage;Peptic Ulcer Perforation;Recurrence;Regional Blood Flow;Treatment Outcome

A randomised clinical trial of the effect of low-level laser therapy for perineal pain and healing after episiotomy: a pilot study. OBJECTIVE: to evaluate the effects of low-level laser therapy for perineal pain and healing after episiotomy. DESIGN: a double-blind, randomised, controlled clinical trial comparing perineal pain scores and episiotomy healing in women treated with low-level laser therapy (LLLT) and with the simulation of the treatment. SETTING: the study was conducted in the Birth Centre and rooming-in units of Amparo Maternal, a maternity service located in the city of SÃ£o Paulo, Brazil. PARTICIPANTS: fifty-two postpartum women who had had mediolateral episiotomies during their first normal delivery were randomly divided into two groups of 26: an experimental group and a control group. INTERVENTION: in the experimental group, the women were treated with LLLT. Irradiation was applied at three points directly on the episiotomy after the suture and in three postpartum sessions: up to 2 hrs postpartum, between 20 and 24 hrs postpartum and between 40 and 48 hrs postpartum. The LLLT was performed with diode laser, with a wavelength of 660 nm (red light), spot size of 0.04 cm(2), energy density of 3.8 J/cm(2), radiant power of 15 mW and 10s per point, which resulted in an energy of 0.15 J per point and a total energy of 0.45 J per session. The control group participants also underwent three treatment sessions, but without the emission of radiation (simulation group), to assess the possible effects of placebo treatment. MAIN OUTCOMES: perineal pain scores, rated on a scale from 0 to 10, were evaluated before and immediately after the irradiation in the three sessions. The healing process was assessed using the REEDA scale (Redness, Edema, Echymosis, Discharge Aproximation) before each laser therapy session and 15 and 20 days after the women's discharge. FINDINGS: comparing the pain scores before and after the LLLT sessions, the experimental group presented a significant within-group reduction in mean pain scores after the second and third sessions ($p=0.003$ and $p<0.001$, respectively), and the control group showed a significant reduction after the first treatment simulation ($p=0.043$). However, the comparison of the perineal pain scores between the experimental and control groups indicated no statistical difference at any of the evaluated time points. There was no significant difference in perineal healing scores between the groups. All postpartum women approved of the low-level laser therapy. CONCLUSIONS: this pilot study showed that LLLT did not accelerate episiotomy healing. Although there was a reduction in perineal pain mean scores in the experimental group, we cannot conclude that the laser relieved perineal pain. This study led to the suggestion of a new research proposal involving another irradiation protocol to evaluate LLLT's effect on perineal pain relief. Adult;Brazil;Episiotomy;Female;Humans;Low-Level Light Therapy;Pain Measurement;Pain, Postoperative;Perineum;Pilot Projects;Puerperal Disorders;Treatment Outcome;Wound Healing;Young Adult

The local treatment and available dressings designed for chronic wounds. The great diversity of wounds and the broad range of available dressings complicate the selection of proper chronic wound treatment. Choosing the right treatment is the essential step in the healing process. In this review, we focus on chronic nonhealing ulcers, which are a critical problem in clinical practice, and current knowledge about persistent wound care. Here, we present the objectives of local treatment with description of several types of dressings and their ingredients, features, indications, and contraindications. These include hydrocolloid, alginate, hydrogel, and dextranomer dressings;

polyurethane foam and membrane dressings; semipermeable polyurethane membrane dressings; and TenderWet (Hartmann, Rock Hill, SC) and flax dressings. There is also a brief section on the use of other alternative wound-healing accelerators, such as platelet-rich plasma and light-emitting diode therapy. Alginates;Colloids;Hexuronic Acids;Polyurethanes;Hydrogel, Polyethylene Glycol Dimethacrylate;Glucuronic Acid;polyurethane foam Administration, Topical;Alginates;Bandages;Chronic Disease;Colloids;Glucuronic Acid;Hexuronic Acids;Humans;Hydrogel, Polyethylene Glycol Dimethacrylate;Polyurethanes;Skin Ulcer

In vivo vitiligo induction and therapy model: double-blind, randomized clinical trial. In this study, we developed an in vivo vitiligo induction model to explore the underlying mechanisms leading to Koebner's phenomenon and to evaluate the efficacy of therapeutic strategies. The model consisted of 12 pigmented test regions on the back of generalized vitiligo patients that were exposed to three Koebner induction methods: cryotherapy, 755 nm laser therapy, and epidermal abrasion. In addition, four cream treatments (pimecrolimus, tacrolimus, steroid and placebo) were randomly applied. Koebnerization was efficiently induced by all three induction methods. In general, cryotherapy was the best method of Koebner induction, followed by 755 nm laser therapy and epidermal abrasion. Reproducible results were obtained, which showed enhanced depigmented surface areas and higher amounts of T lymphocytes in placebo-treated test zones compared to active treated areas. Tacrolimus and local steroids were better inhibitors of Koebner's process ($P < 0.05$) compared to pimecrolimus. Our in vivo vitiligo induction model is very informative to investigate vitiligo induction and to determine the efficacy of topical treatments in vitiligo. This proof of concept confirms the efficient comparison of head-to-head therapeutic strategies intra-individually in a standardized, specific and better timed way. Immunosuppressive Agents;MART-1 Antigen;Ointments;Pregnadienediols;gp100 Melanoma Antigen;Mometasone Furoate;pimecrolimus;Triamcinolone Acetonide;Tacrolimus Administration, Cutaneous;Adult;Cryotherapy;Dermabrasion;Double-Blind Method;Female;Humans;Immunosuppressive Agents;Langerhans Cells;Low-Level Light Therapy;MART-1 Antigen;Male;Middle Aged;Mometasone Furoate;Ointments;Pregnadienediols;Reproducibility of Results;T-Lymphocyte Subsets;Tacrolimus;Triamcinolone Acetonide;Vitiligo;gp100 Melanoma Antigen

Melasma: treatment strategy. Melasma, a hypermelanosis of the face, is a common skin problem of middle-aged women of all racial groups, especially with dark complexion. Its precise etio-pathogenesis is evasive, genetic influences, exposure to sunlight, pregnancy, oral contraceptives, estrogen-progesterone therapies, thyroid dysfunction, cosmetics, and drugs have been proposed. Centro-facial, malar, and mandibular are well-recognized. Epidermal pigmentation appears brown/black, while dermal is blue in color, and can be distinguished by Wood's lamp illumination. The difference may be inapparent with mixed type of melasma in skin types V and VI. An increase in melanin in epidermis: basal and suprabasal layers and/or dermis is the prime defect. There is an increased expression of tyrosinase related protein-1 involved in eumelanin synthesis. The use of broad-spectrum sunscreen is important, lightening agents like retinoic acid (tretinoin), azelaic acid, and combination therapies containing hydroquinone, tretinoin, and corticosteroids, have been used in the treatment of melasma, and are thought to have increased efficacy as compared with monotherapy. Quasi-drugs, placental extracts, ellagic acid, chamomilla extract, butylresorcinol, tranexamic acid, methoxy potassium salicylate, adenosine monophosphate disodium salt, dipropyl-biphenyl-2,2'-diol, (4-hydroxyphenyl)-2-butanol, and tranexamic acid cetyl ester hydrochloride, in addition to kojic and ascorbic acid have been used. Chemical peeling is a good adjunct. Laser treatment is worthwhile. Dermatologic Agents;Sunscreening Agents

Chemexfoliation;Dermatologic Agents;Drug Therapy, Combination;Face;Female;Humans;Low-Level Light Therapy;Melanosis;Severity of Illness Index;Sunscreening Agents

Evaluation of 532-nm KTP laser treatment efficacy on acne vulgaris with once and twice weekly applications. BACKGROUND: Light-based therapies and lasers have been proposed for the treatment of acne vulgaris but the efficacy and application periods of 532-nm KTP laser treatment are not clear. OBJECTIVE: To evaluate the efficacy and safety of 532-nm KTP laser and compare the effects of once and twice weekly applications in the treatment of mild to moderate acne vulgaris. METHODS: Totally 38 patients were treated once weekly and twice weekly in group I and in group II respectively. One half of the face of each patient was treated with 532-nm KTP and the other half was remained as untreated. Patients were evaluated at the beginning, one and four weeks after the last treatment session with MichaÃ«lsson acne severity grading score (MASS). RESULTS: Statistically significant improvement was found at second control ($p = 0.005$) in group I, and at the first ($p = 0.004$), and second ($p < 0.001$) controls in group II for treated sides. For both groups, changes of MASS were insignificant for untreated sites. Improvement of MASS of treated sides was not statistically significant between two treatment groups for both controls. CONCLUSION: 532-nm KTP laser treatment may be an alternative method in selected acne vulgaris patients. No significant difference was noted between once and twice weekly applications. Acne Vulgaris;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Severity of Illness Index;Treatment Outcome;Young Adult

[Port-wine stains of the limbs]. Combined Modality Therapy;Diagnosis, Differential;Embolization, Therapeutic;Extremities;Hemangioma, Capillary;Humans;Infant, Newborn;Klippel-Trenaunay-Weber Syndrome;Lasers, Dye;Leg Length Inequality;Livedo Reticularis;Low-Level Light Therapy;Lymphedema;Port-Wine Stain;Skin Diseases, Vascular;Skin Neoplasms;Sturge-Weber Syndrome;Telangiectasis

Treatment of Davener's dermatosis using a 1064-nm Q-switched Nd:YAG laser with low fluence. Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Young Adult

Photomedicine and LLLT literature watch. Animals;Humans;Low-Level Light Therapy;Photobiology

The role of vascular endothelial growth factor in fractional laser resurfacing with the carbon dioxide laser. The aim of this study was to analyze the role of vascular endothelial growth factor (VEGF) in mechanisms of cutaneous remodeling induced by fractional CO(2) laser treatment. The dorsal skin of Kunming mice was exposed to a single-pass fractional CO(2) laser treatment. Biopsies were taken 1Â h, and 1, 3, 7, 14, 28 and 56Â days after treatment. Skin samples VEGF expression was evaluated by immunohistochemistry and ELISA, fibroblasts by hematoxylin-eosin staining, and types I and III collagen by ELISA. Staining for VEGF was found in many types of cell including fibroblasts. The amount of VEGF in the skin of laser-treated areas had increased significantly compared to that in the control areas on days 1Â and 3Â (Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.01, respectively), then decreased by day 7 after treatment and returned to the baseline level. The number of fibroblasts in the skin of the laser-treated areas had increased significantly compared to that in control areas on days 3, 7, 14, 28 and 56 after irradiation (Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.01, Pâ€‰<â€‰0.01, Pâ€‰<â€‰0.01, Pâ€‰<â€‰0.01, respectively). The amount of type I collagen was significantly higher in the skin of the laser-treated areas compared to that in control areas from day 28 to day 56 (Pâ€‰<â€‰0.05, respectively), and type III collagen was significantly higher from day 3 to day 56 (Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.05, Pâ€‰<â€‰0.01, respectively). There was a positive correlation between the level of VEGF and fibroblast proliferation early stage after laser treatment (râ€‰=â€‰0.853, Pâ€‰<â€‰0.01), but there was no correlation after the first week (râ€‰=â€‰-0.124, Pâ€‰>â€‰0.05). The amounts of type I and III collagen showed no significant

correlations with the expression of VEGF in the late stages after laser treatment (râ€‰=â€‰0.417, Pâ€‰>â€‰0.05 and râ€‰=â€‰0.340, Pâ€‰>â€‰0.05, respectively). The results suggest that VEGF might be mainly involved in the early stages of wound healing, including the stages of acute inflammation, fibroblast proliferation and vessel formation induced by fractional CO(2) laser resurfacing. Collagen Type I;Collagen Type III;Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, mouse Animals;Cell Proliferation;Collagen Type I;Collagen Type III;Female;Fibroblasts;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Mice;Skin;Skin Aging;Vascular Endothelial Growth Factor A;Wound Healing

Bisphosphonates-related osteonecrosis of the jaws: a concise review of the literature and a report of a single-centre experience with 151 patients. The osteonecrosis of the jaws (ONJ) is an adverse side effect of long-term bisphosphonate therapy (BPT) firstly described in 2003. The aetiology of BRONJ remains unknown, and the pathogenesis seems multifactorial and related to several local or general factors. Many expert panel developed preventive protocols to facilitate specialists involved in the multidisciplinary management of BRONJ patients. In this paper, we present a concise review of the literature, and we report the experience of the University of Parma with 151 patients that assumed BPT for both oncological (121 patients) and non-oncological (30 patients) diseases. One hundred and thirty-nine BRONJ sites were treated with different approaches (surgical and non-surgical, laser-assisted and non-laser-assisted): in terms of clinical improvement, a statistically significant difference was found between the group treated with the only medical therapy; in terms of complete healing, the introduction in the treatment protocols of both laser-assisted approach and surgical approach improves the therapeutical results. Anti-Bacterial Agents;Anti-Infective Agents, Local;Bone Density Conservation Agents;Diphosphonates Aged;Anti-Bacterial Agents;Anti-Infective Agents, Local;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Bone Neoplasms;Curettage;Debridement;Diphosphonates;Female;Humans;Laser Therapy;Low-Level Light Therapy;Male;Multiple Myeloma;Oral Surgical Procedures;Osteoporosis;Tooth Extraction;Wound Healing

Dose response effects of 810 nm laser light on mouse primary cortical neurons. BACKGROUND AND OBJECTIVES: In the past four decades numerous studies have reported the efficacy of low level light (laser) therapy (LLLT) as a treatment for diverse diseases and injuries. Recent studies have shown that LLLT can biomodulate processes in the central nervous system and has been extensively studied as a stroke treatment. However there is still a lack of knowledge on the effects of LLLT at the cellular level in neurons. The present study aimed to study the effect of 810â€‰nm laser on several cellular processes in primary cortical neurons cultured from embryonic mouse brains. STUDY DESIGN/MATERIALS AND METHODS: Neurons were irradiated with fluences of 0.03, 0.3, 3, 10, or 30â€‰J/cm(2) of 810-nm laser delivered over varying times at 25â€‰mW/cm(2) and intracellular levels of reactive oxygen species (ROS), nitric oxide and calcium were measured using fluorescent probes within 5â€‰minutes of the end of irradiation. The changes in mitochondrial function in response to light were studied in terms of adenosine triphosphate (ATP) and mitochondrial membrane potential (MMP). RESULTS: Light induced a significant increase in calcium, ATP and MMP at lower fluences and a decrease at higher fluences. ROS was significantly induced at low fluences, followed by a decrease and a second larger increase at 30â€‰J/cm(2). Nitric oxide levels showed a similar pattern of a double peak but values were less significant compared to ROS. CONCLUSIONS: The results suggest that LLLT at lower fluences is capable of inducing mediators of cell signaling processes which in turn may be responsible for the beneficial stimulatory effects of the low level laser. At higher fluences beneficial mediators are reduced and high levels of Janus-type mediators such as ROS and NO (beneficial at low concentrations and harmful at high concentrations) may be

responsible for the damaging effects of high-fluence light and the overall biphasic dose response. Animals;Cerebral Cortex;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Mice;Mice, Inbred C57BL;Neurons

Effects of low-level laser irradiation on mesenchymal stem cell proliferation: a microarray analysis. Increased proliferation after low-level laser irradiation (LLLI) has been well demonstrated in many cell types including mesenchymal stem cells (MSCs), but the exact molecular mechanisms involved remain poorly understood. The aim of this study was to investigate the change in mRNA expression in rat MSCs after LLLI and to reveal the associated molecular mechanisms. MSCs were exposed to a diode laser (635 nm) as the irradiated group. Cells undergoing the same procedure without LLLI served as the control group. Proliferation was evaluated using the MTS assay. Differences in the gene expression profiles between irradiated and control MSCs at 4 days after LLLI were analyzed using a cDNA microarray. Gene ontology and pathway analysis were used to find the key regulating genes followed by real-time PCR to validate seven representative genes from the microarray assays. This procedure identified 119 differentially expressed genes. Real-time PCR confirmed that the expression levels of v-akt murine thymoma viral oncogene homolog 1 (Akt1), the cyclin D1 gene (Ccnd1) and the phosphatidylinositol 3-kinase, catalytic alpha polypeptide gene (Pik3ca) were upregulated after LLLI, whereas those of protein tyrosine phosphatase non-receptor type 6 (Ptpn6) and serine/threonine kinase 17b (Stk17b) were downregulated. cDNA microarray analysis revealed that after LLLI the expression levels of various genes involved in cell proliferation, apoptosis and the cell cycle were affected. Five genes, including Akt1, Ptpn6, Stk17b, Ccnd1 and Pik3ca, were confirmed and the PI3K/Akt/mTOR/eIF4E pathway was identified as possibly playing an important role in mediating the effects of LLLI on the proliferation of MSCs. RNA, Messenger Animals;Cell Proliferation;Cells, Cultured;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Oligonucleotide Array Sequence Analysis;RNA, Messenger;Rats;Rats, Sprague-Dawley;Real-Time Polymerase Chain Reaction;Transcriptome

Cytomorphometric and clinical investigation of the gingiva before and after low-level laser therapy of gingivitis in children. Gingival epithelial cells are the first physical barrier against periodontal pathogenic microorganisms. Bacterial products may penetrate the epithelium and directly disturb its integrity. We investigated the clinical and cytomorphological status of the gingiva in children with gingivitis before and after low-level laser therapy. The study enrolled 130 children divided into three groups: group 1 comprised 50 children with chronic catarrhal gingivitis who received basic treatment, group 2 comprised 50 children with chronic catarrhal gingivitis who received low-level laser treatment in addition to basic treatment, and group 3 comprised 30 children with healthy gingiva as controls. Oral hygiene and the status of the gingiva were assessed using the appropriate indexes before and after treatment. Inflammation of the gingiva was monitored by cytomorphometric evaluation. Cytomorphometric analysis revealed a statistically significant difference ($p < 0.001$) in the size of the nuclei of the stratified squamous epithelial cells of the gingiva before and after treatment in chronic catarrhal gingivitis. Evaluation using clinical parameters showed that treatment of gingivitis with basic treatment was successful. Cytomorphometric analysis showed that after basic treatment the nuclei of the stratified squamous epithelial cells of the gingiva were reduced in size, although not to the size found in healthy gingiva. However, after adjuvant low-level laser therapy, the size of the nuclei of the stratified squamous epithelial cells in the gingiva matched the size of the nuclei in the cells in healthy gingiva.
Child;Cytophotometry;Epithelium;Female;Gingiva;Gingivitis;Humans;Low-Level Light Therapy;Male

Enhancement of cutaneous immune response to bacterial infection after low-level light therapy with 1072 nm infrared light: a preliminary study. We investigated the photobiomodulation effects of 1072 nm infrared light on the natural immune response involved in anti-bacterial and wound healing

processes. Thirty mice infected with MRSA on the skin were divided into two groups. The experimental group was treated with 1072 nm infrared light (irradiance: 20 mW/cm(2), fluence: 12 J/cm(2) for 10 min) at 2, 4, 8, 12, 24 h, 3 and 5 days after inoculation and the control group with sham light. Serial changes of the mRNA levels of TLR2, IL-1Î², TNF-Î±, IL-6, iNOS, MCP-1, TGF-Î², bFGF and VEGF were studied by real time RT-PCR and those of the expression level of VEGF, bFGF, TGF-Î² and NF-ÎºB by immunohistochemistry. The mRNA levels of the cytokines involved in the early phase of anti-bacterial immune response (IL-1Î², TNF-Î±, IL-6, MCP-1) increased significantly in the 1072 nm group, peaking between 12 and 24 h post-inoculation. These levels normalized after 3-5 days. Immunohistochemistry revealed a notably stronger expression of VEGF in the 1072 nm group from 8-h post-inoculation to 5-day post-inoculation. We concluded that 1072 nm infrared light had a photobiomodulation effect which resulted in an enhanced biological immune response to the bacterial infection by MRSA and also increased the expression of VEGF to a significant level. Animals;Dose-Response Relationship, Radiation;Female;Gene Expression Regulation;Infrared Rays;Methicillin-Resistant Staphylococcus aureus;Mice;Mice, Inbred BALB C;Skin;Staphylococcal Infections;Wound Healing

Healing activity of laser InGaAlP (660nm) in rats. PURPOSE: To evaluate the effect the healing activity of diode laser Indium Gallium Aluminum Phosphorus (InGaAlP) Ã«660nm on healing of surgical wounds in rats. METHODS: Fifty-four female Wistar rats were used, divided into three groups (n=18) and subdivided into three subgroups (n=6) to be studied in 5, 10 and 15(th) days after surgical procedures. The wound was induced in the dorsal-cervical using punch. The lesions were irradiated on alternate days with InGaAlP laser, the energy densities of 3J/cm(2) (L3) or 6J/cm(2) (L6). The control group received no irradiation. At 5, 10 and 15(th) days after surgery the animals were euthanized and the repair area was removed and histological sections were stained with hematoxylin-eosin and picrossÃ-rius. We evaluated macroscopic and histological lesions in the times cited, as well as morphometric analysis of angiogenesis and collagen content. RESULTS: The wound healing activity InGaAlP laser was evidenced by increased angiogenesis group L3 and L6 in relation to control group (CG) at the 5(th) day (p=0.0001) and decreased polymorphonuclear infiltrate and hemorrhage (p=0.045 and p=0.07 respectively) in the groups L3 and L6 in relation to control group (GC). On the 10 and 15(th) days was also observed in groups treated with laser L3 and L6 stimulation was pronounced fibroplasia (p=0.0003 and p=0.034 respectively) when compared with the control group (CG). CONCLUSION: The InGaAlP laser acted positively on the healing of skin wounds in rats. Animals;Dermatologic Surgical Procedures;Female;Lasers, Semiconductor;Low-Level Light Therapy;Postoperative Period;Rats;Rats, Wistar;Time Factors;Treatment Outcome;Wound Healing

Linear lichen planus pigmentosus of the forehead treated by neodymium:yttrium-aluminum-garnet laser and topical tacrolimus. Adrenergic beta-Antagonists;Angiotensin Receptor Antagonists;Hypoglycemic Agents;Immunosuppressive Agents;Sulfonylurea Compounds;Tacrolimus Adrenergic beta-Antagonists;Angiotensin Receptor Antagonists;Diabetes Mellitus;Forehead;Humans;Hypoglycemic Agents;Immunosuppressive Agents;Kidney Failure, Chronic;Lasers, Solid-State;Lichen Planus;Low-Level Light Therapy;Male;Middle Aged;Sulfonylurea Compounds;Tacrolimus;Treatment Outcome

Antiinflammatory effect of low-level laser therapy on Staphylococcus epidermidis endophthalmitis in rabbits. A rabbit model of endophthalmitis was established to evaluate the antiinflammatory effect of low-level laser therapy (LLLT) as an adjunct to treatment for Staphylococcus epidermidis endophthalmitis. Rabbits were randomly divided into three groups to receive intravitreal injections into their left eye: group A received 0.5Â mg vancomycin (100Â Î¼l), group B received 0.5Â mg vancomycin + 0.2Â mg dexamethasone (100Â Î¼l), and group C received 0.5Â mg vancomycin (100Â Î¼l) and continuous wave semiconductor laser irradiation (10Â mW, Î»â€‰=â€‰632Â nm)

focused on the pupil. Slit lamp examination and B-mode ultrasonography were conducted to evaluate the symptoms of endophthalmitis. Polymorphonuclear cells and tumour necrosis factor alpha (TNF-Î±) in aqueous fluid were measured at 0Â h, and 1, 2, 3, 7 and 15Â days. A histology test was conducted at 15Â days. B-mode ultrasonography and histology revealed that groups B and C had less inflammation than group A at 15Â days. Groups B and C had fewer polymorphonuclear cells and lower levels of TNF-Î± in aqueous fluid than group A at 2, 3 and 7Â days ($P < 0.05$). There was no significant difference between groups B and C ($P > 0.05$). There was no significant difference between groups A, B and C at 15Â days ($P > 0.05$). As an adjunct to vancomycin therapy to treat S. epidermidis endophthalmitis, LLLT has an antiinflammatory effect similar to that of dexamethasone. Tumor Necrosis Factor-alpha;Vancomycin;Dexamethasone Animals;Combined Modality Therapy;Dexamethasone;Endophthalmitis;Lasers, Semiconductor;Low-Level Light Therapy;Rabbits;Staphylococcal Infections;Staphylococcus epidermidis;Tumor Necrosis Factor-alpha;Ultrasonography;Vancomycin

Comparison of the effects of low energy laser and ultrasound in treatment of shoulder myofascial pain syndrome: a randomized single-blinded clinical trial. BACKGROUND: Myofascial pain syndrome (MPS) is one of the most prevalent musculoskeletal diseases. MPS impaired quality of life in the patients. There is a lot of controversy about different treatment options which include medical treatments, physical therapy, injections, ultrasound and laser. The effects of laser in MPS are challenging. AIM: To assess the effects of laser and ultrasound in treatment of MPS. DESIGN: Randomized single blinded clinical trial SETTING: Outpatient physical therapy clinic at university hospital POPULATION: Sixty three subjects (females: 46, males: 17), (age range: 17-55 year old) who had a diagnosis of definite MPS were entered in the study. METHODS: We measured the pain intensity at rest, during activity and at night using Visual Analogue Scale (VAS) questionnaire. The patients also filled the Neck Disability Index (NDI) form and the pain threshold provoked by pressure was determined using algometric assessment. Then, the patients were categorized randomly in groups A, B and C (receiving laser therapy, ultrasound and sham laser therapy, respectively). Six weeks after the initial visit, they were visited again and filled the forms again. RESULTS: Ultrasound was effective in VAS improvement during activity (46%), at rest (39%) and at night (35%). It also improved NDI scores (34%) and algometric assessment (37%). Laser was effective in VAS improving during activity (54%), at night (51%) and at rest (51%) and also improved NDI scores (73%). It was also found effective in algometric assessment improvement (105%). Laser resulted in more NDI score and algometric assessment improvements comparing to ultrasound ($p<0.05$). CONCLUSION: This study introduces laser as one of the preferred treatments of myofascial pain syndrome in shoulder. Adolescent;Adult;Disability Evaluation;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Myofascial Pain Syndromes;Pain Measurement;Single-Blind Method;Treatment Outcome;Ultrasonic Therapy

Inhibition of AÎ²(25-35)-induced cell apoptosis by low-power-laser-irradiation (LPLI) through promoting Akt-dependent YAP cytoplasmic translocation. Deposition of amyloid-Î²-peptide (AÎ²) in the brain is considered a pathological hallmark of Alzheimer's disease (AD). Our previous studies show that Yes-associated protein (YAP) is involved in the regulation of apoptosis induced by AÎ²(25-35) through YAP nuclear translocation and its pro-apoptotic function is mediated by its interaction with p73. In the present study, we first found that Low-power laser irradiation (LPLI) promoted YAP cytoplasmic translocation and inhibited AÎ²(25-35)-induced YAP nuclear translocation. Moreover, the cytoplasmic translocation was in an Akt-dependent manner. Activated Akt by LPLI phosphorylated YAP on ser127 (S127) and resulted in decreasing the interaction between YAP and p73, and in suppressing the proapoptotic gene bax expression following AÎ²(25-35) treatment. Inhibition of Akt expression by siRNA significantly abolished the effect of LPLI. More importantly, LPLI could inhibit

AÎ²(25-35)-induced cell apoptosis through activation of Akt/YAP/p73 signaling pathway. Therefore, our findings first suggest that YAP may be a therapeutic target and these results directly point to a potential therapeutic strategy for the treatment of AD through Akt/YAP/p73 signaling pathway with LPLI. Amyloid beta-Peptides;BAX protein, human;Cell Cycle Proteins;DNA-Binding Proteins;Nuclear Proteins;Peptide Fragments;TP73 protein, human;Transcription Factors;Tumor Protein p73;Tumor Suppressor Proteins;YY1AP1 protein, human;bcl-2-Associated X Protein;Proto-Oncogene Proteins c-akt Amyloid beta-Peptides;Animals;Apoptosis;Cell Cycle Proteins;Cell Nucleus;Cell Survival;DNA-Binding Proteins;Enzyme Activation;Gene Expression;HEK293 Cells;Humans;Immunoprecipitation;Low-Level Light Therapy;Nuclear Proteins;PC12 Cells;Peptide Fragments;Phosphorylation;Protein Binding;Protein Transport;Proto-Oncogene Proteins c-akt;Rats;Signal Transduction;Transcription Factors;Tumor Protein p73;Tumor Suppressor Proteins;bcl-2-Associated X Protein

Association of laser phototherapy with PRP improves healing of bisphosphonate-related osteonecrosis of the jaws in cancer patients: a preliminary study. The aim of this study was to compare retrospectively the effect of three different treatments on the healing outcome of bisphosphonate-related osteonecrosis of the jaws (BRONJ) in cancer patients. Twenty-two cancer patients were treated for BRONJ with one of the following protocols: clinical (pharmacological therapy), surgical (pharmacological plus surgical therapy), or PRP plus LPT (pharmacological plus surgical plus platelet rich plasma (PRP) plus laser phototherapy (LPT). The laser treatment was applied with a continuous diode laser (InGaAlP, 660 nm) using punctual and contact mode, 40 mW, spot size 0.042 cm(2), 6 J/cm(2) (6 s) and total energy of 0.24 J per point. The irradiations were performed on the exposed bone and surrounding soft tissue. The analysis of demographic data and risk factors was performed by gathering the following information: age, gender, primary tumor, bisphosphonate (BP) used, duration of BP intake, history of chemotherapy, use of steroids, and medical history of diabetes. The association between the current state of BRONJ (with or without bone exposure) and other qualitative variables was determined using the chi-square or Fisher's exact test. In all tests, the significance level adopted was 5%. Most BRONJ lesions occurred in the mandible (77%) after tooth extraction (55%) and in women (72%). A significantly higher percentage of patients reached the current state of BRONJ without bone exposure (86%) in the PPR plus LPT group than in the pharmacological (0%) and surgical (40%) groups after 1-month follow-up assessment. These results suggest that the association of pharmacological therapy and surgical therapy with PRP plus LPT significantly improves BRONJ healing in oncologic patients. Although prospective studies with larger sample sizes are still needed, this preliminary study may be used to inform a better-designed future study. Bone Density Conservation Agents;Diphosphonates;Imidazoles;Zoledronic Acid;Alendronate Adult;Aged;Aged, 80 and over;Alendronate;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Breast Neoplasms;Diphosphonates;Female;Humans;Imidazoles;Lasers, Semiconductor;Low-Level Light Therapy;Lung Neoplasms;Male;Middle Aged;Multiple Myeloma;Platelet-Rich Plasma;Prostatic Neoplasms;Retrospective Studies;Risk Factors;Treatment Outcome;Zoledronic Acid

[Efficacy evaluation of low-level laser therapy on temporomandibular disorder]. OBJECTIVE: To evaluate effectiveness of low-level laser therapy (LLLT) on temporomandibular joint (TMJ) pain. METHODS: The patients with TMJ pain were randomly assigned laser group (n=21) or control group(n=21), once a day for 6 consecutive days of treatment. TMJ pain and function were measured at baseline, just after treatment course, 1 month and 2 months after the treatment. RESULTS: The changes of visual analogue scale (VAS) were appearing over time in both groups but presented statistically significant differences between groups (P<0.001). VAS of laser group decreased faster than that of control group. The same tendency occurred for painless maximum vertical opening

(MVO), left lateral excursion (LLE) and right lateral excursion (RLE), which increased faster in laser group. There were no statistically significant differences between groups and evaluation times for protrusion excursion (PE), but an interaction between group and evaluation times existed and should be explored further. CONCLUSION: LLLT is an appropriate treatment for TMJ pain. Adult;Female;Humans;Light;Low-Level Light Therapy;Male;Temporomandibular Joint Disorders

Home-use laser and light devices for the skin: an update. Over the past several years, a number of home-use laser and light skin devices have been introduced for various indications, including photorejuvenation, hair growth, hair removal and acne treatment. Although these devices allow for privacy and a significant cost advantage, they are typically underpowered and afford lower efficacy than their in-office counterparts. A number of these devices have recently received FDA clearance. Although large clinical trials are lacking, dermatologists should familiarize themselves with the various options to help patients assess their clinical value. Acne Vulgaris;Hair;Hair Removal;Humans;Low-Level Light Therapy;Rejuvenation;Self Care;Skin Aging;Skin Care

Effects of low-level laser irradiation in ultrastructural morphology, and immunoexpression of VEGF and VEGFR-2 of rat masseter muscle. The present study evaluates by ultrastructural and immunohistochemical methods, the possible changes on muscular tissue affected by LLLI during a treatment, for example, in cases of temporomandibular joint disorders. Sixty male Wistar rats divided into 6 groups (n=10) received ten laser irradiations, with different energy densities (groups I-0; II-0.5; III-1.0; IV-2.5; V-5.0; and VI-20 J/cm(2)). Muscles were removed and processed for transmission electron microscopic and immunohistochemical (VEGF and VEGFR-2) analyses. Captured photomicrographs of immunohistochemistry and transmission electron microscopy were evaluated. It was observed in the irradiated muscles, mitochondria of different shapes and sizes, with increased plasticity evidenced by organelles in fusion, division and the presence of elongated structures with characteristics of mitochondria, proximity with the dilated sarcoplasmatic reticulum, suggesting organelles with large amounts of energy, and the presence of cytoplasmic protrusions in the capillaries with high dosages. All studied groups showed immunostainings for both markers (VEGF and VEGFR-2), but in general those who received higher doses also showed the markings more pronounced, suggesting dose-dependent biomodulation. It was concluded that the LLLI was able to modify the ultrastructural characteristics and immunohistochemical pattern of VEGF and VEGFR-2 in the masseter muscle of rats. Vascular Endothelial Growth Factor A;vascular endothelial growth factor A, rat;Vascular Endothelial Growth Factor Receptor-2 Animals;Immunohistochemistry;Lasers;Male;Masseter Muscle;Microscopy, Electron, Transmission;Muscle Cells;Organelles;Rats;Rats, Wistar;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-2

Melasma: a comprehensive update: part II. Several methods of treatment are available to patients with melasma. First-line therapy usually consists of topical compounds that affect the pigment production pathway, broad-spectrum photoprotection, and camouflage. Second-line therapy often consists of the addition of chemical peels, although these must be used cautiously in patients with darker skin. Laser and light therapies represent potentially promising options for patients who are refractory to other modalities, but also carry a significant risk of worsening the disease. A thorough understanding of the risks and benefits of various therapeutic options is crucial in selecting the best treatment. Dicarboxylic Acids;Glycolates;Hydroquinones;Melanins;Plant Extracts;Pyrones;Sunscreening Agents;glycolic acid;Tretinoin;kojic acid;Monophenol Monooxygenase;azelaic acid Administration, Topical;Asian People;Chemexfoliation;Dicarboxylic Acids;Drug Therapy, Combination;Glycolates;Glycyrrhiza;Humans;Hydroquinones;Low-Level Light Therapy;Melanins;Melanosis;Monophenol Monooxygenase;Phototherapy;Phytotherapy;Plant Extracts;Pyrones;Sunscreening Agents;Treatment Outcome;Tretinoin;Ultraviolet Rays

Effect of instrumentation using curettes, piezoelectric ultrasonic scaler and Er,Cr:YSGG laser on the morphology and adhesion of blood components on root surfaces: a SEM study. This study used scanning electron microscopy (SEM) to evaluate the morphology and adhesion of blood components on root surfaces instrumented by curettes, piezoelectric ultrasonic scaler and Er,Cr:YSGG laser. One hundred samples from 25 teeth were divided into 5 groups: 1) Curettes; 2) Piezoelectric ultrasonic scaler; 3) Curettes plus piezoelectric ultrasonic scaler; 4) Er,Cr:YSGG laser; 5) Curettes plus Er,Cr:YSGG laser. Ten samples from each group were used for analysis of root morphology and the other 10 were used for analysis of adhesion of blood components on root surface. The results were analyzed statistically by the Kruskall-Wallis and Mann-Whitney tests with a significance level of 5%. The group treated with curettes showed smoother surfaces when compared to the groups were instrumented with piezoelectric ultrasonic scaler and the Er,Cr:YSGG laser. The surfaces instrumented with piezoelectric ultrasonic scaler and Er,Cr:YSGG laser, alone or in combination with hand scaling and root planing, did not differ significantly ($p>0.05$) among themselves. No statistically significant differences ($p>0.05$) among groups were found as to the adhesion of blood components on root surface. Ultrasonic instrumentation and Er,Cr:YSGG irradiation produced rougher root surfaces than the use of curettes, but there were no differences among treatments with respect to the adhesion of blood components. Fibrin Blood Cells;Cell Adhesion;Dental Scaling;Dentin;Fibrin;Humans;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Piezosurgery;Root Planing;Smear Layer;Subgingival Curettage;Tooth Root

In vitro photodynamic therapy of cervical cancer. OBJECTIVES: Photodynamic therapy is one of the modern therapeutic techniques, in which cytotoxic effects are induced by light. Currently investigators show that it can be used to eliminate cervical cancer cells. AIM: In this study we decided to check whether the Low Level Lasers Therapy (LLLT) can induce the phototoxic changes in HeLa cells, after their photosesitization. MATERIAL AND METHODS: The studies were performed in vitro on HeLa cervical cancer cell line. Protoporphyrin IX (PpIX) in final concentrations: 0.5, 1.0, 5.0 and 10.0 micromol/l was used as photosensitizer. The cells were preincubated with specific concentrations for 6 and 18 hours. After these defined periods of time the cultures were illuminated for 8 minutes by laser light (635 nm and 30 mW/cm2). The cytotoxic effects were assessed by a colorimetric test XTT, 24 and 48 hours after irradiation. RESULTS: Significantly augmented cytotoxic changes were found in HeLa cells 18 hours after preincubation and 48 hours after illumination. Moreover, biostimulating laser exposure preceded by preincubation with protoporphyrin IX caused the cytotoxic changes in cervical cancer cells. CONCLUSION: The obtained results allow us to assume that photodynamic therapy of cervical cancer using biostimulating laser light should be performed 18 hours after the application of protoporphyrin IX. Photosensitizing Agents;Protoporphyrins;protoporphyrin IX Apoptosis;Dose-Response Relationship, Drug;Female;HeLa Cells;Humans;Photochemotherapy;Photosensitizing Agents;Protoporphyrins;Uterine Cervical Neoplasms

Effects of Er:YAG and Er,Cr:YSGG lasers on dentine hypersensitivity. Short-term clinical evaluation. Dentine hypersensitivity (DH) is a painful condition and is a clinical challenge due to the different treatment strategies available. High-intensity lasers have been studied as a possible option. The aim of this randomized, controlled, double-blind clinical study was to evaluate the effects of Er:YAG and Er,Cr:YSGG lasers on DH. The study group comprised 28 subjects who met the inclusion criteria. A visual analogue scale was used to quantify sensitivity before treatment as baseline, immediately before and immediately after treatment, and 1 week and 1 month after treatment. Teeth were assigned to four groups: group 1 control (no treatment), group 2 Er:YAG laser treatment (2 Hz/32.4 mJ/5.9 J/cm(2)), group 3 Er,Cr:YSGG laser treatment (0.25 W/4.4 J/cm(2)), and group 4 Er,Cr:YSGG laser treatment (0.50 W/ 8.9 J/cm(2)). Data were collected and submitted to statistical analysis for

both evaporative (air) and mechanical (probe) stimulation. For both the air and probe stimulation no differences were observed between the pretreatment sensitivities. With the evaporative stimulus, the pain level immediately after treatment was reduced; however, after this the values remained stable. Irradiation with the Er:YAG laser was associated with the lowest level of pain. With the mechanical stimulus, group 4 showed the most pronounced decrease in pain immediately after treatment; however, by the end of the study, pain levels had increased. Groups 1, 2 and 3 showed a reduction in pain that was significantly different from that in group 4 after the 4 weeks of clinical follow up. Based on the results and within the limits of this study, it can be concluded that none of the laser treatments studied was capable of completely eliminating pain, but the Er:YAG and Er,Cr:YSGG lasers are suitable for the treatment of DH. Dentin Sensitivity;Double-Blind Method;Humans;Lasers, Solid-State;Low-Level Light Therapy;Pain Measurement

Evaluation of low-level laser therapy in the prevention and treatment of radiation-induced mucositis: a double-blind randomized study in head and neck cancer patients. The purpose of this prospective study was to determine the effect of the low-level laser in the prevention and treatment of mucositis in head and neck cancer patients. A total of 70 patients with malignant neoplasms in the oral cavity or oropharynx were evaluated. The patients were randomized into two low-level laser therapy groups: Group 1 (660nm/15mW/3.8J/cm(2)/spot size 4mm(2)) or Group 2 (660nm/5mW/1.3J/cm(2)/spot size 4mm(2)) starting on the first day of radiotherapy. Oral mucositis was assessed daily and weekly using the NCI and WHO scales. Oral pain was scored daily with a visual analogue scale before laser application. The patients in Group 1 had a mean time of 13.5days (range 6-26days) to present mucositis grade II, while the patients in Group 2 had a mean time of 9.8days (range 4-14days) (both WHO and NCI p=0.005). In addition, Group 2 also presented a higher mucositis grade than Group 1 with significant differences found in weeks 2 (p=0.019), 3 (p=0.005) and 4 (p=0.003) for WHO scale and weeks 2 (p=0.009) and 4 (p=0.013) for NCI scale. The patients in Group 1 reported lower pain levels (p=0.004). Low-level laser therapy during radiotherapy was found to be effective in controlling the intensity of mucositis and pain. Adult;Aged;Aged, 80 and over;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Mouth Neoplasms;Mucositis;Oropharyngeal Neoplasms;Pain;Pain Measurement;Prospective Studies;Radiation Injuries;Radiotherapy, Conformal;Radiotherapy, Intensity-Modulated;Treatment Outcome;Young Adult

Infrared (810 nm) low-level laser therapy in rat achilles tendinitis: a consistent alternative to drugs. Nonsteroidal anti-inflammatory drugs (NSAIDs) are widely used and can reduce musculoskeletal pain in spite of the cost of adverse reactions like gastrointestinal ulcers or cardiovascular events. The current study investigates if a safer treatment such as low-level laser therapy (LLLT) could reduce tendinitis inflammation, and whether a possible pathway could be through inhibition of either of the two-cyclooxygenase (COX) isoforms in inflammation. Wistar rats (six animals per group) were injected with saline (control) or collagenase in their Achilles tendons. Then, we treated them with three different doses of IR LLLT (810 nm; 100 mW; 10 s, 30 s and 60 s; 3.57 W cm(-2); 1 J, 3 J, 6 J) at the sites of the injections, or intramuscular diclofenac, a nonselective COX inhibitor/NSAID. We found that LLLT dose of 3 J significantly reduced inflammation through less COX-2-derived gene expression and PGE(2) production, and less edema formation compared to nonirradiated controls. Diclofenac controls exhibited significantly lower PGE(2) cytokine levels at 6 h than collagenase control, but COX isoform 1-derived gene expression and cytokine PGE(2) levels were not affected by treatments. As LLLT seems to act on inflammation through a selective inhibition of the COX-2 isoform in collagenase-induced tendinitis, LLLT may have potential to become a new and safer nondrug alternative to coxibs. DNA Primers Achilles Tendon;Animals;Base Sequence;DNA Primers;Infrared Rays;Laser Therapy;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction;Tendinopathy

Evaluation of the clinical efficacy of the 1,450 nm laser in acne vulgaris: a randomized split-face, investigator-blinded clinical trial. BACKGROUND: â€, The 1450 nm laser shrinks sebaceous glands histologically, reduces seborrhoea and has been shown in numerous small uncontrolled studies to improve inflammatory acne. OBJECTIVES: To assess objectively the clinical efficacy and long-term outcome of the 1450 nm laser for inflammatory acne vulgaris. METHODS: Participants over 16 years of age with moderate to severe acne vulgaris were recruited from a secondary care dermatology department. A split-face format was used: the side of the face to be treated was randomized with the other side serving as a within-patient control. Treatment was delivered with the Candela 1450 nm Smoothbeam laser (Candela, Cwmbran, U.K.) using a double-pass technique, 6 mm spot size, 210 ms pulse duration and fluence of 8 or 9 J cm(-2) . Three treatments were performed monthly. The primary outcome was the change in inflammatory lesion count and grading (using the Leeds Revised Acne Grading Scale) between baseline and 4 weeks after the third treatment on the treated side as compared with the change in the control side. Participants were followed up every 3 months for 12 months after the last treatment. The single assessor was blinded as to the side treated. RESULTS: Thirty-eight participants entered the study and 32 completed the study at the primary outcome measure. Within participants, on average, the lesion count reduced by the same amount on both sides of the face [median 0, 95% confidence interval (CI) -4 to 2]. On average, acne grade reduced by the same amount on both sides (median 0, 95% CI -1 to 0). Twelve months after the last treatment (n = 23) the change in lesion count and grade between the treated and control sides of the face remained similar. Treatment was well tolerated. CONCLUSIONS: Treatment with the 1450 nm laser does not reduce inflammatory lesion count or acne grade when compared with a control side, using a split-face format in participants recruited from secondary care. Both sides of the face improved and a systemic effect of the laser is possible. Acne Vulgaris;Adolescent;Adult;Double-Blind Method;Face;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Treatment Outcome;Young Adult

Treatment of persistent idiopathic facial pain (PIFP) with a low-level energy diode laser. OBJECTIVE: The purpose of this study was to test the therapeutic efficacy of low- level energy diode laser on persistent idiopathic facial pain (PIFP). BACKGROUND DATA: PIFP has presented a diagnosis and management challenge to clinicians. Many patients were misdiagnosed, which resulted in unnecessary dental procedures. Low-level energy diode laser therapy has been applied to different chronic and acute pain disorders, including neck, back, and myofacial pain; degenerative osteoarthritis; and headache, and it may be an effective alternative treatment for PIFP. METHODS: A total of 16 patients, who were diagnosed with PIFP, were treated with an 800-nm wavelength diode laser. A straight handpiece having an end size of 0.8 cm in diameter, or an angled handpiece with an end size of 0.5 cm in diameter was used. When laser was applied, the handpiece directly contacted the involved symptomatic region with an energy density of 105 J/cm(2). Overall pain and discomfort was analyzed with a 10-cm visual analogue scale (VAS) before and after treatment. RESULTS: All patients received diode laser therapy between 1 and 10 times. The average pain score was 7.4 before the treatment (ranging from 2.9 to 9.8), and 4.1 after the treatment. An average pain reduction of 43.87% (ranging from 9.3% to 91.8%) was achieved. The pain remained unchanged at a lower level for up to 12 months. CONCLUSIONS: Low-level energy diode laser may be an effective treatment for PIFP. Adult;Aged;Facial Pain;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Treatment Outcome

Photomedicine and LLLT Literature Watch. Humans;Low-Level Light Therapy;Phototherapy

The 800-nm diode laser irradiation induces skin collagen synthesis by stimulating TGF-Î²/Smad signaling pathway. The 800-nm diode laser is used clinically for hair removal and leg vein

clearance. However, the effects of the laser on skin collagen synthesis have not been established. This study aims to research whether the 800-nm laser can be used for non-ablative rejuvenation and its possible mechanism by using an animal model. Eight 2-month-old rats were irradiated with the 800-nm diode laser at 20, 40, and 60Â J/cm(2), respectively. Skin samples were taken for histological study and dermal thickness measurement at day 30 after laser irradiation. The expression of procollagen type I, III, IV, transforming growth factor-Î² (TGF-Î²), Smad2, 3, 4, and phosphorylated-Smad2, 3 in the rat skin was analyzed 24 h after completing all laser treatments by using RT-PCR and Western blot. Immunohistochemistry was performed to evaluate the content of type I collagen in the skin at day 30 after laser irradiation. The 800-nm diode laser treatments markedly improved the histological structure and increased dermal thickness compared to the non-irradiated controls. Laser irradiation at 40Â J/cm(2) significantly up-regulated the expression of procollagen type I and IV, TGF-Î² and Smad2, 3, 4. The p-Smad2 and p-Smad3 levels were also enhanced in the laser-irradiated skin. The 800-nm laser is effective in improving skin structure and inducing skin new collagen expression. New collagen synthesis induced by the 800-nm laser was mediated by TGF-Î²/Smad signaling pathway. Thus, it seemed that the 800-nm laser could be used for non-ablative rejuvenation in the future.
DNA Primers;Smad Proteins;Transforming Growth Factor beta;Collagen Animals;Base Sequence;Collagen;DNA Primers;Female;Lasers, Semiconductor;Low-Level Light Therapy;Rats;Rats, Sprague-Dawley;Signal Transduction;Skin;Skin Aging;Smad Proteins;Transforming Growth Factor beta;Up-Regulation

Endovenous 808-nm diode laser occlusion of perforating veins and varicose collaterals: a prospective study of 482 limbs. BACKGROUND: Endovenous laser ablation (EVLA) was performed in the treatment of great and small saphenous veins (GSVs, SSVs), perforating veins (PVs), and varicose collaterals (VCs). OBJECTIVE To verify the outcome in PVs and VCs. MATERIALS AND METHODS: Four hundred eighty-two limbs of 306 patients were studied. EVLA was performed on 167 GSVs, 52 SSVs, and 534 PVs of 303 limbs and on VCs of 467 limbs; 133 GSVs were stripped, 300 of saphenofemoral junctions (SFJs) and 45 saphenopopliteal junctions (SPJs) were interrupted. Limbs were selected using duplex ultrasound examination and photographs; PVs-VCs diameter (<4 mm) and VC length were measured. EVLA was performed using a 808-nm diode laser, 0.6-mm fibers, continuous emission, 4 to 10 W, and 10 to 20 J/cm. Follow-up on 467 limbs occurred over a mean 27.5 months (range 3 months to 6 years); 98 limbs were followed up for longer than 4 years. RESULTS: Operating time range from 10 to 30 minutes per limb. Blood vaporization, thrombosis, fibrosis, and atrophy prevailed in PVs and in the large VCs (>4 mm) and massive coagulation in the smaller (<4 mm). High rate of occlusion was seen, with different rates of patent PV-VC mainly in diameter >6 mm. Thirty-nine out of 511 patent PVs (7.6%) and 96 out of 778 VCs (12-13%) were re-treated using EVLA or foam sclerotherapy. Minor complications occurred in 88 of the 778 (11%). CONCLUSIONS: EVLA of PVs and VCs is effective and faster than surgery in 2- to 6-mm PVs and VCs using an 808-nm diode laser.
Adolescent;Adult;Aged;Aged, 80 and over;Female;Humans;Lasers, Semiconductor;Leg;Low-Level Light Therapy;Male;Middle Aged;Ultrasonography, Doppler, Duplex;Varicose Veins;Venous Insufficiency;Young Adult

Prevention of thyroidectomy scars in Asian adults using a 532-nm potassium titanyl phosphate laser. BACKGROUND: Prediction of whether postoperative wound healing will result in a hypertrophic scar or keloid is difficult. Diverse treatment options have been developed in an effort to prevent excessive scar formation. OBJECTIVE: To evaluate the efficacy and safety of a 532-nm potassium titanyl phosphate (KTP) laser in the prevention of scar formation after total thyroidectomy. MATERIALS AND METHODS: Twenty-eight individuals with Fitzpatrick skin types IV and V and linear surgical suture lines after total thyroidectomy by the same surgeon were enrolled. Twenty participants were treated using a 532-nm KTP laser two times at 2-week intervals. Eight participants were assigned to the

control group. The Vancouver Scar Scale (VSS), global assessment score (GAS), and participants' subjective satisfaction were used to determine the effect of scar prevention. These results were compared with those of the control group. RESULTS: The average VSS score was remarkably lower in the KTP laser treatment group. Average GASs indicated better cosmetic outcomes in the treatment group. Participant satisfaction was also higher in the treatment group. No significant side effects were observed during follow-up. CONCLUSION: A 532-nm KTP laser can be used safely and efficiently on Asian skin to reduce scar formation after thyroidectomy. The authors have indicated no significant interest with commercial supporters. Adult;Aged;Asian People;Cicatrix, Hypertrophic;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Thyroidectomy;Treatment Outcome

Continuous-wave laser stimulation of the rat prostate cavernous nerves using a compact and inexpensive all single mode optical fiber system. BACKGROUND AND PURPOSE: Laser stimulation of the rat cavernous nerve (CN) recently has been demonstrated as an alternative to electrical stimulation for potential application in nerve mapping during nerve-sparing radical prostatectomy. Advantages include noncontact stimulation and improved spatial selectivity. Previous studies, however, have used large and/or expensive laser sources for stimulation. This study demonstrates the feasibility of optical stimulation of the rat CN, in vivo, using a compact, inexpensive all-single-mode fiberoptic system. MATERIALS AND METHODS: A 1455-nm wavelength infrared diode laser beam was coupled into a 9-Î¼m-core single-mode fiber for delivery through a 10F laparoscopic probe and used for laser stimulation of the CN in a total of eight rats, in vivo. RESULTS: Laser stimulation of the CN was observed at threshold temperatures of 41Â°C, with intracavernous pressure response times as short as 4 s, and magnitudes up to 50 mm Hg, compared with baselines of 10 mm Hg. CONCLUSION: This novel, all-single-mode-fiber laser nerve stimulation system introduces several advantages including: (1) lower cost laser; (2) more robust fiberoptic design, eliminating alignment and cleaning of bulk optical components; and (3) improved Gaussian spatial beam profile for simplified alignment of the laser beam with the nerve. With further development, laser nerve stimulation may be useful for identification and preservation of the CN during prostate cancer surgery. Absorption;Animals;Fiber Optic Technology;Lasers;Low-Level Light Therapy;Male;Optical Fibers;Pressure;Prostate;Rats;Rats, Sprague-Dawley;Time Factors

[Comparative experimental morphological study of efficacy and safety of near-infrared and visible wave-length laser iridoplasty]. The features of interaction of laser radiation with iris tissue were determined in experimental morphological study. The potential of laser irradiation with different spectral characteristics for pupil ectopia correction is estimated. The results of morphometry showed effectiveness of near-infrared diode laser radiation, that presents as an iris contraction in coagulation region with minimal tissue trauma. This fact allows us to propose a near-infrared diode laser radiation as a treatment option for correction of pupil form and location. Alternatively visible wave-length laser showed to be less effective and more traumatic. Animals;Biometry;Histological Techniques;Humans;Infrared Rays;Iris;Laser Coagulation;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Acoustic;Pupil Disorders;Rabbits;Research Design;Treatment Outcome

SHORT-TERM EFFICACY OF LOW-LEVEL LASER THERAPY IN PATIENTS WITH KNEE OSTEOARTHRITIS: A RANDOMIZED PLACEBO-CONTROLLED, DOUBLE-BLIND CLINICAL TRIAL. OBJECTIVE: This study was designed to evaluate the short-term efficacy of low-level laser therapy (LLLT) for improving pain and function in patients with knee osteoarthritis. METHODS: Forty-seven patients with knee osteoarthritis (79 knees), of both genders, participated in this randomized controlled double-blind clinical trial. They were randomly allocated to two groups: laser group with 25 patients (41 knees) and placebo group with 22 patients (38 knees). LLLT was performed three times a week, totaling nine sessions, using a AsGa 904 nm laser with mean power of 60 mW and beam area of 0.5 cm(2). Nine

points were irradiated on the knee, with energy of 3.0 J/point. The placebo group was treated with the same laser device, but with a sealed probe. Evaluations using Lequesne, visual numerical scale (VNS), Timed Up and Go (TUG), goniometry and dynamometry were conducted before the treatment started and after the nine sessions of LLLT. RESULTS: A significant improvement in pain and function was found in all the assessments applied to the laser group. On comparing the laser group with the placebo group, significant differences were found in the VNS-resting and Lequesne evaluations. CONCLUSION: Treatment with LLLT improves pain and function over the short term in patients with knee osteoarthritis.

[Treatment and prevention of cancer treatment related oral mucositis]. One of the most common and troublesome complications of modern intensive anticancer treatments is oral mucositis. The purpose of this review is to summarize current evidence and clinical guidelines regarding its prevention and therapy. The use of keratinocyte growth factor-1, supplementary glutamine and other recently developed treatment modalities are discussed. The injury of the oral mucosa caused by antineoplastic agents promotes the local expression of multiple pro-inflammatory and pro-apoptotic molecules and eventually leads to the development of ulcers. Such lesions predispose patients to several infectious and nutritional complications. Also, they lead to modification of treatment schedules, potentially affecting overall prognosis. Local cryotherapy with ice chips and phototherapy with low energy laser may be useful as preventive measures. Mouthwashes with allopurinol and phototherapy with low energy laser can be used as treatment. In radiotherapy, special radiation administration techniques should be used to minimize mucosal injury. Pain control should always be optimized, with the use of patient controlled analgesia and topical use of morphine. Supplemental glutamine should not be used outside of research protocols. Lastly, thorough attention should be paid to general care and hygiene measures. Antineoplastic Agents;Glutamine Antineoplastic Agents;Cryotherapy;Glutamine;Humans;Low-Level Light Therapy;Neoplasms;Oral Hygiene;Practice Guidelines as Topic;Severity of Illness Index;Stomatitis

Effects of low-level laser therapy (808 nm) on isokinetic muscle performance of young women submitted to endurance training: a randomized controlled clinical trial. Low-level laser therapy (LLLT) has shown efficacy in muscle bioenergetic activation and its effects could influence the mechanical performance of this tissue during physical exercise. This study tested whether endurance training associated with LLLT could increase human muscle performance in isokinetic dynamometry when compared to the same training without LLLT. The primary objective was to determine the fatigue index of the knee extensor muscles (FIext) and the secondary objective was to determine the total work of the knee extensor muscles (TWext). Included in the study were 45 clinically healthy women (21 Â± 1.78 years old) who were randomly distributed into three groups: CG (control group), TG (training group) and TLG (training with LLLT group). The training for the TG and TLG groups involved cycle ergometer exercise with load applied to the ventilatory threshold (VT) for 9 consecutive weeks. Immediately after each training session, LLLT was applied to the femoral quadriceps muscle of both lower limbs of the TLG subjects using an infrared laser device (808 nm) with six 60-mW diodes with an energy of 0.6 J per diode and a total energy applied to each limb of 18 J. VT was determined by ergospirometry during an incremental exercise test and muscle performance was evaluated using an isokinetic dynamometer at 240Â°/s. Only the TLG showed a decrease in FIext in the nondominant lower limb ($P = 0.016$) and the dominant lower limb ($P = 0.006$). Both the TLG and the TG showed an increase in TWext in the nondominant lower limb ($P < 0.001$ and $P = 0.011$, respectively) and in the dominant lower limb ($P < 0.000$ and $P < 0.000$, respectively). The CG showed no reduction in FIext or TWext in either lower limb. The results suggest that an endurance training program combined with LLLT leads to a greater reduction in fatigue than an endurance training program without LLLT. This is relevant to everyone involved in sport and rehabilitation.

Adolescent;Adult;Athletic Performance;Exercise;Female;Humans;Low-Level Light Therapy;Muscle Contraction;Muscle Strength Dynamometer;Physical Education and Training;Physical Endurance;Young Adult
At-home laser and light-based devices. With the advancement in laser technology, there has been a recent trend in laser and light devices towards 'do it yourself' at-home use. There has been an exponential growth in devices aimed at the treatment of acne, hair removal, and psoriasis. With the exception of the at-home UVB box and excimer lasers, these systems do not require a prescription and patients may purchase the systems as over-the-counter products. Medical treatment still remains the standard of care for most conditions, but these at-home devices play a significant role in the treatment of various conditions. Media and marketing have driven the popularity of these devices and have encouraged patients to try them out. Patients are attracted to at-home devices because of the one-time cost, ease of use, convenience, and privacy of use. Naturally, despite these devices being for at-home use, there should be a level of caution adhered to when using any laser or light device. Acne Vulgaris;Cosmetic Techniques;Hair Removal;Humans;Low-Level Light Therapy;Self Care;Skin Aging
Fractional photothermolysis. The novel concept of 'fractional photothermolysis' was introduced to the market in 2003, and has since gained tremendous popularity and importance for numerous clinical indications. Its development and introduction were driven by the need for an effective yet safe and low-risk resurfacing technique, in contrast to the ablative and non-ablative lasers available at the time. The first device that was introduced to the market used non-ablative wavelengths. In 2007, the technology was further developed with ablative wavelengths leading to vaporization of tissue. This new technology has revolutionized the field of laser skin resurfacing and resulted in the development of numerous non-ablative and ablative fractional devices. There is little doubt that fractional technology is here to stay, as (when used properly) it allows the operator to obtain significant clinical results with minimal post-treatment recovery and hence fewer complications. Dermatologic Surgical Procedures;Face;Humans;Low-Level Light Therapy;Phototherapy
Diabetic distal symmetric polyneuropathy: effect of low-intensity laser therapy. Low-intensity laser therapy (LILT) has been considered as a treatment modality in diabetic distal symmetric polyneuropathy (DSP). The aim of this study is to determine the effectiveness of LILT on DSP. We examined 107 subjects with type 2 diabetes for detection of DSP using the Michigan Neuropathy Screening Instrument (MNSI). Seventeen subjects were eligible to be enrolled in the study. Nerve conduction studies (NCS) were performed in all eligible subjects as an objective method to confirm neuropathy. The participants received LILT three times a week for ten sessions. NCSs were reevaluated after completion of the treatment. The absolute changes in NCS parameters were considered to establish the effectiveness of the treatment. Baseline demographics were similar in all participants. The mean differences of NCV parameters were considered for comparison. At the end of the study, the subjects showed a significant increase in neural potential amplitudes ($p < 0.05$). This study clearly demonstrated a significant positive effect of LILT on improvement of nerve conduction velocity on diabetic distal symmetric polyneuropathy (DSP). This finding supports the therapeutic potential of LILT in DSP. Aged;Diabetes Mellitus, Type 2;Diabetic Neuropathies;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Neural Conduction;Peroneal Nerve;Sural Nerve;Tibial Nerve;Treatment Outcome
Initial fibroblast attachment to Erbium:YAG laser-irradiated dentine. AIMS: To evaluate the effects of Erbium (Er):YAG laser irradiation on the morphology of resected dentine surfaces, and to investigate fibroblast attachment to laser-irradiated dentine surfaces. METHODOLOGY: Dentine blocks obtained from single-rooted human teeth were divided into the following groups after sterilization in an autoclave: (i) Laser group treated with Er:YAG laser irradiation (30 mJ per pulse, 10

pps, 60 s); (ii) L-MTAD group treated with laser irradiation as in (i) plus a mixture of doxycycline, tetracycline isomer and citric acid; (iii) RC-Prep group treated with EDTA gel or cream (RC-Prep) and (iv) Control group left untreated. After each treatment, the dentine blocks were incubated with NIH/3T3 fibroblasts cultured to subconfluency in Dulbecco's modified Eagle's medium supplemented with 10% foetal bovine serum and antibiotics. The number of attached cells amongst the groups was analysed statistically at the 5% significance level. The dentine surface morphologies and cell attachments were evaluated by counting assays, histological observations and scanning electron microscopy (SEM). RESULTS: The number of attached cells was significantly higher ($P < 0.05$) in the Laser group than in the RC-Prep and Control groups at 16 h. Dendritic cell extension of the fibroblasts was only observed in the Laser group at 8 h by SEM. In the histological analyses, significantly more attached cells were found on the dentine surfaces treated with laser irradiation. CONCLUSIONS: Er:YAG laser irradiation induced morphological alterations in dentine surfaces, which may improve the attachment of fibroblasts to dentine. Chelating Agents;Peroxides;Polysorbates;Root Canal Irrigants;Waxes;Citric Acid;RC-Prep;Urea;Edetic Acid;Doxycycline 3T3 Cells;Animals;Cell Adhesion;Cell Count;Cell Culture Techniques;Cell Shape;Chelating Agents;Citric Acid;Dentin;Doxycycline;Edetic Acid;Fibroblasts;Humans;Lasers, Solid-State;Low-Level Light Therapy;Mice;Microscopy, Electron, Scanning;Peroxides;Polysorbates;Radiation Dosage;Root Canal Irrigants;Time Factors;Urea;Waxes

Low-level laser light therapy improves cognitive deficits and inhibits microglial activation after controlled cortical impact in mice. Low-level laser light therapy (LLLT) exerts beneficial effects on motor and histopathological outcomes after experimental traumatic brain injury (TBI), and coherent near-infrared light has been reported to improve cognitive function in patients with chronic TBI. However, the effects of LLLT on cognitive recovery in experimental TBI are unknown. We hypothesized that LLLT administered after controlled cortical impact (CCI) would improve post-injury Morris water maze (MWM) performance. Low-level laser light (800â€‰nm) was applied directly to the contused parenchyma or transcranially in mice beginning 60-80â€‰min after CCI. Injured mice treated with 60â€‰J/cmÂ² (500â€‰mW/cmÂ²Ã—2â€‰min) either transcranially or via an open craniotomy had modestly improved latency to the hidden platform ($p<0.05$ for group), and probe trial performance ($p<0.01$) compared to non-treated controls. The beneficial effects of LLLT in open craniotomy mice were associated with reduced microgliosis at 48â€‰h (21.8Â±2.3 versus 39.2Â±4.2 IbA-1+ cells/200Ã—field, $p<0.05$). Little or no effect of LLLT on post-injury cognitive function was observed using the other doses, a 4-h administration time point and 7-day administration of 60â€‰J/cmÂ². No effect of LLLT (60â€‰J/cmÂ² open craniotomy) was observed on post-injury motor function (days 1-7), brain edema (24â€‰h), nitrosative stress (24â€‰h), or lesion volume (14 days). Although further dose optimization and mechanism studies are needed, the data suggest that LLLT might be a therapeutic option to improve cognitive recovery and limit inflammation after TBI. Animals;Brain Injuries;Cognition Disorders;Disease Models, Animal;Low-Level Light Therapy;Male;Maze Learning;Mice;Mice, Inbred C57BL;Microglia;Recovery of Function

Effect of low-level laser therapy after rapid maxillary expansion on proliferation and differentiation of osteoblastic cells. The aim of this study was to investigate the osteoblastic activity of cells derived from the midpalatal suture upon treatment with low-level laser therapy (LLLT) after rapid maxillary expansion (RME). A total of 30 rats were divided into two groups: experimental I (15 rats with RME without LLLT) and experimental II (15 rats with RME + LLLT). The rats were euthanized at 24 h, 48 h, and 7 days after RME, when the osteoblastic cells derived from the rats' midpalatal suture were explanted. These cells were cultured for periods up to 17 days, and then in vitro osteogenesis parameters and gene expression markers were evaluated. The cellular doubling time in the proliferative stage (3-7 days) was decreased in cultured cells harvested from the midpalatal suture at

24 and 48 h after RME + LLLT, as indicated by the increased growth of the cells in a culture. Alkaline phosphatase activity at days 7 and 14 of the culture was increased by LLLT in cells explanted from the midpalatal suture at 24 and 48 h and 7 days after RME. The mineralization at day 17 was increased by LLLT after RME in all periods. Results from the real-time PCR demonstrated that cells harvested from the LLLT after RME group showed higher levels of ALP, Runx2, osteocalcin, type I collagen, and bone sialoprotein mRNA than control cells. More pronounced effects on ALP activity, mineralization, and gene expression of bone markers were observed at 48 h after RME and LLLT. These results indicate that the LLLT applied after RME is able to increase the proliferation and the expression of an osteoblastic phenotype in cells derived from the midpalatal suture. Alkaline Phosphatase Alkaline Phosphatase;Animals;Calcification, Physiologic;Cell Culture Techniques;Cell Differentiation;Cell Proliferation;Gene Expression;Low-Level Light Therapy;Male;Osteoblasts;Osteogenesis;Palatal Expansion Technique;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction

Treatment of trichostasis spinulosa with 0.5-millisecond pulsed 755-nm alexandrite laser. Trichostasis spinulosa (TS) is a follicular disorder in which multiple hairs in a keratinous sheath project above the skin surface. Current treatments provide temporary relief and side effects are common. We report the successful treatment of TS in 20 patients using a short-pulsed 755-nm alexandrite laser. The 20 patients (skin types II-V) presented with TS lesions on the tip of their nose. All patients received a single treatment (one to three passes) with the laser with cold air cooling but without anaesthesia or analgesia. Treatment parameters were as follows: pulse duration 0.5Â ms, fluence 15-17Â J/cm(2), and spot size 5Â mm. The entire procedure required less than 5Â min to perform. The patients were followed up for 3Â months for any adverse effects or recurrence. In all patients the lesions disappeared immediately after treatment with minimal or no pain. Erythema was minimal and lasted 5-20Â min in all patients. Patients were very satisfied. The treated areas were still clear 4 to 5Â weeks later, and a second treatment was not considered necessary. There were adverse effects other than the erythema and there was no recurrence within the follow-up period of 3Â months. A single treatment with a short-pulsed 755-nm alexandrite laser appears to be a rapid, minimally painful, and effective treatment for TS in patients of skin types II to V. Adult;Female;Hair Diseases;Humans;Keratosis;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pruritus;Skin Pigmentation;Treatment Outcome

Buried alive: functional eccrine coils buried under scar tissue? Child;Cicatrix, Hypertrophic;Eccrine Glands;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Stevens-Johnson Syndrome;Sweating

Functional and morphometric differences between the early and delayed use of phototherapy in crushed median nerves of rats. This study evaluated the functional and quantitative differences between the early and delayed use of phototherapy in crushed median nerves. After a crush injury, low-level laser therapy (GaAs) was applied transcutaneously at the injury site, 3 min daily, with a frequency of five treatments per week for 2 weeks. In the early group, the first laser treatment started immediately after surgery, and in the delayed group, after 7 days. The grasping test was used for functional evaluation of the median nerve, before, 10, and 21 days after surgery, when the rats were killed. Three segments of the median nerve were analyzed histomorphometrically by light microscopy and computer analysis. The following features were observed: myelinated fiber and axon diameters, myelin sheath area, g-ratio, density and number of myelinated fibers, and area and number of capillaries. In the proximal segment (site of crush), the nerves of animals submitted to early and delayed treatment showed myelinated fiber diameter and myelin sheath area significantly larger compared to the untreated group. In the distal segment, the myelin sheath area was significantly smaller in the untreated animals compared to the delayed group. The untreated, early,

and delayed groups presented a 50, 57, and 81% degree of functional recovery, respectively, at 21 days after injury, with a significant difference between the untreated and delayed groups. The results suggest that the nerves irradiated with low-power laser exhibit myelinated fibers of greater diameter and a better recovery of function. Animals;Female;Lasers, Semiconductor;Low-Level Light Therapy;Median Nerve;Nerve Crush;Peripheral Nerve Injuries;Phototherapy;Rats;Rats, Wistar

Comparison of the effects of low-level laser therapy and low-intensity pulsed ultrasound on the process of bone repair in the rat tibia. BACKGROUND: Electrophysical agents such as Ultrasound (US) and low-level laser therapy (LLLT) have been increasingly used in physical therapy practice. Studies suggest that these devices are able to stimulate osteoblast proliferation and osteogenesis at the fracture site, resulting in a greater deposition of bone mass and speeding up the consolidation process. OBJECTIVE: The aim of this study was to analyze the effects of US and LLLT on the bone healing process, through biomechanical and histological analysis of the bone callus. METHODS: A total of 30 rats were randomly allocated into three groups: control group fracture without treatment (GC); fracture group treated with pulsed US, burst 1.5 MHz, 200 us, 1 KHz, 30 mW/cmÂ² (GUS) and fracture group treated with laser 830 nm, 100 mW, 120 J/cmÂ² (GL). Bone defects were performed with a circular drill of 2mm in diameter in the animal's tibias. The treatments were carried out after surgery consisting of 7 applications every 48 hours. After 14 days the animals were sacrificed and the tibias were removed to perform the analysis, being the right tibia designated for biomechanical analysis, while the left tibia for histological analysis. RESULTS: The biomechanical analysis showed no statistically significant difference between biomechanical properties of the CG, CL and GUS. In morphometric analysis, both GUS and GL showed a significantly higher woven bone tissue area compared to the control group. However, when the two treatment modalities were compared, there were no statistical differences between them. CONCLUSION: Both devices used in this study were able to accelerate the bone healing process in rats. Animals;Fracture Healing;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Tibial Fractures;Ultrasonic Therapy

Noninvasive body contouring with radiofrequency, ultrasound, cryolipolysis, and low-level laser therapy. Noninvasive body contouring is perhaps one of the most alluring areas of esthetic surgery today. This article discusses current noninvasive body-contouring modalities, including suction massage devices, radiofrequency energy, high-frequency focused ultrasound, cryolipolysis, and low-level light laser therapy devices. It also discusses imminent technologies awaiting approval by the Food and Drug Administration, reviews the basic science and clinical effects behind each of these existing and emerging technologies, addresses patient selection and clinical applications of each modality, and discusses the applicability and economics of providing noninvasive lipolysis services in office. Adipocytes;Adipose Tissue;Animals;Cosmetic Techniques;Cryotherapy;Humans;Laser Coagulation;Lipectomy;Low-Level Light Therapy;Obesity;Patient Selection;Ultrasonography;Waist Circumference

Fractionation: a new era in laser resurfacing. Fractional photothermolysis combines the benefits of fully ablative lasers with significantly reduced downtime and fewer complications. Skin is treated in a fractional manner, with narrow cylinders of tissue being thermally heated and normal adjacent skin left unaffected, and the fractional devices have shown effectiveness in treating a variety of conditions, especially scarring and photodamage. There are many devices that use fractional photothermolysis, and practitioners are becoming more adept at using optimal parameters to induce near CO(2) laser benefits. Fractionated lasers have become the cornerstone of a minimally invasive treatment regimen and have ushered in a new era of laser skin rejuvenation. Cicatrix;Cosmetic Techniques;Dose Fractionation, Radiation;Equipment Design;Erythema;Humans;Laser Therapy;Low-Level Light Therapy;Rhytidoplasty;Skin Aging;Skin Pigmentation

[Assessment of the effectiveness of low level laser in the treatment of alveolar osteitis]. BACKGROUND/AIM: Alveolar osteitis (AO) is the extraction wound healing disorder with a presence of severe pain. Low level laser therapy stimulates cell metabolism and microcirculation, have has pronounced analgesic, antiedematous and anti-inflammatory effect and speeds up wound healing process. The aim of this study was to present results of clinical research that examined the effectiveness of low level laser in pain relief and healing of extraction wounds with alveolar osteitis in the lower jaw which was formed on the second day after tooth extraction. METHODS: The study was conducted on 60 subjects divided into the study and the control group. In both groups extraction wounds were processed in similar way, except that in the study group was applied daily treatment of low level laser with a total of eight sessions of radiation, while in the control group extraction wounds were dressed with zinc oxide eugenol paste, which was changed every 48 hours up to the pain cessation. Measurement of pain intensity was done with a visual analogue scale (VAS) 10 min prior to processing of extraction wounds and daily for the next eight days. Assessment of the effectiveness of low level laser on healing of extraction wounds was performed on the day eight of the treatment. RESULTS: On the day five after beginning of the treatment of extraction wounds with alveolar osteitis in the patients of the study group a lower average value of pain as compared to the control group was registered. This difference was increased within the following days. Extraction wounds healing in the study group was more successful and faster than in the control group. CONCLUSION: This study suggested that the reduction of pain was more pronounced in the patients with alveolar osteitis whose extraction wounds were subjected to low level laser radiation in comparison to those in which extraction wounds were treated with zinc oxide eugenol paste. Adult;Dry Socket;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Tooth Extraction;Wound Healing;Young Adult

Evaluation of clinical improvement in acne scars and active acne in patients treated with the 1540-nm non-ablative fractional laser. INTRODUCTION: Acne is a characteristic condition of puberty; however, adults who continue to have acne outbreaks frequently attend dermatology clinics. Two conditions-active acne and residual scarring-often co-occur in these patients. The objective of the present study was to evaluate the improvement in scarring and active acne after treatment with a 1540-nm erbium: glass fractional laser. MATERIAL AND METHODS: The authors treated 20 patients with acne and scarring. Each patient received panfacial treatment in four sessions with a 1-month interval between sessions. Patients, the treating physician and a blinded observer evaluated the results in four areas: improvement in scars, improvement in pores, improvement in acne, and improvement in sebum secretion. Improvements were graded using the Global Aesthetic Improvement Scale. The evaluation was made 12 weeks after treatment finished. RESULTS: Patients presented an improvement in both acne and scars. In 80 percent of cases, patients felt that the appearance of the scars had improved, and the improvement was classified as very much improved in 40 percent. In 85 percent of cases, patients felt that active acne had improved, and the improvement was classified as very much improved in 45 percent. Pore size was evaluated as improved by 75 percent of patients. Sebum secretion improved in 80 percent of cases. CONCLUSION: A 1540-nm non-ablative fractional laser provides effective treatment of acne scars. Patient satisfaction is high and active acne lesions improve significantly. Treatment of this mixed condition (scarring and active acne) with a single device is reliable, with a favorable safety profile and a high degree of patient acceptance. Erbium Acne Vulgaris;Adult;Cicatrix;Disease Progression;Erbium;Esthetics;Female;Humans;Low-Level Light Therapy;Male;Patient Satisfaction;Time Factors;Treatment Outcome

Red (660 nm) and infrared (830 nm) low-level laser therapy in skeletal muscle fatigue in humans: what is better? In animal and clinical trials low-level laser therapy (LLLT) using red, infrared and

mixed wavelengths has been shown to delay the development of skeletal muscle fatigue. However, the parameters employed in these studies do not allow a conclusion as to which wavelength range is better in delaying the development of skeletal muscle fatigue. With this perspective in mind, we compared the effects of red and infrared LLLT on skeletal muscle fatigue. A randomized double-blind placebo-controlled crossover trial was performed in ten healthy male volunteers. They were treated with active red LLLT, active infrared LLLT (660 or 830 nm, 50 mW, 17.85 W/cm(2), 100 s irradiation per point, 5 J, 1,785 J/cm(2) at each point irradiated, total 20 J irradiated per muscle) or an identical placebo LLLT at four points of the biceps brachii muscle for 3 min before exercise (voluntary isometric elbow flexion for 60 s). The mean peak force was significantly greater ($p < 0.05$) following red (12.14%) and infrared LLLT (14.49%) than following placebo LLLT, and the mean average force was also significantly greater ($p < 0.05$) following red (13.09%) and infrared LLLT (13.24%) than following placebo LLLT. There were no significant differences in mean average force or mean peak force between red and infrared LLLT. We conclude that both red than infrared LLLT are effective in delaying the development skeletal muscle fatigue and in enhancement of skeletal muscle performance. Further studies are needed to identify the specific mechanisms through which each wavelength acts. Adult;Cross-Over Studies;Double-Blind Method;Exercise;Humans;Infrared Rays;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Young Adult

Low-level laser therapy activates NF-kB via generation of reactive oxygen species in mouse embryonic fibroblasts. BACKGROUND: Despite over forty years of investigation on low-level light therapy (LLLT), the fundamental mechanisms underlying photobiomodulation at a cellular level remain unclear. METHODOLOGY/PRINCIPAL FINDINGS: In this study, we isolated murine embryonic fibroblasts (MEF) from transgenic NF-kB luciferase reporter mice and studied their response to 810 nm laser radiation. Significant activation of NF-kB was observed at fluences higher than 0.003 J/cm(2) and was confirmed by Western blot analysis. NF-kB was activated earlier (1 hour) by LLLT compared to conventional lipopolysaccharide treatment. We also observed that LLLT induced intracellular reactive oxygen species (ROS) production similar to mitochondrial inhibitors, such as antimycin A, rotenone and paraquat. Furthermore, we observed similar NF-kB activation with these mitochondrial inhibitors. These results, together with inhibition of laser induced NF-kB activation by antioxidants, suggests that ROS play an important role in the laser induced NF-kB signaling pathways. However, LLLT, unlike mitochondrial inhibitors, induced increased cellular ATP levels, which indicates that LLLT also upregulates mitochondrial respiration. CONCLUSION: We conclude that LLLT not only enhances mitochondrial respiration, but also activates the redox-sensitive NFkB signaling via generation of ROS. Expression of anti-apoptosis and pro-survival genes responsive to NFkB could explain many clinical effects of LLLT. Antioxidants;NF-kappa B;Reactive Oxygen Species;Adenosine Triphosphate;Luciferases Adenosine Triphosphate;Animals;Antioxidants;Cells, Cultured;Embryo, Mammalian;Female;Fibroblasts;Immunoblotting;Low-Level Light Therapy;Luciferases;Mice;Mitochondria;NF-kappa B;Pregnancy;Reactive Oxygen Species;Signal Transduction

[Treatment of patients of elderly and sinile age with fractures of the mandibula]. In the above study, the comparison of efficiency of complex treatment of elderly and senile patients with fractures of mandibula has been carried out. After osteosynthesis of mandibula with mini-plates, frequency of development of traumatic osteomyelitis in these patients was lower than that after osteosynthesis by means of bone suture, especially in the group of patients who were admitted with signs of inflammation of osteal wound, where traumatic osteomyelitis developed 3 times less often than after osteosynthesis with bone suture. At bilateral fractures of mandibula, osteosynthesis with bone suture is not prescribed to the elderly patients who are admitted with signs of inflammation of osteal wound. Application of mini-plates for osteosynthesis at fractures of mandibula in the elderly patients

enabled to restore mandibula motion and chewing function within much earlier terms. Aged;Aged, 80 and over;Bone Plates;Female;Fracture Fixation, Internal;Fracture Healing;Health Services for the Aged;Humans;Low-Level Light Therapy;Male;Mandibular Fractures;Middle Aged;Radiography;Treatment Outcome

[Quantitative estimation of information influence of law intensive laser radiation on macro- and the microelement status in patients of the senior age groups]. Law intensive laser radiation is a multifactorial, inherently information-power influence on biological tissues. Coinciding under characteristics with natural, the dosed out external influence is necessary for live organisms not only as a source of free energy, but also as the supplier of building materials. As an alarm indicator we had chosen the change of concentration of microcells in blood whey, owing to high sensitivity of this parameter. Photoexcitation conducts to acceleration of chemical reactions, in particular the oxidation-reduction. The probability of "capture" of a photon by a molecule depends on its energy and from power level of a molecule. Absorption of a photon by a molecule occurs when the direction transition coincides with fluctuations of an electric vector of a light wave. Efficiency of carrying over can be defined on time of a life of a luminescence. The quantum exit can be expressed through the relation of intensity of fluorescence to a difference of capacities of falling and leaving light streams. As a result of occurrence of a gradient of temperature in around membrane areas there is a change of electric potential of a membrane that causes outflow of ions from a membrane. Thereof the albuminous channels causing active transportation of ions and polar molecules reveal. As a result of change of electrochemical ionic balance lability of microcells to information doses of laser influence is provided. Ion Channels;Ions;Potassium;Calcium Action Potentials;Aged;Aging;Calcium;Cell Membrane;Energy Transfer;Humans;Ion Channels;Ions;Low-Level Light Therapy;Photons;Potassium;Quantum Theory

Histomorphological and angiogenic analyzes of skin epithelium after low laser irradiation in hairless mice. It is not well-understood how low-laser therapy affects the skin of the applied area. This study analyzes skin of the masseteric region of mice from the HRS/J strain after three different application regimens (three, six or ten applications per regimen) of low intensity laser at 20 J/cm(2) and 40 mW for 20 sec on alternate days. Three experimental groups according to the number of laser applications (three, six or ten) and three control groups (N = 5 animals for each group) were used. On the third day after the last irradiation, all animals were sacrificed and the skin was removed and processed to analyze the relative occupation of the test area by each epithelial layer and the aspects of neovascularization. Data were submitted to statistical analyzes. The irradiated groups compared to their respective controls at each period of time, showed no significant difference in relative occupation of the test area by the layers and epithelium areas for three and six applications, but for ten applications, a significant decrease ($P < 0.05$) in the basal and granulosum layers, and epithelium areas were found. From the comparisons of the three irradiated groups together, the group with six laser applications showed statistical difference ($P < 0.05$) in total epithelium and on the layers. Vascular endothelial growth factor (VEGF) and VEGFR-2 immunoreactivities were similar for the control and irradiated groups. Results suggested a biostimulatory effect with low risks associated with superficial tissues, when the treatment aims the deeper layers after six applications. Vascular Endothelial Growth Factor Receptor-2 Animals;Dose-Response Relationship, Radiation;Epithelium;Immunoenzyme Techniques;Low-Level Light Therapy;Male;Masseter Muscle;Mice;Mice, Hairless;Morphogenesis;Neovascularization, Physiologic;Skin;Vascular Endothelial Growth Factor Receptor-2

In vitro assessment of laser efficiency for caries prevention in pits and fissures. This study aimed to assess the in vitro efficacy of the lasers Er:YAG, Nd:YAG, and CO(2) operating in the low energy mode for caries prevention in pits and fissures. Forty-five caries-free enamel occlusal sections were

randomly divided into three groups: G1 - Er:YAG (80 mJ/2 Hz); G2 - Nd:YAG Laser (1 W and 10 Hz); and G3 - CO(2) Laser (0.4 W and 20 Hz). After surface treatment, the samples were submitted to challenge with acid consisting of a 10-day immersion in demineralizing (6 h) and remineralizing solution (18 h). Next, enamel demineralization was quantitatively evaluated by subsurface microhardness test and polarized-light microscopy (PLM, mm(2)) and qualitatively assessed by scanning electron microscopy. The Wilcoxon test was used for comparison of each group with its own control. ANOVA (Î± = 5%) was employed for comparison among groups, and Fisher's LSD multiple comparison test was applied, to check the difference in means. Concerning the microhardness analyses, statistical difference between control, and experimental areas was only detected for the CO(2) group. Experimental values were higher than the controls. As for PLM analyses, smaller demineralized areas were measured for G2 (Nd:YAG) and G3 (CO(2)) compared with the control areas. In conclusion, the present findings suggest that the CO(2) laser should be selected in order to increase the enamel resistance to acid in pits and fissures. Acids Acids;Analysis of Variance;Dental Caries;Dental Enamel;Humans;Immersion;Lasers, Gas;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning;Microscopy, Polarization;Molar, Third;Random Allocation;Surface Properties;Time Factors

Bisphosphonate-related osteonecrosis: laser-assisted surgical treatment or conventional surgery? Bisphosphonates (BSPs) are used for the treatment of multiple myeloma, metastatic breast and lung cancer, Paget's disease, osteoporosis, hypercalcemia due to malignancy, and many other skeletal diseases. BSPs reduce osteoclastic functions, which result in bone resorption. Bisphosphonates-related osteonecrosis of jaws (BRONJ) is a newly developed term that is used to describe the significant complication in patients receiving bisphosphonates. BSPs are known to exhibit an anti-angiogenetic effect that initiates tissue necrosis of the hard tissue. There is currently no consensus on the correct approach to this issue. The aim of this retrospective study is to compare the effects of laser surgery with biostimulation to conventional surgery in the treatment of BSP-induced avascular bone necrosis on 20 patients who have been treated in our clinic. BRONJ was evaluated in patients with lung, prostate, and breast cancer under intravenous BSP treatment. Twenty patients in this study developed mandibular or maxillary avascular necrosis after a minor tooth extraction surgery or spontaneously. Bone turnover rates were evaluated by serum terminal C-telopeptide levels (CTX) using the electrochemiluminescence immunoassay technique and patients were treated with laser or conventional surgical treatments and medical therapy. Ten patients were treated with laser surgery and biostimulation. An Er:YAG laser (Fotona Fidelis Plus IIÂ® Combine laser equipment, Slovenia) very long pulse (VLP) mode (200 mJ, 20 Hz) using a fiber tip 1.3 mm in diameter and 12 mm in length was used to remove the necrotic and granulation tissues from the area of avascular necrosis. Biostimulation was applied postoperatively using an Nd:YAG laser. Low-level laser therapy (LLLT) was applied to the tissues for 1 min from 4 cm distance using an Nd:YAG laser (Fotona-Slovenia) with a R24 950-Âµm fiber handpiece long-pulse (LP) mode, 0.25-W, 10 Hz power/cm(2) from the mentioned distance the spot size was 0.4 cm(2), and power output was 2.5 J. Energy density from the mentioned distance was calculated to be 6.25 J/cm(2). The other ten patients were treated with conventional surgery. Treatment outcomes were noted as either complete healing or incomplete healing. There were no statistically significant differences between laser surgery and conventional surgery ($p > 0.05$). CTX values also did not affect the prognosis of the patients. Treatment outcomes were significantly better in patients with stage II osteonecrosis than in patients with stage I osteonecrosis. Our findings suggest that dental evaluation of the patients prior to medication is an important factor in the prevention of BRONJ. Laser surgery is a beneficial alternative in the treatment of patients with this situation. Further randomized studies with larger patient numbers may also improve our understanding of treatment protocols for this situation. Bone Density Conservation

Agents;Collagen Type I;Diphosphonates;Imidazoles;Peptides;collagen type I trimeric cross-linked peptide;Zoledronic Acid Adult;Aged;Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Breast Neoplasms;Collagen Type I;Diphosphonates;Female;Humans;Imidazoles;Lasers, Solid-State;Low-Level Light Therapy;Lung Neoplasms;Male;Middle Aged;Peptides;Prostatic Neoplasms;Retrospective Studies;Zoledronic Acid
Low-level laser therapy, at 60 J/cm2 associated with a Biosilicate(Â®) increase in bone deposition and indentation biomechanical properties of callus in osteopenic rats. We investigate the effects of a novel bioactive material (Biosilicate(Â®)) and low-level laser therapy (LLLT), at 60 J/cm(2), on bone-fracture consolidation in osteoporotic rats. Forty female Wistar rats are submitted to the ovariectomy, to induce osteopenia. Eight weeks after the ovariectomy, the animals are randomly divided into four groups, with 10 animals each: bone defect control group; bone defect filled with Biosilicate group; bone defect irradiated with laser at 60 J/cm(2) group; bone defect filled with Biosilicate and irradiated with LLLT, at 60 J/cm(2) group. Laser irradiation is initiated immediately after surgery and performed every 48 h for 14 days. Histopathological analysis points out that bone defects are predominantly filled with the biomaterial in specimens treated with Biosilicate. In the 60-J/cm(2) laser plus Biosilicate group, the biomaterial fills all bone defects, which also contained woven bone and granulation tissue. Also, the biomechanical properties are increased in the animals treated with Biosilicate associated to lasertherapy. Our results indicate that laser therapy improves bone repair process in contact with Biosilicate as a result of increasing bone formation as well as indentation biomechanical properties. Bone Substitutes;sodium oxide-calcium oxide-silicon dioxide-diphosphorus pentoxide Animals;Biomechanical Phenomena;Bone Diseases, Metabolic;Bone Regeneration;Bone Substitutes;Bony Callus;Combined Modality Therapy;Female;Fractures, Malunited;Glass;Low-Level Light Therapy;Materials Testing;Osteogenesis;Ovariectomy;Rats;Rats, Wistar;Stress, Mechanical
Viability of fibroblasts cultured under nutritional stress irradiated with red laser, infrared laser, and red light-emitting diode. Phototherapy is noninvasive, painless and has no known side effect. However, for its incorporation into clinical practice, more well-designed studies are necessary to define optimal parameters for its application. The viability of fibroblasts cultured under nutritional stress irradiated with either a red laser, an infrared laser, or a red light-emitting diode (LED) was analyzed. Irradiation parameters were: red laser (660 nm, 40 mW, 1 W/cm(2)), infrared laser (780 nm, 40 mW, 1 W/cm(2)), and red LED (637 Â± 15 nm, 40 mW, 1 W/cm(2)). All applications were punctual and performed with a spot with 0.4 mm(2) of diameter for 4 or 8 s. The Kruskal-Wallis test and analysis of variance of the general linear model (p â‰¤ 0.05) were used for statistical analysis. After 72 h, phototherapy with low-intensity laser and LED showed no toxicity at the cellular level. It even stimulated methylthiazol tetrazolium assay (MTT) conversion and neutral red uptake of fibroblasts cultured under nutritional stress, especially in the group irradiated with infrared laser ($p = 0.004$ for MTT conversion and $p < 0.001$ for neutral red uptake). Considering the parameters and protocol of phototherapy used, it can be concluded that phototherapy stimulated the viability of fibroblasts cultured under nutritional deficit resembling those found in traumatized tissue in which cell viability is reduced. Animals;BALB 3T3 Cells;Cell Survival;Fibroblasts;Humans;Infrared Rays;Lasers;Low-Level Light Therapy;Lysosomes;Mice;Mitochondria;Optical Devices;Phototherapy;Stress, Physiological
Caries inhibition in vital teeth using 9.6-Î¼m CO2-laser irradiation. The aim of this study was to test the hypothesis that in a short-term clinical pilot trial short-pulsed 9.6 Î¼m CO(2)-laser irradiation significantly inhibits demineralization in vivo. Twenty-four subjects scheduled for extraction of bicuspids for orthodontic reasons (age 14.9 Â± 2.2 years) were recruited. Orthodontic brackets were placed on bicuspids (Transbond XT, 3M). An area next to the bracket was irradiated with a CO(2)-laser

(Pulse System Inc, Los Alamos, New Mexico), wavelength 9.6 Î¼m, pulse duration 20 Î¼s, pulse repetition rate 20 Hz, beam diameter 1100 Î¼m, average fluence 4.1 Â± 0.3Jâ^•cm(2), 20 laser pulses per spot. An adjacent nonirradiated area served as control. Bicuspids were extracted after four and twelve weeks, respectively, for a quantitative assessment of demineralization by cross-sectional microhardness testing. For the 4-week arm the mean relative mineral loss Î”Z (vol% Ã— Î¼m) for the laser treated enamel was 402 Â± 85 (mean Â± SE), while the control showed significantly higher mineral loss (Î”Z 738 Â± 131; P = 0.04, t-test). The difference was even larger after twelve weeks (laser arm Î”Z 135 Â± 98; control 1067 Â± 254; P = 0.002). The laser treatment produced 46% demineralization inhibition for the 4-week and a marked 87% inhibition for the 12-week arm. This study shows, for the first time in vivo, that the short-pulsed 9.6 Î¼m CO(2)-laser irradiation successfully inhibits demineralization of tooth enamel in humans. Adolescent;Child;Dental Caries;Dental Enamel;Female;Hardness Tests;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Orthodontic Brackets;Prospective Studies;Single-Blind Method;Time Factors;Tooth Demineralization

Improvement of dermal burn healing by combining sodium alginate/chitosan-based films and low level laser therapy. This paper aimed to evaluate the improvement of burn wounds healing by sodium alginate/chitosan-based films and laser therapy. Natural polymers with different biological activities are widely used as film dressings to improve wound healing. Lasers arrays accelerate the healing repair of soft tissue injuries. Burn procedures were performed on the backs of 60 male rats assigned into six groups: untreated (CTR), dressed with cellulose films (CL), dressed with sodium alginate/chitosan-based films (SC), laser-irradiated undressed wounds (LT), laser-irradiated wounds with cellulose (CLLT) and sodium alginate/chitosan-based films (SCLT). Laser therapy was applied for 7 days. Animals of each group were euthanised 8 and 14 days after the burn procedures. The inflammatory reaction was significantly more intense in the CTR group than in the irradiated groups after 8 and 14 days. Laser therapy stimulated myofibroblastic differentiation in 8 days, with or without dressing films. Combined laser therapy and both dressings improved epithelisation, blood vessels formation and collagenization, promoted rapid replacement of type III for type I collagen and favored the better arrangement of the newly formed collagen fibres. The combination of laser therapy and sodium alginate/chitosan-based dressing improves burn healing, apparently by modulating the epithelisation, blood vessels formation and collagenization processes.
Actins;Alginates;Collagen Type I;Hexuronic Acids;smooth muscle actin, rat;Glucuronic Acid;Chitosan
Actins;Alginates;Animals;Burns;Chitosan;Collagen Type I;Fibroblasts;Glucuronic Acid;Hexuronic Acids;Low-Level Light Therapy;Male;Neovascularization, Physiologic;Rats;Wound Healing

Photomedicine and LLLT literature watch. Low-Level Light Therapy;Phototherapy

[Using a laser based program in patients diagnosed with fibromyalgia]. In this study, the benefits of a program of treatment by laser were evaluated on the improvement of symptoms associated with fibromyalgia. A total of 31 participants took part in the study, all of them women, randomized into two groups: intervention with laser and placebo. The intervention with girlase E11010 consisted of the individual application of six frequencies on seven anatomical zones of the body. The results were statistically significant differences for "weariness" and "difficulty sleeping" variables. In the rest of the variables, we did not find any statistical significance. One of the conclusions from the present study is the need for development of new research to verify the influence of girlase E1.1010 in the improvement of symptoms associated with fibromyalgia.
Adult;Fatigue;Female;Fibromyalgia;Humans;Lasers;Low-Level Light Therapy;Middle Aged;Pain;Pain Measurement;Sleep Disorders, Intrinsic;Surveys and Questionnaires;Treatment Outcome

The latest innovations in hair transplantation. Hair restoration began as a result of the fortuitous finding by Dr. Norman Orentreich that hair follicles taken from an area of nonbalding scalp could be

implanted into an area of male pattern hair loss and continue to grow terminal hair. Since that time, hair transplants have progressed from the use of large plugs to the use of follicular units (normally occurring clusters of hairs). This has allowed surgeons to create undetectable results in cases of androgenetic alopecia and well as other conditions associated with hair loss. Advances continue in hair restoration technique ranging from surgical approach to instrumentation and ways to enhance growth. In this article, the more recent surgical and medical innovations in hair reconstruction are reviewed. Alopecia;Eyebrows;Eyelashes;Hair;Hair Follicle;Humans;Low-Level Light Therapy;Male;Organ Preservation;Platelet-Rich Plasma;Robotics;Scalp;Tissue and Organ Harvesting;Transplant Donor Site

Scleroderma and raynaud's phenomenon improve with high-peak power laser therapy: a case report. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Raynaud Disease;Scleroderma, Systemic

A retrospective study of q-switched alexandrite laser in treating nevus of ota. BACKGROUND: The Q-switched alexandrite laser (QSAL) has been clinically proven to be effective in treating nevus of Ota, but a large-scale retrospective study with long-term follow-up has never been performed. OBJECTIVE: To evaluate the efficacy of the QSAL in treating nevus of Ota, the laser's long-term side effects, complications associated with the treatments, and the recurrence rate. MATERIALS AND METHODS: Eight hundred six patients (651 female, 155 male) with a diagnosis of nevus of Ota who had received a series of QSAL (wavelength 755 nm) treatments were recruited. The typical settings were fluences of 3.8 to 4.8 J/cm(2) and a spot size of 3 mm. Follow-ups were conducted via questionnaire with 590 patients who had completed the treatment at least 3 years earlier. RESULTS: Overall, 93.9% of patients achieved complete clearance after an average of 5.2 sessions. All recurrences (0.8%) appeared beyond the previously treated sites. No long-term adverse effects, including hypopigmentation, hyperpigmentation, textural changes, and malignant transformation, were observed. CONCLUSION: The QSAL is a safe and effective modality for treating nevus of Ota. Recurrence was rare and appeared beyond the previously treated sites. The authors have indicated no significant interest with commercial supporters. Adolescent;Adult;Child;Child, Preschool;Facial Neoplasms;Female;Humans;Infant;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Nevus of Ota;Skin Neoplasms;Young Adult

Effect of LED red and IR Photobiomodulation in tongue mast cells in Wistar rats: histological study. OBJECTIVE: This article aimed to study the effect of LED Phototherapy (LED-PHT) (?630?nm or ?850?nm) on mast cells on the dorsum of the tongue of rodents. BACKGROUND DATA: Vasodilatation is one of the reported effects of laser light on tissues. Laser light is able to induce the release of mediators responsible for vasodilatation, such as those produced by mast cells. Mast cells are also related to some diseases such as hay fever. METHODS: Sixty Wistar rats were divided into three groups: I, Control; II, IR-LED (?850?nm, 21.9?J/cm(2), 73 sec; and III, red-LED (?630?nm, 21.9?J/cm(2), 73?sec). The specimens were taken after, 20, 45, and 60?min following irradiation. The specimens were routinely processed; stained with toluidine blue; and then total, degranulated, and non-degranulated mast cells were counted and statistical analysis performed. RESULTS: Both LED irradiated subjects showed significant difference when compared to the control subjects on the total number mast cells ($p<0.001$, ANOVA), degranulated mast cells ($p<0.001$, ANOVA), and non-degranulated mast cells ($p<0.001$, ANOVA). Comparing the two groups of LED irradiated subjects, significant difference was observed regarding the total number of cells ($p<0.001$, paired t-test) and degranulated mast cells ($p<0.001$, paired t-test) with a greater number of these cells noted in the IR-LED group. On the other hand, Red-LED irradiated subjects showed a significantly greater number of non-degranulated mast cells ($p=0.001$, paired t-test). CONCLUSIONS: Our results lead us to conclude that both red and IR-LED light caused increased mast cell degranulation and that IR-LED light resulted

in a greater number of mast cells. Animals;Infrared Rays;Lasers;Light;Male;Mast Cells;Rats;Rats, Wistar;Tongue

Treatment of hidradenitis suppurativa with intense pulsed light: a prospective study. BACKGROUND: Hidradenitis suppurativa is a chronic skin condition characterized by recurrent inflammation and infection of skin in intertriginous areas containing apocrine glands. Intense pulsed light uses high-energy broad-spectrum light. Current applications include hair removal and the treatment of acne vulgaris, which has a pathogenesis similar to that of hidradenitis suppurativa. The authors conducted a study to determine whether intense pulsed light is an effective treatment for hidradenitis suppurativa. METHODS: Eighteen patients were randomized to treatment of one axilla, groin, or inframammary area with intense pulsed light two times per week for 4 weeks using a Harmony Laser. The contralateral side received no treatment and acted as a control. The response to treatment was assessed using a validated examination and clinical photographs, and by measuring patient satisfaction on a Likert scale. RESULTS: After treatment, there was a significant improvement in the mean examination score that was maintained at 12 months ($p < 0.001$, logistical regression analysis). The improvement was confirmed by independent assessment of clinical photographs (interrater reliability, 0.79; $p < 0.001$). Patients reported high levels of satisfaction with the treatment. There was no concurrent improvement on the untreated control side. CONCLUSIONS: This small study suggests that intense pulsed light may be an effective treatment for hidradenitis suppurativa. It could be added to treatments used for this condition, particularly for patients keen on avoiding surgery and those with groin and inframammary disease. Further studies are required to confirm the efficacy and mechanism of action of intense pulsed light in hidradenitis suppurativa. Adolescent;Adult;Axilla;Female;Follow-Up Studies;Groin;Hidradenitis Suppurativa;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Treatment Outcome;Young Adult

[Comparison of low-power laser and ultrasound litotripsy in the management of middle-distal ureteral stones]. OBJECTIVE: To compare the success rates and complications of ultrasound and low-power Holmium laser-assisted ureteroscopy (URS) in managing middle-distal ureteral stones. MATERIALS AND METHODS: We retrospectively analyzed the records of 90 patients with middle-distal ureteral stones who underwent ureteroscopic lithotripsy at our institution from May 2006 to April 2010. 45 patients were treated with ultrasound (mean size 6.7 mm), 45 patients with low-power Holmium laser (mean size 7.4 mm). The same ureteroscope (9.5/8ch rigid-Storz) was used to treat all the patients. Patients were monitored before the hospital discharge with abdominal radiograph and ultrasonography, and as outpatients after 3 months with abdominal radiograph, ultrasonography and urography in selected cases. RESULTS: We obtained a complete immediate fragmentation of stones in 27/45 (60%) patients with ultrasound, and in 36/45 (80%) patients after laser treatment. A proximal migration of stones was observed in 12/45 (26.8%) patients with ultrasound and 3/45 (6.6) with laser. We observed a ureteral perforation after laser treatment and no patient developed urosepsis. 6/45 (13.3%) patients who were treated with ultrasound underwent auxiliary therapy such as alkalizing therapy, 9/45 (20%) patients a second ureteroscopy, 9/45 (20%) a shockwave lithotripsy. No patient underwent an auxiliary shockwave treatment after laser, 6/45 (13.4%) patients underwent a second ureteroscopy. Operating time (20.33 vs 28.85 minutes) and hospitalization (3.6 vs 5.1 days) were shorter with laser if compared with ultrasound treatment. CONCLUSION: In our study the fragmentation rates of Holmium laser-assisted ureteroscopy were significantly better than with ultrasound in the middle-distal ureteral stones management. We did not have relevant complications using both procedures, and the need for auxiliary procedures was significantly less for Holmium laser-assisted ureteroscopy when compared with ultrasound. Humans;Lithotripsy;Lithotripsy, Laser;Low-Level Light Therapy;Retrospective Studies;Ureteral Calculi

Narrowband ultraviolet B phototherapy and serum folic acid level. Folic Acid Female;Folic Acid;Humans;Low-Level Light Therapy;Male;Psoriasis;Ultraviolet Rays
Cosmetic procedures in skin of color. An increasing proportion of patients undergoing aesthetic procedures are individuals with skin of color (Fitzpatrick skin types IV-VI). Racial or ethnic differences exist in perceptions of beauty, the prevalence of specific cosmetic concerns, as well as optimal approaches to treatment. Most important, is the need to avoid treatment-associated pigmentary alterations and keloid scarring, of which there is a greater risk in patients with skin of color. Here we review leading esthetic concerns in the darker skinned patient and discuss approaches to treatment. Chemexfoliation;Cosmetic Techniques;Culture;Esthetics;Hair Removal;Hirsutism;Humans;Keloid;Lasers, Solid-State;Low-Level Light Therapy;Pigmentation Disorders;Postoperative Complications;Skin Aging;Skin Pigmentation
Recurrent herpes simplex infections: laser therapy as a potential tool for long-term successful treatment. Herpes simplex virus types 1 and 2 are the main infectious agents associated with oral and genital ulcerations. These infections are now widely recognized as sexually transmitted diseases. Among treatment options, low-level laser therapy (LLLT) has shown promising clinical results as a longer-lasting suppression therapy. Two clinical cases are described with recurrent labial herpes for which LLLT was used. Following treatment, both patients remained symptom free during the 17-month clinical follow-up period. Female;Follow-Up Studies;Herpes Labialis;Humans;Low-Level Light Therapy;Male;Middle Aged;Recurrence;Treatment Outcome;Young Adult
Effect of low-level laser therapy (660 nm) on the healing of second-degree skin burns in rats. The aim of this study was to investigate the effects of 660 nm laser on the healing of burn wounds made on the backs of rats. Thirty-two Wistar male rats were used. The animals were randomly distributed into 2 groups of 16 animals each: control group (burned rats without treatment) and laser-treated group (burned rats treated with laser therapy). Each group was divided into two different subgroups, euthanized in different periods (subgroup A: 7 days post-surgery and subgroup B: 14 days post-surgery). Histopathological analysis revealed a significant decrease in the necrotic area in the laser-treated group compared to the controls at days 7 and 14 post-injury. COX-2 positive cells were found in a strong pattern in the group submitted to laser therapy after 7 days. Regarding VEGF immunomarker, a significant VEGF immunoexpression was detected in the laser-exposed group after 14 days when compared to the negative control group. Taken together, our results demonstrate that laser therapy is able to promote skin repair of burned rats as a result of decreasing necrotic area and an up-regulation of COX-2 and VEGF immunoexpression. Vascular Endothelial Growth Factor A;Cyclooxygenase 2 Analysis of Variance;Animals;Burns;Cyclooxygenase 2;Low-Level Light Therapy;Male;Necrosis;Rats;Rats, Wistar;Skin;Vascular Endothelial Growth Factor A;Wound Healing
Pigmentary sequelae of AIDS-related cutaneous Kaposi sarcoma: successful treatment by Q-switched 755-nm alexandrite and 532-nm Nd:YAG lasers. Antiviral Agents;Vincristine Acquired Immunodeficiency Syndrome;Antiretroviral Therapy, Highly Active;Antiviral Agents;CD4 Lymphocyte Count;Humans;Hypopigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Sarcoma, Kaposi;Skin Neoplasms;Vincristine
Photobiomodulation, tissue effects and bystanders. Bystander Effect;Cell Biology;Cell Cycle;Cell Survival;Cells, Cultured;Hot Temperature;Phototherapy;Stress, Physiological
Disseminated eruption of ectopic sebaceous glands following Stevens-Johnson syndrome. Triazines;Lamotrigine Adolescent;Biopsy, Needle;Exanthema;Facial Dermatoses;Female;Follow-Up Studies;Humans;Immunohistochemistry;Lamotrigine;Low-Level Light Therapy;Risk Assessment;Sebaceous Glands;Severity of Illness Index;Stevens-Johnson Syndrome;Treatment Outcome;Triazines

Combination treatment of non-segmental vitiligo with a 308-nm xenon chloride excimer laser and topical high-concentration tacalcitol: a prospective, single-blinded, paired, comparative study. Anti-Inflammatory Agents;Dihydroxycholecalciferols;1 alpha,24-dihydroxyvitamin D3 Administration, Topical;Adolescent;Adult;Anti-Inflammatory Agents;Combined Modality Therapy;Dihydroxycholecalciferols;Esthetics;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Risk Assessment;Single-Blind Method;Treatment Outcome;Vitiligo;Young Adult

Removal of facial and labial lentigines in dyschromatosis universalis hereditaria with a Q-switched alexandrite laser. Esthetics;Facial Dermatoses;Female;Follow-Up Studies;Humans;Japan;Lasers;Lentigo;Low-Level Light Therapy;Middle Aged;Pigmentation Disorders;Skin Diseases, Genetic;Treatment Outcome

Influence of low-level laser associated with osteogenic proteins recombinant human BMP-2 and Hevea brasiliensis on bone repair in Wistar rats. This study analyzed the newly formed bone tissue after application of recombinant human BMP-2 (rhBMP-2) and P-1 (extracted from Hevea brasiliensis) proteins, 2 weeks after the creation of a critical bone defect in male Wistar rats treated or not with a low-intensity laser (GaAlAs 780 nm, 60 mW of power, and energy density dose of 30 J/cm(2)). The animals were divided into two major groups: (1) bone defect plus low-intensity laser treatment and (2) bone defect without laser irradiation. The following subgroups were also analyzed: (a) 5 Î¼g of pure rhBMP-2; (b) 5 Î¼g of pure P-1 fraction; (c) 5 Î¼g of rhBMP-2/monoolein gel; (d) 5 Î¼g of P-1 fraction/monoolein gel; (e) pure monoolein gel. Comparisons of the groups receiving laser treatment with those that did not receive laser irradiation show differences in the areas of new bone tissue. The group treated with 5 Î¼g of rhBMP-2 and laser irradiation was not significantly different ($P > 0.05$) than the nonirradiated group that received the same treatment. The irradiated, rhBMP-2/monoolein gel treatment group showed a lower area of bone formation than the nonirradiated, rhBMP-2/gel monoolein treatment group ($P < 0.001$). The area of new bone tissue in the other nonirradiated and irradiated groups was not significantly different ($P > 0.05$). Furthermore, the group that received the 5 Î¼g of rhBMP-2 application showed the greatest bone formation. We conclude that the laser treatment did not interfere with the area of new bone tissue growth and that the greatest stimulus for bone formation involved application of the rhBMP-2 protein. Bone Morphogenetic Protein 2;Glycerides;Plant Proteins;Recombinant Proteins;Transforming Growth Factor beta;recombinant human bone morphogenetic protein-2;monoolein Animals;Bone Morphogenetic Protein 2;Glycerides;Hevea;Humans;Immunohistochemistry;Low-Level Light Therapy;Male;Osteogenesis;Parietal Bone;Plant Proteins;Rats;Rats, Wistar;Recombinant Proteins;Skull Fractures;Transforming Growth Factor beta

Phototherapy with low-level laser affects the remodeling of types I and III collagen in skeletal muscle repair. The purpose of this article was to analyze the photobiomodulator role of low-level laser therapy (LLLT) on the skeletal muscle remodeling following cryoinjury in rats, focusing the types I and III collagen proteins. Laser phototherapy has been employed to stimulate repair in different tissues. However, its role in skeletal muscle remodeling is not yet well clarified, especially its effect on the collagen component of the extracellular matrix. Fifty adult Wistar rats were divided into four groups: control, sham, cryoinjury, and laser-treated cryoinjury. Laser irradiation was performed three times a week on the injured region using the InGaAlP (indium-gallium-aluminum-phosphorous) laser (660Â nm; beam spot of 0.04Â cm(2), output power of 20Â mW, power density of 0.5Â mW/cm(2), energy density of 5Â J/cm(2), 10-s exposure time, with a total energy dose of 0.2Â J). Five animals were killed after short-term (days 1 and 7) and long-term (14 and 21) durations following injury. The muscles were processed and submitted to hematoxylin and eosin (H&E) and immunohistochemical staining. The histological slices were analyzed qualitatively, semi-quantitatively, and quantitatively.

The data were submitted to statistical analysis using the Kruskal-Wallis test. The qualitative analysis of morphological aspects revealed that the muscle repair were very similar in cryoinjury and laser groups on days 1, 14 and 21. However, at 7Â days, differences could be observed because there was a reduction in myonecrosis associated to formation of new vessels (angiogenesis) in the laser-treated group. The analysis of the distribution of types I and III collagen, on day 7, revealed a significant increase in the depositing of these proteins in the laser-treated group when compared to the cryoinjury group. InGaAlP diode laser within the power parameters and conditions tested had a biostimulatory effect at the regenerative and fibrotic phases of the skeletal muscle repairs, by promoting angiogenesis, reducing myonecrosis, and inducing types I and III collagen synthesis, following cryoinjury in rat. Collagen Type I;Collagen Type III Animals;Collagen Type I;Collagen Type III;Edema;Immunohistochemistry;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Muscle Fibers, Skeletal;Muscle, Skeletal;Necrosis;Rats;Rats, Wistar;Wound Healing

Influence of low-level laser therapy on wound healing in nicotine-treated animals. Low-level laser therapy (LLLT) has been shown to have several biological effects that favor the healing process, and nicotine has been shown to delay the healing process. In this study we investigated the healing of open wounds created on the back of rats treated with nicotine with or without LLLT. Of 115 animals, 59 received subcutaneous injections of saline solution, and the others received subcutaneous injections of nicotine (3 mg/kg body weight), twice a day throughout the study period. After 30 days, skin wounds were created on the back of the animals. The animals receiving saline injections were divided into two groups: group 1 (G1, n = 29), in which the wounds were left untreated, and group 2 (G2, n = 30), in which the wounds were treated with LLLT (GaAlAs, 660 nm, 30 mW, 5.57 J/cm(2) per point, 0.39 J, 13 s per point, 0.42 W/cm(2)). The animals receiving nicotine injections were also divided into two groups: group 3 (G3, n = 29), in which the wounds were left untreated, and group 4 (G4, n = 27), in which the wounds were treated with LLLT. The animals were killed 3, 7 or 14 days after surgery. Wound healing was evaluated histologically both qualitatively and semiquantitatively. Wounds of G2 showed a delay in epithelial migration and connective tissue organization compared to those of G1. Wounds of G2 showed faster healing than those of G1; similarly, wounds of G4 showed more advanced healing than those of G3. LLLT acted as a biostimulatory coadjuvant agent balancing the undesirable effects of nicotine on wound tissue healing. Nicotine Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Nicotine;Rats;Skin;Wound Healing

Low-level laser therapy improves skeletal muscle performance, decreases skeletal muscle damage and modulates mRNA expression of COX-1 and COX-2 in a dose-dependent manner. We tested if modulation in mRNA expression of cyclooxygenase isoforms (COX-1 and COX-2) can be related to protective effects of phototherapy in skeletal muscle. Thirty male Wistar rats were divided into five groups receiving either one of four laser doses (0.1, 0.3, 1.0 and 3.0 J) or a no-treatment control group. Laser irradiation (904 nm, 15 mW average power) was performed immediately before the first contraction for treated groups. Electrical stimulation was used to induce six tetanic tibial anterior muscle contractions. Immediately after sixth contraction, blood samples were collected to evaluate creatine kinase activity and muscles were dissected and frozen in liquid nitrogen to evaluate mRNA expression of COX-1 and COX-2. The 1.0 and 3.0 J groups showed significant enhancement ($P < 0.01$) in total work performed in six tetanic contractions compared with control group. All laser groups, except the 3.0 J group, presented significantly lower post-exercise CK activity than control group. Additionally, 1.0 J group showed increased COX-1 and decreased COX-2 mRNA expression compared with control group and 0.1, 0.3 and 3.0 J laser groups ($P < 0.01$). We conclude that pre-exercise infrared laser irradiation with dose of 1.0 J enhances skeletal muscle performance and decreases post-exercise skeletal muscle damage and inflammation. Membrane Proteins;RNA,

Messenger;Cyclooxygenase 1;Cyclooxygenase 2;Ptgs1 protein, rat;Ptgs2 protein, rat;Creatine Kinase Animals;Creatine Kinase;Cyclooxygenase 1;Cyclooxygenase 2;Dose-Response Relationship, Radiation;Electric Stimulation;Isometric Contraction;Lasers;Light;Low-Level Light Therapy;Male;Membrane Proteins;Muscle Fatigue;Muscle, Skeletal;Physical Endurance;RNA, Messenger;Rats;Rats, Wistar;Real-Time Polymerase Chain Reaction

Coherence and speckle in photomedicine and photobiology. Humans;Low-Level Light Therapy;Optics and Photonics;Photobiology;Phototherapy

Effects of low-level laser therapy on the oxidative metabolism and matrix proteins in the rat masseter muscle. OBJECTIVE: This study aims to analyze the effects of low-level laser therapy (LLLT) on the oxidative activity and the expression/activity of metalloproteinases of the masseter muscle. BACKGROUND DATA: Currently in dentistry LLLT has been used on patients with muscular disorders, such as the temporomandibular disorders (TMDs) but its effect at the cellular level has not been fully elucidated. METHODS: Thirty male Wistar rats divided into 6 groups (n=5) received 10 laser irradiations (780â€‰nm, 5 mmW, CW laser, illuminated area 0.04â€‰cm(2), power density 125 mW/cm(2)), with different energy densities (group I-0; group II-0.5; group III-1.0; group IV-2.5; group V-5.0; and group VI-20â€‰J/cm(2)). Muscles were processed for nicotinamide adenine dinucleotide diaphorase (NADH) and sucinate dehydrogenase (SDH) activities and zymography. The photomicrographs were evaluated by the point counting method using a test system and ImageJ software; and by the ANOVA statistical test. The proteinases' secretion/activity was qualitatively analyzed by zymography. RESULTS: LLLT significantly increased ($p<0.05$) masseter muscle oxidative metabolism shown by the increased area of intermediary fibers in the NADH (groups IV, V, and VI) and SDH (group V) reactions. The same metabolic pattern was observed among the groups in both reactions. Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) zymography detected only the MMP-2 expression/activity for the untreated-control group (group I). The exposure to LLLT increased the activity of MPP-2 in group VI and the activity of MMP-9 in all groups exposed to different energy densities of laser irradiation (groups II, III, IV, V, and VI). CONCLUSIONS: Thus, LLLT stimulated the oxidative metabolism and the expression of matrix metalloproteinase (MMPs) of the masseter muscle, which may indicate a matrix remodeling process. However, group VI did not show the best results for oxidative metabolism, probably indicating that the dosage they were given was high for this protocol. NAD;Succinate Dehydrogenase Analysis of Variance;Animals;Cell Respiration;Electrophoresis, Polyacrylamide Gel;Low-Level Light Therapy;Male;Masseter Muscle;NAD;Photomicrography;Random Allocation;Rats;Rats, Wistar;Succinate Dehydrogenase

A preliminary study of hardness and modulus of elasticity in sheep mandibles submitted to distraction osteogenesis and low-level laser therapy. OBJECTIVES: To investigate the quality of newly formed bone in sheep mandibles submitted to distraction osteogenesis and low-level laser therapy (LLLT), based on hardness and modulus of elasticity values. The ideal moment for laser application (during the latency/activation period vs. during the bone consolidation period) was also evaluated. Computed tomography imaging was used to assess relapse as a result of early device removal. STUDY DESIGN: Extraoral distraction devices were placed in five sheep so as to achieve 1.5 cm of lengthened bone in 60 days. Distraction devices were removed 50, 40, and 33 days after surgery. Four animals were treated with LLLT, at different times, and one was used as control (no LLLT). RESULTS: When applied during the bone consolidation period, LLLT caused an increase in hardness and modulus of elasticity values. On the other hand, animals irradiated with LLLT during the latency/activation period presented a delay in bone healing. A period of consolidation of 13 days (early device removal) was associated with relapse. CONCLUSIONS: Nanoindentation tests were able to detect slight abnormalities in bone metabolism and proved to be important tools for the assessment of bone quality following distraction osteogenesis. LLLT provided increased benefits when applied during the

bone consolidation period, once it promoted an increase in hardness and modulus of elasticity values. According to our results, the bone consolidation period should be of at least 3 weeks, so as to prevent relapse. Animals;Elastic Modulus;Female;Hardness Tests;Low-Level Light Therapy;Mandible;Osteogenesis, Distraction;Sheep, Domestic

Quality appraisal of clinical practice guidelines on the use of physiotherapy in rheumatoid arthritis: a systematic review. OBJECTIVE: To assess the quality of guidelines published in peer-reviewed literature concerning the role of physiotherapy in the management of patients with RA. METHODS: A systematic literature search for clinical practice guidelines that included physiotherapy interventions was performed in four electronic databases. We assessed the quality of the selected guidelines using the appraisal of guidelines for research and evaluation (AGREE) instrument. In addition, the recommendations of guidelines with the highest quality scores were summarized. RESULTS: Eight clinical practice guidelines fulfilled the inclusion criteria. Scope/purpose was the most often adequately addressed AGREE domain (in seven of the eight guidelines) and applicability the least (in two of the eight guidelines). Based on the AGREE domain scores, six guidelines could be recommended or strongly recommended for clinical use. Five out of these six (strongly) recommended guidelines included a recommendation on exercise therapy and/or patient education, with these interventions being recommended in every case. Transcutaneous electrical nerve stimulation and thermotherapy were recommended in four of these six guidelines. US, thermotherapy, low-level laser therapy, massage, passive mobilization and balneotherapy were addressed in one or two of these six guidelines. CONCLUSION: Six of eight clinical practice guidelines addressing physiotherapy interventions were recommended or strongly recommended according to the AGREE instrument. In general, guideline recommendations on physiotherapy intervention, from both the recommended guidelines as well as from the not recommended guidelines, lacked detail concerning mode of delivery, intensity, frequency and duration. Arthritis, Rheumatoid;Databases, Bibliographic;Exercise Therapy;Humans;Patient Education as Topic;Physical Therapy Modalities;Practice Guidelines as Topic;Quality of Health Care

Prevention of toothbrushing abrasion of acid-softened enamel by CO(2) laser irradiation. OBJECTIVE: The aim of the present study was to evaluate the effect of CO(2) laser irradiation (10.6Î¼m) at 0.3J/cm(2) (0.5Î¼s; 226Hz) on the resistance of softened enamel to toothbrushing abrasion, in vitro. METHODS: Sixty human enamel samples were obtained, polished with silicon carbide papers and randomly divided into five groups (n=12), receiving 5 different surface treatments: laser irradiation (L), fluoride (AmF/NaF gel) application (F), laser prior to fluoride (LF), fluoride prior to laser (FL), non-treated control (C). After surface treatment they were submitted to a 25-day erosive-abrasive cycle in 100ml sprite light (90s) and brushed twice daily with an electric toothbrush. Between the demineralization periods samples were immersed in supersaturated mineral solution. At the end of the experiments enamel surface loss was determined using a contact profilometer and morphological analysis was performed using scanning electron microscopy (SEM). For SEM analysis of demineralization pattern, cross-sectional cuts of cycled samples were prepared. The data were statistically analysed by one-way ANOVA model with subsequent pairwise comparison of treatments. RESULTS: Abrasive surface loss was significantly lower in all laser groups compared to both control and fluoride groups ($p<0.0001$ in all cases). Amongst the laser groups no significant difference was observed. Softened enamel layer underneath lesions was less pronounced in laser-irradiated samples. CONCLUSION: Irradiation of dental enamel with a CO(2) laser at 0.3J/cm(2) (5Î¼s, 226Hz) either alone or in combination with amine fluoride gel significantly decreases toothbrushing abrasion of softened-enamel, in vitro. Cariostatic Agents;Diamines;Citric Acid;Olaflur;Sodium Fluoride;Durapatite;Fluorides Cariostatic Agents;Citric Acid;Dental Enamel;Dental Enamel Solubility;Diamines;Durapatite;Fluorides;Humans;Lasers, Gas;Low-Level Light Therapy;Microscopy,

Electron, Scanning;Radiation Dosage;Sodium Fluoride;Time Factors;Tooth Abrasion;Tooth Erosion;Tooth Remineralization;Toothbrushing

Low-level laser therapy (LLLT) in human progressive-intensity running: effects on exercise performance, skeletal muscle status, and oxidative stress. The aim of this work was to evaluate the effects of low-level laser therapy (LLLT) on exercise performance, oxidative stress, and muscle status in humans. A randomized double-blind placebo-controlled crossover trial was performed with 22 untrained male volunteers. LLLT (810 nm, 200 mW, 30 J in each site, 30 s of irradiation in each site) using a multi-diode cluster (with five spots - 6 J from each spot) at 12 sites of each lower limb (six in quadriceps, four in hamstrings, and two in gastrocnemius) was performed 5 min before a standardized progressive-intensity running protocol on a motor-drive treadmill until exhaustion. We analyzed exercise performance (VO(2 max), time to exhaustion, aerobic threshold and anaerobic threshold), levels of oxidative damage to lipids and proteins, the activities of the antioxidant enzymes superoxide dismutase (SOD) and catalase (CAT), and the markers of muscle damage creatine kinase (CK) and lactate dehydrogenase (LDH). Compared to placebo, active LLLT significantly increased exercise performance (VO(2 max) $p = 0.01$; time to exhaustion, $p = 0.04$) without changing the aerobic and anaerobic thresholds. LLLT also decreased post-exercise lipid ($p = 0.0001$) and protein ($p = 0.0230$) damages, as well as the activities of SOD ($p = 0.0034$), CK ($p = 0.0001$) and LDH ($p = 0.0001$) enzymes. LLLT application was not able to modulate CAT activity. The use of LLLT before progressive-intensity running exercise increases exercise performance, decreases exercise-induced oxidative stress and muscle damage, suggesting that the modulation of the redox system by LLLT could be related to the delay in skeletal muscle fatigue observed after the use of LLLT. Thiobarbituric Acid Reactive Substances;L-Lactate Dehydrogenase;Catalase;Superoxide Dismutase;Creatine Kinase, MM Form Adult;Catalase;Creatine Kinase, MM Form;Cross-Over Studies;Double-Blind Method;Exercise;Exercise Test;Humans;L-Lactate Dehydrogenase;Low-Level Light Therapy;Male;Muscle, Skeletal;Oxidative Stress;Running;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances;Young Adult

Effect of 980-nm GaAlAs diode laser irradiation on healing of extraction sockets in streptozotocin-induced diabetic rats: a pilot study. Low-level laser irradiation can promote the healing process in soft and hard tissue but the precise mechanisms are unclear. In this study, we examined the effect of LLLT (low-level laser therapy) on the healing of extraction sockets in diabetic and healthy rats. Forty-eight Sprague-Dawley rats were divided into normal ($n = 24$) and diabetic ($n = 24$) rats, and streptozotocin (STZ) injection was used to induce diabetes in the latter. The left and right maxillary first molars of all the rats were extracted. In the non-diabetic rats, the left extraction sockets were not irradiated (group 1) and the right ones were irradiated daily for 3, 5, 7, and 14 days after extraction with a galium-aluminum-arsenide (GaAlAs) diode laser (group 2), and in the diabetic rats, similarly the left ones were not irradiated (group 3) and the right ones were irradiated (group 4). Specimens acquired at these intervals were examined by hematoxylin and eosin (H&E) staining and reverse transcription polymerase chain reaction (RT-PCR). Histological observations and gene expression analyses revealed that groups 2 (normal rats with LLLT) and 4 (diabetic rats with LLLT) showed faster initial healing and more new alveolar bone formation than group 1 (normal rats without LLLT) and group 3 (diabetic rats without LLLT), respectively. We conclude that 980-nm GaAlAs low-intensity diode laser irradiation is beneficial for the initial stages of alveolar bone healing and for further calcification in both diabetic and normal rats when applied every day at a dose of 13.95 J/cm(2) for 60 s. Collagen Type I;Core Binding Factor Alpha 1 Subunit;Runx2 protein, rat;Osteocalcin;Streptozocin;Aluminum Aluminum;Animals;Collagen Type I;Core Binding Factor Alpha 1 Subunit;Diabetes Mellitus, Experimental;Dose-Response Relationship, Radiation;Galium;Gene

Expression;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar;Osteocalcin;Pilot Projects;Rats;Rats, Sprague-Dawley;Streptozocin;Tooth Extraction;Tooth Socket;Wound Healing

Stability of dental implants after irradiation with an 830-nm low-level laser: a double-blind randomized clinical study. Little is known about the benefits of low-level laser therapy (LLLT) on improvement of stability of dental implants. The aim of this randomized clinical study was to assess the LLLT effect on implants stability by means of resonance frequency analysis (RFA). Thirty implants were distributed bilaterally in the posterior mandible of eight patients. At the experimental side, the implants were submitted to LLLT (830 nm, 86 mW, 92.1 J/cm(2), 0.25 J, 3 s/point, at 20 points), and on the control side, the irradiation was simulated (placebo). The first irradiation was performed in the immediate postoperative period, and it was repeated every 48 h in the first 14 days. The initial implant stability quotient (ISQ) of the implants was measured by means of RFA. New ISQ measurements were made after 10 days, 3, 6, 9, and 12 weeks. The initial ISQ values ranged from 65-84, with a mean of 76, undergoing a significant drop in stability from the 10th day to the 6th week in the irradiated group, and presenting a gradual increase from the 6th to the 12th week. The highest ISQ values were observed on the 10th day in the irradiated group, and the lowest in the 6th week in both groups. Under the conditions of this study, no evidence was found of any effect of LLLT on the stability of the implants when measured by RFA. Since high primary stability and good bone quality are of major relevancy for a rigid bone-implant interface, additional LLLT may have little impact macroscopically. Dental Implants Adult;Dental Implantation, Endosseous;Dental Implants;Dental Stress Analysis;Denture Retention;Double-Blind Method;Female;Follow-Up Studies;Humans;Intention to Treat Analysis;Low-Level Light Therapy;Male;Mandible;Materials Testing;Middle Aged;Osseointegration;Young Adult

In vitro evaluation of chloroaluminum phthalocyanine nanoemulsion and low-level laser therapy on human skin dermal equivalents and bone marrow mesenchymal stem cells. Nanotechnology and tissue engineering are promising scientific fields in the development of advanced materials useful to human health. This article describes the preparation of a nanocarrier for the controlled release of a photosensitizer compound associated with low-level light therapy for skin wound healing treatment and applicable to other skin diseases. A biological model was used as an in vitro skin equivalent based on a three-dimensional culture of fibroblasts and mesenchymal stem cells and denominated by dermal equivalent (DE). Results show that it is possible to use the photomodulation process to control the wound healing in a scratching process and to induce the biomolecules release, both of which are related with the inflammatory wound healing process. In the studies, the MMP-2 and MMP-9 expression from zymography analyses were evaluated. All results showed a dependence on enzymatic activity relating to lowlevel laser applications which indicates a potential application in wound healing processes based on phototherapy and nanotechnology. Emulsions;Indoles;Organometallic Compounds;Photosensitizing Agents;chloroaluminum phthalocyanine;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9 Bone Marrow Cells;Coculture Techniques;Emulsions;Fibroblasts;Humans;Indoles;Low-Level Light Therapy;Matrix Metalloproteinase 2;Matrix Metalloproteinase 9;Mesenchymal Stem Cells;Nanotechnology;Organometallic Compounds;Photochemotherapy;Photosensitizing Agents;Skin;Wound Healing

Laugier-Hunziker syndrome. Diagnosis, Differential;Female;Humans;Low-Level Light Therapy;Mouth Mucosa;Pigmentation Disorders;Syndrome;Young Adult

Amelioration of oral mucositis pain by NASA near-infrared light-emitting diodes in bone marrow transplant patients. PURPOSE: This study seeks to investigate the use of extra-orally applied near-infrared phototherapy for the reduction of oral pain secondary to chemotherapy- and radiation therapy-induced mucositis in adult and pediatric hematopoietic stem cell transplant (HSCT) patients.

METHODS: Eighty HSCT patients were divided into regular (R) and low (L) risk groups, then to experimental (E) and placebo (P) groups, resulting in four groups (ER, EL, PR, PL). Experimental subjects received 670 (Â± 10) nm gallium-aluminum-arsinide light-emitting diode device for 80 s at ~50 mW/cm(2) energy density and power exposure of 4 J/cm(2). Placebo patients received the same procedures, but with a placebo phototherapy (identical device but <5 mW/cm(2) energy density). Patients received their respective light therapy once per day starting on the day of the HSCT (day 0) and continued through day +14. Blinded evaluators examined the patients three times per week and scored their oral tissues and patient-reported pain assessments at each evaluation utilizing the WHO, NCI-CTCAE, and OMAS scales. RESULTS: Analysis of the mean scores at each observation demonstrate that the extra-oral application of phototherapy resulted in a significant reduction in patient-reported pain between the ER and PR patients ($p < 0.05$) at day +14 when graded via the WHO criteria. The ER and EL patients were improved in almost all other categories and assessment scales, but the differences were not statistically significant. CONCLUSION: Phototherapy demonstrated a significant reduction in patient-reported pain as measured by the WHO criteria in this patient population included in this study. Improvement trends were noted in most other assessment measurements. Antineoplastic Agents Adolescent;Adult;Aged;Antineoplastic Agents;Child;Child, Preschool;Double-Blind Method;Female;Hematopoietic Stem Cell Transplantation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Neoplasms;Pain;Pain Management;Pain Measurement;Radiation Injuries;Risk Factors;Stomatitis;Treatment Outcome;Young Adult

[Laser treatment of trophic venous leg ulcers]. Humans;Lasers, Gas;Low-Level Light Therapy;Treatment Outcome;Varicose Ulcer

Selective ex-vivo photothermal ablation of human pancreatic cancer with albumin functionalized multiwalled carbon nanotubes. The process of laser-mediated ablation of cancer cells marked with biofunctionalized carbon nanotubes is frequently called "nanophotothermolysis". We herein present a method of selective nanophotothermolisys of pancreatic cancer (PC) using multiwalled carbon nanotubes (MWCNTs) functionalized with human serum albumin (HSA). With the purpose of testing the therapeutic value of these nanobioconjugates, we have developed an ex-vivo experimental platform. Surgically resected specimens from patients with PC were preserved in a cold medium and kept alive via intra-arterial perfusion. Additionally, the HSA-MWCNTs have been intra-arterially administered in the greater pancreatic artery under ultrasound guidance. Confocal and transmission electron microscopy combined with immunohistochemical staining have confirmed the selective accumulation of HSA-MWCNTs inside the human PC tissue. The external laser irradiation of the specimen has significantly produced extensive necrosis of the malign tissue after the intra-arterial administration of HSA-MWCNTs, without any harmful effects on the surrounding healthy parenchyma. We have obtained a selective photothermal ablation of the malign tissue based on the selective internalization of MWCNTs with HSA cargo inside the pancreatic adenocarcinoma after the ex-vivo intra-arterial perfusion. Nanotubes, Carbon;Serum Albumin;Fluorescein-5-isothiocyanate Ablation Techniques;Area Under Curve;Cell Line, Tumor;Drug Delivery Systems;Fluorescein-5-isothiocyanate;Heat-Shock Response;Histocytochemistry;Humans;Low-Level Light Therapy;Microscopy, Confocal;Nanotubes, Carbon;Necrosis;Pancreatic Neoplasms;Serum Albumin;Spectroscopy, Fourier Transform Infrared;Statistics, Nonparametric;Temperature

Influence of laser phototherapy (Î»660 nm) on the outcome of oral chemical carcinogenesis on the hamster cheek pouch model: histological study. PURPOSE: This study aimed to evaluate, histologically, the effect of low-level laser therapy (LLLT) (Î»660 nm) on DMBA chemically induced lesions of the oral mucosa of hamsters. BACKGROUND DATA: Squamous cell carcinoma (SCC) is the most common neoplasm of the oral cavity. It is aggressive, highly proliferative, invasive, and metastatic. There is evidence that LLLT similarly affects neoplasic and non-neoplasic cells. METHODS:

Cancerous lesions were induced on the cheek pouch of 15 golden Syrian hamsters by using DMBA 3 times a week for 8 weeks. At the end of the cancer induction (8 weeks), animals in G1 were killed and the presence of tumors confirmed. Animals in G3 were irradiated (Î»660 nm, 30 mW, CW, Ã˜=3 mm, area: 0.07 cm(2), 424 mW/cm(2), 133 sec, 56.4(2)J/ cm(2), 4J) at every other day for 4 weeks. G2 received no interventions for the same period. Samples were taken and underwent histological analysis by light microscopy. RESULTS: GI showed 100% well-differentiated SCC. G2 showed 20% moderately differentiated and 80% well-differentiated SCC. G3 showed 40% well-differentiated, 40% poorly differentiated, and 20% moderately differentiated SCC. Significant differences (p=0.02) in the amount of well-differentiated SCC were seen between G1 and G3 and between G3 and G2 (p=0.04). Significant difference was also seen between G3 and G1 and G2 with regard to the amount of poorly differentiated tumors (p=0.04). CONCLUSIONS: It is concluded that LLLT, within the parameters used in the present study, caused a significant progression of the severity of SCC in the oral cavity of hamsters. 9,10-Dimethyl-1,2-benzanthracene 9,10-Dimethyl-1,2-benzanthracene;Animals;Carcinoma, Squamous Cell;Cheek;Cricetinae;Disease Progression;Head and Neck Neoplasms;Low-Level Light Therapy;Male;Mesocricetus;Mouth Mucosa;Mouth Neoplasms;Squamous Cell Carcinoma of Head and Neck

Cytomorphological changes in buccal mucosa of patients treated with low-level 1,064-nm laser radiation. The aim of this study was to examine the cytomorphological changes occurring in the buccal mucosa in patients treated with low-level 1,064-nm laser radiation. Seventeen individuals (12 males, five females) 18-24 years of age were included in the study. Low-level 1,064-nm laser radiation was applied to the right buccal mucosa near the premolar region; this therapy was repeated for 10 days. Buccal epithelial cells were collected from the right and left premolar regions of the individuals with a brush before and after therapy. The specimens collected from the left side were measured cytomorphometrically and used for the control group. Student's t test was used for statistical comparison of the values of the buccal epithelial cells collected from individuals; a p value < 0.05 was considered statistically significant. None of the patients showed any adverse reactions to the low-level 1,064-nm laser radiation therapy during application. There was no cytogenetic damage to the therapied or non-therapied regions in the buccal mucosa cells, as determined cytomorphologically. The results suggest that low-level 1,064-nm laser radiation therapy has no genotoxic potential. Within the limitations of this study, it can be concluded that low-level 1,064-nm laser radiation therapy may be used safely in dental treatments. Adolescent;Bicuspid;Dose-Response Relationship, Radiation;Epithelial Cells;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Mouth Mucosa;Young Adult

The effect of low-energy laser irradiation on apoptotic factors following experimentally induced transient cerebral ischemia. Apoptosis, or programmed cell death, resulting from cerebral ischemia may be related to decreased levels of anti-apoptotic factors, such as serine/threonine kinase (Akt), phosphorylated Akt (pAkt), pBAD, and Bcl-2, and increased levels of pro-apoptotic factors, such as BAD, caspase 9, and caspase 3 activities. In this study, we investigated the effects of low-energy laser (660 nm) irradiation (LLI) on the levels and activity of various anti- and pro-apoptotic factors following ischemia. Transient cerebral ischemia was induced in Sprague-Dawley rats by unilateral occlusion of the middle cerebral artery for 1 h, followed by reperfusion. LLI was then directed on the cerebrum for varying lengths of duration (1, 5, or 10 min at an energy density of 2.64 J/cmÂ², 13.2 J/cmÂ², and 24.6 J/cmÂ², respectively). The expression levels of Akt, pAkt, BAD, pBAD, Bcl-2, caspase 9, and caspase 3 activities were measured 4 days after injury. The levels of Akt, pAkt, Bcl-2, and pBAD were significantly increased following laser irradiation. In addition, LLI significantly decreased caspase 9 and caspase 3 activities caused by ischemia-reperfusion. LLI may protect the brain by upregulating Akt, pAkt, pBAD, and Bcl-2 expression and downregulating caspase 9 and caspase 3 expression

following transient cerebral ischemia. This modality is a promising protective therapeutic intervention after strokes or other ischemic events. Proto-Oncogene Proteins c-bcl-2;bcl-Associated Death Protein;Proto-Oncogene Proteins c-akt;Caspase 3 Animals;Apoptosis;Caspase 3;Ischemic Attack, Transient;Low-Level Light Therapy;Male;Phosphorylation;Pilot Projects;Proto-Oncogene Proteins c-akt;Proto-Oncogene Proteins c-bcl-2;Rats;Rats, Sprague-Dawley;bcl-Associated Death Protein

Granuloma faciale treated with 595-nm pulsed dye laser. Facial Dermatoses;Granuloma;Humans;Lasers, Dye;Low-Level Light Therapy

Laser and intense pulsed light therapy for the treatment of hypertrophic scars: a systematic review. Hypertrophic scars are difficult to improve and remain a therapeutic challenge. Several lasers and light sources have been evaluated in the past decades and have been shown to improve hypertrophic scars. However, a systematic review is not available. To assess current evidence of efficacy of all laser and intense pulsed light therapies used in the treatment of hypertrophic scars, we performed a systematic review searching electronic databases MEDLINE, EMBASE and CENTRAL. The quality of the controlled clinical trials was evaluated according to the Cochrane Collaboration's tool for assessing risk of bias. Thirteen articles involving seven different lasers met the inclusion criteria. Most evidence was found for the pulsed dye laser (PDL) 585 nm (eight studies), followed by the PDL 595 nm (two studies), whereas limited evidence (one trial per laser) was available for the fractional nonablative laser 1540 nm, COâ,, laser 10,600 nm, low-level laser therapy, Nd:YAG laser 532 nm and Erbium:YAG laser 2940 nm. Treatment recommendations should be formulated with caution as current evidence is insufficient for comparing the efficacy of different laser therapies. The PDL 585 nm showed a low efficacy for the treatment of hypertrophic scars. With moderate efficacy, the PDL 595 nm is promising, although more research is necessary. Little evidence was found for the efficacy of other lasers. Future research, with a low risk of bias, well-defined scar characteristics, validated outcome measures, standardized measurement methods, follow-up periods of at least 6 months and well-defined laser settings, is needed. Adult;Cicatrix, Hypertrophic;Clinical Trials as Topic;Female;Humans;Laser Therapy;Male;Middle Aged;Phototherapy;Publication Bias

Tennis elbow. INTRODUCTION: Lateral pain in the elbow affects up to 3% of the population, and is considered an overload injury of the extensor tendons of the forearm where they attach at the lateral epicondyle. Although usually self-limiting, symptoms may persist for over 1 year in up to 20% of people. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical question: What are the effects of treatments for tennis elbow? We searched: Medline, Embase, The Cochrane Library, and other important databases up to November 2009 (Clinical Evidence reviews are updated periodically, please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 80 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review we present information relating to the effectiveness and safety of the following interventions: acupuncture, autologous whole blood injections, corticosteroid injections, combination physical therapies, exercise, extracorporeal shock wave therapy, iontophoresis, low-level laser therapy, manipulation, non-steroidal anti-inflammatory drugs (oral and topical), orthoses (bracing), platelet-rich plasma injections, pulsed electromagnetic field treatment, surgery, and ultrasound. High-Energy Shock Waves;Humans;Low-Level Light Therapy;Physical Therapy Modalities;Platelet-Rich Plasma;Tennis Elbow;Treatment Outcome

Long-pulse neodymium-doped yttrium aluminum garnet laser treatment improves amiodarone-induced hyperpigmentation. Anti-Arrhythmia Agents;Amiodarone

Aged;Amiodarone;Anti-Arrhythmia Agents;Face;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy;Male
Successful treatment of recurrent digital mucoid cysts using a 1,444-nm neodymium-doped yttrium aluminum garnet laser. Aged;Female;Finger Joint;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Recurrence;Synovial Cyst
Exploring the role of a nonablative laser (1320 nm cooltouch laser) in skin photorejuvenation. BACKGROUND: Nonablative laser has been used for the treatment and prevention of skin aging for many years. Although the mechanism has not been elucidated, histological evaluation showed that the dermal fibroblasts and its collagen production should be the main target for this rejuvenation. In order to determine the effects of a 1320 nm nonablative laser on the human dermal fibroblasts, the two main secretion factors, basic fibroblast growth factor (bFGF) and transforming growth factor Î²1(TGF-Î²1), in vitro were detected. METHODS: The human dermal fibroblasts were cultured and irradiated with a 1320 nm laser at the dose of 15, 20, and 24 J/cm(2) respectively. The number of fibroblasts was counted and the levels of bFGF and TGF-Î²1 were detected by enzyme-linked immunosorbent assay at the time points of 0, 24, 48, and 72 h after irradiation. RESULTS: The results showed that both the number of fibroblasts and the secretion of bFGF increased after the irradiation at the dose of 20 and 24 J/cm(2) (P<0.05) compared with that of the control cells. The bFGF secretion in the group exposed to 20 J/cm(2) was more significant than that of 24 J/cm(2), and the peak level was 24 h after irradiation. The level of TGF-Î²1 secretion decreased after irradiation in a dose-dependent manner (15 and 20 J/cm(2), both P<0.05; 24 J/cm(2), P<0.01), and reached a nadir at 24 h. CONCLUSION: Our results suggested that the 1320 nm nonablative laser accelerates the vitality of fibroblasts, promotes the secretion of bFGF, and inhibits TGF-Î²1 secretion by fibroblasts. Transforming Growth Factor beta1;Fibroblast Growth Factor 2 Animals;Cell Count;Dermis;Female;Fibroblast Growth Factor 2;Fibroblasts;Foreskin;Humans;Low-Level Light Therapy;Male;Mice;Mice, Inbred Strains;Primary Cell Culture;Rejuvenation;Transforming Growth Factor beta1
No effect of low-level lasers on in vitro myoblast culture. Effects of phototherapy using low-level lasers depend on irradiation parameters and the type of laser used. The aim of the present study was to evaluate the effect of phototherapy on the proliferation of cultured C2C12 myoblasts under different nutritional conditions using low-level GaAlAs and InGaAlP lasers with different parameters and incubation periods. C2C12 cells cultured in regular and nutrient-deficient medium were irradiated with low-level GaAlAs (780 nm) and InGaA1P (660 nm) lasers with energy densities of 3.8, 6.3 and 10 J/cm2, and 3.8, 10 and 17.5 J/cm2, respectively. Cell proliferation was assessed 48 and 72 h after irradiation by MTT assay. There were no significant differences in cell proliferation between laser-treated myoblasts and control cultures for any of the parameters and incubation periods. Further studies are necessary to determine the correct laser parameters for optimizing the biostirhulation of myoblasts. Animals;Cell Line;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Muscle, Skeletal;Myoblasts, Skeletal;Regeneration
Low-intensity infrared laser increases plasma proteins and induces oxidative stress in vitro. Low-intensity laser therapy is based on the excitation of endogenous chromophores in biotissues and free-radical generation could be involved in its biological effects. In this work, the effects of the low-intensity infrared laser on plasma protein content and oxidative stress in blood from Wistar rats were studied. Blood samples from Wistar rats were exposed to low-intensity infrared laser in continuous wave and pulsed-emission modes at different fluencies. Plasma protein content and two oxidative stress markers (thiobarbituric acid-reactive species formation and myeloperoxidase activity) were carried out to assess the effects of laser irradiation on blood samples. Low-intensity infrared laser exposure increases plasma protein content, induces lipid peroxidation, and increases

myeloperoxidase activity in a dose- and frequency-dependent way in blood samples. The low-intensity infrared laser increases plasma protein content and oxidative stress in blood samples, suggesting that laser therapy protocols should take into account fluencies, frequencies, and wavelengths of the laser before beginning treatment. Blood Proteins;Thiobarbituric Acid Reactive Substances;Peroxidase Animals;Blood;Blood Proteins;Dose-Response Relationship, Radiation;In Vitro Techniques;Low-Level Light Therapy;Male;Oxidative Stress;Peroxidase;Rats;Rats, Wistar;Thiobarbituric Acid Reactive Substances

Effect of diode laser on proliferation and differentiation of PC12 cells. This study investigated the effects of diode (GaAlAs) laser irradiation at an effective energy density of 5 or 20 J/cm(2) on cell growth factor-induced differentiation and proliferation in pheochromocytoma cells (PC12 cells), and whether those effects were related to activation of the p38 pathway. Laser irradiation at 20 J/cm(2) significantly decreased the number of PC12 cells, while no difference was seen between the 5 J/cm(2) group and the control group ($p<0.05$). Western blotting revealed marked expression of neurofilament and Î²-tubulin, indicating greater neurite differentiation in the irradiation groups than in the control group at 48 hr. Irradiation also enhanced expression of phospho-p38. The decrease in number of cells after laser irradiation was accelerated by p38 inhibitor, while neurite differentiation was up-regulated by laser irradiation, even when the p38 pathway was blocked. This suggests that laser irradiation up-regulated neurite differentiation in PC12 cells involving p38 and another pathway. Neurofilament Proteins;Tubulin;Nerve Growth Factor;p38 Mitogen-Activated Protein Kinases Animals;Cell Differentiation;Cell Proliferation;Lasers, Semiconductor;Low-Level Light Therapy;MAP Kinase Signaling System;Nerve Growth Factor;Nerve Regeneration;Neurites;Neurofilament Proteins;PC12 Cells;Rats;Tubulin;Up-Regulation;p38 Mitogen-Activated Protein Kinases

Inhibitory effects of visible 650-nm and infrared 808-nm laser irradiation on somatosensory and compound muscle action potentials in rat sciatic nerve: implications for laser-induced analgesia. Low-level laser therapy (LLLT) has been shown in clinical trials to relieve chronic pain and the World Health Organization has added LLLT to their guidelines for treatment of chronic neck pain. The mechanisms for the pain-relieving effects of LLLT are however poorly understood. We therefore assessed the effects of laser irradiation (LI) on somatosensory-evoked potentials (SSEPs) and compound muscle action potentials (CMAPs) in a series of experiments using visible (Î» = 650 nm) or infrared (Î» = 808 nm) LI applied transcutaneously to points on the hind limbs of rats overlying the course of the sciatic nerve. This approximates the clinical application of LLLT. The 650-nm LI decreased SSEP amplitudes and increased latency after 20 min. CMAP proximal amplitudes and hip/ankle (H/A) ratios decreased at 10 and 20 min with increases in proximal latencies approaching significance. The 808-nm LI decreased SSEP amplitudes and increased latencies at 10 and 20 min. CMAP proximal amplitudes and H/A ratios decreased at 10 and 20 min. Latencies were not significantly increased. All LI changes for both wavelengths returned to baseline by 48 h. These results strengthen the hypothesis that a neural mechanism underlies the clinical effectiveness of LLLT for painful conditions. Action Potentials;Analgesia;Animals;Evoked Potentials, Motor;Evoked Potentials, Somatosensory;Infrared Rays;Lasers;Light;Low-Level Light Therapy;Muscles;Rats;Rats, Sprague-Dawley;Sciatic Nerve

Noninvasive brain stimulation in traumatic brain injury. OBJECTIVE: To review novel techniques of noninvasive brain stimulation (NBS), which may have value in assessment and treatment of traumatic brain injury (TBI). METHODS: Review of the following techniques: transcranial magnetic stimulation, transcranial direct current stimulation, low-level laser therapy, and transcranial Doppler sonography. Furthermore, we provide a brief overview of TMS studies to date. MAIN FINDINGS: We describe the rationale for the use of these techniques in TBI, discuss their possible mechanisms of action, and raise a number of considerations relevant to translation of these methods to clinical use.

Depending on the stimulation parameters, NBS may enable suppression of the acute glutamatergic hyperexcitability following TBI and/or counter the excessive GABAergic effects in the subacute stage. In the chronic stage, brain stimulation coupled to rehabilitation may enhance behavioral recovery, learning of new skills, and cortical plasticity. Correlative animal models and comprehensive safety trials seem critical to establish the use of these modalities in TBI. CONCLUSIONS: Different forms of NBS techniques harbor the promise of diagnostic and therapeutic utility, particularly to guide processes of cortical reorganization and enable functional restoration in TBI. Future lines of safety research and well-designed clinical trials in TBI are warranted to determine the capability of NBS to promote recovery and minimize disability. Neurotransmitter Agents Animals;Brain;Brain Injuries;Brain Injury, Chronic;Brain Mapping;Cerebral Cortex;Combined Modality Therapy;Disease Models, Animal;Electric Stimulation Therapy;Evoked Potentials, Motor;Humans;Magnetic Resonance Imaging;Nerve Regeneration;Neuronal Plasticity;Neurotransmitter Agents;Prognosis;Randomized Controlled Trials as Topic;Thrombolytic Therapy;Transcranial Magnetic Stimulation;Translational Research, Biomedical;Ultrasonography, Doppler, Transcranial

Clinical and microbiological effects of photodynamic therapy associated with nonsurgical periodontal treatment. A 6-month follow-up. Experimental studies in animals and in vitro have shown the usefulness of photodynamic therapy (PDT) as an adjunct to periodontal treatment. The aim of this study was to evaluate the long-term clinical and microbiological effects of PDT associated with nonsurgical periodontal treatment. Three sites in each of 33 patients with chronic periodontitis were randomly allocated in a split-mouth design to a treatment group: (1) scaling and root planing (SRP group); (2) SRP and irrigation with toluidine blue O (TBO group); and (3) SRP, irrigation with TBO and low-level laser irradiation (PDT group). Clinical parameters including visible plaque index, bleeding gingival index, bleeding on probing, probing depth, gingival recession and clinical attachment level were measured at baseline, and after 60, 90 and 180 days. Additionally, subgingival plaque samples were collected for microbiological analysis by PCR. Intergroup and intragroup statistical analyses were performed. All treatment groups showed an improvement in all clinical parameters, and a significant reduction in the proportion of sites positive for periodontopathogens at 60, 90 and 180 days compared to baseline ($p < 0.05$). None of the periodontal parameters showed a significant difference among the groups ($p > 0.05$). At 180 days, PDT treatment led to a significant reduction in the percentage of sites positive for all bacteria compared to SRP alone ($p < 0.05$). Within the limits of this study it may be concluded that PDT as an adjunct to periodontal treatment produced statistically significant reductions in some of the key periodontal pathogens but produced no statistically significant benefit in terms of clinical outcome. Adult;Combined Modality Therapy;Dental Plaque;Dental Plaque Index;Dental Scaling;Female;Follow-Up Studies;Humans;Male;Middle Aged;Periodontal Pocket;Photochemotherapy;Root Planing;Treatment Outcome

Dual Effect of low-level laser therapy (LLLT) on the acute lung inflammation induced by intestinal ischemia and reperfusion: Action on anti- and pro-inflammatory cytokines. BACKGROUND AND OBJECTIVE: It is unknown if pro- and anti-inflammatory mediators in acute lung inflammation induced by intestinal ischemia and reperfusion (i-I/R) can be modulated by low-level laser therapy (LLLT). STUDY DESIGN/MATERIAL AND METHODS: A controlled ex vivo study was developed in which rats were irradiated (660â€‰nm, 30â€‰mW, 0.08â€‰cmÂ² of spot size) on the skin over the right upper bronchus 1â€‰hour post-mesenteric artery occlusion and euthanized 4â€‰hours later. For pretreatment with anti-tumor necrosis factor (TNF) or IL-10 antibodies, the rats received either one of the agents 15â€‰minutes before the beginning of reperfusion. METHODS: Lung edema was measured by the Evans blue extravasation and pulmonary neutrophils influx was determined by myeloperoxidase (MPO) activity. Both TNF and IL-10 expression and protein in lung were evaluated by RT-PCR and ELISA, respectively. RESULTS: LLLT reduced the edema

(80.1â€‰Â±â€‰41.8â€‰Âµgâ€‰gâ•»Â¹ â€‰dry weight), neutrophils influx (0.83â€‰Â±â€‰0.02â€‰Ã—â€‰10â•¶ â€‰cellsâ€‰mlâ•»Â¹), MPO activity (2.91â€‰Â±â€‰0.60), and TNF (153.0â€‰Â±â€‰21.0â€‰pgâ€‰mgâ•»Â¹ â€‰tissue) in lung when compared with respective control groups. Surprisingly, the LLLT increased the IL-10 (0.65â€‰Â±â€‰0.13) in lung from animals subjected to i-I/R. Moreover, LLLT (0.32â€‰Â±â€‰0.07â€‰pgâ€‰mlâ•»Â¹) reduced the TNF-Î± level in RPAECs when compared with i-I/R group. The presence of anti-TNF or IL-10 antibodies did not alter the LLLT effect on IL-10 (465.1â€‰Â±â€‰21.0â€‰pgâ€‰mgâ•»Â¹ â€‰tissue) or TNF (223.5â€‰Â±â€‰21.0â€‰pgâ€‰mgâ•»Â¹ tissue) in lung from animals submitted to i-I/R. CONCLUSION: The results indicate that the LLLT attenuates the i-I/R-induced acute lung inflammation which favor the IL-10 production and reduce TNF generation. Tumor Necrosis Factor-alpha;Interleukin-10;Peroxidase Acute Disease;Animals;Edema;Interleukin-10;Intestines;Ischemia;Lasers, Semiconductor;Low-Level Light Therapy;Lung;Male;Neutrophils;Peroxidase;Pneumonia;Random Allocation;Rats;Rats, Wistar;Reperfusion;Tumor Necrosis Factor-alpha

Induction of autologous mesenchymal stem cells in the bone marrow by low-level laser therapy has profound beneficial effects on the infarcted rat heart. BACKGROUND AND OBJECTIVES: The adult mammalian heart is known to have a very limited regenerative capacity following acute ischemia. In this study we investigated the hypothesis that photobiostimulation of autologous bone-marrow-derived mesenchymal stem cells (MSCs) by low-level laser therapy (LLLT) applied to the bone marrow (BM), may migrate to the infarcted area and thus attenuate the scarring processes following myocardial infarction (MI). MATERIALS AND METHODS: Sprague-Dawley rats underwent experimental MI. LLLT (Ga-Al-As diode laser, power density 10â€‰mW/cmÂ², for 100â€‰seconds) was then applied to the BM of the exposed tibia at different time intervals post-MI (20â€‰minutes and 4â€‰hours). Sham-operated infarcted rats served as control. RESULTS: Infarct size and ventricular dilatation were significantly reduced (76% and 75%, respectively) in the laser-treated rats 20â€‰minutes post-MI as compared to the control-non-treated rats at 3 weeks post-MI. There was also a significant 25-fold increase in cell density of c-kit+ cells in the infarcted area of the laser-treated rats (20â€‰minutes post-MI) as compared to the non-laser-treated controls. CONCLUSION: The application of LLLT to autologous BM of rats post-MI offers a novel approach to induce BM-derived MSCs, which are consequently recruited from the circulation to the infarcted heart and markedly attenuate the scarring process post-MI. Animals;Bone Marrow;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mesenchymal Stem Cells;Myocardial Infarction;Myocardium;Rats;Rats, Sprague-Dawley;Tibia

Efficacy of excimer light therapy (308â€fnm) for palmoplantar pustulosis with the induction of circulating regulatory T cells. In this open-label study, we investigated the efficacy of excimer light (308â€fnm) with a filter to cut off wavelengths below 297â€fnm for the treatment of palmoplantar pustulosis (PPP). Twenty patients with PPP were recruited and treated once a week for a total of 30 sessions. Patient response was assessed every 10 sessions based on the Palmoplantar Pustulosis Area and Severity Index (PPPASI) score. Levels of Th17 cells and regulatory T cells (Treg) in the peripheral blood in patients with PPP were also evaluated. Mean PPPASI score was 19.5 at baseline, 13.2 at 10 treatments, 10.9 at 20 treatments and 9.5 at 30 treatments. Th17 levels after excimer therapy were not significantly different from those at baseline. In contrast, Treg levels after excimer therapy were significantly higher than those at baseline.
Adult;Aged;Female;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Psoriasis;T-Lymphocytes, Regulatory;Th17 Cells;Ultraviolet Therapy

Different power settings of LLLT on the repair of the calcaneal tendon. OBJECTIVE: The purpose of this study was to evaluate the effect of an 830-nm GaAlAs diode laser operating at output powers of 40, 60, 80, and 100 mW and energy density of 30 J/cm(2) on the repair of partial calcaneal tendon ruptures in rats. METHODS: A partial tendon rupture was induced in all animals, which were treated with laser irradiation for 5 consecutive days. Six days after injury, the injured tendons were removed and examined by polarized light microscopy. Collagen fiber organization was evaluated by birefringence measurements, and collagen content was determined by Picrosirius Red staining. RESULTS: It was observed that the higher the output power (60-100 mW) the greater the amount of type III collagen ($p<0.01$). The amount of type I collagen was significantly greater ($p=0.05$) in the 80 mW group than in the control group (sham stimulation). A non-statistically significant improvement in the realignment of collagen fibers was observed in the irradiated groups. CONCLUSIONS: Low-level laser therapy resulted in significantly greater amounts of type III collagen (output powers of 60 mW or more) and type I collagen (output power of 80 mW), however, no significant differences between groups were found in the realignment of collagen fibers. Collagen Achilles Tendon;Analysis of Variance;Animals;Collagen;Disease Models, Animal;Lasers, Semiconductor;Low-Level Light Therapy;Male;Random Allocation;Rats;Rats, Wistar;Rupture;Tendon Injuries

The effect of photosensitizer drugs and light stimulation on osteoblast growth. OBJECTIVE: A promising new treatment in dentistry involves the photodynamic process, which utilizes a combination of two therapeutic agents, namely a photosensitizer drug and a low dose of visible light. We investigated the in vitro effect of low intensity laser irradiation (visible light irradiation at 670 nm) using doses ranging between 0.5 and 3 J/cm(2), combined with nanoemulsion (NE) of the photosensitizer drug aluminum phthalocyanine chloride (AlClPc), ranging from 0.5 to 5 Î¼mol/L, on the growth and differentiation of osteoblastic cells isolated from rat bone marrow. BACKGROUND DATA: Treatments using laser radiation of low intensity in dentistry are of great interest, especially in bucco-maxillofacial surgery and dental implantology, where this approach is currently employed to stimulate osteogenesis. In the presence of oxygen, the combination of these agents could induce cellular biostimulation, via an efficient noninvasive method. METHODS: We have done the colorimetric MTT assay, collagen content, total protein content, ALP activity and bone-like nodule formation. RESULTS: We observed that an increased number of viable cells was evident upon application of a laser dosage equal to 0.5 J/cm(2) when combined with 0.5 Î¼mol/L of AlClPc/NE, suggesting cellular biostimulation. CONCLUSIONS: It was possible to demonstrate that low intensity laser irradiation can play an important role in promoting biostimulation of osteoblast cell cultures. Therefore, whether biostimulation of osteoblastic cell cultures by photodynamic therapy or the cytotoxic effect of this therapy occurs only depends upon the light dose, and the results can be completely reversed. Emulsions;Indoles;Organometallic Compounds;Photosensitizing Agents;Proteins;chloroaluminum phthalocyanine;Collagen Animals;Bone Marrow Cells;Cell Proliferation;Cells, Cultured;Collagen;Colorimetry;Emulsions;In Vitro Techniques;Indoles;Low-Level Light Therapy;Models, Biological;Organometallic Compounds;Osteoblasts;Photosensitizing Agents;Proteins;Rats

Long-term effect of diode laser irradiation compared to sodium fluoride varnish in the treatment of dentine hypersensitivity in periodontal maintenance patients: a randomized controlled clinical study. OBJECTIVE: The aim of this clinical study was to evaluate and compare the desensitizing effects of a gallium?aluminum?arsenide (GaAlAs) laser and sodium fluoride (NaF) varnish on dentine hypersensitivity (DH) in periodontal maintenance patients. BACKGROUND DATA: The use of lasers opens a new dimension in the treatment of DH. METHODS: Forty-eight patients with 244 teeth affected by DH were included in the trial. To be included in the study, the subjects had to have 4 or more hypersensitive teeth at different quadrants. Selected teeth were randomly assigned to a GaAlAs

laser group, placebo laser group, NaF varnish group, or a placebo NaF varnish group. Laser therapy was performed at 8.5?J/cm(2) energy density. In the placebo laser group, the same laser without laser emission was used. In the NaF varnish group, the varnish was painted at the cervical region of the teeth. In the placebo NaF varnish group, the same treatment procedures were performed with a saline solution. DH was assessed with a visual analog scale (VAS); immediately, at 1 week, and at 1, 3, and 6 months after treatments. Intra-group time-dependent data were analyzed by Friedman's test, and Wilcoxon's rank sum test was used to evaluate the differences within groups. RESULTS: GaAlAs laser and NaF varnish treatments resulted in a significant reduction in the VAS scores immediately after treatments that were maintained throughout the study when compared to the baseline and placebo treatments. In the NaF group, there was a significant increase in the VAS scores at 3 and 6 months compared to at 1 week and 1 month. The placebo treatments showed no significant changes in VAS scores throughout the study period. CONCLUSIONS: Within the limits of the study, GaAlAs laser irradiation was effective in the treatment of DH, and it is a more comfortable and faster procedure than traditional DH treatment. Fluorides, Topical;sodium fluoride topical preparation;Sodium Fluoride Adolescent;Adult;Dentin Sensitivity;Female;Fluorides, Topical;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Sodium Fluoride

Does ultra-pulse CO(2) laser reduce the risk of enamel damage during debonding of ceramic brackets? This study seeks to evaluate the enamel surface characteristics of teeth after debonding of ceramic brackets with or without laser light. Eighty premolars were bonded with either of the chemically retained or the mechanically retained ceramic brackets and later debonded conventionally or through a CO(2) laser (188Â W, 400Â Hz). The laser was applied for 5 s with scanning movement. After debonding, the adhesive remnant index (ARI), the incidence of bracket and enamel fracture, and the lengths, frequency, and directions of enamel cracks were compared among the groups. The increase in intrapulpal temperature was measured in ten extra specimens. The data were analyzed with SPSS software. There was one case of enamel fracture in the chemical retention/conventional debonding group. When brackets were removed with pliers, incidences of bracket fracture were 45% for the chemical retention, and 15% for the mechanical retention brackets. No case of enamel or bracket fracture was seen in the laser-debonded teeth. A significant difference was observed in ARI scores among the groups. Laser debonding caused a significant decrease in the frequency of enamel cracks, compared to conventional debonding. The increase in intrapulpal temperatures was below the benchmark of 5.5 Â°C for all the specimens. Laser-assisted debonding of ceramic brackets could reduce the risk of enamel damage and bracket fracture, and produce the more desirable ARI scores without causing thermal damage to the pulp. However, some augmentations in the length and frequency of enamel cracks should be expected with all debonding methods. Dental Cements Ceramics;Dental Cements;Dental Debonding;Dental Enamel;Dental Stress Analysis;Humans;In Vitro Techniques;Lasers, Gas;Low-Level Light Therapy;Orthodontic Brackets;Risk Factors;Temperature;Tooth Fractures

A systematic review with meta-analysis of the effect of low-level laser therapy (LLLT) in cancer therapy-induced oral mucositis. PURPOSE: The purpose of this study is to review the effects of low-level laser therapy (LLLT) in the prevention and treatment of cancer therapy-induced oral mucositis (OM). METHODS: A systematic review and meta-analysis of randomised placebo-controlled trials of LLLT performed during chemotherapy or radiation therapy in head and neck cancer patients. RESULTS: We found 11 randomised placebo-controlled trials with a total of 415 patients; methodological quality was acceptable at 4.10 (SDâ€‰Â±â€‰0.74) on the 5-point Jadad scale. The relative risk (RR) for developing OM was significantly (pâ€‰=â€‰0.02) reduced after LLLT compared with placebo LLLT (RRâ€‰=â€‰2.03 (95% CI, 1.11 to 3.69)). This preventive effect of LLLT improved to RRâ€‰=â€‰2.72 (95% CI, 1.98 to 3.74) when only trials with adequate doses above 1 J were

included. For treatment of OM ulcers, the number of days with OM grade 2 or worse was significantly reduced after LLLT to 4.38 (95% CI, 3.35 to 5.40) days less than placebo LLLT. Oral mucositis severity was also reduced after LLLT with a standardised mean difference of 1.33 (95% CI, 0.68 to 1.98) over placebo LLLT. All studies registered possible side-effects, but they were not significantly different from placebo LLLT. CONCLUSIONS: There is consistent evidence from small high-quality studies that red and infrared LLLT can partly prevent development of cancer therapy-induced OM. LLLT also significantly reduced pain, severity and duration of symptoms in patients with cancer therapy-induced OM. Antineoplastic Agents Antineoplastic Agents;Confidence Intervals;Head and Neck Neoplasms;Health Status Indicators;Humans;Low-Level Light Therapy;Risk;Severity of Illness Index;Statistics as Topic;Stomatitis

Laser treatment of facial scars. PURPOSE OF REVIEW: Facial scars can develop as a result of trauma, surgery, burns, acne, or other conditions. These scars are often quite distressing to patients. Lasers were first used to treat these scars in the 1990s. Recently, new laser technology has been used to prevent and treat scars. This literature review and the report of the senior author's recent experience summarize the recent advances in laser treatment of scars. RECENT FINDINGS: With the development of new laser technology, the treatment options for hypotrophic scars and developing scars have increased. Furthermore, there are expanded options for treatment of established hypertrophic scars. Recent studies have shown that nonablative and fractionated lasers can be effective for treating hypotrophic and developing scars. Scar improvements may be due to direct effects of the laser and/or histochemical effects, including production of heat shock proteins and tumor growth factors. Nonablative and fractionated lasers have a shorter recovery period than CO2 resurfacing lasers. This can vary from a few hours to up to 7 days. SUMMARY: Recent new laser technology has increased the options for treatment of scars. These have been shown to be beneficial for hypotrophic, incipient, and established scars. The benefits of laser therapy may be due to direct and/or histochemical effects. Acne Vulgaris;Cicatrix, Hypertrophic;Esthetics;Facial Injuries;Female;Follow-Up Studies;Humans;Laser Therapy;Low-Level Light Therapy;Male;Risk Assessment;Treatment Outcome

Immunohistological evaluation of skin responses after treatment using a fractional ultrapulse carbon dioxide laser on back skin. BACKGROUND AND OBJECTIVE: Fractional photothermolysis (FP) lasers have been widely used in treating photo-aged skin, acne scars, and other skin conditions. Although plenty of clinical data have demonstrated the efficacy of the FP laser, only limited histologic studies have been available to observe serial short- to long-term skin responses. METHODS: Seven healthy Chinese women received one pass of fractional carbon dioxide laser treatment on the left upper back. Biopsies were taken at the baseline and 4 hours, 1 day, 5 days, 1 month, 3 months, 6 months, and 1 year after the procedure for hematoxylin and eosin stains, immunohistochemical evaluation (for heat shock proteins and elastin), and Verhoeff-iron-hematoxylin stains (for collagen and elastic fiber). RESULTS: Remarkably greater expression of heat shock protein (HSP)70 could be observed 4 hours after the procedure, which diminished significantly by 3 months, 6 months, and 1 year after the procedure. HSP47 reached its peak expression 1 month after the procedure, especially around microscopic thermal zones, and maintained its high level of expression 3 and 6 months after the procedure. Distinct new formation and remodeling of collagen and elastic fibers could be observed 3 and 6 months after procedure. CONCLUSION: FP-induced HSP expression and new formation of collagen and elastic fibers lasted as long as 6 months, longer than the previously acknowledged 3 months. HSP47 Heat-Shock Proteins;HSP70 Heat-Shock Proteins;Collagen;Elastin Collagen;Dermis;Dose Fractionation, Radiation;Elastin;Epidermis;Female;HSP47 Heat-Shock Proteins;HSP70 Heat-Shock

Proteins;Humans;Immunohistochemistry;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Time Factors

Treatment of acne scars in Asian patients using a 2,790-nm fractional yttrium scandium gallium garnet laser. BACKGROUND: Treatment of atrophic scars using a fractional laser resurfacing technique has demonstrated favorable outcomes. OBJECTIVE: To evaluate the efficacy and safety of 2,790-nm-wavelength ablative fractional resurfacing on atrophic acne scars in Asian individuals. METHODS: Twenty participants (8 female, 12 male, mean age 26) with skin phototype IV and atrophic acne scars were treated with two sessions of 2,790-nm ablative fractional resurfacing laser at a 6-week interval. Objective and subjective (clinical evaluation by two blinded dermatologists) assessments were obtained at baseline and 1 and 3 months after the final treatment. RESULTS: At the 3-month follow-up, 70% of the participants were rated as having at least 50% to 89% improvement of scars. Mild erythema was the most common adverse effect, observed in 30% of participants, but resolved completely in an average of 5 days. CONCLUSIONS: Yttrium scandium gallium garnet ablative fractional resurfacing (2,790-nm) appears to be effective and well tolerated for the treatment of atrophic acne scars in Asians. The authors have indicated no significant interest with commercial supporters. Acne Vulgaris;Adult;Asian People;Cicatrix;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Young Adult

Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy

Influence of superpulsed laser therapy on healing processes following tooth extraction. OBJECTIVE: This research studied the effects of laser therapy on healing processes following tooth extraction in healthy human subjects, evaluating some inflammation, osteogenesis, and clinical parameters. BACKGROUND DATA: Alveolar healing following tooth extraction is a complex repair process involving different types of tissues, including epithelium and bone. Therefore, it can be advantageous to use techniques able to influence the healing of all tissues. PATIENTS AND METHODS: Ten healthy human subjects with indications for bilateral tooth extraction entered the split-mouth study. The subject/patient becomes his/her own control, thereby eliminating all individual differences in response to laser treatment. This consisted of: 904-nm laser, 33â€‰ W peak power, 30â€‰ KHz, 200â€‰ ns, average power 200â€‰ mW, illuminated area 1â€‰cm(2), 200â€‰ mW/cm(2), 15â€‰ min, 180â€‰ J, 180 â€‰J/cm(2). In each patient, one post-extraction site was treated with laser radiation, whereas the other was left untreated as a control. Soft-tissue specimens were removed from the extraction site before tooth extraction (T0) and 7 days after from extraction (T7); expression of inflammatory and osteogenesis parameters was evaluated on these specimens. The clinical parameter "pain" was evaluated for each subject. RESULTS: Superpulsed laser irradiation prevented the increase of interleukin (IL)-1Î², IL-6, IL-10, and cyclooxygenase-2 (COX-2), and induced an insignificant increase in collagen at 7 days after extraction, versus levels on day of extraction; no changes were found in the other parameters examined. Patients reported less pain at the site treated with superpulsed laser irradiation than at the control site. CONCLUSIONS: This study suggests that superpulsed laser irradiation may be a treatment of choice for patients scheduled for tooth extraction, as it provides clinical efficacy, is safe and well tolerated, and is able to prevent inflammation. Interleukin-1;Interleukin-6;Interleukin-10;Collagen;Cyclooxygenase 2 Adolescent;Adult;Analysis of Variance;Collagen;Cyclooxygenase 2;Female;Humans;Interleukin-1;Interleukin-10;Interleukin-6;Low-Level Light Therapy;Male;Real-Time Polymerase Chain Reaction;Statistics, Nonparametric;Tooth Extraction;Treatment Outcome;Wound Healing

Management of ear lobule keloids using 980-nm diode laser. The objective of the study was to evaluate the 980-nm diode laser in conjunction with corticosteroids in the treatment of ear lobule keloids. Several methods have been described for the treatment of keloid scars, but none of them

have been 100% successful. Advances in laser techniques have enabled surgeons to define the most appropriate lasers for use in the treatment of different scar types. The diode laser pulses are delivered interstitially in a single repeated mode in non-overlapping sites using a bare optical fiber, followed by intralesional triamcinolone acetonide injection. The number of sessions varies between two to five for the management of more than 75% of keloid size, with a total success rate of 75% and no recurrence in the follow-up of 12 months. The technique used proved to be effective in the treatment of ear lobule keloids. Anti-Inflammatory Agents;Triamcinolone Acetonide Adolescent;Adult;Anti-Inflammatory Agents;Combined Modality Therapy;Ear Diseases;Ear, External;Female;Humans;Injections, Intralesional;Keloid;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Triamcinolone Acetonide;Young Adult

The effect of two phototherapy protocols on pain control in orthodontic procedure--a preliminary clinical study. Phototherapy with low-level coherent light (laser) has been reported as an analgesic and anti-inflammatory as well as having a positive effect in tissue repair in orthodontics. However, there are few clinical studies using low-level LED therapy (non-coherent light). The aim of the present study was to analyze the pain symptoms after orthodontic tooth movement associated with and not associated with coherent and non-coherent phototherapy. Fifty-five volunteers (mean age = 24.1 Â± 8.1 years) were randomly divided into four groups: G1 (control), G2 (placebo), G3 (protocol 1: laser, InGaAlP, 660 nm, 4 J/cm(2), 0.03 W, 25 s), G4 (protocol 2: LED, GaAlAs, 640 nm with 40 nm full-bandwidth at half-maximum, 4 J/cm(2), 0.10 W, 70 s). Separators were used to induce orthodontic pain and the volunteers pain levels were scored with the visual analog scale (VAS) after the separator placement, after the therapy (placebo, laser, or LED), and after 2, 24, 48, 72, 96, and 120 h. The laser group did not have statistically significant results in the reduction of pain level compared to the LED group. The LED group had a significant reduction in pain levels between 2 and 120 h compared to the control and the laser groups. The LED therapy showed a significant reduction in pain sensitivity (an average of 56%), after the orthodontic tooth movement when compared to the control group. Adolescent;Adult;Female;Humans;Low-Level Light Therapy;Male;Orthodontics, Corrective;Pain;Pain Measurement;Tooth Movement Techniques;Young Adult

Low-level laser therapy, at 830 nm, for pain reduction in experimental model of rats with sciatica. Chronic pain, resulting from nerve compression, is a common clinical presentation. One means of conservative treatment is low-level laser therapy, although controversial. The aim of this study was to evaluate the effects of two doses of low-level laser, at 830 nm, on pain reduction in animals subjected to sciatica. Eighteen rats were used, divided into three groups: GS (n=6), sciatica and simulated treatment; G4J (n=6), sciatica and treatment with 4 J/cmÂ²; and G8J (n=6), sciatica and irradiation with 8 J/cmÂ². The right sciatic nerve was exposed and compressed using catgut thread. Five days of treatment were started on the third postoperative day. Pain was assessed by means of the paw elevation time during gait: before sciatica, before and after the first and second therapies, and the end of the fifth therapy. Low-level laser was effective in reducing the painful condition. Animals;Disease Models, Animal;Low-Level Light Therapy;Pain Measurement;Random Allocation;Rats;Rats, Wistar;Sciatica

Nonablative fractional photothermolysis for facial actinic keratoses: 6-month follow-up with histologic evaluation. BACKGROUND: A number of epidermal and papillary dermal skin conditions can be treated safely and effectively with fractional photothermolysis (FP). OBJECTIVE: We sought to evaluate the effectiveness of FP with a 1550-nm fractionated erbium-doped fiber laser for the treatment of facial actinic keratoses (AKs). METHODS: Fourteen men, ages 59 to 79 years, underwent 5 laser treatments (2- to 4-week intervals) at an energy fluence of 20 to 70 mJ and treatment level of 11 (8-10 passes), corresponding to 32% to 40% surface area coverage. AK counts

and photographs were taken at baseline, before each treatment, and at 1-, 3-, and 6-month follow-ups after the last treatment. Biopsies were performed at baseline and at the 3-month follow-up. The clinical improvement of the actinic lesions was evaluated by a dermatologist using digital photography and lesion counts at all 3 follow-up visits. RESULTS: The AK count for each patient was reduced on average by 73.1% (67.5%-77.7%) at the 1-month, 66.2% (60.0%-71.5%) at the 3-month, and 55.6% (43.9%-64.8%) at the 6-month follow-up visit. Excluding two cases, all biopsy specimens (baseline and at the 3-month follow-up) were positive for histologic features of AK and/or squamous cell carcinoma. LIMITATIONS: This study is limited by a small number of patients; therefore further clinical studies are warranted. CONCLUSIONS: FP decreases the number of clinical AKs; however, posttreatment biopsy specimens indicate the histologic persistence of AKs (epidermal tumors). FP is not an adequate single-treatment modality for AKs. Aged;Biopsy, Needle;Confidence Intervals;Facial Dermatoses;Follow-Up Studies;Humans;Immunohistochemistry;Keratosis, Actinic;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Odds Ratio;Prospective Studies;Risk Assessment;Sampling Studies;Severity of Illness Index;Time Factors;Treatment Outcome

Efficacy of low-level laser therapy in the management of pain, facial swelling, and postoperative trismus after a lower third molar extraction. A preliminary study. Pain, swelling, and trismus are the most common complications after surgical removal of impacted lower third molars. The aim of this study was to evaluate the analgesic and anti-inflammatory effects of a low-level laser therapy (Laser Smileâ„¢, BiolaseÂ®, San Clemente, USA) applied to the wound appeared after the surgical removal of impacted lower third molars. A prospective, randomized, and double-blind study was undertaken in 20 healthy patients with two symmetrically impacted lower third molars. The application of a low-level laser was made randomly on one of the two sides after surgery. The experimental side received 5Â J/cm(2) of energy density, a wavelength of 810Â nm, and an output power of 0.5Â W. On the control side, a handpiece was applied intraorally, but the laser was not activated. Evaluations of postoperative pain, trismus, and swelling were made. The sample consisted of 11 women and nine men, and mean age was 23.35Â years (18-37). The pain level in the first hours after surgery was lower in the experimental side than in the placebo side, although without statistically significant differences (pâ€‰=â€‰0.258). Swelling and trismus at the 2nd and 7th postoperative days were slightly higher in the control side, although not statistically significant differences were detected (pâ€‰>â€‰0.05). The application of a low-level laser with the parameters used in this study did not show beneficial affects in reducing pain, swelling, and trismus after removal of impacted lower third molars. Adolescent;Adult;Double-Blind Method;Edema;Face;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Molar, Third;Pain, Postoperative;Prospective Studies;Tooth Extraction;Tooth, Impacted;Trismus;Young Adult

Histomorphometric analysis of inflammatory response and necrosis in re-implanted central incisor of rats treated with low-level laser therapy. Low-level laser therapy is a tool employed in the management of post-operative inflammation process and in the enhancement of reparative process. The aim of the study was to perform histological evaluation of dental and periodontal ligament of rats central upper-left incisor teeth re-implanted and irradiated with low-level laser (InGaAl, 685Â nm, 50Â J/cm(2)) 15, 30, and 60Â days after re-implantation. Seventy-two male rats had the central upper left incisor removed and kept for 15 min on dry gauze before replantation. Laser was irradiated over the root surface and empty alveolus prior replantation and over surrounding mucosa after the re-implantation. After histological procedures, all slices were analyzed regarding external resorption area and histological aspects. We observed an increase of root resorption (pâ€‰<â€‰0.05) in the control group compared to the laser group at 15, 30, and 60Â days. These results showed that the laser groups developed less root resorption areas than the control group in all experimental periods. Additionally, histological analysis revealed less inflammatory cells and necrotic areas in laser groups.

Animals;Dental Pulp Necrosis;Disease Models, Animal;Incisor;Inflammation;Low-Level Light Therapy;Male;Necrosis;Periodontal Ligament;Rats;Rats, Wistar;Tooth Injuries;Tooth Replantation
Neovascularization following facial surgery: possible cause and treatment. Adult;Aged;Cicatrix;Face;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Middle Aged;Neovascularization, Pathologic;Telangiectasis
Efficacy and safety of Q-switched 1,064-nm neodymium-doped yttrium aluminum garnet laser treatment of melasma. BACKGROUND: Melasma is a common pigmentary disorder that affects all skin types but is seen more in individuals with Fitzpatrick skin type IV to VI. Safe and effective treatment options for melasma need to be explored. Already proven effective for the treatment of pigmentary disorders, lasers have been used to treat melasma in recent years. OBJECTIVE: To evaluate the efficacy and safety profile of a 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet (QS Nd:YAG) laser in the treatment of melasma. METHODS: Fifty patients were recruited for this study (47 female; 3 male). All were treated using the 1,064-nm QS Nd:YAG laser at low energy levels weekly for nine sessions. Follow-up was done 3 months after the final laser session, and recurrence rates were evaluated. Digital photographs were taken and the melanin index (MI) measured before each treatment visit and after the final treatment. Melasma Area and Severity Index (MASI) scores were evaluated for all of the patients. Patients were required to evaluate their satisfaction at the end of the nine treatments. We also used a confocal laser scanning microscope (CLSM) for several patients to investigate pathologic changes at baseline, after the treatments, and at the time of recurrence. Statistical analysis was performed to evaluate clinical response and factors related to the therapeutic outcome. RESULTS: Mean MI decreased 35.8%, from 70.0 at baseline to 44.9 after the treatment ($p<.001$). Mean MASI scores decreased 61.3% after therapy (from 10.6-4.1, $p<.001$); 70% of patients had more than a 50% decrease in their MASI values, and 10% had 100% clearance. Recurrence rate at the 3-month follow-up was 64%. CLSM findings indicated less melanin in the treated regions, although it increased at recurrence. Multiple linear regression indicated that the therapeutic outcome depended on disease severity at baseline ($p=.001$, $R=0.494$). Minimal adverse events were observed during the study. CONCLUSIONS: The 1,064-nm QS Nd:YAG laser is an effective and safe treatment for melasma, although recurrence rates remain high, and further adjunctive therapy needs to be explored to prevent this recurrence. Adult;Female;Humans;Lasers, Solid-State;Linear Models;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Patient Satisfaction;Prospective Studies;Recurrence;Severity of Illness Index;Statistics, Nonparametric;Treatment Outcome
Treatment of refractory discoid lupus erythematosus using 1,064-nm long-pulse neodymium-doped yttrium aluminum garnet laser. Adult;Humans;Lasers, Solid-State;Low-Level Light Therapy;Lupus Erythematosus, Discoid;Male;Young Adult
Effect of low-level laser therapy on experimental wounds of hard palate mucosa in mice. Under general anesthesia and sterile conditions, incision wound was induced in the hard palate mucosa of adult male mice. The wounds of groups 1 and 2 were irradiated daily with He-Ne laser at 3 and 7.5 J/cm2 for 120 and 300 s, respectively, while the incision wound of group 3 not exposed served as controls. On day 3 of injury, the laser-treated wounds contained significantly lower neutrophils than the wounds in the control group. By day 7 after injury, the laser-treated wounds contained significantly more fibroblasts and at the same time contained significantly fewer macrophages. In conclusion, an acceleration of the wound healing process of experimental wounds in the hard palate mucosa of mice at low-level laser therapy with a He-Ne laser at energy densities of 3 and 7.5 J/cm2 was observed. Animals;Fibroblasts;Lasers, Gas;Low-Level Light Therapy;Macrophages;Male;Mice;Mouth Mucosa;Neutrophils;Palate, Hard;Time Factors;Wound Healing

Stimulatory effect of low-level laser therapy on root development of rat molars: a preliminary study. Several studies suggest a biomodulatory influence of low-level laser irradiation in the inflammatory and reparative processes of dental tissues. The aim of this study was to investigate the stimulatory effect of 808-nm laser irradiation on root development of rat molars and also to evaluate the histological reaction of pulp and periapical tissues. Twenty-four 30-day-old Wistar male rats were randomly assigned to three-time and five-time laser therapy groups. After initial x-ray, using mammography equipment, laser energy was applied at a wavelength of 808Â nm (2Â J/cm(2), 100Â mW, 20Â s) to the midroot area of the lower molars of one side of mouth at repeated intervals of the 48Â h. The animals were killed 1Â day after the final treatment, and root length development of the experimental samples was compared to contra-lateral non-irradiated molars using mammography. The histological reaction of the pulp and periapical tissue was evaluated under light microscopy. Root development was more advanced in irradiated groups than in the non-irradiated controls (pâ€‰<â€‰0.001). No significant differences, however, could be found between the root development changes in the three-time and five-time laser therapy groups (pâ€‰>â€‰0.05). Histological findings showed that the occurrence of secondary cement formation was significantly higher in the irradiation groups compared to the controls (pâ€‰=â€‰0.003). However, there were no statistically significant differences for the frequencies of pulp hyperemia, periodontal ligament fiber organization, or lamina dura remodeling between the groups (pâ€‰>â€‰0.05). Under the conditions used in this study, 808-nm low-level laser accelerates the rat molar root development in the presence of favorable histological reactions. Animals;Dental Pulp;Low-Level Light Therapy;Male;Models, Animal;Molar;Odontogenesis;Periapical Tissue;Radiography;Rats;Rats, Wistar;Tooth Root

Syringomas versus sebaceous gland prominence of the eyelids. Adult;Eyelids;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Sweat Gland Neoplasms;Syringoma

Treatment of pigmented keratosis pilaris in Asian patients with a novel Q-switched Nd:YAG laser. BACKGROUND: Treatment for most cases of keratosis pilaris requires simple reassurance and general skin care recommendations. Many Asian patients find lesions due to pigmented keratosis pilaris to be cosmetically unappealing. Treatment of post-inflammatory hyperpigmentation using a 1064-nm Q-switched Nd:YAG laser with low fluence is reported. OBJECTIVE: To investigate the efficacy of a novel Q-switched Nd:YAG laser for the treatment of pigmented keratosis pilaris in Asian patients. METHODS: Ten patients with pigmented keratosis pilaris underwent five weekly treatments using a Q-switched Nd:YAG laser (RevLite(Â®); HOYA ConBio(Â®), Freemont, CA, USA) at 1064 nm with a 6-mm spot size and a fluence of 5.9 J/cm(2). Photographic documentation was obtained at baseline and 2 months after the final treatment. RESULTS: Clinical improvement was achieved in all 10 patients with minimal adverse effects. CONCLUSION: For the treatment of keratosis pilaris, the use of a Q-switched Nd:YAG laser can be helpful for improving cosmetic appearance as it can improve pigmentation. Abnormalities, Multiple;Adult;Asian People;Cosmetic Techniques;Darier Disease;Eyebrows;Female;Humans;Keratosis;Lasers, Solid-State;Low-Level Light Therapy;Male;Republic of Korea;Young Adult

Reversing precancerous actinic damage by mixing wavelengths (1064 nm, 532 nm). BACKGROUND: Premalignancies resulting from photodamage, such as actinic keratosis and carcinoma in situ, can be treated with various modalities. Most of these treatments may reverse or treat these conditions although they often involve considerable skin irritation over a long period of time, are very uncomfortable for the patients or they need many office visits and sometimes are very expensive, such as photodynamic therapy (PDT). OBJECTIVE: To study the effectiveness of a mixed session of Q-switched KTP 532 nm and Nd:YAG 1064 nm laser treatment on precancerous lesions resulting from

solar damage. METHODS: Ten patients with long-standing actinic damage/keratosis or carcinoma in situ were subjected to only one session of mixed Q-switched KTP 532 nm and Nd:YAG 1064 nm laser treatment. Lesions were evenly and repeatedly scanned with both wavelengths until light pain or purpura presented. RESULTS: All patients responded extremely well within a period of 20 days, with just one session, with virtually no pain, minimum irritation, no down time at all and excellent cosmetic outcome. CONCLUSION: The use of a mixed Q-switched 532 nm and Nd:YAG 1064 nm laser session seems to be ideal for treating precancerous lesions resulting from photodamage since it can be a fast, painless and simple office procedure with no down time and minimum discomfort for the patient. This method proves to be much more selective than traditional intense pulse light (IPL) photorejuvenation. Humans;Keratosis, Actinic;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Precancerous Conditions;Skin Aging

Effects of the Nd:YAG 1320-nm laser on skin rejuvenation: clinical and histological correlations. The neodymium:yttrium-aluminum-garnet (Nd:YAG) laser is a popular non-ablative treatment used for skin rejuvenation. The purpose of this prospective study was to evaluate the clinical effects, coupled with a quantitative assessment, of the histological changes in response to Nd:YAG 1320-nm laser treatment of periocular wrinkles. Six volunteers with Fitzpatrick skin types III and IV and Glogau class I-II wrinkles were subjected to 3 months of Nd:YAG 1320-nm treatment in the periocular area (six sessions at 2-week intervals). Volunteers were photographed, and skin biopsies were obtained at baseline as well as 3 and 6 months after the start of treatments. Quantitative evaluation of total elastin, newly synthesized tropoelastin, collagen types I, III and VII, and newly synthesized collagen was performed using a computerized morphometric analysis. A noticeable clinical and histological improvement was observed after Nd:YAG 1320-nm treatment. Collagen types I, III and VII, as well as newly synthesized collagen, together with tropoelastin showed a statistically significant increase in response to treatment, while the mean level of total elastin was significantly decreased after treatment. Our data suggest that Nd:YAG 1320 nm is an effective treatment for skin rejuvenation as it stimulates the repair processes, and reverses the clinical, as well as the histopathological, signs of skin aging. Tropoelastin;Collagen Adult;Collagen;Cosmetic Techniques;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Rejuvenation;Skin;Skin Aging;Tropoelastin

Treatment of infraorbital dark circles using a low-fluence Q-switched 1,064-nm laser. OBJECTIVE: To evaluate the efficacy and safety of the low-fluence 1,064-nm Q-switched neodymium-doped yttrium aluminium garnet (QSNY) laser in treating infraorbital dark circles. PARTICIPANTS AND METHODS: Thirty women with infraorbital dark circles (predominant color dark brown) participated in this open-label study. Participants underwent eight sessions of low-fluence QSNY laser treatment at 4.2 J/cm(2) at 3- to 4-day intervals. A spot size of 3.5 mm was used, with a pulse duration of 8 ns. The melanin deposition in the lesional skin was observed in vivo using reflectance confocal microscopy (RCM). Morphologic changes were evaluated using a global evaluation, an overall self-assessment, a narrow-band reflectance spectrophotometer, and a skin hydration measurement instrument. RESULTS: Twenty-six of 30 patients showed global improvement that they rated as excellent or good. Twenty-eight rated their overall satisfaction as excellent or good. The melanin index indicated a substantial decrease, from 225.84 at baseline to 182.65 ($p < .05$). RCM results showed a dramatic decrease of melanin deposition in the upper dermis. Adverse effects were minimal. CONCLUSIONS: The characteristic finding for dark-brown infraorbital dark circles is melanin deposition in the upper dermis. Treatment of infraorbital dark circles using low-fluence 1,064-nm QSNY laser is safe and effective. The authors have indicated no significant interest with commercial supporters. Adult;Eyelids;Female;Humans;Lasers, Solid-State;Low-Level Light

Therapy;Patient Satisfaction;Pigmentation Disorders;Single-Blind Method;Treatment Outcome;Young Adult

Combined use of low level laser therapy and cyclooxygenase-2 selective inhibition on skin incisional wound reepithelialization in mice: a preclinical study. BACKGROUND: Low level laser therapy and cyclooxygenase-2 (ICOX2) selective inhibitors have been widely used to modulate inflammatory response; however, their effect on wound reepithelialization are not well understood. OBJECTIVE: To evaluate the isolated and combined effects of low level laser therapy and ICOX2 in the reepithelization of skin incisional wounds in mice. METHODS: We induced a 1-cm wound on the back of each mouse, which were divided into four groups (N = 20): control, laser therapy, treated with celecoxib and combined therapy. The animals in the celecoxib and combined therapy groups were treated with celecoxib for 10 days before skin incision. The experimental wounds were irradiated with He-Ne low power laser (632nm, dose: 4J/cm2) in scanning for 12 seconds during three consecutive days in the laser therapy and combined therapy groups. The animals were sacrificed 3 days after surgery. Samples of the wounds were collected and stained (Masson's Trichrome) for histomorphometric analysis. RESULTS: Both the laser therapy group and the celecoxib group showed an increase in skin reepithelialization compared to the control group; however, the combined therapy group showed no differences. As for keratinization, the laser therapy and combined therapy groups showed a reduction in keratinocytes compared with the control group. CONCLUSION: The results show that the use of low level laser therapy and ICOX2 in isolation increases epithelial cells, but only low level laser therapy reduced skin keratinocytes. The combined treatment restores innate epithelialization and decreases keratinization in spite of accelerating wound contraction with improvement in the organization of the wound in the skin of mice. Cyclooxygenase 2 Inhibitors;Pyrazoles;Sulfonamides;Celecoxib Animals;Celecoxib;Combined Modality Therapy;Cyclooxygenase 2 Inhibitors;Disease Models, Animal;Keratinocytes;Low-Level Light Therapy;Male;Mice;Pyrazoles;Sulfonamides;Wound Healing

Treatment of bisphosphonate-induced osteonecrosis of the jaws with Nd:YAG laser biostimulation. Antineoplastic Combined Chemotherapy Protocols;Bisphosphonate-Associated Osteonecrosis of the Jaw;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Molar;Mouth Mucosa;Multiple Myeloma;Radiography

The effects of low-level laser irradiation on differentiation and proliferation of human bone marrow mesenchymal stem cells into neurons and osteoblasts--an in vitro study. Bone marrow-derived mesenchymal stem cells (BMSCs) are promising for use in regenerative medicine. Several studies have shown that low-level laser irradiation (LLLI) could affect the differentiation and proliferation of MSCs. The aim of this study was to examine the influence of LLLI at different energy densities on BMSCs differentiation into neuron and osteoblast. Human BMSCs were cultured and induced to differentiate to either neuron or osteoblast in the absence or presence of LLLI. Gallium aluminum arsenide (GaAlAs) laser irradiation (810 nm) was applied at days 1, 3, and 5 of differentiation process at energy densities of 3 or 6 J/cm(2) for BMSCs being induced to neurons, and 2 or 4 J/cm(2) for BMSCs being induced to osteoblasts. BMSCs proliferation was evaluated by MTT assay on the seventh day of differentiation. BMSCs differentiation to neurons was assessed by immunocytochemical analysis of neuron-specific enolase on the seventh day of differentiation. BMSCs differentiation to osteoblast was tested on the second, fifth, seventh, and tenth day of differentiation via analysis of alkaline phosphatase (ALP) activity. LLLI promoted BMSCs proliferation significantly at all energy densities except for 6 J/cm(2) in comparison to control groups on the seventh day of differentiation. LLLI at energy densities of 3 and 6 J/cm(2) dramatically facilitated the differentiation of BMSCs into neurons ($p < 0.001$). Also, ALP activity was significantly enhanced in irradiated BMSCs differentiated to osteoblast on the second, fifth, seventh, and tenth day of differentiation ($p < 0.001$ except for the

second day). Using LLLI at 810 nm wavelength enhances BMSCs differentiation into neuron and osteoblast in the range of 2-6 J/cm(2), and at the same time increases BMSCs proliferation (except for 6 J/cm(2)). The effect of LLLI on differentiation and proliferation of BMSCs is dose-dependent. Considering these findings, LLLI could improve current in vitro methods of differentiating BMSCs prior to transplantation. Bone Marrow Cells;Cell Differentiation;Cell Proliferation;Humans;Immunophenotyping;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Neurons;Osteoblasts

Preparation of polymeric nanoparticles of cyclosporin A using infrared pulsed laser. Nanoparticle formation of poorly water-soluble drugs is a means of providing much benefit for improving solubility and bioavailability. We showed that laser irradiation of drugs can be a novel tool for dispersing drug nanoparticles in water. Using our method, we were able to produce nanoparticles containing immunosuppressant drug, cyclosporin A, which shows poor solubility toward water, with high levels of the drug using polyvinyl pyrrolidone and sodium dodecyl sulfate as stabilizing agents. The absence of degradation products was confirmed and the loss of pharmaceutical activity with an inhibitory effect on the interleukin-2 production of Jurkat T cells did not occur. Cyclosporin A nanoparticles showed a spherical shape and their particle size was distributed uniformly around 200 nm. Powder X-ray diffraction analysis suggested that cyclosporin A in the nanoparticles was in an amorphous state. In the measurement of solubility rate, the nanoparticle formulation showed a higher rate than that which had not been processed. At present, although this laser irradiation technology has low productivity, it is expected as a new technology for drug nanoparticle manufacturing together with the development of a new laser device. Cytokines;Drug Carriers;Immunosuppressive Agents;Interleukin-2;Polymers;Cyclosporine Cyclosporine;Cytokines;Drug Carriers;Drug Compounding;Drug Delivery Systems;Humans;Immunosuppressive Agents;Interleukin-2;Jurkat Cells;Low-Level Light Therapy;Nanoparticles;Particle Size;Polymers;Solubility

Successful treatment of argyria using a low-fluence Q-switched 1064-nm Nd:YAG laser. BACKGROUND: Argyria is a rare skin disease caused by cutaneous deposits of silver granules as a result of exposure to silver substrates or ingestion of silver salt. This pigmentation change causes cosmetic problems, and there was previously no recognized effective treatments for argyria. OBJECTIVE: To evaluate the treatment effect of a low-fluence Q-switched 1064-nm Nd:YAG laser on argyria. SUBJECTS AND METHODS: Case report of a 49-year-old with a history of ingestion of a colloidal silver solution daily for approximately one year as a traditional remedy. RESULTS: After seven sessions of treatment, the patient's skin color returned to normal. CONCLUSION: A low-fluence Q-switched 1064-nm Nd:YAG laser provided safe and effective treatment for the skin discoloration associated with argyria. Argyria;Facial Dermatoses;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome

Efficacy of 694-nm Q-switched ruby fractional laser treatment of melasma in female Korean patients. BACKGROUND: Melasma is a common acquired symmetrical hypermelanosis of sun-exposed areas of the skin. Although the classical Q-switched ruby laser (QSRL) has been used successfully for the removal of tattoos and for the treatment of cutaneous pigmented lesions, its efficacy for melasma remains controversial. OBJECTIVE: We used repeat low-dose fractional QSRL treatment for melasma and analyzed the clinical results. METHODS: Fifteen Korean women with melasma were enrolled. Each patient received six low-dose fractional QSRL treatments to the face at 2-week intervals. Two investigators independently evaluated Melasma Area and Severity Index (MASI) scores before each session and 4 and 16 weeks after the final session. The intensities of pigmentation and erythema were assessed by measuring skin reflectance using a tristimulus color analyzer. RESULTS: Mean MASI score decreased from 15.1 Â± 3.3 before treatment to 10.6 Â± 3.9 16 weeks after the final treatment. The lightness of pigmentation (L-value) increased from 56.6 Â± 3.5 before treatment to 59.9 Â± 2.8 16

weeks after the final treatment. CONCLUSIONS: Multiple treatment sessions of low-dose fractional QSRL may be an effective strategy for the treatment of dermal or mixed-type melasma. Adult;Dose Fractionation, Radiation;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Melanosis;Middle Aged;Patient Satisfaction;Severity of Illness Index;Treatment Outcome
[Principles of development of multifunctional equipment for low level laser and magnetolaser therapy]. Equipment Design;Humans;Lasers;Low-Level Light Therapy;Magnetic Field Therapy
[The influence of low-intensity laser radiation on the vascular endothelium function and the cytokine system in patients with chronic viral hepatitis]. The objective of the present work was to study the influence of low-intensity laser therapy on the cytokine system and the function of vascular endothelium in patients presenting with chronic viral hepatitis. The measurement of blood cytokine levels by an immunoenzyme assay revealed a decrease in the levels of anti-inflammatory IL-1-beta, IL-6, and TNF-alpha and a rise in proinflammatory IL-4 in the treated patients compared with the untreated ones. Medicamental therapy of chronic viral hepatitis did not cause a significant reduction in the plasma nitric oxide level whereas inclusion of low-intense laser irradiation in the combined treatment resulted in its normalization. It is concluded that the use of low-intense laser irradiation as a component of combined therapy of patients presenting with chronic viral hepatitis has marked beneficial effect on the cytokine system. Moreover, various methods of such laser therapy improve the functional activity of vascular endothelium and its NO-producing capacity. Cytokines;Nitrates;Nitrites Adult;Combined Modality Therapy;Cytokines;Data Interpretation, Statistical;Endothelium, Vascular;Female;Hepatitis B, Chronic;Hepatitis C, Chronic;Humans;Low-Level Light Therapy;Male;Nitrates;Nitrites;Treatment Outcome
Low-level infrared laser effect on plasmid DNA. Low-level laser therapy is used in the treatment of many diseases based on its biostimulative effect. However, the photobiological basis for its mechanism of action and adverse effects are not well understood. The aim of this study, using experimental models, was to evaluate the effects of laser on bacterial plasmids in alkaline agarose gel electrophoresis and Escherichia coli cultures. The electrophoretic profile of bacterial plasmids in alkaline agarose gels were used for studying lesions in DNA exposed to infrared laser. Transformation efficiency and survival of Escherichia coli AB1157 (wild-type), BH20 (fpg/mutM(-)), BW9091 (xth(-)), and DH5Î±F'Iq (recA(-)) cells harboring pBSK plasmids were used as experimental models to assess the effect of laser on plasmid DNA outside and inside of cells. Data indicate low-level laser: (1) altered the electrophoretic profile of plasmids in alkaline gels at 2,500-Hz pulsed-emission mode but did not alter at continuous wave, 2.5- and 250-Hz pulsed-emission mode; (2) altered the transformation efficiency of plasmids in wild-type and fpg/mutM(-) E. coli cells; (3) altered the survival fpg/mutM(-), xthA(-) and recA(-) E. coli cultures harboring pBSK plasmids. Low-level infrared laser with therapeutic fluencies at high frequency in pulsed-emission modes have effects on bacterial plasmids. Infrared laser action can differently affect the survival of plasmids in E. coli cells proficient and deficient in DNA repair mechanisms, therefore, laser therapy protocol should take into account fluencies, frequencies and wavelength of laser, as well as tissue conditions and genetic characteristics of cells before beginning treatment. Escherichia coli Proteins;DNA;Rec A Recombinases;DNA-Formamidopyrimidine Glycosylase;DNA-formamidopyrimidine glycosylase, E coli DNA;DNA Damage;DNA Repair;DNA-Formamidopyrimidine Glycosylase;Electrophoresis, Agar Gel;Escherichia coli;Escherichia coli Proteins;Low-Level Light Therapy;Plasmids;Rec A Recombinases;Transformation, Bacterial
Photomedicine and LLLT Literature Watch. Animals;Humans;Low-Level Light Therapy;Phototherapy
Granuloma faciale of the scalp. Granuloma faciale (GF) is an uncommon dermatosis with characteristic clinicopathological features. Extrafacial isolated GF is extremely rare. Pulsed dye laser

(PDL) is a treatment option for GF to minimize the risk of scarring. We report a case of a 78-year-old male with an extensive GF of the scalp successfully treated with pulsed dye laser (PDL).
Aged;Biopsy;Face;Granuloma;Humans;Lasers, Dye;Low-Level Light Therapy;Male;Scalp;Treatment Outcome

Light microscopic description of the effects of laser phototherapy on bone defects grafted with mineral trioxide aggregate, bone morphogenetic proteins, and guided bone regeneration in a rodent model. We carried out a histological analysis on bone defects grafted with mineral trioxide aggregate (MTA) treated or not with laser, bone morphogenetic protein (BMP), and guided bone regeneration (GBR). Benefits of the use of MTA, laser, BMPs, and GBR on bone repair are well known, but there is no report on their association with laser light. Ninety rats were divided into 10 groups each subdivided into 3. Defects on G II and I were filled with the blood clot. G II was further irradiated with LED. G III and IV were filled with MTA; G IV was further irradiated with laser. G V and VI, the defects filled with MTA and covered with a membrane (GBR). G VI was further irradiated with laser. G VII and VIII, BMPs were added to the MTA and group VIII further irradiated with laser. G IX and X, the MTA + BMP graft was covered with a membrane (GBR). G X was further irradiated with laser. Laser light (Î» = 850 nm, 150 mW, 4 J/cm(2)) was applied over the defect at 48-h intervals and repeated for 15 days. Specimens were processed, cut and stained with H&E and Sirius red and underwent histological analysis. Subjects on group X were irradiated. The results showed different tissue response on all groups during the experimental time. Major changes were seen on irradiated subjects and included marked deposition of new bone in advanced maturation. It is concluded that near infrared laser phototherapy improved the results of the use of the MTA on bone defects.
Aluminum Compounds;Bone Morphogenetic Proteins;Calcium Compounds;Drug Combinations;Oxides;Silicates;mineral trioxide aggregate Aluminum Compounds;Animals;Bone Morphogenetic Proteins;Bone Regeneration;Bone Transplantation;Bone and Bones;Calcium Compounds;Drug Combinations;Guided Tissue Regeneration;Infrared Rays;Low-Level Light Therapy;Male;Microscopy;Models, Animal;Oxides;Rats;Rats, Wistar;Silicates

An experimental study of low-level laser therapy in rat Achilles tendon injury. The aim of this controlled animal study was to investigate the effect of low-level laser therapy (LLLT) administered 30 min after injury to the Achilles tendon. The study animals comprised 16 Sprague Dawley male rats divided in two groups. The right Achilles tendons were injured by blunt trauma using a mini guillotine, and were treated with LLLT or placebo LLLT 30 min later. The injury and LLLT procedures were then repeated 15 hours later on the same tendon. One group received active LLLT (Î» = 904 nm, 60 mW mean output power, 0.158 W/cm(2) for 50 s, energy 3 J) and the other group received placebo LLLT 23 hours after LLLT. Ultrasonographic images were taken to measure the thickness of the right and left Achilles tendons. Animals were then killed, and all Achilles tendons were tested for ultimate tensile strength (UTS). All analyses were performed by blinded observers. There was a significant increase in tendon thickness in the active LLLT group when compared with the placebo group ($p < 0.05$) and there were no significant differences between the placebo and uninjured left tendons. There were no significant differences in UTS between laser-treated, placebo-treated and uninjured tendons. Laser irradiation of the Achilles tendon at 0.158 W/cm(2) for 50 s (3 J) administered within the first 30 min after blunt trauma, and repeated after 15 h, appears to lead to edema of the tendon measured 23 hours after LLLT. The guillotine blunt trauma model seems suitable for inflicting tendon injury and measuring the effects of treatment on edema by ultrasonography and UTS. More studies are needed to further refine this model. Achilles Tendon;Animals;Disease Models, Animal;Edema;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Tendon Injuries;Tensile Strength;Ultrasonography

Synergistic administration of photothermal therapy and chemotherapy to cancer cells using polypeptide-based degradable plasmonic matrices. AIM: Resistance of cancer cells to hyperthermic temperatures and spatial limitations of nanoparticle-induced hyperthermia necessitates the identification of effective combination treatments that can enhance the efficacy of this treatment. Here we show that novel polypeptide-based degradable plasmonic matrices can be employed for simultaneous administration of hyperthermia and chemotherapeutic drugs as an effective combination treatment that can overcome cancer cell resistance to hyperthermia. METHOD: Novel gold nanorod elastin-like polypeptide matrices were generated and characterized. The matrices were also loaded with the heat-shock protein (HSP)90 inhibitor 17-(allylamino)-17-demethoxygeldanamycin (17-AAG), currently in clinical trials for different malignancies, in order to deliver a combination of hyperthermia and chemotherapy. RESULTS: Laser irradiation of cells cultured over the plasmonic matrices (without 17-AAG) resulted in the death of cells directly in the path of the laser, while cells outside the laser path did not show any loss of viability. Such spatial limitations, in concert with expression of prosurvival HSPs, reduce the efficacy of hyperthermia treatment. 17-AAG-gold nanorod-polypeptide matrices demonstrated minimal leaching of the drug to surrounding media. The combination of hyperthermic temperatures and the release of 17-AAG from the matrix, both induced by laser irradiation, resulted in significant (>90%) death of cancer cells, while 'single treatments' (i.e., hyperthermia alone and 17-AAG alone) demonstrated minimal loss of cancer cell viability (<10%). CONCLUSION: Simultaneous administration of hyperthermia and HSP inhibitor release from plasmonic matrices is a powerful approach for the ablation of malignant cells and can be extended to different combinations of nanoparticles and chemotherapeutic drugs for a variety of malignancies. Benzoquinones;HSP90 Heat-Shock Proteins;Lactams, Macrocyclic;Peptides;tanespimycin;Gold;Doxorubicin;Elastin;Cysteine Benzoquinones;Cell Line, Tumor;Cell Survival;Cysteine;Doxorubicin;Elastin;Gold;HSP90 Heat-Shock Proteins;Humans;Hyperthermia, Induced;Lactams, Macrocyclic;Low-Level Light Therapy;Male;Nanoparticles;Nanotubes;Peptides;Prostatic Neoplasms

Low-level laser irradiation treatment reduces CCL2 expression in rat rheumatoid synovia via a chemokine signaling pathway. Rheumatoid arthritis (RA) is an inflammatory joint disorder whose progression leads to the destruction of cartilage and bone. Although low-level laser irradiation (LLLI) is currently being evaluated for the treatment of RA, the molecular mechanisms underlying its effectiveness remain unclear. To investigate possible LLLI-mediated antiinflammatory effects, we utilized a collagen-induced arthritis (CIA) rat model and analyzed gene expression profiles in the synovial membranes of the knee joint. Total RNA was isolated from the synovial membrane tissue of the joints of untreated CIA rats or CIA rats treated with LLLI (830 nm Ga-Al-As diode), and gene expression profiles were analyzed by DNA microarray (41,000 rat genes), coupled with Ingenuity pathways analysis (IPA). DNA microarray analysis showed that CCL2 gene expression was increased in CIA tissue, and that LLLI treatment significantly decreased CIA-induced CCL2 mRNA levels. IPA revealed that chemokine signal pathways were involved in the activation of CCL2 production. These microarray data were further validated using real-time PCR and reverse transcription PCR. Immunohistochemistry confirmed that CCL2 production was decreased in CIA rats treated with LLLI. These findings suggest that decreased CCL2 expression may be one of the mechanisms involved in LLLI-mediated RA inflammation reduction. Ccl2 protein, rat;Chemokine CCL2;Chemokines;RNA, Messenger Animals;Arthritis, Experimental;Arthritis, Rheumatoid;Chemokine CCL2;Chemokines;Female;Gene Expression;Gene Regulatory Networks;Lasers, Semiconductor;Low-Level Light Therapy;Oligonucleotide Array Sequence Analysis;Polymerase Chain Reaction;RNA, Messenger;Rats;Rats, Inbred Lew;Signal Transduction;Synovial Membrane

Additive effects of low-level laser therapy with exercise on subacromial syndrome: a randomised, double-blind, controlled trial. The subacromial syndrome is the most common source of shoulder pain. The mainstays of conservative treatment are non-steroidal anti-inflammatory drugs and exercise therapy. Recently, low-level laser therapy (LLLT) has been popularized in the treatment of various musculoskeletal disorders. The aim of this study is to evaluate the additive effects of LLLT with exercise in comparison with exercise therapy alone in treatment of the subacromial syndrome. We conducted a randomised clinical study of 80 patients who presented to clinic with subacromial syndrome (rotator cuff and biceps tendinitis). Patients were randomly allocated into two groups. In group I (nâ€‰=â€‰40), patients were given laser treatment (pulsed infrared laser) and exercise therapy for ten sessions during a period of 2 weeks. In group II (nâ€‰=â€‰40), placebo laser and the same exercise therapy were given for the same period. Patients were evaluated for the pain with visual analogue scale (VAS) and shoulder range of motion (ROM) in an active and passive movement of flexion, abduction and external rotation before and after treatment. In both groups, significant post-treatment improvements were achieved in all parameters (Pâ€‰=â€‰0.00). In comparison between the two groups, a significant improvement was noted in all movements in group I (Pâ€‰=â€‰0.00). Also, there was a substantial difference between the groups in VAS scores (Pâ€‰=â€‰0.00) which showed significant pain reduction in group I. This study indicates that LLLT combined exercise is more effective than exercise therapy alone in relieving pain and in improving the shoulder ROM in patients with subacromial syndrome. Double-Blind Method;Exercise Therapy;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Range of Motion, Articular;Shoulder Impingement Syndrome;Shoulder Pain;Treatment Outcome

Low-power 808-nm laser irradiation inhibits cell proliferation of a human-derived glioblastoma cell line in vitro. It has been reported that low-power laser irradiation (LLI) can modulate various biological processes including cell proliferation. Some reports suggest that LLI interferes with the cell cycle and inhibits cell proliferation, while others suggest that LLI has a stimulatory effect. Mechanisms underlying the effects of LLI remain unclear. Since the effects of LLI on cancer cells are not well understood, with the aim of developing an LLI therapy for malignant glioblastoma, we investigated the effects of LLI on the cell proliferation of the human-derived glioblastoma cell line A-172. Glioblastoma cell cultures were irradiated with a diode laser at a wavelength of 808 nm and the effects on cell viability and proliferation were examined. Cell counting at 24 and 48 h after irradiation showed that LLI (at 18, 36 and 54 J/cm(2)) suppressed proliferation of A-172 cells in a fluence-dependent manner (irradiation for 20, 40 and 60 min). A reduction in the number of viable cells was also demonstrated by a fluorescent marker for viable cells, calcein acetoxymethylester (calcein-AM). The reduction in cell viability was not associated with morphological changes in the cells or with necrotic cell death as demonstrated by propidium iodide staining. LLI also had little effect on cell proliferation as shown by 5-bromo-2'-deoxyuridine staining. We discuss possible mechanisms underlying the suppressive effect of 808-nm LLI on the viability of human-derived glioblastoma A-172 cells. Fluoresceins;Fluorescent Dyes;calcein AM;DNA;Bromodeoxyuridine Bromodeoxyuridine;Cell Count;Cell Line, Tumor;Cell Proliferation;Central Nervous System Neoplasms;DNA;Fluoresceins;Fluorescent Dyes;Glioblastoma;Humans;Low-Level Light Therapy

Laser phototherapy as a treatment for radiotherapy-induced oral mucositis. Oral mucositis is a harmful side effect of radiotherapy (RT) on the head and neck region. There are encouraging reports on the beneficial aspects of the use of laser light on the treatment of oral mucositis. This paper reports the efficacy of laser phototherapy (LPT) on the treatment of oral mucositis in a patient undergoing RT after surgical removal of a squamous cell carcinoma with osseous invasion of the maxilla. Palatal and commissural lesions were treated with Î»660 nm, 40 mW, âˆ…=4 mm(2), in contact mode, 5 x 2.4 J/cm(2) per point, 14.4 J/cm(2) per session. For treating the lesion on the

patient's nasal mucosa, LPT (âˆ…=4 mm(2), Î»780 nm, 70 mW, 3 x 2.1 J/cm(2) per point, 6.3 J/cm(2) per session, contact mode) was used on the external area of the nose. A single dose (2.4 J/cm(2)) with the Î»660 nm laser, as described before, was applied on the entrance of each nostril. LPT was used 3 times/week during 4 weeks. Treatment results indicate that the use of LPT on oral mucositis was effective and allowed the patient to carry on the RT without interruption. However, long-term and controlled clinical trials are necessary to establish both preventive and curative protocols using LPT. Adult;Carcinoma, Squamous Cell;Cranial Irradiation;Humans;Lasers, Semiconductor;Male;Maxillary Neoplasms;Mouth Mucosa;Mucositis;Nasal Mucosa;Phototherapy;Radiation Injuries;Stomatitis

Effect of surface roughness and low-level laser therapy on removal torque of implants placed in rat femurs. The present study measured removal torque and bone-implant interface resistance of machined implants, acid-etched implants, or machined implants irradiated around the implant area with infrared low-level laser therapy (LLLT; 830 nm) immediately after surgery. There were statistically significant differences between Groups A (control) and B (rough surface) (P = .03). Implants with a rough surface seem to add resistance to the bone-implant interface compared with smooth titanium implants or implants treated with LLLT. Dental Implants Analysis of Variance;Animals;Dental Implantation, Endosseous;Dental Implants;Dental Prosthesis Design;Device Removal;Femur;Low-Level Light Therapy;Osseointegration;Rats;Statistics, Nonparametric;Surface Properties;Torque

Pressure ulcers. INTRODUCTION: Unrelieved pressure or friction of the skin, particularly over bony prominences, can lead to pressure ulcers in up to one third of people in hospitals or community care, and one fifth of nursing home residents. Pressure ulcers are more likely in people with reduced mobility and poor skin condition, such as older people or those with vascular disease. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of preventive interventions in people at risk of developing pressure ulcers? What are the effects of treatments in people with pressure ulcers? We searched: Medline, Embase, The Cochrane Library, and other important databases up to June 2010 (Clinical Evidence reviews are updated periodically, please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 64 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review we present information relating to the effectiveness and safety of the following interventions: air-filled vinyl boots, air-fluidised supports, alternating-pressure surfaces (including mattresses), alternative foam mattresses, constant low-pressure supports, debridement, electric profiling beds, electrotherapy, hydrocellular heel supports, low-air-loss beds (including hydrotherapy beds), low-level laser therapy, low-tech constant-low-pressure supports, medical sheepskin overlays, nutritional supplements, orthopaedic wool padding, pressure-relieving overlays on operating tables, pressure-relieving surfaces, repositioning (regular "turning"), seat cushions, standard beds, standard care, standard foam mattresses, standard tables, surgery, therapeutic ultrasound, topical lotions and dressings, topical negative pressure, and topical phenytoin. Anticonvulsants;Phenytoin Anticonvulsants;Bandages;Bedding and Linens;Beds;Debridement;Humans;Low-Level Light Therapy;Negative-Pressure Wound Therapy;Patient Positioning;Phenytoin;Pressure Ulcer;Standard of Care;Ultrasonic Therapy

[Intravenous laser irradiation of blood for the combined treatment of patients presenting with chronic sensorineural hearing loss]. A method for the treatment of chronic sensorineural hearing loss (CSNHL) is proposed that includes administration of trental followed by intravenous laser irradiation of blood (IVLBI). The study included 81 patients at the age from 20 to more than 60 years

presenting with CSNHL. They were allocated to three groups; the patients in group 1 (n=32) were given trental intravenously followed by intravenous laser irradiation of blood, those of group 2 (n=24) were treated with IVLBI alone while patients of group 3 (n=25) received "traditional" treatment. Audiometric examination and rheoencephalography were carried out before and after therapy. The hearing improved to 18-20 dB in group 1, to 10-15 dB in group 2, and to 10 dB in group 3. The improvement of rheoencephalographic characteristics was documented in the patients of all groups but was especially pronounced in group 1. It is concluded that the proposed method significantly increases the efficiency of treatment of chronic sensorineural hearing loss. Vasodilator Agents;Pentoxifylline Adult;Audiometry;Blood;Chronic Disease;Female;Hearing;Hearing Loss, Sensorineural;Humans;Injections, Intravenous;Low-Level Light Therapy;Male;Middle Aged;Pentoxifylline;Treatment Outcome;Vasodilator Agents;Young Adult

ï»¿ï»¿ï»¿ï»¿Conservative management of Achilles tendon wounds: results of a retrospective study. ï»¿Achilles tendon wounds are therapeutically challenging. The tendon`s functional importance, the paucity of soft tissue surrounding the ankle, and common patient comorbidities often limit surgical reconstructive procedure options. Depending on wound depth and overall patient health, secondary intention healing of these wounds can take many months. At the authors' wound care center, patients who are referred with recalcitrant, deep Achilles tendon wounds and who are able to visit the center two to three times per week are offered a protocol of topical hyperbaric oxygen (THBO) followed by low-level laser therapy (LLLT) and moisture-retentive dressings. A retrospective study was conducted to evaluate the outcomes of patients who received treatment for a deep Achilles tendon wound during the years 2004 through 2008. Patients who were seen but did not obtain care at the center were contacted via telephone. Of the 80 patients seen, 15 were referred for amputation, 52 obtained treatment elsewhere, and 13 received the THBO/LLLT protocol. Patient median age was 73 years (range 52-90 years) and most (85%) had diabetes mellitus. Average wound size was 90 cm2 (range 6.25-300 cm2) with an average duration of 11.7 months (range 2-60 months) before treatment. Complete re-epithelialization was achieved in 10 patients (77%) following a mean treatment time of 19 Â± 10 weeks (range 5-42 weeks). Of those, seven remained ambulatory and ulcer-free at mean follow-up of 3.3 Â± 1.8 years. Eight of the 52 patients (15%) who were not treated in the authors' center reported their ulcer was healed and 15 (29%) underwent amputation. Considering the severity of these wounds, the observed treatment outcomes are encouraging and may present a reasonable alternative for some patients with Achilles tendon wounds. Research is needed to clarify the role of these modalities in the conservative treatment of patients with Achilles tendon ulceration. Achilles Tendon;Aged;Aged, 80 and over;Diabetes Complications;Humans;Hyperbaric Oxygenation;Laser Therapy;Middle Aged;Retrospective Studies;Wound Healing

Effects of 635nm light-emitting diode irradiation on angiogenesis in CoCl(2) -exposed HUVECs. BACKGROUND AND OBJECTIVES: It is recognized that hypoxic/ischemic conditions leading to production of reactive oxygen species (ROS) are an important mediator of angiogenesis in the wound-healing process. Recently, low level light irradiation at 635â€‰nm, which is used in many clinical fields, was found to decrease intracellular ROS levels, and consequently alleviate oxidative stress. The purpose of the present study was to investigate the effects of 635â€‰nm light-emitting diode (LED) irradiation on angiogenesis in human umbilical vein endothelial cells, in an in vitro CoCl(2) -induced severe hypoxia model. STUDY DESIGN/MATERIALS AND METHODS: The effects were assessed on cell viability, tube formation, hypoxia-inducible factor-1, vascular endothelial growth factor (VEGF), VEGF-1 and -2 protein expression, mitogen-activated protein kinase (MAPK) phosphorylation, and ROS dissociation. RESULTS: The results showed that, under hypoxic/ischemic conditions, irradiation with 635 leads to reduced production and increased scavenging of intracellular ROS, which results in

alleviation of VEGFR-1 suppression, enhanced VEGF expression and ERK MAPK activation, and subsequent acceleration of angiogenesis with improved cell viability and tube formation. CONCLUSION: Taken together, irradiation with 635â€‰nm was shown to reduce intracellular ROS production, which results in increased angiogenesis. Thus, we suggest that irradiation with 635â€‰nm accelerate angiogenesis under hypoxic/ischemic conditions, and may prove to be a useful alternative tool in wound healing. HIF1A protein, human;Hypoxia-Inducible Factor 1, alpha Subunit;Reactive Oxygen Species;VEGFA protein, human;Vascular Endothelial Growth Factor A;Cobalt;Vascular Endothelial Growth Factor Receptor-1;cobaltous chloride Analysis of Variance;Blotting, Western;Cell Survival;Cells, Cultured;Cobalt;Endothelial Cells;Humans;Hypoxia-Inducible Factor 1, alpha Subunit;In Vitro Techniques;Lasers, Semiconductor;Neovascularization, Physiologic;Oxidative Stress;Phosphorylation;Radiation Dosage;Reactive Oxygen Species;Signal Transduction;Umbilical Veins;Vascular Endothelial Growth Factor A;Vascular Endothelial Growth Factor Receptor-1;Wound Healing

A comparative study on ocular damage induced by 1319nm laser radiation. BACKGROUND AND OBJECTIVES: High energy loss of 1,319â€‰nm laser due to pre-retinal water absorption makes the ocular axial length more critical, while the relative low absorbance of melanin makes retinal pigmented epithelium less contributing, to retinal damage threshold. However, both have never been illustrated experimentally. Here we determined and compared the retinal damage thresholds at this wavelength in three species with different axial lengths and retinal pigmentations. The corneal damage threshold was also determined for further comparative analysis. MATERIALS AND METHODS: The retinal damage thresholds of albino rat, non-pigmented and pigmented rabbit, and the corneal damage threshold of non-pigmented rabbit were determined for 0.2 and/or 0.4-second exposure durations. The incident beam diameter on cornea was 5â€‰mm for rabbit retinal and 2â€‰mm for rat retinal and rabbit corneal lesion. Minimum visible lesions were examined 1- and 24-hour post-exposure. Probit analysis was used to establish the estimated damage threshold for 50% of exposures (ED(50)). The direct transmittance of pre-retinal eye media was used for further comparative analysis. RESULTS: The retinal ED(50) of albino rat for 0.2â€‰seconds, non-pigmented rabbit for 0.2â€‰seconds, 0.4â€‰seconds, pigmented rabbit for 0.4â€‰seconds was 8.8, 12.1, 22.5, 18.5â€‰J/cm(2) (0.28, 2.4, 4.4, 3.6â€‰J in total intraocular energy (TIE)). The corneal ED(50) was 86.1â€‰J/cm(2) . Under the condition of 5â€‰mm beam diameter and 0.4-second exposure duration, the calculated retinal ED(50) of human was higher, while that of rhesus monkey was lower than the corneal ED(50) . CONCLUSION: For 1,319â€‰nm laser radiation, the ocular axial length has great, while the retinal pigmentation has only slight influence on retinal damage threshold. The relative lower direct transmittance of human eye media makes the retina more resistant to laser lesion, which should be considered when deriving human maximum permissible exposure (MPE). Animals;Cornea;Dose-Response Relationship, Radiation;Eye;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Macaca mulatta;Male;Models, Animal;Rabbits;Radiation Injuries;Radiotherapy Dosage;Random Allocation;Rats;Rats, Wistar;Retina;Species Specificity

Combining confluent and fractionally ablative modalities of a novel 2790nm YSGG laser for facial resurfacing. BACKGROUND: Several laser technologies exist for improving rhytides, pigmentation, and skin texture. Recent advances in technology introduced a new wavelength, 2,790â€‰nm, erbium:yttrium-scandium-galium-garnet (Er:YSGG) for treatment of photoaging. 2,790â€‰nm Er:YSGG has a water absorption coefficient between CO(2) laser and Er:YAG laser and has both ablative and fractional-ablative capabilities. OBJECTIVES: To evaluate the efficacy and safety of combining the ablative (confluent) and fractional-ablative modes of 2,790â€‰nm Er:YSGG laser for treatment of photoaging. STUDY DESIGN/MATERIALS AND METHODS: In this uncontrolled, open label, prospective study, 10 subjects were enrolled and had a single treatment of combined confluent

and fractional-ablative 2,790â€‰nm lasers for photoaging. The primary clinical end point of the study was the change in Fitzpatrick wrinkle score from baseline at different time points as determined by blinded reviewer assessments. Secondary clinical end points were the improvement in fine lines, tone/texture, and pigmentation; the subjects' self assessment; the incidence of side effects; and the tolerability of treatments. RESULTS: Based on blinded photo-assessments by two independent dermatologists, subjects showed clinically and statistically significant mean improvement of 1.9 (95% CI: 1.1-2.6), 1.6 (95% CI: 0.8-2.3), and 1.2 (95% CI: 0.5-2.0) in Fitzpatrick wrinkle scores at 6 weeks, 3 and 6 months, respectively. Of the 90% of subjects who showed improvement in Fitzpatrick wrinkle scores, 78% continued to have improvement at the 6-month follow-up visit. Mild erythema observed post-treatment was resolved by the 6-week follow-up visit in all subjects. No transient or permanent post-inflammatory hyperpigmentation (PIH); or serious adverse events were reported. CONCLUSION: A combined confluent and fractional-ablative 2,790â€‰nm Er:YSGG laser treatment improves photodamaged skin for at least 6 months. The treatment was well-tolerated and PIH was not found in our study. Adult;Aged;Analysis of Variance;Combined Modality Therapy;Esthetics;Female;Follow-Up Studies;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Rhytidoplasty;Risk Assessment;Skin Aging;Treatment Outcome

Evidence-based guideline: Treatment of painful diabetic neuropathy: report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. OBJECTIVE: To develop a scientifically sound and clinically relevant evidence-based guideline for the treatment of painful diabetic neuropathy (PDN). METHODS: We performed a systematic review of the literature from 1960 to August 2008 and classified the studies according to the American Academy of Neurology classification of evidence scheme for a therapeutic article, and recommendations were linked to the strength of the evidence. The basic question asked was: "What is the efficacy of a given treatment (pharmacological: anticonvulsants, antidepressants, opioids, others; and non-pharmacological: electrical stimulation, magnetic field treatment, low-intensity laser treatment, Reiki massage, others) to reduce pain and improve physical function and quality of life (QOL) in patients with PDN?" RESULTS AND RECOMMENDATIONS: Pregabalin is established as effective and should be offered for relief of PDN (Level A). Venlafaxine, duloxetine, amitriptyline, gabapentin, valproate, opioids (morphine sulphate, tramadol, and oxycodone controlled-release), and capsaicin are probably effective and should be considered for treatment of PDN (Level B). Other treatments have less robust evidence or the evidence is negative. Effective treatments for PDN are available, but many have side effects that limit their usefulness, and few studies have sufficient information on treatment effects on function and QOL. Academies and Institutes;Diabetic Nephropathies;Electrodiagnosis;Evidence-Based Medicine;Humans;Neurology;Pain;Physical Therapy Specialty;Practice Guidelines as Topic;Societies, Medical;United States

[Is there any place for laser devices in the treatment of melasma?]. Follow-Up Studies;Humans;Low-Level Light Therapy;Melanosis;Treatment Outcome

Use of laser phototherapy on a delayed wound healing of oral mucosa previously submitted to radiotherapy: case report. Radiotherapy produces both acute and delayed effects on mucosal tissues, disturbing their healing. This report shows a successful treatment with laser phototherapy (LPT) on a delayed wound healing in oral mucosa previously submitted to radiotherapy with a follow up of 3 years. A 47-year-old patient treated 6 months earlier for tongue squamous cell carcinoma by surgery and radiotherapy presented with a mass in the operated area. Biopsy showed chronic inflammatory infiltrate around a residual polyglactin suture. After 2 months there was a painful mucosal dehiscence on the biopsy site. LPT was performed using a semiconductor laser with 660-nm

wavelength (InGaAlP) and spot size of 0Â·04 cm(2) . The parameters applied were 40 mW, 4 Jcm(2) /point, 0Â·16 J/point, 2Â·4 J/session. The irradiation was performed punctually, through contact mode in 15 points (4 seconds/point), on top of and around the lesion, during ten sessions. The wound healed completely after ten sessions. This treatment proved to be conservative and effective, inducing healing of a chronic wound in a tissue previously submitted to radiotherapy.
Carcinoma, Squamous Cell;Cranial Irradiation;Follow-Up Studies;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Mouth Mucosa;Oral Ulcer;Radiation Injuries;Time Factors;Tongue Neoplasms;Wound Healing

Chiropractic manipulative therapy and low-level laser therapy in the management of cervical facet dysfunction: a randomized controlled study. PURPOSE: The aim of this study was to determine the short-term effect of chiropractic joint manipulation therapy (CMT) and low-level laser therapy (LLLT) on pain and range of motion in the management of cervical facet dysfunction. METHODS: Sixty ambulatory women between the ages of 18 and 40 years with cervical facet joint pain of more than 30-day duration and normal neurologic examination were randomized to receive 1 of 3 treatment options: (1) CMT of the cervical spine, (2) LLLT applied to the cervical facet joints, or (3) a combination of CMT and LLLT. Each participant received 6 treatments in 3 weeks. The main outcome measures were as follows: the Numerical Pain Rating Scale, Neck Disability Index, Cervical Range of Motion Instrument, and Baseline Digital Inclinometer. Measurements were taken during weeks 1 (baseline), 2, 3, and 4. RESULTS: No differences existed between the 3 groups at baseline. A significant difference was seen between groups 1 (CMT) and 2 (LLLT) for cervical flexion, between groups 1 (CMT) and 3 (CMT + LLLT) for cervical flexion and rotation, and between groups 2 (LLLT) and 3 (CMT + LLLT) for pain disability in everyday life, lateral flexion, and rotation. CONCLUSION: All 3 groups showed improvement in the primary and secondary outcomes. A combination of CMT and LLLT was more effective than either of the 2 on their own. Both therapies are indicated as potentially beneficial treatments for cervical facet dysfunction. Further studies are needed to explore optimal treatment procedures for CMT and LLLT and the possible mechanism of interaction between therapies.
Adolescent;Adult;Cervical Vertebrae;Combined Modality Therapy;Female;Humans;Low-Level Light Therapy;Manipulation, Chiropractic;Neck Pain;Young Adult

Induction of de novo hair regeneration in scars after fractionated carbon dioxide laser therapy in three patients. Adolescent;Adult;Cicatrix;Female;Hair;Hand Injuries;Humans;Incidental Findings;Lasers, Gas;Low-Level Light Therapy;Thigh

Is effect of low-level laser therapy in patients with burning mouth syndrome result of a placebo?
Burning Mouth Syndrome;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male

Evidence-based guideline: treatment of painful diabetic neuropathy--report of the American Association of Neuromuscular and Electrodiagnostic Medicine, the American Academy of Neurology, and the American Academy of Physical Medicine & Rehabilitation. The objective of this report was to develop a scientifically sound and clinically relevant evidence-based guideline for the treatment of painful diabetic neuropathy (PDN). The basic question that was asked was: "What is the efficacy of a given treatment (pharmacological: anticonvulsants, antidepressants, opioids, others; non-pharmacological: electrical stimulation, magnetic field treatment, low-intensity laser treatment, Reiki massage, others) to reduce pain and improve physical function and quality of life (QOL) in patients with PDN?" A systematic review of literature from 1960 to August 2008 was performed, and studies were classified according to the American Academy of Neurology classification of evidence scheme for a therapeutic article. Recommendations were linked to the strength of the evidence. The results indicate that pregabalin is established as effective and should be offered for relief of PDN (Level A). Venlafaxine, duloxetine, amitriptyline, gabapentin, valproate, opioids (morphine sulfate, tramadol, and oxycodone controlled-release), and capsaicin are probably effective and should be

considered for treatment of PDN (Level B). Other treatments have less robust evidence, or the evidence is negative. Effective treatments for PDN are available, but many have side effects that limit their usefulness. Few studies have sufficient information on their effects on function and QOL. Analgesics Analgesia;Analgesics;Combined Modality Therapy;Diabetic Neuropathies;Evidence-Based Medicine;Humans;Nervous System Diseases;Neuromuscular Diseases;United States

Infrared (810-nm) low-level laser therapy on rat experimental knee inflammation. Arthritis of the knee is the most common type of joint inflammatory disorder and it is associated with pain and inflammation of the joint capsule. Few studies address the effects of the 810-nm laser in such conditions. Here we investigated the effects of low-level laser therapy (LLLT; infrared, 810-nm) in experimentally induced rat knee inflammation. Thirty male Wistar rats (230-250 g) were anesthetized and injected with carrageenan by an intra-articular route. After 6 and 12 h, all animals were killed by CO(2) inhalation and the articular cavity was washed for cellular and biochemical analysis. Articular tissue was carefully removed for real-time PCR analysis in order to evaluate COX-1 and COX-2 expression. LLLT was able to significantly inhibit the total number of leukocytes, as well as the myeloperoxidase activity with 1, 3, and 6 J (Joules) of energy. This result was corroborated by cell counting showing the reduction of polymorphonuclear cells at the inflammatory site. Vascular extravasation was significantly inhibited at the higher dose of energy of 10 J. Both COX-1 and 2 gene expression were significantly enhanced by laser irradiation while PGE(2) production was inhibited. Low-level laser therapy operating at 810 nm markedly reduced inflammatory signs of inflammation but increased COX-1 and 2 gene expression. Further studies are necessary to investigate the possible production of antiinflammatory mediators by COX enzymes induced by laser irradiation in knee inflammation. Interleukin-1;Interleukin-6;Membrane Proteins;Evans Blue;Carrageenan;Peroxidase;Ptgs2 protein, mouse;Cyclooxygenase 1;Cyclooxygenase 2;Ptgs1 protein, mouse;Dinoprostone Animals;Arthritis, Experimental;Carrageenan;Cyclooxygenase 1;Cyclooxygenase 2;Dinoprostone;Evans Blue;Extravasation of Diagnostic and Therapeutic Materials;Gene Expression Regulation;Interleukin-1;Interleukin-6;Knee Joint;Leukocyte Count;Low-Level Light Therapy;Male;Membrane Proteins;Peroxidase;Rats;Rats, Wistar

Effects of photobiostimulation on edema and hemorrhage induced by Bothrops moojeni venom. Antivenom (AV) treatment has been ineffective in neutralizing the severe local fast-developing tissue damage following snake-bite envenoming. We studied the effectiveness of low-level laser (LLL) and light-emitting diode (LED) irradiation alone or in combination with AV in reducing local edema formation and hemorrhage induced by Bothrops moojeni venom (BmV) in mice. Edema formation was induced by injection of 1 Î¼g per paw of BmV into the right paw and was evaluated before and at several intervals after BmV intraplantar injection. Hemorrhagic activity was evaluated after intradermal injection of 20 Î¼g of BmV by measuring the diameter of the hemorrhagic area on the inner side of the skin. The site of BmV injection was irradiated by LLL or LED 30 min after BmV inoculation. AV was also administered intravenously 30 min after BmV injection. Irradiation with LLL at a wavelength of 685 nm and a dose of 2.2 J/cm(2) and with a red LED and an infrared LED at wavelengths of 635 nm and 945 nm, respectively, and a dose of 4 J/cm(2) reduced edema formation and hemorrhage induced by BmV ($p < 0.05$). The combined AV and LLL or LED treatment showed the same reduction as LLL or LED irradiation separately. In conclusion, both LLL and LED irradiation reduced venom-induced local effects even though symptoms were already present. Thus, the effect of phototherapy in reducing local effects induced by BmV may be clinically relevant. Antivenins;Crotalid Venoms Animals;Antivenins;Bothrops;Crotalid Venoms;Edema;Hemorrhage;Low-Level Light Therapy;Male;Mice;Phototherapy;Snake Bites

Evidence-based guideline: Treatment of painful diabetic neuropathy: report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine,

and the American Academy of Physical Medicine and Rehabilitation. OBJECTIVE: To develop a scientifically sound and clinically relevant evidence-based guideline for the treatment of painful diabetic neuropathy (PDN). METHODS: We performed a systematic review of the literature from 1960 to August 2008 and classified the studies according to the American Academy of Neurology classification of evidence scheme for a therapeutic article, and recommendations were linked to the strength of the evidence. The basic question asked was: "What is the efficacy of a given treatment (pharmacologic: anticonvulsants, antidepressants, opioids, others; and nonpharmacologic: electrical stimulation, magnetic field treatment, low-intensity laser treatment, Reiki massage, others) to reduce pain and improve physical function and quality of life (QOL) in patients with PDN?" RESULTS AND RECOMMENDATIONS: Pregabalin is established as effective and should be offered for relief of PDN (Level A). Venlafaxine, duloxetine, amitriptyline, gabapentin, valproate, opioids (morphine sulfate, tramadol, and oxycodone controlled-release), and capsaicin are probably effective and should be considered for treatment of PDN (Level B). Other treatments have less robust evidence or the evidence is negative. Effective treatments for PDN are available, but many have side effects that limit their usefulness, and few studies have sufficient information on treatment effects on function and QOL. Analgesics, Opioid;Anticonvulsants;Antidepressive Agents Analgesics, Opioid;Anticonvulsants;Antidepressive Agents;Diabetic Neuropathies;Electric Stimulation Therapy;Electromagnetic Fields;Evidence-Based Medicine;Humans;Pain;Pain Management

Erythema ab igne successfully treated using 1,064-nm Q-switched neodymium-doped yttrium aluminum garnet laser with low fluence. Erythema;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Leg;Low-Level Light Therapy;Young Adult

Early and long-term results of physical methods in the treatment of venous leg ulcers: randomized controlled trial. OBJECTIVE: To estimate early and long-term results of physical methods in the treatment of venous leg ulcers. METHOD: In group A after surgical operation, 40 patients were treated with the high-voltage stimulation (HVS) (100 Âµs, 100 Hz, 100 V) and drug therapy. In group B after operation, 37 patients were treated with ultrasound (0.5 W/cm(2), 1 MHz) and drug therapy. In group C after operation, 33 patients were treated with low-level laser therapy (LLLT) (810 nm, 65 mW) and drug therapy. In group D after operation, 35 patients were treated with the compression stockings (25-31 mmHg) and drug therapy. In group E after operation, 37 patients were only treated with drug therapy. Group F consisted of 32 patients, conservatively treated with the HVS and drug therapy. Group G consisted of 20 patients, conservatively treated with ultrasound and drug therapy. Group H consisted of 21 patients, conservatively treated with LLLT and drug therapy. Group I consisted of 30 patients, conservatively treated with compression and drug therapy. Group J consisted of 27 patients only treated with drug therapy. RESULTS: Both short and long term parameters showed that compression therapy is the most efficient in ulcer healing. The electrical and ultrasound methods are less effective. The laser therapy ared useless. CONCLUSION: Superficial venous surgery in addition to compression therapy is the most efficient treatment of venous leg ulcers. The compression therapy should be continued both surgically and conservatively treated patients with healed ulcers. In special cases after superficial venous surgery (isolated superficial reflux) compression therapy could be applied only to the time of ulcer closure without continuing it longer. HVS and ultrasound therapy are useful methods in conservative treatment of venous leg ulcers. For surgically-treated patients these physical therapies are efficient only in superficial plus deep reflux cases. HVS and ultrasound can be alternative methods, but are less effective in recurrence risk. LLLT is not an efficient physical method in treatment of venous leg ulcers. Adult;Aged;Aged, 80 and over;Female;Humans;Leg Ulcer;Male;Middle Aged;Physical Therapy Modalities;Prospective Studies;Stockings, Compression;Time Factors;Vascular Surgical Procedures

Pulsed dye laser double-pass treatment of patients with resistant capillary malformations. The pulsed dye laser is an effective and established treatment for port-wine stains and has become the generally accepted standard of care. However, in many cases, complete clearance cannot be achieved as a significant proportion of lesions become resistant to treatment. Multiple passes or pulse-stacking techniques have been used to improve the extent and rate of fading, but concerns over increased adverse effects have limited this clinical approach. In this work, a double-pass technique with the pulsed dye laser has been described, which may allow for increased depth of vascular injury, greater efficacy, and an acceptable risk profile. Our aim was to determine the efficacy and the rate of side-effects for a double-pass protocol with a pulsed dye laser (PDL) to treat patients previously treated with PDL and/or other laser modalities. A retrospective chart review was conducted of 26 patients treated with a minimum of three double-pass treatments alone, or in combination, with single pass conventional PDL. Almost half of the patients (nâ€‰=â€‰12) showed either a moderate or significant improvement in fading compared to pre-treatment photographs with the double-pass technique. In a further 12 patients, there was a mild improvement. In two patients, there was no change. Sixteen patients developed mild side-effects: blisters (nâ€‰=â€‰5), dry scabs (nâ€‰=â€‰11) and transient hyperpigmentation (nâ€‰=â€‰4). This preliminary experience suggests that a double-pass technique at defined intervals between the first and second treatment with PDL can further lighten some port-wine stains, which are resistant to conventional single-pass treatments. This technique may be a useful addition to the laser treatment of PWS and deserves further scrutiny with randomized prospective studies and histological analysis to confirm the increased depth of vascular injury.
Adolescent;Adult;Aged;Capillaries;Female;Humans;Lasers, Dye;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Port-Wine Stain;Treatment Outcome;Young Adult

Chemotherapy-induced oral mucositis in a patient with acute lymphoblastic leukaemia. BACKGROUND: Oral mucositis is the main complication of chemotherapy and radiotherapy used in the treatment of cancer. Phototherapy has proven effective in the treatment of mucositis, as it accelerates the tissue healing process and has both analgesic and anti-inflammatory properties. CASE REPORT: This paper reports the case of a paediatric patient with oral mucositis stemming from chemotherapy employed for the treatment of acute lymphoblastic leukaemia. TREATMENT: The lesions were treated daily with a light-emitting diode (LED). FOLLOWUP: Remission of the lesions occurred after 10 days of treatment. CONCLUSIONS: LED was effective in the treatment of mucositis, as it diminished pain symptoms and accelerated the tissue repair process. Anti-Inflammatory Agents Analgesia;Anti-Inflammatory Agents;Antineoplastic Combined Chemotherapy Protocols;Cellulitis;Child, Preschool;Female;Hand Dermatoses;Humans;Lasers, Semiconductor;Lip Diseases;Low-Level Light Therapy;Oral Ulcer;Pain Measurement;Precursor Cell Lymphoblastic Leukemia-Lymphoma;Remission Induction;Stomatitis;Tongue Diseases;Wound Healing

Low level laser therapy in oral mucositis: a pilot study. AIM: The goal of this pilot study was to investigate the capacity of pain relief and wound healing of low level laser therapy (LLLT) in chemotherapy-induced oral mucositis (OM) in a paediatric oncology population group. STUDY DESIGN AND METHODS: 16 children (mean age 9.4 years) from the Gent University Hospital - Department Paediatric Oncology/haematology, suffering from chemotherapy-induced OM were selected. During clinical investigations, the OM grade was assessed using the WHO classification. All children were treated using a GaAlAs diode laser with 830 nm wavelength and a potency of 150 mW. The energy released was adapted according to the severity of the OM lesions. The same protocol was repeated every 48 hrs until healing of each lesion occurred. Subjective pain was monitored before and immediately after treatment by an appropriate pain scale and functional impairment was recorded. At each visit, related blood cell counts were recorded. RESULTS: After 12 mths, records were

evaluated and information about treatment sequence, treatment sessions and frequencies related to the pain sensation and comfort were registered. Immediately after beaming the OM, pain relief was noticed. Depending on the severity of OM, on average, 2.5 treatments per lesion in a period of 1 week were sufficient to heal a mucositis lesion. CONCLUSIONS: LLLT, one of the most recent and promising treatment therapies, has been shown to reduce the severity and duration of mucositis and to relieve pain significantly. In the present study similar effects were obtained with the GaAlAs 830nm diode laser. It became clear that using the latter diode device, new guidelines could be developed as a function of the WHO-OM grades i.e. the lower the grade, the less energy needed. Immediate pain relief and improved wound healing resolved functional impairment that was obtained in all cases.
Antineoplastic Agents Antineoplastic Agents;Child;Erythema;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Leukemia;Leukocyte Count;Low-Level Light Therapy;Lymphoma;Male;Mouth Mucosa;Necrosis;Neutrophils;Oral Hygiene;Oral Ulcer;Osteosarcoma;Pain;Pain Measurement;Pilot Projects;Platelet Count;Radiotherapy Dosage;Stomatitis;Time Factors;Wound Healing

Case report: laser-assisted rebonding of a central incisor tooth due to a severe trauma - 4 years of follow-up. BACKGROUND: The success of reattaching fractured tooth crowns fragments, as a result of trauma, has improved as a result of the introduction of lasers in dental care. This case report documents a 4 year follow-up of a re-bonded tooth fragment on a maxilary first permanent incisor. CASE REPORT: An 8-year-old girl presented with a fractured maxillary might first permanent incisor (II) as a result of a severe trauma. The child's parents had preserved the tooth fragment in a glass of milk immediately after the injury. TREATMENT: An Er,Cr:YSGG Laser with a wavelength of 2,780 nm was used with 20Hz, 5 W (250 mJ), 90 % air, 80% water for etching of the enamel and 20 Hz, 3W (150 mJ), 65% air, 55% water for dentine etching with a G6 (600 micron, sapphire, 6mm long) tip. For conditioning the enamel and dentine no additional acid etching was used. Only a 2 step self-etched adhesive system Clearfil ProtectÂ® (Kuraray Medical, Japan) was applied. Then a flowable composite resin, Grandi FlowÂ® (Voco, Cuxhaven, Germany) was applied in order to bind the broken fragment onto the tooth. FOLLOW-UP: The re-bonded tooth fragment has been retained in place and symptom free, as assessed by clinical examination, intraoral photographs and radiographs for a period of 4 years. CONCLUSION: Laser-assisted re-bonding of a tooth fragment was found to be successful.
Clearfil Protect Bond;Composite Resins;Dental Materials;Dentin-Bonding Agents Child;Composite Resins;Dental Bonding;Dental Enamel;Dental Etching;Dental Materials;Dental Restoration, Permanent;Dentin;Dentin-Bonding Agents;Female;Follow-Up Studies;Humans;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Maxilla;Photography, Dental;Radiography, Dental, Digital;Tooth Crown;Tooth Fractures

The effect of low level laser therapy on pain during dental tooth-cavity preparation in children. AIM: To evaluate the effect of low level laser therapy on pain during cavity preparation with laser in paediatric dental patients. STUDY DESIGN AND METHODS: The study was carried out on 10 children aged 6 to 9 years old for a total of 20 primary molar teeth. For laser preparation an Er: YAG laser was used. Half of the preparations were treated by low level laser therapy (LLLT) before laser preparation and the remaining half without LLLT (non-LLLT) before laser preparation. All cavities were prepared by ER:YAG laser, restored with light-cured composite resin following the application of acid etching and bonding agent. Children were instructed to rate their pain on the visual analogue scale (VAS) from 0 to 5 points. Statistical analyses were performed using Mann Whitney U test. RESULTS: VAS Median (min-max) scores were 1(0-2) for LLLT and 3(1-4) for the non-LLT treated children. Between LLLT and non- LLLT groups results were statistically significant ($p<0.01$). CONCLUSIONS: The use of LLLT before cavity preparation with laser decreased pain in paediatric dental patients.

Analgesia;Child;Dental Cavity Preparation;Female;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Male;Molar;Pain;Pain Measurement;Tooth, Deciduous

Diode laser irradiation and fluoride uptake in human teeth. AIM: To evaluate chemically the effects of diode laser on fluoride uptake before and after laser irradiation of enamel surfaces. METHODS: Crowns of 20 sound human teeth were halved and a 3 x 3 mm acid-resistant varnish uncovered window left for: A) no treatment; B) fluoride (Elmex gel); C) diode (fluoride + diode laser); D) diode (diode laser + fluoride). The dental surfaces were analysed using a fluoride ion-selective electrode, in order to evaluate the fluoride treatment in combination with a diode laser. Also, to investigate laser-induced compositional changes (contents in F(-)) in enamel before/after laser irradiation and topical fluoride application. RESULTS: The mean Â± SD of fluoride uptake of teeth of group A was 1.55 Â± 0.89 mg/l. Mean fluoride uptake increased sevenfold after fluoride gel treatment: 10.51 Â± 3.38 mg/l for group B, up to 15 times after gel and laser treatment: 23.62 Â± 3.58 mg/l for group C and was 22.7 Â± 4.60 mg/l for group D (diode laser before fluoride application). The Kruskal Wallis test indicated a statistically significant effect of fluoride uptake for all three treatments ($p<0.001$). The Student-Newman-Keuls multiple comparison test indicated a statistically significant increase of fluoride uptake before and after all treatments, and also a statistically significant difference for laser treatment versus fluoride gel. However, there was no statistically significance difference between laser groups. CONCLUSIONS: There is an enhanced capability of lasers to increase fluoride uptake of enamel and providing protection to enamel surface from acid attack. Cariostatic Agents;Diamines;Fluorides, Topical;Olaflur;Fluorides Cariostatic Agents;Dental Enamel;Diamines;Fluorides;Fluorides, Topical;Humans;Ion-Selective Electrodes;Lasers, Semiconductor;Low-Level Light Therapy

Lasers in dental traumatology and low level laser therapy (LLLT). BACKGROUND: Dental trauma in children is a frequent and often complex clinical event in which laser-assisted therapy, particularly using erbium lasers, can offer new treatment possibilities, improving the outcomes and reducing the associated complications. REVIEW: In particular, it is worth considering that the use of laser-assisted therapies is associated with a marked reduction in the use of analgesics and anti-inflammatory medications compared with conventional procedures. Laser anaesthesia is another interesting and challenging area. CONCLUSION: Given the paucity of data on laser-assisted dental trauma therapy in the international literature and the absence of well-structured guidelines, this is an area ripe for scientific research. Analgesics;Anti-Inflammatory Agents Analgesics;Anesthesia, Dental;Anti-Inflammatory Agents;Child;Humans;Laser Therapy;Lasers, Solid-State;Low-Level Light Therapy;Periodontium;Tooth Fractures;Tooth Injuries

Laser restorative dentistry in children and adolescents. BACKGROUND: The idea of substituting a drill with a laser light, has led to its introduction in dentistry. Besides being more accepted to patients, in paediatric dentistry the laser has demonstrated safety compared with rotating instruments. REVIEW: A review of the past 20 years of the dental literature concerning laser use in dentistry, including paediatric dentistry was completed. The findings of that review are presented. TECHNIQUES: The various types of lasers and their uses for caries detection, tooth sealing and caries removal are described. RESULTS: Laser caries detection demonstrated a good reproducibility, reliability and predictability to monitor the caries process over time. Erbium lasers have been found to be efficient for caries removal, tooth cleaning and decontamination. CONCLUSION: The laser erbium technology represents a safe device to effectively and selectively remove carious tissues from decayed teeth. For children, all the recognized advantages of this technique play a decisive role in the successful day-to-day treatment of dental caries. Adolescent;Child;Dental Care for Children;Dental Caries;Dental Restoration, Permanent;Humans;Laser Therapy;Lasers;Lasers, Solid-State;Low-Level Light Therapy

Laser physics and a review of laser applications in dentistry for children. AIM: The aim of this introduction to this special laser issue is to describe some basic laser physics and to delineate the potential of laser-assisted dentistry in children. REVIEW: A brief review of the available laser literature was performed within the scope of paediatric dentistry. Attention was paid to soft tissue surgery, caries prevention and diagnosis, cavity preparation, comfort of the patient, effect on bacteria, long term pulpal vitality, endodontics in primary teeth, dental traumatology and low level laser therapy. Although there is a lack of sufficient evidence taking into account the highest standards for evidence-based dentistry, it is clear that laser application in a number of different aetiologies for soft tissue surgery in children has proven to be successful. Lasers provide a refined diagnosis of caries combined with the appropriate preventive adhesive dentistry after cavity preparation. This will further lead to a new wave of micro-dentistry based on 'filling without drilling'. CONCLUSION: It has become clear from a review of the literature that specific laser applications in paediatric dentistry have gained increasing importance. It can be concluded that children should be considered as amongst the first patients for receiving laser-assisted dentistry. Child;Dental Care for Children;Dental Caries;Humans;Laser Therapy;Lasers;Low-Level Light Therapy;Oral Surgical Procedures;Physics

Effect of intraoral low-level laser therapy on quality of life of patients with head and neck cancer undergoing radiotherapy. BACKGROUND: Low-level laser therapy has been used to reduce complications of head and neck cancer treatment. The aim was to assess the impact of laser in the quality of life (QOL) of patients receiving radiotherapy. METHODS: Sixty outpatients were randomly assigned into 2 groups. The laser group received applications and the placebo group received sham laser. QOL was assessed using the University of Washington QOL questionnaire. A repeated-measures analysis of variance (ANOVA) was used for comparisons of overall QOL scores and Mann-Whitney test compared changes in domain scores. RESULTS: A decrease in QOL scores was observed in both groups and the reduction in the laser group was significantly lower ($p < .01$). Changes in QOL scores regarding pain, chewing, and saliva domains were evident in the placebo group. Both health-related QOL and overall QOL were rated higher by patients who received laser therapy. CONCLUSION: Laser therapy reduces the impact of radiotherapy on the QOL of patients with head and neck cancer. Antineoplastic Agents Adult;Aged;Aged, 80 and over;Antineoplastic Agents;Cohort Studies;Dose Fractionation, Radiation;Female;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Male;Middle Aged;Neck Dissection;Quality of Life;Recovery of Function;Stomatitis;Treatment Outcome

Transcriptional regulation of bone sialoprotein gene by CO(2) laser irradiation. Bone sialoprotein (BSP), an early marker of osteoblast differentiation, has been implicated in the nucleation of hydroxyapatite during de novo bone formation. Low-power laser irradiation has a stimulating effect on cells and tissues. Although the carbon dioxide (CO(2)) laser is a hard surgical laser, we have attempted to use it at low energy density to achieve biological alterations. To investigate the effects of CO(2) laser irradiation on BSP gene transcription, we used rat osteoblast-like ROS17/2.8 cells. BSP mRNA levels were increased at 12 h after irradiation with the CO(2) laser (2 W, 20 s). Transient transfection assays using various sizes of the rat BSP gene promoter linked to the luciferase reporter gene showed that CO(2) laser irradiation induced luciferase activity of a -116 to +60 BSP promoter construct (pLUC3) at 12 h in the cells. Transcriptional stimulation by CO(2) laser irradiation was abrogated in the pLUC3 construct containing a 2-bp mutation in the fibroblast growth factor 2 response element (FRE). Gel shift analyses showed that CO(2) laser irradiation increased the binding of nuclear protein to FRE. These studies demonstrate that CO(2) laser irradiation increases BSP transcription via FRE in the rat BSP gene promoter. Integrin-Binding Sialoprotein;Fibroblast Growth Factor 2;Luciferases Animals;Cells, Cultured;Fibroblast Growth Factor 2;Gene Expression Regulation;Integrin-Binding Sialoprotein;Lasers, Gas;Low-Level Light

Therapy;Luciferases;Osteoblasts;Promoter Regions, Genetic;Rats;Response Elements;Transcription, Genetic

[New methods of physical therapy and instruments for their application (based on projects developed in Belarus)]. This article was designed to overview new methods (thermomagnetotherapy, photomagnetotherapy, vacuum darsonvalization, low-frequency fonotherapy, etc.) developed in Belarus under the guidance of the author. The information about the influence of these therapeutic modalities on the human organism is presented along with indications for their application in clinical and sports medicine. Atmospheric Pressure;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Magnetic Field Therapy;Physical Therapy Modalities;Republic of Belarus;Ultrasonic Therapy;Vacuum

[Combined application of magnetolaserotherapy and polyunsaturated fatty acids for the treatment of patients with hypertensive disease]. The authors report the results of combined treatment including application of magnetolaserotherapy and n-3 polyunsaturated fatty acids for the management of patients presenting with hypertensive disease. These data give evidence of the accumulation of atherogenic fractions of plasma lipids and pathological modification of the fatty acid composition in erythrocyte membranes. They suggest the appropriateness of lipid-correcting and membrane-protective treatment for patients presenting with hypertensive disease. It is concluded that the proposed combination of magnetolaserotherapy and polyunsaturated fatty acids may be instrumental in the normalization of the serum lipid profile and the correction of the cellular fatty acid composition. Fatty Acids, Omega-3;Lipids;Membrane Lipids Adult;Blood Pressure;Combined Modality Therapy;Dietary Supplements;Erythrocytes;Fatty Acids, Omega-3;Female;Humans;Hypertension;Lipids;Low-Level Light Therapy;Magnetic Field Therapy;Male;Membrane Lipids;Middle Aged;Treatment Outcome

Noninvasive body sculpting technologies with an emphasis on high-intensity focused ultrasound. BACKGROUND: Body-sculpting procedures are becoming increasingly popular in the United States. Although surgical lipoplasty remains the most common body sculpting procedure, a demand exists for noninvasive alternatives capable of reducing focal adiposity without the risks of adverse events (AEs) associated with invasive excisional body-sculpting procedures. METHODS: This report describes the mechanism of action, efficacy, safety, and tolerability of cryolipolysis, radiofrequency ablation, low-level external laser therapy, injection lipolysis, low-intensity nonthermal ultrasound, and high-intensity focused ultrasound (HIFU), with an emphasis on thermal HIFU. The articles cited were identified via a PubMed search, with additional article citations identified by manual searching of the reference lists of articles identified through the literature search. RESULTS: Each of the noninvasive treatments reviewed can be administered on an outpatient basis. These treatments generally have fewer complications than lipoplasty and require little or no anesthesia or analgesia. However, HIFU is the only treatment that can produce significant results in a single treatment, and only radiofrequency, low-level laser therapy, and cryolipolysis have been approved for use in the United States. Early clinical data on HIFU support its efficacy and safety for body sculpting. In contrast, radiofrequency, laser therapy, and injection lipolysis have been associated with significant AEs. CONCLUSIONS: The published literature suggests that noninvasive body-sculpting techniques such as radiofrequency ablation, cryolipolysis, external low-level lasers, laser ablation, nonthermal ultrasound, and HIFU may be appropriate options for nonobese patients requiring modest reduction of adipose tissue. Adult;Cosmetic Techniques;Cryotherapy;Esthetics;Female;Follow-Up Studies;High-Intensity Focused Ultrasound Ablation;Humans;Lipectomy;Low-Level Light Therapy;Male;Middle Aged;Risk Assessment;Subcutaneous Fat, Abdominal;Surgery, Plastic;Treatment Outcome

Laser "explosion" technique for treatment of unexpanded coronary stent.
Angioplasty, Balloon, Coronary;Coronary Artery Disease;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Middle Aged;Radiography;Stents

Potassium titanyl phosphate 532-nm laser for treatment of a chronic nonhealing exophytic wound with hypergranulation tissue. Aged;Granuloma;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Scalp;Skin Diseases;Wound Healing

Evaluation of laser phototherapy in the inflammatory process of the rat's TMJ induced by carrageenan. AIM: The aim of this study was to evaluate, by light microscopy, the effects of laser phototherapy (LPT) at 780â€‰nm or a combination of 660 and 790â€‰nm, on the inflammatory process of the rat temporomandibular joint (TMJ) induced by carrageen. BACKGROUND: Temporomandibular disorders (TMDs) are frequent in the population and generally present an inflammatory component. Previous studies have evidenced positive effects of laser phototherapy on TMDs. However, its mechanism of action on the inflammation of the TMJ is not known yet. MATERIALS AND METHODS: Eighty-five Wistar rats were divided into 9 groups: G1, Saline; G2, Salineâ€‰+â€‰LPT IR; G3, Salineâ€‰+â€‰LPT IRâ€‰+â€‰R; G4, Carrageenan; G5, Carrageenanâ€‰+â€‰LPT IR; G6, Carrageenanâ€‰+â€‰LPT IRâ€‰+â€‰R; G7, previous LPTâ€‰+â€‰Carrageenan; G8, previous LPTâ€‰+â€‰carrageenanâ€‰+â€‰LPT IR; and G9, previous LPTâ€‰+â€‰carrageenanâ€‰+â€‰LPT IRâ€‰+â€‰R, and then subdivided in subgroups of 3 and 7 days. After animal death, specimens were taken, routinely cut and stained with HE, Sirius Red, and Toluidine Blue. Descriptive analysis of components of the TMJ was done. The synovial cell layers were counted. RESULTS: Injection of saline did not produced inflammatory reaction and the irradiated groups did not present differences compared to nonirradiated ones. After carrageenan injection, intense inflammatory infiltration and synovial cell layers proliferation were observed. The infrared irradiated group presented less inflammation and less synovial cell layers number compared to other groups. Previous laser irradiation did not improve the results. CONCLUSION: It was concluded that the LPT presented positive effects on inflammatory infiltration reduction and accelerated the inflammation process, mainly with IR laser irradiation. The number of synovial cell layers was reduced on irradiated group. Carrageenan
Animals;Carrageenan;Inflammation;Lasers, Semiconductor;Low-Level Light Therapy;Male;Photomicrography;Rats;Rats, Wistar;Temporomandibular Joint;Temporomandibular Joint Disorders

Effect of low-level treatment with an 80-Hz pulsed infrared diode laser on mast-cell numbers and degranulation in a rat model of third-degree burn. BACKGROUND DATA: Low-level laser therapy (LLLT) has been reported to be capable of changing mast cell numbers and degranulation in experimental burns in rats. OBJECTIVE: We conducted a study of the influence of LLLT on mast cells in a rat model of third-degree burn. METHODS: In this study we divided 48 rats equally into two groups of 24 rats each. Third-degree burns were inflicted at three different locations on each rat in each group. The first burn site on rats in group I was treated with 890-nm pulsed laser, 75W peak, 80â€‰Hz, 180â€‰ns, average power 1mW, illuminated area 1â€‰cm(2), 1â€‰mW/cm(2), 856â€‰sec, 0.924â€‰J/cm(2). The second burn site on both groups of rats was treated with 0.2% nitrofurazone cream. Mast cell numbers and degranulation at each burn site on each group of rats were then assessed at 4, 8, 13, and 20 days after the infliction of burns. RESULTS: Analysis of variance on day 4 showed that the total numbers of mast cells were significantly lower at the laser-treated burn sites than at other burn sites on both groups of rats. On day 8 the total numbers of mast cells were again significantly lower at the laser-treated burn sites than at other burn sites, and on day 13, the numbers of both types 1 and 2 mast cells were significantly lower at the laser-treated burn sites than at other burn sites. CONCLUSIONS: We conclude that LLLT can significantly decrease total

numbers of mast cells during the proliferation and remodeling phases of healing in a rat model of third-degree burn. Animals;Burns;Cell Count;Disease Models, Animal;Granulation Tissue;Lasers, Semiconductor;Low-Level Light Therapy;Male;Mast Cells;Rats;Rats, Wistar;Wound Healing

Inhibitory effects of laser irradiation on peripheral mammalian nerves and relevance to analgesic effects: a systematic review. OBJECTIVE: The objective of this review was to systematically identify experimental studies of non-ablative laser irradiation (LI) on peripheral nerve morphology, physiology, and function. The findings were then evaluated with special reference to the neurophysiology of pain and implications for the analgesic effects of low-level laser therapy (LLLT). BACKGROUND: LLLT is used in the treatment of pain, and laser-induced neural inhibition has been proposed as a mechanism. To date, no study has systematically evaluated the effects of LI on peripheral nerve, other than those related to nerve repair, despite the fact that experimental studies of LI on nerves have been conducted over the past 25 years. METHODS: We searched computerized databases and reference lists for studies of LI effects on animal and human nerves using a priori inclusion and exclusion criteria. RESULTS: We identified 44 studies suitable for inclusion. In 13 of 18 human studies, pulsed or continuous wave visible and continuous wave infrared (IR) LI slowed conduction velocity (CV) and/or reduced the amplitude of compound action potentials (CAPs). In 26 animal experiments, IR LI suppressed electrically and noxiously evoked action potentials including pro-inflammatory mediators. Disruption of microtubule arrays and fast axonal flow may underpin neural inhibition. CONCLUSIONS: This review has identified a range of laser-induced inhibitory effects in diverse peripheral nerve models, which may reduce acute pain by direct inhibition of peripheral nociceptors. In chronic pain, spinal cord changes induced by LI may result in long-term depression of pain. Incomplete reporting of parameters limited aggregation of data. Action Potentials;Analgesia;Animals;Evoked Potentials;Humans;Low-Level Light Therapy;Neural Conduction;Pain;Peripheral Nerves

Phenomenon of laser power loss during curettage of infected periodontal pockets. OBJECTIVE: The purpose of this study was to evaluate the reduction in laser power output (PO) at the optical fiber tip during laser curettage of infected periodontal pockets. BACKGROUND DATA: The combination of mechanical debridement with laser therapy has been used successfully in the treatment of periodontitis. METHODS: The study group consisted of 28 teeth selected in 12 patients with chronic periodontitis. The teeth were treated with scaling and root planing (SRP), and infected pocket epithelium was removed with an 810-nm diode laser operating at a laser power of 1.7 W in continuous-wave mode (CW). Laser power was set to 1.0 W at the control panel before each measurement to facilitate mathematical analysis, and PO at the optical fiber tip was measured using a power meter. Four laser applications were performed per tooth (duration, 10-15 sec per application; total duration, 40-60 sec per tooth). The fiber tip was cleaved every four applications. Also, 28 irradiations (four PO measurements per irradiation) were performed in non-contact mode and used as controls. RESULTS: There were significant PO losses between applications in the study group. PO losses of 20.89%, 30.39%, and 40.26% were found between the first and second, first and third, and first and fourth applications, respectively. A low transmission loss of the optical fiber was observed in the control measurements (mean PO loss of 1.58% between the first and fourth irradiations). CONCLUSIONS: Our results indicated that optical fiber tips need to be cleaved frequently during laser curettage to minimize PO loss. Adult;Aged;Analysis of Variance;Curettage;Debridement;Dental Scaling;Electric Power Supplies;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Periodontal Pocket;Root Planing;Statistics, Nonparametric;Treatment Outcome

Low-level laser therapy (LLLT) at 830â€‰nm positively modulates healing of tracheal incisions in rats: a preliminary histological investigation. OBJECTIVE: The aim of the present study was to evaluate whether LLLT at 830â€‰nm is able to positively modulate trachea incisional wound healing in Sprague-Dawley rats. BACKGROUND DATA: Tracheotomy may be associated with numerous complications. Development of excess granulation tissue represents a late complication that may lead to airway occlusion. Low-level laser therapy (LLLT) has been shown to have stimulatory effects on wound healing of different tissues. Therefore, it may be suggested that LLLT could be able to positively modulate trachea wound healing as well. MATERIALS AND METHODS: Using general anesthesia, a median incision was performed from the second to the fifth tracheal cartilage ring in 24 rats. Animals were then randomly divided into sham-irradiated control and laser-treated groups. LLLT (power density: 450â€‰mW/cm(2); total daily dose: 60â€‰J/cm(2); irradiated area âˆ¼1â€‰cm(2)) treatment was performed daily during the first week after surgery. Samples for histological evaluation were removed 7 and 28 days after surgical procedure. Histological sections were stained with hematoxylin-eosin and van Gieson. RESULTS: Results from our investigation showed that LLLT was able to reduce granulation tissue formation and simultaneously increase new cartilage development at both evaluated time intervals. CONCLUSIONS: From this point of view, LLLT at 830â€‰nm may be a valuable tool in trachea wound healing modulation. Nevertheless, further detailed research is needed to find optimal therapeutic parameters and to test these findings on other animal models. Animals;Granulation Tissue;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Trachea;Tracheotomy;Wound Healing;Wounds, Penetrating

Low-level laser therapy on the viability of skin flap in rats subjected to deleterious effect of nicotine. OBJECTIVE: The purpose of this study was to evaluate the effect of 830-nm laser in blocking the action of nicotine on the viability of skin flap. BACKGROUND DATA: The authors have analyzed the deleterious effect of cigarette smoke or nicotine on the skin flap alone with evidence of increased skin necrosis in the flap. MATERIALS AND METHODS: Twenty-four Wistar-albino rats were divided into three groups of eight animals each: Group 1 (control), subjected to a surgical technique to obtain a flap for cranial base, laser irradiation simulation, and a subcutaneous injection of saline; Group 2, similar to Group 1, with subcutaneous injection of nicotine (2 â€‰mg/kg/day) for a period of 1 week before and 1 week after surgery; and Group 3, similar to Group 2, with skin flaps subjected to a Î» 830-nm laser irradiation. The laser parameters used were: power 30 mW, beam area 0.07 cm(2), irradiance 429 mW/cm(2), irradiation time 84â€‰ sec, total energy 2.52 â€‰J, and energy density 36 J/cm(2). The laser was used immediately after surgery and for 4 consecutive days, in one point at 2.5â€‰ cm of the flap cranial base. The areas of necrosis were examined by two macroscopic analyses: paper template and Mini-Mop(Â®). The pervious blood vessels were also counted. RESULTS: The results were statistically analyzed by ANOVA and post-test contrast orthogonal method (multiple comparisons), showing that the laser decreased the area of necrosis in flaps subjected to nicotine, and consequently, increased the number of blood vessels (pâ€‰<â€‰0.05). CONCLUSIONS: The laser proved to be an effective way to decrease the area of necrosis in rats subjected to nicotine, making them similar to the control group. Nicotine Analysis of Variance;Animals;Lasers, Semiconductor;Low-Level Light Therapy;Male;Necrosis;Nicotine;Rats;Rats, Wistar;Scalp;Surgical Flaps;Tissue Survival

The diabetic foot and leg: combined He-Ne and infrared low-intensity lasers improve skin blood perfusion and prevent potential complications. A prospective study on 30 Egyptian patients. The objective of this study was to examine skin blood flow in diabetic patients having disease-related skin lesions, and to evaluate possible improvement imposed by low-intensity laser therapy (LILT) as a new treatment modality. Thirty patients (in addition to 15 controls receiving conventional treatment = group II and 15 others receiving no treatment = group III) having diabetes-related skin lesions were

tested for skin blood flow by laser Doppler flowmetry. Group I patients received LILT by a specified dosimetry. This was by combined uniform He-Ne and infrared lasers delivered by a scanner over the affected area. This study used a paired t test to determine the significance of blood flow recovery after treatment within each group while Independent t test compared results between the three groups. The level of significance was $p < 0.05$. The most frequently detected diabetes specific skin lesions were dryness, nail changes, hair loss, infections, itching, and frank eczema-like reactions, mostly in combinations (76%). This pattern appears specific for Egyptians as it is different from data registered in foreign literature. The minimum perfusion flow improved from 16.45 before LILT to 25.94 after, while maximum flow recovered from 32.91 to 48.47 and basal perfusion changed from 24.68 to 34.84 blood perfusion units. The percentage change in perfusion values was 23.17. All these were statistically significant. The study demonstrates that diabetes-linked skin lesions have a special pattern in Egyptians and are apparently caused by deranged skin blood flow .The deficit is measurable by laser flowmetry and can be partially reversed by LILT. Adult;Diabetic Foot;Egypt;Female;Humans;Infrared Rays;Laser-Doppler Flowmetry;Lasers, Gas;Leg;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Regional Blood Flow;Skin

Gold nanoparticles in biology and medicine: recent advances and prospects. Functionalized gold nanoparticles with controlled geometrical and optical properties are the subject of intensive studies and biomedical applications, including genomics, biosensorics, immunoassays, clinical chemistry, laser phototherapy of cancer cells and tumors, the targeted delivery of drugs, DNA and antigens, optical bioimaging and the monitoring of cells and tissues with the use of state-of-the-art detection systems. This work will provide an overview of the recent advances and current challenges facing the biomedical application of gold nanoparticles of various sizes, shapes, and structures. The review is focused on the application of gold nanoparticle conjugates in biomedical diagnostics and analytics, photothermal and photodynamic therapies, as a carrier for delivering target molecules, and on the immunological and toxicological properties. Keeping in mind the huge volume and high speed of the data update rate, 2/3 of our reference list (certainly restricted to 250 Refs.) includes publications encompassing the past 5 years.

Effect of Ga-As (904nm) and He-Ne (632.8 nm) laser on injury potential of skin full-thickness wound. Injury potential may have a triggering biological role in wound healing. In this study, the effect of photostimulation to promote wound healing and its effect on injury potential was investigated using the Ga-As and He-Ne lasers. In this study, 30 healthy male Sprague-Dawley rats were randomly divided into a control and two laser groups, He-Ne and Ga-As laser. A 2.5 cm craniocaudal full-thickness skin incision was made on each animal's dorsal region. Differential skin surface potential was measured before and immediately after the injury and also up to the 21st day, every other day. Wound surface area was also measured. Immediately after injury, wound potential significantly increased in all three groups. Maximum positive peak of injury potential was greater in Ga-As group compared to He-Ne laser and control groups ($P<0.05$) and lasting period of maximum positive potential in two laser groups was longer than that in the control group. There were no significant differences between the mean potential of before wounding and after the 15th, 17th, and 19th day in Ga-As, He-Ne, and control group, respectively ($P>0.05$). On the other hand, Ga-As and He-Ne laser facilitated the normal distribution of skin potential after wounding. These findings demonstrate that Ga-As laser may be more effective on wound closure and on returning the injury potential to normal level than the He-Ne laser. Animals;Electrophysiological Phenomena;Lasers;Low-Level Light Therapy;Male;Rats;Rats, Sprague-Dawley;Skin;Skin Physiological Phenomena;Wound Healing

Low-level laser for treatment of tinnitus: a self-controlled clinical trial. BACKGROUND: Despite the high prevalence and morbidity, tinnitus still remains an obscure symptom. We assessed the efficacy of low-level laser for treatment of tinnitus. METHODS: It was a self controlled clinical trial

study on 61 outpatients with subjective tinnitus. The patients were irradiated with a 650-nm, 5-mW soft laser for twenty days and twenty minutes per day. The sensation of tinnitus was measured on a Visual Analog Scale (VAS) before and two weeks after treatment and they were compared by means of Wilcoxon signed ranktest. RESULTS: Thirty-eight (62.3%) patients were men and twenty-three (37.7%) were women. Fourteen patients (31.8%) worked in noisy environment. The VAS mean difference before and after the treatment was statistically significant ($p < 0.0001$). The best treatment effect was in the youngest group and there were significant differences between this group and the middle age and older groups ($p = 0.018$ and 0.001, respectively). The mean VAS score reduction was not statistically significant between male and female patients ($p = 0.23$). Also, the treatment outcome according to the noise level in patient's workplaces was not significantly different in women ($p = 0.693$), but it was significant in men ($p = 0.029$). CONCLUSIONS: Transmeatal low-level laser irradiation is effective for the treatment of tinnitus and some variables like age and job can affect the treatment outcome.

Rehardening of acid-softened enamel and prevention of enamel softening through CO2 laser irradiation. OBJECTIVES: The aims of the present study were to investigate whether irradiation with a CO(2) laser could prevent surface softening (i) in sound and (ii) in already softened enamel in vitro. METHODS: 130 human enamel samples were obtained and polished with silicon carbide papers. They were divided into 10 groups (n = 13) receiving 5 different surface treatments: laser irradiation (L), fluoride (AmF/NaF gel) application (F), laser prior to fluoride (LF), fluoride prior to laser (FL), non-treated control (C); and submitted to 2 different procedures: half of the groups was acid-softened before surface treatment and the other half after. Immersion in 1% citric acid was the acid challenge. Surface microhardness (SMH) was measured at baseline, after softening and after treatment. Additionally, fluoride uptake in the enamel was quantified. The data were statistically analysed by two-way repeated measurements ANOVA and post hoc comparisons at 5% significance level. RESULTS: When softening was performed either before or after laser treatment, the L group presented at the end of the experiments SMH means that were not significantly different from baseline ($p = 0.8432$, $p = 0.4620$). Treatment after softening resulted for all laser groups in statistically significant increase in SMH means as compared to values after softening ($p < 0.0001$). Enamel fluoride uptake was significantly higher for combined laser-fluoride treatment than in control ($p<0.0001$). CONCLUSION: Irradiation of dental enamel with a CO(2) laser at 0.3J/cm(2) (5 Î¼s, 226 Hz) not only significantly decreased erosive mineral loss (97%) but also rehardened previously softened enamel in vitro. Cariostatic Agents;Diamines;Saliva, Artificial;Citric Acid;Olaflur;Fluorides Cariostatic Agents;Citric Acid;Dental Enamel;Diamines;Fluorides;Hardness;Humans;Hydrogen-Ion Concentration;Lasers, Gas;Low-Level Light Therapy;Saliva, Artificial;Tooth Demineralization;Tooth Erosion;Tooth Remineralization

Effect of low level laser on sutured wound healing in rats. PURPOSE: To evaluate the effect of low-level laser therapy (LLLT) Ã«904 nm on healing of surgical wounds in rats. METHODS: Forty male Wistar rats were used, divided into four groups, underwent incision along the lines Alba covering skin, subcutaneous and muscle abdominal, sutured continuously for nylon 5-0. Eight and fifteen days after the surgery process, the repairing area was removed and histological sections were stained with hematoxylin-eosin to assess cellularity inflammatory, Masson's Trichrome and Picrossirus to quantify the collagen fibers and immunohistochemical technique for counting newly formed vessels. The data were compared statistically using analysis of variance ANOVA, with a "post-hoc Tukey test, $p <0.05$. RESULTS: Low-level laser therapy reduced the intensity of the inflammatory reaction and influenced the dynamic of the immunoinflammatory response by inducing switching of the leukocyte infiltration pattern (neutrophilic to lymphoplasmacytic infiltration). Also stimulate the deposition and enhance the organization of collagen fibers, featuring a delicate collagen type III. Furthermore, it appeared to

a significant increase in the average number of newly formed vessels (p = 0.00 and p = 0.02, respectively). CONCLUSION: Low-level laser therapy resulted in modulate of the inflammatory response, enhanced deposition of collagen fibers and increase in the average number of newly formed vessels. Collagen Animals;Collagen;Low-Level Light Therapy;Male;Rats;Rats, Wistar;Suture Techniques;Wound Healing

[Bullous retinal detachment in chronic central serous chorioretinopathy treated with photodynamic therapy]. CASE REPORT: We describe a case of serous retinal detachment as an atypical presentation of bilateral chronic central serous chorioretinopathy, DISCUSSION: We present its differential diagnosis and therapeutical management with low-fluence photodynamic therapy, achieving satisfactory anatomical and functional results. Porphyrins;Verteporfin;Cyclosporine;Prednisone Adult;Blister;Central Serous Chorioretinopathy;Chronic Disease;Cyclosporine;Diagnosis, Differential;Diagnostic Errors;Fluorescein Angiography;Humans;Low-Level Light Therapy;Male;Photochemotherapy;Porphyrins;Prednisone;Retinal Detachment;Retinal Pigment Epithelium;Tomography, Optical Coherence;Uveomeningoencephalitic Syndrome;Verteporfin;Vitrectomy

Inhibition of carrageenan-induced expression of tissue and plasma prekallikreins mRNA by low level laser therapy in a rat paw edema model. BACKGROUND: Low level laser therapy (LLLT) has been used clinically in order to treat inflammation, where tissue and plasma prekallikrein have crucial importance. Plasma prekallikrein (PPK) is synthesized by the hepatocytes and secreted into the bloodstream, where it participates in the surface-dependent activation of blood coagulation, fibrinolysis, kinin generation and inflammation. Tissue prekallikrein is associated with important disease states (including cancer, inflammation, and neurodegeneration) and has been utilized or proposed as clinically important biomarker or therapeutic target of interest. OBJECTIVE: To evaluate if LLLT modulates tissue and plasma prekallikreins mRNA expression in the carrageenan-induced rat paw edema. METHODS: Experimental groups were assigned as followed: A(1) (Control-saline), A(2) (Carrageenan-only), A(3) (laser 660 nm only) and A(4) (Carrageenan + laser 660 nm). Edema was measured by a plethysmometer. Subplantar tissue was collected for the quantification of prekallikreins mRNA by Real time-Polymerase Chain Reaction. RESULTS: A significantly decrease in the edema was observed after laser irradiation. Expression of prekallikreins increased after carrageenan injection. Tissue and plasma prekallikrein mRNA expression significantly decreased after LLLT's 660 nm wavelength. CONCLUSION: These results suggest that expression of tissue and plasma prekallikreins is modulated by LLLT, which can be used in clinical practice due to its anti-inflammatory effects. RNA, Messenger;Carrageenan;Prekallikrein Animals;Carrageenan;Disease Models, Animal;Edema;Extremities;Low-Level Light Therapy;Male;Prekallikrein;RNA, Messenger;Rats;Rats, Wistar

Ex vivo soft-laser treatment inhibits the synovial expression of vimentin and Î±-enolase, potential autoantigens in rheumatoid arthritis. BACKGROUND: Soft-laser therapy has been used to treat rheumatic diseases for decades. The major effects of laser treatment may be dependent not on thermal mechanisms but rather on cellular, photochemical mechanisms. However, the exact cellular and molecular mechanisms of action have not been elucidated. OBJECTIVE: The aim of this study was to investigate the ex vivo effects of low-level laser treatment (with physical parameters similar to those applied previously) on protein expression in the synovial membrane in rheumatoid arthritis (RA). DESIGN: Synovial tissues were laser irradiated, and protein expression was analyzed. METHODS: Synovial membrane samples obtained from 5 people who had RA and were undergoing knee surgery were irradiated with a near-infrared diode laser at a dose of 25 J/cm(2) (a dose used in clinical practice). Untreated synovial membrane samples obtained from the same people served as controls.

Synovial protein expression was assessed with 2-dimensional polyacrylamide gel electrophoresis followed by mass spectrometry. RESULTS: The expression of 12 proteins after laser irradiation was different from that in untreated controls. Laser treatment resulted in the decreased expression of Î±-enolase in 2 samples and of vimentin and precursors of haptoglobin and complement component 3 in 4 samples. The expression of other proteins, including 70-kDa heat shock protein, 96-kDa heat shock protein, lumican, osteoglycin, and ferritin, increased after laser therapy. LIMITATIONS: The relatively small sample size was a limitation of the study. CONCLUSIONS: Laser irradiation (with physical parameters similar to those used previously) resulted in decreases in both Î±-enolase and vimentin expression in the synovial membrane in RA. Both proteins have been considered to be important autoantigens that are readily citrullinated and drive autoimmunity in RA. Other proteins that are expressed differently also may be implicated in the pathogenesis of RA. Our results raise the possibility that low-level laser treatment of joints affected with RA may be effective, at least in part, by suppressing the expression of autoantigens. Further studies are needed. Autoantigens;Chondroitin Sulfate Proteoglycans;Heat-Shock Proteins;Intercellular Signaling Peptides and Proteins;LUM protein, human;Lumican;OGN protein, human;Vimentin;Ferritins;Keratan Sulfate;Phosphopyruvate Hydratase Adult;Aged;Analysis of Variance;Arthritis, Rheumatoid;Autoantigens;Case-Control Studies;Chondroitin Sulfate Proteoglycans;Electrophoresis, Polyacrylamide Gel;Enzyme-Linked Immunosorbent Assay;Female;Ferritins;Heat-Shock Proteins;Humans;In Vitro Techniques;Intercellular Signaling Peptides and Proteins;Keratan Sulfate;Low-Level Light Therapy;Lumican;Mass Spectrometry;Middle Aged;Phosphopyruvate Hydratase;Synovial Membrane;Vimentin

Non-surgical therapies for peripheral nerve injury. BACKGROUND: Non-surgical approaches have been developed to enhance nerve recovery, which are complementary to surgery and are an adjunct to the reinnervation process. SOURCES OF DATA: A search of PubMed, Medline, CINAHL, DH data and Embase databases was performed using the keywords 'peripheral nerve injury' and 'treatment'. AREAS OF CONTROVERSY: Most of the conservative therapies are focused to control neuropathic pain after nerve tissue damage. Only physical therapy modalities have been studied in humans and their effectiveness is not proved. GROWING POINTS: Many modalities have been experimented with to promote nerve healing and restore function in animal models and in vitro studies. Despite this, none have been actually translated into clinical practice. AREAS TIMELY FOR DEVELOPING RESEARCH: The hypotheses proved in animals and in vitro should be translated to human clinical practice. Nerve Growth Factors Animals;Disease Models, Animal;Electric Stimulation Therapy;Humans;Low-Level Light Therapy;Nerve Growth Factors;Nerve Regeneration;Peripheral Nerve Injuries;Physical Therapy Modalities;Rats;Stem Cell Transplantation

[Low power laser in the treatment of the acute low back pain]. BACKGROUND/AIM: Acute low back pain (ALBP) is one of the most frequent painful conditions in the human population. The objective of the paper was to compare the efficacy of the low power laser (LPL) in the pain and the muscular spasm reduction with conservative methods of physical medicine. METHOD: The prospective cohort study was done. The study involved 70 patients, both men and women, from 25 to 64 years of age with the diagnosis of ALBP. Two groups were formed. There were 40 patients in the first group and they were treated with the LPL with frequency of 73 Hz. The second group was the control one and it consisted of 30 patients who were treated with conservative methods of physical medicine (electrotherapy: diadynamic currents CP +/- 3 and CP +/- 3, interferent currents--90 Hz for 15 min; electrophoresis with novocaine). The ALBP were diagnosed by clinical examination and by the nuclear magnetic resonance imaging (NMRI). The low power laser--Gallium Arsenide (GaAs) was used. The laser sonde consisted of 4 laser diodes, each powered of 15 mW, wavelength 904 nm and with frequency 73 Hz. The total period of time for each treatment was 10 minutes and the total dose per

treatment was 15 J. The intensity of acute low back pain was assessed by Roland's scale. The degree of the spasm was assessed in the relaxed position and during movements. Results. The average score in the first group before the onset of rehabilitation was 3.3 +/- 1.1 (Me = 3.0), and in the control group was 3.43 +/- 0.89 (Me = 3.0). After five treatments in patients who were treated with LPL the average score in Roland's scale was decreased (1.12 +/- 1.3, Me = 2.0) and in the control group there were no changes. After 10 treatments with the LPL the analgesic effect was obtained in 82.5% of patients from the first group and in 20% of patients in the control group. The analgesic effect in patients of the first group was obtained after 7.5 +/- 2.1 treatments and in the second group after 17.9 +/- 3.2 treatments. The difference was statistically significant ($t = 15.652173$, $p < 0.001$). The spasm disappeared in 92.5% of patients in the first group and in 20% of patients in the control group after 7.02 +/- 2.2 and 17.9 +/- 3.2 treatments respectively. The difference was statistically significant ($t = 15.652173$, $p < 0.001$). CONCLUSION: The pain and spasm reduction were obtained in the greater number of patients by usage of the LPL than by usage of conservative methods of physical medicine.
Acute Disease;Adult;Female;Humans;Low Back Pain;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Physical Therapy Modalities

[Familial benign chronic pemphigus (Hailey-Hailey disease): successful treatment with carbon dioxide laser]. Hailey-Hailey disease is a rare, autosomal dominantly inherited genodermatosis, which manifests with recurrent intraepidermal blistering and erythematous hyperkeratotic patches in intertriginous areas. Conventional therapeutic approaches include topical and systemic steroids, antibiotic agents, as well as oral retinoids. Alternative treatments include surgical interventions such as excision, dermabrasion and laser ablation. A 56-year-old woman presented with 15-year history of severe therapy-resistant Hailey-Hailey disease. We performed laser ablation with carbon dioxide laser under general anesthesia. Six weeks after treatment complete remission within ablated areas was achieved. Six-month follow-up showed no relapse. In our opinion carbon dioxide laser ablation represents an effective and safe therapeutic option for Hailey-Hailey disease.
Female;Humans;Lasers, Gas;Low-Level Light Therapy;Middle Aged;Pemphigus, Benign Familial;Treatment Outcome

Photobiomodulation protects the retina from light-induced photoreceptor degeneration.
PURPOSE: In this study, the hypothesis that near-infrared (NIR) light treatment (photobiomodulation) attenuates bright-light damage in the albino rat retina was tested. METHODS: Young adult Sprague-Dawley (SD) albino rats were raised in dim (5 lux), cyclic light and then exposed to bright (1000 lux), continuous light for 24 hours. The animals were treated with 670-nm light (9 J/cm(2)) in an LED array before, during, or after exposure to light. The retinas were examined for function, structural changes, cell loss, and markers of stress and inflammation at 1 week and 1 month after exposure to damaging white light. RESULTS: Bright light caused photoreceptor-specific cell death in control retinas. Significant upregulation of stress and neuroprotective factors and the presence of activated microglia were also noted after light-induced damage. Photobiomodulation profoundly attenuated histopathologic alterations in all three treatment groups. NIR treatment also abolished microglial invasion of the retina and significantly reduced the presence of stress and neuroprotectant molecules. Bright-light-induced reductions in photoreceptor function were significantly ameliorated by photobiomodulation in animals treated before and during exposure to damaging light. Photoreceptor function was initially reduced in animals treated after bright-light-induced damage, but recovered by 1 month after exposure. CONCLUSIONS: NIR photobiomodulation is protective against bright-light-induced retinal degeneration, even when NIR treatment is applied after exposure to light. This protective effect appears to involve a reduction of cell death and inflammation. Photobiomodulation has the potential to become an important treatment modality for the prevention or treatment of light-induced stress in the retina. More generally, it could be beneficial in

the prevention and treatment of retinal conditions involving inflammatory mechanisms. Aif1 protein, rat;Calcium-Binding Proteins;Ciliary Neurotrophic Factor;Glial Fibrillary Acidic Protein;Microfilament Proteins;Fibroblast Growth Factor 2 Animals;Calcium-Binding Proteins;Ciliary Neurotrophic Factor;Electroretinography;Fibroblast Growth Factor 2;Fluorescent Antibody Technique, Indirect;Glial Fibrillary Acidic Protein;Immunomodulation;Infrared Rays;Light;Microfilament Proteins;Phototherapy;Radiation Injuries, Experimental;Rats;Rats, Sprague-Dawley;Retina;Retinal Degeneration;Reverse Transcriptase Polymerase Chain Reaction;Stress, Physiological

Microbiologic results after non-surgical erbium-doped:yttrium, aluminum, and garnet laser or air-abrasive treatment of peri-implantitis: a randomized clinical trial. BACKGROUND: The purpose of this study is to assess clinical and microbiologic effects of the non-surgical treatment of peri-implantitis lesions using either an erbium-doped:yttrium, aluminum, and garnet (Er:YAG) laser or an air-abrasive subgingival polishing method. METHODS: In a 6-month clinical trial, 42 patients with peri-implantitis were treated at one time with an Er:YAG laser or an air-abrasive device. Routine clinical methods were used to monitor clinical conditions. Baseline and 6-month intraoral radiographs were assessed with a software program. The checkerboard DNA-DNA hybridization method was used to assess 74 bacterial species from the site with the deepest probing depth (PD) at the implant. Non-parametric tests were applied to microbiology data. RESULTS: PD reductions (mean Â± SD) were 0.9 Â± 0.8 mm and 0.8 Â± 0.5 mm in the laser and air-abrasive groups, respectively (not significant). No baseline differences in bacterial counts between groups were found. In the air-abrasive group, Pseudomonas aeruginosa, Staphylococcus aureus, and Staphylococcus anaerobius were found at lower counts at 1 month after therapy (P <0.001) and with lower counts in the laser group for Fusobacterium nucleatum naviforme (P = 0.002), and Fusobacterium nucleatum nucleatum (P = 0.002). Both treatments failed to reduce bacterial counts at 6 months. Porphyromonas gingivalis counts were higher in cases with progressive peri-implantitis (P <0.001). CONCLUSIONS: At 1 month, P. aeruginosa, S. aureus, and S. anaerobius were reduced in the air-abrasive group, and Fusobacterium spp. were reduced in the laser group. Six-month data demonstrated that both methods failed to reduce bacterial counts. Clinical improvements were limited. Actinomyces;Aged;Aggregatibacter actinomycetemcomitans;Air Abrasion, Dental;Alveolar Bone Loss;Bacteria;Bacterial Load;Bacteroides;Dental Polishing;Female;Follow-Up Studies;Fusobacterium nucleatum;Gingival Hemorrhage;Humans;Lasers, Solid-State;Longitudinal Studies;Low-Level Light Therapy;Male;Peri-Implantitis;Periodontal Pocket;Porphyromonas gingivalis;Pseudomonas aeruginosa;Single-Blind Method;Staphylococcus;Staphylococcus aureus;Treatment Outcome

Photodynamic therapy outcome for oral dysplasia. INTRODUCTION: Photodynamic therapy (PDT) is a minimally invasive surgical intervention used in the management of tissue disorders. It can be applied before, or after, any of the conventional modalities, without compromising these treatments or being compromised itself. MATERIALS AND METHODS: In this prospective study, a total of 147 consecutive patients with oral potentially malignant disorders were treated with surface illumination PDT, using 5-ALA or mTHPC as the photosensitizer. The average age was 53â€‰Â±â€‰8.9 years. The patients' recovery was uneventful and no complications reported. Comparisons with the clinical and histopathological features and rate of recurrence as well as malignant transformation were made. The patients were followed-up for a mean of 7.3 years. ANALYSIS AND RESULTS: Homogenous leukoplakias were identified in 55 patients, non-homogenous leukoplakias in 73 patients, whereas 19 patients had erythroplakias. Ex- and current lifelong smokers formed 84.4% of the recruited patients. While people who currently smoke and drink formed 38.1% (56 patients) of the cohort. Erythroplakias were mainly identified in heavy lifelong smokers. The most common identified primary anatomical locations were the lateral border of tongue, floor of mouth and retromolar area.

Moderate dysplasia was identified in 33 patients while 63 patients had severe dysplasias; and 32 patients had a histopathological diagnosis of carcinoma in situ. The rate of recurrence in laser surgery was approximately 11.6%. Malignant transformation was observed in 11 patients (7.5%), in the tongue, floor of mouth and retromolar area. Recurrence and malignant transformation was mainly identified in erythroplakias and non-homogenous leukoplakias. The final outcome of the cohort showed that 11 (7.5%) suffered from progressive disease, 5 (3.4%) had stable disease, 12 (8.2%) were considered partially responsive to the therapy. Complete response was identified in 119/147 patients (81%). CONCLUSION: 5-ALA-PDT and/or mTHPC-PDT offer an effective alternative treatment for oral potentially malignant disorders. Mesoporphyrins;Photosensitizing Agents;Aminolevulinic Acid;temoporfin Aged;Aminolevulinic Acid;Carcinoma in Situ;Drug Administration Schedule;Female;Humans;Lasers, Semiconductor;Leukoplakia, Oral;Low-Level Light Therapy;Male;Mesoporphyrins;Middle Aged;Mouth Neoplasms;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Treatment Outcome

About the treatment of xanthelasma palpebrarum using a 1,064 Q-switched neodymium-doped yttrium aluminum garnet laser. Eyelid Diseases;Humans;Lasers, Solid-State;Low-Level Light Therapy;Treatment Outcome;Xanthomatosis

A study of multiple full-face treatments with low-energy settings of a 2940-nm Er:YAG fractionated laser. BACKGROUND AND OBJECTIVE: Fractional Er:YAG 2940-nm laser resurfacing is a relatively new approach to the treatment of photodamaged skin. Typically, this approach uses fairly high delivered energies in order to create 'microscopic wounds' of tissue coagulation at various dermal depths. The purpose of this study was to evaluate the efficacy, safety and tolerability of low-energy, multiple-treatment, fractional Er:YAG laser resurfacing for the treatment of photoaged skin. METHODS: Sixteen subjects with photoaged skin received six, lower-fluence laser treatments with a 2940-nm wavelength Er:YAG laser, using a fractionated handpiece and a maximum energy of 30 mJ per micro-spot. Subject satisfaction, treatment tolerability, and subject outcome assessment were performed. RESULTS: Of the 12 subjects who completed the trial, all recorded improvement in their treated skin; half reported over 50% improvement. Most patients reported none or only mild stinging and burning during and after treatment. There was no downtime associated with the procedure. No adverse events were reported. Patient satisfaction rates were high. CONCLUSION: Low-energy, multiple treatment, 2940-nm Er:YAG laser resurfacing with this novel device is a safe and well-tolerated method for the treatment of superficial to moderate photoaged skin. Adult;Cosmetic Techniques;Dose Fractionation, Radiation;Erythema;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Prospective Studies;Rejuvenation;Skin Aging;Treatment Outcome

Comparison of alvogyl, SaliCept patch, and low-level laser therapy in the management of alveolar osteitis. PURPOSE: The aim of the present randomized prospective clinical trial was to compare the effects of alvogyl, the SaliCept patch, and low-level laser therapy in the management of alveolar osteitis. PATIENTS AND METHODS: The study population included 104 patients who had been referred to our clinic with a complaint of alveolar osteitis. The patients were randomly assigned to 1 of 4 groups: group 1, curettage and irrigation alone; group 2, curettage and irrigation followed by alvogyl applied directly to the socket; group 3, curettage and irrigation followed by a SaliCept patch applied directly to the socket; and group 4, curettage and irrigation followed by continuous-mode diode laser irradiation (808 nm, 100 mW, 60 seconds, 7.64 J/cm(2)). The treatment procedures were repeated after 3 days. The clinical signs and symptoms for each patient were recorded at diagnosis, at 3 days after the diagnosis, and at 7 days after the diagnosis. In addition, the pain intensity levels for each patient were recorded at diagnosis and daily for 7 days after the initial treatment. RESULTS: No statistically significant differences in the management of alveolar osteitis were observed between

groups 2 and 3. However, the management of alveolar osteitis was significantly better in group 4 than in the other 3 groups. CONCLUSION: Within the limitations of the present study, it can be concluded that acemannan in the form of the SaliCept patch is an acceptable alternative to alvogyl as a dressing for the management of alveolar osteitis. However, low-level laser therapy treatment at 7.64 J/cm(2) (0.1 W Ã— 60 seconds = 6 J) performed superiorly to both SaliCept and alvogyl in managing alveolar osteitis in our study population. Aminobenzoates;Drug Combinations;Hydrocarbons, Iodinated;Mannans;Oils, Volatile;Plant Extracts;butyl aminobenzoate, eugenol, iodoform, spearmint oil drug combinations;para-Aminobenzoates;Eugenol;acemannan Adult;Agricultural Irrigation;Aminobenzoates;Bandages;Curettage;Drug Combinations;Dry Socket;Eugenol;Female;Humans;Hydrocarbons, Iodinated;Low-Level Light Therapy;Male;Mannans;Oils, Volatile;Pain Measurement;Phytotherapy;Plant Extracts;para-Aminobenzoates

Comparing different physical factors on serum TNF-Î± levels, chondrocyte apoptosis, caspase-3 and caspase-8 expression in osteoarthritis of the knee in rabbits. OBJECTIVE: To study the therapeutic effects that different physical factors may have on rabbits with osteoarthritis of the knee. METHODS: A total of 64 rabbits were randomised and organised into eight groups, eight of which were each assigned a different physical factor, in which the rabbits received one type of physical therapy: millimetre waves for 20 min, pulsed electromagnetic fields, millimetre waves for 40 min, ultrasound, low-level laser therapy or ultrashort wave diathermy. The two remaining groups, the normal group and the model group, served as controls. The efficacy of the different treatments were determined by observing the configuration and structure of the cartilaginous tissue by haematoxylin and Eosin staining, measuring the serum tumour necrosis factor-Î± levels by enzyme immunoassay, evaluating the expression levels of caspases-3 and -8 by immunohistochemistry, and calculating the ratio of chondrocytes apoptosis by TdT-mediated dUTP nick end labelling. The values obtained for each assessment of the eight groups were analysed by a One-way ANOVA. RESULTS: By applying upmentioned physical treatments, the organisational configuration and structure of cartilage cells from the knees of rabbits with osteoarthritis increased. These treatments also decreased serum tumour necrosis factor-Î± levels, reduced the expression of caspase-3 and caspase-8 and reduced chondrocyte apoptosis, resulting in an overall delay in osteoarthritis development. CONCLUSION: The application of pulsed electromagnetic fields, millimetre waves for 40 min, ultrasound, or low-level laser therapy had significant effects in improving osteoarthritis; in particular, treatment with pulsed electromagnetic fields or ultrasound yielded the greatest therapeutic effect. Tumor Necrosis Factor-alpha;Caspase 3;Caspase 8 Animals;Anterior Cruciate Ligament Injuries;Apoptosis;Cartilage, Articular;Caspase 3;Caspase 8;Chondrocytes;Diathermy;Disease Models, Animal;Electromagnetic Fields;Female;Low-Level Light Therapy;Male;Osteoarthritis, Knee;Physical Therapy Modalities;Rabbits;Short-Wave Therapy;Time Factors;Treatment Outcome;Tumor Necrosis Factor-alpha;Ultrasonics

Large-area irradiated low-level laser effect in a biodegradable nerve guide conduit on neural regeneration of peripheral nerve injury in rats. This study used a biodegradable composite containing genipin-cross-linked gelatin annexed with Î²-tricalcium phosphate ceramic particles (genipin-gelatin-tricalcium phosphate, GGT), developed in a previous study, as a nerve guide conduit. The aim of this study was to analyse the influence of a large-area irradiated aluminium-gallium-indium phosphide (AlGaInP) diode laser (660 nm) on the neural regeneration of the transected sciatic nerve after bridging the GGT nerve guide conduit in rats. The animals were divided into two groups: group 1 comprised sham-irradiated controls and group 2 rats underwent low-level laser (LLL) therapy. A compact multi-cluster laser system with 20 AlGaInP laser diodes (output power, 50mW) was applied transcutaneously to the injured peripheral nerve immediately after closing the wound, which

was repeated daily for 5 min for 21 consecutive days. Eight weeks after implantation, walking track analysis showed a significantly higher sciatic function index (SFI) score (P<0.05) and better toe spreading development in the laser-treated group than in the sham-irradiated control group. For electrophysiological measurement, both the mean peak amplitude and nerve conduction velocity of compound muscle action potentials (CMAPs) were higher in the laser-treated group than in the sham-irradiated group. The two groups were found to be significantly different during the experimental period (P<0.005). Histomorphometric assessments revealed that the qualitative observation and quantitative analysis of the regenerated nerve tissue in the laser-treated group were superior to those of the sham-irradiated group. Thus, the motor functional, electrophysiologic and histomorphometric assessments demonstrate that LLL therapy can accelerate neural repair of the corresponding transected peripheral nerve after bridging the GGT nerve guide conduit in rats. Calcium Phosphates;Cross-Linking Reagents;beta-tricalcium phosphate Absorbable Implants;Animals;Calcium Phosphates;Cross-Linking Reagents;Guided Tissue Regeneration;Low-Level Light Therapy;Myelin Sheath;Nerve Regeneration;Peripheral Nerve Injuries;Peripheral Nerves;Rats;Rats, Sprague-Dawley;Sciatic Nerve;Wound Healing

Tuberculosis (HIV-negative people). INTRODUCTION: About one third of the world's population has latent tuberculosis. In 2004, more than 14 million people had active tuberculosis. About 1.7 million people died from the infection in 2006. More than 80% of new cases diagnosed in 2004 were in people in Africa, South-East Asia, and Western Pacific regions. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of interventions to prevent tuberculosis in people without HIV infection at high risk of developing tuberculosis? What are the effects of interventions to prevent tuberculosis in people without HIV infection at high risk of developing multidrug-resistant tuberculosis? What are the effects of different drug regimens in people with newly diagnosed pulmonary tuberculosis without HIV infection? What are the effects of different drug regimens in people with multidrug-resistant tuberculosis without HIV infection? What are the effects of low-level laser therapy in people with tuberculosis without HIV infection? Which interventions improve adherence to treatment in people with tuberculosis without HIV infection? We searched: Medline, Embase, The Cochrane Library, and other important databases up to June 2010 (Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 32 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review, we present information relating to the effectiveness and safety of the following interventions: adding pyrazinamide in chemotherapy regimens lasting up to 6 months, adding rifampicin to isoniazid regimens, benefits of different regimens, chemotherapy for <6 months, daily chemotherapy, direct observation treatment, intermittent chemotherapy for 6 months or longer, isoniazid, low-level laser therapy for pulmonary tuberculosis, regimens containing quinolones, rifampicin plus isoniazid, substituting rifampicin with ethambutol in the continuous phase, and support mechanisms for directly observed treatment. Antitubercular Agents;Isoniazid Antitubercular Agents;HIV Infections;Humans;Isoniazid;Low-Level Light Therapy;Tuberculosis;Tuberculosis, Multidrug-Resistant;Tuberculosis, Pulmonary

Laser and IPL treatment of port-wine stains: therapy options, limitations, and practical aspects. Port-wine stains (PWS) are congenital, progressive vascular malformations of the dermis that are often disfiguring, particularly when located in a cosmetically relevant area. Thus, the successful clearance of PWS is of highest medical relevance, and laser therapy is the treatment of choice for this

indication. Numerous trials have shown the effectiveness of both lasers and incoherent light sources. Laser or IPL treatments achieve good clearance in the majority of PWS, but complete clearance is rare. Thus, new therapeutic options are urgently required. Photodynamic therapy is a relatively new approach in the treatment of PWS. Our review aims to summarize therapy options of port-wine stains, depending on treatment area, patient age, and vessel architecture. Recent developments in this field and new insights into the pathogenesis of PWS are discussed. The review also highlights practical aspects, complications that can occur, and how to prevent them. Humans;Low-Level Light Therapy;Photochemotherapy;Phototherapy;Port-Wine Stain;Recurrence;Treatment Outcome

Effects of low-level laser therapy (685 nm) at different doses in osteogenic cell cultures. The present in vitro study evaluated parameters of osteogenesis under the influence of low-level laser therapy (LLLT) at different doses. Osteogenic cells originated from rat calvaria were cultivated in polystyrene plates and exposed to a laser irradiation using an indium-gallium-aluminum phosphide therapeutic laser (InGaAlP), at wavelength of 685Â nm, power of 35Â mW, 600-Î¼m-diameter optical fiber, and continuous wave. In the attempt of observing the existence of a dose response and its effects, laser irradiation was performed at 25, 77, and 130Â J/cm(2) (7, 22, and 37 s, respectively). The following parameters were assessed: growth curve (4, 7, and 11Â days), cell viability (24Â h), and nodular formation of mineralized matrix (14Â days). The results did not show significant differences related to the growth curve (4, 7, and 11Â days) and cell viability (24Â h). Within 14Â days, osteogenic cultures showed nodular areas with well-defined calcified matrix. The total area stained with Alizarin Red did not show any differences between doses of 25 and 130Â J/cm(2). However, the percentage of stained area was significantly higher in the 25Â J/cm(2) group when compared to the group of 77Â J/cm(2) (Kruskal-Wallis test, pâ€‰<â€‰0.05). It was possible to conclude that the 685-nm laser irradiation (at 25, 77, and 130Â J/cm(2)) did not influence cell growth and proliferation, although the extracellular mineralization process may have its pattern altered by the LLLT on osteogenic cell cultures. Animals;Cell Culture Techniques;Cell Proliferation;Cell Survival;Dose-Response Relationship, Radiation;Low-Level Light Therapy;Osteoblasts;Osteogenesis;Rats;Statistics, Nonparametric

Efficacy of a multiple diode laser system for body contouring. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) has been shown to induce cellular reactions in nonphotosynthetic cells however skepticism remains regarding efficacy at the clinical level. The purpose of this study was to evaluate the efficacy of LLLT independent of liposuction. Additionally, a weight loss supplement (Curvaâ„¢, Santa Barbra Medical Innovations, Santa Barbra, CA) was evaluated. This clinical trial evaluates the effectiveness of the Erchonia EML Laser (Zeronaâ„¢ System, Santa Barbra Medical Innovations) for non-invasive fat reduction and body contouring in a split-body clinical evaluation. MATERIALS AND METHODS: Five subjects were enrolled and completed the study. Subjects had a body mass index (BMI) of less than or equal to 29â€‰kg/m(2) and satisfied the set inclusion criteria. Participants were randomly assigned to receive low-level laser treatments on one side of the body three times per week for 2 weeks. One group took the weight loss supplement and was also treated with the laser. Subject satisfaction questionnaires, physician blinded photo evaluation, circumference measurements and ultrasound measurements were utilized to evaluate efficacy. RESULTS: Circumference measurements revealed no statistically significant reduction at either 7 days or 1 month post-treatment. One month following treatment the greatest circumference reduction overall was 0.5â€‰Â±â€‰0.3 inches. Ultrasound measurements also did not reveal statistically significant reduction in fat layer thickness (Pâ€‰>â€‰0.5). Evaluation by three blinded dermatologists resulted in average correct photo identification of 51.1%. Results reflect little clinical difference between post-treatment and baseline images. Three subjects recording a "dissatisfied" rating on satisfaction

questionnaires and all subjects reported the effects of the treatment were less than expected. Subjects who took the weight loss supplement had no greater circumference reduction or identifiable clinical outcome. CONCLUSIONS: This small study demonstrates to the authors that there needs to be more evidence to show clinical circumferential reduction before LLLT can be recommended as an effective therapeutic option. Anti-Obesity Agents Anti-Obesity Agents;Body Fat Distribution;Body Mass Index;Combined Modality Therapy;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Overweight;Patient Satisfaction;Subcutaneous Fat;Subcutaneous Fat, Abdominal;Thigh;Treatment Outcome;Ultrasonography;Waist Circumference

Endoscopic successful management of tracheobronchomalacia with laser: apropos of a Mounier-Kuhn syndrome. Mounier-Kuhn syndrome is a rare condition that combines tracheobronchomegaly (TBM) and severe tracheobronchomalacia. Symptoms can be severe with recurrent bronchopulmonary infections and cough-induced syncope. Therapeutic management is non-specific and limited to chest physiotherapy and antibiotics during infectious exacerbations. We report a case of Mounier-Kuhn syndrome that was successfully managed by treating the posterior collapse of the central airway with yttrium aluminum pevroskyte laser. Endoscopic aspects, respiratory symptoms, and lung function tests all improved and remained stable with a follow-up of 8 years. Laser, at low power settings, could be a new therapeutic option in selected cases of tracheobronchomalacia. Aged;Bronchoscopy;Female;Follow-Up Studies;Humans;Lasers, Solid-State;Low-Level Light Therapy;Recurrence;Respiratory Tract Infections;Tracheobronchomalacia;Tracheobronchomegaly;Treatment Outcome

Effect of laser on TNF-alpha expression in inflamed human gingival tissue. This study sought to evaluate the effect of low-level laser treatment combined with scaling and root planing (SRP) on gingival tissue levels of TNF-alpha in subjects with periodontal disease. Eighty gingival papilla biopsy samples were obtained from 60 patients diagnosed with chronic advanced periodontitis; randomly assigned to three treatment groups (n = 20), as well as 20 subjects with no periodontal disease (group A). Group B received SRP on a single quadrant/day for four consecutive days. On day 5, all quadrants were rescaled. Groups C and D received the same treatment as group B plus laser application with the low-level diode laser (630-670 nm, 1.875 J/cm(2)) for five and ten consecutive days, respectively. Papilla biopsies were obtained from subjects and evaluated by ELISA for levels of TNF-alpha. The values in the control group were 5.2 Â± 3.21 pg/mg and baseline values for the examined groups were 46.01 Â± 16.69. Significantly decreased level of TNF-alpha for groups C and D was found after treatment, while group B demonstrated reduction of TNF-alpha of 31.34%. The results of this study show suppression of TNF-alpha in gingival tissue after low-level laser treatment as adjunct to SRP. Data may suggest beneficial anti-inflammatory effects of the laser treatment when used as adjunctive periodontal treatment. Tumor Necrosis Factor-alpha Adult;Aged;Chronic Periodontitis;Combined Modality Therapy;Dental Scaling;Female;Gingiva;Humans;Low-Level Light Therapy;Male;Middle Aged;Root Planing;Tumor Necrosis Factor-alpha

[The application of supravascular laser irradiation of blood for the treatment of cochleovestibular disorders]. A total of 165 patients presenting with neurosensory impairement of hearing and Meniere's disease were treated by supravascular (extracorporeal) laser irradiation of blood. The study undertaken to evaluate the efficacy of this treatment confirmed its beneficial effect in patients with acute hearing disorders. It was equally effective as regards elimination of labyrinthine hydropsis in patients presenting with Meniere's disease. The method proved less efficacious for the management of long-standing hearing impairement and chronic loss of hearing, but it can be used to prevent the development of these conditions. Adult;Aged;Blood;Cochlear

Diseases;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Treatment Outcome;Vestibular Diseases;Young Adult
Photomedicine and LLLT literature watch. Humans;Low-Level Light Therapy;Phototherapy
Near-infrared irradiation photobiomodulation: the need for basic science. Enzymes;Adenosine Triphosphate;Electron Transport Complex IV Adenosine Triphosphate;Cell Biology;Cell Proliferation;Electron Transport Complex IV;Energy Transfer;Enzymes;Humans;Infrared Rays;Mitochondria;Phototherapy;Radiation, Nonionizing
Influence of low intensity laser irradiation on isolated human adipose derived stem cells over 72 hours and their differentiation potential into smooth muscle cells using retinoic acid. INTRODUCTION: Human adipose derived stem cells (hADSCs), with their impressive differentiation potential, may be used in autologous cell therapy or grafting to replace damaged tissues. Low intensity laser irradiation (LILI) has been shown to influence the behaviour of various cells, including stem cells. AIMS: This study aimed to investigate the effect of LILI on hADSCs 24, 48 or 72 h post-irradiation and their differentiation potential into smooth muscle cells (SMCs). METHODOLOGY: hADSCs were exposed to a 636Â nm diode laser at a fluence of 5 J/cm(2). hADSCs were differentiated into SMCs using retinoic acid (RA). Morphology was assessed by inverted light and differential interference contrast (DIC) microscopy. Proliferation and viability of hADSCs was assessed by optical density (OD), Trypan blue staining and adenosine triphosphate (ATP) luminescence. Expression of stem cell markers, Î²1-integrin and Thy-1, and SMC markers, smooth muscle alpha actin (SM-Î±a), desmin, smooth muscle myosin heavy chain (SM-MHC) and smoothelin, was assessed by immunofluorescent staining and real-time reverse transcriptase polymerase chain reaction (RT-PCR). RESULTS: Morphologically, hADSCs did not show any differences and there was an increase in viability and proliferation post-irradiation. Immunofluorescent staining showed expression of Î²1-integrin and Thy-1 72 h post-irradiation. RT-PCR results showed a down regulation of Thy-1 48 h post-irradiation. Differentiated SMCs were confirmed by morphology and expression of SMC markers. CONCLUSION: LILI at a wavelength of 636 nm and a fluence of 5 J/cm(2) does not induce differentiation of isolated hADSCs over a 72 h period, and increases cellular viability and proliferation. hADSCs can be differentiated into SMCs within 14 days using RA. Biomarkers;Desmin;Integrin beta1;Thy-1 Antigens;Tretinoin;Adenosine Triphosphate Adenosine Triphosphate;Adipose Tissue;Biomarkers;Cell Differentiation;Cell Proliferation;Cell Survival;Desmin;Fluorescent Antibody Technique;Humans;Integrin beta1;Lasers, Semiconductor;Low-Level Light Therapy;Myocytes, Smooth Muscle;Reverse Transcriptase Polymerase Chain Reaction;Stem Cells;Thy-1 Antigens;Time Factors;Tretinoin
Effect of photodynamic therapy on clinical isolates of Staphylococcus spp. Staphylococcus spp. are opportunistic microorganisms known for their capacity to develop resistance against antimicrobial agents. The objective of this study was to evaluate the effect of photodynamic therapy (PDT) on 20 Staphylococcus strains isolated from the human oral cavity, including S. aureus, S. schleiferi, S. epidermidis, S. capitis, S. haemolyticus, and S. lentus. A suspension of each Staphylococcus strain (10(6) cells/mL) was submitted to PDT using methylene blue and a low power laser. The isolated effects of methylene blue, laser treatment and ciprofloxacin were also evaluated. After the experimental treatments, 0.1 mL aliquots of the suspensions were seeded onto BHI agar for determination of the number of colony-forming units (CFU/mL). The results were analyzed by analysis of variance and Tukey's test ($p < 0.05$). The mean reduction in bacterial counts of the strains submitted to PDT ranged from 4.89 to 6.83 CFU (log10)/mL, with the observation of a decreasing susceptibility to treatment of S. schleiferi, S. haemolyticus, S. epidermidis, S. capitis, S. aureus, and S. lentus. The results showed that PDT was effective in reducing the number of viable cells of all clinical

Staphylococcus isolates studied. Anti-Infective Agents;Photosensitizing Agents;Ciprofloxacin;Methylene Blue Analysis of Variance;Anti-Infective Agents;Ciprofloxacin;Colony Count, Microbial;Humans;Light;Low-Level Light Therapy;Methylene Blue;Mouth;Photochemotherapy;Photosensitizing Agents;Staphylococcus

Therapeutic photobiomodulation: nitric oxide and a novel function of mitochondrial cytochrome c oxidase. Currently, light therapies are widely used in both human and veterinarian medicine. The application of light to clinical therapeutics includes: photodynamic therapy, used to kill cancer cells; UVA therapies, used to treat a variety of skin diseases; and photobiomodulation, used to promote cell growth and recovery from injury. Photobiomodu-lation uses light emitting diodes (LEDs) or low energy lasers, which emit light in the visible red to near infrared range. Light in this range penetrates tissue reasonably well, lacks the carcinogenic/mutagenic properties of UV light, and acts on an endogenous photoreceptor which likely acts to initiate light-altered signaling pathways. Although early studies identified mitochondrial cytochrome c oxidase as an endogenous photoreceptor for photobiomodulation, the cellular and molecular mechanisms underlying photobiomodulation have not been clear. Three recent findings provide important new insight. First, nitric oxide has been implicated. Second, cytochrome c oxidase, an enzyme known to reduce oxygen to water at the end of the mitochondrial respiratory chain, has been shown to have a new enzymatic activity--the reduction of nitrite to nitric oxide. This nitrite reductase activity is elevated under hypoxic conditions but also occurs under normoxia. And third, low intensity light enhances nitric oxide synthesis by cytochrome c oxidase without altering its ability to reduce oxygen. From these findings, we propose that cytochrome c oxidase functions in photobiomodulation by producing nitric oxide, a signaling molecule which can then function in both intra- and extracellular signaling pathways. We also propose that the effectiveness of photobiomodulation is under the control of tissue oxygen and nitrite levels. Nitric Oxide;Electron Transport Complex IV;Oxygen Animals;Biological Availability;Electron Transport Complex IV;Humans;Mitochondria;Nitric Oxide;Oxygen;Phototherapy

Does long-pulsed neodymium:yttrium-aluminum-garnet work on acne lesions?: management of acne in Asian patients with a combinational laser treatment. Acne Vulgaris;Adult;Asian People;Combined Modality Therapy;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Republic of Korea;Young Adult

Low-level laser irradiation alters cardiac cytokine expression following acute myocardial infarction: a potential mechanism for laser therapy. OBJECTIVES: Low-level laser irradiation (LLLI) has the potential of exerting cardioprotective effect following myocardial infarction (MI). The authors hypothesized that LLLI could influence the expression of cardiac cytokines and contribute to the reversal of ventricular remodeling. BACKGROUND: LLLI regulates the expression of cytokines after tissue damage. However, little is known concerning the alteration of the cardiac cytokine expression profile after LLLI. METHODS: MI was created by coronary ligation. The surviving rats were divided randomly into laser and control groups. 33 rats were exposed to a diode laser (635 â€‰nm, 5â€‰ mW, CW, laser, beam spot size 0.8â€‰ cm(2), 6â€‰ mW/cm(2), 150â€‰ sec, 0.8â€‰ J, 1J/cm(2)) as laser group. Another 33 rats received only coronary ligation and served as control group. 28 rats received a thoracotomy without coronary ligation (sham group). One day after laser irradiation, 5 rats from each group were sacrificed and the heart tissues were analyzed by cytokine antibody arrays. Enzyme-linked immunosorbent assay (ELISA) was performed to confirm its reliability. Two weeks after MI, cardiac function and structure were evaluated by echocardiography and histological study. RESULTS: Cytokine antibody array indicated 4 cytokines were significantly changed after laser therapy. ELISA confirmed that granulocyte-macrophage colony stimulating factor and fractalkine were the cytokines involved in the response to therapeutic laser irradiation. However, there was no difference in cytokine release between various groups at 2 weeks after MI. Although LLLI did not

improve the damaged heart function, it did reduce the infarct area expansion. CONCLUSIONS: The antibody-based protein array technology was applied for screening the cytokine expression profile following MI, with or without laser irradiation. The expression of multiple cytokines was regulated in the acute phase after LLLI. Our results revealed a potential novel mechanism for applying laser therapy to the treatment of heart disease. Cytokines Animals;Cytokines;Echocardiography;Female;In Vitro Techniques;Low-Level Light Therapy;Myocardial Infarction;Myocardium;Rats;Rats, Sprague-Dawley;Ventricular Remodeling

Effect of narrowband ultraviolet B phototherapy on serum folic acid levels in patients with psoriasis. Narrowband ultraviolet B phototherapy (NB-UVB) is a widely used modality in the treatment of psoriasis and is generally accepted as safe in pregnancy. Previous studies have described photodegradation of serum folate after exposure to UVA radiation but the effect of UVB is not known. We studied the effect of NB-UVB phototherapy on serum folic acid levels in patients with psoriasis and the relationship between changes in serum folate levels and the total cumulative dose of NB-UVB. Included in the study were 30 psoriatic patients between 13 and 55Â years of age. Serum folate levels were measured at baseline, and after exposure to 18 and 36 sessions of NB-UVB irradiation. There were significant decreases in mean serum folate levels after NB-UVB exposure. After exposure to 18 and 36 sessions the decreases were 19% and 27%, respectively. After 18 sessions, the mean serum folate level had decreased in 18 patients (60%) from 8.64Â ng/ml at baseline to 7.02Â ng/ml (mean NB-UVB cumulative dose 40.02Â J/cm(2); Pâ€‰=â€‰0.019). After 36 sessions, the mean serum folate levels had decreased in 22 patients (73%) to 6.32Â ng/ml (mean NB-UVB cumulative dose 118.16Â J/cm(2); Pâ€‰=â€‰0.002). The present study showed that high cumulative NB-UVB doses can induce folate photodegradation and decrease serum folate levels in patients with psoriasis and that this effect is directly related to the total cumulative dose of NB-UVB. Folic Acid Adolescent;Adult;Female;Folic Acid;Humans;Linear Models;Low-Level Light Therapy;Male;Middle Aged;Psoriasis;Skin;Statistics as Topic;Treatment Outcome;Ultraviolet Rays;Young Adult

Greater collagen deposition with the microneedle therapy system than with intense pulsed light. BACKGROUND: Intense pulsed light (IPL) and the microneedle therapy system (MTS) are currently available for the treatment of scars. Greater collagen deposition has been proposed as a mechanism for the treatment of scars. OBJECTIVE: To compare the effects of IPL and MTS on collagen deposition. MATERIALS AND METHODS: Fifty-four imprinting control region mice were divided into three groups: untreated controls, treatment with IPL, and treatment with MTS. A single pass of IPL 10.5 J/cm(2) and five passes (total 15 strokes) of MTS were performed three times every 2 weeks. Four weeks after the last treatment, skin thickness measurements using a caliper, microscopic examination, Western blot analysis for type I collagen, and enzyme-linked immunosorbent assay for total collagen content were performed. RESULTS: Measured using calipers, MTS, resulted in greater skin thickness than IPL that paralleled the dermal thickness of the biopsied specimens. MTS also increased expression levels of type I collagen and total collagen content more than IPL. IPL effects were superior to control. CONCLUSION: MTS increased collagen deposition more than IPL, and MTS might be more effective than IPL for scar treatment. The authors have indicated no significant interest with commercial supporters. Collagen Acne Vulgaris;Animals;Cicatrix;Collagen;Disease Models, Animal;Low-Level Light Therapy;Mice;Miniaturization;Needles;Skin;Treatment Outcome

Differential responses of fibroblasts, non-neoplastic epithelial cells, and oral carcinoma cells to low-level laser therapy. Low-level laser therapy (LLLT) is used in the treatment of chemoradiotherapy- or radiotherapy-induced oropharyngeal mucositis (ORM). In head and neck cancer, tumor cells may lie in the LLLT irradiation field, and LLLT might promote tumor progression. We therefore investigated the effect of LLLT on proliferation, cell cycle distribution, and apoptosis in a

human oral carcinoma cell line (SCC-25), non-malignant epithelial cells (BEAS-2B), and fibroblasts in vitro. The cell lines were subjected to LLLT on three consecutive days for 15 min. Cell proliferation was assessed using the MTT assay, cell cycle distribution by flow cytometry and propidium-iodide DNA staining, and apoptosis using an Annexin V-FITC assay. Controls were sham-treated, but not exposed to the laser treatment. LLLT treatment resulted in increased fibroblast proliferation ($p < 0.001$), whereas decreased cell proliferation was observed after LLLT treatment of BEAS-2B ($p = 0.003$) and SCC-25 cells ($p < 0.001$). In SCC-25 cells, an increased percentage of S-phase cells and decreased percentage of G1-phase cells were observed ($p < 0.001$). Moreover, a proapoptotic effect of LLLT was observed in SCC-25 cells ($p = 0.02$). LLLT did not exhibit a tumor-promoting effect in this in vitro study. Apoptosis;Carcinoma, Squamous Cell;Cell Cycle;Cell Proliferation;Cell Survival;Cells, Cultured;Chemoradiotherapy;Epithelial Cells;Fibroblasts;Head and Neck Neoplasms;Humans;Low-Level Light Therapy;Mouth Neoplasms;Radiation Injuries;Stomatitis

Silica coating improves the efficacy of Pd nanosheets for photothermal therapy of cancer cells using near infrared laser. Thickness does matter! The ultrathin nature of 1.8 nm-thick Pd nanosheets prevents them entering cells effectively. A 13-times enhancement in the cells' uptake of the Pd nanosheets has now been achieved by silica coating together with surface functionalization, therefore significantly improving their NIR photothermal cell-killing efficacy. Palladium;Silicon Dioxide Cell Line, Tumor;Cell Survival;Humans;Low-Level Light Therapy;Nanostructures;Neoplasms;Palladium;Silicon Dioxide

A meta-analysis on the effectiveness of propranolol for the treatment of infantile airway haemangiomas. OBJECTIVE: To study the effectiveness of propranolol in infantile airway haemangiomas and compare the effectiveness of propranolol vs. different therapies. METHODS: A literature search of Ovid, Embase, the Cochrane database, Googleâ„¢ Scholar, and Medline using PubMed as the search engine was performed to identify studies that analysed the effect of propranolol treatment in children with airway haemangiomas. Random-effect meta-analytical techniques were conducted for the outcome measures. RESULTS: Thirteen studies, comprising 36 patients were included in the analysis. Propranolol was found to be an effective intervention for the resolution of infantile airway haemangiomas ($P<0.00001$). Meta-analysis of effectiveness of propranolol vs. steroids, CO(2) laser, or vincristine showed that propranolol is the most effective treatment. CONCLUSIONS: This meta-analysis demonstrated that propranolol should be recommended as a first-line treatment in infantile airway haemangiomas. However, because of the possible side effects of propranolol, current infantile haemangioma treatment centres recommend a full cardiovascular and respiratory review be performed prior to initiation of therapy. Steroids;Vincristine;Propranolol Dose-Response Relationship, Drug;Drug Administration Schedule;Female;Hemangioma;Humans;Infant;Infant, Newborn;Laryngeal Neoplasms;Low-Level Light Therapy;Male;Prognosis;Propranolol;Risk Assessment;Steroids;Survival Rate;Treatment Outcome;Vincristine

Effects of rehabilitative interventions on pain, function and physical impairments in people with hand osteoarthritis: a systematic review. INTRODUCTION: Hand osteoarthritis (OA) is associated with pain, reduced grip strength, loss of range of motion and joint stiffness leading to impaired hand function and difficulty with daily activities. The effectiveness of different rehabilitation interventions on specific treatment goals has not yet been fully explored. The objective of this systematic review is to provide evidence based knowledge on the treatment effects of different rehabilitation interventions for specific treatment goals for hand OA. METHODS: A computerized literature search of Medline, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), ISI Web of Science, the Physiotherapy Evidence Database (PEDro) and SCOPUS was performed. Studies that had an evidence level of 2b or higher and that compared a rehabilitation intervention with a control

group and assessed at least one of the following outcome measures - pain, physical hand function or other measures of hand impairment - were included. The eligibility and methodological quality of trials were systematically assessed by two independent reviewers using the PEDro scale. Treatment effects were calculated using standardized mean difference and 95% confidence intervals. RESULTS: Ten studies, of which six were of higher quality (PEDro score >6), were included. The rehabilitation techniques reviewed included three studies on exercise, two studies each on laser and heat, and one study each on splints, massage and acupuncture. One higher quality trial showed a large positive effect of 12-month use of a night splint on hand pain, function, strength and range of motion. Exercise had no effect on hand pain or function although it may be able to improve hand strength. Low level laser therapy may be useful for improving range of motion. No rehabilitation interventions were found to improve stiffness. CONCLUSIONS: There is emerging high quality evidence to support that rehabilitation interventions can offer significant benefits to individuals with hand OA. A summary of the higher quality evidence is provided to assist with clinical decision making based on current evidence. Further high-quality research is needed concerning the effects of rehabilitation interventions on specific treatment goals for hand OA. Hand;Humans;Occupational Therapy;Osteoarthritis;Pain;Physical Therapy Modalities;Recovery of Function

Irradiation at 636 nm positively affects diabetic wounded and hypoxic cells in vitro. OBJECTIVE: This study investigated the effect of low-intensity laser irradiation (LILI) on pro-inflammatory cytokines involved in wound healing processes in diabetes and hypoxia. BACKGROUND DATA: Diabetes is associated with impaired wound healing and a prolonged inflammatory phase. Pro-inflammatory cytokines such as interleukin (IL)-1Î², tumor necrosis factor (TNF)-Î± and IL-6 are elevated in diabetes. LILI has been reported to accelerate wound healing and decrease inflammatory cytokines. METHODS: A human skin fibroblast cell line (WS1) was used in vitro. Cells were exposed to various insults, namely, wounding, and a diabetic or hypoxic environment. Experimental cells were exposed to an energy density of 5 â€‰J/cm(2) using a continuous wave 636-nm diode laser at an average power of 95 â€‰mW, an illuminated area of 9.05 â€‰cm(2), and an irradiance of 11 mW/cm(2) (irradiation time, 476â€‰ sec). The effect of laser irradiation on cytokine expression was examined at 1 or 24â€‰ h post-irradiation. Cellular morphology, viability, proliferation, and cytokine expression (IL-1Î², IL-6, and TNF-Î±) were investigated. Translocation of nuclear factor-kappa B (NF-ÎºB) was also determined. RESULTS: There was a higher rate of migration in irradiated wounded cultures, and irradiated hypoxic cells showed an improvement in cellular morphology. All cell models showed an increase in proliferation. Normal wounded cells showed a decrease in apoptosis, TNF-Î±, and IL-1Î². Diabetic wounded cells showed an increase in viability and a decrease in apoptosis and IL-1Î², whereas hypoxic cells showed an increase in viability and IL-6, and a decrease in apoptosis and TNF-Î±. NF-ÎºB was translocated into the nucleus post-irradiation. CONCLUSIONS: Phototherapy resulted in hastened wound closure, increased proliferation, and normalization of cellular function. The decrease in the different pro-inflammatory cytokines and NF-ÎºB translocation was model and time dependent. Overall, laser irradiation resulted in a reduction in inflammatory cytokines and directed cells into the cell survival pathway. Interleukin-1;Interleukin-6;Tumor Necrosis Factor-alpha Analysis of Variance;Cell Line;Cell Proliferation;Cell Survival;Diabetes Mellitus;Fibroblasts;Humans;Hypoxia;In Vitro Techniques;Interleukin-1;Interleukin-6;Low-Level Light Therapy;Tumor Necrosis Factor-alpha;Wound Healing;Wounds and Injuries

Effectiveness of laser in dentinal hypersensitivity treatment: a systematic review. INTRODUCTION: The effectiveness of laser treatment in reducing dentinal hypersensitivity (DH) is controversial, with important concerns related to the high efficacy of placebo laser. The purpose of this systematic review was to identify and evaluate literature regarding the effectiveness of laser therapy compared with placebo laser therapy. The secondary aim was to survey the literature

regarding laser treatment safety. METHODS: An exhaustive literature search with strict inclusion and exclusion criteria was performed with electronic databases and by hand. The goal was to identify all randomized, placebo-controlled clinical trials that have assessed the effectiveness of DH reduction compared with placebo laser. RESULTS: Only 3 randomized clinical trials were retrieved. These studies supported that laser treatment could reduce DH, but the reduction was not significant compared with placebo laser treatment. No side effects, adverse reactions, or pulp damage were reported at the energy and power settings used. CONCLUSIONS: Laser therapy can reduce DH-related pain, but the evidence for its effectiveness is weak, and the possibility of a placebo effect must be considered. Placebos Dentin Sensitivity;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Placebo Effect;Placebos;Randomized Controlled Trials as Topic;Safety;Treatment Outcome

Commentary: Herpes zoster in the distribution of the trigeminal nerve after nonablative fractional photothermolysis of the face. Herpes Zoster;Herpesvirus 3, Human;Humans;Low-Level Light Therapy;Trigeminal Nerve;Virus Activation

Immunohistochemical evaluation of skin before and after micro-ablative fractional erbium-doped yttrium aluminum garnet laser treatment. Antigens, CD1;CD1a antigen;Toll-Like Receptors Antigens, CD1;Humans;Langerhans Cells;Lasers, Solid-State;Low-Level Light Therapy;Skin;Toll-Like Receptors

Experience with non-ablative fractional photothermolysis with a dual-mode laser device (1,440/1,320 nm): no considerable clinical effect on hypertrophic/acne scars and facial wrinkles. In the literature, non-ablative fractionated photothermolysis (nFP) is accredited with improvement of wrinkles and scars combined with a reduced downtime. The purpose of this work was to evaluate the impact of a combination laser (1,320/1,440Â nm) for nFP on hypertrophic scars, acne scars, and facial wrinkles. Thirty-six patients suffering from hypertrophic scars (nâ€‰=â€‰7), acne scars (nâ€‰=â€‰9), and wrinkles (nâ€‰=â€‰20) were treated using a combination Nd:YAG laser [Î»(em)â€‰=â€‰1,320 and 1,440Â nm, pulse duration: 3-ms single pulse, fluence: 8.0-9.0Â J/cm(2) (1,320Â nm); 2.0-2.5Â J/cm(2) (1,440Â nm)]. The appearance of the treated condition was evaluated in a retrospective study by two blinded investigators based on follow-up photographs and by patient self-assessment. The frequency of side-effects was also assessed. Both patients and blinded observers rated the treatment results for hypertrophic scars and acne scars as slight improvement, and for wrinkles as equal as compared to baseline. No serious side-effects were reported. The light device used did not lead to a considerable clinical improvement of hypertrophic scars, acne scars, or wrinkles in this study. Acne Vulgaris;Adolescent;Adult;Aged;Analysis of Variance;Cicatrix, Hypertrophic;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain;Pain Measurement;Retrospective Studies;Skin Aging;Statistics, Nonparametric;Treatment Outcome;Young Adult

[Narrowband UV-B, monochromatic excimer laser, and photodynamic therapy in psoriasis: a consensus statement of the Spanish Psoriasis Group]. Novel treatment strategies and new information concerning the management of moderate to severe psoriasis justify a reassessment of the role of the classic therapies in this setting. This consensus statement evaluates narrowband UV-B therapy, which is currently considered the phototherapy option of choice in psoriasis because of its risk-to-benefit ratio. The role of excimer laser and photodynamic therapies are also discussed. These targeted therapies are still only available in a small number of centers in Spain and are used principally in the treatment of localized and recalcitrant forms of psoriasis. We discuss the efficacy and safety of phototherapy as well as treatment regimens, combination therapy, and clinical considerations relating to the characteristics of the patient or the disease. Adrenal Cortex Hormones;Acitretin Acitretin;Adrenal Cortex Hormones;Adult;Child;Clinical Trials as Topic;Combined Modality Therapy;Comorbidity;Contraindications;Erythema;Female;Humans;Lasers,

Excimer;Low-Level Light Therapy;Neoplasms, Radiation-Induced;PUVA Therapy;Photochemotherapy;Pregnancy;Pregnancy Complications;Psoriasis;Radiotherapy Dosage;Ultraviolet Therapy

Laser photobiomodulation of gene expression and release of growth factors and cytokines from cells in culture: a review of human and animal studies. AIM: The aim of this paper was to review experimental studies of laser irradiation of human and animal cells in culture to assess the photobiomodulatory effects of such irradiation on gene expression and release of growth factors and CYTOKINES. BACKGROUND: Previous studies have reported that the release of certain growth factors and cytokines by various types of cells can be modulated by laser irradiation. A review of recent studies may provide further insight into the clinical effects brought about by laser irradiation of cells and tissues, including changes in inflammation and cellular proliferation. METHODS: A systematic review was completed of original research papers investigating the effects of laser phototherapy on gene expression and release of these mediators from human and animal cells in culture (January 2002 to September 2009). Relevant papers were retrieved primarily from PubMed and Medline databases. The search terms were "growth factors", "cytokines", "laser therapy", "laser irradiation", "laser phototherapy," and "phototherapy". RESULTS: A total of 17 relevant papers were included in the review, comprising studies on a variety of cell types. Considerable variation occurred in research design, methodology, and irradiation parameters employed, limiting comparison of research findings between studies. Results demonstrated that laser irradiation at green, red, or infrared wavelengths at a range of dosage parameters can cause significant changes in the cellular gene expression and release of these mediators, and that such effects depend upon wavelength and radiant exposure. CONCLUSION: Findings from the reviewed studies clearly demonstrate the ability of laser irradiation to modulate gene expression and the release of growth factors and cytokines from cells in culture. Further work is indicated at the clinical level to elucidate the putative clinical relevance of these cellular-level effects. Cytokines;Intercellular Signaling Peptides and Proteins Animals;Cells, Cultured;Cytokines;Gene Expression;Humans;Intercellular Signaling Peptides and Proteins;Laser Therapy;Lasers

Low-level laser therapy induces differential expression of osteogenic genes during bone repair in rats. OBJECTIVES: The aim of this study was to measure the temporal pattern of the expression of osteogenic genes after low-level laser therapy during the process of bone healing. We used quantitative real-time polymerase chain reaction (qPCR) along with histology to assess gene expression following laser irradiation on created bone defects in tibias of rats. MATERIAL AND METHODS: The animals were randomly distributed into two groups: control or laser-irradiated group. Noncritical size bone defects were surgically created at the upper third of the tibia. Laser irradiation started 24 h post-surgery and was performed for 3, 6, and 12 sessions, with an interval of 48â€‰h. A 830â€‰nm laser, 50â€‰J/cm(2), 30 mW, was used. On days 7, 13, and 25 post-injury, rats were sacrificed individually by carbon dioxide asphyxia. The tibias were removed for analysis. RESULTS: The histological results revealed intense new bone formation surrounded by highly vascularized connective tissue presenting slight osteogenic activity, with primary bone deposition in the group exposed to laser in the intermediary (13 days) and late stages of repair (25 days). The quantitative real-time PCR showed that laser irradiation produced an upregulation of BMP-4 at day 13 post-surgery and an upregulation of BMP4, ALP, and Runx 2 at day 25 after surgery. CONCLUSION: Our results indicate that laser therapy improves bone repair in rats as depicted by differential histopathological and osteogenic genes expression, mainly at the late stages of recovery. Animals;Bone Regeneration;Low-Level Light Therapy;Male;Osteogenesis;Rats;Rats, Wistar;Tibia

Application of low-level laser irradiation (LLLI) and rhBMP-2 in critical bone defect of ovariectomized rats: histomorphometric evaluation. OBJECTIVES: The aim of this study was to evaluate the

osteogenic potential of recombinant human bone morphogenetic protein-2 (rhBMP-2) and low-level laser irradiation (LLLI), isolated or combined in critical bone defects (5â€‰mm) in parietal bone using ovariectomized female rats as an experimental animal model. MATERIALS AND METHODS: Forty-nine female Wistar rats, bilaterally ovariectomized (OVX), were divided into seven treatment groups of seven animals each: (I) laser in a single application, (II) 7â€‰Î¼g of pure rhBMP-2, (III) laser and 7â€‰Î¼g of pure rhBMP-2, (IV) 7â€‰Î¼g of rhBMP-2/monoolein gel, (V) laser and 7â€‰Î¼g of rhBMP-2/monoolein gel, (VI) laser and pure monoolein gel, and (VII) critical bone defect controls. The low-level laser source used was a gallium aluminum arsenide semiconductor diode laser device (Î»â€‰=â€‰780â€‰nm, Dâ€‰=â€‰120â€‰J/cm(2)). RESULTS: Groups II and III presented higher levels of newly formed bone than all other groups with levels of 40.57% and 40.39%, respectively (pâ€‰<â€‰0.05). The levels of newly formed bone of groups I, IV, V, and VI were similar with levels of 29.67%, 25.75%, 27.75%, and 30.64%, respectively (pâ€‰>â€‰0.05). The area of new bone formation in group VII was 20.96%, which is significantly lower than groups I, II, III, and VI. CONCLUSIONS: It was concluded that pure rhBMP-2 and a single dose of laser application stimulated new bone formation, but the new bone formation area was significantly increased when only rhBMP-2 was used. Additionally, the laser application in combination with other treatments did not influence the bone formation area. Bone Morphogenetic Protein 2;Recombinant Proteins;Transforming Growth Factor beta;recombinant human bone morphogenetic protein-2 Analysis of Variance;Animals;Bone Morphogenetic Protein 2;Female;Lasers, Semiconductor;Low-Level Light Therapy;Osteogenesis;Ovariectomy;Parietal Bone;Rats;Rats, Wistar;Recombinant Proteins;Transforming Growth Factor beta;Wound Healing

Recalcitrant nongenital warts. Nongenital warts are a common presentation in general practice. Despite treatment according to evidence based guidelines, a significant proportion of common warts fail to resolve, becoming recalcitrant. This poses a problem in clinical management. The recommendations for treating recalcitrant warts are unclear and there is a wide range of second line treatments available. This article reviews the available methods of treatment for recalcitrant nongenital warts as described in the medical literature. Anti-Infective Agents, Local;Antiviral Agents;Dermatologic Agents;Immunosuppressive Agents;Salicylates;Salicylic Acid Anti-Infective Agents, Local;Antiviral Agents;Cryotherapy;Dermatologic Agents;Evidence-Based Medicine;General Practice;Humans;Immunosuppressive Agents;Injections, Intralesional;Low-Level Light Therapy;Photochemotherapy;Salicylates;Salicylic Acid;Warts

Phototherapy for chronic rhinosinusitis. OBJECTIVES: Near-infrared laser illumination (NILI), with or without photo-activated (PA) agents, has bactericidal and wound healing promoting effects. NILI may have a potential role managing chronic rhinosinusitis (CRS). METHODS: A prospective randomized study with 23 symptomatic post-surgical CRS patients with positive cultures was conducted. Two groups (GR1 and GR2) were treated with NILI. Objective nasal endoscopic scoring (NES) was elaborated. GR1 was treated with a 940â€‰nm laser, while GR2 was treated with a topical PA agent, indocyanine-green, followed with 810â€‰nm laser. SNOT20 scores, NES, and cultures were obtained prior to illumination. Saccharin test was performed 1 week following treatment. RESULTS: Some cultures remained positive through treatment, with Staph. aureus predominating. Both therapy arms demonstrated clinical efficacy. The SNOT20 score change was 0.9, 0.8 for GR1 and GR2, respectively (Pâ€‰<â€‰0.05). Improvement (Pâ€‰<â€‰0.05) was observed based on NES. No significant difference was observed between two treatment groups. All passed the saccharin test. Therapeutic effect was sustained for a minimum of 2 months. Side effects were minimal. CONCLUSIONS: NILI was objectively and subjectively beneficial in managing CRS, safe, reproducible, sustained and appeared not to interfere with ciliary motility. CRS exacerbation was avoided without using antibiotics or steroids. Photosensitizing Agents;Indocyanine Green Chronic

Disease;Endoscopy;Female;Humans;Indocyanine Green;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Photochemotherapy;Photosensitizing Agents;Prospective Studies;Quality of Life;Rhinitis;Severity of Illness Index;Sinusitis;Treatment Outcome
Photomedicine and LLLT literature watch. Low-Level Light Therapy;Phototherapy
The erbium micropeel: a prospective, randomized trial of the effects of two fluence settings on facial photoaging. BACKGROUND: Recent studies have suggested that a series of low-energy, single-pass ablative laser resurfacing micropeels can reduce photoaging with decreased downtime. This randomized, prospective single-blinded trial sought to determine the ideal settings of sequential erbium:yttrium-aluminum-garnet (Er:YAG) laser treatments that maximize efficacy and patient satisfaction. METHODS: Forty-six subjects with mild-to-moderate facial dyschromia and rhytides were evenly randomized to two Er:YAG treatment arms. Patients in the lower fluence (LF) (2.5 J/cm2) and higher fluence (HF) (3.8 J/cm2) groups each received three one-pass, full-face treatments one month apart. Patient and investigator assessments of rhytides, dyschromia and global appearance were performed at baseline and at four, eight and 20 weeks using a nominal scale from 1â€“4. Adverse events and patient satisfaction were also evaluated. RESULTS: Patient scores showed rhytid improvement only with HF treatments. Investigator scores at three months post-treatment showed dyschromia was significantly improved in both study arms, with a 24 and 36 percent reduction for the LF and HF groups, respectively. Global appearance scores improved by 25 and 32 percent, respectively. A trend towards greater post-procedure erythema and time-to-erythema resolution was observed in the HF group. Mild peeling was the most common adverse event. Individuals who underwent LF treatments were more likely to pursue future treatments. CONCLUSION: Both settings resulted in moderate but significant improvement in dyschromia, although only HF treatment improved rhytides. The decreased downtime of LF treatments made this the preferred choice of patients. Adult;Aged;Erythema;Face;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Single-Blind Method;Skin Aging;Skin Pigmentation;Treatment Outcome
Herpes zoster in the distribution of the trigeminal nerve after nonablative fractional photothermolysis of the face: report of 3 cases. Female;Herpes Zoster;Herpesvirus 3, Human;Humans;Low-Level Light Therapy;Middle Aged;Trigeminal Nerve;Virus Activation
Effect of a newly synthesized Zn sulfophthalocyanine derivative on cell morphology, viability, proliferation, and cytotoxicity in a human lung cancer cell line (A549). Photodynamic therapy (PDT) is a photochemotherapeutic process that is used for the treatment of cancer. Photofrin is the most widely used photosensitizer, however, the chemical composition of Photofrin is unclear and it has a low absorption in the therapeutic wavelength (600-900Â nm). This factor has stimulated research in synthesis and testing of new photosensitizers. This in vitro study evaluated the effectiveness of a Zn sulfophthalocyanine (ZnPcS(mix)) as a potential photosensitizer in the treatment of human lung cancer. Lung cancer cells (A549) were divided into four groups: group 1 was control cells receiving neither light nor drug; group 2 was light control for cells exposed to laser irradiation at a fluence of 4.98Â J/cm(2); group 3 was drug control for cells incubated with 15.8Â Î¼M photosensitizer and not exposed to laser irradiation, while group 4 was cells receiving the experimental treatment with 15.8Â Î¼M photosensitizer and irradiation with 4.98Â J/cm(2). Laser irradiations were performed using a 636-nm diode laser with an output power of 110Â mW at 4.98Â J/cm(2). Changes in cellular responses were evaluated by cell morphology, viability, proliferation, and cytotoxicity. While control groups 1, 2, and 3 showed no changes in cell morphology, viability, proliferation, or cytotoxicity, group 4 receiving both photosensitizer and irradiation showed changes in cell morphology, a decrease in cell viability and proliferation, and an increase in cytotoxicity, cell death, and cell membrane damage. Irradiation or photosensitizer alone

had no effect on the lung cancer cells since the cells remained viable and showed no evidence of damage. However, irradiation in the presence of a photosensitizer induced cell death. Indoles;Organometallic Compounds;Photosensitizing Agents;Hematoporphyrin Derivative Adenocarcinoma;Adenocarcinoma of Lung;Analysis of Variance;Cell Proliferation;Cell Survival;Cells, Cultured;Hematoporphyrin Derivative;Humans;Indoles;Low-Level Light Therapy;Lung Neoplasms;Organometallic Compounds;Photochemotherapy;Photosensitizing Agents

Reduction in thigh circumference and improvement in the appearance of cellulite with dual-wavelength, low-level laser energy and massage. OBJECTIVES: This study evaluated the efficacy and safety of a low-level, dual-wavelength laser energy and massage device for improving the appearance of cellulite and reducing thigh circumference. METHODS: Subjects (n = 83) with mild to moderate cellulite enrolled in this IRB-approved, open-label, multicenter study. Their right or left thighs received eight treatments with a low-level, dual-wavelength laser and massage device. The untreated contralateral thigh served as a control. Circumferences of the upper, middle, and lower thighs (treated and untreated) were measured before the fifth and eighth treatments and 1 month after the final treatment. RESULTS: Reduction in thigh circumference of the treated areas exceeded those of the control areas for the upper, middle, and lower thigh in most subjects. The maximum reduction (-0.82 cm) occurred in the upper thigh at 1 month. The mean reduction of the upper, middle, and lower thigh circumferences was -0.64 cm for the treated thighs compared to -0.20 cm for untreated thighs. The difference was significant ($p < 0.0001$). Fifty-nine (71.1%) treatment thighs lost circumference compared to 44 (53.0%) control thighs. Resolution of adverse effects including erythema, swelling, and increased urination was seen within 30 minutes after treatment. All were resolved without sequelae and within the expected duration. CONCLUSION: The low-level, dual-wavelength laser energy and massage device safely improves the appearance of cellulite while reducing thigh circumference. Adipose Tissue;Adult;Cosmetic Techniques;Female;Humans;Low-Level Light Therapy;Massage;Thigh

Low-level laser therapy: a useful technique for enhancing the proliferation of various cultured cells. The aim of this work is to review the available literature on the details of low-level laser therapy (LLLT) use for the enhancement of the proliferation of various cultured cell lines including stem cells. A cell culture is one of the most useful techniques in science, particularly in the production of viral vaccines and hybrid cell lines. However, the growth rate of some of the much-needed mammalian cells is slow. LLLT can enhance the proliferation rate of various cell lines. Literature review from 1923 to 2010. By investigating the outcome of LLLT on cell cultures, many articles report that it produces higher rates of ATP, RNA, and DNA synthesis in stem cells and other cell lines. Thus, LLLT improves the proliferation of the cells without causing any cytotoxic effects. Mainly, helium neon and gallium-aluminum-arsenide (Ga-Al-As) lasers are used for LLLT on cultured cells. The results of LLLT also vary according to the applied energy density and wavelengths to which the target cells are subjected. This review suggests that an energy density value of 0.5 to 4.0 J/cm(2) and a visible spectrum ranging from 600 to 700 nm of LLLT are very helpful in enhancing the proliferation rate of various cell lines. With the appropriate use of LLLT, the proliferation rate of cultured cells, including stem cells, can be increased, which would be very useful in tissue engineering and regenerative medicine. Animals;Biophysics;Cell Proliferation;Cells, Cultured;Dental Pulp;Dose-Response Relationship, Radiation;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Mesenchymal Stem Cells;Signal Transduction;Stem Cells;Time Factors

Long-term follow-up of a case of cheek hyperpigmentation associated with McCune-Albright syndrome treated with Q-switched ruby laser. Cheek;Child;Female;Fibrous Dysplasia, Polyostotic;Follow-Up Studies;Humans;Hyperpigmentation;Lasers, Solid-State;Low-Level Light Therapy

Early postoperative treatment of thyroidectomy scars using a fractional carbon dioxide laser. BACKGROUND: Ablative carbon dioxide fractional laser systems (CO(2) FS) have been effectively used to improve the appearance of scarring after surgical procedures, but an optimal treatment time has not been established. OBJECTIVE: To evaluate the efficacy and safety of CO(2) FS in early postoperative thyroidectomy scars. METHODS: Twenty-three Korean women with thyroidectomy scars were enrolled in this study. All patients underwent a single session of two passes of a CO(2) FS with a pulse energy setting of 50 mJ and a density of 100 spots/cm(2) 2 to 3 weeks after surgery. RESULTS: Mean Vancouver Scar Scale (VSS) scores were statistically significantly lower after laser treatment. Three months after CO(2) FS treatment of thyroidectomy scarring, 12 of 23 participants showed clinical improvement of more than 51% from 2 to 3 weeks after surgery. The mean grade of clinical improvement based on independent clinical assessment was 2.6 Â± 0.9. CONCLUSION: Early postoperative CO(2) FS treatment of thyroidectomy scars is effective and safe.
Adult;Cicatrix;Cohort Studies;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Postoperative Care;Thyroid Neoplasms;Thyroidectomy;Treatment Outcome

Histological analysis of low-intensity laser therapy effects in peripheral nerve regeneration in Wistar rats. PURPOSE: Analyze the influence of low-intensity laser therapy in the sciatic nerve regeneration of rats submitted to controlled crush through histological analysis. METHODS: Were used 20 Wistar rats, to analyze the influence of low-intensity laser therapy in the sciatic nerve regeneration, where the injury of the type axonotmesis was induced by a haemostatic clamp Crile (2nd level of the rack). The animals were randomly distributed in 2 groups. Control group (CG n = 10) and Laser group (LG n = 10). These were subdivided in 2 subgroups each, according to the euthanasia period: (CG14 - n = 5 and CG21 - n = 5) and (LG14 - n = 5 and LG21 - n = 5). At the end of treatment, the samples were removed and prepared for histological analysis, where were analyzed and quantified the following findings: Schwann cells, myelinic axons with large diameter and neurons. RESULTS: In the groups submitted to low-intensity laser therapy, were observed an increase in the number of all analyzed aspects with significance level. CONCLUSION: The irradiation with low intensity laser (904nm) influenced positively the regeneration of the sciatic nerve in Wistar rats after being injured by crush (axonotmesis), becoming the nerve recovery more rapid and efficient.
Animals;Low-Level Light Therapy;Male;Nerve Crush;Nerve Regeneration;Peripheral Nerve Injuries;Peripheral Nerves;Random Allocation;Rats;Rats, Wistar;Sciatic Nerve

Sequential treatment with triple combination cream and intense pulsed light is more efficacious than sequential treatment with an inactive (control) cream and intense pulsed light in patients with moderate to severe melasma. BACKGROUND: Triple combination (TC) cream is a stable combination of fluocinolone acetonide 0.01%, hydroquinone 4%, and tretinoin 0.05% and is currently the only hydroquinone-containing drug approved by the Food and Drug Administration for the treatment of melasma. OBJECTIVE: To evaluate the safety and efficacy of TC cream when used sequentially with intense pulsed light (IPL) treatments in patients with moderate to severe melasma. MATERIALS & METHODS: This was a 10-week, split-face study in which 56 patients with symmetrical melasma lesions were treated with TC cream on one side of the face and an inactive control cream on the other side of the face. Patients also had two IPL treatments at weeks 2 and 6. (Topical treatment was suspended during IPL treatments Â± 1 day.) RESULTS: Melasma severity was significantly less with TC cream and IPL than with inactive cream and IPL at weeks 6 (p=.007) and 10 (p=.002). Improvement in melasma was greater with TC cream and IPL than with inactive cream and IPL according to investigator and patient evaluations at weeks 6 and 10 (p<.001 for both time points). Treatment with TC cream and IPL was well tolerated. CONCLUSION: The results of this study suggest that TC cream and IPL treatment is an effective and safe treatment option for patients with melasma.
Anti-Inflammatory Agents;Hydroquinones;Keratolytic Agents;Radiation-Protective

Agents;Fluocinolone Acetonide;Tretinoin;hydroquinone Adult;Aged;Anti-Inflammatory Agents;Combined Modality Therapy;Female;Fluocinolone Acetonide;Humans;Hydroquinones;Keratolytic Agents;Low-Level Light Therapy;Male;Melanosis;Middle Aged;Radiation-Protective Agents;Tretinoin
En coup de sabre presenting as a port-wine stain initially treated with a pulsed dye laser. Diagnostic Errors;Facial Dermatoses;Female;Humans;Lasers, Dye;Low-Level Light Therapy;Port-Wine Stain;Scleroderma, Localized;Young Adult
New approaches in light/laser therapies and photodynamic treatment of acne. Acne is a domain in which the technology and understanding of light/laser therapeutic procedures have advanced considerably. The aim of the paper was to revisit adjunctive physical treatments of acne, including light/laser treatments and photodynamic therapy. This review summarizes findings about such treatment modalities with particular emphasis on efficacy and safety. A number of laser/light-based modalities have been developed to meet the increasing demand for new acne treatments. The current devices correspond, on the one hand, to light-emitting diode therapy and, on the other hand, to the 532-nm potassium titanyl phosphate laser, the 585- and 595-nm pulsed dye laser, the 1450-nm diode laser, the 1320-nm Nd:YAG laser and intense pulsed light. Photodynamic therapy is also available. It is claimed that light/laser treatments might induce a faster response compared with the 1-3 months needed for response to traditional oral and topical treatments. In conclusion, pulsed dye laser shows efficacy in some patients with mild to moderate acne. The relative effectiveness compared with other treatments is unconfirmed; from the published information, evidence-based efficacy assessment of light/laser therapies in acne remains almost impossible. Porphyrins Acne Vulgaris;Evidence-Based Medicine;Humans;Laser Therapy;Lasers, Dye;Photochemotherapy;Porphyrins;Propionibacterium;Propionibacterium acnes;Time Factors
Influence of low-level laser on the speed of orthodontic movement. INTRODUCTION: This study evaluated the effect of low-level laser irradiation on the speed of orthodontic tooth movement of canines submitted to initial retraction. METHODS: Twenty-six canines were retracted by using NiTi spring (force of 150â€‰g/side). Thirteen of those were irradiated with diode laser (780â€‰nm, 20â€‰mW, 10â€‰sec, 5â€‰J/cm(2)) for 3 days, and the other 13 were not irradiated and thus were considered the control group. Patients were followed up for 4 months, and nine laser applications were performed (three each month). The movement of the canines was evaluated through 3D casts, and the statistical analysis was performed with ANOVA and Tukey tests (pâ€‰<â€‰0.05). Periapical radiographs of the studied teeth were submitted to Levander, Malmgreen, and alveolar bone ridge analyses to evaluate tissue integrity and were compared with the Wilcoxon test (pâ€‰<â€‰0.05). RESULTS: A statistically significant increase in the movement speed of irradiated canines was observed in comparison with nonirradiated canines in all evaluation periods. No statistically significant difference was observed in bone and root resorption of canines, whether irradiated or not. CONCLUSION: The diode laser used within the protocol guidelines increased the speed of tooth movement. This might reduce orthodontic treatment time. Acceleration;Adolescent;Analysis of Variance;Case-Control Studies;Child;Cuspid;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Orthodontic Brackets;Radiography;Reference Values;Sensitivity and Specificity;Statistics, Nonparametric;Tooth Movement Techniques;Young Adult
Current chemical peels and other resurfacing techniques. The currently available methods for resurfacing will be addressed in this article, which has been divided into three areas of focus: chemical peels, lasers, and dermabrasion. Emphasis will be placed on chemical peels, a technique with a long history that provides a very reliable method of resurfacing and that every facial plastic surgeon should be familiar with. Anti-Bacterial Agents;Antiviral Agents;Keratolytic Agents

Anti-Bacterial Agents;Antiviral Agents;Chemexfoliation;Dermabrasion;Humans;Keratolytic Agents;Laser Therapy;Life Style;Low-Level Light Therapy;Patient Selection;Postoperative Care;Preoperative Care;Rejuvenation;Rhytidoplasty;Skin Aging;Smoking;Sunbathing

Evaluation of the osteogenic effect of low-level laser therapy (808Â nm and 660Â nm) on bone defects induced in the femurs of female rats submitted to ovariectomy. The present study aimed to evaluate the effects of LLLT (660- and 808-nm wavelengths) on the process of repairing bone defects induced in the femurs of female rats submitted to ovariectomy. Bilateral ovariectomies were performed on 18 female Wistar rats, which were divided into control and irradiated groups after the digital analysis of bone density showed decreased bone mass and after standardized drilling of the femurs. The irradiated groups received 133Â J/cm(2) of AsGaAl (660-nm) and InGaAlP (880-nm) laser radiation. The animals were euthanized on days 14 and 21 after the bone defects were established. Detailed descriptive histological evaluations were performed, followed by semi-quantitative histomorphometry. The results from days 14 and 21 showed that the irradiated groups presented increased density of osteoblasts, fibroblasts, and immature osteocytes on the tissue surface compared with the control (non-irradiated) groups (pâ€‰<â€‰0.05). Additionally, inflammatory infiltrate evaluations showed that LLLT decreased the accumulation of leukocytes when compared to the control treatment (pâ€‰<â€‰0.05). We concluded that, in our experimental model, both wavelengths (660-nm and 880-nm) inhibited the inflammatory process and induced the proliferation of cells responsible for bone remodeling and repair. Animals;Bone Density;Disease Models, Animal;Female;Femur;Fibroblasts;Low-Level Light Therapy;Osteogenesis;Osteoporosis;Rats;Statistics, Nonparametric

Effect of low-level laser therapy on the healing process after tooth replantation: a histomorphometrical and immunohistochemical analysis. Success of tooth replantation is limited because part of the replanted tooth is lost because of progressive root resorption. This study used histomorphometry and immunohistochemistry to evaluate the effect of low-level laser therapy (LLLT) on the healing process of rat teeth replanted after different extra-oral periods, simulating immediate and delayed replantation. Sixty Wistar rats (Rattus norvegicus albinus) had their maxillary right incisors extracted and randomly assigned to six groups (n = 10): C4, C30 and C45, in which the teeth were replanted 4 min (immediate), 30 min (delayed) and 45 min (delayed) after extraction, respectively, and L4, L30 and L45, in which the teeth were replanted after the same extra-alveolar times, but the root surfaces and the alveolar wounds were irradiated with a gallium-aluminum-arsenate (GaAlAs) diode laser before replantation. The animals were sacrificed after 60 days. The anatomic pieces containing the replanted teeth were obtained and processed for either histomorphometrical analysis under optical microscopy or immunohistochemical expression of receptor activator of nuclear factor Kappa-B (RANK), and its ligand (RANKL), osteoprotegerin (OPG) and tartrate-resistant acid phosphatase (TRAP) proteins. Areas of external replacement and inflammatory root resorption were observed in all groups, without statistically significant differences ($P > 0.05$). Ankylosis was more frequent in L30 than in C30 ($P < 0.05$). RANKL immunostaining predominated over RANK and OPG immunostaining in both groups with immediate tooth replantation ($P < 0.05$). For the 45-min extra-alveolar time, however, there was greater evidence of RANK immunostaining compared to RANKL for both control and laser-treated groups ($P < 0.05$). Positive TRAP immunostaining predominated in L4 and L30 ($P < 0.05$). In conclusion, under the tested conditions, the treatment of the root surface and the alveolar wound with LLLT did not improve the healing process after immediate and delayed tooth replantation in rats. Isoenzymes;Osteoprotegerin;RANK Ligand;Receptor Activator of Nuclear Factor-kappa B;Acid Phosphatase;Tartrate-Resistant Acid Phosphatase Acid Phosphatase;Animals;Immunohistochemistry;Incisor;Isoenzymes;Low-Level Light

Therapy;Male;Maxilla;Osteoprotegerin;Periodontium;RANK Ligand;Random Allocation;Rats;Rats, Wistar;Receptor Activator of Nuclear Factor-kappa B;Statistics, Nonparametric;Tartrate-Resistant Acid Phosphatase;Time Factors;Tooth Replantation;Tooth Root;Tooth Socket;Wound Healing

Infrared photostimulation of the crista ampullaris. The present results show that the semicircular canal crista ampullaris of the toadfish, Opsanus tau, is sensitive to infrared radiation (IR) applied in vivo. IR pulse trains (âˆ¼1862 nm, âˆ¼200 Î¼s pulseâ•»Â¹) delivered to the sensory epithelium by an optical fibre evoked profound changes in phasic and tonic discharge rates of postsynaptic afferent neurons. Phasic afferent responses to pulsed IR occurred with a latency of <8 ms while tonic responses developed with a time constant (Ï„) of 7 ms to 10 s following the onset or cessation of the radiation. Afferents responded to direct optical radiation of the sensory epithelium but did not respond to thermal stimuli that generated nearly equivalent temperature increases of the whole organ. A subset of afferent neurons fired an action potential in response to each IR pulse delivered to the sensory epithelium, at phase-locked rates up to 96 pulses per second. The latency between IR pulses and afferent nerve action potentials was much greater than synaptic delay and spike generation, demonstrating the presence of a signalling delay interposed between the IR pulse and the action potential. The same IR stimulus applied to afferent nerve axons failed to evoke responses of similar magnitude and failed to phase-lock afferent nerve action potentials. The present data support the hypothesis that pulsed IR activates sensory hair cells, thus leading to modulation of synaptic transmission and afferent nerve discharge reported here. Calcium Action Potentials;Animals;Batrachoidiformes;Calcium;Female;Hair Cells, Ampulla;Infrared Rays;Lasers;Low-Level Light Therapy;Male;Photic Stimulation;Semicircular Ducts

Study of short-pulse laser propagation in biological tissue by means of the boundary element method. Propagation of short pulses of light through biological tissues can be studied by numerically solving the diffusion equation. The boundary integral method was used to convert the differential equation to integral form and the result was solved using the boundary element method. The effects of different optical parameters of the tissue, i.e. scattering, absorption coefficients and anisotropic factor, on temporal evolution of the diffusely reflected pulse were studied. The results were compared with those obtained using the finite difference time domain method and the boundary integral method was found to be more precise and faster than the last method. The method can be used to investigate reflected pulses in the study of cell morphology and tumours in different types of tissue. Algorithms;Anisotropy;Finite Element Analysis;Fourier Analysis;Humans;Low-Level Light Therapy;Models, Biological;Monte Carlo Method;Nephelometry and Turbidimetry;Phototherapy;Statistics as Topic;Time

Clinical evaluation of Er,Cr:YSGG and GaAlAs laser therapy for treating dentine hypersensitivity: A randomized controlled clinical trial. OBJECTIVE: The advent of dental lasers has raised another possible treatment option for dentine hypersensitivity (DH) and has become a research interest in the last decades. The aim of this randomized, controlled, double-blind, split mouth, clinical study was to evaluate and compare the desensitizing effects of erbium, chromium-doped:yttrium, scandium, gallium and garnet (Er,Cr:YSGG) to galium-aluminium-arsenide (GaAlAs) laser on DH. METHODS: Fifty-one patients participated in this study for a total of 174 teeth. DH was assessed for all groups with a visual analog scale. For each patient, the teeth were randomized to three groups. In the diode laser group, sensitive teeth were irradiated with the GaAlAs laser at 8.5J/cm(2) energy density. In the Er,Cr:YSGG laser group, sensitive teeth were irradiated with Er,Cr:YSGG laser in the hard tissue mode using a none-contact probe at an energy level of 0.25W and repetition rate of 20Hz, 0% water and 10% air. In the control group no treatment was performed. Treatment time was 60s for GaAlAs laser and 30s for Er,Cr:YSGG laser. RESULTS: When compared with the control group and baseline data, in both laser groups, laser irradiation provided a desensitizing effect immediately after treatment and

this effect was maintained throughout the study (p<0.05). No significant differences between Er,Cr:YSGG and GaAlAs laser groups were found at any follow-up examination (p>0.05). CONCLUSION: Based on these findings, it may be concluded that both Er,Cr:YSGG and GaAlAs lasers were effective in the treatment of DH following a single application. Adolescent;Adult;Dentin;Dentin Sensitivity;Double-Blind Method;Female;Follow-Up Studies;Humans;Lasers, Semiconductor;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Radiotherapy Dosage;Time Factors;Treatment Outcome;Young Adult

Observation of pain control in patients with bisphosphonate-induced osteonecrosis using low level laser therapy: preliminary results. BACKGROUND: Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is an adverse side effect associated with bisphosphonate (BP) therapy, especially when parenteral BP administration is used. Patients affected by BRONJ present wide areas of exposed necrotic bone, particularly after surgical oral procedures. The main symptom is pain that is poorly controlled by common analgesic drugs. Recently, many studies have pointed to the beneficial effect of low-level laser therapy (LLLT) in pain reduction for many pathological conditions. The purpose of this study is to investigate whether LLLT could be helpful in managing BRONJ by reducing the problems associated with this condition and the use of analgesic drugs. METHODS: Twelve patients affected by BRONJ were monitored at the Complex Operative Unit of Oral Pathology. Among these patients, only seven referred to pain in necrotic areas and were recruited for LLLT. Laser applications were performed with a double diode laser simultaneously emitting at two different wavelengths (Î»â€‰=â€‰650â€‰nm and Î»â€‰=â€‰904-910â€‰nm, spot sizeâ€‰=â€‰8â€‰mm). All of the patients were irradiated with a fluence of 0.053â€‰J/cm(2) for 15â€‰min five times over a period of 2 weeks, in a non-contact mode, âˆ¼1â€‰mm from the pathologic area. The patient's maximum and minimum pain was recorded using a numeric rating scale (NRS) evaluation before and after the treatment. Statistical analysis was performed using the Kruskal-Wallis test. RESULTS: Six patients showed significant pain reduction, and only one patient indicated a worsening of the symptoms, which was probably related to a reinfection of the BRONJ site, which occurred during the study. A statistically significant difference (pâ€‰<â€‰0.05) was found between the NRS rates before and after the protocol. CONCLUSIONS: This pilot study suggests that LLLT may be a valid technique to support the treatment of BRONJ-related pain, even though the low number of cases in this study does not permit any conclusive consideration. Bone Density Conservation Agents;Diphosphonates Aged;Aged, 80 and over;Bone Density Conservation Agents;Diphosphonates;Facial Pain;Female;Humans;Jaw Diseases;Low-Level Light Therapy;Male;Middle Aged;Osteonecrosis;Treatment Outcome

Mitochondrial oxidative stress causes mitochondrial fragmentation via differential modulation of mitochondrial fission-fusion proteins. Mitochondria are dynamic organelles that undergo continual fusion and fission to maintain their morphology and functions, but the mechanism involved is still not clear. Here, we investigated the effect of mitochondrial oxidative stress triggered by high-fluence low-power laser irradiation (HF-LPLI) on mitochondrial dynamics in human lung adenocarcinoma cells (ASTC-a-1) and African green monkey SV40-transformed kidney fibroblast cells (COS-7). Upon HF-LPLI-triggered oxidative stress, mitochondria displayed a fragmented structure, which was abolished by exposure to dehydroascorbic acid, a reactive oxygen species scavenger, indicating that oxidative stress can induce mitochondrial fragmentation. Further study revealed that HF-LPLI caused mitochondrial fragmentation by inhibiting fusion and enhancing fission. Mitochondrial translocation of the profission protein dynamin-related protein 1 (Drp1) was observed following HF-LPLI, demonstrating apoptosis-related activation of Drp1. Notably, overexpression of Drp1 increased mitochondrial fragmentation and promoted HF-LPLI-induced apoptosis through promoting cytochrome c release and caspase-9 activation, whereas overexpression of mitofusin 2 (Mfn2), a

profusion protein, caused the opposite effects. Also, neither Drp1 overexpression nor Mfn2 overexpression affected mitochondrial reactive oxygen species generation, mitochondrial depolarization, or Bax activation. We conclude that mitochondrial oxidative stress mediated through Drp1 and Mfn2 causes an imbalance in mitochondrial fission-fusion, resulting in mitochondrial fragmentation, which contributes to mitochondrial and cell dysfunction. Membrane Proteins;Microtubule-Associated Proteins;Mitochondrial Proteins;Reactive Oxygen Species;Cytochromes c;Caspase 9;GTP Phosphohydrolases;MFN2 protein, human;DNM1L protein, human;Dynamins Animals;Apoptosis;COS Cells;Caspase 9;Cell Line, Tumor;Chlorocebus aethiops;Cytochromes c;Dynamins;GTP Phosphohydrolases;Humans;Lasers;Membrane Proteins;Microtubule-Associated Proteins;Mitochondria;Mitochondrial Proteins;Oxidative Stress;Reactive Oxygen Species

Molecular changes during skin aging and wound healing after fractional ablative photothermolysis. Photo-damaged skin is characterized by major alterations of the extracellular matrix and collagen network, leading to clinically obvious signs of skin aging. UV radiation increases the levels of matrix metalloproteinase (MMP) 1, which initiates the cleavage of fibrillar collagen types I and III. The developing collagen fragments are further degraded by MMPs 2 and 9. Various ablative, non-ablative, thermal and non-thermal rejuvenation modalities have been tested for their capacity to reverse epidermal and dermal signs of photo- and chronological-aging. Light and laser therapies are among the most effective treatment options for skin rejuvenation. Conventional laser therapy treats entire surface areas by selective photothermolysis or ablation. Recently, intervention with a fractional ablative laser leads to fast wound healing, and hence, a substantial amount of the target skin area is left untreated. It is not known if the efficacy of a particular ablative skin rejuvenation treatment depends on the extent of microwounding and/or the amount of heat produced. The underlying molecular changes are not fully understood but have been postulated to be induced by time-dependent changes in heat shock proteins, transforming growth factor Î², MMPs, hyaluronic acid synthethases, hyaluronidases and HA, among others. Cosmetics;HSP70 Heat-Shock Proteins;Transforming Growth Factor beta;Matrix Metalloproteinases Cosmetics;HSP70 Heat-Shock Proteins;Humans;Laser Therapy;Low-Level Light Therapy;Matrix Metalloproteinases;Rejuvenation;Skin Aging;Transforming Growth Factor beta;Wound Healing

The thermal effects of therapeutic lasers with 810 and 904 nm wavelengths on human skin. OBJECTIVE: To investigate the effect of therapeutic infrared class 3B laser irradiation on skin temperature in healthy participants of differing skin color, age, and gender. BACKGROUND: Little is known about the potential thermal effects of Low Level Laser Therapy (LLLT) irradiation on human skin. METHODS: Skin temperature was measured in 40 healthy volunteers with a thermographic camera at laser irradiated and control (non-irradiated) areas on the skin. Six irradiation doses (2-12â€‰J) were delivered from a 200â€‰mW, 810â€‰nm laser and a 60â€‰mW, 904â€‰nm laser, respectively. RESULTS: Thermal effects of therapeutic LLLT using doses recommended in the World Association for Laser Therapy (WALT) guidelines were insignificant; below 1.5Â°C in light, medium, and dark skin. When higher irradiation doses were used, the 60â€‰mW, 904â€‰nm laser produced significantly (pâ€‰<â€‰0.01) higher temperatures in dark skin (5.7, SDâ€‰Â±â€‰1.8Â°C at 12â€‰J) than in light skin, although no participants requested termination of LLLT. However, irradiation with a 200â€‰mW, 810â€‰nm laser induced three to six times more heat in dark skin than in the other skin color groups. Eight of 13 participants with dark skin asked for LLLT to be stopped because of uncomfortable heating. The maximal increase in skin temperature was 22.3Â°C. CONCLUSIONS: The thermal effects of LLLT at doses recommended by WALT-guidelines for musculoskeletal and inflammatory conditions are negligible (<1.5Â°C) in light, medium, and dark skin. However, higher LLLT doses delivered with a strong 3B laser (200â€‰mW) are capable of increasing

skin temperature significantly and these photothermal effects may exceed the thermal pain threshold for humans with dark skin color. Adult;Age Factors;Aged;Analysis of Variance;Dose-Response Relationship, Radiation;Female;Humans;Inflammation;Low-Level Light Therapy;Male;Middle Aged;Musculoskeletal Diseases;Radiation Dosage;Reference Values;Risk Assessment;Sampling Studies;Sex Factors;Skin;Skin Pigmentation;Skin Temperature

The use of 808-nm light therapy to treat experimental chronic osteomyelitis induced in rats by methicillin-resistant Staphylococcus aureus. BACKGROUND DATA: In vivo and in vitro studies have reported that laser energy in differing wavelengths and irradiation regimes has a potential bactericidal effect on Staphylococcus aureus. OBJECTIVE: The purpose of this study was to investigate whether a light wavelength of 808â€‰ nm in varying doses has an effect on chronic osteomyelitis induced experimentally in the rat tibia. METHODS: Intramedullary cavities were surgically created in the left tibias of 39 adult Wistar albino rats. Five randomly selected subjects were injected with a sterile saline solution, and methicillin-resistant S. aureus (MRSA) was used to induce osteomyelitis in the remaining rats. After 3 weeks, rats with evidence of osteomyelitis were treated with debridement alone (nâ€‰=â€‰7), with debridement plus laser irradiation to induce photoeradication (nâ€‰=â€‰21), or were not treated at all [negative control, (nâ€‰=â€‰6)]. Active irradiation was performed using an 808 â€‰nm, 100 â€‰mW continuous-wave diode laser with a beam spot size of 0.7854 â€‰cm(2) (irradianceâ€‰=â€‰127.3 â€‰mW/cm(2)). Laser treatment commenced immediately after debridement surgery and was applied daily for 5 consecutive days. Irradiation lasted 60â€‰ secs (6â€‰ J at 7.64 â€‰J/cm(2): nâ€‰=â€‰7), 120 â€‰secs (12 â€‰J at 15.29 â€‰J/cm(2): nâ€‰=â€‰7), or 180â€‰ secs (18 â€‰J at 22.93â€‰ J/cm(2): nâ€‰=â€‰7). Rats in the sham and negative control groups were killed 21 days post-induction surgery, and those in the treatment groups were killed after 42 days. Following killing, tibias were removed and analyzed histopathologically, radiographically, and microbiologically. RESULTS: Histopathological analysis showed that infection levels had decreased by 37%, 67%, 81%, and 93% in the groups treated by debridement or by debridement plus 7.64, 15.29, and 22.93â€‰ J/cm(2) light therapy, respectively, compared to the negative control group. Osteomyelitis-induced rats had the highest bacteria count (5â€‰Ã—â€‰10(5)). Bacterial counts fell to 1.6â€‰Ã—â€‰10(4), 4.3â€‰Ã—â€‰10(2), 5.5â€‰Ã—â€‰10(1), and 3.3â€‰Ã—â€‰10(0) in groups treated by debridement or by debridement plus 7.64, 15.29, and 22.93â€‰ J/cm(2) light therapy, respectively, compared to the negative control group. CONCLUSIONS: Within the limitations of this study, laser phototherapy with the appropriate irradiation parameters appears to be a promising adjunct and/or alternative technique to pharmacological agents in the treatment of osteomyelitis. The 808â€‰ nm 100 â€‰mW (127.3â€‰ mW/cm(2)) laser device used in this study achieved a maximum effect with an irradiation time of 180 â€‰secs, delivering 18 â€‰J at an energy density of 22.93â€‰ J/cm(2). Animals;Chronic Disease;Low-Level Light Therapy;Male;Methicillin-Resistant Staphylococcus aureus;Osteomyelitis;Rats;Rats, Wistar;Staphylococcal Infections;Tibia

Photobiomodulation and cancer and other musings. Immunologic Factors Humans;Immunologic Factors;Light;Neoplasms

660 AsGaAl laser to alleviate pain caused by cryosurgical treatment of oral leukoplakia: a preliminary study. OBJECTIVE: To investigate the ability of low-level laser therapy (LLLT) to alleviate pain caused by the cryosurgical treatment of oral leukoplakia (OL). METHODS: Ten patients with OL were submitted to cryosurgical treatment (Non-LLLT group) and eight were submitted to cryosurgical treatment associated with LLLT (LLLT group). Laser irradiation of patients within the LLLT group was performed using a 50â€‰mW 660â€‰nm continuous wave Gallium Aluminum Arsenide (GaAlAs) laser with a spot size at the tissue surface of 0.0286â€‰cm(2) (irradianceâ€‰=â€‰1.75â€‰W/cm(2)). Three points within an area of 1â€‰cm(2) around the

cryosurgical site were irradiated in contact mode for 28â€‰s per point (1.4â€‰J at 49â€‰J/cm(2) per point). Irradiation was carried out immediately following cryosurgical treatment and at 48 and 72â€‰h post-cryosurgical treatment. A numerical rating scale was used to assess the pain. The relationship between the treated groups and pain was assessed using the Mann-Whitney test. RESULTS: Treated OL sites appeared to be clinically normal and with no evidence of recurrence during the average 9-month follow-up period. It could be observed that the LLLT group reported less pain than did the non-LLLT group. CONCLUSION: LLLT is an important strategy used to reduce post-surgical pain caused by cryosurgical treatment of OL. Adult;Aged;Aged, 80 and over;Cryosurgery;Female;Humans;Lasers, Semiconductor;Leukoplakia, Oral;Low-Level Light Therapy;Male;Middle Aged;Pain, Postoperative

Influence of the combination of infrared and red laser light on the healing of cutaneous wounds infected by Staphylococcus aureus. AIM: We aimed to assess the use of two wavelengths on the healing of infected wounds. BACKGROUND: Infection is the most significant cause of impaired wound repair or healing. Several therapeutic approaches are used for improving wound healing including the use of different light sources, such as the laser. Some wavelengths yield positive photobiological effects on the healing process. MATERIAL AND METHODS: The backs of 24 young adult male Wistar rats under general anesthesia were shaved and cleaned, and a 1 by 1â€‰cm cutaneous wound was created with a scalpel and left untreated. The wounds were infected with Staphylococcus aureus, and the rats were randomly divided into two sets of four subgroups with three animals in each subgroup: control, red laser light, infrared laser light, and redâ€‰+â€‰infrared laser light. Laser phototherapy was carried out with a diode [Î»680â€‰nm/790â€‰nm, power (P)â€‰=â€‰30 mW/40â€‰mW, continuous wave laser, Ã˜â€‰=â€‰3â€‰mm, power density (P)â€‰=â€‰424 and 566â€‰mW/cm(2), timeâ€‰=â€‰11.8/8.8â€‰sec, Eâ€‰=â€‰0.35â€‰J] and started immediately after surgery and repeated every other day for 7 d. Laser light was applied on four points around the wounded area (5â€‰J/cm(2)). The animals were killed either 8 or 15 d after contamination. Specimens were taken, embedded in paraffin, and sectioned and stained for histological analysis. RESULTS: Histological analysis showed that control subjects had a lower amount of blood vessels when compared with irradiated subjects. Irradiated subjects had more advanced resolution of inflammation compared with controls. Irradiated subjects also showed a more intense expression of the collagen matrix. The collagen fibers were mostly mature and well organized in these subjects at the end of the experimental time especially when both wavelengths were used. CONCLUSION: The results of the present study indicate that laser phototherapy has a positive effect on the healing of infected wounds, particularly with the association of Î»680â€‰+â€‰Î»790â€‰nm. Animals;Biopsy, Needle;Combined Modality Therapy;Disease Models, Animal;Immunohistochemistry;Infrared Rays;Lasers, Semiconductor;Low-Level Light Therapy;Male;Photomicrography;Radiation Dosage;Random Allocation;Rats;Rats, Wistar;Skin;Staphylococcal Infections;Surgical Wound Infection;Treatment Outcome;Wound Healing

Effects of 810-nm laser on murine bone-marrow-derived dendritic cells. OBJECTIVE: The purpose of this study was to investigate the effect of 810-nm low level laser therapy (LLLT) on dendritic cells (DC) in vitro. BACKGROUND DATA: LLLT can enhance wound healing and increase cell proliferation and survival, and is used to treat inflammatory conditions. However there are reports that LLLT can stimulate leukocytes and could therefore be pro-inflammatory. Recently, DC have been found to play an important role in inflammation and immune response. METHODS: Murine bone-marrow-derived DC were isolated, stimulated with lipopolysaccharide (LPS) or CpG oligodeoxynucleotide and treated with 810-nm laser, using fluences of 0.3, 3, and 30 â€‰J/cm(2) delivered at irradiances of 1, 10, and 100â€‰ mW/cm(2) respectively. Confocal microscopy, flow cytometry for DC markers, viability using propidium iodide, enzyme-linked immunosorbent assays (ELISA) for secreted interleukin-12 (IL-12),

and bioluminescence measurements in cells transduced with a reporter for toll-like receptor (TLR)-9/nuclear factor kappa B (NF-ÎºB) activation, were performed. RESULTS: LLLT changed the morphology of LPS-stimulated DC, increased their viability, and altered the balance of DC activation markers (major histocompatibility complex [MHC] class 2 up and CD86 down). LLLT reduced IL-12 secretion from DC stimulated by either LPS or CpG. LLLT reduced NF-ÎºB activation in reporter cells stimulated with CpG. There was no obvious light dose response observed. CONCLUSIONS: Taken together, these data suggest that 810-nm LLLT has an anti-inflammatory effect on activated DC, possibly mediated by cyclic adenosine monophosphate (cAMP) and reduced NF-ÎºB signaling. Antigens, Surface;B7-2 Antigen;CD11c Antigen;Lipopolysaccharides;NF-kappa B;Interleukin-12 Animals;Antigens, Surface;B7-2 Antigen;Bone Marrow Cells;CD11c Antigen;Cell Death;Dendritic Cells;Genes, MHC Class II;In Vitro Techniques;Interleukin-12;Lipopolysaccharides;Low-Level Light Therapy;Male;Mice;Mice, Inbred C57BL;Microscopy, Confocal;NF-kappa B

A comparative pilot study of low intensity laser versus topical corticosteroids in the treatment of erosive-atrophic oral lichen planus. BACKGROUND AND OBJECTIVE: Treatment of oral lichen planus (OLP) remains a great challenge for clinicians. The aim of our study was to compare the effect of low intensity laser therapy (LILT) with topical corticosteroids in the treatment of oral erosive and atrophic lichen planus. MATERIALS AND METHODS: Thirty patients with erosive-atrophic OLP were randomly allocated into two groups. The experimental group consisted of patients treated with the 630â€‰ nm diode laser. The control group consisted of patients who used Dexamethason mouth wash. Response rate was defined based on changes in the appearance score and pain score (Visual Analogue Scale) of the lesions before and after each treatment. RESULTS: Appearance score, pain score, and lesion severity was reduced in both groups. No significant differences were found between the treatment groups regarding the response rate and relapse. CONCLUSION: Our study demonstrated that LILT was as effective as topical corticosteroid therapy without any adverse effects and it may be considered as an alternative treatment for erosive-atrophic OLP in the future. Glucocorticoids;Mouthwashes;Dexamethasone
Adult;Atrophy;Dexamethasone;Glucocorticoids;Humans;Lasers, Semiconductor;Lichen Planus, Oral;Low-Level Light Therapy;Mouthwashes;Pain Measurement

A randomized clinical trial on the effect of low-level laser therapy on chronic diabetic foot wound healing: a preliminary report. BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) has been shown to promote chronic wound healing in conditions of reduced microcirculation. In this preliminary study, we report the results of using LLLT to heal foot ulcers in patients with diabetes mellitus. MATERIALS AND METHODS: Twenty-three patients with a diabetic foot wound for at least 3 months were included in this double-blind randomized clinical trial. Patients were randomized to receive placebo treatment (n = 10) or LLLT (n = 13) (685 nm, energy density 10 J/cm(2)) in addition to conventional therapy. Patients were followed for 20 weeks. Ulcer size reduction and the number of patients with complete healing were compared between the LLLT and placebo groups. RESULTS: There were no significant differences in baseline characteristics of patients and foot ulcers receiving LLLT and placebo treatment. At week 4, the size of ulcers decreased significantly in the LLLT group (p = 0.04). After 20 weeks, in the LLLT group, eight patients had complete healing and in the placebo group only three patients experienced complete wound healing. The mean time of complete healing in LLLT patients (11 weeks) was less than that in placebo patients (14 weeks) though the difference was not statistically significant. CONCLUSIONS: The study provides evidence that LLLT can accelerate the healing process of chronic diabetic foot ulcers, and it can be presumed that LLLT may shorten the time period needed to achieve complete healing. Aged;Chronic Disease;Diabetic Foot;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Middle Aged;Wound Healing

Dentin surface modification using the Er,Cr:YSGG laser and a meshwork mask: light and SEM microscopic observations. OBJECTIVE: We have developed a novel technique of utilizing a stainless steel meshwork mask during treatment of dentin with the Er,Cr:YSGG laser. It is the purpose of this study to observe the surface modifications produced by this method. BACKGROUND DATA: Many techniques have been developed to facilitate bonding of various materials to dentin. However, an optimal bond has not yet been achieved. METHODS: Four teeth ground to dentin were randomly assigned to two groups. Group 1: Er,Cr:YSGG laser treatment; and Group 2: laser treatment while a 100 Î¼m aperture stainless steel mesh was situated over the dentinal surface. RESULTS: Group 1 samples appeared rugged but relatively flat. Group 2 samples presented a surface with uniformly aligned craters âˆ¼100â€‰ Î¼m wide, 150 â€‰Î¼m deep. CONCLUSIONS: Masking the dentinal surface with a stainless steel mesh during laser irradiation produces a surface texture that appears to facilitate mechanical retention. Dental Bonding;Dentin;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Microscopy, Electron, Scanning

Effectiveness of Er,Cr:YSGG laser on dentine hypersensitivity: a controlled clinical trial. AIM: Attempts have been made to treat dentine hypersensitivity (DH) with lasers. However, there is limited knowledge on the effects of erbium, chromium-doped:yttrium, scandium, gallium and garnet (Er,Cr:YSGG) laser on DH. The aim of this study was to evaluate the efficacy of Er,Cr:YSGG laser on reduction in DH. METHODS: Forty-two patients (146 teeth) were included. Teeth were assigned to an experimental group and irradiated with the Er,Cr:YSGG laser. In the control group same clinical instrument was used without laser emission. DH was assessed for both groups utilizing the visual analog scale. Plaque index (PI) scores were recorded immediately following treatment, at 1 week, 1 and 3 months. RESULTS: The results showed that Er,Cr:YSGG laser irradiation had a significantly higher desensitizing effect compared with the placebo immediately after treatment ($p<0.05$). Intra-group comparisons revealed no statistically significant differences within the placebo group ($p>0.05$). For the test group, the differences between baseline and all time points following treatment were statistically significant ($p<0.05$). No significant differences were observed in PI between the test and control groups at any follow-up examination ($p>0.05$). CONCLUSION: Within the limits of this study, it appears that Er,Cr:YSGG laser is effective in the treatment of DH compared with the placebo treatment. Placebos Adult;Bicuspid;Cuspid;Dental Plaque Index;Dentin Sensitivity;Female;Follow-Up Studies;Humans;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Male;Pain Measurement;Placebos;Treatment Outcome

The 308-nm excimer laser: a promising device for the treatment of childhood vitiligo. BACKGROUND: Numerous modalities have been used to treat vitiligo in children. Up to now, phototherapy and topical corticosteroids are the most commonly used treatments for adult vitiligo but studies evaluating the efficacy of these treatments in the pediatric population remain insufficient. OBJECTIVE: This study was a retrospective review to evaluate the efficacy and safety of 308-nm excimer laser treatment in 30 childhood vitiligo patients. METHODS: Thirty vitiligo patients with 40 vitiligo patches were evaluated after the cessation of 308-nm excimer laser treatment. RESULTS: Seventeen patients (56.7%) with 20 patches (50%) achieved an acceptable degree (>50%) of repigmentation at the end of the treatment, with five patches (12.5%) showing >75% of repigmentation. The treatment response showed anatomical preferences, favoring the face, neck and trunk. However, the treatment response did not correlate to the cumulative dose or duration of treatment. Side effects occurred in nine patients, but were transient and minimal. CONCLUSION: The results of this study shows that the 308-nm excimer laser can be an effective and promising device for the treatment of various vitiligo types, other than generalized, in childhood. Adolescent;Burns;Child;Child, Preschool;Female;Folliculitis;Humans;Lasers, Excimer;Low-Level Light Therapy;Male;Retrospective Studies;Treatment Outcome;Vitiligo

Efficacy and safety of hemoporfin in photodynamic therapy for port-wine stain: a multicenter and open-labeled phase IIa study. BACKGROUND/PURPOSE: This phase IIa study aimed to study the efficacy and safety of hemoporfin in photodynamic therapy (PDT) with a 532 nm continuous laser for port-wine stain (PWS). METHODS: In this 8-week open-labeled study in three centers, three different laser exposure times (532 nm continuous laser for 20, 30 and 40 min) were used in stage I, group A, stage II, group B and stage III, group C, respectively. Primary efficacy assessment was performed by an independent group of experts, who reviewed the standardized photos. Secondary efficacy assessment consisted of the subjective grading of the PWS fading by the investigators and the patients. Treatment reactions and adverse events (AE) were recorded separately. RESULTS: Forty patients were initially enrolled in the study, but stage III had to be cancelled eventually for the safety of the patients. Patients in groups A and B showed similar satisfactory results in efficacy assessments, the total 'response' rate being 80.0% and 94.7% in groups A and B, respectively. The AE rates were also similar in the two groups. Self-limiting photosensitive dermatitis and hyperpigmentation were the most frequently observed AE. CONCLUSION: Hemoporfin-PDT is effective and safe for patients with PWS aged 16-50. Hematoporphyrins;Photosensitizing Agents;hematoporphyrin monomethyl ether Adolescent;Adult;Hematoporphyrin Photoradiation;Hematoporphyrins;Humans;Low-Level Light Therapy;Middle Aged;Photosensitizing Agents;Port-Wine Stain;Treatment Outcome;Young Adult

Low level laser can be a novel adjuvant method for orthodontic tooth movement on postmenopausal women. Osteoporosis, a pathological state commonly saw on postmenopausal women, has shown to affect jaw bone and the periodontium. While more and more adult patients seeking orthodontic treatment for a beautiful smile, the current strategy has not work well for extraction space closure in postmenopausal women with osteoporosis and concurrent bisphosphates taken. A new and non-invasive method is hoped to make a beginning. There are ample evidences showing low level laser has favorable effects on pain relief and wound healing procedure of hard and soft tissue. These effects are due to its ability to stimulate cell metabolism, angiogenesis, bone formation and osteoclastogenesis. The hypothesis we proposed herein is that low level laser may be a valuable adjuvant method for protecting and facilitating orthodontic tooth movement on this kind of patients. Bone Remodeling;Female;Humans;Low-Level Light Therapy;Osteoporosis;Periodontium;Postmenopause;Radiotherapy, Adjuvant;Tooth Movement Techniques;Wound Healing

Management of tennis elbow. CLINICAL QUESTION: What is the best treatment for tennis elbow? RESULTS: Despite a wealth of research, there is no true consensus on the most efficacious management of tennis elbow especially for effective long-term outcomes. Corticosteroid injections do show large pain-relieving effects in the short term but are associated with risks of adverse events and long-term reoccurrence. Advice with a "wait and see" approach is recommended as the first-line treatment in primary care for most cases. In the medium term physiotherapy and or low-level laser therapy may be effective. IMPLEMENTATION: Rule out alternative diagnosis. Onward referral may be indicated if the condition does not resolve after 12 months.

New combined laser therapy for small mass of melanocytic nevi on the face. BACKGROUND AND AIMS: A small mass of melanocytic nevi on the face is commonly treated by surgical resection. This method is associated with cosmetic complications, such as scarring and scar contracture. The use of CO2 Laser treatment to avoid these complications is increasing. However, scarring or recurrence may still occur after CO2 Laser treatment. To resolve these problems, we developed a new Combined Laser Therapy (CLT) protocol using three laser instruments. SUBJECTS AND METHODS: We used CO2 Laser, Nd:YAG Laser and Q-Switched Ruby Laser. The first treatment was a minimal mass reduction using CO2 Laser. The surface is covered with carbonized tissue. The second treatment with Nd:YAG

Laser which removes the carbonized tissue, because the laser specifically absorbs black chromatophores. Finally, any surviving nevus cells containing melanin are destroyed with Q-Switched Ruby Laser. RESULTS: This method was used for 12 cases presenting with small masses of melanocytic nevi on the face. The maximum size of the mass was 20 mm. All cases resulted in a cosmetic improvement and there was no scarring or recurrence. Either satisfactory or greatly improved cosmetic results were obtained in all cases. CONCLUSIONS: We think that the wound healing without scarring observed in all of our cases is related to the administration of both CLT and auto-simultaneous Low reactive Level Laser Therapy (LLLT) in these cases. Therefore, this method may provide the better treatment than surgical resection in the future.

Reduction of interleukin-6 expression in human synoviocytes and rheumatoid arthritis rat joints by linear polarized near infrared light (Superlizer) irradiation. BACKGROUND: Rheumatoid arthritis (RA) is a systemic autoimmune disorder that involves inflammation and pain of joints. Low-level laser irradiation is being evaluated for treating RA, however, the effectiveness of linear polarized near infrared light (SuperLizer; SL) irradiation is unclear. AIM: It has been reported that interleukin 6 (IL-6) plays a key role in the progression of RA. In our previous study, using DNA microarray analysis, we examined the gene expression profiling of human rheumatoid fibroblast-like synoviocyte MH7A in response to IL-1ÃŸ administration and SL irradiation. As a result, IL-6 was listed in altered gene as increased by IL-1ÃŸ and decreased by SL irradiation. MATERIAL AND METHODS: The reduction of IL-6 gene expression in MH7A by SL irradiation was confirmed by reverse transcription polymerase chain reaction (RT-PCR) and real-time PCR. Effect of SL irradiation on the RA inflammation in the collagen induced arthritis (CIA) rats was also studied by measuring temperature. IL-6 production in knee joint of rats was analyzed by immunohisto-chemistry. RESULTS: Scatter plot analysis demonstrated that an increase in IL-6 gene expression by IL-1ÃŸ was reduced by SL irradiation. The reduction of IL-6 mRNA level by SL irradiation was successfully confirmed by RT-PCR and real-time PCR. SL irradiation treated CIA rat decreased the temperature of knee joints. The immunohistochemical analysis demonstrated a strong IL-6 staining in synovial membrane tissue of CIA rat joint, and SL irradiation significantly reduced the staining. DISCUSSION: Since IL-6 has been identified to be an important proinflarnmatory cytokine in the pathogenesis of RA, the reduction of IL-6 expression is one of mechanisms in reduction of inflammation in RA joints by SL irradiation suggesting that SL irradiation may be useful for RA therapy. CONCLUSION: SL irradiation reduced IL-6 gene expression in MH7A, and reduced inflammation and IL-6 protein expression in knee joint of CIA rats.

Low level laser therapy on experimental myopathy. PURPOSE: The aim of the present work was to study the effect of Helium-Neon (HeNe) and Gallium Arsenide (GaAs) laser upon nitric oxide (NO) plasma levels, an inflammatory biomarker associated with oxidative stress, in rats with experimental myopathy. These were evaluated through histological assessment. MATERIALS AND METHODS: The groups studied were: (A) control (intact rats that received LLLT sham exposures), (B) rats with myopathy and sacrificed at 24 h later, (C) rats with myopathy and sacrificed 8 days later, (D) rats with myopathy and treated with HeNe laser, (E) rats with myopathy and treated with GaAs laser, (F) intact rats treated with HeNe laser and (G) intact rats treated with GaAs laser. Myopathy was induced by injecting 50Î¼l of 1% carrageenan Î» (type IV) in the left gastrocnemius muscle. Low Level Laser Therapy (LLLT) was applied with 9.5 J.cm(-2) daily for 10 consecutive days with each laser. The determination of the NO was made by spectrophotometry. The muscles were stained with Hematoxylin-Eosin and examined by optic microscopy. Quantitative variables were statistically analyzed by the Fisher test, and categorical by applying Pearson's Chi Squared test at $p < 0.05$ for all cases. RESULTS: In groups B and C, NO was significantly increased compared to groups A, D, E, F and G ($p<0.05$). In group C, the percentage of area with inflammatory infiltration was significantly increased

compared to the other groups (p<0.001). CONCLUSIONS: LLLT decreased plasma levels of NO in rats with experimental myopathies and significant muscle recovery.

Laser assisted tooth replantation case report. BACKGROUND AND AIM: Although intentional replantation for extraoral treatment is a solution for complicated endodontic cases, it is accompanied with risk of root resorption which is most likely due to extraction trauma and infected remnants. Laser therapies have long been proved for bactericidal and biostimulation effects. In the present case, a pulpitis combined severe periodontal destruction molar was extracted with an Er:YAG laser for thorough degranulation and disinfection. Before the extraction and right after the treatment, low level laser therapy (LLLT) with 810nm diode was applied for biostimulation. RESULT: Patient reported no post operative pain after laser treatment. Clinical follow-up showed uneventful healing, and excellent bone regeneration. CONCLUSION: The Er:YAG laser coupled with low level laser therapy (810 nm diode) has shown to assist and improve intentional replantation in disinfection procedure, and it may preserve more vital cells and enhance bioregeneration for less operative pain and better healing.

LLLT and PDT.

Is light-emitting diode phototherapy (LED-LLLT) really effective? BACKGROUND: Low level light therapy (LLLT) has attracted attention in many clinical fields with a new generation of light-emitting diodes (LEDs) which can irradiate large targets. To pain control, the first main application of LLLT, have been added LED-LLLT in the accelerated healing of wounds, both traumatic and iatrogenic, inflammatory acne and the patient-driven application of skin rejuvenation. Rationale and Applications: The rationale behind LED-LLLT is underpinned by the reported efficacy of LED-LLLT at a cellular and subcellular level, particularly for the 633 nm and 830 nm wavelengths, and evidence for this is presented. Improved blood flow and neovascularization are associated with 830 nm. A large variety of cytokines, chemokines and macromolecules can be induced by LED phototherapy. Among the clinical applications, non-healing wounds can be healed through restoring the collagenesis/collagenase imbalance in such examples, and 'normal' wounds heal faster and better. Pain, including postoperative pain, postoperative edema and many types of inflammation can be significantly reduced. Experimental and clinical evidence: Some personal examples of evidence are offered by the first author, including controlled animal models demonstrating the systemic effect of 830 nm LED-LLLT on wound healing and on induced inflammation. Human patients are presented to illustrate the efficacy of LED phototherapy on treatment-resistant inflammatory disorders. CONCLUSIONS: Provided an LED phototherapy system has the correct wavelength for the target cells, delivers an appropriate power density and an adequate energy density, then it will be at least partly, if not significantly, effective. The use of LED-LLLT as an adjunct to conventional surgical or nonsurgical indications is an even more exciting prospect. LED-LLLT is here to stay.

Effect of 630-NM pulsed laser irradiation on the proliferation of HeLa cells in Photofrin(Â®)-mediated photodynamic therapy. BACKGROUND AND AIMS: Red laser light of wavelength 630 nm is usually used for Photofrin(Â®)-mediated photodynamic therapy (PDT). The 630-nm light employed in PDT corresponds to the region of the wavelength used in low-level laser therapy (LLLT) may influence on the photodynamic effect required for killing cancer cells. The aim of this in vitro study was to investigate the changes in cell viability and degree of cell proliferation after Photofrin(Â®)-mediated PDT using 630-nm pulsed laser irradiation (10 Hz repetition rate and 7-9 ns pulse width), which was clinically found to induce no remarkable cell injury. MATERIALS AND METHODS: A study has been conducted in which HeLa cells are incubated with Photofrin(Â®) for 15 min (10 Âµg/ml). Irradiation was carried out at an average fluence rate of 50 mW/cm(2) with light doses of 1, 3, and 5 J/cm(2). The cytotoxic effects on the cells are evaluated by the XTT (2,3-bis[2-methoxy-4-nitro-5-sulfophenyl]-5-[(phenylamino)carbonyl]-2H-tetrazolium hydroxide) assay. RESULTS: The results showed that the

laser irradiated cells exhibited a greater clonogenic activity than normal and PDT treated cells for a short period after the laser irradiation. CONCLUSION: If the level of 630-nm pulsed laser irradiation employed in a PDT is comparatively lowered, it would have a biostimulatory effect like that of in LLLT.

Low level laser therapy (LLLT) for patients with sacroiliac joint pain. BACKGROUND AND AIMS: Sacroiliac joint pain not associated with a major etiological factor is a common problem seen in the orthopedic clinical setting, but diagnosis is difficult because of the anatomical area and thus it is sometimes difficult to effect a complete cure. Low level laser therapy (LLLT) has been well-reported as having efficacy in difficult pain types, so the following preliminary study was designed to assess the efficacy of LLLT for sacroiliac pain. MATERIALS AND METHODS: Nine patients participated, 4 males and 5 females, average age of 50.4 yrs, who attended the outpatient department with sacroiliac pain. The usual major disorders were ruled out. Pain was assessed subjectively pre-and post-LLLT on a visual analog scale, and trunk range of motion was examined with the flexion test to obtain the pre- and post-treatment finger to floor distance (FFD). The LLLT system used was an 830 nm CW diode laser, 1000 mW, 30 sec/point (20 J/cm(2)) applied on the bilateral tender points twice/week for 5 weeks. Baseline and final assessment values (after the final treatment session) were compared with the Wilcoxon signed rank test (nonparametric score). RESULTS: All patients completed the study. Eight of the 9 patients showed significant pain improvement and 6 demonstrated significantly increased trunk mobility ($P < 0.05$ for both). CONCLUSIONS: LLLT was effective for sacroiliac pain, and this may be due to improvement of the blood circulation of the strong ligaments which support the sacroiliac joint, activation of the descending inhibitory pathway, and the additional removal of irregularities of the sacroiliac joint articular surfaces. Further larger-scale studies are warranted.

Reduction of CXCR4 expression in Rheumatoid Arthritis Rat Joints by low level diode laser irradiation. BACKGROUND: Rheumatoid arthritis (RA) is an inflammatory joint disorder, whose progression leads to the destruction of cartilage and bone. Chemokines and their receptors are potential therapeutic targets in RA. Among these, it has been suggested that CXC chemokine 4 (CXCR4) and its ligand CXC ligand 12 (CXCL12) are involved in RA pathogenesis. Low-level laser irradiation (LLLI) is currently being evaluated for the treatment of RA; however, the molecular mechanisms underlying its effectiveness remain unclear. AIM: To understand the anti-inflammatory effect of LLLI, we used the collagen-induced arthritis (CIA) rat as RA model and analyzed the gene expression profile in synovial membrane in the hindpaw joints of control, CIA and CIA + LLLI. Expression of CXCR4 and CXCL12 genes were also studied. MATERIALS AND METHODS: Total RNA was isolated from the synovial membrane tissue of CIA rat joints or CIA joints treated with LLLI (830 nm Ga-Al-As diode), and gene expression profiles were analyzed by DNA microarray (41,000 rat genes). The mRNA levels were confirmed by reverse transcription polymerase chain reaction (RT-PCR) and real-time PCR. Immunohistochemical examination to examine CXCR4 protein expression was also carried out. RESULTS: DNA microarray analysis showed that CXCR4 gene expression was increased in CIA tissue and LLLI treatment significantly decreased CIA-induced CXCR4 mRNA levels. In contrast, CXCL12 did not show any significant changes. The microarray data of CXCR4 mRNA levels were further validated using RT-PCR and real-time PCR. Increased CXCR4 mRNA levels by CIA and its reduction following LLLI was successfully confirmed. CXCR4 production was increased in CIA joints and its production was decreased by LLLI. CONCLUSION: Decreased CXCR4 expression may be one of the mechanisms in LLLI-mediated reduction of RA inflammation.

Enhancement of microtubule-associated protein-1 Alpha gene expression in osteoblasts by low level laser irradiation. BACKGROUND: Low level laser irradiation (LLLI) stimulates bone regeneration. However, the molecular mechanisms leading to this is not yet understood. The stepwise subtractive cDNA cloning technology has been developed, coupled with DNA homology searched in DNA database is useful to identify the certain gene. AIM: In order to understand the mechanism, we

attempted to identify genes whose expressions are enhanced by LLLI. MC3T3-E1 osteoblastic cells were irradiated with an 830 nm Ga-Al-As diode laser, and a cDNA library was constructed using subtractive gene cloning. MATERIAL AND METHODS: The cDNA library of osteoblasts which was treated by LLLI was constructed. Nucleotide sequences were analyzed and homology searched in a DNA database using BLASTN program to identify the gene with altered expression. Altered mRNA levels by LLLI were confirmed by reverse transcription polymerase chain reaction (RT-PCR) and real-time PCR. RESULTS: The DNA sequence of a subtracted gene clone MCL129 indicated high homology (99%) with the microtubule-associated protein 1A (MAP1A) gene. Increase in MAP-1A mRNA level by LLLI was successfully confirmed by RT-PCR and real-time PCR. DISCUSSION: MAP1A has been shown to promote microtubule assembly and its functional expression. Microtubules play an important role in cell division, cell shape and polarity, cell movement, intracellular transport, signal transduction, and synthesis and secretion of collagen. Thus, enhancement of MAP1A gene expression by LLLI may be one of the molecular mechanisms involved in accelerating bone formation by LLLI. CONCLUSION: LLLI irradiation enhances MAP1A gene expression and modulates microtubule assembly and the functional structure of microtubules, in turn, stimulates osteoblastic proliferation and differentiation.

New classification for single-system light treatment. BACKGROUND AND AIMS: Although the use of the laser in medical applications has increased dramatically during the last three decades, it is significant that during the last few years non-laser light sources have gained prominence in photomedicine and photosurgery, particularly the use of light-emitting diodes (LEDs) and intense pulsed light (IPL). The author therefore believed it was important to devise a new classification of light/tissue interactions, and that the well-accepted acronym LLLT and HLLT should now stand for low level light therapy and for high level light treatment, since the 'L' in 'laser', LED and IPL stands for 'light'. RATIONALE: The author herein presents a classification, which is based on the level of reaction induced by the light incident on tissue, rather than being based on the system used to deliver the light energy. When the level of tissue reactivity to light of very low incident power and energy densities is well below the cells' damage threshold, so that instead of being damaged the cells are directly activated by the low incident photon density, the changes in the irradiated tissue are photoactivative and reversible: the author hereafter refers to this group of reactions as low level light therapy (LLLT). When the level of tissue reactivity to light of very high incident power and energy densities is over the cells' damage threshold, so that the cells are directly destroyed, the changes in the irradiated tissue are photodestructive and irreversible: the author hereafter refers to this group of reactions as high level light treatment (HLLT). For levels of tissue reaction intermediate to HLLT and LLLT, the author suggests the new term, medium level light treatment (MLLT), as described in detail herein. CONCLUSIONS: When the new classification system of light treatment (LT) is understood and used, the author feels this offers an accurate and simple method of classifying light/tissue reactions by the therapeutic reaction itself, rather than by the light source, laser, LED, IPL system or other, used to produce the reaction.

Can lung volumes and capacities be used as an outcome measure for phrenic nerve recovery after cardiac surgeries? Phrenic nerve is the main nerve drive to the diaphragm and its injury is a well-known complication following cardiac surgeries. It results in diaphragmatic dysfunction with reduction in lung volumes and capacities. This study aimed to evaluate the objectivity of lung volumes and capacities as an outcome measure for the prognosis of phrenic nerve recovery after cardiac surgeries. In this prospective experimental study, patients were recruited from Cardio-Thoracic Surgery Department, Educational-Hospital of College of Medicine, Cairo University. They were 11 patients with right phrenic nerve injury and 14 patients with left injury. On the basis of receiving low-level laser irradiation, they were divided into irradiated group and non-irradiated group. Measures of phrenic nerve latency, lung volumes and capacities were taken pre and post-operative and at 3-

months follow up. After 3Â months of low-level laser therapy, the irradiated group showed marked improvement in the phrenic nerve recovery. On the other hand, vital capacity and forced expiratory volume in the first second were the only lung capacity and volume that showed improvement consequent with the recovery of right phrenic nerve (P value <0.001 for both). Furthermore, forced vital capacity was the single lung capacity that showed significant statistical improvement in patients with recovered left phrenic nerve injury (P value <0.001). Study concluded that lung volumes and capacities cannot be used as an objective outcome measure for recovery of phrenic nerve injury after cardiac surgeries.

Histological and physical analysis of bone neoformation by osteogenesis distraction: A preliminary report. INTRODUCTION: Osteogenesis distraction (OD) is a mainstream technique in maxillofacial surgical reconstruction with varied applications. OD technique employs a distractor with the aim to get new bone in the site of interest. Osseous maturation time is necessary before the device can be removed and few patients' complaint of related discomfort, especially when these devices are external, and induces superficial infections, paresthesia, hypertrophic scars and social relationship difficulties. The use of Low Level Laser Therapy (LLLT) has been proved beneficial to soft tissue and osseous repairs. MATERIALS AND METHOD: 12 rabbits were randomly divided in to two groups. In all animals, distractor was placed and one group was exposed to LLLT while the other group served as control. After consolidation, animals were sacrificed, the new bone formed were subjected to investigations including histomorphometric, physical analysis and tomographical analysis. Statistical analyses were performed using SPSS software. RESULT: Newly formed bone was significantly different between the groups. The physical properties of the neobone were comparatively better when the animals were exposed to LLLT with varying statistical significance. CONCLUSION: The results obtained with smaller sample size in this study need to be interpreted with care. The results of this preliminary pilot study encourage the use of LLLT during healing period. However the histological, tomographical and physical findings need to be ascertained using a larger sample size to study the bio-stimulatory effects with laser therapy from basics to clinical relevance on wound and bone healing.

Biphasic dose response in low level light therapy - an update. Low-level laser (light) therapy (LLLT) has been known since 1967 but still remains controversial due to incomplete understanding of the basic mechanisms and the selection of inappropriate dosimetric parameters that led to negative studies. The biphasic dose-response or Arndt-Schulz curve in LLLT has been shown both in vitro studies and in animal experiments. This review will provide an update to our previous (Huang et al. 2009) coverage of this topic. In vitro mediators of LLLT such as adenosine triphosphate (ATP) and mitochondrial membrane potential show biphasic patterns, while others such as mitochondrial reactive oxygen species show a triphasic dose-response with two distinct peaks. The Janus nature of reactive oxygen species (ROS) that may act as a beneficial signaling molecule at low concentrations and a harmful cytotoxic agent at high concentrations, may partly explain the observed responses in vivo. Transcranial LLLT for traumatic brain injury (TBI) in mice shows a distinct biphasic pattern with peaks in beneficial neurological effects observed when the number of treatments is varied, and when the energy density of an individual treatment is varied. Further understanding of the extent to which biphasic dose responses apply in LLLT will be necessary to optimize clinical treatments.

[Effectiveness of chronic periodontal disease treatment by infrared laser light]. Thirty-six patients with light and moderate chronic periodontal disease (CPD) were included in the study. The patients were divided in two groups according to treatment options: first group (18 patients) received conventional periodontal treatment, second (18 patients) - in addition to conventional treatment were treated by phototherapy (infrared laser light). Control group included 10 persons with no signs of periodontal disease. Treatment effectiveness was assessed by local cytokine profile (IL-1Î², IL-1ra, IL-6, IL-10, TNF-Î±, OPG and RANKL). Increased level of inflammatory cytokines TNF-Î±, IL-1Î², IL-6

confirmed pronounced inflammation in periodontal tissues in CPD patients. OPG level was lower than in control group while RANKL level increased significantly. After treatment in both CĐ D groups TNF-Î± and IL-6 decrease was observed, IL-1Î² (had not changed. In the second group RANKL level also decreased dramatically - 6.7-fold compared to its values before treatment. Cytokines Adult;Chronic Disease;Cytokines;Female;Humans;Infrared Rays;Low-Level Light Therapy;Male;Middle Aged;Periodontal Diseases;Treatment Outcome

Laser-induced modification of the patellar ligament tissue: comparative study of structural and optical changes. The effects of non-ablative infrared (IR) laser treatment of collagenous tissue have been commonly interpreted in terms of collagen denaturation spread over the laser-heated tissue area. In this work, the existing model is refined to account for the recently reported laser-treated tissue heterogeneity and complex collagen degradation pattern using comprehensive optical imaging and calorimetry toolkits. Patella ligament (PL) provided a simple model of type I collagen tissue containing its full structural content from triple-helix molecules to gross architecture. PL ex vivo was subjected to IR laser treatments (laser spot, 1.6Â mm) of equal dose, where the tissue temperature reached the collagen denaturation temperature of 60â€‰Â±â€‰2Â°C at the laser spot epicenterin the first regime, and was limited to 67â€‰Â±â€‰2Â°C in the second regime. The collagen network was analyzed versus distance from the epicenter. Experimental characterization of the collagenous tissue at all structural levels included cross-polarization optical coherence tomography, nonlinear optical microscopy, light microscopy/histology, and differential scanning calorimetry. Regressive rearrangement of the PL collagen network was found to spread well outside the laser spot epicenter (>2Â mm) and was accompanied by multilevel hierarchical reorganization of collagen. Four zones of distinct optical and morphological properties were identified, all elliptical in shape, and elongated in the direction perpendicular to the PL long axis. Although the collagen transformation into a random-coil molecular structure was occasionally observed, it was mechanical integrity of the supramolecular structures that was primarily compromised. We found that the structural rearrangement of the collagen network related primarily to the heat-induced thermo-mechanical effects rather than molecular unfolding. The current body of evidence supports the notion that the supramolecular collagen structure suffered degradation of various degrees, which gave rise to the observed zonal character of the laser-treated lesion. Collagen Animals;Calorimetry, Differential Scanning;Collagen;Female;Low-Level Light Therapy;Male;Optical Phenomena;Patellar Ligament;Protein Denaturation;Rabbits;Tomography, Optical Coherence

Resonance frequency analysis of orthodontic miniscrews subjected to light-emitting diode photobiomodulation therapy. The aim of this prospective experimental study was to evaluate the effect of light-emitting diode (LED) photobiomodulation therapy (LPT) on the stability of immediately loaded miniscrews under different force levels, as assessed by resonance frequency analysis (RFA). Sixty titanium orthodontic miniscrews with a length of 8 mm and a diameter of 1.4 mm were implanted into cortical bone by closed flap technique in each proximal tibia of 15 New Zealand white adult male rabbits (n = 30). The animals were randomly divided into irradiated and control groups under different force levels (0, 150, and 300 cN). OsseoPulseÂ® LED device (Biolux Research Ltd.) 618 nm wavelength and 20 mW/cm(2) output power irradiation (20 minutes/day) was applied to the miniscrews for 10 days. The RFA records were performed at miniscrew insertion session (T1) and 21 days after surgery (T2). Wilcoxon and Mann-Whitney U-tests were used for statistical evaluation at $P < 0.005$ level. It was found that initial primer stability of all miniscrews was similar in all groups at the start of the experimental procedure. Statistically significant differences were found for changes in implant stability quotient (ISQ) values between LED-photobiomodulated group and the control (0 cN, $P = 0.001$; 150 cN, $P < 0.001$; and 300 cN, $P < 0.001$). Significant increase was found in ISQ values of LPT applied miniscrews under 0 cN (+11.63 ISQ), 150 cN (+10.50 ISQ), and 300 cN (+7.00 ISQ) force

during observation period. By the increase of force levels, it was determined that ISQ values decreased in non-irradiated control miniscrews. Within the limits of this in vivo study, the present RFA findings suggest that LPT might have a favourable effect on healing and attachment of titanium orthodontic miniscrews. Dental Materials;Titanium Animals;Bone Screws;Dental Materials;Male;Orthodontic Anchorage Procedures;Osseointegration;Phototherapy;Rabbits;Radiation Dosage;Random Allocation;Stress, Mechanical;Tibia;Time Factors;Titanium;Torque;Vibration

Low-level laser therapy (LLLT) acts as cAMP-elevating agent in acute respiratory distress syndrome. The aim of this work was to investigate if the low-level laser therapy (LLLT) on acute lung inflammation (ALI) induced by lipopolysaccharide (LPS) is linked to tumor necrosis factor (TNF) in alveolar macrophages (AM) from bronchoalveolar lavage fluid (BALF) of mice. LLLT has been reported to actuate positively for relieving the late and early symptoms of airway and lung inflammation. It is not known if the increased TNF mRNA expression and dysfunction of cAMP generation observed in ALI can be influenced by LLLT. For in vivo studies, Balb/c mice (nâ€‰=â€‰5 for group) received LPS inhalation or TNF intra nasal instillation and 3Â h after LPS or TNF-Î±, leukocytes in BALF were analyzed. LLLT administered perpendicularly to a point in the middle of the dissected bronchi with a wavelength of 660Â nm and a dose of 4.5Â J/cm(2). The mice were irradiated 15Â min after ALI induction. In vitro AM from mice were cultured for analyses of TNF mRNA expression and protein and adenosine3':5'-cyclic monophosphate (cAMP) levels. One hour after LPS, the TNF and cAMP levels in AM were measured by ELISA. RT-PCR was used to measure TNF mRNA in AM. The LLLT was inefficient in potentiating the rolipram effect in presence of a TNF synthesis inhibitor. LLLT attenuated the neutrophil influx and TNF in BALF. In AM, the laser increased the cAMP and reduced the TNF-Î± mRNA. LLLT increases indirectly the cAMP in AM by a TNF-dependent mechanism. DNA Primers;Lipopolysaccharides;Phosphodiesterase 4 Inhibitors;RNA, Messenger;Tumor Necrosis Factor-alpha;Cyclic AMP;Rolipram Animals;Base Sequence;Cyclic AMP;DNA Primers;Disease Models, Animal;Lipopolysaccharides;Low-Level Light Therapy;Macrophages, Alveolar;Male;Mice;Mice, Inbred BALB C;Phosphodiesterase 4 Inhibitors;RNA, Messenger;Respiratory Distress Syndrome;Rolipram;Tumor Necrosis Factor-alpha

Effect of photobiomodulation on vinblastine-poisoned murine HERS cells. OBJECTIVE: The aim of this study was to investigate the effect of near-infrared (NIR) photobiomodulation on the proliferation and glutathione levels in murine Hertwig's epithelial root sheath (HERS) cells after poisoning with vinblastine. BACKGROUND: Photobiomodulation has been shown to improve wound healing in a number of animal models. There have been no studies on the effect of photobiomodulation on cancer-related chemotherapy injury to the cells that initiate tooth root growth. MATERIALS AND METHODS: Control groups consisted of murine HERS cells without vinblastine (VB-) and cells with vinblastine at 10, 20, and 30â€‰ng/mL (VB10, VB20, and VB30). Experimental groups consisted of these same groups with light therapy (VB-L, VB10L, VB20L, and VB30L). The cells were exposed to vinblastine for 1â€‰h. Photobiomodulation consisted of a 75-cm(2) gallium-aluminum-arsenide light-emitting diode (LED) array at an energy density of 12.8â€‰J/cm(2), delivered with 50â€‰mW/cm(2) power over 256â€‰s. RESULTS: Vinblastine alone significantly decreased HERS cell proliferation and glutathione levels at all concentrations (VB10 [-55%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-8)]; VB20 [-72%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-9)]; VB30 [-80%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-10)]; and VB10 [-36%, pâ€‰<â€‰0.0001]; VB20 [-49%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-6)]; VB30 [-53%, pâ€‰<â€‰1.0â€‰Ã—â€‰10(-7)] respectively). Photobiomodulation significantly increased cell proliferation at all levels of vinblastine exposure (VB10L [+50%, pâ€‰<â€‰0.0001]; VB20L [+45%, pâ€‰<â€‰0.05]; VB30 [+39%, pâ€‰<â€‰0.05]) but not of the control (+22%, pâ€‰=â€‰0.063). The photobiomodulation significantly increased glutathione production in all concentrations of vinblastine except 20â€‰ng/mL (VB10L [+39%,

pâ€‰=â€‰0.007]; VB20L [+19%, pâ€‰=â€‰0.087]; VB30 [+14%, pâ€‰=â€‰0.025]) and the control (+12%, pâ€‰=â€‰0.13). CONCLUSIONS: Photobiomodulation demonstrated an improvement in proliferation and glutathione levels in vinblastine-poisoned murine HERS cells.
Vinblastine;Glutathione Animals;Cell Proliferation;Epithelial Cells;Glutathione;Mice;Phototherapy;Tooth Root;Vinblastine;Wound Healing

Improved cognitive function after transcranial, light-emitting diode treatments in chronic, traumatic brain injury: two case reports. OBJECTIVE: Two chronic, traumatic brain injury (TBI) cases, where cognition improved following treatment with red and near-infrared light-emitting diodes (LEDs), applied transcranially to forehead and scalp areas, are presented. BACKGROUND: Significant benefits have been reported following application of transcranial, low-level laser therapy (LLLT) to humans with acute stroke and mice with acute TBI. These are the first case reports documenting improved cognitive function in chronic, TBI patients treated with transcranial LED. METHODS: Treatments were applied bilaterally and to midline sagittal areas using LED cluster heads [2.1â€³ diameter, 61 diodes (9â€‰Ã—â€‰633â€‰nm, 52â€‰Ã—â€‰870â€‰nm); 12-15â€‰mW per diode; total power: 500â€‰mW; 22.2â€‰mW/cm(2); 13.3â€‰J/cm(2) at scalp (estimated 0.4â€‰J/cm(2) to cortex)]. RESULTS: Seven years after closed-head TBI from a motor vehicle accident, Patient 1 began transcranial LED treatments. Pre-LED, her ability for sustained attention (computer work) lasted 20 min. After eight weekly LED treatments, her sustained attention time increased to 3 h. The patient performs nightly home treatments (5 years); if she stops treating for more than 2 weeks, she regresses. Patient 2 had a history of closed-head trauma (sports/military, and recent fall), and magnetic resonance imaging showed frontoparietal atrophy. Pre-LED, she was on medical disability for 5 months. After 4 months of nightly LED treatments at home, medical disability discontinued; she returned to working full-time as an executive consultant with an international technology consulting firm. Neuropsychological testing after 9 months of transcranial LED indicated significant improvement (+1, +2SD) in executive function (inhibition, inhibition accuracy) and memory, as well as reduction in post-traumatic stress disorder. If she stops treating for more than 1 week, she regresses. At the time of this report, both patients are continuing treatment. CONCLUSIONS: Transcranial LED may improve cognition, reduce costs in TBI treatment, and be applied at home. Controlled studies are warranted.
Brain Injuries;Brain Injury, Chronic;Cognition Disorders;Female;Humans;Low-Level Light Therapy;Middle Aged

Low-level laser therapy promotes vascular endothelial growth factor receptor-1 expression in endothelial and nonendothelial cells of mice gastrocnemius exposed to snake venom. Crotalinae snake venoms cause severe local myonecrosis and microvasculature failure at the bite site. We evaluated whether low-level laser therapy (LLLT) could accelerate angiogenesis and myoregeneration in male Swiss mice injected with Bothrops moojeni venom through immunohistochemistry of the vascular endothelial growth factor receptor-1 (VEGFR-1). Envenomed gastrocnemius was either unirradiated (V) or irradiated with HeNe (VHN, 632.8 nm) or GaAs (VGA, 904 nm, 10000 Hz). Animals sacrificed at 3 and 12 h were irradiated once (4 J cm(-2)), at 24 h (twice) and at 3, 7, 21 days (4, 8, 22 times, respectively). At 3 days, LLLT increased angiogenesis (80%:HeNe vs 40%:GaAs), decreased neutrophils and increased proliferation of regenerating cells. However, after 21 days, myoregeneration observed in the VHN group appeared delayed compared with the V group. As LLLT improved revascularization, the suggestive delay in myoregeneration could be a dose-response inhibitory effect caused by multiple irradiations in myogenesis. The immunodetection of VEGFR-1 in neutrophils, macrophages, satellite cells, fibroblasts, Schwann cells and skeletal and smooth muscle fibers (not seen in saline-controls) at only the acute stages of envenoming suggests a mediator role for VEGFR-1 in local alterations. This is the first time that VEGFR-1 expression, and its modulation by photostimulation, has been demonstrated in endothelial and nonendothelial cells of snake

envenomed skeletal muscle. Crotalid Venoms;Vascular Endothelial Growth Factor Receptor-1 Animals;Bothrops;Cell Proliferation;Crotalid Venoms;Endothelial Cells;Gene Expression Regulation;Immunohistochemistry;Low-Level Light Therapy;Male;Mice;Muscle, Skeletal;Vascular Endothelial Growth Factor Receptor-1

Comparative effects of low-intensity pulsed ultrasound and low-level laser therapy on injured skeletal muscle. OBJECTIVE: The main purpose of this study was to compare the effects of low-intensity pulsed ultrasound (US) and low-level laser therapy (LLLT) on injured skeletal muscle after cryolesion by means of histopathological analysis and immunohistochemistry for cyclo-oxygenase-2 (COX-2). BACKGROUND AND METHODS: Thirty-five male Wistar rats were randomly distributed into four groups: intact control group with uninjured and untreated animals; injured control group with muscle injury and no treatment; LLLT-treated group with muscle injury treated with 830-nm laser; and US-treated group with muscle injury treated with US. Treatments started 24â€‰h postsurgery and were performed during six sessions. RESULTS: LLLT-treated animals presented minor degenerative changes of muscle tissue. Exposure to US reduced tissue injuries induced by cryolesion, but less effectively than LLLT. A large number of COX-2 positive cells were found in untreated injured rats, whereas COX-2 immunoexpression was lower in both LLLT- and US-treated groups. CONCLUSION: This study revealed that both LLLT and US therapies have positive effects on muscle metabolism after an injury in rats, but LLLT seems to produce a better response. Cyclooxygenase 2 Animals;Cyclooxygenase 2;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Ultrasonic Therapy

Microtensile bond strength of resin cement to a feldspathic ceramic. OBJECTIVE: The purpose of this study was to evaluate the microtensile bond strength of resin cement to a feldspathic ceramic after treating the surface with (a) hydrofluoric (HF) acid, (b) air abrasion, (c) Er:YAG laser irradiation, (d) Nd:YAG laser irradiation, and (e) HF acid etching after either air abrasion or laser irradiation. BACKGROUND DATA: It is unknown whether the laser application or its combination with another treatment method can be used as a tool to roughen the surface of a feldspathic ceramic in order to increase the bond strength between the resin cement and ceramic surface. MATERIALS AND METHODS: Forty feldspathic ceramic blocks (Ceramco(TM)) were prepared and divided into eight equal groups (nâ€‰=â€‰5) according to the following surface treatments: no treatment; etching with 9.5% HF acid; air abrasion with 50â€‰Î¼m Al(2)O(3); Er:YAG laser irradiation; Nd:YAG laser irradiation; air abrasion plus acid etching; Er:YAG laser plus acid etching; and Nd:YAG laser plus acid etching. After surface treatment, a silane-coupling agent and resin cement (Panavia F(TM)) were applied to each block. After storing for 24â€‰h at 37Â°C and thermocycling between 5Â°C and 55Â°C for 1000 cycles, the microtensile bond strength of each specimen was measured. RESULTS: The highest bond strength was obtained from HF acid etching. HF acid etching after each laser irradiation significantly increased the bond strength (pâ€‰<â€‰0.05). However, HF acid etching after air abrasion decreased bond strength when compared to air abrasion alone. CONCLUSIONS: HF acid etching is the most effective surface treatment method for a feldspathic ceramic. However, laser irradiation with either the Er:YAG or Nd:YAG laser is not an adequate method for improving the bond strength of Panavia F. The laser application should be combined with HF acid etching. Dental Materials;Panavia-Fluoro;Resin Cements;Dental Porcelain;Ceramco;Hydrofluoric Acid Acid Etching, Dental;Air Abrasion, Dental;Analysis of Variance;Dental Bonding;Dental Materials;Dental Porcelain;Dental Stress Analysis;Humans;Hydrofluoric Acid;In Vitro Techniques;Low-Level Light Therapy;Materials Testing;Resin Cements;Tensile Strength

Bisphosphonate-related osteonecrosis of the jaws: a case series of 25 patients affected by osteoporosis. Bisphosphonates (BPs) are used to treat metabolic bone diseases, such as osteoporosis. In this study the occurrence of bisphosphonates-related osteonecrosis of the jaws

(BRONJ) is reported in 25 patients who received BP therapy for osteoporosis with different drug schedules. From June 2005 to May 2009, 25 patients affected by BRONJ were observed. A history of oral surgery was reported for 18 patients (72%). Of the 22 patients treated by the authors, 20 (91%) recorded healing improvement with a mean follow-up of 16.6 months, with particular regard for those treated with oral surgery and laser applications (10/22, 45%) who were all characterised by complete mucosal healing over time. The risk of developing BRONJ in patients treated with BP for osteoporosis is lower than in cancer patients, but is not negligible. It is advisable for the prescribing physician to recommend a dental check-up prior to treatment, at least for patients who have not been to the dentist in the last 12 months. An early surgical and possible laser-assisted approach for patients who develop BRONJ is recommended. Anti-Bacterial Agents;Bone Density Conservation Agents;Dental Implants;Diphosphonates;Drug Combinations;Glucocorticoids Aged;Aged, 80 and over;Anti-Bacterial Agents;Arthritis, Rheumatoid;Bone Density Conservation Agents;Combined Modality Therapy;Curettage;Debridement;Dental Care;Dental Implants;Dentures;Diabetes Mellitus, Type 2;Diphosphonates;Drug Combinations;Female;Follow-Up Studies;Glucocorticoids;Humans;Jaw Diseases;Laser Therapy;Low-Level Light Therapy;Middle Aged;Osteonecrosis;Osteoporosis, Postmenopausal;Patient Care Planning;Risk Factors;Tooth Extraction;Wound Healing

Oral mucositis prevention by low-level laser therapy in head-and-neck cancer patients undergoing concurrent chemoradiotherapy: a phase III randomized study. PURPOSE: Oral mucositis is a major complication of concurrent chemoradiotherapy (CRT) in head-and-neck cancer patients. Low-level laser (LLL) therapy is a promising preventive therapy. We aimed to evaluate the efficacy of LLL therapy to decrease severe oral mucositis and its effect on RT interruptions. METHODS AND MATERIALS: In the present randomized, double-blind, Phase III study, patients received either gallium-aluminum-arsenide LLL therapy 2.5 J/cm(2) or placebo laser, before each radiation fraction. Eligible patients had to have been diagnosed with squamous cell carcinoma or undifferentiated carcinoma of the oral cavity, pharynx, larynx, or metastases to the neck with an unknown primary site. They were treated with adjuvant or definitive CRT, consisting of conventional RT 60-70 Gy (range, 1.8-2.0 Gy/d, 5 times/wk) and concurrent cisplatin. The primary endpoints were the oral mucositis severity in Weeks 2, 4, and 6 and the number of RT interruptions because of mucositis. The secondary endpoints included patient-reported pain scores. To detect a decrease in the incidence of Grade 3 or 4 oral mucositis from 80% to 50%, we planned to enroll 74 patients. RESULTS: A total of 75 patients were included, and 37 patients received preventive LLL therapy. The mean delivered radiation dose was greater in the patients treated with LLL (69.4 vs. 67.9 Gy, p = .03). During CRT, the number of patients diagnosed with Grade 3 or 4 oral mucositis treated with LLL vs. placebo was 4 vs. 5 (Week 2, p = 1.0), 4 vs. 12 (Week 4, p = .08), and 8 vs. 9 (Week 6, p = 1.0), respectively. More of the patients treated with placebo had RT interruptions because of mucositis (6 vs. 0, p = .02). No difference was detected between the treatment arms in the incidence of severe pain. CONCLUSIONS: LLL therapy was not effective in reducing severe oral mucositis, although a marginal benefit could not be excluded. It reduced RT interruptions in these head-and-neck cancer patients, which might translate into improved CRT efficacy. Cisplatin Adenocarcinoma, Clear Cell;Adult;Aged;Body Weight;Brazil;Carcinoma;Carcinoma, Squamous Cell;Chemoradiotherapy;Cisplatin;Deglutition Disorders;Double-Blind Method;Female;Head and Neck Neoplasms;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Prospective Studies;Radiotherapy Dosage;Stomatitis;Treatment Failure;Young Adult

Increased mobility and stem-cell proliferation rate in Dugesia tigrina induced by 880nm light emitting diode. The therapeutic effects elicited by photobiostimulation in the near infrared range may be associated with increased proliferation rate of particular cell-types. The present study utilized commercial light emitting diodes to investigate the effects of low-level near-infrared radiation on the

proliferation rate of stem cells in amputated planarian. Whole and amputated animals were exposed to either ambient diurnal lighting, darkness, white light, red light, or near-infrared (880 nm) light. Irradiation was consistent for the duration of the experiments and was provided using commercial 5mm light emitting diodes (âˆ¼1.0 mW/m(2) in power density and âˆ¼0.01 J/cm(2) in radiant exposure). Compared to other groups amputated planarian exposed to near-infrared displayed increased mobility by the 3rd day of exposure (F((4,26))=4.31, p<0.04, Î·(2)=41%). Higher densities of stem cells were measured in these worms 84 h post injury (F((4,72))=4.78, p<0.01, Î·(2)=21%). These findings suggest that non-coherent light sources with power-densities about 1000 times lower than contemporary low-power laser settings remain effective in generating photobiostimulation effects and warrants further investigation on stem-cell proliferation induced by near-infrared light emitting diodes. Animals;Cell Movement;Cell Proliferation;Low-Level Light Therapy;Planarians;Stem Cells;Time Factors

Enhancing effect of pretreatment with topical niacin in the treatment of rosacea-associated erythema by 585-nm pulsed dye laser in Koreans: a randomized, prospective, split-face trial.
BACKGROUND: Rosacea is a chronic dermatosis that is usually confined to the face. A pulsed dye laser (PDL) system has been proven to be effective in treating rosacea-associated erythema and telangiectasias. Niacin is a cutaneous vasodilator that can increase the chromophore through increased blood flow. OBJECTIVES: We hypothesized that increased blood flow by pretreatment with topical niacin could enhance the effect of PDL in the treatment of rosacea. METHODS: Eighteen Korean patients with rosacea were recruited. Three sessions of 585-nm PDL using a subpurpuragenic dose with and without pretreatment with niacin cream were performed on randomly assigned half-faces at 3-week intervals. Erythema was assessed objectively by a polarization colour imaging system, and evaluations were also made by three blinded dermatologists. Patient satisfaction was evaluated using a 10-point visual analogue scale. RESULTS: Fifteen patients completed this study. All patients showed an improvement in erythema after three sessions of PDL treatment both with and without niacin pretreatment (P = 0Â·023 and P = 0Â·009, respectively). There was no significant difference in the improvement of objective erythema between the two sides. However, based on physician assessment the overall clinical improvement on the niacin side was significantly higher (P = 0Â·005), and patient satisfaction was also higher on the niacin-pretreated side (P = 0Â·007). There were no remarkable side-effects, with the exception of transient erythema and oedema. CONCLUSIONS: Pretreatment with topical niacin safely enhanced the effect of 585-nm PDL treatment of rosacea-associated erythema in Koreans. Application of niacin can be helpful in overcoming the relatively lower effect of subpurpuragenic PDL in dark-skinned Asians. Vasodilator Agents;Niacin Adult;Asian People;Erythema;Female;Humans;Korea;Low-Level Light Therapy;Male;Middle Aged;Niacin;Patient Satisfaction;Photochemotherapy;Prospective Studies;Rosacea;Vasodilator Agents

Prevention of crown and root caries in adults. Anti-Infective Agents, Local;Antimicrobial Cationic Peptides;Cariostatic Agents;Caseins;Dietary Sucrose;Pit and Fissure Sealants;Sugar Alcohols;Sweetening Agents;casein phosphopeptide-amorphous calcium phosphate nanocomplex;Triclosan;Fluorides;Chlorhexidine Adult;Anti-Infective Agents, Local;Antimicrobial Cationic Peptides;Biofilms;Cariostatic Agents;Caseins;Chlorhexidine;Dental Caries;Dental Caries Activity Tests;Dietary Sucrose;Fluorescence;Fluorides;Humans;Low-Level Light Therapy;Pit and Fissure Sealants;Probiotics;Radiography, Bitewing;Risk Assessment;Root Caries;Streptococcus mutans;Sugar Alcohols;Sweetening Agents;Tooth Remineralization;Toothbrushing;Triclosan

Low-level laser in the treatment of carpal tunnel syndrome: clinical, electrophysiological, and ultrasonographical evaluation. The objective of this study is to investigate the efficacy of low-level laser therapy (LLLT) in patients with carpal tunnel syndrome (CTS). Sixty patients with CTS were included in this placebo-controlled and double-blind study and randomly assigned to three treatment

groups: active laser with a dosage of 1.2Â J/per painful point, active laser with a dosage of 0.6Â J/per painful point, and placebo groups. A total of 5 points across the median nerve trace were irradiated with Gal-Al-As diode laser. All groups were treated 5 times per week for 3Â weeks. Clinical assessments included pain intensity, grip strength, symptom severity score (SSS), functional status score (FSS), nerve conduction studies, and cross-sectional area (CSA) of the median nerve as measured by ultrasonography. Compared to baseline, post-treatment VAS scores (group 1, PÂ <Â 0.001; group 2, PÂ <Â 0.001; group 3, PÂ <Â 0.01), grip strength (PÂ <Â 0.05), SSS scores (group 1, PÂ <Â 0.001; group 2, PÂ <Â 0.001; group 3, PÂ <Â 0.01), and FSS scores (PÂ <Â 0.05) improved significantly in all groups. Only sensorial nerve velocity measurements on the palmar region showed a significant improvement in both active laser groups (PÂ <Â 0.01). There was no significant difference in any of the outcome measures among the groups. With the chosen laser type and dose regimen, the results suggested that LLLT was no more effective than placebo in CTS.
Adult;Aged;Carpal Tunnel Syndrome;Dose-Response Relationship, Radiation;Double-Blind Method;Female;Humans;Low-Level Light Therapy;Male;Median Nerve;Middle Aged;Prospective Studies;Treatment Outcome;Ultrasonography

The efficacy of low-energy selective laser trabeculoplasty. BACKGROUND AND OBJECTIVE: to analyze the efficacy of low-energy selective laser trabeculoplasty (SLT) in patients. PATIENTS AND METHODS: in 74 patients (74 eyes) with ocular hypertension, suspected glaucoma, or primary open-angle glaucoma, SLT was the first-choice treatment. Thirty-nine patients in the low-energy group received treatment using half of conventional laser energy over 360Â° of the trabecular meshwork (at 100 points). Thirty-five patients in the control group received conventional laser energy. Patients were observed for 1 year. Complications and intraocular pressure (IOP) were observed. RESULTS: postoperative transient IOP spike (â‰¥ 3 mm Hg) occurred in three eyes on the day of treatment and partial peripheral anterior synechiae occurred in one eye 1 month after treatment only in the control group. Effective rates of treatment (â‰¥ 20% IOP reduction) at week 2 and month 1, 3, 6, and 12 after treatment were 69.23%, 64.10%, 61.54%, 53.85%, and 48.72% in the low-energy group and 71.43%, 71.43%, 60%, 51.43%, and 48.57% in the control group, respectively. There was no statistically significant difference between the two groups at various time points (P = .836, .501, .892, .835, .990). CONCLUSION: compared with SLT using conventional laser energy, low-energy SLT lowers IOP with fewer complications, making it a safe and effective option.
Adult;Aged;Female;Glaucoma, Open-Angle;Humans;Intraocular Pressure;Intraoperative Complications;Low-Level Light Therapy;Male;Middle Aged;Ocular Hypertension;Postoperative Complications;Prospective Studies;Tonometry, Ocular;Trabeculectomy;Treatment Outcome

The effect of diode laser irradiation on dentin as a preventive measure against dental erosion: an in vitro study. Increasing rates of non-carious cervical lesions due to dental erosion, exposure of dentinal tubules, and hypersensitivity to environmental stimuli have led to the development of new prevention strategies. This study evaluated the effects of a low-intensity diode laser (Î» = 808 nm) on the dentinal chemical composition and prevention of demineralization. In addition, the study monitored temperature changes during the course of irradiation. Forty dentin specimens were randomly allocated into four groups (n = 10): G1 - No treatment (control), G2 - irradiated with 15 J/cm(2), G3 - irradiated with 30 J/cm(2), and G4 - irradiated with 60 J/cm(2). Each specimen was partially covered with nail varnish, treated according to the group irradiation levels, and exposed to an erosive challenge (1.0 M hydrochloric acid) for 5 min. Afterwards, dentin loss was profilometrically analyzed and examined by scanning electron microscopy (SEM) combined with energy dispersive X-ray (EDX). Intrapulpal temperatures were measured during the dentin irradiation. One-way ANOVA and Tukey tests ($p < 0.05$) were performed to assess differences. For all irradiated groups, intrapulpal temperature changes were less than 3Â°C. The G2 group showed statistically significant differences

when compared to the other groups, representing the lowest temperature increase. A quantitative element analysis via EDX did not significantly differ ($p < 0.05$) for Ca, P, F, O, or C between the four groups when measured after irradiation/erosion. The mean wear rates (Â± SD, Î¼m) were 35.66 Â± 7.28; 40.70 Â± 5.03; 38.17 Â± 10.81 and 25.25 Â± 6.87 for G1-G4, respectively. The G4 group statistically differed from all other groups representing the lowest wear rate. These results suggest that dentin irradiation, using a diode laser with levels set at 60 J/cm(2), may induce inhibitory effects on root dentin demineralization without causing any harmful thermal effects. However, the exact mechanism of the action of the laser remains unclear. Phosphorus;Calcium Calcium;Dentin;Humans;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Phosphorus;Spectrometry, X-Ray Emission;Temperature;Tooth Demineralization;Tooth Erosion

Update dermatologic laser therapy. New trends in dermatological laser therapy during the last years are based on new wavelengths, concepts and treatment combinations resulting in a variety of new dermatologic indications. Fractional laser therapy of chronic actinic damage of the skin has been introduced and already represents a standard technique. The concept of fractional non-ablative and ablative laser treatment has been shown to be safe and effective. Also pigmented and vascular skin changes can be treated by this method. New, very promising concepts for laser epilation include linear scanned as well as low fluence laser systems. The first enable very short treatment times for large areas; the latter are the basis for the growing market of laser epilation devices for home use. Nevertheless, the potential of low fluence laser devices for long-term hair reduction has not been tested so far. Furthermore, no data exist on side effects resulting from repetitive application of laser light to melanocytic lesions. Laser lipolysis has been introduced as the latest, minimally invasive way of removing small localised fat deposits. The new procedure may have a great potential for liposculpture; its further development should be thoughtfully observed. The latest innovations for precise ablation are ultra-short pulsed laser systems. Femtosecond lasers avoid thermal damage at the border areas of ablation zones. Humans;Laser Therapy;Low-Level Light Therapy;Skin Diseases

Comparison between cold water immersion therapy (CWIT) and light emitting diode therapy (LEDT) in short-term skeletal muscle recovery after high-intensity exercise in athletes--preliminary results.
In the last years, phototherapy has becoming a promising tool to improve skeletal muscle recovery after exercise, however, it was not compared with other modalities commonly used with this aim. In the present study we compared the short-term effects of cold water immersion therapy (CWIT) and light emitting diode therapy (LEDT) with placebo LEDT on biochemical markers related to skeletal muscle recovery after high-intensity exercise. A randomized double-blind placebo-controlled crossover trial was performed with six male young futsal athletes. They were treated with CWIT (5Â°C of temperature [SD Â±1Â°]), active LEDT (69 LEDs with wavelengths 660/850Â nm, 10/30Â mW of output power, 30 s of irradiation time per point, and 41.7Â J of total energy irradiated per point, total of ten points irradiated) or an identical placebo LEDT 5Â min after each of three Wingate cycle tests. Pre-exercise, post-exercise, and post-treatment measurements were taken of blood lactate levels, creatine kinase (CK) activity, and C-reactive protein (CRP) levels. There were no significant differences in the work performed during the three Wingate tests (pâ€‰>â€‰0.05). All biochemical parameters increased from baseline values (pâ€‰<â€‰0.05) after the three exercise tests, but only active LEDT decreased blood lactate levels (pâ€‰=â€‰0.0065) and CK activity (pâ€‰=â€‰0.0044) significantly after treatment. There were no significant differences in CRP values after treatments. We concluded that treating the leg muscles with LEDT 5Â min after the Wingate cycle test seemed to inhibit the expected post-exercise increase in blood lactate levels and CK activity. This suggests that LEDT has better potential than 5Â min of CWIT for improving short-term post-exercise recovery. Lactic

Acid;C-Reactive Protein;Creatine Kinase Adaptation, Physiological;Adolescent;Adult;Analysis of Variance;C-Reactive Protein;Creatine Kinase;Cross-Over Studies;Cryotherapy;Double-Blind Method;Exercise;Humans;Immersion;Lactic Acid;Low-Level Light Therapy;Male;Muscle Fatigue;Muscle, Skeletal;Sports;Statistics as Topic;Time Factors;Young Adult
Effects of low level laser therapy (808Â nm) on physical strength training in humans. Recent studies have investigated whether low level laser therapy (LLLT) can optimize human muscle performance in physical exercise. This study tested the effect of LLLT on muscle performance in physical strength training in humans compared with strength training only. The study involved 36 men (20.8Â±2.2Â years old), clinically healthy, with a beginner and/or moderate physical activity training pattern. The subjects were randomly distributed into three groups: TLG (training with LLLT), TG (training only) and CG (control). The training for TG and TLG subjects involved the leg-press exercise with a load equal to 80% of one repetition maximum (1RM) in the leg-press test over 12 consecutive weeks. The LLLT was applied to the quadriceps muscle of both lower limbs of the TLG subjects immediately after the end of each training session. Using an infrared laser device (808Â nm) with six diodes of 60Â mW each a total energy of 50.4Â J of LLLT was administered over 140Â s. Muscle strength was assessed using the 1RM leg-press test and the isokinetic dynamometer test. The muscle volume of the thigh of the dominant limb was assessed by thigh perimetry. The TLG subjects showed an increase of 55% in the 1RM leg-press test, which was significantly higher than the increases in the TG subjects (26%, Pâ€‰=â€‰0.033) and in the CG subjects (0.27%, Pâ€‰<â€‰0.001). The TLG was the only group to show an increase in muscle performance in the isokinetic dynamometry test compared with baseline. The increases in thigh perimeter in the TLG subjects and TG subjects were not significantly different (4.52% and 2.75%, respectively; Pâ€‰=â€‰0.775). Strength training associated with LLLT can increase muscle performance compared with strength training only. Adolescent;Humans;Low-Level Light Therapy;Male;Models, Biological;Muscle Strength;Muscle Strength Dynamometer;Quadriceps Muscle;Resistance Training;Young Adult
Granuloma Faciale treated with 595-nm pulsed dye laser. Aged;Cheek;Facial Dermatoses;Female;Forehead;Granuloma;Humans;Low-Level Light Therapy;Male;Middle Aged
The successful treatment of Schamberg's disease with the 595 nm vascular laser. Humans;Leg;Low-Level Light Therapy;Male;Middle Aged;Pigmentation Disorders
Susceptibility of Candida albicans, Staphylococcus aureus, and Streptococcus mutans biofilms to photodynamic inactivation: an in vitro study. The purpose of this study was to evaluate specific effects of photodynamic inactivation (PDI) using methylene blue as photosensitizer and low-power laser irradiation on the viability of single-, dual-, and three-species biofilms formed by C. albicans, S. aureus, and S. mutans. Biofilms were grown in acrylic discs immersed in sterile brain heart infusion broth (BHI) containing 5% sucrose, inoculated with microbial suspension (10(6) cells/ml) and incubated for 5Â days. On the fifth day, the effects of the methylene blue (MB) photosensitizer at a concentration of 0.1Â mg/ml for 5Â min and InGaAlP laser (660Â nm) for 98Â s, alone and conjugated were evaluated. Next, the discs were placed in tubes with sterile physiological solution [0.9% sodium chloride (NaCl)] and sonicated for to disperse the biofilms. Ten-fold serial dilutions were carried and aliquots seeded in selective agar, which were then incubated for 48Â h. Then the numbers CFU/ml (log(10)) were counted and analyzed statistically (ANOVA, Tukey test, pâ€‰<â€‰0.05). Scanning electron microscopy (SEM) on discs treated with PDI and control biofilms groups was performed. Significant decreases in the viability of all microorganisms were observed for biofilms exposed to PDI mediated by MB dye. Reductions (log(10)) of single-species biofilms were greater (2.32-3.29) than the association of biofilms (1.00-2.44). Scanning electron microscopy micrographs suggested that lethal photosensitization occurred predominantly in the outermost layers of the biofilms. The results

showed that PDI mediated by MB dye, might be a useful approach for the control of oral biofilms. Photosensitizing Agents;Methylene Blue Biofilms;Candida albicans;Humans;In Vitro Techniques;Lasers, Solid-State;Methylene Blue;Microscopy, Electron, Scanning;Mouth;Photochemotherapy;Photosensitizing Agents;Staphylococcus aureus;Streptococcus mutans

An in vitro and in vivo study of combination therapy with PhotogemÂ®-mediated photodynamic therapy and cisplatin on mouse cancer cells (CT-26). OBJECTIVE: This study was designed to evaluate the anticancer effect of cisplatin and photodynamic therapy (PDT) combined in vitro and in vivo. BACKGROUND DATA: PDT, these days, is a promising modality for the treatment of cancer and infections. In order to optimize the treatment, cisplatin is often combined with other chemotherapeutic agents. METHODS: Colon cancer cells were incubated with cisplatin (0.1, 1, and 6â€‰Î¼g/ml), followed by photosensitization with PhotogemÂ® and irradiation with a 632â€‰nm diode laser at an energy density of 3.2â€‰J/cm(2). An MTT assay was then used to measure cell viability. For in vivo studies, established tumors were treated with cisplatin (3â€‰mg/kg) alone or with PDT (5â€‰mg/kg of PhotogemÂ®, 600â€‰J/cm(2)). The sizes of the tumors were continuously measured to note the effects. RESULTS: The cell viability of the combined therapy group was 19.88â€‰Â±â€‰0.41, corresponding to a 9% increase compared with that of the cisplatin- or PDT-only groups. In vivo, the tumors treated with PDT or combination therapy disappeared completely three days after each treatment, but on the 14th day, the recurrence rate was significantly lower in the combination therapy group than in the PDT group. CONCLUSIONS: Combination therapy results in an enhanced anticancer effect, presenting the possibility of minimizing the administration dosage of PhotogemÂ® and cisplatin. Antineoplastic Agents;Cisplatin Analysis of Variance;Animals;Antineoplastic Agents;Apoptosis;Cisplatin;Colonic Neoplasms;Combined Modality Therapy;Disease Models, Animal;Female;In Vitro Techniques;Lasers, Semiconductor;Low-Level Light Therapy;Mice;Mice, Inbred BALB C;Neoplasm Transplantation;Photochemotherapy;Random Allocation;Reference Values;Skin Absorption;Spectrum Analysis;Treatment Outcome;Tumor Cells, Cultured

The effect of low-level laser therapy on salivary glands in patients with xerostomia. OBJECTIVE: The aim of this study was to investigate the effect of low-level laser irradiation on the secretory function of salivary glands in 34 patients with xerostomia (dry mouth). BACKGROUND DATA: Xerostomia, a common complaint of oral dryness within the elderly population, is caused by a reduction in normal salivary secretion due to different causes. Treatment is aimed at increasing salivary flow, although in most cases it remains palliative. MATERIALS AND METHODS: In this study, laser light from a pulsed Ga-As laser operating at 904â€‰nm was applied bilaterally on each salivary gland area: extraorally on the parotid and submandibular gland areas and intraorally on the sublingual gland area. The operational probe distance from the irradiated area was 0.5â€‰cm resulting in an irradiance of 246â€‰mW/cm(2). The exposure time was 120â€‰sec per daily treatment during 10 consecutive days. The average energy density per exposure was 29.5â€‰J/cm(2). The control group consisted of 16 patients who were treated with 15â€‰mL of a 2% citric acid solution applied as a mouth rinse for 30â€‰sec. RESULTS: The average difference in the amount of salivation (dQ-sal, mL/min) before and after laser therapy increased linearly from dQ-salâ€‰=â€‰0.05â€‰mL/min on the first day, up to dQ-salâ€‰=â€‰0.13â€‰mL/min on the last (10th) day of therapy. In the control group, the average dQ-sal initially demonstrated a gradual increase, with a reversal of the trend toward the end of the therapy period and eventually yielding no correlation between the duration of therapy and dQ-sal. CONCLUSION: The results of our study indicate that the effects of low-level laser therapy on salivary glands are not only stimulating, but also regenerative to a degree since the glandular response to the same amount of applied laser energy

increased linearly over time. Adult;Aged;Case-Control Studies;Female;Follow-Up Studies;Humans;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Radiation Dosage;Reference Values;Risk Assessment;Salivary Glands;Salivation;Severity of Illness Index;Treatment Outcome;Xerostomia

The effect of different preparation and etching procedures on the microleakage of direct composite veneer restorations. OBJECTIVES: The aim of this in vitro study was to compare the microleakage of direct composite veneer restorations prepared by a conventional dental bur or Er,Cr:YSGG (erbium, chromium doped yttrium scandium gallium garnet) laser and etched with different procedures. METHODS: Fifty maxillary incisor teeth prepared for direct veneers with gingival margins in dentin and incisal margins in enamel were randomly divided into five groups (nâ€‰=â€‰10): group 1 (control), prepared with diamond bur and etched with phosphoric acid; group 2, prepared with diamond bur and etched with Er,Cr:YSGG laser (Waterlase MD/Biolase); group 3, prepared with laser and not etched; group 4, prepared with laser and etched with phosphoric acid; and group 5, prepared and etched with laser. After the application of the etch and rinse adhesive system (Prime & Bond NT/Dentsply), teeth were restored with the nano ceramic restorative material (Ceram X Duo/Dentsply), subjected to thermocycling and immersed in 0.5% basic fuchsin dye for 24â€‰h. The teeth were sectioned longitudinally and dye penetration was evaluated by a binocular stereomicroscope equipped with a measuring device. Data were analyzed by Kruskal-Wallis and Wilcoxon signed ranks tests. The level of significance was set at pâ€‰=â€‰0.05. RESULTS: Significant differences were observed in enamel of the five groups (pâ€‰<â€‰0.05). Minimal microleakage was observed in groups 1 and 3. The highest microleakage was evaluated in group 5 (pâ€‰<â€‰0.05). No significant differences were found among the five groups in dentin (pâ€‰>â€‰0.05). No differences were recorded between the microleakage values in enamel and dentin within each group and this was valid for all groups (pâ€‰>â€‰0.05). CONCLUSIONS: The results confirmed that enamel and dentin surfaces prepared with Er,Cr:YSGG laser for direct composite veneer restorations may provide comparable sealing. Phosphoric Acids;phosphoric acid Acid Etching, Dental;Dental Cavity Preparation;Dental Enamel;Dental High-Speed Equipment;Dental Leakage;Dental Restoration, Permanent;Humans;In Vitro Techniques;Incisor;Lasers, Solid-State;Low-Level Light Therapy;Phosphoric Acids;Sensitivity and Specificity

Effects of low-level laser therapy on expression of TNF-Î± and TGF-Î² in skeletal muscle during the repair process. The aim of the present study was to determine the effect of low-level laser therapy (LLLT) on the expression of TNF-Î± and TGF-Î² in the tibialis anterior muscle of rats following cryoinjury. Muscle regeneration involves cell proliferation, migration and differentiation and is regulated by growth factors and cytokines. A growing body of evidence suggests that LLLT promotes skeletal muscle regeneration by reducing the duration of acute inflammation and accelerating tissue repair. Adult male Wistar rats (nâ€‰=â€‰35) were randomly divided into three groups: control group (no lesion, untreated, nâ€‰=â€‰5), cryoinjury without LLLT group (nâ€‰=â€‰15), and cryoinjury with LLLT group (nâ€‰=â€‰15). The injured region was irradiated three times a week using an AlGaInP laser (660Â nm; beam spot 0.04Â cm(2), output power 20Â mW, power density 500Â mW/cm(2), energy density 5Â J/cm(2), exposure time 10Â s). Muscle remodeling was evaluated at 1, 7 and 14Â days (long-term) following injury. The muscles were removed and total RNA was isolated using TRIzol reagent and cDNA synthesis. Real-time polymerase chain reactions were performed using TNF-Î± and TGF-Î² primers; GAPDH was used to normalize the data. LLLT caused a decrease in TNF-Î± mRNA expression at 1 and 7Â days following injury and in TGF-Î² mRNA expression at 7Â days following cryoinjury in comparison to the control group. LLLT modulated cytokine expression during short-term muscle remodeling, inducing a decrease in TNF-Î± and TGF-Î². RNA,

Messenger;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha Animals;Base Sequence;Gene Expression;Low-Level Light Therapy;Male;Muscle, Skeletal;RNA, Messenger;Rats;Rats, Wistar;Regeneration;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Wound Healing

Punchgraft testing in vitiligo; effects of UVA, NB-UVB and 632.8 nm Helium-Neon laser on the outcome. Biopsy, Needle;Dose-Response Relationship, Radiation;Humans;Lasers, Gas;Low-Level Light Therapy;Phototherapy;Single-Blind Method;Skin;Time Factors;Treatment Outcome;Ultraviolet Rays;Vitiligo

Metrical and histological investigation of the effects of low-level laser therapy on orthodontic tooth movement. The aim of this study was to evaluate the effects of 820-nm diode laser on osteoclastic and osteoblastic cell proliferation-activity and RANKL/OPG release during orthodontic tooth movement. Thirty-eight albino Wistar rats were used for this experiment. Maxillary incisors of the subjects were moved orthodontically by a helical spring with force of 20 g. An 820-nm Ga-Al-As diode laser with an output power of 100 mW and a fiber probe with spot size of 2 mm in diameter were used for laser treatment and irradiations were performed on 5 points at the distal side of the tooth root on the first, second, and 3rd days of the experiment. Total laser energy of 54 J (100 mW, 3.18 W/cm(2), 1717.2 J/cm(2)) was applied to group II and a total of 15 J (100 mW, 3.18 W/cm(2), 477 J/cm(2)) to group III. The experiment lasted for 8 days. The number of osteoclasts, osteoblasts, inflammatory cells and capillaries, and new bone formation were evaluated histologically. Besides immunohistochemical staining of PCNA, RANKL and OPG were also performed. No statistical difference was found for the amount of tooth movement in between the control and study groups ($p > 0.05$). The number of osteoclasts, osteoblasts, inflammatory cells, capillary vascularization, and new bone formation were found to be increased significantly in group II ($p < 0.05$). Immunohistochemical staining findings showed that RANKL immunoreactivity was stronger in group II than in the other groups. As to OPG immunoreactivity, no difference was found between the groups. Immunohistochemical parameters were higher in group III than in group I, while both were lower than group II. On the basis of these findings, low-level laser irradiation accelerates the bone remodeling process by stimulating osteoblastic and osteoclastic cell proliferation and function during orthodontic tooth movement. Osteoprotegerin;Proliferating Cell Nuclear Antigen;RANK Ligand Animals;Bone Remodeling;Fibroblasts;Incisor;Lasers, Semiconductor;Low-Level Light Therapy;Male;Osteoblasts;Osteoclasts;Osteogenesis;Osteoprotegerin;Proliferating Cell Nuclear Antigen;RANK Ligand;Rats;Rats, Wistar;Tooth Movement Techniques;Tooth Root

Six-month follow-up multicenter prospective study of 368 patients, phototypes III to V, on epilation efficacy using an 810-nm diode laser at low fluence. Laser hair removal is currently a popular cosmetic procedure. Traditional high-fluence laser treatment for hair elimination is associated with discomfort and adverse events and it is restricted to low phototype skins. A multicenter study of hair epilation with low fluences and high repetition pulse rate using an 810-nm diode laser was carried out on 368 patients (phototypes III to V) to test its efficacy in a 6-month follow-up after five treatments on the face and various body areas. Objective and subjective assessment as well as histologies show a high index of patient satisfaction due to high efficacy of hair elimination, also proved histologically by the damage observed at hair structure level. Results obtained a high degree of patient satisfaction and a low index of adverse events. Laser epilation was well accepted regarding discomfort and was also complication-free for dark and tanned skins. Treatment is easy to conduct and requires adapting the movement of the hand-piece to a constant speed in order to achieve high-energy deposit on tissue avoiding risks of burning. Adult;Female;Follow-Up Studies;Hair Removal;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Prospective Studies;Treatment Outcome;Young Adult

Laser phototherapy for Stevens-Johnson syndrome: a case report. BACKGROUND AND OBJECTIVE: Stevens-Johnson syndrome (SJS) is a life-threatening dermatosis characterized by epidermal sloughing and stomatitis. We report the case of a 7-year-old boy in whom laser phototherapy (LPT) was highly effective in reversing the effects of an initial episode of SJS that had apparently developed in association with treatment with phenobarbital for a seizure disorder. The patient was first seen in the intensive care unit (ICU) of our institution with fever, cutaneous lesions on his extremities, trunk, face, and neck; mucosal involvement of his genitalia and eyes (conjunctivitis); ulcerative intraoral lesions; and swollen, crusted, and bleeding lips. He reported severe pain at the sites of his intraoral and skin lesions and was unable to eat, speak, swallow, or open his mouth. MATERIALS AND METHODS: Trying to prevent and minimize secondary infections, gastric problems, pain, and other complications, the patient was given clindamycin, ranitidine, dipyrone, diphenhydramine (Benadryl) drops, and morphine. In addition, he was instructed to use bicarbonate solution and Ketoconazole (Xylogel) in the oral cavity. Because of the lack of progress of the patient, the LPT was selected. RESULTS: At 5 days after the initial session of LPT, the patient was able to eat gelatin, and on the following day, the number and severity of his intraoral lesions and his labial crusting and swelling had diminished. By 6 days after his initial session of LPT, most of the patient's intraoral lesions had disappeared, and the few that remained were painless; the patient was able to eat solid food by himself and was removed from the ICU. Ten sessions of LPT were conducted in the hospital. The patient underwent three further and consecutive sessions at the School of Dentistry, when complete healing of his oral lesions was observed. CONCLUSION: The outcome in this case suggests that LPT may be a new adjuvant modality for SJS complications.
Child;Humans;Low-Level Light Therapy;Male;Stevens-Johnson Syndrome;Treatment Outcome

Low-level laser therapy on hands of patients with rheumatoid arthritis. Arthritis, Rheumatoid;Clinical Trials as Topic;Double-Blind Method;Hand;Humans;Low-Level Light Therapy;Treatment Outcome

The prevention of induced oral mucositis with low-level laser therapy in bone marrow transplantation patients: a randomized clinical trial. BACKGROUND DATA AND OBJECTIVE: Patients who have received high doses of chemotherapy, either alone or in combination with total body irradiation often cite oral mucositis (OM) as the most debilitating side effect. The aim of this study was to investigate the clinical effects of low-level laser therapy (LLLT) on the prevention of conditioning-induced OM in hematopoietic stem cell transplantation (HSCT). METHODS: We randomized 42 patients who underwent autologous or allogeneic HSCT. A low-level InGaAlP diode laser was used, emitting light at 660â€‰nm, 40â€‰mW, and 4â€‰J/cm(2). An evaluation of OM was carried out using the World Health Organization scale. RESULTS AND CONCLUSION: In the LLLT group, 57.1% of patients had an OM grade 0, 9.6% had grade 1, and 33.3% had grade 2, whereas in the control group, only 4.8% of patients were free of OM (grade 0). Our results indicate that the preventive use of LLLT in patients who have undergone HSCT is a powerful instrument in reducing OM incidence. Adult;Bone Marrow Transplantation;Female;Humans;Low-Level Light Therapy;Male;Postoperative Complications;Stomatitis

Treatment of burning mouth syndrome with a low-level energy diode laser. OBJECTIVE: To test the therapeutic efficacy of low-level energy diode laser on burning mouth syndrome. BACKGROUND: Burning mouth syndrome is characterized by burning and painful sensations in the mouth, especially the tongue, in the absence of significant mucosal abnormalities. Although burning mouth syndrome is relatively common, little is known regarding its etiology and pathophysiology. As a result, no treatment is effective in all patients. Low-level energy diode laser therapy has been used in a variety of chronic and acute pain conditions, including neck, back and myofascial pain, degenerative osteoarthritis, and headache. METHODS: A total of 17 patients who had been diagnosed with burning

mouth syndrome were treated with an 800-nm wavelength diode laser. A straight handpiece was used with an end of 1-cm diameter with the fiber end standing 4 cm away from the end of handpiece. When the laser was applied, the handpiece directly contacted or was immediately above the symptomatic lingual surface. The output used was 3 W, 50 msec intermittent pulsing, and a frequency of 10 Hz, which was equivalent to an average power of 1.5 W/cm(2) (3 W Ã— 0.05 msec Ã— 10 Hz = 1.5 W/cm(2)). Depending on the involved area, laser was applied to a 1-cm(2) area for 70 sec until all involved area was covered. Overall pain and discomfort were analyzed with a 10-cm visual analogue scale. RESULTS: All patients received diode laser therapy between one and seven times. The average pain score before the treatment was 6.7 (ranging from 2.9 to 9.8). The results showed an average reduction in pain of 47.6% (ranging from 9.3% to 91.8%). The burning sensation remained unchanged for up to 12 months. CONCLUSION: Low-level energy diode laser may be an effective treatment for burning mouth syndrome. Adult;Aged;Burning Mouth Syndrome;Female;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Treatment Outcome

The effect of low-level laser therapy as an adjunct to non-surgical periodontal treatment. BACKGROUND: The aim of this study is to evaluate the effect of low-level laser therapy (LLLT) as an adjunct to non-surgical periodontal therapy of smoking and non-smoking patients with moderate to advanced chronic periodontitis. METHODS: All 36 systemically healthy patients who were included in the study initially received non-surgical periodontal therapy. The LLLT group (n = 18) received GaAlAs diode laser therapy as an adjunct to non-surgical periodontal therapy. A diode laser with a wavelength of 808 nm was used for the LLLT. Energy density of 4 J/cm(2) was applied to the gingival surface after periodontal treatment on the first, second, and seventh days. Each of the LLLT and control groups was divided into two groups as smoking and non-smoking patients to investigate the effect of smoking on treatment. Gingival crevicular fluid samples were collected from all patients and clinical parameters were recorded on baseline, the first, third, and sixth months after treatment. Matrix metalloproteinase-1, tissue inhibitor matrix metalloproteinase-1, transforming growth factor-Î²1, and basic-fibroblast growth factor levels in the collected gingival crevicular fluid were measured. RESULTS: The primary outcome variable in this study was change in gingival bleeding and inflammation. At all time points, the LLLT group showed significantly more improvement in sulcus bleeding index (SBI), clinical attachment level, and probing depth (PD) levels compared to the control group (P <0.001). There were clinically significant improvements in the laser-applied smokers' PD and SBI levels compared to smokers to whom a laser was not applied, between the baseline and all time points (P <0.001) (SBI score: control group 1.12, LLLT group 1.49; PD: control group 1.21 mm, LLLT group 1.46 mm, between baseline and 6 months). Transforming growth factor-Î²1 levels and the ratio of matrix metalloproteinase-1 to tissue inhibitor matrix metalloproteinase-1 decreased significantly in both groups at 1, 3, and 6 months after periodontal therapy (P <0.001). Basic-fibroblast growth factor levels significantly decreased in both groups in the first month after the treatment, then increased in the third and sixth months (P <0.005). No marker level change showed significant differences between the groups (P <0.05). CONCLUSION: LLLT as an adjunctive therapy to non-surgical periodontal treatment improves periodontal healing. Tissue Inhibitor of Metalloproteinase-1;Transforming Growth Factor beta1;Fibroblast Growth Factor 2;Matrix Metalloproteinase 1 Adult;Chronic Periodontitis;Dental Scaling;Female;Fibroblast Growth Factor 2;Gingival Crevicular Fluid;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Matrix Metalloproteinase 1;Middle Aged;Periodontal Index;Radiotherapy, Adjuvant;Smoking;Statistics, Nonparametric;Tissue Inhibitor of Metalloproteinase-1;Transforming Growth Factor beta1;Wound Healing

BiosilicateÂ® and low-level laser therapy improve bone repair in osteoporotic rats. The aim of this study was to investigate the effects of a novel bioactive material (BiosilicateÂ®) and low-level laser therapy (LLLT) on bone fracture consolidation in osteoporotic rats. Forty female Wistar rats

were submitted to ovariectomy (OVX) to induce osteopenia. Eight weeks after surgery, the animals were randomly divided into four groups of 10 animals each: a bone defect control group (CG); a bone defect filled with Biosilicate group (BG); a bone defect filled with Biosilicate and irradiated with LLLT at 60 J/cm(2) group (BG60); and a bone defect filled with Biosilicate and irradiated with LLLT at 120 J/cm(2) group (BG120). Bone defects were surgically performed on both tibias. The size of particle used for Biosilicate was 180-212 Âµm. Histopathological analysis showed that bone defects were predominantly filled with the biomaterial in specimens treated with Biosilicate. LLLT with either 60 or 120 J/cm(2) was able to increase collagen, Cbfa-1, VGEF and COX-2 expression in the circumjacent cells of the biomaterial. A morphometric analysis revealed that the Biosilicate + laser groups showed a higher amount of newly formed bone. Our results indicate that laser therapy improves bone repair process in contact with Biosilicate as a result of increasing bone formation, as well as COX-2 and Cbfa-1 immunoexpression, angiogenesis and collagen deposition in osteoporotic rats. Azo Compounds;Core Binding Factor Alpha 1 Subunit;Silicates;sodium oxide-calcium oxide-silicon dioxide-diphosphorus pentoxide;C.I. direct red 80;Collagen;Cyclooxygenase 2 Animals;Azo Compounds;Biomechanical Phenomena;Collagen;Core Binding Factor Alpha 1 Subunit;Cyclooxygenase 2;Female;Glass;Humans;Immunohistochemistry;Low-Level Light Therapy;Osteogenesis;Osteoporosis;Rats;Rats, Wistar;Silicates;Tibia;Wound Healing

Effects of low-power laser irradiation (LPLI) at different wavelengths and doses on oxidative stress and fibrogenesis parameters in an animal model of wound healing. Gallium-arsenide (GaAs) and helium-neon (HeNe) lasers are the most commonly used low-energy lasers in physiotherapy for promoting wound healing and pain modulation. The aim of this study was investigate the effect of low-power laser irradiation (LPLI) at different wavelengths and doses on oxidative stress and fibrogenesis parameters in an animal model of wound healing. The animals were randomly divided into five groups (n=6): Controls (skin injured animals without local or systemic treatment), skin injury treated with HeNe 1 J/cm(2) (two seg); skin injury treated with HeNe 3 J/cm(2) (six seg); skin injury treated with GaAs 1 J/cm(2) (three seg); skin injury treated with GaAs 3 J/cm(2) (nine seg). A single circular wound measuring 8 mm in diameter was surgically created on the back of the animal. The rats were irradiated at 2, 12, 24, 48, 72, 96, and 120 h after skin injury. The parameters, namely hydroxyproline content, activities of the antioxidant enzymes superoxide dismutase (SOD) and catalase (CAT), and lipid (TBARS) and protein oxidation (carbonyl groups) measurements were assessed. In addition, wound size regression was also analyzed. The results showed an improvement in the wound healing reflected by the reduction in wound size and increased collagen synthesis. Moreover, a significant reduction in TBARS levels, carbonyl content, and SOD and CAT activities were observed after laser irradiation, particularly with the treatments HeNe laser 1 and 3 J/cm(2) dose and GaAs 3 J/cm(2) dose. The data strongly indicate that LPLI therapy is efficient in accelerating the skin wound healing process after wounding, probably by reducing the inflammatory phase and inducing collagen synthesis. Thiobarbituric Acid Reactive Substances;Collagen;Catalase;Superoxide Dismutase;Hydroxyproline Animals;Catalase;Collagen;Dose-Response Relationship, Radiation;Hydroxyproline;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Male;Models, Animal;Oxidative Stress;Rats;Rats, Wistar;Skin;Superoxide Dismutase;Thiobarbituric Acid Reactive Substances;Wound Healing

Influence of carbon dioxide laser irradiation on the healing process of extraction sockets. OBJECTIVE: To clarify the healing-promoting effects of carbon dioxide laser irradiation in high and low reactive-level laser therapies (HLLT and LLLT, respectively) on extraction sockets after tooth extraction. MATERIAL AND METHODS: Forty-two 5-week-old male Wistar rats were divided into laser irradiation and non-irradiation (control) groups and compared. The laser-irradiation group underwent HLLT immediately after tooth extraction and then LLLT 1 day post-extraction. Tissue was excised 6 h

and 3, 7, or 21 days after extraction and histopathologically investigated. The alveolar crest height was measured osteomorphometrically 21 days post-extraction, and granulation tissue in the extraction socket surface layer was immunohistologically investigated using anti-Î±-smooth muscle actin (anti-Î±-SMA) antibody 3 and 7 days post-extraction. RESULTS: Many osteoclasts appeared and active bone resorption was noted in the irradiation group 3 days after extraction compared to the controls. On Day 7, new bone formation started around the extraction socket in the control group, but from the superficial to over the middle layer of the socket in the irradiation group. On Day 21, a concavity existed in the alveolar crest region in the controls, whereas this region was flat, with no concavity, in the irradiation group. On osteomorphometry, the alveolar crest height was significantly higher in the irradiation (0.7791 Â± 0.0122) than the control (0.6516 Â± 0.0181) group ($P < 0.05$). On immunostaining, many Î±-SMA-positive cells were noted in the control group, but very few in the irradiation group. CONCLUSION: Laser-irradiated extraction wound healing showed characteristics different from those of the normal healing process, suggesting a favorable healing-promoting effect. Actins;Carbon Dioxide Actins;Animals;Bone Remodeling;Carbon Dioxide;Granulation Tissue;Lasers, Gas;Low-Level Light Therapy;Male;Myofibroblasts;Osteoclasts;Radiation Dosage;Rats;Rats, Wistar;Tooth Extraction;Tooth Socket;Wound Healing

Combined photodynamic and low-level laser therapies as an adjunct to nonsurgical treatment of chronic periodontitis. BACKGROUND AND OBJECTIVE: In recent years, there has been a growing interest in the use of dental lasers for treatment of periodontal diseases. The purpose of this short-term clinical trial was to evaluate the effects of a combination of photodynamic therapy with low-level laser therapy as an adjunct to nonsurgical treatment of chronic periodontitis. MATERIAL AND METHODS: Twenty-four nonsmoking adults with untreated chronic periodontitis were randomly assigned in a split-mouth design to receive scaling and root debridement with or without one course of adjunctive photodynamic therapy and low-level laser therapy within 5 d. Plaque, bleeding on probing, probing depth and gingival recession were recorded at baseline, 1 and 3 mo after the treatment. Gingival crevicular fluid was collected for assay of interleukin-1Î² levels at baseline, 1 wk and 1 mo. RESULTS: The test teeth achieved greater reductions in the percentage of sites with bleeding on probing and in mean probing depth at 1 mo compared with the control teeth ($p < 0.05$). A significant decrease in gingival crevicular fluid volume was observed in both groups at 1 wk ($p < 0.001$), with a further decrease at 1 mo in the test sites ($p < 0.05$). The test sites showed a greater reduction of interleukin-1Î² levels in gingival crevicular fluid at 1 wk than the control sites ($p < 0.05$). No significant differences in periodontal parameters were found between the test and control teeth at 3 mo. CONCLUSIONS: The present study suggests that a combined course of photodynamic therapy with low-level laser therapy could be a beneficial adjunct to nonsurgical treatment of chronic periodontitis on a short-term basis. Further studies are required to assess the long-term effectiveness of the combination of photodynamic therapy with low-level laser therapy as an adjunct in nonsurgical treatment of periodontitis. Interleukin-1beta Adult;Chronic Periodontitis;Combined Modality Therapy;Dental Scaling;Female;Gingival Crevicular Fluid;Humans;Interleukin-1beta;Low-Level Light Therapy;Male;Middle Aged;Periodontal Debridement;Photochemotherapy;Single-Blind Method;Treatment Outcome

Ultra-low-level laser therapy. A growing number of laboratory and clinical studies over the past 10 years have shown that low-level laser stimulation (633 or 670 nm) at extremely low power densities (about 0.15 mW/cm(2)), when administered through a particular emission mode, is capable of eliciting significant biological effects. Studies on cell cultures and animal models as well as clinical trials give support to a novel therapeutic modality, which may be referred to as ultra low level laser therapy (ULLLT). In cultured neural cells, pulsed irradiation (670 nm, 0.45 mJ/cm(2)) has shown to stimulate NGF-induced neurite elongation and to protect cells against oxidative stress. In rats, anti-

edema and anti-hyperalgesia effects following ULLL irradiation were found. Clinical studies have reported beneficial effects (also revealed through sonography) in the treatment of musculoskeletal disorders. The present paper reviews the existing experimental evidence available on ULLLT. Furthermore, the puzzling issue of the biophysical mechanisms that lie at the basis of the method is explored and some hypotheses are proposed. Besides presenting the state-of-the-art about this novel photobiostimulation therapy, the present paper aims to open up an interdisciplinary discussion and stimulate new research on this subject. Acupuncture Points;Animals;Biophysical Phenomena;Cell Adhesion;Humans;Low-Level Light Therapy;Mechanotransduction, Cellular;Models, Biological;Musculoskeletal Diseases;Neurites;Oxidation-Reduction;Pain;Rats;Signal Transduction;Treatment Outcome

Pulsed laser light forces cancer cells to absorb anticancer drugs--the role of water in nanomedicine. Anticancer drugs executing their function intracellularly enter cancer cells via diffusive processes. Complementary to these slow processes, cells can be forced to incorporate drugs by convection - a more efficient transport process. Transmembrane convection is induced by moderately intense pulsed laser light (or light emitting diodes) changing the structure of nanoscopic water layers in cells. This is a fundamental difference with the method of photodynamic therapy. In a model system we demonstrate that a total irradiation time of one minute is sufficient to completely inhibit proliferation of cancer cells. Transmembrane convection protects healthy cells from extended chemotherapy exposure, could be exploited to overcome multidrug resistance, and is a promising new tool in a variety of therapies as well as in skin rejuvenation. Antineoplastic Agents;Water Antineoplastic Agents;Biological Transport;Cell Growth Processes;Cell Membrane Permeability;Drug Delivery Systems;HeLa Cells;Humans;Low-Level Light Therapy;Nanomedicine;Neoplasms;Water

Safe and effective one-session fractional skin resurfacing using a carbon dioxide laser device in super-pulse mode: a clinical and histologic study. Carbon dioxide (CO(2)) laser ablative fractional resurfacing produces skin damage, with removal of the epidermis and variable portions of the dermis as well as associated residual heating, resulting in new collagen formation and skin tightening. The nonresurfaced epidermis helps tissue to heal rapidly, with short-term postoperative erythema. The results for 40 patients (8 men and 32 women) after a single session of a fractional CO(2) resurfacing mode were studied. The treatments included resurfacing of the full face, periocular upper lip, and residual acne scars. The patients had skin prototypes 2 to 4 and wrinkle degrees 1 to 3. The histologic effects, efficacy, and treatment safety in various clinical conditions and for different phototypes are discussed. The CO(2) laser for fractional treatment is used in super-pulse mode. The beam is split by a lens into several microbeams, and super-pulse repetition is limited by the pulse width. The laser needs a power adaptation to meet the set fluence per microbeam. Laser pulsing can operate repeatedly on the same spot or be moved randomly over the skin, using several passes to achieve a desired residual thermal effect. Low, medium, and high settings are preprogrammed in the device, and they indicate the strength of resurfacing. A single treatment was given with the patient under topical anesthesia. However, the anesthesia was injected on areas of scar tissue. Medium settings (2Â Hz, 30Â W, 60Â mJ) were used, and two passes were made for dark skins and degree 1 wrinkles. High settings (2Â Hz, 60Â W, 120Â mJ) were used, and three passes were made for degree 3 wrinkles and scar tissue. Postoperatively, resurfaced areas were treated with an ointment of gentamycin, Retinol Palmitate, and DL-methionine (Novartis; Farmaceutics, S.A., Barcelona, Spain). Once epithelialization was achieved, antipigment and sun protection agents were recommended. Evaluations were performed 15Â days and 2Â months after treatment by both patients and clinicians. Treatment improved wrinkle aspect and scar condition, and no patient reported adverse effects or complications, irrespective of skin type, except for plaques of erythema in areas that received extra laser passes, which were not seen at the 2-month assessment. The results evaluated by clinicians

were very much in correlation with those of patients. Immediately after treatment, vaporization was produced by stacked pulses, with clear ablation and collateral heat coagulation. An increased number of random pulses removed more epidermis, and with denser pulses per area, a thermal deposit was noted histologically. At 2Â months, a thicker, multicelluar epidermis and an evident increase in collagen were observed. Fractional CO(2) laser permits a variety of resurfacing settings that obtain safe, effective skin rejuvenation and correct scar tissue in a single treatment.
Adult;Dermis;Dose Fractionation, Radiation;Epidermis;Facial Dermatoses;Female;Humans;Lasers, Gas;Low-Level Light Therapy;Male;Middle Aged;Patient Satisfaction;Plastic Surgery Procedures;Rejuvenation;Skin Aging;Treatment Outcome

Bactericidal effect of a Nd:YAG laser on Enterococcus faecalis at pulse durations of 15 and 25 ms in dentine depths of 500 and 1,000 Î¼m. The success of endodontic treatment depends on the effective elimination of microorganisms from the root canal, and lasers provide more effective disinfection than conventional treatment using rinsing solutions. The objective of this in vitro study was to determine the bactericidal effect of laser irradiation in dentine of various depths at a wavelength of 1,064 nm and pulse durations of 15 and 25 ms. A total of 90 dentine slices were cut from bovine incisors and divided into two groups (45 slices each) of thickness 500 and 1,000 Î¼m. All were inoculated with a suspension of Enterococcus faecalis (5.07 Ã— 10(9) bacteria/ml). Based on the clinically accepted dose (approximately 300 J/cm(2)), the following laser settings were chosen for this study: 1.75 W, 0.7 Hz for 4 s, three repetitions. The two groups were divided into two subgroups of 15 slices each to be irradiated with pulse durations of 15 and 25 ms. The remaining 15 slices per group were not irradiated to serve as a control. After irradiation, the colony-forming units (CFU) were counted and evaluated. To determine the bactericidal effect of irradiation with different pulse durations, the results in the different groups were compared statistically. For all irradiated subgroups a bactericidal effect was observed at pulse durations of 15 and 25 ms ($p=0.0085$ and $p<0.0001$). The corresponding average log kills were 0.29 (15 ms) and 0.52 (25 ms) for 500 Î¼m and 0.15 and 0.3 for 1,000 Î¼m, respectively. The results of this in vitro study showed that Nd:YAG laser irradiation with a pulse duration of 15 ms eliminated an average of 49% and 29% of E. faecalis at dentine depths of 500 Î¼m and 1,000 Î¼m, respectively, and irradiation with a pulse duration of 25 ms eliminated 70% (500 Î¼m) and 50% (1,000 Î¼m). However, these values are lower than those achieved with the established protocol using microsecond pulses. Animals;Bacterial Load;Cattle;Dental Pulp Cavity;Dentin;Disinfection;Enterococcus faecalis;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Models, Animal;Root Canal Therapy

Tooth desensitization with an Er:YAG laser: in vitro microscopical observation and a case report. Tooth hypersensitivity is a frequent condition that causes discomfort and sometimes severe pain. It is caused by exposure of spots of dentinal tubules to the oral environment. Conventional desensitizing agents (professional pastes, toothpastes, mouthwashes) aim to obliterate the exposed dentinal tubules. Laser desensitization was introduced as an alternative efficient tool for the immediate treatment of tooth hypersensitivity. We explored in vitro the microscopical occluding effects of the Er:YAG laser on exposed dentinal tubules. The clinical application of this technique is also described.
Dentin;Dentin Sensitivity;Humans;In Vitro Techniques;Lasers, Solid-State;Low-Level Light Therapy;Male;Microscopy, Electron, Scanning;Middle Aged;Pain Threshold

Low-level laser therapy (LLLT; 780 nm) acts differently on mRNA expression of anti- and pro-inflammatory mediators in an experimental model of collagenase-induced tendinitis in rat. Low-level laser therapy (LLLT) has been found to produce anti-inflammatory effects in a variety of disorders. Tendinopathies are directly related to unbalance in expression of pro- and anti-inflammatory cytokines which are responsible by degeneration process of tendinocytes. In the current study, we decided to investigate if LLLT could reduce mRNA expression for TNF-Î±, IL-1Î², IL-6,

TGF-Î² cytokines, and COX-2 enzyme. Forty-two male Wistar rats were divided randomly in seven groups, and tendinitis was induced with a collagenase intratendinea injection. The mRNA expression was evaluated by real-time PCR in 7th and 14th days after tendinitis. LLLT irradiation with wavelength of 780 nm required for 75 s with a dose of 7.7 J/cm(2) was administered in distinct moments: 12 h and 7 days post tendinitis. At the 12 h after tendinitis, the animals were irradiated once in intercalate days until the 7th or 14th day in and them the animals were killed, respectively. In other series, 7 days after tendinitis, the animals were irradiated once in intercalated days until the 14th day and then the animals were killed. LLLT in both acute and chronic phases decreased IL-6, COX-2, and TGF-Î² expression after tendinitis, respectively, when compared to tendinitis groups: IL-6, COX-2, and TGF-Î². The LLLT not altered IL-1Î² expression in any time, but reduced the TNF-Î± expression; however, only at chronic phase. We conclude that LLLT administered with this protocol reduces one of features of tendinopathies that is mRNA expression for pro-inflammatory mediators. DNA Primers;Inflammation Mediators;Interleukin-1beta;Interleukin-6;RNA, Messenger;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha;Cyclooxygenase 2;Collagenases Animals;Base Sequence;Collagenases;Cyclooxygenase 2;DNA Primers;Disease Models, Animal;Gene Expression;Inflammation Mediators;Interleukin-1beta;Interleukin-6;Low-Level Light Therapy;Male;RNA, Messenger;Rats;Rats, Wistar;Tendinopathy;Tendons;Transforming Growth Factor beta;Tumor Necrosis Factor-alpha

Current treatments for radiation retinopathy. BACKGROUND: to review the currently available therapeutic modalities for radiation retinopathy (RR), including newer investigational interventions directed towards specific aspects of the pathophysiology of this refractory complication. METHODS: a review of the literature encompassing the pathogenesis of RR and the current therapeutic modalities available was performed. RESULTS: RR is a chronic and progressive condition that results from exposure to any source of radiation. It might be secondary to radiation treatment of intraocular tumors such as choroidal melanomas, retinoblastomas, and choroidal metastasis, or from unavoidable exposure to excessive radiation from the treatment of extraocular tumors like cephalic, nasopharyngeal, orbital, and paranasal malignancies. After the results of the Collaborative Ocular Melanoma Study, most of the choroidal melanomas are being treated with plaque brachytherapy increasing by that the incidence of this radiation complication. RR has been reported to occur in as many as 60% of eyes treated with plaque radiation, with higher rates associated with larger tumors. Initially, the condition manifests as a radiation vasculopathy clinically seen as microaneurysms and telangiectases, with posterior development of retinal hard exudates and hemorrhages, macular edema, neovascularization and tractional retinal detachment. Regrettably, the management of these eyes remains limited. Photodynamic therapy, laser photocoagulation, oral pentoxyphylline and hyperbaric oxygen have been attempted as treatment modalities with inconclusive results. Intravitreal injections of anti-vascular endothelial growth factor such as bevacizumab, ranibizumab and pegaptanib sodium have been recently used, also with variable results. DISCUSSION: RR is a common vision threatening complication following radiation therapy. The available therapeutic options are limited and show unsatisfactory results. Further large investigative studies are required for developing better therapeutic as well as preventive treatment strategies. Adrenal Cortex Hormones;Anti-Inflammatory Agents;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Aptamers, Nucleotide;Vascular Endothelial Growth Factor A;pegaptanib;Bevacizumab;Pentoxifylline;Ranibizumab Adrenal Cortex Hormones;Anti-Inflammatory Agents;Antibodies, Monoclonal;Antibodies, Monoclonal, Humanized;Aptamers, Nucleotide;Bevacizumab;Brachytherapy;Eye Neoplasms;Head and Neck Neoplasms;Humans;Laser Coagulation;Light Coagulation;Low-Level Light Therapy;Pentoxifylline;Photochemotherapy;Radiation

Injuries;Ranibizumab;Retina;Retinal Diseases;Tomography, Optical Coherence;Vascular Endothelial Growth Factor A

Characterizing photothrombotic distal middle cerebral artery occlusion and YAG laser-induced reperfusion model in the Izumo strain of spontaneously hypertensive rats. No study has systematically studied the relevance of original Izumo strain of spontaneously hypertensive rats (SHR/Izm) as a stroke model. Furthermore, both SHR/Izm and stroke-prone SHR/Izm (SHRSP/Izm) are commercially available, and recent progress in genetic studies allowed us to use several congenic strains of rats constructed with SHR/Izm and SHRSP/Izm as the genetic background strains. A total of 166 male SHR/Izm and 17 male SHRSP/Izm were subjected to photothrombotic middle cerebral artery (MCA) occlusion with or without YAG laser-induced reperfusion. The pattern of distal MCA was recorded. Infarct volumes were determined with 2,3,5-triphenyltetrazolium chloride. At 24 or 48 h after MCA occlusion, infarct volumes in the permanent occlusion and 2-h occlusion groups (88 Â± 22 [SD] and 87 Â± 25 mmÂ³, respectively) were significantly larger than that in the 1-h occlusion group (45 Â± 14 mmÂ³), indicating the presence of sizeable zone of penumbra. Infarct size in SHRSP/Izm determined at 24 h after MCA occlusion was fairly large (124.0 Â± 34.8 mmÂ³, n = 10). Infarct volume in SHR/Izm with simple distal MCA was 76 Â± 19 mmÂ³, which was significantly smaller than 95 Â± 22 mmÂ³ in the other SHR/Izm with more branching MCA. These data suggest that this stroke model in SHR/Izm is useful in the preclinical testing of stroke therapies and elucidating the pathophysiology of cerebral ischemia/reperfusion. Animals;Blood Pressure;Cerebrovascular Circulation;Disease Models, Animal;Infarction, Middle Cerebral Artery;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Cerebral Artery;Rats;Rats, Inbred SHR;Reperfusion

Influence of laser photobiomodulation on collagen IV during skeletal muscle tissue remodeling after injury in rats. OBJECTIVE: The aim of the present study was to determine the effect of GaAlAs low-level laser therapy (LLLT) on collagen IV remodeling of the tibialis anterior (TA) muscle in rats after cryolesion. BACKGROUND: Considerable interest exists in skeletal muscle regeneration in situations such as repair after exercise-induced muscle injury, after muscle transplantation, in muscular dystrophy, exercise-induced muscle injury, and the recovery of strength after atrophy due to disuse. A number of studies have demonstrated the potential of LLLT in facilitating the muscle-healing process; however, no consensus is found in the literature regarding the best laser-irradiation parameters. METHODS: Adult male Wistar rats (nâ€‰=â€‰45) were used and randomly divided into three groups: control (nâ€‰=â€‰5); nontreated cryolesioned group (nâ€‰=â€‰20), and LLLT-cryolesioned group (nâ€‰=â€‰20). The cryolesioned groups were analyzed at 1, 7, 14, and 21 days after the injury procedure. Laser irradiation was performed 3 times per week on the injured region by using the GaAlAs laser (660 nm; beam spot of 0.04â€‰cm(2), output power of 20 mW, power density of 500 mW/cm(2), and energy density of 5â€‰J/cm(2), for 10â€‰sec). The muscles were removed, frozen, cryosectioned, and then stained with hematoxylin-eosin for the visualization of general morphology or used for immunohistochemical analysis of collagen IV. RESULTS: It was demonstrated that LLLT promotes an increase in collagen IV immunolabeling in skeletal muscle in the first 7 days after acute trauma caused by cryoinjury, but does not modify the duration of the tissue-repair process. Even with LLLT, the injured muscle tissue needs âˆ¼21 days to achieve the same state of organization as that in the noninjured muscle. CONCLUSION: The collagen IV content is modulated in regenerating skeletal muscle under LLLT, which might be associated with better tissue outcome, although the histologic analysis did not detect tissue improvement in the LLLT group. Collagen Type IV Animals;Collagen Type IV;Immunohistochemistry;Low-Level Light Therapy;Male;Muscle, Skeletal;Rats;Rats, Wistar;Regeneration;Wound Healing

High fluence low-power laser irradiation induces apoptosis via inactivation of Akt/GSK3Î² signaling pathway. High fluence low-power laser irradiation (HF-LPLI) is a newly discovered stimulus

through generating reactive oxygen species (ROS) to trigger cell apoptosis. Activation of glycogen synthase kinase 3Î² (GSK3Î²) is proved to be involved in intrinsic apoptotic pathways under various stimuli. However, whether the proapoptotic factor GSK3Î² participates in HF-LPLI-induced apoptosis has not been elucidated. Therefore, in the present study, we investigated the involvement of GSK3Î² in apoptosis under HF-LPLI treatment (120â€‰J/cm2, 633â€‰nm). We found that GSK3Î² activation could promote HF-LPLI-induced apoptosis, which could be prevented by lithium chloride (a selective inhibitor of GSK3Î²) exposure or by GSK3Î²-KD (a dominant-negative GSK3Î²) overexpression. We also found that the activation of GSK3Î² by HF-LPLI was due to the inactivation of protein kinase B (Akt), a widely reported and important upstream negative regulator of GSK3Î², indicating the existence and inactivation of Akt/GSK3Î² signaling pathway. Moreover, the inactivation of Akt/GSK3Î² pathway depended on the fluence of HF-LPLI treatment. Furthermore, vitamin c, a ROS scavenger, completely prevented the inactivation of Akt/GSK3Î² pathway, indicating ROS generation was crucial for the inactivation. In addition, GSK3Î² promoted Bax activation by down-regulating Mcl-1 upon HF-LPLI treatment. Taken together, we have identified a new and important proapoptotic signaling pathway that is consisted of Akt/GSK3Î² inactivation for HF-LPLI stimulation. Our research will extend the knowledge into the biological mechanisms induced by LPLI. Myeloid Cell Leukemia Sequence 1 Protein;Proto-Oncogene Proteins c-bcl-2;Reactive Oxygen Species;bcl-2-Associated X Protein;GSK3B protein, human;Glycogen Synthase Kinase 3 beta;Proto-Oncogene Proteins c-akt;Glycogen Synthase Kinase 3 Animals;Apoptosis;Cell Line;Cell Nucleus;Dose-Response Relationship, Radiation;Down-Regulation;Enzyme Activation;Glycogen Synthase Kinase 3;Glycogen Synthase Kinase 3 beta;Humans;Light;Low-Level Light Therapy;Models, Biological;Myeloid Cell Leukemia Sequence 1 Protein;Protein Transport;Proto-Oncogene Proteins c-akt;Proto-Oncogene Proteins c-bcl-2;Reactive Oxygen Species;Signal Transduction;bcl-2-Associated X Protein

Objective and non-invasive evaluation of photorejuvenation effect with intense pulsed light treatment in Asian skin. BACKGROUND: Intense pulsed light (IPL) has been widely used for photorejuvenation. Although previous literature has shown clinical effectiveness of IPL treatments on cutaneous photoaging, the associated changes in the biophysical properties of the skin following IPL treatments have not been fully elucidated. OBJECTIVE: The aim of this study was to evaluate changes in skin biophysical properties in patients with photoaging after IPL treatments, using non-invasive, objective skin measuring devices. PATIENTS AND METHODS: A total of 26 Korean women with facial dyschromias underwent three sessions of IPL treatment at 4-week intervals. Outcome assessments included standardized photography, global evaluation by blinded investigators, patients' self-assessment and objective measurements of colour (Mexameter MX18, Chromatometer), elasticity (Cutometer), roughness (Visiometer), sebum (Sebumeter) and skin hydration (Corneometer). Resultsâ€, Intense pulsed light treatments produced a 15% decrease in the size of representative pigmented lesions ($P < 0.05$). Patients' self-assessment revealed that 84% and 58% of subjects considered their pigmented lesions and wrinkles were improved respectively. Objective colorimetric measurement demonstrated significant improvements following IPL treatments that were most remarkable after one session of IPL. Moreover, skin elasticity showed significant improvements at the end of the study. Skin wrinkles as measured using Visiometer showed a mild improvement without statistical significance. Sebum secretion and water content of skin remained unchanged. CONCLUSIONS: Intense pulsed light provided significant improvement in the appearance of facial pigmented lesions in Korean patients. These effects appeared to be more remarkable in improving pigmentation, skin tone and elasticity. Adult;Asian People;Face;Female;Humans;Low-Level Light Therapy;Middle Aged;Patient Satisfaction;Pigmentation Disorders;Rejuvenation;Republic of Korea;Skin Aging;Treatment Outcome;Young Adult

Low-level laser therapy supported teeth extractions of two patients receiving IV zolendronate. BRONJ (bisphosphonate-related osteonecrosis of jaws) is a frequently encountered disease, particularly in the maxillofacial region, and a consequence of bisphosphonate use. Treatment of BRONJ remains controversial, as efficiency of medical and surgical approaches as well as a combination of these methods with supportive treatments have not been clearly demonstrated in the literature. In recent years, laser usage alone or in combination with the main therapy methods, has become popular for the treatment of bisphosphonate-related osteo-necrosis of jaws. In this article, we present the successful management of two dental patients who had high potentials for BRONJ development as a result of chemo and radiotherapy combined with IV zoledronic acid application. Multiple consecutive teeth extractions followed with primary wound closure and LLLT applications were performed under high doses of antibiotics prophylaxis. Satisfactory wound healing in both the surrounding soft and hard tissues was achieved. LLLT application combined with atraumatic surgical interventions under antibiotics prophylaxis is a preferable approach in patients with a risk of BRONJ development. Adjunctive effect of LLLT in addition to careful infection control on preventing BRONJ was reported and concluded. Bone Density Conservation Agents;Diphosphonates Bisphosphonate-Associated Osteonecrosis of the Jaw;Bone Density Conservation Agents;Breast Neoplasms;Diphosphonates;Female;Humans;Infusions, Intravenous;Low-Level Light Therapy;Male;Middle Aged;Multiple Myeloma;Risk Factors;Tooth Extraction

Clinical comparison of potassium-titanyl-phosphate (KTP) versus neodymium:YAG (Nd:YAG) laser treatment for lower extremity telangiectases. BACKGROUND: The Nd:YAG laser has been considered the gold standard of treatment for leg veins, but pain and side effects have fueled physicians to use treatment alternatives. OBJECTIVE: To compare the clinical efficacy of the long-pulsed 1064-nm Nd:YAG laser with KTP laser irradiation in the treatment of leg telangiectasia. METHODS: A series of 16 patients with size-matched superficial telangiectases of the lower extremities were randomly assigned to receive three consecutive monthly treatments with the long-pulsed 1064-nm Nd:YAG on one leg and 532-nm KTP laser irradiation on the other. RESULTS: For the 16 patients who completed the study, 64 leg vein sites were treated. Average clinical improvement scores were 1.94 and 1.25 for the KTP laser-treated leg and 3.38 and 3.50 for the Nd:YAG laser-treated leg with thin (â‰¤ 1 mm) and large (1-3 mm) vessels, respectively. After the third treatment session, average improvement scores of 2.44, 1.31 and 3.75, 3.23 were given for the KTP and Nd:YAG laser-treated sides, respectively. CONCLUSION: Both the 1064-nm Nd:YAG and KTP lasers are effective in the treatment of lower extremity telangiectases. However, the KTP laser has very low efficacy with vessels larger than 1 mm and should not be elected when treating such vessels. Adult;Female;Humans;Lasers, Solid-State;Low-Level Light Therapy;Lower Extremity;Middle Aged;Telangiectasis

A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. Low back pain (LBP) is a common and disabling disorder in western society. The management of LBP comprises a range of different intervention strategies including surgery, drug therapy, and non-medical interventions. The objective of the present study is to determine the effectiveness of physical and rehabilitation interventions (i.e. exercise therapy, back school, transcutaneous electrical nerve stimulation (TENS), low level laser therapy, education, massage, behavioural treatment, traction, multidisciplinary treatment, lumbar supports, and heat/cold therapy) for chronic LBP. The primary search was conducted in MEDLINE, EMBASE, CINAHL, CENTRAL, and PEDro up to 22 December 2008. Existing Cochrane reviews for the individual interventions were screened for studies fulfilling the inclusion criteria. The search strategy outlined by the Cochrane Back Review Groups (CBRG) was followed. The following were included for selection criteria: (1) randomized controlled trials, (2) adult (â‰¥ 18 years) population with chronic (â‰¥ 12

weeks) non-specific LBP, and (3) evaluation of at least one of the main clinically relevant outcome measures (pain, functional status, perceived recovery, or return to work). Two reviewers independently selected studies and extracted data on study characteristics, risk of bias, and outcomes at short, intermediate, and long-term follow-up. The GRADE approach was used to determine the quality of evidence. In total 83 randomized controlled trials met the inclusion criteria: exercise therapy (n = 37), back school (n = 5), TENS (n = 6), low level laser therapy (n = 3), behavioural treatment (n = 21), patient education (n = 1), traction (n = 1), and multidisciplinary treatment (n = 6). Compared to usual care, exercise therapy improved post-treatment pain intensity and disability, and long-term function. Behavioural treatment was found to be effective in reducing pain intensity at short-term follow-up compared to no treatment/waiting list controls. Finally, multidisciplinary treatment was found to reduce pain intensity and disability at short-term follow-up compared to no treatment/waiting list controls. Overall, the level of evidence was low. Evidence from randomized controlled trials demonstrates that there is low quality evidence for the effectiveness of exercise therapy compared to usual care, there is low evidence for the effectiveness of behavioural therapy compared to no treatment and there is moderate evidence for the effectiveness of a multidisciplinary treatment compared to no treatment and other active treatments at reducing pain at short-term in the treatment of chronic low back pain. Based on the heterogeneity of the populations, interventions, and comparison groups, we conclude that there are insufficient data to draw firm conclusion on the clinical effect of back schools, low-level laser therapy, patient education, massage, traction, superficial heat/cold, and lumbar supports for chronic LBP. Humans;Low Back Pain;Physical Therapy Modalities;Treatment Outcome

BIOMECHANICAL AND HISTOLOGICAL ANALYSIS OF THE GASTROCNEMIUS IN RATS SUBJECTED TO MUSCLE INJURY AND TREATMENT WITH LOW-LEVEL LASER THERAPY. OBJECTIVE: To mechanically and histologically evaluate the application of low-level laser therapy to the reparative process on lesions caused by impact on the gastrocnemius muscles of rats. METHODS: 45 female Wistar rats were divided into three groups (n=15/ group): C (control, no lesion), ML (muscle lesion) and ML-L (muscle lesion and laser therapy). The experimental muscle lesion was produced by letting a 250 g load drop from a height of 30 cm, directly onto the muscle. The animals in the ML-L group were subjected to application of 960 nm laser, 2 J/cm(2), on the lesion site, for three days, twice a day. Mechanical tests were performed on an Emic(Â®) universal testing machine. RESULTS: The mean values for the maximum force were: 35.70 (Â± 2.69) N in group C, 31.77 (Â± 2.59) N in group ML and 34.36 (Â± 3.63) N in group ML-L, with a statistically significant difference between groups C and ML ($p < 0.05$). The mean values for relative stiffness were: 3.75 (Â± 0.98) N/mm in group C, 3.84 (Â± 0.32) N/mm in group ML and 4.43 (Â± 0.68) N/mm in group ML-L, with no statistically significant differences ($p>0.05$). Histological analysis showed the presence of blood vessels in group ML-L and hematomas during the repair process. CONCLUSION: Laser therapy had a positive effect on the regeneration process of the muscle injury.

Low-level laser therapy of dentin hypersensitivity: a short-term clinical trial. The aim of this study was to evaluate low-level laser therapy in cervical dentin hypersensitivity. A randomized controlled clinical trial was conducted with a total of 64 teeth. Dentin desensitizer and diode laser were applied on the cervical dentin surfaces. Distilled water and placebo laser was used as the placebo groups. The irradiance used was 4 J/cm(2) per treatment site. The baseline measurement of hypersensitivity was made by using visual analog scale (VAS). Twenty-four hours and 7 days after the application of desensitizer, diode laser and placebo groups, a new VAS analysis was conducted for the patients' sensitivity level. The mean pain scores of placebo groups were significantly higher than the desensitizer's and diode laser's mean scores (ANOVA, $p < 0.05$). The VAS analysis revealed a significant decrease in dentin hypersensitivity in 7 days with the use of the desensitizer and low-level

laser therapy and no statistically significant difference was observed between these two treatments ($p > 0.05$). Although low-level laser and glutaraldehyde containing desensitizer present distinct modes of action, experimental agents caused a significant reduction of dentin hypersensitivity without showing secondary effects, not irritating the pulp or causing pain, not discoloring or staining the teeth, and not irritating the soft tissues at least for a period of 1 week with no drawbacks regarding handling and/or ease of application. Low-level laser therapy and desensitizer application had displayed similar effectiveness in reducing moderate dentin hypersensitivity. Dentin Desensitizing Agents;Glutaral Adult;Dentin Desensitizing Agents;Dentin Sensitivity;Female;Glutaral;Humans;Lasers, Semiconductor;Low-Level Light Therapy;Male;Middle Aged;Pain Measurement;Time Factors;Young Adult

Long-term effects of a single application of a water-cooled pulsed Nd:YAG laser in supplement to scaling and root planing in patients with periodontal inflammation. The aim of this work was to investigate the long-term effects of a single application of a water-cooled pulsed neodymium yttrium aluminium garnet (Nd:YAG) laser, in combination with scaling and root planing (SRP) for the treatment of periodontal inflammation. Twenty-two patients were included in this split-mouth single blind randomized controlled clinical trial. The parameters of the air and water-cooled Nd:YAG laser were: 4 W, 80 mJ/pulse, 50 Hz and a pulse width of 350 Î¼s. The "test side" was treated with a single application of Nd:YAG laser and SRP; while the "control side " was treated with SRP alone. At baseline, and after a median follow-up time of 20 months (range 12-39), periodontal inflammatory parameters (plaque index [PI], gingival index [GI], probing pocket depth [PPD]), and marginal bone loss (on digital bite-wing radiographs) were measured. Gingival crevicular fluid (GCF) was collected from the teeth 35, 36, 45, and 46 at baseline and at follow-up. Pl ($p < 0.01$), GI ($p < 0.01$), and PPD ($p < 0.001$) were significantly lower on the test side compared to the control side at follow-up. Radiological results showed significantly less bone loss on the test side compared to the control side ($p < 0.05$). GCF volume was lower on the test side compared to the control side ($p < 0.01$). In conclusion, a single application of Nd:YAG laser in combination with SRP had a positive long-term effect on periodontal health compared to treatment by SRP alone. Adult;Aged;Combined Modality Therapy;Dental Scaling;Female;Follow-Up Studies;Gingival Crevicular Fluid;Humans;Lasers, Solid-State;Low-Level Light Therapy;Male;Middle Aged;Periodontal Index;Periodontitis;Root Planing;Single-Blind Method

Quantification of fibrosis and mast cells in the tissue response of endodontic sealer irradiated by low-level laser therapy. Low-level laser therapy (LLLT) accelerates tissue repair. Mast cells induce the proliferation of fibroblasts and the development of local fibrosis. The objective of this study was to quantify fibrosis rate and mast cells in connective tissue after endodontic sealer zinc oxide and eugenol (ZOE) was implanted and submitted to LLLT, immediately after implant and again 24 h later. Sixty mice were distributed into three groups: GI, GII, and GIII ($n = 20$). In GI, the tubes filled with Endofill were implanted in the animals and were not irradiated with LLLT. In GII, the tubes containing Endofill were implanted in the animals and then irradiated with red LLLT (InGaAlP) 685-nm wavelength, D = 72 J/Cm(2), E = 2 J, T = 58 s, P = 35 mW, and in GIII, the tubes with Endofill were implanted and irradiated with infrared LLLT (AsGaAl) 830-nm wavelength, D = 70 J/Cm(2), E = 2 J, T = 40 s, P = 50 mW. After 7 days and 30 days, the animals were killed. A series of 6-Âµm-thick sections were obtained and stained with Toluidine Blue and Picrosirius and analyzed under a standard light microscope using a polarized light filter for the quantification of fibrosis. The statistics were qualitative and quantitative with a significance of 5%. The irradiation with LLLT did not offer improvement in the fibrosis rate, however, it provided a significant decrease in the concentration of independent mast cells for the period studied. Root Canal Filling Materials;Endo-Fill;Eugenol;Zinc

Oxide Animals;Eugenol;Fibrosis;Low-Level Light Therapy;Male;Mast Cells;Mice;Root Canal Filling Materials;Root Canal Therapy;Wound Healing;Zinc Oxide
Treatment of post-mastectomy lymphedema with laser therapy: double blind placebo control randomized study. BACKGROUND: In post-mastectomy patients, lymphedema has the potential to become a permanent progressive condition and become extremely resistant to treatment. Thus, it can results in function impairment and decrease quality of life. The aim of this study was to evaluate the effect of low level laser therapy (LLLT) on limb volume, shoulder mobility, and hand grip strength. MATERIAL AND METHODS: Fifty women with breast cancer-related lymphedema were enrolled in a double-blind, placebo controlled trial. Patients were randomly assigned to active laser (n = 25) and placebo (n = 25) groups and received irradiation with Ga-As laser device that had wavelength of 904 nm, power of 5 mW, and spot size of 0.2 cm(2) over the axillary and arm areas, three times a week for 12 wk. The total energy applied at each point was 300 mjoules over seven points, giving a dosage of 1.5 joules/cm(2) in the active group. The placebo group received placebo therapy in which the laser had been disabled without affecting its apparent function. Limb circumference, shoulder mobility, and grip strength were measured before treatment and at 4, 8, and 12 wk. RESULTS: The two groups had similar parameters at baseline. The reduction of limb volume tended to decline in both groups. The trend being more significantly pronounced in active LLLT group than placebo at 8 and 12 wk, respectively ($P < 0.05$). Goniometric data for shoulder mobility and hand grip strength were statistically significance for LLLT group than for placebo. CONCLUSION: Laser treatment was found to be effective in reducing the limb volume, increase shoulder mobility, and hand grip strength in approximately 93% of patients with postmastectomy lymphedema. Double-Blind Method;Extremities;Female;Hand Strength;Humans;Low-Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Range of Motion, Articular;Shoulder
The short-term effects of low-level laser therapy in the management of breast-cancer-related lymphedema. BACKGROUND: Breast-cancer-related lymphedema (BCRL) is a chronic disease, and currently there is no definitive treatment for it. There are some therapeutic interventions targeted to decrease the limb swelling and the associated problems. Low-level laser therapy (LLLT) has been used in the treatment of post-mastectomy lymphedema since 2007 in the US. The aim of this study is to review our short-term experience with LLLT in the treatment of BCRL. METHOD: Seventeen BCRL patients referred to our lymphedema program between 2007 and 2009 were enrolled in this study. All patients had experienced at least one conventional treatment modality such as complex physical therapy, manual lymphatic drainage, and/or pneumatic pump therapy. LLLT was added to patients' ongoing therapeutic regimen. All patients completed the full course of LLLT consisting of two cycles. The difference between sums of the circumferences of both affected and unaffected arms (Î”C), pain score, scar mobility, and range of motion were measured before and after first and second cycles of LLLT sequentially. RESULTS: All patients were female with a median age of 51.8 (44-64) years. Î”C decreased 54% (15-85%) and 73% (33-100%), after the first and second cycles of LLLT, respectively. Fourteen out of seventeen experienced decreased pain with motion by an average of 40% (0-85%) and 62.7% (0-100%) after the first and second cycle of LLLT, respectively. Three patients had no improvement in pain after LLLT. Scar mobility increased in 13 (76.4%) and shoulder range of motion improved in 14 (82.3%) patients after LLLT. One patient developed cellulitis during LLLT. CONCLUSION: Patients with BCRL received additional benefits from LLLT when used in conjunction with standard lymphedema treatment. These benefits include reduction in limb circumference, pain, increase in range of motion and scar mobility. Additionally, two cycles of LLLT were found to be superior to one in this study. Adult;Arm;Breast Neoplasms;Cellulitis;Cicatrix;Combined Modality Therapy;Female;Follow-Up Studies;Humans;Low-

Level Light Therapy;Lymphedema;Mastectomy;Middle Aged;Pain;Range of Motion, Articular;Shoulder Pain;Treatment Outcome

Laser disruption and killing of methicillin-resistant Staphylococcus aureus biofilms. OBJECTIVE: The aim of the study was to study the efficacy of 2 different lasers in vitro, in disrupting biofilm and killing planktonic pathogenic bacteria. MATERIALS AND METHODS: Biofilms of a stable bioluminescent of Staphylococcus aureus Xen 31 were grown in a 96-well microtiter plate for 3 days. The study included 7 arms: (a) control; (b) ciprofloxacin (3 mg/L, the established minimum inhibitory concentration [MIC]) alone; (c) shock wave (SW) laser alone; (d) near-infrared (NIR) laser alone; (e) SW laser and ciprofloxacin; (f) SW and NIR lasers; (g) SW, NIR lasers, and ciprofloxacin. The results were evaluated with an in vivo imaging system (IVIS) biophotonic system (for live bacteria) and optical density (OD) for total bacteria. RESULTS: Without antibiotics, there was a 43% reduction in OD ($P < .05$) caused by the combination of SW and NIR suggesting that biofilm had been disrupted. There was an 88% reduction ($P < .05$) in live biofilm. Ciprofloxacin alone resulted in a decrease of 28% of total live cells (biofilm remaining attached) and 58% of biofilm cells (both $P > .05$). Ciprofloxacin in combination with SW and SW + NIR lasers caused a decrease of more than 60% in total live biomass and more than 80% of biofilm cells, which was significantly greater than ciprofloxacin alone ($P < .05$). CONCLUSIONS: We have demonstrated an effective nonpharmacologic treatment method for methicillin-resistant Staphylococcus aureus (MRSA) biofilm disruption and killing using 2 different lasers. The preferred treatment sequence is a SW laser disruption of biofilm followed by NIR laser illumination. Treatment optimization of biofilm is possible with the addition of ciprofloxacin in concentrations consistent with planktonic MIC. Culture Media;Ciprofloxacin Biofilms;Ciprofloxacin;Culture Media;High-Energy Shock Waves;Humans;In Vitro Techniques;Low-Level Light Therapy;Methicillin-Resistant Staphylococcus aureus;Microbial Sensitivity Tests;Reference Values;Sensitivity and Specificity;Spectroscopy, Near-Infrared;Staphylococcal Infections

Comparison of effects of diode laser and CO2 laser on human teeth and their usefulness in topical fluoridation. Various authors have reported more effective fluoridation from the use of lasers combined with topical fluoride than from conventional topical fluoridation. Besides the beneficial effect of lasers in reducing the acid solubility of an enamel surface, they can also increase the uptake of fluoride. The study objectives were to compare the action of CO(2) and GaAlAs diode lasers on dental enamel and their effects on pulp temperature and enamel fluoride uptake. Different groups of selected enamel surfaces were treated with amine fluoride and irradiated with CO(2) laser at an energy power of 1 or 2Â W or with diode laser at 5 or 7Â W for 15Â s each and compared to enamel surfaces without treatment or topical fluoridated. Samples were examined by means of environmental scanning electron microscopy (ESEM). Surfaces of all enamel samples were then acid-etched, measuring the amount of fluoride deposited on the enamel by using a selective ion electrode. Other enamel surfaces selected under the same conditions were irradiated as described above, measuringÂ the increase in pulp temperature with a thermocouple wire. Fluorination with CO(2) laser at 1Â W and diode laser at 7Â W produced a significantly greater fluoride uptake on enamel (89â€‰Â±â€‰18Â mg/l) and (77â€‰Â±â€‰17Â mg/l) versus topical fluoridation alone (58â€‰Â±â€‰7Â mg/l) and no treatment (20â€‰Â±â€‰1Â mg/l). Diode laser at 5Â W produced a lesser alteration of the enamel surface compared to CO(2) laser at 1Â W, but greater pulp safety was provided by CO(2) laser (Î”TÂ° 1.60Â°â€‰Â±â€‰0.5) than by diode laser (Î”TÂ° 3.16Â°â€‰Â±â€‰0.6). Diode laser at 7Â WÂ and CO(2) laser at 2Â W both caused alterations on enamel surfaces, but great pulp safety was again obtained with CO(2) (Î”TÂ° 4.44Â°â€‰Â±â€‰0.60) than with diode (Î”TÂ° 5.25Â°â€‰Â±â€‰0.55). Our study demonstrates that CO(2) and diode laser irradiation of the enamel surface can both increase fluoride uptake; however, laser energy parameters must be carefully controlled in order to limit increases in pulpal temperature and

alterations to the enamel surface. Fluorides, Topical Dental Caries;Dental Enamel;Dental Pulp;Fluorides, Topical;Humans;Lasers, Gas;Lasers, Semiconductor;Low-Level Light Therapy;Microscopy, Electron, Scanning;Surface Properties;Temperature;Tooth
Efficacy of low-level laser therapy for body contouring and spot fat reduction. BACKGROUND: Low-level laser therapy (LLLT) is commonly used in medical applications, but scientific studies of its efficacy and the mechanism by which it causes loss of fat from fat cells for body contouring are lacking. This study examined the effectiveness and mechanism by which 635â€“680 nm LLLT acts as a non-invasive body contouring intervention method. METHODS: Forty healthy men and women ages 18â€“65 years with a BMI <30 kg/m2 were randomized 1:1 to laser or control treatment. Subject's waistlines were treated 30 min twice a week for 4 weeks. Standardized waist circumference measurements and photographs were taken before and after treatments 1, 3, and 8. Subjects were asked not to change their diet or exercise habits. In vitro assays were conducted to determine cell lysis, glycerol, and triglyceride release. RESULTS: Data were analyzed for those with body weight fluctuations within 1.5 kg during 4 weeks of the study. Each treatment gave a 0.4â€“0.5 cm loss in waist girth.Cumulative girth loss after 4 weeks was âˆ’2.15 cm (âˆ’0.78 Â± 2.82 vs. 1.35 Â± 2.64 cm for the control group,p < 0.05). A blinded evaluation of standardized pictures showed statistically significant cosmetic improvement after 4 weeks of laser treatment. In vitro studies suggested that laser treatment increases fat loss from adipocytes by release of triglycerides, without inducing lipolysis or cell lysis. CONCLUSIONS: LLLT achieved safe and significant girth loss sustained over repeated treatments and cumulative over 4 weeks of eight treatments. The girth loss from the waist gave clinically and statistically significant cosmetic improvement. Triglycerides Adipocytes;Adolescent;Adult;Aged;Body Fat Distribution;Cosmetic Techniques;Double-Blind Method;Female;Humans;Lasers, Semiconductor;Lipolysis;Low-Level Light Therapy;Male;Middle Aged;Overweight;Subcutaneous Fat, Abdominal;Triglycerides;Waist Circumference;Young Adult